7SG22 Iota

Input / Output Units

Document Release History

This document is issue 2010/02. The list of revisions up to and including this issue is:

Pre release

2010/02	Document reformat due to rebrand

Software Revision History

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Contents

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1 Introduction

The IOTA relay has provision for communication either locally to a computer or remotely to an operations centre.

The Communication Interface, figure 1, incorporates the following ports:

A pair of fibre optic SMA connectors for transmit and receive communications to a substation SCADA or integrated control system or for downloading files (Com 1 or Com 2).

A pair of fibre optic SMA connectors for access by protection engineers (Com 2b). The same port can be accessed instead through an RS232 (Com 2a) connector mounted on the relay fascia and provides facilities for access to the relay from a laptop computer or PC.

The relay will support both IEC60870-5-103 and ASCII protocols.
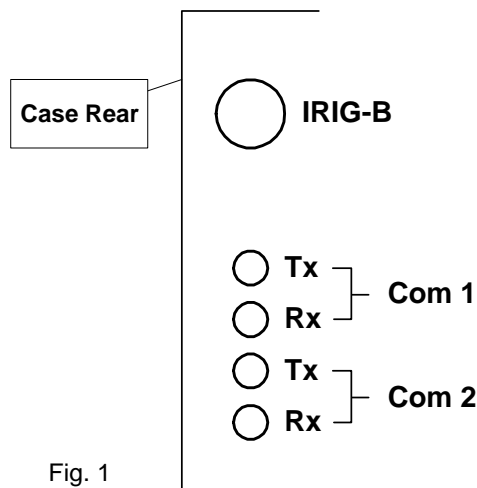The IEC60870-5-103 standard protocol can be set

Fig. 1

to operate on either com port 1 or 2, with the other port defaulting to ASCII protocol, and is used by the relay for the transfer of data and is fully described in the Reyrolle document "**Informative Communication Interface".**
The ASCII protocol is used for the transfer of ReyLogic script files from a PC to the relay.
An IRIG-B port is also provided for time synchronisation.

The Sigma range of products are available to connect to the fibre optic ports of the relays.

Sigma 1 is a fibre optic hub with one system port and up to 29 ports for connecting to the relays.

Sigma 3 is a fibre optic to dual RS232 interface. It has one fibre optic port for connection to the relay(s), and two electrical RS232 ports. The rear electrical port is intended for connection to a control system. The front port allows local access, for example, from a laptop PC. When a device is

connected to the front port the rear port is overridden. Figure 2.

Sigma 4 is a portable fibre optic to RS232 conversion unit available in two versions – 'polymer and glass'.

2 Connections

3.1 Physical Characteristics

The IOTA relays are equipped with two fibre-optic, and one electrical serial communication ports. The fibre optic ports named Com 1 and Com2 are located at the rear of the relay. Each consists of a pair of 9mm SMA connectors, a transmitter (Tx) and a receiver (Rx). See figure 1.

The RS232 electrical port is on the front of the relay. It uses a 25 pin D type socket. The relay is wired as a Data Communications Equipment (DCE) device, allowing standard serial cables to be used to connect it to a computer. The electrical port is also named Com2, allowing local access overriding the fibre-optic Com 2.

3.2 Fibre Optic Cable

The IOTA relay is optimised to use either a 50/125 μm or 62.5/125 μm glass fibre optic cable. It is also suitable for use with 1mm polymer and 200PCS fibre optic cables over shorter distances.

Fibre-optic transmission distances vary with transmitter, receiver and type of fibre. The tables at the end of this section show the achievable distances between Reyrolle devices.

3.3 Connection Methods

The fibre-optic ports of the relay are intended for connection to a master station or an adjacent relay either using a 'star' or 'ring' configuration. The "Transmit" output on the IOTA must be connected to the "Receive" input of the next device, the "Receive" input on the IOTA must be connected to the "Transmit" output of the previous device, see figures 2, 3 & 4 attached to the end of this section.

The fibre-optic ports may be used to build a ring network of relays, see figure 2. If a ring is not considered to have sufficient security a Sigma 1 can be utilised to create a star network, see figure 3.

Remote Dial-Up can be achieved with the use of telephone modems, see figure 4. More information on connecting using telephone modems is given in the document **434/TIR/007 Remote Communications**.

Connection to the electrical port is via a standard modem cable.

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3 Relay Settings

3.1 Transmission Methods

Half duplex serial asynchronous transmission.

3.2 Communications Menu

The relay communications are set-up by accessing the 'configuration/communications' menu of the relay. The settings on the relay should be matched to the settings on the master station. The settings for Com 2 apply to both the fibre-optic and electrical ports.

3.3 Station Address

Sets the unique address given to the relay to allow communications. The valid addresses are 1 to 254, allowing 254 devices on a network. Address 0 switches communications to the relay off.

3.4 IEC60870 on Port

Sets the port the IEC60870-5-103 protocol should operate on, either COM1 or COM2.

3.5 Com 1 Baud Rate and Com 2 Baud Rate

Sets the rate the respective port will operate at in bits per second. Options are 75, 110, 150, 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600 and 115200.

3.6 Com 1 Parity and Com 2 Parity

Sets the parity used by the port. Options are None, Even and Odd.

Default – Even

3.7 Com 1 Line Idle and Com 2 Line Idle

Sets the line idle state used by the port. Options **light off** and **light on**. IEC60870-5-103 defines the line idle state as light on. However, some hardware may not be able to produce this so an option to switch to **light off** is provided. The sigma units 1 & 3 contain switches to switch between Light off and Light On. On Sigma 4 this is achieved with a jumper connection, jumper OFF is **light off**. This setting has no effect on the electrical Com 2 port.

3.8 Com 1 Data Echo and Com 2 Data Echo

When the relays are connected in a ring this setting should be **on**, enabling data to be echoed from one relay to the next. Otherwise it should be **off** to reduce the communications overhead.

3.9 Com 2 Direction

This setting effects how the Com 2 ports, fibre optic or electrical are used. Options are **Auto-Detect**, **Rear Port** and **Front Port**. Auto-Detect automatically switches to the front port when a device is plugged into it, reverting to the rear when the device is removed. The Rear Port and Front Port settings explicitly set which port is active. If you try to communicate with a port when the other is active no communication will take place.

4 Fibre-optic distances

These figures are maximum distances based on manufacturers' data and may be subject to change without notice. No account is taken of minimum distances. With certain fibres with short distances and high transmitting powers, it is possible to overload the receivers thus causing errors. Full data for transmit and receive powers is available on request. All distances are in metres, and are maximum figures, allowing for LED degradation.

NOTE: IOTA is a Modular II relay.

1mm polymer

SOURCE	DESTINATION							
	Argus	Modular I	Modular II	Sigma 1	Sigma 3	Sigma 4p	Sigma 4g	Honeywell
Argus	40	0	70	70	40	80	80	130
Modular I	0	5.5	0	0	3.5	6.0	6.0	13.5
Modular II	4.5	0	6.5	6.5	4.5	7.0	6.0	14.5
Sigma 1	4.5	0	6.5	6.5	4.5	7.0	7.0	14.5
Sigma 3	10.0	35	35	35	10.0	45	45	35
Sigma 4p	38	65	65	65	35	75	75	125
Sigma 4g	2.5	4.5	4.5	4.5	2.5	5.0	5.0	12.5
Honeywell	5.0	7.0	7.0	7.0	5.0	7.5	7.5	15.0

200µm PCS

SOURCE	DESTINATION							
	Argus	Modular I	Modular II	Sigma 1	Sigma 3	Sigma 4p	Sigma 4g	Honeywell
Argus	100	0	260	260	100	320	320	620
Modular I	0	1320	0	0	750	1520	1520	3610
Modular II	1540	0	2110	2110	1540	2310	2310	4400
Sigma 1	1540	0	2110	2110	1540	2310	2310	4400
Sigma 3	0	0	0	0	0	0	0	250
Sigma 4p	0	0	0	0	0	0	0	250
Sigma 4g	370	940	940	940	370	1140	1140	3230
Honeywell	1290	1860	1860	1860	1290	2060	2060	4140

62.5/125 µm glass

SOURCE	DESTINATION							
	Argus	Modular I	Modular II	Sigma 1	Sigma 3	Sigma 4p	Sigma 4g	Honeywell
Argus	0	0	0	0	0	0	0	40
Modular I	0	350	0	0	0	850	850	6070
Modular II	350	0	1780	1780	350	2280	2280	7500
Sigma 1	350	0	1780	1780	350	2280	2280	7500
Sigma 3	0	0	0	0	0	0	0	0
Sigma 4p	0	0	0	0	0	0	0	0
Sigma 4g	0	0	0	0	0	0	0	4750
Honeywell	0	210	210	210	0	710	710	5930

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50/125 µm glass

SOURCE	DESTINATION							
	Argus	Modular I	Modular II	Sigma 1	Sigma 3	Sigma 4p	Sigma 4g	Honeywell
Argus	0	0	0	0	0	0	0	0
Modular I	0	0	0	0	0	0	0	5070
Modular II	0	0	420	420	0	920	920	6140
Sigma 1	0	0	420	420	0	920	920	6140
Sigma 3	0	0	0	0	0	0	0	0
Sigma 4p	0	0	0	0	0	0	0	0
Sigma 4g	0	0	0	0	0	0	0	3510
Honeywell	0	0	0	0	0	0	0	4760

Example:

A ring of relays with a Sigma 4p is required to communicate with a PC. The ring consists of an Argus relay and a Modular II. From the Transmitter of the Sigma 4p to the Receiver of the Argus, using 1mm polymer fibre, the maximum distance is 38m. From the Transmitter of the Argus to the Receiver of the Modular II using 1mm polymer fibre, the maximum distance is 70m. From the Transmitter of the Modular II to the Receiver of the Sigma 4p, the maximum distance is only 7m with 1mm polymer fibre. However, it can be seen from the tables that using an alternative fibre type, maximum distances which can be achieved will vary, for example in the above instance using 200PCS, the maximum distance is extended to 2.3km! (There is a minimum distance associated with this configuration, however, of around 1.5km)

For detail of fibre optic budget loss calculations a copy of 'APPLICATION GUIDE REYROLLE PROTECTION – RELAY COMMUNICATIONS' should be examined.
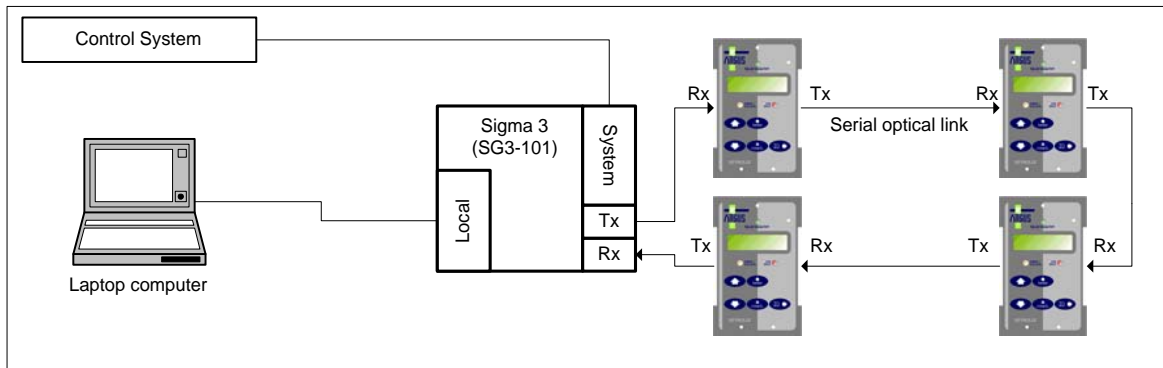
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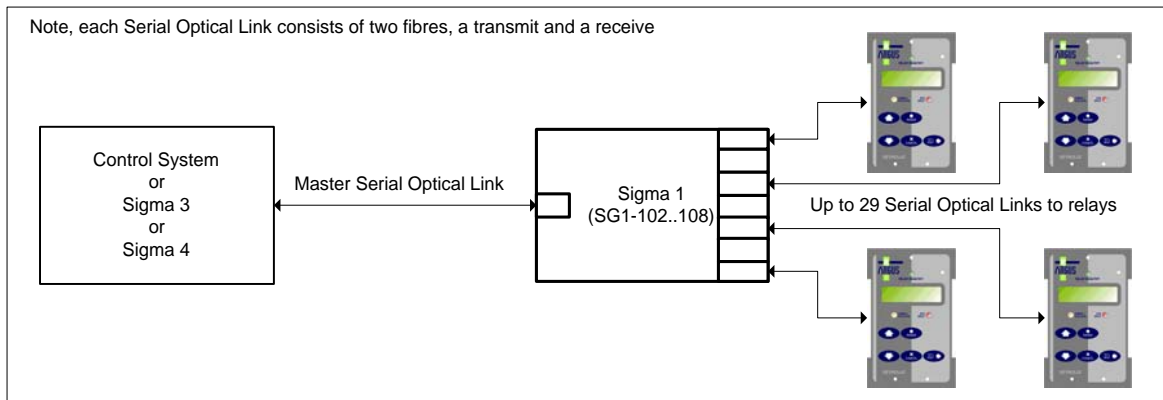**Figure 2 - Fibre Optic Ring Connection using Sigma 3**
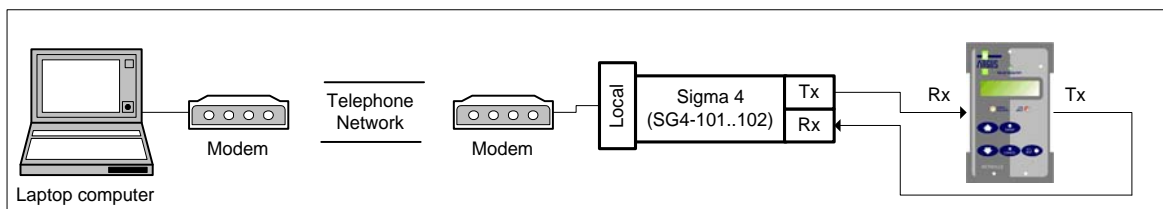

Figure 3 - Fibre Optic Star Connection Using Sigma 1

Figure 4 – Remote Dial-Up Connection using Sigma 4

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