DIGSI central/remote operation general information

Introduction

With the DIGSI central or remote operation, SIPROTEC devices in remote or inaccessible locations can be accessed quickly and conveniently, thereby facilitating the servicing and extraction of stored event and disturbance records for swift fault diagnosis. This can be done in different ways, to suit the requirements of the different devices, local conditions and especially the safety regulations..

Central operation is implemented whenever the devices are associated with a fixed "control centre" (load dispatch centre). The operating personnel can access all the devices from a service PC without having to leave the control centre. Remote operation is applied when several persons have to access various remote devices from different locations. The connection is achieved with dial-up or leased line modems, via the public telephone network, private company network or leased line.

Central operation

A pre-requisite for central operation of devices is that all the devices have a suitable serial interface, which may have different physical characteristics. All devices must "speak the same language" in accordance with a specified communication protocol, and have a unique address. The connection with the central device is achieved with a radial or bus connection, whereby electrical or optical connections are used to suit the topology and safety requirements.

Remote operation

Remote operation of a number of devices in a substation includes the requirements of central operation. Accordingly it is important to consider the requirements of remote operation via modem, for possible retro-fit when planning the central operation.

The choice of modem primarily depends on the devices that have to be operated. The available communication medium must however also be considered. Devices with large data volumes (e.g. SIPROTEC 4) should be operated via fast modems (e.g. ISDN or analogue 56K). On poor communication links. The use of a fast modem however makes no sense. It is recommended to use the same type of modem at the terminals.

Analogue Modems

The word modem is a combination of the terms **mo**dulate and **dem**odulate. A digital signal is serially modulated onto a carrier signal, and retrieved at the opposite end by demodulation. The transfer of a bit to the remote end, via this process, takes approximately 60-80ms, and is constant. The transmission of a single byte (8N1=10 Bit) at 9600 Baud (Bit/s) takes approx. only 1 ms, i.e. the total communication speed is not doubled when the baud rate is doubled. A consequence of this are the relatively long transmission times with SIRPOTEC 4 devices, as a large number of short telegrams with acknowledgement of reception are transmitted..

ISDN-Modems (terminal adapter/controller)

The term modem is actually incorrect here, as nothing is modulated in this case. Consequently these devices are also referred to as terminal adapters or controllers. In comparison with analogue modems, the time delays introduced by modulation and demodulation do not apply here. The transfer of a bit to the opposite end only takes approx. 10ms depending on the type of modem used, and is also constant. At 64k baud transmission links, the SIPROTEC 4 devices can be operated at 57,6 k baud.

SIPROTEC 3 devices

With SIPROTEC 3 devices having baud rates up to 19,2kB, the modems with baud rates up to 28,8kB are most commonly used, as recommended. The modems (MT2834 and LOGEM 928 viz. LGH28.8D) are supported by the DIGSI V3 operating program and ensure secure, fast and convenient operation of the V3 protection devices with the data format 8E1.

SIPROTEC 4 devices

With the introduction of the new range SIPROTEC 4 and the new operating program DIGSI 4, the data transfer rate has increased to up to 115kB. The amount of data that needs to the transferred has however also drastically increased. Fast analogue modems e.g. the MT5600 (7XV5800-3xA00) , or the even faster ISDN modems LOGES 64k (7XV5810), largely cope with these new requirements. For convenient operation the digital ISDN modems are recommended (refer to analogue modems).

SIPROTEC 3 and 4 devices

If SIPROTEC 4 devices must be added to a station that already has SIPROTEC 3 devices that communicate via 28,8k Baud modems, then the SIPROTEC 4 devices must be set with the same serial communication parameters (e.g. 9600 8E1). As all devices must have the same baud rate, they can only be operated with a maximum of 19200 baud (SIPROTEC 3), even if a faster modem is used. The convenient operation of the SIPROTEC 4 devices is however possible by adding an "active mini star coupler" 7XV5550-0xA00, faster modems and DIGSI 4.3x. Initially all devices and the active mini star coupler (channel switch) are moved or added to the substation manager in DIGSI 4.3x. Then the new modems are installed and finally the modem settings are done (refer to catalogue leaflet 7XV5550).

Protection devices V1/2

Protection devices V1/2 can also be moved to or added to the substation manager in DIGSI 4.3. These devices can also be centrally or remotely operated via an "active mini star coupler" (channel switch).

Data format / Transmission security

The new analogue modem MT5600, as well as many of the available „Internet-Modems" no longer fully support the previously recommended data format 8E1.

This also increasingly applies to standard software and operating systems such as Windows.

The data format 8N1 (8 data bit, no parity, 1 Stop-Bit) has prevailed.
The missing parity bit (fault detection bit) was sufficiently replaced by new fault detection and correction techniques applied to the data transfer via modem.

The SIPROTEC 4 devices and DIGSI 4 followed this trend and make use of improved fault detection techniques such as for example check sums (CRC32). Accordingly we recommend the standard data format 8N1 and the maximum available transmission rate for future projects.

Approvals

Analogue modems are used world wide. Each modem must have a country specific approval for use in the public telephone network. Most modems are prepared and suitable for operation in the different networks, which does not remove the obligation of obtaining an approval. Please consider the approval when ordering. In private networks such as closed company networks no approval is generally required.

Digital modems or network adapters were developed for certain national or limited international areas e.g. Europe, and can only be applied there. The required approval must be considered.

Snookered by choice

As may be derived from the above, a number of options exist, depending on the topology, required performance and security.

The modem must be carefully chosen, with particular consideration for the application is substations and the transmission characteristics e.g. in conjunction no gap tolerant V3 devices.

Practical solutions were found and tested with our recommended components such as DIGSI, Modems 7XV58, star couplers and various converters.
Therefor we can off detailed application examples, which will assist with the choice of the correct components, speedy construction of the plant and secure commissioning.

Selection criteria

Central or remote control?

When central control is applied, the possibility of future remote control should also be considered. Central control is often only the first step.

Optical star coupler or RS485-Bus?

The optical star configuration provides device communication in the substation with the highest interference immunity. It is always recommended when the highest degree of security is required or when communication over large distances or between buildings is required. Caution! Not all devices have fibre optic interfaces. Corresponding converters are however available (refer to accessories).

The RS485-Bus is preferred for communication restricted to one building or room, to connect devices in one or more cubicles. Connection to the substation modem should always be via optical isolation. Not all devices have RS485 interfaces (see accessories).

Are the protection devices addressable?

All addressable protection devices SIPROTEC 3 and SIPROTEC 4 can be connected via a modular star coupler, mini star coupler or RS485 bus.

Non addressable protection devices V1 or V2 can only be connected via active mini star coupler 7XV5550 for central or remote operation.

Are protection devices „gap tolerant"?

If only gap tolerant devices such as all SIPROTEC 4 devices or the 7SA511 / 7SA513 from V3.2x are being used, just about any modem can be used together with a star coupler or RS485 bus to operate them (see note below).

For all other devices, our recommended modems 7XV5800 / 7XV5810 must be used.

Which modem fit?

If only SIPROTEC 4 devices are being used, then analogue 56k or ISDN modems should be used in accordance with the exchange. The exchange must allow for high data rates.

If e.g. SIPROTEC 3 devices are operated with a maximum of 19,2 kB, or if only a poor communication line is available, "slow" analogue 28,8 kB modems may also be used.

We recommend the use of our components, in particular the modems, as these were tested by us to detect possible weaknesses. If problems are encountered, these can be registered via our services department for clarification. (see note below)

Where do I find support?

Services   Tel. +49 (0) 180 524 7000   E-Mail: Services@ptd.siemens.de

Important note:
the support of our hotline is restricted to the modems 7XV5800 and 7XV5810, recommended and tested by us. **The application of other modems takes place at own risk.**