



DigiRail-4C

Digital Counter Input Module

INSTRUCTION MANUAL

INTRODUCTION

The Modbus Module for Digital Inputs - **DigiRail-4C** is an electronic unit with four digital counter inputs. An RS485 serial interface allows reading and configuration of these inputs, through communication network. It's appropriate for mounting on DIN 35 mm rails.

The inputs are electrically insulated from the serial interface and the module supply. There is no electrical insulation between serial interface and supply. There is no electrical insulation between the inputs 1 and 2 (common negative terminal), as well as between the inputs 3 and 4.

Configuration of the **DigiRail-4C** is performed through the RS485 interface by using Modbus RTU commands. The **DigiConfig** software allows the configuration of all features of the **DigiRail** as well as its diagnostics. The **DigiConfig** offers features for detecting the devices present in the Modbus network and for configuring the communication parameters of the **DigiRail-4C**.

This manual provides the instructions for installation and connection of the module. The installer for **DigiConfig** and the documentation regarding Modbus communication for the **DigiRail-4C** (*Communication Manual of the DigiRail-4C*) are included in the CD-ROM which accompanies the product. They are also available for download at www.audon.co.uk.

SPECIFICATIONS

Inputs: 4 Digital Inputs: Logical level 0 = 0 to 1 Vdc; Logical level 1 = 4 to 35 Vdc

Internal current limitation at the inputs: approximately 5 mA

Maximum count frequency: 1000 Hz for signals with square wave and working cycle of 50%. Input 1 can be configured for counting signals of up to 100 kHz.

Counting capacity (per input): 32 bits (0 to 4.294.967.295)

Feed: 10 to 35 Vdc / 50 mA maximum. Internal protection against polarity inversion.

Electrical insulation between inputs and supply/serial port: 1000 Vdc for 1 minute

Serial communication: RS485 at two wires, Modbus RTU protocol. Configurable parameters: Communication speed: from 1200 to 115200 bps; Parity: even, odd or none

Key for restoring communication parameters: The RCom key, at the front panel, will set the device in diagnostics mode (address 246, baud rate 1200, parity even, 1 stop bit), able to be detected and configured by the DigiConfig software.

Frontal light indicators for communication and status:

TX: Signalizes that the device is sending data on the RS485 line;

RX: Signalizes that the device is receiving data on the RS485 line;

Status: When the light is permanently on, this means that the device is in normal operation; when the light is flashing in a second interval (approximately), this means that the device is in diagnostics mode.

Software configurator in Windows environment: DigiConfig

Electromagnetic compatibility: EN 61326:2000

Operating temperature: 0 to 70 °C

Operational relative humidity: 0 to 90% RH

Assembly: DIN 35 mm rail

Dimensions: Figure 1 shows the dimensions of the module.

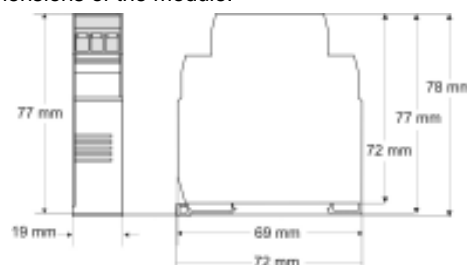


Figure 1 – Dimensions

ELECTRICAL INSTALLATION

RECOMMENDATIONS FOR INSTALLATION

- Input and communication signal conductors must pass through the system plant separated from the electrical network conductors, if possible, in grounded conduits.
- The supply for the instruments must be provided from a proper network for instrumentation.
- In control and monitoring applications, it is essential considering what may occur if any of the system parts should fail.
- We recommend the use of RC FILTERS (47 μ and 100nF, series) in parallel with contactor and solenoid coils which are close or connected to **DigiRail**.

ELECTRICAL CONNECTIONS

Figure 2 shows the necessary electrical connections. The terminals 1, 2, 3, 7, 8 and 9 are intended for the input connections, 5 and 6 for the module supply and 10, 11 and 12 for the digital communication. For obtaining a better electrical contact with the connectors, we recommend the use of pin terminals at the conductors' end. For direct wire connection, the minimum gage recommended is 0.14 mm², not exceeding 4.00 mm².



Be careful when connecting the supply terminals to the **DigiRail**. If the positive conductor of the supply source is connected, even momentarily, to one of the communication connection terminals, the module may be damaged.

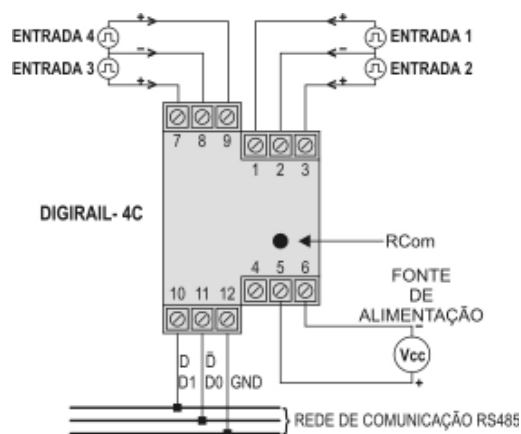


Figure 2 – Electrical Connections

Additional information regarding the connection and use of the communication network can be found in the *Communication Manual of DigiRail-4C*, included in the CD-ROM which accompanies the product.

CONFIGURATION

The application **DigiConfig** is a program for Windows® used for configuration of the modules **DigiRail**. For its installation, run the **DigiConfigSetup.exe** file from the CD-ROM of the product and follow the instructions as shown.

DigiConfig is provided with a complete help file, giving all the information necessary for its full use. For using the help feature, start the application and chose the "Help" menu or press the F1 key.

If you do not have the CD-ROM which comes together with the product, go to www.audon.co.uk in order to obtain the installer for **DigiConfig** and the additional product manuals.

MODBUS ADDRESS ASSIGNMENT SYSTEMATICS

The **DigiRail** equipment do not have keys for determination of the Modbus communication address. This must be determined by using the communication in the Modbus protocol itself. This will require that the address of the device to be configured is known, this being possible by two different means:

- If the equipment is a new one, it will show the configuration as set by the factory: Address=247, Baud rate=1200, Parity Even, 1 Stop Bit.
- If the equipment has already been used and you do not know its address and/or other communication parameters, press the RCom button on your front panel. It will enter the diagnostics mode during 1 minute, assuming the following communication parameters: Address=246, Baud rate=1200, parity even, 1 stop bit.

The **DigiConfig** software configurator is provided with a function of searching the network for temporary devices, exactly the devices in the previous conditions. Once having been localized, the address and the other communication parameters of the device can be changed according to the necessity of the application.

The communication parameters in the two previous conditions are not very common in Modbus networks, and they may probably cause no conflicts with other equipment of the network. Obviously only one **DigiRail** in the network can be in each of the previous conditions so that the communication with the configurator **DigiConfig** is possible. If several new **DigiRail** are to be included in a network, they must be inserted individually. Only after changing the communication parameters for the definitive values, the next new **DigiRail** can be inserted. In an already existing network, only one **DigiRail** at a time can be set in diagnostics mode in order to be detected by the **DigiConfig**.

It is important to emphasize that the **DigiConfig** software acts as a master in the Modbus network. Its utilization requires that the original master of the network (SCADA software, for instance) be disconnected during its use. For further details please refer to the on-line Help of the **DigiConfig**.

MODBUS COMMANDS

The Modbus RTU commands (functions) listed below are implemented. For further information with respect to each one of these commands and the Modbus protocol in general, please access the website:

<http://www.modbus.org>

READ COILS – 01H

This command can be used for reading the current state of one or several digital inputs, according to the table below.

Address	Description
0	State of digital input 1 (0=off; 1=on)
1	State of digital input 2 (0=off; 1=on)
2	State of digital input 3 (0=off; 1=on)
3	State of digital input 4 (0=off; 1=on)

The specified *addresses* correspond to the low level physical addresses, where zero (0) corresponds to the address of PLC 00001.

The response of this command will inform the state of each requested input with one bit only. Thus the state of the first requested input comes at bit 0 (less significant bit), the state of the second at bit 1 and so on.

READ DISCRETE INPUTS - 02H

This command can be used for reading the current state of one or several digital inputs, according to the table below.

Address	Description
0	State of digital input 1 (0=off; 1=on)
1	State of digital input 2 (0=off; 1=on)
2	State of digital input 3 (0=off; 1=on)
3	State of digital input 4 (0=off; 1=on)

The specified *addresses* correspond to the low level physical addresses, where zero (0) corresponds to the address of PLC 10001.

The response of this command will inform the state of each requested input with one bit only. Thus the state of the first requested input comes at bit 0 (less significant bit), the state of the second at bit 1 and so on.

READ HOLDING REGISTERS – 03H

This command can be used for reading one or several holding registers, according to the table in the chapter apart.

WRITE SINGLE REGISTER – 06H

This command can be used for writing in a holding register, according to the table in the chapter apart.

TABLE OF HOLDING REGISTERS

The specified *addresses* correspond to the low level physical addresses, where zero (0) corresponds to the address of PLC 40001. The columns *minimum* and *maximum* contain the range of values valid for each parameter. The column *R/W* indicates if the parameter is for writing and reading (R/W) or for reading (R) only.

Addresses	Description	Minimum	Maximum	R/W
0	Series number (word high)	0	65535	R
1	Series number (word low)	0	65535	R
2	Baud-rate	0	7	R/W
3	Modbus Address	1	247	R/W
4	Parity	0	2	R/W
5	Firmware version	0	999	R
6	Diagnostic state timer (in tenths of seconds)	0	600	R/W
7	State of the digital inputs, where bit 0 represents input 1, bit 1 represents input 2 (0=off; 1=on), etc.	0	15	R
8	State of digital input 1 (0=off; 1=on)	0	1	R
9	State of digital input 2 (0=off; 1=on)	0	1	R
10	State of digital input 3 (0=off; 1=on)	0	1	R
11	State of digital input 4 (0=off; 1=on)	0	1	R
12	Debounce of the digital input 1 (in ms)	0	10000	R/W
13	Debounce of the digital input 2 (in ms)	0	10000	R/W
14	Debounce of the digital input 3 (in ms)	0	10000	R/W
15	Debounce of the digital input 4 (in ms)	0	10000	R/W
16	Configuration of the digital inputs	0	1	R/W
17	Preset, inhibiting and selecting the margin of the counters	0	4095	R/W
18	Value of the input 1 counts - most significant word	0	0	R
19	Value of the input 1 counts - less significant word	0	0	R
20	Value of the input 2 counts - most significant word	0	65535	R
21	Value of the input 2 counts - less significant word	0	65535	R
22	Value of the input 3 counts - most significant word	0	65535	R
23	Value of the input 3 counts - less significant word	0	65535	R
24	Value of the input 4 counts - most significant word	0	65535	R
25	Value of the input 4 counts - less significant word	0	65535	R
26	Preset value of the input 1 counts - most significant word	0	65535	R/W
27	Preset value of the input 1 counts - less significant word	0	65535	R/W
28	Preset value of the input 2 counts - most significant word	0	65535	R/W
29	Preset value of the input 2 counts - less significant word	0	65535	R/W
30	Preset value of the input 3 counts - most significant word	0	65535	R/W
31	Preset value of the input 3 counts - less significant word	0	65535	R/W
32	Preset value of the input 4 counts - most significant word	0	65535	R/W
33	Preset value of the input 4 counts - less significant word	0	65535	R/W
34	Device tag - characters 1 and 2	0	65535	R/W
35	Device tag - characters 3 and 4	0	65535	R/W
36	Device tag - characters 5 and 6	0	65535	R/W
37	Device tag - characters 7 and 8	0	65535	R/W
38	Device tag - characters 9 and 10	0	65535	R/W
39	Tag of digital input 1 - characters 1 and 2	0	65535	R/W
40	Tag of digital input 1 - characters 3 and 4	0	65535	R/W
41	Tag of digital input 1 - characters 5 and 6	0	65535	R/W
42	Tag of digital input 1 - characters 7 and 8	0	65535	R/W

Addresses	Description	Minimum	Maximum	R/W
43	Tag of digital input 1 - characters 9 and 10	0	65535	R/W
44	Tag of digital input 2 - characters 1 and 2	0	65535	R/W
45	Tag of digital input 2 - characters 3 and 4	0	65535	R/W
46	Tag of digital input 2 - characters 5 and 6	0	65535	R/W
47	Tag of digital input 2 - characters 7 and 8	0	65535	R/W
48	Tag of digital input 2 - characters 9 and 10	0	65535	R/W
49	Tag of digital input 3 - characters 1 and 2	0	65535	R/W
50	Tag of digital input 3 - characters 3 and 4	0	65535	R/W
51	Tag of digital input 3 - characters 5 and 6	0	65535	R/W
52	Tag of digital input 3 - characters 7 and 8	0	65535	R/W
53	Tag of digital input 3 - characters 9 and 10	0	65535	R/W
54	Tag of digital input 4 - characters 1 and 2	0	65535	R/W
55	Tag of digital input 4 - characters 3 and 4	0	65535	R/W
56	Tag of digital input 4 - characters 5 and 6	0	65535	R/W
57	Tag of digital input 4 - characters 7 and 8	0	65535	R/W
58	Tag of digital input 4 - characters 9 and 10	0	65535	R/W
59-61	Reserved	0	0	R
62	DigiRail model	0	4	R
63-84	Reserved	0	0	R

DETAILS OF SOME REGISTERS

REGISTER 2 – BAUD RATE

Code of speed used in Modbus communication.

Code	Baud rate
0	1.200
1	2.400
2	4.800
3	9.600
4	19.200
5	38.400
6	57.600
7	115.200

REGISTER 3 – MODBUS ADDRESS

Address of the device in the Modbus network. Valid values: from 1 to 247. We recommend using the lower addresses for the equipment.

REGISTER 4 – PARITY

Code of the parity used in Modbus communication.

Code	Parity
0	No parity
1	Odd
2	Even

REGISTER 5 – FIRMWARE VERSION

Indicates the firmware version of the equipment, according to the examples below:

If the version is "1.00", the value "100" will be read. If the version is "2.04", the value "204" will be read.

REGISTER 6 – DIAGNOSTIC STATE TIMER

Internally used by the DigiConfig software.

REGISTER 7 – STATE OF THE DIGITAL INPUTS

Bit at 0: Input deactivated

Bit at 1: Input activated

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Entry	-	-	-	-	-	-	-	-	-	-	-	-	4	3	2	1

REGISTER 16 – CONFIGURATION OF THE DIGITAL INPUTS

Only bit 0 is used.

Bit 0 in 0 - Input 1 operates as normal counter input

Bit 0 in 1 - Input 1 operates as fast counter input. Debounce for input 1 is ignored

REGISTER 17 – PRESET, INHIBITING AND SELECTING THE MARGIN OF THE COUNTERS

Preset: When setting the bit corresponding to the input, the counter of that input will assume the value in the respective register as preset value of the counts (registers 26 to 33). After that, the bit will be reset to zero automatically.

Inhibition:

Bit in 0 - Count enabled

Bit in 1 - Count disabled (suspended)

Selection of margin:

Bit in 0 - Count at the positive margin (0 for 1)

Bit in 1 - Count at the negative margin (1 for 0)

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Input Preset	-	-	-	-	-	-	-	-	-	-	-	-	4	3	2	1
Input Inhibition	-	-	-	-	-	-	-	-	4	3	2	1	-	-	-	-
Input Margin	-	-	-	-	4	3	2	1	-	-	-	-	-	-	-	-

REGISTERS 34 TO 58 – TAGS

DigiRail features some identification Tags, where characters can be written in order to help identifying the device and its inputs:

- Identification tag of the device (10 characters).
- Identification tag of the input points (10 characters for each input).

REGISTER 62 – DIGIRAIL MODEL

Provides the code of the DigiRail model. Internally used by the DigiConfig software.

Model	Amount
2A	1
2R	3
4C	4