

# SIEMENS

## SIMADYN D

### Application Module FM 458

#### User Manual

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Contents

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**Definitions**

---

**1**

**Product description**

---

**2**

**Mounting**

---

**3**

**Configuring**

---

**4**

**ESD guidelines**

---

**5**

Order No.: 6DD1904-0AE0

# Contents

|          |                                                                   |            |
|----------|-------------------------------------------------------------------|------------|
| <b>1</b> | <b>Definitions .....</b>                                          | <b>1-1</b> |
| <b>2</b> | <b>Product description .....</b>                                  | <b>2-1</b> |
| 2.1      | Application module FM 458 .....                                   | 2-1        |
| 2.1.1    | Application and design .....                                      | 2-1        |
| 2.1.2    | Performance features .....                                        | 2-4        |
| 2.1.3    | Supplementary components .....                                    | 2-5        |
| 2.1.4    | Connections .....                                                 | 2-6        |
| 2.1.5    | Status displays .....                                             | 2-8        |
| 2.1.6    | Technical data .....                                              | 2-9        |
| 2.2      | I/O expansion module EXM 438 .....                                | 2-10       |
| 2.2.1    | Application and design .....                                      | 2-10       |
| 2.2.2    | Performance features .....                                        | 2-11       |
| 2.2.3    | Supplementary components .....                                    | 2-12       |
| 2.2.4    | Connection possibilities .....                                    | 2-13       |
| 2.2.5    | Incremental encoder settings .....                                | 2-20       |
| 2.2.6    | Technical data .....                                              | 2-21       |
| 2.3      | I/O expansion module EXM 438-1 .....                              | 2-25       |
| 2.3.1    | Application and design .....                                      | 2-25       |
| 2.3.2    | Performance features .....                                        | 2-26       |
| 2.3.3    | Supplementary components .....                                    | 2-26       |
| 2.3.4    | Connection possibilities .....                                    | 2-26       |
| 2.3.5    | Incremental encoder settings .....                                | 2-27       |
| 2.3.6    | Technical data .....                                              | 2-28       |
| 2.4      | Communications expansion module EXM 448 .....                     | 2-30       |
| 2.4.1    | Application and design .....                                      | 2-30       |
| 2.4.2    | Performance features .....                                        | 2-31       |
| 2.4.3    | Supplementary components .....                                    | 2-32       |
| 2.4.4    | Installing the option module .....                                | 2-32       |
| 2.1.5    | Connection possibilities .....                                    | 2-34       |
| 2.1.6    | Status displays .....                                             | 2-36       |
| 2.1.7    | Technical data .....                                              | 2-36       |
| <b>3</b> | <b>Mounting .....</b>                                             | <b>3-1</b> |
| 3.1      | Mounting the expansion modules .....                              | 3-1        |
| 3.2      | Installing the assembly into the SIMATIC subrack .....            | 3-7        |
| 3.3      | Application information and noise immunity .....                  | 3-8        |
| <b>4</b> | <b>Configuring .....</b>                                          | <b>4-1</b> |
| 4.1      | Freely configuring the FM 458 application module .....            | 4-1        |
| 4.2      | Configuring and parameterizing the components .....               | 4-2        |
| 4.3      | Coupling to the SIMATIC S7-CPU .....                              | 4-5        |
| 4.3.1    | Overview of the 3 data transfer types, FM 458 ↔ SIMATIC-CPU ..... | 4-6        |
| 4.3.2    | Initiating a process interrupt on SIMATIC-CPU .....               | 4-7        |
| 4.3.3    | Data transfer via I/O accesses .....                              | 4-8        |
| 4.3.4    | Transferring data sets .....                                      | 4-11       |

## 2 Product description

### 2.1 Application module FM 458

| Designation               | Order No.    |
|---------------------------|--------------|
| Application module FM 458 | 6DD1607-0AA0 |

#### 2.1.1 Application and design

**Application**

The FM 458 (**F**unction **M**odule) application module is an application module which can be graphically freely configured and which can be used for sophisticated high-dynamic performance open-loop and closed-loop control functions. It is designed for use in a SIMATIC S7-400 station as a passive node which is connected to the SIMATIC backplane buses (P bus and K bus).

Applications include higher-level closed-loop drive controls for:

- Closed-loop tension control
- Closed-loop position control
- Winders and coilers
- Angular and synchronous controls
- Positioning
- Cross-cutters and flying saws
- Other closed-loop controls

**Expansion modules**

| Designation                             | Order No.     |
|-----------------------------------------|---------------|
| Input/output expansion module EXM 438   | 6DD 1607-0CA0 |
| Input/output expansion module EXM 438-1 | 6DD 1607-0CA1 |
| Communications expansion module EXM 448 | 6DD 1607-0EA0 |

As the FM 458 is a passive node on the backplane bus, the S7-CPU module must read-in signals from the SIMATIC I/O, and send these to the FM 458. The FM can be supplemented by the following expansion modules for fast process coupling:

- The I/O expansion module EXM 438/EXM 438-1 provides additional digital and analog I/O as well as incremental and absolute value encoders.

- Communications via PROFIBUS-DP (master or slave) is realized using the EXM 448 communications expansion module. Optionally, MASTERDRIVES-plug-in modules, e.g. SLB for SIMOLINK, can increase their functionality.

A maximum of two expansion modules can be used together with the FM 458 application module. The following combinations are possible:

| Application module | 1 <sup>st</sup> expansion module | 2 <sup>nd</sup> expansion module |
|--------------------|----------------------------------|----------------------------------|
| FM 458             | None                             | None                             |
|                    | EXM 438 or EXM 438-1             | None                             |
|                    | EXM 448                          | None                             |
|                    | EXM 438 or EXM 438-1             | EXM 438 or EXM 438-1             |
|                    | EXM 448                          | EXM 448                          |
|                    | EXM 438 or EXM 438-1             | EXM 448                          |
|                    | EXM 448                          | EXM 438 or EXM 438-1             |

Table 2-1 Possibilities of combining expansion modules

#### NOTE

When configuring the system, please note that the maximum load capability of the S7 power supply module may not be exceeded as a result of the current drawn by the FM 458 module.

When using an IM module, which is also used to transfer power to other modules, its maximum load capability must also be observed.

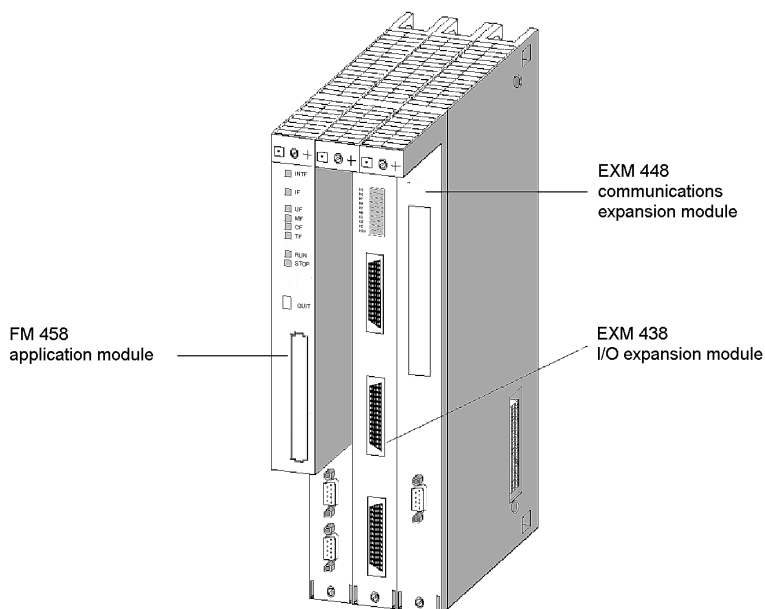


Fig. 2-1 View of the FM 458 application module with two expansion modules

## Design

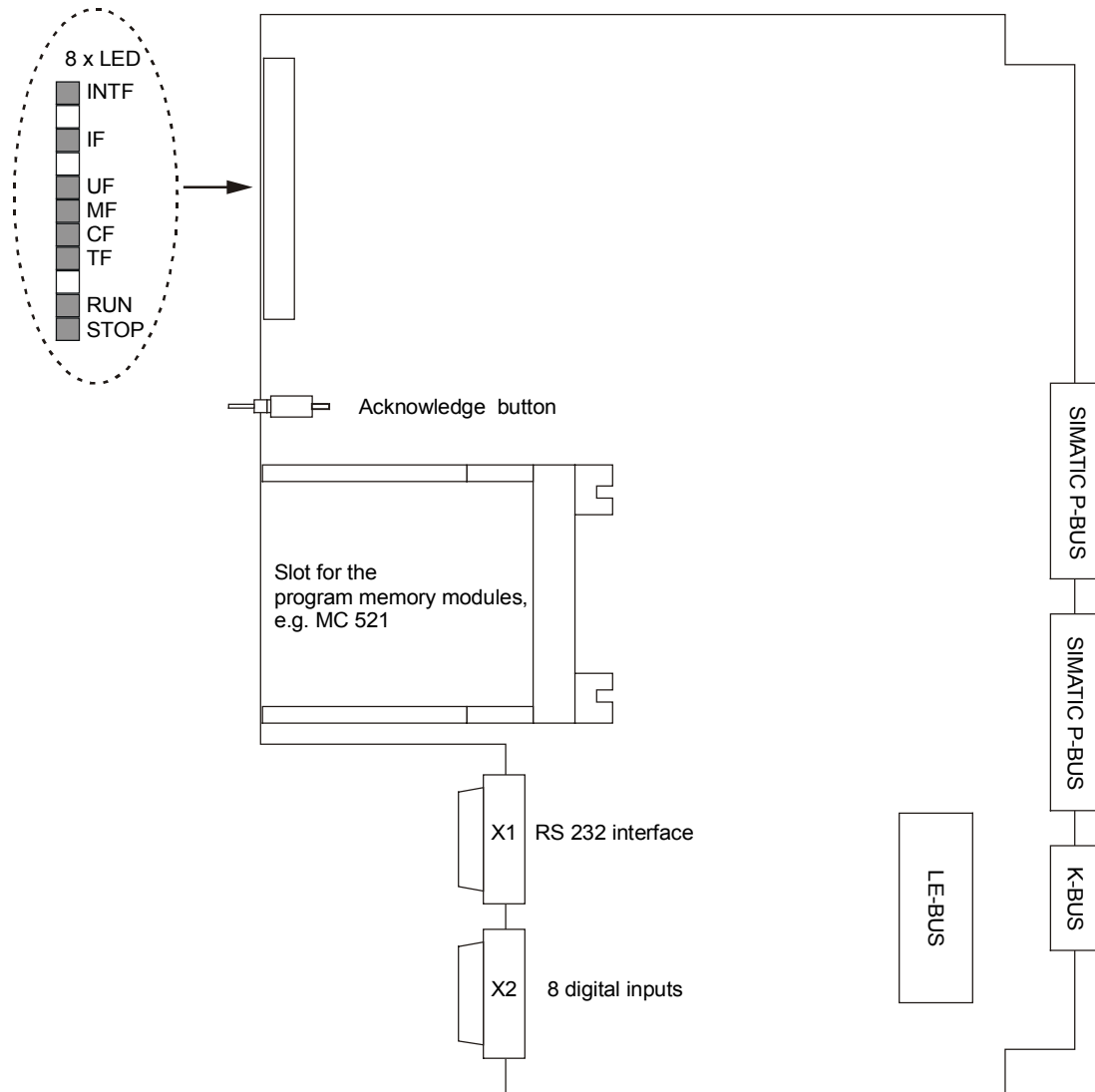


Fig. 2-2 Mechanical design of the FM 458 application module

### 2.1.2 Performance features

The FM 458 application module has the high-performance processor core of the PM6 SIMADYN D CPU module and has the following performance features:

- Computational performance
  - 128 MHz, 64 bit RISC floating-point-processor
  - fastest cycle times of 0.1 ms, typical 0.5 ms
- DRAM (8 MB)
  - Program code is loaded when the memory module is loaded and expanded when the memory module is initialized (boot flash is provided separately)
  - Data memory for the operating system, communications, message buffer, trace
- SRAM (256 KB)

The buffered SRAM contains the following data, which should be saved (non-volatile) even when the power fails:

- Error diagnostics of the operating system ("exception buffer")
- max. 1000 process quantities, configured using the SAV function block
- Data, traced using the message system or trace function (optional SRAM configuring)
- Replaceable program memories
  - MC 521 mit 2 MB Flash EPROM und 8 kByte EEPROM
  - MC 500 mit 4 MB Flash EPROM und 8 kByte EEPROM
- Two interfaces are available to load the user program into the program memory:
  - via a PCMCIA-IPC card slot (load offline)
  - directly from the PC via the serial service interface (loading online)
- 8 interrupt tasks can be called via 8 digital inputs.
- RS-232 interface (V.24) with service protocol DUST1 (19.2 kBd) for:
  - CFC test mode (incl. download)
  - "Service/IBS"/TELEMASTER [IBS = Start-up]
- 8 LEDs to display the operating status

- **Acknowledge button**  
Sporadically occurring faults (TF) or non-critical faults (MF) can be cancelled in the LED display using the acknowledge button. If another fault/error exists, then it is displayed after the first has been acknowledged.

- **LE bus**

The LE bus ensures fast data transfer between the FM 458 application module and its expansion modules EXM 438/EXM 438-1/EXM 448.

- **P bus**

The peripheral (I/O) bus (P bus) is the parallel SIMATIC backplane bus which is designed for fast I/O signal transfer. Each SIMATIC subrack has a P bus.

### 2.1.3 Supplementary components

| Components                                 | Designation | Order No.    |
|--------------------------------------------|-------------|--------------|
| Program memory                             | MC 521      | 6DD1610-0AH3 |
| Program memory                             | MC 500      | 6DD1610-0AH4 |
| Cable for PC connection<br>(9-pin/9-pin)   | SC57        | 6DD1684-0FH0 |
| Cable for digital inputs<br>(9-pin/10-pin) | SC64        | 6DD1684-0GE0 |
| Interface module                           | SU12        | 6DD1681-0AJ1 |
| Interface module                           | SB10        | 6DD1681-0AE2 |
| Interface module                           | SB60        | 6DD1681-0AF4 |
| Interface module                           | SB61        | 6DD1681-0EB3 |

Table 2-2      *Supplementary components for the FM 458 application module*

### 2.1.4 Connections

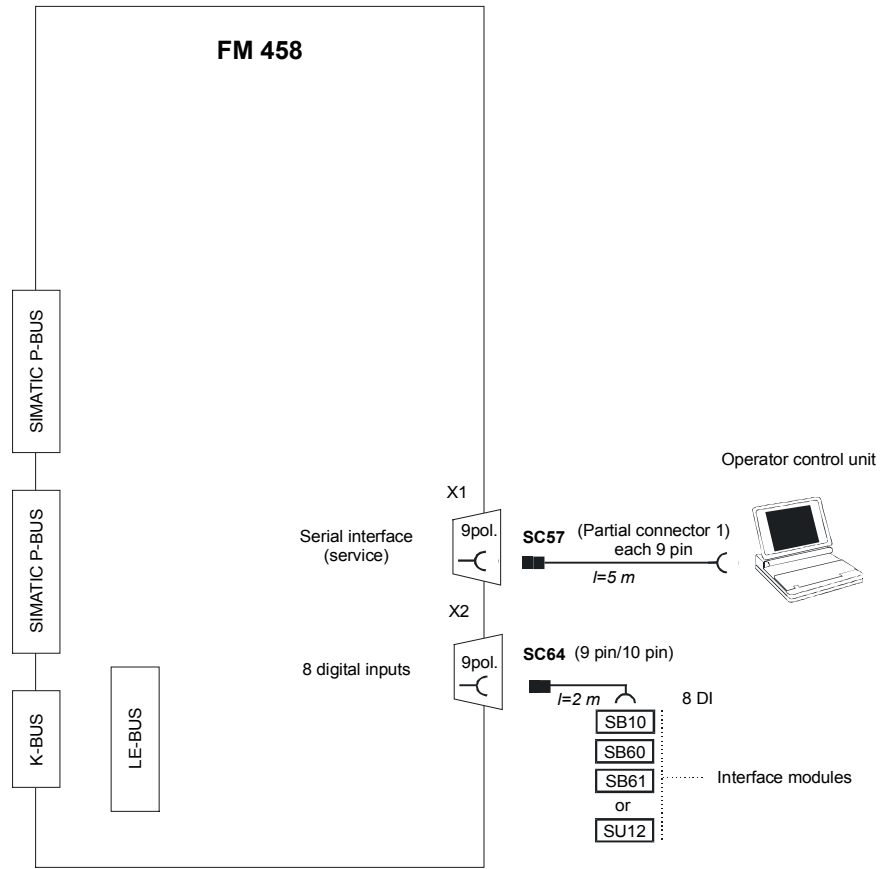
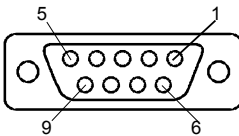


Fig. 2-3 Possibilities of connecting the FM 458 application module

#### Serial service interface (X1)

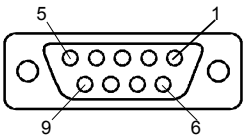


An operator control or configuring-PC is connected to the 9-pin sub-D socket via the SC57 PC cable.

| X1  |                   | SC57           |                |
|-----|-------------------|----------------|----------------|
| PIN | Designation       | PIN<br>FM-side | PIN<br>PC-side |
| 1   | -                 | -              | -              |
| 2   | Receive Data In   | 2              | 3              |
| 3   | Transmit Data Out | 3              | 2              |
| 4   | -                 | -              | -              |
| 5   | Ground 0V         | 5              | 5              |
| 6   | -                 |                |                |
| 7   | Request to Send   |                |                |
| 8   | Clear to Send     |                |                |
| 9   | -                 |                |                |

Table 2-3 Connection assignment of X1 and SC57 cable

**Digital inputs (X2)**



The digital inputs are connected at the 9-pin sub-D socket via cable SC64.

| PIN | Designation       |
|-----|-------------------|
| 1   | Interrupt input 1 |
| 2   | Interrupt input 3 |
| 3   | Interrupt input 5 |
| 4   | Interrupt input 7 |
| 5   | Ground            |
| 6   | Interrupt input 2 |
| 7   | Interrupt input 4 |
| 8   | Interrupt input 6 |
| 9   | Interrupt input 8 |

Table 2-4 Connector assignment of X2

**LE-bus connection**

An expansion module (EXM 438/EXM 438-1 or EXM 448) can be inserted at this 5 x 24-pin socket connector.

**P-bus connection**

Two 5 x 17-pin socket connectors are used to connect to the SIMATIC S7 backplane bus.

**K-bus connection**

A 5 x 7-pin socket connector is provided for connection to the SIMATIC K bus.

**Interface modules**

The screw terminals for the digital inputs are available via the interface modules.

| Interface modules | Function                                        |
|-------------------|-------------------------------------------------|
| SB10, SU12        | Electrical 1:1 connection, no signal conversion |
| SB60, SB61        | With electrical isolation and signal conversion |

Refer to Catalog DA 99 for information on the interface modules.

## 2.1.5 Status displays

There are eight LED displays on the front panel of the FM 458. They provide information about its actual operating status and data for diagnostics.

| LED  | Color  | Status   | Significance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|------|--------|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| INTF | red    | lit      | <b>Internal error</b> , user program is not running                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| IF   | red    | lit      | <b>Initialization error</b><br>For errors, which occur when initializing the system, the user program doesn't start. Initialization errors due to incorrect modules or modules which are incorrectly inserted with respect to how they were originally configured.                                                                                                                                                                                                                                                                                                                                                                              |
| UF   | yellow | lit      | <b>User error</b><br>The user program runs, user-defined diagnostics event with the function block USF                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| MF   | yellow | lit      | <b>Monitoring error</b><br>User program runs, low-priority error during initialization which permits standard operation to start, e.g. missing or discharged buffer battery.                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| CF   | yellow | lit      | <b>Communications error</b><br>User program runs, erroneous configured communications or erroneous connection to SIMATIC S7 or EMX 448                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| TF   | yellow | lit      | <b>Task administration error</b><br>User program runs, the following error cases are possible:<br><i>Cycle error</i><br>a task was not able to be completed within the task sampling time.<br><i>Task back-up</i><br>If the task is not marked as a task to run with the highest priority, and it must be restarted.<br><i>No free local buffer</i><br>The data buffer is no longer enabled. Task start is bypassed.<br><i>Software Watchdog</i><br>if the basic sampling time is not processed four times one after the other. The basic clock cycle timer is re-initialized with the configured basic sampling time and processing continued. |
| RUN  | green  | lit      | <b>RUN condition</b><br>User program runs, the module operates normally also if UF, MF, CF or TF = "lit"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|      |        | flashing | Initialization running                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| STOP | yellow | lit      | <b>STOP status</b><br>User program is not running, module is in the stop condition, e.g. or fatal system-, initialization errors or the S7-CPU is in the stop condition.                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|      |        | flashing | Download running in the STOP condition (is faster than the download in the run condition, which runs in the background)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

Table 2-5 Significance of the LED status displays

Errors can be acknowledged by pressing the acknowledge button. If an additional error exists, it is displayed after the first error has been acknowledged.

More information on EMC and environment/ambient conditions, refer to the SIMADYN D Hardware Manual, Section "General Technical Data" or the appropriate SIMATIC S7 documentation!

## 2.1.6 Technical data

### Order No.

|                           |              |
|---------------------------|--------------|
| Application module FM 458 | 6DD1607-0AA0 |
|---------------------------|--------------|

### Digital inputs

|                                                                                                                                                                    |                                                           |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|
| Number                                                                                                                                                             | 8                                                         |
| Electrical isolation                                                                                                                                               | No                                                        |
| Input voltage <ul style="list-style-type: none"> <li>• Permissible range</li> <li>• Nominal voltage</li> <li>• For a 0 signal</li> <li>• For a 1 signal</li> </ul> | -1 V to +33 V<br>24 V<br>-1 V to +6 V<br>+13,5 V to +33 V |
| Input current <ul style="list-style-type: none"> <li>• For a 0 signal, typ.</li> <li>• For a 1 signal, typ.</li> </ul>                                             | 0 mA<br>3 mA                                              |
| Delay time per channel, max                                                                                                                                        | 100 µs                                                    |

### Voltages, currents

|                       |       |               |
|-----------------------|-------|---------------|
| Rated voltage         | +5 V  | 3,4 V battery |
| Typical current drain | 1,8 A | 10 µA         |

### Dimensions

|                           |                |
|---------------------------|----------------|
| Assignment, slots         | 1              |
| Dimensions W x H x D [mm] | 25 x 290 x 210 |
| Weight                    | 0,92 kg        |