

Racal 1260-45A

## High-Density Switch Matrix (Option 01 or 01T Compatible)



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# **RACAL INSTRUMENTS 1260-45 SWITCH MODULE**

**PUBLICATION NO. 980673-008**

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# FOR YOUR SAFETY

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Before undertaking any troubleshooting, maintenance or exploratory procedure, read carefully the **WARNINGS** and **CAUTION** notices.



**CAUTION**  
RISK OF ELECTRICAL SHOCK  
DO NOT OPEN



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

**1260-45A CRIMP Signal Matrix module, P/N 407052-001**  
**1260-45A IDC Signal Matrix module, P/N 407052-101**  
**1260-45B IDC Signal Matrix module, P/N 407052-102**  
**1260-45B CRIMP Signal Matrix module, P/N 407052-002**  
**1260-45C CRIMP Signal Matrix module, P/N 407052-003**  
**1260-45C IDC Signal Matrix module, P/N 407052-103**

They conform to the following Product Specifications:

**Safety:** EN61010-1:1993+A2:1995

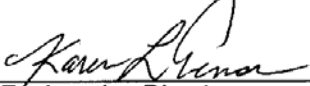
**EMC:** EN61326:1997+A1:1998

### 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, May 14, 2002

  
Engineering Director

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## **NOTE FOR SYSTEMS WITH 1260-OPT 01T**

The “Module-Specific Syntax” section of this manual shows the command syntax for the 1260-01S Smart Card. If you are using the newer 1260-01T Smart Card, the commands will NOT work as shown.

Consult the 1260-01T Manual for a description of the commands which may be used with the 1260-01T Smart Card.

The channel numbers described in this manual are valid for the 1260-01T. The channel numbers continue to be used for the 1260-01T.

The syntax of the commands which use channel numbers has changed for those cards controlled by the 1260-01T.

The new syntax used to close a channel is:

CLOSE (@ <module address> ( <channel> ) )

For example, with for a relay module whose <module address> is set to 7, closing <channel> 0 is performed with the command:

CLOSE (@ 7 (0))

Using the older 1260-01S, the command would be (as shown in this manual):

CLOSE 7.0

Many other command syntax differences exist. Please consult chapter 2 of the 1260-01T manual for a description of the commands which are available for the 1260-01T.

### Control Information for the 1260-45 (A, B, and C)

The following information describes the control-register-to-relay-channel mapping for a 1260-45 Relay Module. This information may be used to control a 1260-45 when using a 1260-01T in the register-based mode of operation.

The relays used on this module are latching relays. They stay closed even if power is removed. However, guard relays isolate the matrix from the edge connector when power is removed.

A variety of control registers are used to control the matrix relays. These control registers are accessible by writing to memory locations in the A24 address space. The A24 address of each control register is based on three items:

- the A24 Offset assigned to the 1260-01T by the Resource Manager
- the Module Address assigned to the relay module with DIP Switch SW-1
- which control register to write to (Control Register 0 through 5)

The “A24 Base Address” of the 1260-45 module can be computed by:

$$(A24 \text{ Address Assigned to } 1260-01T) + (\text{Module Address} \times 400_{16}) + 1$$

For example, suppose the following setup:

A24 Address Assigned to 1260-01T by Resource Manager = 204 000<sub>16</sub>  
Module Address of 1260-45 = 7

Then the “A24 Base Address” for the 1260-45 Module would be:

$$\begin{aligned} 204\,000_{16} + (7 \times 400_{16}) + 1 &= \\ 204\,000_{16} + 1C00_{16} + 1 &= \\ 205\,C01_{16} \end{aligned}$$

Control Registers are located at offsets from the “A24 Base Address” of the module. Control Registers are located only at odd addresses. The following Control Registers are implemented by the 1260-45:

| Designator | Offset from A24 Base Addr | Description                                         |
|------------|---------------------------|-----------------------------------------------------|
| CROWADDR1  | 0                         | Holds Row to Close, Channels 0000 thru 1315         |
| CROWADDR2  | 2                         | Holds Row to Close, Channels 2000 thru 3315         |
| OROWADDR1  | 4                         | Holds Row to Open, Channels 0000 thru 1315          |
| OROWADDR2  | 6                         | Holds Row to Open, Channels 0000 thru 3315          |
| CWADDR1    | 8                         | Write Address for columns 0 thru 7 of selected row  |
| CWADDR2    | A (hexadecimal)           | Write Address for columns 8 thru 15 of selected row |
| GRDADDR    | C (hexadecimal)           | Control Address for Guard Relays                    |

NOTE: When using VISA functions, such as viIn8() and viOut8(), the base A24 offset of the 1260-01T is already included by VISA. Therefore, when using a function such as viOut8() to write the value A7 (hex) to CWADDR1 in the example above, do **NOT** include the A24 in the function call:

Thus, the following function call may be used to write the value C6 to Control Register CWADDR1 of a 1260-45 at module address 7:

```
viOut8( hdl, 0x1C09, 0xA7 );
```

Relays are operated in parallel, up to all 16 in a column at one time. Relays are selected for operation by writing to the CWADDR1 and CWADDR2 Control Registers before writing to CROWADDR1 or CROWADDR2 (for closing relays) or OROWADDR1 or OROWADDR2 (for opening relays).

The CWADDR1 and CWADDR2 together form a 16-bit control register which defines which of the 16-relays in the selected row will be operated. This is shown in the table below:

| Control Register Bit | Controls Column of Selected Row | Bit Weight |
|----------------------|---------------------------------|------------|
| CWADDR1, bit 0       | 0                               | 0x01       |
| CWADDR1, bit 1       | 1                               | 0x02       |
| CWADDR1, bit 2       | 2                               | 0x04       |
| CWADDR1, bit 3       | 3                               | 0x08       |
| CWADDR1, bit 4       | 4                               | 0x10       |
| CWADDR1, bit 5       | 5                               | 0x20       |
| CWADDR1, bit 6       | 6                               | 0x40       |
| CWADDR1, bit 7       | 7                               | 0x80       |
| CWADDR2, bit 0       | 8                               | 0x01       |
| CWADDR2, bit 1       | 9                               | 0x02       |
| CWADDR2, bit 2       | 10                              | 0x04       |
| CWADDR2, bit 3       | 11                              | 0x08       |
| CWADDR2, bit 4       | 12                              | 0x10       |
| CWADDR2, bit 5       | 13                              | 0x20       |
| CWADDR2, bit 6       | 14                              | 0x40       |
| CWADDR2, bit 7       | 15                              | 0x80       |

The following procedure may be used to open the relays in a selected row:

- 1) Determine which OROWADDR Control Register that will be used. For Channels 0000 through 1315, use OROWADDR1; for Channels 2000 through 3315, use OROWADDR2.
- 2) Determine which columns of the row are to be opened. Form the control values for CWADDR1 and CWADDR2 by OR-ing the bit weights for the desired relays. For example, if columns 0, 3, 12, and 13 are to be opened, the value  $9_{16}$  would be used for CWADDR1 and  $30_{16}$  would be used for CWADDR2. Write the calculated values to CWADDR1 and CWADDR2 (using ViOut8() or equivalent)
- 3) Write one of the following control values to OROWADDR1 or OROWADDR2, depending on which row you wish to operate.
  - 1 : to open relays in row 0
  - 2 : to open relays in row 1
  - 4 : to open relays in row 2
  - 8 : to open relays in row 3

- 4) Wait 4 milliseconds
- 5) Write the value 0 to OROWADDR1 or OROWADDR2

The following procedure may be used to close the relays in a selected row:

- 1) Determine which CROWADDR Control Register that will be used. For Channels 0000 through 1315, use CROWADDR1; for Channels 2000 through 3315, use CROWADDR2.
- 2) Determine which columns of the row are to be closed. Form the control values for CWADDR1 and CWADDR2 by OR-ing the bit weights for the desired relays. For example, if columns 1, 2, 5, 10, and 15 are to be closed, the value  $26_{16}$  would be used for CWADDR1 and  $84_{16}$  would be used for CWADDR2. Write the calculated values to CWADDR1 and CWADDR2 (using ViOut8() or equivalent)
- 3) Write one of the following control values to CROWADDR1 or CROWADDR2, depending on which row you wish to operate.
  1. 1 : to close relays in row 0
  2. 2 : to close relays in row 1
  3. 4 : to close relays in row 2
  4. 8 : to close relays in row 3

- 4) Wait 4 milliseconds
- 5) Write the value 0 to CROWADDR1 or CROWADDR2

Example:

Close Channel 2312, or matrix group 2, row 3, column 12:

- 1) Write 0 to CWADDR1
- 2) Write  $10_{16}$  to CWADDR2 (this selects column 12)
- 3) Write 8 to CROWADDR1 (this selects row 3)
- 4) Wait 4 milliseconds
- 5) Write 0 to CROWADDR1

In addition to the matrix, there are guard relays which isolate the matrix from the edge connector when the VXI chassis is powered down. When the chassis is powered up, the firmware on the 1260-01T will ensure that the guard relays are closed AFTER the firmware has opened all relays within the matrix. However, if direct manipulation of the guard relays is desired, the value 3 may be written to the control register GRDADDR to close the guard relays. The value 0 may be written to open all guard relays.

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## Chapter 1

# MODULE SPECIFICATION

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### General

The 1260-45 Signal Matrix Module is a quad 4 x 16 matrix. It switches two lines per channel, and has the capability of being configured as either four 4 x 16, two 4 x 32, or two 8 x 16 matrices. The configuration is determined at the time of ordering, and is set in the factory. The user connector pinouts have been designed to also allow external configuration by the user, with a minor degradation in high-frequency response. The extent of the degradation is dependent upon the user's cabling, but should be negligible in most applications. The performance specifications given below are for a single 4 x 16 array

### 1260-45 Module Specifications

#### Factory Configurations:

|          |             |
|----------|-------------|
| 1260-45A | Quad 4 x 16 |
| 1260-45B | Dual 4 x 32 |
| 1260-45C | Dual 8 x 16 |

#### Additional 1260-45A Configurations Via External Cabling:

|                                    |               |                |
|------------------------------------|---------------|----------------|
| Single 4 x 64                      | Single 8 x 32 | Single 16 x 16 |
| Dual 4 x 32                        | Dual 8 x 16   |                |
| Dual 4 x 16 and a Single 4 x 32    |               |                |
| Dual 4 x 16 and a Single 8 x 16    |               |                |
| Single 4 x 32 and a Single 8 x 16  |               |                |
| Single 4 x 16 and a Single 4 x 48  |               |                |
| Single 4 x 16 and a Single 12 x 16 |               |                |

#### Additional 1260-45B Configurations Via External Cabling:

|               |               |
|---------------|---------------|
| Single 4 x 64 | Single 8 x 32 |
|---------------|---------------|

#### Additional 1260-45C Configurations Via External Cabling:

|               |                |
|---------------|----------------|
| Single 8 x 32 | Single 16 x 16 |
|---------------|----------------|

Larger matrices can be configured by interconnecting multiple modules. For more information, see enclosed Application Note SWI002.

## Maximum Switchable Voltage

(Terminal-Terminal or  
Terminal-Chassis) 300 VDC, 300 VAC

## Maximum Switchable Power

Per Channel 30W, 62.5 VA (Resistive Load)

## Path Resistance

Worst Case < 1.6Ω  
End of Life < 2.5Ω

Isolation Hi-Lo > 100 MΩ

## Capacitance

Open Channel <100 pF  
Channel-Chassis <200 pF  
Hi-Lo <200 pF

Minimum Bandwidth 50Ω Termination  
25 MHz (4 x 16)  
25 MHz (4 x 32)  
20 MHz (4 x 64)  
10 MHz (16 x 16)

Insertion Loss, 50Ω Termination  
< 1 dB to 100 kHz  
< 1.5 dB to 1 MHz

Crosstalk, 50Ω Termination  
(4X16) < -50 dB to 100 kHz  
-50 dB to 1 MHz

## Cooling

Airflow 4.0 litres/sec.  
Backpressure 0.5mm H<sub>2</sub>O

Power (I<sub>pm</sub>)

+5V .4A (2.8A Option 01 installed)  
+24V 0.16A

Weight 3.07 lbs. (1.38kg)  
3.35 lbs. (1.51kg) w/ Opt 01

User Connector 64-Pin (2 rows)  
IDC Quick Disconnect\*

\* A crimp connector kit is also available for this module (P/N 407051-001). A strain relief option can be ordered separately for this crimp connector kit, P/N 407207.

## Chapter 2

# INSTALLATION INSTRUCTIONS

---

### Unpacking and Inspection



1. Remove the 1260-45 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 1260-45 module option and the 1260-45 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 1260-45 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.

### Option 01 Installation

Installation of the Option 01 into the 1260-45 is described in the Installation section of the 1260 Series VXI Switching Cards Manual.

## **Module Installation**

Installation of the 1260-45 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, Publication No. 986673. The ID byte DIP switch, SW1, should be set as follows:

|           |             |
|-----------|-------------|
| 1260-45A: | 6=OFF 5=OFF |
| 1260-45B: | 6=OFF 5=ON  |
| 1260-45C: | 6=ON 5=OFF  |

## Chapter 3

# MODULE SPECIFIC SYNTAX

---

### Module Specific Command Syntax

This section contains the command syntax information that is unique to the 1260-45. A more detailed explanation of the individual commands is contained in the 1260 Series VXI Switching Cards Manual, Publication No. 980673.

The Module Specific Syntax for the 1260-45 is required in the use of the OPEN and CLOSE commands. It will also appear in data output by the 1260 Series Master in response to the PDATAOUT command.

---

### Syntax

The Module Specific Syntax for the 1260-45 Quad 4 x 16 Signal Matrix module is as follows:

<mod addr>.<grp no><row no><col no>

where <mod addr> is the switch card address.

---

#### **NOTE:**

The <mod addr> used here is not the VXIbus defined logical address of the 1260 Series Master. It is peculiar to the 1260 Series and describes the switching module in relation to the 1260 Master. This address corresponds to the binary value of the switch setting of SW1 on the switching module PCB.

---

<grp no> is a reference to the matrix containing the relay to be switched. It is a single digit number between 0 and 3.

<row no> is the matrix row to be connected. It is a single digit number between 0 and 3.

<col no> is the matrix column to be connected. It is a two digit number between 00 and 15.

Refer to **Figures 3-1, 3-2**, and **Table 3-1** for group numbers, row numbers, column numbers, and connector pins for this module.

If more than one connection is to be made or broken with contiguous rows or columns, the following format is supported:

<mod addr>.<row no.><col no.>-<row no.><col no.>

Multiple paths and path groups can be specified on a single command line by separating the path designators by commas. Command lines terminate at the end of the line.

**EXAMPLE:**

OPEN 3.0115,0200-0205,1200-1209,1213,2300,3315

All configurations respond to the same sets of values for <grp no>, <row no>, and <col no>.

## **PDATAOUT Command**

The PDATAOUT command causes the specified module to transmit the CLOSED state of the relays. The syntax used is:

PDATAOUT <mod addr>[;<mod addr>][;<mod addr>]....

The response to the PDATAOUT command is as follows:

```
<header>
<mod addr>. <grp no><row no><col no>[,...]
<grp no><row no><col no>[,...]
<mod addr>.END
```

where <header> is as follows:

1260-45A: <mod addr>. 1260-45A Quad 4x16 SIGNAL MATRIX  
MODULE

1260-45B: <mod addr>. 1260-45B Dual 4x32 SIGNAL MATRIX  
MODULE

1260-45C: <mod addr>. 1260-45C Dual 8x16 SIGNAL MATRIX  
MODULE

Note the actual <header> sent is determined by the setting of the ID Byte DIP switches on the module, and is independent of any external user configuration cables.

## PSETUP Command

The PSETUP command causes the specified module to transmit its sequence mode. The supported sequence modes are IMM (Immediate), BBM (Break-Before-Make), and MBB (Make-Before-Break). The syntax used is:

PSETUP <mod addr>[;<mod addr>][;<mod addr>]....

The response to the PSETUP command is as follows:

```
<header>
<mod addr>.<seq mode>
<mod addr>.END
```

where <seq mode> is IMM, BBM, or MBB, and  
where <header> is as follows:

1260-45A: <mod addr>. 1260-45A Quad 4x16 SIGNAL MATRIX  
MODULE

1260-45B: <mod addr>. 1260-45B Dual 4x32 SIGNAL MATRIX  
MODULE

1260-45C: <mod addr>. 1260-45C Dual 4x32 SIGNAL MATRIX  
MODULE

Note the actual <header> sent is determined by the setting of the ID Byte DIP switches on the module, and is independent of any external user configuration cables.

The 1260-45 supports most standard 1260 features. These include Confidence Mode, Equate/Exclude/Scan Lists commands, and the STORE/RECALL commands.

---

## Connector Pin Configuration

Refer to **Figure 3-1** for pin configurations of the front panel connectors J200 to J203. J200 to J203 is Part Number 602005. The part numbers for the mating connectors and discrete wire connectors are shown below. The actual pinouts are given in **Table 3-1** and **Figure 3-2**.

### Mating Connectors

|            |                |
|------------|----------------|
| 602004     | Connector Body |
| 602004-001 | Strain Relief  |
| 602004-002 | Pull Tabs      |

### Crimp (Discrete Wire Connectors)

|            |      |
|------------|------|
| 602159-064 | Body |
| 602159-900 | Pins |

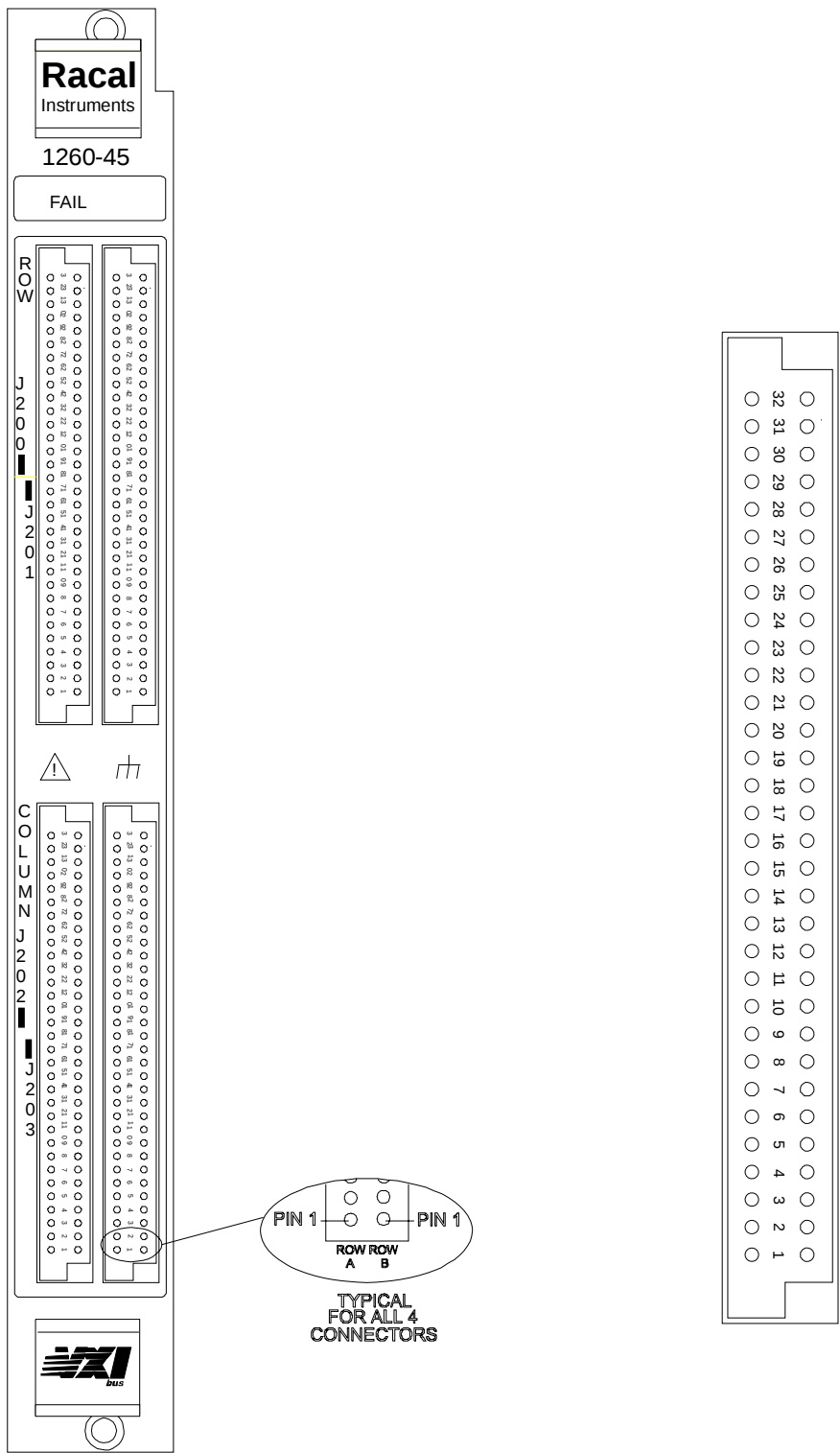


Figure 3-1, 1260-45 User Connector Pin Configuration

Table 3-1, 1260-45 Pin Assignments

| Grp | Row | Hi Pin   | Lo Pin   | Col | Hi Pin   | Lo Pin   |
|-----|-----|----------|----------|-----|----------|----------|
| 0   | 0   | J200-A18 | J200-B18 | 0   | J202-A32 | J202-B32 |
|     | 1   | J200-A22 | J200-B22 | 1   | J202-A30 | J202-B30 |
|     | 2   | J200-A26 | J200-B26 | 2   | J202-A28 | J202-B28 |
|     | 3   | J200-A30 | J200-B30 | 3   | J202-A26 | J202-B26 |
|     |     |          |          | 4   | J202-A24 | J202-B24 |
|     |     |          |          | 5   | J202-A22 | J202-B22 |
|     |     |          |          | 6   | J202-A20 | J202-B20 |
|     |     |          |          | 7   | J202-A18 | J202-B18 |
|     |     |          |          |     |          |          |
|     |     |          |          | 8   | J202-A16 | J202-B16 |
|     |     |          |          | 9   | J202-A14 | J202-B14 |
|     |     |          |          | 10  | J202-A12 | J202-B12 |
|     |     |          |          | 11  | J202-A10 | J202-B10 |
|     |     |          |          | 12  | J202-A8  | J202-B8  |
|     |     |          |          | 13  | J202-A6  | J202-B6  |
|     |     |          |          | 14  | J202-A4  | J202-B4  |
|     |     |          |          | 15  | J202-A2  | J202-B2  |
|     |     |          |          |     |          |          |
| Grp | Row | Hi Pin   | Lo Pin   | Col | Hi Pin   | Lo Pin   |
| 1   | 0   | J200-A20 | J200-B20 | 0   | J202-A31 | J202-B31 |
|     | 1   | J200-A24 | J200-B24 | 1   | J202-A29 | J202-B29 |
|     | 2   | J200-A28 | J200-B28 | 2   | J202-A27 | J202-B27 |
|     | 3   | J200-A32 | J200-B32 | 3   | J202-A25 | J202-B25 |
|     |     |          |          | 4   | J202-A23 | J202-B23 |
|     |     |          |          | 5   | J202-A21 | J202-B21 |
|     |     |          |          | 6   | J202-A19 | J202-B19 |
|     |     |          |          | 7   | J202-A17 | J202-B17 |
|     |     |          |          |     |          |          |
|     |     |          |          | 8   | J202-A15 | J202-B15 |
|     |     |          |          | 9   | J202-A13 | J202-B13 |
|     |     |          |          | 10  | J202-A11 | J202-B11 |
|     |     |          |          | 11  | J202-A9  | J202-B9  |
|     |     |          |          | 12  | J202-A7  | J202-B7  |
|     |     |          |          | 13  | J202-A5  | J202-B5  |
|     |     |          |          | 14  | J202-A3  | J202-B3  |
|     |     |          |          | 15  | J202-A1  | J202-B1  |

Table 3-1, 1260-45 Pin Assignments (continued)

| Grp | Row | Hi Pin   | Lo Pin   | Col | Hi Pin   | Lo Pin   |
|-----|-----|----------|----------|-----|----------|----------|
| 2   | 0   | J201-A18 | J201-B18 | 0   | J203-A32 | J203-B32 |
|     | 1   | J201-A22 | J201-B22 | 1   | J203-A30 | J203-B30 |
|     | 2   | J201-A26 | J201-B26 | 2   | J203-A28 | J203-B28 |
|     | 3   | J201-A30 | J201-B30 | 3   | J203-A26 | J203-B26 |
|     |     |          |          | 4   | J203-A24 | J203-B24 |
|     |     |          |          | 5   | J203-A22 | J203-B22 |
|     |     |          |          | 6   | J203-A20 | J203-B20 |
|     |     |          |          | 7   | J203-A18 | J203-B18 |
|     |     |          |          |     |          |          |
|     |     |          |          | 8   | J203-A16 | J203-B16 |
|     |     |          |          | 9   | J203-A14 | J203-B14 |
|     |     |          |          | 10  | J203-A12 | J203-B12 |
|     |     |          |          | 11  | J203-A10 | J203-B10 |
|     |     |          |          | 12  | J203-A8  | J203-B8  |
|     |     |          |          | 13  | J203-A6  | J203-B6  |
|     |     |          |          | 14  | J203-A4  | J203-B4  |
|     |     |          |          | 15  | J203-A2  | J203-B2  |
|     |     |          |          |     |          |          |
| Grp | Row | Hi Pin   | Lo Pin   | Col | Hi Pin   | Lo Pin   |
| 3   | 0   | J201-A20 | J201-B20 | 0   | J203-A31 | J203-B31 |
|     | 1   | J201-A24 | J201-B24 | 1   | J203-A29 | J203-B29 |
|     | 2   | J201-A28 | J201-B28 | 2   | J203-A27 | J203-B27 |
|     | 3   | J201-A32 | J201-B32 | 3   | J203-A25 | J203-B25 |
|     |     |          |          | 4   | J203-A23 | J203-B23 |
|     |     |          |          | 5   | J203-A21 | J203-B21 |
|     |     |          |          | 6   | J203-A19 | J203-B19 |
|     |     |          |          | 7   | J203-A17 | J203-B17 |
|     |     |          |          |     |          |          |
|     |     |          |          | 8   | J203-A15 | J203-B15 |
|     |     |          |          | 9   | J203-A13 | J203-B13 |
|     |     |          |          | 10  | J203-A11 | J203-B11 |
|     |     |          |          | 11  | J203-A9  | J203-B9  |
|     |     |          |          | 12  | J203-A7  | J203-B7  |
|     |     |          |          | 13  | J203-A5  | J203-B5  |
|     |     |          |          | 14  | J203-A3  | J203-B3  |
|     |     |          |          | 15  | J203-A1  | J203-B1  |

### Chassis Ground:

|      |                                                                                      |
|------|--------------------------------------------------------------------------------------|
| J200 | A1-A4, A19, A21, A23, A25, A27, A29, A31<br>B1-B4, B19, B21, B23, B25, B27, B29, B31 |
| J201 | A1-A4, A19, A21, A23, A25, A27, A29, A31<br>B1-B4, B19, B21, B23, B25, B27, B29, B31 |

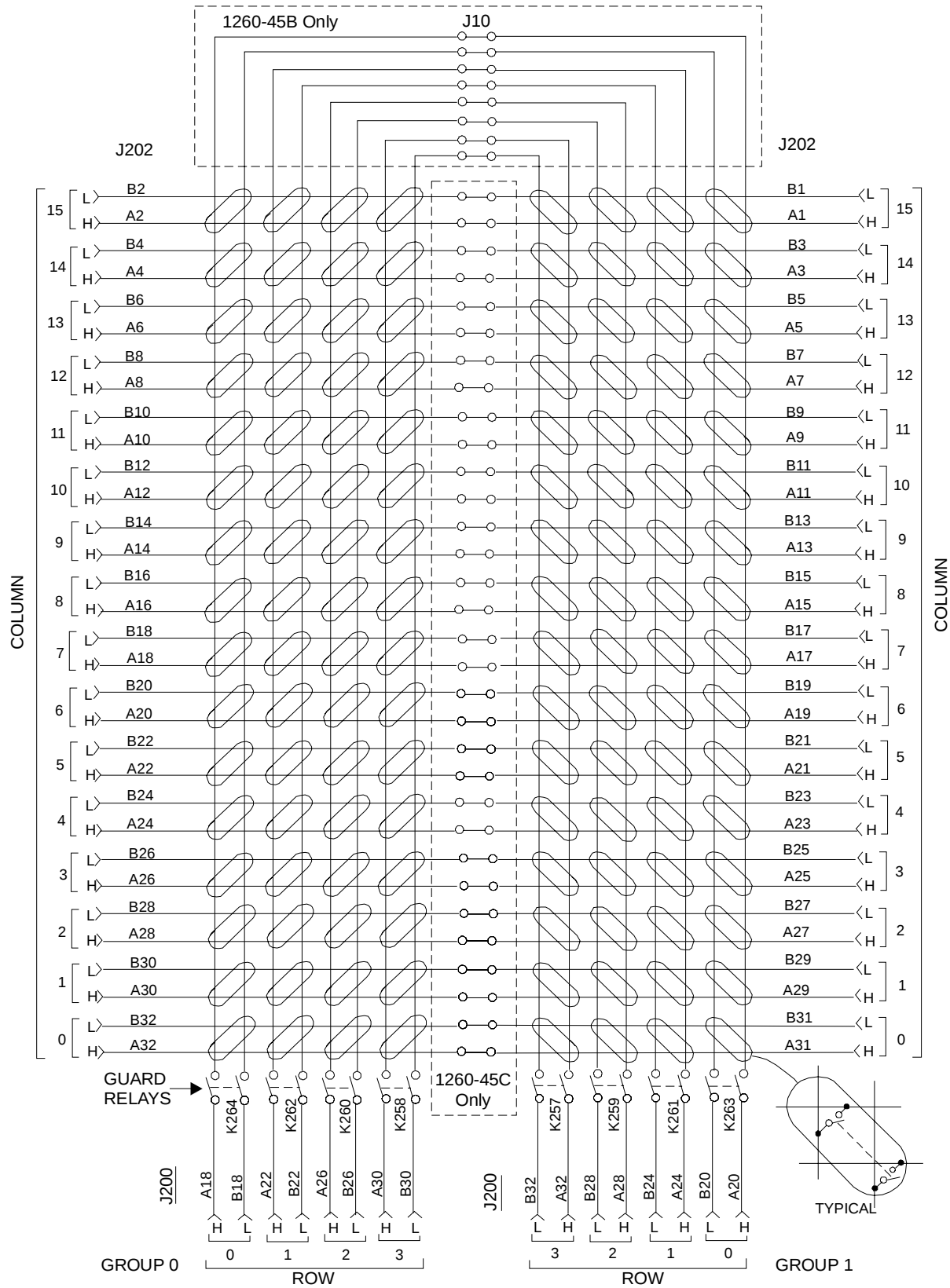


Figure 3-2a, 1260-45 Matrix Pinouts

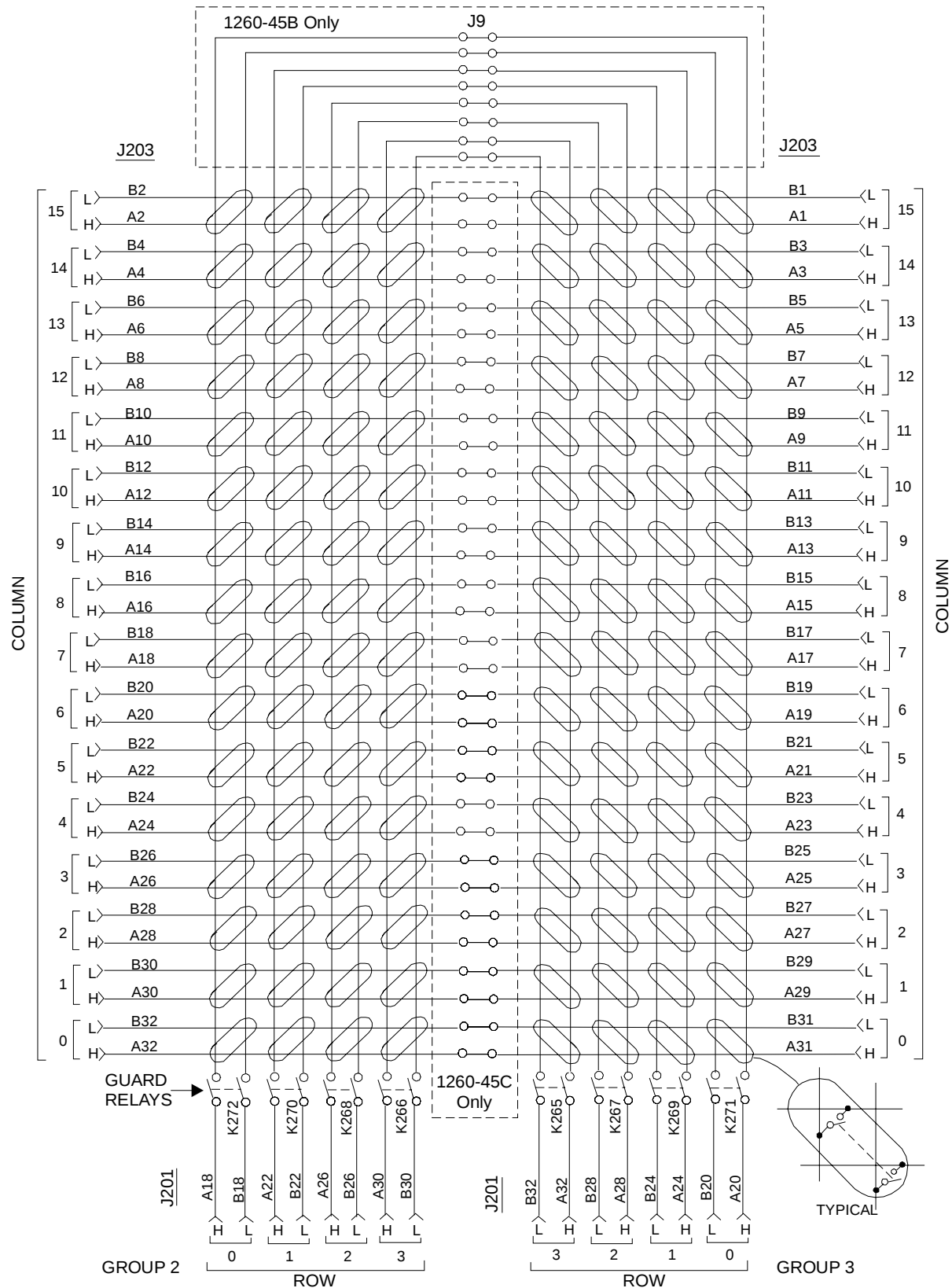


Figure 3-2b, 1260-45 Matrix Pinouts

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## Expansion and Configuration

Internally, the 1260-45 consists of two PCBAs with identical, dual 4 x 16 matrices. Each PCB assembly can be configured, via internal push-on jumpers, to connect the Rows and Columns of the two matrices. If Row 0 of the first matrix is connected to Row 0 of the second matrix, Row 1 of the first is connected to Row 1 of the second, etc., the PCB assembly becomes a 4 x 32 matrix. The difference between the 1260-45A and the 1260-45B is the -45B module is shipped with these jumpers installed on both PCB assemblies at the factory. Similarly, if Column 0 of the first matrix is connected to Column 0 of the second matrix, etc., the PCB assembly becomes an 8 x 16 matrix. The 1260-45C has the columns of the two PCB assemblies connected in this fashion when shipped from the factory. (Refer to **Figure 3-2**. The jumpers are designated J7 and J8 for the columns, and J9 and J10 for the rows).

The 1260-45 module can also be configured externally. The P/N 407058, shown in **Figure 3-3**, is included in the ship kit of each module for this purpose. Connector 3 is the regular user interface. The mate to this connector can be a discrete wire connector or a ribbon cable, depending upon user preferences. Connectors 1 and 2 are connected in parallel across the ribbon cable. When these are inserted into J200 and J201, the result is a dual 4 x 32 array.

Unlike the 1260-45B configuration, the interconnected matrices are on different PCBAs inside the module. This ribbon cable can then be extended to adjacent 1260-45 modules in the VXI mainframe to yield dual 4 x 64, dual 4 x 96, etc. matrices. The dual arrays can be connected together using either the internal jumpers in a 1260-45B module, jumpers in the user cabling, or a "configuration" connector across the ribbon cable. The mate to the configuration connector should be a discrete wire, loopback connector; i.e., it connects Group 0 Row 0 to Group 2 Row 0, Group 1 Row 1 to Group 1 Row 2, etc. This loopback "configuration" connector would allow a single 1260-45A to become a 4 x 64 matrix.

Columns can be connected in the same fashion to yield a single 16 x 16 matrix per module. **Table 3-2** shows some common configurations. Refer to Application Note SWI002 for more information on the 1260-45 configurations.

Table 3-2, Common 1260-45 Configurations

| Configuration | Start With       | Cabling Used                                    |
|---------------|------------------|-------------------------------------------------|
| 4 x 64        | 1260-45B         | Rows with Loopback                              |
| 8 x 32        | 1260-45B         | Columns with Loopback                           |
| 16 x 16       | 1260-45C         | Columns with Loopback                           |
| 8 x 64        | 4 x 64 2 modules | Columns with Loopback<br>Between Modules (LBBM) |
| 16 x 32       | 8 x 32 2 modules | Columns with Loopback<br>Between Modules (LBBM) |

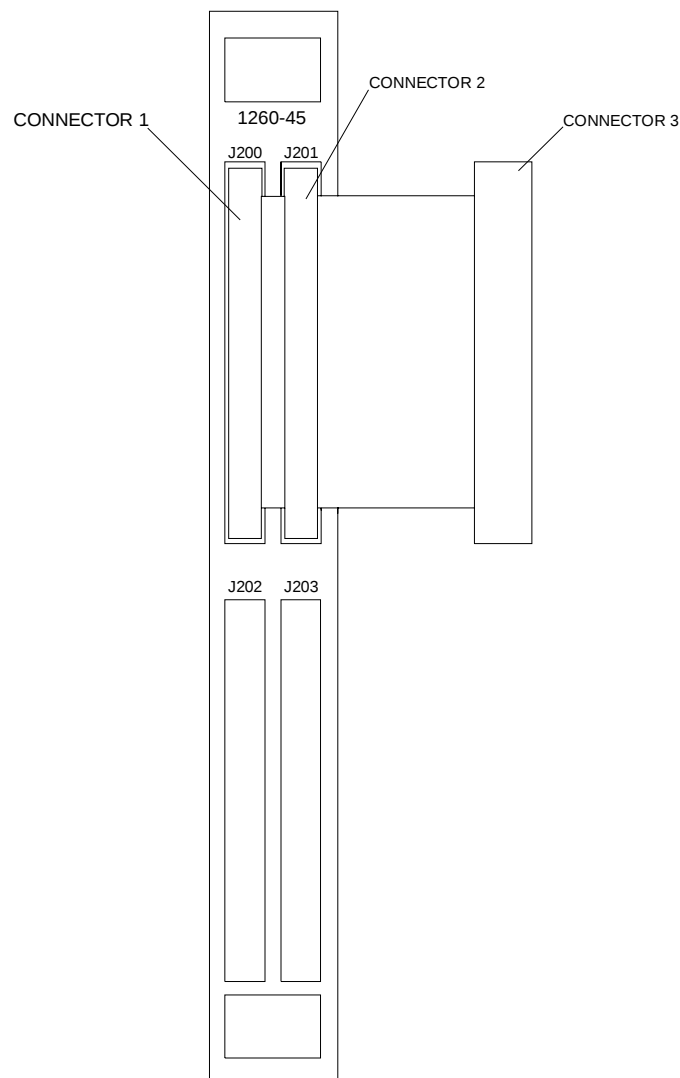


Figure 3-3, Sample Expansion/Configuration Cable

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## Chapter 4

# OPERATION

---

### Theory of Operation

The 1260-45 consists of two PCBAs. The larger PCBA, 405043, contains the VXI LBus interface, as well as half of the relay matrix and all of the relay drive electronics. The smaller PCBA, 405044, contains the other half of the relay matrix. The boards are connected by a ribbon cable which connects the relay coils to the drive electronics. The relay signal lines are not passed between the two PCB assemblies inside the module. The VXI interface is described in the Theory of Operation section of the 1260 Series VXI Switching Cards Manual.

There is no connection between the relay and coil signal lines. They both are arranged into two 4 x 16 matrices on each board. There are two coils and the associated circuitry for each relay; one to set the relay, and one to reset it. The latching-type relays' coils are only energized when their state is to be changed.

Several features have been incorporated into the card to reduce the time necessary to update the state of the relays on the card. First, relay coils have been grouped into sets of 16. This reduces the amount of backplane overhead associated with communicating an update from the -01 CPU to the individual switch module. Second, the software in the -01 keeps track of the state of the relays. Commands are only sent to the card for the relays that change, rather than for the entire array. This minimizes the volume of data that must be sent to the card via the serial, local bus interface.

All of the rows have non-latching relays in series with the signal line inputs. This causes the row lines to be opened upon power fail. Upon power up, these relays remain open until after the -01 CPU has reset each relay. When the power-up sequence is completed, these "guard" relays are closed and the card functions normally. The guard relays are transparent, and are not accessible, to the user.

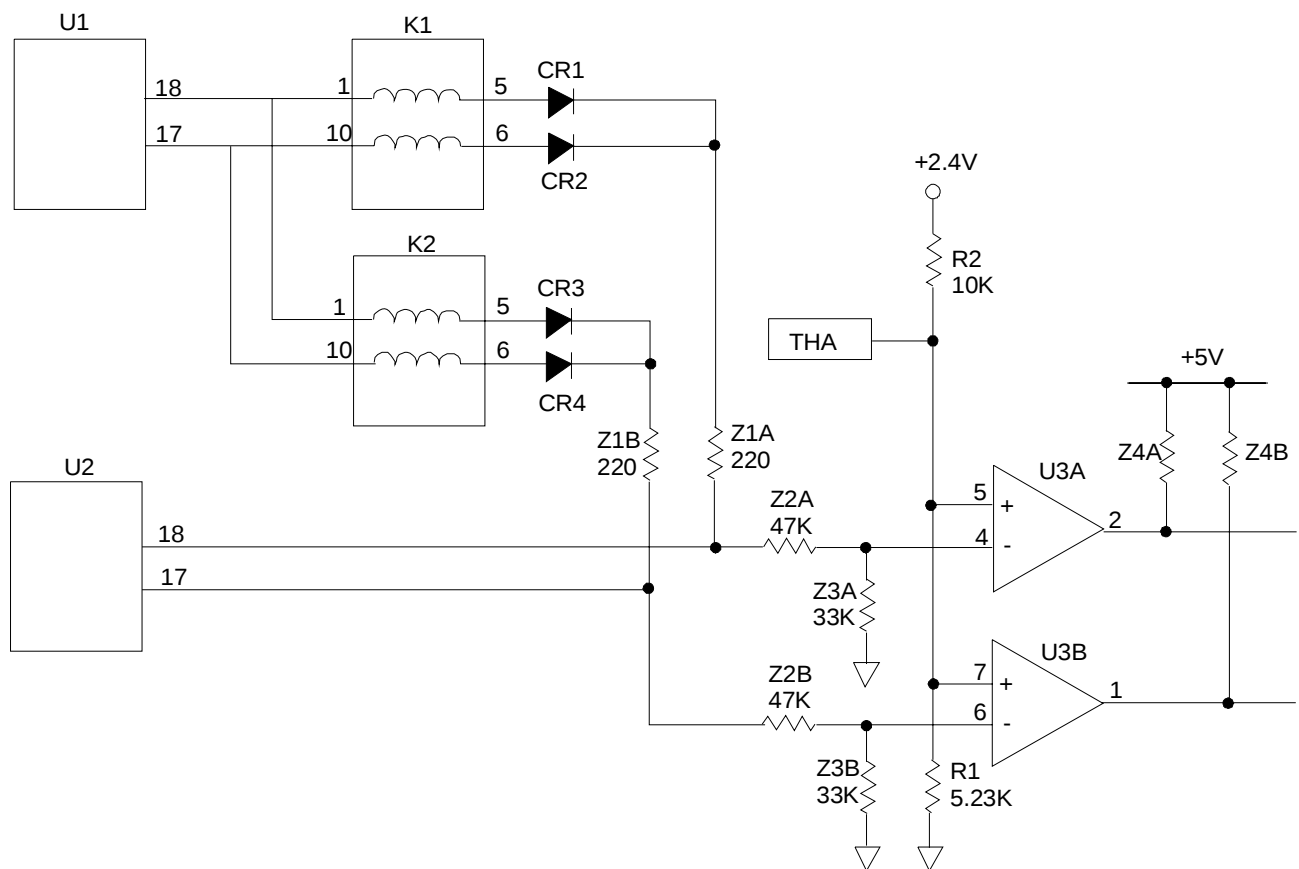
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## Relay Drive Circuitry

The quantity of drivers is reduced, and the MTBF improved by arranging the relay coils into matrices. As shown in **Figure 4-1**, one end of each relay is connected to a source driver, and the other end is connected to a sink driver. The relay is not actuated unless the relay coil's source and sink drivers are both turned on.

The diodes in series with the relay coils have two functions. The first function is to protect the driver ICs by clamping the flyback voltages. The second function is to block "trap door" paths through the array which might cause non-specified relays to actuate.

Circuitry is also included to test for hardware faults in the coil/diode circuitry. Both opens and shorts can be detected. The basic technique is to measure the voltage applied to the sink driver when the source driver is ON or OFF. Referring to **Figure 4-1**, assume the relay coil on K1 between pins 1 and 5 is actuated. This means all drivers are OFF except for U1 Pin 18 and U2 Pin 18. Under normal conditions, this will cause the voltage on U3A Pin 4 to be below the reference threshold. At the same time, the voltage on U3B Pin 6 will be higher than the reference threshold because its sink driver is OFF, eliminating the IR voltage drop across Pin 1 and 5 of K2. If either that coil or CR3 are open, there will be no pull-up voltage, and the voltage on U3B Pin 6 will be lower than the reference threshold causing the software to detect a fault. If the coil between Pins 1 and 5 of K1 is shorted, the voltage on U3A Pin 4 will be above the threshold which will also be detected as a fault. If CR4 is shorted, the voltage on U3B Pin 6 will basically be the result of the voltage divider formed by K2 Pins 1-5, K2 Pins 10-6, and K1 Pins 10-6. The threshold voltage has been chosen so this resulting voltage is below it. A fault condition will then be detected.



### Figure 4-1, Relay Drive Circuitry

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## Chapter 5

# OPTIONAL HARNESS ASSEMBLIES

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The following harness assemblies are used to connect 1260-45 to Freedom Series Test Receiver Interfaces.

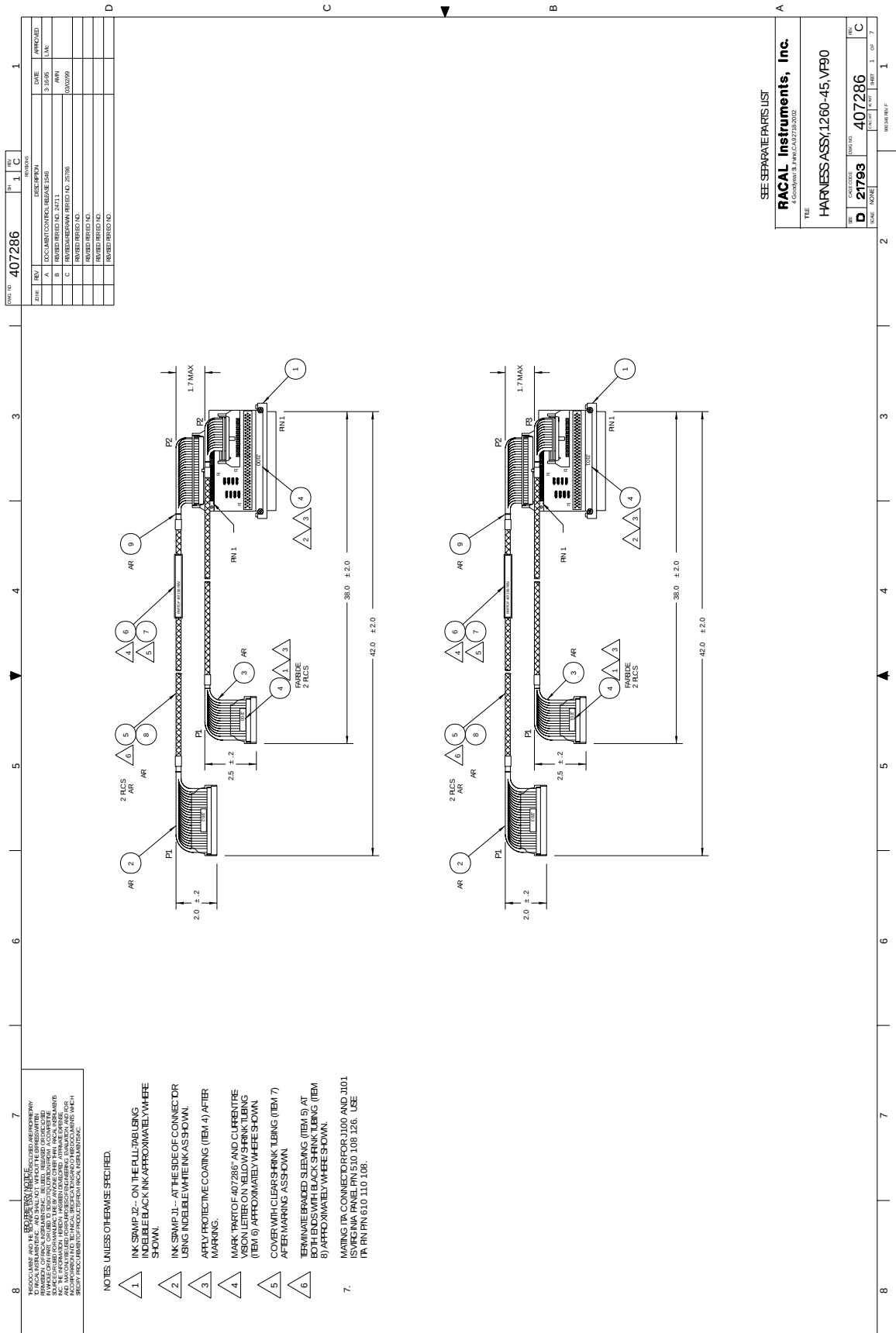
Each harness documentation consists of an assembly drawing, parts list, system wire list and wire list.

407286      Virginia Panel, Inc. Series VP90 Interface  
                 Harness

407287      TTI Testron, Inc. Interface Harness  
                 (TTI Receiver must be above chassis)

For more information on Racal Instruments complete line of Test Receiver Interface solutions, contact your Sales Representative.

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**RACAL INSTRUMENTS INC.**

Assembly 407286

HARNESS ASSY, 1260-45, VP90

Date 3/03/99 Revision C

| # | Component      | Description                     | U/M | Qty Reqd | Ref        |
|---|----------------|---------------------------------|-----|----------|------------|
| 1 | 405085         | PCB ASSY, VP90 INTFC, 96CONTACT | EA  | 2.00000  | J100, J101 |
| 2 | 407259         | CABLE ASSY, IDC, 64COND, VP90   | EA  | 2.00000  | J202, J203 |
| 3 | 407356         | CABLE ASSY, IDC, 32COND, VP90   | EA  | 2.00000  | J200, J201 |
| 4 | 910541         | POLYURETHANE CONFORMAL COAT     | EA  | .00001   |            |
| 5 | GRP-I10-1/2    | TBGWOV-POY. 250ID-BLACK         | FT  | .00001   |            |
| 6 | M23053/5-109-4 | TBGSRK-POF. 750ID-YELLOW        | FT  | .00001   |            |
| 7 | 500104         | TBGSRK-POF. 750ID-CLEAR         | FT  | .00001   |            |
| 8 | 500017         | TBGSRK-POF. 500ID-BLACK         | FT  | .00001   |            |
| 9 | 500005         | TIE CORD NYLON                  | FT  | .00001   |            |

## ENGINEERING WIRE LIST

| WIRE                                                                                                                                                                                               | FROM             | TO                         | TYPE  | PART #   | WIRE LEN     | REFERENCE        |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|----------------------------|-------|----------|--------------|------------------|
|                                                                                                                                                                                                    | BLK AA<br>(J100) | Uxx-SLOT yy<br>(J200,J202) | CABLE | 407286   |              | SYSTEM WIRE LIST |
|                                                                                                                                                                                                    | BLK AA<br>(J101) | Uxx-SLOT yy<br>(J201,J203) | CABLE | 407286   |              |                  |
| <p>This system wirelist serves as a template for incorporating this harness assembly into the overall system wirelist. It does not in any way affect the fabrication of this harness assembly.</p> |                  |                            |       |          |              |                  |
| <p>RACAL Instruments, Inc., 4 Goodyear St., Irvine, CA 92718</p>                                                                                                                                   |                  |                            |       |          |              |                  |
| DOCUMENT TITLE                                                                                                                                                                                     |                  |                            | SIZE  | CODE NO. | DOCUMENT NO. | REV              |
| HARNESS ASSEMBLY, 1260-45, VP90                                                                                                                                                                    |                  |                            | A     | 21793    | 407286       | C                |
|                                                                                                                                                                                                    |                  |                            | DRN   |          | SHEET 2 of 7 |                  |

DOC. NO. 407286

SCCS 1.4

## ENGINEERING WIRE LIST

| WIRE                                                      | FROM    | TO       | TYPE | PART #   | WIRE LEN     | REFERENCE     |
|-----------------------------------------------------------|---------|----------|------|----------|--------------|---------------|
| 1                                                         | J100-1  | J200-A17 | BLU  | 407356   | 41.5"        | ROW 00 AH RTN |
| 2                                                         | J100-34 | J200-A18 | GRN  | 407356   | 41.5"        | ROW 00 AH     |
| 3                                                         | J100-66 | J200-A19 | YEL  | 407356   | 41.5"        | ROW 04 AH RTN |
| 4                                                         | J100-3  | J200-A20 | ORN  | 407356   | 41.5"        | ROW 04 AH     |
| 5                                                         | J100-36 | J200-A21 | RED  | 407356   | 41.5"        | ROW 01 AH RTN |
| 6                                                         | J100-68 | J200-A22 | BRN  | 407356   | 41.5"        | ROW 01 AH     |
| 7                                                         | J100-5  | J200-A23 | BLK  | 407356   | 41.5"        | ROW 05 AH RTN |
| 8                                                         | J100-38 | J200-A24 | WHT  | 407356   | 41.5"        | ROW 05 AH     |
| 9                                                         | J100-70 | J200-A25 | GRY  | 407356   | 41.5"        | ROW 02 AH RTN |
| 10                                                        | J100-7  | J200-A26 | VIO  | 407356   | 41.5"        | ROW 02 AH     |
| 11                                                        | J100-40 | J200-A27 | BLU  | 407356   | 41.5"        | ROW 06 AH RTN |
| 12                                                        | J100-72 | J200-A28 | GRN  | 407356   | 41.5"        | ROW 06 AH     |
| 13                                                        | J100-9  | J200-A29 | YEL  | 407356   | 41.5"        | ROW 03 AH RTN |
| 14                                                        | J100-42 | J200-A30 | ORN  | 407356   | 41.5"        | ROW 03 AH     |
| 15                                                        | J100-74 | J200-A31 | RED  | 407356   | 41.5"        | ROW 07 AH RTN |
| 16                                                        | J100-11 | J200-A32 | BRN  | 407356   | 41.5"        | ROW 07 AH     |
|                                                           |         |          |      |          |              |               |
| 17                                                        | J100-33 | J200-B17 | TAN  | 407356   | 41.5"        | ROW 00 BL RTN |
| 18                                                        | J100-65 | J200-B18 | TAN  | 407356   | 41.5"        | ROW 00 BL     |
| 19                                                        | J100-2  | J200-B19 | TAN  | 407356   | 41.5"        | ROW 04 BL RTN |
| 20                                                        | J100-35 | J200-B20 | TAN  | 407356   | 41.5"        | ROW 04 BL     |
| 21                                                        | J100-67 | J200-B21 | TAN  | 407356   | 41.5"        | ROW 01 BL RTN |
| 22                                                        | J100-4  | J200-B22 | TAN  | 407356   | 41.5"        | ROW 01 BL     |
| 23                                                        | J100-37 | J200-B23 | TAN  | 407356   | 41.5"        | ROW 05 BL RTN |
| 24                                                        | J100-69 | J200-B24 | TAN  | 407356   | 41.5"        | ROW 05 BL     |
| 25                                                        | J100-6  | J200-B25 | TAN  | 407356   | 41.5"        | ROW 02 BL RTN |
| 26                                                        | J100-39 | J200-B26 | TAN  | 407356   | 41.5"        | ROW 02 BL     |
| 27                                                        | J100-71 | J200-B27 | TAN  | 407356   | 41.5"        | ROW 06 BL RTN |
| 28                                                        | J100-8  | J200-B28 | TAN  | 407356   | 41.5"        | ROW 06 BL     |
| 29                                                        | J100-41 | J200-B29 | TAN  | 407356   | 41.5"        | ROW 03 BL RTN |
| 30                                                        | J100-73 | J200-B30 | TAN  | 407356   | 41.5"        | ROW 03 BL     |
| 31                                                        | J100-10 | J200-B31 | TAN  | 407356   | 41.5"        | ROW 07 BL RTN |
| 32                                                        | J100-43 | J200-B32 | TAN  | 407356   | 41.5"        | ROW 07 BL     |
|                                                           |         |          |      |          |              |               |
| 33                                                        | J101-1  | J201-A17 | BLU  | 407356   | 41.5"        | ROW 08 AH RTN |
| 34                                                        | J101-34 | J201-A18 | GRN  | 407356   | 41.5"        | ROW 08 AH     |
| 35                                                        | J101-66 | J201-A19 | YEL  | 407356   | 41.5"        | ROW 12 AH RTN |
| 36                                                        | J101-3  | J201-A20 | ORN  | 407356   | 41.5"        | ROW 12 AH     |
| 37                                                        | J101-36 | J201-A21 | RED  | 407356   | 41.5"        | ROW 09 AH RTN |
| 38                                                        | J101-68 | J201-A22 | BRN  | 407356   | 41.5"        | ROW 09 AH     |
| 39                                                        | J101-5  | J201-A23 | BLK  | 407356   | 41.5"        | ROW 13 AH RTN |
| 40                                                        | J101-38 | J201-A24 | WHT  | 407356   | 41.5"        | ROW 13 AH     |
| 41                                                        | J101-70 | J201-A25 | GRY  | 407356   | 41.5"        | ROW 10 AH RTN |
| 42                                                        | J101-7  | J201-A26 | VIO  | 407356   | 41.5"        | ROW 10 AH     |
| 43                                                        | J101-40 | J201-A27 | BLU  | 407356   | 41.5"        | ROW 14 AH RTN |
| 44                                                        | J101-72 | J201-A28 | GRN  | 407356   | 41.5"        | ROW 14 AH     |
| 45                                                        | J101-9  | J201-A29 | YEL  | 407356   | 41.5"        | ROW 11 AH RTN |
| 46                                                        | J101-42 | J201-A30 | ORN  | 407356   | 41.5"        | ROW 11 AH     |
|                                                           |         |          |      |          |              |               |
| RACAL Instruments, Inc., 4 Goodyear St., Irvine, CA 92718 |         |          |      |          |              |               |
| DOCUMENT TITLE                                            |         |          | SIZE | CODE NO. | DOCUMENT NO. | REV           |
| HARNESS ASSEMBLY, 1260-45, VP90                           |         |          | A    | 21793    | 407286       | C             |
|                                                           |         |          | DRN  |          | SHEET 3 of 7 |               |

DOC NO. 407286

SCS 1.7

## ENGINEERING WIRE LIST

| WIRE                                                      | FROM    | TO       | TYPE | PART #   | WIRE LEN     | REFERENCE     |
|-----------------------------------------------------------|---------|----------|------|----------|--------------|---------------|
| 47                                                        | J101-74 | J201-A31 | RED  | 407356   | 41.5"        | ROW 15 AH RTN |
| 48                                                        | J101-11 | J201-A32 | BRN  | 407356   | 41.5"        | ROW 15 AH     |
| 49                                                        | J101-33 | J201-B17 | TAN  | 407356   | 41.5"        | ROW 08 BL RTN |
| 50                                                        | J101-65 | J201-B18 | TAN  | 407356   | 41.5"        | ROW 08 BL     |
| 51                                                        | J101-2  | J201-B19 | TAN  | 407356   | 41.5"        | ROW 12 BL RTN |
| 52                                                        | J101-35 | J201-B20 | TAN  | 407356   | 41.5"        | ROW 12 BL     |
| 53                                                        | J101-67 | J201-B21 | TAN  | 407356   | 41.5"        | ROW 09 BL RTN |
| 54                                                        | J101-4  | J201-B22 | TAN  | 407356   | 41.5"        | ROW 09 BL     |
| 55                                                        | J101-37 | J201-B23 | TAN  | 407356   | 41.5"        | ROW 13 BL RTN |
| 56                                                        | J101-69 | J201-B24 | TAN  | 407356   | 41.5"        | ROW 13 BL     |
| 57                                                        | J101-6  | J201-B25 | TAN  | 407356   | 41.5"        | ROW 10 BL RTN |
| 58                                                        | J101-39 | J201-B26 | TAN  | 407356   | 41.5"        | ROW 10 BL     |
| 59                                                        | J101-71 | J201-B27 | TAN  | 407356   | 41.5"        | ROW 14 BL RTN |
| 60                                                        | J101-8  | J201-B28 | TAN  | 407356   | 41.5"        | ROW 14 BL     |
| 61                                                        | J101-41 | J201-B29 | TAN  | 407356   | 41.5"        | ROW 11 BL RTN |
| 62                                                        | J101-73 | J201-B30 | TAN  | 407356   | 41.5"        | ROW 11 BL     |
| 63                                                        | J101-10 | J201-B31 | TAN  | 407356   | 41.5"        | ROW 15 BL RTN |
| 64                                                        | J101-43 | J201-B32 | TAN  | 407356   | 41.5"        | ROW 15 BL     |
| 65                                                        | J100-44 | J202-A1  | RED  | 407259   | 41.5"        | COL 31 A      |
| 66                                                        | J100-76 | J202-A2  | BRN  | 407259   | 41.5"        | COL 15 A      |
| 67                                                        | J100-13 | J202-A3  | BLK  | 407259   | 41.5"        | COL 30 A      |
| 68                                                        | J100-46 | J202-A4  | WHT  | 407259   | 41.5"        | COL 14 A      |
| 69                                                        | J100-78 | J202-A5  | GRY  | 407259   | 41.5"        | COL 29 A      |
| 70                                                        | J100-15 | J202-A6  | VIO  | 407259   | 41.5"        | COL 13 A      |
| 71                                                        | J100-48 | J202-A7  | BLU  | 407259   | 41.5"        | COL 28 A      |
| 72                                                        | J100-80 | J202-A8  | GRN  | 407259   | 41.5"        | COL 12 A      |
| 73                                                        | J100-17 | J202-A9  | YEL  | 407259   | 41.5"        | COL 27 A      |
| 74                                                        | J100-50 | J202-A10 | ORN  | 407259   | 41.5"        | COL 11 A      |
| 75                                                        | J100-82 | J202-A11 | RED  | 407259   | 41.5"        | COL 26 A      |
| 76                                                        | J100-19 | J202-A12 | BRN  | 407259   | 41.5"        | COL 10 A      |
| 77                                                        | J100-52 | J202-A13 | BLK  | 407259   | 41.5"        | COL 25 A      |
| 78                                                        | J100-84 | J202-A14 | WHT  | 407259   | 41.5"        | COL 09 A      |
| 79                                                        | J100-21 | J202-A15 | GRY  | 407259   | 41.5"        | COL 24 A      |
| 80                                                        | J100-54 | J202-A16 | VIO  | 407259   | 41.5"        | COL 08 A      |
| 81                                                        | J100-86 | J202-A17 | BLU  | 407259   | 41.5"        | COL 23 A      |
| 82                                                        | J100-23 | J202-A18 | GRN  | 407259   | 41.5"        | COL 07 A      |
| 83                                                        | J100-56 | J202-A19 | YEL  | 407259   | 41.5"        | COL 22 A      |
| 84                                                        | J100-88 | J202-A20 | ORN  | 407259   | 41.5"        | COL 06 A      |
| 85                                                        | J100-25 | J202-A21 | RED  | 407259   | 41.5"        | COL 21 A      |
| 86                                                        | J100-58 | J202-A22 | BRN  | 407259   | 41.5"        | COL 05 A      |
| 87                                                        | J100-90 | J202-A23 | BLK  | 407259   | 41.5"        | COL 20 A      |
| 88                                                        | J100-27 | J202-A24 | WHT  | 407259   | 41.5"        | COL 04 A      |
| 89                                                        | J100-60 | J202-A25 | GRY  | 407259   | 41.5"        | COL 19 A      |
| 90                                                        | J100-92 | J202-A26 | VIO  | 407259   | 41.5"        | COL 03 A      |
| 91                                                        | J100-29 | J202-A27 | BLU  | 407259   | 41.5"        | COL 18 A      |
| 92                                                        | J100-62 | J202-A28 | GRN  | 407259   | 41.5"        | COL 02 A      |
| RACAL Instruments, Inc., 4 Goodyear St., Irvine, CA 92718 |         |          |      |          |              |               |
| DOCUMENT TITLE                                            |         |          | SIZE | CODE NO. | DOCUMENT NO. | REV           |
| HARNESS ASSEMBLY, 1260-45, VP90                           |         |          | A    | 21793    | 407286       | C             |
|                                                           |         |          | DRN  |          | SHEET 4 of 7 |               |

DOC NO. 407286

## ENGINEERING WIRE LIST

| WIRE | FROM    | TO       | TYPE | PART # | WIRE LEN | REFERENCE |
|------|---------|----------|------|--------|----------|-----------|
| 93   | J100-94 | J202-A29 | YEL  | 407259 | 41.5"    | COL 17 A  |
| 94   | J100-31 | J202-A30 | ORN  | 407259 | 41.5"    | COL 01 A  |
| 95   | J100-64 | J202-A31 | RED  | 407259 | 41.5"    | COL 16 A  |
| 96   | J100-96 | J202-A32 | BRN  | 407259 | 41.5"    | COL 00 A  |
| 97   | J100-75 | J202-B1  | TAN  | 407259 | 41.5"    | COL 31 B  |
| 98   | J100-12 | J202-B2  | TAN  | 407259 | 41.5"    | COL 15 B  |
| 99   | J100-45 | J202-B3  | TAN  | 407259 | 41.5"    | COL 30 B  |
| 100  | J100-77 | J202-B4  | TAN  | 407259 | 41.5"    | COL 14 B  |
| 101  | J100-14 | J202-B5  | TAN  | 407259 | 41.5"    | COL 29 B  |
| 102  | J100-47 | J202-B6  | TAN  | 407259 | 41.5"    | COL 13 B  |
| 103  | J100-79 | J202-B7  | TAN  | 407259 | 41.5"    | COL 28 B  |
| 104  | J100-16 | J202-B8  | TAN  | 407259 | 41.5"    | COL 12 B  |
| 105  | J100-49 | J202-B9  | TAN  | 407259 | 41.5"    | COL 27 B  |
| 106  | J100-81 | J202-B10 | TAN  | 407259 | 41.5"    | COL 11 B  |
| 107  | J100-18 | J202-B11 | TAN  | 407259 | 41.5"    | COL 26 B  |
| 108  | J100-51 | J202-B12 | TAN  | 407259 | 41.5"    | COL 10 B  |
| 109  | J100-83 | J202-B13 | TAN  | 407259 | 41.5"    | COL 25 B  |
| 110  | J100-20 | J202-B14 | TAN  | 407259 | 41.5"    | COL 09 B  |
| 111  | J100-53 | J202-B15 | TAN  | 407259 | 41.5"    | COL 24 B  |
| 112  | J100-85 | J202-B16 | TAN  | 407259 | 41.5"    | COL 08 B  |
| 113  | J100-22 | J202-B17 | TAN  | 407259 | 41.5"    | COL 23 B  |
| 114  | J100-55 | J202-B18 | TAN  | 407259 | 41.5"    | COL 07 B  |
| 115  | J100-87 | J202-B19 | TAN  | 407259 | 41.5"    | COL 22 B  |
| 116  | J100-24 | J202-B20 | TAN  | 407259 | 41.5"    | COL 06 B  |
| 117  | J100-57 | J202-B21 | TAN  | 407259 | 41.5"    | COL 21 B  |
| 118  | J100-89 | J202-B22 | TAN  | 407259 | 41.5"    | COL 05 B  |
| 119  | J100-26 | J202-B23 | TAN  | 407259 | 41.5"    | COL 20 B  |
| 120  | J100-59 | J202-B24 | TAN  | 407259 | 41.5"    | COL 04 B  |
| 121  | J100-91 | J202-B25 | TAN  | 407259 | 41.5"    | COL 19 B  |
| 122  | J100-28 | J202-B26 | TAN  | 407259 | 41.5"    | COL 03 B  |
| 123  | J100-61 | J202-B27 | TAN  | 407259 | 41.5"    | COL 18 B  |
| 124  | J100-93 | J202-B28 | TAN  | 407259 | 41.5"    | COL 02 B  |
| 125  | J100-30 | J202-B29 | TAN  | 407259 | 41.5"    | COL 17 B  |
| 126  | J100-63 | J202-B30 | TAN  | 407259 | 41.5"    | COL 01 B  |
| 127  | J100-95 | J202-B31 | TAN  | 407259 | 41.5"    | COL 16 B  |
| 128  | J100-32 | J202-B32 | TAN  | 407259 | 41.5"    | COL 00 B  |
| 129  | J101-44 | J203-A1  | RED  | 407259 | 41.5"    | COL 63 A  |
| 130  | J101-76 | J203-A2  | BRN  | 407259 | 41.5"    | COL 47 A  |
| 131  | J101-13 | J203-A3  | BLK  | 407259 | 41.5"    | COL 62 A  |
| 132  | J101-46 | J203-A4  | WHT  | 407259 | 41.5"    | COL 46 A  |
| 133  | J101-78 | J203-A5  | GRY  | 407259 | 41.5"    | COL 61 A  |
| 134  | J101-15 | J203-A6  | VIO  | 407259 | 41.5"    | COL 45 A  |
| 135  | J101-48 | J203-A7  | BLU  | 407259 | 41.5"    | COL 60 A  |
| 136  | J101-80 | J203-A8  | GRN  | 407259 | 41.5"    | COL 44 A  |
| 137  | J101-17 | J203-A9  | YEL  | 407259 | 41.5"    | COL 59 A  |
| 138  | J101-50 | J203-A10 | ORN  | 407259 | 41.5"    | COL 43 A  |

**RACAL Instruments, Inc., 4 Goodyear St., Irvine, CA 92718**

| DOCUMENT TITLE                  | SIZE | CODE NO. | DOCUMENT NO. | REV |
|---------------------------------|------|----------|--------------|-----|
| HARNESS ASSEMBLY, 1260-45, VP90 | A    | 21793    | 407286       | C   |
| DRN                             |      |          | SHEET 5 of 7 |     |

DOC NO. 407286

## ENGINEERING WIRE LIST

| WIRE                                                      | FROM    | TO       | TYPE | PART #   | WIRE LEN     | REFERENCE    |
|-----------------------------------------------------------|---------|----------|------|----------|--------------|--------------|
| 139                                                       | J101-82 | J203-A11 | RED  | 407259   | 41.5"        | COL 58 A     |
| 140                                                       | J101-19 | J203-A12 | BRN  | 407259   | 41.5"        | COL 42 A     |
| 141                                                       | J101-52 | J203-A13 | BLK  | 407259   | 41.5"        | COL 57 A     |
| 142                                                       | J101-84 | J203-A14 | WHT  | 407259   | 41.5"        | COL 41 A     |
| 143                                                       | J101-21 | J203-A15 | GRY  | 407259   | 41.5"        | COL 56 A     |
| 144                                                       | J101-54 | J203-A16 | VIO  | 407259   | 41.5"        | COL 40 A     |
| 145                                                       | J101-86 | J203-A17 | BLU  | 407259   | 41.5"        | COL 55 A     |
| 146                                                       | J101-23 | J203-A18 | GRN  | 407259   | 41.5"        | COL 39 A     |
| 147                                                       | J101-56 | J203-A19 | YEL  | 407259   | 41.5"        | COL 54 A     |
| 148                                                       | J101-88 | J203-A20 | ORN  | 407259   | 41.5"        | COL 38 A     |
| 149                                                       | J101-25 | J203-A21 | RED  | 407259   | 41.5"        | COL 53 A     |
| 150                                                       | J101-58 | J203-A22 | BRN  | 407259   | 41.5"        | COL 37 A     |
| 151                                                       | J101-90 | J203-A23 | BLK  | 407259   | 41.5"        | COL 52 A     |
| 152                                                       | J101-27 | J203-A24 | WHT  | 407259   | 41.5"        | COL 36 A     |
| 153                                                       | J101-60 | J203-A25 | GRY  | 407259   | 41.5"        | COL 51 A     |
| 154                                                       | J101-92 | J203-A26 | VIO  | 407259   | 41.5"        | COL 35 A     |
| 155                                                       | J101-29 | J203-A27 | BLU  | 407259   | 41.5"        | COL 50 A     |
| 156                                                       | J101-62 | J203-A28 | GRN  | 407259   | 41.5"        | COL 34 A     |
| 157                                                       | J101-94 | J203-A29 | YEL  | 407259   | 41.5"        | COL 49 A     |
| 158                                                       | J101-31 | J203-A30 | ORN  | 407259   | 41.5"        | COL 33 A     |
| 159                                                       | J101-64 | J203-A31 | RED  | 407259   | 41.5"        | COL 48 A     |
| 160                                                       | J101-96 | J203-A32 | BRN  | 407259   | 41.5"        | COL 32 A     |
|                                                           |         |          |      |          |              |              |
| 161                                                       | J101-75 | J203-B1  | TAN  | 407259   | 41.5"        | COL 63 B     |
| 162                                                       | J101-12 | J203-B2  | TAN  | 407259   | 41.5"        | COL 47 B     |
| 163                                                       | J101-45 | J203-B3  | TAN  | 407259   | 41.5"        | COL 62 B     |
| 164                                                       | J101-77 | J203-B4  | TAN  | 407259   | 41.5"        | COL 46 B     |
| 165                                                       | J101-14 | J203-B5  | TAN  | 407259   | 41.5"        | COL 61 B     |
| 166                                                       | J101-47 | J203-B6  | TAN  | 407259   | 41.5"        | COL 45 B     |
| 167                                                       | J101-79 | J203-B7  | TAN  | 407259   | 41.5"        | COL 60 B     |
| 168                                                       | J101-16 | J203-B8  | TAN  | 407259   | 41.5"        | COL 44 B     |
| 169                                                       | J101-49 | J203-B9  | TAN  | 407259   | 41.5"        | COL 59 B     |
| 170                                                       | J101-81 | J203-B10 | TAN  | 407259   | 41.5"        | COL 43 B     |
| 171                                                       | J101-18 | J203-B11 | TAN  | 407259   | 41.5"        | COL 58 B     |
| 172                                                       | J101-51 | J203-B12 | TAN  | 407259   | 41.5"        | COL 42 B     |
| 173                                                       | J101-83 | J203-B13 | TAN  | 407259   | 41.5"        | COL 57 B     |
| 174                                                       | J101-20 | J203-B14 | TAN  | 407259   | 41.5"        | COL 41 B     |
| 175                                                       | J101-53 | J203-B15 | TAN  | 407259   | 41.5"        | COL 56 B     |
| 176                                                       | J101-85 | J203-B16 | TAN  | 407259   | 41.5"        | COL 40 B     |
| 177                                                       | J101-22 | J203-B17 | TAN  | 407259   | 41.5"        | COL 55 B     |
| 178                                                       | J101-55 | J203-B18 | TAN  | 407259   | 41.5"        | COL 39 B     |
| 179                                                       | J101-87 | J203-B19 | TAN  | 407259   | 41.5"        | COL 54 B     |
| 180                                                       | J101-24 | J203-B20 | TAN  | 407259   | 41.5"        | COL 38 B     |
| 181                                                       | J101-57 | J203-B21 | TAN  | 407259   | 41.5"        | COL 53 B     |
| 182                                                       | J101-89 | J203-B22 | TAN  | 407259   | 41.5"        | COL 37 B     |
| 183                                                       | J101-26 | J203-B23 | TAN  | 407259   | 41.5"        | COL 52 B     |
| 184                                                       | J101-59 | J203-B24 | TAN  | 407259   | 41.5"        | COL 36 B     |
| 185                                                       | J101-91 | J203-B25 | TAN  | 407259   | 41.5"        | COL 51 B     |
| 186                                                       | J101-28 | J203-B26 | TAN  | 407259   | 41.5"        | COL 35 B     |
|                                                           |         |          |      |          |              |              |
| RACAL Instruments, Inc., 4 Goodyear St., Irvine, CA 92718 |         |          |      |          |              |              |
| DOCUMENT TITLE                                            |         |          | SIZE | CODE NO. | DOCUMENT NO. | REV          |
| HARNESS ASSEMBLY, 1260-45, VP90                           |         |          | A    | 21793    | 407286       | C            |
|                                                           |         |          | DRN  |          |              | SHEET 6 of 7 |

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## ENGINEERING WIRE LIST

| WIRE                                                                                                                                                                                                                                                                                                                                                                         | FROM    | TO       | TYPE | PART # | WIRE LEN | REFERENCE |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|----------|------|--------|----------|-----------|
| 187                                                                                                                                                                                                                                                                                                                                                                          | J101-61 | J203-B27 | TAN  | 407259 | 41.5"    | COL 50 B  |
| 188                                                                                                                                                                                                                                                                                                                                                                          | J101-93 | J203-B28 | TAN  | 407259 | 41.5"    | COL 34 B  |
| 189                                                                                                                                                                                                                                                                                                                                                                          | J101-30 | J203-B29 | TAN  | 407259 | 41.5"    | COL 49 B  |
| 190                                                                                                                                                                                                                                                                                                                                                                          | J101-63 | J203-B30 | TAN  | 407259 | 41.5"    | COL 33 B  |
| 191                                                                                                                                                                                                                                                                                                                                                                          | J101-95 | J203-B31 | TAN  | 407259 | 41.5"    | COL 48 B  |
| 192                                                                                                                                                                                                                                                                                                                                                                          | J101-32 | J203-B32 | TAN  | 407259 | 41.5"    | COL 32 B  |
| <div>DOC. NO. 407286</div>                                                                                                                                                                                                                                                                                                                                                   |         |          |      |        |          |           |
| <div> <div>RACAL Instruments, Inc., 4 Goodyear St., Irvine, CA 92718</div> <div> <div>DOCUMENT TITLE</div> <div>SIZE</div> <div>CODE NO.</div> <div>DOCUMENT NO.</div> <div>REV</div> </div> <div> <div>HARNESS ASSEMBLY, 1260-45, VP90</div> <div>A</div> <div>21793</div> <div>407286</div> <div>C</div> </div> <div> <div>DRN</div> <div>SHEET 7 of 7</div> </div> </div> |         |          |      |        |          |           |



## ENGINEERING PARTS LIST

[illegible]

## ENGINEERING WIRE LIST

| WIRE                                                                                                                                                                                               | FROM                    | TO                    | TYPE  | PART #   | WIRE<br>LEN  | REFERENCE        |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|-----------------------|-------|----------|--------------|------------------|
|                                                                                                                                                                                                    | BLK AAx RW 01<br>(J100) | Uxx-SLOT yy<br>(J200) | CABLE | 407287   |              | SYSTEM WIRE LIST |
|                                                                                                                                                                                                    | BLK AAx RW 02<br>(J101) | Uxx-SLOT yy<br>(J200) | CABLE | 407287   |              |                  |
|                                                                                                                                                                                                    | BLK AAx RW 03<br>(J102) | Uxx-SLOT yy<br>(J201) | CABLE | 407287   |              |                  |
|                                                                                                                                                                                                    | BLK AAx RW 04<br>(J103) | Uxx-SLOT yy<br>(J201) | CABLE | 407287   |              |                  |
|                                                                                                                                                                                                    | BLK AAx RW 05<br>(J104) | Uxx-SLOT yy<br>(J202) | CABLE | 407287   |              |                  |
|                                                                                                                                                                                                    | BLK AAx RW 06<br>(J105) | Uxx-SLOT yy<br>(J202) | CABLE | 407287   |              |                  |
|                                                                                                                                                                                                    | BLK AAx RW 07<br>(J106) | Uxx-SLOT yy<br>(J202) | CABLE | 407287   |              |                  |
|                                                                                                                                                                                                    | BLK AAx RW 08<br>(J107) | Uxx-SLOT yy<br>(J202) | CABLE | 407287   |              |                  |
|                                                                                                                                                                                                    | BLK AAx RW 09<br>(J108) | Uxx-SLOT yy<br>(J202) | CABLE | 407287   |              |                  |
|                                                                                                                                                                                                    | BLK AAx RW 10<br>(J109) | Uxx-SLOT yy<br>(J202) | CABLE | 407287   |              |                  |
|                                                                                                                                                                                                    | BLK AAx RW 11<br>(J110) | Uxx-SLOT yy<br>(J202) | CABLE | 407287   |              |                  |
|                                                                                                                                                                                                    | BLK AAx RW 12<br>(J111) | Uxx-SLOT yy<br>(J203) | CABLE | 407287   |              |                  |
|                                                                                                                                                                                                    | BLK AAx RW 13<br>(J112) | Uxx-SLOT yy<br>(J203) | CABLE | 407287   |              |                  |
|                                                                                                                                                                                                    | BLK AAx RW 14<br>(J113) | Uxx-SLOT yy<br>(J203) | CABLE | 407287   |              |                  |
|                                                                                                                                                                                                    | BLK AAx RW 15<br>(J114) | Uxx-SLOT yy<br>(J203) | CABLE | 407287   |              |                  |
|                                                                                                                                                                                                    | BLK AAx RW 16<br>(J115) | Uxx-SLOT yy<br>(J203) | CABLE | 407287   |              |                  |
|                                                                                                                                                                                                    | BLK AAx RW 17<br>(J116) | Uxx-SLOT yy<br>(J203) | CABLE | 407287   |              |                  |
|                                                                                                                                                                                                    | BLK AAx RW 18<br>(J117) | Uxx-SLOT yy<br>(J203) | CABLE | 407287   |              |                  |
| <p>This system wirelist serves as a template for incorporating this harness assembly into the overall system wirelist. It does not in any way affect the fabrication of this harness assembly.</p> |                         |                       |       |          |              |                  |
| <p><b>RACAL Instruments, Inc., 4 Goodyear St., Irvine, CA 92718</b></p>                                                                                                                            |                         |                       |       |          |              |                  |
| DOCUMENT TITLE                                                                                                                                                                                     |                         |                       | SIZE  | CODE NO. | DOCUMENT NO. | REV              |
| HARNESS ASSY, 1260-45, TTI                                                                                                                                                                         |                         |                       | A     | 21793    | 407287       | A                |
|                                                                                                                                                                                                    |                         |                       | DRN   |          | SHEET 3 of 8 |                  |

DOC. NO. 407287

## ENGINEERING WIRE LIST

| WIRE                                                             | FROM    | TO       | TYPE | PART #   | WIRE LEN     | REFERENCE    |
|------------------------------------------------------------------|---------|----------|------|----------|--------------|--------------|
| 1                                                                | J101-6  | J200-A18 | GRN  | 407357   | 41.5"        | ROW 00 AH    |
| 2                                                                | J101-8  | J200-A20 | ORN  | 407357   | 41.5"        | ROW 04 AH    |
| 3                                                                | J101-10 | J200-A22 | BRN  | 407357   | 41.5"        | ROW 01 AH    |
| 4                                                                | J100-9  | J200-A24 | WHT  | 407357   | 41.5"        | ROW 05 AH    |
| 5                                                                | J100-7  | J200-A26 | VIO  | 407357   | 41.5"        | ROW 02 AH    |
| 6                                                                | J100-5  | J200-A28 | GRN  | 407357   | 41.5"        | ROW 06 AH    |
| 7                                                                | J100-3  | J200-A30 | ORN  | 407357   | 41.5"        | ROW 03 AH    |
| 8                                                                | J100-1  | J200-A32 | BRN  | 407357   | 41.5"        | ROW 07 AH    |
|                                                                  |         |          |      |          |              |              |
| 9                                                                | J101-5  | J200-B18 | TAN  | 407357   | 41.5"        | ROW 00 BL    |
| 10                                                               | J101-7  | J200-B20 | TAN  | 407357   | 41.5"        | ROW 04 BL    |
| 11                                                               | J101-9  | J200-B22 | TAN  | 407357   | 41.5"        | ROW 01 BL    |
| 12                                                               | J100-10 | J200-B24 | TAN  | 407357   | 41.5"        | ROW 05 BL    |
| 13                                                               | J100-8  | J200-B26 | TAN  | 407357   | 41.5"        | ROW 02 BL    |
| 14                                                               | J100-6  | J200-B28 | TAN  | 407357   | 41.5"        | ROW 06 BL    |
| 15                                                               | J100-4  | J200-B30 | TAN  | 407357   | 41.5"        | ROW 03 BL    |
| 16                                                               | J100-2  | J200-B32 | TAN  | 407357   | 41.5"        | ROW 07 BL    |
|                                                                  |         |          |      |          |              |              |
| 17                                                               | J103-6  | J201-A18 | GRN  | 407357   | 41.5"        | ROW 08 AH    |
| 18                                                               | J103-8  | J201-A20 | ORN  | 407357   | 41.5"        | ROW 12 AH    |
| 19                                                               | J103-10 | J201-A22 | BRN  | 407357   | 41.5"        | ROW 09 AH    |
| 20                                                               | J102-9  | J201-A24 | WHT  | 407357   | 41.5"        | ROW 13 AH    |
| 21                                                               | J102-7  | J201-A26 | VIO  | 407357   | 41.5"        | ROW 10 AH    |
| 22                                                               | J102-5  | J201-A28 | GRN  | 407357   | 41.5"        | ROW 14 AH    |
| 23                                                               | J102-3  | J201-A30 | ORN  | 407357   | 41.5"        | ROW 11 AH    |
| 24                                                               | J102-1  | J201-A32 | BRN  | 407357   | 41.5"        | ROW 15 AH    |
|                                                                  |         |          |      |          |              |              |
| 25                                                               | J103-5  | J201-B18 | TAN  | 407357   | 41.5"        | ROW 08 BL    |
| 26                                                               | J103-7  | J201-B20 | TAN  | 407357   | 41.5"        | ROW 12 BL    |
| 27                                                               | J103-9  | J201-B22 | TAN  | 407357   | 41.5"        | ROW 09 BL    |
| 28                                                               | J102-10 | J201-B24 | TAN  | 407357   | 41.5"        | ROW 13 BL    |
| 29                                                               | J102-8  | J201-B26 | TAN  | 407357   | 41.5"        | ROW 10 BL    |
| 30                                                               | J102-6  | J201-B28 | TAN  | 407357   | 41.5"        | ROW 14 BL    |
| 31                                                               | J102-4  | J201-B30 | TAN  | 407357   | 41.5"        | ROW 11 BL    |
| 32                                                               | J102-2  | J201-B32 | TAN  | 407357   | 41.5"        | ROW 15 BL    |
|                                                                  |         |          |      |          |              |              |
| 33                                                               | J110-3  | J202-A1  | RED  | 407260   | 41.5"        | COL 31 A     |
| 34                                                               | J110-1  | J202-A2  | BRN  | 407260   | 41.5"        | COL 15 A     |
| 35                                                               | J109-2  | J202-A3  | BLK  | 407260   | 41.5"        | COL 30 A     |
| 36                                                               | J109-4  | J202-A4  | WHT  | 407260   | 41.5"        | COL 14 A     |
| 37                                                               | J109-6  | J202-A5  | GRY  | 407260   | 41.5"        | COL 29 A     |
| 38                                                               | J109-8  | J202-A6  | VIO  | 407260   | 41.5"        | COL 13 A     |
| 39                                                               | J109-10 | J202-A7  | BLU  | 407260   | 41.5"        | COL 28 A     |
| 40                                                               | J108-9  | J202-A8  | GRN  | 407260   | 41.5"        | COL 12 A     |
| 41                                                               | J108-7  | J202-A9  | YEL  | 407260   | 41.5"        | COL 27 A     |
| 42                                                               | J108-5  | J202-A10 | ORN  | 407260   | 41.5"        | COL 11 A     |
|                                                                  |         |          |      |          |              |              |
| <b>RACAL Instruments, Inc., 4 Goodyear St., Irvine, CA 92718</b> |         |          |      |          |              |              |
| DOCUMENT TITLE                                                   |         |          | SIZE | CODE NO. | DOCUMENT NO. | REV          |
| HARNESS ASSEMBLY, 1260-45, TTI                                   |         |          | A    | 21793    | 407287       | A            |
|                                                                  |         |          | DRN  |          |              | SHEET 4 of 8 |

DOC NO. 407287

## ENGINEERING WIRE LIST

| WIRE                                                             | FROM    | TO       | TYPE | PART #   | WIRE LEN     | REFERENCE |
|------------------------------------------------------------------|---------|----------|------|----------|--------------|-----------|
| 43                                                               | J108-3  | J202-A11 | RED  | 407260   | 41.5"        | COL 26 A  |
| 44                                                               | J108-1  | J202-A12 | BRN  | 407260   | 41.5"        | COL 10 A  |
| 45                                                               | J107-2  | J202-A13 | BLK  | 407260   | 41.5"        | COL 25 A  |
| 46                                                               | J107-4  | J202-A14 | WHT  | 407260   | 41.5"        | COL 09 A  |
| 47                                                               | J107-6  | J202-A15 | GRY  | 407260   | 41.5"        | COL 24 A  |
| 48                                                               | J107-8  | J202-A16 | VIO  | 407260   | 41.5"        | COL 08 A  |
| 49                                                               | J107-10 | J202-A17 | BLU  | 407260   | 41.5"        | COL 23 A  |
| 50                                                               | J106-9  | J202-A18 | GRN  | 407260   | 41.5"        | COL 07 A  |
| 51                                                               | J106-7  | J202-A19 | YEL  | 407260   | 41.5"        | COL 22 A  |
| 52                                                               | J106-5  | J202-A20 | ORN  | 407260   | 41.5"        | COL 06 A  |
| 53                                                               | J106-3  | J202-A21 | RED  | 407260   | 41.5"        | COL 21 A  |
| 54                                                               | J106-1  | J202-A22 | BRN  | 407260   | 41.5"        | COL 05 A  |
| 55                                                               | J105-2  | J202-A23 | BLK  | 407260   | 41.5"        | COL 20 A  |
| 56                                                               | J105-4  | J202-A24 | WHT  | 407260   | 41.5"        | COL 04 A  |
| 57                                                               | J105-6  | J202-A25 | GRY  | 407260   | 41.5"        | COL 19 A  |
| 58                                                               | J105-8  | J202-A26 | VIO  | 407260   | 41.5"        | COL 03 A  |
| 59                                                               | J105-10 | J202-A27 | BLU  | 407260   | 41.5"        | COL 18 A  |
| 60                                                               | J104-9  | J202-A28 | GRN  | 407260   | 41.5"        | COL 02 A  |
| 61                                                               | J104-7  | J202-A29 | YEL  | 407260   | 41.5"        | COL 17 A  |
| 62                                                               | J104-5  | J202-A30 | ORN  | 407260   | 41.5"        | COL 01 A  |
| 63                                                               | J104-3  | J202-A31 | RED  | 407260   | 41.5"        | COL 16 A  |
| 64                                                               | J104-1  | J202-A32 | BRN  | 407260   | 41.5"        | COL 00 A  |
|                                                                  |         |          |      |          |              |           |
| 65                                                               | J110-4  | J202-B1  | TAN  | 407260   | 41.5"        | COL 31 B  |
| 66                                                               | J110-2  | J202-B2  | TAN  | 407260   | 41.5"        | COL 15 B  |
| 67                                                               | J109-1  | J202-B3  | TAN  | 407260   | 41.5"        | COL 30 B  |
| 68                                                               | J109-3  | J202-B4  | TAN  | 407260   | 41.5"        | COL 14 B  |
| 69                                                               | J109-5  | J202-B5  | TAN  | 407260   | 41.5"        | COL 29 B  |
| 70                                                               | J109-7  | J202-B6  | TAN  | 407260   | 41.5"        | COL 13 B  |
| 71                                                               | J109-9  | J202-B7  | TAN  | 407260   | 41.5"        | COL 28 B  |
| 72                                                               | J108-10 | J202-B8  | TAN  | 407260   | 41.5"        | COL 12 B  |
| 73                                                               | J108-8  | J202-B9  | TAN  | 407260   | 41.5"        | COL 27 B  |
| 74                                                               | J108-6  | J202-B10 | TAN  | 407260   | 41.5"        | COL 11 B  |
| 75                                                               | J108-4  | J202-B11 | TAN  | 407260   | 41.5"        | COL 26 B  |
| 76                                                               | J108-2  | J202-B12 | TAN  | 407260   | 41.5"        | COL 10 B  |
| 77                                                               | J107-1  | J202-B13 | TAN  | 407260   | 41.5"        | COL 25 B  |
| 78                                                               | J107-3  | J202-B14 | TAN  | 407260   | 41.5"        | COL 09 B  |
| 79                                                               | J107-5  | J202-B15 | TAN  | 407260   | 41.5"        | COL 24 B  |
| 80                                                               | J107-7  | J202-B16 | TAN  | 407260   | 41.5"        | COL 08 B  |
| 81                                                               | J107-9  | J202-B17 | TAN  | 407260   | 41.5"        | COL 23 B  |
| 82                                                               | J106-10 | J202-B18 | TAN  | 407260   | 41.5"        | COL 07 B  |
| 83                                                               | J106-8  | J202-B19 | TAN  | 407260   | 41.5"        | COL 22 B  |
| 84                                                               | J106-6  | J202-B20 | TAN  | 407260   | 41.5"        | COL 06 B  |
| 85                                                               | J106-4  | J202-B21 | TAN  | 407260   | 41.5"        | COL 21 B  |
| 86                                                               | J106-2  | J202-B22 | TAN  | 407260   | 41.5"        | COL 05 B  |
| 87                                                               | J105-1  | J202-B23 | TAN  | 407260   | 41.5"        | COL 20 B  |
| 88                                                               | J105-3  | J202-B24 | TAN  | 407260   | 41.5"        | COL 04 B  |
| 89                                                               | J105-5  | J202-B25 | TAN  | 407260   | 41.5"        | COL 19 B  |
| 90                                                               | J105-7  | J202-B26 | TAN  | 407260   | 41.5"        | COL 03 B  |
|                                                                  |         |          |      |          |              |           |
| <b>RACAL Instruments, Inc., 4 Goodyear St., Irvine, CA 92718</b> |         |          |      |          |              |           |
| DOCUMENT TITLE                                                   |         |          | SIZE | CODE NO. | DOCUMENT NO. | REV       |
| HARNESS ASSEMBLY, 1260-45, TTI                                   |         |          | A    | 21793    | 407287       | A         |
|                                                                  |         |          | DRN  |          | SHEET 5 of 8 |           |

DOC. NO. 407287

## ENGINEERING WIRE LIST

| WIRE                                                             | FROM    | TO       | TYPE | PART #   | WIRE LEN     | REFERENCE    |
|------------------------------------------------------------------|---------|----------|------|----------|--------------|--------------|
| 91                                                               | J105-9  | J202-B27 | TAN  | 407260   | 41.5"        | COL 18 B     |
| 92                                                               | J104-10 | J202-B28 | TAN  | 407260   | 41.5"        | COL 02 B     |
| 93                                                               | J104-8  | J202-B29 | TAN  | 407260   | 41.5"        | COL 17 B     |
| 94                                                               | J104-6  | J202-B30 | TAN  | 407260   | 41.5"        | COL 01 B     |
| 95                                                               | J104-4  | J202-B31 | TAN  | 407260   | 41.5"        | COL 16 B     |
| 96                                                               | J104-2  | J202-B32 | TAN  | 407260   | 41.5"        | COL 00 B     |
|                                                                  |         |          |      |          |              |              |
| 97                                                               | J117-3  | J203-A1  | RED  | 407260   | 41.5"        | COL 63 A     |
| 98                                                               | J117-1  | J203-A2  | BRN  | 407260   | 41.5"        | COL 47 A     |
| 99                                                               | J116-2  | J203-A3  | BLK  | 407260   | 41.5"        | COL 62 A     |
| 100                                                              | J116-4  | J203-A4  | WHT  | 407260   | 41.5"        | COL 46 A     |
| 101                                                              | J116-6  | J203-A5  | GRY  | 407260   | 41.5"        | COL 61 A     |
| 102                                                              | J116-8  | J203-A6  | VIO  | 407260   | 41.5"        | COL 45 A     |
| 103                                                              | J116-10 | J203-A7  | BLU  | 407260   | 41.5"        | COL 60 A     |
| 104                                                              | J115-9  | J203-A8  | GRN  | 407260   | 41.5"        | COL 44 A     |
| 105                                                              | J115-7  | J203-A9  | YEL  | 407260   | 41.5"        | COL 59 A     |
| 106                                                              | J115-5  | J203-A10 | ORN  | 407260   | 41.5"        | COL 43 A     |
| 107                                                              | J115-3  | J203-A11 | RED  | 407260   | 41.5"        | COL 58 A     |
| 108                                                              | J115-1  | J203-A12 | BRN  | 407260   | 41.5"        | COL 42 A     |
| 109                                                              | J114-2  | J203-A13 | BLK  | 407260   | 41.5"        | COL 57 A     |
| 110                                                              | J114-4  | J203-A14 | WHT  | 407260   | 41.5"        | COL 41 A     |
| 111                                                              | J114-6  | J203-A15 | GRY  | 407260   | 41.5"        | COL 56 A     |
| 112                                                              | J114-8  | J203-A16 | VIO  | 407260   | 41.5"        | COL 40 A     |
| 113                                                              | J114-10 | J203-A17 | BLU  | 407260   | 41.5"        | COL 55 A     |
| 114                                                              | J113-9  | J203-A18 | GRN  | 407260   | 41.5"        | COL 39 A     |
| 115                                                              | J113-7  | J203-A19 | YEL  | 407260   | 41.5"        | COL 54 A     |
| 116                                                              | J113-5  | J203-A20 | ORN  | 407260   | 41.5"        | COL 38 A     |
| 117                                                              | J113-3  | J203-A21 | RED  | 407260   | 41.5"        | COL 53 A     |
| 118                                                              | J113-1  | J203-A22 | BRN  | 407260   | 41.5"        | COL 37 A     |
| 119                                                              | J112-2  | J203-A23 | BLK  | 407260   | 41.5"        | COL 52 A     |
| 120                                                              | J112-4  | J203-A24 | WHT  | 407260   | 41.5"        | COL 36 A     |
| 121                                                              | J112-6  | J203-A25 | GRY  | 407260   | 41.5"        | COL 51 A     |
| 122                                                              | J112-8  | J203-A26 | VIO  | 407260   | 41.5"        | COL 35 A     |
| 123                                                              | J112-10 | J203-A27 | BLU  | 407260   | 41.5"        | COL 50 A     |
| 124                                                              | J111-9  | J203-A28 | GRN  | 407260   | 41.5"        | COL 34 A     |
| 125                                                              | J111-7  | J203-A29 | YEL  | 407260   | 41.5"        | COL 49 A     |
| 126                                                              | J111-5  | J203-A30 | ORN  | 407260   | 41.5"        | COL 33 A     |
| 127                                                              | J111-3  | J203-A31 | RED  | 407260   | 41.5"        | COL 48 A     |
| 128                                                              | J111-1  | J203-A32 | BRN  | 407260   | 41.5"        | COL 32 A     |
|                                                                  |         |          |      |          |              |              |
| 129                                                              | J117-4  | J203-B1  | TAN  | 407260   | 41.5"        | COL 63 B     |
| 130                                                              | J117-2  | J203-B2  | TAN  | 407260   | 41.5"        | COL 47 B     |
| 131                                                              | J116-1  | J203-B3  | TAN  | 407260   | 41.5"        | COL 62 B     |
| 132                                                              | J116-3  | J203-B4  | TAN  | 407260   | 41.5"        | COL 46 B     |
| 133                                                              | J116-5  | J203-B5  | TAN  | 407260   | 41.5"        | COL 61 B     |
| 134                                                              | J116-7  | J203-B6  | TAN  | 407260   | 41.5"        | COL 45 B     |
| 135                                                              | J116-9  | J203-B7  | TAN  | 407260   | 41.5"        | COL 60 B     |
| 136                                                              | J115-10 | J203-B8  | TAN  | 407260   | 41.5"        | COL 44 B     |
|                                                                  |         |          |      |          |              |              |
| <b>RACAL Instruments, Inc., 4 Goodyear St., Irvine, CA 92718</b> |         |          |      |          |              |              |
| DOCUMENT TITLE                                                   |         |          | SIZE | CODE NO. | DOCUMENT NO. | REV          |
| HARNESS ASSEMBLY, 1260-45, TTI                                   |         |          | A    | 21793    | 407287       | A            |
|                                                                  |         |          | DRN  |          |              | SHEET 6 of 8 |

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## ENGINEERING WIRE LIST

| WIRE                                                             | FROM    | TO         | TYPE | PART #   | WIRE LEN     | REFERENCE |
|------------------------------------------------------------------|---------|------------|------|----------|--------------|-----------|
| 137                                                              | J115-8  | J203-B9    | TAN  | 407260   | 41.5"        | COL 59 B  |
| 138                                                              | J115-6  | J203-B10   | TAN  | 407260   | 41.5"        | COL 43 B  |
| 139                                                              | J115-4  | J203-B11   | TAN  | 407260   | 41.5"        | COL 58 B  |
| 140                                                              | J115-2  | J203-B12   | TAN  | 407260   | 41.5"        | COL 42 B  |
| 141                                                              | J114-1  | J203-B13   | TAN  | 407260   | 41.5"        | COL 57 B  |
| 142                                                              | J114-3  | J203-B14   | TAN  | 407260   | 41.5"        | COL 41 B  |
| 143                                                              | J114-5  | J203-B15   | TAN  | 407260   | 41.5"        | COL 56 B  |
| 144                                                              | J114-7  | J203-B16   | TAN  | 407260   | 41.5"        | COL 40 B  |
| 145                                                              | J114-9  | J203-B17   | TAN  | 407260   | 41.5"        | COL 55 B  |
| 146                                                              | J113-10 | J203-B18   | TAN  | 407260   | 41.5"        | COL 39 B  |
| 147                                                              | J113-8  | J203-B19   | TAN  | 407260   | 41.5"        | COL 54 B  |
| 148                                                              | J113-6  | J203-B20   | TAN  | 407260   | 41.5"        | COL 38 B  |
| 149                                                              | J113-4  | J203-B21   | TAN  | 407260   | 41.5"        | COL 53 B  |
| 150                                                              | J113-2  | J203-B22   | TAN  | 407260   | 41.5"        | COL 37 B  |
| 151                                                              | J112-1  | J203-B23   | TAN  | 407260   | 41.5"        | COL 52 B  |
| 152                                                              | J112-3  | J203-B24   | TAN  | 407260   | 41.5"        | COL 36 B  |
| 153                                                              | J112-5  | J203-B25   | TAN  | 407260   | 41.5"        | COL 51 B  |
| 154                                                              | J112-7  | J203-B26   | TAN  | 407260   | 41.5"        | COL 35 B  |
| 155                                                              | J112-9  | J203-B27   | TAN  | 407260   | 41.5"        | COL 50 B  |
| 156                                                              | J111-10 | J203-B28   | TAN  | 407260   | 41.5"        | COL 34 B  |
| 157                                                              | J111-8  | J203-B29   | TAN  | 407260   | 41.5"        | COL 49 B  |
| 158                                                              | J111-6  | J203-B30   | TAN  | 407260   | 41.5"        | COL 33 B  |
| 159                                                              | J111-4  | J203-B31   | TAN  | 407260   | 41.5"        | COL 48 B  |
| 160                                                              | J111-2  | J203-B32   | TAN  | 407260   | 41.5"        | COL 32 B  |
|                                                                  |         |            |      |          |              |           |
| 161                                                              | J101-1  | NO CONNECT |      |          |              |           |
| 162                                                              | J101-2  | NO CONNECT |      |          |              |           |
| 163                                                              | J101-3  | NO CONNECT |      |          |              |           |
| 164                                                              | J101-4  | NO CONNECT |      |          |              |           |
|                                                                  |         |            |      |          |              |           |
| 165                                                              | J103-1  | NO CONNECT |      |          |              |           |
| 166                                                              | J103-2  | NO CONNECT |      |          |              |           |
| 167                                                              | J103-3  | NO CONNECT |      |          |              |           |
| 168                                                              | J103-4  | NO CONNECT |      |          |              |           |
|                                                                  |         |            |      |          |              |           |
| 169                                                              | J110-5  | NO CONNECT |      |          |              |           |
| 170                                                              | J110-6  | NO CONNECT |      |          |              |           |
| 171                                                              | J110-7  | NO CONNECT |      |          |              |           |
| 172                                                              | J110-8  | NO CONNECT |      |          |              |           |
| 173                                                              | J110-9  | NO CONNECT |      |          |              |           |
| 174                                                              | J110-10 | NO CONNECT |      |          |              |           |
|                                                                  |         |            |      |          |              |           |
| 175                                                              | J117-5  | NO CONNECT |      |          |              |           |
| 176                                                              | J117-6  | NO CONNECT |      |          |              |           |
| 177                                                              | J117-7  | NO CONNECT |      |          |              |           |
| 178                                                              | J117-8  | NO CONNECT |      |          |              |           |
| <b>RACAL Instruments, Inc., 4 Goodyear St., Irvine, CA 92718</b> |         |            |      |          |              |           |
| DOCUMENT TITLE                                                   |         |            | SIZE | CODE NO. | DOCUMENT NO. | REV       |
| HARNESS ASSEMBLY, 1260-45, TTI                                   |         |            | A    | 21793    | 407287       | A         |
|                                                                  |         |            | DRN  |          | SHEET 7 of 8 |           |

DOC NO. 407287

## ENGINEERING WIRE LIST

| WIRE                                                      | FROM    | TO         | TYPE | PART #   | WIRE<br>LEN  | REFERENCE |
|-----------------------------------------------------------|---------|------------|------|----------|--------------|-----------|
| 179                                                       | J117-9  | NO CONNECT |      |          |              |           |
| 180                                                       | J117-10 | NO CONNECT |      |          |              |           |
| <div>DOC. NO.   407287</div>                              |         |            |      |          |              |           |
|                                                           |         |            |      |          |              |           |
|                                                           |         |            |      |          |              |           |
|                                                           |         |            |      |          |              |           |
| RACAL Instruments, Inc., 4 Goodyear St., Irvine, CA 92718 |         |            |      |          |              |           |
| DOCUMENT TITLE                                            |         |            | SIZE | CODE NO. | DOCUMENT NO. | REV       |
| HARNESS ASSEMBLY, 1260-45, TTI                            |         |            | A    | 21793    | 407287       | A         |
|                                                           |         |            | DRN  |          | SHEET 8 of 8 |           |

## Chapter 6

# PRODUCT SUPPORT

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### 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 1260-45 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.

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

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

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

Call before shipping

Ship instruments to nearest support office.

Note: We do not accept  
"collect" shipments.

# Appendix A

## HOW TO CONFIGURE THE 1260-45 MATRIX MODULE

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### Introduction

The 1260-45 is a high-density matrix module containing four 4x16 matrices. Larger matrices may be configured via internal jumpers or by using external cabling. This application note will detail how to achieve this interconnection and give a practical example. **Figure A-1** shows that J200 and J201 contain the rows of the matrices and J202 and J203 contain the columns of the matrices.

### Configuration

The 1260-45 module is constructed from two printed circuit boards mounted one on top of the other. (See **Figures A-1** and **A-2** for a block diagram of the module.) Modules may be purchased from the factory with internal jumpers installed. Following are the three basic configurations:

- \* 1260-45A Quad 4x16 matrices (no jumpers) (See **Figure A-4**)
- \* 1260-45B Dual 4x32 matrices (rows jumpered), J9, J10 (See **Figure A-5**)
- \* 1260-45C Dual 8x16 matrices (columns jumpered), J7 J8 (See **Figure A-6**)

The flexibility of this module allows the user to reconfigure these on-board jumpers. Additional flexibility is achieved because of the pin-out of the front panel connectors. The matrices may also be interconnected across boards via external cabling. A simple ribbon cable across J200 and J201 connects the rows of group 0-2, 1-3 in parallel.

## Larger Matrices

To build a 4x64 matrix, start with the dual 4x32 module (1260-45B). This is used because the 1260-45B already has the rows paralleled, eliminating the time it would take the user to do this by removing module covers on a 1260-45A. The 1260-45C has the columns paralleled, which is not required here. Connect a ribbon cable between J200 and J201 to parallel group 0 to 2 and group 1 to 3. See **Figure A-7**.

The principle of interconnecting multiple matrices to build larger matrices is the same:

1. Establish the module building blocks (-45 A, B or C)
2. Establish external interconnect

## Example

Let's look at the configuration of an 8x64 matrix. Start with the Dual 4x32 matrix (1260-45B). Two modules will be required. Connect J200 on each module and J201 on each module to achieve the 8 rows. Connect J202 to J203 on each of the modules to give you the 64 columns. See **Figure A-8**.

We could easily have started with a 1260-45C, because in this example some paralleling of rows and columns was necessary.

## Summary

The following table provides a list of a number of different configurations and how you would realize them with the 1260-45 module.

| Configuration | Start With       | Cabling Used      |
|---------------|------------------|-------------------|
| 4 x 64        | 1260-45B         | Rows with LB      |
| 8 x 32        | 1260-45B         | Columns with LB   |
| 16 x 16       | 1260-45C         | Columns with LB   |
| 8 x 64        | 4 x 64 2 modules | Columns with LBBM |
| 16 x 32       | 8 x 32 2 modules | Columns with LBBM |

Note: LB refers to the loopback connector used to connect J200 to J201 (rows) or J202 to J203 (columns). LBBM refers to the loopback connector connecting the rows or columns on adjacent modules.

Also remember, all of these configurations can be made from the 126045A module. The covers must be removed to access the on-board jumpers to turn the module into a B or C version.

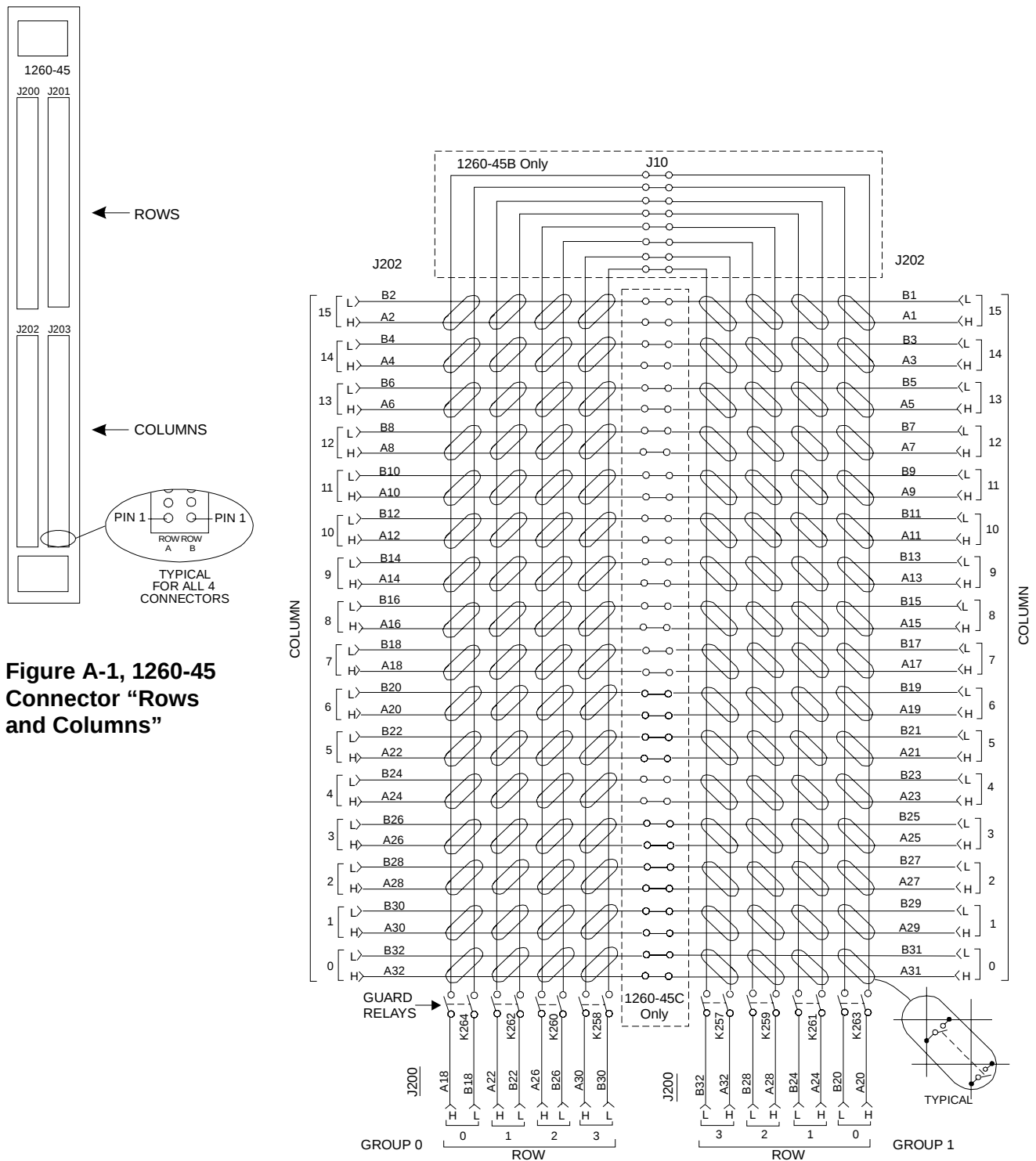


Figure A-2, J200 &amp; J202 Block Diagram

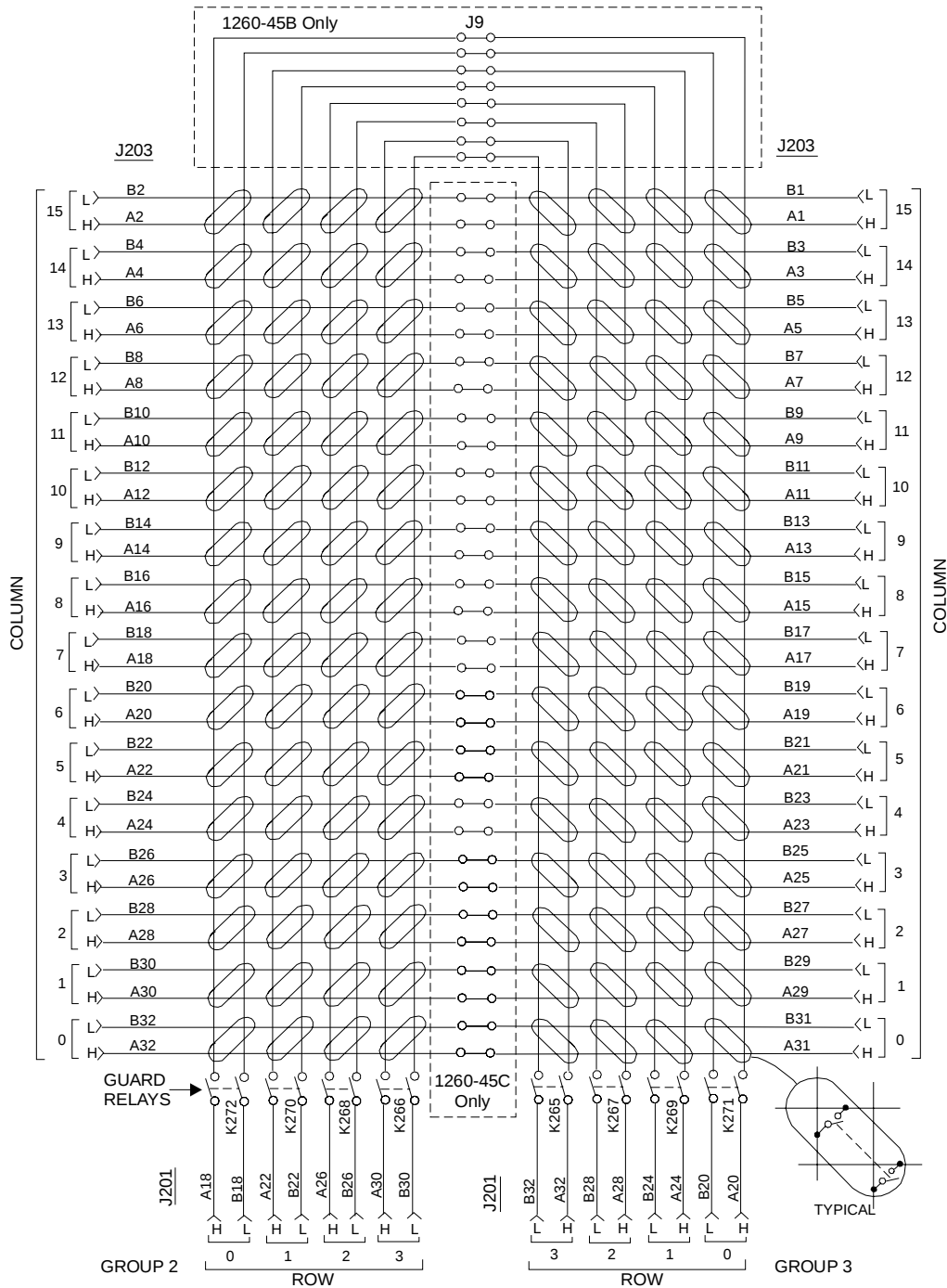


Figure A-3, J201 &amp; J203 Block Diagram

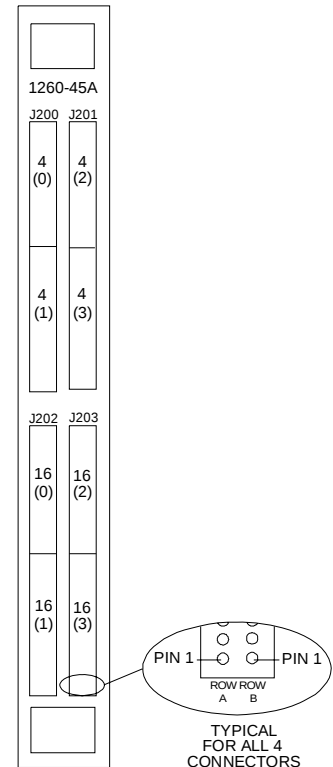


Figure A-4, 1260-45A Quad 4X16 Matrices

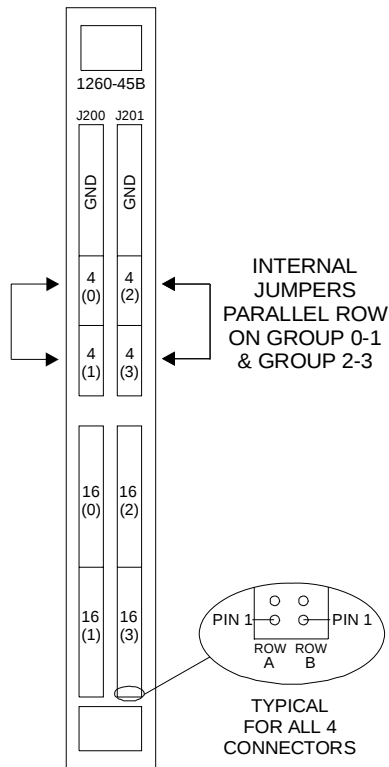


Figure A-5, 1260-45B Dual 4X32 Matrices

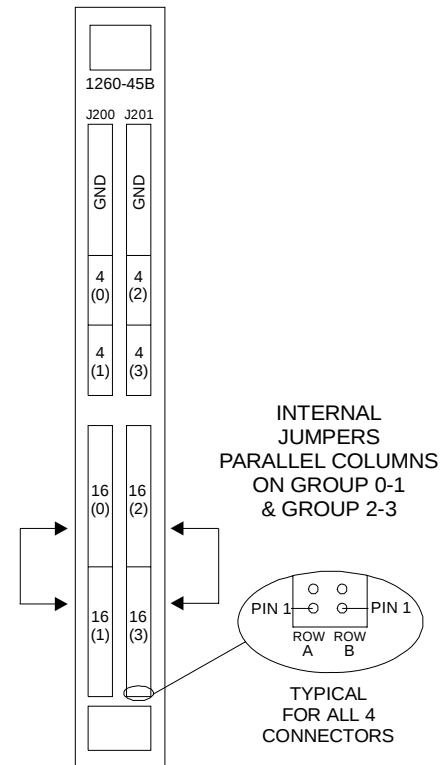


Figure A-6, 1260-45C Dual 8X16 Matrices

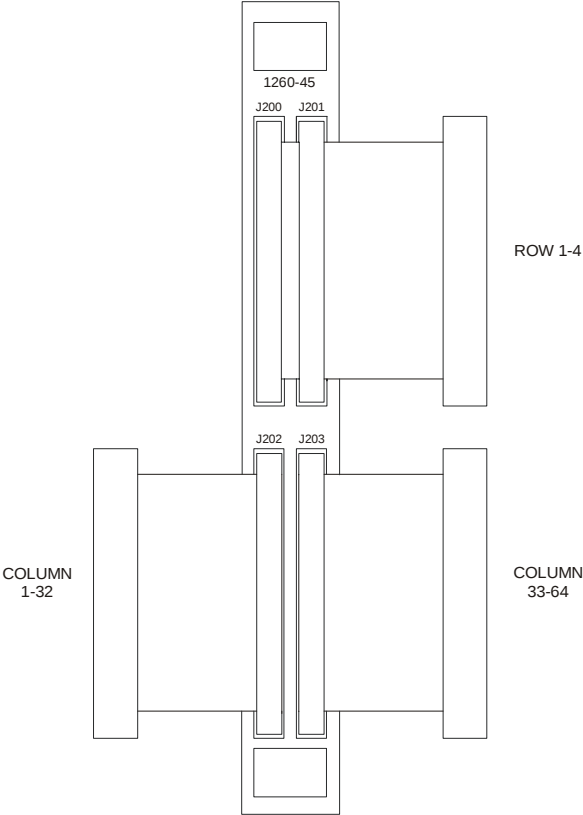


Figure A-7, 1260-45B Configured as 4X64 Matrix

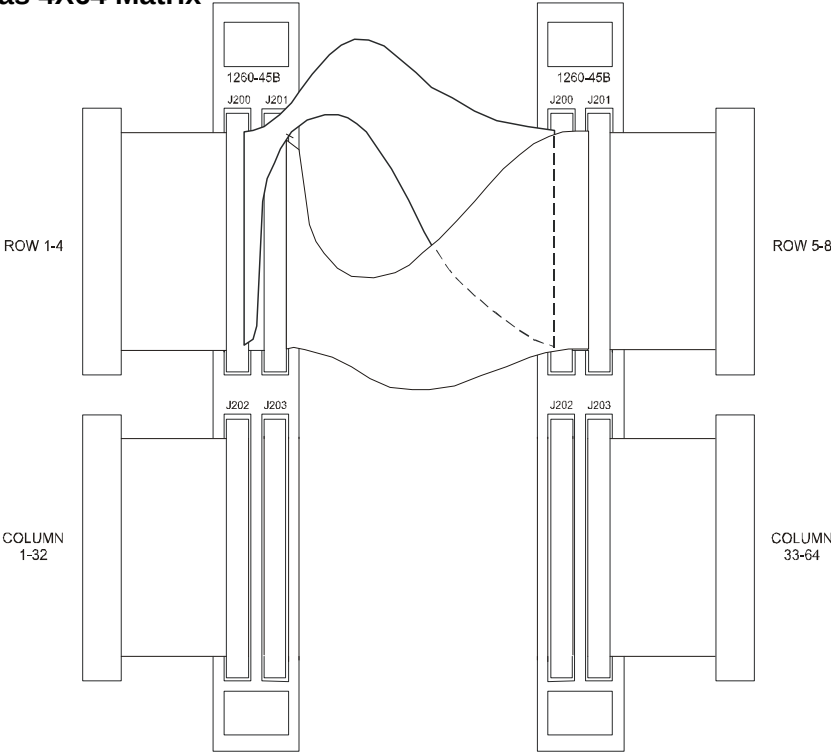


Figure A-8, 1260-45B Configured as 8X64 Matrix

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