RFID SYSTEMS

SIMATIC RF620R/RF630R

Configuration Manual · 02/2013

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SIMATIC RF620R/RF630R

Configuration Manual

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Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

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indicates that death or severe personal injury **will** result if proper precautions are not taken.

⚠WARNING

indicates that death or severe personal injury **may** result if proper precautions are not taken.

⚠CAUTION

indicates that minor personal injury can result if proper precautions are not taken.

NOTICE

indicates that property damage can result if proper precautions are not taken.

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Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

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We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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Table of contents

Introduction 1

1.1 Validity of the documentation

Note

Scope of this documentation

This documentation is valid for the parameter assignment of the readers RF620R/RF630R as of firmware V2.5 with the function blocks FB 45 as of V1.8 and FB 55 as of V1.6. If you are assigning parameters for older firmware versions, please use the documentation edition 10/2009.

1.2 Preface

Purpose of this document

This Configuration Manual contains all the information required to assign parameters to and commission the RF620R and RF630R readers of the SIMATIC RF600 system in conjunction with communications modules and FB 45 / FB 55.

This manual is intended for:

- Commissioning engineers
- Configuration engineers
- Service technicians

Documentation classification

The commissioning of the communications modules is described in the operating instructions of the relevant interface modules/communications modules.

For programmers who want to create their own function block, the communications rules and frames can be found in the "Appendix (Page 171)".

These additional descriptions can be found in the "Service & Support Portal (http://support.automation.siemens.com)" on the Internet.

Option of connecting via communications modules

Table 1- 1 Option of connecting the RF620R/RF630R readers

Function blocks	Interface modules/communications modules						
	ASM 456	RF170C [1)]	RF180C	ASM 475 [1)]	RF182C [2)]	RF160C [1)] [2)]	RFID 181EIP [2)]
FB 45	1 - 2 readers	1 - 2 readers	1 - 2 readers	1 - 2 readers	N/A	N/A	N/A
FB 55	1 - 2 readers	1 - 2 readers	1 - 2 readers	1 - 2 readers	N/A	N/A	N/A
XML	N/A	N/A	N/A	N/A	1 - 2 readers	N/A	N/A
FC 44	N/A	N/A	N/A	N/A	N/A	1 - 2 readers	N/A
Ethernet/IP	N/A	N/A	N/A	N/A	N/A	N/A	1 - 2 readers
With all possible combinations, the input voltage at the communications module must not be below 21.6 V. The CMs/ASMs may only be operated up to an ambient temperature of maximum 55 °C. [1)] If 2 readers are used with a CM/ASM, the CM/ASM may only be operated at a maximum ambient temperature of 35 ℃. [2)] The communications modules do not currently support multitag operation.							

You will find more detailed information on assigning parameters to the ASM 456, ASM 475, RF170C and RF180C in the section "Commissioning (Page 13)". You will find more detailed information on RF160C and RF182C on the Internet:

- for RF160C (http://support.automation.siemens.com/WW/view/en/42788808)
- for RF182C (http://support.automation.siemens.com/WW/view/en/38507897)

History

Previous edition(s) of this Configuration Manual:

Edition	Note
11/2008	First edition
03/2009	Revised and expanded edition
07/2009	Revised and expanded edition for FCC reader versions
10/2009	Revised and expanded edition for multitag mode
06/2012	Revised and expanded edition for firmware V2.0. Addition of any EPC-ID length in multitag mode. Addition of a section on the use of industrial UHF algorithms.
02/2013	Revised and expanded version for firmware V2.5. Expanded diagnostics and filter functions. Addition of EPC Data filter, SLG-STATUS with "sub_command = 0x08, 0x20, 0x21", GET command with "sub_command = 0x20, 0x21" and Field Diagnosis Indicator (FDI).

1.3 Abbreviations and naming conventions

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

Read/write device (SLG)	Readers
Mobile data storage units (MDS)	Transponder, tag
Interface module, ASM	Communications module, CM

1.4 Guide through the parameterization manual

Structure of contents	Contents
Table of Contents	Organization of the documentation, including the index of pages and sections.
Introduction	Purpose, layout and description of the important topics.
Description	Basics of parameter assignment
Commissioning	Description of commissioning the hardware and software
Parameter assignment	Description of parameter assignment with the function blocks FB 45 and FB 55
Error messages and troubleshooting	Overview of error messages and troubleshooting guide
Industrial UHF algorithms	Description of the applications and algorithms
Appendix	Frame expansions Description of the firmware update for SIMATIC
Service & Support	Service and support, contact partners, training centers

Description 2

You can assign parameters to your SIMATIC RF620R and SIMATIC RF630R readers with the function blocks FB 45 or FB 55. The differences between the two function blocks are explained briefly below:

Differences in parameter assignment between FB 45 and FB 55

FB 45 - single tag mode

The function block FB 45 is suitable for PROFIBUS DP, PROFINET IO and a centralized configuration (ASM 456, ASM 475, RF170C, RF180C) in single tag mode.

In single tag mode with FB 45, there is the following RFID mode:

- MOBY_mode = 5: no UID necessary.

FB 55 - single tag / multitag mode

The function block FB 55 is suitable for PROFIBUS DP, PROFINET IO and a centralized configuration (ASM 456, ASM 475, RF170C, RF180C) in multitag or single tag mode.

In single tag mode with FB 55, a distinction is made between the two following RFID modes:

- MOBY_mode = 6: 4 bytes UID = 0x00
- MOBY_mode = 7: 8 bytes UID = 0x00

In multitag mode, a distinction is made between the two following RFID modes:

- Mode with any length EPC-ID (MOBY_mode = 6)
- Compatibility mode with an EPC-ID = 12 bytes (MOBY_mode = 7)

The UID is used to address transponders in the antenna field in the SIMATIC protocol (FB 55). Addressing via the air interface uses the EPC-ID. You will find the relationship between the UID and EPC-ID described in the section "UID (Page 59)".

Differences between single tag mode and multitag mode

When using UHF readers, a distinction is made between operation in single tag mode and multitag mode. Which mode is more suitable for your requirements depends on the concrete situation.

The main feature of the single tag mode is that the reader only expects a single transponder in the antenna field as is often the case in a production environment. If, on the other hand, there are several transponders in the antenna field, the reader reports an error. The use of this mode is comparatively simple since all data access to the transponder is unspecific. This means that no transponder lists need to be managed and no addressing of the transponder using its ID is necessary.

The multitag mode can be used flexibly and allows the reader to manage several transponders in the antenna field as is often required in logistics. In this mode, however, for data access to transponders it is necessary to inform the reader precisely which transponder needs to be accessed based on an ID. The access is therefore multi-stage on the PLC. An initial step identifies which transponders are currently located in the antenna field. Using the application logic, one transponder is then selected that can be accessed specifically. The multitag mode can also be used when only one transponder is located in the antenna field.

Commissioning 3

Note

Setting up software with the TIA Portal

You can also operate the RF600 readers in the TIA Portal with the communications modules. You will find more detailed information on operating the RF600 readers with the TIA Portal on the RFID system DVD "Software & Documentation".

3.1 Connecting the hardware

Requirements

- An interface/communications module is connected via PROFIBUS DP or via PROFINET IO to the SIMATIC S7-300/400. The modules RF160C and RF182C are released for single tag mode and the modules ASM456, ASM475, RF170C and RF180C for multitag mode.
- The reader is connected via the RS-422 cable to the interface module being used.
- Internal or external antenna (RF620R) or one or two antennas (RF630R) are connected via standard antenna cables and the RTNC connector on the reader.

Configuration of RF620R/RF630R

The configuration of the reader is shown in the following graphic:

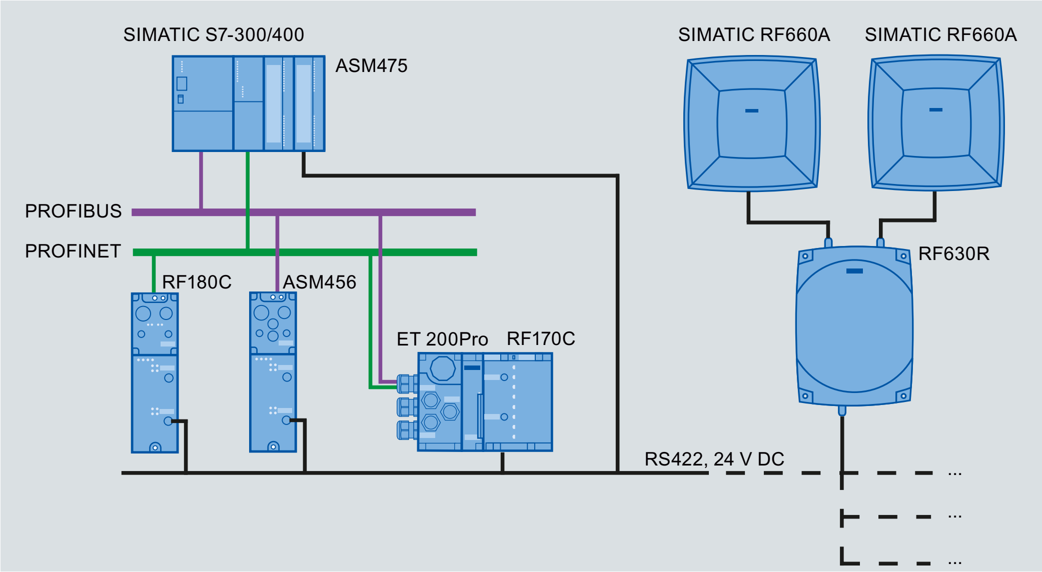


Figure 3-1 Configuration of the RF600 reader

Alternatively, one of the interface modules /communications modules can be connected to the reader.

3.2 Setting up the software

3.2.1 1. Step: Install ASM/communication module in STEP 7

To install the interface/communications modules in STEP 7, follow the steps below depending on the module you are using:

- PROFIBUS ASM

  Link the GSD file to the device catalog using HW Config ("Options Install GSD file"...):

  – Siem8114.GSD for ASM 456

  – GSDML-V2.2-SIEMENS-RF180C-20100329.xml for RF180C

- RF170C and the ASM 475

  Link the modules into the hardware catalog of STEP 7 using the "Hardware Support Package (HSP)". You will find the required HSP files on the current RFID system DVD "Software & Documentation" ("daten\S7_HSP").

Note

The "S7-compatible" setting results in addressing errors!

To operate the ASM 456 using the relevant GSD file, the DP interface of the DP master must be set to "DP-V1".

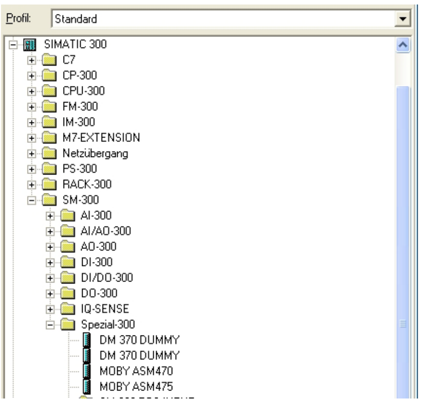
3.2.2 2. Step: Configuring hardware in STEP 7

The configuration varies depending on which MOBY ASM/communications module is being used:

Example:

- RF170C: distributed configuration via PROFIBUS or PROFINET and ET 200pro
- RF180C: Distributed configuration via PROFINET
- ASM 456: Distributed setup with PROFIBUS
- ASM 475: Centralized configuration in S7-300
- ASM 475: Distributed configuration with PROFIBUS and ET 200M

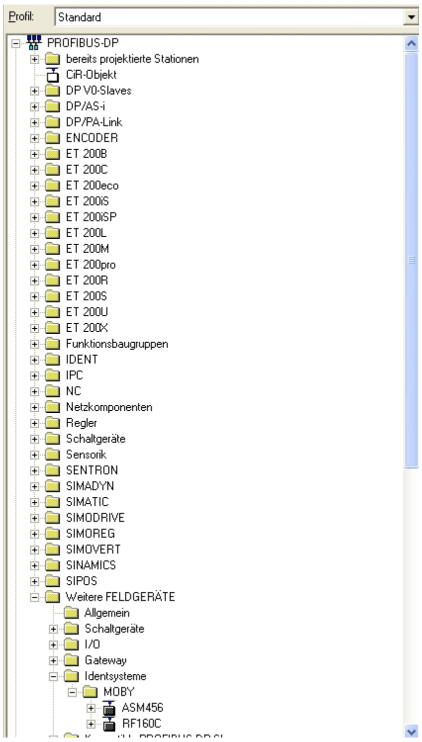
The following figure shows the placement of the MOBY-ASMs in the hardware catalog.



Profil: Standard

```
SIMATIC 300
  C7
  CP-300
  CPU-300
  FM-300
  IM-300
  M7-EXTENSION
  Netzübergang
  PS-300
  RACK-300
  SM-300
    AI-300
    AI/AO-300
    AO-300
    DI-300
    DI/DO-300
    DO-300
    IQ-SENSE
    Spezial-300
      DM 370 DUMMY
      DM 370 DUMMY
      MOBY ASM470
      MOBY ASM475
```

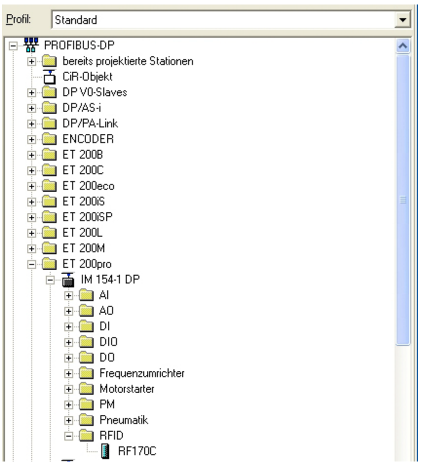
ASM475 in a central configuration



Profil: Standard

```
PROFIBUS-DP
  bereits projektierte Stationen
  CiR-Objekt
  DP V0-Slaves
  DP/AS-i
  DP/PA-Link
  ENCODER
  ET 200B
  ET 200C
  ET 200eco
  ET 200iS
  ET 200iSP
  ET 200L
  ET 200M
  ET 200pro
  ET 200R
  ET 200S
  ET 200U
  ET 200X
  Funktionsbaugruppen
  IDENT
  IPC
  NC
  Netzkomponenten
  Regler
  Schaltgeräte
  Sensorik
  SENTRON
  SIMADYN
  SIMATIC
  SIMODRIVE
  SIMOREG
  SIMOVERT
  SINAMICS
  SIPOS
  Weitere FELDGERÄTE
    Allgemein
    Schaltgeräte
    I/O
    Gateway
    Identsysteme
      MOBY
        ASM456
        RF160C
```

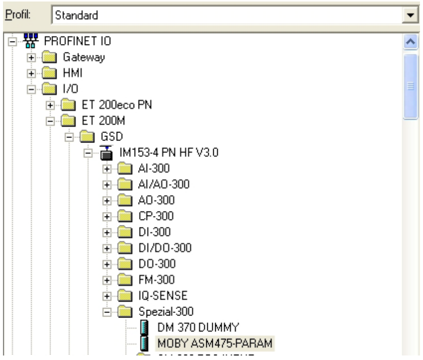
RF160C and ASM456 in a distributed configuration via PROFIBUS



Profil: Standard

```
PROFIBUS-DP
  bereits projektierte Stationen
  CiR-Objekt
  DP V0-Slaves
  DP/AS-i
  DP/PA-Link
  ENCODER
  ET 200B
  ET 200C
  ET 200eco
  ET 200iS
  ET 200iSP
  ET 200L
  ET 200M
  ET 200pro
    IM 154-1 DP
      AI
      AO
      DI
      DIO
      DO
      Frequenzumrichter
      Motorstarter
      PM
      Pneumatik
      RFID
        RF170C
```

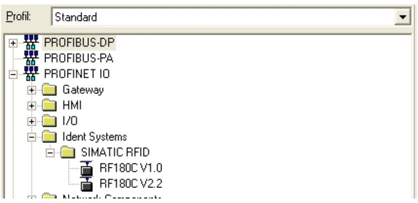
RF170C in a distributed configuration via ET 200pro



Profil: Standard

```
PROFINET IO
  Gateway
  HMI
  I/O
    ET 200eco PN
    ET 200M
      GSD
        IM153-4 PN HF V3.0
          AI-300
          AI/AO-300
          AO-300
          CP-300
          DI-300
          DI/DO-300
          DO-300
          FM-300
          IQ-SENSE
          Spezial-300
            DM 370 DUMMY
            MOBY ASM475-PARAM
```

ASM475 in a distributed configuration via ET 200M and PROFINET IO



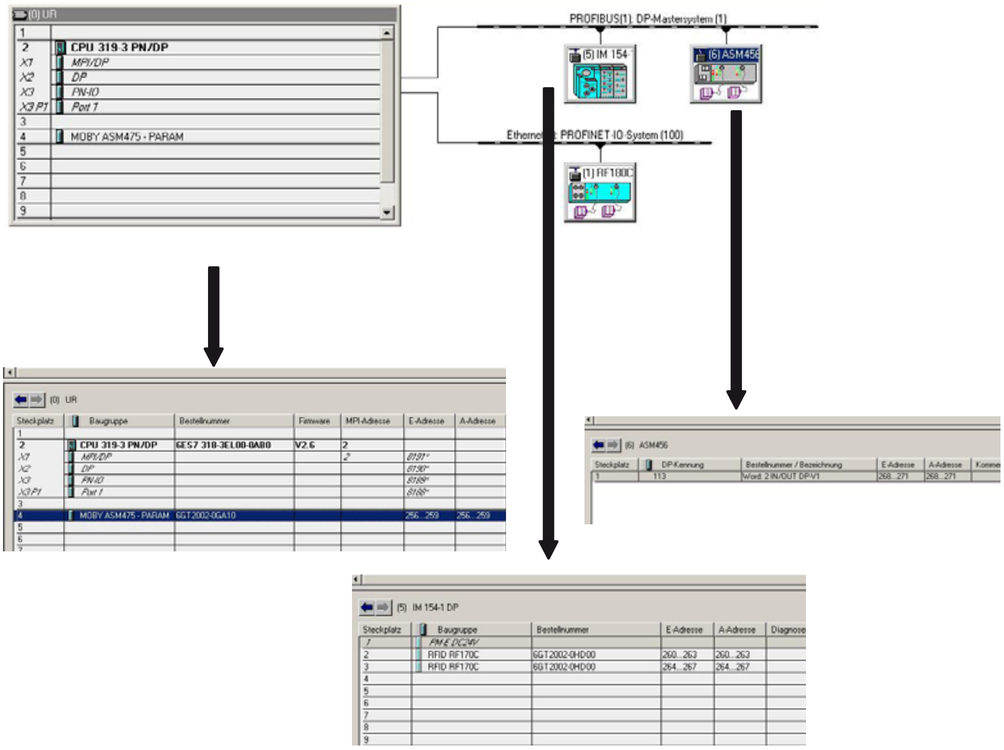
Profil: Standard

```
PROFIBUS-DP
PROFIBUS-PA
PROFINET IO
  Gateway
  HMI
  I/O
  Ident Systems
    SIMATIC RFID
      RF180C V1.0
      RF180C V2.2
```

RF180C in a distributed configuration via PROFINET IO

Figure 3-2 Position of the communications modules in the hardware catalog

During configuration, make sure that the I address and the Q address have the same values. The value in the I address field must be copied later into the "ASM_address" variable in the STEP 7 project. If a communications module has more than one channel (e.g. ASM 475 = 2 channels), the same I address must be used for every channel. The following figure shows an example of a hardware configuration:


PROFIBUS(1): DP-Mastersystem (1)
(5) IM 154
(6) ASM456
Ethernet(1): PROFINET-IO-System (100)
(1) RF180C

(0) UR

1	
2	CPU 319-3 PN/DP
X1	MPI/DP
X2	DP
X3	PN-IO
X3 P1	Port 1
3	
4	MOBY ASM475 - PARAM
5	
6	
7	
8	
9	

(0) UR

Steckplatz	Baugruppe	Bestellnummer	Firmware	MPI-Adresse	E-Adresse	A-Adresse
1						
2	CPU 319-3 PN/DP	6ES7 318-3EL00-0AB0	V2.6	2		
X1	MPI/DP			2	8191*	
X2	DP				8190*	
X3	PN-IO				8189*	
X3 P1	Port 1				8188*	
3						
4	MOBY ASM475 - PARAM	6GT2002-0GA10			256...259	256...259
5						
6						

(6) ASM456

Steckplatz	DP-Kennung	Bestellnummer / Bezeichnung	E-Adresse	A-Adresse	Kommen
1	113	Word: 2 IN/OUT DP-V1	268...271	268...271	

(5) IM 154-1 DP

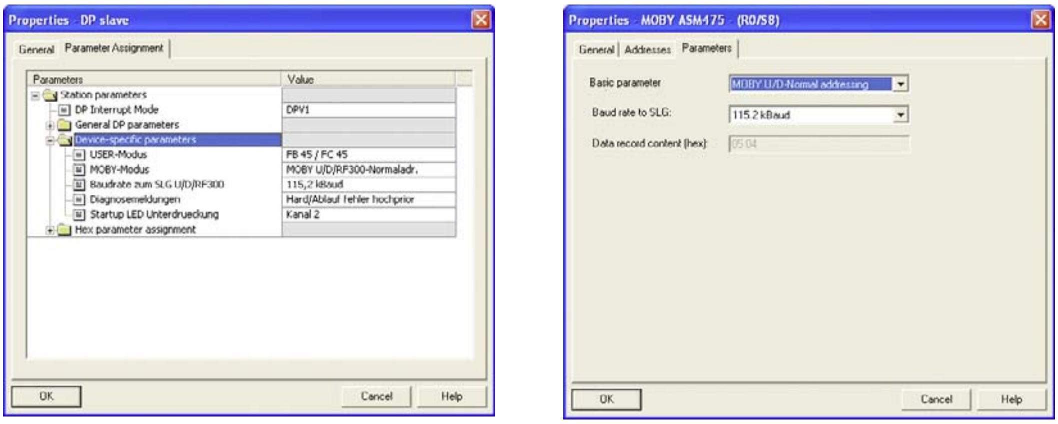
Steckplatz	Baugruppe	Bestellnummer	E-Adresse	A-Adresse	Diagnose
1	PM-E DC24V				
2	RFID RF170C	6GT2002-0HD00	260...263	260...263	
3	RFID RF170C	6GT2002-0HD00	264...267	264...267	
4					
5					
6					
7					
8					
9					

Figure 3-3 Example of hardware configuration

If the project is downloaded to the hardware in this step(without a user program), the SIMATIC CPU and the PROFIBUS must change to RUN. If this is not the case, continue troubleshooting PROFIBUS/PROFINET (check the PROFIBUS address settings on the communications module or the IP address with PROFINET against the configuration in HW Config).

3.2.3 3. Step: Set properties of the ASM/communication module

Now set the basic function of the communications module in the object properties of the module (e.g. MOBY U, serial baud rate). The object properties are shown in one of the following windows. The possible options are displayed in the drop-down list or in the parameter tree.



Parameters	Value
Station parameters	
DP Interrupt Mode	DPV1
General DP parameters	
Device-specific parameters	
USER-Modus	FB 45 / FC 45
MOBY-Modus	MOBY U/D/RF300-Normaladr.
Baudrate zum SLG U/D/RF300	115,2 kBaud
Diagnosemeldungen	Hard/Ablauf fehler hochprior
Startup LED Unterdrueckung	Kanal 2
Hex parameter assignment	

Basic parameter: MOBY U/D-Normal addressing
Baud rate to SLG: 115.2 kBaud
Data record content (hex): 05 04

Figure 3-4 Setting object properties of the ASM 456 and ASM 475

With the ASM 456, for example, you can set the following properties:

- USER mode

  FB 45 / FC 45 (single tag mode) or FB 55 / FC 55 (multitag mode)
- MOBY mode

  MOBY U/D/RF300 standard addr.
- Baud rate for SLG U/D/RF300

  19.2 kBd, 57.6 kBdor 115.2 kBd

3.2.4 4. Step: Insert blocks in the STEP 7 project

This step is based on the sample program supplied with the system.

- Select the required block:
  - Single tag mode: Function block FB 45 is suitable for PROFIBUS DP, PROFINET IO and a centralized configuration in single tag mode.
  - Multitag mode: The function block FB 55 is suitable for PROFIBUS DP, PROFINET IO and a central configuration in multitag mode and single tag mode.
- Copy all blocks from the FB 45 or FB 55 sample program to the newly created STEP 7 project.
- Select the suitable UDT depending on the number of configured readers:

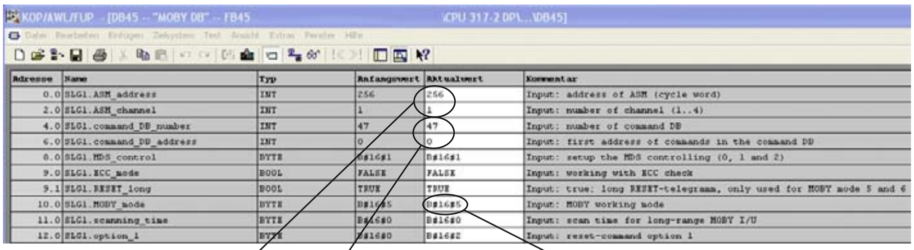
  Single tag mode:
  - In the data view of DB 45 (DB with UDT 10 structure), the parameters are declared for up to two readers (reader 1 = channel 1, reader 2 = channel 2).
  - "ASM_address": This parameter must match the I/O start address of the ASM from the hardware configuration.
  - "command_DB": 47, number of the DB with UDT 20 structure in which the commands of the application are entered.
  - You will find further single tag parameters in the section "INPUT parameters (Page 27)".

  Multitag mode:
  - In the data view of DB 55 (DB with UDT 10 structure), the parameters are declared for up to two readers (reader 1 = channel 1, reader 2 = channel 2).
  - "ASM_address": This parameter must match the I/O start address of the ASM from the hardware configuration.
  - "command_DB": 58, number of the DB with UDT 30 structure in which the commands of the application are entered.
  - You will find further multitag parameters in the section "INPUT parameters (Page 51)".

- Adapt the data block:
  - Single tag mode: Then display DB 45 in the "data view" of the editor and modify the "input parameters" in the "Actual value" column. For simple commissioning of RF200/RF300, all you have to do is adjust parameters "ASM_address" and "ASM_channel" to the HW Config addresses.

    Constraint: Each reader uses the same command (DB 47) and the same data (DB 48).
  - Multitag mode: Then display DB 55 in the "data view" of the editor and modify the "input parameters" in the "Actual value" column. For simple commissioning of RF200/RF300, all you have to do is adjust parameters "ASM_address" and "ASM_channel" to the HW Config addresses.

    Constraint: Each reader uses the same command (DB 58) and the same data (DB 59).


KOP/AWL/FUP - [DB45 -- "MOBY DB" -- FB45 \CPU 317-2 DP\...\DB45]
Datei Bearbeiten Einfügen Zielsystem Test Ansicht Extras Fenster Hilfe

Adresse	Name	Typ	Anfangswert	Aktualwert	Kommentar
0.0	SLG1.ASM_address	INT	256	256	Input: address of ASM (cycle word)
2.0	SLG1.ASM_channel	INT	1	1	Input: number of channel (1..4)
4.0	SLG1.command_DB_number	INT	47	47	Input: number of command DB
6.0	SLG1.command_DB_address	INT	0	0	Input: first address of commands in the command DB
8.0	SLG1.MDS_control	BYTE	B#16#1	B#16#1	Input: setup the MDS controlling (0, 1 and 2)
9.0	SLG1.ECC_mode	BOOL	FALSE	FALSE	Input: working with ECC check
9.1	SLG1.RESET_long	BOOL	TRUE	TRUE	Input: true: long RESET-telegramm, only used for MOBY mode 5 and 6
10.0	SLG1.MOBY_mode	BYTE	B#16#5	B#16#5	Input: MOBY working mode
11.0	SLG1.scanning_time	BYTE	B#16#0	B#16#0	Input: scan time for long-range MOBY I/U
12.0	SLG1.option_1	BYTE	B#16#0	B#16#2	Input: reset-command option 1

These two variables must be adapted for each channel.

When commissioning RF200/RF300, the value "5" is correct here. Otherwise this value max need to be adapted.

The pointer to the "command_DB" can retain the default value during initial commissioning.

Figure 3-5 Editing DB 45 (FB 45) or DB 55 (FB 55)

- Edit OB 1 and program a cyclic FB 45 / FB 55 call for each channel; declare a memory bit for the command start for each RFID channel.
- Set the variable "init_run" in the parameter DB in OB 100 for each RFID channel.

3.2.5 5. Step: Download and test the program

- Download the project onto the SIMATIC CPU
- Connect a reader of the selected RFID type to each RFID channel
- Change the wireless profile parameter "scanning_time" from 0 to 1. With the setting "scanning_time = 1", each RF600 reader works with the default wireless profile. The RF620R/RF630R readers can only be commissioned with the setting "scanning_time ≥ 0".

- After restarting the SIMATIC CPU (STOP → RUN), the CPU must not change to STOP mode. If the CPU does indicate STOP, you should continue by troubleshooting. This is done by evaluating the diagnostic messages of the CPU (function: destination system - module status).

  The main causes of errors are:

  – There is a mismatch between the I/O address of the modules in HW Config and the "ASM_address" configured in the MOBY DB (UDT 10) or the "ASM_address" does not exist in the I/O.

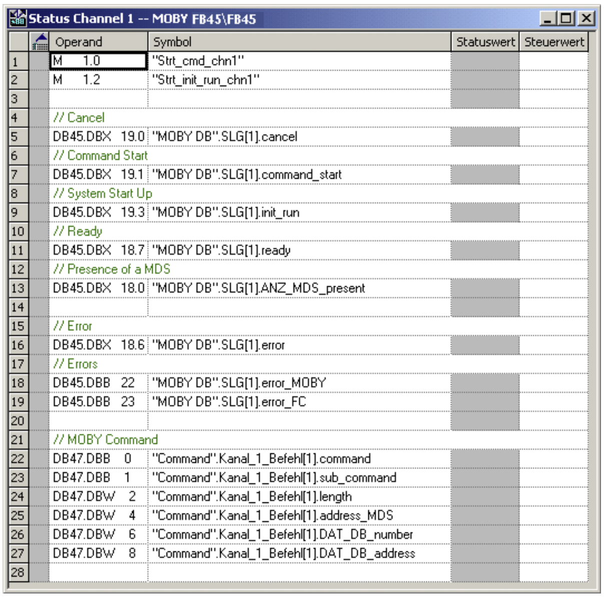
  – A slave has failed and OB 122 is not programmed.

- Since the default parameter assignment of FB 45 / FB 55 is set with "MDS_control = B#16#1, the presence check on the reader must already be active now. The RxD LED of the CM flickers and indicates active communication. If you now place a transponder in the antenna field of a reader, the PRE or ANW LED must light up. The LED on the reader also indicates presence.

  If the RxD LED does not go on, continue with trouble-shooting as described in the next point.

- Checking operation using the programming device

  With the "Modify Variables" function, you can display the status of communication between FB 45 / FB 55 and CM, track errors and initiate commands. The following figure shows the necessary variables. It can be found in the sample project under the name "Status Channel 1":



Status Channel 1 -- MOBY FB45\FB45

	Operand	Symbol	Statuswert	Steuerwert
1	M 1.0	"Strt_cmd_chn1"		
2	M 1.2	"Strt_init_run_chn1"		
3				
4	// Cancel			
5	DB45.DBX 19.0	"MOBY DB".SLG[1].cancel		
6	// Command Start			
7	DB45.DBX 19.1	"MOBY DB".SLG[1].command_start		
8	// System Start Up			
9	DB45.DBX 19.3	"MOBY DB".SLG[1].init_run		
10	// Ready			
11	DB45.DBX 18.7	"MOBY DB".SLG[1].ready		
12	// Presence of a MDS			
13	DB45.DBX 18.0	"MOBY DB".SLG[1].ANZ_MDS_present		
14				
15	// Error			
16	DB45.DBX 18.6	"MOBY DB".SLG[1].error		
17	// Errors			
18	DB45.DBB 22	"MOBY DB".SLG[1].error_MOBY		
19	DB45.DBB 23	"MOBY DB".SLG[1].error_FC		
20				
21	// MOBY Command			
22	DB47.DBB 0	"Command".Kanal_1_Befehl[1].command		
23	DB47.DBB 1	"Command".Kanal_1_Befehl[1].sub_command		
24	DB47.DBW 2	"Command".Kanal_1_Befehl[1].length		
25	DB47.DBW 4	"Command".Kanal_1_Befehl[1].address_MDS		
26	DB47.DBW 6	"Command".Kanal_1_Befehl[1].DAT_DB_number		
27	DB47.DBW 8	"Command".Kanal_1_Befehl[1].DAT_DB_address		
28				

Figure 3-6 Variables for checking operation - VAT1

It must now display the variables "ready" = "TRUE" and "error" = "FALSE" for each channel. If this is not the case continue troubleshooting (see section "Error messages and troubleshooting (Page 83)").

If "ready" = "FALSE":

- This channel is not called in OB 100.
- This channel is not processed cyclically by an FB 45 / FB 55 call in OB 1.

If "error" = "TRUE":

- Read out the precise cause of the error using the variables "error_MOBY", "error_FB" or "error_BUS". The error causes and their remedy are described in Section "Error messages and troubleshooting".

  The variable "ANZ_MDS_present" now indicates the presence of a transponder as soon as you place a transponder in the antenna field of the reader. This is the same display as the PRE LED on the CM or the yellow LED on the reader.

  You can now start the selected RFID command using the auxiliary variable "Befehl_starten" = "TRUE" . If there is no transponder in the reader's antenna field, the command remains active on the CM for an indefinite length of time.

  This status is indicated by "ready" = "FALSE in the "Modify variables" window. Now, move a transponder into the antenna field. As soon as the transponder has been processed, the result is transferred to FB 45 / FB 55 and "ready" = "TRUE" is indicated.
- To start the reader, send an "init_run" to the reader from the controller via the CM.

Commissioning of the RFID components is now complete. You can now program your own Ident application based on the sample program.

Parameterizing 4

4.1 Overview of commands

SIMATIC blocks FB 45 and FB 55 provide various commands that can be used to access transponders and check reader settings.

Tag commands

For access to a transponder, the following commands are available:

- INIT

  Use this command to initialize the USER memory area of a transponder. In this case, this memory area is written with the desired bit pattern.
- READ

  Use this command to read the addressed memory contents of a transponder.
- WRITE

  Use this command to write data to the addressed memory area of a transponder or a reader.
- MDS-STATUS

  Use this command to read the status and diagnostics data of a transponder.
- GET (available only with FB 55)

  With the command, you detect all transponders in the antenna field of the reader in multitag mode.

Detailed information on the individual commands can be found in the following sections.

Reader commands

The following commands are available for monitoring functions and settings on the reader:

- init_run

  Use this command to define the operating mode of the reader and in particular the wireless standard, transmit power and speed. Displayed and reported errors are deleted.
- SLG-STATUS

  Use this command to read the status and diagnostics information of the reader.
- SET-ANT

  Use this command to switch the antenna of the reader on or off.

Detailed information on the individual commands can be found in the following sections.

Note

Reader commands are very complex

The Reader commands are very complex. To avoid unwanted results, read all the relevant sections on the reader commands before you work with these commands.

Command repetition

Use the repeat command to repeat the last command. You can repeat the following commands:

- INIT
- READ
- WRITE
- MDS-STATUS

Command chaining

Command chaining permits various address areas of the transponder to be processed by starting just one command. The advantage of command chaining is the optimum speed at which commands are processed in the reader.

You can chain the following commands:

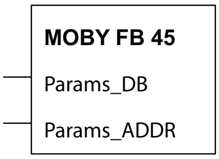
- READ
- WRITE
- INIT
- GET
- SET-ANT
- MDS-STATUS
- SLG-STATUS

4.2 FB 45 parameter assignment

4.2.1 Configuration scheme of FB 45

Use function block FB 45 to assign parameters in single tag mode.

Table 4- 1 MOBY FB 45 configuration system

Ladder logic programming box	Parameter	Data type	Permitted range	Description
"Inst-DB FB 45"  	Params_DB	INT	2 ... 32767	Parameter data block number for an RFID channel (reader)
	Params_ADDR	INT	0, 50, 100, *...	Address pointer in the parameter data block to the start of a UDT 10

*) These values are exemplary whenever only data structures of the UDT 10 type are arranged in succession.
These values change if UDT 10 is followed by a command structure (UDT 20).

"Params_DB" and "Params_ADDR" form a pointer to a data structure. This data structure is defined by linking in UDT 10 (English) or UDT 11 (German). A separate data structure must be defined for each reader.

4.2.2 Parameter assignment in the parameter DB

Each reader needs its own parameters. These are predefined in a data structure as UDT 10 (with commentary in English) or UDT 11 (with commentary in German) or UDT 14 (with commentary in Spanish). This UDT must be linked into a data block for each reader. Various variables are defined in UDT 10:

- INPUT parameters: These variables must be entered by the user once during configuration (exception: "command_DB_number" / "command_DB_address"). Throughout the entire runtime, it is not necessary to change or scan these parameters.

  Please note that after changing an INPUT parameter, the new setting is only effective after you execute an "init_run". An "init_run" executes when the corresponding bit is set in the control bits.
- Control bits: The user starts his commands with these Boolean variables.
- Displays: The displays indicate the command progress to the user. Error analyses can be performed easily.
- FB-internal variables: These variables are not relevant for the user. They must not be changed by the application. Malfunctions and data corruption would otherwise ensue.

The following table shows the complete UDT 10. For programmers who prefer to address using absolute values, the first column specifies the relative addresses.

Table 4- 2 UDT 10 "MOBY Param"

Address	Name	Type	Initial value	Comment
0.0		STRUCT		
+0.0	ASM address	INT	256	Input: address of ASM (cycle word)
+2.0	ASM channel	INT	1	Input: number of channel (1..4)
+4.0	command DB number	INT	47	Input: number of command DB
+6.0	command_DB_address	INT	0	Input: first address of commands in the command DB
+8.0	MDS_control	BYTE	B#16#1	Input: setup the MDS controlling (0, 1 and 2)
+9.0	ECC mode	BOOL	FALSE	Input: working with ECC check
+9.1	RESET_long	BOOL	TRUE	Input: true: long RESET-telegramm, only used for MOBY mode 5 and 6
+10.0	MOBY mode	BYTE	B#16#5	Input: MOBY working mode
+11.0	scanning time	BYTE	B#16#0	Input: reset-command option 1
+12.0	option 1	BYTE	B#16#0	Input: "init run" Option 1
+13.0	distance limiting	BYTE	B#16#F	Input: range limit
+14.0	multitag	BYTE	B#16#1	Input: max. no. of MDS in field
+15.0	field ON control	BYTE	B#16#0	Input: working mode of Bero
+16.0	field ON time	BYTE	B#16#0	Input: time has be of Bero
+17.0	reserved0	BYTE	B#16#0	
+18.0	ANZ MDS present	BOOL	FALSE	MDS is present
+18.1	ANZ cancel	BOOL	FALSE	Cancel-bit in the PEW is set
+18.2	ANZ ECC	BOOL	FALSE	Error correctionen done
+18.3	reserved1	BOOL	FALSE	
+18.4	LR bat	BOOL	FALSE	Battery of the MDS 507
+18.5	Battery_low	BOOL	FALSE	Battery check has indicated low voltage
+18.6	error	BOOL	FALSE	Error during command processing has appeared
+18.7	ready	BOOL	FALSE	Command chain has been finished
+19.0	cancel	BOOL	FALSE	Set: stop command or command chain
+19.1	command_start	BOOL	FALSE	Set: startup signal for command or command chain
+19.2	repeat command	BOOL	FALSE	Set: repeat last command
+19.3	init run	BOOL	TRUE	Set: Reset ASM and parameterize again
+19.4	ASM_failure	BOOL	FALSE	OB122 set: ASM removed from PROFIBUS
+19.5	FB45 active	BOOL	FALSE	FB is active
+19.6	ANZ next	BOOL	FALSE	Last command was NEXT
+19.7	ANZ reset	BOOL	FALSE	Last command was RESET
+20.0	ASM busy	BOOL	FALSE	A command is processed by ASM
+20.1	command_rep_active	BOOL	FALSE	ASM command repetition has been activated
+21.0	number_MDS	BYTE	B#16#0	Number of MDS actual in field
+22.0	error MOBY	BYTE	B#16#0	Error indication of interface module
+23.0	error FB	BYTE	B#16#0	Error display of FB
+24.0	error BUS	WORD	W#16#0	Error appeared on PROFIBUS
+26.0	version MOBY	WORD	W#16#0	Firmware version of MOBY
+28.0	counter customer	BYTE	B#16#2	Internal cycle counter
+29.0	counter_actual	BYTE	B#16#0	Internal FB variables. May not be changed by the user.
+30.0 ... +49.0				FB internal
=50.0		END_STRUCT		

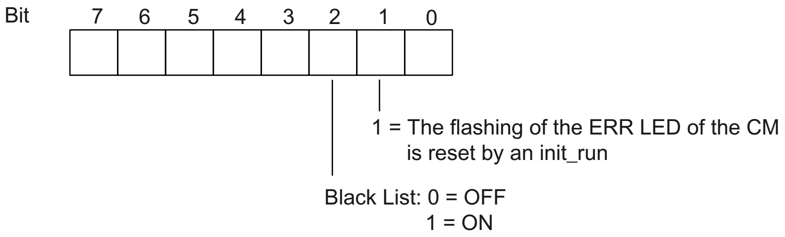
Note

The UDTs are used in various RFID systems. As result, certain comments also relate to other RFID systems.

4.2.3 INPUT parameters

Table 4- 3 FB 45 INPUT parameters for RF620R/RF630R

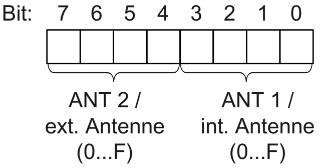
<table>
<tr><th>Variable</th><th colspan="3">Description</th></tr>
<tr><td>ASM_address</td><td colspan="3">Logical base address of the CM; this address must match the "start address" of the CM in HW Config of the SIMATIC Manager. Remember that this address has nothing to do with the PROFIBUS address that is set on the CM or the ET 200M.</td></tr>
<tr><td>ASM_channel</td><td colspan="3">Number of the RFID channel to be used.
Range of values: 1, 2</td></tr>
<tr><td>command_DB_ number</td><td colspan="2">Number of the data block in which the tag command is specified</td><td rowspan="2">**Note:**
These INPUT parameters can be changed whenever "ready" = 1. An "init_run" does not need to be executed after changing these parameters.</td></tr>
<tr><td>command_DB_ address</td><td colspan="2">Address within the "command_DB". The next tag command starts at this address. "command_DB_number" and "command_DB_address" form a data pointer to the next command.</td></tr>
<tr><td rowspan="4">MDS_control</td><td colspan="3">"MDS_control" switches the presence check or transponder control on the CM on or off. If the presence check is active, transponders entering the antenna field are displayed.</td></tr>
<tr><td>Value</td><td colspan="2">Transponder control</td></tr>
<tr><td>0</td><td colspan="2">Presence check is off. The variable "ANZ_MDS_present" does not indicate a valid value.
Note: With this setting, the antennas remain switched on. It is not possible to turn off the antennas with the "SET_ANT" command.</td></tr>
<tr><td>1</td><td colspan="2">Presence check is on. The transponder control is off. The variable "ANZ_MDS_present" indicates a transponder in the antenna field of a reader.</td></tr>
<tr><td>ECC_mode</td><td colspan="3">TRUE = Intelligent Singletag Mode (ISTM) "ON"
FALSE = Intelligent Singletag Mode (ISTM) "OFF"
You will find more detailed information in the section "Industrial UHF algorithms (Page 95)".</td></tr>
<tr><td>RESET_long</td><td colspan="3">TRUE (MOBY_mode = 5)</td></tr>
<tr><td rowspan="4">MOBY_mode</td><td colspan="3">RFID mode setting</td></tr>
<tr><td>Value</td><td colspan="2">Mode</td></tr>
<tr><td>5</td><td colspan="2">Single tag mode</td></tr>
<tr><td colspan="3">**Note:** MOBY_mode may only be changed after a CM is turned on.</td></tr>
</table>

<table>
<tr><th>Variable</th><th colspan="5">Description</th></tr>
<tr><td rowspan="15">scanning_time</td><td colspan="5">"scanning_time" describes the wireless profile according to EPC Global. Set the correct standard according to the country in which you want to operate the reader. Please check which standard is applicable to your country before you select a country/wireless profile.</td></tr>
<tr><td colspan="2"></td><td colspan="3">RF600 reader variant</td></tr>
<tr><td>scanning_time</td><td>Description</td><td>ETSI</td><td>FCC</td><td>CMIIT</td></tr>
<tr><td>0</td><td>No standard selected; the error 0x15 is sent</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>1</td><td>Reader works with the default wireless profile.</td><td>ETSI new</td><td>FCC</td><td>China</td></tr>
<tr><td>2</td><td>ETSI new: EU, EFTA, Turkey;
4-channel plan</td><td>X</td><td>-</td><td>-</td></tr>
<tr><td>3</td><td>ETSI old: EU, EFTA, Turkey;
readers commissioned after December 31, 2009, must not be operated with this setting.</td><td>X</td><td>-</td><td>-</td></tr>
<tr><td>4</td><td>FCC: e.g. USA, Canada, Mexico</td><td>-</td><td>X</td><td>-</td></tr>
<tr><td>5</td><td>Reserved</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>6</td><td>China</td><td>-</td><td>-</td><td>X</td></tr>
<tr><td>7</td><td>Thailand</td><td>-</td><td>X</td><td>-</td></tr>
<tr><td>8</td><td>Brazil</td><td>-</td><td>X</td><td>-</td></tr>
<tr><td>9</td><td>South Korea</td><td>-</td><td>X</td><td>-</td></tr>
<tr><td>C0</td><td>India</td><td>X</td><td>-</td><td>-</td></tr>
<tr><td colspan="5"><b>Note:</b> If you select country profiles other than those defined for the particular reader variant, the error message "09" (see section Error messages and flashing codes (Page 84)) is acknowledged.</td></tr>
<tr><td>option_1</td><td colspan="5">This byte is bit-coded. As default, it has the value B#16#0.


Bit
7
6
5
4
3
2
1
0
1 = The flashing of the ERR LED of the CM is reset by an init_run
Black List: 0 = OFF
1 = ON

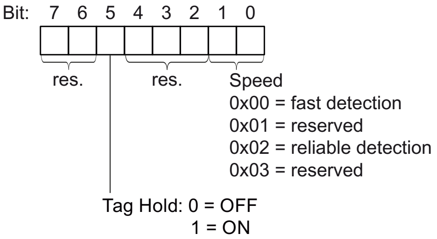
You will find more detailed information on the Black List in the section "Use of industrial UHF algorithms (Page 99)".</td></tr>
</table>

<table>
<tr><th>Variable</th><th>Description</th></tr>
<tr><td>distance_limiting</td><td>"distance_limiting" sets the transmit power of the reader.



By default, ANT 1 is used with the preset transmit power. Section "SET-ANT (Page 39)" describes how to switch over to ANT 2 with the transmit power defined here.

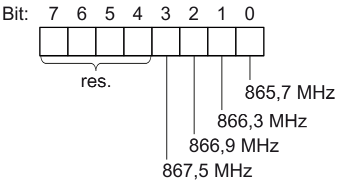
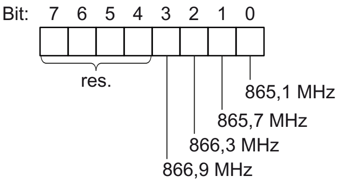
<table>
<tr><th>Hex value</th><th>RF630R transmit power</th><th colspan="3">RF620R radiated power (internal antenna)</th><th>RF620R transmit power</th></tr>
<tr><th></th><th></th><th>ETSI</th><th>FCC</th><th>CMIIT</th><th></th></tr>
<tr><th></th><th>dBm / (mW)</th><th>dBm / (mW) ERP</th><th>dBm / (mW) EIRP</th><th>dBm / (mW) ERP</th><th>dBm / (mW)</th></tr>
<tr><td>0</td><td>18 / (65)</td><td>18 / (65)</td><td>20 / (105)</td><td>18 / (65)</td><td>18 / (65)</td></tr>
<tr><td>1</td><td>19 / (80)</td><td>19 / (80)</td><td>21 / (130)</td><td>19 / (80)</td><td>19 / (80)</td></tr>
<tr><td>...</td><td>...</td><td>...</td><td>...</td><td>...</td><td>...</td></tr>
<tr><td>9</td><td>27 / (500)</td><td>27 / (500)</td><td>29 / (795)</td><td>27 / (500)</td><td>27 / (500)</td></tr>
<tr><td>A</td><td>27 / (500)</td><td>28 / (630)</td><td>30 / (1000)</td><td>28 / (630)</td><td>27 / (500)</td></tr>
<tr><td>B (...F)</td><td>27 / (500)</td><td>29 / (800)</td><td>31 / (1260)</td><td>29 / (800)</td><td>27 / (500)</td></tr>
</table></td></tr>
<tr><td>multitag</td><td>Maximum number of transponders expected in the antenna field.
Permitted values: 0x01</td></tr>
<tr><td>field_ON_control</td><td>"field_ON_control" sets the communications speed (fast/slow) and Tag Hold (ON/OFF).



Reader parameter assignments that have been optimized depending on the application are available with Speed:

- 0x00 = fast detection
- 0x02 = slower, more reliable detection

You will find more detailed information on Tag Hold in the section "Use of industrial UHF algorithms (Page 99)".</td></tr>
</table>

<table>
<tr><th>Variable</th><th colspan="2">Description</th></tr>
<tr><td rowspan="3">field_ON_time</td><td colspan="2"><b>ETSI/India variant:</b> 0x00 ... 0x0F</td></tr>
<tr><td>Changing the channel assignment in the ETSI wireless profile ("scanning_time = 0x02"):

 </td><td>Changing the channel assignment in the India wireless profile ("scanning_time = 0xC0"):

 </td></tr>
<tr><td colspan="2">0x00: Default; the channels of the reader are used in 4-channel mode. Note: The setting 0x0F is identical to 0x00.
With bits 0 to 3 of the "field_ON_time" byte, a channel (frequency) plan can be created for the situation in which several readers are operated in close proximity. 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 (as of ETSI EN 302 208 V1.2.1). With time-critical applications, a smaller loss in performance can therefore be assumed in contrast to 2 to 4-channel mode of a reader.
If 2 to 4 channels per reader are used, the reader switches to another channel after 0.1 second in two-antenna mode and after 4 seconds in single-antenna mode.
<b>FCC and CMIIT variant:</b> Normal: 0x00</td></tr>
<tr><td>reserved0</td><td colspan="2">reserved</td></tr>
</table>

4.2.4 Command and status word

The control bits of FB 45 are defined in the command and status word.

The command and status word "BEST" (DBW 18) with the variables is generated using UDT 10. The variables and the associated relative addresses in UDT 10 are shown in the following figure.

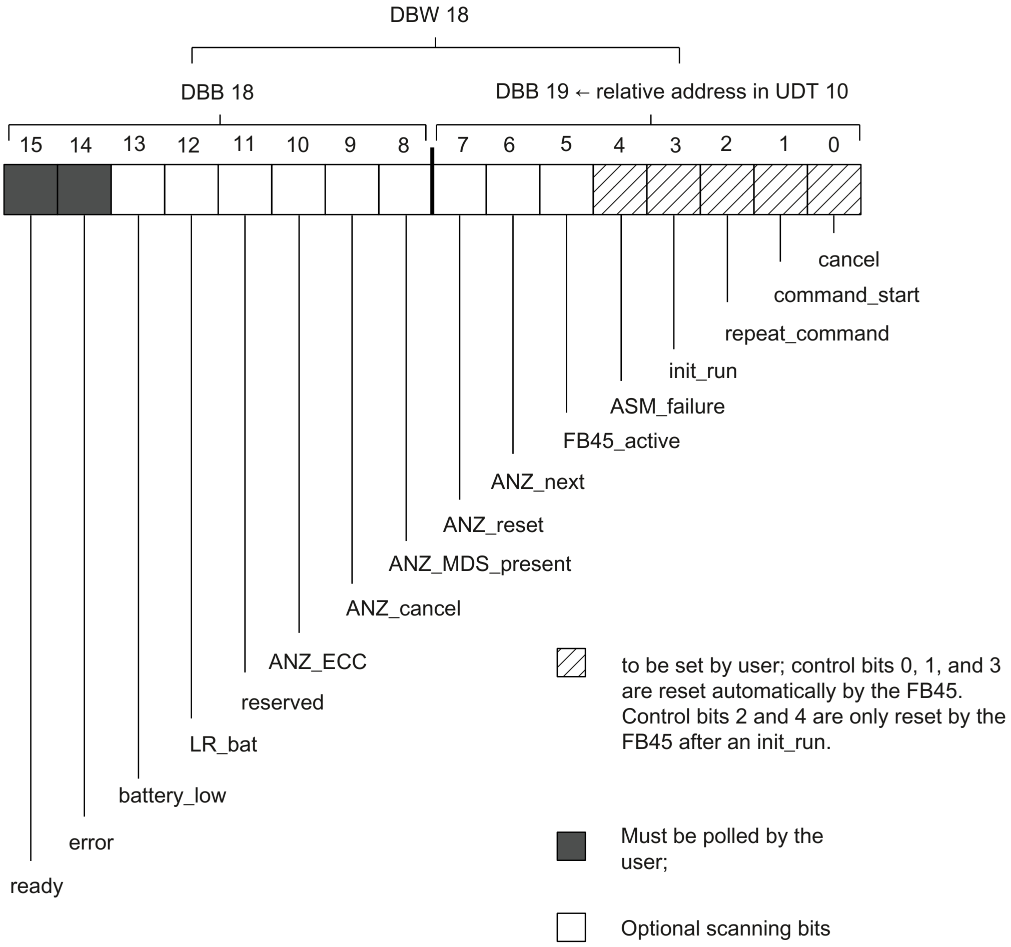

DBW 18
DBB 18
DBB 19 ← relative address in UDT 10
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
cancel
command_start
repeat_command
init_run
ASM_failure
FB45_active
ANZ_next
ANZ_reset
ANZ_MDS_present
ANZ_cancel
ANZ_ECC
reserved
LR_bat
battery_low
error
ready
▨ to be set by user; control bits 0, 1, and 3 are reset automatically by the FB45. Control bits 2 and 4 are only reset by the FB45 after an init_run.
■ Must be polled by the user;
□ Optional scanning bits

Figure 4-1 Command and status word "BEST" (DBW 18) with variable names

Table 4- 4 Variables in command and status word

Variable	Description
cancel	Not used
command_start	TRUE = Starts a command or a command chain. FALSE = reset occurs automatically with FB 45.
repeat_command	TRUE = command repetition: The last command or command chain stored on the CM is processed again with the next transponder. Command processing for the transponder is only started after the transponder that has already been processed has left the antenna field ("ANZ_MDS_present = 0") and a new transponder has entered the antenna field of the reader ("ANZ_MDS_present": 0 → 1). FALSE = no command repetition or command repetition is stopped after the command started with the "repeat_command" bit has been processed. Remember that this bit must be reset by the user to stop command repetition. The result of command repetition is fetched when "command_start" is set by the user. "repeat_command" is not automatically reset by FB 45 after command processing. The "init_run" command resets the "repeat_command" variable. This also interrupts a command repetition on the CM. "repeat_command" can be set again by the application with the next "command_start". The handling of command repetitions is described in the section "Command repetition (Page 163)". **Note:** The "repeat_command" bit can only be used to good effect when MOBY_mode = 5, 7.
init_run	TRUE = restart of the communications module. FB 45 is reset and the CM parameters are reassigned. All data and commands on the CM are lost. This bit must be set in the restart OB (OB 100) for each RFID channel or CM to ensure an automatic restart of the CM following a failure. After a CM failure, the "error_MOBY = 0F" error is signaled to the user. The user must then execute an "init_run". **Note:** • The "init_run" bit is initialized with "TRUE " when a parameter data block is downloaded from the programming device to the SIMATIC device. This causes an automatic restart on the CM. • The execution time of "init_run" is normally in the millisecond range. In the event of an error, the time may be up to 15s. FALSE = reset occurs automatically with FB 45.
ASM_failure	TRUE = the CM has failed. This bit is set by the user in OB 122. FB 45 signals an error to the user ("error_FB" = 09") and interrupts an active command. If OB 122 is not programmed by the user, the PLC changes to STOP if there is a CM failure. FALSE = reset occurs automatically with FB 45.
FB45_active	FB 45 is currently executing a command. This variable is set when the command is started ("command_start=True") and remains active until • FB 45 has received the last acknowledgment from the CM • The "init_run" bit was set • An error message was reported by the CM
ANZ_next	Not used
ANZ_reset	This bit indicates that the last command to be executed was a RESET . The RESET command was started by the user with "init_run".

Variable	Description
ANZ_MDS_present	Indicates the presence of a transponder in the antenna field of the reader. The number of transponders ("ANZ_MDS_present") is only indicated when the INPUT parameter "MDS_control" (see section "INPUT parameters (Page 27)") was set by the user. Remember that when an "init_run" executes, the "ANZ_MDS_present" display disappears briefly even when a transponder is permanently located in the antenna field.
ANZ_cancel	Not used
ANZ_ECC	Not used
reserved	Not used at this time
LR_bat	Not used
battery_low	Not used
error	FB 45 sets this bit if a command is terminated abnormally. The "error" bit is the checksum error bit for all errors that occur. The exact cause of the error is stored in the "error_ MOBY", "error_FB" or "error_BUS" variable (see section "Further displays (Page 33)" or section "Error messages and troubleshooting (Page 83)"). The error bit is reset when a command is started again.
ready	Ready message: After "ready" = TRUE is signaled, the "error" bit = FALSE still needs to be queried. This ensures that the command was executed normally. **Note:** To start "init_run" or "cancel", the "ready" bit does not need to be set.

4.2.5 Further displays

Table 4- 5 Displays

Variable	Description
ASM_busy	**RF600:** No meaning. This variable is always FALSE.
command_rep_active	The CM is currently processing a command repetition. The bit is set as a response to the control variable "repeat_command". After an "init_run", "command_rep_active" is first reset by FB 45 and then set again after a delay because FB 45 first transfers the MOBY commands to the CM.
number_MDS	The number of transponders presently located in the displayed is indicated. If more than 15 transponders are located in the antenna field, the "number_MDS" display remains set to 0F hex.
error_MOBY	This error was reported by the reader. The error is usually displayed by the ERR LED of the communications module or the reader (see section "Error messages and troubleshooting (Page 83)").
error_FB	Error message from FB 45 (see section "Error messages and troubleshooting (Page 83)").
error_BUS	The transmission path between FB 45 and the CM reports an error. It is usually a PROFIBUS/PROFINET error (see Section "Error messages and troubleshooting (Page 83)"). This error is signaled by system functions SFC 58/59.
version_MOBY	Display of the communications module firmware version. The value entered here is updated each time the CM starts up. It is ASCII-coded. Example: DBB 26 DBB 27 31 hex 30 hex → Version 1.0 “1“ “0“

All other variables of UDT 10 are for FB-internal use. They must never be changed by the user.

4.2.6 RFID commands of FB 45

Note

This section provides a description of all commands that can by processed by FB 45.

Before you can start an RFID command with the "command_start" control bit, you need to define this. UDT 20 (commentary in English), UDT 21 (commentary in German) or UDT 24 (Spanish commentary) is available for the simple definition of a command:

Table 4- 6 UDT 20 "MOBY CMD"

Address	Name	Type	Initial value	Comment
0.0		STRUCT		
+0.0	command	BYTE	B#16#2	MDS command: 1=write, 2=read, 3=init, 4=slg-status, 8=end, A=set-ant, B=mds-status
+1.0	sub_command	BYTE	B#16#0	Bit-pattern for INIT; mode for END,SET-ANT,MDS-STATUS,SLG-STATUS
+2.0	length	INT	1	Number of bytes to be read/written
+4.0	address_MDS	WORD	W#16#0	First addr on MDS; last addr on MDS for INIT; Week/Year for MDS-STATUS
+6.0	DAT DB number	INT	48	Number of DAT DB; data-DB for MDS data
+8.0	DAT DB address	INT	0	First address in DAT DB
=10.0		END_STRUCT		

Note

The UDTs are used in various RFID systems. As result, certain comments also relate to other RFID systems.

The "actual value" of the variables can be modified using the editor in the data view of the DB or in the STEP 7 application program.

Please note that the actual values can only be changed if no command is active ("ready" = 1).

4.2.7 Parameter assignment of the commands with FB 45

4.2.7.1 Overview of commands

Table 4- 7 Overview of commands

Command [hex]		Command	
normal	chained	syntax	Description
01	41	WRITE [1]	Write data to the transponder/reader
02	42	READ [1]	Read data from the transponder/reader
03	43	INIT [1]	Initialize transponder
04	44	SLG-STATUS	Query SLG/reader status
0A	4A	SET-ANT	Turn antenna on/off, if necessary initialize UHF algorithms.
0B	4B	MDS-STATUS	Query MDS/transponder status

[1] For information on the memory structure, refer to the sections "Memory configuration (Page 95)" and "Special memory configuration of the RF600 transponders (Page 98)".

4.2.7.2 WRITE

Table 4- 8 Writing data to the transponder or reader (according to "command_DB", UDT 20)

Command [hex]	sub_command [hex]	length [dez]	address_MDS [hex]	DAT_DB_Nr [dez]	DAT_DB_adr [dez]
0x01	–	1 to 32767 bytes length of the data to written to the transponder data	0x0000 to 0xFFFF The data is written to the transponder starting at this start address.	Number of the user DB containing the data to be written.	Start address of the data to be written.

Note

Acknowledging the successful write process

The reader has time-optimized writing functionality with which the following response can occur:

- If no data is modified on the transponder, writing is always acknowledged positively. This response also applies to write-protected transponders.
- Significantly shortened write access to transponders depending on the data content of the transponder.

4.2.7.3 READ

Table 4- 9 Reading data from the transponder/reader (according to "command_DB", UDT 20)

Command [hex]	sub_command [hex]	length [dez]	address_MDS [hex]	DAT_DB_Nr [dez]	DAT_DB_adr [dez]
0x02	–	1 to 32767 length of data to be read from the transponder	0x0000 to 0xFFFF Data is read from the transponder starting at this start address.	Number of the user DB in which the read data will be stored.	Start address of the read data.

4.2.7.4 INIT

Table 4- 10 Initialize transponder (according to "command_DB", UDT 20)

Command [hex]	sub_command [hex]	length [dez]	address_MDS [hex]	DAT_DB_Nr [dez]	DAT_DB_adr [dez]
0x03	0x00 to 0xFF Value with which the transponder is written	–	Memory size of the transponder to be initialized. You will find the memory size in the technical specifications of the transponder.	–	–

This command is used to initialize the user-memory area. During initialization, data relating to the preset length is written to the transponder.

4.2.7.5 SLG STATUS

Table 4- 11 SLG-STATUS (according to "command_DB", UDT 20)

Command [hex]	sub_command [hex]	length [dez]	address_MDS [hex]	DAT_DB_Nr [dez]	DAT_DB_adr [dez]
0x04	0x07 = status after UDT 300 [1]	–	–	Number of the user DB with UDT 30x structure in which the read data will be stored.	Start address of the read data.
	0x08 = status after UDT 340 [1]			Number of the user DB with UDT 34x structure in which the read data will be stored.	
	0x20 = first entries from Black List			Number of the user DB with UDT 37x structure in which the read data will be stored.	
	0x21 = all other entries from Black List.				

[1] You will find the UDT description in the section "UDTs of FB 45 (Page 41)".

With the "sub_command = 0x20, 0x21" of SLG-STATUS, all IDs of the transponders currently in the Black Listare read out. If there are more transponders in the Black List than can be transferred with one data record ("SLG-STATUS" with sub_command = 0x20), further data can be read out using the "sub_command = 0x21". This procedure can be repeated until all transponder IDs have been read out of Black List. If all IDs have been read out and you start another query, you will obtain a success acknowledgement with no data content.

If the number of transponders in the Black List changes between the queries with "sub_command = 0x20" and "sub_command = 0x21", 0 transponders will be reported. In this case, repeat the query.

You will find more detailed information on the Black List in the section "Black List algorithm (Page 124)".

Programming "SLG-STATUS" for transponders of the Black List

If the number of transponders in the Black List is greater than the number of transponders transferred with a "sub_command = 20", use the following programming.

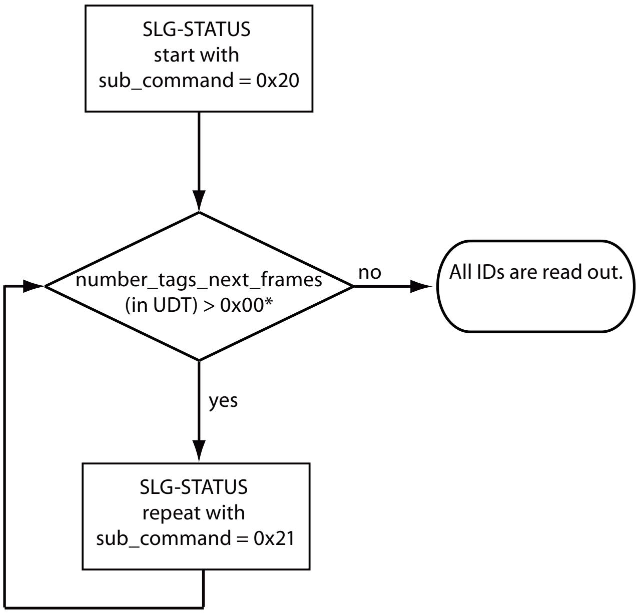


Figure 4-2 Sequence of "SLG-STATUS"

* The number of returned data records "X" depends on the set memory size of Black List and length of the saved EPC-IDs (see following table).

Table 4- 12 Returned data records with the "SLG-STATUS" command for transponders of the Black List

MOBY_mode	sub_command	Data structure	Maximum number of returned data records "X"
5 and 6	0x20	UDT 370	13 / 6 / 3 [1)]
	0x21		

[1)] Values for EPC-ID lengths of 96 / 240 / 496 bits

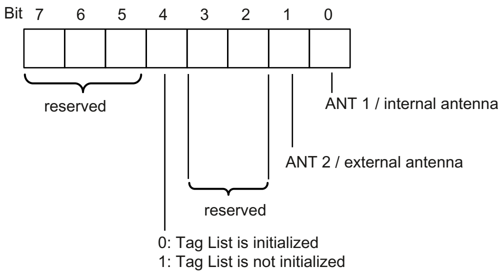
Note

"SLG-STATUS" command used as a chained command

If, for example, a maximum of 40 transponders are expected in the Black List, it may be an advantage to use the "SLG-STATUS" as a chained command according to the above table. If there are no additional transponders in the Black List, the value "0x00" is returned in the "number_tags_next_frames" and "number_tags_frame" variables of UDT370 in the result. You will find more detailed information on UDT 370 in the section "UDTs of FB 45 (Page 41)".

4.2.7.6 SET-ANT

Table 4- 13 Switch antenna of reader on and off (according to "command_DB", UDT 20)

Command [hex]	sub_command [hex]	length [dez]	address_MDS [hex]	DAT_DB_Nr [dez]	DAT_DB_adr [dez]
0x0A	 Bit 7 6 5 4 3 2 1 0 reserved ANT 1 / internal antenna ANT 2 / external antenna reserved 0: Tag List is initialized 1: Tag List is not initialized	–	–	–	–

You will find more detailed information on the UHF algorithms in the section "Use of industrial UHF algorithms (Page 99)".

The startup procedure

Following "init_run", the INPUT parameters are loaded on the reader and the reader is started:

ANT 1 is activated with the power setting defined in bits 0-3 and ANT 2 in bits 4-7 of the "distance_limiting" byte. With the RF630R, the antennas typically operate in multiplex mode of 100 ms. With the RF620R, the internal antenna is active.

Switching to the external antenna with the RF620R

Apart from the internal antenna of the RF620R, an external antenna can also be connected to the reader. This results in two different antenna modes that you can set on the reader. Using "SET-ANT", you can select the required mode taking into account the restrictions defined in this section.

Mode 1: Internal antenna activated

When the reader is started up initially, the internal antenna is activated automatically. You can turn the internal antenna off/on as required with bit 0 of "sub_command".

Switching to mode 2 (external antenna)

Send the "SET-ANT" command with "sub_command" ANT 1 = 0 and ANT 2 = 1. It is now no longer possible to switch back to the internal antenna. The internal antenna only becomes active after turning the reader off and on again. The external and internal antenna cannot be activated at the same time.

Mode 2: External antenna activated

You can turn the external antenna off/on as required with bit 1 of "sub_command".

External antenna of RF630R

Note

If only one antenna is connected to the RF630R reader:

After an "init_run", both antennas of the RF630R are switched on.

If you have connected only one antenna, switch off the antenna that is not connected immediately after the "init_run" using the "SET-ANT" command or the reader will report an error.

If the "SET-ANT" command to switch off the antenna is not sent before the read/write commands are sent, the reader must be restarted with "init_run".

4.2.7.7 MDS-STATUS

Table 4- 14 MDS-STATUS (according to "command_DB", UDT 20)

Command [hex]	sub_command [hex]	length [dez]	address_MDS [hex]	DAT_DB_Nr [dez]	DAT_DB_adr [dez]
0x0B	0x04 = status after UDT 290 [1]	–	–	Number of the user DB with UDT 29x / UDT 32x structure in which the read data will be stored	Start address of the read data.
	0x05 = status after UDT 320 [1]				

[1] You will find the UDT description in the section "UDTs of FB 45 (Page 41)".

4.2.8 UDTs of FB 45

The "MDS-/SLG-STATUS" commands return a variety of data. You can use the UDTs described in the following section for clear presentation and easy definition of the data blocks for the result.

UDT 300: Result of "SLG-STATUS" ("sub_command = 0x07")

Table 4- 15 UDT 300: "SLG-STATUS"

Address	Name	Type	Comment
0.0		STRUCT	
+0.0	status info	BYTE	SLG status mode
+1.0	hardware	CHAR	Type of hardware
+2.0	hardware version	WORD	Version of hardware
+4.0	reserved0	WORD	
+6.0	firmware	CHAR	Type of firmware
+8.0	firmware version	WORD	Version of firmware
+10.0	driver	CHAR	Type of driver
+12.0	current time	STRUCT	Current time
+0.0	hour	BYTE	Hours [1]
+1.0	min	BYTE	Minutes [1]
+2.0	sec	BYTE	Seconds [1]
+3.0	reserved1	BYTE	
=4.0		END_STRUCT	
+16.0	SLG version	BYTE	SLG version
+17.0	baud	BYTE	Baudrate
+18.0	reserved2	BYTE	
+19.0	distance limiting SLG	BYTE	Selected transmit power
+20.0	multitag SLG	BYTE	Multitag SLG
+21.0	field ON control SLG	BYTE	Selected comunication typ
+22.0	field ON time SLG	BYTE	Selected channel
+23.0	expert mode	BYTE	Expert mode
+24.0	status_ant	BYTE	Status of antenna [2]
+25.0	scanning time SLG	BYTE	Radio communication profile
+26.0	MDS control	BYTE	Presence mode
=28.0		END_STRUCT	

[1] The internal time stamp of the internal reader clock that relates to this event is output. The internal reader clock is not synchronized with UTC.

[2] The antenna status refers to the last executed "sub_command" command (bits 0 and 1) of "SET-ANT" or to the value preset by "init_run". In "init_run" of the RF620R, the default value is "1" (int. antenna on), with the RF630R, it is "3" (antennas 1 and 2 on).

UDT 340: Result of "SLG-STATUS" ("sub_command = 0x08")

Table 4- 16 UDT 340: "SLG-STATUS"

Address	Name	Type	Comment
0.0		STRUCT	
+0.0	status_info	BYTE	SLG-Status mode(Subcommand)
+1.0	hardware	CHAR	Type of hardware
+2.0	hardware_version	WORD	Version of hardware
+4.0	reserved_word1	WORD	Reserved
+6.0	firmware	CHAR	Type of firmware
+7.0	firmware_version_HB	BYTE	Version of firmware (High-Byte)
+8.0	firmware_version_LB	BYTE	Version of firmware (Low-Byte)
+9.0	driver	CHAR	Type of driver
+10.0	current_time_hour	BYTE	Hours 1)
+11.0	current_time_minute	BYTE	Minutes 1)
+12.0	current_time_sek	BYTE	Seconds 1)
+13.0	current_time_reservByte	BYTE	
+14.0	SLG_version	BYTE	SLG-Version
+15.0	baud	BYTE	Baudrate
+16.0	reserved_byte1	BYTE	Reserved
+17.0	distance_limiting_SLG	BYTE	Selected transmit power
+18.0	multitag_SLG	BYTE	Multitag SLG
+19.0	field_ON_control_SLG	BYTE	Selected communication type
+20.0	field_ON_time_SLG	BYTE	Selected channel
+21.0	expert_mode	BYTE	Expert mode
+22.0	status_ant	BYTE	Status of antenna 2)
+23.0	scanning_time_SLG	BYTE	Radio communication profile (country specific radio standard)
+24.0	MDS_control	BYTE	Precence mode
+25.0	blink_pattern	BYTE	Blink Pattern
+26.0	activated_algorithms	STRUCT	Information on currently selected algorithms
+0.0	Single_Tag	FALSE	Single_Tag [1]
+0.1	ITF_Phase2	FALSE	ITF_Phase2 [2]
+0.2	ITF_Phase1	FALSE	ITF_Phase1 [3]
+0.3	Smoothing	FALSE	Smoothing [4]
+0.4	Blacklist	FALSE	Blacklist [5]
+0.5	RSSI_Threshold	FALSE	RSSI_Threshold [6]
+0.6	Power_Ramp	FALSE	Power_Ramp [7]
+0.7	Power_Gap	FALSE	Power_Gap [8]
+1.0	Reserved1	FALSE	Reserved1 [1]
+1.1	Reserved2	FALSE	Reserved2 [2]
+1.2	Reserved3	FALSE	Reserved3 [3]
+1.3	Reserved4	FALSE	Reserved4 [4]
+1.4	EPC_MemBankFilter	FALSE	EPC_MemBankFilter [5]
+1.5	Tag_Hold	FALSE	Tag_Hold [6]

Address	Name	Type	Comment
+1.6	Multi_Tag	FALSE	Multi_Tag [7]
+1.7	ISTM	FALSE	ISTM [8]
=2.0		END_STRUCT	
+28.0	reserved_word2	WORD	Reserved
+30.0	reserved_word3	WORD	Reserved
+32.0	reserved_word4	WORD	Reserved
+34.0	filtered_max_rssi	BYTE	Maximum RSSI value of a tag, of all filtered tags
+35.0	reserved_byte2	BYTE	Reserved
+36.0	filtered_tags_rssi	BYTE	Number of tags, filtered out by the RSSI threshold
+37.0	reserved_byte3	BYTE	Reserved
+38.0	filtered_tags_black_list	WORD	Number of tags, filtered out via Black List
+40.0	filtered_tags_epc_data	WORD	Number of tags, filtered out via EPC Data Filter
+42.0	filtered_tags_smoothing	WORD	Number of tags in Tag List of status Not Observed
+44.0	itf_ph1_max_detect	WORD	Number of reads of a Tag, filtered out via ITF phase 1
+46.0	itf_ph1_tags_detect	WORD	Number of tags, filtered out via ITF phase 1
+48.0	itf_ph2_max_detect	WORD	Number of reads of a Tag, filtered out via ITF phase 2
+50.0	itf_ph2_tags_detect	WORD	Number of tags, filtered out via ITF phase 2
+52.0	filtered_istm_min_dist	WORD	Minimum distance of Tags according to sorting criterion of ISTM
+54.0	filtered_istm_tags	WORD	Number of tags, filtered out via ISTM algorithm
+56.0	last_error	BYTE	error code of the last occuring error (last_command)
+57.0	reserved_byte4	BYTE	Reserved
+58.0	error_command1	WORD	Last command (has lead to error code) "last_error"
+60.0	error_command2	WORD	Last command (has lead to error code) "last_error"
+62.0	error_command3	WORD	Last command (has lead to error code) "last_error"
+64.0	reserved_word5	WORD	Reserved
+66.0	reserved_array_byte	ARRAY[1...30]	
*1.0		BYTE	
=96.0		END_STRUCT	

[1] The internal time stamp of the internal reader clock that relates to this event is output. The internal reader clock is not synchronized with UTC.
[2] The antenna status refers to the "sub_command" (bits 0 and 1) of "SET-ANT" or to the value preset by "init_run". In "init_run" of the RF620R, the default value is "1" (int. antenna on), with the RF630R, it is "3" (antennas 1 and 2 on).

Note

Information on the UDTs in addresses +25 to +62

The meaning and use of the variables in addresses +25 to +62 is explained in the section "Status display of industrial UHF algorithms using of SLG-STATUS (Page 106)".

UDT 370: Result of "SLG-STATUS" ("sub_command = 0x20, 0x21")

The following example of UDT 370 is only valid if the EPC-ID length is 96 bits for all transponders. With other or variable EPC-ID lengths, this UDT must be adapted for the specific situation.

Table 4- 17 Example of UDT 370 "SLG-STATUS"

Address	Name	Type	Comment
0.0		STRUCT	
+0.0	reserved_byte0	BYTE	Reserved
+1.0	Status_info	BYTE	Status-Info, SLG-Status SubCommand 20/21
+2.0	number_tags_frame	BYTE	Number of Tags in this frame
+3.0	number_tags_next_frames	BYTE	Number of Tags in the next frames
+4.0	reserved_byte1	BYTE	Reserved
+5.0	reserved_byte2	BYTE	Reserved
+6.0	reserved_byte3	BYTE	Reserved
+7.0	reserved_byte4	BYTE	Reserved
+8.0	reserved_byte5	BYTE	Reserved
+9.0	reserved_byte6	BYTE	Reserved
+10.0	Black_List_ID	ARRAY[1..13]	
*0.0		STRUCT	
+0.0	EPC_Length	BYTE	EPC-ID Length
+1.0	Antenna	BYTE	Antenna = Default 3
+2.0	Filtered_tag	WORD	Number of times - EPC-ID filtered out via Black List
+4.0	EPC_1_2	WORD	EPC-ID
+6.0	EPC_3_4	WORD	EPC-ID
+8.0	EPC_5_6	WORD	EPC-ID
+10.0	EPC_7_8	WORD	EPC-ID
+12.0	EPC_9_10	WORD	EPC-ID
+14.0	EPC_11_12	WORD	EPC-ID
=16.0		END_STRUCT	
=218.0		END_STRUCT	

Table 4- 18 Explanations of UDT 370

Parameter status	Address	Meaning	
number_tags_ frame	+2.0	0x00 … 0xFF	Number of transponders entered in the Black List and displayed by the current "SLG-STATUS" query with "sub_command = 20".
number_tags_ next_frames	+3.0	0x00 … 0xFF	Number of transponders not included in the current "SLG-STATUS" query but read out of the Black List by subsequent queries with "sub_command = 21". Note: If the value is "0xFF", ≥ 255 transponders are in the Black List.
EPC_Length	+0.0	0x00 … 0xFF	Length of the EPC-ID in bytes
Antenna	+1.0	0x03	Transponders are entered in or filtered out of the Black List via the internal and external antenna or ANT1 or ANT2
Filtered_tag	+2.0	0x0000…0x FFFF	Number of inventories with which the transponder has already been filtered out and discarded via the Black List. If the maximum value "0xFFFF" is reached, the counter remains at the maximum value until the statistics are reset.
EPC_1_2 ... EPC_11_12	+4.0 ... +14.0	-	12-byte EPC-ID of the transponder

Note

EPC-IDs

"number_tags_frame" corresponds to the number of EPC-IDs in "SLG-STATUS" with "sub_command = 20". To receive the EPC-IDs of all transponders in the Black List, it may be necessary to send a repeated "SLG-STATUS" with "sub_command = 0x21" if "number_tags_next_frames > 0x00" until "number_tags_next_frames = 0x00.

UDT 290: Result of "MDS-STATUS" ("sub_command = 0x04")

Table 4- 19 UDT 290: "MDS-STATUS"

Address	Name	Type	Comment
0.0		STRUCT	
+0.0	reserved0	BYTE	
+1.0	status_info	BYTE	MDS status mode
+2.0	UID	STRUCT	
+0.0	Byte_1_4	DWORD	Unique identifier (MDS number)
+4.0	Byte_5_8	DWORD	
=8.0		END_STRUCT	
+10.0	antenna	BYTE	Antenna which has observed the MDS
+11.0	RSSI	BYTE	RSSI value
+12.0	last_observed	STRUCT	Last observed time
+0.0	hour	BYTE	Hours [1)
+1.0	min	BYTE	Minutes [1)
+2.0	sec	BYTE	Seconds [1)
+3.0	channel	BYTE	Channel
=4.0		END_STRUCT	
+16.0	EPC_length	BYTE	EPC-Length
+17.0	reserved1	BYTE	
=18.0		END_STRUCT	

[1) The internal time stamp of the internal reader clock that relates to this event is output. The internal reader clock is not synchronized with UTC.

UDT 320: Result of "MDS-STATUS" ("sub_command = 0x05")

Table 4- 20 UDT 320: "MDS-STATUS"

Address	Name	Type	Comment
0.0		STRUCT	
+0.0	reserved0	BYTE	
+1.0	status_info	BYTE	MDS status mode
+2.0	antenna	BYTE	Antenna which has observed the MDS
+3.0	channel	BYTE	Channel
+4.0	UID	STRUCT	
+0.0	Byte_1_4	DWORD	Unique identifier (MDS-Number)
+4.0	Byte_5_8	DWORD	
=8.0		END_STRUCT	
+12.0	DT_glimpsed	DWORD	Time elapsed between achknowledgement and first read in [ms]
+16.0	reserved1	DWORD	
+20.0	last_observed	STRUCT	Last observed time
+0.0	hour	BYTE	Hours 1)
+1.0	min	BYTE	Minutes 1)
+2.0	sec	BYTE	Seconds 1)
+3.0	EPC_length	BYTE	EPC-Length
=4.0		END_STRUCT	
+24.0	EPC_ID_Byte	STRUCT	
+0.0	Byte_01_02	WORD	Byte 01-02 of EPC-ID
+2.0	Byte_03_04	WORD	Byte 03-04 of EPC-ID
+4.0	Byte_05_06	WORD	Byte 05-06 of EPC-ID
+6.0	Byte_07_08	WORD	Byte 07-08 of EPC-ID
+8.0	Byte_09_10	WORD	Byte 09-10 of EPC-ID
+10.0	Byte_11_12	WORD	Byte 11-12 of EPC-ID
+12.0	Byte_13_14	WORD	Byte 13-14 of EPC-ID
+14.0	Byte_15_16	WORD	Byte 15-16 of EPC-ID
+16.0	Byte_17_18	WORD	Byte 17-18 of EPC-ID
+18.0	Byte_19_20	WORD	Byte 19-20 of EPC-ID
+20.0	Byte_21_22	WORD	Byte 21-22 of EPC-ID
+22.0	Byte_23_24	WORD	Byte 23-24 of EPC-ID
+24.0	Byte_25_26	WORD	Byte 25-26 of EPC-ID
+26.0	Byte_27_28	WORD	Byte 27-28 of EPC-ID
+28.0	Byte_29_30	WORD	Byte 29-30 of EPC-ID
+30.0	Byte_31_32	WORD	Byte 31-32 of EPC-ID
+32.0	Byte_33_34	WORD	Byte 33-34 of EPC-ID
+34.0	Byte_35_36	WORD	Byte 35-36 of EPC-ID
+36.0	Byte_37_38	WORD	Byte 37-38 of EPC-ID
+38.0	Byte_39_40	WORD	Byte 39-40 of EPC-ID
+40.0	Byte_41_42	WORD	Byte 41-42 of EPC-ID
+42.0	Byte_43_44	WORD	Byte 43-44 of EPC-ID

Address	Name	Type	Comment
+44.0	Byte_45_46	WORD	Byte 45-46 of EPC-ID
+46.0	Byte_47_48	WORD	Byte 47-48 of EPC-ID
+48.0	Byte_49_50	WORD	Byte 49-50 of EPC-ID
+50.0	Byte_51_52	WORD	Byte 51-52 of EPC-ID
+52.0	Byte_53_54	WORD	Byte 53-54 of EPC-ID
+54.0	Byte_55_56	WORD	Byte 55-56 of EPC-ID
+56.0	Byte_57_58	WORD	Byte 57-58 of EPC-ID
+58.0	Byte_59_60	WORD	Byte 59-60 of EPC-ID
+60.0	Byte_61_62	WORD	Byte 61-62 of EPC-ID
=62.0		END_STRUCT	
+86.0	reads	WORD	Number of Reads of MDS in Inventory (1 - 65535)
+88.0	RSSI	BYTE	Current RSSI value of MDS [2]
+89.0	mean RSSI	BYTE	Mean RSSI value of MDS
+90.0	max RSSI	BYTE	Max RSSI value of MDS
+91.0	min RSSI	BYTE	Min RSSI value of MDS
+92.0	min POWER	BYTE	Min Power value of MDS
+93.0	current_POWER	BYTE	Current Power value of MDS [3]
+94.0	reserved2	ARRAY[1..137]	-
*1.0		BYTE	
=232.0		END_STRUCT	

[1] The internal time stamp of the internal reader clock that relates to this event is output. The internal reader clock is not synchronized with UTC.

[2] The value "Reads" indicates the total transponder recognitions (inventories) regardless of the set smoothing parameters. In this way, in extreme situations, the "Reads" counter can reach extremely high values without the transponder ever reaching the "Observed" status.

[3] The "current_Power" value is specified as radiated power in 0.25 dBm steps (ERP). A "current_Power" value of 72 (0x48) therefore corresponds to 18 dBm (ERP).

The bytes of the 8-byte handle ID are described in the section "Memory configuration (Page 95)".

Note

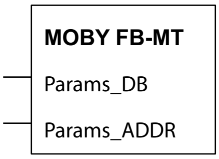
Comments

The UDTs are used in various RFID systems. As a result, certain comments also relate to other RFID systems.

4.3 FB 55 parameter assignment

4.3.1 Configuration scheme of FB 55

Table 4- 21 Configuration scheme of FB 55

Ladder logic programming box	Parameter	Data type	Permitted range	Description
"Inst-DB FB 55" 	Params_DB	INT	2 to 32767	Parameter data block number for an RFID channel (reader)
	Params_ADDR	INT	0, 50, 100,... *)	Address pointer in the parameter data block to the start of a UDT 10

*) These values are examples of when only data structures of the UDT 10 type follow in succession. These values change if UDT 10 is followed by a command structure (UDT 30).

"Params_DB" and "Params_ADDR" form a pointer to a data structure. This data structure is defined by linking in UDT 10 (English) or UDT 11 (German). A separate data structure must be defined for each reader.

4.3.2 Parameter assignment in the parameter DB

Each reader needs its own parameters. These are predefined in a data structure as UDT 10 (with commentary in English) or UDT 11 (with commentary in German) or UDT 14 (with commentary in Spanish). This UDT must be linked into a data block for each reader. Various variables are defined in UDT 10:

- INPUT parameters: These variables must be entered by the user once during configuration. Throughout the run time it is not necessary to change or scan these parameters.

  Please note that after changing an INPUT parameter, the new setting is only effective after you execute an "init_run".
- Control bits: The user starts his commands with these Boolean variables.
- Displays: The displays indicate the command progress to the user. Error analyses can be performed easily.
- FB-internal variables: These variables are not relevant for the user. They must not be changed by the application. Malfunctions and data corruption would otherwise ensue.

The following table shows the complete UDT 10 / UDT 11. For programmers who prefer to address using absolute values, the first column specifies the relative addresses.

Table 4- 22 UDT 10 "MOBY Param"

Address	Name	Type	Initial value	Comment
0.0		STRUCT		
+0.0	ASM address	INT	256	Input: address of ASM (cycle word)
+2.0	ASM channel	INT	1	Input: number of channel (1..4)
+4.0	command DB number	INT	47	Input: number of command DB
+6.0	command_DB_address	INT	0	Input: first address of commands in the command DB
+8.0	MDS_control	BYTE	B#16#1	Input: setup the MDS controlling (0 and 1)
+9.0	reserved0	BOOL	FALSE	
+9.1	RESET_long	BOOL	TRUE	Input: true: long RESET-telegramm, only used for MOBY mode 5
+10.0	MOBY_mode	BYTE	B#16#6	Input: MOBY working mode (only 6 and 7)
+11.0	scanning time	BYTE	B#16#0	Input: scan time for MOBY D/U
+12.0	option 1	BYTE	B#16#0	Input: reset-command option 1
+13.0	distance limiting	BYTE	B#16#F	Input: range limit
+14.0	multitag	BYTE	B#16#1	Input: max. no. of MDS in field
+15.0	field ON control	BYTE	B#16#0	Input: working mode of Bero
+16.0	field ON time	BYTE	B#16#0	Input: time has be of Bero
+17.0	reserved1	BYTE	B#16#0	
+18.0	ANZ MDS present	BOOL	FALSE	MDS is present
+18.1	reserved2	BOOL	FALSE	
+18.2	reserved3	BOOL	FALSE	
+18.3	reserved4	BOOL	FALSE	
+18.4	reserved5	BOOL	FALSE	
+18.5	reserved6	BOOL	FALSE	
+18.6	error	BOOL	FALSE	Error during command processing has appeared
+18.7	ready	BOOL	FALSE	Command chain has been finished
+19.0	reserved7	BOOL	FALSE	
+19.1	command_start	BOOL	FALSE	Set: startup signal for command or command chain
+19.2	repeat command	BOOL	FALSE	Set: repeat last command
+19.3	init run	BOOL	TRUE	Set: Reset ASM and parameterize again
+19.4	ASM failure	BOOL	FALSE	OB122 set: ASM removed from PROFIBUS
+19.5	FC55 active	BOOL	FALSE	FB is active
+19.6	reserved8	BOOL	FALSE	
+19.7	ANZ reset	BOOL	FALSE	Last command was RESET
+20.0	ASM busy	BOOL	FALSE	A command is processed by ASM
+20.1	command_rep_active	BOOL	FALSE	ASM command repetition has been activated
+21.0	number MDS	BYTE	B#16#0	Number of MDS actual in field
+22.0	error MOBY	BYTE	B#16#0	Error indication of interface module
+23.0	error FB	BYTE	B#16#0	Error display of FB
+24.0	error BUS	WORD	W#16#0	Error appeared on PROFIBUS
+26.0	version MOBY	WORD	W#16#0	Firmware version of MOBY
+28.0	counter customer	BYTE	B#16#2	Internal cycle counter
+29.0	counter_actual	BYTE	B#16#0	Internal FB variables. May not be changed by the user.
+30.0 ... +49.0				FC internal
=50.0		END_STRUCT		

Note

The UDTs are used in various RFID systems. As result, certain comments also relate to other RFID systems.

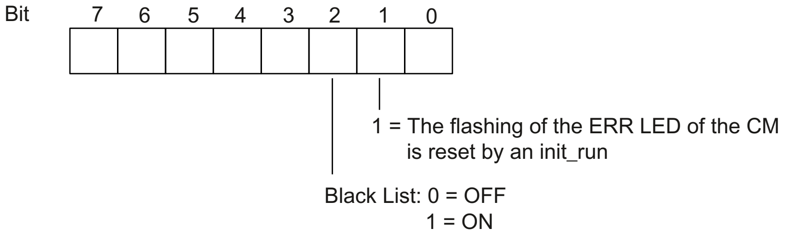
Note

"number_MDS" only agrees with the actual number of transponders in the antenna field (presence) if there are between 1 and 14 (0x01 hex - 0x0E hex) transponders in the antenna field at the same time. If "number_MDS" displays the value 0x0F, 15 or more transponders (0x0F) can be in the antenna field at the same time. The maximum number of transponders is restricted only by physical constraints (e.g. effective radiated power, antenna field characteristics, and spatial arrangement of transponders).

4.3.3 INPUT parameters

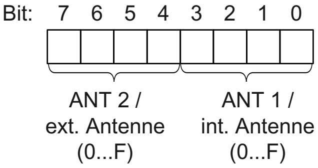
Table 4- 23 FB 55 INPUT parameters for RF620R/RF630R

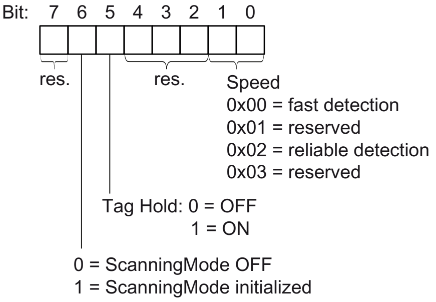
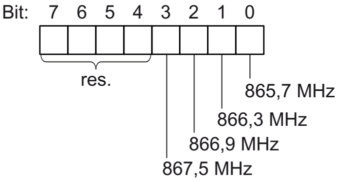
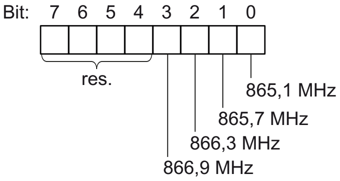
<table>
<tr><th>Variable</th><th colspan="3">Description</th></tr>
<tr><td>ASM_address</td><td colspan="3">Logical base address of the CM; this address must match the "start address" of the CM in HW Config of the SIMATIC Manager. Remember that this address has nothing to do with the PROFIBUS address set on the CM or the ET200X/M.</td></tr>
<tr><td>ASM_channel</td><td colspan="3">Number of the RFID channel to be used.
Range of values: 1, 2</td></tr>
<tr><td>command_DB_ number</td><td colspan="2">Number of the data block in which the tag command is specified</td><td rowspan="2">**Note:**
These INPUT parameters can be changed whenever "ready" = 1. An "init_run" does not need to be executed after changing these parameters.</td></tr>
<tr><td>command_DB_ address</td><td colspan="2">Address within the "command_DB". The next tag command starts at this address. "command_DB_number" and "command_DB_address" form a data pointer to the next command.</td></tr>
<tr><td rowspan="4">MDS_control</td><td colspan="3">"MDS_control" switches the presence check or transponder control on the CM on or off. If the presence check is active, transponders entering the antenna field are displayed.</td></tr>
<tr><td>Value</td><td colspan="2">Transponder control</td></tr>
<tr><td>0</td><td colspan="2">Presence check is off. The variable "ANZ_MDS_present" does not indicate a valid value.
Note: With this setting, the antennas remain switched on. It is not possible to turn off the antennas with the "SET_ANT" command.</td></tr>
<tr><td>1</td><td colspan="2">Presence check is on. The transponder control is off. The variable "ANZ_MDS_present" indicates a transponder in the antenna field of a reader.</td></tr>
<tr><td>reserved0</td><td colspan="3">reserved</td></tr>
<tr><td>RESET_long</td><td colspan="3">Long "RESET" frame.
RF600: = TRUE</td></tr>
</table>

<table>
<tr><th>Variable</th><th colspan="5">Description</th></tr>
<tr><td rowspan="5">MOBY_mode</td><td colspan="5">RFID mode setting</td></tr>
<tr><td>Value</td><td colspan="4">Mode</td></tr>
<tr><td>6</td><td colspan="4">RF600:
• with single tag handling (UID = 0x00), 4 bytes UID of the 8 byte handle ID
• with multitag handling, 4 bytes UID as handle ID for access to transponders with an EPC-ID of any length</td></tr>
<tr><td>7</td><td colspan="4">RF600:
• with single tag handling (UID = 0x00), 8 bytes UID
• with multitag handling, 8 bytes UID of bytes 5-12 or the 12-byte long EPC-ID</td></tr>
<tr><td colspan="5"><b>Note:</b>"MOBY_mode" may only be changed after a CM is turned on.</td></tr>
<tr><td rowspan="15">scanning_time</td><td colspan="5">"scanning_time" describes the wireless profile according to EPC Global. Set the correct standard according to the country in which you want to operate the reader. Please check which standard is applicable to your country before you select a country/wireless profile.</td></tr>
<tr><td colspan="2"></td><td colspan="3">RF600 reader variant</td></tr>
<tr><td>scanning _time</td><td>Description</td><td>ETSI</td><td>FCC</td><td>CMIIT</td></tr>
<tr><td>0</td><td>No standard selected; the error 0x15 is sent</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>1</td><td>Reader works with the default wireless profile. Value of the default wireless profile:</td><td>ETSI new</td><td>FCC</td><td>China</td></tr>
<tr><td>2</td><td>ETSI new: EU, EFTA, Turkey;
4-channel plan</td><td>X</td><td>-</td><td>-</td></tr>
<tr><td>3</td><td>ETSI old: EU, EFTA, Turkey;
readers commissioned after December 31, 2009, must not be operated with this setting.</td><td>X</td><td>-</td><td>-</td></tr>
<tr><td>4</td><td>FCC: e.g. USA, Canada, Mexico</td><td>-</td><td>X</td><td>-</td></tr>
<tr><td>5</td><td>Reserved</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>6</td><td>China</td><td>-</td><td>-</td><td>X</td></tr>
<tr><td>7</td><td>Thailand</td><td>-</td><td>X</td><td>-</td></tr>
<tr><td>8</td><td>Brazil</td><td>-</td><td>X</td><td>-</td></tr>
<tr><td>9</td><td>South Korea</td><td>-</td><td>X</td><td>-</td></tr>
<tr><td>C0</td><td>India</td><td>X</td><td>-</td><td>-</td></tr>
<tr><td colspan="5"><b>Note:</b> If you select country profiles other than those defined for the particular reader variant, the error message "09" (see section Error messages and flashing codes (Page 84)) is acknowledged.</td></tr>
<tr><td>option_1</td><td colspan="5">This byte is bit-coded. As default, it has the value B#16#0.


Bit
7
6
5
4
3
2
1
0
1 = The flashing of the ERR LED of the CM is reset by an init_run
Black List: 0 = OFF
1 = ON

You will find more detailed information on the Black List in the section "Use of industrial UHF algorithms (Page 99)".</td></tr>
</table>

<table>
<tr><th>Variable</th><th colspan="6">Description</th></tr>
<tr><td rowspan="9">distance_limiting</td><td colspan="6">"distance_limiting" sets the transmit power of the reader.

By default, ANT 1 is used with the preset transmit power. Section "SET-ANT (Page 65)" describes how to switch over to ANT 2 with the transmit power defined here.</td></tr>
<tr><td>Hex value</td><td>RF630R
transmit power</td><td colspan="3">RF620R
radiated power (internal antenna)</td><td>RF620R
transmit power</td></tr>
<tr><td></td><td>dBm / (mW)</td><td>ETSI
dBm / (mW)
ERP</td><td>FCC
dBm / (mW)
EIRP</td><td>CMIIT
dBm / (mW)
ERP</td><td>dBm / (mW)</td></tr>
<tr><td>0</td><td>18 / (65)</td><td>18 / (65)</td><td>20 / (105)</td><td>18 / (65)</td><td>18 / (65)</td></tr>
<tr><td>1</td><td>19 / (80)</td><td>19 / (80)</td><td>21 / (130)</td><td>19 / (80)</td><td>19 / (80)</td></tr>
<tr><td>...</td><td>...</td><td>...</td><td>...</td><td>...</td><td>...</td></tr>
<tr><td>9</td><td>27 / (500)</td><td>27 / (500)</td><td>29 / (795)</td><td>27 / (500)</td><td>27 / (500)</td></tr>
<tr><td>A</td><td>27 / (500)</td><td>28 / (630)</td><td>30 / (1000)</td><td>28 / (630)</td><td>27 / (500)</td></tr>
<tr><td>B (...F)</td><td>27 / (500)</td><td>29 / (800)</td><td>31 / (1260)</td><td>29 / (800)</td><td>27 / (500)</td></tr>
<tr><td>multitag</td><td colspan="6">Number of transponders expected in the antenna field.
Permitted values:
• 0x01 ... 0x28 for RF620R
• 0x01 ... 0x50 for RF630R with 2 antennas (SET-ANT = 0x03)
• 0x01 ... 0x28 for RF630R with 1 antenna (SET-ANT = 0x01 or SET-ANT = 0x02).
The value stored in "multitag" defines the maximum expected number of transponders to be read (EPC-ID) in the Inventory.
The value does not restrict the number of transponders to be processed in the antenna field.
To allow an efficient inventory of transponders in the antenna field, the values given here should not deviate from the maximum number of transponders expected in the antenna field by more than approx. 10%.</td></tr>
</table>

Variable	Description
field_ON_control	"field_ON_control" sets the communications speed (fast/slow) and Tag Hold(ON/OFF).  Bit: 7 6 5 4 3 2 1 0 res. res. Speed 0x00 = fast detection 0x01 = reserved 0x02 = reliable detection 0x03 = reserved Tag Hold: 0 = OFF 1 = ON 0 = ScanningMode OFF 1 = ScanningMode initialized Reader parameter assignments that have been optimized depending on the application are available with Speed: • 0x00 = fast detection • 0x02 = slower, more reliable detection * You will find more detailed information on Tag Hold in the section "Use of industrial UHF algorithms (Page 99)".
	ScanningMode: bit 6 = 0: Normal multitag mode (including "repeat_command") Bit 6 = 1: Unspecified read commands (UID = 0x00) are also accepted by the CM/reader if there is more than one transponder in the antenna field. By setting bit 6 to 1, the reader in multi-tag mode is prepared for the use of "ScanningMode". You will find more detailed information on "ScanningMode" in the section "Command repetition and ScanningMode (Page 163)".
field_ON_time	**ETSI/India variant:** 0x00 ... 0x0F
	Changing the channel assignment in the ETSI wireless profile ("scanning_time = 0x02"):  Bit: 7 6 5 4 3 2 1 0 res. 865,7 MHz 866,3 MHz 866,9 MHz 867,5 MHz Changing the channel assignment in the India wireless profile ("scanning_time = 0xC0"):  Bit: 7 6 5 4 3 2 1 0 res. 865,1 MHz 865,7 MHz 866,3 MHz 866,9 MHz
	0x00: Default; the channels of the reader are used in four channel mode. Note: The setting 0x0F is identical to 0x00. With bits 0 to 3 of the "field_ON_time" byte, a channel (frequency) plan can be created for the situation in which several readers are operated in close proximity. 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 (as of ETSI EN 302 208 V1.2.1). With time-critical applications, a smaller loss in performance can therefore be assumed in contrast to 2 to 4-channel mode of a reader. If 2 to 4 channels per reader are used, the reader switches to another channel after 0.1 second in two-antenna mode and after 4 seconds in single-antenna mode. If only one of the 4 channels is selected, a port of 100 ms is forced after 4 seconds according to the standard. **FCC and CMIIT variant:** Normal: 0x00
reserved1	reserved

4.3.4 Command and status word

The control bits of FB 55 are defined in the command and status word.

The command and status word "BEST" (DBW 18) with the variables is generated using UDT 10. The variables and the associated relative addresses in UDT 10 are shown in the following figure.

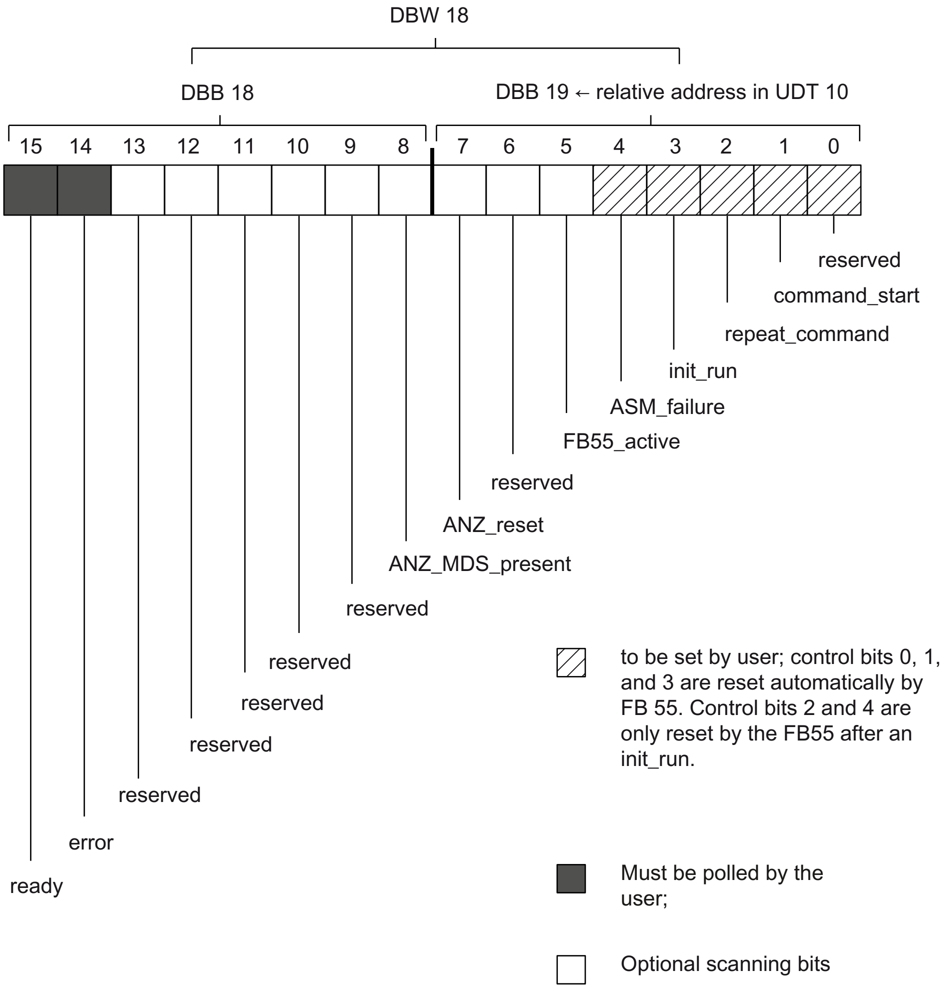

DBW 18
DBB 18
DBB 19 ← relative address in UDT 10
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
reserved
command_start
repeat_command
init_run
ASM_failure
FB55_active
reserved
ANZ_reset
ANZ_MDS_present
reserved
reserved
reserved
reserved
reserved
error
ready
to be set by user; control bits 0, 1, and 3 are reset automatically by FB 55. Control bits 2 and 4 are only reset by the FB55 after an init_run.
Must be polled by the user;
Optional scanning bits

Figure 4-3 Assignment of the command and status word "BEST" (DBW 18) with variable names

Table 4- 24 Variables in command and status word

Variable	Description
command_start	TRUE = Starts a command or a command chain.
repeat_command	TRUE = command repetition: The last command or command chain stored on the CM is processed again with the next transponder. Command processing for the transponder is only started after the transponder that has already been processed has left the antenna field ("ANZ_MDS_present = 0") and a new transponder has entered the antenna field of the reader ("ANZ_MDS_present": 0 → 1). FALSE = no command repetition or command repetition is stopped after the command started with the "repeat_command" bit has been processed. Remember that this bit must be reset by the user to stop command repetition. The result of command repetition is fetched when "command_start" is set by the user. "repeat_command" is not automatically reset by FB 55 after command processing. The "init_run" command resets the "repeat_command" variable. This also interrupts a command repetition on the CM. "repeat_command" can be set again by the application with the next "command_start". The handling of command repetitions is described in the section "Command repetition (Page 163)". **Note:** The "repeat_command" bit can only be used to good effect when MOBY_mode = 5, 7. If you want to use "repeat_command" with a multitag application, refer to the section "Command repetition and ScanningMode (Page 163)".
init_run	TRUE = restart of the communications module. FB 55 is reset and the CM parameters are reassigned. All data and commands on the CM are lost. This bit must be set in the restart OB (OB 100) for each RFID channel or CM to ensure an automatic restart of the CM following a failure. After a communications module failure, an "init_run" is not executed automatically. "error_MOBY = 0F" is reported to the user. **Note:** • The "init_run" bit is initialized with "TRUE " when a parameter data block is downloaded from the programming device to the SIMATIC device. This causes an automatic restart on the CM. • The execution time of "init_run" is normally in the millisecond range. In the event of an error, the time may be up to 15s.
ASM_failure	TRUE = the CM has failed. This bit is set by the user in OB 122. FB 55 then signals an error to the user ("error_FB" = 09) and interrupts an active command. If OB 122 is not programmed by the user, the PLC changes to STOP if there is a CM failure.
FB55_active	FB 55 is currently executing a command. This variable is set when the command is started ("command_start=True") and remains active until • FB 55 has received the last acknowledgment from the CM • "init_run" bit has been set • An error message was reported by the CM
ANZ_reset	This bit indicates that the last command to be executed was a RESET . The RESET command was started by the user with "init_run".
ANZ_MDS_present	Indicates the presence of one or more transponders in the antenna field of the reader. The number of transponders ("ANZ_MDS_present") is only indicated when the INPUT parameter "MDS_control" (see section "INPUT parameters (Page 51)") was set by the user. Remember that when an "init_run" executes, the "ANZ_MDS_present" display disappears briefly even when a transponder is permanently located in the antenna field.

Variable	Description
error	FB 55 sets this bit if a command is terminated abnormally. The "error" bit is the checksum error bit for all errors that occur. The exact cause of the error is stored in the "error_ MOBY", "error_FB" or "error_BUS" variable (see section "Further displays (Page 57)" or section "Error messages and troubleshooting (Page 83)"). The "error" bit is reset when a command is started again.
ready	Ready message: After "ready" = TRUE is signaled, the "error" bit = FALSE still needs to be queried. This ensures that the command was executed normally. **Note:** To start "init_run" or "cancel", the "ready" bit does not need to be set.

4.3.5 Further displays

Table 4- 25 Displays

Variable	Description
ASM_busy	**RF600:** No meaning. This variable is always FALSE.
command_rep_active	The CM is currently processing a command repetition. The bit is set as a response to the control variable "repeat_command". After an "init_run", "command_rep_active" is first reset by FB 55 and then set again after a delay because FB 55 first transfers the MOBY commands to the CM.
number_MDS	The number of transponders presently located in the displayed is indicated. If more than 15 transponders are located in the antenna field, the "number_MDS" display remains set to 0F hex.
error_MOBY	This error was reported by the reader. The error is usually displayed by the ERR LED of the communications module or the reader (see section "Error messages and troubleshooting (Page 83)").
error_FB	Error message from FB 55 (see section "Error messages and troubleshooting (Page 83)").
error_BUS	The transmission path between FB 55 and the CM reports an error. This is usually a PROFIBUS/PROFINET error. (see section "Error messages and troubleshooting (Page 83)"). This error is signaled by system functions SFC 58/59.
version_MOBY	Display of the firmware version of the communications modules. The value entered here is updated each time the CM starts up. It is ASCII-coded. Example: DBB 26 DBB 27 31 hex 30 hex → Version 1.0 “1“ “0“

All other variables of UDT 10 are for FB-internal use. They must never be changed by the user.

4.3.6 RFID commands of FB 55

4.3.6.1 UDT 30 - the structure for the RFID command

Note

This section provides a description of all commands that can by processed by FB 55.

Before you can start an RFID command with "command_start", you need to define the command. UDT 30 (comments in English) or UDT 31 (comments in German) is available for the simple definition of a command:

Table 4- 26 UDT 30 "MOBY 55 CMD"

Address	**Name**	**Type**	**Initial value**	**Comment**
0.0		STRUCT		
+0.0	command	BYTE	B#16#2	MDS command: 1=write, 2=read, 3=init, 4=slg-status, 8=end, A=set-ant, B=mds-status
+1.0	sub_command	BYTE	B#16#0	bit-pattern for INIT; mode for END,SET-ANT,MDS-STATUS,SLG-STATUS,GET
+2.0	length	INT	1	number of bytes to be read/written
+4.0	address_MDS	WORD	W#16#0	first addr on MDS; last addr on MDS for INIT; Week/Year for MDS-STATUS
+6.0	DAT_DB_number	INT	59	number of DAT DB; data-DB for MDS data
+8.0	DAT_DB_address	INT	0	first address in DAT DB

+10.0	UID_1_4	DWORD	DW#16#0	UID;
				length MOBY U: 4 Bytes;
				length MOBY D: 8 Bytes
				(1.-4. Byte)

+14.0	UID_5_8	DWORD	DW#16#0	UID; MOBY D: 5.-8. Byte
+18.0	Copy_address_MDS	WORD	W#16#0	first address on destination MDS

+20.0	Copy_UID_1_4	DWORD	DW#16#0	UID of destination MDS;
				length MOBY U: 4 Bytes;
				MOBY D: 8 Bytes (1.-4. Byte)

+24.0	Copy_UID_5_8	DWORD	DW#16#0	UID of destination MDS; MOBY D: 5.-8. Byte
+28.0	reserved	WORD	W#16#0	
=30.0		END_STRUCT		

Note

The UDTs are used in various RFID systems. As result, certain comments also relate to other RFID systems.

The "actual value" of the variables can be modified using the editor in the data view of the DB or in the STEP 7 application program.

Please note that the actual values can only be changed if no command is active ("ready" = 1).

4.3.6.2 UID

The UID is stored in the "UID_1_4" and "UID_5_8" field in UDT 30. With this field, you can when necessary access a specific transponder within a bunch of them. The UID parameter (unique identifier) is used to uniquely assign the command to be executed to the transponder in multitag mode.

With RF600, the UID can be formed in two ways. The setting is made using the "MOBY_mode" parameter in UDT 10:

- MOBY_mode = 6: the UID consists of the first 4 bytes of the 8 byte long handle ID
- MOBY_mode = 7: the UID consists of an 8-byte long ID that is copied from the least significant 8 bytes of the EPC-ID.

RFID mode: MOBY_mode = 6

With MOBY_mode = 6 , the 4 bytes of the 8 byte handle ID take over the function of the UID as well.

The handle ID must be queried in advance with the "GET" command.

If there is only one transponder in the antenna field, the UID can also be assigned the value zero (= single tag mode). The command is then executed for the transponder currently located in the antenna field.

Setting the UID in the command	Meaning
00000000	Single tag mode: Any individual transponder located in the antenna field. ScanningMode: Any number of transponders located in the antenna field.
00000001 to FFFFFFFF	Multitag mode: The 4 bytes of a handle ID belonging to the transponder. The assignment to the EPC-ID of a transponder is random and can be called up using "GET".

Note

Behavior in multitag mode with UID > 0x00

The reader can only access a specific transponder within a bunch of them if the handle ID of the transponder in the antenna field is known.

Note

Behavior in single tag mode or in scanning mode when UID = 0x00

Single tag mode: The reader can only access one specific transponder if there are no other transponders in the antenna field.
ScanningMode: The reader processes every transponder in the antenna field with the command/command chain on the reader.

If the content of the handle ID is copied into the UID in the multitag command, the transponder with the handle ID is accessed. This works only when there is not more than one transponder with the same EPC-ID in the antenna field and when the transponder has a valid handle ID.

If the reader detects a violation of this rule, it outputs an error message "0x1D" (see section Classification of error messages (Page 83)).

The exception here is the ScanningMode which, when active, allows transponders to be read even if the handle ID of the transponder is unknown.

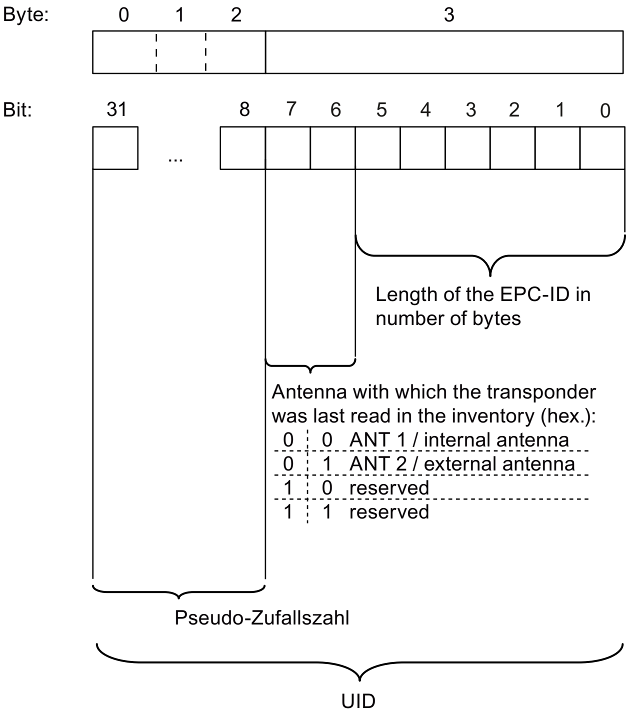

Byte:
0
1
2
3
Bit:
31
...
8
7
6
5
4
3
2
1
0
Length of the EPC-ID in number of bytes
Antenna with which the transponder was last read in the inventory (hex.):
0 0 ANT 1 / internal antenna
0 1 ANT 2 / external antenna
1 0 reserved
1 1 reserved
Pseudo-Zufallszahl
UID

Figure 4-4 Structure of the UID of the 8-byte handle ID when MOBY_mode = 6

RFID mode: MOBY_mode = 7

With MOBY_mode = 7 , the least significant part of the EPC-ID also takes over the function of the UID.

The EPC-ID must be queried in advance with the "GET" command.

If there is only one transponder in the antenna field, the UID can also be assigned the value zero. The command is then executed for the transponder currently located in the antenna field.

Setting the UID in the command	Meaning
0000000000000000	Single tag mode: Any individual transponder located in the antenna field.
0000000000000001 to FFFFFFFFFFFFFFF	Multitag mode: The last 8 bytes of the EPC-ID are transferred in the UID field

Note

Note that the MSB bytes of the EPC-ID not used in the UID should always have the same content. If different values are used in the first bytes, an error message "0x1D" may be output when there is multitag access later to this transponder (UID ≠ to 00).

4.3.7 Parameter assignment of the commands with FB 55

4.3.7.1 Overview of commands

Table 4- 27 Overview of commands

Command [hex]		Command	
normal	chained	syntax	Description
01	41	WRITE [1)]	Write data to the transponder/reader
02	42	READ [1)]	Read data from the transponder/reader
03	43	INIT [1)]	Initialize transponder
04	44	SLG-STATUS	Reader status
0A	4A	SET-ANT	Turn antenna on/off, if necessary initialize UHF algorithms.
0B	4B	MDS-STATUS	MDS/transponder status
0C	4C	GET [1)]	Display transponder and Black List

[1)] For information on the memory structure, refer to the sections "Memory configuration (Page 95)" and "Special memory configuration of the RF600 transponders (Page 98)".

4.3.7.2 WRITE

Table 4- 28 Writing data to the transponder or reader in MOBY_mode = 6 or 7 (according to "command_DB", UDT 30; see INPUT parameter)

Command [hex]	sub_command [hex]	length [dez]	address_MDS [hex]	DAT_DB_Nr [dez]	DAT_DB_adr [dez]	UID [hex]
0x01	–	1 to 32767 bytes length of the data to written to the transponder data	0x00 to maximum length of the (user data - 1) The user data is written to the transponder starting at this address.	Number of the user DB containing the data to be written.	Start address of the data to be written.	MOBY_mode = 6, 7: one transponder, non-specific access. UID_1_4 = 0 UID_5_8 = 0 MOBY_mode = 6: specific access. UID_1_4 = 4 bytes of the handle ID UID_5_8 = 0 MOBY_mode = 7: specific access. UID_1_4 = EPC-ID bytes 5-8 UID_5_8 = EPC-ID bytes 9-12

Note

Sequence of storage

Even if there is only one transponder in the antenna field, it is advisable to read and verify the EPC-ID before writing to the transponder. The write command should always be sent using the UID (EPC-ID or handle ID). This ensures that the write data is written to the correct transponder.

Note

Acknowledging the successful write process

The reader has time-optimized writing functionality with which the following response can occur:

- If no data is modified on the transponder, writing is always acknowledged positively. This response also applies to write-protected transponders.
- Significantly shortened write access to transponders depending on the data content of the transponder.

4.3.7.3 READ

Table 4- 29 Read data from the transponder/reader in MOBY_mode = 6 or 7 (according to "command_DB", UDT 30; see INPUT parameter)

Command [hex]	sub_command [hex]	length [dez]	address_MDS [hex]	DAT_DB_Nr [dez]	DAT_DB_adr [dez]	UID [hex]
0x02	–	1 to 32767 bytes - length of data to be read from the transponder	0x00 to maximum length of the (user data - 1) The user data is read from the transponder starting at this address.	Number of the user DB containing the read data.	Start address of the data that was read.	MOBY_mode = 6, 7: on transponder, non-specific access. UID_1_4 = 0 UID_5_8 = 0 MOBY_mode = 6: specific access. UID_1_4 = 4 bytes of the handle ID UID_5_8 = 0 MOBY_mode = 7: specific access. UID_1_4 = EPC-ID bytes 5-8 UID_5_8 = EPC-ID bytes 9-12

4.3.7.4 INIT

Table 4- 30 Initialize transponder in MOBY_mode = 6 or 7 (according to "command_DB", UDT 30; see INPUT parameter)

Command [hex]	sub_command [hex]	length [dez]	address_MDS [hex]	DAT_DB_Nr [dez]	DAT_DB_adr [dez]	UID [hex]
0x03	0x00 to 0xFF Value with which the transponder is written	–	Memory size of transponder to be initialized. You will find the memory size in the technical specifications of the transponder.	-	-	MOBY_mode = 6, 7: on transponder, non-specific access. UID_1_4 = 0 UID_5_8 = 0 MOBY_mode = 6: specific access. UID_1_4 = 4 bytes of the handle ID UID_5_8 = 0 MOBY_mode = 7: specific access. UID_1_4 = EPC-ID bytes 5-8 UID_5_8 = EPC-ID bytes 9-12

This command is used to initialize the user-memory area. During initialization, data relating to the preset length is written to the transponder.

4.3.7.5 SLG STATUS

Table 4- 31 SLG-STATUS (according to "command_DB", UDT 30)

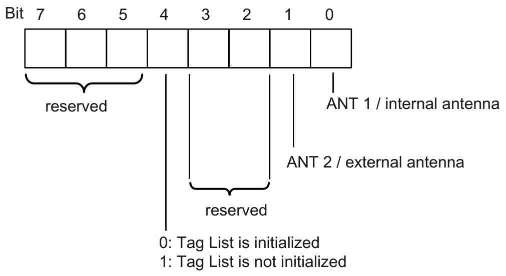
Command [hex]	sub_command [hex]	length [dez]	address_MDS [hex]	DAT_DB_Nr [dez]	DAT_DB_adr [dez]	UID [hex]
0x04	0x07 = status after UDT 300 [1] [2]	–	–	Number of the user DB with UDT 30x structure in which the read data will be stored.	Start address of the data that was read.	UID_1_4 = 0 UID_5_8 = 0
	0x08 = status after UDT 340 [1]			Number of the user DB with UDT 34x structure in which the read data will be stored.		
	0x20 = first entries from Black List [2]			Number of the user DB with UDT 37x structure in which the read data will be stored.		
	0x21 = all other entries from Black List [2]					

[1] You will find the UDT description in the section "UDTs of FB 55 (Page 71)".

[2] The "SLG-STATUS" can also be queried with the "sub_command 0x20" and "0x21". This in this case, however, the use of the "GET" command is more suitable.

4.3.7.6 SET-ANT

Table 4- 32 Switch antenna of reader on and off (according to "command_DB", UDT 30)

Command [hex]	sub_command [hex]	length [dez]	address_ MDS [hex]	DAT_DB_Nr [dez]	DAT_DB_adr [dez]	UID [hex]
0x0A		–	–	–	–	–

You will find more detailed information on the UHF algorithms in the section "Use of industrial UHF algorithms (Page 99)".

The startup procedure

Following "init_run", the INPUT parameters are loaded on the reader and the reader is started:

ANT 1 is activated with the power setting defined in bits 0-3 and ANT 2 in bits 4-7 of the "distance_limiting" byte. With the RF630R, the antennas typically operate in multiplex mode of 100 ms. With the RF620R, the internal antenna is active.

Switching to the external antenna with the RF620R

Apart from the internal antenna of the RF620R, an external antenna can also be connected to the reader. This results in two different antenna modes that you can set on the reader. Using "SET-ANT", you can select the required mode taking into account the restrictions defined in this section.

Mode 1: Internal antenna activated

When the reader is started up initially, the internal antenna is activated automatically. You can turn the internal antenna off/on as required with bit 0 of "sub_command".

Switching to mode 2 (external antenna)

Send the "SET-ANT" command with "sub_command" ANT 1 = 0 and ANT 2 = 1. It is now no longer possible to switch back to the internal antenna. The internal antenna only becomes active after turning the reader off and on again. The external and internal antenna cannot be activated at the same time.

Mode 2: External antenna activated

You can turn the external antenna off/on as required with bit 1 of "sub_command".

External antenna of RF630R

Note

If only one antenna is connected to the RF630R reader:

After an "init_run", both antennas of the RF630R are switched on.

If you have connected only one antenna, switch off the antenna that is not connected immediately after the "init_run" using the "SET-ANT" command or the reader will report an error.

If the "SET-ANT" command to switch off the antenna is not sent before the read/write commands are sent, the reader must be restarted with "init_run".

4.3.7.7 MDS-STATUS

Table 4- 33 MDS-STATUS (according to "command_DB", UDT 30)

Command [hex]	sub_command [hex]	length [dez]	address_MDS [hex]	DAT_DB_Nr [dez]	DAT_DB_adr [dez]	UID [hex]
0x0B	0x04 = status after UDT 290 1) 0x05 = status after UDT 320 1)	–	–	Number of the user DB with UDT 29x, 32x structure in which the read data will be stored.	Start address of the data that was read.	MOBY_mode = 6, 7: on transponder, non-specific access. UID_1_4 = 0 UID_5_8 = 0 MOBY_mode = 6: specific access. UID_1_4 = 4 bytes of the handle ID UID_5_8 = 0 MOBY_mode = 7: specific access. UID_1_4 = EPC-ID bytes 5-8 UID_5_8 = EPC-ID bytes 9-12

1) You will find the UDT description in the section "UDTs of FB 55 (Page 71)".

4.3.7.8 GET

With the "GET" command, all IDs of the transponders currently located in the antenna field or saved in the Black List are read out. With the IDs of the transponders currently in the antenna field, you can decide whether you want to read out the handle ID or the EPC-ID or both IDs. With Black List, the EPC-IDs are displayed.

Table 4- 34 Acquire existing transponders with EPC-ID or handle ID (according to "command_DB", UDT 30)

Command [hex]	sub_command [hex]	length [dez]	address_MDS [hex]	DAT_DB_Nr [dez]	DAT_DB_adr [dez]	UID [hex]
0x0C	0x02 = read out the next data record	–	–	Number of the user DB with UDT 21x, 31x, 41x structure in which the read data will be stored.[2]	Start address of the data that was read.	UID_1_4 = 0 UID_5_8 = 0
	0x03 = read handle ID when MOBY_mode = 6 and EPC-ID when MOBY_mode = 7					
	0x05 = read handle-IDs and EPC-IDs					
	0x10 = read out handle IDs sorted in descending order according to the mean RSSI value					
	0x11 = read out handle IDs sorted in descending order according to the maximum RSSI value					
	0x12 = read out handle IDs sorted in descending order according to read frequency					
	0x20 = read out first entries from Black List.[1]			Number of the user DB with UDT 36x structure in which the read data will be stored.[2]		
	0x21 = read out further entries from Black List.[1]					

[1] Available with MOBY_mode = 6 You will find more detailed information on the Black List in the section "Black List algorithm (Page 124)".

[2] You will find the UDT description in the section "UDTs of FB 55 (Page 71)".

The precise relationships between UIDs and handle IDs are described in the section "UID (Page 59)". You will find the diagram explaining the bits of the 8-byte handle ID in the section "Memory configuration (Page 95)".

If there are more transponders in the antenna field than can be transferred with one data record ("GET" command with sub_command 0x03, 0x05, 0x10, 0x11 and 0x12 or with sub_command 0x20), further data can be read out using the "sub_command = 0x02" or sub_command = 0x21. This procedure can be repeated until all transponder IDs have been read out. If all IDs have been read out and you start another query, you will obtain a success acknowledgement with no data content.

Note

The reader can only access a specific transponder within a bunch of them if the handle ID of the transponder in the antenna field is known.

"GET" command and handle-ID:

- Read out handle IDs using "GET" with "sub_command = 0x03, 0x10, 0x11, 0x12" (or next data record 0x02).

  Extract length of the EPC-ID from the handle ID (see section "UID (Page 59)").
- To read the EPC-ID, a "READ" command must be executed on the EPC MemBank with handle ID and EPC-ID length.

"GET" command and EPC-ID:

- Read out handle IDs and EPC-IDs using "GET" with "sub_command = 0x05" (or next data record 0x02).
- Extracting EPC-IDs. The EPC-ID follows on directly after the 8-byte handle ID. The length of the EPC-ID must be extracted from the handle ID (see section "UID (Page 59)").

Note

MOBY_mode = 6 and validity of the handle ID after "GET" acknowledgements

Handle IDs are assigned the first time a transponder is detected. If the reader recognizes that the transponder is no longer valid, the handle ID also becomes invalid. When the same transponder is detected again, a new handle ID is assigned.

If the time between acknowledging the "GET" command and the subsequent "READ" or "WRITE" command is too long, handle IDs can lose their validity if the corresponding transponder has left the antenna field. If a transponder is accessed with an invalid handle ID, the error message "0x1D" is signaled.

Note

To allow the reader to recognize all the transponders in the antenna field as valid, it is advisable to make adequate time available between the "init_run" or "SET-ANT" commands and the "GET" command depending on the number of transponders.

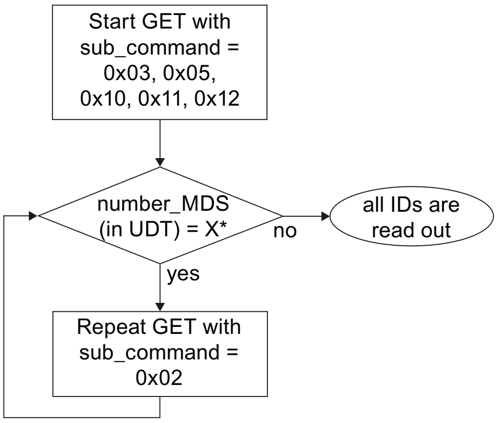
Note

Information on the use and parameter assignment of the Black List

You will find more detailed information on using the Black List and its parameter assignment in the section "Tag list (Page 114)".

4.3.7.9 Programming the "GET" command for transponders in the antenna field

We recommend that you use the programming shown below if the number of transponders in the antenna field is unknown.


Start GET with sub_command = 0x03, 0x05, 0x10, 0x11, 0x12
number_MDS (in UDT) = X*
no
all IDs are read out
yes
Repeat GET with sub_command = 0x02

* The number of returned data records "X" depends on the "MOBY_mode" used and the "sub_command" (compare table below).

Figure 4-5 Program sequence of the "GET" command for transponder populations of any size

Table 4- 35 Returned data records with the "GET" command for transponder populations

MOBY_mode	sub_command	Data structure	Number of returned data records "X"
6	0x03	UDT 210	29
6	0x05	UDT 410	11 / 6 / 3 [1)]
6	0x10	UDT 210	29
6	0x11	UDT 210	29
6	0x12	UDT 210	29
7	0x03	UDT 310	19

[1)] Values for EPC-ID lengths of 96 / 240 / 496 bits

Note

"GET" command used as a chained command

If, for example, a maximum of 40 transponders are expected in an application, it may be an advantage to use the "GET" as a chained command according to the above table. If there are less than 29 transponders in the antenna field, a repeated "GET" query returns "number_MDS = 0".

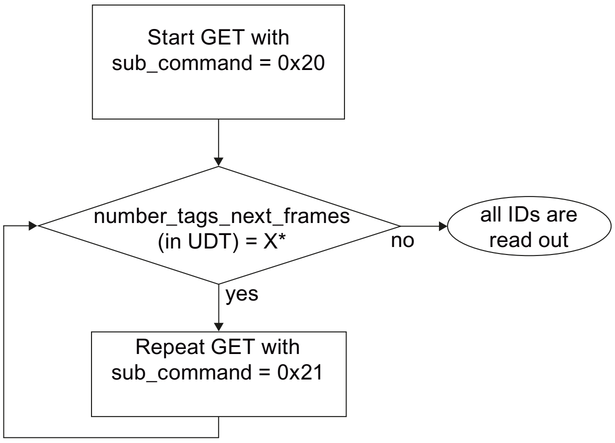
Note

"number_MDS" in UDT 21x, 31x and 41x

"number_MDS" matches the number of data records transferred with this "GET" command. If the maximum number per acknowledgement "X" is displayed, you may need to repeat the "GET" command with "sub_command = 0x02" to obtain the other data records.

4.3.7.10 Programming the "GET" command for transponders in the Black List

We recommend that you use the programming shown below if the number of transponders in the Black List is unknown.



* The number of returned data records "X" depends on the set memory size of Black List and length of the saved EPC-IDs (compare following table).

Figure 4-6 Program sequence of the "GET" command for any number of transponders in the Black List

Table 4- 36 Returned data records with the "GET" command for transponders of the Black List

MOBY_mode	sub_command	Data structure	Number of returned data records "X"
6	0x20	UDT 360	13 / 6 / 3 1)

1) Values for EPC-ID lengths of 96 / 240 / 496 bits

Note

"GET" command used as a chained command

If, for example, a maximum of 40 transponders are expected in the Black List, it may be an advantage to use the "GET" command as a chained command according to the above table. If there are no additional transponders in the Black List, the value "0x00" is returned in the "numb_tags_frames" variable of UDT 360 in the result. You will find more detailed information on UDT 360 in the section "UDTs of FB 55 (Page 71)".

4.3.8 UDTs of FB 55

The "MDS-/SLG-STATUS" commands return a variety of data. You can use the UDTs described in the following section for clear presentation and easy definition of the data blocks for the result.

UDT 300: Result of "SLG-STATUS" ("sub_command = 0x07")

Table 4- 37 UDT 300: "SLG-STATUS"

Address	Name	Type	Comment
0.0		STRUCT	
+0.0	status info	BYTE	SLG status mode
+1.0	hardware	CHAR	Type of hardware
+2.0	hardware version	WORD	Version of hardware
+4.0	reserved0	WORD	
+6.0	firmware	CHAR	Type of firmware
+8.0	firmware version	WORD	Version of firmware
+10.0	driver	CHAR	Type of driver
+12.0	current time	STRUCT	Current time
+0.0	hour	BYTE	Hours [1]
+1.0	min	BYTE	Minutes [1]
+2.0	sec	BYTE	Seconds [1]
+3.0	reserved1	BYTE	
=4.0		END_STRUCT	
+16.0	SLG version	BYTE	SLG version
+17.0	baud	BYTE	Baudrate
+18.0	reserved2	BYTE	
+19.0	distance limiting SLG	BYTE	Selected transmit power
+20.0	multitag SLG	BYTE	Multitag SLG
+21.0	field ON control SLG	BYTE	Selected comunication typ
+22.0	field ON time SLG	BYTE	Selected channel
+23.0	expert mode	BYTE	Expert mode
+24.0	status_ant	BYTE	Status of antenna [2]
+25.0	scanning time SLG	BYTE	Radio communication profile
+26.0	MDS control	BYTE	Presence mode
=28.0		END_STRUCT	

[1] The internal time stamp of the internal reader clock that relates to this event is output. The internal reader clock is not synchronized with UTC.

[2] The antenna status refers to the last executed "sub_command" command (bits 0 and 1) of "SET-ANT" or to the value preset by "init_run". In "init_run" of the RF620R, the default value is "1" (int. antenna on), with the RF630R, it is "3" (antennas 1 and 2 on).

UDT 340: Result of "SLG-STATUS" ("sub_command = 0x08")

Table 4- 38 UDT 340: "SLG-STATUS"

Address	Name	Type	Comment
0.0		STRUCT	
+0.0	status_info	BYTE	SLG-Status mode(Subcommand)
+1.0	hardware	CHAR	Type of hardware
+2.0	hardware_version	WORD	Version of hardware
+4.0	reserved_word1	WORD	Reserved
+6.0	firmware	CHAR	Type of firmware
+7.0	firmware_version_HB	BYTE	Version of firmware (High-Byte)
+8.0	firmware_version_LB	BYTE	Version of firmware (Low-Byte)
+9.0	driver	CHAR	Type of driver
+10.0	current_time_hour	BYTE	Hours 1)
+11.0	current_time_minute	BYTE	Minutes 1)
+12.0	current_time_sek	BYTE	Seconds 1)
+13.0	current_time_reservByte	BYTE	
+14.0	SLG_version	BYTE	SLG-Version
+15.0	baud	BYTE	Baudrate
+16.0	reserved_byte1	BYTE	Reserved
+17.0	distance_limiting_SLG	BYTE	Selected transmit power
+18.0	multitag_SLG	BYTE	Multitag SLG
+19.0	field_ON_control_SLG	BYTE	Selected communication type
+20.0	field_ON_time_SLG	BYTE	Selected channel
+21.0	expert_mode	BYTE	Expert mode
+22.0	status_ant	BYTE	Status of antenna 2)
+23.0	scanning_time_SLG	BYTE	Radio communication profile (country specific radio standard)
+24.0	MDS_control	BYTE	Precence mode
+25.0	blink_pattern	BYTE	Blink Pattern
+26.0	activated_algorithms	STRUCT	Information on currently selected algorithms
+0.0	Single_Tag	FALSE	Single_Tag [1]
+0.1	ITF_Phase2	FALSE	ITF_Phase2 [2]
+0.2	ITF_Phase1	FALSE	ITF_Phase1 [3]
+0.3	Smoothing	FALSE	Smoothing [4]
+0.4	Blacklist	FALSE	Blacklist [5]
+0.5	RSSI_Threshold	FALSE	RSSI_Threshold [6]
+0.6	Power_Ramp	FALSE	Power_Ramp [7]
+0.7	Power_Gap	FALSE	Power_Gap [8]
+1.0	Reserved1	FALSE	Reserved1 [1]
+1.1	Reserved2	FALSE	Reserved2 [2]
+1.2	Reserved3	FALSE	Reserved3 [3]
+1.3	Reserved4	FALSE	Reserved4 [4]
+1.4	EPC_MemBankFilter	FALSE	EPC_MemBankFilter [5]
+1.5	Tag_Hold	FALSE	Tag_Hold [6]

Address	Name	Type	Comment
+1.6	Multi_Tag	FALSE	Multi_Tag [7]
+1.7	ISTM	FALSE	ISTM [8]
=2.0		END_STRUCT	
+28.0	reserved_word2	WORD	Reserved
+30.0	reserved_word3	WORD	Reserved
+32.0	reserved_word4	WORD	Reserved
+34.0	filtered_max_rssi	BYTE	Maximum RSSI value of a tag, of all filtered tags
+35.0	reserved_byte2	BYTE	Reserved
+36.0	filtered_tags_rssi	BYTE	Number of tags, filtered out by the RSSI threshold
+37.0	reserved_byte3	BYTE	Reserved
+38.0	filtered_tags_black_list	WORD	Number of tags, filtered out via Black List
+40.0	filtered_tags_epc_data	WORD	Number of tags, filtered out via EPC Data Filter
+42.0	filtered_tags_smoothing	WORD	Number of tags in Tag List of status Not Observed
+44.0	itf_ph1_max_detect	WORD	Number of reads of a Tag, filtered out via ITF phase 1
+46.0	itf_ph1_tags_detect	WORD	Number of tags, filtered out via ITF phase 1
+48.0	itf_ph2_max_detect	WORD	Number of reads of a Tag, filtered out via ITF phase 2
+50.0	itf_ph2_tags_detect	WORD	Number of tags, filtered out via ITF phase 2
+52.0	filtered_istm_min_dist	WORD	Minimum distance of Tags according to sorting criterion of ISTM
+54.0	filtered_istm_tags	WORD	Number of tags, filtered out via ISTM algorithm
+56.0	last_error	BYTE	error code of the last occuring error (last_command)
+57.0	reserved_byte4	BYTE	Reserved
+58.0	error_command1	WORD	Last command (has lead to error code) "last_error"
+60.0	error_command2	WORD	Last command (has lead to error code) "last_error"
+62.0	error_command3	WORD	Last command (has lead to error code) "last_error"
+64.0	reserved_word5	WORD	Reserved
+66.0	reserved_array_byte	ARRAY[1...30]	
*1.0		BYTE	
=96.0		END_STRUCT	

[1] The internal time stamp of the internal reader clock that relates to this event is output. The internal reader clock is not synchronized with UTC.
[2] The antenna status refers to the "sub_command" (bits 0 and 1) of "SET-ANT" or to the value preset by "init_run". In "init_run" of the RF620R, the default value is "1" (int. antenna on), with the RF630R, it is "3" (antennas 1 and 2 on).

Note

Information on the UDTs in addresses +25 to +62

The meaning and use of the variables in addresses +25 to +62 is explained in the section "Status display of industrial UHF algorithms using of SLG-STATUS (Page 106)".

UDT 290: Result of "MDS-STATUS" ("sub_command = 0x04")

Table 4- 39 UDT 290: "MDS-STATUS"

Address	Name	Type	Comment
0.0		STRUCT	
+0.0	reserved0	BYTE	
+1.0	status_info	BYTE	MDS status mode
+2.0	UID	STRUCT	
+0.0	Byte_1_4	DWORD	Unique identifier (MDS number)
+4.0	Byte_5_8	DWORD	
=8.0		END_STRUCT	
+10.0	antenna	BYTE	Antenna which has observed the MDS
+11.0	RSSI	BYTE	RSSI value
+12.0	last_observed	STRUCT	Last observed time
+0.0	hour	BYTE	Hours [1]
+1.0	min	BYTE	Minutes [1]
+2.0	sec	BYTE	Seconds [1]
+3.0	channel	BYTE	Channel
=4.0		END_STRUCT	
+16.0	EPC_length	BYTE	EPC-Length
+17.0	reserved1	BYTE	
=18.0		END_STRUCT	

[1] The internal time stamp of the internal reader clock that relates to this event is output. The internal reader clock is not synchronized with UTC.

Table 4- 40 Explanations of UDT 290

Parameter status	**Address**	**Meaning**	
UID	+2.0	-	MOBY_mode = 6: Handle; MOBY_mode = 7: Lower 8 bytes of the EPC-ID of the transponder
antenna	+10.0		Antenna with which the data carrier was read
		0x01	Antenna 1 (internal antenna / ANT 1)
		0x02	Antenna 2 (external antenna / ANT 2)
RSSI	+11.0		Current RSSI value of the transponder
		0x00	Very low received field strength of the transponder.
		…	
		0xFF	Very high received field strength of the transponder.
last_observed	+12.0		1/100 seconds according to the UTC standard accumulated from 01.01.1970 to the point in time of the last successful reading of the MDS, displayed in hex value. The bytes are, however, displayed in reverse order.
		Byte 14	Hour
		Byte 15	Minute
		Byte 16	Second
channel	+3.0	0x00 … 0xFF	Channel with which the data carrier was read. Reserved for future expansions. Today always set to 0x00.
EPC_length	+16.0	0x00 … 0xFF	Length of the EPC-ID in bytes

UDT 320: Result of "MDS-STATUS" ("sub_command = 0x05")

Table 4- 41 UDT 320: "MDS-STATUS"

Address	Name	Type	Comment
0.0		STRUCT	
+0.0	reserved0	BYTE	
+1.0	status info	BYTE	MDS status mode
+2.0	antenna	BYTE	Antenna which has observed the MDS
+3.0	channel	BYTE	Channel
+4.0	UID	STRUCT	
+0.0	Byte_1_4	DWORD	Unique identifier (MDS-Number)
+4.0	Byte_5_8	DWORD	
=8.0		END_STRUCT	
+12.0	DT_glimpsed	DWORD	Time elapsed between achknowledgement and first read in [ms]
+16.0	reserved1	DWORD	
+20.0	last observed	STRUCT	Last observed time
+0.0	hour	BYTE	Hours 1)
+1.0	min	BYTE	Minutes 1)
+2.0	sec	BYTE	Seconds 1)
+3.0	EPC_length	BYTE	EPC-Length
=4.0		END_STRUCT	
+24.0	EPC_ID_Byte	STRUCT	
+0.0	Byte_01_02	WORD	Byte 01-02 of EPC-ID
+2.0	Byte_03_04	WORD	Byte 03-04 of EPC-ID
+4.0	Byte_05_06	WORD	Byte 05-06 of EPC-ID
+6.0	Byte_07_08	WORD	Byte 07-08 of EPC-ID
+8.0	Byte_09_10	WORD	Byte 09-10 of EPC-ID
+10.0	Byte_11_12	WORD	Byte 11-12 of EPC-ID
+12.0	Byte_13_14	WORD	Byte 13-14 of EPC-ID
+14.0	Byte_15_16	WORD	Byte 15-16 of EPC-ID
+16.0	Byte_17_18	WORD	Byte 17-18 of EPC-ID
+18.0	Byte_19_20	WORD	Byte 19-20 of EPC-ID
+20.0	Byte_21_22	WORD	Byte 21-22 of EPC-ID
+22.0	Byte_23_24	WORD	Byte 23-24 of EPC-ID
+24.0	Byte_25_26	WORD	Byte 25-26 of EPC-ID
+26.0	Byte_27_28	WORD	Byte 27-28 of EPC-ID
+28.0	Byte_29_30	WORD	Byte 29-30 of EPC-ID
+30.0	Byte_31_32	WORD	Byte 31-32 of EPC-ID
+32.0	Byte_33_34	WORD	Byte 33-34 of EPC-ID
+34.0	Byte_35_36	WORD	Byte 35-36 of EPC-ID
+36.0	Byte_37_38	WORD	Byte 37-38 of EPC-ID
+38.0	Byte_39_40	WORD	Byte 39-40 of EPC-ID
+40.0	Byte_41_42	WORD	Byte 41-42 of EPC-ID
+42.0	Byte_43_44	WORD	Byte 43-44 of EPC-ID

Address	Name	Type	Comment
+44.0	Byte_45_46	WORD	Byte 45-46 of EPC-ID
+46.0	Byte_47_48	WORD	Byte 47-48 of EPC-ID
+48.0	Byte_49_50	WORD	Byte 49-50 of EPC-ID
+50.0	Byte_51_52	WORD	Byte 51-52 of EPC-ID
+52.0	Byte_53_54	WORD	Byte 53-54 of EPC-ID
+54.0	Byte_55_56	WORD	Byte 55-56 of EPC-ID
+56.0	Byte_57_58	WORD	Byte 57-58 of EPC-ID
+58.0	Byte_59_60	WORD	Byte 59-60 of EPC-ID
+60.0	Byte_61_62	WORD	Byte 61-62 of EPC-ID
=62.0		END_STRUCT	
+86.0	reads	WORD	Number of Reads of MDS in Inventory (1 - 65535)
+88.0	RSSI	BYTE	Current RSSI value of MDS 2)
+89.0	mean RSSI	BYTE	Mean RSSI value of MDS
+90.0	max RSSI	BYTE	Max RSSI value of MDS
+91.0	min RSSI	BYTE	Min RSSI value of MDS
+92.0	min POWER	BYTE	Min Power value of MDS
+93.0	current_POWER	BYTE	Current Power value of MDS 3)
+94.0	reserved2	ARRAY[1..137]	-
*1.0		BYTE	
=232.0		END_STRUCT	

1) The internal time stamp of the internal reader clock that relates to this event is output. The internal reader clock is not synchronized with UTC.

2) The value "Reads" indicates the total transponder recognitions (inventories) regardless of the set smoothing parameters. In this way, in extreme situations, the "Reads" counter can reach extremely high values without the transponder ever reaching the "Observed" status.

3) The "current_Power" value is specified as radiated power in 0.25 dBm steps (ERP). A "current_Power" value of "72" therefore corresponds to 18 dBm (ERP).

The bytes of the 8-byte handle ID are described in the section "Memory configuration (Page 95)".

UDT 310: Result of "GET" (MOBY_mode = 7 with "sub_ command = 0x02, 0x03")

Table 4- 42 UDT 310: "GET"

Address	**Name**	**Type**	**Comment**
0.0		STRUCT	
+0.0	reserved0	BYTE	
+1.0	number MDS	BYTE	Number of MDS
+2.0	EPC	ARRAY[1…19]	EPC ID (unique identifier)
*0.0		STRUCT	
+0.0	Byte_1_4	DWORD	First 4 bytes of EPC ID (has to be identical for using multitag commands)
+4.0	Byte_5_8	DWORD	=> UID_1_4 of write/read command
+8.0	Byte_9_12	DWORD	=> UID_5_8 of write/read command
=12.0		END_STRUCT	
=230.0		END_STRUCT	

Note

"number_MDS" agrees with the number of transponder EPC-IDs (1 to 18) actually transferred with this "GET" command. To receive the EPC-IDs of all transponders located in the antenna field, it may be necessary to send repeated "GET" commands with "sub_command = 0x02".

UDT 360: Result of "GET" (MOBY_mode = 6 with "sub_ command = 0x20, 0x21")

The following example of UDT 360 is only valid if the EPC-ID length is 96 bits for all transponders. With other or variable EPC-ID lengths, this UDT must be adapted for the specific situation.

Table 4- 43 Example of UDT 360 "GET"

Address	Name	Type	Comment
0.0		STRUCT	
+0.0	reserved_byte0	BYTE	Reserved
+1.0	reserved_byte1	BYTE	Reserved
+2.0	number_tags_frame	BYTE	Number ob Tags in this frame
+3.0	number_tags_next_frames	BYTE	Number of Tags in the next frames
+4.0	reserved_byte2	BYTE	Reserved
+5.0	reserved_byte3	BYTE	Reserved
+6.0	reserved_byte4	BYTE	Reserved
+7.0	reserved_byte5	BYTE	Reserved
+8.0	reserved_byte6	BYTE	Reserved
+9.0	reserved_byte7	BYTE	Reserved
+10.0	Black_List_ID	ARRAY[1..13]	
*0.0		STRUCT	
+1.0	EPC_Length	BYTE	EPC-ID Length
+2.0	Antenna	BYTE	Antenna = Default 3
+3.0	Filtered_tag	WORD	Number of times - EPC-ID filtered out via Black List
+4.0	EPC_1_2	WORD	EPC-ID
+6.0	EPC_3_4	WORD	EPC-ID
+8.0	EPC_5_6	WORD	EPC-ID
+10.0	EPC_7_8	WORD	EPC-ID
+12.0	EPC_9_10	WORD	EPC-ID
+14.0	EPC_11_12	WORD	EPC-ID
=16.0		END_STRUCT	
=218.0		END_STRUCT	

Table 4- 44 Explanations of UDT 360

Parameter status	**Address**	**Meaning**	
number_tags_frame	+2.0	0x00 … 0xFF	Number of transponders entered in the Black List and displayed by the current "GET" query with "sub_command = 20".
number_tags_next_frames	+3.0	0x00 … 0xFF	Number of transponders not included in the current "GET" query but included and displayed in the Black List by subsequent queries with "sub_command = 21". Note: If the value is "0xFF", ≥ 255 transponders are in the Black List.
EPC_Length	+1.0	0x00 … 0xFF	Length of the EPC-ID in bytes
Antenna	+2.0	0x03	Transponders are always adopted in or filtered out of the Black List via the two antennas (internal and external antenna). For this reason, the value is always 0x03 (for the RF620R as well).
Filtered_tag	+3.0	0x0000…0xFFFF	Number of inventories with which the transponder has already been filtered out and discarded via the Black List. If the maximum value "0xFFFF" is reached, the counter remains at the maximum value until the statistics are reset.
EPC_1_2 … EPC_11_12	+4.0 ... +14.0	-	12-byte EPC-ID of the transponder

Note

EPC-IDs

"number_tags_frame" corresponds to the number of EPC-IDs in "GET" with "sub_command = 20". To receive the EPC-IDs of all transponders in the Black List, it may be necessary to send repeated "GET" commands with "sub_command = 0x21" if "number_tags_next_frames > 0x00" until "number_tags_next_frames = 0x00.

UDT 210: Result of "GET" (MOBY_mode = 6 with "sub_command = 0x02, 0x03, 0x10, 0x11, 0x12")

Table 4- 45 UDT 210: "GET"

Address	Name	Type	Comment
0.0		STRUCT	
+0.0	reserved0	BYTE	
+1.0	number MDS	BYTE	Number of MDS
+2.0	UID	ARRAY[1…29]	
*0.0		STRUCT	
+0.0	Byte_1_4	DWORD	MDS number (unique identifier)
+4.0	Byte_5_8	DWORD	
=8.0		END_STRUCT	
+234.0	reserved1	DWORD	
+238.0	Data	ARRAY[1…222]	
*1.0		BYTE	
=460.0		END_STRUCT	

Note

"number_MDS" specifies the number of handle IDs (1 to 29) transferred with this "GET" command. To receive the handle IDs of all transponders located in the antenna field, it may be necessary to send repeated "GET" commands with "sub_command = 0x02".

UDT 410: Result of "GET" (MOBY_mode = 6 with "sub_ command = 0x05")

The following example of UDT 410 is only valid if the EPC-ID length is 96 bits for all transponders. With other or variable EPC-ID lengths, this UDT must be adapted for the specific situation. UDT 410 is not supplied with FB 55.

Table 4- 46 Example of UDT 410 "GET"

Address	Name	Type	Comment
0.0		STRUCT	
+0.0	reserved	BYTE	
+1.0	number_MDS	BYTE	
+2.0	ID	ARRAY[1…11]	
*0.0		STRUCT	
+0.0	Handle_1_4	DWORD	see UDT 210
+4.0	Handle_5_8	DWORD	see UDT 210
+8.0	EPC_1_4	DWORD	Byte 1-4 of EPC-ID
+12.0	EPC_5_8	DWORD	Byte 5-8 of EPC-ID
+16.0	EPC_9_12	DWORD	Byte 9-12 of EPC-ID
=20.0		END_STRUCT	
=222.0		END_STRUCT	

Note

"number_MDS" agrees with the number of data pairs (handle IDs and EPC-IDs with 1 to n data pairs) actually transferred with this "GET" command. To receive the EPC-IDs of all transponders located in the antenna field, it may be necessary to send repeated "GET" commands with "sub_command = 0x02".

Note

The UDTs are used in various RFID systems. As a result, certain comments also relate to other RFID systems.

Error messages and troubleshooting 5

5.1 Classification of error messages

An error state exists in FB 45/FB 55 whenever the "error" variable is set for a channel. If this is the case, the exact cause of the error can be found in the variables "error_MOBY", "error_FB" or "error_BUS".

Table 5- 1 Classification of error messages

Error variable	Classification
error_MOBY	This error was reported by the communications module/reader. There are two main reasons for this: • Communication between ASM/communications module and write/read device/reader or between write/read device/reader and MDS/transponder is faulty. • The ASM is unable to process the command. The "error_MOBY" error is indicated on the ASM on the ERR LED by an appropriate flashing pattern.
error_FB	This error is signaled by FB 45/FB 55. Main cause • There is a parameter error in "Params_DB" or "command_DB".
error_BUS	The transport layer of PROFIBUS/PROFINET is signaling an error. A PROFIBUS tracer or a wireshark and a PROFIBUS/PROFINET tester (BT 200; order no. 6ES7 181-0AA00-0AA0) is an invaluable tool for accurate troubleshooting. The PROFIBUS system diagnostics can provide further information about the cause of the error. The error shown here is reported by the SFB 52/53 system functions in the "RET_VAL" parameter. For a detailed description of the "RET_VAL" parameter, refer to the SIMATIC S7 system manuals (see system software for S7-300/400).

5.2 Error messages and flashing codes

error_MOBY

The ERR LED of the reader flashes when there are error messages. Some errors are also indicated by the flashing ERR LED of the CM.

Table 5- 2 Error messages of the communications module via the "error_MOBY" variable

Error code (B#16#..)	Flashing of ERR LED	Description
00	–	No error Default value if everything is ok
	1x	Boot message
01	2x	Presence error, possible causes: • The active command was not carried out completely • The transponder left the field while the command was being processed • Communication problem between reader and transponder The next command is automatically executed on the next transponder. A read or write command is possible. If the write command is aborted with error code 01, inconsistencies between the expected and actual data may occur on the data carrier. Repeat the read/write command.
03	3x	Problem on the connection to the reader or antenna problem. • The cable between the communications module and reader is wired incorrectly or there is a cable break • Antenna error: (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 CM has blown • Hardware defect • Another reader is in the vicinity and is active • Interference on reader - or PROFIBUS line • Execute "init_run" after eliminating the problem

Error code (B#16#..)	Flashing of ERR LED	Description
05	5x	Command/parameter assignment error, possible causes: • Unknown command • Incorrect parameter • Function not allowed • Mode in "SET-ANT" command unknown FB 45 / FB 55 is sending an uninterpretable command to the communications module. • "command_DB" contains invalid command parameters • The "command_DB" was overwritten by the user • The transponder has signaled an address error
06	6x	Field disturbance on reader The reader is receiving interference pulses from the environment. • 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
07	7x	No free ETSI transmit channel
09	9x	Wrong communications standard selected in the "init_run" command (e.g. FCC for ETSI reader)
0B	11x	Transponder memory cannot be read correctly or cannot be written to. The transponder signals an error. Options for troubleshooting: • Increase power • Change antenna alignment • Avoid field interference
0C	12x	Memory of the transponder cannot be written to • Transponder memory is defective • Memory is write-protected (Memory Locked: 000000100B) (The transponder memory is PERMA-locked and cannot be overwritten or the reader password has to be reset)
0D	13x	Error in specified address (address error) • The specified address does not exist on the transponder • The command must be checked and corrected. • This is not the correct transponder type. • Access attempted to non-existent or non-accessible memory areas (Memoryoverrun: 00000011B)
0E	14x	Password error • Incorrect transponder password (the reader password must be set again so that it matches the password).

Error code (B#16#..)	Flashing of ERR LED	Description
0F	1x	Start-up message from CM. The CM was off and has not yet received an "init_run" command • "init_run" needs to be executed • The same physical CM channel is used in two (or more) UDT 10 structures. Check "ASM_address" and "ASM_channel" in all UDT 10 structures.
10	16x	"NEXT" not possible or not permitted • CM is operating without MDS control ("MDS_control = 0,1") • CM has already received a "NEXT" command • CM/reader does not recognize a "NEXT" command "REPEAT" after forbidden commands: • "REPEAT" for "SET-ANT" • "REPEAT" for "SLG-STATUS"
11	–	Short circuit or overload of the 24 V outputs (DQ, 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 start "init_run"
12	18x	Internal CM communication error. • Connector contact problem on the CM • Defective CM hardware – Return CM for repair • Start the "init_run" command after eliminating the problem
13	19x	• CM/reader does not have enough buffer space to store the command temporarily. • Maximum allowable number of 150 commands in a command chain was ignored. If "REPEAT" is used in conjunction with a command chain, the maximum number of commands is also 150 (including the number of commands from a command repetition). If a command chain contains more than 150 commands, after the 150th command is called, it will be stopped 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.
14	20x	Internal CM/reader error. • Program sequence error on the CM • Cycle power to the CM • Start the "init_run" command after eliminating the problem • Watchdog error on reader

Error code (B#16#..)	Flashing of ERR LED	Description
15	21x	Bad parameter assignment of the CM/reader • Check INPUT parameters in UDT 10 • Check parameters in HW Config • Transmit power set too high • Unused parameter bits are not 0. • "init_run" command has incorrect parameters • After a start-up, the CM has still not received an "init_run". • "scanning_time = 0x00" parameter was set (no standard selected).
16	22x	The FB command cannot be executed with the CM parameter assignment on PROFIBUS. • Length of the input/output areas too small for the cyclic I/O word. Did you use the right GSD file? • FB command (e.g. read) has too much user data (data length > 233 bytes)
17	23x	Communication error between FB 45 / FB 55 and communications module. Handshake error • "Params_DB" (UDT 10) of this CM station is overwritten by other parts of the program • Check parameter assignment of communications module in UDT 10 • Check FB 45/FB 55 command that caused this error • Start the "init_run" command after eliminating the problem
18	–	An error has occurred that must be acknowledged with an "init_run". • A temporary short circuit has occurred on PROFIBUS • The "init_run" command is incorrect • Start the "init_run" command after eliminating the problem • Check the parameters "ASM_address", "ASM_channel" and "MOBY_mode".
19	25x	Previous command is active or buffer overflow The user sent a new command to the CM although the last command was still active. • Active command can only be terminated with an "init_run" • Before a new command can be started "READY-Bit = 1 must be set; exception: "init_run" • Two FB 45/FC 55 calls were set with the same "ASM_address" and "ASM_channel" parameters • Two FB 45/FC 55 calls are using the same "Params_DB" pointer • Start the "init_run" command after eliminating the problem • When command repetition (e.g. read-only MDS) is used, no data is fetched from the transponder. The data buffer on the CM has overflowed. Transponder data has been lost.

Error code (B#16#..)	Flashing of ERR LED	Description
1A	–	PROFIBUS DP error occurred. • The PROFIBUS DP bus connection was interrupted – Wire break on the bus – Bus connector on CM was removed briefly • PROFIBUS DP master does not address CM anymore • "init_run" needs to be executed • The CM has detected a frame interruption on the bus. PROFIBUS may have been reconfigured (e.g. with HW Config). This error is only indicated when access monitoring has been enabled in the PROFIBUS configuration.
1B	27x	There is an inconsistency in the parameter assignment of the reader. Parameters were probably set in the Advanced User Parameter parameter with which the reader cannot work. • ETSI performance testing faulty
1C	28x	• Antenna is already switched off • Antenna is already switched on • Mode in "SET-ANT" unknown.
1D	–	More transponders are located in the antenna field than can be processed simultaneously by the reader. A read or write command was sent to a transponder (UID) and one of the following conditions was met at the same time: • Only 1 transponder at a time can be processed with FB 45. • With FB 45 and FB 55: there is more than one transponder with the same EPC-ID in the antenna field of the reader. Countermeasures: • with FB 55: Increase the value in multitag or decrease the number of transponders in the field. • with FB 55 (with MOBY_mode = 7): There is one or more transponder in the antenna field for which the content of the "FF00 – FF03" addresses of the EPC-ID does not match (uniqueness when accessing transponders using a UID with the length of 8 bytes). • Power supply of the transponder in the limit range: Due to short-term power shortage, a transponder loses its communication status (session) and the identical EPC-ID is sent a second time as soon as power is above the limit value again. Increase the reader's radiated power and/or reduce the distance between antenna and transponder until this effect no longer occurs.

Error code (B#16#..)	Flashing of ERR LED	Description
1E	30x	Wrong number of characters in the command message frame.
1F	31	Active command canceled by "RESET ("init_run" or "cancel") or bus connector removed • Communication with the transponder was aborted by "init_run" • This error can only be reported if there is an "init_run" or "cancel"

*) You will find the meaning of the error numbers in the EPC Global Class 1 Gen 2 document, Annex I.

error_FB

Table 5- 3 Error variable "error_FB"

Error code (B#16#...)	Description
00	No error; default value if everything is ok
01	"Params_DB" is not available in SIMATIC
02	"Params_DB" is too small • UDT 10/11 was not used during definition • "Params_DB" must be 300 bytes in length (for each channel) • "Params_DB", "Params_ADDR" - check that they are correct
03	The DB after the "command_DB_number" pointer is not available in the SIMATIC controller.
04	The "command_DB" on the SIMATIC controller is too small • UDT 20/21 was not used during command definition • The last command in the "command_DB" is a chained command; reset the chaining bit • Check the "command_DB_number/command_DB_address" command pointer
05	Invalid command type. The valid commands are described in the section "RFID commands of FB 45 (Page 34)" or "RFID commands of FB 55 (Page 58)". • Check the "command_DB_number/command_DB_address" command pointer • Check the actual values in the "command_DB" – "init_run" needs to be executed
06	Unexpected acknowledgement received. The parameters of the command and acknowledgement frame do not match ("command", "length", "address_MDS"). • The user changed the "command_DB_number/-_address" pointer during command execution. • The user changed the command parameters in the MOBY CMD data block (UDT 20) during command execution. • Check the parameter assignment of "ASM_address" and "ASM_channel". "ASM_address" and "ASM_channel" have the same parameter assignment for different channels. • The acknowledgement counter and command counter between the CM and FB are no longer synchronized – "init_run" needs to be executed
07	The "MOBY_mode" or "MDS_control" parameter (defined in UDT 10) has an invalid value
08	A bus error has occurred that is signaled by system functions SFB 52/53. More information on this error is available in the "error_BUS" variable. • "ASM_address" or "ASM_channel" not available • "init_run" needs to be executed

Error code (B#16#...)	Description
09	The CM has failed. • Loss of power on CM • PROFIBUS connector removed or PROFIBUS cable interrupted • "ASM_address" or "ASM_channel" not available This error is indicated if the "ASM_failure" bit was set in OB 122. OB 122 is called if FB 45 can no longer access the cyclic word for the CM.
0A	Another "init_run" was started while "init_run" was executing without waiting for "ready" • "init_run" must not be not set cyclically • The same physical channel/reader is used in two (or more) UDT 10 structures. Check "ASM_address" and "ASM_channel" in all UDT 10 structures.
0B	"init_run" cannot be executed; cyclic process image for the CM is disrupted; FB 45 reports a timeout of the process image for the CM The timeout time can be adapted in DBB 47 of UDT 10 if required. The default value is 50 (dec.) = 2 seconds. Greater values (255 max.) increase the timeout time. • "ASM_address" in UDT 10 has bad parameter settings. The "ASM_address" may be on the wrong module. • "ASM_channel" setting is ≥16 or ≤0 • CM hardware/firmware is faulty. • The same physical channel/reader is used in two (or more) UDT 10 structures. Check "ASM_address" and "ASM_channel" in all UDT 10 structures.
0C	Area length error on block move for FB 45. • "DAT_DB" does not exist or is set too small. "DAT_DB_number" and "DAT_DB_address" in UDT 20 need to be checked • Write command with length = 0 was sent • "init_run" needs to be executed
0D	An "init_run" was not completed correctly. The process image is inconsistent. This message is equivalent to a timeout. A timeout is reported 15s after starting "init_run". This time can be adjusted when necessary in DBW 44. • Execute "init_run" again • Turn CM off and on again • The "RUN-STOP" switch on the CPU was pressed rapidly several times in succession (particularly with slow PROFIBUS baud rates) • The same physical channel/reader is used in two (or more) UDT 10 structures. Check "ASM_address" and "ASM_channel" in all UDT 10 structures.

error_BUS

Note

The following table of bus errors does not claim to be complete. If you receive any messages that are not documented here, you will find them in "System and standard functions S7-300/400, volume 1/2 (http://support.automation.siemens.com/WW/view/en/44240604)".

Table 5- 4 Error variable "error_BUS" when operating via PROFIBUS/PROFINET

Error code (W#16#...)	Description
800A	CM is not ready (temporary message) • This message is received by a user who is not using FB 45 and is querying the CM acyclically in very quick succession.
8x7F	Internal error in parameter x. Cannot be remedied by the user.
8x22 8x23	Area length error when reading a parameter. Area length error when writing a parameter. This error code indicates that parameter x is partially or completely outside the operand range or the length of a bit array for an "ANY" parameter is not divisible by 8.
8x24 8x25	Area error when reading a parameter. Area error when writing parameter. This error code indicates that parameter x is in an area not allowed for the system function.
8x26	Parameter contains a time cell number that is too high.
8x27	Parameter contains a counter cell number that is too high.
8x28 8x29	Alignment error when reading a parameter. Alignment error when writing a parameter. The reference to parameter x is an operand whose bit address is not equal to 0.
8x30 8x31	The parameter is located in the write-protected global DB. The parameter is located in the write-protected instance DB.
8x32 8x34 8x35	The parameter contains a DB number that is too high. The parameter contains an FC number that is too high. The parameter contains an FB number that is too high.
8x3A 8x3C 8x3E	The parameter contains a DB number that is not loaded. The parameter contains an FC number that is not loaded. The parameter contains an FB number that is not loaded.
8x42 8x43	An access error occurred while the system was attempting to read a parameter from the I/O area of the inputs. An access error occurred while the system was attempting to write a parameter to the I/O area of the outputs.
8x44 8x45	Error on nth (n > 1) read access after an error occurred. Error on nth (n > 1) write access after an error occurred.
8090	Specified logical base address is invalid: There is no assignment in SDB1/SDB2x, or it is not a base address.
8092	A type other than "BYTE" has been specified in an "ANY" reference.

Error code (W#16#...)	Description
8093	The area identifier contained in the configuration (SDB1, SDB2x) of the logical address is not permitted for these SFCs. Permitted: • 0 = S7-400 • 1 = S7-300 • 2, 7 = DP modules
80A0	Negative acknowledgment when reading from module; FB fetches acknowledgment although no acknowledgment is ready. A user who is not using the FB 45 would like to fetch DS 101 (or DS 102 to 104) although no acknowledgment is available. • Execute an "init_run" for resynchronization between CM and application
80A1	Negative acknowledgment while writing to the module. FB sends command although a CM is unable to receive a command
80A2	DP protocol error with layer 2 • DP-V1 mode must be set in the header module for distributed I/O. • Possible hardware defect
80A3	DP protocol error in Direct-Data-Link-Mapper or User-Interface/User. Could be a hardware defect.
80B0	• SFC not possible for module type. • Data record unknown to module. • Data record number ≥ 241 is not allowed. • Data records 0 and 1 are not permitted for SFB 52/53 "WR_REC".
80B1	The length specified in the "RECORD" parameter is wrong.
80B2	The configured slot is not occupied.
80B3	Actual module type is not the expected module type specified in "SDB1"
80C0	• RDREC: The module has the record, but there is no read data there yet. • WRREC: CM is not ready to receive new data – Wait until the cyclic counter has been incremented
80C1	The data of the preceding write job on the module for the same data record have not yet been processed by the module.
80C2	The module is currently processing the maximum possible number of jobs for a CPU.
80C3	Required resources (memory, etc.) are currently in use. This error is not reported by the FB 45. If this error occurs, the FB 45 waits until the system is able to provide resources again.

Error code (W#16#...)	Description
80C4	Communication error • Parity error • SW ready not set • Error in block length management • Checksum error on CPU side • Checksum error on module side
80C5	Distributed I/O not available.

Industrial UHF algorithms 6

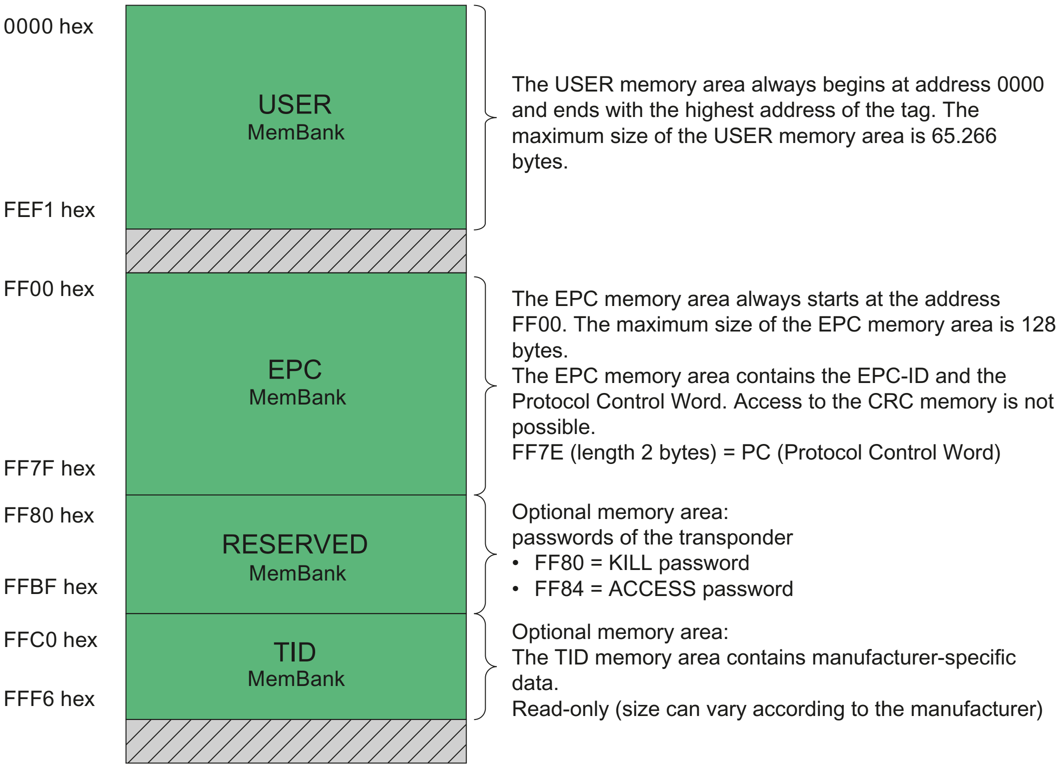
6.1 Memory configuration

Physical and virtual memory

When using the term memory configuration, a distinction must always be made between the physical memory on the RFID transponder and the virtual memory in the SIMATIC world. To read or write an address on the transponder, you only need to know the structure of the virtual SIMATIC memory. During the actual write or read process, the reader converts this virtual address in memory into a physical address on the transponder.

The following graphic shows the structure of the virtual SIMATIC memory and explains the function of the individual memory areas.

SIMATIC memory configuration



The USER memory area always begins at address 0000 and ends with the highest address of the tag. The maximum size of the USER memory area is 65.266 bytes.

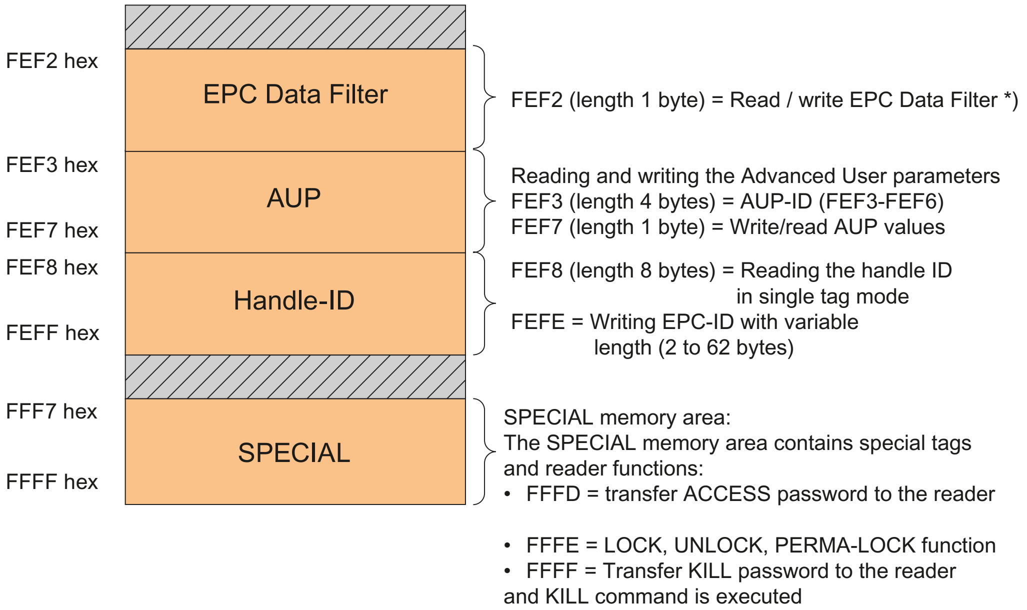
The EPC memory area always starts at the address FF00. The maximum size of the EPC memory area is 128 bytes.
The EPC memory area contains the EPC-ID and the Protocol Control Word. Access to the CRC memory is not possible.
FF7E (length 2 bytes) = PC (Protocol Control Word)

Optional memory area:
passwords of the transponder

- FF80 = KILL password
- FF84 = ACCESS password

Optional memory area:
The TID memory area contains manufacturer-specific data.
Read-only (size can vary according to the manufacturer)

Figure 6-1 SIMATIC memory areas of the RF600 transponders


FEF2 hex
FEF3 hex
FEF7 hex
FEF8 hex
FEFF hex
FFF7 hex
FFFF hex
EPC Data Filter
AUP
Handle-ID
SPECIAL
FEF2 (length 1 byte) = Read / write EPC Data Filter *)
Reading and writing the Advanced User parameters
FEF3 (length 4 bytes) = AUP-ID (FEF3-FEF6)
FEF7 (length 1 byte) = Write/read AUP values
FEF8 (length 8 bytes) = Reading the handle ID in single tag mode
FEFE = Writing EPC-ID with variable length (2 to 62 bytes)
SPECIAL memory area:
The SPECIAL memory area contains special tags and reader functions:
• FFFD = transfer ACCESS password to the reader
• FFFE = LOCK, UNLOCK, PERMA-LOCK function
• FFFF = Transfer KILL password to the reader and KILL command is executed

*) To avoid inconsistencies when writing the EPC Data Filter, the entries of Tag List and Black List are deleted and Smoothing or ITF are initialized and restarted.

Figure 6-2 SIMATIC memory areas of the RF600 readers for special functions

Structure of the handle ID and the EPC-ID

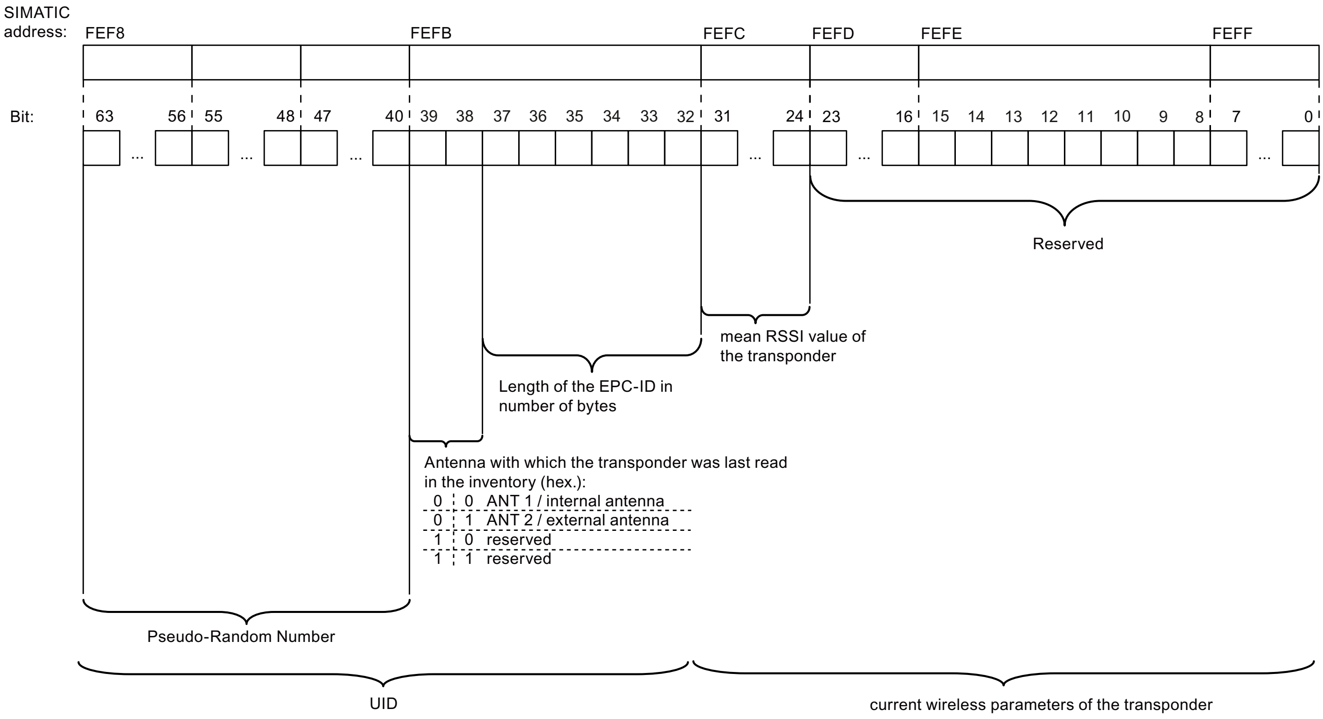

SIMATIC address:
FEF8
FEFB
FEFC
FEFD
FEFE
FEFF
Bit:
63
56
55
48
47
40
39
38
37
36
35
34
33
32
31
24
23
16
15
14
13
12
11
10
9
8
7
0
...
Reserved
mean RSSI value of the transponder
Length of the EPC-ID in number of bytes
Antenna with which the transponder was last read in the inventory (hex.):
0 0 ANT 1 / internal antenna
0 1 ANT 2 / external antenna
1 0 reserved
1 1 reserved
Pseudo-Random Number
UID
current wireless parameters of the transponder

Figure 6-3 Structure of the 8-byte handle ID

This structure of the handle ID is also stored with the "GET" command in UDT 210.

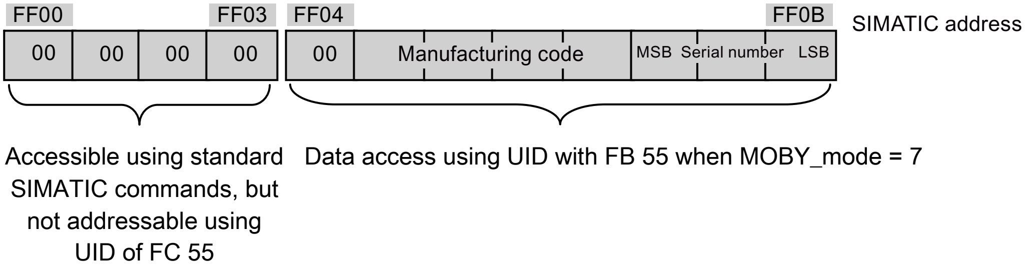

FF00
FF03
FF04
FF0B
SIMATIC address
00
00
00
00
00
Manufacturing code
MSB
Serial number
LSB
Accessible using standard SIMATIC commands, but not addressable using UID of FC 55
Data access using UID with FB 55 when MOBY_mode = 7

Figure 6-4 Structure of the EPC-ID with SIMATIC RF600 industrial transponders

MOBY_mode = 6:

Readers can work with any EPC-ID length in multitag mode. Even within a recognizable transponder population, the EPC-ID lengths can vary without any restrictions.

MOBY_mode = 7:

Readers can work only with an EPC-ID length of 12 bytes in multitag mode. If a transponder with an EPC-ID other than 12 bytes enters an antenna field, this transponder is not displayed by the presence check or LED.

Structure of the EPC MemBank memory

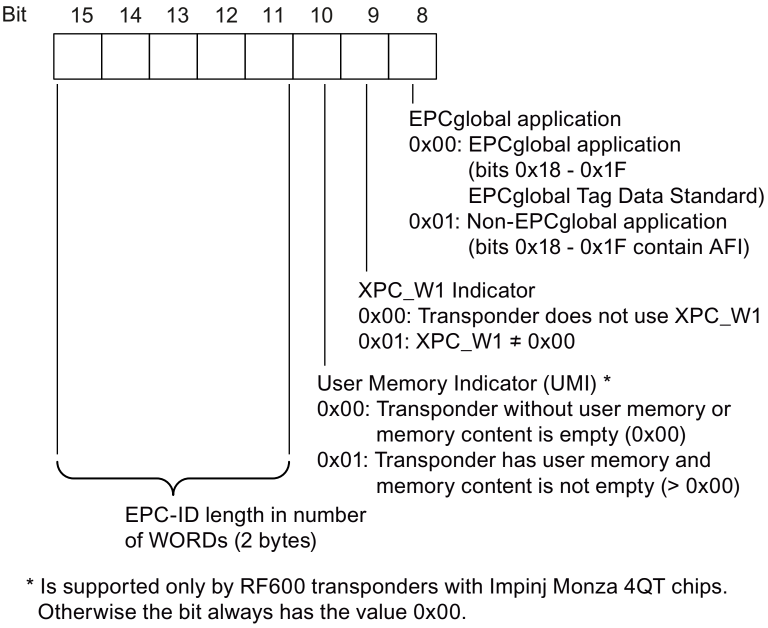

Bit
15
14
13
12
11
10
9
8
EPCglobal application
0x00: EPCglobal application
(bits 0x18 - 0x1F
EPCglobal Tag Data Standard)
0x01: Non-EPCglobal application
(bits 0x18 - 0x1F contain AFI)
XPC_W1 Indicator
0x00: Transponder does not use XPC_W1
0x01: XPC_W1 ≠ 0x00
User Memory Indicator (UMI) *
0x00: Transponder without user memory or
memory content is empty (0x00)
0x01: Transponder has user memory and
memory content is not empty (> 0x00)
EPC-ID length in number
of WORDs (2 bytes)
* Is supported only by RF600 transponders with Impinj Monza 4QT chips.
Otherwise the bit always has the value 0x00.

Figure 6-5 Structure of the EPC MemBank

6.2 Special memory configuration of the RF600 transponders

Tag	Chip type	User [hex]	EPC		TID	RESERVED (passwords)	Special	
			Range (preset length)	Access			KILL-PW	Lock function
RF630L (-2AB00, -2AB01)	Impinj Monza 2	-	FF00-FF0B (96 bits = FF00-FF0B)	read/ write	FFC0-FFC7	FF80-FF87	Yes	Yes
RF630L (-2AB02)	Impinj Monza 4QT [1]	00 - 3F	FF00-FF0F (96 bits = FF00-FF0B)	read/ write	FFC0-FFC9	FF80-FF87	Yes	Yes
RF630L (-2AB03)	NXP G2XM	00 - 3F	FF00-FF1D (96 bits = FF00-FF0B)	read/ write	FFC0-FFC7	FF80-FF87	Yes	Yes
RF680L	NXP G2XM	00 - 3F	FF00-FF1D (96 bits = FF00-FF0B)	read/ write	FFC0-FFC7	FF80-FF87	Yes	Yes
RF610T	NXP G2XM	00 - 3F	FF00-FF1D (96 bits = FF00-FF0B)	read/ write	FFC0-FFC7	FF80-FF87	LOCKED	Yes
RF610T ATEX	NXP G2XM	00 - 3F	FF00-FF1D (96 bits = FF00-FF0B)	read/ write	FFC0-FFC7	FF80-FF87	LOCKED	Yes
RF620T	Impinj Monza 4QT [1]	00 - 3F	FF00-FF0F (96 bits = FF00-FF0B)	read/ write	FFC0-FFC9	FF80-FF87	LOCKED	Yes
RF625T	Impinj Monza 4QT [1]	00 - 3F	FF00-FF0F (96 bits = FF00-FF0B)	read/ write	FFC0-FFC9	FF80-FF87	LOCKED	Yes
RF630T	NXP G2XM	00 - 3F	FF00-FF1D (96 bits = FF00-FF0B)	read/ write	FFC0-FFC7	FF80-FF87	LOCKED	Yes
RF640T	NXP G2XM	00 - 3F	FF00-FF1D (96 bits = FF00-FF0B)	read/ write	FFC0-FFC7	FF80-FF87	LOCKED	Yes
RF680T	NXP G2XM	00 - 3F	FF00-FF1D (96 bits = FF00-FF0B)	read/ write	FFC0-FFC7	FF80-FF87	LOCKED	Yes

[1] Uses User Memory Indicator (UMI), see section "UDT for EPC data filter"

6.3 Use of industrial UHF algorithms

An application-optimized selection of the existing industrial UHF algorithms along with antenna management serve to minimize potential mutual interference of the neighboring UHF RF600 readers in an industrial UHF environment.

The industrial UHF algorithms show a change in the response of the readers, especially if the number of channels is very limited and therefore the likelihood of mutual interference via the air interface is high.

Note

Use of the UHF algorithms

The use of the algorithms described here is complex and can change the response of the reader significantly. You should therefore only use these when the environment or the application demands them.

6.3.1 Overview of industrial UHF algorithms

The basic settings as described in the previous sections allow the use of the UHF readers in a standard electromagnetic environment in which, for example, few readers are being used and the metallic environment does not provoke any overshoot. The algorithms described here are used to introduce a degree of freedom so that they can be used as a preliminary filter for transponder access in physically difficult applications.

Note

The reader does not report any transponders

The aim of the industrial UHF algorithms is to filter the read transponders. This means that not all the transponders detected as being present in the antenna field are reported by the reader.

Make sure that the parameters for the algorithms are assigned so that access to the transponders in the environment you have selected and in the arrangements you require can be performed efficiently!

The following overview illustrates the flow of information from the physical detection of a transponder in the antenna field through to communication with the CM module. This results in the possible combinations of filters shown in the following table.

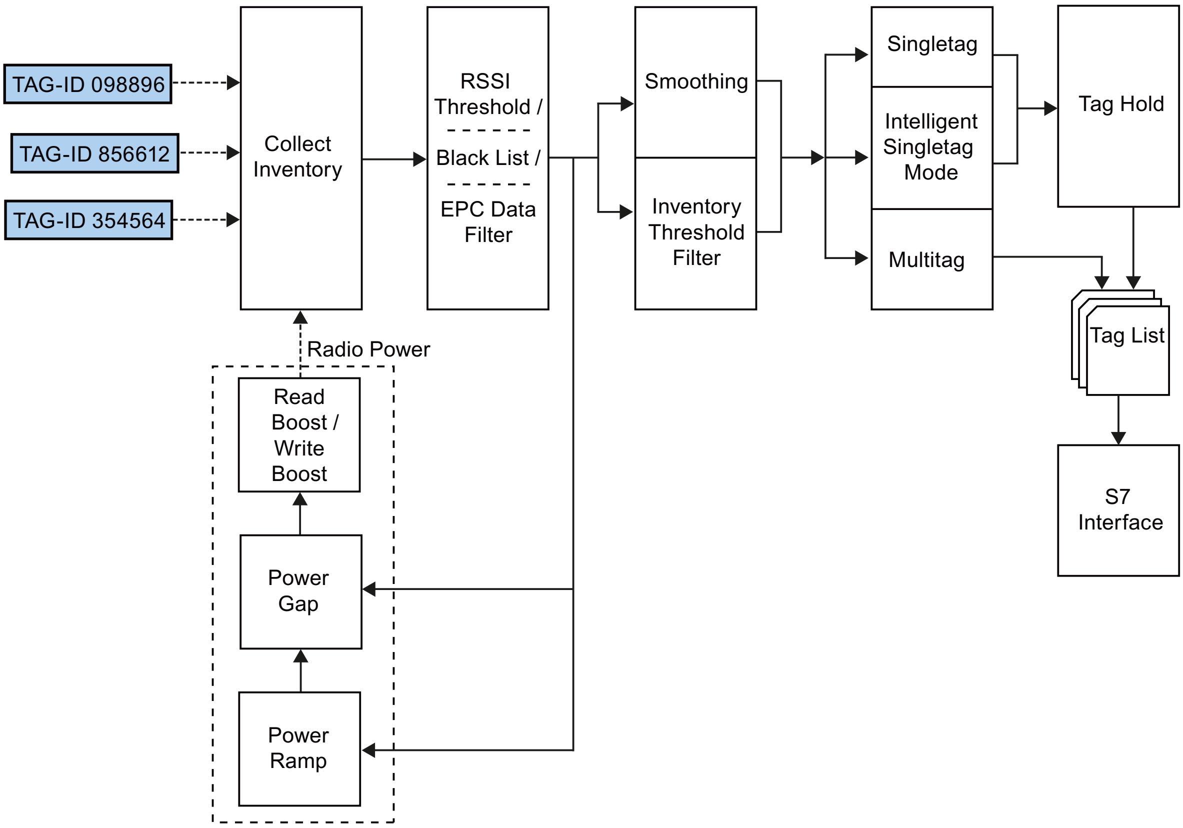


Figure 6-6 Tag List Processing by the industrial SIMATIC UHF algorithms of the RF600 reader

Brief description of the UHF algorithms:

- RSSI Threshold: Filtering out of transponders based on their RSSI value
- Black List: List with the transponders to be filtered out the
- EPC Data Filter: Filtering out of transponders based on EPC data content
- Smoothing:Filtering if transponders are not constantly detectable
- Inventory Threshold Filter: Filtering of transponders based on their read frequency
- Intelligent Singletag Mode: Automatic selection of a transponder based on its properties in the wireless field
- Tag Hold: Reliable process access to a transponder that has already been processed
- Power Ramp: Automatic adaptation of the transmit power
- Power Gap: Improved interference immunity when operating readers installed close together
- Read/Write Boost: Increased power when reading and writing transponders

This results in the following options for combining filters:

Possible combinations of the UHF algorithms

Mode	Read Boost	Write Boost	Power Ramp	Power Gap	RSSI Threshold	Black List	EPC Data Filter	ISTM[1)]	Tag Hold
Smoothing single tag mode	X	X	X	X	X	X	X	X	X
Smoothing multitag mode	X	X	X	X	X	X	X	-	-
ITF single tag mode	X	X	X	X	X	X	X	X	X
ITF multitag mode	X	X	X	X	X	X	X	-	-

[1)] Intelligent Singletag Mode

Single tag mode:

- MOBY_mode = 5 or
- MOBY_mode = 6, with "READ", "WRITE", and "INIT" commands with UID = 0x00

6.3.2 Status display of industrial UHF algorithms and RF600 blink codes

You can display additional information on the reader status as an option by enabling the Field Diagnosis Indicator (FDI). With FDI enabled, the reader status is indicated by the reader LED when working through the industrial UHF algorithms. Based on the various statuses of the reader LED, you can quickly identify the source of problems if problems occur.

Sequence of enabling the Field Diagnosis Indicator (FDI)

The setting "Field Diagnosis Indicator = 0x01" supports you on-site at the reader when trying the find the causes of data access problems. If the reader is linked to the PLC via a CM, the LED blinks green because no "init_run" command was sent. The reader must be initialized with the "RESET" command or an antenna status change from "all antennas off" to "at least one antenna on" before it processes a new transponder; the LED is then lit green.

Starting from this status, each transponder runs through the same statuses and stops at the same prioritization once processing is complete. If the application shows an abnormal behavior, you can recognize the status in which the reader algorithms stop. With the help of the table, you can find out the cause of the problem and eliminate it directly regardless of the displayed FDI.

Following a further "init_run" command, the processing sequence is restarted (LED static green).

Table 6- 1 Display of the reader status via the operating display with Field Diagnosis Indicator (FDI) enabled

Sequence (priority)	Blink coding		Value (address +25.0, UDT 340)	Description
	LED color	Blinking / Flashing / Static [1)]		
-	-	-	0x00	The device is without power.
1	Green	Blinking	0xFF	IDLE (Reader waits for an antenna to be activated): All antennas are turned off. Source of the problem and how to eliminate it: If no "init_run" has yet been sent, the antenna(s) was/were not turned on. Runtime error in user program
2	Green	Static	0xFE	READY (Reader is ready for operation): At least one antenna has been activated and inventories are being taken actively. Smoothing: The reader uses smoothing. At the time of the display, no transponder has been recognized. ITF: The reader uses ITF. At the time of the display, the ITF is being run through. Source of the problem and how to eliminate it: Smoothing There is no transponder in the antenna field or the transponder is defective. ITF: The ITF operation is not yet completed.
3	Green	Flashing	0xFD	ITF COMPLETED (Reader waits for further commands or ITF restart): On completion of the ITF, no inventories are taken, no transponder was detected using ITF. Source of the problem and how to eliminate it: ITF is completed; the reader waits for commands from the application.
4	Yellow	Flashing	0xFC	FILTERED (Transponders recognized in the antenna field were filtered): Transponders were recognized in the antenna field but due to at least one of the algorithms: • RSSI Threshold, • Black List, • EPC Data Filter, • ITF/Smoothing, • ISTM (single tag mode only) they were completely filtered out. No transponder was reported as present. Source of the problem and how to eliminate it: Transponders were recognized. But these are not available for the command because they have been filtered out. This is an indication that the "correct" transponder is defective or that the parameter assignments of the algorithms listed above are incorrect.
5	Yellow	Blinking	0xFB	PRESENCE (Presence reported): The presence of at least one transporter was reported. Read/write commands not yet completed (acknowledged). With ISTM, a read/write command is executed to make sure that a transponder is located in the antenna field. Source of the problem and how to eliminate it: Transponder was recognized for processing. The command from the application is still missing or the command is currently being processed in the reader.

Sequence (priority)	Blink coding		Value (address +25.0, UDT 340)	Description
	LED color	Blinking / Flashing / Static [1)]		
6	Yellow	Static	0xFA	ACCESS (read/write commands to transponder successfully processed): All submitted read/write accesses to transponders have been successfully processed. Source of the problem and how to eliminate it: None
7	Red	Blinking	0x01 ... 0x1F	ERROR(Error occurred): If the value is > 0x01, the reader has detected an error. The value decides the frequency at which the ERR-LED flashes. Eliminate the cause of the problem with the help of the section "Error messages and flashing codes (Page 84)" and then send an "init_run" command.

[1)] Blinking: The length of time lit and the length of time unlit are identical; flashing: Short length of time lit and longer length of time unlit; static: LED lit permanently

Parameter assignment

With the reader factory setting, the Field Diagnosis Indicator (FDI) is disabled. You will find the description of the reader status without FDI in the section "Operating display for RF620R and RF630R" in "RF600 system manual (http://support.automation.siemens.com/WW/view/en/22437600)"). You can enable and disable FDI using the AUP "Advanced LED Status".

Activating/deactivating the Field Diagnosis Indicator (FDI)

To enable the Field Diagnosis Indicator, write the value "0x01", to disable the FDI write the value "0x00" in the AUP "FieldDiagnosisIndicator".

Principle of how the Field Diagnosis Indicator (FDI) operates

If the Field Diagnosis Indicator is active, the reader displays the status of the industrial UHF algorithms (see table). The sequence of the status change is only indicated from a lower (lesser) priority to a higher priority but never the other way around. You need to reset the status display to display a status of lower priority.

Resetting the reader status of the Field Diagnosis Indicator (FDI)

Reset the display of the reader status using the following mechanisms:

- Restarting the reader
- Setting an "init_run" command with "bit 1 = 1" in the "option_1" variable.

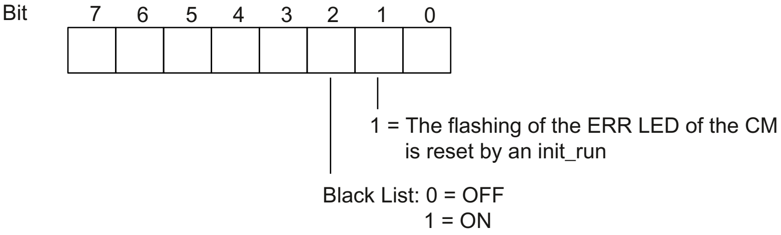

Bit
7 6 5 4 3 2 1 0
1 = The flashing of the ERR LED of the CM is reset by an init_run
Black List: 0 = OFF
1 = ON

Figure 6-7 The INPUT parameter "option_1"

- Status change using the "SET-ANT" command:

  Disable and then enable the antennas with "SET-ANT".

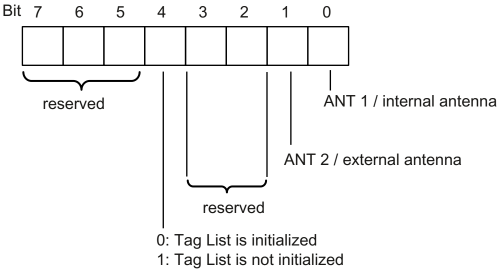


Figure 6-8 The "sub_command" with the "SET-ANT" command

Note

The Field Diagnosis Indicator (FDI) is not specific to an antenna

The FDI shows the status of the industrial algorithms of all activated antennas. If only one antenna of the RF600 reader is processing transponders in the antenna field, this is not visible in the status display. To check the arrangement separately for each antenna, enable only one antenna at a time.

Note

Conditional LED diagnostics capability in multitag mode and ScanningMode

The status LED always shows only the status with the highest priority that was reached during the last runs. If a status with lower priority was reached during one of the runs, this priority is not indicated; in other words, the coding does not fall back to the lower priority. In ScanningMode, additional errors during read access to memory content is not indicated by the transponder.

The operating display of the reader

Table 6- 2 Display of the reader status via the operating display with Field Diagnosis Indicator (FDI) disabled

Blink coding		Value (address +25.0, UDT 340)	Description
LED color	Blinking / Static		
-	-	0x00	The device is starting up.
Green	Blinking	0xFF	The device is ready. The antenna is switched off.
Green	Static	0xFE	The device is ready. The antenna is switched on.
Yellow	Static	0xFA	"With presence": there is at least one transponder in the antenna field. "Without presence": Communication with a transponder is active.
Red	Blinking	0x01 ... 0x1F	Reader is not active, a serious error has occurred. In addition, this LED also indicates the fault status through the number of blinking pulses. A restart (cycle power off → on) is necessary. For the "INACTIVE" status, the LED flashes once. In this case, no restart is necessary.

Note

Operating/status display of industrial UHF algorithms and RF600 blink codes with SLG-STATUS

The current status indicated by the LED of the reader using a flashing code is also output in UDT 340, address +25.0 as a hexadecimal value.

6.3.3 Status display of industrial UHF algorithms using of SLG-STATUS

You can display additional information about the reader status when processing the industrial UHF algorithms using "SLG-STATUS" with "sub_command = 0x08". The information acknowledged by the reader, however, corresponds to "sub_command = 0x07" with additional information consisting of overview, filter status and debug.

Remember that "sub_command = 0x08" resets the statistical values of the UHF algorithms to "0".

Table 6- 3 Additional information on the industrial UHF algorithms

Information category	Variable	UDT 340 address	Description
Flash coding	blink_pattern	+25.0	Operating display of the reader or shows the reader status using the Field Diagnosis Indicator (FDI).
Overview	activated_algorithms	+26.0	Shows the activated industrial UHF algorithms.
Filter status [1]	filtered_max_rssi	+34.0	Maximum measured RSSI value of a transponder. Starting with all transponders that were filtered out.
	filtered_tags_rssi	+36.0	Number of transponders that were filtered out by the RSSI threshold.
	filtered_tags_black_list	+38.0	Number of transponders that were detected and filtered out by the Black List. This list contains no empty entries or double counts of transponders with an identical EPC-ID.
	filtered_tags_epc_data	+40.0	Number of reads of all transponders that were detected and filtered out by the EPC filter.
	filtered_tags_smoothing	+42.0	Number of transponders in the Tag List that are in Smoothing as undetected transponders at the time of the query.
	itf_ph1_max_detect	+44.0	Maximum number of reads of a transponder in phase 1 of the last ITF operation. Starting with all transponders that were filtered out.
	itf_ph1_tags_detect	+46.0	Number of transponders that were filtered out by the ITF phase 1. The value is reset by a status query.
	itf_ph2_max_detect	+48.0	Maximum number of reads of a transponder in phase 2 of the last ITF operation. Starting with all transponders that were filtered out.
	itf_ph2_tags_detect	+50.0	Number of transponders that were filtered out by the ITF phase 2. The value is reset by a status query.
	filtered_istm_min_dist	+52.0	Minimum distance of two transponders that were evaluated by the ISTM using the selected sort criterion (1st and 2nd transponder in the sorted list).
	filtered_istm_tags	+54.0	Number of transponders that were filtered out by the ISTM algorithm.
Debug	last_error	+56.0	Error code of the last error to occur that was triggered as a result of the "error_command1…3" command.
	error_command1	+58.0	Command that resulted in the "last_error" to occur.
	error_command2	+60.0	
	error_command3	+62.0	

[1] If one of the variables reaches the maximum value, the variable stops at this value and does not continue to count. The only exception is the variable "filtered_istm_min_dist". The variable always shows the lowest measured distance value.

Parameter assignment

Starting and resetting the status display

To start data acquisition, you need to send an "init_run" command.

To reset the status display and restart, there are two mechanisms:

- Restarting the reader followed by sending a valid "init_run" command
- Sending the "SLG-STATUS" with "sub_command = 0x08"

Deactivating of the status display

Deactivation is not possible.

Sequence of the status display algorithm

After starting the algorithm, all bits are set to the "activated_algorithms" status. The "filtered_istm_min_dist" variable is written with an initial value "0xFFFF". The other variables are initialized with "0x00" or "0x0000".

Each variable is updated with every cycle of the individual filters and algorithms. By calling the "SLG-STATUS" with "sub_command = 0x08", the values valid at the time of the call are acknowledged and the variables are reinitialized.

Acknowledging the data

After acknowledgement of the "SLG-STATUS", the following information is available:

- "activated_algorithms"

  The "activated_algorithms" variable is shown in UDT 340 (address +26.0):

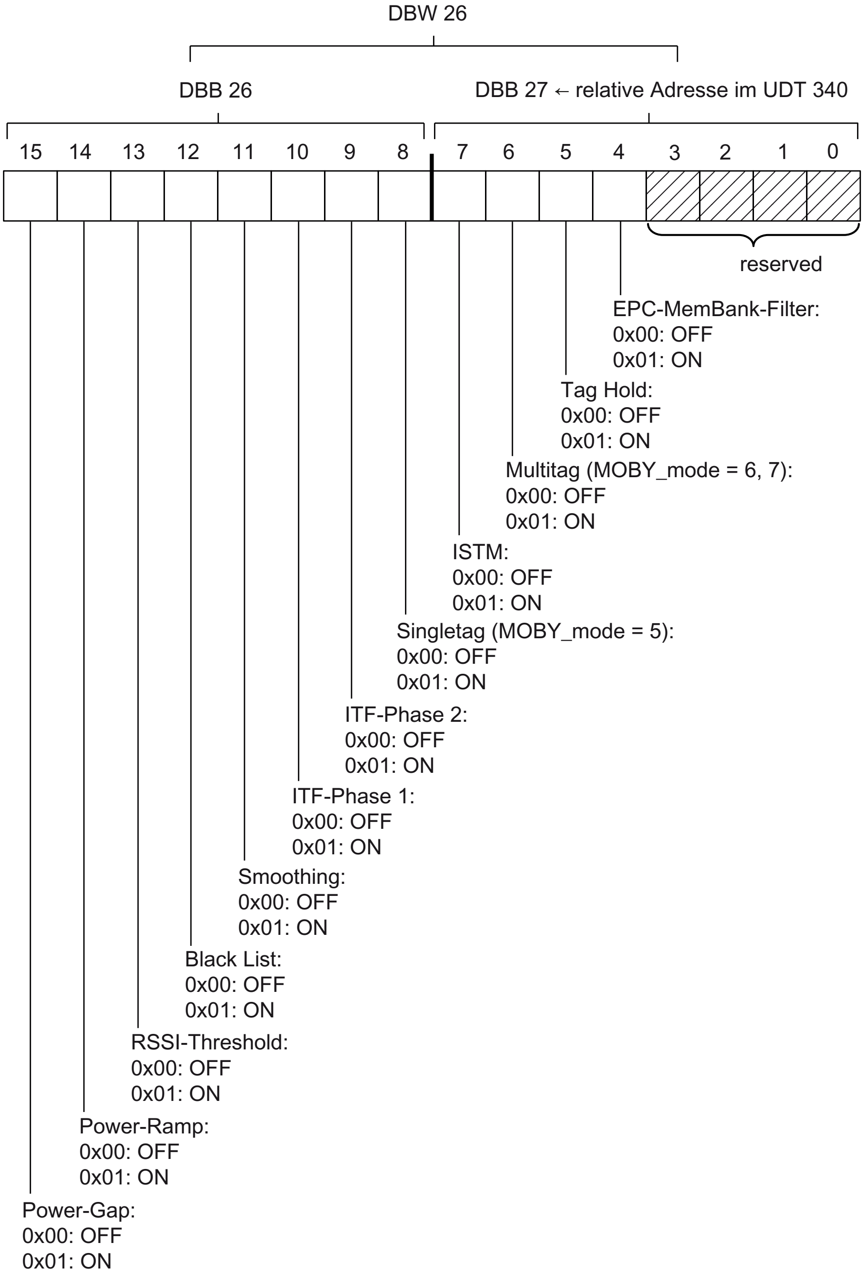


Figure 6-9 Meaning of the bits of "activated_algorithms"

- "filtered_max_rssi"
  - The "filtered_max_rssi" variable is shown in UDT 340 (address +34.0).
  - Highest measured RSSI value of all transponders that were filtered out by the RSSI Threshold function.
- "filtered_tags_rssi"
  - The "filtered_tags_rssi" variable is shown in UDT 340 (address +36.0).
  - Total number of transponder recognitions that were discarded by the filter.
  - The counter is independent of the EPC-ID; in other words, if an EPC-ID is discarded more than once due to the RSSI threshold, the counter is incremented by the number of multiple filter actions.
- "filtered_tags_black_list"
  - The "filtered_tags_black_list" variable is shown in UDT 340 (address +38.0).
  - Total number of transponders that were filtered out by the filter. The number differs from the number of transponders in the Black List as output, for example by a "GET" or "SLG-STATUS" command with "sub_command = 0x20".

    Example: If a new transponder is added to the Black List with a "SET-ANT" command (antenna = off, Tag List initialize = 0), the content of the Black List will be modified, however the "filtered_tags_black_list" variable remains unchanged because with the antenna off, this special transponder could not yet be filtered out. If a "SET-ANT" command (antenna = off, Tag List initialize = 0) is executed without a valid transponder being in the antenna field, a so-called empty tag/empty entry is added to the Black List.

    Possible double counts:

    Double counts may occur due to the finite and manageable data management in the reader when a transponder exits the circular buffer in the meantime and is then added once again.

    Example of a double count

    Step 1:

    Four or five of the transponders in the Black List have been recognized at least twice and therefore marked as "filtered out ("filtered_tags_black_list = 0x0004"):

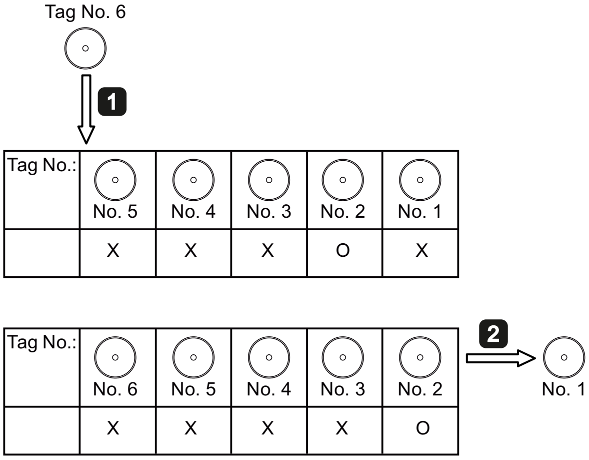
Black List

Tag No.:	◎ No. 5	◎ No. 4	◎ No. 3	◎ No. 2	◎ No. 1
	X	X	X	O	X

X	Transponder entered in or filtered out of the Black List
O	Empty entry (no transponder recognized)

Step 2:

Another transponder enters the antenna field and is added to the Black List. Because the Black List memory is full, transponder no. 1 is removed and transponder no. 6 is included in the Black List (filtered_tags_black_list = 0x0004):

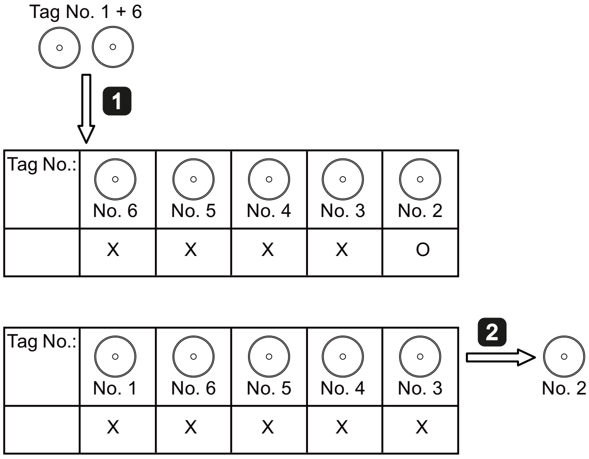


Tag No.:	No. 5	No. 4	No. 3	No. 2	No. 1
	X	X	X	O	X

Tag No.:	No. 6	No. 5	No. 4	No. 3	No. 2
	X	X	X	X	O

Step 3:

Transponder no. 1 and no. 6 return to the antenna field, transponder no. 6 is marked as "filtered out" ("filtered_tags_black_list = 0x0005"), transponder no. 1 is included in the Black List ("filtered_tags_black_list = 0x0006") and transponder no. 2 is removed:



Tag No.:	No. 6	No. 5	No. 4	No. 3	No. 2
	X	X	X	X	O

Tag No.:	No. 1	No. 6	No. 5	No. 4	No. 3
	X	X	X	X	X

Because the ring memory of the Black List was selected too small, transponder no. 1 is taken into account twice in the "filtered_tags_black_list" counter. There are two countermeasures to avoid such inconsistencies.

Countermeasure to prevent double counts:

- Increase the size of the ring memory
- Reduce the time between two "SLG-STATUS" queries.

- "filtered_tags_epc_data"
  - The "filtered_tags_epc_data" variable is shown in UDT 340 (address +38.0).
  - Total number of filter actions with which transponders were filtered out using the EPC Data Filter at the time of the "SLG-STATUS" query.

Note

Displays the number of transponders filtered out

If "x" different transponders were filtered out "y" times consecutively, the number " x * y" is displayed by "filtered_tags_epc_data".

Example: If 5 transponders are filtered out 10 times, the value "500" (0x01F4) is displayed.

- "filtered_tags_smoothing"
  - The "filtered_tags_smoothing" variable is shown in UDT 340 (address +40.0).
  - Total number of transponders that were filtered out at the time or "SLG-STATUS" by Smoothing.

Note

Status display with "filtered_tags_smoothing"

The "filtered_tags_smoothing" variable returns the current status of the Tag List. The variable does not display the total number of transponders between two "SLG-STATUS" queries that were filtered out by Smoothing.

- "itf_ph1_max_detect"
  - The "itf_ph1_max_detect" variable is shown in UDT 340 (address +42.0).
  - The maximum number of reads of a transponder in phase 1. Starting with all the transponders that were filtered out by the ITF in phase 1.
  - Quantitative measure for the selection of "ITF_Histogramm_Phase1". The greater the distance between "itf_ph1_max_detect" and "ITF_Histogramm_Phase1" and if only the selected transponder is processed further, the more reliable the detection of the transponder using ITF.
  - If the ITF is run more than once, you always receive the maximum number of reads of the transponder that was read most often in one of the runs. This transponder, however, has not reached the minimum number of transponder recognitions and was filtered out.
- "itf_ph1_tags_detect"
  - The "itf_ph1_tags_detect" variable is shown in UDT 340 (address +44.0).
  - Total number of transponder recognitions discarded by the ITF in phase 1.
  - If the ITF is run through more than once, the total number of transponders that were filtered out in all the runs of the ITF in phase 1 is displayed.

- "itf_ph2_max_detect“
  - The "itf_ph2_max_detect" variable is shown in UDT 340 (address +46.0).
  - The maximum number of reads of a transponder in phase 2. Starting with all the transponders that were filtered out by the ITF in phase 2.
  - Quantitative measure for the selection of "ITF_Histogramm_Phase2". The greater the distance between "itf_ph2_max_detect" and "ITF_Histogramm_Phase2" and if only the selected transponder is processed further, the more reliable the detection of the transponder using ITF.
  - If the ITF is run more than once, you always receive the maximum number of reads of the transponder that was read most often in one of the runs. This transponder, however, has not reached the minimum number of transponder recognitions and was filtered out.
- "itf_ph2_tags_detect"
  - The "itf_ph2_tags_detect" variable is shown in UDT 340 (address +48.0).
  - Total number of transponder recognitions discarded by the ITF in phase 2.
  - If the ITF is run through more than once, the total number of transponders that were filtered out in all the runs of the ITF in phase 1 is displayed.
- "filtered_istm_min_dist"
  - The "filtered_istm_min_dist" variable is shown in UDT 340 (address +50.0).
  - Minimum distance of two transponders that were evaluated by the ISTM using the selected sort criterion (1st and 2nd transponder in the sorted list).
  - The minimum distance always defines the worst-case scenario. If no valid transponder could be found with ISTM, the minimum distance is "0x0000". If a valid transponder was found using ISTM, the minimum distance is the threshold of the ISTM.

- "filtered_istm_tags"
  - The "filtered_istm_tags" variable is shown in UDT 340 (address +52.0).
  - Total number of transponder recognitions that were discarded by ISTM.
  - If the ISTM is run through, the total number of transponders that were filtered out in all the runs of the ISTM in phase 1 is displayed.

  Example of the ISTM statistics:

  - With each run, the distance, from the point of view of the sorting criterion Sorting between the 1st and 2nd transponder is detected. The distance is updated if the distance between the first two transponders has become less than in all previous runs. The value determines the shortest distance that was ever reached between the first two transponders. As result, the distance can reach the minimum value "0x0000".
  - When successful, in other words, when a transponder is reported as valid, the number of all discarded transponders is added up and the distance between the 1st and 2nd transponder is defined as "0xFFFF". This assumes that there was no 2nd transponder in the antenna field.
  - With a run through of the ISTM, there are three possibilities:

    a. One or no transponder was recognized:

    - "filtered_istm_tags = 0x0000"

    - "filtered_istm_min_dist = 0xFFFF"

    b. "n" transponders were recognized, the distance criterion between the 1st and 2nd transponder was kept to:

    - "filtered_istm_tags = n - 1";

    - "filtered_istm_min_dist = 0xXXXX", where "0xXXXX" is the hexadecimal value for the distance between the 1st and 2nd transponder.

    b. "n" transponders were recognized, the distance criterion between the 1st and 2nd transponder was not kept to:

    - "filtered_istm_tags = n";

    - "filtered_istm_min_dist = 0xXXXX", where "0xXXXX" is the hexadecimal value for the distance between the 1st and 2nd transponder.
- "last_error"
  - Error code of the last error to occur that was triggered as a result of the "error_command1,...,error_command3" command.
  - If no error has occurred, the data content of "last_error = 0x00"
- "error_command1,…,error_command3"
  - Call for the command that resulted in the "last_error" to occur.
  - If no error has occurred, the data content of "error_command1 = 0x0000,…,error_command3 = 0x0000"
  - The first 3 WORD (2 bytes) of a command/command header are output. If the command is > 6 bytes, the remainder is truncated. If the command is < 6 bytes, the remainder is padded with "0x00".

Note

The statistics of all variables are corrupted in the filter status

Note that the following changes between two successful acknowledgements of "SLG-STATUS" with "sub_command = 0x08" can lead to the statistics being corrupted:

- Reassigning parameters of the industrial UHF algorithms using the "RESET" command,
- Enabling/disabling RSSI Threshold, Black List, EPC Data Filter or
- Setting the AUPs.

6.3.4 Tag list

The Tag List is a reader-internal list of transponders. Each transponder recognized as being valid by a reader is entered in the Tag List. The Tag List contains information about the transponders, for example handle IDs, EPC-IDs and RSSI values.

In MOBY_mode = 6, you can read out the Tag List with the "GET" command. With the "sub_command" parameter of the "GET" command, you can select various sorting criteria. As an example, the transponder with the highest average RSSI value can be transferred to the first position in the list. This means that you can specify access the transponder closest to the antenna.

Note

Initialization of the Tag List

As soon as the "SET-ANT" command (with the "sub_command" bit 4 = 0) has been sent, the entries in the Tag List are discarded, the "ANZ_MDS_present" bit is set to 0.

With an "init_run" or a "SET-ANT" command (antenna ON) with bit 4 = 0, all entries in the Tag List are discarded and the Tag List is initialized. All the transponders in the antenna field are re-entered in the Tag List and the number of transponders is updated.

If bit 4 = 1 is set in the "SET-ANT" command of "sub_command", the Tag List is not discarded but continues to be updated. This also applies if the antennas are turned off. When using Smoothing, the reader makes further inventories internally. If the antenna is turned off, these inventories do not receive any transponders so that after 5 inventories, the transponder is removed from the Tag List.

6.3.5 Smoothing versus Inventory Threshold Filter (ITF)

Smoothing

For standard applications, the reader uses the Smoothing algorithm.

During Smoothing, following an "init_run" command, the reader always takes inventories in the background while processing SIMATIC commands and with these inventories, it can analyze which transponders are in the antenna field when and how often. With the help of these inventories, the Smoothing algorithm can avoid disruptions.

A transponder counts as being recognized when it is detected often enough successively in the inventories that have been taken. The Smoothing criterion, the number of successive detections is defined by the "Observed Threshold Count" parameter.

If a transponder is not recognized for the number of successive inventories specified in "Observed Threshold Count", a transponder is discarded and declared as not present.

Data access using SIMATIC is only possible after a transponder has been marked as detected:

- Updating the presence
- Read/write access to the transponder

The smoothing algorithm is re-initialized and started after an "init_run" or "SET-ANT" command in which bit 4 = 0 is set in the "sub_command".

While the Smoothing is active, the Tag List is updated continuously.

Note

Duration of pauses

When using Smoothing, remember to include a pause between "init_run" or "SET-ANT" and the "GET" command. This is the only way to make sure that the reader has adequate time to detect all transponders in the antenna fields.

Remember that the time of the pause is N times longer depending on the number of transponders in the antenna field. If "Observed Threshold Count" is active, the time of the pause increases again depending on the set value and the transponders located in the antenna field.

Example

It is difficult to bring 2 or more transponders into an antenna field from the outside dynamically at the same time. In such a situation, typically only one single transponder is detected first. With Smoothing (a transponder must be detected 5x in succession), this means that this transponder is also the first to be recognized as valid.

The response described is a UHF system property.

- If, for example, 2 or more transponders are placed statically in front of the antenna and the sequence is started on the reader, the error "0x1D" - "more than one tag in the field" - is reported in single tag mode.
- If the sequence is started on the reader before there are transponders in the antenna field and if 2 or more transponders are then brought into the antenna field and left in an ideal position in front of the antenna, no "0x1D" error is reported because the first detected transponder is processed immediately.

This response can be avoided with the help of the ITF algorithm.

Inventory Threshold Filter (ITF)

For applications in which transponder access can be critical due to the environment (overshoots, sporadic detection/non-detection of transponders etc.) The Inventory Threshold Filter is available.

Following an "init_run" command, the readers take a selectable number of inventories. On completion of the last inventory, the transponders detected with a selectable frequency are marked as being valid. Only then is the presence updated and read/write access to the transponders possible.

Remember that transponders are detected only while the ITF is running. After this, no further inventories are made until the ITF is restarted.

The ITF uses two phases that differ in their duration and Power Ramp functions.

- ITF phase 1:

  The Power Ramp (Page 119) is used. If only one transponder was selected following phase 1, filtering is completed. The selected transponder is processed further and phase 2 is not run through. This also applies to the multitag mode. The ITF phase 1 is run through taking into account the parameter assignment of the ITF Duration Phase 1 and ITF Histogram Phase 1.

- ITF phase 2:

  If no or more than one transponder was detected in phase 1, phase 2 is started. The parameter assignment for phase 2 is not dependent on phase 1. The Power Ramp for phase 2 differs from the normal Power Ramp:

  1. A fixed number of inventories is defined that are executed with a constant antenna power. Following this, the power is increased by a selectable amount before the next fixed number of inventories is worked through.

  2. The initial power of phase 2 is the same as the power currently set by phase 1.

  3. All the transponders recognized as being valid at the end of phase 2 are processed further; in other words, phase 2 - in contrast to phase 1 - can also return more than one transponder.

Note

Using the ITF

Use the ITF only when you can be sure that the transponders to be read are located in the antenna field within a defined time.

ITF parameter assignment

The ITF algorithm is stopped, re-initialized and started after an "init_run" or "SET-ANT" command in which bit 4 = 0 is set in the "sub_command".

The ITF algorithm is stopped if no antenna is active; in other words following an "init_run" command, a "SET-ANT" command is sent in which bits 0 and 1 = 0 in the "sub_command".

Group	Name	Note
Power Ramp	Boost Step Size ANT 1	Increased power per step of the Power Rampof antenna 1 in 0.25 dB steps (e.g. 0x02 corresponds to 0.5 dB power increase in one step).
	Boost Step Size ANT 2	Increased power per step of the Power Ramp of antenna 1 in 0.25 dB steps (e.g. 0x02 corresponds to 0.5 dB power increase in one step).
	Boost Max ANT 1	Maximum power increase after N steps of the Power Ramp of antenna 1 in 0.25 dB steps. With the basic setting 0x00, the Power Ramp for antenna 1 is deactivated.
	Boost Max ANT 2	Maximum power increase after N steps of the Power Ramp of antenna 1 in 0.25 dB steps. With the basic setting 0x00, the Power Ramp for antenna 2 is deactivated.
	Boost Threshold ANT 1	Number of consecutive inventories worked through via antenna 1 in which no transponder was detected before the power is increased. When the Inventory Threshold Filter is active, number of inventories taken consecutively via antenna 1 before the power is increased.

Group	Name	Note
	Boost Threshold ANT 2	Number of consecutive inventories taken via antenna 2 in which no transponder was detected before the power is increased. When the Inventory Threshold Filter is active, number of inventories taken consecutively via antenna 2 before the power is increased.
Power Ramp 2 (only with ITF with phase 2)	Boost2 Step Size ANT 1	Increased power per step of the Power Ramp of antenna 1 in 0.25 dB steps (e.g. 0x02 corresponds to 0.5 dB power increase in one step).
	Boost2 Step Size ANT2	Increased power per step of the Power Ramp of antenna 2 in 0.25 dB steps (e.g. 0x02 corresponds to 0.5 dB power increase in one step).
	Boost2 Max ANT 1	Maximum power increase after N steps of the Power Ramp of antenna 1 in 0.25 dB steps. With the basic setting 0x00, the Power Ramp for antenna 1 is deactivated.
	Boost2 Max ANT 2	Maximum power increase after N steps of the Power Ramp of antenna 1 in 0.25 dB steps. With the basic setting 0x00, the Power Ramp for antenna 2 is deactivated.
	Boost2 Threshold ANT 1	Number of inventories taken consecutively via antenna 1 before the power is increased.
	Boost2 Threshold ANT 2	Number of inventories taken consecutively via antenna 2 before the power is increased.
	Gap Min Duration	Minimum pause between two inventories in ms.
	Gap Max Duration	Maximum pause between two inventories in ms. If the maximum pause length = 0 ms, Power Gap is deactivated. If max < min, Power Gap is also deactivated.
Inventory Threshold Filter	ITF Duration phase 1	Specifies the duration of the Inventory Threshold Filter. The value defines the number of inventories to be taken. If the value = 0, the phase is not worked through. The ITF is turned off (and therefore Smoothing is active) when: ITF Duration phase 1 = 0;
	ITF Histogramm phase 1	Number of inventories in which a transponder must be detected, so that it is recognized as valid.
	ITF Duration phase 2	Specifies the duration of the Inventory Threshold Filter. The value defines the number of inventories to be taken. If the value = 0, the phase is not run through.
	ITF Histogramm phase 2	Number of inventories in which a transponder must be detected, so that it is recognized as valid.

You will find more detailed information on setting the parameters in the section "Setting the Advanced User Parameters (AUP) (Page 139)".

6.3.6 Read/Write Boost algorithm

Write or read access to a transponder may require a higher power than is necessary to simply detect a transponder. To increase access reliability, an increased power can be defined for read and write access.

Parameter assignment

The power offset can be set using the Advanced User Parameters "ReadBoost" and "WriteBoost" separately for reading and writing. Note that the maximum physical transmit power must not be exceeded under any circumstances.

You will find more detailed information on parameter assignment in the section "Setting the Advanced User Parameters (AUP) (Page 139)".

6.3.7 Power Ramp algorithm

The Power Ramp algorithm allows a ramped increase in the radiated power of an antenna.

The advantage of the Power Ramp compared with a constantly set power is that the power is increased only until a transponder is detected. This avoids unnecessarily high power settings and side-effects such as overshoot, disruption of neighboring reader applications etc. are restricted. The algorithm operates separately for each antenna so that each individual antenna can be adapted to the optimum setting.

Power Ramp parameter assignment

The Power Ramp is set separately for each antenna available via the reader:

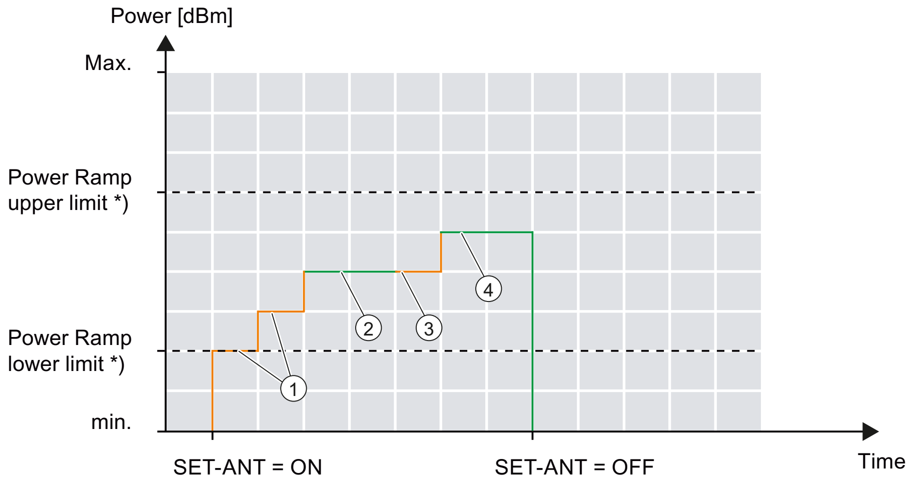
- Starting value of the power for Power Ramp ANT 1: RESET [distance_limiting, bit 0-3]
- Starting value of the power for Power Ramp ANT 2: RESET [distance_limiting, bit 4-7]
- "Boost Step Size ANT 1","Boost Step Size ANT 2":

  Increased power per step of the Power Rampof the relevant antenna in 0.25 dB steps (e.g. 0x02 corresponds to 0.5 dB power increase in one step)
- "Boost Max ANT 1","Boost Max ANT 2":

  Maximum power increase after N steps of the Power Ramp of the relevant antenna in 0.25 dB steps. With the basic setting 0x00, the Power Ramp for this antenna is deactivated.
- "Boost Threshold ANT 1","Boost Threshold ANT 2":

  Specifies the number of inventories taken one after the other after the power is increased if no transponder is detected.

Sequence of the Power Ramp algorithm



① Transponder is not detected, power is increased

② Transponder is detected, power remains constant

③ Connection to the transponder is lost, power is increased

④ Transponder is detected, power remains constant

*) Lower limit = start power,
upper limit = start power + Boost Max

Figure 6-10 How the Power Ramp algorithm works

The upper limit of the Power Ramp is never exceeded.

1. Following an "init_run" or "SET-ANT" command ("SET-ANT[Byte mode, Bit 4 = 0]"), the power specified in "RESET [distance_limiting]" is set for the antenna.
2. The inventories are taken.

   Following each inventory, there is a check to establish whether a transponder was read, and if necessary the power is increased:

   – If a transponder was read in the current inventory, the power of the antenna remains constant and this power is used for subsequent access to the transponder.

   – If no transponder was read via antenna x after "Boost Threshold ANT x" inventories have been taken one after the other and at the same time the final power of the Power Ramp ("Boost Max") has not yet been reached, the power is increased by the "Boost Step Size ANT x".

   – The maximum power of the reader is never exceeded (saturation). The inventories continue to be taken.

Note

With time-critical data access, remember that the Power Ramp algorithm requires additional time to find the lowest possible power.

You will find more detailed information on setting the parameters in the section "Setting the Advanced User Parameters (AUP) (Page 139)".

6.3.8 Power Gap algorithm

If several readers are being operated in close proximity to each other, this can cause disruptions since the antenna fields of the various readers overlap. These disruptions can be minimized by defining pause times that the readers must keep to following each inventory. During this time other readers can communicate with the transponders with no disruption.

Note

The Power Gap algorithm delays the other algorithms.

Parameter assignment of the Power Gap algorithm

Using the Advanced User Parameter "Gap Threshold", the start time for inserting pauses is defined. The algorithm is restarted with each "init_run". Depending on whether the Power Ramp has reached the maximum power, different mechanisms are used to calculate the start time when send pauses are inserted.

The pause length is reselected randomly by the reader for each pause between the time defined by "Gap Min Duration" and "Gap Max Duration".

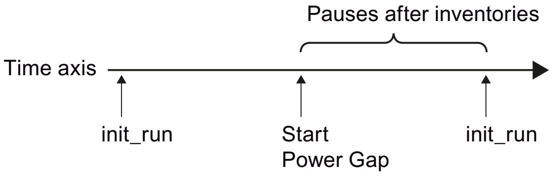


Figure 6-11 Sequence of the Power Gap over time

Sequence of the algorithm

For the start time, it does not matter whether or not the inventory contains a transponder. After the number of inventories specified by "Gap Threshold", a pause is inserted following each inventory.

The aim is to give the Power Ramp algorithm priority and not to delay it with pauses. Depending on whether the Power Ramp has reached the maximum power, there are various different reactions:

- Power Ramp is not at maximum

  For the start time, only inventories containing at least one transponder are counted. If an inventory does not contain a transponder the counter belonging to "Gap Threshold" is reset again.

  If at least "Gap Threshold" inventories with at least one detected transponder are taken, a pause is inserted after each Inventory .

  As soon as an inventory does not detect a transponder, the algorithm starts from the beginning again. This means that at least "Gap Threshold" inventories with at least one detected transponder must be taken again successfully before a pause is inserted.

- Power Rampis at maximum or not active

  For the start time, it does not matter whether or not the inventory contains a transponder. After the number of inventories specified by "Gap Threshold", a pause is inserted following each inventory. The counter for the start time is no longer reset.

The parameter assignment mechanism of Power Ramp is described in the section "Power Ramp algorithm (Page 119)". You will find more detailed information on parameter assignment in the section "Setting the Advanced User Parameters (AUP) (Page 139)".

6.3.9 Filter mechanisms based on the RSSI or the EPC-IDs

Each transponder (each EPC-ID recognized in the antenna field) is filtered after Collect Inventory in the following order:

1. RSSI Threshold
2. Black List
3. EPC Data Filter

Only when a transponder has met the criteria of RSSI Threshold, Black List and EPC Data Filter, is it processed by Smoothing or ITF followed by the UHF algorithms.

6.3.9.1 RSSI Threshold

Using the RSSI Threshold all the transponders that have a lower RSSI value than the value defined in the RSSI Threshold are ignored and even during "Collect Inventory" they are not recognized.

Parameter assignment

RSSI Threshold is set for the specific antenna with "RSSI Threshold ANT1" ("RadioSetRSSIThreshold1") for ANT1 and "RSSI Threshold ANT2" ("RadioSetRSSIThreshold2") for ANT2. You will find more detailed information on the Radio Settings in the table in the section "Setting the Advanced User Parameters (AUP) (Page 139)".

Activation of the RSSI Threshold

- "RadioSetRSSIThreshold1 > 0x00" activates the algorithm for ANT1
- "RadioSetRSSIThreshold2 > 0x00" activates the algorithm for ANT2

Sequence of the algorithm

All transponders in the antenna field of ANT1 or ANT2 that have an RSSI value smaller than the value defined by RSSI Threshold ANT1 or RSSI Threshold ANT2 are ignored by the reader.

Deactivation of the RSSI Threshold

- "RadioSetRSSIThreshold1 = 0x00" deactivates the algorithm for ANT1
- "RadioSetRSSIThreshold2 = 0x00" deactivates the algorithm for ANT2

Example of RSSI Threshold

In this example, the following values were set for ANT1 and ANT2:

- "RadioSetRSSIThreshold1 = 0x50" and
- "RadioSetRSSIThreshold2 = 0x3F".

The following table shows which transponders in the antenna field are detected by ANT1 and/or ANT2 of an RF630R:

Table 6- 4 Recognized transponders

Tag No.:	RSSI of ANT1	RSSI of ANT2	transponder would be recognized by the following antenna:		Transponders recognized by the RF630R
			ANT1	ANT2	
1	0x52	0x4A	✓	✓	✓
2	0x40	0x3A	-	-	-
3	0x60	0x60	✓	✓	✓
4	0x4A	0x4A	-	✓	✓
5	0x20	0x30	-	-	-

6.3.9.2 Black List algorithm

The Black List algorithm is used to hide transponders that have already been processed. Using the Black List algorithm, overshoots etc. can be avoided in difficult UHF environments.

The algorithm can be put to good use when the time for inclusion of a transponder in the Black List and the deletion of a transponder from the Black List can be specified deterministically in a sequence. Only one transponder can ever be added. If there is more than one transponder in the antenna field, this causes an error and as result no transponder can be added to the Black List.

In single tag mode, only one transponder can be added to the Black List. If there is more than one transponder in the antenna field, these cannot be added. In this case, no transponder is entered in the Black List.

The Black List is a ring buffer with a selectable size; in other words, the number of EPC-IDs that can be entered in the Black List is limited. The oldest EPC-ID is deleted when a further EPC-ID is entered after the maximum memory size has been reached.

Parameter assignment

The size of the ring buffer can be changed with the Advanced User Parameter "BlackListEntries".

Activation of the Black List

If an "init_run" with bit 2 = 1 in the INPUT parameter "option_1" is sent, the Black List is activated. Any existing entries are not changed.

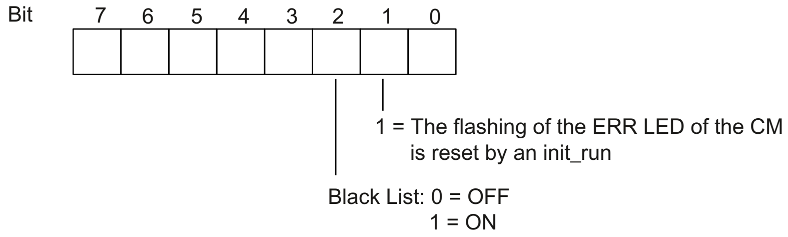


Figure 6-12 The INPUT parameter "option_1"

Sequence of the algorithm

If the Black List algorithm is active, sending a "SET-ANT" command in which both antennas are turned off and the UHF algorithm is initialized at the same time ("sub_command" bit 0 = 0, bit 1 = 0, bit 4 = 0), all the transponders in the Tag List are adopted in the Black List. If the "sub_command" ≠ 0, no entries are made in the Black List. If a "SET-ANT" command (antenna = off,
Tag List initialize = 0) is executed without a valid transponder being in the antenna field, a so-called empty tag/empty entry is added to the Black List.

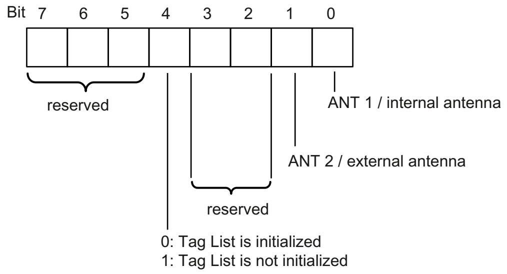


Figure 6-13 The INPUT parameter "sub_command"

Deactivating and deleting the Black List at the same time

If an "init_run" command with bit 2 = 0 in the "option_1" variable is sent, the "SET-ANT" command no longer causes new entries to be added to the Black List and all existing entries in the Black List are deleted.

Example: Black List

Example of the sequence of the Black List functionality with ANT 1 and a single transponder located statically in the antenna field.

- Assigning parameters to a reader and initializing the Black List:
  - 1. Turn on Black List functionality: "init_run" command with bit 2 = 1 in the variable "option_1", and turn on the presence check with "MDS_control = 1".
  - 2. Turn on ANT 1, turn off ANT 2: "SET-ANT" command with bit 4 = 0, bit 1 = 0, bit 0 = 1 in "sub_command".

    (Note no entry is made in the Black List here because bit 0 = 1.)
  - 3. The transponder is detected, its presence is signaled via the controller ("MDS_control = 1")
- Enter transponder in the Black List:
  - 4. Turn off antennas: "SET-ANT" command with bit 4 = 0, bit 1 = 0, bit 0 = 0 in "sub_command".

    (The transponder detected in step 3 is entered in the Black List. The transponder is no longer recognized by the reader.)
  - 5. Turn on antenna as in step 2: "SET-ANT" command with bit 4 = 0, bit 1 = 0, bit 0 = 1 in "sub_command".

    (No entry is made in the Black List here because bit 0 = 1.)
  - 6. Turn off antennas: "SET-ANT" command with bit 4 = 0, bit 1 = 0, bit 0 = 0 in "sub_command".

    If no transponder was detected, an empty entry is made in the Black List.

Note

Changing the size of the ring buffer during operation

Note that if the size of the ring buffer is changed, the Black List is not changed. The size of the ring buffer is adapted only with the next entry in the Black List.

Example: The size is set to 5 and all 5 entries have transponder IDs. If the size is now changed to 0, all 5 entries remain active. The size is changed to 0 and all entries are deleted only when there is a renewed attempt to make an entry in the Black List (regardless of whether this is a transponder ID or empty entry).

Note

Entry of detected transponders in the Black List

Detected transponders are the transponders that the reader acknowledges as detected to the application.

If more than one transponder runs through the various mechanisms in single tag mode, the error "0x1D" - "too many transponders in field" is generated. This means that no transponder is signaled as detected to the outside and therefore no transponder is entered in the Black List. As in the other cases, the content of the ring buffer is shifted by 1 place (in other words an empty entry is generated). If the ring buffer is already full, the oldest transponder entry is removed.

You will find more detailed information on parameter assignment in the section "Setting the Advanced User Parameters (AUP) (Page 139)".

6.3.9.3 EPC Data Filter

The EPC Data Filter is used to filter out transponders from further processing if they have fixed data content in the EPC-ID or the PC (Protocol Control). If the EPC Data Filter is active, each transponder remaining in the Tag List is checked by the EPC Data Filter for the expected and the actual result and if applicable discarded. Here, you can decide between direct or inverse filtering.

You can define the filter using the following filter properties:

- Filter length

  Specifies the number of bytes to be filtered.
- Filter criterion

  Specifies whether filtering will be direct or inverse.
- Filter data

  Specifies the data content to be filtered.
- Filter mask

  Specifies which bits of the filter data are checked.

Parameter assignment

The parameters of the EPC Data Filter are assigned using UDT 350.

Activation of the EPC Data Filter

To enable the EPC Data Filter, use a write command to the address "0xFEF2". The write command must have a defined data length of 148 (0x94) bytes and a pointer to UDT 350 with a filter length > 0 bytes. The filter length must match the number of masked bytes to be filtered.

Note

For the EPC Data Filter to be successfully set on the reader, the number of bytes with a value > 0x00 must match the value specified in address +0.0 of UDT 350.

Sequence of the algorithm

If the EPC Data Filter is active, all transponders in the antenna field are evaluated and if necessary removed according to the set filter criteria.

- Direct filtering: The filter criterion (address "+1.0") in UDT 350 has the value "0x00"

  If the expected and actual result match, the transponder is removed.
- Inverse filtering: The filter criterion (address "+1.0") in UDT 350 has the value "0x01"

  If the expected and actual result do not match, the transponder is removed.

Note

Transponders with undefined data relevant for filtering are separated out

If EPC data is not defined for a transponder that will be checked by the EPC Data Filter, the filter result will be evaluated as a mismatch between expected and actual data and the transponder separated out.

Deactivating and deleting the EPC Data Filter at the same time

The EPC Data Filter is initialized and deactivated at the same time by:

- Restarting the reader
- Executing a write command to the address "0xFEF2". The write command must have a defined data length of 148 (0x94) bytes, a pointer to UDT 350 and a filter length = 0 bytes and number of masked bytes = 0.

Reading out the EPC Data Filter

The EPC Data Filter can be read out with a read command to address "0xFEF2" with a length of 148 bytes. The arrangement of the bytes corresponds to that of UDT 350.

Procedure

To determine the EPC Data Filter , follow the steps below:

1. Determine the requirements.
2. Determine the filter mask and filter data based on the requirements.
3. Decide whether you want to use direct or inverse filtering.
4. Count the number of bytes in the filter masks of address "+78 ... +147" of UDT 350 that have a value > 0x00.
5. Enter the filter length, the filter criterion, the filter data and the filter mask in UDT 350.
6. Enable the EPC Data Filter with a write command to the address "0xFEF2". The write command must have defined data length of 148 bytes and a pointer to UDT 350.

Note

Setting the filter mask

Which bits of the filter data are checked is specified in the filter mask by setting the individual bits (e.g. bit 0 = 1). All other bits of the filter data are irrelevant for filtering.

Examples of the use of the EPC Data Filter

Example 1:

Only the transponders that meet the following requirement should be read in an application:

Requirements: All transponders on read station 1 whose EPC-ID covers the numeric range 0xD8 to 0xDB in the SIMATIC address 0xFF03 should be recognized and further processed. All other transponders should be ignored.

- Bit 2 of the LSB byte of the 2nd WORD ("EPC_data_epc_id_w2_lsb") has the value 0_b.
- Bit 3 of the LSB byte of the 2nd WORD ("EPC_data_epc_id_w2_lsb") has the value 1_b.
- Bits 4-7 of the LSB byte of the 2nd WORD ("EPC_data_epc_id_w2_lsb") have the value D_b.

Filter data (UDT 350, address +15) [1)]									
Bit	7	6	5	4	3	2	1	0	Permitted values in bytes
	1	1	0	1	1	0	-	-	=0xD8, 0xD9, 0xDA, 0xDB

[1] Only values that need to be specified are explicitly defined.

Filter mask (UDT 350, address +85)									
Bit	7	6	5	4	3	2	1	0	Permitted values in bytes
	1	1	1	1	1	1	0	0	=0xFC

- The remaining values of bits 0-1 are freely available.

In the example, there must be inverse filtering because all transponders that do not meet the requirements must be removed. 1 byte is written to the address "+85" of UDT 350 with a value > 0x00.
The filter for the example is defined as follows:

- Filter length (byte +0.0): 0x01
- Filter criterion (byte +1.0): 0x01
- Filter data (byte +15.0): 0xD8
- Filter mask (byte +85.0): 0xFC

Table 6- 5 Structure of UDT 350 [1)]

Address	Name	Type	Value of the variables
0.0		STRUCT	
+0.0	EPC_filter_length	BYTE	0x01
+1.0	EPC_filter_criterion	BYTE	0x01
...	...	...	...
+15.0	EPC_data_epc_id_w2_lsb	BYTE	0xD8
...	...	...	...
+85.0	EPC_mask_epc_id_w2_lsb	BYTE	0xFC
...	...	...	...
=148.0		END STRUCT	

[1)] All data content of UDT 350 that is not explicitly listed has the value "0x00".

Example 2:

Only the transponders that meet the following requirement should be read in an application:

Requirements: All transponders on read station 2 whose EPC-ID does NOT cover the numeric range 0xD8 to 0xDB in the SIMATIC address 0xFF03 should be recognized and further processed. All transponders that were not processed by read station 1 are processed at read station 2.

In this example, the filter data, filter mask and therefore the filter length are identical to the values of the EPC data filter in example 1. The only difference in this filter is the filter criterion. Since direct filtering is required, all transponders that do not meet the requirements from example 1 must be removed.

The filter for the example is defined as follows:

- Filter length (byte +0.0): 0x01
- Filter criterion (byte +1.0): 0x00
- Filter data (byte +15.0): 0xD8
- Filter mask (byte +85.0): 0xFC

Table 6- 6 Structure of UDT 350 [1)]

Address	Name	Type	Value of the variables
0.0		STRUCT	
+0.0	EPC_filter_length	BYTE	0x01
+1.0	EPC_filter_criterion	BYTE	0x00
...	...	...	...
+15.0	EPC_data_epc_id_w2_lsb	BYTE	0xD8
...	...	...	...
+85.0	EPC_mask_epc_id_w2_lsb	BYTE	0xFC
...	...	...	...
=148.0		END STRUCT	

[1)] All data content of UDT 350 that is not explicitly listed has the value "0x00".

Example 3:

Only the transponders that meet the following requirement for the filter mask or filter data should be read in an application:

- Requirement 1:

  The 3rd WORD (bytes 5 and 6) of the EPC-ID should be even:

  – Bit 0 of the LSB byte of the 3rd WORD ("EPC_data_epc_id_w3_lsb") has the value 0_b.

Filter data (UDT 350, address +17) [1]									
Bit	7	6	5	4	3	2	1	0	Permitted values in bytes
	-	-	-	-	-	-	-	0	=0x00, 0x02, ..., 0xFE

[1] Only values that need to be specified are explicitly defined.

Filter mask (UDT 350, address +87)									
Bit	7	6	5	4	3	2	1	0	Permitted values in bytes
	0	0	0	0	0	0	0	1	=0x01

  – The remaining values of bits 1-7 are freely available.

- Requirement 2:

  The 5th WORD (bytes 9-10) of the EPC-ID should be in the range of values from 224 … 255:

  – The MSB byte of the 5th WORD ("EPC_data_epc_id_w5_msb") has the value 0x00

Filter data (UDT 350, address +20) [1]									
Bit	7	6	5	4	3	2	1	0	Permitted values in bytes
	0	0	0	0	0	0	0	0	=0x00

[1] Only values that need to be specified are explicitly defined.

Filter mask (UDT 350, address +90)									
Bit	7	6	5	4	3	2	1	0	Permitted values in bytes
	1	1	1	1	1	1	1	1	=0xFF

  – Bits 5-7 of the LSB byte of the 5th WORD ("EPC_data_epc_id_w5_lsb") have the value 1_b.

Filter data (UDT 350, address +21) [1]									
Bit	7	6	5	4	3	2	1	0	Permitted values in bytes
	1	1	1	-	-	-	-	-	=0xE0 ... 0xFF

[1] Only values that need to be specified are explicitly defined.

Filter mask (UDT 350, address +91)									
Bit	7	6	5	4	3	2	1	0	Permitted values in bytes
	1	1	1	0	0	0	0	0	=0xE0

  – The remaining values of bits 0-4 are freely available.

- Requirement 3:

  This must be an EPC global application:

  Bit 8 of the MSB PC byte has the value 0_b.

- Requirement 4:

  The transponder should have the value 0x00 in the user memory (requirement: The transponder supports this function):

  Bit 10 of the MSB PC byte has the value 0_b.

- Requirement 5:

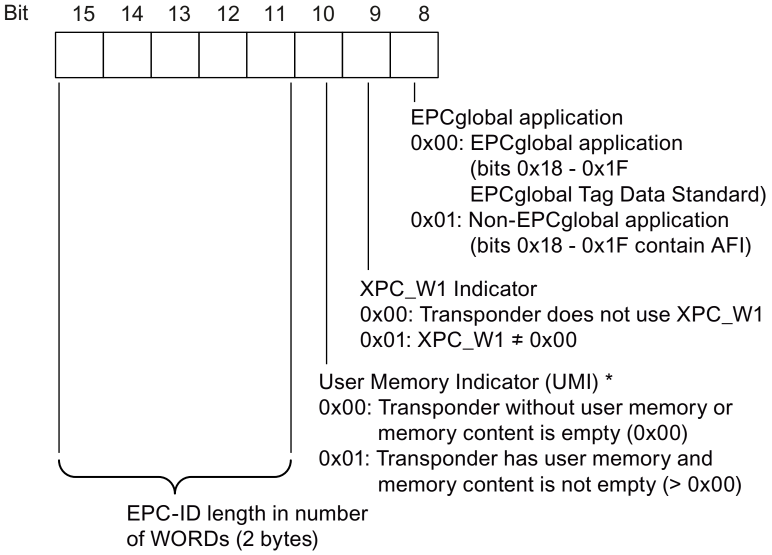
  The EPC-ID should be maximum of 14 bytes (7 WORDs) long:

  Bits 14-15 of the MSB PC byte have the value 0_b.

Filter data (UDT 350, address +10) [1)]									
Bit	15	14	13	12	11	10	9	8	Permitted values in bytes
	0	0	-	-	-	0	-	0	=0x00, ... , 0X3A

[1] Only values that need to be specified are explicitly defined.

Filter mask (UDT 350, address +80)									
Bit	15	14	13	12	11	10	9	8	Permitted values in bytes
	1	1	0	0	0	1	0	1	=0xC7


Bit
15 14 13 12 11 10 9 8
EPCglobal application
0x00: EPCglobal application (bits 0x18 - 0x1F EPCglobal Tag Data Standard)
0x01: Non-EPCglobal application (bits 0x18 - 0x1F contain AFI)
XPC_W1 Indicator
0x00: Transponder does not use XPC_W1
0x01: XPC_W1 ≠ 0x00
User Memory Indicator (UMI) *
0x00: Transponder without user memory or memory content is empty (0x00)
0x01: Transponder has user memory and memory content is not empty (> 0x00)
EPC-ID length in number of WORDs (2 bytes)

* Is supported only by RF600 transponders with Impinj Monza 4QT chips. Otherwise the bit always has the value 0x00.

Figure 6-14 MSB parameter of UDT 350

In the example, there must be inverse filtering because all transponders that do not meet the requirements must be removed. 4 bytes in address "+78 ... +147" of UDT 350 are written with a value > 0x00.

The filter for the example is defined as follows:

- Filter length (byte +0.0)
- Filter criterion (byte +1.0)
- Filter data (byte +8.0 ... +77.0)
- Filter mask (byte +78.0 ... +147.0)

Table 6- 7 Structure of UDT 350 [1)]

Address	Name	Type	Value of the variables
0.0		STRUCT	
+0.0	EPC_filter_length	BYTE	0x04
+1.0	EPC_filter_criterion	BYTE	0x01
...	...	...	...
+10.0	EPC_data_pc_msb	BYTE	0x00
...	...	...	...
+17.0	EPC_data_epc_id_w3_lsb	BYTE	0x00
...	...	...	...
+20.0	EPC_data_epc_id_w5_msb	BYTE	0x00
+21.0	EPC_data_epc_id_w5_lsb	BYTE	0xE0
...	...	...	...
+80.0	EPC_mask_pc_msb	BYTE	0xC5
...	...	...	...
+87.0	EPC_mask_epc_id_w3_lsb	BYTE	0x01
...	...	...	...
+90.0	EPC_mask_epc_id_w5_msb	BYTE	0xFF
+91.0	EPC_mask_epc_id_w5_lsb	BYTE	0xE0
...	...	...	...
=148.0		END STRUCT	

[1)] All data content of UDT 350 that is not explicitly listed has the value "0x00".

Setting, enabling and verifying filters

The filter is set and activated on the reader:

Table 6- 8 Activating EPC Data Filter (according to "command_DB", UDT 20)

Command [hex]	sub_command [hex]	length [dez]	address_MDS [hex]	DAT_DB_Nr [dez]	DAT_DB_adr [dez]
0x01	-	148	0xFEF2	Number of the user DB in which the filter is defined.	Start address of the data to be written.

In case of a verification, the EPC Data Filter is read out by means of:

Table 6- 9 Reading out EPC Data Filter (according to "command_DB", UDT 20)

Command [hex]	sub_command [hex]	length [dez]	address_MDS [hex]	DAT_DB_Nr [dez]	DAT_DB_adr [dez]
0x02	-	148	0xFEF2	Number of the user DB in which the filter is stored.	Start address of the read data.

Filtering sequence: Each transponder is processed by the EPC Data Filter and, if there is a match between the expected and actual data it is reported to the other UHF algorithms. Transponders whose EPC-ID length is > 7 WORDs (14 bytes) are always removed.

Note

Change/activation/deactivation of the EPC Data Filter during operation

Keep in mind that a change/activation/deactivation of the EPC Data Filter causes an initialization of the algorithms that follow in the order shown to prevent inconsistencies in the Tag List, Black List, ITF or Smoothing:

1. Deleting all transponders from the Black List
2. Deleting all transponders from the Tag List
3. Restart:
   - Restart of Smoothing after initialization of the Tag List or
   - Restart of ITF after initialization of the Tag List and ITF

Note

No retentive storage of the EPC Data Filter

Remember that the EPC Data Filter needs to be activated again after startup of the reader.

6.3.10 Intelligent Single-tag mode (ISTM) and sorting

The Intelligent Singletag Mode (ISTM) provides the user with an algorithm to allow operation in single tag mode even if there is more than one transponder in the antenna field. To do this, the recognized transponders from the Tag List can be sorted according to different criteria. A transponder is only recognized as being valid if it is first in the list following sorting and also keeps to the minimum distance to the next transponder. The user can select the sort criterion and the distance.

If only one transponder is detected this is used without any checking.

The algorithm is evaluated only when there is a "READ"/"WRITE"/"INIT" access to a transponder.

ISTM and Sorting parameter assignment

ISTM is enabled by the "init_run" command via the "ECC_mode" variable ("Param" byte, bit 4 = 1). The distance criterion is defined using the "ISTM Delta" parameter. If this is 0, ISTM is inactive.

The sort criterion is selected using the Advanced User Parameter "Sorting".

Note

Valid settings for the sort criterion

The following settings for the sort criterion are valid:

- Only a maximum of one bit may be set in the value.
- If no bit is set (value = 0), sorting is not active.

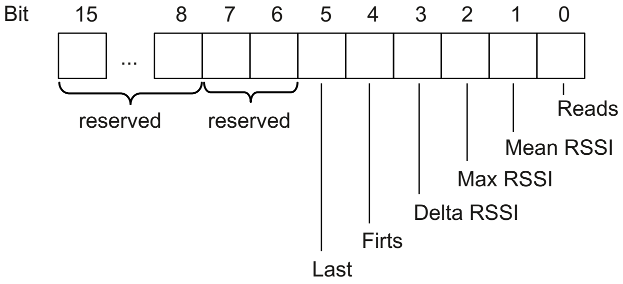


Figure 6-15 Structure of AUP "Sorting"

You can use the following sort criteria:

- First:

  The list is sorted in ascending order according to "DT Glimpsed" (elapsed time [ms] between a successful transponder read and the current query).

  This means that the first detected transponder is first in the list. The unit of the distance criterion is defined here as milliseconds.

- Last:

  The list is sorted in descending order according to "Last Obs" (time stamp [ms] when the transponder was last read successfully).

  This means that the transponder detected last is first in the list. The unit of the distance criterion is defined here as milliseconds.

- Delta RSSI: (Received Signal Strength Indicator)

  The list is sorted in descending order based on the difference ("Max RSSI" → "Min RSSI").

  This means that the transponder with the highest difference in its measured RSSI values is first in the list. The distance criterion is defined here as "Delta RSSI" value.

- Mean RSSI:

  The list is sorted in descending order based on the "Mean RSSI" value.

  This means that the transponder with the highest mean measured RSSI values is first in the list.

- Max RSSI:

  The list is sorted in decreasing order.

  This means that the transponder with the highest measured RSSI value is first in the list. The distance criterion is defined here as "Delta RSSI" value.

- Reads:

  The list is sorted in descending order based on the number of successful reads.

  This means that the transponder with the most successful reads is first in the list. The distance criterion is defined here as Delta.

Example:

The reader was started with "RESET" and there are 4 transponders in the antenna field. "Mean RSSI" (bit 1 = 1) is set as the sort criterion. The value 0x14 (20) is set in the AUP "ISTM Delta".

The mean RSSI values of the 4 transponders are 60, 80, 50 and 120.

The 4th transponder in the antenna field has the highest mean RSSI value. In addition to this, the distance between the mean RSSI value of the 4th transponder and the 2nd transponder (120 or 80) is greater than the preset "ISTM Delta". For this reason the 4th transponder is marked as having been detected and the other 3 transponders are ignored.

6.3.11 Tag Hold algorithm

The Tag Hold algorithm is available in single tag mode or Intelligent Singletag Mode and is used for reliable process access to a transponder that has already been processed.

If the Tag Hold algorithm is active, a detected transponder is saved on the reader with the first "READ" / "WRITE" access. In contrast to the normal mode, if the Tag Hold algorithm is activated, all subsequent "READ" / "WRITE" commands execute only for this transponder. After successful access to transponder data, if further access leads to errors, this does not influence the reader since the EPC-ID of the transponder remains stored until the Tag Hold is reset.

If access to this transponder causes an error, the access is repeated with higher power. If this access also leads to an error, the next access is repeated with the next higher power. If access to the transponder is successful, the original power is used again.

Tag Hold parameter assignment

Activate or reset Tag Hold:

- Tag Hold is activated with the "init_run" command (byte "field_on_control", bit 5 = 1).
- Tag Hold is reset with the "init_run" or SET-ANT command (byte "sub_command", bit 4 = 0).

Using the "init_run" command (byte "field_on_control", bit 5 = 0) or "SET-ANT" with byte "sub_command", bit 4 = 0, the Tag Hold algorithm is reset. This means that the saved transponder is discarded and detected again with the next read or write access.

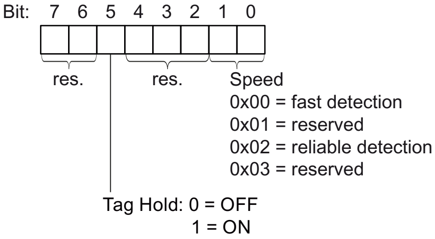


Figure 6-16 The "field_on_control" byte of FB 45

Table 6- 10 The Tag Hold parameters

Group	Name	Note
Tag Hold	Tag Hold Boost ANT 1	Increase of power on antenna 1 if the first read/write attempt via antenna 1 was not successful (increase in 0.25 dB steps). Max. power is limited by hardware.
	Tag Hold Boost ANT 2	Increase of power on antenna 2 if the first read/write attempt via antenna 2 was not successful (increase in 0.25 dB steps). Max. power is limited by hardware.
	Tag Hold Max ANT 1	Increase of power on antenna 1 if the first read/write attempt via antenna 1 was not successful (increase in 0.25 dB steps). Max. power is limited by hardware.
	Tag Hold Max ANT 2	Increase of power on antenna 2 if the first read/write attempt via antenna 2 was not successful (increase in 0.25 dB steps). Max. power is limited by hardware.

Effect on presence

Note that the Tag Hold algorithm affects the presence message:

- Without the Tag Hold algorithm, the presence always indicates that one or more transponders were detected. A transponder counts as detected if it was signaled by the Smoothing or the ITF algorithm as being valid ("Observed"). The presence also indicates the number of transponders detected at the same time. This presence response does not depend on any other algorithms.
- As soon as the Tag Hold algorithm has held an EPC-ID, presence only signals the transponder with this EPC-ID.

  If, for example, Smoothing is active, the present status is cancelled as soon as the transponder with this EPC-ID is no longer detected as being valid. If this transponder is detected by Smoothing again, presence indicates precisely one transponder. This occurs regardless of whether or not other transponders are detected as being valid by Smoothing .
- As soon as the Tag Hold algorithm has held an EPC-ID, an attempt is made immediately to access the transponder with "READ" or "WRITE". In other words, in this situation no presence is reported.

  In contrast to this, without a held EPC-ID, inventories are always taken first to detect a transponder in the antenna field. The actual "READ" or "WRITE" access is sent only after a transponder has been detected (= presence).

You will find more detailed information on parameter assignment of Tag Hold in the section "Setting the Advanced User Parameters (AUP) (Page 139)".

6.4 Setting the Advanced User Parameters (AUP)

To assign parameters for the industrial UHF algorithms, the mechanism described below is available. Here, the reader is informed that the writing ("WRITE" command) of data to reserved SIMATIC addresses involves data access to internal parameters and not to transponders.

Note

Avoiding inconsistencies with "init_run"

To avoid inconsistencies during operation and in data management, after setting a AUP, run an "init_run".

Parameter sets

There are two different parameter sets that can be selected with the value of bits 0 and 1 in byte "field_ON_control" of the "init_run" command.

With the factory setting, the two parameter sets only differ in the "Observed Threshold Count". The "Observed Threshold Count" specifies for Smoothing how often a transponder must be read before it is included in the Tag List :

- Parameter set "1" (fast, bit 0 = 0 / bit 1 = 0) has "Observed Threshold Count = 1"

  Transponders are recognized as being valid with the first inventory.
- Parameter set "2" (reliable, bit 0 = 0 / bit 1 = 1) has "Observed Threshold Count = 5"

  Transponders must be detected five times in succession. Overshoot and reflections are filtered out by this.

The settings of the AUP always apply only to the currently selected parameter set. Each AUP is referenced using a unique ID.

Reading and writing parameters

- The ID of the required AUP is written to address "0xFEF3".
- The AUP is set by sending a write command to the address "0xFEF7" with an ID and parameter value.
- The AUP is read out by sending a read command to address "0xFEF7". As the return value, the ID and the parameter value are sent. To make this possible, however, the ID of the AUP must already have been written to the address "0xFEF3". The read therefore relates to the last AUP-ID written to the address "0xFEF3".
- Addressing "0xFEF3" and "0xFEF7" is exclusive and only possible using direct addressing; in other words, read/write commands to other addresses (for example read command to "0xFEF2" with the length of 5 or "0xFEF3" with the length of 8 do not lead to functional access. This avoids inconsistencies occurring.
- Sending a write command to the address "0xFEF7" only with an ID and no parameter value resets this AUP to the factory setting.

- The values for the factory settings are stored permanently on the reader when it is supplied and cannot be changed by the user.
- After turning on the power again, the AUP stored on the reader are loaded again.
- By writing the AUP ("Save Parameters"), all currently used (temporary) AUP are stored in non-volatile memory on the reader. The fast or reliable parameter set selected with "init_run" parameter "field_ON_control" is written to.

Note

Activating industrial UHF algorithms

The use of the industrial UHF algorithms is complex and can change the response of the reader significantly. You should therefore only use these when the environment or the application demands them.

The order of the bytes of the IDs and parameter values of the AUP are listed in the following table. Make sure that you keep strictly to the order of bytes.

Table 6- 11 List of the Advanced User Parameters

Group	ID				Parameter value (default)				Name	Min. value (hex)	Default (hex)	Max. value (hex)	Note
Factory Defaults	00	00	00	00	-	-	-	-	Load Factory Defaults	-	-	-	Resets all parameters to the factory setting. The values are, however, not stored retentively. To save the factory setting in flash memory, the AUP "Save Parameters" must then be called.
Fast Read	00	F0	40	00	FF	00	00	00	Fast Read	00	FF	FF	When the transponder ID is read again, the transponder is not read again but rather the stored transponder ID is returned.
Read Boost	AC	10	42	10	04	00	00	00	Read Boost	00 0 dB	04 1 dB	FF -	Additional power with "READ" commands in steps of 0.25 dB (for example 0x08 corresponds to an increased power of 2 dB).
Write Boost	AB	10	42	10	0C	00	00	00	Write Boost	00 0 dB	0C 3 dB	FF -	Additional power with "WRITE" commands in steps of 0.25 dB (for example 0x08 corresponds to an increased power of 2 dB).

Group	ID				Parameter value (default)				Name	Min. value (hex)	Default (hex)	Max. value (hex)	Note
Power Ramp	BE	10	42	10	04	00	00	00	Boost Step Size ANT1	00 0 dB	04 1 dB	FF -	Increased power per step of the Power Rampof antenna 1 in 0.25 dB steps (e.g. 0x02 corresponds to 0.5 dB power increase in one step).
	BF	10	42	10	04	00	00	00	Boost Step Size ANT2	00 0 dB	04 1 dB	FF -	Increased power per step of the Power Rampof antenna 1 in 0.25 dB steps (e.g. 0x02 corresponds to 0.5 dB power increase in one step).
	D2	10	42	10	00	00	00	00	Boost Max ANT1	00 0 dB	00 0 dB	FF -	Maximum power increase after N steps of the Power Ramp of antenna 1 in 0.25 dB steps. With the basic setting 00 hex, the Power Ramp for antenna 1 is deactivated.
	D3	10	42	10	00	00	00	00	Boost Max ANT2	00 0 dB	00 0 dB	FF -	Maximum power increase after N steps of the Power Ramp of antenna 1 in 0.25 dB steps. With the basic setting 0x00, the Power Ramp for antenna 2 is deactivated.
	E6	10	80	20	02	00	00	00	Boost Threshold ANT1	0000 0000	0002 0002	FFFF 65535 dez	Number of consecutive inventories worked through via antenna 1 in which no transponder was detected before the power is increased. When the Inventory Threshold Filter is active, number of inventories taken consecutively via antenna 1 before the power is increased.
	E7	10	80	20	02	00	00	00	Boost Threshold ANT2	0000 0000	0002 0002	FFFF 65535 dez	Number of consecutive inventories taken via antenna 2 in which no transponder was detected before the power is increased. When the Inventory Threshold Filter is active, number of inventories taken consecutively via antenna 2 before the power is increased.

Group	ID				Parameter value (default)				Name	Min. value (hex)	Default (hex)	Max. value (hex)	Note
Power Ramp 2 (only with ITF with phase 2)	0C	F0	42	10	04	00	00	00	Boost2 Step Size ANT1	00 0 dB	04 1 dB	FF -	Increased power per step of the Power Rampof antenna 1 in 0.25 dB steps (e.g. 0x02 corresponds to 0.5 dB power increase in one step).
	0D	F0	42	10	04	00	00	00	Boost2 Step Size ANT2	00 0 dB	04 1 dB	FF -	Increased power per step of the Power Rampof antenna 2 in 0.25 dB steps (e.g. 0x02 corresponds to 0.5 dB power increase in one step).
	0E	F0	42	10	00	00	00	00	Boost2 Max ANT1	00 0 dB	00 0 dB	FF -	Maximum power increase after N steps of the Power Ramp of antenna 1 in 0.25 dB steps. With the basic setting 0x00, the Power Ramp for antenna 1 is deactivated.
	0F	F0	42	10	00	00	00	00	Boost2 Max ANT2	00 0 dB	00 0 dB	FF -	Maximum power increase after N steps of the Power Ramp of antenna 1 in 0.25 dB steps. With the basic setting 0x00, the Power Ramp for antenna 2 is deactivated.
	10	F0	80	20	02	00	00	00	Boost2 Thres hold ANT1	0000 0	0002 2 dez	FFFF 65535 dez	Number of inventories taken consecutively via antenna 1 before the power is increased.
	11	F0	80	20	02	00	00	00	Boost2 Thres hold ANT2	0000 0	0002 2 dez	FFFF 65535 dez	Number of inventories taken consecutively via antenna 2 before the power is increased.

Group	ID				Parameter value (default)				Name	Min. value (hex)	Default (hex)	Max. value (hex)	Note
Power Gap	AD	10	80	20	03	00	00	00	Gap Thres hold	0000 0 ms	0003 3 ms	FFFF 65535 ms	Number of successive inventories before pauses are inserted between each further inventory. Here, it is important to make the following distinctions: • 1. Power Ramp not yet at maximum: Only inventories that contain at least one transponder are counted. If an inventory does not contain a transponder, the counter is reset again. • 2. Power Ramp at maximum: For the counting it does not matter whether an inventory contains a transponder or not. Typically, the number should be > 2. Value 0 just as value 1 means exactly one inventory. Changes to the parameters only take effect following an "init_run" ("RESET[. . .]") or a "SET-ANT" command "SET-ANT[Byte sub_command, Bit 4 = 0]" (reset the Tag List). Remember that the "Carrier Off Delay" has priority. To turn off the carrier (= pause), the pause duration must be longer than the carrier off delay.
	AE	10	84	20	00	00	00	00	Gap Min Duration	0000 0 ms	0000 0 ms	FFFF 65535 ms	Minimum pause in [ms] between two inventories.
	AF	10	84	20	00	00	00	00	Gap Max Duration	0000 0 ms	0000 0 ms	FFFF 65535 ms	Maximum pause in [ms] between two inventories. If the maximum pause length = 0 ms, Power Gap is deactivated. If max < min, Power Gapis also deactivated.

Group	ID				Parameter value (default)				Name	Min. value (hex)	Default (hex)	Max. value (hex)	Note
Intelligent Singletag Mode / Sorting	07	F0	80	20	00	00	00	00	Sorting	0000 -	0000 -	0020 -	Specifies the type of sorting order. A maximum of one bit may ever be set in the word. Valid values: 0x0000 = no sorting 0x0001 = Reads 0x0002 = Mean RSSI 0x0004 = Max RSSI 0x0008 = Delta RSSI 0x0010 = First 0x0020 = Last
	05	F0	80	20	00	00	00	00	ISTM Delta	0000 -	0000 -	FFFF -	Specifies the distance criterion for the set sort criterion.
Tag Hold	01	F0	42	10	00	00	00	00	TagHold Boost ANT1	00 0 dB	04 1 dB	FF -	Increase of power on antenna 1 if the first read/write attempt via antenna 1 was not successful (increase in 0.25 dB steps). Max. power is limited by the hardware.
	02	F0	42	10	04	00	00	00	TagHold Boost ANT2	00 0 dB	04 1 dB	FF -	Increase of power on antenna 2 if the first read/write attempt via antenna 2 was not successful (increase in 0.25 dB steps). Max. power is limited by the hardware.
	03	F0	41	10	04	00	00	00	TagHold Max ANT1	00 0 dBm	04 1 dBm	FF -	Increase of power on antenna 1 if the first read/write attempt via antenna 1 was not successful (increase in 0.25 dB steps). Max. power is limited by hardware.
	04	F0	41	10	04	00	00	00	TagHold Max ANT2	00 0 dBm	04 1 dBm	FF -	Increase of power on antenna 2 if the first read/write attempt via antenna 2 was not successful (increase in 0.25 dB steps). Max. power is limited by the hardware.
Inventory Thres hold Filter	08	F0	80	20	00	00	00	00	ITF Duration Phase 1	0000 -	0000 -	FFFF -	Specifies the duration of the Inventory Threshold Filters. The value defines the number of inventories to be taken. If the value = 0, the phase is not run through. The ITF is turned off (and therefore Smoothing is active) if: ITF Duration Phase 1 = 0;

Group	ID				Parameter value (default)				Name	Min. value (hex)	Default (hex)	Max. value (hex)	Note
	09	F0	80	20	00	00	00	00	ITF Histogram m Phase 1	0000 -	0000 -	FFFF -	Number of inventories in which a transponder must be detected, so that it is recognized as valid.
	0A	F0	80	20	00	00	00	00	ITF Duration Phase 2	0000 -	0000 -	FFFF -	Specifies the duration of the inventory threshold filter. The value defines the number of inventories to be taken. If the value = 0, the phase is not run through.
	0B	F0	80	20	00	00	00	00	ITF Histogram m Phase 2	0000 -	0000 -	FFFF -	Number of inventories in which a transponder must be detected, so that it is recognized as valid.
Black List	11	20	80	20	03	00	00	00	Black List Entries	0000 0	0003 3 dez	0200 512 dez	Number of transponders to be included in the Black List ring buffer.
Radio Settings	14	10	85	20	00	00	00	00	Carrier Off Delay	0000 0 s	0000 0 s	FFFF 65535 s	Specifies the time in seconds that the carrier remains turned on after a transponder operation. The legal restrictions of the selected wireless standard are adhered to.
	6E	10	40	10	00	00	00	00	RSSI Thres hold ANT1	00	00	FF	Antenna 1: Specifies the minimum RSSI value that a transponder must have before it will be processed. Threshold = 0: Transponders with any RSSI value are accepted. Threshold = 255: No transponders are read.
	6F	10	40	10	00	00	00	00	RSSI Thres hold ANT2	00	00	FF	Antenna 2: Specifies the minimum RSSI value that a transponder must have before it will be processed. Threshold = 0: transponders with any RSSI value are accepted. Threshold = 255: No transponders are read.
Smoo thing	01	30	40	10	05	00	00	00	Observed Thres hold Count	00	05 01	FF	Number of inventories in which a transponder must be detected, before it is assigned the "Observed" status. There are different default values for the two parameter sets 0 and 2: Set 0 = 01 Set 2 = 05

Group	ID				Parameter value (default)				Name	Min. value (hex)	Default (hex)	Max. value (hex)	Note
Field Diagnosis Indicator	16	F0	40	10	00	00	00	00	Field Diagnosis Indicator	00	00	01	Displays the status of the UHF algorithms of the reader using an extended flash coding. FDI = 00 → FDI OFF FDI > 00 → FDI ON
Parameter Sets	14	F0	40	00	FF	00	00	00	Save Parameters	01 FALSE	FF TRUE	FF TRUE	If the parameter is set with a value > 0x00, all parameter settings are stored in the flash of the reader. If the value = 0 is set, an error is returned for 0x05. Reading out always produces the value = 0.

Preparatory step for parameter processing

Table 6- 12 Informing the reader of the additional parameter ID (according to "command_DB", UDT 20)

Command [hex]	sub_command [hex]	length [dez]	address_MDS [hex]	DAT_DB_Nr [dez]	DAT_DB_adr [dez]
0x01	-	4 bytes length of the parameter ID (AUP-ID)	0xFEF3	Number of the user DB containing the read data (AUP-ID, parameter value).	Start address of the data that was read.

Parameter processing

Table 6- 13 Set additional parameter ID on the reader (according to "command_DB", UDT 20)

Command [hex]	sub_command [hex]	length [dez]	address_MDS [hex]	DAT_DB_Nr [dez]	DAT_DB_adr [dez]
0x01	-	8 bytes (4 bytes length of the parameter ID + length of the parameter value)	0xFEF7	Number of the user DB containing the data to be written (AUP-ID, parameter value).	Start address of the data to be written.

Table 6- 14 Read out value of the additional parameter on the reader (according to "command_DB", UDT 20)

Command [hex]	sub_command [hex]	length [dez]	address_MDS [hex]	DAT_DB_Nr [dez]	DAT_DB_adr [dez]
0x02	-	8 bytes (4 bytes length of the parameter ID + length of the parameter value)	0xFEF7	Number of the user DB containing the read data (AUP-ID, parameter value).	Start address of the data that was read.

Table 6- 15 Resetting the value of the additional parameter to the factory setting on the reader (according to "command_DB", UDT 20)

Command [hex]	sub_command [hex]	length [dez]	address_MDS [hex]	DAT_DB_Nr [dez]	DAT_DB_adr [dez]
0x01	-	4 bytes length of the parameter ID (AUP-ID)	0xFEF7	Number of the user DB containing the data to be written (AUP-ID, parameter value).	Start address of the data to be written.

6.5 UDT for industrial UHF algorithms

For the parameter assignment of the industrial UHF algorithms,

- UDT 330 is required to set parameters for the AUP and
- UDT 350 to set parameters for the EPC Data Filter.

6.5.1 UDT for Advanced User Parameters

Table 6- 16 UDT 330 "Advanced User Parameters"

Address	Name	Type	Value	Comment
0.0		STRUCT		
+0.0	LoadFactory Defaults	STRUCT		Advanced User Parameters Default
+0.0	ID	DWORD	DW#16#0	Sets all parameters of the selected parameter record to the default setting
+4.0	Param	DWORD	DW#16#0	Reserved
=8.0		END STRUCT		
+8.0	FastRead	STRUCT		
+0.0	ID	DWORD	DW#16#F04000	If FastRead is active, the marked TagID is used
+4.0	Param	DWORD	DW#16#FF000000	Min=00 (FALSE), Default=FF (TRUE), Max=FF (TRUE)
=8.0		END_STRUCT		
+16.0	ReadBoost	STRUCT		
+0.0	ID	DWORD	DW#16#AC104210	Additional power with READ commands in 1/4 dB steps
+4.0	Param	DWORD	DW#16#4000000	Min=00 (0 dB), Default=04 (1 dB), Max=FF (63,75 dB)
=8.0		END_STRUCT		
+24.0	WriteBoost	STRUCT		
+0.0	ID	DWORD	DW#16#AB104210	Additional power with WRITE commands in 1/4 dB steps
+4.0	Param	DWORD	DW#16#C000000	Min=00 (0 dB), Default=0C (3 dB), Max=FF (63,75 dB)
=8.0		END_STRUCT		
+32.0	PowerRamp BoostStepSize1	STRUCT		Power Ramp
+0.0	ID	DWORD	DW#16#BE104210	Power increase per step of the Power Ramp of antenna 1
+4.0	Param	DWORD	DW#16#4000000	Min=00 (0 dB), Default=04 (1 dB), Max=FF (63,75 dB)
=8.0		END_STRUCT		
+40.0	PowerRamp BoostStepSize2	STRUCT		
+0.0	ID	DWORD	DW#16#BF104210	Power increase per step of the Power Ramp of antenna 2
+4.0	Param	DWORD	DW#16#4000000	Min=00 (0 dB), Default=04 (1 dB), Max=FF (63,75 dB)
=8.0		END_STRUCT		
+48.0	PowerRamp BoostMax1	STRUCT		
+0.0	ID	DWORD	DW#16#D2104210	Maximum power increase after N steps of the Power Ramp of antenna 1
+4.0	Param	DWORD	DW#16#0	Min=00 (0 dB), Default=00 (0 dB), Max=FF (63,75 dB)

Address	Name	Type	Value	Comment
=8.0		END_STRUCT		
+56.0	PowerRamp BoostMax2	STRUCT		
+0.0	ID	DWORD	DW#16#D3104210	Maximum power increase after N steps of the Power Ramp of antenna 2
+4.0	Param	DWORD	DW#16#0	Min=00 (0 dB), Default=00 (0 dB), Max=FF (63,75 dB)
=8.0		END_STRUCT		
+64.0	PowerRamp BoostThreshold1	STRUCT		Power Ramp
+0.0	ID	DWORD	DW#16#E6108020	Number of inventories executed consecutively via antenna 1
+4.0	Param	DWORD	DW#16#2000000	Min=0000 (0), Default=0002 (2), Max=FFFF (65535)
=8.0		END_STRUCT		
+72.0	PowerRamp BoostThreshold2	STRUCT		
+0.0	ID	DWORD	DW#16#E7108020	Number of inventories executed consecutively via antenna 2
+4.0	Param	DWORD	DW#16#2000000	Min=0000 (0), Default=0002 (2), Max=FFFF (65535)
=8.0		END_STRUCT		
+80.0	PowerRamp Boost2StepSize1	STRUCT		Power Ramp 2 (only with ITF with phase 2)
+0.0	ID	DWORD	DW#16#0CF04210	Power increase per step of the Power Ramp of antenna 1
+4.0	Param	DWORD	DW#16#4000000	Min=00 (0 dB), Default=04 (1 dB), Max=FF (63,75 dB)
=8.0		END_STRUCT		
+88.0	PowerRamp Boost2StepSize2	STRUCT		Power Ramp 2 (only with ITF with phase 2)
+0.0	ID	DWORD	DW#16#0DF04210	Power increase per step of the Power Ramp of antenna 2
+4.0	Param	DWORD	DW#16#4000000	Min=00 (0 dB), Default=04 (1 dB), Max=FF (63,75 dB)
=8.0		END_STRUCT		
+96.0	PowerRamp Boost2Max1	STRUCT		Power Ramp 2 (only with ITF with phase 2)
+0.0	ID	DWORD	DW#16#EF04210	Maximum power increase after N steps of the Power Ramp of antenna 1
+4.0	Param	DWORD	DW#16#0	Min=00 (0 dB), Default=00 (0 dB), Max=FF (63,75 dB)
=8.0		END_STRUCT		
+104.0	PowerRamp Boost2Max2	STRUCT		Power Ramp 2 (only with ITF with phase 2)
+0.0	ID	DWORD	DW#16#FF04210	Maximum power increase after N steps of the Power Ramp of antenna 2
+4.0	Param	DWORD	DW#16#0	Min=00 (0 dB), Default=00 (0 dB), Max=FF (63,75 dB)
=8.0		END_STRUCT		
+112.0	PowerRamp Boost2Thres1	STRUCT		Power Ramp 2 (only with ITF with phase 2)
+0.0	ID	DWORD	DW#16#10F08020	Number of inventories executed consecutively via antenna 1
+4.0	Param	DWORD	DW#16#2000000	Min=0000 (0), Default=0002 (2), Max=FFFF (65535)
=8.0		END_STRUCT		
+120.0	PowerRamp Boost2Thres2	STRUCT		Power Ramp 2 (only with ITF with phase 2)
+0.0	ID	DWORD	DW#16#11F08020	Number of inventories executed consecutively via antenna 2
+4.0	Param	DWORD	DW#16#2000000	Min=0000 (0), Default=0002 (2), Max=FFFF (65535)
=8.0		END_STRUCT		

Address	Name	Type	Value	Comment
+128.0	PowerGap Threshold	STRUCT		
+0.0	ID	DWORD	DW#16#AD108020	Number of consecutive inventories before pauses are inserted
+4.0	Param	DWORD	DW#16#3000000	Min=0000 (0), Default=0003 (3), Max=FFFF (65535)
=8.0		END_STRUCT		
+136.0	PowerGap MinDuration	STRUCT		
+0.0	ID	DWORD	DW#16#AE108420	Minimum pause between two inventories in ms
+4.0	Param	DWORD	DW#16#0	Min=0000 (0 ms), Default=0000 (0 ms), Max=FFFF (65535 ms)
=8.0		END_STRUCT		
+144.0	PowerGap MaxDuration	STRUCT		
+0.0	ID	DWORD	DW#16#AF108420	Maximum pause between two inventories in ms
+4.0	Param	DWORD	DW#16#0	Min=0000 (0 ms), Default=0000 (0 ms), Max=FFFF (65535 ms)
=8.0		END_STRUCT		
+152.0	Sorting	STRUCT		
+0.0	ID	DWORD	DW#16#7F08020	Sorting criterion
+4.0	Param	DWORD	DW#16#0	Criterion: 1=Reads, 2=Mean RSSI, 4=Max RSSI, 8=Delta RSSI, 10=First, 20=Last
=8.0		END_STRUCT		
+160.0	IntelliSingle TagDelta	STRUCT		
+0.0	ID	DWORD	DW#16#5F08020	Difference of the values of the sort criterion after the Tag List is sorted
+4.0	Param	DWORD	DW#16#0	Min=0000 (0), Default=0000 (0), Max=FFFF (65535)
=8.0		END_STRUCT		
+168.0	TagHoldBoost1	STRUCT		
+0.0	ID	DWORD	DW#16#1F04210	Increase in power on antenna 1 after 1 unsuccessful read/write attempt
+4.0	Param	DWORD	DW#16#0	Min=00 (0 dB), Default=04 (1 dB), Max=FF (63,75 dB)
=8.0		END_STRUCT		
+176.0	TagHoldBoost2	STRUCT		
+0.0	ID	DWORD	DW#16#2F04210	Increase in power on antenna 2 after 1 unsuccessful read/write attempt
+4.0	Param	DWORD	DW#16#4000000	Min=00 (0 dB), Default=04 (1 dB), Max=FF (63,75 dB)
=8.0		END_STRUCT		
+184.0	TagHoldMax1	STRUCT		
+0.0	ID	DWORD	DW#16#3F04110	Increase in power on antenna 1 after 2 unsuccessful read/write attempt
+4.0	Param	DWORD	DW#16#4000000	Min=00 (0 dB), Default=04 (1 dB), Max=FF (63,75 dB)
=8.0		END_STRUCT		
+192.0	TagHoldMax2	STRUCT		
+0.0	ID	DWORD	DW#16#4F04110	Increase in power on antenna 1 after 2 unsuccessful read/write attempt
+4.0	Param	DWORD	DW#16#4000000	Min=00 (0 dB), Default=04 (1 dB), Max=FF (63,75 dB)
=8.0		END_STRUCT		
+200.0	ITF_Duration Phase1	STRUCT		Inventory Threshold Filter

Address	Name	Type	Value	Comment
+0.0	ID	DWORD	DW#16#8F08020	Specifies the duration (number of inventories) of the inventory threshold filter
+4.0	Param	DWORD	DW#16#0	Min=0000 (0) (0 = ausgeschaltet), Default=0000 (0), Max=FFFF (65535)
=8.0		END_STRUCT		
+208.0	ITF_Histogramm Phase1	STRUCT		
+0.0	ID	DWORD	DW#16#9F08020	Number of inventories that a transponder must have detected, then invalid
+4.0	Param	DWORD	DW#16#0	Min=0000 (0), Default=0000 (0), Max=FFFF (65535)
=8.0		END_STRUCT		
+216.0	ITF_Duration Phase2	STRUCT		
+0.0	ID	DWORD	DW#16#AF08020	Specifies the duration (number of inventories) of the inventory threshold filter
+4.0	Param	DWORD	DW#16#0	Min=00 (0 dB), Default=00 (0 dB), Max=FF (63,75 B)
=8.0		END_STRUCT		
+224.0	ITF_Histogramm Phase2	STRUCT		
+0.0	ID	DWORD	DW#16#BF08020	Number of inventories that a transponder must have detected, then invalid
+4.0	Param	DWORD	DW#16#0	Min=0000 (0), Default=0000 (0), Max=FFFF (65535)
=8.0		END_STRUCT		
+232.0	BlackList Entries	STRUCT		
+0.0	ID	DWORD	DW#16#11208020	Number of transponders to be included in the Black List ring buffer
+4.0	Param	DWORD	DW#16#3000000	Min=0000 (0), Default=0003 (3), Max=0200 (512)
=8.0		END_STRUCT		
+240.0	RadioSet CarrierOffDelay	STRUCT		
+0.0	ID	DWORD	DW#16#14108520	Time in seconds that the carrier remains turned on after a tag operation
+4.0	Param	DWORD	DW#16#0	Min=0000 (0s), Default=0005 (5s), Max=FFFF (65535s)
=8.0		END_STRUCT		
+248.0	RadioSet RSSIThreshold1	STRUCT		
+0.0	ID	DWORD	DW#16#6E104010	RSSI-threshold value (antenna1)
+4.0	Param	DWORD	DW#16#0	Min=00 (0), Default=00 (0), Max=FF (255)
=8.0		END_STRUCT		
+256.0	RadioSet RSSIThreshold2	STRUCT		
+0.0	ID	DWORD	DW#16#6F104010	RSSI-threshold value (antenna2)
+4.0	Param	DWORD	DW#16#0	Min=00 (0), Default=00 (0), Max=FF (255)
=8.0		END_STRUCT		
+264.0	Smoothing ObsThresCount	STRUCT		
+0.0	ID	DWORD	DW#16#1304010	Number of inventories before it is assigned the status "Observed"
+4.0	Param	DWORD	DW#16#5000000	Min=00 (0), Default=05 (5), Max=FF (255)
=8.0		END_STRUCT		
+272.0	FieldDiagnosisIndicator	STRUCT		

Address	**Name**	**Type**	**Value**	**Comment**
+0.0	ID	DWORD	DW#16#16F04010	Field Diagnosis Indicator ON / OFF, with value > 0x00 FDI is activated.
+4.0	Param	DWORD	DW#16#0	Min=00 (FDI OFF), Default=00 (FDI OFF), Max=FF (FDI ON)
=8.0		END_STRUCT		
+280.0	SaveParameters	STRUCT		
+0.0	ID	DWORD	DW#16#14F04000	With a value >0, all parameters are stored in the flash of the reader
+4.0	Param	DWORD	DW#16#FF000000	Min=00 (FALSE), Default=FF (TRUE), Max=FF (TRUE)
=8.0		END_STRUCT		
=288.0		END_STRUCT		

Note

The UDTs are used in various RFID systems. As a result, certain comments also relate to other RFID systems.

6.5.2 UDT for EPC Data Filter

Table 6- 17 UDT 350 "EPC Data Filter"

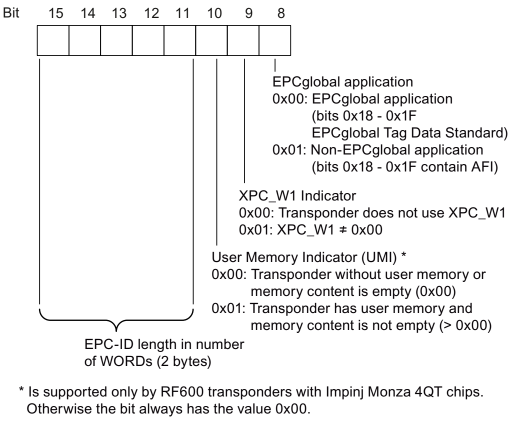
Address	Name	Type	Comment
0.0		STRUCT	
+0.0	EPC_filter_length	BYTE	Number of Bytes of EPC data filter
+1.0	EPC_filter_criterion	BYTE	= 0x00: direct filtering [1)] = 0x01: inverse filtering [2)]
+2.0	EPC_reserved0	BYTE	Reserved
+3.0	EPC_reserved1	BYTE	Reserved
+4.0	EPC_reserved2	BYTE	Reserved
+5.0	EPC_reserved3	BYTE	Reserved
+6.0	EPC_reserved4	BYTE	Reserved
+7.0	EPC_reserved5	BYTE	Reserved
+8.0	EPC_data_crc_msb	BYTE	CRC MSB Byte of filter data
+9.0	EPC_data_crc_lsb	BYTE	CRC LSB Byte of filter data
+10.0	EPC_data_pc_msb	BYTE	PC MSB Byte of filter data
+11.0	EPC_data_pc_lsb	BYTE	PC LSB Byte of filter data
+12.0	EPC_data_epc_id_w1_msb	BYTE	EPC-ID Word 1 MSB Byte of filter data
+13.0	EPC_data_epc_id_w1_lsb	BYTE	EPC-ID Word 1 LSB Byte of filter data
...	...	...	...
+72.0	EPC_data_epc_id_w31_msb	BYTE	EPC-ID Word 31 MSB Byte of filter data
+73.0	EPC_data_epc_id_w31_lsb	BYTE	EPC-ID Word 31 LSB Byte of filter data
+74.0	EPC_data_xpc_w1_msb	BYTE	XPC Word 1 MSB Byte of filter data
+75.0	EPC_data_xpc_w1_lsb	BYTE	XPC Word 1 LSB Byte of filter data
+76.0	EPC_data_xpc_w2_msb	BYTE	XPC Word 2 MSB Byte of filter data
+77.0	EPC_data_xpc_w2_lsb	BYTE	XPC Word 2 LSB Byte of filter data
+78.0	EPC_mask_crc_msb	BYTE	CRC MSB Byte of filter mask
+79.0	EPC_mask_crc_lsb	BYTE	CRC LSB Byte of filter mask
+80.0	EPC_mask_pc_msb	BYTE	PC MSB Byte of filter mask
+81.0	EPC_mask_pc_lsb	BYTE	PC LSB Byte of filter mask
+82.0	EPC_mask_epc_id_w1_msb	BYTE	EPC-ID Word 1 MSB Byte of filter mask
+83.0	EPC_mask_epc_id_w1_lsb	BYTE	EPC-ID Word 1 LSB Byte of filter mask
...	...	...	...
+142.0	EPC_mask_epc_id_w31_msb	BYTE	EPC-ID Word 31 MSB Byte of filter mask
+143.0	EPC_mask_epc_id_w31_lsb	BYTE	EPC-ID Word 31 LSB Byte of filter mask
+144.0	EPC_mask_xpc_w1_msb	BYTE	XPC Word 1 MSB Byte of filter mask
+145.0	EPC_mask_xpc_w1_lsb	BYTE	XPC Word 1 LSB Byte of filter mask
+146.0	EPC_mask_xpc_w2_msb	BYTE	XPC Word 2 MSB Byte of filter mask
+147.0	EPC_mask_xpc_w2_lsb	BYTE	XPC Word 2 LSB Byte of filter mask
=148.0		END STRUCT	

[1] Transponders whose EPC data matches the filter are removed from the Tag List.

[2] Transponders whose EPC data does not match the filter are removed from the Tag List.

The following overview shows the relationship between the EPC data of a transponder according to ISO 18000-6C (EPCglobal Gen 2 Standard) and the bits of the parameters of UDT 350:

Table 6- 18 Relationship of the EPC addresses with UDT 350

Address EPC Data - UDT 350	Address EPC mask - UDT 350	Address SIMATIC EPC-ID	Bit address EPC global WORD	EPC data content of the transponder	EPC data structure MSB: Bit 15 - 8 LSB: Bit 7 - 0							
+8.0	+78.0	-	0x00	Stored CRC (MSB)	15	14	13	12	11	10	9	8
+9.0	+79.0	-		Stored CRC (LSB)	7	6	5	4	3	2	1	0
+10.0	+80.0	0xFF7E	0x10	Stored PC (MSB)	15	14	13	12	11	10	9	8
					 Bit 15 14 13 12 11 10 9 8 EPCglobal application 0x00: EPCglobal application (bits 0x18 - 0x1F EPCglobal Tag Data Standard) 0x01: Non-EPCglobal application (bits 0x18 - 0x1F contain AFI) XPC_W1 Indicator 0x00: Transponder does not use XPC_W1 0x01: XPC_W1 ≠ 0x00 User Memory Indicator (UMI) * 0x00: Transponder without user memory or memory content is empty (0x00) 0x01: Transponder has user memory and memory content is not empty (> 0x00) EPC-ID length in number of WORDs (2 bytes) * Is supported only by RF600 transponders with Impinj Monza 4QT chips. Otherwise the bit always has the value 0x00.							
+11.0	+81.0	0xFF7F		Stored PC (LSB)	7	6	5	4	3	2	1	0
					Bit 0-7 of the Numbering System Identifier (NSI)							
+12.0	+82.0	0xFF00	0x20	EPC Word 1 (MSB)	15	14	13	12	11	10	9	8
+13.0	+83.0	0xFF01		EPC Word 1 (LSB)	7	6	5	4	3	2	1	0
+14.0	+84.0	0xFF02	0x30	EPC Word 2 (MSB)	15	14	13	12	11	10	9	8
+15.0	+85.0	0xFF03		EPC Word 2 (LSB)	7	6	5	4	3	2	1	0
...	...	...	...	...	...							
+72.0	+142.0	0xFF3C	0x200	EPC Word 31 (MSB)	15	14	13	12	11	10	9	8
+73.0	+143.0	0xFF3D		EPC Word 31 (LSB)	7	6	5	4	3	2	1	0

Address EPC Data - UDT 350	Address EPC mask - UDT 350	Address SIMATIC EPC-ID	Bit address EPC global WORD	EPC data content of the transponder	EPC data structure MSB: Bit 15 - 8 LSB: Bit 7 - 0							
+74.0	+144.0	-	0x210	XPC_W1 (MSB)	15	14	13	12	11	10	9	8
+75.0	+145.0	-		XPC_W1 (LSB)	7	6	5	4	3	2	1	0
+76.0	+146.0	-	0x220	XPC_W2 (MSB)	15	14	13	12	11	10	9	8
+77.0	+147.0	-		XPC_W2 (LSB)	7	6	5	4	3	2	1	0

Note

Use and meaning of the bits of PC and XPC of the transponders

A detailed description of the meaning and use of the bits of PC (Protocol Control) and XPC of the transponder can be found in ISO 18000-6C or the EPCglobal Standard. These are freely available using the Internet.

Note

RF600 transponders do not support XPC or XPW_W1 Indicator

No RF600 transponder currently supports the functions and memory areas of an XPC_W1 or XPC_W2. The XPC_W1 Indicator (see bit 9 of the stored PC (MSB)) is therefore "reserved".

6.6 Writing the EPC-ID

The EPC-ID is the feature that identifies a transponder. After changing the EPC-ID, the previously detected transponders of the reader are invalid and must be detected again.

Transponders with the same EPC-ID

If several transponders with identical EPC-IDs are in the antenna field at the same time, access to a specific transponder is not possible. When writing, for example, the data would be written at random to any transponder with the relevant EPC-ID.

For this reason, if there are multiple transponders with an identical EPC-ID (data content and EPC-ID length) in the antenna field of the reader at the same time, the error "0x1D" is generated. No further data access takes place.

This prevents random access to transponders.

Assigning different EPC-IDs

The SIMATIC RF600 industrial transponders always have different EPC-IDs when they are supplied and can normally be used immediately. The SIMATIC RF600 labels (e.g. RF630L), on the other hand, all have the same EPC-ID.

Bring one RF630L separately into the antenna field and assign its special EPC-ID with a "WRITE" command.

Writing EPC-IDs

The write command to address FF00 allows the EPC-ID memory bank to be written to and the content but not the length of the EPC-ID can be changed. To be able to define an EPC-ID with a different length (2 - 62 bytes), a write command to address "FEFE" is necessary. The maximum length of the EPC-ID is restricted by the transponder hardware and depends on the transponder type being used.

Note

Structure of the EPC-ID

The data content of the write command consists of 2 bytes EPC-ID length + n bytes data content (EPC-ID). This data content is transferred to address "FEFE" on the transponder with a write command. The length of the EPC-ID must always be even.

Example:

A 6 byte long EPC-ID ("00 06") with EPC-ID ("010203040506") will be written to the transponder.

In this case write the data "00 06 01 02 03 04 05 06".

Note

Behavior of the display "ANZ_MDS_present" when writing a new EPC-ID to a transponder

After changing the EPC-ID of a transponder, the present status is briefly deleted ("ANZ_MDS_present = 0"). After a successful inventory of the transponder with the newly assigned EPC-ID, the present status is set again.

A handle ID assigned to a transponder before writing the EPC-ID is therefore invalid after changing the EPC-ID. After changing the EPC-ID, a new handle ID is assigned to the transponder by the inventory.

You should therefore take this process of switching the bit off and on into consideration if "ANZ_MDS_present" is evaluated in the user program.

You will find more detailed information on writing the MOBY_mode = 6 using the UID in the section "UID (Page 59)".

6.7 Special functions of the RF600 transponders

This section introduces you to the password, LOCK and KILL functions of the EPC transponder. You will find detailed information specifically about the use of these functions in a SIMATIC environment. You will find a detailed description of all EPC functions in the standard ISO 18000-6C.

6.7.1 Setting passwords and erasing them again

Function of the passwords

For write and read commands, the password protection provided by the air interface standard EPC Class 1 Gen 2 (ISO 18 000-6C) is used.

A 4-byte long ACCESS and KILL password is provided for each individual transponder. Each password is considered undefined as long as it has the value 0. A password is considered defined once a value > 0 has been written to the transponder.

ACCESS and KILL password

The ACCESS password can be used to restrict access to the memory banks (USER-Memory, EPC-MemBank and TID-MemBank) of the relevant transponder.

The KILL password serves as protection and prevents accidental permanent deactivation of a transponder. When supplied, the SIMATIC RF630L, for example, has the "KILL" password = 0, that prevents it from being deactivated in its default status. The RFID label is made permanently unusable only after a KILL password has been written and a KILL command executed.

The ACCESS password and the KILL password are stored in the "RESERVED" memory bank of the transponder. There you can read them out, delete them and set them again.

In the SIMATIC controller, the following password address assignments apply:

- KILL password: Address FF80; length 4 bytes on the transponder
- ACCESS password: Address FF84; length 4 bytes on the transponder
- KILL password: Address FFFF; length 4 bytes on the reader;
  write-only; also executes the KILL function of the transponder at the same time
- ACCESS password: Address FFFD; length 4 bytes on the reader;
  write-only

The following rules apply to passwords:

- Passwords can be written and read normally if they are in the UNLOCK status.
- After the LOCK , passwords can only be changed using the ACCESS password.
- After the Perma-LOCK of the "RESERVED" memory bank, passwords are permanently set.

Note

Using passwords

- As long as no ACCESS password has been stored on the transponder (as shipped: ACCESS password = 0), you can write to the user area of the transponder without any restriction.
- If no ACCESS password has been stored on the transponder and an ACCESS password has been saved on the reader, you cannot write to the transponder in the UNLOCK status. An error message is issued.
- The various passwords are saved using the "WRITE" command at default addresses on the transponder or on the reader. On the reader, the password is lost after it is turned off.
- After you have written a password to the transponder, you must transfer this password to the reader with each subsequent "WRITE/READ/INIT" command. For read or write access to the transponder, the password transferred to the reader must be identical to the password stored on the transponder.
- The LOCK function protects a memory area on the transponder from being overwritten or deleted.
- A KILL function cannot execute on the transponder unless you have stored a KILL password on the transponder. After you have saved a KILL password on the transponder, you can execute the KILL function and make the transponder unusable.
- If you switch off the supply voltage on the reader or send an "init_run" command to the reader, the password on the reader (ACCESS password, KILL password) will be deleted, in other words, set to 0.
- Transponders with different passwords can therefore only be read if the password assigned to the transporter is set on the reader prior to the read.

6.7.2 Application of the LOCK function

Transponders that are operated via the air interface protocol EPC Class 1 Gen 2 or ISO 18000-6C can be temporarily or permanently locked or even unlocked for read and write access.

Using the LOCK functions you can block or permit write access for each transponder memory bank.

Set the corresponding access rights separately for each of the memory banks and each password.

Note

Transponder can become unusable

Only use the LOCK and password functions when you are sure what you want to achieve. If these functions are handled incorrectly, the transponder may become permanently unusable for your application

The following applies:

After you have written a password to the transponder, make sure that this password is stored on the reader each time the "WRITE/READ/INIT" command is used later. For read or write access to the transponder, the password transferred to the reader must be identical to the password stored on the transponder.

The LOCK function is implemented using the SIMATIC "WRITE" command. With this "WRITE" command, the following information is always transferred:

- Address [hex] "FF FE"
- The length of the data must always be 3 bytes
- Codings for the "LOCK" function (see section "Codes for the LOCK function (Page 161)")

6.7.3 (Perma) LOCK/(perma) UNLOCK and read or write accesses to transponders with ACCESS password

Data access combinations in different LOCK states of the EPC and USER memory bank

The table below summarizes all data access combinations to transponders that can occur on transponders and readers in the (Perma) LOCK/(Perma) UNLOCK status with and without an ACCESS password.

The actions permitted in the relevant state are shown in the right-hand column.

Requirements							Permitted actions			
Reader: ACCESS-Pwd		Transponder: ACCESS-Pwd		Memory bank (EPC, USER) has status			Reading memory bank (EPC, USER)		Writing to memory bank (EPC, USER)	
YES	NO	YES	NO	LOCK	Perma LOCK	UNLOCK or Perma UNLOCK	YES	NO [1]	YES	NO [1]
X		X		X			X		X	
X		X			X		X			0x0C
X		X				X	X		X	
X			X	X				0x0E		0x0E
X			X		X			0x0E		0x0E
X			X			X		0x0E		0x0E
	X	X		X			X			0x0C
	X	X			X		X			0x0C
	X	X				X	X		X	
	X		X	X			X		X	
	X		X		X		X			0x0C
	X		X			X	X		X	

[1] Error message of the reader

Designation	Meaning
ACCESS-Pwd = NO	ACCESS-Pwd has the value 0x00
ACCESS-Pwd = YES	ACCESS-Pwd > 0x00

It is still assumed that the ACCESS passwords on the transponder and reader are identical if for both passwords the option ACCESS-Pwd = YES is selected.

6.7.4 Codes for the LOCK function

Core statement

The following table provides an overview of the codings that define the LOCK functionality (LOCK, UNLOCK or Perma LOCK) for the relevant memory area.

The function is executed by a "WRITE" command and the address "FFFE", length = 3 with the data set specified in the table. This information cannot be read out from the transponder.

Table 6- 19 Perma LOCK/UNLOCK after temporary LOCK/UNLOCK

	(temporary)		→	Perma LOCK/ UNLOCK
	LOCK	UNLOCK		
KILL password	00 02 08 hex	00 00 08 hex	→	00 01 04 hex
ACCESS password	80 00 02 hex	00 00 02 hex	→	40 00 01 hex
EPC	20 80 00 hex	00 80 00 hex	→	10 40 00 hex
TID	08 20 00 hex	00 20 00 hex	→	04 10 00 hex
USER	02 08 00 hex	00 08 00 hex	→	01 04 00 hex

Table 6- 20 Direct Perma LOCK/UNLOCK

	Perma LOCK	Perma UNLOCK
KILL password	00 03 0C hex	00 01 0C hex
ACCESS password	C0 00 03 hex	40 00 03 hex
EPC	30 C0 00 hex	10 C0 00 hex
TID	0C 30 00 hex	04 30 00 hex
USER	03 0C 00 hex	01 0C 00 hex

The LOCK functionalities named above can also be activated on the transponder at the same time by sending a pre-planned sequence of commands as a chained command to the reader.

Note

After Perma LOCK/UNLOCK, the transponder status can no longer be reversed

If Perma LOCK/UNLOCK is sent as a command, the transponder is either in the LOCK or UNLOCK status. After executing Perma-LOCK/Perma-UNLOCK, the current state is "frozen" and can no longer be undone.

You should therefore only use the Perma LOCK/UNLOCK command if you are sure that the LOCK or UNLOCK functionality is stored on the transponder.

Example: LOCK command on ACCESS password

Table 6- 21 SIMATIC command (according to "command_DB", UDT 20)

Command [hex]	sub_command [hex]	length [dez]	address_MDS [hex]	DAT_DB_Nr [dez]	DAT_DB_adr [dez]
0x01	–	3 bytes	0xFFFE	Number of the user DB containing the data to be written.	Start address of the data to be written. Pointer to address in the data block (where the coding 80 00 02 is stored).

Following this command, the memory area FF 84 to FF 87 (ACCESS memory area) is temporarily locked.

6.7.5 Application of the KILL function

The following applies:

After you have written a password to the transponder, you must transfer this password to the reader with each subsequent "WRITE/READ/INIT" command. You only need to inform the reader of the password once. After this, the password is always automatically adapted. For read or write access to the transponder, the password transferred to the reader must be identical to the password stored on the transponder.

A transponder can be made unusable with the KILL function. After a successfully executed KILL function, a transponder will no longer respond to reader queries. It makes sense to "kill" a transponder, when the data on the transponder needs to be made permanently unusable.

The KILL function is implemented using the SIMATIC "WRITE" command. With this "WRITE" command, the following information is always transferred:

- Address [hex] "FF FF"
- Length of the KILL password = 4 bytes
- KILL password (must be known)

Preconditions for the KILL function:

The KILL password for the "WRITE" command is identical to the KILL password stored on the transponder.

Note

Deactivating the KILL function

The password "00 00 00 00" on the transponder permanently prevents the KILL function.

6.8 Command repetition and ScanningMode

Definition of terms

The terms "command repetition", "ScanningMode" and "unspecified read commands" are closely associated with each other. The following definitions of the terms are intended to help you to understand the methods and their uses.

- Command repetition

  Command repetition is a sequence of commands that runs automatically on the reader that is used with each new transponder.

  In the simple mode (ScanningMode is deactivated) command repetition operates in applications in which the transponders are read singly one after the other. This means that only one transponder is permitted in the antenna field at any one time.

- ScanningMode

  The ScanningMode is a special form of command repetition. In contrast to command repetition without ScanningMode , the ScanningMode can be used with any transponder population. This means that the ScanningMode is only available when working with FB 55 (MOBY_mode = 6, 7).

- Unspecified read command

  An unspecified read command is a read command with which the UID is specified with the value = 0 (4 bytes with MOBY_mode = 6 and 8 bytes with MOBY_mode = 7). This makes it possible to access a transponder with any EPC-ID without the EPC-ID being known in advance.

  You will find more detailed information in the section "UID (Page 59)".

6.8.1 Command repetition

Operating principle

After a restart (or "init_run") of the reader, the FB 45/ FB 55 transfers the command (or command chain) once to the CM/reader. Command transmission is automatic with the first "command_start". This command (or the last command or the command chain) always remains intermediately stored in the reader. If command repetition is started now, the temporarily stored command on the reader is executed again, and the result(s) transferred to FB 45 / FB 55.

Advantages of command repetition

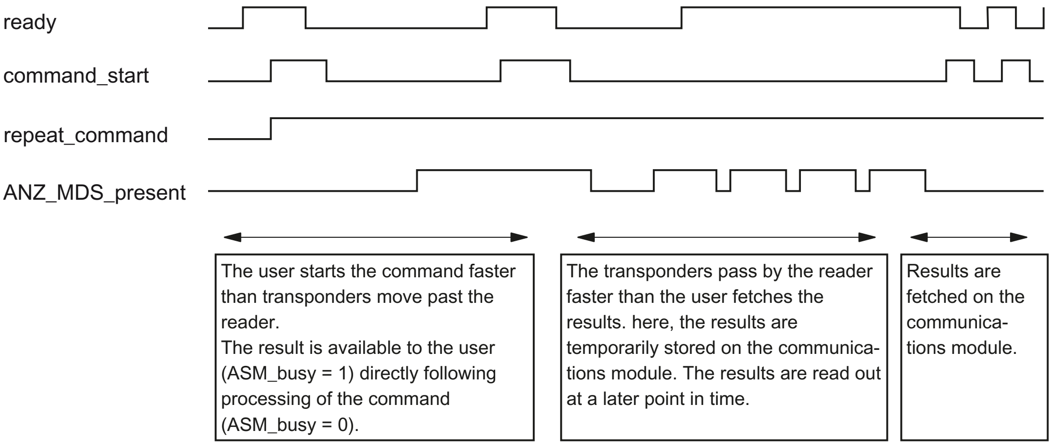
- The data transfer on PROFIBUS/PROFINET is minimized. This is particularly noticeable with extensive bus configurations and slow (bus) transmission speeds.
- The reader processes each transponder regardless of FB 45 / FB 55. In concrete terms, this means that in applications with very fast transponder sequences or gate applications with many transponders, each transponder is processed. This takes place no matter what the (PROFI) BUS speed.
- Total data throughput is increased considerably particularly with controllers that have few system resources for acyclic frames.
- Any number of transponders can be detected simply.

Command overview for use with command repetition

Command [hex]		Command	Permitted with command repetition
normal	chained		
01	41	Write data to MDS	no
02	42	Read data from MDS	yes
03	43	Initialize MDS	no
04	44	SLG-STATUS	no
0A	4A	Antenna on/off	no
0B	4B	MDS-STATUS	yes
0C	4C	GET	no

Programming

After programming the CM/reader with a command using "command_start", "repeat_command" is set and remains set. The following diagram shows the primary states.



The user starts the command faster than transponders move past the reader.
The result is available to the user (ASM_busy = 1) directly following processing of the command (ASM_busy = 0).

The transponders pass by the reader faster than the user fetches the results. here, the results are temporarily stored on the communications module. The results are read out at a later point in time.

Results are fetched on the communications module.

Figure 6-17 Permanent reading of each passing transponder. "repeat_command" remains set.

Further results can be read out with "command_start" and "ready". In this mode, new commands are always started with "command_start". This means that the results are available very quickly.

When permanent command repetition is used, data may be transferred to the FB slower than new transponders are being processed (fast transponder sequence, slow data transfer). In this case, the results are temporarily stored on the CM. The CM or reader has a number of buffers for this intermediate storage. If the buffers are full because the FB has not fetched data and additional transponders arrive, these transponders are no longer processed.

Table 6- 22 Readers and communications modules that support command repetition

Device type	Number of buffers (number of commands)	Max. user data that can be processed with command repetition
RF620R	150	233 bytes × 150 = 34 950 bytes
RF630R	150	233 bytes × 150 = 34 950 bytes
RF170C	150	233 bytes × 150 = 34 950 bytes
RF180C	150	233 bytes × 150 = 34 950 bytes
ASM 456	150	233 bytes × 150 = 34 950 bytes
ASM 475	70	233 bytes × 70 = 16 310 bytes

6.8.2 Enabling the ScanningMode

The ScanningMode is always prepared with "init_run" on the reader. The ScanningMode is assigned parameters by setting bit 6 in the "field_ON_control" variable of FB 55.

Subsequent activation of the ScanningMode is achieved by starting command repetition with "command_start" and "repeat_command".

Benefits and drawbacks of ScanningMode

- The ScanningMode processes any number of transponders very quickly and is uncomplicated. This makes bulk reading at gates very simple.
- In ScanningMode , no error messages are output if the processing of a transponder is not completed correctly. The transponders affected do not appear in the results list.

Sequence of the ScanningMode

1. Preparation of the ScanningMode by setting bit 6 = 1.
2. Command chains of unspecific read commands are then used with all transponders located in the antenna field.

Deactivation of the ScanningMode by setting bit 6 = 0.

Setting bit 6 = 1 followed by "init_run"	- ScanningMode prepared
Sending an unspecified read command or a chain of unspecified read commands	- ScanningMode prepared
Setting the control bit "repeat_command"	- ScanningMode is activated
Optional: Resetting the control bit "repeat_command"	- ScanningMode prepared

In this mode, the reader uses the read command or chained read commands for all transponders in the Tag List in sequence and reads out their data.

6.8.3 Operating conditions

- **Logging in the Tag List**

  The Tag List logs the transponders for which an unspecified read command or a chain of unspecified read commands was completed successfully. The next time the Tag List is run through with "repeat_command", this unspecified read command or this chain of unspecified read commands is not sent to the transponder again (with this unique EPC-ID).

- **Initial reader status or "repeat_command = OFF" (only after "repeat_command = ON")**

  If an unspecified read command or a chain of unspecified read commands is sent, then the read command or the entire chain of read commands relates to the first transponder in a Tag List. As a result of repeated sending of an unspecified read command or chain of unspecified read commands, the commands always relate to the first transponder in the current Tag List .

- **"repeat_command = ON"**

  An unspecified read command or a chain of unspecified read commands is only used with all transponders in a Tag List when there is a "repeat_command = ON" following an unspecified read command or a chain of unspecified read commands.
  When command repetition is started, the first transponder is not processed again after it has been processed once.

- **Read result with a command chain**

  The reader only returns the complete result of a command chain when this has been executed completely and correctly. If the reader finds an error within a chain, all previous partial results are discarded. This means that the user does not receive a result for this transponder.

- Aborting of command repetition

  If a command chain with "repeat_command = ON" is identified as being a correct sequence of commands the first time it is run through, command repetition can only be stopped in the following ways:

  – Sending an "init_run" or

  – "repeat_command = OFF"

  If execution of a chain has already started before the "repeat_command = OFF" is received, this will be completed and, if applicable, acknowledged. Only then will the reader send "command_rep_active = 0".

- Activating command repetition again

  After deactivating the command repetition and reactivating it again, the last pending unspecified command or unspecified chain of commands is used again for the current Tag List .

6.8.4 Errors and special cases

Error when reading within a chain

As soon as an error occurs within a valid chain of unspecified read commands, the remaining read commands in the chain will be canceled for the transponder (Tag List) currently due to be processed, and the chain will be applied to the next tag in the Tag List.

Display of read errors on the reader

As described in the previous paragraph, error messages in ScanningMode are not forwarded to the function block. Nevertheless, the red LED on the reader makes it possible to see that the reader has not been able to execute a command properly. In this case, the LED on the reader lights up red for a certain time (see section Error messages and flashing codes (Page 84)).

Error in the command chain

Write commands, incorrect command formats etc. are identified as errors the first time a chain is run through and are output as an error message. Any set "repeat_command" is ignored.

Use of passwords

If you want to use passwords for access to transponders, make sure that the same password is are used for all transponders in the antenna field and stored and used appropriately on the reader.

Several transponders with identical EPC-IDs in the antenna field

If several tags with identical EPC-IDs are present in the antenna field of the reader, data is not returned by any of these transponders.

6.9 Transmit / radiated power setting

The transmit power is set on the RF630R reader. On the RF620R reader, you can set the radiated power directly using the "distance_limiting" parameter. The transmit power is the power transmitted at the reader output, the radiated power is the power radiated by an antenna.

Because the RF620R reader has an integrated antenna, in contrast to the RF630R reader, the cable attenuation and antenna gain cannot be adjusted. You can influence the radiated power of the antenna connected to the RF630R with the following parameters: Cable attenuation, antenna gain, transmit power of the reader.

You can find out the radiated power needed to meet your requirements using the "Tool for calculating the radiated power(RF600) (http://support.automation.siemens.com/WW/view/en/59585543)" tool.

Appendix A

A.1 Differences between SIMATIC command level and message frame level

The parameters for the RF600 readers can be set in two ways:

- using SIMATIC commands of FB 45 and FB 55
- using a customer-specific PC program that sends the command frames directly for the reader

Since parameter assignment using function blocks FB 45 and FB 55 is the standard method, this method will be described in detail.

SIMATIC command level

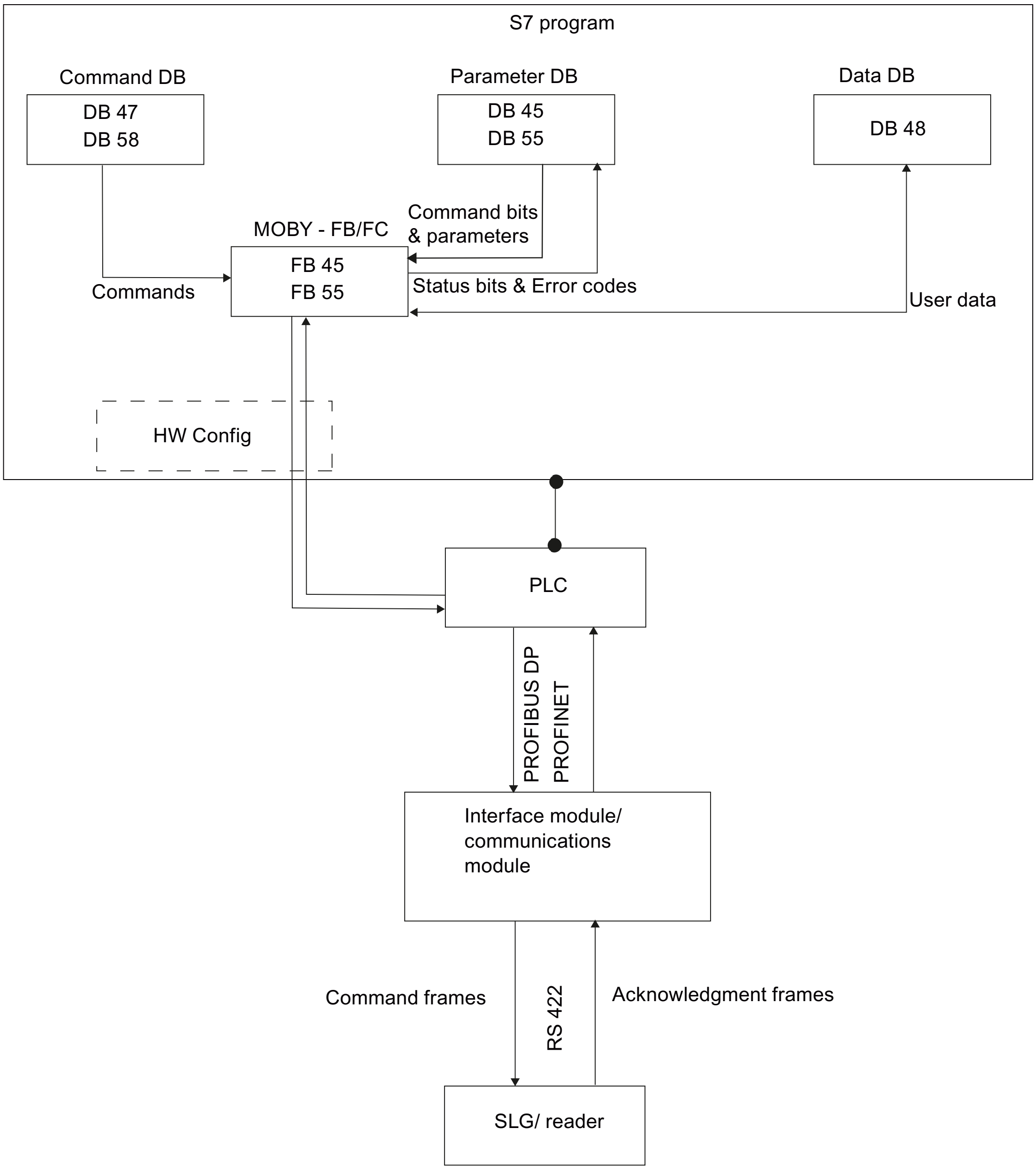


Figure A-1 Flow chart for SIMATIC command level

Message frame level

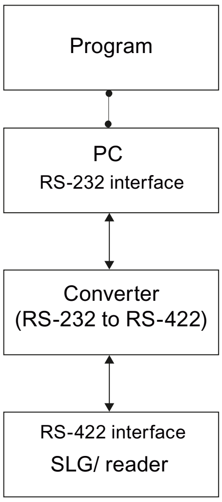


Figure A-2 Flow diagram for message frame level

A.2 Programming the communications modules on PROFIBUS

A.2.1 Programming the communications modules on PROFIBUS DP-V1

For whom is this Appendix intended?

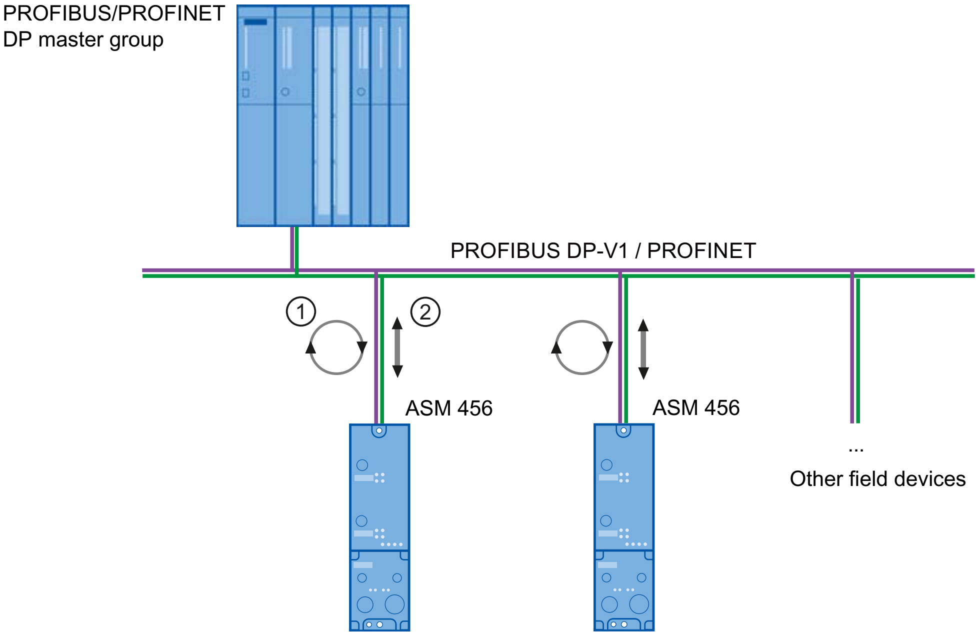
This section does not need to be considered by SIMATIC users. It is intended particularly for programmers of PCs and third-party PLCs. The information allows the programmer to develop a customized function block or driver for the communications module.

Note

Some signals in this appendix have the same meaning as the variables in section "Parameterizing (Page 23)". In order to distinguish between them, an underscore "_" is appended to the relevant signals (e.g. ANZ_MDS_present_).

Communication between communications module and PROFIBUS/PROFINET master

It must be possible to transfer both the cyclic (DP) and the acyclic data DP-V1 via PROFIBUS DP.



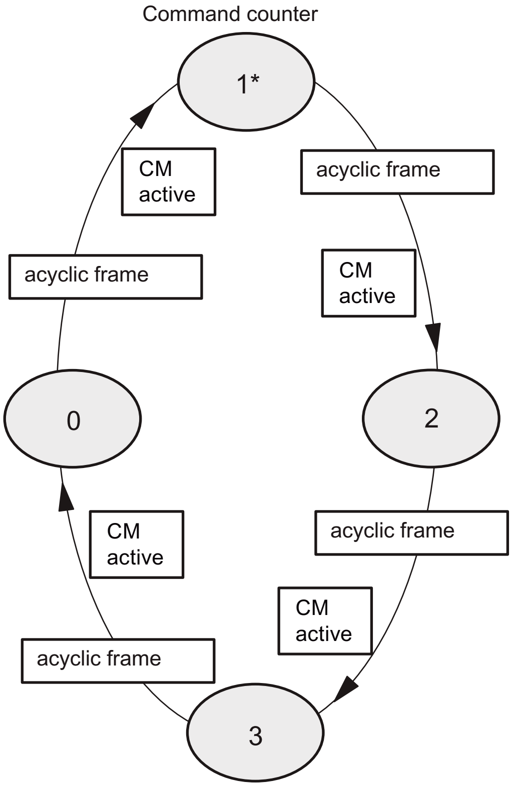
① Cyclic communication via PROFIBUS/PROFINET.
Status information is exchanged.

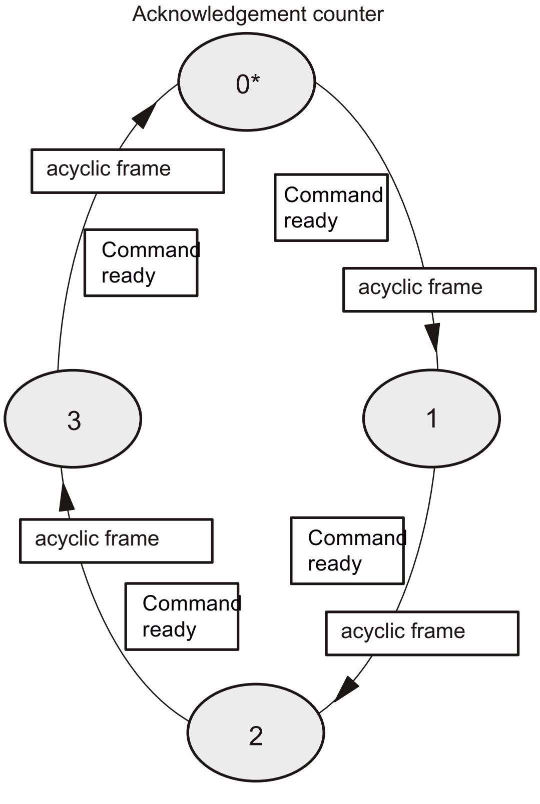
② Acyclic communication via PROFIBUS/PROFINET. Commands and acknowledgments are exchanged.

The master may only send new commands to the slave (communications module) when the ASM is ready. Status information is used in cyclic communication to indicate that the communications module is ready. The same applies to acknowledgments. The communications module may only fetch new acknowledgments when a new acknowledgment is actually waiting (i.e. has not yet been read). This information is also indicated by status information.

Two condition codes are defined in the status information. The PROFIBUS/PROFINET master uses these two codes to decide whether a DP-V1 frame can be sent to or from the communications module.

Principle of controlling acyclic communication with command and acknowledgment counter





* Status of the counters after CM startup or after an init_run_

Figure A-3 Command and acknowledgement counter statuses

As can be seen from the diagram above, an acyclic frame triggers the change from one defined status to the next. A new acyclic frame is not permitted until the next status is reached. An acyclic frame is either a command to the CM or an acknowledgment from it.

For this reason, it is important to inform the master whether a new acyclic frame can be executed. Each status is coded in 2 bits and counted up (as shown in the diagram above). The terms status buts or status counters are also used.

The status bits are transmitted cyclically to the master via PROFIBUS DP. The user must evaluate the bits in his program. When the status bit changes, a new status (new status = old status + 1) is created. Only now can the next acyclic frame be sent.

Two statuses must be coded:

1. Command status (command counter) to indicate to the user whether a new/next command may be transferred to the CM.
2. Acknowledgment status (acknowledgment counter) to indicate to the user whether a new acknowledgment from the CM is pending.

The user must evaluate the acknowledgement status with higher priority. In other words, when the user wants to send a frame to the ASM but a frame from the CM is waiting to be fetched at the same time, the frame from the CM must be fetched first.

Both the command and the acknowledgment status are coded in 2 bits each. The two statuses are stored in one byte.

A.2.2 Cyclic control word between master and communications module

The cyclic control word is used to synchronize frame traffic between master (FB/FC) and slave (communications module). The actual acyclic command and acknowledgment frame may not be started until this is indicated by the cyclic byte of the communications module in the command or acknowledgment counter.

Cyclic word to communications module: I/O output

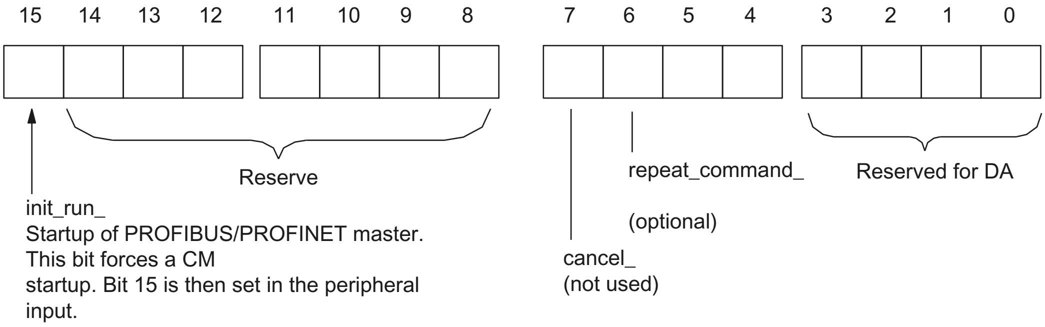


Figure A-4 Structure of the cyclic control word: Peripheral output

Cyclic word from communications module: I/O input

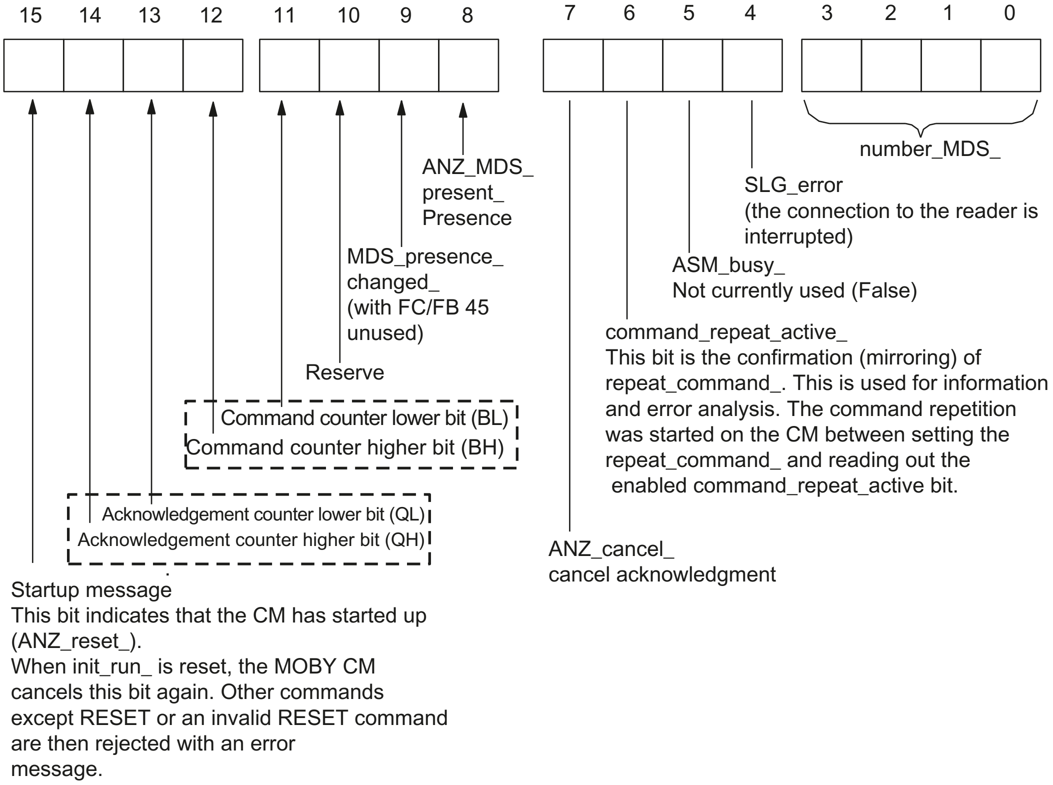
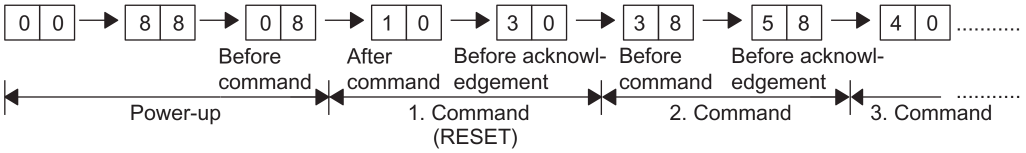

15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
number_MDS_
ANZ_MDS_
present_
Presence
SLG_error
(the connection to the reader is
interrupted)
MDS_presence_
changed_
(with FC/FB 45
unused)
ASM_busy_
Not currently used (False)
command_repeat_active_
This bit is the confirmation (mirroring) of
repeat_command_. This is used for information
and error analysis. The command repetition
was started on the CM between setting the
repeat_command_ and reading out the
enabled command_repeat_active bit.
Reserve
Command counter lower bit (BL)
Command counter higher bit (BH)
Acknowledgement counter lower bit (QL)
Acknowledgement counter higher bit (QH)
ANZ_cancel_
cancel acknowledgment
Startup message
This bit indicates that the CM has started up
(ANZ_reset_).
When init_run_ is reset, the MOBY CM
cancels this bit again. Other commands
except RESET or an invalid RESET command
are then rejected with an error
message.

Figure A-5 Structure of the cyclic control word: Peripheral input

After startup, the "cyclic word from the CM" appears as follows in sequence (bits 8 to 15 are shown):



Synchronizing of command and acknowledgment counters

The command (BZ) and acknowledgment (QZ) counters are synchronized during a startup. The CM sets QZ = 0 and BZ = 1. The startup can be triggered by both the CM (return of power) and the user (init_run_).

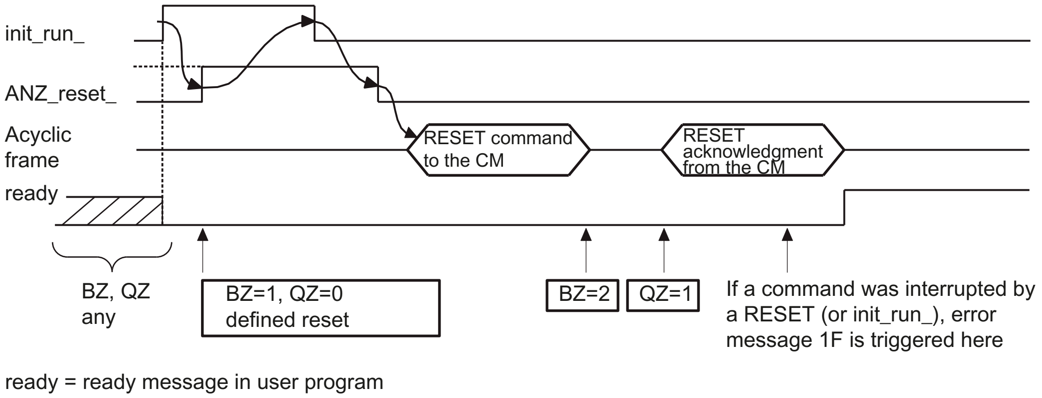

init_run_
ANZ_reset_
Acyclic frame
ready
RESET command to the CM
RESET acknowledgment from the CM
BZ, QZ any
BZ=1, QZ=0 defined reset
BZ=2
QZ=1
If a command was interrupted by a RESET (or init_run_), error message 1F is triggered here
ready = ready message in user program

Figure A-6 Power-up timing initiated by user

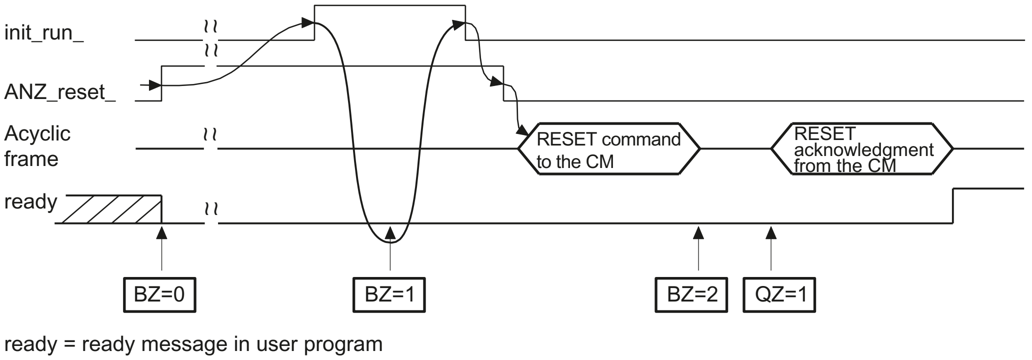


Figure A-7 Startup timing of the CM initiated by power down

A.2.3 Methods of operation with the communications module

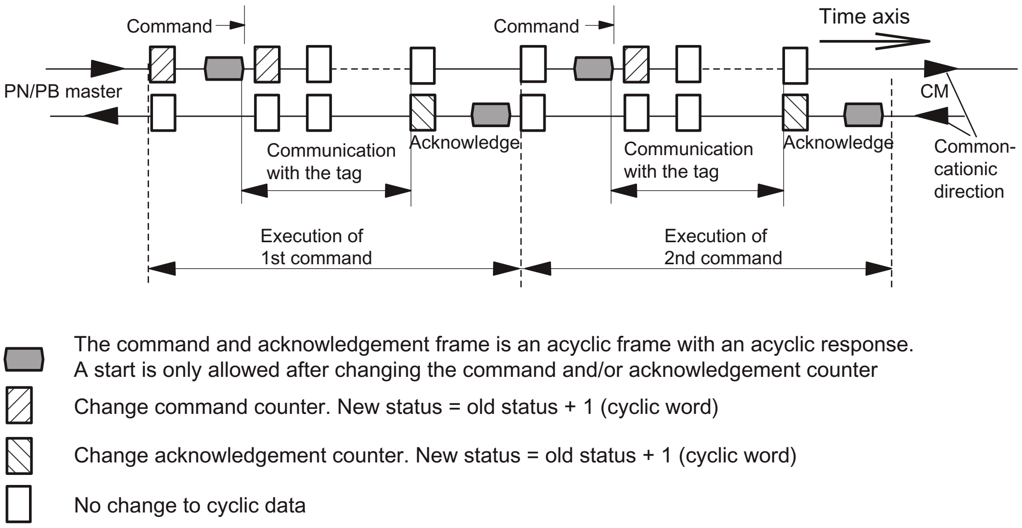
Commands are executed one at a time

This means that, after each command, the user must wait for the acknowledgment (result) before the next command is sent to the CM. This type of programming involves the following characteristics:

- Simple function block programming
- No optimal-speed data transmission for several consecutive commands.

The following diagram shows the sequence of the command and acknowledgement exchange between user (PROFINET/PROFIBUS master) and CM.

RFID command execution



⬬ The command and acknowledgement frame is an acyclic frame with an acyclic response. A start is only allowed after changing the command and/or acknowledgement counter

▨ Change command counter. New status = old status + 1 (cyclic word)

▧ Change acknowledgement counter. New status = old status + 1 (cyclic word)

□ No change to cyclic data

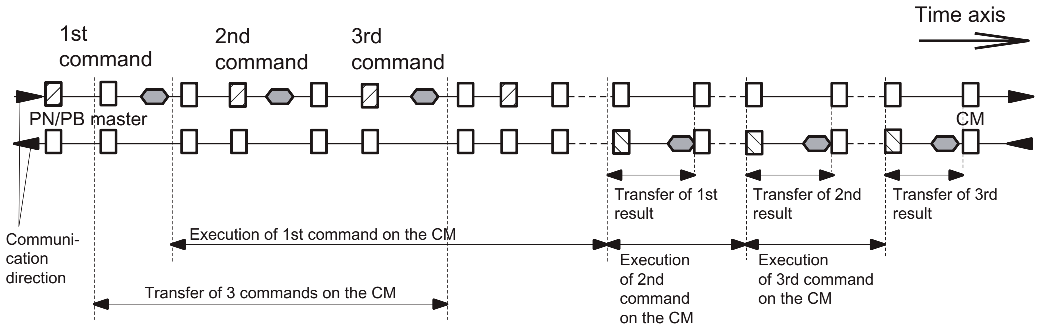
Figure A-8 Command execution: one command at a time

Command chaining and buffering on the CM

Command chaining is indicated when the chaining bit (bit 6 in the command) is set.
Command buffering is a property of the CM or reader. A variety of buffers are available to the CM/reader for intermediate storage of commands and results.
Use of command chaining and command buffering involves the following properties:

- Programming a function block becomes more complex
- Optimum data throughput to and from the transponder.
  This is particularly noticeable with high data lengths (> 1 KB) and slower PROFIBUS transmission rate.

The following diagram shows the procedure used for command and acknowledgment communication between user (PROFINET/PROFIBUS master) and communications module when a chained command is used:



⬬ The command and acknowledgement frame is an acyclic frame with an acyclic response.
A start is only allowed after changing the command and/or acknowledgement counter

▨ Change command counter. New status = old status + 1 (cyclic word)

▧ Change acknowledgement counter. New status = old status + 1 (cyclic word)

□ No change to cyclic data

Figure A-9 Command execution: Command chaining and buffering

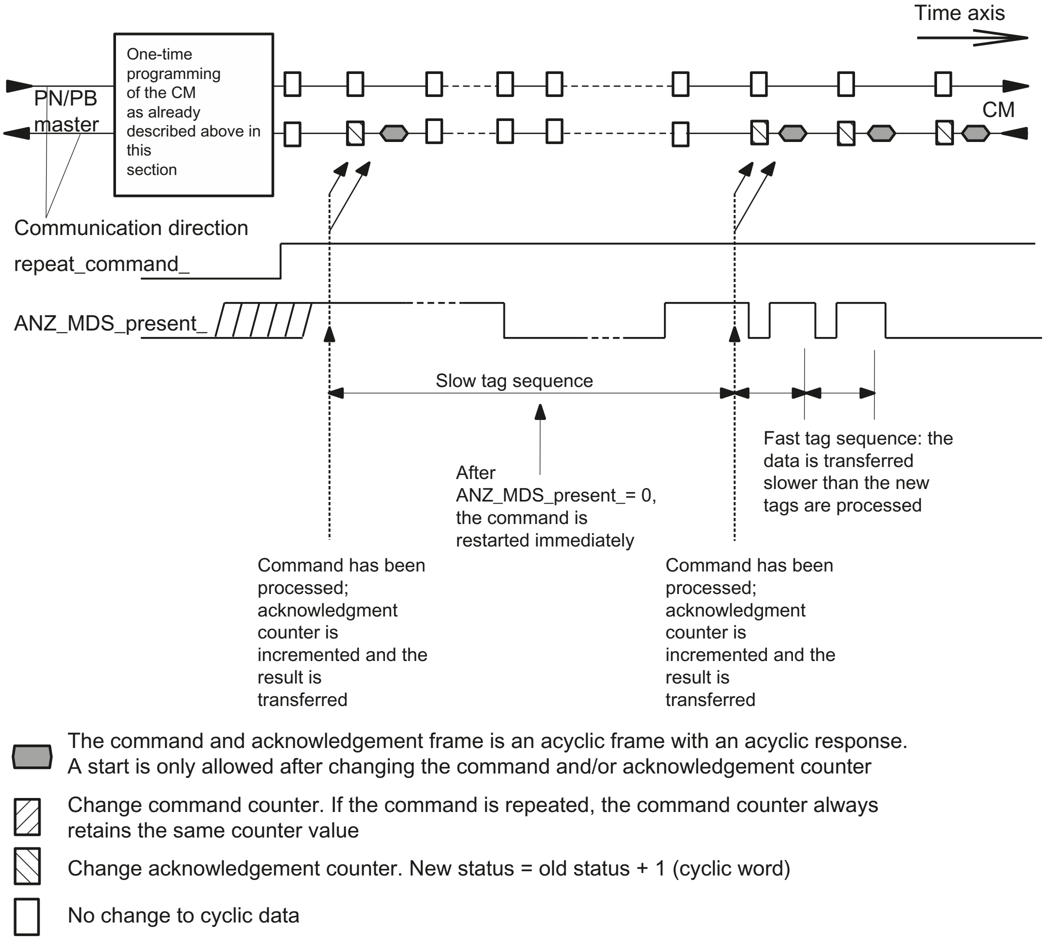
The following general conditions apply to the procedures shown in the diagram above:

- It is obvious that data transmission and execution of the commands take place parallel to each other.
- The sequences shown in the diagram above may vary depending on the bus transmission rate and the transponder transmission rate.
- If the PN/PB master module only provides limited resources (buffers) for acyclic data transfer, data transmission may take quite some time. This is particularly noticeable in extensive bus configurations with CMs.
- If the master module can be set to permit several acyclic frames between cyclic data exchange, data transmission can be speeded up in a bus configuration with many CMs. However, this has a negative effect on the cyclic data exchange of I/O modules that are also part of the same PROFIBUS line. The cycle time of PN/PB becomes irregular and sporadically may become very high.
- When commands need to be processed by the CM or reader for which there is not enough buffer space on the CM/reader, the user must first fetch results from the CM before new commands can be sent to the CM.
- The CM does not necessarily need the chaining bit in the command. However, from the user's point of view, it is an elegant way to identify related partial commands. A chaining bit set in the command is returned by the CM in the acknowledgment.
- The number of buffers on the CM/reader depends on the CM or reader type.

Command repetition

Programming of command repetition at the PN/PB level is described below. Command repetition is controlled by the peripheral input and output word.

The following diagram shows frame exchange between user (PN/PB master) and CM:


Time axis
One-time programming of the CM as already described above in this section
PN/PB master
CM
Communication direction
repeat_command_
ANZ_MDS_present_
Slow tag sequence
After ANZ_MDS_present_= 0, the command is restarted immediately
Fast tag sequence: the data is transferred slower than the new tags are processed
Command has been processed; acknowledgment counter is incremented and the result is transferred
Command has been processed; acknowledgment counter is incremented and the result is transferred

⬬ The command and acknowledgement frame is an acyclic frame with an acyclic response. A start is only allowed after changing the command and/or acknowledgement counter

▨ Change command counter. If the command is repeated, the command counter always retains the same counter value

▧ Change acknowledgement counter. New status = old status + 1 (cyclic word)

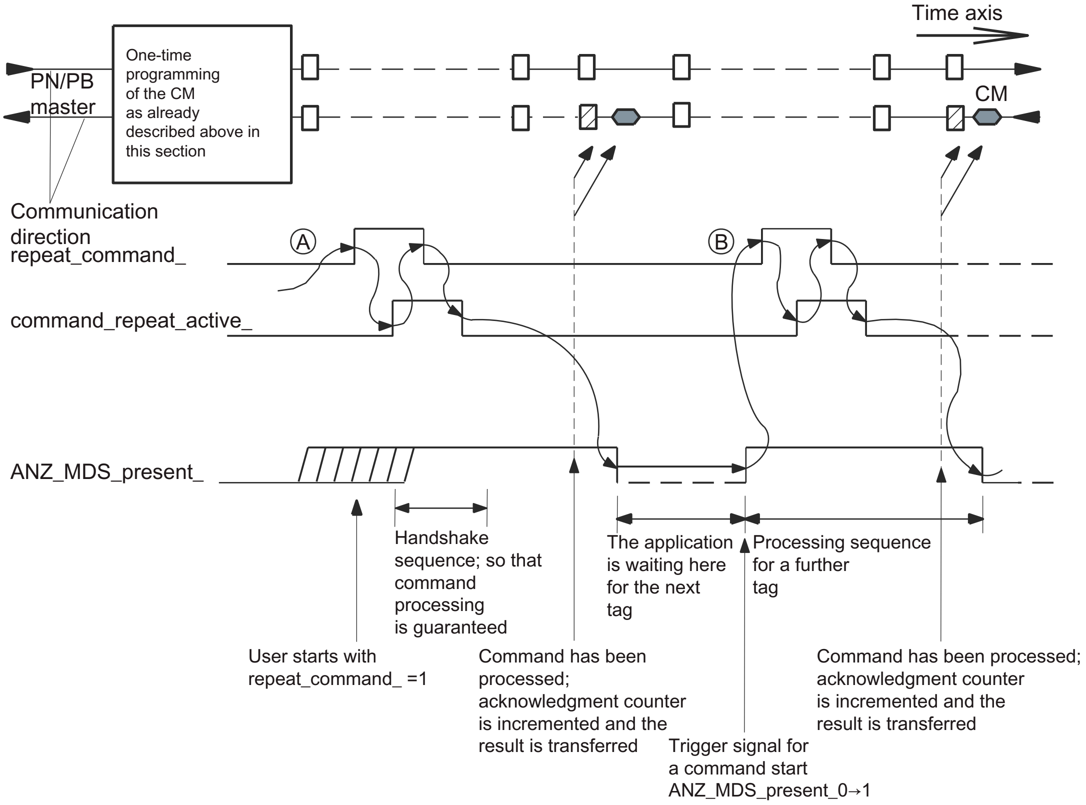
□ No change to cyclic data

Figure A-10 Command repetition using I/O words

Command repetition can also be as shown below:

- An external proximity switch (BERO) is used to signal that a new transponder is entering the antenna field (see figure below: Ⓐ).
- A new transponder is detected with the ANZ_MDS_present_ bit, and command repetition is then started (see figure below: Ⓑ).

In this case, the command_repeat_active_ bit must be scanned to make sure the command repetition was accepted.


Time axis
PN/PB master
One-time programming of the CM as already described above in this section
CM
Communication direction
A
B
repeat_command_
command_repeat_active_
ANZ_MDS_present_
Handshake sequence; so that command processing is guaranteed
The application is waiting here for the next tag
Processing sequence for a further tag
User starts with repeat_command_ =1
Command has been processed; acknowledgment counter is incremented and the result is transferred
Trigger signal for a command start ANZ_MDS_present_0→1
Command has been processed; acknowledgment counter is incremented and the result is transferred

⬬ The command and acknowledgement frame is an acyclic frame with an acyclic response. A start is only allowed after changing the command and/or acknowledgement counter

▨ Change command counter. If the command is repeated, the command counter always retains the same counter value.

▧ Change acknowledgement counter. New status = old status + 1 (cyclic word)

□ No change to cyclic data

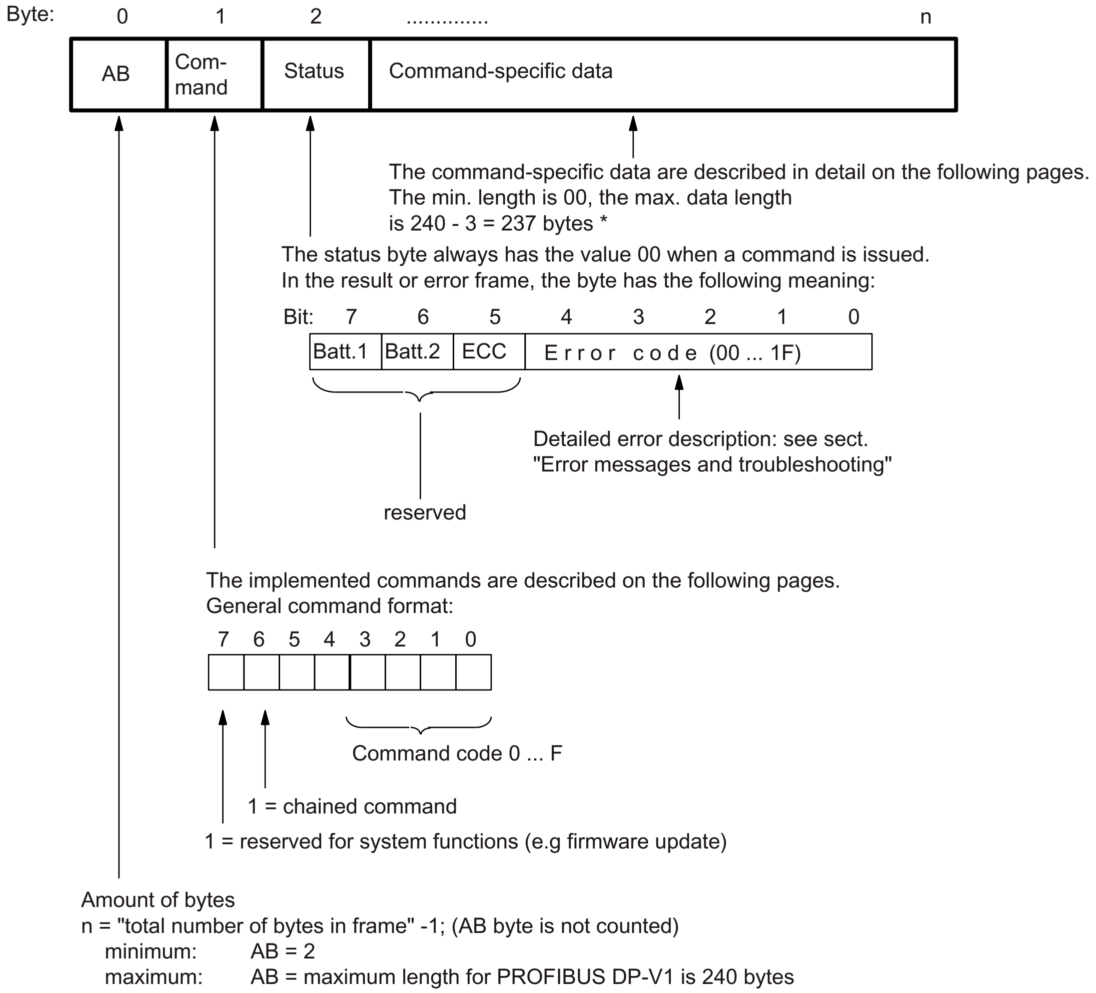
Figure A-11 Focused command repetition

A.2.4 Command and acknowledgement telegrams

Commands and results are transmitted and received using the acyclic frame service of PROFIBUS/PROFINET. The frames are described in this section.

General frame format

The frame structure applies to both command frames to the CM module and result frames from the CM.


Byte: 0 1 2 .... n
AB
Com-mand
Status
Command-specific data
The command-specific data are described in detail on the following pages.
The min. length is 00, the max. data length
is 240 - 3 = 237 bytes *
The status byte always has the value 00 when a command is issued.
In the result or error frame, the byte has the following meaning:
Bit: 7 6 5 4 3 2 1 0
Batt.1
Batt.2
ECC
Error code (00 ... 1F)
Detailed error description: see sect.
"Error messages and troubleshooting"
reserved
The implemented commands are described on the following pages.
General command format:
7 6 5 4 3 2 1 0
Command code 0 ... F
1 = chained command
1 = reserved for system functions (e.g firmware update)
Amount of bytes
n = "total number of bytes in frame" -1; (AB byte is not counted)
minimum: AB = 2
maximum: AB = maximum length for PROFIBUS DP-V1 is 240 bytes

* The length specified here is the maximum length for PROFIBUS. The ASM 475 is an exception with a max. length 1 byte shorter (max. data length = 239; command-specific data = 236).

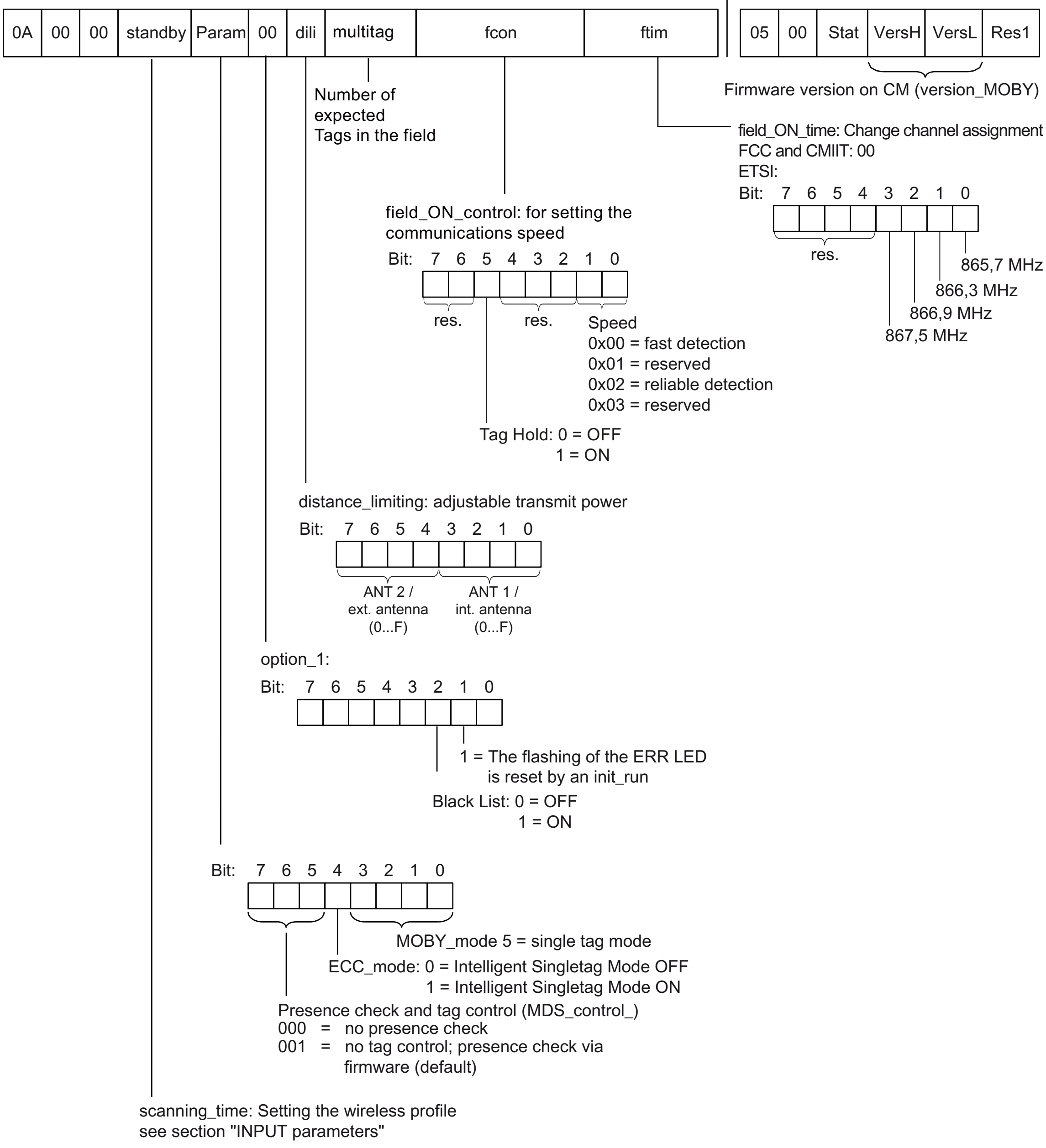
Figure A-12 General frame format

Command table

Command code [hex]	Command code chained [hex]	Command	Description
0	–	RESET	CM is reset. The active command is aborted. (If a tag command was interrupted with "RESET", the reset acknowledgment indicates error 1F.) The "init_run" command can be used to change the CM to various operating modes.
1	41	WRITE	To write transponder data, for example "EPC-ID" or "USER_Memory".
2	42	READ	To read transponder data, for example "EPC-ID" or "USER_Memory". Or to read from the reader (e.g. ACCESS password or AUP).
3	43	INIT	This command is needed if a new transponder is used that has never been written to. The transponder is already initialized for normal use.
4	44	SLG STATUS	Returns UDT 300, UDT 340, UDT 360 or UDT 370, the status byte of the selected reader and the ANZ_MDS_present_ bit as the result. This command checks whether a reader is connected to the CM and, if so, whether it is functioning and ready for operation. An appropriate error is reported, if necessary. With RF600, various diagnostics data can be fetched from the reader using the UDTs.
A	4A	Antenna on/off	This command can be used among other things to turn the antenna fields on the reader off and on again.
B	4B	MDS-STATUS	Returns the properties of the transponder in the result
C	4C	GET	Read out transponder (EPC-ID, handle ID) and Black List

Precise frame structure with FB 45 (MOBY_mode = 5)

Command code	Command frame to CM/reader	Result frame from CM/reader
RESET		


0A
00
00
standby
Param
00
dili
multitag
fcon
ftim
05
00
Stat
VersH
VersL
Res1
Firmware version on CM (version_MOBY)
Number of expected Tags in the field
field_ON_time: Change channel assignment
FCC and CMIIT: 00
ETSI:
Bit: 7 6 5 4 3 2 1 0
res.
865,7 MHz
866,3 MHz
866,9 MHz
867,5 MHz
field_ON_control: for setting the communications speed
Bit: 7 6 5 4 3 2 1 0
res.
res.
Speed
0x00 = fast detection
0x01 = reserved
0x02 = reliable detection
0x03 = reserved
Tag Hold: 0 = OFF
1 = ON
distance_limiting: adjustable transmit power
Bit: 7 6 5 4 3 2 1 0
ANT 2 / ext. antenna (0...F)
ANT 1 / int. antenna (0...F)
option_1:
Bit: 7 6 5 4 3 2 1 0
1 = The flashing of the ERR LED is reset by an init_run
Black List: 0 = OFF
1 = ON
Bit: 7 6 5 4 3 2 1 0
MOBY_mode 5 = single tag mode
ECC_mode: 0 = Intelligent Singletag Mode OFF
1 = Intelligent Singletag Mode ON
Presence check and tag control (MDS_control_)
000 = no presence check
001 = no tag control; presence check via firmware (default)
scanning_time: Setting the wireless profile see section "INPUT parameters"

<table>
<tr><th>Command code</th><th>Command frame to CM/reader</th><th>Result frame from CM/reader*</th></tr>
<tr><td>01, 41
(WRITE)</td><td><table><tr><td>AB</td><td>01, 41</td><td>00</td><td>Address
MSB | LSB</td><td>LNG</td><td>D1 ... Dn</td></tr></table></td><td><table><tr><td>02</td><td>01, 41</td><td>00**
(40,C0)</td></tr></table></td></tr>
<tr><td>02, 42
(READ)</td><td><table><tr><td>05</td><td>02, 42</td><td>00</td><td>Address
MSB | LSB</td><td>LNG</td></tr></table></td><td><table><tr><td>AB</td><td>02, 42</td><td>00**
(40,C0)</td><td>Address
MSB | LSB</td><td>LNG</td><td>D1 ... Dn</td></tr></table></td></tr>
<tr><td>03, 43
(INIT)</td><td><table><tr><td>06</td><td>03, 43</td><td>00</td><td>INIT pattern</td><td>End addr. + 1
00 | MSB | LSB</td></tr></table></td><td><table><tr><td>02</td><td>03, 43</td><td>00**
(40,C0)</td></tr></table></td></tr>
</table>

Meaning:

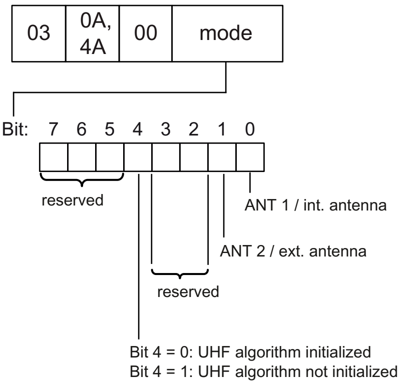
D1 ... Dn	User data of user (1 to 234; for ASM 475: 1 to 233)
LNG	Length of data block (D1 .... Dn) Note: Address + LNG must be lower than the end address of the tag.
Address	Start address of the data to be processed on the tag: MSB = most significant address part LSB = least significant address part
AB	Number of the following characters in the frame AB = LNG + 5 Note: AB + 1 must not be higher than the bus configuration.
INIT pattern	The value "Init pattern" is written to the tag during initialization.
End addr. + 1	Memory size of the tag

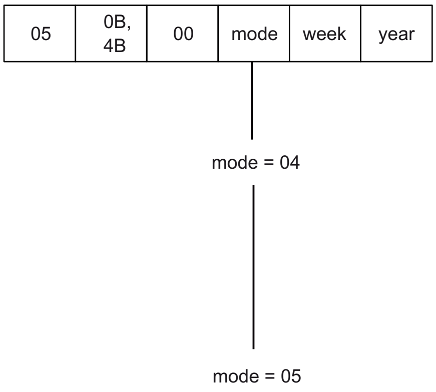
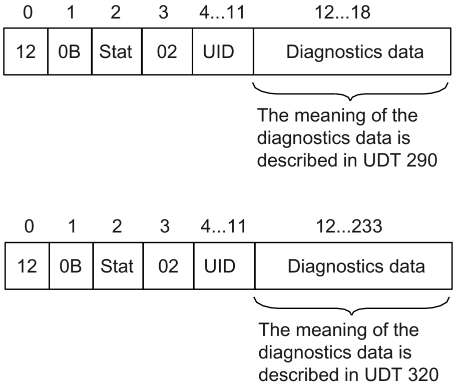
*) In the event of an error, the format of the result frame is as follows:
The AB byte (02) can have a value > 2 for the read command.
In this case, the data is only partially correct and must be rejected
.

02	Com-mand	Faults

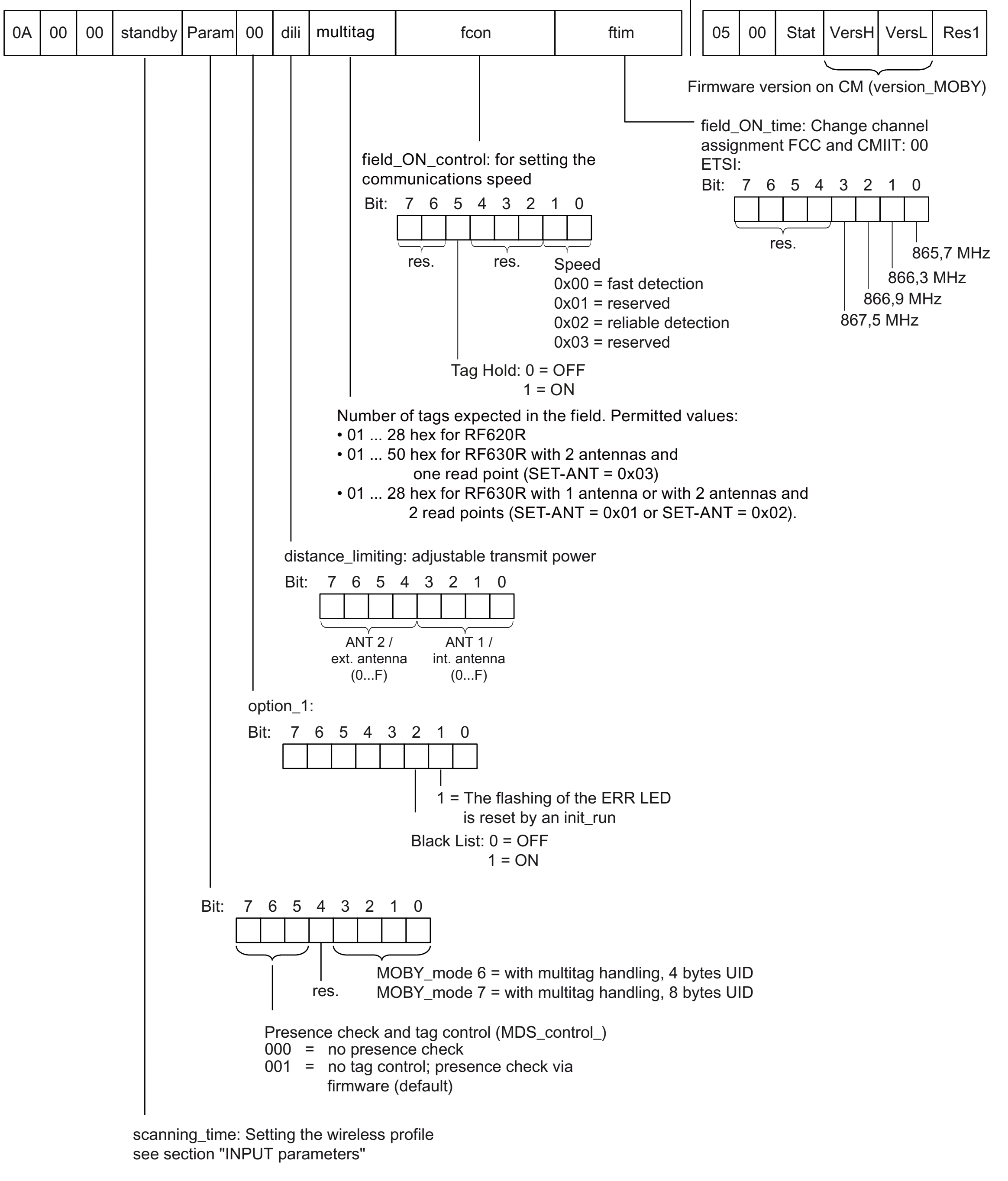
**) The status byte in the result frame depends on the tag type (battery states)

<table>
<tr><th>Command code</th><th>Command frame to the CM/reader</th><th>Command frame from the CM/reader</th></tr>
<tr><td>04, 44
(SLG-STATUS)</td><td><table><tr><td>06</td><td>04, 44</td><td>00</td><td>mode</td><td>res</td><td>res</td><td>res</td></tr></table>mode = 07 SLG-STATUS
mode = 08 SLG-STATUS
mode = 20 SLG-STATUS
mode = 21 SLG-STATUS</td><td><table><tr><td>AB</td><td>04</td><td>Stat</td><td>06</td><td>SLG-STATUS</td></tr></table>The meaning of the diagnostics data is described in UDT 300, UDT 340 and UDT 370.</td></tr>
</table>

Command code	Command frame to CM/reader	Result frame from CM/reader
0A, 4A (antenna on/off)		02 0A, 4A Stat

Command code	Command frame to the CM/reader	Command frame from the CM/reader
0B, 4B (MDS-STATUS)		

Precise frame structure with FB 55 (MOBY_mode = 6, 7)

Command code	Command frame to CM/reader	Result frame from CM/reader
RESET	 0A 00 00 standby Param 00 dili multitag fcon ftim 05 00 Stat VersH VersL Res1 Firmware version on CM (version_MOBY) field_ON_time: Change channel assignment FCC and CMIIT: 00 ETSI: Bit: 7 6 5 4 3 2 1 0 res. 865,7 MHz 866,3 MHz 866,9 MHz 867,5 MHz field_ON_control: for setting the communications speed Bit: 7 6 5 4 3 2 1 0 res. res. Speed 0x00 = fast detection 0x01 = reserved 0x02 = reliable detection 0x03 = reserved Tag Hold: 0 = OFF 1 = ON Number of tags expected in the field. Permitted values: • 01 ... 28 hex for RF620R • 01 ... 50 hex for RF630R with 2 antennas and one read point (SET-ANT = 0x03) • 01 ... 28 hex for RF630R with 1 antenna or with 2 antennas and 2 read points (SET-ANT = 0x01 or SET-ANT = 0x02). distance_limiting: adjustable transmit power Bit: 7 6 5 4 3 2 1 0 ANT 2 / ext. antenna (0...F) ANT 1 / int. antenna (0...F) option_1: Bit: 7 6 5 4 3 2 1 0 1 = The flashing of the ERR LED is reset by an init_run Black List: 0 = OFF 1 = ON Bit: 7 6 5 4 3 2 1 0 res. MOBY_mode 6 = with multitag handling, 4 bytes UID MOBY_mode 7 = with multitag handling, 8 bytes UID Presence check and tag control (MDS_control_) 000 = no presence check 001 = no tag control; presence check via firmware (default) scanning_time: Setting the wireless profile see section "INPUT parameters"	

Command code	Command frame to CM/reader	Result frame from CM/reader*
01, 41 (WRITE)	AB*** │ 01, 41 │ 00** │ UID*** │ Address MSB│LSB │ LNG │ D1 ... Dn	06,*** 0A │ 01, 41 │ 00** │ UID***
02, 42 (READ)	09,*** 0D │ 02, 42 │ 00** │ UID*** │ Address MSB│LSB │ LNG	0A,*** 0E │ 02, 42 │ 00** │ UID*** │ Address MSB│LSB │ LNG │ D1 ... Dn
03, 43 (INIT)	0A,*** 0E │ 03, 43 │ 00** │ UID*** │ INIT pattern │ Endadr. + 1 00 │MSB│LSB	06,*** 0A │ 03, 43 │ 00** │ UID***

Meaning:

D1 ... Dn	User data of user (1 to 234; for ASM 475: 1 to 233)
LNG	Length of data block (D1 .... Dn) Note: Address + LNG must be lower than the end address of the tag.
Address	Start address of the data to be processed on the tag: MSB = most significant address part LSB = least significant address part
AB	Number of the following characters in the frame AB = LNG + 5 Note: AB + 1 must not be higher than the bus configuration.
INIT pattern	The value "Init pattern" is written to the tag during initialization.
End addr. + 1	Memory size of the tag

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

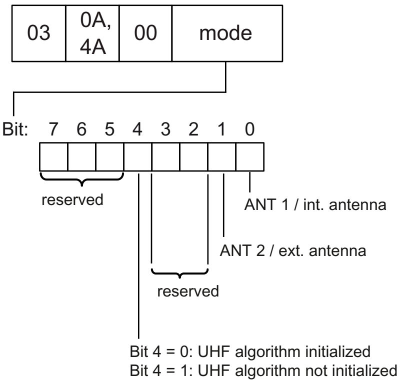
02 │ Com-mand │ Faults

**) The status byte in the result frame depends on the tag type (battery states)

***) with MOBY_mode = 6: 4 bytes UID;
with MOBY_mode = 7: 8 bytes UID

Command code	Command frame to the CM/reader	Command frame from the CM/reader

04, 44 (SLG-STATUS)	06 │ 04, 44 │ 00 │ mode │ res │ res │ res
	mode = 07 SLG-STATUS
	mode = 08 SLG-STATUS
	mode = 20 SLG-STATUS
	mode = 21 SLG-STATUS
		AB │ 04 │ Stat │ 06 │ SLG-STATUS
		The meaning of the diagnostics data is described in UDT 300, UDT 340 and UDT 370.

Command code	Command frame to CM/reader	Result frame from CM/reader
0A, 4A (antenna on/off)	03 0A, 4A 00 mode  Bit: 7 6 5 4 3 2 1 0 reserved ANT 1 / int. antenna ANT 2 / ext. antenna reserved Bit 4 = 0: UHF algorithm initialized Bit 4 = 1: UHF algorithm not initialized	02 0A, 4A Stat

Command code	Command frame to the CM/reader	Command frame from the CM/reader
0B, 4B (MDS-STATUS)	05 0B, 4B 00 mode week year mode = 04 mode = 05	mode = 04: 0 1 2 3 4...11 12...18 12 0B Stat 02 UID Diagnostics data The meaning of the diagnostics data is described in UDT 290 mode = 05: 0 1 2 3 4...11 12...233 12 0B Stat 02 UID Diagnostics data The meaning of the diagnostics data is described in UDT 320

<table>
<tr><th>Command code</th><th>Command frame
to the CM/reader</th><th>Command frame
from the CM/reader</th></tr>
<tr>
<td>0C, 4C
(GET)</td>
<td>
<table><tr><td>AB</td><td>0C,
4C</td><td>00</td><td>mode</td><td>Address
MSB LSB</td><td>LNG</td></tr></table>

mode = 02 read out
next data record

mode = 03 read
EPC-ID in MOBY_mode = 7 and
Handle ID in MOBY_mode = 6

mode = 05 read Handle IDs and
EPC-IDs in MOBY_mode = 6

mode = 10 read out handle IDs sorted in
descending order acc. to mean RSSI value

mode = 11 read out Handle IDs acc. to
maximum RSSI value in desc. order
sorted

mode = 12 read out Handle IDs acc. to
read frequency in desc. order

mode = 20 first entries
read out from Black List

mode = 21 further entries
read out from Black List
</td>
<td>
<table><tr><td>AB</td><td>0C,
4C</td><td>Status</td><td>No. of MDS *</td><td>GET data</td></tr></table>

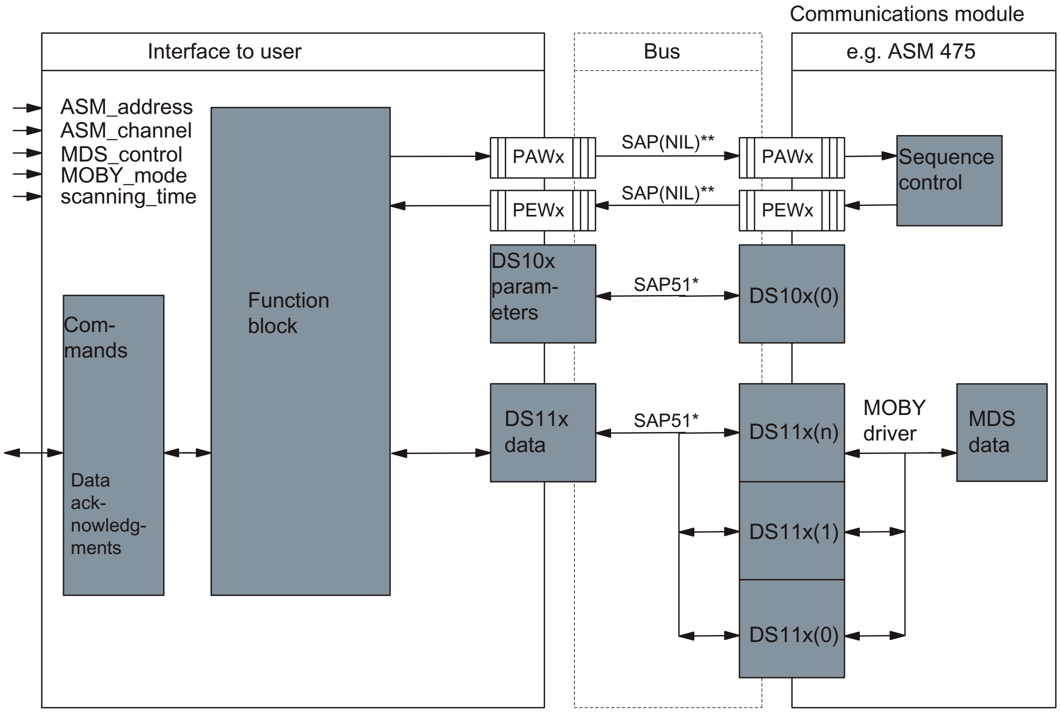
The structure of the result frame is described in the section "Parameter assignment of the commands with FB 55 > "GET".

* in UDT 360 = reserved
</td>
</tr>
</table>

A.2.5 PROFIBUS/PROFINET implementation

PROFIBUS/PROFINET is implemented on the communications modules strictly in accordance with standard IEC 61784-1:2002 Ed1 CP 3/1. Cyclic data traffic (standard specified by EN 50170) and optional acyclic data traffic are used.

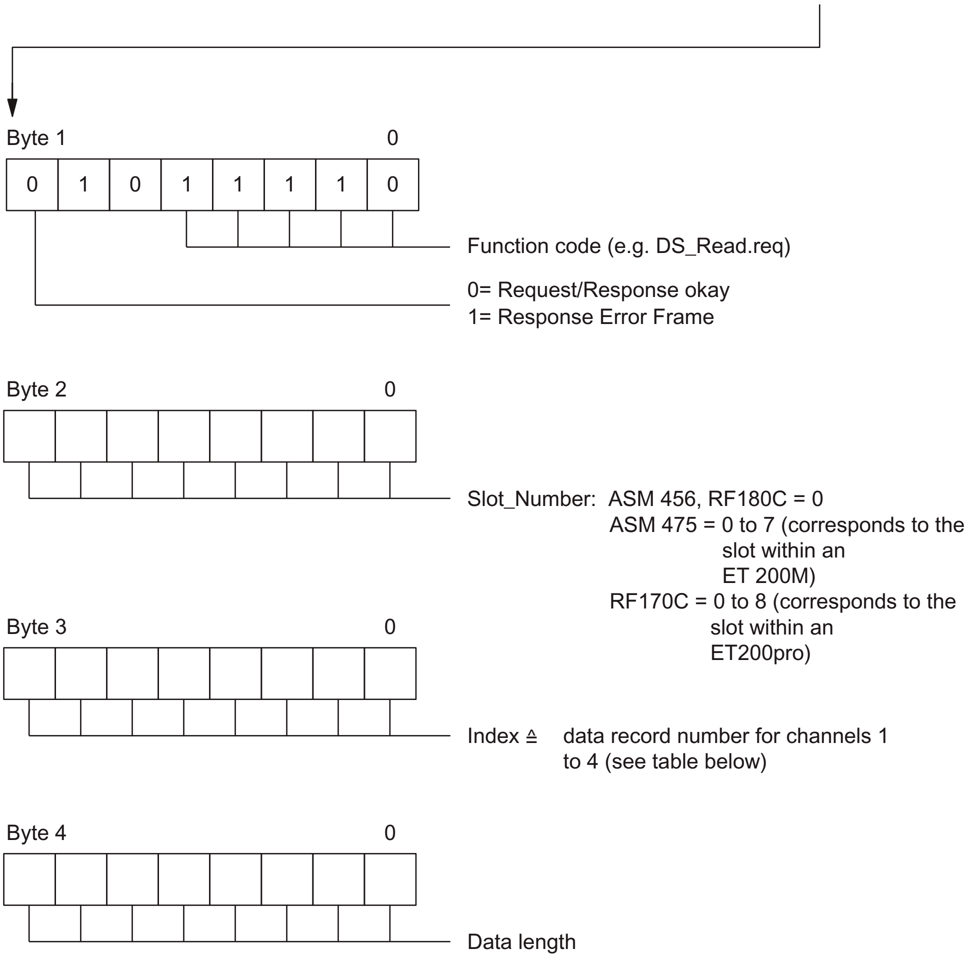
The following figure shows the communication interface to a communications module. PQW and PIW are exchanged cyclically between ASM and function block. PIW informs the function block when commands and data may be transferred to the communications module. Commands and data are put into data records.



x = channel
n = no. of the command on the CM (n_{max} = number of buffers on CM; see section "Command repetition".)
* = SIMATIC S7 uses SAP 51 and SAP 54 for acyclic communication.
** = The transfer of the control word (PQW/PIW) is handled by the cyclic data_exchange service of PROFIBUS (SAP = 255 = NIL).

The following figure shows the layout of a acyclic data record. SAP 51 is used to transmit the data. The data unit (DU) indicates how the MOBY-ASM is addressed:

SD	LE	LEr	SD	DA	SA	FC	DSAP	SSAP	DU	FCS	ED
68H	x	x	68H	8x	8x	x	51/33H	51/33H	x...	x	16H


Byte 1
0
0 1 0 1 1 1 1 0
Function code (e.g. DS_Read.req)
0= Request/Response okay
1= Response Error Frame
Byte 2
0
Slot_Number: ASM 456, RF180C = 0
ASM 475 = 0 to 7 (corresponds to the slot within an ET 200M)
RF170C = 0 to 8 (corresponds to the slot within an ET200pro)
Byte 3
0
Index ≙ data record number for channels 1 to 4 (see table below)
Byte 4
0
Data length

The following data records have been implemented on the CM for communication.

Table A- 1 Data record numbers (index)

Data record number	Exist on CM/reader	Description
101	all	Parameter assignment channel 1
102	all	Parameter assignment channel 2
103	-	Parameter assignment channel 3
104	-	Parameter assignment channel 4
111	all	Data transmission channel 1
112	all	Data transmission channel 2
113	-	Data transmission channel 3
114	-	Data transmission channel 4
121	ASM 456, RF160C, (RF170C) RF180C	System command to reader (in preparation for RF170C)
122	ASM 456, RF160C, (RF170C) RF180C	System command to reader (in preparation for RF170C)
150	ASM 473, ASM 475	reserved (diagnostics of power parameters)
151	ASM 473, ASM 475	Reserved (diagnostic buffer)
180	RF180C	Reserved
231	RF170C, (ASM 456, RF160C)	I&M0 (with ASM 456 and RF160C normally using DS 255)
232	RF170C, (ASM 456, RF160C)	I&M1 (with ASM 456 and RF160C normally using DS 255)
233	RF170C, (ASM 456, RF160C)	I&M2 (with ASM 456 and RF160C normally using DS 255)
234	RF170C, (ASM 456, RF160C)	I&M3 (with ASM 456 and RF160C normally using DS 255)
239	ASM 456, ASM 473, ASM 475, RF160C, RF170C, RF180C	Firmware update
246	ASM 473, ASM 475	SSL reserved
247	(ASM 456, RF160C)	SSL reserved
248	ASM 473, ASM 475, RF170C, (ASM 456, RF160C)	System: SSL processing I&A
255	ASM 456, RF160C	I&M PROFIBUS

Data record 10x

One RFID channel is assigned parameters with the data records (DS) 101 to 104. DS 10x must contain an "init_run" command. After the module starts up, DS 10x must be sent to each RFID channel. The channel is not ready for operation until this is done.

A DS 10x is also accepted during normal operation. DS 10x interrupts a running command. The user receives no further acknowledgment for the interrupted command.

Data record 11x

DS 111 to 114 are used for sending the actual commands and related acknowledgments (all commands except RESET).

A.3 Example of the writing the Advanced User Parameter "BlackListEntries"

1. Preparation of the parameter

Using UDT 330 in a user data block

Table A- 2 Inform the reader of the additional parameter ID

Command [hex]	sub_command [hex]	length [dez]	address_MDS [hex]	DAT_DB_Nr [dez]	DAT_DB_adr [dez]
0x01 WRITE or 0x41 WRITE chained	0x00	4 bytes length of the parameter ID (AUP-ID)	0xFEF3	21 User DB	232 Start address of the AUP in the user DB

Table A- 3 User data block (e.g. AUP – DB21) with UDT 330 (Advanced User Parameters)

Address	Name	Type	Initial value	Current value
0.0	AUP.LoadFactoryDefaults.ID	DWORD	DW#16#0	DW#16#0
4.0	AUP.LoadFactoryDefaults.Param	DWORD	DW#16#0	DW#16#0
8.0	AUP.FastRead.ID	DWORD	DW#16#F04000	DW#16#F04000
12.0	AUP.FastRead.Param	DWORD	DW#16#FF000000	DW#16#FF000000
16.0	AUP.ReadBoost.ID	DWORD	DW#16#AC104210	DW#16#AC104210
…	…	…		
232.0	AUP.BlackListEntries.ID	DWORD	DW#16#11208020	DW#16#11208020
236.0	AUP.BlackListEntries.Param	DWORD	DW#16#3000000	DW#16#3000000

During preparation, ID "11 20 80 20" of the AUP ("BlackListEntries.ID") is now written to the address FEF3.

2. Writing the parameter

Table A- 4 Setting additional parameter ID on the reader

Command [hex]	sub_command [hex]	length [dez]	address_MDS [hex]	DAT_DB_Nr [dez]	DAT_DB_adr [dez]
0x01 WRITE	0x00	8 bytes (4 bytes length of the parameter ID + length of the parameter value)	0xFEF7	21 User DB	232 Start address of the AUP in the user DB

When writing the parameter, 8 bytes (AUP-ID and AUP parameter value) are now written to address FEF7.

A.4 Example of the EPC-ID with SIMATIC RF600 industrial transponders

Table A- 5 Define EPC-ID of the transponder (EPC-ID, date and length; according to command_DB, UDT 20)

Command [hex]	sub_command [hex]	length [dez]	address_MDS [hex]	DAT_DB_Nr [dez]	DAT_DB_adr [dez]
0x01	–	4 to 64 bytes Length of transponder data to be written 2 + number of bytes of the EPC-ID to be written.	0xFEFE	Number of the user DB containing the data to be written.	Start address of the data to be written. Pointer to user data (date of the EPC-ID) to be written to the transponder. 2 bytes length of the EPC-ID + EPC-ID

A.5 Examples of (Perma) LOCK/(Perma) UNLOCK/KILL

A.5.1 Example: Perma-LOCK command on EPC ID and temporary LOCK on USER memory bank and ACCESS password of an RF640T Gen2 transponder

The identification of a specific transponder is always done via the EPC ID. In many applications it therefore makes sense to no longer change this once it is defined. Perma-LOCK makes the EPC ID no longer changeable.

To ensure that not everyone can change the USER memory, access is protected via a 4-byte long ACCESS password.

Step 1

A unique EPC ID must be assigned to the transponder, i.e. this EPC ID should only exist once throughout the company.

Table A- 6 SIMATIC command

Command [hex]	sub_command [hex]	length [dez]	address_MDS [hex]	DAT_DB_Nr [dez]	DAT_DB_adr [dez]
0x01	–	12 bytes	0xFF00	Number of the user DB containing the data to be written.	Start address of the data to be written. Pointer to address in the data block (where the coding CC BB AA 99 88 77 66 55 44 33 22 11 is stored).

Step 2:

If no ACCESS password has been assigned yet to the transponder, it must be written. See "Example: Writing an ACCESS password on an RF630L in the delivery state".

Step 3:

If an ACCESS password has already been assigned to the transponder, this must be transferred to the reader after an init-run. See "Example: Writing an ACCESS password on an RF630L in the delivery state".

Step 4:

After the ACCESS password is saved in the reader and on the transponder in the field, it can be locked. See example "LOCK command on ACCESS password". This ensures that nobody can change the password without knowing the ACCESS password.

Step 5:

Executing the following command permanently protects the EPC ID against changes.

Table A- 7 SIMATIC command

Command [hex]	sub_command [hex]	length [dez]	address_MDS [hex]	DAT_DB_Nr [dez]	DAT_DB_adr [dez]
0x01	–	3 bytes	0xFFFE	Number of the user DB containing the data to be written.	Start address of the data to be written. Pointer to address in the data block (where the coding 30 C0 00 is stored).

After sending this command, the EPC ID is permanently locked.

Step 6:

To ensure that the user memory cannot be changed in any way, the ACCESS password will also have to be transferred to the user memory in the future for write access. The user memory is (temporarily) locked for this reason.

Table A- 8 SIMATIC command

Command [hex]	sub_command [hex]	length [dez]	address_MDS [hex]	DAT_DB_Nr [dez]	DAT_DB_adr [dez]
0x01	–	3 bytes	0xFFFE	Number of the user DB containing the data to be written.	Start address of the data to be written. Pointer to address in the data block (where the code 02 08 00 is stored).

After sending this command, the EPC ID is permanently locked.

A.5.2 Example: Permanent protection of a transponder against the KILL function

In many applications, the transponder is to be permanently protected against the KILL function. This is achieved by saving "00 00 00 00" hex as the KILL password (delivery state of labels) and this is permanently defined via Perma-LOCK.

The KILL function with KILL password "00 00 00 00" hex on the transponder cannot be carried out.

Step 1:

It must be ensured that "00 00 00 00" hex is saved on the transponder as the KILL password.

Table A- 9 SIMATIC command

Command [hex]	sub_command [hex]	length [dez]	address_MDS [hex]	DAT_DB_Nr [dez]	DAT_DB_adr [dez]
0x01	–	4 bytes	0xFF80	Number of the user DB containing the data to be written.	Start address of the data to be written. Pointer to address in the data block (where the code 00 00 00 00 is stored).

After this command is successfully sent, the value 0 hex is present in the KILL memory area of the transponder (no KILL password assigned).

Step 2:

A Perma-LOCK permanently prevents any change to the KILL password.

Table A- 10 SIMATIC command

Command [hex]	sub_command [hex]	length [dez]	address_MDS [hex]	DAT_DB_Nr [dez]	DAT_DB_adr [dez]
0x01	–	3 bytes	0xFFFE	Number of the user DB containing the data to be written.	Start address of the data to be written. Pointer to address in the data block (where the code 00 03 0C is stored).

After this command is successfully sent, the KILL password of the transponder is permanently protected and because the value 0 hex has been saved as the KILL password, the transponder can no longer be coded as unusable.

A.6 ACCESS/KILL password

A.6.1 Writing an ACCESS password on an RF630L in the delivery state

As delivered, the RF630L labels do not have an ACCESS password (i.e. the ACCESS password has the value 00 00 00 00 hex). The ACCESS password is not protected by LOCK or LOCK & Perma-LOCK. If "BA FF FF FF" is to be written to the transponder as the ACCESS password, the following command must be issued.

Table A- 11 SIMATIC command (according to "command_DB", UDT 20)

Command [hex]	sub_command [hex]	length [dez]	address_MDS [hex]	DAT_DB_Nr [dez]	DAT_DB_adr [dez]
0x01	–	4 bytes	0xFF84	Number of the user DB containing the data to be written.	Start address of the data to be written. Pointer to address in the data block (where the code BA FF FF FF is stored).

Following this command, "BA FF FF FF" is written to the memory area FF 84 to FF 87 (ACCESS memory area).

From this point on, data is to be accessed via the ACCESS password. In order for the reader to do this, the password must be saved in the reader.

Table A- 12 SIMATIC command (according to "command_DB", UDT 20)

Command [hex]	sub_command [hex]	length [dez]	address_MDS [hex]	DAT_DB_Nr [dez]	DAT_DB_adr [dez]
0x01	–	4 bytes	0xFFFD	Number of the user DB containing the data to be written.	Start address of the data to be written. Pointer to address in the data block (where the code BA FF FF FF is stored).

Following this command, "BA FF FF FF" is written to the virtual memory area FF FD (ACCESS memory area for the reader). This ACCESS password will automatically be used for each transponder access.

If no reader run-up or init-run takes place, the password is retained in the memory of the reader.

A.6.2 Write KILL password to an RF630L with temporary LOCK

If the KILL password on transponders has been protected with a temporary LOCK, the reader must also send the ACCESS password for data accesses on the password. This is accomplished by writing the ACCESS password to the virtual SIMATIC address "FFFD" after a reader is restarted or an init-run.

Table A- 13 SIMATIC command (according to "command_DB", UDT 20)

Command [hex]	sub_command [hex]	length [dez]	address_MDS [hex]	DAT_DB_Nr [dez]	DAT_DB_adr [dez]
0x01	–	4 bytes	0xFFFD	Number of the user DB containing the data to be written.	Start address of the data to be written. Pointer to address in the data block (where the code BA FF FF FF is stored).

Following this command, "BA FF FF FF" is written to the virtual memory area "FF FD" (ACCESS memory area for the reader). This ACCESS password will automatically be used for each transponder access.

Thus, as the next step the reader can write a KILL password of the transponder that is partially protected by a temporary LOCK.

Table A- 14 SIMATIC command (according to "command_DB", UDT 20)

Command [hex]	sub_command [hex]	length [dez]	address_MDS [hex]	DAT_DB_Nr [dez]	DAT_DB_adr [dez]
0x01	–	4 bytes	0xFF80	Number of the user DB containing the data to be written.	Start address of the data to be written. Pointer to address in the data block (where the code 01 01 01 01 is stored).

After this command is sent, "01 01 01 01" is written to the memory area FF80 (KILL password memory area). The KILL password can only be read out for checking as long as the ACCESS password BA FF FF FF is stored on the reader.

NOTICE

Permanent destruction of the transponder

If an application writes the password "01 01 01 01" to the virtual address FFFF, the transponder is permanently disrupted

Table A- 15 SIMATIC command (according to "command_DB", UDT 20)

Command [hex]	sub_command [hex]	length [dez]	address_MDS [hex]	DAT_DB_Nr [dez]	DAT_DB_adr [dez]
0x02	–	4 bytes	0xFF80	Number of the user DB containing the data to be written.	Start address of the data to be written. Pointer to address in the data block.

In response to this command, 4 bytes are read out from the memory area of the transponder starting from the address "FF 80". The reader returns the KILL password "01 01 01 01" hex in the acknowledgment message.

Example: KILL command

To make a transponder unusable with the KILL function, you need to know the KILL password. The KILL password cannot always be read out in the unlocked state.

Table A- 16 SIMATIC command (according to "command_DB", UDT 20)

Command [hex]	sub_command [hex]	length [dez]	address_MDS [hex]	DAT_DB_Nr [dez]	DAT_DB_adr [dez]
0x01	–	4 bytes	0xFFFF	Number of the user DB containing the data to be written.	Start address of the data to be written. Pointer to address in the data block (where the KILL PW is stored).

Following this command, the memory area of the reader is written with the 4 byte long KILL password starting from the address "FF FF". If this password matches the KILL password stored on the transponder, the password is deleted and can no longer be addressed.

A.7 Overview of the UDTs

Table A- 17 Overview of the UDTs mentioned in the document

UDTs [1]	Symbolic name	Result of the command	Description	FB no.	DB no.	Reference
1x	MOBY Param_* MOBY 55 Param_*	-	Assigning reader parameters	FB 45 FB 55	DB45 DB55	A)
2x	MOBY CMD_*	-	UDT for MOBY commands FB45	FB 45	DB47	B)
3x	MOBY 55 CMD_*	-	UDT for MOBY commands FB55	FB 55	DB58	C)
21x	MOBY UID8_*	GET (MOBY_mode = 6) (sub_command = 0x02, 0x03, 0x10, 0x11)	Handle IDs of the transponders	FB 45 FB 55	DB69	D)
29x	RF600 MDS-Status 4_*	MDS-STATUS (sub_command = 0x04)	Basic data of transponders	FB 45 FB 55	DB60	
30x	RF600 SLG-Status 7_*	SLG-STATUS (sub_command = 0x07)	Status display and settings of the reader	FB 45 FB 55	DB61	
31x	MOBY UID12_*	GET (MOBY_mode = 7) (sub_command = 0x02, 0x03)	EPC-ID of transponders	FB 55	DB78	
32x	RF600 MDS-Status 5_*	MDS-STATUS (sub_command = 0x05)	Extended transponder data	FB 45 FB 55	DB60	
33x	RF600 AdvUserParam_*	-	UDT for parameter assignment and for reading out the AUPs	FB 45 FB 55	-	E)
34x	RF600 SLG-Status 8_	SLG-STATUS (sub_command = 0x08)	Status display and settings of the reader with statistics of the UHF algorithms	FB 45 FB 55	DB61	D)
35x	RF600 EPC-ID-filter_*	-	UDT for parameter assignment and for reading out the EPC data filter	FB 45 FB 55	-	F)
36x	-	GET (MOBY_mode = 6) (sub_command = 0x20, 0x21)	Example of a UDT: Output of the Black List of transponders with a 12 byte EPC-ID in multitag mode.	FB 55	-	D)
37x	-	SLG-STATUS (sub_command = 0x20, 0x21)	Example of a UDT: Output of the Black List of transponders with a 12 byte EPC-ID.	FB 45 FB 55	-	
41x	-	GET (MOBY_mode = 6) (sub_command = 0x02, 0x05)	Example of a UDT: For outputting the handle ID and EPC-ID of transponders with a 12 byte EPC-ID.	FB 55	-	

[1] The UDTs are language-specific. x: 0 = English, 1 = German, 4 = Spanish

References to the UDTs:

- A) Parameter assignment in the parameter DB (Page 25) and Parameter assignment in the parameter DB (Page 49)
- B) RFID commands of FB 45 (Page 34)
- C) UDT 30 - the structure for the RFID command (Page 58)
- D) UDTs of FB 45 (Page 41) and UDTs of FB 55 (Page 71)
- E) UDT for Advanced User Parameters (Page 148)
- F) UDT for EPC Data Filter (Page 153)

Firmware update B

B.1 Requirements for the firmware update

The firmware (FW) can be downloaded to a reader via the CM. For this purpose, you need a PC/programming device with SIMATIC STEP 7 as of V5.1 with SP3.

Note

FW update via the TIA Portal

You can also update the firmware of the RF600 reader in the TIA Portal via the communication modules.

You will find additional information on operating the RF600 reader on the RFID system DVD "Software & Documentation (http://support.automation.siemens.com/WW/view/en/4090419)" (order no.: 6GT2080-2AA20).

In order to be able to perform the FW update, you require the update file suitable for your CM. You can download these files from the "Industry Online Support" Web page.

FW update files: (http://support.automation.siemens.com/WW/view/en/61199127)

There are different update files for the three different communication modules RF160C, RF180C and ASM 456.

You can perform the firmware update for up to two readers at the same time. The download depends on the configuration:

- If only one reader is connected to the CM, the download only takes place for this reader.
- If two readers are connected to the CM, the new firmware is downloaded to both readers.

Only one or two readers of the RF600 series are permitted to be connected to the CM. A FW update is only possible for readers as of FW version 2.0.

B.2 Performing the firmware update

This manual describes the FW update for the communication modules RF160C, RF180C and ASM 456. As the firmware update procedure is identical for the communication modules RF160C and ASM 456, the firmware update is illustrated on the basis of RF160C in the following chapter.

The update procedure for the communication module RF180C differs slightly, so the FW update for RF180C is illustrated separately.

Preparation for the FW update

1. Download the update file suitable for your CM.

   You will find the update file on the "Industry Online Support" Web page:

   – FW update files: (http://support.automation.siemens.com/WW/view/en/61199127)
2. Save the file on your PC or programming device.
3. Unzip the file.

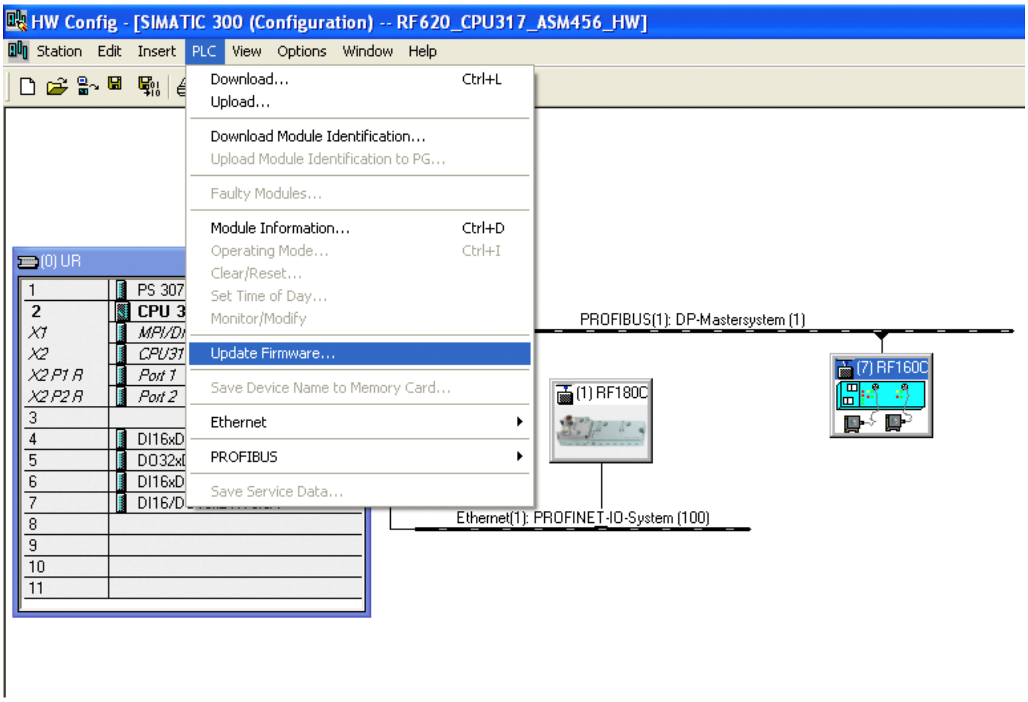
   The file contains 3 "*.upd" files.

B.3 Firmware update with RF160C and ASM 456

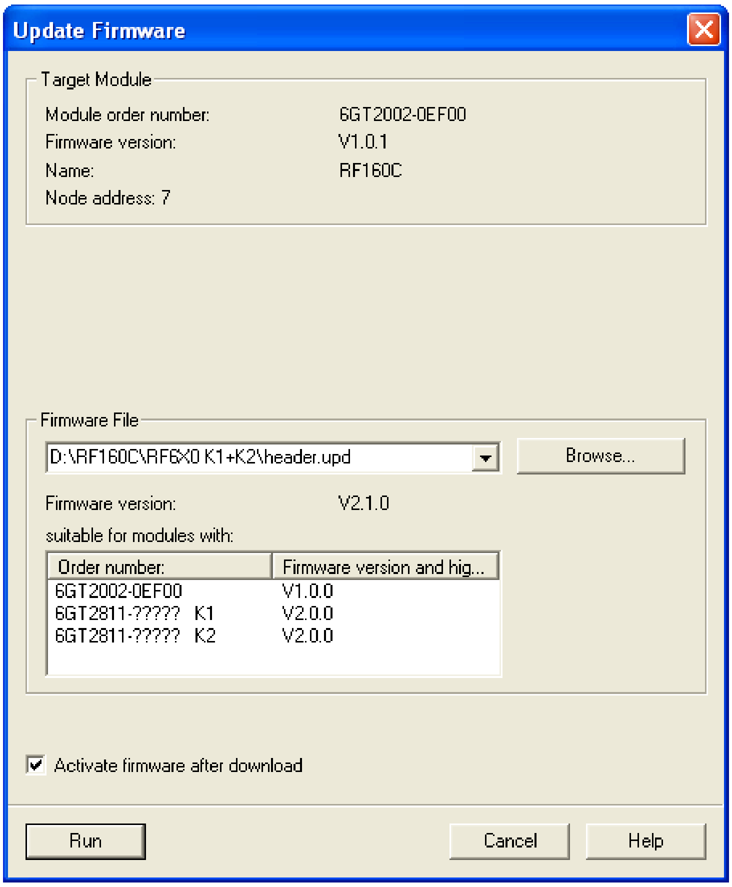
Step 1: Start the update

1. Start the SIMATIC Manager.
2. Start "HW Config" with a double-click on the hardware of the current project.
3. Select the CM on which the readers are operated.

4. Click the menu command "PLC" > "Update Firmware …".


HW Config - [SIMATIC 300 (Configuration) -- RF620_CPU317_ASM456_HW]
Station Edit Insert PLC View Options Window Help
Download... Ctrl+L
Upload...
Download Module Identification...
Upload Module Identification to PG...
Faulty Modules...
Module Information... Ctrl+D
Operating Mode... Ctrl+I
Clear/Reset...
Set Time of Day...
Monitor/Modify
Update Firmware...
Save Device Name to Memory Card...
Ethernet
PROFIBUS
Save Service Data...
(0) UR
1 PS 307
2 CPU 3
X1 MPI/DI
X2 CPU31
X2 P1 R Port 1
X2 P2 R Port 2
3
4 DI16xD
5 DO32xI
6 DI16xD
7 DI16/D
8
9
10
11
PROFIBUS(1): DP-Mastersystem (1)
(7) RF160C
(1) RF180C
Ethernet(1): PROFINET-IO-System (100)

Reaction: The "Update Firmware" dialog opens.



Update Firmware

Target Module

Module order number: 6GT2002-0EF00

Firmware version: V1.0.1

Name: RF160C

Node address: 7

Firmware File

D:\RF160C\RF6X0 K1+K2\header.upd

Firmware version: V2.1.0

suitable for modules with:

Order number:	Firmware version and hig...
6GT2002-0EF00	V1.0.0
6GT2811-????? K1	V2.0.0
6GT2811-????? K2	V2.0.0

☑ Activate firmware after download

5. Click "Browse..." and select the "header.upd" update file which you have unzipped and which is suitable for your CM.

   Reaction: In the "suitable for modules with:" field, the order numbers for the connected CM and readers are shown.

   In addition, the firmware version is shown which the devices must have in order for you to be able to perform the FW update.

6. Select the check box "Activate firmware after download" if you wish to activate the FW directly upon completion of the download.

   If you do not select this option, the FW is automatically activated the next time the reader is restarted.

Note

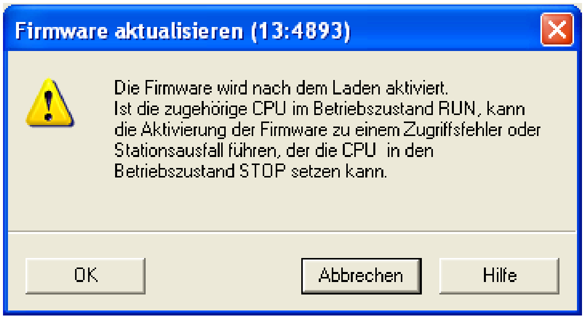
Performing the FW update with an older firmware version

The update cannot be performed with older FW versions. In this case, contact Customer Support (see chapter "Service & Support (Page 213)").

Step 2: Run the download

1. Click "Run" in the "Update Firmware" dialog.

   Reaction: The following dialog box opens.



Firmware aktualisieren (13:4893)

Die Firmware wird nach dem Laden aktiviert.
Ist die zugehörige CPU im Betriebszustand RUN, kann die Aktivierung der Firmware zu einem Zugriffsfehler oder Stationsausfall führen, der die CPU in den Betriebszustand STOP setzen kann.

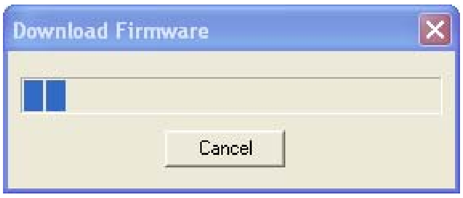
2. Confirm with "OK".

   Reaction: The download starts.

   The download takes a few minutes. During the download, the progress is shown on the screen. At the same time:

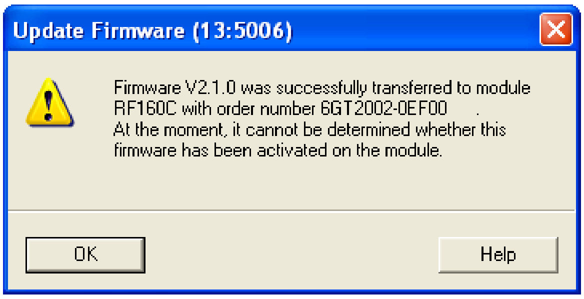
   – The LED flashes red and green alternately on the reader.

   – The "ERR_1" and "ERR_2" LEDs flash alternately on the IM and the "SF" LED is on.



Step 3: End the download

Once the download has been completed successfully, the following dialog box opens.



Update Firmware (13:5006)

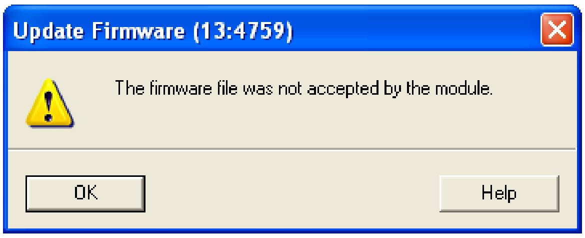
Firmware V2.1.0 was successfully transferred to module RF160C with order number 6GT2002-0EF00 .
At the moment, it cannot be determined whether this firmware has been activated on the module.

1. Confirm with "OK".
2. To activate the firmware on the module, restart the reader.

   After the restart, you can check by means of the "SLG-STATUS" command whether the firmware on the reader has been updated.

The download was not completed successfully

If the download was not completed successfully, the following dialog box opens.



Update Firmware (13:4759)

The firmware file was not accepted by the module.

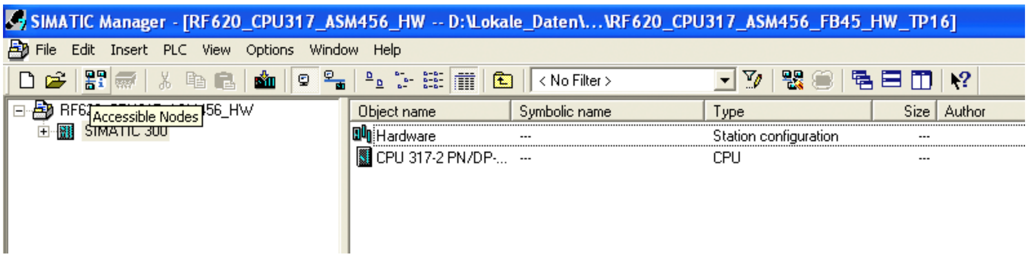
This message appears when, for example, an update file which is not suitable for the hardware was selected in step 1.

In this case, restart the reader and then execute the download process again.

B.4 Firmware update with RF180C

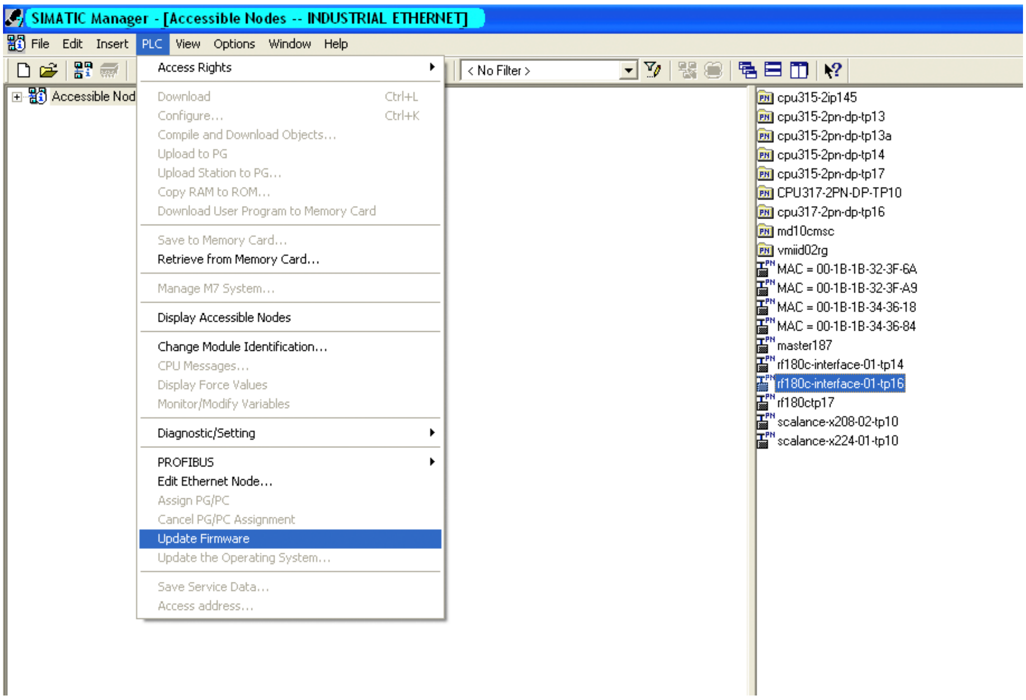
Step 1: Start the update

1. Start the SIMATIC Manager.
2. In the toolbar, click the "Accessible Nodes" symbol.


SIMATIC Manager - [RF620_CPU317_ASM456_HW -- D:\Lokale_Daten\...\RF620_CPU317_ASM456_FB45_HW_TP16]
File Edit Insert PLC View Options Window Help
< No Filter >
RF620_CPU317_ASM456_HW
Accessible Nodes
SIMATIC 300

Object name	Symbolic name	Type	Size	Author
Hardware	---	Station configuration	---	
CPU 317-2 PN/DP-...	---	CPU	---	

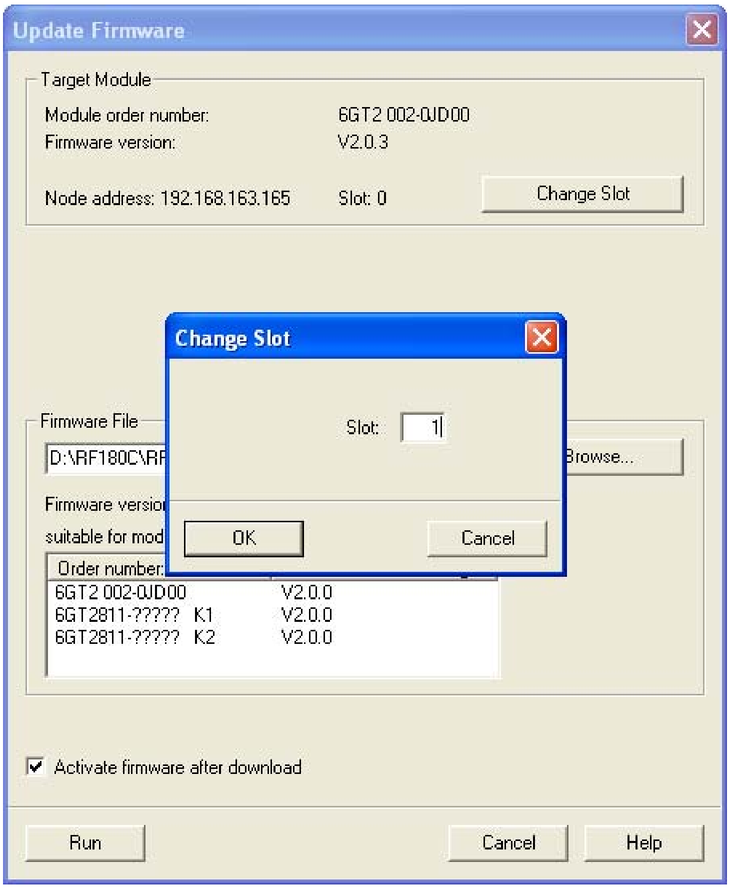
3. Select the CM on which the readers are operated.
4. Click the menu command "PLC" > "Update Firmware …".



Reaction: The "Update Firmware" dialog opens.

5. Click "Change Slot..." and specify the slot "1".

6. Confirm with "OK".



Module order number: 6GT2 002-0JD00

Firmware version: V2.0.3

Node address: 192.168.163.165 Slot: 0

Slot: 1

D:\RF180C\RF

Firmware versio

suitable for mod

Order number:	
6GT2 002-0JD00	V2.0.0
6GT2811-????? K1	V2.0.0
6GT2811-????? K2	V2.0.0

☑ Activate firmware after download

7. Click "Browse..." and select the "header.upd" update file which you have unzipped and which is suitable for your CM.

   Reaction: In the "suitable for modules with:" field, the order numbers for the connected CM and readers are shown.

   In addition, the firmware version is shown which the devices must have in order for you to be able to perform the FW update.

8. Select the check box "Activate firmware after download" if you wish to activate the FW directly upon completion of the download.

   If you do not select this option, the FW is automatically activated the next time the reader is restarted.

   Note

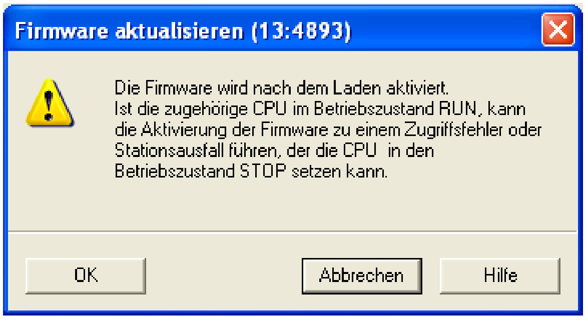
   Performing the FW update with an older firmware version

   The update cannot be performed with older FW versions. In this case, contact Customer Support (see chapter "Service & Support (Page 213)").

Step 2: Run the download

1. Click "Run" in the "Update Firmware" dialog.

Reaction: The following dialog box opens.



Firmware aktualisieren (13:4893)

Die Firmware wird nach dem Laden aktiviert.
Ist die zugehörige CPU im Betriebszustand RUN, kann die Aktivierung der Firmware zu einem Zugriffsfehler oder Stationsausfall führen, der die CPU in den Betriebszustand STOP setzen kann.

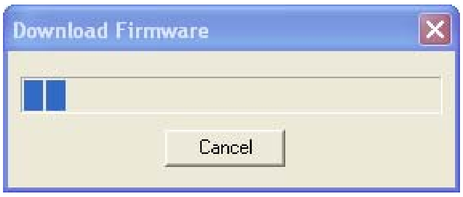
2. Confirm with "OK".

   Reaction: The download starts.

   The download takes a few minutes. During the download, the progress is shown on the screen. At the same time:

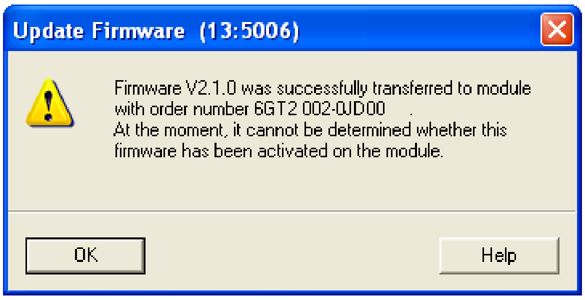
   – The LED flashes red and green alternately on the reader.

   – The "ERR_1" and "ERR_2" LEDs flash alternately on the IM and the "SF" LED is on.



Step 3: End the download

Once the download has been completed successfully, the following dialog box opens.



Update Firmware (13:5006)

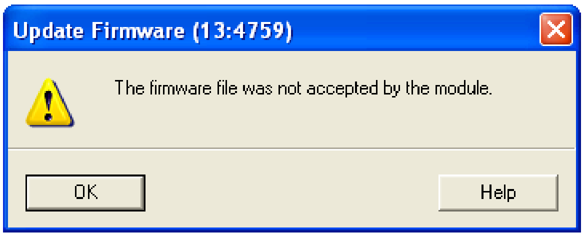
Firmware V2.1.0 was successfully transferred to module with order number 6GT2 002-0JD00 .
At the moment, it cannot be determined whether this firmware has been activated on the module.

1. Confirm with "OK".
2. To activate the firmware on the module, restart the reader.

   After the restart, you can check by means of the "SLG-STATUS" command whether the firmware on the reader has been updated.

The download was not completed successfully

If the download was not completed successfully, the following dialog box opens.



Update Firmware (13:4759)

The firmware file was not accepted by the module.

This message appears when, for example, an update file which is not suitable for the hardware was selected in step 1.

In this case, restart the reader and then execute the download process again.

Service & Support

C

Technical Support

You can access technical support for all IA/DT projects via the following:

- Phone: + 49 (0) 911 895 7222
- Fax: + 49 (0) 911 895 7223
- E-mail (mailto:support.automation@siemens.com)
- Internet: Online support request form: (http://www.siemens.com/automation/support-request)

Contacts

If you have any further questions on the use of our products, please contact one of our representatives at your local Siemens office.

The addresses are found on the following pages:

- On the Internet (http://www.siemens.com/automation/partner)
- In Catalog CA 01
- In Catalog ID 10 specifically for industrial communication / industrial identification systems

Service & support for industrial automation and drive technologies

You can find various services on the Support homepage (http://www.siemens.com/automation/service&support) of IA/DT on the Internet.

There you will find the following information, for example:

- Our newsletter containing up-to-date information on your products.
- Relevant documentation for your application, which you can access via the search function in "Product Support".
- A forum for global information exchange by users and specialists.
- Your local contact for IA/DT on site.
- Information about on-site service, repairs, and spare parts. Much more can be found under "Our service offer".

RFID homepage

For general information about our identification systems, visit RFID homepage (http://www.siemens.com/ident/rfid).

Technical documentation on the Internet

A guide to the technical documentation for the various products and systems is available on the Internet:

SIMATIC Guide manuals (http://www.siemens.com/simatic-tech-doku-portal)

Online catalog and ordering system

The online catalog and the online ordering system can also be found on the Industry Mall Homepage (http://www.siemens.com/industrymall).

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