

RADIO MODULE



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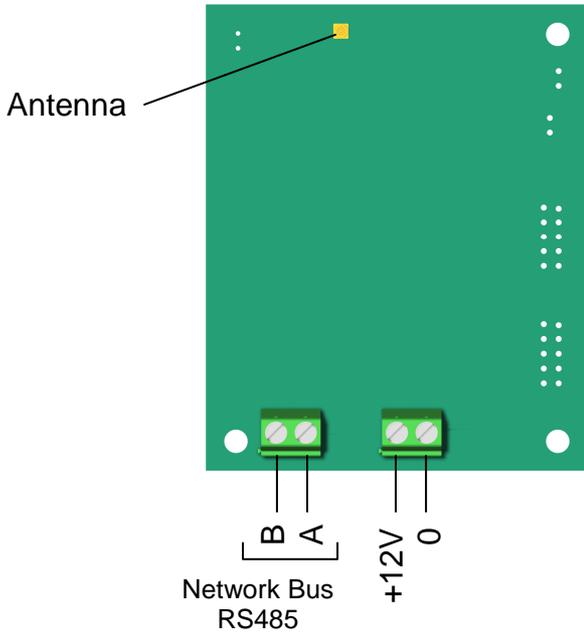
RADIO MODULE
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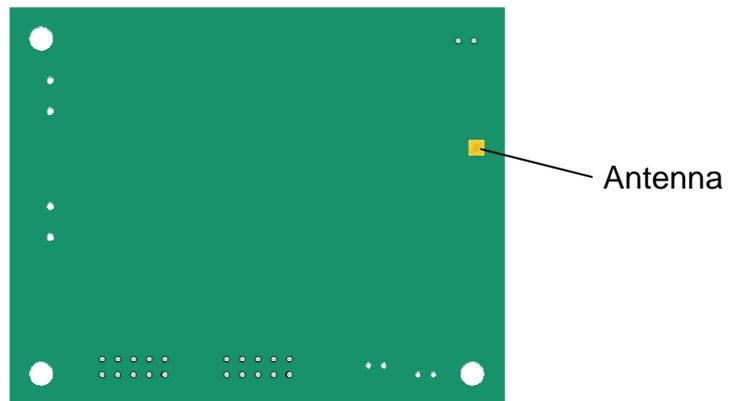
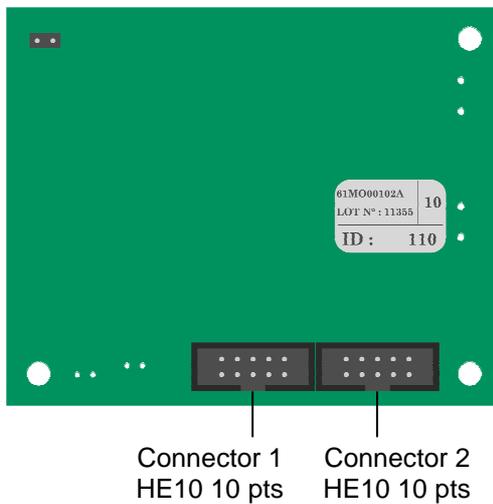
1 Wiring

1.1 Module RS485



The RS485 module is the interface for the control equipment. It operates at 9600 baud with 1 start bit, 8 data bits and 1 stop bit using the MODBUS protocol. The LSB for each byte is transmitted first. There are 3 standard commands: read n word (3), write 1 word (6) and write n words (16). The JBUS slave number for Radio RS485 is 100.

1.2 Radio Module



Wiring Connector 1 HE10 10 pts

N° of terminal	Item
1	2.5 V +/-100 mV, undulation max. of 50 mVcc, current max. 70 mA
2, 8	GND
5	Battery voltage or unregulated battery between 3.1 V and 5.0 V
9	Rx RS232 full duplex
10	Tx RS232 full duplex
3, 4, 6, 7	NC

Wiring Connector 2 HE10 10 pts

N° of terminal	Item
1	NC
2, 8	GND
5	NC
9	Rx RS232 full duplex
10	Tx RS232 full duplex
3, 4, 6,7	NC

Alarm interface command to Radio Module:

Dialogue between the alarm interfaces and Radio Module is carried out via a serial full-duplex RS232 connection at 9600 baud +/- 2.5%, 8 data bits, no parity and 1 stop bit. The LSB for each byte is transmitted first.

The alarm interfaces status is sent via RS232 link using 2 bytes. The first byte contains its 7 bit address (between 1 and 125) and the second byte contains the alarm status using 8 bits.

Send:

Alarm interface address	Interface status
7 bits (MSB) + LSB not used	8 data bits

- 1st byte: Bit 1 to 7: alarm interface address
Bit 0: not used
- 2nd byte: Bit 0 to 7: interface status using 8 bits

Response:

X 0 0 0 0 0 0 0	0
7 bits (MSB) + LSB not used	

Bit 7: Indicates radio module is OK (0) or not in service (1)

Identification of alarm interface addresses assigned to a radio module is made when its status is first sent. These addresses are recorded in flash memory of the Radio Module linked to the alarm interface.

2 DESCRIPTION OF ACCESSIBLE DATA

2.1 Installation mode

The RS485 module must be commanded while in installation mode so that it can configure all the un-configured radio modules that it finds. The number of modules on the network is updated for each radio module that is found. It must then read the factory identification for each radio module on the network in the table of serial numbers.

This association of the radio module number with the factory identifier allows the installer to know which radio modules are visible on the network. The installation can be terminated by sending a JBUS command to the RS485 radio once the desired number of radio modules is reached.

RSSI levels:

The signal strength information between each radio module at completion of the installation is stored in table format. To update this table, a deletion command for the RSSI levels must be sent and configuration redone.

2.2 Operating mode

A radio module can send alarm statuses for 0 to 4 alarm interfaces.

There is no dialogue between the alarm interface and the radio module outside of passing on an alarm. For that reason, the alarm interface address is not taken into account until occurrence of the first alarm.

The table of alarm interface numbers associated with the radio module number makes it possible to know which alarm interface belongs to a certain radio module. Once the association is made, it is possible to know which alarm interfaces are present on the site and the radio module that will transmit the alarm.

Alarm status:

A read word in the alarm table provides the status of the alarm interfaces. Each address for an alarm interface present on the site serves as an index for the table entry.

Radio network status:

A read word in the radio alarm table provides the status of the radio modules. Each address for a radio module present on the site serves as an index to the table entry.

Reading of the status of the RS485 Radio provides its current operating mode.

Search path mode is indicated by the RS485 module when a radio module is not responding to it.

Path search lasts for 20 seconds, then the RS485 module returns to operating mode.

Two path searches are separated by a duration of at least 15 minutes.

The received signal level and the number of hops between the radio module (number) and the RS485 module are updated at each exchange.

2.3 Maintenance mode

Command to delete an alarm interface:

It is possible to delete an alarm interface associated with a radio module. This operation is necessary in order to assign a new interface to the radio module.

Command to edit the address of an alarm interface:

The command to edit the address of an alarm interface allows assignment or reassignment of an address to an alarm interface.

Command to delete a radio module:

To delete a radio module from the network, the delete command must be issued. To replace a radio module, configuration mode must be reentered to add a new radio module to the network.

3 MAPPING

0x0100: Reserved (table registers SYSRSTIV)
 0x0180: Reserved (table registers SYSSNIV)
 0x0200: Reserved (table registers SYSUNIV)

0x0E00: Number of radio modules found
 0x0E01: Channel number
 0x0E02: Status of RS485 module
 0x0E03: Reserved
 0x0E04: Counter for reconfiguration of radio chip in Reception mode
 0x0E05: Counter for reconfiguration of radio chip in Transmission mode

0x1001: Table of alarm interfaces in read mode
 0x2001: Table of alarm interfaces in write mode
 0x2101: Table of status of alarm interface commands
 0x3001: Table of radio module alarms in read mode
 0x4000: Table containing the serial numbers of radio modules in read mode
 0x5002: Table containing the numbers of associated interface alarms in read mode
 0x6001: Table of hops made to reach the RS485 module in read mode
 0x6201: Table of minimum and maximum number of hops made to reach the RS485 module in read mode
 0x7001: Table of RSSI (reception level) for RS485 module in read mode
 0x8000: Table of RSSI recorded at time of installation
 0xFFFE: Slave address for RS485 module = 100 (0x64)

0x0F00: 6 bytes in write and read mode for RS485 module commands

4 TABLE OF RADIO MODULES

4.1 Commands for RS485 module

- MODBUS function **Write word** at address 0X0F00:
 Command word:
 - 0x0001: Command to configure radio network (Write 1 word)
 - 0x0002: Command to stop configuration of radio network (Write 1 word)
 - 0x0003: Command to delete RSSI table (Write 1 word)
 - 0x0004: Command to delete a radio module (Write 3 words)

The command to configure the radio network must be followed by a read word (Modbus function 3) at address 0x0F00.

If the response is 0x001, the command is being executed.

If the response is 0x000, the command has finished.

Once the command has finished, the status of the RS485 module must be read in configuration mode at address 0x0E02.

The command to stop configuration of the radio network must be followed by a read word (Modbus function 3) at address 0x0F00.

If the response is 0x002, the Command is still being executed.

If the response is 0x000, the Command has finished.

Once the command has finished, the status of the RS485 module must be read in operating mode at address 0x0E02.

The command to delete the RSSI tables must be followed by a read word (Modbus function 3) at address 0x0F00.

If the response is 0x003, the command is still being executed.

If the response is 0x000, the command has finished.

This command must always be followed by a return to configuration mode (for a minimum of one minute) to update the RSSI table.

Command to delete a radio module:

0x0004: Command to delete a radio module (Write 3 words)

Argument for the command: LSB for the radio ID in 0x0F01

Argument for the command: MSB for the radio ID in 0x0F02

This command must always be followed by reading the non-initialized ID in table 0x4000 at the location of the deleted radio to ensure proper activation of the delete command.

Comment: When the network is not configured, the RS485 module waits for the start configuration command.

Comment: Termination of configuration must take place at least 60 seconds after the last radio module has been found (Update of RSSI tables).

Comment: Deletion of a radio module leads to discontinuities in the numbers of radio modules present. The number of radio modules is therefore not the same as that of the entry index for the last radio.

- **MODBUS function Write 2 words at address 0X0F00:**

Command word:

0xA5 0x5A: Factory reset of RS485 module. Each Radio Module must be reset.

4.2 RS485 Radio Status

Address of register: 0x0E02 (read-only access)

if 0X0000 = RS485 module is in operating mode

if 0x0001 = RS485 module is in installation mode

if 0x0002 = RS485 module is performing a path search

4.3 Number of radio modules

Address of table: 0x0E00

1 word accessible in read-only by RS485 module at address 0x0E00

Number of radios present on RS485 module.

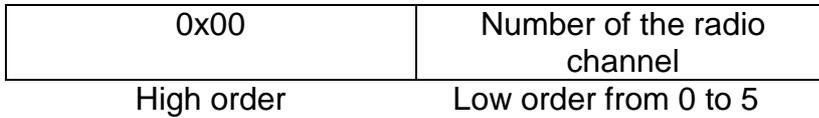
0x00	Number of radio modules
High order	Low order from 0 to 64

4.4 Channel number

Address of table: 0x0E01

1 word accessible in read-only at address 0x0E01

By default if RS485 Radio non-configured then channel number = 255



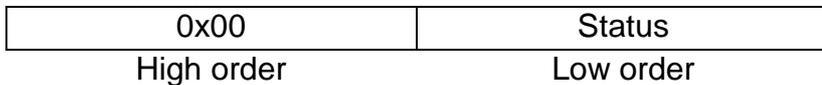
The center frequency of channel N with N ranging from 0 to 5 is: 915000 kHz + N * 50 kHz.

4.5 Table of radio module alarms

Address of table: 0x3001

Accessible range in read-only mode by the hub: 0x3001 to 0x3040

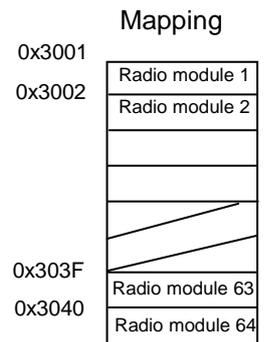
Result for 1 word:



- Bit 0: set to 1 to signal that the radio module is new
- Bit 1: set to 1 to signal loss of the radio connection
- Bit 2: set to 1 by the radio module to signal a reset
- Bit 3: set to 1 for a known radio module following a reset by the coordinator
- Bit 4: Repeater tamper alarm
- Bit 5: Repeater low battery alarm

Bit 0 function: as long as the radio module is not identified, this bit remains at 0. Once identified, the bit is set to 1.

Reading of the table by the system host resets this bit to 0.



4.6 Table of serial numbers of the radio modules

Address of table: 0x4000

Result for 2 words:

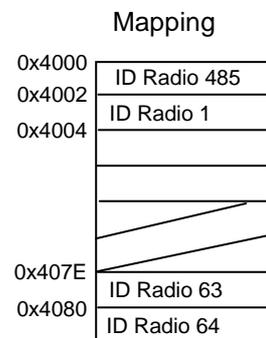
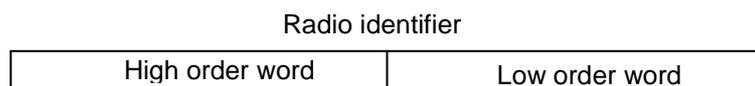
Accessible range in read-only mode: 0x4000 to 0x4080

Address of radio module identifier:

$N = 0x4000 + 2x (\text{Radio_number})$

For a Radio number set between 0 and 64

Result for 2 words:



If not initialized = 0.

The ID's for radios can be arranged non-consecutively in the table.

The number of radio ID's found must correspond to the number of radio modules of the RS485 Radio.

4.7 Table containing the numbers of associated alarm interfaces

Address of table: 0x5002

Result for 2 words:

Accessible range in read-only mode: 0x5002 to 0x5080

The table provides the numbers of the alarm interfaces with which the radio module is associated.

Alarm interfaces associated with Radio Module as address:

$$N = 0x5000 + 2x (\text{number_Radio})$$

Result for 2 words:

@Interfaces for Radio X

Interface 4	Interface 3	Interface 2	Interface 1
-------------	-------------	-------------	-------------

Mapping

0x5002	@Interface for Radio 1
0x5004	@Interfaces for Radio 2
0x5006	
0x507E	@ Interface for radio 63
0x5080	@ Interface for radio 64

Interface address: no associated alarm interface or not configured when first powered on = 0. If a radio module sees no associated alarm interface, it operates as a repeater.

Comment: An alarm interface 3 can exist without an alarm interface 2.

4.8 Table of hops made to reach the RS485 module

Address of table: 0x6001

Accessible range in read-only mode: 0x6001 to 0x6040

Entry index: radio module number between 0x01 and 0x40 (1 to 64).

Result for 1 word:

0x00	Number of hops
High order	Low order from 0 to 255

0 = directly seen by module RS485

If not initialized = 0.

Mapping

0x6001	Hops Radio 1
0x6002	Hops Radio 2
0x6003	
0x603F	Hops Radio 63
0x6040	Hops Radio 64

4.9 Table of minimum and maximum number of hops made to reach the RS485 module

Address of table: 0x6201

Accessible range in read-only mode: 0x6201 to 0x6240

Entry index: radio module number between 0x01 and 0x40 (1 to 64).

Result for 1 word:

Number of maximum hops (1 to 255)	Number of minimum hops (0 to 255)
High order byte	Low order byte

Mapping

0x6201	Hops Radio 1
0x6202	Hops Radio 2
0x6203	
0x623F	Hops Radio 63
0x6240	Hops Radio 64

If not initialized = 0xFFFF.

4.10 Table of RSSI

A table that is read-only accessible contains the reception level between the radio module and the RS485 module for each radio module.

This table is updated after each communication.

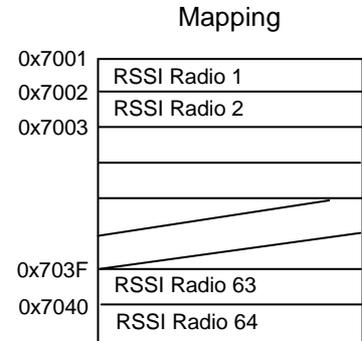
Address of table: 0x7001

Accessible range in read-only mode: 0x7001 to 0x7040

RSSI: Received Signal Strength Indication

Result for 1 word:

0x00	RSSI
High order	Maximum real value 0 to 230



If not initialized / Radio lost / Radio not directly seen = 0

Comment: RSSI is one byte with a value between 0 and 230. The detection threshold is at about 20, with a maximum theoretical value of 230. A value of 150 corresponds to a maximal observed reception.

4.11 Table of RSSI recorded at time of installation

Address of table: 0x8000

Accessible range in read-only mode: 0x8000 to 0x9080

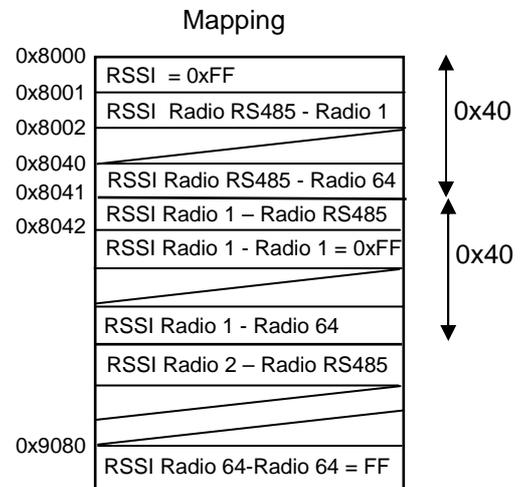
Entry index: for $i \neq j$ (i different than j), RSSI index of j seen by i is given by: $65 * i + j$

$0 < i \leq 64$

$0 < j \leq 64$

If $i = 0$: The RSSI is that of the coordinator with the radio j. i and j are the logical numbers of the radio.

0x00	RSSI
High order	Maximum real value 0 to 230



If not initialized RSSI = 0x00FF.

If $i = j$ then RSSI = 0x00FF.

During the execution of a command, the RS485 module does not modify the corresponding word. When the command has terminated successfully, the RS485 module sets the corresponding word to 0. If the command was not executed successfully, the RS485 module writes an error code in the low order 8 bits and the cause of the error in the high order 8 bits. The error codes are 0xFF and 0xFE.

During the execution of a command, a write made by a user to the corresponding address will cause cancellation of the command.

The code 0xFE is only returned for an edit address command when the alarm interface has responded to an unwanted address. In such a case, the response by the alarm interface is returned in the high order 8 bits and is the byte returned by the alarm interface without shifting.

The code 0xFF is returned for other errors and the high order 8 bits indicate the cause of the error:

- 0x01 → Command invalid (different than 1, 2 or 4)
- 0x02 → Command argument invalid
- 0x03 → Radio module containing the interface out of order
- 0x04 → Command interrupted by a write made by the user
- 0x05 → No response by radio module or alarm interface not found
- 0x06 → No response by alarm interface

Comment: A write by the hub that sets the command word to 0 resets the corresponding word to 0 and involves no other user action, except when a command corresponding to the interface number is executing, in which case the command is interrupted and the RS485 Radio returns the corresponding error code.

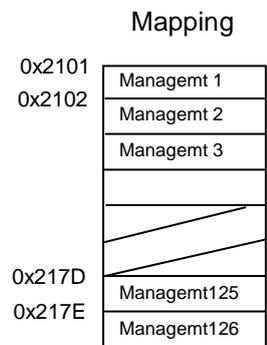
5.3 Table of progress status of alarm interface commands

Address of table: 0x2101

Entry index: number of alarm interface between 0x01 and 0x7E (1 to 126).

Accessible range in read-only mode: 0x2101 to 0x207E

xxxxxxxx	Progress status
High order	Low order



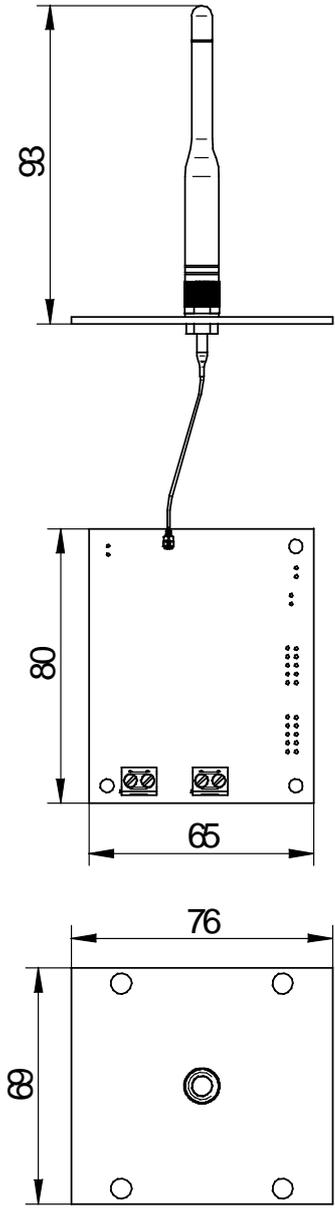
The value of the read word indicates the progress status of the command that involves the concerned alarm interface.

The values are as follows:

- 0 → No command in progress, last command terminated
- 1 → Write command by user, waiting for execution
- 2 → Radio packet waiting for transmission
- 3 → Waiting for response by radio module containing the alarm interface
- 4 → Start of 2nd transmission
- 5 → No response by radio module, second attempt to transmit radio packet waiting for transmission
- 6 → Waiting for response by radio module following retransmission

6 TECHNICAL SPECIFICATIONS

	RADIO NETWORK
Maximum exterior range	200 meters
Maximum number of radio modules	32
Response time	adjustable from 40 ms to 800 ms
Power	<ul style="list-style-type: none"> – Radio module: 2.5V +/-100 mV and battery voltage of 3.1 V to 5 V. – RS485 Module: 12 Vdc +/- 10%
Operating temperature	-35°C / +55°C
Relative humidity	95% max. without condensation
Electromagnetic compatibility	Complies with European standards (CE label)
Radio specification: <ul style="list-style-type: none"> • Radio standard • Frequency • Number of channels • Channel width 	NF EN 300220-3 915.000MHz – 915.250MHz 6 50KHz



Radio Module

7 WARNINGS

“This transmitter module is authorized to be used in other devices only by OEM integrators under the following conditions:

1. 1. *The antenna(s) must be installed such that a minimum separation distance of 20 cm is maintained between the radiator (antenna) & user’s/nearby person’s body at all times.*
2. 2. *The transmitter module must not be co-located with any other antenna or transmitter.*

8 WARNINGS

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help

This equipment complies with FCC’s radiation exposure limits set forth for an uncontrolled environment under the following conditions :

This equipment should be installed and operated such that a minimum separation distance of 20cm is maintained between the radiator (antenna) and user’s/nearby person’s body at all times. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

In compliance with European directives on the environment, this product must not be disposed of in household waste, but recycled in an approved facility.

THIS DEVICE COMPLIES WITH PART 15 OF THE FCC RULES. OPERATION IS SUBJECT TO THE FOLLOWING TWO CONDITIONS: (1) THIS DEVICE MAY NOT CAUSE HARMFUL INTERFERENCE, AND (2) THIS DEVICE MUST ACCEPT ANY INTERFERENCE RECEIVED, INCLUDING INTERFERENCE THAT MAY CAUSE UNDESIRE OPERATION.



In compliance with European directives on the environment, this product must not be disposed of in household waste, but recycled in an approved facility.