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# SPC Bridge Modbus User Manual

Revision 1.0

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## History Record

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## Contents

<b>1</b>	<b>INTRODUCTION.....</b>	<b>5</b>
1.1	SPC Bridge Modbus.....	5
1.2	Main Features.....	5
1.3	Hardware Specification.....	5
1.4	Modbus.....	6
<b>2</b>	<b>INSTALLATION.....</b>	<b>7</b>
2.1	Prerequisites.....	7
2.2	First Time Installation Workflow.....	7
<b>3</b>	<b>SYSTEM ADMINISTRATION.....</b>	<b>8</b>
3.1	System Administration Login.....	8
3.2	Static IP Address .....	9
3.3	Time Setting .....	9
3.4	Change Administration Password.....	9
<b>4</b>	<b>SPC BRIDGE CONFIGURATION.....</b>	<b>10</b>
4.1	SPC Bridge Sign In .....	10
4.2	SPC Communication (FlexC).....	10
4.2.1	SPC Panel - FlexC Settings.....	10
4.2.2	SPC Bridge - SPC Communication Settings.....	11
4.3	SPC Communication Test.....	12
4.4	Modbus TCP Server .....	12
4.5	Modbus Datapoints.....	13
4.6	System Info.....	14
4.7	System User.....	14
<b>5</b>	<b>MODBUS COMMUNICATION.....</b>	<b>15</b>
5.1	Modbus Function Codes .....	15
5.2	Modbus Error Codes.....	15
5.3	Modbus Register Map.....	15
5.3.1	Register Types.....	15
5.3.2	Communication Status.....	15
5.3.3	SPC Area Commands .....	16
5.3.4	SPC Zone Commands.....	16
5.3.5	SPC Area Arm Status.....	17
5.3.6	SPC Area Status.....	18
5.3.7	SPC Zone Input States .....	19
5.3.8	SPC Zone Status .....	20
<b>6</b>	<b>ADVANCED USERS.....</b>	<b>21</b>
6.1	Backup of Configuration Settings.....	21
6.2	Upgrading software .....	21

6.3	SSH Access .....	21
6.4	Resetting the SPC Bridge .....	21
<b>7</b>	<b>APPENDICES .....</b>	<b>22</b>
7.1	SPC Command Error Codes .....	22
7.2	End-User License Agreement for SPC Bridge (EULA) .....	24
7.3	Open Source Software .....	25
7.4	Open Source Hardware .....	25

# 1 Introduction

## 1.1 SPC Bridge Modbus



SPC Bridge

**SPC Bridge Modbus** allows integration of Vanderbilt SPC intrusion system with a third-party system, e.g. a SCADA system, using the Modbus protocol. Using the SPC Bridge you are able to use events from all your SPC connected motion detectors, door/window contacts, fire detectors and alarm status for automations in the third-party system.

## 1.2 Main Features

- SPC Bridge Modbus acts as a Modbus TCP server (only one Modbus TCP client connection is allowed at a time).
- Provides SPC zone and area states/status to a Modbus TCP client, e.g. a SCADA system.
- Support for area and zone commands from a Modbus TCP client, e.g. arm/disarm, inhibit zone.
- SPC Panel Communication based on Vanderbilt official FlexC protocol.
- Web based Admin GUI
- Recommended for maximum 128 zones and 16 areas. (The Modbus Register Map is designed for 256 zones and 16 areas. The recommendation is only an estimation. The actual limit depends on the use case, e.g. number of SPC events, number of motion detectors and the Modbus polling rate)
- Recommended Modbus Client poll rate  $\geq 2$  seconds.

## 1.3 Hardware Specification

SPC Bridge	
Processor	400MHz, 24K MIPS
Flash	16MB
RAM	64MB
Power input	9 – 12V DC
Network	2 x 10M/100M RJ45 Connectors
WiFi	802.11 b/g/n
USB	1 x USB 2.0 host connector
Type Approval	FCC Part15 Subpart B, Subpart C, CE NB, C-Tick

## 1.4 Modbus

SPC Bridge Modbus provides a Modbus TCP server. The default port for Modbus TCP Client connection is 502, but port number can be reassigned if desired. Only one Client connection is accepted at a time. For increased security it is possible to restrict which Client (client ip address) is allowed to connect.

There is any stated time for the poll rate. A lot of factors will come into play that can affect the response time, such as the type of request and how much data is being requested. Read multiple might take slightly longer for a response but more data will be transferred at once vs a read single might take less time to respond to but you will need to send more requests increasing the time. As a general recommendation you should use a poll rate  $\geq 2$  seconds.

## 2 Installation

### 2.1 Prerequisites

- Vanderbilt SPC panel with firmware  $\geq$  3.6 (3.6 was the first version with support for FlexC)
- Network router with DHCP server enabled
- SPC Bridge and SPC panel connected to same local network
- Internet access (to be able to use time synchronization via NTP)
- A Modbus TCP client, e.g. a SCADA system

### 2.2 First Time Installation Workflow

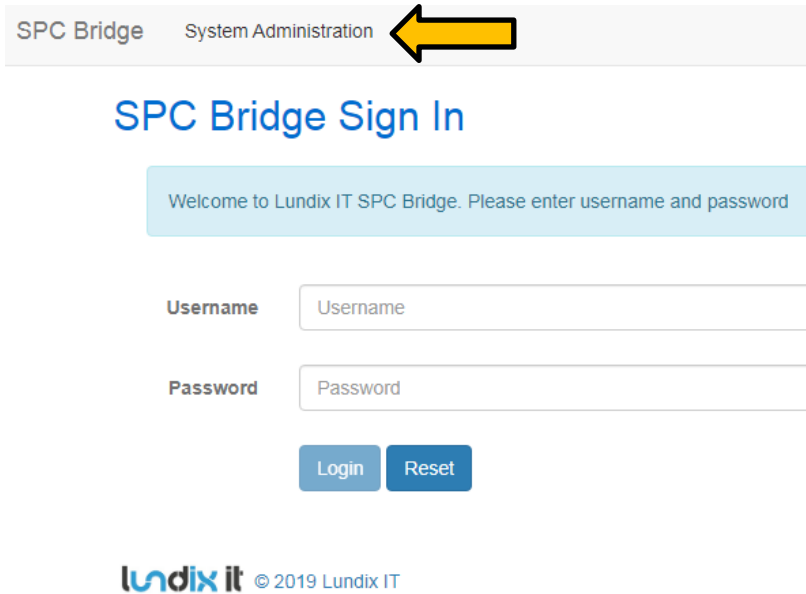
1. Read carefully **End-User License Agreement for SPC Bridge (EULA)** in last section in this document. If you do not agree to the terms of the EULA, do not install or use the SPC Bridge.
2. Connect the SPC Bridge **LAN** port, with a regular network cable, to your network switch or router.
3. Power up the device by connecting the included power adapter to a wall socket and then to the SPC Bridge.
4. Wait (~3 minutes) until the SPC Bridge has fully started.
5. Open a web browser and access your router (DHCP-server) to find the IP address assigned to the SPC Bridge. Type the IP address in the web browser to go to the SPC Bridge sign in page.
6. Assign a static IP address to the SPC Bridge. Follow instructions in section **System Administration, Static IP Address**.
7. Configure SPC communication. Follow the instructions in section **SPC Bridge Configuration, SPC Communication**.
8. Test the SPC Communication. See **SPC Communication Test**.
9. Configure the Modbus communication.

### 3 System Administration

The SPC Bridge is based on a standard Linux platform, OpenWrt, that is very common on routers. The System Administration Web GUI contains many settings intended only for advanced users. Only the settings described in this section should be changed by normal users.

#### 3.1 System Administration Login

Type IP address of the SPC Bridge in the web browser address field, go to SPC Bridge sign in page and click on **System Administration** in the **top bar**.



This will open the OpenWRT sign in page. Enter username (**root**) and password (default: **dragino**) and click on **Login**.

#### Authorization Required

Please enter your username and password.

Username

Password

**NOTE!** To return to SPC Bridge sign in page you need to type the SPC Bridge IP address in the web browser address field.



## 3.2 Static IP Address

Default will SPC Bridge use DHCP to get an IP Address. To be sure that the SPC Bridge keeps the IP address after a network/router restart you should assign the SPC Bridge a static IP Address. In the System Administration GUI, go to **Network -> Interfaces** and:

1. Select **LAN – Edit**.
2. In **Interfaces – LAN**, select **Static address** in the **Protocol** option menu
3. Click on **Switch Protocol**
4. In **Common Configuration – General Setup** fill in; IPv4 address, netmask, gateway and custom DNS servers.
5. In **DHCP Server – General Setup**; check the checkbox **Ignore interface**. **NOTE!** It is very important to disable the DHCP server in the SPC Bridge to avoid conflict with your normal DHCP server.
6. Click on **Save & Apply**.
7. Redirect your browser to the new IP Address.

## 3.3 Time Setting

To set correct Timezone, go to **System -> System** and select **Timezone** in section **System Properties – General Settings**.

The device is as default using NTP to synchronize time. This setting is in **System -> System** section **Time Synchronization**.

**NOTE!** The device has no RTC clock. During boot the device can have incorrect time. Some events in the system log can therefore have incorrect timestamps.

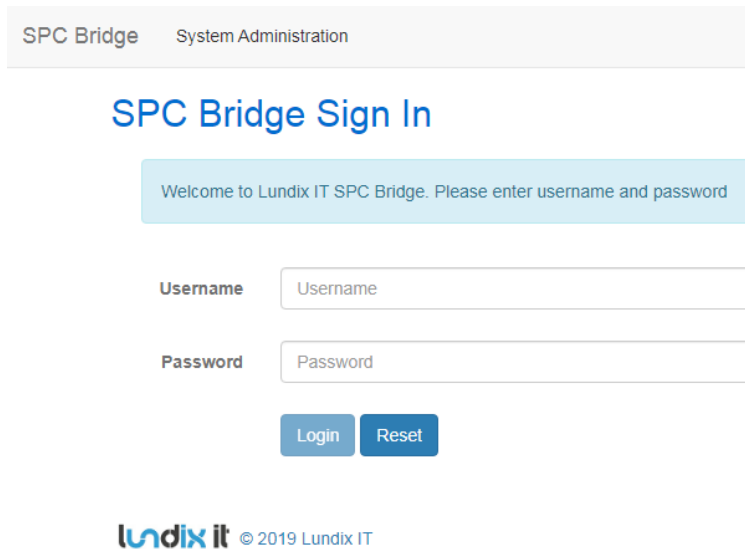
## 3.4 Change Administration Password

The default administration password for accessing the device is **dragino**. Of security reasons it is highly recommended to change the password as soon as possible. Go to **System -> Administration** section **Device Password** to change the password. The same password is used in both Administration Web GUI and for ssh access to the device.

## 4 SPC Bridge Configuration

### 4.1 SPC Bridge Sign In

Type IP address of the SPC Bridge in the web browser address field, go to SPC Bridge sign in page, enter username (**spcbridge**) and password (default **Spcbridge!**) and click **Login**.



### 4.2 SPC Communication (FlexC)

To setup the communication link between SPC Panel and SPC Bridge you have to configure the link in both SPC Panel and SPC Bridge ends.

#### 4.2.1 SPC Panel - FlexC Settings.

Use **Vanderbilt SPC Web interface** and define the FlexC communication following this instructions:

1. Select Full Engineer mode
2. Create a specific user for the SPC Bridge communication, e.g **spcbridge**. User profile should be Manager and you need also to define a web password for the user. (To be able to set a web password you need to login as the user in the SPC web interface).
3. Select **Communications -> FlexC -> Event Profiles**. Click on **Add** to add a new event profile. Give the event profile the name **SPC Bridge Events** and select (check) the report checkboxes for all event types. (You may consider reducing these settings later to just necessary events for the application)
4. Select **Communications -> FlexC -> FlexC ATS**. Select **Add Custom ATS** and change following from the default settings:
  - ATS Name = SPC Bridge
  - Event Profile = SPC Bridge Events (created in step 3)
  - ATS Polling Timeout = 60 seconds
  - Uncheck Generate FTC and Re-queue Events

5. Select **Add ATP to FlexC RCT** and change following from the default settings:
  - SPT Account Code = 999
  - RCT URL or IP Address = IP Address of the SPC Bridge
  - ATP Category = Cat 6 [Ethernet]
  
6. Open **Advanced ATP Settings** and change following from the default settings:
  - Encryption Key Mode = Fixed Encryption
  - Encryption key (64 hex digits) = Your own key. Must be exactly 64 hex digits (0-9, a-f).
  
7. Leave Full Engineer mode.

**NOTE!** In Full Engineer mode the SPC panel is not reporting any events to the SPC Bridge.

### 4.2.2 SPC Bridge - SPC Communication Settings

In the **SPC Bridge Web interface**, login and select **SPC ->SPC Communication** and fill in the form according to:

#### SPC Communication

Configuration of FlexC, to be able to communicate with the Vanderbilt SPC Panel. The values must match the settings in the SPC Panel.

#### FlexC Settings

<b>ATP Encryption Key</b>	Encryption Key (leave blank if you don't want to change it)	
<b>SPT Account Code</b>	999	^ v
<b>RCT ID</b>	1	^ v
<b>RCT TCP Port</b>	52000	^ v
<b>SPC Username</b>	spcbridge	
<b>SPC Password</b>	Password (leave blank if you don't want to change it)	

Save

Element	Description
ATP Encryption Key	ATP Encryption Key. 64 hex numbers (0-9, a-f, A-F). Must match corresponding key in SPC Panel FlexC settings. (Default key: 000011112222...ddddeeeeffff) <b>NOTE!</b> Of security reason a saved encryption key is never shown again. Just leave the field blank if you don't want to change the key.

SPC Account Code	ATP Account Code. Must match corresponding key in SPC Panel FlexC settings.
RCT ID	RCT Id. Must match corresponding id in SPC Panel FlexC settings.
RCT TCP Port	RCT TCP Port. Must match corresponding value in SPC Panel FlexC settings.
SPC Username and Password	<p>Credentials for FlexC communication. User must be defined in the SPC Panel and have a corresponding web password.</p> <p>Valid username: max 16 characters, not including space, double quotes, backslash or tilde characters.</p> <p>Valid password: max 16 characters, not including space, double quotes, backslash or tilde characters.</p> <p><b>NOTE!</b> Of security reason a saved password is never shown again. Just leave the field blank if you don't want to change the password.</p>

### 4.3 SPC Communication Test

To be sure that the communication between SPC Bridge and SPC panel is working properly you can use the tests provided in **SPC ->SPC Communication Test**. In the option menu you can choose between query SPC areas, zones or the system log.

#### SPC Communication Test

Test Case

GET SPC Areas

Raw JSON Reply

```
{
  "area_status": [
    {
      "area_id": "1",
      "area_name": "Area 1",
      "mode": "0",
      "partseta_enable": "1",
      "partsetb_enable": "1",
      "partseta_name": "Partset A",
      "partsetb_name": "Partset B",
      "last_set_time": "1573225019",
      "last_set_time_spc": "13565908112019",
      "last_set_user_id": "1",
      "last_set_user_name": "Gol",
      "last_unset_time": "1573225044",
      "last_unset_time_spc": "13572408112019",
      "last_unset_user_id": "1",
      "last_unset_user_name": "Gol",
      "last_alarm": "1573225178",
      "last_alarm_spc": "13593808112019",
      "internal_bells": "0",
      "external_bells": "0"
    },
    {
      "area_id": "2",
      "area_name": "Area 2",
      "mode": "0",
      "partseta_enable": "0",
      "partsetb_enable": "0",
      "last_set_time": "1573225009",
      "last_set_time_spc": "13564908112019",
      "last_set_user_id": "1",
      "last_set_user_name": "Gol",
      "last_unset_time": "1573225044",
      "last_unset_time_spc": "13572408112019",
      "last_unset_user_id": "1",
      "last_unset_user_name": "Gol",
      "internal_bells": "0",
      "external_bells": "0"
    }
  ]
}
```

Formatted Example

Area ID	Area Name	Mode	Last Set	Last Unset	Last Alarm
1	Area 1	Unset	2019-11-08 15:56:59 [Gol]	2019-11-08 15:57:24 [Gol]	2019-11-08 15:59:38
2	Area 2	Unset	2019-11-08 15:56:49 [Gol]	2019-11-08 15:57:24 [Gol]	-

### 4.4 Modbus TCP Server

#### Modbus TCP Server

Modbus Server Port

502

Allowed Modbus Client

0.0.0.0

For increased security, set IP address of allowed Modbus Client.  
Default value 0.0.0.0 allows any Client to connect.

Save

Element	Description
---------	-------------

Modbus Server Port	The port the Modbus Client should use for connection to SPC Bridge Modbus. Default value is 502.
Allowed Modbus Client	IP Address of Modbus Client allowed to connect to SPC Bridge Modbus. Default value 0.0.0.0 allows any Client to connect.

**NOTE!** Of security reason, it is highly recommended to set the IP address of the Modbus Client in **Allowed Modbus Client**.

## 4.5 Modbus Datapoints

**Interface -> Modbus Datapoints** shows the current values of the Modbus datapoints and can be used for troubleshooting. The objects are divided in following categories:

- Com Status
- SPC Area Arm Status
- SPC Area Status
- SPC Zone Input States
- SPC Zone Status
- SPC Area Commands
- SPC Zone Commands

See section **5.3 Modbus Register Map** for the datapoints details.

## Modbus Datapoints

SPC Area Arm Modes ↻

Register	Address	Description	Value	Format	Access
10272	271	Area 1 unset	0	BOOL	Read only
10273	272	Area 1 partset A	0	BOOL	Read only
10274	273	Area 1 partset B	0	BOOL	Read only
10275	274	Area 1 fullset	1	BOOL	Read only
10276	275	Area 1 intrusion alarm	0	BOOL	Read only
10277	276	Area 1 fire alarm	0	BOOL	Read only
10278	277	Area 1 tamper alarm	0	BOOL	Read only
10279	278	Area 1 confirmed alarm	0	BOOL	Read only
10282	281	Area 2 unset	1	BOOL	Read only
10283	282	Area 2 partset A	0	BOOL	Read only

Element	Description
Register	Modbus register number
Address	Modbus relative address (decimal)
Description	Datapoint description
Value	Current value
Format	BOOL (0/1) or UINT16 (16 bits unsigned integer)

Access	Read only: Modbus client is only allowed to read the value Write only: Modbus client is allowed to change the value. (Read is not supported)
--------	---

## 4.6 System Info

**System -> System Info** shows some basic information about the SPC Bridge hardware and software.

### System Info

System Name	dragino-18c950
Firmware Version	OpenWrt Chaos Calmer 15.05.1
Product Version	1.0-1
Uptime	93 days 04:58:22
Local Time	Mon Nov 18 2019 16:36:47 GMT+0100
Load Average	0.00 0.00 0.00
Total Memory	61124 kB
Free Memory	18568 kB

## 4.7 System User

To change the password for the SPC Bridge user (spcbridge) go to **System -> User** and enter a new password twice. **Note!** Username is not possible to change.

### User Credentials

Username	spcbridge
New Password	Password
Retype Password	Password
<input type="button" value="Save"/>	

## 5 Modbus Communication

### 5.1 Modbus Function Codes

SPC Bridge Modbus supports following function codes:

Function Code	Description	Max Consecutive Values in reply
02	Read discrete inputs (1x). Value type: 1-bit (0 or 1) (BOOL)	2000
03	Read holding registers (4x). Value type: unsigned 16 bits integer (UINT16)	125
04	Read input registers (3x). Value type: unsigned 16 bits integer (UINT16)	125
06	Write a single holding register (4x). Value type: unsigned 16 bits integer (UINT16)	-

### 5.2 Modbus Error Codes

SPC Bridge Modbus can reply with following errors:

Error Code	Name	Description
1	Illegal Function	The function code received in the query is not allowed by the Modbus server
2	Illegal Data Address	The data address (register number) received in the query is not an allowed address for the Modbus server. If multiple registers were requested, at least one was not permitted.
3	Illegal Data Value	The value contained in the query's data field is not acceptable to the Modbus server.

### 5.3 Modbus Register Map

#### 5.3.1 Register Types

SPC Bridge Modbus use following Modbus Registers:

Register	Modbus Address Range	Description
Discrete Input (1x)	0 - 430	Discrete inputs. Value type: 1 bit (0 or 1) (BOOL)
Input Register (3x)	0 - 350	Input registers. Value type: unsigned 16 bits integer (UINT16)
Holding Register (4x)	0 - 24	Holding register. Value type: unsigned 16 bits integer (UINT16)

#### 5.3.2 Communication Status

Following data are available:

Register Number	Modbus Address	Name	Values	Format	Access
30001	0	SPC com status	0 = SPC communication is under initialization (datapoint values are not reliable), 1 = SPC communication is OK, 2 = SPC communication has failed (datapoint values are not reliable)  To test SPC communication please see section 4.3.	UINT16	Read only

30002	1	Area command reply status	0 = Last area command succeeded, 1-255 = Area command failed error code.  Codes are listed in section 7.1 SPC Command Error Codes.	UINT16	Read only
30003	2	Zone command reply status	0 = Last zone command succeeded, 1-255 = Zone command failed error code.  Codes are listed in section 7.1 SPC Command Error Codes.	UINT16	Read only

### 5.3.3 SPC Area Commands

Common for all SPC areas following commands will be available:

Register Number	Modbus Address	Name	Values	Format	Access
40012	11	Area unset command	ID of area to unset  The success/error of the command is reported in "Area command reply status".	UINT16	Read/Write
40013	12	Area partset A command	ID of area to partset A  The success/error of the command is reported in "Area command reply status".	UINT16	Read/Write
40014	13	Area partset B command	ID of area to partset B  The success/error of the command is reported in "Area command reply status".	UINT16	Read/Write
40015	14	Area fullset command	ID of area to fullset (immediately)  The success/error of the command is reported in "Area command reply status".  The fail to set reason is reported in "Area fail to set reason"	UINT16	Read/Write
40016	15	Area delayed fullset command	ID of area to fullset when exit time has expired  The success/error of the command is reported in "Area command reply status".  The fail to set reason is reported in "Area fail to set reason" (after exit time has expired or been canceled)	UINT16	Read/Write

Area ID = 1 to maximum number of areas (16).

### 5.3.4 SPC Zone Commands

Common for all SPC zones following commands will be available:



Register Number	Modbus Address	Name	Values	Format	Access
40022	21	Zone inhibit command	ID of zone to inhibit  The success/error of the command is reported in "Zone command reply status".	UINT16	Read/Write
40023	22	Zone deinhibit command	ID of zone to deinhibit  The success/error of the command is reported in "Zone command reply status".	UINT16	Read/Write
40024	23	Zone isolate command	ID of zone to isolate  The success/error of the command is reported in "Zone command reply status".	UINT16	Read/Write
40025	24	Zone deisolate command	ID of zone to deisolate  The success/error of the command is reported in "Zone command reply status".	UINT16	Read/Write

Zone ID = 1 to maximum number of zones (256).

### 5.3.5 SPC Area Arm Status

For each SPC area following arm status will be available:

Relative Register Number *	Relative Modbus Address **	Name	Values	Format	Access
+1	+1	Area X unset	0 = Area is not unset, 1 = Area is unset (disarmed)	BOOL	Read only
+2	+2	Area X partset A	0 = Area is not partset A, 1 = Area is partset A	BOOL	Read only
+3	+3	Area X partset B	0 = Area is not partset B, 1 = Area is partset B	BOOL	Read only
+4	+4	Area X fullset	0 = Area is not fullset, 1 = Area is fullset (armed)	BOOL	Read only
+5	+5	Area X intrusion alarm	0 = Area has no intrusion alarm ***, 1 = Area has at least one intrusion alarm ***	BOOL	Read only
+6	+6	Area X fire alarm	0 = Area has no fire alarm ****, 1 = Area has at least one fire alarm ****	BOOL	Read only
+7	+7	Area X tamper alarm	0 = Area has no tamper alarm *****, 1 = Area has at least one tamper alarm *****	BOOL	Read only
+8	+8	Area X confirmed alarm	0 = Area has no confirmed alarm ***, 1 = Area has at least one confirmed alarm ***	BOOL	Read only
+9	+9	Not used			

+10	+10	Not used		
-----	-----	----------	--	--

X = 1 to maximum number of areas (16).

- \* Register number = 10271 + (X-1) \* 10 + 'relative register number'
- \*\* Modbus address = 270 + (X-1) \* 10 + 'relative modbus address'.
- \*\*\* Value is based on Alarm status for zone types Alarm, Exit/Entry, Glassbreak and Exit/Entry2.
- \*\*\*\* Value is based on Alarm status for zone type Fire.
- \*\*\*\*\* Value is based on Alarm status for zone type Tamper and Tamper status for all zone types.

**Example.**

Register Number	Modbus Address	Name
10272	271	Area 1 unset
10273	272	Area 1 partset A
10274	273	Area 1 partset B
10275	274	Area 1 fullset
10276	275	Area 1 intrusion alarm
10277	276	Area 1 fire alarm
10278	277	Area 1 tamper alarm
10279	278	Area 1 confirmed alarm
10280	279	Not used
10281	280	Not used
10282	281	Area 2 unset
10283	282	Area 1 partset A
10422	421	Area 16 unset
10423	422	Area 16 partset A
10429	428	Area 16 confirmed alarm
10430	429	Not used
10431	430	Not used

**5.3.6 SPC Area Status**

For each SPC area following area status will be available:

Relative Register Number *	Relative Modbus Address **	Name	Values	Format	Access
+1	+1	Area X unset user id	1 – 255 = SPC User ID of user who last unset the area, 0 = User Id is unknown  Will be updated every time Area mode changes to Unset and if value changes of other reason e.g at startup.	UINT16	Read only
+2	+2	Area X fullset user id	1 – 255 = SPC User ID of user who last fullset the area, 0 = User Id is unknown	UINT16	Read only

			Will be updated when Area mode changes to Fullset (and if value changes of other reason e.g at startup)		
+3	+3	Area X fail to set reason	<p>0 = Area fullset succeeded, 1 = Interlocked, 2 = Calendar was preventing area fullset, 100 (0x64) = An area was preventing area fullset, 101 (0x65) = A (open) zone was preventing area fullset, 102 (0x66) = An alert was preventing area fullset, 200 (0xC8) = Other reason was preventing area fullset</p> <p>Will be updated every time Area mode changes to new value and if value changes of other reason e.g at exit delay and startup.</p>	UINT16	Read only
+4	+4	Not used			
+5	+5	Not used			

X = 1 to maximum number of areas (16).

\* Register number = 30271 + (X-1) \* 5 + 'relative register number'

\*\* Modbus address = 270 + (X-1) \* 5 + 'relative modbus address'

**Example.**

Register Number	Modbus Address	Name
30272	271	Area 1 unset user id
30273	272	Area 1 fullset user id
30274	273	Area 1 fail to set reason
30275	274	Not used
30276	275	Not used
30277	276	Area 2 unset user id
30278	277	Area 2 fullset user id
30279	278	Area 2 fail to set reason
30280	279	Not used
30281	280	Not used
30347	346	Area 16 unset user id
30348	347	Area 16 fullset user id
30349	348	Area 16 fail to set reason
30350	349	Not used
30351	350	Not used

**5.3.7 SPC Zone Input States**

For each SPC zone (alarm input) following input value will be available:

Register Number	Modbus Address	Name	Values	Format	Access
10011 + X	10 + X	Zone X state	0 = Zone is Closed, 1 = Zone is Open	BOOL	Read only

X = 1 to maximum number of zones (256).

**Example.**

Register Number	Modbus Address	Name
10012	11	Zone 1 state
10013	12	Zone 2 state
10139	138	Zone 128 state
10267	266	Zone 256 state

### 5.3.8 SPC Zone Status

For each SPC zone (alarm input) following status value will be available:

Register Number	Modbus Address	Name	Values	Format	Access
30011 + X	10 + X	Zone X status	0 = OK, 1 = Inhibited, 2 = Isolated, 3 = Soak, 4 = Tamper, 5 = Alarm, 6 = OK, 7 = Trouble, 8 = Masked, 9 = Post Alarm	UINT16	Read only

X = 1 to maximum number of zones (256).

**Example.**

Register Number	Modbus Address	Name
30012	11	Zone 1 status
30013	12	Zone 2 status
30139	138	Zone 128 status
30267	266	Zone 256 status

## 6 Advanced Users

### 6.1 Backup of Configuration Settings

In **System Administration -> System -> Backup / Flash Firmware**, section **Backup / Restore**, you can save a backup copy of your settings on your PC and later use it to restore the settings.

### 6.2 Upgrading software

In **System Administration -> System -> Backup / Flash Firmware**, you can upgrade the firmware to a new version. The firmware/image file should have the name **dragino-spc-bridge-Modbus-vX.X.X-squashfs-sysupgrade.bin**. For minor upgrades you can keep your current settings by selecting **Keep settings**. For major upgrades it is preferable to not keep the settings, because they can be incompatible with the new firmware.

1. Copy the image file provided by Lundix to the desktop of your PC.
2. In SPC Bridge **System Administration GUI**, go to **System->Backup/Flash firmware**
3. Just to be sure, do a backup copy of your settings with **Download backup**
4. Under **Flash new firmware image**
  - Check **Keep settings** if you would like to preserve your current settings.
  - Select **Image** file. Select and open the new image file.
  - Click on **Flash image**. The file is now uploaded and verified. Click **Proceed** to continue the installation
5. Wait at least 5 minutes until the installation is finished. (LED Power is ON and LED LAN is ON or Blinking)
6. Go back to sign in page, sign in again and check the settings

### 6.3 SSH Access

The device has as default **ssh** access enabled. Login using username **root** and same password as in the System Administration GUI (default **dragino**). The settings for the SSH access can be changed in the **System Administration->System -> Administration**, section **SSH Access**.

### 6.4 Resetting the SPC Bridge

The SPC Bridge has a toggle button which can be used to reset the device. When the SPC Bridge is **running in normal mode**, you can use a paper clip or similar to press and hold the toggle button.

- If pressing the toggle button and hold it for **5 seconds**, it will reset the **network settings** and other settings will be kept.
- If pressing the toggle button and hold it for **30 seconds**, it will reset **ALL settings** to factory default

## 7 Appendices

### 7.1 SPC Command Error Codes

Error Code	Error Message
0	OK: Command succeeded
10	ERROR: Generic
11	ERROR: Unknown
12	ERROR: Missing ID
13	ERROR: Invalid ID
14	ERROR: Unknown Tag
15	ERROR: Memory Full
16	ERROR: Invalid Data
17	ERROR: Missing Data
18	ERROR: Invalid CRC
19	ERROR: Invalid Length
20	ERROR: Not ready
21	ERROR: Invalid Sequence No
22	ERROR: Invalid Decryption
23	ERROR: Invalid Connection Details
24	ERROR: Invalid Username
25	ERROR: Invalid Password
40	ERROR: Generic check failed
50	ERROR: Active
51	ERROR: Inactive
52	ERROR: Invalid User
53	ERROR: Invalid Number
54	ERROR: Authentication Failed
55	ERROR: Engineer Not Authorized
56	ERROR: Invalid Name
57	ERROR: Invalid Profile
58	ERROR: Invalid Site Code
59	ERROR: Invalid PIN
60	ERROR: Duplicate
61	ERROR: Invalid Card Number
62	ERROR: In use
63	ERROR: Global ID in use
64	ERROR: Global Data Protected
65	ERROR: No Rights
66	ERROR: System Set
67	ERROR: Cannot delete
68	ERROR: Cannot delete last
69	ERROR: Date
70	ERROR: Calendar
71	ERROR: Area
72	ERROR: Door
73	ERROR: Web password not enabled

74	ERROR: Null data
75	ERROR: Bad Command
76	ERROR: Pin Expired
77	ERROR: Blocked
78	ERROR: Not allowed in Engineer mode
79	ERROR: Cannot delete default profile
80	ERROR: Cannot edit default profile
100	ERROR: XML – Buffer Fail
101	ERROR: XML – Bad Format
102	ERROR: XML – Bad Data
103	ERROR: XML – Unknown Tag
104	ERROR: XML – Compulsory Parameter Not Found
120	ERROR: File – Fail
121	ERROR: File – No Space
122	ERROR: File –Not Found
123	ERROR: File – Header
124	ERROR: File – Flash
125	ERROR: File – Flash Verify
126	ERROR: File – Flash Erase
140	ERROR: HTTP – Compulsory Parameter Not Found
160	ERROR: SAM – WD Output
255	ERROR: SPC Communication error

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## 7.4 Open Source Hardware

The SPC Bridge hardware is based on the open source hardware Dragino, <http://www.dragino.com>. The Dragino hardware design is released under the **Creative Commons License**, <https://creativecommons.org/licenses/>. The modular Dragino design enables rapid development cycles for commercial products.

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