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**Device Server
STS-DS1 Rev 1.0
User Guide**

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Introduction

The SmarTek Systems Serial Device Server (STS-DS1) connects serial (RS-232) devices to Ethernet networks using the IP protocol family. The STS-DS1 is designed to operate in harsh environments (**-40 deg C to 85 deg C, 5% to 95% humidity, non-condensing**) and has a very compact footprint (5.5 in L x 1.25 in W x 0.75 in H) as shown in Figure 1. An efficient onboard switching voltage regulator allows a wide range of input DC voltage levels (8 to 24 VDC).

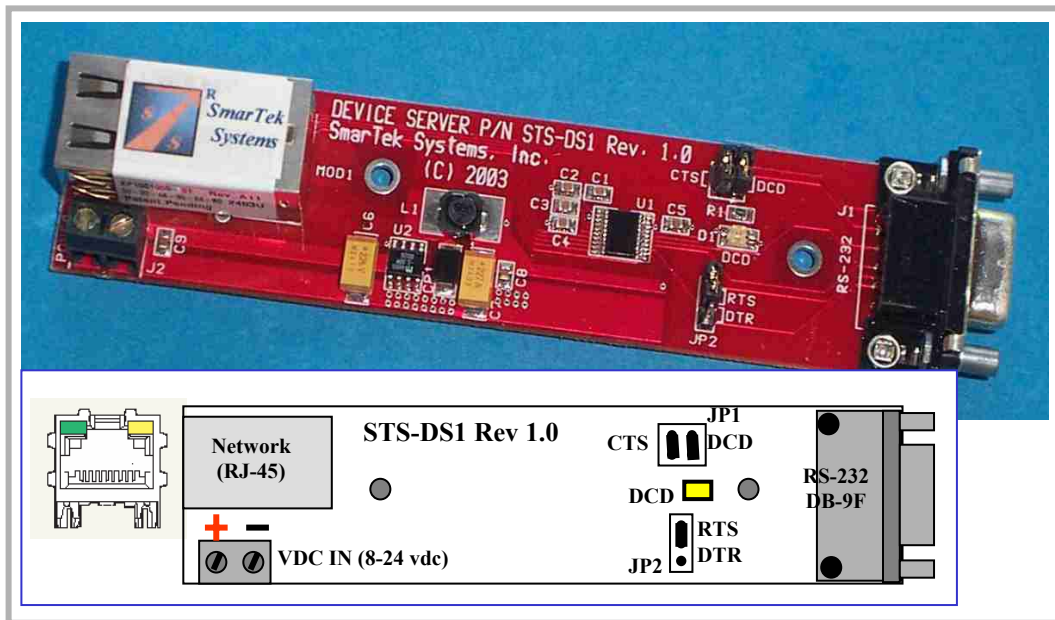


Figure 1 Device Server (STS-DS1 Rev 1.0)

The STS-DS1 connects a serial RS-232 device to a network through a TCP channel or by sending datagrams using a UDP channel. Every TCP connection and every UDP datagram is defined by a destination **IP Address** and a **Port Number**. The STS-DS1 unit's serial comm port can be associated with a specific user specified Port Number with the exception of 9999. Port number 9999 is reserved for access to the units Setup/Configuration Mode.

The STS-DS1 may be configured via the Serial Comm Port, or via a Web Browser (after IP Address has been set), or via Telnet (after IP Address has been set). The STS-DS1 IP Address must be configured before a network connection is available.

Connectors and LEDs

The STS-DS1 has a serial RS-232 comm port that supports Baud Rates up to 230K bps. The serial comm port also supports both software (XON/XOFF) and hardware (RTS/CTS) handshaking and DCD status indicating whether a socket connection is made or not. The connector for the serial RS-232 comm port is a standard DB-9F. The pinout for the comm port connector corresponds to that for Data Communication Equipment (DCE) as follows:

| DB-9F Pin # | Direction | Description | Notes |
|-------------|-----------|-------------|-------|
|-------------|-----------|-------------|-------|

| | | | |
|---|-----|-----|----------------------------|
| 1 | Out | DCD | JP1-Jumper on Pins 3 and 4 |
| 2 | Out | RxD | |
| 3 | In | TxD | |
| 4 | In | DTR | JP2-Jumper on Pins 2 and 3 |
| 5 | | GND | |
| 6 | Out | DSR | No Connection |
| 7 | In | RTS | JP2-Jumper on Pins 1 and 2 |
| 8 | Out | CTS | JP1-Jumper on Pins 1 and 2 |
| 9 | Out | RI | No Connection |

Note: The push pin jumpers on JP1 Route CTS and DCD to pins on the DB-9F connector. A single push pin jumper on JP2 determines whether DTR or RTS is routed to the appropriate pin on the DB-9F connector.

The STS-DS1 network interface is an RJ-45 Ethernet (IEEE 802.3) supporting 10Base-TX or 100Base-TX with Auto-Sensing. Ethernet link status LEDs are built into the RJ-45 jack housing. The table in Figure 2 shows the Link Status LED meaning.

| Left LED | Right LED | Meaning |
|----------------|----------------|---------------------------------|
| Off | Off | No Link |
| Off | Solid Amber | 100BASE-T Half Duplex Link |
| Off | Blinking Amber | 100BASE-T Half Duplex; Activity |
| Off | Solid Green | 100BASE-T Full Duplex Link |
| Off | Blinking Green | 100BASE-T Full Duplex; Activity |
| Solid Amber | Off | 10BASE-T Half Duplex Link |
| Blinking Amber | Off | 10BASE-T Half Duplex; Activity |
| Solid Green | Off | 10BASE-T Full Duplex Link |
| Blinking Green | Off | 10BASE-T Full Duplex; Activity |

Figure 2 RJ-45 Link Status LED Meaning

Power is connected to the STS-DS1 via the 2-position screw down connector (**J2**) located next to the RJ-45 housing. Since the STS-DS1 has an onboard regulator, input VDC can be unregulated but must be within the range +8 VDC to +24 VDC. **Note that the positive (+) lead is connected nearest the end of the circuit board as shown in Figure 1.**

The surface mount Bi-Color LED (labeled DCD) located beside the mounting hole nearest the DB-9F connector is both a Power On indicator and a Socket Connection indicator. When power is applied to the STS-DS1, the LED is on and is Green. When a TCP/IP socket is made (connection), this LED is on and is Red.

Connecting the STS-DS1

The diagram in Figure 3 shows the STS-DS1 properly connected to VDC power, a network, and an RS-232 device for initial setup and testing.

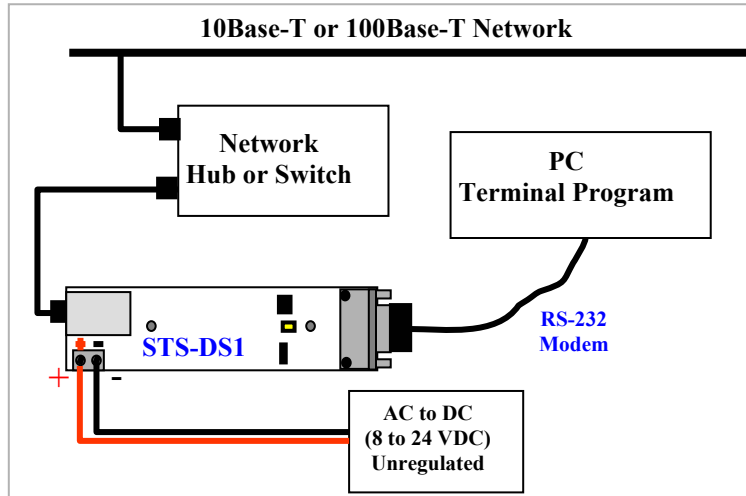


Figure 3 Connecting the STS-DS1 to a Network and a Serial Device

Configuring the STS-DS1

Before using the STS-DS1, you must configure the unit so that it can communicate on a network with the serial device attached to it via the DB-9F connector. For example, you must set the way the unit will respond to serial and network traffic, what its IP Address and Port Number will be, and how a connection will be established. You can configure the STS-DS1 locally or remotely using one or more of the following procedures:

- 1) Use a terminal program and PC to setup the STS-DS1 via the Serial Comm Port,
- 2) Use a standard Web browser to access the STS-DS1's internal Web pages and configure the unit over the network. This is by far the easiest and preferred method. To use this method, the STS-DS1 must already have an IP Address assigned.
- 3) Use a Telnet connection (Port Number=9999) to configure the unit over the network. To use this method, the STS-DS1 must already have an IP Address assigned.

The STS-DS1's configuration is stored in nonvolatile memory and is retained without power. The unit will perform a reset after the configuration is changed and stored.

SmarTek Systems ships each STS-DS1 unit with a pre-assigned IP Address allowing the end-user to configure the unit using the Web browser method. The pre-assigned IP Address is specified on the Tag attached to the STS-DS1 circuit board.

Web Browser Configuration Method

Open a Java enabled Web browser and enter the STS-DS1 IP Address and click the Go Button. The STS-DS1 Web Manager page will open (may take a few seconds to load). Use the **Menu Buttons** to navigate to a specific page for configuration. After all changes are made, click the **Update Button** to save the modified settings. **Note that clicking the Factory Settings1 Button will reset all STS-DS1 parameters to their original factory values.**

Click on **Unit Configuration Button** (under Menu on left side of page) to display the Server and Port Configuration settings. This display is not interactive.

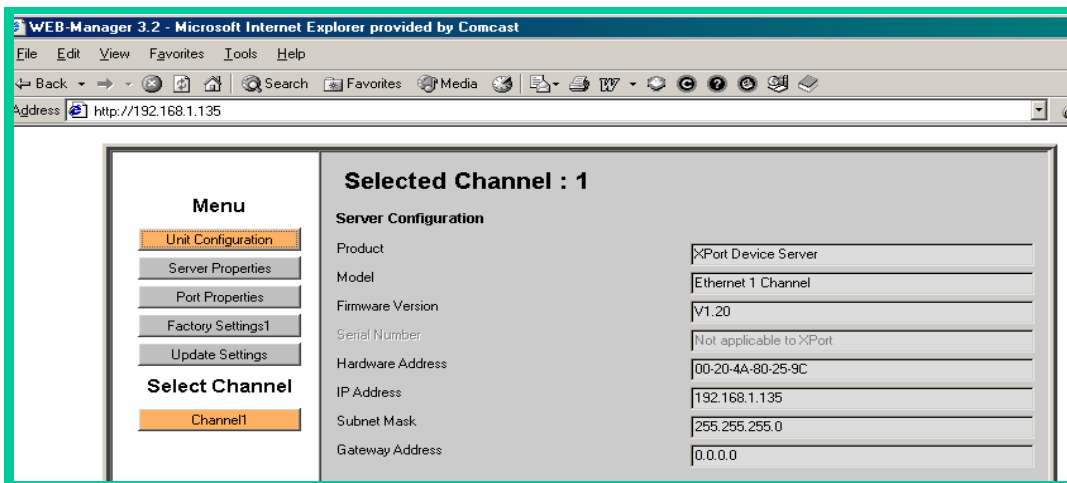


Figure 4 STS-DS1 Configuration Web Page (Partial)

To configure the STS-DS1 server properties, click the **Server Properties Button**, then edit any of the fields on the Server Properties Web page (Figure 5). Linger over any of the fields will display a help message. Changing the IP address will require you to enter the new IP Address in the browser to reload the page.

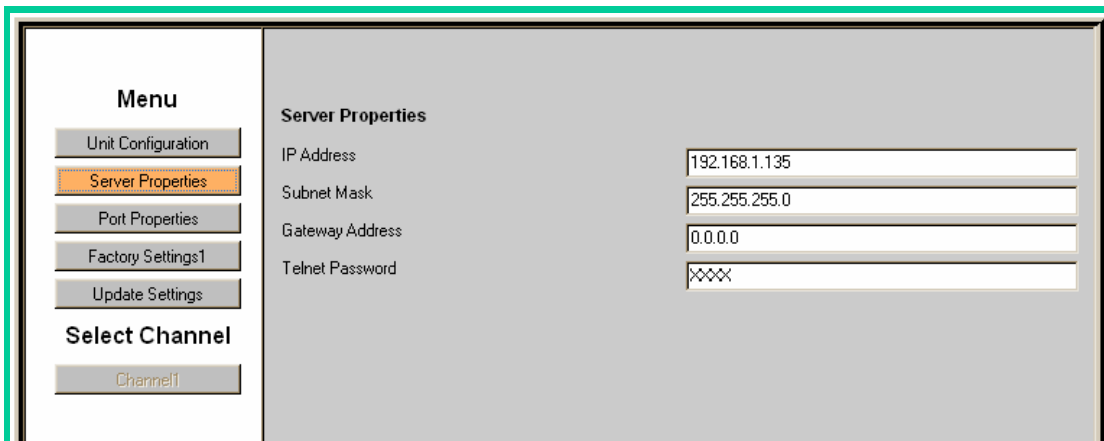


Figure 5 STS-DS1 Server Properties Web Page

To configure the STS-DS1 port properties, click the Port Properties Button, then edit any of the fields on the Port Properties page (Figure 6). Note that RS-232 is the only Serial Protocol option. Character size is also known as the number of data bits. The Local Port Number is associated with the serial port so that an incoming connection (TCP/IP socket) is established using the Server IP Address and the Local Port Number.

Figure 6 STS-DS1 Port Properties Web Page (Partial)

Telnet Configuration Method

To configure the STS-DS1 over the network, establish a telnet connection to Port Number 9999. From the **Windows Start** menu, click **Run** and type:

```
telnet x.x.x.x 9999
```

where **x.x.x.x** is the STS-DS1 **IP Address** (example 192.168.1.135).

Click **OK** and the STS-DS1 Setup window appears. *You must press Enter within 5 seconds to enter Setup Mode or the connection will be dropped.*

Select an option on the menu by entering the option number in the **Your Choice?** field followed by **Enter**.

To enter a value for a parameter, type the value and press **Enter**. To confirm a current value, just press **Enter**.

When finished, save the configuration (**Option 9**). The STS-DS1 will then reboot.

Note that several of the parameter entries are in the form of a bit-coded byte that is entered in Hexidecimal notation. See the tables in Appendix A for definitions of each bit for each of the bit-coded parameters.

Serial Port Configuration Method

To configure the STS-DS1 using the serial comm port connection:

- 1) Connect a PC running a Terminal Emulation program to the STS-DS1 serial comm port using a Modem Cable. Set the Terminal Program's comm port settings to **9600 baud, 8 bits, no parity, 1 stop bit, and no flow control**.
- 2) To enter Setup mode, power cycle the STS-DS1 while holding the **lower case x** key down in the terminal program.
- 3) At this point, the Setup Mode screen is the same as that using a Telnet session.

You must press Enter within 5 seconds to enter Setup Mode or the connection will be dropped.

Select an option on the menu by entering the option number in the **Your Choice?** field followed by **Enter**.

To enter a value for a parameter, type the value and press **Enter**. To confirm a current value, just press **Enter**.

When finished, save the configuration (**Option 9**). The STS-DS1 will then reboot.

Note that several of the parameter entries are in the form of a bit-coded byte that is entered in Hexidecimal notation. See the tables in Appendix A for definitions of each bit for each of the bit-coded parameters.

References and Additional Setup Information

The SmarTek Device Server hardware uses the Lantronix XPort embedded device server module as the core for the STS-DS1. Because of this, the STS-DS1 has all of the capability and flexibility of the Lantronix XPort module. For a more detailed and comprehensive description of setting up the STS-DS1 (Lantronix XPort) refer to the XPort User Manual which can be downloaded from the Lantronix Web site at

<http://www.lantronix.com/products/eds/xport/index.html> . The user manual is in PDF format (**Xport_UM_900-270.pdf**).

Appendix A-Bit Definition Tables for Bit-Coded Bytes

Interface (I/F) Mode Options

| I/F Mode Option | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---------------------------|---|---|---|---|---|---|---|---|
| RS-232C ⁽¹⁾ | | | | | | | 0 | 0 |
| 7 Bit | | | | | 1 | 0 | | |
| 8 Bit | | | | | 1 | 1 | | |
| No Parity | | | 0 | 0 | | | | |
| Even Parity | | | 1 | 1 | | | | |
| Odd Parity | | | 0 | 1 | | | | |
| 1 Stop bit | 0 | 1 | | | | | | |
| 2 Stop bit ⁽¹⁾ | 1 | 1 | | | | | | |

Common Interface Mode Settings are:

RS-232, 8 bit, No Parity, 1 Stop bit.....01001100 (binary)....4C (Hex)

RS-232, 7 bit, Even Parity, 1 Stop bit.....01111000 (binary)....78 (Hex)

Flow Control Options

| Flow Control Option | Hex |
|---------------------------------------|-----|
| No flow control | 00 |
| XON/XOFF flow control | 01 |
| Hardware handshake with RTS/CTS lines | 02 |
| XON/XOFF pass characters to host | 05 |

Connect Mode Options

| Connect Mode Option | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|---|
| Incoming Connection | | | | | | | | |
| Never accept incoming | 0 | 0 | 0 | | | | | |
| Accept with DTR Active | 0 | 1 | 0 | | | | | |
| Always Accept | 1 | 1 | 0 | | | | | |
| Response | | | | | | | | |
| Nothing (quiet) | | | | 0 | | | | |
| Character response (C=connect, D=disconnect, N=unreachable) | | | | 1 | | | | |
| Active Startup | | | | | | | | |
| No active startup | | | | | 0 | 0 | 0 | 0 |
| With any character | | | | | 0 | 0 | 0 | 1 |
| With DTR Active | | | | | 0 | 0 | 1 | 0 |
| With Carriage Return (0x0D) only | | | | | 0 | 0 | 1 | 1 |
| Manual connection | | | | | 0 | 1 | 0 | 0 |
| Autostart | | | | | 0 | 1 | 0 | 1 |
| Hostlist | 0 | 0 | 1 | 0 | | | | |
| Datagram Type | | | | | | | | |
| Directed UDP | | | | | 1 | 1 | 0 | 0 |
| Modem Mode | | | | | | | | |
| Full Verbose | | | | 1 | 0 | 1 | 1 | 0 |
| Without Echo | | | | 0 | 0 | 1 | 1 | 0 |
| 1-character Response | | | | 1 | 0 | 1 | 1 | 1 |

A Common Connect Mode Setting is11000000 (binary)...C0 (hex)

Disconnect Mode Options

| Disconnect Mode Option | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|--|---|---|---|---|---|---|---|---|
| Disconnect with DTR drop ⁽⁶⁾ | 1 | | | | | | | |
| Ignore DTRa | 0 | | | | | | | |
| Telnet mode and terminal type setup ⁽¹⁾ | | 1 | | | | | | |
| Channel (port) password ⁽²⁾ | | | | 1 | | | | |
| Hard disconnect ⁽³⁾ | | | | | 0 | | | |
| Disable hard disconnect | | | | | 1 | | | |
| State LED off with connection ⁽⁴⁾ | | | | | | | | 1 |
| Disconnect with EOT (^D) ⁽⁵⁾ | | | 1 | | | | | |

1. The XPort™ will send the "Terminal Type" upon an outgoing connection.
2. A password is required for a connection to the serial port from the network.
3. The TCP connection will close even if the remote site does not acknowledge the disconnection.
4. When there is a network connection to or from the serial port, the state LED will turn off instead of blink.
5. When Ctrl D or Hex 04 is detected, the connection is dropped. Both Telnet mode and Disconnect with EOT must be enabled for Disconnect with EOT to function properly. Ctrl D will only be detected going from the serial port to the network.
6. When DTR transitions from a high state to a low state, then the network connection to or from the serial port will drop.

Flush Mode Options

Flush Mode Options

| Function | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|--|---|---|---|---|---|---|---|---|
| Input Buffer (Serial to Network) | | | | | | | | |
| Clear with a connection that is initiated from the device to the network | | | | 1 | | | | |
| Clear with a connection initiated from the network to the device | | | 1 | | | | | |
| Clear when the network connection to or from the device is disconnected | | 1 | | | | | | |
| Output Buffer (Network to Serial) | | | | | | | | |
| Clear with a connection that is initiated from the device to the network | | | | | | | | 1 |
| Clear with a connection initiated from the network to the device | | | | | | | 1 | |
| Clear when the network connection to or from the device is disconnected | | | | | | 1 | | |
| Alternate Packing Algorithm (Pack Control) | | | | | | | | |
| Enable | 1 | | | | | | | |

Pack Control Options

Pack Control Options

| Option | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-----------------------------------|---|---|---|---|---|---|---|---|
| Idle Time | | | | | | | | |
| Force transmit: 12ms | | | | | | | 0 | 0 |
| Force transmit: 52ms | | | | | | | 0 | 1 |
| Force transmit: 250ms | | | | | | | 1 | 0 |
| Force transmit: 5sec | | | | | | | 1 | 1 |
| Trailing Characters | | | | | | | | |
| None | | | | | 0 | 0 | | |
| One | | | | | 0 | 1 | | |
| Two | | | | | 1 | 0 | | |
| Send Characters | | | | | | | | |
| 2-Byte Send Character Sequence | | | | 1 | | | | |
| Send Immediately After Send chars | | | 1 | | | | | |