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# PCI263

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16 CHANNEL

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REED

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RELAY

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OUTPUT

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BOARD

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This Instruction Manual is supplied with the PCI263 board to provide the user with sufficient information to properly utilise the product as purchased. The information contained has been reviewed and is believed to be accurate and reliable, however **Amplicon Liveline Limited** accepts no responsibility for any problems caused by errors or omissions. Specifications and instructions are subject to change without notice.

**PCI263 Instruction Manual Part N° 860 038 44 Issue B4**

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## **DECLARATION OF CONFORMITY**

**AMPLICON LIVELINE LIMITED  
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We declare that the product(s) described in this Instruction Manual are manufactured by Amplicon Liveline Limited and perform in conformity with the following standards or standardisation documents:

Electro Magnetic Compatibility (EMC):

EMC Directive	89/336/EEC
LVD Directive	73/23/EEC
CE Directive	93/68/EEC



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## 1 INTRODUCTION

### 1.1 The Amplicon 200 Series

The **Amplicon 200 Series** of Personal Computer based data acquisition products provides very high performance, affordable hardware with user sympathetic software. The 200 Series is designed for users requiring fast or complex data I/O to the host PC and comprises a range of boards and software to handle most analog and digital signal types.

When a large-scale system is required, multiple boards can be added from the 200 Series without conflict. For analog input systems, the capacity of the PC mounted hardware can be extended by external expansion panels to provide a convenient to use system with low cost per channel and maintained high performance.

### 1.2 Features of the PCI263

The PCI263 board is designed to meet stringent performance requirements and ease of use.

- 16 independent reed relay outputs.
- All contact pairs isolated.
- On-board LED display of relay status.
- Read-back of relay register status.
- PCI Bus version 2.1 Plug and play interface.
- Device driver software compatible with Windows 95, 98, ME, NT, 2000, and XP.
- Linux drivers.
- Visual Basic example software.
- Functionally compatible with PC263.

### 1.3 General Description

The PCI263 is a plug-in board which provides 16 isolated reed relay contact outputs. The board can be used on any PC that supports the PCI bus version 2.1. The card is supplied with Windows NT, 95, 98, Me, 2000 & XP compatible device drivers. Linux Comedi drivers are available from [www.comedi.org](http://www.comedi.org)

#### 1.3.1 The Software

The PCI263 is supplied with the SOFTMAN CD-ROM. This contains all the software for the card, and is documented in the Amplicon ADIO software manual. This manual can be accessed when the software is installed from the CD.

1.4 What the Package Contains



Some of the components on the board are susceptible to electrostatic discharge, and proper handling precautions should be observed. As a minimum, an earthed wrist strap must be worn when handling the PCI263 outside its protective bag. Full static handling procedures are defined in British Standards Publication BSEN100015/BSEN100015-1:1992.

When removed from the bag, inspect the board for any obvious signs of damage and notify Amplicon if such damage is apparent. Do not plug a damaged board into the host computer. Keep the protective bag for possible future use in transporting the board.

The package as delivered from **Amplicon Liveline Ltd.** contains:-

1. The plug-in card as ordered, in a protective bag. The PCI263 is identified by the type number printed on the board.

**PCI263**      PCI Bus Reed Relay card      Part N° 960 038 43

2. Distribution software and manual on CD      Part N° 8698 6559 v2000A or later

Any additional accessories (mating connectors, software etc.) may be packed separately.

1.5 The Amplicon Warranty Covering the PCI263

This product is covered by the warranty as detailed in the Terms and Conditions stated in the current domestic or international **Amplicon Liveline** catalogue.

1.6 Contacting Amplicon Liveline Limited for Support or Service

The PCI263 boards are designed and manufactured by Amplicon Liveline Ltd and maintenance is available throughout the supported life of the product.

1.6.1 Technical Support

Should this product appear defective, please check the information in this manual and the Ampdio32 manual appropriate to the program in use to ensure that the product is being correctly applied.

If a problem persists, please request Technical Support in one of the following ways:

Telephone: UK		0844 324 0617
	<small>Calls cost 5p per min from a BT landline. Calls from other services may vary</small>	
Fax: UK		01273 570 215
Email		support@amplicon.com
Web:		www.amplicon.com

It will assist the support engineer if you have the following information available when you call:

- Date of purchase
- Your account number or postcode
- The Operating System you are running under
- The specification of your computer
- The nature of your problem and the results of any tests you have conducted
- The version number of your Softman CD.

### 1.6.2 Repairs

If the PCI263 requires repair then please return the goods enclosing a repair order detailing the nature of the fault. If the PCI263 is still under warranty, there will be no repair charge unless any damage is a consequence of improper use.

For traceability when processing returned goods, a Returned Materials Authorisation (RMA) procedure is in operation. Before returning the goods, please request an individual RMA number by contacting Amplicon Technical Support by telephone or fax on the above numbers. Give the reason for the return and, if the goods are still under warranty, the original invoice number and date. Repair turnaround time is normally five working days but the Service Engineers will always try to co-operate if there is a particular problem of time pressure.

Please mark the RMA number on the outside of the packaging to ensure that the package is accepted by the Goods Inwards Department.

Address repairs to:           The Service Department  
                                          AMPLICON LIVELINE LIMITED  
                                          Centenary Industrial Estate  
                                          Brighton, East Sussex  
                                          BN2 4AW  
                                          England

## 2 GETTING STARTED

### 2.1 General Information

The PCI263 card is Plug and Play compatible and comes complete with all the software required to install and operate the card in any PCI version 2.1 compliant host PC running under Windows 95, 98, Me, NT, 2000, or XP and allow full card functionality.

### 2.2 Host Computer Requirements

When installing one or more PCI263 series boards, ensure that the host computer has sufficient capacity. Take into account other boards or adapters that may be installed in the computer when assessing physical space, address space in the I/O map, interrupt levels and the power requirements.

This board is suitable for use in any PC compatible computer that can provide a single PCI Bus version 2.1 slot, with sufficient space for a half-length card.

The computer must run under one of the following operating systems. Windows 95, Windows 98, Windows Me, Windows NT 4.0, Windows 2000, or Windows XP.

### 2.3 Installing the Board

**ENSURE THAT THE POWER TO THE COMPUTER IS SWITCHED OFF BEFORE INSTALLING OR REMOVING ANY EXPANSION BOARD. OBSERVE HANDLING PRECAUTIONS NOTED IN SECTION 1.4.**

**REPAIR OF DAMAGE CAUSED BY MIS-HANDLING IS NOT COVERED UNDER THE AMPLICON WARRANTY.**

**DO NOT MAKE ANY MODIFICATIONS TO A BOARD THAT IS ON EVALUATION**

Please refer to the manufacturer's hardware manual supplied with the PC for instructions on how to remove the cover and install devices into a PCI slot. The PCI263 may be installed in any available position in the machine provided that there is no restriction specified for that location by the computer manufacturer.

The PCI263 board is a Plug and Play device. The installation software supplied will handle the configuration of the card.

When the board is physically installed in the PC, and the PC is rebooted, The Windows 95, Windows 98, Windows Me, Windows 2000, or Windows XP operating system will detect new hardware and prompt for installation of the device drivers. Windows NT 4.0 will not be aware of the board until the drivers have been installed.

## 2.4 Software Installation

Please refer to the ADIO software manual, [ampdio32manual.pdf](#), for the latest Windows 32-bit driver installation information.

### 2.4.1 Windows 95/98/Me Installation

The Windows 95 drivers supplied with this card are compatible with installation and operation under Windows 98 and Windows Me.

#### To install the drivers under Windows 95:

1. Turn on the PC and allow the operating system to discover new hardware. Insert the SOFTMAN CD into the CD-ROM drive and click the 'Next' button on the first 'Update Device Driver Wizard' dialog.
2. If Windows fails to find the correct INF file automatically, click on the 'Other Locations' button, browse to the top-level directory of the SOFTMAN CD and click 'OK'.
3. Windows should correctly identify the board as a PCI263. Click the 'Finish' button.
4. Windows will now proceed to copy the driver software from the CD. If Windows asks for the 'Amplicon DIO Drivers Disk' to be inserted, ensure the SOFTMAN CD is in the drive, click 'OK', click 'Browse', browse to the top-level directory of the SOFTMAN CD (which contains the file Windows is trying to find) and click 'OK'.

To install the example software, rerun Amplicon Softman CD and select the 'Access your manual and software' button, and then double click on the '32 bit' software button for the PCI263. This will extract and run file AMPDIO.EXE on the SOFTMAN CD. Follow the instructions to install the samples onto your PC.

#### To install the drivers under Windows 98 or Windows Me:

1. Turn on the PC and allow the operating system to discover new hardware. Insert the SOFTMAN CD into the CD-ROM drive. On the 'Add New Hardware Wizard' dialog, select the 'Search for the best driver for your device' option and click 'Next'.
2. Make sure the 'CD-ROM drive' option is checked and click 'Next'. If Windows fails to find the correct INF file, click 'Back', select the 'Specify a location' option, click the 'Browse' button, browse to the top-level directory of the SOFTMAN CD and click 'OK'.
3. Windows should correctly identify the board as a PCI263. Click 'Next'.
4. Windows will process to copy the driver software from the CD. When it has finished, click the 'Finish' button.

To install the example software, rerun Amplicon Softman CD and select the 'Access your manual and software' button, and then double click on the '32 bit' software button for the PCI263. This will extract and run file AMPDIO.EXE on the SOFTMAN CD. Follow the instructions to install the samples onto your PC.

### 2.4.2 Windows NT4.0 Installation

Please ensure that PLUG n PLAY OS (or equivalent) option on the BIOS settings screen is set to NO or OFF.

The driver is installed as part of the set-up process for the remaining software.

1. To install the example software, rerun Amplicon Softman CD and select the 'Access your manual and software' button, and then double click on the '32 bit' software button for the PCI236. This will extract and run file AMPDIO.EXE on the SOFTMAN CD. Follow the instructions to install the samples onto your PC.
2. After rebooting the PC, the PCI263 will be detected by the installed driver and configured automatically.
3. The Amplicon DIO control panel applet can be used to verify that the board has been detected. This will also show the base address and IRQ settings for the board.

### 2.4.3 Windows 2000/XP Installation

For versions of the AMPDIO software prior to 4.32, please follow the instructions for installing a card in Windows NT 4.0 (see section 2.4.2). For versions 4.30 and 4.31, the supplied AMPDIOV4.INF file will allow the supported PCI cards to appear under Device Manager, but these are just dummy entries. For versions prior to 4.30 the supported PCI cards will appear as unknown devices under Device Manager.

For AMPDIO software versions 4.32 and later, a 'Plug and Play' Windows 2000/XP driver is used. This section describes how to install a PCI card to use this Plug and Play driver under Windows 2000 or Windows XP.

#### To install the drivers under Windows 2000:

1. Turn on the PC and allow the operating system to discover new hardware. Insert the SOFTMAN CD into the CD-ROM drive. If Windows opens the 'Welcome to the Found New Hardware Wizard' page, press 'Next' and go to step 2. If Windows just asks for a disk labeled 'Amplicon DIO Drivers Disk' go to step 5.
2. Select the 'Search for a suitable driver for my device (recommended)' option and press 'Next'.
3. Check the 'CD-ROM drives' option. Press 'Next'.
4. On the 'Driver Files Search Results' page, Windows should say 'Windows found a driver for this device'. Press 'Next'.
5. If Windows asks for a disk labeled 'Amplicon DIO Drivers Disk' when trying to copy files, click 'OK' to cancel the alert box, then browse to the root directory on the CD-ROM and press 'Open', then 'OK'. Windows will copy the files and install the driver.
6. On the 'Completing the Found New Hardware' screen, Windows should correctly identify the device as a PCI263. Press 'Finish'

**To install the drivers under Windows XP:**

1. If installing from CD-ROM rather than from the self-extract target directory, ensure the Amplicon SOFTMAN CD-ROM is in the CD-ROM drive.
2. When Windows detects the new hardware and opens the 'Welcome to the Found New Hardware Wizard' page, press 'Next'.
3. If installing from the CD-ROM, select the 'Install the software automatically (Recommended)' option. If installing from the self-extract target directory, select the 'Install from a list or specific location (Advanced)' option. Press 'Next'.
4. If installing from the self-extract target directory, select the 'Search for the best driver in these locations' option, deselect the 'Search removable media (Floppy, CD-ROM...)' option, select the 'Include this location in the search' option, press the 'Browse' button and browse to the self-extract target directory. Then press 'Next'.
5. Windows will install the driver and reach the 'Completing the Found New Hardware Wizard' page.
6. On the 'Completing the Found New Hardware Wizard' page, press 'Finish'.

To install the example software, rerun Amplicon Softman CD and select the 'Access your manual and software' button, and then double click on the '32 bit' software button for the PCI263. This will extract and run file AMPDIO.EXE on the SOFTMAN CD. Follow the instructions to install the samples onto your PC.

**2.5 Application Software**

Example application software, including source code for the applications and the DLL are supplied in the self-extracting archive AMPDIO.EXE along with the SETUP program. When the self-extracting archive is run and software is extracted to a suitable directory (e.g. C:\AMPLICON\AMPDIO), the examples and DLL source code can be found in subdirectories off this directory. The software supplied with this card supports operation with Windows 95, 98, Me, 2000 & NT 4.0 only. Refer to the AMPDIO W32 DRIVERS document ([ampdio32manual.pdf](#)) for details.

## 2.6 Installation Testing

Ensure the PC and BIOS are PCI 2.1 compliant

### 2.6.1 Verifying Installation for Windows 95/98/Me

**To verify the correct driver has been installed:**

- (a) Use Windows Explorer to browse to the <WINDOWS>\system directory.
- (b) Click on the AMPDIO.VXD file and select 'Properties' from the explorer 'File' menu.
- (c) Click on the 'Version' tab on the properties dialog box.
- (d) Verify that the file version is at least 4.31.

**To verify the card has been detected:**

- (a) Open the Control Panel, e.g. via 'Start' -> 'Settings' -> 'Control Panel'.
- (b) Double click the 'System' icon (or open it from the Control Panel's File menu).
- (c) On the System Properties dialog box, click the 'Device Manager' tab.
- (d) Click the 'View devices by type' radio button if this is not already selected.
- (e) Look for and select the PCI card under the branch labeled 'Amplicon Analogue/Digital IO Counter Timer Cards'.
- (f) Check the device status message box to make sure the device appears to be working correctly.
- (g) Click the 'Properties' button.
- (h) On the properties dialog box, check there are no resource conflicts.

### 2.6.2 Verifying Installation for Windows NT 4.0

Please verify that the Windows NT build is at least 1381 (Service Pack 3). Ensure that the card has been correctly inserted into a slot on the PC's PCI bus and the PC has been rebooted.

**To verify the correct driver has been installed:**

- (a) Use Windows NT Explorer to browse to the <WINDOWS>\system32\drivers directory.
- (b) Click on the AMPDIO.SYS file and select 'Properties' from the Explorer 'File' menu.
- (c) Click on the 'Version' tab on the properties dialog box.
- (d) Verify that the File version is at least 4.31.

**To verify the correct control panel extension has been installed:**

- (a) Use Windows NT Explorer to browse to the Windows\system32 directory.
- (b) Click on the AMPDIO.CPL file and select 'Properties' from the Explorer 'File' menu.
- (c) Click on the 'Version' tab on the properties dialog box.
- (d) Verify that the file version is at least 2.2.0.0.

**To verify that the driver is running:**

- (a) Open the Control Panel, e.g. via 'Start' -> 'Settings' -> 'Control Panel'.
- (b) Double click the 'Devices' icon (or open it from the Control Panel's File menu).
- (c) Look down the list for the device called 'AmpDIO' and verify that its status is 'Started'.

**To verify that the driver has recognised the card:**

- (a) Open the Control Panel, e.g. via 'Start' -> 'Settings' -> 'Control Panel'.
- (b) Double click the 'Amplicon DIO' icon (or open it from the Control Panel's File menu).
- (c) Select each of the 'DIO' entries from the list in turn. For each selected entry, click the 'Settings' button.

- (d) For one of the listed DIO $n$  entries, the dialog box which pops up should list the PCI card type, its location on the PCI bus (e.g. 0/20) and a status in square brackets. If the status says '[OK]', then a card of the indicated type has been detected at the indicated location on the PCI bus.

**N.B.:**

- (a) If any of the DIO $n$  entries correspond to ISA cards, a different dialog box will be shown when 'Settings' is clicked for that entry.
- (b) If there are 8 DIO $n$  entries DIO0 through DIO7 and the new card does not appear to be amongst them or appears to be marked '[BAD]'. The new card may have been detected but not used by the driver. Try deleting one of the DIO $n$  entries. If the 'Add PCI' button becomes active, click it and see if the new card appears in the drop-down list of cards.
- (c) PCI cards will also be marked '[BAD]' if the driver has not been started since the system was last rebooted (e.g. if has been set to start manually).

**2.6.3 Verifying Installation for Windows 2000****To verify the correct driver has been installed:**

- (a) Use Windows 2000 Explorer to browse to the <WINDOWS>\system32\drivers directory.
- (b) Click on the AMPDIO2K.SYS file and select 'Properties' from the explorer 'File' menu.
- (c) Click on the 'Version' tab on the properties dialog box.
- (d) Verify that the file version is at least 4.32.
- (e) Use Windows 2000 Explorer to browse to the <WINDOWS>\system32 directory.
- (f) Click on the AMPDIOCO.DLL file and select 'Properties' from the explorer 'File' menu.
- (g) Click on the 'Version' tab on the properties dialog box.
- (h) Verify that the file version is at least 4.32.

**To verify the card has been detected:**

- (a) Open the Control Panel, e.g. via 'Start' -> 'Settings' -> 'Control Panel'.
- (b) Double click the 'System' icon (or open it from the Control Panel's File menu).
- (c) On the System Properties dialog box, click the 'Hardware' tab and press the 'Device Manager' button.
- (d) On the Device Manager dialog box, ensure the 'Devices by type' option is selected on the 'View' menu.
- (e) Look for and select the PCI card under the branch labeled 'Amplicon Analogue/Digital IO Counter Timer Cards'.
- (f) Double click on the selected card (or select 'Properties' on the File menu).
- (g) Check the device status message box to make sure the device appears to be working correctly.
- (h) Click the 'Settings' tab and check that the card has been assigned a DIO port number in the range DIO0 to DIO7.
- (i) Click the 'Resources' tab, check there are no resource conflicts.

**2.6.4 Verifying Installation for Windows XP****To verify the correct driver has been installed:**

- (a) Use Windows Explorer to browse to the <WINDOWS>\system32\drivers directory.
- (b) Click on the AMPDIO2K.SYS file and select 'Properties' from the explorer 'File' menu.
- (c) Click on the 'Version' tab on the properties dialog box.
- (d) Verify that the file version is at least 4.32.
- (e) Use Windows Explorer to browse to the <WINDOWS>\system32 directory.
- (f) Click on the AMPDIOCO.DLL file and select 'Properties' from the explorer 'File' menu.
- (g) Click on the 'Version' tab on the properties dialog box.
- (h) Verify that the file version is at least 4.32.

## To verify the card has been detected:

- (a) Open the Control Panel, e.g. via 'Start' -> 'Control Panel' -> 'Performance and Maintenance'.
- (b) Double click the 'System' icon.
- (c) On the System Properties dialog box, click the 'Hardware' tab and press the 'Device Manager' button.
- (d) On the Device Manager dialog box, ensure the 'Devices by type' option is selected on the 'View' menu.
- (e) Look for and select the PCI card under the branch labeled 'Amplicon Analogue/Digital IO Counter Timer Cards'.
- (f) Double click on the selected card (or select 'Properties' on the File menu).
- (g) Check the device status message box to make sure the device appears to be working correctly.
- (h) Click the 'Settings' tab and check that the card has been assigned a DIO port number in the range DIO0 to DIO7.
- (i) Click the 'Resources' tab, check there are no resource conflicts and that the PCI card has been assigned an IRQ.

## 2.7 The PCI Interface

The PCI263 is a PCI bus slave card. Communication between the host PC and the PCI263 board is via the PCI bus. This bus provides data, address, and control lines together with the power supply for the PCI263.

The PCI263 is allocated one Base Address (BA) in the available I/O space. The board base address is set up by the PCI enumerator software during installation.

The PCI263 uses only the +5 V supply from the host PC and this supply rail is also available for external use via the I/O connector at a maximum of 100mA.

### 3 ELECTRICAL CONNECTIONS

This chapter describes the signal and control connections that the user must make between the PCI263 and any external devices. These output connections are made through the D-type connector protruding from the PC adapter slot corresponding to the chosen board position. The metal shell is connected to the local PC chassis ground. All signals are referred to the relevant signal ground.

#### 3.1 37 way D-type Connector (SK1 - User I/O)

Connections from the PCI263 to the user devices are made via a 37 way D-type female (or socket) connector. The pin assignments for the connector SK1 (which are compatible with previous Amplicon reed relay boards) are shown in Figure 3.1.

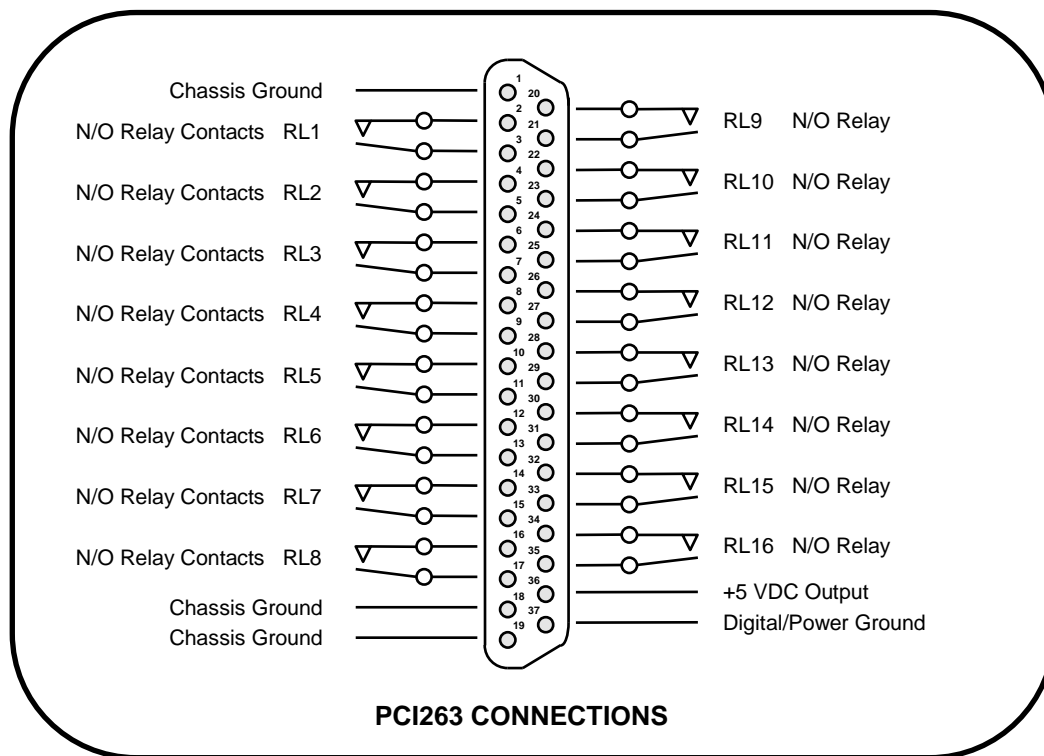


FIGURE 3-1 37 WAY D-TYPE CONNECTOR (SK1 - USER OUTPUT)

When the PCI263 is installed, SK1 is accessible through the slot in the PC expansion back-plate. A mating cable or user wired D connector (male) will plug into SK1 when the board is in position, and can be firmly held in position by means of jack screws.

Connection accessories are available from Amplicon:

Description	Order Code
37 way Screw terminal assembly	9089 1950
37 way 1m screened interconnect cable	9095 6109
37 way 2m screened interconnect assembly	9101 4933

### 3.2 Voltage Outputs Available on SK1

In addition to the 16 Reed relay contact pairs, the +5VDC PC voltage rail is brought out on SK1 pin 36 with the ground return on pin 37. No more than 100 mA should be drawn from the +5 V rail. Refer to the computer technical reference manual for current availability from the source power supplies.

### 3.3 Relay Contact Outputs

All 16 relay contact connections are available on SK1, a 37 way D-type connector. The pin arrangement is such that each contact occupies an adjacent pair on the connector or termination panel. There are 16 normally open (form A) relay outputs labeled RL1 to RL16. The load on each contact should be within the following maximum ratings:

<b>Contact Ratings (Max)</b>	Power	(Switching)	15W
	Voltage	(Switching)	200 VDC see note on Low Voltage directive
	Current	(Switching)	1.0 A
	Current	(Carrying)	1.25 A
<b>Contact Resistance</b>	Resistance	(Initial)	400 mΩ
		(Includes track and connector resistance)	

#### Low Voltage Directive

This product uses parts that are rated in excess of the 75VDC Low Voltage Directive, however to maintain safety compliance we recommend that you do not use this product to switch voltages greater than 75VDC.

#### 3.3.1 Series or Parallel Connection of Relay Contacts

Relay contacts should not be wired in series or parallel in an attempt to increase the voltage or current capacity. Make and break delays of the contacts are both about 0.5 ms and no two relays can be guaranteed to make or break simultaneously, therefore one of a series or paralleled pair would have to carry the total load momentarily during this skew period.

#### 3.3.2 Unused Outputs

If any of the relay outputs are not required for the application, the unused pins on SK1 should be left unconnected.

### 3.4 The Connecting Cables

The cables connecting the PCI263 or its termination assembly to the driven devices may be of any length commensurate with the application and whose resistance will not cause excessive voltage drops. However, the capacitance of long cables can result in a current transient on contact closure, and this should be suppressed.

### 3.5 Use of Shielded Cables

Pins 1, 18 and 19 of SK1 are connected to the host PC chassis and may be connected to protective ground or a cable overall screen in order to reduce interference problems.

A shielded 1 metre cable is available. However if the user manufactures custom cables for use in a severe or noisy environment, it may be considered advisable to use overall shielded cables.



**DANGER**  
High Voltage

#### **BE AWARE**

#### **DANGER OF ELECTRIC SHOCK**

When the PCI263 board is in use in an open computer chassis, high voltages may be exposed on the connector and associated circuitry.

## 4 USING THE PCI263

This chapter and gives notes for users of the PCI263. The PCI263 is a PCI bus version of the PC263 and is functionally equivalent to it. The differences are in how the software accesses the card. For the PCI263, the AMPDIO software gives access to all the functions of the card and is covered in the programming section of the manual.

### 4.1 Relay Contact Protection

Because the PCI263 is designed for general purpose use in a variety of possible switching applications, the reed relay contacts are directly available to the user, and the broad usage precludes on-board protection.

**IT IS ESSENTIAL THAT THE USER CONSIDERS THE REQUIREMENT FOR CONTACT PROTECTION BEFORE CONNECTING THE PCI263 IN A POTENTIALLY DAMAGING SWITCHING APPLICATION.**

### 4.2 Relay Contact Life Expectancy

The life expectancy of a reed relay contact is very high but varies with the load conditions, the duty cycle and the operating temperature. At light loads, the life expectancy of the reeds used in the PCI263 is in excess of 50 million operations, but this figure can drop to as low as one million operations when the contacts are fully loaded. Overloading the contacts by exceeding the rated voltage, current or power maxima can result in rapid breakdown with either a high contact resistance or a permanent contact weld occurring.

Inductive, capacitive or non-linear loads can cause transient conditions in excess of the specified ratings with a consequent reduction in contact life. Under the same conditions, arcing inside the relay may cause high frequency noise to be generated, which may couple into the PC circuits and interfere with normal operations.

To alleviate the above potential problems, proper protection should be incorporated in the external circuits for any loads that are not totally resistive. Apparent resistive loads may be compromised by the capacitance of long connecting cables or by non-linear resistance characteristics such as found in a tungsten filament lamp.

### 4.3 Software Selection of Reed Relay Closures

The required energisation of the reed relays is selected by a host computer program that writes the appropriate data to the registers of the PCI263. The computer can also read back the current status of the relay energisation. This method of operation is known as 'Program Mode' and as all timing is under the control of the computer, this is the mode in which the PCI263 always operates. Any combination of reed relays may be selected, from zero to all sixteen energised. This gives a total of 65536 ( $2^{16}$ ) selections under the control of the 8 bit data bytes written to the two ports A and B.

Port A is located at the base address automatically set by the PCI plug and play mechanism, and Port B is located at this base address + 1. A byte of data written to the addressed port comprises eight bits which map directly onto the eight relays associated with that port. Each bit of the byte that is active (high or '1' level) will cause the respective relay to be energised and each bit that is inactive (low or '0' level) will cause the respective relay to be de-energised. These new states will be taken up without regard to the state of the relays before the new data byte was written.

If one or more relay(s) in a group needs to be activated without changing the state of the other relays in that group, then the current status must first be determined either by a read from that port or by a software reference to the previously written data. A new byte must then be written that contains the previous states plus the change(s).

The table in figure 4.6 details the relationship between the ports, the port addresses, the bits, the relays, the LED indicators and the output connections.

Port	ADDRESS	Bit	Relay	LED Indicator	Connections
A	Base	A0	RL1	D1	SK1 2-3
A	Base	A1	RL2	D2	SK1 4-5
A	Base	A2	RL3	D3	SK1 6-7
A	Base	A3	RL4	D4	SK1 8-9
A	Base	A4	RL5	D5	SK1 10-11
A	Base	A5	RL6	D6	SK1 12-13
A	Base	A6	RL7	D7	SK1 14-15
A	Base	A7	RL8	D8	SK1 16-17
B	Base +1	B0	RL9	D9	SK1 20-21
B	Base +1	B1	RL10	D10	SK1 22-23
B	Base +1	B2	RL11	D11	SK1 24-25
B	Base +1	B3	RL12	D12	SK1 26-27
B	Base +1	B4	RL13	D13	SK1 28-29
B	Base +1	B5	RL14	D14	SK1 30-31
B	Base +1	B6	RL15	D15	SK1 32-33
B	Base +1	B7	RL16	D16	SK1 34-35

**FIGURE 4-1 PCI263 REGISTER ASSIGNMENTS**

**4.4 The LED Indicators**

The status of each relay RL1 to 16 can be monitored by the host PC and can also be monitored visually by an in-line LED display along the top edge of the PCI263 board. Each LED is lit to indicate that its corresponding relay is energised. Note that the relays are numbered RL1 to RL16 in keeping with normal component practice, whereas the data bits are numbered 0 to 7, again as is normal practice.

**4.5 Board Resets**

A PCI263 board reset clears all the latches so that the board is in a known initial condition.

**4.5.1 Power-up Reset**

On switch-on, the host PC generates a 'RESET DRV' signal and causes the board to perform a global reset which initialises the internal latches to the zero condition and ensure that all the relays are de-energised. This reset signal is also generated if the mains supply voltage to the PC drops below the specified lower level.

**4.5.2 Software Reset**

To perform a software reset, zero data values must be written to the two ports.

## 5 PROGRAMMING THE PCI263

The PCI236 is supplied with Windows 95, Windows NT and Windows 2000 specific drivers. The Windows 95 driver is also compatible with Windows 98 and Windows Me. Programming for use under other operating systems is beyond the scope of this manual. A Dynamic Link Library (DLL) is supplied to provide an Application Programming Interface (API) for user programs.

### 5.1 Copyright

Software supplied with the PCI236 is **Amplicon** copyright. Permission is granted for the purchaser of the PCI236 to incorporate any part of the **Amplicon** copyright software into related application programs, and to use, resell or otherwise distribute such application programs for operation with PCI236 hardware purchased from **Amplicon Liveline Limited**.

### 5.2 Guide to User Programming

When developing an application specific program, it is advised that the supplied driver and dynamic link library functions be used for 32-bit Windows applications. Please refer to the ADIO software manual, **ampdio32manual.pdf**, for details of programming using the functions in the DLL.

The relevant sections in the Win32 Drivers manual are as follows:

- 1 INTRODUCTION
- 2 GETTING STARTED
- 3 DRIVER FUNCTIONS AND CONCEPTS, introductory section
- 3.2 Digital I/O Functions
- 4 SOFTWARE INSTALLED WITH THE DRIVER
- 4.2.1 Digital IO – INOUT.EXE
- 6 PROGRAMMING WITH THE ADIO DRIVER
- 6.3 Using the Dynamic Link Library
- 6.4 Windows 32 Library Functions
- 6.4.1 Initialization Functions
- 6.4.11 Digital Input/Output Functions
- 6.4.23 Driver Interface Functions
- 6.5 Library Error Codes
- 7 IOCTL Interface

### 5.3 Interfacing with Commercial Software Packages

The supplied Visual Basic software example (INOUT.EXE) is not intended to be a stand alone applications program, other than for demonstration and test purposes. To meet most user requirements, either a dedicated program must be written using the functions and example provided or the PCI263 can be interfaced to a commercial applications package.

#### Other Applications Packages

Further interface packages to commercial software will be made available as requirements expand. Check the 'README' files on the distribution CD, and/or the **Amplicon Product Catalogue** or Sales Department for the latest information.

## 5.4 Notes for Users of the PC263

The PCI263 is a PCI bus compatible replacement for the PC263 ISA Reed Relay card. Where the PCI263 is used in systems previously using the PC263, the user should note the following.

### Base Address

The I/O Base address is assigned by the PC plug and play BIOS, rather than being set by jumpers. These tend to get reassigned by the BIOS when PCI hardware is added or removed.

If using the supplied Windows 32-bit driver and DLL, calls to the registerBoard function should be replaced by calls to registerBoardEx or registerBoardPci which do not rely on the base address remaining fixed. Please refer to the ADIO software manual, **ampdio32manual.pdf**, for details.

If using the registerBoard or registerBoardPci functions, the card type PCI263 (=263) may be used instead of PC263 (=263). They have the same numeric value.

## APPENDICES

### APPENDIX A. TECHNICAL SPECIFICATIONS

#### A.1 Electrical Specification

##### DIGITAL OUTPUT

**Data Bit Configuration** 16 individual reed relays, each allocated to a single data bit with the 16 bit data word configured as two separately addressable bytes:

Low byte at even I/O locations (Base Address).  
Bits 0 to 7 directly map onto relays RL1 to RL8

High byte at odd I/O locations (Base Address + 1)  
Bits 0 to 7 directly map onto relays RL9 to RL16

**Output Modes** Program mode.

**Relay Contacts** Dry Reed  
Form A (Normally Open)

**Contact Ratings (Max)**

Power	(Switching)	15W
Voltage	(Switching)	200 VDC see note on Low Voltage directive
Current	(Switching)	1.0 A
Current	(Carrying)	1.25 A

**Contact Resistance** Resistance (Initial) 400 mΩ  
(Includes track and connector resistance)

**Low Voltage Directive** This product uses parts that are rated in excess of the 75VDC Low Voltage Directive, however to maintain safety compliance we recommend that you do not use this product to switch voltages greater than 75VDC.

**User I/O Connector** 37 way female D-type. 16 relay contact pairs, power, and ground.

**Address Range** The board's address range is assigned by the plug and play mechanism.

**Power** Powered by +5 Volts from the host PC bus.

PCI263 draws up to 500mA maximum.

+5 VDC at 100 mA PC bus voltage is available at the user I/O connector:

**A.2 Software Specification**

The distribution software is supplied on a CD-ROM.

Windows NT 4.0, 2000 & 95/98/Me Driver Software provides Application level access to all the advanced features of the card from these operating systems.

**A.3 Environmental Conditions**

**Environment**

The PCI263 is designed to operate in a PC/AT environment. Particular attention is paid at the design stage to minimize emission of noise and susceptibility to external radiated noise.

**Specific conditions**

<b>I/O Positions Required</b>	One PCI bus version 2.1 I/O adapter slot with room for half-length card.
<b>Board Dimensions</b>	Length 132 mm Height 82 mm plus edge connectors.
<b>Temperature Range</b>	Operating 0°C to +60°C Storage -20 to +70°C
<b>Humidity Range</b>	20% to 80% non-condensing @ 40°C
<b>Power Requirements</b>	5 VDC at 0.5A maximum from host computer power supply.
<b>Dissipation</b>	Each PCI263 will dissipate typically 2.0 Watts of heat
<b>Handling</b>	Normal static handling precautions apply. Damage could result if not observed

**Order Codes**

The Order Code for the PCI263 is 960 038 43

**Optional Accessories**

<b>Amplicon Order Code</b>	<b>Description</b>
9089 1950	37 way Screw terminal assembly
9085 6109	37 way 1m screened interconnect cable
9109 4933	37 way 2m screened interconnect cable

## APPENDIX B. CIRCUIT LAYOUT AND SCHEMATIC DRAWINGS

Full circuit diagrams and layout drawings of the PCI263 are given in this appendix.

### B.1 ASSEMBLY DETAIL

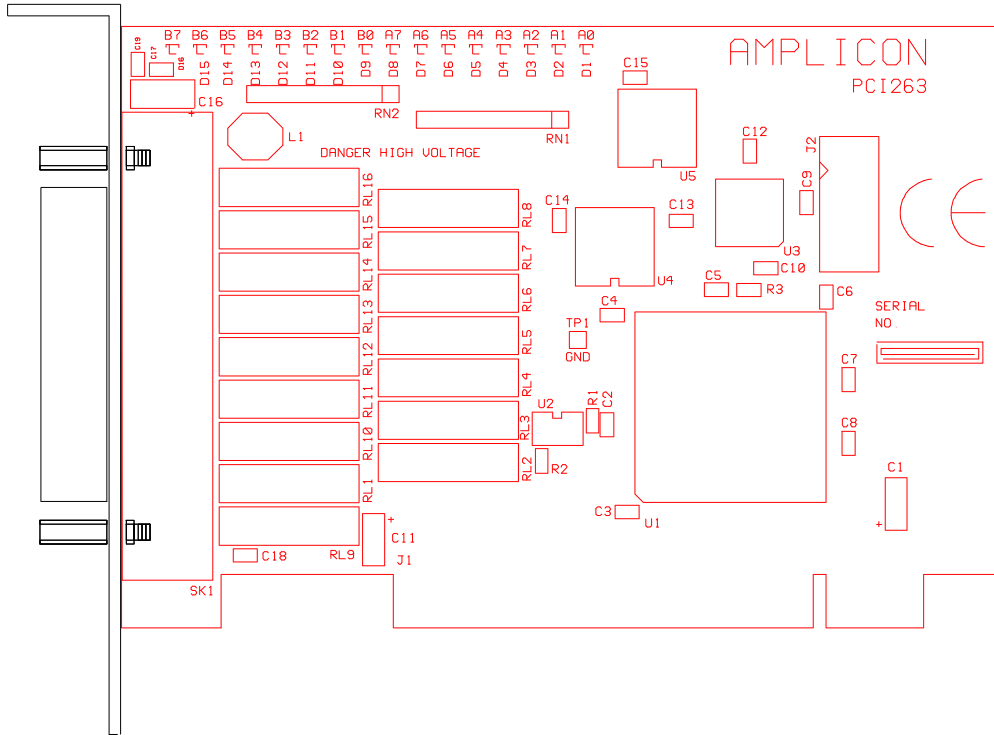


FIGURE B-1 PRINTED CIRCUIT LAYOUT

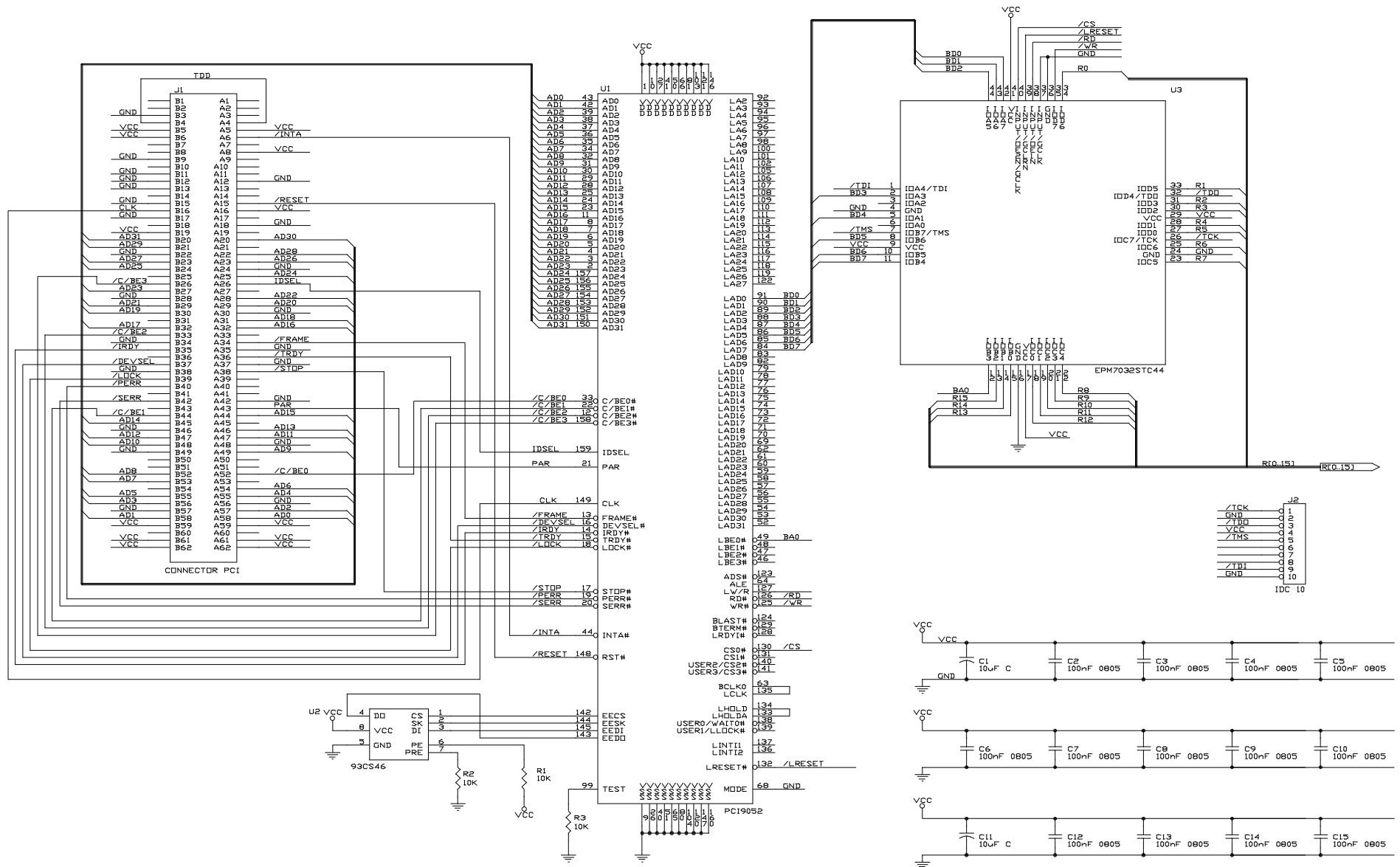


FIGURE B-2 PCI263 CIRCUIT DIAGRAM (SHEET1)

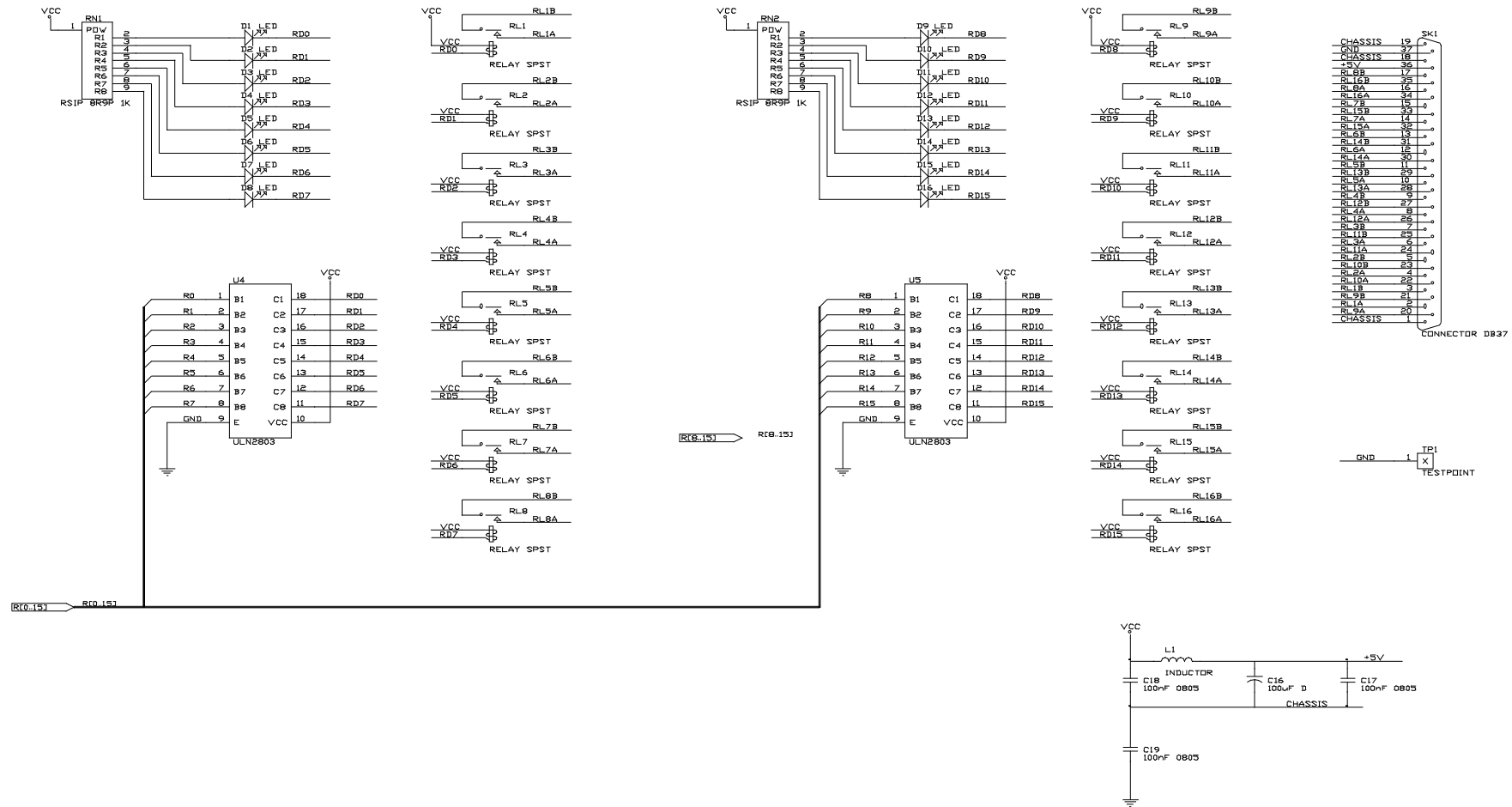


FIGURE B-3 PCI263 CIRCUIT DIAGRAM (SHEET 2)