



# Modbus SecuriPro Protocol Bridge



Synopsis :                    This document explains device functionality, its setup and address layout description.

<b>Version:</b>	1.1
<b>Author:</b>	Dušan Ferbas Jiří Šindelář
<b>Status:</b>	Draft
<b>Date:</b>	January 23, 2005
<b>Document ID:</b>	Modbus050123

# 1. Overview

Device is on one side connected with a serial cable to a SIB-71 module of SECURITON equipment. Second interface is 10 Mbit ethernet. Here standard Modbus TCP port 502 is used. Modbus requests are translated into SecuriPro command sequences. After necessary data are collected, response is sent back to a Modbus request originator.

Available information is for areas, zones, detectors, inputs, outputs and system.

Implemented approach was chosen to offer maximal addressing flexibility with minimal resources needed. If there will be a requirement to reduce response latency, a gateway with polled data approach has to be used.

## 1.1 Setup

---

When DIP switch 1 is set to ON during power up, it is possible to connect an arbitrary terminal program. Set baud rate to 115000Bd and configure device over a serial line. For connection to a computer a cross cable DB9M – DB9M (i.e. Laplink) is needed. Such is connected to device's port 1 (see picture at end of this document). Port 2 is used for connection to SECURITON device.

Basic network parameters (IP address, mask, gateway) are easily configured over ethernet with HerculesSetup program. At that time DIP SW 1 has to be set to OFF position. This is done by UDP broadcast so no previous or matching IP setup is needed.

Protocol configuration (config.txt), or firmware upgrade (choice with "radio" buttons), can be done from index.htm web page. On this page there is also a link to actual config.txt content. Access to web pages is controlled with a password, which can be set in serial setup. Information string on index.htm web page (down the page) can be modified from the serial setup too. All html tags can be used.

### 1.1.1 Serial Setup

---

When device is powered up there is an output at 115000Bd with following meaning. If it is missed, then press <Enter> to redisplay it. Current parameter value is displayed within square brackets.

```
--[ Modbus <-> SecuriPro bridge 1.0.3 (C) 2003 by www.dfsoft.cz ]--  
  
Parameters in EEPROM are preserved between different code versions.  
  
--[ MoSec setup ]--  
  
h,?... help  
-----  
i ... IP address      [192.168.1.99]  
m ... netmask        [255.255.255.0]  
g ... gateway address [192.168.1.100]  
-----  
u ... HTTP user name  [uziv]  
p ... HTTP password   [heslo]  
-----  
l ... debug level     [5]  
s ... HTML string     [Detailed information can be found on <a href = "http:  
//www.dfsoft.cz">http://www.dfsoft.cz</a>]  
-----  
d ... load default setup  
r ... system reboot  
x ... exit
```

MoSec>

i, m, g - IP setup parameters  
u,p - name and password for web pages access  
s - custom defined HTML string (down at index.htm)  
d - load factory default parameters  
r - device SW restart  
x - end of setup, continue with application (like normal power up with SW 1 OFF)  
ATTENTION! If SW 1 is not changed to OFF then setup is entered again during next power up  
l - debugging level (output to setup port)  
    0 .. no debug info  
    1 .. only errors  
    2 .. + info messages  
    3 .. + receiving HW telegrams  
    4 .. + sending HW telegrams  
    5 .. + Modbus  
    6 .. + send/receive GW telegrams  
    7 .. full debug

## 1.2 Software Functionality

---

After power up program checks if a valid parameter configuration is loaded. If not, factory default is used and saved as a current one. Then configuration for communication with a concrete SECURITON® device is read from config.txt file.

### 1.2.1 CD-ROM Contents

---

\Modbus_SecuriPro_bridge.pdf	- functionality description
\_Config\config.txt	- protocol configuration
\_App_\curl.exe	- SW for batch file upload over http connection
\_App_\TERM	- common terminal, also possibility to upload FW over serial line (choice File-Transfer-XMODEM, transfer type 1K)
\_App_\Hercules\HerculesSetup.exe	- UDP setup, batch FW upload FW over serial line
\Modbus\mbpollsetup.exe	- test utility for Modbus over TCP
\Modbus\Modbus_over_serial_line_V1.pdf	- Modbus specification
\Modbus\Modbus messaging implementation guide V1.pdf	
\Modbus\Modbus Application Protocol v1.pdf	
\bin\upload_bin.bat	- FW upload over http
\bin\upload_all.bat	- same, but with web pages included
\bin\burn_bin.bat	- FW upload over serial line
\bin\burn_all.bat	
\bin\MoSec_bin.eti	- own FW file (without web pages, faster upload)
\bin\MoSec_all.eti	- own FW, complete

### 1.2.2 Login

---

When application is started, device attempts to log into a SecuriPro system (name and password from config.txt). If there is a conflict (the other side also transmits) or system does not respond, device enters "Error" state.

If device is in error state and Modbus request arrives, device tries to login again. The only exception is request for communication state. In such case there is no attempt for login.

### 1.2.3 System States

---

- Invalid Config File – error in configuration file
- Invalid Login – wrong name or password
- Initializing – maximally 15s after startup or until login (e.g. after serial cable unplug).
- Error – cannot establish communication
- Ready – device is ready running

### 1.2.4 Configuration and Firmware Upload

---

After upload from web page, device restarts itself. If serial setup is not enabled (SW 1 position), index.htm is read again. Here system state (FW version) can be checked.

If a configuration file does not have proper syntax, system stays in „Invalid Config File“ state.

For http FW upload there is a support needed in application. So if for any reason you do not have an application loaded the only remaining method is to use serial FW upload. This one is completely supported by bootloader.

### 1.2.5 Configuration File, Object State

---

- When SecuriPro object's state is queried, object starts to transmit replies. An 8-bit state register is being set according to them.
- If replies completed, **highest bit index** is decoded.
- index +1 = object state.
- If there is no reply, then object state = 0;
- Rules for setting and 8-bit register can be modified in config.txt configuration file
  
- In file there can be set, which bit of the state register will be set/cleared for a given **property** and **value** combinations.
- format: 1=property; value; state register bit index; value
  
- In a pre release there was possible to set different rules for inputs, outputs, system and arzode (area, zone, detector). Finally it was decided to use common setup.

config.txt example:

```
userName = User1;
userPassword = User1;

[ArZoDe]
;alarm on
1=1-3,10,16,17,19,27,56; 1,3,4; 16; 1;

;sabotage on
2=4,11,21,22; 1,3; 8; 1;

;fault on
3=5-8,12-15,18,23,26,29; 3; 4; 1;

;switched off
4=33; 9; 2; 1;

;maintenance on
5=33; 11; 1; 1;
```

## 1.2.6 Standards

- Modbus due to **MODBUS Application Protocol Specification**
- protocol SecuriPro® Release R02.00 according to document SECURITON T 130 175 E

## 1.2.7 Response Time

With 19200Bd baud rate response time 200 – 400 ms is achieved. Response time depends on a relevant detector state. If such is in an alarm state then more data telegrams are transmitted.

## 1.3 Address Space

Following tables serves for conversion of Modbus addresses into SecuriPro address space. Because more intuitive approach was chosen and also because Modbus has smaller address space, there is a need to adapt to a following limitation – area 0-5, zone 0-9, inputs/outputs 0-1999. Detectors have full range 0-255.

### 1.3.1 Requests

Modbus function 01 – Read Coils		
Modbus address	Meaning	bits/object
0 – 59999	Area, zone, detector	3
60000 – 61999	Inputs	1
62000 – 63999	Outputs	1
64000 – 64002	Panel state	3
64003 – 64005	System state	3
64006	State of connection with SecuriPro	1
64007 – 65535	Unused addresses	-

Address space division 0 – 59999 (area, zone, detector):

0..5 | 0..9 | 000..764    => area | zone | detector  
x    | x    | 765...999    => unused addresses

#### Examples:

- detector    03 02 01 (area zone detector) => 32003 .. 32005 (3bits)
- detector    03 02 02                    => 32006 .. 32008
- zone        03 02 00                    => 32000 .. 32002
- zone        01 01 00                    => 11000 .. 11002
- area        01 00 00                    => 10000 .. 10002

#### Meaning of a 3bit value:

If factory protocol configuration file is used following is set:

- 0 .. device was not able to read object state
- 1 .. ok
- 2 .. maintenance
- 3 .. switched off
- 4 .. failure
- 5 .. sabotage
- 6 .. alarm
- (7 .. unused)

## 1.3.2 Commands

---

Modbus function 05 – Write Single Coil		
Modbus address	Meaning	bits/object
0 – 59999	area, zone, detector	3
60000 – 65535	unused addresses	-

Address space division 0 – 59999 (area, zone, detector):

- same as for Requests

0..5 | 0..9 | 000..764   => area | zone | detector  
 x   |x   | 765...999   => unused addresses

Meaning of a 3bit value:

Bit	value	Function
0	0	not supported
0	1	alarm acknowledge
1	0	switch off
1	1	switch on
2	0	maintenance off
2	1	maintenance on

Examples (address, value):

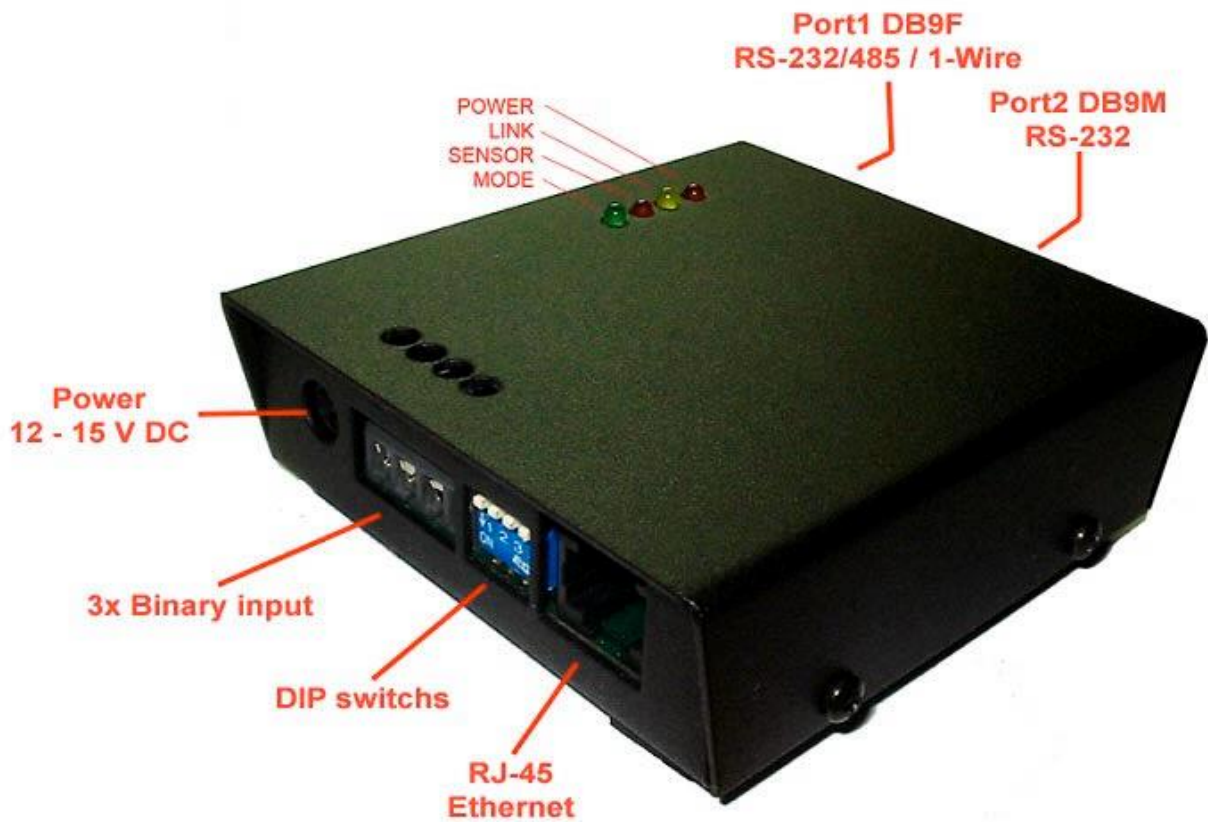
- 30201, 1       => detector (03 02 01) – alarm acknowledge
- 30202, 0       => detector (03 02 01) – switch off
- 30202, 1       => detector (03 02 01) – switch on
- 30203, 0       => detector (03 02 01) – maintenance off
- 30203, 1       => detector (03 02 01) – maintenance on
- 32001, 0       => zone (03 02 00) – switch off
- 30001, 0       => area (03 00 00) – switch off

## 1.4 Hardware

---

Solution is based on a proven modular HW with following parameters:

- 1x RS232, 1x RS232/485, 1x 10Mb ethernet RJ45
- 4x DIP switch for setup mode, RS232/485 choice, 2 are free for possible application use
- dimensions 80 x 80 x 25 mm
- 9-12V external DC power source
- MAC address from official IANA assigned range
- Unit view without top cover can be found on a first page of this document



Dušan Ferbas and Jiří Šindelář, December 22, 2004