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## Orion3 RS-232/485 over IP Application Note

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### Summary

This document describes the RS-232 and RS-485 serial data transmission over an IP Network with Orion3 equipment. The following data transmissions are possible:

- Point-To-Point
- Point-To-MultiPoint
- Broadcast
- Com-Server Applications, Com Port Extender

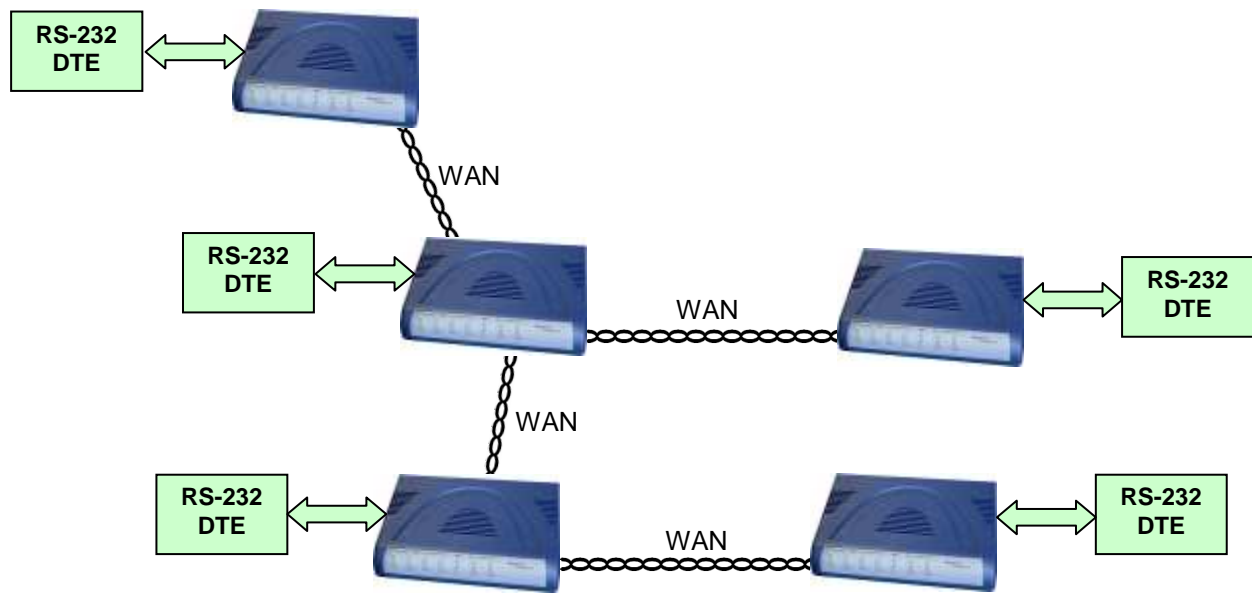
The basic configuration commands are described too with some application examples. When using Orion3 equipment with RS-232 Emulation or Virtual Serial Ports on a computer some helpful utility programs are mentioned.

## 1 Orion3 Serial Data Handling Possibilities

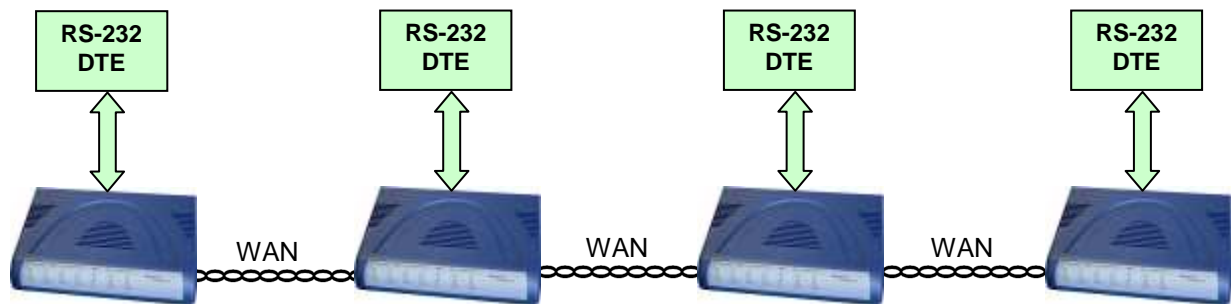
In Orion3 there are several models available with 1xRS-232, 4xRS-232 or 1xRS-485 interfaces. There are two ways to transmit the serial data:

- MODE-1: Transmit over DSL, E1 or WAN (Wide Area Network) with command RSIP OFF
- MODE-2: Transmit over IP (Internet Protocol) with command RSIP ON

When transmitting serial data over DSL/E1/WAN (MODE-1), there is a PTMP (Point-To-MultiPoint) command available to realize bus and star topologies.



Picture 1.1. RS-232 Star Topology



Picture 1.2. RS-232 Bus Topology

The command PTMP ADD [IF] adds an interface to Point-to-MultiPoint group channel

The command PTMP DEL [IF] deletes an interface from Point-to-MultiPoint group channel

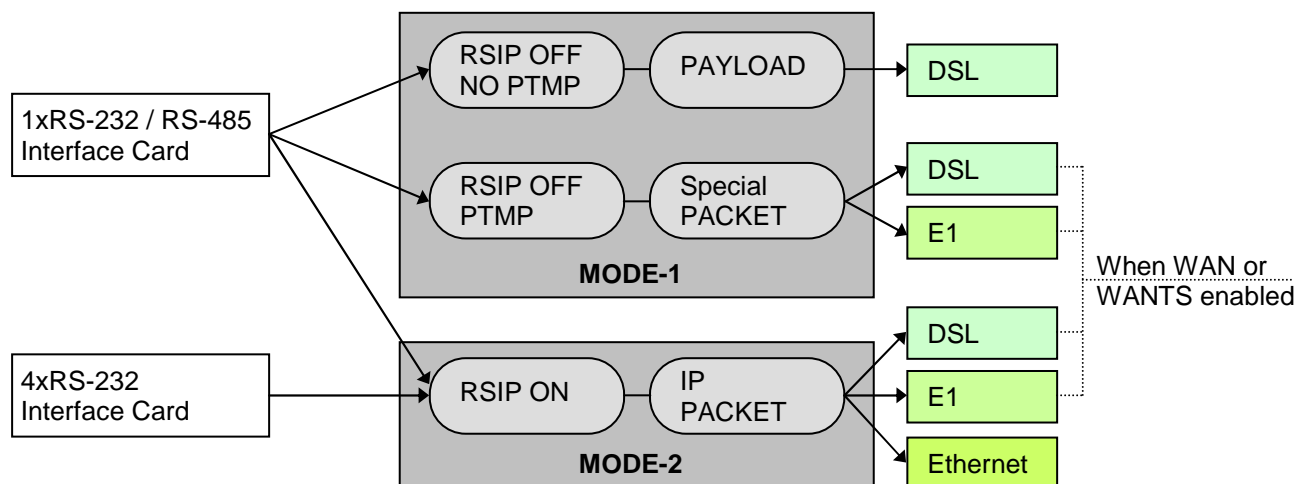
[IF] is the name of interface, such as:

- RS, RS1 (RS-232/485 interface of the Orion3 modem)
- WAN1-WAN4 (WAN interface to transmit PTMP data through)
- DSL1-DSL2 (DSL interface transmitting WAN)

To configure the serial data format please see in the manual the following commands:

- RSRATE (for example RSRATE 115200, means baud rate 115200)
- RSFORMAT (for example RSFORMAT 8N1, means 8 data bits, no parity, 1 stop bit)

The picture below shows all available ways to transmit serial data using Orion3 modem.



Picture 1.3. Ways to Transfer Serial Data

To sum up, we have the following situation. When serial data is carried as Payload (DSL) data, it is transferred between two units connected with DSL. When serial data is carried within PTMP group, it can be transferred through DSL and/or E1 lines where the PTMP function is active and when WAN transmission is switched on. In this mode each RS-232 and RS-485 interface card will broadcast its data to all other PTMP units in the network.

The RSIP ON functionality allows transferring serial data through any IP network. It combines the advantages of two previous described modes:

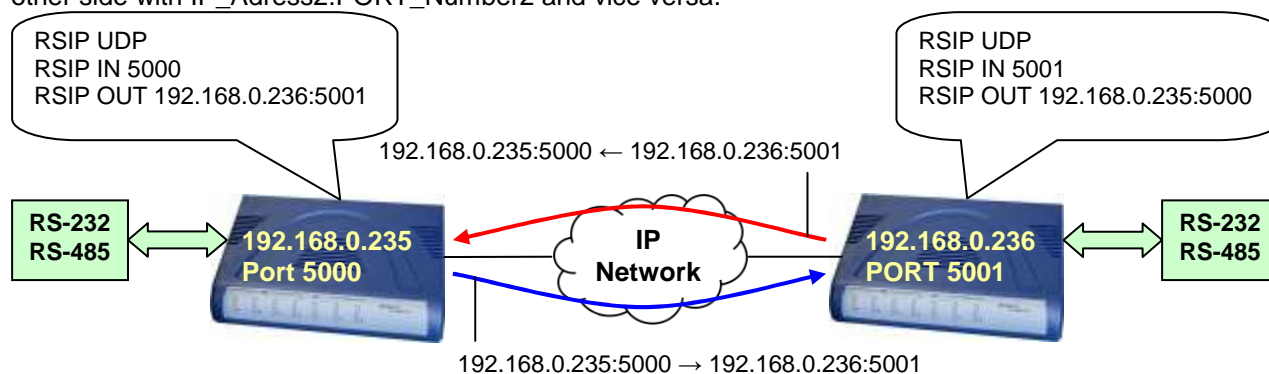
- Point-To-Point operation through IP network with any topology
- Point-To-MultiPoint and broadcast operation
- Independent configuration of the units
- Can be used as any Computers COM port extender

## 2 Serial Data over IP (RSIP ON)

Serial data transmission can be done using UDP or TCP protocols. The UDP protocol allows operating in both Point-To-Point (PTP) and Point-To-MultiPoint (PTMP) modes. Point-To-MultiPoint mode allows to set up several broadcasting nodes and to build a broadcast configuration. The TCP/IP protocol allows only working in Point-To-Point mode.

### 2.1 UDP Point-To-Point

In this mode two serial data endpoints should be configured with each other's IP Address and PORT Number as illustrated on following picture. It means one side with IP\_Address1:PORT\_Number1 sends data to the other side with IP\_Address2:PORT\_Number2 and vice versa.



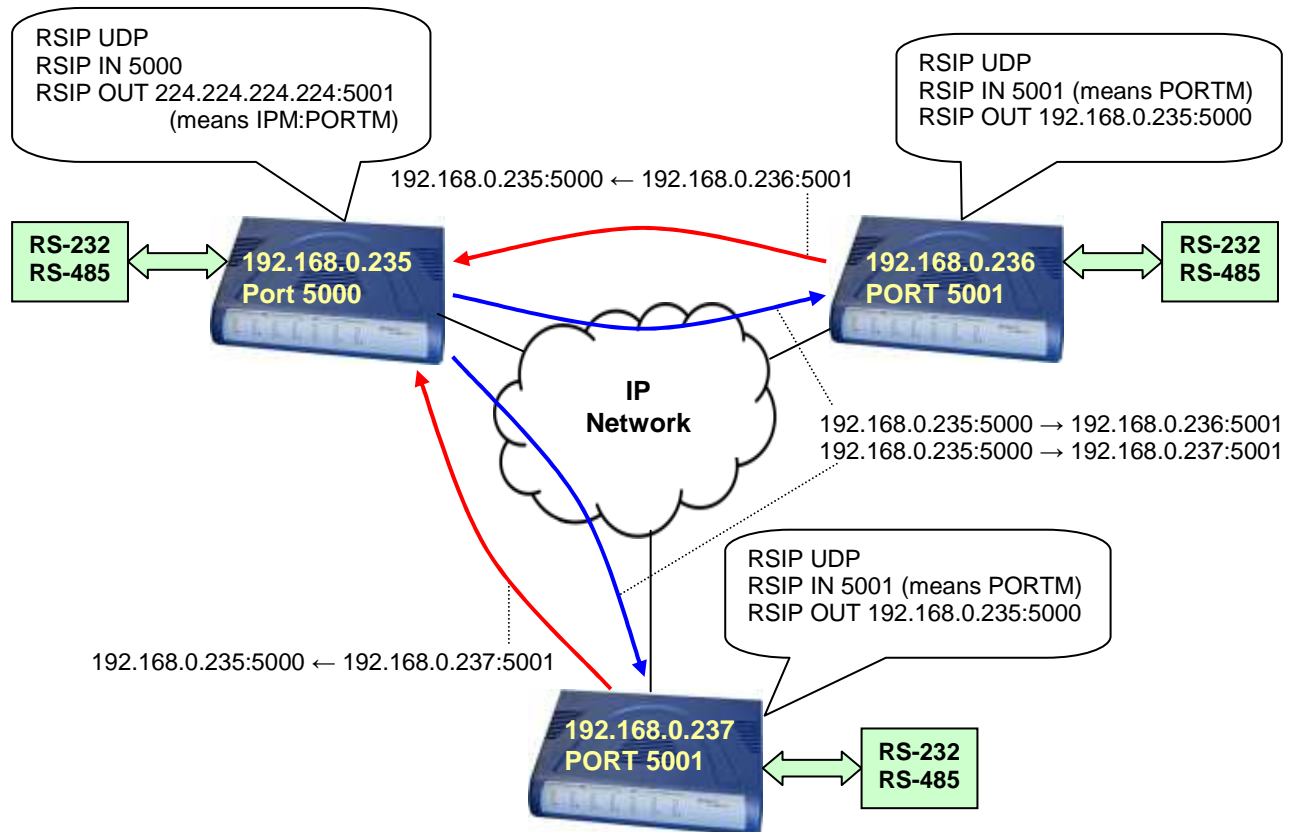
Picture 2.1. Serial Data Transmission with UDP Point-To-Point

## 2.2 UDP Point-To-MultiPoint

In Point-To-MultiPoint mode the endpoint ("Master") should have configured to send serial data with a multicast IP Address (IPM) and some PORT Number (PORTM) as outgoing address. Outgoing data of such an endpoint will reach all other endpoints. Endpoints with input PORT Number PORTM will accept received data and other endpoints will discard it.

Non broadcasting endpoints should be configured as they work with "Master" endpoint in Point-to-Point mode with incoming PORT Number set to PORTM.

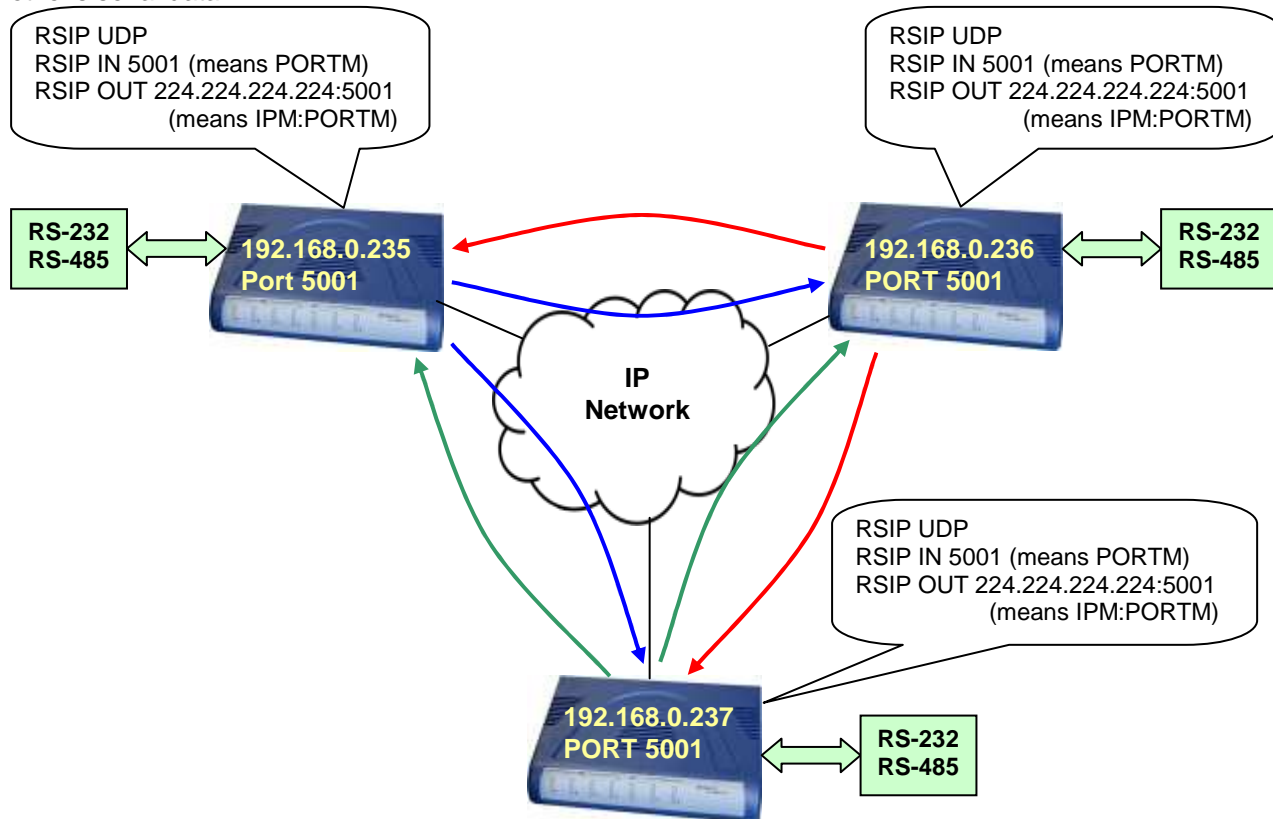
Any multicast address acceptable in the application network can be used. Endpoints distinguish incoming broadcast data by destination PORT Number (PORTM). Multicast addresses are IP Addresses in range from 224.0.0.0 to 239.255.255.255.



Picture 2.2. Serial Data Transmission with UDP Point-To-MultiPoint

### 2.3 UDP Broadcast Mode

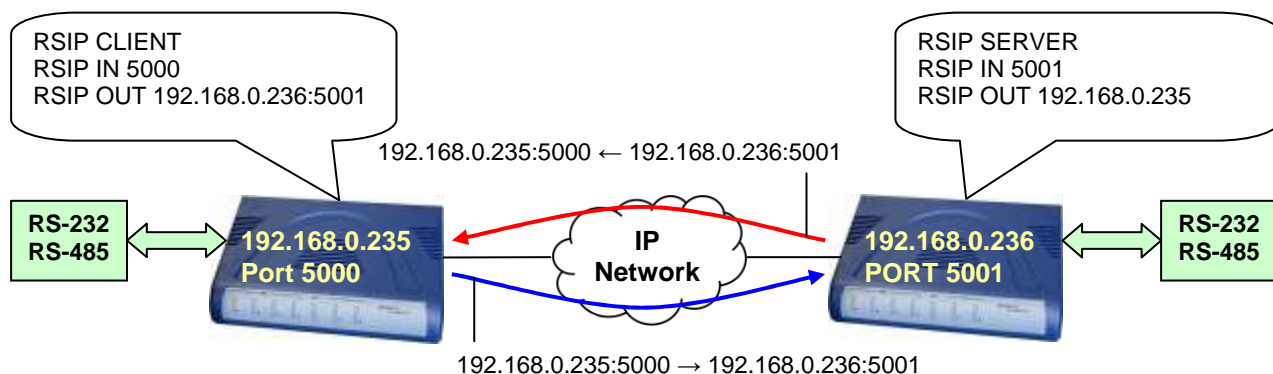
In this mode the endpoints should be configured to send their serial data to the multicast IP Address (IPM). Incoming and outgoing PORT Number (PORTM) should be the same for all endpoints to receive each other's serial data.



Picture 2.3. Serial Data Transmission with UDP Broadcast

### 2.4 TCP Point-To-Point

In this mode one serial data endpoint should be configured as Server and the other as Client. Client configuration is the same as UDP endpoint. On the Server endpoint the Client IP Address and incoming PORT Number should be specified.



Picture 2.4. Serial Data Transmission with TCP Point-To-Point

## 2.5 Configuration Commands for Serial Data Transmission over IP Networks

Following configurations are possible when programming serial data over an IP Network:

- Mode (UDP/TCP Client/TCP Server)
- Local IP PORT Number for incoming serial data
- Remote IP Address and PORT Number for outgoing serial data
- Operation over IP Network or not (RSIP ON/OFF)

To enable the serial data transmission over IP Network functionality on the specific interface, it should be removed from DSL Payload and from the PTMP group. The following commands allow configuring the interfaces:

```
RSIP [[MODE]/ON/OFF] [IF]
RSIP IN [PORT] [IF]
RSIP OUT [ADDR] [IF]
```

[MODE] define the protocol and mode, such as:

- UDP (Switch to UDP protocol for serial data transmission)
- CLIENT (Switch to TCP protocol for serial data transmission, Client side)
- SERVER (Switch to TCP protocol for serial data transmission, Server side)

[IF] is the name of interface, such as:

- RS or RS1 (if one 1xRS-232 or 1xRS-485 interface card is installed)
- 4RS,[channel\_number] or 4RS1,[channel\_number] (if one 4xRS-232 interface card is installed)
- 4RS1,[channel\_number] or 4RS2,[channel\_number] (if two 4xRS-232 interface cards are installed)

[PORT] is the PORT\_Number, decimal from 1024 to 65535 inclusively

[ADDR] is [IP\_Address:PORT\_Number] for UDP and TCP Client, but [IP\_Address] for TCP Server mode.

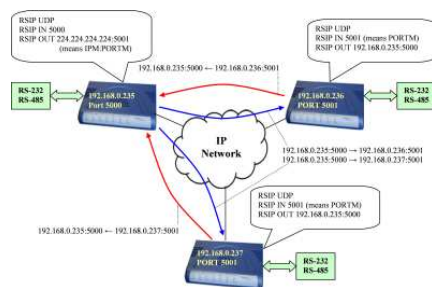
IN and OUT have following meaning: It means to configure - INput or OUTput Address. With IN the local IP port (listen port) will be configured that is used to receive serial data packets from the IP Network. With OUT the remote IP Address will be configured where serial data packets will be forwarded to.

Examples for possible commands:

- RSIP UDP RS (Switch serial data to IP Network with UDP protocol)
- RSIP CLIENT 4RS,2 (Switch second channel of 4xRS-232 card to TCP Client mode)
- RSIP IN 5000 RS1 (Receive and send serial data with PORT Number 5000)
- RSIP OUT 172.16.53.1:5000 RS1 (Select endpoint with IP Address 172.16.53.1 and PORT Number 5000 as remote side for serial data)

## 3 Applications

### 3.1 Serial Data Transmission UDP Point-To-MultiPoint



Please refer to picture 2.2 in paragraph 2.2 UDP Point-To-MultiPoint.

You can perform on "Master" unit the following commands in menu 3 (CM):

- RSIP UDP
- RSIP IN 5000
- RSIP OUT 224.224.224.224:5001

Please see the configuration on the unit with IP Address 192.168.0.235:

-----  
Running Line Configuration  
-----

```
xDSL          DSL1          DSL2
Mode          : Master(HTU-C)  Master(HTU-C)
PAM, Baserate : PAM32,89      PAM32,89
Annex         : B              B
Payload       : WAN            WAN
Clock source  : Int            Int
Reserve       : ---            ---
Power         : OFF            OFF
GS compatible : OFF
NM/LA alarm   : OFF/OFF
```

RS:RS-232

```
Mode          : RS<->IP
Rate          : 9600
Format        : 8N1
RS<->IP (UDP,ON)
Remote IP, port:
224.224.224.224,
5001
Local port: 5000
```

You can perform on other units the following commands in menu 3 (CM):

- RSIP UDP
- RSIP IN 5001
- RSIP OUT 192.168.0.235:5000

Please see the configuration on the unit with IP Address 192.168.0.236 and 192.168.0.237:

-----  
Running Line Configuration  
-----

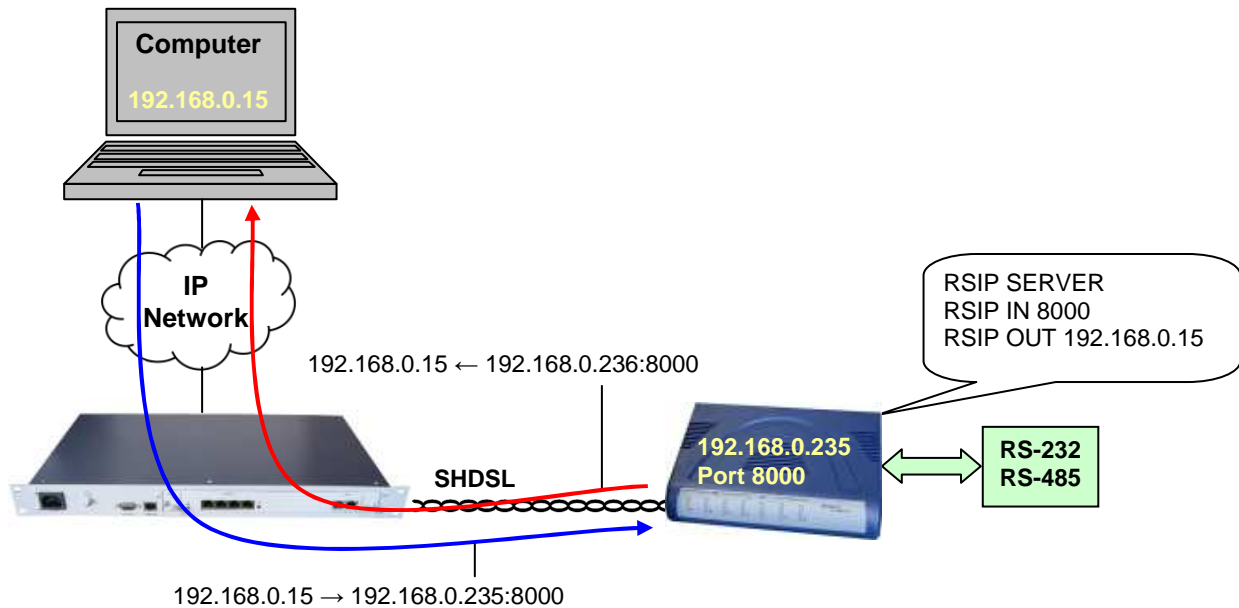
```
xDSL          DSL1          DSL2
Mode          : Slave(HTU-R)   Slave(HTU-R)
PAM, Baserate : PAM32,89      PAM32,89
Annex         : B              B
Payload       : WAN            WAN
Clock source  : Int            Int
Reserve       : ---            ---
GS compatible : OFF
NM/LA alarm   : OFF/OFF
```

RS:RS-232

```
Mode          : RS<->IP
Rate          : 9600
Format        : 8N1
RS<->IP (UDP,ON)
Remote IP, port:
192.168.0.235,
5000
Local port: 5001
```

### 3.2 COM-Server (COM Port Extender, Virtual Serial Port)

At the central side is a computer with the IP Address 192.168.0.15. At this computer any application program can work that needs the serial data of any equipment on the CPE side connected to the RS-232 card. The CPE side has the IP Address 192.168.0.235.



Picture 3.1. COM-Server application

You can perform on the Orion3 unit with the serial interface card the following commands in menu 3 (CM):

- RSIP SERVER
- RSIP IN 8000
- RSIP OUT 192.168.0.15

Please see the configuration on the CPE unit with IP Address 192.168.0.235:

-----  
Running Line Configuration  
-----

```
xDSL          DSL1          DSL2
Mode           : Slave(HTU-R)  Slave(HTU-R)
PAM, Baserate : AUTO          AUTO
Annex          : A/B           A/B
Payload        : WAN           WAN
Clock source   : Int           Int
Reserve        : ---           ---
GS compatible  : OFF
NM/LA alarm    : OFF/OFF
```

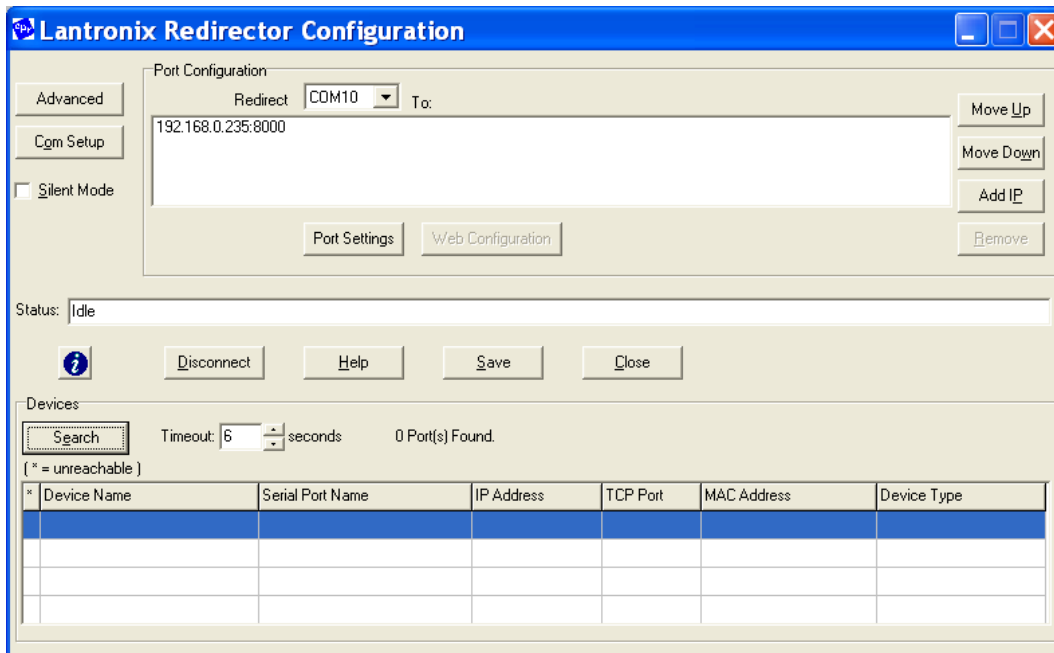
```
RS:RS-232
Mode          : RS<->IP
Rate          : 9600
Format        : 8N1
RS<->IP (Server,ON)
Remote IP:
192.168.0.15
Local port: 8000
-----
```

The application program at the computer can now connect to a Virtual COM Port (Serial Port) with the help of any additional program like (there are many program available, these are just examples):

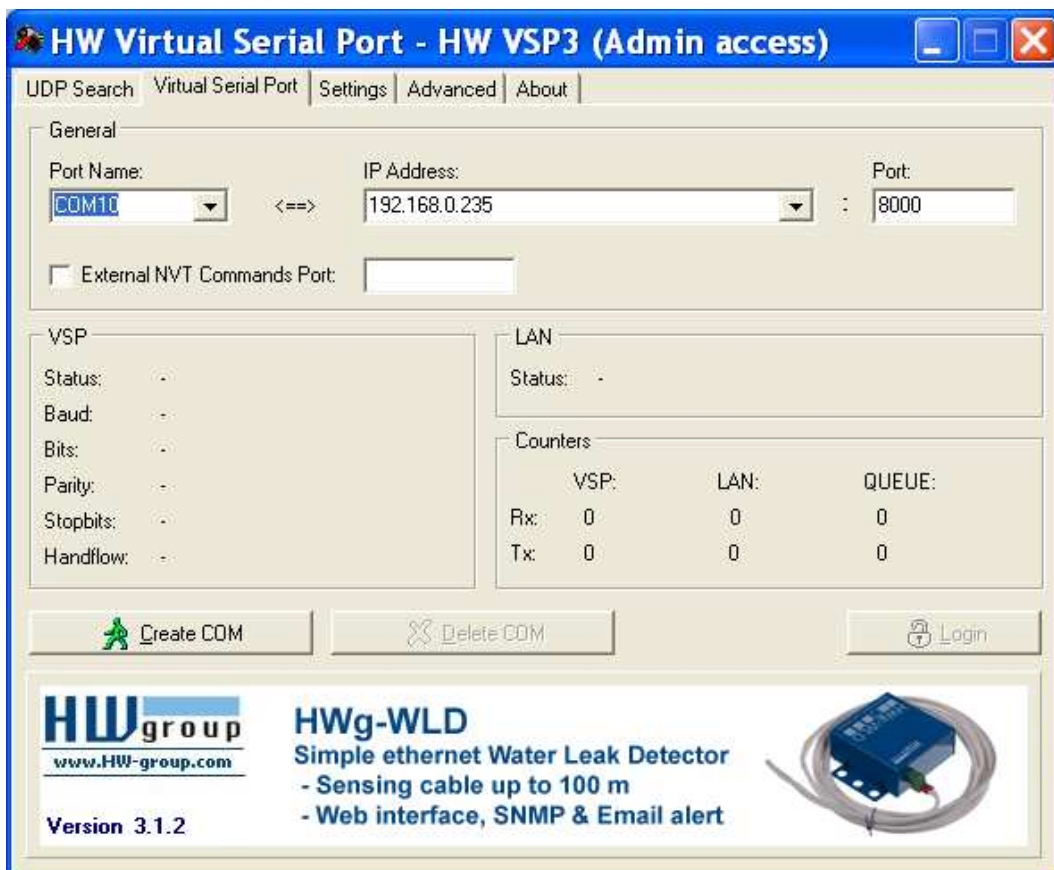
- Lantronix Com Port Redirector (<http://www.lantronix.com>)
- HW VSP3 – Virtual Serial Port (<http://www.hw-group.com>)

After the correct settings in such utility program, the main application can connect to the corresponding COM Port at it would be a COM Port on the computer.



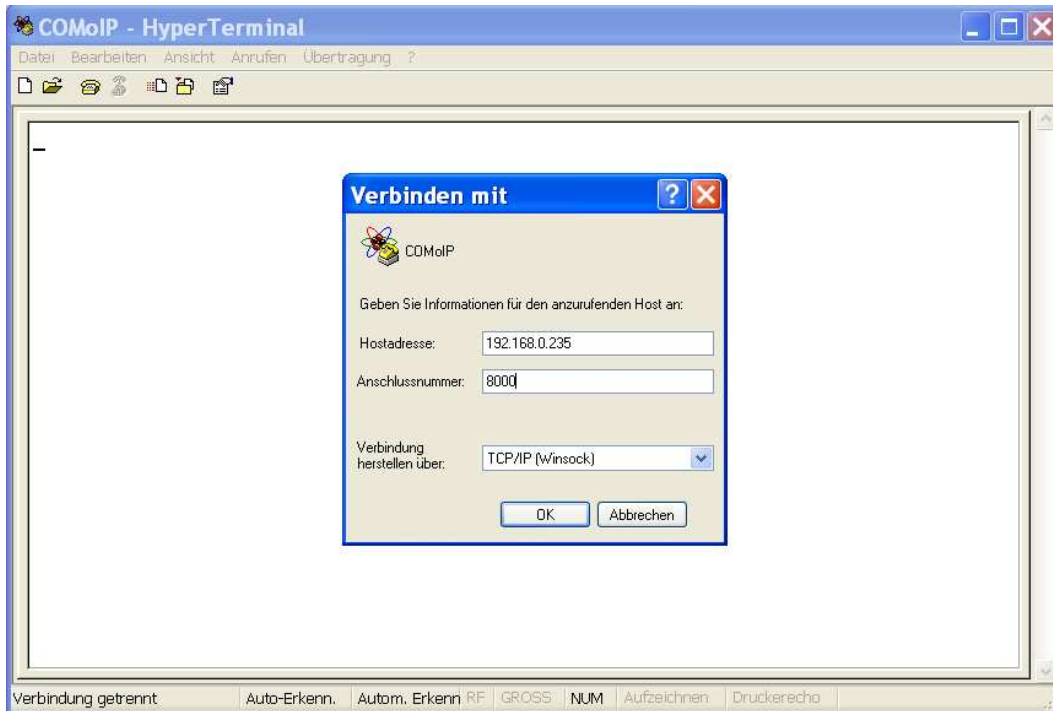


Picture 3.2. Example with Lantronix Com Port Redirector (<http://www.lantronix.com>)



Picture 3.3. Example with HW VSP3 – Virtual Serial Port (<http://www.hw-group.com>)

You can also connect directly with the HyperTerminal (without a Virtual COM Port) from a windows computer with following steps



Picture 3.4. Example with HyperTerminal, there is no need for Virtual COM Port utility program

If you would like to work with Linux operating system, there is a standard utility SOCAT that allows redirecting TCP/IP or UDP connection to pseudo TTY (PTY). This PTY then can be used by any software just as usual serial port TTY (Virtual COM Port). SOCAT has a number of options to set up TCP Client, TCP Server and UDP connection. Following examples show how to use SOCAT:

- UDP point-to-point:  
socat PTY,link=/tmp/ttyS0 UDP-DATAGRAM:192.168.0.235:8000,bind=192.168.0.15:8000
- UDP PTMP, PC broadcasting:  
socat PTY,link=/tmp/ttyS0 UDP-DATAGRAM:224.224.224.224:8000,bind=192.168.0.15:8000
- TCP Server:  
socat PTY,link=/tmp/ttyS0 TCP: 192.168.0.235:8000
- TCP Client:  
socat PTY,link=/tmp/ttyS0 TCP: 192.168.0.235:8000