

SIEMENS

SIMATIC

SIMATIC C7-621 AS-i Control System

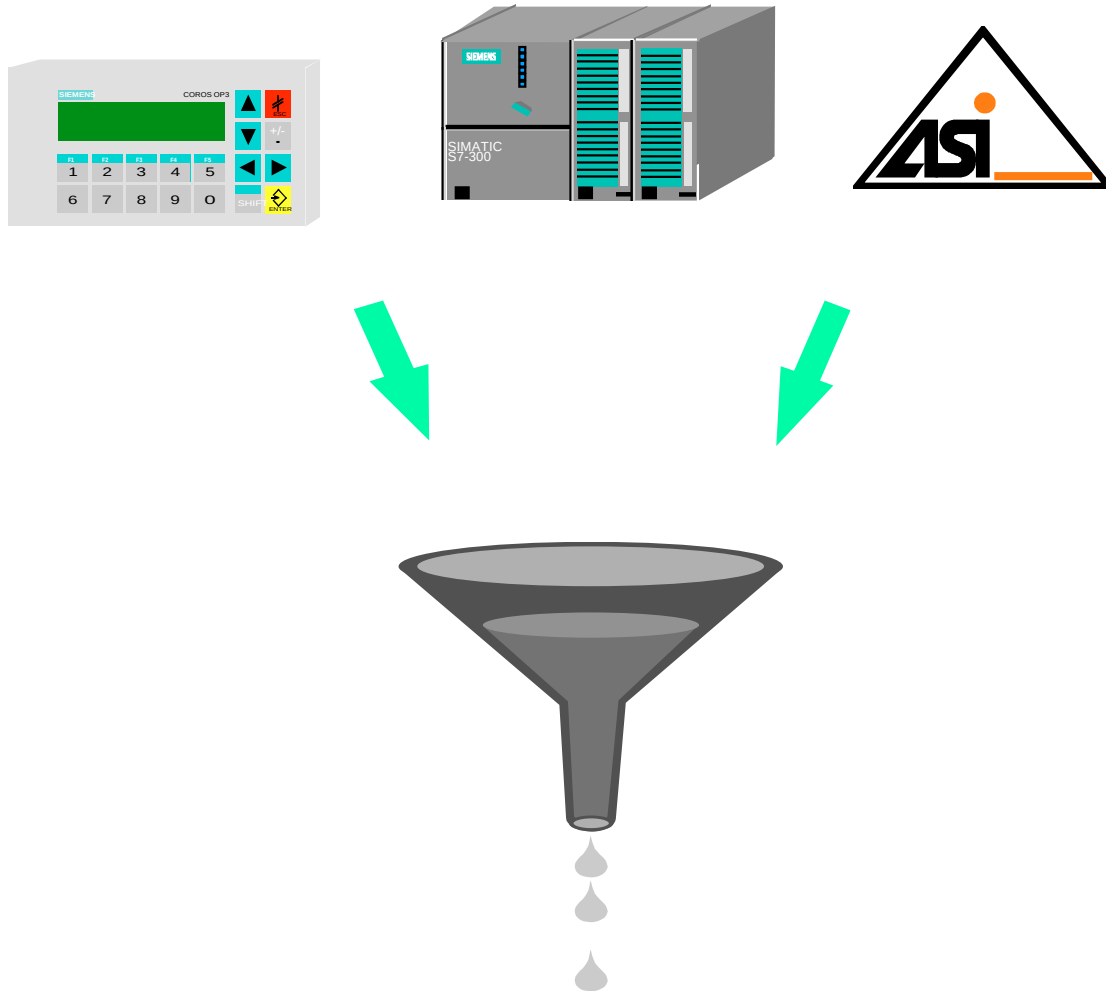
First steps with STEP 7-Mini and ProTool/Lite

Guide

Edition 07/1999

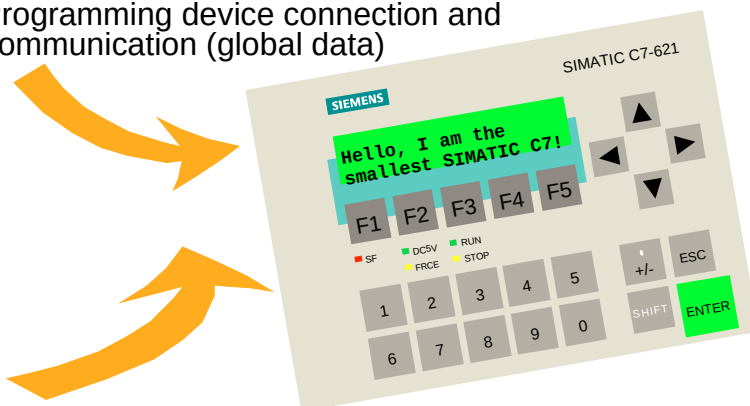
AppendixZentralbaugruppe / Central Processing Unit

6ES7 613-0CA00-1CA0	6ES7 626-2AG02-0AE3
6ES7 613-1CA02-0AE3	6ES7 626-2CG01-0AE3
6ES7 621-1AD02-0AE3	6ES7 626-2DG04-0AE3
6ES7 621-1AD00-6AE3	6ES7 630-0DA00-0AB0
6ES7 621-6BD02-0AE3	6ES7 633-1DF02-0AE3
6ES7 623-1AE01-0AE3	6ES7 633-2BF02-0AE3
6ES7 623-1CE01-0AE3	6ES7 633-2BJ02-0AE3
6ES7 623-1DE01-0AE3	6ES7 634-1DF02-0AE3
6ES7 624-1AE01-0AE3	6ES7 634-2BF02-0AE3
6ES7 624-1DE01-0AE3	6ES7 635-2EB02-0AE3
6ES7 626-1AG02-0AE3	6ES7 635-2EC02-0AE3
6ES7 626-1CG02-0AE3	6ES7 636-2EB00-0AE3
6ES7 626-1DG04-0AE3	6ES7 636-2EC00-0AE3



MPI interface

Programming device connection and communication (global data)



AS-Interface master

Can control up to 31 slaves

Up to 248 binary elements

External I/O extension

Interface for connecting an expansion unit



Introduction

The SIMATIC C7-621-AS-i control system gives you a variety of options for clearly structured, convenient automation, operation and monitoring of your process. The integrated AS-Interface allows high-powered automation solutions at the process level.

This brochure shows you how easily and quickly you can solve your tasks with the C7-621-AS-i, the programming software STEP 7 or STEP 7-Mini^{*)} and the configuring software ProTool or ProTool/Lite^{**)} under Windows 95. We take a sample assignment from real life and show you **how to solve it step by step**.

In self-contained chapters, we explain the essential functions of the SIMATIC C7-621-AS-i, typical tasks on a sample system, and further tips and tricks.

All chapters are structured as follows:

First the task is explained.

Then the individual solution steps are described, with the help of selected dialog boxes.

Finally, we show you the result so that you can check your own result immediately after each programming/configuring step.

Conventions:



A mouse indicates that entries are to be made on the PC/programming device.



This hand indicates that you are to make entries/perform operations on the C7-621-AS-i control system.

A hand pointing upward indicates that you must work with AS-i slaves.

system_1.pdb

Texts to be configured, program parts to be programmed, or entries to be selected from existing possibilities appear in Courier.

File → New

Menus, menu items, dialog boxes or texts in dialog boxes that you select are written in *italics*.

^{*)} referred to simply as STEP 7 below

^{**)} referred to simply as ProTool below

Checklist for startup

The following basic steps are necessary for starting up the SIMATIC C7-621-AS-i:

- Install STEP 7 or STEP 7-Mini on PC/programming device
- Install ProTool or ProTool/Lite integrated under STEP 7 or STEP 7-Mini on PC/programming device
- Connect C7 to power supply (+24V)
- Connect power pack to C7-AS-i port
- Set up AS-i network
- Set addresses of slaves and parameterize C7-AS-i-CP
- Select STEP 7-Mini on programming device/PC and create PLC program
- Connect C7 ↔ PC/programming device via PC/MPI cable
- Overall reset of C7-CPU and C7-OP
- Transfer PLC program to C7
- Select ProTool/Lite on programming device/PC and create OP configuration
- Transfer configuration to C7

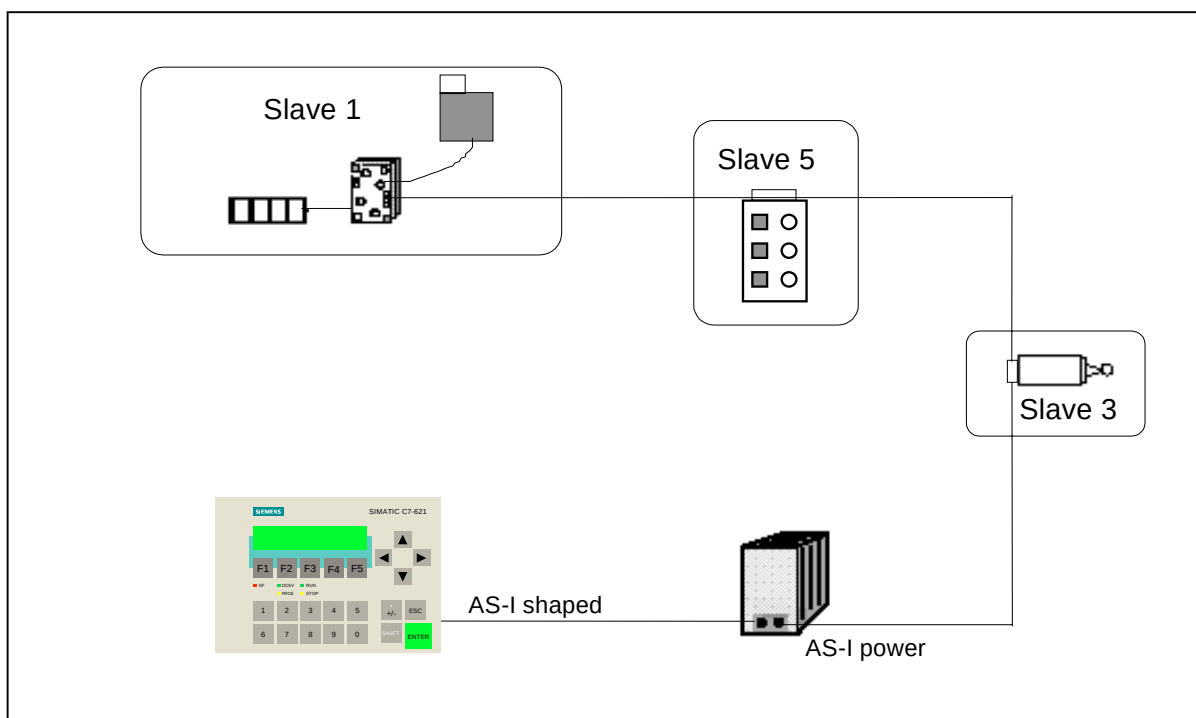
Setup and Configuration of the AS-i Network

Before you actually program your automation solution, you must set up your system and connect and parameterize the AS-i components involved.

The yellow AS-i shaped cable enables fast and easy installation of your slaves in the AS-i network. This cable is the transmission medium for communication between the master and the stations. It also carries the supply voltage for the stations. A slave is identified by its address, which is always stored in non-volatile memory in the slave.

On delivery, all slaves have the address “zero” by default. Each slave in the network must have a unique address that is not “zero”.

The C7-621-AS-i allows you to change the set address of a slave through operation on the C7. When using the C7 addressing function, it is therefore necessary to connect all new slaves to the AS-i cable consecutively to ensure that they are each assigned a unique address.



Set up your AS-i network according to the diagram above. Connect your slave 1 to your yellow AS-i shaped cable. If you have problems connecting the slaves to the AS-i cable, please read the setup instructions supplied with the AS-i components.

The C7-CPU must be in STOP mode for you to be able to configure your AS-i network.

On the C7-621-AS-i control system, select the System Functions menu by pressing the

SHIFT

0

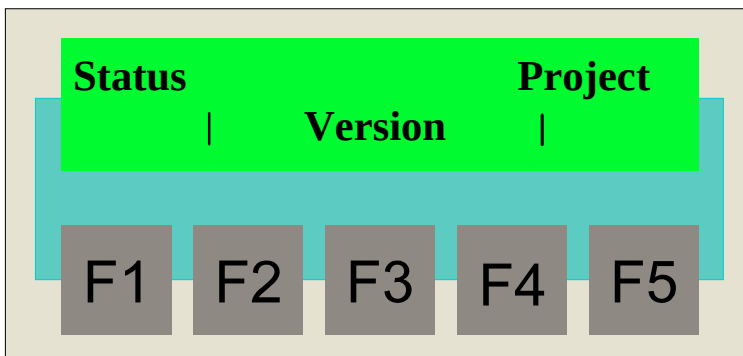
Press **F1** to select the C7 System Functions menu.

Press **F3** to select the operating mode STOP. The STOP LED lights up.

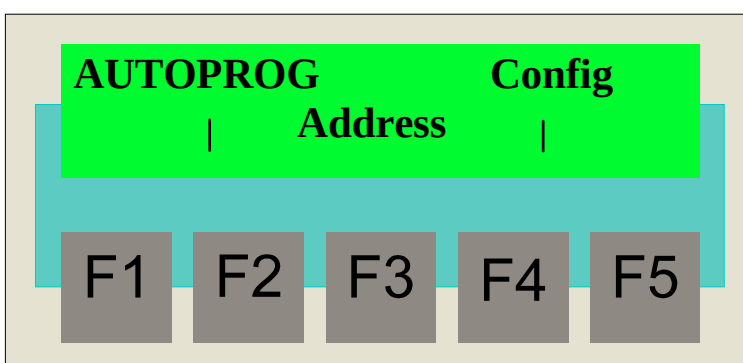
If a password has not yet been entered, the system requests one. When the C7 is shipped, the password is preset to 100. Enter the digits 100 via the numeric keypad and confirm your input with ENTER. Select the operating mode STOP.

To quit the mask, press the **ESC** key once.

Now press the **F5** key to display the start menu for the individual AS-i functions.



In the start menu for the AS-i functions, select *Project* by pressing **F4** once.

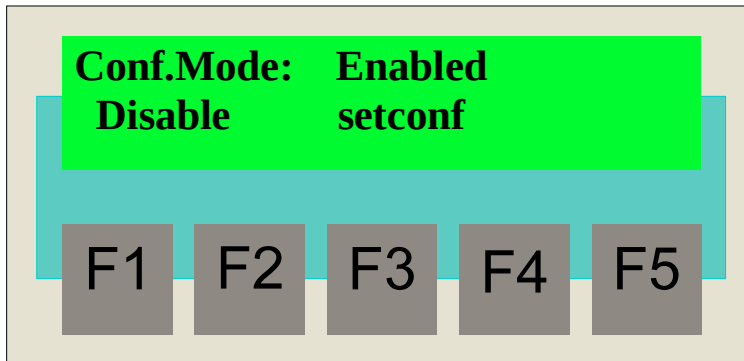


For setting addresses, the mode set for the device must be the configuring mode. When the C7 is shipped, this mode is preset by default.

To check whether the device is in the configuring mode, select *Config* with the **F4** key.

Note:

If the following mask appears, you can skip the next two steps.

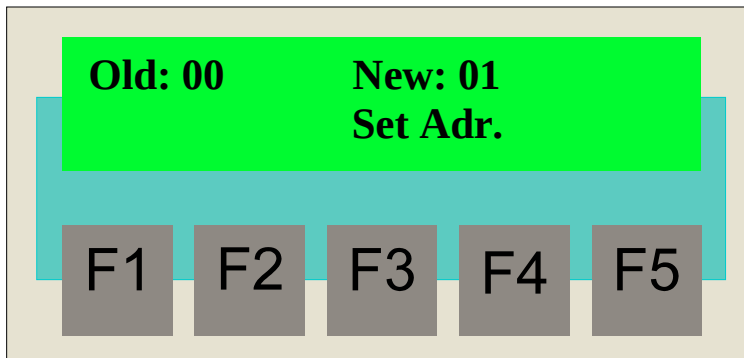


You must switch from protected mode to configuring mode. To do this, press **F2**.

Wait a moment, then press **F5**. If the above mask appears, you may proceed. Otherwise, repeat the last two steps.

Quit the mask by pressing the **ESC** key once.

In the *Project menu*, select the menu item *Address* by pressing the **F3** key. Enter the old address in the first field, and the new address in the second field.



Press **F4** to confirm your entry.

If you have made all the entries and settings correctly, the message *NO_ERROR* will appear in the display of the C7-621-AS-i control system.

Press **F5** to complete the current addressing process.

Connect the next slave to your AS-i shaped cable according to the setup diagram.

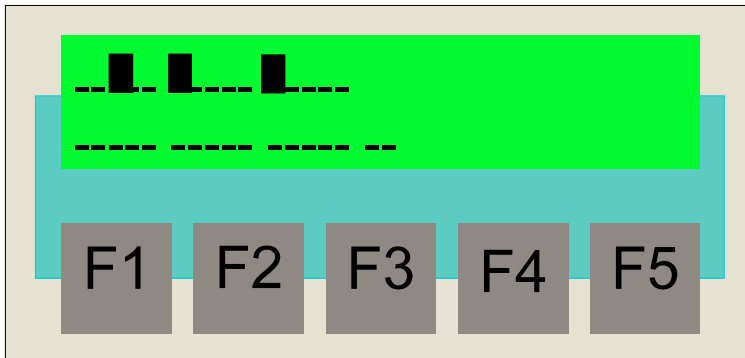
Repeat your entries in the *Address menu* for all slaves used in the application.

Once you have addressed all the slaves, quit the *Address menu* by pressing the **ESC** key twice.

In the menu that now appears, press **F2** to select the *Status* menu.

Press **F2** again to see the status display of the existing and activated slaves.

If you have set up your AS-i network as described, the screen will look like this.



If the display is different from your configuration, please check your settings against the descriptions in the system manual.

Quit the status display by pressing the **ESC** key twice.

Select the *Config menu* by pressing **F4** twice.

Accept the actual configuration recognized by the system as the setpoint configuration. To do this, press **F4** again to call the menu for setting the setpoint configuration.

If you wish you can view the actual configuration again by pressing **F2**. To close the display, press **ESC**.

Press **F4** to accept the current actual configuration as the setpoint configuration.

Press **F5** to confirm the *NO_ERROR* message.

Finally, switch your C7 control system from configuring mode to protected mode. To do this, press **F4** to select the *Config menu* again. Press **F2** to switch to protected mode. Confirm your input with **F5**.

Once the last step is complete, you have set up and configured your first AS-i network. You are now ready to program your control task.

Setting the address areas and accessing the AS-i user data

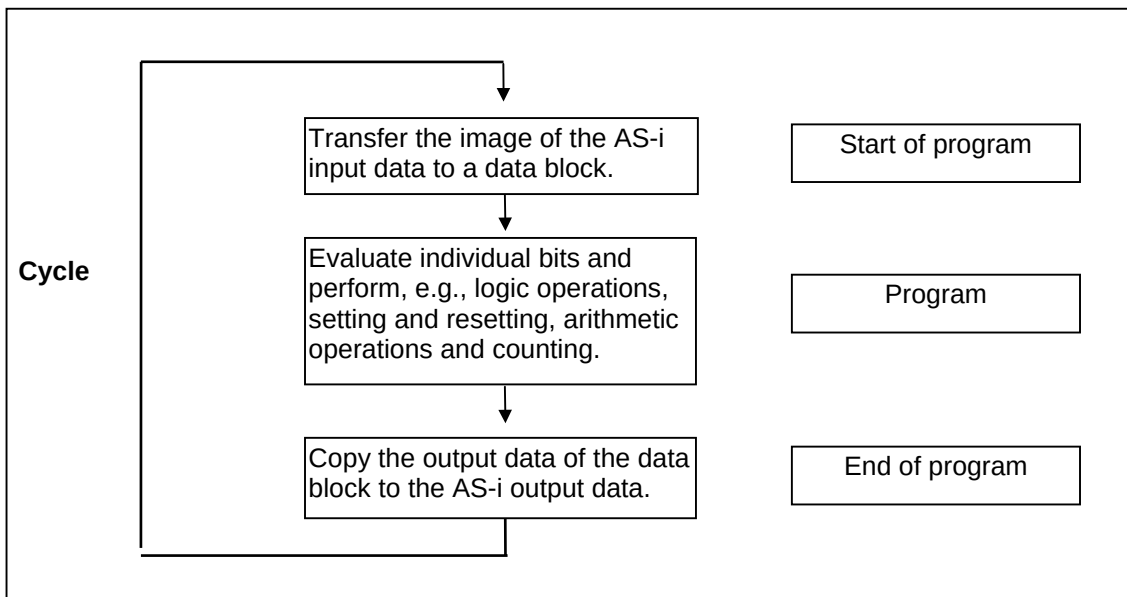
In standard operation, the AS-i communications processor behaves like an I/O module. It occupies 16 input and 16 output bytes in the analog area of the controller. Each slave on the AS-i cable is assigned four bits (a nibble) by the C7-AS-i-CP. The C7-CPU can access a nibble for reading and writing. The start address of this address area is fixed at 256 in the C7-AS-i. For the assignment of the slave I/O bits to the I/O bytes of the C7-CPU, see the AS-i interface table.

Assignment table

I/O-byte number	Bit 7-4	Bit 3-0	I/O byte number	Bit 7-4	Bit 3-0
256	reserved	Slave 1	264	Slave 16	Slave 17
257	Slave 2	Slave 3	265	Slave 18	Slave 19
258	Slave 4	Slave 5	266	Slave 20	Slave 21
259	Slave 6	Slave 7	267	Slave 22	Slave 23
260	Slave 8	Slave 9	268	Slave 24	Slave 25
261	Slave 10	Slave 11	269	Slave 26	Slave 27
262	Slave 12	Slave 13	270	Slave 28	Slave 29
263	Slave 14	Slave 15	271	Slave 30	Slave 31
	Bit 3 Bit 2 Bit 1 Bit 0	Bit 3 Bit 2 Bit 1 Bit 0		Bit 3 Bit 2 Bit 1 Bit 0	Bit 3 Bit 2 Bit 1 Bit 0

The parameters required in the application appear on a gray background.

The diagram below illustrates the access to the input and output data of the individual slaves.



Because the bits of the AS-i line can only be accessed in word mode or doubleword mode, it is necessary to set up a memory data block. In the data block the AS-i data can be accessed in bit mode.

 Select the operating mode STOP by pressing . The STOP LED lights up.

 If a password has not yet been entered, the system requests one. When the C7 is shipped, the password is preset to 100. Enter the digits 100 via the numeric keypad and confirm your input with ENTER. Select the operating mode STOP again.

Deleting the C7-CPU memory / Overall reset of C7-OP

Before you load a project into the CPU for the first time, you must make sure the C7-621-AS-i is in a neutral state. To do this, you must delete both integrated C7 flash memories and then restart the C7-621-AS-i. To delete the C7 flash memories, proceed as follows:

Deleting C7-CPU memory:

In the SIMATIC Manager select the *Accessible Nodes* icon . In the window which appears, open the folders *MPI=2* and *Blocks* by double-clicking on them.

Mark all OBs, FBs, FCs and DBs. Delete the marked objects from the C7-CPU. You have now deleted the load memory of the C7-CPU.

Mark the folder *MPI=2* and copy the contents of the load memory into the C7-CPU flash memory via *PLC → Save RAM to ROM*. You have now deleted the integrated CPU flash memory.

Close the *Accessible Nodes* window.

Overall reset of C7-OP:

Switch off the power supply of the C7-621-AS-i.

Now press the  and  and  keys simultaneously, keep these keys depressed, and switch on the power supply.

Do not release the keys until the message “Flash Test” appears in the display. After the startup tests, the idle message is displayed and the overall reset of the C7-OP too is complete.

Saving RAM to ROM

Because the PLC program, when loaded into the C7-CPU, is only transferred into the unbuffered load memory and not automatically also into the C7-CPU flash memory, the program would be lost when the C7-621-AS-i was restarted. To prevent this, you must copy the PLC program into the flash memory explicitly. Proceed as follows:

- ☞ Call up the System Functions menu by pressing the   keys on the C7-621-AS-i.
- ☞ Press  to call the C7 System Functions menu.
- ☞ Press  to select the operating mode STOP. The STOP LED lights up.
- ☞ If a password has not yet been entered, the system requests one. When the C7 is shipped, the password is preset to 100. Enter the digits 100 via the numeric keypad and confirm your input with *ENTER*. Select the operating mode STOP again.
- ☞ In the SIMATIC Manager select the *Accessible Nodes* symbol  again. In the dialog window displayed, mark the folder *MPI=2*. Copy the contents of the load memory into the C7-CPU flash memory via the menu item *PLC → Save RAM to ROM*. The PLC program is now stored in non-volatile memory in the C7-CPU.
Close the *Accessible Nodes* window.
- ☞ On the C7 621-AS-i, press  to change back to the operating mode RUNP. The RUN LED lights up.

You have completed your first programming task in STEP 7. You can now test the functionality of your sorting system. We will test the programmed count function.

- ☞ To control the function of the counter, click on  in the toolbar of the SIMATIC Manager to go to the online data management. Open the *Function FC2* and select the first network. Then in the menu bar, go into test mode via *Debug → Monitor*.

Network 1 : Count

```

A      DB1.DBX1.0
A      DB1.DBX0.1
A      DB1.DBX4.0
FP     M30.0
CV     C1
L      C1
T      MW22
AN     C1
A      DB1.DBX4.0
L      C#0
S      C1
L      MW22
L      10
>I
R      C1

```

VKE	STA	STANDARD
0	1	7
0	1	7
0	1	7
0	1	7
0	1	7

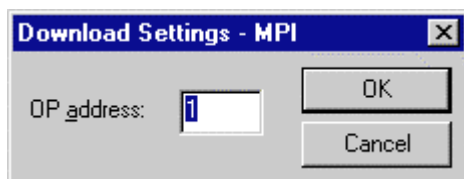
- ☞ Close the LAD/STL/FBD editor and in the SIMATIC Manager your GetStart online project.
- ☞ Open the GetStart folder.

Transferring the configured data

Before the actual transfer, you must perform three steps:

- Save
- Generate the project
- Define the transfer parameters (once only).

- ☞ To save the project, select *File* → *Save* in the menu bar.
- ☞ Then in the menu bar select *File* → *Generate* to generate from the configuration file a file that can be executed on the OP. During the generation process, a status window opens which displays any relevant notes, warnings or errors in the configuration.
- ☞ Finally, set the parameters for the transfer.
In the menu bar, select *File* → *Settings* → *Download*. The following dialog box is displayed:



In the dialog box, specify the OP address (default = 1).

Note

The transfer parameters retain this value; they do not need to be reset before each transfer.

- ☞ Then put the C7-621 into transfer mode with an overall reset:
Switch off the power supply of the C7-621.

Then press the  and  and  keys simultaneously, keep these keys depressed, and switch on the power supply.

Do not release the keys until the message "Flash Test" appears in the display. After the startup tests, the idle message is displayed and the overall reset of the C7-OP too is complete.

- ☞ Once the C7 has been started, select the system screens stored in the firmware with the ENTER key. Press  to select *System* and  to select *OpMode*. Press  and  simultaneously to switch to *MPI down* and confirm your entries with *ENTER*. The message *Ready for transfer* appears on the C7-OP.
- ☞ If a password has not yet been entered, the system requests one. Enter the digits 100 again via the numeric keypad and confirm your input with *ENTER*. Select the operating mode *MPI down* again and confirm with *ENTER*.
- ☞ Now select *File* → *Download* in the menu bar to initiate the data transfer from the PC/programming device to the C7.

Incorporating Standard Screens into the Configuration

At the start of the configuration, you selected the standard screens as the basis for your configuration and saved the file under the new name `System_1`.

You will need the standard screens if you want to use the standard functions of the C7-621-AS-i. These functions include changing the operating mode, editing the password, logging on and off with the password, etc.

Now that you have marked the `Start_Sys1` screen you configured as the start screen, the standard screens incorporated in it can no longer be selected on the OP. So that you can use the standard screens again, define a softkey with which you can select them.

- In the start screen, select the softkey *F1* and proceed as described under “Linking and branching between screens via softkeys” on **page 38**. As the screen name, use the name of the standard basic screen `Z_SYSTEM_MEN`. As the assignment note, configure the abbreviation `Sys` at the beginning of the second line of the start screen.

Now you can transfer the extended configuration to the OP and try it out.

- Put the C7-621-AS-i control system in transfer mode with an overall reset:

Switch off the power supply of the C7-621-AS-i, press the three keys  and  and  simultaneously and, keeping them depressed, switch on the power supply again.

Do not release the keys until the message “Flash Test” appears in the display. After the startup tests, the idle message is displayed and the overall reset of the C7-OP too is complete.

- Once the C7 has started up, select the system screens stored in the firmware with the `ENTER` key.

Press  to select *System* and  to select *OpMode*. Press the `SHIFT` and down-arrow keys simultaneously to switch to *MPI down* and confirm your entries with `ENTER`. The message *Ready for transfer* appears on the C7-OP

- If a password has not yet been entered, the system requests one. Enter the digits 100 via the numeric keypad and confirm your input with `ENTER`. Select *MPI down* again and confirm with `ENTER`.
- Now select *File* → *Download* in the menu bar to initiate the data transfer from the PC/programming device to the C7. If you have made changes to the configuration, the steps ‘save’ and ‘generate’ are performed automatically after a query. Answer the question as to whether to save, with *Yes*.

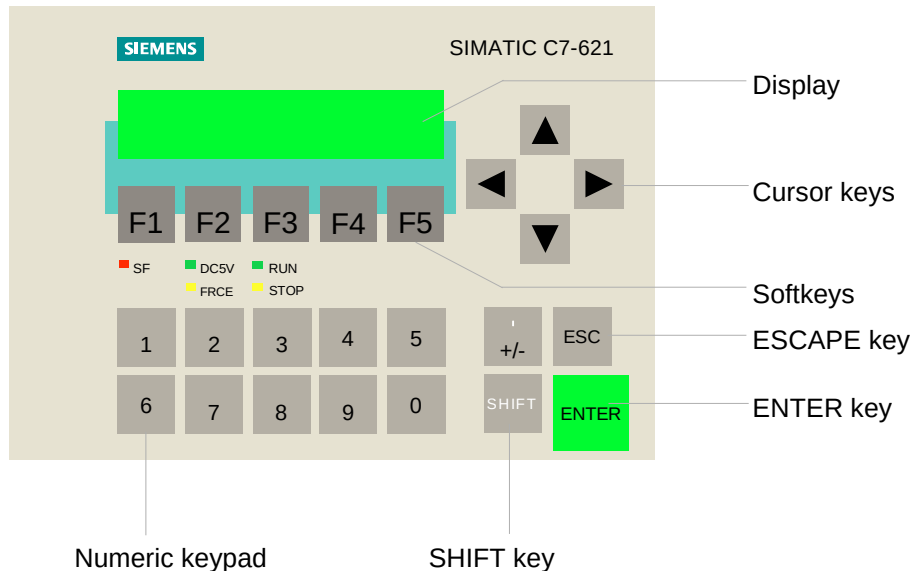
Once the transfer is complete, the C7-OP starts up. When you press `ENTER`, the start screen appears with the cursor in the first screen entry.

- Now activate the softkey  to reach the standard screens. Select the various screens with which you can trigger already implemented functions.

- Activate the  key to quit the standard screens and display your own configuration.

Operating the C7-621-AS-i

To help you operate the C7-621, the most important keys of the C7-621-AS-i are described briefly below.



ESCAPE key

→  takes you from the current level to the superordinate level.

Example: If you press , you quit the system screen `Parce ls_1` and return to the start screen

`Start_Sys1`. If you press  again you will reach the message level.

→ With  you can terminate inputs, i.e. the value you have just entered in the input field is discarded.

ENTER key

→ With ENTER you accept entries that have been made, i.e. the value you have entered in the input field is sent to the controller.

Cursor keys

→ With the up and down cursor keys you can page between several screen entries of a screen.

Example: In the screen `Parce ls_1` you page down into the second screen entry with the cursor.