

## Product Description

The AL-3415 is an Ethernet communication interface for Hadron RTUs. It allows the integration of Hadron HD3002 RTU with control centers using the IEC 60870-5-104 protocol. Acting as a data server of the RTU, it performs the exchange of data and events to IEC 60870-5-104 clients and also receives their commands.

Each Hadron RTU supports up to 4 AL-3415 interfaces on the bus (rack). Each interface supports up to 4 clients. Thus, each RTU can support up to 16 IEC 60870-5-104 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 4,000 events
- Support for the main IEC 60870-5-104 data types
- 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-3415 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-3415 module
- Installation guide
- Technical support guide

### Product Code

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

Code	Description
AL-3415	IEC 60870-5-104 Ethernet Interface

### Related Products

In order to use the AL-3415 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-3415 TCP/IP Ethernet channel allows the connection with IEC 60870-5-104 masters for supervision and control.

AL-2004 CPU supports up to 4 AL-3415 interfaces on its bus and all can operate independently. Each AL-3415 interface can manage communication with up to 4 clients.

## General Features

AL-3415	
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 °C (exceeds IEC 1131 standard)
Storage temperature	-25 to 75 °C (according IEC 1131 standard)
Operation humidity	5 a 95% without condensation (according IEC 1131 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-3415	
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-3415	
Connector type	RJ45 shielded female
Baud rate	10/100 Mbps
Cabling	UTP or ScTP, category 5
Distance	100 m
Diagnose	Green and yellow LEDs

## Software Characteristics

	AL-3415
Link level	LLC (Logical Link Control)
Network level	IP (Internet Protocol)
Transport level	TCP (Transmission Control Protocol)
Application level	Slave IEC 60870-5-104 (Controlled station)
Connection mode	Server
Server port	Configurable for each client
Maximum number of connections	4
Queue of events	Two bases of events, everyone with capacity to 4,000 events
Configuration	MasterTool Hadron XE
Control	CPU operands
Diagnose	CPU operands

## Database Characteristics

	AL-3415
Maximum number of communication points	5000 points for RTU
Maximum number of groups of communication points	256 groups for RTU
Maximum number of mapping points	512 mapping groups for client 7680 mapping groups for RTU
Maximum number of analog points with integral type dead band	500 points for RTU
Maximum number of points to engineering conversion	500 points for RTU
Maximum number of points to alarms	Until 256 %M operands. Each %M operand can store until 16 alarms.

## IEC 60870-5-104 Protocol Characteristics

ASDU types supported by interface at the communication process:

ASDU	Description
M_SP_NA_1	Single-point information
M_DP_NA_1	Double-point information
M_ST_NA_1	Step position information
M_ME_NA_1	Measured value, normalized value
M_ME_NB_1	Measured value, scaled value
M_ME_NC_1	Measured value, short floating point value
M_IT_NA_1	Integrated totals
M_SP_TB_1	Single-point information with time tag CP56Time2a
M_DP_TB_1	Double-point information with time tag CP56Time2a
M_ST_TB_1	Step position information with time tag CP56Time2a
M_ME_TD_1	Measured value, normalized value with time tag CP56Time2a
M_ME_TE_1	Measured value, scaled value with time tag CP56Time2a
M_ME_TF_1	Measured value, short floating point value with time tag CP56Time2a
M_IT_TB_1	Integrated totals with time tag CP56Time2a
C_SC_NA_1	Single command
C_DC_NA_1	Double command
C_RC_NA_1	Regulating step command
C_SE_NA_1	Set point command, normalized value
C_SE_NB_1	Set point command, scaled value
C_SE_NC_1	Set point command, short floating point value
M_EI_NA_1	End of initialization
C_IC_NA_1	Interrogation command
C_CI_NA_1	Counter interrogation command

## Compatibility with Other Products

For some of the related products, the AL-3415 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 1.10 or greater

## Installation

### AL-3415 Interface Installation

This section describes the minimum requirements for the mechanical installation of the AL-3415 module and for the Ethernet network cable.

#### Mechanical Installation

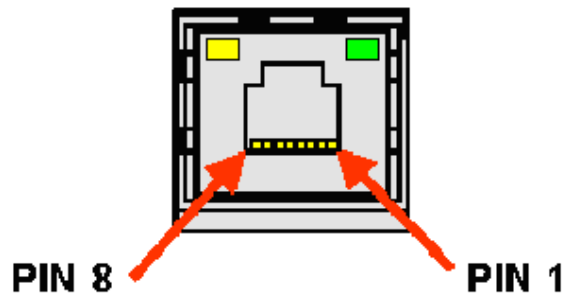
A Hadron HD3002 RTU is composed by the following basic elements: rack, power supply and CPU. Other elements can be part of the RTU, as for example: PROFIBUS network interfaces, math coprocessors, rack expanders and digital and analog I/O modules.

The following information about mechanical installation are 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-3415 module, identified by "NET" at the panel, has a standard pinout, 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-3415 module. The identification and description of pinout 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.

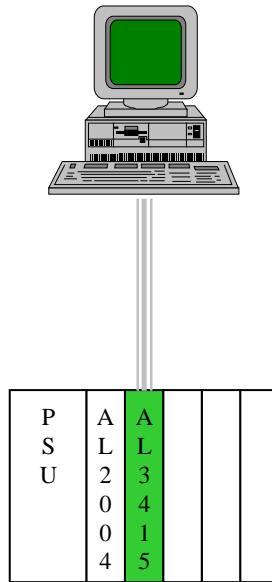
Usually those cables have a connection lock which guarantees a perfect connection between the female connector of the interface and the male connector of the cable. For installation, the cable male connector must be inserted on the module female connector. A lock specific sound (like a "click") must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

Some AL-3415 module architectures are shown as follows in order to exemplify interlinking through network cable.

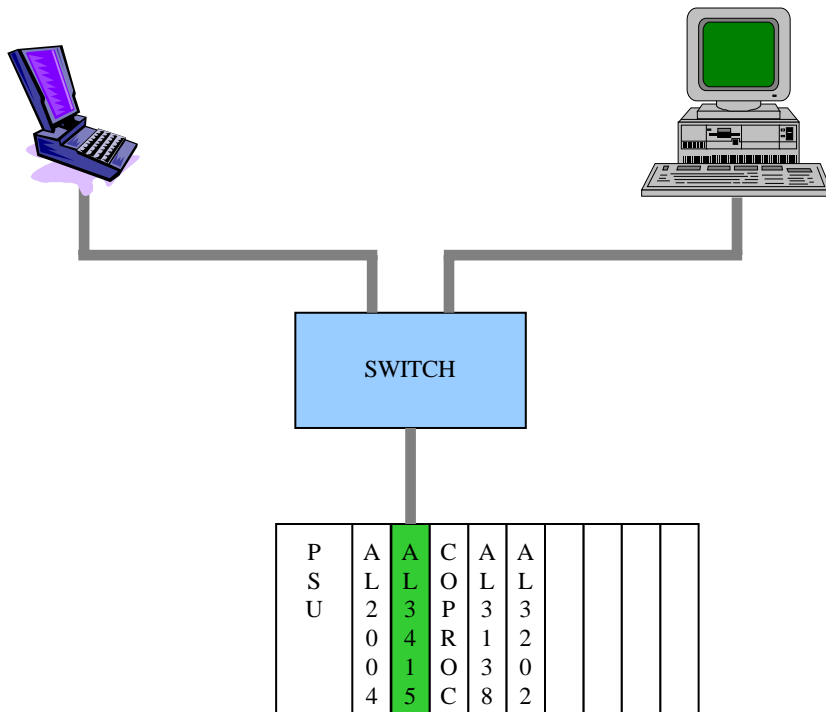
**Legend:** crossover cable  
parallel cable



### Point-to-point

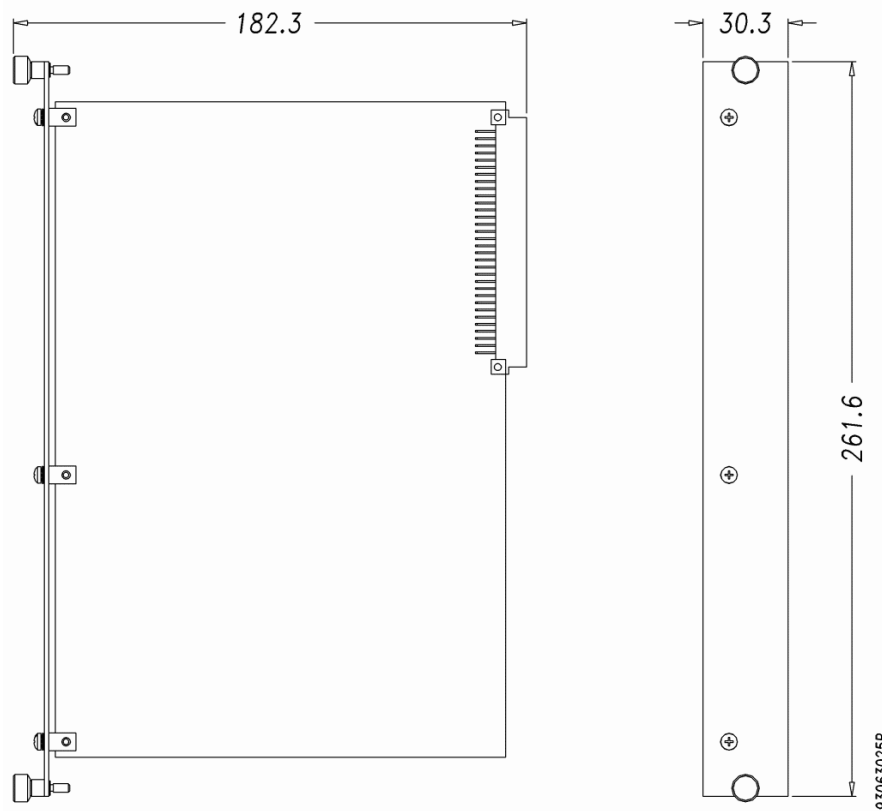


### Single Network



## Physical Dimensions

Dimensions in millimeters.





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## Maintenance

### Most Common Problems

If the module AL-3415 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-3415 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-3415 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-3415 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-3415 module configuration are correct?
- Timeout parameters are correctly configured in the IEC 60870-5-104 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.

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## 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