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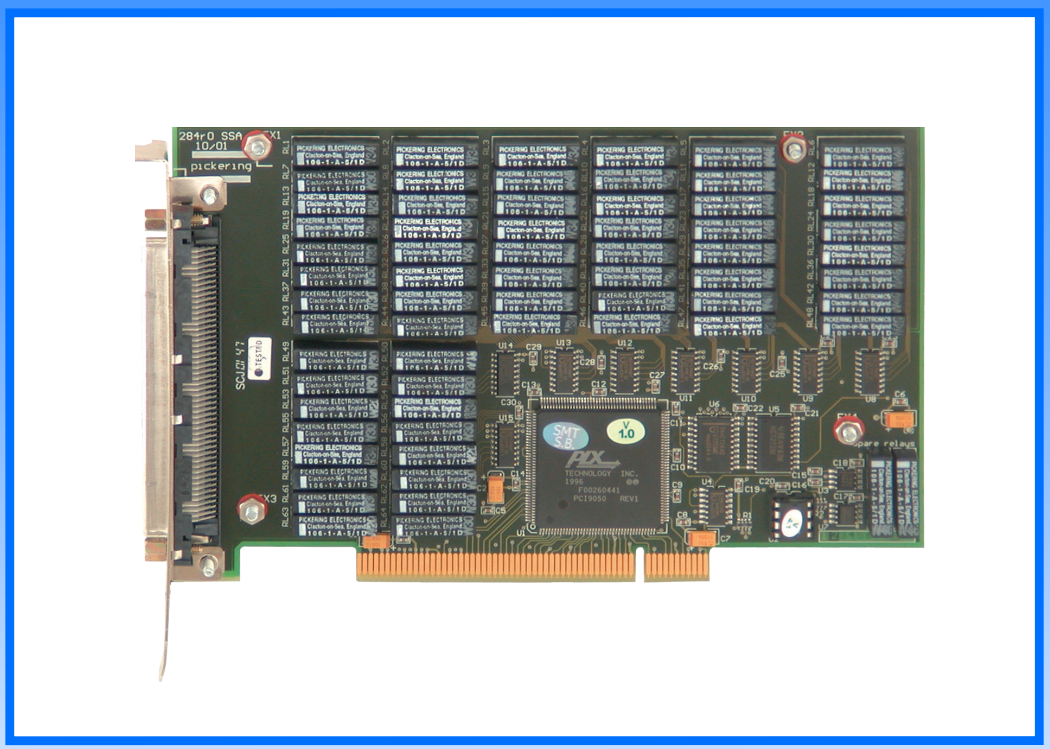
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Find the *Pickering 50-110-121-S1* at our website: *Click HERE*

USER MANUAL

PCI CONVENTIONAL™

GENERAL PURPOSE REED RELAY MODULE
(MODEL Nos. 50-110 / 115-021 / 121)



Issue 4.0 April 2012

pickering

www.pickeringtest.com

BSI REGISTERED FIRM
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Observe the Electrical Hazard Warning detailed in Section 8.



Observe the Electrostatic Sensitive Device Caution detailed in Section 8.

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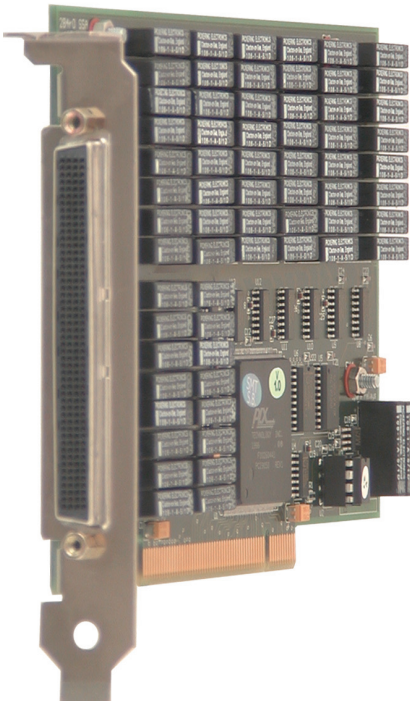
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SECTION 1 - TECHNICAL SPECIFICATION

50-110/115/120/125
PCI Reed Relay Card

- 25, 32, 50 or 64 Reed Relays Per Card
- SPST, DPST, SPDT and Shielded Configurations
- Ruthenium Reed Relays Suitable For Low Level Signals
- Uses High Reliability Pickering Reed Relays For Maximum Performance
- Fast Operating Speed 250µs Typical
- Switch up to 150VDC/100VAC, 1.25A with 20W Max Power
- VISA, IVI & Kernel Drivers Supplied for Windows XP/Vista/7
- Shares Similar Architecture To PXI 40-110 Card
- 2 Year Warranty



The 50-110/115 range of switching cards are available in both Changeover (SPDT) and Normally Open (SPST & DPST) configurations. Connections are made via a front panel 200-pin female connector.

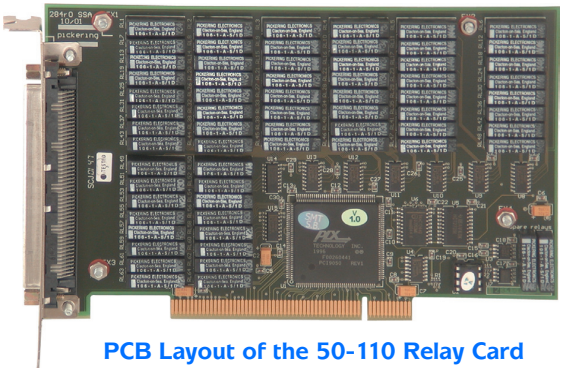
For applications requiring improved bandwidth and crosstalk performance please look at our 50-120/125 range of shielded reed relay cards.

General purpose reed relays are suitable for the construction of small switching networks, for slaving up to larger switches or for operating external devices (e.g. lamps, solenoids etc.).

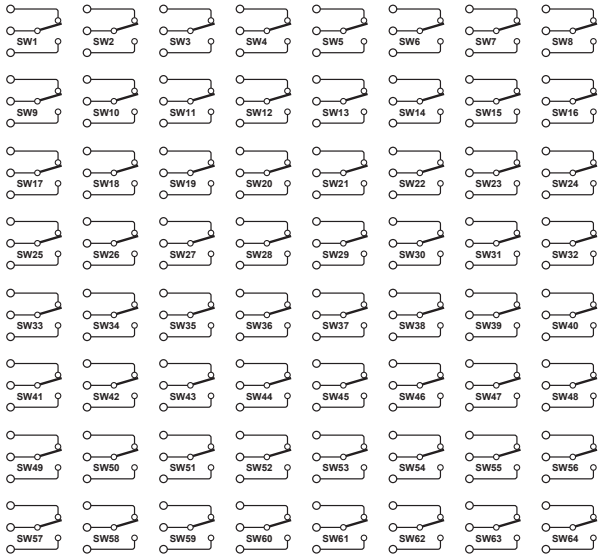
All of the reed relays used in our PCI cards are manufactured by our sister company Pickering Electronics. Pickering reed relays offer very high reliability (over 10^8 operations) with maximum switching performance, especially for low level signals.

Range Description:

50-110	32 or 64 x SPDT Reed Relays.
50-115-X21	32 or 64 x SPST Reed Relays.
50-115-X22	25 or 50 x DPST Reed Relays.
50-120	32 x Shielded SPDT Reed Relays.
50-125	32 or 50 Shielded SPST Reed Relays.



PCB Layout of the 50-110 Relay Card



Schematic of the 50-110-121 Relay Card – 64 x SPDT Reed Relays

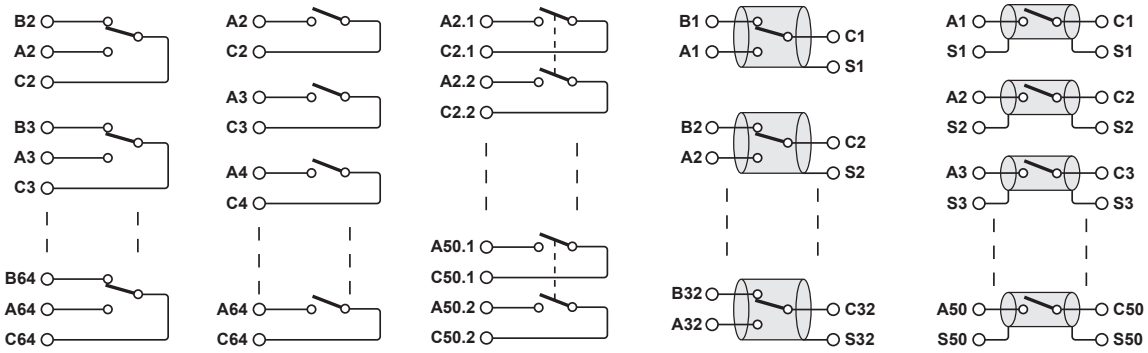
Relay Type

The 50-110/115/120/125 is fitted with Reed Relays (Ruthenium electroplated type), these offer very long life with good low level switching performance and excellent contact resistance stability.

Spare Reed Relays are built onto the circuit board to facilitate easy maintenance with minimum downtime.

All reed relays are manufactured by our sister company Pickering Electronics, www.pickeringrelay.com.

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50-110-121 50-115-121 50-115-122 50-120-021 50-125-121

Switching Diagrams for the 50-110/115/120/125 Reed Relay Card

Programming

Pickering provide kernel, IVI and VISA (NI and Agilent) drivers which are compatible with Windows XP/Vista and Windows 7 operating systems. The VISA driver is also compatible with Real-Time Operating Systems such as LabVIEW RT. For other RTOS support contact Pickering.

These drivers may be used with a variety of programming environments and applications including:

National Instruments products (LabVIEW/LabWindows/CVI/MAX/TestStand etc.)

Microsoft Visual Studio products (Visual Basic/Visual C+)

Agilent VEE

Mathworks Matlab

Geotest ATE Easy

Drivers for popular Linux distributions are available, other environments are also supported, please contact Pickering with specific enquiries.

Power Requirements

Power consumption from the 5V backplane is as follows:

Minimum: 0.8W Typical: 1.4W Maximum: 5W.

Physical Parameters

Physical characteristics:	Single slot short PCI format
Signalling Environment:	+5V only
Signal Connector:	200-way female LFH connector

PCI Compliance

The 50-110 series complies with the PCI Specification 2.0 (issued Aug 2000).

Safety & CE Compliance

All cards are fully CE compliant and meet applicable EU directives: Low-voltage safety EN61010-1:2001, EMC Immunity EN61000-6-1:2001, Emissions EN55011:1998.

Operating/Storage Conditions

Operating Conditions

Operating Temperature:	0°C to 55°C
Humidity:	Up to 90% non-condensing
Altitude:	5000m

Storage and Transport Conditions

Storage Temperature:	-20°C to +75°C
Humidity:	Up to 90% non-condensing
Altitude:	15000m

Latest Details

Please refer to our Web Site for Latest Product Details:
www.pickeringtest.com

Switching Specification

Switch Type:	Ruthenium Reed
Max Switching Voltage:	150VDC/100VAC
Max Power: Max Switch Current: Max Carry Current:	20W (3W for SPDT) 1A (0.25A for SPDT) 1.25A
On Path Resistance: Off Path Resistance: Differential Thermal Offset:	<800mΩ (400mΩ typical) >10^9Ω <10µV
Crosstalk (100Ω balanced): Isolation (100Ω balanced):	80dB (1MHz), 72dB (10MHz) 62dB (25MHz) 75dB (1MHz), 60dB (10MHz) 55dB (25MHz)
Operate Time: Release Time:	<0.5ms, 0.25ms typical <0.5ms, 0.25ms typical
Expected Life, low power: Expected Life, full power:	>1x10^8 operations >1x10^6 operations

Product Order Codes

32 x SPDT, Ruthenium Reed Relays	**50-110-021**
64 x SPDT, Ruthenium Reed Relays	**50-110-121**
32 x SPST, Ruthenium Reed Relays	**50-115-021**
64 x SPST, Ruthenium Reed Relays	**50-115-121**
25 x DPST, Ruthenium Reed Relays	**50-115-022**
50 x DPST, Ruthenium Reed Relays	**50-115-122**
32 x Shielded SPDT Reed Relays	**50-120-021**
32 x Shielded SPST Reed Relays	**50-125-021**
50 x Shielded SPST Reed Relays	**50-125-121**

Mating Connectors & Cabling

For connection accessories for the 50-110 series please refer to the **90-002D** 200-way LFH Connector Accessories data sheet where a complete list and documentation can be found for accessories, or refer to the Connection Solutions catalog.

Support Products

Spare Relay Kits

Kits of replacement relays are available for the majority of Pickering's PXI switching modules, simplifying servicing and reducing down-time. The relay kits for the 50-110 range are as follows:

91-100-061 kit for 50-110-021 & 50-110-121
91-100-048 kit for 50-115-021 & 50-115-121
91-100-017 kit for 50-115-022 & 50-115-122
91-100-074 kit for 50-120-021
91-100-058 kit for 50-125-021 & 50-125-121

For further assistance, please contact your local Pickering sales office.

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SECTION 2 - TECHNICAL DESCRIPTION

FUNCTIONAL DESCRIPTION

A functional block diagram is provided in Figure 2.1. The Reed Relay Module is powered by a +5V input via the edge connector. The interface to the user test equipment is via the front panel mounted 200-way SCSI type connector, J1. The module comprises a PCB populated with 32 or 64, SPDT or SPST reed relays, depending on the module type. The relays are energised via control signals from relay drivers U8 to U15. The relay driver is addressed by PCI bridge U1 to output the required signal. Module configuration is determined by data stored in EEPROM U7. PCI Bridge U1 is configured by EEPROM U2.

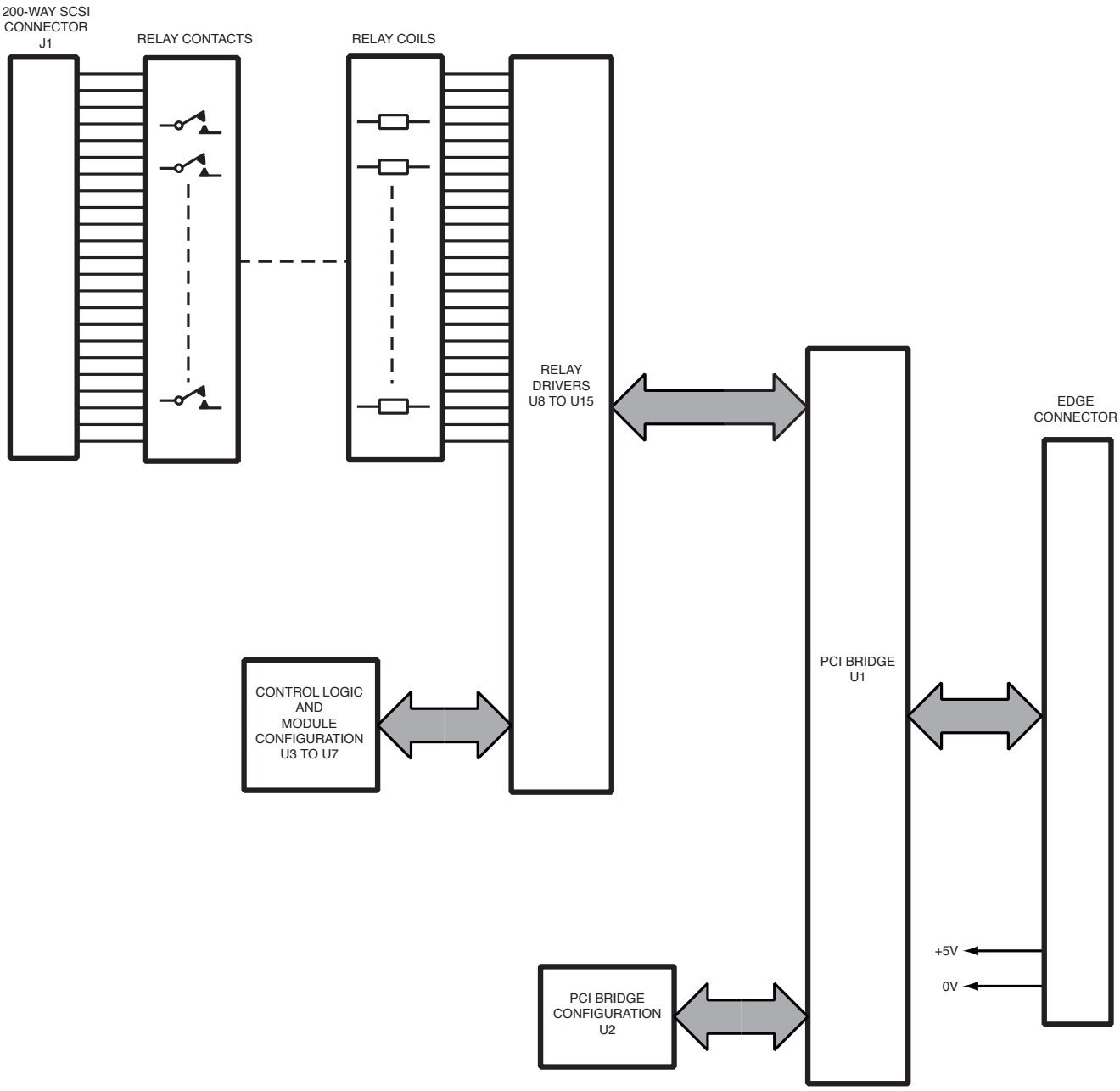


Figure 2.1 - General Purpose Reed Relay Module (50-110/115): Functional Block Diagram

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SECTION 3 - INSTALLATION

HARDWARE INSTALLATION

CAUTION

Electrostatic discharge can damage the components on the card. To avoid such damage in handling the card, touch the anti-static bag to a metal part of the chassis before removing the card from the bag.

The card should be installed in accordance with the following procedure:

1. Ensure that the system is turned OFF but still connected to mains so that it remains grounded.
2. Choose an appropriate free PCI slot in the host system.
3. Remove the blanking plate for the chosen slot and retain the fixing screw.
4. Carefully remove the card from its anti-static bag and insert the card's edge connector into the free slot in the host system.
5. Ensure the card is fully inserted into the edge connector and the front panel is fully in contact with the back of card aperture in the host chassis.
6. Use the fixing screw to secure the front panel of the card to the host chassis' mounting rail.
7. Replace the chassis cover(s).
7. Power-up the host system.



Figure 3.1 - Inserting a PCI Card into a PC Chassis

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SOFTWARE INSTALLATION

First install the appropriate Pickering PXI switch card drivers by running the installer program Setup.exe, either from the CD-ROM supplied, or by downloading the latest version from our website http://www.pickeringtest.com - the recommended method. There are different versions of the Setup program to suit different Windows versions and software environments. Setup is accompanied by a ReadMe file containing additional installation information. A single installation covers all cards in the System 40, System 45 and System 50 ranges.

When installation completes, the installed drivers' ReadMe file is offered for display. It can also be displayed later using a shortcut on the Programs>>Pickering menu.

If you are not a LabVIEW user you should choose the "full" version, and once that has been installed run the LabVIEW Runtime Engine installer via the shortcut on the Programs>>Pickering menu. In the absence of LabVIEW the Runtime Engine is required to support the Pickering Test Panels application.

TESTING OPERATION

After installation of the hardware start the Test Panels application from the Programs>>Pickering>>PXI Utilities menu. If you are a LabVIEW user, run "Test Panels (LabVIEW VI)"; if not, run "Test Panels (EXE)". A selector panel will appear, listing all installed Pickering PXI switch cards. Click on the card you wish to control, and a graphical control panel is presented allowing operation of the card. Panels can be opened simultaneously for all the installed cards.

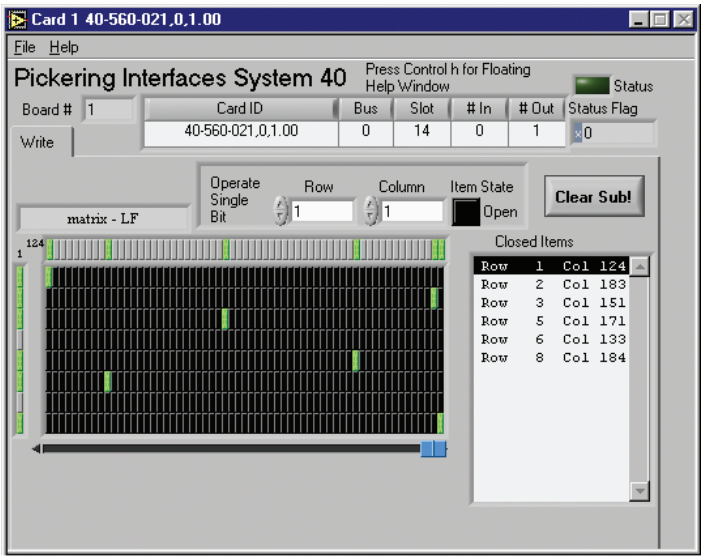


Figure 3.2 - Typical Test Panel Display

As an alternative to the Test Panels, the simple Terminal Monitor program PILMon (again on the Programs>>Pickering>>PXI Utilities menu) allows access to all functions of Pickering switch cards through a command-line interface. In PILMon, enter "HE" for help on it's commands.

Please note that both the Test Panels and Terminal Monitor gain exclusive access to the cards, and so only one of them can be operational at any time.

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SECTION 4 - PROGRAMMING GUIDE

PROGRAMMING OPTIONS FOR PICKERING INTERFACES PCI CARDS

Software drivers are supplied for Microsoft Windows XP/Vista/7 operating systems, with specific support for the following development environments:

- Microsoft Visual Studio (VB, C++, C#)
- Borland C++
- National Instruments LabWindows/CVI
- National Instruments LabVIEW and LabVIEW RT

Windows drivers are supplied in the form of Dynamic Link Libraries, which should also be usable in any other development environment that supports them.

Programming for PCI

A number of different Windows drivers are available to meet particular system requirements, and should none of these be suitable there is also the option of register-level programming. Drivers are generally 'universal', handling all models in the System 40, 45 and 50 ranges; however some models that are not compliant with the Ivi Swtch class cannot be used with the pi40iv IVI driver. The pipx40 and Pilpxi drivers are also applicable to certain models in the System 41 (PXI Instruments) range - see these drivers' System 41 support list.

Please note that this documentation is available in its most up-to-date form as HTML help files, fully hyperlinked for easy access - both pipx40 and Pilpxi documents are included in the Pipx40vpp software installation.

IVI Driver for Windows - pi40iv

The pi40iv IVI (Interchangeable Virtual Instrument) driver supports all Pickering Interfaces PXI switch cards that are consistent with the Iviswtch class model - as are the great majority of cards in the System 40/45/50 ranges. It integrates well with LabWindows/CVI and LabVIEW, and is fully compatible with Switch Executive. It is also usable in general-purpose programming environments such as Visual C++ and Visual Basic.

Prior installation of the VISA and IviEngine from National Instruments are required for the correct installation and operation of this driver.

VISA Driver for Windows - pipx40

The pipx40 driver conforms to the VISA (Virtual Instrument Software Architecture) standard for programmable instrumentation. Instrument control environments such as LabVIEW and LabWindows/CVI are based on VISA, and pipx40 support libraries are provided for them.

Prior installation of VISA from National Instruments is required for the operation of this driver.

Where VISA is available, pipx40 can also be used in general-purpose programming environments such as Visual C++ and Visual Basic. When IVI is not a system requirement this driver will often yield faster operation than the pi40iv driver.

Direct I/ODriver for Windows - Pilpxi

The Pilpxi driver accesses cards directly, without using the VISA software layer, while offering similar overall functionality to pipx40. It is most commonly used in general-purpose programming environments such as Visual C++ and Visual Basic. Operating speed of the VISA and Direct I/O drivers is generally comparable.

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Register-level Programming

Where the supplied drivers are not suitable, register-level programming can be employed - for example:

- If the functionality of the supplied drivers does not meet the application requirements
- If security considerations demand full source-code for the application
- In development environments that have alternate mechanisms for accessing PCI bus
- For operating systems other than Windows

General Pickering Card Architecture

With most drivers, before programming a Pickering card it is important to understand the basic architecture of Pickering cards.

The switches on a Pickering card are organized into logical sub-units, each sub-unit containing a set of objects of similar type and use. These objects may be switches, digital outputs, digital inputs, resistors, power supplies etc, depending on the nature of the specific card.

For example a simple matrix card will usually contain a single sub-unit containing the switches arranged in a 2-dimensional array. However a similar card with additional isolating relays connected to the matrix will contain additional sub-units containing those isolation relays.

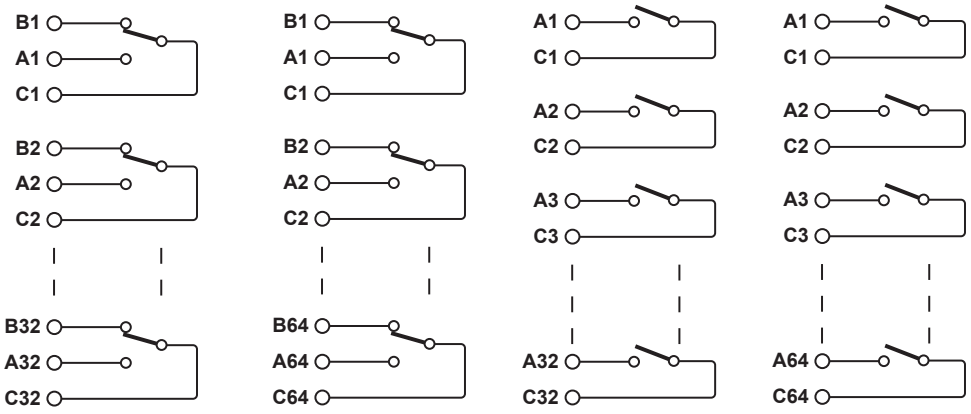
Low level drivers include functions to allow the programmer to query the card to ascertain the number of sub-units, and the size and type of each sub-unit.

For full details of the driver functions available the programmer should refer to the documentation provided.

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MODULE ARCHITECTURE

The Modules utilise up to 64 SPST or SPDT relays depending on the option. In the default state the relays are either open circuit (SPST) or to the 'B' terminal (SPDT). Energising a particular relay creates a signal path between the 'C' and 'A' terminals. The relay module's switching architectures are shown in their default state in the diagrams below:



50-110-021
32 x SPDT

50-110-121
64 x SPDT

50-115-021
32 x SPST

50-115-121
64 x SPST

One sub-unit is used to control the module's relays as shown below. Enabling a particular bit closes the C to A signal path(s).

TABLE 4.1 - Module Sub-Units

Sub-Unit	Bit	Signal Path (Relay Energised) 50-110-021 50-115-021	Signal Path (Relay Energised) 50-110-121 50-115-121	Relay
1	1	com1-A1	com1-A1	1
	2	com2-A2	com2-A2	2
	3	com3-A3	com3-A3	3
	4	com4-A4	com4-A4	4
	5	com5-A5	com5-A5	5
	6	com6-A6	com6-A6	6
	7	com7-A7	com7-A7	7
	8	com8-A8	com8-A8	8
	9	com9-A9	com9-A9	9
	10	com10-A10	com10-A10	10
	11	com11-A11	com11-A11	11
	12	com12-A12	com12-A12	12
	13	com13-A13	com13-A13	13
	14	com14-A14	com14-A14	14
	15	com15-A15	com15-A15	15
	16	com16-A16	com16-A16	16
	17	com17-A17	com17-A17	17
	18	com18-A18	com18-A18	18
	19	com19-A19	com19-A19	19
	20	com20-A20	com20-A20	20

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TABLE 4.1 - Module Sub-Units (continued)

Sub-Unit	Bit	Signal Path (Relay Energised) 50-110-021 50-115-021	Signal Path (Relay Energised) 50-110-121 50-115-121	Relay
1	21	com21-A21	com21-A21	21
	22	com22-A22	com22-A22	22
	23	com23-A23	com23-A23	23
	24	com24-A24	com24-A24	24
	25	com25-A25	com25-A25	25
	26	com26-A26	com26-A26	26
	27	com27-A27	com27-A27	27
	28	com28-A28	com28-A28	28
	29	com29-A29	com29-A29	29
	30	com30-A30	com30-A30	30
	31	com31-A31	com31-A31	31
	32	com32-A32	com32-A32	32
	33	-	com33-A33	33
	34	-	com34-A34	34
	35	-	com35-A35	35
	36	-	com36-A36	36
	37	-	com37-A37	37
	38	-	com38-A38	38
	39	-	com39-A39	39
	40	-	com40-A40	40
	41	-	com41-A41	41
	42	-	com42-A42	42
	43	-	com43-A43	43
	44	-	com44-A44	44
	45	-	com45-A45	45
	46	-	com46-A46	46
	47	-	com47-A47	47
	48	-	com48-A48	48
	49	-	com49-A49	49
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	57	-	com57-A57	57
	58	-	com58-A58	58
	59	-	com59-A59	59
	60	-	com60-A60	60
	61	-	com61-A61	61
	62	-	com62-A62	62
	63	-	com63-A63	63
	64	-	com64-A64	64

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PROGRAMMING THE MODULE

Here are some simple examples of using the drivers with the 50-110-121 (64 Channel SPDT) module.

Using PILPXI

To operate a relay the user could use the simple OpBit command or the WriteSub commands

OpBit

```
DWORD sub_unit = 1;
PIL_OpBit( card_num, sub_unit, 1, 1);    // Connects channel A1 to com 1
PIL_OpBit( card_num, sub_unit, 1, 0);    // Disconnects channel A1 from com 1
                                            Reconnects channel B1 to com 1
PIL_OpBit( card_num, sub_unit, 6, 1);    // Connects channel A6 to com 6
```

WriteSub

```
// Sub-unit is 64 bits wide, so 2 DWORDs are needed to hold the pattern
DWORD data[2];
data[0] = 1;             // Sets lowest bit to 1, channel A1 to com 1
PIL_WriteSub( card_num, sub_unit, data);
data[0] = 0x20;          // Sets 6th bit, channel A6 to com 6
                         // All other relays are set to off
PIL_WriteSub( card_num, sub_unit, data);
```

Using PIPX40

setChannelState

```
ViUInt32 sub_unit = 1;
pipx40_setChannelState(vi, sub_unit, 1, VI_ON);     // Connects chA1 to com1
pipx40_setChannelState(vi, sub_unit, 1, VI_OFF);    // Disconnects chA1 from com1
                                                       Reconnects chB1 to com1
pipx40_setChannelState(vi, sub_unit, 6, VI_ON);     // Connects chA6 to com6
```

setChannelPattern

```
// Sub-unit is 64 bits wide, so 2 ViUInt32 values are needed to hold the entire pattern
ViUInt32 data[2];
data[0] = 1;             // Sets lowest bit to 1, chA1 to com1
pipx40_setChannelPattern( vi, sub_unit, data);
data[0] = 0x20;          // Sets 6th bit, chA6 to com6
                         // All other relays are set to off
pipx40_setChannelPattern( vi, sub_unit, data);
```

Using pi40iv

The IVI driver has no special labelling for this card and treats the relays as an array of switches, labelling the channels using com / nc / no labelling tags.

```
pi40iv_Connect(vi, “com1”, “no1”);       // Connects chA1 to com 1
pi40iv_Disconnect(vi, “com1”, “n01”);    // Disconnects chA1 from com 1
                                            Reconnects chB1 to com 1
pi40iv_Connect(vi, “com1”, “no6”);       // Connects chA6 to com 6
```

SPST and DPST versions use the simple com/ch labeling tags.

The IVI Switch driver specification contains no bulk setting capabilities.

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SECTION 5 - CONNECTOR INFORMATION

Figures 5.1 and 5.2 provide the Pin-Out information for the General Purpose Reed Relay Module.

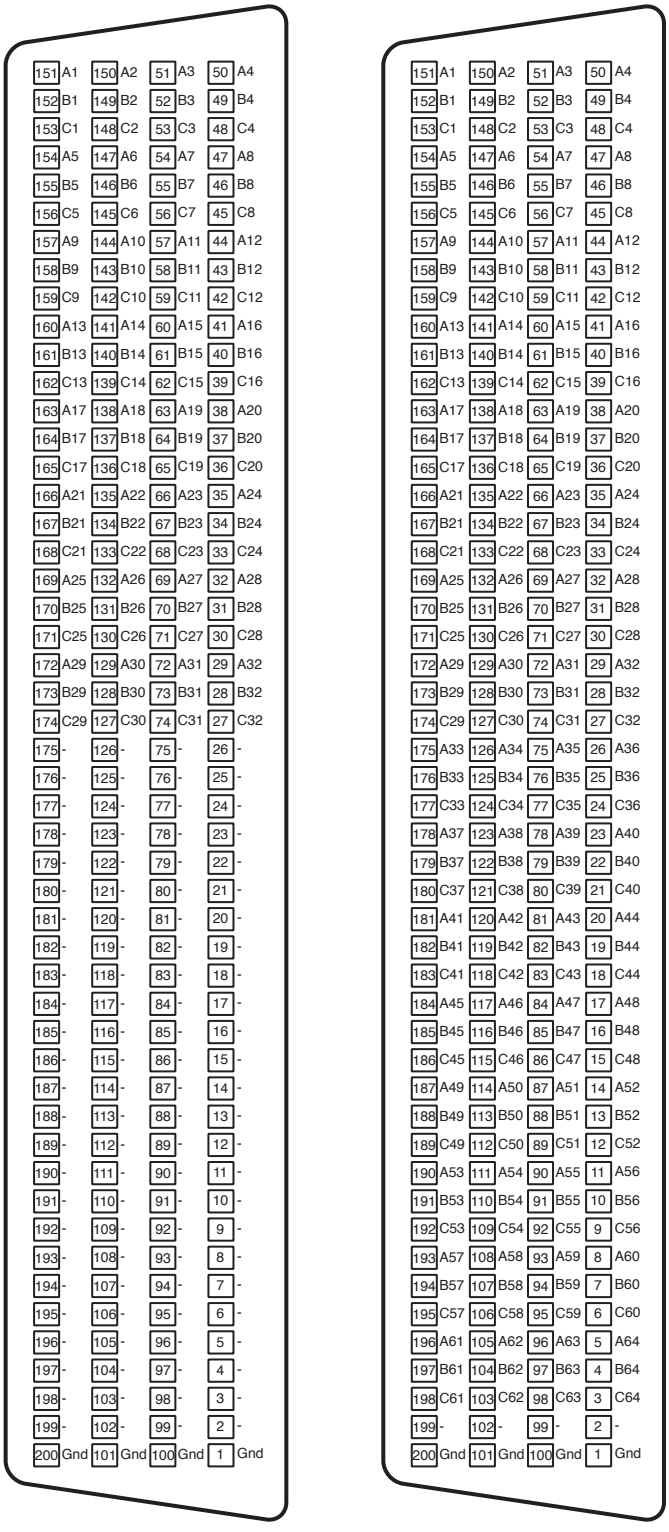


Figure 5.1 - General Purpose Reed Relay Module (50-110-021/121): Pin-Outs

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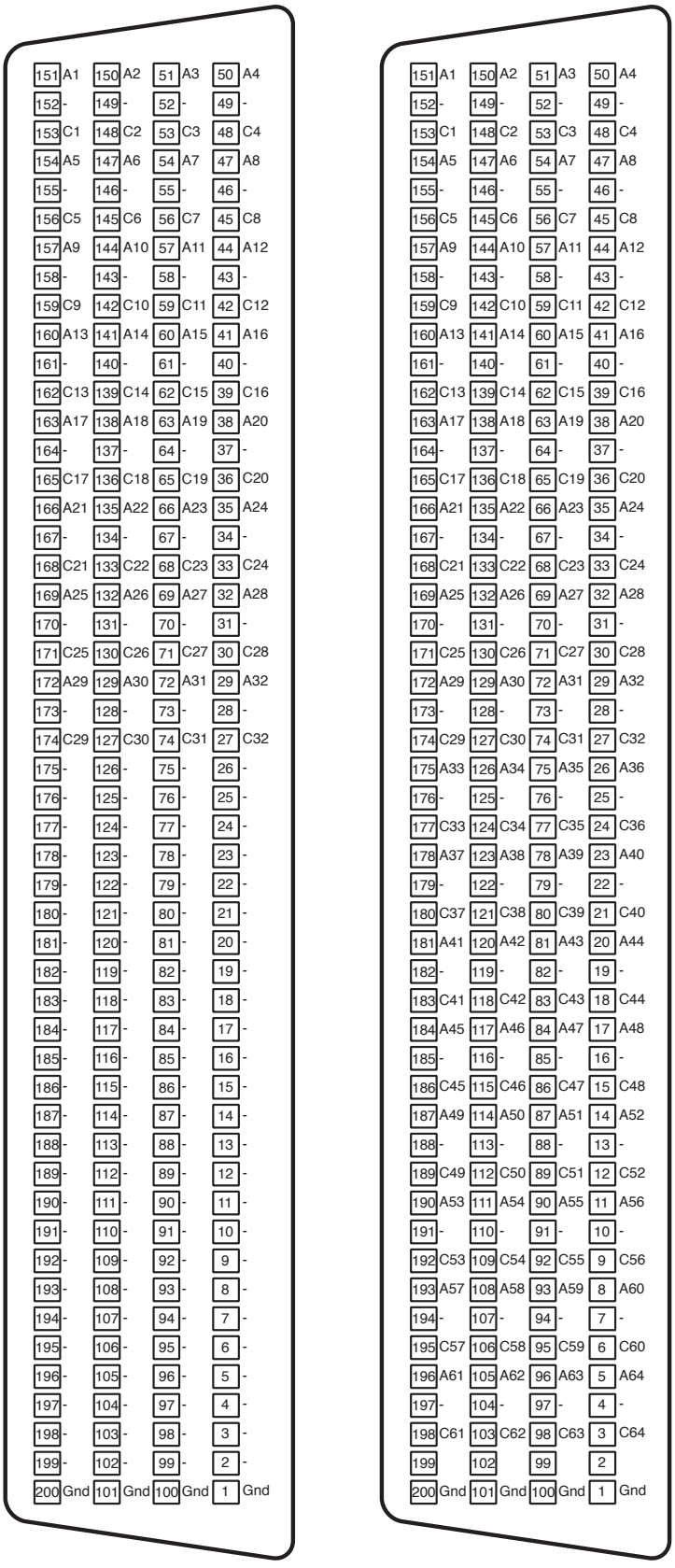


Figure 5.2 - General Purpose Reed Relay Module (50-115-021/121): Pin-Outs

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SECTION 6 - TROUBLESHOOTING

INSTALLATION PROBLEMS

The Plug & Play functionality of Pickering switch cards generally ensures trouble-free installation.

If you do experience any installation problems you should first ensure that all cards are properly seated in their slots. Improperly mated cards may go undetected by the operating system, or may be detected as a card of an unknown type. They can also cause the computer to freeze at various stages in the boot sequence.

If your system employs MXI-3 you should check the integrity of all MXI-3 links. When the system is powered up, and during Windows start-up, you should expect to see periodic activity on the MXI-3 RX/TX (yellow) indicators, clearing to leave only the PWR/LNK (green) LEDs illuminated. The RX/TX indicators should show activity when you attempt to access a card.

DIAGNOSTIC UTILITY

The Pickering Diagnostic Utility (accessible through the Programs>>Pickering>>PXI Utilities menu) generates a diagnostic report of the system's PCI configuration, highlighting any potential configuration problems. Specific details of all installed Pickering switch cards are included. All the installed Pickering switch cards should be listed in the "Pilpxi information" section - if one or more cards is missing it may be possible to determine the reason by referring to the PCI configuration dump contained in the report, but interpretation of this information is far from straightforward, and the best course is to contact Pickering support: support@pickeringtest.com, if possible including a copy of the diagnostic report.

In the "VISA information" section, if VISA is not installed it's absence will be reported. This does not affect operation using the Direct I/O driver, and is not a problem unless you wish to use VISA. VISA is a component of National Instruments LabWindows/CVI and LabVIEW, or is available as a standalone environment.

If VISA is present and is of a sufficiently recent version, the section "Pipx40 information" should present a listing similar to "Pilpxi information".

Please note that the Diagnostic Utility cannot access cards if they are currently opened by some other application, such as the Test Panels or Terminal Monitor.

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SECTION 7 - MAINTENANCE INFORMATION

SOFTWARE UPDATE

For PCI modules operating in a PCI system, no module software updates are required. For the latest version of the driver please refer to our web site www.pickeringtest.com where links to our Software Download page will provide the latest version of the driver software for the various programming environments encountered.

RELAY LOOK-UP TABLES

See Section 4 for a cross reference between the switching channels of the Reed Relay Module and the physical relays on the PCB.

The tables can be used in the fault finding process and should be used in conjunction with the PCB layout diagram below to identify the position of faulty relays.

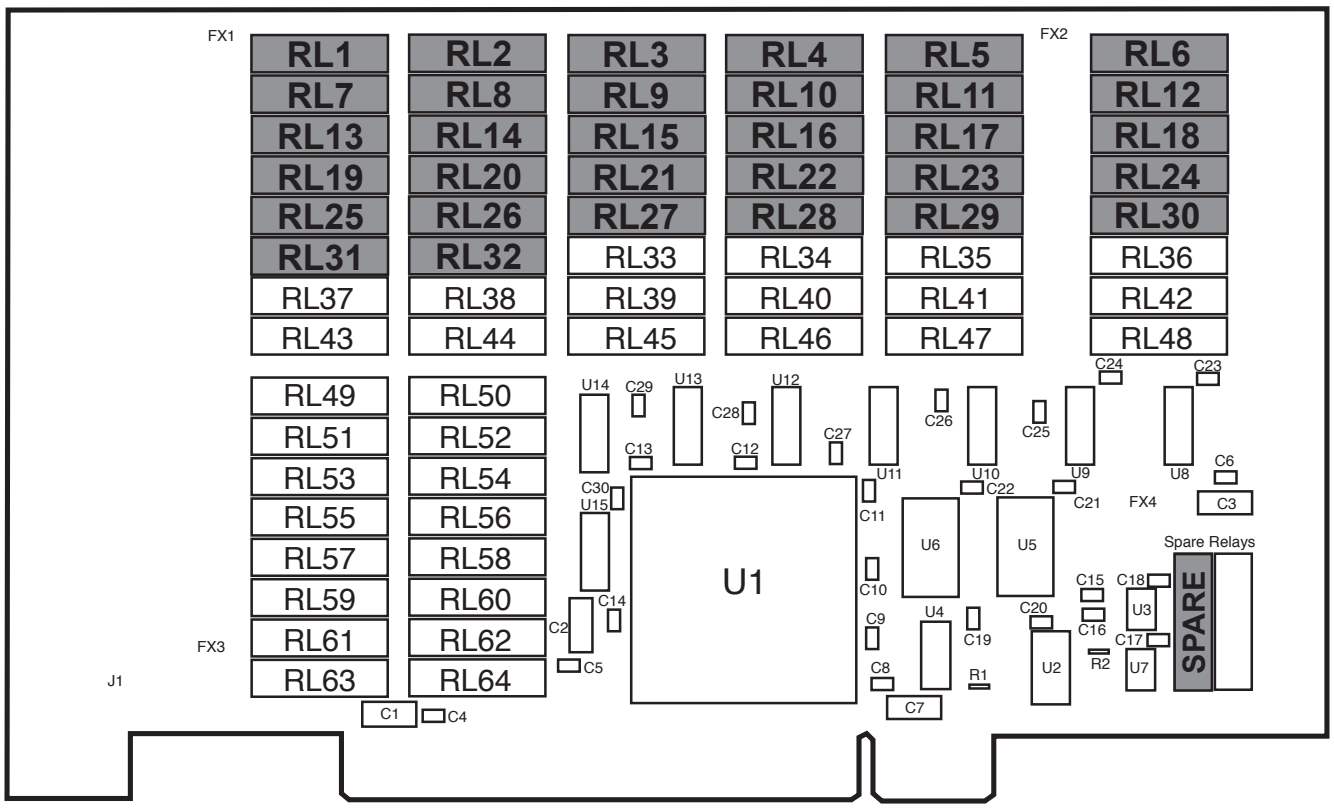


Figure 7.1 - Modules 50-110-021 & 50-115-021: Component Layout

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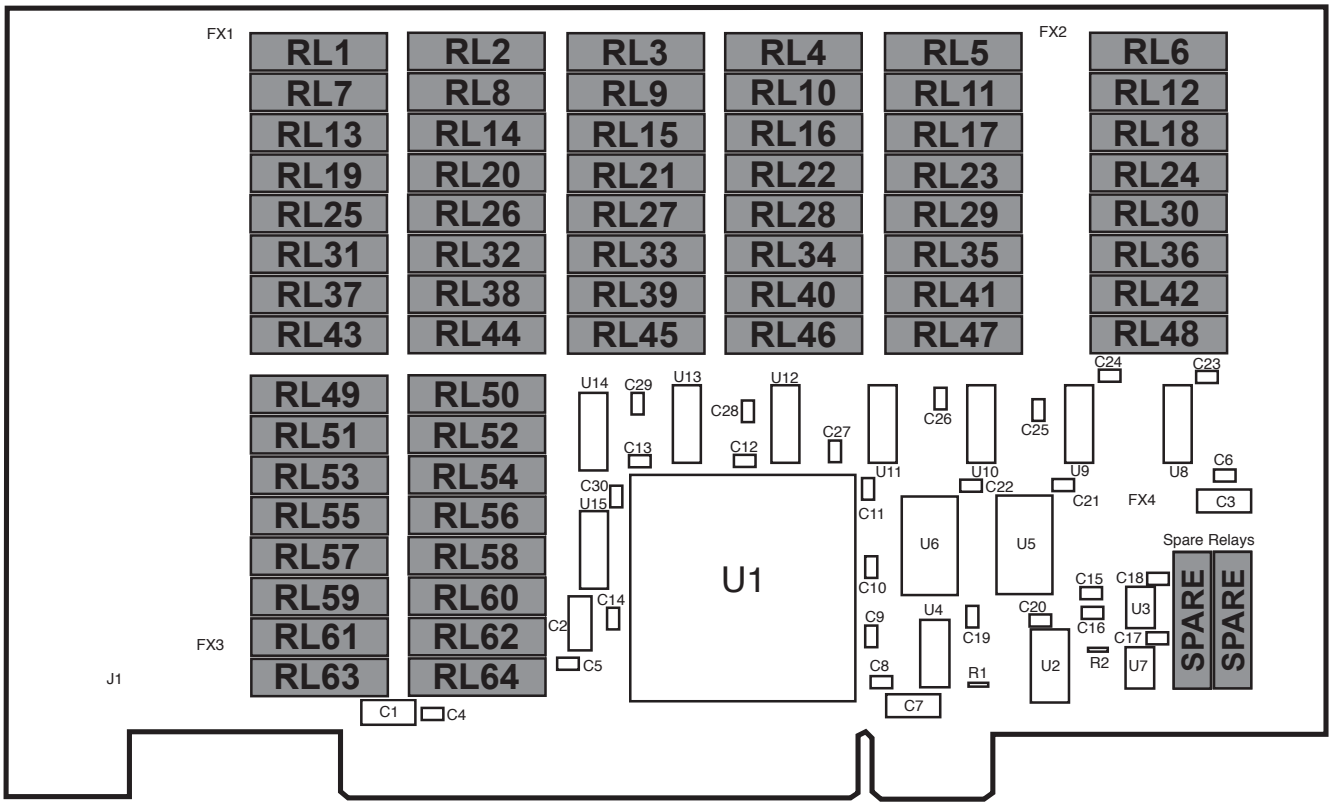


Figure 7.2 - Modules 50-110-121 & 50-115-121: Component Layout

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SECTION 8 - WARNINGS AND CAUTIONS

WARNING – HAZARDOUS ENVIRONMENTS

This product is not specifically designed for use in hazardous environments, for example in explosive atmospheres. If the product is to be used in hazardous environments we recommend that the user ensures suitable protective measures are taken.



WARNING - DANGER OF ELECTRIC SHOCK

THIS MODULE MAY CONTAIN HAZARDOUS VOLTAGES. BEFORE REMOVING THE MODULE FROM THE RACK REMOVE ALL SUPPLIES.



CAUTION – Handling of Electrostatic-Sensitive Semiconductor Devices

Certain semiconductor devices used in this equipment are liable to damage due to static voltage. Observe the following precautions when handling these devices in their unterminated state, or sub-units containing these devices:

1. Persons removing sub-units from an equipment using these devices must be earthed by a wrist strap and a resistor at the point provided on the equipment.

2. Soldering irons used during the repair operations must be low voltage types with earthed tips and isolated from the mains voltage by a double insulated transformer.

3. Outer clothing worn must be unable to generate static charges.

4. Printed Circuit Boards (PCBs) fitted with these devices must be stored and transported in anti-static bags.

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