Arctic Control Hardware Manual

Arctic Control (2320, 2321)

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Declaration of Conformity

(according to ISO/IEC Guide 22 and EN 45014)

Manufacturer's Name: Viola Systems Ltd.

Manufacturer's Address:

Lemminkäisenkatu 14-18 B

FI-20520 Turku

Finland

declares that this product:

Product Name:

Arctic Control

conforms to the following standards:

EMC:

EN 55022 Emission Test (Class A)

1. Radiated Emissions (30-1000MHz)
2. Conducted Emissions (0.15-30MHz)

EN 50082-1 Immunity Test

1. IEC 801-3: Radio Frequency Electromagnetic Field
2. IEC 801-2: Electrostatic Discharge
3. IEC 801-4: Fast Transients, AC Power Ports and Signal cables

Supplementary Information:

"The product complies with the requirements of the Low Voltage Directive 73/23/EEC and EMC directive 89/336/EEC."

Note!
This is a Class A product. In a domestic environment this product may cause radio Interference which may make it necessary for the user to take adequate measures.

Manufacturer's Contact Information:

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Warranty and Safety Instructions

Read these safety instructions carefully before using the products mentioned in this manual:

Warranty will be void if the product is used in any way in contradiction with the instructions given in this manual or if the product has been tampered with.

The devices mentioned in this manual are to be used only according to the instructions described in this manual. Faultless and safe operation of the devices can be guaranteed only if the transport, storage, operation and handling of the devices is appropriate. This also applies to the maintenance of the products.

To prevent damage both the product and any terminal devices must always be switched OFF before connecting or disconnecting any cables. It should be ascertained that different devices used have the same ground potential. Before connecting any power cables the output voltage of the power supply should be checked.

This product is not fault-tolerant and is not designed, manufactured or intended for use or resale as on-line control equipment or as part of such equipment in any hazardous environment requiring fail- safe performance, such as in the operation of nuclear facilities, aircraft navigation or communication systems, air traffic control, direct life support machines, or weapons systems, in which the failure of Viola Systems manufactured hardware or software could lead directly to death, personal injury, or severe physical or environmental damage.

Revisions

Date	Document version	Firmware version	Description of changes
10/2009	1.04		Manual released
10/2010	1.1		Lay-out changed
7/2014	2.0		EDGE functionality added; updates to content

Contents

1 Introduction

1.1 About Arctic Control

Arctic Control is a controlling device for disconnector stations with integrated wireless communications. Arctic Control is used in direct remote control configurations of disconnectors.

1.2 Arctic Control features

The following are the features of Arctic Control:

- Controls three disconnectors and grounding separators
- Advanced charging and monitoring of external battery pack
- Measurement of disconnector transaction time and energy
- Software and hardware protection of disconnector faults
- Supports both local and remote disconnector control
- Easy LED display for disconnector and grounding status
- Full support for IEC-101 and IEC-104 protocols
- Support for external Medium Voltage (MV) load control and directional fault indication
- Support for external Multifunction LV metering for power quality parameters
- Redundant IEC-104 connections provide extra availability
- Inputs/Outputs in the default configuration:
  - 15 digital inputs for disconnector status control (5 per disconnector)
  - 6 relay outputs for open/close the disconnector (2 per disconnector)
  - 1 relay output for the load cut (motor protection)
  - 2 analog inputs: 1 for load measurement, 1 extra for other use
  - 1 relay output for test load of the battery test
  - 1 relay output for the external heater
  - 2 extra general purpose digital inputs for other use
  - 1 extra general purpose relay ouput for other use
- Total number of inputs / outputs: 17 digital in, 10 relay out and 2 analog in

1.3 Typical connection

Figure 1. *Connection digram 1*

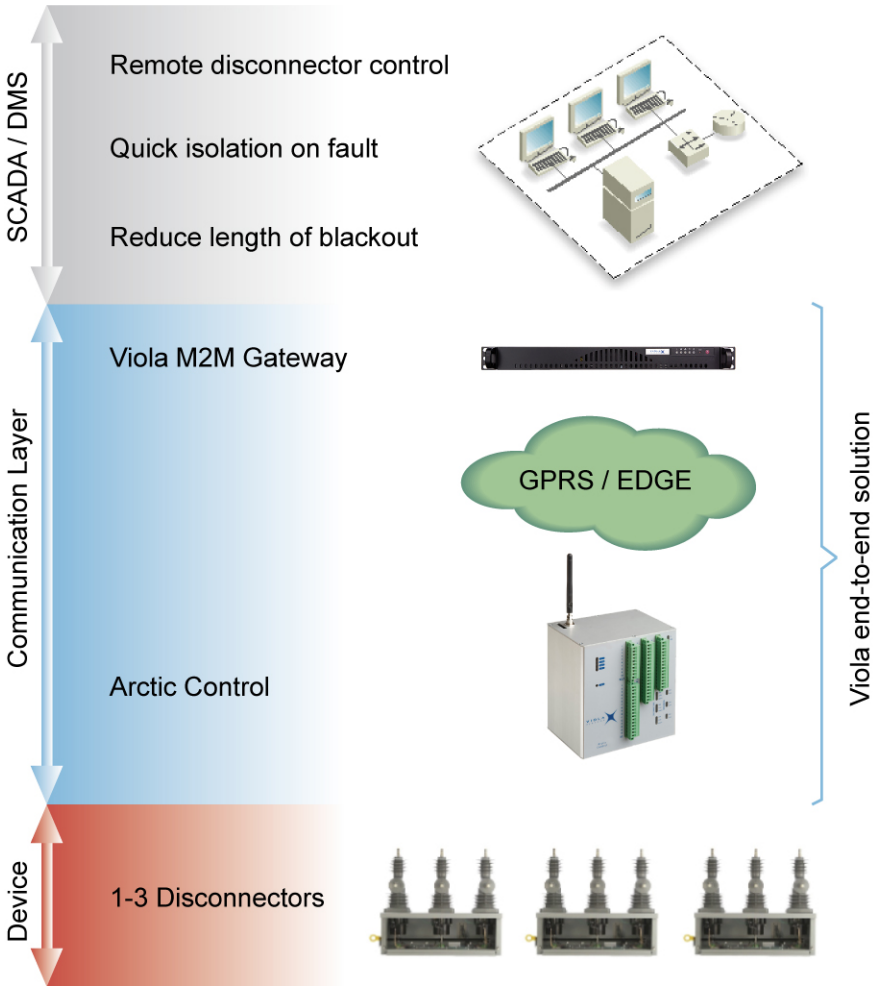
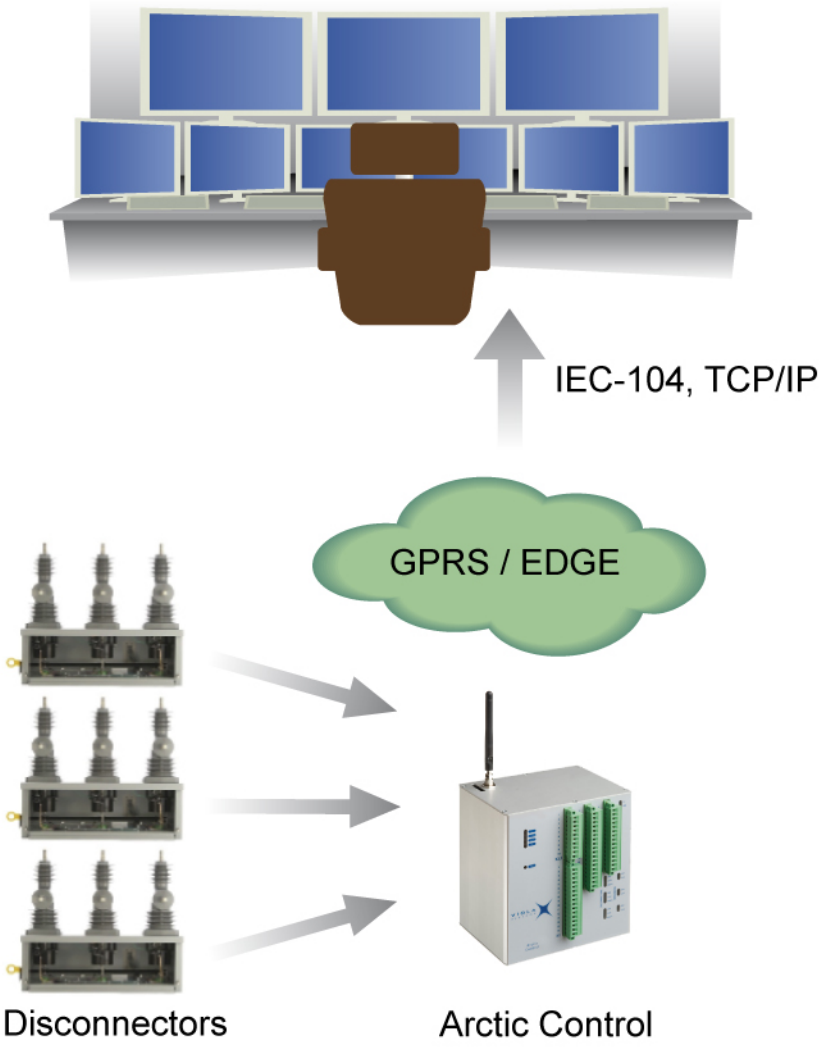


Figure 2. *Connection diagram 2*



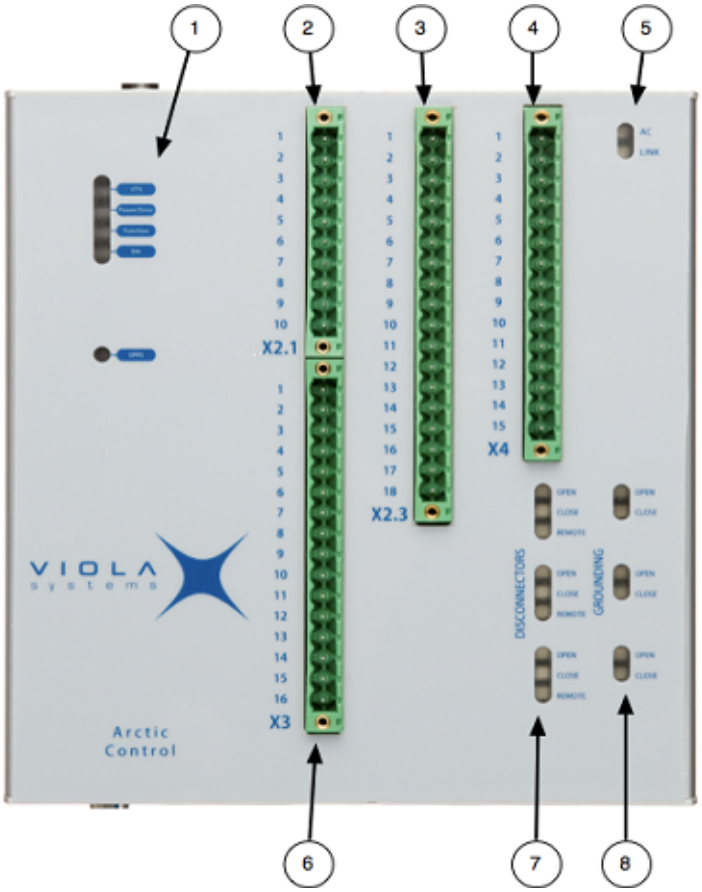
2 Hardware

This section describes the physical interfaces on Arctic Control.

2.1 Front panel

Arctic Control front panel is shown in figure 3.

Figure 3. *Front panel*



LEDs and connectors:

1. System status LEDs (section 2.4)
2. X2.1 connector
3. X2.3 connector
4. X4 connector
5. AC and LINK LEDs (section 3.5)
6. X3 connector
7. Disconnector status LEDs (section 3.5)
8. Grounding disconnector status LEDs (section 3.5)

2.2 Serial panel

Arctic Control serial panel is shown in figure 4.

Figure 4. *Serial panel*

Switches and connectors:

1. Serial port 1 (console or application port)
2. Power switch
3. Serial console switch
4. Serial port 2 configuration DIP switches
5. Serial port 2
6. Ethernet connector

2.3 Antenna panel

Arctic Control antenna panel is shown in figure 5.

Figure 5. *Antenna Panel*

Connectors:

1. SIM card tray
2. SIM card tray release button
3. Antenna connector (FME male)

2.4 System status LEDs

Arctic Control has 8 LEDs indicating the system status. They are located on the front panel.

Table 1: System status LED description

LED	State	Description
VPN	On Blink Off	VPN connection is up VPN connection is starting VPN connection is disabled
Power/Error	On Off	Operating power is turned on Operating power is turned off
Function	On Blink	Device is starting Device is operating normally
Eth	On Blink Off	Ethernet link is up Ethernet link is transferring data Ethernet link is down
GPRS	Blink	GPRS is starting or transferring data

LED	State	Description
	Off	GPRS is inactive

2.5 Networking

2.5.1 GPRS (product code 2320) and EDGE (product code 2321)

Arctic Control has a wireless functionality which allows the use of wireless applications. Arctic Control supports wireless data speed up to 86 kbit/s (GPRS version) or 236.8 kbit/s (EDGE version), however the practical data transfer rates depend on the subscription details and wireless network capacity.

Table 2: Wireless specifications

Network	Frequencies	Maximum data rate
GPRS class 10	850/900/1800/1900MHz	86 kbps downlink
EDGE class 10	850/900/1800/1900MHz	236.8 kbps downlink

The Arctic's antenna connector type is FME male. A SIM card with enabled data transfer is required for using the wireless connection. To install the SIM card:

1. Turn off the unit.
2. Gently push the yellow button in the SIM card slot to eject the SIM card tray.
3. Put the SIM card in the tray, andmake sure the SIM card is installed the right way (contacts facing inside the unit).
4. Insert the tray carefully back to the holder and press the tray until it is locked.

Note!
It is not recommended to insert or remove the SIM card while the device is turned on.

2.5.2 Ethernet

Arctic Control has an RJ45 connector for 10/100 Mbps Ethernet connection. Maximum length of the Ethernet cable is 100m.

Figure 6. *Ethernet Connector*

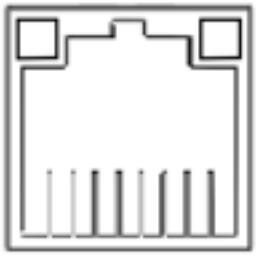


Table 3: Ethernet Port Configuration

Number of ports	1
Speed	10Base-T, 100Base-TX
Duplex	Half and Full
Auto-negotiation	No
Recommended cabling	Cat5e or better

Note!
The cross-connected cable is only for connecting the Arctic to the network interface of a PC. When connecting to a local network (e.g. hub or switch), a direct Ethernet cable must be used.

2.6 Serial port

Arctic Control has two application serial ports. Serial port 1 is configurable to either console or data mode and supports only RS-232, while serial port 2 is configurable to multiple serial modes (RS-232/422/485). Serial port connectors are 9-pin D-sub (male) connectors. Serial ports enact as DTE devices.

2.6.1 Console/Serial port 1

Console Switch enables or disables console access. When the switch is in the right position, serial port 1 is in serial port mode and when in the left position, serial port 1 is in console mode.

Figure 7. *Console/RS1 port connector*

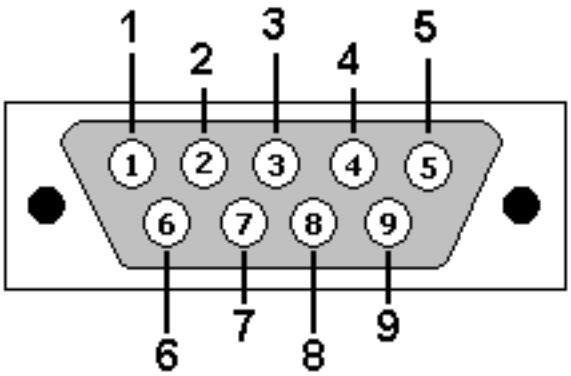


Table 4: Console/RS1 port pinout

PIN	Function
1	DCD
2	RXD
3	TXD
4	DTR
5	GND
6	DSR
7	RTS
8	CTS
9	RI

Table 5: Console/RS1 port configuration

Parameter	Value
Baud rate	300 . . . 230400 (console 19200)
Data bits	8
Parity	No parity
Stop bits	1
Flow control	No flow control

Console switch is located below serial port 1 connector. Power off the Arctic before toggling the console switch as the switch position is only read during the boot sequence. Baudrate is fixed to 19200 when port is configured in serial console mode.

2.6.2 Serial port 2

Serial port 2 is configurable to multiple serial formats (RS-232/422/485). Default is RS-232.

Figure 8. *Application serial port*

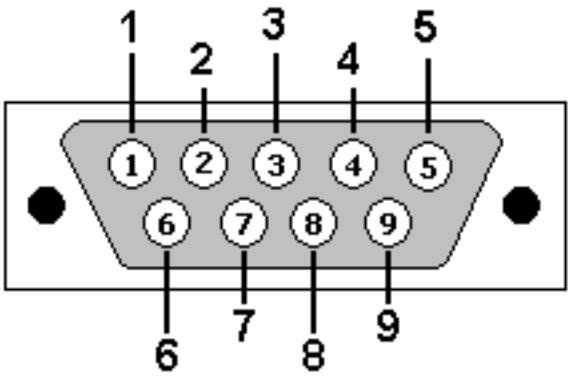


Table 6: Application serial port Pinout (RS-232)

PIN	Function
1	DCD
2	RXD
3	TXD
4	DTR
5	GND
6	DSR
7	RTS
8	CTS
9	RI

Table 7: Application serial port Configuration

Parameter	Value
Baud rate	300 . . . 230400
Data bits	8
Parity	No parity
Stop bits	1
Flow control	CTS/RTS

DIP switch configuration for serial port 1 is described in the table below. By default all are set to ’0’ position (RS-232 mode). DIP switches 2-4 apply only when port is set in RS-485 mode (DIP switch 1 on ’1’ position).

Table 8: Application serial port DIP switches

DIP	Function	State	Description
1	RS-232 / RS-485	0=RS-232, 1=RS-485	Selects serial port operation mode
2	DUPLEX	0=FULL, 1=HALF	Selects between half (2-wire) and full (4-fire) duplex
3	BIAS	0=OFF, 1=ON	RS-485 biasing
4	TERMINATION	0=OFF, 1=ON	RS-485 termination

Warning!
Make sure you DO NOT connect RS-422 or RS-485 cables to a serial port configured to RS-232 mode. This could damage the port and the connected equipment.

Serial port pinouts in RS-422 and RS-485 modes are described in the table below.

Table 9: Application serial port pinouts in RS-422/485modes

PIN	RS-485 full-duplex (4-wire)	RS-485 half-duplex (2-wire)
1	-	-
2	RXD positive (in)	-
3	TXD negative (out)	TXD/RXD negative (out/in)
4	-	-
5	Ground	Ground
6	-	-
7	TXD positive (out)	TXD/RXD positive (out/in)
8	RXD negative (in)	-
	-	-

2.7 Power switch

Power switch is located on serial panel. It turns the unit on and off.

2.8 Power connector

Operating power for Arctic Control is supplied from connector X2.1.

Arctic Control can use either unregulated AC line input or regulated DC input. For wiring instructions refer to section *X2.1 connector*.

Table 10: Operating voltages

Input pins	Operating voltage range
X2.1 pins 1 & 2 (AC)	90 . . . 264 VAC or 85 . . . 200 VDC
X2.1 pins 6 & 7 (DC)	20 . . . 30 VDC

Typical power consumption is 10W when not charging the external battery pack.

2.9 DIN rail mounting

Arctic Control has mounting holes for DIN rail mounting brackets. The order code for the DIN rail mounting brackets option is 3000.

2.10 Product label

Product label is found on the bottom of the device and it contains the basic information about the unit such as product name, serial number and Ethernet MAC address.

Figure 9. *Product label*

2.11 Accessories

Viola Systems supplies certain accessories for Arctic Control. Possible accessories are listed in the table below.

Table 11: Available accessories

Accessory	Order code
Serial console cable	3100
Magflex antenna	3410
Rooflex puck antenna	3551
DIN rail clips	3000

3 I/O Hardware

3.1 X2.1 connector

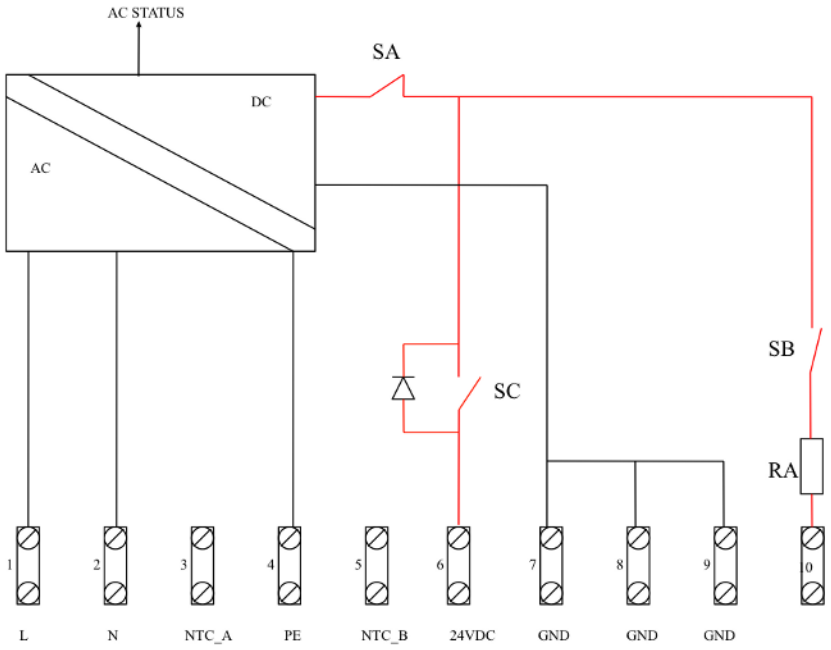
Table 12: X2.1 connector pinout

PIN	Symbol	Description
1	L	230VAC
2	N	230VAC
3	NTC_A	NTC Resistor (Battery temperature Comp.)
4	PE	Protective Earth
5	NTC_B	NTC Resistor (Battery temperature Comp.)
6	24VDC	24VDC Output/Input
7	GND	DC Ground
8	GND	DC Ground
9	GND	DC Ground
10	BAT	Battery Charging

Table 13: X2.1 connector types

Connector	Manufacturer	Connector type (part number)
Panel header	Phoenix Contact	MSTBV 2,5 HC/10-GF-5,08 (1924606)
Matching plug	Phoenix Contact	MSTB 2,5 HC/10-STF-5,08 (1912265)

Figure 10. *X2.1 connector schematics*



3.2 X2.3 connector

Table 14: X2.3 connector pinout

PIN	Symbol	Description	Disconnector function
1	DI1	Digital input 1	Disconnector 1 opened
2	DI_C1	Common supply voltage for DI1 and DI2	
3	DI2	Digital input 2	Disconnector 1 closed
4	DI3	Digital input 3	Disconnector 2 opened
5	DI_C2	Common supply voltage for DI3 and DI4	
6	DI4	Digital input 4	Disconnector 2 closed
7	DI5_A	Digital input 5	Local/Remote switch for Disconnector 1
8	DI5_B	Digital input 5	
9	DI6_A	Digital input 6	Local/Remote switch for Disconnector 2
10	DI6_B	Digital input 6	
11	DO1_A	Relay output 1	Close disconnector 1
12	DO1_B	Relay output 1	
13	DO2_A	Relay output 2	Open disconnector 1
14	DO2_B	Relay output 2	
15	DO3_A	Relay output 3	Close disconnector 2

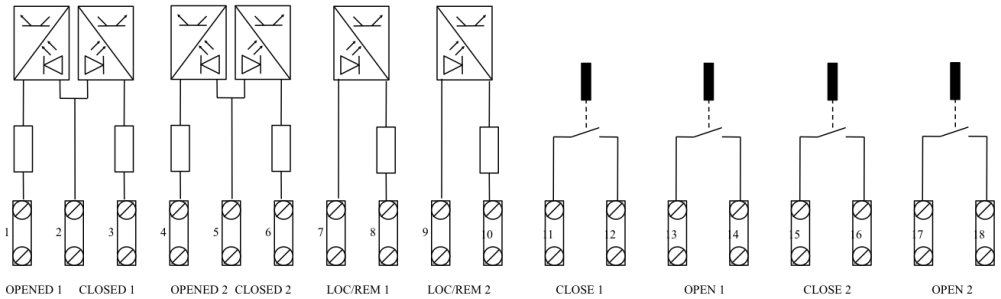
PIN	Symbol	Description	Disconnector function
16	DO3_B	Relay output 3	
17	DO4_A	Relay output 4	Open disconnector 2
18	DO4_B	Relay output 4	

Table 15: X2.3 connector types

Connector	Manufacturer	Connector type (part number)
Panel header	Phoenix Contact	MSTBV 2,5/18-GF-5,08 (1777235)
Matching plug	Phoenix Contact	MSTB 2,5/18-STF-5,08 (1778140)

X2.3 connector schematics are shown in figure

Figure 11. *X2.3 connector schematics*



3.3 X3 connector

Disconnector 3 and Grounding Disconnectors

Table 16: IO3 connector pinout

PIN	Symbol	Description	Disconnector function
1	DI7	Digital input 7	Disconnector 3 opened
2	DI_C3	Common supply voltage for DI7 and DI8	
3	DI8	Digital input 8	Disconnector 3 closed
4	DI9_A	Digital input 9	Local/Remote switch for Disconnector 3
5	DI9_B	Digital input 9	
6	DO5_A	Relay output 5	Close Disconnector 3
7	DO5_B	Relay output 5	
8	DI5_A	Relay output 6	
9	DI6_B	Relay output 6	Open Disconnector 3
10	DI_C4	Common supply voltage for DI10, DI11, DI12, DI13, DI14 and DI15	

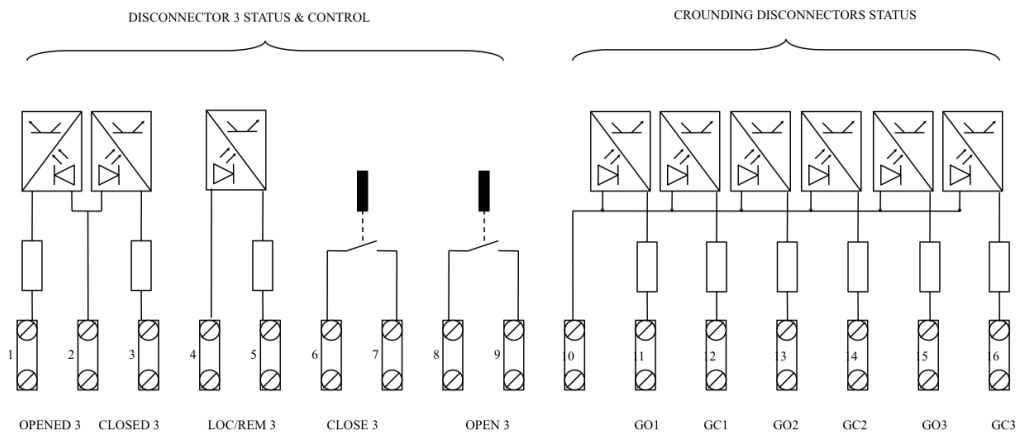
PIN	Symbol	Description	Disconnector function
11	DI10	Digital input 10	Grounding Disconnector 1 open
12	DI11	Digital input 11	Grounding Disconnector 1 closed
13	DI12	Digital input 12	Grounding Disconnector 2 open
14	DI13	Digital input 13	Grounding Disconnector 2 closed
15	DI14	Digital input 14	Grounding Disconnector 3 open
16	DI15	Digital input 15	Grounding Disconnector 3 closed

Table 17: X3 connector types

Connector	Manufacturer	Connector type (part number)
Panel header	Phoenix Contact	MSTBV 2,5/16-GF-5,08 (1777219)
Matching plug	Phoenix Contact	MSTB 2,5/16-STF-5,08 (1778124)

X3 connector schematics are shown in figure 12.

Figure 12. *X3 connector schematics*



3.4 X4 connector

Table 18: X4 connector pinout

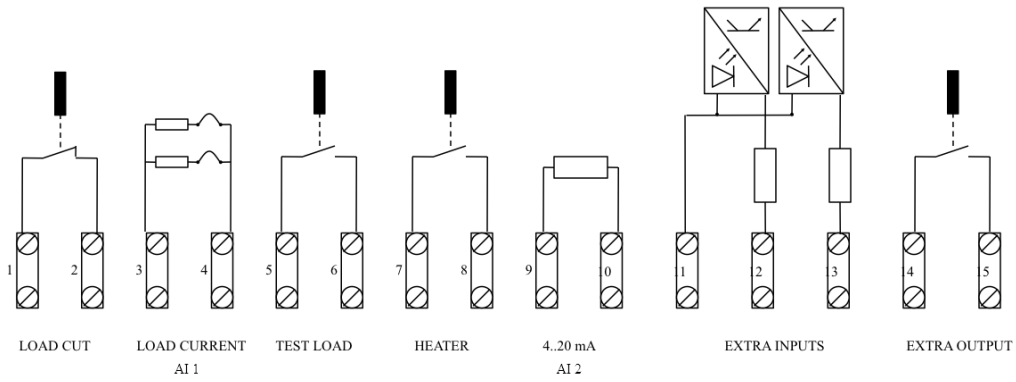
PIN	Symbol	Description
1	LOADCUT_A	Load control relay out, normal closed (NC)
2	LOADCUT_B	Load control relay out, normal closed (NC)
3	AI1_A	Analog In 1, #5V...+5V measurement, Hall-sensor
4	AI1_B	Analog In 1, #5V...+5V measurement, Hall-sensor

PIN	Symbol	Description
5	TESTLOAD_A	Relay out, test load for battery test case
6	TESTLOAD_B	Relay out, test load for battery test case
7	HTR_A	Heater/Extra relay
8	HTR_B	Heater/Extra relay
9	AI2_A	Analog In 2, #5V...+5V measurement
10	AI2_B	Analog In 2, #5V...+5V measurement
11	DIC_5	Common supply voltage for DI16, DI17
12	DI16	Digital input 16
13	DI17	Digital input 17
14	DO7_A	Relay output 7
15	DO7_B	Relay output 7

Table 19: X4 connector types

Connector	Manufacturer	Connector type (part number)
Panel header	Phoenix Contact	MSTBV 2,5/15-GF-5,08 (1777206)
Matching plug	Phoenix Contact	MSTB 2,5/15-STF-5,08 (1778111)

Figure 13. *X4 connector schematics*



3.5 IO LEDs

3.5.1 AC and LINK LEDs

AC and LINK LEDs

Table 20: AC and LINK LEDs

LED	Description
AC	AC power connected to connector X2.1 pins 1 & 2

LED	Description
LINK	IEC control link to SCADA is active

3.5.2 Disconnector LEDs

Arctic Control has 9 LEDs indicating the disconnector status. They are located on the front panel (see section 2.1). Each disconnector has three LEDs which indicate the status of the particular disconnector. LEDs are described in table 21 .

Table 21: Disconner LEDs

Disconnector LED	Description
Disconnector 1 open	Disconnector 1 is opened
Disconnector 1 close	Disconnector 1 is closed
Disconnector 1 remote	Disconnector 1 is on remote control
Disconnector 2 open	Disconnector 1 is opened
Disconnector 2 close	Disconnector 1 is closed
Disconnector 2 remote	Disconnector 1 is on remote control
Disconnector 3 open	Disconnector 1 is opened
Disconnector 3 close	Disconnector 1 is closed
Disconnector 3 remote	Disconnector 1 is on remote control

Disconnector LEDs have two special cases:

Table 22: Disconner LED special cases

Disconnector LEDs	Disconnector state
Open and close LEDs are both OFF	Disconnector is changing state
Open and close LEDs are both ON	Disconnector error

3.5.3 Grounding LEDs

Arctic Control has 6 LEDs indicating the grounding status. They are located on the front panel (see section 2.1). Each grounding disconnector has two LEDs indicating the status of the particular grounding disconnector. LEDs are described in table

Table 23: Grounding disconnector LEDs

Grounding LED	Description
Disconnector 1 open	Connector X3 digital input on pin 11 is active high
Disconnector 1 close	Connector X3 digital input on pin 12 is active high
Disconnector 2 open	Connector X3 digital input on pin 13 is active high

Grounding LED	Description
Disconnector 2 close	Connector X3 digital input on pin 14 is active high
Disconnector 3 open	Connector X3 digital input on pin 15 is active high
Disconnector 3 close	Connector X3 digital input on pin 16 is active high

All grounding disconnector digital input pins have connector X3 pin 10 as common ground pin. See connector X3 description on section 3.3.

Specifications

Table 24: Generic specifications

Processor	32-bit RISC processor
RAM	32 MB SDRAM
Flash memory	8MB flash
Input voltage	90 . . . 264 VAC or 85 . . . 200 VDC 20 . . . 30 VDC (external battery)
Power consumption	10W typical (when not charging battery)
Casing	Aluminium sheet
Operating temperature	-20 . . .+55 C without external heater -40 . . .+55 C with external heater
Storage temperature	-40 . . .+70 C
Humidity	5 . . . 85 % non-condensing
Network connection	10/100M
Approvals	CE
Size	175 x 108 x 160mm(without DIN rail clips)
Weight	2 kg
Protection class	IP20

Table 25: Serial port specifications

Serialmode (RS1)	RS-232
Serialmode (RS2)	RS-232 / 422 / 485
Baud rate	300 - 460800
Data bit	7 / 8
Parity	None / Even / Odd
Stop bits	1 / 2
Flow control	None / Hardware (RTS/CTS) / Software (XON/XOFF)

Table 26: I/O specifications

Input pin voltage range	0 . . . 60 VDC (>18 VDC detected as 1)
Input pin current consumption	5mA
Input pin power consumption	less than 0.3W
Output pin rated voltage	24 VDC
Output pin rated current	1A / 30 VDC switching capacity

Technical specifications are subject to change without notice.

Limited Warranty

Coverage

Viola Systems warrants this hardware product to be free from defects in materials and workmanship for the warranty period. This non-transferable, limited warranty is only for the first end-user purchaser. The warranty begins on the date of purchase and lasts for the period specified below:

Arctic Control: one (1) year

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This warranty does not apply to: (a) Viola Systems software products; (b) expendable components such as cables and connectors; or (c) third party products, hardware or software, supplied with the warranted product. Viola Systems makes no warranty of any kind on such products which, if included, are provided "AS IS." Excluded is damage caused by accident, misuse, abuse, unusually heavy use, or external environmental causes.

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Technical Support

Contacting Technical Support

Phone: +358 20 1226 226

Fax: +358 20 1226 220

E-mail: support@violasystems.com

Internet: http://www.violasystems.com

Recording Arctic Information

Before contacting our Technical Support staff, please record (if possible) the following information about the Arctic product:

Product name:

_____

Serial no:

_____

Note the status of the Arctic in the space below before contacting technical support. Include information about error messages, diagnostic test results, and problems with specific applications.

_____

_____

_____

This appendix briefly describes the differences between Arctic Control (product code: 2320) and Arctic Control 48VDC (product code: 2322) hardware.

1. Changes in the power supply and battery usage

In the Arctic control 48VDC (2322) the power supply **can only be a nominal DC voltage between 24VDC - 48VDC**, **Not AC input voltage** as in the Arctic Control 2320. Also, the integrated battery charging function is not supported, nor the battery voltage output from the device. For this reason, the Arctic Control 48VDC (2322) devices can't be chained together (from device 1 DC out to device 2 DC in).

2. The battery condition monitoring and testing

Not supported. This feature is available only in the Arctic Control 2320

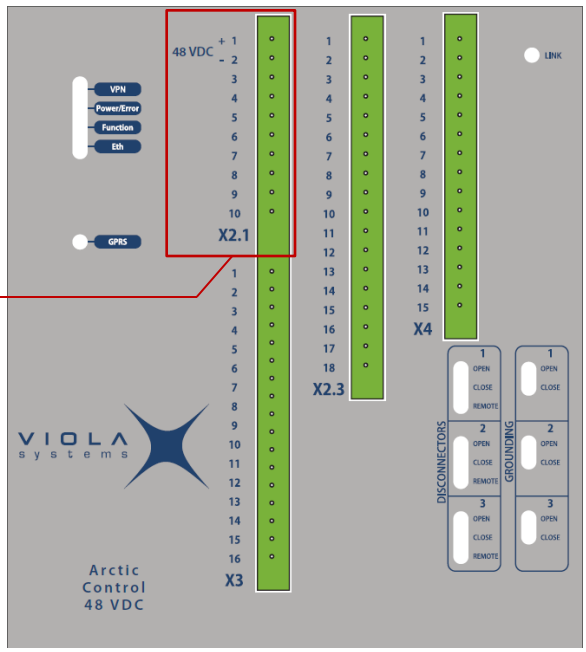
3. Wireless communication interface

Arctic Control 48VDC (2322) supports both GPRS and EDGE connection
GPRS: Quad band 850/900/1800/1900 MHz, GPRS multi-slot class 12, max 85.6 kbps
EDGE: Quad band 850/900/1800/1900 MHz, EDGE class 10, max 236.8 kbps

Picture/table references to the manual chapter: 3. I/O Hardware / 3.1 X2.1 connector

PIN	Symbol	Description
1	+	+48 VDC in positive
2	–	VDC in negative
3	-	NC (Not Connected)
4	PE	Protective Earth
5	-	NC (Not Connected)
6	-	NC (Not Connected)
7	GND	DC Ground
8	GND	DC Ground
9	GND	DC Ground
10	-	NC (Not Connected)

Table 1: X2.1 connector pin out



Picture 1: The front panel