SIEMENS

SIMATIC Sensors

RFID systems
RF160C communication module with FC 44

Operating Instructions

05/2010
J31069-D0219-U001-A1-7618

Legal information

Warning notice system

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Introduction

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Purpose of these operating instructions

The information provided in these operating instructions will enable you to commission the RF160C communication module on the PROFIBUS DP/DP-V0 as a DP slave.

Basic knowledge required

These operating instructions assume general knowledge of automation engineering and identification systems.

Scope of the manual

The operating instructions apply to the RF160C communication module.

Position in the information landscape

- In addition to these operating instructions, you require the operating instructions for the DP master used.
- The manual of the relevant SIMATIC identification system contains information on the write/read devices to be connected.

Conventions

The following terms/abbreviations are used synonymously in this document:

- Reader, read/write device, SLG
- Tag, transponder, mobile data memory, data carrier, MDS
- Communication module, interface module, ASM

Registered trademarks

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Guide

These operating instructions describe the hardware and programming of the RF160C communication module. They comprise introductory chapters and reference chapters (e.g. technical data).

The operating instructions include the following subject areas:

- Connection of the RF160C communication module
- Parameterization of the RF160C communication module with the FC44
- Programming of the RF160C in third-party controllers and PC environments
- Diagnostics information
- Display elements of the RF160C communication module
- Description of the firmware update
- Technical data as well as dimension drawings of the RF160C communication module
- Ordering data

Recycling and disposal

- Due to its non-toxic equipment, the RF160C communication module can be recycled.
- For ecologically compatible recycling and disposal of your old device, contact a certificated disposal service for electronic scrap.

Description

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2.1 Area of application

The RF160C communication modules are slave modules for operating SIMATIC RFID components via the PROFIBUS DP/DP-V0 on any control systems.

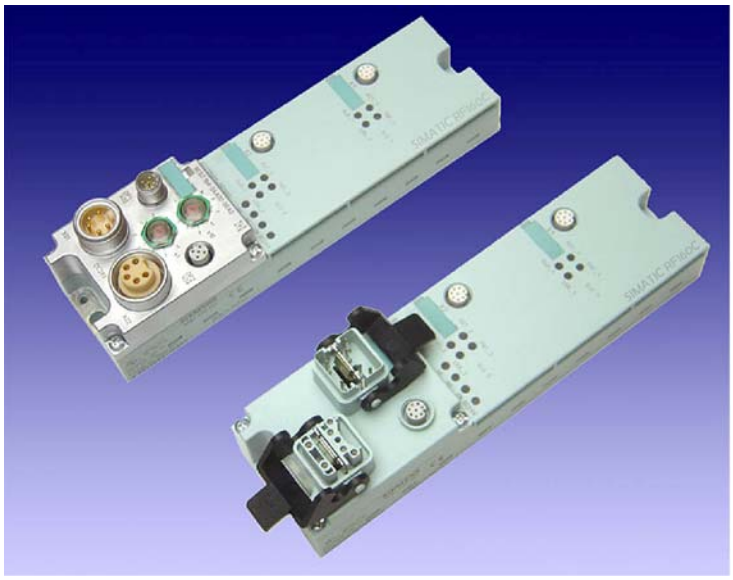

Figure 2-1 RF160C communication module with M12, 7/8" or ECOFAST connection block

When operating the communication modules on a SIMATIC S7, a user-friendly function block is made available to the user.

The following RFID readers and code readers can be operated with the RF160C:

- RF300 (standard addressing)
- RF600
- MOBY D
- MOBY U (standard addressing)

2.2 Features

The RF160C replaces the ASM 450 in terms of functionality and provides a simplified connection system. The user software of applications created for ASM 450 can continue to be used for RF160C.

The tag data are accessed by means of physical addressing of the transponder.

The RF160C communication modules have the following characteristics:

- Degree of protection IP67
- System integration with ECOFAST or M12, 7/8" concept
- T functionality, that is, a component can be replaced without adversely affecting other modules with regard to bus communication and power supply
- Central firmware update; management via the SIMATIC Manager
- PROFIBUS interface module up to 12 Mbit/s with automatic transfer rate detection
- Parameterizable device-related diagnostic data with text display in the engineering system
- Support for I&M functionality (a mechanism for reading out information via the module and saving system information such as function, installation date, installation location, and comments).

2.3 Design

The RF160C has the same enclosure as the distributed I/O system ET 200eco.

The communication module has a connection block for connecting to PROFIBUS DP. This block is available optionally as ECOFAST version or M12, 7/8" version.

The following figure shows the basic design of the RF160C.

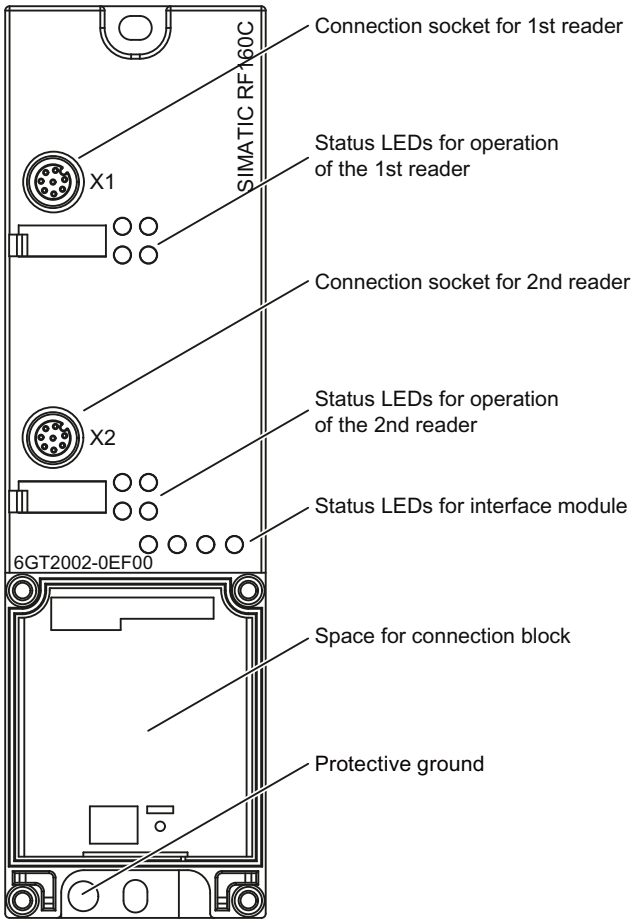

Figure 2-2 Basic design of the RF160C

2.4 Potential

Ungrounded installation of the system is possible with the RF160C. The following circuit shows the internal relationships of the reference potentials.

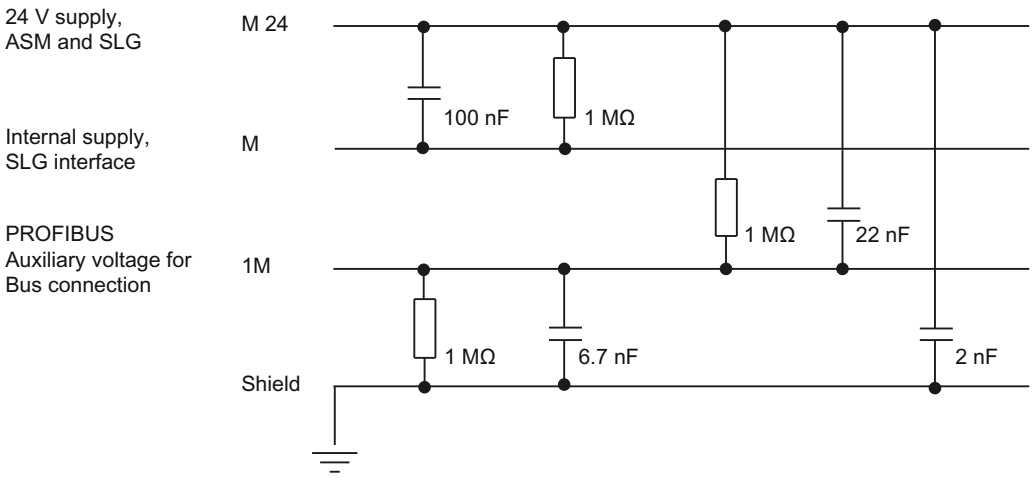

Figure 2-3 Galvanic isolation for RF160C (ground to shield)

2.5 System integration

The following figure shows how the RF160C is integrated in an automation system.

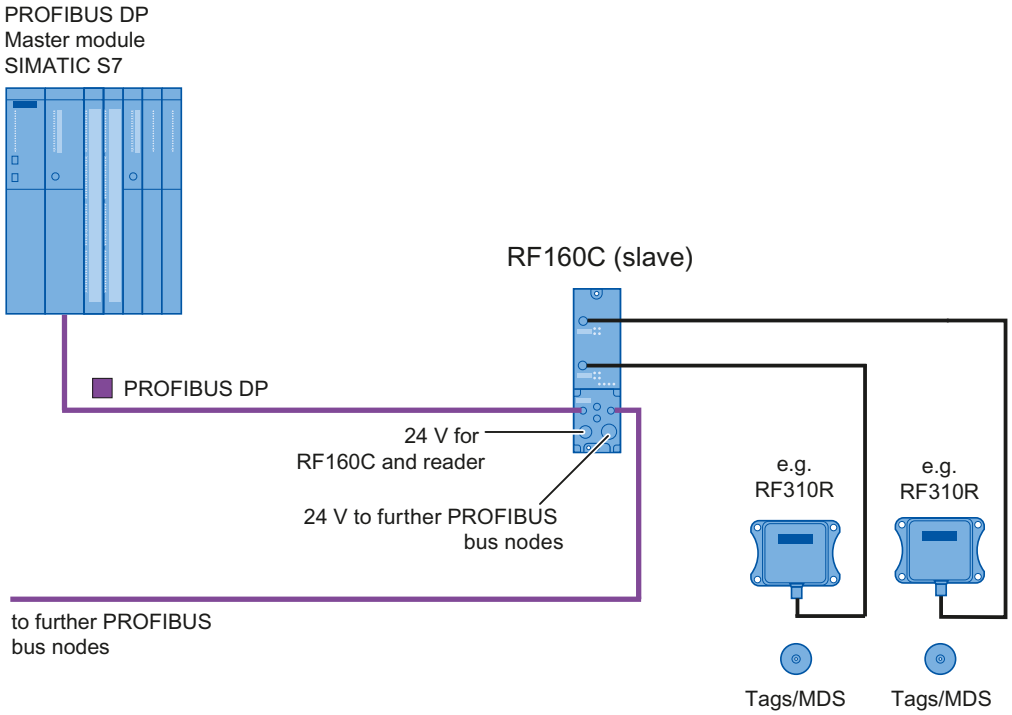

Figure 2-4 Configuration of RF160C

The RF160C is integrated into the hardware configuration by means of a GSD file. The communication module can then be configured using HW Config of the SIMATIC Manager or another PROFIBUS tool (e.g. operating mode). The GSD file can be found on the CD "*RFID Systems Software & Documentation*" or on the Internet (see chapter "Service & Support (Page 95)").

Mounting

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The RF160C communication module is designed for easy mounting.

3.1 Mounting position, mounting dimensions

Mounting position

There are no restrictions regarding the mounting position for the RF160C.

Mounting dimensions and spacing

Table 3- 1 Mounting dimensions of basic module with M12 connection block (7/8", without connector)

Designation	Dimensions
Mounting width	60 mm
Mounting height	210 mm
Mounting depth	54 mm

Table 3- 2 Mounting dimensions of basic module with push-pull connection block (without connector)

Designation	Dimensions
Mounting width	60 mm
Mounting height	216 mm
Mounting depth	100 mm

3.2 Mounting the communication module

The base unit is mounted on a stable surface

Note

Functional ground (PE)

If a grounded metal mounting surface is used, the bottom mounting screw of the RF160C module already establishes a reliable grounding connection. This eliminates the need for a separate grounding cable. If you use the fixing screw as grounding connection, the thread of the fixing screw or the contact facing of the fastening nut on the base must be unpainted. This ensures a low-resistance connection.

Requirements

Screws:

Quantity	Screw type	Description
2	M5 cylinder head screw according to ISO 1207/ISO 1580 (DIN 84/DIN 85) for fixing	The screw should be at least 20 mm long. You will also need washers according to DIN 125.
1	M5 cylinder head screw according to DIN 912 for grounding	

Required tools

Screwdriver to fit the screws used, torque wrench

Procedure

Fix the base unit onto a level surface using the screws. The base unit must be screwed to the surface (3 Nm tightening torque) at both fixing points (front, top and bottom).

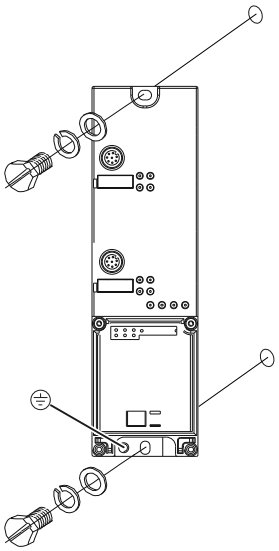

Figure 3-1 Mounting the communication module

Connecting

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Proper use

When connecting non-specified devices to the RF160C, it is possible that the connected device may be destroyed.

PROFIBUS connection system

Detailed information on how to connect the RF160C to PROFIBUS DP can be found in the ET 200eco manual (see IK PI Catalog). Descriptions of network components can also be found in this manual.

Reader connection system

One reader always occupies one M12 connection socket on the RF160C. A pre-assembled cable therefore permits the optimum, easy connection of the reader. The standard version connection cable is 2 m long.

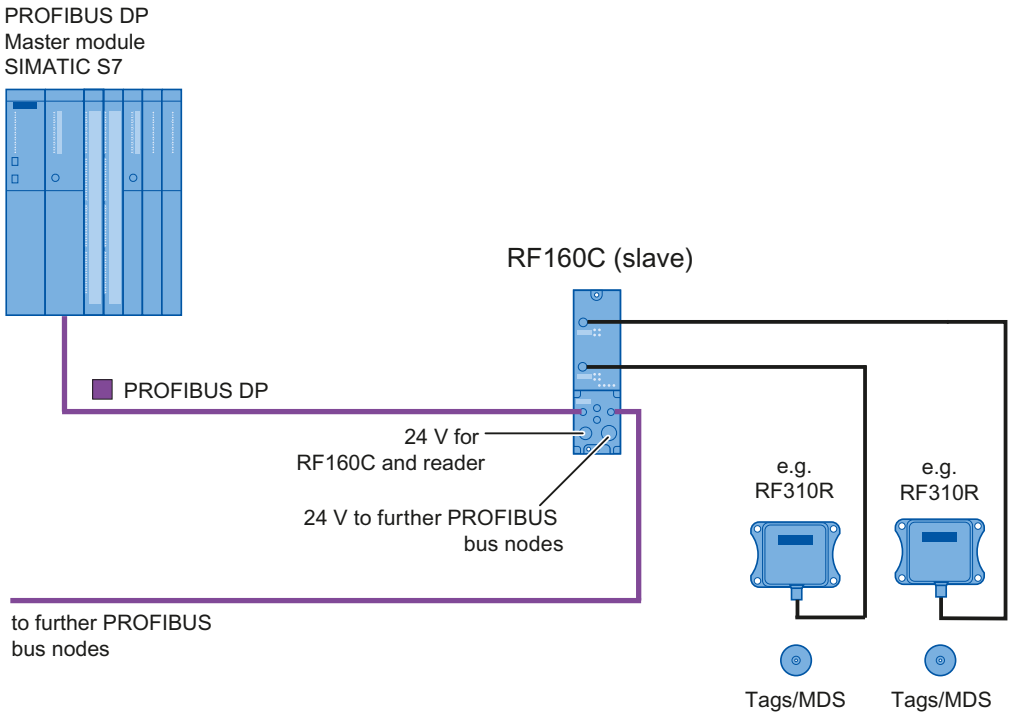


Figure 4-1 Overview of wiring

4.1 Setting the PROFIBUS address

Properties

The PROFIBUS address defines the address at which the RF160C distributed I/O device is found on the PROFIBUS DP.

Requirements

- The PROFIBUS DP address for the RF160C is set on the connection block.
- Each address can be assigned only once on the PROFIBUS DP.
- The PROFIBUS address set must match the PROFIBUS address defined in the configuring software (for the RF160C).
- Changes to the PROFIBUS DP address only take effect once the mains have been switched ON on the RF160C.

Tools required for M12, 7/8" connection block

- Socket wrench 14 mm
- Screwdriver with 2.5 mm blade

Setting PROFIBUS DP addresses on connection block M12, 7/8"

Valid PROFIBUS DP addresses are 1 to 99.

1. Remove the two seal caps from the rotary switches (if necessary, use a 14 mm socket wrench).
2. Set the required PROFIBUS address on the rotary switches using a screwdriver.
   - Lower rotary switch: 1st position
   - Upper rotary switch: 10th position
3. Screw the two seal caps back onto the rotary switches (torque: 0.5 Nm to 0.8 Nm.)

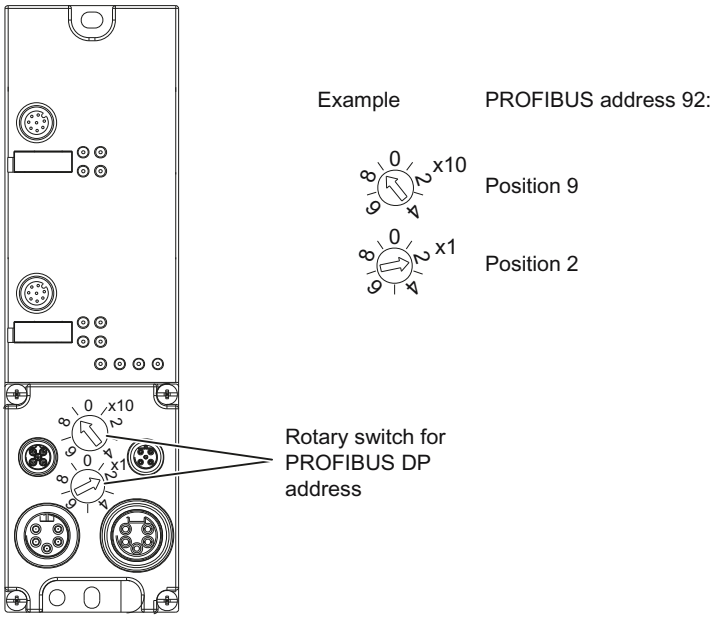


Figure 4-2 Setting the PROFIBUS DP address on M12, 7/8" connection block

Setting PROFIBUS DP addresses on connection block ECOFAST

Valid PROFIBUS DP addresses are 1 to 99.

1. Loosen the screws of the configuration connector with the ECOFAST terminal block and strip it off the connector.

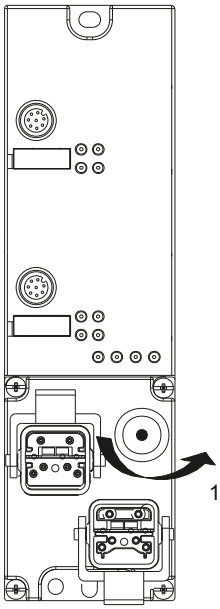


Figure 4-3 Loosening the configuration plug's screw connection

2. Remove the cap from the configuration connector.
3. Set the PROFIBUS address at the DIL switches.

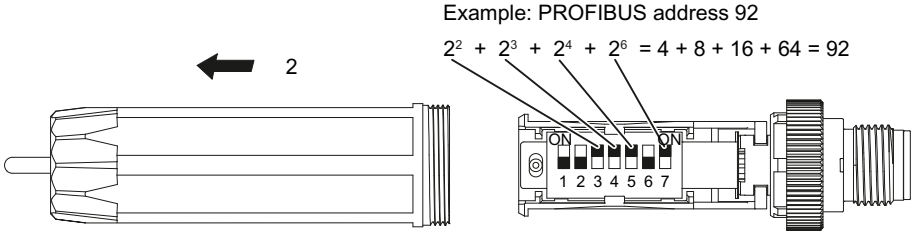


Figure 4-4 Setting PROFIBUS address on configuration plug

4. Screw the cover cap back down, plug the configuration plug onto the connection block and screw the configuration plug to the connection block.
5. After the initial connection of the 24 V power supply, the connector can be removed. The Profibus address remains retentively stored in the RF160C. To ensure it remains impermeable, the plug should be sealed with a screw cap.

4.2 Wiring connection block ECOFAST

Properties

- Connect up the supply voltages and PROFIBUS DP on the ECOFAST connection block using an ECOFAST connector plug.
- You can loop the supply voltages and PROFIBUS DP through via another ECOFAST connector plug.
- The first and last node on PROFIBUS DP must be equipped with a terminating resistor.

Requirements

You have set the PROFIBUS address (according to your project).

Required tools

Screwdriver, stripping and crimping tool for wiring the ECOFAST connector plug, if you are not using pre-assembled ECOFAST connector plugs.

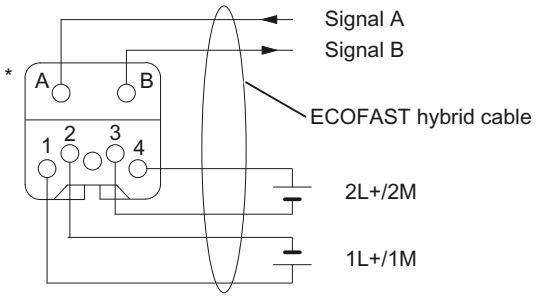
Accessories required

- Pre-assembled ECOFAST hybrid cable with ECOFAST connector. The cable is available in different lengths.
- If you are not using a pre-assembled ECOFAST hybrid cable (see table below):
  - Han Brid Cu cable connector and/or Han Brid Cu cable socket
  - ECOFAST hybrid cable
- Terminating resistor (ECOFAST) for PROFIBUS DP
- For order numbers, refer to "Ordering data" section.

Wiring ECOFAST connector plugs

The table below contains the connector assignment for the ECOFAST connector plugs

Table 4- 1 Connection assignment for ECOFAST connector plugs

Pin	Assignment	View of ECOFAST connector plug (wiring end for supply and loop-through connection)
A	PROFIBUS DP signal A	
B	PROFIBUS DP signal B	
1	Electronics/encoder supply (1L+) (power supply for RF160C and reader)	
2	Ground for electronic / encoder supply (1M)	
3	Load voltage ground (2M)	
4	Load voltage supply (2L+) (unused)	

*) You will find the assembly instructions in the packaging of the Han Brid Cu cable connector or Han Brid Cu cable socket.

Connecting up ECOFAST connector plugs

1. Press down the interlock for ECOFAST connector plugs on the connection block.
2. Connect the ECOFAST connector plugs (for 1L+/1M and the PROFIBUS DP) into the sockets on the connection block. In so doing, note the mechanical coding of the connector plugs for supply and loop-through connection.
3. Press up the interlock for ECOFAST connector plugs.

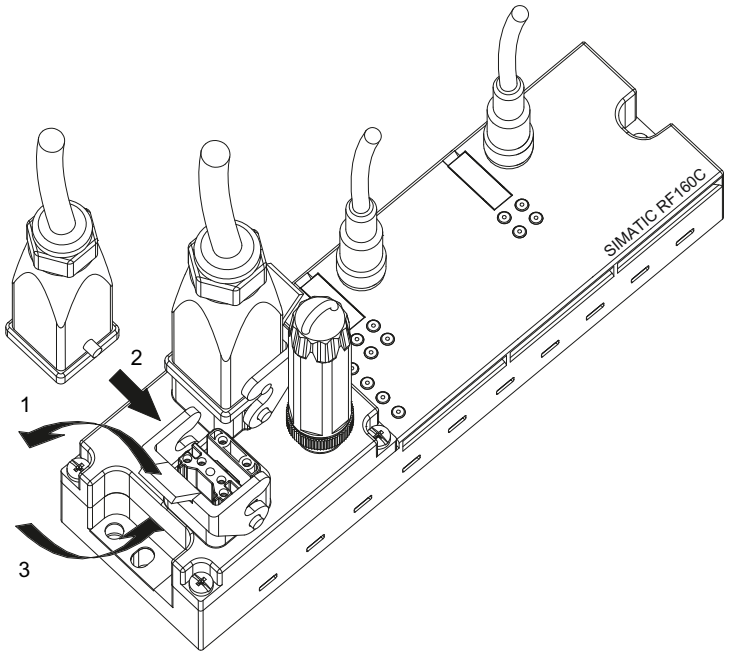


Figure 4-5 Connecting up ECOFAST connector plugs

Connecting up ECOFAST terminating resistor

A PROFIBUS DP segment must be terminated at both ends, in other words on the first and last node of the segment with its characteristic impedance.

Connect the terminating resistor at the last bus node to the right connector plug of the corresponding ECOFAST connection module. For procedure refer to connecting up ECOFAST connector plugs For order number, refer to "Ordering data" section.

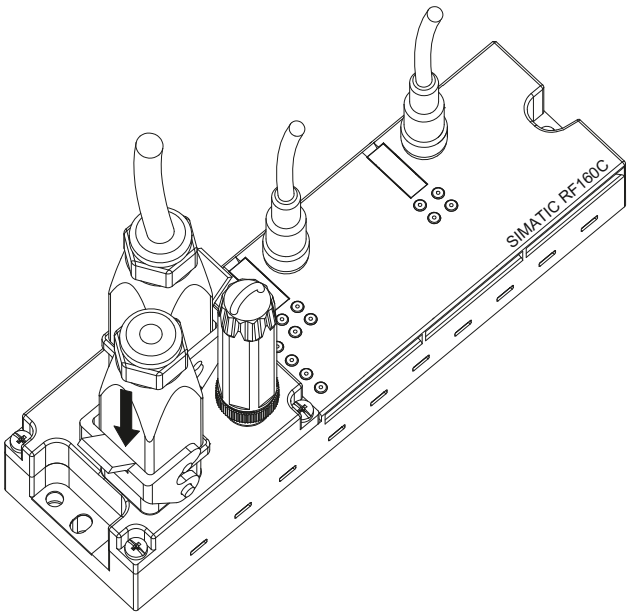


Figure 4-6 Connecting the ECOFAST terminating resistor

NOTICE
The terminating resistor is supplied by the electronic/encoder supply (1L+/1M). Perfect functioning of the terminating resistor is only guaranteed if the electronics/encoder supply (1L+/1M) is within the tolerance range of 20 to 30 V.

Sealing unused sockets

Seal all unused RF160C sockets using caps in order to achieve degree of protection IP65, IP66 or IP67. For order numbers, refer to "Ordering data" section.

4.3 Wiring connection block M12, 7/8"

Properties

- Connect the power supplies and PROFIBUS DP to the M12, 7/8" terminal block.
  - M12 connection: PROFIBUS DP
  - 7/8" connection: Power supply voltages
- You can loop the supply voltages and PROFIBUS DP through via M12 and/or 7/8" round sockets.
- The first and last node on PROFIBUS DP must be equipped with a terminating resistor.

Requirements

- Wire connection block M12, 7/8" when the supply voltage is switched off.
- The PROFIBUS address is set (according to your project and assigned where applicable to the terminating resistor)

Required tools

Stripping tool and screwdriver for wiring the M12 or 7/8" connector if you are not going to use ready-to-use connectors.

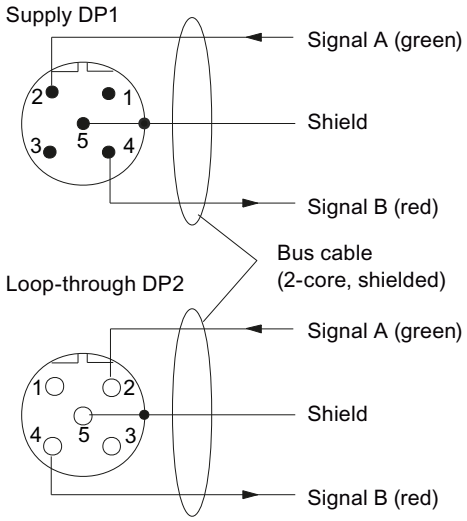
Accessories required

- Pre-assembled cable with connector
- If you are not using a pre-assembled connector:
  - M12: 2-core cable, shielded (bus cable) and M12 connector (see "Connection assignment for M12 connector (PROFIBUS DP)" table)
  - 7/8": 5-core cable and 7/8" connector (see "Connection assignment for 7/8" connector (supply voltage)" table)
- M12 terminating resistor for PROFIBUS DP
- For order numbers, refer to "Ordering data" section.

Wiring M12, 7/8" connector

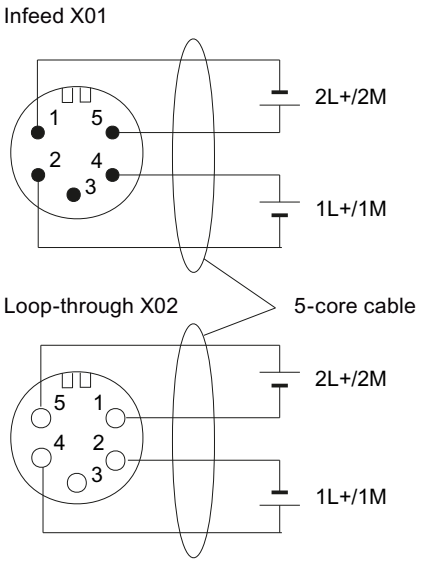
The tables below contain the connector assignment for the M12, 7/8" connector:

Table 4- 2 Connection assignment for M12 connector (PROFIBUS DP)

Pin	Assignment	View of M12 connector (wiring side)
1	Supply positive (P5V2) *	
2	Data line A (RxD / TxD-N)	
3	Data reference potential (M5V2) *	
4	Data line B (RxD / TxD-P)	
5	Shield	
Thread	Shield	

*) Can only be used for the M12 terminating resistor. Looping the voltage through to the next connector via a 5-core cable is not permitted.

Table 4- 3 Connection assignment for 7/8" connector (supply voltages)

Pin	Assignment	View of 7/8" connector (wiring side)
1	Load voltage ground (2M)	
2	Ground for electronic / encoder supply (1M)	
3	PE	
4	Electronics/encoder supply (1L+) (power supply for RF160C and reader)	
5	Load voltage supply (2L+) (unused on RF160C)	

Note

When connecting up the supply voltage, we recommend the cable specified in the "Ordering data" section (cable 5 x 1.5 mm^2 pre-assembled with 7/8" connectors).

If you want to assemble the cable yourself, then the conductor cross-section should be 1.5 mm^2.

Connecting the M12, 7/8” connector

1. Press the connector (M12 or 7/8") into the relevant round socket on the connection block. Ensure that the correct stop is provided between the connector and bush (groove and spring).
2. Use the knurled locking ring to secure the connector.

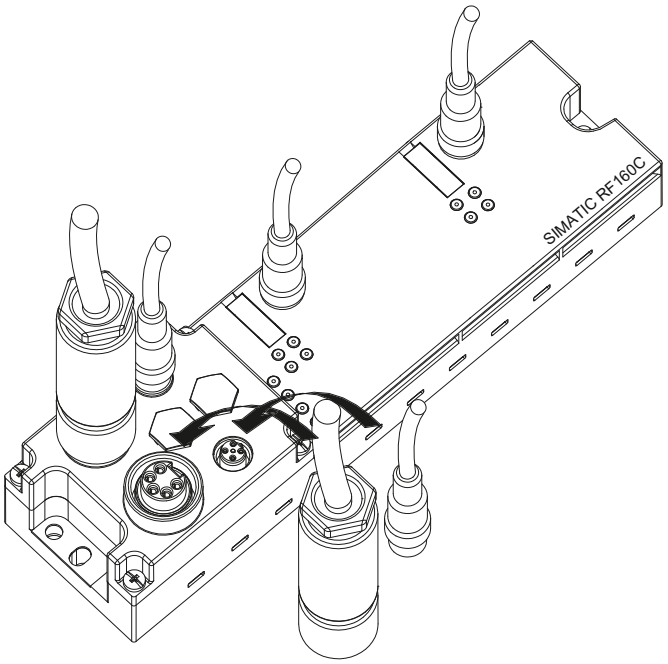


Figure 4-7 Connecting up M12, 7/8” connector

Connecting up terminating resistor for PROFIBUS DP

A PROFIBUS DP segment must be terminated at both its ends, that is, on the first and last segment node, with its characteristic impedance.

If the RF160C is the **last** PROFIBUS node, then you must terminate the PROFIBUS DP with the M12 terminating resistor. For order number, refer to "Ordering data" section.

1. Press the M12 terminating resistor in the right **loop-through connection** M12 round socket on the connection block. Ensure that it locks correctly.
2. Use the knurled locking ring to secure the M12 terminating resistor.

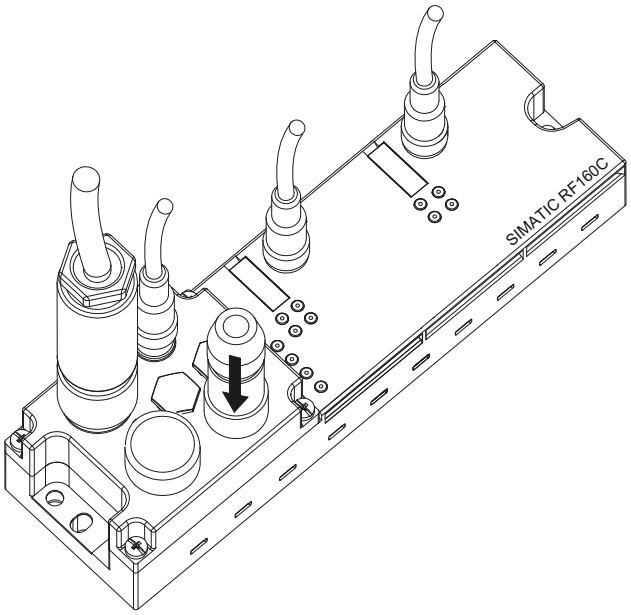


Figure 4-8 Connecting the M12 terminating resistor

Sealing unused sockets

Always close all unused sockets using M12 or 7/8" seal caps in order to achieve the degree of protection IP65, IP66 or IP67. For order numbers, refer to "Ordering data" section.

4.4 Loop-through connection of PROFIBUS DP and supply voltage

Properties

Each connection block has one connector for the supply and one socket for the loop-through of the supply voltage and PROFIBUS DP. The connector for supply and the socket for loop-through are linked with one another internally.

Result: If you remove the connection block during operations, then subsequent PROFIBUS nodes do not fail.

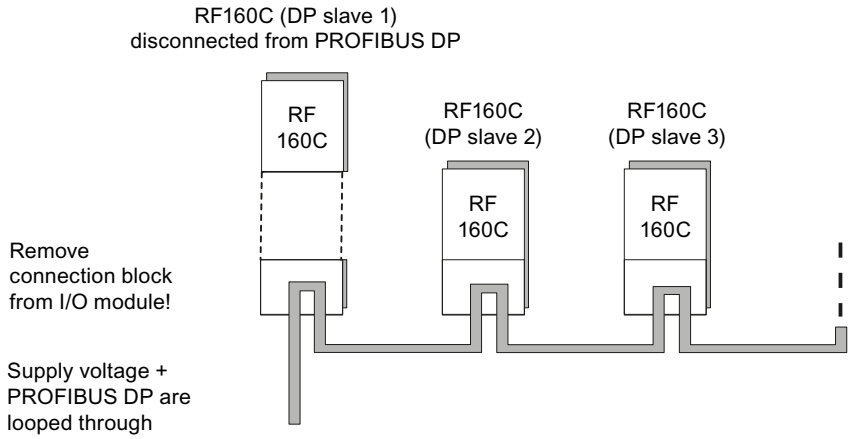


Figure 4-9 Loop-through connection of PROFIBUS DP and supply voltage

CAUTION
The IP65, IP66 or IP67 degree of protection is no longer guaranteed when the connection block is dismounted.

Notes for wiring

- If you are wiring your structure, then you must take into account the impact of cable length on supply voltage to the RF160C.

  Example of ECOFAST connection block:

  When using a 10 m long cable with a diameter of 1.5 mm^2, the voltage drop is 2.5 V with a loading of 10 A. This corresponds to 0.25 V at a 1 A load.

- The maximum supply current
  - of the ECOFAST connection block is 8 A at 1L+
  - of the M12, 7/8" connection block is 6 A at 1L+

  These values must not be exceeded.

CAUTION
If you do not observe the maximum supply currents and the cable cross-sections required, this may result in the cable isolation and contacts overheating and to the device being damaged.

4.5 Connection of RF160C to protective ground (PE)

Properties

- You have to connect the RF160C to protective ground. This normally happens when you mount the device on a grounded metal support. If you mount the module on a support that is not grounded, a separate grounding screw must be provided on the communications bus.
- The connection to protective earth is also required to deflect the interference currents and for EMC resistance.

Requirements

Always make sure there is a low-impedance contact with the protective earth. The threads of the mounting screw or the contact surface of the mounting nut on the support must not be painted in order to establish a low-impedance connection.

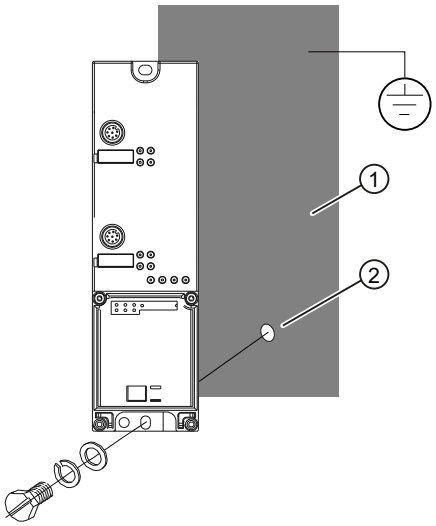
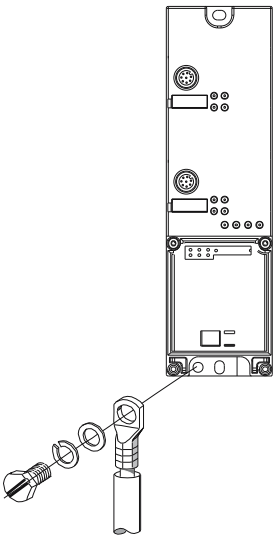
Required tools

- Screwdriver
- Stripping tool (optional)
- Crimp tool (optional)

Required accessories (optional)

- M5 x 10 retaining bolt and washers
- Grounding cable (copper braided cable) with minimum cross-section of 4 mm^2.
- Cable lug

Connection of RF160C to protective ground

Standard grounding via the fixing screw	Optional grounding via a grounding cable
1. Mount the module on the grounded, metallic base as described in chapterMounting the communication module (Page 14). ① Grounded, metallic base ② Unpainted thread or nut base	1. Isolate the grounding cable and secure the cable lug. 2. Screw the cable lug on to the communication module (M5 grounding screw). The tightening torque is 3 Nm.
	

Parameterizing 5

5.1 Configuration

After wiring and mounting, the following steps are necessary to commission the RF 160C communication module.

Installing the GSD file

To be able to configure and parameterize the RF160C for PROFIBUS via a management tool (e.g. SIMATIC Manager), the GSD file SIEM818A.GSD is required.

If the RF160C is not yet in the catalog of the management tool, this file must be installed.

In the case of SIMATIC Manager, this occurs in HW Config via the menu items "Tools > Install GSD files".

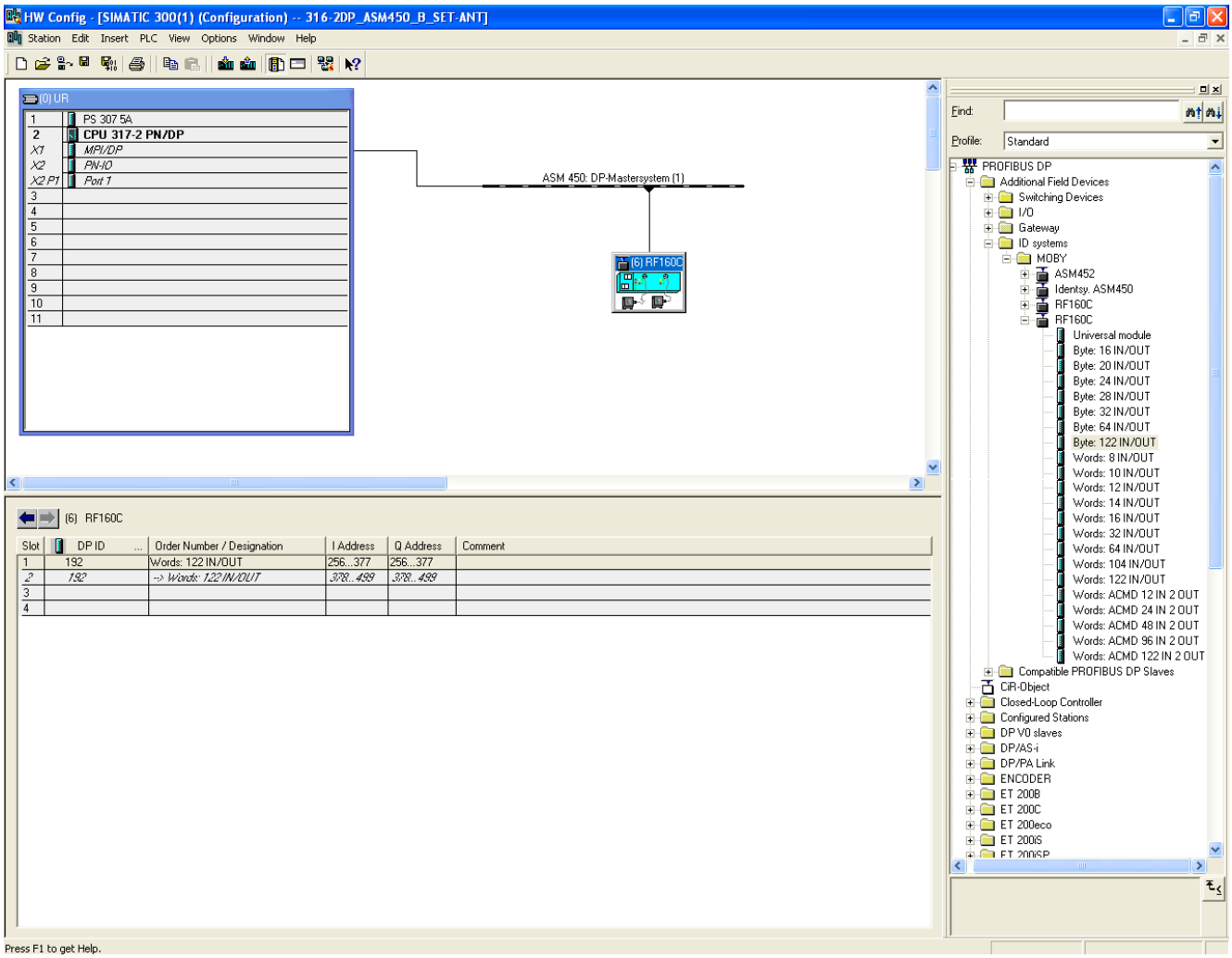
The GSD file is located

- on the CD "RFID Systems Software & Documentation" in the directory "daten\PROFI_GSD\RF160C" or
- on the Internet at comdec page (http://www.siemens.de/comdec) > PROFIBUS GSD files.

Integrating the RF160C

A new project must be created with a PROFIBUS system via a management tool or an existing project must be opened with which the RF160C is to be integrated.

HW Config is used for configuration in SIMATIC Manager. There, the module from the catalog can be dragged and dropped to the desired position in the PROFIBUS system.



Observe the following settings and entries:

- **PROFIBUS address**

  The PROFIBUS address set must match the PROFIBUS address defined in the configuring software (for the RF160C). See chapter Connecting (Page 17).

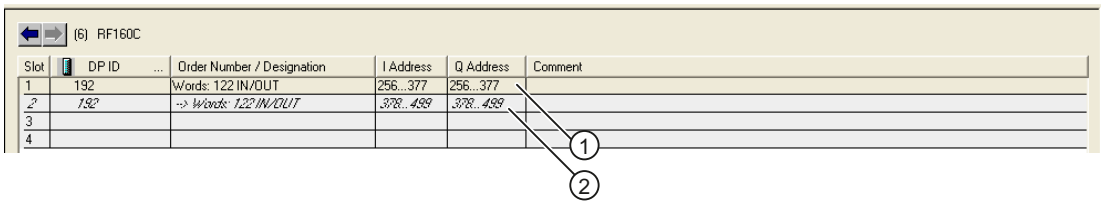
- **Address range data exchange**:

  Using the catalog, a predefined module can be dragged to the slots of the RF160C or defined manually via the universal module. The size of the selected data range depends on how large the application's maximum amounts of data to be transmitted are.

  The address is automatically assigned in the SIMATIC Manager, but it can also be changed manually.

  When using the FC 44, make sure that the input and output range are in the same address space.

  The address range is divided into two halves, where the half with the lower addresses is assigned to channel 1 and the area with the higher addresses to channel 2. The predefined modules are usually divided into two segments so that the address allocation for both channels is shown.



① Channel 1
② Channel 2

Figure 5-1 Division of address ranges

If the FC44 is used, each channel start address must be given in call parameter ADR.

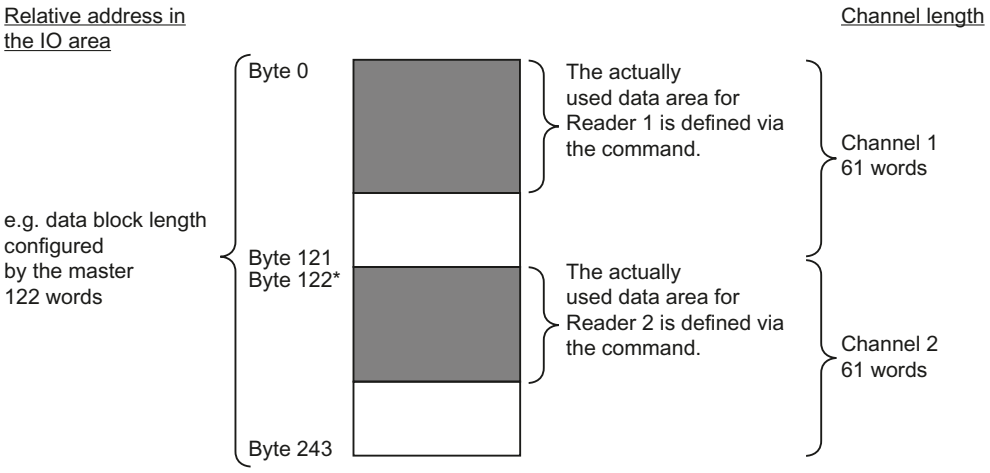
In the above example, the start address 256 is for channel 1 and 378 is for channel 2.

Note

The two address segments do not have to follow each other in an unbroken sequence in the address space, as long as each input and output range has the same start address, and each segment is consistent in itself, i.e it is always transferred undivided as a cohesive unit.

NOTICE
If the user data in a write command is parameterized to be larger than indicated in the table above, then the programmable controller enters the STOP condition with time-out, or the telegram data is sent to the wrong address.

Division of the I/O range between the two readers connected to the RF160C



* Start address for reader 2: This address must be entered correctly during configuration of the FC 44. See ADR in chapter Configuration scheme (Page 45).

Module selection in the GSD file	Relative address for channel 1	Relative address for channel 2	Maximum user data length per command in bytes
Byte 16 IN/OUT	0	8	2
Byte 20 IN/OUT	0	10	4
Byte 24 IN/OUT	0	12	6
Byte 28 IN/OUT.	0	14	8
Byte 32 IN/OUT	0	16	10
Byte 64 IN/OUT	0	32	26
Byte 122 IN/OUT	0	61	55
Word 8 IN/OUT	0	8	2
Word 10 IN/OUT	0	10	4
Word 12 IN/OUT	0	12	6
Word 14 IN/OUT	0	14	8
Word 16 IN/OUT	0	16	10
Word 32 IN/OUT	0	32	26
Word 64 IN/OUT	0	64	58
Word 104 IN/OUT	0	104	98
Word 122 IN/OUT	0	122	116

5.2 Parameter setting by means of GSD file

The additional parameters required for the MOBY D/U RF300/600 identification systems are set during configuration or via the GSD file.

The values are to be entered in decimal format in the GSD file via the SIMATIC Manager.

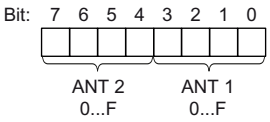
NOTICE
Configuration of 2 channels each The parameterization is divided into 2 channels, i.e. RP_1... and RP_2... or ACMD_1... and ACMD_2...

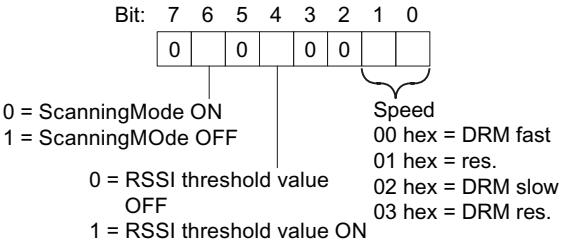
Table 5- 1 Setting of the RF160C-relevant parameters

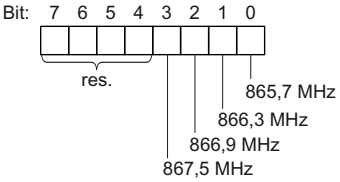
Parameter name	Value	Note
USER_Mode	FC44	Default
	FC44 compatibility	With later firmware version
	Automatic Command (ACMD)	With later firmware version
MOBY_Mode	MOBY U/D/RF300/600	Default
Baudrate Reader RF300/600 MOBY U/D	19,2 kBaud	
	57,6 kBaud	Not permitted with MOBY D with reader D11S/D12S
	115,2 kBaud (Default)	
Diagnostic	None (default)	Standard diagnostics only
	Hardware fault	Hardware-related messages only
	Low-priority hardware/execution error	All messages
	High-priority hardware/execution error	All messages high-priority
Start up LED suppression	None	Default
	Channel 1	Suppression of startup flashing on channel 1 if no reader is connected there.
	Channel 2	Suppression of startup flashing on channel 2 if no reader is connected there.
DP-cycle delay	0 - 10 (00 - 0A hex)	Default = 0

Table 5- 2 Setting of the parameters for reader 1 and reader 2

Parameter name*	Value	Note
RP_1 MDS_control RP_2 MDS_control	Off	
	On (default)	Presence check via firmware
RP_1 ECC_mode RP_2 ECC_mode	Off (default)	With later firmware version
	On	
RP_1 scanning_time RP_2 scanning_time	**Moby U**: 0 (00 hex) = no standby mode 1…200 (01...C8 hex) = 7 ms ... 1400 ms standby time	Default 0
	Moby D, RF300: 0 (00 hex) → not used	
	RF600: Countries list according to EPC Global 0 (00 hex) = no country selected 1 (01 hex) = autodetect 2 (02 hex) = ETSI new (EN 302 208 V1.2.1) 3 (03 hex) = ETSI old (EN 302 208 V1.1.2) 4 (04 hex) = FCC: USA, Canada 6 (06 hex) = China 7 (07 hex) = Thailand	Also see RF620R/RF630R Parameterization Manual
RP_1 option_1 RP_2 option_1	**RF300:** 0 (00 hex) = Do not reset Err LED on reader 2 (02 hex) = Reset Err LED on reader **RF600, MOBY D, U:** 0 (00 hex) (not used)	Default 2

<table>
<tr><th>Parameter name*</th><th colspan="2">Value</th><th>Note</th></tr>
<tr><td rowspan="6">RP_1 distance_limiting
RP_2 distance_limiting</td><td colspan="2">Moby U:</td><td>Default 15</td></tr>
<tr><td>Normal transmit power[1)]</td><td>Reduced transmit power[2)]</td><td></td></tr>
<tr><td>5 (05 hex) = 0,5 m
10 (0A hex) = 1,0 m
15 (0F hex) = 1,5 m
20 (14 hex) = 2,0 m
25 (19 hex) = 2,5 m
30 (1E hex) = 3,0 m
35 (23 hex)= 3,5 m</td><td>133 (85 hex)
138 (8A hex)
143 (8F hex)
145 (91 hex)
153 (99 hex)
158 (9E hex)
163 (A3 hex)</td><td></td></tr>
<tr><td colspan="3">[1)] Intermediate values in steps of 0.1 m are possible (02, 03, ..., 23 hex)
[2)] Reduced transmit power must be set when several readers are positioned close together or when data memories which are located in the vicinity of a reader are detected later or not at all. Disadvantage: The field lobe becomes smaller and there is less time for communication or positioning must be more precise.</td></tr>
<tr><td colspan="2">Moby D:
HF power from 0.5 W to 10 W in increments of 0.25 W
2 (02 hex) = 0,5 W
:
16 (10 hex) = 4 W (default)
:
40 (28 hex) = 10 W</td><td>Only effective with SLG D10S; a power of 1 W (04 hex) is set for SLG D11S / D12S and cannot be changed.</td></tr>
<tr><td colspan="2">RF300: 0 (00 hex) → not used</td><td></td></tr>
<tr><td colspan="2">RF600: Adjustable transmit power
RF630R: 00...FF
First hex value: Transmit power ANT1,
second hex value: Transmit power ANT2.
0 (00 hex) ≙ 18 dBm (65 mW)
1 (01 hex) ≙ 19 dBm (80 mW)
:
9 (09 hex) ≙ 27 dBm
10...15 (A...F hex) ≙ 27 dBm (500 mW)
RF620R (ETSI): 00...0F
First hex value: Radiant power ANT1,
second hex value: 0
0 (00 hex) ≙ 18 dBm (65 mW) ERP
1 (01 hex) ≙ 19 dBm (80 mW) ERP
:
9 (09 hex) ≙ 27 dBm ERP
10...15 (A...F hex) ≙ 27 dBm (500 mW) ERP
RF620R (FCC) / RF620R (CHINA): 00...0F
First hex value: Radiant power ANT1,
second hex value: 0
0 (00 hex) ≙ 20 dBm (105 mW) EIRP
1 (01 hex) ≙ 21 dBm (130 mW) EIRP
:
9 (09 hex) ≙ 29 dBm ERP (795 mW) EIRP
10...15 (A...F hex) ≙ 29 dBm (795 mW) EIRP</td><td> 
Also see RF620R/RF630R Parameterization Manual
When setting the transmit power, see the notes in the Parameterization Manual, chapter "Parameterization of the commands" (page 39) if only one antenna is connected to the RF630R.</td></tr>
</table>

Parameter name*	Value		Note
RP_1 multitag RP_2 multitag	**MOBY U/D bzw. RF300/600:** Maximum number of transponders that can be processed simultaneously in the field. 1 (01 hex) (default)		Permissible value: 1
RP_2 field_ON_control RP_1 field_ON_control	**Moby U**: 0 (00 hex) = 1 (01 hex) = 2 (02 hex) = 3 (03 hex) =	BERO mode; automatic switching the antenna field on/off. without BEROs; no SLG synchronization field_ON_time_ switches the field off 1st BERO switches the field on; 2nd BERO switches the field off SLG synchronization activated via cable connection	Default 0 see manual for configuring, mounting, and service for MOBY U
	Moby D, RF300: 0 (00 hex) → not used		
	RF600: Modulation scheme  		Default 0 Also see RF620R/RF630R Parameterization Manual
RP_1 field_ON_time RP_2 field_ON_time	**Moby U**: 0 (00 hex) = without BERO (time monitoring switched off) 1…255 (01...FF hex) = 1...255 s ON time for the SLG field		Default 0
	Moby D: MDS type Binary value: 0 ... 255 **=** MDS type 0 (00 hex) = I-Code 1 (e.g. MDS D139) 1 (01 hex) = ISO transponder 2 (02 hex) = I-Code 1 and ISO transponder 3 (03 hex) = ISO-my-D (only for SLG D10S)		Default 0 For the SLG D11S/D12S, the value 01 hex is parameterized for the ISO-my-D.
	RF300: 0 (00 hex) = RF300 Mode (no ISO) 1 (01 hex) = multi-vendor tag 3 (03 hex) = ISO-my-d (InfineonSRF 55V10P)) 4 (04 hex) = ISO (Fujitsu MB89R118) 5 (05 hex) = ISO I-Code SLI (NXP SL2 ICS20) 6 (06 hex) = ISO Tag-it HFI (Texas Instruments) 7 (07 hex) = ISO ST LRI2K)		Default 0

Parameter name*	Value	Note
	RF600: setting of channels 4-channel chart 00..FF **SIMATIC RF620R/RF630R (ETSI**): 6GT2811-5BA00-0AA0, 6GT2811-4AA00-0AA0):  0x00 preset channels of the reader are used in four-channel mode in accordance with ETSI EN 302 208 V1.2.1. In the event that ETSI new (scanning_time = 01 or 02) is used, the channels with the following frequencies can be selected via the bits 0-3 of the byte field_ON_time: • 865,7 MHz • 866,3 MHz • 866,9 MHz • 867,5 MHz This enables a channel (frequency) schedule to be generated for a situation in which several readers are operated in close proximity (in Dense Reader Mode). Readers that use different channels will interfere with each other to a lesser extent. If only one channel is used per reader, the reader must pause for 100 ms at intervals of 4 seconds (ETSI EN 302 208 V1.2.1). The air interface is served asynchronously by the reader, so this interval cannot be triggered. With time-critical applications, a smaller loss in performance can therefore be assumed in contrast to 2 to 4-channel mode of a reader. **RF620R**: If 2 to 4 channels per reader are used, the reader switches to another channel after 4 seconds in single-antenna mode. An interval of 100 ms is not necessary in these cases. **RF630R**: If 2 to 4 channels per reader are used, the reader switches to another channel after 1 second in two-antenna mode and after 4 seconds in single-antenna mode. An interval of 100 ms is not necessary in these cases. **SIMATIC RF620R/RF630R (FCC**): 6GT2811-5BA00-1AA0, 6GT2811-4AA00-1AA0: 0 (00 hex) **SIMATIC RF620R/RF630R (CHINA**): 6GT2811-5BA00-2AA0, 6GT2811-4AA00-2AA0: 0 (00 hex)	Default 0 Also see RF620R/RF630R Parameterization Manual

The parameterization is divided into 2 channels, i.e. RP_1... and RP_2...

The following parameters are used for parameterizing the command to be repeated in process image mode. These settings must only be considered if the parameter USER_Mode was set to "automatic command (ACMD)".

Table 5- 3 Settings of the process image mode parameters

Parameter name*	Value	Note
ACMD_1 read trigger ACMD_2 read trigger	Off (default)	With later firmware version
	On	
ACMD_1 length ACMD_2 length	0 (00 hex); Default 0	With later firmware version
ACMD_1 command ACMD_2 command	0 (00 hex); Default 0	With later firmware version
ACMD_1 param 1 ACMD_2 param 1	0 (00 hex); Default 0	With later firmware version
ACMD_1 param 2 ACMD_2 param 2	0 (00 hex); Default 0	With later firmware version
ACMD_1 param 3 ACMD_2 param 3	0 (00 hex); Default 0	With later firmware version
ACMD_1 param 4 ACMD_2 param 4	0 (00 hex); Default 0	With later firmware version
ACMD_1 param 5 ACMD_2 param 5	0 (00 hex); Default 0	With later firmware version

* The parameterization is divided into 2 channels, i.e. ACMD _1... and ACMD _2

5.3 Description of the FC 44

5.3.1 General

The FC 44 function is available for SIMATIC S7.

The programming interface is described in the Appendix for "non-SIMATIC" users.

5.3.2 Block specification

The FC 44 can be operated in all S7-CPUs with an integrated PROFIBUS DP master.

5.3.2.1 Technical data

Table 5- 4 General technical data

Block number	FC44
Block name	FC44
Symbolic name	MOBY 450
Family	S7_MOBY
Block length: approx.	2800 Byte
Called blocks	None
Assignment of data blocks	BEDB . 17 data words
Bit memories used	None
Counters used	None
Registers used	AR1, AR2
Call	cyclic

Table 5- 5 Cycle load per FC operation (examples)

	S7-CPU	MLFB of the CPU	Idle run	Read bytes	Write bytes
FC 44	315-2 DP	6ES7315-2AG10-0AB0	0,16	0,5 +n.0,028	0,5 +n.0,028
	416-2 DP	6ES7416-2FK04-0AB0	0,01	0,5 +n.0,0003	0,5 +n.0,0003

n: Amount of processed user data per read or write command in bytes

Comment:

The times of the RF160C for data exchange with the data memories are described in the catalog.

NOTICE
If the FC 44 is used in a CPU 414-2 DP , the block Moby 450 Version ≥ 2.1 must be used.

5.3.2.2 Communication between RF160C and FC 44

The RF160C is a MOBY slave module for operating on the PROFIBUS DP/DP-V0.

Communication between the S7/PROFIBUS and the RF160C is implemented by reading and writing correspondingly parameterized address ranges (input and output ranges) of the RF160C. The start address and size of the input/output ranges are determined by parameterization (also see chapter Application examples (Page 64)).

The software interface is implemented through command and acknowledgment telegrams. These telegrams are controlled by means of handshake signals and transferred between the RF160C and the S7 via PROFIBUS DP.

The command to the RF160C or the acknowledgement from the RF160C consists of a header and the corresponding user data. The command or acknowledgement header of the read/write commands is 6 bytes long.

The relationship between parameterization and user data is explained in chapter Processing data memories (Page 56).

Calculation of data throughput

The data throughput calculation is important if long data sequences must be exchanged with the transponder (e.g. reading 1000 bytes) An incorrect configuration of the PROFIBUS can significantly increase reader transfer times. Data throughput is primarily determined by:

- PLC cycle time (user program)
- PROFIBUS cycle time
- Reader transmission time (see MOBY configuration manuals on the CD "RFID Systems, Software & Documentation")

Note

Data throughput calculation program

An Excel-based data throughput calculation program is available on the "RFID Systems, Software & Documentation" CD. This allows data throughput to be determined in advance during configuration.

5.3.2.3 Configuration scheme

Table 5- 6 Configuration scheme (from V2.0 of the FC 44)

LAD box	Parameter	Data type	Permissible values/characters	Description
ADR	ADR	INT	≥ 256 [1]	Start address of the input and output ranges of the RF160C
BEDB	BEDB	INT	≥ 1	Work data
MOBY	MOBY	INT	0	reserved [2]
ANW	ANW	INT	0	reserved [2]
ABTA	ABTA	BYTE	00	reserved [2]
OPT	OPT	BYTE	00	reserved [2]
OPT2	OPT2	WORD	W#16#0000	reserved (enter the value 2 or 3 for the CPU 414-2 DP)

[1] Depending on the CPU; the value must be outside the process image.

[2] These parameters are parameterized in HWCONFIG via the GSD file and are no longer used here.

ADR

Parameterized start address of the input/output ranges of a channel on the RF160C slave station in the SIMATIC S7 I/O area. This parameterization must agree with the PROFIBUS configuration.

NOTICE

- The start address of the input/output ranges must be even-numbered.
- The start addresses of the input ranges and output ranges are identical. The input and output ranges are set with ADR.

BEDB

Command data block for FC 44-internal use (see also chapter BEDB command data block (Page 46))

A BEDB must be set up by the user for each RF160C slave station.

Length is at least 17 words (DBW 0 to DBW 32), from DBW 34 free for the user, e.g. for DATDB with the user data.

5.3.3 BEDB command data block

5.3.3.1 General description of the BEDB

To function, the FC 44 requires a BEDB command data block for each channel. All control information is stored in the BEDB, such as the pointer to the data field (DATDB/DATDW), error messages, and status bits. The BEDB is always updated on cycle changeover.

The minimum length of 17 data words (DBW 0 to DBW 32) must be complied with.

5.3.3.2 Structure of the BEDB

The BEDB is structured as shown below:

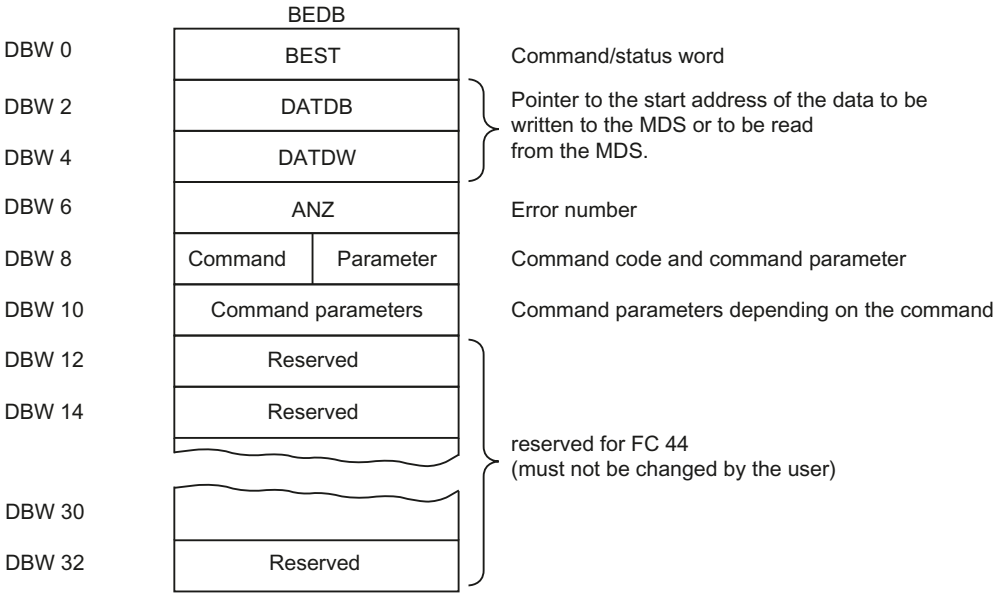


Figure 5-2 Structure of the BEDB

Note

The minimum length of the BEDB is 17 data words or 34 data bytes (DBW 0 to DBW 32).

In the BEDB the data words DBW 0 to DBW 8 are available to the user. Writing, reading, or parameterization of these data words can cause individual commands to be sent to the RF160C or user messages to be displayed.

Further information

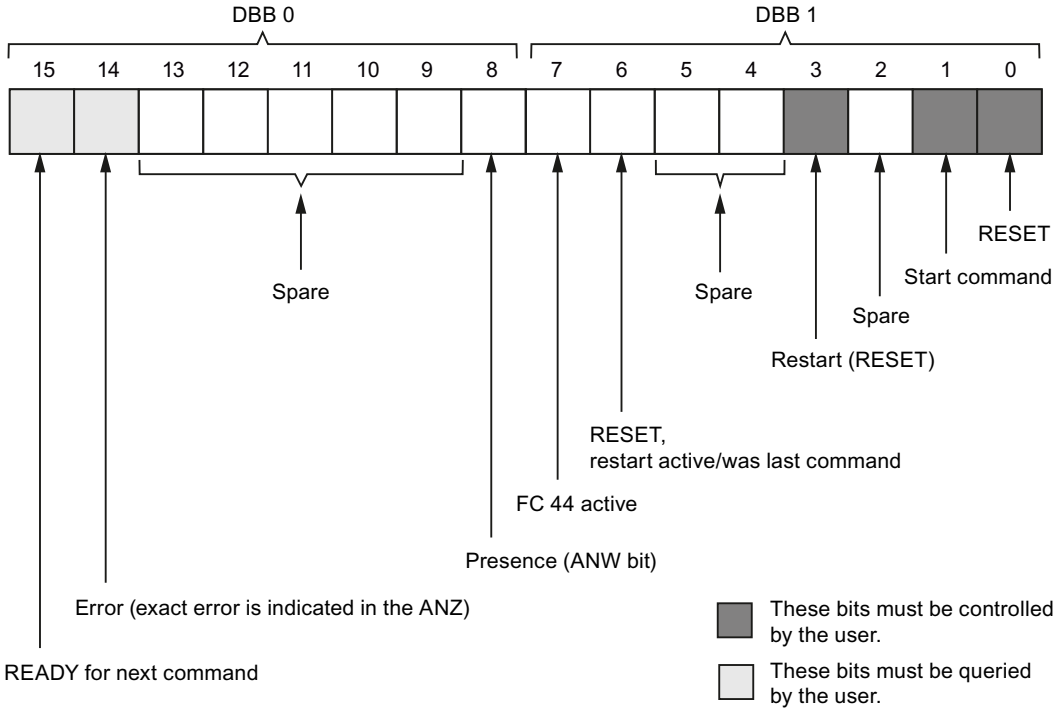
Detailed information on BEDB setup can be found in the following subsections:

- Command and status word "BEST" (Page 47)
- DATDB/DATDW data field indicator (Page 50)
- Error display word "ANZ" (Page 51)
- Table of possible commands (Page 52)
- Parameterization of the commands (Page 52)

5.3.3.3 Command and status word "BEST"

DBW 0 = BEST

BEST is always valid and can be polled by the user at any time.



Comment:

The BEST parameter should be preconfigured with W#16#0008 in the restart branch in each OB (see catalog).

- OB 100 for restart
- OB 101 for hot restart

Table 5- 7 Permitted modification of control bits in the BEST

BEST bit:	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Set:	F	F	F	F	F	F	F	F	F	F	F	F	A	F	A	F/A
Reset:	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
Queries:	F/A	F/A	0	0	0	0	0	A	A	A	0	0	F/A	0	F/A	F/A

Legend: A = user, F = FC, 0 = always 0

BIT 0: RESET

Resetting a read or write command. After first commissioning and after each change to the parameters ADR, BEDB, MOBY, ANW, ABTA, OPT and OPT2 , a RESET must be initiated so that the parameter test and the command setup can be performed again in BEDB.

BIT 1: Start command

Start signal for the FC 44. Execution of the parameterized command. After the command execution begins, the bit is reset by the FC.

BIT 2: Spare

BIT 3: Restart

User setting after restart and restoration of power. Function as RESET; the bit is, however, polled during command processing.

BIT 4 and 5: Spare

BIT 6: RESET, restart active/was last command

This bit is set after a RESET or restart command is started. It shows that one of these commands is active or was last executed.

BIT 7: FC 44 active

The is active for command execution. If BIT 7 is set, BIT 15 is reset.

BIT 8: Presence (ANW bit)

This bit is only set if MDS_control is set on the RF160C (see also chapter Parameterizing (Page 33))

0 = No transponder in the field of the reader

1 = Transponder is presently in the reader field

BIT 9 to BIT 13: Spare

BIT 14: Error

The FC 44 sets this bit if a command is terminated abnormally. The exact cause of the error is given in the data word "ANZ" (= DBW 6). The error bit is reset when a new command is started.

BIT 15: READY

- The last command is ended.
- The user can start a new command.

Note

To start a RESET command, the READY BIT does not need to be set.

5.3.3.4 DATDB/DATDW data field indicator

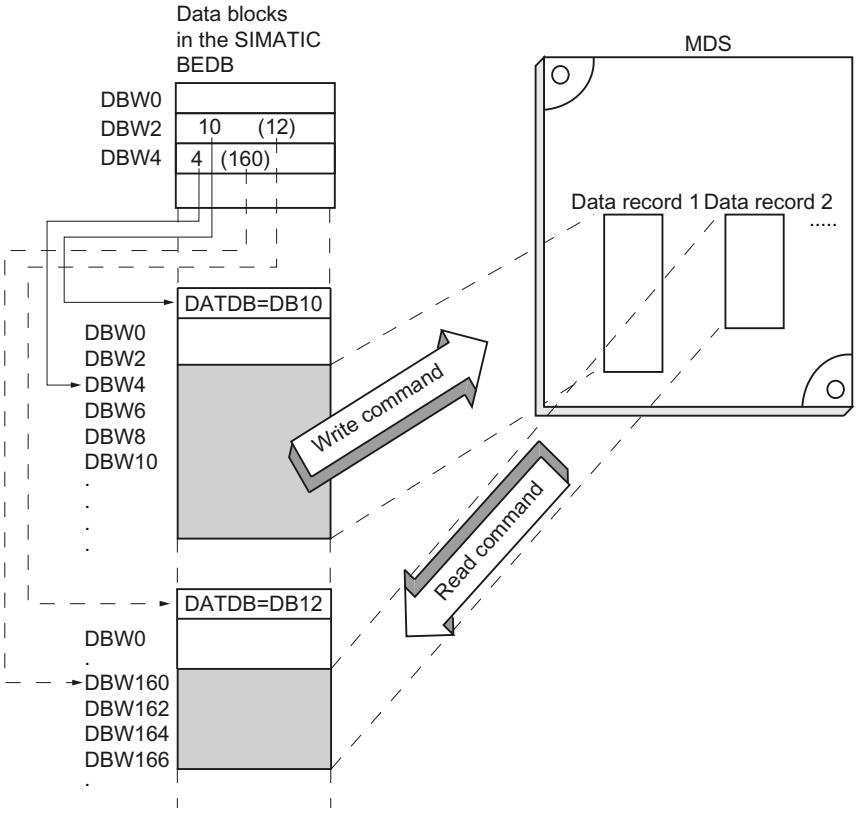
The entire command set of the FC 44 can in principle be divided into "reading" and "writing" commands. If a reading command is started, the incoming read data must be stored in a data block (DATDB). On a reading command, the data to be written on the transponder must also be taken from a data block. Consequently, when starting a command, the user must specify a DATDB (generate in the AS before that) to which the relevant user data are to be transferred. The start address of the data in the DATDB is set by the DATDW.

Note

DATDB can also be BEDB if DATDW > DBW 34. On starting a read or write command, a DATDB/DATDW must be specified in DBW 2 of the BEDB.

The following example should help to explain the situation:

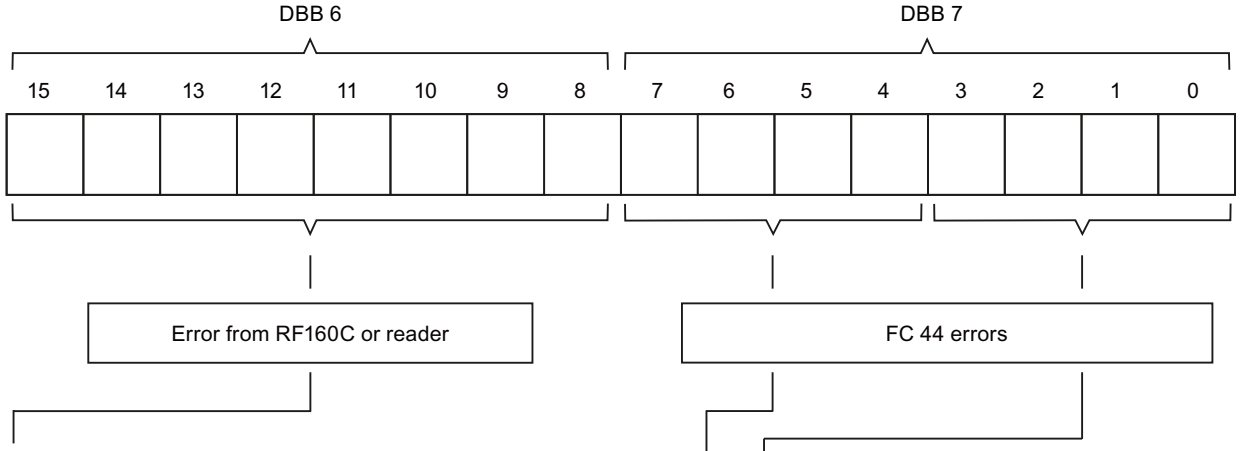
The data to be written on the transponder should be taken from data block DB 10 beginning with data word DBW 4. The data to be read from the transponder should be stored in the data block DB 12 beginning with the "address" DBW 160. The values for DATDB and DATDW must each be entered in the data field indicator DBW 2 of the BEDB before FC 44 commands are started.



5.3.3.5 Error display word "ANZ"

DBW 6 = ANZ

ANZ is always valid if the READY bit or the READY and error bits are set in BEST. The error is displayed in hexadecimal form.



- 01 Presence error: MSS outside of field during active command
- 02 Presence error: MDS passed reader without command
- 03 Faulty connection to the reader or antenna not connected
- 04 Error in the MDS memory (not initialized)
- 05 RF160C cannot interpret the command
- 06 Field disturbance on reader
- 07 Too many transmit errors
- 08 CRC transmit error
- 09 INIT: CRC error
- 0A INIT: MDS cannot be initialized
- 0B INIT: Timeout during initialization
- 0C INIT: Write error during initialization
- 0D Address error
- 11 Short circuit
- 12 RF160C-internal communication error
- 13 Buffer overflow
- 14 RF160C-internal error
- 15 Wrong parameterization of the RF160C
- 16 RF160C parameterization is not in line with this FC 44 command
- 17 Handshake error between RF160C and FC 44
- 18 Only RESET command permissible
- 19 Previous command is active
- 1A PROFIBUS DP fault
- 1C The antenna is switched off
- 1D Too many tags in the field
- 1E Error when processing the function FC 44
- 1F Running command was canceled by RESET

- 1 Wrong FC 44 parameter
- 2 Wrong command code or parameter
- 3 Only RESET command permissible
- 4 Synchronization error
- 5 Startup message of the RF160C or PROFIBUS DP fault
- 6 Command or acknowledgement code is not identical
- 7 Impermissible length of acknowledgment
- 8 Different user data lengths
- 9 Read user data length is too long

- 1 Any command permissible as next command
- 2 Only RESET permissible as next command

For ANZ, the following generally applies:

Set:	FB
Reset:	FB
Queries:	User

For a detailed error description, refer to chapter Evaluation of the error display ANZ (FC44) (Page 75)

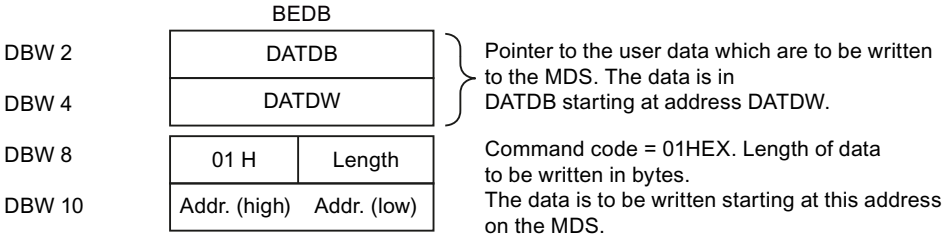
5.3.3.6 Table of possible commands

Command code (hexadecimal)	Description	Note
00	Reserved for RESET	Do not use command; set bit 0 and bit 3 in BEST
01	Write data to transponder	Communication with the data memory takes place.
02	Read data from transponder	
03	Initialization (INIT) of the transponder	
07	Poll status of the RF160C	No communication with the data memory takes place.
0A	Antenna on/off: This command can be used to switch the antenna field on the reader off and on again.	
–	RESET. Is started by setting bit 0 in BEST.	
–	Restart: No command code exists; is initiated by setting bit 3 in BEST.	

5.3.3.7 Parameterization of the commands

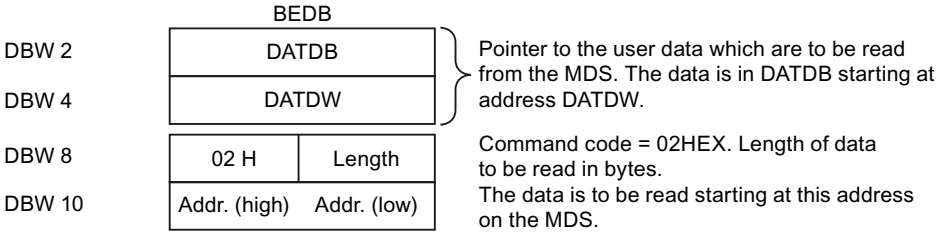
To run the commands, the command parameters (DBW 6 and DBW 8) must first be set accordingly in the BEDB. Parameterization and initiating the commands is only allowed if the "READY" bit (bit 15 in BEST) is set.

Write



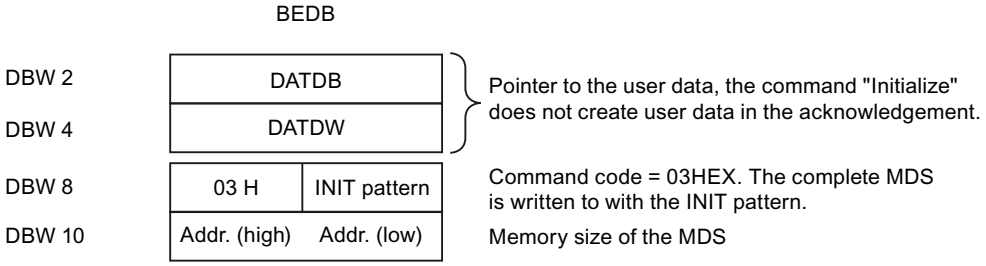
After starting the command, the "READY" bit (bit 15 in BEST) is set. The user data range of the user (DATDB) is not changed.

Read



After starting the command, the "READY" bit (bit 15 in BEST) is set. The read data is in the DATDB from "address" DATDW.

Initialize (INIT)



After starting the command, the "READY" bit (bit 15 in BEST) is set. The user data range of the user (DATDB) is not changed.

Initialize transponder

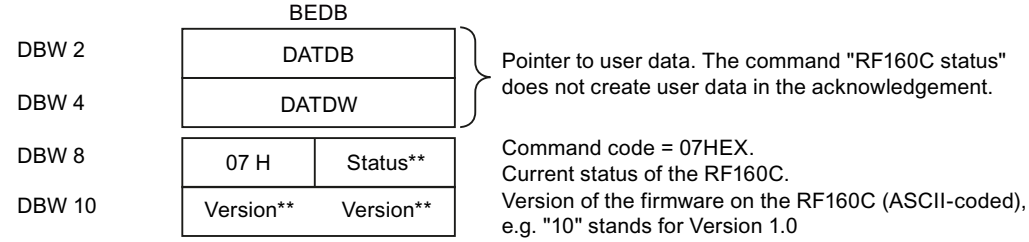
Command [hex]	sub_command [hex]	length [dec]	address_MDS [hex]	DAT_DB [dec]	Comment
03	00 to FF Hexadecimal value that is written to the transponder	–	Memory size of transponder to be initialized	–	

Tag type			Memory size	Init duration normal
2 KByte	MOBY U:	RAM*	**08 00**	Approx. 1 s
32 KByte	MOBY U:	RAM*	**80 00**	Approx. 1.5 s
44 Byte	MOBY D:	I-Code 1	**00 2C**	Approx. 0.4 s
112 Byte	MOBY D:	ISO I-Code SLI	**00 70**	Approx. 0.5 s
256 Byte	MOBY D:	ISO Tag-it HF-I ISO	**01 00**	Approx. 1 s
992 Byte	MOBY D:	my-d	**03 E0**	Approx. 3 s
2000 Byte	MOBY D	FRAM	**07 0D**	Approx. 3 s
20 Byte	RF300:	EEPROM	**00 14**	Approx. 0.2 s
8 KByte	RF300:	FRAM*	**20 00**	0.3 s
32 KByte	RF300:	FRAM*	**80 00**	1.2 s
64 KByte	RF300:	FRAM *	**FF 00**	2.4 s

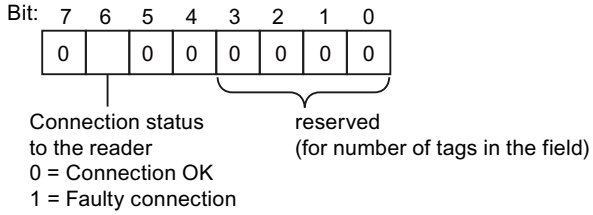
*) The OTP memory is not initialized with this command.

If the memory cannot be initiated, an error message is output.

RF160C status



Status:

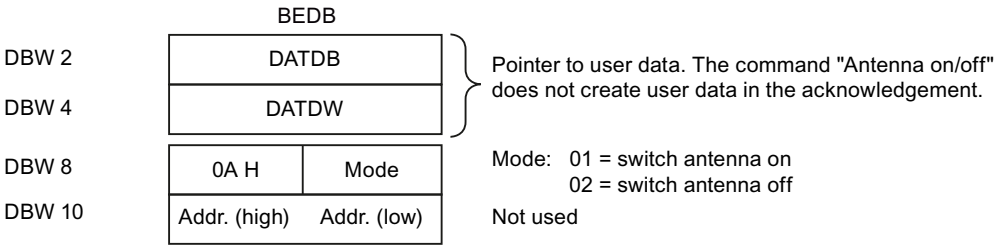


* The ANW bit is also available in DBW 0, so that the status command for the ANW information is not absolutely essential.

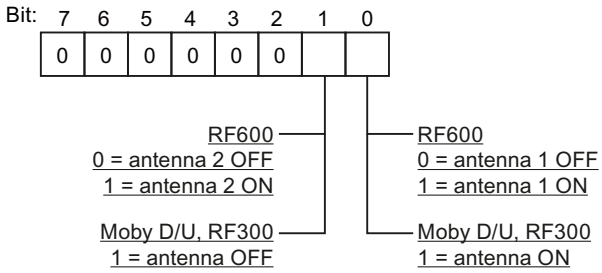
** These bytes do not need to be preassigned when the command starts.

After starting the command, the "READY" bit (bit 15 in BEST) is set. The user data range of the user (DATDB) is not changed. The status of the ASM is indicated in DBW 6 and DBW 8.

Antenna on/off



Mode:



RESET

Resets a read or write command.
After initial startup, after relevant error messages (see chapter 4.2.3), or after any change in the parameters ADR or BEDB, a RESET should be initiated to ensure that the parameter test and the command structure are re-executed in the BEDB and the connection between the FC 44 and RF160C is reinitialized and synchronized.

The RESET command is started by setting bit 0 in BEST (DBW 0). After starting the command, the "READY" bit (bit 15 in BEST) is set. The user data range of the user (DATDB) is not changed.

Restart

User setting after restart and restoration of power. Function as RESET; the bit is, however, polled during command processing.

The restart command is triggered by setting bit 3 in BEST (DBW 0). After starting the command, the "READY" bit (bit 15 in BEST) is set. The user data range of the user (DATDB) is not changed.

5.3.3.8 Starting the commands

There are two basic start options for commands:

- Starting a command directly (only "RESET" possible)
  Start "RESET" command by setting bit 0 in BEST
- Start a parameterized command via the "Start" bit (bit 1 in BEST)
  All other commands via setting bit 1 in BEST (the commands are parameterized as per chapter Parameterization of the commands (Page 52) and started with the "Start" bit)

5.3.4 Processing data memories

Data memory types

Mobile data memories with different storage capacities are available. The memory capacities available at present are given in the following subsections for the individual tag variants.

Addressing

The data memories are addressed linearly from address 0000 (or the specified start address) to the end address. The communication module or reader automatically recognizes the size of the memory on the transponder. If the end address on the transponder is exceeded, an error message is indicated in ANZ.

The tables in the following chapters show the address space of the individual transponder versions. The variables addr. (high), addr. (low) and length must be parameterized according to this address space.

5.3.4.1 Address space of the data memory versions for MOBY D

Data memory types

Table 5- 8 Available memory capacities

Memory capacity	Memory type	RFID family	Tag type
44 bytes	EEPROM	MOBY D	e.g. MDS D139/ I-Code 1
112 bytes	EEPROM	MOBY D 1)	I-Code SLI
256 bytes	EEPROM	MOBY D 1)	Tag-it HF-I/MDS D2xx
992 bytes	EEPROM	MOBY D 1)	MDS D3xx
2000 bytes	FRAM	MOBY D 1)	MDS D4xx (available soon)

1) Also for operation with RF300 readers that support ISO mode.

Address space of the MDS versions for MOBY D

System	Addressing	16-bit hexadecimal number	Integer number
MOBY D	**MDS D139 (I-Code 1; 44 Byte)**		
	Start address End address	0000 002B	+0 +43
	ID No.: (fixed-coded; can only be read as a whole)		
	Start address Length	FFF0 0008	-16 +8
	ISO-MDS (I-Code SLI; 112 Byte) [1]		
	Start address End address	0000 006F	+0 +111
	ID No.: (fixed-coded; can only be read as a whole)		
	Start address Length	FFF0 0008	-16 +8
	ISO-MDS (Tag-it HF-I; 256 Byte) [1]		
	Start address End address	0000 00FF	+0 +255
	ID No.: (fixed-coded; can only be read as a whole)		
	Start address Length	FFF0 0008	-16 +8
	ISO-MDS (my-d SRF55V10P; 992 Byte) [1]		
	Start address End address	0000 03DF	+0 +991
	ID No.: (fixed-coded; can only be read as a whole)		
	Start address Length	FFF0 0008	-16 +8
	ISO-MDS (MB 89R118B, 2000 Byte) [1]		
	Start address End address	0000 07CF	+0 +1999
	ID No.: (fixed-coded; can only be read as a whole)		
	Start address Length	FFF0 0008	-16 +8

[1] Also for operation with RF300 readers that support ISO mode.

5.3.4.2 Address space of the data memory versions for MOBY U

Data memory types

Table 5- 9 Available memory capacities

Memory capacity	Memory type	MOBY family	MDS type
2 KB	RAM, 16 bytes OTP	MOBY U	e.g. MDS U313
32 KB	RAM, 16 bytes OTP	MOBY U	e.g. MDS U524

Address space of the MDS versions for MOBY U

System	Addressing	16-bit hexadecimal number	Integer number
MOBY U	**2 KB data memory**		
	Start address End address	0000 07FF	+0 +2047
	Read OTP memory (write access only possible once. The OTP memory of MOBY U can only be processed completely, i.e. the start address must always be specified with value FFF0 hex and the length with value 10 hex.)		
	Start address Length	FFF0 10	-16 +16
	ID No.: (4 fixed-coded bytes; can only be read with the MDS status command)		
	32 KB data memory		
	Start address End address	0000 7FFF	+0 +32767
	Read OTP memory (write access only possible once)*		
	Start address Length	FFF0 10	-16 +16
	ID No.: (4 fixed-coded bytes; can only be read with the MDS status command)		

5.3.4.3 Address space of the data memory versions for RF300

Data memory types

Table 5- 10 Available memory capacities

Memory capacity	Memory type	MOBY family	Tag type
20 Byte	EEPROM	RF300	RF320T
8 KByte	FRAM	RF300	e.g. RF340T
32 KByte	FRAM	RF300	e.g. RF350T
64 KByte	FRAM	RF300	e.g. RF350T (64K)

Address space of the transponder versions for RF300

System	Addressing	16-bit hexadecimal number	Integer number
RF300	**20 bytes of data memory (EEPROM)**		
	R/W or OTP memory (EEPROM) (The EEPROM user memory for RF300 can be used either as R/W memory or as an OTP memory (see RF300 system manual))		
	Start address End address	FF00 FF13	-256 -237
	ID No.: (fixed-coded; can only be output as a whole)		
	Start address Length	FFF0 0008	-16 +8
	8 KB data memory (FRAM/EEPROM)		
	R/W or OTP memory (EEPROM) (The EEPROM user memory for RF300 can be used either as R/W memory or as an OTP memory (see RF300 system manual))		
	Start address End address	FF00 FF13	-256 -237
	R/W memory (FRAM)		
	Start address End address	0000 1FFC	+0 +8188
	ID no.: (fixed-coded, can only be read as a whole)		
	Start address Length	FFF0 0008	-16 +8
	32 KB data memory (FRAM/EEPROM)		
	R/W or OTP memory (EEPROM) (The EEPROM user memory for RF300 can be used either as R/W memory or as an OTP memory (see RF300 system manual))		
	Start address End address	FF00 FF13	-256 -237
	R/W memory (FRAM)		
	Start address End address	0000 7FFC	+0 +32764
	ID No.: (fixed-coded; can only be output as a whole)		

System	Addressing	16-bit hexadecimal number	Integer number
	Start address Length	FFF0 0008	-16 +8
	64 KB data memory (FRAM/EEPROM)		
	R/W or OTP memory (EEPROM) (The EEPROM user memory for RF300 can be used either as R/W memory or as an OTP memory (see RF300 system manual))		
	Start address End address	FF00 FF13	-256 -237
	R/W memory (FRAM)		
	Start address End address	0000 FEFC	+0 –
	ID No.: (fixed-coded; can only be output as a whole)		
	Start address Length	FFF0 0008	-16 +8

RF300: General notes on the OTP memory

RF300 tags and ISO tags have a memory area that can be protected against overwriting. This memory area is called OTP. Five block addresses are available for activating the OTP function:

- FF80, FF84, FF88, FF8C and FF90

A write command to this block address with a valid length (4, 8, 12, 16, 20 depending on the block address) protects the written data from subsequent overwriting.

NOTICE

OTP writing/locking should only be used in static operation.

NOTICE

Use of the OTP area is not reversible.

If you use the OPT area, you cannot undo it, because the OPT area can only be written to once.

RF300: Address mapping of OTP memory on the RF300 transponder

R/W EEPROM memory and OTP memory is only available once on the transponder.

The following table shows the mapping of addresses on the transponder.

Data can be read via the R/W address or the OTP address.

R/W EEPROM		Write RF300 OTP once	
Address	Length	Address	Length
FF00	1 .. 20	FF80	4,8,12,16,20
FF01	1 .. 19		
FF02	1 .. 18		
FF03	1 .. 17		
FF04	1 .. 16	FF84	4,8,12,16
FF05	1 .. 15		
FF06	1 .. 14		
FF07	1 .. 13		
FF08	1 .. 12	FF88	4,8,12
FF09	1 .. 11		
FF0A	1 .. 10		
FF0B	1 .. 9		
FF0C	1 .. 8	FF8C	4,8
FF0D	1 .. 7		
FF0E	1 .. 6		
FF0F	1 .. 5		
FF10	1 .. 4	FF90	4
FF11	1 .. 3		
FF12	1 .. 2		
FF13	1		

NOTICE

Write access to addresses starting at FF80 to FF93 activates the write protection (OTP function) on the EEPROM user memory. This operation is not reversible. Switching on write protection must always take place in ascending order without gaps, starting at address FF80.

RF300: Address mapping of OTP memory on the ISO transponders

For the OTP area, a 16-byte address space is always reserved at the end of the memory area. The subdivision of the blocks depends on the chip type. The corresponding addresses for the user data are therefore not available to the application when the OTP area is used.

The last 16 bytes of the tag address always contains the OTP data:

R/W EEPROM			Write ISO (MOBY D) OTP once (all tag types)		
Tag type	Address	Length	Address	Length	Length MB89
ISO I-Code SLI (NXP SL2 ICS20)	001B	1 .. 16	FF80	4,8,12,16	8,10
ISO Tag-it HFI (Texas Instruments)	005F	1 .. 16	FF84	4,8,12	-
ISO my-d (Infineon SRF 55V10P)	03CF	1 .. 16	FF88	4,8	8
ISO (Fujitsu MB89R118)	07BF	1 .. 16	FF8C	4	-

NOTICE

Write access to addresses starting at FF80 to FF8F activates the write protection (OTP function) on the EEPROM user memory. This operation is not reversible.

5.3.4.4 Address space of the data memory versions for RF600

Data memory types and address space of the data memory versions for RF600

Tags	User [hex]	EPC		TID	RESERVED (passwords)	Special	
		Range	Access			KILL-PW	Lock function
RF630L	-	FF00-FF0B	read/ write	FFC0-FFC3	FF80-FF87	Yes	Yes
RF620T	-	FF00-FF0B	read/ write	FFC0-FFC3	FF80-FF87	Blocked	Yes
RF630T	00 - 3F	FF00-FF0B (240 bit = FF00-FF1D)	read/ write	FFC0-FFC7	FF80-FF87	Blocked	Yes
RF640T Gen 2	00 - 3F	FF00-FF0B (240 bit = FF00-FF1D)	read/ write	FFC0-FFC7	FF80-FF87	Blocked	Yes
RF680T	00 - 3F	FF00-FF0B (240 bit = FF00-FF1D)	read/ write	FFC0-FFC7	FF80-FF87	Blocked	Yes

Special information on the data memory types of the RF600 system and on addressing can be found in the section "Examples/Applications" of the "Configuration Manual RF620R/RF630R".

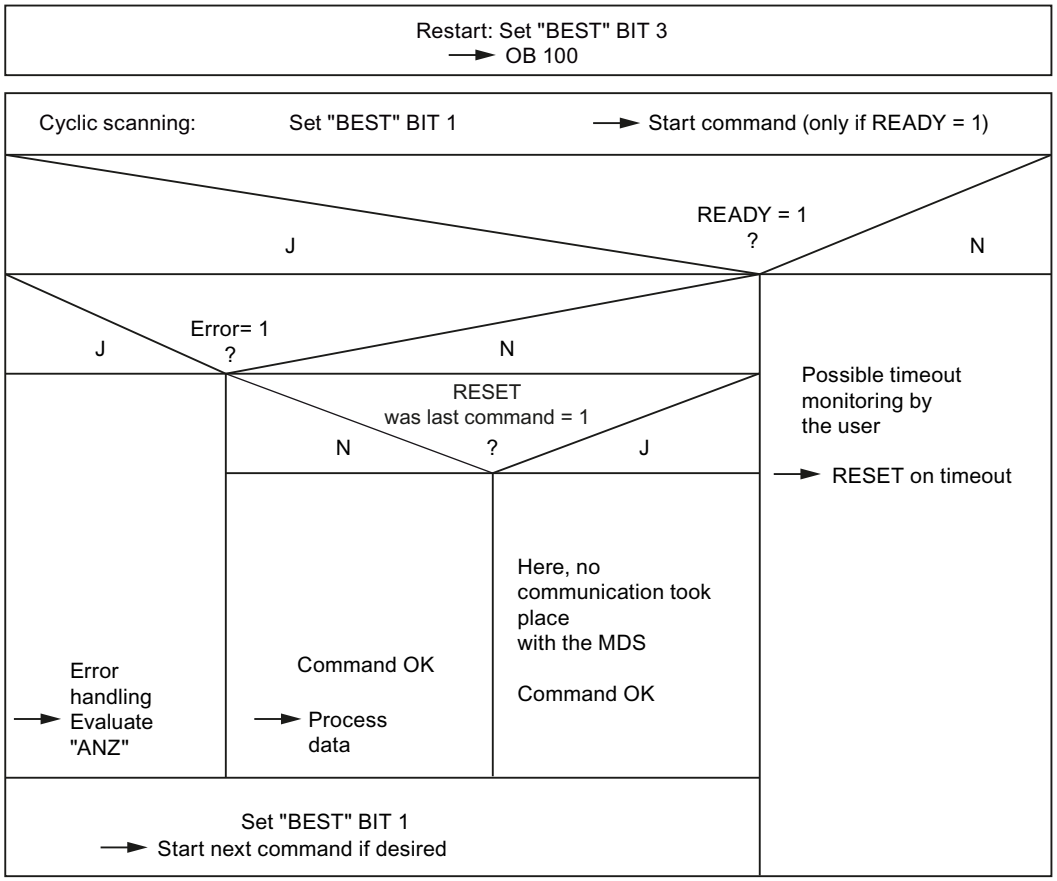
You will especially find information on handling passwords and the lock functions

5.3.5 Application examples

5.3.5.1 Structogram: FC 44 scanning by user

Comment:

No presence check was parameterized for RF160C (MDS_control = 0).



5.3.5.2 Initialization of data memories

The complete data memory is written to with the INIT pattern (see command "Initialize")

Requirement:

- A new data memory that has never been written to is used

The error "Error in the RAM of the data memory" (04HEX) is deleted. Initialization occurs by starting the initialization command.
In operation, the initialization command is not needed.

5.3.5.3 Parameterization examples

EXAMPLE 1:

Cyclic call of the FC44 and execution of write commands on channel 1 as long as M0.0 has not been set.

```
CALL  FC    44
       ADR :=256                //(Address 256 --> Channel 1)
       BEDB:=100                //DB100 command data block
       MOBY:=0
       ANW :=0
       ABTA:=B#16#0
       OPT :=B#16#0
       OPT2:=W#16#0

      UN    DB100.DBX    0.7    //Ready?
      BEB

      U     DB100.DBX    0.6    //Scanning for errors
      BEB

      U     M      0.0
      BEB

      L     W#16#A             //DATDB = 10
      T     DB100.DBW    2
      L     W#16#0             //DATDW = 0
      T     DB100.DBW    4
      L     W#16#114           //Write command 1 of 20 (=14HEX) bytes
      T     DB100.DBW    8
      L     W#16#0             //From address 0HEX on the tag
      T     DB100.DBW   10

      UN    M   0.0
      FP    M   0.1
      S     DB100.DBX   1.1    //Start command

      BE
```

EXAMPLE 2:

Channel 2 when choosing the module "122 Word IN/OUT" in the hardware configuration, because this causes channel 2 to begin exactly 122 bytes above channel 1. In this example, read commands are executed as long as M0.0 has not been set.

```
CALL  FC    44
       ADR :=378                  //(Address 256+122 bytes --> Channel 2)
       BEDB:=101                  //DB101 command data block
       MOBY:=0
       ANW :=0
       ABTA:=B#16#0
       OPT :=B#16#0
       OPT2:=W#16#0

      UN    DB101.DBX    0.7      //Ready?
      BEB

      U     DB101.DBX    0.6      //Scanning for errors
      BEB

      U     M      0.0
      BEB

      L     W#16#B                //DATDB = 11
      T     DB101.DBW    2
      L     W#16#0                //DATDW = 0
      T     DB101.DBW    4
      L     W#16#214              //Read command 2 of 20 (=14HEX) bytes
      T     DB101.DBW    8
      L     W#16#0                //From address 0HEX on the tag
      T     DB101.DBW   10

      UN    M   0.0
      FP    M   0.1
      S     DB101.DBX    1.1      //Start command

      BE
```

5.3.6 Commissioning instructions for RF160C with FC 44

Hardware parameterization via the GSD file.

- Load the GSD file in the hardware catalog of SIMATIC Manager
- Configuration of the RF160C through selection in the HW catalog
- Select the module to set the parameters

Load the FC 44

- Load the project with FC 44 to the automation system

Pre-assignment of the organization blocks

- Preassign the parameter "BEST" in the OB for restart as follows:
  - for hot restart 0008HEX:
  - for restart 0008HEX

Note

If several readers in a control are operated, the BEDB "Best" must be preassigned for each reader.

Setting up BEDB and data block DATDB

- A different BEDB must be set up for every channel of an RF160C.
- Set up data block DATDB if DATDB is not equal to BEDB.

Call FC 44 in the user program

- Always call FC 44 absolutely (CALL FC 44)
- The parameters "ADR", "BEDB", "MOBY", "ANW", "ABTA" , "OPT" and "OPT2" must be specified (see chapter Parameterizing (Page 33))

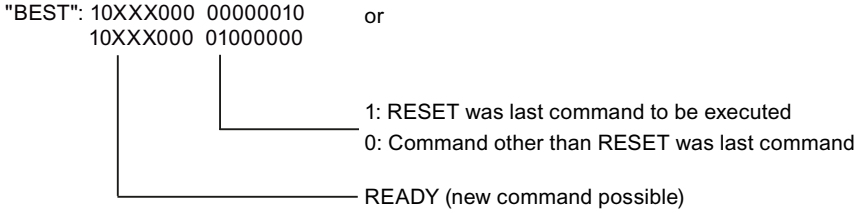
Program processing

- Call user program e.g. in OB1 (cyclical call)

Functional check

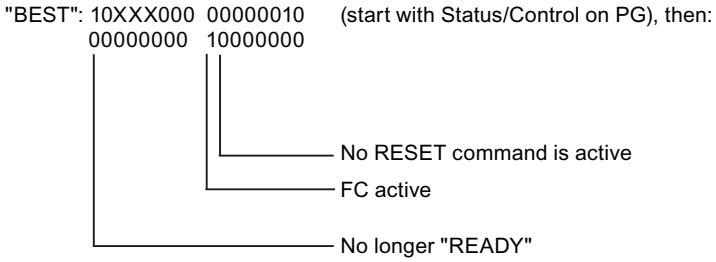
With the PG, an RF160C function control can be executed via the "Status/Control" function. The parameter "BEST" (= DBW 0 in the BEDB) is shown on the screen.

Program is processing, no command is processed



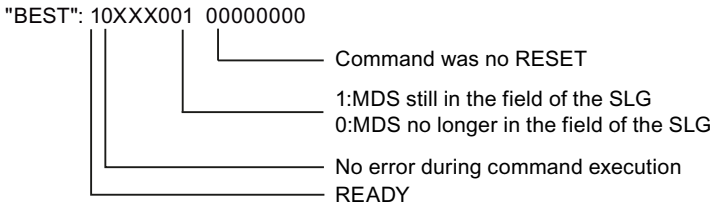
If the state of the two parameters differs from that shown above, a RESET command should be initiated. If the content of both parameters is now still different from that shown above, work should continue with a fault description as in chapter Evaluation of the error display ANZ (FC44) (Page 75)".

Command is given



The state of the two parameters lasts until a tag enters the reader's operating range and the command was processed correctly with the tag.

Command executed



The values of "BEST" and "ANZ" have the same states for reading and writing.

After the command is executed, "BEST" returns to the basic setting.
If an error is detected and one of the parameters differs from the image shown, work should continue with a fault description as in chapter "Evaluation of the error display ANZ (FC44) (Page 75)".

Diagnostics

6

6.1 Diagnosis using LEDs

The following figure shows details of the LEDs of the RF160C.

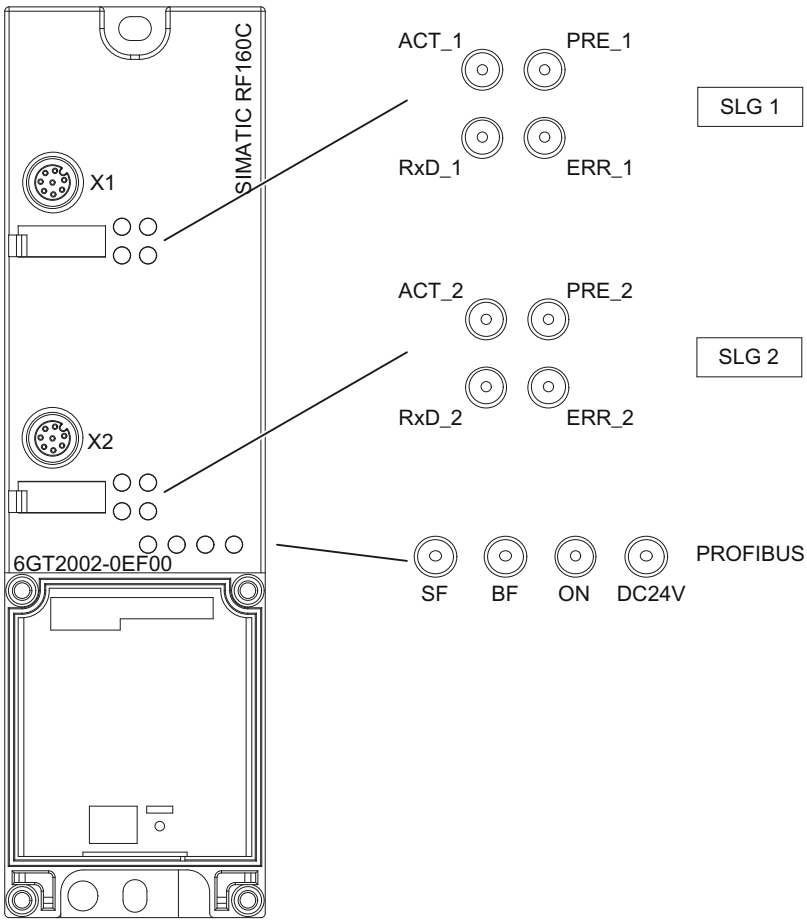


Figure 6-1 LEDs of the RF160C

Meaning of LEDs for RF160C

ERR:

Errors are indicated with a flashing LED. It is always the last error state recognized that is shown. The error display is overwritten by a new error. It is only possible to reset the error display through a hardware reset or, if parameterized accordingly, an FC 44 reset.

Note

The flashing of the ERR-LED in normal operation is of secondary importance to the user, as long as the system continues to function without error. The programmer can evaluate some errors in his program and respond to them.
The error LED is especially helpful for commissioning and servicing.
Errors are shown in detail for each channel by the ERR-LED .

RxD:

Rapid, irregular flashing indicates ongoing dialog with the reader or transponder. If presence control is switched on, this LED is constantly lit.

PRE:

The LED has only one function when the user has parameterized a type of presence control. The LED indicates the presence of a transponder in the field of the reader.

OFF =	No data storage is present or transponder control is switched off.
ON =	An MDS is currently within the operating range of the reader.

Table 6- 1 Status LEDs for the RF160C

LED	Meaning*
ON	Lights up when there is logic voltage at the ASM (is generated by the 24 V supply voltage.)
DC 24 V	Lights up when the 24 V supply voltage is connected to the ASM.
ACT_1, ACT_2	No significance for RF300/600, MobyD/U
ERR_1, ERR_2 1)	A flashing pattern indicates the last error to occur.
PRE_1, PRE_2 2)	Indicates the presence of an MDS.
RxD_1, RxD_2	Indicates live communication with the reader. May also indicate malfunctions on the reader.

1) The meaning of the individual flashing patterns and associated fault descriptions is described in the relevant FB and FC documentation.

2) In the case of multitag operation, this LED uses a flashing interval to indicate the number of data carriers currently within the range of the reader.

Table 6- 2 LED display for PROFIBUS diagnosis

BF	SF	Cause of error	Error handling
On	–	• ASM is in start-up mode.	–
		• Connection to DP Master failed. • ASM not detecting a baud rate	• Check the PROFIBUS DP connection. • Check the DP Master
		• Bus interrupt • DP Master not functioning	• Check all cables on your PROFIBUS DP network. • Check whether the connector plugs for the PROFIBUS DP are securely plugged into the ASM.
Flashing	On	• The project data sent to the ASM by the DP Master do not match the configuration of the ASM.	• Check the project for the ASM (input/output, PROFIBUS address). • Correct GSD file being used?
Flashing	–	• ASM has detected the baud rate, but is not activated by the DP Master. • ASM has not been assigned project plans.	• Check the PROFIBUS address set in ASM and/or in the project software. • Check the project for the ASM (station type).
On	Flashing	• There is a hardware defect in the ASM.	• Replace the ASM.
Off	On	• Diagnosis available	• Evaluate the diagnostic information.
On	Off	• The set PROFIBUS address is incorrect or greater than 99.	• Set the address in the range 1 to 99 and carry out new run-up.

– = Status not relevant

The following ASM states are also indicated with the LEDs PRE, ERR, ACT, SF und ON :

ON	SF	PRE_1	ERR_1	ACT_1	PRE_2	ERR_2	ACT_2	Description
On	Off	Off	Off	On	Off	Off	Off	Ramp-up active
Off	On	Off	On	Off	Off	Off	Off	Checksum error at ramp-up
Off	On	Off	Off	Off	Off	On	Off	Firmware invalid
On	On	On	On	On	On	On	On	LED test for approximately 4 seconds; otherwise firmware fault
Off	On	Off	On	On	Off	On	On	Checksum error at ramp-up
Off	On	On	On	On	Off	On	On	Checksum error of the firmware
Off	On	On	On	On	On	On	On	External RAM defective
Off	On	On	Off	On	On	On	On	DPC-RAM defective
Off	On	Off	On	On	On	On	On	ID error firmware
On	–	Off	1 x flash every 3 s	Off	Off	1 x flash every 3 s	Off	ASM successfully ramped up, waiting for reset command
–	–	–	n x flashes every 3 s	–	–	m x flashes every 3 s	–	The last reported fault in the channel can be seen from the number of flashes (n, m).
On	–	–	Flashing	Rapid flashing	–	Flashing	Rapid flashing	Firmware update; alternate flashing of the error LEDs at approximately 1 Hz

– = not relevant

Error displays

Errors are indicated by the ERR-LED.

Hardware fault on the RF160C:

After a hardware fault, the RF160C cannot be addressed. The fault is not sent via the bus. The RF160C must be replaced.

Flashing pattern:

All other errors are indicated by an easily recognizable flashing pattern. They can be read by counting the number of pulses between two long pulse pauses. The number of pulses agrees with the last RF160C error message sent.

See also chapter Error messages of the RF160C or connected readers. Left byte from ANZ (DBB6 in BEDB) (Page 76).

6.2 Parameterization of the diagnostics

In addition to the PROFIBUS standard diagnostics, the RF160C offers user-specific diagnostics data structured in the form of device-related diagnostics.

Along with error messages that are also communicated with command processing, diagnostics data contain cross-application information such as the start of a firmware update.

The diagnostics data can be read out as follows:

- As a plaintext display on S7 interfaces.
- Storage of the diagnostics data with the help of SFC 13 in the data area of an application.
- Evaluation with FB 125 or FC 125.

Parameterization methods (see chapter "Parameterization via GSD file"):

1. None

   No other diagnostics data are reported, apart from standard diagnostics.

2. Hard Errors

   Extended diagnostics messages are generated in the case of the following events.

   – Hardware fault (memory test)
   – Firmware fault (checksum)
   – Break in write/read device connection
   – Short-circuit/break, if supported by hardware
   – Firmware update (message at start/end)

   In the case of this diagnostics information, the Ext_Diag bit is set, that is, it is treated as high-priority diagnostics information in the PLC (SF-LED is ON)

3. Hard/Soft Errors Low Prior

   In contrast to 2., faults occurring during command processing are also reported here. The diagnostics information is treated like status information, and the Ext_Diag bit is not set.

4. Hard/Soft Errors High Prior

   As under 3. but the Ext_Diag bit is set.

With the diagnostics messages, a distinction is made between incoming and outgoing diagnostics.

Incoming diagnosis
An event occurs and triggers a diagnostics message. The Ext_Diag bit is set, depending on parameterization.

Outgoing diagnosis
The event is no longer pending and a diagnostics message is output without a set Ext_Diag bit.
In the case of events that are only pending for a moment, cancellation is delayed by 3 seconds.

The hard errors are supported by text messages stored in the GSD file.

6.3 Structure of the diagnostics frame

When using device-relate diagnostics, it can be evaluated using the table below.

The diagnostics frame consists of 6 bytes of standard diagnostics and 18 bytes of diagnostics extension.

For the RF160C, the diagnostics extension is designed as a status PDU for device-related diagnostics. The structure complies with the PROFIBUS Profile Guideline (PROFIBUS Proxy Guideline, Identification Systems Proxy Ident Function Block) for Identification Systems with MOBY-specific additional information.

Byte	Name	Contents	
PROFIBUS Profile Guideline for Identification Systems			
6	sign_len	Bit 7..6	00b: Identifier for device-related diagnostics
		Bit 5..0	010010b (18d): Length of the extension including header
7	status_type	Bit 7	1b: Identifier for status (0 = alarm)
		Bit 6..0	1d: Type for status message
8	slot_number	Bit 7..0	0d: Device in total
9	specifier	Bit 7..2	Reserved
		Bit 1..0	00b: No further differentiation 10b: Status inactive (outgoing) 01b: Staus active (incoming) 11b: Reserved
10	channel_num	Bit 7..0	1d: relating to write/read device 1 2d: relating to write/read device 2
11	function_num	See Profile Guideline	
12	error_decode	See Profile Guideline	
13	error_code_1	See Profile Guideline	
14	error_code_2	See Profile Guideline	
MOBY-specific additional information			
15	moby_code_1	MOBY error code byte 1	
16	moby_code_2	MOBY error code byte 2	
17	moby_code_3	MOBY error code byte 3	
18	moby_code_4	MOBY error code byte 4	
19	meldecode	Error code for diagnostics messages (see GSD file)	
20	counter_high	Continuous event counter high-order byte	
21	counter_low	Continuous event counter low-order byte	
22	fw_version_high	Firmware version high-order byte	
23	fw_version_low	Firmware version low-order byte	

6.4 Evaluation of the error display ANZ (FC44)

6.4.1 FC 44 error messages: Right byte from ANZ (DBB7 in BEDB)

In the event of error messages on the FC 44, the ERR-LED of the RF160C does not flash. The content of the byte should be stated hexadecimally (HEX) and as a fixed-point number (DEC).

Table 6- 3 FC 44 error messages

ANZ (right byte)	Description
02HEX/02DEC	Impermissible command code or command parameter was entered. Data words in BEDB should be parameterized correctly according to the command description.
06HEX/06DEC	The command code and the received acknowledgement code are not equal. Input and output range of the RF160C are not sufficiently parameterized. Correctly parameterize the PROFIBUS master.
07HEX/07DEC	The acknowledgement received is too long. Input and output range of the RF160C are not sufficiently parameterized. Read error: The given length of the data to be read is too long. Correctly parameterize the PROFIBUS master.
08HEX/08DEC	The parameterized user data length in BEDB of the read/write command is not equal to the received user data length of the acknowledgement. Input and output range of the RF160C are not sufficiently parameterized. Correctly parameterize the PROFIBUS master.
09HEX/09DEC	The user data received is too long. Input and output range of the RF160C are not sufficiently parameterized. Read command: The given length of the data to be read is too long. Correctly parameterize the PROFIBUS master.
11HEX/17DEC	The formal operands of the FC 44 have been parameterized incorrectly or the parameterization of the PROFIBUS master is incorrect. Correctly parameterize the FC 44. Correctly parameterize the PROFIBUS master, checking parameter ADR in particular. Then initiate RESET command.
13HEX/19DEC	The FC 44 signals that only RESET is permissible as the next command. After an RF160C startup message, no RESET was executed No RESET was executed following an error message requiring RESET as the next command Initiate RESET command
14HEX/20DEC	Synchronization error between RF160C and FC 44. The handshake of the command and acknowledgement telegram is defective. There may be a contact problem or the power supply is unstable. Initiate RESET command.
15HEX/21DEC	The RF160C has performed a boot sequence or there is a PROFIBUS-DP bus error. Power supply of the RF160C is unstable. See RF160C error message 1AHEX in chapter Error messages of the RF160C or connected readers. Left byte from ANZ (DBB6 in BEDB) (Page 76). Then initiate RESET command.

6.4.2 Error messages of the RF160C or connected readers. Left byte from ANZ (DBB6 in BEDB)

The errors reported by ANZ can either be generated directly by the RF160C or they are supplied by a connected reader and repeated by the RF160C.

In the first instance, the ERR_LED of the RF160C indicates an error, while in the second instance the ERR_LED of the reader becomes active.

The content of the byte should be stated hexadecimally (HEX) and as a fixed-point number (DEC) (cf. chapter Configuration scheme (Page 45) and annex Commands (Page 100)).

Table 6- 4 Error messages of the RF160C or connected readers

ANZ (left byte)	Flashing of the ERR-LED*	Description
00HEX/00DEC	–	No error Default value if everything is ok.
	1 x	No error The RF160C has executed a start-up and is waiting for a RESET or restart command.
01HEX/01DEC	2 x	Presence error: The transponder has moved out of the transmission window of the reader. The command was executed only partially. Read command: No data is supplied. Write command: The transponder which has just left the field contains an incomplete data record. • Operating distance from reader to transponder is not being maintained. • Configuration error: The data record to be processed is too large (in dynamic mode)
02HEX/02DEC	2 x	Presence error: A transponder has passed by a reader without being processed by a command. • This error message is not reported immediately. Instead, the RF160C is waiting for the next command (read, write). This command is immediately replied to with this error. This means that a read or write command is not processed. The next command is executed normally by the RF160C again. A RESET command also resets this error state. • Bit 2 is set in parameter "option_1" and no tag is in the transmission window.
03HEX/03DEC	3 x	Error in the connection to the reader. The reader does not answer. • The cable between RF160C and reader is wired incorrectly or there is a cable break • Antenna fault: (cable is defective), cable is no longer connected • The 24 V supply voltage is not connected or is not on or has failed briefly. • Automatic fuse on the RF160C has blown • Hardware defect • Another reader is in the vicinity and is active. • Interference on reader or PROFIBUS line • Execute init_run after error correction

ANZ (left byte)	Flashing of the ERR-LED*	Description
04HEX/04DEC	4 x	Error in transponder memory The transponder has never been written to or has lost the contents of its memory due to a battery failure (this error cannot occur for a tag with 128-byte EEPROM). • Initialize tag • Replace tag
05HEX/05DEC	5 x	• Unknown command • Incorrect parameter • Function not allowed • Mode in SET-ANT command unknown The FC44 is sending an uninterpretable command to the RF160C. • The BEDB was overwritten by the user • The transponder has indicated an address error
06HEX/06DEC	6 x	Field disturbance on reader The reader is receiving interference pulses from the environment. • External interference field • The distance between two readers is too small and does not correspond to the configuration guidelines. • The connecting cable to the reader is defective or too long or does not comply with the specification.
07HEX/07DEC	7 x	• Too many transmit errors The transponder was not able to correctly receive the command or the write data from the RF160C even after several attempts. • The transponder is located exactly in the limit range of the transmission window. • Data transfer to the transponder is being affected by external interference. • No free ETSI transmit channel
08HEX/08DEC	8 x	CRC transmit error • The receiver monitor has detected at least one fault during transmission. – Cause same as error 06HEX. • The transponder signals CRC errors frequently. – The transponder is in the boundary area of the reader. – Hardware defect of the transponder and/or reader.
09HEX/09DEC	9x	Only during initialization: CRC error during acknowledgment receipt from transponder • Cause same as error 06HEX. Wrong communications standard selected in the init_run command (e.g. FCC in ETSI reader)
0AHEX/10DEC	10 x	Only during initialization: Transponder is unable to perform the initialization command. • Transponder is defective

ANZ (left byte)	Flashing of the ERR-LED*	Description
0BHEX/11DEC	11 x	Only during initialization: Timeout during initialization of the transponder • The transponder is positioned exactly on the boundary of the transmission window • The transponder is consuming too much power (defective) • For Moby U: Memory of the transponder cannot be read correctly Tag memory cannot be read correctly or cannot be written. The tag reports an error: • Other error (00000000B) 1) • Insufficient power (00001011B): Tag is in the limit range 1) • Non specific error (00001111B) 1)
0CHEX/12DEC	12 x	Memory of the transponder cannot be write-accessed • Transponder memory is defective • EEPROM transponder was written too frequently and has reached the end of its service life • Memory write-protected (Memory Locked: 000000100B) (The tag memory is PERMA-locked and cannot be overwritten or the reader password has to be reset)
0DHEX/13DEC	13 x	Address error The address area of the transponder is exceeded. • The start address in BEDB is invalid at command start. • The transponder type is incorrect. • The specified address does not exist on the tag • The command must be checked and corrected. • This is not the correct tag type. • Access attempted to non-existent or non-accessible memory areas (memory overrun: 00000011B)
0EHEX/14DEC	14 x	Password error • Incorrect tag password (the reader password must be set again so that is agrees with the password).
0FHEX/15DEC	1 x	Start-up message from ASM. The ASM was off and has not yet received an init_run command • Perform a reset
10HEX/16DEC	16 x	NEXT command not possible or not permitted
11HEX/17DEC	17 x	Short circuit or overload of the 24 V outputs (error code, presence) • The affected output is turned off. • All outputs are turned off when total overload occurs. • A reset can only be performed by turning the 24 V voltage off and on again. • Then trigger RESET command.
12HEX/18DEC	18 x	Internal error: Restart module • Hardware of the RF160C is defective – Send RF160C to repair center • Then trigger RESET command

ANZ (left byte)	Flashing of the ERR-LED*	Description
13HEX/19DEC	19 x	Buffer overrun: Perform a reset • ASM/reader does not have enough buffer to store the command intermediately. • Maximum allowable number of 150 commands in a command chain was ignored. If a command chain contains more than 150 commands, after the 150th command is called, it will be canceled and the above error message will be sent without processing the complete chain. Commands in the command chain that have already been executed can still be sent later after the error message "0x13" is sent.
14HEX/20DEC	20 x	RF160C-internal error. • Program execution error on the RF160C • Turn power supply to RF160C off and on again • Then trigger RESET command • Watchdog error on reader
15HEX/21DEC	--	Wrong parameterization of the RF160C • Check Hardware Config parameterization • Transmit power set too high • Parameter scanning_time = 0x00 was set (no standard selected).
16HEX/22DEC	22 x	Check Hardware Config parameterization. • Length of input/output range too short for the user data of the command • A command with a user data length > 240 bytes has been placed
17HEX/23DEC	23 x	Communication error between FC 44 and RF160C. Handshake error. • BEDB of the RF160C station is being overwritten by other parts of the program • Check parameterization of the RF160C • Check FC 44 command which causes this error • Then trigger RESET command
18HEX/24DEC	--	An error has occurred which must be acknowledged with a RESET. • Data exchange is temporarily interrupted on PROFIBUS • The RESET command is faulty • The RF160C and has not yet received a reset command
19HEX/25DEC	25 x	Previous command is active The user sent a new command to the RF160C although the last command was still active. • Active command can only be terminated with RESET. • Before a new command can be started the READY bit must be 1 (exception: RESET) • Two FC 44 calls were parameterized with the same "ADR" parameters • Two FC 44 calls are using the same BEDB • Then trigger RESET command
1AHEX/26DEC	--	PROFIBUS DP error occurred. • The PROFIBUS DP bus connection is interrupted – Wire break on the bus – Bus connector on RF160C unplugged • PROFIBUS DP master doesn't address the RF160C anymore

ANZ (left byte)	Flashing of the ERR-LED*	Description
1BHEX/27DEC	27 x	There is an inconsistency in the parameterization of the reader. Parameters were probably set in expert mode that the reader cannot use. • ETSI performance testing faulty
1CHEX/28DEC	28 x	The antenna of the reader is turned off. A transponder command to the ASM was started in this state. • Turn on the antenna with the command "antenna on/off." • The antenna is turned on (off) and has received an additional turn-on (turn-off) command. • Antenna is already switched off • Antenna is already switched on • Mode in SET-ANT command not recognized.
1DHEX/29DEC	--	More transponders are located in the transmission window than can be processed concurrently by the reader. • Only 1 transponder can be processed at a time with FB 45 • Transponder power supply in range limit: Due to short-term power shortage, a transponder loses its communications status (session), upon which the identical EPC-ID is sent a second time as soon as the power supply range limit is again exceeded. Increase the reader's radiated power and/or reduce the distance between antenna and transponder until this effect no longer occurs.
1EHEX/30DEC	30 x	Error when processing the function • The data in the BEDB are incorrect; execute RESET command • Parameterization error • RF160C hardware defective: The RF160C receives wrong data during a RESET • AB byte does not comply with the useful data length (cf. appendix Programming of the RF160C on PROFIBUS DP (Page 97)).
1FHEX/31DEC	--	Running command canceled by RESET • Communication with the transponder was aborted by RESET • This error can only be reported if there is a RESET command

1) ERR_LED of the RF160C or connected reader

Service and maintenance 7

7.1 Firmware update

The firmware of the RF160C can be updated via PROFIBUS. The update takes place via the SIMATIC Manager.

Requirements:

- The ASM is on PROFIBUS with functional DP communication (basic communication only, no application required).
- The PLC must be suitable for the download. Alternatively, the update can be performed directly via a PG using the C2 channel.
- The update is possible both with and without a running application.

In the case of a running application, both the update and command processing can be slower.

Procedure

For this purpose, the required update files (.upd) must be copied to a folder and the RF160C communication module must be selected in the Hardware Manager. The directory can be selected in the folder "PLC > Firmware update" and either the file "CPU_HD.upd" or "Header.upd" can be selected. Following this, it is possible to start the update with or without the option "Activate firmware after loading".

With the C2 channel, the firmware update can be found in the home window of SIMATIC Manager under "PLC > Show available nodes".

Then select the module that is displayed and select the file via "PLC > Update firmware".

Option "Activate firmware after loading":

- If this option is activated, a successful update is followed by a new ramp-up of the RF160C during which the new firmware is activated (active commands on the communication module are canceled).
- Otherwise, the RF160C remains in the previous status following the update. Activation of the new firmware takes place the next time the supply voltage is switched on/off.

If the ASM is in the download procedure, this is indicated by alternate flashing of ERR_1 and ERR_2 at approximately 1 Hz. With the appropriate parameterization, an update operation is also reported with diagnostics (see chapter Diagnostics (Page 69)).

Technical data

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Table 8- 1 Technical data

Interface to the user	
Serial interface to the user	PROFIBUS DP / DP-V0
Procedure after connection	EN 50170 Vol. 2 PROFIBUS M12 and 7/8" technology/ECOFAST
Transmission rate	9600 baud to 12 Mbaud (automatic detection)
Max. block length	Total of 122 words divided according to parameter; max. 61 words cyclically per channel
Serial interface to the reader/SLG	
Connector	2 x M12 coupler plugs, 8-pin
Max. cable length	1000 m, dependent on reader/SLG (2 m = standard length; for other standard cables and self-assembled cables, refer to chapter Connecting cable (Page 89))
Connectable readers/SLGs	2x readers/SLGs of the RFID families RF300/600, MOBY D/U
Software functions	
Programming	Via process image
SIMATIC S7	FC 44 (normal addressing without multitag)
Tag addressing	Direct access via addresses
Commands	Initialize tag, read data from tag, write data to tag, etc.
Identification & Maintenance	I&M0, I&M1, I&M2, I&M3
Supply voltage[2)]	
Rated value	DC 24 V
Permissible range	20 V to 30 V DC
Current consumption [1)]	max. 800 mA; typ. 80 mA (without reader)
Current drain via reader/reader outputs	max. 600 mA (for one or 2 readers)
Galvanic isolation	Yes
Ambient temperature	
During operation	0 to +55°C
Transport and storage	-40 to +70°C
Dimensions (W x H x D) in mm	
RF160C only	60 x 210 x 30
RF160C with ECOFAST connection block	60 x 210 x 60
Weight	Approx. 210 g

Degree of protection	IP67
MTBF (at 40 °C)	122 years
Approvals	cULus (File E116536)

1) The power supply must provide the current required (max. 800 mA) during brief power failures of ≤ 20 ms.

2) All supply and signal voltages must be safety extra low voltage (SELV/PELV according to EN 60950)
24 V DC supply: Safe (electrical) isolation of extra-low voltage (SELV / PELV acc. to EN 60950)

Dimension drawings

9

9.1 Dimension drawings for RF160C with fixing holes

The following figure shows the dimension drawing of an RF160C with bus connection block.

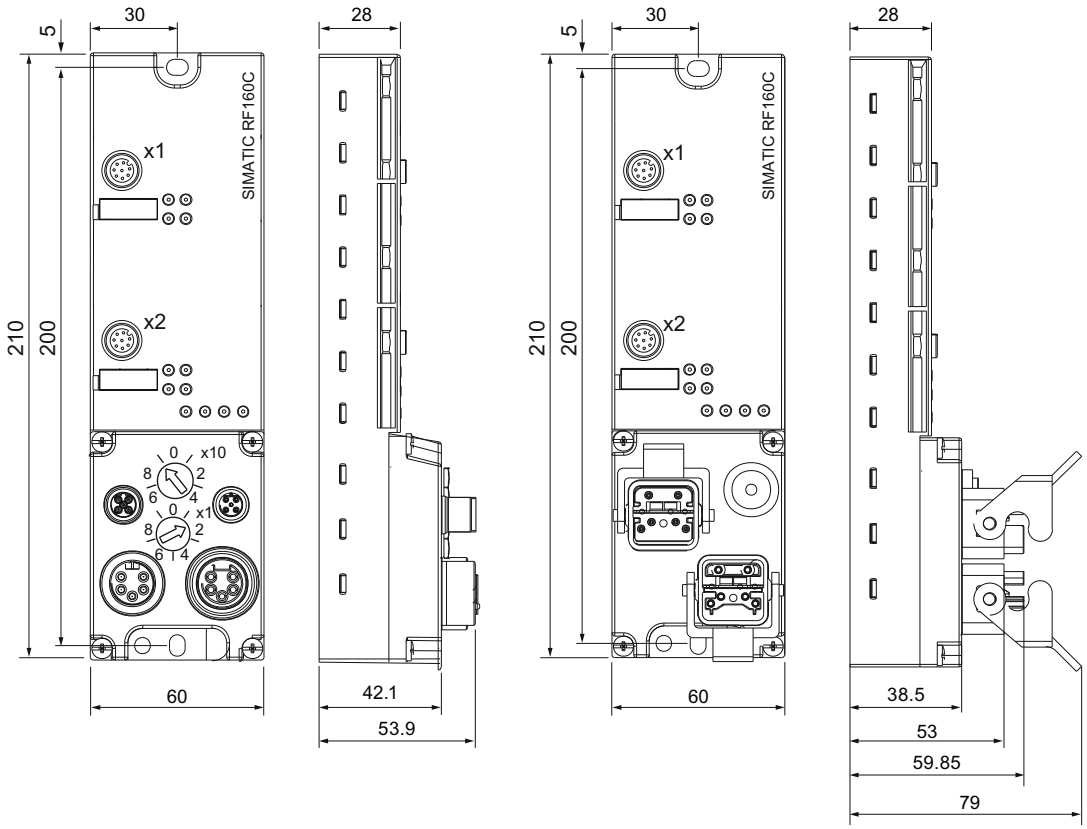

Figure 9-1 Dimension drawing of RF160C (in mm)

Connecting cable

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10.1 Routing of standard cables

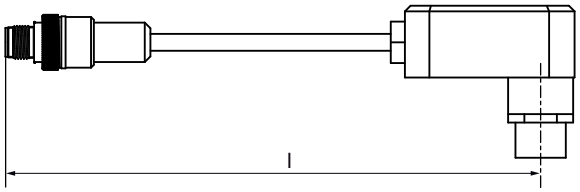


Figure 10-1 Connecting cable M12 ↔ Reader; l = 2 m, 5 m (MOBY U)

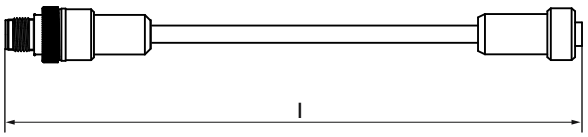


Figure 10-2 Connecting cable/extension cable M12 ↔ M12; l = 2 m, 5 m, 10 m, 20 m, 50 m

- Connecting cable RF300, RF600
- Extension cable for all MOBY systems

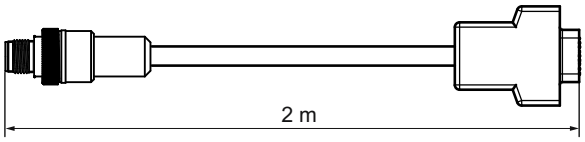


Figure 10-3 Connecting cable M12 ↔ Sub-D (MOBY D)

Maximum cable length

The RF160C can be operated with any reader configuration with a maximum cable length of 50 m.
Longer connecting cables of up to 1000 m are possible in some instances. The current consumption of the connected reader must however be taken into account. You will find information in the relevant system manuals.
Sequential arrangement of more than 2 sub-sections to form a long section of cable should be avoided due to the additional contact resistances.

Pin assignment

Table 10- 1 M12 connecting cable ↔ reader

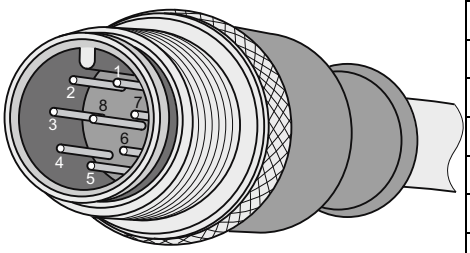
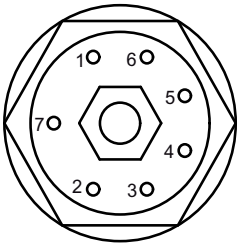
M12 connector (male)		Write/read device connector (female)
	1	2
	2	5
	3	3
	4	4
	5	6
	6	1
	7	–
	8	7
		

Table 10- 2 Connecting cable/extension cable M12 ↔ M12

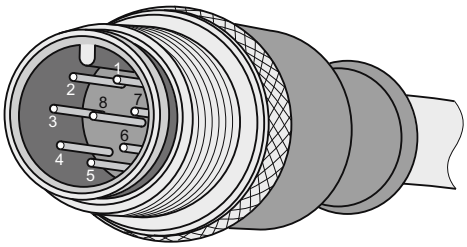
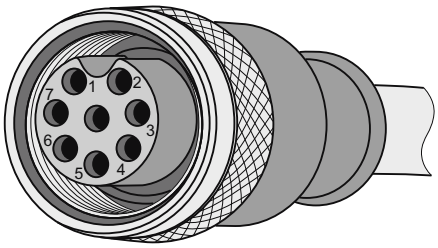
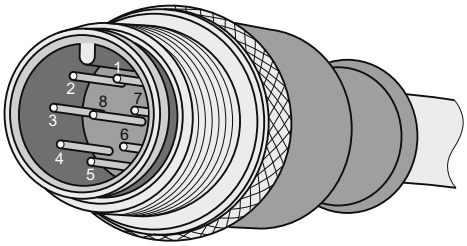
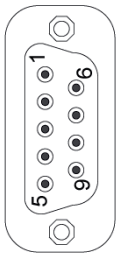
M12 connector (male)		M12 connector (female)
	1	1
	2	2
	3	3
	4	4
	5	5
	6	6
	7	7
	8	8
		

Table 10- 3 Connecting cable M12 ↔ sub-D 9-pin

M12 connector (male)		Sub-D connector (female)
	1	-
	2	5
	3	7
	4	3
	5	2
	6	6
	7	-
	8	1, 8
		

Note:
Reader with Sub-D connector must be supplied over an additional connector with 24 V DC.

10.2 Self-assembled cables

A reader connector plug with screw-on clamps is provided for users who want to individually pre-assemble their own cables (refer to the relevant system manual). Cables and reader cable connectors can be ordered from the RFID catalog.

The pin assignment is listed in the following table.

Cable structure

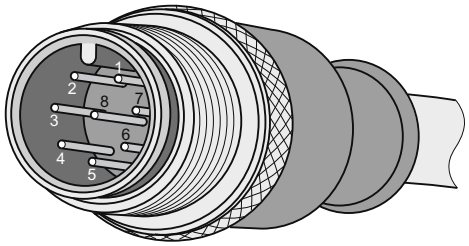
You will need cables of the following specifications for self-assembled cables:

7 x 0,25 mm^2
LiYC11Y 7 x 0,25

Connectors

M12 connectors can be obtained from the relevant specialist dealers (e.g. Binder).

Table 10- 4 Pin assignment

M12 connector (male)	Pin	Signal	Core color
	1	+24 V	Note data sheet provided by cable manufacturer
	2	−RxD	
	3	0 V	
	4	RxD	
	5	TxD	
	6	−TxD	
	7	Free	
	8	PE / Shield	

Ordering data

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Table 11- 1 Ordering data for RF160C

RF160C interface for PROFIBUS DP / DP-V0 max. 2 SLGs or readers can be connected		6GT2 002-0EF00
Accessories ECOFAST connection:		
Connection block ECOFAST		6ES7 194-3AA00-0AA0
PROFIBUS ECOFAST Hybrid plug 180		
• with pin insert (5 per pack) • with socket insert (5 per pack)		6GK1 905-0CA00 6GK1 905-0CB00
PROFIBUS ECOFAST termination plug with terminating resistor		6GK1 905-0DA10
ECOFAST hybrid cable (pre-assembled)		6XV1 830-7Bxxx *
ECOFAST hybrid cable (not pre-assembled, sold by the meter)		6XV1 830-7AH10
Accessories for M12 7/8" connection:		
Connection block M12		6ES7 194-3AA00-0BA0
M12 terminal resistor for PROFIBUS (5 per pack)		6GK1 905-0EC00
PROFIBUS cable with pre-assembled M12 connectors		6XV1 830-3Dxxx *
Cable for supply voltage with pre-assembled 7/8" connectors		6XV1 822-5Bxxx *
PROFIBUS FC standard non-pre-assembled cable; min. length 20 m, max. length 1000 m		6XV1 830-0EH10
Energy cable Trailing power cable, 5 x 1.5 mm^2; by the meter, length min. 20 m, length max. 1000 m		6XV1 830-8AH10
PROFIBUS M12 connector plug (5 per pack)		
• with pin insert • with socket insert		6GK1 905-0EA00 6GK1 905-0EB00
Connector plug 7/8" for voltage (5 per pack)		
• with pin insert • with socket insert		6GK1 905-0FA00 6GK1 905-0FB00
Covering caps 7/8" (10 items)		6ES7 194-3JA00-0AA0
Accessories for RFID		
MOBY U reader cable	2 m 5 m	6GT2 091-0FH20 6GT2 091-0FH50
MOBY D reader cable	2 m	6GT2 691-0FH20
RF300 reader cable, RF300/MOBY U/D extension cable	2 m 5 m 10 m 20 m 50 m	6GT2 891-0FH20 6GT2 891-0FH50 6GT2 891-0FN10 6GT2 891-0FN20 6GT2 891-0FN50

RF300 reader cable; connector on the reader is angled	2 m	6GT2891-0JH20
M12 sealing caps for unused reader connections (10 units)		3RX9 802-0AA00
RFID software with FB 44, GSD file and descriptions of the blocks and RFID systems		6GT2 080-2AA10
Other accessories for RF160C (network components)		See Catalog IK PI

*) These cables are available in different lengths.
See Catalog IK PI for more details

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Programming of the RF160C on PROFIBUS DP

A

A.1 Introduction

For whom is this Appendix intended?

This section does not need to be considered by SIMATIC users that use the FC 44. It is intended particularly for programmers of PCs and third-party PLCs. The information enables the programmer to develop customized function blocks or drivers for the RF160C.

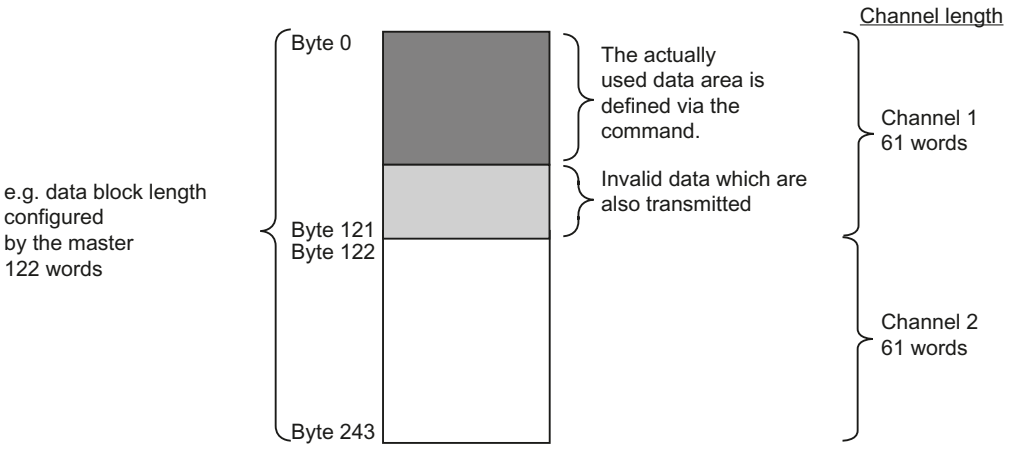
Communication with the RF160C

The data transfer via the bus is determined by the master, which addresses each slave (RF160C) cyclically, one after the other. Per cycle, data is transferred to the slave as well as retrieved from the slave. The data block length is set during bus configuration with the configuration tool and stays the same for every cycle.

One half of the data area to be set in the configuration is assigned to each of the two channels. Channel 2 always starts in the middle of the whole data area and occupies the half with the higher addresses. The maximum data block length is 122 words.

In this case, Channel 1 and Channel 2 are set with 61 words each. For example, an addressing to address 256 means that channel 1 is accessed from the address 256 and channel 2 from the address 378.

Communication with the RF160C is performed with command telegrams that the user issues via the bus and result telegrams that the communication module returns. These telegrams are written to the configured data blocks in such a way that the first byte stands at the very beginning of the block. In each telegram, the amount of valid data (frame length) must be specified (see telegram structure). Although the bus transfers the entire data block, the RF160C (as well as the user) evaluates only the valid bytes.



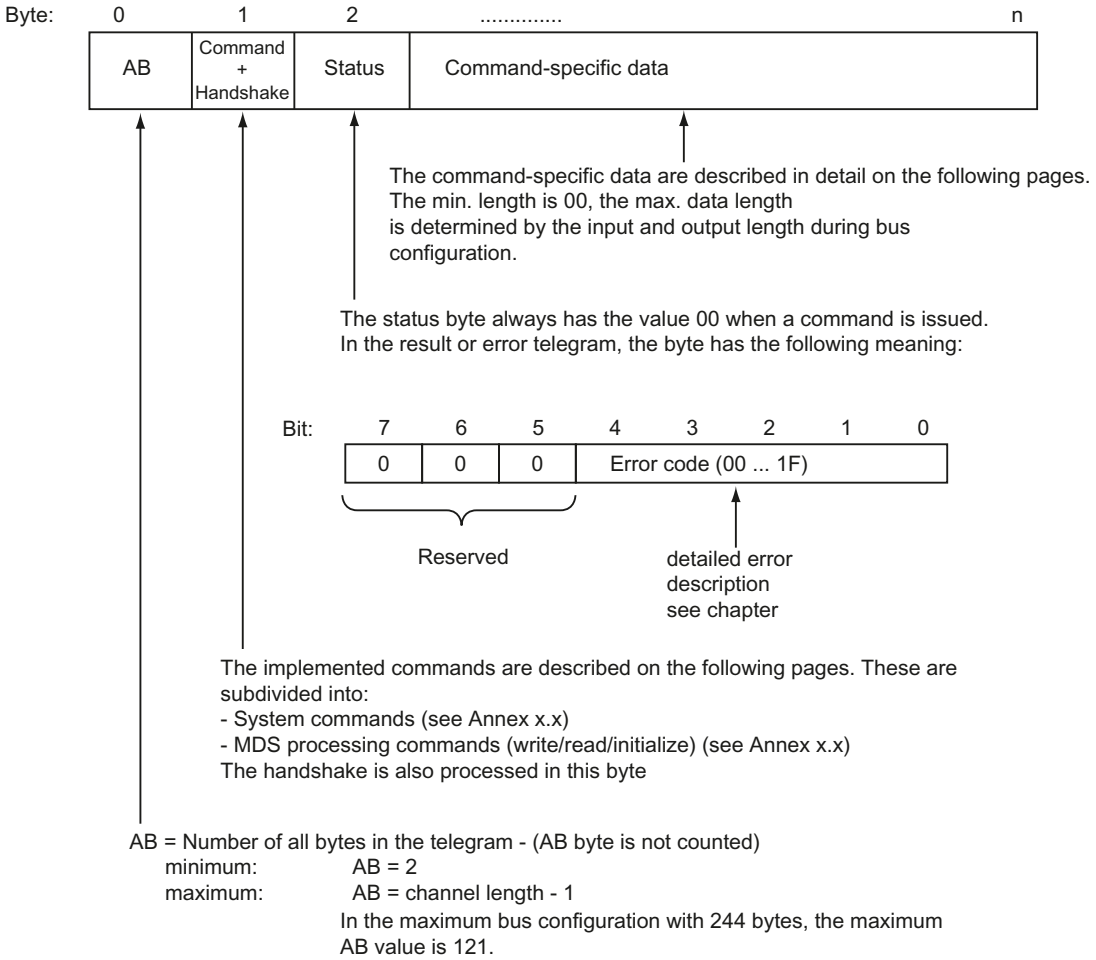
If the data between two bus cycles does not change, the previous data blocks are always transmitted. The presence bit in the command byte always has the current state. This happens even without a previous command.

To ensure secure telegram handling, the handshake described in Appendix Handshake control (Page 103) must be considered.

The telegrams described below are the same for all MDS types in RFID.

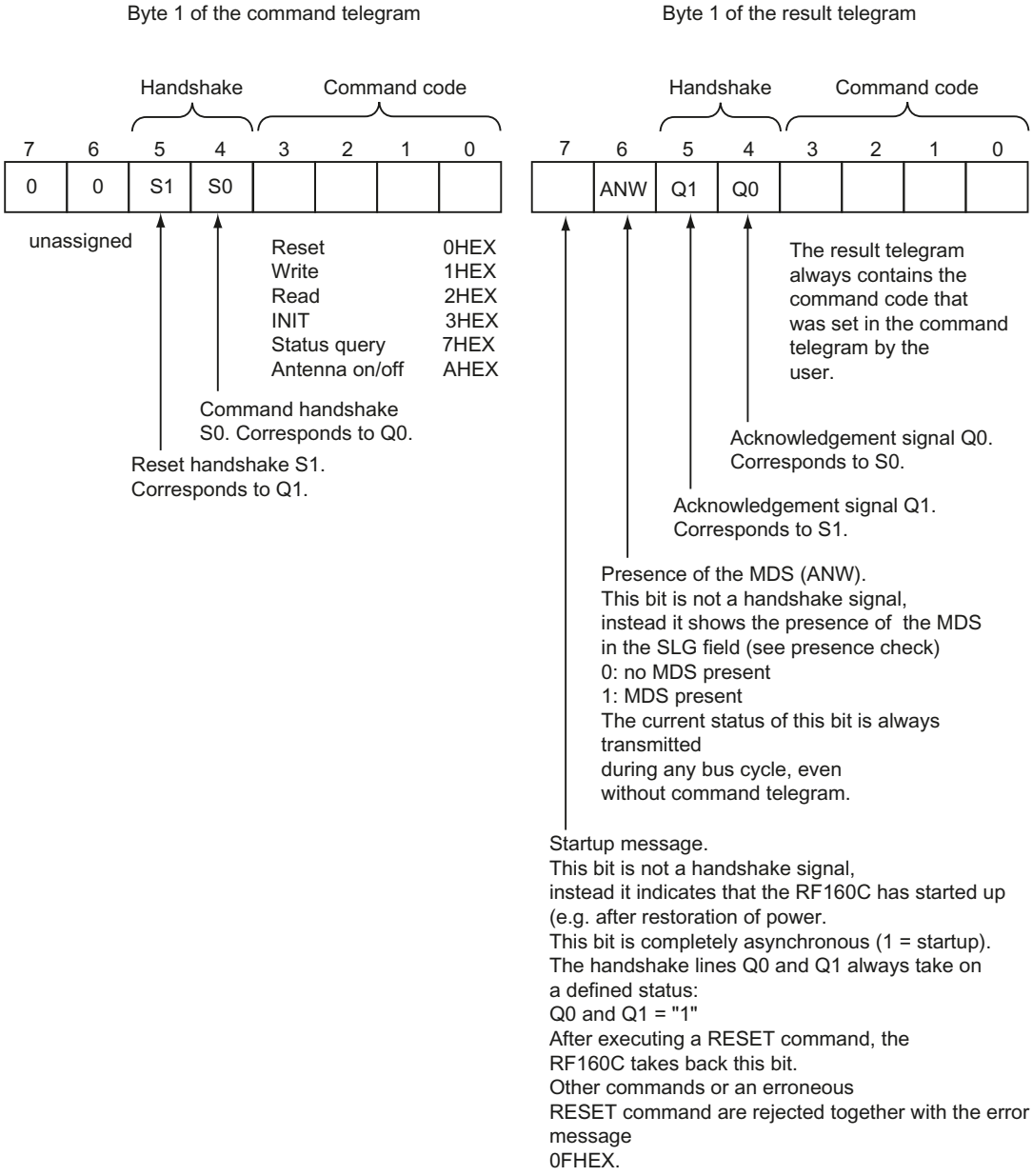
Telegram structure

The telegram structure refers to a channel, and applies to both command telegrams to the RF160C and to result telegrams from the communications module.



A.2 Structure of the command byte (byte 1 of the telegram)

The command byte has the following structure:



A.3 Commands

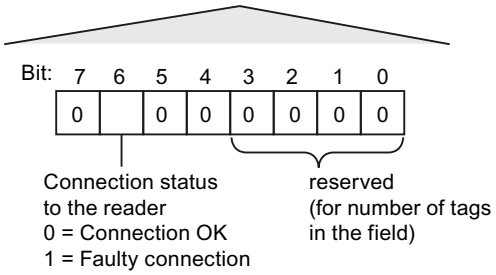
The commands are used for monitoring and the control of the processing sequence.

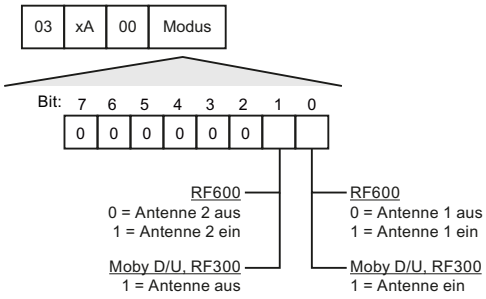
Command table

Command code [hex]	Command	Description
0	RESET	ASM is reset. The active command is terminated. (If an MDS command was terminated with RESET, the reset acknowledgment reports error 1F.) The RESET command can be used to switch the ASM to various operating modes. RESET is parameterized via the GSD file.
1	Write	Write data block to MDS For the permissible values of the tag address ranges, refer to chapter Processing data memories (Page 56).
2	Read	Read data block from MDS For the permissible values of the tag address ranges, refer to chapter Processing data memories (Page 56).
3	Initialize	This command is needed if a new MDS is used that has never been written to. The MDS is already initialized for normal use. See also Parameterization of the commands (Page 52)
7	Status query	Returns the status byte of the RF160C as result. The result of this command is to confirm whether a reader is connected to the RF160C.
A	Antenna on/off	Only MOBY U/D, RF300 or RF600: This command turns the antenna field on the reader off and on again.

Exact telegram structure

Command code [hex]	Command frame to RF160C	Result telegram from the RF160C*
0 (Reset)	05 | x0 | 00 | 00 | 00 | 00	02 | x0 | 0F 02 | x0 | Stat Reset message after startup. It will be continuously output until the first Reset command starts.
1	AB | x1 | 00 | Address MSB | LSB | LNG | D1 ... Dn	02 | x1 | 00
2	05 | x2 | 00 | Address MSB | LSB | LNG	AB | x2 | 00 | Address MSB | LSB | LNG | D1 ... Dn
3	06 | x3 | 00 | INIT pattern | End addr. + 1 00 | MSB | LSB	02 | x3 | 00
7 (Status)	02 | x7 | 00	7 | x7 | Stat | Status | Version***
A (Switch antenna on/off)	03 | xA | 00 | Modus	02 | xA | Stat





*) In the event of an error, the structure of the result telegram is as follows: | 02 | command | error |
The AB byte (02) can even store a value > 2 for the read command. In this case, the data are only partially correct and must be rejected.

***) The firmware version number of the ASM is ASCII-coded, e.g. "10" stands for Version 1.0.

Meaning of the abbreviations used:

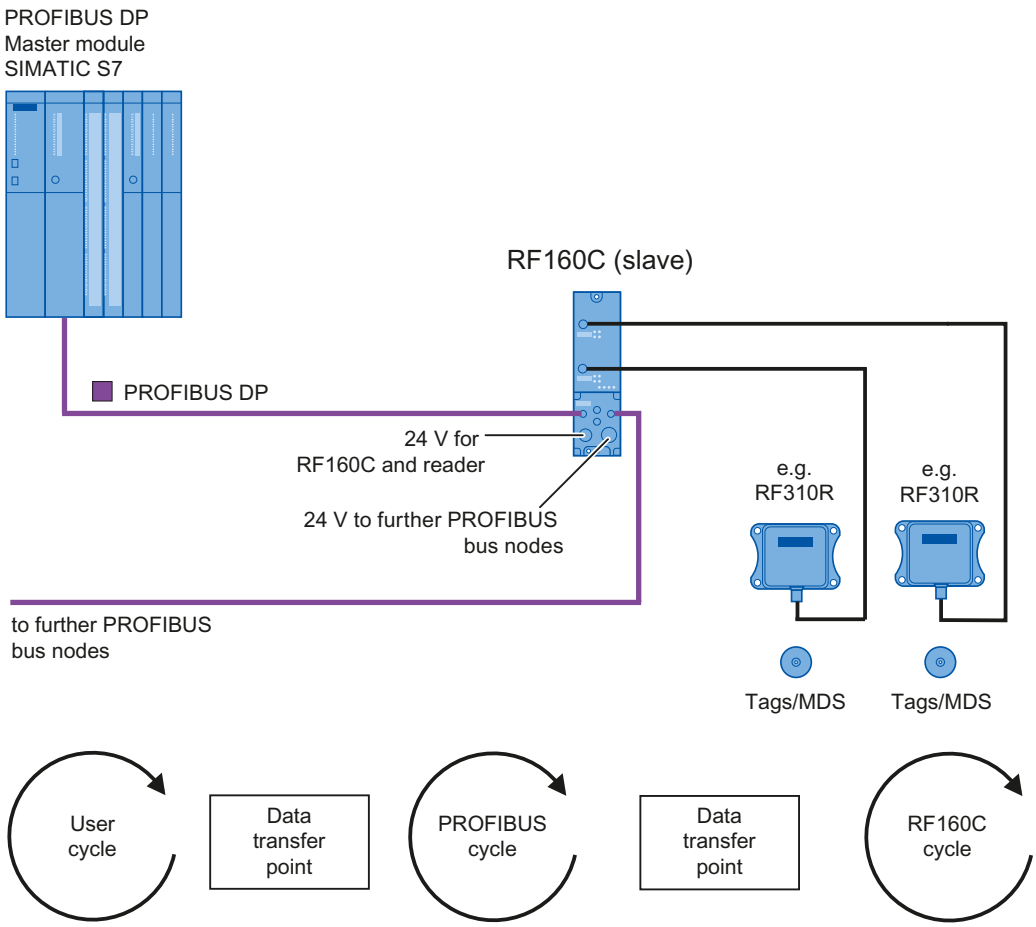
D1 ... Dn	User data of user (max. length is specified during configuration of the bus)
LNG	Length of data block (D1 .... Dn) Comment: address + LNG must be smaller than the end address of the MDS
Address	Start address of the data to be processed on the MDS: • MSB = most significant address part • LSB = least significant address part
AB	Number of the following characters in the telegram • AB = LNG + 5 Comment: AB + 1 must not be greater than the bus configuration
INIT pattern	The value "INIT pattern" is written to the MDS during initialization
End addr. + 1	Memory size of the MDS
x	in the command code stands for the handshake signals

Handshake control

B

B.1 Introduction

The data transfer scheme is as follows:



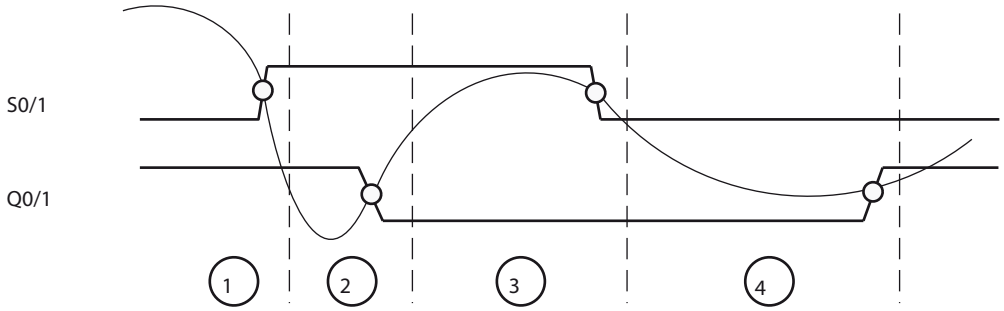
The cycles described above are independent of each other, with the cycle time varying from case to case. Because the operations on the data transfer stations can not be fully matched to each other due to these characteristics, the consistency of the data must be ensured by a handshake sequence.

To cancel a command by a RESET command, an additional handshake must be considered specially for the RESET command.

The PROFIBUS DP master addresses the slaves cyclically. If the ASM has no new data, because no command has been started or because a command is not yet processed, the telegram is always issued. Exception: The presence bit, like the startup bit in the command byte, is always transmitted in its current state. This happens even without a previous command.

B.2 General handshake sequence

The following diagram shows the basic sequence of the handshake procedure for controlling the command and acknowledgment transmission between user and RF160C.



1. The user prepares the command. Subsequently, the S0/1 bit is set in byte 1 (byte1 = command byte). Using the set bit S0/1, the RF160C recognizes that a command message has been transferred completely and is valid.

   Comment: Q0/1 must be set before the command start of the RF160C.

NOTICE
The following procedure is important to ensure data consistency: 1. Set the command-specific data with AB byte 2. Write command byte with handshake bits to the transfer buffer only as the last byte

2. The RF160C confirms receipt of the command by resetting the bit Q0/1. At the same time, the RF160C initiates the command.

   Comment: In general, the Q0/1 bit is passed on at the next bus cycle after the command transfer.

3. If the user recognizes that Q0/1 is 0, he also sets the bit S0/1 to 0, and thus signals to the RF160C that he is ready to receive the result telegram.

4. The RF160C has finished performing the command and passes the result telegram to the bus. The RF160C then waits for a bus cycle and only then sets Q0/1. This ensures that the telegram has been transmitted completely if the user recognizes the set Q0/1.

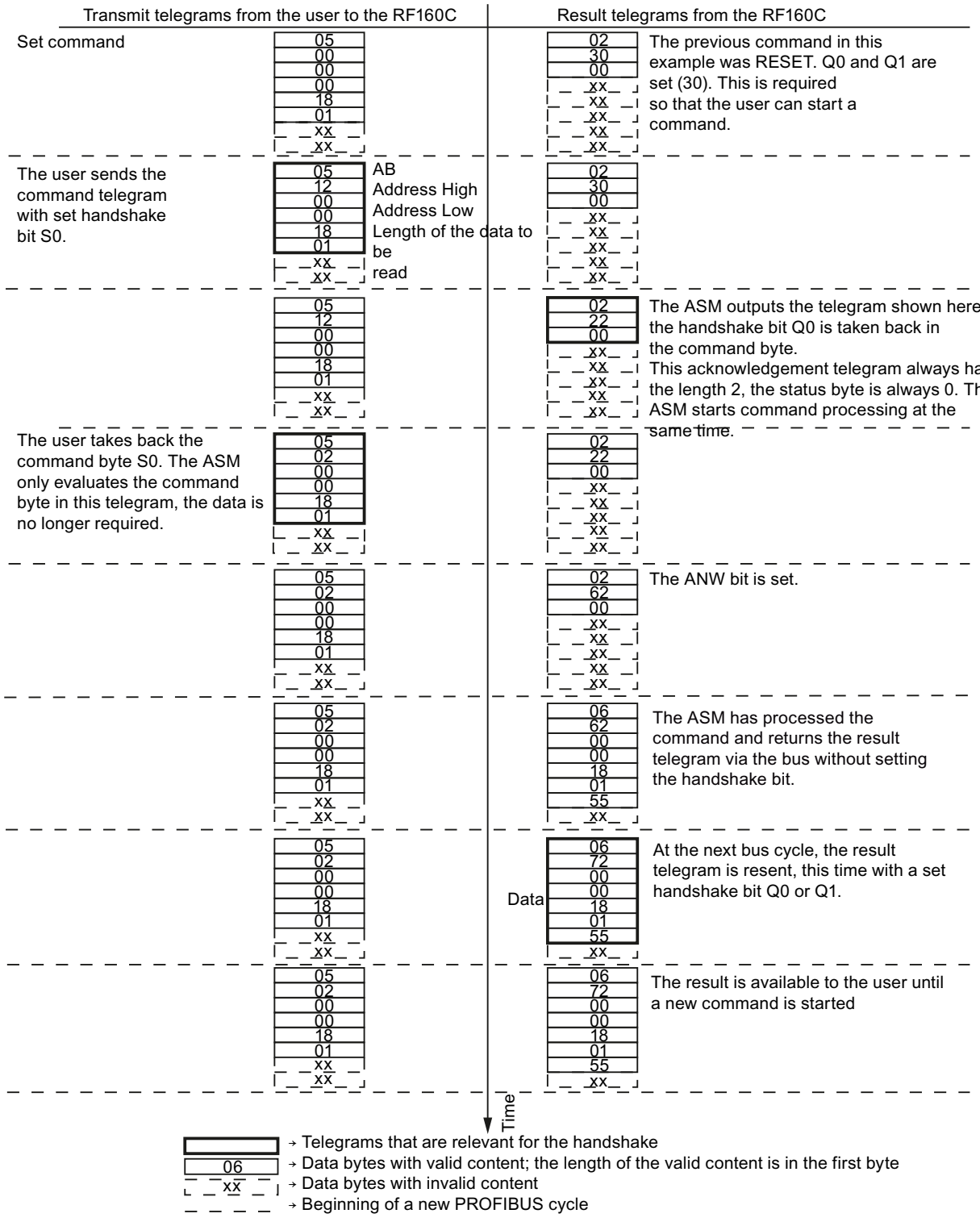
   Before further processing of the result telegram, the user must first check the status byte (byte 2) of the acknowledgement for errors.

   Comment: The result telegram (set Q0/1) is returned at the earliest in the bus cycle after next when the ASM takes back S0/1. If an MDS processing command has been started and no MDS is present, the process lasts until an MDS enters the transmission field and the command can be ended.

B.3 Telegram traffic for a command

The following telegrams are necessary for the handshake sequence:

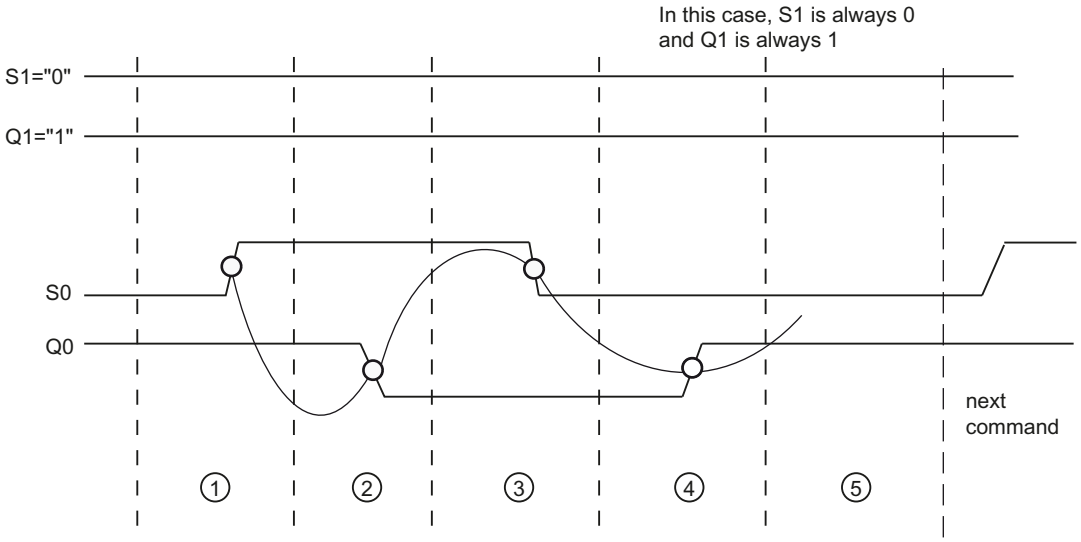
Example: Read command from address 18HEX with length of 1 byte. An MDS is not yet located in the field of the SLG.


Transmit telegrams from the user to the RF160C
Result telegrams from the RF160C
Set command
05 00 00 00 18 01 xx xx
02 30 00 xx xx xx xx xx
The previous command in this example was RESET. Q0 and Q1 are set (30). This is required so that the user can start a command.
The user sends the command telegram with set handshake bit S0.
05 12 00 00 18 01 xx xx
AB
Address High
Address Low
Length of the data to be read
02 30 00 xx xx xx xx xx
05 12 00 00 18 01 xx xx
02 22 00 xx xx xx xx xx
The ASM outputs the telegram shown here, the handshake bit Q0 is taken back in the command byte.
This acknowledgement telegram always has the length 2, the status byte is always 0. The ASM starts command processing at the same time.
The user takes back the command byte S0. The ASM only evaluates the command byte in this telegram, the data is no longer required.
05 02 00 00 18 01 xx xx
02 22 00 xx xx xx xx xx
05 02 00 00 18 01 xx xx
02 62 00 xx xx xx xx xx
The ANW bit is set.
05 02 00 00 18 01 xx xx
06 62 00 00 18 01 55 xx
The ASM has processed the command and returns the result telegram via the bus without setting the handshake bit.
05 02 00 00 18 01 xx xx
Data
06 72 00 00 18 01 55 xx
At the next bus cycle, the result telegram is resent, this time with a set handshake bit Q0 or Q1.
05 02 00 00 18 01 xx xx
06 72 00 00 18 01 55 xx
The result is available to the user until a new command is started
Time
→ Telegrams that are relevant for the handshake
06 → Data bytes with valid content; the length of the valid content is in the first byte
xx → Data bytes with invalid content
→ Beginning of a new PROFIBUS cycle

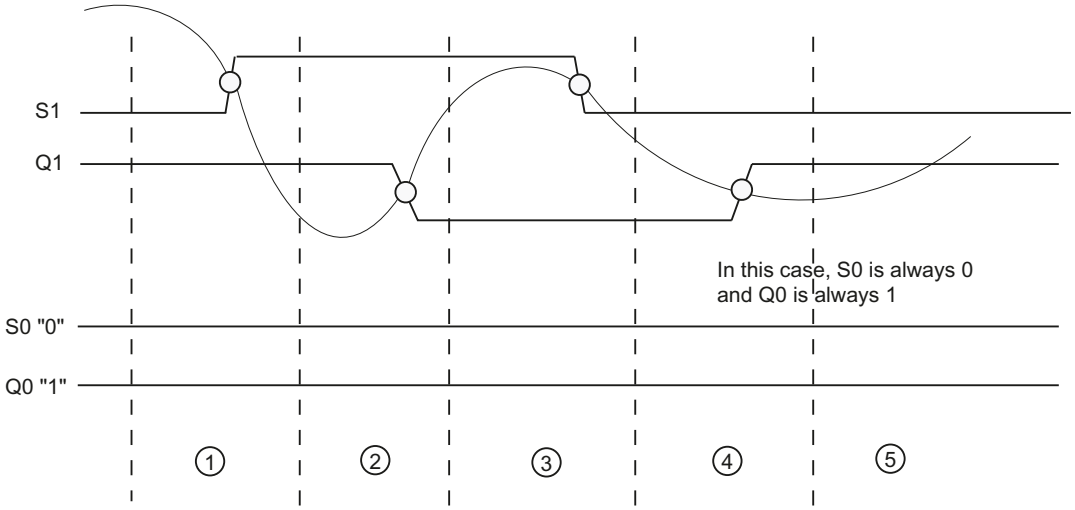
B.4 Signal timing for command and RESET command handshake

The following flow diagrams show the handshake mechanism in detail.

Command handshake



RESET command handshake



① The user sets S0 for reset command S1

② The ASM takes back bit Q0 or Q1

③ The user acknowledges status 2 by removing bit S0 or S1

④ The ASM has concluded performing the command and sets the acknowledgement signal Q0 or Q1

⑤ The user evaluates the data or the ASM is ready for the next command. Also see Appendix Programming of the RF160C on PROFIBUS DP (Page 97)

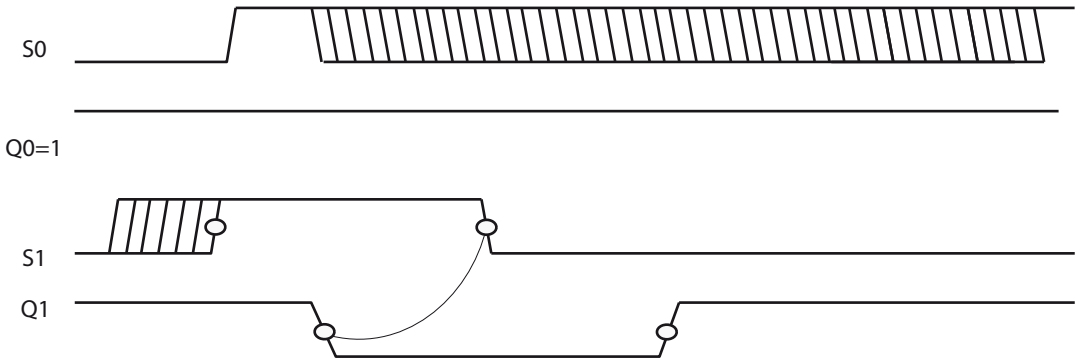
B.5 Cancellation of a running command

It is always possible to cancel a command that has been started with a RESET command. The following diagrams illustrate the process and show the different states that may occur when the RESET command is started.

Note

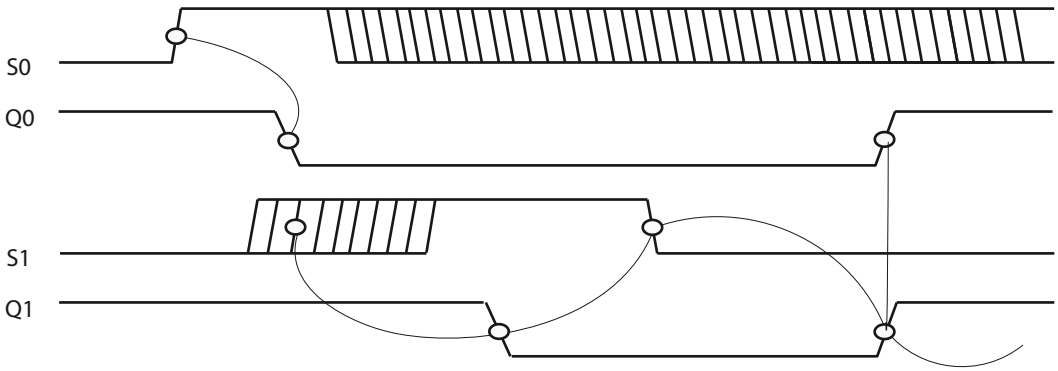
A running RESET command cannot be aborted by a new RESET command. If this occurs anyway, the RESET command is discarded, as long as Q1 is still 0 from the perspective of the ASM.

Command is canceled at the moment of starting by RESET command



If the user transmits both a set S0 and S1 in the same bus cycle, only the RESET command is obeyed. S0 is ineffective and Q0 remains at 1. Between the setting of S1 and the setting of Q1 (from the perspective of the ASM), S0 has no effect. The timing of the resetting of S0 is left to the user. The further procedure corresponds to the previous diagrams.

Command cancellation if S0 has already been transferred to the ASM



A set S0 has already been transferred to ASM and one or more bus cycles later a RESET command is started with S1. The command that has started is canceled, Q0 remains at 0 and goes together with Q1 to 1 when the RESET command is completed. Only the result telegram of the RESET command is returned. S0 can be reset at any time.

B.6 Programming example according to DIN IEC 61131

This chapter is intended for all PLC programmers of non-SIMATIC controls. It is kept very simple and thus easy to understand. Because of the programming in DIN IEC 61131, the example can easily be applied and adapted to other controls.

```
      U     M      0.0          //Increments the process bit memory by 1
      FP    M      0.1
      SPBN  VOR
      L     MW   100            //Increment by 1
      INC   1
      T     MW   100
      R     M      0.0

BEFORE:  L     PEB  257            //buffer result telegram
T     MB     1

      ON    M      1.5          //Acknowledge handshake Q1 set?
      O(                        //Process bit memory step 1?
      L     MW   100
      L     W#16#1
      <>I
      )
      SPB   ST_1

      L     2#10     //AB byte indicates valid command length of 2 bytes
      T     PAB  256
      L     2#100000            //Set RESET handshake S1
      T     PAB  257

      BEA

ST_1: O     M      1.5    //Acknowledgement handshake Q1 has been taken
back?
      O(                 //Process bit memory step 2?
      L     MW   100
      L     W#16#2
      <>I
      )
      SPB   ST_2

      L     2#0                //Take back RESET handshake S1
      T     PAB  257

      BEA

ST_2: ON    M      1.5         //Acknowledgement handshake Q1 back to 1?
      O(                       //Process bit memory step 3?
      L     MW   100
      L     W#16#3
      <>I
```

```
)
BEB

L     W#16#0             //Reset process bit memory
T     MW   100    //Command processing complete
BE                //-->Valid acknowledgement, ready for next command
```