ThinkIO™ - P

Premium DIN Rail PC
for Fieldbus and IO Systems

Manual ID: 29867.06, Rev. Index 01
19 March, 2007

PROGRAMMING ASSISTANCE GUIDE

-

CoDeSys PLC

The product described in this manual is in compliance with all applied CE standards.

29867.06_01.VC.070319/151228

Revision History

Publication Title:	ThinkIO™ - P: Programming Assistance Guide - CoDeSys PLC	
ID Number:	29867.06	
Rev. Index	Brief Description of Changes	Date of Issue
01	Initial issue	19 Mar, 2007

Imprint

Kontron Modular Computers GmbH may be contacted via the following:

MAILING ADDRESS

Kontron Modular Computers GmbH

Sudetenstraße 7

D - 87600 Kaufbeuren Germany

TELEPHONE AND E-MAIL

+49 (0) 800-SALESKONTRON

sales@kontron.com

For further information about other Kontron Modular Computers products, please visit our Internet web site: www.kontron.com

29867.06_01.VC.070319/151228

Table of Contents

29867.06_01.VC.070319/151229

This page has been intentionally left blank.

29867.06_01.VC.070319/151229

1. Copyright

2. First Steps with CoDeSys on ThinkIO-P

This document provides basic information as well as step by step procedures for creating a new CoDeSys target, setting up the target settings, compiling, downloading, and starting a CoDeSys program within the CoDeSys workbench (IDE). For further details refer to the CoDeSys documentation.

The following hardware, software, and documentation are required in order to perform the procedures provided in this document:

- a Host PC with either Windows XP or Windows 2000 operating system
- a ThinkIO-P configured with appropriate WAGO IO modules and a PROFIBUS fieldbus interface
- a network connection between the Host PC and the ThinkIO-P
  (1-to-1 patch cable or a crossed Ethernet cable)
- a DVD from Kontron containing the CoDeSys IDE and CoDeSys ThinkIO-P target files
- a USB keyboard for the ThinkIO-P
- a monitor (TFT or CRT) and either a DVI cable or a cable adapter DVI to VGA and a VGA cable for the ThinkIO-P
- CoDeSys manuals

29867.06_01.VC.070319/151229

3. Virtual Console

ThinkIO-P (for CoDeSys with Target Visualization) supports two consoles:

- Console 1: login text console (operating system command line)
- Console 2: graphic console (used for CoDeSys Target Visualization)

The default resolution of the graphic console is 640 x 480 pixels, 16-bit color depth. To switch between the consoles, use the keys <ALT><F1> and <ALT><F2>. The resolution can be changed with the "vgaconfig" tool or the resolution can also be changed via Web Based Management. The settings for graphic console must corrrespond to those supported by the monitor display in use.

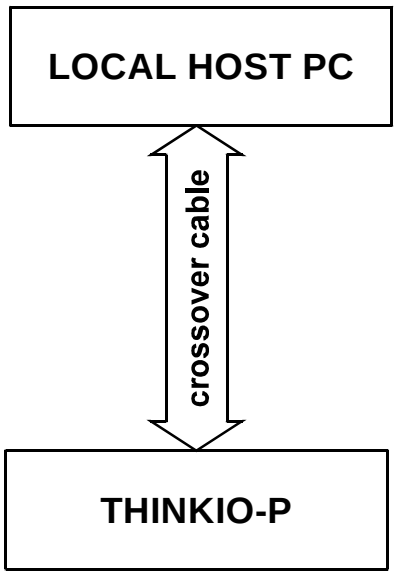
4. Ethernet Network Configuration

4.1 Interfacing

The ThinkIO-P ports X8 and X9 provide interfacing for an Ethernet network. The port X8 is configured for BootP and the port X9 is configured with the IP address of 192.168.0.50 at the factory.

Use of the Ethernet interface requires that the IP addresses of the local host PC and the ThinkIO-P be known, and the IP address of the gateway if the ThinkIO-P and the local host PC are in different networks. If requred, consult the system administrator for this information.

The following figures illustrate the basic types of network connections that are possible with the ThinkIO-P.

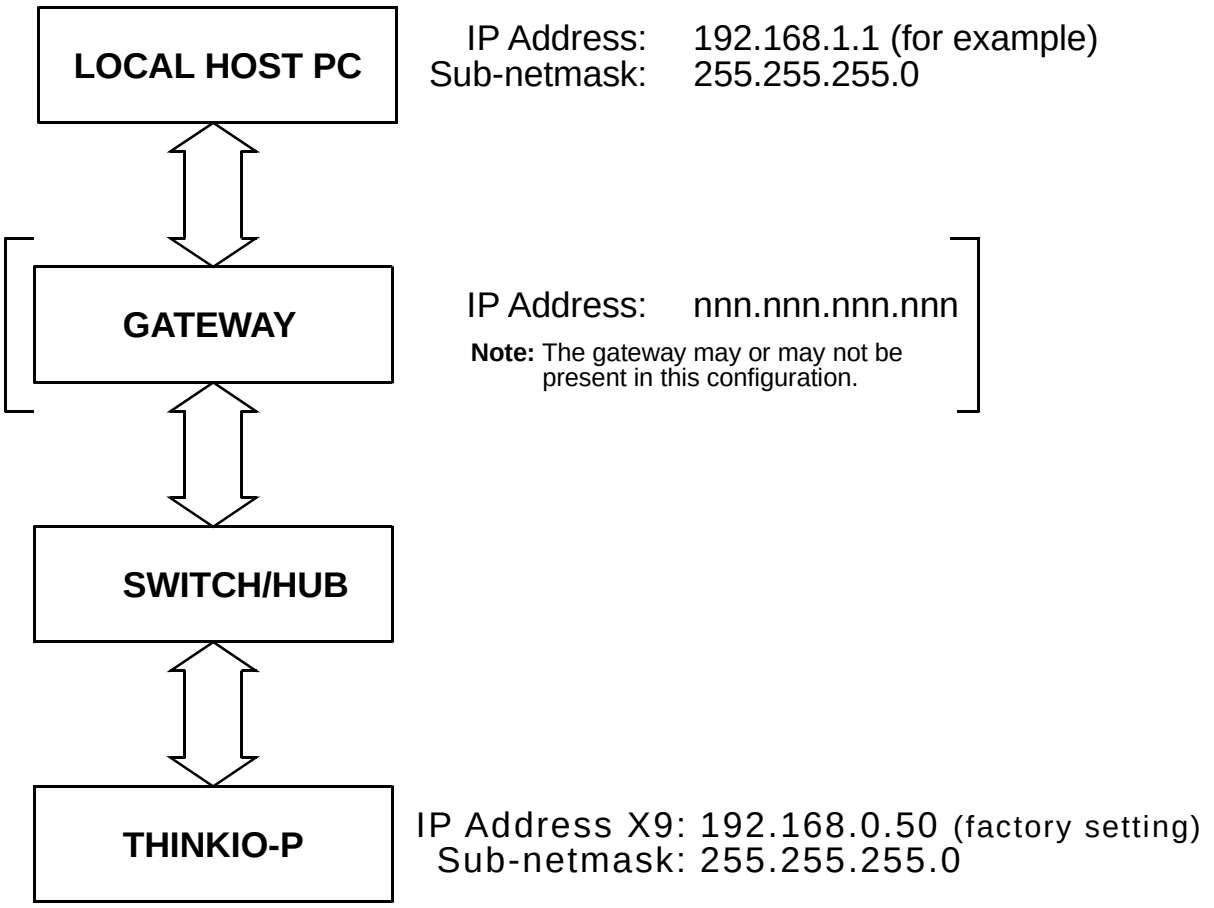


IP Address X9: 192.168.0.50 (factory setting)
Sub-netmask: 255.255.255.0

Simple ThinkIO-P to Local Host PC (development system) Configuration

The addresses indicated in these figures are for illustration purposes only and do not necessarily represent the actual development situation.

29867.06_01.VC.070319/151229



Standard Network Configuration

If the IP address of the ThinkIO-P is known and it is required to change the address, the ThinkIO-P maybe accessed via Web Based Management. In any event, the IP address of the ThinkIO-P is required to download a CoDeSys application.

4.2 Providing a Route Between the Windows Host PC and the ThinkIO-P

If the host PC and the ThinkIO-P reside in two different networks, a logical route between the networks must be established. This is accomplished using the DOS line command "route" on the Windows host PC.

In the following example, 192.168.52.220 is the IP address of the ThinkIO-P, and the address of the gateway for this network is 193.102.136.40. The command is as follows:

route ADD 192.168.52.220 MASK 255.255.255.0 193.102.136.40

target sub-netmask gateway

To verify the communication path, issue a "ping" command.

29867.06_01.VC.070319/151229

5. CoDeSys Installation and Settings

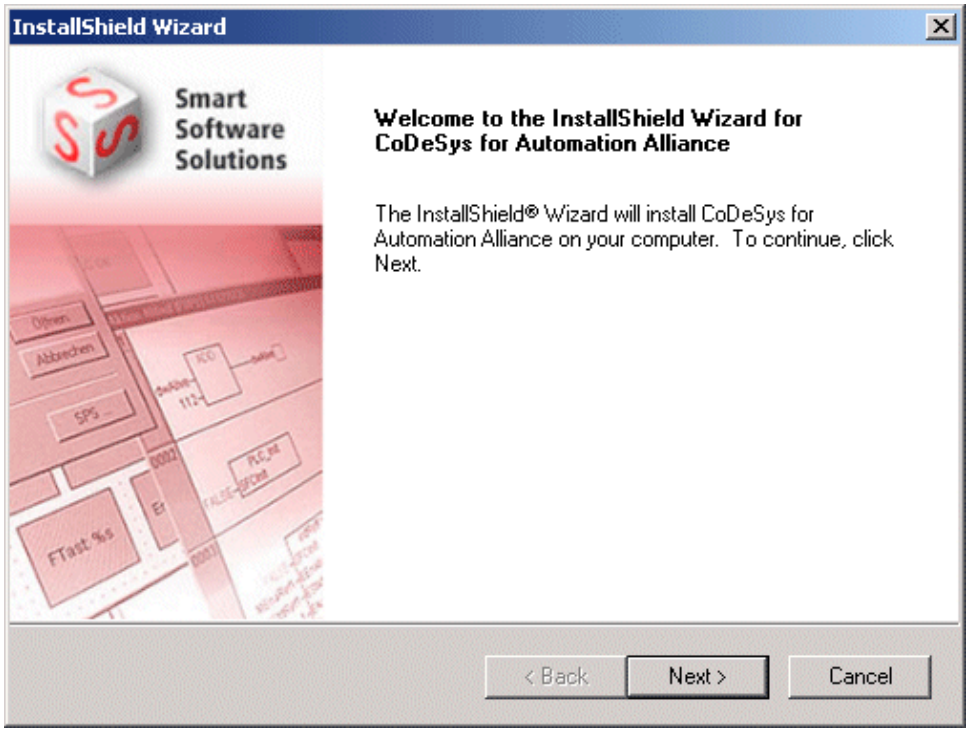
5.1 Installation of CoDeSys IDE on a Host PC (Windows)

Perform the following procedures to install the CoDeSys IDE on an Windows application development system.

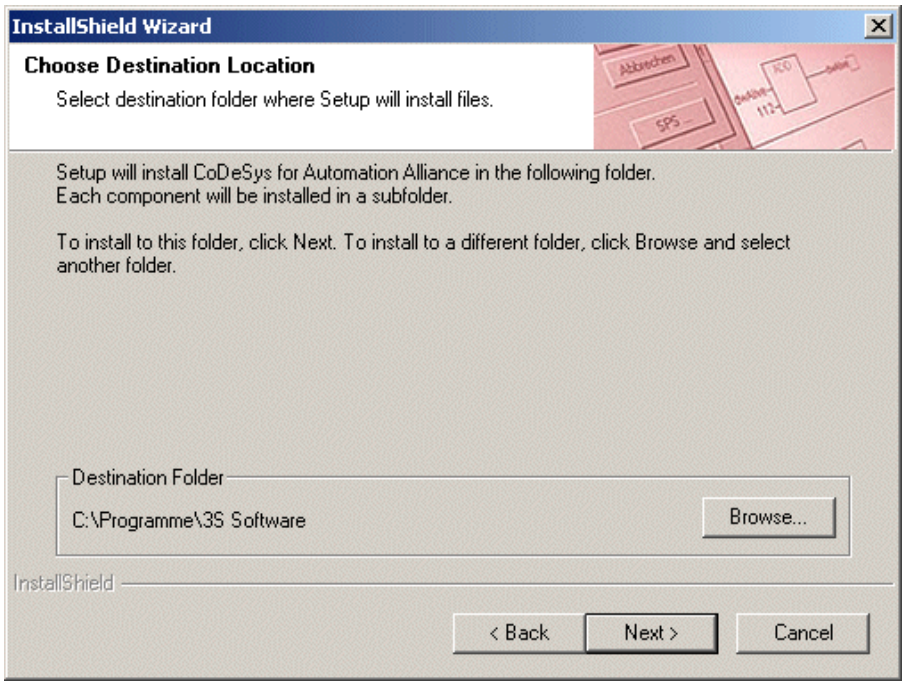
PROCEDURE START: Installation of CoDeSys

1. Insert the DVD which contains CoDeSys IDE
2. Run the "setup.exe" in the CoDeSys directory
3. Choose a language and then click **OK**

4. If requested by the InstallShield Wizard, close all running applications, and then click **OK**
5. To continue, click **Next**

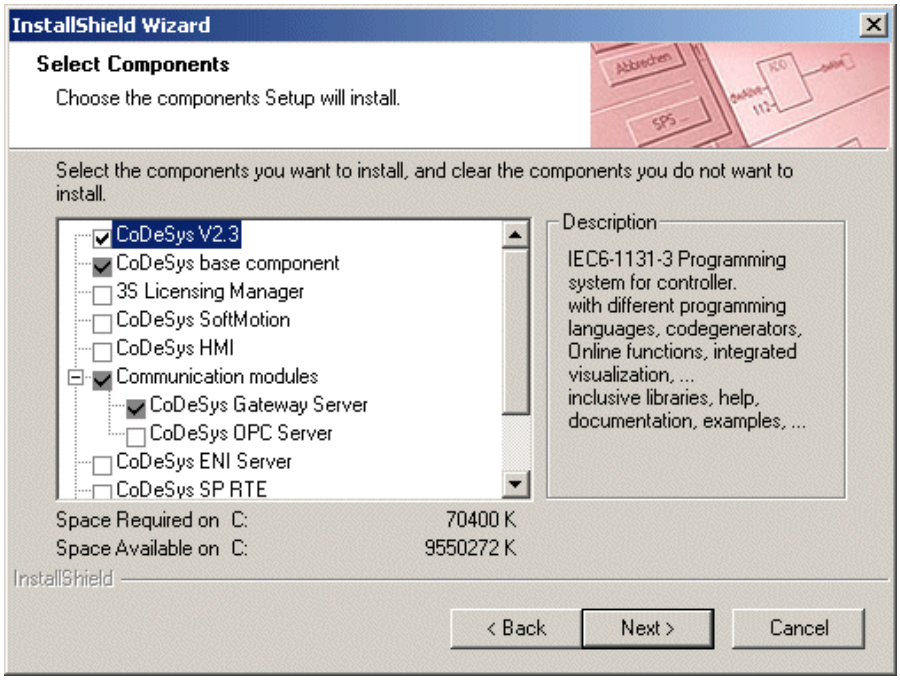


6. Select the installation destination folder
   - to select the default folder, click **Next**
   - to select a different folder, click **Browse** and select an appropriate folder or create a new folder, and then click **Next**

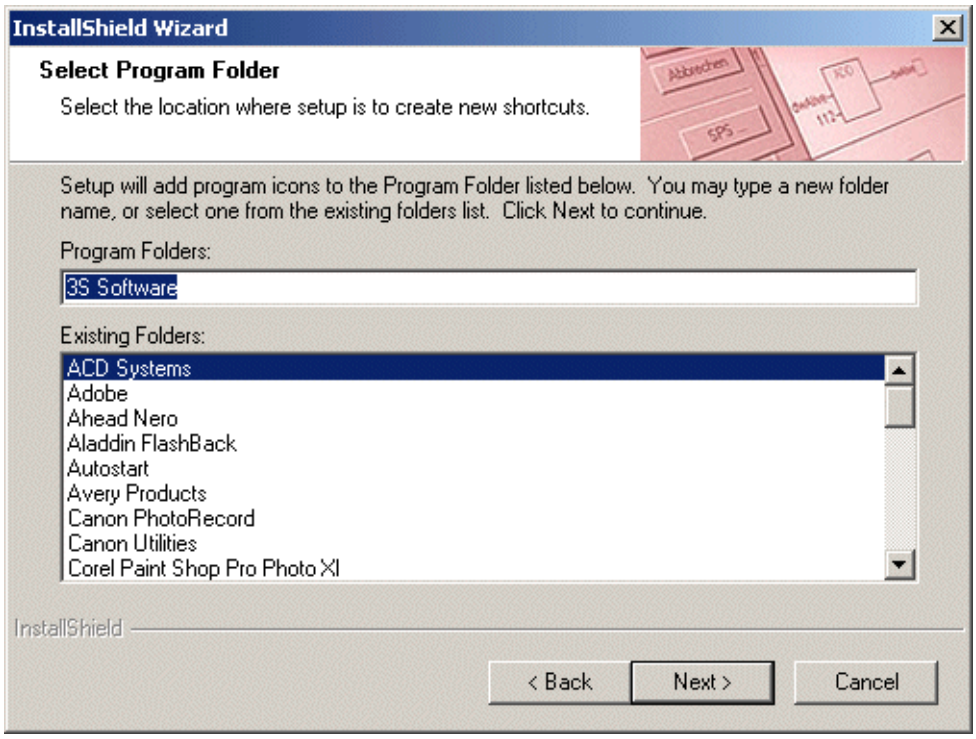


7. Select CoDeSys components
   - to select components, set or delete selections as required
   - to continue, click **Next**

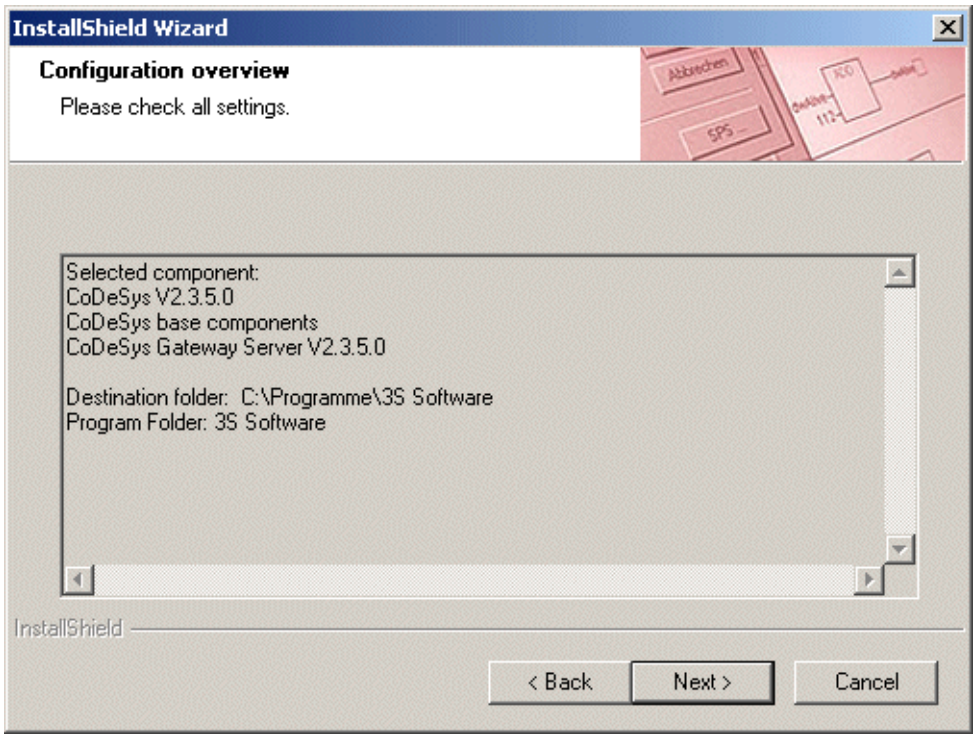
   The selection indicated below is minimal but sufficient for an installation.



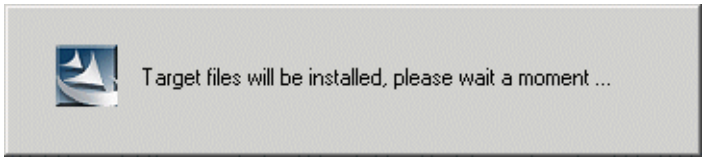
8. To accept the proposed program folder click **Next**



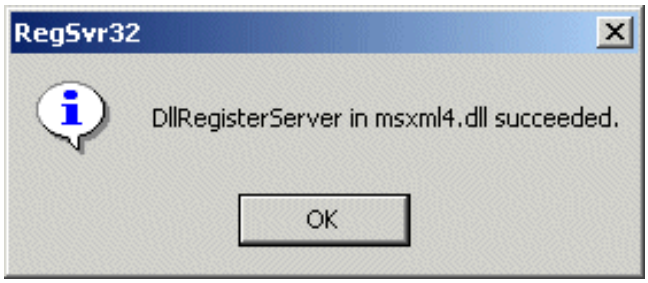
9. Examine the **Configuration Overview**
   - if satisfactory, click **Next** to continue
   - to revise, click **Back** and modify as required



The InstallShield Wizard copies all of the required files from the DVD disk and installs all Target files.

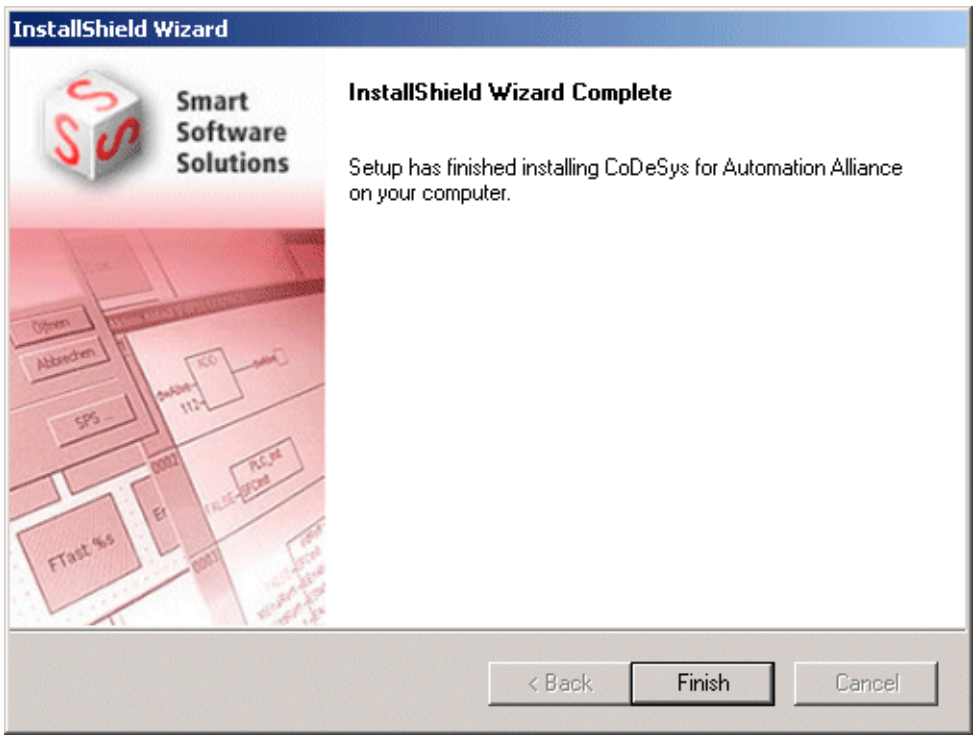


10. Click **OK** to complete the installation of xml4



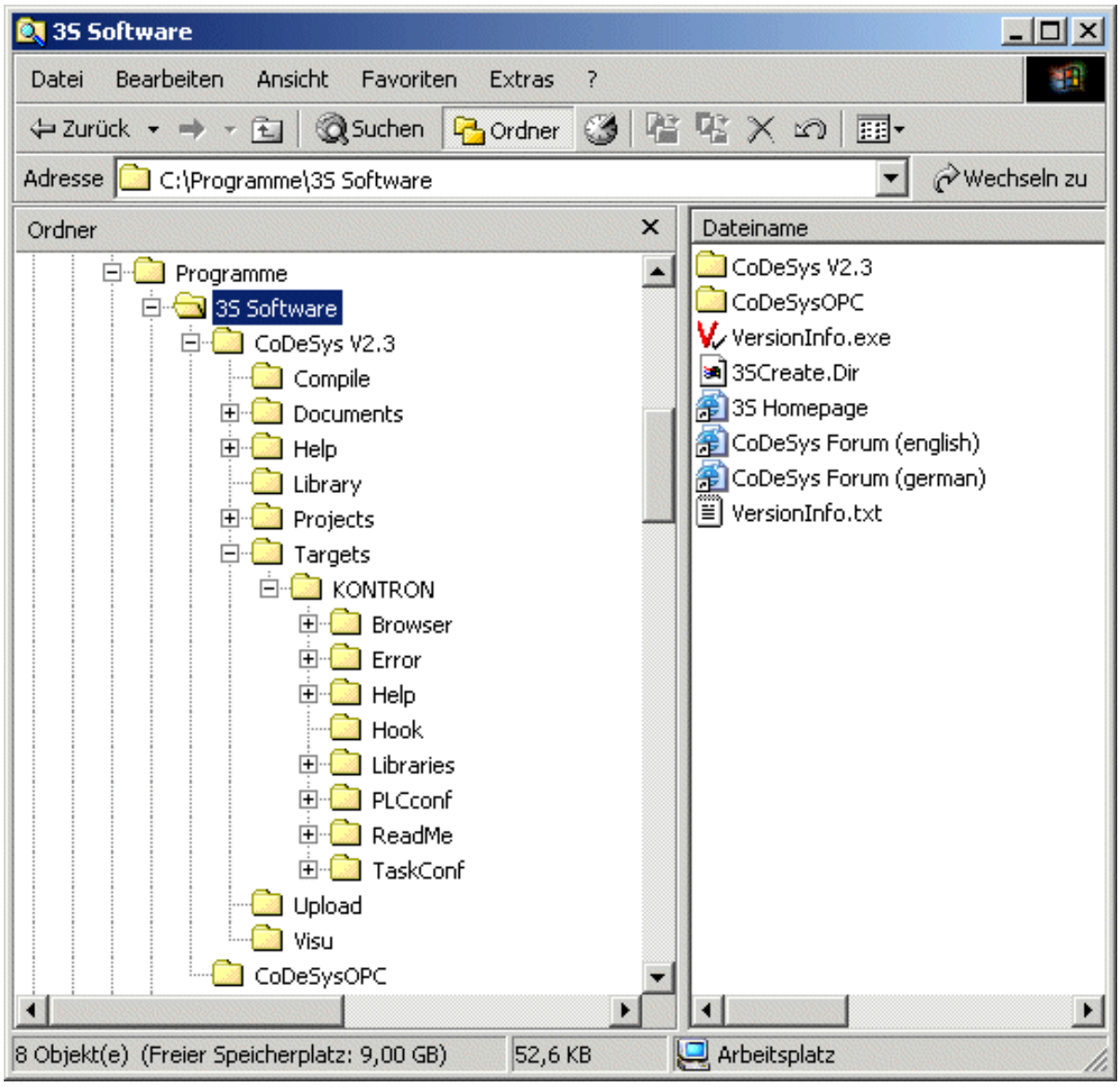
The Microsoft XML Parser is now installed. This is required due to the fact that there may be an older version of the parser installed which will not operate with this version of the CoDeSys software.

11. Click **Finish** to exit the InstallShield Wizard

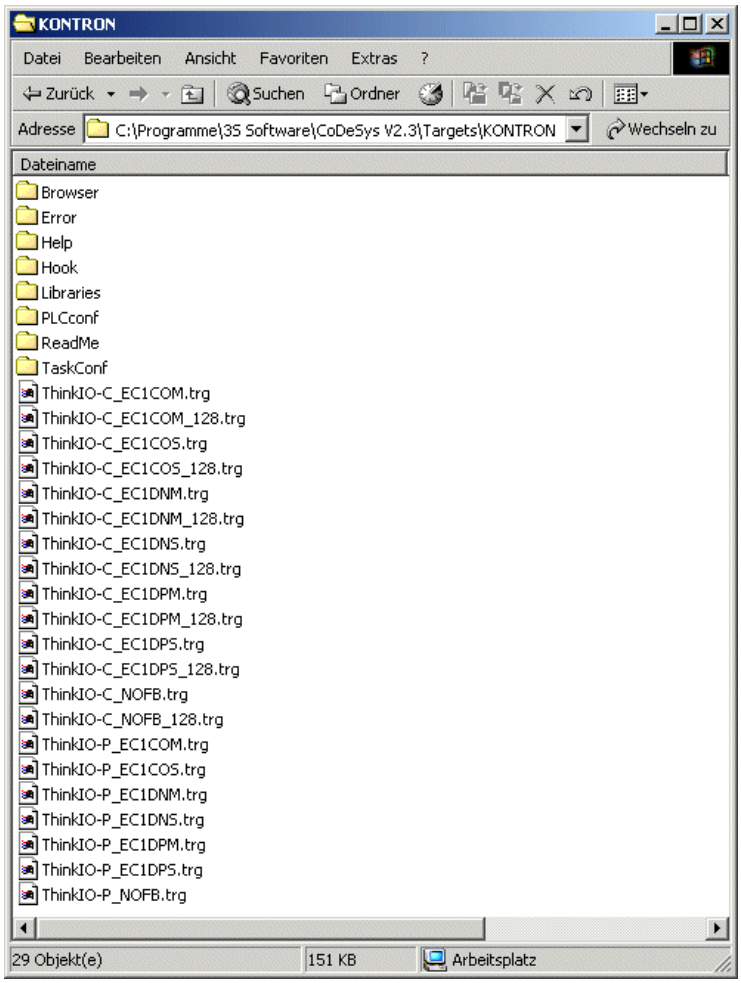


PROCEDURE END: Installation of the CoDeSys components is now complete.

The installation in the folder "Programme" or "Program Files" now should look like this:



Of special interest is the "Targets\KONTRON" folder:



Variations of ThinkIO-P differ depending on the support provided for field busses:

- K-Bus without a field bus (NOFB) in the file "ThinkIO-P_NOFB.trg"
- K-Bus plus PROFIBUS DP Master on EC1 chip (EC1DPM) in the file "ThinkIO-P_ EC1DPM.trg"
- etc.

When installing from the KONTRON distribution DVD, all required ThinkIO-P targets will be installed automatically (see files ThinkIO-P_ ... .trg in the directory above).

5.2 Installing the CoDeSys Target Support Package (TSP)

Normally all implemented ThinkIO-P targets are installed automatically when installing CoDeSys from the Kontron DVD.

If for some reason targets are to be installed afterwards, then first deinstall the old targets using the InstallTarget tool from 3S and then delete the empty folders.

Before proceeding, it is recommended to read the "CoDeSys_V23_E.pdf" document. The fundamentals of the Target Support Package (TSP) are described in detail in this document.

29867.06_01.VC.070319/151234

The variations of ThinkIO-P differ in the support of field busses. There are different variations:

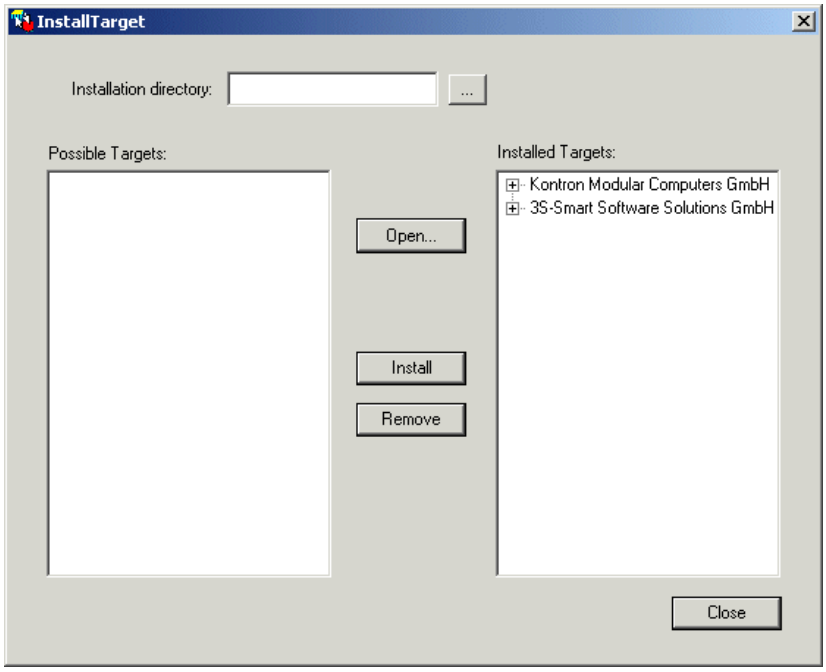
- K-Bus, but no field bus (NOFB)
- K-Bus plus PROFIBUS-DP Master on EC1 chip (EC1DPM)
- K-Bus plus PROFIBUS-DP Slave on EC1 chip (EC1DPS)
- K-Bus plus CAN open Master on EC1 chip (EC1COM)
- K-Bus plus CAN open Slave on EC1 chip (EC1COS)

To install the TSP for one of the supported variations of ThinkIO-P follow these steps:

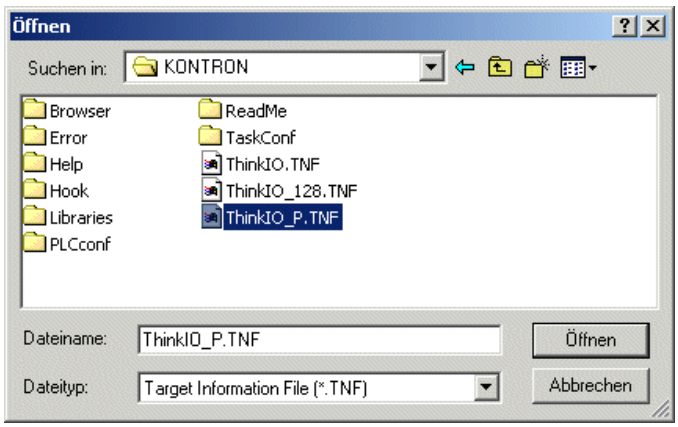
PROCEDURE START: Target Installation

1. Start the program "InstallTarget.exe"
   - click the **Start** button
   - select **Programs,** then **3S Software,** then **CoDeSys V2.3**, then click **InstallTarget**

   If no targets have been installed, the InstallTarget page is completely empty.

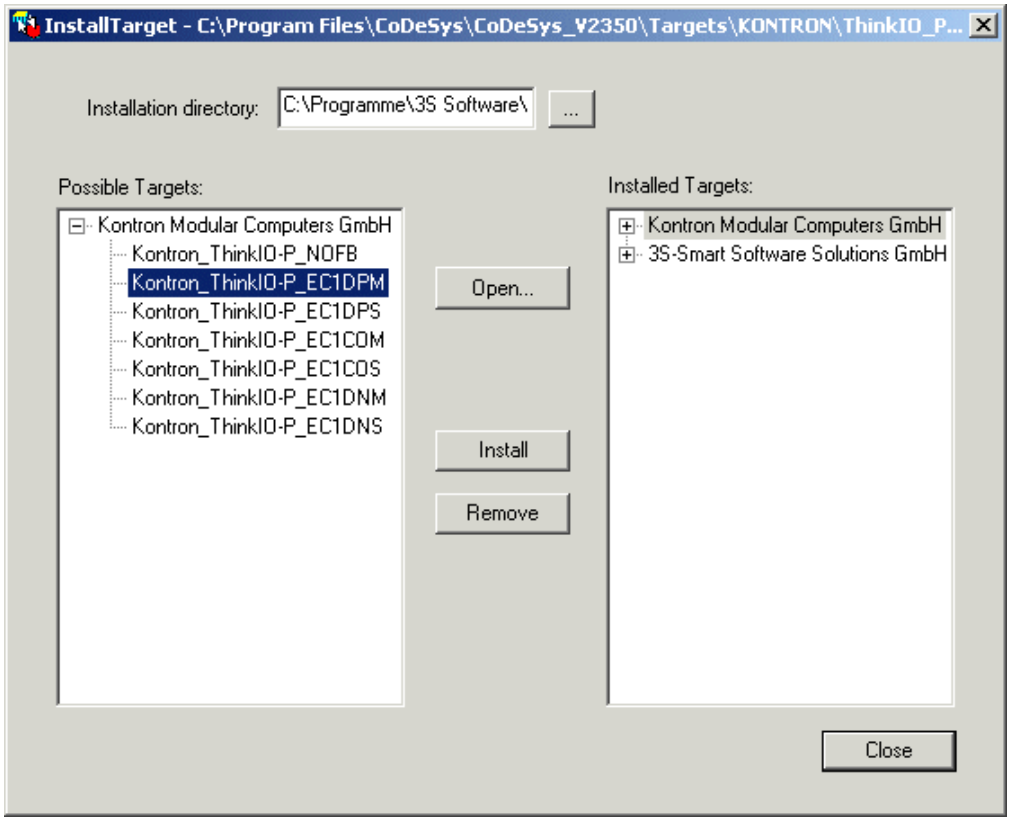


2. Click **Open** to select and open a ".tnf" file



3. Click the file to be installed and then click **Open**

   The ".tnf" file for the ThinkIO-P is "…\Targets\KONTRON\ThinkIO_P.tnf".



4. At the top of the InstallTarget box the installation directory is displayed. Ensure that the path indicated is correct for the CoDeSys installation, i.e.

   "C:\Programme\3S Software\CoDeSys V2.3\Targets\KONTRON\THINKIO\"

   If it is not correct, revise it as required.

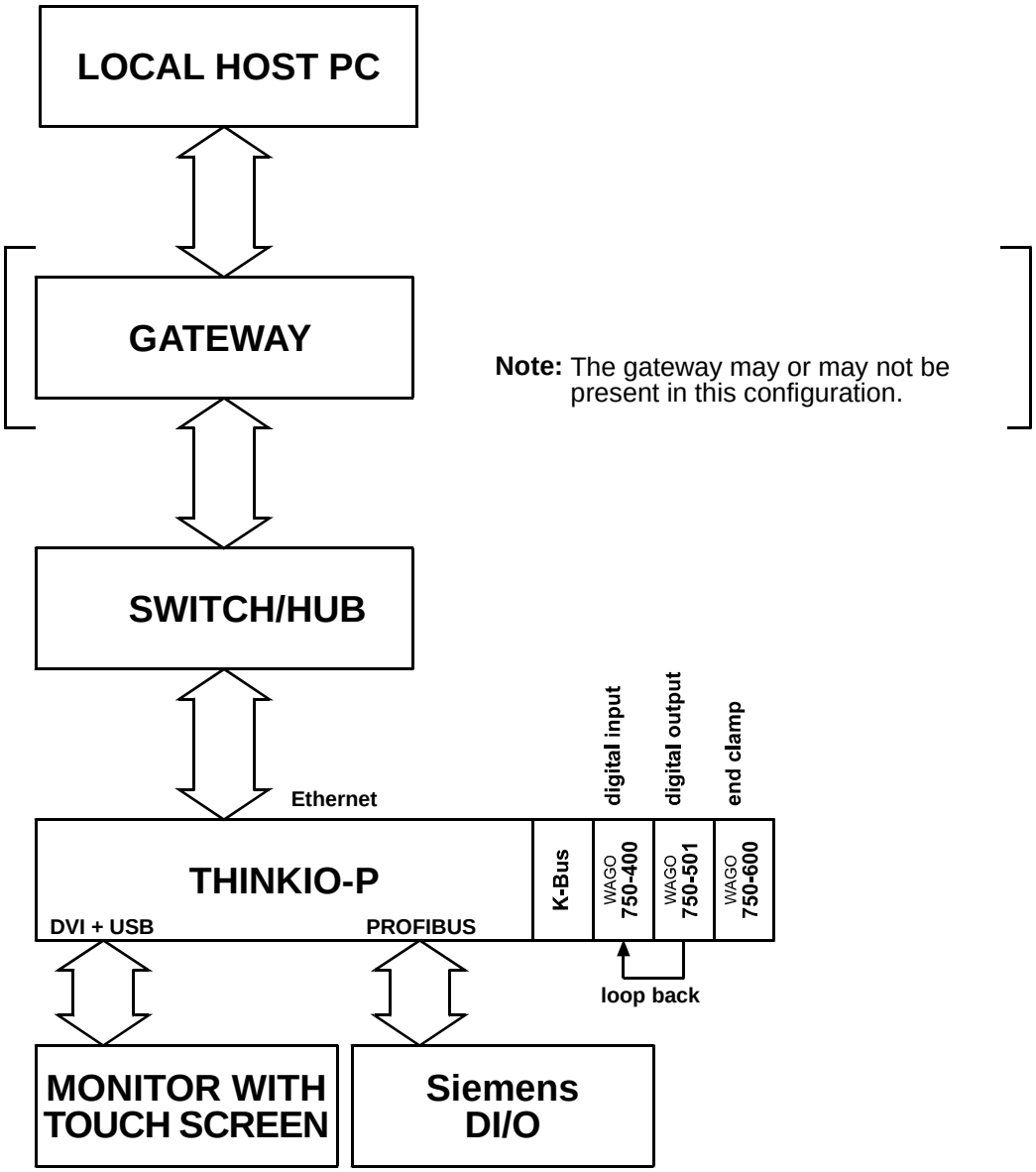
5. From the **Possible targets** list, select the target to be installed, then click **Install**

6. As required, repeat step 5 for every target to be installed, then click **Close** to exit the **InstallTarget** box

PROCEDURE END: Installation of the targets is now complete

6. Working with the CoDeSys IDE

The ensuing sections which serve to illustrate how to work with the CoDeSys IDE are based on the following sample system.



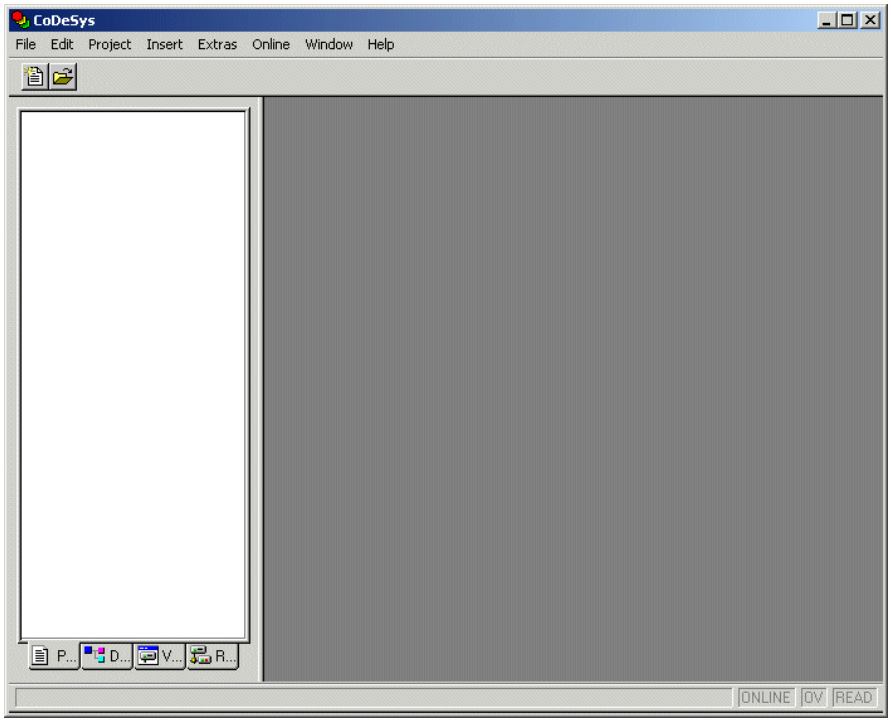
Sample System for CoDeSys Application Development

6.1 Creating a New Project

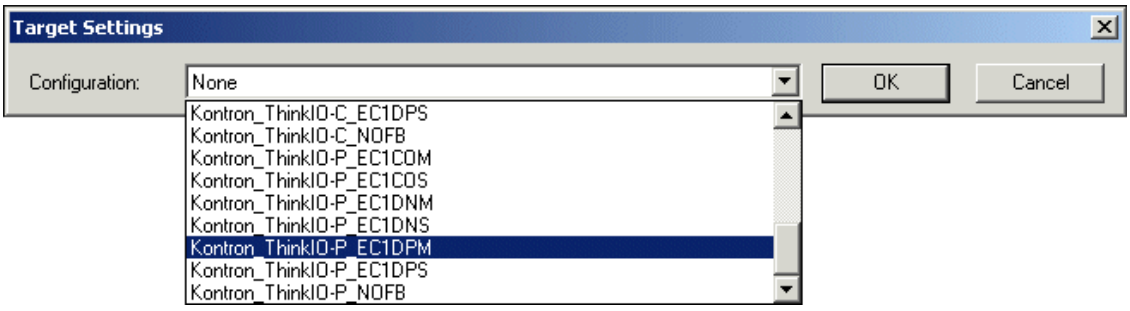
To create a new project, perform the following:

PROCEDURE START: Create new project and select target settings

1. Click the **Start** button
2. Select **Programs, 3S Software, CoDeSys V2.3**, and then click **CoDeSys V2.3**

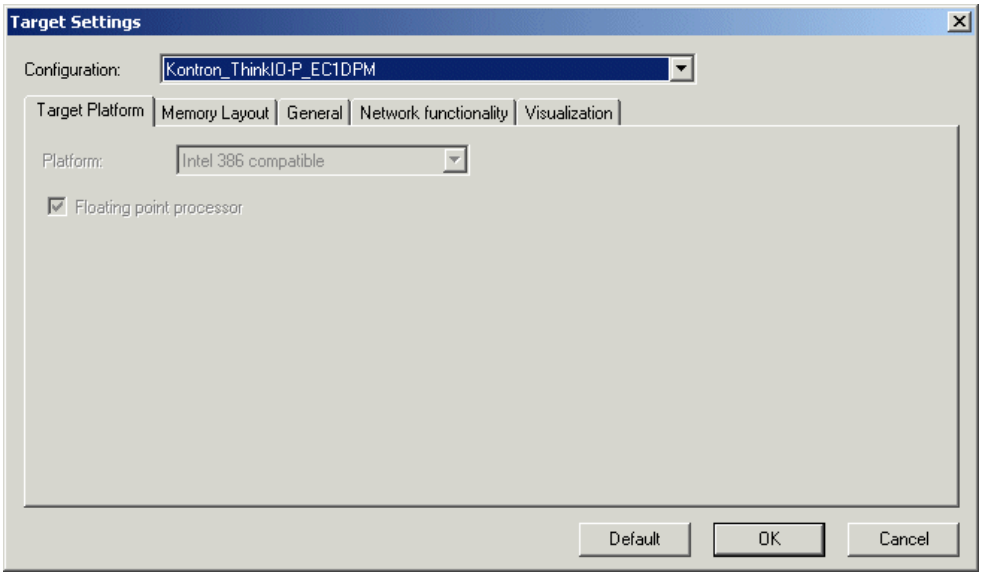


3. Select **File** and then click **NEW**

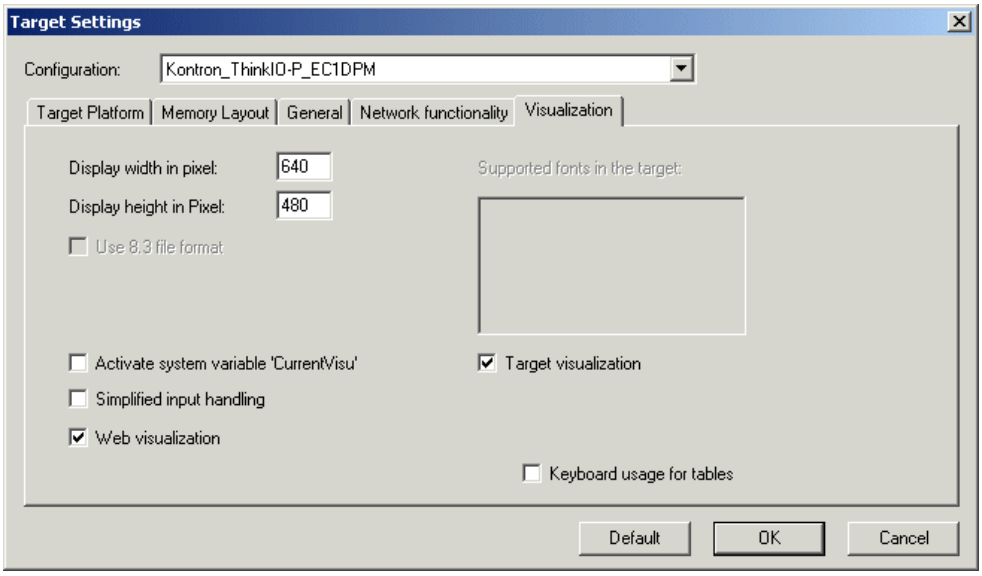


4. Select the project target and then click **OK**

29867.06_01.VC.070319/151235

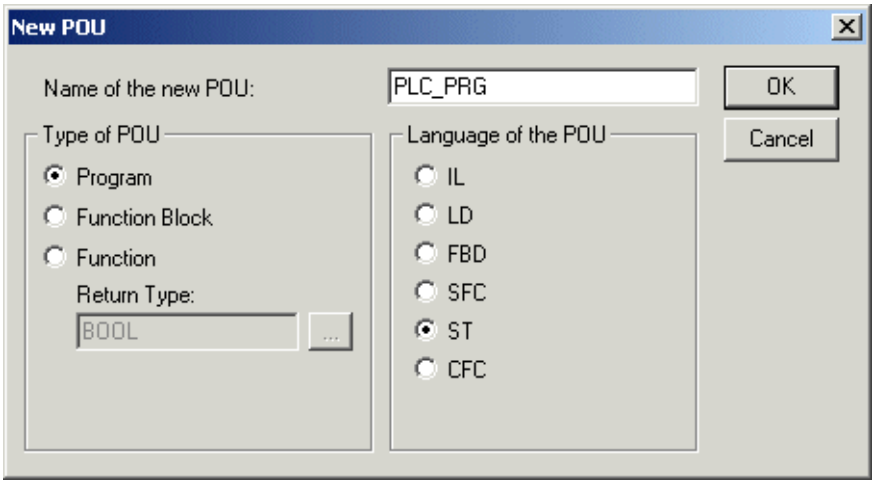


5. Select the **Visualization** tab

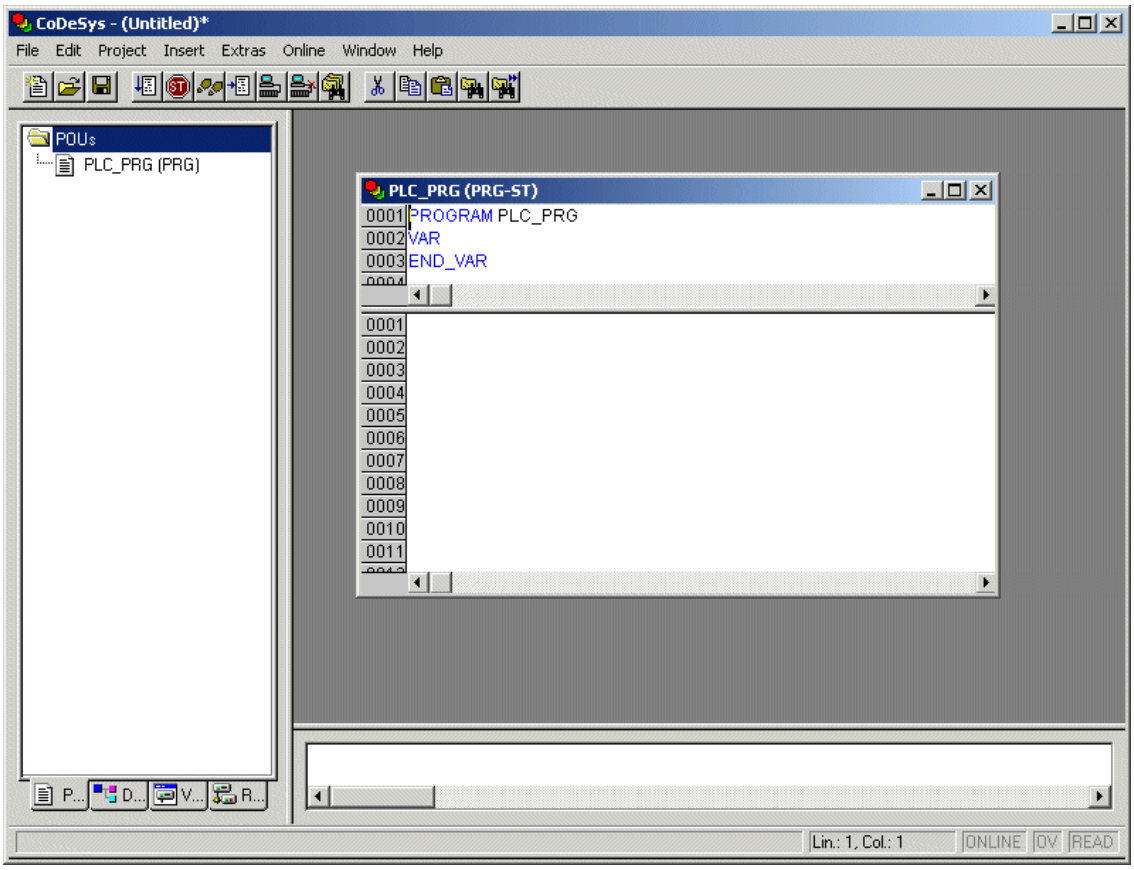


6. Type or select the resolution of the target system display, select **Target visualization**, select **Web visualization**, then select **OK**

   When designing the Target Visualization, the display resolution should also be considered in the CoDeSys project as well as the ThinkIO-P settings.



7. Accept the selections as indicated or revise accordingly, then click **OK**



8. Now select **File,** then **Save** and enter an appropriate file name and click **OK**

PROCEDURE END: A new project has been created, given a name, and the target settings have been selected. The screen displayed after step 8 is the starting screen for the procedure in section 6.2.1.

6.2 PLC Configuration (I/O)

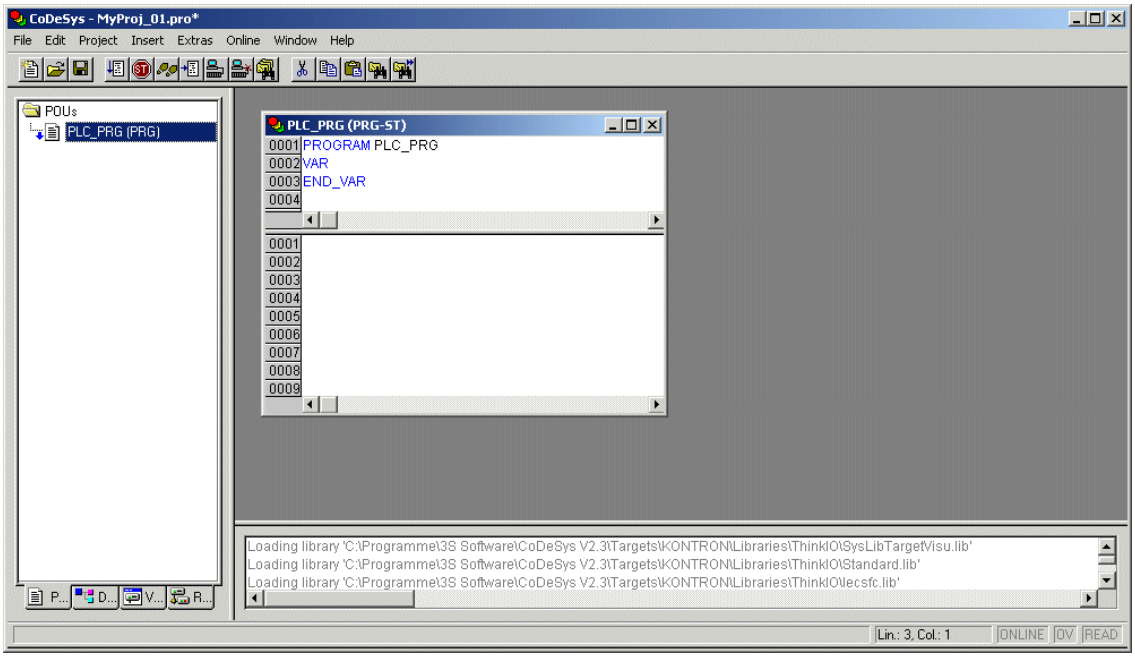
6.2.1 Configuring K-Bus I/O Modules

On the left side of the CoDeSys main display window there is a box called the resources area, at the bottom of which there are four selection tabs. The right most tab is the **Resources** tab. The following procedure begins with the selection of this tab.

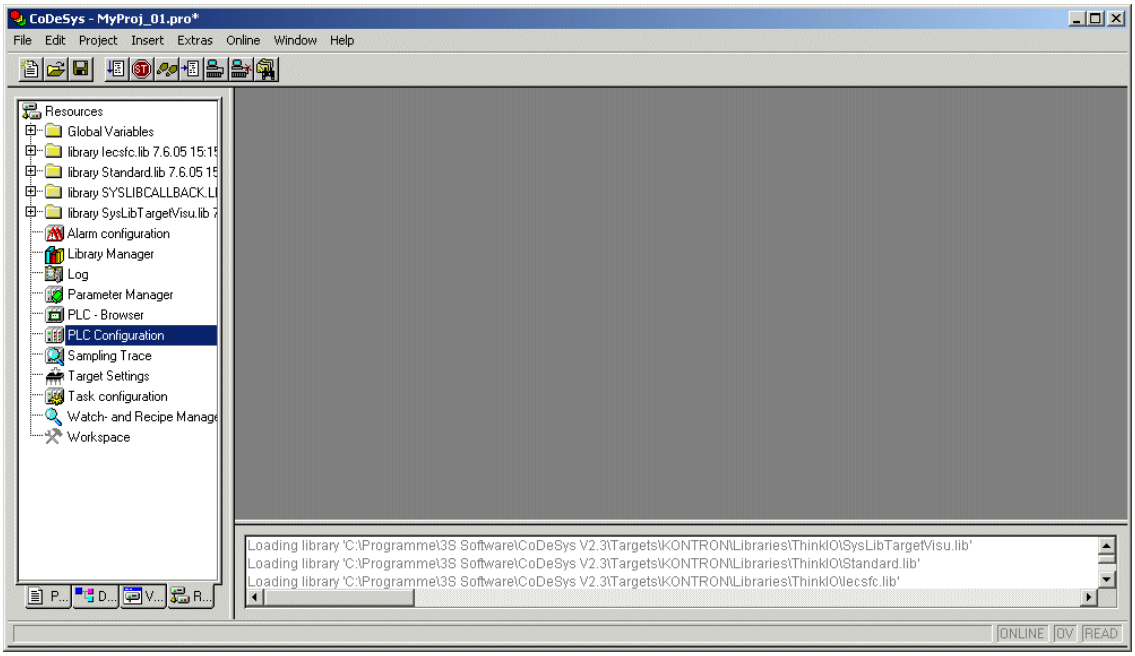
To add and configure K-Bus I/O modules using the K-Bus configurator, perform the following:

PROCEDURE START: Configuring K-Bus I/O modules

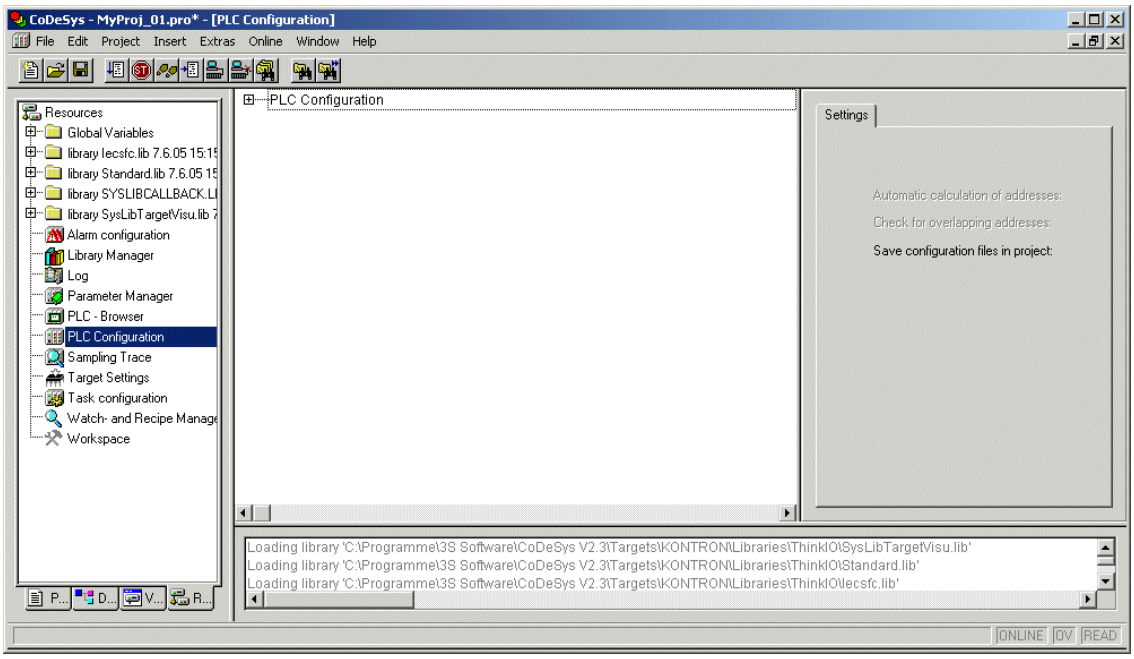
1. Initial screen (same as in section 6.1, after step 8)



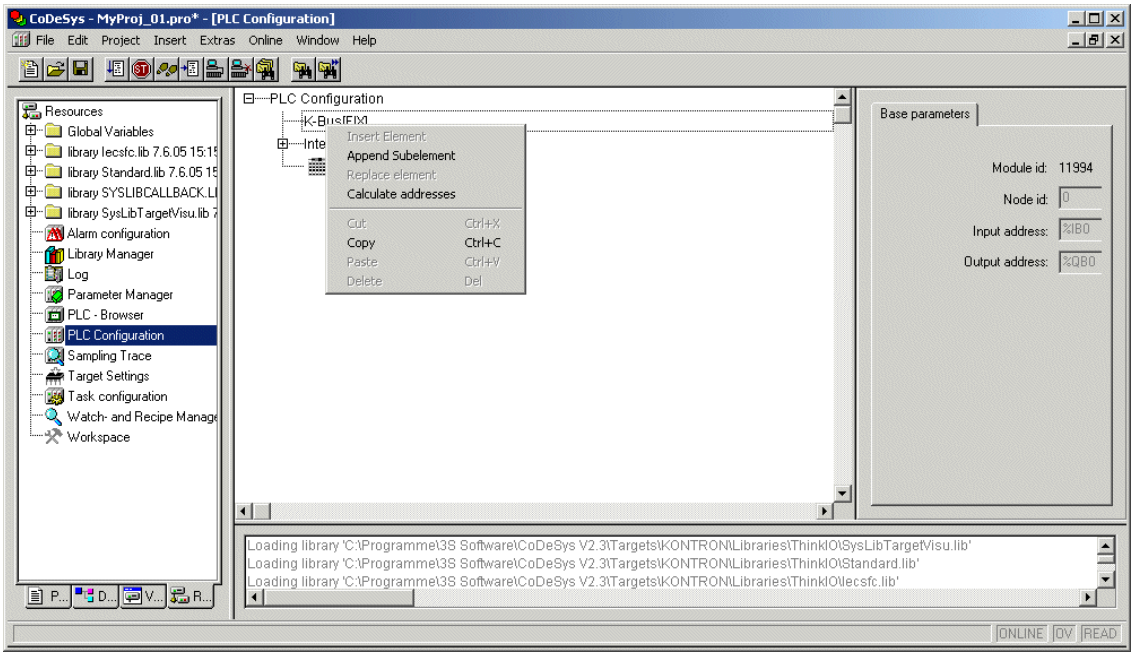
2. Click the **Resources** tab

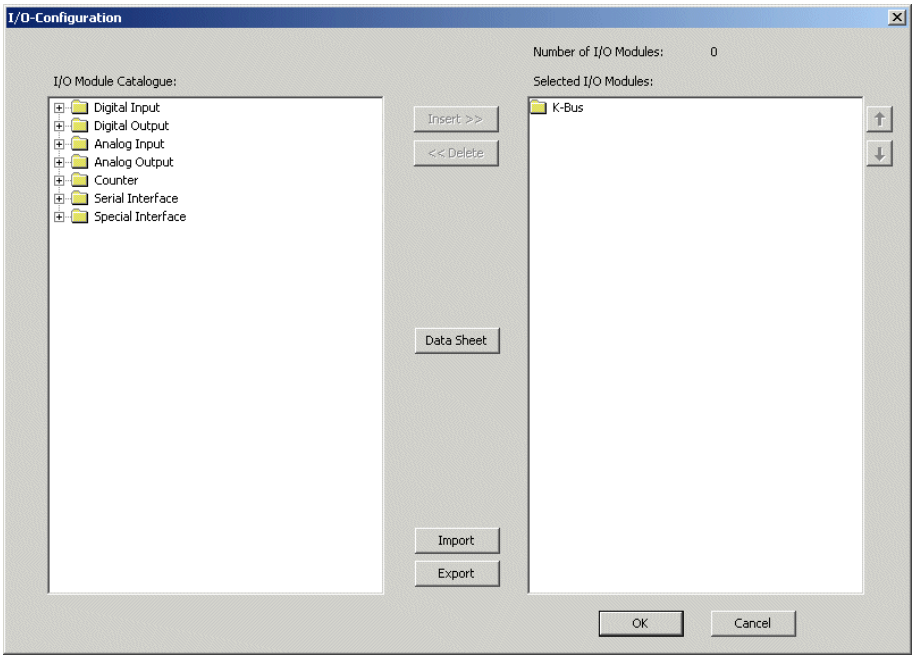


3. Double click **PLC Configuration** in the resources area



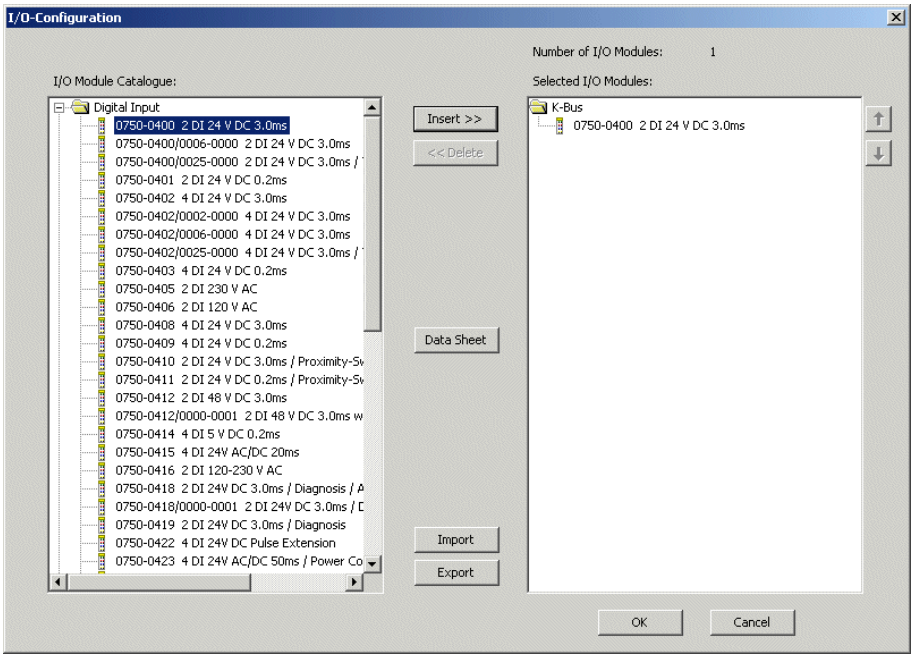
4. Double click **PLC Configuration** in the work space area to the right of the resources area, then right click **K-Bus**, then click the **Append Subelements**

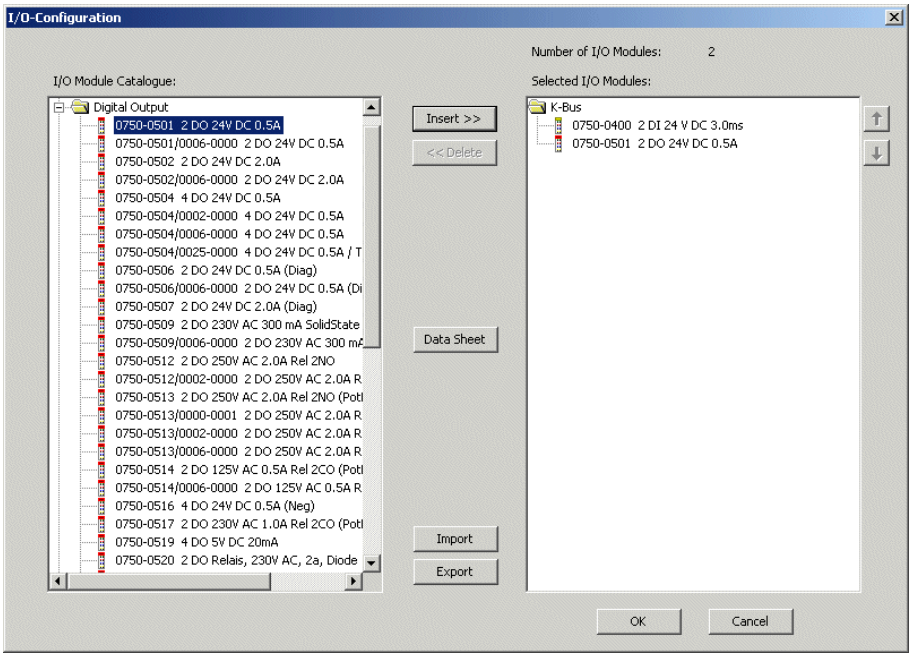




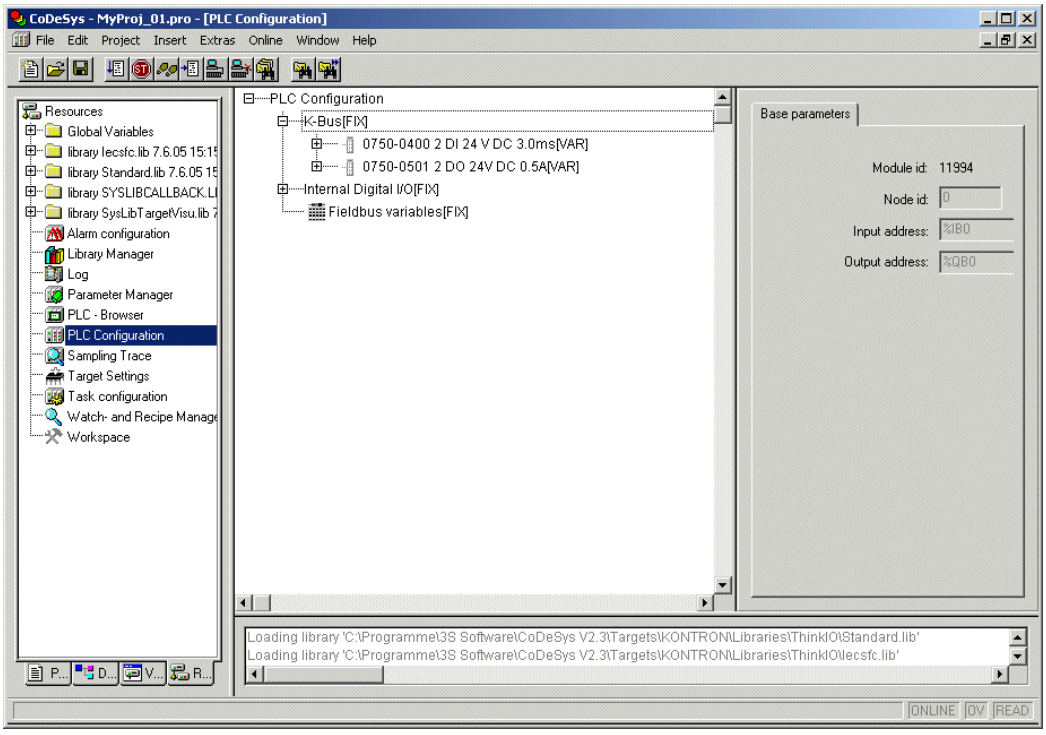
5. Select the input or output module which is to be added to the configuration:
   - Select the module to be added from the **I/O Module Catalogue** list
   - Click **Insert**
   - If more than one module is to be added to the configuration, repeat the above until all modules have been selected

   The following screens indicate the selections required for the sample system.



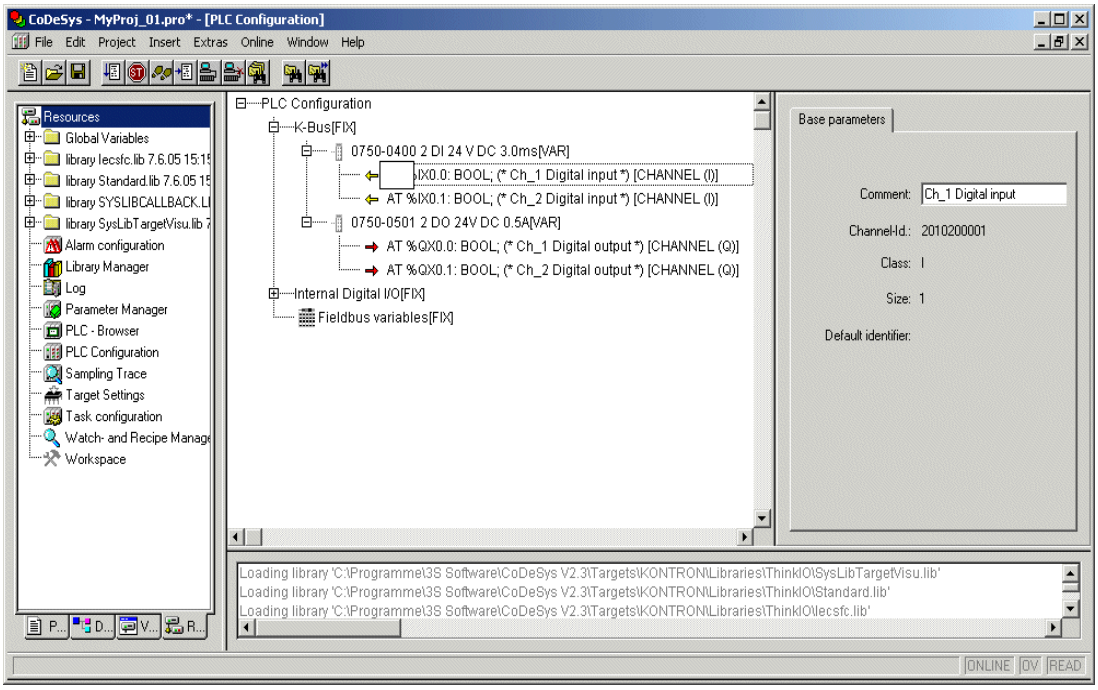


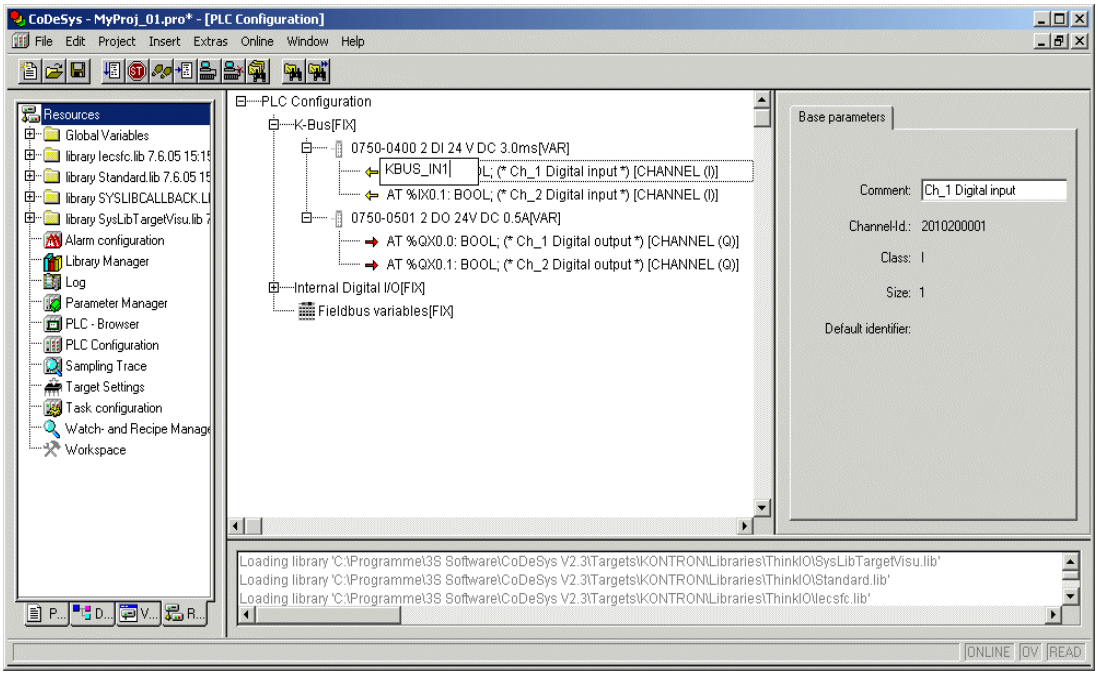
6. Click OK to add the selected modules to the configuration



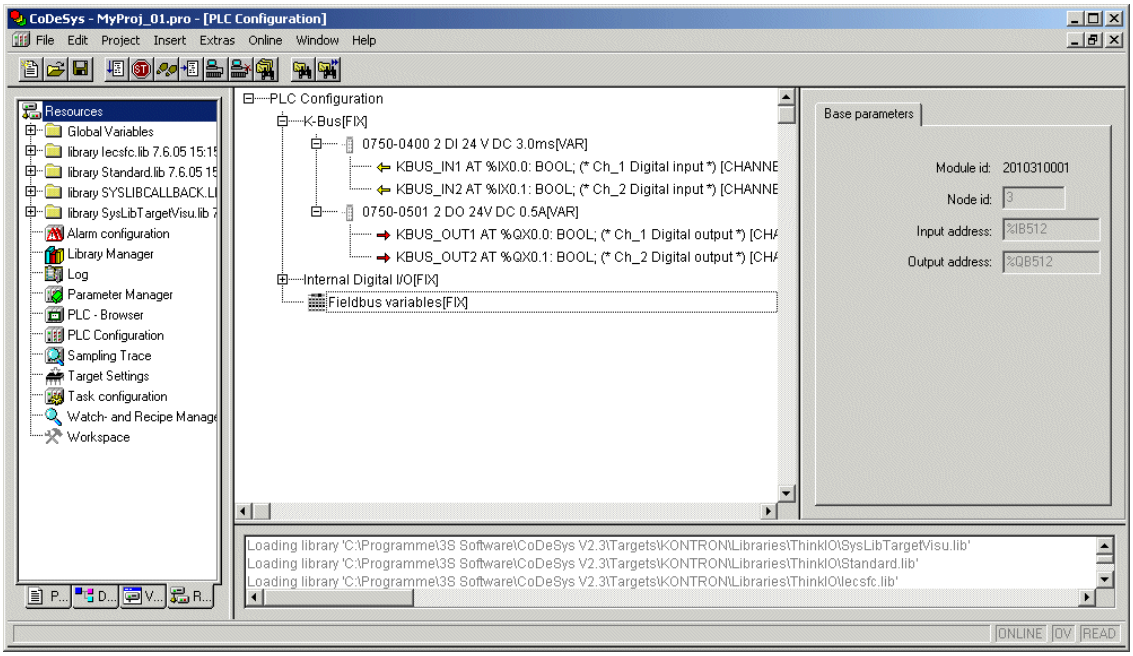
29867.06_01.VC.070319/151249

7. Assign variables to the addresses of the inputs or outputs of the modules for use within the application. (e.g. module 750-400 with variable names KBUS_IN1, KBUS_IN2 and module 750-501 with variable names KBUS_OUT1, KBUS_OUT2)
   - to assign a variable to an input or output of a module, first expand the module by clicking the plus sign (+) in front of the module designator, click the input/output to highlight it, then click "AT" at the beginning of the address of the module to open a text insertion box
   - type the variable name in the text insertion box, then press **<ENTER>** to accept the name and close the box
   - repeat the above until all inputs and outputs have been assigned variable names





29867.06_01.VC.070319/151251



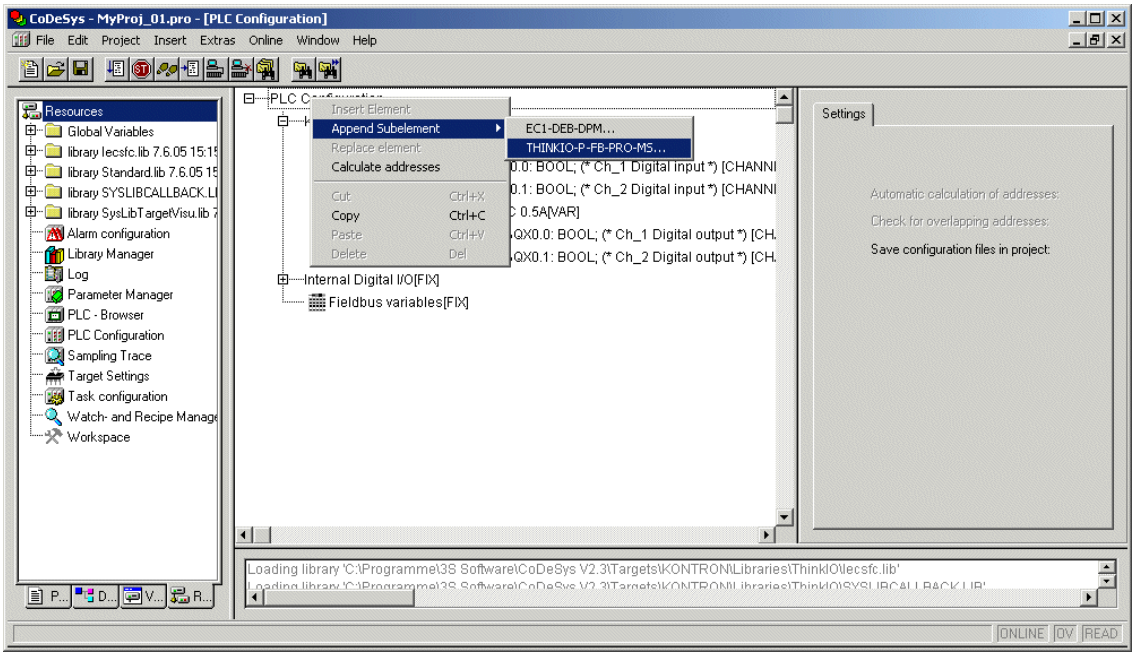
PROCEDURE END: Configuring of the K-Bus modules is now complete

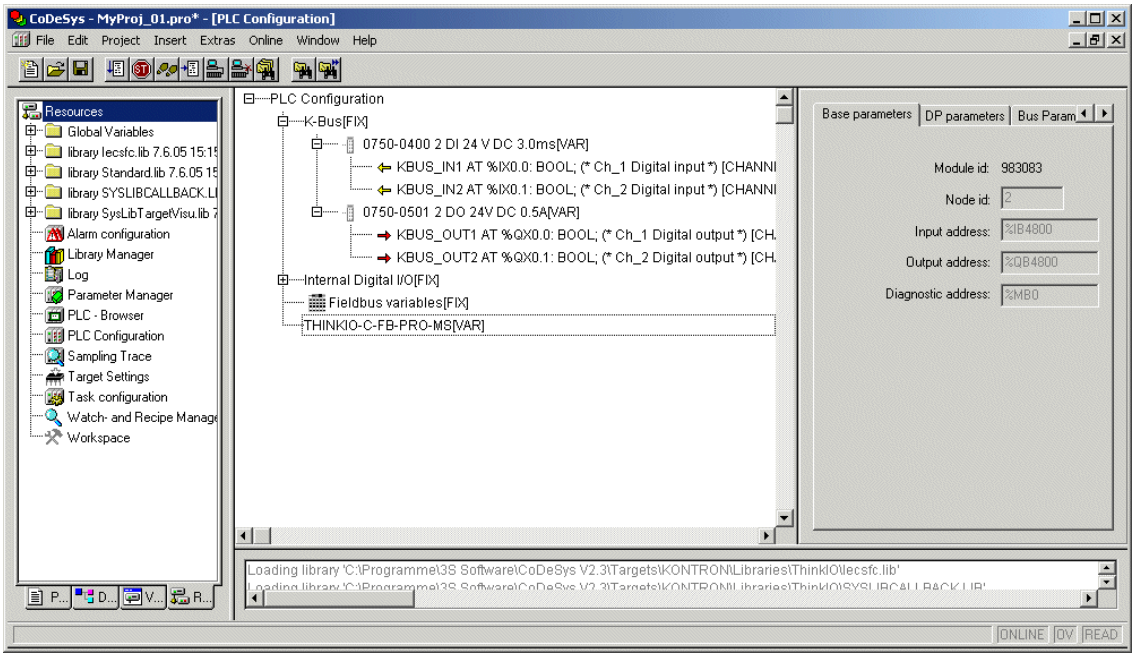
6.2.2 Configuring a Fieldbus

Fieldbus devices must be configured before application programs can access them. The CoDeSys IDE programming software is capable of configuring these devices. The following procedure demonstrates how to configure a PROFIBUS DP master device.

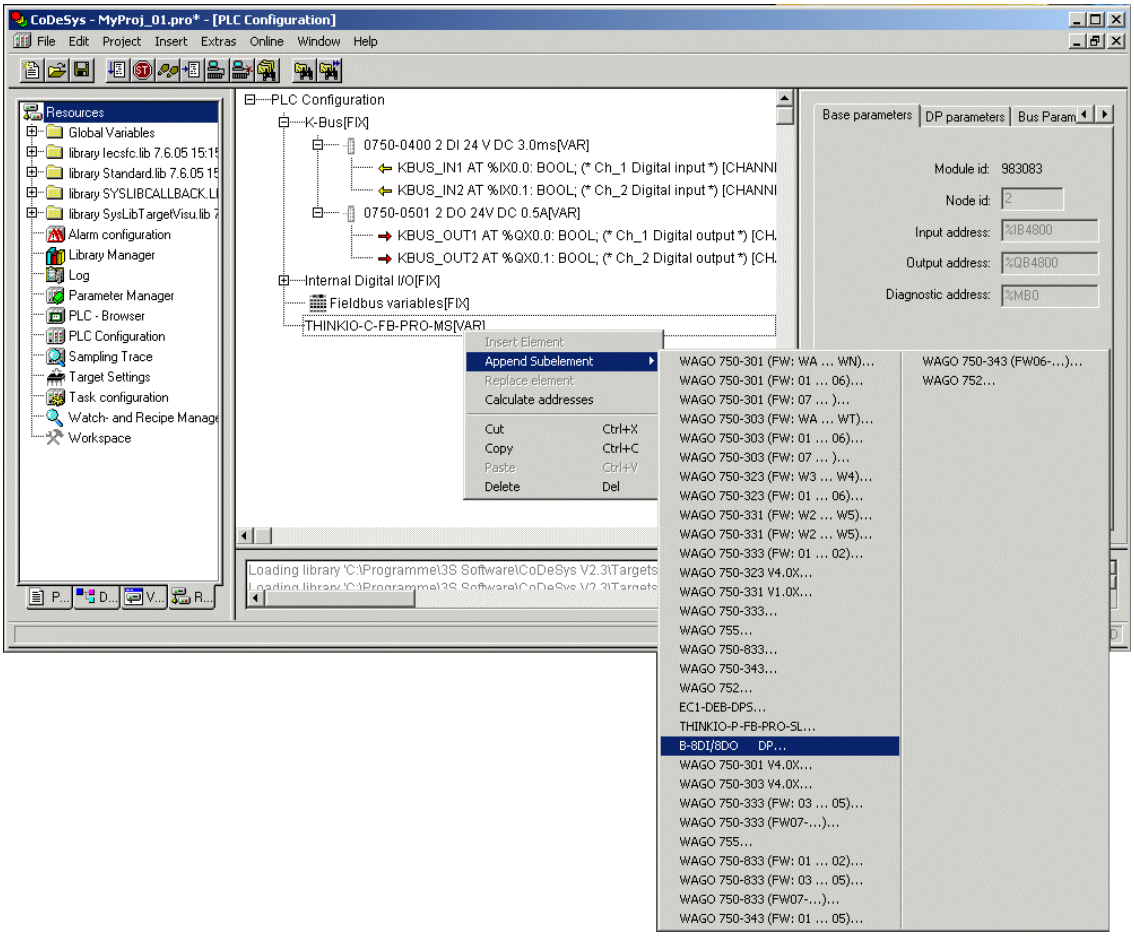
PROCEDURE START: Configuring a fieldbus - PROFIBUS DP Master

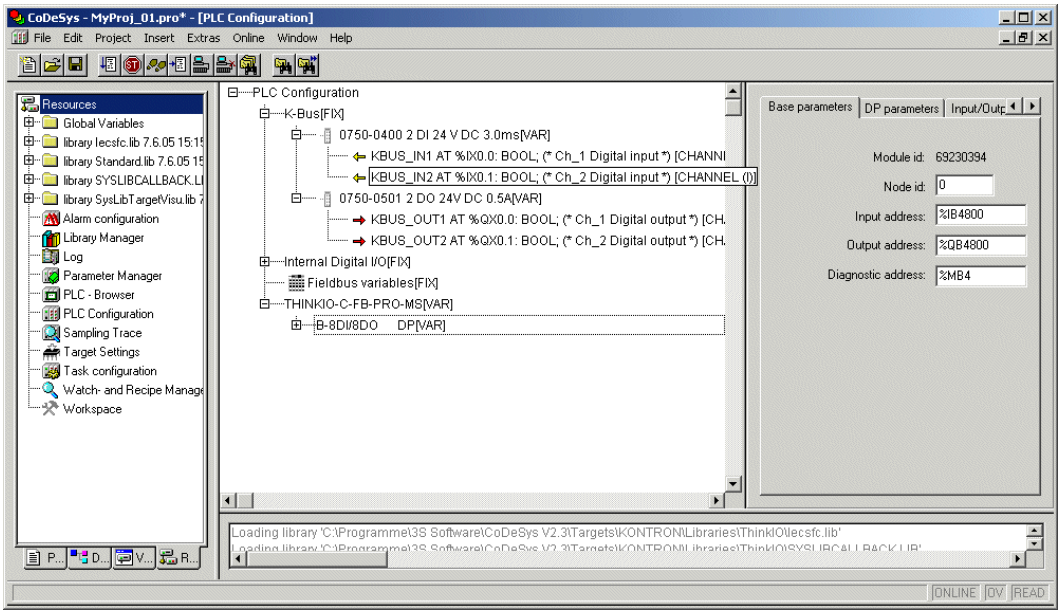
1. Right click **PLC Configuration**, select **Append Subelement**, then click **THINKIO-C-FB-PRO-MS…**





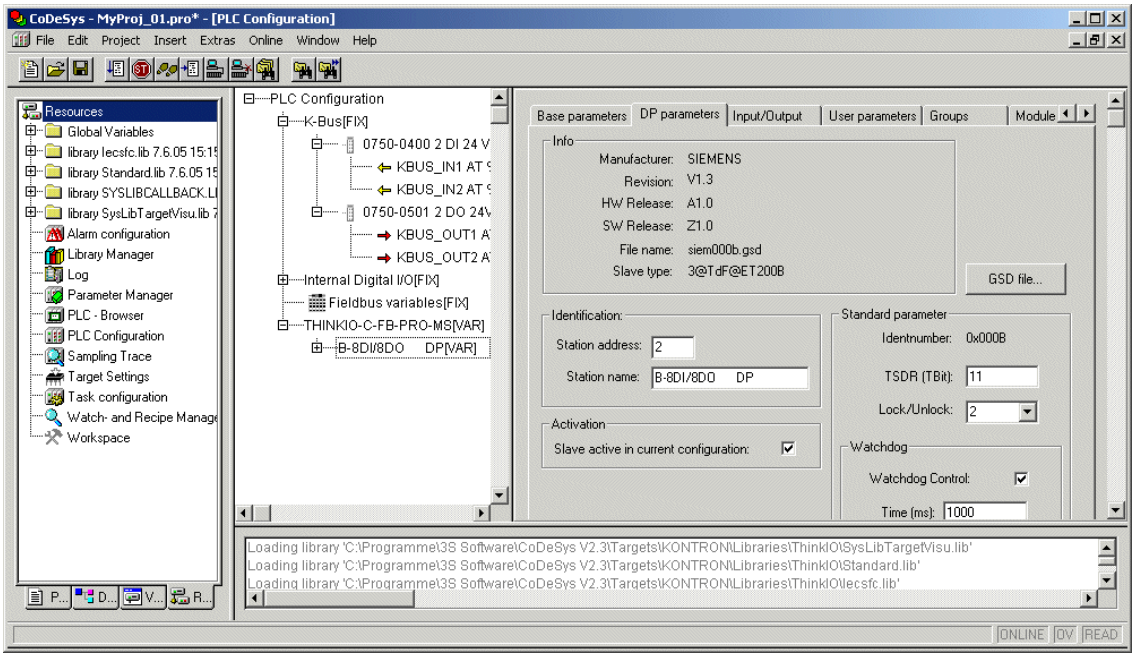
2. To add PROFIBUS slaves (in this case Siemens Slaves ET 200B 8DI/8DO):
   - Right click **THINKIO-C-FB-PRO-MS[VAR]**, select **Append Subelement**, then click **B-8DI/8DO**



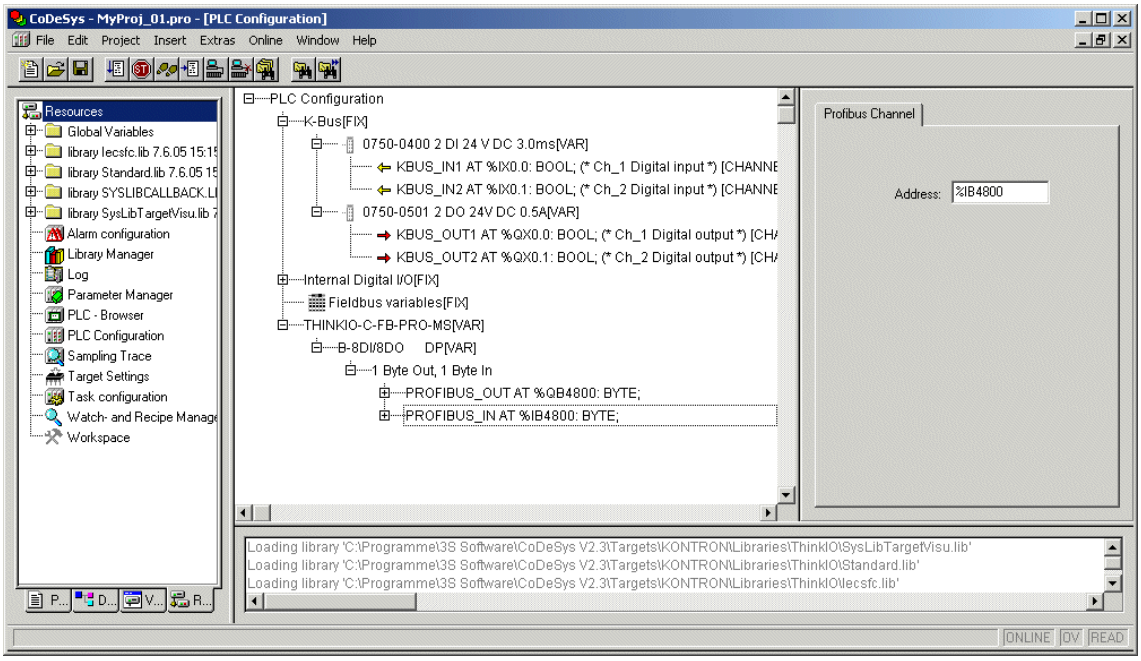


3. Ensure that the **Station address:** for PROFIBUS specified under tab **DP parameters** is correct

   The **Station address:** is automatically generated for the first node. This entry should match the node address set on the PROFIBUS slave DIP switches.



4. Assign variables to the addresses of the fieldbus I/O modules and use the variable names in the application. (e.g. PROFIBUS output with variable name: **PROFIBUS_OUT** and PROFIBUS input with the variable name: **PROFIBUS_IN**)



PROCEDURE END: Configuring fieldbus - PROFIBUS DP Master - now complete

6.3 Writing a Test Application

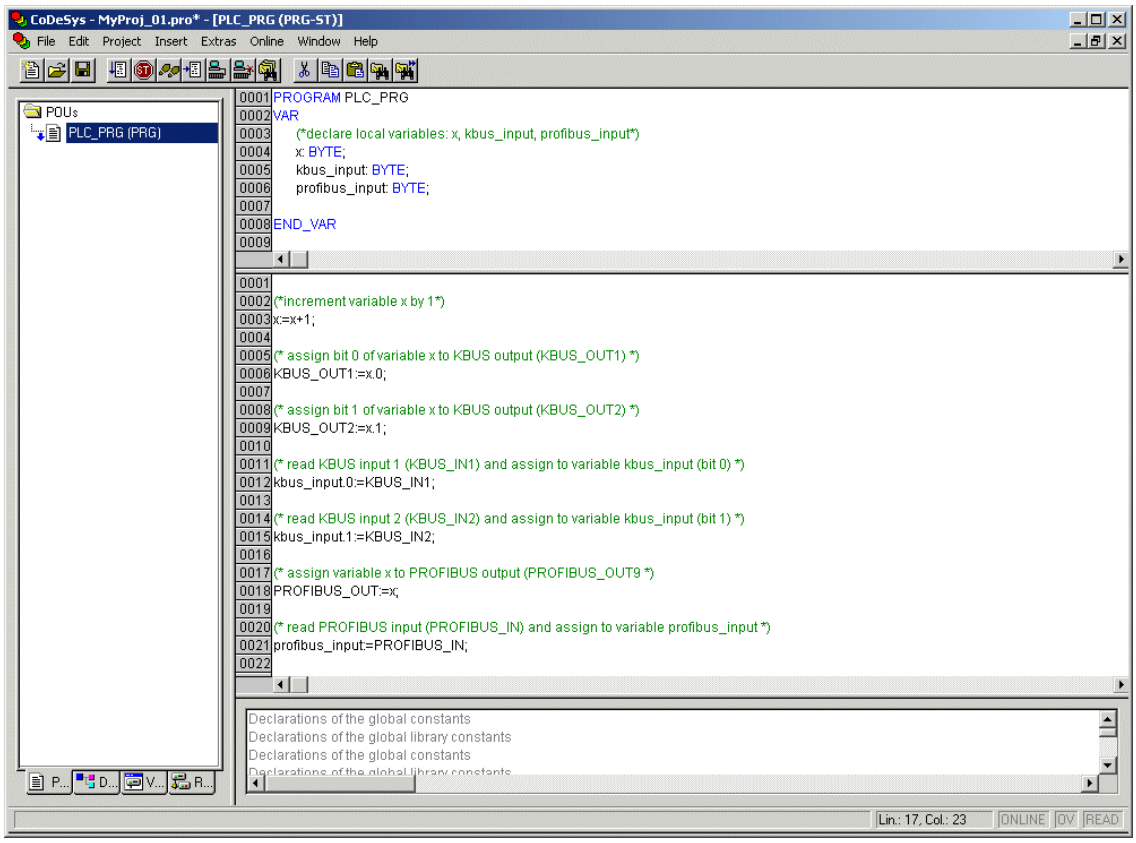
A new POU “PLC_PRG“ is created using the programming language ”ST“.

The following simple application will:

- make a simple assignment in the statement part of the program
- count the variable x
- assign bit 0 of variable x to KBUS output 1 (KBUS_OUT1)
- assign bit 1 of variable x to KBUS output 2 (KBUS_OUT2)
- read KBUS input 1 (KBUS_IN1) and assign to variable kbus_input (bit 0)
- read KBUS input 2 (KBUS_IN2) and assign to variable kbus_input (bit 1)
- assign variable x to PROFIBUS output (PROFIBUS_OUT)
- read PROFIBUS input (PROFIBUS_IN) and assign to variable profibus_input

If the test program can be compiled without any problems it can then be loaded into the ThinkIO-P PROFIBUS Master.

PROFIBUS will be automatically initialized when the user program starts. The I/O communication with the slave and reading from and writing to K-Bus modules will start when the program starts.

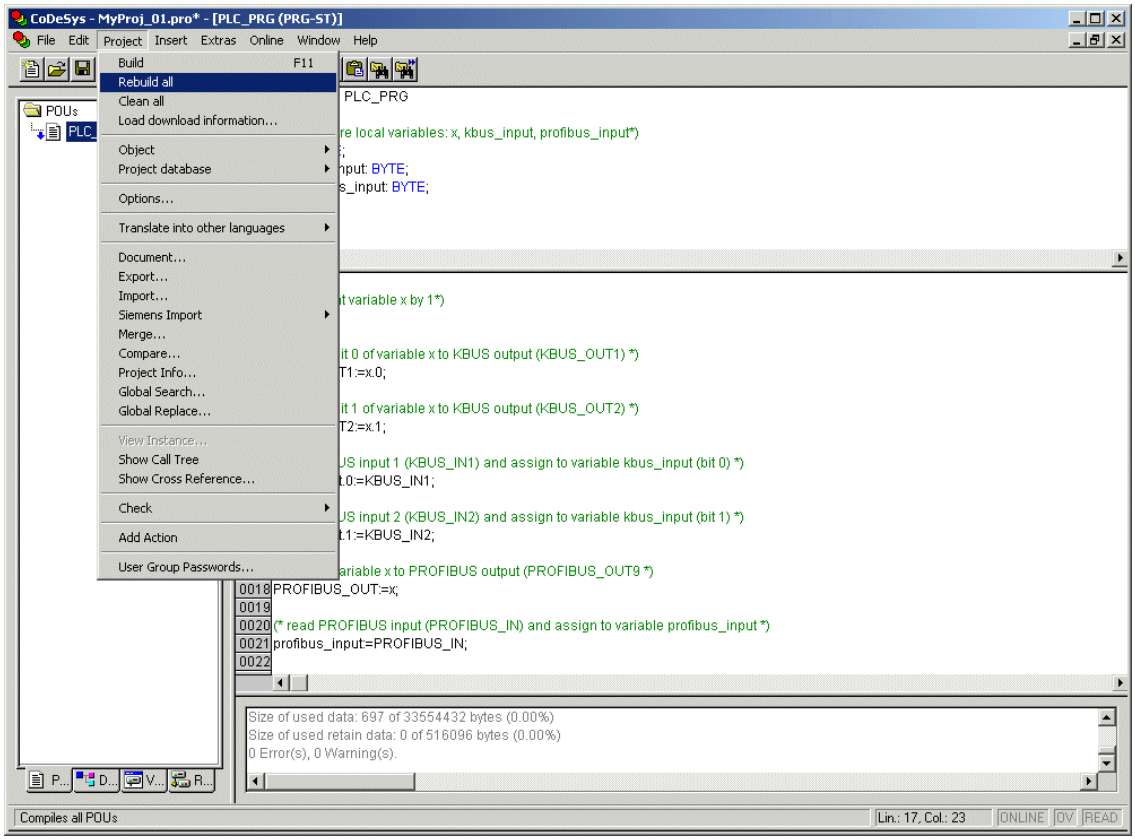


6.4 Creating a Visualization

In the object organizer at the bottom left select the third tab from the left, named Visualization. Use the object organizer's quick menu to call the Add object command. Give the visualisation object a Name. The first visualization object must be named as PLC_VISU. You can use the visualization object for target visualization and for Web visualization.

6.5 Compiling the Project

The compilation is started by selecting **Project** and then clicking **Rebuild all**.

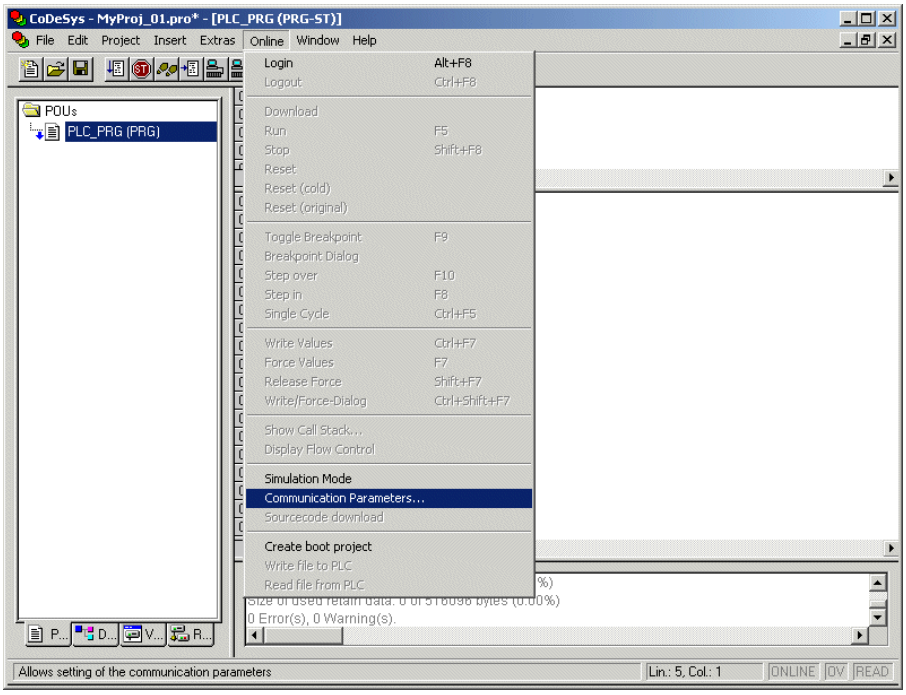


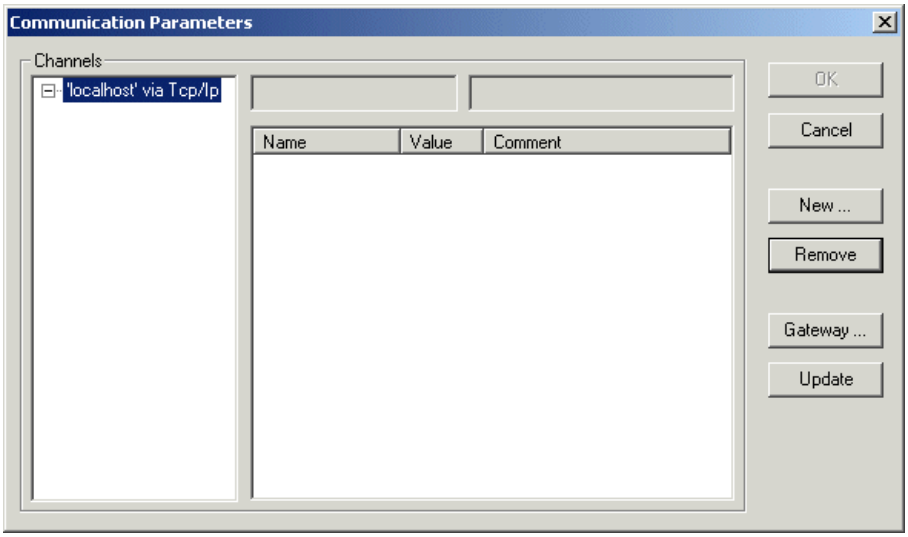
6.6 Setting Up the Gateway Server for Communication

Any time it is necessary to communicate with a ThinkIO-P (e.g to download a project) a gateway server is required to be operating using preselected communication parameters. When needed, the gateway server will be started automatically (if not already running) by the CoDeSys IDE. Before the gateway server can communicate with the ThinkIO-P, however, certain parameters must be set. This is accomplished as follows.

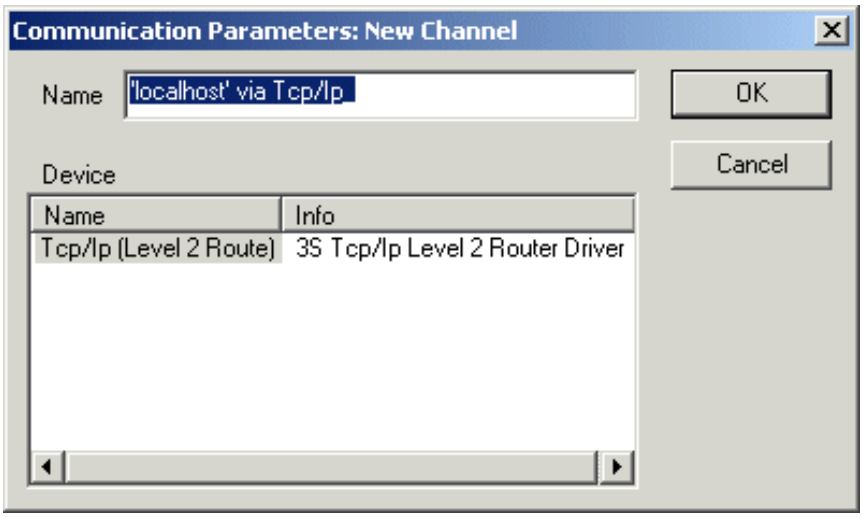
PROCEDURE START: Setting up the communication parameters

1. Select **Online**, then click **Communication parameters**

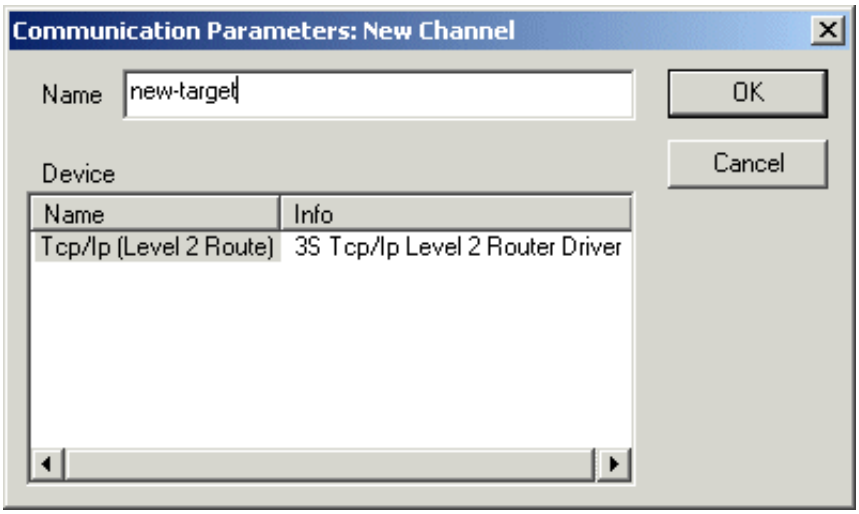




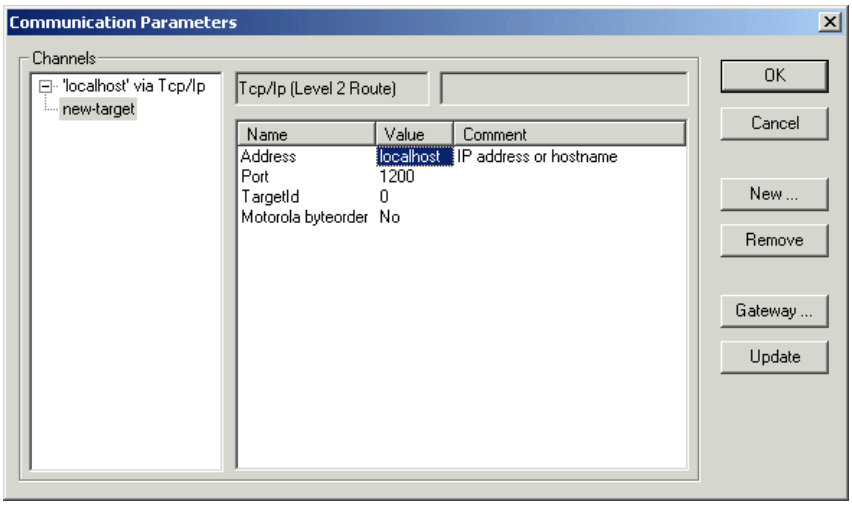
2. Click **New**



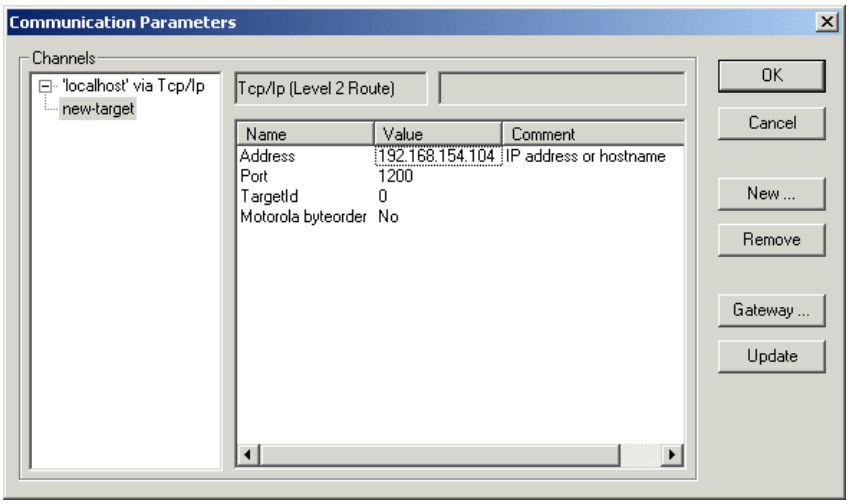
3. Enter an appropriate name for the connection and then click **OK**



4. Select a device from the **Device list**, then click **OK**



5. Enter the IP address or the target name in **Value** for the **Address**, then click **OK**

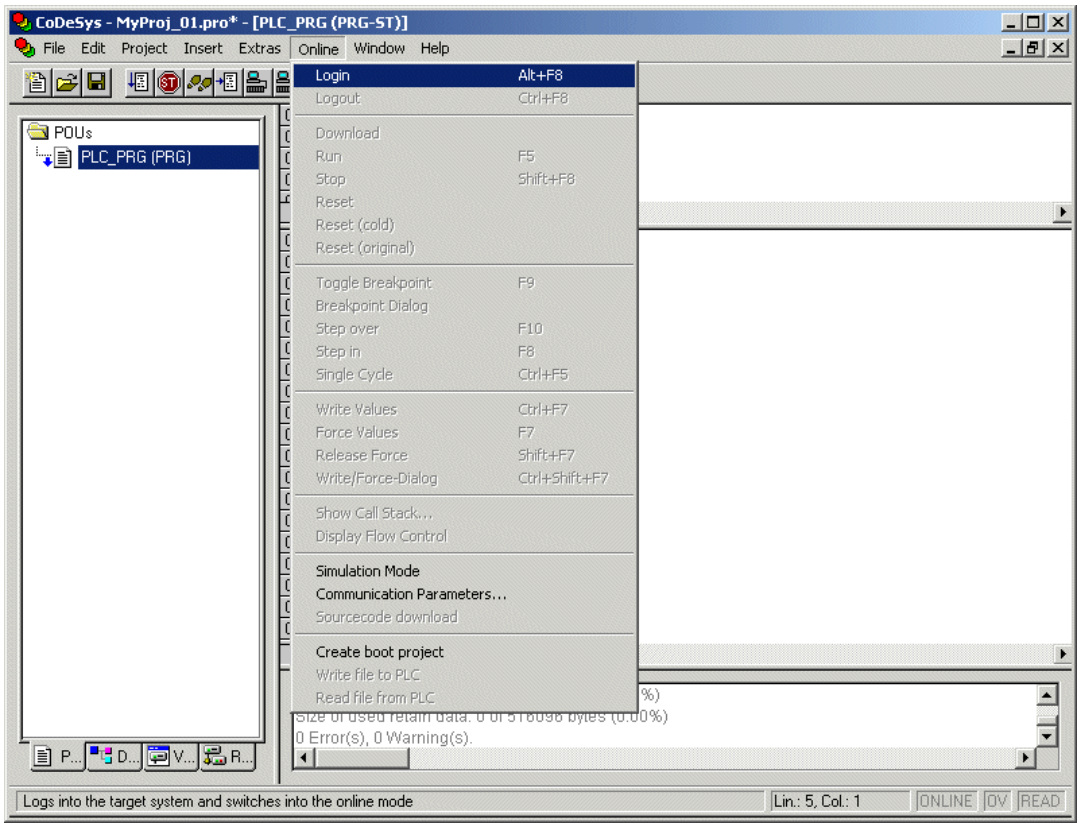


PROCEDURE END: Setting up of the communication parameters is now complete

Now the communication parameters are stored along with the project currently loaded in the IDE.

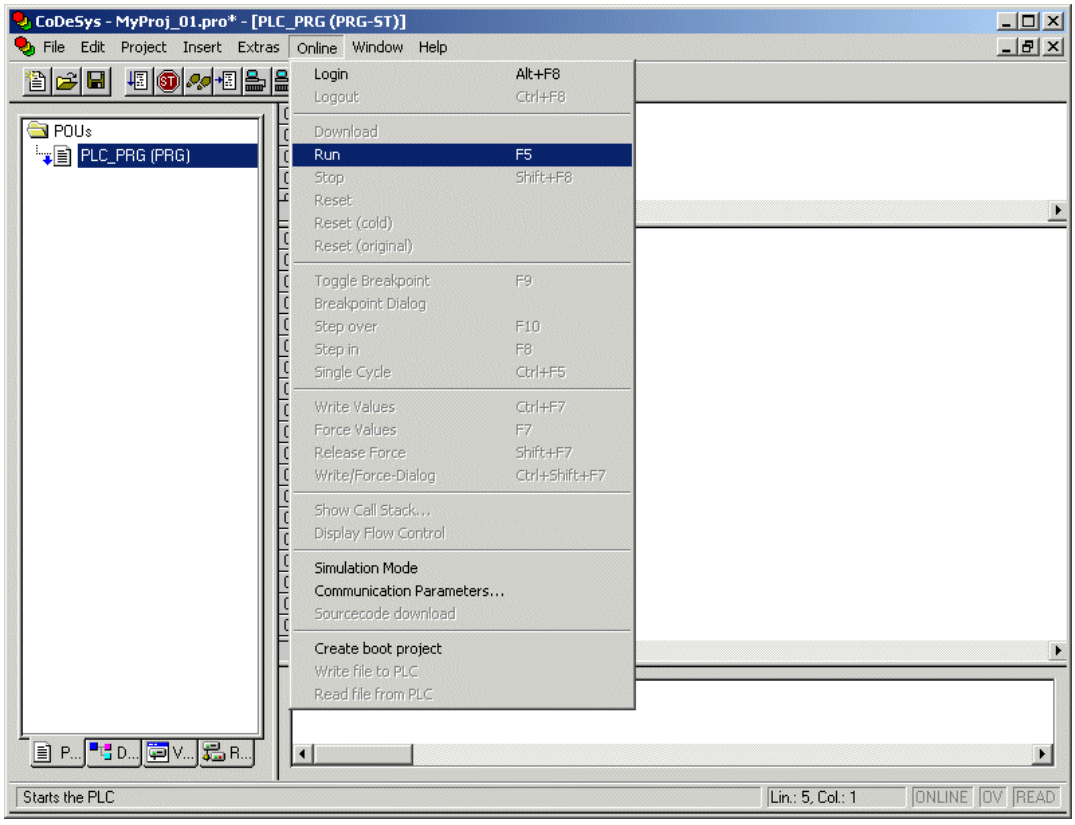
6.7 Download the Program

To download the program select **Online** and then click **Login**.



6.8 Start the Program

To start the program select **Online** and then click **Run**.



7. Transfering an Application to the ThinkIO-P

One way to transfer a CoDeSys application program to the ThinkIO-P is to log in to the ThinkIO-P from the host PC and transfer the application using the CoDeSys Development Environment. This requires an Ethernet network connection.

Another way is the on-the-fly update of a CoDeSys boot project from an external non-bootable CompactFlash card. First, on the host PC, create a CoDeSys boot project and transfer it to the CompactFlash card to the directory "/data" in the "root" directory. The boot project files must be renamed to: DEFAULT.CHK and DEFAULT.PRG.

Then, after ensuring that the ThinkIO-P is switched off, insert the CF card in the ThinkIO-P and restart it. At boot time the ThinkIO-P detects the files "/data/DEFAULT.CHK" and "/data/DEFAULT.PRG" on the external CompactFlash, and then "/data" will be recursively copied to the onboard Flash memory "/data" directory (read/writable partition). After the copying is finished, halt the system, turn power off, remove the external CompactFlash card, and reboot the system.

A third way is to transfer the boot project using ftp into the "/data" directory on the ThinkIO-P. After the transfer is finished, log in to the ThinkIO-P per telnet or directly from the console. Now run the "sync" command and then reboot the system. This solution can be used only if enough memory is available on the onboard flash.

29867.06_01.VC.070319/151310