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USER MANUAL

PXI MICROWAVE RELAY MODULE
(MODEL No. 40-780-522/532/712)



Issue 2, Sep 2005

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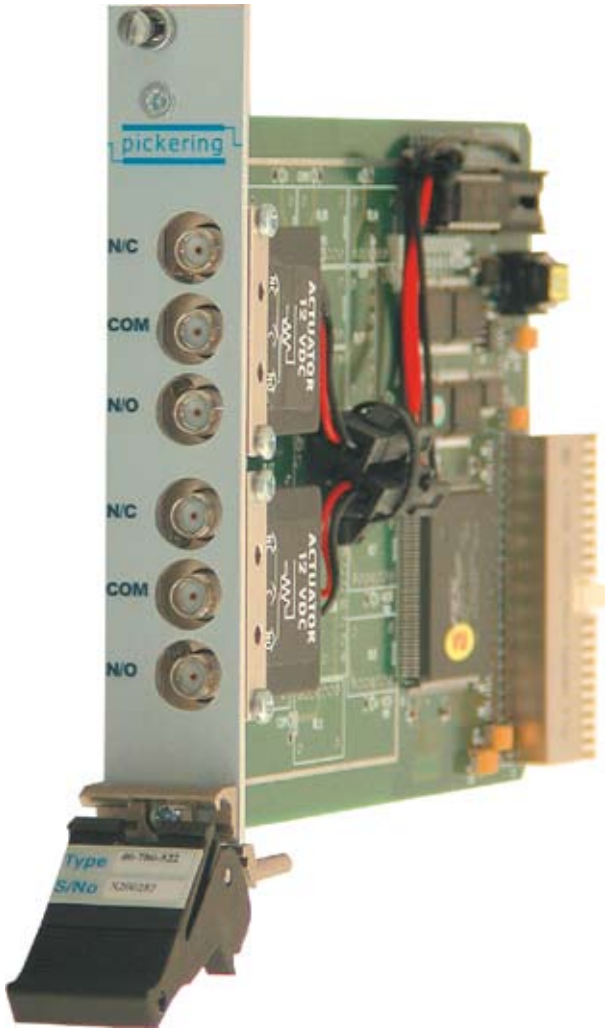
SECTION 1 - INTRODUCTION

GENERAL

The 40-780-522/532/712 Microwave Relay Module forms part of the System 40 PXI Programmable Switching system.

The Microwave Relay Module is provided in the following configurations:

- 20GHz, 2 x Changeover (SPDT) Microwave Relays 50 Ω SMA Coaxial Connector (40-780-522)
- 25.6GHz, 2 x Changeover (SPDT) Microwave Relays 50 Ω SMA Coaxial Connector (40-780-532)
- 4GHz, 2 x Changeover (SPDT) Microwave Relays 75 Ω SMZ/Type 43 Coaxial Connector (40-780-712)



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SECTION 2 - SPECIFICATION

Specification (20GHz Version)

Characteristic Impedance:	50Ω
Maximum Frequency: Rise Time: Insertion Loss (<20GHz): V.S.W.R. (<20GHz): Isolation (<20GHz):	20GHz <3ps <0.5dB <1:1.5 >60dB
Maximum Power (<3GHz): Maximum Power (3 - 12GHz): Maximum Power (12 - 20GHz):	100W 60W 30W
Maximum Voltage: Maximum Switch Current:	100Vd.c. 1A
On Path Resistance: Off Path Resistance:	<200mΩ $>10^{10}$Ω
Vibration:	Sine 1mm, 5 - 60Hz Sine 10g 60 - 2000Hz
Expected Life (Low Power): Expected Life (Max Power):	$1x10^9$ operations $>5x10^6$ operations
Switching Time:	15ms

Additional Specification (26.5GHz & 40GHz Versions)

Insertion Loss (<26.5GHz): V.S.W.R. (<26.5GHz): Isolation (<26.5GHz):	<0.7dB <1:1.7 >55dB
Expected Life:	$>1x10^7$ operations
Insertion Loss (<40GHz): V.S.W.R. (<40GHz): Isolation (<40GHz):	<0.8dB <1:1.9 >50dB
Expected Life:	$1x10^7$ operations

Additional Specification (50GHz & 65GHz Versions)

Insertion Loss (<50GHz): V.S.W.R. (<50GHz): Isolation (<50GHz):	<1.1dB <1:1.9 >50dB
Expected Life:	$>1x10^7$ operations
Insertion Loss (<65GHz): V.S.W.R. (<65GHz): Isolation (<65GHz):	<1.1dB <1:1.9 >50dB
Expected Life:	$1x10^7$ operations

Programming

All PXI cards are supplied with complete Windows 98/2000/NT/XP drivers, these perform the following functions:-

- Write word/s to card (to set relay pattern)
- Write bit to card (to operate an individual relay)
- Full relay status reporting
- Card identification and location information
- Set and read card calibration information

Up to date driver software is available from our web site at www.pickeringtest.com

Power Requirements

Power consumption from the backplane supply is as follows:

+3.3V	+5V	+12V	-12V
0	0.5A (typ 0.34A)	0	0

Width and Dimensions

40-780: Single slot 3U PXI (CompactPCI card).

40-782: Double slot 3U PXI (CompactPCI card).

PXI & CompactPCI Compliance

All Pickering Interfaces PXI cards comply with the PXI Specification 2.1. Local Bus, Interrupts, Trigger Bus and Star Trigger are not implemented.

Supplied soft front panels and driver software are fully Windows 98/2000/NT/XP compatible.

Connectors

PXI bus via 32 bit P1/J1 backplane connector.

Signals via front panel mounted coaxial connectors.

Product Order Codes

20GHz Microwave Relays, 50Ω SMA	
1 x Changeover (SPDT)	**40-780-512**
2 x Changeover (SPDT)	**40-780-522**
26.5GHz Microwave Relays, 50Ω SMA	
1 x Changeover (SPDT)	**40-780-532**
2 x Changeover (SPDT)	**40-780-532**
40GHz Microwave Relays, 50Ω SMA-2.9	
1 x Changeover (SPDT)	**40-780-542**
2 x Changeover (SPDT)	**40-780-542**
50GHz Microwave Relays, 50Ω SMA-2.4	
1 x Changeover (SPDT)	**40-780-552**
2 x Changeover (SPDT)	**40-780-552**
65GHz Microwave Relays, 50Ω SMA-1.8	
1 x Changeover (SPDT)	**40-780-562**
2 x Changeover (SPDT)	**40-780-562**
2GHz Microwave Relays, 75Ω SMZ/Type 43	
1 x Changeover (SPDT)	**40-780-711**
2 x Changeover (SPDT)	**40-780-522**
4GHz Microwave Relays, 75Ω mini-SMB	
1 x Changeover (SPDT)	**40-780-512**
2 x Changeover (SPDT)	**40-780-712**
18GHz Microwave Transfer Switch, 50Ω SMA	
1 x Transfer Switch	**40-782-521**
2 x Transfer Switch	**40-782-522**

Mating Connectors & Cabling

Please refer to the Pickering Interfaces "**Interconnection Solutions**" catalog for a full list of connector/cabling options, including drawings, photos and specifications. This is 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.

Latest Details

Please refer to our Web Site for Latest Product Details.

www.pickeringtest.com

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SECTION 3 - INSTALLATION

SOFTWARE INSTALLATION

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

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

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

HARDWARE INSTALLATION

CAUTION

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

Ensure that there is adequate ventilation in accordance with the PXI Specification.

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.

CAUTION

Do not raise the injector/ejector handle whilst inserting the module. The module will not insert properly unless the handle is in its downward position.

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. Screw the front panel of the module to the front panel mounting rail.
8. In a system employing MXI-3 to connect a desktop PC to a PXI chassis or to link multiple chassis, power-up the system as follows:

a. For a system comprising a PC and one chassis, power up the chassis before powering up the PC.

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 PC or chassis containing the system controller.

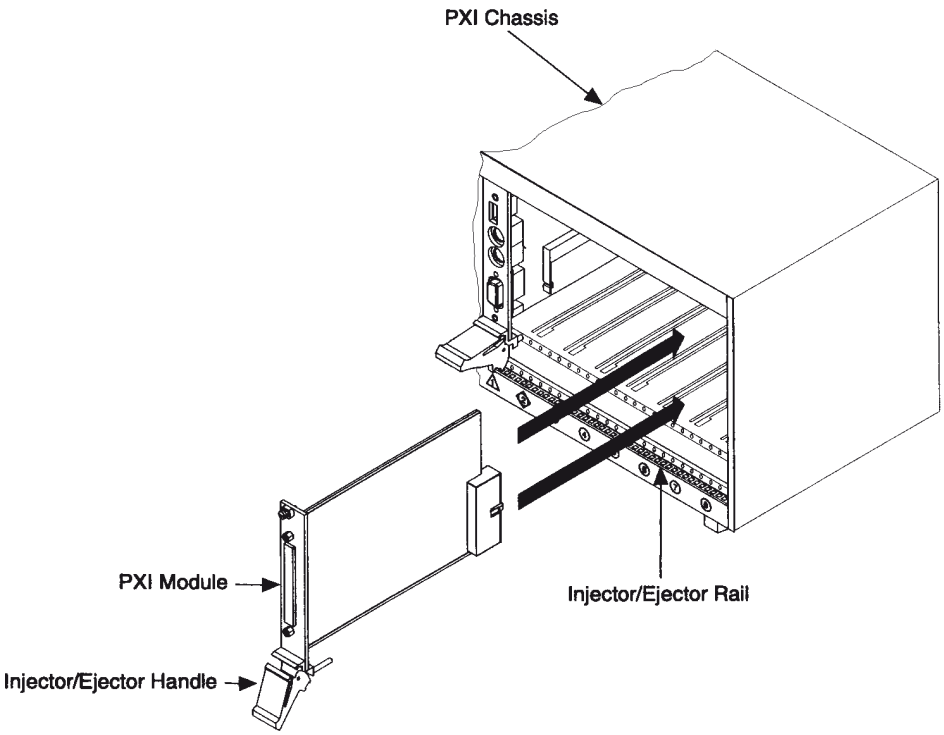


Figure 3.1 - Installing the module into a PXI/Compact PCI Chassis

TESTING OPERATION

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

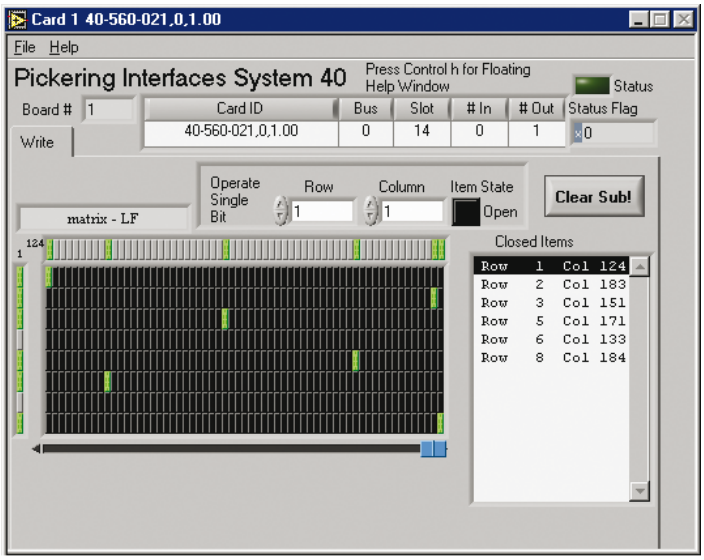


Figure 3.2 - Typical Test Panel Display

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

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

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SECTION 4 - PROGRAMMING

System 40, System 45 and System 50 cards are supported by comprehensive Windows software drivers and can also be programmed at register-level.

There are two separate Windows drivers, one accessing cards by Direct I/O and the other through VISA (Virtual Instrument Software Architecture). Both are fully documented by ReadMe and HTML help files, accessible through shortcuts on the Programs>>Pickering menu.

The following programming environments are supported for both drivers:

- Microsoft Visual Basic
- Microsoft Visual C++
- Borland C++
- National Instruments LabWindows/CVI
- National Instruments LabVIEW

Support for all these environments is included in the standard installation.

Please refer to the PXI Switching Programming Manual for complete programming information. This manual is available on the Pickering Interfaces website at http://www.pickeringtest.com.

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SECTION 5 - CONNECTOR PIN OUTS

Figure 5.1 provides pin outs for the Microwave Relay Modules in the 40-780-522/532/712 model range.



Figure 5.1 - Microwave Relay Module 40-780-522/532/712: Pin Outs

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SECTION 6 - TROUBLESHOOTING

INSTALLATION PROBLEMS

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

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

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

DIAGNOSTIC UTILITY

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

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

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

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

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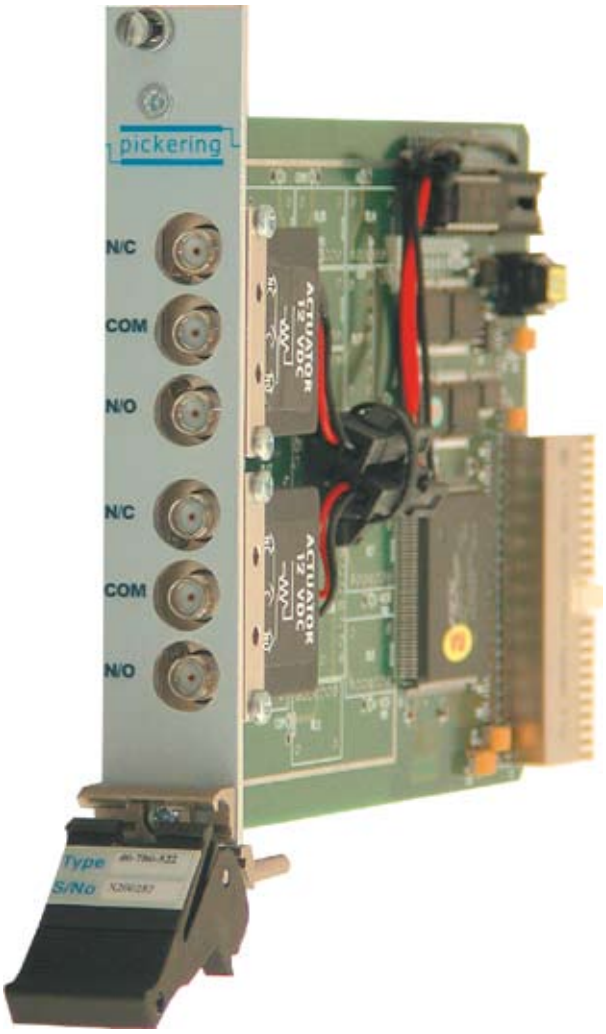
SECTION 7 - FUNCTIONAL DESCRIPTION

MECHANICAL DESCRIPTION

The Microwave Relay Module conforms to the 3U height (128mm) Eurocard standard. The module comprises the following:

- CPCI Ejector Handle
- Front Panel mounted 50Ω SMA connectors or 75Ω SMZ/Type 43 connectors
- Two Microwave Relays
- Compact PCI backplane connector
- PCI Bridge (U1)
- Control Logic

The front panel is secured to the PCB by two M2.5 x 6mm pan-head posi-drive screws.



FUNCTIONAL DESCRIPTION

A functional block diagram is provided in Figure 7.1. The Microwave Relay Module is powered by +12V and +5V inputs via Compact PCI connector J1. The interface to the user test equipment is via the front panel mounted SMA or SMZ/Type 43 connectors. The module comprises a PCB populated with control logic and front panel mounted changeover Microwave Relays. The relays are energised via control signals from relay driver U10. The relay driver is addressed by PCI bridge U1, via output register U8, to output the required signal. PCI Bridge U1 is configured by EEPROM U2.

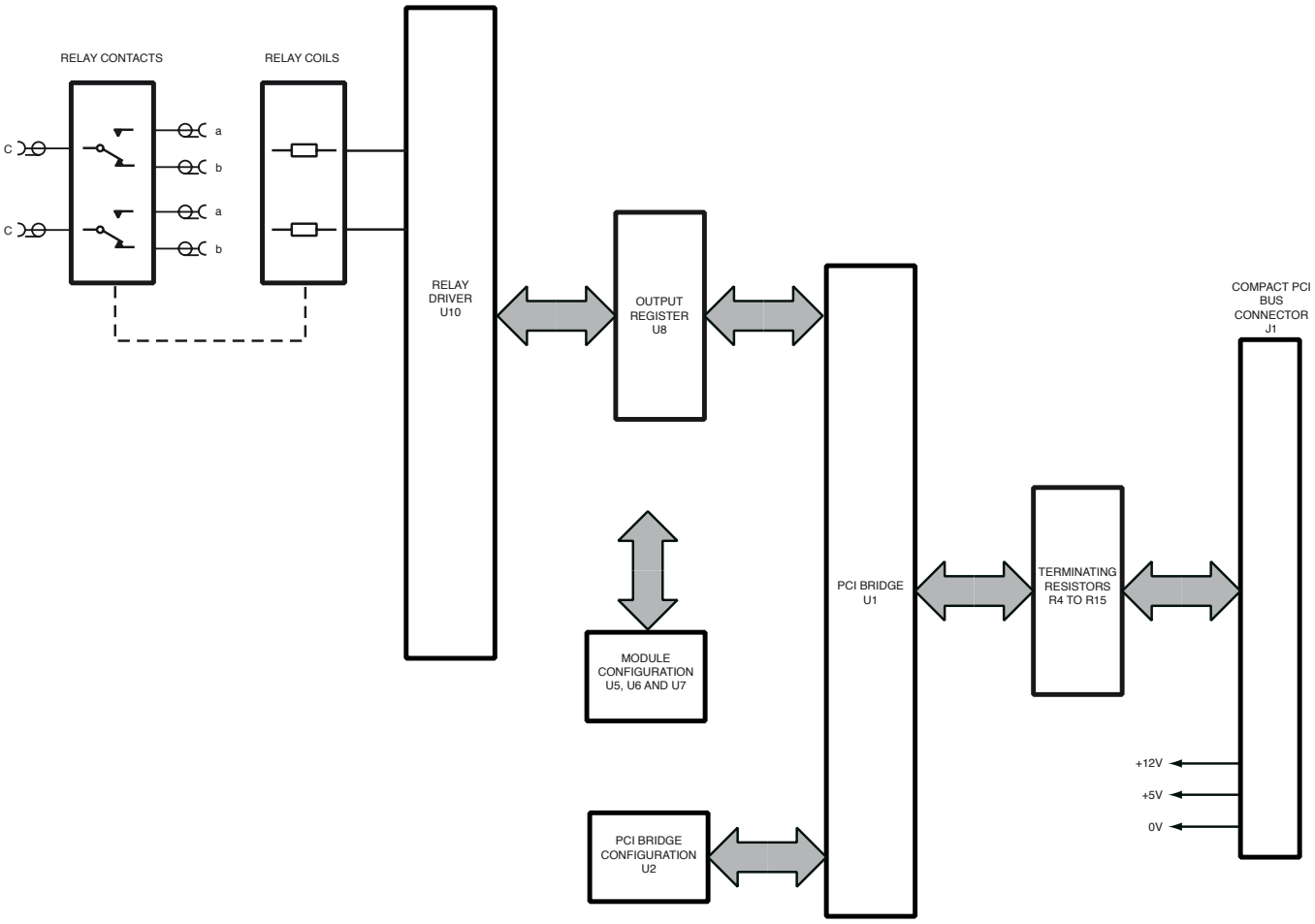


Figure 7.1 - Microwave Relay Module: Functional Block Diagram

SECTION 8 - PARTS LIST

The following pages provide a parts list and a component layout diagram for the Microwave Relay Module.



Table 8.1 provides a parts list and Figure 8.1 a component layout diagram for the 40-780-522/532/712 Multiplexer Module.

TABLE 8.1 - Microwave Relay Module 40-780-522/532/712 Parts List

PCB Location	Pickering Interfaces Part Number	Part Description	Quantity
R1, R2	C/RS/079	RESISTOR N/W 4 x 10k 1206	2
R3	C/RS/085	RESISTOR 10k 0805	1
R4 to R15	C/RS/102	RESISTOR N/W 4 x 10R 1206	12
Relays	C/RL/022		2
	C/CN/305	TWO WAY CONNECTOR, MOLEX	1
C1, C2, C5 to C23	C/CP/034	CAPACITOR 100nF 0603	21
C3, C4, C24, C25	C/CP/024	CAPACITOR 10uF TANT SMD	4
J1	C/CN/355	cPCI J1 CONNECTOR	1
U1	C/IC/098	PCI9050 PQFP	1
U2	C/IC/099	93CS46 DIP	1
	C/IC/035	8 PIN DIP SKT	1
U3	C/IC/056	7705 SOP	1
U4	C/IC/087	74HCT32 SOP	1
U5, U8, U9	C/IC/100	74HCT273 SOP	3
U6	C/IC/101	74HCT244 SOP	1
U7	C/IC/090	93C56 SOP	1
U10	C/IC/038	UDN2981A	1

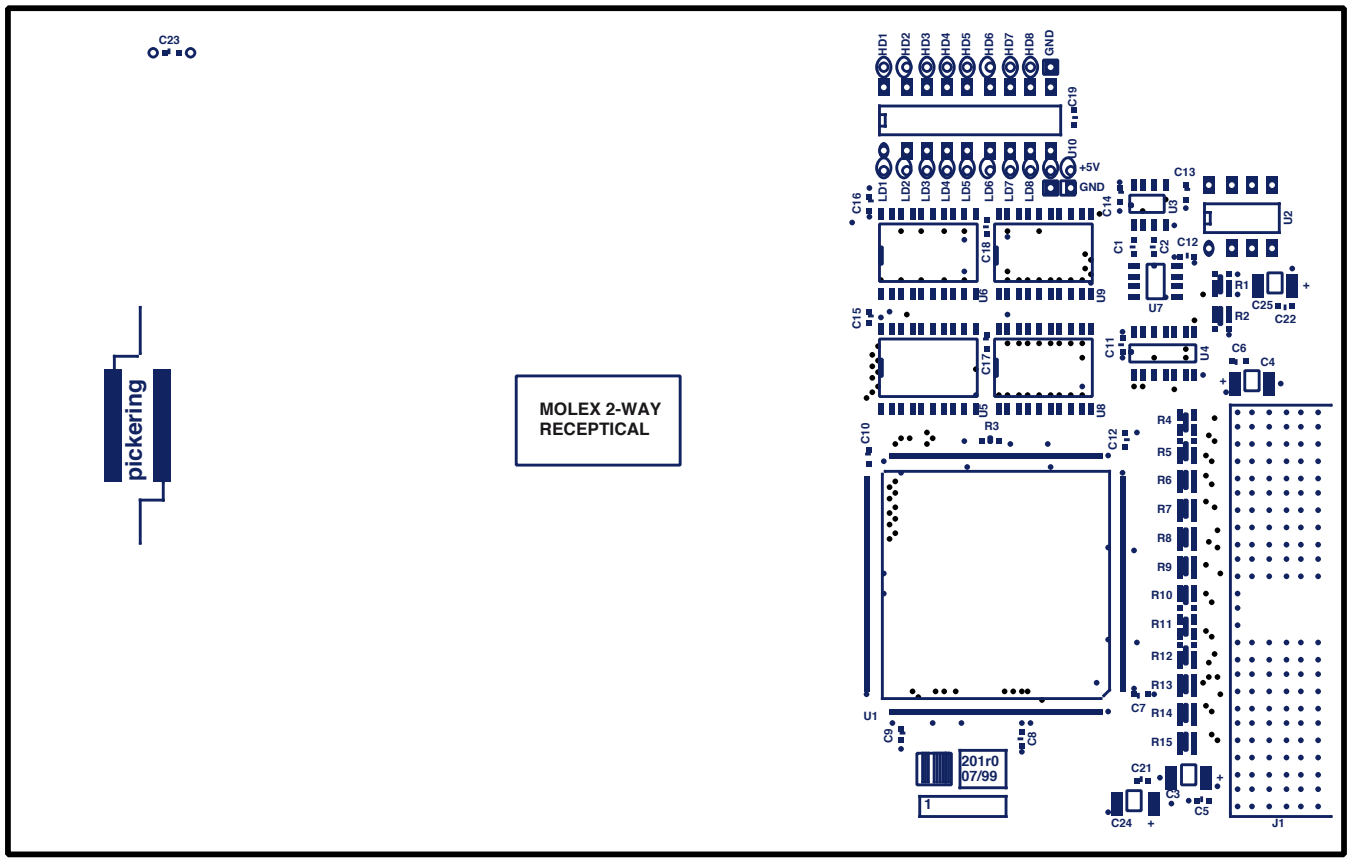
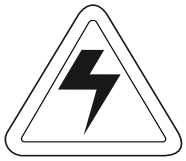


Figure 8.1 - Microwave Relay Module: Component Layout

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SECTION 9 - WARNINGS AND CAUTIONS



WARNING - DANGER OF ELECTRIC SHOCK

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



CAUTION
Handling of Electrostatic-Sensitive Semiconductor Devices

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

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

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

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

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

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