

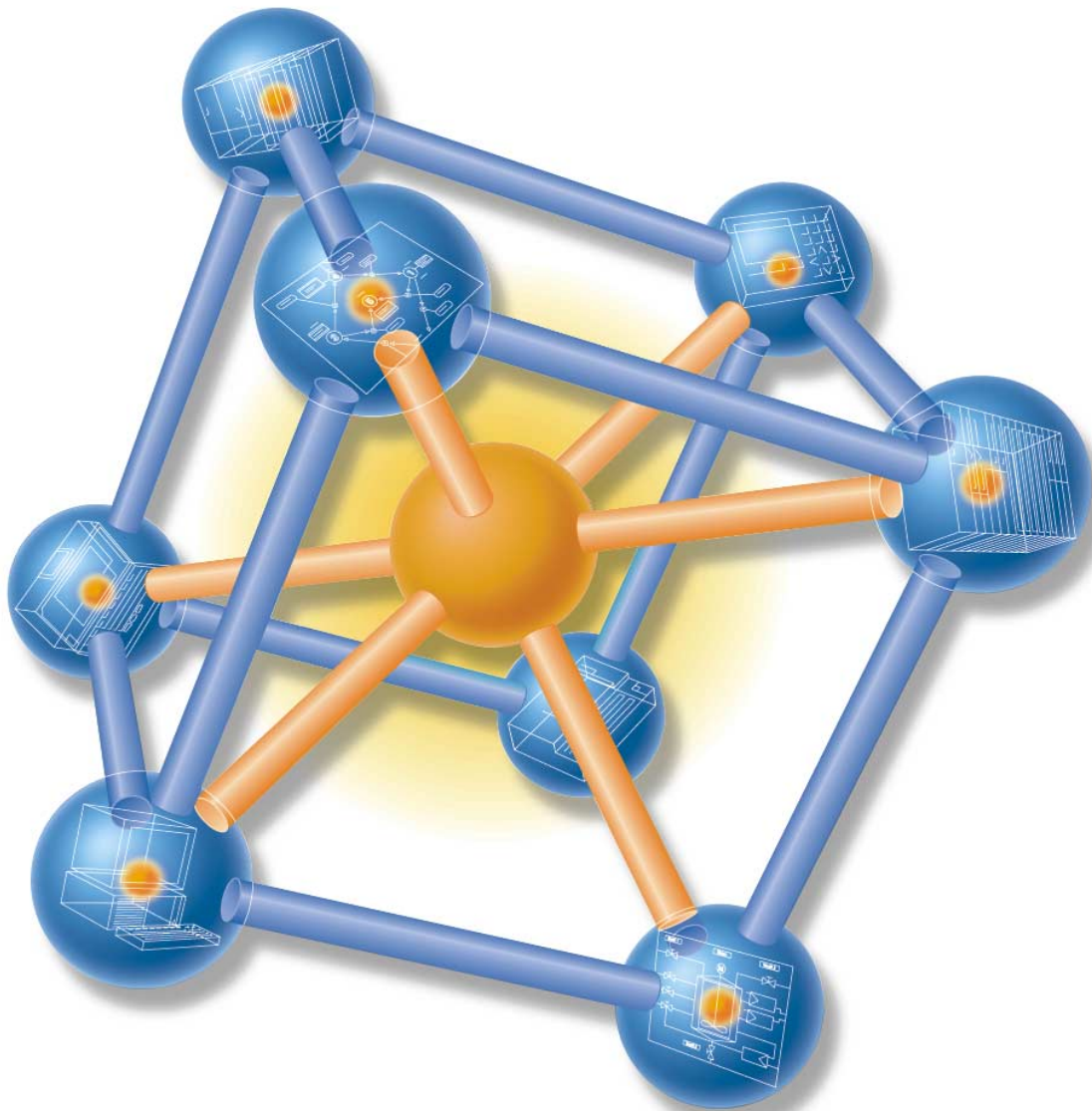
# SIEMENS

## SIMATIC FM 351

Getting Started

Edition 02/2000

### First Steps in Commissioning



Based on a concrete example, this primer guides you through five steps in which you install and start up a functioning application with which you can execute a travel operation via channel 1 and then try out and test the basic hardware and software functions of your FM 351 and obtain and check the application-dependent parameters. The references to the manual will also help you to get a general overview of the information it contains. Depending on your degree of experience, working through the sample will take between one and two hours.

## Requirements

The following requirements must be met:

- You have an S7-300 station consisting of a power supply and a CPU.
- You have installed STEP 7 ( $\geq V4.02$ ) correctly on your programming device. Please note, however, that the instructions below relate to STEP 7 (V5.0).
- You have created a project for the S7-300 station.
- The programming device is connected to the CPU.
- You have an FM 351 module, the configuration package belonging to the FM 351, an external 24 V DC power supply, an encoder, a drive, and the required accessories such as bus interconnectors, front connectors, and wiring.
- To protect both your equipment and personnel, you have provided hardware limit switches and an EMERGENCY STOP switch.

## Install the Configuration Package on the Programming Device

The configuration package contains the configuration software for the FM 351, the required functions (FCs) and the data structures (UDTs) as well as a sample project with sample programs.

Insert the CD in your CD drive.

Start the software installation dialog in Windows by double-clicking the “Add/Remove Programs” icon in the “Control Panel”.

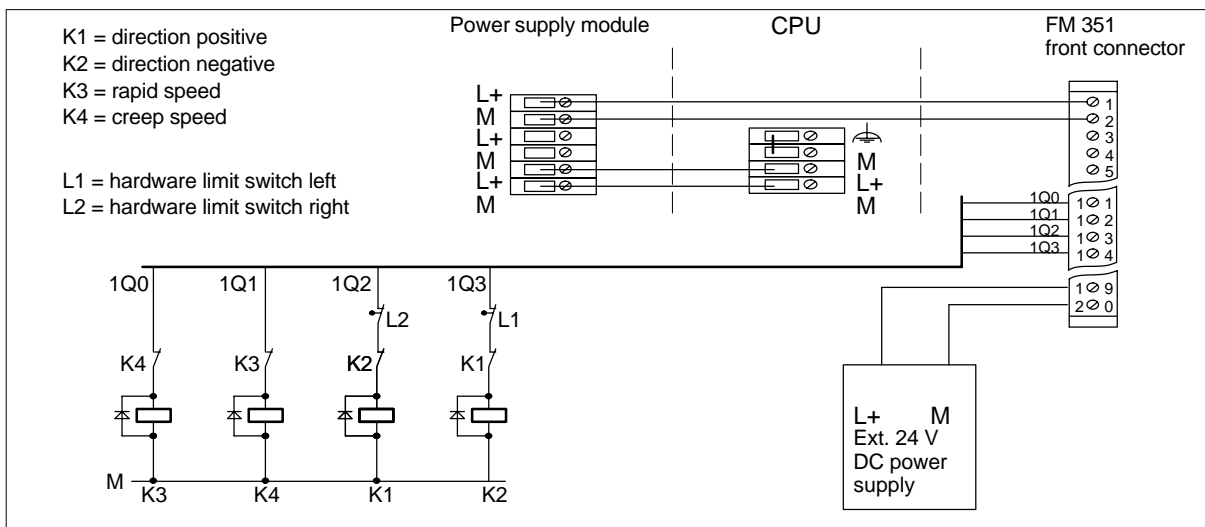
Click the [Install...](#) button, select the Setup.exe file in the FMx51\Disk1 folder on the CD and follow the instructions displayed by the installation program.

## Install and Wire up the FM 351

Turn off the power supply and change the mode selector on the CPU to STOP.

Plug the bus connector supplied with the FM 351 onto the bus connector of the CPU. Hook the top of the FM 351 onto the rail, swing it down and secure it with screws (for more detailed information, refer to Chapter 3 of the manual).

Wire up the front connector as shown in the following picture (the full pinout of the front connector is described in Chapter 4.3 of the manual).



Plug in the wired-up front connector on the FM 351 and push it in securely.

Connect your encoder to the “ENCODER CH1” sub-D connector: Whenever possible, use a preassembled connecting cable (refer to Appendix B of the manual; the complete pinout of the sub-D connector is described in Section 4.1 of the manual).

## Set the Parameters for the FM 351

Open your project in the SIMATIC Manager.

Open the HW Config configuration table in your project.

Select the FM 351 with the correct order number from the hardware catalog and drag it to the slot you want to use in your hardware configuration. Note down the module address. You require this value for your user program.

By double-clicking on this FM 351, you open the window “Positioning Module – [FM 351 FIX. SPEED (*slot*) (parameter assignment) — *project name*/*station name*]” of the configuration software.

Select the following settings in the parameter assignment dialogs (please leave all other settings unchanged since they are not yet required during the commissioning phase):

- Channel: 1 (you have only wired up this channel)
- System of units: mm (3 decimal places)
- Drive:
  - Control mode: 1
  - Target range: 1.000 mm
  - Monitoring time: 2000 ms
  - Stationary range: 1.000 mm
  - Stationary speed: 30.000 mm/min
  - Switchover difference plus: > Switch-off difference plus
  - Switchover difference minus: > Switch-off difference minus
  - Switch-off difference plus: > 1/2 x target range
  - Switch-off difference minus: > 1/2 x target range

The correct values for the switchover difference plus, switchover difference minus, switch-off difference plus and switch-off difference minus for your particular system are obtained following the basic parameter assignment and can then be adapted to the requirements of your system.

- Axis
  - Linear axis/rotary axis: Application-dependent
  - Software limit switch: Application-dependent
  - End of the rotary axis: Application-dependent
- Encoder
  - Encoder type: Select the type of encoder you are using.
  - All further encoder settings depend on the encoder used and your equipment.

Enter the parameter settings for the FM 351 with [File > Save](#) in your configuration and close the configuration software with [File > Exit](#).

Save the configuration you have created with [Station > Save and Compile](#) in your project.

Transfer the configuration with the CPU in the STOP mode with [PLC > Download...](#)

The data are then transferred directly to the CPU and the FM 351. From now on, as long as the configuration on the CPU remains battery backed, the data will always be transferred from the CPU to the FM 351 whenever the CPU changes from STOP to RUN.

## Test the FM 351

Double-click the FM 351 again in HW config to open the window “Positioning Module – [FM 351 FIX. SPEED (*slot*) (parameter assignment) — *project name|station name*]”.

Select [Test > Commissioning](#) to open the commissioning dialog [FM 351 FIX. SPEED (*slot*) (Commissioning) — *project name|station name*]”.

For “Operating mode” select the “Jogging” setting and enter the required speed (rapid or creep).

Click the “On” button for “Drive Enable”. As a reaction to this setting, the “Start enable” indicator in the commissioning dialog is displayed in green. If you have not wired the enable input on the FM 351, activate the option “Do not evaluate enable input” under the “Function Switches” of the “Further Test Functions” and click the “Apply” button.

Click the DIR\_M or DIR\_P button: The drive moves as long as you hold down the mouse button. You can now monitor the actual value and the actual speed.

**Note:** The actual value changes according to the direction selected: DIR\_M (move in a minus direction) or DIR\_P (move in a plus direction). If the count direction is incorrect, open the “Encoder” window in the “Change Parameters for” group box and change the count direction from “normal” to “inverted”. You can download the changed setting to the CPU and the FM 351 with [PLC > Channel Download > 1](#). The displayed actual speed for the rapid speed and creep speed indicates whether or not the digital outputs of the FM 351 are correctly wired up.

If errors occur during the test, these are indicated by the “Error” display. You can acknowledge these errors with [Test > Error Evaluation](#) and then continue with the test.

To allow correct positioning, you must now adapt the switchover differences and switch-off differences to your system.

Select the “Incremental Approach Absolute” setting for the “Operating Mode” and enter the number 255 as the “Incremental Dimension Number”. The boxes “Incremental Dimension”, “Switchover Difference” and “Switch-Off Difference” are displayed. In the “Incremental Dimension” box, enter a positive value for the location at which you want to position. In the switchover difference and switch-off difference boxes, enter the values set as defaults in the drive dialog. Make sure that the incremental dimension you select is higher than the switchover and switch-off difference.

In “Further Test Functions” select the “Set Reference Point” setting, enter 0.000 mm as the reference point and click the “Apply” button. The axis is then synchronized. The message “Channel Synchronized” is displayed.

Select “Further Test Functions > Function Switches > Do Not Evaluate Enable Input” and click the “Apply” button.

Activate the drive enable. The message “Start Enable” is displayed. When you click the “Start” button, the axis starts to move to the specified incremental dimension. The “remaining distance” and “position reached - hold” LEDs indicate the accuracy of the positioning.

By reducing or increasing the switchover and switch-off difference, you can improve the accuracy of the positioning. You can also obtain the “position reached - hold” signal by increasing the target range. Change the parameters until you obtain the “position reached - hold” signal and the actual value of the positioning is close enough to the incremental dimension. Note down the current settings for the positive switchover and switch-off difference.

To obtain the negative switchover and switch-off difference, select a negative incremental dimension.

Select “Change Parameters For > Drive” to open the window with the drive parameters and enter the values you obtained by trial and error for the appropriate parameters.

Enter the settings with [File > Save](#) and close the configuration software with [File > Exit](#).

Save the configuration you have created with [Station > Save and Compile](#) in your project.

Transfer the configuration with the CPU in the STOP mode with [PLC > Download](#).

## Linking into your User Program

Open the FMx51LIB in the library in the SIMATIC Manager with [File > Open... > Libraries](#).

Copy FC0, FC1 and UDT1 from the blocks folder of the FMx51LIB library to the “Blocks” folder of your project.

Select the menu command [Insert > S7 Block > Data Block](#) and insert DB1 in the “Blocks” folder of your project and then select the menu command [Insert > S7 Block > Organization Block](#) and insert OB100.

Open DB1 and create it with the assigned user-defined data type UDT1. This creates the channel DB.

Select [View→ Data View](#) and enter the decimal module address in the “Actual Value” column of the MOD\_ADDR parameter and the channel number 1 for the CH\_NO parameter in DB1.

Save DB1 with [File > Save](#) and close the DB editor with [File > Exit](#).

Now open OB100 and OB1 in your project. Call FC0 in OB100 and FC1 in OB1 and supply the FCs with parameters (refer to the manual, Section 6.2 or 6.3):

OB100:

```
CALL FC0
    DB_NO := 1
```

OB1:

```
CALL FC1
    DB_NO := 1
    RET_VAL := FW0
```

Save both OB100 and OB1 with [File > Save](#).

Select the blocks FC0, FC1, DB1, OB1 and OB100 in your project.

Download the your program to the CPU with [PLC > Download](#).

**Test:** Using “Monitor/modify variables” you can now monitor the selected channel as follows:

Create a symbol with the name “ABS” for DB 1 using the symbol editor.

Select the “Blocks” folder in your project. Using the menu command [Insert > S7 Block > Variable Table](#) insert the variable table VAT 1 and confirm with [OK](#).

Open the variable table VAT1 and make the following entries in the “Symbol”, “Monitor Format” and “Modify Value” columns:

Address	Symbol	Mon Format	Mon Value	Modify Value	Meaning
DB1.DBX 22.3	ABS.OT_ERR	BIN		0	Operator error occurred
DB1.DBX 14.3	ABS.OT_ERR_A	BIN		0	Acknowledge operator error
DB1.DBX 15.0	ABS.START	BIN		0	Start positioning
DB1.DBX 15.1	ABS.STOP	BIN		0	Stop currently active traverse
DB1.DBX 15.2	ABS.DIR_M	BIN		0	Direction minus
DB1.DBX 15.3	ABS.DIR_P	BIN		1	Direction plus
DB1.DBX 15.7	ABS.DRV_EN	BIN		1	Enable drive on
DB1.DBX 34.2	ABS.EI_OFF	BIN		1	Do not evaluate enable input
DB1.DBB 16	ABS.MODE_IN	DEC		1	Requested mode: 1 = jogging
DB1.DBB 17	ABS.MODE_TYPE	DEC		1	Initial speed for jogging
DB1.DBD 26	ABS.ACT_POS	DEC			Current position of the axis

Save the variable table VAT 1 with [Table > Save](#).

Switch to online with [PLC > Connect to > configured CPU](#).

Switch to monitoring with [Variable > Monitor](#).



### Caution

With the next two steps in the test you start the drive.

You can stop the drive again in one of the following ways:

- Set the control value for the direction to 0 again and activate it
  - Set the control value for the drive enable to 0 again and activate it
  - Change the CPU to the STOP mode
- 

Change the CPU to RUN-P.

With [Variable > Activate Modify Values](#), you make the modify values valid.

The drive is started. In the “Modify Value” column, you can now monitor the current actual value (ACT\_POS) of the position.

### Diagnostics

Errors can occur due to incorrect operator input, incorrect wiring, or conflicting parameter settings.

How to analyze such errors and messages is described in Section 6.4 and Chapter 11 of the manual.

### Example

The project zEn18\_01\_FMx51 contains further samples that you can use as a basis and adapt to your application.