

R2D3

Data Capture Card

INSTALLATION AND OPERATION

Scope

This User Guide covers *R2D3* Data Capture Card for 2,048 kbits/s E1/PRI and DAB ETI applications.

Part Numbers:

R2D3-ASSY-0326	R2D3-ASSY-0327
R2D3-ASSY-0426	R2D3-ASSY-0427
R2D3-ASSY-0130	
R2D3-ASSY-0431	R2D3-ASSY-0131

Document Reference

R2D3-MAN-E102

Publication Date

5 October 2006

Published by

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DECLARATION OF CONFORMITY

Name of Manufacturer: Somerdata Ltd.
Address of Manufacturer: Somerdata Ltd
Underwood Business Park
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Equipment description: PCI Input/Output Card

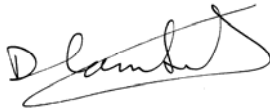
Model: **R2D3**

Conforms to the following Product Specifications:

Safety: IEC 950

EMC: 89/336/EEC EN55022 Harmonised Standard

The product complies with the requirements of the Electromagnetic Compatibility Directive 89/336/EEC as amended and the Low Voltage Directive 73/23/EEC and carries the CE marking accordingly.



Signed:

Position: Technical Director

Date: 20th June 2004

SOMERDATA AND THE ENVIRONMENT

Introduction

SomerData is committed to design and introduce products that conform to applicable environmental legislation and standards.

One of our missions is to integrate environmental stewardship into the business of providing quality products, services, and customer support at the best value.

In order to achieve this, SomerData has established a strategic team to focus on the importance of meeting our environmental obligations in the design, manufacture and support of our products.

We have developed a broad appreciation of the impact of these directives on our entire business model, from technical processes for materials, to finished goods manufacturing.

Current Compliance Activities

The Company's current environmental compliance commitment has been structured to meet the following European Union directives:

- Restriction of Hazardous Substance or RoHS Compliance (EU Directive 2002/95/EC)
- Waste Electrical & Electronic Equipment or WEEE Compliance (EU Directive 2002/96/EC)

Our goal is to meet or exceed compliance obligations of these EU directives.

Restriction of use of Hazardous Substances (RoHS)

Somerdata has also established a RoHS qualification process to help ensure that products meet stringent reliability and quality requirements, as well as regulatory compliance requirements.

The maximum allowable hazardous substance at a homogeneous material level under the EU RoHS Directive is shown in the following table.

From 1st July 2006 all SomerData manufactured products use lead-free soldering

Substances	Maximum Concentration Values (ppm)
Lead and its compounds	1000
Mercury and its compounds	1000
Hexavalent Chromium (Cr+6)	1000
Cadmium and its compounds	100
PolyBrominated Biphenyls (PBBs)	1000
PolyBrominated Diphenyl Ethers (PBDEs)	1000

Waste of Electrical & Electronic Equipment WEEE

Your SomerData product may be returned to SomerData at the end of its life at the customer's expense, provided that the product is free from radiation or biological contaminants. Somerdata products may be recycled free of charge at any local authority recycling centre as long as the Somerdata logo appears on the product and the following WEEE producer registration number is quoted: WEE/HA0074UR/PRO



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CONTENTS

1. INTRODUCTION	1-1
IN THIS SECTION	1-1
WHAT'S IN THIS USER GUIDE	1-1
USER GUIDE AVAILABILITY	1-2
2. PRODUCT DESCRIPTION	2-1
IN THIS SECTION	2-1
INTRODUCTION	2-2
APPLICABLE VERSIONS	2-3
E1/PRI CARDS	2-3
R2D3-ASSY-0426	2-3
R2D3-ASSY-0427	2-3
R2D3-ASSY-0326	2-4
R2D3-ASSY-0327	2-4
DAB/DMB CARDS	2-5
R2D3-ASSY-0431	2-5
R2D3-ASSY-0131	2-5
R2D3-ASSY-0130	2-5
DATA HANDLING	2-6
HARDWARE FEATURES	2-6
DATA INTERFACE	2-7
ON-BOARD BUFFER	2-7
APPLICATIONS	2-7
SYSTEM REQUIREMENTS	2-7
DATA-FLOW BLOCK DIAGRAM	2-8
3. SIGNAL CONNECTIONS	3-1
IN THIS SECTION	3-1
SIGNAL INTERFACE	3-2
G.703 RECOMMENDATION	3-2
G.703 PULSE MASK	3-3
INPUT AND OUTPUT IMPEDANCE	3-4
SIGNAL INPUT/OUTPUT CONNECTIONS	3-4
BNC CONNECTORS	3-5

SIGNAL GROUNDING LINKS	3-5
RJ-45 CONNECTORS	3-5
INTERFACE ADAPTER OPTION	3-7
INTERFACE ADAPTER CONFIGURATION	3-8
INTERFACE ADAPTER SPECIFICATION	3-9
E1DT - E1 SPLITTER/BUFFER OPTION	3-10
E1DT SIGNAL CONNECTIONS	3-10
4. OPERATION	4-1
IN THIS SECTION	4-1
INPUT/OUTPUT SIGNAL PATHS	4-2
SIGNAL INPUT	4-2
SIGNAL OUTPUT	4-2
SIGNAL OUTPUT	4-3
OUTPUT (REPLAY) CLOCK SELECTION	4-3
LED STATUS INDICATORS	4-4
LED INDICATOR FUNCTIONS	4-5
BUFFER THRESHOLD TRIGGER	4-5
INPUT SIGNAL LOSS	4-5
CONNECTING DATA STREAMS	4-6
POINT-TO-POINT CONNECTIONS	4-6
TERMINATED INPUTS	4-6
TERMINATED INPUT AND OUTPUT	4-7
NON-INTRUSIVE CONNECTIONS	4-7
NON-INTRUSIVE CONNECTIONS	4-8
TEE CONNECTION	4-8
MONITOR CONNECTION	4-9
SIGNAL OUTPUT EXAMPLES	4-10
"OFF-LINE" DATA ANALYSIS	4-10
"REAL-TIME" SIGNAL SOURCE	4-10
5. FRAME SYNCHRONISATION	5-1
IN THIS SECTION	5-1
E1 (G.703/G.704) FRAME RECOGNITION	5-2
WORD ALIGNMENT	5-3
CAPTURING FRAME SYNC. ERRORS	5-3

DAB ETI-NI/ETI-NA FRAME RECOGNITION	5-4
WORD ALIGNMENT	5-5
G.704 FRAMED DATA STRUCTURE	5-6
6. TROUBLESHOOTING	6-1
IN THIS SECTION	6-1
CHECKING INPUT SIGNAL STATUS AND CARD OPERATION	6-1
INPUT SIGNAL LOSS	6-2
BUFFER THRESHOLD TRIGGER	6-2
POWER AND SELF-TEST	6-2
PROGRAMMING LINK	6-3
SIGNAL GROUNDING OPTIONS (BNC CARD)	6-3
GROUNDING LINKS	6-3
7. INSTALLATION	7-1
IN THIS SECTION	7-1
MINIMUM SYSTEM REQUIREMENTS	7-2
WHAT YOU RECEIVED	7-3
RECORDER AND REPLAYER SOFTWARE	7-4
DEVICE DRIVER INSTALLATION	7-5
PREPARATION	7-5
GROUNDING PREPARATIONS	7-5
HANDLING PRECAUTIONS	7-6
CARD INSTALLATION	7-6
SOFTWARE INSTALLATION	7-7
8. SPECIFICATIONS	8-1
IN THIS SECTION	8-1
R2D3-ASSY-0326 (BNC CONNECTORS)	8-2
R2D3-ASSY-0426 (BNC CONNECTORS)	8-2
SIGNAL INPUT	8-2
SIGNAL OUTPUT	8-2
R2D3-ASSY-0327 (RJ-45 CONNECTORS)	8-3
R2D3-ASSY-0427 (RJ-45 CONNECTORS)	8-3
SIGNAL INPUT	8-3
SIGNAL OUTPUT	8-3

R2D3-ASSY-0130 (BNC CONNECTORS)	8-4
R2D3-ASSY-0131 (BNC CONNECTORS)	8-4
R2D3-ASSY-0431 (BNC CONNECTORS)	8-4
SIGNAL INPUT	8-4
SIGNAL OUTPUT	8-4
INPUT/OUTPUT JITTER ATTENUATION	8-5
PCI INTERFACE	8-5
ON-BOARD BUFFER	8-5
PHYSICAL	8-5
SYSTEM REQUIREMENTS	8-6
APPROVALS	8-6
9. SUPPORT	9-1
IN THIS SECTION	9-1
WHAT TO DO IF YOU HAVE A PROBLEM	9-1
SERVICING, MAINTENANCE AND REPAIRS	9-1
IF YOU NEED SUPPORT	9-2
SOMERDATA CONTACT INFORMATION	9-2
SUPPORT REQUESTS	9-3
RETURNS	9-4
END-OF-LIFE DISPOSAL	9-5
10. INDEX	10-1

1. INTRODUCTION

In this Section

WHAT'S IN THIS USER GUIDE	1-1
APPLICABLE PART NUMBERS	1-1
USER GUIDE AVAILABILITY	1-2

What's in this User Guide

This User Guide covers the **R2D3 PCI Data Capture Card - E1/PRI**, Digital Audio Broadcast (DAB) and Digital Multimedia Broadcast (DMB) Ensemble Transport Interface (ETI).

Applicable Part Numbers

R2D3-ASSY-0326	R2D3-ASSY-0327
R2D3-ASSY-0130	R2D3-ASSY-0131
R2D3-ASSY-0426	R2D3-ASSY-0427
R2D3-ASSY-0431	

*Section 2 – **PRODUCT DESCRIPTION*** gives an overview of your card's capabilities, features and applications.

*Section 3 – **INSTALLATION*** covers the procedure for installing and configuring your card in a host computer.

*Section 4 – **INPUT/OUTPUT CONNECTIONS*** provides details of connectors, pinouts and connection options.

*Section 5 – **OPERATION*** provides information on card setup, signal input / output paths and typical data stream connection examples.

*Section 6 – **FRAME SYNCHRONISATION*** describes the way in which the card supports ITU (G.703 / G.704) signal framing formats.

*Section 7 – **TROUBLESHOOTING*** provides information on solving common installation and operation problems.

*Section 8 – **SPECIFICATION*** describes the technical parameters for different card versions.

Section 9 – *SUPPORT* describes the procedure and contact details for obtaining customer support on this product.

User Guide Availability

Printed copies of Hardware and Software User Guides are supplied with the original products.

Additional printed copies, including the Programmer's Reference Guide can be supplied on request. Please contact your local supplier or SomerData for ordering details.

Electronic copies (Adobe Acrobat files) are included on the SomerData CD-ROM that is supplied with the original products.

The electronic User Guide library, which also includes product data sheets, can be accessed by browsing the `\Documents\` folder for the required document.

Additional and updated copies of the CD-ROM can be supplied on request. Please contact your local supplier or SomerData for ordering details.

2. PRODUCT DESCRIPTION***In this Section***

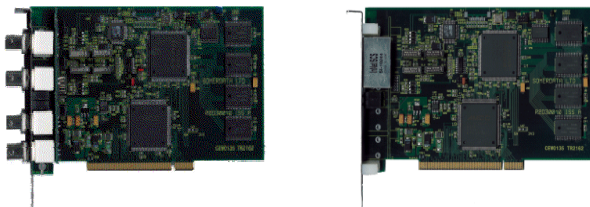
INTRODUCTION	2-2
APPLICABLE VERSIONS	2-3
E1/PRI CARDS	2-3
R2D3-ASSY-0426	2-3
R2D3-ASSY-0427	2-3
R2D3-ASSY-0326	2-4
R2D3-ASSY-0327	2-4
DAB/DMB CARDS	2-5
R2D3-ASSY-0431	2-5
R2D3-ASSY-0131	2-5
R2D3-ASSY-0130	2-5
DATA HANDLING	2-6
HARDWARE FEATURES	2-6
DATA INTERFACE	2-7
ON-BOARD BUFFER	2-7
APPLICATIONS	2-7
SYSTEM REQUIREMENTS	2-7
DATA-FLOW BLOCK DIAGRAM	2-8

Introduction

R2D3 Data Capture Card is designed to provide a real-time data input / output interface for Personal Computers and other compatible platforms.

With the appropriate control and application software **R2D3** can be used to record, replay and monitor HDB3 (G.703/G.704) 2,048 kbits/s telecommunications and Digital Audio Broadcast signals, with real-time data being transferred to or from disk or host memory. Typical signal types include: E1, Primary Rate ISDN and DAB ETI-NI/ETI-NA.

Incoming data streams can be recorded as binary files suitable for loading into user's analysis software. Data from disk or memory can be replayed in real-time as HDB3 (G.703/G.704) 2,048 kbits/s streams (e.g. E1, Primary Rate ISDN, DAB ETI-NI/ETI-NA).



R2D3 E1/PRI and DAB ETI Data Capture Cards

Applicable Versions

E1/PRI Cards

R2D3-ASSY-0426

- PCI-X compatible
- E1/PRI applications
- Supports framed (G.704) and unframed (G.703)
- 2 x BNC input connectors
- 2 x BNC output connectors
- Operating Modes:
 - Single-stream input *or* single-stream output
 - Dual-stream input *or* dual-stream output
(subject to software functionality)

R2D3-ASSY-0427

- PCI-X compatible
- E1/PRI applications
- Supports framed (G.704) and unframed (G.703)
- 2 x RJ-45 input/output connectors
- Operating Modes:
 - Single-stream input *or* single-stream output
 - Dual-stream input *or* dual-stream output
(subject to software functionality)

R2D3-ASSY-0326

(replaced by R2D3-ASSY-0436 from September 2006)

- PCI 2.1 compatible
- E1/PRI applications
- Supports framed (G.704) and unframed (G.703)
- 2 x BNC input connectors
- 2 x BNC output connectors
- Operating Modes:
 - Single-stream input *or* single-stream output
 - Dual-stream input *or* dual-stream output
(subject to software functionality)

R2D3-ASSY-0327

(replaced by R2D3-ASSY-0437 from September 2006)

- PCI 2.1 compatible
- E1/PRI applications
- Supports framed (G.704) and unframed (G.703)
- 2 x RJ-45 input/output connectors
- Operating Modes:
 - Single-stream input *or* single-stream output
 - Dual-stream input *or* dual-stream output
(subject to software functionality)

DAB/DMB Cards

R2D3-ASSY-0431

- PCI-X compatible
- DAB/DMB-ETI applications
- Supports ETI-NA (G.704) and ETI-NI (G.703)
- 2 x BNC input connectors
- 2 x BNC output connectors
- Operating Modes:
 - Single-stream input *and* single-stream output
 - Two-stream input *or* two-stream output
(subject to software functionality)

R2D3-ASSY-0131

(replaced by R2D3-ASSY-0431 in September 2006)

- PCI 2.1 compatible
- DAB/DMB-ETI applications
- Supports ETI-NA (G.704) and ETI-NI (G.703)
- 2 x BNC input connectors
- 2 x BNC output connectors
- Operating Modes:
 - Single-stream input *and* single-stream output
 - Two-stream input *or* two-stream output
(subject to software functionality)

R2D3-ASSY-0130

(replaced by R2D3-ASSY-0131 in September 2003)

- PCI 2.1 compatible
- DAB/DMB-ETI applications
- Supports ETI-NA (G.704) *and* ETI-NI (G.703)
- 2 x BNC input connectors
- 2 x BNC output connectors
- Operating Modes:
 - Single-stream input *or* single-stream output
 - Two-stream input *or* two-stream output
(subject to software functionality)

Data Handling

For card inputs, **R2D3** accepts 2,048 kbits/s HDB3 signals compatible with ITU specifications G.703 and G.704.

In telecommunications applications, these signals are referred to as *framed* and *unframed*. In DAB applications, these signals are referred to as *ETI-NI* and *ETI-NA*.

The HDB3 encoded input signals are decoded, buffered and made available to the user's application software for transfer over the PCI bus.

For card outputs, data streams transferred across the PCI bus to the card are buffered, encoded into HDB3 signals and output at 2,048 kbits/s, synchronised to either an internal or external clock source.

Hardware Features

- PCI card for PC platforms
- PCI 2.1 or PCI-X compatible, depending on version (see above)
- 16 Mbits on-board buffer
- Real-time input and output data transfers
- ITU-T G.703 (2,048 kbits/s) compatible data interface
- Raw data transferred to/from PCI bus
- E1 versions support framed (G.704) and unframed (G.703) bitstreams
- DAB version supports ETI-NI (G.703) and ETI-NA (G.704) bitstreams, including simultaneous single-stream input and single-stream output (R2D3-ASSY-0131 from September 2003)
- Selection of internal and external replay clock synchronisation
- 75 Ω / 120 Ω data interface (selectable on E1 cards)
- 40k Ω high-impedance input selection (on E1 cards)
- Optional Splitter/Buffer for non-intrusive connections

Data Interface

Depending upon the card version, signal connections are via one pair of BNC connectors or one RJ-45 connector for each input/output bitstream.

The data interface supports ITU (G.703/G.704) 2,048 kbits/s input and output data transfers.

On-board Buffer

The card uses on-board memory to buffer data to and from the PCI Bus, with 16 Mbits of SDRAM.

Applications

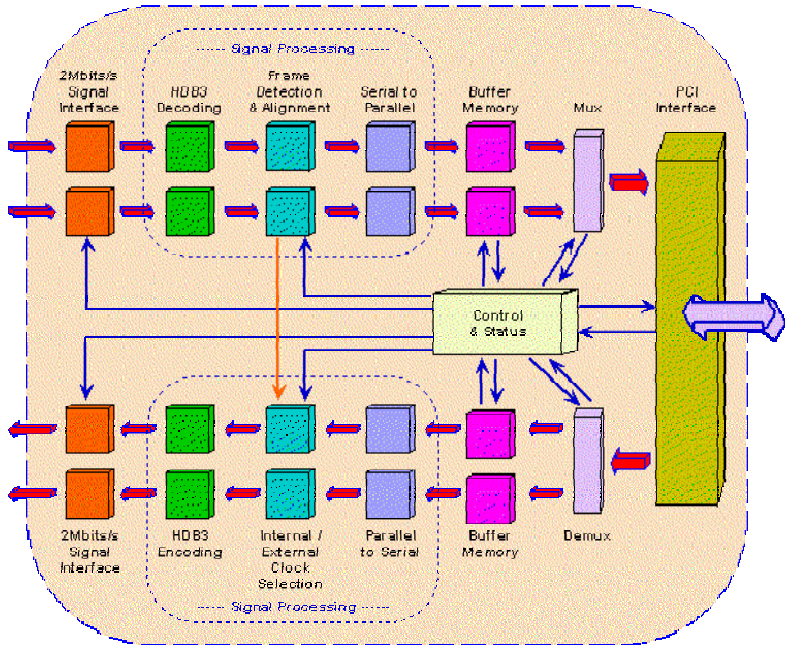
When installed in a suitable personal computer and accompanied by appropriate software, **R2D3** can be used to support applications such as: recording & replay, real-time monitoring & analysis, data sharing, store and forward, signal generation.

System Requirements

Pentium™ class Personal Computer (200 MHz minimum) with at least 128 Mbytes system memory (RAM) and the following:

- PCI 2.1 or PCI-X, depending on version (see above)
- 1 Free PCI slot
- Motherboard with +3.3 Volts and +5 Volts power on the PCI connector

Data-Flow Block Diagram



3. SIGNAL CONNECTIONS

In this Section

SIGNAL INTERFACE	3-2
G.703 RECOMMENDATION	3-2
G.703 PULSE MASK	3-3
INPUT AND OUTPUT IMPEDANCE	3-4
SIGNAL INPUT/OUTPUT CONNECTIONS	3-4
BNC CONNECTORS	3-5
SIGNAL GROUNDING LINKS	3-5
RJ-45 CONNECTORS	3-5
INTERFACE ADAPTER OPTION	3-7
INTERFACE ADAPTER CONFIGURATION	3-8
INTERFACE ADAPTER SPECIFICATION	3-9
E1DT - E1 SPLITTER/BUFFER OPTION	3-10
E1DT SIGNAL CONNECTIONS	3-10

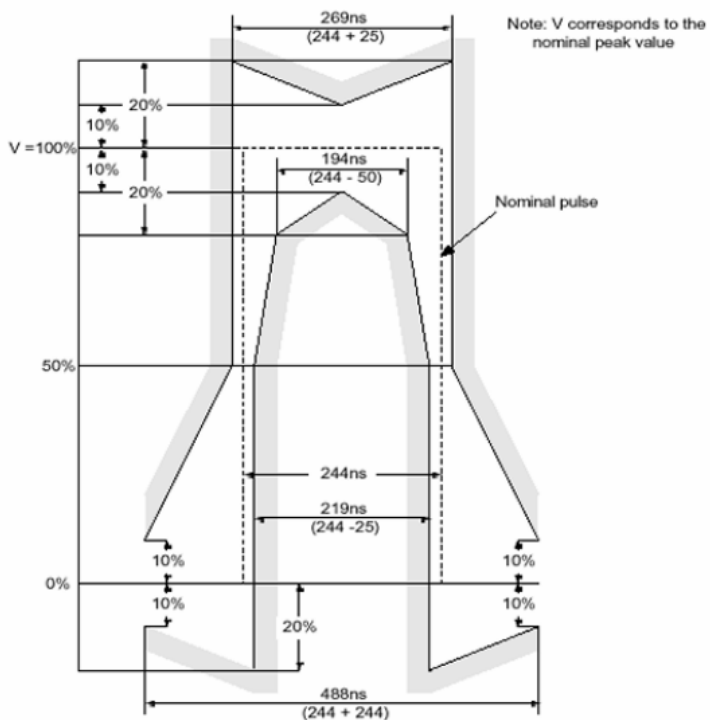
Signal Interface

The signal Interface supports HDB3 encoded 2,048 kbits/s signals in accordance with ITU-T Recommendation G.703.

G.703 Recommendation

Pulse shape (nominally rectangular)	All marks of a valid signal must conform to the mask irrespective of the sign. The value V corresponds to the nominal peak value.	
Pair in each direction	One coaxial pair	One symmetrical pair
Load impedance	75 Ohms	120 Ohms
Nominal peak voltage of a mark (pulse)	2.37V	3V
Peak voltage of a space (no pulse)	$0 \pm 0.237V$	$0 \pm 0.3V$
Nominal pulse width	244ns	
Ratio of the amplitudes of positive and negative at the centre of the pulse interval	0.95 to 1.05	
Ratio of the widths of positive and negative pulses at the normal pulse amplitude	0.95 to 1.05	

G.703 Pulse Mask



Input and Output Impedance

The default input/output impedance settings for each card version are as follows:

<i>R2D3-ASSY-0326</i>	75 Ω unbalanced
<i>R2D3-ASSY-0426</i>	75 Ω unbalanced
<i>R2D3-ASSY-0327</i>	120 Ω balanced
<i>R2D3-ASSY-0427</i>	120 Ω balanced
<i>R2D3-ASSY-0130</i>	75 Ω unbalanced
<i>R2D3-ASSY-0131</i>	75 Ω unbalanced
<i>R2D3-ASSY-0431</i>	75 Ω unbalanced

On E1 cards, input impedance is software selectable between 75 Ω , 120 Ω and high-impedance (40 k Ω).

When using high-impedance (40 k Ω) connections, the recommended maximum cable length is 2 metres. For greater distances, SomerData recommends using a SomerData *Splitter/Buffer*.

<i>Signal Input/Output Connections</i>

R2D3 cards are available in the following signal connector configurations:

<i>R2D3-ASSY-0326</i>	BNC Connectors
<i>R2D3-ASSY-0426</i>	BNC Connectors
<i>R2D3-ASSY-0327</i>	RJ-45 Connectors
<i>R2D3-ASSY-0427</i>	RJ-45 Connectors
<i>R2D3-ASSY-0130</i>	BNC Connectors
<i>R2D3-ASSY-0131</i>	BNC Connectors
<i>R2D3-ASSY-0431</i>	BNC Connectors

BNC Connectors

Connect your signal leads as shown below.

The upper pair of connectors are used for Stream A and the lower pair of connectors are used for Stream B.

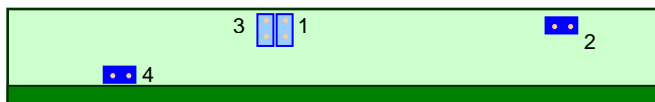
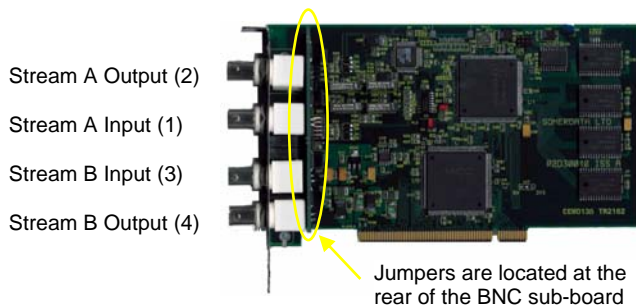
Connections should be made with 75 Ohm coaxial cable. A recommended cable is RG179B/U.

Signal Grounding Links

The default settings are in accordance with ITU G.703.

Input screens are not connected to ground (no links fitted). Output screens are connected to ground (links fitted).

Signal Grounding Links are located on the sub-board behind the connector panel as shown below.




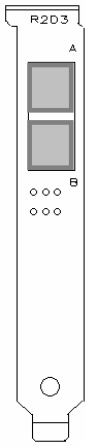
RJ-45 Connectors

Connect your signal leads with wiring as shown below.

One 8-way connector is provided for each E1/PRI stream.

The upper connector is used for Stream A and the lower connector is used for Stream B.

Connections should be made shielded 8-way cable.

Pin	Function	Comments	
RJ-45			 <p>Stream A</p> <p>Stream B</p>
1	RTIP	Card Input	
2	RRING	Card Input	
3	TX Ground		
4	TTIP	Card Output	
5	TRING	Card Output	
6	RX Ground		
7	Not used		
8	Not used		


Interface Adapter Option

In-line adapter connects 75Ω unbalanced BNC Input/Output connections with RJ-45 120Ω balanced circuits.

The Interface Adapter requires no power for operation.

R2D2-ASSY-0036

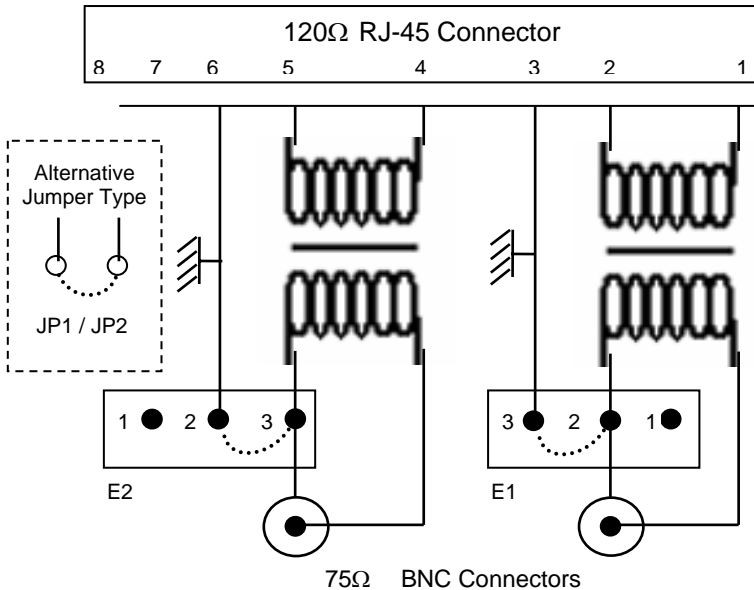


Pin	Function	Comments
RJ-45		
1	RTIP	
2	RRING	
3	TX Ground	
4	TTIP	
5	TRING	
6	RX Ground	
7	Not used	
8	Not used	

Interface Adapter Configuration

The Interface Adapter is pre-set to work in most applications without additional configuration.

The only user-configurable settings are shield connection links between the 75Ω and 120Ω interfaces as shown in the diagram below.

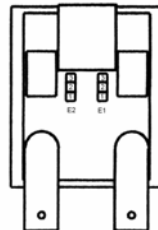


In the default configuration, the shield connections are closed when jumper E1 and E2 links connect pins 2 and 3, thus passing both shield connections through.

On the alternative version, the shield connections are closed when jumpers JP1 and JP2 links are fitted.

To open (break) one or both of the shield connections, proceed as follows.

Insert a small flat-bladed screwdriver into the slots on the side of the Interface Adapter and twist. The case will pop open to reveal the jumpers on the circuit board.



With the RJ-45 connector, locate jumpers E1 and E2 (or JP1 and JP2 on the alternate version).

To open the shield connections, change the E1 and E2 jumper connections from pins 2-3 to pins 1-2. (On the alternative version remove the JP1 and JP2 jumper links, keeping them in a safe place for future use).

To re-assemble the Interface Adapter, re-align the two halves and end inserts. Ensure that the label on the case is on the same side as the component side of the circuit board.

Snap the case halves together.

Interface Adapter Specification

Interface: G.703 unstructured

Data Rate: 2,048 kbits/s

75 Ω unbalanced interface: BNC connector

120 Ω balanced interface: 8-pin RJ-45 shielded connector

E1DT - E1 Splitter/Buffer Option

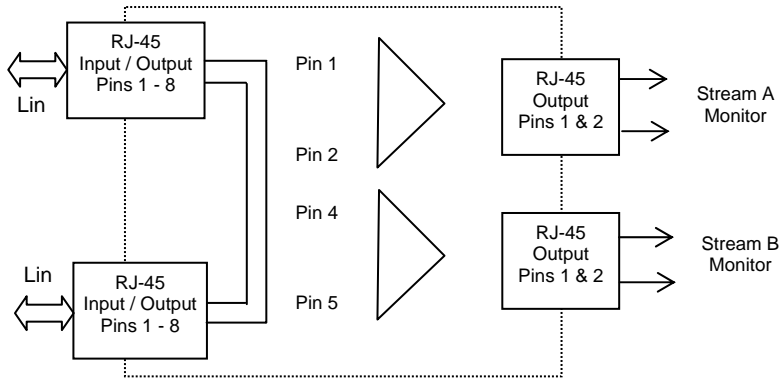
E1DT provides a means of monitoring 2Mbps/s E1/PRI communications links with minimum loading of the line and without the cable-length restriction when using the card's high-impedance input setting.



Line signals are split and fed into a high-impedance buffer, which drives a low impedance output to the monitoring equipment.

The unit provides RJ-45 connectors for line input/output. An optional adapter cable is available for BNC line connections.

E1DT Signal Connections



Monitor outputs are on two RJ-45 connectors – one for the Line TX and the other for the Line RX bitstreams. Both bitstreams appear on the TX pins of the monitor output connectors. Connections from **E1DT** to **R2D3** should be made using standard CAT5 (1:1) cable.

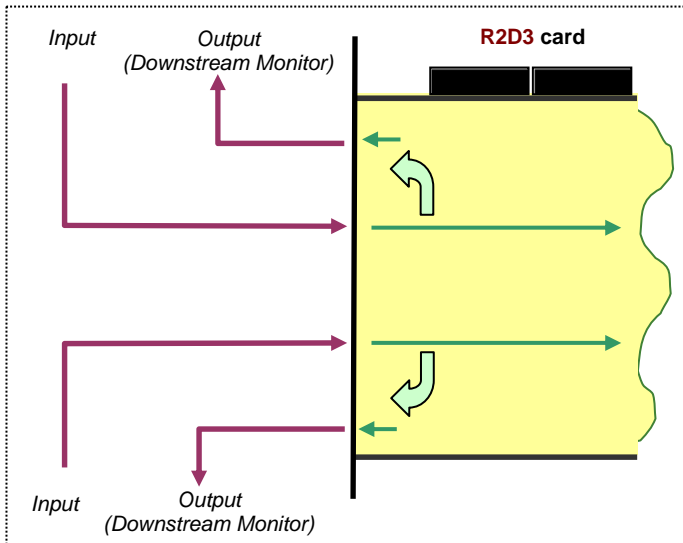
4. OPERATION***In this Section***

INPUT/OUTPUT SIGNAL PATHS	4-2
SIGNAL INPUT	4-2
SIGNAL OUTPUT	4-2
SIGNAL OUTPUT	4-3
OUTPUT (REPLAY) CLOCK SELECTION	4-3
LED STATUS INDICATORS	4-4
LED INDICATOR FUNCTIONS	4-5
BUFFER THRESHOLD TRIGGER	4-5
INPUT SIGNAL LOSS	4-5
CONNECTING DATA STREAMS	4-6
POINT-TO-POINT CONNECTIONS	4-6
TERMINATED INPUTS	4-6
TERMINATED INPUT AND OUTPUT	4-7
NON-INTRUSIVE CONNECTIONS	4-7
NON-INTRUSIVE CONNECTIONS	4-8
TEE CONNECTION	4-8
MONITOR CONNECTION	4-9
SIGNAL OUTPUT EXAMPLES	4-10
“OFF-LINE” DATA ANALYSIS	4-10
“REAL-TIME” SIGNAL SOURCE	4-10

Input/Output Signal Paths

Signal Input

The input signals are routed to the output except when the card is set for output data transfers, or the input connection has been disabled in software.



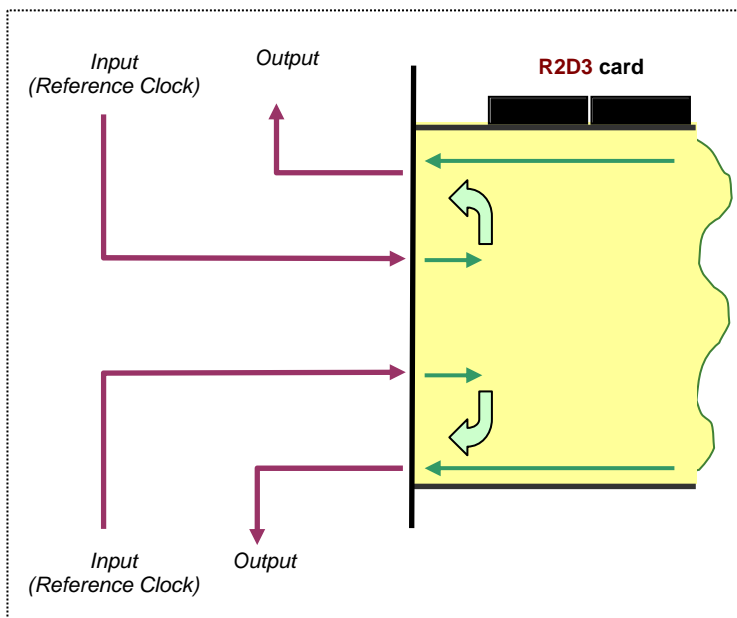
Signal Output

Output (Replay) Clock Selection

The data capture card requires a reference clock in order to output data stream(s),

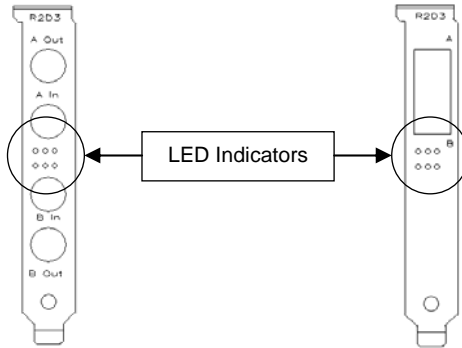
The use of an external 2,048kbits/s (E1 or DAB) signal will ensure that the output signal will be synchronised with the external source.

Where an external signal is not available, or synchronisation is not required, the internal 2,048kHz clock source should be selected.



LED Status Indicators

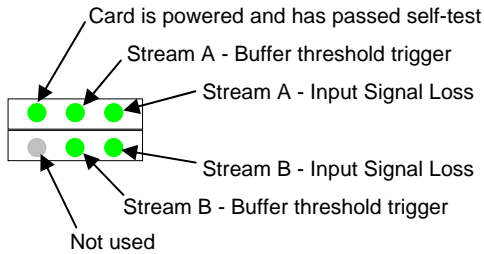
Six status LED indicators are located on the card's input/output panel as shown below.



R2D3-ASSY-0326
R2D3-ASSY-0130
R2D3-ASSY-0131
R2D3-ASSY-0426
R2D3-ASSY-0430
R2D3-ASSY-0431

R2D3-ASSY-0327
R2D3-ASSY-0427

LED Indicator Functions



Buffer Threshold Trigger

The Buffer Threshold LEDs will light when the amount of data in the buffer is above (input data transfers) or below (output data transfers) the threshold point.

Input Signal Loss

The Signal Loss LEDs will light when the input signal contains more than 175 consecutive zeros.

Connecting Data Streams

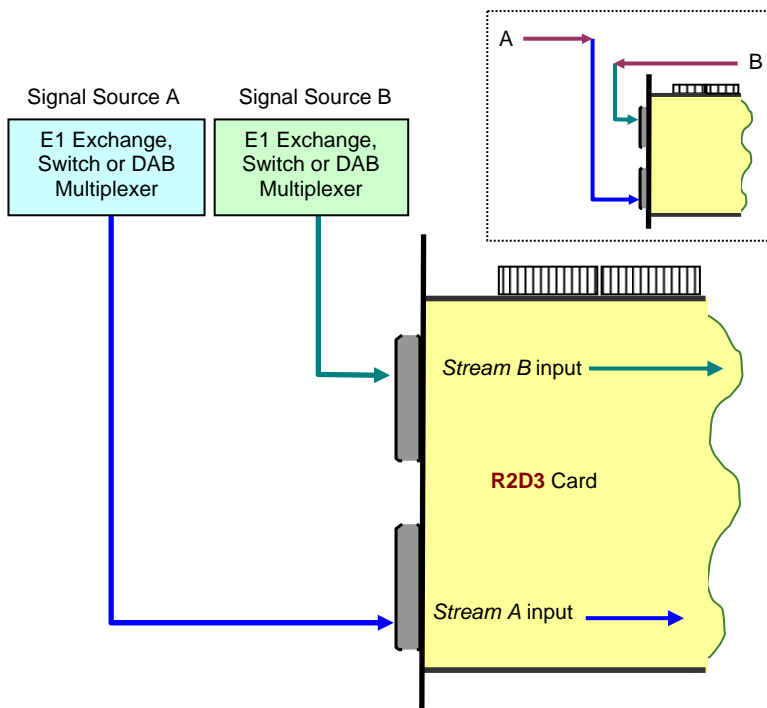
Connections with signal sources will vary according to the application. Some typical examples are shown below.

Point-to-Point Connections

Terminated Inputs

75 Ω unbalanced or 120 Ω balanced depending on **R2D3** card version.

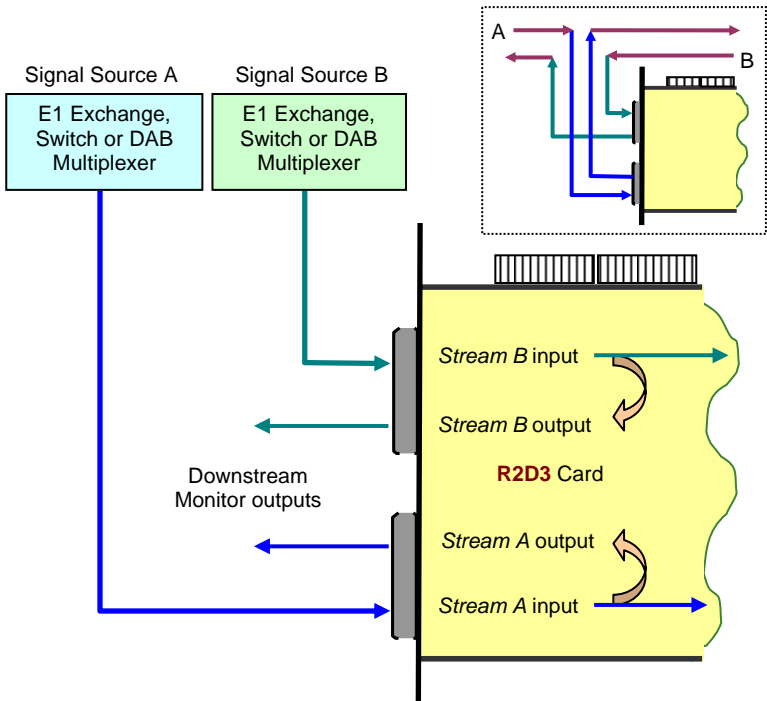
An *Interface Adapter* must be used where there is an impedance mismatch between the signal source and **R2D3** card terminations.



Terminated Input and Output

75 Ω unbalanced or 120 Ω balanced depending on R2D3 card version.

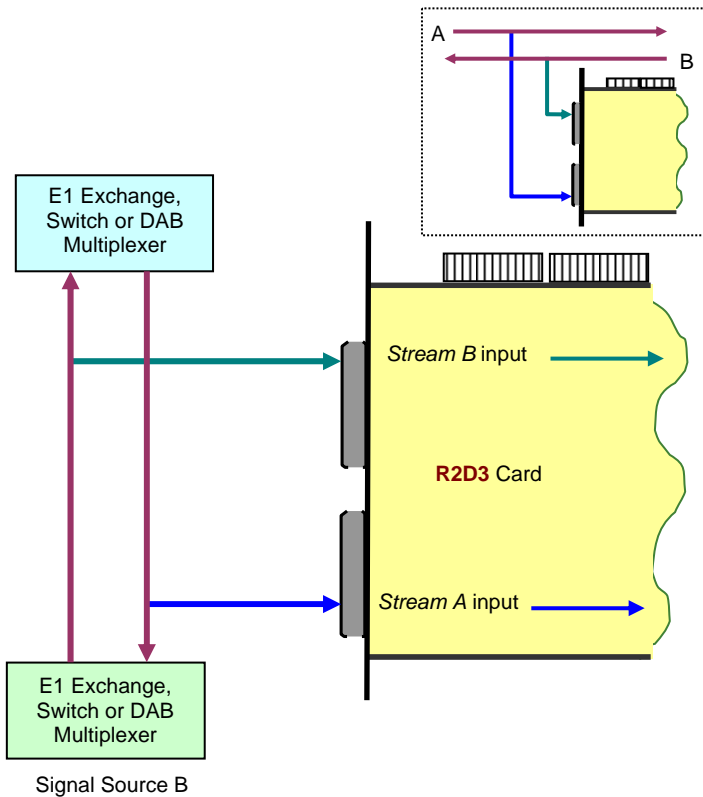
An *Interface Adapter* must be used where there is an impedance mismatch between the signal source and R2D3 card terminations.



Non-Intrusive Connections

Tee Connection

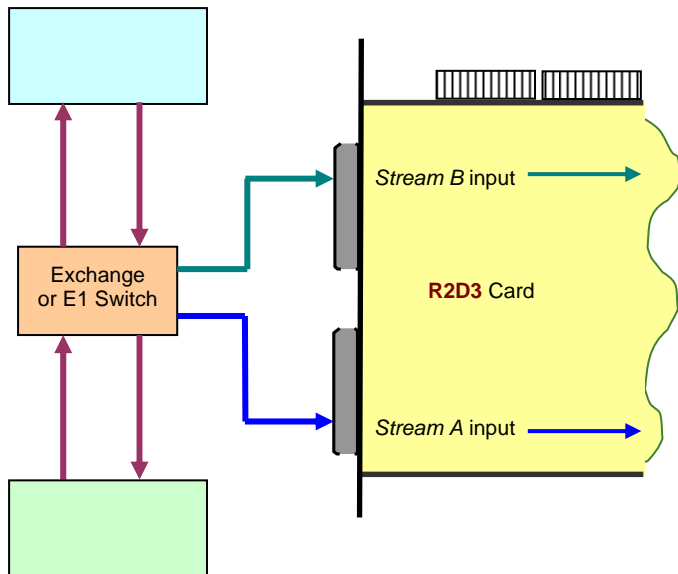
R2D3 card should be set to High Impedance ($40\text{ k}\Omega$).
The recommended maximum cable length is 2 metres.
For greater distances, SomerData recommends using a SomerData *Splitter/Buffer*.



Monitor Connection

When connecting to “Monitor” points it may be necessary to set the **R2D3** card to High Impedance for signal level compatibility.

The recommended maximum cable length is 2 metres when using high-impedance connections. For greater distances, SomerData recommends using a SomerData *Splitter/Buffer*.



Signal Output Examples

“Off-Line” Data Analysis

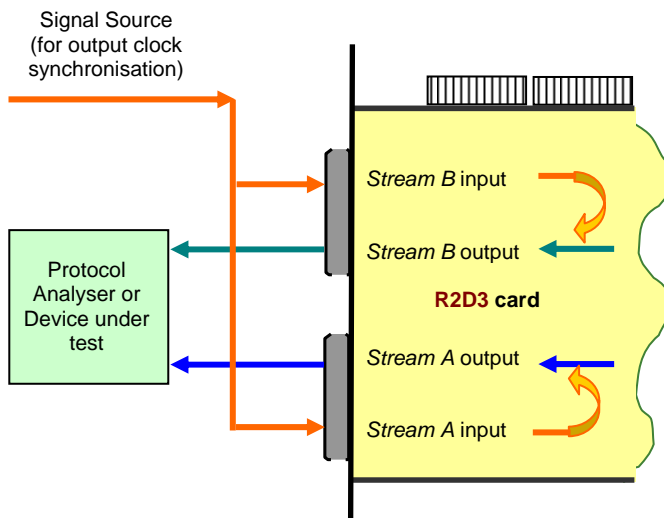
“Real-Time” Signal Source

In addition to replaying previously captured data for off-line analysis, R2D3 can be used as a source of “real-time” signals to support product development and testing.

The source signals can be previously recorded or generated data files.

This enables the user to build and use a library of “live” data files with different protocols, data types and traffic conditions.

If required, output signals can be synchronised to an external source by connecting a 2,048kbits/s E1 or DAB signal to the input connectors and setting the card to use External Clock.



5. FRAME SYNCHRONISATION

In this Section

E1 (G.703/G.704) FRAME RECOGNITION	5-2
WORD ALIGNMENT	5-3
CAPTURING FRAME SYNC. ERRORS	5-3
DAB ETI-NI/ETI-NA FRAME RECOGNITION	5-4
WORD ALIGNMENT	5-5
G.704 FRAMED DATA STRUCTURE	5-6

E1 (G.703/G.704) Frame Recognition

Card versions: R2D3-ASSY-0326 (BNC connectors)
R2D3-ASSY-0327 (RJ-45 connectors)
R2D3-ASSY-0426 (BNC connectors)
R2D3-ASSY-0427 (RJ-45 connectors)

R2D3 cards provide frame synchronisation support for ITU (G.703/G.704) signals as described below.

When set to *UNFRAMED*, incoming data will be transferred to the buffer as soon as *START* has been commanded.

When set to *FRAMED*, Incoming data will only be transferred to the buffer once three consecutive frame alignment words (to ITU G.704) have been received in the form *S0011011* (where S is a signalling bit).

The stream will only be deemed to be locked if 3 frames have been received with 2 valid frame alignment words as above, alternated with the alternate frame alignment word in the form *S1ASSSS* (where S are signalling bits and A is the remote alarm indicator).

Once locked, the stream will stay locked unless 3 consecutive frame alignments fail to be found in the expected bit positions.

In the event of this occurring, the locking procedure as described above will recommence.

If the stream has already commenced recording, the received data will be faithfully passed through to be recorded.

The only exception to this is if on re-locking, the frame is no longer in the same relative word position as under the previous lock condition.

In this event up to 15 bits will be lost while word-alignment is implemented.

Word Alignment

Word alignment is only implemented when the card is set for *FRAMED* data.

The effect of this feature is to place the frame alignment word into the first Byte of the word that is passed to the processor.

It is assumed that the little-endian format is used (this is typical for all Intel PCs).

As the first word in the memory is the frame alignment word, the first word in any saved file can also be the frame alignment word.

However, should there be a loss of sync. then the frame alignment word may appear to move.

This is because the card's firmware can discard 15 bits during the alignment process.

Should the loss of bits during re-lock not be acceptable, then the card should be set for *UNFRAMED* data.

Capturing Frame Sync. Errors

It is possible to start a recording as *FRAMED* data to line up the frame at the start of the recording, and select *UNFRAMED* as soon as the recording has commenced (e.g. at the first interrupt or data read).

Once *UNFRAMED* has been selected, the card will capture all subsequent data errors, slips and omissions.

Note that this will result in the initial recording being in an obvious frame structure, but after a bit slip the data will become more difficult to interpret.

DAB ETI-NI/ETI-NA Frame recognition

Card versions: R2D3-ASSY-0130 (before September 2003)
R2D3-ASSY-0131 (from September 2003)
R2D3-ASSY-0431

For ETI-NI signals, incoming data will only be transferred to the buffer once three consecutive ETI-NI (G.703) frame sync words have been received (073AB6_H).

For ETI-NA signals, incoming data will only be transferred to the buffer once three consecutive ITU (G.704) frame sync words have been received (S0011011₂), where S is a signalling bit).

The stream will only be deemed to be locked if 3 frames have been received with 2 valid frame sync words as above, alternated with the alternate frame sync word.

Once locked, the stream will stay locked unless 3 consecutive frame sync words fail to be found in the expected bit positions.

In the event of this occurring, the locking procedure as described above will recommence.

If the stream has already commenced recording, the received data will be faithfully passed through to be recorded.

The only exception to this is if on re-locking, the frame is no longer in the same relative word position as under the previous lock condition.

In this event up to 15 bits will be lost while word-alignment is implemented.

Word Alignment

The effect of word-alignment is to place the DAB G.703 frame sync word (ETI-NI) or ITU G.704 frame alignment word (ETI-NA) into the first Byte of the word that is passed to the processor.

It is assumed that the little-endian format is used (this is typical for all Intel PCs).

As the first word in the memory is the frame alignment word, the first word in any saved file can also be the frame alignment word.

However, should there be a loss of sync. then the frame alignment word may appear to move.

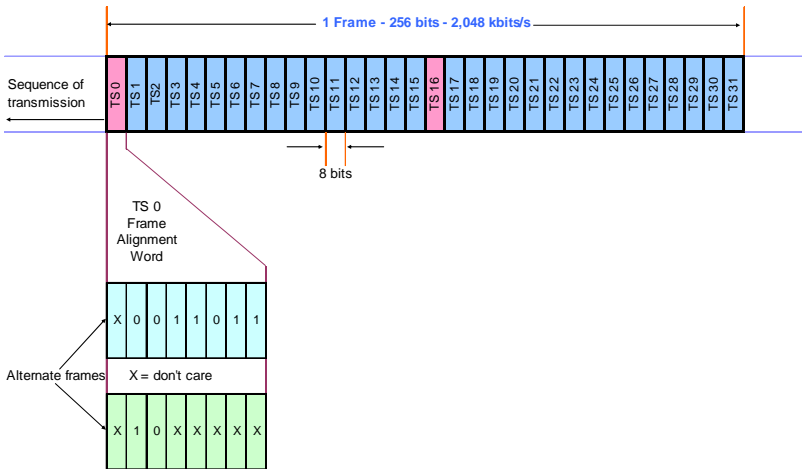
This is because the card's firmware can discard 15 bits during the alignment process.

G.704 Framed Data Structure

All versions of the card synchronise to framed E1/PRI (ITU-T G.703/G.704) input signals with the following data structure.

The bitstream should consist of 32 byte frames containing a Frame Alignment Synchronising Byte (FAS) in every other frame with an appropriate alternate (NFAS) Byte in other frames.

A sequence of correct FAS/NFAS/FAS (three frames) is required to ensure synchronisation is achieved.



Loss of synchronisation will be indicated when this sequence is not present.

To ensure correct operation, the signal should be present before recording commences.

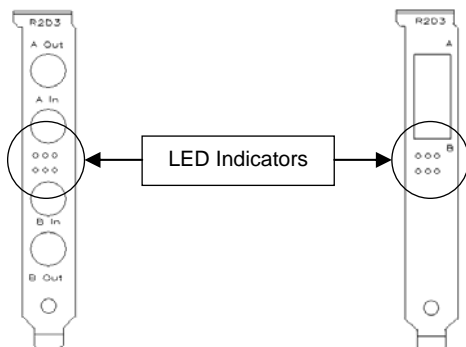
6. TROUBLESHOOTING

In this Section

CHECKING INPUT SIGNAL STATUS AND CARD OPERATION	6-1
INPUT SIGNAL LOSS	6-2
BUFFER THRESHOLD TRIGGER	6-2
POWER AND SELF-TEST	6-2
PROGRAMMING LINK	6-3
SIGNAL GROUNDING OPTIONS (BNC CARD)	6-3
GROUNDING LINKS	6-3

Checking Input Signal Status and Card Operation

Six status LED indicators are located on the card's input/output panel as shown below.

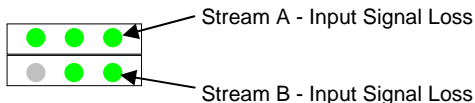


R2D3-ASSY-0326
R2D3-ASSY-0130
R2D3-ASSY-0131
R2D3-ASSY-0426
R2D3-ASSY-0430
R2D3-ASSY-0431

R2D3-ASSY-0327
R2D3-ASSY-0427

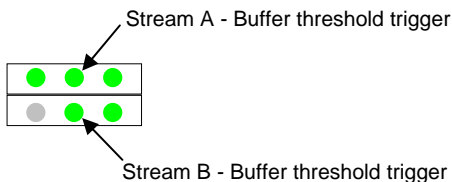
Input Signal Loss

The Signal Loss LEDs will light when the input signal contains more than 175 consecutive zeros.



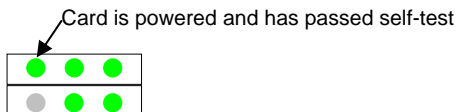
Buffer Threshold Trigger

The Buffer Threshold LEDs will light when the amount of data in the buffer is above (input data transfers) or below (output data transfers) the threshold point.



Power and Self-Test

If the card is not communicating with the device driver or control software, check the Power/Self-Test LED.



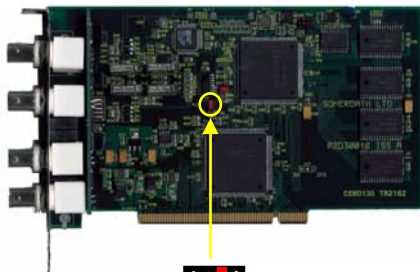
If this is not lit green, this usually means that either:


the motherboard does not support PCI cards that require 3.3V

the programming link (PL3) is damaged or missing

Programming Link

The link is located at the centre of the main board as shown below.



 Programming link (PL3)

Signal Grounding Options (BNC Card)

Only applies to cards with BNC connectors.

The card's default settings are in accordance with ITU G.703.

Input screens are not connected to ground (no links fitted).

Output screens are connected to ground (links fitted).

Grounding Links

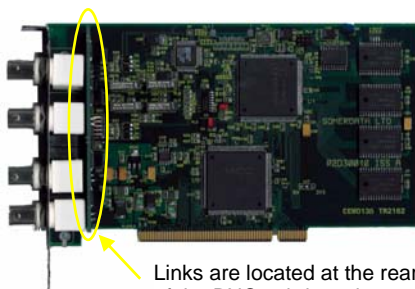
The links are located on the sub-board behind the connector panel as shown below.

Stream A Output (2)

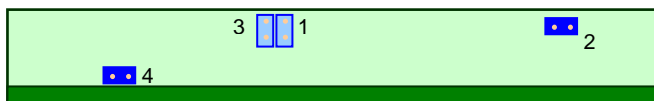
Stream A Input (1)

Stream B Input (3)

Stream B Output (4)



Links are located at the rear of the BNC sub-board



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7. INSTALLATION

In this Section

MINIMUM SYSTEM REQUIREMENTS	7-2
WHAT YOU RECEIVED	7-3
RECORDER AND REPLAYER SOFTWARE	7-4
DEVICE DRIVER INSTALLATION	7-5
PREPARATION	7-5
GROUNDING PREPARATIONS	7-5
HANDLING PRECAUTIONS	7-6
CARD INSTALLATION	7-6
SOFTWARE INSTALLATION	7-7

Minimum System Requirements

Below are the minimum recommended host PC requirements for operating the R2D3 card with SomerData **Recorder** and **Replayer** application software.

Customer-developed application software may require alternative configurations.

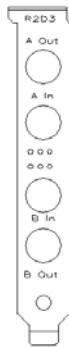
- Single-processor system
- Pentium™ IV processor 2GHz
- 256 Mbytes system memory (RAM)
- 1 free PCI slot (per PCI revision 2.1) 32-bit bus
- Motherboard with +3.3 Volts and +5 Volts power on the PCI connector
- Mouse or other pointing device
- 1024 x 768 resolution graphics, 256-bit colour depth, or greater
- Windows XP Professional™, or Windows 2000 Professional™ (SP1 or later)

What you received

Please ensure that you have received the items in accordance with the configuration that you ordered.

Your **R2D3** has been supplied in one of the following configurations.

Different card versions may have a similar appearance so it is very important to check the part number and input / output connector labelling before use.



BNC Connectors
R2D3-ASSY-0326
R2D3-ASSY-0130
R2D3-ASSY-0326
R2D3-ASSY-0426
R2D3-ASSY-0431



RJ-45 Connectors
R2D3-ASSY-0327
R2D3-ASSY-0427

	BNC	RJ-45
<i>R2D3-ASSY-0326 - E1/PRI card</i>	✓	
<i>R2D3-ASSY-0426 - E1/PRI card</i>	✓	
<i>R2D3-ASSY-0327 - E1/PRI card</i>		✓
<i>R2D3-ASSY-0427 - E1/PRI card</i>		✓
<i>R2D3-ASSY-0130 - DAB-ETI card</i>	✓	
<i>R2D3-ASSY-0131 - DAB-ETI card</i>	✓	
<i>R2D3-ASSY-0431 - DAB-ETI card</i>	✓	
<i>E1DT-ASSY-0029 - E1 Splitter/Buffer</i>		option
<i>R2D2-ASSY-0036 - Interface Adapter (75Ω - 120Ω)</i>	option	option

Recorder and Replayer Software

If your order included SomerData *Recorder* and/or *Replayer* application software, please refer to the Software Installation User Guide.

Device Driver Installation

If your order included SomerData *Recorder*, *Replayer* and/or *Monitor* application software, the R2D3 Device Driver installer should be run *before* installing the R2D3 card.

Please refer to the Software Installation User Guide for the R2D3 Device Driver installation procedure.

Preparation

Check the items received to ensure that they match your data input/output configuration requirements (refer to the table above).

No special tools are required. You will need cross-headed and flat-headed screwdrivers in order to complete the following hardware installation steps.

Refer to your PC system documentation for the correct procedure on installing a PCI expansion card in your particular system.

Grounding Preparations

- Wear a grounding wrist strap
- Make a diagram that notes where the cables connect to the back of your PC system
- Turn off the PC system power
- Remove all the cables, except for the power cable
- Remove the PC system case cover
- Ground yourself by touching the power supply or exposed metal surface while it is plugged in
- Unplug the power cable

Handling Precautions

- Never slide cards or other parts over any surface
- Avoid static-causing surfaces, such as plastic and polystyrene, in your work area
- Remove the **R2D3** card from its anti-static packing only when you are ready to use it
- Do not lay the **R2D3** card on the outside of the anti-static packing, as only the inside of the packing provides anti-static protection
- Always hold the card by its edges and metal mounting bracket
- Avoid touching components on the card and the edge connectors that connect to expansion slots

Card Installation

- Before installing the card, ensure that +3.3 Volts and +5 Volts are provided on the PCI connector; otherwise the **R2D3** card will not function.
- Refer to the PC system manufacturer's documentation for instructions on opening the system case and installing PCI option cards.
- Use the above Grounding Procedure to open the PC system, and ground yourself.
- Remove the screw that holds the metal plate over one of your system's empty PCI expansion card slots
- Press the card straight into the PCI slot. Make sure that you push evenly on both edges until the card is firmly seated. You may need to press in on the bottom of the metal bracket to keep it from catching on the case. It may be necessary to slightly rock the card end-to-end, but do not bend the card sideways
- Secure the card to the case with the screw you removed in Step 3
- Replace the cover and the cables on the back of the system, but do not fasten the screws yet
- Tighten down the system cover once you have verified that everything works

Software Installation

If your order included SomerData *Recorder*, *Replayer* and/or *Monitor* application software, please refer to the Software Installation User Guide.

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8. SPECIFICATIONS***In this Section***

R2D3-ASSY-0326 (BNC CONNECTORS)	8-2
R2D3-ASSY-0426 (BNC CONNECTORS)	8-2
SIGNAL INPUT	8-2
SIGNAL OUTPUT	8-2
R2D3-ASSY-0327 (RJ-45 CONNECTORS)	8-3
R2D3-ASSY-0427 (RJ-45 CONNECTORS)	8-3
SIGNAL INPUT	8-3
SIGNAL OUTPUT	8-3
R2D3-ASSY-0130 (BNC CONNECTORS)	8-4
R2D3-ASSY-0131 (BNC CONNECTORS)	8-4
R2D3-ASSY-0431 (BNC CONNECTORS)	8-4
SIGNAL INPUT	8-4
SIGNAL OUTPUT	8-4
INPUT/OUTPUT JITTER ATTENUATION	8-5
PCI INTERFACE	8-5
ON-BOARD BUFFER	8-5
PHYSICAL	8-5
SYSTEM REQUIREMENTS	8-6
APPROVALS	8-6

R2D3-ASSY-0326 (BNC Connectors)**R2D3-ASSY-0426 (BNC Connectors)****Signal Input**

Signal Interface:	G.703, 2,048 kbits/s
Pulse shape:	As ITU-T G.703 pulse mask
Line code:	HDB3
Data type:	framed to ITU G.704 or unframed
Input impedance ¹ :	75 Ω unbalanced - default (selectable 40 k Ω / 120 Ω)
Input sensitivity:	-13.6dB
Input amplitude:	Nominal: ± 2.37 V into 75 Ω Maximum: ± 5 V Minimum: ± 500 mV
Loss of signal threshold:	300 mV
Data decision threshold:	43% to 57% peak
Pulse width:	230 ns to 260 ns
Input jitter tolerance:	1200 UI at 10 kHz 14 UI at 750 Hz 0.4 UI at 10 kHz – 100 kHz

Signal Output

Signal Interface:	ITU G.703, 2,048 kbits/s
Line code:	HDB3
Output impedance:	75 Ω unbalanced - default (selectable 120 Ω)
Output amplitude:	± 2.37 V $\pm 10\%$ into 75 Ω
Pulse width:	244 ± 20 ns (at mid level)
Pulse-to-pulse jitter:	<100ns using internal clock and <32ns using clock recovered from an external E1/HDB3 signal

¹ When using high-impedance (40 k Ω) connections, the recommended maximum cable length is 2 metres. For greater distances, SomerData recommends using a SomerData *Splitter/Buffer*.

R2D3-ASSY-0327 (RJ-45 Connectors)**R2D3-ASSY-0427 (RJ-45 Connectors)****Signal Input**

Signal Interface:	G.703, 2,048 kbits/s
Pulse shape:	As ITU-T G.703 pulse mask
Line code:	HDB3
Data type:	framed to ITU G.704 or unframed
Input impedance 1:	120 Ω balanced - default (selectable 40 k Ω / 75 Ω)
Input sensitivity:	-13.6dB
Input amplitude:	Nominal: ± 3.00 V into 120 Ω Maximum: ± 5 V Minimum: ± 500 mV
Loss of signal threshold:	300 mV
Data decision threshold:	43% to 57% peak
Pulse width:	230 ns to 260 ns
Input jitter tolerance:	1200 UI at 10 kHz 14 UI at 750 Hz 0.4 UI at 10 kHz – 100 kHz

Signal Output

Signal Interface:	ITU G.703, 2,048 kbits/s
Line code:	HDB3
Output impedance:	120 Ω balanced - default (selectable 75 Ω)
Output amplitude:	± 3.00 V $\pm 10\%$ V into 120 Ω
Pulse width:	244 ± 20 ns (at mid level)
Pulse-to-pulse jitter:	<100ns using internal clock and <32ns using clock recovered from an external 2,048kbits/s signal

¹ When using high-impedance (40 k Ω) connections, the recommended maximum cable length is 2 metres. For greater distances, SomerData recommends using a SomerData *Splitter/Buffer*.

R2D3-ASSY-0130 (BNC Connectors)**R2D3-ASSY-0131 (BNC Connectors)****R2D3-ASSY-0431 (BNC Connectors)****Signal Input**

Signal Interface:	G.703, 2,048 kbits/s
Pulse shape:	As ITU-T G.703 pulse mask
Line code:	HDB3
Data type:	ETI-NA (G.704) ETI-NI (G.703)
Input impedance 1:	75 Ω unbalanced
Input sensitivity:	-13.6dB
Input amplitude:	Nominal: ± 2.37 V into 75 Ω Maximum: ± 5 V Minimum: ± 500 mV
Loss of signal threshold:	300 mV
Data decision threshold:	43% to 57% peak
Pulse width:	230 ns to 260 ns
Input jitter tolerance:	1200 UI at 10 kHz 14 UI at 750 Hz 0.4 UI at 10 kHz – 100 kHz

Signal Output

Signal Interface:	G.703, 2,048 kbits/s
Pulse shape:	As ITU-T G.703 pulse mask
Line code:	HDB3
Data type:	ETI-NA (G.704) ETI-NI (G.703)
Output impedance:	75 Ω unbalanced
Output amplitude:	± 2.37 V $\pm 10\%$ into 75 Ω
Pulse width:	244 ± 20 ns (at mid level)
Pulse-to-pulse jitter:	<100ns using internal clock and <32ns using clock recovered from an external 2,048kbits/s signal

Input/Output Jitter Attenuation

The card applies jitter attenuation on the input signal for input data transfers and to the output signal when the input signal is used as an external clock reference for output data transfers.

Jitter attenuation at 40 kHz is typically 45 dB. The card attenuates jitter at 20 dB / decade above the 10 kHz corner frequency.

PCI Interface

Both +3.3V and +5V power are required on the PCI connector.

R2D3-ASSY-032x and R2D3-ASSY-013x Versions

32-bit 33 MHz PCI bus, PCI specification revision 2.1.

R2D3-ASSY-04xx Versions

PCI-X compatible.

On-board Buffer

The card uses on-board memory to buffer data to and from the PCI Bus, with 16 Mbits of SDRAM.

Physical

R2D3 is a short PCI board designed to fit a standard PC slot.

The card is 174 mm long, 106 mm high and all components fit within the 19 mm form width of the PC I/O panel

BNC connectors (R2D3-ASSY-0326, R2D3-ASSY-0426, R2D3-ASSY-0130, R2D3-ASSY-0131 and R2D3-ASSY-0431) or RJ-45 connectors (R2D3-ASSY-0327 and R2D3-ASSY-0427) are mounted on the card's input/output panel.

System Requirements

Minimum recommended host PC requirements for operating the R2D3 card with SomerData **Recorder** and **Replayer** application software.

Customer-developed application software may require alternative configurations.

- PCI 2.1 or PCI-X, depending on version (see above)
- 1 Free PCI slot
- Motherboard with +3.3 Volts and +5 Volts power on the PCI connector
- Single-processor system
- Pentium™ IV processor 2GHz
- 256 Mbytes system memory (RAM)
- Mouse or other pointing device
- 1024 x 768 resolution graphics, 256-bit colour depth, or greater
- Windows XP Professional™, or Windows 2000 Professional™ (SP1 or later)
- Soundblaster™ compatible audio

Approvals

This product does not carry approvals for connection to public telecommunications systems.

It is the User's responsibility to ensure that this equipment is used in compliance with appropriate legislation relating to the recording of telecommunications and connection with telecommunications networks.

9. SUPPORT

In this Section

WHAT TO DO IF YOU HAVE A PROBLEM	9-1
SERVICING, MAINTENANCE AND REPAIRS	9-1
IF YOU NEED SUPPORT	9-2
SOMERDATA CONTACT INFORMATION	9-2
SUPPORT REQUESTS	9-3
RETURNS	9-4
END-OF-LIFE DISPOSAL	9-5

What to do if you have a problem

Firstly, please ensure that you have followed the installation, connection and operation instructions in the appropriate User Guide.

Also, check the Troubleshooting section (where appropriate) to eliminate common problems.

Servicing, Maintenance and Repairs

Please contact your supplier or SomerData for all questions relating to maintenance and repairs.

Any unauthorised attempt to open, modify or otherwise repair the product will invalidate the SomerData warranty and may result in the product being left in an irreparable condition.

If you need Support

For warranty, technical and application support issues, you should initially contact your supplier to check whether your SomerData product is covered by warranty, extended warranty or maintenance contract.

At SomerData, we will make our best efforts to provide prompt and friendly support by phone, fax and e-mail.

However, please do not expect us to be magicians or mind-readers!

Diagnosing a problem will require your co-operation and we expect you to provide a detailed description of the problem in the form of a detailed Fault Report.

SomerData Contact Information

Address: Somerdata Limited
Underwood Business Park
Wookey Hole Road
Wells
Somerset
BA5 1AF
UK

Phone: UK 01749-671481
International +44 1749-671481

Fax: UK 01749-671482
International +44 1749-671482

E-Mail: support@somerdata.com

Website: www.somerdata.com

Support Requests

When contacting SomerData for support, please provide as much information as possible about the problem or issue for which you require assistance.

We will be able to deal with your request more efficiently if you provide the following details (where available) in your Fault Report:

- Part Number or Model Number (e.g. R2D3-ASSY-0327)

Serial Number (e.g. 2004/20/5)

Software Version (e.g. 1200.2.0)

USB Licence Key serial number (e.g. 0324436)

Details of any symptoms or error messages

Diagnostics information (if available)

Sequence of events/actions or other circumstances that triggered the problem

How you are able to identify that there is a problem

How you have been able to measure, log or otherwise display the problem

Details of the host PC (if appropriate) including: operating system; hardware configuration; other hardware devices (e.g. additional PCI cards); other software applications (e.g. analysis or processing programs) that are running at the same time

Sample data files (if appropriate)

When we acknowledge your support request, you will be given a *Support Tracking Number* (STN), which should be quoted in all further correspondence relating to that specific support request.

Returns

Please do not return any products to SomerData without first contacting SomerData and obtaining a Return Merchandise Authorisation (RMA) Number.

This will ensure that the processing of any repair or upgrade is handled efficiently and in accordance with any agreed action.

If the SomerData product is under warranty, repairs are free-of charge. If not, there will be a repair charge, which will comprise an initial evaluation fee and quotation, followed by repair and parts (if authority is given to carry-out the repair).

Pack the item in its original packaging. If the original packaging is not available, it must be packed in such a way to avoid transit damage. Damage sustained in transit is not covered under warranty.

Returned goods should be accompanied by documentation that indicates the RMA Number along with a detailed fault report and contact details (name, organisation, phone, fax and e-mail).

Mark the RMA Number on the outside of the package.

Ship the item by insured, prepaid carrier to the above address.

Items being returned from outside the European Community *must* be accompanied by a Commercial Invoice. This should include a description of the goods, value for Customs Purposes and state that the goods are being temporarily returned to the UK for repair. SomerData will not accept liability for UK importation costs resulting from inadequate documentation.

End-of-Life Disposal

Your SomerData product may be returned to SomerData at the end of its life at the customer's expense, under the EU regulations on waste from electrical and electronic equipment legislation; provided that the product is free from radiation or biological contaminants and that no other legislation forbids the return.

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10. INDEX

Applicable Versions	2-3
Applications	2-7
Approvals	8-6
Block Diagram	2-8
BNC Connectors.....	3-5
Buffer Threshold Trigger.....	6-2
Buffer Threshold Trigger Status.....	4-5
Checking Input Signal Status and Card Operation	6-1
Connecting Data Streams	
High-Impedance	4-8
Monitor Connection	4-9
Non-Intrusive Connections	4-8
Off-Line Data Analysis.....	4-10
Point-to-Point Connections.....	4-6
Real-Time Signal Source.....	4-10
Signal Output Example.....	4-10
Tee Connection	4-8
Terminated Input and Output.....	4-7
Terminated Inputs.....	4-6
Connecting Data Streams	4-6
Customer Support	9-1
DAB/DMB Cards.....	2-5
Data Handling.....	2-6
Data Interface	2-7
Data-Flow Block Diagram.....	2-8
E1 Interface	3-2
E1 Splitter/Buffer	
Description.....	3-10
Signal Connections.....	3-10
E1/PRI Cards.....	2-3
Frame Synchronisation.....	5-1
Capturing Frame Sync. Errors	5-3
DAB ETI-NI/ETI-NA Frame recognition	5-4
DAB Word Alignment.....	5-5
E1 (G.703/G.704) Frame recognition	5-2
E1 Word Alignment.....	5-3

G.703.....	3-2
G.703 Pulse Mask	3-3
G.704 Framed Data Structure	5-6
Grounding Links	3-5, 6-3
Hardware Features	2-6
High-Impedance Connections	4-8
Indicator LEDs	4-4
Input Signal Loss	6-2
Input Signal Loss Status	4-5
Input/Output Connector Options	
E1DT - E1 Splitter/Buffer	3-10
Interface Adapter (120 Ω - 75 Ω)	3-7
Input/Output Jitter Attenuation	8-5
Input/Output Signal Paths	4-2
Installation	7-1
Card Installation.....	7-6
Device Driver Installation	7-5
Grounding Preparations	7-5
Handling Precautions	7-6
Minimum System Requirements	7-2
Preparation	7-5
Software	7-4
Software Installation	7-7
What You Received	7-3
Interface Adapter	
Configuration	3-8
Description.....	3-7
Specification	3-9
Introduction.....	1-1
ITU-T G.703.....	3-2
Jitter.....	8-5
LED Indicator Functions	4-5
LED Status Indicators.....	4-4
Monitor Connection	4-9
Non-Intrusive Connections	4-8
Off-Line Data Analysis	4-10
Installation and Operation	10-2

Operation.....	4-1
Connecting Data Streams.....	4-6
Input/Output Signal Paths.....	4-2
Output (Replay) Clock Selection.....	4-3
Output (Replay) Clock Selection.....	4-3
PCI Interface.....	8-5
Physical	8-5
Point-to-Point Connections	4-6
Power	6-2
Product Description	2-1
Applicable Versions	2-3
Applications	2-7
Data Handling.....	2-6
Data Interface	2-7
Hardware Features.....	2-6
Introduction.....	2-2
On-board Buffer.....	2-7, 8-5
System Requirements	2-7
Product Support.....	9-1
Programming Link	6-3
R2D2-ASSY-0036 Interface Adapter (75Ω - 120Ω)	3-7
R2D3-ASSY-0130	2-5, 8-4
R2D3-ASSY-0131	2-5, 8-4
R2D3-ASSY-0326	2-4, 8-2
R2D3-ASSY-0327	2-4, 8-3
R2D3-ASSY-0426	2-3, 8-2
R2D3-ASSY-0427	2-3, 8-3
R2D3-ASSY-0431	2-5, 8-4
RJ-45 Connectors.....	3-5
Self-Test.....	6-2
Signal Connections.....	3-1, 3-4
8-Way RJ-45.....	3-5
BNC.....	3-5
Signal Grounding Links	3-5
Signal Grounding Options (BNC Card).....	6-3
Signal Input Path	4-2
Signal Interface.....	3-2
Signal Loss	6-2
Signal Loss Status.....	4-5
Signal Output Path	4-3
Specifications	8-1

Approvals.....	8-6
Input/Output Jitter Attenuation.....	8-5
Jitter.....	8-5
PCI Interface.....	8-5
Physical.....	8-5
R2D3-ASSY-0130.....	8-4
R2D3-ASSY-0131.....	8-4
R2D3-ASSY-0326.....	8-2
R2D3-ASSY-0327.....	8-3
R2D3-ASSY-0426.....	8-2
R2D3-ASSY-0427.....	8-3
R2D3-ASSY-0431.....	8-4
System Requirements.....	8-6
Status Indicator LEDs.....	4-4
Support.....	9-1
End of life disposal.....	9-5
System Requirements.....	2-7, 8-6
Tee Connection.....	4-8
Terminated Input and Output.....	4-7
Terminated Inputs.....	4-6
Troubleshooting.....	6-1
Buffer Threshold Trigger.....	6-2
Checking Input Signal Status and Card Operation.....	6-1
Input Signal Loss.....	6-2
Power.....	6-2
Programming Link.....	6-3
Self-Test.....	6-2
Signal Loss.....	6-2
User Guide	
What's in this User Guide.....	1-1
User Guide Availability.....	1-2
What's in this User Guide.....	1-1