R507 I.S. Interface Module

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User Manual

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Contents

Introduction

Background

The R507 is an interface module providing power and data to Intrinsically Safe (I.S.) equipment located in a zone 0 hazardous area, and providing galvanic isolation between the safe area and the I.S. hazard area connection.

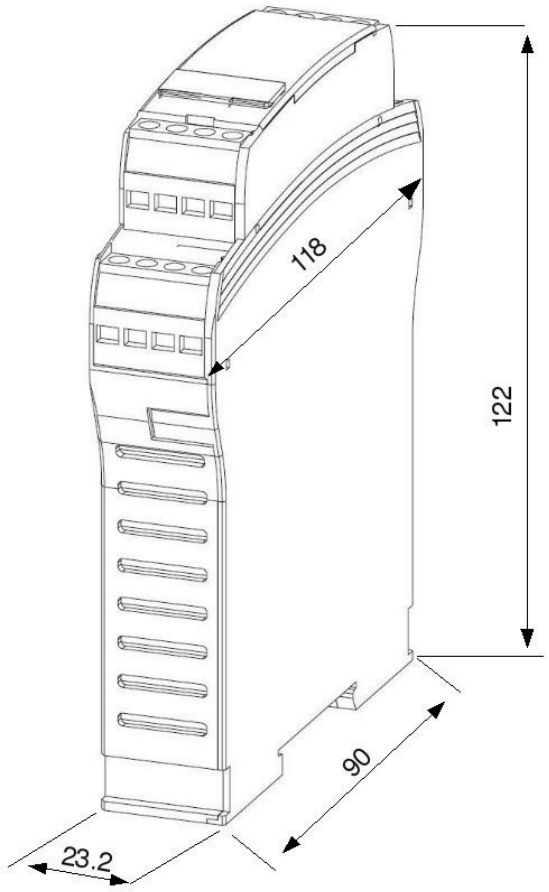
In the safe area, the communication ports provide both RS-232 for point-to-point communications or RS-422/485 with tri-state control for point-to-point or multi-drop systems. Power and data are transmitted over distances up to 1 km in the hazardous area.

The R507 interface module is a critical safety component and should be installed by a competent person in accordance with EN 60079-14

Size

The R507 I.S.Interface Module gives almost twice the packing density of its predecessor, the R007.

The overall size, including the demountable connectors, but excluding the wiring, is 118mm by 122mm by 23.2mm, maximum.



Mounting

Rail Type

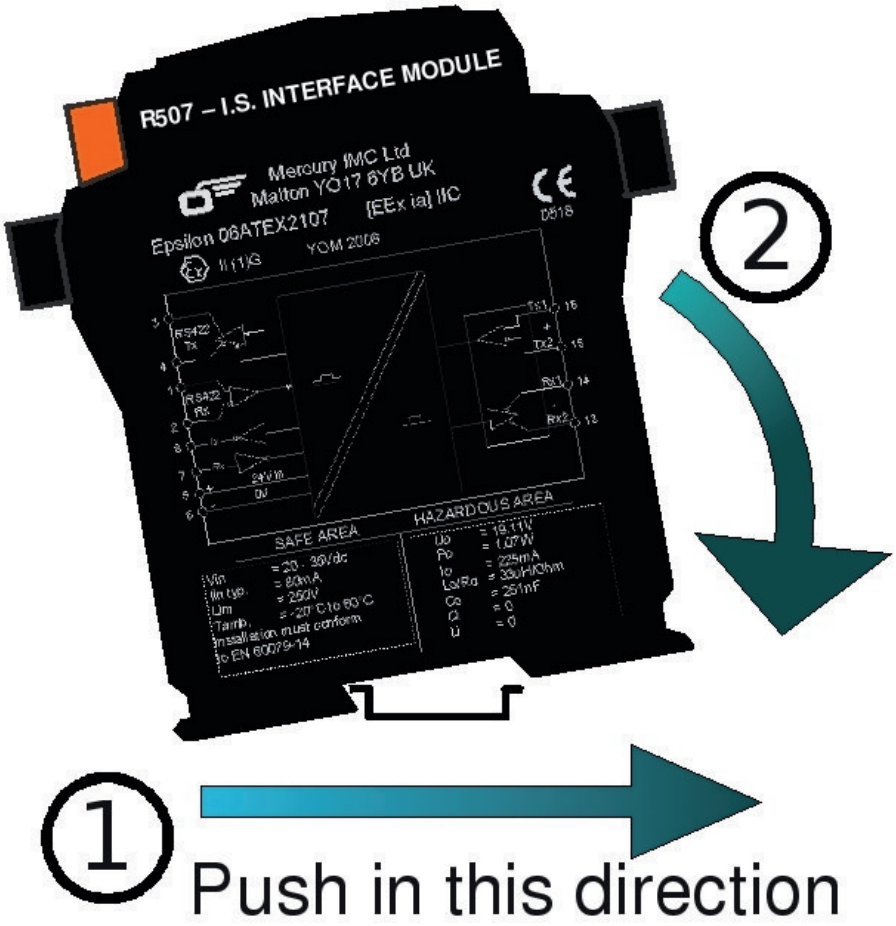
The R507 I.S. Interface Module is designed to be mounted on standard 35mm symmetrical top-hat rail to EN50022 (formerly DIN Standard 46277).

The R507 is rated to IP54 and is intended to be mounted in a control panel, a cubicle or rail-mounted enclosure.

Mounting

To mount the R507, tilt the module as shown, engage the lower portion on to the top-hat rail and while applying light pressure, lower the R507 until it is horizontal.

Release the lateral pressure and the R507 should now be secured to the rail. Repeat this process for all subsequent R507 modules.



Removing

To remove the R507 from the top-hat rail, apply gentle lateral pressure in the direction indicated by arrow No.1, and tilt the far end upward. The unit will then come away from the rail.

Connections

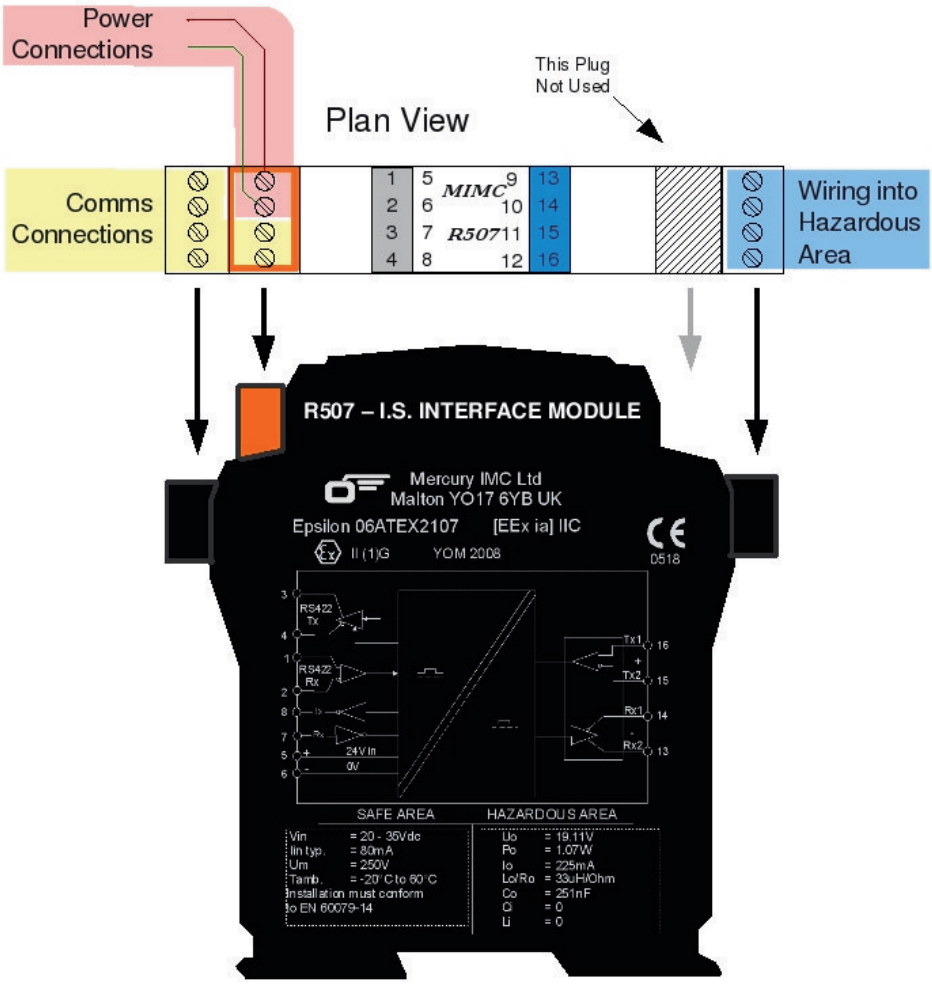
Segregation

The R507 I.S. Interface Module is designed so that all the safe area connections are on one side, the left-hand side in the illustration below, and the Intrinsically Safe wiring to the hazardous area is connected on the right-hand side of the module. This makes the layout and cable segregation simple.

The safe area wiring is made to terminals 1 to 8 and the hazardous area wiring is made to terminals 13 to 16. Terminals 9 to 12 are not used and are not connected within the R507 module.

WARNING

Care must be taken to ensure that the plug (orange plug supplied with later modules) carrying the 24V power, intended for the upper terminals on the safe area (5 to 8) is not plugged into the lower safe area terminals 1 to 4, which are used for the RS-422 communication. The R507 can be damaged if 24V power is applied to the RS-422 communications ports.



Cabling

Intrinsically Safe Connections

The R507 I.S. Interface Module provides a voltage and current limited power source for the equipment mounted in potentially hazardous areas while also providing bi-directional communications and multi-drop control using a quad core or two twisted pairs of a cable.

The R507 is designed to drive Mercury 2, Mercury 2e or Mercury 2+ Operator Terminals as well as the Sentry Card Reader

WARNING

Power must be disconnected before connecting or inspecting the IS interface module.

No Intrinsically Safe earth is required as the unit is galvanically isolated.

Cable Safety Description

The inter-connection cable between the safe area IS Interface Module and the hazard area equipment requires four cores, which may be either two twisted pairs or a quad. Where a quad is used, diagonally opposite cores should be paired to reduce any communications cross-talk. Each pair is restricted to the following maximum parameters:

Loop Resistance	40 Ohms
Capacitance	125 nF max
L/R Ratio	30 micro H / Ohm

For example, a 1 Square millimeter quad cable has approximately the following parameters.

Resistance	38 Ohms/ km (loop)
Capacitance	55 nF / km
L/R Ratio	12.5 micro H / Ohm
Inductance	0.48 milli H / km

For a cable length of 1km, this would satisfy safety and operating requirements.

I.S. Wiring

The 4 core Intrinsically Safe wiring can be extended from the safe area, where the barrier is mounted up to 1km into the hazardous area to any of the Mercury 2 family of Operator Terminals or the Sentry Card Reader. The wiring schedules are shown below:

Mercury Wiring

Barrier Pin No & Name		Mercury Name & No		
R507 Pin 13	Rx2-	====>	RX2-	J5 Pin 4
R507 Pin 14	Rx1-	====>	RX1-	J5 Pin 3
R507 Pin 15	Tx2+	<====	TX2+	J5 Pin 2
R507 Pin 16	Tx1+	<====	TX1+	J5 Pin 1

Sentry Wiring

Barrier Pin No & Name		Sentry Name & No		
R507 Pin 13	Rx2-	====>	A-	J5 Pin 4
R507 Pin 14	Rx1-	====>	B-	J5 Pin 3
R507 Pin 15	Tx2+	<====	B+	J5 Pin 2
R507 Pin 16	Tx1+	<====	A+	J5 Pin 1

Mercury IMC Limited recommend that no power is supplied to the R507 I.S. Interface Module while hazardous area wiring is being terminated at either the R507 or the Mercury / Sentry in the field.

WARNING

The R507 I.S. Interface Module is a critical safety component and should be installed by a competent person in accordance with EN 60079-14

Safe Area Wiring

The R507 I.S. Interface Module requires a nominal 24V supply of two watts. The voltage can be in the range of 20 to 32 Volts, but it should be a smoothed and regulated supply with low ripple

Power

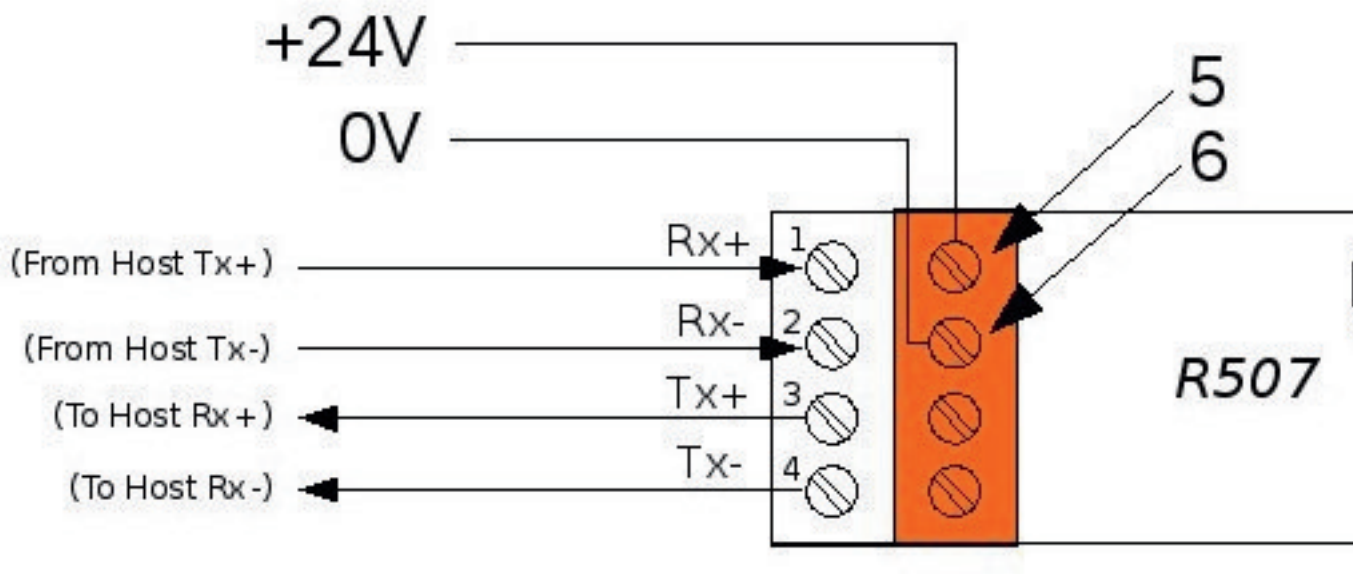
Power Name		R507 Name & No.	
24V Supply	====>	+24V In	5
0V Return	====>	0V	6

Comms

The R507 is designed to work with several physical serial communications standards. These are RS-232 for simple point to point communications, point to point RS-422, multidrop RS-422 (also known as four wire RS-485) and two wire RS-485.

RS-422 Or 4 wire RS-485

Host Signal Name		R507 Name & No.	
RS-422 Host Tx+	====>	Rx+	1
RS-422 Host Tx-	====>	Rx-	2
RS-422 Host Rx+	<====	Tx+	3
RS-422 Host Rx-	<====	Tx-	4



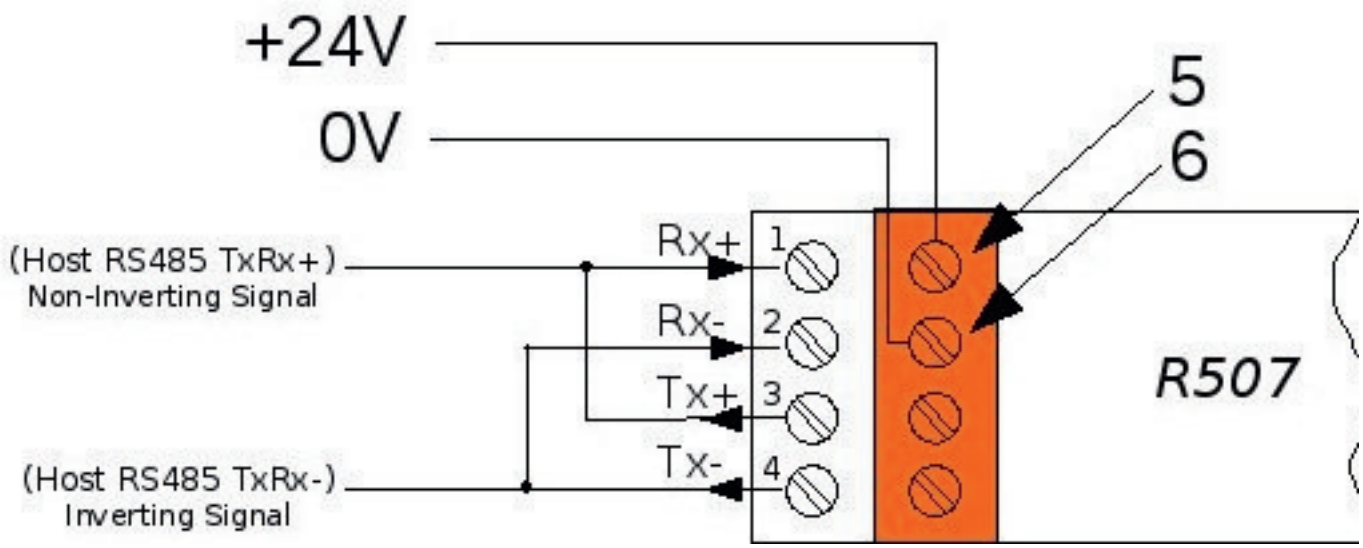
RS-485 Wiring

It must be remembered that since two wire RS-485 is a half-duplex transmission medium, you cannot use point to point mode in conjuction with RS-485, since the transmit to and reception from the Mercury 2 family or Sentry are completely asynchronous events.

As RS-485 can only transmit information in one direction at a time, unlike RS-232, RS-422 and four wire RS-485 (also known as multidrop RS-422) which are full-duplex transmision media, it requires that a protocol to control the flow of information and to enable the transmitters and receivers to be disabled and enabled as required. RS-485 is more of a communications bus than a simple point to point connection.

If you are not familiar with two wire RS-485 and the difficulties of debugging RS-485 communications, we recommend the use of a full-duplex connection.

Host Signal Name		R507 Name & No.	
RS-485 Host TxRx+	<===>	Tx+ & Rx+	1 & 3
RS-485 Host TxRx-	<===>	Tx- & Rx-	2 & 4

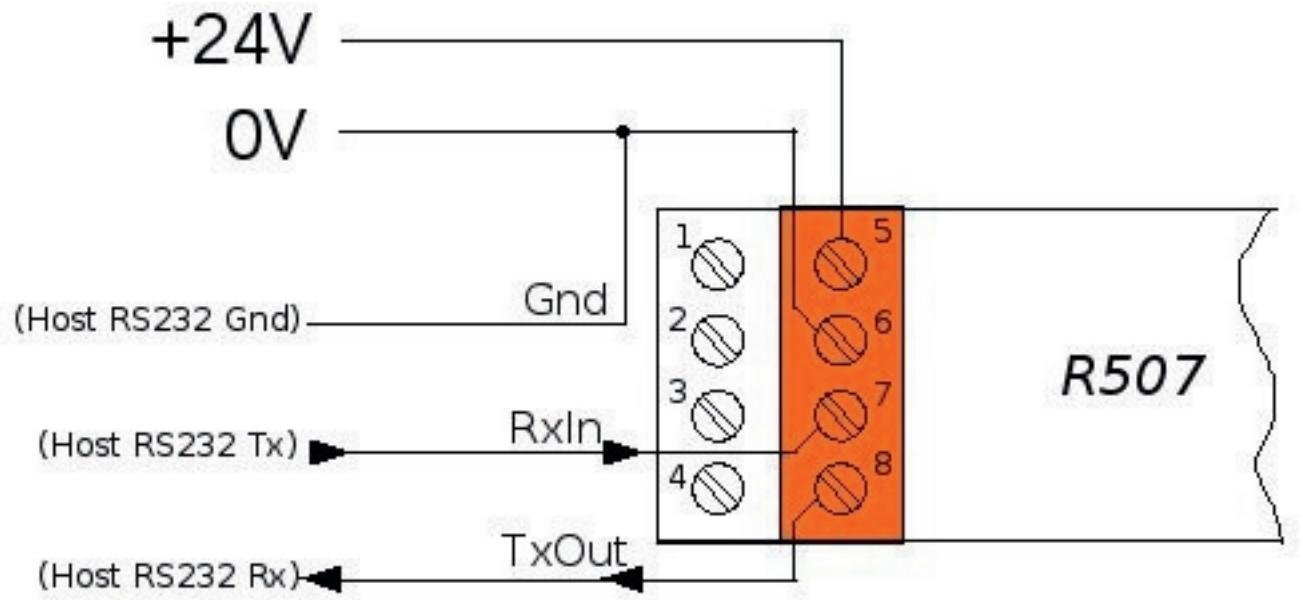


RS-232 Wiring

RS-232 is a very reliable communications medium over short distances. When utilised up to 25 Metres and 115,200 baud, no problems should be experienced as long as cables are segregated carefully, and care is taken to eliminate noise from the 0V terminal.

The PC 9 way (DE-9) pin number is shown in brackets

Host Signal Name		R507 Name & No.	
RS-232 TxD (3)	====>	RxIn	7
RS-232 RxD (2)	<====	TxOut	8
RS-232 Gnd (5)	<===>	GND	6

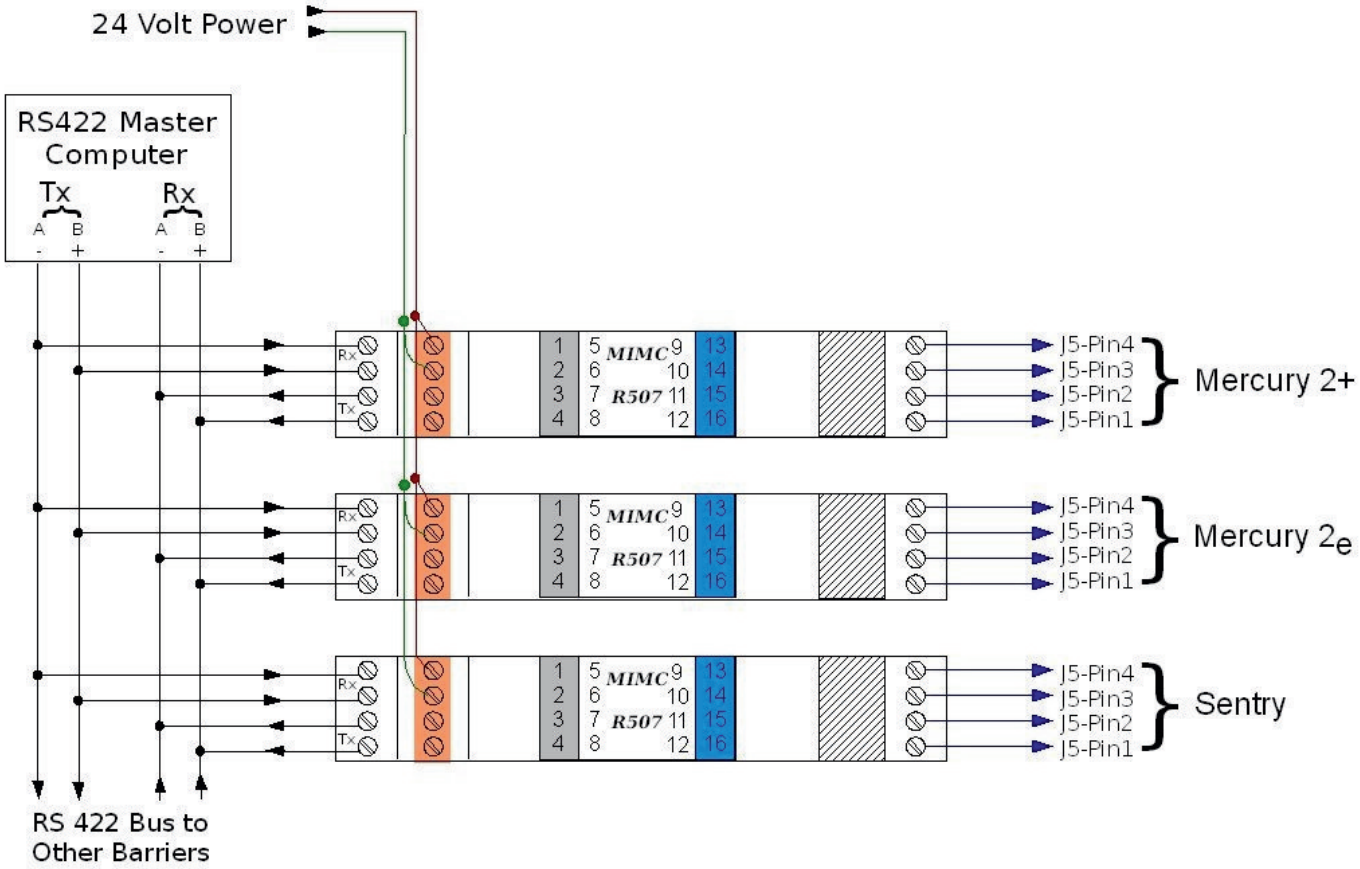


Multidrop Wiring

When a number of Mercury Terminals or Sentry Card Readers need to be connected to a single port on a host PC, a DCS or other control system, the multi-drop facility can be used.

Multi-drop RS-422 (four wire RS-485) or two wire RS-485 should be selected as the communications protocol.

Each piece of hazardous area equipment needs its own R507 module in the safe area, and the R507s should be connected to the same host port. Each Sentry or Mercury Terminal will need to be configured to have a unique address.



Specification

Part Number

R507 I.S. Interface Module

Part Number 8185070

Certification

EPSILON 06ATEX2107

The R507 must be mounted in a safe area

Physical Data

Overall Dimensions	
Height	122mm.
Width	118 mm, including connectors.
Depth	23.2 mm.
Weight	160 grams, including connectors.
Material	Plastic
Colour	Black.

Connections

IS Terminals	20V, 100 Ohm nominal, galvanically isolated.
IS Cabling	See page 7
Mounting	35mm transverse rail EN50022
Power	20-35V d.c. 2W maximum. Nominal 80mA at 24V.
IS Earth	Not Required.
Isolation	2 galvanically isolated ports.
Communications	RS-232, RS-422 and RS-485

Environmental Conditions

Operating Temperature	-20 to +60°C.
Storage	-40 to +70°C.
Humidity	95% non-condensing.
Protection	IP 54.
Location	Safe Area.

R507 Pin Description

	Pin No.	Name	Description
Safe Area Differential Comms	Pin 1	RS-422 Rx -	Input to the active low differential receiver
	Pin 2	RS-422 Rx +	Input to the active high differential receiver
	Pin 3	RS-422 Tx -	Input to the active low differential transmitter
	Pin 4	RS-422 Tx +	Input to the active high differential transmitter
Power & RS-232 Comms	Pin 5	+ 24V In	Positive power input terminal
	Pin 6	0V	The 0 volt power return and RS-232 Common
	Pin 7	RxIn	RS-232 Receiver input
	Pin 8	TxOut	RS-232 Transmitter output
Not Used	Pin 9	Not Used	No internal connection
	Pin 10	Not Used	No internal connection
	Pin 11	Not Used	No internal connection
	Pin 12	Not Used	No internal connection
Hazardous Area Wiring	Pin 13	Rx2-	MIMC IS Power & Comms
	Pin 14	Rx1-	MIMC IS Power & Comms
	Pin 15	Tx2+	MIMC IS Power & Comms
	Pin 16	Tx1+	MIMC IS Power & Comms