7SG15 MicroTAPP

Automatic Voltage Control

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

Contents

1 Introduction

The MicroTAPP 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 ST connectors for transmit and receive communications to a substation SCADA or integrated control system (Com 1).

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

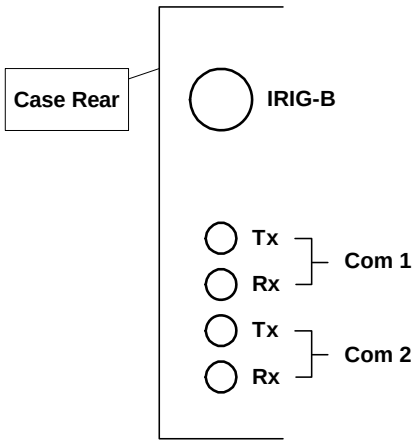

Figure 1

The IEC60870-5-103 standard protocol used by the relay for the transfer of data is fully described in the Reyrolle document 434TM05 “Informative Communication Interface”. An IRIG-B port is also provided for time synchronisation.

The Sigma range of products is 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 is overridden, see Figure 2.

Sigma 4 is a portable fibre optic to RS232 conversion unit.

2 Connections

2.1 Physical Characteristics

The modular II relays are equipped with two fibre-optic, and one electrical serial communication ports. The fibre optic ports named Com1 and Com2 are located at the rear of the relay. Each consists of a pair of ST connectors, a transmitter (Tx) and a receiver (Rx). See Figure 1 left.

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 for connection to a computer. The electrical port is also named Com 2, allowing local access overriding the fibre-optic Com2.

2.2 Fibre Optic Cable

The modular II relay is optimised to use either a 50/125 µm or 62.5/125 µm glass fibre optic cable.

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.

2.3 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 MicroTAPP must be connected to the "Receive" input of the next device, while the "Receive" input on the MicroTAPP must be connected to the "Transmit" output of the next device, see Figures 2, 3, 4 and 5 attached to the end of this section.

The fibre-optic ports may be used to build a ring network of relays, see Figures 2 & 3. If a ring is not considered to have sufficient security a Sigma 1 can be utilised to create a star network, see Figure 4.

Remote Dial-Up can be achieved with the use of telephone modems, see Figure 5. More information on connecting using telephone modems is given in the Reyrolle document 434/TIR/007.

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

3 Relay Settings

3.1 Transmission Method

Half duplex serial asynchronous transmission.

3.2 Communications Menu

The relay communications are set-up by accessing the 'configuration/communications' menu of the relay.
Relay settings should be matched to the settings on the master station. The settings for Com2 apply to both the fibre-optic and electrical ports.

3.2.1 Station Address

This is the relay's unique identifier for communications. The valid addresses are 1 to 254, allowing 254 devices on a network. Address 0 switches communications to the relay off.

3.2.2 IEC60870 on Port

Sets the port the IEC60870-5-103 protocol should operate on, either Com1 or Com2.

3.2.3 Com1 Baud Rate and Com2 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.

3.2.4 Com1 Parity and Com2 Parity

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

3.2.5 Com1 Line Idle and Com2 Line Idle

Sets the line idle state used by the port, either **light off** or **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 Com2 port.

3.2.6 Com1 Data Echo and Com2 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.

3.2.7 Com2 Direction

This setting affects how the Com2 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 setting explicitly defines 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 Data

4.1 Launch Power (dBm)

The amount of light that can be focussed into the fibre.

CABLE TYPE	SOURCE								
	Argus (p)	Argus	Modular I	Modular II	Sigma 1	Sigma 3 (p)	Sigma 3	Sigma 4 (p)	Sigma 4
1 mm polymer	-10.5	-7	-10	-7	-7	14.8	-14.6	10.6	-14.6
200 µm PCS	-14.4	-6.2	-11.7	-6.2	-6.2	21.8	-13.4	21.7	-13.4
62.5 / 125 µm glass	-29	-16	-20	-16	-16		-22.7		-22.7
50 / 125 µm glass	-32.6	-19.8	-22.8	-19.8	-19.8		-26.2		-26.2

P = Polymer
G = Glass

4.2 Receiver Sensitivity (dBm)

The minimum amount of light required for operation.

	DESTINATION								
	Argus (p)	Argus	Modular I	Modular II	Sigma 1	Sigma 3 (p)	Sigma 3	Sigma 4 (p)	Sigma 4
Sensitivity (dBm)	-20	-24	-24	-24	-24	-20	-25.4	-25.4	-25.4

P = Polymer
G = Glass

4.3 Distance Calculation

Taking the launch power and receiver sensitivity from the above two tables, and allowing for a safety margin, losses due to joints in the cables and the loss per kilometre in the cables as specified by the cable manufacturer, the distance can be calculated as follows:

$$Distance(km) = \frac{LaunchPower - ReceiverSensitivity - SafetyMargin - JointLoss}{LossPerKiloMetre}$$

4.4 Distances

These figures are based on manufacturers' data and may be subject to change without notice. No account is taken of minimum distances. With certain fibres, it is possible to overload the receivers thus causing errors. All distances are in metres, and are maximum figures, allowing for LED degradation. All products are optimised for use with glass fibre cable, except where polymer (p) is stated.

1mm polymer

SOURCE	DESTINATION								
	Argus (p)	Argus	Modular I	Modular II	Sigma 1	Sigma 3 (p)	Sigma 3 (ST)	Sigma 4 (p)	Sigma 4
Argus (p)	40	70	0	70	70	40	80	80	80
Argus	4.5	6.5	0	6.5	6.5	4.5	6.0	7.0	6.0
Modular I	0	0	5.5	0	0	3.5	6.0	6.0	6.0
Modular II	4.5	6.5	0	6.5	6.5	4.5	6.0	7.0	6.0
Sigma 1	4.5	6.5	0	6.5	6.5	4.5	7.0	7.0	7.0
Sigma 3 (p)	10.0	35	35	35	35	10.0	45	45	45
Sigma 3 (ST)	2.5	4.5	4.5	4.5	4.5	2.5	5.0	5.0	5.0
Sigma 4 (p)	38	65	65	65	65	35	75	75	75
Sigma 4 (ST)	2.5	4.5	4.5	4.5	4.5	2.5	5.0	5.0	5.0

200µm PCS

SOURCE	DESTINATION								
	Argus (p)	Argus	Modular I	Modular II	Sigma 1	Sigma 3 (p)	Sigma 3 (ST)	Sigma 4 (p)	Sigma 4
Argus (p)	100	260	0	260	260	100	320	320	320
Argus	1540	2110	0	2110	2110	1540	2310	2310	2310
Modular I	0	0	1320	0	0	750	1520	1520	1520
Modular II	1540	2110	0	2110	2110	1540	2310	2310	2310
Sigma 1	1540	2110	0	2110	2110	1540	2310	2310	2310
Sigma 3 (p)	0	0	0	0	0	0	0	0	0
Sigma 3 (ST)	370	940	940	940	940	370	1140	1140	1140
Sigma 4 (p)	0	0	0	0	0	0	0	0	0
Sigma 4 (ST)	370	940	940	940	940	370	1140	1140	1140

62.5/125 µm glass

SOURCE	DESTINATION								
	Argus (p)	Argus	Modular I	Modular II	Sigma 1	Sigma 3 (p)	Sigma 3 (ST)	Sigma 4 (p)	Sigma 4
Argus (p)	0	0	0	0	0	0	0	0	0
Argus	350	1780	0	1780	1780	350	2280	2280	2280
Modular I	0	0	350	0	0	0	850	850	850
Modular II	350	1780	0	1780	1780	350	2280	2280	2280
Sigma 1	350	1780	0	1780	1780	350	2280	2280	2280
Sigma 3 (p)	0	0	0	0	0	0	0	0	0
Sigma 3 (ST)	20	20	20	20	20	20	20	20	20
Sigma 4 (p)	0	0	0	0	0	0	0	0	0
Sigma 4 (ST)	20	20	20	20	20	20	20	20	20

50/125 µm glass

SOURCE	DESTINATION								
	Argus (p)	Argus	Modular I	Modular II	Sigma 1	Sigma 3 (p)	Sigma 3 (ST)	Sigma 4 (p)	Sigma 4
Argus (p)	0	0	0	0	0	0	0	0	0
Argus	0	420	0	420	420	0	920	920	920
Modular I	0	0	0	0	0	0	0	0	0
Modular II	0	420	0	420	420	0	920	920	920
Sigma 1	0	420	0	420	420	0	920	920	920
Sigma 3 (p)	0	0	0	0	0	0	0	0	0
Sigma 3 (ST)	20	20	20	20	20	20	20	20	20
Sigma 4 (p)	0	0	0	0	0	0	0	0	0
Sigma 4 (ST)	20	20	20	20	20	20	20	20	20

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 MicroTAPP. 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 MicroTAPP (Modular II) using 1mm polymer fibre, the maximum distance is 70m. From the Transmitter of the MicroTAPP to the Receiver of the Sigma 4p, the maximum distance is only 7m with 1mm polymer fibre. However, using 200PCS, the maximum distance is extended to 2.3km! (There is a minimum distance associated with this configuration, however, of around 1.5km).

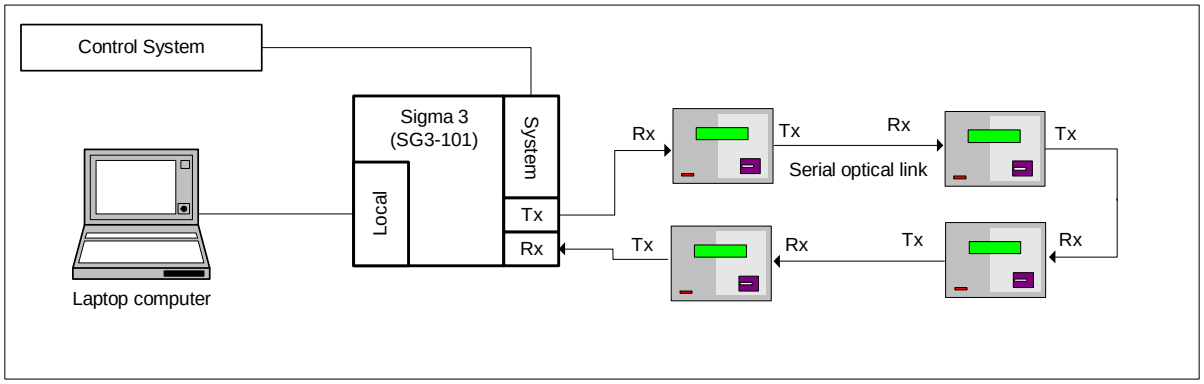

Figure 2 - Fibre Optic Ring Connection using Sigma 3

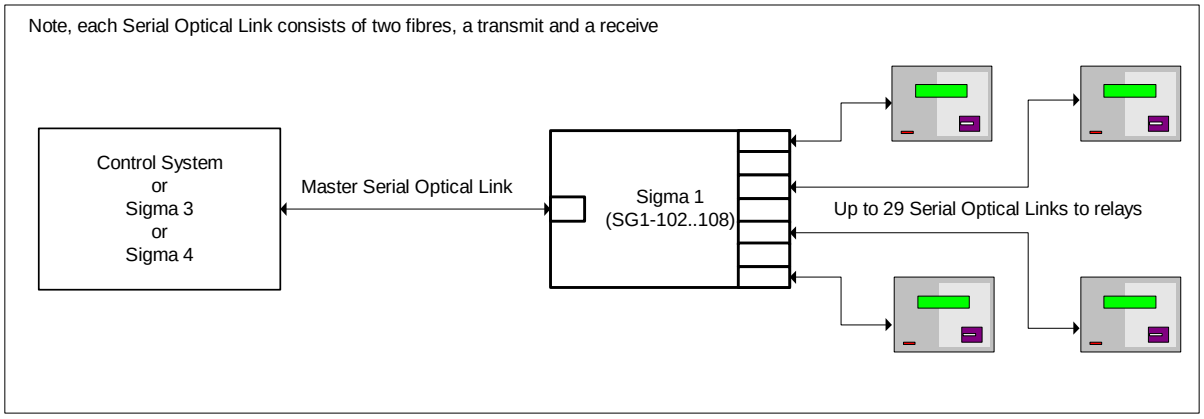

Figure 3 - Fibre Optic Star Connection Using Sigma 1

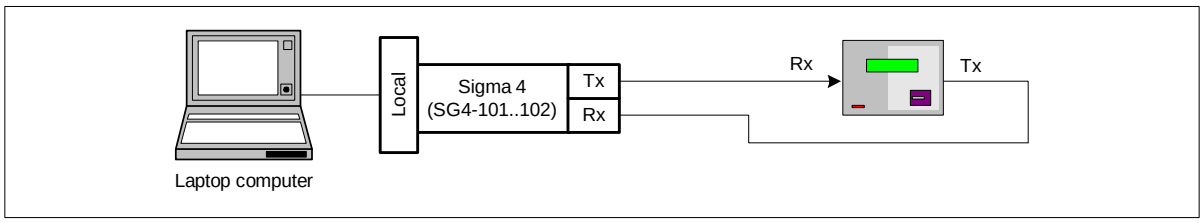

Figure 4 - Fibre Optic Connection to One Relay using Sigma 4

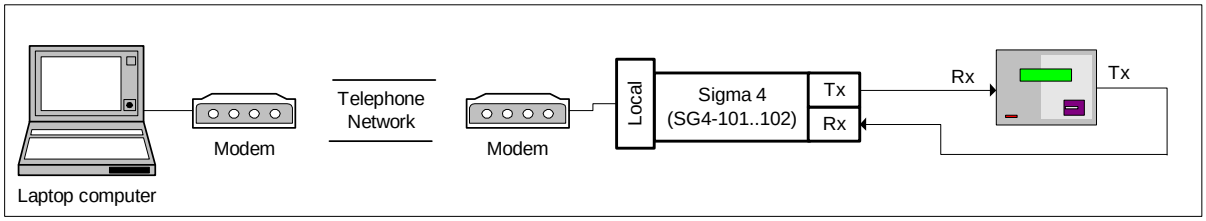

Figure 5 – Remote Dial-Up Connection using Sigma 4