



PRODUCTION SYSTEMS

CTU Diagnostic tool

DIAGNOSTIC TOOL MANUAL

Binar Production Systems – CTU Diagnostic tool

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Table of Contents

1. Introduction and system overview	4
1.1 Introduction	4
1.1.1 Prepared for the future	4
1.2 CTU.....	5
2. Diagnostic tool	6
2.1 Overview	6
2.2 Connecting Ethernet.....	6
2.3 Ethernet M12 to RJ45 standard cables	7
2.4 Access the homepage	7
2.5 Diagnose menu.....	8
2.5.1 Connector channel 1 - 4	8
2.5.2 Changing the connector	9
2.5.3 Diagnostic mode On and Off	9
2.5.4 Change output	9
2.5.5 Change LED output.....	10
2.5.6 Adapter cable switch input status	10
2.5.7 Read analog input	11
2.5.8 Running test plug	11
3. Setup menu	12
3.1 Overview	12
3.2 IP settings.....	12
3.3 Change to default IP settings.....	13
4. Firmware	13
4.1 Firmware upgrade of the LP335 CTU unit	13
4.1.1 Prepare the SD-card	13
4.1.2 Update firmware with the SD-card.....	14
4.2 Restore the original firmware.....	14
5. PC network setup	15
5.1 How to setup	15

1. Introduction and system overview

1.1 Introduction

The CTU system is used to perform component connection tests to preassembled car parts. The test objective is to find assembly errors before the parts are assembled in the car. In order to manufacture at low cost, it is very important to keep high quality throughout the whole process and not only assure quality at the EOL, but also at every workstation where assembly is done.

In a modern car, there are a lot of electrical consumers like LEDs, speakers, sensors, switches, outlets and so on. Those components are assembled onto parts like seats, interior door panels, interior roofs, bumpers and cockpits. If one of those sensors, switches etc. is not functioning when the car is checked at the EOL, there is often a major cost to correct it.

The LP335 CTU, Connection Test Unit, is a module that has a standardized electrical interface that may be used to quality assure assembly of electrical harness. The most common method is to power up the components that has been connected to the harness and measure the current consumption. The system can also measure the impedance. For the more intelligent modules connected to the harness, there are three communication channels; CAN, LIN and Serial (RS232), that can be used. Those channels require a specific driver to be developed for each case.

To be able to connect to each harness, a specific cable adapter must be manufactured. LP335 CTU includes in- and outputs to control LEDs and read a switch in the adaptor. The LEDs can be lit up in the colors green, yellow and red. They will show status to the operator during the test sequence. A switch inside the adaptor is used to verify that the adaptor has been connected to the test harness.

1.1.1 Prepared for the future

The CTU is based on a PCB that is developed together with Volvo Car Tooling. The board contains several features that is used in other equipment sold to Volvo Car.

1.2 CTU

The main part of the CTU System is the CTU. The CTU is connected to the factory network and is acting like an intelligent I/O-node. The interface is either CAN or ProfiNet.



Picture: LP335 – CTU (Connection test unit)

The CTU has 8 connectors at the bottom intended for connection of test objects. In the current version of the CTU only connector 1 to 4 is implemented, Connector 5 to 8 is intended for future usage to communicate with test objects.

In addition, there is one power connector and two bus connectors to connect to the factory network.

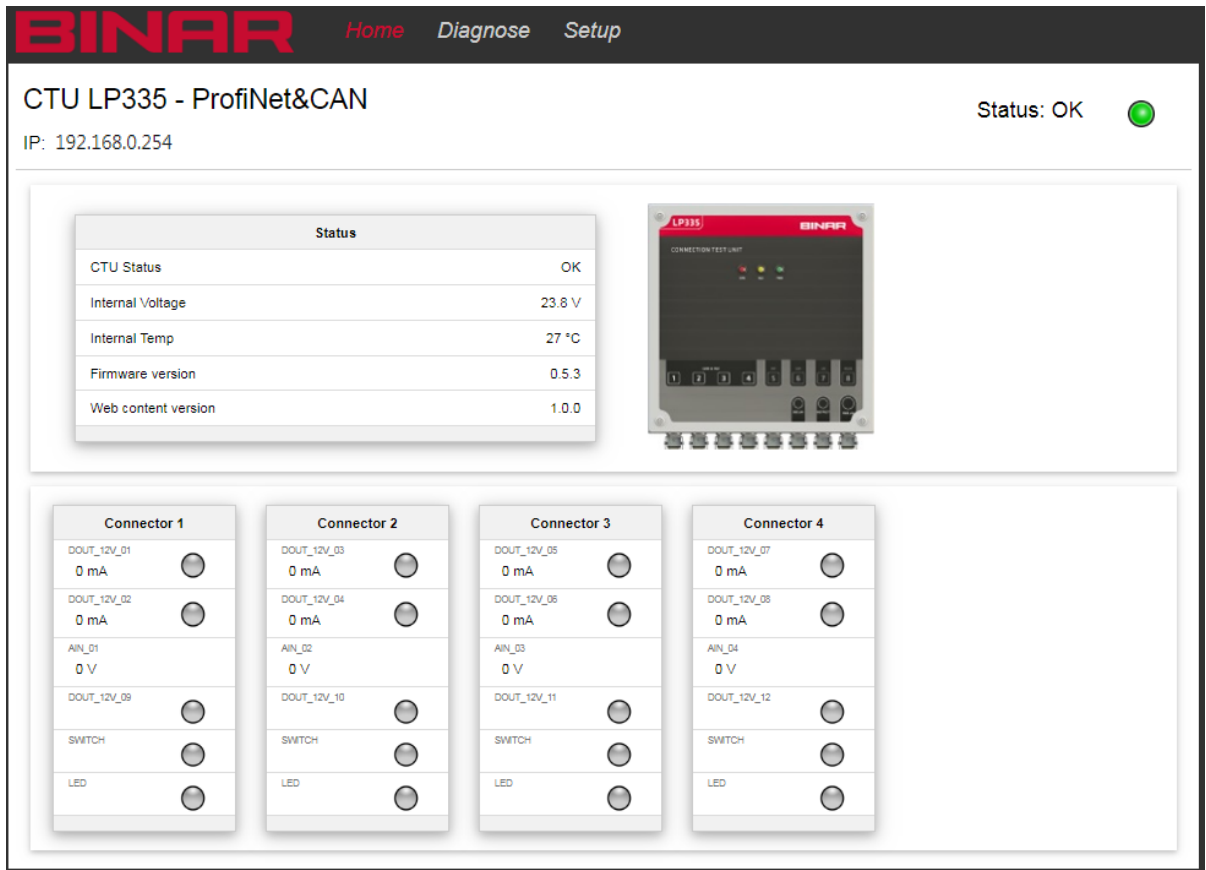
In most installations it is not enough with one CTU. When several CTUs is needed or when special cross connections are required a HAU is used.



2. Diagnostic tool

2.1 Overview

The CTU have an internal homepage that you can use for diagnosing the inputs and output status.



BINAR Home Diagnose Setup

CTU LP335 - ProfiNet&CAN Status: OK ●

IP: 192.168.0.254

Status	
CTU Status	OK
Internal Voltage	23.8 V
Internal Temp	27 °C
Firmware version	0.5.3
Web content version	1.0.0

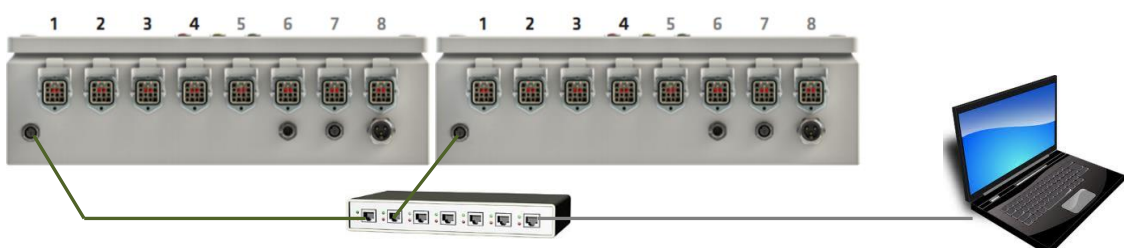
Connector 1	Connector 2	Connector 3	Connector 4
DOUT_12V_01 0 mA	DOUT_12V_03 0 mA	DOUT_12V_05 0 mA	DOUT_12V_07 0 mA
DOUT_12V_02 0 mA	DOUT_12V_04 0 mA	DOUT_12V_06 0 mA	DOUT_12V_08 0 mA
AIN_01 0 V	AIN_02 0 V	AIN_03 0 V	AIN_04 0 V
DOUT_12V_09	DOUT_12V_10	DOUT_12V_11	DOUT_12V_12
SWITCH	SWITCH	SWITCH	SWITCH
LED	LED	LED	LED

2.2 Connecting Ethernet

Connect the CTU to your laptop or local network with a M12 to RJ45 cable. If you want to diagnose more the one CTU you need to connect the CTUs to a switch.



Picture: LP335 – (connected to a laptop)



Picture: LP335 – (connected to a switch)

2.3 Ethernet M12 to RJ45 standard cables

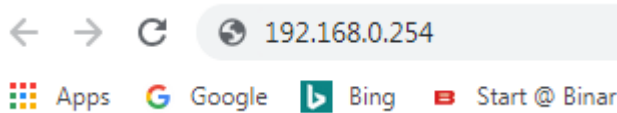
To connect the CTU to ethernet use ethernet to RJ45 cable.

51520	Profinet/ethernet, Green, PUR 0.5m	M12-RJ45
51521	Profinet/ethernet, Green, PUR 1m	M12-RJ45
51522	Profinet/ethernet, Green, PUR 2m	M12-RJ45
51523	Profinet/ethernet, Green, PUR 5m	M12-RJ45
51524	Profinet/ethernet, Green, PUR 10m	M12-RJ45
51525	Profinet/ethernet, Green, PUR 15m	M12-RJ45



2.4 Access the homepage

To access the homepage in the CTU open your browser and type in the default **IP 192.168.0.254** and press enter.



You will now see a page containing an overview of the CTU. Check your local PC network settings, cables and CTU power supply if you get problem to access. You have the following menus, "Home", "Diagnose" and "Setup".

In the Home view you can see the CTU connection 1 – 4 status and the system status.

2.5 Diagnose menu

In the diagnostic menu you can see the input and output status on each connector. You can set the CTU in diagnostic mode and manual set outputs and read the measured values. You can also test the connector with the test plug for to verify that the connector channels are OK.

Function	PIN	Name	Description
Status Indication	1	DOUT_24V_01	Red LED
Outputs	2	DOUT_24V_09	Green LED
Digital Output 12V With Current Measurement	3	DOUT_0V_01	GND
Digital Output 12V With Current Measurement	4	DOUT_12V_01	Output 12V
Digital Output 12V With Current Measurement	5	DOUT_0V_02	GND
Digital Output 12V With Current Measurement	6	DOUT_12V_02	Output 12V
Analog Input 0-12V	7	AIN_01	Analog Input
Analog Input 0-12V	8	AIN_0V_01	Analog GND
Digital Output 12V GND	9	DOUT_12V_09	Output 12V
Digital Output 12V GND	10	DOUT_0V_09	GND
Connection Control, 24V Digital Input 24V	11	24V_01	24V
Connection Control, 24V Digital Input 24V	12	DIN_24V_01	Input
Shield	PE	PE	PE

2.5.1 Connector channel 1 - 4

Description of the Channel Box.

Channel 1 - Auto

DOUT12V_1: 0 mA, Pin 4

DOUT12V_2: 0 mA, Pin 6

AIN_01: 0 V, Pin 7

DOUT12V_9: Pin 9

SWITCH: Pin 12

LED: Pin 1, 2

Channel 1 - Manual control

DOUT12V_1: 12.2 mA, Pin 4

DOUT12V_2: 66.5 mA, Pin 6

AIN_01: 0 V, Pin 7

DOUT12V_9: Pin 9

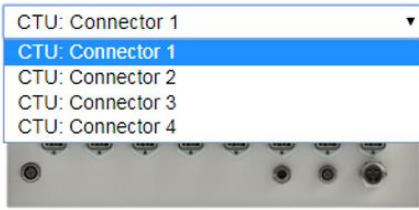
SWITCH: Pin 12

LED: Pin 1, 2

- Channel status, Auto or Manual control
- Output current measurement x mA
- Output On = green and gray = Off
- Analog input voltage/mA
- Output On = green and gray = Off
This output is normally used for pull-up together with the analog input
- Adapter connector switch input
- Adapter connector LED output, RED, Green or Yellow

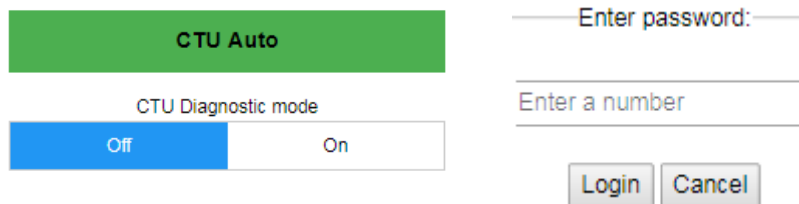
2.5.2 Changing the connector

To change the viewed connector, click on the drop-down menu.



2.5.3 Diagnostic mode On and Off

To change the diagnostic mode, click the On button. You need to enter password 1632.



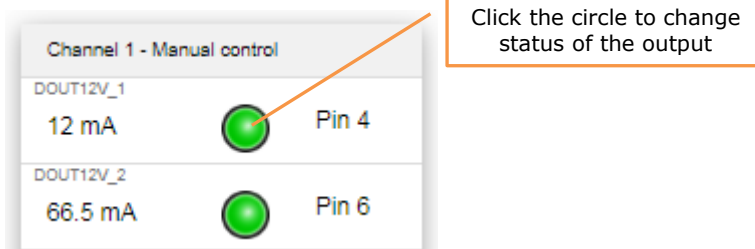
After entering the password, the "Diagnostic Mode" box flashes red. After 3 minutes of inactivity the CTU will automatically go back to Auto mode.



When CTU is in the "Diagnostic Mode" the output control is in manual control and cannot be set from Profinet or CAN master system!

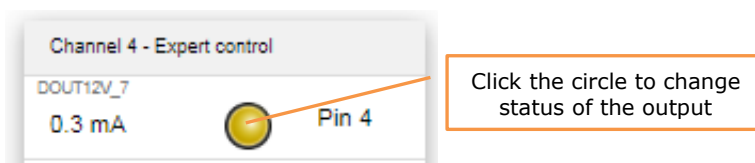
2.5.4 Change output

To set a output, click the DOUTxx circle.



Click the circle to change status of the output

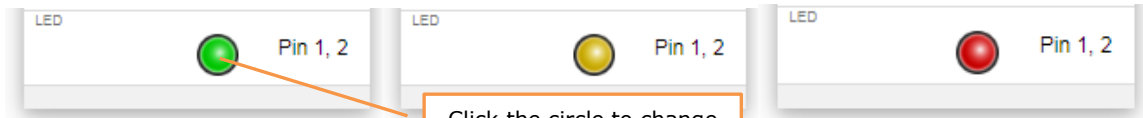
To make the output blink 2Hz click once more. This function is used for "keep alive" measurements.



Click the circle to change status of the output

2.5.5 Change LED output

To change the LED, click the LED circle.

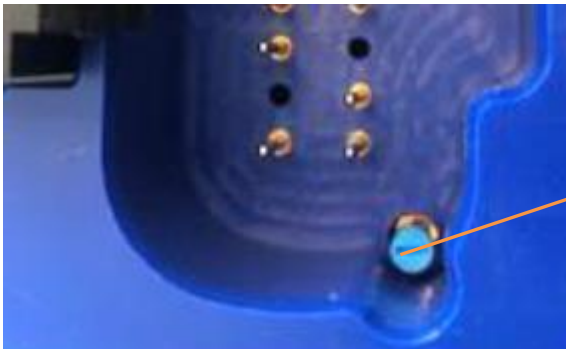


Click the circle to change status of the output



2.5.6 Adapter cable switch input status

When green the input is on.



Example of a switch sensor

2.5.7 Read analog input

To change an output, click the DOUTxx circle.

AIN_01 11.7 V	Pin 7
DOUT12V_9	Pin 9

Click the circle to change status of the output
 This output is normally used for pull-up
 together with the analog input.
 Check drawings to verify function in
 your application.

2.5.8 Running test plug

Connect the test plug to the connector that you want to test and click "Start Test".

In the "Test plug status" you will get information about the test.

Diagnostic Mode

CTU Diagnostic mode

Off On

Click her to start the test

Internal test with test plug

Off Start Test

Test plug status

Current at DOUT1 out of tolerance: 11.7mA, should be between 29.2 and 32.2



3. Setup menu

3.1 Overview

In the Setup menu you can change the network settings and update the firmware. You can also see the status of the analog inputs. The input can be set by the controlling system to voltage 0-10V input or 1-20mA current measurement input. Normally this input is used with 0-10V.

The screenshot shows the Binar web interface for the CTU LP335. The page title is "CTU LP335 - ProfiNet&CAN" and the status is "OK" with a green indicator. The IP address is 192.168.0.254. The setup menu is divided into three sections:

- IP address assignment:** Radio buttons for "DHCP (automatic)" and "Manual" (selected).
- IP Address:** Input fields for IPv4 Address (192.168.0.254), Subnet Mask (255.255.0.0), and Default Gateway (192.168.0.1). A "Submit" button is below.
- Firmware upgrade:** Radio buttons for "Web interface" and "LP335 Firmware" (selected). A "Choose File" button shows "No file chosen". A "Reboot and upgrade" button is on the right.
- Analog input configuration:** Four panels for AIN0, AIN1, AIN2, and AIN3. Each panel has radio buttons for "Voltage" (selected) and "Current".

3.2 IP settings

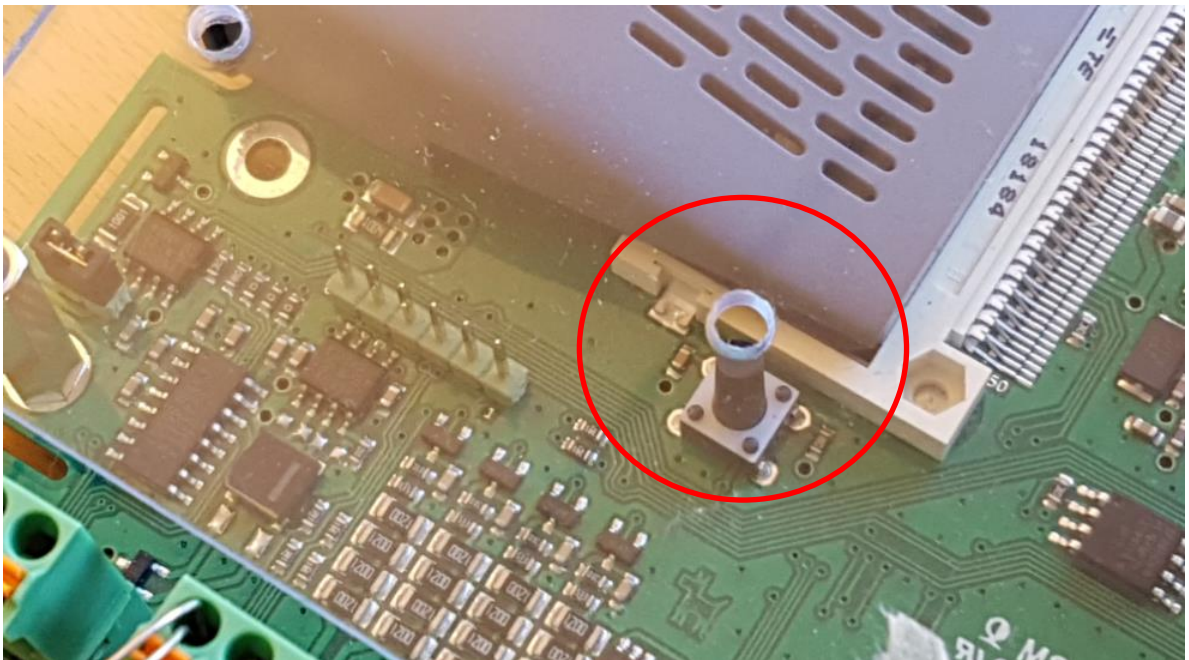
You can change the default settings in the IP address settings, the default IP is 192.168.0.254.

This block shows a close-up of the IP address settings section from the screenshot. It includes the following elements:

- IP address assignment:** Radio buttons for "DHCP (automatic)" and "Manual" (selected).
- IP Address:** Input fields for IPv4 Address (192.168.0.254), Subnet Mask (255.255.0.0), and Default Gateway (192.168.0.1).

3.3 Change to default IP settings

You can reset the CTU to default IP address settings (192.168.0.254) by pressing the reset button on the CTU card in 3 seconds.



4. Firmware

4.1 Firmware upgrade of the LP335 CTU unit

You can reset the CTU to new firmware with a simple SD-card.

4.1.1 Prepare the SD-card

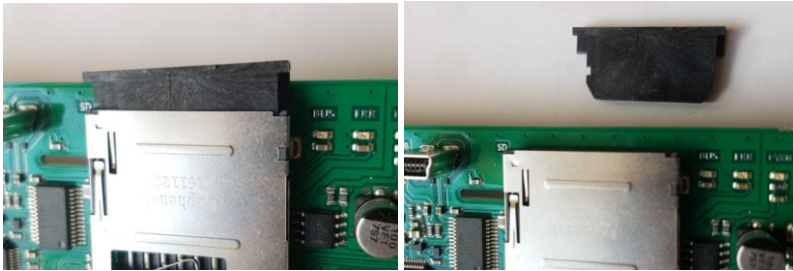
The LP335 board contains a bootloader able to upgrade the firmware from a SD card. If not already done, the SD-card must be prepared with the correct firmware the way described below:

1. Ensure the SD-card is formatted with FAT32.
2. Open the .zip file
fw_LP335CTU_v0.5.3.zip
3. Copy all the files in the "fw_LP335CTU_v0.5.3" folder (red marked in picture) to the SD memory card root directory.

fw_LP335CTU_v0.5.3	File folder		
ifs_001.img	Disc Image File		379 KB
lp335.bin	BIN File		88 KB
original	File folder		
lp335.bin		2019-01-07 11:27	BIN File 100 KB

4.1.2 Update firmware with the SD-card

1. Switch off the power of the LP335 CTU unit.
2. Remove the LP335 black lid to be able to access the LP335 SD-card socket.



3. Insert the SD-card (holding the correct firmware version) to LP335 SD-card socket.



4. Connect the 24VDC power and **wait 60 seconds.**
5. Disconnect the 24VDC power.
6. Remove the SD-card.
7. The CTU is now ready, switch on the 24VDC.

4.2 Restore the original firmware

Follow instructions from chapter "Prepare the SD-card" except use files from the "original" folder.

5. PC network setup

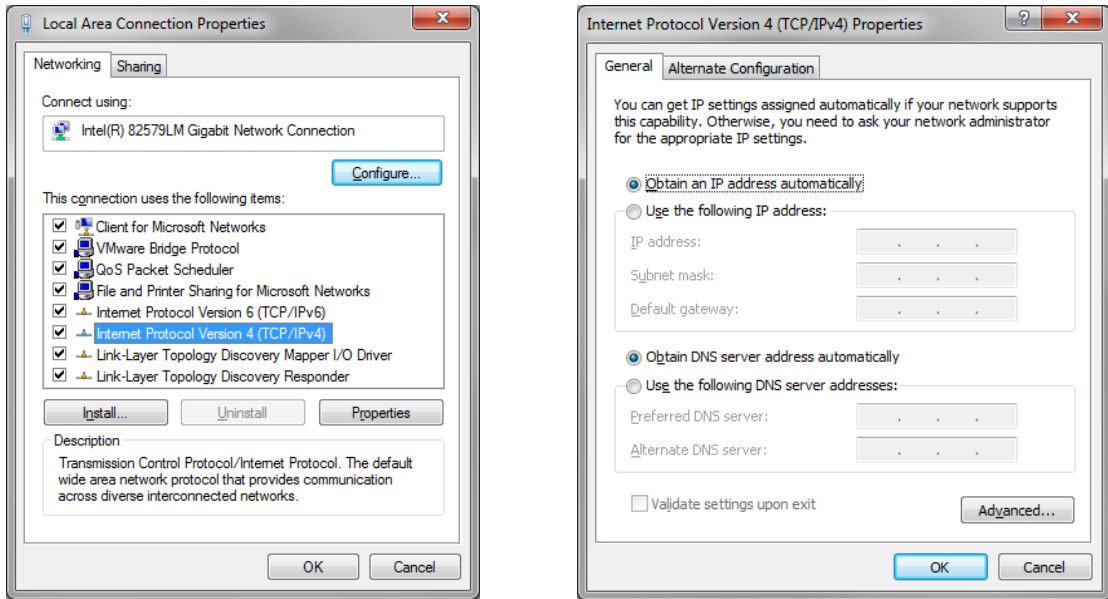
When using a PC to access the local WEB-page with default CTU settings you need to have correct network settings.



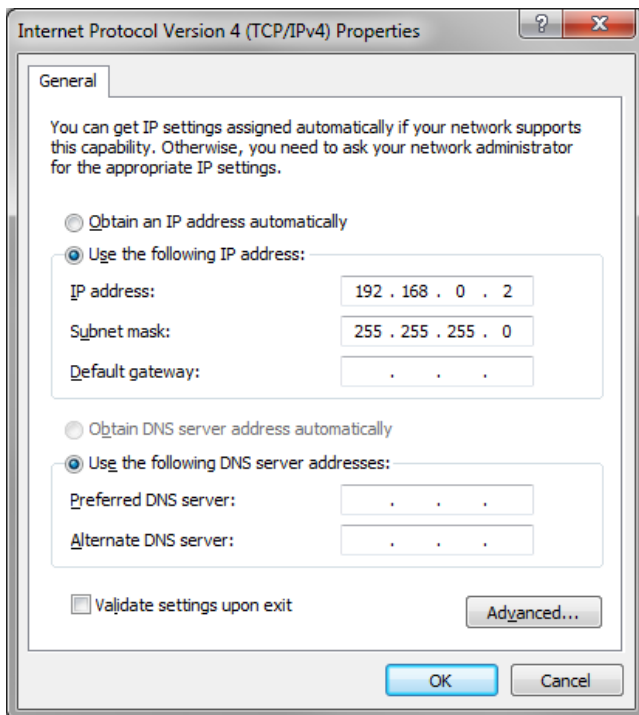
5.1 How to setup

Open the "Local Area Connection Properties" on your PC.

Open the Internet Protocol Version 4.
Normally the IP address is set to DHCP (Obtain an IP address automatically).



Change to "Use The Following address:" and fill in the address as showed below. You should now be able to access the CTU-WEB page, there you can change the default network settings, so it matches your local standards.



Don't forget to restore your network settings when you are ready with the CTU work.