Managed Ethernet switch 500NMD02
EDS500 series - Ethernet & DSL switches

Application, characteristics and technical data have to be taken from the hardware data sheet:

500NMD02 Data sheet 1KG1 150 841

Operation
The compact modem 500NMD02 has two wide area network SHDSL interfaces and four Ethernet interfaces. There are two serial interfaces for configuration or process interface (e.g. to connect telecontrol units). A configurable alarm relay and an extension interface (e.g. to use the configuration stick) complete the device.

Connections
Ethernet interfaces (Port1 - Port4)

Every Ethernet interface detects automatically whether the connected counterpart works as transmission or network termination device. This way both normal and crossover cables can be used (MDI/MDI-X).

The Ethernet interface can operate at transmission rates of 10 or 100 Mbps, depending on the connected devices in half duplex or full duplex mode. The operation mode is detected and set automatically by the EDS500 devices. A manual configuration is possible.

Pin allocation Ethernet interface (RJ-45)

<table>
<thead>
<tr>
<th>Pin</th>
<th>assigned as data transmission device (MDI)</th>
<th>assigned as network termination device (MDI-X)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Tx+</td>
<td>Rx+</td>
</tr>
<tr>
<td>2</td>
<td>Rx-</td>
<td>Tx-</td>
</tr>
<tr>
<td>3</td>
<td>n.c.</td>
<td>n.c.</td>
</tr>
<tr>
<td>4</td>
<td>n.c.</td>
<td>n.c.</td>
</tr>
<tr>
<td>5</td>
<td>Rx-</td>
<td>n.c.</td>
</tr>
<tr>
<td>6</td>
<td>n.c.</td>
<td>n.c.</td>
</tr>
</tbody>
</table>

DSL interfaces (X3 - X4)
The data transmission method SHDSL “Single-pair High-speed Digital Subscriber Line” has been specified by the International Telecommunications Union (ITU recommendation G.991.2) and represents a modern, high performance, comfortable and secure communication method. SHDSL works with data rates from 192 kbps up to 5.696 Mbps on a copper pair in full duplex mode. EDS500 devices additionally use a proprietary extension of the SHDSL standard and can reach data rates of up to 15.000 Mbps. Wires with a diameter of 0.8 mm give a range of 13 km at 2.048 Mbps or 25 km at 192 kbps.

Pin allocation DSL interface (X3 - X4)

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Line A (DSL A)</td>
</tr>
<tr>
<td>2</td>
<td>Line B (DSL B)</td>
</tr>
<tr>
<td>3</td>
<td>Functional earthing and cable shield</td>
</tr>
</tbody>
</table>

ADVICE
The SHDSL interface is designed as a 2 wire interface. For an effective overvoltage protection it is mandatory to connect the functional earthing as well as the cable shield.

ADVICE
Any SHDSL port supports auto-crossover detection and correction, so signals A and B may be interchanged.
The signal lines are short-circuit protected and may be connected while the module is powered and working.

Serial Interfaces (Con0 - Con1)
The serial interfaces of the devices are signal compatible to RS-232. The connector is a RJ-12 female plug. The factory pre-sets are speed 57600 Baud, no parity, 1 stop bit, no flow control. On delivery, the management console can be accessed via the serial interface.

Pin allocation serial interface RS-232 (RJ-12)

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
<th>Direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DCD</td>
<td>Output</td>
</tr>
<tr>
<td>2</td>
<td>CTS</td>
<td>Output</td>
</tr>
<tr>
<td>3</td>
<td>RTS</td>
<td>Input</td>
</tr>
<tr>
<td>4</td>
<td>GND</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>RxD</td>
<td>Output</td>
</tr>
<tr>
<td>6</td>
<td>TxD</td>
<td>Input</td>
</tr>
</tbody>
</table>

Pin allocation serial interface RS-485 half duplex (RJ-12)

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
<th>Direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>B (-)</td>
<td>bi-directional</td>
</tr>
<tr>
<td>2</td>
<td>GND</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>A (+)</td>
<td>bi-directional</td>
</tr>
</tbody>
</table>

Pin allocation serial interface RS-485 full duplex (RJ-12)

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
<th>Direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>B (-)</td>
<td>Input</td>
</tr>
<tr>
<td>2</td>
<td>B (-)</td>
<td>Output</td>
</tr>
<tr>
<td>3</td>
<td>GND</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>A (+)</td>
<td>Input</td>
</tr>
</tbody>
</table>

ADVICE
Due to the internal overvoltage protection, interrupt any connection to ground of the device for the time of the measurement before you carry out isolation measurement. This includes the earthing of the hat rail as well as all shields of all transmission lines and supply feedings. RJ-12 plugs or RJ-45 plugs can establish earthing via the shield.

Power connector (X1)
The EDS500 devices are equipped with a wide range power supply for voltages between 24 and 60 Volts DC (power consumption see device label). The connector is a 4-pin Phoenix plug with screw terminals.

Pin allocation power supply (X1)

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>24-60 V DC</td>
</tr>
<tr>
<td>2</td>
<td>Functional earth (internally wired to pin 4)</td>
</tr>
<tr>
<td>3</td>
<td>GND</td>
</tr>
<tr>
<td>4</td>
<td>Functional earth (internally wired to pin 2)</td>
</tr>
</tbody>
</table>

Extension interface (EXT)
The plug of the proprietary expansion bus is designed as USB type B but uses a manufacturer specific protocol.
The configuration parameters are stored directly on the device. In addition, a configuration stick can be connected to the expansion bus to save data externally, in example to exchange defective devices easily.

ADVICE
Due to the internal overvoltage protection, interrupt any connection to ground of the device for the time of the measurement before you carry out isolation measurement. This includes the earthing of the hat rail as well as all shields of all transmission lines and supply feedings. RJ-12 plugs or RJ-45 plugs can establish earthing via the shield.

Alarm-Relay (X2)
The devices are equipped with a potential free alarm output (relay with isolated switchover contact). This output corresponds to a device alarm and is activated when the device looses the power supply or the alarm LED is constantly on. The reason for the signalling of an alarm can be referenced in the system alarm table.

Pin allocation alarm output (X2)

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 &amp; 2</td>
<td>Normal state</td>
</tr>
<tr>
<td>1 &amp; 3</td>
<td>Alarm state</td>
</tr>
<tr>
<td>4</td>
<td>Common contact (connected to 1)</td>
</tr>
</tbody>
</table>

WARNING
The relay is designed for switching only safe low voltages.

Signaling

<table>
<thead>
<tr>
<th>LED</th>
<th>Description</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power</td>
<td>Voltage Supply</td>
<td>off Device is without power supply</td>
</tr>
</tbody>
</table>
The serial port of a PC/notebook.

1KGT038912R0001), the device can be connected to a line. Using a serial configuration cable (500CAB06 configuration mode to provide access to the command In delivery status all serial interfaces are in Configuration using a serial configuration cable EDS500 Manual - Part 2: Functions (1KGT151021).

The 500NMD02 can be configured locally as well as from remote. In the following some methods are introduced, for a complete description please see EDS500 Manual - Part 2: Functions (1KGT151021).

The command line interface

The command line of the 500NMD02 is similar to the (DOS) command line known from the PC. All device properties can be set and shown here.

• Commands are typed into the console, pressing <Enter> will start execution.
• Commands can be abbreviated as soon as they are unambiguous, i.e. <sh sy> is equivalent to <show system>, <se sw pl n s> is equivalent to <set switch port1 no shutdown>.
• A command overview can be listed on every level by typing <sh>. Example: <sh sy ?> translates to <show system ?> and results in snmp sntp ssh syslog temperature being shown as command keywords to follow, i.e. one possible command is <show system temperature>.
• There are two authentication levels on the command line: Login authentication and Enable authentication. Login authentication can be described as a read only mode and is accessible directly after establishing a serial connection with the PC. Enable authen-tication is required once you need to change system settings or show the complete system parameter set. Enable authentication is reached by entering the <enable> command. Both authentication levels can be protected by a password, the respective commands are <set loginpass {string20}> and <set enablepass {string20}>.

Device configuration

The 500NMD02 can be configured locally as well as from remote. In the following some methods are introduced, for a complete description please see EDS500 Manual - Part 2: Functions (1KGT151021).

Configuration using a serial configuration cable

In delivery status all serial interfaces are in configuration mode to provide access to the command line. Using a serial configuration cable (500CAB06 1KGT038912R0001), the device can be connected to a serial port of a PC/notebook.

The default configuration for the serial connection is: 57600 Baud 8N1 (8 data bits, no parity, 1 stop bit), no hardware flow control.

IP based configuration, remote configuration

After establishing a network connection to the device and configuring IP addresses as required (i.e. “the device can be pinged”), the following remote configuration features can be used:

• Telnet
  Telnet clients like HyperTerminal, PuTTY or telnet.exe (on the PC command line interface) can be used to establish a telnet session with the device. The IP address of the unit has to be used as Telnet target. Telnet access can be disabled by a configuration command.
• SSH
  Suitable SSH clients on the PC side are programs like Tera Term or PuTTY. The tar-get address is the device’s IP address. During the connection you will be prompted for authentication credentials. The default login name is edsllogin, the password is empty when in delivery status. SSH access can be disabled by configuration.
• Webserver
  With the webserver activated (default setting) browsers like Firefox, Opera, Safari, Chrome or the Internet Explorer can be used to configure the devices using the web interface. To do so enter the device IP into the browser address field. The device will subsequently request authentication credentials. The default login name is edsllogin, the password is empty when in delivery status. Webserver access can be disabled by a configuration command.

### LED | Description | Function
--- | --- | ---
| Ready | Ready | off Hardware fault or booting
| DSL Master | DSL unit in slave mode | green DSL unit in master mode
| DSL Activity | DSL activity | off No activity on the DSL interface
| Con DCD | Con DCD inactive on Con interface | green DCD inactive on Con interface
| Alarm | Alarm | off No alarm
| DSL Alarm | DSL alarm | red Alarm about DSL interfaces
| L | Ethernet connection | off No connection
| S | Ethernet data rate | off Data rate 10 Mbps

During start-up all displays light up shortly for about 1 second. As soon as the start-up has been finalized successfully (about 30 seconds after switching on the device) the LED “Ready” switches to green.

| LED | Description | Function
--- | --- | ---
green | Power supply switched on
off | Hardware fault or booting
green | Device ready
off | No active DSL link
green | DSL link established
off | No activity on the DSL interface
red | Alarm
orange | Data rate 10 Mbps
 | Data rate 100 Mbps

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- **SSH**
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<table>
<thead>
<tr>
<th>LED</th>
<th>Description</th>
<th>Function</th>
</tr>
</thead>
</table>
green | Power supply switched on |
off | Hardware fault or booting |
green | Device ready |
off | No active DSL link |
green | DSL link established |
off | No activity on the DSL interface |
green | Data is transmitted via DSL |
green | Data is transmitted via Con |
green | Data is transmitted via Con |
red | Alarm |
red | Alarm about DSL interfaces |
off | No alarm |
green | Link established |
flash | Activity (send or receive) |
green | Data rate 10 Mbps |
green | Data rate 100 Mbps |
• Configuration commands entered on the command line interface are stored in the running configuration of the device, which represents the current state of the system. To preserve this status after a reboot, the running configuration must be transferred to the startup configuration using the command `<write>`. During system startup all commands from the startup configuration are being executed and thus create the running configuration. When a configuration stick is attached both with regular and crossover cables. The current master/slave setting is set to “read only”). During system startup with attached config stick, the stick configuration overwrites the startup configuration.

• The current configuration (running configuration) can be displayed using the command `<show running-config>` (only with Enable authentication). The start configuration may be shown using `<show startup-config>`. When a config stick is attached, its content can be shown using `<show stick-config>`. The current configuration of the device, which represents the current state of the system, is set to “read only”). During system startup with attached config stick, the stick configuration overwrites the startup configuration.

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Interface configuration

SHDSL interfaces

The DSL interfaces of the 500NM02 work as point-to-point connections over two-wire copper lines. One side needs to be configured as master, the other one as slave. The current master/slave setting is indicated through the interface’s “Master” LED on the front panel and can be displayed using the command `<show interface {dsl1 | dsl2}>` respectively. To change the master/slave setting use `<set interface {dsl1 | dsl2} mode master>` and `<set interface {dsl1 | dsl2} mode slave>`.

In delivery status, the speed of the DSL interfaces defaults to 192 kbps. However, depending on wire length, condition of the line and the desired signal quality, significantly higher speed rates can be achieved.

Table 1: Speed settings for the DSL interfaces

<table>
<thead>
<tr>
<th>Speed: local fixed, remote auto</th>
<th>Speed: local fixed remote ext-auto</th>
</tr>
</thead>
<tbody>
<tr>
<td>192...11400, step size 8 kbps</td>
<td>192...11400, step size 8 kbps</td>
</tr>
</tbody>
</table>

Figure 2: Signal quality with 0.8mm cable diameter, no additive noise

After activating interfaces on both sides of the line using the command `<set interface {dsl1 | dsl2} no shutdown>` automatic connection establishment will be initiated (this setting is already activated when in delivery status). Depending on line length, line condition and speed settings, this procedure might need some time and several attempts before a successful connection can be established. The negotiation phase is signaled through the front panel LEDs: the DSL activity LED is blinking while DSL link LED is off.

Generally automatic speed negotiation is configured on the less accessible end of the DSL line (`.<set interface {dsl1 | dsl2} speed auto>`)

or `.<set interface {dsl1 | dsl2} speed ext-auto>` , see following table), while a fixed speed value is applied to the better reachable end of the line.

Table 1: Speed settings for the DSL interfaces

<table>
<thead>
<tr>
<th>Speed: local fixed, remote auto</th>
<th>Speed: local fixed, remote ext-auto</th>
</tr>
</thead>
<tbody>
<tr>
<td>192...2304, step size 8 kbps</td>
<td>192...2304, step size 8 kbps</td>
</tr>
</tbody>
</table>

Ethernet Interfaces

The Fast Ethernet interfaces (IEEE802.3 compliant, 10Base-T/100BaseTX) support auto MDIX, therefore terminal devices and network equipment can be connected both with regular and crossover cables. Connection uses conventional 8P8C connectors (RJ45). Auto negotiation as well as static speed and duplex settings are supported. In delivery state all interfaces are activated and auto negotiation is con-figured. If you need to configure, for instance, a 10 Mbps half duplex connection for port 2, the
following commands must be issued: `<set switch port2 duplex half>, <set switch port2 speed 10> and <set switch port2 no shutdown>`.

VLAN configuration

The Ethernet, DSL and optical interfaces of the EDS500 devices support virtual LANs complying with the IEEE 802.1Q standard. Thus it is possible to define logical sub-nets for different applications (for instance, one subnet for RTU communication, another subnet for voice-over-IP). The interfaces can be configured as trunk or access ports. In default state the DSL interfaces are configured as trunk.

Example:
- `<set switch port1 access-vlan 10>` configures port 1 as access port for VLAN 10.
- `<set switch port2 trunk-vlan 10>, <set switch port2 trunk-vlan 20>` configures port 2 as trunk port for VLANs 10 and 20 (secure trunk).
- `<set switch port3 trunk-vlan all>` configures port 3 as trunk for all VLANs.

System settings

Device IP Address

In delivery state the devices have following IP configuration:
- IP Address 10.0.0.2
- IP Subnet Mask 255.0.0.0
- IP Gateway 10.0.0.1

These parameters can be changed by commands listed below:
- `<set system ip {IP address}>`
- `<set system subnetmask {subnet mask}>`
- `<set system gateway {IP address}>`

System Identification Settings

For an easier identification of the devices several description parameters can be set:
- Hostname: `<set system hostname {name}>`
- Contact: `<set system contact {contact}>`
- Location: `<set system location {location}>`
- Description: `<set system description {text}>`

Device monitoring

For central processing of device syslog messages a syslog server can be configured with the following command:
- `<set system syslog server {IP address} {{0-7} | abb-security-events}>`

In order to provide "real" timestamps in the event log and the syslog messages a SNTP time server can be configured:
- `<set system sntp server {IP address}>`
- `<set system sntp timezone {cet | cet-cest | eet | gmt}>`

Specifying a SNMP trap server:
- `<set system snmp trap-target {IP address} {{v1|v2c}} {{community}}>`

Firmware Update

The firmware is updated by transferring a firmware image to the device. It can be downloaded with the help of the command line (Telnet, SSH, serial terminal) as well as with the help of the integrated web interface, scripts or a management program. It is mandatory that there is an IP connection to the device.

ADVICE

During a firmware update the power supply must not be interrupted or a reboot must not be triggered as this could leave the device in an inoperable state.

Reset Button

Pressing the reset button restarts the device and loads the saved configuration (startup-config or stick-config). As a protection against accidental triggering, the reset button is in a concealed place and be reached with a pointed tool (e.g. paper clip).

ADVICE

If the running configuration (= running-config) does not match the saved configuration (= startup-config) it is lost with the restart.

ADVICE

All established communication connections will be lost during restart.

Safety

DANGER

Interrupt the power supply before mounting or dismounting the device.

WARNING

An easy to access manual interrupter has to be installed into the power feed of the modem to be able to disconnect the modem from the power supply in the case of an emergency.

WARNING

The DC power supply has to fulfil the following requirements in order to supply appropriate fire protection:
- Limited power source according to IEC 60950-1 or PS2 classified according to IEC 62368-1
- Short-circuit current < 8A
**WARNING**

The device shall be powered off while accessing any of the connectors X1 (power connector) or X2 (alarm relay). Any other connectors (e.g. Ethernet, RS-232, RS-485 or DSL) are hot-pluggable while the device is operating.

**WARNING**

No plug shall be freely accessible in normal operation due to safety reasons.
Figure 3: 500NMD02 Front plate

Figure 4: 500NMD02 Label