PCI High Density Matrix Card



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FM38792

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Products serviced and repaired outside of the warranty period are warranted for ninety days.

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Safety Symbols

The following safety symbols may be used on the product and throughout the product documentation.

Meaning/Description	Symbol
PROTECTIVE EARTH (GROUND) To identify any terminal which is intended for connection to an external conductor for protection against electric shock in case of a fault, or the terminal of a protective earth (ground) electrode.	
DANGEROUS VOLTAGE To indicate hazards arising from dangerous voltages.	
WARNING/CAUTION An appropriate safety instruction should be followed or caution to a potential hazard exists. Refer to the relevant instructions detailed within the product manual.	
HEAVY If this product is heavy reference should be made to the safety instructions for provisions of lifting and moving.	
STATIC SENSITIVE To indicate that static sensitive devices are present and handling precautions should be followed.	

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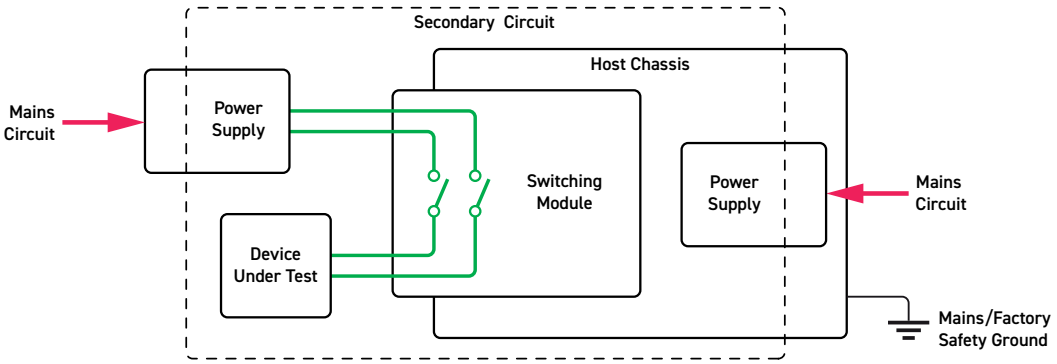
Warnings & Cautions

WARNING - Hazardous Environments	Symbol
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	Symbol
This module may contain hazardous voltages. Before removing the module from the rack remove all supplies and disconnect user I/O signals. Unused slots in the PXI/PXIe/LXI chassis are populated with blanking plates to prevent access to user I/O signals that may be present. Blanking panels are available to order from Pickering in a variety of slot widths. If the product is not used in this manner for example by using an extender card then additional care must be taken to avoid contact with exposed signals. Not to be used in safety critical circuits, refer to the Pickering Interfaces' terms & conditions of sale. This module must not be used for the switching of Mains Circuits. For the switching of voltages up to the module's full specification, Secondary Circuit power supplies and the Device Under Test must be fully isolated from the Mains Circuit and the safety earth. The host chassis must be correctly installed and be connected to mains or factory safety ground, please refer to your chassis installation manual.  **Diagram Showing Separation Between The Mains Circuit and Secondary Circuit / DUT** For the purposes of this document, a Mains Circuit is an installation classified as Overvoltage Category II up to 300 V. Separation between the Secondary Circuit and Mains Circuit is achieved by a transformer in which the primary windings are separated from the secondary windings by reinforced insulation, double insulation, or a screen connected to the protective conductor terminal.	

CAUTION - Handling of Electrostatic-Sensitive Devices	Symbol
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-assemblies containing these devices: • Persons removing sub-assemblies from equipment using these devices must be earthed by a wrist strap and a resistor at the point provided on the equipment. • 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. • Outer clothing worn must be unable to generate static charges. • Printed Circuit Boards (PCBs) fitted with these devices must be stored and transported in anti-static bags.	

CAUTION - Product Documentation	Symbol
Suitably qualified & trained users should ensure that the accompanying documentation is fully read and understood before attempting to install or operate the product.	

Safety Instructions

Safety Instructions
All cleaning and servicing requires the equipment to be isolated and disconnected from the power source and user I/O signals (refer to the Maintenance Section). • Appropriate manual handling procedures should be followed as dictated by the weight of the individual module or the combined weight of the modules & chassis. • Should a fault occur with the module or chassis, immediately isolate and disconnect the incoming power to the chassis and the user I/O signals. • Ensure the equipment is installed, operated and maintained by trained and authorised personnel. • For suitably equipped products in the event of an emergency press the red "emergency stop" button situated on the front of the unit.

Section 1 - Technical Specification

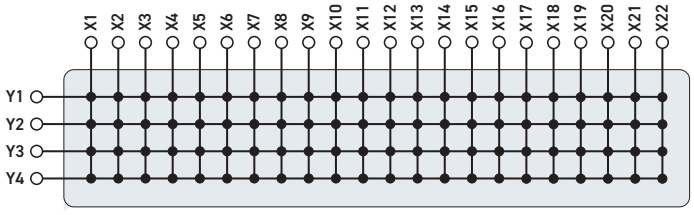
- High Density Reed Relay Matrix Card
- 1 Standard Slot PCI
- 22x4, Dual 20x4, 22x8 or 44x4
- 1-Pole or 2-Pole Versions
- Large Matrices Built Using Multiple Cards
- Uses High Reliability Pickering Reed Relays For Maximum Performance
- Fast Operating Speed <500 µs
- Switch up to 100 V, 1.2 A with 20 W Max Power
- Relay Cycle Counting Included
- Drivers Supplied for Windows & Linux, Plus Support for Real-time Systems
- Supported by *eBIRST* ™
- 3 Year Warranty



The 50-510B series of matrix cards feature a wide range of switching configurations (22x4, dual 20x4, 22x8 and 44x4).

Larger matrices may be constructed by daisy chaining the common signals from multiple cards. For example four 44x4 cards will form a 176x4 Matrix, a total of 1704 crosspoints.

Typical applications include signal routing in functional ATE and data acquisition systems. These PCI matrix cards are constructed using high reliability ruthenium electro-plated reed relays, offering >10^8 operations to give maximum switching confidence with long life and stable contact resistance. Available switching architectures are 1-pole and 2-pole.



50-510B 22x4 Matrix
(Available as 1-Pole or 2-Pole)

Supported by *eBIRST*

eBIRST switching system test tools simplify switching system fault-finding by quickly testing the system and graphically identifying the faulty relay.

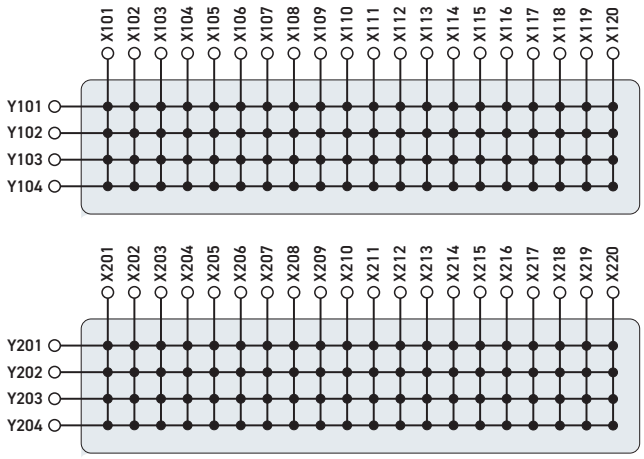
For more information go to: pickeringtest.com/ebirst

Relay Cycle Counting

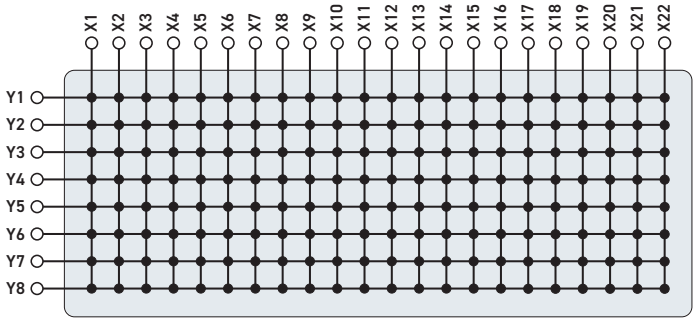
To aid with module "health" monitoring all versions are provided with a relay cycle counting feature. The number of operations per contact are stored on the module and can be used to determine if a relay is approaching EOL. This information could allow system connections to be revised so that signals applied to heavily used contacts are swapped with lightly used contacts to prolong the working life of the relay(s).

Updated Product Information

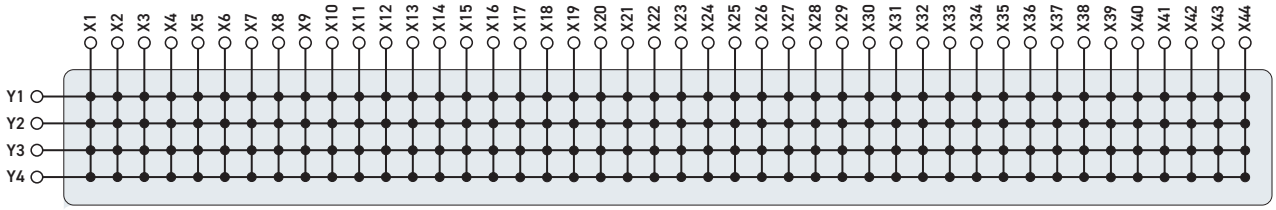
This product has been introduced as a "form & fit" update to the 50-510A/511A/512A/513A, the changes are to provide an updated bus interface which will require the use of an updated software driver. Otherwise, the electrical performance is very similar and the software and pinout are identical.



50-511B Dual 20x4 Matrix
(Available as 1-Pole or 2-Pole)



50-512B 22x8 2-Pole Matrix
(Available as 1-Pole or 2-Pole)



50-513B Single 44x4 Matrix
(Available as 1-Pole or 2-Pole)

Relay Type

The 50-510B range of matrix cards are fitted with Series 109 ruthenium electroplated reed relays manufactured by our Relay Division. These offer very long life with good low level switching performance and excellent contact resistance stability.

Series 109 reed relays are the smallest double pole reed relays currently available (the picture shows two 109-2-A-12/2D reed relays together with a British 1 pence coin, shown actual size).



Spare reed relays are built onto the circuit board to allow easy maintenance with minimum downtime.

For more information please visit:
pickeringrelay.com

Section 1 - Technical Specification

Switching Specification

Switch Type:	Ruthenium Reed
Max Switching Voltage:	100 V*
Max Power:	20 W
Max Switch Current:	0.5 A
Max Carry Current:	1.2 A
On Path Resistance:	<1500 mΩ
Off Path Resistance:	>10^9 Ω
Thermal Offset:	<25 µV
Operate Time:	<1 ms, 0.5 ms typical
Release Time:	<1 ms, 0.5 ms typical
Expected Life	
Low power load:	>1x10^8 operations
Full power load:	>5x10^6 operations

* For full voltage rating, signal sources must be fully isolated from mains supply and safety earth.

Power Requirements

+3.3 V	+5 V	+12 V	-12 V
260 mA (typical)	2.4 A	0	0

RF Specification

Bandwidth, -3 dB (typical):	10 MHz (50-510B/511B) 16 MHz (50-512B/513B)	
Crosstalk (typical):	10 kHz: 100 kHz: 1 MHz: 10 MHz	-60 dB -60 dB -40 dB -10 dB
Isolation (typical):	10 kHz: 100 kHz: 1M Hz: 10 MHz	55 dB 55 dB 35 dB 15 dB

Mechanical Characteristics

Single slot standard (>175 mm) PCI format.

Card weight: 375 g

3D models for all versions in a variety of popular file formats are available on request.

Connectors

Signals via a 96-pin male 1.27 mm pitch connector, for pin outs please refer to the operating manual.

PCI Compliance

The 50-510B series comply with the PCI Specification 2.0 (issued Feb 2004).

Signalling Environment: 33 MHz, 32-bit Universal (+3.3 V & +5 V).

Safety & CE Compliance

All cards are fully CE compliant and meet applicable EU directives:

Low-voltage safety EN61010-1:2010,
EMC Immunity EN61326-1:2013,
Emissions EN55011:2009+A1:2010.

Operating/Storage Conditions

Operating Temperature:	0 °C to +55 °C
Humidity:	Up to 90 % non-condensing
Altitude:	5000 m
Storage/Transport Temperature:	-20 °C to +75 °C
Humidity:	Up to 90 % non-condensing
Altitude:	15000 m

Product Order Codes

Single 22x4 Matrix, 1-Pole	50-510B-021
Single 22x4 Matrix, 2-Pole	50-510B-022
Dual 20x4 Matrix, 1-Pole	50-511B-021
Dual 20x4 Matrix, 2-Pole	50-511B-022
Single 22x8 Matrix, 1-Pole	50-512B-021
Single 22x8 Matrix, 2-Pole	50-512B-022
Single 44x4 Matrix, 1-Pole	50-513B-021
Single 44x4 Matrix, 2-Pole	50-513B-022
Expansion Cables:	
50-512B Expansion to 44x8	50-976-020-0.1M
50-512B Expansion to 22x16	50-976-050-0.1M
50-513B Expansion to 88x4	50-976-020-0.1M
50-513B Expansion to 44x8	50-976-050-0.1M

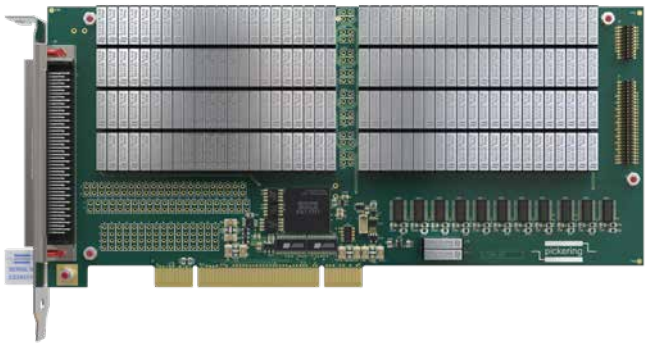
Product Customization

Pickering PCI cards are designed and manufactured on our own flexible manufacturing lines, giving complete product control and enabling simple customization to meet very specific requirements.

Customization can include:

- Alternative reed relay types
- Mixture of reed relay types
- Alternative number of relays
- Different performance specifications

All customized products are given a unique part number, fully documented and may be ordered at any time in the future. Please contact your local sales office to discuss.



50-513B-022 PCI Single 44x4 2-pole matrix - side view

Support Products

eBIRST Switching System Test Tool

This product is supported by the *eBIRST* test tools which simplify the identification of failed relays, the required *eBIRST* tools are below. For more information go to: pickeringtest.com/ebirst

Product	Test Tool	Adaptor	Termination
50-510B/511B /512B/513B	93-002-001	93-002-226	93-016-103

Spare Relay Kits

Kits of replacement relays are available for the majority of Pickering's PXI switching products, simplifying servicing and reducing down-time.

Product	Relay Kit
50-510B-021	91-100-003
50-510B-022	91-100-008
50-511B-021	91-100-003
50-511B-022	91-100-008
50-512B-021	91-100-003
50-512B-022	91-100-008
50-513B-021	91-100-003
50-513B-022	91-100-008

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

Mating Connectors & Cabling

For connection accessories for the 50-510B series please refer to the 90-016D 96-pin 1.27 mm pitch Connector Accessories data sheet where a complete list and documentation can be found for accessories.



Pickering can supply mating connectors and cable assemblies to enable easy integration of this series of PCI cards

Functional Description

A functional block diagram is provided in Figure 2.1. The Matrix Card is powered by +3.3 V and +5 V inputs via the PCI bus edge connector. The interface to the user test equipment is via the front panel mounted 96-pin 1.27 mm pitch connector, J1. The card comprises a PCB populated with up to 176 reed relays, these are either single pole or double pole depending on the card type. The relays are energized via control signals from relay drivers U15 to U25 under control from the PCI interface and control logic.

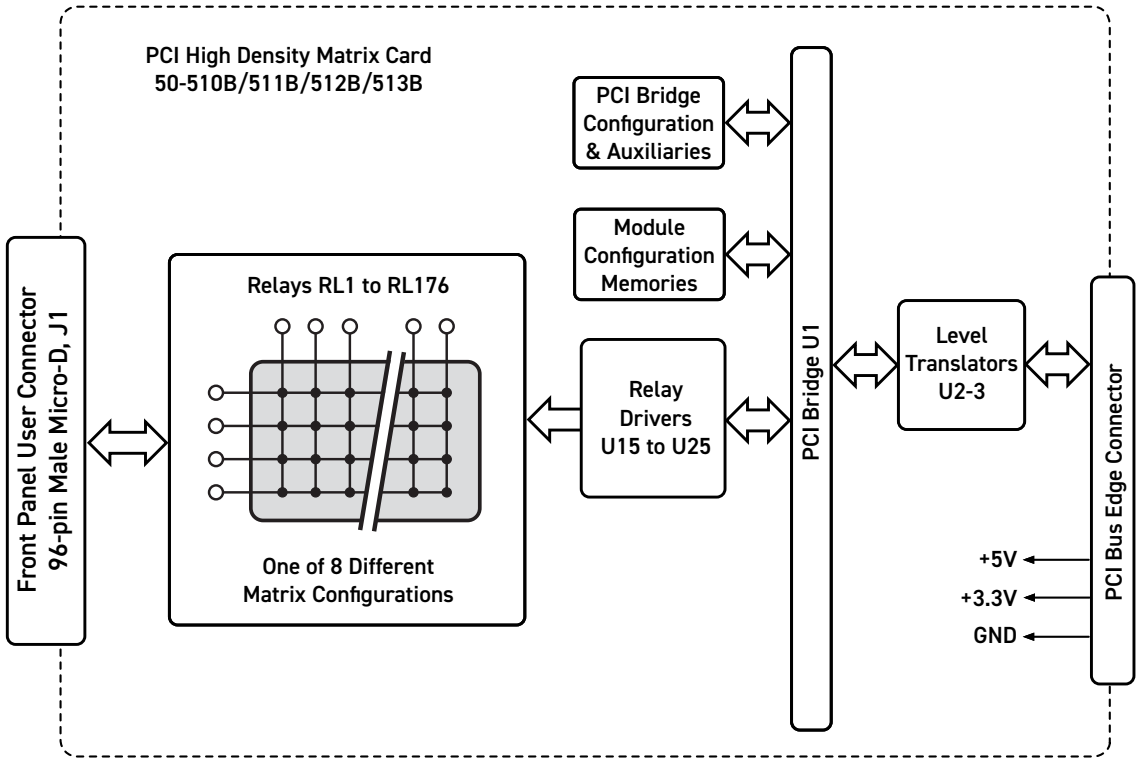


Figure 2.1 - PCI Matrix Card (50-510B/511B/512B/513B): Functional Block Diagram

Expanding the Matrix

50-512B and 50-513B cards can easily be expanded to larger matrix sizes using ribbon cables. The cables are fitted to PCB connectors J3 or J4 on the back edge of the card as shown in Figure 2.2. J3 is used to link the Y buses of adjacent cards allowing the matrix to be expanded in the X direction (see Figures 2.4 and 2.6). J4 is used to link the X buses of adjacent cards allowing the matrix to be expanded in the Y direction (see Figures 2.3 and 2.5). Ribbon cables are available in various lengths with multiple connectors allowing the daisy-chaining of X or Y signals between 2, 3 or more cards allowing larger matrices to be created. Examples of cable part numbers are as follows:

50-976-020-0.1M Fitted to connector J3 for linking the Y bus between two cards.

50-976-020-0.2M Fitted to connector J3 for linking the Y bus between three cards.

50-976-050-0.1M Fitted to connector J4 for linking the X bus between two cards.

50-976-050-0.2M Fitted to connector J4 for linking the X bus between three cards.

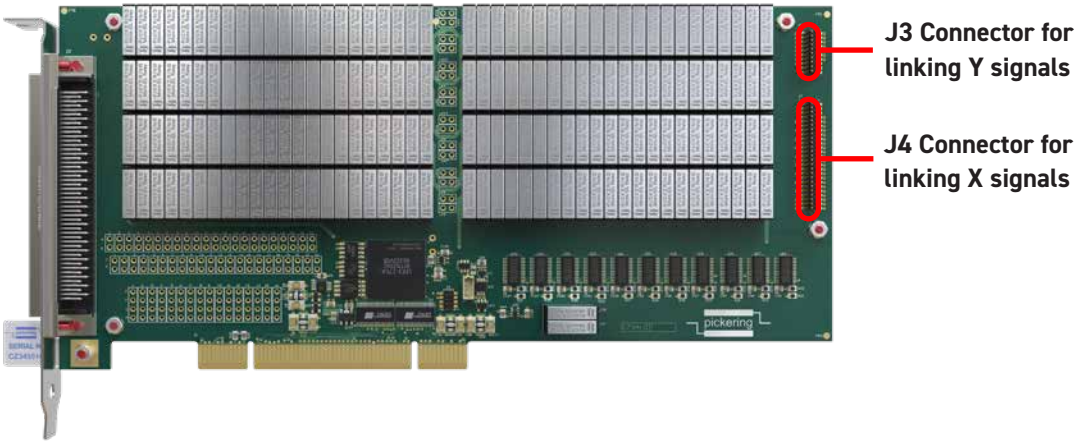


Figure 2.2 - Side View of 50-512B/513B Matrix Card, Showing J3 and J4 Expansion Connectors

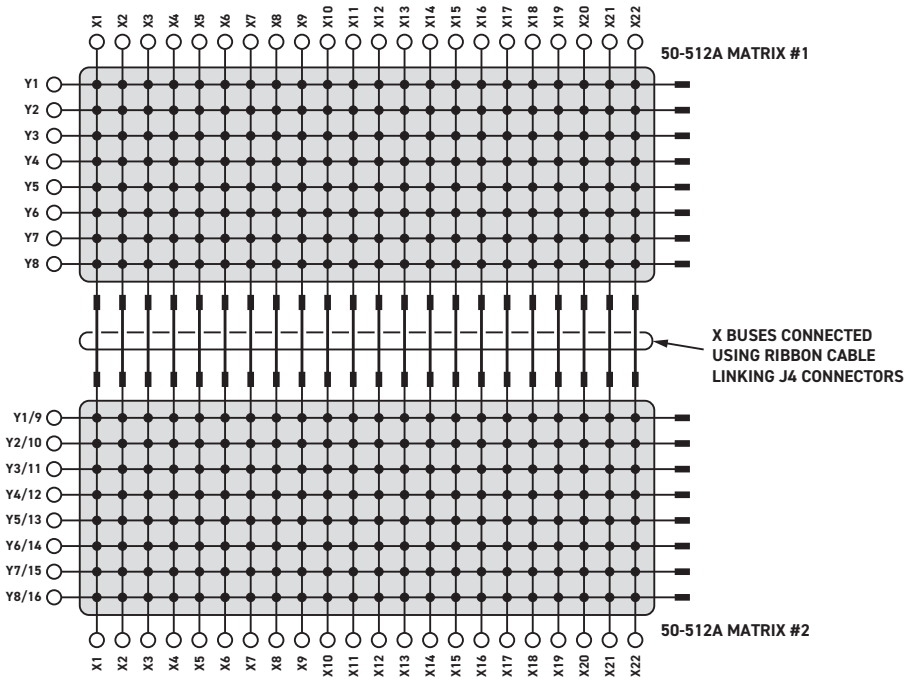


Figure 2.3 - Linking Two 50-512B Cards
Using 50-976-050 Ribbon Cable to Create a 22x16 Matrix

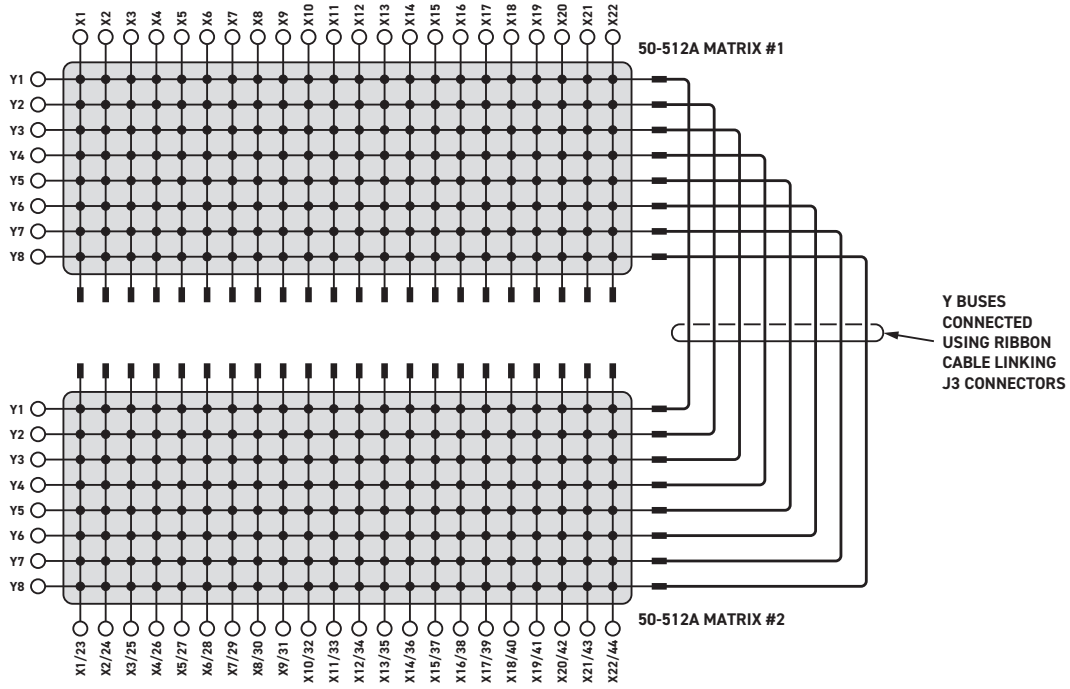


Figure 2.4 - Linking Two 50-512B Cards
Using 50-976-020 Ribbon Cable to Create a 44x8 Matrix

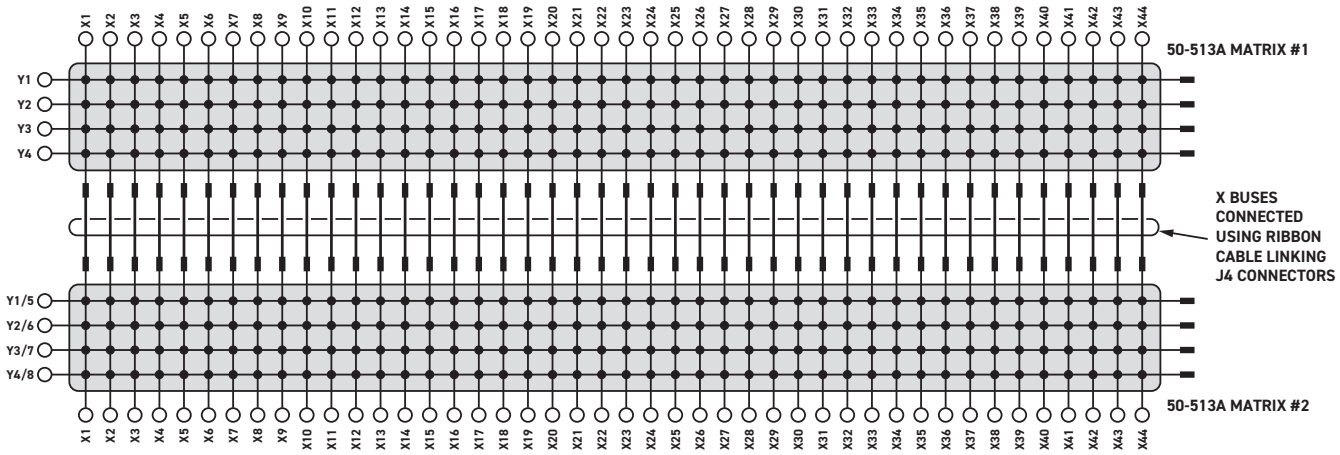


Figure 2.5 - Linking Two 50-513B Cards Using 50-976-050 Ribbon Cable to Create a 44x8 Matrix

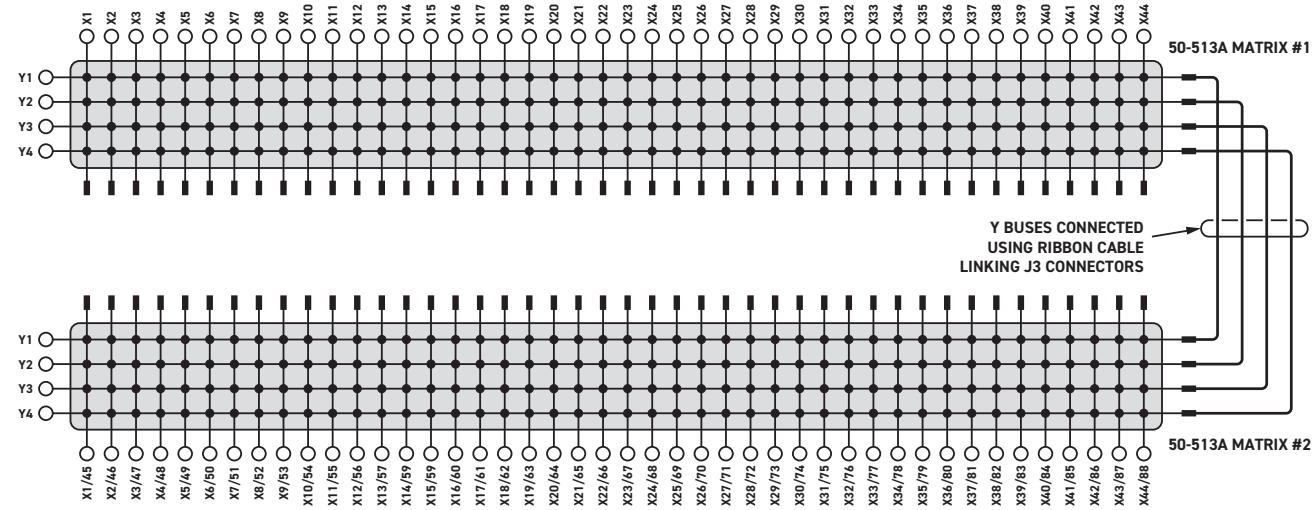


Figure 2.6 - Linking Two 50-513B Cards Using 50-976-020 Ribbon Cable to Create an 88x4 Matrix

Section 3 - Installation

Refer to the Warnings and Cautions at the front of this manual

Modular products require installation in a suitable chassis. The card is designed for indoor use only.

Pre-operation Checks (Unpacking)

1. Check the card for transport damage and report any damage immediately to Pickering Interfaces.
   Do not attempt to install the product if any damage is evident.
2. Position the chassis relative to any other equipment the card(s) will connect with. Ensure the chassis is not connected to the electrical supply.
3. Ensure that the designated area for the chassis containing the card(s) is of flat and solid construction to withstand and support the combined weight of the PC chassis and cards.



Figure 3.1 - Inserting a PCI Card into a PC Chassis

Hardware Installation Electrical Connection (Chassis)

The PCI card must be electrically installed in accordance with local regional electrical codes by a qualified engineer.

The PC chassis must be grounded.

Electrostatic discharge can damage the components on the card and in the chassis. To avoid such damage in handling the board

refer to page vii.

Ensure that there is adequate ventilation.

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 (refer to Figure 3.1).
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).
8. Power-up the host system.

Software Installation

First install the appropriate Pickering PCI switch card drivers by running the installer program Setup.exe (provided in a compressed zip file), either from the CD-ROM supplied, or by downloading the latest version from our website: pickeringtest.com - the recommended method. Setup is accompanied by a ReadMe file containing additional installation information. A single installation covers all Pickering switching and simulation PCI, PXI and PXIe products.

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 and Pickering PXI Driver software package start the General Soft Front Panel (GSFP) using the desktop icon or via the Start menu (***Start Menu-> Pickering Interfaces Ltd -> General Soft Front Panel***).



Figure 3.2 - General Soft Front Panel Icon

A selector panel will appear, listing all installed Pickering PCI, PXI or LXI switch cards and resistor 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.

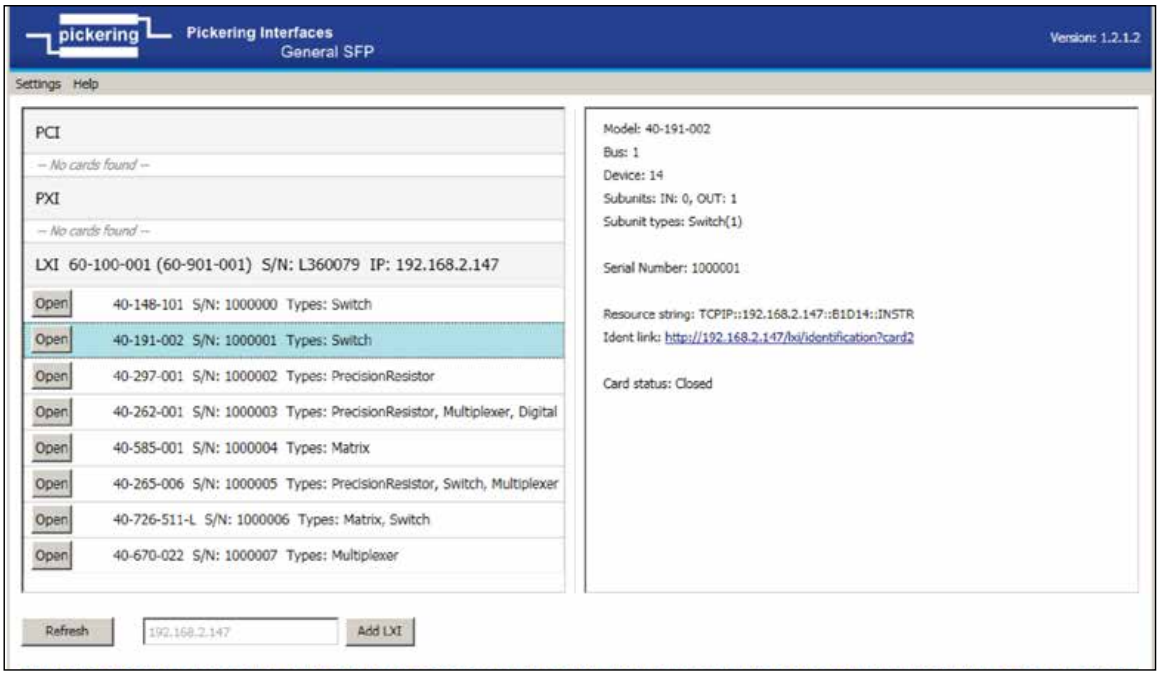


Figure 3.3 - General Soft Front Panel Selector

More details how to use the GSFP can be found in the manual, via menu ***Help\Manual***.

Section 4 - Programming

Programming options for Pickering Interfaces PCI Cards

For information on the installation and use of drivers and the programming of Pickering's products in various software environments, please refer to the Software User Manual.

This is available as a download from:
pickeringtest.com/support/software-drivers-and-downloads

Also, it can be accessed from the DVD supplied with the product:
<DVD_DRIVE>\downloads\Documentation\Software-Manual.pdf

Relay Cycle Counting Feature Details

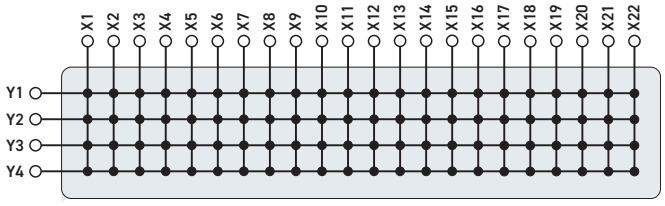
For information related to the relay cycle counting feature present on this product, please refer to the Relay Cycle Counting User Guide.

This is available as a download from:
pickeringtest.com/portal/web/256/content/private/manuals/Relay-Cycle-Counting-User-Guide.pdf

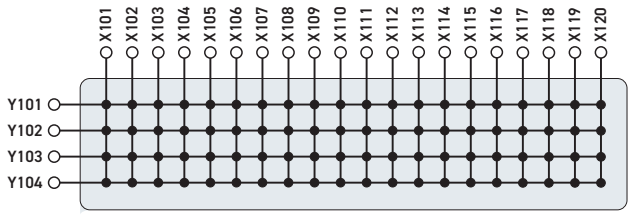
Also, it can be accessed from the DVD supplied with the product:
<DVD_DRIVE>\downloads\Documentation\Relay-Cycle-Counting-User-Guide.pdf

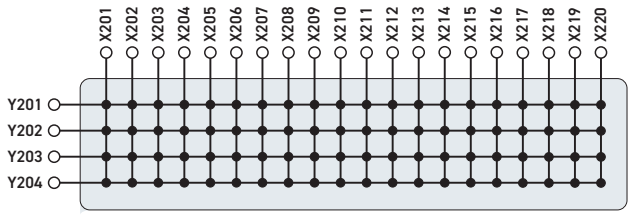
Card Architecture

The 50-510B series of matrices includes single 22x4, dual 20x4, single 22x8 and single 44x4 configurations. Each configuration is available with single pole or dual pole switching. Connections are made by operating the relays at the crosspoints between X and Y lines allowing single X-Y connections, or X-X connections using a Y line as a path. The matrix range is summarized in the diagrams below:

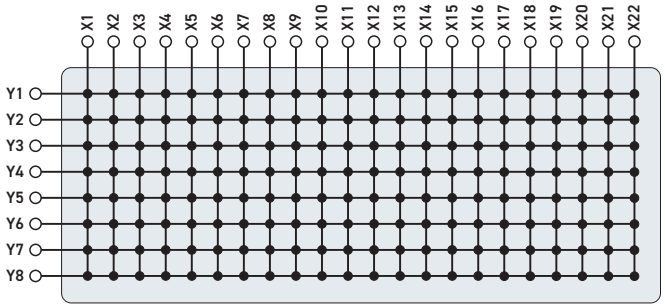


50-510B Single 22x4

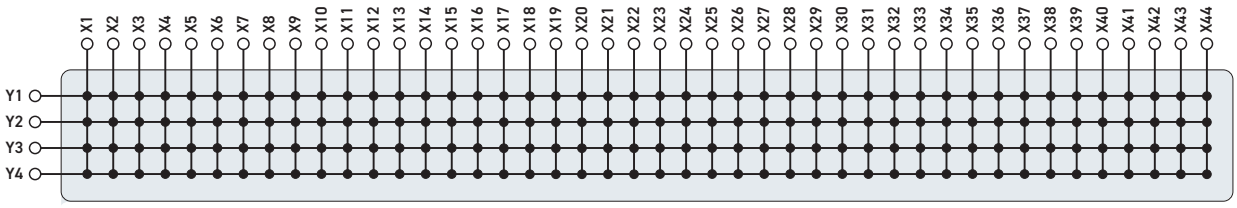




50-511B Dual 20x4



50-512B Single 22x8



50-513B Single 44x4

Figure 4.1 50-510B Series of PCI High Density Matrix Cards

Card Sub-Units

For single matrices, the entire matrix is treated as a single programming sub-unit designated as Sub-Unit 1, dual matrices are programmed as two separate Sub-Units, 1 and 2. For dual pole matrices, operating a crosspoint bit closes both poles simultaneously. The sub-units used to control the module's relays are detailed in the tables on the following pages. The end of this section shows some simple programming examples using the provided drivers: the IVI driver, the Direct I/O driver, and the IVI compliant driver.

Table 4.1 - 50-510B Single 22x4 Matrix: Sub-unit/Bit Cross Reference

Sub Unit	Bit	X	Y	Sub Unit	Bit	X	Y	Sub Unit	Bit	X	Y	Sub Unit	Bit	X	Y
1	1	1	1	1	23	1	2	1	45	1	3	1	67	1	4
	2	2	1		24	2	2		46	2	3		68	2	4
	3	3	1		25	3	2		47	3	3		69	3	4
	4	4	1		26	4	2		48	4	3		70	4	4
	5	5	1		27	5	2		49	5	3		71	5	4
	6	6	1		28	6	2		50	6	3		72	6	4
	7	7	1		29	7	2		51	7	3		73	7	4
	8	8	1		30	8	2		52	8	3		74	8	4
	9	9	1		31	9	2		53	9	3		75	9	4
	10	10	1		32	10	2		54	10	3		76	10	4
	11	11	1		33	11	2		55	11	3		77	11	4
	12	12	1		34	12	2		56	12	3		78	12	4
	13	13	1		35	13	2		57	13	3		79	13	4
	14	14	1		36	14	2		58	14	3		80	14	4
	15	15	1		37	15	2		59	15	3		81	15	4
	16	16	1		38	16	2		60	16	3		82	16	4
	17	17	1		39	17	2		61	17	3		83	17	4
	18	18	1		40	18	2		62	18	3		84	18	4
	19	19	1		41	19	2		63	19	3		85	19	4
	20	20	1		42	20	2		64	20	3		86	20	4
	21	21	1		43	21	2		65	21	3		87	21	4
	22	22	1		44	22	2		66	22	3		88	22	4

Table 4.2 - 50-511B Dual 20x4 Matrix: Sub-unit/Bit Cross Reference

Sub Unit	Bit	X	Y	Sub Unit	Bit	X	Y	Sub Unit	Bit	X	Y	Sub Unit	Bit	X	Y
1	1	101	101	1	21	101	102	1	41	101	103	1	61	101	104
	2	102	101		22	102	102		42	102	103		62	102	104
	3	103	101		23	103	102		43	103	103		63	103	104
	4	104	101		24	104	102		44	104	103		64	104	104
	5	105	101		25	105	102		45	105	103		65	105	104
	6	106	101		26	106	102		46	106	103		66	106	104
	7	107	101		27	107	102		47	107	103		67	107	104
	8	108	101		28	108	102		48	108	103		68	108	104
	9	109	101		29	109	102		49	109	103		69	109	104
	10	110	101		30	110	102		50	110	103		70	110	104
	11	111	101		31	111	102		51	111	103		71	111	104
	12	112	101		32	112	102		52	112	103		72	112	104
	13	113	101		33	113	102		53	113	103		73	113	104
	14	114	101		34	114	102		54	114	103		74	114	104
	15	115	101		35	115	102		55	115	103		75	115	104
	16	116	101		36	116	102		56	116	103		76	116	104
	17	117	101		37	117	102		57	117	103		77	117	104
	18	118	101		38	118	102		58	118	103		78	118	104
	19	119	101		39	119	102		59	119	103		79	119	104
	20	120	101		40	120	102		60	120	103		80	120	104
2	1	201	201	2	21	201	202	2	41	201	203	2	61	201	204
	2	202	201		22	202	202		42	202	203		62	202	204
	3	203	201		23	203	202		43	203	203		63	203	204
	4	204	201		24	204	202		44	204	203		64	204	204
	5	205	201		25	205	202		45	205	203		65	205	204
	6	206	201		26	206	202		46	206	203		66	206	204
	7	207	201		27	207	202		47	207	203		67	207	204
	8	208	201		28	208	202		48	208	203		68	208	204
	9	209	201		29	209	202		49	209	203		69	209	204
	10	210	201		30	210	202		50	210	203		70	210	204
	11	211	201		31	211	202		51	211	203		71	211	204
	12	212	201		32	212	202		52	212	203		72	212	204
	13	213	201		33	213	202		53	213	203		73	213	204
	14	214	201		34	214	202		54	214	203		74	214	204
	15	215	201		35	215	202		55	215	203		75	215	204
	16	216	201		36	216	202		56	216	203		76	216	204
	17	217	201		37	217	202		57	217	203		77	217	204
	18	218	201		38	218	202		58	218	203		78	218	204
	19	219	201		39	219	202		59	219	203		79	219	204
	20	220	201		40	220	202		60	220	203		80	220	204

Table 4.3 - 50-512B Single 22x8 Matrix: Sub-unit/Bit Cross Reference

Sub Unit	Bit	X	Y	Sub Unit	Bit	X	Y	Sub Unit	Bit	X	Y	Sub Unit	Bit	X	Y
1	1	1	1	1	23	1	2	1	45	1	3	1	67	1	4
	2	2	1		24	2	2		46	2	3		68	2	4
	3	3	1		25	3	2		47	3	3		69	3	4
	4	4	1		26	4	2		48	4	3		70	4	4
	5	5	1		27	5	2		49	5	3		71	5	4
	6	6	1		28	6	2		50	6	3		72	6	4
	7	7	1		29	7	2		51	7	3		73	7	4
	8	8	1		30	8	2		52	8	3		74	8	4
	9	9	1		31	9	2		53	9	3		75	9	4
	10	10	1		32	10	2		54	10	3		76	10	4
	11	11	1		33	11	2		55	11	3		77	11	4
	12	12	1		34	12	2		56	12	3		78	12	4
	13	13	1		35	13	2		57	13	3		79	13	4
	14	14	1		36	14	2		58	14	3		80	14	4
	15	15	1		37	15	2		59	15	3		81	15	4
	16	16	1		38	16	2		60	16	3		82	16	4
	17	17	1		39	17	2		61	17	3		83	17	4
	18	18	1		40	18	2		62	18	3		84	18	4
	19	19	1		41	19	2		63	19	3		85	19	4
	20	20	1		42	20	2		64	20	3		86	20	4
	21	21	1		43	21	2		65	21	3		87	21	4
	22	22	1		44	22	2		66	22	3		88	22	4
1	89	1	5	1	111	1	6	1	133	1	7	1	155	1	8
	90	2	5		112	2	6		134	2	7		156	2	8
	91	3	5		113	3	6		135	3	7		157	3	8
	92	4	5		114	4	6		136	4	7		158	4	8
	93	5	5		115	5	6		137	5	7		159	5	8
	94	6	5		116	6	6		138	6	7		160	6	8
	95	7	5		117	7	6		139	7	7		161	7	8
	96	8	5		118	8	6		140	8	7		162	8	8
	97	9	5		119	9	6		141	9	7		163	9	8
	98	10	5		120	10	6		142	10	7		164	10	8
	99	11	5		121	11	6		143	11	7		165	11	8
	100	12	5		122	12	6		144	12	7		166	12	8
	101	13	5		123	13	6		145	13	7		167	13	8
	102	14	5		124	14	6		146	14	7		168	14	8
	103	15	5		125	15	6		147	15	7		169	15	8
	104	16	5		126	16	6		148	16	7		170	16	8
	105	17	5		127	17	6		149	17	7		171	17	8
	106	18	5		128	18	6		150	18	7		172	18	8
	107	19	5		129	19	6		151	19	7		173	19	8
	108	20	5		130	20	6		152	20	7		174	20	8
	109	21	5		131	21	6		153	21	7		175	21	8
	110	22	5		132	22	6		154	22	7		176	22	8

Table 4.4 - 50-513B Single 44x4 Matrix: Sub-unit/Bit Cross Reference

Sub Unit	Bit	X	Y	Sub Unit	Bit	X	Y	Sub Unit	Bit	X	Y	Sub Unit	Bit	X	Y
1	1	1	1	1	45	1	2	1	89	1	3	1	133	1	4
	2	2	1		46	2	2		90	2	3		134	2	4
	3	3	1		47	3	2		91	3	3		135	3	4
	4	4	1		48	4	2		92	4	3		136	4	4
	5	5	1		49	5	2		93	5	3		137	5	4
	6	6	1		50	6	2		94	6	3		138	6	4
	7	7	1		51	7	2		95	7	3		139	7	4
	8	8	1		52	8	2		96	8	3		140	8	4
	9	9	1		53	9	2		97	9	3		141	9	4
	10	10	1		54	10	2		98	10	3		142	10	4
	11	11	1		55	11	2		99	11	3		143	11	4
	12	12	1		56	12	2		100	12	3		144	12	4
	13	13	1		57	13	2		101	13	3		145	13	4
	14	14	1		58	14	2		102	14	3		146	14	4
	15	15	1		59	15	2		103	15	3		147	15	4
	16	16	1		60	16	2		104	16	3		148	16	4
	17	17	1		61	17	2		105	17	3		149	17	4
	18	18	1		62	18	2		106	18	3		150	18	4
	19	19	1		63	19	2		107	19	3		151	19	4
	20	20	1		64	20	2		108	20	3		152	20	4
	21	21	1		65	21	2		109	21	3		153	21	4
	22	22	1		66	22	2		110	22	3		154	22	4
	23	23	1		67	23	2		111	23	3		155	23	4
	24	24	1		68	24	2		112	24	3		156	24	4
	25	25	1		69	25	2		113	25	3		157	25	4
	26	26	1		70	26	2		114	26	3		158	26	4
	27	27	1		71	27	2		115	27	3		159	27	4
	28	28	1		72	28	2		116	28	3		160	28	4
	29	29	1		73	29	2		117	29	3		161	29	4
	30	30	1		74	30	2		118	30	3		162	30	4
	31	31	1		75	31	2		119	31	3		163	31	4
	32	32	1		76	32	2		120	32	3		164	32	4
	33	33	1		77	33	2		121	33	3		165	33	4
	34	34	1		78	34	2		122	34	3		166	34	4
	35	35	1		79	35	2		123	35	3		167	35	4
	36	36	1		80	36	2		124	36	3		168	36	4
	37	37	1		81	37	2		125	37	3		169	37	4
	38	38	1		82	38	2		126	38	3		170	38	4
	39	39	1		83	39	2		127	39	3		171	39	4
	40	40	1		84	40	2		128	40	3		172	40	4
	41	41	1		85	41	2		129	41	3		173	41	4
	42	42	1		86	42	2		130	42	3		174	42	4
	43	43	1		87	43	2		131	43	3		175	43	4
	44	44	1		88	44	2		132	44	3		176	44	4

Programming the Card

Here are some simple examples of using the drivers with the 50-510B-021 module (22x4 Single Pole Matrix). Other modules in the range operate in a similar way.

Using PILPXI

To operate a relay the user could use the simple `OpCrosspoint`, `OpBit` or the `WriteSub` commands

OpCrosspoint

```
DWORD sub_unit = 1;
PIL_OpCrosspoint( card_num, sub_unit, 1, 1, 1);   // Operates the X1/Y1 relay
PIL_OpCrosspoint( card_num, sub_unit, 1, 1, 0);   // Releases the X1/Y1 relay
PIL_OpCrosspoint( card_num, sub_unit, 1, 6, 1);   // Operates the X6/Y1 relay
```

OpBit

```
DWORD sub_unit = 1;
PIL_OpBit( card_num, sub_unit, 1, 1);   // Operates the X1/Y1 relay
PIL_OpBit( card_num, sub_unit, 1, 0);   // Releases the X1/Y1 relay
PIL_OpBit( card_num, sub_unit, 6, 1);   // Operates the X6/Y1 relay
```

WriteSub

```
// Sub-unit is 88 bits wide, so 3 DWORDs are needed to hold the pattern
DWORD data[3];
data[0] = 1;       // Sets lowest bit to 1, X1/Y1 relay
PIL_WriteSub( card_num, sub_unit, data);
data[0] = 0x20;    // Sets 6th bit, X6/Y1 relay;
                   // 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);   // Operates the X1/Y1 relay
pipx40_setChannelState(vi, sub_unit, 1, VI_OFF);  // Releases the X1/Y1 relay
pipx40_setChannelState(vi, sub_unit, 6, VI_ON);   // Operates the X6/Y1 relay
```

setChannelPattern

```
// Sub-unit is 88 bits wide, so 3 ViUInt32 values are needed to hold the entire pattern
ViUInt32 data[3];
data[0] = 1;       // Sets lowest bit to 1, X1/Y1 relay
pipx40_setChannelPattern( vi, sub_unit, data);
data[0] = 0x20;    // Sets 6th bit, X6/Y1 relay;
                   // 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 array of switches as a simple array, labelling the channels using the normal X,Y labelling tags. Dual versions use xA,yA and xB,yB labelling tags.

```
pi40iv_Connect(vi, "X1", "Y1");    // Operates the X1/Y1 relay
pi40iv_Disconnect(vi, "X1", "Y1");// Releases the X1/Y1 relay
pi40iv_Connect(vi, "X6", "Y1");    // Operates the X6/Y1 relay
```

Note: The IviSwtch Class driver specification contains no bulk setting capabilities.

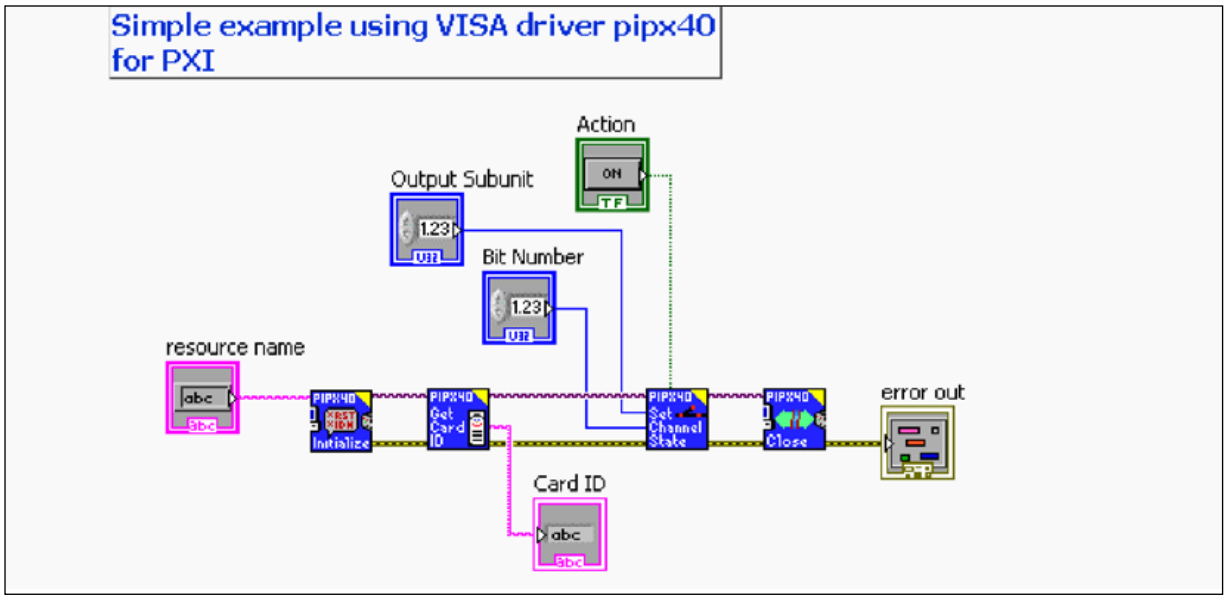
Using Pickering Drivers In LabVIEW

Most Pickering drivers include a LabVIEW wrapper to permit full operation of the Pickering product from the LabVIEW environment. These wrappers are normally installed to the current LabVIEW folder system during installation of the Pickering driver.

The process of controlling a Pickering product normally consists of the following steps:

1. Open a control session on the product.
2. Use functions in the library to operate the product.
3. Close the control session.

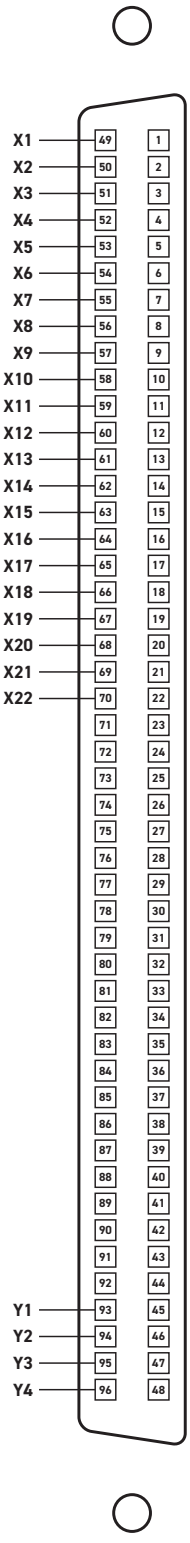
Following is a simple example of the use of the most common Pickering drivers:

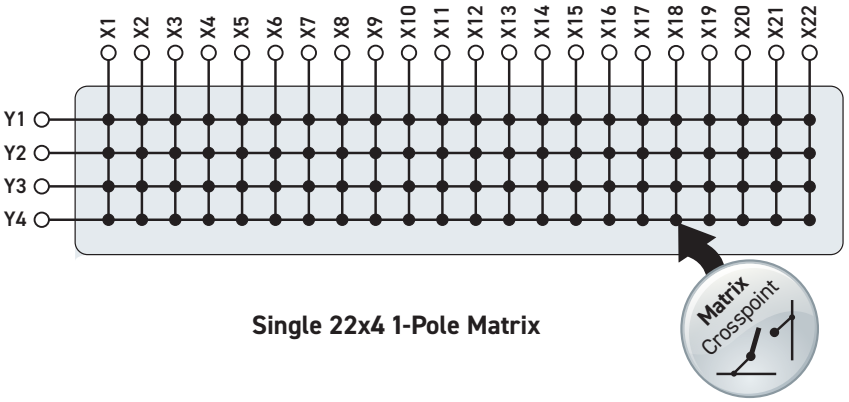


Example Use of Pickering Drivers in LabVIEW

To download LabVIEW examples, please go to:

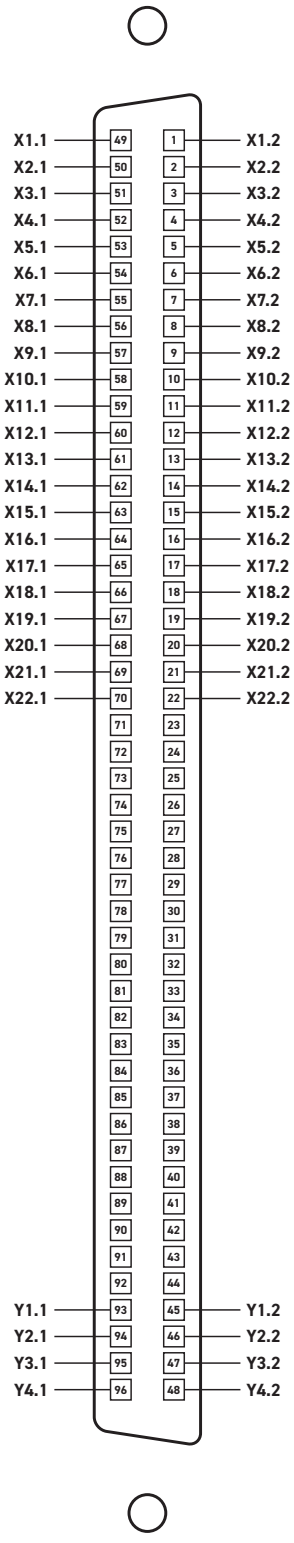
Using Pickering Drivers in LabVIEW

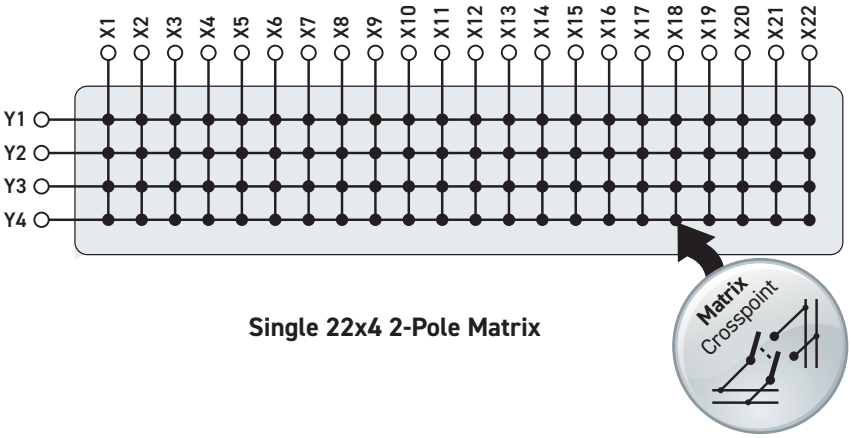




Single 22x4 1-Pole Matrix

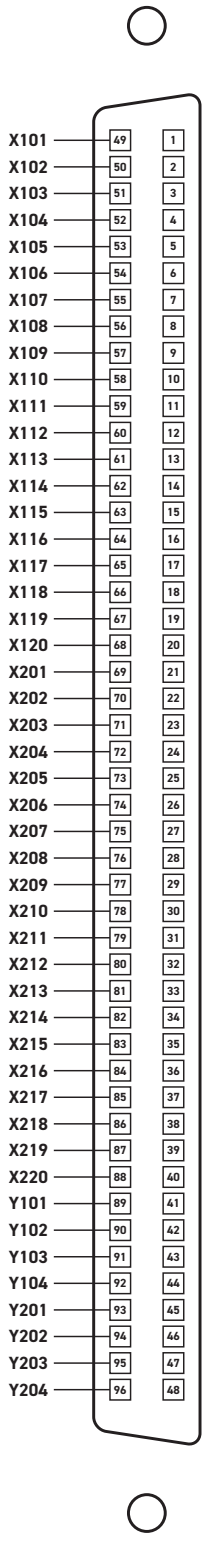
Figure 5.1 - 50-510B-021 Pinout
(96-pin male 1.27 mm pitch Connector Viewed From Front of Card)
Note: Internal PCB shield plane is connected to the connector's outer shell.

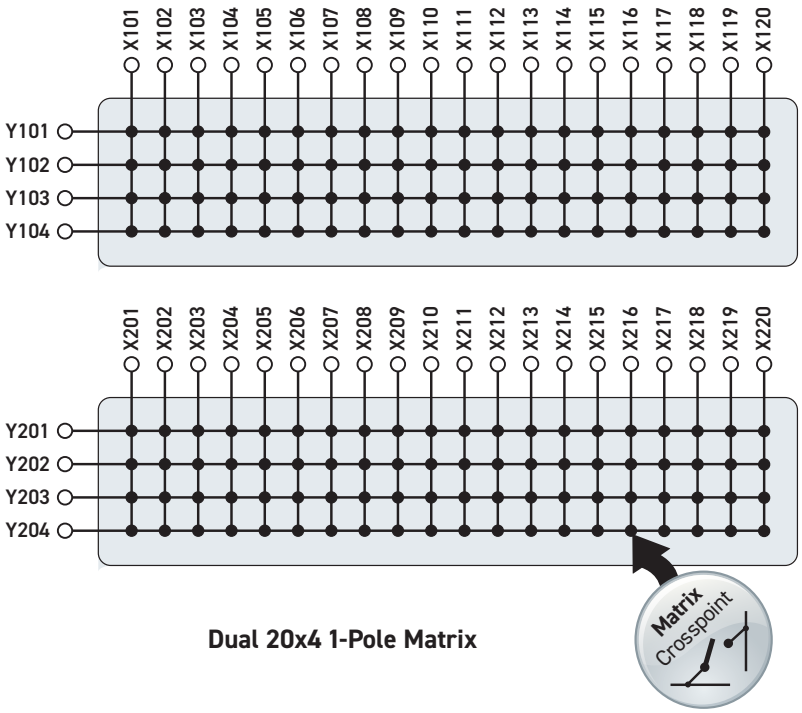




Single 22x4 2-Pole Matrix

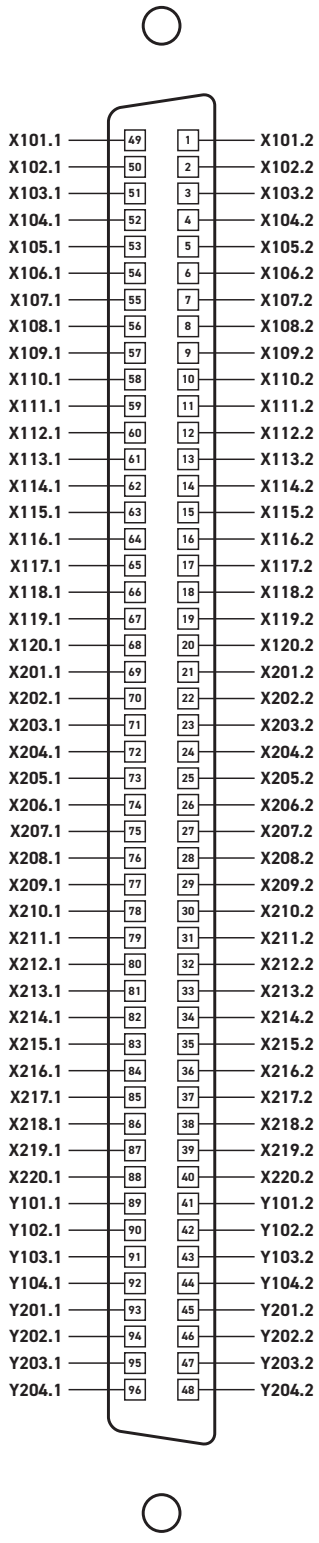
Figure 5.2 - 50-510B-022 Pinout
(96-pin male 1.27 mm pitch Connector Viewed From Front of Card)
Note: Internal PCB shield plane is connected to the connector's outer shell.

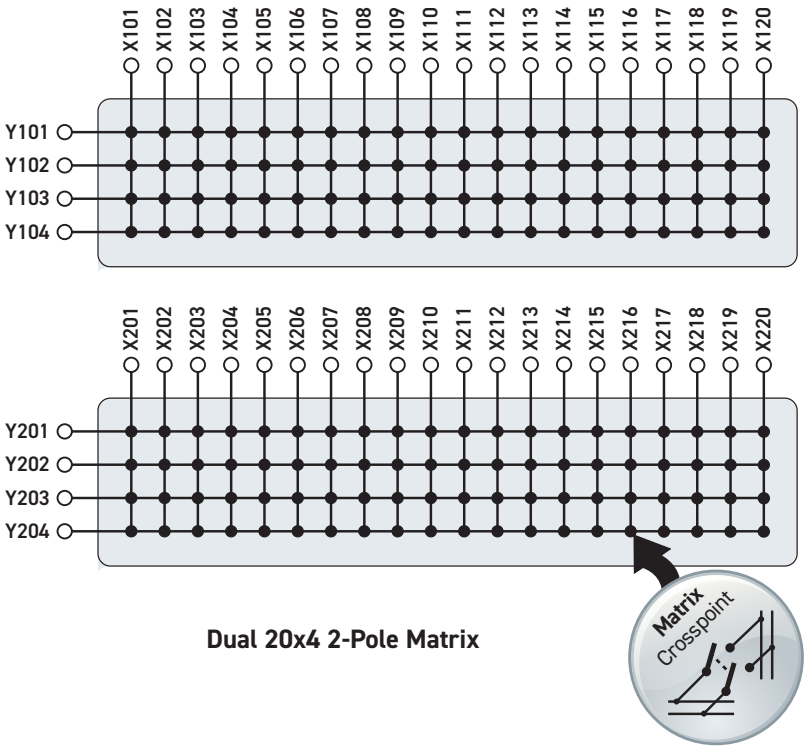




Dual 20x4 1-Pole Matrix

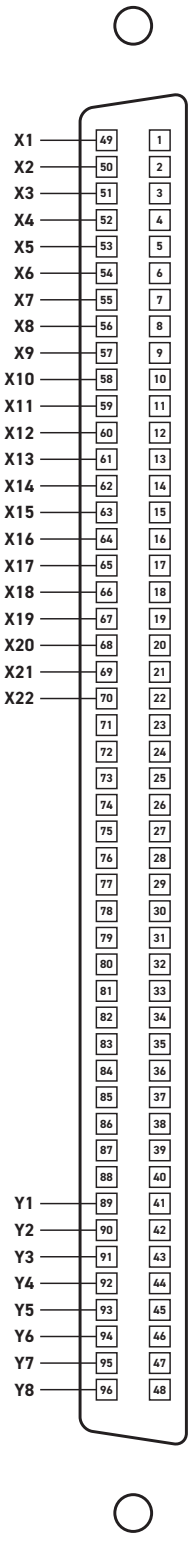
Figure 5.3 - 50-511B-021 Pinout
(96-pin male 1.27 mm pitch Connector Viewed From Front of Card)
Note: Internal PCB shield plane is connected to the connector's outer shell.

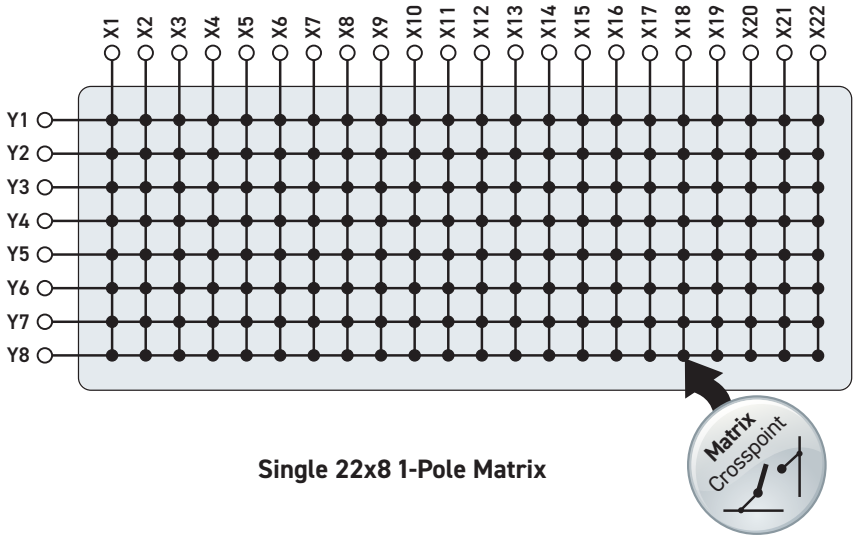




Dual 20x4 2-Pole Matrix

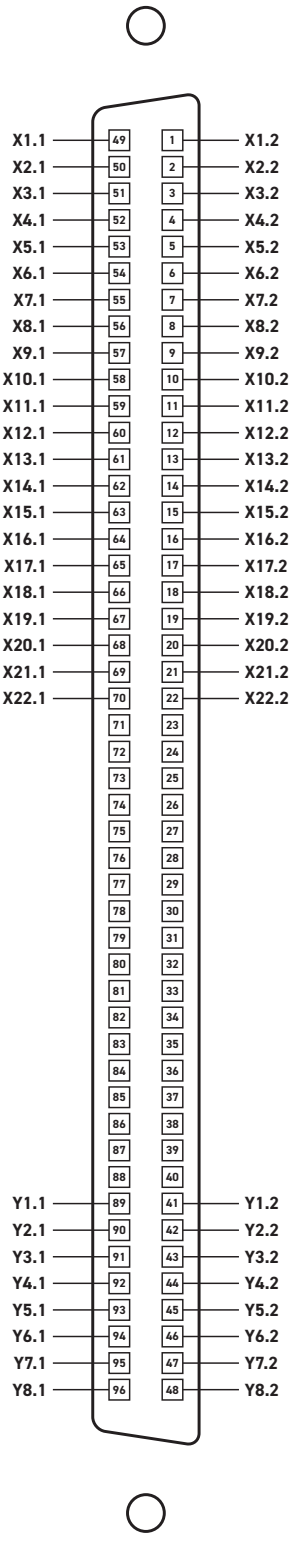
Figure 5.4 - 50-511B-022 Pinout
(96-pin male 1.27 mm pitch Connector Viewed From Front of Card)
Note: Internal PCB shield plane is connected to the connector's outer shell.

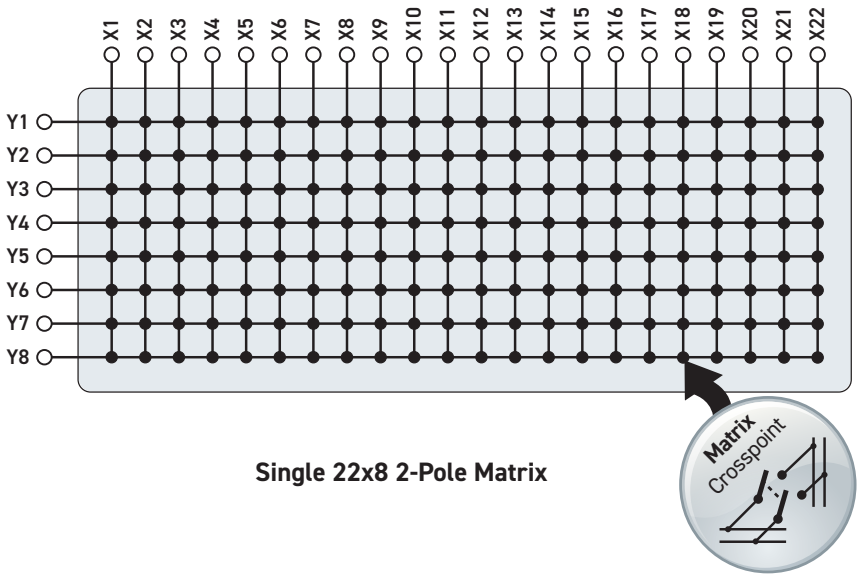




Single 22x8 1-Pole Matrix

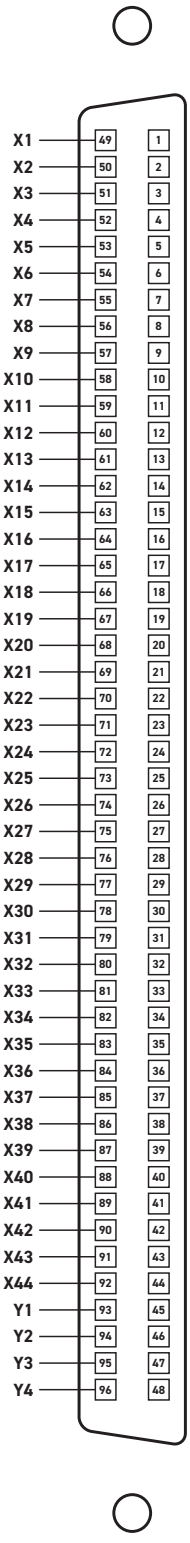
Figure 5.5 - 50-512B-021 Pinout
(96-pin male 1.27 mm pitch Connector Viewed From Front of Card)
Note: Internal PCB shield plane is connected to the connector's outer shell.

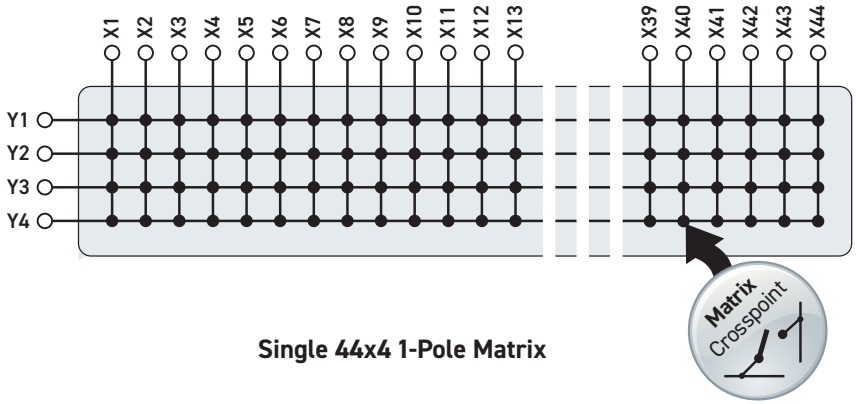




Single 22x8 2-Pole Matrix

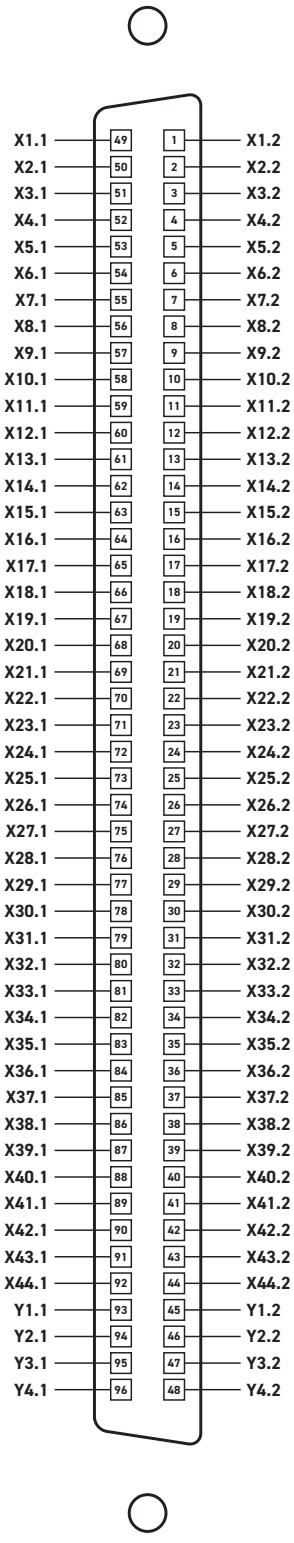
Figure 5.6 - 50-512B-022 Pinout
(96-pin male 1.27 mm pitch Connector Viewed From Front of Card)
Note: Internal PCB shield plane is connected to the connector's outer shell.

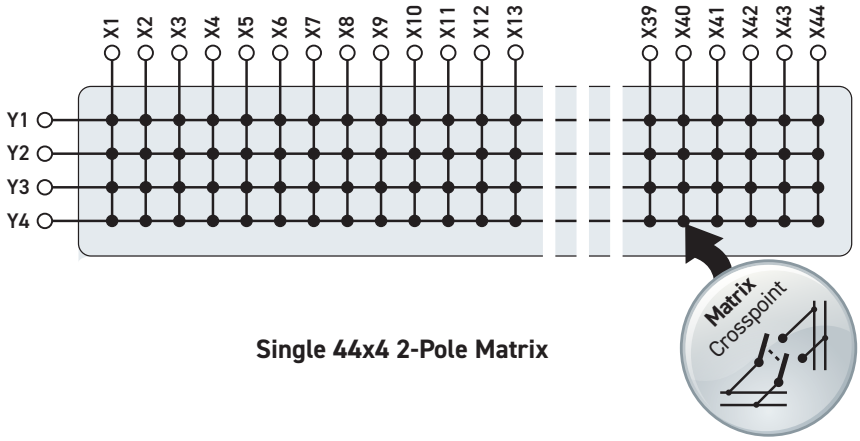




Single 44x4 1-Pole Matrix

Figure 5.7 - 50-513B-021 Pinout
(96-pin male 1.27 mm pitch Connector Viewed From Front of Card)
Note: Internal PCB shield plane is connected to the connector's outer shell.





Single 44x4 2-Pole Matrix

Figure 5.8 - 50-513B-022 Pinout
(96-pin male 1.27 mm pitch Connector Viewed From Front of Card)
Note: Internal PCB shield plane is connected to the connector's outer shell.

Section 6 - Troubleshooting

Refer to the Warnings and Cautions at the front of this manual. 

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.

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 its 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.

Section 7 - Maintenance Information

Refer to the Warnings and Cautions at the front of this manual. 

Periodic Maintenance

The PCI card does not require any periodic maintenance. Please consult the chassis supplier regarding any periodic maintenance required for the chassis.

General Cleaning

- Isolate the electrical power from the chassis and ensure that no user I/O signals are being applied.
- Wipe the product & chassis surfaces with a clean dry anti-static cloth only.

Software Update

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

Switching System Test Tools

We recommend the use of ***eBIRST*** to provide a check of the correct operation of relays and to identify the location of any faulty relay. For more information visit: pickeringtest.com/ebirst

Relay Look-up Tables

The following pages provide a cross reference between the signal paths of the product 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 corresponding PCB layout diagrams to identify the position of faulty relays.

Relay Look-up Table 50-510B

Table 7.1 - 50-510B Single 22x4 Matrix: Relay Numbering

X	Y	Relay No.	X	Y	Relay No.	X	Y	Relay No.	X	Y	Relay No.
1	1	RL1	1	2	RL45	1	3	RL89	1	4	RL133
2	1	RL2	2	2	RL46	2	3	RL90	2	4	RL134
3	1	RL3	3	2	RL47	3	3	RL91	3	4	RL135
4	1	RL4	4	2	RL48	4	3	RL92	4	4	RL136
5	1	RL5	5	2	RL49	5	3	RL93	5	4	RL137
6	1	RL6	6	2	RL50	6	3	RL94	6	4	RL138
7	1	RL7	7	2	RL51	7	3	RL95	7	4	RL139
8	1	RL8	8	2	RL52	8	3	RL96	8	4	RL140
9	1	RL9	9	2	RL53	9	3	RL97	9	4	RL141
10	1	RL10	10	2	RL54	10	3	RL98	10	4	RL142
11	1	RL11	11	2	RL55	11	3	RL99	11	4	RL143
12	1	RL12	12	2	RL56	12	3	RL100	12	4	RL144
13	1	RL13	13	2	RL57	13	3	RL101	13	4	RL145
14	1	RL14	14	2	RL58	14	3	RL102	14	4	RL146
15	1	RL15	15	2	RL59	15	3	RL103	15	4	RL147
16	1	RL16	16	2	RL60	16	3	RL104	16	4	RL148
17	1	RL17	17	2	RL61	17	3	RL105	17	4	RL149
18	1	RL18	18	2	RL62	18	3	RL106	18	4	RL150
19	1	RL19	19	2	RL63	19	3	RL107	19	4	RL151
20	1	RL20	20	2	RL64	20	3	RL108	20	4	RL152
21	1	RL21	21	2	RL65	21	3	RL109	21	4	RL153
22	1	RL22	22	2	RL66	22	3	RL110	22	4	RL154
Not Fitted		RL23	Not Fitted		RL67	Not Fitted		RL111	Not Fitted		RL155
Not Fitted		RL24	Not Fitted		RL68	Not Fitted		RL112	Not Fitted		RL156
Not Fitted		RL25	Not Fitted		RL69	Not Fitted		RL113	Not Fitted		RL157
Not Fitted		RL26	Not Fitted		RL70	Not Fitted		RL114	Not Fitted		RL158
Not Fitted		RL27	Not Fitted		RL71	Not Fitted		RL115	Not Fitted		RL159
Not Fitted		RL28	Not Fitted		RL72	Not Fitted		RL116	Not Fitted		RL160
Not Fitted		RL29	Not Fitted		RL73	Not Fitted		RL117	Not Fitted		RL161
Not Fitted		RL30	Not Fitted		RL74	Not Fitted		RL118	Not Fitted		RL162
Not Fitted		RL31	Not Fitted		RL75	Not Fitted		RL119	Not Fitted		RL163
Not Fitted		RL32	Not Fitted		RL76	Not Fitted		RL120	Not Fitted		RL164
Not Fitted		RL33	Not Fitted		RL77	Not Fitted		RL121	Not Fitted		RL165
Not Fitted		RL34	Not Fitted		RL78	Not Fitted		RL122	Not Fitted		RL166
Not Fitted		RL35	Not Fitted		RL79	Not Fitted		RL123	Not Fitted		RL167
Not Fitted		RL36	Not Fitted		RL80	Not Fitted		RL124	Not Fitted		RL168
Not Fitted		RL37	Not Fitted		RL81	Not Fitted		RL125	Not Fitted		RL169
Not Fitted		RL38	Not Fitted		RL82	Not Fitted		RL126	Not Fitted		RL170
Not Fitted		RL39	Not Fitted		RL83	Not Fitted		RL127	Not Fitted		RL171
Not Fitted		RL40	Not Fitted		RL84	Not Fitted		RL128	Not Fitted		RL172
Not Fitted		RL41	Not Fitted		RL85	Not Fitted		RL129	Not Fitted		RL173
Not Fitted		RL42	Not Fitted		RL86	Not Fitted		RL130	Not Fitted		RL174
Not Fitted		RL43	Not Fitted		RL87	Not Fitted		RL131	Not Fitted		RL175
Not Fitted		RL44	Not Fitted		RL88	Not Fitted		RL132	Not Fitted		RL176

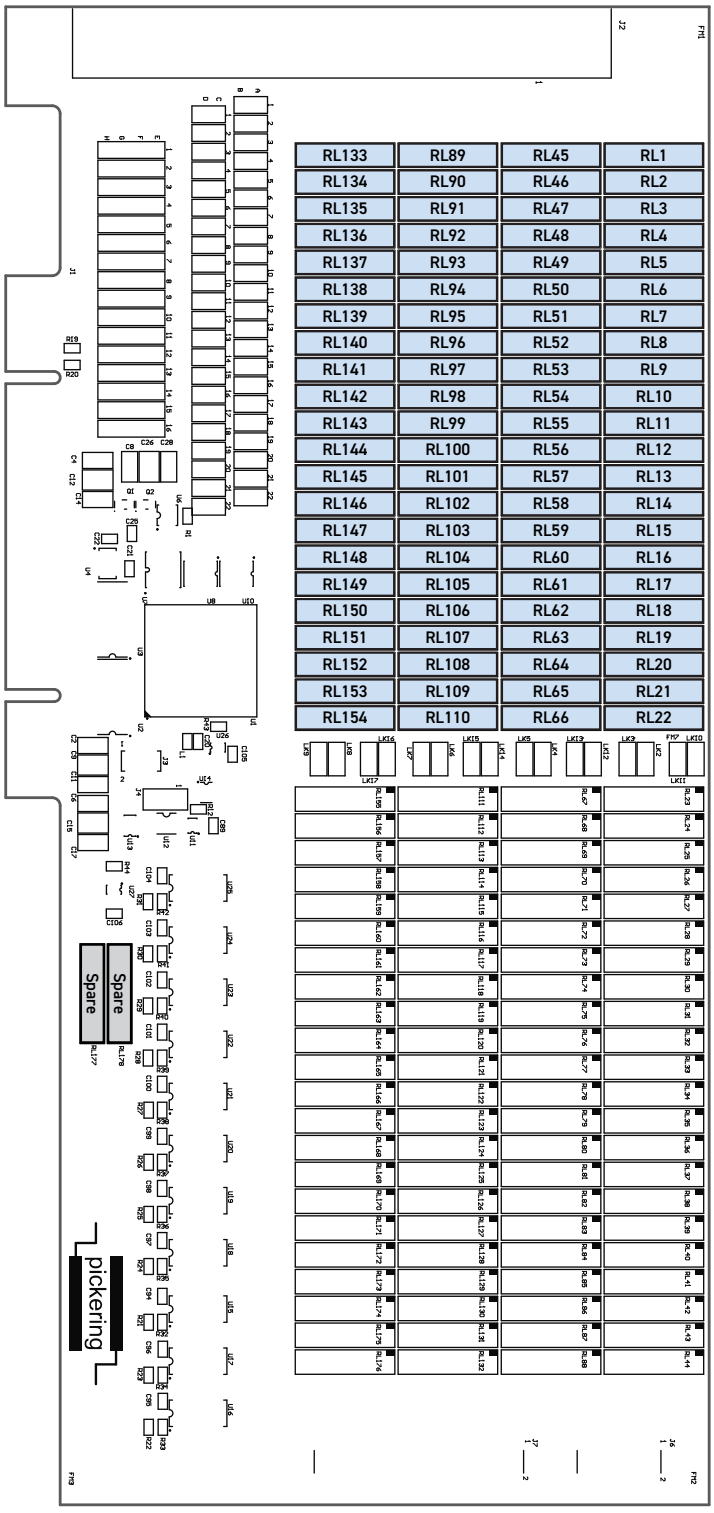


Figure 7.1 - 50-510B Single 22x4 Matrix: Component Layout

Relay Look-up Table 50-511B

Table 7.2 - 50-511B Dual 20x4 Matrix: Relay Numbering

X	Y	Relay No.	X	Y	Relay No.	X	Y	Relay No.	X	Y	Relay No.
101	101	RL1	101	102	RL45	101	103	RL89	101	104	RL133
102	101	RL2	102	102	RL46	102	103	RL90	102	104	RL134
103	101	RL3	103	102	RL47	103	103	RL91	103	104	RL135
104	101	RL4	104	102	RL48	104	103	RL92	104	104	RL136
105	101	RL5	105	102	RL49	105	103	RL93	105	104	RL137
106	101	RL6	106	102	RL50	106	103	RL94	106	104	RL138
107	101	RL7	107	102	RL51	107	103	RL95	107	104	RL139
108	101	RL8	108	102	RL52	108	103	RL96	108	104	RL140
109	101	RL9	109	102	RL53	109	103	RL97	109	104	RL141
110	101	RL10	110	102	RL54	110	103	RL98	110	104	RL142
111	101	RL11	111	102	RL55	111	103	RL99	111	104	RL143
112	101	RL12	112	102	RL56	112	103	RL100	112	104	RL144
113	101	RL13	113	102	RL57	113	103	RL101	113	104	RL145
114	101	RL14	114	102	RL58	114	103	RL102	114	104	RL146
115	101	RL15	115	102	RL59	115	103	RL103	115	104	RL147
116	101	RL16	116	102	RL60	116	103	RL104	116	104	RL148
117	101	RL17	117	102	RL61	117	103	RL105	117	104	RL149
118	101	RL18	118	102	RL62	118	103	RL106	118	104	RL150
119	101	RL19	119	102	RL63	119	103	RL107	119	104	RL151
120	101	RL20	120	102	RL64	120	103	RL108	120	104	RL152
201	201	RL21	201	202	RL65	201	203	RL109	201	204	RL153
202	201	RL22	202	202	RL66	202	203	RL110	202	204	RL154
203	201	RL23	203	202	RL67	203	203	RL111	203	204	RL155
204	201	RL24	204	202	RL68	204	203	RL112	204	204	RL156
205	201	RL25	205	202	RL69	205	203	RL113	205	204	RL157
206	201	RL26	206	202	RL70	206	203	RL114	206	204	RL158
207	201	RL27	207	202	RL71	207	203	RL115	207	204	RL159
208	201	RL28	208	202	RL72	208	203	RL116	208	204	RL160
209	201	RL29	209	202	RL73	209	203	RL117	209	204	RL161
210	201	RL30	210	202	RL74	210	203	RL118	210	204	RL162
211	201	RL31	211	202	RL75	211	203	RL119	211	204	RL163
212	201	RL32	212	202	RL76	212	203	RL120	212	204	RL164
213	201	RL33	213	202	RL77	213	203	RL121	213	204	RL165
214	201	RL34	214	202	RL78	214	203	RL122	214	204	RL166
215	201	RL35	215	202	RL79	215	203	RL123	215	204	RL167
216	201	RL36	216	202	RL80	216	203	RL124	216	204	RL168
217	201	RL37	217	202	RL81	217	203	RL125	217	204	RL169
218	201	RL38	218	202	RL82	218	203	RL126	218	204	RL170
219	201	RL39	219	202	RL83	219	203	RL127	219	204	RL171
220	201	RL40	220	202	RL84	220	203	RL128	220	204	RL172
Not Fitted		RL41	Not Fitted		RL85	Not Fitted		RL129	Not Fitted		RL173
Not Fitted		RL42	Not Fitted		RL86	Not Fitted		RL130	Not Fitted		RL174
Not Fitted		RL43	Not Fitted		RL87	Not Fitted		RL131	Not Fitted		RL175
Not Fitted		RL44	Not Fitted		RL88	Not Fitted		RL132	Not Fitted		RL176

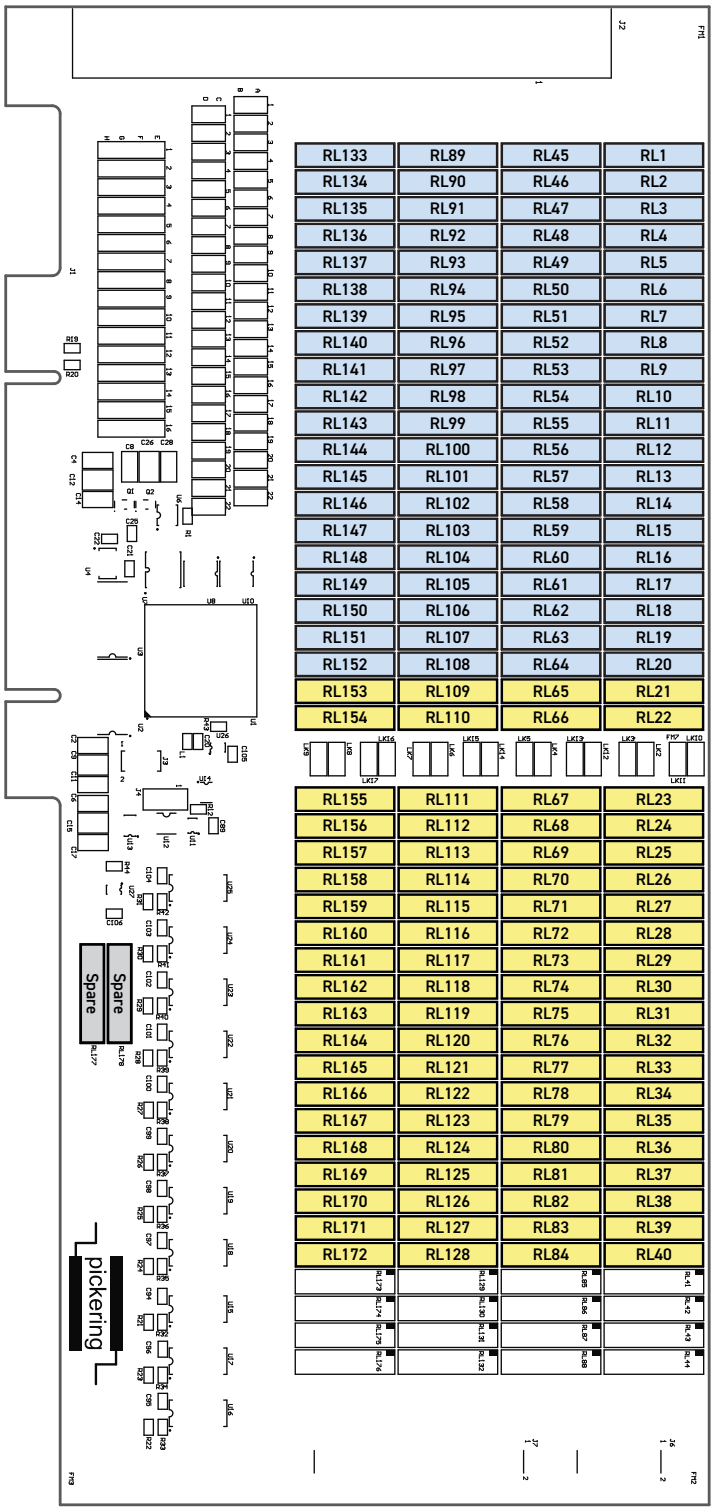


Figure 7.2 - 50-511B Dual 20x4 Matrix: Component Layout

Relay Look-up Table 50-512B

Table 7.3 - 50-512B Single 22x8 Matrix: Relay Numbering

X	Y	Relay No.	X	Y	Relay No.	X	Y	Relay No.	X	Y	Relay No.
1	1	RL1	1	2	RL45	1	3	RL89	1	4	RL133
2	1	RL2	2	2	RL46	2	3	RL90	2	4	RL134
3	1	RL3	3	2	RL47	3	3	RL91	3	4	RL135
4	1	RL4	4	2	RL48	4	3	RL92	4	4	RL136
5	1	RL5	5	2	RL49	5	3	RL93	5	4	RL137
6	1	RL6	6	2	RL50	6	3	RL94	6	4	RL138
7	1	RL7	7	2	RL51	7	3	RL95	7	4	RL139
8	1	RL8	8	2	RL52	8	3	RL96	8	4	RL140
9	1	RL9	9	2	RL53	9	3	RL97	9	4	RL141
10	1	RL10	10	2	RL54	10	3	RL98	10	4	RL142
11	1	RL11	11	2	RL55	11	3	RL99	11	4	RL143
12	1	RL12	12	2	RL56	12	3	RL100	12	4	RL144
13	1	RL13	13	2	RL57	13	3	RL101	13	4	RL145
14	1	RL14	14	2	RL58	14	3	RL102	14	4	RL146
15	1	RL15	15	2	RL59	15	3	RL103	15	4	RL147
16	1	RL16	16	2	RL60	16	3	RL104	16	4	RL148
17	1	RL17	17	2	RL61	17	3	RL105	17	4	RL149
18	1	RL18	18	2	RL62	18	3	RL106	18	4	RL150
19	1	RL19	19	2	RL63	19	3	RL107	19	4	RL151
20	1	RL20	20	2	RL64	20	3	RL108	20	4	RL152
21	1	RL21	21	2	RL65	21	3	RL109	21	4	RL153
22	1	RL22	22	2	RL66	22	3	RL110	22	4	RL154
1	5	RL23	1	6	RL67	1	7	RL111	1	8	RL155
2	5	RL24	2	6	RL68	2	7	RL112	2	8	RL156
3	5	RL25	3	6	RL69	3	7	RL113	3	8	RL157
4	5	RL26	4	6	RL70	4	7	RL114	4	8	RL158
5	5	RL27	5	6	RL71	5	7	RL115	5	8	RL159
6	5	RL28	6	6	RL72	6	7	RL116	6	8	RL160
7	5	RL29	7	6	RL73	7	7	RL117	7	8	RL161
8	5	RL30	8	6	RL74	8	7	RL118	8	8	RL162
9	5	RL31	9	6	RL75	9	7	RL119	9	8	RL163
10	5	RL32	10	6	RL76	10	7	RL120	10	8	RL164
11	5	RL33	11	6	RL77	11	7	RL121	11	8	RL165
12	5	RL34	12	6	RL78	12	7	RL122	12	8	RL166
13	5	RL35	13	6	RL79	13	7	RL123	13	8	RL167
14	5	RL36	14	6	RL80	14	7	RL124	14	8	RL168
15	5	RL37	15	6	RL81	15	7	RL125	15	8	RL169
16	5	RL38	16	6	RL82	16	7	RL126	16	8	RL170
17	5	RL39	17	6	RL83	17	7	RL127	17	8	RL171
18	5	RL40	18	6	RL84	18	7	RL128	18	8	RL172
19	5	RL41	19	6	RL85	19	7	RL129	19	8	RL173
20	5	RL42	20	6	RL86	20	7	RL130	20	8	RL174
21	5	RL43	21	6	RL87	21	7	RL131	21	8	RL175
22	5	RL44	22	6	RL88	22	7	RL132	22	8	RL176

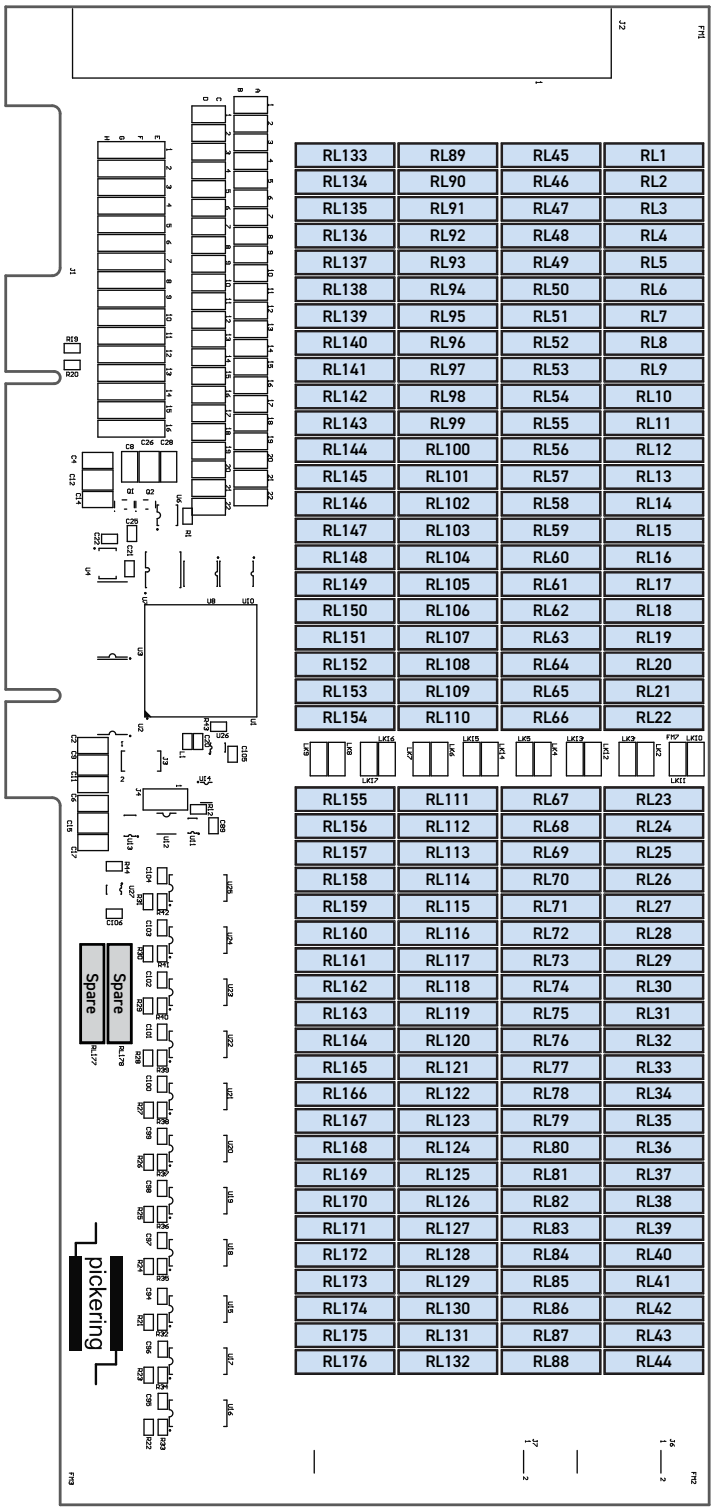


Figure 7.3 - 50-512B Single 22x8 Matrix: Component Layout

Relay Look-up Table 50-513B

Table 7.4 - 50-513B Single 44x4 Matrix: Relay Numbering

X	Y	Relay No.	X	Y	Relay No.	X	Y	Relay No.	X	Y	Relay No.
1	1	RL1	1	2	RL45	1	3	RL89	1	4	RL133
2	1	RL2	2	2	RL46	2	3	RL90	2	4	RL134
3	1	RL3	3	2	RL47	3	3	RL91	3	4	RL135
4	1	RL4	4	2	RL48	4	3	RL92	4	4	RL136
5	1	RL5	5	2	RL49	5	3	RL93	5	4	RL137
6	1	RL6	6	2	RL50	6	3	RL94	6	4	RL138
7	1	RL7	7	2	RL51	7	3	RL95	7	4	RL139
8	1	RL8	8	2	RL52	8	3	RL96	8	4	RL140
9	1	RL9	9	2	RL53	9	3	RL97	9	4	RL141
10	1	RL10	10	2	RL54	10	3	RL98	10	4	RL142
11	1	RL11	11	2	RL55	11	3	RL99	11	4	RL143
12	1	RL12	12	2	RL56	12	3	RL100	12	4	RL144
13	1	RL13	13	2	RL57	13	3	RL101	13	4	RL145
14	1	RL14	14	2	RL58	14	3	RL102	14	4	RL146
15	1	RL15	15	2	RL59	15	3	RL103	15	4	RL147
16	1	RL16	16	2	RL60	16	3	RL104	16	4	RL148
17	1	RL17	17	2	RL61	17	3	RL105	17	4	RL149
18	1	RL18	18	2	RL62	18	3	RL106	18	4	RL150
19	1	RL19	19	2	RL63	19	3	RL107	19	4	RL151
20	1	RL20	20	2	RL64	20	3	RL108	20	4	RL152
21	1	RL21	21	2	RL65	21	3	RL109	21	4	RL153
22	1	RL22	22	2	RL66	22	3	RL110	22	4	RL154
23	1	RL23	23	2	RL67	23	3	RL111	23	4	RL155
24	1	RL24	24	2	RL68	24	3	RL112	24	4	RL156
35	1	RL25	35	2	RL69	35	3	RL113	35	4	RL157
26	1	RL26	26	2	RL70	26	3	RL114	26	4	RL158
27	1	RL27	27	2	RL71	27	3	RL115	27	4	RL159
28	1	RL28	28	2	RL72	28	3	RL116	28	4	RL160
29	1	RL29	29	2	RL73	29	3	RL117	29	4	RL161
30	1	RL30	30	2	RL74	30	3	RL118	30	4	RL162
31	1	RL31	31	2	RL75	31	3	RL119	31	4	RL163
32	1	RL32	32	2	RL76	32	3	RL120	32	4	RL164
33	1	RL33	33	2	RL77	33	3	RL121	33	4	RL165
34	1	RL34	34	2	RL78	34	3	RL122	34	4	RL166
35	1	RL35	35	2	RL79	35	3	RL123	35	4	RL167
36	1	RL36	36	2	RL80	36	3	RL124	36	4	RL168
37	1	RL37	37	2	RL81	37	3	RL125	37	4	RL169
38	1	RL38	38	2	RL82	38	3	RL126	38	4	RL170
39	1	RL39	39	2	RL83	39	3	RL127	39	4	RL171
40	1	RL40	40	2	RL84	40	3	RL128	40	4	RL172
41	1	RL41	41	2	RL85	41	3	RL129	41	4	RL173
42	1	RL42	42	2	RL86	42	3	RL130	42	4	RL174
43	1	RL43	43	2	RL87	43	3	RL131	43	4	RL175
44	1	RL44	44	2	RL88	44	3	RL132	44	4	RL176

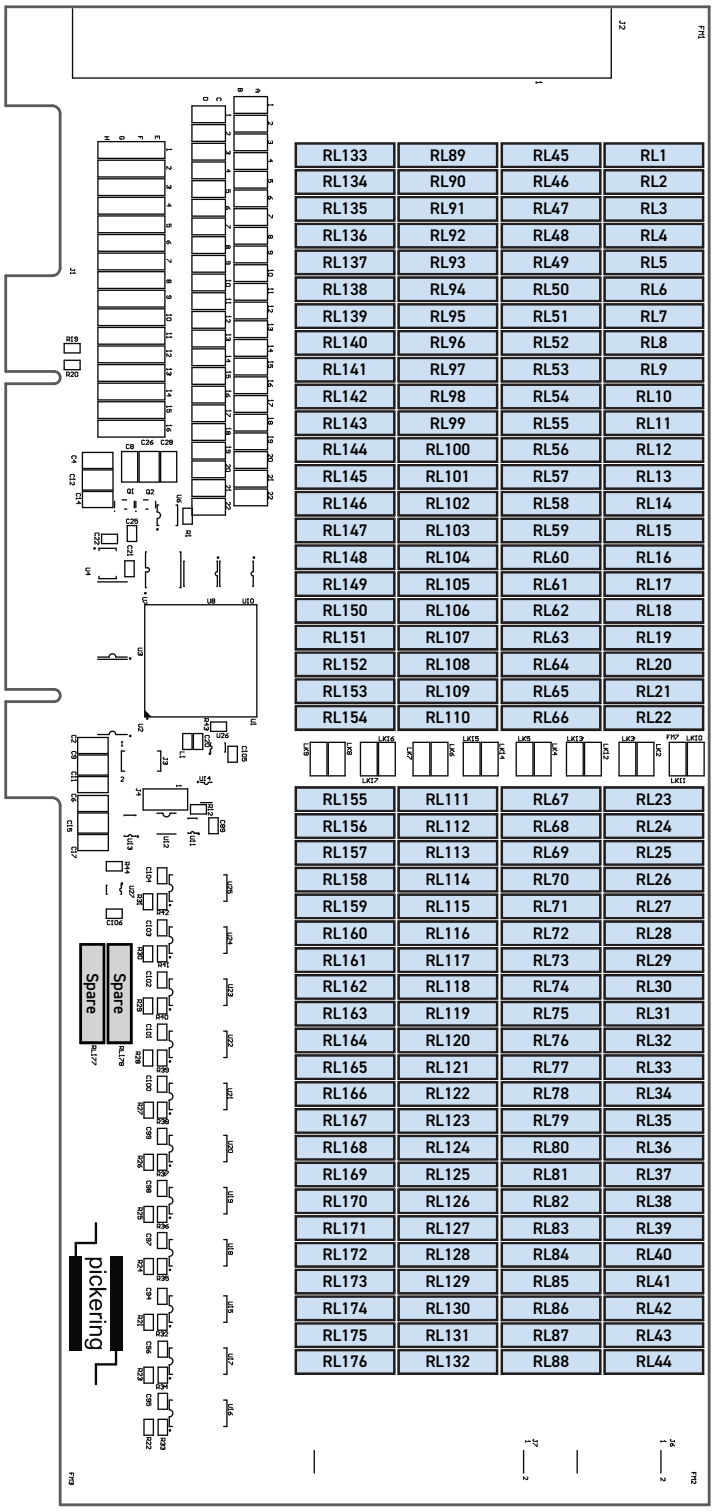


Figure 7.4 - 50-513B Single 44x4 Matrix: Component Layout

Appendix A

Product Lifecycle Status

Product Number:	50-510/511/512/513
Introduced:	2003
Product Change Notification (If applicable):	Not applicable
Status:	Obsolete
Compatibility, forward:	50-510B/511B/512B/513B
Compatibility, backward:	Not applicable, original version
Last Time Buy Date:	Not defined
Form, fit, function to previous version:	Not applicable, original version
Details of update from previous version:	Not applicable, original version

Product Number:	50-510A/511A/512A/513A
Introduced:	2016
Product Change Notification (If applicable):	Not applicable
Status:	Obsolete
Compatibility, forward:	50-510B/511B/512B/513B
Compatibility, backward:	50-510/511/512/513
Last Time Buy Date:	31/07/2026
Form, fit, function to previous version:	Yes / No, driver update required
Details of update from previous version:	Backplane control interface replaced.

Product Number:	50-510B/511B/512B/513B
Introduced:	2026
Product Change Notification (If applicable):	PCN 0010-26
Status:	Active
Compatibility, forward:	Not applicable, latest version
Compatibility, backward:	50-510A/511A/512A/513A
Last Time Buy Date:	Not applicable
Form, fit, function to previous version:	Yes / No, driver update required
Details of update from previous version:	Backplane control interface replaced. and relay cycle counting feature added.