SIEMENS

SIMATIC

FM 357-2

First Steps in Commissioning

This Guide uses a concrete example to guide you through 5 start-up steps in the order given below until you have obtained a functional application. You will then be able to traverse an axis and get to know and try out the basic hardware and software functions of your FM 357-2. The references to the Manual are intended to give you an initial overview of the information contained in the Manual.

Depending on your level of experience, you will need approximately 2 to 3 hours to work through this example.

Hardware and software requirements

The following preconditions must be fulfilled:

- You have a SIMATIC 300 station, comprising a power supply module and a CPU (CPU 314 or later).
- You have an FM 357-2 module, the associated configuring package, the memory card with the corresponding firmware and the necessary accessories such as bus connector, front connector and wiring material.
- You have a power section (e.g. SIMODRIVE 611-A or FM STEPDRIVE), a motor (e.g. 1FT5 or SIMOSTEP) and the appropriate setpoint cable. The power section and motor have already been commissioned.
- You have a rotary incremental encoder (for servo drive only) and matching measuring system cable.
- STEP 7 (V4.02 or later) is correctly installed on your programming device.

Installing and wiring up the FM 357-2

Insert the bus connector supplied with the FM 357-2 into the CPU bus connector. Place the FM 357-2 module on the mounting rail, lower it down into position and tighten the mounting screws. For more detailed instructions, please refer to Section 3.1 of the Manual.

Connect up the power supply to the screw-type terminal block on the FM 357-2. For more detailed wiring instructions, please refer to Section 4.2 of the Manual.

Wire up the front connector. The NC-READY output must be connected into the EMERGENCY STOP circuit. Insert the front connector in the FM 357-2 and lock. For a description and connection instructions for front connector, please refer to Sections 4.8 and 4.9 of the Manual.

Connecting up the drive (servo and stepper drives):

Connect the free end of the connecting cable to the terminals of the drive unit or insert the subminiature D socket connector (15-way) in the FM STEPDRIVE module. (The terminal designations at the ends of pre-assembled cables ordered from the catalog specify the correct terminals for SIMODRIVE equipment) Insert the subminiature D socket connector (50-way) in connector X2 on the FM 357-2. Tighten the knurled-head screws to lock the connector in place. For a description and connection instructions for the drive, please refer to Sections 4.4 and 4.5 of the Manual.

Connecting up the encoder (for servo drives only):

Attach the connecting cable to the encoder. Insert the subminiature D connector (15-way) in socket X3 (axis 1) on the FM 357-2. Tighten the knurled-head screws to lock the connector in place. For a description and connection instructions for the encoder, please refer to Sections 4.6 and 4.7 of the Manual.
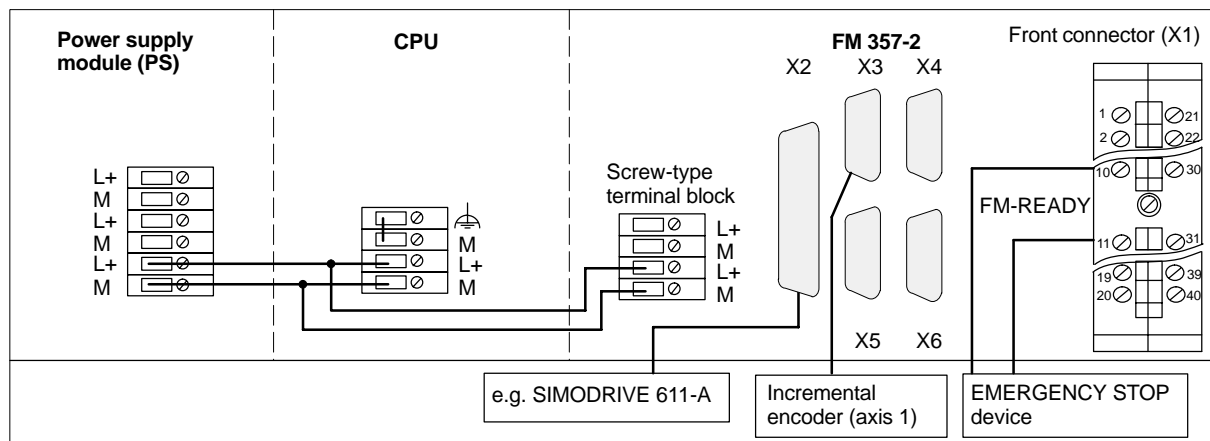
Connect the programming device to the CPU.

Switch the CPU to the STOP state.

Test: *Switch on the supply on the power supply module. If the connections are correct, LEDs "DC 5V" (green) on the CPU and FM 357-2 will light up.*

Installing firmware from the memory card

Proceed as follows:

Insert the memory card with the firmware to be installed into the control switched-off.

Switch the start-up switch to position A.

Switch the control "ON" → the system software and data are transferred from the memory card to the control.

The "SF" LED lights up and the "DIAG" LED flashes cyclically four times during the data transfer.

An error is indicated in the following cases (see Manual Table 11-2):

- If the "SF" LED flashes (2 Hz). The firmware cannot be transferred to the internal memory of the FM (e.g. system software on the internal memory partly deleted).
- If the "SF" LED lights up and the "DIAG" LED flashes briefly three times and then flashes periodically three times. The firmware cannot be transferred to the internal memory of the FM (e.g. system software on the memory card defective).

If the "DIAG" LED flashes five times cyclically and the "SF" LED goes out, the data transfer has been completed → control "OFF".

Leave the memory card inserted in the FM 357-2.

Switch the start-up switch of the FM 357-2 to position 1

Control "ON" → Wait until the control has booted with default values. After approx. 1 minute, the "DIAG" LED flashes cyclically (3 Hz).

Control "OFF"

Switch the start-up switch of the FM 357-2 to position 0

Control "ON" → the control boots with the firmware

During booting of the FM 357-2, the licence on the memory card is checked with the version of the firmware loaded onto the FM.

Installation of the firmware is described in Section 3.2 and start-up of the FM in Section 7.2 of the Manual.

Installing the configuring package on the programming device

The configuring package contains the parameterization tool, the standard function blocks, user examples, a preconfigured example interface for the OPs (irrelevant here) and NC-VAR-Selector (irrelevant here).

Install the software in the following way:

Insert the CD-ROM in the CD drive of your programming device/PC.

Start the SETUP.EXE file on the CD-ROM.

Follow step by step the instructions displayed by the installation routine.

Select the following components in the dialog "FM 357-2 Toolset: Components":

- Parameterize FM 357-2
- FM 357-2 Basic functions V3

The software is installed in the following directories when the defaults are accepted:

- "Parameterize FM 357-2" parameterization tool: "[STEP7 directory]\S7FM357"
- Function blocks FM 357-2: "[STEP7 directory]\S7LIBS/FM357_2L"
- User examples FM 357-2: "[STEP7 directory]\EXAMPLES\zEn16_01"

Instructions on how to install the configuring package can also be found in Section 5.1 of the Manual.

Linking into user program

If you have not yet created a project, proceed as follows:

Start the SIMATIC Manager and create a new project using the guided dialogs via File → Assistant "New project" (assign a project name).

Select the SIMATIC 300-Station. Open the S7 hardware configuration screen by selecting menu commands Edit → Open Object.

Open the hardware catalog by selecting Insert → Hardware Components or View → Catalog. Select SIMATIC 300 → FM-300 → FM357-2 (observe the order no.). Drag the FM 357-2 to the slot desired (in the example: slot 4).

Save and compile your hardware project by selecting commands Station → Save and Compile.

The configured CPU and FM 357-2 are now included in your project in the SIMATIC Manager.

Open your project in the SIMATIC Manager.

Select SIMATIC 300-Station → CPUxxx → S7-Program.

Open library FM357_2L in the SIMATIC Manager with commands File → Open... → Libraries.

In this library, select S7 directory "BF_V3...". This directory contains:
- a "Symbols" file
- a "Sources" directory
- a "Blocks" directory

Select the "Symbols" file and copy it to your project under SIMATIC 300-Station → CPUxxx → S7 Program.

When the message "... Do you want to replace the existing object and all its contents?" is displayed, click on Yes.

Open the "Sources" directory and copy the STL source file "fm357ob_n1" (one FM 357-2) to the "Sources" directory of your project.

Open the "Blocks" directory and copy all the blocks it contains into the "Blocks" directory of your project.

Open the copied STL source file "fm357ob_n1" (in "Sources" directory) in your project.

The LAD/STL/CSF editor is started.

Enter the FM 357-2 module address (256 in this example) in the FC 1 call line FMLADDR in OB 100.

Select menu commands File → Save and File → Compile to generate organization blocks (OB 1, OB 82, OB 100) from the STL source.

Close the Editor.

Select SIMATIC 300-Station → CPUxxx → S7 Program → Blocks in the SIMATIC Manager. Load all the S7 blocks (including system data) in this directory to your CPU (CPU must be in STOP state) by selecting Target System → Load.

Test: *Switch the CPU to the RUN state. After a maximum of 60 seconds, the yellow LED "DIAG" on the FM 357-2 starts to flash cyclically to indicate successful combined power-up of the CPU and FM 357-2.*

For information about programming standard function blocks, please refer to Section 6 of the Manual.

Parameterizing the FM 357-2

Open your project in the SIMATIC Manager.

Select the SIMATIC 300-Station. Open the S7 Hardware Configuration screen by selecting commands Edit → Open Object. Select the FM 357-2.

Select commands Edit → Object Properties to start the "Properties – FM 357-2 4AxisControl – (R0/S4)" dialog.

Click on button Parameters... to call the "Parameterize FM 357-2" parameterization screen.

Open an online project by selecting Target System → Open Online Project.

Select the data area "Machine Data" in the project window over FM 357.

With a double click on the block, the Machine Data Wizard is opened.

Note: The machine data are then uploaded.

Enter the following data in the relevant parameterization areas for this example (settings that are not mentioned are defaults and irrelevant for the purposes of this test):

- Configuration: Drive: 1st axis "Servo drive" or "Stepper motor (SM) without encoder" and
                        Drive: 3rd axis "Servo drive" or "Stepper motor (SM) without encoder"
                        (as CPU axis for the example)
- Encoder adjustment: Set according to your encoder type: "Increments per encoder revolution"
                        or
                        "Steps per motor revolution"

Select commands Target System → Transfer/Activate Data to transfer the above settings to the FM 357-2 and activate them.

Close the Machine Data Wizard.

Test: *Open the start-up window by selecting Test → Start-up.*

Click on the Test button.

Select operating mode Jog.

Make sure that "Feed Stop" is deselected and select "Controller enable" and "Pulse enable".

Position the override pointer with the left mouse key to set the override to 50 %.

Click on button R+.

You can now start a traversing motion by pressing the spacer key. As long as this key is pressed down, your motor will rotate and you can monitor the actual position in the Startup display (dynamic response of axis according to defaults).

If an error occurs during the test run, you can reset the test by clicking on the "Reset" button in the Startup window.

You can display the error message with error number and error text by selecting commands Test → Troubleshooting.

Note: For remaining start-up procedure, refer to Section 7 of the Manual.

Fur further information about parameterizing the FM 357-2, please refer to Section 5 of the Manual.

Diagnostics

Errors may occur as a result of input mistakes, incorrect wiring or inconsistent parameter settings. These errors are displayed by the group error LED "SF" on the FM 357-2.

Instructions on how to localize and eliminate such errors and error messages can be found in Section 11 of the Manual.

Example

When you installed the configuring package, you also installed example project "zEn16_01_FM357-2_BF_EX". Using Example 3 (EXAMPLE3) from this project, you will be able to traverse the first axis of the FM 357-2 as a CPU axis.

Proceed as follows:

Close "Parameterize FM 357-2" and "S7 Hardware Configuration".

Open example project "zEn16_01_FM357-2_BF_EX" in the SIMATIC Manager by selecting File → Open... → Projects.

Select the S7 directory "EXAMPLES" in this project. This directory contains:

a "Symbols" file, a "Sources" directory and a "Blocks" directory.

Select the "Symbols" file and copy it to your project under SIMATIC 300-Station → CPUxxx → S7 Program.

Open the "Sources" directory and copy the STL sources "example3", "ob_example" and "userdb" to the "Sources" directory of your project. Open the "Blocks" directory and copy all blocks to the "Blocks" directory of your project.

Open the copied STL source "ob_example" in your project ("Sources" directory)..

When calling FC 1 in the OB 100, enter the FM 357-2 module address under FMLADDR (in the example: 256). Change the call "CALL EXAMPLE1" in OB 1 to "CALL EXAMPLE3".

Select menu commands File → Save and File → Compile to generate organization blocks (OB 1, OB 82, OB 100) from the STL source.

Close the Editor.

Go to the Blocks directory in the SIMATIC Manager by selecting SIMATIC 300-Station → CPUxxx → S7 Program → Blocks. Load all S7 blocks (and system data) stored under Blocks to the CPU (CPU in the STOP state) by selecting menu commands Target system → Load.

Switch your CPU to the **RUN-P state**.

"JOG" mode is preset when the FM 357-2 has powered up successfully.

Select SIMATIC 300-Station → CPUxxx → S7 Program → Blocks in your project and start the "Control and Monitor Variables" tool (required for monitoring/controlling the axis) via the menu Target System → Monitor/Control Variables.

Enter the following markers in the "Operand" column:
- DB115.dbx11.0 (CTR_EN_AX3 – Controller enable axis 3)
- DB115.dbx11.1 (START – Start of CPU axis 3)
- DB115.dbx11.5 (ERR – Error CPU axis 3)
- DB115.dbx11.6 (INPOS – CPU axis 3 position reached)
- DB115.dbx11.7 (ACTIV – CPU axis active)
- DB115.dbb10 (ERR_NO – in the case of an error, error number of the CPU axis)

Establish the connection to the CPU via the menu Target System → Establish Connection to → Directly Connected CPU.

By selecting commands Variables → View, you can now monitor these operands cyclically.

The operands are updated once for monitoring when you select commands Variables → Update Status Values.

In order to start the third axis, enter the value "2#1" in the line of the marker DB115.dbx11.0 under the column "Control Value". The controller enable signal of the axis is thus set. Then enter the value "2#1" in the line DB115.dbx11.1 in order to start the CPU axis 3.

Set the marker cyclically by selecting menu commands Variables → Control
or
set the marker once by selecting menu commands Variables → Activate Control Values.

The bit "ACTIV"=TRUE indicates that the axis is being positioned. When the position has been reached ("INPOS"=TRUE) without any error, positioning is terminated through resetting of the control signal "Start" = FALSE. If an error occurred during positioning ("ERR" = TRUE), this error is stored intermediately in the byte "ERR_NO" for evaluation.

Note:

After the start, the axis traverses a relative (incremental) path of 300 mm with a velocity of 0.5 m/min. The output messages "INPOS", "ACTIV" and "ERR" indicate the various axis positions in relation with axis positioning of the 3rd axis. If an error occurs during the execution (ERR = TRUE), the data byte "ERR_NO" (DB115.dbb10) must be evaluated (see Section 6.5.1, Axis control of CPU).