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SERCOS
Input/Output Unit
RECO02.2

Functional Description

SYSTEM200

DOK-CONTRL-RECO02.2***-FK01-EN-P

Rexroth
Indramat

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Purpose of the document This documentation represents the functional description of firmware FWA-RMK02*-SER-18VRS-NN.

The document includes:

- Operating oriented setup instructions for the SERCOS-RECO with a SRECOS compatible control
- Parameter value assignment of SERCOS-RECO
- Information on error diagnoses and error elemination

Configuration control

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Contents

1 System Overview

1.1 Field of Application

The SERCOS-RECO is a sensor / actor device in the SERCOS drive loop. SRECOS-RECO offers solution for all sensor and actor tasks in:

- Tool machines
- Printing machines
- Unitting machines
- Machines used for general automatisation systems

The SERCOS-RECO offers the following advantages:

- Standardized digital drive interface SERCOS
- Short cycle periods
- Variable equipment (digital/analogue I/O)
- Real time data
- Cyclic data exchange for commands value and actual values
- Transfer without failure

1.2 Hardware Design

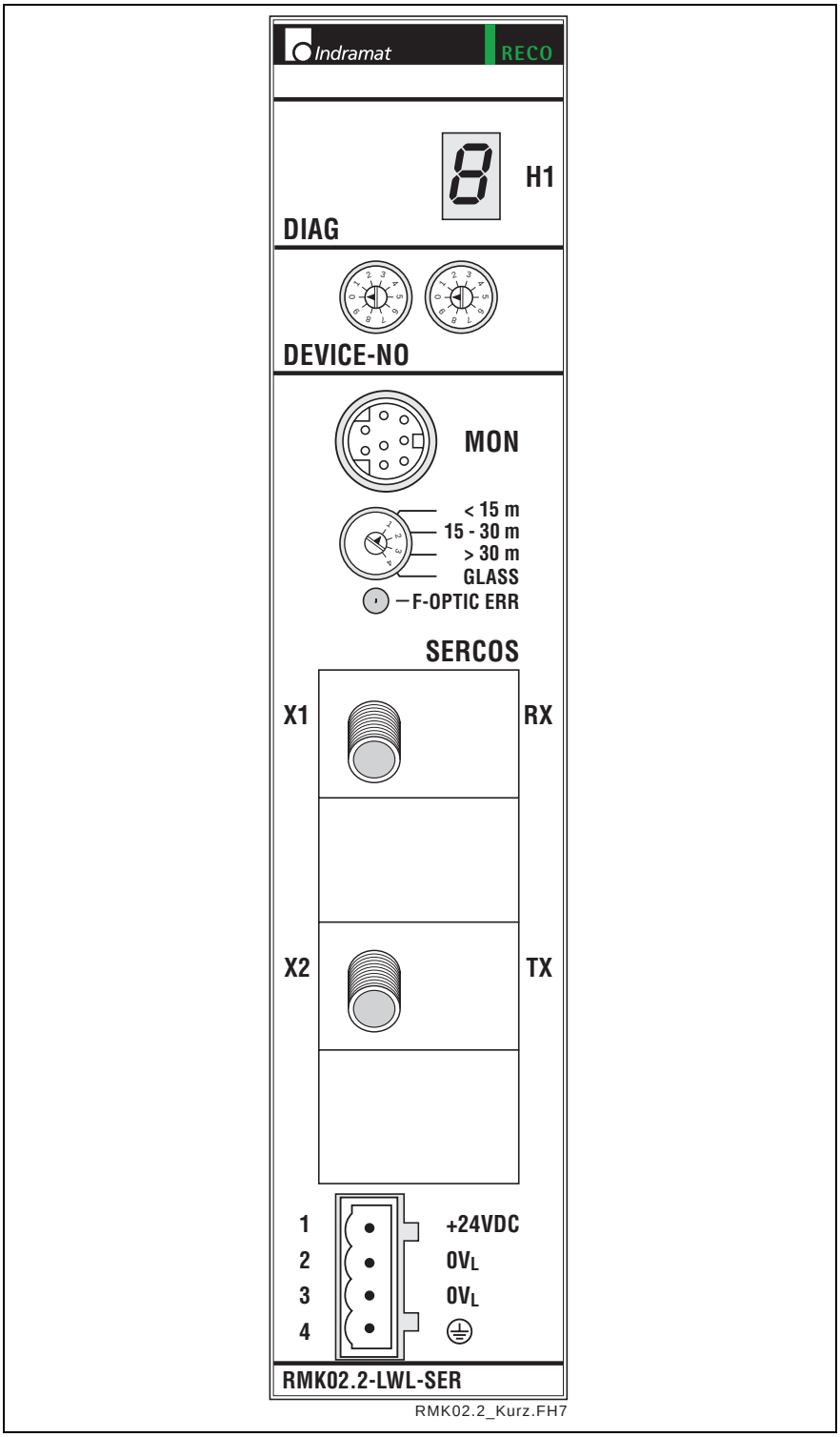

Fig. 1-1: Front view RMK02.2-LWL-SER

1.3 Basic Operatiry Data - General Functions

The communication between control and drive corresponds to the communication between control and SERCOS I/O device. Only the data contents differs, i, e. instead of the command values and actual values, input and output information are included in the data blocks. The transfer of the data, as well as the transfer of the required data and the diagnoses, is executed after the SERCOS interface I/O functions specification.

Basic Operatiry Data

- Operatiry mode without regulation

General Functions

- Extensive diagnose possibilities
- Input and output channels for assigning parameter values
- Language selection
- Analogue outputs

2 General Installation Instructions

2.1 Explanation of Terms

For a better understanding the terms in this document are explained.

Parameter

Communication with the SERCOS-RECO occurs (with a few exceptions) with the help of parameters. They can be used for:

- Setting the configuration
- Assigning parameter values I/O-channal settings
- Accessing control/drive functions and commands
- Configuring the cyclic telegrams

A parameter is identified with its ID numbers

All of the I/O-device´s operating data is identified by ID numbers. All the parameter ID numbers available in the drive are listed in parameter **S-0-0017, IDN list of all operation data**.

Data Status

Each parameter is provided with a data status, which can also be read. It serves the following purposes:

- Identifying the validity/invalidity of the parameter
- Contains the command acknowledgement if the parameter acts as a command (see Commands)

Data Block Structure

Each parameter has 7 different data block elements that can be read or written by a SERCOS control system.

Data Block Structure: Element No.:	Designation:	Remarks:
1	ID Number	Parameter identification
2	Name	can be changed in language selection
3	Attribute	contains data length, type and decimal part digits
4	Unit	can be changed in language selection
5	Minimum Input Value	contains the minimum input value of the operating data
6	Maximum Input Value	contains the maximum input value of the operating data
7	Operating Data	actual parameter value

Fig. 2-1: Data Block Structure

Changing the operating data depends on the communication phase

Only the operating data can be changed; all other elements can only be read. The operating data can be write-protected either continuously or temporarily.

Possible Error Messages when Reading and Writing the Operating Data

Error:	Reason:
0x7004, Data not changeable	The operating data is write-protected
0x7005, Data currently write-protected	The operating data cannot be written to in this communication phase (see Supplement A: Writing to Parameters)
0x7006, Data smaller than minimum value	The operating data is smaller than its minimal input value
0x7007, Data larger than maximum value	The operating data is larger than ist maximum input value
0x7008, Data is not correct	The value could not be accepted as written because internal tests lead to a negative result

Fig. 2-2: Error messages while reading/writing operating data

Operating Modes

The SERCOS-RECO uses operating modes without regulation only. A rising edge at Bit 15 of the master command word sets the output information to valid.

The device shows „**b**“ in the H1 display.

Error

In dependence to paramter settings, various checks are executed. If a status is recognised which does not permit regular operation, an error message is generated.

Error Classes

The error class is evident from the diagnostic message.

Errors are separated into four different error classes. They determine the drive’s error response.

Error class:	Diagnose:	Device reaction:
SERCOS interface	F4xx	In accordance with best possible deceleration
Non-fatal	F2xx	In accordance with best possible deceleration

Fig. 2-3: Error class divisions

Error Reaction

If an error is noticed in the SERCOS-RECO, the execution of an error reaction is started automatically. The 7-segment display H1 flashes with F/x / x/x. With not fatal errors, an information is generated via the diagnose long word of the SERCOS-RECO connection (slot 0; please refer to Fig. 2-11: diagnose/ status information).

Clearing Errors

Errors must be cleared externally.

Errors are not cleared automatically; they are externally cleared by:

Initiating the command **S-0-0099, Reset Class 1 Diagnostics or** pressing the **"S1"** key.

If the error state is still present, then the error will be detected again immediately. A rising edge bit on the controller enable signal (Bit 15) is necessary in order to turn the I/O-device on.

Commands

Commands are used to control complex functions in the I/O-device. For example, the functions "Drive-Controlled Homing Procedure" or "Preparation For Transistion Check of Phase 3 After 4" are defined as commands.

Each command that is started must also be cleared.

A primary control can start, interrupt or erase a command.

Each command has a parameter with which the command can be controlled.

While a command is being executed, the diagnostic message "Cx" or "dx" appears in the H1 display. x is the number of the command.

Command Values and Actual Values

- **Command Values** ⇒ Output data and output sizes of the I/O-device to peripherial devices
- **Actual Values** ⇒ Input data and measuring values of the I/O-device

I/O Basis

Addressing I/O specific identification numbers, there are functionally three different identification number sections. Each section has ist own basis address.

- general I/O section with **I/O BASIS**
- I/O data channel with **DATA BASIS**
- I/O command channel with **COMMAND BASIS**

I/O BASIS, **DATA BASIS** and **COMMAND BASIS** include an identification number in the operating data. The identification number represents the basis address and is used for calculating the identification number of a function or a date.

The identification number of the **I/O BASIS** (IDN S-0-0291) is included in the absolutely addressed section of the SERCOS interface and is consequently the key to all I/O specific identification numbers, consequently the key to all I/O specific identification numbers, also to the ident. numbers of **DATA BASIS** and **COMMAND BASIS.**

The **DATA BASIS** at the SERCOS-RECO cannot be moved; it is fixed to IDN-S-0-2000.

2.2 Diagnostic Configurations

Overview of Diagnostic Configurations

The diagnostics are configured into 2 groups

- Current operating status and diagnostics
- Class diagnostics

Parameters exist for all important operating data.

Identification of Current Operating State

The current operating condition of the I/O-device is evident by which errors, warnings, commands are available and which operating mode is active. Whether the I/O-device is in preparation for operation or in parameter mode also is displayed.

The current operating condition can be determined from

- the 2-part seven-segment display (H1 display)
- the diagnostic parameter **S-0-0095, Diagnostic Message**
- the parameter **S-0-0390, Diagnostic Message Number**
- the parameter **P-0-0009, Error Number**

The current diagnostic message with the highest priority is always shown in the H1 display, in the diagnostic parameter **S-0-0095, Diagnostic Message** and in the parameter **S-0-0390, Diagnostic Message Number**. The parameter **P-0-0009, Error Number** will contain a value unequal to 0 if an error is present.

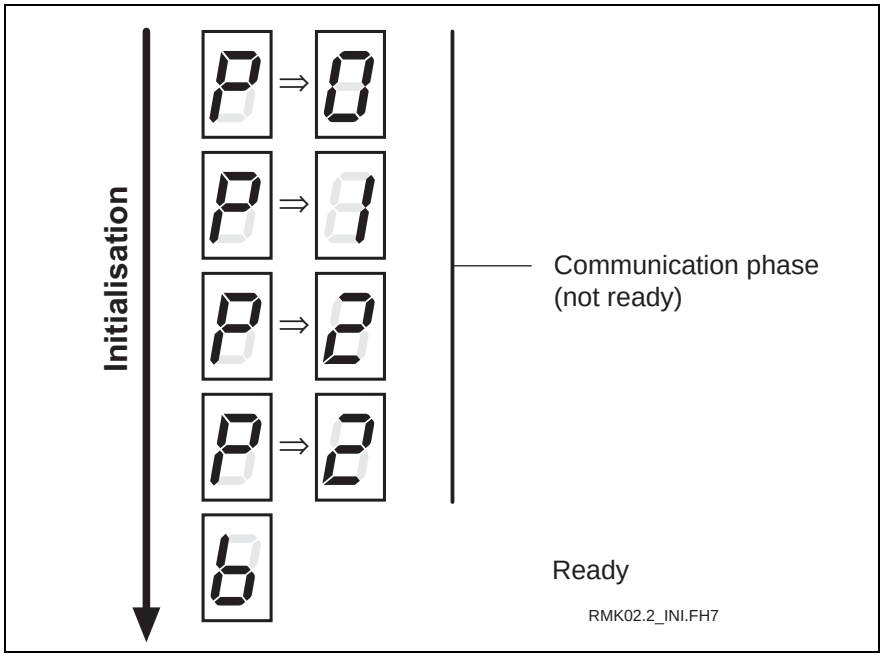

Fig. 2-4: Communication phases of RMK02.2

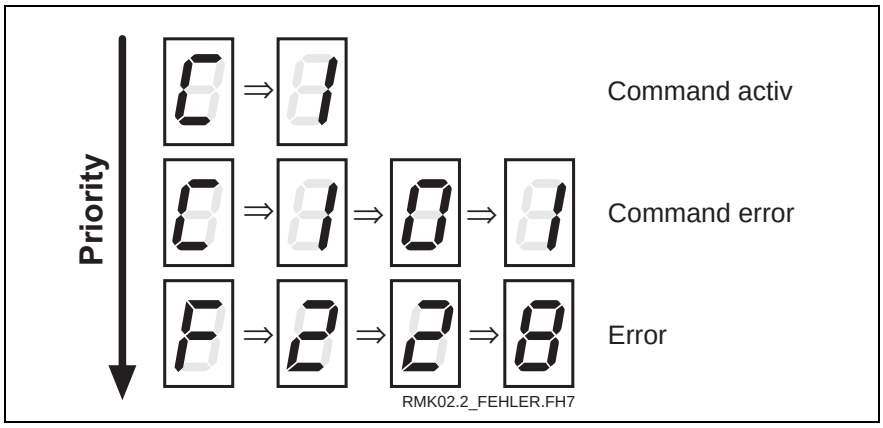

Fig. 2-5: Priority-dependent diagnostic formation in the H1 display

Structure of a Diagnose

Each operatiry state is masked by a diagnose which consists of a

- diagnostic number and a
- diagnostic text

For example, the diagnose for the not fatal error „switch to not initialised operating mode“ is represented as follows:

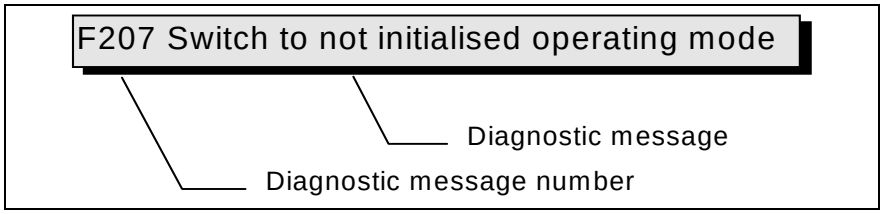

Fig. 2-6: Diagnostic message composition with a diagnostic message number and text

In the H1 display „F“, „2“, „0“, „7“ appears in turns. In the Parameter **S-0-0390, Diagnostic Number**, the diagnose number is displayed hexadecimal. With this example it would be (0x)F207. In the parameter **S-0-0095, Diagnose,** the diagnostic number and the diagnostic text are strings ("F207, swtich to not initialised operating mode").

H1-Display

The diagnostic number appears on the one-part 7-segment display. The form of the display emerges from the graphic "Priority-Dependent Display of the Diagnostic Message".

With the help of this display, it is possible to quickly determine the current operating status without using a communication interface.

Diagnostic Message

The diagnostic message contains the diagnostic number followed by the diagnostic text, as shown in the example, "Swtich to not initialised operating mode". It can be read with the parameter **S-0-0095, Diagnostic Message** and directly displays the operation status on an operator interface.

The diagnostic message language can be changed.

Diagnostic Message Number

The diagnostic message number contains only the diagnostic number without the text. It can be read with the parameter **S-0-0390, Diagnostic Message Number** .

Error Number

The error number contains only the error number without the diagnostic text. It can be read with the parameter **P-0-0009, Error Number** and can indicate an error condition without a language barrier. This parameter contains a value unequal to "0" if an error is present in the I/O-device.

An error is formed from the bottom 3 digits of the diagnostic number. For example, the error "F207, Swtich to not initialised operatiry mode" with the diagnostic message number "(0x)F207" would produce the error number "207“.

Collection of Status

The class diagnostic parameters provide a collection of status and diagnostic information for displaying operating conditions. These parameters are:

- **S-0-(I/O-BASIS+00005), Class 1 Diagnostics**
- **S-0-(I/O-BASIS+00006), Class 2 Diagnostics**
- **S-0-(I/O-BASIS+00007), Class 3 Diagnostics**

S-0-(I/O-BASIS+00005), I/O Status Class 1

In the parameter **S-0-(I/O-BASIS+00005), I/O Status Class 1** bits are available for the different errors. If an error occurs, in this parameter a bit is being set. At the same time, the bit „Device locked, error in status class 1“ is being set in the **I/O Status Word**.

All bits in the status class 1 are deleted by the execution of the command **S-0-0099, Reset I/O Status Class 1.**

The following bits are supported in the I/O Status Class 1.

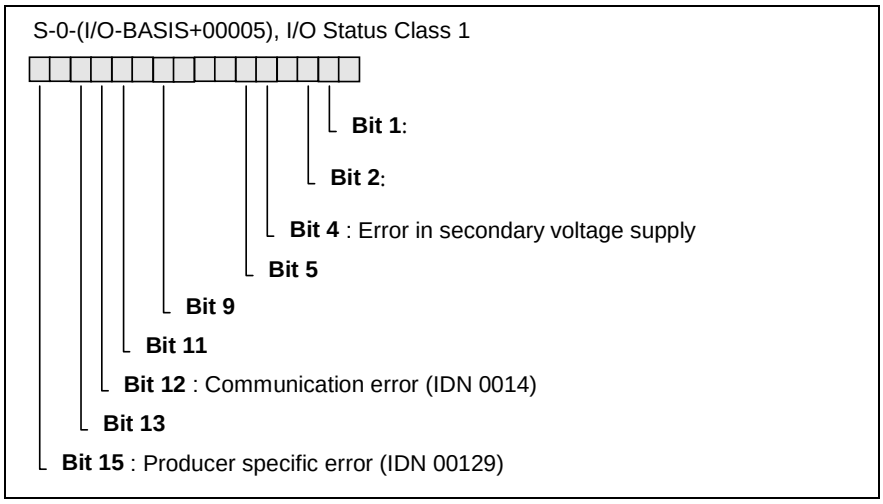

Fig. 2-7: S-0-(I/O-BASIS+00005), I/O Status Class 1

S-0-(I/O-BASIS+00006), I/O Status Class 2

Toggling a bit is indicated by a modification bit in the I/O Status Word

In this parameter, bits for the different caution messages are available. If a caution message is displayed, a bit is being set in this parameter. At the same time, the bit "modification bit I/O Status Class 2" is being set in the **I/O Status Word**. Reading **S-0-(I/O BASIS+00006), I/O Status Class 2**, deletes this modification bit. With the parameter **S-0-(I/O-BASIS+00008),Mask I/O Status Class 2** caution messages can be ignored in correspondence to their effect on the modification bit.

The following bits are supported in the I/O Status Class 2:

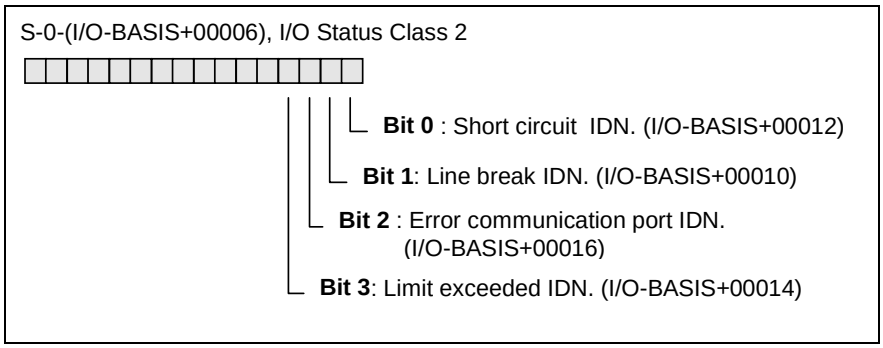

Fig. 2-8: Structure of Parameter S-0-(I/O-BASIS+00006), I/O Status Class 2

S-0-(I/O-BASIS+00007), I/O Status Class 3

This includes the different messages of operating states. If a message state changes, a bit is being set in the **Drive Status Word** ("modification bit status class 3"). Reading **S-0-(I/O-BASIS+00007), I/O Status Class 3**, deletes this modification bit again. With the parameter **S-0-(I/O-BASIS+0000p), Mask I/O Status Class 3**, the messages can be ignored in correspondence to their effect on the modification bit.

The following bits are supported in the I/O Status Class 3:

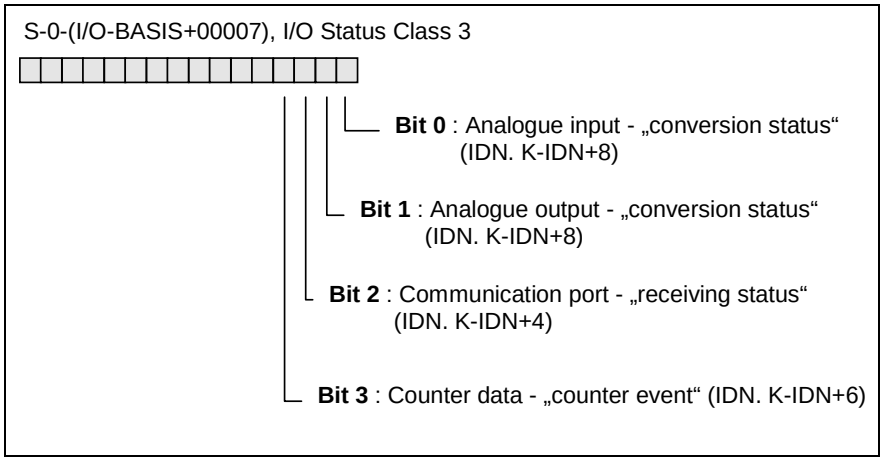

Fig. 2-9: Structure of S-0-(I/O-BASIS+00007), I/O Status Class 3

Modification Bits of Status Class 2 and 3 in the I/O Status Word

If a bit state changes in **S-0-(I/O-BASIS+00006), I/O Status Class 2** or **S-0-(I/O-BASIS+00007), I/O Status Class 3**, the modification bit I/O status class 2 or 3 is being set in the I/O status word. By reading the parameter, this modification bit is deleted again. Setting the modification bit due to bit toggling in **S-0-(I/O-BASIS+00006)** or **S-0-(I/O-BASIS +00007)** can be ignored with the help of the parameters **S-0-(I/O-BASIS+00008), Mask I/O Status Class 2** or **S-0-(I/O-BASIS+00009), Mask Status Class 3.**

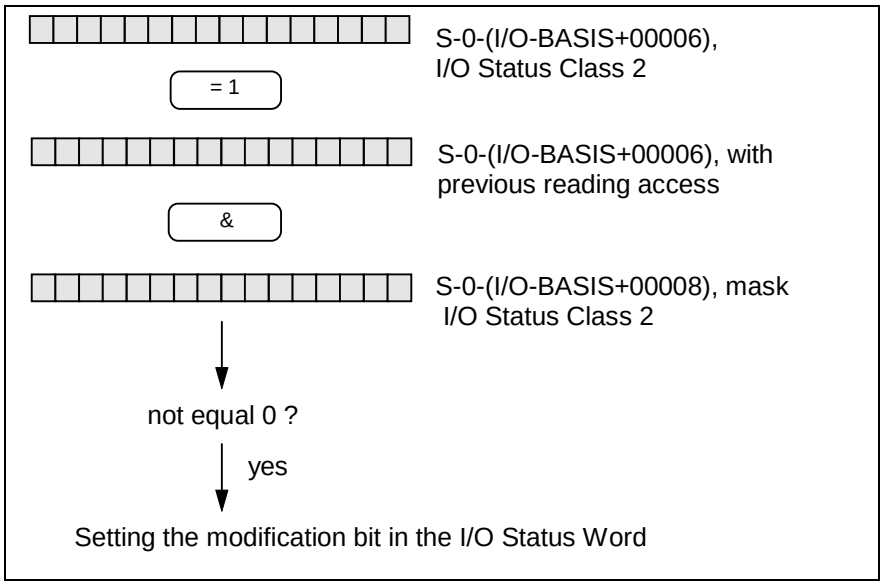

Fig. 2-10: Creation of the modification bit of the I/O Status Class 2

2.3 Module error and Status Information of the SERCOS-RECO

The SERCOS-RECO recognizes module errors, i.e. the module error occurs if there is no connection to the modules or if certain registers cannot be read. The module errors are displayed by the manufacturer specific error in the I/O status class 1 and also provided by S-0-0095 (diagnose) in text mode. The diagnostic number is displayed in S-0-0390. Possible errors:

diagnose no.:	error text
F101	faulty module at slot 1
F102	Faulty module at slot 2
F103	Faulty module at slot 3
F104	Faulty module at slot 4
F105	Faulty module at slot 5
F106	Faulty module at slot 6
F107	Faulty module at slot 7
F108	Faulty module at slot 8
F109	Faulty module at slot 9
F110	Faulty module at slot 10
F111	Faulty module at slot 11
F112	Faulty module at slot 12
F113	Faulty module at slot 13
F114	Faulty module at slot 14
F115	Faulty module at slot 15

Fig. 2-11: List of module error messages

Furthermore the SERCOS-coupler RMK02.2-LWL-SER provides long word input information. This long word is necessary for displaying error and status information. It can be programmed via the SERCOS parameter IDN P-0-0777 and should always be component of the cyclic data contents. Consequently, the control can react quickly to error messages.

The long word is transfered to slot 0; it is defined as follows:

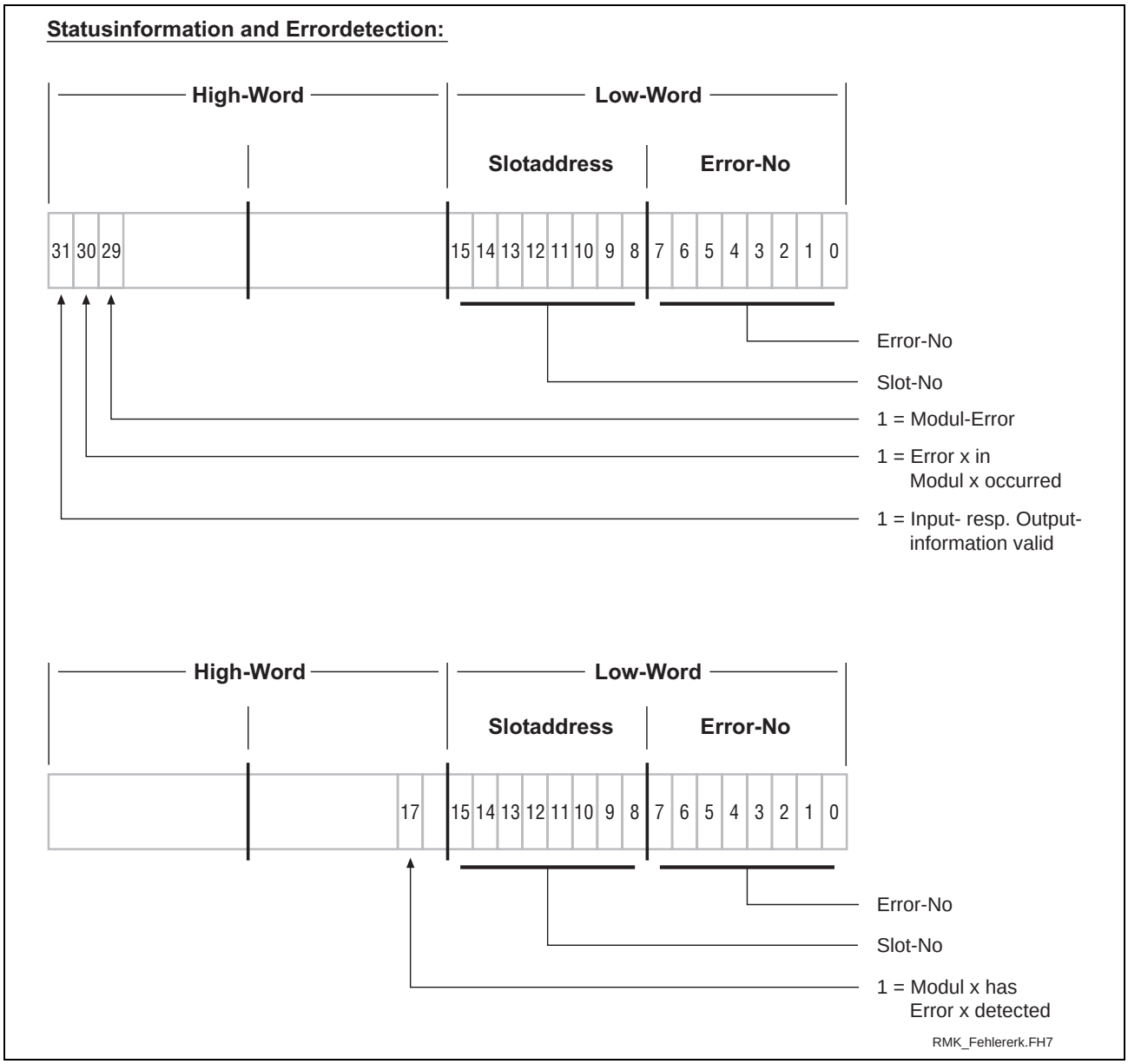

Fig. 2-12: Diagnose/status information

The transistor output module RMA02.2-16-D024-200 and RMA02.2-32-DC024-50 is equipped with a 24V voltage supervision. For each module, a supervision bit is provided on a bit bar with a width of 1 word. Bit 16 on "1" indicates one or multiple missing 24V supply voltages (bit no. corresponds to slot no.). This status information is updated constantly. An error of higher priority overwrites the status information.

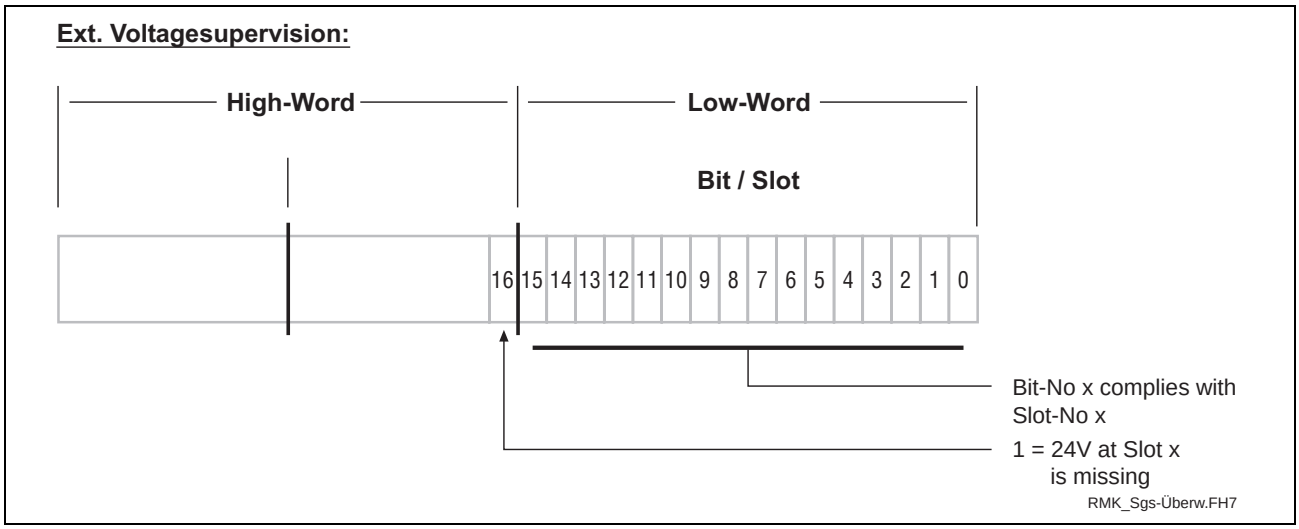

Fig. 2-13: Voltage supervision

Example for the external loss of voltage

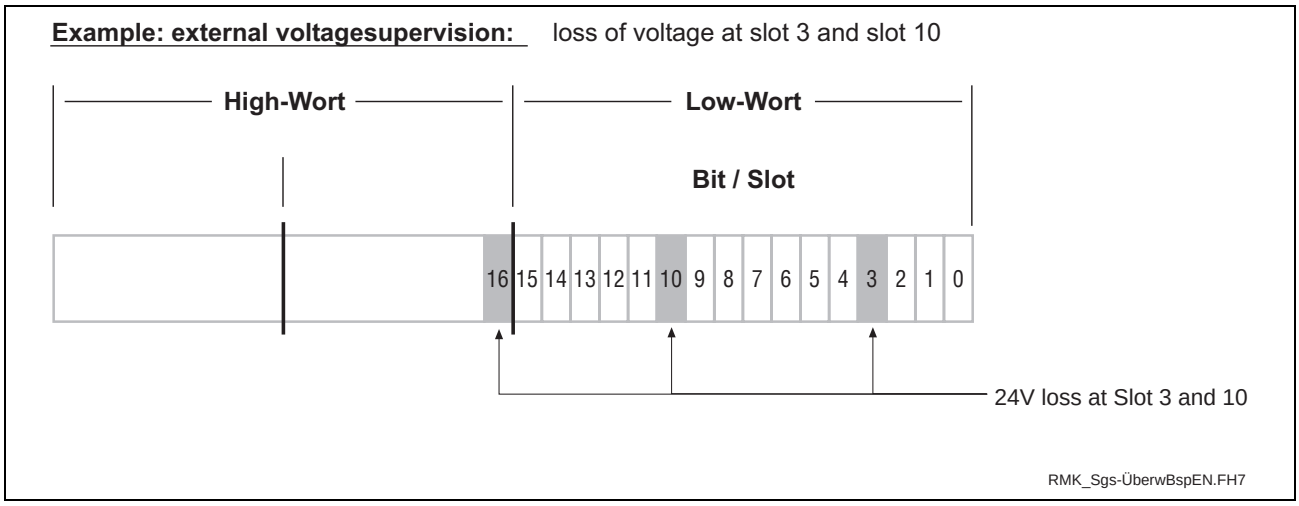

Fig. 2-14: Example for missing external voltage

Bit 31:	0	The input information as well as the output information of the SERCOS I/O-device are invalid. If a serious fault is discovered at the SERCOS I/O-device (e. g. faulty module), the bit of the SERCOS I/O-device as well as the corresponding bit in low word for the slot concerned are set to "0".
	1	Input information valid
Bit 30:	1	The SERCOS I/O device reports a fault. In the low word slot - no and error-no are transferred
Bit 29:	1	The SERCOS I/O device recognizes one module error. In the low word the corresponding bit is sat for the slot with "1".
Bit 17:	1	The intelligent SERCOS I/O-device reports module error.
Bit 16:	1	24V at the output modules at "0" is ok. At failure of the 24V, the bit and the corresponding bit in low word for the slot concerned are set to "1".

Fig. 2-15: Explanation error and status bit

2.4 Parameter Mode - Operation Mode

The SERCOS control sets the communication phases including parameter mode.

After the drive is turned on, it does not automatically switch to the operating mode. The drive is put through a series of checks before the SERCOS control can switch the drive into operating mode. Switching the drive to the operating mode is dependent on making the SERCOS interface system ready to operate. This must occur in steps and is controlled by the master control by entering the communication phase 0 through 4 and starting/ending the commands **S-0-0127, C1 Communication Phase 3 Transition Check** and **S-0-0128, C2 Communication Phase 4 Transition Check**.

If the device reaches phase 4 without errors, "**b**" will appear on the H1 display. The diagnostic message is: **A107 without control.**

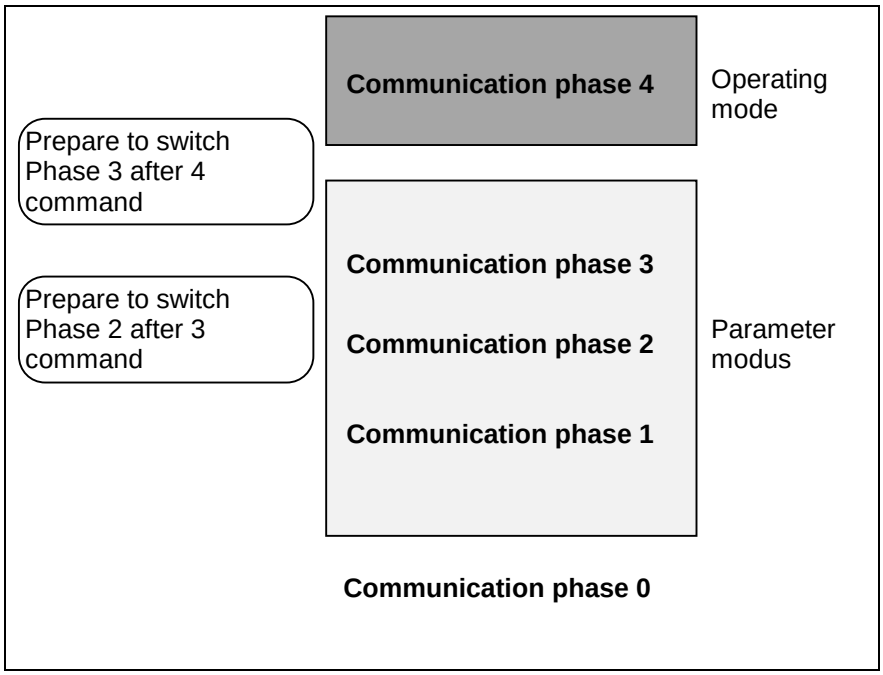

Fig. 2-16: Communication Phases

Communication between the SERCOS master and the device is not possible during phase 0. Parameterization mode is given during communication phases 2 and 3.

Monitoring in the Transition Check Command

Transition check commands must be activated in the drive in order to switch from communication phase 2 to 3 and from 3 to 4. This includes a series of checks and parameter calculations.

S-0-0127, C1 Communication Phase 3 Transition Check

The descriptions and solutions or transition check errors can be found in Supplement B, Diagnostic Message Descriptions.

The following checks are run when this command is activated. The telegram configuration is checked. The SERCOS cyclic telegram is checked for valid parameters configured in the MDT or AT data blocks and to ensure that the maximum length is not exceeded.

The command errors:

C104 Config. IDN for MDT not configurable

C105 Configurated Length > Max. Length for MDT

C106 Config. IDN for AT not configurable

C107 Configurated Length > Max. Length for AT

may occur.

Parameters are checked for proper values before the drive can switch into phase 3. If a parameter has an improper value, the following command error will occur:

C101 Communications Parameter Incomplete (S-0-0021)

The SERCOS ID numbers of invalid parameters are listed in **S-0-0021, IDN List of Invalid Op. Data for Comm. Ph. 2** and must be corrected before allowing a transition to phase 3.

The timing parameter for SERCOS communication in phase 3 and 4 are checked for proper values.

The command errors:

C108 Time Slot Parameter > SERCOS Cycle Time

C109 Position of Data Record in MDT even (S-0-0009)

C110 Length of MDT odd (S-0-0010)

C111 S-0-0009 + Record Length - 1 > S-0-0010

C112 TNcyc (S-0-0001) or TScyc (S-0-0002) Error

C113 Relation TNcyc (S-0-0001) to TScyc (S-0-0002) Error

C114 T4 > TScyc (S-0-0002) - T4min (S-0-0005)

C115 T2 too small

may occur.

S-0-0128, C2 Communication Phase 4 Transition Check

The following checks are run when this command is activated:

- The parameters are checked for proper values required for switching in phase 4. The command error **C201 Invalid Parameter (-> S-0-0022)** occurs if one or more of the required parameters are invalid. The SERCOS ID numbers of the invalid parameters are listed in **S-0-0022, IDN List of Invalid Op. Data for Comm. Ph. 3** and must be corrected.
- Values are checked for each parameter. The minimum and maximum values of each of the parameters are checked, and parameters with bit format are checked for proper configuration. If an error is found, the command error **C202 Parameter Limit Error (-> S-0-0022)** is issued. The SERCOS ID- numbers of the invalid parameters are listed in **S-0-0022, IDN List of Invalid Op. Data for Comm. Ph.3** and should be corrected.

2.5 Software Update

The software is updated via the MON socket on the front panel of the RMK02.2 module with a particular cable (boot cable).

This cable includes a switch which is to be set to **"BOOT" necessarily.**

There may only be 24V supply voltage if the switch is set to BOOT.

Programm „Pshell.exe“

The program PSHELL.EXE runs under Windows95 and WindowsNT from version 3.2 onwards.

Firmware

The firmware to be transferred must be set in the first screen of the Pshell.exe with the option "firmware" with path indications.

e. g. Firmware = KOM218V00.HEX (1st version)

or Update: KOM2xxVxx.HEX

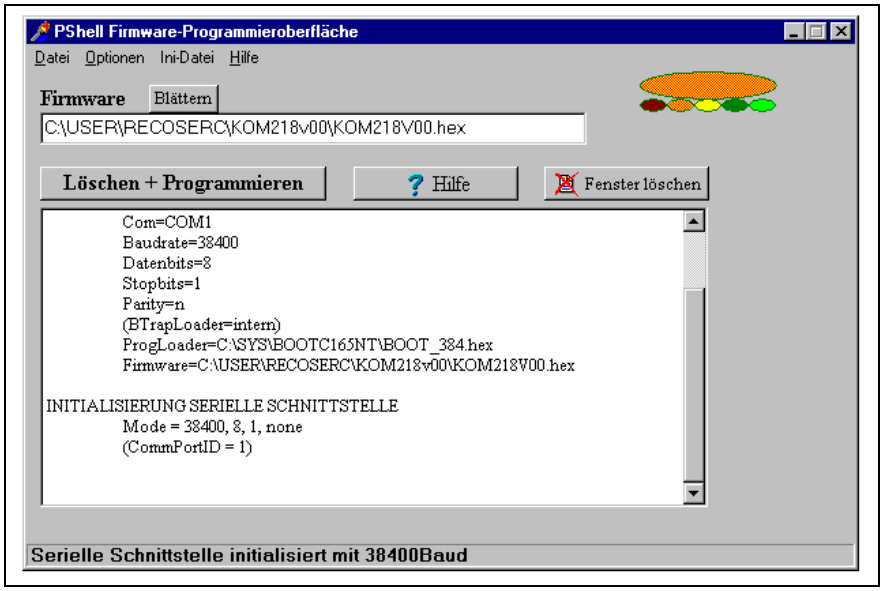

Fig. 2-17: First screen

Options

The following options can be selected:

Com

Com1, Com2, Com3, Com4

Data bits: 8 (required)

Stop bits:1 (required)

Baudrate: 9600

(refers to the 2nd Level Loader, e. g. BOOT_096.HEX)

Parity: none (necessary)

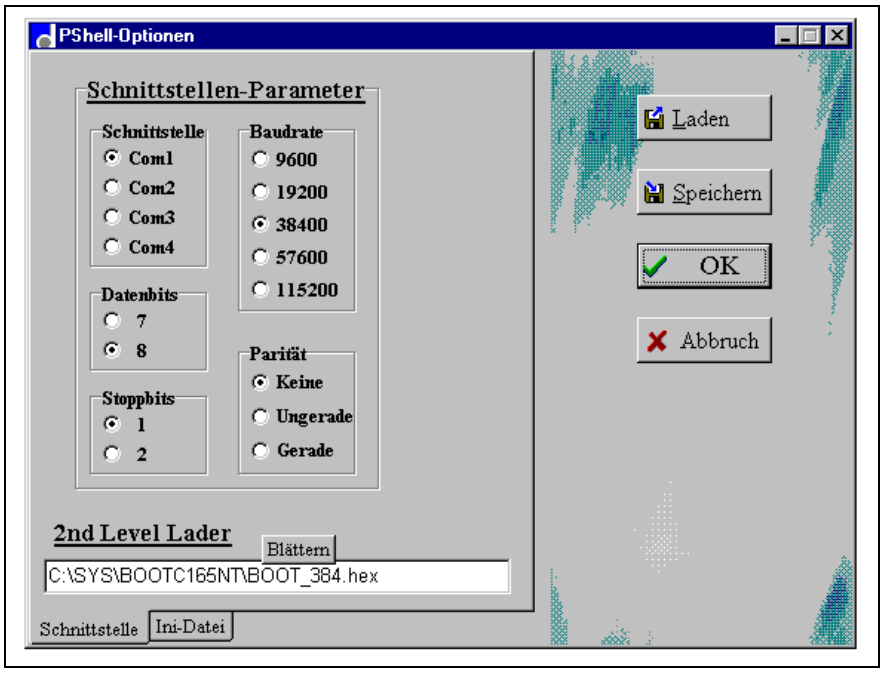

Fig. 2-18: Setting options

2nd Level Lader

z. B.: C:\BOOTC165\BOOT_096.HEX
C:\BOOTC165\BOOT_192.HEX
C:\BOOTC165\BOOT_384.HEX
C:\BOOTC165\BOOT_576.HEX

The settings selected have to be saved now!

INI - Datei

The INI-file in the Pshell options only reflects the settings and the programs to transfer.

Deleting and Programming

selecting

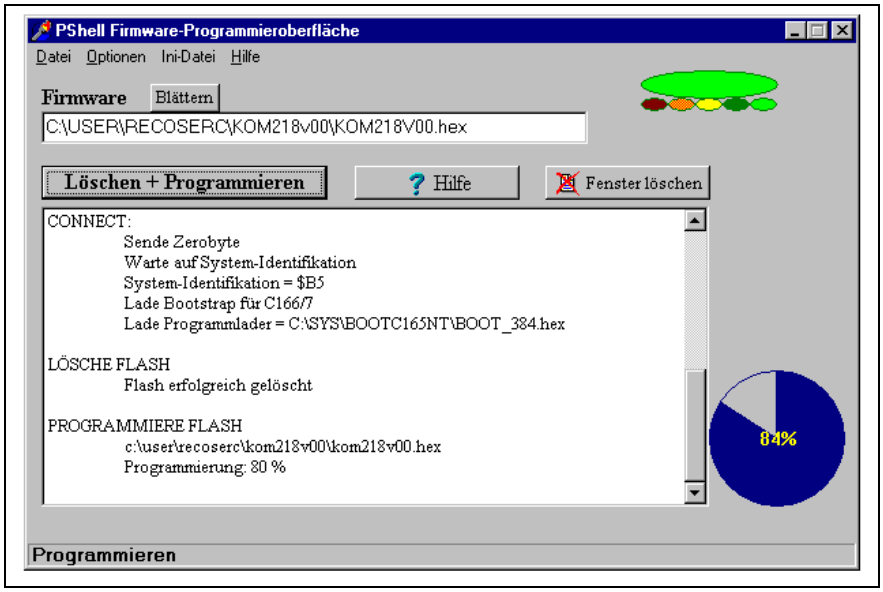

Fig. 2-19: Deleting and Programming

Connecting

Sending Zerobyte

Wait for system identification = **$B5** (important: if ⫩ switch 24V supply off and on again, connect again)

Deleting Flash

If the execution was successful, the following message will be displayed after some seconds:

"Flash deleted successfully"

Programming Flash

Programming: (runs from 1% to 100%)

File sent.

During the firmware transfer, the point of the 7-segment display H1 (front panel) of the SERCOS-RECO coupler RMK02.2 is flashing.

Running the Firmware

There are two possibilites to start the firmware:

- Switch boot cable to **"RUN"** and switch 24V power supply off and on.
- Start firmware via menu item File/Software Reset.

Reset started

Note: Remove boot cable before switching the SERCOS RECO on again or select switch position "RUN".

3 Communication through the SERCOS interface

3.1 Overview of SERCOS communication

Communication of devices with SERCOS RECO software can be done only through the SERCOS interface at this time. The basic features of this interface are:

- **Data exchange cycle of set and actual values with exact time equidistance**
- **Synchronization of measurement point and command value input**
- **Overall synchronization of all drives connected to the control**
- **Minimum cycle time 0,5 msec / maximum cycle time 65msec**
- **Baud rate selectable, either 2 or 4 MBaud**
- **Service channel for settings and diagnostics**
- **Data transfer through fiber optic ring**
- **Configuration of the telegram contents**

The features of the interface are mentioned here briefly. More detailed information is included in the SERCOS interface specification.

3.2 Data Transfer Cycle through SERCOS

To synchronize the drives in a loop, the **Master Synchronization Telegram** (MST) is sent at the beginning of every SERCOS cycle. The MST contains only the preset communication phase information from the master.

You can configure the master data and drive telegram.

Once during every Sercos cycle, a **Master Data Telegram** (MDT) is sent from the control to every drive. The master control word, the service channel and a configurable data block are included here. In this data block, the command and limit values are contained, which are sent by the control according to the operation mode of the drive. The contents of this data block can be configured through the telegram settings.

The master data telegram is received by all drives in the ring at the same time.

In addition, a **Drive Telegram** (AT) is sent during each Sercos cycle time from every drive to the control. The drive status word, the service channel and a configurable data block are contained here. This data block contains mainly actual and status values, which are needed to operate the corresponding drives by the control.

Master Control Word

The master control word is part of the Master Data Telegram. The most important control information for the drives is contained here, such as

- **Drive ON and Drive enable**
- **Real-time control bit 1 and 2**
- **Control information for the service channel**

The master control word is structured as follows:

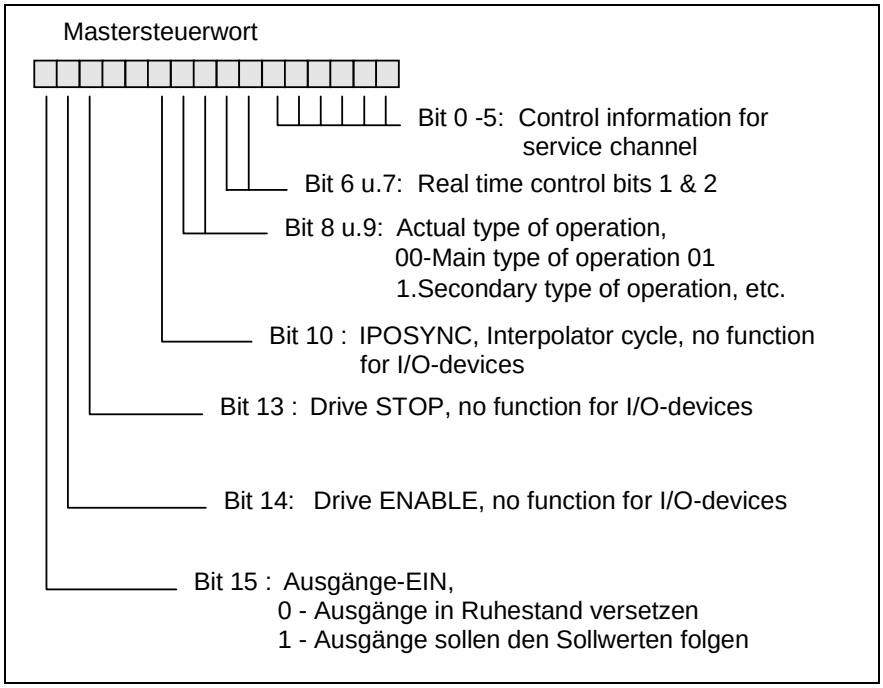

Fig. 3-20: Structure of the master control word

The master control word is transferred through the service channel to the control by using the parameter **S-0-0134, Master Control Word**.

Controller enable

The activation of the drive is done through a 0-1 edge of the controller enable signal. For drive controllers with a SERCOS interface, the controller enable signal corresponds to bit 15 in the master control word of the master data telegram.

To have the output enable signal accepted, the following requirements must be fulfilled:

- SERCOS interface in operating mode (Communication phase 4)
- that the 24V supply voltage is switched on with transistor output modules

The SERCOS-RECO shows „**b**“ on the 7-segment display with this state, the diagnose via the parameter **S-0-0095, diagnose** is ....**A107 without control.**

Drive Status Word

The I/O status word is part of the I/O telegram. All important status information for the device is contained here.

- **Readiness for use of the I/O-device**
- **Device error**
- **Change bits for diagnostics class 2 and 3**
- **Real-time status bits 1 and 2**
- **Status information for the service channel**

The I/O Status Word is structured as follows:

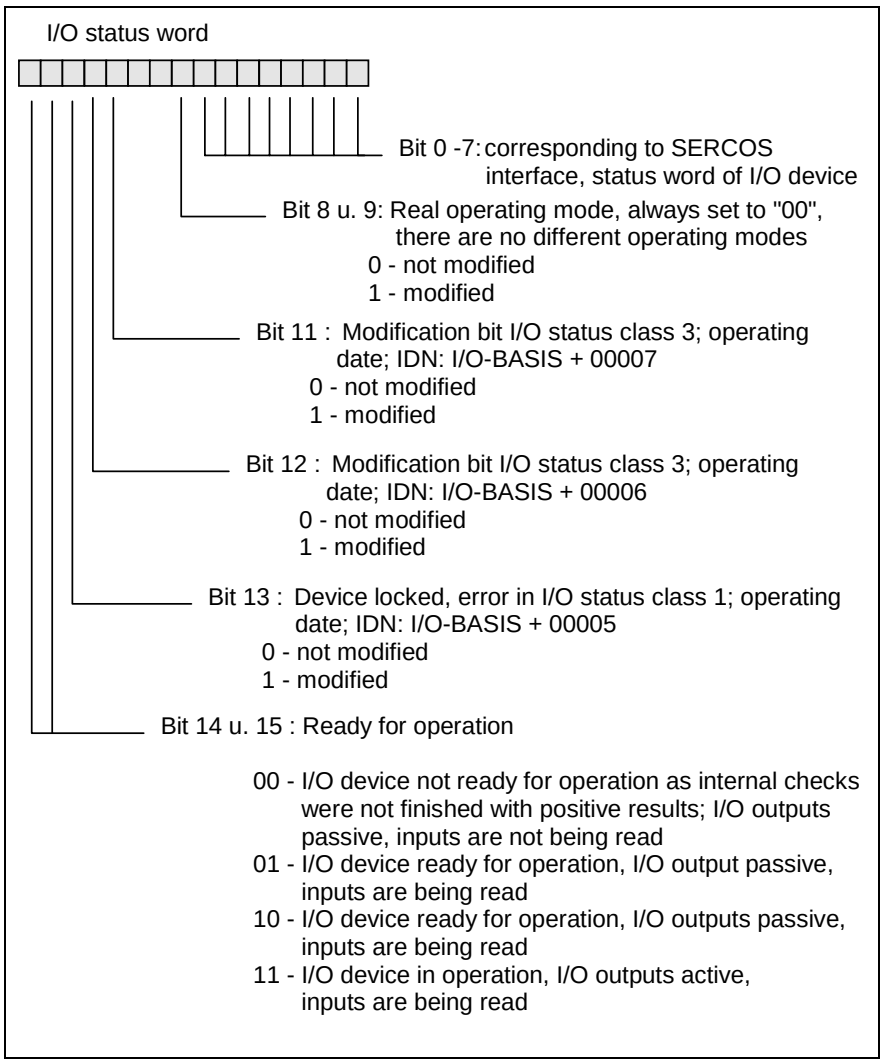

Fig. 3-21: Structure of the I/O Status Word

The I/O-device status word is transferred through the service channel to the control with the parameter **S-0-0135, Drive Status Word**.

3.3 Real-Time Control and Status Bits

In the master control and I/O-Device status words, there are 2 configurable real-time bits. The configuration of these binary signals is achieved through parameters

- **S-0-0301, Allocation of Real-Time Control Bit 1**
- **S-0-0303, Allocation of Real-Time Control Bit 2**
- **S-0-0305, Allocation of Real-Time Status Bit 1**
- **S-0-0307, Allocation of Real-Time Status Bit 2**

The parameter number that will be assigned to the corresponding real-time status bit is set here. Bit 0 of this parameter will be sent cyclically to the master or the drive via the real-time status or control bit.

3.4 Transmission of Required Data through SERCOS

Required data are not transmitted cyclically; they are transmitted through the service channel.

The transmission through the service channel is done in several steps for the MDT and AT, and the transmission of an element could last over several Sercos cycles.

The service channel is used for:

- **Assigning parameter values**

and

- **Diagnoses**

3.5 Start Up for the SERCOS interface

To start the interface you have to:

- **connect the fiber optic cable**
- **set the drive address**
- **set the transmission power**

All settings can be done with switches on the front plate of the SERCOS-RECO coupler RMK02.2.

The settings should be complete before connecting communication to the fiber optic loop.

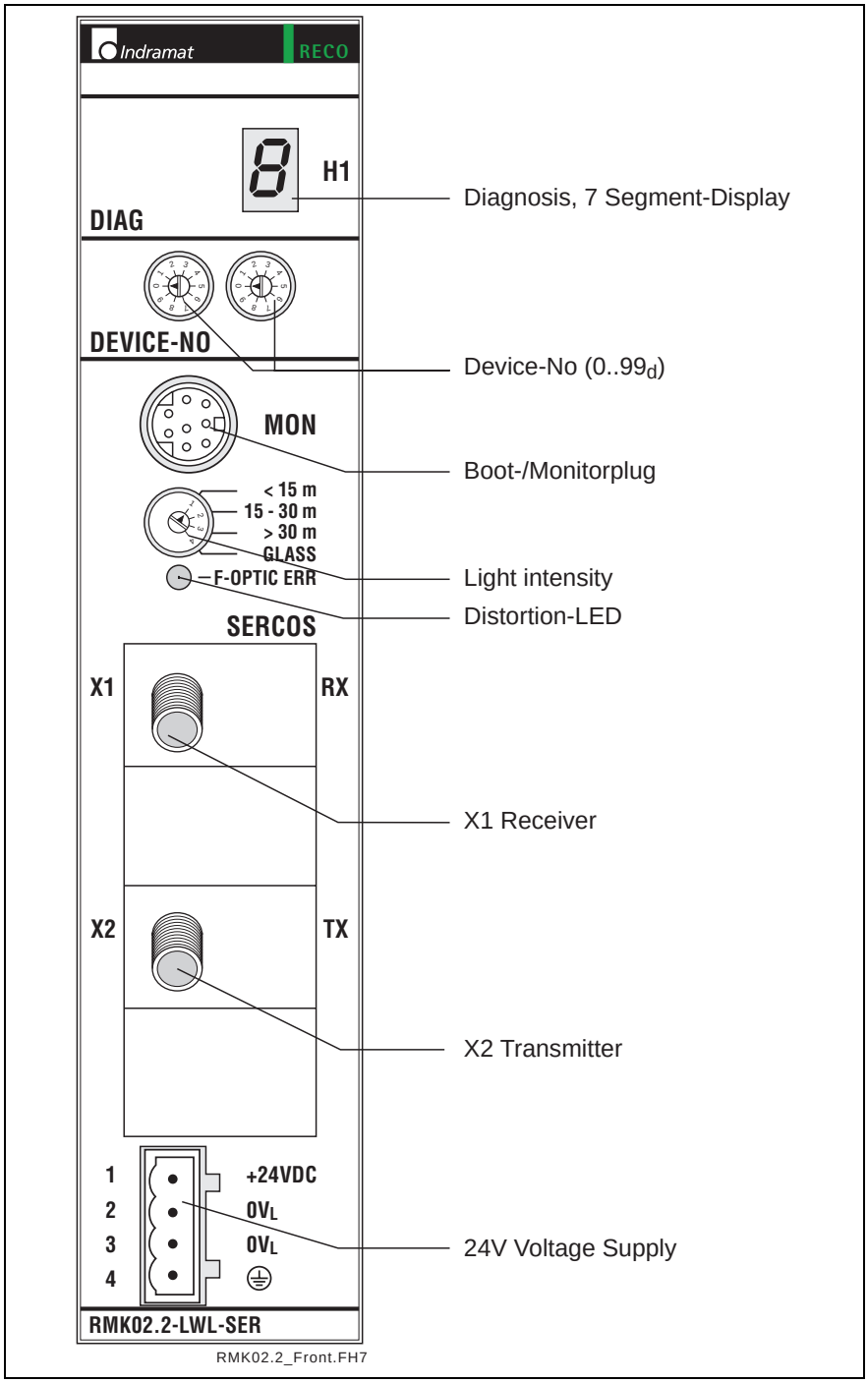

Fig. 3-22: SERCOS-RECO module RMK02.2

Setting the Device Address of the SERCOS interface

As well as the SERCOS drive, the SERCOS-RECO has a device address. The address is being set via the two 10 digits rotary switches (on the left "high", on the right "low"). The address area ranges from 1-99, the address 0 is not valid.

The device address is independent of the order the devices are connected via the fiber optic loop.

Connection of the Fiber Optic Loops the SERCOS interface

Resulting from the loop structure, the transmitter of the previous device has to be connected to the receiver of the following device.

The fiber optic loop with the receiving signal has to be connect to X1 (RX). If a signal is introduced into it, a red light can be seen. The received light signal is amplified in the interface module and appears at the transmitter (X2) again, if the voltage supply of the SERCOS-RECO is siwtched on. The fiber optic loop is to be connected to X2 (TX) which leads to the receiver of the next device.

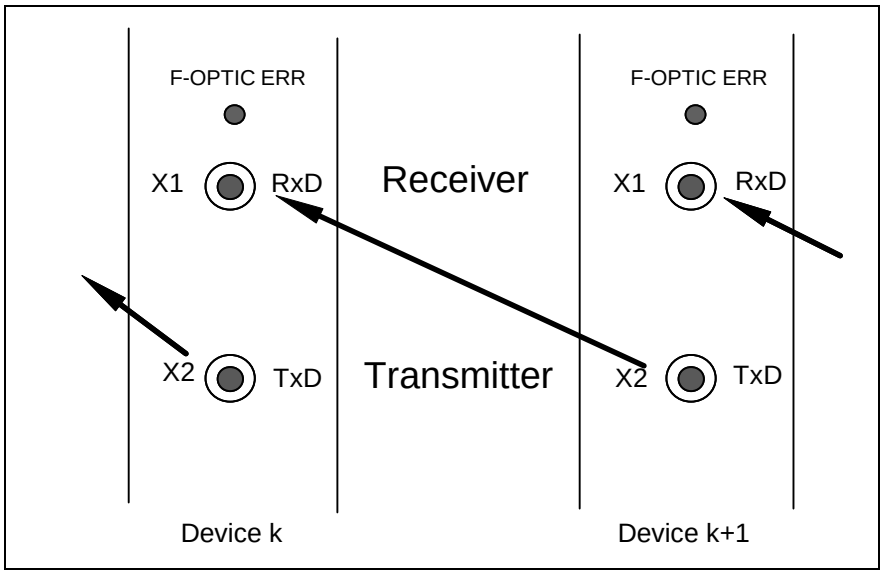

Fig. 3-23: Connection of the Fiber Optic Loop in general

Transmission rate of the SERCOS RECO

The SERCOS RECO can be operated with 2MBaud and 4MBaud. During the initialization phase it recognizes the master baudrate independently. Changing the master baudrate requires that the SERCOS RECO is reset.

Light intensity of the SERCOS-RECO

There are four possibilities for setting the light intensity.

LWL Length	switch position
<15m	1
15-30m	2
<30m	3
Glasfaser	4

Fig. 3-24: Setting the light intensity

Fiber optic type, fiber optic lengths between SERCOS devices are disribed in the „LWL Handling“ documentation“ (209-0090-4101-06 DE/01.96).

Distortion-LED (F-OPTIC ERR) of the SERCOS-RECO

The distortion LED flashes if the performance of the received signal is too high or too low, or if there are no flanks on the received signal.

- By adjusting the transmit power of the previous loop device, the signal level has to be set to the permissible area. The LED is off then.

3.6 SERCOS Telegram Configuration

To operate the drive properly, the settings of the telegram send and receive times, their lengths, and content have to be transmitted from the SERCOS master to the drive.

Configuration of the Telegram Send and Receive Times

The requirements to calculate the time slot parameter (telegram send and receive times) are stored in the following parameters:

- **S-0-0003, Minimum AT Transmit Starting Time (T1min)**
- **S-0-0004, Transmit/Receive Transition Time (TATMT)**
- **S-0-0005, Minimum Feedback Acquisition Time (T4min)**
- **S-0-0088, Receive to Receive Recovery Time (TMTSG)**
- **S-0-0090, Command Value Transmit Time (TMTSG)**

within the drive. The SERCOS Master calculates from the information received from all drives the time slot parameters for the operation of the communication phase 3. Those values are transferred to the drive in communication phase 2 through the parameters:

- **S-0-0002, SERCOS Cycle Time (Tscyc)**
- **S-0-0006, AT Transmission Starting Time (T1)**
- **S-0-0007, Feedback Acquisition Starting Time (T4)**
- **S-0-0008, Command Valid Time (T3)**
- **S-0-0009, Beginning Address in Master Data Telegram**
- **S-0-0010, Length of Master Data Telegram**
- **S-0-0089, MDT Transmit Starting Time (T2)**

The drive checks these settings while processing the command **S-0-0127, C1 Transfer preparation to comm.-phase 3**. The following error messages may appear:

- **C101 Invalid Communications Parameter (S-0-0021)**
- **C108 Time Slot Parameter > SERCOS Cycle Time**
- **C109 Position of Data Record in MDT Even(S-0-0009)**
- **C110 Length of MDT Odd (S-0-0010)**
- **C111 ID9 + Record Length - 1 > Length MDT (S-0-0010)**
- **C112 TNcyc (S-0-0001) or TScyc (S-0-0002) Error**
- **C113 Relation TNcyc (S-0-0001) to TScyc (S-0-0002) Error**
- **C114 T4 > TScyc (S-0-0002) - T4min (S-0-0005)**
- **C115 T2 Too Small**

Configuration of Telegram Contents

The telegram contents are set through parameters:

- **S-0-0015, Telegram Type Parameter**
- **S-0-0016, Custom Amplifier Telegram Configuration List**
- **S-0-0024, Config.-List of the Master Data Telegram**

However, the drive-directed conditions for the type and number of configured data must be in the set range. Those are provided by the drive in:

- **S-0-0185, Length of the Configurable data record in the AT**
- **S-0-0186, Length of the Config. Data Record in the MDT**
- **S-0-0187, List of Configurable Data in the AT**
- **S-0-0188, List of Configurable Data in the MDT**

The drive checks these settings while processing the command **S-0-0127, C1 Transfer preparation to comm.-phase 3**. The following error messages may appear:

- **C104 Config. IDN for MDT Not Configurable**
- **C105 Configurated Length > Max. Length for MDT**
- **C106 Config. IDN for AT Not Configurable**
- **C107 Configurated Length > Max. Length for AT**

Multiplex-Channel

Frequently the SPS cycle time is longer than the SERCOS cycle time. Therefore it is not necessary to exchange I/O information multiple times in each SPS cycle. Also the sercos cycle time depends on the quantity of I/O information. Overloading the SERCOS loop could possibly increase the SERCOS cycle time. The SERCOS interface offers the possibility to transfer data via multiplex channel. For the transfer, two multiplex data channels are available (refer to documentation SERCOS interface) The data size of the containers is 4 Bytes. If it is necessary to transfer one word only, this word ist transferred in low word of the long word.

For the multiplex channel settings, the **IDN S-0-0360/S-0-0361 MDT data container A/B**, **S-0-0364/S-0-0365 AT-data container A/B**, **S-0-0368/ S-0-0369 addressing data container A/B** as well as **S-0-0370 configuration list MDT-data container und S-0-0371 configuration list AT-data container** are necessary.

The SERCOS master informs via the index (addressing to configuration list MDT) which data is included in the data container A/B. Furthermore it shows via the index (addressing to configuration list AT) which data is expected to be in the data container A/B of the AT telegram.

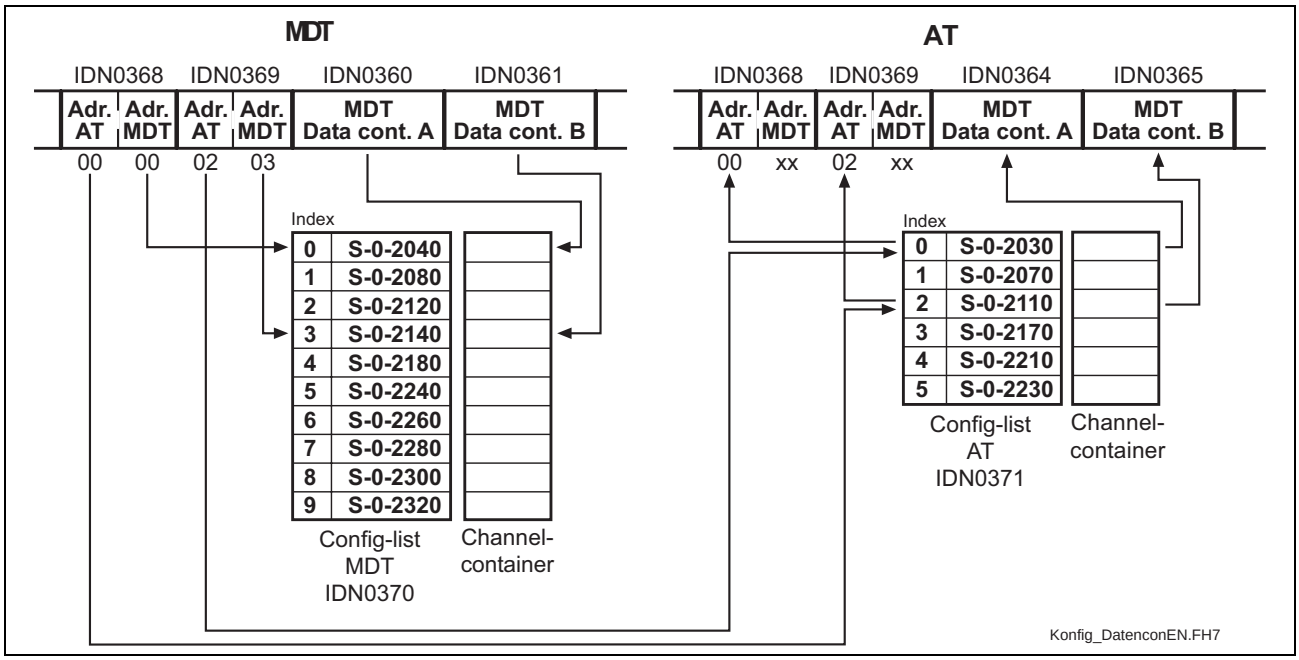

Fig. 3-25: example for representation of multiplex operation

Initialization of multiplex-channel

The initialization of the multiplex channel takes place in SERCOS phase 2. It is explained in the following table:

set IDN	date	comment
S-0-0370		Configuration list MDT-data container
	20	List length (in Bytes)
	2040	Output channel 1, slot 1
	2060	Output channel 2, slot 2
	2100	Output channel 4, slot 4
	2140	Output channel 6, slot 6
	2180	Output channel 8, slot 8
	2220	Output channel 10, slot 10
	2260	Output channel 12, slot 12
	2280	Output channel 13, slot 13
	2300	Output channel 14, slot 14
	2320	Output channel 15, slot 15
S-0-0024		Configuration list Master Data Telegram
	08	List length (in Bytes)
	0368	Addressing for data container A
	0369	Addressing for data container B
	0360	MDT-data container A
	0361	MDT-data container B
S-0-0371		Configuration list AT-data container
	12	List length (in Bytes)
	2030	Input channel 0, slot 0
	2090	Input channel 3, slot 3
	2130	Input channel 5, slot 5
	2170	Input channel 7, slot 7

	2210	Input channel 9, slot 9
	2250	Input channel 11, slot 11
S-0-0016		Custom amplifier telegram configuration list
	08	List length (in Bytes)
	0368	Addressing data container A
	0369	Addressing data container B
	0364	AT-data container A
	0365	AT-data container B

Fig. 3-26: Example multiplex channel initialization

3.7 SERCOS interface Error

If conditions are detected in the I/O device that prevent the correct operation of the interface, or if error values are recognized during the initialization phase, the drive responds by resetting to communication phase 0. This means that no I/O device telegrams will be sent. The I/O-device proceeds with the programmed error reaction and waits for the reinitialization of the SERCOS ring through the master.

Possible errors could be:

- **F401 Double MST Error Shutdown**
- **F402 Double MDT Error Shutdown**
- **F403 Invalid Communication Phase Shutdown**
- **F404 Error During Phase Progression**
- **F405 Error During Phase Regression**
- **F406 Phase Switching Without Ready Signal**

Diagnostic of the interface Status

The parameter **S-0-0014, Interface Status** is used to analyze the existing initialization error and the current communication phase.

Error Count for Telegram Interrupts

The drive checks every received master synchronization and master data telegram for

- **the correct receive time set point,**
- **the assigned telegram length and**
- **the correct CRC check sum**

A telegram interrupt is registered with an incrementation in the error counter. For this purpose, these two parameters are used: **S-0-0028, MST Error Count** and **S-0-0029, MDT Error Count.**

These parameters are canceled by switching the communication phase from 2 to 3 (S-0-0028) or from 3 to 4 (S-0-0029).

4 SERCOS-RECO

4.1 Data Exchange of SERCOS interface and RecoBus

Long Word

The data exchange between MDT and AT and the RecoBUS runs in correspondence to the scheme represented below. With this long word example represented, $44 is high byte and $11 is low byte.

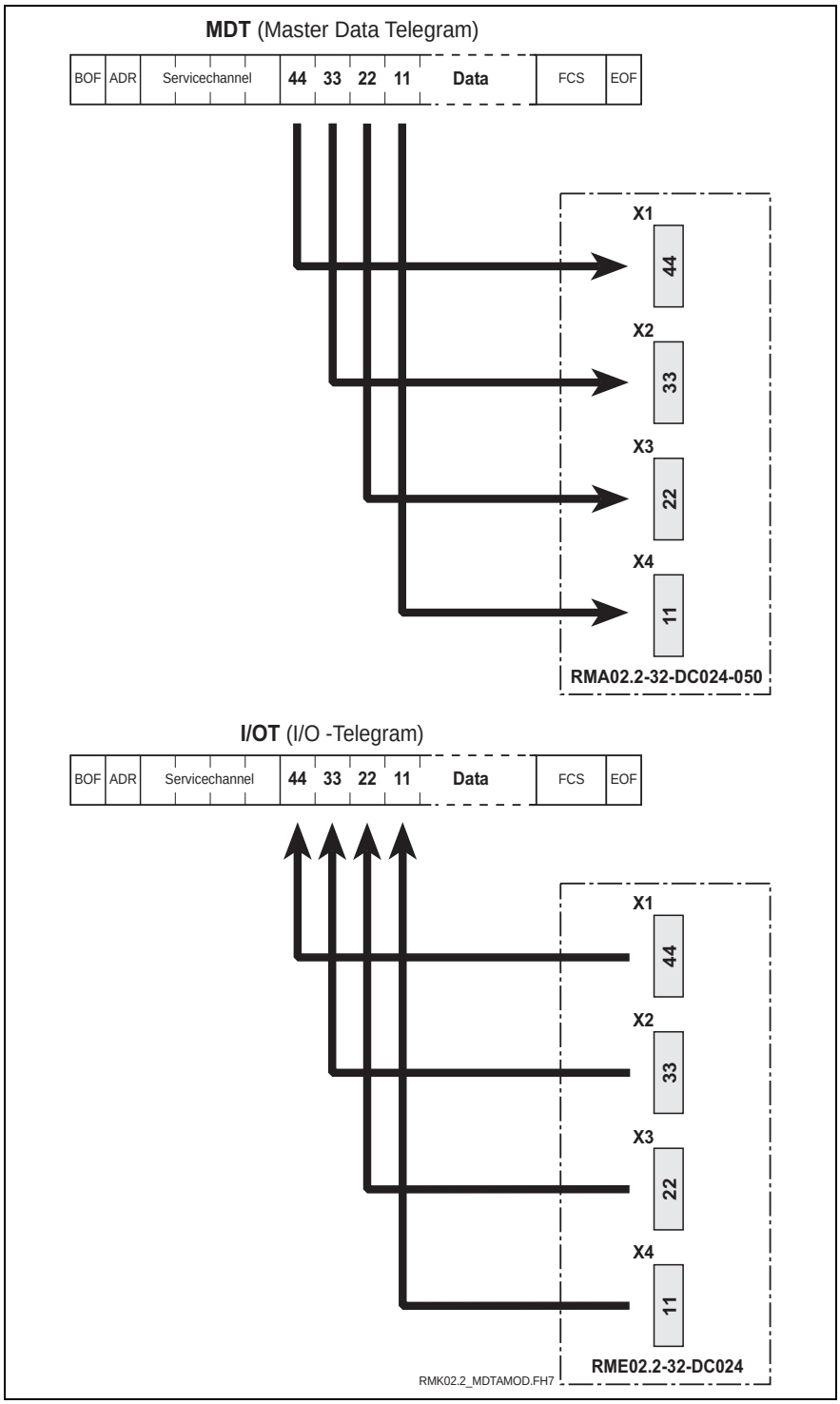

Fig. 4-27: Data Exchange MDT / I/OT ->RecoBus (Long Word)

Word

The data exchange with word access runs in correspondence to the scheme represented.

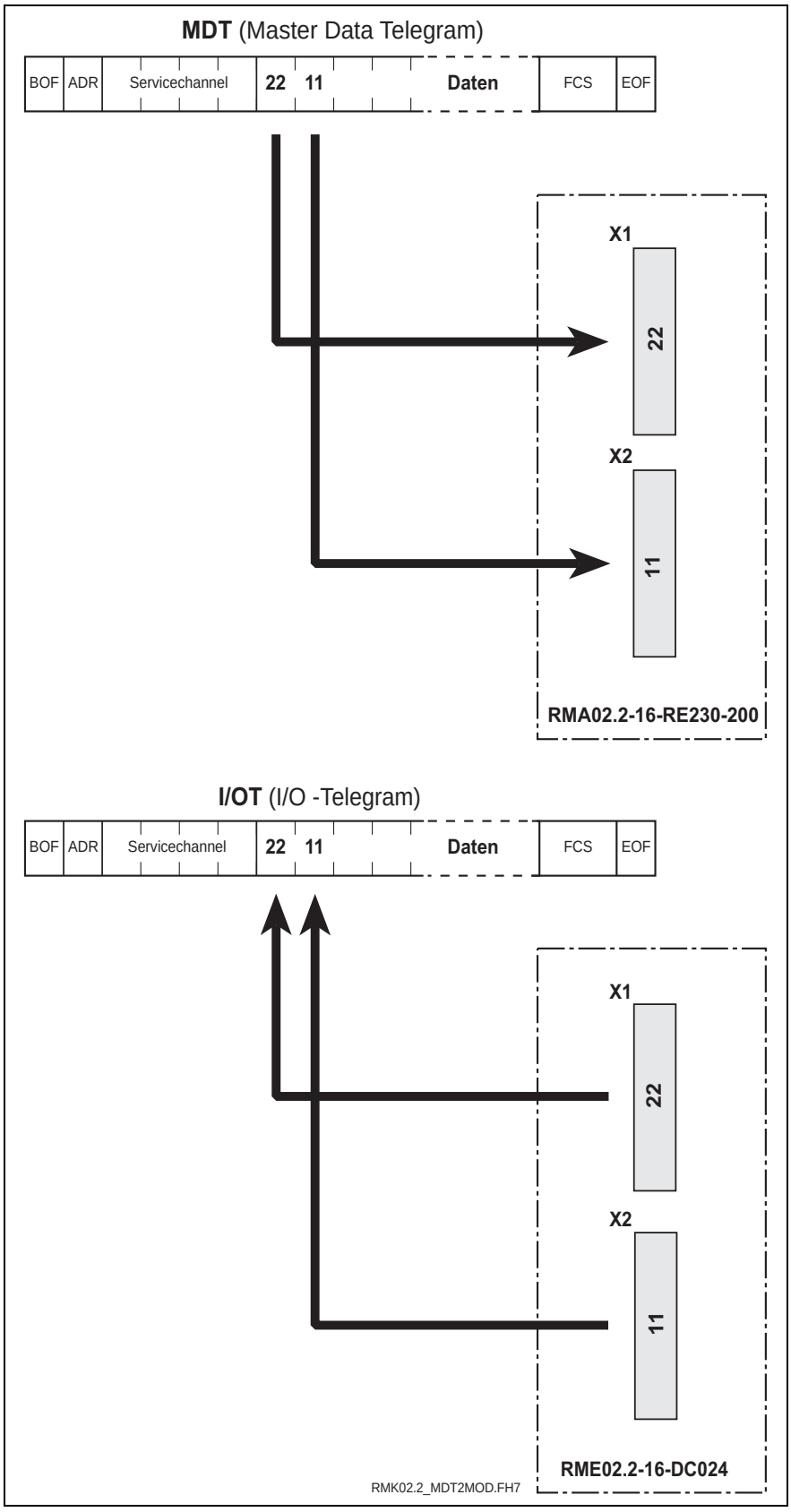

Fig. 4-28: Data Exchange MDT / I/OT -> RecoBus (Word)

4.2 Data Exchange SERCOS Interface -> RecoBus Analogmodule

With the analog module, the data exchange between MDT and / or I/OT and the RecoBus is executed according to the following diagram.

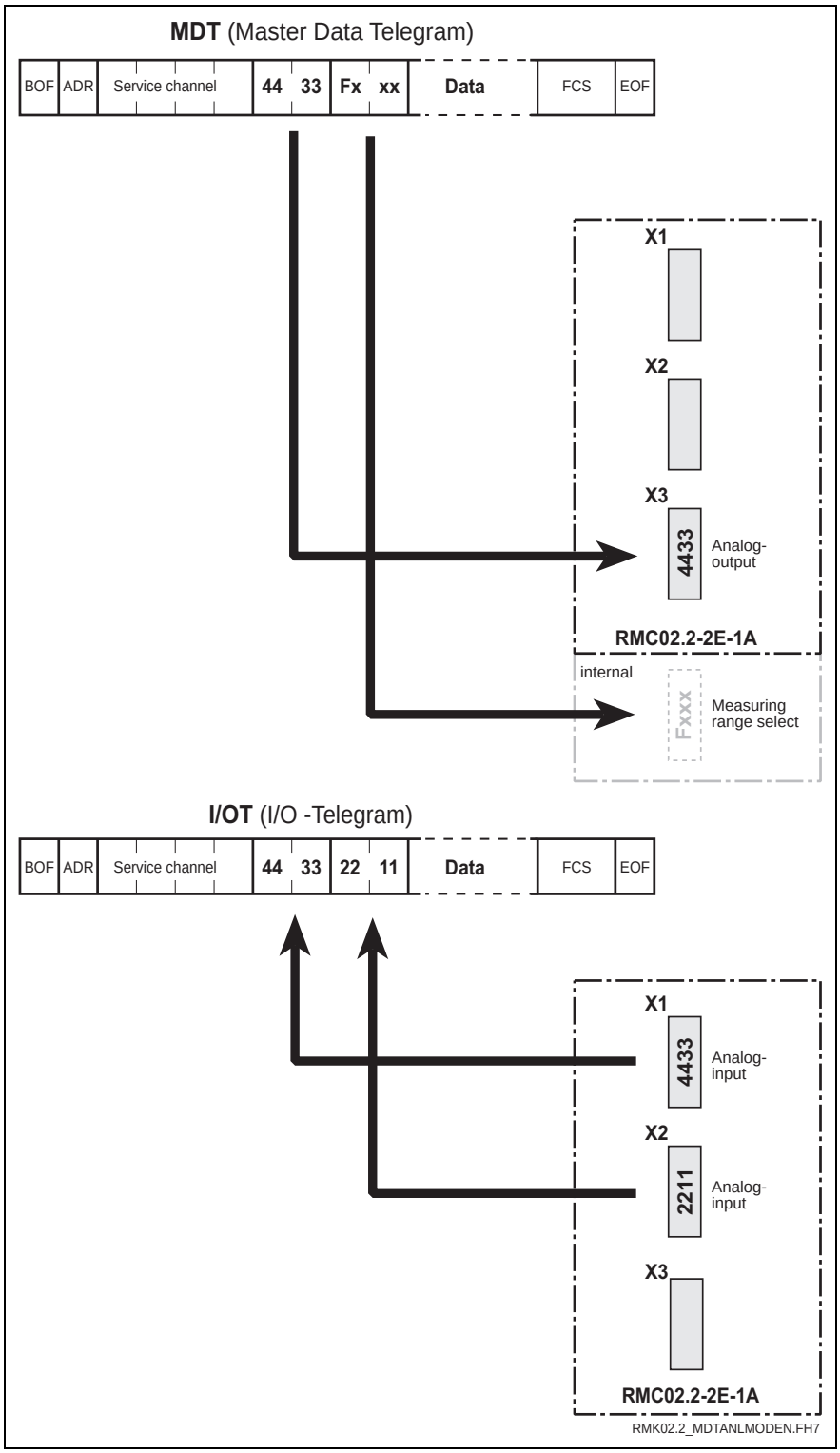

Fig. 4-29: Data exchange MDT/ I/OT -> RecoBus analog module

4.3 Ident. No of the I/O-devices

IO-BASIS IDN. 00291

Function:	In the operation date, the basic identification number is given by the I/O device for the calculation of the general I/O specific identification numbers. The identification number is fixed to **IDN S-0-2000** for the Indramat I/O device.
Data length:	2 Byte
Data type:	Identication number

Example:

In the operation date of the I/O-BASIS (IDN 00291) the value 2000 is included.

For calculating the identification number I/O status class 1 with the identification number description IDN. I/O-BASIS + 0005, in addition to the content of the operation date of I/O BASIS 5 has to be added and the following identification number results:

I/O status class 1 = IDN 02005

Please also refer to the description "SERCOS interface, I/O-functions",

4.4 Ident. No. of the I/O data channels

The identification numbers for the I/O data channels are assigned to the slot. Via the data channels, the command values and the actual values are transferred cyclically or not cyclically. Each of the I/O data channels consists of 10 successive ident. Numbers (refer to the description: SERCOS interface I/O EXP ENansions).

Slot	Parameter of the output data channel	Parameter of the input data channel
0	S-0-2020	S-0-2030
1	S-0-2040	S-0-2050
2	S-0-2060	S-0-2070
3	S-0-2080	S-0-2090
4	S-0-2100	S-0-2110
5	S-0-2120	S-0-2130
6	S-0-2140	S-0-2150
7	S-0-2160	S-0-2170
8	S-0-2180	S-0-2190
9	S-0-2200	S-0-2210
10	S-0-2220	S-0-2230
11	S-0-2240	S-0-2250
12	S-0-2260	S-0-2270
13	S-0-2280	S-0-2290
14	S-0-2300	S-0-2310
15	S-0-2320	S-0-2330

4.5 Module identity of the RecoBus modules

General

Each module is specified in detail in the channel data buffers, channel type. The examination of each channel data buffer for data size, channel type, channel identification list and the channel parameters is necessary for recognizing the overall configuration of the I/O-device, i. e. it is determined which type of modules are used and which data size is used.

Each module on hte RECO02 bus identifies hardware automatically. This module identification is the basis for the extended module identification.

It can be called with the parameter "P-0-0777, I/O-module identification".

The module can be identified in detail by the module identification.

These manufacturer specific parameters have the advantage to get detailled information on the configuration of the SERCOS I/O-device (assignment of the I/O modules) without having to examine each channel data buffer.

Module identity

module identity																	
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0		
modul type				variant				module channel width									
								input				output				Module type	module identity
0	0	0	1	x	x	x	x	x	x	x	x	x	x	x	x	digital module	$ 1xxx
0	0	1	0	x	x	x	x	x	x	x	x	x	x	x	x	analog module	$ 2xxx
0	0	1	1	x	x	x	x	x	x	x	x	x	x	x	x	interface	$ 3xxx
1	1	1	1	x	x	x	x	x	x	x	x	x	x	x	x	intelligence module	$ Fxxx

Fig. 4-30: Overview module identification

module channel width											
7	6	5	4	3	2	1	0				
input				output				channel width	input only	output only	input and output
0	0	0	0	0	0	0	0	reserviert	$ xx00	$ xx00	$ xx00
0	0	0	1	0	0	0	1	1 Byte	$ xx10	$ xx01	$ xx11
0	0	1	0	0	0	1	0	2 Byte	$ xx20	$ xx02	$ xx22
0	0	1	1	0	0	1	1	3 Byte	$ xx30	$ xx03	$ xx33
0	1	0	0	0	1	0	0	4 Byte	$ xx40	$ xx04	$ xx44
0	1	0	1	0	1	0	1	5 Byte	$ xx50	$ xx05	$ xx55
0	1	1	0	0	1	1	0	6 Byte	$ xx60	$ xx06	$ xx66
0	1	1	1	0	1	1	1	8 Byte	$ xx70	$ xx07	$ xx77
1	0	0	0	1	0	0	0	10 Byte	$ xx80	$ xx08	$ xx88
1	0	0	1	1	0	0	1	12 Byte	$ xx90	$ xx09	$ xx99
1	0	1	0	1	0	1	0	14 Byte	$ xxA0	$ xx0A	$ xxAA
1	0	1	1	1	0	1	1	16 Byte	$ xxB0	$ xx0B	$ xxBB
1	1	0	0	1	1	0	0	32 Byte	$ xxC0	$ xx0C	$ xxCC
1	1	0	1	1	1	0	1	64 Byte	$ xxD0	$ xx0D	$ xxDD
1	1	1	0	1	1	1	0	128 Byte	$ xxE0	$ xx0E	$ xxEE
1	1	1	1	1	1	1	1	256 Byte	$ xxF0	$ xx0F	$ xxFF

Fig. 4-31: Module channel width identification

module type	module label	module identity
input modul 16*24VDC	RME02.2-16-DC024	$ 1020
input modul 32*24VDC	RME02.2-32-DC024	$ 1040
input modul 16*115VAC	RME02.2-16-AC115	$ 1120
output modul 16*2A (24VDC)	RMA02.2-16-DC024-200	$ 1102
output modul 32*0,5A (24VDC)	RMA02.2-32-DC024-050	$ 1004
output modul 16*2A Relais (230VAC)	RMA02.2-16-RE230-200	$ 1002
output modul 16*2A Thyristor (230VAC)	RMA02.2-16-AC230-200	$ 1302
analog modul	RMC02.2-2E-1A	$ 2143
SERCOS interface	RMK02.2-LWL-SER-FW	$ 3240

Fig. 4-32: Module overview

5 General Information

5.1 Using This Manual

All standard and product specific parameters are listed in this chapter in a numerically ascending order.

This chapter supplements the feature description and represents a complete description of all parameters used in the DIAX04 software. The description of the individual parameters is divided into two subsections.

General description

This section contains the feature or meaning of the parameter and tips for setting parameters.

Description of attributes

The characteristic values or features listed here help to classify the parameter. They are necessary for a complete description of the parameter. However, they are not required to get a general idea of the meaning of the parameter.

Definitions

The following Figreviations are used:

Data length:

2-byte - the data length for the operating data is 2 bytes.

4-byte - the data length for the operating data is 4 bytes.

1-byte variable - this is a piece of operating data of variable length (list). The length of a data unit is 1 byte.

2-byte variable - this is a piece of operating data of variable length (list). The length of a data unit is 2 bytes.

4-byte variable - this is a piece of operating data of variable length (list). The length of a data unit is 4 bytes.

Format:

BIN - the display format for the operating data should be binary.

HEX - the display format for the operating data should be hexadecimal.

DEC_OV - The display format for the operating data should be decimal without a sign.

DEC_MV - The display format for the operating data should be decimal with a sign.

ASCII - the operating data is an ASCII string.

IDN - the operating data is an ID number (IDN).

Editability:

No - the operating data cannot be edited.

P2 - The operating data can only be edited in communications phase 2.

P23 - The operating data can only be edited in communications phases 2 and 3.

P234 - The operating data can be edited in any communications phase.

P3 - The operating data can only be edited in communications phase 3.

P4 - The operating data can only be edited in communications phase 4.

Memory:

fixed - the operating data is programmed in the I/O-device.

no - The operating data is not buffered in the I/O-device; the value is undefined after the drive controller is switched on.

Param.E²prom - The operating data is buffered in E²prom of the SERCOS-coupler RMK02.2.

Validity check:

no - the operating data is not checked for validity.

Phase2 - the operating data is checked in the "Communications phase 3 transition check" command.

Phase3 - the operating data is checked in the "Communications phase 4 transition check" command.

Extreme value check:

no - the operating data is not checked for its extreme values when it is written to.

yes - the operating data is checked for its extreme values when it is written to.

Combination check:

no - the operating data is not checked (bitwise) for a valid combination with other parameter values when it is written to.

yes - The operating data is checked (bitwise) for a valid combination with other parameter values when it is written to.

Cyc. transmittable:

no - The operating data cannot be configured as cyclical data in the master data telegram or in the drive telegram.

AT - The operating data can be configured as cyclical data in the drive telegram.

MDT - The operating data can be configured as cyclical data in the master data telegram.

6 Product Specific Parameters

P-0-0009, Error Message Number

Description:

If an error occurs during cyclical operation, it will be diagnosed by the I/O-device and shown in the seven-segment display H1.

At the same time, a bit will be set in **S-0-0011, Class 1 diagnostic**, and the change bit for that Class 1 diagnostic will be set in the operation status word. The control can now determine the queued error condition passed to the I/O-device diagnostic display by reading this parameter, which contains only the last three significant decimals of the diagnostic message number (in range 201..899), and determine a specific error response or custom diagnostic text message.

If no error is pending, then the value of this parameter is "0".

Example:

Pending error:	F207, "Switching to uninitialized operating mode“.
P-0-0009:	207

See also the functional description: "Error number."

P-0-0009 Attributes

ID number:	P-0-0009	**Editability:**	no
Function:	Parameter	**Memory:**	no
Data length:	2 bytes	**Validity check:**	no
Format:	HEX	**Extreme value check:**	no
Unit:	--	**Combination check:**	no
Decimal places:	0	**Cyc. transmittable:**	no
Input min/max:	--/--		

P-0-0777, IO Module Identification

Description:

This manufacturer specific parameter offers detailled information on the configuration of the SERCOS I/O device without having to examine each channel data buffer.

The module identifications are given word by word, slot oriented by the SERCOS RECO. A module identification with "00.00" has the significance: the slot is not equipped.

The first word indicates the length of the programmed text in bytes in the I/O device. The second word indicates the length (bytes) available at the maximum of the text in the I/O device (also refer to SERCOS interface Specification, chapter 5.1.3.4, Unit of Operation Date, Text).

Example: P-0-0777:

	$0020	Length information of the programmed text in bytes
	$0020	Length available max. for the text in bytes
Slot-No.	**Identi-fication**	**Module type**
0	$3240	RMK02.2-LWL-SER-FW
1	$1004	RMA02.2-32-DC024-050
2	$1040	RME02.2-32-DC024
3	$1004	RMA02.2-32-DC024-050
4	$1040	RME02.2-32-DC024
5	$1102	RMA02.2-16-DC024-200
6	$1102	RMA02.2-16-DC024-200
7	$1020	RME02.2-16-DC024
8	$1004	RMA02.2-32-DC024-050
9	$1040	RME02.2-32-DC024
10	$1020	RME02.2-16-DC024
11	$1002	RMA02.2-16-RE230-200
12	$1102	RMA02.2-16-DC024-200
13	$1102	RMA02.2-16-DC024-200
14	$0000	no Module
15	$1002	RMA02.2-16-RE230-200

Fig. 6-33: List of I/O-module identification

P-0-0777 Attribute

Identification number:	P-0-0777	**Modification possible:**	nein
Function:	Parameter	**Saving:**	nein
Data length:	2Byte-variabel	**Check validity**	nein
Format:	HEX	**Chech extreme value:**	nein
Unit German:	-/-	**Check combination:**	nein
Part Digits:	0	**Transfer cyclically:**	nein
Input min / max:	--		

7 Parameter

7.1 List of SERCOS-RECO Parameter

S-0-0001	NC Cycle Time (TNcyc)
S-0-0002	SERCOS Cycle Time (Tscyc)
S-0-0003	Minimum AT Transmit Starting Time (T1min)
S-0-0004	Transmit/Receive Transition Time (TATMT)
S-0-0005	Minimum Feedback Acquisition Time(T4min)
S-0-0006	AT Transmission Starting Time (T1)
S-0-0007	Feedback Acquisition Starting Time (T4)
S-0-0008	Command Valid Time (T3)
S-0-0009	Beginning Address in Master Data Telegram
S-0-0010	Length of Master Data Telegram
S-0-0014	Interface Status
S-0-0015	Telegram Type Parameter
S-0-0016	Custom Amplifier Telegram Configuration List
S-0-0017	IDN List of all Operation Data
S-0-0018	IDN-list of operation data for CP2
S-0-0019	IDN-list of operation data for CP3
S-0-0021	IDN List of invalid op. Data for Comm. Ph. 2
S-0-0022	IDN List of invalid op. Data for Comm. Ph. 3
S-0-0024	Config. List of the Master Data Telegram
S-0-0025	IDN-list of all procedure commands
S-0-0028	MST error counter
S-0-0029	MDT error counter
S-0-0030	Manufacturer Version
S-0-0032	Primary Mode of Operation
S-0-0088	Receive to Receive Recovery Time (TMTSG)
S-0-0089	MDT Transmit Starting Time (T2)
S-0-0090	Command Value Transmit Time (TMTSG)
S-0-0095	Diagnostic Message
S-0-0096	Slave arrangement (SLKN)
S-0-0099	Reset class 1 diagnostic
S-0-0127	Communication phase 3 transition check
S-0-0128	Communication phase 4 transition check
S-0-0129	Hersteller-Zustandsklasse-1
S-0-0134	Master control word
S-0-0135	Drive status word
S-0-0142	Application type
S-0-0143	SYSTEM interface version
S-0-0182	Manufacturer Class 3 Diagnostics
S-0-0185	Length of the configurable data record in the AT

S-0-0186	Length of the configurable data record in the MDT
S-0-0187	List of Configurable Data in the AT
S-0-0188	List of Configurable Data in the MDT
S-0-0192	IDN-List of backup operation data
S-0-0262	Command Basic Load
S-0-0265	Language Selection
S-0-0267	Password
S-0-0290	Type of participant
S-0-0291	I/O-Base
S-0-0301	Allocation of Real-Time Control Bit 1
S-0-0303	Allocation of Real-Time Control Bit 2
S-0-0305	Allocation of Real-Time Status Bit 1
S-0-0307	Allocation of Real-Time Status Bit 2
S-0-0360	MDT-Datencontainer A
S-0-0361	MDT-Datencontainer B
S-0-0364	AT-Datencontainer A
S-0-0365	AT-Datencontainer B
S-0-0368	Addressing for data container A
S-0-0369	Addressing for data container B
S-0-0370	Configuration list for the MDT data container
S-0-0371	Configuration list for the AT data container
S-0-0390	Diagnostic Message Number
S-0-2000	DATA BASE
S-0-2001	Max. number of I/O channels
S-0-2002	Occupation of I/O data channels
S-0-2003	COMMAND BASE
S-0-2004	Max. number of I/O command channels
S-0-2005	I/O class 1 diagnostic
S-0-2006	I/O class 2 diagnostic
S-0-2007	I/O class 3 diagnostic
S-0-2008	Mask I/O class 2 diagnostic
S-0-2009	Mask I/O class 3 diagnostic
S-0-2010	Cable break
S-0-2011	Cable break source
S-0-2012	Short circuit
S-0-2013	Origin of short circuit
S-0-2014	Range limit departed from
S-0-2015	Range error source
S-0-2016	Error communication interface
S-0-2017	Communication interface error and source
S-0-2020	Output channel container 0
S-0-2021	Channel type Output-channel 0
S-0-2022	ID list Output-channel 0
S-0-2023	Parameter 0 Output-channel 0

S-0-2024	Parameter 1 Output-channel 0
S-0-2025	Parameter 2 Output-channel 0
S-0-2026	Parameter 3 Output-channel 0
S-0-2027	Parameter 4 Output-channel 0
S-0-2028	Parameter 5 Output-channel 0
S-0-2029	Parameter 6 Output-channel 0
S-0-2030	Input-channel container 0
S-0-2031	Channel type Input-channel 0
S-0-2032	ID list Input-channel 0
S-0-2033	Parameter 0 Input-channel 0
S-0-2034	Parameter 1 Input-channel 0
S-0-2035	Parameter 2 Input-channel 0
S-0-2036	Parameter 3 Input-channel 0
S-0-2037	Parameter 4 Input-channel 0
S-0-2038	Parameter 5 Input-channel 0
S-0-2039	Parameter 6 Input-channel 0
S-0-2040	Output-channel container 1
S-0-2041	Channel type Output-channel 1
S-0-2042	ID list Output-channel 1
S-0-2043	Parameter 0 Output-channel 1
S-0-2044	Parameter 1 Output-channel 1
S-0-2045	Parameter 2 Output-channel 1
S-0-2046	Parameter 3 Output-channel 1
S-0-2047	Parameter 4 Output-channel 1
S-0-2048	Parameter 5 Output-channel 1
S-0-2049	Parameter 6 Output-channel 1
S-0-2050	Input-channel container 1
S-0-2051	Channel type Input-channel 1
S-0-2052	ID list Input-channel 1
S-0-2053	Parameter 0 Input-channel 1
S-0-2054	Parameter 1 Input-channel 1
S-0-2055	Parameter 2 Input-channel 1
S-0-2056	Parameter 3 Input-channel 1
S-0-2057	Parameter 4 Input-channel 1
S-0-2058	Parameter 5 Input-channel 1
S-0-2059	Parameter 6 Input-channel 1
S-0-2060	Output-channel container 2
S-0-2061	Channel type Output-channel 2
S-0-2062	ID list Output-channel 2
S-0-2063	Parameter 0 Output-channel 2
S-0-2064	Parameter 1 Output-channel 2
S-0-2065	Parameter 2 Output-channel 2
S-0-2066	Parameter 3 Output-channel 2
S-0-2067	Parameter 4 Output-channel 2

S-0-2068	Parameter 5 Output-channel 2
S-0-2069	Parameter 6 Output-channel 2
S-0-2070	Input-channel container 2
S-0-2071	Channel type Input-channel 2
S-0-2072	ID list Input-channel 2
S-0-2073	Parameter 0 Input-channel 2
S-0-2074	Parameter 1 Input-channel 2
S-0-2075	Parameter 2 Input-channel 2
S-0-2076	Parameter 3 Input-channel 2
S-0-2077	Parameter 4 Input-channel 2
S-0-2078	Parameter 5 Input-channel 2
S-0-2079	Parameter 6 Input-channel 2
S-0-2080	Output-channel container 3
S-0-2081	Channel type Output-channel 3
S-0-2082	ID list Output-channel 3
S-0-2083	Parameter 0 Output-channel 3
S-0-2084	Parameter 1 Output-channel 3
S-0-2085	Parameter 2 Output-channel 3
S-0-2086	Parameter 3 Output-channel 3
S-0-2087	Parameter 4 Output-channel 3
S-0-2088	Parameter 5 Output-channel 3
S-0-2089	Parameter 6 Output-channel 3
S-0-2090	Input-channel container 3
S-0-2091	Channel type Input-channel 3
S-0-2092	ID list Input-channel 3
S-0-2093	Parameter 0 Input-channel 3
S-0-2094	Parameter 1 Input-channel 3
S-0-2095	Parameter 2 Input-channel 3
S-0-2096	Parameter 3 Input-channel 3
S-0-2097	Parameter 4 Input-channel 3
S-0-2098	Parameter 5 Input-channel 3
S-0-2099	Parameter 6 Input-channel 3
S-0-2100	Output-channel container 4
S-0-2101	Channel type Output-channel 4
S-0-2102	ID list Output-channel 4
S-0-2103	Parameter 0 Output-channel 4
S-0-2104	Parameter 1 Output-channel 4
S-0-2105	Parameter 2 Output-channel 4
S-0-2106	Parameter 3 Output-channel 4
S-0-2107	Parameter 4 Output-channel 4
S-0-2108	Parameter 5 Output-channel 4
S-0-2109	Parameter 6 Output-channel 4
S-0-2110	Input-channel container 4
S-0-2111	Channel type Input-channel 4

S-0-2112	ID list Input-channel 3
S-0-2113	Parameter 0 Input-channel 4
S-0-2114	Parameter 1 Input-channel 4
S-0-2115	Parameter 2 Input-channel 4
S-0-2116	Parameter 3 Input-channel 4
S-0-2117	Parameter 4 Input-channel 4
S-0-2118	Parameter 5 Input-channel 4
S-0-2119	Parameter 6 Input-channel 4
S-0-2120	Output-channel container 5
S-0-2121	Channel type Output-channel 5
S-0-2122	ID list Output-channel 5
S-0-2123	Parameter 0 Output-channel 5
S-0-2124	Parameter 1 Output-channel 5
S-0-2125	Parameter 2 Output-channel 5
S-0-2126	Parameter 3 Output-channel 5
S-0-2127	Parameter 4 Output-channel 5
S-0-2128	Parameter 5 Output-channel 5
S-0-2129	Parameter 6 Output-channel 5
S-0-2130	Input-channel container 5
S-0-2131	Channel type Input-channel 5
S-0-2132	ID list Input-channel 5
S-0-2133	Parameter 0 Input-channel 5
S-0-2134	Parameter 1 Input-channel 5
S-0-2135	Parameter 2 Input-channel 5
S-0-2136	Parameter 3 Input-channel 5
S-0-2137	Parameter 4 Input-channel 5
S-0-2138	Parameter 5 Input-channel 5
S-0-2139	Parameter 6 Input-channel 5
S-0-2140	Output-channel container 6
S-0-2141	Channel type Output-channel 6
S-0-2142	ID list Output-channel 6
S-0-2143	Parameter 0 Output-channel 6
S-0-2144	Parameter 1 Output-channel 6
S-0-2145	Parameter 2 Output-channel 6
S-0-2146	Parameter 3 Output-channel 6
S-0-2147	Parameter 4 Output-channel 6
S-0-2148	Parameter 5 Output-channel 6
S-0-2149	Parameter 6 Output-channel 6
S-0-2150	Input-channel container 6
S-0-2151	Channel type Input-channel 6
S-0-2152	ID list Input-channel 6
S-0-2153	Parameter 0 Input-channel 6
S-0-2154	Parameter 1 Input-channel 6
S-0-2155	Parameter 2 Input-channel 6

S-0-2156	Parameter 3 Input-channel 6
S-0-2157	Parameter 4 Input-channel 6
S-0-2158	Parameter 5 Input-channel 6
S-0-2159	Parameter 6 Input-channel 6
S-0-2160	Output-channel container 7
S-0-2161	Channel type Output-channel 7
S-0-2162	ID list Output-channel 7
S-0-2163	Parameter 0 Output-channel 7
S-0-2164	Parameter 1 Output-channel 7
S-0-2165	Parameter 2 Output-channel 7
S-0-2166	Parameter 3 Output-channel 7
S-0-2167	Parameter 4 Output-channel 7
S-0-2168	Parameter 5 Output-channel 7
S-0-2169	Parameter 6 Output-channel 7
S-0-2170	Input-channel container 7
S-0-2171	Channel type Input-channel 7
S-0-2172	ID list Input-channel 7
S-0-2173	Parameter 0 Input-channel 7
S-0-2174	Parameter 1 Input-channel 7
S-0-2175	Parameter 2 Input-channel 7
S-0-2176	Parameter 3 Input-channel 7
S-0-2177	Parameter 4 Input-channel 7
S-0-2178	Parameter 5 Input-channel 7
S-0-2179	Parameter 6 Input-channel 7
S-0-2180	Output-channel container 8
S-0-2181	Channel type Output-channel 8
S-0-2182	ID list Output-channel 8
S-0-2183	Parameter 0 Output-channel 8
S-0-2184	Parameter 1 Output-channel 8
S-0-2185	Parameter 2 Output-channel 8
S-0-2186	Parameter 3 Output-channel 8
S-0-2187	Parameter 4 Output-channel 8
S-0-2188	Parameter 5 Output-channel 8
S-0-2189	Parameter 6 Output-channel 8
S-0-2190	Input-channel container 8
S-0-2191	Channel type Input-channel 8
S-0-2192	ID list Input-channel 8
S-0-2193	Parameter 0 Input-channel 8
S-0-2194	Parameter 1 Input-channel 8
S-0-2195	Parameter 2 Input-channel 8
S-0-2196	Parameter 3 Input-channel 8
S-0-2197	Parameter 4 Input-channel 8
S-0-2198	Parameter 5 Input-channel 8
S-0-2199	Parameter 6 Input-channel 8

S-0-2200	Output-channel container 9
S-0-2201	Channel type Output-channel 9
S-0-2202	ID list Output-channel 9
S-0-2203	Parameter 0 Output-channel 9
S-0-2204	Parameter 1 Output-channel 9
S-0-2205	Parameter 2 Output-channel 9
S-0-2206	Parameter 3 Output-channel 9
S-0-2207	Parameter 4 Output-channel 9
S-0-2208	Parameter 5 Output-channel 9
S-0-2209	Parameter 6 Output-channel 9
S-0-2210	Input-channel container 9
S-0-2211	Channel type Input-channel 9
S-0-2212	ID list Input-channel 9
S-0-2213	Parameter 0 Input-channel 9
S-0-2214	Parameter 1 Input-channel 9
S-0-2215	Parameter 2 Input-channel 9
S-0-2216	Parameter 3 Input-channel 9
S-0-2217	Parameter 4 Input-channel 9
S-0-2218	Parameter 5 Input-channel 9
S-0-2219	Parameter 6 Input-channel 9
S-0-2220	Output-channel container 10
S-0-2221	Channel type Output-channel 10
S-0-2222	ID list Output-channel 10
S-0-2223	Parameter 0 Output-channel 10
S-0-2224	Parameter 1 Output-channel 10
S-0-2225	Parameter 2 Output-channel 10
S-0-2226	Parameter 3 Output-channel 10
S-0-2227	Parameter 4 Output-channel 10
S-0-2228	Parameter 5 Output-channel 10
S-0-2229	Parameter 6 Output-channel 10
S-0-2230	Input-channel container 10
S-0-2231	Channel type Input-channel 10
S-0-2232	ID list Input-channel 10
S-0-2233	Parameter 0 Input-channel 10
S-0-2234	Parameter 1 Input-channel 10
S-0-2235	Parameter 2 Input-channel 10
S-0-2236	Parameter 3 Input-channel 10
S-0-2237	Parameter 4 Input-channel 10
S-0-2238	Parameter 5 Input-channel 10
S-0-2239	Parameter 6 Input-channel 10
S-0-2240	Output-channel container 11
S-0-2241	Channel type Output-channel 11
S-0-2242	ID list Output-channel 11
S-0-2243	Parameter 0 Output-channel 11

S-0-2244	Parameter 1 Output-channel 11
S-0-2245	Parameter 2 Output-channel 11
S-0-2246	Parameter 3 Output-channel 11
S-0-2247	Parameter 4 Output-channel 11
S-0-2248	Parameter 5 Output-channel 11
S-0-2249	Parameter 6 Output-channel 11
S-0-2250	Input-channel container 11
S-0-2251	Channel type Input-channel 11
S-0-2252	ID list Input-channel 11
S-0-2253	Parameter 0 Input-channel 11
S-0-2254	Parameter 1 Input-channel 11
S-0-2255	Parameter 2 Input-channel 11
S-0-2256	Parameter 3 Input-channel 11
S-0-2257	Parameter 4 Input-channel 11
S-0-2258	Parameter 5 Input-channel 11
S-0-2259	Parameter 6 Input-channel 11
S-0-2260	Output-channel container 12
S-0-2261	Channel type Output-channel 12
S-0-2262	ID list Output-channel 12
S-0-2263	Parameter 0 Output-channel 12
S-0-2264	Parameter 1 Output-channel 12
S-0-2265	Parameter 2 Output-channel 12
S-0-2266	Parameter 3 Output-channel 12
S-0-2267	Parameter 4 Output-channel 12
S-0-2268	Parameter 5 Output-channel 12
S-0-2269	Parameter 6 Output-channel 12
S-0-2270	Input-channel container 12
S-0-2271	Channel type Input-channel 12
S-0-2272	ID list Input-channel 12
S-0-2273	Parameter 0 Input-channel 12
S-0-2274	Parameter 1 Input-channel 12
S-0-2275	Parameter 2 Input-channel 12
S-0-2276	Parameter 3 Input-channel 12
S-0-2277	Parameter 4 Input-channel 12
S-0-2278	Parameter 5 Input-channel 12
S-0-2279	Parameter 6 Input-channel 12
S-0-2280	Output-channel container 13
S-0-2281	Channel type Output-channel 13
S-0-2282	ID list Output-channel 13
S-0-2283	Parameter 0 Output-channel 13
S-0-2284	Parameter 1 Output-channel 13
S-0-2285	Parameter 2 Output-channel 13
S-0-2286	Parameter 3 Output-channel 13
S-0-2287	Parameter 4 Output-channel 13

S-0-2288	Parameter 5 Output-channel 13
S-0-2289	Parameter 6 Output-channel 13
S-0-2290	Input-channel container 13
S-0-2291	Channel type Input-channel 13
S-0-2292	ID list Input-channel 13
S-0-2293	Parameter 0 Input-channel 13
S-0-2294	Parameter 1 Input-channel 13
S-0-2295	Parameter 2 Input-channel 13
S-0-2296	Parameter 3 Input-channel 13
S-0-2297	Parameter 4 Input-channel 13
S-0-2298	Parameter 5 Input-channel 13
S-0-2299	Parameter 6 Input-channel 13
S-0-2300	Output-channel container 14
S-0-2301	Channel type Output-channel 14
S-0-2302	ID list Output-channel 14
S-0-2303	Parameter 0 Output-channel 14
S-0-2304	Parameter 1 Output-channel 14
S-0-2305	Parameter 2 Output-channel 14
S-0-2306	Parameter 3 Output-channel 14
S-0-2307	Parameter 4 Output-channel 14
S-0-2308	Parameter 5 Output-channel 14
S-0-2309	Parameter 6 Output-channel 14
S-0-2310	Input-channel container 14
S-0-2311	Channel type Input-channel 14
S-0-2312	ID list Input-channel 14
S-0-2313	Parameter 0 Input-channel 14
S-0-2314	Parameter 1 Input-channel 14
S-0-2315	Parameter 2 Input-channel 14
S-0-2316	Parameter 3 Input-channel 14
S-0-2317	Parameter 4 Input-channel 14
S-0-2318	Parameter 5 Input-channel 14
S-0-2319	Parameter 6 Input-channel 14
S-0-2320	Output-channel container 15
S-0-2321	Channel type Output-channel 15
S-0-2322	ID list Output-channel 15
S-0-2323	Parameter 0 Output-channel 15
S-0-2324	Parameter 1 Output-channel 15
S-0-2325	Parameter 2 Output-channel 15
S-0-2326	Parameter 3 Output-channel 15
S-0-2327	Parameter 4 Output-channel 15
S-0-2328	Parameter 5 Output-channel 15
S-0-2329	Parameter 6 Output-channel 15
S-0-2330	Input-channel container 15
S-0-2331	Channel type Input-channel 15

S-0-2332	ID list Input-channel 15
S-0-2333	Parameter 0 Input-channel 15
S-0-2334	Parameter 1 Input-channel 15
S-0-2335	Parameter 2 Input-channel 15
S-0-2336	Parameter 3 Input-channel 15
S-0-2337	Parameter 4 Input-channel 15
S-0-2338	Parameter 5 Input-channel 15
S-0-2339	Parameter 6 Input-channel 15
P-0-0009	Error Message number
P-0-0777	IO modul identification
P-0-4023	Communication phase 2 transition
P-0-4094	Command Base-Parameter load

8 Error Messages

8.1 List of error messages in SERCOS RECO

F101	Faulty module at slot 1
F102	Faulty module at slot 2
F103	Faulty module at slot 3
F104	Faulty module at slot 4
F105	Faulty module at slot 5
F106	Faulty module at slot 6
F107	Faulty module at slot 7
F108	Faulty module at slot 8
F109	Faulty module at slot 9
F110	Faulty module at slot 10
F111	Faulty module at slot 11
F112	Faulty module at slot 12
F113	Faulty module at slot 13
F114	Faulty module at slot 14
F115	Faulty module at slot 15
F207	Switch to not initialised operating mode
F401	Double MST error shutdown
F402	Double MDT error shutdown
F403	Invalid communication phase shutdown
F404	Error during phase progression
F405	Error during phase regression
F406	Phase switching without ready signal
E410	Device not scanned or device address = 0
E408	Error in the multiplex channel MDT
E409	Error in the multiplex channel AT

9 Examples

9.1 Example 1

The SERCOS-RECO is equiped with 2 x 32 bit, 2 x 16 bit outputs and 2 x 32 bit, 1 x 16 bit inputs.

SERCOS-RECO	Module type	Module identification
Slot 0	RMK02.2-LWL-SER	$3240
Slot 1	RMA 02.2-32-DC024-050	$1004
Slot 2	RME 02.2-32-DC024	$1040
Slot 3	RMA 02.2-32-DC024-050	$1004
Slot 4	RME 02.2-32-DC024	$1040
Slot 5	RMA 02.2-16-DC024-200	$1102
Slot 6	RMA 02.2-16-DC024-200	$1102
Slot 7	RME 02.2-16-DC024	$1020

Parameter	**Description**	**Value**
S-0-2001	Max. I/O Data channels	8 Reco Slots
S-0-2002	Occupation I/O Data channel	2030, 2040, 2070, 2080, 2110, 2120, 2140,2170
S-0-2030	Channel container 4 Byte	Slot 0
S-0-2031	Channel type	dig. I/O
S-0-2032	IDN list	2030, 2031, 2032, 2033, 2034
S-0-2033	Occupation inputs	0xFFFF.FFFF
S-0-2034	Occupation outputs	0
S-0-2040	Channel container 4 Byte	Slot 1
S-0-2041	Channel type	dig. I/O
S-0-2042	IDN list	2140, 2141, 2142, 2143, 2144
S-0-2043	Occupation inputs	0
S-0-2044	Occupation outputs	0xFFFF.FFFF
S-0-2070	Channel container 4 Byte	Slot 2
S-0-2071	Channel type	dig. I/O
S-0-2072	IDN list	2070, 2071, 2072, 2073,2074
S-0-2073	Occupation inputs	0xFFFF.FFFF
S-0-2074	Occupation outputs	0
S-0-2080	Channel container 4 Byte	Slot 3
S-0-2081	Channel type	dig. E/A
S-0-2082	IDN list	2080, 2081, 2082, 2083, 2084
S-0-2083	Occupation inputs	0
S-0-2084	Occupation outputs	0xFFFF.FFFF
S-0-2110	Channel container 4 Byte	Slot 4
S-0-2111	Channel type	dig. E/A

S-0-2112	IDN list	2110, 2111, 2112, 2113, 2114
S-0-2113	Occupation inputs	0xFFFF.FFFF
S-0-2114	Occupation outputs	0
S-0-2120	Channel container 2 Byte	Slot 5
S-0-2121	Channel type	dig. I/O
S-0-2122	IDN-Liste	2120, 2121, 2122, 2123, 2124
S-0-2123	Occupation inputs	0
S-0-2124	Occupation outputs	0x0000.FFFF
S-0-2140	Channel container 2 Byte	Slot 6
S-0-2141	Channel type	dig. I/O
S-0-2142	IDN list	2140, 2141, 2142, 2143, 2144
S-0-2143	Occupation inputs	0
S-0-2144	Occupation outputs	0x0000.FFFF
S-0-2170	Channel container 2 Byte	Slot 7
S-0-2171	Channel type	dig. I/O
S-0-2172	IDN list	2170, 2171, 2172, 2173, 2174
S-0-2173	Occupation inputs	0x0000.FFFF
S-0-2174	Occupation outputs	0

Fig. 9-34: Example 1 paramter list

9.2 Error and Status Information

Error	Status	SLOT / No		
31-24	23-16	15 - 8	7 - 0	Bit No
$00	$00	$00	$00	invalid I/Os
$80	$00	$00	$00	valid I/Os
$40	$00	$00	$01	Error at RMK02.2, Slot 0, software error
		Bit per Slot		
$20	$00	$01	$00	Modul faulty, at Slot 8
$80	$01	$00	$18	24V missing at Slot 3 and 4
		Slot	No	
$80	$02	$01	$01	valid I/Os, module status, Slot 1, parity error
$80	$02	$02	$02	valid I/Os, module status, Slot 2, framing error
$80	$02	$03	$03	valid I/Os, module status, Slot 3, overrun error

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Kundenbetreuungsstellen - Sales & Service Facilities

Deutschland – Germany

vom Ausland: (0) nach Landeskennziffer weglassen!!
from abroad: don't dial (0) after country code!

Vertriebsgebiet Mitte Germany Centre ☒V/S ☒ Service	Vertriebsgebiet Ost Germany East ☒V/S ☒ Service	Vertriebsgebiet West Germany West ☒V/S ☒ Service	Vertriebsgebiet Nord Germany North ☒V/S ☐ Service
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Kundenbetreuungsstellen in Deutschland - Service agencies in Germany

Europa – Europe

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Europäische Kundenbetreuungsstellen (ohne Deutschland)
European Service agencies (without Germany)

Außerhalb Europa – outside Europe

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Argentina ☒V/S ☐ Service

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e-mail: **Fehler! Textmarke nicht definiert.**net
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Kundenbetreuungsstellen außerhalb Europa - Service agencies outside Europe

Außerhalb Europa / USA – outside Europe / USA

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