Product Description

The AL-3417 is an Ethernet communication interface for Hadron RTUs. It allows the integration of Hadron HD3002 RTU with control centers using the DNP3 protocol. Acting as a data server of the RTU, it performs the exchange of data and events to DNP3 clients and also receives their commands.

Each Hadron RTU supports up to 4 AL-3417 interfaces on the bus (rack). Each interface supports up to 4 clients. Thus, each RTU can support up to 16 DNP3 clients.

The module has a 10/100Base-TX electrical interface using a standard shielded female RJ45 connector, compatible with UTP or ScTP category 5 cables.

Its main features are:

- Support for up to 4 clients (control centers)
- Capacity for up to 5,000 communication points
- Individual data base for each center
- Two event banks each one with capacity of 3,000 events
- Support for the main DNP3 data types, complying with Level 3 and supporting some objects of Level 4
- Compatible with the AL-2004 CPU
- Diagnostic through frontal LEDs, indicating the state of connection and of the interface
- Support for ScTP (screened twisted pair) shielded cables, increasing the noise immunity
- Configuration by MasterTool Hadron XE software

ATTENTION:
The AL-3417 module is compatible with versions 3.04 or greater of the AL-2004 CPU.

Ordering Information

Included Items

The product package contains the following items:

- AL-3417 module
- Installation guide
- Technical support guide

Product Code

The following part number must be used when ordering the product:

Code	Description
AL-3417	DNP3 Ethernet Interface

Related Products

In order to use the AL-3417 interface, the following products are necessary as a minimum system configuration:

- Rack
- Power supply
- CPU
- Configuration software

The following table shows the possible choices for these products:

Code	Description
AL-3631	Rack for PSU, CPU and 4 intelligent modules
AL-3634	Rack for PSU, CPU and 16 modules
AL-3635	Rack for PSU, CPU and 8 intelligent modules
AL-3642	Rack for redundant PSU, CPU and 16 modules
AL-3511	80W 24-48Vdc input double-euro power supply
AL-3512	80W AC/DC input double-euro power supply
AL-2004	CPU with 2048 digital I/Os - 1MB Flash
HD8000	MasterTool Hadron XE

Notes

More complete systems can also be configured with the following products:

- Digital I/O modules
- Analog I/O modules
- Bus interfaces
- PROFIBUS interfaces
- Serial protocol interfaces

Product Features

The AL-3417 TCP/IP Ethernet channel allows the connection with DNP3 masters for supervision and control.

AL-2004 CPU supports up to 4 AL-3417 interfaces on its bus and all can operate independently. Each AL-3417 interface can manage communication with up to 4 clients.

General Features

	AL-3417
Network interface	Ethernet 10/100Base-TX physical level with shielded female RJ45 connector
Memory	1 Mbytes of code (Flash) 1 Mbytes of data (RAM)
Interface with CPU	DMA for CPU memory accessing
State indication	4 LEDs on panel 2 LEDs on RJ45 connector
Diagnose indication	LEDs CPU operands
Configurable parameters	Through MasterTool Hadron XE
Auto testing	Executed on module start-up
Operation temperature	0 to 60 ºC (exceeds IEC 61131 standard)
Storage temperature	-25 to 75 ºC (according IEC 61131 standard)
Operation humidity	5 a 95% without condensation (according IEC 61131 standard RH2 level)
Weight	0.5 Kg
Physical dimensions	261.6 x 30.3 x 182.3 mm (H x W x D)

Electrical Characteristics

	AL-3417
Bus power consumption	600 mA @ 5 Vdc
Power dissipation	3 W
Electrical chock protection	According to IEC 536 (1976) standard, class I

Connection Characteristics

	AL-3417
Connector type	Shielded female RJ45
Baud rate	10/100 Mbps
Cabling	UTP or ScTP, category 5
Distance	100 m
Diagnostics	Green and yellow LEDs

Software Characteristics

	AL-3417
Link level	LLC (Logical Link Control)
Network level	IP (Internet Protocol)
Transport level	TCP (Transmission Control Protocol)
Application level	Slave DNP3 (outstation)
Connection mode	Server
Server port	Configurable for each client
Maximum number of connections	4
Queue of events	Two event banks, each one with capacity of 3,000 events
Configuration	MasterTool Hadron XE
Control	CPU operands
Diagnose	CPU operands

Database Characteristics

	AL-3417
Maximum number of communication points	5,000 points per RTU
Maximum number of groups of communication points	256 groups per RTU
Maximum number of mapping points	512 mapping groups per client 7,680 mapping groups per RTU
Maximum number of analog points with integral type dead band	500 points per RTU
Maximum number of points to engineering conversion	500 points per RTU
Maximum number of points to alarms	Up to 256 %M operands Each %M operand can store up to 16 alarms
Maximum number of Counters and Frozen Counters	256 points per RTU

DNP3 Protocol Characteristics

The AL-3417 interface complies with DNP3 Level 3 and supports some objects of the greater levels. The following table shows a list of the supported objects:

Group	Variation	Description
1	1	Binary Input – Packed format
1	2	Binary Input – With flags
2	1	Binary Input Event – Without time
2	2	Binary Input Event – With absolute time
2	3	Binary Input Event – With relative time
3	1	Double-bit Binary Input – Packed format
3	2	Double-bit Binary Input – With flags
4	1	Double-bit Binary Input Event – Without time
4	2	Double-bit Binary Input Event – With absolute time
4	3	Double-bit Binary Input Event – With relative time
10	1	Binary Output – Packed format
10	2	Binary Output – Output status with flags
12	1	Binary Command – Control relay output block (CROB)
20	1	Counter – 32-bit with flag
20	2	Counter – 16-bit with flag
20	5	Counter – 32-bit without flag
20	6	Counter – 16-bit without flag
21	1	Frozen Counter – 32-bit with flag
21	2	Frozen Counter – 16 bit with flag
21	9	Frozen Counter – 32-bit without flag
21	10	Frozen Counter – 16-bit without flag
22	1	Counter Event – 32-bit with flag
22	2	Counter Event – 16-bit with flag
22	5	Counter Event – 32-bit with flag and time
22	6	Counter Event – 16-bit with flag and time
23	1	Frozen Counter Event – 32-bit with flag
23	2	Frozen Counter Event – 16-bit with flag
23	5	Frozen Counter Event – 32-bit with flag and time
23	6	Frozen Counter Event – 16-bit with flag and time
30	1	Analog Input – 32-bit with flag
30	2	Analog Input – 16-bit with flag
30	3	Analog Input – 32-bit without flag
30	4	Analog Input – 16-bit without flag
30	5	Analog Input – Single-prec flt-pt with flag
32	1	Analog Input Event – 32-bit without time
32	2	Analog Input Event – 16-bit without time
32	3	Analog Input Event – 32-bit with time
32	4	Analog Input Event – 16-bit with time
32	5	Analog Input Event – Single-prec flt-pt without time
32	7	Analog Input Event – Single-prec flt-pt with time
40	1	Analog Output Status – 32-bit with flag
40	2	Analog Output Status – 16-bit with flag
40	3	Analog Output Status – Single-prec flt-pt with flag
41	1	Analog Output – 32-bit
41	2	Analog Output – 16-bit
41	3	Analog Output – Single-prec flt-pt
50	1	Time and Date – Absolute time

50	**3**	Time and Date – Absolute time at last recorded time
51	**1**	Time and Date CTO – Absolute time, synchronized
51	**2**	Time and Date CTO – Absolute time, unsynchronized
52	**1**	Time Delay – Coarse
52	**2**	Time Delay – Fine
60	**1**	Class Objects – Class 0 data
60	**2**	Class Objects – Class 1 data
60	**3**	Class Objects – Class 2 data
60	**4**	Class Objects – Class 3 data
80	**1**	Internal Indications – Packed format

Compatibility with Other Products

For some of the related products, the AL-3417 interface is compatible only since a specific version as shown on the following table:

Product	**Version**
AL-2004	Version 3.04 or greater
HD8000	Version 1.20 or greater

Installation

AL-3417 Interface Installation

This section describes the minimum requirements for the mechanical installation of the AL-3417 module and for the Ethernet network cable.

Mechanical Installation

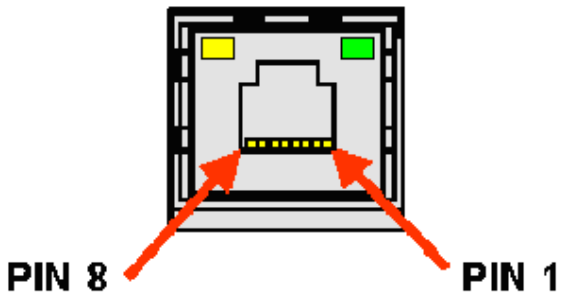
A Hadron HD3002 RTU is composed by the following basic elements: rack, power supply and CPU. Other elements can be part of the RTU, as for example: PROFIBUS network interfaces, math coprocessors, rack expanders and digital and analog I/O modules.

The following information about mechanical installation is very brief. For further details please refer to the Installation chapter of AL-2002/AL-2003/AL-2004 - MU207011 User's Manual.

Network Cable Installation

The Ethernet port of AL-3417 module, identified by "NET" at the panel, has a standard pin out, same as used in personal computers for example. The module has a RJ45 female shielded connector with 10/100Base-TX electrical interface. An UTP or ScTP (category 5) standard cable must be used in order to interconnect the module to an Ethernet network access device.

The following figure and table show a RJ45 female connector from the AL-3417 module. The identification and description of pin out are valid to 10Base-T and 100Base-TX physical levels.



Pin	Signal	Description
1	TD +	data transmission, positive
2	TD -	data transmission, negative
3	RD +	data reception, positive
4	NU	unused
5	NU	unused
6	RD -	data reception, negative
7	NU	unused
8	NU	unused

The interface can be connected to a communication network through hub or switch or directly to a device in order to communicate with it. For direct linking, a cross-over cable must be used (it is same kind of cable which connects two personal computers in point-to-point mode through Ethernet port).

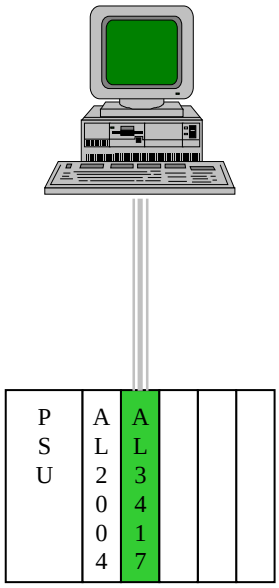
Network cable can be defined as a pair of RJ45 male connectors interconnecting themselves through UTP or ScTP (category 5) standard cable, over direct or cross-over configuration. It is used to interconnect two devices with Ethernet port.

Usually those cables have a connection lock which guarantees a perfect connection between the female connector of the interface and the male connector of the cable. For installation, the cable male connector must be inserted on the module female connector. A lock specific sound (like a "click") must to be listened. To unconnected them, the lever from the male connector must be used.

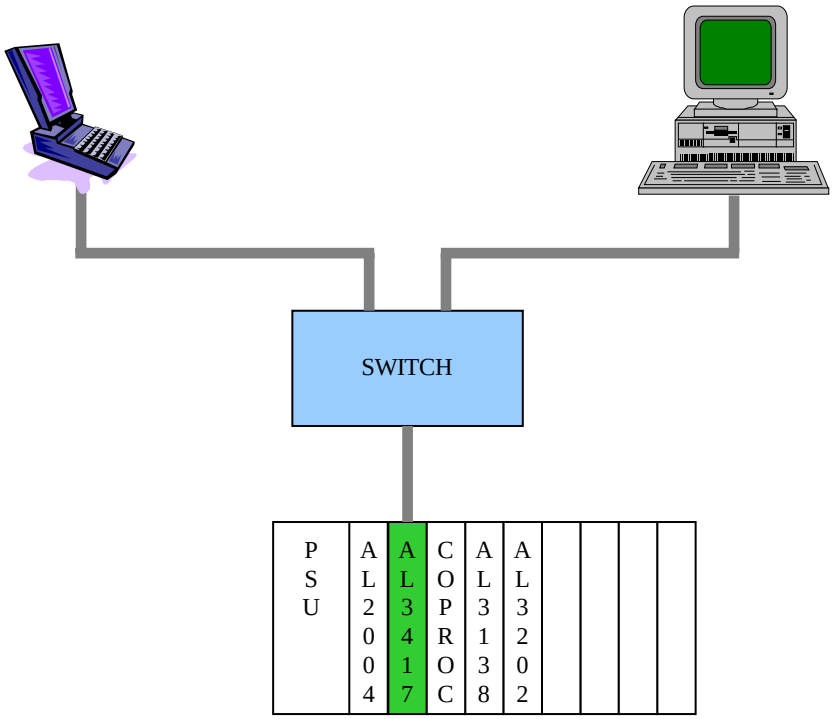
Some AL-3417 module architectures are shown as follows in order to exemplify interlinking through network cable.

Legend: cross-over cable
parallel cable

Point-to-point

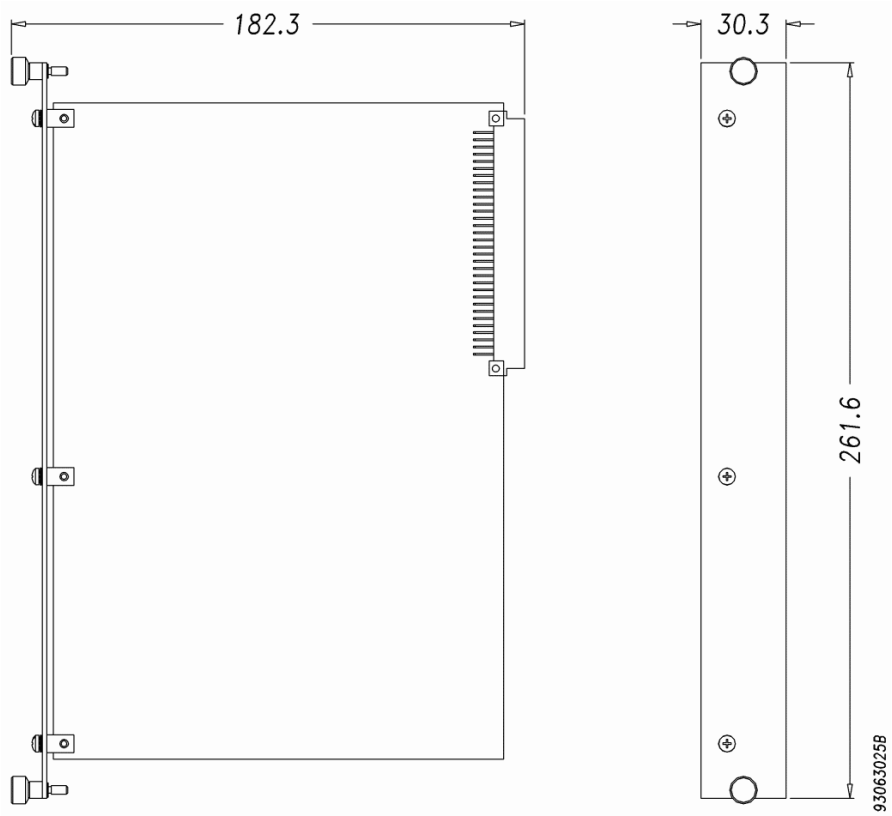


Single Network



Physicals Dimensions

Dimensions in millimeters.



Maintenance

Most Common Problems

If the module AL-3417 does not start to work when powering on the RTU, the following items must be checked:

- The environment temperature is within the range supported by the equipments?
- The input voltage of the rack power supply is correct? The power supply is the module placed at the most left position of the rack (front side view), followed by the CPU module.
- There is any Jumper inserted on the connectors of the AL-3417 module? These connectors are identified by the CMx marking, where "x" is the number of the connector.
- Network equipments such as hubs, switches or routers are powered on, interconnected, configured and working properly?
- Ethernet network cable is correctly connected to the NET port of AL-3417 module and to the network equipment?
- The AL-2004 CPU (bus master) is powered on and in execution mode?
- The module was correctly declared in the main rack of AL-2004 CPU?
- Program modules were correctly loaded on AL-2004 CPU?

If the AL-3417 module is on execution state but does not respond to the requested communications, the following items must be checked:

- The network parameters on the CPU configuration are correct?
- The Ethernet parameters on the AL-3417 module configuration are correct?
- Timeout parameters are correctly configured in the DNP3 client?

If the problem is not solved, please contact Altus Customer Support.

Preventive Maintenance

- It is necessary to verify, annually, if interconnection cables are firmly connected without excessive dust specially on protection devices.
- In environments subjected to excessive dust, it is necessary to clean the equipment periodically.

Manuals

For further technical details, configuration, installation, diagnostics and programming of Hadron HD3002 RTU products please consult the following documents:

Document Code	Description
MU208302	HADRON – HD3002 RTU User's Manual
MU207011	AL-2002/AL-2003/AL-2004 User's Manual
MU208802	MasterTool Hadron XE User's Manual