

CAN-ETH
CAN/Ethernet
gateway
User manual

CAN-ETH

CAN/Ethernet gateway: User manual

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Important user information

This manual explains how to install, operate and configure a *CAN-ETH*. This device may only be used for the applications described in this document.

These instructions are intended for use by trained specialists in electrical installation and control and automation engineering, who are familiar with the applicable national standards and safety procedures.

Safety Precautions



ELECTRICAL HAZARD

- This equipment must be installed and serviced only by qualified personnel. Such work should be performed only after reading this entire set of instructions.
- Before performing visual inspections, tests, or maintenance on this equipment, disconnect all sources of electric power. Assume that all circuits are live until they have been completely de-energized, tested, and tagged. Pay particular attention to the design of the power system. Consider all sources of power, including the possibility of backfeeding.
- Apply appropriate personal protective equipment and follow safe electrical practices.
- Turn off all power supplying the equipment in which the *CAN-ETH* is to be installed before installing, wiring or removing the *CAN-ETH*.
- Always use a properly rated voltage sensing device to confirm that power is off.
- The successful operation of this equipment depends upon proper handling, installation, and operation. Neglecting fundamental installation requirements may lead to personal injury as well as damage to electrical equipment or other property.

Failure to follow these instructions could result in death or serious injury!

Document conventions

Throughout this manual we use the following symbols and typefaces to make you aware of safety or other important considerations:



Indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.



Indicates a potentially hazardous situation that, if not avoided, could result in damage to equipment.



Indicates information that is critical for successful application and understanding of the product.



Provides other helpful user information that does not fall in above categories.



Provides supplemental user information.

Acronym

This typeface is used to introduce acronyms or product names.

Command

This typeface is used to represent commands, prompts, input fields and filenames. In the context of programming it is used for functions, variable names, constants or class names.

Placeholder

This typeface is used to represent replaceable text. Replaceable text is a placeholder for data you have to provide, like filenames or command line arguments.

User input

This typeface is used to represent data entered by the user or buttons.

Screen output

Screen output or program listing

Chapter 1. Introduction

The *CAN-ETH* is a CAN to Ethernet gateway specifically designed to interface CAN networks with TCP/IP networks. The gateway features a CAN and an Ethernet port and can be mounted on a DIN rail. It encapsulates CAN messages into UDP packets and transports them via Ethernet. The gateway can operate in peer-to-peer or broadcast modes.



Common applications include:

- CAN bus length extensions
- CAN to DSL bridging
- Wireless networking of CAN networks

Features

The *CAN-ETH* gateway provides the following key features:

- UDP encapsulation for CAN messages
- Peer-to-peer mode
- Broadcast mode
- 8 CAN receive filters
- Low configuration overhead, just an IP address and CAN bitrate to set-up
- Embedded web server for easy configuration and commissioning using a web browser
- Firmware upgradeable via Ethernet
- Status LEDs for power, Ethernet link, device status and communication status
- DIN rail mountable
- 24 V DC (10-30 V) power supply

Quick start checklist

- Read this set of instructions properly and in its entirety.
- Mount the unit.
- Connect the power. Do not connect yet CAN bus or serial ports.
- Configure the Ethernet communications settings with a web browser (using an Ethernet crossover cable) or with a terminal program like *HyperTerminal* (using a null modem cable)
- Configure the CAN bus settings.
- Configure the serial line communication settings.
- Configure the operational aspects of the device.
- Wire CAN bus.
- Wire serial line interfaces.

Chapter 2. Description

The power and CAN terminals are placed on the top side of the unit. The RS-232 and Ethernet connectors are placed on the bottom side of the unit as shown in the following illustration:

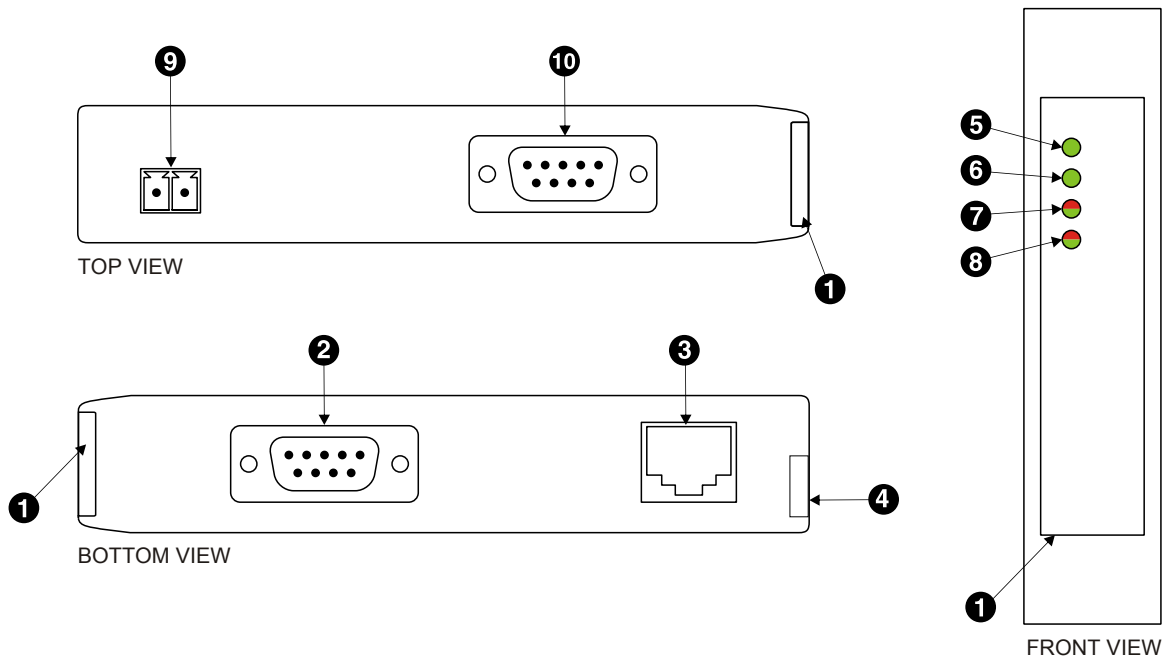


Figure 2.1: Location of connectors

- ❶ Clear front cover
- ❷ Diagnostic port connector
- ❸ Ethernet connector
- ❹ DIN rail clip
- ❺ Power LED
- ❻ Ethernet link LED
- ❼ Device status LED
- ❽ Communication status LED
- ❾ Power terminals
- ❿ CAN connector

LED indicators

Four LEDs located at the front panel indicate the status of the *CAN-ETH*. The LEDs assist maintenance personnel in quickly identifying wiring or communication errors.

A LED test is exercised at power-up, cycling each LED off, green and then red for approximately 0.25 seconds. At the same time the power-on self test of the device is performed.

The following table outlines the indicator condition and the corresponding status after the power-on self test has been completed:

LED	Function	Condition	Indication
Power	Power	Off	No power applied to the device.
		Green	Power supply OK
Link	Ethernet link	Off	No Ethernet link
		Green	Ethernet link OK
Status1	Device status	Off	The device has an unrecoverable fault; may need replacing.
		Flashing green at 1 s rate	Device operational but needs commissioning due to configuration missing, incomplete or incorrect.
		Green	The device is operating in normal condition.
		Flashing red at 1 s rate	Device operational but has a fault listed which requires acknowledgment.
		Red	The device has an unrecoverable fault; may need replacing. Flashing sequence and rate of Status2 LED indicates fault class.

Table 2.1: LED diagnostic codes

Chapter 3. Installation

Regulatory notes



1. The *CAN-ETH* is suitable for use in non-hazardous locations only.
2. The *CAN-ETH* is not authorized for use in life support devices or systems.
3. Wiring and installation must be in accordance with applicable electrical codes in accordance with the authority having jurisdiction.
4. This is a Class A device and intended for commercial or industrial use. This equipment may cause radio interference if used in a residential area; in this case it is the operator's responsibility to take appropriate measures.
5. The precondition for compliance with EMC limit values is strict adherence to the guidelines specified in this set of instructions. This applies in particular to the area of grounding and shielding of cables.

FCC Notice (USA only)

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Industry Canada Notice (Canada only)

This Class A digital apparatus complies with Canadian ICES-003.

Unpacking, handling and storage



1. Please read this set of instructions. carefully before fitting it into your system.
2. Keep all original packaging material for future storage or warranty shipments of the unit.
3. Do not exceed the specified temperatures.

Before connecting anything

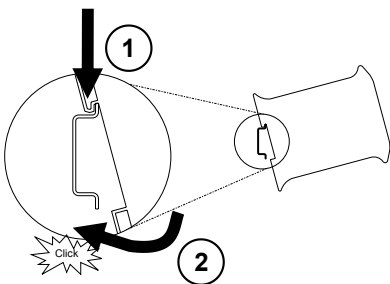


1. Before installing or removing the unit or any connector, ensure that the system power and external supplies have been turned off.
2. Check the system supply voltage with a multimeter for correct voltage range and polarity.

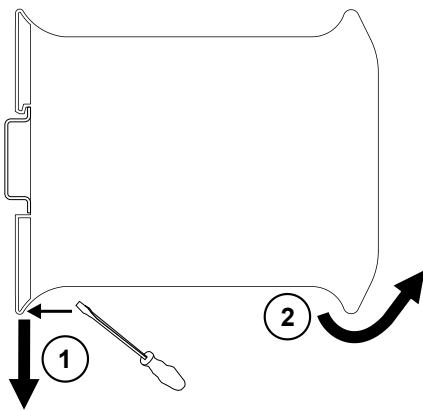
3. Connect the power supply cable and switch on the system power. Check if the Power LED is lit.
4. Turn off system power.
5. Connect all I/O cables.
6. Once you are certain that all connections have been made properly, restore the power.

DIN rail mounting and removal

The *CAN-ETH* gateway is designed to be mounted on a 35 mm DIN rail according to DIN/EN 50022. The enclosure features a 35 mm profile at the back which snaps into the DIN rail. No tools are required for mounting. Please observe the rules outlined in the section called "Mounting rules".



To mount the unit on a DIN rail, slot the top part of the *CAN-ETH* into the upper guide of the rail and lower the enclosure until the bottom of the red hook clicks into place.



To remove the *CAN-ETH* from the DIN rail, use a screw driver as a lever by inserting it in the small slot of the red hook and push the red hook downwards. Then remove the unit from the rail by raising the bottom front edge of the enclosure.

Mounting rules

The enclosure provides protection against solid objects according to IP 20 / NEMA Type 1 protection rating. When mounting the unit observe the following rules:



- No water splash and water drops
- No aggressive gas, steam or liquids
- Avoid dusty environments.
- Avoid shock or vibration

- Do not exceed the specified operational temperatures and humidity range.
- Mount inside an electrical switchboard or control cabinet.
- Make sure there is sufficient air ventilation and clearance to other devices mounted next to the unit.
- Observe applicable local regulations like EN60204 / VDE0113.

Powering the CAN-ETH



Before connecting power please follow the rules in the section called “Safety Precautions” and the section called “Before connecting anything”.

Power is supplied via a 3.81 mm 2-pin pluggable terminal block located at the top side of the mounted unit (refer to Figure 2.1, “Location of connectors”). The following table and picture shows the power terminal socket pinout:



Pin	Signal	Function
1	V+	Positive voltage supply (10 - 30 V DC)
2	V-	Negative voltage supply, DC power return

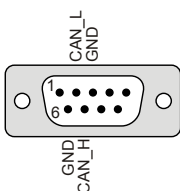
Table 3.1: Power supply connector pinout



Make sure that the polarity of the supply voltage is correct before connecting any device to the serial and CAN ports! A wrong polarity can cause high currents on the ground plane between the V- power supply pin and the CAN port and serial port ground pins, which can cause damage to the device.

Wiring the CAN interface

The CAN connector is a male 9-pin D-sub type located at the top side of the mounted unit (refer to Figure 2.1, “Location of connectors”). It has industry standard CiA DS-102 pinout as shown in the following table and picture:



Pin	Signal	Function
1	NC	
2	CAN_L	CAN_L bus line
3	CAN_GND	CAN ground
4	NC	
5	NC	
6	CAN_GND	CAN ground
7	CAN_H	CAN_H bus line
8	NC	
9	NC	

Table 3.2: CAN connector pinout

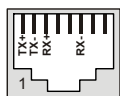
- The network must be terminated at both ends with its characteristic impedance, typically a 120 Ohm 1/4 W resistor.
- Maximum number of electrically connected CAN nodes is 64 ¹.
- Maximum CAN cable length is 250 m (820 ft) and is derated depending on bit rates and cable type.
- Stub connections off the main line should be avoided if possible or at least be kept as short as possible. Stub connections must not have terminating resistors.
- To ensure a high degree of electromagnetic compatibility and surge protection the cable should be twisted pairs and shielded. An additional cable conductor or pair may be used for the CAN_GND reference.



Do *not* connect the cable shield to the CAN_GND pins or the connector shell! Use an external *chassis ground* connection to terminate the shield.

Connecting Ethernet

The following table describes the 10BASE-T Ethernet RJ-45 connector pinout:



Pin	Signal	Function
1	TX+	Non-inverting transmit signal
2	TX-	Inverting transmit signal
3	RX+	Non-inverting receive signal
4		Internal termination network
5		Internal termination network
6	RX-	Inverting receive signal
7		Internal termination network
8		Internal termination network

Table 3.3: Ethernet connector pinout

- We recommend to use Category 5 UTP network cable.
- Maximum cable length is 100 m (3000 ft).

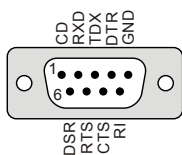
Connecting to the diagnostic port

The device has a RS-232 interface which is used as a diagnostic port and only active after power-up of the device. It allows configuration of the IP settings and reset of the settings to factory defaults via a terminal program.

The Diagnostic port connector is a male 9-pin D-sub type located at the bottom side of the mounted unit (refer to Figure 2.1, "Location of connectors"). It has industry standard

¹The number of logically addressable units may be less.

EIA-574 data terminal equipment (DTE) pinout as shown in the following table and picture:



Pin	Signal	Function	Direction
1	DCD	Data carrier detect	in
2	RXD	Receive data	in
3	TXD	Transmit data	out
4	DTR	Data terminal ready	out
5	GND	Signal ground	
6	DSR	Data set ready	in
7	RTS	Request to send	out
8	CTS	Clear to send	in
9	RI	Ring indicator	in

Table 3.4: Diagnostic port connector pinout

- Maximum cable length is 15 m (50 ft) or a length equal to a line capacitance of 2500 pF, both at the maximum standard bit rate of 20 kbps. If operating at higher bit rates the maximum cable length drops to 3 m (10 ft) at a bit rate of 57.6 kbps.
- To assure a high degree of electromagnetic compatibility and surge protection the RS-232 cable should be shielded. The shield shall be connected to an external chassis ground at the either or both ends, depending on the application.
- The shield must *not* be connected to the GND pin.



To connect the *CAN-ETH* to a PC (Personal Computer) or any other device with data terminal equipment (DTE) pinout you need a null-modem or cross-over cable.

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Chapter 4. Ethernet & IP configuration

Before configuring the *CAN-ETH*, obtain a unique static IP address, subnet mask, and default gateway address from your network administrator.

The factory default IP address of the *CAN-ETH* is 169.254.0.10 which is in the Automatic Private IP Addressing (APIPA) address range.

There are several methods of configuring the unit's IP address:

1. Removing your PC from your corporate network and using a cross-over network cable (see the section called "IP setup using a web browser and a cross-over network cable").
2. Via the diagnostic port and a terminal program like *HyperTerminal* (see the section called "IP setup using a terminal program like HyperTerminal").
3. Leaving your PC connected to your corporate network and temporarily changing the IP settings on your PC to match the subnet of the *CAN-ETH* (see the section called "Temporarily changing the IP settings on your PC").



In order to connect to the *CAN-ETH* via TCP/IP, your PC must be on same IP subnet as the gateway. In most situations this means that the first three numbers of the IP address have to be identical.

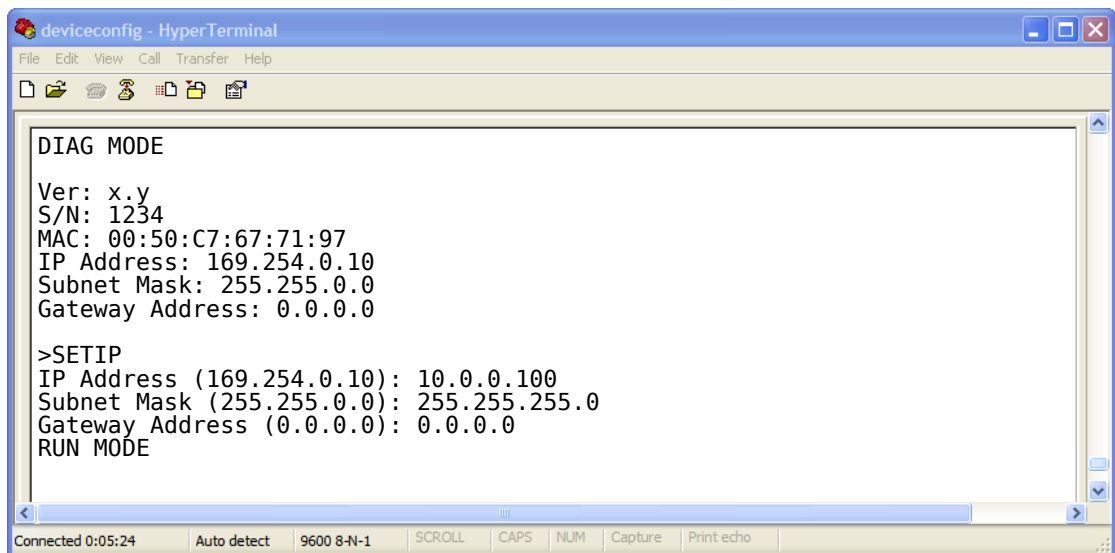
IP setup using a web browser and a cross-over network cable

This method applies only to operating systems like Windows, which support APIPA (Automatic Private IP Addressing). It also requires your PC to be configured for DHCP. If your computer is configured with a static IP address, follow the procedure in the section called "Temporarily changing the IP settings on your PC".

1. Disconnect your PC from your corporate network. If your computer is configured for DHCP it should now automatically fall back to use a default IP address from the APIPA range 169.254.x.x (Windows PCs only).
2. Connect an Ethernet crossover cable from the *CAN-ETH* to the computer.
3. Start *Internet Explorer*.
4. In the address box, type 169.254.0.10 and then press **Enter**.
5. Click **Configuration...** and then **Ethernet & IP** in the menu on the left side of the page.
6. Enter the IP address, subnet mask, and gateway address assigned to your *CAN-ETH*, then click **save**.
7. Reconnect your computer to your corporate network.

IP setup using a terminal program like HyperTerminal

1. Connect a null modem RS-232 cable between your PC and the *CAN-ETH's* diagnostic port.
2. In Windows XP, click **Start**, point to **All Programs**, point to **Accessories**, point to **Communications**, and then click **HyperTerminal**.
3. When *HyperTerminal* starts, it opens a dialog box and asks for a name for the new connection. Enter a name (for example, `deviceconfig`) then click **OK**.
4. The **Connect to** dialog opens. Select the COM port you will be using in the **Connect using** drop-down list box, then click **OK**.
5. Select **9600, 8, None, 1, None** in the **COM Properties** dialog, then click **OK**.
6. *HyperTerminal* is now connected to the serial line.
7. Keep the **space** bar pressed in *HyperTerminal* and power-cycle your device at the same time.
8. A menu should appear after one or two seconds showing device information, the current IP configuration and a **>** prompt.
9. Type **SETIP**, then press **Enter** within 10 seconds after the prompt is shown:



The screenshot shows a HyperTerminal window titled "deviceconfig - HyperTerminal". The window displays the following text:

```
DIAG MODE

Ver: x.y
S/N: 1234
MAC: 00:50:C7:67:71:97
IP Address: 169.254.0.10
Subnet Mask: 255.255.0.0
Gateway Address: 0.0.0.0

>SETIP
IP Address (169.254.0.10): 10.0.0.100
Subnet Mask (255.255.0.0): 255.255.255.0
Gateway Address (0.0.0.0): 0.0.0.0
RUN MODE
```

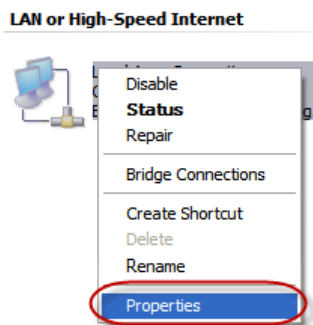
The status bar at the bottom of the window shows "Connected 0:05:24", "Auto detect", "9600 8-N-1", "SCROLL", "CAPS", "NUM", "Capture", and "Print echo".

10. The device will show current values and prompt for new values for IP address, net mask and gateway address. Enter the new values and press **Enter**. A key press must be received at least every 10 seconds otherwise the device will go back to *RUN MODE* and resume normal operation.
11. The gateway will return to the main prompt. Type **x** and press **Enter** to leave *DIAG MODE* and resume normal operation indicated with `RUN MODE`.

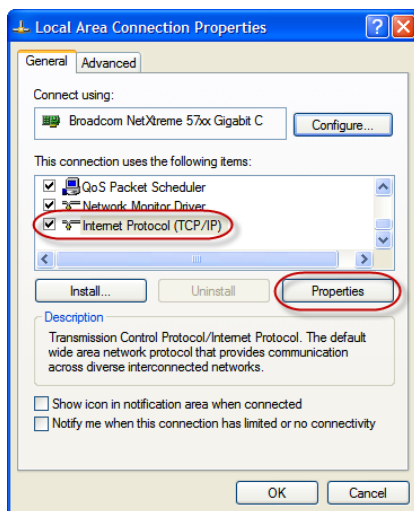
Temporarily changing the IP settings on your PC

This method involves manually assigning an IP address to your PC in the same subnet as the gateway. The default subnet of the gateway is 169.254.0.0/16.

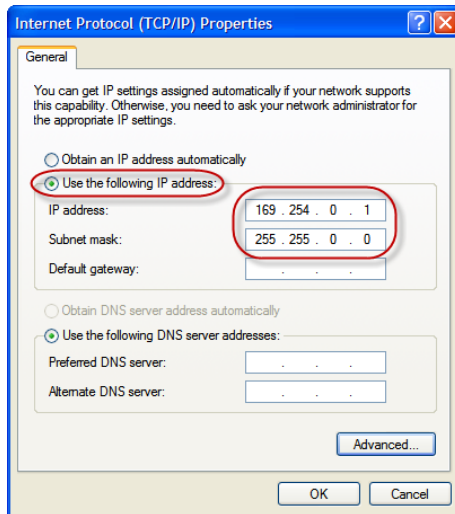
1. Connect the *CAN-ETH* to your Ethernet network.
2. On a Windows PC, open the **Control Panel** and double-click on **Network Connections**. Right-click on the Network Connection associated with your network adapter and select **Properties**:



This will show the Local Area Connection Properties Dialog:



3. Select the **Internet Protocol (TCP/IP)** entry and click on **Properties** to open the TCP/IP Properties dialog as shown below:



4. Write down your current settings so they can be restored later.
5. Select **Use the following IP address** and configure a static IP address in the same subnet as the device, for example 169.254.0.1 and the subnet mask 255.255.0.0. Click **OK** to save the changes.
6. Start *Internet Explorer*.
7. In the address box, type 169.254.0.10 and then press **Enter**.
8. Click **Configuration...** and then **Ethernet & IP** in the menu on the left side of the page.
9. Enter the IP address, subnet mask, and gateway address assigned to your *CAN-ETH*, then click **Save**.
10. Restore your computer's original settings.

Chapter 5. Web browser based management

The *CAN-ETH* incorporates an embedded web server. This allows you to connect to the device and monitor and configure it using a web browser. Most browsers should work, provided they support JavaScript. We recommend *Internet Explorer 6.0* or higher.

Connecting to the CAN-ETH

Once you made sure that your PC is configured to be on the same subnet as the *CAN-ETH*, start your web browser. In the address box, type the IP address of your device (169.254.0.10 is the default), and then press **Enter**. (See Chapter 4, *Ethernet & IP configuration*)

The web browser will establish communication with the embedded web server and an overview page similar to the following picture will appear:

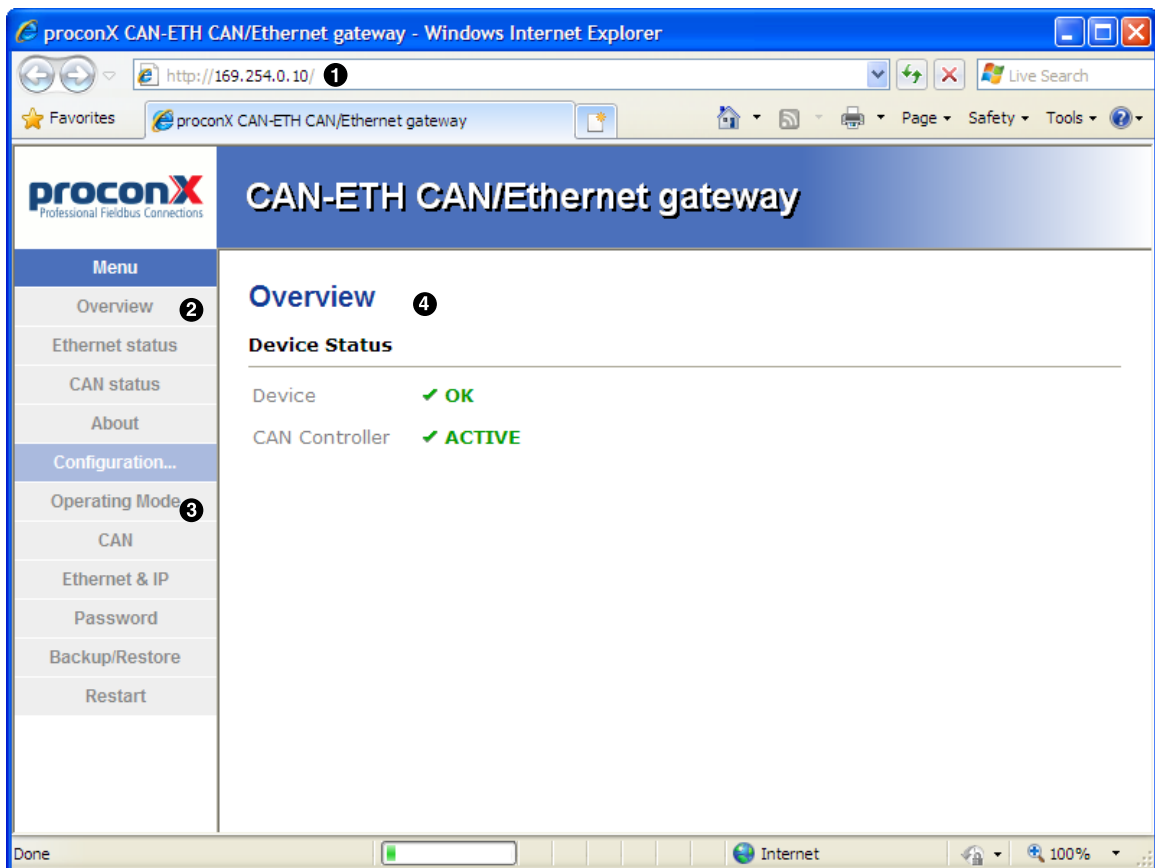


Figure 5.1: Device management and configuration via the web browser

- ❶ Gateway IP address
- ❷ Main menu
- ❸ Configuration sub-menu
- ❹ Information area

Use the menu bar shown on the left side to navigate the different pages.



In order to connect to the *CAN-ETH* via TCP/IP, your PC must be on same IP subnet as the gateway. In most situations this means that the first three numbers of the IP address have to be identical.

Monitoring and diagnostic

The *CAN-ETH* offers several web pages which allow monitoring of the status of the different communication networks and the device performance.

Device status

The `Overview` page shows the principal device status as shown in the following picture:



Figure 5.2: Overview page

The value shown in the `Device` row represents the device status register which keeps track of run-time faults. All run-time faults are latched and must be reset by the user. The following faults can be listed here:

OK

The device is fault free.

Watchdog reset

This warning indicates that the device was reset by its internal watchdog supervision circuit.

Brown out reset

This warning indicates that the device was reset by its internal supply voltage monitoring circuit. This fault occurs when the supply voltage drops below the lower limit.

Device out of memory

This warning indicates that the internal dynamic memory has been exhausted and due to this a certain function could not be completed.

Device configuration data write failure

This alarm indicates that the configuration data could not be written to the non-volatile memory. Configuration data changes will be lost once the device is power-cycled or reset.

Reset to factory defaults

This alarm indicates that the device' configuration data was reset to factory defaults. The device requires re-commissioning.

The `CAN controller` status indicates the status of the CAN interface and can be in one of the following states:

ACTIVE

The CAN bus is fault free.

PASSIVE

CAN's built in fault confinement mechanism has set the node to *error passive state* due to a large number of errors on the CAN bus. This warning indicates a wiring error.

BUS-OFF

CAN's built in fault confinement mechanism has set the node to *bus-off* state due to excessive errors on the CAN bus. This alarm indicates a wiring error. The *CAN-ETH* will not transmit or receive any message on the CAN bus once entered this state. The device needs to be manually restarted on order to recover from this fault.

CAN communication status

The `CAN Status` page shows status and statistics about the CAN bus traffic. These values provide valuable information used to troubleshoot CAN problems. This page is automatically updated every 5 seconds.

Detailed Status				
CAN Gateway Processor				
Messages Received	Messages Sent	Transmit Errors		
0	0	0		
CAN Driver				
Messages Received	Messages Sent	Interrupts	Overruns	Errors
0	0	0	0	0
<input type="button" value="Clear Counter"/>				

Figure 5.3: CAN communication status page



This page shows accumulated readings since the *CAN-ETH* was last activated or reset. If power to the *CAN-ETH* is lost, all cumulative values are reset to zero.

The CAN communication channel between a Woodward CANopen based control and the *CAN-ETH* can be in one of the following states:

OK

The CAN communication channel with the Woodward CANopen based control has been established. The Woodward device is cyclically sending visualisation data via its TXPDO.

WAIT

The presence of a supported Woodward CANOpen based control has been detected however the *CAN-ETH* is currently waiting to receive a complete visualisation data set.

TIME-OUT

No CANOpen PDO was received for a period of 1 second. A Woodward control must be configured to transmit cyclically visualisation data using a TXPDO with a specific COB-ID number and the correct Data Protocol.

The following statistics are maintained:

Messages received

A counter that increments each time an inbound CANOpen PDO matching the shown COB-ID is successfully received.

Messages sent

A counter that is incremented each time a SDO message is sent.

The cumulative diagnostic data is reset when the device is power cycled or reset. The data is also reset by pressing the **Clear Counter** button.

Finding the firmware version and serial number

Click on the **About** menu entry on the menu bar to show the product information as shown below:



Figure 5.4: About page

This product information is important for service and support inquiries. The following product information is provided:

Product name

The name of the product.

Hardware version

CAN-ETH hardware version.

Firmware version

The firmware version that is installed on the *CAN-ETH*.

Serial number

The serial number of the *CAN-ETH*. The serial number is specific to your device.

Configuring and commissioning

The configuration pages are accessed by clicking on the **Configuration...** menu entry on the menu bar which then expands a configuration sub-menu. All configuration settings are kept in the device' non-volatile memory.



If you make changes to any settings, remember to save each page before changing to a different page!

Configuring Ethernet and IP

Select the **Configuration**→**Ethernet & IP** sub-menu from the menu bar to open the **Ethernet** and **IP** settings which are shown below:

The screenshot shows a web interface titled "Configuration". Under the "Ethernet" section, the MAC Address is displayed as "00-50-C7-67-70-7B". Under the "IP Settings" section, there are three rows of input fields: "IP Address" with values 169, 254, 0, 10; "Subnet Mask" with values 255, 255, 0, 0; and "Gateway Address" with values 0, 0, 0, 0. At the bottom of the IP Settings section, there are "Save" and "Cancel" buttons.

Figure 5.5: Ethernet and IP settings page

The following Ethernet parameters are shown:

MAC address

The device' unique MAC address. This number is hard coded and cannot be changed.

The following Internet protocol (IP) settings can be entered:

IP address

The IP address assigned to this device.

Subnet mask (also known as indexterm2:[network mask])

If you have a router, enter the subnet mask for the segment to which this device is attached.

Gateway address

If your network segment has a router, enter its IP address here. Otherwise leave the address as 0.0.0.0.

Once you click **save** the new settings are stored and applied instantly. The new settings are confirmed with the following page:



Figure 5.6: IP settings changed confirmation



Please write down the new IP address so you are able to communicate with the device in the future!

Configuring CAN and CANopen

The *CAN-ETH* gateway itself does not require any CANopen configuration. No Node-ID is allocated for the *CAN-ETH* because it operates as a CANopen consumer and client only.

However the CANopen settings of the connected Woodward controls must be configured accordingly. (Refer to ???)

Remote restarting the device

You can perform a remote restart of the device from the web interface. A remote restart is similar to power cycling the device. Possibly connected clients are disconnected and communication is interrupted until the device has rebooted.

To perform a remote restart, click on the **Configuration** sub-menu and then click on the **Restart** menu entry. This will open the device restart page as shown below:

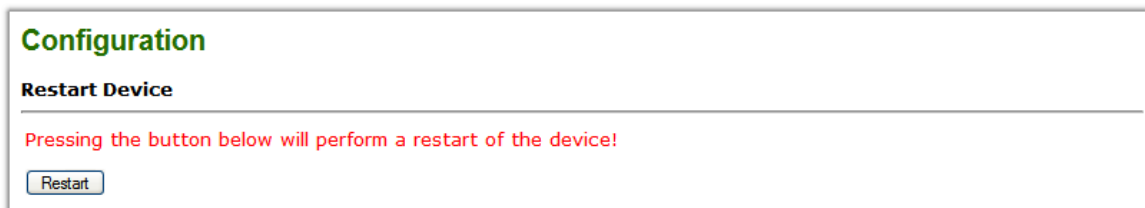


Figure 5.7: Restart device page

Click on the **Restart** button to perform a restart of the device. The restart is confirmed with the following notification:

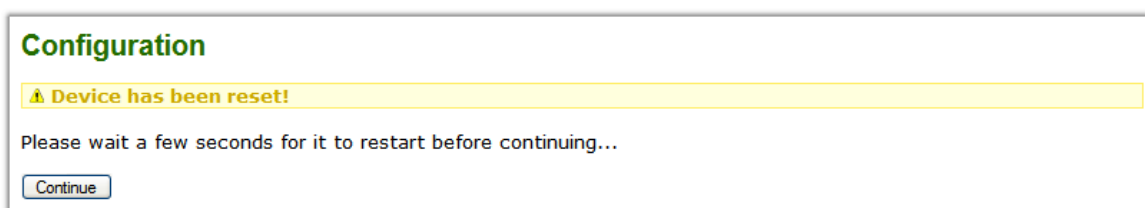


Figure 5.8: Restart confirmation page

Please allow a few seconds before continuing working with the device as it has to fully start-up first, before being able to respond to further web browser requests.



After a remote restart a *Watchdog reset* alarm is shown on the device' home page. This is a side-effect of the remote restart procedure and the alarm shall be ignored and cleared.

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Chapter 6. Protocol Description

The *CAN-ETH* gateway sends and receives CAN frames via TCP/IP using UDP datagrams. UDP was chosen over TCP as UDP is similar to CAN, a connectionless protocol.

The implemented protocol is conceptually easy to understand, easy to implement, efficient and gives high performance.

UDP Datagram

The default UDP port is 11898.

One UDP datagram can contain up to 16 CAN frames. How CAN messages are embedded in a UDP datagram is shown in the following drawing:

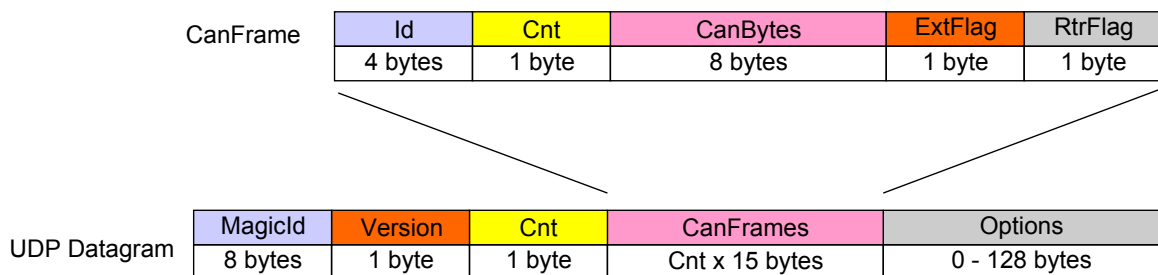


Figure 6.1: Structure of encapsulated CAN messages

A *CAN-ETH* UDP datagram contains the following fields:

Position	Designator	Content
0	MagicId	The ASCII characters "ISO11898"
8	Version	Version number of this datagram specification. Set to 1.
9	Cnt	Number of CAN frames embedded in this UDP message. Range: 1 to 16.
10	CanFrames	Variable size array of the CAN frames.
10 + Cnt x 15	Options	Array with option bytes. Length can be 0 to 128. Currently not used, should be empty.

Table 6.1: Elements of a UDP datagram

An encapsulated CAN frame contains the following fields:

Position	Designator	Content
0	Id	CAN identifier as 32-bit integer (least significant byte first, little-endian format)
4	Cnt	Number of data bytes used in the CanBytes array. Range: 0 to 8.
5	CanBytes	Array of CAN bytes (least significant byte first). Always 8 bytes. If less than 8 bytes transmitted, the unused bytes are zero filled.
13	ExtFlag	0/1 Flag which indicates if CAN identifier is 11 bit or 29 bit.
14	RtrFlag	0/1 Flag which indicates a remote transmission frame.

Table 6.2: Elements of a CAN frame

Example

The CAN message 18h 22h 3Ah 8Fh 77h 12h 88h 7Dh with identifier 181h is encoded as shown in this example:

Position	Value	Description
0	49h	The ASCII character "I"
1	53h	The ASCII character "S"
2	4Fh	The ASCII character "O"
3	31h	The ASCII character "1"
4	31h	The ASCII character "1"
5	38h	The ASCII character "8"
6	39h	The ASCII character "9"
7	38h	The ASCII character "8"
8	1	Version number 1
9	1	Frame count of 1
10	181h	CAN ID
14	8	Number of valid CAN bytes
15	18h	CAN byte 1
16	22h	CAN byte 2
17	3Ah	CAN byte 3
18	8Fh	CAN byte 4
19	77h	CAN byte 5
20	12h	CAN byte 6
21	88h	CAN byte 7
22	7Dh	CAN byte 8
23	0	Extended message flag: Standard Message
22	0	Remote transmission flag: No RTR

Table 6.3: Example CAN message

Chapter 7. Decommissioning

Before disconnecting the *CAN-ETH* unit please follow the rules in the section called "Safety Precautions".

Disconnecting



1. Ensure that the system power and external supplies have been turned off.
2. Disconnect power supply plug.
3. Disconnect all I/O cables.
4. Remove the *CAN-ETH* from the DIN rail following the procedure described in the section called "DIN rail mounting and removal".

Disposal



This product must be disposed of at a specialized electronic waste recycling facility. Do not dispose of in domestic waste.

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Appendix A.Specifications

Product name	CAN-ETH
Interfaces	
Ethernet	1
Serial ports	1 for diagnostics (RS-232)
CAN	1
User interface	
LED indicators	Power (green), Ethernet link (green), 2 status (bi-color red/green)
Monitoring & configuration	Web browser based
Diagnostic	
High availability features	Watchdog supervision, brown-out detection
CAN interface	
Connector	male 9-pin D-sub, CiA DS-102 pin-out
Physical layer	ISO 11898
Isolation	non-isolated
Speed	10, 20, 50, 100, 125, 250, 500, 800 kbit/s, 1 Mbit/s
Max. number of connected nodes	64
Diagnostic port	
Connector	male 9-pin D-sub, DTE, EIA-574 pin-out
Physical layer	EIA-232-F
Isolation	n/a
Signals	RXD, TXD, RTS, CTS, DTR, DSR, DCD, RI
Speed	9600 bps
Protocols	ASCII terminal
Ethernet port	
Connector	8-pin RJ-45 socket for Cat 5 UTP
Physical & Data Link Layer Layer	IEEE 802.3i 10BASE-T
Isolation	1.5 kV galvanic
Speed	10 Mbit/s
Max. cable length	100 m (328 ft)
Ethernet frame types	802.3
Protocols	UDP, HTTP, IP, TCP, ARP
Concurrent connections	2 HTTP
Power supply	
Connector	3.81 mm 2-pin pluggable terminal block header
Voltage	10-30 V DC
Current	30 mA typical @ 24 V DC
Intrinsic consumption	750 mW
Electromagnetic compatibility	
Emissions (radiated and conducted)	AS/NZS CISPR 22 / EN 55022 (Class A)
Immunity	EN 55024
Electrostatic discharge	EN 61000-4-2
Radiated RF	EN 61000-4-3

Fast transients	EN 61000-4-4
Conducted RF	EN 61000-4-6
Enclosure	
Material	Self-extinguishing PC/ABS blend (UL 94-V0)
Mounting	35 mm DIN rail (EN 60715)
Classification / Type rating	IP 20 / NEMA Type 1
Cooling	Convection
Environmental	
Operating temperature	0 to 60 °C / 32 to 140 °F
Storage temperature	-25 to 85 °C / -13 to 185 °F
Humidity	10 to 95% non condensing
Operating ambience	Free from corrosive gas, minimal dust
Physical	
Dimensions	101 x 22.5 x 120 mm / 3.98 x 0.886 x 4.72 in
Weight	0.13 kg / 0.287 lb
Compliance	
Australia	C-Tick
Europe	CE, RoHS
USA	FCC Part 15 (Class A)
Canada	ICES-003 (Class A)

Dimensions

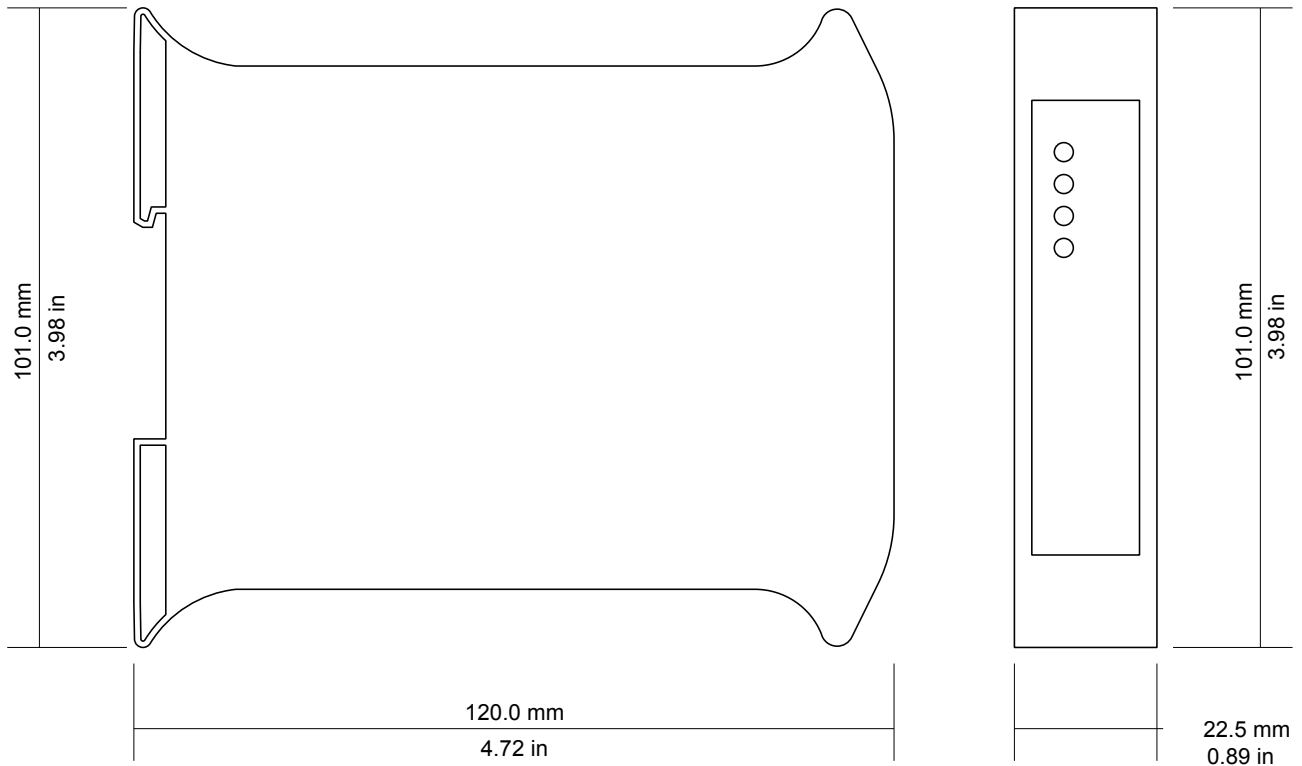


Figure A.1: Enclosure dimensions

Glossary

10BASE-T

10 Mbit/s twisted pair Ethernet standard. Standardized in IEEE 802.3i.

APIPA

Automatic Private IP Addressing

CAN

Controller area network. Standardized in ISO 11898.

CANopen

Internationally standardized (EN 50325-4) CAN-based higher-layer protocol for embedded control systems.

CiA

CAN in Automation. International industry organization involved in the standardization of CAN protocols.

CiA DR-303-1

Standard for CAN cabling

CiA DS-102

Standard for the pinout of CAN connectors

Class A

Class A equipment is that used in commercial or light industrial environments.

DIN

German Institute for Standardization

DIN rail

35 mm wide mounting bracket standardized in DIN/EN 50022.

DTE

Data terminal equipment. DTE and DCE devices have different pinouts for RS-232 connectors. A PC for example is a DTE.

EIA

Electronic Industries Alliance. Standard organisation for serial communication.

EIA-232

Standard for serial transmission of data between two devices, also known as RS-232 and V.24.

EIA-574

Standard for the pinout of serial D-sub connectors.

EMC

Electromagnetic compatibility

EMI

Electromagnetic interference

EN

European standard

ESD

Electrostatic discharge

Ethernet

The standard for local area networks developed jointly by Digital Equipment Corp., Xerox, and Intel. Ethernet is used as the underlying transport vehicle by several upper-level protocols, including TCP/IP.

Fieldbus

Digital communication network used to connect process instrumentation and control systems.

Frame

A single block of data transmission from a device.

Gateway

A network device that passes data between different networks or fieldbuses. It is different to a Bridge in that protocol conversion occurs above the application layer rather than in the datalink layer.

Gateway address

The IP address of the gateway or router used to access the Internet from the local area network.

HMI

Human-Machine Interface

IEEE

Institute of Electrical and Electronics Engineers

IP

Internet Protocol

<p>IP Ingress Protection Rating according IEC 60529. Standard for various grades of electrical enclosures.</p>	<p>used to restrict transmissions to certain subnets.</p>
<p>IP address A numeric address used by computer hosts to transmit and receive information over the Internet.</p>	<p>Switch A device that facilitates transmissions between nodes in a star-formed network</p>
<p>ISO International Standards Organisation</p>	<p>TCP/IP Transport Control Protocol/Internet Protocol. Connection-orientated transfer protocol.</p>
<p>KiB, KiByte 1024 bytes. The SI standard recommends the usage of the binary unit prefix <i>Ki</i> for 1024.</p>	<p>TIA Telecommunications Industry Association. US trade association and standardization committee.</p>
<p>MAC address Every piece of Ethernet hardware has a unique number assigned to it called it's MAC address. MAC addresses are administered and assigned by the IEEE organization.</p>	<p>UL 94 Plastics flammability standard released by Underwriters Laboratories of the USA.</p>
<p>NEMA National Electrical Manufacturers Association. NEMA defines standards for various grades of electrical enclosures.</p>	<p>Watchdog A fail-safe mechanism which resets a device if it becomes unresponsive.</p>
<p>Node A communications device on the network.</p>	
<p>PC/ABS Polycarbonate-ABS. Widely used thermoplastic material.</p>	
<p>Physical Layer This layer defines everything required to make a physical connection to the network or fieldbus.</p>	
<p>PLC Programmable Logic Controller</p>	
<p>RS-232 See <i>EIA-232</i>.</p>	
<p>SCADA Supervisory Control and Data Acquisition</p>	
<p>Subnet mask A numeric address used in conjunction with an IP address to segment network traffic;</p>	

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