

User Manual

Revision 1.014
English

Modbus TCP Slave / Modbus Master – Converter

(Ethernet Switch Inside for enter/exit connection)

(Order Code: HD67508-A1-232, HD67508-A1-485)

for Website information:

www.adfweb.com?Product=HD67508-A1

for Price information:

www.adfweb.com?Price=HD67508-A1-232

www.adfweb.com?Price=HD67508-A1-485

Benefits and Main Features:

- ✚ Very easy to configure
- ✚ 35mm Rail DIN mount
- ✚ Wide supply input range
- ✚ Two Ethernet ports
- ✚ Temperature range: -40°C/+85°C (-40°F/+185°F)



For others products, see also the following links:

RS232 / RS485 / USB / Ethernet

www.adfweb.com?Product=HD67118 (RS232 / RS485 - Converter)

www.adfweb.com?Product=HD67119 (USB / RS485 - Converter)

www.adfweb.com?Product=HD67038 (RS485 / RS232 / Ethernet - Converter)

CAN / CANopen / Modbus / Modbus TCP

www.adfweb.com?Product=HD67001 (CANopen / Modbus Master - Converter)

www.adfweb.com?Product=HD67502 (CANopen / Modbus Slave - Converter)

www.adfweb.com?Product=HD67011 (CAN / Modbus Master - Converter)

www.adfweb.com?Product=HD67012 (CAN / Modbus Slave - Converter)

www.adfweb.com?Product=HD67514 (CAN / Modbus TCP Master – Converter)

www.adfweb.com?Product=HD67515 (CAN / Modbus TCP Slave – Converter)

Modbus RTU Slave / Modbus TCP Master - Converter

www.adfweb.com?Product=HD67510

Do you have your customer protocol? Then go to:

www.adfweb.com?Product=HD67003

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

www.adfweb.com?Cmd=helpme



User Manual

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UPDATED DOCUMENTATION:

Dear customer, we thank you for your attention and we remind you that you need to check that the following document is:

- ➔ Updated
- ➔ Related to the product you own

To obtain the most recently updated document, note the "document code" that appears at the top right-hand corner of each page of this document.

With this "Document Code" go to web page www.adfweb.com/download/ and search for the corresponding code on the page. Click on the proper "Document Code" and download the updates.

REVISION LIST:

Revision	Date	Author	Chapter	Description
1.011	10/12/2012	FI	All	Revision
1.012	07/02/2013	Nt	All	Added new chapters
1.013	29/01/2014	FI	All	Revision
1.014	12/02/2014	FI	All	Revision

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ADFweb.com is not responsible for any error this manual may contain.

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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:

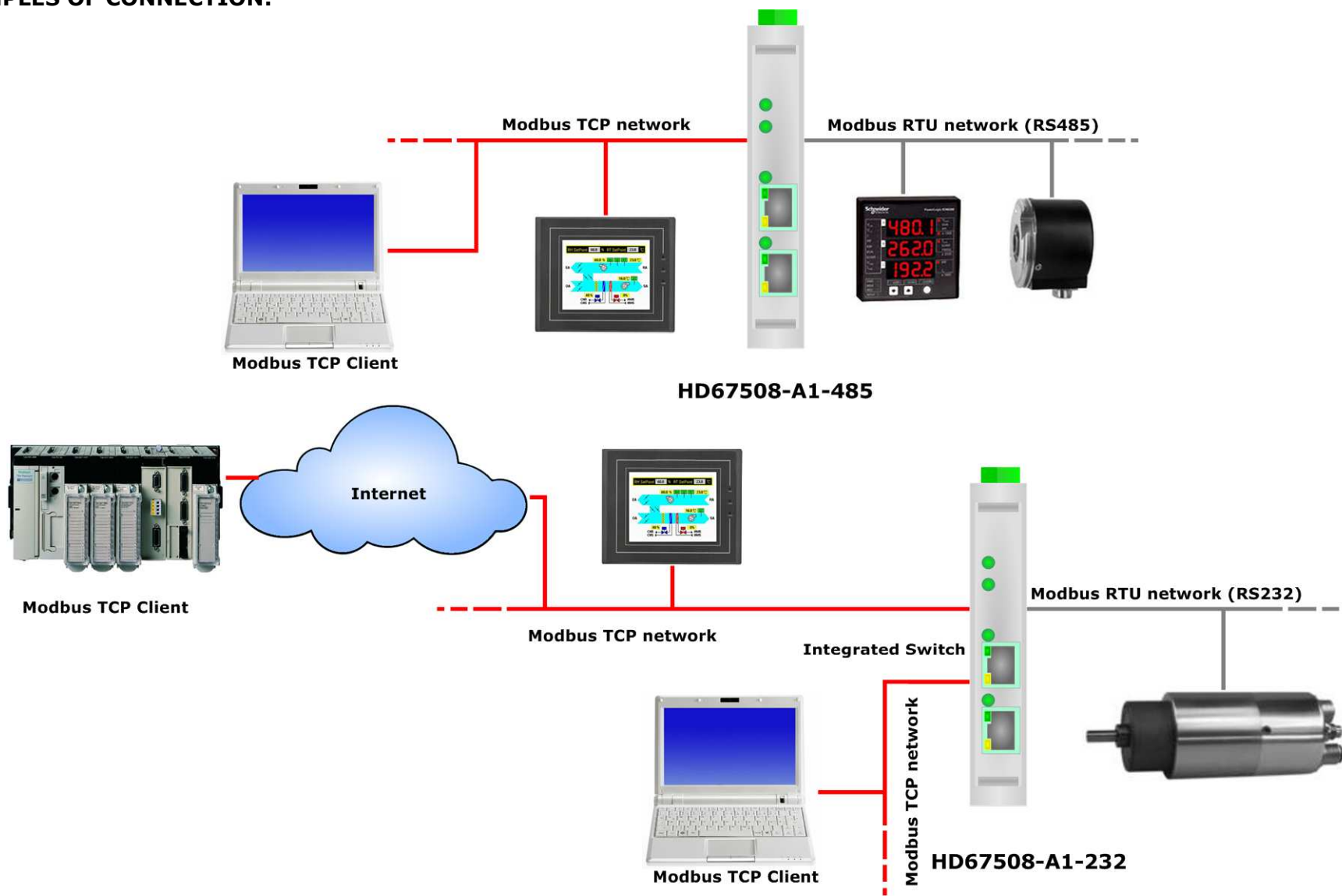


This symbol indicates that non-observance of the safety instructions is a danger for people that could lead to serious injury or death and / or the possibility of damage.

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.



EXAMPLES OF CONNECTION:



CONNECTION SCHEME:

Dip-Switch A:

- Dip1 - Must be at ON
- Dip2 - Functioning Mode

 = Normal
  = Boot

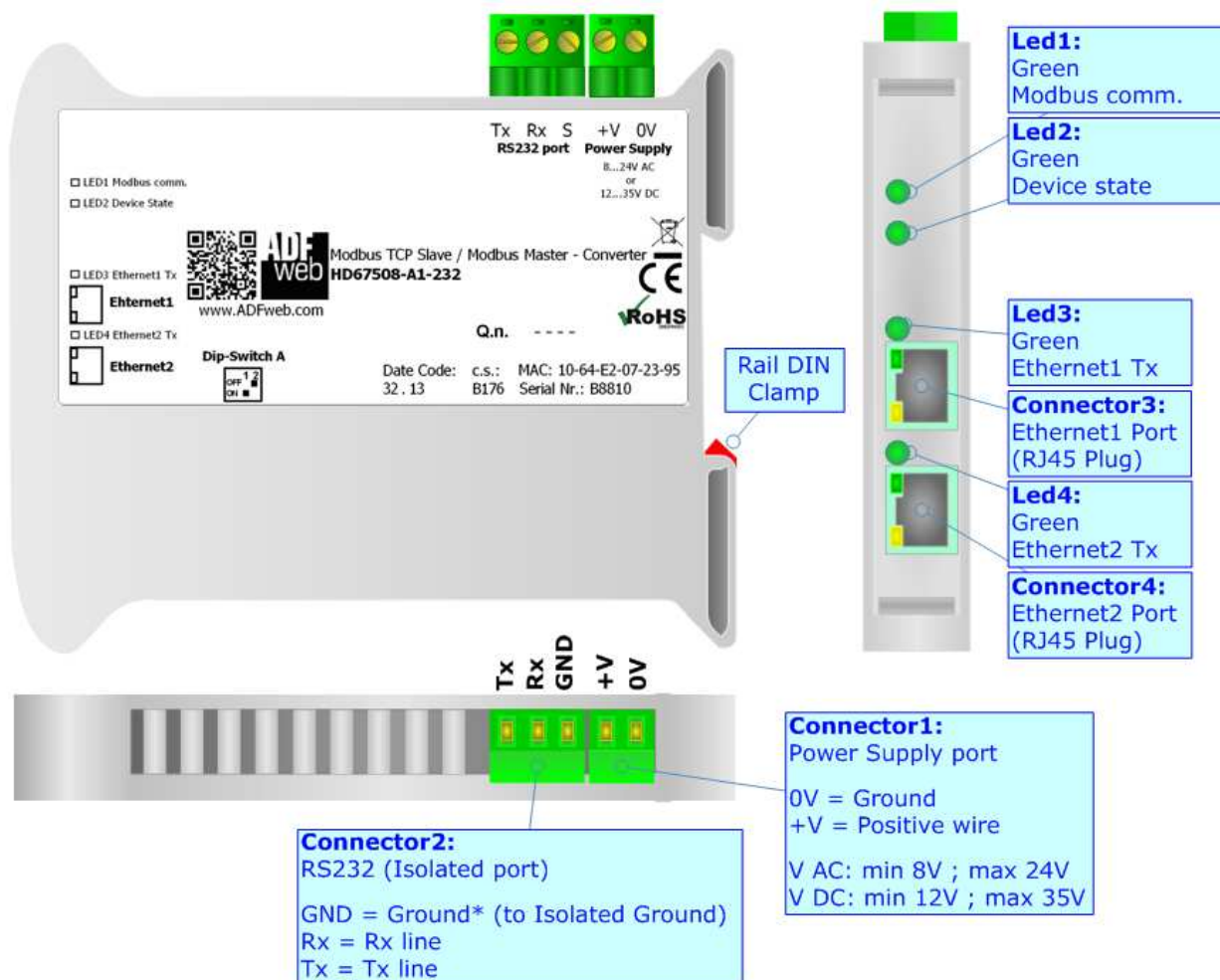
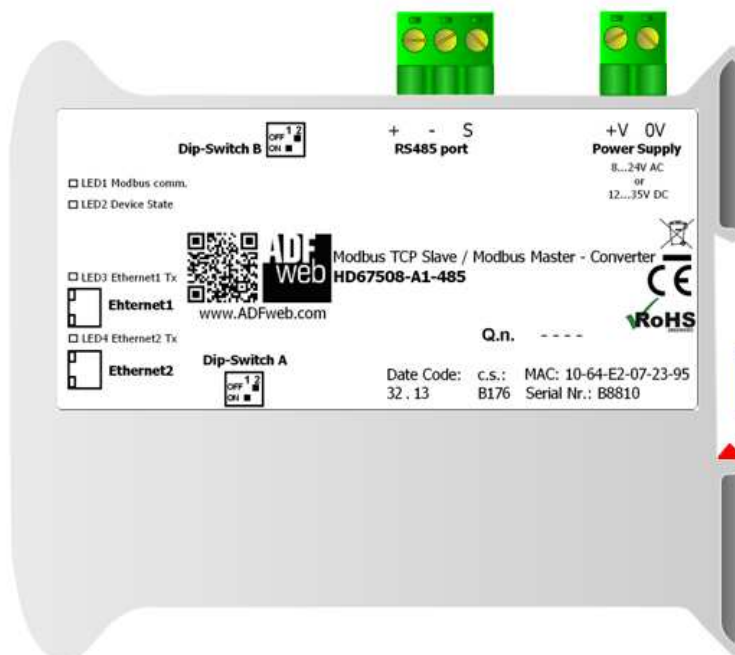


Figure 1a: Connection scheme for HD67508-A1-232

Dip-Switch A:

- Dip1 – Must be at ON
- Dip2 – Functioning Mode

 = Normal
  = Boot



Rail DIN Clamp

Led1:
Green
Modbus comm.

Led2:
Green
Device state

Led3:
Green
Ethernet1 Tx

Connector3:
Ethernet1 Port
(RJ45 Plug)

Led4:
Green
Ethernet2 Tx

Connector4:
Ethernet2 Port
(RJ45 Plug)

Dip-Switch B:

- Dip1 – RS485 Termination Resistor
- Dip2 – Not used

 = Open
  = 220 Ohm

Connector5:

- RS485 (Isolated port)
- S = Shield* (to Isolated Ground)
- B = Negative wire
- A = Positive wire

Connector1:
Power Supply port

0V = Ground
+V = Positive wire

V AC: min 8V ; max 24V
V DC: min 12V ; max 35V

Figure 1b: Connection scheme for HD67508-A1-485

CHARACTERISTICS:

The “Modbus TCP Slave / Modbus Master – Converter” allows the following characteristics:

- Triple isolation between RS232/RS485 - Power Supply, RS232/RS485- Ethernet, Power Supply - Ethernet;
- Internal Ethernet switch;
- Ethernet 10Base-T / 100Base-T, autosensing for Modbus TCP ;
- Mountable on 35mm Rail DIN;
- Wide power supply input range: 8...24V AC or 12...35V DC
- Temperature range -40°C / +85°C [-40°F / +185°F];

This device is able to manage a maximum of ten simultaneous connections from Ethernet side.

It can be used in two operative ways:

- In the “**Routing Mode**” the command Modbus is forwarded on the serial line using the same requested addresses.
- In the “**Natting Mode**” the device addresses and data are altered through a translation table of the addresses.



CONFIGURATION:

You need Compositor SW67508 software on your PC in order to perform the following:

- Define the parameters of Modbus TCP line;
- Define the parameters of Modbus Serial line;
- Update the device.

POWER SUPPLY:

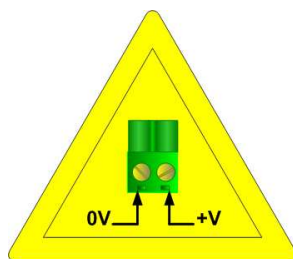
The devices can be powered at 8...24V AC and 12...35V DC. The consumption depends to the code of the device. For more details see the two tables below.

VAC 		VDC 	
Vmin	Vmax	Vmin	Vmax
8V	24V	12V	35V

Consumption at 24V DC:

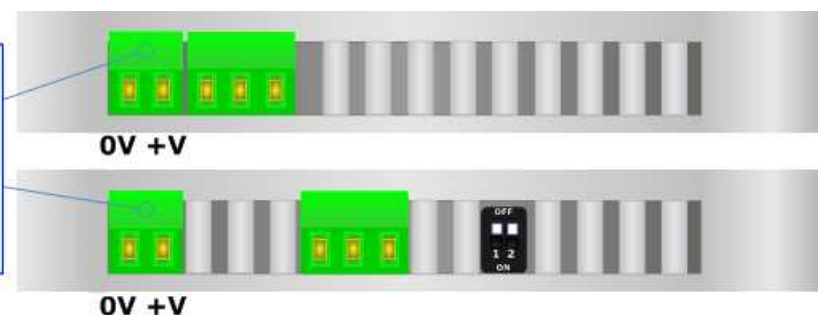
Device	Consumption [W/VA]
HD67508-A1-232	3.5
HD67508-A1-485	3.5

 **Warning: Not reverse the polarity power**



HD67508-A1-232
HD67508-A1-485

Connector1:
Power Supply port
0V = Ground
+V = Positive wire
V AC: min 8V ; max 24V
V DC: min 12V ; max 35V



FUNCTION MODES:

The device has got two functions mode depending of the position of the 'Dip2 of Dip-Switch A':

- The first, with 'Dip2 of Dip-Switch A' at "OFF" position, is used for the normal working of the device.
- The second, with 'Dip2 of Dip-Switch A' at "ON" position, is used for upload the Project and/or Firmware.

For the operations to follow for the updating, see 'UPDATE DEVICE' section.

According to the functioning mode, the LEDs will have specifics functions, see 'LEDS' section.

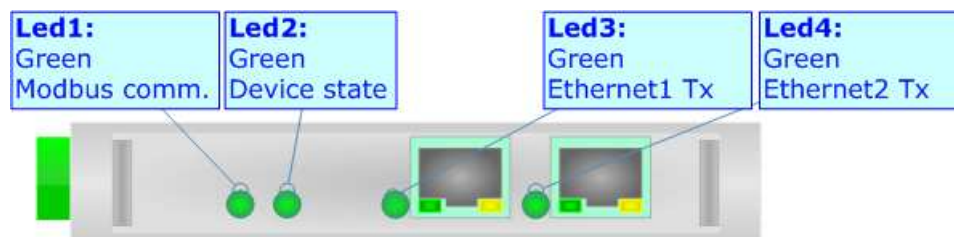
**Warning:**

Dip1 of 'Dip-Switch A' must be at ON position for working even if the Ethernet cable isn't inserted.

LEDS:

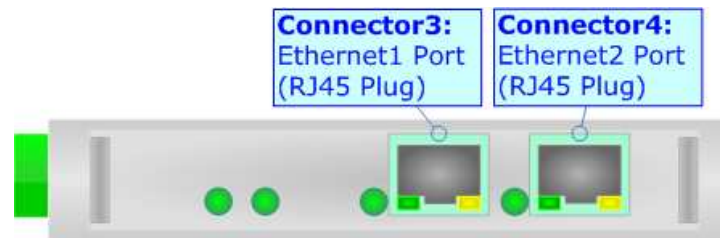
The devices has got four LEDs that are used to give information of the functioning status.
The various meanings of the LEDs are described in the table below.

LED	Normal Mode	Boot Mode
1: Serial comm. (green)	Blinks when receive a Serial Modbus reply	Blinks quickly: Boot state Blinks very slowly (~0.5Hz): update in progress
2: Device state (green)	Blinks slowly (~1Hz)	Blinks quickly: Boot state Blinks very slowly (~0.5Hz): update in progress
3: Ethernet1 Tx (green)	Blinks quickly for a short time when sends Ethernet frames	Blinks quickly: Boot state Blinks very slowly (~0.5Hz): update in progress
4: Ethernet2 Tx (green)	Blinks quickly for a short time when sends Ethernet frames	Blinks quickly: Boot state Blinks very slowly (~0.5Hz): update in progress

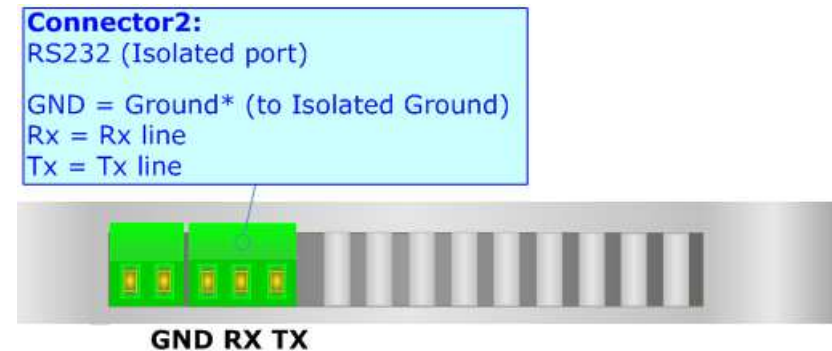


ETHERNET:

The Modbus TCP connection must be made using Connector3 and/or Connector4 of HD67508-A1-xxx 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 a Hub/Switch the use of a straight cable is recommended. To connect the device to a PC/PLC/other the use of a cross cable is recommended.

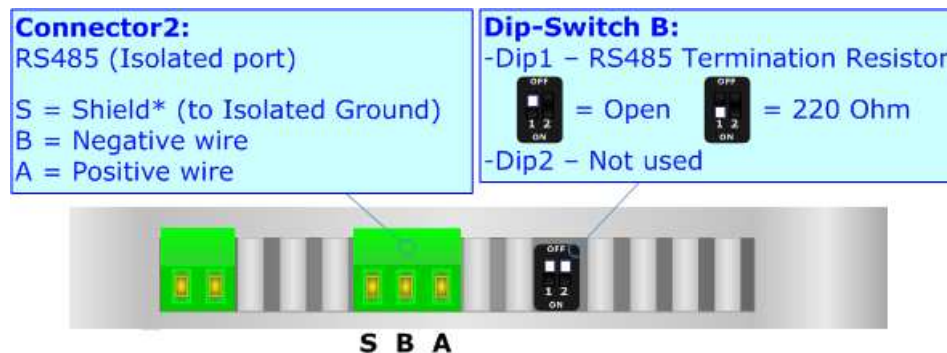
**RS232:**

The connection from a RS232 socket to a serial port (example one from a personal computer) must be made with a NULL MODEM cable (a serial cable where the pins 2 and 3 are crossed). It is recommended that the RS232 cable not exceed 15 meters.



RS485:

To terminate the RS485 line with a 220Ω resistor, it is necessary to put dip 1 ON, like in figure.



The maximum length of the cable should be 1200m (4000 feet).

Here some codes of cables:

- Belden: p/n 8132 - 2x 28AWG stranded twisted pairs conductor + foil shield + braid shield;
- Belden p/n 82842 - 2x 24AWG stranded twisted pairs conductor + foil shield + braid shield;
- Tasker: p/n C521 - 1x 24AWG twisted pair conductor + foil shield + braid shield;
- Tasker: p/n C522 - 2x 24AWG twisted pairs conductor + foil shield + braid shield.

USE OF COMPOSITOR SW67508:

To configure the Converter, use the available software that runs with Windows called SW67508. 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 (MS 2000, XP, Vista, Seven, 8; 32/64bit).

When launching the SW67508, the window on the right appears (Fig. 2).

**Note:**

It is necessary to have installed .Net Framework 4.

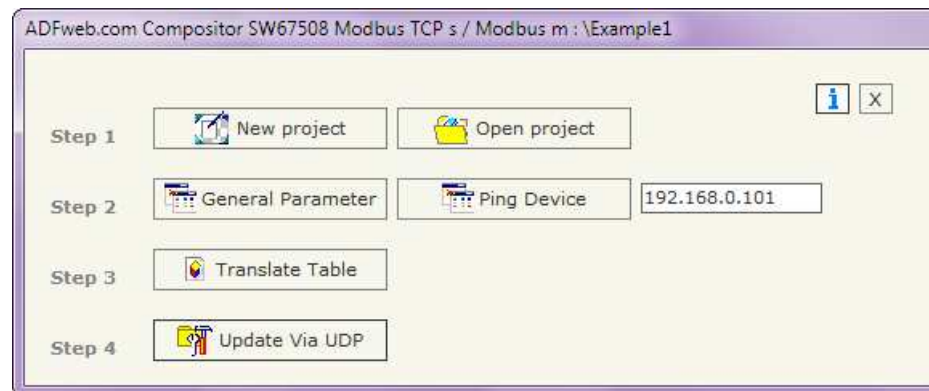


Figure 2: Main window for SW67508

NEW PROJECT / OPEN PROJECT:

The “**New Project**” button creates the folder which contains the entire device’s configuration.



A device’s configuration can also be imported or exported:

- To clone the configurations of a programmable “Modbus TCP Slave / Modbus Master – 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 “**New Project**”.

GENERAL PARAMETER:

This section defines the fundamental communication parameters of two buses, Modbus TCP and Modbus RTU.

By pressing the **General Parameter** button from the main window for SW67508 (Fig. 2), the window "General Parameter" appears (Fig. 3).

The section "Operation Mode" defines the operation of the Converter in **Routing Mode** or **NAT Mode** (see the description at page 16).

The meanings for the fields of "MODBUS TCP" are:

- In the field **IP Address** insert the IP address that you want to give to the slave Modbus TCP;
- In the field **Subnet Mask** insert the SubNet Mask;
- In the fields **Gateway** insert the default gateway that you want to use. This feature can be enabled or disabled pressing the Check Box field. This feature is used for going out of the net.
- In the field **Port** the port used for Modbus TCP communication is defined;
- Checking **Enable UDP Port** field it is possible to do a Broadcast request. This request must be made at Port 64223 (\$FADF) with these six byte of data: \$53, \$45, \$41, \$52, \$43, \$48. Each device in response sends a total of 10 Bytes. These bytes are four for the IP and the other for the MAC address (Example of response: 0xC0, 0xA8, 0x01, 0x2A, 0x11, 0x22, 0x33, 0x44, 0x55, 0x58. So the IP is: 192.168.1.42; and the MAC Address: 11-22-33-44-55-58).
- If the field **Enable Special Command** is checked, it is possible to send a no-Modbus request through the Converter. i.e. a TCP frame with the first two characters 0x55 and 0xAA is sent in the Modbus RTU line as is. If you don't want to send the first two bytes (0x55, 0xAA) in the RTU line it is possible to check the field **Cancel the first two bytes**;
- If the field **Fast StartUp (only 100Mb/s)** is checked, the Converter take less time to go online. This command can use only if the Converter is used in a 100Mb/s network;
- If the field **No TCP frame on RTU Timeout** is checked, the Converter don't sends back the reply on TCP (error response) if the Slave RTU interrogated has not replied.

Figure 3: "General Parameter" window

The means for the fields of "MODBUS RTU" are:

- If the field "**RS232**" is checked the serial line in use is the RS232, otherwise is the "**RS485**";
- In the field "**Baud rate**" the velocity of the Modbus RTU is defined;
- In the field "**Parity**" the Modbus RTU parity is defined;
- "**Timeout**" is the maximum time that the device attends for the answer from the Slave interrogated;
- In the field "**RS485 Stop bits**" the number of Stop-Bit of Modbus RTU is defined;
- If the field "**Enable delay from last receive**" is checked the Converter, before send another Modbus RTU request, waits the time written in the field below (expressed in ms).

PING DEVICE:

If it is necessary to do a Ping on the net, before pressing the "**Ping Device**" button insert a value in the field on the right and then press the button.



Note:

In order to do this, the Converter must be in Normal Mode.



Warning:

Under Windows Vista, Seven and 8 you need Administrator Rights to use this command successfully.

OPERATION MODE:**ROUTING:**

A few characteristics of the Modbus RTU package have been modified in the standard of the Modbus TCP protocol. Two bytes of the final CRC were eliminated (no longer necessary for the information to reach its already corrected destination). The first byte of the slave identification was changed, leaving the one that is called PDU. A frame denominated as MBAP header with dimensions of 7 bytes was added to the head of the PDU.

It is composed by the following:

- Word transaction identifier (recopied from the slave in the response phase);
- Word protocol identifier (0=Modbus protocol);
- Word length (number of successive bytes);
- Byte unit identifier (used for the routing operation).

By using the last byte of the MBAP header, it is possible to carry out the routing from a requested Modbus TCP toward a serial line using the address from the slave which is specified by the byte unit identifier.

Example:

A requested Modbus TCP made in the device as the address 192.168.0.200 for the holding register address \$2000, which is MBAP unit identifier has the value of 2. It will be followed by the request on the serial for the device with the address 2 at the word \$2000.

After the request is made, the RTU will respond. The master TCP will be given the same response which will be reconstructed according to the specifications of the Modbus TCP.

If the RTU slave responds with an exception, that exception code will be transmitted again to the TCP master. If the RTU slave does not respond in the estimated time defined by the Timeout parameter, an exception response will be given: error code \$0B.

NATTING:

When using the operation mode, Natting, the requested data will be processed through a table of translations of the Modbus network addresses.

TRANSLATE TABLE:

Within the section "Translate Table" you can define the variables that can be read or written by the TCP bus on the RTU bus when the device is in NAT mode.

By pressing the "**Translate Table**" button from the main window for SW67507 (Fig. 2), the window "Set Translate Table" appears (Fig. 4).

N°	Data Type	Address Device TCP	Address TCP	Address Device	Address RTU	N° Point	Mnemonic
1	Holding Register	1	100	5	200	1	Temprature
2	Input Register	1	150	5	234	1	SetPoint
3							
4							
5							

Figure 4: "Set Translate Table" window

The data of the columns have the following meanings:

- In the field "**Data Type**" insert the type of data that is being considered;
- In the field "**Address Device TCP**" insert the virtual address of the device on the TCP Modbus that contains the data;
- In the field "**Address TCP**" insert the virtual address of the present data in a device in the TCP Modbus;
- In the field "**Address Device RTU**" insert the address of the device on the RTU Modbus that contains the data;
- In the field "**Address RTU**" insert the address of the data on the RTU device;
- In the field "**N° Point**" insert the number of consecutive data that you want to configure. For example, you create Address TCP=1000, Address RTU=100 and N° point = 5, the following gets set-up automatically: addresses TCP 1001, 1002, 1003, 1004 and the variables RTU 101, 102, 103, 104;
- In the field "**Mnemonic**" you can insert a brief description.

Example 1:

If you want, from TCP network, write a data it the RTU network on the device at:

- Address 5;
- Through Gateway WORD 100 (Address RTU);
- Address TCP 1000.

In the above scenario:

Specify the type of data between:

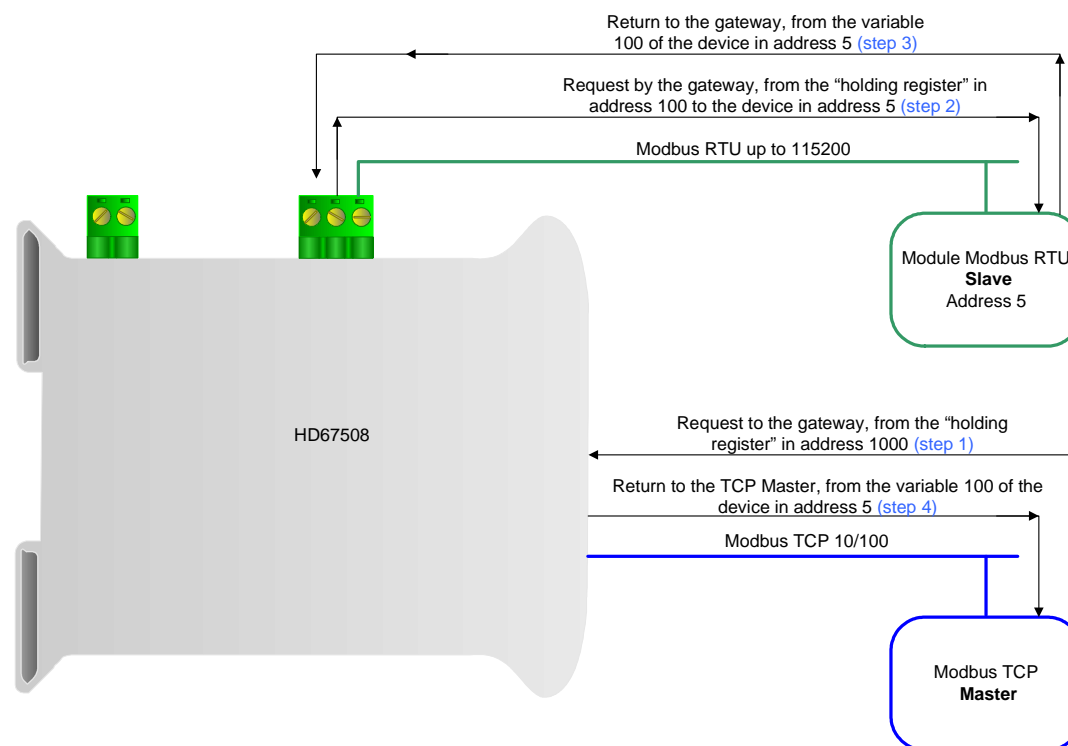
- Coil Status (bit in read write);
- Input Status (bit in read);
- Holding Register (word in read and write);
- Input Register (word in read).

From the side of the MODBUS TCP:

- Address of data to read.

From the side of the MODBUS RTU:

- Address of the device to interrogate;
- Address of data to read on device.



Note:

If the RTU slave responds with an exception, that exception code will be transmitted to the TCP Master. If the RTU slave does not respond within the estimated time defined by the Timeout parameter, an exception response will be given on TCP side: error code \$0B.

UPDATE DEVICE VIA UDP:

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

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

- Turn off the Device;
- Put Dip2 of 'Dip-Switch A' in ON position;
- Turn on the device
- Connect the Ethernet cable;
- 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" turn off the Device;
- Put Dip2 of 'Dip-Switch A' in OFF position;
- Turn on the device.

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

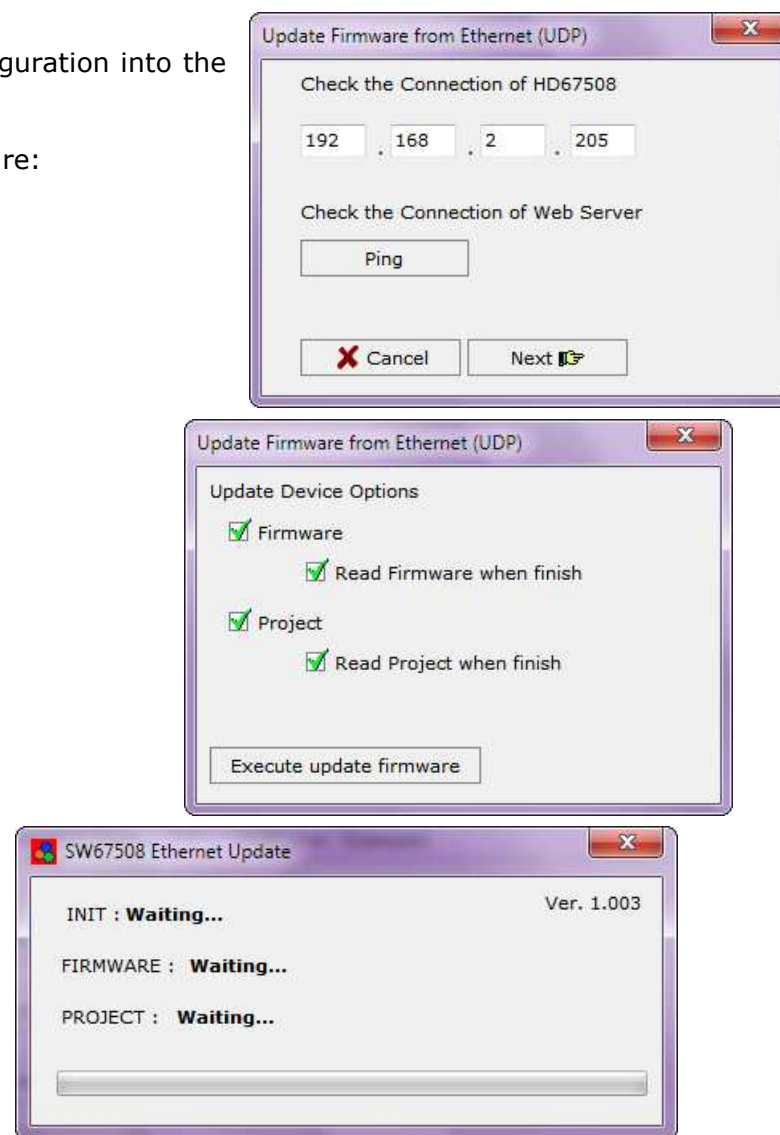


Figure 5: "Update device" windows

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.



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 HD67508-A1-232 or HD67508-A1-485 device.



Note:

When you receive the device, for the first time, you also have to update the Firmware in the HD67508-A1-232 or HD67508-A1-485 device.

**Warning:**

If Fig. 6 appears when you try to do the Update try these points before seeking assistance:

- Try to repeat the operations for the updating;
- Try with another PC;
- Try to restart the PC;
- If you are using the program inside a Virtual Machine, try to use in the main Operating System;
- If you are using Windows Seven or Vista or 8, make sure that you have the administrator privileges;
- Check the LAN settings;
- Take attention at Firewall lock;
- 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 you have to launch the "Command Prompt" with Administrator Rights
- Check the LAN settings.



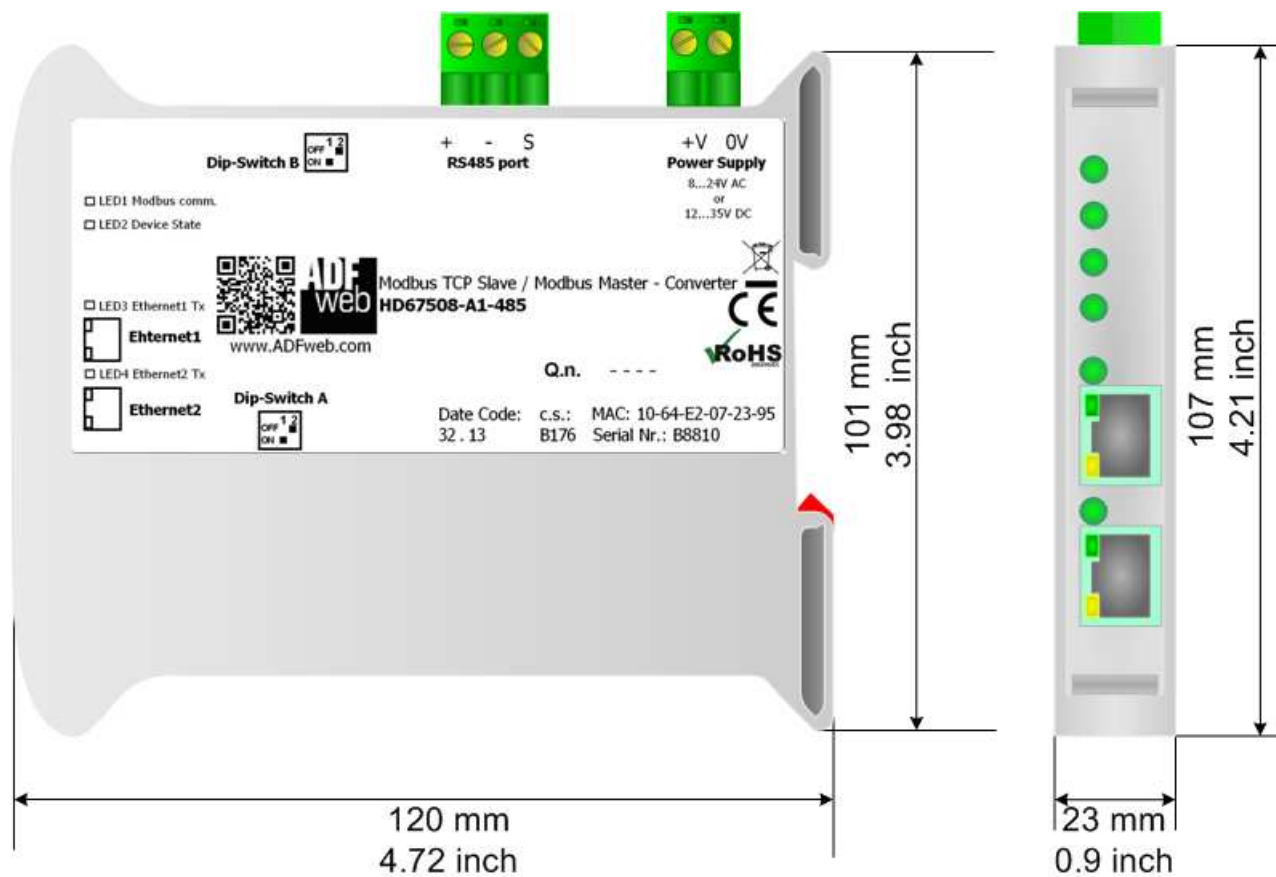
Figure 6: "Protection" window



In the case of HD67508-A1-232 or HD67508-A1-485 you have to use the software "SW67508":

www.adfweb.com/download/filefold/SW67508.zip.

MECHANICAL DIMENSIONS:



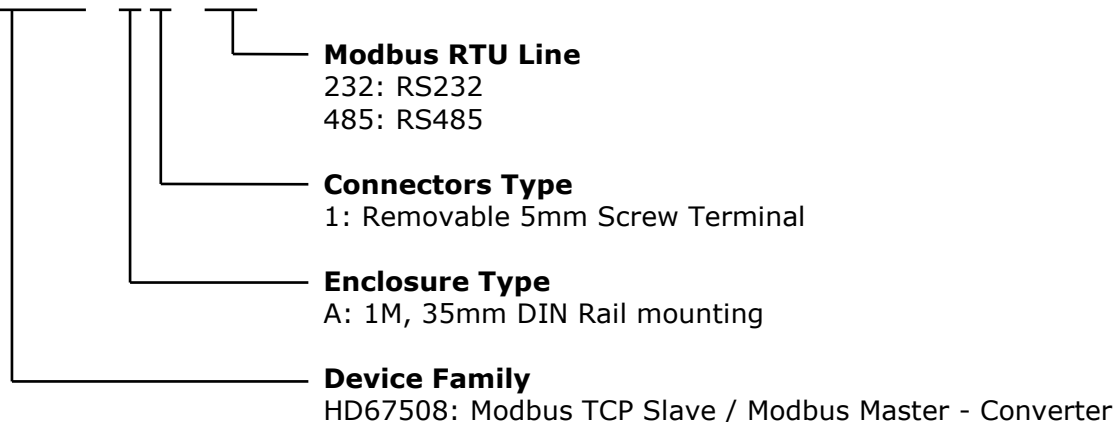
Housing: PVC
Weight: 200g (Approx)

Figure 7: Mechanical dimensions scheme for HD67508-A1-xxx

ORDERING INFORMATION:

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

HD67508 - A 1 - 232



Order Code: **HD670508-A1-232** - Modbus TCP Slave / Modbus Master - Converter (Ethernet Switch Inside for enter / exit connection)
(RS232 for Modbus RTU communication)

Order Code: **HD670508-A1-485** - Modbus TCP Slave / Modbus Master - Converter (Ethernet Switch Inside for enter / exit connection)
(RS485 for Modbus RTU communication)

ACCESSORIES:

Order Code: **AC34001** - 35mm Rail DIN - Power Supply 220/240V AC 50/60Hz – 12 V AC

Order Code: **AC34002** - 35mm Rail DIN - Power Supply 110V AC 50/60Hz – 12 V AC

DISCLAIMER:

All technical content within this document can be modified without notice. The content of the document is a under continual renewal. For losses due to fire, earthquake, third party access or other accidents, or intentional or accidental abuse, misuse, or use under abnormal conditions repairs are charged to the user. ADFweb.com S.r.l. will not be liable for accidental loss of use or inability to use this product, such as loss of business income. ADFweb.com S.r.l. shall not be liable for consequences of improper use.

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.

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.



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