white bream

User Manual

Synchronous Com-server

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1.0	Oct 21, 2006	Henk Bliek	Initial document	

White Bream	Terborchdreef 26	3262 NB	Oud-Beijerland	The Netherlands	www.whitebream.com

Description:	Synchronous Com-server SCS v1.0		M025RP001 User Manual.odt
Project:	M025	**Internal use only**	
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Table of Contents

1 Introduction

The Synchronous Com-server is an 'Ethernet modem' for synchronous HDLC and generic asynchronous communication networks.

This communication device is designed to replace existing leased line communication paths and their modems. These modems are replaced by the Synchronous Com-Server and the leased line is replaced with an always-on Internet connection such as ADSL or cable-internet.

Because of the steep cost reduction of Internet based network access, this provides a way to cut exploitation cost of nation-wide communication between legacy devices having only asynchronous or synchronous communication methods.

1.1 Disclaimer

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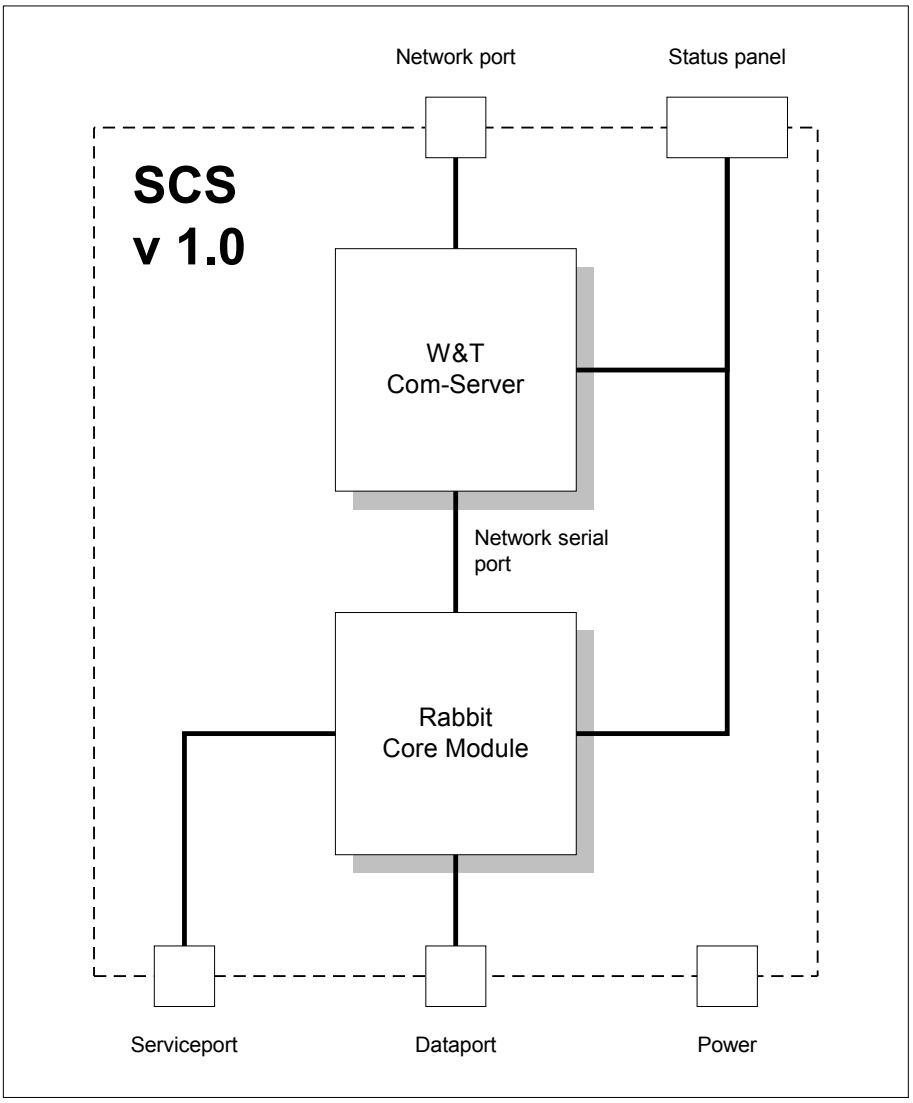
2 Overview

The Synchronous Com-Server (SCS) is designed around two standard modules; a Rabbit core module and a W&T Com-Server OEM module.

The Rabbit core module is programmed to take care of the serial port and the synchronous protocol handling.
On the network side, all Ethernet and TCP/IP communication is handled by the embedded Com-Server.



Throughout this manual both the term “Synchronous Com-Server” and its abbreviation “SCS” are used at random to reference the same product.

This manual assumes basic knowledge of the reader with serial communication techniques and with networking technologies such as TCP/IP.

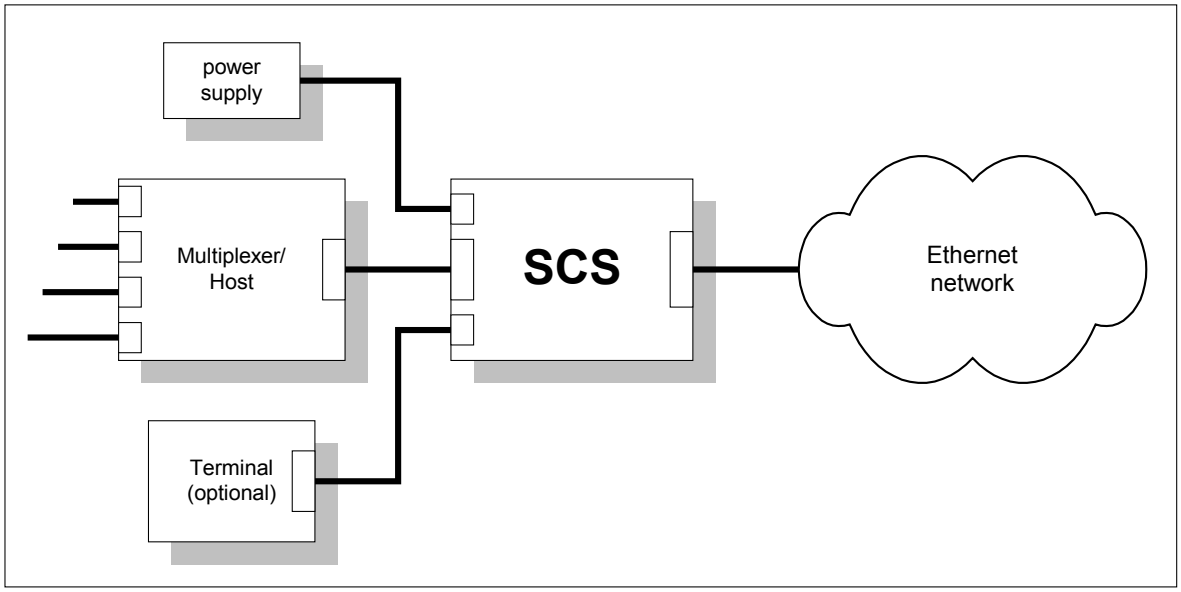
3 Unpacking & Install

3.1 Package contents

- Synchronous Com-Server,
- Mains power supply,
- SCS User manual,
- Com-Server short guide,
- Device ID card.

The configuration settings of the Synchronous Com-Server can be written on the device ID card. This card comes with a self-adhesive bag, which can be stuck on the case of the SCS. This makes it easier to identify different SCS units by their MAC address or their assigned IP address.

3.2 Installation



It is important to use only the supplied mains adaptor for the power supply to prevent damage to the Synchronous Com-Server.

4 Specifications

4.1 Communication

Parameter	Value	Unit
Synchronous interface	X.21/V.11 DCE	
Synchronous data format	HDLC-NRZ	
Asynchronous interface	V.24	
Network interface	Ethernet	
Synchronous receive buffer	4095	Bytes
Synchronous transmit buffer	8191	Bytes
Asynchronous receive buffer	1023	Bytes
Asynchronous transmit buffer	1023	Bytes
Network serial port transmit buffer	1023	Bytes
Network serial port receive buffer	1023	Bytes

4.2 Mechanical

Parameter	Min	Typical	Max	Unit
Width		150		mm
Height		33.5		mm
Depth without cables		174		mm
Depth with cables		280		mm

4.3 Environmental

Parameter	Min	Typical	Max	Unit
Temperature (operating)	0	+20	+50	°C
Humidity (operating) [1)]	5		90	%
Temperature (storage)	-20	+20	+70	°C
Humidity (storage) [1)]	5		90	%

Note 1: Non condensing

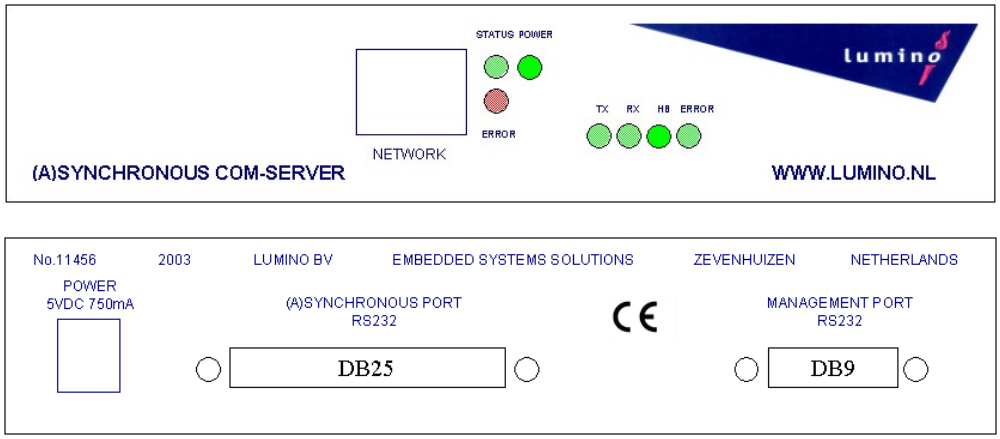
4.4 Normative

The synchronous com-server is tested with positive results for compliance against the following CE standards:

Standard	Version	Description
EN55022/+A1	1998/2000	Class A: Limits and methods of measurement of radio disturbance characteristics of information technology equipment.
EN55024/+A1	1998/2001	Limits and methods of immunity characteristics of information technology equipment.
EN61000-6-2	2001	Generic Standard for equipment placed in industrial environments.
89/336/EEC	1989	"The Synchronous Comserver has been found in compliance with the harmonized standards under the EMC directive 89/336/EEC, as mentioned above."

5 Connections

Panel views for connections and status displays.



5.1 Power

The power connector is a standard DC power jack with 2.5mm center contact.

5.1.1 Specifications

Parameter	Min	Typical	Max	Unit
Input voltage	4.75	5.0	5.25	V
Input voltage maximum rating	-0.5		7.0	V
Input current		350	450	mA
Input protection fuse			1	A/F

5.1.2 Pinout

Pin	Name	Direction	Description
Center	VIN	in	Power input
Ring	GND		Ground

Correct input polarity is guarded by a surface mount (soldered) quick-blow fuse, this fuse is not to be replaced by the end-user. Reversing the polarity requires the fuse to be replaced by service personnel.

5.1.3 Recommended power supplies

Manufacturer	Type	Ordercode
Egston	P2EFSW6W5V	

5.2 Synchronous/asynchronous link

The serial link connector is a 25-pin female Sub-D connector in DCE configuration.

The interface is known to be working and tested with the following synchronous communication devices:

- Securicor datatrak 8-channel Time Division Multiplexer (Eclipse),
- Securicor datatrak HMUX-64,
- Hewlett Packard 4955A Protocol analyzer/line simulator,
- Multitech 4-channel MultiMux statistical multiplexer MMH904Ca,
- Hewlett Packard 4957A Protocol analyzer.

5.2.1 Specifications

Parameter	Min	Typical	Max	Unit
Input voltage	-30		+30	V
Input high voltage threshold		1.7	2.4	V
Input low voltage threshold	0.8	1.2		V
Input impedance	3	5	7	kΩ
Output high voltage	+5	+9	+10	V
Output low voltage	-10	-9	-5	V
Output short-circuit current		±10		mA

5.2.2 Pinout

Pin	Name	Direction	Description
1	FGND		Frame ground
2	TXD	in	Transmit data
3	RXD	out	Receive data
4	RTS	in	Ready to send
5	CTS	out	Clear to send
6	DSR	out	Data set ready
7	SGND		Signal ground
8	DCD	out	Data carrier detect
15	TSET	out	Transmit clock
17	RSET	out	Receive clock
20	DTR	in	Data terminal ready
others	NC		Not connected/no connection

DSR and DTR are looped internally.

5.3 Management port

The management port connector is a 9-pin female Sub-D connector in DCE configuration.
This port can be connected to the PC with a standard 1:1 male/female extension cable.

5.3.1 Specifications

Parameter	Min	Typical	Max	Unit
Input voltage	-30		+30	V
Input high voltage threshold		1.7	2.4	V
Input low voltage threshold	0.8	1.2		V
Input impedance	3	5	7	kΩ
Output high voltage	+5	+9	+10	V
Output low voltage	-10	-9	-5	V
Output short-circuit current		±10		mA

5.3.2 Pinout

Pin	Name	Direction	Description
1	DCD	out	Data carrier detect (not used, always active)
2	RXD	out	Receive data
3	TXD	in	Transmit data
4	DTR	in	Data terminal ready (ignored)
5	SGND		Signal ground
6	DSR	out	Data set ready (not used, always active)
7	RTS	in	Request to send (ignored)
8	CTS	out	Clear to send (not used, always active)
9	RI	out	Ring indicator (not used, always inactive)

5.4 Ethernet

5.4.1 Specifications

Parameter	Min	Typical	Max	Unit
Protocol		10bT/100bT autosensing		
Isolation voltage	500			V

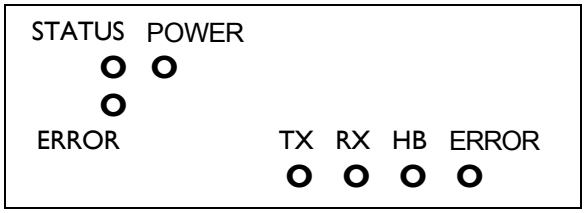
In order to comply with the CE requirements, the port should be connected to the network with a shielded (STP/FTP) twisted pair Cat 5 cable.

5.4.2 Pinout

Pin	Name	Direction	Description
1	TXP	out	Transmit signaling pair
2	TXN	out	"
3	RXP	in	Receive signaling pair
4	-		Shorted with pin 5
5	-		Shorted with 75Ω and 1nF to shield
6	RXN	in	Receive signaling pair
7	-		Shorted with pin 8
8	-		Shorted with 75Ω and 1nF (same capacitor) to shield

6 Indicators

There are seven LED devices on the frontpanel of the synchronous com-server to provide indications on the internal operating status of the interface. The indicators are arranged as follows:



The function of the power LED is pretty obvious; it shows that the SCS is receiving power.

The two leds on the left are related to the network interface;

6.1 Network status

Action	Description
off	Standby
on	Error
blink	Connection
flash	Traffic

6.2 Network error

Action	Description
off	OK
1 x	Network problem
2 x	Internal serial data format problem
3 x	Internal serial handshake problem

In case of network problems check the IP address, netmask and gateway settings. Also make sure that one SCS is configured for Box-2-Box master mode (with the correct slave IP address) and that the slave SCS does not have a configuration nor that it is locked in a session with another master device.

In case of serial errors, make sure that the network serial port is configured to 38400 baud, 8 data bits, no parity, 1 stop bit and hardware handshake mode [see the com-server documentation on how to do this]. Also the internal serial port ('network serial port') must be configured to these settings in the configuration menu.

6.3 Receive/transmit indication

The TX (transmit) and RX (receive) leds are connected to the corresponding signals on the synchronous/asynchronous serial port. During normal operation these leds should flicker according the data passing the line. (Note that during synchronous operation, the line is never inactive because of the idle flag that is being sent continuously. This results in the leds being lit at 25% intensity all the time.)

6.4 Heartbeat indication

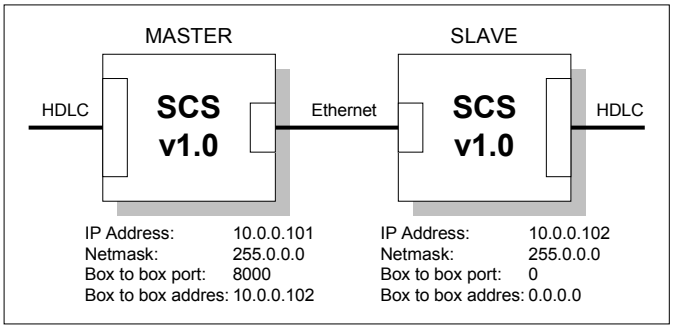
The heartbeat indication blinks once a second during normal operation. When the menu is active, the led turns on continuously and flashes when receiving commands.

6.5 Generic error

When the device cannot fulfil it's task, probably because of network problems, the buffers will under or overrun. When that happens the error led is turned on. Note that because the buffers are large it may take a while before the error state is cleared after the problem is solved.

7 Networking setup

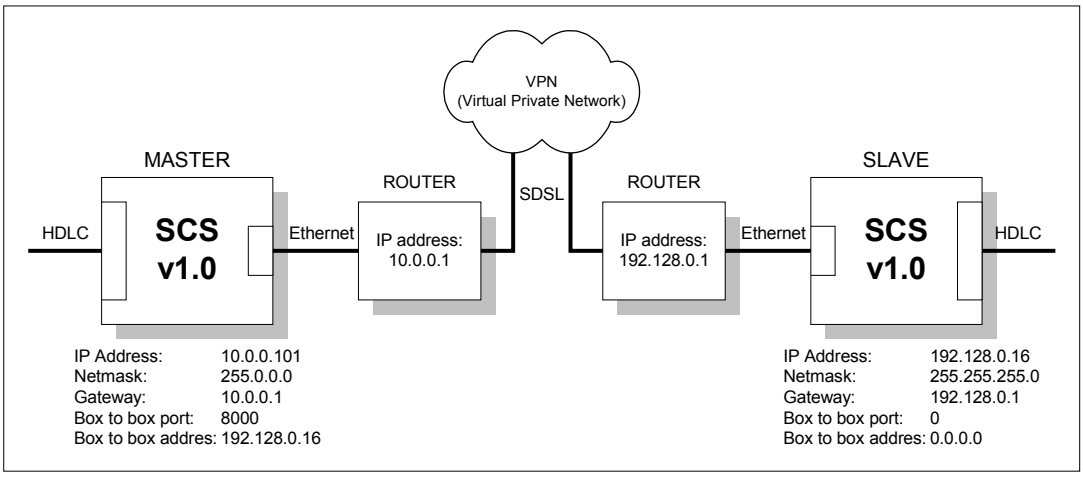
7.1 Direct connection



Direct cable connection between two devices requires either a crossover cable or a network hub to be connected between the two SCS in order to work properly.

Since there exist no active networking components between the two Synchronous Com-Servers, the SCS can address each other directly. Therefore no gateway address needs to be set and the destination address of the master SCS is simply the IP address of the slave device.

7.2 Connection through a VPN

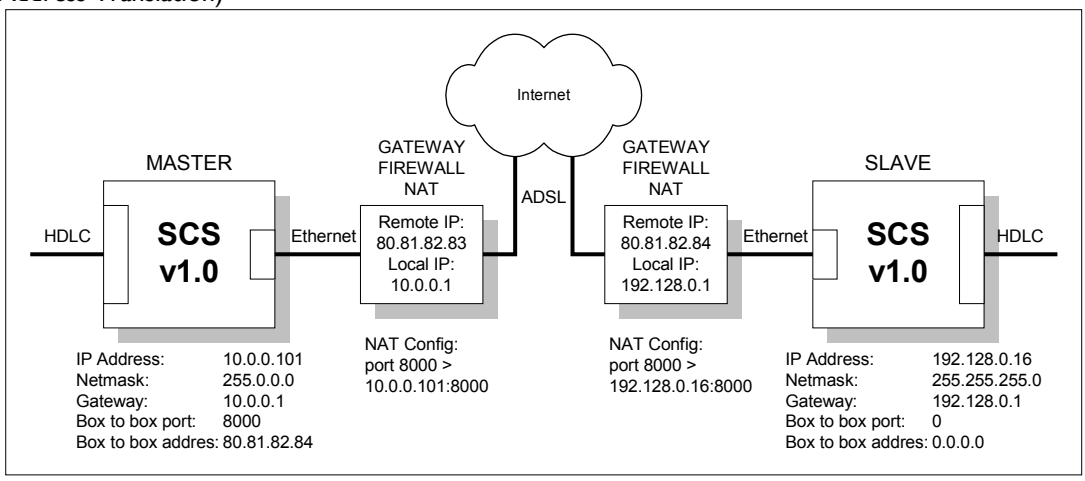


With respect to configuration, this setup is almost the same as with a direct cable connection. The only difference is that both SCS must get a valid gateway setting so that they know how to get to the other network. Usually this gateway address is the same address as the routers inside IP address.

If the router supports some form of firewall functionality then make sure that the firewall is configured properly. In case of connection troubles the first potential problem that should be eliminated is the firewall, by disabling it (only for the moment of course).

7.3 Connection through gateway with NAT

(Network Address Translation)



This is the typical (low-cost) Internet oriented setup, which uses an Internet provider supplied gateway device. This device performs the translation between the internal network addresses and the public (provider supplied) IP address. Note that it is important to have a service that provides a fixed IP address. Many consumer accounts use a dynamic IP address, which might change over time. If the IP address of the slave SCS setup changes than it require a reconfiguration of the master SCS. Dynamic DNS services are not a solution to this problem because the Com-Servers only deal with raw IP addresses. They cannot resolve domainnames or hostnames.

Because the master device cannot directly 'see' the slave device, which is located in another private network, it must talk to the gateway device of the other network. That gateway device is configured to route all data arriving at a particular port (e.g. 8000) to the SCS.

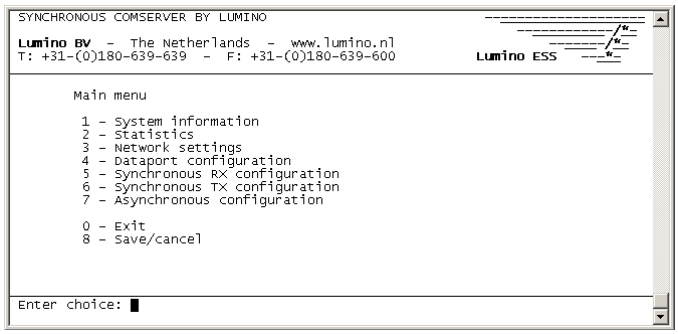
The documentation provided by the gateway manufacturer and by the Internet access provider will give practical information regarding the required configuration of the gateway device. Unfortunately it would lead too far to cover all that in this manual, especially because of the huge selection of available devices and providers.

8 Management menu

The system configuration menu is accessible via the management port by using a VT100 terminal or VT100 compatible terminal emulator.

Fixed port settings: 19200 baud, 8 data bits, no parity, 1 stop bit. The SCS sends out a poll string "CFG ", which is sent every two seconds.

From here the menu can be accessed by pressing space or enter. After a 1-minute keyboard inactivity timeout, the menu is closed and the system returns to polling mode.



In any menu, press ESC to return to the main menu. Press ESC again to cancel all changes and once more to exit the menu and to return to the polling mode.

8.1 System information

Shows the hardware and software version numbers. This menu also provides a system reset function. Use this reset after saving an updated configuration if the SCS cannot or should not be power cycled.

8.2 Statistics

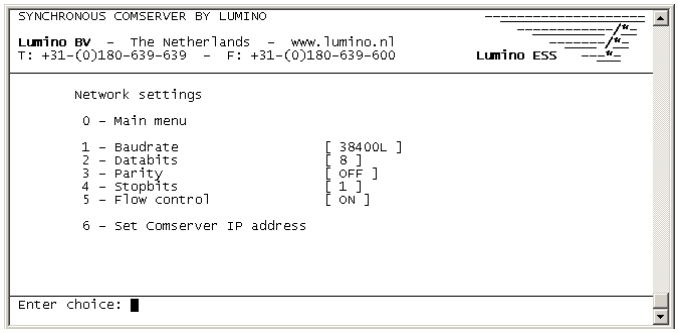
This page show the number of received bytes, the number of transmitted bytes as well as the number of idle flag bytes that have been rejected by the receiver (only when operating in synchronous mode and with idle flag reject enabled).

8.3 Network settings

The line settings that are needed to communicate with the internal network interface device.

The following settings apply to all asynchronous serial interfaces.

Baudrate: After selecting '1 – Baudrate', any of the standard baudrate values can be entered directly (9600, 19200, 38400, 57600 or 115200). In order to enter non-standard values, the typed value has to be trailed with an L, e.g. "28800L".



Databits: The number of data bits in a single serial character can be set to either 7 or 8 bits.
In this application, 7-bit mode is NOT SUPPORTED on the serial network port and results in invalid data!

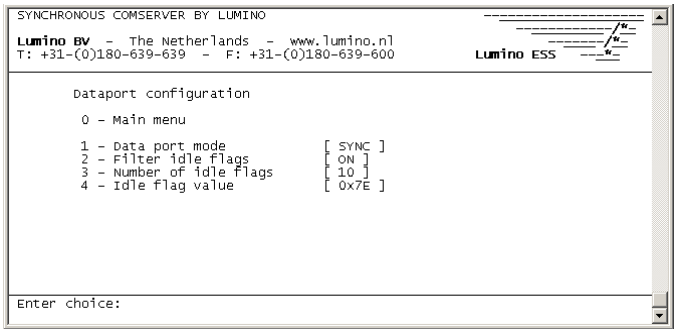
Parity: The three possible settings for the parity bit are NONE, ODD and EVEN. These can be entered by fully typing or by abbreviating them to the first letter e.g. N, O or E. Note that when the parity is set to NONE, the configuration menu inattentively displays OFF instead of NONE. Because of the very short path of the network serial port, there is no worthy use for any parity checking.

Stopbits: The number of stop bits can only be set to values other than 1 when the parity is set to NONE. In normal situations, there should not be any use for 2 stop bits instead of only one.

Flowcontrol: Select hardware (RTS/CTS) flow control ON or OFF. In case of communication problems always try to disable hardware flow control temporarily, to track possible problem causes.

Set Comserver IP address: For convenience, also the IP address of the network interface (Com-Server) can be set here. This resets the Com-Server module, applies the correct baudrate (9600 baud) and sends a couple of 'x' characters to the module. After that is passes control to the menu interface. More information on the subject of Com-Server configuration can be found in the Com-Server high-speed manual.

8.4 Dataport configuration



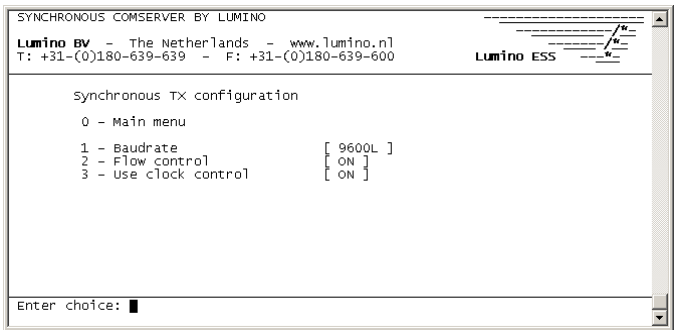
Data port mode: Configure the serial port for synchronous HDLC ('S' or 'SYNC') or asynchronous ('A' or 'ASYNC') communication.

Filter idle flags: Enable this feature to reduce network load, reduce communication latency and to reduce the chance for serial communication errors.

Number of idle flags: This defines the number of idle flag bytes that are sent over the network before the filtering begins. A minimum of two flags is required for the mechanism to work properly.
Note that every 5 seconds, this number of idle flags is send again to keep the network connection alive and to prevent the Com-Server from being reset.

Idle flag value: In the idle flag filter mechanism, there is a search algorithm that looks for all possible notations of this idle flag value. So setting the default value to 0x7E (binary 0111.1110) has the same outcome as 0xE7 (binary 1110.0111). This field is only used for synchronous communication with idle flag filtering enabled.

8.5 Synchronous RX/TX configuration



Baudrate: Signaling rate on the synchronous port. When clock control is turned on and idleflags are not filtered out, then it is advisable to set the receive rate about 1% higher than the transmit rate (typically 9696 baud). This gives the transmitter on the other side the chance to keep the buffer at a safe level.

Flow control: Turn hardware flow control on or off.

Use clock control: When turned on, the system will adjust the transmit baudrate according the buffer contents by up to 4%.

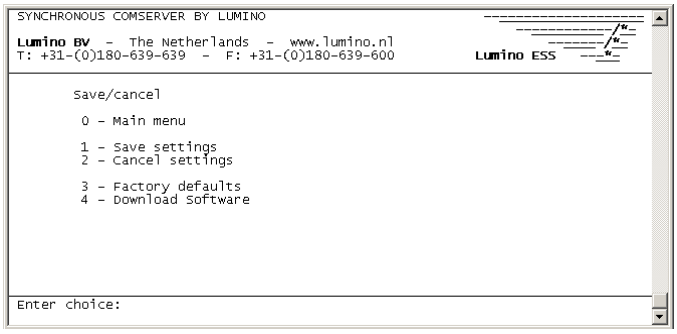
8.6 Asynchronous configuration

All the usual asynchronous serial port settings; baudrate, parity, flow control and such, see also paragraph 6.3.

Here both a databits setting of 7 bits and parity settings other than NONE are allowed here. In practice, these settings will be dictated by the client application and should be followed. As long as the settings (especially the databits setting) are equal on both sides, there is no problem.

Note that the network interface serial port is typically configured for 38400 baud, so when the serial port has to be faster than the network interface port might need to be set faster as well.

8.7 Save/cancel



Save settings: Write the current configuration to non-volatile memory. A reset or restart is necessary to apply the new settings (see also 7.1).

Cancel settings: Undo all changes made so far. All the current active settings are copied back to the various menu fields.

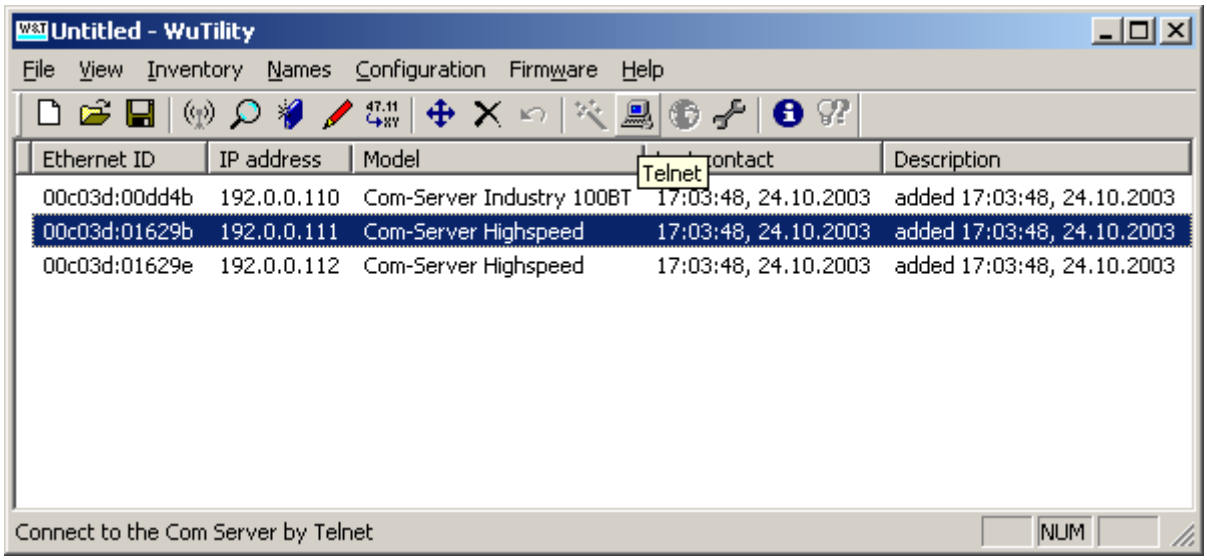
Factory defaults: Load the factory default settings. Use save settings and reset to actually apply these defaults. See the next paragraph for an overview of these default settings.

Download software: Select this option only when the firmware upgrade utility with a new firmware version is available and started. The firmware upgrade utility should come with documentation on the upgrade procedure.

8.7.1 Default settings

Tag	Setting	Value	Description
3	***Network settings***		
3.1	Baudrate	38400	These are the settings for a conventional configured ('PC compatible') serial port at 38400 baud.
3.2	Databits	8	
3.3	Parity	NONE (OFF)	
3.4	Stopbits	1	
3.5	Flow control	ON	
4	***Dataport configuration***		
4.1	Dataport mode	SYNC	Synchronous communication is what this device is primary intended for.
4.2	Filter idle flags	ON	Idle flag are removed to save network bandwidth.
4.3	Number of idle flags	10	Assure that both sides know that the line is idle.
4.4	Idle flag value	0x7E	The standard HDLC idle line filler.
5	***Synchronous RX configuration***		
5.1	Baudrate	9696L	Synchr. receive rate (1 % higher than nominal)
5.2	Flow control	ON	Hardware flow control
6	***Synchronous TX configuration***		
6.1	Baudrate	9600	Sync transmit rate
6.2	Flow control	ON	Hardware flow control
6.3	Use clock control	ON	Increase the transmit rate when the buffers are filling up.
7	***Asynchronous configuration***		
7.1	Baudrate	9600	These are the settings for a conventional configured serial port at 9600 baud.
7.2	Databits	8	
7.3	Parity	NONE (OFF)	
7.4	Stopbits	1	
7.5	Flow control	ON	

9 Network configuration



This utility makes it convenient to locate the Synchronous Com-Servers in the network. It can be downloaded from the website of the module manufacturer; www.WuT.de

10 References

DOC.ID	Author	Description	Version	Status
Short Guide Com-Server	W&T Gmbh	Quick configuration quide for the network interface device.	1.2	FINAL
Manual Com-Server Highspeed	W&T Gmbh	Manual for the network interface device.	2.03	FINAL
WuTility	W&T Gmbh	W&T Com Server Utility	2.17	RELEASE

11 Document history

Version	Author	Changes	Status
0.5	Henk Bliek	Added potential ARP problem in FAQ	DRAFT
0.4	Henk Bliek	Added VPN setup description	DRAFT
0.3	Henk Bliek	Added Wutility and another power supply	DRAFT
0.2	Henk Bliek	Textual changes & additions	DRAFT
0.1	Henk Bliek	Initial document	DRAFT

12 Annex A: Quick setup

In order to setup a synchronous link at 9600 baud with a direct network connection (i.e. a connection without any gateway or router), these steps can be followed. Start with designating two IP-addresses, one for each side of the link. Also mark one Synchronous Com-Server to be the master device on the link and the other Synchronous Com-Server to be the slave. In this quick setup the following two addresses are assumed: 192.168.128.1 for the master SCS and 192.168.128.2 for the slave SCS.

The configuration of each device is entered in two parts, using two separate connections. All applicable steps should be executed in the designated order, particularly if no experience with configuration of the Synchronous Com-Server is available.

Part 1: Configuration using the serial management port.

1. Connect to serial management port with a 1:1 serial cable at 19200 baud, 8N1, no flow control,
1. Hit enter or space to enter the menu,
2. Select "3 – Network settings",
3. Verify that the settings are 38400 baud, 8 databits, parity off, 1 stopbits and flow control on,
4. Select "0 – Main menu" and then "4 – Dataport configuration",
5. Select "1 – Data port mode", "SYNC",
6. Select "2 – Filter idle flags", Y,
7. Select "3 – Number of idle flags", 10,
8. Select "0 – Main menu" and then "5 – Synchronous RX configuration",
9. Select "1 – Baudrate", enter "9696L",
10. Select "2 – Flow control", Y,
11. Select "0 – Main menu" and then "6 – Synchronous TX configuration",
12. Select "1 – Baudrate", enter "9600",
13. Select "2 – Flow control", Y,
14. Select "3 – Use clock control", Y,
15. Select "0 – Main menu" and then "8 – Save/cancel" followed by "1 – Save", Y,
16. Select "0 – Main menu" and then "6 – Set Comserver address", Y,
17. Enter the desired IP address for the network interface; master: "192.168.128.1", slave: "192.168.128.2", The SCS will now restart and the serial part of the configuration is done.

Part 2: Configuration over Ethernet.

18. Connect with Telnet to the SCS IP-address (192.168.128.1/192.168.128.2) on port 1111, "Com-Server Highspeed mainmenu" should appear,
19. Select "3 – SETUP Port 0" and then "2 – UART Setup",
20. Select "1 – Baud" and then "1 – Standard baudrates",
21. Select "4 – 38400", enter,
22. Verify that the settings are now "38400, N, 8, 1, H, FIFO OFF",
23. Enter,
24. Select "3 – TCP/IP" and then "1 – Port state",
25. Select "3 – Clear port mode", Y, followed by 2 x enter,

Only if this SCS is the master device:

26. Select "3 – TCP/IP" and then "7 – Box to box",
27. Select "1 – Slave port", enter the number 8000,
28. Select "2 – Slave IP-address",
29. Enter the IP address of the slave SCS: "192.168.128.2", followed by 3 x enter,

30. Select "4 – Save", Y,
31. Now interrupt power to the SCS for 5 seconds to apply this new configuration.

13 Annex B: FAQ & Common problems

13.1 Synchronous Com-Servers cannot connect to each other

Phenomenon: Although the master is configured correctly with the IP address of the slave and also the slave is assigned this IP address, a connection cannot be made.

Solution: Often when this happens, the slave device has itself locked into a session with another master Com-Server. Verify this by connecting to port 1111 of the slave device using telnet. Go to menu Setup Port 0 > Port state > Connection state. If this menu says "B2B Slave" then the device's connection state must be reset. Do this by going to the menu Setup Port 0 > Port State > Clear port mode and enter Y. After resetting the device, a connection should be established.

13.2 Synchronous Com-Server has IP address in wrong subnet

Phenomenon: If the network address of the Com-Server is different from the network address of the 'other device' (PC or other SCS), then no connection can be made without a valid and available gateway device.

Solution: The methods described in the Com-Server high-speed manual are not all very usable because these require physical or direct access to the OEM module. However in the configuration menu, there is a menu item Set Com-Server IP address. This allows setting a new IP address for the Com-Server module.

13.3 Why not just one port for configuration?

Phenomenon: In order to fully set-up a Synchronous Com-Server, two stages of configuration have to be done, one stage over serial and one stage using Ethernet.

Explanation: This necessity is by design and caused by the choice for an embedded Com-Server device. This choice assures a consistent, reliable and proven network connection at the expense of ease of configuration.

13.4 After replacing a Synchronous Com-Server, the new one can't get a connection

Phenomenon: After replacing an existing Synchronous Com-Server with another one, which is identical configured, the connection does not come up. There happens some network activity every few seconds, but no data comes through and the Error led stays on.

Explanation: This can happen because the master SCS or the closest active network device (for example the ADSL router/gateway or a network switch) maintains an address resolution table (ARP) to map the IP address of the SCS on it's MAC address. Because the new SCS has another MAC address, the other network device will send the data to the old (and obsolete) MAC address.

Solution: This can be solved by waiting long enough for the ARP table to clear automatically or the ARP table can be cleared manually. When the closest active network device is the other SCS, then it is sufficient to power cycle the device.