![ADFweb logo] **Industrial Electronic Devices**

User Manual
Revision 1.001
English

NMEA 2000 / Modbus TCP Slave – Converter

(Order Code: HD67455)

for Website information:
www.adfweb.com?Product=HD67455

for Price information:
www.adfweb.com?Price=HD67455

Benefits and Main Features:

⊕ Very easy to configure

⊕ Isolation between two buses

⊕ Temperature range: -40°C / +105°C (-40°F / +221°F)

User Manual

For others Gateways / Bridges:

J1939 to Modbus

See also the following links:
www.adfweb.com?Product=HD67212 (Modbus RTU)

CANopen to Modbus

See also the following links:
www.adfweb.com?Product=HD67001 (Modbus RTU Master)
www.adfweb.com?Product=HD67002 (Modbus RTU Slave)
www.adfweb.com?Product=HD67004 (Modbus TCP Master)
www.adfweb.com?Product=HD67005 (Modbus TCP Slave)

For others Gateways / Bridges:
For **CAN bus 2.0A** and/or **CAN bus 2.0B** to **Modbus**

See also the following links:
www.adfweb.com?Product=HD67011 (Modbus RTU Slave)
www.adfweb.com?Product=HD67012 (Modbus RTU Master)
www.adfweb.com?Product=HD67014 (Modbus TCP Slave)
www.adfweb.com?Product=HD67015 (Modbus TCP Master)

Do you have an your customer protocol?

See the following links:
www.adfweb.com?Product=HD67003

Do you need to choose a device? do you want help?

Ask it to the following link:
www.adfweb.com?Cmd=helpme

INDEX:

UPDATED DOCUMENTATION:

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REVISION LIST:

Revision	Date	Author	Chapter	Description
1.000	27/10/2016	Ff	All	First released version
1.001	13/03/2017	Ff	All	Revision

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SECURITY ALERT:

GENERAL INFORMATION
To ensure safe operation, the device must be operated according to the instructions in the manual. When using the device, legal and safety regulation are required for each individual application. The same applies also when using accessories.

INTENDED USE
Machines and systems must be designed so the faulty conditions do not lead to a dangerous situation for the operator (i.e. independent limit switches, mechanical interlocks, etc.).

QUALIFIED PERSONNEL
The device can be used only by qualified personnel, strictly in accordance with the specifications.
Qualified personnel are persons who are familiar with the installation, assembly, commissioning and operation of this equipment and who have appropriate qualifications for their job.

RESIDUAL RISKS
The device is state-of-the-art and is safe. The instruments can represent a potential hazard if they are inappropriately installed and operated by untrained personnel. These instructions refer to residual risks with the following symbol:
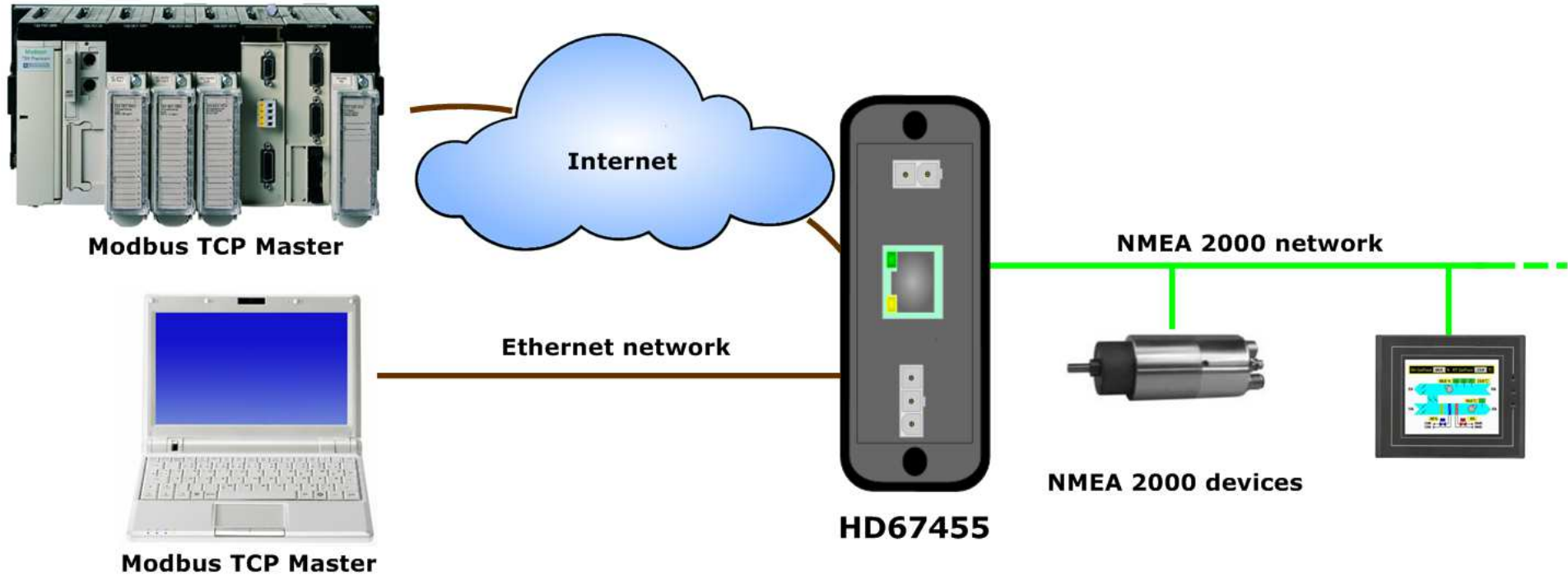
⚠️ This symbol indicates that non-observance of the safety instructions is a danger for people that could lead to serious injury or death and / or the possibility of damage.

CE CONFORMITY
The declaration is made by our company. You can send an email to support@adfweb.com or give us a call if you need it.

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EXAMPLE OF CONNECTION:

Modbus TCP Master

Internet

Ethernet network

Modbus TCP Master

HD67455

NMEA 2000 network

NMEA 2000 devices

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CONNECTION SCHEME:

Connector3:
NMEA 2000 port
Lo →
Shl1 →
Hi →

Hi = High wire
Lo = Low wire
Shl1 = Shield (to Isolated Ground)

Connector2:
Ethernet Port
(RJ45 Plug)

Connector1:
Power Supply port
0V   +V

0V = Ground
+V = Positive wire

V AC: min 8V ; max 26V
V DC: min 10V ; max 40V

Connector4:
USB port

Led 1:
Green
Device State

Led 2:
Green
NMEA 2000 comm.

Led 3:
Yellow
USB link

Led 4:
Green
Ethernet comm.

Figure 1a: Connection scheme for HD67455-E4x-xx

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Connector3:
NMEA 2000 port

Hi = High wire
Lo = Low wire
Shl1 = Shield (to Isolated Ground)

Lo →
Shl1 →
Hi →

Connector2:
Ethernet Port

1 = TX -
2 = TX +
3 = RX +
4 = RX -

4 →
3 →
2 →
1 →

Connector1:
Power Supply port

0V = Ground
+V = Positive wire

V AC: min 8V ; max 26V
V DC: min 10V ; max 40V

0V→
+V→

Connector4:
USB port

Led 1:
Green
Device State

Led 2:
Green
NMEA 2000 comm.

Led 3:
Yellow
USB link

Led 4:
Green
Ethernet comm.

Figure 1b: Connection scheme for HD67455-E7x-xx

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CHARACTERISTICS:

The "HD67455" series are rugged devices used to interface NMEA 2000 devices with a Modbus TCP Master.
With his particular enclosure, equipped with four fixing lugs, makes available the mounting of the device in any plane surface (horizontal, vertical, oblique).
It is possible to have the device varnished or totally resined and also in both cases with "Mini-Fit®" connectors or "AMP SuperSeal 1.5" connectors. If is resined, the enclosure, like the "AMP SuperSeal 1.5" connectors, is waterproof.

All the four series have these characteristics:

- Triple 4kV isolation between Power Supply / Ethernet / NMEA 2000;
- Varnished / Resined (optionally);
- Wide power supply input range: 8…26V AC | 10…40V DC;
- Mini-Fit® / AMP SuperSeal 1.5 connectors;
- Metal enclosure with fixing lugs;
- Possibility to use Metal hose clamps for fixing it without using lugs;
- Microprocessor for data control;
- Wide temperature range: -40°C / 105°C (-40°F / 221°F).

CONFIGURATION:

You need Compositor SW67455 software on your PC in order to perform the following:

- Define the parameters for the Modbus TCP side;
- Define the parameters for the NMEA 2000 side;
- Define which NMEA 2000 messages are readable on Modbus TCP side;
- Define which NMEA 2000 messages are writeable from Modbus TCP side;
- Update the device.

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POWER SUPPLY:

The devices can be powered between a wide range of tensions. For more details see the two tables below.

	VAC 〰		VDC ▬▬	
	Vmin	**Vmax**	**Vmin**	**Vmax**
HD67455-Exx-xx	**8V**	**26V**	**10V**	**40V**

Consumption at 24V DC:

Device	W/VA
HD67455-Exx-xx	4

⚠️ **Caution: Not reverse the polarity power**

HD67455-E4x-xx   HD67455-E7x-xx
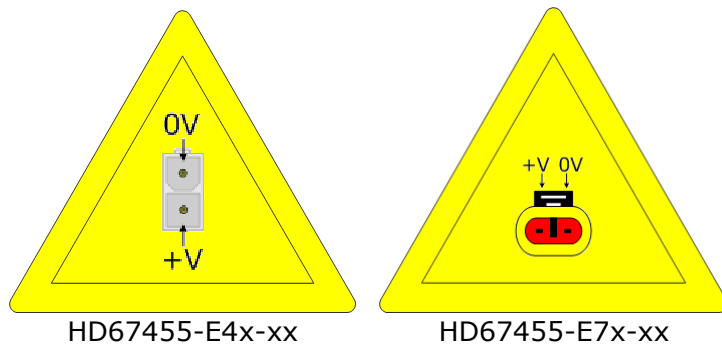
📝 Note: It is possible to use also negative tensions. In this case the polarity must be inverted.

Connector1:
Power Supply port

0V = Ground
+V = Positive wire

V AC: min 8V ; max 26V
V DC: min 10V ; max 40V

0V +V

Connector1:
Power Supply port

0V = Ground
+V = Positive wire

V AC: min 8V ; max 26V
V DC: min 10V ; max 40V

0V→
+V→

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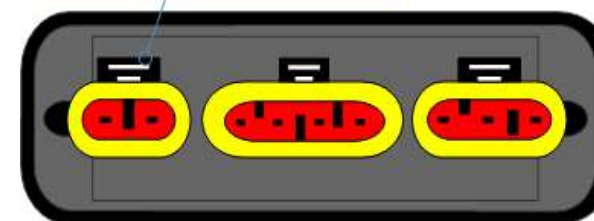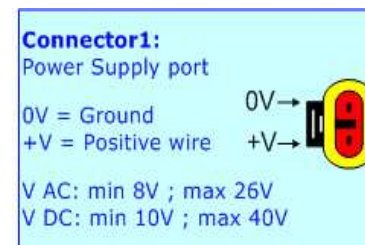
LEDS:

The device has got four LEDs that are used to give information of the functioning status.
The various meanings of the LEDs are described in the table below.

LED	Normal Mode	Boot Mode
1: Device state (green)	Blinks slowly (~1Hz)	**Blinks quickly:** Boot state **Blinks very slowly (~0.5Hz):** update in progress
2: CAN Communication (green)	Blinks when NMEA 2000 frames are received	**Blinks quickly:** Boot state **Blinks very slowly (~0.5Hz):** update in progress
3: USB link (yellow)	**ON**: USB cable inserted **OFF**: USB cable not inserted	**ON**: USB cable inserted **OFF**: USB cable not inserted
4: Ethernet communication (yellow)	Blinks when a Modbus TCP request is received	**Blinks quickly:** Boot state **Blinks very slowly (~0.5Hz):** update in progress

Led 1:
Green
Device State

Led 2:
Green
CAN comm.

Led 3:
Yellow
Boot Mode

Led 4:
Green
Ethernet comm.

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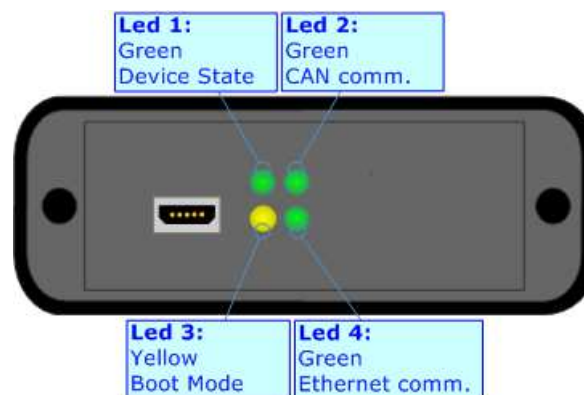
NMEA 2000:

The connection of NMEA 2000 in the HD67455-E4x-xx device must be made with a 3way MiniFit Female connector. The pinout of Male Mini-Fit connector of the board is at right side of the page.

The connection of NMEA 2000 in the HD67455-E7x-xx device must be made with a AMP SuperSeal 1.5 Male connector. The pinout of Female connector of the board is at right side of the page.

The termination of NMEA 2000 line, with a 120Ω resistor, in the HD67455-Exx-xx is made internally of the device; when the order is performed. If the device have the NMEA 2000 terminated the code is the follow: HD67455-Exx-Yx; otherwise is this other: HD67455-Exx-Nx.
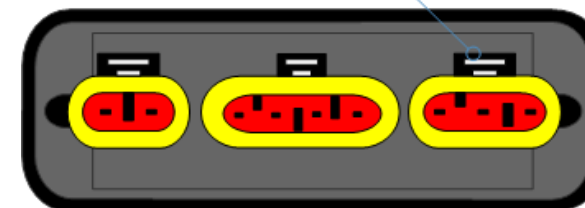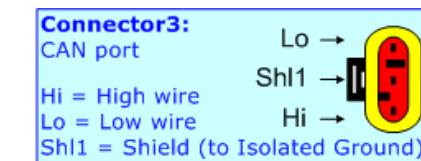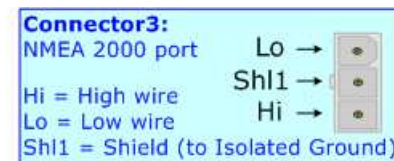
Cable characteristics:

DC parameter:		Impedance	70 Ohm/m

AC parameters:		Impedance	120 Ohm/m
		Delay	5 ns/m

Length		Baud Rate [bps]	Length MAX [m]
		10 K	5000
		20 K	2500
		50 K	1000
		100 K	650
		125 K	500
		250 K	250
		500 K	100
		800 K	50
		1000 K	25

Industrial Electronic Devices

ETHERNET:

The connection of Ethernet in the HD67455 device must be made with at least a Category 5E cable. The maximum length of the cable should not exceed 100m. The cable has to conform to the T568 norms relative to connections in cat.5 up to 100 Mbps. To connect the device to an Hub/Switch is recommended the use of a straight cable, to connect the device to a PC/PLC/other is recommended the use of a cross cable.

The connection of Ethernet in the HD67455-E4x-xx device must be made with RJ45 connector.

The connection of the Ethernet in the HD67455-E7x-xx device must be made with a AMP SuperSeal 1.5 Male connector. The pinout of Female connector of the board is at right side of the page.

Connector2:
Ethernet Port

1 = TX -
2 = TX +
3 = RX +
4 = RX -

4 →
3 →
2 →
1 →
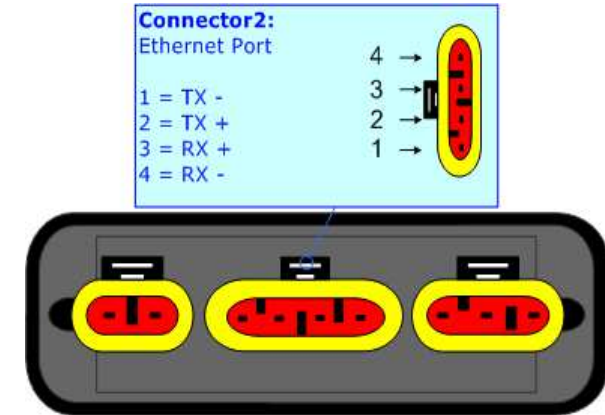
USB:

The USB port is used to start the converter in Boot Mode. It is necessary to use a Micro USB type B cable.

Connector4:
USB port

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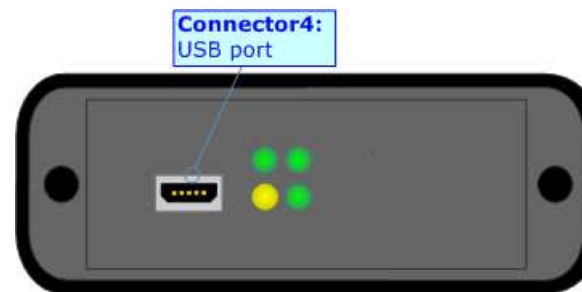
USE OF COMPOSITOR SW67455:

To configure the Converter, use the available software that runs with Windows called SW67455. It is downloadable on the site www.adfweb.com and its operation is described in this document. *(This manual is referenced to the last version of the software present on our web site)*. The software works with MSWindows (XP, Vista, Seven, 8, 10; 32/64bit).

When launching the SW67455, the window below appears (Fig. 2).

Note:
It is necessary to have installed .Net Framework 4.
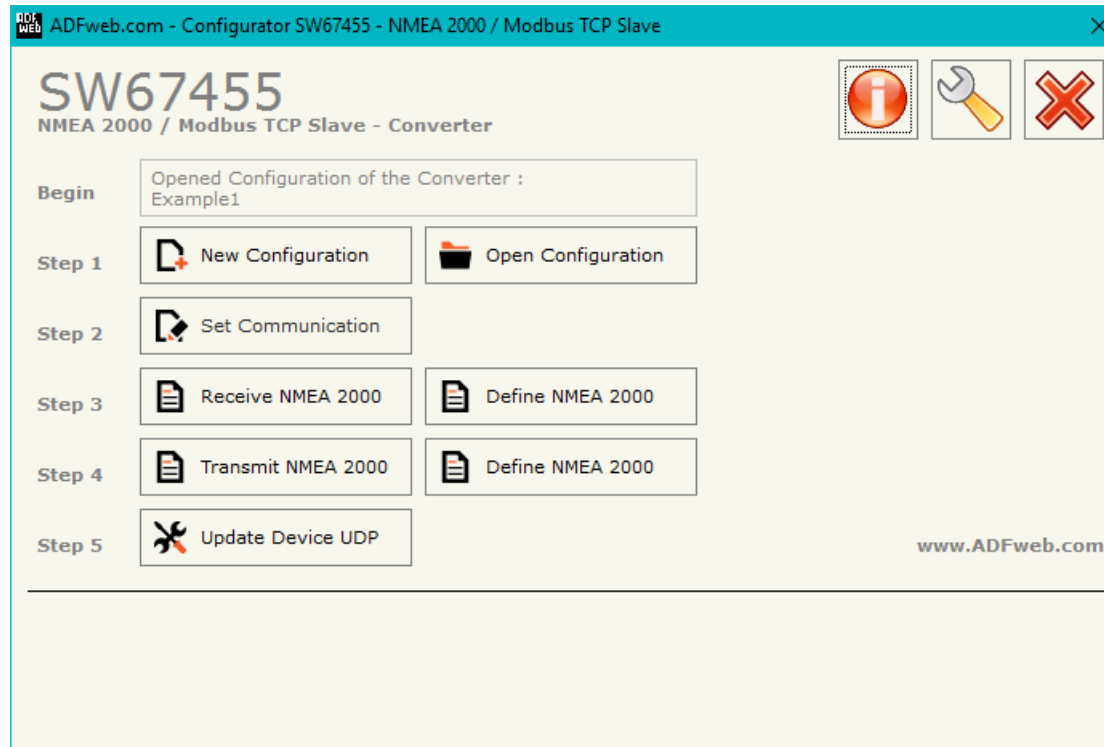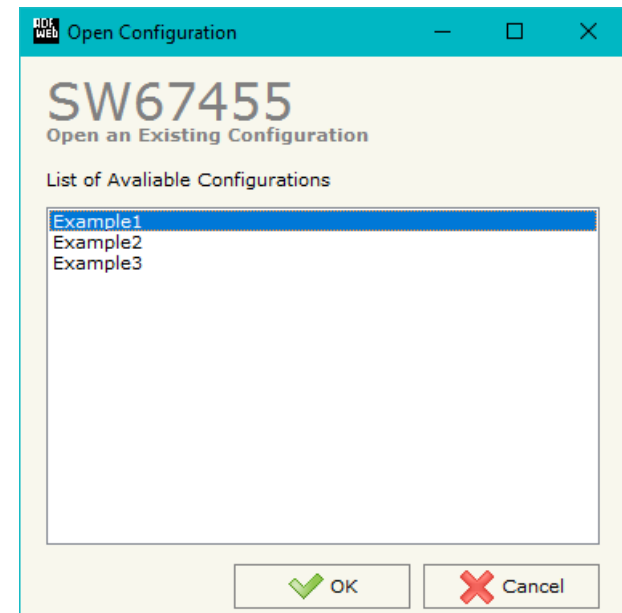

Figure 2: Main window for SW67455

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NEW PROJECT / OPEN PROJECT:

The "**New Configuration**" button creates the folder which contains the entire device's configuration.

Create New Configuration

SW67455
Create New Configuration

Name of the new Configuration

Example2

✔ OK   ✗ Cancel
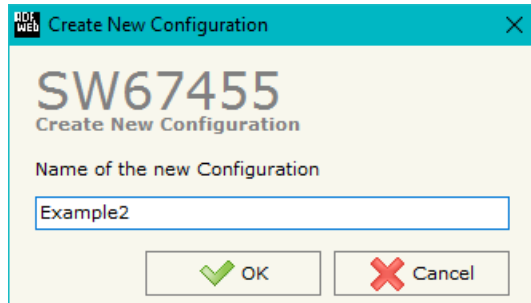
A device's configuration can also be imported or exported:

➥ To clone the configurations of a Programmable "NMEA 2000 / Modbus TCP Slave - Converter" in order to configure another device in the same manner, it is necessary to maintain the folder and all its contents;
➥ To clone a project in order to obtain a different version of the project, it is sufficient to duplicate the project folder with another name and open the new folder with the button "**Open Configuration**".

Open Configuration

SW67455
Open an Existing Configuration

List of Avaliable Configurations

Example1
Example2
Example3

✔ OK   ✗ Cancel

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SOFTWARE OPTIONS:

By pressing the "**Settings**" (🔧) button there is the possibility to change the language of the software and check the updatings for the compositor.

In the section "Language" it is possible to change the language of the software.
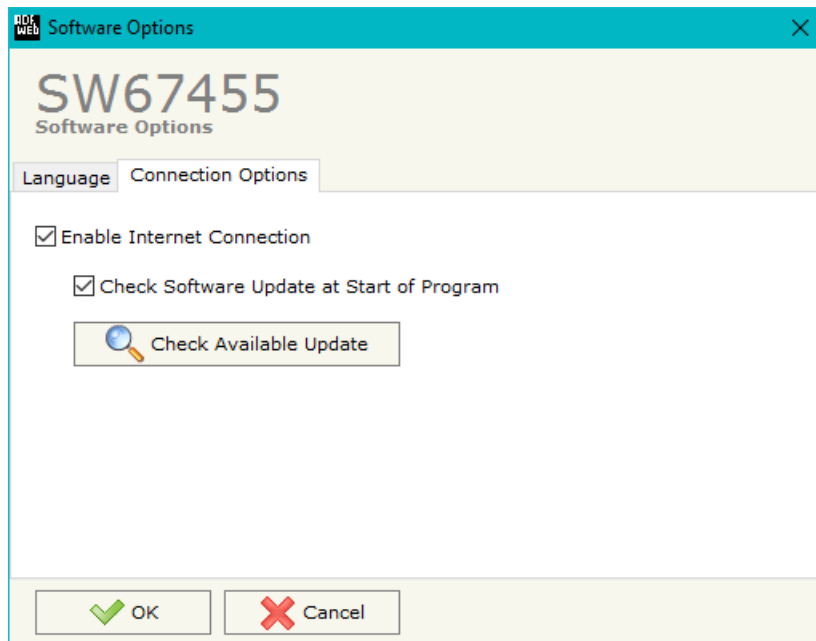
In the section "Connection Options", it is possible to check if there are some updatings of the software compositor in ADFweb.com website.
Checking the option "**Check Software Update at Start of Program**", the SW67455 check automatically if there are updatings when it is launched.

Industrial Electronic Devices

SET COMMUNICATION:

This section defines the fundamental communication parameters of two buses, NMEA 2000 and Modbus TCP**.**

By pressing the "**Set communication**" button from the main window for SW67455 (Fig. 2) the window "Set Communication" appears (Fig. 3). It is divided in two sub-section, one for the NMEA 2000 (CAN Bus) and the other for the Modbus TCP (Ethernet).

The means for the fields for the "NMEA 2000" are:

➡ In the field "**Baud Rate**" the baud rate of the NMEA 2000 is defined;

➡ In the field "**TimeOut**" the timeout of the data is defined. If this time is elapsed the value of the data of the NMEA 2000 frame become "0". If the "Cancel Data" field is checked in the "Receive NMEA 2000" window;

➡ The field "**Modbus Reg. TimeOut**" a Modbus register is defined. In this register it is possible to visualize if the data is reliable, if '1' the data is ok, if '0' the data is oldest of the time inserted in the "TimeOut Data" field;

➡ If the field "**Enable Peer to Peer**" is checked, the Source Address of the PGNs received by the converter is masked (only if a single NMEA device is connected);

➡ In the field "**Device ID NMEA 2000**" the ID of the converter is defined;

➡ If the field "**Filter FECA (ms)**" is checked, when the FECA PGN arrives the gateway puts the values in Standby. If the time, expressed in milliseconds and written at the right side of "Filter FECA", is elapsed and there aren't arrived the frames of Transport Protocol the gateway put the data of FECA into Modbus Registers. Otherwise if the Transport Protocol arrives before the time is elapsed the gateway put his data into Modbus Registers discarding the data of FECA. When this field is checked the values aren't updated when the FECA frame arrive but there is an offset of xx ms. You can use this function if there is only one NMEA 2000 device in the network.
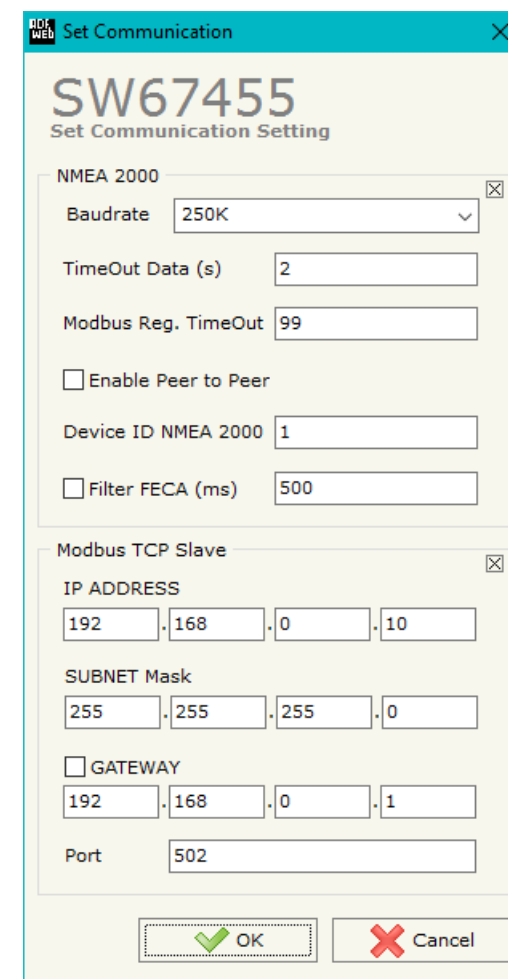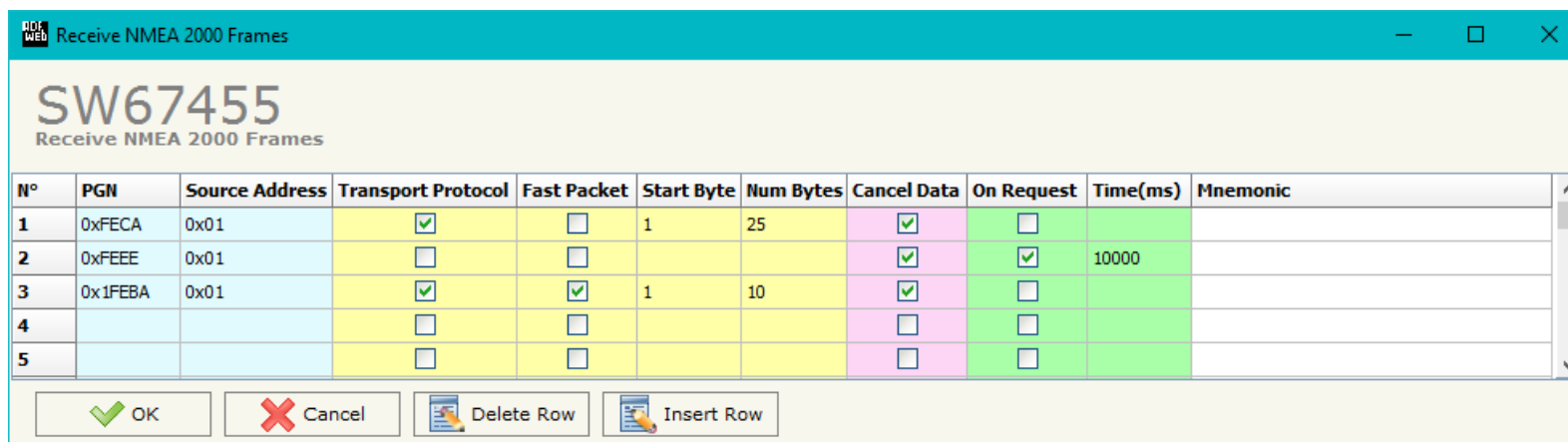

Figure 3: "Set Communication" window

Industrial Electronic Devices

The means for the fields for "Modbus TCP Slave" are:

- In the field "**IP Address**" the IP address of Modbus TCP side is defined;
- In the field "**SubNet Mask**" the SubNet Mask is defined;
- In the field "**Gateway**" the default gateway of the Ethernet network is defined. This feature can be enabled or disabled pressing the Check Box field. This feature is used to go out of the net;
- In the field "**Port**" the TCP port used for Modbus TCP communication is defined.

Industrial Electronic Devices

RECEIVE NMEA 2000:

By pressing the "**Receive NMEA 2000**" button from the main window for SW67455 (Fig. 2) the window "Receive NMEA 2000 Frames" appears (Fig. 4).

N°	PGN	Source Address	Transport Protocol	Fast Packet	Start Byte	Num Bytes	Cancel Data	On Request	Time(ms)	Mnemonic
1	0xFECA	0x01	☑	☐	1	25	☑	☐		
2	0xFEEE	0x01	☐	☐			☑	☑	10000	
3	0x1FEBA	0x01	☑	☑	1	10	☑	☐		
4			☐	☐			☐	☐		
5			☐	☐			☐	☐		

Figure 4: "Receive NMEA 2000 Frames" window

The means of the fields of the table are:

- In the field "**PGN**" the PGN of the NMEA 2000 message to receive is defined (in the NMEA 2000 protocol, the PGN is an identifier);
- In the field "**Source Address**" the address of the device that sends the frame is defined.
- If the field "**Transport Protocol**" is checked, the frame can use transport protocol functions;
- If the field "**Fast Packet**" is checked, the frame will use the Fast Packet functions;
- In the field "**Start Byte**" the starting byte to save on Modbus side is defined. This field is enabled only when the field "Transport Protocol" is checked;
- In the field "**Num Bytes**" the number of consecutive byte from the starting one is defined. For example, if the Start Byte is '20' and Num Bytes is '10', it is possible to read the byte from 20 to 30;
- If the field "**Cancel Data**" is checked and the "Modbus Register" in the section "Set Communication" is different from '0', the converter, when the data is oldest of the time inserted in the "TimeOut Data", sets "0xFF" in the Modbus registers reserved for the PGN;
- If the field "**On Request**" is checked, the converter sends a request for the PGN: this option is used if the PGN can be only sent on request by the NMEA 2000 devices;

- In the field "**Time(ms)**" the delay between two NMEA 2000 requests is defined;
- In the field "**Mnemonic**" the description for the frame is defined.

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DEFINE NMEA 2000

By pressing the "**Define NMEA 2000**" button near "Receive COB" from the main window for SW67455 (Fig. 2) the window "Define Modbus Registers for Receive NMEA 2000 Frames" appears (Fig. 5):

➤ In the field "**List of Receive NMEA 2000 Frames**" there is the list of NMEA 2000 frames that you inserted in "Receive NMEA 2000" section

➤ In the field "**List of Modbus Registers**" there are the Modbus words.

➤ In the field "**Create/Modify a Modbus Register**" you can define the index of the Modbus register and the bytes of the can frame that you map in.

For example:

Click on the frame, insert the valid address in the field "Index of Modbus Register", select the byte position (Byte 1 in High Modbus byte and Byte 3 in Low Modbus byte), click the "Create" button, in the field "List of Modbus Registers" appears the new Modbus register created with the data that it contains.
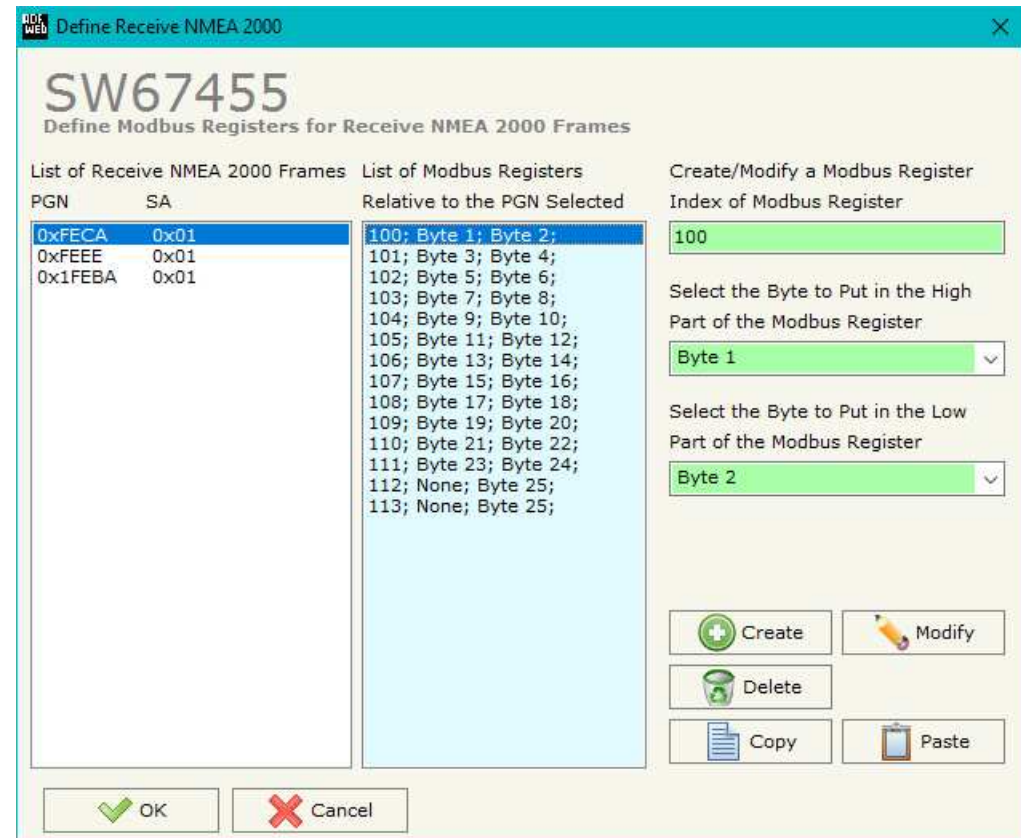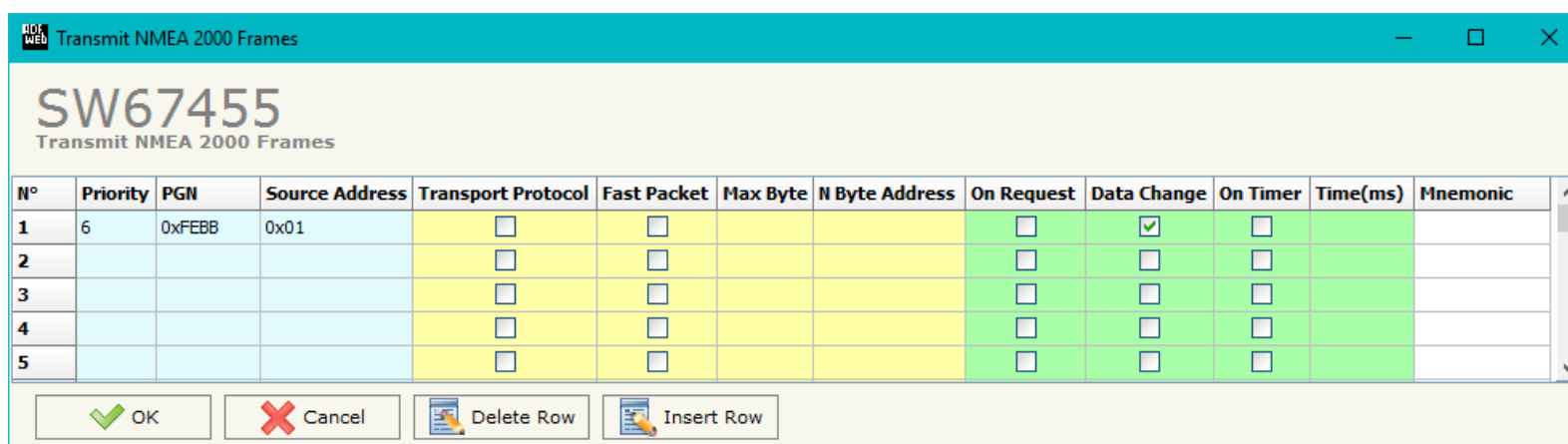

Figure 5: "Define Modbus Registers for Receive NMEA 2000 Frames" window

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TRANSMIT NMEA 2000

By pressing the "**Transmit NMEA 2000**" button from the main window of SW67455 the window "Transmit NMEA 2000 Frames" appears (Fig. 6).

Figure 6: "Transmit NMEA 2000 frame" window

The means of the fields of the table are:

- In the field "**Priority**" the priority of the NMEA 2000 message is defined. In NMEA 2000 protocol, the priority is a number between 0 and 7. 0 is the highest priority and 7 is the lowest;
- In the field "**PGN**" the PGN of the NMEA 2000 message to be written from Modbus is defined (in NMEA 2000 protocol the PGN is an identifier);
- In the field "**Source Address**" the address of the device that sends the frame is defined;
- If the field "**Transport Protocol**" is checked, the frame can use transport protocol functions;
- If the field "**Fast Packet**" is checked, the frame will use the Fast Packet functions;
- In the field "**Max Byte**" the maximum number of bytes of the NMEA 2000 message is defined. This field is enabled only when the field "Transport Protocol" is checked;
- In the field "**N Byte Address**" the Modbus register where writing the number of bytes to transmit is defined;
- If the field "**On Request**" is checked, the NMEA 2000 frame is sent when arrive a request frame from the NMEA 2000 network;
- If the field "**Data Change**" is checked, the NMEA 2000 frame is sent when a byte from Modbus side changes value;

Industrial Electronic Devices

- If the field "**On Timer**" is checked, the NMEA 2000 frame is sent cyclically;
- In the field "**Time (ms)**" the delay (in milliseconds) with which sending the NMEA 2000 message is defined;
- In the field "**Mnemonic**" a description for the frame is defined.

DEFINE NMEA 2000

By pressing the "**Define COB**" button near "Transmit COB" from the main window for SW67455 (Fig. 2) the window "Define Modbus Registers for Transmit NMEA 2000 Frames" appears (Fig. 7):

+ In the field "**List of Transmit NMEA 2000 Frames**" there is the list of NMEA 2000 frames that you inserted in "Transmit NMEA 2000" Section.
+ In the field "**List of Modbus Registers**" there are the Modbus words.
+ In the field "**Create/Modify a Modbus Register**" you can define the index of the Modbus register and the bytes of the NMEA 2000 frame where you write it.
+ With the field "**Send NMEA 2000 frame on Modbus Write**" it is possible to decide when to send the NMEA 2000 frame. If a Modbus word has written "False "in this field, the NMEA 2000 frame is not sent immediately but it is sent when another word that have this field "True" is written.

For example:

Click on the frame, insert the valid address in the field "Index of Modbus Register", select the byte position (Byte 1 in High Modbus byte and Byte 2 in Low Modbus byte), click the "Create" button, in the field "List of Modbus Registers" appears the new Modbus register created.
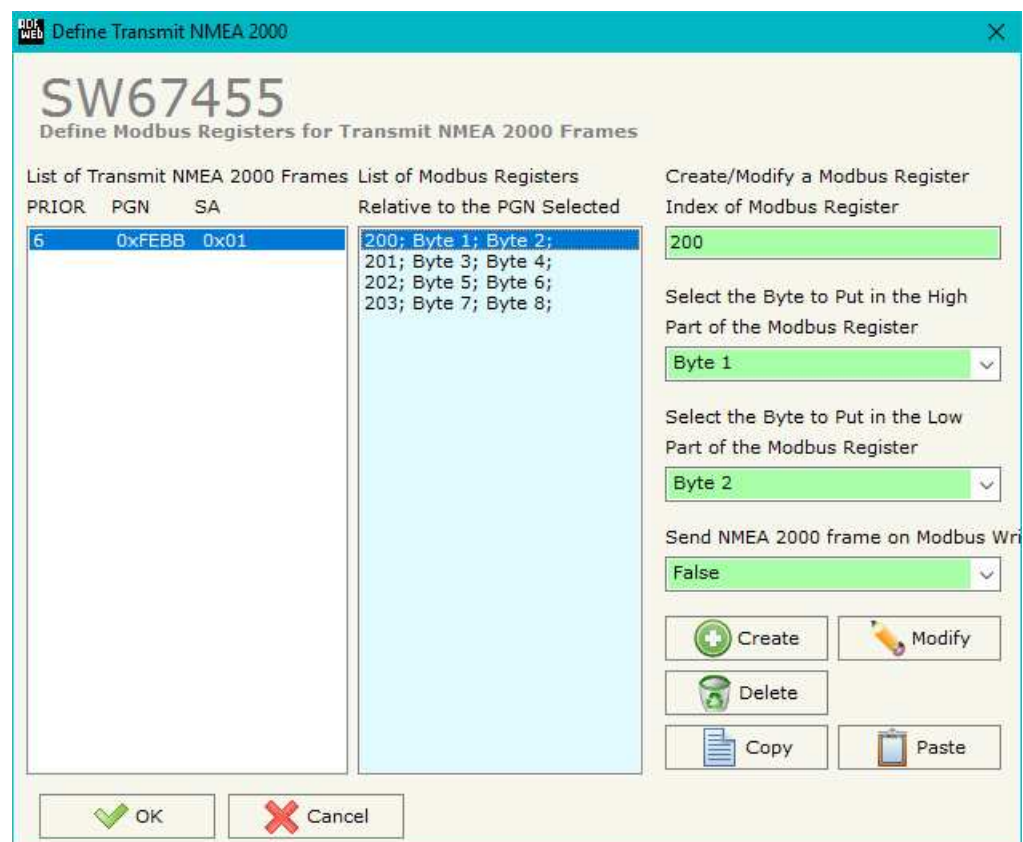

Figure 7: "Define Modbus Registers for Transmit NMEA 2000 Frames" window

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UPDATE DEVICE:

By pressing the "**Update Device**" button, it is possible to load the created Configuration into the device; and also the Firmware, if necessary.

If you don't know the actual IP address of the device you have to use this procedure:

- Connect the USB cable;
- Connect the Ethernet cable;
- Turn ON the converter;
- Insert the IP "**192.168.2.205**";
- Press the "**Ping**" button, "Device Found! must appear";
- Press the "**Next**" button;
- Select which operations you want to do;
- Press the "**Execute update firmware**" button to start the upload;
- When all the operations are "OK", the updating is done;
- Remove the USB cable;

If you know the actual IP address of the device, you have to use this procedure:

- Turn on the Device with the Ethernet cable inserted;
- Insert the actual IP of the Converter;
- Press the "**Ping**" button, must appear "Device Found!";
- Press the "**Next**" button;
- Select which operations you want to do;
- Press the "**Execute update firmware**" button to start the upload;
- When all the operations are "OK" the device automatically goes at Normal Mode.

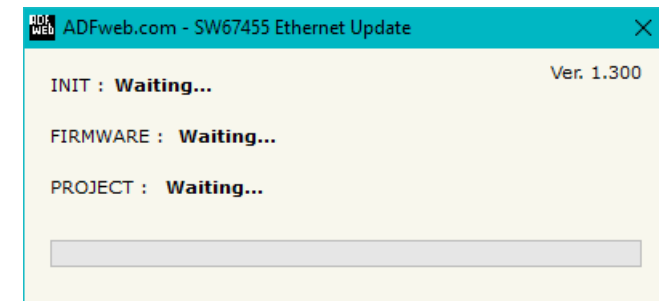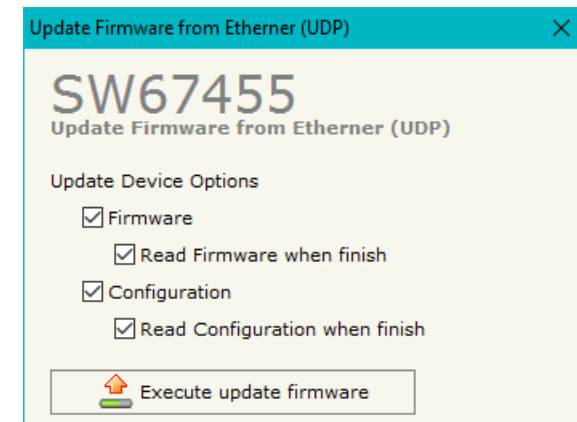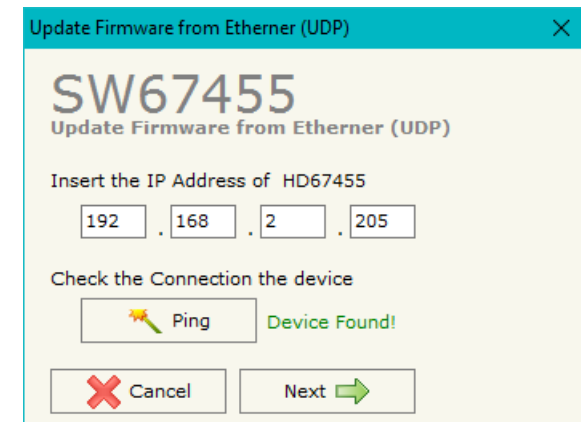At this point the configuration/firmware on the device is correctly updated.

Figure 8: "Update Device" windows

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Note:
When you install a new version of the software, if it is the first time it is better you do the update of the Firmware in the HD67455 device.

Note:
When you receive the device, for the first time, you also have to update the Firmware in the HD67455 device.

Warning:
If Fig. 9 appears when you try to do the Update try these points before seeking assistance:

Figure 9: "Protection" window

+ Try to repeat the operations for the updating;
+ Try with another PC;
+ Try to restart the PC;
+ Check the LAN settings;
+ If you are using the program inside a Virtual Machine, try to use in the main Operating System;
+ If you are using Windows Seven, Vista, 8 or 10 make sure that you have the administrator privileges;
+ In case you have to program more than one device, using the "UDP Update", you have to cancel the ARP table every time you connect a new device on Ethernet. For do this you have to launch the "Command Prompt" and write the command "arp -d". Pay attention that with Windows Vista, Seven, 8 or 10 you have to launch the "Command Prompt" with Administrator Rights;
+ Pay attention at Firewall lock.

In the case of HD67455 you have to use the software "SW67455": www.adfweb.com\download\filefold\SW67455.zip.

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MECHANICAL DIMENSIONS:

36

86

74

ADFweb.com S.r.l

E-type enclosure measures
without fixing lugs

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Type A

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E-type enclosure measures
with fixing lugs Type A

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Type B

ADFweb.com S.r.l	SCALE 1:1			PROJECT:	
E-type enclosure measures with fixing lugs Type B				DATE: 24-05-2012	
				AUTHOR:	

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Type C

40

112,5

95

92

105

ADFweb.com S.r.l

E-type enclosure measures
with fixing lugs Type C

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ORDERING INFORMATIONS:

The ordering part number is formed by a valid combination of the following:

HD67455 – E y z – s f

Fixing lugs
A: Type A
B: Type B
C: Type C
D: without fixing lugs

NMEA 2000 Termination
Y: Terminated with 120Ω
N: Not terminated

Varnished/Resinated
V: Varnished
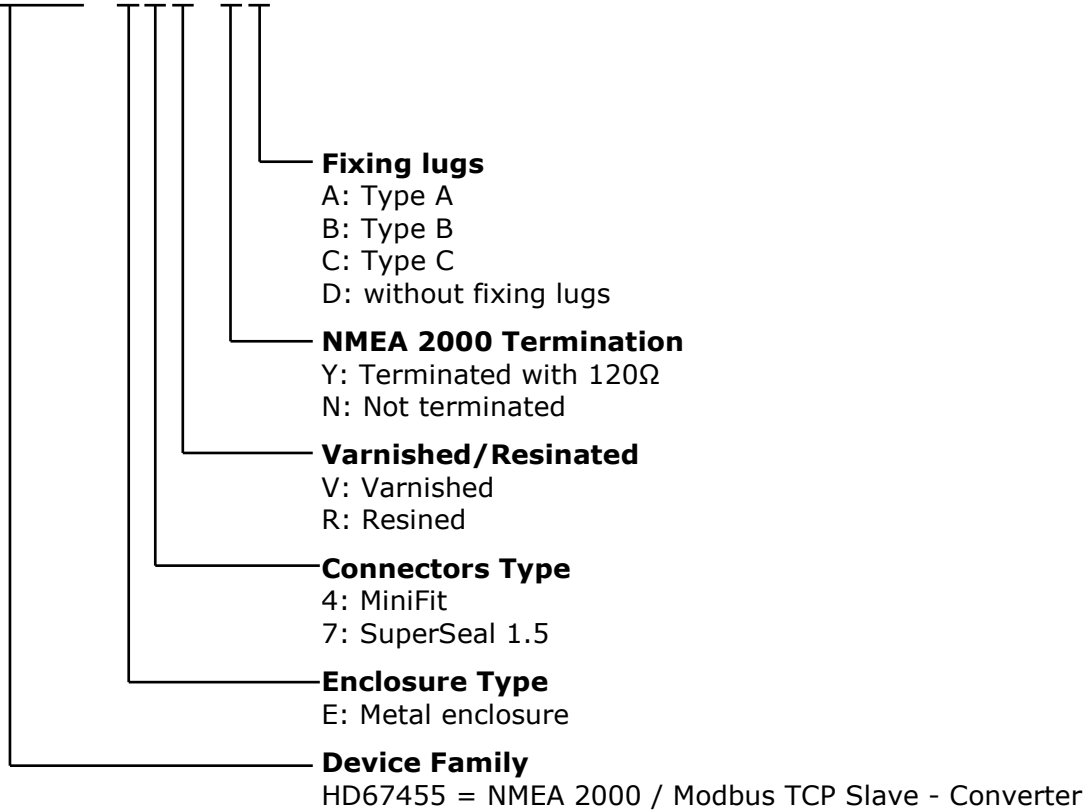R: Resined

Connectors Type
4: MiniFit
7: SuperSeal 1.5

Enclosure Type
E: Metal enclosure

Device Family
HD67455 = NMEA 2000 / Modbus TCP Slave - Converter

ACCESSORIES:

Order Code: **AC34001** -   Rail DIN - Power Supply 220/240V AC 50/60Hz – 12 V AC

Order Code: **AC34002** -   Rail DIN - Power Supply 110V AC 50/60Hz – 12 V AC

Order Code: **AC67410** -   Accessory Automotive Devices - Support for rail DIN

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OTHER REGULATIONS AND STANDARDS:

WEEE INFORMATION

Disposal of old electrical and electronic equipment (as in the European Union and other European countries with separate collection systems).

This symbol on the product or on its packaging indicates that this product may not be treated as household rubbish. Instead, it should be taken to an applicable collection point for the recycling of electrical and electronic equipment. If the product is disposed correctly, you will help prevent potential negative environmental factors and impact of human health, which could otherwise be caused by inappropriate disposal. The recycling of materials will help to conserve natural resources. For more information about recycling this product, please contact your local city office, your household waste disposal service or the shop where you purchased the product.

RESTRICTION OF HAZARDOUS SUBSTANCES DIRECTIVE

The device respects the 2002/95/EC Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment (commonly referred to as Restriction of Hazardous Substances Directive or RoHS).

CE MARKING

The product conforms with the essential requirements of the applicable EC directives.

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WARRANTIES AND TECHNICAL SUPPORT:

For fast and easy technical support for your ADFweb.com SRL products, consult our internet support at www.adfweb.com.
Otherwise contact us at the address support@adfweb.com

RETURN POLICY:

If while using your product you have any problem and you wish to exchange or repair it, please do the following:

- Obtain a Product Return Number (PRN) from our internet support at www.adfweb.com. Together with the request, you need to provide detailed information about the problem.
- Send the product to the address provided with the PRN, having prepaid the shipping costs (shipment costs billed to us will not be accepted).

If the product is within the warranty of twelve months, it will be repaired or exchanged and returned within three weeks. If the product is no longer under warranty, you will receive a repair estimate.