RIO for IBM AIX

User's Guide

5500003-11

FCC Note

The products described in this manual have been found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions in this Guide, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his/her own expense.

EN 55022: 1998, Class A Note

Warning: This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

CE

Caution: The products described in this manual are approved for commercial use only.

Table of Contents

Chapter 1

Introduction

Product Overview

Installation Overview

Installation Checklist

1.1 Product Overview

RIO is an extremely versatile and flexible serial connectivity solution. It consists of a host card connected to external serial port units called Remote Terminal Adapters (RTAs). These 8 or 16 port RTAs can be cabled up to 75m from the host using non-proprietary RS422 cable.

As well as connecting four RTAs direct to the host card, you can add RTAs to RTAs, creating chains or networks of RTAs. You can keep on adding RTAs up to the system maximum of 128 ports. This flexibility means that **RTAs can be located anywhere you want them,** whether this is stacked in the machine room, distributed around a building or campus, or installed in remote offices. This enables you to tailor RIO to your specific needs. A bespoke solution at an off-the-peg price.

RIO provides the following features and benefits:

128 ports per host card, 512 ports per system	True enterprise-wide connectivity.
Comprehensive range of port/connector types	Customise workgroups for specific connectivity requirements (e.g. RS232, RS422, Parallel, Surge Protected).

.

Eight and sixteen port modular upgrades	Add (and pay for) extra ports only when required.
Fibre Optic Link Kit (FOLK)	Cable RTAs up to 1Km from the host card or another RTA via fibre optic cabling.
Long Distance Module (LDM)	Install RTAs in remote locations via leased line or telephone system, or cable up to 1Km from the host or another RTA via shielded twisted-pair RS422 cabling.
Fault Tolerant Cabling	Create alternative routes between the host card and RTAs to protect against cable disruption.
Hot Swap Workgroups	Add, remove and move RTAs while the system is up-and-running, i.e. without disturbing other users.
Dual Host Failsafe	For mission-critical applications - install mirrored backup system to protect against server failure.

1.2 Installation Overview

Installation involves four main steps:

1. **Software Installation** - The first step is to install the RIO device driver. This is the software interface between RIO and AIX. It is supplied on the RIO AIX driver diskette. The driver is installed using the AIX *installp* command. You must be logged in as root. Chapter 2 (Software Installation) describes how to do this.
2. **Hardware Installation** - Once the driver has been installed, your machine must be switched off so that you can install the RIO Host Card. This involves taking the lid of your machine and inserting the card into an available expansion slot. Host card installation is described in Chapter 3 (Installing the Host Card).
3. **RTA Installation** - With the host card installed you can install your Remote Terminal Adapters (RTAs) and associated peripherals.Chapter 4 (Installing Remote Terminal Adapters) describes how to plan your RIO network and how to install RTAs.

Note *If you are going to make your own cables for connecting devices to RTA ports, make sure they conform to the specifications laid out in Appendix A (Port Specifications & Cabling).*

4. **RTA Configuration** - The peripheral devices you attach to your RTA ports will not work straight away; the ports have to be configured to support them. Ports are configured using the AIX System Management Interface Tool (SMIT). Using SMIT you can create and configure a login device (tty) or a printer device (lp) for each port.This is described in Chapter 5 (Configuring RTAs).

Note *You should be familiar with AIX device management terminology before you try to configure your RTAs. If you are not, refer to the AIX documentation.*

1.3 Installation Checklist

Before installing your RIO system, please make sure that you have been supplied with the following items:

- **RIO AIX device driver diskette.** Make sure that the driver is for the version of AIX that you are using.
- **RIO Host Card(s).** Check that you have the correct type of host card.
- **Remote Terminal Adapters (RTAs).** Eight-port RTAs should be supplied with a 5-metre RIO Link cable, a power supply unit and a mains lead. Sixteen-port RTAs are supplied with a short 0.5m RIO Link cable for connecting racked or stacked units. They have an internal power supply. If you make your own RIO Link cables, make sure they conform to the specification stated in Appendix A (Port Specifications & Cabling).

Optional:

- **Fibre Optic Link Kits (FOLKs).** The Fibre Optic Link Kit consists of 2 fibre-optic converter units, each with a metre-long RIO cable at one end. Make sure that the fibre optic cabling has been laid, and that its connectors can be accessed where your RIO network will require them. The correct specification for the fibre-optic cable is given in Appendix A (Port Specifications & Cabling).
- **Long Distance Modules (LDMs).** The LDM consists of two Long Distance Units, each with a metre-long RIO cable connected to one end, and a modem cable connected to the other.

Chapter 2

Software Installation

Installing the RIO Device Driver

Removing the RIO Device Driver

2.1 Installing the RIO Device Driver

Caution **Remove any previous version of RIO software before installing the RIO for AIX device driver. Use the procedure described in Section 2.2.**

Note *For best results, check whether the following are installed on your machine before installation:*

4.2.0.0. bos.printers.rte
4.2.0.0. bos.terminfo.rte

If not installed, use your AIX CD or tape to install them.

To install the RIO device driver, follow the instructions below:

1. Log in as root.
2. Insert the RIO diskette into the drive.
3. Enter the command:

```
installp -FX all
```

The RIO Software will install.

2.2 Removing the RIO Device Driver

If you need to remove the RIO software, use the following procedure:

1. Log in as root.
2. Remove existing RIO devices.
3. Enter the command:

```
installp -ug devices.rio
```

The RIO software will be removed.

Chapter 3

Installing the Host Card

3.1 Overview

The RIO Host Card is available in ISA, Micro Channel and PCI formats. You can install up to four host cards per machine, and if your machine allows it you can install different card types (e.g. ISA and PCI).

Before you install your host card(s), record the serial and assembly numbers printed on each card. You may need these if you contact Technical Support.

3.2 Installing an ISA Host Card

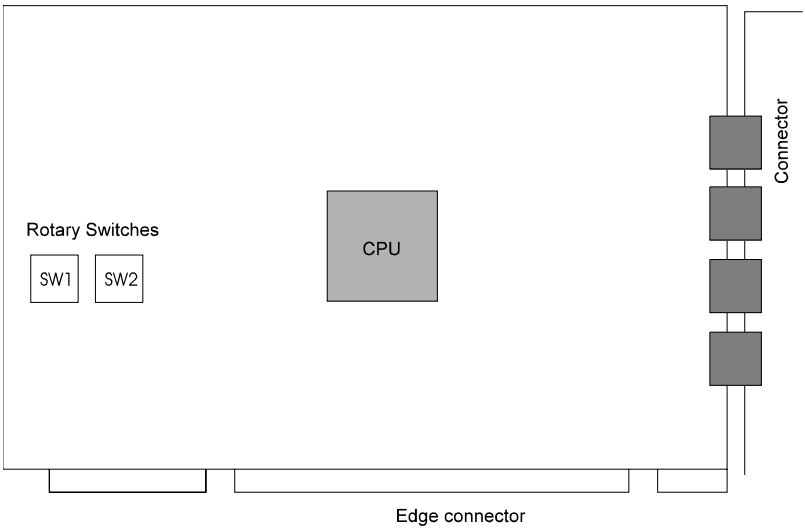
Installing an ISA host card involves three stages:

1. **Setting the memory address on the card** - you must set the memory address using two rotary switches on the card's surface.

2. **Installing the card in your machine** - the host card fits into an ISA slot inside your PC.

3. **Configuring the card using SMIT**- you must enter a memory address and an interrupt level for each card.If you are installing more than one host card, they can be set to use polled mode.

Figure 1
ISA card:
location of the
rotary
switches



3.2.1 Setting the Memory Address

Set the memory address of the card using the two rotary switches (SW1 and SW2) on the card (see Figure 1). The rotary switches select a 64Kb segment.

In detail, set the address as follows:

Each switch is a dial displaying the hex values 0-F. Set the two switches to the first two digits of the address (in hexadecimal). For example, if you were using the default address 0D0000 (i.e. below 1 megabyte), you would set the first switch to 0 and the second switch to D. If you were using the address F00000 (i.e. in the 16th Megabyte), you would set them to F and 0 respectively. If you are unsure of the memory address, use the default address 0D0000.

Caution ***Make a note of the address you have used: you will need to enter it into SMIT later.***

Note *If installation fails due to a clashing memory address, you can change the switch settings without having to re-run the installation program.*

3.2.2 Installing the ISA Host Card

The ISA host card fits inside your machine by slotting into one of the ISA slots on the motherboard.

1. Make sure that your system is switched off.
2. Remove the cover of the machine, locate an empty ISA slot and insert the card.
3. Repeat for each host card you want to install.
4. Replace the cover of your computer, and reboot.

3.2.3 Configuring the ISA Host Card

1. Run SMIT. Select 'Devices', then select 'ISA Adapters' then select 'Add an ISA Adapter'.
2. Choose 'ISA Bus' for the parent device; then select the RIO Host Adapter. In the field 'Bus Memory Address' enter the same address you set on the rotary switches.

Note *Do not specify '0x' before the hexadecimal address value.*

3. In the 'Bus Interrupt Field' enter an interrupt level of your choosing. Other devices installed in your machine may occupy some of the interrupt levels offered in this field.

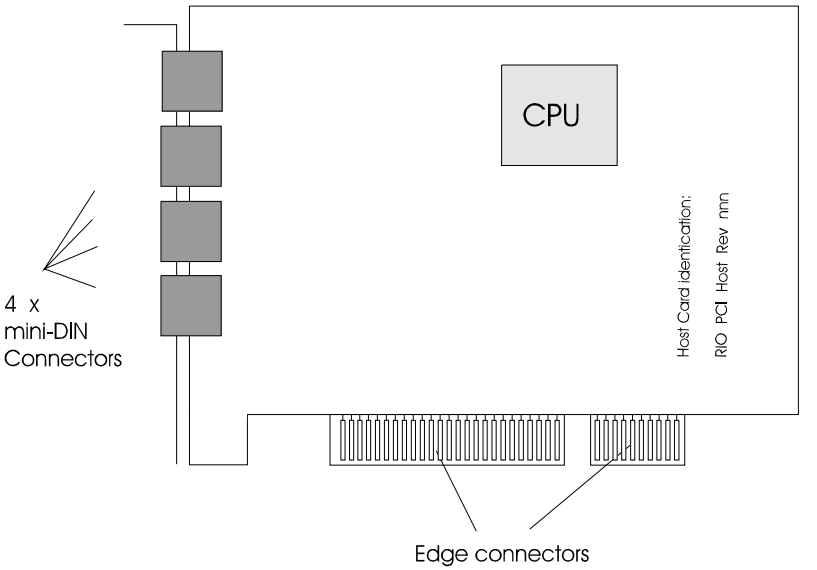
   When installing a second card, choose both a unique memory address *and* interrupt level. Ensure that either both cards use 'polled' mode or both cards use numbered interrupt levels. Do not mix polled and numbered interrupt levels.

   You should see in 'Output': 'RIO0 available'; in this example, '0' is the first RIO host card installed. If you have an error you may have entered an incorrect/clashing address. For help, see the "Troubleshooting" section in Appendix B.
4. Now go to Chapter 4.

3.3 Installing a PCI Host Card

The RIO PCI Host Card is configured automatically by the machine into which it is installed. The layout of the card is shown in Figure 2; you insert the card solder side up.

Figure 2
PCI card:
general
appearance



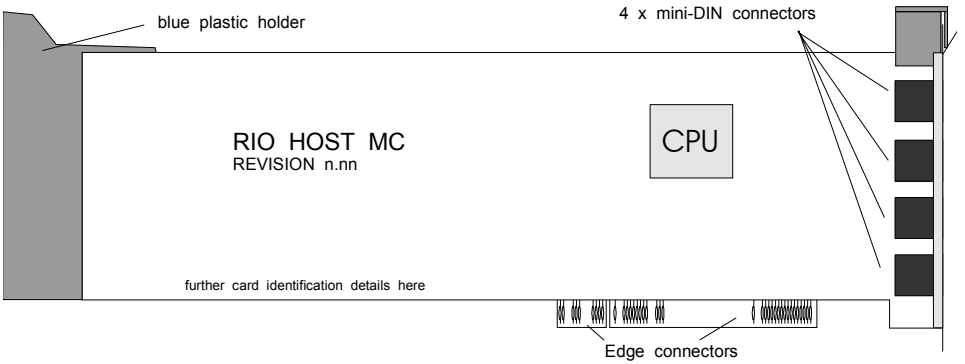
The steps of the installation process are:

1. Make sure your machine is shutdown.
2. Remove the cover and install the card in a PCI slot.
3. Repeat for each host card you want to install.
4. Replace the cover and power up your machine. Your card should be configured automatically; there is no need to configure the card in SMIT. When you are in SMIT, you should see your PCI card(s) listed.
5. Now go to Chapter 4.

3.4 Installing a Micro Channel Host Card

The Micro Channel host card fits into a 32-bit expansion slot on the motherboard. AIX selects an address and interrupt for each card automatically when the machine is rebooted.

Figure 3 Micro Channel card: general appearance



1. Ensure that your system is switched off.
2. Remove the cover of your machine and install the card in a 32-bit expansion slot. Repeat for each host card you want to install.
3. Replace the cover of your computer, and reboot.
4. Now go to Chapter 4 (Installing Remote Terminal Adapters).

Chapter 4

Installing Remote Terminal Adapters

4.1 Installation Tips

Remote Terminal Adapters (RTAs) are the external adapters that connect to the RIO Host Card and provide the serial ports for your system. RTAs are available as 8 or 16 port models, and with a wide range of port/connector types (see Appendix A).

The host card has four RIO Link ports, each of which can be connected directly to an RTA. Each RTA also has four RIO Link ports, enabling you to connect RTAs to other RTAs rather than directly to the host card. This gives you the flexibility to configure your RIO system how you want to.

You can add a maximum of 128 ports to a host card using any combination of units.

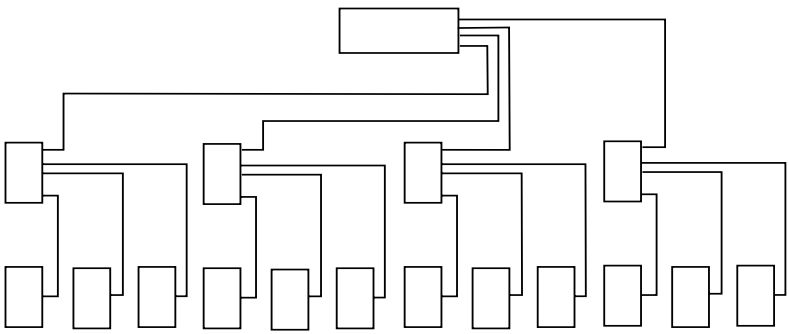
RIO provides four cabling options: standard RIO twisted-pair cabling (up to 75m), extended twisted-pair cabling (up to 1Km), fibre optic cabling (up to 1Km), and leased line/modem connection. Each host card and RTA model will support all four types of connection.

RIO's unique architecture enables you to add RTAs while the system is up-and-running. Configuration status messages will appear on the system console as RTAs are added.

The link cables supplied with RIO are 5 metres long. Using the specifications for link cables in Appendix A (Port Specifications & Cabling) you can build your own cables up to 75 metres long.

Optimum performance is achieved by installing your RTAs as near (node-wise) to the host card as possible. For example, best performance from a 16 RTA system would be achieved with the two-tier configuration shown in Figure 4.

Figure 4
Optimum Configuration for Sixteen RTAs



4.1.1 Fault Tolerant Cabling

With four data ports on the host card and on each RTA, most RIO systems will have a number of unused ports. You can use these ports to install additional links between RTAs. This creates multiple paths between RTAs and the host card. We call these "fault tolerant links". Data will be rerouted via a fault tolerant link if the primary link becomes disconnected or disrupted. If no fault tolerant link can be found, data is buffered until the faulty link is repaired. Non-proprietary cabling means that fault tolerant links can be installed with little expense.

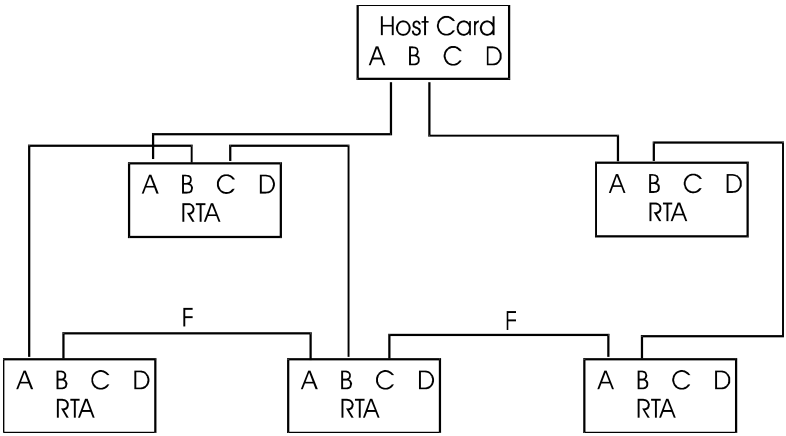
You can obtain extra RIO link cables from your RIO supplier or make your own using the specification in Appendix A (Port Specifications & Cabling).

No additional configuration is necessary. Under normal circumstances Fault Tolerant links are idle.

It only takes a few fault tolerant links to protect your whole RTA system, and standard RIO link, LDM, and FOLK connections can be used.

Consider Figure 5 - the use of fault tolerant links means that no RTA can be isolated by the failure of a single link.

Figure 5 Fault Tolerant Links



4.2 Getting to Know Your RTAs

This section describes the features of the 8-port and 16-port Remote Terminal Adapter.

4.2.1 RTA8

On the top of the RTA8 unit are eight ports; these are for connecting your peripheral devices to. Notice that the ports are numbered 1 to 8. Each port is labelled with its port type (e.g. RS232). Note that the seven serial ports on the RTA/P (Parallel module) are labelled as RS232*. These have a limited RS232 functionality - see Appendix A for details.

On the side of the unit are four RIO Link sockets and the power supply socket. The power supply socket is for the external power supply unit (PSU) supplied with the RTA. Notice that the Link sockets are labelled A to D. RIO uses these letters to address RTAs in your network. They are also used in the RTA Topology (See Section Section 7.1 Draw RIO RTA Topology).

Each RTA has six diagnostic LEDs which enable you to judge the status of the RTA at a glance.

Each RIO link has an LED, the colour of which identifies the status of the link:

- Orange - the link is transmitting system traffic (e.g. boot packets).
- Green - the link is transmitting data traffic.
- Red (flashing) - errors are being detected on the link.
- Red (for about 20 seconds then off) - the link has failed or has been disconnected.

A full description of link LED states is given, in context, in Section 4.3 Installing an 8-Port RTA.

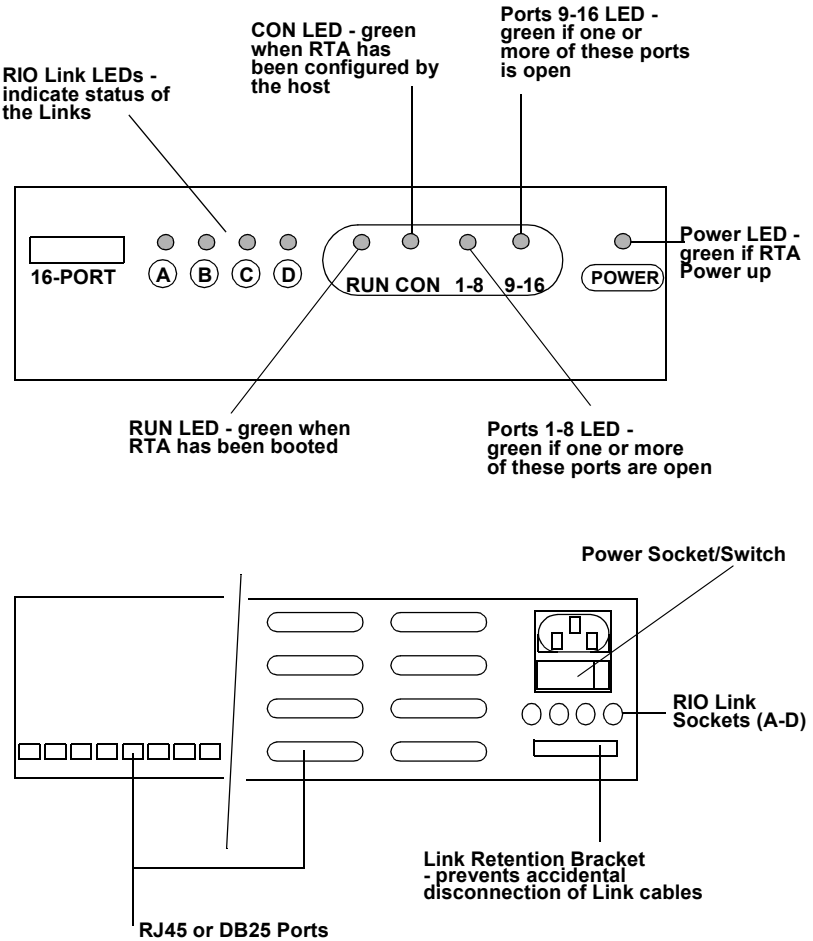
4.2.2 RTA16

The 16-port RTA is a rackable, stackable unit, ideal for locating ports close to the host server — for use with a patch panel for example. Alternatively, the 16-port can be used just like an 8-port RTA and located within your workgroups.The RTA16 is fully compatible with all 8-port RTA models, and will support up to 2 LDM or 4 FOLK connections.

Available with DB25 or RJ45 ports, the RTA16 also features an integral power supply unit, nine diagnostic LEDs, and a lockable bracket which will prevent accidental disconnection of RIO Link cables. The main features of the unit are highlighted in Figure 6 below.

Caution **do not stack more than four RTA16s on top of one another**

Figure 6 Features of the RTA16 (front and back)



4.3 Installing an 8-Port RTA

This section covers installation using standard RIO Link cabling. If you are using a RIO Fibre Optic Link Kit (FOLK) or Long Distance Module (LDM), see their respective sections for installation details.

1. Connect the RTA to the host card, or another RTA, by plugging the Link cable into one of the Link sockets on each unit. Any free Link socket can be used.
2. The RTA should be supplied with a power supply unit (PSU). Plug the PSU into the socket marked Power. It is important that you secure this connection with the retaining screws on the connector. Plug the PSU into the mains power supply.

Warning **Use of a power supply unit - other than that supplied with the product - may damage the unit and will invalidate your warranty. Do not use any other psu, including psu's supplied with other Perle products.**

Caution **Make sure that the power supply unit is kept in a dry, well- ventilated area. DO NOT block any of the vents and NEVER stack PSUs.**

3. Switch on the power supply to the RTA. The colour of the unit's LEDs during bootup will tell you whether it initialises correctly or not. The LED boot sequence should be:

   Link LED orange — unit being booted by host.
   Port 1 LED green — unit booted successfully.
   Port 5 LED green — unit has been assigned an internal ID.

   The configured RTA should have three lit LEDs: the Link LED (orange), Port 1 (green) and Port 5 (green).

   If the host card doesn't appear to be booting any of the RTAs connected to it, then the host card may not have been installed successfully. Reboot and check that the host card is identified correctly during startup.

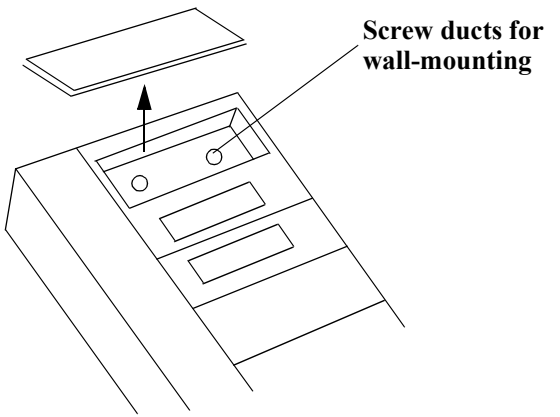
   If the LED next to port 5 does not light up, then the host card has already assigned 128 ports. If you haven't got 128 ports installed, this means that you have previously removed one or more RTAs from the network but not deleted them from the configuration. Refer to Removing an RTA in **Chapter 7 (System Management)**.

A full rundown of LED states is :

State of RTA	Link LED	Port 1 LED	Port 5 LED
Switched off	Off	Off	Off
Being booted by host	Orange	Off	Off
Booted OK	Orange	Green	Off
Assigned ID by host	Orange	Green	Green
Traffic on Link	Green	Green	Green
Error on Link	Flashing Red	Green	Green
Isolated from host	Red/Off	Green	Off

4. You can wall-mount RTAs using the screw ducts shown in the diagram below.

Figure 7 Location of screw ducts for wall mounting the RTA8



Note *When installing RTAs, particularly if wall-mounting, make sure that you follow the correct strain relief procedures in order to avoid undue strain on RIO link connection*

4.4 Installing a 16-port RTA

This section covers installation using standard RIO Link cabling. If you are using a RIO Fibre Optic Link Kit (FOLK) or Long Distance Module (LDM), see their respective sections for installation details.

1. Connect the RTA to the host card (or another RTA) by plugging the RIO cable into a link socket on each unit.

If you are going to stack (no more than four high) or rack the RTA16, use the short RIO cable supplied with the unit. If you need a longer cable, contact your supplier or refer to the RIO Link cable specification in Appendix A (Port Specifications & Cabling).

The RTA16 has an integral power supply. Take the power cable supplied with the RTA and plug it into the socket marked 'Power' in the back of the unit. Plug the other end of the cable into the AC (mains) power supply. Switch on the RTA power supply.

2. Switch on the AC power supply. The colour of the unit's LEDs during bootup will tell you whether it initialises correctly or not. The LED boot sequence should be:

Link LED:	orange	(unit being booted by host)
RUN LED:	green	(unit booted successfully)
CON LED:	green	(a software connection has been made between the RTA and the RIO driver)

The RUN and CON LEDs will remain green. The colour of the Link LED depends on the state of the Link. A full run-down of LED states is given below:

State of RTA	Link LED	RUN LED	CON LED
Switched off	Off	Off	Off
Being booted by Host	Orange	Off	Off
Booted OK	Orange	Green	Off
Assigned ID by Host	Orange	Green	Green
Traffic on Link	Green	Green	Green
Error on Link	Flashing Red	Green	Green
Isolated from Host	Red/ for 20 seconds then Off	Green	Off

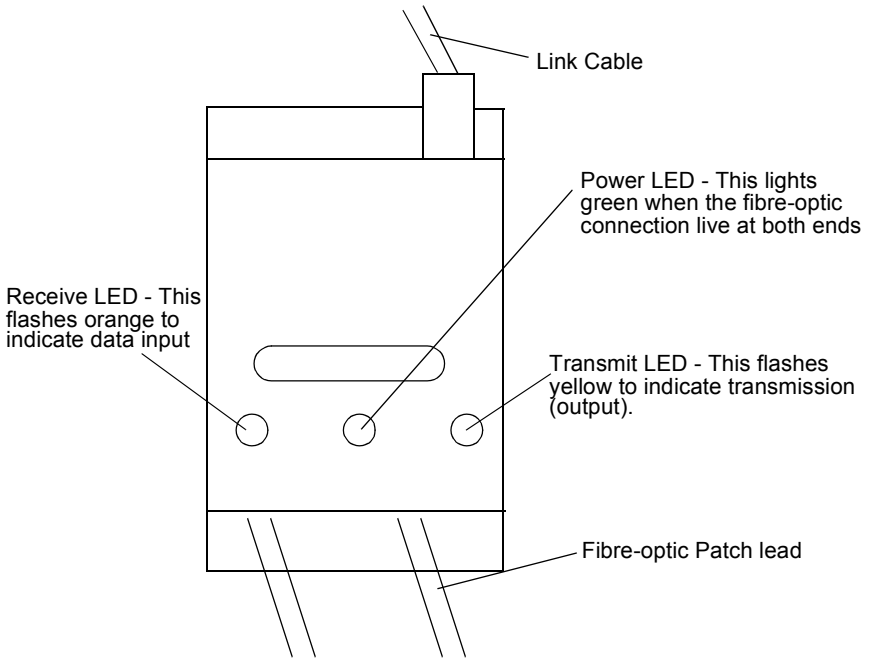
WARNING

If the CON LED does not light up, then you have already installed the maximum number of RTAs (up to 128 ports) on this host card. This situation may arise if you have previously removed RTAs from the system but not deleted them. See *'Removing an RTA'* in Chapter 7 System Management.

4.5 Installing a RIO Fibre Optic Link Kit

The RIO Fibre-optic Link Kit (FOLK) enables you to extend the range of a RIO Link, via fibre-optic cable, to one kilometre. The Kit consists of two fibre-optic modules (see Figure 8). The module consists of a one-metre RIO Link cable connected to a fibre-optic converter. This converts the transputer signals into light. The fibre-optic cable plugs into these converters, one at each end of the connection.

Figure 8 Fibre Optic Module



4.5.1 To install the FOLK

1. The fibre-optic cable should already be installed. It will probably have been wired into a junction box, and should emerge in the form of a patch lead with two bayonet connectors at the end.

2. At one end of the fibre-optic cable, plug the patch lead into the transceivers of the fibre-optic converter. Keep the caps of the transceivers safe. These should be replaced if the patch lead is removed (because any dust or dirt will impede the passage of light, thus corrupting the signal).
3. Plug the RIO Link cable into one of the Link sockets on the side of the RTA/ Host Card to be connected.
4. Repeat at the other end of the fibre-optic cable. Make sure that each strand of the fibre-optic cable is plugged into a transmit channel at one end and a receive channel at the other.
5. When the units (Host card/RTA) at each end are powered up, check that the Connect LED on each fibre-optic module is green.

Note *You will notice that on each side of the fibre-optic module is a dovetail connector. These enable adjacent modules to be connected together .*

4.6 Installing the RIO Long Distance Module

The RIO Long Distance Module (LDM) enables you to extend your RIO system in two ways:

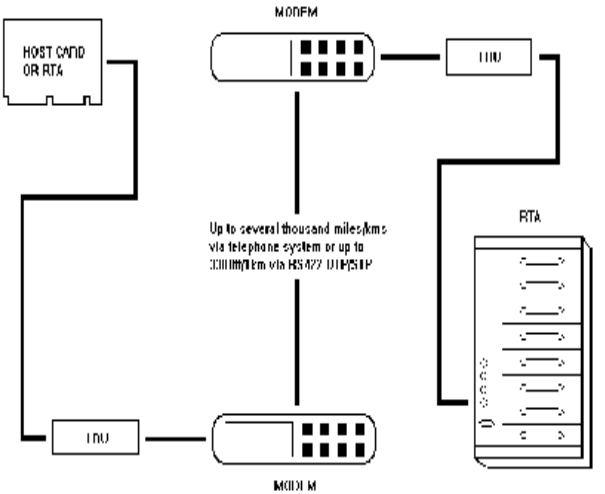
- via leased line or standard telephone connection. Connections can be made over thousands of miles using synchronous (X.21/X.21bis) or asynchronous interfaces.
- via twisted-pair RS422 "Long-wire" cable up to 1Km. This may provide a more cost-effective solution than the RIO Fibre Optic Link Kit in environments with low interference levels or a low security risk.

Note *The LDM is specifically designed for use on high-speed synchronous connections. Slower, asynchronous speeds are supported but are only recommended for applications where low throughput is acceptable.*

You can increase the number of RTAs on the remote site using standard RIO cables, making the LDM more cost-effective and more practical than a multiplexor.

The LDM consists of two Long Distance Units (LDUs). One LDU connects your local host card or RTA to a modem, the other connects the remote RTA to a modem (see Figure 9). The speed and protocol are configured using a dial on the LDU.

Figure 9 Using RIO LDM to connect your local server to remote sites

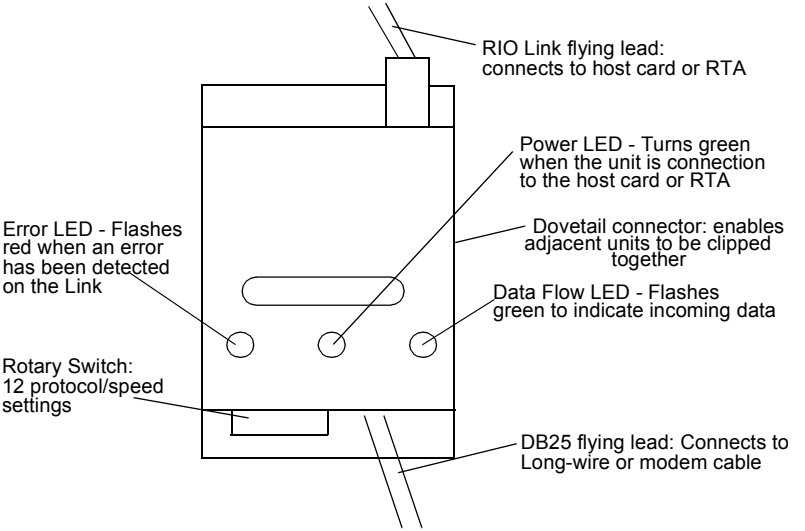


Note *Due to the limitations of telephone networks, performance will decrease with distance. For distances up to 1Km, however, the RIO Fibre Optic Link Kit (FOLK) will transmit data without noticeable performance loss.*

4.6.1 The RIO Long Distance Unit (LDU)

The LDU consists of a converter box with two flying leads (see Figure 10). One is a metre-long RIO Link cable which plugs into your host card or RTA; the other is a serial cable with a DB25 connector which connects to your modem or RS422 long-wire cable.

Figure 10 RIO Long Distance Unit



4.6.2 Installing an LDM Connection

1. For modem installations, a converter cable must be used to connect the LDU DB25 flying lead to the modem. On long-wire installations, the long-wire can be connected directly to the DB25 flying lead. Make sure your long-wire or modem cable conforms to the specifications defined in Appendix A (Port Specifications & Cabling).
2. Using a small screwdriver, set the rotary switch on each LDU to the required setting:

Switch	Line Speed	Transmission	Connection
0	9600	Asynchronous	Modem
1	19200	Asynchronous	Modem
2	38400	Asynchronous	Modem
3	RESERVED	—	—
4	RESERVED	—	—
5	78000	Asynchronous	Long-wire
6	156250	Asynchronous	Long-wire
7	312500	Asynchronous	Long-wire
8	Ext Rx, Ext Tx Clk*	Synchronous	Modem
9	Ext Rx/Tx Clock**	Synchronous	X21bis
A	Ext Rx/Tx Clock**	Synchronous	X21
B	RESERVED	—	—
C	9600	Asynchronous	Modem/Autodial
D	19200	Asynchronous	Modem/Autodial
E	38400	Asynchronous	Modem/Autodial
F	RESERVED	—	—

* Transmit and receive clocks are separate inputs.
** One clock input provides both transmit and receive clocks.

Notes

- Switches 3, 4, B and F must not be selected.
- For an asynchronous modem, select switch setting 0, 1 or 2. Select the fastest speed setting (2), unless operating in a noisy environment where a slower speed is advisable.
- If using long-wire cable, select switch setting 5, 6 or 7. Speed recommendations are as above.
- For synchronous modems, select switch setting 8.
- If you are connecting the LDM to ISDN TERMINAL ADAPTORS, choose switch setting 9 or A (depending on your installation).
- When using the autodial feature of the LDU it is only necessary to configure one end of the link to autodial; the other end should be configured as a standard modem (for example, the local LDU is set to switch position 2, the remote LDU to position E).
- Synchronous connections can be run at a maximum speed of 64Kbits/sec and a minimum speed of 14.4 Kbits/sec.
- Switch positions C, D and E should be used when connecting to modems that autodial on DTR assertion.

3. Make sure your modems are configured correctly. For synchronous modes:

   - Speeds below 14.4 Kbit/s are not supported.
   - Modems should be configured to 8 data bits.
   - Flow control must be disabled.
   - Command echo must be disabled.
   - Display of result codes must be suppressed.

   For asynchronous modes:

   - Modems must support a minimum of V32bis.
   - Modems must connect at a minimum speed of 9600 baud.
   - Modems should be set to 8 data bits, 1 stop bit and no parity.
   - Hardware flow control must be enabled.
   - Command echo must be disabled.
   - Display of result codes must be suppressed.

4. If using modems, take one of the LDUs and connect the DB25 flying lead to the modem converter cable. Connect the modem converter cable to the modem. Make sure that the modem is powered on before connecting the LDU to your RIO system

5. If using a long-wire connection, take one of the LDUs and connect the DB25 flying lead to your long-wire cable.

6. Connect the RIO Link flying lead to any free Link socket on the Host Card/ RTA to be connected.

7. Repeat for the LDU at the other end of the connection.

8. When the units (Host Card/RTAs) at each end of the LDM connection are powered up, check that the Power LED on each LDU is green.

Note *Once a connection has been established, some asynchronous modems are able to negotiate a faster line speed on the telecommunications link. If you are using such modems, your RTAs will temporarily disconnect and then reconnect at the higher speed. This is, of course, to your advantage, and the fault status messages output to the console by the RIO configuration software can be ignored.*

Note *Terminals logged in when modems are disconnected or the line dropped will continue where they left off when the line is reconnected.*

Chapter 5

Configuring RTAs

Defining an RTA

Enabling a Login Device

Enabling a Print Device

5.1 Defining an RTA

1. Enter *smit rio* at the command line to display the "Specialix RIO" menu. (alternatively, start smit, and then select Devices, Communication, Specialix RIO).
2. From this menu select 'Remote Terminal Adapter', then 'Add a Specialix RIO RTA'. All undefined RTAs connected to your host card will be listed:

```
              Remote Terminal Adapter ID

Select one item from the list
  e000106e
  e1000013
  e000000d
  e1000024


F1 = Help   F2 = Help     F3 = Cancel
F8 = Image  F10 = Exit    Enter = Do
```

The RTAs are listed by their ID numbers, detected by AIX.

3. Selected an RTA; the following form will be displayed:

```
                Add a Specialix RIO RTA

Type or select values in entry fields
Press Enter AFTER making all desired changes
  [Entry Fields]

   Unique ID                                e000106e
   RTA name                                 []

F1 = Help    F2 = Refresh    F3 = Cancel F4 = List
F5 = Undo    F6 = Command    F7 = Edit   F8 = Image
F9 = Shell   F10 = Exit      Enter = Do
```

This is the RTA Configuration form. It has two fields:

Unique ID	AIX reads the unique ID from the RTA's software. You cannot change this field.
RTA name	In this field enter a name for the RTA. We suggest you use a name describing the RTA's location or usage (e.g. 'Accounts' or 'Modems'). The name can be up to 15 characters long but cannot include spaces.

5.2 Enabling a Login Device

You can set up local and remote login connections using the AIX SMIT utilities.

1. Enter the command *smit tty* from the command line. Select 'Add a TTY'. The following menu will be displayed:

```
TTY

Move cursor to desired item and press Enter.

  tty rs232  Asynchronous Terminal
  tty rs422  Asynchronous Terminal
  tty rio    Terminal on Specialix RIO


F1=Help    F2=Refresh    F3=Cancel
F8=Image   F10=Exit      Enter=Do
/=Find     n=Find Next
```

2. Select '*Terminal on Specialix RIO'*. A list of RTAs will be displayed:

```
Parent Adaptor

Move cursor to desired item and press Enter.

  RTA0 Available rio-000 Remote Terminal Adapter (8 port)

F1=Help    F2=Refresh     F3=Cancel
F8=Image   F10=Exit      Enter=Do
/=Find     n=Find Next
```

In this example, only one RTA has been added. RTA0 is the name assigned to the RTA.

Note *If your RTA is listed as 'Defined' rather than 'Available', AIX was unable to configure the RTA at bootup. See "Troubleshooting" in Appendix B (Technical Support).*

3. Select the RTA that you want to configure the login on. The 'Add a TTY' form will be displayed:

```
Add a TTY

Type or select values in entry fields.
Press Enter AFTER making all desired changes.

[TOP]                          [Entry Fields]
  TTY type                     tty
  TTY interface                rio
  Description                  Terminal on Specialix rio
  Parent adaptor               rta0
  *PORT number                 []
  BAUD rate                    [9600]
  PARITY                       [none]
  BITS per character           [8]
  Number of STOP BITS          [1]
[MORE...]

F1=Help      F2=Refresh     F3=Cancel     F4=List
ESC+5=Reset  F6=Command     F7=Edit       F8=Image
F9=Shell      F10=Exit        Enter=Do
```

4. Complete the fields as described below:

Port number The host card recognizes whether 8 or 16 port RTAs are connected, and names the unit's ports 0-7 or 0-15.

BAUD rate You are presented with the following baud rates: 50, 75, 110, 134,150, 200, 300, 600, 1200, 1800, 2400, 4800, 9600, 19200 and 38400.
Recommended Value: 9600

Note *The speed 50 is mapped to 57600 baud. The speed 110 is mapped to 115200 baud. So, to select 57600 baud on a Specialix port, for example, you should select 50 baud in the 'BAUD rate' field. This mapping can be disabled in the 'Change/Show Host Card' option*

PARITY Recommended Value: no parity

BITS per character Recommended Value: 8

Number of STOP BITS Certain applications and system functions are tailored to specific terminal types. Terminals do not identify themselves to the system so this field can be used to set the TERM environment variable. This field also controls transparent print *on* and *off* strings.

Terminal Type Certain applications and system functions are tailored to specific terminal types.Terminals do not identify themselves to the system so this field can be used to set the TERM environment variable. This field also controls transparent on and off strings.

Status of device at BOOT time Make sure this field is set to available.

Enable Login This attribute indicates the type of login connection required. The available values are:

enable This is the most commonly used setting for local or dial-in modem connections. It instructs a *getty* to be run on the port.

share For bidirectional modem connections, this setting allows dial-in and dial-out processes to share the port. The *getty* process will wait for a dial-out process to finish before attempting to open the port.

delay Similar to 'share', but a keystroke must be received from the user before the login prompt is displayed.

disable Indicates that no *getty* process is to be run on the port.

STTY attributes for RUN time This field enables you to specify a list of *stty* attributes to be used after the user has logged in. By default, most relevant attributes are set for you. For local terminal connections, make sure the default 'clocal' flag is present in this field. For dial-in and bidirectional modem connections, make sure that clocal is not included. If you want to use software flow control, make sure that the *ixon* and *ixoff* flags are included in this field.

STTY attributes for LOGIN This field enables you to specify a list of *stty* attributes to be used while the user attempts to log in. This is usually a subset of the attributes valid during run time since few of these are required before login. Again, most relevant attributes are set for you.

5. When you have completed the form, press Enter to add the TTY to the database. A command status report will be displayed:

```
COMMAND STATUS

Command: OK      stdout: yes     stderr: no

Before command completion, additional instructions may
appear below.

tty1 Available



F1=Help    F2=Refresh    F3=Cancel    F6=Command
F8=Image   F9=Shell        F10=Exit
```

AIX will assign the lowest unassigned tty number to the port. For this reason, we recommend that you configure your RTAs in order.

Note *If the message 'Command: failed' is displayed, the tty has not been added to the database. Some kind of error message will be displayed by SMIT. The most likely cause is that you haven't completed the form correctly. Press F3 to return to the form.*

Note *Ports may be reconfigured or removed but they must not be in use at the time. Therefore, if a port is in use, disable login on a port via the 'Change/Show Characteristics of a TTY' option on the SMIT TTY menu. Use the same option for reconfiguring a port. For removing a port use the 'Remove a TTY' option.*

5.3 Enabling a Print Device

This section describes how to add a printer and a print queue. RIO will support both direct serial and parallel printing (printer attached to RTA serial port) or transparent printing (printer attached to terminal).

Note *You must have login enabled on a port before using transparent printing. See Section 5.1 (Enabling a Login Device).*

5.3.1 Adding a Printer

1. Use the FastPath command *smit pdp* to display the Printer/Plotter Devices menu. Select 'Add a Printer/Plotter'. A list of printer/plotter devices will be displayed:

```
Printer/Plotter Type

Move cursor to desired item and press Enter.

[TOP]
  2380   IBM 2380 Personal Printer II
  2381   IBM 2381 Personal Printer II
  2390   IBM 2390 Personal Printer II
  2391   IBM 2391 Personal Printer II
  3812-2 IBM 3812 Model 2 Page Printer
  3816   IBM 3816 Page Printer
  4019   IBM 4019 LaserPrinter
  4019   IBM 4019 LaserPrinter
  4029   IBM 4029 LaserPrinter
  4039   IBM 4039 LaserPrinter
  4070   IBM 4070 IJ printer
[MORE...]

F1=Help   F2=Refresh    F3=Cancel
F8=Image  F10=Exit     Enter=Do
/=Find    n=Find Next
```

2. Select the model of printer you are going to attach. You will next be asked to select the appropriate printer interface:

```
                Printer/Plotter Interface

Move cursor to desired item and press Enter

parallel
rs232
rs422
rio_xp
rio

F1=Help    F2=Refresh     F3=Cancel
F8=Image   F10=Exit       Enter=Do
/=Find     n=Find Next
```

3. Select *rio* for direct printing or *rio_xp* for transparent printing (printer attached to the rear of a terminal). If you select the direct printing device, you will next be asked to select which RTA the printer is attached to. If you selct the transparent print device, you will be askedto select which terminal the printer is attached to. When you have selected, the printer configuration form will be displayed:

```
Add a Printer/Plotter

Type or select values in entry fields.
Press Enter AFTER making all desired changes.

[TOP]                              [Entry Fields]
  Printer/Plotter type             2380
  Printer/Plotter interface        rio    (or rio_xp)
  Description                      IBM2380
  Personal
                                   print>
  Parent adaptor                   rta0
  *PORT number                     []              +
  BAUD rate                        [9600]          +
  PARITY                           [none]          +
[MORE...]

F1=Help    F2=Refresh     F3=Cancel     F4=List
F5=Undo    F6=Command     F7=Edit       F8=Image
F9=Shell    F10=Exit        Enter=Do
```

The "Printer/Plotter Interface" field will show *rio* or *rio_xp*, depending on your choice of printer.

4. In the PORT Number field, select a port number not in use by a TTY or other printer. For transparent printing, press F4, (this action selects the option 'transparent').
5. For other specific configuration requirements (where the default will not suffice), check your printer's specification.
6. Press Enter when you have completed the form. Confirmation that the printer has been added will be displayed. For direct printing, an example is:

```
COMMAND STATUS

Command: OK        stdout: yes    stderr: no

Before command completion, additional instructions
may appear below.

lp0   Available

F1=Help   F2=Refresh    F3=Cancel    F6=Command
F8=Image  F9=Shell  F10=Exit
```

The printer is assigned the next available print device name (lp0 in this example).

For transparent printing, the status screen is updated as in the following example

```
COMMAND STATUS

Command: OK        stdout: yes    stderr: no

Before command completion, additional instructions
may appear below.

xp0   Available

F1=Help   F2=Refresh    F3=Cancel    F6=Command
F8=Image  F9=Shell  F10=Exit
```

5.3.2 Adding a Print Queue

1. Enter the FastPath command `smit printer` to display the Printer/Plotter menu.
2. Select 'Print Spooling', then select 'Add a Print Queue'. The following menu will be displayed:

```
Attachment Type. Description

local      Printer attached to Local Host
remote     Printer attached to Remote Host
xstation   Printer attached to Xstation
ascii      Printer attached to ASCII terminal
(more)

F1=Help    F2=Refresh     F3=Cancel
F8=Image   F10=Exit       Enter=Do
```

3. Use 'Printer attached to Local Host' for both direct and transparent printing.
4. Next you will be asked to specify a printer for this print queue:

```
  Name      Description
  lp0       IBM 4201 Model 3 Proprinter III

Enter device name (or! to exit): (lp0) ->
```

If your printer is not on the list, select one of the generic terms (e.g. postscript printer). Select the required printer by pressing Enter.

5. The next prompt asks you for a print queue:

```
Enter print queue name:    -> (lp0)
```

You can specify an existing queue or a new queue. The default queue is displayed in brackets. The default queue is used when a print request is made without specifying a print queue.

Note *Queue names cannot exceed 20 characters.*

6. When you have entered the print queue, a confirmation message will be displayed, for example:

```
4201-3 configured for printer queue lp0

Press Enter to continue.
```

The printer queue is now available for use with the AIX `enq`, `qprt`, `lpr` and `lp` commands.

5.3.3 Reconfiguring a Print Queue

From the 'Devices' menu, select 'Printer/Plotter', followed by 'Print Spooling', followed by one of the following:

'Add a Print Queue'

'Change/Show Print Queue Characteristics'

'Remove a Print Queue'

For more information on the other options shown on this screen, refer to your AIX documentation; (the options are not related to the RIO software).

Chapter 6

RIO Dual Host Failsafe

6.1 What is RIO Dual Host Failsafe?

RIO enables you to protect against server failure by connecting your RTA subsystem to two host cards, installed in separate machines. If one host fails, the other takes control of the RTAs.

In the form described in this manual, RIO Dual Host Failsafe provides support where the switch to the reserve host is initiated manually. RIO does not provide automatic host-switching, but it does provide the support for such a system if installed.

Recommendations for an advanced dual host failsafe system are two servers sharing a RAID disk array and watchdog software, which you can obtain from a third party. Using these products you will need to set up background processes to ensure that RIO's RTA and port information is kept up-to-date on the reserve host.

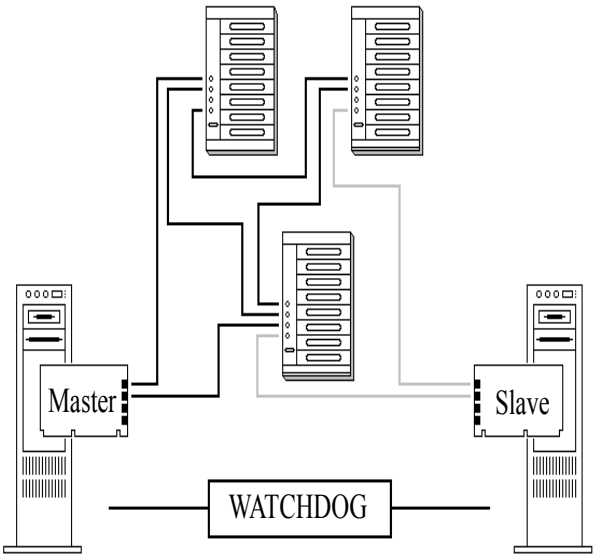
Note *In a Dual Host Failsafe configuration, only one RIO Host Card can be installed in each server.*

The relationship between the two hosts in a Dual Host Failsafe system may take two forms: Master/Slave or Shared.

6.1.1 Master/Slave mode

The simplest form is the **master/slave** mode in which a second host card (the slave) is connected to a complete RIO system (the master). If the master host fails, the slave host will take control of the RTA subsystem (see Figure 11).

Figure 11 A Master/Slave Dual Host Failsafe Configuration

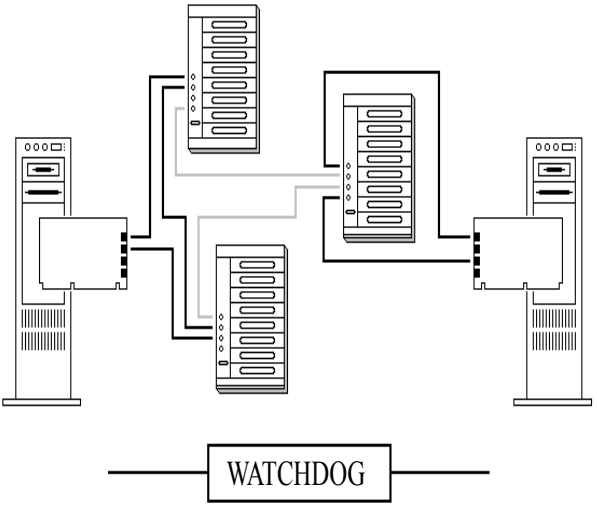


In master/slave mode, the slave host exists solely to provide support for the master system.

6.1.2 Shared Mode

RIO Dual Host Failsafe also supports the combining of two complete RIO systems, i.e. two RIO systems supporting their own RTAs (see Figure 12). The RTAs in such **shared** systems are 'owned' by their respective host cards. If one host card fails, its RTAs will be adopted by the other host.

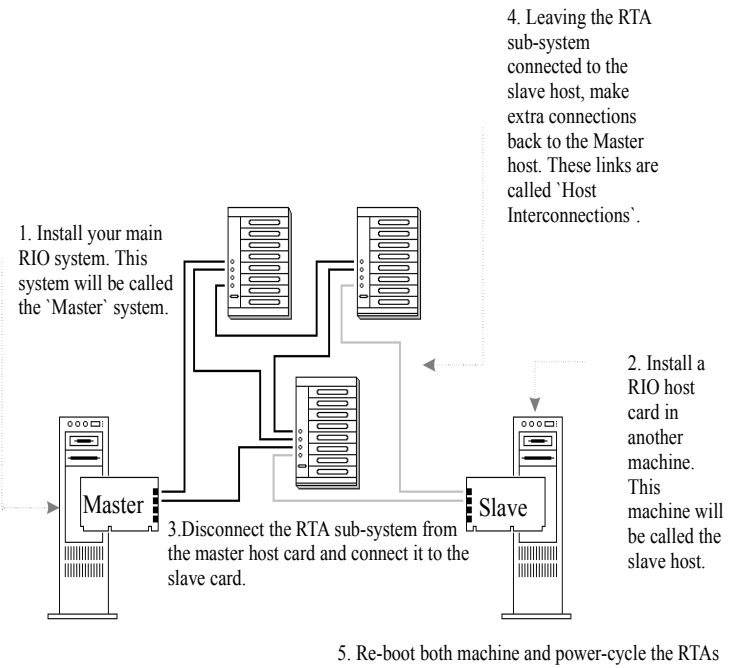
Figure 12 A Shared Dual Host Failsafe Configuration



6.2 Installing a Master/Slave Dual Host System

The steps required to configure a master/slave dual host failsafe system are outlined in Figure 13 and listed here:

Figure 13 The four main steps to installing a Master/Slave Dual Host Failsafe system



1. Install and configure your main (master) RIO system.

2. Using the "Save RIO Device Configuration" option on the smit RIO menu (see Section 7.15 Save RIO Device Configuration), save the configuration of your master RIO system to file.

3. Install a RIO host card and device driver in the slave machine, but do not connect the slave host to the RTA subsystem yet.

4. Disconnect physically the RTA sub-system from the master host card and connect it to the slave card.

5. Copy the directory /usr/tmp/riocnf and its contents from the master system to the slave system. This is where the RIO configuration information is saved. Now load the configuration information using the "Load RIO Device Configuration" option on the smit RIO menu (see Section 7.16 Load RIO Device Configuration).

6. On the slave card, in SMIT, use the option 'Change/Show Characteristics of a Specialix RIO Host Adapter' to set the slave card to 'slave'.
7. Leaving the RTA sub-system connected to the slave host card, use standard RIO cabling to make extra connections back to the master host card. Ensure that all RTAs have at least one route to the master host, and that all RTAs are protected by fault tolerant links. You can use as many of the master host's links as you need.
8. Re-boot both machines simultaneously. At the same time power-cycle the RTAs. (The exact order of all these actions is not important, provided you do them all at approximately the same time).

Your Dual Host Failsafe system should now be set-up

6.2.1 When the Master Host Fails

If your master host fails, use the instructions below to switch control of the RTA subsystem to the slave host. If you want to automate the process you will need to install watchdog software to monitor both servers, and run the appropriate commands on the slave host when required.

1. Go to the slave host and in the option 'Change/Show Characteristics of a Specialix RIO Host Adapter', change the host card from 'slave' to 'master'.
2. Reboot interconnected RTAs using the "Reboot RTAs" feature on the Remote Terminal Adapters menu (see Section 7.9 Reboot RTAs).
3. The original slave host card, now configured as 'master', should be able to run your RTA system, while you attend to the failed host.
4. While repairing the failed master host, when you power it up and down, the RTAs will remain under the control of the working host (now acting as the master).

6.2.2 When the failed host is available again:

Assuming you want the failed master to resume control of the RTAs, do the following:

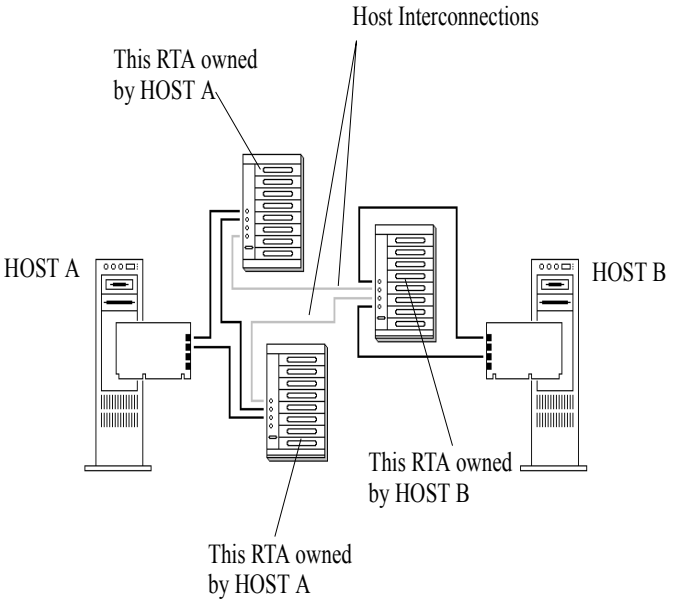
1. Ensure the repaired machine is turned off.
2. On the working machine, in the option 'Change/Show a Specialix RIO Host Adapter', change the host card from 'master' back to 'slave'.
3. Leave all the physical connections between RTAs and the two host cards in place.
4. Turn on the repaired master host machine.

5. On the master, reboot interconnected RTAs using the "Reboot RTAs" feature on the Remote Terminal Adapters menu (see Section 7.9 Reboot RTAs).

6.3 Installing a Shared Dual Host Failsafe System

Follow the procedure outlined below, referring to Figure 14:

Figure 14 The Mechanics of a Shared Dual Host Failsafe System



1. Install host card A, connect and configure the RTAs that you want owned by host A. Using fault tolerant links, make sure each RTA has at least one route to the host card.
2. Install host card B, connect and configure the RTAs owned by host B.
3. Using standard RIO cabling, make the additional links between the RTAs of Hosts A and B. Such links are called **host interconnections**. For each host card, in the option 'Display the Configuration of an RTA', the additional links will show as '....connected to another network'.

4. Note the configuration settings (RTA and TTY) of each machine. We suggest you do this manually.

6.3.1 When one host fails:

1. Ensure the failed machine is shutdown.
2. Power cycle manually the RTAs connected to the failed machine. These RTAs will then become adopted by the host card in the working machine.
3. In the working machine go to the options 'Add a Specialix RIO RTA' and 'Add a TTY' and copy in the settings on the newly adopted RTAs
4. The working machine will be able to manage your RTA system while you attend to the failed host.
5. Leave in place the host interconnection links.
6. While repairing the failed master host, when you power it up and down, the RTAs will remain under the control of the working host.

6.3.2 When the failed host is available again:

1. Ensure the repaired host is shutdown.
2. Disconnect physically the host interconnection links. The RTAs will then be attached only to their original host cards. Leave the power connections to the RTAs in place.
3. Turn on the repaired host. The RTAs will still be "owned" by the working host.
4. Reboot interconnected RTAs using the "Reboot RTAs" feature on the Remote Terminal Adapters menu (see Section 7.9 Reboot RTAs).
5. Re-connect the host interconnections. The two RIO systems should resume managing their own RTAs.

Chapter 7

System Management

7.1 Draw RIO RTA Topology

To help you keep track of the RTAs in your RIO network, SMIT creates a diagrammatic illustration of each RIO system installed in your machine. These 'RTA Topologies' show the host card, remote terminal adapters, RIO links and even the link sockets that each link cable is plugged into.

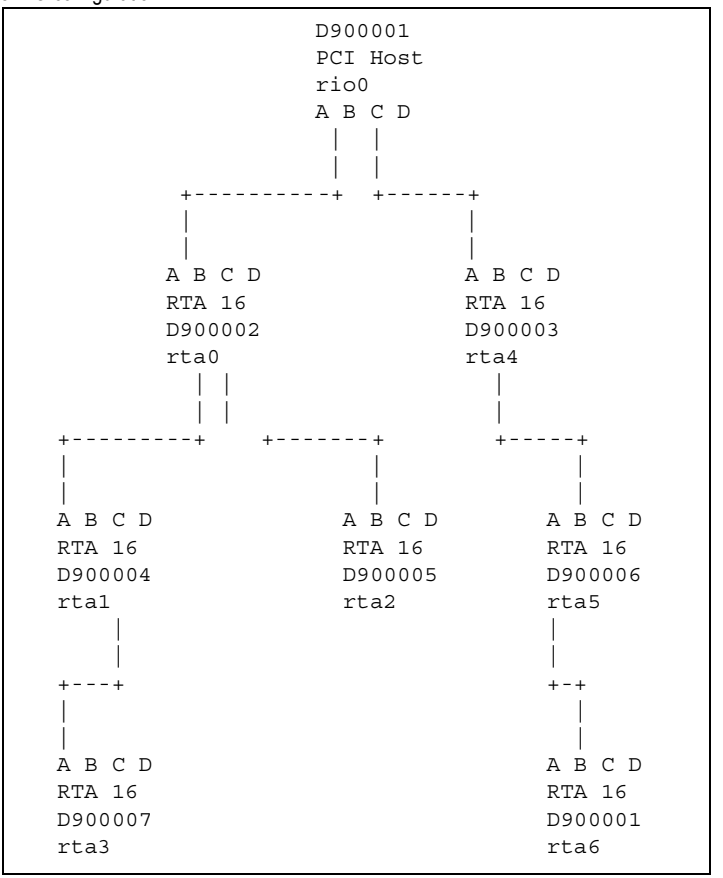
RTAs are detected as soon as they are connected. Before they are defined they are identified by their internal ID numbers.

1. Use the FastPath command `smit rio` to access the Specialix RIO menu. From this menu select 'Remote Terminal Adapters'. The following menu will be displayed

```
                RIO Remote Terminal Adapter

Move cursor to desired item and press Enter.

  List Specialix RIO RTAs
  Add a Specialix RIO RTA
  Draw Specialix RIO RTA Topology
  Adopt new Specialix RIO RTA
  Reboot Specialix RIO RTAs
  Identify a Specialix RIO RTA
  Remove a Specialix RIO RTA


F1=Help       F2=Refresh    F3=Cancel     Esc+8=Image
Esc+9=Shell   Esc+0=Exit    Enter=Do
```

2. Select 'Draw Specialix RIO RTA Topology' and then select which RIO system you want to display. The RTA Topology for this host card will be displayed:

Figure 15 Example RIO configuration



Note *If you have fault tolerant links installed, your RTA Topology may not look how you expect. See Section 7.2 Adding a Fault Tolerant Link.*

7.2 Adding a Fault Tolerant Link

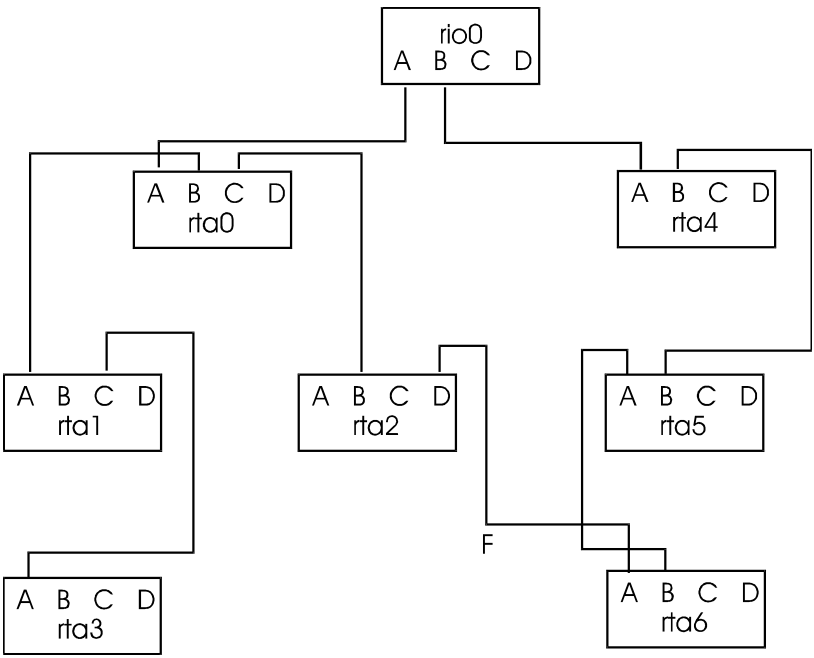
Fault tolerant links can be added to your system at any time without powering your system down.

On the RTA Topology, fault tolerant links are displayed as normal links but may result in the topology taking on a completely different look.

By their nature, fault tolerant links connect different branches of an RTA network - creating a loop. When the RTA Topology is drawn, one branch would be seen as an extension of the other, not a separate branch.

Using the example configuration in the previous section, a fault tolerant link could be added to connect rta2 and rta6 (see below).

Figure 16 Example RIO Configuration with Fault Tolerant Link



The fault tolerant link has effectively connected Links A and C on the host card. When the topology gets to rta2, it now finds link D connected to rta6 and so on. The RTA network connected to Link C will now be treated as an extension to the RTA network connected to Link A.

The topology would not read the configuration again, in reverse order, from Link C on the host card.

7.3 Link Failure or Disconnection

In the event of link failure or disconnection, data will either be buffered until the link is restored or re-routed automatically via a fault tolerant link. Data will not be lost (unless an RTA is switched off). If data is buffered, users will experience a delay.

Link failure can be diagnosed by looking at an RTA's LEDs or the RTA Topology.

The LED on a failed link will turn red (for about 20 seconds) and then die. If the RTA has been isolated by the link failure, the LED next to port 5 will die as well.

If you display the RTA Topology after a link has failed, you will find that the failed link and any isolated RTAs are not displayed. They will reappear, however, if the topology is redisplayed once the link has been restored.

Note *The RTA Topology may be constructed differently if a fault tolerant link becomes an RTA's primary route to the host card. This effect is explained in Section 7.2 Adding a Fault Tolerant Link.*

7.4 Adding a New RTA

Remote terminal adaptors can be added without powering your system down. They will be added to the RTA Topology automatically, initially recorded by their internal ID number. They must be defined in the database as normal (see Chapter 5 (Configuring RTAs).

You can install up to 128 ports on a host card using 8 and 16 port RTAs. Above this number, RTAs will be rejected.

Note *If you have removed RTAs from the network without deleting them from the configuration as well, you may reach the point where RIO thinks there are sixteen RTAs installed when there aren't. See Section 7.5 Removing an RTA.*

7.5 Removing an RTA

You can remove an RTA without having to power your system down. However, this causes the same effect as disconnecting a link cable so take care not to isolate any other RTAs. You can prevent RTA isolation by the use of fault tolerant links.

If you display the RTA topology you will notice that the removed RTA is no longer displayed. If you were to reconnect the RTA, and re-display the topology, the RTA would reappear.

To remove an RTA, type `smit rio`, select 'Remote Terminal Adapter', then select 'Remove Remote Terminal Adapter'. More details are provided below.

7.5.1 Temporary Removal

If you are removing the RTA to have it tested or repaired, you may want to bring it down to the 'Defined' state in the configuration database. In this state, it won't be displayed on the topology. To do this, disconnect the RTA and reboot your machine. When the machine starts up again, the RTA and any devices assigned to it will have changed to the 'Defined' state.

When you re-install the RTA, its internal ID will be automatically matched with the 'saved' definition. Run the command `mkdev -l <rta name>` from the shell prompt to bring the RTA up to the 'Available' state again. The associated 'Defined' devices can be configured using the 'Configure a Defined TTY' option (FastPath = `smit tty`); the associated 'Defined' print devices can be configured using the 'Configure a Defined Printer/Plotter' option (FastPath = `smit pdp`).

7.5.2 Permanent Removal

If you are removing an RTA permanently it is important to delete it from the database as well. This will add the port numbers that were assigned to the RTA to the list of available port numbers. Furthermore, failing to delete RTAs from the configuration may cause the situation where RIO thinks that the maximum number of RTAs have been installed. In this situation, any new RTAs added to the system will be rejected. Deleting an RTA is described below.

7.5.3 Deleting an RTA

To delete an RTA from the configuration database, use the following procedure:

1. Delete all the ttys, print devices and print queues associated with the RTA.
2. Make sure the RTA is physically disconnected from the host card.
3. Use the FastPath command `smit rio` to access the Specialix RIO menu. From this menu select 'Remote Terminal Adapter'. Then select 'Remove a Specialix RIO RTA'. A list of RTAs will be displayed. This list will include RTAs connected to all host cards installed in your machine. Select the RTA that you want to delete.

   The following form will be displayed:

```
           Remove a Specialix RIO RTA

Type or select values in entry fields.
Press Enter AFTER making all desired changes.

                                      [Entry Fields]
* Adapter Name                        rta7
  Keep Definition in Database?    no

F1=Help       F2=Refresh   F3=Cancel   F4=List
F5=Undo       F6=Command   F7=Edit     F8=Image
F9=Shell      F10=Exit     Enter=Do
```

4. This form has just one field for you to set - whether you want to keep the RTA's definition or not. This should be set to 'no'. Press Enter to execute.

7.6 Moving an RTA

RTAs that have been defined in the database can be moved around your RIO system without further configuration. The device driver will detect their ID and configuration automatically, and will relocate them in the RTA Topology.

The main consideration, here, is whether the removal of the RTA from its original location will cause the isolation of any other RTAs. Isolation of RTAs can be prevented with the use of fault tolerant links.

7.7 List RTAs

The 'List Specialix RIO RTAs' option on the Remote Terminal Adapters menu will display the name, status and location of all the RTAs defined on your system. This includes RTAs connected to all RIO host cards installed in your machine. The RTAs will be listed in the order they were defined. RTAs that haven't been defined will not be listed.

The form looks as follows:

```
                    COMMAND STATUS

Command: OK    stdout: yes     stderr: no

Before command completion, additional instructions
may appear below.

name status  location         description

rta0        Available rio-000  Specialix RIO RTA
rta1        Available rio-001  Specialix RIO RTA
rta2        Available rio-002  Specialix RIO RTA
rta3        Available rio-003  Specialix RIO RTA
rta4       Available rio-004 Specialix RIO RTA

F1=Help     F2=Refresh   F3=Cancel   F6=Command
F8=Image    F9=Shell     F10=Exit
```

7.8 Adopt New RTA

The function 'Adopt new Specialix RIO RTA' can be employed after an RTA had to be replaced, to integrate the new RTA into the system with as little effort as possible.

Note *This function is only intended for the cases where the RTA is replaced with an adapter of the same type (e.g. 8-port).*

Proceed as follows:

1. Install the replacement RTA as described inChapter 4 (Installing Remote Terminal Adapters). Make sure it has booted correctly.
2. Use the FastPath command `smit rio` to display the Specialix RIO menu. From this menu, select 'Remote Terminal Adapter'.

3. In the menu 'RIO Remote Terminal Adapter' select 'Adopt new Specialix RIO RTA'
4. You are prompted for the old RTA name
5. Select the old RTA name, and then select the unique ID name of the replacement RTA.
6. Once booted again, the new RTA will be integrated into the system after its next reboot.

7.9 Reboot RTAs

RTAs may need to be rebooted after a reorganisation of links or after a Dual Host Failsafe operation.

1. Use the FastPath command `smit rio` to display the Specialix RIO menu. From this menu, select 'Remote Terminal Adapters'.
2. Select 'Reboot Specialix RTAs', and then press Enter.
3. You are prompted to select one of the two options:
   a. Reboot Connected RTAs
   (Connected RTAs have a known route to the host that booted them.)
   b. Reboot Interconnected RTAs
   (Interconnected RTAs no longer have a route to the host that booted them, e.g. after a Dual Host Failsafe operation.)

7.10 Identify an RTA

This function helps to identify which physical RTA is associated with which name (e.g. RTA0).

Proceed as follows:

1. Use the FastPath command `smit rio` to display the Specialix RIO menu. From this menu, select 'Remote Terminal Adapter'.
2. Select 'Identify Specialix RIO RTAs'
3. Select the name of the RTA you want to identify

   The LEDs on the RTA associated with the selected name will flash until the Enter key is pressed.

7.11 Adding a Host Card

If you are going to install another RIO host card (i.e. another RIO system) you must shut down AIX and switch your machine off. Install the host card as described in Chapter 3 (Installing the Host Card).

7.12 Removing a Host Card

Before removing a host card you must shut down AIX and switch your machine off.

When the machine has been rebooted, the host card will be flagged as 'Defined'. If you subsequently re-install the host card it will be matched up with its saved definition.

If you are removing the host card permanently, or replacing it with a new card, you should delete the definition of the host card from the device configuration database. This is described below:

7.12.1 Deleting a Host Card

To delete a host card from the configuration database, use the following procedure (see Section 7.5 Removing an RTA).

1. Delete all the RTAs associated with the host card from the configuration database.
2. Use the command *smit rio* to display the Specialix RIO menu. From this menu, select 'Host Adaptor'. From the 'Host Adaptor' menu, select 'Remove a RIO Adaptor'. A list of your host cards will be displayed; select the one you want to delete. The following form will be displayed:

```
            Delete A RIO Host Adaptor

    Type or select values in entry fields.
Press Enter AFTER making all desired changes.
                                [Entry Fields]
*Adaptor Device                 rio0
 Keep Definition?               yes

F1=Help    F2=Refresh    F3=Cancel    F4=List
F5=Undo    F6=Command    F7=Edit      F8=Image
F9=Shell    F10=Exit       Enter=Do
```

This form has just one field for you to set - whether you want to keep the definition of the host card or not. This should be set to 'no'. Press Enter to execute.

7.13 Display the Configuration of a Host Card

You can display the memory address, interrupt level and interrupt priority of any RIO host card. Use the FastPath command `smit rio` to display the Specialix RIO menu. From this menu, select 'RIO Host Adapter'. Then select 'Change/Show a Specialix RIO Host Adapter'. A list of your host cards will be displayed; select the one you want.

The configuration screen looks like this:

```
      Change/Show a Specialix RIO Host Adapter

Type or select values in entry fields.
Press Enter AFTER making all desired changes.

                                    [Entry Fields]
Adapter Name                        rio0
Bus Memory address                  0xc0000
Bus Interrupt level                 15
Adapter master/slave mode           [master]
Adapter fast baud rate mapping      [on]
Adapter Swap DCD/DTR mode           [off]
Adapter polled mode                [on]


F1=Help       F2=Refresh     F3=Cancel   F4=List
Esc+5=Reset   Esc+6=Command  Esc+7=Edit  Esc+8=Image
Esc+9=Shell   Esc+0=Exit     Enter=Do
```

The user-configurable fields are described as follows:

Adapter master/ slave mode Enables you to set a host card as the master or slave in a master/slave Dual Host System

Fast baud rate mapping *on* indicates that the speed 50 is mapped to 57600 Baud, and speed 110 is mapped to 115200 baud

off indicates that the speed 50 represents 50 Baud, and speed 110 represents 115200 Baud

Swap DTR/DCD Mode	This option defines whether it is the logic on pin 20 (DCD) or the one on pin 8 (DCD) that sends SIGHUP.
Polled mode	Forces the host card to use software timeouts instead of interrupt requests.

7.14 List Host Cards

You can list the RIO host cards installed in your machine. The list will include the name, status and location (in the machine) of each host card.

Use the `smit rio` command to display the Specialix RIO menu. From this menu, select the 'RIO Host Adapter' option. From the RIO Host Adapter menu, select 'List All RIO Adapters'. Your host cards will be listed:

```
                        COMMAND STATUS

Command: OK       stdout: yes       stderr: no

Before command completion, additional instructions may
appear below.

name  status    location description
rio0  Available 00-01x  Specialix RIO Host Adapter (PCI)
rio1  Available 00-02x  Specialix RIO Host Adapter (PCI)


F1=Help    F2=Refresh    F3=Cancel    F6=Command
F8=Image   F9=Shell      F10=Exit
```

Host cards are listed in the order that they were installed.

The status of a host card can be 'Available' or 'Defined'. If 'Available', the host card is installed and configured. If 'Defined' the host card has been removed but the definition saved in the database.

7.15 Save RIO Device Configuration

You can save a snapshot of all RIO devices and their configuration. This feature can be used to build a mirror slave server, or to save a complete configuration before an AIX or RIO upgrade.

1. Type the command:

   ```
   smit rio
   ```

   The Specialix RIO main menu will be displayed.
2. Select the option 'Save RIO device configuration' and press Enter.
3. The configuration information is saved to the directory /usr/tmp/riocnf.

7.16 Load RIO Device Configuration

You can reload a snapshot configuration created by the feature 'Save RIO device configuration' (see section above). This feature can, for example, be used to regenerate a RIO configuration after an AIX or RIO upgrade.If using this feature to create a slave dual host failsafe system, make sure you have copied the directory /usr/tmp/riocnf and its contents from the master host onto the slave host.

1. Type the command `smit rio`

   The Specialix RIO main menu will be displayed.
2. Select the option 'Load RIO device configuration' and press Enter

7.17 Remove all RIO Devices

You can remove all devices and their configuration that are associated with RIO. This feature can, for example, be used to prepare a system upgrade.

1. Type the command `smit rio`

   The Specialix RIO main menu will be displayed.
2. Select the option 'Remove all RIO devices'.
3. Press Enter
4. You will be prompted to confirm this action
5. Press Enter

Appendix A

Port Specifications & Cabling

A.1 Overview

This appendix describes pin specifications of the various types of connectors. It also guides you in cabling your devices to equipment.

The contents of this appendix is pin specifications,example connections for most Perle connectors, and various RIO product cabling specifications.

Pin specifications:

Connection examples:

- for Direct (1:1) connections, see mini-Table of Contents at Section A.8.1.
- for Structured Cabling Systems, see mini-Table of Contents at Section A.23.1

RIO product cabling specifications:

- RIO Long Distance Unit (LDU) Section A.30
- RIO Link Cable Section A.31
- Fibre Optic Cable Section A.32

A.2 RS232 DB25 Ports (Female) DCE

These ports provide a full RS232 interface for serial devices. The female DB25 connectors are wired as RS232 Data Communications Equipment (DCE).

Use a straight through cable to be used when connecting to DTE devices such as terminals. When connecting to other DCE devices, such as modems, a crossover cable must be used. Connection examples are shown in:

Section A.7 Direct (1:1) Connections, Example Connections, and Section A.22 Structured Cabling Systems, Example Connections.

The RS232 DB25 DCE serial pinouts are:

Table 6
RS232 DB25 (female) pin-outs

Pin	Circuit	Direction	Function
1	P/GND	-	Connect to case
2	RXD	Input	Receive Data
3	TXD	Output	Transmit Data
4	RTS	Input	Transmit Hardware Flow Control
5	CTS	Output	Receive Hardware Flow Control
6	DSR	Output	Data Set Ready
7	S/GND	-	Connect to logic 0V
8	DCD	Input	Data Carrier Detect
20	DTR	Input	Data Terminal Ready
22	RI	Input	Ring Indicator

Notes:

1. P/GND means Protective (Chassis) Ground
2. S/GND means Signal Ground

Note: *Optionally you can order these ports with* ***surge suppression.*** *This feature enables the ports to absorb high static discharges and surges. Contact your supplier for more information.*

A.3 RS232 DB25 Ports (Male) DTE

These ports provide a full RS232 interface for serial devices. The male DB25 connectors are wired as RS232 Data Terminal Equipment (DTE).

You can use straight (pin 1 to pin 1, etc.) connections to Data Communications Equipment (DCE) such as modems. When connecting to other DTE devices, such as terminals, a crossover cable or device must be used. Connection examples are shown in:

Section A.7 Direct (1:1) Connections, Example Connections, and Section A.22 Structured Cabling Systems, Example Connections.

The RS232 DB25 DTE serial pin-outs are:

Table 7 RS232 DB25 (male) pin-outs

Pin	Circuit	Direction	Function
1	P/GND	—	Connect to case
2	TXD	Output	Transmit Data
3	RXD	Input	Receive Data
4	RTS	Output	Receive Hardware Flow Control
5	CTS	Input	Transmit Hardware Flow Control
6	DSR	Input	Data Set Ready
7	S/GND	—	Connect to logic 0V
8	DCD	Input	Data Carrier Detect
20	DTR	Output	Data Terminal Ready
22	RI	Input	Ring Indicator

Notes:

1. P/GND means Protective (Chassis) Ground
2. S/GND means Signal Ground

Note: *Optionally you can order these ports with* ***surge suppression.*** *This feature enables the ports to absorb high static discharges and surges. Contact your supplier for more information.*

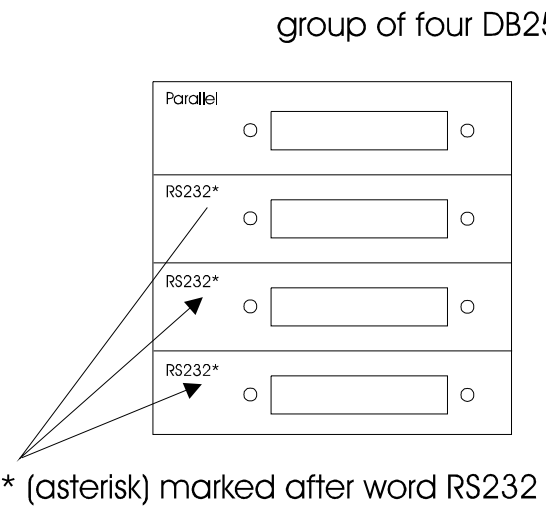
A.4 RS232* (asterisk) DB25 Ports

On the casing of your product, you may have DB25 ports marked with an asterisk after the letters RS232. These RS232 ports have reduced capability: they do not support the Ring Indicator (RI) or Data Terminal Ready (DTR) signals. When cabling your devices to a RS232* port, bear in mind this limitation.

See pin-out details for DB25 connectors in Table 6 or Table 7.

The RS232 * ports are part of an option where a parallel port is provided; see Figure 17. One of the ports in the group is a parallel port.

Figure 17
RS232* ports



Note: *As an option you can have order the RS232* ports with surge suppression capability. This feature allows the ports to absorb high static discharges and surges.*

A.5 RS232 RJ45 ports (with shielded connector)

The shielded RS232 RJ45 ports comply with the RS232 specification.

Note: *(There is an older non-shielded version of these ports; see Section A.6 RJ45 Ports (no shielding).*

Connection examples are shown in:

Section A.7 Direct (1:1) Connections, Example Connections, and Section A.22 Structured Cabling Systems, Example Connections.

The pin-outs are shown in Table 8.

Table 8 shielded RJ45 pin-outs

Pin	Circuit	Direction	Function
1	DCD	Input	Data Carrier Detect
2	DSR	Output	Data Set Ready
3	DTR	Input	Data Terminal Ready
4	S/GND	—	Signal Ground
5	TXD	Output	Transmit Data
6	RXD	Input	Receive Data
7	CTS	Output	Clear To Send
8	RTS	Input	Request To Send
Shield	P/GND	—	Protective (Chassis) Ground

Caution: *the pin-outs above are different from those of the earlier version of these ports, the RJ45 non-shielded ports.*

Notes:

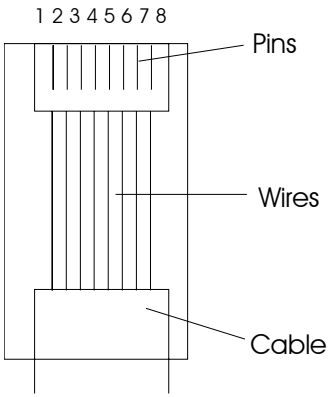
1. P/GND means Protective (Chassis) Ground
2. S/GND means Signal Ground

Note: *Optionally you can order these ports with* ***surge suppression.*** *This feature enables the ports to absorb high static discharges and surges. Contact your supplier for more information.*

The pins in the RJ45 socket are located at the top, with pin 1 on the left (see Figure 18).

Viewing the RJ45 plug from above (with the clip underneath), the pins are numbered as follows:

Figure 18
RJ45 Pin
Numbering



A.6 RJ45 Ports *(no shielding)*

These RJ45 ports do not have shielding around the connector.

Caution: *these ports are being phased out. Their replacement are the shielded RJ45 ports; (see Section A.5 RS232 RJ45 ports (with shielded connector)).*

The pin-outs are as follows:

Table 9
non-shielded
RJ45 pin-outs

Pin	Circuit	Direction	Function
1	DSR	Output	Data Set Ready
2	DCD	Input	Data Carrier Detect
3	RXD	Input	Receive Data
4	CTS	Output	Receive Hardware Flow Control
5	S/GND	—	Ground
6	TXD	Output	Transmit Data
7	DTR	Input	Data Terminal Ready
8	RTS	Input	Receive Hardware Flow Control

Notes:

1. S/GND means Signal Ground

To determine the position of pins inside the connector, see Figure 18.

A.7 Direct (1:1) Connections

This section details direct (1:1) connections (definition below). For structured cabling systems, go toSection A.22 Structured Cabling Systems.

Definition of a Direct (1:1) connection:

a single length of cable joins the device and your equipment; there is *no* structured cabling system or any other connection in-between.

Notes:

1. Some user equipment need additional signals on the connector. These may not be supported by the Perle device or your cable. The normal way to overcome this is to loop-back - on your equipment - one of the output lines to the required input. Refer to the documentation supplied with your equipment, or the supplier of the equipment, for information on which loop-backs, if any, are required.
2. Other than a specific requirement at your equipment (as in note 1), do not connect unused pins on either connector.
3. On the DB25 connector, Protective Ground (P/GND) is pin 1. On the RJ45 connector, Protective Ground (P/GND) terminates on the connector and so does not have a pin number.

A.8.1 Example Connections

In this section we show example connections between Perle ports and the following devices:

Terminals	
Terminals (slow speed or using software flow control)	**Section A.10.1**
Terminals (faster speed or using Hardware Flow Control)	**Section A.11.2**
Terminal Connection using the modem device, Without hardware flow control:	**Section A.13.1**

Terminals	
Terminal Connection using the modem device, With hardware flow control:	**Section A.14.2**

Modems	
direct (1:1) connections:	**Section A.16.1**

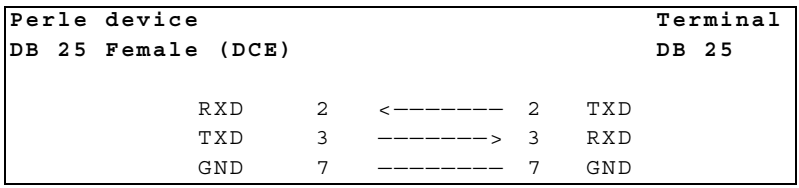
PCs (DB9 connectors)	
PCs (DB9 connectors)	**Section A.17**

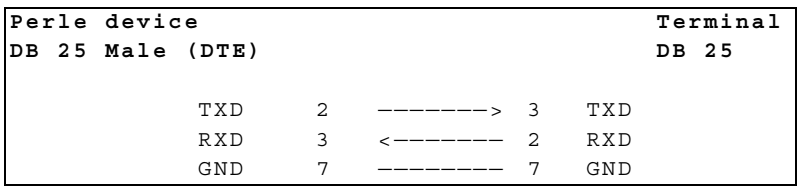
Serial Printers	
with software flow control	**Section A.19.1**
with hardware flow control	**Section A.20.2**

A.9 Terminals

A.10.1 Terminals (slow speed or using software flow control)

For a standard terminal operating at slow speeds, or using software flow control, a simple 3-pin connection can be used:





Notes:

1. Some terminals need additional signals on the connector. These signals may not be supported by the Perle device, or your cable. The normal way to overcome this is to loop-back one of the output lines from the terminal into the required input. Refer to the documentation supplied with your terminal, or the supplier of the terminal, for information on which loop-backs, if any, are required.

2. In addition to the signals shown in the examples above, you may connect Protective Ground (P/GND), at *either* your equipment *or* the Perle device (but not both). P/GND will reduce interference in noisy environments.

Terminal connections (slow speed or using software flow control)

continued:

with a Perle RJ45 connector and a direct (1:1) connection
(no structured cabling system present):

(shielded RJ45 ports only;
- see note 2. below)

```
Perle device                          Terminal
RJ45                                  DB25

        RXD    6   <--------  2   TXD
        TXD    5   ------->>  3   RXD
        S/GND  4   --------   7   S/GND
```

Notes:

1. In addition to the signals shown in the examples above, you may connect Protective Ground (P/GND) if you have shielded twisted-pair (STP) cable. Connect P/GND at *either* your equipment *or* the Perle device (but not both). P/GND will reduce interference in noisy environments.

2. the example for RJ45 connector shown above is for shielded ports only. If you have non-shielded RJ45 ports, use the pin-outs for the Perle device detailed in Section A.6.

A.11.2 Terminals (faster speed or using Hardware Flow Control)

For a slow terminal operating at speeds faster than 9600 baud, or for a terminal which can't use xon/xoff flow control, the following connections are required:

```
Perle device                                    Terminal
DB25 Female (DCE)                               DB25

          RXD  2  <--------  2        TXD
          TXD  3  -------->  3        RXD
          RTS  4  <--------  4 or 20  RTS/
                                      DTR
          *CTS 5  -------->  5        *CTS
          GND  7  --------   7        GND
```

:

```
Perle device                                    Terminal
DB25 Male (DTE)                                 DB25

          TXD  2  -------->  3        RXD
          RXD  3  <--------  2        TXD
          *RTS 4  -------->  5        *CTS
          CTS  5  <--------  4 or     RTS/
                             20       DTR
          GND  7  --------   7        GND
```

Notes:

1. * asterisk denotes that you should connect these pins only if input (from the Terminal to the Perle device) flow control is required.
2. the pins used for hardware flow control may vary from terminal to terminal, but RTS (pin 4) on the Perle device port must be connected to the pin on the terminal which indicates that the terminal buffer is full.
3. In addition to the signals shown in the examples above, you may connect Protective Ground (P/GND), at *either* your equipment *or* the Perle device (but not both). P/GND will reduce interference in noisy environments.

4. Some terminals need additional signals on the connector. These may not be supported by the Perle device, or your cable. The normal way to overcome this is to loopback one of the output lines from the terminal into the required input. Refer to the documentation supplied with your terminal, or the supplier of the terminal, for information on which loop-backs, if any, are required.

Terminals (faster speed or using Hardware Flow Control)

continued:

with a Perle RJ45 connector on a direct (1:1) connection (no structured cabling system present):

(shielded RJ45 ports only;
- see note 2. below)

```
Perle device                                  Terminal
RJ45                                          DB25

        RXD    6   <--------  2        TXD
        TXD    5   -------->  3        RXD
        RTS    8   <--------  4 or     RTS or
                               20       DTR
        *CTS   7   -------->  5        *CTS
        S/GND  4   --------   7        S/GND
```

Notes:

1. In addition to the signals shown in the examples above, you may connect Protective Ground (P/GND) if you have shielded twisted-pair (STP) cable. Connect P/GND at *either* your equipment *or* the Perle device (but not both). P/GND will reduce interference in noisy environments.

2. the example for RJ45 connector shown above is for shielded ports only. If you have non-shielded RJ45 ports, use the pin-outs for the Perle device detailed in Section A.6.

3. * asterisk denotes that you connect CTS to CTS only if input flow control (from the Terminal to the Perle device) is required.

A.12 Terminal Connection *using the modem device*

A.13.1 *Without* hardware flow control:

Using the modem device on a local connection, you can ensure that the login process is killed when the terminal is switched off. This is achieved by wiring RTS or DTR on the terminal to DCD on the Perle device port:

Perle device DB25 Female (DCE)						Terminal DB25
RTA	RXD	2	<--------	2	TXD	
	TXD	3	-------->	3	RXD	
	GND	7	--------	7	GND	
	DCD	8	<--------	4/20	RTS/DTR	

Perle device DB25 Male (DTE)						Terminal DB25
RTA	TXD	2	-------->	3	RXD	
	RXD	3	<--------	2	TXD	
	GND	7	--------	7	GND	
	DCD	8	<--------	4/20	RTS/DTR	

Notes:

1. Some terminals need additional signals on the connector. These may not be supported by the Perle device, or your cable. The normal way to overcome this is to loopback one of the output lines from the terminal into the required input. Refer to the documentation supplied with your terminal, or the supplier of the terminal, for information on which loop-backs, if any, are required.

2. In addition to the signals shown in the examples above, you may connect Protective Ground (P/GND), at *either* your equipment *or* the Perle device (but not both). P/GND will reduce interference in noisy environments.

Terminal Connection *using the modem device*

Without **hardware flow control**

(continued)

with a Perle RJ45 connector on a direct (1:1) connection (no structured cabling system present):

(shielded RJ45 ports only;
- see note 2. below)

```
Perle device                          Terminal
RJ45                                  DB25

        RXD    6   <---------  2     TXD
        TXD    5   ---------->  3     RXD
        S/GND  4   ---------    7     S/GND
        DCD    1   <---------  4/    RTS/
                                20    DTR
```

Notes:

1. In addition to the signals shown in the examples above, you may connect Protective Ground (P/GND) if you have shielded twisted-pair (STP) cable. Connect P/GND at *either* your equipment *or* the Perle device (but not both). P/GND will reduce interference in noisy environments.

2. the example for RJ45 connector shown above is for shielded RJ45 ports only. If you have non-shielded RJ45 ports use the pin-outs for the Perle device detailed in Section A.6.

Terminal Connection *using the modem device*

A.14.2 *With* hardware flow control:

Using the modem device on a local connection, you can ensure that the login process is killed when the terminal is switched off. This is achieved by wiring RTS on the terminal to DCD on the Perle device port:

```
Perle device                                    Terminal
DB25 Female (DCE)                               DB25

        RXD   2   <--------   2    TXD
        TXD   3   -------->   3    RXD
        RTS   4   <--------   20   DTR
        GND   7   ---------   7    GND
        DCD   8   <--------   4    RTS
```

```
Perle device                                    Terminal
DB25 Male (DTE)                                 DB25

         TXD  2 -------->  3      RXD
         RXD  3 <--------  2      TXD
         CTS  5 <--------  20     DTR
         GND  7 --------   7      GND
         DCD  8 <--------  4      RTS
```

Notes:

1. The above examples assume that DTR on the terminal is being used for hardware flow control.

   If you are using RTS on the terminal as the hardware flow control pin, connect DTR on the Terminal to DCD on the Perle device, and connect RTS on the terminal to either RTS or CTS on the Perle device (RTS if Perle connector is female (wired as DCE); CTS if Perle connector is male (wired as DTE)).

2. In addition to the signals shown in the examples above, you may connect Protective Ground (P/GND), at *either* your equipment *or* the Perle device (but not both). P/GND will reduce interference in noisy environments.

3. If your terminal still needs additional signals on the connector, note that these signals may not be supported by the Perle device, or your cable. The normal way to overcome this is to loopback one of the output lines from the terminal into the required input. Refer to the documentation supplied with your terminal, or the supplier of the terminal, for information on which loop-backs, if any, are required.

Terminal Connection *using the modem device*

***With* hardware flow control:**

(continued)

with a Perle RJ45 connector on a direct (1:1) connection
(no structured cabling system present):

(shielded RJ45 ports only;
- see note 2. below)

Perle device RJ45				**Terminal DB25**
RXD	6	<————————	2	TXD
TXD	5	————————>	3	RXD
RTS	8	<————————	20	DTR
S/GND	4	————————	7	S/GND
DCD	1	<————————	4	RTS

Notes:

1. In addition to the signals shown in the examples above, you may connect Protective Ground (P/GND) if you have shielded twisted-pair (STP) cable. Connect P/GND at *either* your equipment *or* the Perle device (but not both). P/GND will reduce interference in noisy environments.

2. the example for RJ45 connector shown above is for shielded RJ45 ports only. If you have a non-shielded RJ45 ports, use the pin-outs for the Perle device detailed in Section A.6.

3. The above example assumes that DTR on the terminal is being used for hardware flow control.

   If you are using RTS on the terminal as the hardware flow control pin, connect DTR on the Terminal to DCD on the Perle device, and connect RTS on the terminal to RTS on the Perle device.

A.15 Modems

A.16.1 direct (1:1) connections:

```
Perle device                                          Modem
DB25 Female (DCE)                                      DB25

            RXD   2   <--------     3   RXD    Modem
            TXD   3   -------->     2   TXD
            RTS   4   <--------     5   CTS
            CTS   5   -------->     4   RTS
            DSR   6   -------->     20  DTR
            GND   7   --------      7   GND
            DCD   8   <--------     8   DCD
            DTR   20  <--------     6   DSR
```

```
Perle device                                          Modem
DB25 Male (DTE)                                        DB25

            TXD   2   -------->     2   TXD    Modem
            RXD   3   <--------     3   RXD
            RTS   4   -------->     4   RTS
            CTS   5   <--------     5   CTS
            DSR   6   <--------     6   DSR
            GND   7   --------      7   GND
            DCD   8   <--------     8   DCD
            DTR   20  -------->     20  DTR
```

Notes:

1. In addition to the signals shown in the examples above, you may connect Protective Ground (P/GND), at *either* your equipment *or* the Perle device (but not both). P/GND will reduce interference in noisy environments.

Modems; example connections,

continued:

with a Perle RJ45 connector and a direct (1:1) connection to the modem (no structured cabling system present):

(shielded RJ45 ports only;
- see note 2. below)

```
Perle device                          Modem
RJ45                                  DB25

        RXD    6   <--------  3   RXD
        TXD    5   ------->  2   TXD
        RTS    8   <--------  5   CTS
        CTS    7   ------->  4   RTS
        DSR    2   ------->  20  DTR
        S/GND  4   --------   7   S/GND
        DCD    1   <--------  8   DCD
        DTR    3   <--------  6   DSR
```

Notes:

1. at the modem, signal RXD is received data from the PSTN; signal TXD is transmitted data to the PSTN.
2. In addition to the signals shown in the examples above, you may connect Protective Ground (P/GND) if you have shielded twisted-pair (STP) cable. Connect P/GND at *either* your equipment *or* the Perle device (but not both). P/GND will reduce interference in noisy environments.
3. the example for RJ45 connector shown above is for shielded RJ45 ports only. If you have non-shielded RJ45 ports use the pin-outs for the Perle device detailed in Section A.6.

A.17 PCs (DB9 connectors)

direct (1:1) connections:

Perle device DB25 Female (DCE)					PC DB9
TXD	3	——————>	2	RXD	PC
RXD	2	<——————	3	TXD	
CTS	5	——————>	8	CTS	
RTS	4	<——————	7	RTS	
GND	7	——————	5	GND	
DTR	20	<———————	4	DTR	
DSR	6	——————>	6	DSR	

Perle device DB25 Male (DTE)					PC DB9
TXD	2	——————>	2	RXD	PC
RXD	3	<——————	3	TXD	
RTS	4	——————>	8	CTS	
CTS	5	<——————	7	RTS	
GND	7	——————	5	GND	
DSR	6	<——————	4	DTR	
DTR	20	——————>	6	DSR	

Note:

1. In addition to the signals shown in the examples above, you may connect Protective Ground (P/GND), at *either* your equipment *or* the Perle device (but not both). P/GND will reduce interference in noisy environments.

2. if your PC is fitted with a DB25 connector, use the same DB25 pin-outs as for modems, shown in Section A.15 Modems

PC, example connections,

(continued):

(shielded RJ45 ports only;
- see note 4. below)

```
Perle device                          PC
RJ45                                  DB9

        TXD    5   --------->  3    TXD
        RXD    6   <---------  2    RXD
        RTS    8   <---------  7    RTS
        CTS    7   --------->  8    CTS
        S/GND  4   ---------   5    S/GND
```

1. if your PC is fitted with a DB25 connector, use the same DB25 pin-outs as for modems, shown in Section A.15 Modems
2. we assume you are connecting your PC directly to the Perle device (no structured cabling system).
3. In addition to the signals shown in the examples above, you may connect Protective Ground (P/GND) if you have shielded twisted-pair (STP) cable. Connect P/GND at *either* your equipment *or* the Perle device (but not both). P/GND will reduce interference in noisy environments.
4. the example for RJ45 connector shown above is for shielded RJ45 ports only. If you have non-shielded RJ45 ports use the pin-outs for the Perle device detailed in Section A.6.

A.18 Serial Printers

A.19.1 with *software* flow control

Perle device DB25 Female DCE				Printer DB25
RXD	2	<--------	2	TXD
TXD	3	-------->	3	RXD
GND	7	--------	7	GND

Perle device DB25 Male DTE				Printer DB25
TXD	2	-------->	3	RXD
RXD	3	<--------	2	TXD
GND	7	--------	7	GND

Notes on both examples:

1. In addition to the signals shown, you may connect Protective Ground (P/GND), at *either* your equipment *or* the Perle device (but not both). P/GND will reduce interference in noisy environments.

2. Some printers require additional pins to be held high (connected). Check your printer's documentation and follow any instructions.

Serial Printers; example connections,

with *software* flow control

(continued)

with a Perle RJ45 connector and a direct (1:1) connection to the printer (no structured cabling system present):

(shielded RJ45 ports only;
- see note 1. below)

```
Perle device                          Printer
RJ45                                  DB25

        RXD    6   <---------  2     TXD
        TXD    5   ------->>   3     RXD
        S/GND  4   --------     7     S/GND
```

Notes:

1. the example for RJ45 connector shown above is for shielded ports only. If you have non-shielded RJ45 ports, use the pin-outs for the Perle device detailed in Section A.6.

2. In addition to the signals shown in the examples above, you may connect Protective Ground (P/GND) if you have shielded twisted-pair (STP) cable. Connect P/GND at *either* your equipment *or* the Perle device (but not both). P/GND will reduce interference in noisy environments.

3. Some printers require additional pins to be held high (connected). Check your printer's documentation and follow any instructions.

Serial Printers, example connections, continued:

A.20.2 with *hardware* flow control

CTS/RTS

Where you have selected (in the Perle software menus) CTS/RTS as the hardware flow control mechanism. CTS/RTS flow control refers to signals at the Perle device end.

Perle device DB25 Female DCE				Printer DB25
RXD	2	<———————	2	TXD
TXD	3	———————>	3	RXD
RTS	4	<———————	20	DTR
GND	7	———————	7	GND

Perle device DB25 Male DTE				Printer DB25
TXD	2	———————>	3	RXD
RXD	3	<———————	2	TXD
CTS	5	<———————	20	DTR
GND	7	———————	7	GND

Notes on both examples:

1. Printers have independent hardware flow control, using their DTR pin. Check your printer is doing the same.
2. In addition to the signals shown, you may connect Protective Ground (P/GND), at *either* your equipment *or* the Perle device (but not both). P/GND will reduce interference in noisy environments.
3. Some printers require additional pins to be held high (connected). Check your printer's documentation and follow any instructions.

Serial Printers; example connections,

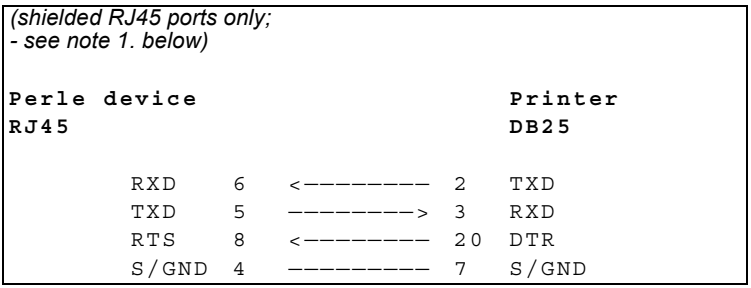
with *hardware* flow control

(continued)

CTS/RTS

Where you have selected (in the Perle software menus) CTS/RTS as the hardware flow control mechanism. CTS/RTS flow control refers to signals at the Perle device end.

(shielded RJ45 ports only;
- see note 1. below)



Notes:

1. the example for RJ45 connector shown above is for shielded ports only. If you have non-shielded RJ45 ports, use the pin-outs for the Perle device detailed in Section A.6.
2. the printer has independent hardware flow control, using its DTR pin. Check your printer is doing the same.
3. In addition to the signals shown in the examples above, you may connect Protective Ground (P/GND) if you have shielded twisted-pair (STP) cable. Connect P/GND at *either* your equipment *or* the Perle device (but not both). P/GND will reduce interference in noisy environments.
4. Some printers require additional pins to be held high (connected). Check your printer's documentation and follow any instructions.

Serial Printers, example connections, continued:

A.21.3 with DSR/DTR *hardware* flow control

Where you have selected (in the Perle software menus) DSR/DTR as the hardware flow control mechanism. DSR/DTR flow control refers to signals at the Perle device end.

```
Perle device                                        Printer
DB25 Female DCE                                       DB25

      RXD   2   <--------       2       TXD
      TXD   3   -------->       3       RXD
      DTR   20  <--------       20      DTR
      GND   7   ---------       7       GND
```

```
Perle device                                        Printer
DB25 Male DTE                                         DB25

      TXD   2   -------->       3       RXD
      RXD   3   <--------       2       TXD
      DSR   6   <--------       20      DTR
      GND   7   ---------       7       GND
```

Notes on both examples:

1. Printers have independent hardware flow control, using their DTR pin. Check your printer is doing the same.
2. In addition to the signals shown, you may connect Protective Ground (P/GND), at *either* your equipment *or* the Perle device (but not both). P/GND will reduce interference in noisy environments.
3. Some printers require additional pins to be held high (connected). Check your printer's documentation and follow any instructions.

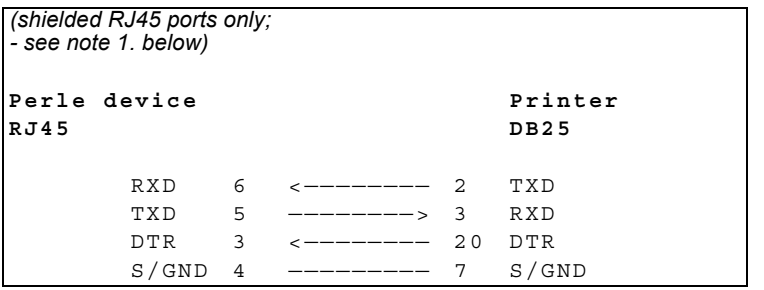
Serial Printers; example connections,

with DSR/DTR *hardware* flow control

(continued)

Where you have selected (in the Perle software menus) DSR/DTR as the hardware flow control mechanism. DSR/DTR flow control refers to signals at the Perle device end.

(shielded RJ45 ports only;
- see note 1. below)



Notes:

1. the example for RJ45 connector shown above is for shielded ports only. If you have non-shielded RJ45 ports, use the pin-outs for the Perle device detailed in Section A.6.
2. the printer has independent hardware flow control, using its DTR pin. Check your printer is doing the same.
3. In addition to the signals shown in the examples above, you may connect Protective Ground (P/GND) if you have shielded twisted-pair (STP) cable. Connect P/GND at *either* your equipment *or* the Perle device (but not both). P/GND will reduce interference in noisy environments.
4. Some printers require additional pins to be held high (connected). Check your printer's documentation and follow any instructions.

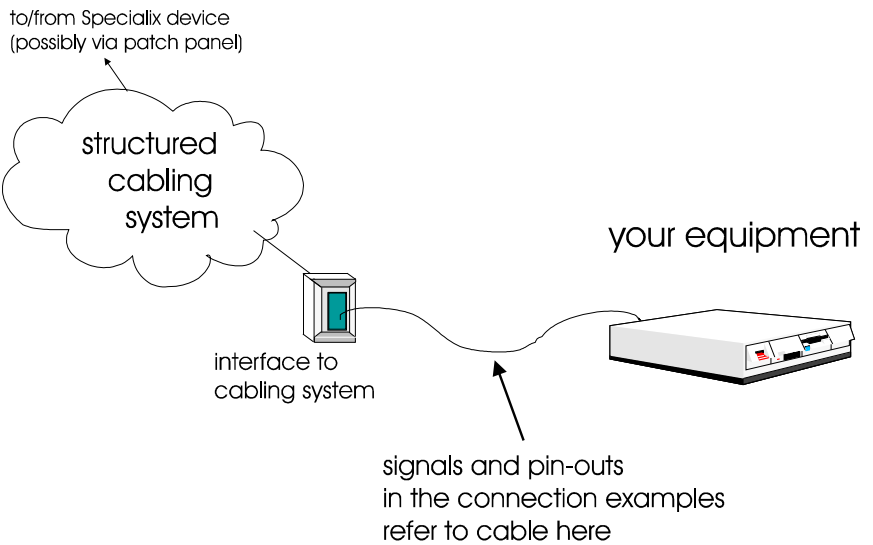
A.22 Structured Cabling Systems

This section details structured cabling systems. For direct (1:1) connections, go to Section A.7 Direct (1:1) Connections.

Notes:

1. In the connection examples which follow, the signals shown refer to the connection at the end of the cabling system to which your equipment is attached - see Figure 19. At the other end of the cabling system, where the Perle device is attached, we assume - and recommend - you use a straight-through RJ45 cable to connect our Perle device to the cabling system.

Figure 19 structured cabling system environment



2. *Within* the structured cabling system, we presume you use straight-through cabling, i.e. pin 1 to pin 1, pin 2 to pin 2, etc.

3. Some user equipment need additional signals on the connector. These may not be supported by the Perle device, or your cable. The normal way to overcome this is to loopback - on the your equipment - one of the output lines to the required input. Refer to the documentation supplied with your equipment, or the supplier of the equipment, for information on which loop-backs, if any, are required.

4. At each end of the cable, you must terminate all pairs of wires on connector pins. An unconnected wire will receive electromagnetic radiation and possibly create interference in the cable.

5. If you have wiring other than shown in the connection examples, and DCD is an input on your equipment, ensure that it is **not** connected to DCD in the Perle device.

6. On the RJ45 connector, Protective Ground (P/GND) terminates on the connector and so does not have a pin number.

A.23.1 Example Connections

In this section we show example connections between Perle ports and the following devices:

Terminals	
structured cabling system	**Section A.24.2**
Terminal Connection using the modem device	**Section A.25.3**

Modems	
structured cabling system	**Section A.26.4**

PCs (DB9 connectors)	
structured cabling system	**Section A.27.5**

Serial Printers	
structured cabling system	**Section A.28.6**

Terminals, example connections:

A.24.2 structured cabling system

With a structured cabling system, use the example below to connect any type of terminal. The pins and signals refer to the end of the cabling system to which the terminal is attached - see Figure 19. We have shown the signals of a Wyse 60 terminal; for any other type of terminal, refer to the product's documentation.

(- see note 2. below about the Perle RJ45 connectors

```
Interface to cabling system          Terminal
RJ45                                 DB25

        RXD    6   <--------  2    TXD
        TXD    5   -------->  3    RXD
        RTS    8   <--------  20   DTR
        CTS    7   -------->  5    CTS
        DSR    2   -------->  6    DSR
        S/GND  4   --------   7    S/GND
        DCD    1   <--------|
                              4    RTS
        DTR    3   <--------|
                   (n/c)           DCD
```

Notes:

1. in addition to the signals shown in the examples above, you may connect Protective Ground (P/GND) if you have shielded twisted-pair cable. Connect P/GND at *either* your equipment *or* the interface to cabling system (but not both). P/GND will reduce interference in noisy environments.

2. *meaning of* | :the DCD and DTR signals to the interface to the cabling system originate jointly on the RTS pin at the terminal.

3. the DCD pin at the terminal is not connected (n/c); (devices other than the Wyse 60 may require that the DCD pin is held high).

4. at the end of the cabling system to which the Perle device is attached, use a straight-through cable.

5. the example for RJ45 connector shown above is for shielded RJ45 ports only. If you have non-shielded RJ45 ports, use the pin-outs for the Perle device detailed in Section A.6.

6. the minimum connection requirement is the RXD/TXD, TXD/RXD, RTS/RTS or DTR, CTS/CTS (if input flow control required) and S/GND signals (Interface to Cabling System/Terminal). The other pins may be connected (as in our example) to ensure minimum interference from unconnected pins.

7. for general advice on structured cabling systems, see Section A.22 Structured Cabling Systems.

Terminal Connection *using the modem device*

example connections:

A.25.3 structured cabling system:

(- see note 2. below about the Perle RJ45 connectors

```
Interface to cabling system          Terminal
RJ45                                 DB25

        RXD    6   <--------  2    TXD
        TXD    5   -------->  3    RXD
        RTS    8   <--------  20   DTR
        CTS    7   -------->  5    CTS
        DSR    2   -------->  6    DSR
        S/GND  4   --------   7    S/GND
        DCD    1   <-------|
                           4    RTS
        DTR    3   <-------|
                   (n/c)          DCD
```

Notes:

1. in addition to the signals shown in the examples above, you may connect Protective Ground (P/GND) if you have shielded twisted-pair (STP) cable. Connect P/GND at *either* your equipment *or* the interface to the cabling system (but not both). P/GND will reduce interference in noisy environments.

2. the example for RJ45 connector shown above is for shielded RJ45 ports only. If you have a non-shielded RJ45 ports, use the pin-outs for the Perle device detailed in Section A.6.

3. the above example assumes that DTR on the terminal is being used for hardware flow control. If you are using RTS on the terminal as the hardware flow control pin, connect DTR on the Terminal to DCD and DTR on the interface to the cabling system, and connect RTS on the terminal to RTS on the interface to the cabling system.

4. *meaning of* | the DCD and DTR signals at the interface to the cabling system originate jointly on the RTS pin at the terminal.

5. the minimum connection requirement is the RXD/TXD, TXD/RXD, RTS/DTR, S/GND and DCD-DTR/RTS signals (Interface to Cabling System/Terminal). The other pins may be connected (as in our example) to ensure minimum interference from unconnected pins.

Modems, example connections:

A.26.4 structured cabling system

with a structured cabling system present, the example below is shown at the modem end - see Figure 19; (use a straight-through cable at the Perle device end).

(- shielded RJ45 ports only;
see note 3. below)

```
Interface to cabling system      Modem
RJ45                             DB25

        RXD    6   <--------  3   RXD
        TXD    5   ------->  2   TXD
        RTS    8   <--------  5   CTS
        CTS    7   ------->  4   RTS
        DSR    2   ------->  20  DTR
        S/GND  4   --------   7   S/GND
        DCD    1   <--------  8   DCD
        DTR    3   <--------  6   DSR
```

Notes:

1. at the modem, signal RXD is received data from the PSTN; signal TXD is transmitted data to the PSTN.
2. in addition to the signals shown in the examples above, you may connect Protective Ground (P/GND) if you have shielded twisted-pair (STP) cable. Connect P/GND at *either* your equipment *or* the interface to cabling system (but not both). P/GND will reduce interference in noisy environments.
3. at the Perle device we assume you are using shielded RJ45 ports (as per details in Section A.5). If you have non-shielded RJ45 ports use the pin numbers detailed in Section A.6.
4. for general advice on structured cabling systems, see Section A.22 Structured Cabling Systems.

PC, example connections:

A.27.5 structured cabling system

(shielded RJ45 ports only;
- see note 3. below)

```
Interface to cabling system     PC
RJ45                            DB9

        TXD    5   ---------->  3   TXD
        RXD    6   <----------  2   RXD
        RTS    8   <----------  7   RTS
        CTS    7   ---------->  8   CTS
        S/GND  4   ----------  5   S/GND
        DCD    1   <----------  1   DCD
        DSR    2   ---------->  6   DSR
        DTR    3   <----------  4   DTR
```

1. if your PC is fitted with a DB25 connector, use the same DB25 pin-outs as for modems, shown in Section A.26.4

2. in addition to the signals shown in the examples above, you may connect Protective Ground (P/GND) if you have shielded twisted-pair (STP) cable. Connect P/GND at *either* your equipment *or* the interface to cabling system (but not both). P/GND will reduce interference in noisy environments.

3. the example for RJ45 connector shown above is for shielded RJ45 ports only. If you have non-shielded RJ45 ports use the pin-outs for the Perle device detailed in Section A.6.

4. the minimum connection requirement is the TXD/TXD, RXD/RXD, RTS/RTS, S/GND and CTS/CTS signals (Interface to Cabling System/Terminal). The other pins may be connected (as in our example) to ensure minimum interference from unconnected pins.

5. for general advice on structured cabling systems, see Section A.22 Structured Cabling Systems.

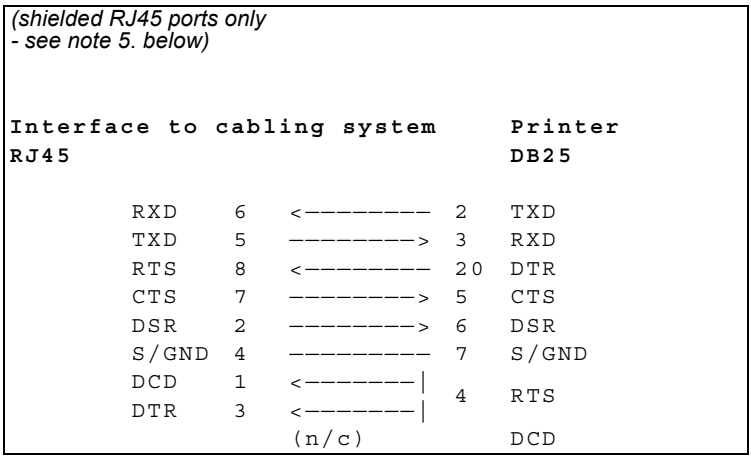
Serial Printers, example connections:

A.28.6 structured cabling system

with CTS/RTS *hardware* flow control

Where you have selected (in the Perle software menus) CTS/RTS as the hardware flow control mechanism. CTS/RTS flow control refers to signals at the Perle device end.

With a structured cabling system present, the example below is shown at the printer end; (use a straight-through cable at the Perle device end).



Notes:

1. *meaning of* | :the DCD and DTR wires at the cabling system originate jointly on the RTS pin at the printer.
2. the DCD pin at the printer is not connected (n/c); (other printers may require that the DCD pin is held high).
3. the minimum connection requirement is the RXD/TXD, TXD/RXD, RTS/DTR and S/GND connections (Interface to Cabling System/Printer). The other pins may be connected (as in our example) to ensure that there is minimum interference from unterminated pins.

4. in addition to the signals shown in the examples above, you may connect Protective Ground (P/GND) if you have shielded twisted-pair (STP) cable. Connect P/GND at *either* your equipment *or* the interface to cabling system (but not both). P/GND will reduce interference in noisy environments.

5. the example for RJ45 connector shown above is for shielded RJ45 ports only. If you have non-shielded RJ45 ports use the pin-outs for the Perle device detailed in Section A.6.

6. the printer is using its DTR pin for hardware flow control. Check your printer is doing the same.

7. for general advice on structured cabling systems, see Section A.22

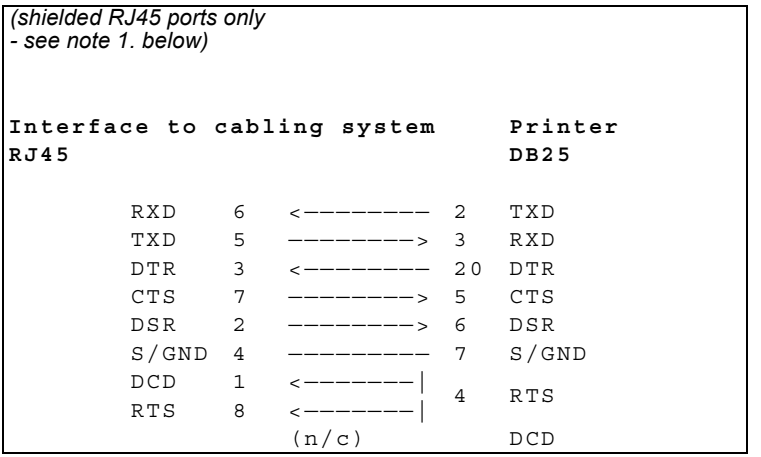
Serial Printers; example connections,

A.29.7 structured cabling system

with DSR/DTR *hardware* flow control

Where you have selected (in the Perle software menus) DSR/DTR as the hardware flow control mechanism. DSR/DTR flow control refers to signals at the Perle device end.

(shielded RJ45 ports only
- see note 1. below)



Notes:

1. the example for RJ45 connector shown above is for shielded ports only. If you have non-shielded RJ45 ports, use the pin-outs for the Perle device detailed in Section A.6.

2. the printer is using its DTR pin for hardware flow control. Check your printer is doing the same.

3. In addition to the signals shown in the examples above, you may connect Protective Ground (P/GND) if you have shielded twisted-pair (STP) cable. Connect P/GND at *either* your equipment *or* the Perle device (but not both). P/GND will reduce interference in noisy environments.

4. the minimum connection requirement is the RXD/TXD, TXD/RXD, DTR/DTR and S/GND connections (Interface to Cabling System/Printer). The other pins may be connected (as in our example) to ensure that there is minimum interference from unterminated pins.

5. Some printers require additional pins to be held high (connected). Check your printer's documentation and follow any instructions.

6. *meaning of* | :the DCD and RTS wires at the cabling system originate jointly on the RTS pin at the printer.

A.30 RIO Long Distance Unit (LDU)

The LDUs include a flying lead with a DB25 female connector. This connects to your modem or long-wire cable. The pin-outs of the DB25 connector are as follows:

Table 10
RIO LDU pin-outs

Pin	Signal	Name	Direction
1	Chassis	Chassis Ground	—
2	TXD	Transmit Data	Output RS232
3	RXD	Receive Data	Input RS232
4	RTS*	Request To Send	Output RS232
5	CTS*	Clear To send	Input RS232
6	N/C	Not Connected	—
7	GND	Ground	—
8	DCD*	Data Carrier Detect	Input RS232
9	DCD+	Data Carrier Detect	Input RS422
10	RXD-	Inverse RXD	Input RS422
11	RXD+	Receive Data	Input RS422
12	TXD-	Inverse TXD	Output RS422
13	TXD+	Transmit Data	Output RS422
14	CTS-	Inverse CTS	Input RS422
15	TXC	Transmit Clock	Input RS232
16	CTS+	Clear To Send	Input RS422
17	RXC	Receive Clock	Input RS232
18	RTS-	Inverse RTS	Output RS422
19	RTS+	Request To Send	Output RS422
20	DTR*	Data Terminal ready	Output RS232
21	DCD-	Inverse DCD	Input RS422
22	DTR+	Data Terminal Ready	Output RS422
23	DTR-	Inverse DTR	Output RS422
24	RXC-	Inverse RXC	Input RS422
25	RXC+	Receive Clock	Input RS422

* Active low signals.

Asynchronous (Long Wire) Cable

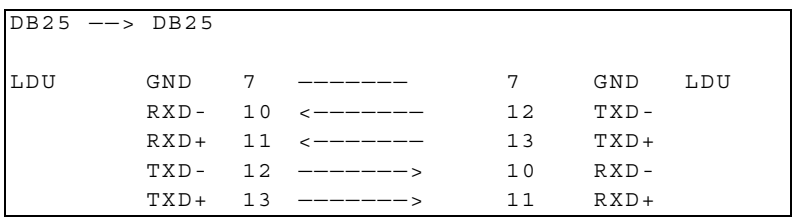
If you are going to build your own Long-wire cable, make sure it conforms to the following specification:

- **Type:** For most applications, unshielded, twisted-pair cable can be used. For noisy environments, you will also require individual screens made from aluminised polyester tape, a tinned drain, and an overall braid screen.
- **Size:** 7/0.2 minimum
- **Length:** up to 1000 metres
- **Noise:** The receiver does not require a differential input voltage more than 200mV to correctly assume the binary state over an entire common-mode voltage range of -7V to +7V. Thus, noise must not reach more than +/-7V.
- **Characteristic nominal impedance:** 100 Ohms
- **Ground Potential:** The maximum voltage between either receiver input and receive ground must not exceed 8V (80% - 3V signal + 7V common mode voltage) in magnitude. Thus excessive differences in 0V between communication devices (systems) are unacceptable. Typical causes are insufficient mains earthing, heavily laden mains, or heavily laden PC slots.

Category 5 cabling meets the requirements listed above.

The asynchronous long-wire connection to the LDU should be wired as follows:

Asynchronous Long-wire Connection:



The other pins must not be connected.

Other wiring connections for the RIO LDU are as follows:

Asynchronous/Synchronous Modem & X21bis Connections:

```
DB25 --> DB25

LDM       TXD    2   -------       2     TXD   Modem
          RXD    3   -------       3     RXD
          RTS    4   -------       4     RTS
          CTS    5   -------       5     CTS
          GND    7   -------       7     GND
          DCD    8   -------       8     DCD
          TXC    15  -------       15    TXC
          RXC    17  -------       17    RXC
          DTR    20  -------       20    DTR
```

The other pins must not be connected.

Synchronous X.21 Connection:

```
DB25 --> DB15

LDM     Chassis 1   -------       1    Chassis   NTU
        GND     7   -------       8    GND
        DCD+    9   -------       5    Indicate+
        DCD-    21  -------       12   Indicate-
        DTR+    22  -------       3    Control+
        DTR-    23  -------       10   Control-
        RXC+    25  -------       6    Clock+
        RXC-    24  -------       13   Clock-
        TXD+    13  -------       2    TXD+
        TXD-    12  -------       9    TXD-
        RXD+    11  -------       4    RXD+
        RXD-    10  -------       11   RXD-
```

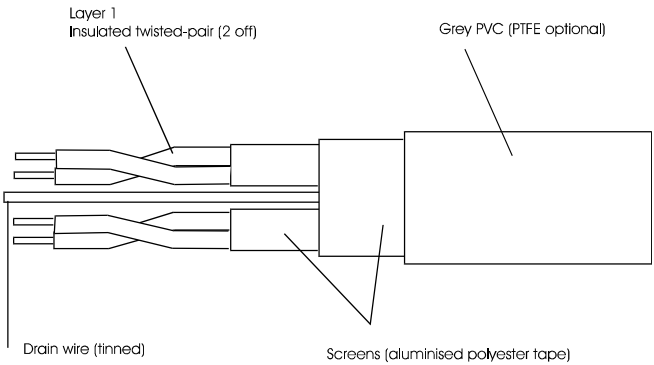
The other pins must not be connected.

A.31 RIO Link Cable

RIO link cables are made to the following specification:

- **Size:** 7/0.2 minimum
- **Type:** Two individually screened twisted pairs with drain and overall screen, sheathed over all in grey PVC (or PTFE). The screen is aluminised polyester tape. The drain wire is tinned. For particularly noisy environments and distances greater than 5 metres we recommend an additional overall braid screen.

Figure 20
Structure of the RIO Link cable



- **Length:** 5.0 metres
- **Noise:** The receiver does not require a differential input voltage more than 200mV to correctly assume the binary state over an entire common-mode voltage range of -7V to +7V. Thus, noise must not reach more than +/-7V.
- **Nominal Impedance:** 100 Ohms
- **Ground Potential:** The maximum voltage between either receiver input and receive ground must not exceed 8V (80% - 3V signal + 7V common mode voltage) in magnitude. Thus excessive differences in 0V between

communication devices (systems) are unacceptable. Typical causes are insufficient mains earthing, heavily laden mains, or heavily laden PC slots.

Note: *Other screening methods may be adopted dependent on the environment. For example, a suitable cable is Belden equivalent 9829, which has been tested to 75 metres. Also suitable is shielded Category 5 cable.*

Your RIO supplier can supply you with extra RIO link cables if you need them, and can advise you of which ready-made cables to use with your RTAs.

Plug Specification

RIO Link cables use 6-way Minidin plugs. The pin-outs for the Minidin plug are as follows:

Figure 21 Structure of the RIO Link Connector

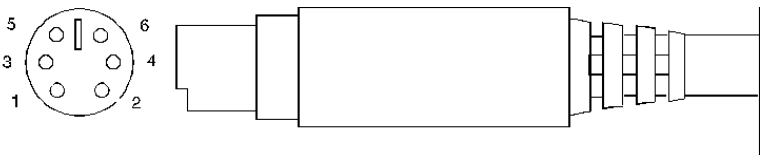


Table 11 RIO Link Connector pin-outs

Pin	Signal	Direction	Function
1	GND	—	Ground
2	VCC	—	Supply Voltage
3	RXD-	Input	Inverse RXD
4	TXD-	Output	Inverse TXD
5	RXD+	Input	Receive Data
6	TXD+	Output	Transmit Data

The cable should be wired as follows:

Minidin	GND	1	Not Connected	1	GND	Minidin
	VCC	2	Not Connected	2	VCC	
	RXD-	3	———————	4	TXD-	
	TXD-	4	———————	3	RXD-	
	RXD+	5	———————	6	TXD+	
	TXD+	6	———————	5	RXD+	

Wires 3 and 4, and 5 and 6, must be twisted together. For high noise and/or ground potential differences we recommend the Fibre-optic module.

A.32 Fibre Optic Cable

Fibre-optic cable must conform to the following specification:

- **Fibre Type:** 62.5µm/125µm multimode silica graded index fibre (=62.5µm core diameter, 125µm cladding inside 250µm buffer).
- **Cable Type:** Tight buffered/jacketed.
- **Fibres:** Duplex, 4 core, etc., as required by installation (2 fibres are used by each Perle fibre-optic link). Each core sub-jacketed, individually coloured.
- **Connectors:** ST-type connector.
- **Strength Member:** Aramid (e.g. Kevlar) strength suitable for installation procedure.
- **Numerical Aperture:** 0.27 - 0.3 (0.275 will be typical of most fibres).
- **Attenuation:** Max 6db/km @ 820nm (4db will be typical of most fibres).

Cable Jacketing

Low Smoke Zero Halogen (LSOH) cable should be used in situations where smoke from burning cables could concentrate in a public area.

Steel wire armouring, steel wire braid or corrugated tube cable will be required for underground installation of fibre (by direct burial).

Cable with a metal (aluminium) foil layer and a petroleum jelly moisture barrier will be required where the cable is going to be exposed to moisture.

Non-metallic, self-supporting cable will be required for aerial (pole) applications.

Normal indoor cable requires installation in conduit or cable trays. In other situations, crush-resistant cables may be required to withstand handling and environment. In all situations, cable handling should not exceed the specifications laid down by the cable manufacturer.

Installation Advice

Installation temperature range, minimum bending radius and maximum installation tension must all be strictly adhered to. The most suitable method for pulling through a fibre-optic cable is with a tool made specifically for this purpose. Cable must not be allowed to kink or twist and must not be pulled over sharp edges in ducts or cable trays.

Wherever possible, you are strongly advised to splice pre-terminated pigtails on site. This will ensure the greatest possible reliability and performance. Such pigtails are readily available ex-stock from a number of distributors and will have been terminated in clean conditions unlikely to be encountered when terminating on site. In practice, productivity and reliability of installation is increased by splicing rather than direct application of connectors on site. The most suitable tool for splicing is a fusion splicer.

You can choose to have one or more redundant, terminated fibres in a link. You can also choose to use a fibre with more cores than necessary. Where a RIO fibre-optic link requires only duplex cable, four-core may be installed instead

Installation may be easier if the cable is divided into two smaller lengths, pulled through separately and spliced at a suitable midpoint. The join should be made in a suitable splice enclosure or box to enable maintenance.

You are advised to terminate each end of the main fibre in a distribution enclosure, with an excess length of cable coiled and secured in the enclosure at each end. Connection from the enclosure to the equipment should then be made with a patch lead. This patch lead can be easily replaced if it becomes damaged, and can be moved to reconfigure the system or swap over to a redundant link. You are advised to use the same ST-type connector throughout your system.

Fibre communication distance is rated at one kilometre maximum.

A.33 Parallel DB25 Port

This port provides a Centronics-type interface for Parallel printers. Parallel cables use a straight 25-way connection.

*Table 12*Parallel pin-outs

Pin	Circuit	Direction	Function
1	STROBEN*	Output	PSTROBE
2	D0	Output	DATA 1
3	D1	Output	DATA 2
4	D2	Output	DATA 3
5	D3	Output	DATA 4
6	D4	Output	DATA 5
7	D5	Output	DATA 6
8	D6	Output	DATA 7
9	D7	Output	DATA 8
10	PACKN*	Input	ACK
11	PBUSY	Input	BUSY
12	PPE	Input	PE
13	PSLCT	Input	SLCT
14	AUTOFDXT*	Output	AUTOFEED
15	PERRORN*	Input	FAULT
16	PINITN*	Output	INPUT PRIME
17	PSLINN*	Output	SLCT IN
18	GND	—	GROUND
19	GND	—	GROUND
20	GND	—	GROUND
21	GND	—	GROUND
22	GND	—	GROUND
23	GND	—	GROUND
24	GND	—	GROUND
25	GND	—	GROUND

* = Active low

A.34 RS232 RJ45 Opto-isolated Ports

These ports have the RXD+ and RXD- pins electrically isolated from the rest of the unit using opto-isolators. This provides two advantages: the signal will not pick up interference, and power surges or sparks caused by voltage changes will not be transmitted.

Further noise reductions can be achieved by using software flow control. The pin-outs for these ports are as follows:

Table 13
RS232 RJ45 Opto-isolated pin-outs

Pin	Signal	Direction	Function
1	Chassis	—	Chassis Ground
2	RTS-	Output	Inverse RTS
3	TXD-	Output	Inverse TXD
4	RXD+	Input	Receive Data
5	RXD-	Input	Inverse RXD
6	Ground	—	Signal Ground
7	CTS	Input	Clear To Send
8	Chassis	—	Chassis Ground

Pin 6 (Ground) should be used as TXD+; pin 7 (CTS) should be connected to pin 2 (RTS-) on the peripheral device.

The pins in the RJ45 socket are located at the top, with pin 1 on the left (see Figure 18).

A.35 RS422 DB25 Ports

These ports provide a full RS422 interface for serial devices. When wiring with RS422 ports refer to the documentation supplied with the device, or the suppliers of the device, for wiring instructions.

RS422 twisted-pair cable allows you to run a serial device at 115.2Kb up to 1km from the Perle device port.

The RS422 D25 pin descriptions are:

Table 14 RS422 DB25 pin-outs

Pin	Circuit	Direction	Function
1	Chassis		Connects to case
2	RXD+	Input	Receive Data
3	TXD+	Output	Transmit Data
4	RTS+	Input	Receive Hardware Flow Control
5	CTS+	Output	Transmit Hardware Flow Control
6	DTR+	Output	Data Terminal Ready
7	Ground	—	Connects to logic 0V
8	DSR+	Input	Data Set Ready
10	DSR-	Input	Inverse DSR
13	CTS-	Output	Inverse CTS
14	RXD-	Input	Inverse RXD
16	TXD-	Output	Inverse TXD
18	DTR-	Output	Inverse DTR
19	RTS-	Input	Inverse RTS
20	DCD+	Input	Data Carrier Detect
21	RI-	Input	Inverse RI
22	RI+	Input	Ring Indicator
23	DCD-	Input	Inverse DCD

The two wires (+ and -) for each signal must be twisted together to form a pair.

The names of some of these signals are often used in reverse. Here, CTS and DTR are outputs, RTS and DSR are inputs.

Appendix B

Technical Support

Troubleshooting

Symptoms	Diagnosis	Solution
Warning displayed on console during bootup: `Host card 'defined' but not 'available'.`	Hardware clash—the memory address or interrupt selected for the host card is already being used by another device.	To pinpoint the clash, enter the command `smit lsattr` . This displays the List Devices menu. The 'Show Characteristics of a Defined Device' option enables you to display the configuration of devices installed in your machine, including interrupt and memory address. Check the configuration of your RIO card against the other hardware devices (particularly networking cards, SCSI controllers, & VGA cards). When you locate the clash, reconfigure your host card.
After rebooting, RIO ttys are 'defined' but not 'available'.	The driver was unable to configure the TTY	Check a) all the RTAs are connected b) the host card is seated correctly c) the wiring
Message: `prerequisite failure while de-installing the rio software`	You still have RIO devices available or defined	Remove all RIO devices via SMIT.
Error: `piocustp:<rio> not a valid adapter`	You have selected an incorrect print queue for transparent printing	Go to the SMIT menu option 'Add a print queue'. Select Attachment Type 'local - printer attached to local host'.

Symptoms	Diagnosis	Solution
Warning: `device busy`	You are trying to reconfigure/delete a device whilst the device is open (enabled)	Ensure there is no login running on the port (either through Enable Login or through User Login via the keyboard). For a printer (lp0 or xp0), ensure no print job is running.
Warning: `device tty n has configured children` (where n is the device number)	You have a transparent print connection enabled on the device. You may be trying to reconfigure/ delete the TTY device.	Delete the transparent printer (the child).
Warning: `memory address might be incorrect`	On the ISA host card, you may have selected an incorrect memory address	Try the next memory address on the rotary switches and reboot.
There is no communication between an RTA and its host card when the RTA is showing as 'available'.	You may have changed the links between the RTA and the host card while your machine was off or rebooting.	reboot the RTA by disconnecting and re-connecting the cable to it. Avoid changes to your system while the host card cannot communicate with its RTAs.
You are unable to boot an RTA	There may be a problem with the connector and /or cable	Try another cable.
Warning: `RTA has configured children`	You are trying to delete an RTA while the RTA has a tty or printer still defined.	Ensure the RTA has no TTY or printer (child) devices.
Warning: `another adapter address/interrupt conflicts with this one`	You have selected an interrupt level on the ISA host card which clashes with another device.	Try another interrupt level.
Message: `'There are no items of this type' when using the option 'Add an RTA'.`	The RTA is not responding.	Ensure the RTA is connected to the host card. Power-cycle the RTA manually.

Symptoms	Diagnosis	Solution
Inconsistent LED pattern on an RTA: on an 8-port RTA, one or other of the LEDs next to ports 1 and 5 not lit;. on a 16-port RTA, one or other of the RUN and CON LEDs is not lit.	The RTA is not responding.	Power-cycle the RTA manually.

Making a technical support query

This section contains the following information about making a query;

- <hypertext>Who to contact on page <hypertext>118
- <hypertext>Information needed when making a query on page <hypertext>119
- <hypertext>Making a support query via the Perle web page on page <hypertext>120

Who to contact

If you bought your product from a registered Perle supplier, you must contact their Technical Support department; they are qualified to deal with your problem.

If you are a registered Perle supplier, and bought your product from Perle, contact Perle Technical Support at the offices listed below.

Information needed when making a query

When you make a technical support enquiry please have the following information ready;

> Hint
> Print out this page and fill in the table provided with the basic information you need.

Item	Write details here
Product name and version	
Problem description	
Operating system version	
Driver version	
Details of any other cards installed in your system	
Your name	
Company Name	
Country	
Phone number	
Fax number	
Email address (if available)	

Making a support query via the Perle web page

If you have an internet connection, please send details of your problem to Technical Support using the email links provided on the Perle web site in the 'Support' area.

See also <hypertext>Perle support centres worldwide on page <hypertext>123 for email links and other contact details for the Perle technical support centres.

Click here to access our website at the following URL:
http://www.perle.com

Repair procedure

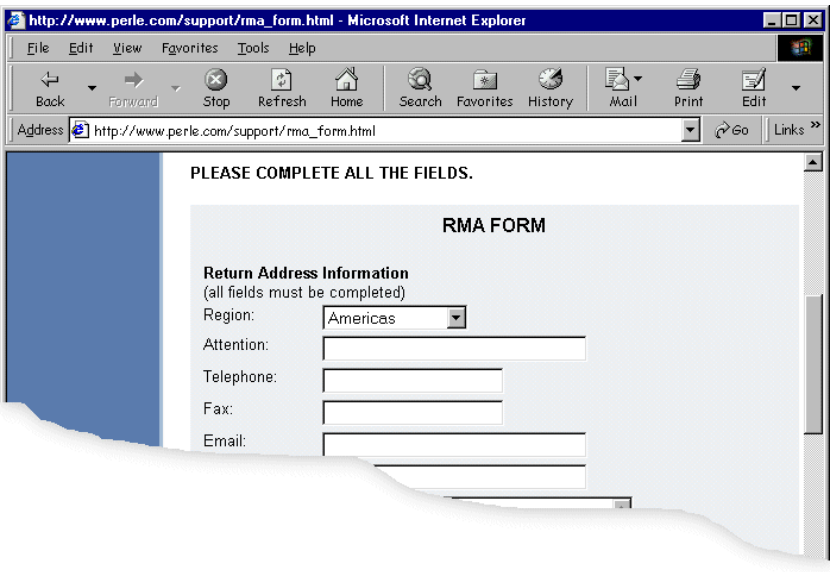
Before sending a unit for repair, you must contact your Perle supplier. If, however, you bought your product directly from Perle you can contact directly. See <hypertext>Perle support centres worldwide on page <hypertext>123 for contact information.

Customers who are In Europe, Africa or Middle East can submit repair details via a website form shown in the next picture. This form is on the Perle website, **www.perle.com**, in the **Support** area.

Click here to access our web site at the following URL:
http://www.perle.com/support/rma_form.html

In the USA and Asia contact the office shown in the Technical Support section.

Website RMA (Return Material Authorisation) Form



Feedback about this manual

If you have any comments or suggestions for improving this manual please email Perle using the following address;

docfeedback@perle.com

Please include the ***title***, ***part number*** and ***date*** of the manual (you can find these on the title page at the front of this manual).

Perle support centres worldwide

Note

Perle offers free technical support to Perle Authorised Distributors and Registered Perle Resellers.

To access technical support please visit the Perle website at **www.perle.com/support.**

If you are unable to find the information you require, please feel free to contact our technical support teams by email using the addresses shown in the next table.

Country	Address	Email
North America	*Perle Systems Ltd.* *60 Renfrew Drive* *Markham* *Ontario* *Canada* *L3R OE1*	***Email: ptac@perle.com***
Europe	*Perle Systems Europe Ltd.* *3 Wintersells Road* *Byfleet Surrey* *KT14 7LF* *UK*	***Email: ptac@perle.com***
Asia	*Perle Asia Pacific (Pte) Ltd.* *Yu Li Industrial Building* *No 37 Lor 23 Sims Avenue* *04-01/05* *Singapore 388371*	***Email: ptac@perle.com***
Worldwide	*Perle Systems Ltd.* *60 Renfrew Drive* *Markham* *Ontario* *Canada* *L3R OE1*	***Email: ptac@perle.com***

Index

L

M

O

P

R

S

T

W

X