SIEMENS

SIMOTION

Supplement to the FM 350-1, FM 350-2 and FM 352 Modules

Function Manual

03/2009 Edition

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Ⓟ 03/2009

Preface

Contents of the function manual

This document is part of the SIMOTION Programming - References documentation package.

This documentation is a supplement to the following SIMATIC manuals:

- FM 350-1 Function Module, *Installation and Parameter Assignment*
- FM 350-2 Counter Module, *Installation and Parameter Assignment*
- FM 352 Electronic Cam Controller, *Installation and Parameter Assignment*

These documents are included in the SIMOTION SCOUT scope of delivery as electronic documentation.

This manual supplement will help you to correctly integrate and commission the FM 350-1, FM 350-2 and FM 352 modules in a SIMOTION system.

Differences in handling which result from the software architecture of a SIMOTION system as compared to the software architecture of a SIMATIC system will be described.

Function blocks

The function blocks required for communication between the SIMOTION system and the FM 350-1, FM 350-2 and FM 352 modules are included in the command library of the "SIMOTION SCOUT" engineering system.

SIMOTION Documentation

An overview of the SIMOTION documentation can be found in a separate list of references.

This documentation is included as electronic documentation with the supplied SIMOTION SCOUT.

The SIMOTION documentation consists of 9 documentation packages containing approximately 80 SIMOTION documents and documents on related systems (e.g. SINAMICS).

The following documentation packages are available for SIMOTION V4.1 SP3:

- SIMOTION Engineering System
- SIMOTION System and Function Descriptions
- SIMOTION Diagnostics
- SIMOTION Programming
- SIMOTION Programming - References
- SIMOTION C
- SIMOTION P350
- SIMOTION D4xx
- SIMOTION Supplementary Documentation

Hotline and Internet addresses

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If you have any technical questions, please contact our hotline:

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Fax	+49 180 5050 223
Internet	http://www.siemens.com/automation/support-request

	Americas
Phone	+1 423 262 2522
Fax	+1 423 262 2200
E-mail	mailto:techsupport.sea@siemens.com

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Country-specific telephone numbers for technical support are provided under the following Internet address:

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Questions about this documentation

If you have any questions (suggestions, corrections) regarding this documentation, please fax or e-mail us at:

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The latest information about SIMOTION products, product support, and FAQs can be found on the Internet at:

- General information:
  - http://www.siemens.de/simotion (German)
  - http://www.siemens.com/simotion (international)
- Product support:
  - http://support.automation.siemens.com/WW/view/en/10805436

Additional support

We also offer introductory courses to help you familiarize yourself with SIMOTION.

Please contact your regional training center or our main training center at D-90027 Nuremberg, phone +49 (911) 895 3202.

Information about training courses on offer can be found at:

www.sitrain.com

Table of contents

Description 1

1.1 General part

This section describes the general similarities and differences in the operation of the function modules (FMs) in a SIMOTION system as compared to a SIMATIC system.

Note

This manual is a supplement to the following SIMATIC manuals:

- *FM 350–1 Function Module Installation and Parameter Assignment*
- *FM 350–2 Counter Function Module Installation and Parameter Assignment*
- *FM 352 Electronic Cam Controller, Installation and Parameter Assignment*

These documents are included in the SIMOTION SCOUT scope of delivery as electronic documentation!

The following software versions are required for the standard functions described in this documentation:

- SIMOTION SCOUT V4.0 or higher
- SIMOTION Kernel V4.0 or higher
- SIMOTION technology packages V4.0 or higher

Note

The following new functions of the FM 350-1 module (order no.:6ES7 350-1AH03-0AE0) are **not** supported by the function blocks:

- Setting/resetting digital outputs DO0 and DO1
- The behavior of digital outputs DO0 and DO1 cannot be changed!

1.2 Product description

FM 350-1 counter module

The FM 350-1 is a single-channel, high-speed counter module. The module can function in the following counter ranges:

- 0 to 2^{32} - 1
- -2^{31} to 2^{31} - 1

The maximum input frequency of the counter signals is up to 500 kHz depending on the encoder signal.

The FM 350-1 can be used for the following counting and measuring tasks:

- Continuous counting
- Single counting
- Periodic counting
- Frequency measurement
- Period measurement
- Speed measurement

You can start and stop the count or measurement process either via the user program (software gate) or via external signals (hardware gate).

From release 3 (MLFB no.: 6AG1350-1AH03-2AE0), you can also operate the FM 350-1 in a clock synchronized manner with a suitable interface module (IM) in the ET 200M system.

FM 350-2 counter module

The FM 350-2 is an 8-channel counter module with dosing functions. The module can function in the following counter ranges:

- -2^{31} to 2^{31} - 1

The maximum input frequency of the counter signals is up to 10 kHz per counter channel depending on the encoder signal.

The FM 350-2 can be used for the following tasks:

- Continuous counting up/down
- Single counting up/down
- Periodic counting up/down
- Frequency measurement
- Speed measurement
- Period measurement
- Dosing

You can start and stop the count either via the user program (software gate) or via external signals (hardware gate).

The counter, gate and direction signals can be connected directly to the module.

FM 352 electronic cam controller

The FM 352 is a single-channel electronic cam controller. It supports both rotary axes and linear axes. Initiators, incremental encoders or absolute encoders (SSI) can be connected for position sensing. As a slave, the FM 352 can also listen in on the SSI message frame of an absolute encoder.

Up to a maximum of 128 position-based or time-based cams can be parameterized. The position-based and time-based cams can be assigned to 32 cam tracks. The first 13 cam tracks are output via the digital outputs on the module.

Function blocks

Function blocks are required for controlling the function modules. The function blocks for the SIMOTION system are described in this manual.

Functionality of the function modules

The function blocks (FBs) and the function modules (FMs) have the same functionality in a SIMOTION system as in a SIMATIC S7 automation system. However, the execution of data transfers and the handling of FBs have been adapted to the given SIMOTION boundary conditions.

Possible fields of application

In addition to the possible applications described in the SIMATIC manuals, the FM 350-1, FM 350-2 and FM 352 function modules can also be used in a SIMOTION system. The function modules can be used as centralized modules (on the SIMOTION C2xx only) or as distributed modules (SIMOTION C2xx, SIMOTION P35x and SIMOTION D4xx).

Several FM 350-1, FM 350-2 and FM 352 modules can be operated on one SIMOTION device.

The following figure shows you how to connect an ET 200M distributed I/O device with IM 153-1 and FM 350-1 or FM 350-2 or FM 352 to a SIMOTION device (e.g. SIMOTION C2xx).

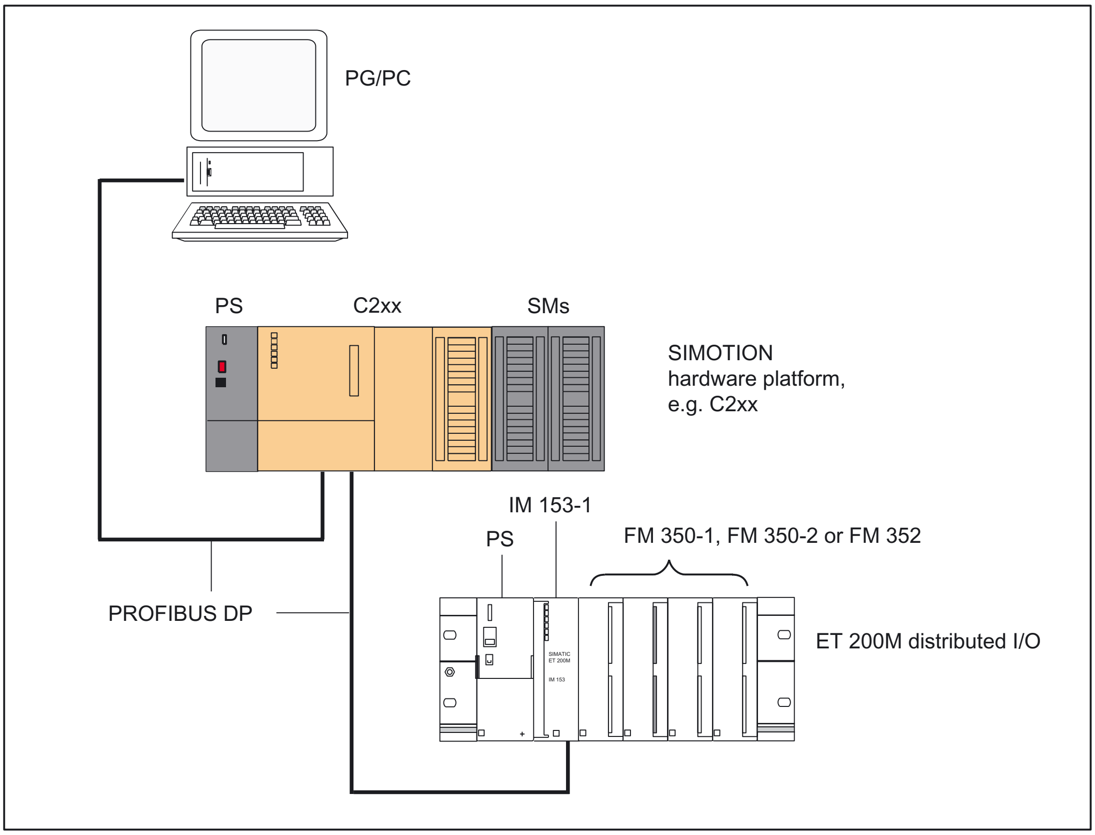


Figure 1-1 Connection of the FMs in an ET 200M to the SIMOTION C2xx device (example of distributed application)

1.3 Installation and connection

Overview

The following steps need to be carried out in order to commission the FM 350-1, FM 350-2 or FM 352 function modules and to control them from the SIMOTION system:

Distributed application (SIMOTION C2xx, SIMOTION P350, and SIMOTION D4xx)

1. Assemble and wire the ET 200M distributed I/O device complete with power supply (PS), interface module (IM) and function module (FM).
2. Establish the PROFIBUS connection between the ET 200M and the SIMOTION device.
3. Set the PROFIBUS DP node address on the IM.
4. Switch on the terminating resistor at the first and last bus node.

Note

For steps 1 to 4, refer to the *ET 200M Distributed I/O* manual.

This documentation is included in the SIMOTION SCOUT scope of delivery as electronic documentation!

5. Insert the function modules FM 350-1 / FM 350-2 / FM 352 into the SIMOTION project, see chapter Inserting function modules into the SIMOTION project (Page 14).
6. Assign parameters for the FM 350-1, FM 350-2 or FM 352 function module.

   The following SIMATIC manuals describe how to install the parameter assignment interfaces for the FMs and how to assign the module parameters:

   – For FM 350-1, refer to the *FM 350-1 Function Module, Installation and Parameter Assignment* manual.

   – For FM 350-2, refer to the *FM 350-2 Counter Module, Installation and Parameter Assignment* manual.

   – For FM 352, refer to the *FM 352 Electronic Cam Controller, Installation and Parameter Assignment* manual.
7. Link the function blocks to the SIMOTION project (refer to chapter Integrating the function blocks in the user project (Page 15)).

Centralized application (SIMOTION C2xx only)

1. For information on planning the mechanical installation and preparing and mounting the SIMOTION components, refer to the *SIMOTION C2xx* operating instructions and the *SIMATIC S7-300 Automation System, software installation manual*.

   These documents are included in the SIMOTION SCOUT scope of delivery as electronic documentation!
2. To continue, refer to steps 5 to 7 for distributed application.

1.4 Inserting function modules into the SIMOTION project

Requirement

The following requirements must be fulfilled in the case of networking via PROFIBUS:

1. You have created a project in SIMOTION SCOUT and have inserted a rack with a SIMOTION hardware platform in the hardware configuration.
2. You have configured a PROFIBUS subnet (for distributed application only).

Note

Consult the *SIMOTION SCOUT* online help to learn how to create a project and configure a PROFIBUS subnet.

The following requirements must be fulfilled in the case of networking via PROFINET:

1. You have created a project in SIMOTION SCOUT and have inserted and configured a rack with a PROFINET-ready SIMOTION device in the hardware configuration.
2. You have configured a PROFINET IO system (for distributed application only).

Note

Consult the *SIMOTION SCOUT* online help to learn how to create a project and configure a PROFINET IO system.

Inserting FM 350-1, FM 350-2 or FM 352 (distributed application)

The description below is an example of networking via PROFIBUS.

1. In SIMOTION SCOUT, open the **User Projects** dialog box with the **Project > Open** menu command. In this dialog box, select your project and confirm your choice with **OK**.
2. Open **HW Config**.
3. In the **HW Config** window, open the **hardware catalog** with the **View > Catalog** menu command.
4. Open the **PROFIBUS DP** folder and the **ET 200M** subfolder in the hardware catalog. Select, for example, the **IM 153-1 interface module** (MLFB no.: 6ES7 153-1AA03-0XB0 or a replacement module) there.
5. Use a drag-and-drop operation to place the IM 153-1 I/O device on the PROFIBUS subnet of your project. The **Properties - PROFIBUS IM 153-1 Interface** dialog box opens. In this dialog box, select the address you set on the IM 153-1 (see *ET 200M Distributed I/O Device* manual) and confirm with **OK**.

   The selected IM 153-1 I/O device is inserted into the project.

6. The inserted I/O device must now be fitted with your project modules. To do this, open the **FM300** subfolder below the selected I/O device in the hardware catalog and select the relevant **FM modules**.

> **Note**
>
> By default, the diagnostic alarms and process alarms are not enabled. Activate the alarms for each module in the **Properties** dialog box.

7. **Save** and **compile** your project.

1.5 Integrating the function blocks in the user project

Creating the FBs instance in the user project

The function blocks are part of the command library of the SIMOTION SCOUT engineering system. For working with the blocks, an instance has to be created in the user project for each function block used.

Example:

```
VAR_GLOBAL
...
    myInstFM3502Ctrl    : _FM3502_control;    // create FB instance
    myInstFM3501Ctrl    : _FM3501_control;    // create FB instance
    myInstFM352Ctrl     : _FM352_control;     // create FB instance
...
END_VAR
```

Call (LAD representation)

The LAD representation of the individual function blocks can be found in the respective function block descriptions.

Application example

The application example is included on the "SIMOTION Utilities & Applications" CD-ROM and is available for various SIMOTION hardware platforms.

The "SIMOTION Utilities & Applications" CD-ROM is provided free of charge and part of the SIMOTION SCOUT scope of delivery.

1.6 Creating I/O variables

Overview

Communication between the SIMOTION device and the FM 350-1, FM 350-2 and FM 352 takes place via direct I/O access and data set transfer. For data set transfer, the module address is transferred to the FB as an input parameter. I/O variables are used to address the direct read/write access to the I/O.

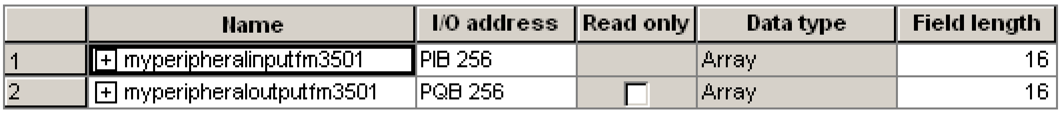
You can freely assign the names of I/O variables in SIMOTION SCOUT. I/O variables must be specified as ARRAY [0..15] of BYTE. You assign the address settings in the hardware configuration to these I/O variables.

The names of the I/O inputs must be transferred to the function blocks as call parameters (**periIn**). The prepared data for the I/O outputs are provided by the FB as in/out parameters (**periOut**). The in/out parameter must be supplied with a variable of type ARRAY [0..15] of BYTE. After the block is called, this variable must be assigned to the I/O variables for the I/O outputs (see call example in chapter "Calling the function blocks").

Note

The variable for supplying the in/out parameters **must not** be created as a temporary variable (VAR_TEMP or local variable of a function).

The following example shows how to assign the module addresses to the I/O variables in SIMOTION SCOUT.



	Name	I/O address	Read only	Data type	Field length
1	⊞ myperipheralinputfm3501	PIB 256		Array	16
2	⊞ myperipheraloutputfm3501	PQB 256	□	Array	16

Figure 1-2 Address assignment in SIMOTION SCOUT

Note

For additional information, see the following sources:

- *SIMOTION SCOUT* online help
- Programming manual of the corresponding programming language, e.g.:
  - *SIMOTION ST, Structured Text* programming manual
  - *SIMOTION MCC, Motion Control Chart* programming manual
  - *SIMOTION LAD/FBD, Ladder Diagram and Function Block Diagram* programming manual

These documents are included in the SIMOTION SCOUT scope of delivery as electronic documentation!

Function blocks of the FM 350-1 2

2.1 Overview of the FM 350-1 function blocks

This section describes the function blocks (FBs) and the data structure required for parameter assignment, control and commissioning of the FM 350-1 module.

The function blocks form the software interface between the SIMOTION device and the FMs. They must be called repeatedly (in cycles) from the user program.

The following function blocks are available:

- Function block _FM3501_control (Page 18)
- Function block _FM3501_diagnostic (Page 22)

SIMOTION SCOUT contains all of the required FBs and data structure Struct_FM3501_fmData of the FM 350-1. The function blocks can be used to control one or more FM 350-1 modules.

Note

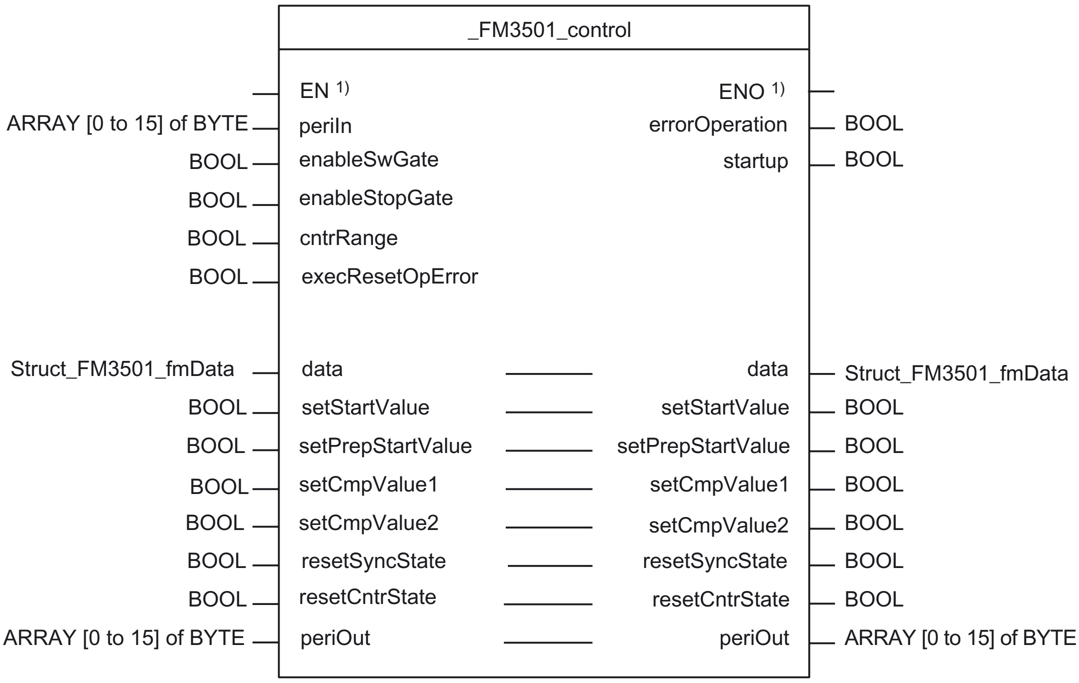
The SIMOTION identifiers have changed as of V4.0. A comparison of the SIMOTION and SIMATIC identifiers can be found in the appendix SIMOTION and SIMATIC names (Page 87) in the table "SIMOTION and SIMATIC identifiers FM 350-1".

2.2 Function block _FM3501_control

Introduction

The **_FM3501_control** function block can be used to control the module and to scan the status of the FM 350-1.

Call (LAD representation)



[1] LAD-specific parameter

Parameter description

Table 2- 1 Parameters of the _FM3501_control function block

Name	P type [1]	Data type	Meaning	Actions performed by user	Actions performed by block
periIn	IN	ARRAY [0 to 15] of BYTE	Transfers I/O inputs of the FM to the FB	I/O variable of the I/O inputs of the FM transferred to the FB	Checked
enableSwGate	IN	BOOL	"SW gate (start/stop)" counter control bit	Sets and resets this	Checked
enableStopGate	IN	BOOL	"Stop gate" counter control bit	Sets and resets this	Checked
cntrRange	IN	BOOL	Counter range limit of the FM FALSE: $-2^{31} \leq$ count value $< 2^{31}-1$ TRUE: $0 \leq$ count value $< 2^{32}-1$	Sets and resets this	Checked

Name	P type [1]	Data type	Meaning	Actions performed by user	Actions performed by block
execResetOpError	IN	BOOL	Acknowledges operator error in the case of a rising edge	Sets and resets this	Checked
data	IN/OUT	Struct_FM3501 _fmData	Data structure	Entered and checked	Checked and entered
setStartValue	IN/OUT	BOOL	Count: Transfers "direct loading" trigger bit [2] Measuring: may not be used.	set	Checks and resets this
setPrepStartValue	IN/OUT	BOOL	Count: Transfers "preparatory loading" trigger bit [3] Measuring: Transmission of the lower limit	set	Checks and resets this
setCmpValue1	IN/OUT	BOOL	Count: Transfers "comparison value 1" trigger bit Measuring: Transmission of the upper limit	set	Checks and resets this
setCmpValue2	IN/OUT	BOOL	Count: Transfers "comparison value 2" trigger bit Measuring: Transmission of the update time	set	Checks and resets this
resetSyncState	IN/OUT	BOOL	Deletes "synchronization" status bit	set	Checks and resets this
resetCntrState	IN/OUT	BOOL	Deletes "zero crossing" status bit	set	Checks and resets this
periOut	IN/OUT	ARRAY [0 to 15] of BYTE	Prepared data of the FB for the I/O outputs of the FM [4]	Checked and entered on the I/O variable for the I/O outputs	Entered
errorOperation	OUT	BOOL	An operator error has occurred	Checked	Sets and resets this
startup	OUT	BOOL	Indicates the startup of the FM	Checked	Entered

[1] Parameter types: IN = input parameter, OUT = output parameter, IN/OUT = in/out parameter

[2] The **setStartValue**parameter specifies that the load value is transmitted to the load register and directly to the counter.

[3] The **setPrepStartValue**parameter specifies that the load value will be stored in the load register only. The load value in the load register will then be transferred at the next trigger (FM input "DI set" - set counter). The following requirement must be met:
- **enableReverseSetting= TRUE** (element of data structure **Struct_FM3501_fmData**or
- **enableForwardSetting = TRUE** (element of data structure **Struct_FM3501_fmData**

[4] **Note:**The **periOut**parameter must be supplied with an array of type **ARRAY [0..15] of BYTE**. Create a local or global array in your program under **VAR**(do not create a temporary array under VAR_TEMP). After the FB has been called, this array must be assigned to the I/O variable for the I/O outputs of the module. See call example for FM350-1.

Functionality

The **_FM3501_control** function block transfers data cyclically from a data structure of type **Struct_FM3501_fmData** to the FM 350-1. It also reads data from the FM 350-1 and enters this data in the elements of the data structure.

Note

Count:

The **cntrRange** input parameter must be set according to the assigned count range limits of the FM 350-1.

- **cntrRange** := **FALSE**, count range -231 ≤ count value < 231 - 1
  - loadValue1, cmpValue1_1, cmpValue2_1 are written from the FB to the FM
  - actValue1, actCntrValue1 are read from the FM
- **cntrRange** := **TRUE**, count range 0 ≤ count value < 232 - 1
  - loadValue2, cmpValue1_2, cmpValue2_2 are written from the FB to the FM
  - actValue2, actCntrValue2 are read from the FM

The same count ranges must be selected in the parameterization tools and in the data structure (**cntrRange**).

Measuring:

In measuring modes (frequency measurement, speed measurement, period measurement) the input parameter **cntrRange** = **TRUE** must be set.

Task integration (call)

The **_FM3501_control** function block must be called cyclically in the **BackgroundTask** or in the **TimerInterruptTask**. Calling in the **SystemInterruptTask** is not permitted. Calling the function block in the **IPOSynchronousTask** is not recommended for runtime reasons.

You can start a job for the FM 350-1 via the appropriate parameters **setStartValue**, **setPrepStartValue**, **setCmpValue1**, **setCmpValue2**, **resetSyncState**, **resetCntrState**, **execResetOpError**, **enableStopGate** or **enableSwGate**.

Depending on the job, the following values must be entered in the data structure before each call:

- during counting: the load value or the comparison value
- during measuring: the lower limit, the upper limit or the update time.

Once the job is carried out, the **_FM3501_control** function block deletes any set in/out parameter (**setStartValue**, **setPrepStartValue**, **setCmpValue1**, **setCmpValue2**, **resetSyncState** or **resetCntrState**). This enables you to recognize that the job has been executed by the FM 350-1.

Startup behavior

As soon as the **_FM3501_control** function block detects that the FM 350-1 is starting up, any pending job is deferred until after the startup is acknowledged. A startup of the FM 350-1 is indicated by output parameter **startup**=**TRUE**. Any deferred jobs are carried out once the startup is finished and are therefore not lost.

Error message during an FB call

If an error occurs during an FB call, it is indicated at the **errorOperation** block parameter. You can read out the error information in the **errorIdOperation** element of the data structure. You can acknowledge the error using the **execResetOpError** parameter.

Note

No new errors can be signaled until you have acknowledged the error.

Error numbers

The following error numbers can be displayed in the **errorIdOperation** element in the data structure.

Table 2- 2 Error number assignment

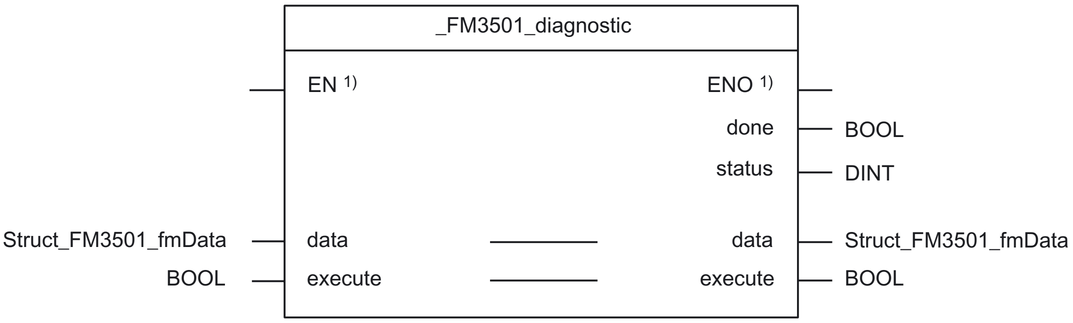
Error number	Meaning
0	No error
1	Operating mode cannot be started using the SW gate
2	Operating mode cannot be aborted
4	Only permitted if there is a pending output disable (OD)

2.3 Function block _FM3501_diagnostic

Introduction

The **_FM3501_diagnostic** function block enables you to read out the complete diagnostic data from the FM 350-1.

Call (LAD representation)



1) LAD-specific parameter

Parameter description

Table 2- 3 Parameters of the _FM3501_diagnostic function block

Name	P type 1)	Data type	Meaning	Actions performed by user	Actions performed by block
data	IN/OUT	Struct_FM3501 _fmData	Data structure with counter data and diagnostic data	Entered and checked	Checked and entered
execute	IN/OUT	BOOL	Trigger bit for diagnostic data set	set	Checks and resets this
done	OUT	BOOL	Job completed without errors	Checked	Entered
status	OUT	DINT	Return value (error ID) 2) **_readRecord**	Checked	Entered

[1] Parameter types: IN = input parameters, OUT = output parameters, IN/OUT = in/out parameters

[2] A detailed description is contained in the *SIMOTION System Function/Variables*parameter manual. This documentation is included in the SIMOTION SCOUT scope of delivery as electronic documentation!

Functional description

Diagnostic data is read out from the **_FM3501_diagnostic** function block and made available in the associated **Struct_FM3501_fmData** data structure. The return value (error ID) can be read out at the **status** output parameter of the function block.

Sequence

Data is transferred as follows:

1. If in/out parameter **execute** = **TRUE** is set, the diagnostic data is read out from the FM 350-1.
2. The data are entered in data structure **data** of the **_FM3501_diagnostic** function block.
3. The return value (error ID) is copied to the **status** parameter of FB instance **_FM3501_diagnostic**.

Note

The return value (error ID) in the **status** parameter is present for one cycle only. The values 0x7001 and 0x7002 indicate that a data transfer has been initiated and is active.

4. As soon as the function has been executed, in/out parameter**execute** is reset.

Note

For the diagnostic sequence to be correct, the module address must be entered in the **moduleAddress** element of the data structure of type **Struct_FM3501_fmData**.

Task integration (call)

The **_FM3501_diagnostic** function block can be called in the **PeripheralFaultTask**, **BackgroundTask** or **TimerInterruptTask**. For performance reasons, the function block should not be called in the **PeripheralFaultTask**.

2.4 Data structure of the FM 350-1

Overview

The data structure of type **Struct_FM3501_fmData** contains the control and checkback signals of the FM 350-1 and the diagnostic data.

The data structure is used by the **_FM3501_control** and **_FM3501_diagnostic** function blocks. Elements of the data structure are accessed using a variable of data type **Struct_FM3501_fmData**, which you must define yourself.

The **Struct_FM3501_fmData** data structure is shown in the table below.

Note

The SIMOTION identifiers have changed as of V4.0. A comparison of the SIMOTION and SIMATIC identifiers can be found in the appendix SIMOTION and SIMATIC names (Page 87) in the table "SIMOTION and SIMATIC identifiers FM 350-1".

Table 2- 4 Data structure of Struct_FM3501_fmData

Name	Type	Initial value	Counting	Measuring
General data				
xxxReserved1 1)	BYTE	16#00	Reserved	Reserved
xxxReserved2 1)	BYTE	16#00	Reserved	Reserved
moduleAddress	INT	256	Module address (see hardware configuration)	Module address (see hardware configuration)
xxxReserved3 1)	BYTE	16#00	Reserved	Reserved
Control signals				
loadValue1	DINT	0	New load value (cntrRange := FALSE)	-
cmpValue1_1	DINT	0	New comparison value 1 (cntrRange := FALSE)	-
cmpValue2_1	DINT	0	New comparison value 2 (cntrRange := FALSE)	-
loadValue2	UDINT	0	New load value (cntrRange := TRUE)	Lower limit
cmpValue1_2	UDINT	0	New comparison value 1 (cntrRange := TRUE)	Upper limit
cmpValue2_2	UDINT	0	New comparison value 2 (cntrRange := TRUE)	Update time
xxxReserved4 1)	BOOL	FALSE	Reserved	Reserved
xxxReserved5 1)	BOOL	FALSE	Reserved	Reserved
xxxReserved6 1)	BOOL	FALSE	Reserved	Reserved
xxxReserved7 1)	BOOL	FALSE	Reserved	Reserved
enableForwardSetting	BOOL	FALSE	Enable setting in forward direction	-
enableReverseSetting	BOOL	FALSE	Enable setting in reverse direction	-
xxxReserved8 1)	BOOL	FALSE	Reserved	Reserved
xxxReserved9 1)	BOOL	FALSE	Reserved	Reserved
enableOutput0	BOOL	FALSE	Enable output 0	Enable output 0
enableOutput1	BOOL	FALSE	Enable output 1	Enable output 1
xxxReserved10..15 1)	BOOL	FALSE	Reserved	Reserved
Checkback signals				
actValue1	DINT	0	Current load or latch value (cntrRange := FALSE)	-
actCntrValue1	DINT	0	Current count value (cntrRange := FALSE)	-
actValue2	UDINT	0	Current load or latch value (cntrRange := TRUE)	Current measured value
actCntrValue2	UDINT	0	Current count value (cntrRange := TRUE)	Actual count value

Name	Type	Initial value	Counting	Measuring
errorIdData	WORD	16#0000	Specification of the data error	Specification of the data error
errorIdOperation	BYTE	16#00	Operator error (error number)	Operator error (error number)
xxxReserved16 1)	BOOL	FALSE	Reserved	Reserved
xxxReserved17 1)	BOOL	FALSE	Reserved	Reserved
xxxReserved18 1)	BOOL	FALSE	Reserved	Reserved
xxxReserved19 1)	BOOL	FALSE	Reserved	Reserved
dataError	BOOL	FALSE	Data error (can be read out via the parameterization tool or in the "errorIdData" element)	Data error (can be read out via the parameterization tool or in the "errorIdData" element)
xxxReserved20 1)	BOOL	FALSE	Reserved	Reserved
xxxReserved21 1)	BOOL	FALSE	Reserved	Reserved
parameterized	BOOL	FALSE	Module parameterized	Module parameterized
opState	BOOL	FALSE	Counter operation status	Counter operation status
opDirection	BOOL	FALSE	Count direction status	Count direction status
zeroCrossing	BOOL	FALSE	Zero crossing status	Full scale value
overflow	BOOL	FALSE	Status overflow	Status overflow
underflow	BOOL	FALSE	Status underflow	Status underflow
synchronized	BOOL	FALSE	Counter synchronization status	-
stateGate	BOOL	FALSE	Status of the internal gate	Status of the internal gate
stateSwGate	BOOL	FALSE	SW gate status	SW gate status
stateSetInput	BOOL	FALSE	Status of digital input "DI set"	Status of digital input "DI set"
xxxReserved22 1)	BOOL	FALSE	Reserved	Reserved
stateOfDiStart	BOOL	FALSE	Status of digital input "DI start"	Status of digital input "DI start"
stateOfDiStop	BOOL	FALSE	Status of digital input "DI stop"	Status of digital input "DI stop"
stateCompValue1	BOOL	FALSE	Status of output of comparison value 1	Status of output of comparison value 1
stateCompValue2	BOOL	FALSE	Status of output of comparison value 2	Status of output of comparison value 2
xxxReserved23..28 1)	BOOL	FALSE	Reserved	Reserved
xxxReserved29 1)	DINT	0	Reserved	Reserved
xxxReserved30 1)	DINT	0	Reserved	Reserved
Diagnostic data				
faultModule	BOOL	FALSE	Module fault	
internFault	BOOL	FALSE	Internal fault	
extFault	BOOL	FALSE	External fault	
faultChannel	BOOL	FALSE	Channel fault (for decoding, refer to elements starting with **chType**)	
faultExtVoltage	BOOL	FALSE	Auxiliary voltage fault	
faultConnector	BOOL	FALSE	Front connector	
invalidConfig	BOOL	FALSE	Parameter assignment missing	
invalidPara	BOOL	FALSE	Parameter assignment faulty	
moduleType	BYTE	16#00	Module type	

Name	Type	Initial value	Counting	Measuring
faultSubModule	BOOL	FALSE	Incorrect/missing interface module	
faultCommunication	BOOL	FALSE	Communication error	
moduleStop	BOOL	FALSE	RUN/STOP mode display	
faultWatchdog	BOOL	FALSE	Watchdog (FM)	
faultIntPower	BOOL	FALSE	Internal power supply fault	
xxxReserved47 [1]	BOOL	FALSE	Reserved	
xxxReserved48 [1]	BOOL	FALSE	Reserved	
xxxReserved31 [1]	BOOL	FALSE	Reserved	
faultRack	BOOL	FALSE	Rack fault	
faultDevice	BOOL	FALSE	SIMOTION device fault	
faultEprom	BOOL	FALSE	EPROM fault	
faultRam	BOOL	FALSE	RAM fault	
faultAdc	BOOL	FALSE	ADC fault	
faultFuse	BOOL	FALSE	Fuse fault	
lostProcessAlarm	BOOL	FALSE	Process alarm lost	
xxxReserved32 [1]	BOOL	FALSE	Reserved	
chType	BYTE	16#00	Channel type	
lenDiagData	BYTE	16#00	Length of diagnostic data per channel	
chNumber	BYTE	16#00	Channel number	
groupErrorChannel1	BOOL	FALSE	Group error channel 1	
xxxGroupErrorChannel2 [1]	BOOL	FALSE	Group error channel 2	
xxxReserved33...38 [1]	BOOL	FALSE	Reserved	
faultCh1SignalA	BOOL	FALSE	Channel 1, signal A fault	
faultCh1SignalB	BOOL	FALSE	Channel 1, signal B fault	
faultCh1SigZero	BOOL	FALSE	Channel 1, signal zero fault	
faultChannel1	BOOL	FALSE	Channel 1, fault between channels	
faultCh1EncSupply	BOOL	FALSE	Channel 1, 5.2 V encoder supply fault	
xxxReserved39..41 [1]	BOOL	FALSE	Reserved	
xxxReserved42 [1]	BYTE	16#00	Reserved	
faultCh2SignalA	BOOL	FALSE	Channel 2, signal A fault	
faultCh2SignalB	BOOL	FALSE	Channel 2, signal B fault	
faultCh2SigZero	BOOL	FALSE	Channel 2, signal zero fault	
faultChannel2	BOOL	FALSE	Channel 2, fault between channels	
faultCh2EncSupply	BOOL	FALSE	Channel 2, 5.2 V encoder supply fault	
xxxReserved43..45 [1]	BOOL	FALSE	Reserved	
xxxReserved46 [1]	BYTE	16#00	Reserved	

[1] Variable for internal FB use (not relevant to users)

2.5 Calling function blocks

In order to be able to work with the function blocks in your user project, proceed as follows (the numbers shown in the following program segment correspond to the steps below):

1. Create the function block instance (see the following program segment, e.g. create instance for FB _FM3501_control).
2. Set up variables for the data structure.
3. Create an array for the in/out parameters of the FB.
4. Call instance of the function block.
5. Transfer input parameters.
6. The output parameters of the FB are accessed with <instance name of FB>. <name of output parameter>.
7. Data prepared by the FB for the I/O outputs are assigned to the array of the I/O variables created in step 3.

Note

The call example is an extract from the supplied E_FM3501 application example, which is contained on the "SIMOTION Utilities & Applications" CD-ROM.

If you wish to control more than one FM 350-1, you must create a new variable for the data structure and FB instances with a new name for each FM 350-1 used.

Call example

```
UNIT E_FM3501;
INTERFACE
    VAR_GLOBAL
    myDataFM3501 : Struct_FM3501_fmData;      // Create variable of data structure              (2)
    // Following variables are - set by application to activate function;
    // - reset by FB to signal completion of function.

    MyLoadStartValue          : BOOL;            // Load load value directly
    MyLoadPrepareStartValue   : BOOL;            // Load load value in preparation
    ...

    // INPUT VARIABLES
    MySetSoftwareGate         : BOOL;            // Software gate
    MyStopGate                : BOOL;            // Stop gate
    ...

    // OUTPUT VARIABLES
    MyOperationError          : BOOL;            // Error in FB _FB_FM3501_control
    MyStateFMStartup          : BOOL;            // Start-up status

    myInstFM3501Ctrl          : _FM3501_control;  // create FB instance                          (1)
    END_VAR
END_INTERFACE

IMPLEMENTATION

PROGRAM ExampleFM3501                            // Program in BackroundTask

VAR
    FMOutputArray      : ARRAY [0..15] of BYTE;  // Array for FM output data                    (3)
END_VAR

// CALL INSTANCE of _FM3501_control                                                               (4)
 myInstFM3501Ctrl(
    EnableSwGate       := mySetSoftwareGate,        // Control software gate                     (5)
    EnableStopGate     := myStopGate,               // Control internal gate
    ExecResetOpError   := myResetError,             // Acknowledge operator error
    CntrRange          := TRUE,                     // Counter range
    PeriIn             := myPeripheralInputFM3501,  // input address
    Data               := myDataFM3501,             // Transfer data structure
    PeriOut            := FMOutputArray,            // FM output data array
  // following IN_OUT parameters are set by the application
  // and reset by the FB! (shake-hand-effect)
    SetStartValue      := myLoadStartValue,         // Load counter
    SetPrepStartValue  := myLoadPrepareStartValue,  // Load counter in preparation
    setCmpValue1       := myLoadComparisonValue1,   // Load new comparison value 1
    setCmpValue2       := myLoadComparisonValue2,   // Load new comparison value 2
    resetSyncState     := myResetSyncState,         // Reset synchronization bit
    resetCntrState     := myResetCounterState,      // Reset status bit
    );
// TRANSFER DATA TO FM
    myPeripheralOutputFM3501 := FMOutputArray;   // Assign array of FM output data                (7)
                                                 // to I/O variables
// EVALUATE AND DISPLAY STATUS MESSAGES
    MyStateFMStartup   := myInstFM3501Ctrl.startup;          // Start-up status                  (6)
    MyOperationError   := myInstFM3501Ctrl.errorOperation;
END_PROGRAM           // ExampleFM3501
END_IMPLEMENTATION
```

Note

The PROGRAM ExampleFM3501 must be assigned in the execution system.

2.6 Application example for FM 350-1

Introduction

The following example uses the "Transfer load value to FM 350-1" and "Start counter" functions to show how the _FM3501_control function block can be applied. This example is representative for all of the functions of this module. A call example for the _FM3501_diagnostic function block is located in the diagnostic section (PeripheralFaultTask).

Table 2- 5 Input symbols used

Symbol	Data type	Description
myLoadStartValue	BOOL	Directly load the load value
myLoadPrepareStartValue	BOOL	Load the load value in preparation
myLoadComparisonValue1	BOOL	Transfer comparison value 1
myLoadComparisonValue2	BOOL	Transfer comparison value 2
myResetSyncState	BOOL	Reset the synchronization status bit
myResetCntrState	BOOL	Reset the status bit for zero crossing/overflow/underflow
mySetSoftwareGate	BOOL	Software gate
myEnableStopGate	BOOL	Stop gate
myResetError	BOOL	Acknowledge error
myResetDiagnosticAlarm	BOOL	Acknowledge diagnostic alarm
myResetProcessAlarm	BOOL	Acknowledge process alarm

Table 2- 6 Output symbols used

Symbol	Data type	Description
myErrorOperation	BOOL	Error in the _FM3501_control function block
myStateFMStartup	BOOL	Startup status
myLoadStartValueActive	BOOL	Load count value active
myLoadPrepareStartValueActive	BOOL	Load count value in preparation active
myLoadComparisonValue1Active	BOOL	Load comparison value 1 active
myLoadComparisonValue2Active	BOOL	Load comparison value 2 active
myResetSyncActive	BOOL	Reset synchronization status bit active
myResetCounterStateActive	BOOL	Reset zero crossing/overflow/underflow status bit active
myDiagnosticAlarm	BOOL	Receive diagnostic alarm
myProcessAlarm	BOOL	Receive process alarm
myStateCounter	BOOL	Counter running (opState)
myStateDirection	BOOL	Direction bit (opDirection)
myStateZeroCrossing	BOOL	Zero crossing
myCounterOverflow	BOOL	Counter overflow
myCounterUnterflow	BOOL	Counter underflow
myStateSwGate	BOOL	Software gate (stateSwGate)
myStateGate	BOOL	Internal gate (stateGate)

Note

Depending on the type of signal used, you should pay attention to the coding plug of the FM 350-1 (for example, position D for 24 V signals).

You can either monitor and modify the input and output variables used in the programming example in the INTERFACE section of the unit (under VAR_GLOBAL) using the symbol browser, or you can assign real inputs and outputs to the input and output variables in your unit.

Contents of example

When the _FM3501_control function block is called, the control and checkback signals are exchanged cyclically between the SIMOTION device (C230-2, P350, D435) and the FM 350-1. All of the data that are relevant to the module are located in data structure "dataFM3501".

Depending on the configuration of the FM 350-1 (operating mode, use of gates, alarm configuration, etc.), the FM 350-1 counts the pulses at the wired encoder signal input if, for example, the value of the "myStateSwGate" input is "TRUE". The counting operation stops if input "myStateSwGate" = FALSE or if input "myEnableStopGate" = TRUE.

Transferring the load values

Two parameters are available for transferring the load value to the FM 350-1. When the _FM3501_control FB is called, either the "myLoadStartValue" or "myLoadPrepareStartValue" parameter is selected at a rising edge. The "myLoadStartValue" parameter specifies that the load value will be transferred to the load register and directly to the counter (you must set input "myLoadStartValue" = TRUE).
The "myLoadPrepareStartValue" parameter specifies that the load value will be stored in the load register only (you must set trigger bit "myLoadPrepareStartValue" = TRUE in your user program).
The load value in the load register is then transferred at the next event (FM input "DI set") that sets the counter.
The FB must be called until the FB has reset the selected trigger bit ("myLoadStartValue" or "myLoadPrepareStartValue").
The in/out parameter remains set while the transfer is active. If the trigger bit you set has been reset by the _FM3501_control function block, the FM 350-1 has received the load value.

Loading comparison values

New comparison values are transferred to the FM by setting the "myLoadComparisonValue1" or "myLoadComparisonValue2" inputs (rising edge).

Deleting status bits

The synchronization status bit is reset by setting the "myResetSyncState" input (rising edge) and the zero crossing/overflow/underflow status bit is reset by setting the "myResetCntrState" input.

Process alarm / diagnostic alarm

If a process alarm or diagnostic alarm is triggered by the FM 350-1, this is indicated by the "myProcessAlarm" and "myDiagnosticAlarm" variable, respectively. If the "PeripheralFaultFM3501" program is integrated in the PeripheralFaultTask, this task is started and the most important task start information is stored temporarily in the "myAlarmDetails", "mylogAddressIn" and "myAlarmInterrupt" variables. If a diagnostic alarm has been signaled, the **_FM3501_diagnostic** FB is started, which reads out detailed diagnostic information from the module. These diagnostic data are then located in data structure "dataFM3501". Setting the "myResetDiagnosticAlarm" input variable (to acknowledge a diagnostic alarm) or the "myResetProcessAlarm" input variable (to acknowledge a process alarm) acknowledges the respective alarms.

The respective states are signaled by the output variables used (see Table "Output symbols used").

Hardware platform

The application example is available for various SIMOTION hardware platforms and is intended for distributed use of the FM 350-1.

Note

If the application example is not available for your hardware platform, you must adapt the hardware configuration.

Adapting the application example

The configuration in the example and its available hardware must be adapted.

The following options are available:

1. You can adapt the configuration in the example to the available hardware (PROFIBUS DP address).
2. You can adapt the configuration of the hardware to the example (PROFIBUS DP address).

Calling the application example

The application example can be found on the "SIMOTION Utilities & Applications" CD-ROM. The "SIMOTION Utilities & Applications" CD-ROM is provided free of charge and part of the SIMOTION SCOUT scope of delivery.

1. Dearchive and open the project containing the application example.
2. Check the hardware configuration: PROFIBUS DP addresses.
3. Check the module addresses (hardware configuration) against the I/O addresses of the controller in SIMOTION SCOUT and module address in the program (dataFM3501.moduleAddress).
4. Save and compile the example project. Then, you can download the example to the SIMOTION device and switch to **RUN** mode.

Function blocks of the FM 350-2 3

3.1 Overview of the FM 350-2 function blocks

This section describes the function blocks (FBs) and the data structure required for parameter assignment, control and commissioning of the FM 350-2 module.

The function blocks form the software interface between the SIMOTION device and the FMs. They must be called repeatedly (in cycles) from the user program.

The following function blocks are available:

- Function block _FM3502_control (Page 34)
- Function block _FM3502_write (Page 36)
- Function block _FM3502_read (Page 38)
- Function block _FM3502_diagnostic (Page 40)

SIMOTION SCOUT contains all of the required FBs and data structure **Struct_FM3502_fmData** of the FM 350-2. The function blocks can be used to control one or more FM 350-2 modules.

Note

The SIMOTION identifiers have changed as of V4.0. A comparison of the SIMOTION and SIMATIC identifiers can be found in the appendix SIMOTION and SIMATIC names (Page 87) in the table "SIMOTION and SIMATIC identifiers FM 350-2".

Note

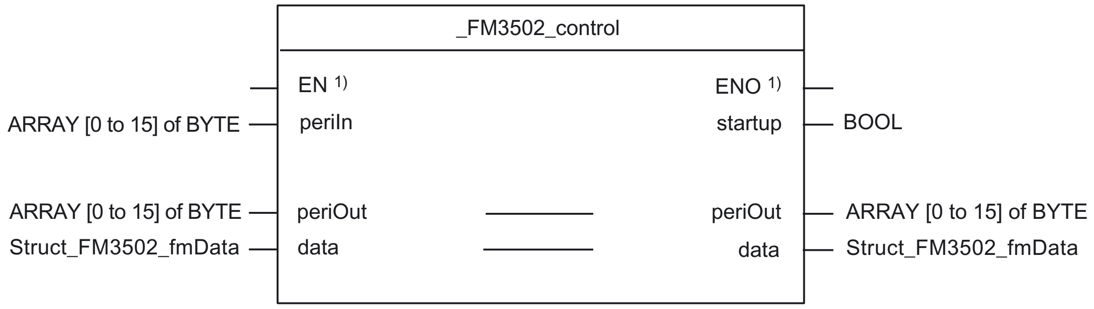
The online functions of the parameter assignment tool in STEP 7 **HW Config** can only be used for diagnostic purposes (read-only access to the module). Write access (control function) has no effect. The parameters set by the program can be read out using the parameter assignment tool.

3.2 Function block _FM3502_control

Introduction

The **_FM3502_control** function block can be used to control the module and to scan the status of the FM 350-2.

Call (LAD representation)



[1] LAD-specific parameter

Parameter description

Table 3- 1 Parameters of the _FM3502_control function block

Name	P type [1]	Data type	Meaning	Actions performed by user	Actions performed by block
periIn	IN	ARRAY [0 to 15] of BYTE	Transfers I/O inputs of the FM to the FB	I/O variable of the I/O inputs of the FM transferred to the FB	Checked
periOut	IN/OUT	ARRAY [0..15] of BYTE	Prepared data of the FB for the I/O outputs of the FM [2]	Checked and entered on the I/O variable for the I/O outputs	Entered
data	IN/OUT	Struct_FM3502_fmData	Data structure with channel-specific data	Entered and checked	Checked and entered
startup	OUT	BOOL	Indicates the startup of the FM	Checked	Entered

[1] Parameter types: IN = input parameter, OUT = output parameter, IN/OUT = in/out parameter

[2] **Note:**The **periOut**parameter must be supplied with an array of type **ARRAY [0..15] of BYTE**. Create a local or global array in your program under **VAR**(do not create a temporary array under VAR_TEMP). After the FB has been called, this array must be assigned to the I/O variable for the I/O outputs of the module. See FM 350-2 call example!

Functional description

The **_FM3502_control** function block cyclically transfers the control signals from the **control** substructure of the data structure of type **Struct_FM3502_fmData** to the FM 350-2. In addition, it reads the checkback signals from the FM 350-2 and enters these into the **checkback** substructure of the data structure of type **Struct_FM3502_fmData.**

The **_FM3502_control** function block is absolutely essential for operation of the FM 350-2.

Task integration (call)

The**_FM3502_control** function block must be called cyclically via the **BackgroundTask** or the **TimerInterruptTask**. Calling in the **SystemInterruptTask** is not permitted. Calling the function block in the **IPOSynchronousTask** is not recommended for runtime reasons.

Before the call, you enter the current control signals in the **control** substructure of the **Struct_FM3502_fmData** data structure. After the call, the checkback signals are updated in the **checkback** substructure of the data structure. They can then be processed further.

The **_FM3502_control** function block must be called cyclically for **each** FM 350-2 integrated in the project.

Startup behavior

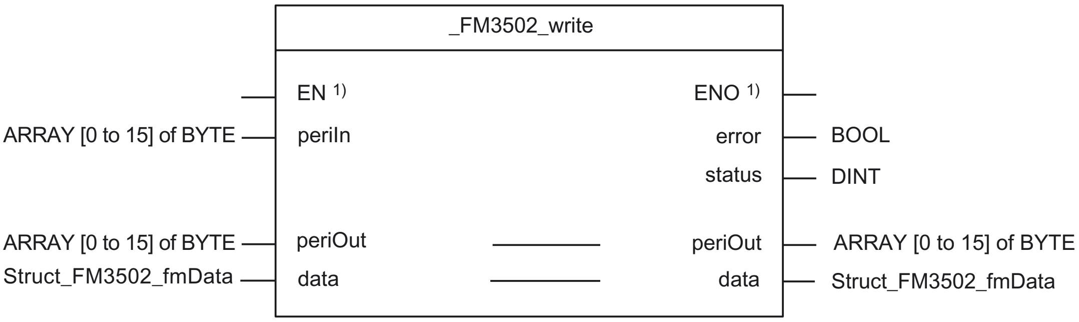
The **_FM3502_control** function block performs startup coordination with the FM 350-2. A startup of the FM 350-2 is indicated by output parameter **startup** = **TRUE**.
After startup has been acknowledged, the control and checkback signals are exchanged with the FM 350-2.

3.3 Function block _FM3502_write

Introduction

The **_FM3502_write** function block executes write jobs (for example, loading count values and comparison values) to the FM 350-2.

Call (LAD representation)



[1] LAD-specific parameter

Parameter description

Table 3- 2 Parameters of the _FM3502_write function block

Name	P type [1]	Data type	Meaning	Actions performed by user	Actions performed by block
periIn	IN	ARRAY [0 to 15] of BYTE	Transfers I/O inputs of the FM to the FB	I/O variable of the I/O inputs of the FM transferred to the FB	Checked
periOut	IN/OUT	ARRAY [0 to 15] of BYTE	Prepared data of the FB for the I/O outputs of the FM [2]	Checked and entered on the I/O variable for the I/O outputs	Entered
data	IN/OUT	Struct_FM3502 _fmData	Data structure with channel-specific data	Entered and checked	Checked and entered
error	OUT	BOOL	Request completed with errors	Checked	Entered
status	OUT	DINT	Error ID [3]**_writeRecord**	Checked	Entered

[1] Parameter types: IN = input parameter, OUT = output parameter, IN/OUT = in/out parameter

[2] **Note:**The **periOut**parameter must be supplied with an array of type **ARRAY [0..15] of BYTE**. Create a local or global array in your program under **VAR**(do not create a temporary array under VAR_TEMP). After the FB has been called, this array must be assigned to the I/O variable for the I/O outputs of the module. See FM 350-2 call example!

[3] A detailed description is contained in the *SIMOTION System Function/Variables*parameter manual. This documentation is included in the SIMOTION SCOUT scope of delivery as electronic documentation!

Functional description

The _FM3502_write function block loads the counters and comparators of the FM 350-2 from the data structure of type Struct_FM3502_fmData by means of a write job.

The _FM3502_write function block should only be called when executing write jobs.

Task integration (call)

The _FM3502_write function block can be called via the BackgroundTask or the TimerInterruptTask. Calling in the SystemInterruptTask is not permitted. Calling the function block in the IPOSynchronousTask is not recommended for runtime reasons.

Before executing a write job, you must supply the appropriate values in the data range associated with the write job. A write job is triggered by assigning the job number in the write.execJobNumber element. The _FM3502_write function block must continue to be called cyclically until the write.execJobNumber element is zero. The last write job must be complete before a new write job can be executed, i.e. write.execJobNumber is deleted.

Note

To ensure the correct sequence, the module address must be entered (in "general data") in the moduleAddress element of the data structure of type Struct_FM3502_fmData.

Startup behavior

The _FM3502_write function block does not perform startup coordination with the FM 350-2. During the startup phase, job execution is disabled. Any pending jobs are not lost, but they are not executed until the startup has been acknowledged.

Error message during a call

If an error occurs during a call, it is reported in the status output parameter.

Note

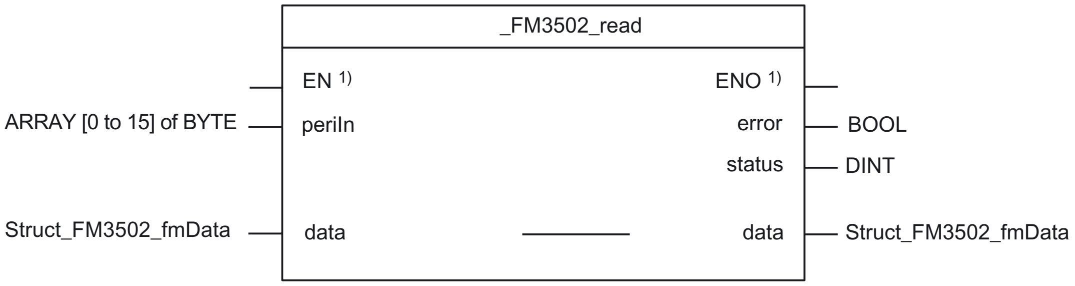
The return value (error ID) in the status parameter is present for one cycle only. The values 0x7001 and 0x7002 indicate that a data transfer has been initiated and is active.

3.4 Function block _FM3502_read

Introduction

The **_FM3502_read** function block is used to read out the count values and measured values of the FM 350-2.

Call (LAD representation)



1) LAD-specific parameter

Parameter description

Table 3- 3 Parameters of the _FM3502_read function block

Name	P type 1)	Data type	Meaning	Actions performed by user	Actions performed by block
periIn	IN	ARRAY [0 to 15] of BYTE	Transfers I/O inputs of the FM to the FB	I/O variable of the I/O inputs of the FM transferred to the FB	Checked
data	IN/OUT	Struct_FM3502_fmData	Data structure with channel-specific data	Entered and checked	Checked and entered
error	OUT	BOOL	Request completed with errors	Checked	Entered
status	OUT	DINT	Error ID 3) **_readRecord**	Checked	Entered

[1] Parameter types: IN = input parameter, OUT = output parameter, IN/OUT = in/out parameter

[2] **Note:**The **periOut**parameter must be supplied with an array of type **ARRAY [0..15] of BYTE**. Create a local or global array in your program under **VAR**(do not create a temporary array under VAR_TEMP). After the FB has been called, this array must be assigned to the I/O variable for the I/O outputs of the module. See FM 350-2 call example!

[3] A detailed description is contained in the *SIMOTION System Function/Variables list manual.* This documentation is included in the SIMOTION SCOUT scope of supply as electronic documentation!

Functional description

The _FM3502_read function block executes the read jobs entered in the read.execJobNumber element and transfers the read data to the data structure of type Struct_FM3502_fmData.

The _FM3502_read function block should only be called when executing read jobs.

Task integration (call)

The _FM3502_read function block can be called via the BackgroundTask or the TimerInterruptTask. Calling in the SystemInterruptTask is not permitted. Calling the function block in the IPOSynchronousTask is not recommended for runtime reasons.

A read job is triggered by assigning the job number in the read.execJobNumber element. The _FM3502_read function block must continue to be called cyclically until the read.execJobNumber element is zero. The current read job must be complete before a new read job can be executed, i.e. read.execJobNumber is deleted.

Note

To ensure the correct sequence, the module address must be entered (in "general data") in the moduleAddress element of the data structure of type Struct_FM3502_fmData.

Startup behavior

The _FM3502_read function block does not perform startup coordination with the FM 350-2. During the startup phase, job execution is disabled. Any pending jobs are not lost, but they are not executed until the startup has been acknowledged.

Error message during a call

If an error occurs during a call, it is reported in the status output parameter.

Note

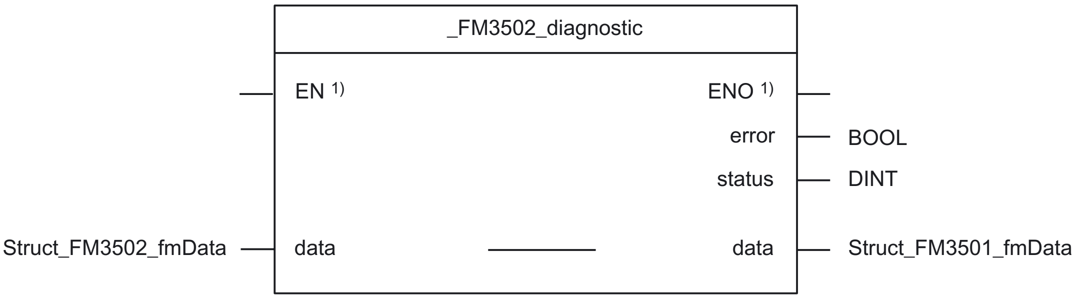
An error ID in status is present for one cycle only. The values 0x7001 and 0x7002 indicate that a data transfer has been initiated and is active.

3.5 Function block _FM3502_diagnostic

Introduction

The **_FM3502_diagnostic** function block enables you to read out the complete diagnostic data from the FM 350-2.

Call (LAD representation)



[1] LAD-specific parameter

Parameter description

Table 3- 4 Parameters of the _FM3502_diagnostic function block

Name	P type [1]	Data type	Meaning	Actions performed by user	Actions performed by block
data	IN/OUT	Struct_FM3502_fmData	Data structure with channel-specific data	Entered and checked	Checked and entered
error	OUT	BOOL	Request completed with errors	Checked	Entered
status	OUT	DINT	Return value (error ID) [2] **_readRecord**	Checked	Entered

[1] Parameter types: IN = input parameter, OUT = output parameter, IN/OUT = in/out parameter

[2] A detailed description is contained in the *SIMOTION System Function/Variables*parameter manual. This documentation is included in the SIMOTION SCOUT scope of delivery as electronic documentation!

Functional description

The entire diagnostic data are read out by the **_FM3502_diagnostic** function block and made available in the **diagnostic** substructure of the **Struct_FM3502_fmData** data structure.

The return value (error ID) can be read out at the **status** output parameter of the function block.

Sequence

Data is transferred as follows:

1. When the **_FM3502_diagnostic** function block is called, data transfer is enabled and the data are transferred. You can view the error ID at the **status** output parameter.

   Note

   The return value (error ID) in the **status** parameter is present for one cycle only. The values 0x7001 and 0x7002 indicate that a data transfer has been initiated and is active.

2. The data are entered in the data structure of type **Struct_FM3502_fmData**.
3. The return value (error ID) is provided at the **status** parameter of the **_FM3502_diagnostic** function block.
4. The reading out of diagnostic data is finished when **status** = 0 is signaled.

   Note

   To ensure the correct sequence, the module address must be entered (in "general data") in the **moduleAddress** element of the data structure of type **Struct_FM3502_fmData**.

Task integration (call)

The **_FM3502_diagnostic** function block can be called in the **PeripheralFaultTask**, **BackgroundTask** or **TimerInterruptTask**. For performance reasons, the function block should only be called in the **PeripheralFaultTask**.

3.6 Data structures of the FM 350-2

Overview

The data structure of type **Struct_FM3502_fmData** contains all data of the FM 350-2 relevant for operation, as well as diagnostic data.

The data structures are used by the the following function blocks: **_FM3502_control**, **_FM3502_write**, **_FM3502_read** and **_FM3502_diagnostic**. Elements in the data structure are accessed using a variable of data type **Struct_FM3502_fmData**, which you must define yourself.

The **Struct_FM3502_fmData** data structure is shown in the table below.

Note

The SIMOTION identifiers have changed as of V4.0. A comparison of the SIMOTION and SIMATIC identifiers can be found in the appendix SIMOTION and SIMATIC names (Page 87) in the table "SIMOTION and SIMATIC identifiers FM 350-2".

Table 3- 5 Data structure of Struct_FM3502_fmData

Struct_FM3502_fmData			
Name	**Type**	**Initial value**	**Comment**
Write job (data structure)			
write	**Struct_FM3502_wrJob**		Write job elements
execJobNumber	BYTE	16#00	Number
busy	BOOL	FALSE	Write job in progress
done	BOOL	FALSE	Write job finished
invalid	BOOL	FALSE	Write job not possible
unknown	BOOL	FALSE	Write job unknown
Read job (data structure)			
read	**Struct_FM3502_rdJob**		Read job elements
execJobNumber	BYTE	16#00	Number
busy	BOOL	FALSE	Read job in progress
done	BOOL	FALSE	Read job finished
invalid	BOOL	FALSE	Read job not possible
unknown	BOOL	FALSE	Read job unknown
General data			
xxxReserved1 1)	ARRAY [1..3] of WORD		Reserved
xxxReserved2 1)	WORD	16#0000	Reserved
moduleAddress	INT	256	Module address
xxxReserved3 1)	BYTE	16#00	Reserved

Struct_FM3502_fmData			
Name	Type	Initial value	Comment
Control signals (data structure)			
control	Struct_FM3502_control		Elements for control signals
xxxReserved4..11 [1]	BOOL	FALSE	Reserved
enableOutput0	BOOL	FALSE	Output 0 enabled
enableOutput1	BOOL	FALSE	Output 1 enabled
enableOutput2	BOOL	FALSE	Output 2 enabled
enableOutput3	BOOL	FALSE	Output 3 enabled
enableOutput4	BOOL	FALSE	Output 4 enabled
enableOutput5	BOOL	FALSE	Output 5 enabled
enableOutput6	BOOL	FALSE	Output 6 enabled
enableOutput7	BOOL	FALSE	Output 7 enabled
setOutput0	BOOL	FALSE	Set output 0
setOutput1	BOOL	FALSE	Set output 1
setOutput2	BOOL	FALSE	Set output 2
setOutput3	BOOL	FALSE	Set output 3
setOutput4	BOOL	FALSE	Set output 4
setOutput5	BOOL	FALSE	Set output 5
setOutput6	BOOL	FALSE	Set output 6
setOutput7	BOOL	FALSE	Set output 7
enableSwGate0	BOOL	FALSE	Open SW gate counter 0
enableSwGate1	BOOL	FALSE	Open SW gate counter 1
enableSwGate2	BOOL	FALSE	Open SW gate counter 2
enableSwGate3	BOOL	FALSE	Open SW gate counter 3
enableSwGate4	BOOL	FALSE	Open SW gate counter 4
enableSwGate5	BOOL	FALSE	Open SW gate counter 5
enableSwGate6	BOOL	FALSE	Open SW gate counter 6
enableSwGate7	BOOL	FALSE	Open SW gate counter 7
xxxReserved12 [1]	DWORD	16#0000 0000	Reserved
xxxReserved13 [1]	DWORD	16#0000 0000	Reserved
xxxReserved14 [1]	DWORD	16#0000 0000	Reserved
Checkback signals (data structure)			
checkback	Struct_FM3502_checkback		Elements for checkback signals
xxxReserved15 [1]	BOOL	FALSE	Reserved
testModePg	BOOL	FALSE	Test mode is selected on the parameter assignment tool
xxxReserved16..17 [1]	BOOL	FALSE	Reserved
dataError	BOOL	FALSE	Data error (can be read out via parameterization tool)
xxxReserved18..19 [1]	BOOL	FALSE	Reserved
parameterized	BOOL	FALSE	Module parameterized
stateCmpValue0	BOOL	FALSE	Comparator 0 addressed

Struct_FM3502_fmData			
Name	Type	Initial value	Comment
stateCmpValue1	BOOL	FALSE	Comparator 1 addressed
stateCmpValue2	BOOL	FALSE	Comparator 2 addressed
stateCmpValue3	BOOL	FALSE	Comparator 3 addressed
stateCmpValue4	BOOL	FALSE	Comparator 4 addressed
stateCmpValue5	BOOL	FALSE	Comparator 5 addressed
stateCmpValue6	BOOL	FALSE	Comparator 6 addressed
stateCmpValue7	BOOL	FALSE	Comparator 7 addressed
cntr0Underflow	BOOL	FALSE	Underflow counter 0
cntr1Underflow	BOOL	FALSE	Underflow counter 1
cntr2Underflow	BOOL	FALSE	Underflow counter 2
cntr3Underflow	BOOL	FALSE	Underflow counter 3
cntr4Underflow	BOOL	FALSE	Underflow counter 4
cntr5Underflow	BOOL	FALSE	Underflow counter 5
cntr6Underflow	BOOL	FALSE	Underflow counter 6
cntr7Underflow	BOOL	FALSE	Underflow counter 7
cntr0Overflow	BOOL	FALSE	Overflow counter 0
cntr1Overflow	BOOL	FALSE	Overflow counter 1
cntr2Overflow	BOOL	FALSE	Overflow counter 2
cntr3Overflow	BOOL	FALSE	Overflow counter 3
cntr4Overflow	BOOL	FALSE	Overflow counter 4
cntr5Overflow	BOOL	FALSE	Overflow counter 5
cntr6Overflow	BOOL	FALSE	Overflow counter 6
cntr7Overflow	BOOL	FALSE	Overflow counter 7
cntr0Reverse	BOOL	FALSE	Reverse counting direction for counter 0
cntr1Reverse	BOOL	FALSE	Reverse counting direction for counter 1
cntr2Reverse	BOOL	FALSE	Reverse counting direction for counter 2
cntr3Reverse	BOOL	FALSE	Reverse counting direction for counter 3
cntr4Reverse	BOOL	FALSE	Reverse counting direction for counter 4
cntr5Reverse	BOOL	FALSE	Reverse counting direction for counter 5
cntr6Reverse	BOOL	FALSE	Reverse counting direction for counter 6
cntr7Reverse	BOOL	FALSE	Reverse counting direction for counter 7
input0	BOOL	FALSE	Digital input 0 active/not active
input1	BOOL	FALSE	Digital input 1 active/not active
input2	BOOL	FALSE	Digital input 2 active/not active
input3	BOOL	FALSE	Digital input 3 active/not active
input4	BOOL	FALSE	Digital input 4 active/not active
input5	BOOL	FALSE	Digital input 5 active/not active
input6	BOOL	FALSE	Digital input 6 active/not active
input7	BOOL	FALSE	Digital input 7 active/not active
output0	BOOL	FALSE	Digital output 0 active/not active
output1	BOOL	FALSE	Digital output 1 active/not active

Struct_FM3502_fmData			
Name	Type	Initial value	Comment
output2	BOOL	FALSE	Digital output 2 active/not active
output3	BOOL	FALSE	Digital output 3 active/not active
output4	BOOL	FALSE	Digital output 4 active/not active
output5	BOOL	FALSE	Digital output 5 active/not active
output6	BOOL	FALSE	Digital output 6 active/not active
output7	BOOL	FALSE	Digital output 7 active/not active
gate0	BOOL	FALSE	Internal gate counter 0 open/closed
gate1	BOOL	FALSE	Internal gate counter 1 open/closed
gate2	BOOL	FALSE	Internal gate counter 2 open/closed
gate3	BOOL	FALSE	Internal gate counter 3 open/closed
gate4	BOOL	FALSE	Internal gate counter 4 open/closed
gate5	BOOL	FALSE	Internal gate counter 5 open/closed
gate6	BOOL	FALSE	Internal gate counter 6 open/closed
gate7	BOOL	FALSE	Internal gate counter 7 open/closed
opValue0	WORD	16#0000	Depending on assigned count value/measured value 0...3 (is updated each time the **_FM3502_control** FB is called)
opValue1	WORD	16#0000	
opValue2	WORD	16#0000	
opValue3	WORD	16#0000	
loadValue0	DINT	0	Load counter 0 directly
loadValue1	DINT	0	Load counter 1 directly
loadValue2	DINT	0	Load counter 2 directly
loadValue3	DINT	0	Load counter 3 directly
loadValue4	DINT	0	Load counter 4 directly
loadValue5	DINT	0	Load counter 5 directly
loadValue6	DINT	0	Load counter 6 directly
loadValue7	DINT	0	Load counter 7 directly
prepValue0	DINT	0	Load counter 0 in preparation
prepValue1	DINT	0	Load counter 1 in preparation
prepValue2	DINT	0	Load counter 2 in preparation
prepValue3	DINT	0	Load counter 3 in preparation
prepValue4	DINT	0	Load counter 4 in preparation
prepValue5	DINT	0	Load counter 5 in preparation
prepValue6	DINT	0	Load counter 6 in preparation
prepValue7	DINT	0	Load counter 7 in preparation
cmpValue0	DINT	0	Load comparison value 0
cmpValue1	DINT	0	Load comparison value 1
cmpValue2	DINT	0	Load comparison value 2
cmpValue3	DINT	0	Load comparison value 3

Struct_FM3502_fmData			
Name	**Type**	**Initial value**	**Comment**
cmpValue4	DINT	0	Load comparison value 4
cmpValue5	DINT	0	Load comparison value 5
cmpValue6	DINT	0	Load comparison value 6
cmpValue7	DINT	0	Load comparison value 7
actCntrValue0	DINT	0	Actual counter value 0
actMeasValue0	DINT	0	Measured value result 0
actCntrValue1	DINT	0	Actual counter value 1
actMeasValue1	DINT	0	Measured value result 1
actCntrValue2	DINT	0	Actual counter value 2
actMeasValue2	DINT	0	Measured value result 2
actCntrValue3	DINT	0	Actual counter value 3
actMeasValue3	DINT	0	Measured value result 3
actCntrValue4	DINT	0	Actual counter value 4
actMeasValue4	DINT	0	Measured value result 4
actCntrValue5	DINT	0	Actual counter value 5
actMeasValue5	DINT	0	Measured value result 5
actCntrValue6	DINT	0	Actual counter value 6
actMeasValue6	DINT	0	Measured value result 6
actCntrValue7	DINT	0	Actual counter value 7
actMeasValue7	DINT	0	Measured value result 7
Diagnostic data (data structure)			
diagnostic	**Struct_FM3502_diagInfo**		Elements for diagnostic data
xxxReserved20..23 [1]	BYTE	16#00	Reserved
chType	BYTE	16#00	Channel type
chInfoLength	BYTE	16#00	Length of channel info
numOfChannel	BYTE	16#00	Number of channels
chFault	BYTE	16#00	Channel fault vector
cntr0Fault	BYTE	16#00	Counter 0 fault
cntr1Fault	BYTE	16#00	Counter 1 fault
cntr2Fault	BYTE	16#00	Counter 2 fault
cntr3Fault	BYTE	16#00	Counter 3 fault
cntr4Fault	BYTE	16#00	Counter 4 fault
cntr5Fault	BYTE	16#00	Counter 5 fault
cntr6Fault	BYTE	16#00	Counter 6 fault
cntr7Fault	BYTE	16#00	Counter 7 fault

[1] Variable for internal FB use (not relevant to users)

3.7 Calling function blocks

In order to be able to work with the function blocks in your user project, proceed as follows (the numbers shown in the following program segment correspond to the steps below):

1. Create the function block instance (see the following program segment, e.g. create instance for FB _FM3502_control).
2. Set up variables for the data structure.
3. Create an array for the in/out parameters of the FB.
4. Call instance of the function block.
5. Transfer input parameters.
6. The output parameters of the FB are accessed with <instance name of FB>.
   <name of output parameter>.
7. Data prepared by the FB for the I/O outputs are assigned to the array of the I/O variables created in step 3.

Note

The call example is an extract from the supplied E_FM3502 application example, which is contained on the "SIMOTION Utilities & Applications" CD-ROM.

If you wish to control more than one FM 350-2, you must create a new variable for the data structure and FB instances with a new name for each FM 350-2 used.

Call example

```
UNIT E_FM3502;
INTERFACE
VAR_GLOBAL
    myDataFM3502        : Struct_FM3502_fmData; // variable for data structure                          (2)

    // OUTPUT VARIABLES
    myStateFMStartup    : BOOL; // Start-up status
    myInstFM3502Ctrl    : _FM3502_control;        // create FB instance                                 (1)

END_VAR
END_INTERFACE

IMPLEMENTATION

PROGRAM ExampleFM3502 // Program in BackgroundTask

// Variables used: see interface area under VAR_GLOBAL
VAR
    FMOutputArray      : ARRAY [0..15] of BYTE; // Array for FM output data                             (3)
END_VAR
// CALL INSTANCE of FB _FB_FM3502_control                                                               (4)
    myInstFM3502Ctrl
        (
        periIn         := myPeripheralInputFM3502,   // I/O variable of I/O inputs                      (5)
        periOut        := FMOutputArray,             // FM output data array
        data           := myDataFM3502               // Data structure
        );

// TRANSFER DATA TO FM
    myPeripheralOutputFM3502   := FMOutputArray;     // Assign array of FM output                       (7)
                                                     // data to I/O variable

    myStateFMStartup  := myInstFM3502Ctrl.startup;   // Start-up status                                 (6)

END_PROGRAM                  // ExampleFM3502
END_IMPLEMENTATION
```

Note

The PROGRAM ExampleFM3502 must be assigned in the execution system.

3.8 Application example for FM 350-2

Introduction

In this example, the FM 350-2 counter module is used to solve two different tasks. Counter channels 0 and 1 will be used to control a filling unit. At the same time, a frequency measurement with limit value check will be performed using counter channel 4.

Filling unit

A box will be filled with a certain number of parts from a collection bin. Counter channel 0 counts 10 (0...9) parts and controls the filling valve. Counter channel 1 is used to control the motor that transports the boxes and to count the number of boxes. When the box is in the correct position, the valve is opened and the parts are filled into the box. When the specified number has been reached, the valve is closed and the box transport is initiated. Arriving parts are counted until the next box arrives.

While the box is being transported, a new number of parts can be specified.
The number of filled parts and the number of boxes can be monitored (in the symbol browser).

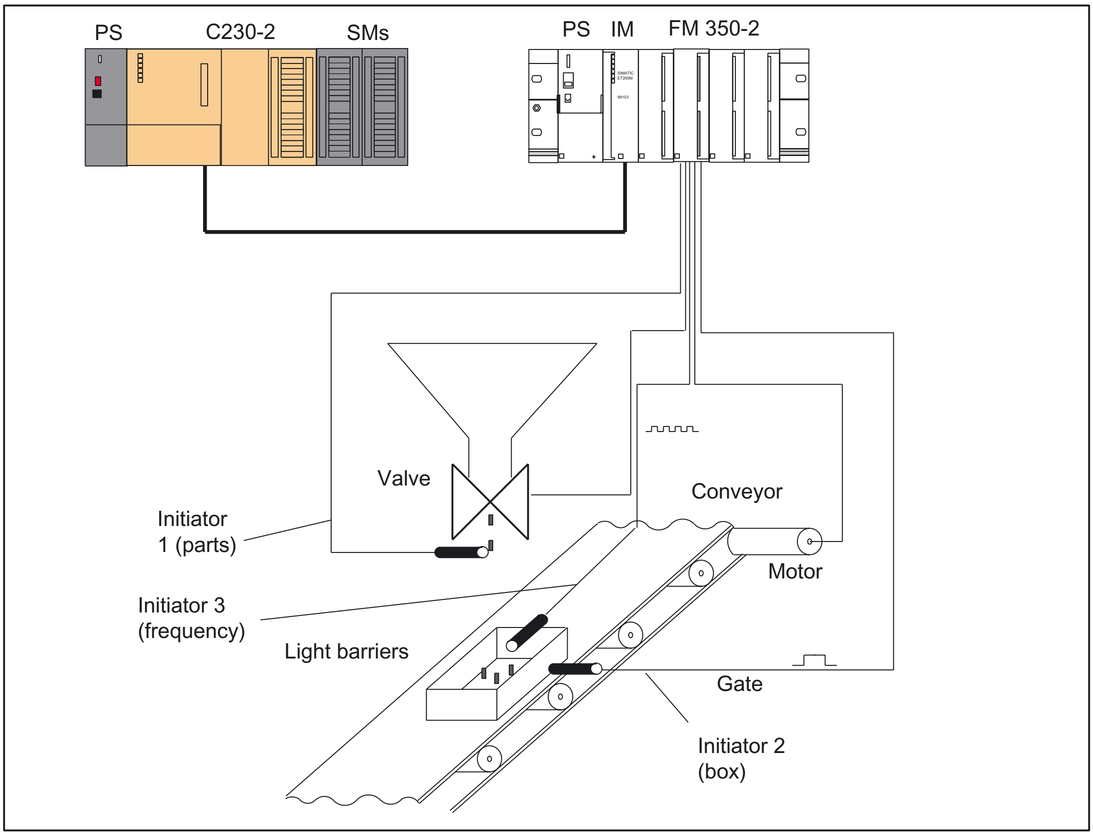


Figure 3-1 Example application for the FM 350-2

Frequency measurement

A frequency measurement (speed of falling parts) is made at counter channel 4 for frequencies up to 10 kHz. The measured frequency is subjected to a limit value check for the lower limit of 1 kHz and upper limit of 9 kHz. The status of the limit values, the measured frequency and the continuously counted pulses can be monitored (in the symbol browser).

FM 350-2 installation and wiring

Proceed as follows to install and wire the FM 350-2:

1. Insert the bus connector supplied with the FM 350-2 onto the bus plug.
2. Hook the FM 350-2 onto the rail, pivot the module downwards and bolt it into place (more detailed instructions can be found in SIMATIC manual *FM 350-2 Counter Module Installation and Parameter Assignment*).
3. Wire the front connector as shown below (a complete pin assignment for the front connector can be found in SIMATIC manual *FM 350-2 Installation and Parameter Assignment*).

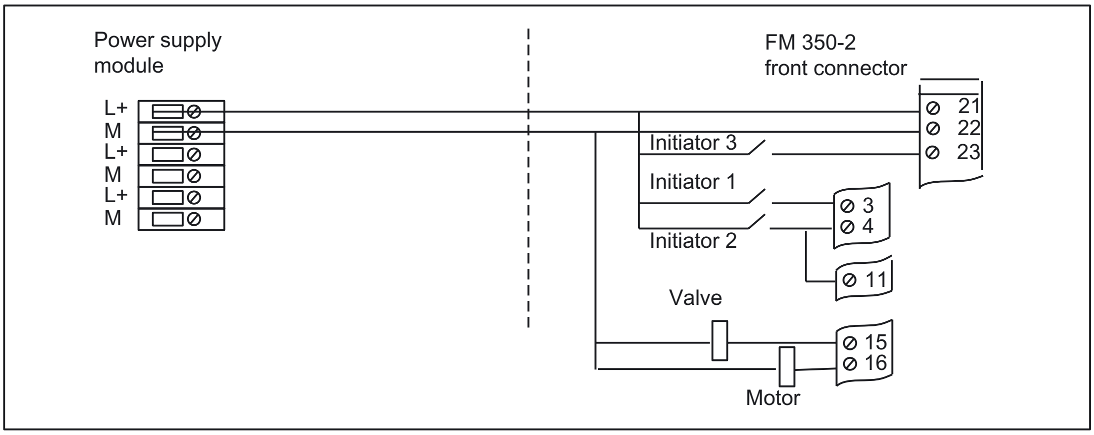


Figure 3-2 FM 350-2 installation and wiring

Terminal	Name	Meaning
21	L+	24 V power supply
22	M	Ground
23	A4	Frequency input from 24 V initiator 3
3	A0	Counter pulses for parts from 24 V initiator 1
4	A1	Counter pulses for boxes from 24 V initiator 2
11	I0	Box in position (HW gate) from terminal 4
15	Q0	Actuation of valve for filling parts
16	Q1	Actuation of the motor for box transport

4. Plug the front connector into the FM 350-2 and screw tightly.

Assigning module parameters

Proceed as follows:

1. Open your project in SIMOTION SCOUT.
2. Open the hardware configuration in SIMOTION SCOUT.
3. Configure your hardware station.
4. Double-click **FM350-2** to open the **Properties** dialog box for the module. There you will see the "General", "Addresses" and "Basic parameters" tabs for the module.
5. Click the Parameters button. The parameter assignment screen forms of the FM 350-2 will open. The parameters for encoders, operating modes, alarm enabling, and outputs are stored for every channel in these screen forms.

   Under the **Edit > Specify channels** menu command, you will find the global settings for all of the channels of the FM 350-2.
6. Change the following parameters:

   Specify channels:

   – Specify channels 0...7 as single counters!

   – For USER_TYP2, select data type DWORD and for channel 4, select the "Measured value" setting instead of "Counter value".

   Afterwards, click **OK** to confirm.

   Channel 0:

   – Mode: "Single counting" and activation of "Use hardware gate"

   – Under alarm enable, enter the comparison value "9" (10 parts) (all alarm enables alarms are deactivated).

   Channel 4:

   – Mode: "Frequency measurement" and x10 ms for time window "1"

   – Under alarm enable, enter "1000000" for the range underflow limit and "9000000" for the range overflow limit (all alarm enables are deactivated).
7. Transfer the parameter assignment for the FM 350-2 to the hardware configuration using the **File > Save** menu command and close the "FM350-2 Counter" window using the **File > Exit** menu command.
8. Save the hardware configuration with the **Station > Save and compile** menu command.
9. Download the hardware configuration with the **Target system > Download to module** menu command.

   The red "SF" LED of the FM 350-2 turns on and off after the module parameter assignment is downloaded without errors.

Hardware platform

The application example is available for various SIMOTION hardware platforms and is intended for distributed use of the FM 350-2.

Note

If the application example is not available for your hardware platform, you must adapt the hardware configuration.

Adapting the application example

The configuration in the example and its available hardware must be adapted.

The following options are available:

1. You can adapt the configuration in the example to the available hardware (PROFIBUS DP address).
2. You can adapt the configuration of the hardware to the example (PROFIBUS DP address).

Calling the application example

The application example can be found on the "SIMOTION Utilities & Applications" CD-ROM. The "SIMOTION Utilities & Applications" CD-ROM is provided free of charge and part of the SIMOTION SCOUT scope of delivery.

1. Dearchive and open the project containing the application example.
2. Check the hardware configuration: PROFIBUS DP addresses.
3. Check the module addresses (hardware configuration) against the I/O addresses of the controller in SIMOTION SCOUT and module address in the program (myDataFM3502.moduleAddress).
4. Save and compile the example project. Then, you can download the example to the SIMOTION device and switch to **RUN** mode.

Input/output symbols

Table 3- 6 Input symbols used

Symbol	Data type	Description
myStartFillup	BOOL	Start the filling unit
myMeasurementFrequency	BOOL	Start the frequency measurement
mySetNewCounterValue	BOOL	Start to load new quantity
myReadActualCounterValue	BOOL	Start to read current values
myChangeChannelActualValue	BOOL	Read selection of current values FALSE: Channels 0..3 TRUE: Channels 4..7
myNewQuantity	UINT	New quantity

Symbol	Data type	Description
myResetProcessAlarm	BOOL	Acknowledgement of process alarm
myResetDiagnosticAlarm	BOOL	Acknowledgement of diagnostic alarm

Table 3- 7 Output symbols used

Symbol	Data type	Description
myStateLoad	BOOL	New quantity loaded
myErrorWrite	BOOL	Error when loading quantity
myErrorRead	BOOL	Error when reading current values
myCounterOverflow	BOOL	Upper frequency limit exceeded
myCounterUnderflow	BOOL	Lower frequency limit fallen below
myStateFMStartup	UINT	Startup status
myProcessAlarm	BOOL	Process alarm
myDiagnosticAlarm	BOOL	Diagnostic alarm

Note

You can either monitor and modify the input and output variables used in the programming example in the INTERFACE section of the unit (under VAR_GLOBAL) using the symbol browser, or you can assign real inputs and outputs to the input and output variables in your unit.

Filling unit application sequence

The sequence for the "Filling unit" application is reproduced below.

1. Start the filling unit application by setting the "myStartFillup" input.

   Output Q1 of the FM 350-2 is set to move the box into position.

2. Actuate 24 V initiator 2 (box in position/box counting pulses) when the box is in position.

   A "1" is displayed in data structure "myDataFM3502.checkback.opValue1" (number of boxes).

   Then the valve is opened via output Q0 of the FM 350-2, and the parts are counted. When you actuate 24 V initiator 1, the number of filled parts is incremented in "myDataFM3502.checkback.opValue0" (number of parts). When 10 parts are reached, the valve is closed and the box transport is activated. The process is repeated when the next box arrives.

   Proceed as follows to change the number of parts:

3. Enter the new quantity in the "myNewQuantity" input parameter as a control value and activate it. The new quantity is applied with "Immediate control".

4. Set the "mySetNewCounterValue" input to load the new quantity. The "mySetNewCounterValue" input evaluates the rising edge and only then starts a new write job (transfer of new parts is resumed only if the "mySetNewCounterValue" input was set to "FALSE" beforehand). If the new quantity is successfully loaded, the "myStateLoad" output is briefly set.

Frequency measurement application sequence

The sequence for the "Frequency measurement" application is reproduced below.

1. Start the frequency measurement application by setting the "myMeasurementFrequency" input.
2. Actuate 24 V initiator 3 (frequency input), for example, by connecting a frequency generator to it.
3. Set the "myChangeChannelActualValue" input and the "myReadActualCounterValue" input.

   As long as these inputs are set, the current values are displayed in data structures "myDataFM3502".counterValue4 to "myDataFM3502".measuringValue7.

   You have the option of reading the current values of counter channels 0 to 3 by deleting the "myChangeChannelActualValue" input.

   If the value drops below the lower frequency limit of 1 kHz, this is indicated at the"myCounterUnderflow" output.

   If the value exceeds the upper frequency limit of 9 kHz, this is indicated at the "myCounterOverflow" output.

   In addition, you can also read the current values (counter values and measured values) of counter channels 4 to 7.

Diagnostic alarm / process alarm

Incorrect wiring can cause errors, which the FM 350-2 displays using the "SF" group error LED and in the "myProcessAlarm" and "myDiagnosticAlarm" variables. In these cases, the FM 350-2 triggers a diagnostic alarm/process alarm, provided the basic parameters are set accordingly (alarm generation: YES; and alarm selection: diagnostic or diagnostic+process). If the "PeripheralFaultFM3502" program is integrated in the PeripheralFaultTask, this task is started and the most important task start information is stored temporarily in the "myAlarmDetails", "myLogBaseAddressIn" and "myAlarmInterrupt" variables.

If a diagnostic alarm has been signaled, the _FM3502_diagnostic FB is started, which reads out detailed diagnostic information from the module. These diagnostic data are then located in data structure "myDataFM3502". You can acknowledge the respective alarm by setting the "myResetDiagnosticAlarm" input variable (when acknowledging a diagnostic alarm) or "myResetProcessAlarm" input variable (when acknowledging a process alarm).

Function Blocks of the FM 352 4

4.1 Overview of the FM 352 function blocks

This section describes the function blocks (FBs) and the data structures required for parameter assignment, control and commissioning of the FM 352 module.

The function blocks form the software interface between the SIMOTION device and the FMs. They must be called repeatedly (in cycles) from the user program.

The following function blocks are available:

- Function block _FM352_initialize (Page 56)
- Function block _FM352_control (Page 57)
- Function block _FM352_diagnostic (Page 60)

SIMOTION SCOUT contains all of the required FBs and data structures **Struct_FM352_ctrlData**, **Struct_FM352_diagData** and **Struct_FM352_paraData** of the FM 352. The function blocks can be used to control one or more FM 352 modules.

Note

The SIMOTION identifiers have changed as of V4.0. A comparison of the SIMOTION and SIMATIC identifiers can be found in the appendix SIMOTION and SIMATIC names (Page 87) in the table "SIMOTION and SIMATIC identifiers FM 352".

Note

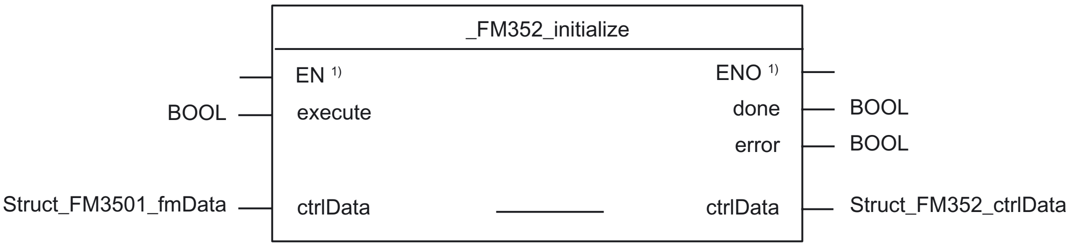
The online functions of the parameter assignment tool in STEP 7 **HW Config** can only be used for diagnostic purposes (read-only access to the module). Write access (control function) has no effect. The parameters set by the program can be read out using the parameter assignment tool.

4.2 Function block _FM352_initialize

Introduction

The **_FM352_initialize** function block allows you to initialize the channel data after startup of the FM 352 module.

Call (LAD representation)



1) LAD-specific parameters

Parameter description

Table 4- 1 Parameters of the _FM352_initialize function block

Name	P type 1)	Data type	Meaning
execute	IN	BOOL	Activation
ctrlData	IN/OUT	Struct_FM352_ctrlData	Data structure with channel-specific data
done	OUT	BOOL	Function or job executed completely without errors
error	OUT	BOOL	Request completed with errors

1) Parameter types: IN/OUT = in/out parameter

Functional description

The _FM352_initialize function block initializes the channel data structure:

- Control signals
- Checkback signals
- Trigger bits, done bits and error bits of jobs
- Function switches and their done bits and error bits
- Job management and internal buffers for the **_FM352_control** function block

The data required for **_FM352_initialize** function block are transferred in variables of the data structure of type **Struct_FM352_ctrlData**.

Task integration (call)

The **_FB_FM352_initialize** function block must be run through after startup of the SIMOTION system. Therefore, you should call it in the **StartupTask** or in a self-programmed initialization phase of your user program. In this way you can ensure that your user program does not access outdated data.

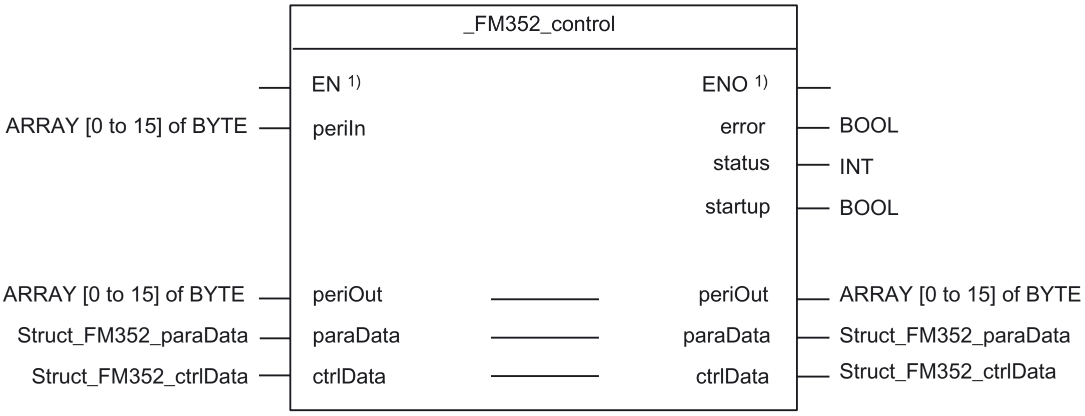
4.3 Function block _FM352_control

Introduction

The **_FM352_control** function block enables you to do the following:

- Write control signals and read out checkback signals from the FM 352
- Read and write parameters of the FM 352

Call (LAD representation)



[1] LAD-specific parameter

Parameter description

Table 4- 2 Parameters of the _FM352_control function block

Name	P type [1]	Data type	Meaning
periIn	IN	ARRAY [0..15] of BYTE	Transfers I/O variable of the I/O inputs of the FM to the FB
periOut	IN/OUT	ARRAY [0..15] of BYTE	Prepared data of the FB for the I/O outputs of the FM [2]
ctrlData	IN/OUT	Struct_FM352_ctrlData	Data structure with channel-specific data
paraData	IN/OUT	Struct_FM352_paraData	Data structure with machine data and output cam data
error	OUT	BOOL	Request completed with errors
status	OUT	INT	Status 0: FB inactive 1: FB active -1: Error
startup	OUT	BOOL	Indicates the startup of the FM

[1] Parameter types: IN = input parameters, OUT = output parameters, IN/OUT = in/out parameters

[2] **Note:**The **periOut**parameter must be supplied with an array of type **ARRAY [0..15] of BYTE**. Create a local or global array in your program under **VAR**(do not create a temporary array under VAR_TEMP). After the FB has been called, this array must be assigned to the I/O variable for the I/O outputs of the module. Call example for FM 352!

Functional description

The _FM352_control function block performs the following activities in the BackgroundTask:

- Reading checkback signals

  The FB reads all of the checkback signals of the FM 352 and enters them into the channel data structure. Because the control signals and jobs are not executed until after this step, the checkback signals reflect the status of the module before the block was called.

- Writing control signals

  The control signals entered in the channel data structure are transferred to the module. Enabling of output cam processing, however, is delayed as long as the trigger for a "Set reference point" job or "Write output cam data" job is set.

- Executing read/write jobs

  The jobs to be executed are specified in channel data structure Struct_FM352_ctrlData using "trigger bits". More than one job can be activated at the same time. The jobs are executed by the _FM352_control function block in the order received.

Task integration (call)

The _FM352_control function block must be called cyclically in the BackgroundTask or in the TimerInterruptTask. Calling in the SystemInterruptTask is not permitted. Read and write jobs are triggered by setting the corresponding trigger bits in the data structure. Calling the function block in the IPOSynchronousTask is not recommended for runtime reasons.

To ensure the proper sequence, the module address must be entered (under general data / version switches) in the moduleAddress element of the data structure of type Struct_FM352_ctrlData.

Startup behavior

The _FM352_control function block acknowledges the module startup. During this time, status and jobBusy = 1. During the startup phase, job execution is disabled. Any pending jobs are not lost and they will be executed after startup has been acknowledged.

Error message during a call

You can read out error information in the data structure in the **jobErrorId** element of the data structure of type **Struct_FM352_ctrlData**.

- The programming device or PC enables you to read out the diagnostic buffer via the parameter assignment interface using the **Test > Error evaluation** menu command.
  - You will find the error class and the error number along with plain text.
- You can evaluate errors in your program. The following means are available for this purpose:
  - Return values (**status**) of the integrated FBs as a group display for errors that occurred during execution of the FBs.
  - Error bits of the jobs as a group display for errors that occurred during execution of a job.
  - **dataError** error bit as a group display for an error that has been detected by the FM 352 during a write job.
  - Error ID in **jobErrorId** for the cause of the error during communication between FB and FM 352. The return values of system functions **_writeRecord** and **_readRecord** are entered in **jobErrorId**.

    Further information on the system functions is contained in the *SIMOTION System Function/Variables* parameter manual. This documentation is included in the SIMOTION SCOUT scope of delivery as electronic documentation!
  - **_FM352_diagnostic** function block for reading out the diagnostic buffer of the FM 352. Here you can obtain the causes for errors, for jobs and asynchronous events (operating errors, diagnostic errors).

Note

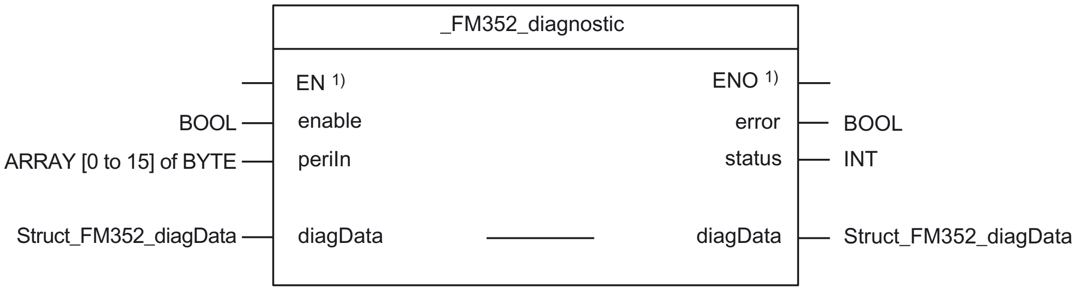
The return value (error ID) in the **status** parameter is present for one cycle only. The values 0x7001 and 0x7002 indicate that a data transfer has been initiated and is active.

4.4 Function block _FM352_diagnostic

Introduction

The **_FM352_diagnostic** function block enables you to read out complete diagnostic data from the FM 352.

Call (LAD representation)



[1] LAD-specific parameter

Parameter description

Table 4- 3 Parameters of _FM352_diagnostic function block

Name	P type [1]	Data type	Comment
enable	IN	BOOL	Enable
periIn	IN	ARRAY [0..15] of BYTE	I/O variable for access to I/O inputs from the FM 352
diagData	IN/OUT	Struct_FM352_diagData	Data structure for diagnostic data
error	OUT	BOOL	Request completed with errors
status	OUT	INT	Return value 0 : FB inactive 1: FB reading data -1 : Error

[1] Parameter types: IN = input parameters, OUT = output parameters, IN/OUT = in/out parameters

Functional description

The diagnostic data are read out by the **_FM352_diagnostic** function block and made available to you in the associated **Struct_FM352_diagData** data structure. The return value (error ID) can be read out at the **status** output parameter of the function block.

The **_FM352_diagnostic** function block reads the diagnostic data when checkback signal **diagDataChanged** = **TRUE** either automatically or per job (**diagInformation** = **TRUE**).

Sequence

The data are transferred as follows:

1. If the set trigger parameter **diagInformation** = TRUE or **diagDataChanged** = TRUE in the data structure of type **Struct_FM352_diagData**, the diagnostic data are read out from the FM 352.
2. The data are entered in the data structure of the **_FM352_diagnostic** function block.
3. The return value (error ID) is provided at the **status** output parameter of the **_FM352_diagnostic** function block.

   Note

   The return value (error ID) in the **status** parameter is present for one cycle only. The values 0x7001 and 0x7002 indicate that a data transfer has been initiated and is active.

4. As soon as the function has been executed, the trigger parameter is signaled as finished by the transfer.

   Note

   To ensure the proper sequence, the module address must be entered in the **moduleAddress** element of the data structure of type **Struct_FM352_diagData**.

Task integration (call)

The **_FM352_diagnostic** function block must be called in the **BackgroundTask** or **TimerInterruptTask**. An additional call in the **SystemInterruptTask** is not permitted. At least two calls (cycles) are required for complete execution of the function. For performance reasons, the function block should only be called in the **PeripheralFaultTask**.

Job

You can read the diagnostic buffer independent of a new entry by setting the **diagInformation** trigger bit. After the diagnostic buffer is read, the trigger bit is set to **FALSE**.

Error message during a call

If an error occurs during a call, it is reported in the **status** output parameter (= -1). The return value of the **_readRecord** system function is entered in the **jobErrorId** element of the data structure of type **Struct_FM352_diagData**.

Further information on the system function is contained in the *SIMOTION System Function/Variables* parameter manual. This documentation is included in the SIMOTION SCOUT scope of delivery as electronic documentation!

Note

The error ID in the jobErrorId element and the **status** output parameter is present for one cycle.

4.5 Data structures of the FM 352

4.5.1 Overview of the FM 352 data structures

The data structures contain all data of the FM 352 relevant for operation, as well as diagnostic data. Three different data structures are provided as type declarations for the FM 352.

- Data structure of type Struct_FM352_ctrlData (Page 63)
- Data structure of type Struct_FM352_diagData (Page 72)
- Data structure of type Struct_FM352_paraData (Page 70)

These data structures are used by the following function blocks: _FM352_initialize, _FM352_control and _FM352_diagnostic. The elements of the data structure are accessed using a variable of the appropriate data type, which is to be defined by the user.

Note

The SIMOTION identifiers have changed as of V4.0. A comparison of the SIMOTION and SIMATIC names of the "Data structure of Struct_FM352_ctrlData", "Data structure of Struct_FM352_paraData" and "Data structure of Struct_FM352_diagData" tables can be found in the appendix SIMOTION and SIMATIC names (Page 87) in the table "SIMOTION and SIMATIC names for FM 352".

4.5.2 Struct_FM352_ctrlData

The **Struct_FM352_ctrlData** data structure is shown in the table below.

Table 4- 4 Data structure of Struct_FM352_ctrlData

Struct_FM352_ctrlData			
Name	**Type**	**Initial value**	**Comment**
General data / version switches			
moduleAddress	INT	256	Module address
FmType	BOOL	TRUE	FM 352 V5.0 and higher
Control signals			
enableSimPositive	BOOL	FALSE	Simulation in positive direction
enableSimNegative	BOOL	FALSE	Simulation in negative direction
enableOutputCam	BOOL	FALSE	Output cam processing enabled
enableTrack0Counter	BOOL	FALSE	Counter function of counter output cam track 0 enabled
enableTrack1Counter	BOOL	FALSE	Counter function of counter output cam track 1 enabled
enableTrack	WORD	16#0000	Enable output cam tracks 0 to 15 Bit 0: Track 0
Checkback signals			
diagDataChanged	BOOL	FALSE	New entry in the diagnostic buffer of the FM 352 (can be read out with **_FM352_diagnostic**)
dataError	BOOL	FALSE	Data error (can be read out using the parameterization tool)
parameterized	BOOL	FALSE	Module parameterized
outputCamActive	BOOL	FALSE	Output cam processing running
synchronized	BOOL	FALSE	Axis is synchronized
measDone	BOOL	FALSE	Length measurement or edge detection is finished
dirNegative	BOOL	FALSE	Axis moving in a negative direction
dirPositive	BOOL	FALSE	Axis moving in a positive direction
hystZone	BOOL	FALSE	Axis is within the hysteresis range
floatActValue	BOOL	FALSE	Set actual value on-the-fly executed
actPosition	DINT	0	Current position of axis (cyclic updating)
trackSignals	DWORD	16#0000 0000	Current track signals of tracks 0 to 31 Bit 0: Track 0
Function switches			
enableEdgeDetection	BOOL	FALSE	Edge detection ON
enableSimulation	BOOL	FALSE	Simulation ON

Struct_FM352_ctrlData			
Name	Type	Initial value	Comment
enableLenMeasuring	BOOL	FALSE	Length measuring ON
execRetrigRefPoint	BOOL	FALSE	Retrigger reference point
switchOffSwLimit	BOOL	FALSE	Software limit switch disabled
Trigger bits for write jobs			
execWrMachineData	BOOL	FALSE	Write machine data
execWrActivateMData	BOOL	FALSE	Activate machine data
execWrActValueRevoke	BOOL	FALSE	Set actual value, undo on-the-fly actual value setting
execWrOutputCamData1	BOOL	FALSE	Write output cam data 1 (output cams 1 to 15)
execWrOutputCamData2	BOOL	FALSE	Write output cam data 2 (output cams 16 to 31)
execWrOutputCamData3	BOOL	FALSE	Write output cam data 3 (output cams 32 to 47)
execWrOutputCamData4	BOOL	FALSE	Write output cam data 4 (output cams 48 to 63)
execWrOutputCamData5	BOOL	FALSE	Write output cam data 5 (output cams 64 to 79)
execWrOutputCamData6	BOOL	FALSE	Write output cam data 6 (output cams 80 to 95)
execWrOutputCamData7	BOOL	FALSE	Write output cam data 7 (output cams 96 to 111)
execWrOutputCamData8	BOOL	FALSE	Write output cam data 8 (output cams 112 to 127)
execWrSetRefPoint	BOOL	FALSE	Set reference point coordinates
execWrActValue	BOOL	FALSE	Set actual value
execWrActValSetOnTheFly	BOOL	FALSE	Set actual value on-the-fly
execWrZeroOffset	BOOL	FALSE	Set zero point offset
execWrOutputCamEdge1	BOOL	FALSE	Write output cam edge setting (1 cam)
execWrOutputCamEdge16	BOOL	FALSE	Write settings for fast output cam change (16 output cams)
Trigger bits for read jobs			
execRdMachineData	BOOL	FALSE	Read machine data
execRdOutputCamData1	BOOL	FALSE	Read output cam data 1
execRdOutputCamData2	BOOL	FALSE	Read output cam data 2
execRdOutputCamData3	BOOL	FALSE	Read output cam data 3
execRdOutputCamData4	BOOL	FALSE	Read output cam data 4
execRdOutputCamData5	BOOL	FALSE	Read output cam data 5
execRdOutputCamData6	BOOL	FALSE	Read output cam data 6
execRdOutputCamData7	BOOL	FALSE	Read output cam data 7
execRdOutputCamData8	BOOL	FALSE	Read output cam data 8
execRdMeasValue	BOOL	FALSE	Read measured values
execRdCntrValueTrack	BOOL	FALSE	Read the count values of the counter cam tracks
execRdActPosition	BOOL	FALSE	Read position data and track data
execRdEncValue	BOOL	FALSE	Read encoder values
execRdOutputCamData	BOOL	FALSE	Read output cam data and track data

Struct_FM352_ctrlData			
Name	Type	Initial value	Comment
Done bits for function switches			
enableEdgeDetectDone	BOOL	FALSE	"Switch edge detection ON or OFF" completed
enableSimDone	BOOL	FALSE	"Switch simulation ON or OFF" completed
enableLenMeasDone	BOOL	FALSE	"Switch length measurement ON or OFF" completed
retrigRefPointDone	BOOL	FALSE	"Switch retrigger reference point ON or OFF" completed
switchOffSwLimDone	BOOL	FALSE	"Switch software limit switch ON or OFF" completed
Done bits for write jobs			
wrMdDone	BOOL	FALSE	"Write machine data" job completed
wrActivateMdDone	BOOL	FALSE	"Activate machine data" job completed
wrActValueRevokeDone	BOOL	FALSE	"Set actual value, undo on-the-fly actual value setting" completed
wrOutputCamData1Done	BOOL	FALSE	"Write output cam data 1" job completed
wrOutputCamData2Done	BOOL	FALSE	"Write output cam data 2" job completed
wrOutputCamData3Done	BOOL	FALSE	"Write output cam data 3" job completed
wrOutputCamData4Done	BOOL	FALSE	"Write output cam data 4" job completed
wrOutputCamData5Done	BOOL	FALSE	"Write output cam data 5" job completed
wrOutputCamData6Done	BOOL	FALSE	"Write output cam data 6" job completed
wrOutputCamData7Done	BOOL	FALSE	"Write output cam data 7" job completed
wrOutputCamData8Done	BOOL	FALSE	"Write output cam data 8" job completed
wrRefPointDone	BOOL	FALSE	"Set reference point coordinates" job completed
wrActValueDone	BOOL	FALSE	"Set actual value" job completed
wrActValSetOnTheFlyDone	BOOL	FALSE	"Set actual value on-the-fly" job completed
wrZeroOffsetDone	BOOL	FALSE	"Set zero point offset" job completed
wrOutputCamEdge1Done	BOOL	FALSE	"Change 1 output cam" job completed
wrOutputCamEdge16Done	BOOL	FALSE	"Change 16 output cams" job completed
Done bits for read jobs			
rdMdDone	BOOL	FALSE	"Read machine data" job completed
rdOutputCamData1Done	BOOL	FALSE	"Read output cam data 1" job completed
rdOutputCamData2Done	BOOL	FALSE	"Read output cam data 2" job completed
rdOutputCamData3Done	BOOL	FALSE	"Read output cam data 3" job completed
rdOutputCamData4Done	BOOL	FALSE	"Read output cam data 4" job completed
rdOutputCamData5Done	BOOL	FALSE	"Read output cam data 5" job completed
rdOutputCamData6Done	BOOL	FALSE	"Read output cam data 6" job completed
rdOutputCamData7Done	BOOL	FALSE	"Read output cam data 7" job completed
rdOutputCamData8Done	BOOL	FALSE	"Read output cam data 8" job completed
rdMeasValueDone	BOOL	FALSE	"Read measured values" job completed

Struct_FM352_ctrlData			
Name	Type	Initial value	Comment
rdCntrValueTrackDone	BOOL	FALSE	"Read count values of the counter output cam tracks" job completed
rdActPosDone	BOOL	FALSE	"Read position data and track data" job completed
rdEncValueDone	BOOL	FALSE	"Read current encoder values" job completed
rdOutputCamDataDone	BOOL	FALSE	"Read output cam data and track data" job completed
Error bits for function switches			
enableEdgeDetectError	BOOL	FALSE	Error during "Switch edge detection ON or OFF"
enableSimError	BOOL	FALSE	Error during "Switch simulation ON or OFF"
enableLenMeasError	BOOL	FALSE	Error during "Switch length measurement ON or OFF"
retrigRefPointError	BOOL	FALSE	Error during "Switch retrigger reference point ON or OFF"
switchOffSwLimitError	BOOL	FALSE	Error during "Switch software limit switch ON or OFF"
Error bits for write jobs			
wrMdError	BOOL	FALSE	Error during "Write machine data" job
wrActivateMdError	BOOL	FALSE	Error during "Activate machine data" job
wrActValueRevokeError	BOOL	FALSE	Error during "Set actual value, undo on-the-fly actual value setting" job
wrOutputCamData1Error	BOOL	FALSE	Error during "Write output cam data 1" job
wrOutputCamData2Error	BOOL	FALSE	Error during "Write output cam data 2" job
wrOutputCamData3Error	BOOL	FALSE	Error during "Write output cam data 3" job
wrOutputCamData4Error	BOOL	FALSE	Error during "Write output cam data 4" job
wrOutputCamData5Error	BOOL	FALSE	Error during "Write output cam data 5" job
wrOutputCamData6Error	BOOL	FALSE	Error during "Write output cam data 6" job
wrOutputCamData7Error	BOOL	FALSE	Error during "Write output cam data 7" job
wrOutputCamData8Error	BOOL	FALSE	Error during "Write output cam data 8" job
wrSetRefPointError	BOOL	FALSE	Error during "Set reference point coordinates" job
wrActValueError	BOOL	FALSE	Error during "Set actual value" job
wrActValSetOnTheFlyError	BOOL	FALSE	Error during "Set actual value on-the-fly" job
wrZeroOffsetError	BOOL	FALSE	Error during "Set zero point offset" job
wrOutputCamEdge1Error	BOOL	FALSE	Error during "Change 1 output cam" job
wrOutputCamEdge16Error	BOOL	FALSE	Error during "Change 16 output cams" job
Error bits for read jobs			
rdMdError	BOOL	FALSE	Error during "Read machine data" job
rdOutputCamData1Error	BOOL	FALSE	Error during "Read output cam data 1" job

Struct_FM352_ctrlData			
Name	Type	Initial value	Comment
rdOutputCamData2Error	BOOL	FALSE	Error during "Read output cam data 2" job
rdOutputCamData3Error	BOOL	FALSE	Error during "Read output cam data 3" job
rdOutputCamData4Error	BOOL	FALSE	Error during "Read output cam data 4" job
rdOutputCamData5Error	BOOL	FALSE	Error during "Read output cam data 5" job
rdOutputCamData6Error	BOOL	FALSE	Error during "Read output cam data 6" job
rdOutputCamData7Error	BOOL	FALSE	Error during "Read output cam data 7" job
rdOutputCamData8Error	BOOL	FALSE	Error during "Read output cam data 8" job
rdMeasValueError	BOOL	FALSE	Error during "Read measured values" job
rdCntrValueTrackError	BOOL	FALSE	Error during "Read count values of the counter cam tracks" job
rdActPosError	BOOL	FALSE	Error during "Read position data and track data" job
rdEncValueError	BOOL	FALSE	Error during "Read encoder values" job
rdOutputCamDataError	BOOL	FALSE	Error during "Read output cam data and track data" job
Job management for _FM352_control function block			
jobErrorId	INT	0	Communication error
jobBusy	BOOL	FALSE	At least one job running
execJobReset	BOOL	FALSE	Reset all errors and error bits
Data for jobs			
Zero point offset			
zeroOffset	DINT	0	Zero point offset
Set actual value			
actValue	DINT	0	Coordinate for "Set actual value"
Set actual value on-the-fly			
actValueSetOnTheFly	DINT	0	Coordinate for "Set actual value on-the-fly"
Set reference point			
refPoint	DINT	0	Coordinate for "Set reference point"
Set output cam edge			
outputCamNumber	INT	0	Output cam numbers for "Change output cam edges"
beginOutputCam	DINT	0	Beginning of output cam for "Change output cam edges"
endOutputCam	DINT	0	End of output cam for "Change output cam edges"
Length/edge measurement			
beginLenMeasuring	DINT	0	Starting value for length/edge measurement
endLenMeasuring	DINT	0	End value for "length/edge measurement"
measRange	DINT	0	Length for "length/edge measurement"
Read count values			
cntrValueTrack0	INT	0	Current count value for counter output cam track 0

Struct_FM352_ctrlData			
Name	Type	Initial value	Comment
cntrValueTrack1	INT	0	Current count value for counter output cam track 1
Read position data and track data			
actPosition1	DINT	0	Current position of axis (read with "execRdActPosition" job)
actSpeed	DINT	0	Current velocity
trackState1	DWORD	16#0000 0000	Track ID bits for tracks 0..31
Read encoder data			
encValue	DINT	0	Read encoder values
cntrValueByZero	DINT	0	Count value at the last zero mark
absEncOffset	DINT	0	Absolute encoder adjustment
Read output cam data and track data			
outputCamData00_31	DWORD	16#0000 0000	Output cam data 0 to 31
outputCamData32_63	DWORD	16#0000 0000	Output cam data 32 to 63
outputCamData64_95	DWORD	16#0000 0000	Output cam data 64 to 95
outputCamData96_127	DWORD	16#0000 0000	Output cam data 96 to 127
trackState2	DWORD	16#0000 0000	Track ID bits for tracks 0...31
actPosition2	DINT	0	Current position of axis (read with "execRdOutputCamData" job)
Fast output cam change			
numOfOutputCamsToSet	BYTE	16#00	Volume of project data: 0, 1, 2, 3 = max. 16, 32, 64, 128 cams
disableDataCheck	BOOL	FALSE	Disable data check
Output cam data (data structure)			
outputCam	**ARRAY [0..15] of outputCamType**		Elements for output cam data
number	BYTE	16#00	Output cam number
setForceDirection	BOOL	FALSE	"Change force direction of output cam" job
setBegin	BOOL	FALSE	"Change beginning of output cam" job
setEnd	BOOL	FALSE	"Change end of output cam" job
setActuationTime	BOOL	FALSE	"Change actuation time" job
deactivate	BOOL	FALSE	Switch off the output cam during the output cam change
posForceDirection	BOOL	FALSE	Force direction positive (plus)
negForceDirection	BOOL	FALSE	Force direction negative (minus)
beginOutputCam	DINT	0	Beginning of output cam
endOutputCam	DINT	0	End of output cam / ON duration
actuationTime	UINT	0	Actuation time
Variables for FB-internal use (not relevant to users)			
xxxEnableScom	BOOL	FALSE	Internal use
xxxEnableSfct	BOOL	FALSE	Internal use
xxxScomDone	BOOL	FALSE	Internal use

Struct_FM352_ctrlData			
Name	Type	Initial value	Comment
xxxSfctDone	BOOL	FALSE	Internal use
xxxErrorScom	BOOL	FALSE	Internal use
xxxErrorSfct	BOOL	FALSE	Internal use
xxxmeasJobErrorId	INT	0	Internal use
xxxMeasJobBusy	BOOL	FALSE	Internal use
xxxActOrder	INT	0	Internal use
xxxNextOrder	INT	0	Internal use
xxxDataSetNumber	DINT	0	Internal use
xxxDataSetLength	INT	0	Internal use
xxxDataSetStart	DINT	0	Internal use
xxxEdgeOnOld	BOOL	FALSE	Internal use
xxxSimOnOld	BOOL	FALSE	Internal use
xxxMeasOnOld	BOOL	FALSE	Internal use
xxxReftrOnOld	BOOL	FALSE	Internal use
xxxSswOffOld	BOOL	FALSE	Internal use
xxxRead	BOOL	FALSE	Internal use
xxxError	BOOL	FALSE	Internal use
xxxEnableEdgeDetectOld	BOOL	FALSE	Internal use
xxxEnableSimOld	BOOL	FALSE	Internal use
xxxEnableLenMeasOld	BOOL	FALSE	Internal use
xxxRetrigRefPointOld	BOOL	FALSE	Internal use
xxxSwitchOffSwLimOld	BOOL	FALSE	Internal use
xxxDataSet11	WORD	16#0000	Internal use
xxxDataSet12	WORD	16#0000	Internal use
xxxControl	DWORD	16#00000000	Internal use
xxxFeedback0	DWORD	16#00000000	Internal use

4.5.3 Struct_FM352_paraData

The **Struct_FM352_paraData** data structure is shown in the table below.

Table 4- 5 Data structure Struct_FM352_paraData

Struct_FM352_paraData			
Name	**Type**	**Initial value**	**Comment**
Machine data			
xxxModuleType1 1)	BOOL	FALSE	0 for FM 352
enableProcessAlarm	BOOL	FALSE	Enable process alarm: Output cam ON/OFF
xxxModuleType2 1)	BOOL	FALSE	0 for FM 352
minEdgeDistance	DINT	0	Minimum edge distance for edge detection
unitDimension	DINT	1	Dimension system
axisType	DINT	0	Linear axis = 0 Rotary axis = 1
endRotAxis	DINT	100000	End of rotary axis
encType	DINT	1	Encoder type, message frame length
lenPerRevolution	DINT	80000	Length per encoder revolution
incPerRevolution	DINT	500	Increments per encoder revolution
cntOfRevolutions	DINT	1024	Number of encoder revolutions
baudRate	DINT	0	Transmission rate
refPoint	DINT	0	Home position coordinates
absEncOffset	DINT	0	Absolute encoder adjustment
refPointTrigMode	DINT	0	Reference point retrigger mode
cntrDirection	BOOL	FALSE	Counting direction: 0 = normal, 1 = inverted
openCircuit	BOOL	TRUE	Wire break monitoring
transmissionError	BOOL	TRUE	Message frame error monitoring
missingPulse	BOOL	TRUE	Missing pulse monitoring
swLimitStart	DINT	-100000000	Start of software limit switch
swLimitEnd	DINT	100000000	End of software limit switch
numOfOutputCamsToSet	DINT	0	Volume of project data: 0,1,2,3 = max. 16,32,64,128 output cams
hysteresis	DINT	0	Hysteresis
simSpeed	DINT	0	Simulation speed
ctrlTrackOutputs	WORD	16#0000	Track output actuation: 0 = electronic cam controller, 1 = SIMOTION device; Bit number = track number
enableInput3	BOOL	FALSE	Enable input I3
xxxEnableInput4..10 1)	BOOL	FALSE	Reserved
track0CntrOutputCam	BOOL	FALSE	Track 0 is the counter cam track
track1CntrOutputCam	BOOL	FALSE	Track 1 is the counter cam track
track2CntrOutputCam	BOOL	FALSE	Track 2 is the counter cam track
track0CntrLimit	DINT	2	Upper count value for counter cam track 0

Struct_FM352_paraData			
Name	**Type**	**Initial value**	**Comment**
track1CntrLimit	DINT	2	Upper count value for counter cam track 1
Output cam data for output cams 0 to 15 / 0 to 31 / 0 to 63 / 0 to 127 (data structure)			
outputCam	**ARRAY [0..127] of outputCamData**		Elements for output cam data
valid	BOOL	FALSE	Output cam valid
posForceDirection	BOOL	FALSE	Force direction positive (plus)
negForceDirection	BOOL	FALSE	Force direction negative (minus)
outputCamType	BOOL	FALSE	FALSE: Position-based cams, TRUE: Time-based output cam
switchOnAlarm	BOOL	FALSE	Process alarm while switching on
switchOffAlarm	BOOL	FALSE	Process alarm while switching off
trackNumber	BYTE	16#00	Track number
beginOutputCam	DINT	0	Beginning of output cam
endOutputCam	DINT	0	End of output cam / ON duration
actuationTime	UINT	0	Actuation time

[1] Variable for FB-internal use (not relevant to users)

4.5.4 Struct_FM352_diagData

The **Struct_FM352_diagData** data structure is shown in the table below. This data structure contains the diagnostic data of the FM 352.

Table 4- 6 Data structure Struct_FM352_diagData

Struct_FM352_diagData			
Name	Type	Initial value	Comment
moduleAddress	INT	256	Module address
jobErrorId	INT	0	Description of errors
jobBusy	BOOL	FALSE	At least one job running
diagInformation	BOOL	FALSE	Essential to read the diagnostic buffer
numOfValidEntries	INT	0	Number of valid entries in the list
Diagnostic data (data structure)			
diagnosticEntry	**ARRAY [1..4] of diagType**		Elements for diagnostic data
incomingAlarm	BOOL	FALSE	Event coming
internFault	BOOL	FALSE	Internal fault
extFault	BOOL	FALSE	External fault
faultClass	INT	0	Fault class
faultNumber	INT	0	Error code
chNumber	INT	0	Channel number
outputCamNumber	INT	0	Output cam numbers 0 to 127 with fault class = output cam data error
Variables for FB-internal use (not relevant to users)			
xxxDataSet	ARRAY [0..227] of BYTE		Internal use
xxxDiagnosis0	Struct_FM352_diagType	-	Internal use
xxxFeedback0	DWORD	16#00000000	Internal use
xxxNextOrder	INT	0	Internal use
xxxDataSetNumber	BYTE	16#00	Internal use
xxxDataSetLength	INT	0	Internal use
xxxCntOfBuffers	INT	0	Internal use
xxxEnableDataSet236	BOOL	FALSE	Internal use
xxxDataSet	BOOL	FALSE	Internal use

4.6 Calling function blocks

In order to be able to work with the function blocks in your user project, proceed as follows (the numbers shown in the following program segment correspond to the steps below):

1. Create the function block instance (see the following program segment, e.g. create instance for FB_FM352_control).
2. Set up variables for the data structure.
3. Create an array for the in/out parameters of the FB.
4. Call instance of the function block.
5. Transfer input parameters.
6. The output parameters of the FB are accessed with <instance name of FB>. <name of output parameter>.
7. Data prepared by the FB for the I/O outputs are assigned to the array of the I/O variables created in step 3.

Note

The call example is an extract from the supplied E_FM352 application example, which is contained on the "SIMOTION Utilities & Applications" CD-ROM.

If you wish to control more than one FM 352, you must create a new variable for the data structure and FB instances with a new name for every FM 352 used.

Call example

```
UNIT E_FM352;
INTERFACE
VAR_GLOBAL
  myDataFM352Ctrl       : Struct_FM352_ctrlData ; // variable of data structure                  (2)
  myDataFM352Parameter  : Struct_FM352_paraData ; // variable of data structure
  myInstFM352Ctrl       : FM352_control ; // create FB instance                                  (1)
END_VAR

PROGRAM ExampleFM352; // program in background task

END_INTERFACE
IMPLEMENTATION

PROGRAM ExampleFM352
VAR
    FMOutputArray        : ARRAY [0..15] of BYTE; // Array for FM output data                    (3)
END_VAR

// CALL INSTANCE of FB _FB_FM352_control                                                         (4)

  myInstFM352Ctrl
    (
    periIn      := myPeripheralInputFM352,  // variable of I/O inputs                            (5)
    ctrlData    := myDataFM352Ctrl,         // variable with channel-specific data
    paraData    := myDataFM352Parameter,    // variable with machine and output
                                            // cam data
    periOut     := FMOutputArray            // FM output data array
    );

   // TRANSFER DATA TO FM
  myPeripheralOutputFM352  := FMOutputArray;    // Copy array of FM output                       (7)
                                                // data to I/O variables
  myStateFMStartup   := myInstFM352Ctrl. startup; // Start-up status                             (6)
END_PROGRAM // ExampleFM352

END_IMPLEMENTATION
```

Note

The PROGRAM ExampleFM352 must be assigned in the execution system.

4.7 Application example for FM 352

Introduction

In this example you use a user program to control an output cam controller.

Once startup of the FM 352 is complete, the example program transfers stored machine data to the FM 352. The FM 352 is now parameterized for the application example. It then executes a series of steps in response to events.

Using the variable tables, you can specify events, monitor the reactions of the module and evaluate the diagnostic buffer.

This example will familiarize you with the following block options:

- Submitting several jobs at once
- Mixing read and write jobs
- Reading using a continuous job without waiting for the end of the job
- Evaluating the checkback signals of the block
- Evaluating the checkback signals for an individual job
- Centralized error evaluation by the **_FM352_diagnostic** function block at the end of the user program
- Evaluating the diagnostic buffer in conjunction with "dataError"

FM 352 installation and wiring

Connect the power supply to the front connector of the FM 352 at terminal 1 "L+" and terminal 2 "M" (24 V).

Assigning module parameters

Proceed as follows:

1. Open your project in SIMOTION SCOUT.
2. Open the hardware configuration in SIMOTION SCOUT.
3. Configure your hardware station.
4. You will find the FM 352 module under the corresponding ET 200M.
5. Save the hardware configuration with the **Station > Save and compile** menu command.
6. Download the hardware configuration with the **Target system > Download to module** menu command.

   The red "SF" LED on the FM 352 turns on and then off if the assigned module parameters have been downloaded without errors.

Hardware platform

The application example is available for various SIMOTION hardware platforms and is intended for distributed use of the FM 352.

Note

If the application example is not available for your hardware platform, you must adapt the hardware configuration.

Adapting the application example

The configuration in the example and your available hardware must be adapted.

The following options are available:

1. You can adapt the configuration in the example to the available hardware (PROFIBUS DP address).
2. You can adapt the configuration of the hardware to the example (PROFIBUS DP address).

Calling the application example

The application example can be found on the "SIMOTION Utilities & Applications" CD-ROM. The "SIMOTION Utilities & Applications" CD-ROM is provided free of charge and part of the SIMOTION SCOUT scope of delivery.

1. Dearchive and open the project containing the application example.
2. Check the hardware configuration: PROFIBUS DP addresses.
3. Check the module addresses (hardware configuration) against the I/O addresses of the controller in SIMOTION SCOUT and module address in the program (myDataFM352Ctrl.moduleAddress).
4. Save and compile the example project. Then, you can download the example to the SIMOTION device and switch to **RUN** mode.

Default settings for machine and output cam data

The following FM 352 data are preset in the program and transferred to the FM at the start of the example (see Starting the example).

• Measuring system:	Degrees (4 decimal places)	
• Axis:	Rotary axis:	
	End of rotary axis:	360.0000 degrees
	Simulation speed:	360.0000 degrees/min
• Encoder:	Monitoring:	Switch off wire break and missing pulse
• Cams:		

No.	Valid	Track	Type	Start [degrees]	End [degrees]	Time [ms]	Actuation time [ms]	Effective direction	Process alarm
0	x	0	Distance	0.0000	90.0000	-	0.0	Both	None
1	x	0	Distance	180.0000	270.0000	-	0.0	Both	None
2	x	1	Distance	0.0000	90.0000	-	2000.0	Both	None
3	x	1	Distance	180.0000	270.0000	-	2000.0	Both	None
4	x	2	Distance	130.0000	330.0000	-	0.0	Both	None
5	x	3	Distance	130.0000	330.0000	-	2000.0	Both	None

Application sequence

The SIMOTION device (C230-2, P350, D435) is in "RUN" mode. Create a watch table in your project and insert the values from tables "Current cam tracks and output cams", "Switch", "Current actual value" and "Error displays".

Default settings in the program

The following constants are defined in the **E_FM352** unit:

Table 4- 7 Constants

Name	Data type	Control value	Meaning
myRefPoint	DINT	1000	Reference coordinate
myBeginOutputCam0	DINT	1470000	Beginning of output cam 0
myEndOutputCam0	DINT	1920000	End of output cam 0
myBeginOutputCam1	DINT	2000000	Beginning of output cam 1
myEndOutputCam1	DINT	3000000	End of output cam 1

Table 4- 8 Current cam tracks and output cams

Name	Data type	Meaning
myDataFM352Ctrl.synchronized	BOOL	= TRUE if the axis is synchronized
myDataFM352Ctrl.outputCamActive	BOOL	Output cam processing running
myDataFM352Ctrl.trackSignalsCamActive	DWORD	Current track signals (tracks 0...31)
myDataFM352Ctrl.outputCamData00_31	DWORD	Output cam identifier bits for output cams 0 to 31
myDataFM352Parameter.outputCam[0].beginOutputCam	DINT	Beginning of output cam 0
myDataFM352Parameter. outputCam[0].endOutputCam	DINT	End of output cam 0
myDataFM352Parameter. outputCam[1].beginOutputCam	DINT	Beginning of output cam 1
myDataFM352Parameter. outputCam[1].endOutputCam	DINT	End of output cam 1

Table 4- 9 Switch

Name	Data type	Control value	Meaning
mySwitch	BOOL	TRUE	Input for simulated switch

Table 4- 10 Current actual value

Name	Data type	Meaning
myDataFM352Ctrl.actPosition	DINT	Current axis position
myStepNumber	INT	Step number

Table 4- 11 Error displays

Name	Data type	Meaning
myError	BOOL	Group errors
myOutputCamError	BOOL	Output cam errors
myDataFM352Ctrl.jobErrorId	INT	Error code

Starting the example

Start the example by setting input myExampleStart = TRUE. Once the program has detected a rising edge at this input, all of the machine data and output cam data required for the example are transferred to the FM and an axis is then started in simulation. You can observe the changes in the actual position (myDataFM352Ctrl.actPosition), output cam data (myDataFM352Ctrl.outputCamData00_31) and track signals (myDataFM352Ctrl.trackSignals). You can also observe the step number of the step sequence (myStepNumber).

When output cam 4 is set (130 degrees), parameters for output cams 0 and 1 are reset to the default values (see Table "Constants"). You can see the change in the watch table.

The program then waits for an external event. Switch the simulated switch by setting mySwitch = TRUE. The output cam data revert back to the previous values.

After this pass, the sequence of steps is executed, the step number is -2 and the simulation is stopped.

Error assessment

If an error occurs during execution, the step sequence is stopped and the simulation is switched off. Step number -1 is entered.

User program (sequence steps)

The user program executes a sequence of steps as follows:

- Step 99: The program waits in cyclic processing mode for the example to start (StartupTask has been executed but "exampleStart" = FALSE).
- Step 0: The output cam controller is initialized. Associated data is set to the jobs that are to be executed when the module is restarted. Module restart can be triggered, for example, by a restart of the C230-2.
- Step 1: The program waits for the set jobs to be executed.
- Step 2: The program continuously reads the output cam ID bits and waits until output cam 4 is set.
- Step 3: Parameters for output cams 0 and 1 are reassigned. To enable you to observe the change, the output cam data are read out before and after the change and displayed in the watch table.
- Step 4: The program waits for the set jobs to be executed.
- Step 5: Here the program waits for "external" event "Switch ON"

  (mySwitch = TRUE), which you can set via the watch table.
- Step 6: When the event occurs, output cams 0 and 1 are reset to the value that was read out in the initialization step.
- Step 7: The program waits for the set jobs to be executed.

At the end of the sequence of steps, the instance of FB _FM352_control and the instance of FB _FM352_diagnostic are called.

If the diagnostics detected a message about invalid output cam data, the myOutputCamError output is set.

Alarm processing

5

5.1 Overview of alarm processing

Pending error messages are processed and evaluated differently in a SIMOTION system than in a SIMATIC system. By default, the diagnostic alarms and process alarms are not enabled. Activate the alarms for the relevant module in the hardware configuration (refer to Chapter Inserting function modules into the SIMOTION project (Page 14)).

If you have parameterized process alarms and/or diagnostic alarms, program the alarm processing sequence in accordance with the flow diagram below.

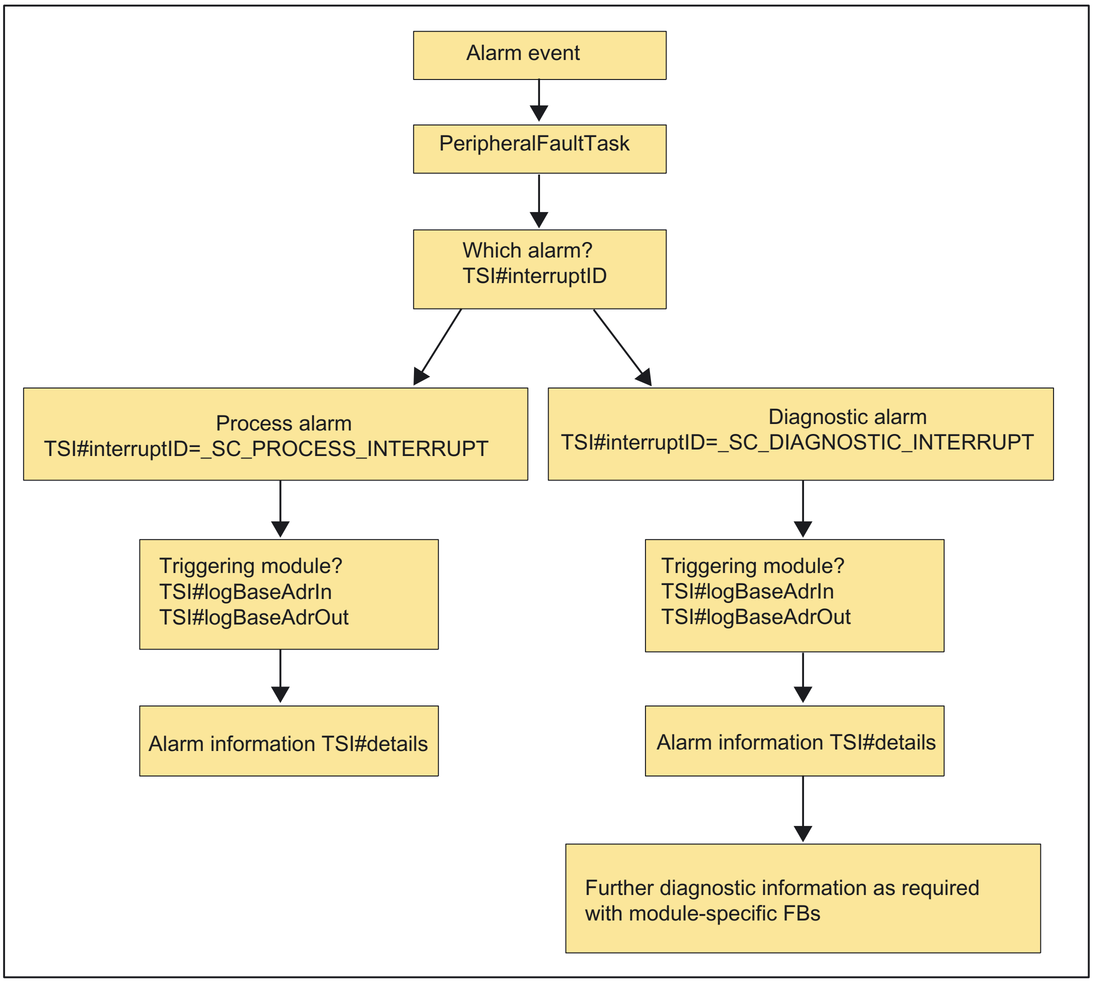


Figure 5-1 Alarm processing in the FM modules

Alarm evaluation

Alarms originating from the I/O are evaluated in the **PeripheralFaultTask**. When the **PeripheralFaultTask** is started, the **Taskstartinfo** is made available, which you can evaluate in the user program.

The **Taskstartinfo** of the **PeripheralFaultTask** is comparable to the local data of OB40 and OB82 in the SIMATIC system.

Table 5- 1 Meaning of the Taskstartinfo

Task	TSI		Note
PeripheralFaultTask	DT	TSI#startTime	Start time of the task
	UDINT	TSI#interruptID	Identifies the triggering event: • _SC_PROCESS_INTERRUPT • _SC_DIAGNOSTIC_INTERRUPT • _SC_STATION_DISCONNECTED • _SC_STATION_RECONNECTED
	DINT	TSI#logBaseAdrIn	Logical base address if a process alarm (PRAL) or a diagnostic alarm (DAL) was caused by an input area on the module, otherwise _SC_INVALID_ADDRESS
	DINT	TSI#logBaseAdrOut	Logical base address if a process alarm (PRAL) or a diagnostic alarm (DAL) was caused by an output area on the module, otherwise _SC_INVALID_ADDRESS
	DINT	TSI#logDiagAdr	Diagnostic address of a DP slave if the alarm was caused by a station failure or station recovery of an associated DP slave, otherwise _SC_INVALID_ADDRESS
	DWORD	TSI#details	Detail information (bit fields)

5.2 Process alarms

For the FM modules, you can select which events will trigger a process alarm. The assignment can be made in the parameter assignment screen forms of the configuration package for each module.

Definition of a process alarm

If an event needs a response irrespective of the cycle of the SIMOTION device, the relevant FM module can trigger a process alarm.

Events that trigger a process alarm

The criteria (events) that trigger process alarms in a SIMOTION system are the same as those in a SIMATIC system.

For a more detailed description, refer to the *FM 350-1/FM 350-2/FM 352 Installation and Parameter SIMATIC* manuals.

Reactions to a process alarm

A process alarm causes the following to occur:

- Process data are written in the **TSI#details** variable in the Taskstartinfo of **PeripheralFaultTask**.
- The SIMOTION device goes into STOP mode if a program has not been assigned in the **PeripheralFaultTask**.

Bit assignment

The **TSI#details** variable is assigned in the same way as in a SIMATIC system.

Note

More information is available in the following SIMATIC manuals:

- *FM 350-1 Function Module Installation and Parameter Assignment*
- *FM 350-2 Counter Function Module Installation and Parameter Assignment*
- *FM 352 Electronic Cam Controller Installation and Parameter Assignment*

Evaluation of process alarms in the FM

If a process alarm is triggered, the data in the Taskstartinfo of **PeripheralFaultTask** are written to the **TSI#details** variable and made available there.

Note

If an event occurs that should trigger a process alarm, but a previous identical event has not yet been acknowledged, a new alarm is not triggered. The new process alarm is lost.

Subject to parameter assignment, this can result in a diagnostic alarm ("Process alarm lost").

If < 2 ms elapse between two events that should normally both trigger a process alarm, the second process alarm is lost and no diagnostic alarm can be triggered (for FM 350-2 only).

The **TSI#details** variable is assigned in the same way as in a SIMATIC system.

5.3 Diagnostic alarms

Definition of a diagnostic alarm

If the user program is to respond to an internal or external error, you can set the parameters for a diagnostic alarm that will interrupt the cyclical program of the SIMOTION device.

Events that trigger a diagnostic alarm

The criteria (events) that trigger diagnostic alarms in a SIMOTION system are the same as in a SIMATIC system.

For a more detailed description, refer to the *FM 350-1/FM 350-2/FM 352, Installation and Parameter Assignment* SIMATIC manuals.

Responses to a diagnostic alarm

If a diagnostic alarm is issued, the following occurs:

- Diagnostic data are written to **TSI#details** variable in the Taskstartinfo of **PeripheralFaultTask**.
- The SIMOTION device goes into STOP mode if a program has not been assigned in the **PeripheralFaultTask**.
- You can use module-specific FBs to read additional diagnostic data in the **PeripheralFaultTask** or **BackgroundTask** according to FM type.
- The group error LED (SF) of the FM module lights up. The group error LED (SF) is extinguished as soon as the error has been remedied.

Bit assignment

The **TSI#details** variable is assigned in the same way as in a SIMATIC system.

Note

More information is available in the following SIMATIC manuals:

- *FM 350-1 Function Module Installation and Parameter Assignment*
- *FM 350-2 Counter Function Module Installation and Parameter Assignment*
- *FM 352 Electronic Cam Controller, Installation and Parameter Assignment*

Evaluation of diagnostic alarms

If a diagnostic alarm is triggered, the data in the Taskstartinfo of the **PeripheralFaultTask** are written to the **TSI#details** variable. The **PeripheralFaultTask** is called automatically and provides 4 bytes of diagnostic information for fast analysis. The contents of the diagnostic information are the same as in a SIMATIC system.

Additional information can be read out using module-specific FBs.

FM 350-1

FB **_FM3501_diagnostic** reads out 16 bytes of diagnostic data and makes them available in the data structure of type **Struct_FM3501_data**. The function block can be called in the **PeripheralFaultTask**, **BackgroundTask** or **TimerInterruptTask**.

FM 350-2

FB **_FM3502_diagnostic** reads out 16 bytes of diagnostic data and enters them in the **diagnostic** substructure of the data structure of type **Struct_FM3502_data**. The function block can be called in the **PeripheralFaultTask**, **BackgroundTask** or **TimerInterruptTask**.

FM 352

FB **_FM352_diagnostic** reads out all diagnostic data and enters them into the data structure of type **Struct_FM352_diagnosticData**. The FB must be called in the **BackgroundTask** or **TimerInterruptTask**.

Appendix A

A.1 SIMOTION and SIMATIC names

The tables below contain a comparison of SIMOTION and SIMATIC names.

Table A- 1 SIMOTION and SIMATIC names for FM 350-1

Name in SIMOTION System, V4.0 and higher (command library in SCOUT)	Name in the SIMATIC system	Name in the SIMOTION system up to V3.2 (SIMOTION Function Library)
Function block parameters		
_FM3501_control	**FC CNT_CTRL (FC 0)**	**_FB_FM3501_control**
periIn	-	inputInterface
enableSwGate	SW_GATE	softwareGate
enableStopGate	GATE_STP	stopGate
cntrRange	-	counterRange
execResetOpError	OT_ERR_A	resetOperationError
data	DB_NO	data
setStartValue	L_DIRECT	setStartValue
setPrepStartValue	L_PREPARE	setPrepareStartValue
setCmpValue1	T_CMP_V1	setComparisonValue1
setCmpValue2	T_CMP_V2	setComparisonValue2
resetSyncState	RES_SYNC	resetSyncState
resetCntrState	RES_ZERO	resetCounterState
periOut	-	outputInterface
errorOperation	OT_ERR	operationError
startup	-	startup
_FM3501_diagnostic	**FC DIAG_INF (FC 1)**	**_FB_FM3501_diagnostic**
data	DB_NO	data
execute	IN_DIAG	requestDiagnosticData
done	-	-
status	-	returnValue
Data structure elements		
Struct_FM3501_fmData		**Struct_FM3501_data**
xxxReserved1 [1)]	FP	dedicatedData1
xxxReserved2 [1)]	RESERVED	dedicatedData2
moduleAddress	MOD_ADR	moduleAddress
xxxReserved3 [1)]	A_BYTE	dedicatedData3
loadValue1	LOAD_VAL	loadValue_1

Name in SIMOTION System, V4.0 and higher (command library in SCOUT)	Name in the SIMATIC system	Name in the SIMOTION system up to V3.2 (SIMOTION Function Library)
cmpValue1_1	CMP_V1	comparisonValue1_1
cmpValue2_1	CMP_V2	comparisonValue2_1
loadValue2	-	loadValue_2
cmpValue1_2	-	comparisonValue1_2
cmpValue2_2	-	comparisonValue2_2
xxxReserved4 1)	A_BIT0_0	dedicatedData4
xxxReserved5 1)	TFB	enableTestMode
xxxReserved6 1)	A_BIT0_3	dedicatedData5
xxxReserved7 1)	A_BIT0_6	dedicatedData6
enableForwardSetting	ENSET_UP	enableSettingForward
enableReverseSetting	ENSET_DN	enableSettingReverse
xxxReserved8 1)	A_BIT1_2	dedicatedData7
xxxReserved9 1)	A_BIT1_3	dedicatedData8
enableOutput0	CTRL_DQ0	enableOutput0
enableOutput1	CTRL_DQ1	enableOutput1
xxxReserved10..15 1)	A_BIT3_0...5	dedicatedData9..14
actValue1	ACT_LOAD	actualValue_1
actCntrValue1	ACT_CNTV	actualCounterValue_1
actValue2	-	actualValue_2
actCntrValue2	-	actualCounterValue_2
errorIdData	DA_ERR_W	dataErrorNumber
errorIdOperation	OT_ERR_B	operationErrorNumber
xxxReserved16 1)	E_BIT0_0	dedicatedData15
xxxReserved17 1)	STS_TFB	testMode
xxxReserved18 1)	E_BIT0_2	dedicatedData16
xxxReserved19 1)	E_BIT0_3	dedicatedData17
dataError	DATA_ERR	dataError
xxxReserved20 1)	E_BIT0_5	dedicatedData18
xxxReserved21 1)	E_BIT0_6	dedicatedData19
parameterized	PARA	parameterized
opState	STS_RUN	operationState
opDirection	STS_DIR	operationDirection
zeroCrossing	STS_ZERO	zeroCrossing
overflow	STS_OFLW	overflow
underflow	STS_UFLW	underflow
synchronized	STS_SYNC	synchronized
stateGate	STS_GATE	stateGate
stateSwGate	STS_SW_G	stateSoftwareGate
stateSetInput	STS_SET	stateInputSet
xxxReserved22 1)	E_BIT2_1	dedicatedData20
stateOfDiStart	STS_STA	stateInputStart

Name in SIMOTION System, V4.0 and higher (command library in SCOUT)	Name in the SIMATIC system	Name in the SIMOTION system up to V3.2 (SIMOTION Function Library)
stateOfDiStop	STS_STP	stateInputStop
stateCompValue1	STS_CMP1	comparisonValue1Reached
stateCompValue2	STS_CMP2	comparisonValue2Reached
xxxReserved23..28 1)	E_BIT3_0...5	dedicatedData21...26
xxxReserved29 1)	ACT_CMP1	dedicatedData27
xxxReserved30 1)	ACT_CMP2	dedicatedData28
faultModule	MDL_DEFECT	moduleFault
internFault	INT_FAULT	internalFault
extFault	EXT_FAULT	externalFault
faultChannel	PNT_INFO	channelFault
faultExtVoltage	EXT_VOLTAGE	externalVoltageFault
faultConnector	FLD_CONNCTR	connectorFault
invalidConfig	NO_CONFIG	configFault
invalidPara	CONFIG_ERR	configInvalid
moduleType	MDL_TYPE	moduleType
faultSubModule	SUB_MDL_ERR	submoduleFault
faultCommunication	COMM_FAULT	communicationFault
moduleStop	MDL_STOP	moduleStop
faultWatchdog	WTCH_DOG_FLT	watchdogFault
faultIntPower	INT_PS_FLT	intPowerSupplyFault
xxxReserved47 1)	PRIM_BATT_FLT	dedicatedData45
xxxReserved48 1)	BCKUP_BATT_FLT	dedicatedData46
xxxReserved31 1)	RESERVED_2	dedicatedData29
faultRack	RACK_FLT	rackFault
faultDevice	PROC_FLT	deviceFault
faultEprom	EPROM_FLT	EPROMFault
faultRam	RAM_FLT	RAMFault
faultAdc	ADU_FLT	ADUFault
faultFuse	FUSE_FLT	fuseFault
lostProcessAlarm	HW_INTR_FLT	processAlarmFault
xxxReserved32 1)	RESERVED_3	dedicatedData30
chType	CH_TYPE	channelType
lenDiagData	LGTH_DIA	lengthDiagnosticData
chNumber	CH_NO	channelNumber
groupErrorChannel1	GRP_ERR1	groupFault1
xxxGroupErrorChannel2 1)	GRP_ERR2	groupFault2
xxxReserved33..38 1)	D_BIT7_2...7	dedicatedData31..36
faultCh1SignalA	CH1_SIGA	channel1SignalAFault
faultCh1SignalB	CH1_SIGB	channel1SignalBFault
faultCh1SigZero	CH1_SIGZ	channel1SignalZeroFault
faultChannel1	CH1_BETW	channel1ChannelFault

Name in SIMOTION System, V4.0 and higher (command library in SCOUT)	Name in the SIMATIC system	Name in the SIMOTION system up to V3.2 (SIMOTION Function Library)
faultCh1EncSupply	CH1_5V2	channel1EncoderSupplyFault
xxxReserved39..41 1)	D_BIT8_5...7	dedicatedData37..39
xxxReserved40 1)	D_BYTE9	dedicatedData40
faultCh2SignalA	CH2_SIGA	channel2SignalAFault
faultCh2SignalB	CH2_SIGB	channel2SignalBFault
faultCh2SigZero	CH2_SIGZ	channel2SignalZeroFault
faultChannel2	CH2_BETW	channel2ChannelFault
faultCh2EncSupply	CH2_5V2	channel2EncoderSupplyFault
xxxReserved43..45 1)	D_BIT10_5...7	dedicatedData41..43
xxxReserved46 1)	D_BYTE11	dedicatedData44

1) Variable for internal FB use (not relevant to users)

Table A- 2 SIMOTION and SIMATIC names for FM 350-2

Name in SIMOTION System, V4.0 and higher (command library in SCOUT)	Name in the SIMATIC system	Name in the SIMOTION system up to V3.2 (SIMOTION Function Library)
Function block parameters		
_FM3502_control	FC CNT2_CTR (FC 2)	_FB_FM3502_control
periIn	-	inputInterface
data	DB_NO	data
periOut	-	outputInterface
startup	-	startup
_FM3502_write	FC CNT2_WR (FC 3)	_FB_FM3502_write
periIn	-	inputInterface
data	DB_NO	data
periOut	-	outputInterface
error	-	-
status	-	returnValue
_FM3502_read	FC CNT2_RD (FC 4)	_FB_FM3502_read
periIn	-	inputInterface
data	DB_NO	data
error	-	-
status	-	returnValue
_FM3502_diagnostic	FC DIAG_RD (FC 5)	_FB_FM3502_diagnostic
enable	-	-
data	DB_NO	data
error	-	-

Name in SIMOTION System, V4.0 and higher (command library in SCOUT)	Name in the SIMATIC system	Name in the SIMOTION system up to V3.2 (SIMOTION Function Library)
status	-	returnValue
Data structure elements		
Struct_FM3502_fmData		Struct_FM3502_data
write (Struct_FM3502_wrJob)	JOB_WR	write (Struct_FM3502_writeJob)
execJobNumber	NO	jobNumber
busy	BUSY	busy
done	DONE	done
invalid	IMPOSS	invalid
unknown	UNKNOWN	unknown
read (Struct_FM3502_rdJob)	JOB_RD	read (Struct_FM3502_readJob)
execJobNumber	NO	jobNumber
busy	BUSY	busy
done	DONE	done
invalid	IMPOSS	invalid
unknown	UNKNOWN	unknown
xxxReserved1 [1)]	RESERV_0	dedicatedData1
xxxReserved2 [1)]	RESERV_1	dedicatedData2
moduleAddress	MOD_ADR	moduleAddress
xxxReserved3 [1)]	RESERV_2	dedicatedData3
control (Struct_FM3502_control)	CONTROL_SIGNALS	control (Struct_FM3502_controlSignals)
xxxReserved4..11 [1)]	BIT0_0...BIT0_7	dedicatedData4..11
enableOutput0	CTRL_DQ0	enableOutput0
enableOutput1	CTRL_DQ1	enableOutput1
enableOutput2	CTRL_DQ2	enableOutput2
enableOutput3	CTRL_DQ3	enableOutput3
enableOutput4	CTRL_DQ4	enableOutput4
enableOutput5	CTRL_DQ5	enableOutput5
enableOutput6	CTRL_DQ6	enableOutput6
enableOutput7	CTRL_DQ7	enableOutput7
setOutput0	SET_DQ0	setOutput0
setOutput1	SET_DQ1	setOutput1
setOutput2	SET_DQ2	setOutput2
setOutput3	SET_DQ3	setOutput3
setOutput4	SET_DQ4	setOutput4
setOutput5	SET_DQ5	setOutput5
setOutput6	SET_DQ6	setOutput6
setOutput7	SET_DQ7	setOutput7
enableSwGate0	SW_GATE0	softwareGate0
enableSwGate1	SW_GATE1	softwareGate1
enableSwGate2	SW_GATE2	softwareGate2

Name in SIMOTION System, V4.0 and higher (command library in SCOUT)	Name in the SIMATIC system	Name in the SIMOTION system up to V3.2 (SIMOTION Function Library)
enableSwGate3	SW_GATE3	softwareGate3
enableSwGate4	SW_GATE4	softwareGate4
enableSwGate5	SW_GATE5	softwareGate5
enableSwGate6	SW_GATE6	softwareGate6
enableSwGate7	SW_GATE7	softwareGate7
xxxReserved12 [1)]	CTRL_DWORD1	dedicatedData12
xxxReserved13 [1)]	CTRL_DWORD2	dedicatedData13
xxxReserved14 [1)]	CTRL_DWORD3	dedicatedData14
checkback (Struct_FM3502_checkback)	CHECKBACK_SIGNALS	checkback (Struct_FM3502_checkback)
xxxReserved15 [1)]	BIT0_0	dedicatedData15
testModePg	STS_TFB	testMode
xxxReserved16..17 [1)]	BIT0_2...BIT0_3	dedicatedData16...17
dataError	DATA_ERR	dataError
xxxReserved18..19 [1)]	BIT0_5...BIT0_6	dedicatedData18...19
parameterized	PARA	parameterized
stateCmpValue0	STS_CMP0	stateComparisonValue0
stateCmpValue1	STS_CMP1	stateComparisonValue1
stateCmpValue2	STS_CMP2	stateComparisonValue2
stateCmpValue3	STS_CMP3	stateComparisonValue3
stateCmpValue4	STS_CMP4	stateComparisonValue4
stateCmpValue5	STS_CMP5	stateComparisonValue5
stateCmpValue6	STS_CMP6	stateComparisonValue6
stateCmpValue7	STS_CMP7	stateComparisonValue7
cntr0Underflow	STS_UFLW0	underflow0
cntr1Underflow	STS_UFLW1	underflow1
cntr2Underflow	STS_UFLW2	underflow2
cntr3Underflow	STS_UFLW3	underflow3
cntr4Underflow	STS_UFLW4	underflow4
cntr5Underflow	STS_UFLW5	underflow5
cntr6Underflow	STS_UFLW6	underflow6
cntr7Underflow	STS_UFLW7	underflow7
cntr0Overflow	STS_OFLW0	overflow0
cntr1Overflow	STS_OFLW1	overflow1
cntr2Overflow	STS_OFLW2	overflow2
cntr3Overflow	STS_OFLW3	overflow3
cntr4Overflow	STS_OFLW4	overflow4
cntr5Overflow	STS_OFLW5	overflow5
cntr6Overflow	STS_OFLW6	overflow6
cntr7Overflow	STS_OFLW7	overflow7
cntr0Reverse	STS_DIR0	counter0Reverse

Name in SIMOTION System, V4.0 and higher (command library in SCOUT)	Name in the SIMATIC system	Name in the SIMOTION system up to V3.2 (SIMOTION Function Library)
cntr1Reverse	STS_DIR1	counter1Reverse
cntr2Reverse	STS_DIR2	counter2Reverse
cntr3Reverse	STS_DIR3	counter3Reverse
cntr4Reverse	STS_DIR4	counter4Reverse
cntr5Reverse	STS_DIR5	counter5Reverse
cntr6Reverse	STS_DIR6	counter6Reverse
cntr7Reverse	STS_DIR7	counter7Reverse
input0	STS_DI0	input0
input1	STS_DI1	input1
input2	STS_DI2	input2
input3	STS_DI3	input3
input4	STS_DI4	input4
input5	STS_DI5	input5
input6	STS_DI6	input6
input7	STS_DI07	input7
output0	STS_DQ0	output0
output1	STS_DQ1	output1
output2	STS_DQ2	output2
output3	STS_DQ3	output3
output4	STS_DQ4	output4
output5	STS_DQ5	output5
output6	STS_DQ6	output6
output7	STS_DQ7	output7
gate0	STS_GATE0	gate0
gate1	STS_GATE1	gate1
gate2	STS_GATE2	gate2
gate3	STS_GATE3	gate3
gate4	STS_GATE4	gate4
gate5	STS_GATE5	gate5
gate6	STS_GATE6	gate6
gate7	STS_GATE7	gate7
opValue0	USER_STAT_WORD0	operatingValue0
opValue1	USER_STAT_WORD1	operatingValue1
opValue2	USER_STAT_WORD2	operatingValue2
opValue3	USER_STAT_WORD3	operatingValue3
loadValue0	LOAD_VAL0	loadValue0
loadValue1	LOAD_VAL1	loadValue1
loadValue2	LOAD_VAL2	loadValue2
loadValue3	LOAD_VAL3	loadValue3
loadValue4	LOAD_VAL4	loadValue4
loadValue5	LOAD_VAL5	loadValue5

Name in SIMOTION System, V4.0 and higher (command library in SCOUT)	Name in the SIMATIC system	Name in the SIMOTION system up to V3.2 (SIMOTION Function Library)
loadValue6	LOAD_VAL6	loadValue6
loadValue7	LOAD_VAL7	loadValue7
prepValue0	LOAD_PREPARE_VAL0	preparedValue0
prepValue1	LOAD_PREPARE_VAL1	preparedValue1
prepValue2	LOAD_PREPARE_VAL2	preparedValue2
prepValue3	LOAD_PREPARE_VAL3	preparedValue3
prepValue4	LOAD_PREPARE_VAL4	preparedValue4
prepValue5	LOAD_PREPARE_VAL5	preparedValue5
prepValue6	LOAD_PREPARE_VAL6	preparedValue6
prepValue7	LOAD_PREPARE_VAL7	preparedValue7
cmpValue0	CMP_VAL0	comparisonValue0
cmpValue1	CMP_VAL1	comparisonValue1
cmpValue2	CMP_VAL2	comparisonValue2
cmpValue3	CMP_VAL3	comparisonValue3
cmpValue4	CMP_VAL4	comparisonValue4
cmpValue5	CMP_VAL5	comparisonValue5
cmpValue6	CMP_VAL6	comparisonValue6
cmpValue7	CMP_VAL7	comparisonValue7
actCntrValue0	ACT_CNTV0	actualCounterValue0
actMeasValue0	ACT_MSRV0	actualMeasuringValue0
actCntrValue1	ACT_CNTV1	actualCounterValue1
actMeasValue1	ACT_MSRV1	actualMeasuringValue1
actCntrValue2	ACT_CNTV2	actualCounterValue2
actMeasValue2	ACT_MSRV2	actualMeasuringValue2
actCntrValue3	ACT_CNTV3	actualCounterValue3
actMeasValue3	ACT_MSRV3	actualMeasuringValue3
actCntrValue4	ACT_CNTV4	actualCounterValue4
actMeasValue4	ACT_MSRV4	actualMeasuringValue4
actCntrValue5	ACT_CNTV5	actualCounterValue5
actMeasValue5	ACT_MSRV5	actualMeasuringValue5
actCntrValue6	ACT_CNTV6	actualCounterValue6
actMeasValue6	ACT_MSRV6	actualMeasuringValue7
actCntrValue7	ACT_CNTV7	actualCounterValue7
actMeasValue7	ACT_MSRV7	actualMeasuringValue7
diagnostic (Struct_FM3502_diagInfo)	**DIAGNOSTIC_INT_INFO**	**diagnostic (DIAGNOSTIC_INT_INFO_TYPE)**
xxxReserved20..23 1)	BYTE0...BYTE3	dedicatedData20..23
chType	BYTE4	channelType
chInfoLength	BYTE5	lengthChannelInfo
numOfChannel	BYTE6	numberOfChannel
chFault	BYTE7	channelFault

Name in SIMOTION System, V4.0 and higher (command library in SCOUT)	Name in the SIMATIC system	Name in the SIMOTION system up to V3.2 (SIMOTION Function Library)
cntr0Fault	BYTE8	counter0Fault
cntr1Fault	BYTE9	counter1Fault
cntr2Fault	BYTE10	counter2Fault
cntr3Fault	BYTE11	counter3Fault
cntr4Fault	BYTE12	counter4Fault
cntr5Fault	BYTE13	counter5Fault
cntr6Fault	BYTE14	counter6Fault
cntr7Fault	BYTE15	counter7Fault

[1] Variable for internal FB use (not relevant to users)

Table A- 3 SIMOTION and SIMATIC names for FM 352

Name in SIMOTION System, V4.0 and higher (command library in SCOUT)	Name in the SIMATIC system	Name in the SIMOTION system up to V3.2 (SIMOTION Function Library)
Function block parameters		
_FM352_initialize	FC CAM_INIT (FC 0)	_FB_FM352_initialize
execute	-	-
ctrlData	DB_NO	controlData
done	-	-
error	-	-
_FM352_control	FC CAM_CTRL (FC 1)	_FB_FM352_control
periIn	-	inputInterface
ctrlData	DB_NO	controlData
paraData	DB_NO	parameterData
periOut	-	outputInterface
error	-	-
status	-	returnValue
startup	-	startup
_FM352_diagnostic	FC CAM_DIAG (FC 2)	_FB_FM352_diagnostic
enable	-	-
periIn	-	inputInterface
diagData	DB_NO	diagnosticData
error	-	-
status	-	returnValue
Data structure elements		
Struct_FM352_ctrlData	-	Struct_FM352_controlData
moduleAddress	MOD_ADDR	moduleAddress
FmType	FM_TYPE	FMType
enableSimNegative	DIR_M	simulateNegative
enableSimPositive	DIR_P	simulatePositive
enableOutputCam	CAM_EN	enableOutputCam
enableTrack0Counter	CNTC0_EN	enableCounterTrack0
enableTrack1Counter	CNTC1_EN	enableCounterTrack1
enableTrack	TRACK_EN	enableTrack
diagDataChanged	DIAG	diagnosticDataModify
dataError	DATA_ERR	dataError
parameterized	PARA	parameterized
outputCamActive	CAM_ACT	outputCamActive
synchronized	SYNC	synchronized
measDone	MSR_DONE	measuringDone
dirNegative	GO_M	negativeDirection

Name in SIMOTION System, V4.0 and higher (command library in SCOUT)	Name in the SIMATIC system	Name in the SIMOTION system up to V3.2 (SIMOTION Function Library)
dirPositive	GO_P	positiveDirection
hystZone	HYS	hysteresisZone
floatActValue	FVAL_DONE	floatingActualValue
actPosition	ACT_POS	actualPosition
trackSignals	TRACK_OUT	trackSignals
enableEdgeDetection	EDGE_ON	enableEdgeDetection
enableSimulation	SIM_ON	enableSimulation
enableLenMeasuring	MSR_ON	enableLengthMeasuring
execRetrigRefPoint	REFTR_ON	retriggerReferencePoint
switchOffSwLimit	SSW_OFF	switchOffSoftwareLimit
execWrMachineData	MDWR_EN	writeMachineData
execWrActivateMData	MD_EN	writeActivateMachineData
execWrActValueRevoke	AVALREM_EN	writeActualValueRevoke
execWrOutputCamData1	CAM1WR_EN	writeOutputCamData1
execWrOutputCamData2	CAM2WR_EN	writeOutputCamData2
execWrOutputCamData3	CAM3WR_EN	writeOutputCamData3
execWrOutputCamData4	CAM4WR_EN	writeOutputCamData4
execWrOutputCamData5	CAM5WR_EN	writeOutputCamData5
execWrOutputCamData6	CAM6WR_EN	writeOutputCamData6
execWrOutputCamData7	CAM7WR_EN	writeOutputCamData7
execWrOutputCamData8	CAM8WR_EN	writeOutputCamData8
execWrSetRefPoint	REFPT_EN	writeReferencePoint
execWrActValue	AVAL_EN	writeActualValue
execWrActValSetOnTheFly	FVAL_EN	writeActualValueSettingOnTheFly
execWrZeroOffset	ZOFF_EN	writeZeroOffset
execWrOutputCamEdge1	CH01CAM_EN	writeOutputCamEdge1
execWrOutputCamEdge16	CH16CAM_EN	writeOutputCamEdge16
execRdMachineData	MDRD_EN	readMachineData
execRdOutputCamData1	CAM1RD_EN	readOutputCamData1
execRdOutputCamData2	CAM2RD_EN	readOutputCamData2
execRdOutputCamData3	CAM3RD_EN	readOutputCamData3
execRdOutputCamData4	CAM4RD_EN	readOutputCamData4
execRdOutputCamData5	CAM5RD_EN	readOutputCamData5
execRdOutputCamData6	CAM6RD_EN	readOutputCamData6
execRdOutputCamData7	CAM7RD_EN	readOutputCamData7
execRdOutputCamData8	CAM8RD_EN	readOutputCamData8
execRdMeasValue	MSRRD_EN	readMeasuringValue
execRdCntrValueTrack	CNTTRC_EN	readCounterValueTrack
execRdActPosition	ACTPOS_EN	readActualPosition
execRdEncValue	ENCVAL_EN	readEncoderValue
execRdOutputCamData	CAMOUT_EN	readOutputCamData

Name in SIMOTION System, V4.0 and higher (command library in SCOUT)	Name in the SIMATIC system	Name in the SIMOTION system up to V3.2 (SIMOTION Function Library)
xxxEnableScom [1)]	-	scom_en
xxxEnableSfct [1)]	-	sfct_en
enableEdgeDetectDone	EDGE_D	enableEdgeDetectionDone
enableSimDone	SIM_D	enableSimulationDone
enableLenMeasDone	MSR_D	enableLengthMeasuringDone
retrigRefPointDone	REFTR_D	retriggerReferencePointDone
switchOffSwLimDone	SSW_D	switchOffSoftwareLimitDone
wrMdDone	MDWR_D	writeMachineDataDone
wrActivateMdDone	MD_D	writeActivateMachineDataDone
wrActValueRevokeDone	AVALREM_D	writeActualValueRevokeDone
wrOutputCamData1Done	CAM1WR_D	writeOutputCamData1Done
wrOutputCamData2Done	CAM2WR_D	writeOutputCamData2Done
wrOutputCamData3Done	CAM3WR_D	writeOutputCamData3Done
wrOutputCamData4Done	CAM4WR_D	writeOutputCamData4Done
wrOutputCamData5Done	CAM5WR_D	writeOutputCamData5Done
wrOutputCamData6Done	CAM6WR_D	writeOutputCamData6Done
wrOutputCamData7Done	CAM7WR_D	writeOutputCamData7Done
wrOutputCamData8Done	CAM8WR_D	writeOutputCamData8Done
wrRefPointDone	REFPT_D	writeReferencePointDone
wrActValueDone	AVAL_D	writeActualValueDone
wrActValSetOnTheFlyDone	FVAL_D	writeActualValueSettingOnTheFlyDone
wrZeroOffsetDone	ZOFF_D	writeZeroOffsetDone
wrOutputCamEdge1Done	CH01CAM_D	writeOutputCamEdge1Done
wrOutputCamEdge16Done	CH16CAM_D	writeOutputCamEdge16Done
rdMdDone	MDRD_D	readMachineDataDone
rdOutputCamData1Done	CAM1RD_D	1readOutputCamDataDone
rdOutputCamData2Done	CAM2RD_D	readOutputCamData2Done
rdOutputCamData3Done	CAM3RD_D	readOutputCamData3Done
rdOutputCamData4Done	CAM4RD_D	readOutputCamData4Done
rdOutputCamData5Done	CAM5RD_D	readOutputCamData5Done
rdOutputCamData6Done	CAM6RD_D	readOutputCamData6Done
rdOutputCamData7Done	CAM7RD_D	readOutputCamData7Done
rdOutputCamData8Done	CAM8RD_D	readOutputCamData8Done
rdMeasValueDone	MSRRD_D	readMeasuringValueDone
rdCntrValueTrackDone	CNTTRC_D	readCounterValueTrackDone
rdActPosDone	ACTPOS_D	readActualPositionDone
rdEncValueDone	ENCVAL_D	readEncoderValueDone
rdOutputCamDataDone	CAMOUT_D	readOutputCamDataDone
xxxScomDone [1)]	-	scom_D
xxxSfctDone [1)]	-	sfct_D
enableEdgeDetectError	EDGE_ERR	enableEdgeDetectionError

Name in SIMOTION System, V4.0 and higher (command library in SCOUT)	Name in the SIMATIC system	Name in the SIMOTION system up to V3.2 (SIMOTION Function Library)
enableSimError	SIM_ERR	enableSimulationError
enableLenMeasError	MSR_ERR	enableLengthMeasuringError
retrigRefPointError	REFTR_ERR	retriggerReferencePointError
switchOffSwLimitError	SSW_ERR	switchOffSoftwareLimitError
wrMdError	MDWR_ERR	writeMachineDataError
wrActivateMdError	MD_ERR	writeActivateMachineDataError
wrActValueRevokeError	AVALREM_ERR	writeActualValueRevokeError
wrOutputCamData1Error	CAM1WR_ERR	writeOutputCamData1Error
wrOutputCamData2Error	CAM2WR_ERR	writeOutputCamData2Error
wrOutputCamData3Error	CAM3WR_ERR	writeOutputCamData3Error
wrOutputCamData4Error	CAM4WR_ERR	writeOutputCamData4Error
wrOutputCamData5Error	CAM5WR_ERR	writeOutputCamData5Error
wrOutputCamData6Error	CAM6WR_ERR	writeOutputCamData6Error
wrOutputCamData7Error	CAM7WR_ERR	writeOutputCamData7Error
wrOutputCamData8Error	CAM8WR_ERR	writeOutputCamData8Error
wrSetRefPointError	REFPT_ERR	writeReferencePointError
wrActValueError	AVAL_ERR	writeActualValueError
wrActValSetOnTheFlyError	FVAL_ERR	writeActualValueSettingOnTheFlyError
wrZeroOffsetError	ZOFF_ERR	writeZeroOffsetError
wrOutputCamEdge1Error	CH01CAM_ERR	writeOutputCamEdge1Error
wrOutputCamEdge16Error	CH16CAM_ERR	writeOutputCamEdge16Error
rdMdError	MDRD_ERR	readMachineDataError
rdOutputCamData1Error	CAM1RD_ERR	readOutputCamData1Error
rdOutputCamData2Error	CAM2RD_ERR	readOutputCamData2Error
rdOutputCamData3Error	CAM3RD_ERR	readOutputCamData3Error
rdOutputCamData4Error	CAM4RD_ERR	readOutputCamData4Error
rdOutputCamData5Error	CAM5RD_ERR	readOutputCamData5Error
rdOutputCamData6Error	CAM6RD_ERR	readOutputCamData6Error
rdOutputCamData7Error	CAM7RD_ERR	readOutputCamData7Error
rdOutputCamData8Error	CAM8RD_ERR	readOutputCamData8Error
rdMeasValueError	MSRRD_ERR	readMeasuringValueError
rdCntrValueTrackError	CNTTRC_ERR	readCounterValueTrackError
rdActPosError	ACTPOS_ERR	readActualPositionError
rdEncValueError	ENCVAL_ERR	readEncoderValueError
rdOutputCamDataError	CAMOUT_ERR	readOutputCamDataError
xxxErrorScom [1)]	-	scom_ERR
xxxErrorSfct [1)]	-	sfct_ERR
jobErrorId	JOB_ERR	jobError
jobBusy	JOBBUSY	jobBusy
execJobReset	JOBRESET	jobReset
xxxmeasJobErrorId [1)]	-	jobError_M

Name in SIMOTION System, V4.0 and higher (command library in SCOUT)	Name in the SIMATIC system	Name in the SIMOTION system up to V3.2 (SIMOTION Function Library)
xxxMeasJobBusy 1)	-	jobBusy_M
xxxActOrder 1)	-	aktAuftrag
xxxNextOrder 1)	-	naechsterAuftrag
xxxDataSetNumber 1)	-	DS_nummer
xxxDataSetLength 1)	-	DS_laenge
xxxDataSetStart 1)	-	DS_anfang
xxxEdgeOnOld 1)	-	edge_on_alt
xxxSimOnOld 1)	-	sim_on_alt
xxxMeasOnOld 1)	-	msr_on_alt
xxxReftrOnOld 1)	-	reftr_on_alt
xxxSswOffOld 1)	-	ssw_off_alt
xxxRead 1)	-	lesen
xxxError 1)	-	fehler
xxxEnableEdgeDetectOld 1)	-	enableEdgeDetectionDone_OLD
xxxEnableSimOld 1)	-	enableSimulationDone_OLD
xxxEnableLenMeasOld 1)	-	enableLengthMeasuringDone_OLD
xxxRetrigRefPointOld 1)	-	retriggerReferencePointDone_OLD
xxxSwitchOffSwLimOld 1)	-	switchOffSoftwareLimit_D_OLD
xxxDataSet11 1)	-	ds11
xxxDataSet12 1)	-	ds12
xxxControl 1)	-	steuer
xxxFeedback0 1)	-	rueck0
zeroOffset	ZOFF	zeroOffset
actValue	AVAL	actualValue
actValueSetOnTheFly	FVAL	actualValueSettingOnTheFly
refPoint	REFPT	referencePoint
outputCamNumber	CAM_NO	outputCamNumber
beginOutputCam	CAM_START	beginOfOutputCam
endOutputCam	CAM_END	endOfOutputCam
beginLenMeasuring	BEG_VAL	beginOfLengthMeasuring
endLenMeasuring	END_VAL	endOfLengthMeasuring
measRange	LEN_VAL	measuringRange
cntrValueTrack0	CNT_TRC0	counterValueTrack0
cntrValueTrack1	CNT_TRC1	counterValueTrack1
actPosition1	ACTPOS	actualPosition1
actSpeed	ACTSPD	actualSpeed
trackState1	TRACK_ID	trackState1
encValue	ENCVAL	encoderValue
cntrValueByZero	ZEROVAL	counterValueByZeroCrossing
absEncOffset	ENC_ADJ	offsetOfAbsoluteEncoder
outputCamData00_31	CAM_00_31	outputCamData00_31

Name in SIMOTION System, V4.0 and higher (command library in SCOUT)	Name in the SIMATIC system	Name in the SIMOTION system up to V3.2 (SIMOTION Function Library)
outputCamData32_63	CAM_32_63	outputCamData32_63
outputCamData64_95	CAM_64_95	outputCamData64_95
outputCamData96_127	CAM_96_127	outputCamData96_127
trackState2	TRACK_ID1	trackState2
actPosition2	ACTPOS1	actualPosition2
numOfOutputCamsToSet	C_QTY	activatedOutputCam
disableDataCheck	DIS_CHECK	disableDataCheck
outputCam (Struct_FM352_outCamCtrl)	**CAM**	**outputCam (outputCamTypeFM352)**
number	CAM_NO	number
setForceDirection	C_EFFDIR	changeForceDirection
setBegin	C_CBEGIN	changeBeginOfOutputCam
setEnd	C_CEND	changeEndOfOutputCam
setActuationTime	C_LTIME	changeActuationTime
deactivate	CAM_OFF	deactivate
posForceDirection	EFFDIR_P	forceDirectionPositive
negForceDirection	EFFDIR_M	forceDirectionNegative
beginOutputCam	CBEGIN	beginOfOutputCam
endOutputCam	CEND	endOfOutputCam
actuationTime	LTIME	actuationTime
Struct_FM352_paraData	-	**Struct_FM352_parameterData**
xxxModuleType1 1)	PI_MEND	moduleType1
enableProcessAlarm	PI_CAM	enableProcessAlarm
xxxModuleType2 1)	PI_MSTRT	moduleType2
minEdgeDistance	EDGEDIST	minimumEdgeDistance
unitDimension	UNITS	dimensionUnit
axisType	AXIS_TYPE	axisType
endRotAxis	ENDROTAX	endOfRotaryAxis
encType	ENC_TYPE	encoderType
lenPerRevolution	DISP_REV	lengthPerRevolution
incPerRevolution	INC_REV	incrementsPerRevolution
cntOfRevolutions	NO_REV	numberOfRevolution
baudRate	BAUDRATE	baudrate
refPoint	REFPT	referencePoint
absEncOffset	ENC_ADJ	offsetOfAbsoluteEncoder
refPointTrigMode	RETR_TYPE	referencePointTriggerMode
cntrDirection	CNT_DIR	counterDirection
openCircuit	MON_WIRE	openCircuit
transmissionError	MON_FRAME	transmissionError
missingPulse	MON_PULSE	missingPulse
swLimitStart	SSW_STRT	softwareLimitSwitchBegin
swLimitEnd	SSW_END	softwareLimitSwitchEnd

Name in SIMOTION System, V4.0 and higher (command library in SCOUT)	Name in the SIMATIC system	Name in the SIMOTION system up to V3.2 (SIMOTION Function Library)
numOfOutputCamsToSet	C_QTY	activatedOutputCam
hysteresis	HYS	hysteresis
simSpeed	SIM_SPD	simulationSpeed
ctrlTrackOutputs	TRACK_OUT	trackOutControl
enableInput3	EN_IN_I3	enableInput3
xxxEnableInput4..10 1)	EN_IN_I4	enableInput4...10
track0CntrOutputCam	SPEC_TRC0	counterOutputCamTrack0
track1CntrOutputCam	SPEC_TRC1	counterOutputCamTrack1
track2CntrOutputCam	SPEC_TRC2	counterOutputCamTrack2
track0CntrLimit	CNT_LIM0	counterLimitTrack0
track1CntrLimit	CNT_LIM1	counterLimitTrack1
outputCam (Struct_FM352_outCamPara)	**CAM**	**outputCam (outputCamData)**
valid	CAMVALID	valid
posForceDirection	EFFDIR_P	forceDirectionPositive
negForceDirection	EFFDIR_M	forceDirectionNegative
outputCamType	CAM_TYPE	typeOfOutputCam
switchOnAlarm	PI_SW_ON	switchOnAlarm
switchOffAlarm	PI_SW_OFF	switchOffAlarm
trackNumber	TRACK_NO	trackNumber
beginOutputCam	CBEGIN	beginOfOutputCam
endOutputCam	CEND	endOfOutputCam
actuationTime	LTIME	actuationTime
Struct_FM352_diagData	-	**Struct_FM352_diagnosticData**
moduleAddress	MOD_ADDR	moduleAddress
xxxDataSet 1)	-	ds
xxxDiagnosis0 1)	-	DIAG0
xxxFeedback0 1)	-	rueck0
xxxActOrder 1)	-	aktAuftrag
xxxNextOrder 1)	-	naechsterAuftrag
xxxDataSetNumber 1)	-	DS_nummer
xxxDataSetLength 1)	-	DS_laenge
xxxCntOfBuffers 1)	-	anzPuffer
xxxEnableDataSet236 1)	-	ds236_en
xxxDataSet 1)	-	ds237_en
jobErrorId	JOB_ERR	jobError
jobBusy	JOBBUSY	jobBusy
diagInformation	DIAGRD_EN	diagnosticInformation
numOfValidEntries	DIAG_CNT	numberOfValidEntries
diagEntry (Struct_FM352_diagType)	**DIAG**	**diagnosticEntry (diagnosticData)**
incomingAlarm	STATE	alarmIncoming

Name in SIMOTION System, V4.0 and higher (command library in SCOUT)	Name in the SIMATIC system	Name in the SIMOTION system up to V3.2 (SIMOTION Function Library)
internFault	INTF	internalFault
extFault	EXTF	externalFault
faultClass	FCL	faultClass
faultNumber	FNO	faultNumber
chNumber	CH_NO	chanNumber
outputCamNumber	CAM_NO	outputCamNumber

[1] Variable for internal FB use (not relevant to users)

A.2 List of abbreviations

Table A- 4 Abbreviations

Abbreviation	Meaning
ADC	Analog-digital converter
DI	Digital Input
DP	Distributed I/O
EPROM	Erasable Programmable Read-Only Memory (Erasable programmable read-only memory)
FB	Function block
FM	Function module
IM	Interface Module (SIMATIC S7-300 interface module)
IN	Input parameter
IN/OUT	In/out parameter
LAD	Ladder Logic
LED	Light Emitting Diode (LED displays)
OB	Organization block
OUT	Output parameter
Programming device/PC	Programming device / Personal computer
PS	Power Supply (SIMATIC S7-300 power supply)
RAM	Random Access Memory
SF	System Fault (System error)
SW	Software

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