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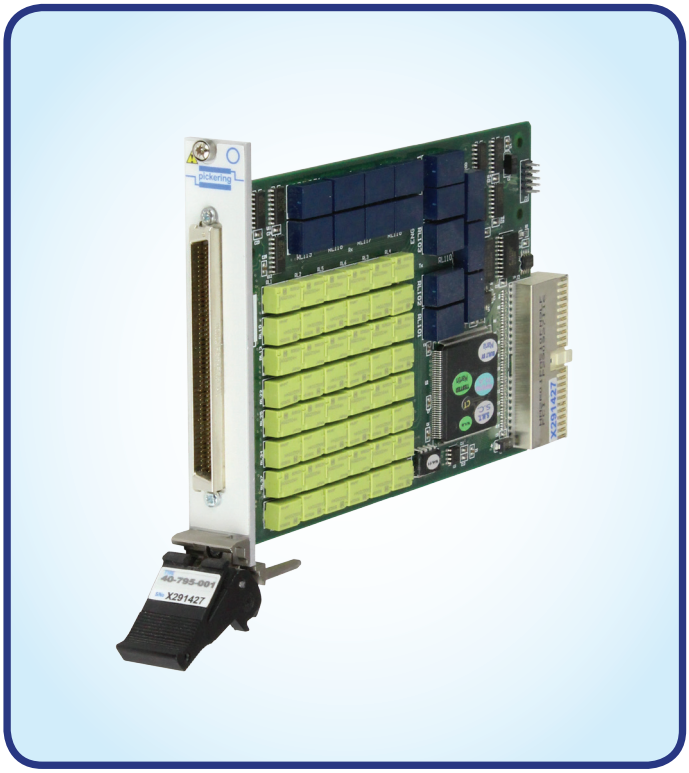
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Find the *Pickering 40-796-922* at our website: ***Click HERE***

User Manual

PXI

8/16 Tributary Daisy Chain Switch, Balanced
(Model Nos. 40-795-001 / 40-796-001)



Issue 3.2 May 2017

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PRODUCT SAFETY

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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CONTENTS

Copyright Statement II

Technical Support and Warranty III

Product Safety IV

Contents (this page) V

Warnings and Cautions VII

Section 1
Technical Specification 1.1

Section 2
Technical Description 2.1
- Functional Description 2.1
- Relay Schematic 2.3

Section 3
Installation 3.1
- Pre Operation Checks 3.1
- Hardware Installation 3.2
- Software Installation 3.2
- Testing Operation 3.3

Section 4
Programming Guide 4.1
- Programming Options For Pickering PXI Cards 4.1
- Module Architecture 40-795/796 ..... 4.3
- Programming The Module 40-795/796 ..... 4.9
- Sub-unit Schematics 4.10
- Signal Routing Examples 4.12

Section 5
Connector Information 5.1

Section 6
Trouble Shooting 6.1

Section 7
Maintenance Information 7.1
- Component Layout 7.2

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WARNINGS AND 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/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.	

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: 1. 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. 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.	

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.

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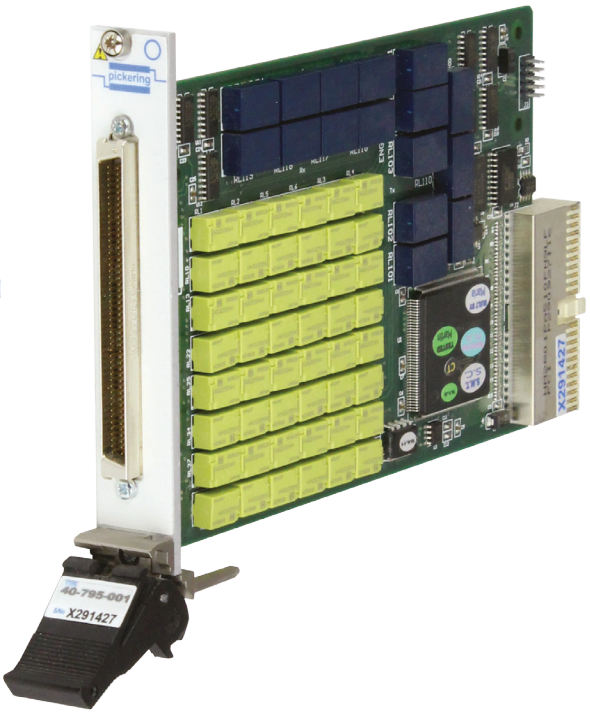
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SECTION 1 - TECHNICAL SPECIFICATION

40-795/796
8/16 Tributary Daisy Chain Switch Balanced

- Suitable For Testing SONET/SDH Transmission Multiplexers
- Suitable For Switching 100/120Ω Balanced Lines
- 8 or 16 Tributaries Per 1-Slot Module
- Up To 272 Tributaries Per 18 Slot PXI Chassis
- Expandable To Any Size: 8, 16, 24...
- All Tributaries Can be Daisy-Chained to One Signal
- VISA, IVI & Kernel Drivers Supplied for Windows
- Supported by PXI or LXI Chassis
- Diagnostic Tool Available (PI-MXT)
- 3 Year Warranty



The 40-795/796 Daisy Chain Switching Module is designed for telecom test applications. It allows production or verification testing of SONET/SDH transmission multiplexers switching 2MBit/s (E1) or 1.5MBit/s (T1) data over 100Ω or 120Ω balanced lines. The following modules are available:

- 8 Tributary Daisy Chain Switch Balanced Module (40-795-001)
- 16 Tributary Daisy Chain Switch Balanced Module (40-796-001)

Multiple modules can be cascaded together to form very large systems, for example a 7-slot PXI chassis can contain a 112 tributary switching system and an 18-slot PXI chassis can contain up to 272 tributaries.

The Daisy Chain Switching Module allows traffic to be sequentially Daisy-Chained through all tributaries (or any selection of tributaries) and modules can be cascaded to test any number of tributaries. Multiplexers are provided to allow transmit or receive instrumentation to be connected to any tributary. This allows specific testing of a port, for example for the measurement of pulse shape distortion or return loss.

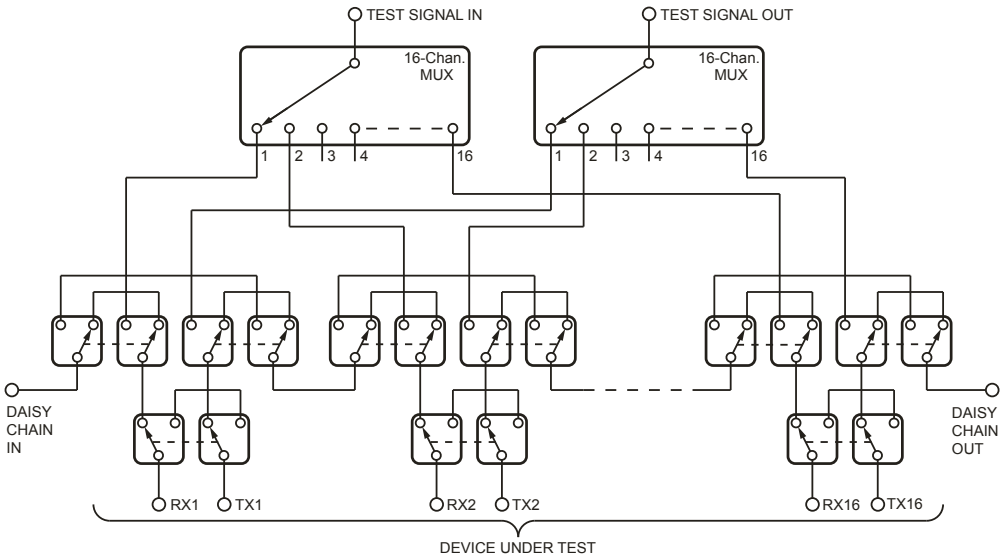
SDH/SONET Tributary Testing is a very specialised area, please contact Pickering Interfaces for additional application information and to discuss your exact requirements.

Pickering Interfaces also have SDH/SONET switching solutions in our System 30 (VXI) and system 20 (IEEE-488) switching systems.

Simplified Block Diagram for the 16 Tributary Daisy Chain Switch Balanced Module (40-796).

The 8 Tributary version (40-795) is the same configuration with half the channels.

Note that each path and switch shown represents a two-pole balanced connection.



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General Specification

Maximum Voltage:	100VDC/100VAC
Maximum Power:	30W
Maximum Switch Current:	1A
On Path Resistance:	<1.5Ω for all connections (except for Daisy Chain In – Daisy Chain Out, which is <5Ω)
Off Path Resistance:	$>1x10^8\Omega$
Expected Life (Low Power):	$>1x10^8$ operations
Expected Life (Max Power):	$>2x10^5$ operations
Total Switching Time:	10ms
Relay Mechanical Setting Time:	<3ms

R.F. Specification

Characteristic Impedance:	100/120Ω
Insertion Loss	
Test Signal to Rx/Tx:	<0.25dB to 10MHz
Daisy Chain:	<0.5dB (40-795) and <1dB (40-796) to 10MHz
VSWR	
Test Signal to Rx/Tx:	<1.3 to 10MHz
Daisy Chain:	<1.5 to 10MHz (40-795) and to 5MHz (40-796)

Power Requirements

+3.3V	+5V	+12V	-12V
0	500mA	0	0

Width and Dimensions

Single width 3U PXI/CompactPCI instrument module consisting of mother and daughter cards (40-796) or mother card only (40-795)

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

Connectors

PXI bus: 32-bit P1/J1 backplane connector

Front panel connector: 96-pin male micro-D

Using The Tributary Daisy Chain Switch

The 40-795/796 comprises 2 sections (see graphic on previous page).

1. Daisy-Chain switches. These are used to feed 2M signals into and out of the DUT (device under test), any selection of tributaries may be routed (e.g. all even, all odd, etc).

2. Breakout multiplexer. This is used to test a specific tributary.

The 40-795/796 is programmed as a 4x16 matrix:-

1st row is used to route the Daisy-Chain switches. The default setting is for all tributaries to be selected.

2nd row is used to switch polarity.

3rd row is used to select the receive multiplexer to a specific tributary.

4th row is used to select the transmit multiplexer to a specific tributary.

Product Order Codes

8-Tributary Daisy Chain Switch Balanced Module	**40-795-001**
16-Tributary Daisy Chain Switch Balanced Module	**40-796-001**

Support Products

Self-Test Diagnostic Tool (PI-MXT)

These modules are compatible with Pickering's 90-100 PI-MXT test tool. This enables all switch paths to be automatically tested so that faulty relays can be easily identified. The tool consists of a Windows executable program and an adapter for the specific module, a user supplied multimeter capable of 4-wire resistance measurement is also required.

The PI-MXT test adapter required for the Tributary Daisy Chain Switch module is as follows:

90-100-229 supports 40-795-001 & 40-796-001

For further details on the PI-MXT tool, please refer to the 90-100 data sheet and user manual available from the Pickering website.

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 40-795/796 range are as follows:

91-100-040 & 91-100-023 kits for 40-795-001
91-100-040 & 91-100-023 kits for 40-796-001

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

Mating Connectors & Cabling

For connection accessories for the 40-795/796 modules please refer to the **90-016D** 96-pin micro-D connector data sheet where a complete list and documentation can be found for accessories, or refer to the Connection Solutions catalog.

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Programming

Pickering provide kernel, IVI and VISA (NI & Keysight) drivers which are compatible with all Microsoft supported versions of Windows and popular older versions. For a list of all supporting operating systems, please see: www.pickeringtest.com/os
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:

- **Pickering Interfaces Switch Path Manager**
- **MTQ Testsolutions** Tecap Test & Measurement Suite
- **National Instruments** products (LabVIEW, LabWindows/CVI, Switch Executive, MAX, TestStand, VeriStand, etc.)
- **Microsoft Visual Studio** products (Visual Basic, Visual C+)
- **Keysight** VEE • **Mathworks** Matlab • **Marvin** ATEasy

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

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

PXI & CompactPCI Compliance

The module is compliant with the PXI Specification 2.2. Local Bus, Trigger Bus and Star Trigger are not implemented.
Uses a 33MHz 32-bit backplane interface.

Safety & CE Compliance

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

PXI & LXI Chassis Compatibility

Compatible with all chassis conforming to the 3U PXI and 3U cPCI specification. Compatible with Legacy and Hybrid peripheral slots in a 3U PXI Express chassis.
Compatible with Pickering Interfaces LXI Modular Chassis. For information on driving your switching solution in an LXI environment refer to the LXI Product Guide.



Latest Details

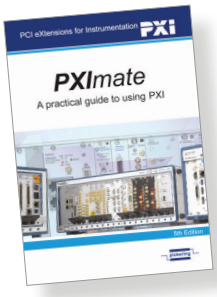
Please refer to our Web Site for Latest Product Details.
www.pickeringtest.com



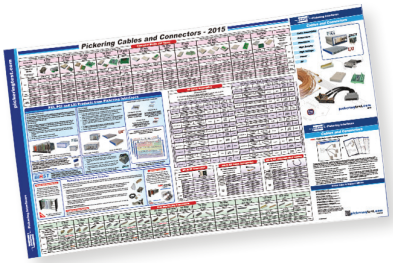
Please refer to the 200 page Pickering Interfaces "**Connection Solutions**" catalog for the full list of connector/cabling options, including drawings, photos and specifications. Available in either print or as a download.
Alternatively our web site has dynamically linked connector/cabling options, including pricing, for all Pickering PXI modules.



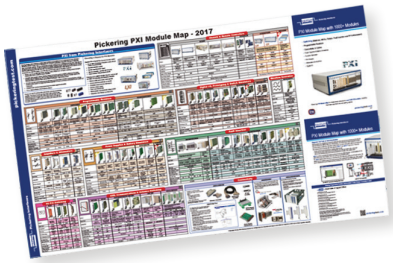
"**The Big PXI Catalog**" gives full details of Pickering's entire range of PXI switch modules, instrument modules and support products.
At over 500 pages, the Big PXI Catalog is available on request or can be downloaded from the Pickering website.



Ever wondered what PXI is all about?
Pickering Interfaces' "**PXImate**" explains the basics of PXI and provides useful data for engineers working on switch based test systems.
The PXImate is available free on request from the Pickering website.

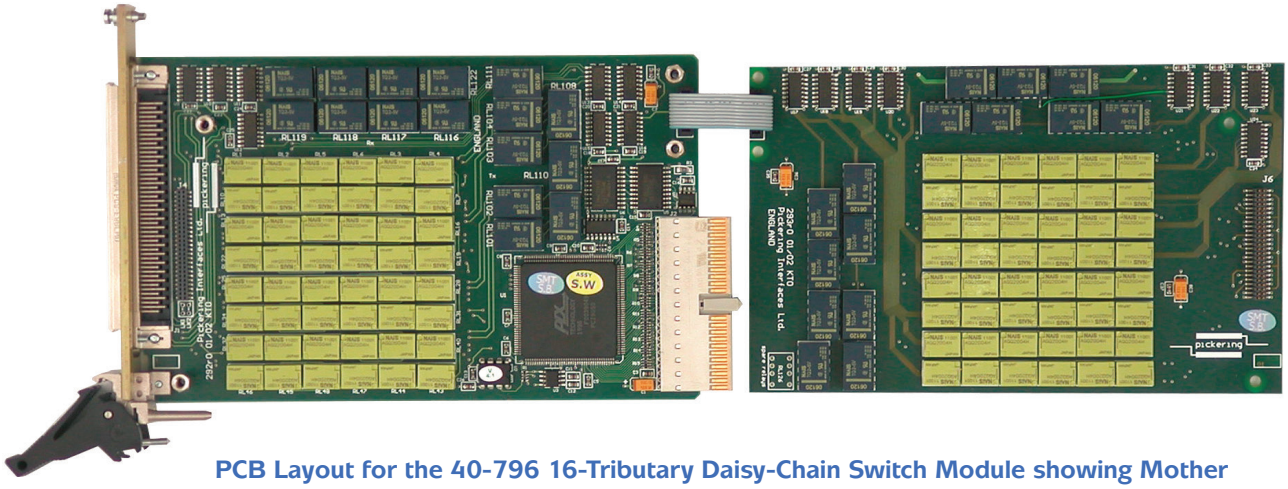


The "**Cables & Connectors Map**" - outlines the cable and connector options available for all PXI Modules.



The "**PXI Module Map**" - a simple fold-out selection guide to all Pickering's 1000+ PXI Modules.

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PCB Layout for the 40-796 16-Tributary Daisy-Chain Switch Module showing Mother and Daughter cards. The 8-tributary version (40-795) consists of the Mother card only.

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SECTION 2 - TECHNICAL DESCRIPTION

FUNCTIONAL DESCRIPTION

A functional block diagram is provided in Figure 2.1. The Daisy Chain Module is powered by a +5V input via Compact PCI connector J1. The interface to the user test equipment is via the front panel mounted 96-pin micro-D connector, J2. The module comprises a motherboard and daughterboard populated with two pole relays configured as Daisy Chain paths, Tributary paths and Loopback paths (the 8 tributary version of the module utilises the motherboard only, whereas the 16 tributary version utilises both motherboard and daughterboard). The motherboard and daughterboard are connected via ribbon cable. The relays are energised via control signals from relay drivers U9 to U16 (40-795), or relay drivers U9 to U24 (40-796). The relay drivers are addressed by PCI bridge U1, via the control logic, to output the required signal. Module configuration is determined by data stored in EEPROM U7. PCI Bridge U1 is configured by EEPROM U2.

Figures 2.2 and 2.3 provide a schematic representation of the Daisy Chain paths (Bank 1), Tributary (Rx/Tx) paths (Bank 2) and Loopback paths (Bank 3). The Daisy Chain paths are used for low quality measurements, e.g. Bit Error Rate Test. The Rx/Tx Select paths are used for high quality measurement e.g. Return Loss/SWR, Pulse Shape.

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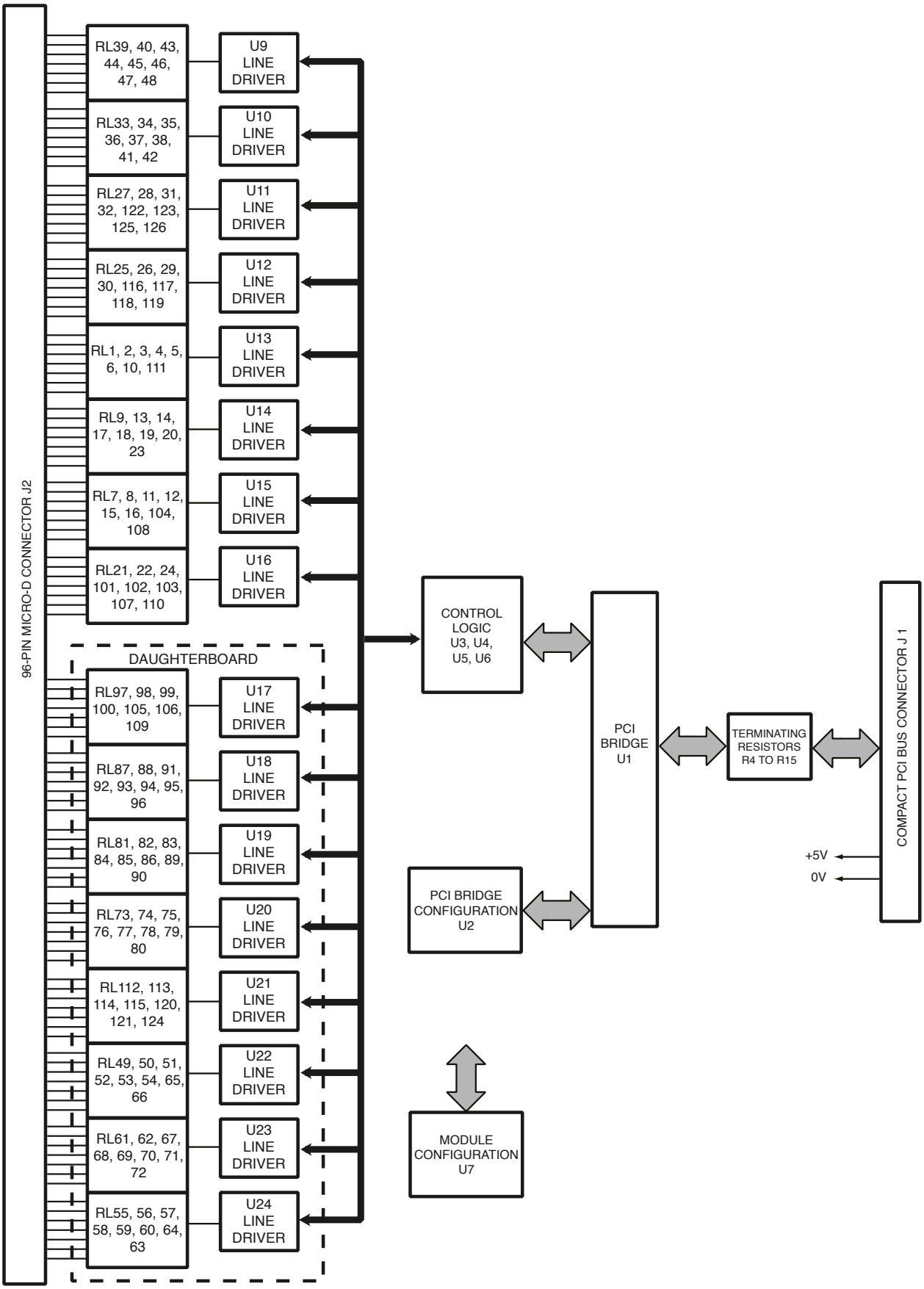
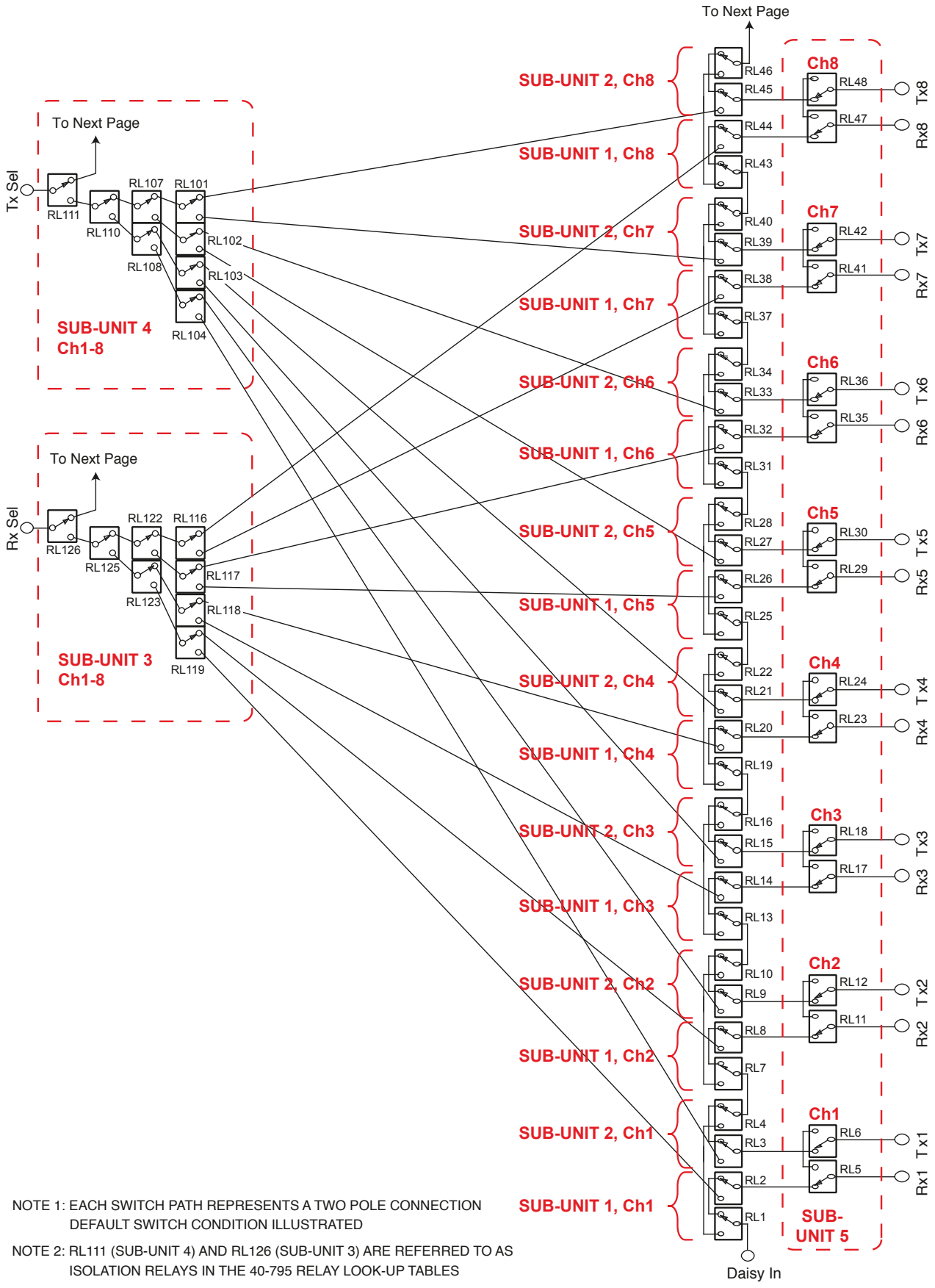


Figure 2.1 - 8/16 Tributary Daisy Chain Switch, Balanced (40-795/796): Block Diagram

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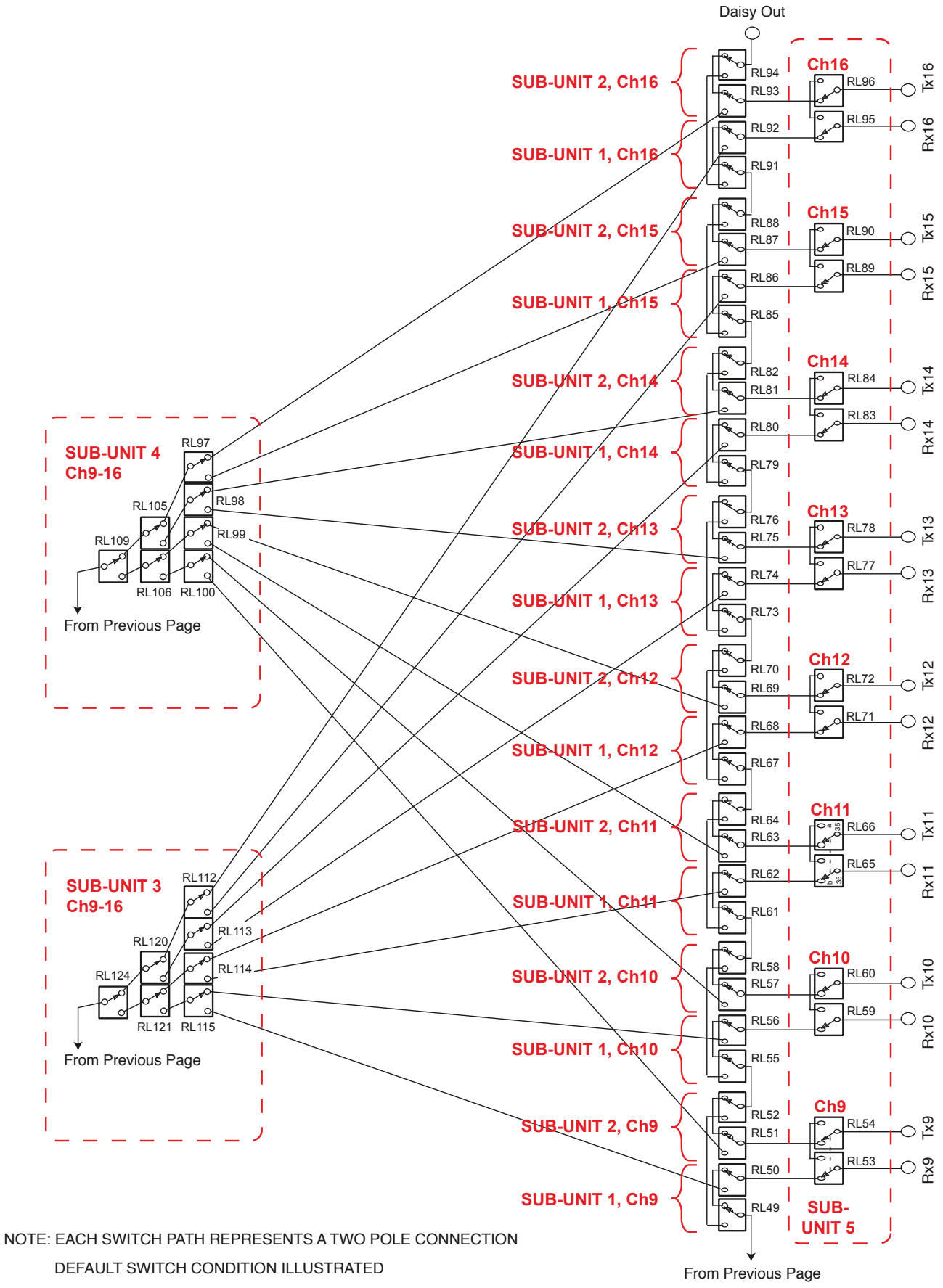


NOTE 1: EACH SWITCH PATH REPRESENTS A TWO POLE CONNECTION
DEFAULT SWITCH CONDITION ILLUSTRATED

NOTE 2: RL111 (SUB-UNIT 4) AND RL126 (SUB-UNIT 3) ARE REFERRED TO AS ISOLATION RELAYS IN THE 40-795 RELAY LOOK-UP TABLES

Figure 2.2 - 8/16 Tributary Daisy Chain Switch Balanced (40-795-001 / 40-796-001): Relay Schematic Sheet 1

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NOTE: EACH SWITCH PATH REPRESENTS A TWO POLE CONNECTION

DEFAULT SWITCH CONDITION ILLUSTRATED

Figure 2.3 - 16 Tributary Daisy Chain Switch Balanced (40-796-001): Relay Schematic Sheet 2

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SECTION 3 - INSTALLATION

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

Modular products require installation in a suitable PXI/LXI chassis. The module is designed for indoor use only.

PREOPERATION CHECKS (UNPACKING)

1. Check the module 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 module(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 module is of flat and solid construction to withstand and support the combined weight of the module(s) and chassis.

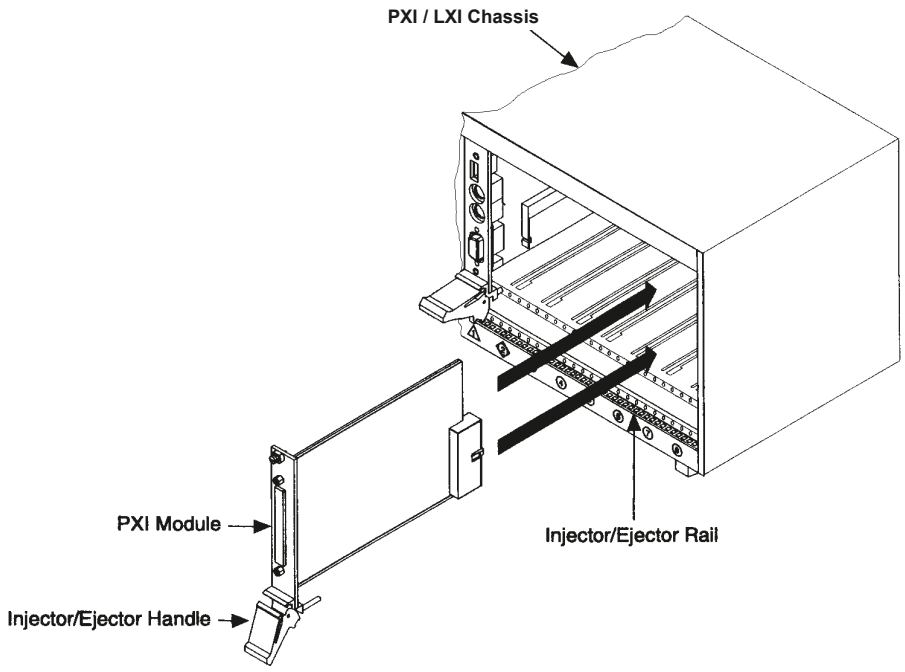


Figure 3.1 - Installing the Module into a PXI/cPCI/LXI Chassis

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HARDWARE INSTALLATION
ELECTRICAL CONNECTION (CHASSIS)

1. The chassis must be electrically installed in accordance with local regional electrical codes by a qualified engineer.
2. The chassis must be grounded.

Electrostatic discharge can damage the components on the module. To avoid such damage in handling the board refer to page VII.

Ensure that there is adequate ventilation.

The module 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 slot in the rack.
3. Remove the blanking plate for the chosen slot.
4. Ensure that the injector/ejector handle is in its downward position. Align the module with the card guides on the top and bottom of the slot.

   Do not raise the injector/ejector handle whilst inserting the module as the module will not insert properly.
5. Hold the handle whilst slowly sliding the module into the card guides until the handle catches on the injector/ejector rail (refer to Figure 3.1).
6. Raise the injector/ejector handle until the module firmly seats into the backplane. The front panel of the module should be flush with the front panel of the chassis.
7. Secure the front panel of the module using both screws to the chassis front panel mounting rails.
8. In a system employing a remote control interface to connect an external controller to a PXI chassis or to link multiple chassis, power-up the system as follows:
   a. For a system comprising an external controller and one chassis, power up the chassis before powering up the external controller.
   b. For a system comprising more than one chassis, turn ON the last chassis in the system followed by the penultimate, etc, and finally turn ON the external controller or chassis containing the system controller.
9. For Pickering Interfaces modular LXI installation there is no requirement to use any particular power up sequence.

SOFTWARE INSTALLATION

First install the appropriate Pickering PXI 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 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.

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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.

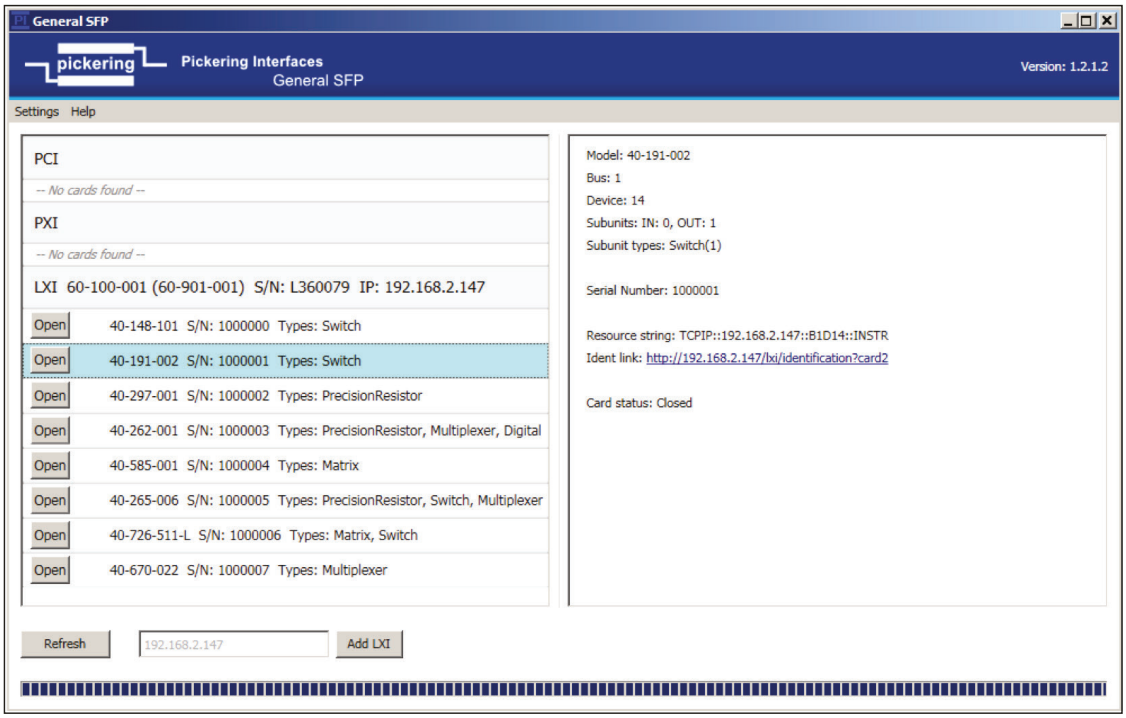


Figure 3.3 - General Soft Front Panel Selector

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

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SECTION 4 - PROGRAMMING GUIDE

PROGRAMMING OPTIONS FOR PICKERING INTERFACES PXI CARDS

Software drivers are supplied for Microsoft Windows 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.

Some recent drivers developed for the LXI platform are capable of addressing both PXI and LXI domains. Such duality may be of help to users considering future migration from PXI based systems to LXI based systems, or indeed systems containing both PXI and LXI components.

Programming for PXI

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/O Driver 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

Programming for LXI

When Pickering PXI cards are inserted into an LXI Modular Chassis a different set of drivers is available.

IVI Driver for Windows - pi40iv

The pi40iv IVI also supports LXI inserted cards simply by changing the resource string to address string to the appropriate address.

Direct I/O Driver for Windows - Piplx

The piplx driver is based on the PXI Direct I/O driver pilpxi, but with added functionality to deal with the added need to address the chassis using an IP address. 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.

Please note that this driver may also be used in the PXI domain. If the addressed card is in the local computer PCI/PXI system, commands will be passed through to the PXI Direct I/O driver. This mechanism allows the piplx driver to be used for both PXI and LXI cards.

The LXI format offers additional interface options not available in PXI :

.NET

A .NET native driver is also available. Once again this may be used for both LXI and PXI card control.

SOAP

Pickering LXI products include a SOAP interface which is usable from a wide variety of platforms and languages.

SSH

Pickering LXI products include an SSH interface which allows remote command line access to control cards, or, using a suitable package, programmatic control.

The user is advised to visit the Pickering web site for further details of all the above drivers, where documentation, example programs, and further help with driver choice are available.

LabVIEW, LabWindows/CVI and Switch Executive are trademarks of National Instruments Corporation.

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.

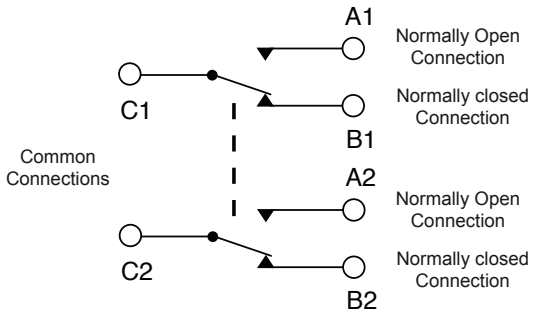
Low level drivers include functions to allow the programmer to query the card to ascertain the number of sub-units, and the size and type of each sub-unit.

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

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MODULE ARCHITECTURE 40-795/796

Both module types use 2 Form C changeover relays. The 40-795 utilises an effective array of 64 relays and the 40-796 an effective array of 126 relays. In the default state the daisy chain is routed through all tributaries and the multiplexers are inactive. Energising a particular relay creates a signal path between its C and A terminals the effects of which vary depending on the relays function. The relay module's switching architectures are shown in detail in Figures 2.2 and 2.3. The architecture of an individual 2 Form C relay is as shown below:



2 Form C Relay

Definitions

A multiplexer (MUX) sub-unit may only have 1 bit selected, setting a bit will clear a previously set bit.

A multi-way multiplexer (MUXM) sub-unit may have any number of bits concurrently selected.

Sub-Units

The 40-795/796 modules have 5 sub-units as follows:

Sub-Unit	40-795	40-796	Purpose
1	8 way MUXM	16 way MUXM	Rx Route
2	8 way MUXM	16 way MUXM	Tx Route
3	8 way MUX	16 way MUX	Rx MUX select
4	8 way MUX	16 way MUX	Tx MUX select
5	8 way MUXM	16 way MUXM	Rx/Tx link

Each bit in a sub-unit corresponds to a channel, i.e. bit 1 controls channel 1 etc.

Operation

Sub-units 1, 2, and 5 work together to allow routing of the signals in a number of ways.

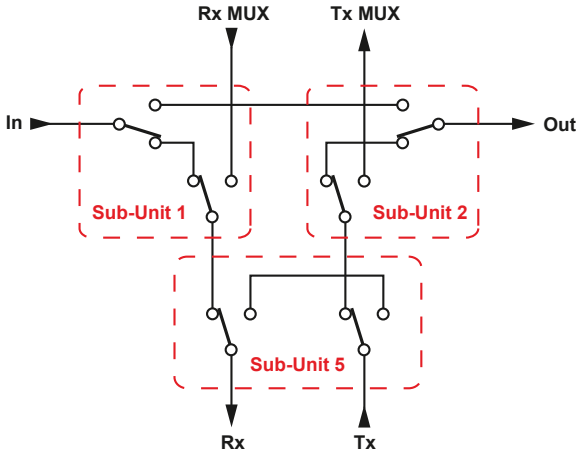


Figure 4.1 - Sub-Units 1, 2 and 5 on a Single Channel of the 40-795/796

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Table 4.1 - Sub-Units 1, 2 and 5 on a Single Channel of the 40-795/796

Sub-Unit 1	Sub-Unit 2	Sub-Unit 5	Routing
0	0	0	In → Rx Tx → Out Rx MUX, Tx MUX disconnected
1	0	0	In disconnected Tx → Out Rx → Rx MUX Tx MUX disconnected
0	1	0	In → Rx Out disconnected Tx → Tx MUX Rx MUX disconnected
1	1	0	In → Out Rx → Rx MUX Tx → Tx MUX
1	1	1	Rx → Tx In → Out Rx MUX, Tx MUX disconnected
All Other Settings			Rx → Tx All others disconnected

Sub-units 3 and 4 are simple multiplexer units that allow any one of the daisy chain selections to be routed to the test ports

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TABLE 4.2 - Daisy Chain Switch 40-795: Sub-Units

40-795		
SUB-UNIT 1 - Rx Route		
Bit No.	**Function**	**Relay No.**
1	Channel 1, Relay 1	RL1
	Channel 1, Relay 2	RL2
2	Channel 2, Relay 1	RL7
	Channel 2, Relay 2	RL8
3	Channel 3, Relay 1	RL13
	Channel 3, Relay 2	RL14
4	Channel 4, Relay 1	RL19
	Channel 4, Relay 2	RL20
5	Channel 5, Relay 1	RL25
	Channel 5, Relay 2	RL26
6	Channel 6, Relay 1	RL31
	Channel 6, Relay 2	RL32
7	Channel 7, Relay 1	RL37
	Channel 7, Relay 2	RL38
8	Channel 8, Relay 1	RL43
	Channel 8, Relay 2	RL44
SUB-UNIT 2 - Tx Route		
Bit No.	**Function**	**Relay No.**
1	Channel 1, Relay 1	RL3
	Channel 1, Relay 2	RL4
2	Channel 2, Relay 1	RL9
	Channel 2, Relay 2	RL10
3	Channel 3, Relay 1	RL15
	Channel 3, Relay 2	RL16
4	Channel 4, Relay 1	RL21
	Channel 4, Relay 2	RL22
5	Channel 5, Relay 1	RL27
	Channel 5, Relay 2	RL28
6	Channel 6, Relay 1	RL33
	Channel 6, Relay 2	RL34
7	Channel 7, Relay 1	RL39
	Channel 7, Relay 2	RL40
8	Channel 8, Relay 1	RL45
	Channel 8, Relay 2	RL46
SUB-UNIT 3 - Rx MUX		
Bit No.	**Function**	**Relay No.**
1	Channel 1, Relay 1	RL125
	Channel 1, Relay 2	RL123
	Channel 1, Relay 3	RL119
2	Channel 2, Relay 1	RL125
	Channel 2, Relay 2	RL123
3	Channel 3, Relay 1	RL125
	Channel 3, Relay 2	RL118
4	Channel 4, Relay 1	RL125
5	Channel 5, Relay 1	RL122
	Channel 5, Relay 2	RL117
6	Channel 6, Relay 1	RL122
7	Channel 7, Relay 1	RL116
N/A	Isolation Relay	RL126
SUB-UNIT 4 - Tx MUX		
Bit No.	**Function**	**Relay No.**
1	Channel 1, Relay 1	RL110
	Channel 1, Relay 3	RL104
2	Channel 2, Relay 1	RL110
	Channel 2, Relay 2	RL108
3	Channel 3, Relay 1	RL110
	Channel 3, Relay 2	RL103
4	Channel 4, Relay 1	RL110
5	Channel 5, Relay 1	RL107
	Channel 5, Relay 2	RL102
6	Channel 6, Relay 1	RL107
7	Channel 7, Relay 1	RL101
N/A	Isolation Relay	RL111
SUB-UNIT 5 - Rx/Tx Link		
Bit No.	**Function**	**Relay No.**
1	Channel 1, Relay 1	RL5
	Channel 1, Relay 2	RL6
2	Channel 2, Relay 1	RL11
	Channel 2, Relay 2	RL12
3	Channel 3, Relay 1	RL17
	Channel 3, Relay 2	RL18
4	Channel 4, Relay 1	RL23
	Channel 4, Relay 2	RL24
5	Channel 5, Relay 1	RL29
	Channel 5, Relay 2	RL30
6	Channel 6, Relay 1	RL35
	Channel 6, Relay 2	RL36
7	Channel 7, Relay 1	RL41
	Channel 7, Relay 2	RL42
8	Channel 8, Relay 1	RL47
	Channel 8, Relay 2	RL48

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TABLE 4.3 - Daisy Chain Switch 40-796: Sub-Units

40-796					
SUB-UNIT 1 - Rx Route			SUB-UNIT 2 - Tx Route		
Bit No.	Function	Relay No.	Bit No.	Function	Relay No.
1	Channel 1, Relay 1	RL1	1	Channel 1, Relay 1	RL3
	Channel 1, Relay 2	RL2		Channel 1, Relay 2	RL4
2	Channel 2, Relay 1	RL7	2	Channel 2, Relay 1	RL9
	Channel 2, Relay 2	RL8		Channel 2, Relay 2	RL10
3	Channel 3, Relay 1	RL13	3	Channel 3, Relay 1	RL15
	Channel 3, Relay 2	RL14		Channel 3, Relay 2	RL16
4	Channel 4, Relay 1	RL19	4	Channel 4, Relay 1	RL21
	Channel 4, Relay 2	RL20		Channel 4, Relay 2	RL22
5	Channel 5, Relay 1	RL25	5	Channel 5, Relay 1	RL27
	Channel 5, Relay 2	RL26		Channel 5, Relay 2	RL28
6	Channel 6, Relay 1	RL31	6	Channel 6, Relay 1	RL33
	Channel 6, Relay 2	RL32		Channel 6, Relay 2	RL34
7	Channel 7, Relay 1	RL37	7	Channel 7, Relay 1	RL39
	Channel 7, Relay 2	RL38		Channel 7, Relay 2	RL40
8	Channel 8, Relay 1	RL43	8	Channel 8, Relay 1	RL45
	Channel 8, Relay 2	RL44		Channel 8, Relay 2	RL46
9	Channel 9, Relay 1	RL49	9	Channel 9, Relay 1	RL51
	Channel 9, Relay 2	RL50		Channel 9, Relay 2	RL52
10	Channel 10, Relay 1	RL55	10	Channel 10, Relay 1	RL57
	Channel 10, Relay 2	RL56		Channel 10, Relay 2	RL58
11	Channel 11, Relay 1	RL61	11	Channel 11, Relay 1	RL63
	Channel 11, Relay 2	RL62		Channel 11, Relay 2	RL64
12	Channel 12, Relay 1	RL67	12	Channel 12, Relay 1	RL69
	Channel 12, Relay 2	RL68		Channel 12, Relay 2	RL70
13	Channel 13, Relay 1	RL73	13	Channel 13, Relay 1	RL75
	Channel 13, Relay 2	RL74		Channel 13, Relay 2	RL76
14	Channel 14, Relay 1	RL79	14	Channel 14, Relay 1	RL81
	Channel 14, Relay 2	RL80		Channel 14, Relay 2	RL82
15	Channel 15, Relay 1	RL85	15	Channel 15, Relay 1	RL87
	Channel 15, Relay 2	RL86		Channel 15, Relay 2	RL88
16	Channel 16, Relay 1	RL91	16	Channel 16, Relay 1	RL93
	Channel 16, Relay 2	RL92		Channel 16, Relay 2	RL94

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TABLE 4.4 - Daisy Chain Switch 40-796: Sub-Units (continued)

40-796					
SUB-UNIT 3 - Rx MUX			SUB-UNIT 4 - Tx MUX		
Bit No.	Function	Relay No.	Bit No.	Function	Relay No.
1	Channel 1, Relay 1	RL126	1	Channel 1, Relay 1	RL111
	Channel 1, Relay 2	RL125		Channel 1, Relay 2	RL110
	Channel 1, Relay 3	RL123		Channel 1, Relay 3	RL108
	Channel 1, Relay 4	RL119		Channel 1, Relay 4	RL104
2	Channel 2, Relay 1	RL126	2	Channel 2, Relay 1	RL111
	Channel 2, Relay 2	RL125		Channel 2, Relay 2	RL110
	Channel 2, Relay 3	RL123		Channel 2, Relay 3	RL108
3	Channel 3, Relay 1	RL126	3	Channel 3, Relay 1	RL111
	Channel 3, Relay 2	RL125		Channel 3, Relay 2	RL110
	Channel 3, Relay 3	RL118		Channel 3, Relay 3	RL103
4	Channel 4, Relay 1	RL126	4	Channel 4, Relay 1	RL111
	Channel 4, Relay 2	RL125		Channel 4, Relay 2	RL110
5	Channel 5, Relay 1	RL126	5	Channel 5, Relay 1	RL111
	Channel 5, Relay 2	RL122		Channel 5, Relay 2	RL107
	Channel 5, Relay 3	RL117		Channel 5, Relay 3	RL102
6	Channel 6, Relay 1	RL126	6	Channel 6, Relay 1	RL111
	Channel 6, Relay 2	RL122		Channel 6, Relay 2	RL107
7	Channel 7, Relay 1	RL126	7	Channel 7, Relay 1	RL111
	Channel 7, Relay 2	RL116		Channel 7, Relay 2	RL101
8	Channel 8, Relay 1	RL126	8	Channel 8, Relay 1	RL111
9	Channel 9, Relay 1	RL124	9	Channel 9, Relay 1	RL109
	Channel 9, Relay 2	RL121		Channel 9, Relay 2	RL106
	Channel 9, Relay 3	RL115		Channel 9, Relay 3	RL100
10	Channel 10, Relay 1	RL124	10	Channel 10, Relay 1	RL109
	Channel 10, Relay 2	RL121		Channel 10, Relay 2	RL106
11	Channel 11, Relay 1	RL124	11	Channel 11, Relay 1	RL109
	Channel 11, Relay 2	RL114		Channel 11, Relay 2	RL99
12	Channel 12, Relay 1	RL124	12	Channel 12, Relay 1	RL109
13	Channel 13, Relay 1	RL120	13	Channel 13, Relay 1	RL105
	Channel 13, Relay 2	RL113		Channel 13, Relay 2	RL98
14	Channel 14, Relay 3	RL120	14	Channel 14, Relay 3	RL105
15	Channel 15, Relay 1	RL112	15	Channel 15, Relay 1	RL97

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TABLE 4.5 - Daisy Chain Switch 40-796: Sub-Units (continued)

40-796		
SUB-UNIT 5 - Rx/Tx Link		
Bit No.	Function	Relay No.
1	Channel 1, Relay 1	RL5
	Channel 1, Relay 2	RL6
2	Channel 2, Relay 1	RL11
	Channel 2, Relay 2	RL12
3	Channel 3, Relay 1	RL17
	Channel 3, Relay 2	RL18
4	Channel 4, Relay 1	RL23
	Channel 4, Relay 2	RL24
5	Channel 5, Relay 1	RL29
	Channel 5, Relay 2	RL30
6	Channel 6, Relay 1	RL35
	Channel 6, Relay 2	RL36
7	Channel 7, Relay 1	RL41
	Channel 7, Relay 2	RL42
8	Channel 8, Relay 1	RL47
	Channel 8, Relay 2	RL48
9	Channel 9, Relay 1	RL53
	Channel 9, Relay 2	RL54
10	Channel 10, Relay 1	RL59
	Channel 10, Relay 2	RL60
11	Channel 11, Relay 1	RL65
	Channel 11, Relay 2	RL66
12	Channel 12, Relay 1	RL71
	Channel 12, Relay 2	RL72
13	Channel 13, Relay 1	RL77
	Channel 13, Relay 2	RL78
14	Channel 14, Relay 1	RL83
	Channel 14, Relay 2	RL84
15	Channel 15, Relay 1	RL89
	Channel 15, Relay 2	RL90
16	Channel 16, Relay 1	RL95
	Channel 16, Relay 2	RL96

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PROGRAMMING THE MODULE 40-795/796

Here are some simple examples of using the drivers with the Daisy Chain section of the 40-795 module. Using the drivers with the 40-796 module is similar.

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);    // Selects RL1 and RL2
PIL_OpBit( card_num, sub_unit, 1, 0);    // Releases RL1 and RL2
PIL_OpBit( card_num, sub_unit, 6, 1);    // Selects RL31 and RL32
```

WriteSub-

```
// Sub-unit 1 is 8 bits wide, so 1 DWORD is needed to hold the pattern
DWORD data[1];
data[0] = 1;             // Sets lowest bit to 1, Selects RL1 and RL2
PIL_WriteSub( card_num, sub_unit, data);

data[0] = 0x20;          // Sets 6th bit, Selects RL31 and RL32
                         // 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);     // Selects RL1 and RL2
pipx40_setChannelState(vi, sub_unit, 1, VI_OFF);    // Releases RL1 and RL2
pipx40_setChannelState(vi, sub_unit, 6, VI_ON);     // Selects RL31 and RL32
```

setChannelPattern

```
// Sub-unit 1 is 8 bits wide, so 1 ViUInt32 value is needed to hold the entire pattern

ViUInt32 data[1];
data[0] = 1;             // Sets lowest bit to 1, Selects RL1 and Rl2
pipx40_setChannelPattern( vi, sub_unit, data);

data[0] = 0x20;          // Sets 6th bit, Selects RL31 and Rl32
// All other relays are set to off
pipx40_setChannelPattern( vi, sub_unit, data);
```

Using pi40iv

The IVI driver labels this card in a similar manner to the Sub-units of the tables above using the normal comA/chA (etc) labelling tags.

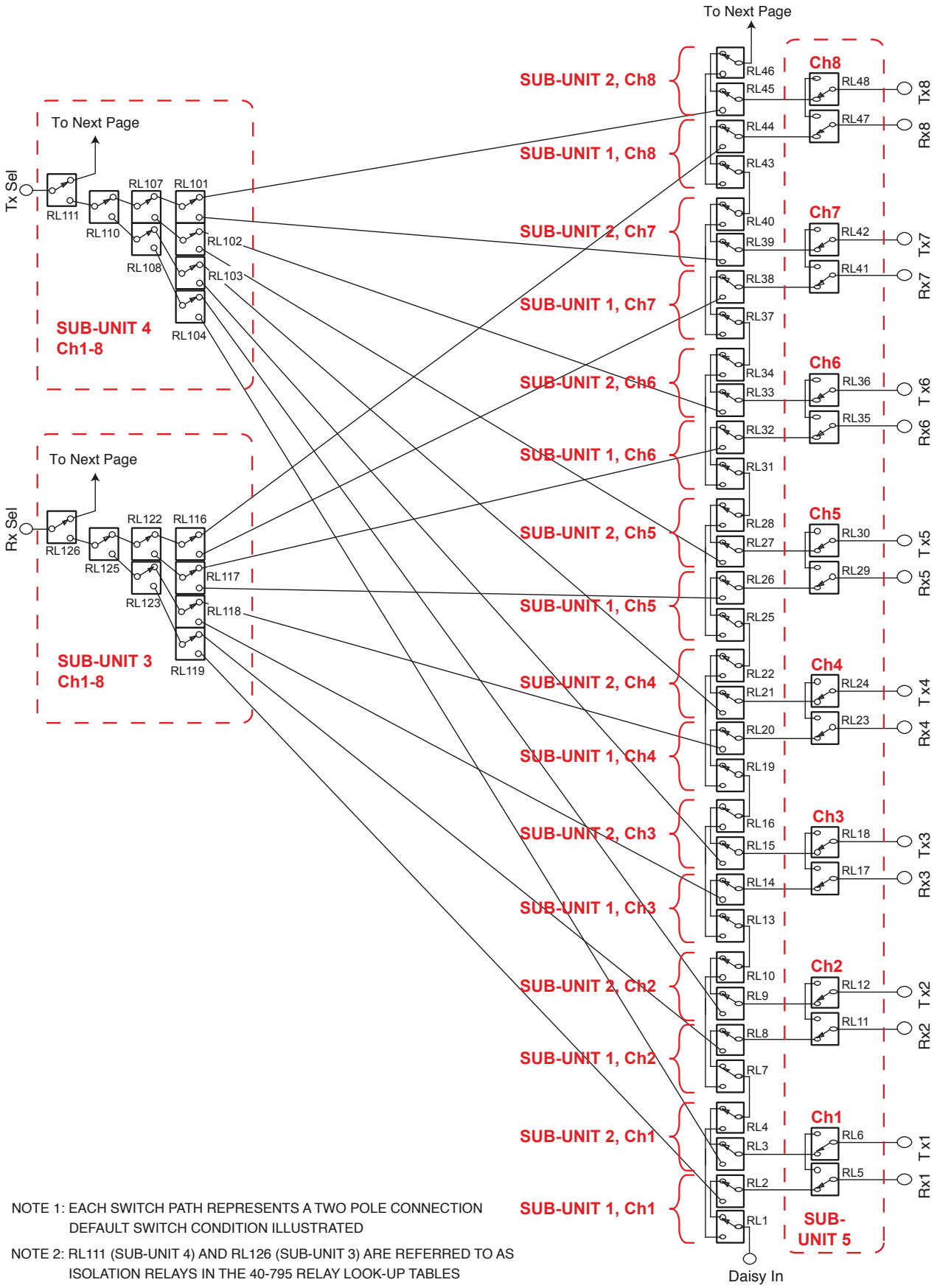
```
pi40iv_Connect(vi, comA, chA1);      // Selects RL1 and RL2

pi40iv_Disconnect(vi, comA, chA1);   // Releases RL1 and RL2

pi40iv_Connect(vi, comA, chA6);      // Selects RL31 and RL32
```

The IVI Swtch driver specification contains no bulk setting capabilities.

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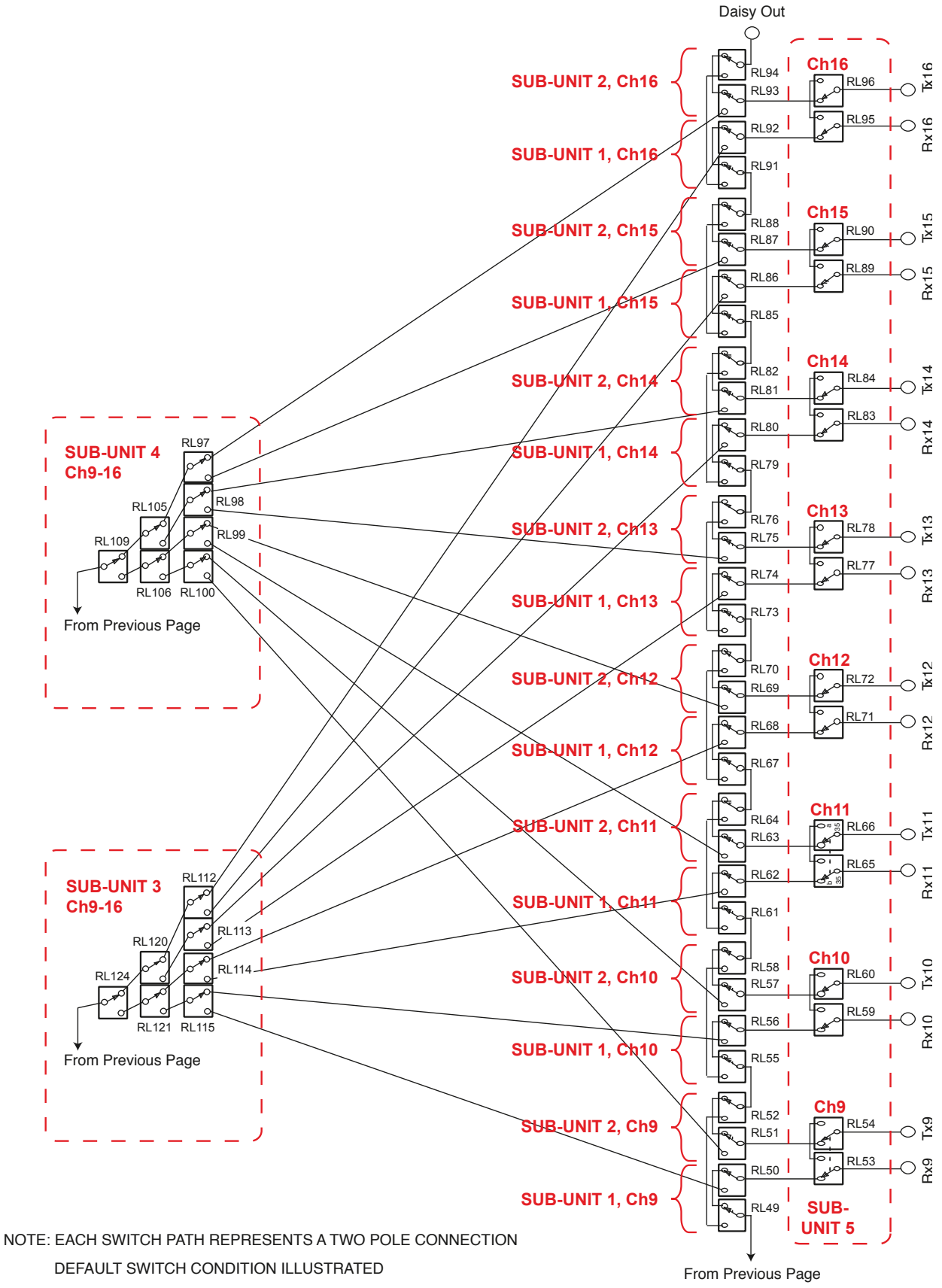


NOTE 1: EACH SWITCH PATH REPRESENTS A TWO POLE CONNECTION
DEFAULT SWITCH CONDITION ILLUSTRATED

NOTE 2: RL111 (SUB-UNIT 4) AND RL126 (SUB-UNIT 3) ARE REFERRED TO AS ISOLATION RELAYS IN THE 40-795 RELAY LOOK-UP TABLES

Figure 4.2 - 8/16 Tributary Daisy Chain Switch (40-795-001 / 40-796-001): Programming Sub-Unit Locations Sheet 1

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NOTE: EACH SWITCH PATH REPRESENTS A TWO POLE CONNECTION

DEFAULT SWITCH CONDITION ILLUSTRATED

Figure 4.3 - 16 Tributary Daisy Chain Switch (40-796-001): Programming Sub-Unit Locations Sheet 2

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40-795/796 Signal Routing Examples

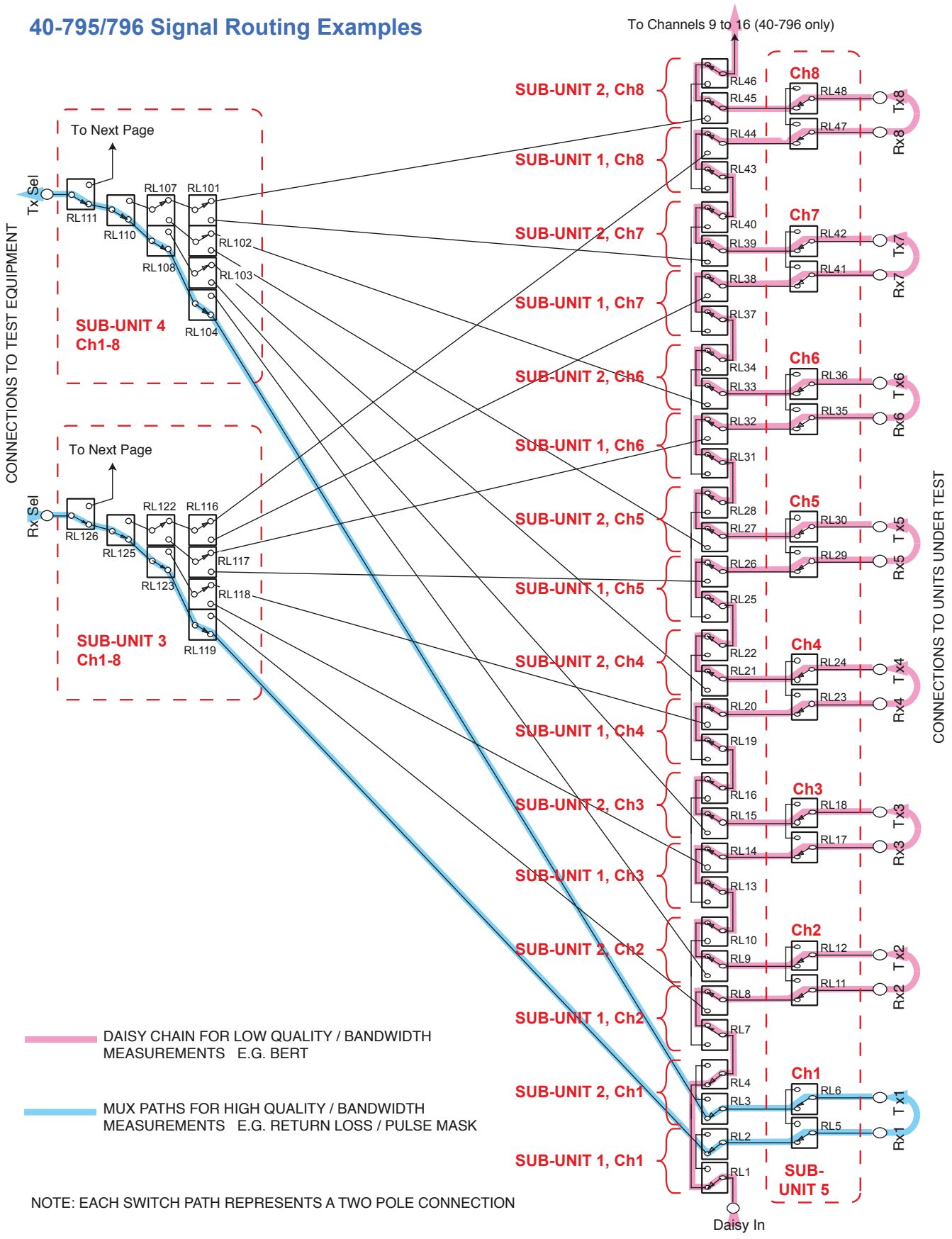


Figure 4.4 - Routing Example 1: Channel 1 connected to test equipment, all other channels daisy chained

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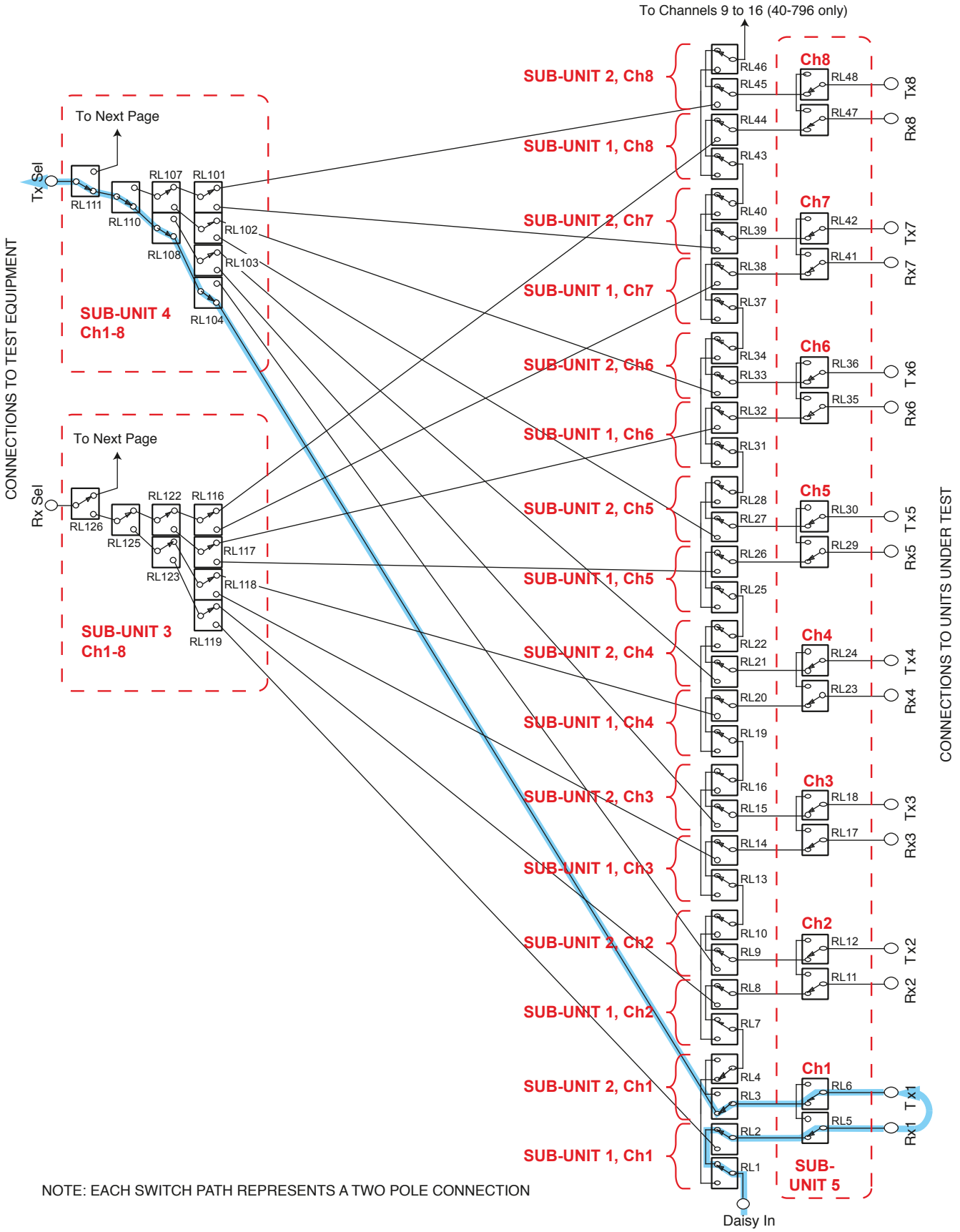


Figure 4.5 - Routing Example 2: Daisy chain signal routed through Channel 1 and broken out to test equipment

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SECTION 5 - CONNECTOR INFORMATION

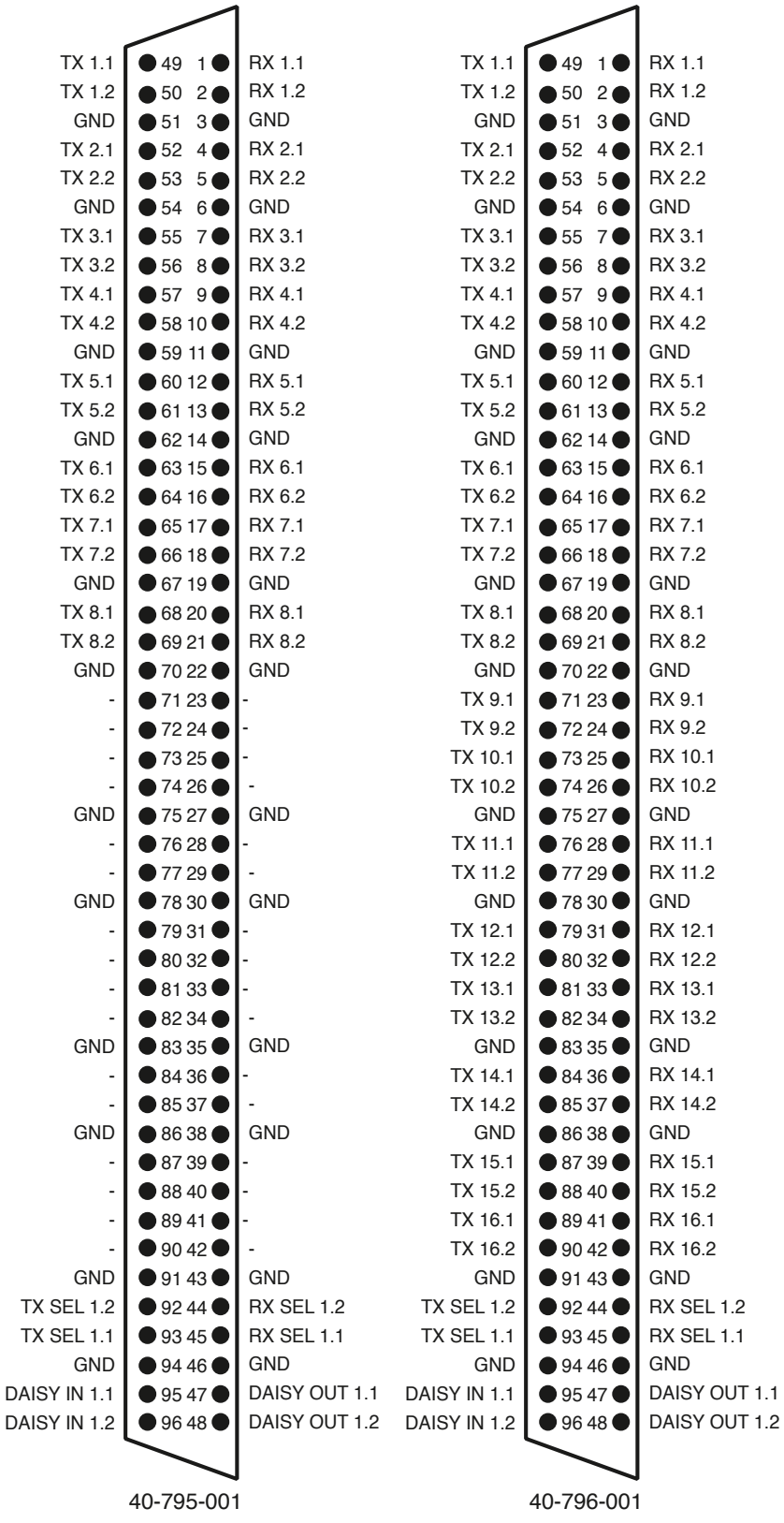


Figure 5.1 - Tributary Daisy Chain Switch Module: Pinuts (96-pin miro-D connectors viewed from front of module)

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SECTION 6 - TROUBLE SHOOTING

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.

If your system employs a remote control interface you should check the integrity of all remote control interface links. When the system is powered up, and during Windows start-up, you should expect to see periodic activity on the remote control interface 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 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.

The 40-795 and 40-796 modules require a 90-100-229 adapter to use the PI-MXT Test Tool.

For more information on the PI-MXT, please refer to the 90-100 data sheet and user manual.

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SECTION 7 - MAINTENANCE INFORMATION

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

PERIODIC MAINTENANCE

This product and its corresponding chassis do not require any periodic maintenance.

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 PXI modules operating in a PXI chassis, 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.

For PXI modules which are supported in one of Pickering Interfaces' Modular LXI Chassis (such as the 60-102B and 60-103B) no module software update is required. If the module was introduced after the LXI chassis was manufactured the module may not be recognized, in this case the chassis firmware may need upgrading. This is a simple process which is described in the manual for the Modular LXI Chassis.

The associated relay trees for the products are detailed in Sections 2 and 4.

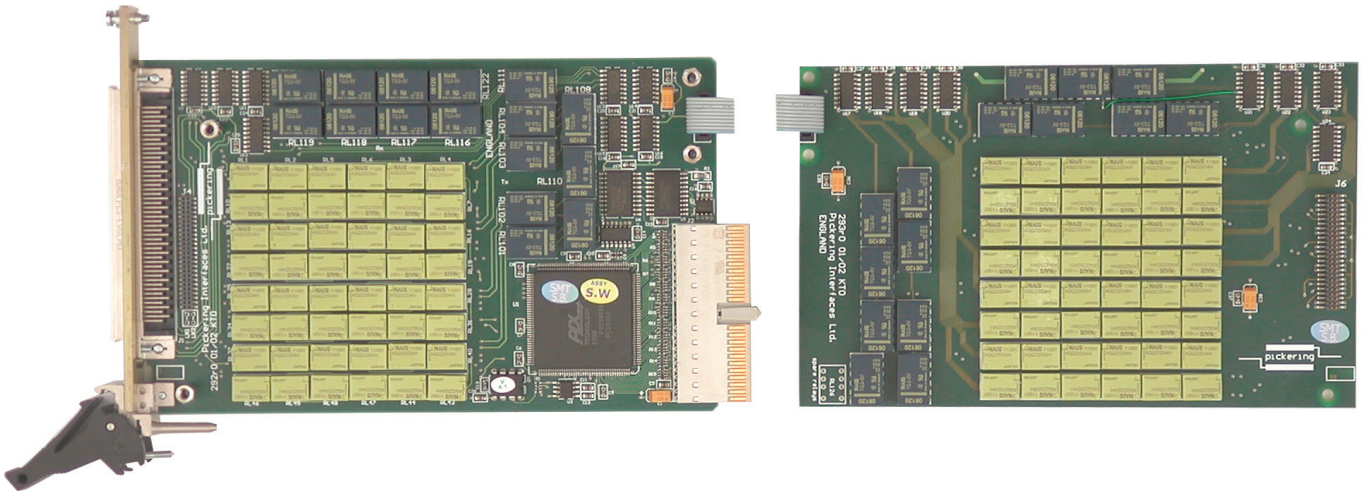


Figure 7.1 - Daisy Chain Switch: Motherboard and Daughterboard

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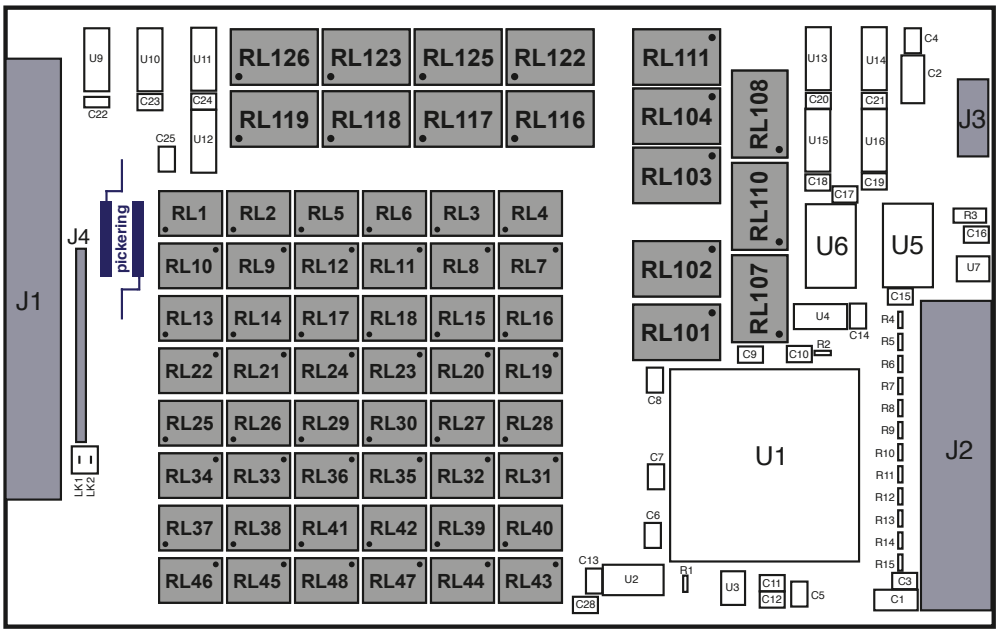


Figure 7.2 - Daisy Chain Switch 40-795/796: Motherboard Component Layout

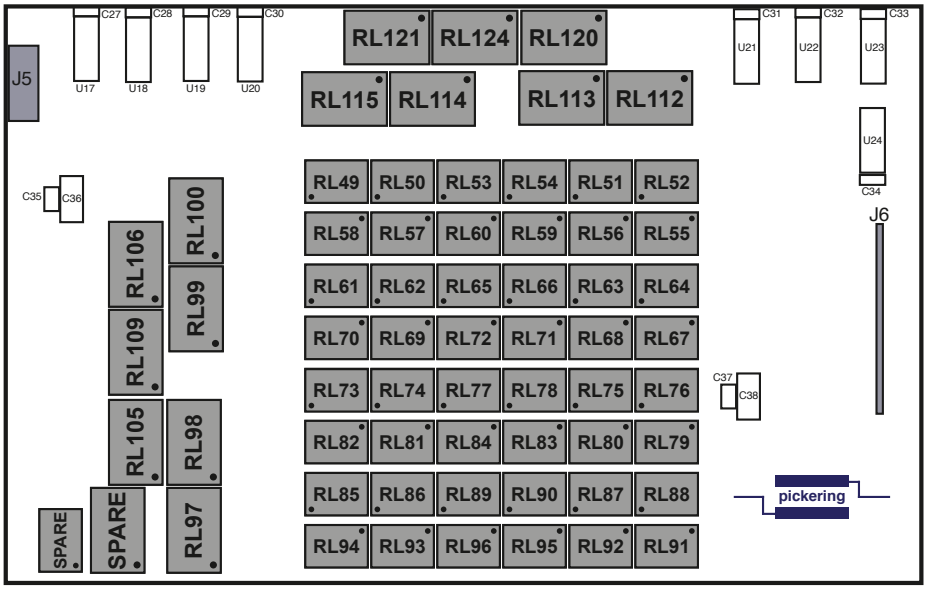


Figure 7.3 - Daisy Chain Switch 40-796: Daughterboard Component Layout

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