

Solutions in ***motion***

FCT CODESYS series

User guide software

Intelligence Production Movement

User guide

FCT CODESYS series

User guide software

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IMPORTANT

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Chapter 1

Introduction

This document describes the basic notions to develop and manage an application program written in IEC 61131-3 with the CODESYS Development System environment for the FCT controllers of CMZ (see [Chapter 5, CODESYS Development System](#)).

1.1. Symbols



Caution

It shows a dangerous situation, in case of failure to comply with safety rules it can lead to a serious or fatal accident or damage to the equipment.



Warning

It shows a potentially dangerous situation, in case of failure to comply with safety rules it can lead to a serious accident or damage to the equipment.



Important

It shows some important information on the mentioned topic.



Note

It shows some important information on the text about the mentioned topic.



Tip

It shows some useful information on the mentioned topic.

1.2. Revisions

Revision History		
Revision 1.0.0	24/09/2020	Author: CMZ SISTEMI ELETTRONICI S.r.l.
<ul style="list-style-type: none">First revision of the document.		
Revision 1.1.0	14/01/2021	Author: CMZ SISTEMI ELETTRONICI S.r.l.
<ul style="list-style-type: none">English version aligned.		
Revision 1.2.0	01/10/2021	Author: CMZ SISTEMI ELETTRONICI S.r.l.
<ul style="list-style-type: none"><i>Section 8.2, “Which SD Cards are compatible with the FCT controllers?”</i>: SD Card model, suggested by CMZ, added.		

Creation of the first program

This chapter provides a guideline that starts with the first turn on of the FCT system and ends with the execution of a first simple application program in the controller, developed with CODESYS Development System (see [Chapter 5, CODESYS Development System](#)).



Important

During the procedure some softwares must be installed so it is necessary an internet connection in order to download the related installation files.

2.1. Step 1: identify the controller type and its license

Looking the controller from the front side, the one with the connectors, its name can be read, while on the left side face the following information can be found: product order code, serial number, hardware revision, MAC Address of the Ethernet ports.

The order code description is reported in the CMZ SISTEMI ELETTRONICI S.r.l. products catalogue, that can be downloaded from the download area in the Commercial documents section (see [Chapter 6, CMZ Download Area](#)).

The controller must have a CODESYS license.



Important

A FCT without a CODESYS license can work only in demo mode for a limited period of time. The license can be installed only in CMZ, not in remote mode.

A system with CODESYS license has a silver coloured sticker with a number and the written "CODESYS".

For the realization of a project it is important to be able to obtain 2 information from the order code: the controller type and if the installed CODESYS license is PLC or SoftMotion type:

FCTnnn.mmmm.XXX.aaa

- nnn: controller type: 200, 300, 640;

- mmmm: describes the hardware characteristics;
- XXX: CODESYS license type:

XXX	CODESYS license description
101	PLC
102	PLC and WebVisu
103	SoftMotion
104	SoftMotion and CNC
105	SoftMotion and WebVisu
106	SoftMotion, CNC and WebVisu

- aaa: this field is present only for FCT640. It represents the maximum SoftMotion drives axes number that can be used in the application (see the catalogue for the details).

2.2. Step 2: connection of the supply to the controller

The system is supplied with 24V. In order to select the suitable power supplier and for the connector description it is necessary to read the hardware manual of the controller, or its short guide. These documents can be downloaded from the download area, in the FCT Series - Product Manuals section (see [Chapter 6, CMZ Download Area](#)).

2.3. Step 3: installation of FCTTool

FCTTool is a software developed by CMZ SISTEMI ELETTRONICI S.r.l. used find the controller in the network and to manage the firmware files. The installation program can be downloaded from the download area in the FCT series with CODESYS - Tools section (see [Chapter 6, CMZ Download Area](#)).

For further details about the system requirements required to the PC and about the functionalities provided by the tool, see [Chapter 4, FCTTool description](#).

2.4. Step 4: check of the Ethernet connection with the controller

In order to be able to program the controller it is necessary to connect to it via Ethernet.

To check that the connection has been properly made and to see the controller IP address, it is necessary:

- to connect the supply to the FCT;

- to connect the Ethernet cable to the controller in ETH for FCT200, ETH 0 for the others. The connection can be made in 2 ways:
- connection to the company network: on the turn on the server will assign an address to the controller;
- direct connection to the pc: if, after some minutes, the controller cannot find a server that assigns it an address, it auto-assigns itself the address 172.16.32.1, subnet mask: 255.255.0.0. In this second case the PC communication port must be configured so that it is compatible with the FCT address.
- turn on the FCT;
- launch FCTTool and in the Target locator page the FCT will appear after the button 'Scan' is pressed:

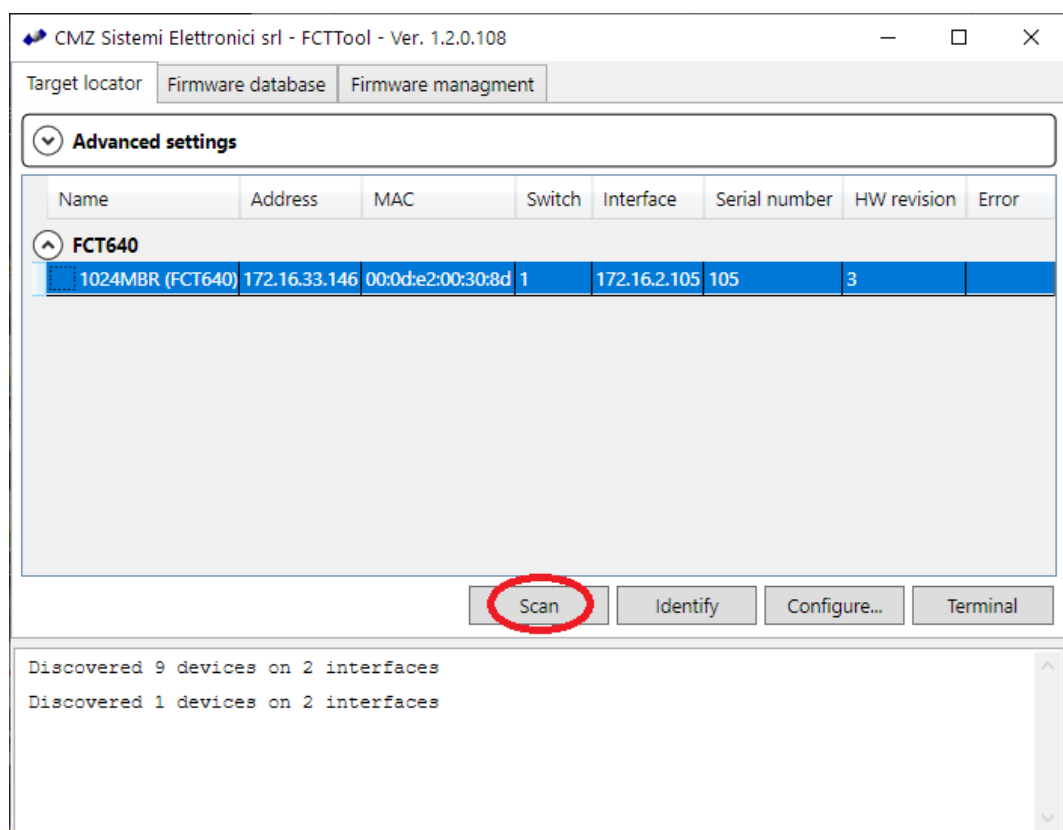


Figure 2.1. FCTTool scan of the network



Important

If the connection is point-to-point between FCT and PC then the answer of the FCT to the network scan may require some minutes. Then it will appear in the list with IP 0.0.0.0 address, it means that it is searching for a server to obtain an address. After some minutes the IP 172.16.32.1 address will be automatically assigned with subnet mask 255.255.0.0. To work with this connection mode, it is advisable to set a static IP address to the controller (see [Section 4.2, "Target locator"](#)) so that to avoid this waiting time at the turn on.

2.5. Step 5: installation of CODESYS Development System

The CODESYS Development System software allows to program in IEC 61131-3 the FCT controller. The installation file can be directly downloaded from the [CODESYS Store: CODESYS Development System V3](#) (it will be necessary the registration to the store to download the file).

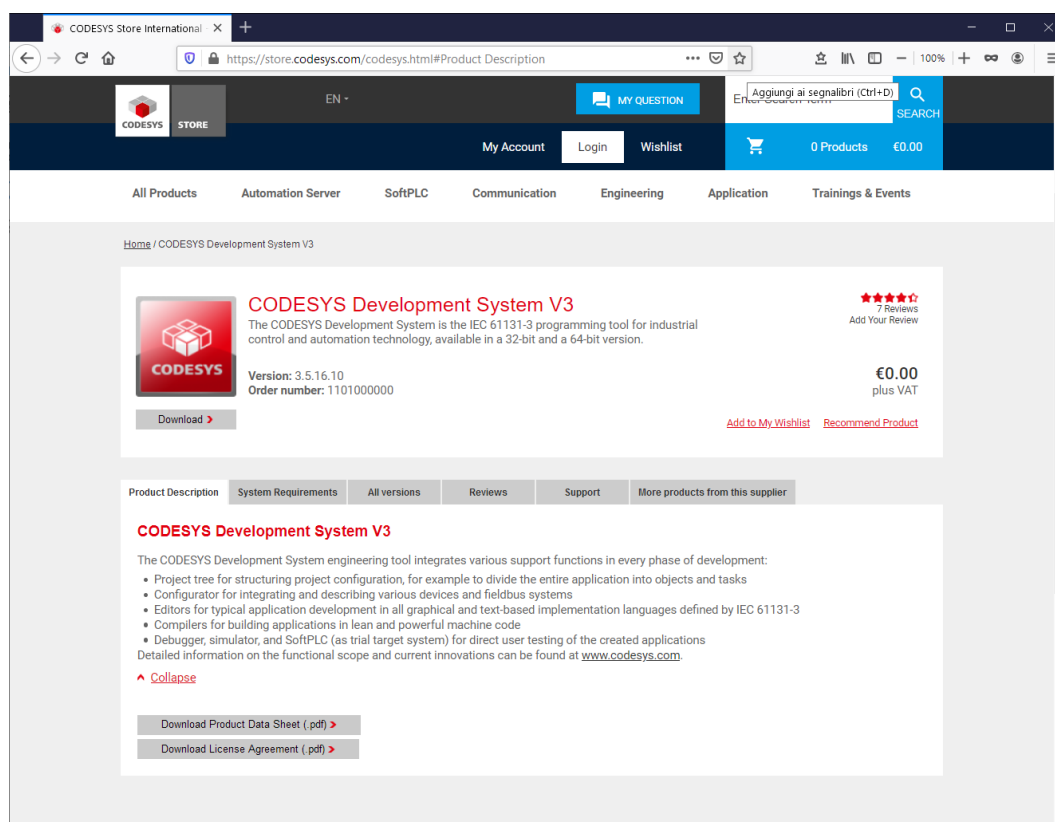


Figure 2.2. CODESYS Store

2.6. Step 6: installation of the package file related to the controller in CODESYS

To realize a program with CODESYS Development System for the FCT controller, the "package" file of the correspondent FCT must be installed. This installation will insert in the CODESYS Development System both the device descriptor file of the controller and the libraries that allow to use the FCT (*Chapter 3, FCT controller functionalities*).

The package file is distributed with the controller firmware, so the firmware file must be downloaded from the download area in the FCT series with CODESYS - Firmware section (see *Chapter 6, CMZ Download Area*).

In this section there are the firmwares for: FCT200, FCT300, FCT640. For each controller the last versions that have been distributed for each service pack are reported. Before to be delivered to the customer, the last firmware version of the last service pack is installed in the controller.

Once the firmware file has been downloaded it must be imported in the FCTTool in this way:

- launch FCTTool;
- enter the tab 'Firmware database' and click on the button 'Import' on the bottom:

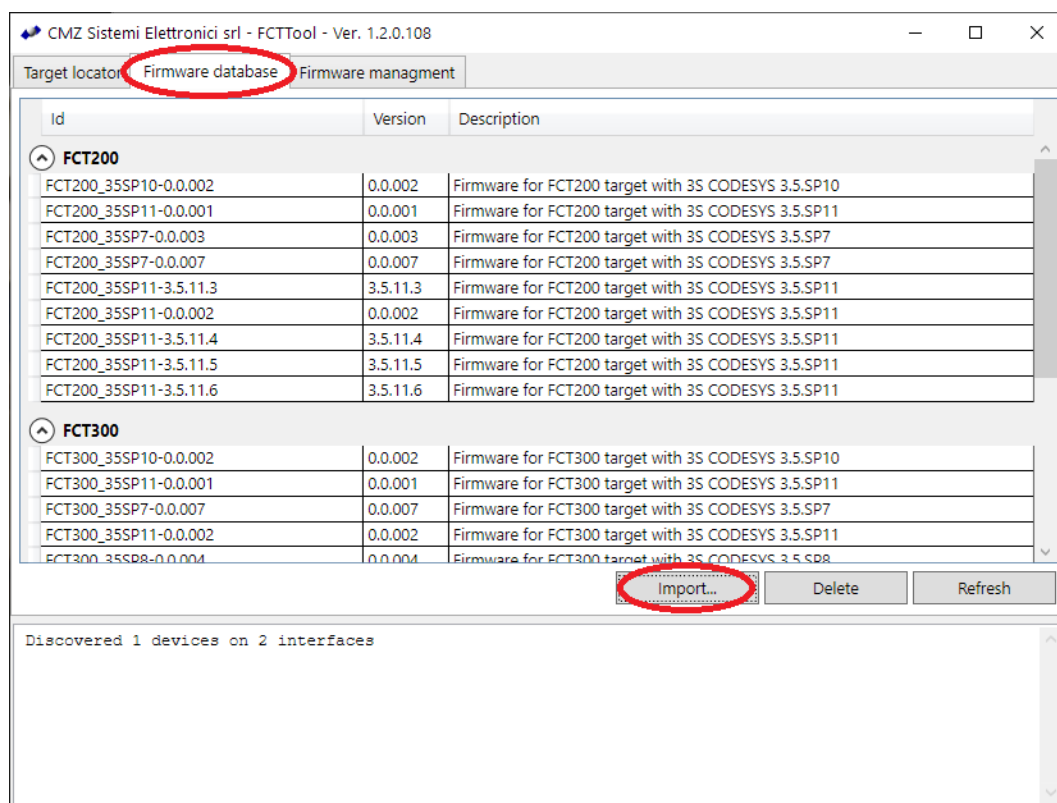


Figure 2.3. firmware import

then select the just downloaded firmware file. After this operation the imported firmware will appear in the list;

- enter the 'Firmware management' tab and click on the '...' on the right of the 'Firmware' line (see [Section 4.4, “Firmware management”](#)):

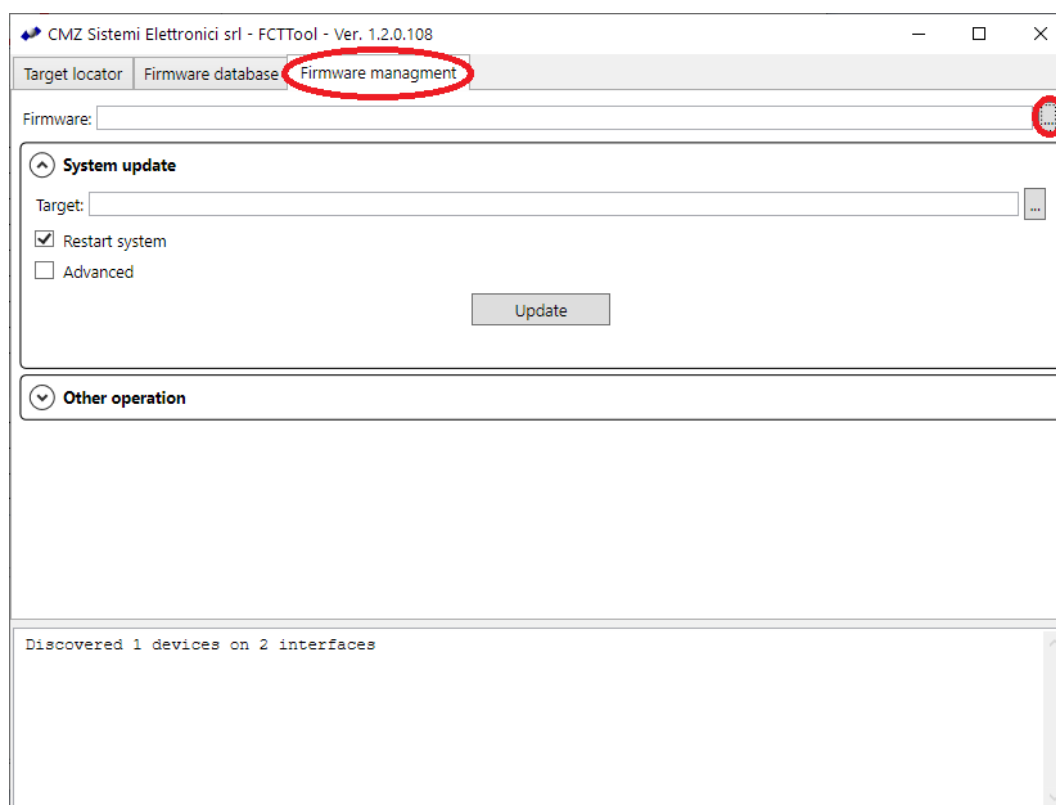


Figure 2.4. firmware selection

at this point the list of the firmwares that are available in the PC appears and, if it is the first installation, will be made only by the just imported firmware. Select the firmware;

- remaining in Firmware management, click on 'Other operation' and then on 'Get File':

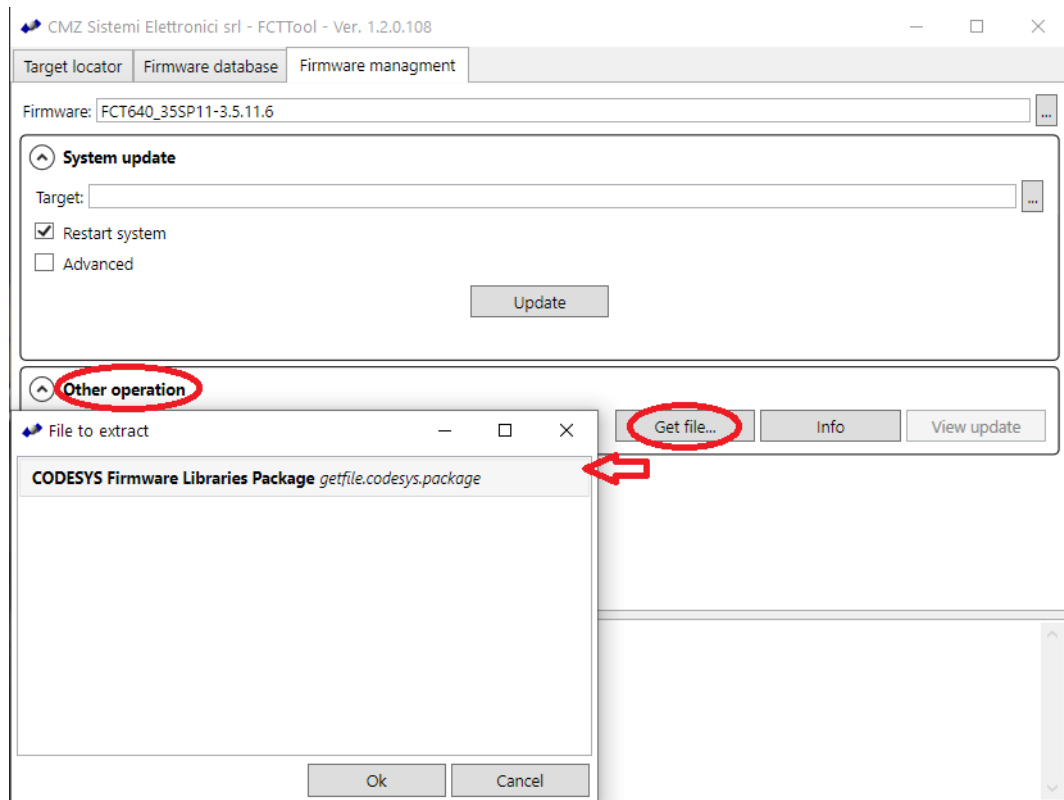


Figure 2.5. extract the package

select 'CODESYS Firmware Libraries Package' and then press OK, then save the file in a folder in the PC;

- in conclusion, execute (double click) the just extracted file that will have the extension *.package*. In the example of FCT640: FCT640_35SP11.package.

A wizard automatically starts: select 'Typical setup' and proceed.



Note

The package installation can be made even by manually extracting from the .zip file of the firmware the package file and then executing it. The advantage to follow the described procedure is that it inserts the downloaded firmware in the FCTTool's database so that it can be easily recovered and used in the future.

2.7. Step 7: installation of the package with the libraries

These are the libraries that expand the CODESYS functionalities (see *Chapter 3, FCT controller functionalities*). Can be downloaded from the download area in the FCT series with CODESYS - Libraries section (see *Chapter 6, CMZ Download Area*):

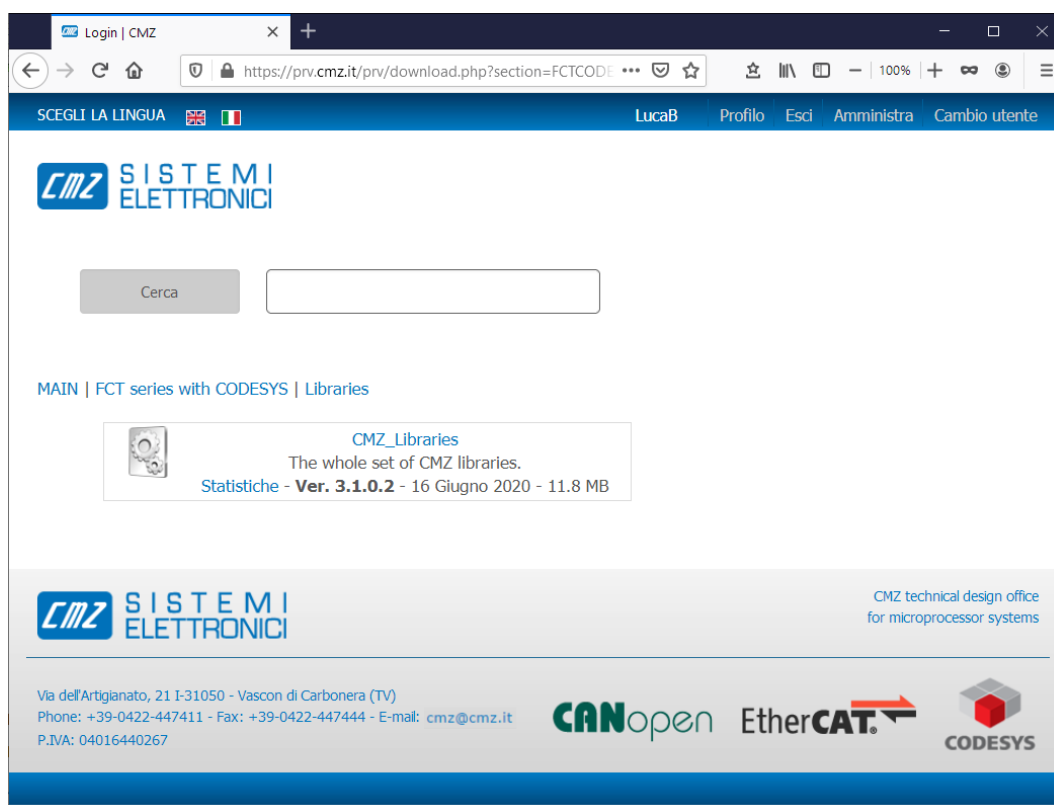


Figure 2.6. libraries download

the downloaded file is a zip.

Launching the CMZ_Libraries.package file contained in the zip, the package installation procedure starts: select 'Typical setup' and execute it 'till the conclusion.



Note

In the zip there is even the CMZ_LibrariesChangeLog file that contains a summary of the libraries history.



Note

The installation of this package is not indispensable for the creation of the first simple project, but it is very useful to prepare the PC to the applications development.

2.8. Step 8: creation of the project

Launch the CODESYS Development System program, normally the installation creates the icon directly on the desktop.

From the initial page click on 'New Project': it appears a window that requires to select the project type to be created. Select:

- Categories: Project;
- Templates: Standard project.

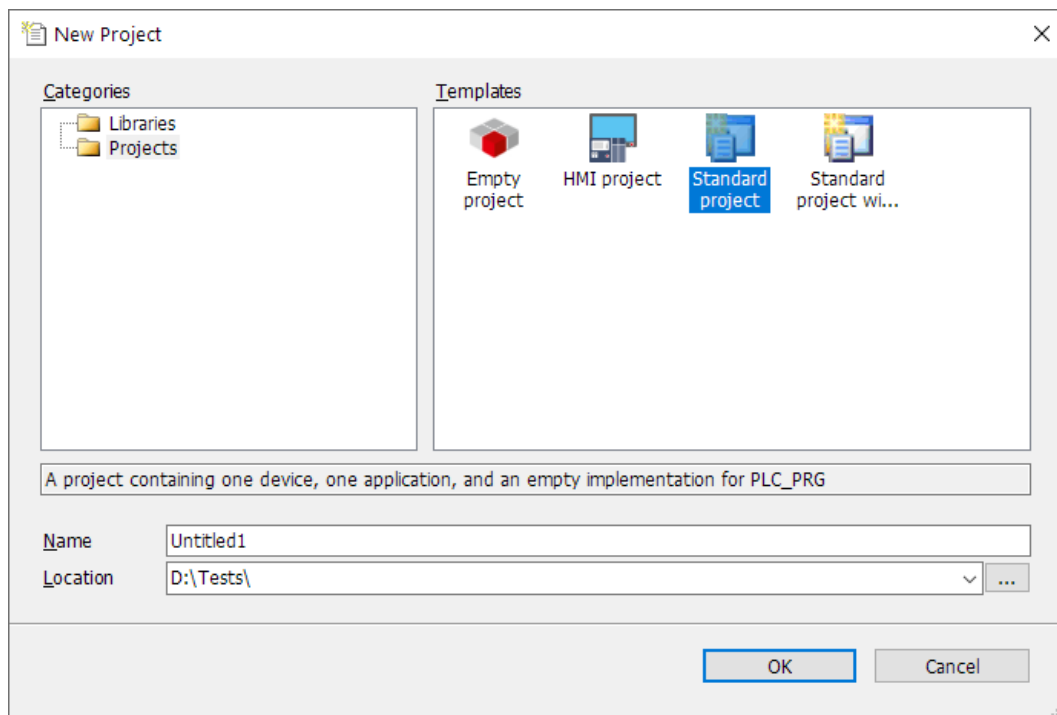


Figure 2.7. Standard project

The a second window appears, that is used to select the device type for which the project has been creating. It must be searched in the list the one that corresponds to the FCT that is in use ([Section 2.1, “Step 1: identify the controller type and its license”](#)). there will be two possibilities (for example for FCT640):

- FCT640 Fieldbus Controller: Standard PLC (CMZ Sistemi Elettronici): select this option if in the FCT it is installed the PLC license (see [Section 2.1, “Step 1: identify the controller type and its license”](#));
- FCT640 Fieldbus Controller: SoftMotion (CMZ Sistemi Elettronici): select this option if in the FCT it is installed the PLC SoftMotion license (see [Section 2.1, “Step 1: identify the controller type and its license”](#)).

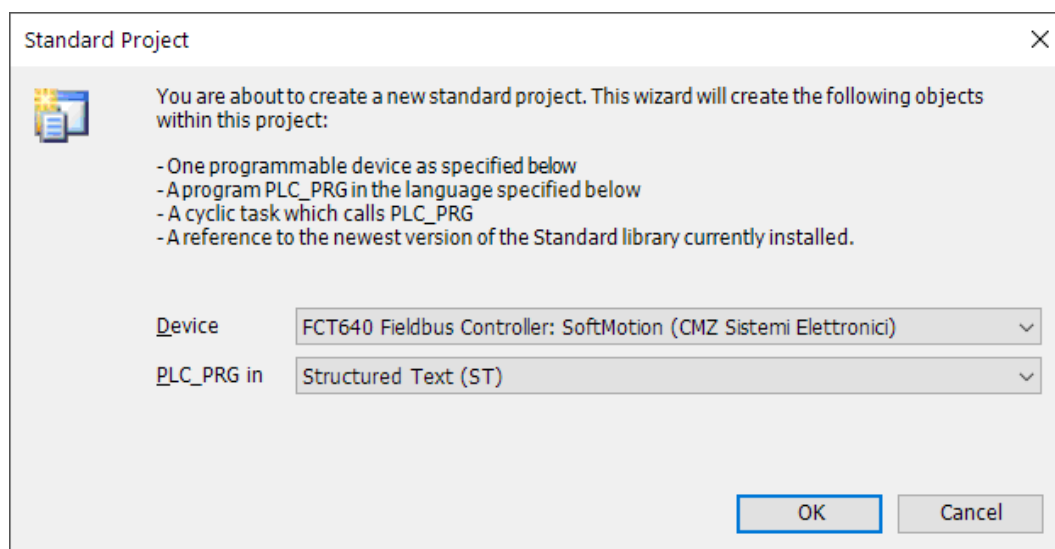


Figure 2.8. select the FCT device

This procedure brings to the creation of a project with an empty application:

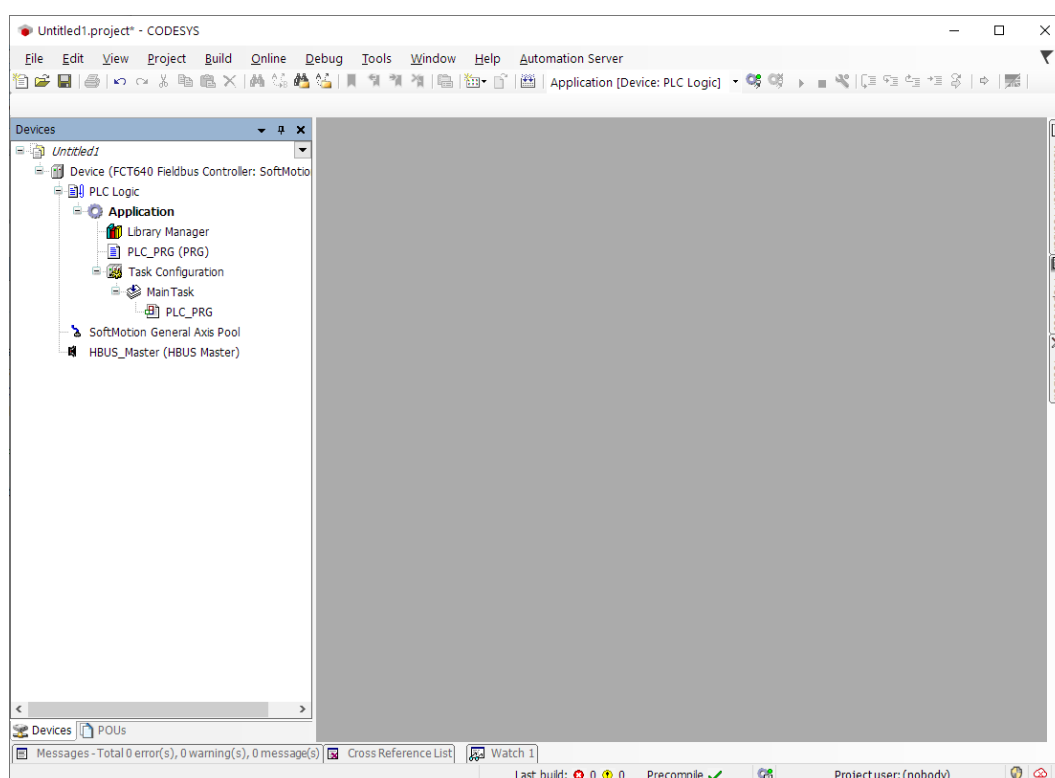


Figure 2.9. empty project

Select PLC_PRG that is the IEC 61131-3 program in structured text and insert the code as showed in the figure (a simple counter):

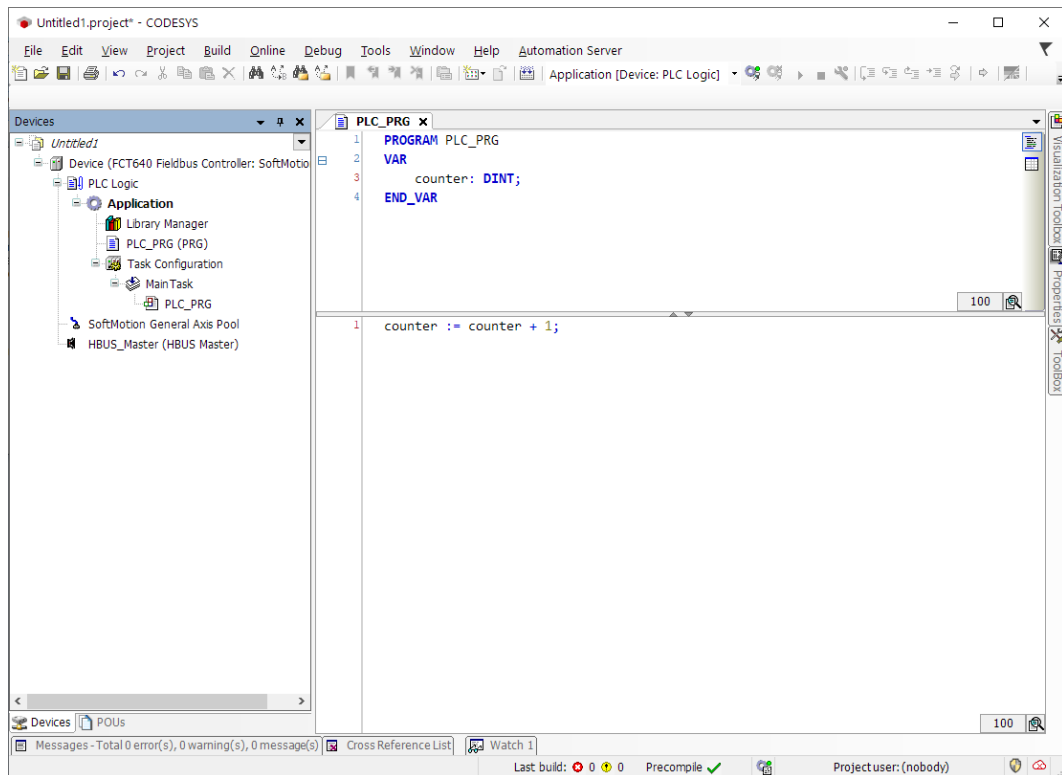


Figure 2.10. first project

2.9. step 9: establish the communication between CODESYS and FCT

In order to download the just written program in the FCT it has to be opened first the communication between CODESYS Development System and FCT. To do this, click on 'Scan Network' in the Communication Settings tab in Device:

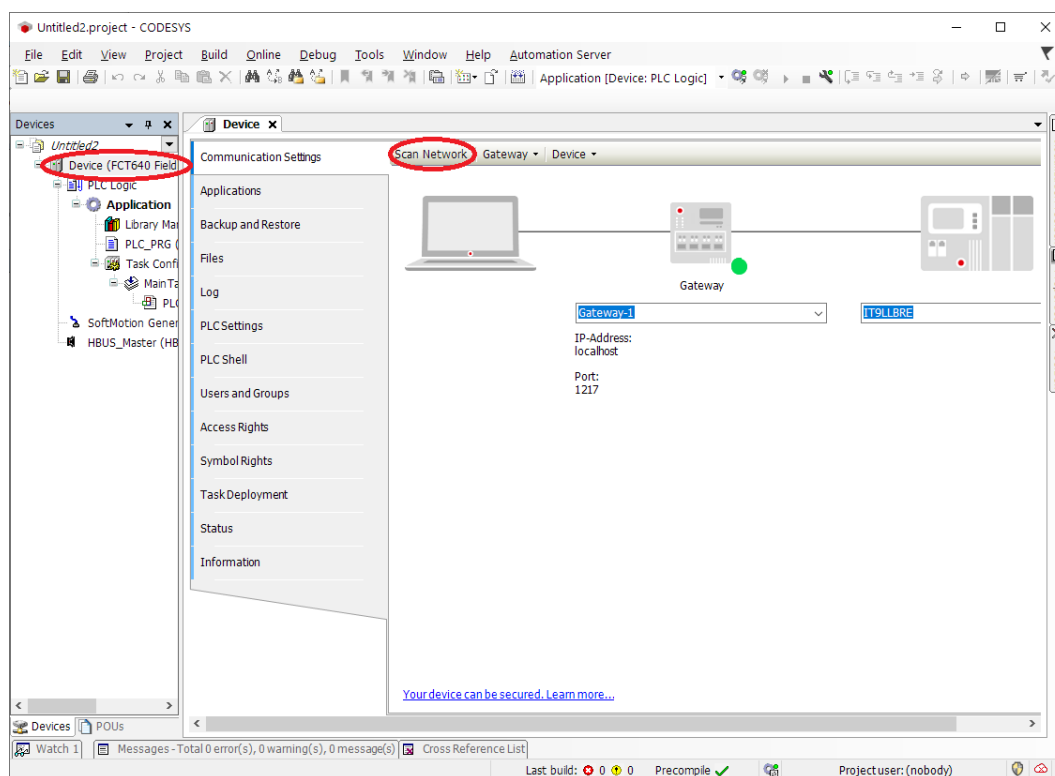


Figure 2.11. network scan start

a page is opened, where the FCT can be seen:

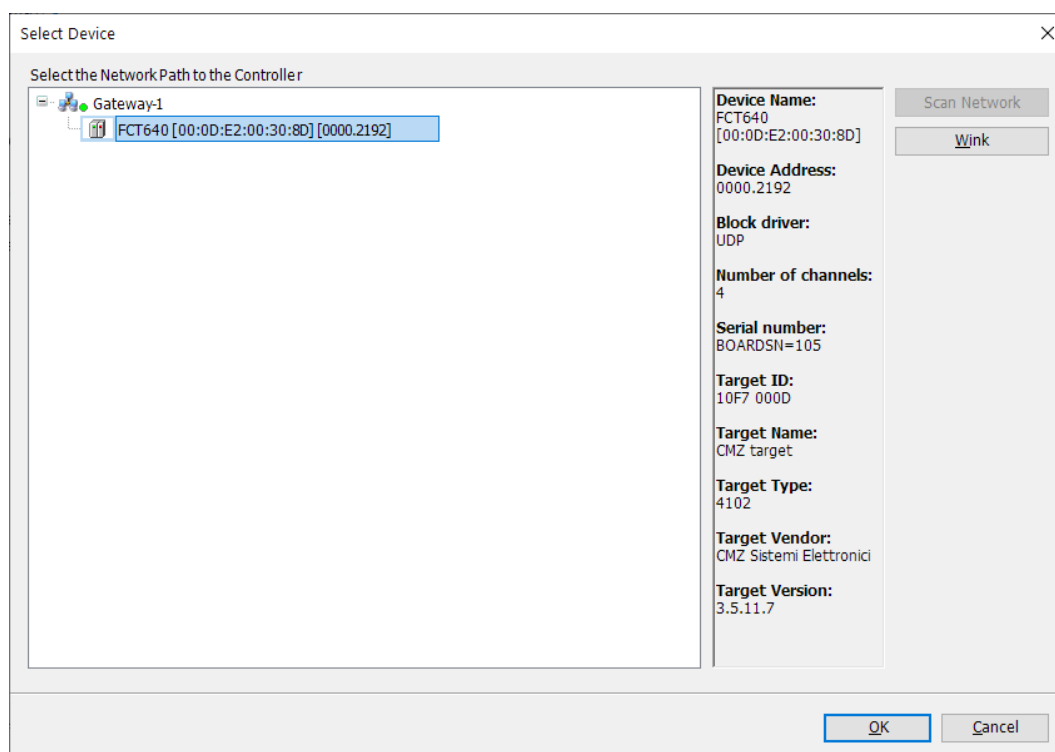


Figure 2.12. network scan

Once the controller is selected and 'OK' has been clicked, the communication is established:

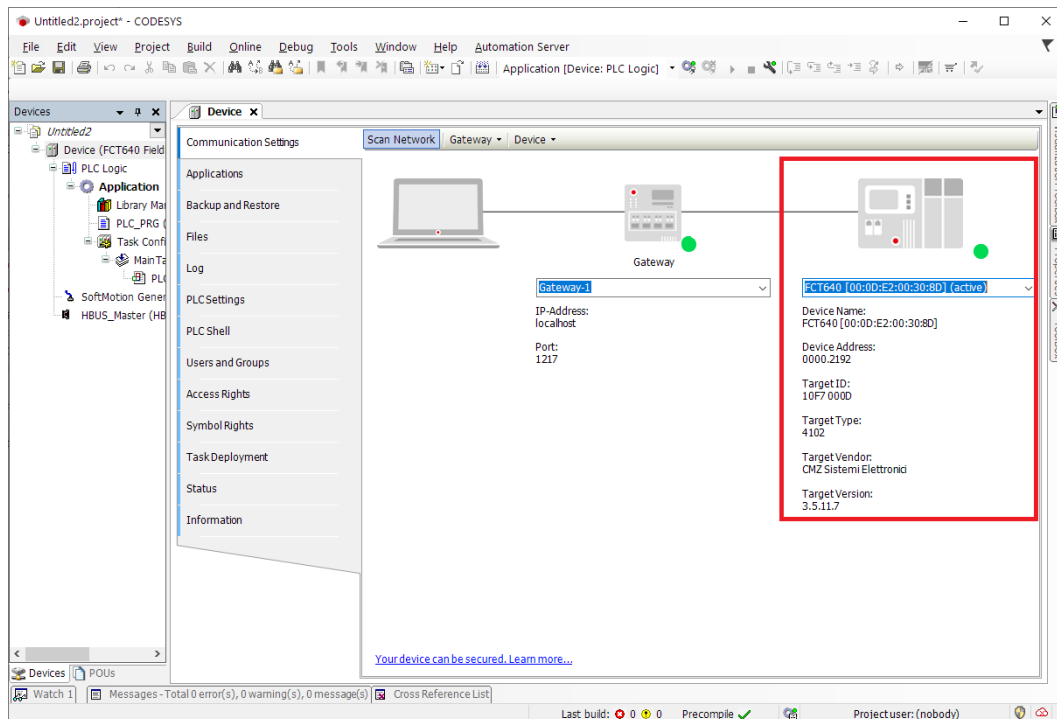


Figure 2.13. communication established

2.10. step 10: execution of the project on FCT

At this point, to download the project in FCT, press Login:

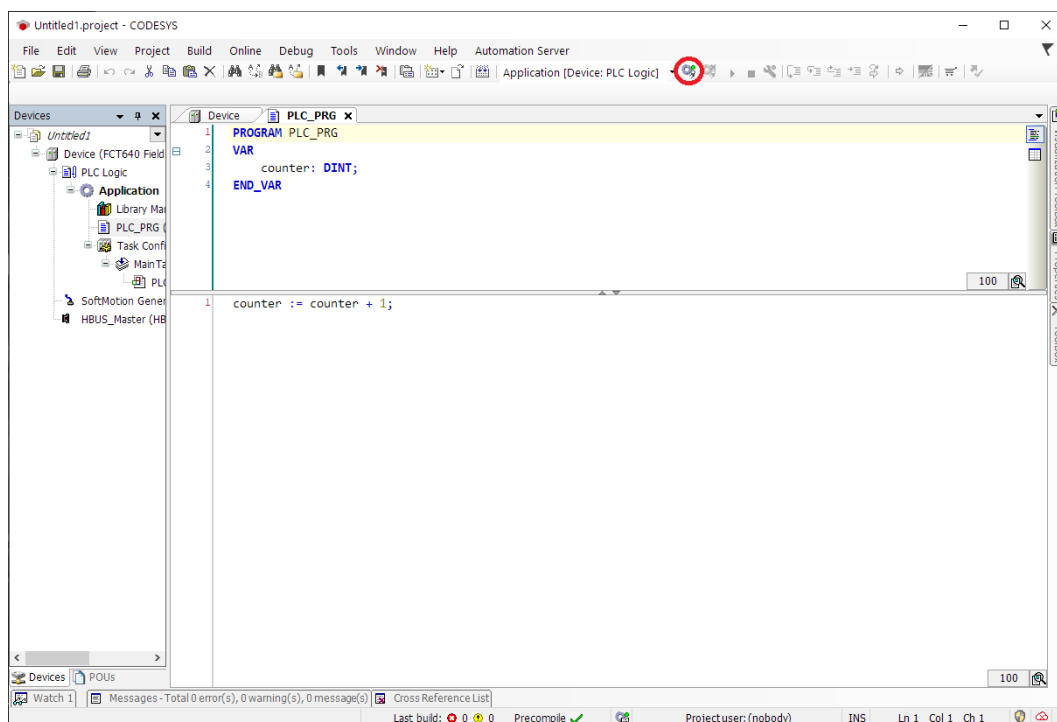


Figure 2.14. Login

The project is compiled and downloaded in the controller and at the end the controller will be in this situation:

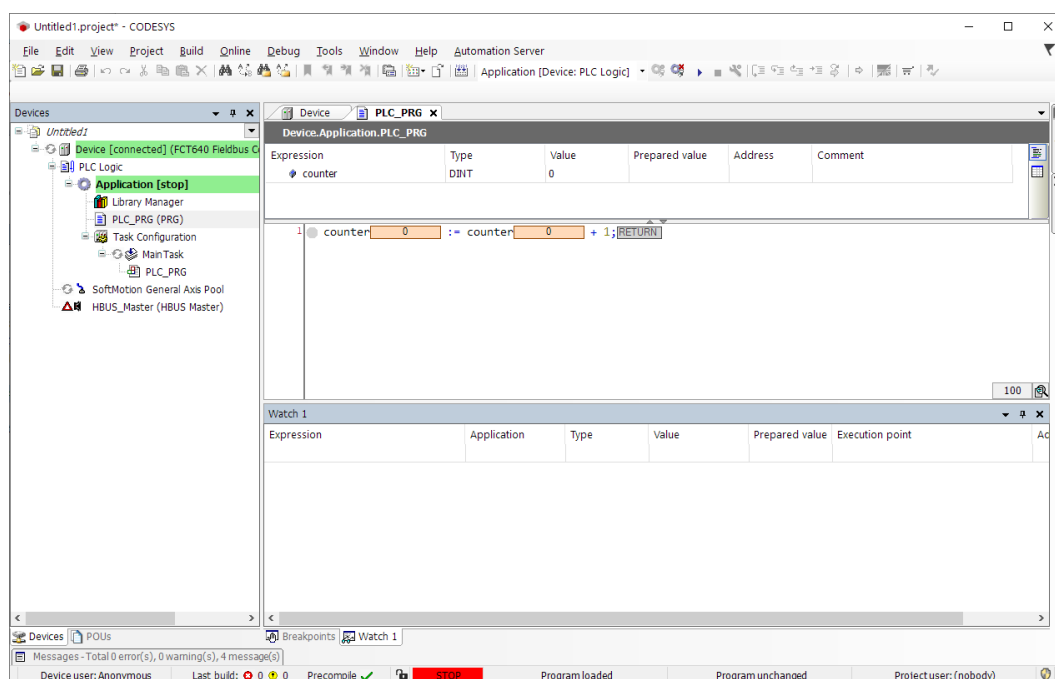


Figure 2.15. program in stop

By pressing Start (or F5) the program starts to be executed and the counter starts to increase:

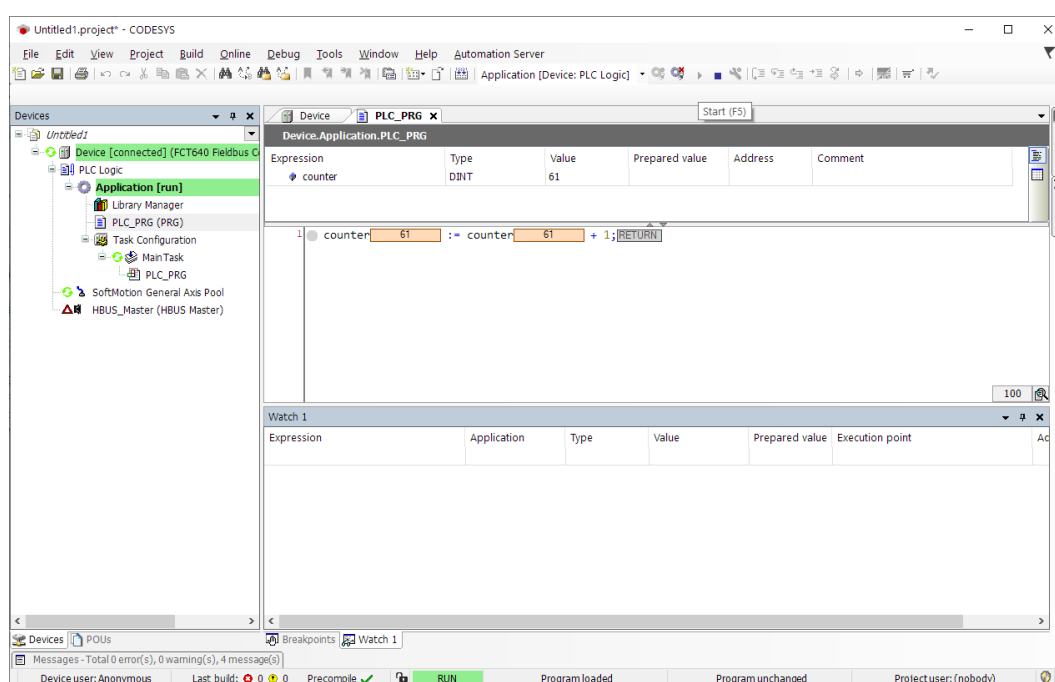


Figure 2.16. program in run

FCT controller functionalities

The FCT controller is a device that can be programmed in IEC 61131-3 with the development environment CODESYS Development System (see [Chapter 5, CODESYS Development System](#)).



Important

FCT requires a CODESYS license. In [Section 2.1, “Step 1: identify the controller type and its license”](#) it is described how to verify the installed license from the order code.

The license in the controller can be read even from CODESYS Development System (see [Chapter 5, CODESYS Development System](#)) by reading the log in the device object.

Furthermore the license can be read with the advanced functionalities (see [Chapter 7, Advanced functionalities by using Winter-s](#)) in the [Section 7.1, “Installed CODESYS license and firmware version reading”](#).

Some application programs can be realized to manage:

- devices connected to a CANopen network: input/output modules DS401, encoder DS406, drive DSP402 with the use of SoftMotion driver of CODESYS;
- devices connected to an EtherCAT network: input/output modules DS401, encoder DS406, drive DSP402 with the use of SoftMotion driver of CODESYS;
- serial and TCP communication protocols as Modbus for the data conversion and to use HMI.

CMZ SISTEMI ELETTRONICI S.r.l. provides even these libraries:

- libraries that allow to use the hardware and software peculiarities of FCT (for example to manage the modules connected to the HBUS of FCT640, or to manage the FTP server present in the controller);
- libraries to expand the functionalities provided by CODESYS.

The libraries that allow to use the hardware and software peculiarities of FCT are distributed with the firmware file (see [Section 2.6, “Step 6: installation of the package file related to the controller in CODESYS”](#)). The libraries are:

- CMZ Ftp Server: allows to enable and manage an FTP server connection in the controller. This allows to access to the controller memory for the exchange of files;
- FCT series utilities: it is a collection of functions that allow to manage special or specific modes of the controllers FCT.
- CMZ LBUS: on the FCT300 and FCT200 controllers allow to manage the communication with the LOCAL IO board that connects to the SMI port of the controller. The LOCAL IO board manages digital inputs and outputs;
- CMZ Ethernet Ip Slave: in the FCT300 controller allows to manage the EtherNet/IP Slave expansion module;
- CMZ Profibus DP Slave: in the FCT300 allows to manage the Profibus DP Slave expansion module;
- CMZ HBUS: on the FCT640 controller allows to manage the TB20 modules connected to the system.

The libraries to expand the CODESYS functionalities are distributed in a package (see [Section 2.7](#), “*Step 7: installation of the package with the libraries*”). The libraries are:

- CMZ Axes Interpolation: it allows to realize synchronized movements of several axes SoftMotion that follow a profile developed on an XY or XYZ plane.
- CMZ Electronic Cams: it allows to realize synchronized movements of several slave axes SoftMotion that follow a master respecting a cam table.
- CMZ Flying Shear: it allows to manage the on-the-fly cut application;
- CMZ MACISO: it allows to manage the synchronized movement of more axes SoftMotion that follow a profile described with an ISO program;
- CMZ TSC: it allows to directly manage the TSC CANopen board for the motion of motors;
- CMZ Modbus: it manages the controller as a Modbus master or slave, both TCP and RTU;
- CMZ Node Utilities: it provides some functions to manage the firmware, parameters file and IEC application update in the CANopen nodes and EtherCAT slave of CMZ;
- CMZ Basic utilities: it provides some useful functions for the application development;
- CMZ_Fieldbus bridge: it provides some functions to manage the SDSetup tool directly with the Ethernet debug connection with the controller. It offers the possibility to access to all the devices that use SDSetup without the direct serial connection.

- CMZ WebServer: it provides some functions to manage a web server in the controller directly from IEC application.

Each library has its own manual (see [Section 3.1, “Libraries manuals”](#)).

3.1. Libraries manuals

Each library has its own manual that describes its functionalities, it can be found in two ways:

- in the Library manager: for example for the CMZ Electronic Cams si trova il pdf CMZ_Cam library

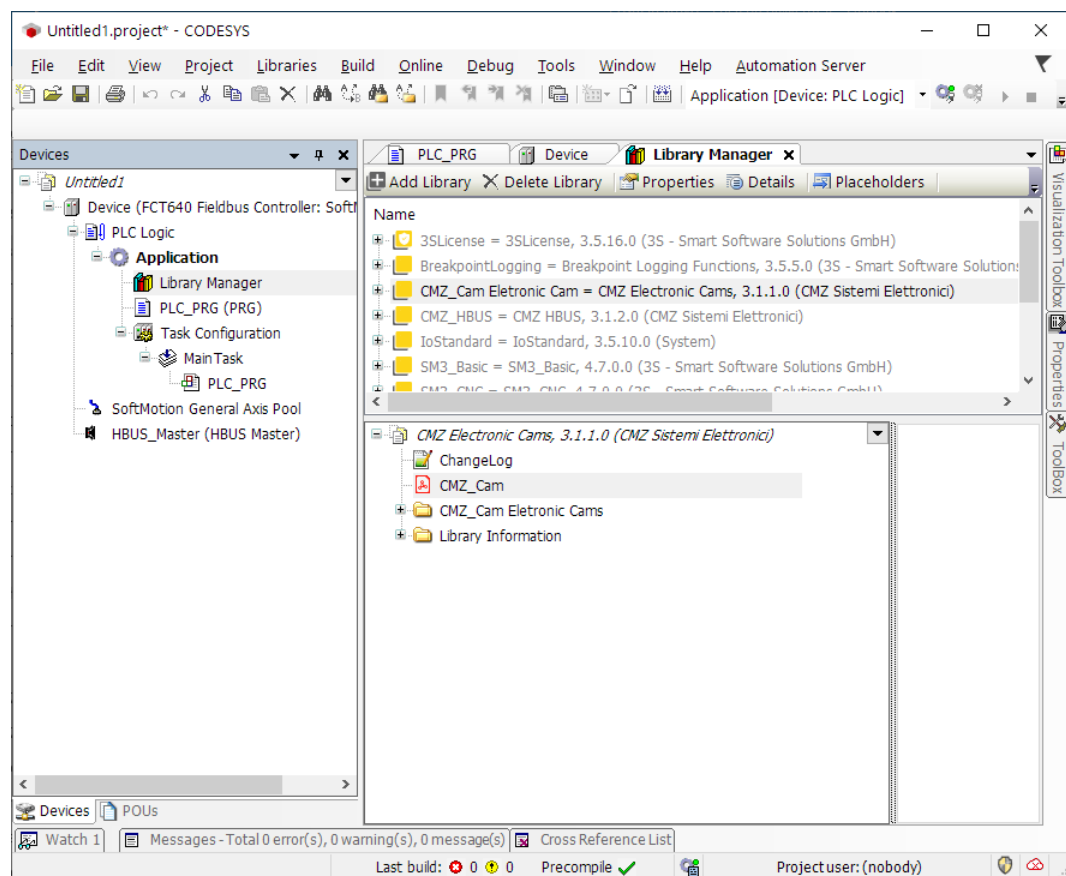


Figure 3.1. CMZ manuals

- in the help of CODESYS Development System (see [Chapter 5, CODESYS Development System](#)) installed in the PC, not in the web one. To access the help that is installed in the PC, from CODESYS Development System, access to 'Tools - Option - Help' and deactivate the option 'Use Online Help if available'. After this operation, by launching the CODESYS Help, in the chapter Libraries a section dedicated to the CMZ libraries can be found:

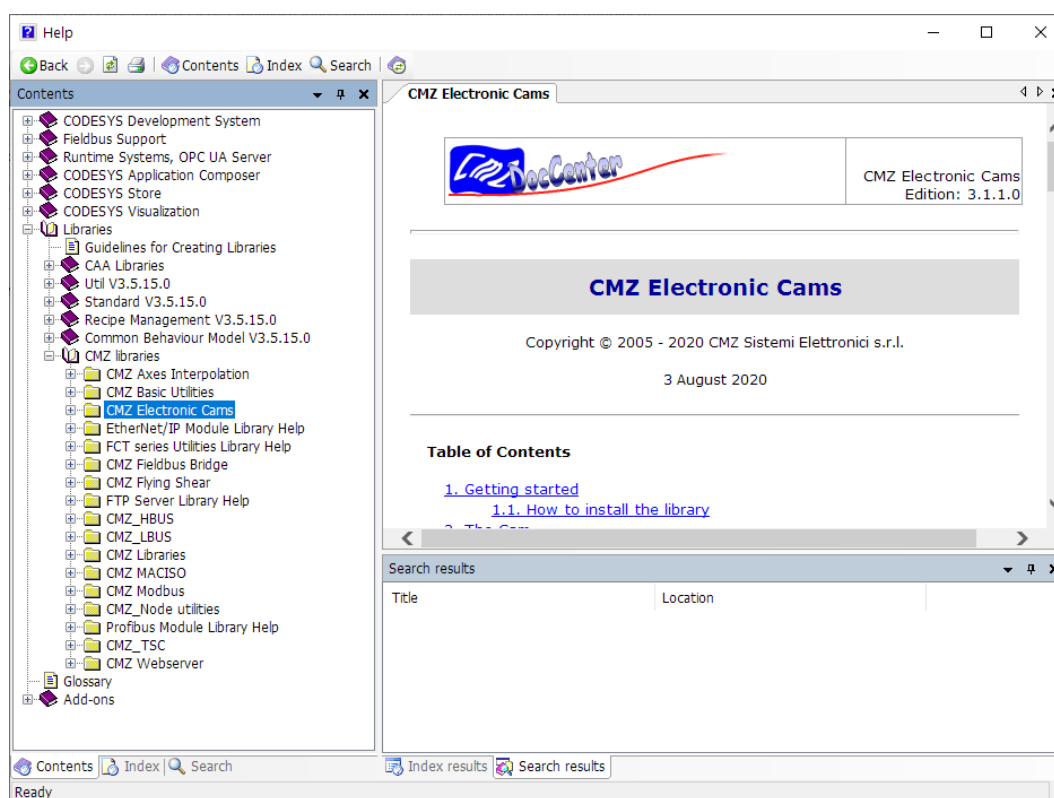


Figure 3.2. CMZ manuals

**Note**

The access to this help can be done directly from the program, by pushing 'F1' over the function of function block.

3.2. Controller cloning

This function allows to clone a system in another one of the same type.

There are two ways to do it::

- by using the functionality in the 'Device' tab -> 'Backup and Restore' of CODESYS Development System (see *Chapter 5, CODESYS Development System*);
- by using a functionality that is inserted in the controller by CMZ.

The main differences between the two modes are:

- the second mode allows to clone even the firmware that is installed in the controller, while the first one does the backup only of the files related to the application.
- the second mode allows to clone even without having a PC with CODESYS installed.

For the description of the first mode (CODESYS Backup and Restore procedure), refer to the environment manual of CODESYS Development System (see [Chapter 5, CODESYS Development System](#)).

For the description of the second mode, continue reading: [Section 7.3, “CMZ cloning procedure”](#).

3.3. Log file

CODESYS Development System (see [Chapter 5, CODESYS Development System](#)) provides an information report in the Log tab of the FCT device.

In the controller it is saved even a Log file that stores other information that can be useful to know the history and even to search eventual error situations. The file is PpcLog.txt and can be found in B:. It can be copied from CODESYS Development System as described in [Section 5.5, “Copy a file from the controller to the PC”](#), or by using the advanced functionalities (see [Chapter 7, Advanced functionalities by using Winter-s](#) and [Section 7.2, “System log file reading”](#)).

3.4. Management of the IO modules on FCT640

The FCT640 controller is a modular system to which some modules with different functionalities can be connected: digital and analogic inputs and outputs, counters (see the Peripherals I/O Modules section in the catalogue).

The management of the modules in a CODESYS program is described in the CMZ_HBUS library manual. This library is distributed with the firmware of the FCT640 system.

The description of the modules is reported in the TB20_Modules_UserGuide manual that can be found in the download area of CMZ ([Chapter 6, CMZ Download Area](#)).

When the modules management is active, the OK/BF, SF leds take the meaning that is described in [Section 3.5, “Meaning of the leds of the controller”](#).

3.5. Meaning of the leds of the controller

There are some differences between the controllers.



Note

Refer even to the hardware manual of the controller or to the short guide.

3.5.1. FCT200 and FCT300

There are some leds that report some information about hte controller status.

- Rs:
 - green: the CPU is on and is working.
 - orange: the controller is in reset.
- FAULT: indicates if there is an error situation in the controller:
 - off: no problem;
 - orange: controller in Boot;
 - red on: system software update in progress;
 - blinking red: the number of blinks reports the error reason:
 - 2 blinks: RTC Clock internal not set or its backup battery out of power;
 - 3 blinks: HW initialization error (Ethernet and other);
 - 5 blinks: hardware error in a controller expansion board;
 - blinking green for as few seconds: controller identification in progress: in CODESYS Develop System the Wink button ([Section 5.1, “Connection to FCT”](#)) has been clicked, or in FCTTool has been clicked the Identify button ([Section 4.2, “Target locator”](#)).
- SD:
 - off: SDCard not inserted;
 - blinking red: the controller is accessing in reading or writing to the SDCard;
 - orange: it has been happened a current overload. Remove the SDCard.

Each Ethernet port has a led that indicates if the communication is active.

3.5.2. FCT640

There are some leds that report some information about hte controller status.

- OK/BF: its meaning changes according to the management of the modules that are connected to the controller. If the program does not manage the modules then the steady on blue light indicates that the cpu is correctly working. If the program manages the modules then:

- off: at the FCT start-up the light remains off for some seconds;
- blinking blue: the management of the modules is in initialization phase;



Important

If this situation persists, means that there is some error in the project: the modules configuration is different from the one really present in the bus.

- red: at least one module is in error and has provided a diagnostic report;
- blue on: the management of the modules is correctly running.
- SF: it has meaning when the management of the modules that are connected to the controller is active:
 - off: no problem;
 - blinking yellow: in the bus a module is missing, compared to the configuration described in the project;
 - yellow on: in the bus a module is wrong, compared to the configuration described in the project, or a module is not CMZ SISTEMI ELETTRONICI S.r.l.;
- FAULT: indicates if there is an error situation in the controller:
 - off: no problem;
 - orange: controller in Boot;
 - red on: system software update in progress;
 - blinking red: the number of blinks reports the error reason:
 - 2 blinks: RTC Clock internal not set or its backup battery out of power;
 - 3 blinks: HW initialization error (Ethernet and other);
 - 4 blinks: overtemperature reached;
 - blinking green for as few seconds: controller identification in progress: in CODESYS Develop System the Wink button ([Section 5.1, “Connection to FCT”](#)) has been clicked, or in FCTTool has been clicked the Identify button ([Section 4.2, “Target locator”](#)).
- SD:

- off: SDCard not inserted;
- blinking red: the controller is accessing in reading or writing to the SDCard;
- orange: it has been happened a current overload. Remove the SDCard.
- Link2: communication status on ETH2. Off means no communication, while blinking green means that the communication is active;
- Link1: communication status on ETH1. Off means no communication, while blinking green means that the communication is active;
- Link0: communication status on ETH0. Off means no communication, while blinking green means that the communication is active;

3.6. RESET button

The RESET button allows to put the controller in Boot by stopping the execution of the program and of the firmware.



Note

This operation should never be necessary, but can be useful in extreme cases to stop critical error situations in which the controller continuously reboots. When the system is in Boot some advanced operations can be executed that allow, for example, to delete the application program: see *Chapter 7, Advanced functionalities by using Windows* in the *Section 7.6, "Management of the system in Boot"*.

In the FCT200 and FCT300 controllers the button is above the RS, FAULT and SD leds and is indicated with RES.

In the FCT640 controller it is on the bottom between the connector X2 ETH0 and X1 24V, it is the button over, named RESET.

To push this button it has to be used a pointed tool (diameter < 0,8 mm) and, before to release it, wait that the FAULT led remains steady on. The button pushing is not easy in order to avoid that the controller is accidentally put in Boot.



Warning

If pushed during the functioning it interrupts any procedure/activity on FCT and on consequence on all the devices and I/O modules managed by it. Verify that the reset request does not determine a risk for the safety of the people or for the damaging of the machine or for the data loss.

3.7. RECOVERY button

This button is present only on the FCT640 controllers.

This button is used to delete the application (formatting the File System: application, parameters, user file, ...), while the firmware and the license are not deleted. This operation can be executed even by using CODESYS Development System, or with the advanced functionalities (see *Chapter 7, Advanced functionalities by using Winter-s*), eventually after the pushing of RESET button (see *Section 3.6, "RESET button"*).

The RECOVERY button allows to restore the controller to the initial status without the necessity of any connection with a PC.

The "RECOVERY" sequence, here after reported, is intentionally complicated, in order to avoid that the application deletion is made by error and/or in a not-awared way.

1. put the controller in the Boot status by pushing the RESET button and waiting that the third led "FAULT" remains steady on;
2. press and hold the button RECOVERY until all the leds turn on, then release it;
3. push the RECOVERY button 3 times with an interval of 2 seconds between every push (in this phase the lowest led corresponds to the button status: it turns on when the button is pushed. Wait the led light every time before to release the button);
4. push the RECOVERY button a fourth time and hold it down until all leds turn on, then release the button;
5. after about 10 seconds the installed application is deleted. The leds blinking will get faster, to indicate the deletion approaching. The procedure can be interrupted before the time elapses, by cutting the system supply (turn off).

Chapter 4

FCTTool description

FCTTool is a program for Windows PC that provides the following functionalities:

- to find a FCT controller in the network;
- to set the Static IP address of the FCT controller;
- to create a CODESYS firmware database for the FCT controllers;
- to update the firmware FCT controllers;
- to extract from the firmware the package with the device descriptor of FCT and the libraries dedicated to the FCT in order to insert them in the CODESYS Development System (*Section 2.6, “Step 6: installation of the package file related to the controlelr in CODESYS”*).
- to execute some activities for expert users by starting the Winter-s terminal.

4.1. Installation

The installation program can be downloaded from the download area of CMZ (*Chapter 6, CMZ Download Area*) in the FCT series with CODESYS - Tools section.

4.1.1. System requirements

The software requires a PC with at least Windows 7 and the .Net Framework 4.5 software, if not already installed.

4.2. Target locator

By clicking on the **Scan** button the network scan to find the FCT controllers is started:

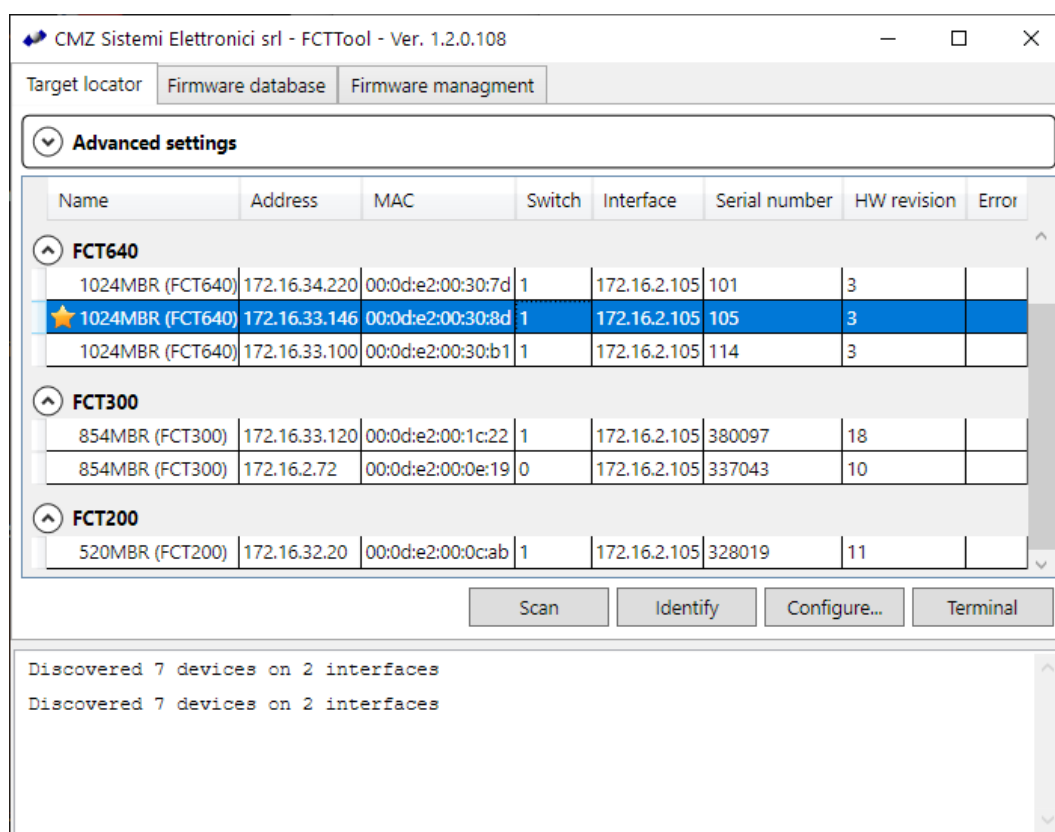


Figure 4.1. Target locator

The FCT controllers are grouped by type and each line reports the following information:

- **Name:** the controller motherboard name is reported and, between baretheses, the commercial name. In this context, to refer to the FCT it is always used the commercial name;



Note

by clicking on the left of the name it is possible to add a "star" to sign it as preferred.

- **Address:** IP address of the system;
- **MAC:** MAC address of the Ethernet port to which the controller is connected;
- **Switch:** it indicates if the FCT has a static IP address (value =1), or if its address is assigned on DHCP, that means by a server at the turn on (value =0);
- **Interface:** IP address of the PC on which the Scan is being executed;
- **Serial number:** serial number of the FCT;
- **HW revision:** hw revision of the FCT;
- **Error:** eventual error reports.

- In the window below the report of the information related to the Scan procedure is reported.



Note

Even in CODESYS Development System (*Chapter 5, CODESYS Development System*) in the Device - Communication Settings - Scan Network (see *Section 5.1, "Connection to FCT"*) it is possible to execute the network scan in order to search the FCT controllers. This network Scan, by default, reports only the ones that are compatible with the developing project, or rather coherent with the Device, both for the FCT type and for the license.

The **Identify** button can be used to identify a particular FCT: select the controller in the list and click on the Identify button, in this way the correspondent controller will start to make the Fault led blinking green. This allows to verify to be connected to the right controller before to execute any operation.



Note

Even in CODESYS Development System (*Chapter 5, CODESYS Development System*) in Device - Communication Settings - Scan Network (see *Section 5.1, "Connection to FCT"*) by using the Wink button, it is possible to execute the same system identification.

The **Configure...** button allows to set the IP address assignment mode for the FCT. By selecting the controller and clicking on the button a new window opens:

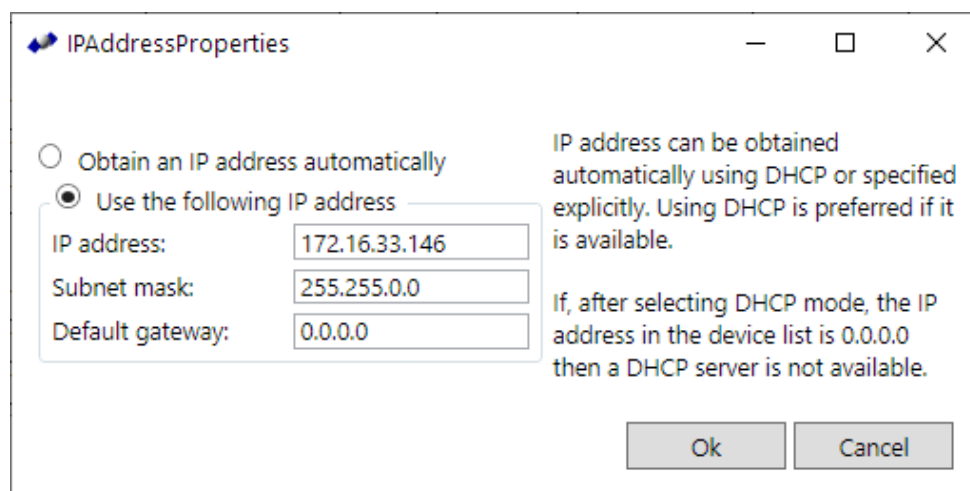


Figure 4.2. IP address configuration

By selecting *Obtain an IP address automatically* the IP address is assigned by the DHCP server at the turn on. Otherwise, if *Use the following IP address* is set, then IP address and Subnet mask have to be manually set and FCT, after a reboot, will take these settings in static mode. In this case even a gateway can be set.

Returning the the scan page and clicking on the **Terminal** button, a new window opens: Winter-s, with the pages with a blue background. It allows to execute some advanced operations, only for expert users. See *Chapter 7, Advanced functionalities by using Winter-s*.



Important

Winter-s is correctly started if FCT and PC are on the same network: in other words, the IP address of the FCT and of the PC have the same numbers in the Subnet Mask. In case of problems one of the two addresses must be modified.



Note

If by clicking on Terminal a black page with a command prompt ('>') opens, it means that the system is in Boot.

Contact support@cmz.it.

See *Chapter 7, Advanced functionalities by using Winter-s* in the *Section 7.6, "Management of the system in Boot"*.

4.2.1. Advanced settings for the Scan

In the Target locator tab, on the top, there is a menu **Advanced settings** that allows to modify the scanning mode:

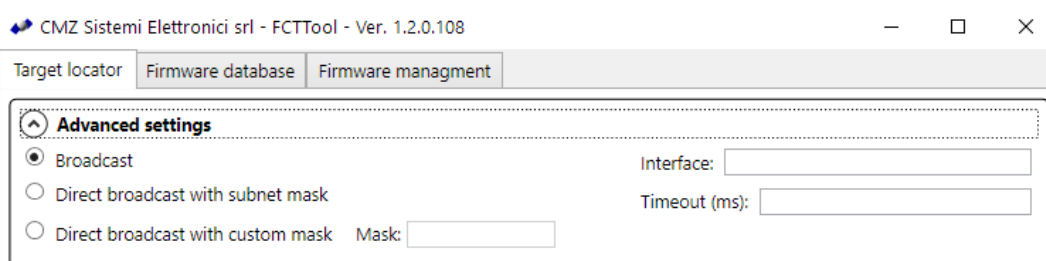


Figure 4.3. Advanced settings

- Broadcast: (default setting) the controllers are searched in all the networks connected to the PC;
- Direct broadcast with subnet mask: only the controllers in the local subnet, that is the subnet mask of the local network, are searched;
- Direct broadcast with custom mask: only the controllers in the network with the subnet mask that is indicated in the Mask field are searched;
- Interface: it allows to specify the interface on which to do the controller research.
- Timeout (ms): how long to wait the controller answer.

4.3. Firmware database

In the Firmware database tab the firmwares that have been downloaded from the download area of CMZ (*Chapter 6, CMZ Download Area*) in the FCT series with CODESYS - Firmware section (see *Section 2.6, “Step 6: installation of the package file related to the controlelr in CODESYS”*) can be imported:

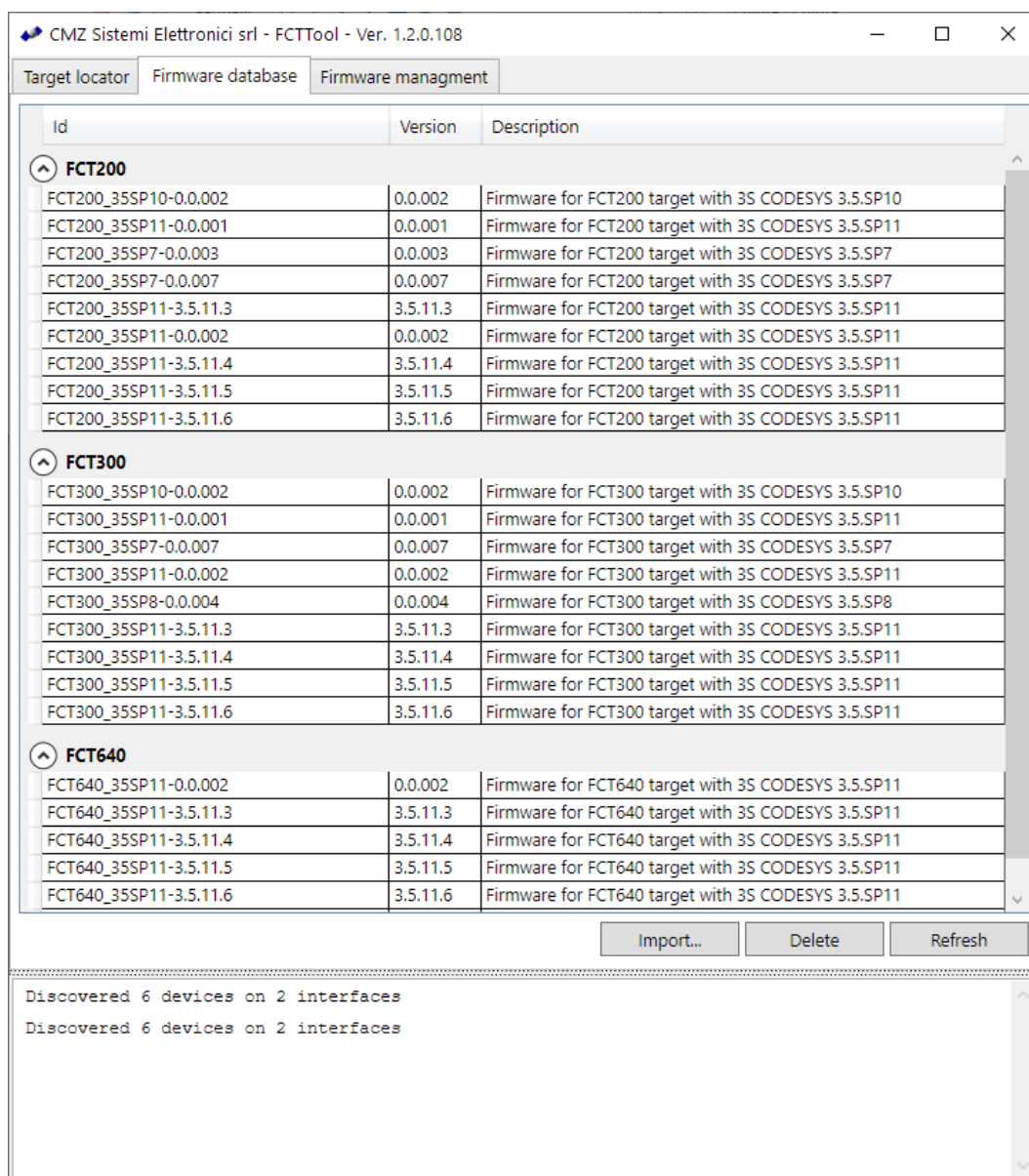


Figure 4.4. Firmware database

4.4. Firmware management

In the Firmware management tab some operations with the CODESYS firmware it is possible:

- to extract the package to be installed in CODESYS, realized for the particular firmware (see *Section 2.6, “Step 6: installation of the package file related to the controlelr in*

CODESYS). Once it has been extracted, to install it it is sufficient to launch the *.package file.

In this package there are:

- the device descriptor files that describe the FCT both with PLC and SoftMotion license;
- the system libraries developed to completely manage the FCT controllers, each one with its own personalizations.

After the package installation (see [Section 2.6, “Step 6: installation of the package file related to the controller in CODESYS”](#)) it is possible to find the FCT ([Section 5.2, “Device FCT”](#)) in the CODESYS Development System in the Device list and the installed libraries ([Section 5.3, “The CMZ libraries in the Library manager”](#)) in the LibraryManager, in the Application - CMZ section.

- to install the firmware in the controller:



Important

Before to do this operation it is important to know that the CODESYS application program is developed for a particular Device and firmware version, so:

- if the firmware is changed before the application has been deleted, it may happen that at the end of the update the "old" application causes malfunctions in the machine or even that produces an error in the controller. It is so strongly recommended to delete the application from CODESYS CODESYS - Online - ResetOrigin before to update the firmware;
- if the project is under development, then once the firmware is updated in the controller the Device FCT version must be aligned in the project. It has to be used Updater Device (see help of CODESYS).

The firmware update procedure can be executed:

- to install the last firmware version;
- to install a particular firmware version that is required by the application, that will be downloaded in the controller, that is because the device descriptor version of the project Device must be the same of the firmware version in the controller.

Before to execute the procedure it is possible to check the version of the firmware installed in the controller in one of the following modes:

- from CODESYS Development System, after making the Scan Network (see [Section 5.1, “Connection to FCT”](#)), by selecting a FCT, in the box on the right of the window several characteristics are provided: **Target Version** is the firmware version;

- from Winter-s as described in [Section 7.1, “Installed CODESYS license and firmware version reading”](#).

The firmware installation procedure is the following:

- click the '...' button on the right of the Firmware line, so an imported firmware list will appear to select the desired one:

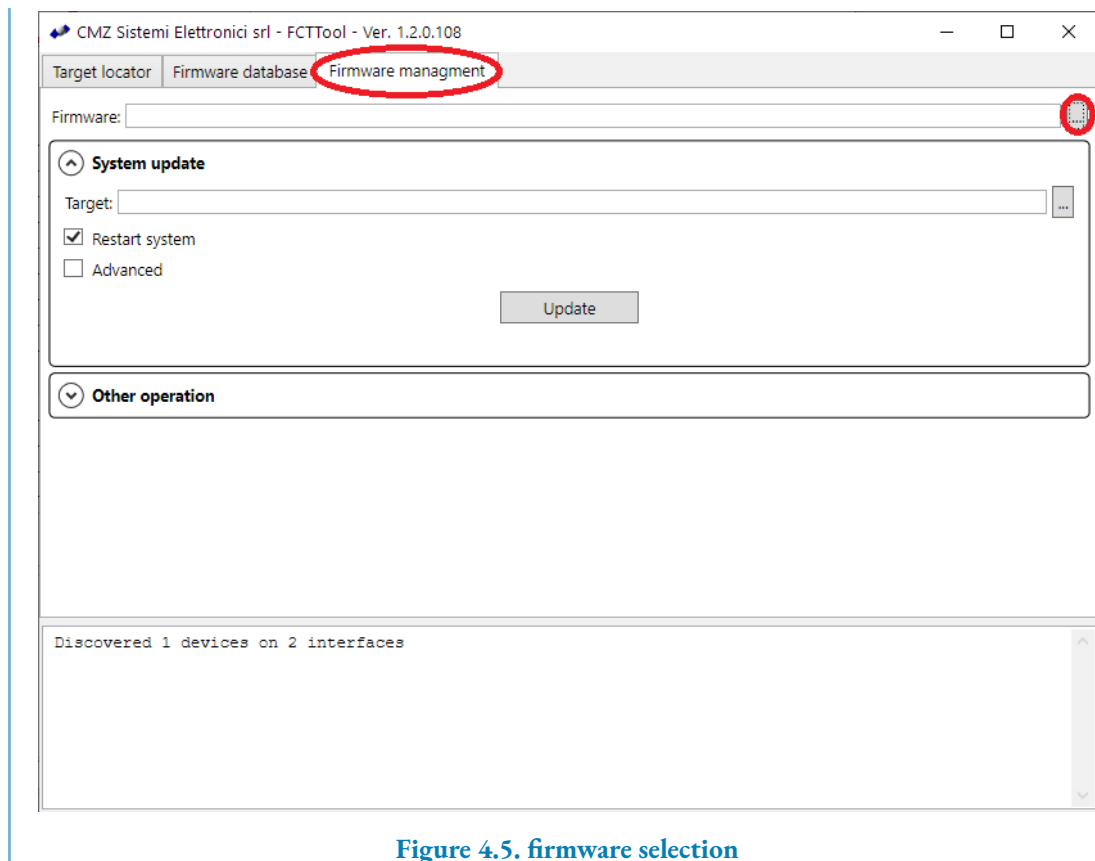


Figure 4.5. firmware selection

- click the '...' button on the right of the Target line, so a window equal to the Target locator tab will appear, from here it is possible to select the controller to be updated;
- click on Update;
- during the procedure a bar that indicates the operation in progress appears, furthermore on the bottom of the FCTTool window it is possible to read the commands under execution;
- at the end of the procedure the system is rebooted;
- in case it is not already be done, install the package related to the firmware that is installed in the PC (see [Section 2.6, “Step 6: installation of the package file related to the controlelr in CODESYS”](#)).

CODESYS Development System

CODESYS Development System is a software developed and distributed by [CODESYS](#). This software allows to create a project with the programming language IEC 61131-3 and to download it in the FCT to be executed.

The software can be directly downloaded from the CODESYS store: [CODESYS Store: CODESYS Development System V3](#) (it will be necessary the registration to the store to download the file).

The installation and the execution are free and don't require any license.

In the [Chapter 2, Creation of the first program](#) it is described how to write the first program.

5.1. Connection to FCT

In Device - Communication Settings - Scan Network

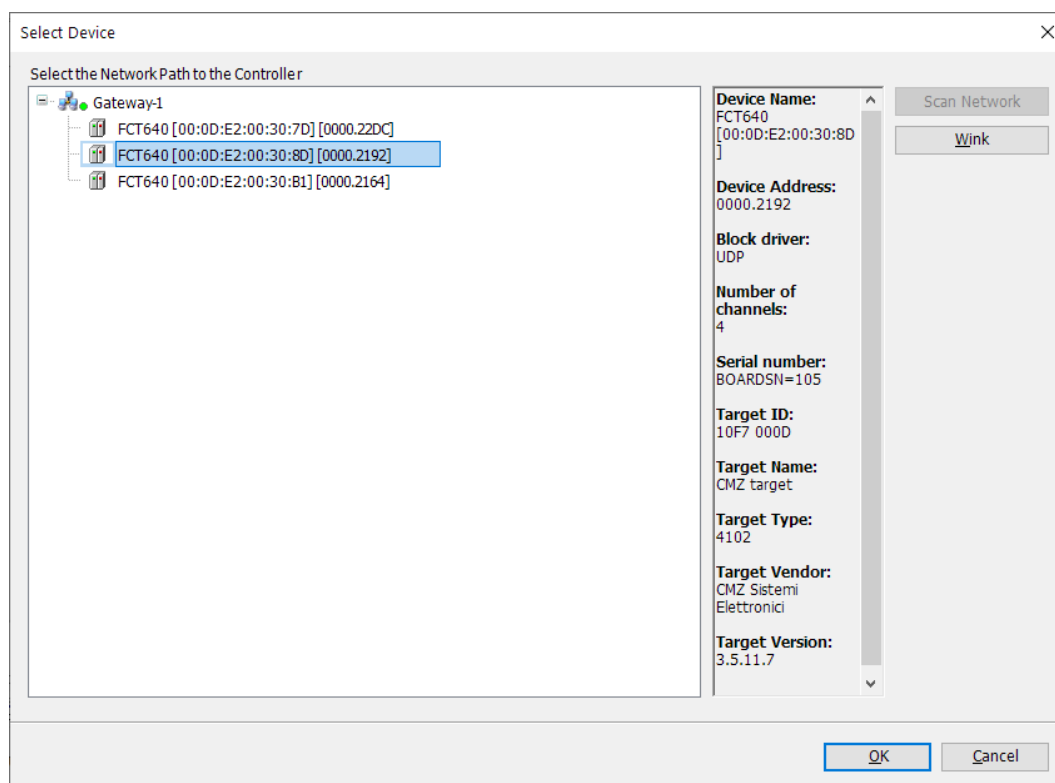


Figure 5.1. Scan Network

This list, by default, reports only the FCT that are compatible with the developing project, or rather coherent with the Device, both for the FCT type and for the license.

The information related to the selected FCT can be read. The most important are for sure:

- Device Name that reports even the MAC address of the port with which the controller is connected.



Note

By using MAC address and Target locator ([Section 4.2, “Target locator”](#)) it is possible to get back the controller IP address.

- Serial number: FCT serial number;
- Target Version: CODESYS firmware version that is running in the FCT.

The **Wink** button allows to execute a controller identification procedure: select the controller from the list and click the Wink button, the corresponding controller will start to make the Fault led blinking green. In this way it is possible to verify to be connected to the correct FCT before to download the project.



Note

This procedure is the same that starts with the Identify button of Target locator ([Section 4.2, “Target locator”](#)).

5.2. Device FCT

After to have installed the package related to the desired FCT (see [Section 2.6, “Step 6: installation of the package file related to the controlelr in CODESYS”](#)) even the corresponding FCT will be present in the available Devices list. For example after the installation of the packages of FCT200, FCT300, FCT640 with firmware version 3.5.11.6 there will be:

String for a full text search		Vendor	CMZ Sistemi Elettronici
Name	Vendor	Version	Description
PLCs			
SoftMotion PLCs			
FCT200 Fieldbus Controller: SoftMotion	CMZ Sistemi Elettronici	3.5.11.6	FCT200 Fieldbus Controller: S
FCT300 Fieldbus Controller: SoftMotion	CMZ Sistemi Elettronici	3.5.11.6	FCT300 Fieldbus Controller: S
FCT640 Fieldbus Controller: SoftMotion	CMZ Sistemi Elettronici	3.5.11.6	FCT640 Fieldbus Controller: S
FCT200 Fieldbus Controller: Standard PLC	CMZ Sistemi Elettronici	3.5.11.6	FCT200 Fieldbus Controller: S
FCT300 Fieldbus Controller: Standard PLC	CMZ Sistemi Elettronici	3.5.11.6	FCT300 Fieldbus Controller: S
FCT640 Fieldbus Controller: Standard PLC	CMZ Sistemi Elettronici	3.5.11.6	FCT640 Fieldbus Controller: S

Figure 5.2. Device repository with the different FCTs

5.3. The CMZ libraries in the Library manager

After the installation of the packages related to the firmware and to the libraries, the libraries that have been developed by CMZ can be used. In the Application - CMZ section can be found:

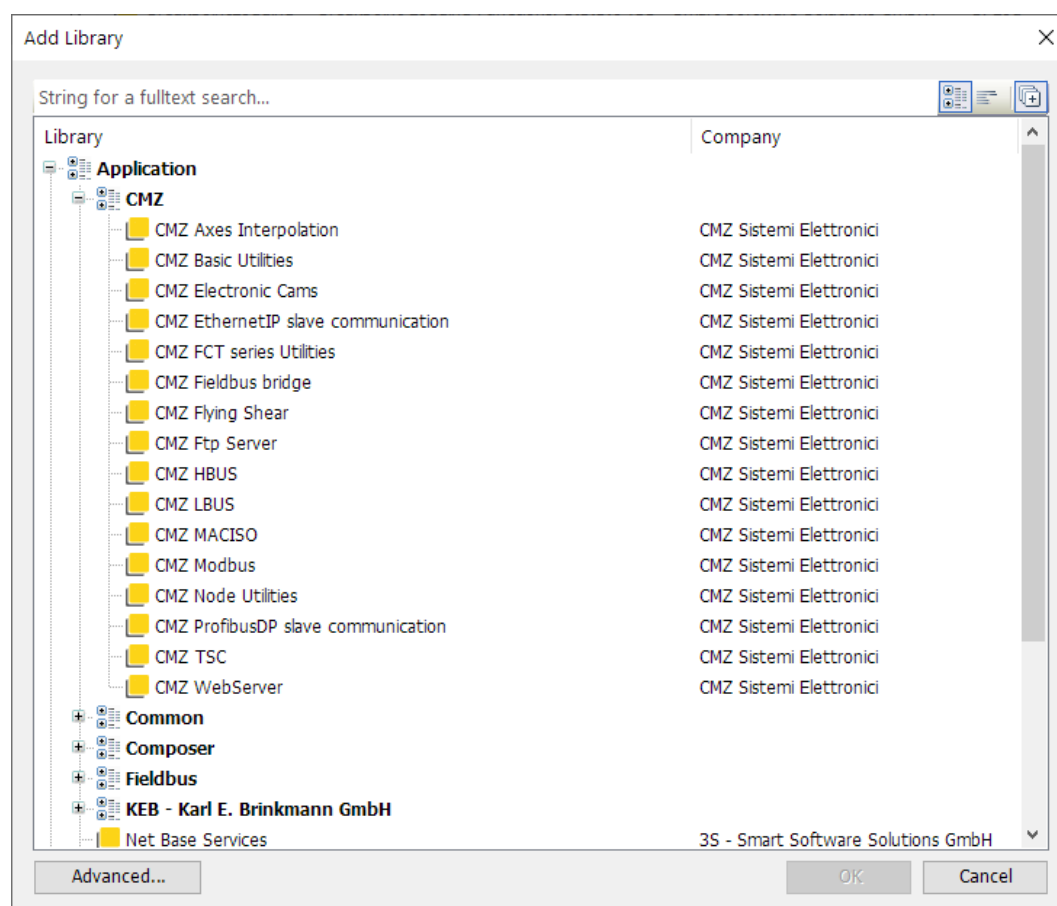


Figure 5.3. CMZ libraries

5.4. Driver SoftMotion for CMZ SISTEMI ELETTRONICI S.r.l. drives

After the CODESYS Development System installation there is already the possibility to manage the following CMZ drives:

- IBD: both CANopen and EtherCAT;
- NBD: both CANopen and EtherCAT;
- ISD: CANopen;
- SVM: CANopen;
- LBD: both CANopen and EtherCAT.

Furthermore, by importing the EDS and ESI files other CMZ boards can be managed.

5.5. Copy a file from the controller to the PC

In Device - Files it is possible to copy a file from the controller to the PC and vice versa. Furthermore it is possible to delete a file from the controller.

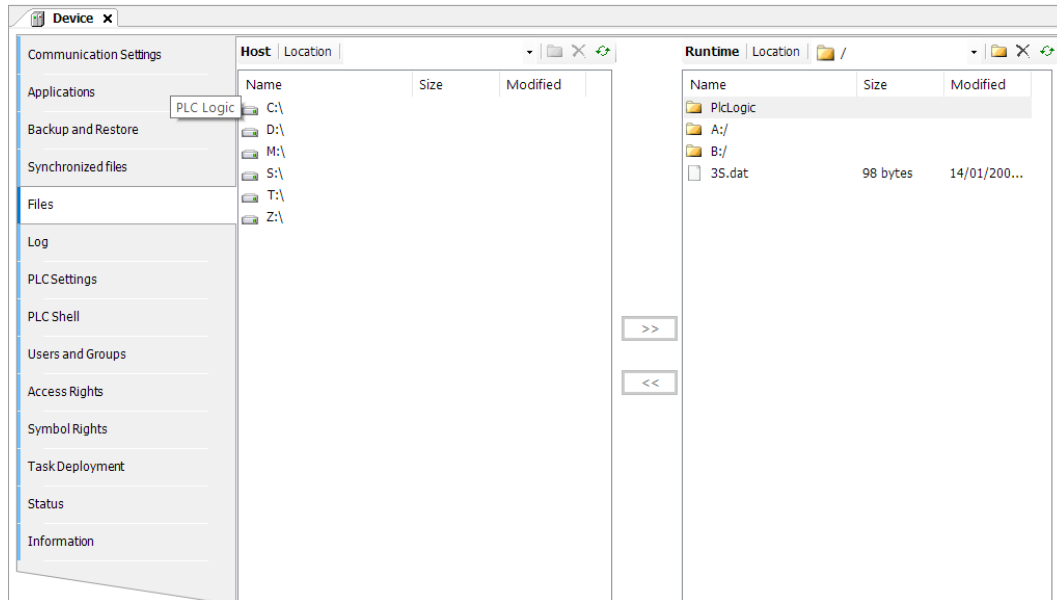





Figure 5.4. Device - Files

CMZ Download Area

In the <http://www.cmz.it> website there is the Download section that allows the access to the technical and software documentation, and to the CMZ SISTEMI ELETTRONICI S.r.l. products catalogues.

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 **SISTEMI ELETTRONICI**

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<input checked="" type="checkbox"/>	 New NF0 series NF0 series controller (CTE158, CTE240, CTN230, CTN330, CTN560, TS1002). Tools, libraries, documentation.	Ultimo aggiornamento: 18 Febbraio 2019
Newsletter		
<input checked="" type="checkbox"/>	 New FCT series FCT series controller (FCT200, FCT241, FCT300). Tools, libraries, documentation.	Ultimo aggiornamento: 29 Luglio 2020
Newsletter		
<input checked="" type="checkbox"/>	 FCT series with CODESYS FCT series controller (FCT200, FCT300) with CODESYS. Tools, libraries, documentation.	Ultimo aggiornamento: 16 Giugno 2020
Newsletter		
<input checked="" type="checkbox"/>	 New Stepper and stepless series Stepper (SDS, MDM) & Stepless (ISD, SVM) series drives and motors. Tools and documentation.	Ultimo aggiornamento: 18 Giugno 2020
Newsletter		
<input checked="" type="checkbox"/>	 Brushless series Brushless series drives and motors. Tools and documentation.	Ultimo aggiornamento: 15 Gennaio 2020
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<input type="checkbox"/>	 New HMI Operator panel. Tools and documentation.	Ultimo aggiornamento: 29 Giugno 2020
Newsletter		
<input checked="" type="checkbox"/>	 Peripherals and accessories Pheripherals and accessories driver and documentation	Ultimo aggiornamento: 18 Febbraio 2019
Newsletter		
<input checked="" type="checkbox"/>	 Commercial documents Catalogues and presentations	Ultimo aggiornamento: 16 Luglio 2020
Newsletter		

Figure 6.1. download area



Important

The access requires a registration.

Advanced functionalities by using Winter-s

Before to use this functionality, always ask help to support@cmz.it or directly contact, by phone, the support department.



Important

In this paragraph some advanced functionalities are described that, if not correctly executed, may irreparably damage the controller.

7.1. Installed CODESYS license and firmware version reading

The procedure is the following:

- connect to the controller via Ethernet by using FCTTool (see [Section 2.4](#), “*Step 4: check of the Ethernet connection with the controller*”);
- after the execution of the Scan from the Target locator tab ([Section 4.2](#), “*Target locator*”), select the FCT to be cloned and then click on the 'Terminal' button on lower right position. A new window called Winter-s will appear:

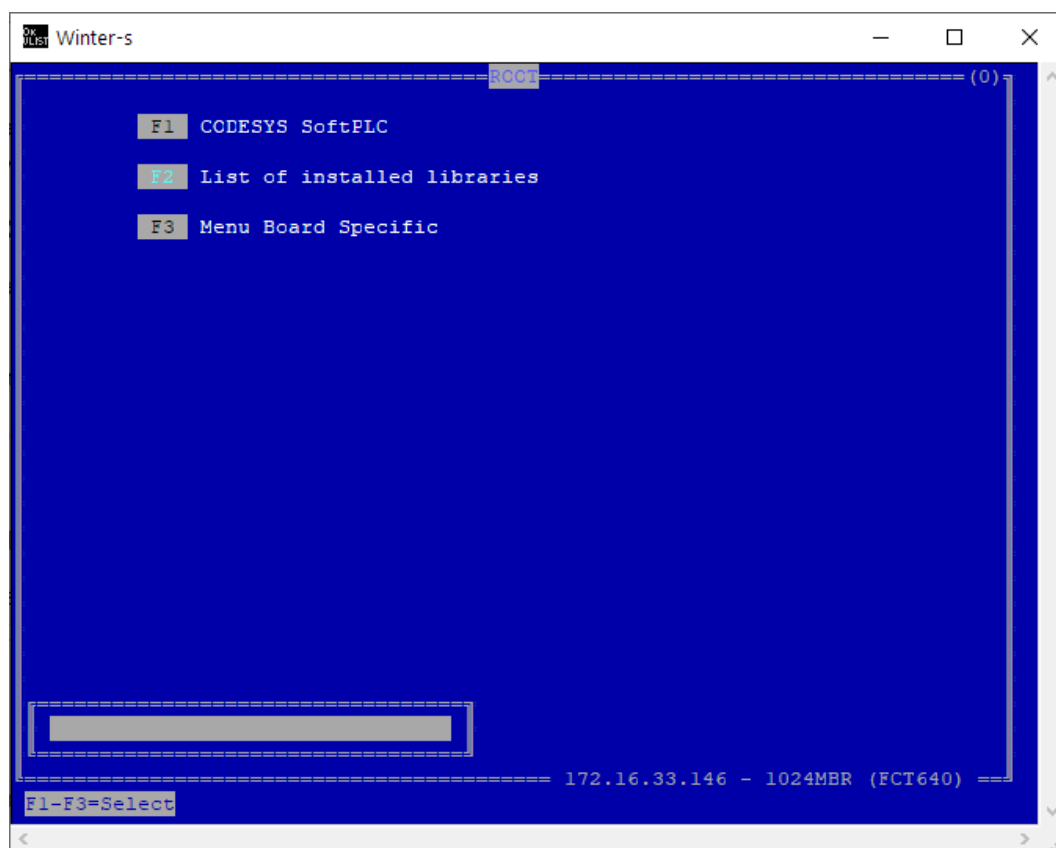


Figure 7.1. Winter-s

- in the editable line at the bottom of the Winter-s write 'CDS' (or by following the menu: CODESYS SoftPLC -> Runtime Menu Info) in order to reach the menu:

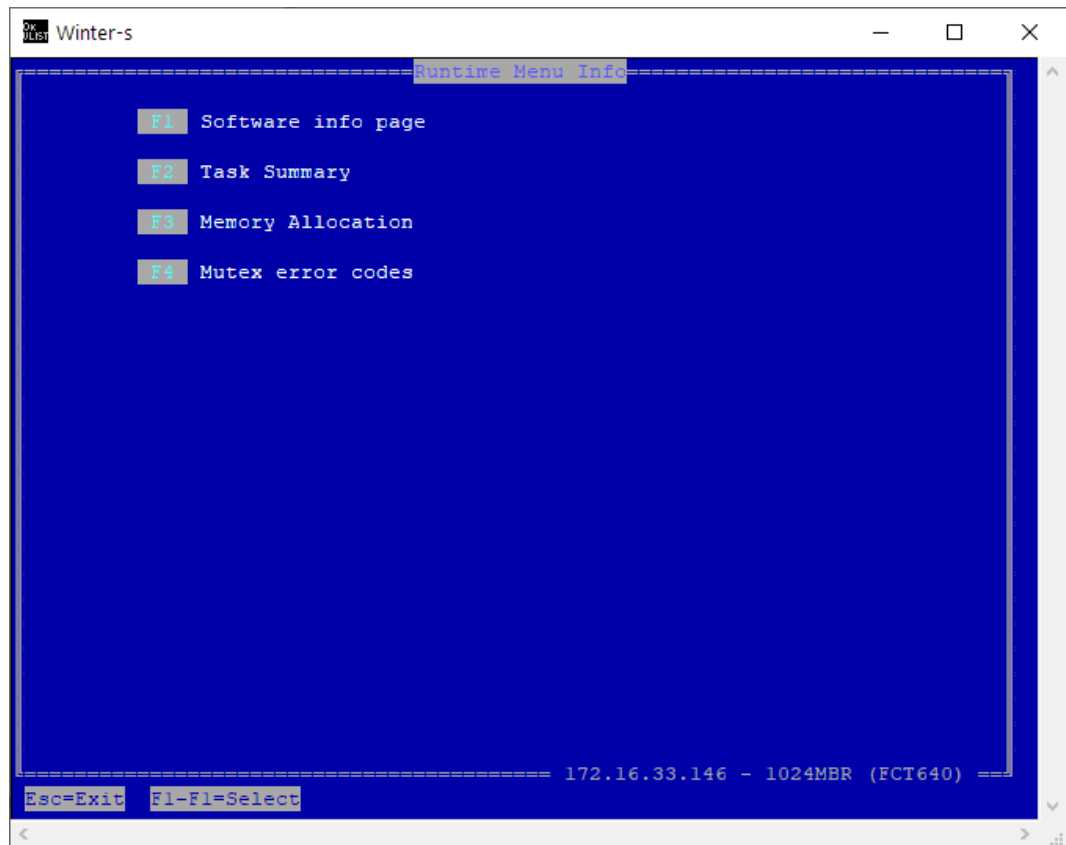


Figure 7.2. Winter-s: Runtime Menu Info

- Select F1 to access the 'Software info page':

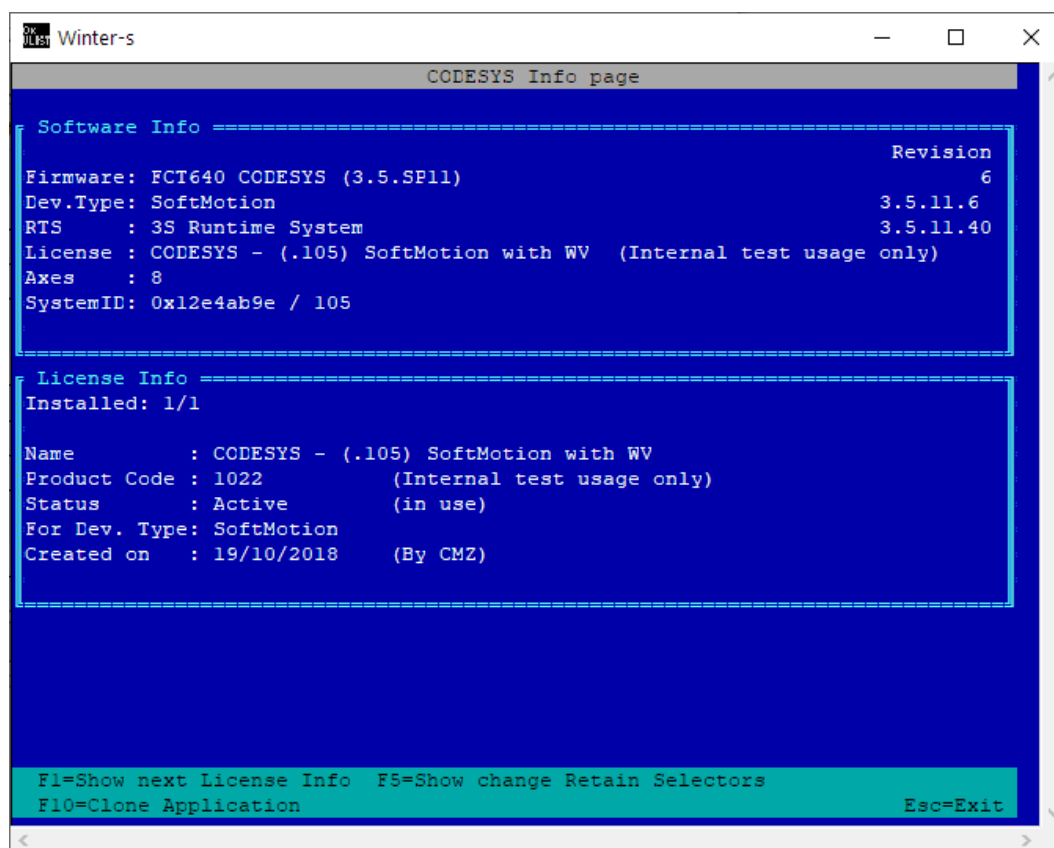


Figure 7.3. Winter-s: Software info page

In the *Software Info* box there are the following information:

- Firmware: report the firmware service pack and, on the right, its version;
- Dev . Type: reports if the controller is PCL or SoftMotion type;
- Axes: reports the maximum SoftMotion axes number that can be used in the application. This number depends on the system order.
- the other information are for internal use.

In the *License Info* box there are the following information:

- Name: reports the license name;
- Product Code: reports an internal code;
- Status: indicates if the license is active;

- For Dev. Type: indicates for what device type the license is compatible;
- Created on: internal information.

7.2. System log file reading

After to have started Winter-s (see [Section 4.2](#), “*Target locator*” Terminal button) it is possible to proceed in two ways:

- by visualizing the content of the log file: write *log* in the editable field;
- by copying the file in the PC: the file is in the partition B: of the system and is named PPCLOG.TXT. It can be copied from CODESYS Development System as described in [Section 5.5](#), “*Copy a file from the controller to the PC*”, or by using Filesystem Commander (see [Section 7.5](#), “*Filesystem Commander*”).

7.3. CMZ cloning procedure

This procedure creates a PPCCLONE.zip file with the files that are related to the application and even to the firmware that is installed in the controller.



Important

Are not cloned:

- the values of the RETAIN and PERSISTENT RETAIN variables;
- the CODESYS license.



Important

Even the configuration for the controller IP address assignment is copied (if it is static, then the cloned controller will have the same IP address of the initial controller).

The PPCCLONE.zip file can be used to replay in a second FCT of the same type the functioning of the FCT from which the PPCCLONE.zip file has been created.

The cloning procedure is the following:

- connect to the controller via Ethernet by using FCTTool (see [Section 2.4](#), “*Step 4: check of the Ethernet connection with the controller*”);

- after the execution of the Scan from the Target locator tab (*Section 4.2, “Target locator”*), select the FCT to be cloned and then click on the 'Terminal' button on lower right position. A new window called Winter-s will appear:

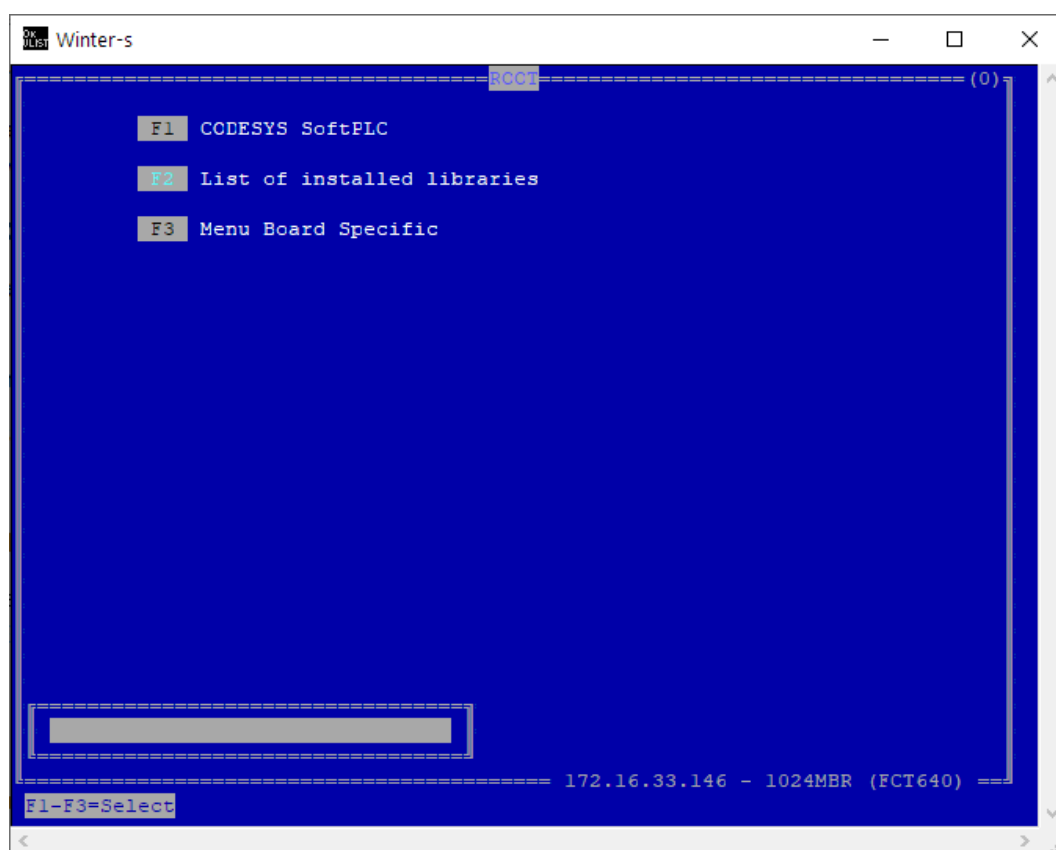


Figure 7.4. Winter-s

- in the editable line at the bottom of the Winter-s write 'CDS' (or by following the menu: CODESYS SoftPLC -> Runtime Menu Info) in order to reach the menu:

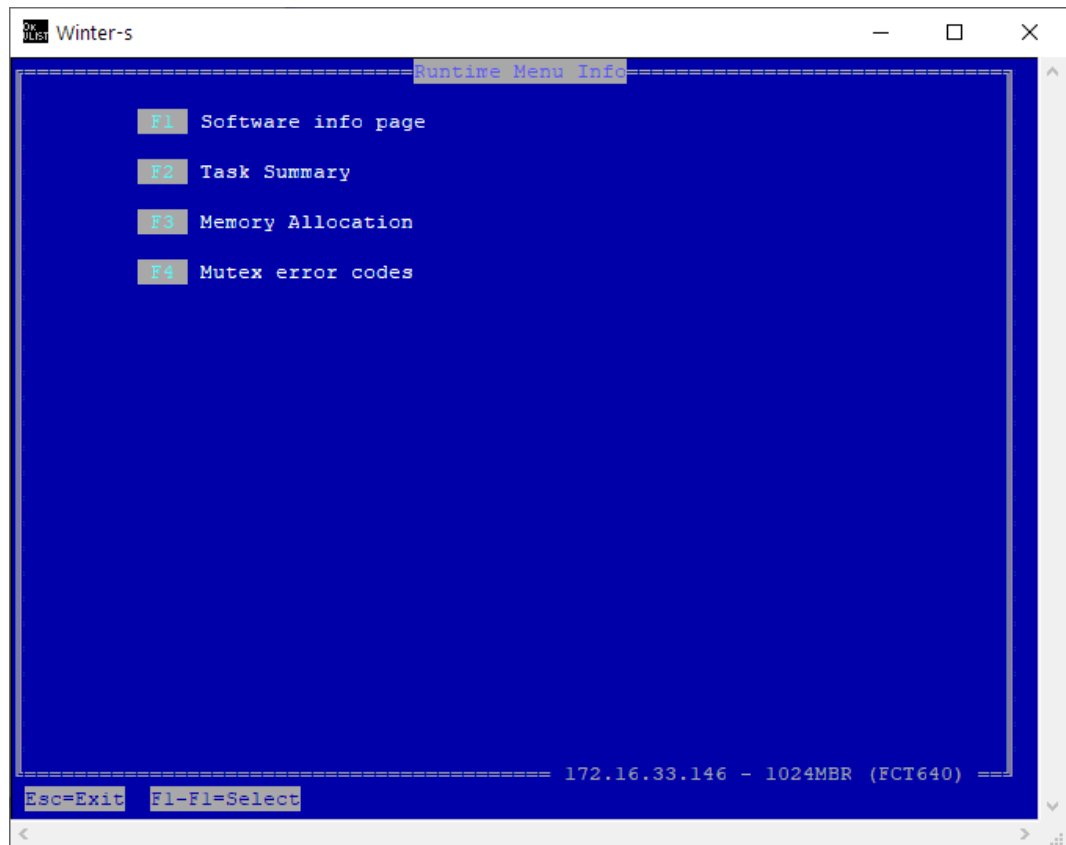


Figure 7.5. Winter-s: Runtime Menu Info

- Select F1 to access the 'Software info page':

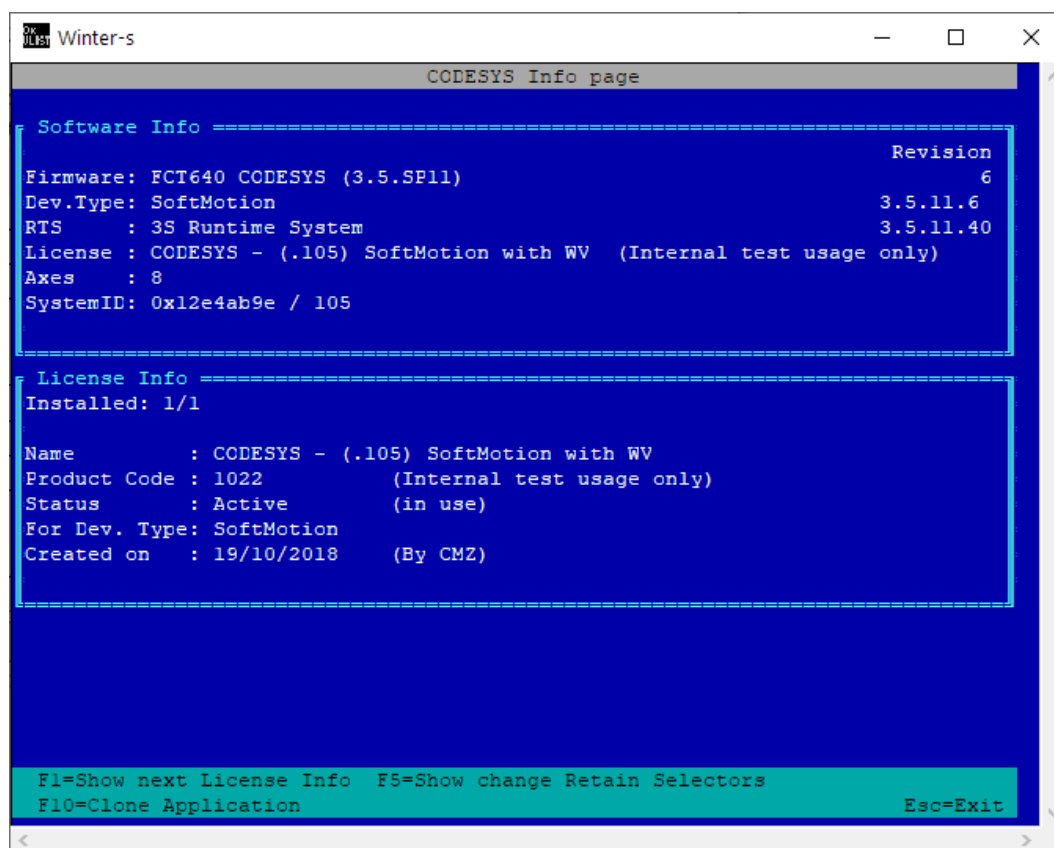


Figure 7.6. Winter-s: Software info page

- Push F10 to start the cloning operation. A window will appear to confirm to proceed. The operation can require even some minutes, during which this message will be displayed:

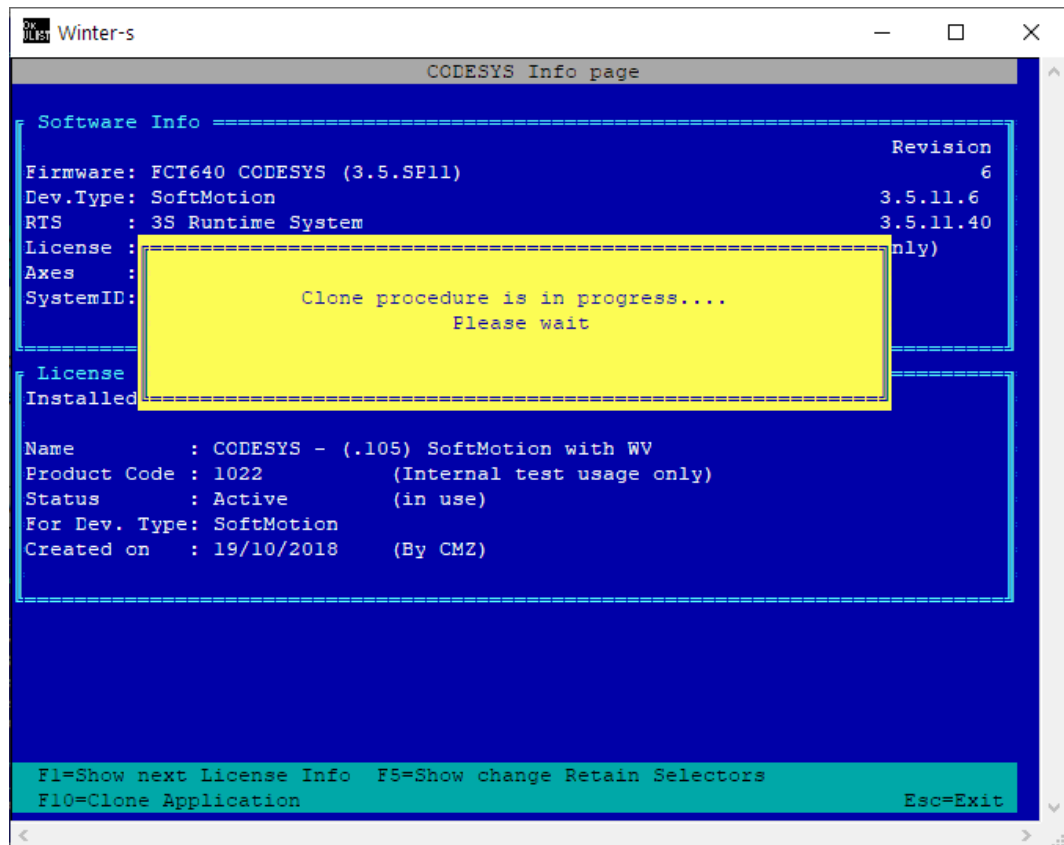


Figure 7.7. Winter-s: cloning in progress

- at the end, the information of the operation successfully ended and of the PPC-CLONE.ZIP file has been saved in the partition B:/ of the FCT appears:

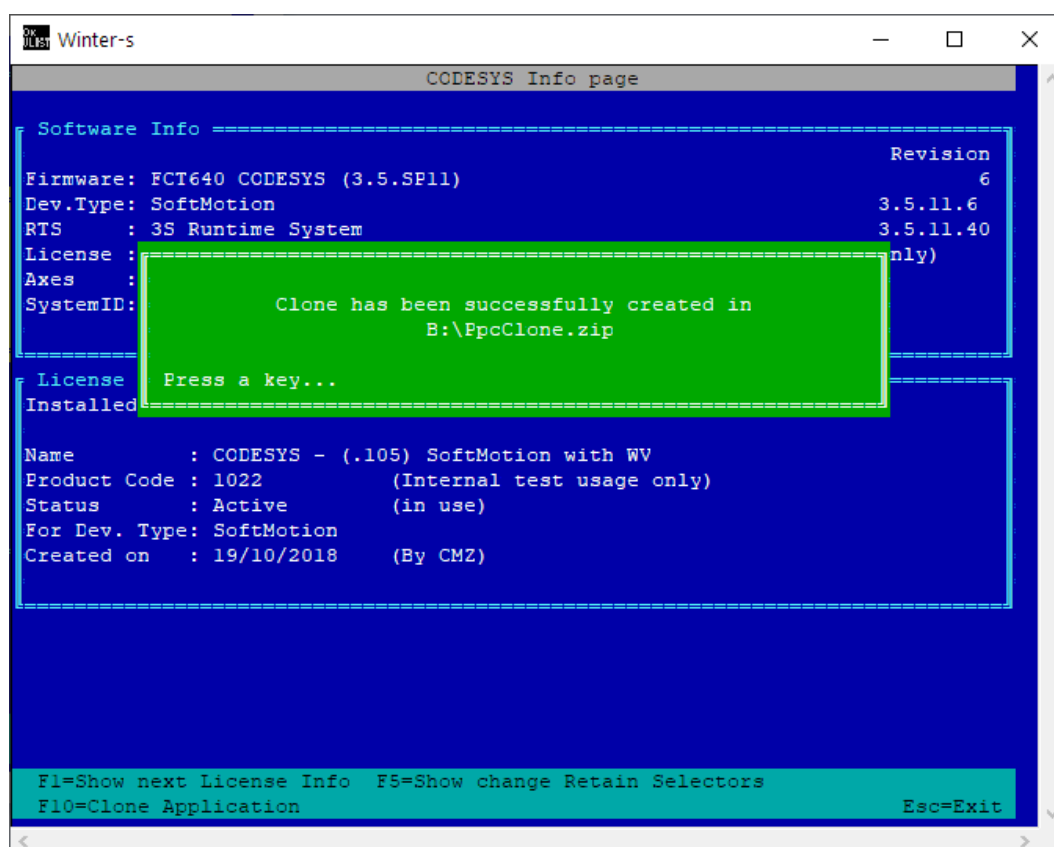


Figure 7.8. Winter-s: cloning succesfully completed

- the PPCLONE.ZIP file must be copied in an SDCard (recommended choice), or moved in the PC and then **must be deleted** from B:\.



Note

For the choose of a suitable SDCard consult the hw manual of the FCT in use. Read even [Section 8.2](#), “Which SD Cards are compatible with the FCT controllers?”.

To move the PPCLONE.zip file from B:\ it is possible to follow different ways:

- if a PC is at disposal, with CODESYS Development System ([Chapter 5, CODESYS Development System](#)) installed, it is possible to use the Files tab of Device, (see [Section 5.5](#), “Copy a file from the controller to the PC”):

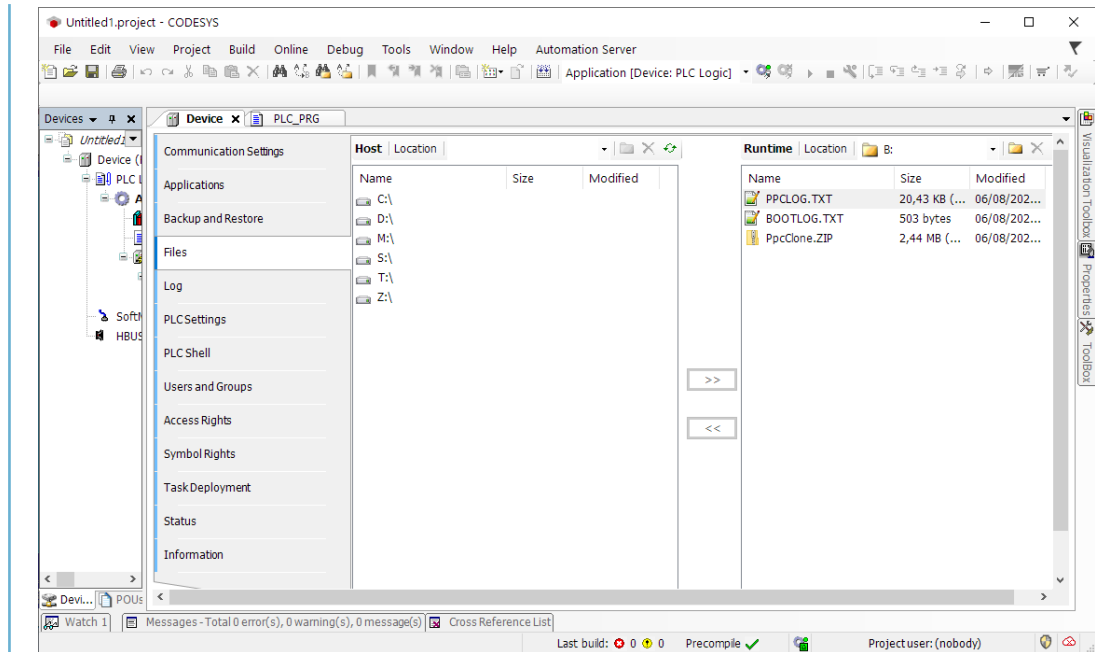


Figure 7.9. Device - File

- it is possible to use the Filesystem Commander service of Winter-s (see [Section 7.5, “Filesystem Commander”](#)). If an SDCard is available the best solution is to insert it in the controller and then select C:, or select a disc on the PC @C, @D.... Then copy the file B:\PPCCCLONE.ZIP in the new position and then delete it from B:\.
- if in the controller it is eventually already active the FTP server connection, it is even possible to use this mode to move the file from B:\ to the PC.
- if the file has been copied in the SDCard, then it is sufficient to turn off the FCT on which the application has to be cloned, insert the SDCard that contains the PPCCLONE.ZIP and switch the controller on. It can be noticed that the FAULT led of the controller will have red light blinkings and then the system will be found with the firmware and the application cloned.



Warning

If the SDCard is left inserted with the PPCCLONE.ZIP, then at every reboot of the controller the cloning operation is performed.

Otherwise, if the file is in the PC, then the file has to be copied in B:\ of the new controller by using CODESYS Device File (see [Section 5.5, “Copy a file from the controller to the PC”](#)), or Filesystem Commander (see [Section 7.5, “Filesystem Commander”](#)). After having copied the file, turn off and on the controller, so that the PPCCLONE.ZIP extraction

operation is executed, the FAULT led will have red light blinkings and then the system will be found with the firmware and the application cloned.



Warning

At the end of the operation the PPCCLONE.zip file must be deleted from B:\, otherwise the cloning operation will be executed at every reboot of the controller.

7.4. Measurement of the controller free resources

There is the possibility to have the information of the free resources in the FCT controller. Start Terminal Winter-s from FCTTool.

From the main page, type MQX in the editable field (or click on the function button Menu Board Specific - MQX) and then push F4 - Kernel Time:

```

===== Kernel Time =====
Current elapsed time:                Offset time (POSIX 1/1/1970):
Seconds:      0x00000067             Seconds:    0x5F2D6C62
Milliseconds: 0x00000146             Start:      14:59:46- 7/08/2020

Current localzone time:              Current attached Rtc callbacks:
Time:         15:01:29               Rtc      :      3
Date:         7/08/2020

DayLight Saving Time (F9=Set):       Rsc performances
Status:       Disabled              Task status :   Blocked
                                           Task priority: 285
Localzone:
Localzone offset:                    Free cpu      :    0.0
Localzone period:                    Free Min cpu :    0.0
Summer Start:                        Free Max cpu :    0.0
Summer End Date:
Next Edge Date:

===== 172.16.33.146 - 1024MBR (FCT640) =====
Esc=Back F1/F2/F3=Time/Date/PCSync F4/F5,F6/F7=RscGo/Stop,+/-Prio F8=Rtc
  
```

Figure 7.10. Kernel time

By pushing F4 the measurement of the free resources of the controller starts. Read the information in the lower right corner: Free cpu with the minimum and maximum values even reported.

7.5. Filesystem Commander

this functionality allows to copy and move files from the PC to the controller and vice versa.

From the initial page of Winter-s, in the editable field, write FC. Then this is the page:

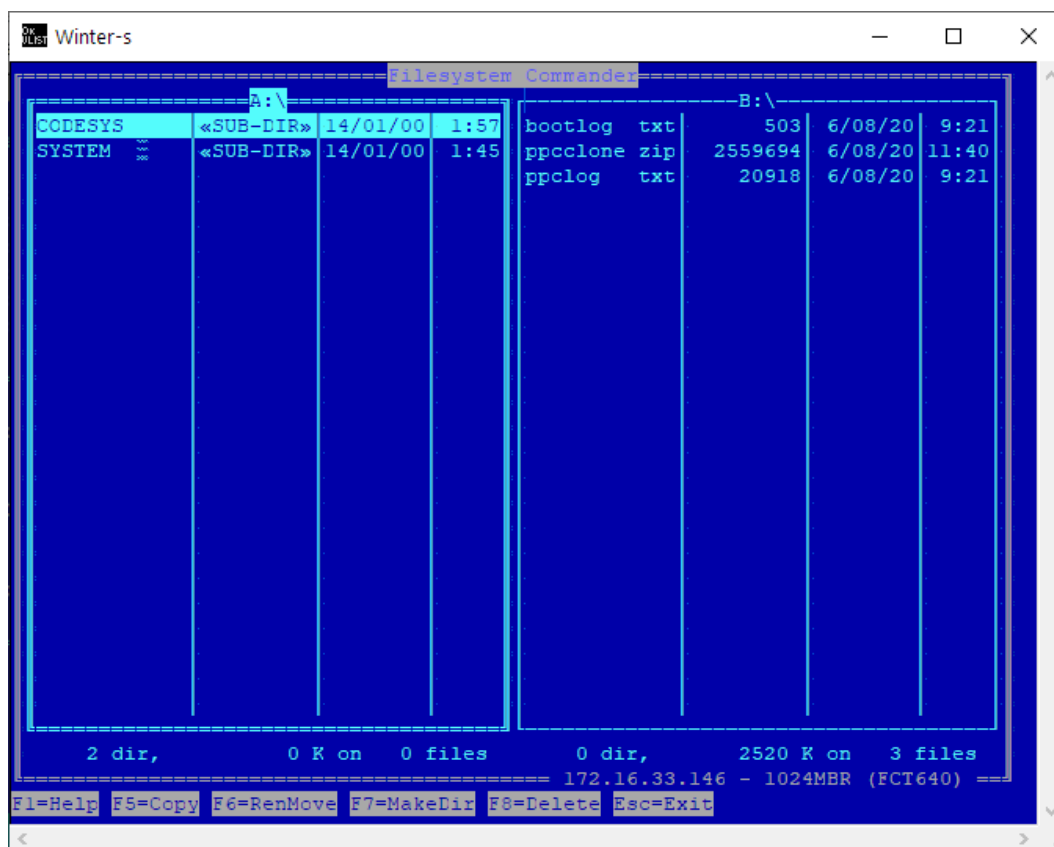


Figure 7.11. Winter-s FC

First the partition A: and B: of the controller are respectively on the left and on the right.

To change the selected partition on the left press Alt-F1 (Alt-F2 to change the one on the right). This window appears:

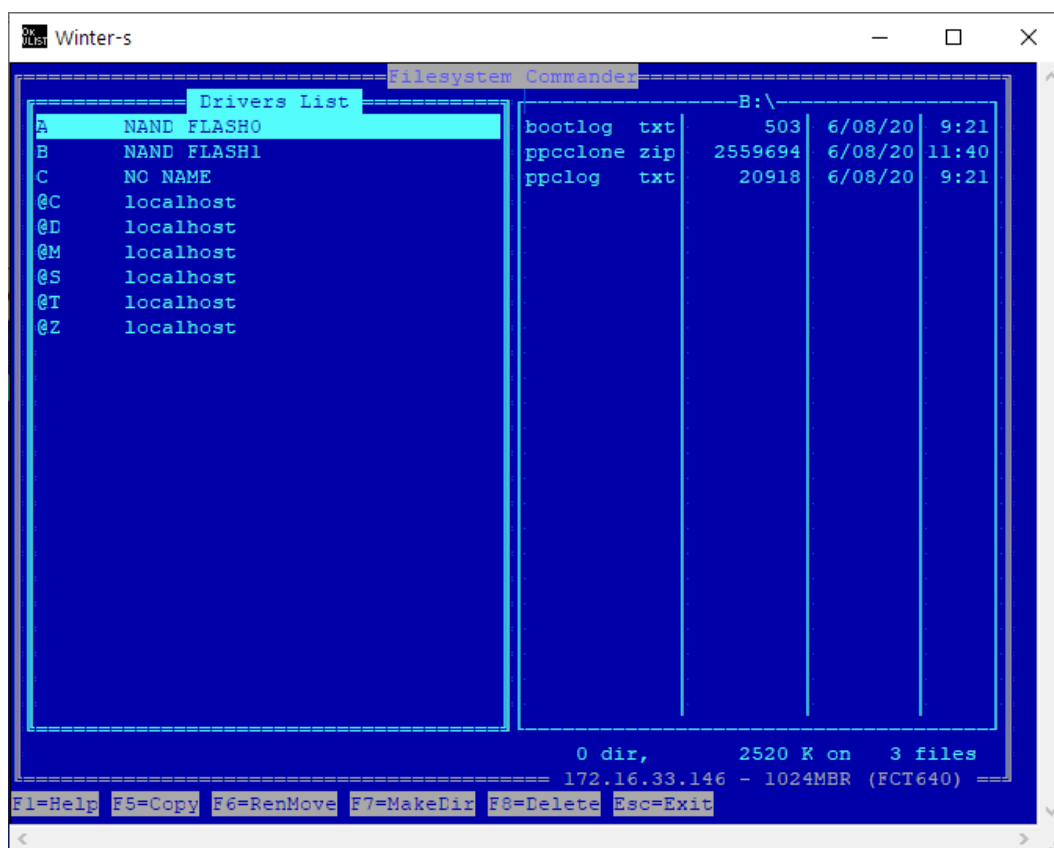


Figure 7.12. Winter-s FC driver list

The proposed partitions are:

- A and B: are the NAND memory partitions in the controller;
- C: SDCard of the controller, if inserted;
- The partitions preceded by the '@' are the ones that are present in the PC.

Once on the left and on the right have been prepared the desired folders, it is sufficient to select the file and push F5 to copy it from a folder the other. With F6, instead, it is moved.



Important

Pushing Alt-F3 a new page opens that allows to verify the integrity of the partitions A: and B:.

7.6. Management of the system in Boot

If the system is in Boot, it can physically be seen because the FAULT led is steady on, but can be seen even through the target locator because in the devices list, in the column Name, beside the name, appears [0]. A controller in Boot cannot be seen in Scan Network of CODESYS Development System (see [Section 5.1, "Connection to FCT"](#)).

A controller normally does not remain in Boot, it passes through it at the turn on before the firmware starts. So if the system remains in Boot is because the RESET button ([Section 3.6, “RESET button”](#)) has been pressed,



Note

Due to an error in the firmware or in the application program, the controller, in extreme cases, it can continuously reboot. In other words, the program starts and causes the error that forces it to restart. In this situation it is not possible to communicate with the controller. The only way to stop this "loop" is to push the RESET button ([Section 3.6, “RESET button”](#)). This stops the controller in Boot, so that it is possible to communicate with it.

In this situation, by clicking on Terminal it is possible to open a command prompt from which it is possible to execute advanced operations.



Important

These operations may damage the system. Before to use them contact support@cmz.it.

There are some actions that are already been prepared: by clicking the right mouse button on the Winter-s window, a menu appears from which, by selecting Execute, a command list opens:

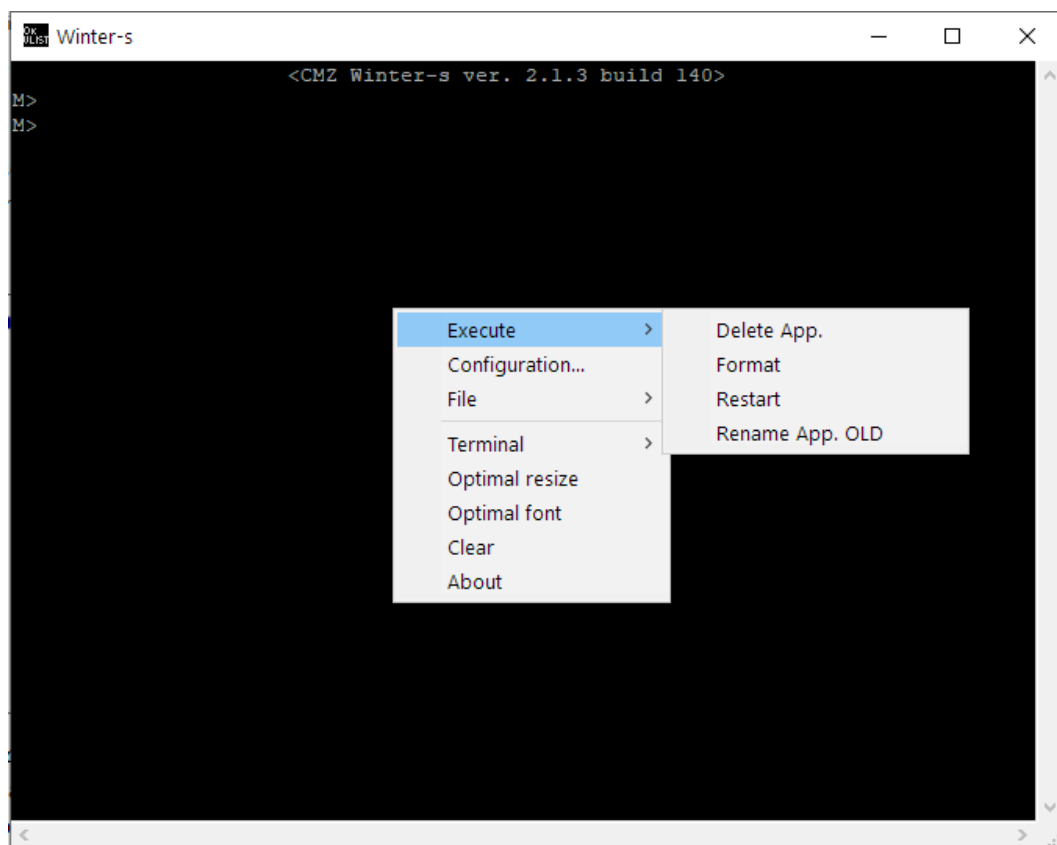


Figure 7.13. Terminal (debugger)

- Delete App.: it deletes the file with the application CODESYS (A:\CODESYS\PLCLOGIC\APPLICATION\Application.app) from the controller: this can be used in extreme situations when the application continuously gets the controller in Boot and it is not possible to take charge of the communication with the system;
- Format: it formats the system, everything will be deleted including the firmware and all the files that have been saved in the controller. Furthermore, at the end of the operation, the FCT cannot communicate with CODESYS, it will be necessary to install a firmware;
- Restart: restarts the firmware;
- Rename App.OLD: renames the application file (A:\CODESYS\PLCLOGIC\APPLICATION\Application.app) to Application.old.

Chapter 8

Frequent questions

Here follow some frequent questions.

8.1. Why is the controller not visible in the network?

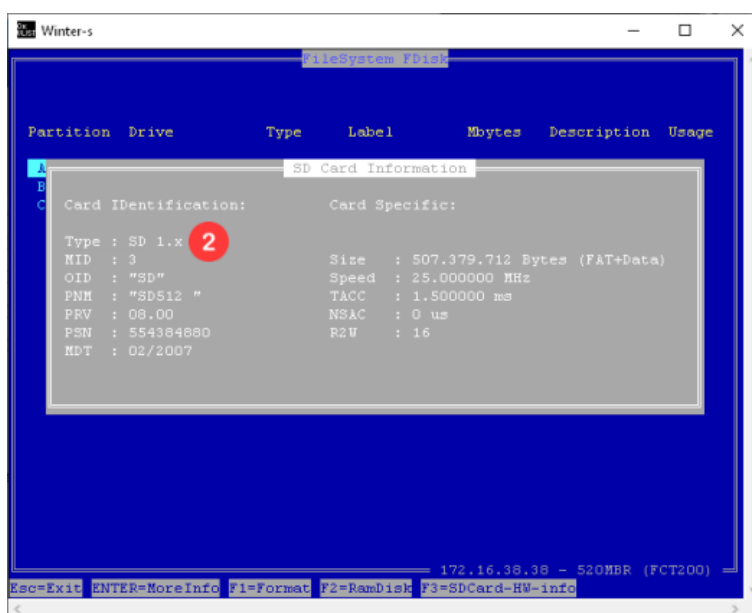
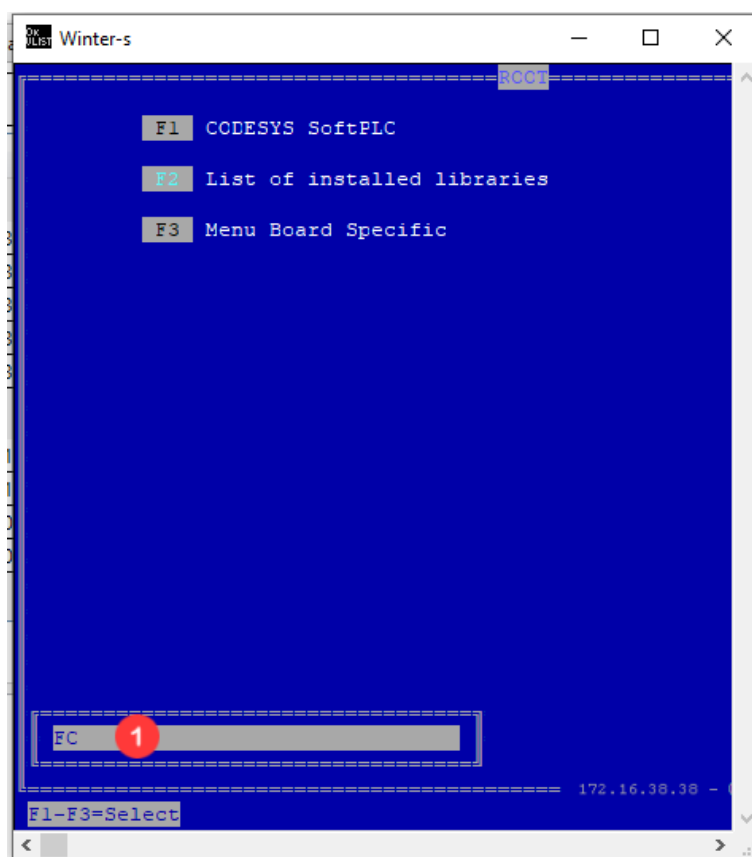
Repeat the procedure described in *Section 2.4*, “*Step 4: check of the Ethernet connection with the controller*”.

8.2. Which SD Cards are compatible with the FCT controllers?

In the FCT640 system only the SD Card that comply with the 2.0 (and newer) specifications can work, while in the FCT200 and FCT300 systems also the SD Card of 1.0 type can be used.

CMZ recommends to use the S-250 series of Swissbit SD cards, after having tested their compatibility with the controller and by recognizing a performance that is suitable with industry about temperature range and data retention reliability (SLC technology). The available sizes are 512 MB, 1 GB and 2 GB and it is possible to purchase the 1 GB version directly from CMZ.

In order to verify the type of an SD Card, it is necessary to follow these steps:



- 1 From FCTTool identify the controller ([Section 4.2, “Target locator”](#)) and open the Winter-s terminal. In the editable field write FC to enter in the Filesystem Commander (see [Section 7.5, “Filesystem Commander”](#)).
- 2 From the page that opens with the FC command, push ALT + F3 and then F3 “SD-Card-HW-info”.

From the page that opens, on the characteristic *Type* there is the inserted SD Card type written.

**FACTORY AND
HEADQUARTERS**

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