

CCTV RS485 CONVERTER



Technical Manual

RELEASE NOTES

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RS485 Converter - Technical Manual		
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Micropack (Engineering) Ltd would greatly appreciate being informed of any errors or omissions that may be found in our documents. To this end we include a form, given in Section 7.6, for you to photocopy, complete and return to us so that we take the appropriate action. Thank you.



Table of Contents

- 1 Safety Instructions..... 4**
 - 1.1 Warnings.....4
 - 1.2 Cautions.....4
 - 1.3 Important Notices4
- 2 Introduction 5**
 - 2.1 Overview5
 - 2.1.1 Led Indications5
 - 2.1.2 Hardware Configuration Links6
 - 2.1.3 Field Terminations.....6
 - 2.2 RS485 Line Turn Around Feature.....6
 - 2.3 Mounting.....6
- 3 Electrical connections..... 7**
 - 3.1 RS485 Communications7
 - 3.1.1 RS485 Line Termination Resistor7
 - 3.1.2 RS485 Line Biasing7
 - 3.2 Earthing & Screening Requirements7
 - 3.3 Power Supply8
 - 3.4 RS485 Cabling.....8
 - 3.5 RS232C Cabling8
- 4 Installation 9**
 - 4.1 Mechanical Installation.....9
 - 4.2 Electrical Installation9
- 5 Maintenance and Testing..... 9**
- 6 Fault Finding 10**
 - 6.1.1 RS485 Communications.....10
 - 6.2 Replacement and Repair.....10
- 7 Technical Specification..... 11**
 - 7.1 Electrical Specification.....11
 - 7.2 Mechanical Specification11
 - 7.3 Environmental Specification.....11
 - 7.4 Certification and Approvals11
 - 7.5 Operating Specification.....11
 - 7.6 HELP US TO HELP YOU12

List of Illustrations

- Figure 1 Converter Overview5
- Figure 2 RS485 Communications Diagnostic Chart 10
- Table 1 LED Status Diagnostic Chart5
- Table 2 Baseboard Configuration Links.....6
- Table 3 Terminal Descriptions6
- Table 4 RS485 Communications Cable Characteristics.....8

1 Safety Instructions

For the correct and effective use of this equipment, to maintain safety and avoid hazards it is essential that you read and understand these instructions and act accordingly **BEFORE** installing, operating or maintaining the equipment.

Pay particular attention to all Safety Warnings, Cautions and Important Notices.

1.1 Warnings

- For UK installations BS/EN60079-14 '*Electrical Installations in Hazardous Areas*' and BS/EN60079-17 '*Inspection and Maintenance in Hazardous Areas*' should be strictly observed where the equipment is located within the hazardous area (a suitable certified enclosure is required)
- For installations in North America the National Electrical Code (NEC) should be strictly observed
- Elsewhere the appropriate local or national regulation should be used
- The equipment must be properly earthed to protect against electrical shock and minimise electrical interference
- Repair of equipment should only be performed in a safe area and by trained personnel

1.2 Cautions

- Use only approved parts and accessories with this equipment
- To maintain safety standards, installation, commissioning and regular maintenance should be performed by qualified personnel

1.3 Important Notices

- Pay attention to the guidelines given throughout this document
- If in any doubt ask your local sales representative or contact Micropack (Engineering) Ltd
- Micropack (Engineering) Ltd take no responsibility for installation and/or use of its equipment if this is not in accordance with the appropriate issue and/or amendment of the manual
- Micropack (Engineering) Ltd reserve the right to change or revise the information contain herein without notice and without obligation to notify any person or organisation of such action

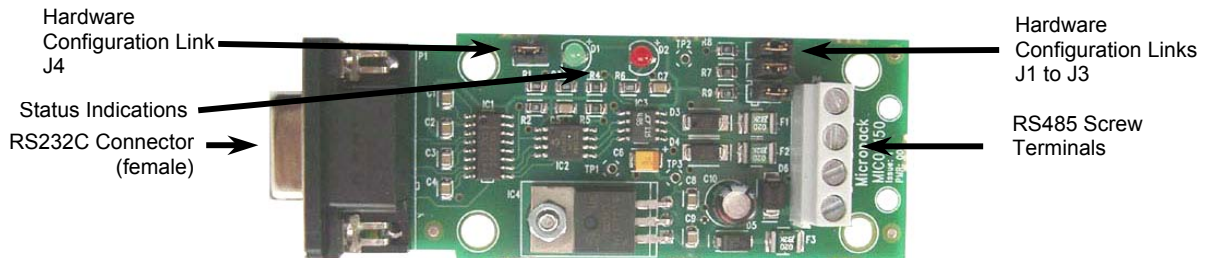
2 Introduction

The **Micropack RS485 Converter (RS2485IF – p/n 3100.0012)** is used to convert between RS232, such as a PC display terminal, and RS485 half duplex interfaces. The converter has been designed specifically for the CCTV Flame detection system and is compatible with the CCTV RS485 communications network and fully meets both the RS232 and EIA-RS485 standards. The converter provides manual RTS controlled line turn around and automatic line turn around when the data is received at the RS232C port. The converter is powered from an industrial standard 24V supply. Internal hardware configuration links are provided for both line termination and line biasing resistors. The converter has been designed specifically to meet the needs of industrial applications.

2.1 Overview

The converter is a single board measuring approximately 100mm x 45mm. Connection to the PC or display terminal is via a standard RS232C female connector (9 pin 'D' Type connector). Connection to the RS485 or CCTV system is via screw terminals. Hardware configuration links and status indicators are mounted on the board as shown below:

Figure 1 Converter Overview



2.1.1 Led Indications

The LED indicators are used to reveal its current state, as shown below:

Table 1 LED Status Diagnostic Chart

Green LED	Red LED	Device Condition	Comment
ON	Pulsing	Healthy - Data Transmission in progress	OK
OFF	OFF	Power Failed	Check power distribution
ON	OFF	Healthy - Converter idle	OK

2.1.2 Hardware Configuration Links

The baseboard has 3 hardware configurable links, these have the following function.

Table 2 Baseboard Configuration Links

Link	Signal	Link Function / Description	State if Link Not Fitted	State if Link Fitted
J1	RS485	RS485 Channel Line Termination Link	Not Terminated	120R Terminated
J2 & 3	RS485	RS485 Channel Line Biasing Link(s)	Not Biased	Biased

2.1.3 Field Terminations

There are 4 field terminals available, these have the following function:

Table 3 Terminal Descriptions

Terminal	Signal
1	RS485 Channel +24V Supply Input
2	RS485 Channel 0V Supply Input
3	RS485 Channel RS485.A
4	RS485 Channel RS485.B

2.2 RS485 Line Turn Around Feature

The RS485 interface is half-duplex, this means that the RS485 line can either be in a transmit mode or receive mode but not both. The process of changing from one mode to another is referred to as line turn around. The converter provides two methods for line turn around, manual RTS control and Automatic line turn around. With RTS control the converter turns the line around when the RS232 RTS signal is asserted. If the RTS line is not asserted the converter will automatically turn the line around when a data transmission is received at the RS232 port. Due to delays within the converter the first character of the transmission may be lost or corrupted at high baud rates.

2.3 Mounting

The Converter can be mounted in the following methods:

- Direct Chassis Mounting (using the four mounting points)
- DIN Rail Mounting (using the optional carrier)

In general the mounting arrangements should be free from vibration, movement or the potential for accidental knocking or forces acting on the connections and to be isolated as far as possible from the sources of local interference and allow ease of access to the equipment for maintenance and repair.

3 Electrical connections

3.1 RS485 Communications

The converter has a single RS485 connection, terminals 3 for RS485.A (-V) and 4 for RS485.B (+V). It is possible to multi-drop more than one device using twisted pair cabling. Each converter represents one RS485 unit load. A maximum of 32 devices, either converters or other RS485 compatible equipment can be connected to a single transmission line.

3.1.1 RS485 Line Termination Resistor

The RS485 line termination link J1 located on the converter should be fitted if it is either the first or last device on a multi-drop.

3.1.2 RS485 Line Biasing

The line biasing facility is intended to prevent the RS485 line floating in an indeterminate state. The RS485 specification defines the meaning of a logic 0 (-200mV) and a logic 1 (+200mV). However, the status of the line when left floating during idle, i.e. neither 0 or 1, is left undefined by the standard. The line biasing links, J2 and J3, ensure that the line is 'forced' into a known logic 1 state when idle.

3.2 Earthing & Screening Requirements

It is important to ensure that the system is correctly connected to earth. Incorrect or poor earthing can adversely affect system operation and may result in comms corruption. The system 0V should be connected to a clean earth at only one point, generally this should be at the panel power supply (or 0V bus bar). Even small differences in earth potentials can cause an earth fault current to flow resulting in communications errors. Where this is not possible the system can either be connected to a local clean earth so long as the maximum potential difference between each earth does not exceed +/-7Vdc. Where earth fault monitoring is used care should be taken to ensure that the system 0V to earth potential is not exceeded. All RS485 cable screens should be connected to the local clean earth at the control panel. The screens (and twisted pairs) should be maintained to within 1" (25.4mm) of the terminations at the relay driver, within all junction boxes and at the control panel. Where unscreened cables are used for panel wiring, then all cables must be suitably twisted into pairs and video cables should be segregated from other all signal sources.

3.3 Power Supply

The supply connects to terminal 1 for +24Vdc and terminal 2 for 0V. The system power supply voltage and power distribution should be arranged such that on the longest cable run the converter has a supply voltage of **greater** than 8V, refer to specification page. To prevent RS485 communications errors the maximum volt drop on the 0V return must be less than +/-7V, refer to figure below. Voltages greater than these will exceed the common mode input range of the RS485 drivers.

3.4 RS485 Cabling

The overall performance and the RS485 transmission distance depends on the selected twisted pair cable. Individually screened twisted pairs offer better electrical immunity. When individually screened twisted pairs are used the transmission distances are considerably reduced due to the higher capacitance introduced by the screen. The choice between screened and unscreened pairs is a compromise between transmission distance and immunity towards noise and crosstalk. When multiple signals are carried on a single cable the pairs must be individually screened to prevent interference. Avoid locating unscreened twisted pair cable parallel to cables carrying high-speed data or high energy and/or high frequency signals. The cable should have the following characteristics:

Table 4 RS485 Communications Cable Characteristics

Cable Characteristic	Characteristic Impedance	Capacitance	Conductor Resistance	Attenuation @ 1MHz	Inductance
Nominal	120R	50nf/Km	--	--	--
Absolute Limit	90R to 150R	100nf/Km	150R	12db	0.7mH/Km

The maximum cable length is dependent on the cable manufacturer attenuation specification, which is approximately proportional to conductor size. The characteristic impedance of a transmission line is a function of the physical dimensions of the conductor and the permittivity of the dielectric (the insulation), at high frequencies this is approximately equivalent to:

$$Z_o(\Omega) = \sqrt{L \div C}$$

A_{db}	= Attenuation Limit (db)
A_m	= Cable Attenuation per Kilometre (db/km)
L_{km}	= Cable length in Kilometres

3.5 RS232C Cabling

RS232 was designed for short distances of up-to a few metres. With short lengths of up-to 1m unscreened cables can be used. For long cable lengths in an industrial installation screened cables should be used.

4 Installation

Experience has shown that poor installation and commissioning practice may result in unreliable communications that is prone to malfunction.

4.1 Mechanical Installation

Notes	Consideration should be given to cable entry with sufficient space for looming When locating the equipment consideration should be given to maintenance access and removal of the converter for repair or replacement The mounting should be secure and vibration free
1	The electronics shall be protected form mechanical damage and external sources of EMI such as X-rays, RFI and electrostatic discharge
2	Mount the converter

4.2 Electrical Installation

In order to maintain compliance it is essential the electrical installation be engineered correctly.

Notes	RS485 cabling must be segregated from cables carrying high-speed data or high energy and/or high frequency signals and other forms electrical interference The converter should only be fitted just prior to commissioning. Experience shows that the sensitive electronics can be damaged due to cable testing operations (Insulation Tests, etc)
1	Isolate all associated power supplies. Ensure that they remain OFF until required for commissioning
2	The electronics should be removed prior to installation. The electronics shall be protected form mechanical damage and external sources of EMI such as X-rays, RFI and electrostatic discharge
3	Prepare the cable tails. The cable screens and twisted pairs should ideally be maintained to within 1" (25mm) of the termination and insulated from contact with the enclosure or any other local earth.
4	Where plastic junction boxes are used the cable screens (shield) should be maintained to within 1" (25mm) of the termination and fully insulated
5	Where unscreened cables are used for panel wiring, then all cables must be suitably twisted into pairs and video cables should be segregated from other signal sources
6	All cable screens (shield) should be connected to the local clean earth at the control panel. The screens (and twisted pairs) should be maintained to within 1" (25.4mm) of the terminations
7	Following installation completion, the cabling shall undergo full earthing and insulation tests (with converter removed)

5 Maintenance and Testing

There are no specific maintenance requirements.

6 Fault Finding

6.1.1 RS485 Communications

If the RS485 communications are poor or completely failed the problem could be due to a great number of possible causes. If the communications to the detector were formerly OK this simplifies the number of possible causes to those shown below. Familiarity with this chart will also help diagnose communications faults during commissioning.

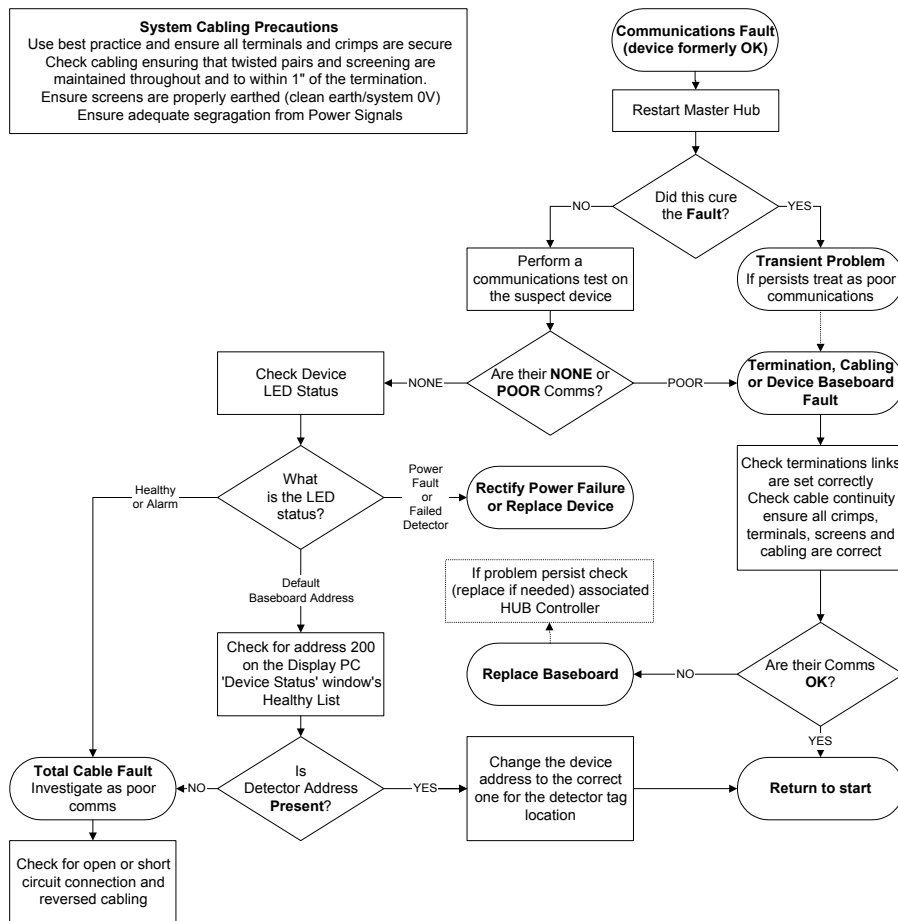


Figure 2 RS485 Communications Diagnostic Chart

6.2 Replacement and Repair

The converter contains no user serviceable parts.

If the converter is replaced its replacement must be reconfigured with the correct jumper link settings.

7 Technical Specification

7.1 Electrical Specification

Parameter	Units	Min	Max	Comment
Power Supply				
Supply Voltage	V	8	32	Inc. ripple
Supply Ripple	V	--	1V	Peak to Peak
Power Consumption	W	0.5	2	
Shutdown voltage (low supply)	V		<7.5	
RS485 Transceiver <i>Meets EIA-485 Specification</i>				
Line Termination Resistor	R	--	120	
Driver Differential Output Voltage	V	1.5	--	
Driver Fan Out	Unit loads	0	31	
Receiver Common Mode Input Range	V	-7	+7	
Receiver Input threshold	V	-0.2 (Lo)	+0.2 (Hi)	
Receiver Unit Load	Unit Loads	--	1	12K Input Resistance

7.2 Mechanical Specification

Parameter	Units	Value	Comment
Overall Dimensions	mm	100L x 45W x 20D	
Shipping Weight	Kg	0.1	
Baseboard Terminal Entries	mm ²	2.5	Maximum

7.3 Environmental Specification

Parameter	Units	Min	Max	Comment
Operating Ambient Temperature	°C	-20	+70	
Storage Ambient Temperature	°C	-20	+80	
Relative Humidity	% RH	5	95	Non Condensing

7.4 Certification and Approvals

Parameter	Authority/Standard	Approval	Certificate
CE Certification	GEC: EN55022 & 082		
Millennium	--	--	Y2K Compliant

7.5 Operating Specification

Parameter	Units	Min	Max	Comment
Communications baud rate	Kbaud	DC	115	
Automatic Line Turn Around Delay	uS	--	176	
RTS controlled turn around delay	US	--	1	



7.6 HELP US TO HELP YOU

TO: QA Department Micropack (Engineering) Limited Fire Training Centre Schoolhill, Portlethan AB12 4RR Tel : +44 (0) 1224 784055 Fax : +44 (0) 1224 784056 Email : info@micropack.co.uk	From: Tel : Fax : Email :
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