



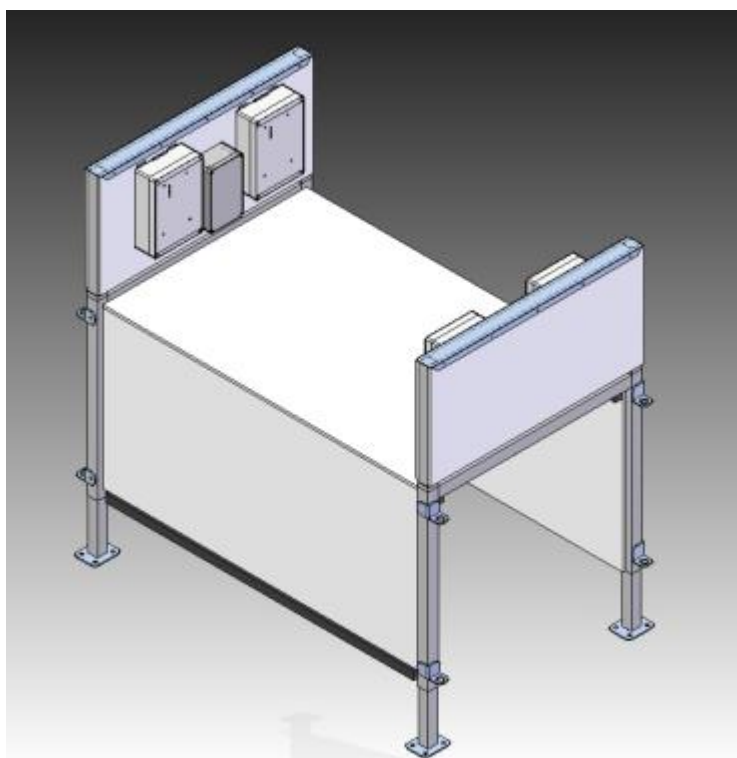
# Wide Lane Reader

## Installation Manual

**D02F1.1**

**WLR 70**

**Apr-2011**



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*This documentation applies to the product WLR manufactured by BioControl, Norway.*

*Documentation version 1.0 completely replaces previous versions.*

*Modifications since last documentation version:*

*1.0 Created document*

*1.1 Updated contents.*

**Note:**

All information in this document describes product and details 'as is'. BioControl can not be held liable for (consequences of) incorrect or missing information in this document. Check our website for latest version of this document and information on this product.

# 1 Contents

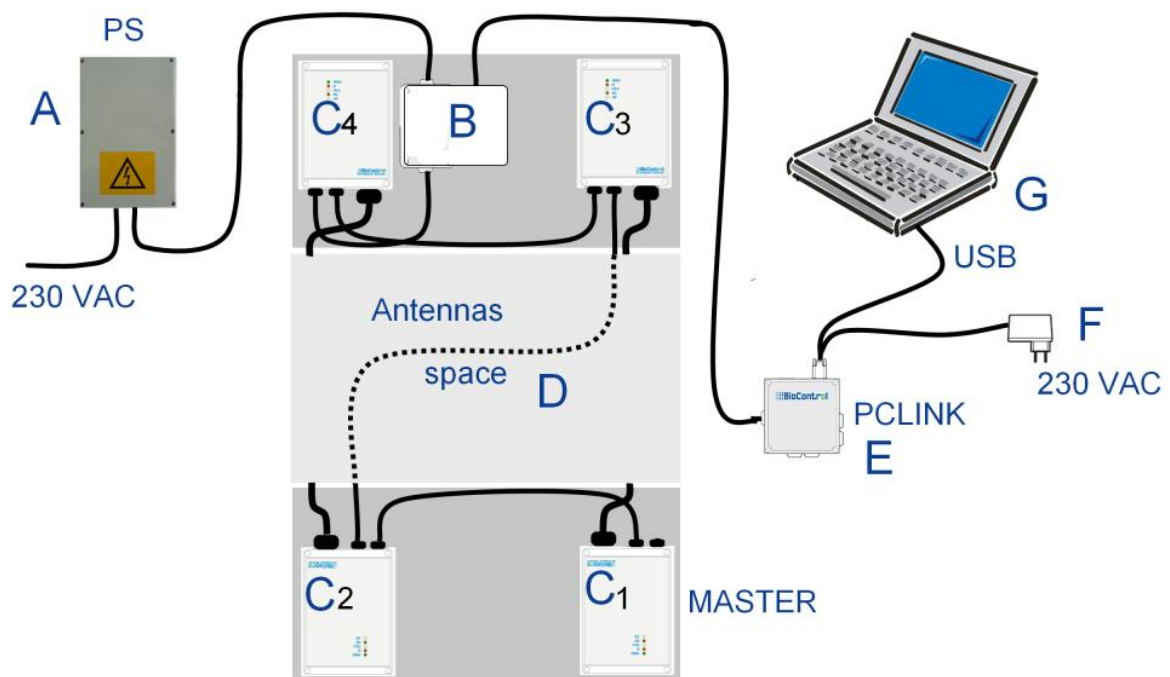
<b>1</b>	<b>Contents .....</b>	<b>3</b>
<b>2</b>	<b>General description.....</b>	<b>4</b>
<b>3</b>	<b>Installation .....</b>	<b>5</b>
3.1	Power supply.....	5
3.2	Stationary Readers SR3000.....	6
3.2.1	Connectors / dipswitches description .....	6
3.2.2	Set up node address.....	9
3.2.3	Settings of synchronization (Master/ Slaves) .....	10
3.2.4	Settings of RS485 bus .....	11
3.2.5	Dipswitch settings of SR3000 for WLR70 .....	12
3.3	PCLink.....	12
<b>4</b>	<b>Software update .....</b>	<b>14</b>
<b>5</b>	<b>Communication Protocol.....</b>	<b>16</b>
5.1.1	Communication settings.....	16
5.1.2	Communication between PCLink and host.....	16
5.1.3	Messages .....	17

## 2 General description

The robust Wide Lane Reader is designed for automatic sheep identification in high throughput applications such as livestock markets, sheep traders, finishers and abattoirs.

The WLR-70 is equipped with 4 well-proven BioControl SR3000 Stationary Readers and Antennae, each equipped with DSP-microprocessors for maximum RFID-performance.

The WLR-70 communicates with a host-PC through the PC Link hardware via USB. The on-board diagnostics software makes it easy to monitor the performance of all individual readers, essential for remote monitoring and maintenance.



**Figure 2.1.** System overview

**Table 2.1.** WLR70 description

	Description
A	Power supply – PS
B	Connection box
C	Stationary reader – SR3000
D	SR 3000 Antennas
E	PC-Link
F	Power supply for PC-Link
G	PC with USB port

## 3 Installation

The WLR-70 needs to be installed with care, paying attention to various factors that will reduce the performance of the system. Guidelines on installation and external forces that can affect the reader have been set out in this chapter to ensure optimum performance of the system.

- The WLR must be installed on hard standing, for example: concrete and it is recommended that it should be bolted to the ground.
- Make sure that there is no metal reinforcement in the concrete.
- Metal in proximity of the antennas (e.g. fences, pipes and metal loops) will cause damping or detuning and the performance of the reader system will be reduced.
- Mount the power supply a minimum of 3 meters away from the unit.
- The Antennae in the WLR need to be connected in a specific way. They are polarized and if they are connected incorrectly performance will be reduced.
- The flow of the animals needs to be managed.
- Hurdles/ gates should be attached to the custom built "eyes" in the front legs
- Cables must be properly routed through trunking or conduit to avoid damage.

RFID is susceptible to "noise" which can be generated from a variety of sources. It is not possible to list all of these sources here, but other readers, similar to the WLR, will interfere with each other and they should be sited a minimum of 50 meters from each other. Air compressors and generators can also cause "noise" and care should be exercised in the siting of these items. In some cases other measures may need to be used to eliminate the "noise" at source but this is very technical and cannot be covered in this instruction.

### 3.1 Power supply

**The Power supply is a critical factor in RFID. For the best performance use ONLY the original BioControl power supply shipped with the unit.**

The Input voltage is between 100-230 V AC. The customer is responsible for supplying a stable voltage supply and surge protection. The WLR requires +13.2V DC stabilized power.

**Note:** The Power Supply should be installed a minimum of 3 meters away from the unit! The power cable must be earthed.

## 3.2 Stationary Readers SR3000

The SR3000 is a Stationary Reader for ISO 11784/11785 transponders. It is equipped with DSP-Processor and an auto-tuning function which gives the unit a superior read range.

The Auto tuning system adapts the reader to its antenna and ensures optimum tuning at all times. There are two auto-tuning functions:

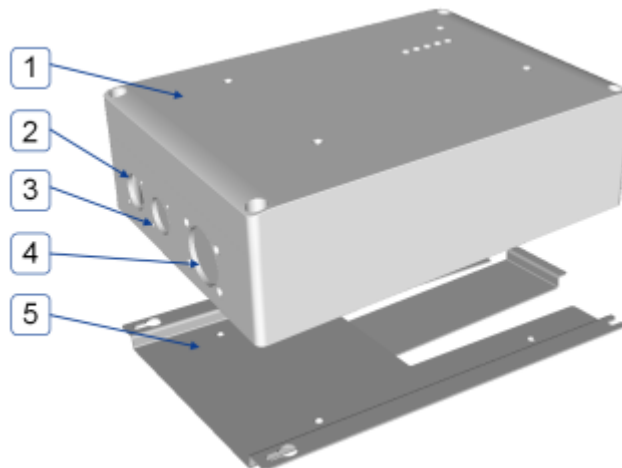
- The First auto tuning is during the first 5 seconds after power up. It is indicated by the three lower LED's and the charge HF LED. During tuning the three lower LED's are illuminated and the HF LED is blinking very fast. This tuning is done to adapt the reader to the connected antenna. This tuning adjusts for component tolerances, antenna tolerances and the fact that some metal will always be in proximity of the antenna.
- The Second auto tuning is carried out continuously to cope with changing ambient and circuit board temperatures. This ensures optimum performance throughout its operation.
- The fuse of SR3000 unit is a 5x20 mm slow glass fuse of 5A.

### 3.2.1 Connectors / dipswitches description

The SR3000 is installed in an IP 65 enclosure with clear RFID indicator lights and external connectors, one large 2-pole connector for the antenna, and two parallel 7-pin connectors for the power and signals (IN and OUT) for ease of installation.

Use only original BioControl cables to connect the readers to each other.

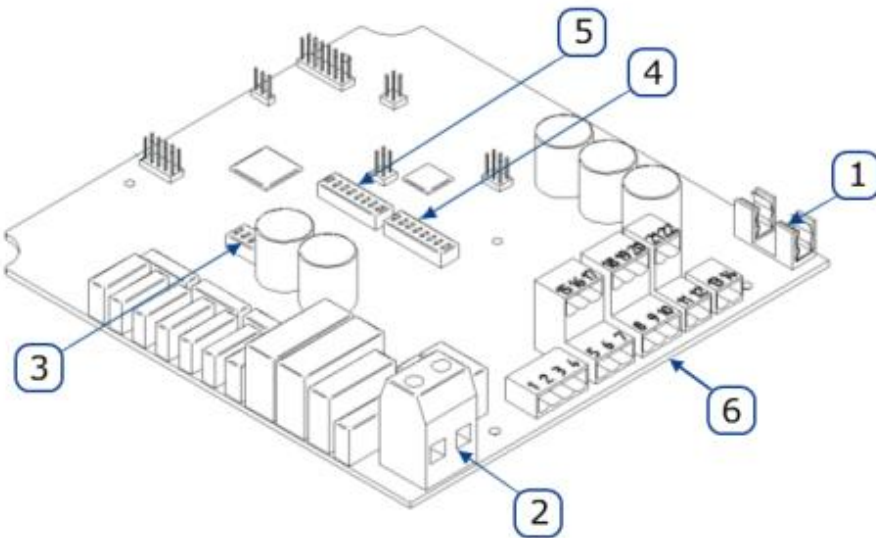
The readers are attached to the unit by brackets so they can be detached easily if necessary.



**Figure 3.1. SR3000 outside overview**

**Table 3.1. SR3000 outside description**

	Description
1	Stationary Reader
2	Amphenol IN connector
3	Amphenol OUT connector
4	Antenna connector
5	Metal bracket

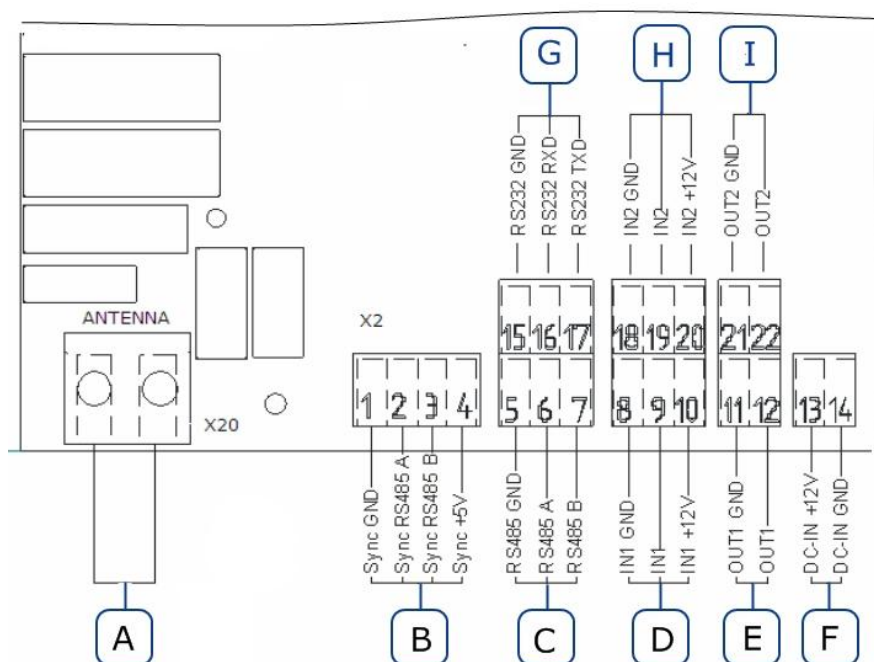


**Figure 3.2: SR3000 inside overview**

**Table 3.2: Description of SR3000 board**

	Component	Description
1	Fuse	F5A/250V slow
2	X20	Antenna connector
3	X11	Dipswitch for Master or Slave settings
4	X23	Dipswitch for node address and mode settings
5	X24	Dipswitch for communication settings
6	X2	Interface connectors

**Warning!** Do not touch the antenna connector X20 – it is charged and can give you an electric shock. Always switch off the power before opening the box.



**Figure 3.3: Interface connectors of SR3000 PCB overview**

**Table 3.3: SR3000 - Internal connections between Amphenol IN/OUT connector and interface connector -X2.**

Amphenol IN/OUT connector pin	Color	Description	SR3000 - X2 Interface	
			pin	connector
1	Yellow	RS485-A	6	C
2	Green	RS485-B	7	C
3	Pink	Sync A	2	B
4	Grey	Sync B	3	B
5	Blue and Red	+13,2V	13	F
6	White and Brown	GND	14	F
GND	Shield	GND		

**Table 3.4: Pin description of dipswitch X11**

X11.	
1	Sync power +5V
2	Sync ground
3	Master / slave
4	ON

**Table 3.5: Pin description of dipswitch X23**

X23	
1	Set address - bit 0
2	Set address - bit 1
3	Set address - bit 2
4	Set address - bit 3
5	For future use - OFF
6	Enables WLR option
7	For future use - OFF
8	Enable real time auto tuning

**Table 3.6: Pin description of dipswitch X24**

X24	
1	Enables RS232 - DSP - OFF
2	Enables RS232 - DSP - OFF
3	Enables RS485
4	Enables RS485
5	Enables RS232
6	Enables RS232
7	End resistor - Sync
8	End resistor - RS485



### 3.2.2 Set up node address

The first 4 micro switches on X23 set the node address. In the table below a "1" indicates that the switch is ON, "0" indicates that the switch is OFF, "X" indicates that the position of it is not relevant in setting the node address.

**Note:** The node address must be unique for each SR3000 unit. Configuration of node address is set independent of master / slave configuration. For WLR70 addresses must be set from 1 to 4.

**Table 3.7: Example settings of node address = 1**

X23. Node address		
1	1	Address bit 0
2	0	Address bit 1
3	0	Address bit 2
4	0	Address bit 3
5	X	
6	X	
7	X	
8	X	

**Table 3.8: Example settings of node address = 2**

X23. Node address		
1	0	Address bit 0
2	1	Address bit 1
3	0	Address bit 2
4	0	Address bit 3
5	X	
6	X	
7	X	
8	X	

**Table 3.9: Example settings of node address = 3**

X23. Node address		
1	1	Address bit 0
2	1	Address bit 1
3	0	Address bit 2
4	0	Address bit 3
5	X	
6	X	
7	X	
8	X	

**Table 3.10: Example settings of node address = 4**

X23. Node address		
1	0	Address bit 0
2	0	Address bit 1
3	1	Address bit 2
4	0	Address bit 3
5	X	
6	X	
7	X	
8	X	

### 3.2.3 Settings of synchronization (Master/ Slaves)

When using the WLR, synchronization of the HF-field is essential because two or more antennas are active within a relatively small distance. For this reason, each SR3000 unit is equipped with a synchronization line. **HF-synchronization requires one master, which triggers the HF-field; other readers must be set as slaves.** It does not matter where the master is (However it is recommended to set the SR3000 -1 as Master). The rest are slaves.

Master or slave configuration is set on the micro switch block X11. Follow the tables below for the settings. "1" indicates that the switch is ON. "0" indicates that the switch is OFF.

**Table 3.11: Set master**

X11. Set master		
1	1	Sync power +5V
2	1	Sync ground
3	0	Master / slave
4	1	ON


**Table 3.12: Set slave**

X11. Set slave		
1	1	Power
2	1	Ground
3	1	Master / slave
4	1	ON

An end resistor is necessary for error free bus communication and must be set for the first and the last SR3000 in the WLR70.

End resistor for synchronization is set on the micro switch block X24. Follow the tables below for settings. "1" indicates that the switch is ON. "0" indicates that the switch is OFF. "X" indicates that the position is not relevant for this setting.

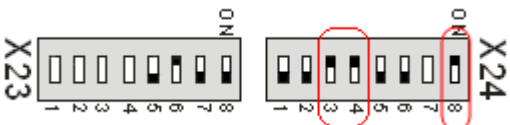
**Table 3.13: Set end resistor for the first and the last SR3000!**

X24. Settings		
1	X	Enables RS232 – DSP
2	X	Enables RS232 – DSP
3	X	Enables RS485
4	X	Enables RS485
5	X	Enables RS232
6	X	Enables RS232
<b>7</b>	<b>1</b>	<b>End resistor - synchronization</b>
8	X	End resistor - RS485

### 3.2.4 Settings of RS485 bus

RS485 is used to communicate between each reader and the PCLink. It is set on the micro switch block X24. Follow the tables below for settings. "1" indicates that the switch is ON. "0" indicates that the switch is OFF. "X" indicates that the position is not relevant for this setting.

**Table 3.14: Turn ON RS-485**

X24. Set RS-485		
1	X	Enables RS232 – DSP
2	X	Enables RS232 – DSP
3	1	Enables RS485
4	1	Enables RS485
5	0	Enables RS232 – Atmega
6	0	Enables RS232 – Atmega
7	X	End resistor - synchronization
8	1/0	<b>End resistor - RS485</b>

An end resistor is necessary for error free bus communication and **must be set only on the last SR3000!**

### 3.2.5 Dipswitch settings of SR3000 for WLR70

Example settings of Masters/slave and end resistor for both synchronization and RS485 bus are shown below for the Wide Lane Reader.

**Table 3.15: Dipswitch settings of SR3000 for WLR70-4.**

Node address	Master/Slave	End resistor for sync	RS485 bus	End resistor for RS485 bus
SR3000 -1	Master	ON	ON	OFF
SR3000 -2	Slave	OFF	ON	OFF
SR3000 -3	Slave	OFF	ON	OFF
SR3000 -4	Slave	ON	ON	ON

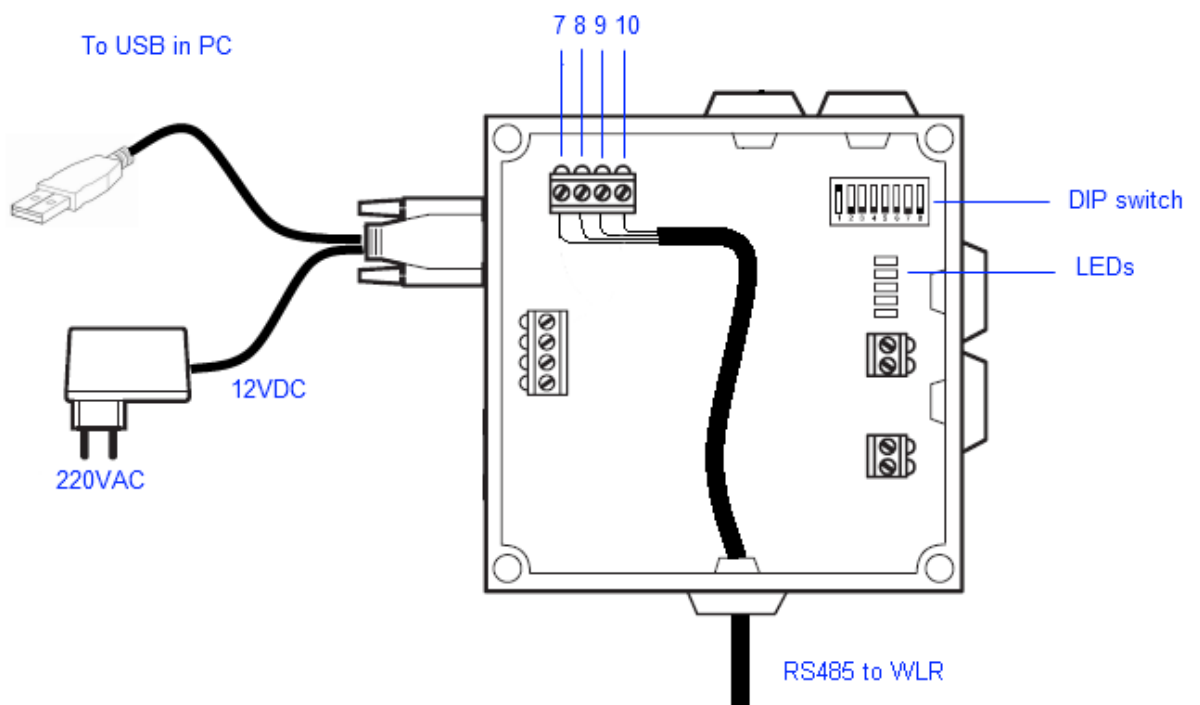
## 3.3 PCLink

The PCLink is a supervisor which pings all readers and sends the unique transponders that are read to the host PC.

The device is equipped with five LEDs to show different states, and DIP switches.

Connect the RS485 cable plug to the connection box in the WLR70 and USB to any free USB port on your PC.

If you have an internet connection - The Microsoft composite device driver will be automatically loaded in the background, if not you will be asked to display the drivers catalog on your PC.




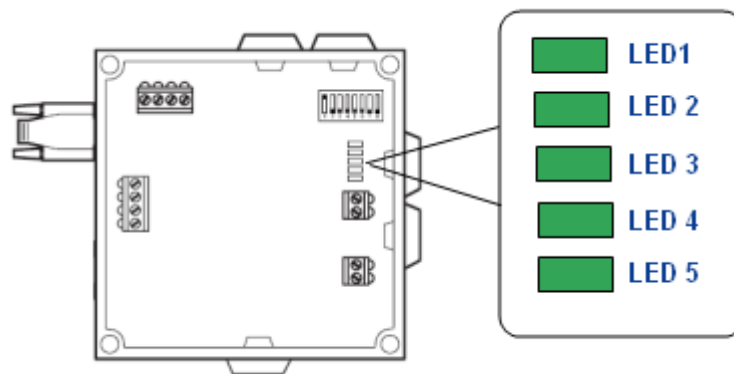
**Figure 3.4: PCLink overview**

**Table 3.16: Cable between SR 3000 and PCLink.**

Amphenol connector pin	Color	Description	PCLink board connector
1	Yellow	RS485-A	8
2	Green	RS485-B	9
3	Brown	+13,2V	10
4	White	GND	7

**Table 3.17: Dipswitch of PCLink**

DIP switch settings	ON 	
1	0/1	WLR70 / Programming mode
2	0/1	DEC/ HEX format
3	0/1	Error message OFF/ON
4	0/1	WLR70 / Service mode
5	X	For future use - OFF
6	X	For future use - OFF
7	0	End resistor
8	1	End resistor for RS485 - opto



**Figure 3.5: PCLink LEDs overview**

**Table 3.13: LED lights description in PCLink board**


LED number	Description
LED 1	Flashing when PCLink requests SR 3000 for transponder
LED 2	Flashing when PCLink receives data from SR3000
LED 3	Flashing when PCLink receives data from USB port
LED 4	Flashing when PCLink sends data to USB port
LED 5	Flashing every second when program is running.

## 4 Software update

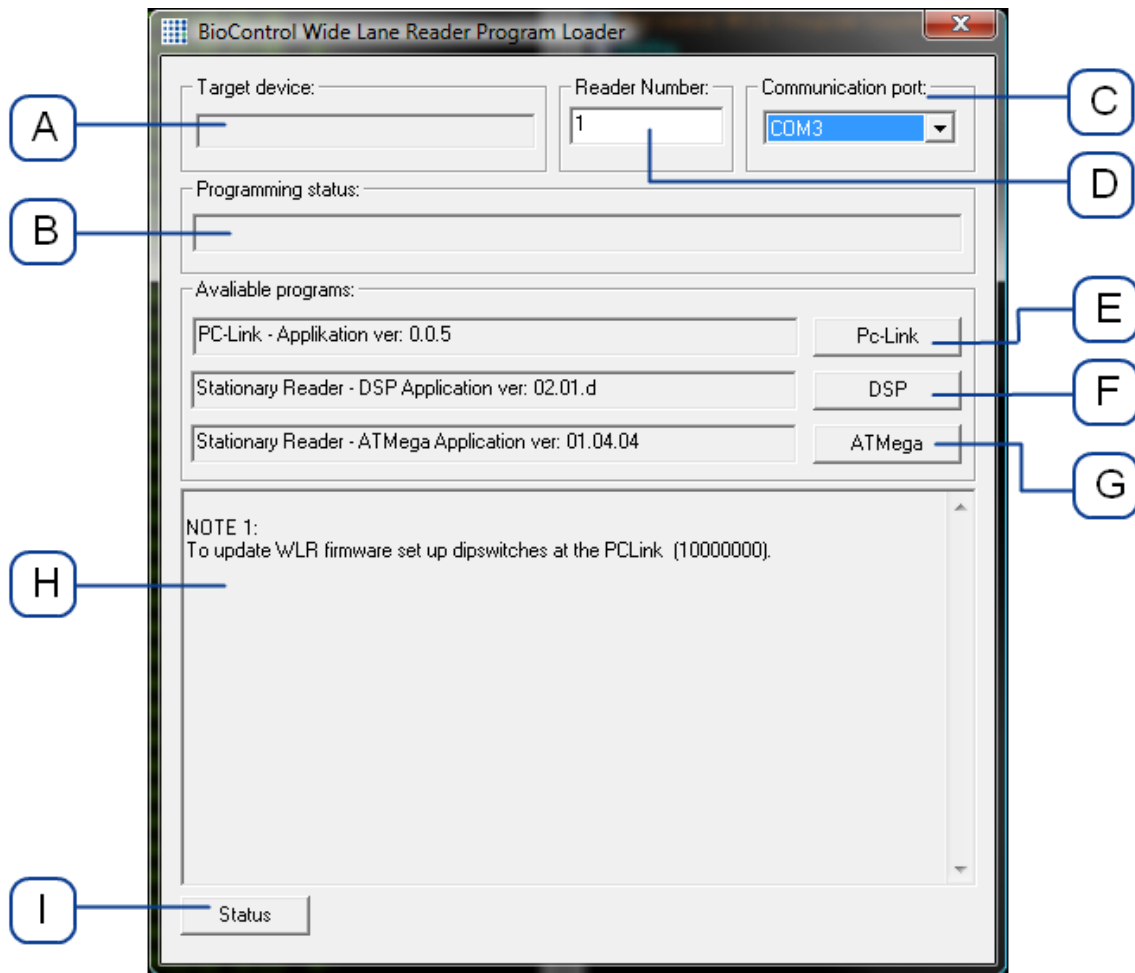
The latest versions of software can be found at [www.biocontrol.no](http://www.biocontrol.no)

To update the WLR software you have to set dipswitches of the PCLink as discribed below:

**Table 4.1: Dipswitch settings to update software in PCLink**

DIP switch settings	ON 	
1	1	Address of PCLink
2	0	Address of PCLink
3	0	Address of PCLink
4	0	Address of PCLink
5	0	Address of PCLink
6	0	Address of PCLink
7	0	End resistor
8	1	End resistor for RS485 - opto

- 1) Connect the PC-Link box into a free USB-port via the communication cable.
- 2) Start the latest version of the BioControl WLR Program Loader
- 3) Chose the correct COM port in the "Communication port" box (C)
- 4) To update the PCLink set up 1 in the box "Reader Number" (D)
- 5) Press button (E)- "PC-Link" to update the PCLink firmware and wait until "Programming status" (B) displays "success!"
- 6) To update Stationary Readers - SR3000, make sure that the "Reader Number" field (D) corresponds with the address of the SR3000 (from 1 to 4 )
- 7) press button (G) – "ATMega" and wait until "Programming status" displays "success!"
- 8) Press button (F) – "DSP" and wait until "Programming status" shows "Application program version x.x.x, DSP program version x.x.x, Voltage=xxx Tuning=xx"
- 9) To update the software in the next reader, repeat steps 6-9.



To check current program versions of the WLR70 (Stationary Readers and PCLink) press button (I) "Status". Results will be displayed in the dialog box (H).

If there any problems with COM ports, close the Program Loader and run it again.

## 5 Communication Protocol

### 5.1.1 Communication settings

The following settings are used for the communication between the PCLink and the host PC via a virtual com port:

**Table 5.1: Communication settings**

Parameter	Value
Baud rate	115200 bit/s
Data bits	8
Parity	None
Stop bits	1
Flow control	None

### 5.1.2 Communication between PCLink and host

The messages to the PCLink are sent as hexadecimal values coded in ASCII. Each hexadecimal value can be in the range 0x00 to 0xFF, thus two ASCII characters are needed for each value sent. Each frame starts with a colon `:`, ASCII 0x3A and ends with a semicolon `;`, ASCII 0x3B. One frame consists of the following items:

<b>Start character</b>	At least one colon as the start character
<b>Destination address</b>	Two ASCII characters defines the destination address
<b>Source address</b>	Two ASCII characters defines the source address
<b>Message type</b>	Two ASCII characters. See table below
<b>Information</b>	Optional
<b>Checksum</b>	The binary sum of all characters, starting with the destination address, ending with the last character before the checksum itself.
<b>Stop character</b>	One semicolon

The checksum is calculated by adding the ascii value of all characters, starting with the destination address, ending with the character in front of the checksum itself:

ASCII value of `f` is 0x46

ASCII value of `8` is 0x38

ASCII value of `0` is 0x30

Etc

When the sum of all the ASCII values are calculated, the least significant byte of the calculation is converted into ASCII and added to the end of the message.

**Note:** Be aware that uppercase letters and lowercase letters have different ASCII values. Thus the checksum will differ for a message if the case is changed!

e.g. `::01f8005f;` or `::01F8003F;`



### 5.1.3 Messages

The following messages are implemented:

**Table 5.2: Messages sent to the PCLink**

Message	Description
00	STOP continuous ping
01	START continuous ping (default)
02	Set service mode
03	Set WLR70 (default)
05	Set transponder format as decimal
06	Set transponder format as hexadecimal
25	Set number of SR 3000 readers
27	Full auto tuning in all SR 3000 readers
0c	Request system parameters
0e	Clear transponders buffers
50	Go to Programming Mode (SR3000)
51	Go to Programming Mode (PCLink)

**Table 5.3: Messages/rapports received from the PCLink\***

Message*	Description
STOP	Confirmation of the '00' message
START	Confirmation of the '01' message
TEST MODE ON	Confirmation of the '02' message
STANDARD MODE ON	Confirmation of the '03' message
CLEAR	Confirmation of the '0e' message
NUMBER OF READERS nn	Confirmation of the '25' message (nn – number of readers)
HEX FORMAT	Confirmation of the '06' message
DEC FORMAT	Confirmation of the '05' message
Rapports	Description
<i>[No response]</i>	Information about the lack of response from the reader (checked every 30s!)
<i>[return system parameters]</i>	Information about all system parameters
<i>[transponder as dec format]</i>	e.g.: "942000001054597"
<i>[transponder as hex format]</i>	e.g. "8000EB8000101785"

\* Every message from WLR is an ASCII string/strings and ends with "\r\n" (ASCII 0x0d, 0x0a)

### 5.1.3.1 Example (00): STOP the continuous ping of SR 3000

The message "STOP the continuous ping" sent to the PCLink with address 01 from the host PC with address 0xF8 is:

**::01f8005f;**

:: Start characters  
01 Destination address  
f8 Source address (the host)  
00 Message type, STOP  
5f The checksum  
; The stop character

The WLR will confirm with "STOP"\*.

### 5.1.3.2 Example (01): START the continuous ping of SR 3000 (default)

The message "START the continuous ping" sent to the PCLink with address 01 from the host PC with address 0xF8 is:

**::01f80160;** or **::01F80140;**

:: Start characters  
01 Destination address  
F8 Source address (the host)  
01 Message type, START  
40 The checksum  
; The stop character

The WLR will confirm with "START"\*.

### 5.1.3.3 Example (02): Set service mode

The message "Set service mode" sent to the PCLink with address 01 from the host PC with address 0xF8 is:

**::01f80261;**

:: Start characters  
01 Destination address (the reader)  
f8 Source address (the host)  
02 Message type, Set test mode  
61 The checksum  
; The stop character

The WLR will confirm with "TEST MODE ON"\*.

#### 5.1.3.4 Example (05): Set transponder format as decimal

The message "Set transponder format as decimal" sent to the PCLink with address 01 from the host PC with address 0xF8 is:

**::01f80564;**      or      **::01F80544;**

::    Start characters  
01    Destination address (the reader)  
F8    Source address (the host)  
05    Message type, Set transponder format as decimal  
44    The checksum  
;     The stop character

The WLR will confirm with "DEC FORMAT"\*.

#### 5.1.3.5 Example (06): Set transponder format as hexadecimal

The message "Set transponder format as hexadecimal" sent to the PCLink with address 01 from the host PC with address 0xF8 is:

**::01f80665;**      or      **::01F80645;**

::    Start characters  
01    Destination address (the reader)  
F8    Source address (the host)  
06    Message type, Set transponder format as hexadecimal  
45    The checksum  
;     The stop character

The WLR will confirm with "HEX FORMAT"\*.

#### 5.1.3.6 Example (0e): Clear all transponder's buffers

The message "Clear all transponder's buffers" sent to address 01 from address 0xF8 is:

**::01f80e94;**

::    Start characters  
01    Destination address (the reader)  
F8    Source address (the host)  
0e    Message type, Clear all transponder's buffers  
94    The checksum  
;     The stop character

The WLR will confirm with "CLEAR"\*.

#### 5.1.3.7 Example (25): Set number of SR 3000 readers

The message "sets number of SR 3000 readers" sent to the PCLink with address 01 from the host PC with address 0xF8 is:

```
::01f8250463;   or  
  
::   Start characters  
01   Destination address (the reader)  
F8   Source address (the host)  
25   Message type, Set number of readers  
04   Readers 4  
64   The checksum  
;    The stop character
```

The WLR will confirm with "NUMBER OF READERS 04".

#### 5.1.3.8 Example (27) Full auto tuning in all SR 3000 readers

The message "Full auto tuning in all SR 3000 readers" sent to the PCLink with address 01 from the host PC with address 0xF8 is:

```
Open exit 1:  
::01f8250362;   or  
  
::   Start characters  
01   Destination address (the reader)  
F8   Source address (the host)  
25   Message type, Set number of readers  
03   Readers 3  
62   The checksum  
;    The stop character
```

The WLR will confirm with ""\*.

#### 5.1.3.9 Example (0C): Request system parameters

The message "Request system parameters" sent to the PCLink with address 01 from the host PC with address 0xF8 is:

```
::01f80c92;     or     ::01F80C52;  
  
::   Start characters  
01   Destination address (the reader)  
F8   Source address (the host)  
0C   Message type, Request system parameters  
52   The checksum  
;    The stop character
```

---

The WLR will send a report with the parameters of all readers (e.g. two readers):

*\*\* Wide Line Reader - BioControl AS \*\**

*Application program version 00.02.00*

*Transponder format = HEX*

*Number of Readers = 02*

*STANDARD MODE ON*

*START*

*\*\* Reader address: 01 \*\**

*Application program version: 01.04.01*

*DSP program version: 01.17.g*

*Antenna Voltage = 361[V], Tuning = 023*

*Readings = 013*

*\*\* Reader address: 02 \*\**

*Application program version: 01.04.01*

*DSP program version: 01.17.g*

*Antenna Voltage = 367[V], Tuning = 018*

*Readings = 025*

*\*\* END \*\**

### 5.1.3.10 Descriptions of reports from WLR

**[return system parameters]** - Information about all system parameters:

**\*\* Wide Line Reader - BioControl AS \*\***

<i>Application program version 00.02.00</i>	- Version of PC-Link program.
<i>Transponder format = HEX</i>	- current transponder format.
<i>Number of Readers = 03</i>	- Number of readers in the system.
<i>STANDARD MODE ON</i>	- current working mode.
<i>START</i>	- START the continuous asking .

Parameters of Stationary Readers:

**\*\* Reader address: 03 \*\***

<i>Application program version: 01.04.02</i>	- Version of ATmega program.
<i>DSP program version: 01.17.g</i>	- Version of DSP program.
<i>Antenna Voltage = 263[V], Tuning = 026</i>	- Antenna's parameters
<i>Readings = 051</i>	- Number of readings not repeated transponders since reset

**[No response]** - Information about the lack of response from the reader (checked every 30s!)

**\*\* Reader address: 02 \*\***

*No response!*

- Address of reader.  
- Reader does not answer.

**[transponder as dec format]\***

e.g.: "942000001054597"

**[transponder as hex format]\***

e.g. "8000EB8000101785"

\* Every message from the WLR is an ASCII string/strings and ends with "\r\n" (ASCII 0x0d, 0x0a)