

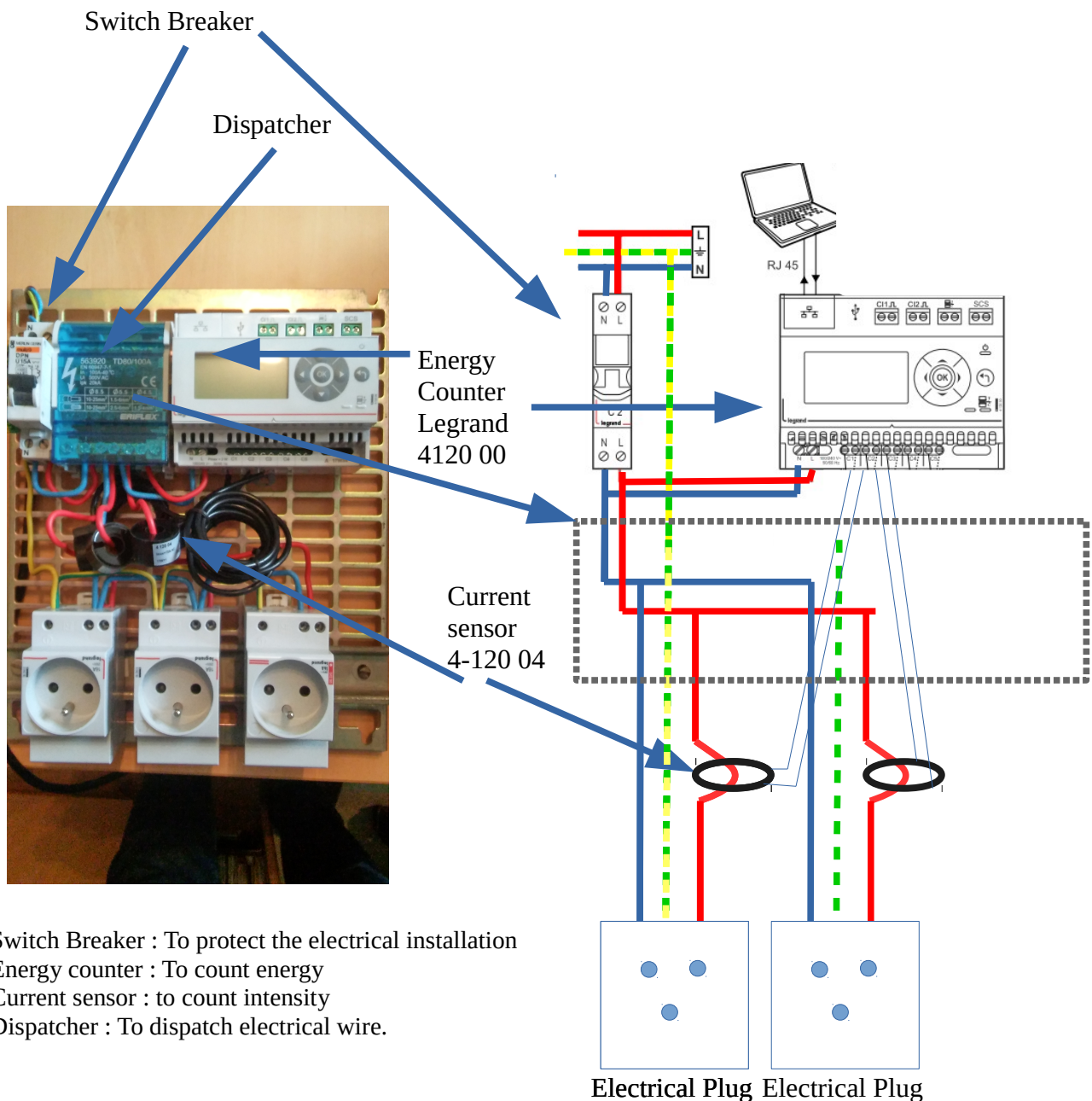
Labworks	English Technology	
Page 1 sur 5	Digital identity : The wiring of a connected energy counter	Lycée E.LIVET

1. Goal:

Through this lab work, you are going to wire a electrical counter which can communicate with a computer by TC/IP protocol.

During this workshop, you are going to configure an electrical energy counter . At the end, you will go to a internet browser and you will see the consumption of devices which are plugged on this system.

a) Presentation



- Switch Breaker : To protect the electrical installation
- Energy counter : To count energy
- Current sensor : to count intensity
- Dispatcher : To dispatch electrical wire.

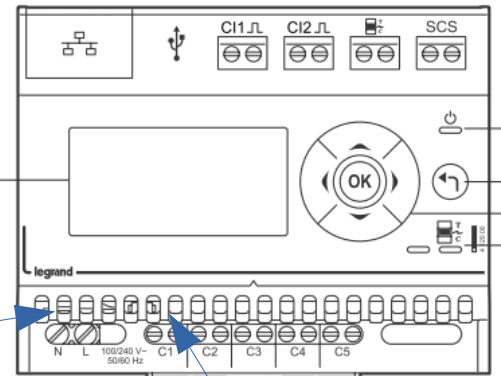
b) Principle of IP electrical counter

The sustainable development standards are stronger and stronger in Europe. The electrical bill increases more and more. To reduce it, one solution is to know which device consumes too much energy, so the user can change it.

To help the user, the IP electrical counter can be telecontrol from everywhere.

To count electrical energy, we must measure the voltage, the current and the time :

Voltage circuit



Current circuit

Power [WATT] = Voltage [Volt] x Current [Ampere]

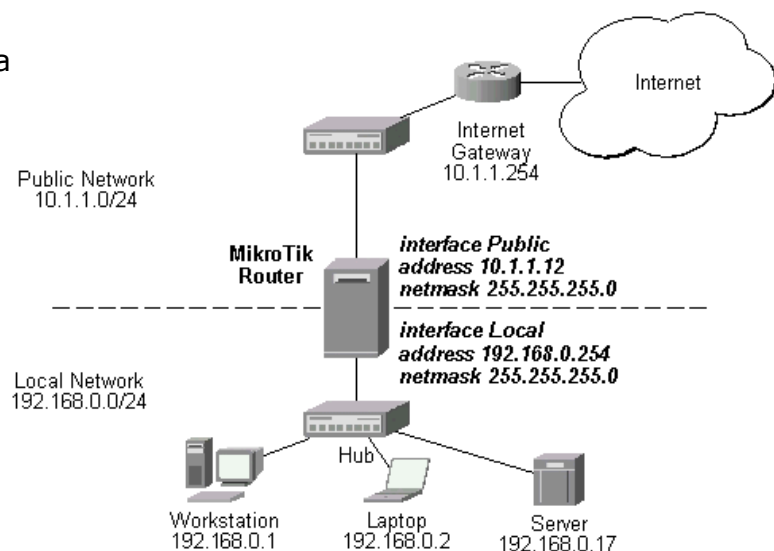
Energy [Watt.Hour or Joule] = Power [Watt] x Time [Hour or second]

c) The different parts of a computer network.

Computer networks are basically built from three components; End Devices, Networking Devices and Media. End Devices:

- ✓ End devices are used to access or transmit the data. Computer, laptop, data server and tablet are the example of end devices.
- ✓ Networking Devices: - Networking devices are used to control the data flow. Switches, Routers, HUB, Bridges, firewalls and modems are the example of networking devices.
- ✓ Media: - Media is used to transmit the data. Copper cables, fiber cable and wireless signals are the example of media.

Following figure illustrate a simple computer network



d) Remark about IP Address and mac address

Every computer in network has a unique network address. This address represents its location in network. Computer address is built from two addresses IP address and MAC address.

IP Address: - IP address is a software address. We need to configure it on each PC. An IP address (Internet Protocol Address) is a label given to a device that is used to identify and locate other devices. These addresses allow devices to communicate on and between networks. To access the web configuration utility, you will need to find the IP address of the device you are using. Often, a local area network has the IP address which begins by 192.168.0.n (n: number of the device)

MAC Address: - MAC address is a hardware address. It is assigned with Ethernet card from its manufacture company. It is identify by 12 hexadecimal numbers .

The topology of our network is given next page

2. Wiring

a) Electrical Wiring

Realise the electrical wiring of the counter thanks to the electrical diagram page 1.

b) Computer Wiring

You are going to wire a female RJ45 socket.

Look at the male Tj45 cable. Identify which wiring has been chosen (type A or type B) thank to the colors) and is it crossed or not?

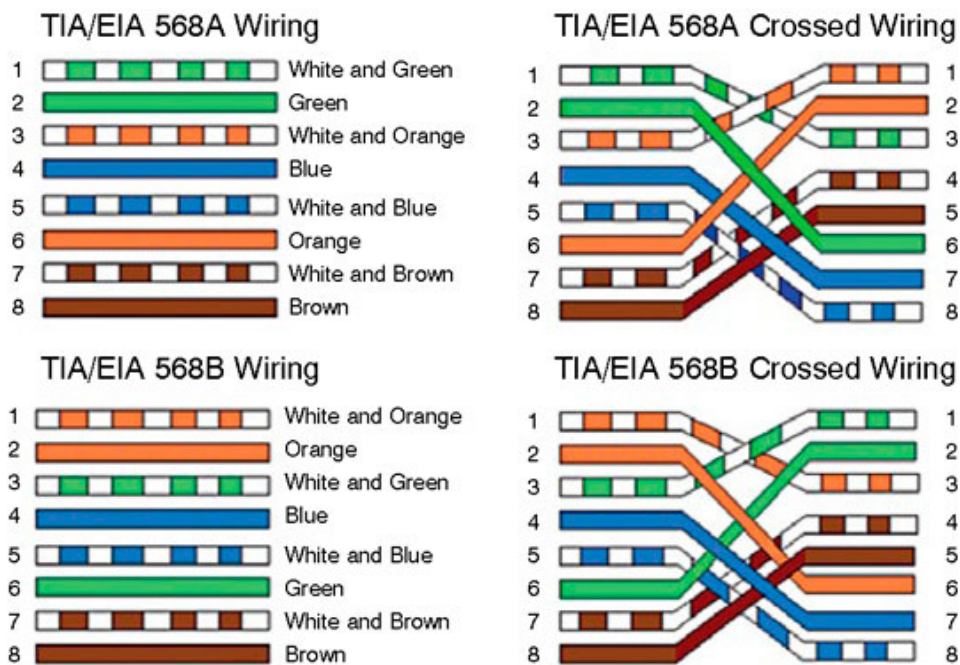


Figure A

Shows the Pin Out of Straight through Cables

Figure B

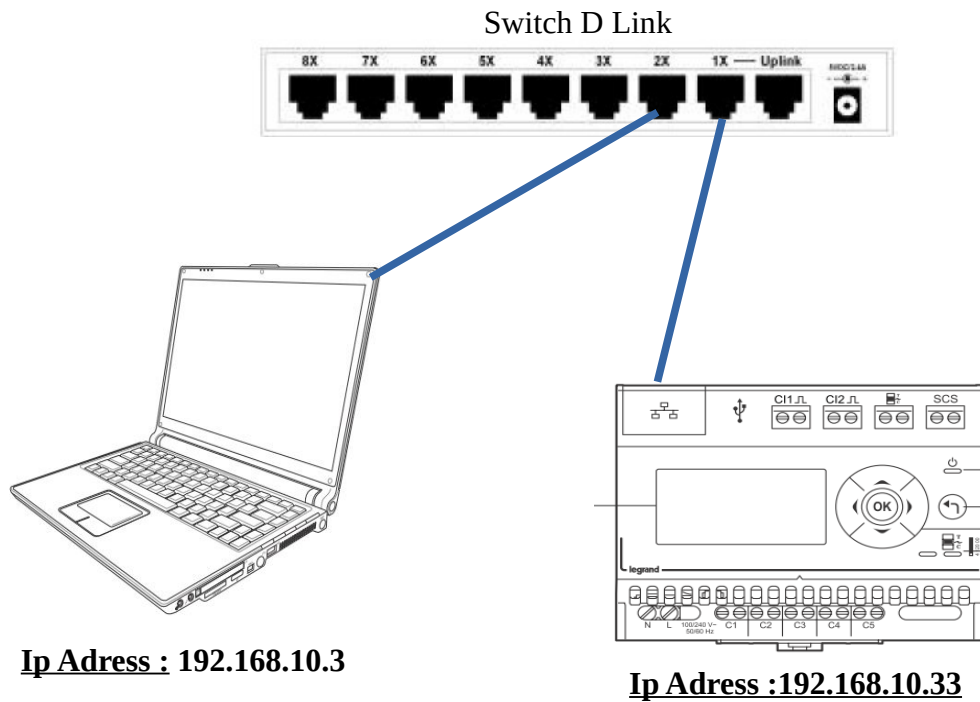
Shows the Pin Out of Crossover Cables

So Wire the RJ 45 connector.

Test it thank to a test RJ45 device. Ask to the teacher to explain how to do.



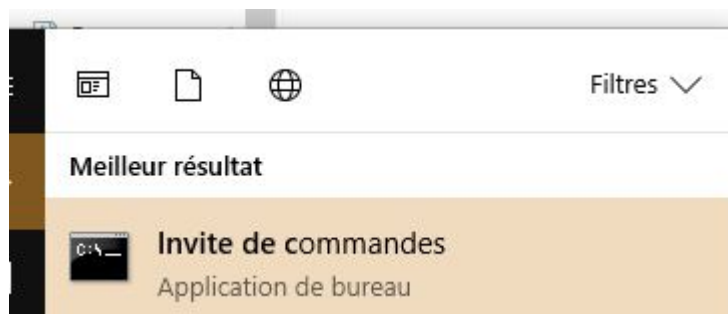
3. NETWORK TOPOLOGY



4. Test the connexion

a) Go to command prompt

Navigate to the start menu and **choose** All Programs > Accessories > Command Prompt. The Command Prompt window opens:



Remember when typing from the command prompt you can only type one command per line, and press Enter after each one to execute it.

b) How to Determine the IP Address of a Device : ipconfig /all

Type ipconfig /all and then press Enter to display the applicable current TCP/IP configuration values.

You obtain this kind of screen

```

C:\Users\franc_000>ipconfig /all

Configuration IP de Windows

Nom de l'hôte . . . . . : PC_Bureau
Suffixe DNS principal . . . . . :
Type de noeud . . . . . : Hybride
Routage IP activé . . . . . : Non
Proxy WINS activé . . . . . : Non
Liste de recherche du suffixe DNS.: home

Carte Ethernet Ethernet :

Suffixe DNS propre à la connexion. . . : home
Description. . . . . : Inventec PCIe GBE Family Controller
Adresse physique . . . . . : BC-EE-78-DB-80-A1
DHCP activé. . . . . : Oui
Configuration automatique activée. . . : Oui
Adresse IPv6 de liaison locale. . . . . : fe80::5d61:d7a7:21a9:9207%3(préféré)
Adresse IPv4. . . . . : 192.168.1.49(préféré)
Masque de sous-réseau. . . . . : 255-255.255.0
Bail obtenu. . . . . : mercredi 1 mars 2017 15:26:14

```

This is the MAC address of your Network Board

This is the ip address of your computer

c) Ping Command

A lot of IP devices are used in industry, home, tertiary sector like bank, supermarket. Some devices are sensors, human machine interface, processing unit, power devices. So, if there is troubleshooting for the accessibility of devices, you can use “PING” command to verify the communication. The ping command is a very common method.

The ping command first sends an echo request packet to an address, then waits for a reply. The ping is successful only if:

- ✓ the echo request gets to the destination, and
- ✓ the destination is able to get an echo reply back to the source within a predetermined time called a timeout. The default value of this timeout is two seconds on Cisco routers.

```

C:\Users\franc_000>ping 192.168.1.11
Envoi d'une requête 'Ping' 192.168.1.11 avec 32 octets de données :
Réponse de 192.168.1.11 : octets=32 temps<1ms TTL=64
Réponse de 192.168.1.11 : octets=32 temps<1ms TTL=64
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Réponse de 192.168.1.11 : octets=32 temps<1ms TTL=64

Statistiques Ping pour 192.168.1.11:
    Paquets : envoyés = 4, recus = 4, perdus = 0 (perte 0%),
    Durée approximative des boucles en millisecondes :
        Minimum = 0ms, Maximum = 0ms, Moyenne = 0ms

```

Time to Live :
Number of router the demand can pass through before to reach its target

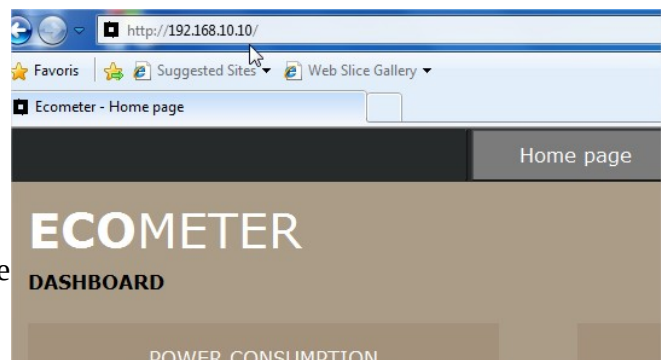
Ping the energy counter to verify if it is configured.

5. Test

Go to your favourite internet browser

Write on the URL command the ip address of the counter

Check that it works correctly



a) Jour Job :

Now you have to prepare a presentation to explain what have you got found out thanks to this lab work.