R500MAP Computer Interface Module
Module Description

Edition 101

CL400 / CL500

R500MAP Computer Interface Module
Module Description

1070 072 158-101 (96.10) GB

© 1996

by Robert Bosch GmbH, Erbach / Germany
All rights reserved, including applications for protective rights.
Reproduction or distribution by any means subject to our prior written
permission.

Discretionary charge 20,- DM

1   Safety Instructions

Before you start working with the module R500MAP, we recommend that you thoroughly familiarize yourself with the contents of this manual. Keep this manual in a place where it is always accessible to all users.

1.1   Proper use

This instruction manual presents a comprehensive set of instructions and information required for the standard operation of the described products.

The products described hereunder

- were developed, manufactured, tested and documented in accordance with the relevant safety standards. In standard operation, and provided that the specifications and safety instructions relating to the project phase, installation and correct operation of the product are followed, there should arise no risk of danger to personnel or property.

- are certified to be in full compliance with the requirements of the

  - COUNCIL DIRECTIVE 89/336/EEC of May 3rd 1989 on the ap-proximation of the laws of the Member States relating to electro-magnetic compatibility, 93/68/EEC (amendments of Directives), and 93/44/EEC (relating to machinery)

  - COUNCIL DIRECTIVE 73/23/EEC (electrical equipment designed for use within certain voltage limits)

  - Harmonized standards EN 50081–2 and EN 50082–2

- are designed for operation in an industrial environment (Class A emis-sions). The following restrictions apply:

  - No direct connection to the public low–voltage power supply is permitted.

  - Connection to the medium and/or high–voltage system must be provided via transformer.

  The following applies for application within a personal residence, in business areas, on retail premises or in a small–industry setting:

  - Installation in a control cabinet or housing with high shield attenua-tion.

  - Cables that exit the screened area must be provided with filtering or screening measures.

  - The user will be required to obtain a single operating license issued by the appropriate national authority or approval body. In Germany, this is the Federal Institute for Posts and Telecommunications, and/or its local branch offices.

$\Rightarrow$ **This is a Class A device. In a residential area, this device may cause radio interference. In such case, the user may be required to intro-duce suitable countermeasures, and to bear the cost of the same.**

Proper transport, handling and storage, placement and installation of the product are indispensable prerequisites for its subsequent flawless serv-ice and safe operation.

1.2 Qualified personnel

This instruction manual is designed for specially trained personnel. The relevant requirements are based on the job specifications as outlined by the ZVEI and VDMA professional associations in Germany. Please refer to the following German–Language publication:
Weiterbildung in der Automatisierungstechnik
Publishers: ZVEI and VDMA Maschinenbau Verlag
Postfach 71 08 64
60498 Frankfurt/Germany

Interventions in the hardware and software of our products not described in this instruction manual may only be performed by our skilled personnel.

Unqualified interventions in the hardware or software or non–compliance with the warnings listed in this instruction manual or indicated on the product may result in serious personal injury or damage to property.

Installation and maintenance of the products described hereunder is the exclusive domain of trained electricians as per IEV 826–09–01 (modified) who are familiar with the contents of this manual.

Trained electricians are persons of whom the following is true:

- They are capable, due to their professional training, skills and expertise, and based upon their knowledge of and familiarity with applicable technical standards, of assessing the work to be carried out, and of recognizing possible dangers.

- They possess, subsequent to several years' experience in a comparable field of endeavour, a level of knowledge and skills that may be deemed commensurate with that attainable in the course of a formal professional education.

With regard to the foregoing, please read the information about our comprehensive training program. The professional staff at our training centre will be pleased to provide detailed information. You may contact the centre by telephone at (+49) 6062 78–258.

1.3 Safety markings on components

DANGER! High voltage!

DANGER! Corrosive battery acid!

CAUTION! Electrostatically sensitive components!

Disconnect mains power before opening!

Lug for connecting PE conductor only!

Functional earthing or low–noise earth only!

Screened conductor only!

1.4 Safety instructions in this manual

DANGEROUS ELECTRICAL VOLTAGE
This symbol warns of the presence of a **dangerous electrical voltage**. Insufficient of lacking compliance with this warning can result in **personal injury.**

DANGER
This symbol is used wherever insufficient or lacking observance of this instruction can result in **personal injury.**

CAUTION
This symbol is used wherever insufficient or lacking observance of instructions can result in **damage to equipment or data files.**

$\Rightarrow$ This symbol is used to alert the user to an item of special interest.

1.5 Safety instructions for the described product

DANGER
Fatal injury hazard through ineffective Emergency–OFF devices!
Emergency–OFF safety devices must remain effective and accessible during all operating modes of the system. The release of functional locks imposed by Emergency–OFF devices must never be allowed to cause an uncontrolled system restart! Before restoring power to the system, test the Emergency–OFF sequence!

DANGER
Danger to persons and equipment!
Test every new program before operating the system!

DANGER
Retrofits or modifications may interfere with the safety of the products described hereunder!

The consequences may be severe personal injury or damage to equipment or the environment. Therefore, any system retrofitting or modification utilizing equipment components from other manufacturers will require express approval by Bosch.

DANGEROUS ELECTRICAL VOLTAGE
Unless described otherwise, maintenance procedures must always be carried out only while the system is isolated from the power supply. During this process, the system must be blocked to prevent an unauthorized or inadvertent restart.

If measuring or testing procedures must be carried out on the active system, these must be carried out by trained electricians.

CAUTION
Danger to the module!
Do not insert or remove the module while the controller is switched ON! This may destroy the module. Prior to inserting or removing the module, switch OFF or remove the power supply module of the controller, external power supply and signal voltage!

CAUTION
Only Bosch–approved spare parts may be used!

> **CAUTION**
> **Danger to the module!**
> **All ESD protection measures must be observed when using the module! Prevent electrostatic discharges!**

Observe the following protective measures for electrostatically endangered modules (EEM)!

- The Employees responsible for storage, transport and handling must be trained in ESD protection.
- EEMs must be stored and transported in the protective packaging specified.
- Out of principle, EEMs may be handled only at special ESD work stations equipped for this particular purpose.
- Employees, work surfaces and all devices and tools that could come into contact with EEMs must be on the same potential (e.g. earthed).
- An approved earthing wrist strap must be worn. It must be connected to the work surface via a cable with integrated 1 MW resistor.
- EEMs may under no circumstances come into contact with objects susceptible to accumulating an electrostatic charge. Most items made of plastic belong to this category.
- When installing EEMs in or removing them from an electronic device, the power supply of the device must be switched OFF.

1.6   Trademarks

All trademarks referring to software that is installed on Bosch products when shipped from the factory represent the property of their respective owners.

At the time of shipment from the factory, all installed software is protected by copyright. Software may therefore be duplicated only with the prior permission of the respective manufacturer or copyright owner.

MS–DOS® and Windows™ are registered trademarks of Microsoft Corporation.

2   Introduction

The R500MAP interface module is the interface between the PLC CL400/CL500 and the MAP-on-Ethernet networks.

Up to four central processing units of the CL400/CL500 multi-processor system can exchange data with external MAP communication partners via an R500MAP interface module.

The R500MAP interface module is operated in the basic unit of the CL400/CL500.

The R500MAP is a double width module which therefore occupies two slots in the basic unit of the CL400/CL500.
The R500MAP interface module fits flush with the CL400/500 standard modules!

The interface for PLC software is comprised of the standard function modules which are also used for all other CL400/CL500 interface modules.

The R500MAP interface module is configured in a very user-friendly manner with the Bosch MAP configurator.

The R500MAP interface module features suitable status displays and a diagnostic connector for a problem-free start-up.

2.1   Compatibility between the R500M-EN and R500MAP

The following compatibility between the R500M-EN and R500MAP interface modules is ensured:
- Functionally compatible
- R500MAP interface module features more powerful hardware
- R500MAP interface module can be expanded to include new services
- MMS-EASE protocol stack on the R500MAP interface module supplied by SISCO

2.2   Copyright

3 Hardware

3.1   Front Panel
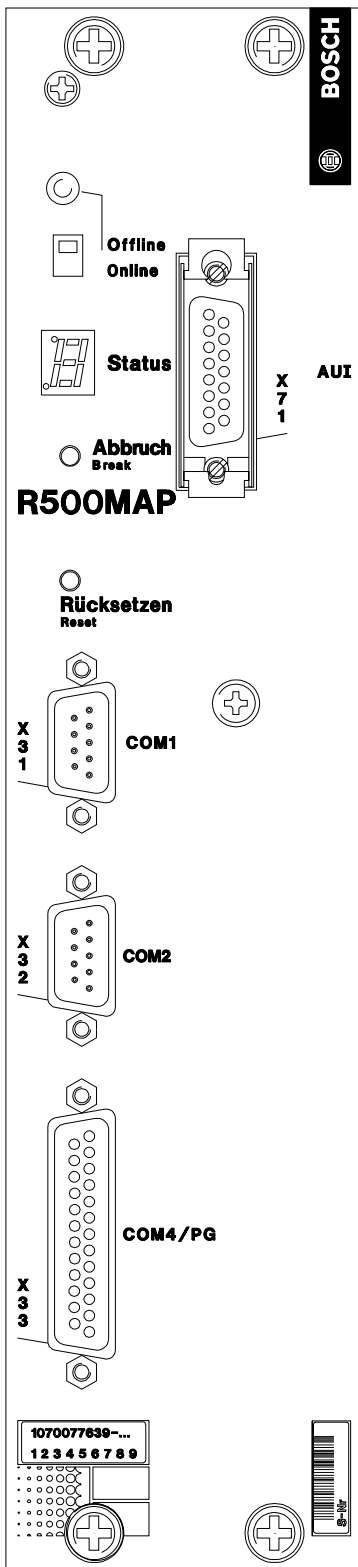
3.2   Elements on the Front Panel

- Off-line/on-line slide switch and associated LED

- Status display

- TERMINATE button

- RESET button

- Female DB-15 connector according to Ethernet Standard AUI X71

- Female DB-25 connector, PG/COM4, X33

- Female DB-9 connector, COM1

- Female DB-9 connector, COM2

3.2.1   R500MAP Serial Interfaces

The R500MAP interface module features the following serial interfaces:

- AUI interface, X71

- PG/COM4 interface

- COM1 interface

- COM2 interface

3.2.1.1   AUI Interface

The AUI interface is the standardised Ethernet interface. The AUI interface connects the AUI cable to the external transceiver. Suitable micro-transceivers can also be connected directly to the AUI connector.

AUI-interface signal assignment:

Pin no.	Designation
1	CNTRL-IN shield
2	CNTRL-IN + (A)
3	Transmit data + (A)
4	Receive shield
5	Receive data + (A)
6	Power return (VC)
7	Control-OUT (A)
8	Control-OUT shield
9	CNTRL-IN - (B)
10	Transmit - (B)
11	Transmit shield
12	Receive - (B)
13	+12V (VP)
14	Voltage shield
15	Control-OUT (B)

In addition, the outer shield of the AUI cable is connected to the R500MAP housing via the hood and slide lock.
The max. permitted length of the cable between the AUI interface of the R500MAP and the transceiver is 50 m.

Warning: The inner shields (Pin 1, 4, 8, 11, 14) in the AUI cable must NOT be connected to the outer shield of the AUI cable! Otherwise, the interference resistance of the system would be considerably impaired.

3.2.1.2   PG/COM4 Interface

The PG/COM4 interface loads the configuration data into the R500MAP. The configuration data can only be loaded when the Bosch MAP configurator is connected to this interface.
This interface can also be used to output trace messages from the integrated MAP protocol monitor to a standard terminal or to a PC. These trace messages provide information on the current status of the Ethernet interface while the R500MAP interface module is operating.

The pin assignment of the PG/COM4 interface corresponds to the Bosch PLC standard for serial interfaces:

V24 Interface

The voltage levels of the signals and the assignment of the connectors satisfy the VDI guidelines 2880, Page 2, for programmable logic controllers and process and data interfaces.

Signal levels (data transmission line):

    logic 1 --> -15V to -3V
    logic 0 --> +3V to +15V

Signal levels (signal and control lines):

    active   --> +3V to +15V
    passive --> -15V to -3V

Meaning	Designation	Pin no.	Signal direction
Shield	Shield	*	
PLC Transmit Data	TxD	2	-->
PLC Receive Data	RxD	3	<--
Signal Ground	Signal-Ground	7	
Data Set Ready	DSR	6	<--
Data Terminal Ready	DTR	20	-->

*: The shield is attached to the metal housing of the male DB connector.

20 mA Interface

Signal levels and assignment of the connectors satisfy the VDI guidelines 2880, Page 2 for programmable logic controllers and process and data interfaces (restriction: max. blocking voltage 27 V). Depending on the pin assignment, the 20 mA interfaces can be enabled, i.e. with a power source, or disabled.

Line statuses: logic 1 --> 20 mA
                    logic 0 --> no power

20 mA enabled

Meaning	Designation	Pin no.	Signal direction
Shield	Shield	*	
Receive Data + PLC	RxD +	12	<--
Receive Data - PLC	RxD -	24	
Transmit Data + PLC	TxD +	13	-->
Transmit Data - PLC	TxD -	25	
Data Set Ready +	DSR +	14	<--
Data Set Ready -	DSR -	18	
Reader Control +	RDRCTL +	16	-->
Reader Control -	RDRCTL -	21	

*: The shield is attached to the metal housing of the male DB connector.

Enable mode requires that Connections 9 (12 V in) and 10 (12 V out) are jumpered.

20 mA disabled

Meaning	Designation	Pin no.	Signal direction
Shield	Shield	*	
Receive Data + PLC	RxD +	22	<--
Receive Data - PLC	RxD -	12	
Transmit Data + PLC	TxD +	23	-->
Transmit Data - PLC	TxD -	13	
Data Set Ready +	DSR +	11	<--
Data Set Ready -	DSR -	14	
Reader Control +	RDRCTL +	19	-->
Reader Control -	RDRCTL -	16	

*: The shield is attached to the metal housing of the male DB connector.

Line length

The maximum permitted line length depends on the baud rate.
The following lengths apply to the Bosch 14 x 0.14 shielded, twisted-pair cable, Bosch no. 1070910152:

Transfer rate	V24	20 mA
Baud rate	m	m
110 to 4800	300	350
9600	300	300
19200	100	150

It is assumed that there are only slight potential differences between the transmitter and receiver (-2 V < Vdiff < +2 V).
It is also assumed that the quality of the partner-device interface modules is at least the same as the R500MAP interface modules.
Do NOT route data transmission lines parallel and adjacent to power lines.

The baud rate and the data format of the PG/COM4 interface is fixed at **9600 bps, without parity, 8 bits, 1 stopbit** for the output of the trace messages to a standard terminal or to a PC.

The Bosch MAP configurator, if connected (Off-line mode), independently specifies a suitable data format for communication with the PG/COM4 interface.

3.2.1.3   COM1 Interface

This interface has no function.

3.2.1.4   COM2 Interface

This interface has no function.

3.2.2   R500MAP Operating Controls

The front panel of the R500MAP interface module features the following operating controls

- RESET button

- On-line/off-line slide switch

- BREAK button

3.2.2.1   RESET Button

The RESET button is used to reset the module if a fault occurs. When the module is reset, all logical connections and all processing jobs are immediately terminated.

If the RESET button is pressed while the On-line/Off-line switch is in the off-line position, the R500MAP interface module must be re-initialised by the R5INIT function module.

3.2.2.2   On-line/Off-line Slide Switch

This switch is used to select the operating mode of the module.

In On-line mode the R500MAP interface module processes centralised and peripheral MAP communication jobs.

In Off-line mode MAP communication jobs are NOT processed. In this operating mode the Bosch MAP configurator loads the configuration data into the R500MAP interface module.

3.2.2.3   BREAK Button

The BREAK button is reserved for internal system functions and must NOT be actuated. This button is recessed in order to prevent unintentional actuation.

3.2.3   R500MAP Display Elements

- Off-line LED

- 7-segment status display

3.2.3.1   Off-line LED

The Off-line LED is illuminated when the R500MAP interface module is in the Off-line mode.

3.2.3.2   7-Segment Status Display

The 7-segment status display indicates error and status messages.

The 7-segment displays are divided into two groups:

- Displays with a decimal point

- Displays without a decimal point

Status display encoded with a decimal point

Displays which include a decimal point identify statuses or faults in the
MAP protocol software of the R500MAP interface module.

Fault and status displays which include a decimal point during the start
sequence of the R500MAP interface module.

.0	No or invalid configuration data. Procedure: Reload configuration data.
.1	No or invalid CCL (Channel Configuration List). Procedure: Reload configuration data.
.2	No or invalid OD (Object Dictionary). Procedure: Reload configuration data.
.3	No or invalid NL (Name List). Procedure: Reload configuration data.
.4	The station parameters for the MAP controller are invalid or could not be transferred. Procedure: Press the R500MAP RESET button
.5	No or invalid addressing information (umap_2.dir, umap2_rte) or the MAP controller could not be started (MAPGO ended with error(s)). Procedure: Press the R500MAP RESET button
.6	Interface driver (Syscom) has initialisation fault. Procedure: Press the R500MAP RESET button
.7	Start of R500MAP interface module terminated, as DOS commands cannot be executed. Module or hard disk defective. Procedure: Replace R500MAP interface module.
.8	Service mode
.9	Inconsistency between the configuration data of the R500MAP and the SC table, e.g. no ZS. Procedure: Check SC table.
.A	Absolute start-up sequence: the MAP stack software is loaded during the initial start-up of the R500MAP interface module Procedure: Wait approx. 2 minutes; temporary status.
.E	Undefined fault Procedure: Contact Bosch Industrial Equipment.
.F	In conjunction with another error code: internal software error. Procedure: Contact Bosch Industrial Equipment and indicate other error code.
.H	Start-up sequence and initialisation of the MAP controller
.U	Time and date could not be transferred from the SK500 because no permissible values were found. Procedure: Set clock on the SK500.
.r	Reset the R500MAP protocol software

Following the R500MAP start-up phase, identified by **.H**, the status display
indicates that three configuration files are being loaded (Propeller):

CCL wird geladen
Tracemonitor ist eingeschaltet
NL wird geladen
OD wird geladen
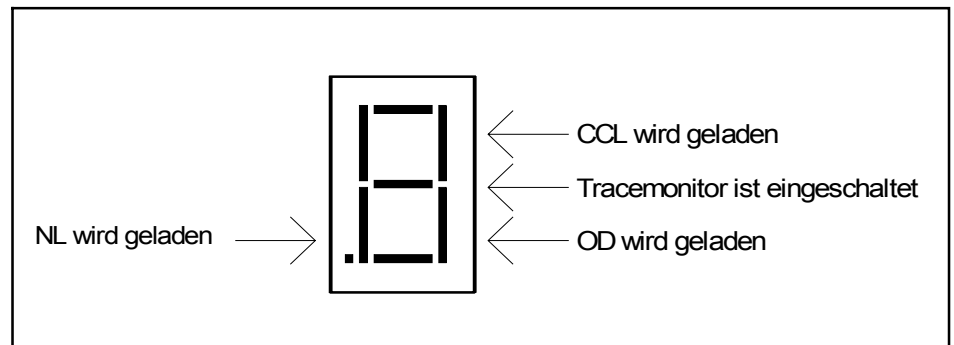
Status displays in On-line mode:

zentraler Auftrag ist
in Bearbeitung

ZS0 ist in Stop

ZS1 ist in Stop

Tracemonitor ist eingeschaltet

ZS2 ist in Stop

ZS3 ist in Stop

Dezimalpunkt
leuchtet

peripherer Auftrag ist
in Bearbeitung
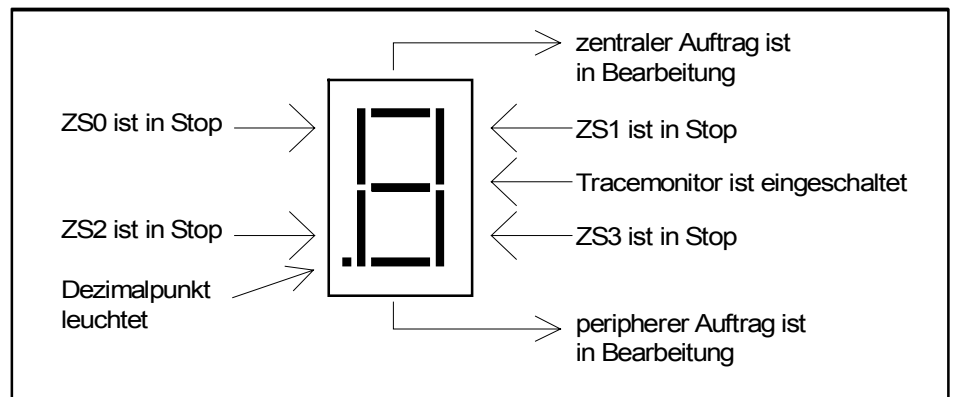
Upper segment illuminated:	At least one centralised job is being processed.
Middle segment illuminated:	R500M protocol monitor is switched ON.
Lower segment illuminated:	At least one peripheral job is being processed
Vertical segment illuminated:	Corresponding ZS is in Stop mode

If several status messages occur simultaneously, the corresponding
segments are also simultaneously switched ON.

The designation of the stop segments is valid when ZS0 to ZS3 have
been entered in the SC table in this sequence as modules 1 to 4, corre-
sponding to VMD (Virtual Manufacturing Device) 1 to 4.
Otherwise, the upper left stop segment refers to the ZS with the lowest
module number (VMD no.), etc.

Status displays in Off-line mode:

.I	The R500MAP is ready to load configuration data from the MAP configurator (I).
.L	Data is being transferred between R500MAP and MAP configurator (L).

Status display encoded without a decimal point
Displays without a decimal point identify statuses or faults in the R500MAP operating system:

0	Hardware problem, possibly due to incorrect selections
3	Communications fault between the R500MAP and system coordinator
b	The R500MAP interface module is in the start-up phase.
b	Flashing b: a fault occurred during the start-up phase of the R500M
C	Synchronisation with the system coordinator in progress.
r	R500MAP RESET button was actuated.

3.3   Hardware Selections

The R500MAP interface module cannot be operated until the block address, which is specified in the SC table, has also been selected on the module.

The block address is selected with the 8-segment S5 DIP switch which is situated underneath the left circuit board; this circuit board also accommodates the plugs for the rear-panel bus. The binary-coded block address is selected with the S5 DIP switch, as for all CL400/CL500 system modules. Multiples of four are permitted for the R500MAP block address. Recommendation: select block addresses $\geq$ 32!

None of the other DIP switches or bridges should be altered.

The S1 DIP switch should only be used to check that the selection is correct and must not be changed:

ON							■	
OFF	1	2	3	4	5	6	7	8

S1 DIP switch

The rocker in Pos. 7 is situated in the upper position on the ON side.

4 Operating Modes

4.1   R500MAP Operating Modes

4.1.1   R500MAP On-line Mode

In On-line mode the R500MAP interface module processes centralised and peripheral MAP communications jobs.
In On-line mode data cannot be exchanged with the MAP configurator.

4.1.2   R500MAP Off-line Mode

MAP communications jobs are not processed in Off-line mode. In this operating mode the Bosch MAP configurator can load configuration data into the R500MAP interface module.
Communications jobs, which the R5REQ function module transfers to the R500MAP interface module in Off-line mode, are stored in the module but are not processed until On-line mode is actuated.

4.1.3   Changing the R500MAP Operating Mode

If On-line mode is changed to Off-line mode, all jobs which are being processed are completed and then all logical connections are released.
Off-line mode cannot be changed to On-line mode unless previously valid configuration data has been loaded by the MAP configurator.

4.2   CL400/CL500 Operating Modes

The CL400/CL500 has the following operating modes:
- A ZS in Run mode
- A ZS in Stop mode
- System stop

4.2.1   A ZS in Run Mode

When a ZS is in Run mode, the PLC program is processed and can transfer centralised jobs to the R500MAP interface module. The R500MAP interface module can also execute peripheral jobs.

4.2.2   A ZS in Stop Mode

When a ZS is in Stop mode, no PLC programs are processed by this central processing unit. As a result, centralised jobs cannot even be transferred from this ZS to the R500MAP interface module. Peripheral jobs are processed.

The Stop mode of a ZS, which has been specified in the R500MAP configuration, is indicated on the R500MAP status display, provided the R500MAP interface module is in On-line mode.

4.2.3   Changing the Operating Mode of a ZS

Changing from Run mode to Stop mode causes all logical connections to be released which were set up by this ZS. All logical connections to the ZS which were set up by the communication partner remain in tact. Centralised jobs which are already being processed are ended. Jobs which have already been transferred to the R500MAP interface module, but which are still waiting to be processed, are terminated and a corresponding error message is output.

Whenever a ZS is switched over to Stop mode, the relevant Stop segment on the R500MAP status display must light up before the ZS can be switched back into Run mode.

4.2.4   System Stop

When the SK500 is in Stop mode, the R500MAP interface module cannot process any centralised jobs.

The R500MAP interface module functions as if all the central processing units have been individually switched to Stop mode.

Peripheral jobs are processed without restriction.

5 MAP Transfer Protocol

MAP (Manufacturing Automation Protocol) is an unrestricted, manufacturer-independent industrial standard.

The MAP protocol of the R500MAP interface module is implemented the same as Version 3.0. Companion standards have not been considered, as these were not adequately stable at the time the R500MAP was developed.

Application of the MAP communications model for the CL400/CL500:

Instead of MAP nomenclature, the Bosch interface-module terms, Centralised job and Peripheral job, are used:

Bosch interface	MAP	Meaning
Centralised job	Client characteristics	Job issued from the PLC program
Peripheral job	Server characteristics	Job issued by the communications partner

The user can access communication objects via the PLC interface, i.e. by means of the Bosch standard function modules for the CL400/CL500 interface modules. Data is exchanged between the R500MAP interface module and the ZS central processing units via the CL400/CL500 system bus.
The R5REQ standard function module transfers centralised jobs to the R500MAP interface module where they are independently processed. Peripheral jobs are processed independently by the R500MAP interface module; the PLC program does not require any function modules or other software procedures (automatic server function). If required, access to communication objects can be controlled by coordination markers.

5.1   Reference between Application Process and Communication Objects

Specifications which are designated during the R500MAP configuration phase and referenced during run time provide the simplest method of accessing communication objects via MAP3.0 in the application process (which is the PLC program of a ZS in the case of the CL400/CL500). These specifications refer mainly to the communication references and communication objects.

5.1.1   Communication References

Application processes communicate with each other via logical connections (communication references).
All logical connections which are required during run time are defined by the Bosch MAP configurator during the configuration phase. Components of this definition include information on the complete address of the communication partner, the 7-context layer, the job monitoring interval, the assigned VMD (virtual manufacturing device, corresponds to a ZS in the CL400/CL500 system), the PDU length and the number of possible simultaneous services.
All communication references of a server are specified in the CCL (channel configuration list). The CCL is a component of the R500MAP configuration data.

5.1.2   Communication Objects

The data areas of a ZS (VMD) which are to be transferred during run time are defined as communication objects by the Bosch MAP configurator during the configuration phase. One of the functions of this definition is to assign the symbolic addressing, recommended in the MMS, to a local index. This index is a number and therefore greatly simplifies handling of the communication object issued by the PLC program; the time-consuming handling procedure, involving symbol names in the PLC program, is therefore avoided. All the communication objects of a server are specified in the OD (object dictionary). The OD is a component of the R500MAP configuration data.

The NL (name list) designates the assignment between the symbolic names of the remote-server communication objects and the local indices in the requesting controller (client). The NL is a component of the R500MAP configuration data.

If the R500MAP interface module is processing a centralised job, the index transferred from the R500MAP to the PLC interface (function module) is replaced by the symbolic name from the name list.
If the R500MAP interface module is processing a peripheral job, the symbolic address received from the network is replaced by the internal physical address and the index from the OD.

5.1.2.1 Coordination Marker

A coordination marker (object sync flag) can be assigned to each communication object. Therefore, when peripheral jobs are being processed, the PLC program can synchronise access to an object. Before a peripheral job is executed, the R500MAP interface module checks the status of the coordination marker. If the status is 0, the object is accessed by the R500MAP interface module. Then the coordination marker is set by the R500MAP interface module.
The R500MAP interface module sets a coordination marker in the I/O state.

If the coordination marker is set to 1, the communication object is not accessed and the service is rejected (object access denied), followed by a MAP error message. The object can only be accessed by the R500MAP interface module when the coordination marker has been reset by the PLC program.

A communication object is designated a coordination marker while the Bosch MAP configurator is implementing the configuration phase of the R500MAP interface module.

5.1.2.2 Data Consistency

All MAP protocol constraints are observed with reference to the data consistency of variable access services .

The following constraints apply to the Read service:

- All read object data comes from exactly one PLC cycle.

The following constraints apply to the Write service:

- All object data which is transferred with a write request is transferred in a block by the R500MAP interface module to the destination data area of the PLC. This block transfer cannot be interrupted by the PLC program.

If several objects are addressed by one service, the data consistency is assured for each object.

Data transferred between the CL400/CL500 and R500MAP interface modules is always out of sync with the I/O state of the PLC for centralised jobs.

Data transferred between the R500MAP and CL400/CL500 interface modules is always in sync with the I/O state of the PLC for peripheral jobs.

The data consistency can also be affected by coordination markers (object-sync. flags).

5.2   MAP Services

By implementing the MAP 3.0 protocol in the PLC of the CL400/CL500, not only the essential services are provided, but also the services which can be used effectively with a PLC:

MMS functions for management of connections (Context Management Services)	
Service	Functionality
Initiate	C/S
Abort	C/S
Conclude	C/S
Reject	S
Cancel	C/S

C	:	Only Client functionality
S	:	Only Server functionality
C/S	:	Client and Server functionality

MMS functions for accessing variables (Variable Access Services)	
Service / Attribute	Functionality
Services	
Read	C/S
Write	C/S
Get variable access attributes	S
Information report	S(1)
Object scope	
AA-specific variables	x
VMD-specific variables	x
Variable access objects	
Named variable object	x
Named type object	x
Data types	
Boolean	x
Bit string	x
Integer 8	x
Integer 16	x
Integer 32	x
Unsigned 8	x
Unsigned 16	x
Unsigned 32	x
Floating point	x
Real (double)	x
Octet string	x
Visible string	x

C   :   Only Client functionality
S   :   Only Server functionality
C/S   :   Client and Server functionality
x   :   Supported
(1)   :   Requester functionality

MMS functions for management of virtual device (VMD Support Services)	
Service	Functionality
Status	C/S
Unsolicited status	C/S
Identify	C/S

C/S   :   Client and Server functionality

MMS Parameters and Options (Implementation Class Parameter CBB Table)	
Parameter	Functionality
Nesting level (NEST)	5
Named address (VNAM)	x
Arrays (STR1)	x

x   :   Supported

General Features of the R500MAP Interface Module	
Parameter	Functionality
MMS protocol monitor	available
Max. number of types	99 (1)
Max. number of communication objects	200 (1)
Max. number of parallel connections	32 (1)
Max. PDU length in bytes	8K (1)
Max. number of outstanding services	16 (1)
Max. number of supported VMDs	4 (1)
Available memory	350K

x   :   Supported
(1)   :   Depends on available memory

Restrictions:

- The Visible string type may be used in structures only up to nesting level 2.

- Bit strings must be in multiples of 8.

6 R500MAP Protocol Monitor

The R500MAP interface module features an integrated protocol monitor which displays all the interactions of the R500MAP as plain text messages (trace messages) on the Layer 7 protocol level (MMS). The protocol monitor also allows access to statistics which are internally controlled by the R500MAP interface module.

The integrated protocol monitor facilitates the start-up sequence of the R500MAP interface module and can often dispense with the need for a network analyser.

When the R500MAP interface module is started up, the protocol monitor is automatically switched ON which then provides information on the loading of the configuration data. When the start sequence is complete, the protocol monitor is automatically switched OFF.

The trace messages can be output from the integrated MAP protocol monitor to a standard terminal or to a PC which features a terminal emulation program.

The baud rate and the data format of the PG/COM4 interface is fixed at **9600 bps, without parity, 8 bits, 1 stopbit** for the output of the trace messages.

Activation, deactivation, selection of the trace mode, selection of the trace level and activation of the statistics output are implemented by prompted dialogue via the keyboard of the connected device.

If **T** or **t** is input while the R500MAP interface module is in on-line mode, the protocol-monitor selection menu is displayed. The listed options are selected by prompted dialogue with the user.

Selections can be modified at any time.

Permitted input is **J** or **j** for yes, **N** or **n** for no, followed by **ENTER**, or just **ENTER,** to retain the current status displayed in the left column.

6.1 Selections

6.1.1 Switch ON Protocol Monitor

- The protocol monitor is activated, followed by prompted dialogue with the user to select the operating mode and output level.
  All messages on the protocol monitor include information on the date and time of the reported event.
  When the protocol monitor is switched ON, the processing speed of the R500MAP interface module is reduced, enabling the clear-text messages to be output at 9600 bps.

6.1.2 Switch OFF Protocol Monitor

- The protocol monitor is deactivated. When the protocol monitor is deactivated, the R500MAP interface module operates at maximum speed.

6.2   Operating Modes

6.2.1   Toggle Mode

- If a trace message is output, processing is discontinued until **C** or **c** for CONTINUE is input via the keyboard.

6.2.2   Run Mode

- All trace messages are continuously output (normal mode).

6.3   Output Level

6.3.1   All Messages

All messages are displayed which are generated by the MMS protocol monitor.

Output additional information
- Service-specific information (object name, type, index, scope) is also displayed.

Output data
- Useful data is also displayed.

6.3.2   Only Error Messages

Only error messages are displayed, including Abort, Conclude and Reject services. All services which have a negative result, as well as error messages from the Lower Layer and Exceptions, are displayed.

6.4   Output Statistics

The R500MAP interface module records statistics on the interactions which occur at the MMS interface. These statistics can be output via the protocol monitor. The statistics, which refer to the connection, record the number of positive and negative centralised jobs, the number of peripheral jobs, the number of Initiate and Abort services and the current status of the connection. There are three connection statuses:

CON	(CONNECT)	:	The connection has been set up
DIS_CON	(DISCONNECT)	:	The connection has been released
PEND	(PENDING)	:	The connection is being set up or released

The node name, the MAC address, the network address and the release of the configuration file are also displayed.

6.4.1   Reset

The statistics counters are reset to zero.

7 PLC Interface

Four standard function modules are available as a PLC interface. These modules are identical for all CL400/CL500 interface modules. They initialise the modules, initiate and monitor centralised jobs and identify peripheral jobs.
The modules are initialised by the R5INIT function module.
Centralised jobs are initiated by the R5REQ function module and monitored by the R5CON module.
The R5IND function module can also be used for providing information on incoming peripheral jobs.

The execution of peripheral jobs can also be controlled by the coordination markers.

The function modules are only required for centralised jobs. Peripheral jobs can be processed without any procedures in the user program.

8 R5INIT Function Module

Before centralised jobs can be initiated, the R500MAP interface module must be initialised by the R5INIT function module.
This module must run only once following start-up of the PLC. It is therefore advisable to call up the module in the OM5 and OM7 start-up OMs.
A single call-up of the R5INIT function module initialises all R500x interface modules in the CL400/CL500 system; the addresses of all modules which are to be initialised are transferred by parameter to the R5INIT.
If centralised jobs are to be initiated by different central processing units via one interface module, the R5INIT function module must be called up once in each of the relevant central processing units.

Parameterisation:

The R5INIT function module has five input parameters and one output parameter.

```
P0 ─────────┐
            │   ┌──────────────┐
P1 ─────────┤   │              │
            │   │              │
P2 ─────────┤   │   R5INIT     │
            │   │              │         P5
P3 ─────────┤   │              │─────────────
            │   │              │
P4 ─────────┘   └──────────────┘
```
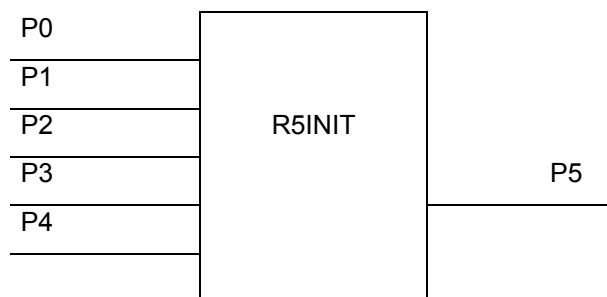
8.1   Input Parameters

P0	(Word)	:	Module number of interface card 0
P1	(Word)	:	Module number of interface card 1
P2	(Word)	:	Module number of interface card 2
P3	(Word)	:	Module number of interface card 3
P4	(Word)	:	Module number of interface card 4

The module number corresponds to the entry in the SC table.
The interface-card number can be freely assigned to the module number. The PLC user program will then use just the interface-card number. If the module numbers are altered in the SC table, only the assignment of the module number to the interface-card number requires alteration during parameterisation of the R5INIT function module; the rest of the user program does not require modification.

Example:

The parameter

• P0   W   K8H

denotes that the interface module specified in the eighth line of the SC table is now addressed as interface card no. 0 in the PLC program.

8.2   Output Parameter

P5	(Word)	Result

This parameter provides the PLC program with the result of the initialisation process and signals any errors:

P5 code	Meaning
0000H	Initialisation process ended error-free
0001H	No interface card according to P0
0002H	No interface card according to P1
0004H	No interface card according to P2
0008H	No interface card according to P3
0010H	No interface card according to P4
0020H	No free memory location
0021H	No data field address in the memory management list, possibly unsuitable ZS version
0030H	Communications fault on the interface module
0031H	Communications fault on the ZS
0092H	Parameter fault during the call-up procedure

9 R5REQ Function Module

Centralised jobs are initiated from the PLC program by calling up the R5REQ function module. This module transfers the job parameters to the interface module and issues a checkback signal to the PLC program to indicate whether the job was transferred correctly to the R500MAP interface module.

Parameterisation:

The R5REQ function module has four input and two output parameters.

```
P0 ─────────────┐
                │   ┌──────────────┐
P1 ─────────────┤   │              │
                │   │              │
P2 ─────────────┤   │    R5REQ     │────────── P4
                │   │              │
P3 ─────────────┘   │              │────────── P5
                    └──────────────┘
```
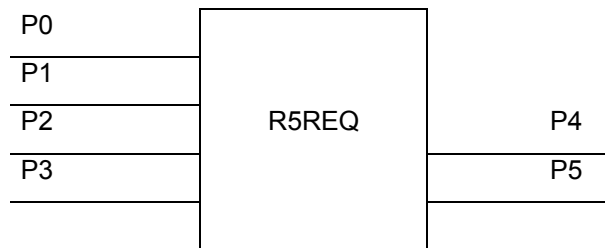
9.1   Input Parameters

P0	(Word)	Data type
P1	(Word)	Data-type attribute
P2	(Word)	Address offset
P3	(Word)	Job bit array

Parameters P0 to P2:

The parameters which specify a job which is to be initiated are not transferred directly to the R5REQ.
These job parameters are each blocks of 16 words located in a selectable data area DM, DF or DB.
The R5REQ parameters P0 to P2 act as a pointer to the start of this data area:

P0: The type of data area is specified in this parameter.

Possible entries are:
- 44H for data module,
- 43H for data field and
- 64H for data buffer

P1: If the type of data module is specified in P0, the data module number is specified in this parameter, otherwise: FFFFH.

P2: This parameter specifies the start address (byte offset) of the selected data area

P3: Job bit array:

Each of the 16 bits of this parameter refers to a block of job parameters in the data area specified by P0 to P2.
Bit 0 of P3 therefore refers to the 0 job parameter block, Bit 15 refers to the 15th. job parameter block in the specified data area.
A set bit in P3 denotes the start of the job specified in the associated job parameter block.
If several bits are set simultaneously, the associated jobs are transferred in the same cycle to the R500MAP interface module.
When the R5REQ with set job bits has undergone a single cycle, the job has completely started. The job bits must then be reset by the user program.

9.2   Output Parameters

P4	(Word)	Error message
P5	(Word)	Result bit array

P4: Basic status and error codes, which are identified by the R5REQ function module when jobs are issued, are entered in this parameter:
- The LOW byte of the P4 contains the status or error code,
- The HIGH byte contains an encoded recommendation for a response.

Error code in the LOW byte:

Code	Meaning
00H	No error, correct call-up
01H	The P3 JBA (job bit array) parameter is zero
02H	The specified data module is not available
03H	The specified data range is too short
04H	The specified byte offset is invalid
06H	Wrong SFL, unsuitable ZS version
07H	R500MAP has not been entered in the SC table
08H	R500MAP has wrong block address

PLC response in the HIGH byte:

Code	Meaning
00H	No error, correct call-up
01H	Repeat R5REQ call-up
02H	Modify PLC program
03H	Modify protocol parameter(s)
04H	The program cycle must be rerun on the R5INIT function module
05H	The program cycle must be rerun on the R5REQ function module
06H	The program cycle must be rerun on the R5CON function module
07H	Reserved, not relevant for the R500MAP

Any other error messages which are identified by the R5REQ function module when a job starts are written by the R5REQ to the zero word of the associated job block.

P5: Result bit array
This array informs the user whether any errors were identified when the jobs were being issued; a job is assigned to each result bit. The assignment corresponds to the assignment for the P3 input parameter. A set result bit indicates that the job which is addressed with the same bit number in P3 could not be issued. A detailed error code is also output in the zero word of the associated job block.

9.3   Explanation of Parameters in the Job Block

A job block with 16 parameters must be reserved for each job in the data field, data module or data buffer.
The start address of the first job block is specified by the R5REQ parameters P0 to P2. Commencing from this start address, a maximum of 16 job blocks, consisting of 16 parameters each, are filed. These parameters represent the 16 jobs which can be started via the particular P3 job bit array of the R5REQ.
Terminology: The 16 parameter words of a job block are designated below as DW0 to DW15, even though they can be located at any address in the DM, DF or DB.

DW0: Job result:

15	8	7	0
PLC response		Status/error code	

Following each call-up of the R5REQ, the status and error messages, which refer to the transfer of the job to the R500MAP interface module, are written to DW0.
A status/error code is transferred in the LOW byte and a PLC response is suggested in the HIGH byte.

LOW byte: Status/error code:

Code	Meaning
00H	Job transferred error-free to the R500MAP
01H	Job being processed
02H	Reserved for R500/R500P
03H	Reserved for R500/R500P
04H	Reserved for R500/R500P
05H	Wrong interface card number
06H	Wrong job number
07H	Job terminated
10H	Interface card no. 0 not initialised
11H	Interface card no. 1 not initialised
12H	Interface card no. 2 not initialised
13H	Interface card no. 3 not initialised
14H	Interface card no. 4 not initialised
20H	Interface card no. 0 not entered in SC-table
21H	Interface card no. 1 not entered in SC-table
22H	Interface card no. 2 not entered in SC-table
23H	Interface card no. 3 not entered in SC-table
24H	Interface card no. 4 not entered in SC-table
30H	Communications fault on the interface module
31H	Communications fault on the ZS
92H	Invalid command parameter
D0H	Reserved for R500/R500P
D1H	Reserved for R500/R500P

HIGH byte: Recommended PLC response:

Code	Meaning
00H	Job transferred error-free to the R500MAP
01H	Call up R5REQ function module again
02H	Modify PLC program
03H	Modify protocol parameter(s)
04H	Call up R5INIT function module again
05H	Call up R5REQ function module again
06H	Call up R5CON function module again
07H	Reserved for R500/R500P

DW1: Number of the interface card according to R5INIT:

15 8	7 0
Number of the interface card	00000000

The number of the interface card, 0 to 4 according to the specification in the R5INIT module, is indicated in the HIGH byte. The LOW byte must contain zero.

DW2: Job number:

15	14				0
0	XXX	XXXX	XXXX	XXXX	

Bits 0 to 14: Job number 0 to 7FFFH,
Bit 15 always 0

The CL400/CL500 interface modules allow up to 16 jobs to start in parallel. The jobs are managed by the individual allocation of job numbers. When referring to a ZS, a job number may only be used once at a time. Another job with the same job number cannot be started until the former job has ended, i.e. until it has been acknowledged by the R5CON function module.

Several centralised jobs which have different job numbers may be started in one PLC cycle. The user must ensure, with reference to a ZS, that not more than 16 jobs are being processed at any one time.

Job numbers from 0 to 7FFFH are permitted, e.g. DM no. can be encoded in the HIGH byte and a 1 from the 16-identifier of the job block can be encoded in the DM in the LOW byte. Many projected jobs can therefore be structured.

There is no compulsory interdependence between the 16 bits of the P3 job bit array with reference to the job number in DW2, i.e. a job, which receives the job number 7FFFH, can be started with the zero bit of the job bit array.

The R5CON function module must retrieve an acknowledgement for each job which is successfully issued, i.e. DW0=0.

DW3: Communication Reference

Local designation and number of the logical connection, via which the job is to be processed.
The CR number is specified by the MAP configurator during the configuration phase.

DW4: Service

This word entry is ASCII-coded and identifies the MAP service which is to be executed. Capital letters and/or their codes should be used:

DW4	MAP-Service
IN	Initiate
AB	Abort
CO	Conclude
CA	Cancel
RE	Read
WR	Write
IR	Information Report
ST	Status
ID	Identify
SS	Set Status
US	Unsolicited Status

DW5 to DW15:

The job parameters DW5 to DW15 depend on the MAP service specified in DW4:

9.3.1 Environment and General Management Services

DW4	IN (Initiate)	AB (Abort)	CO (Conclude)	CA (Cancel)
DW5 to DW15	-	-	-	-

Job parameters DW5 to DW15 are not required for the following MAP services: Initiate, Abort, Conclude and Cancel. Recommended entries: 0.

9.3.2   Variable Access Services

DW4	RE (Read)	WR (Write)	IR (Information Report)
DW5	Index	Index	Index
DW6	Type index	Type index	Type index
DW7	Destination field type	Source field type	-
DW8	Field index	Field index	-
DW9	Byte offset	Byte offset	-
DW10 to DW15	-	-	-

9.3.2.1   Read Service

DW5: Index:

Local identifier for the variable which is to be read for the communication partner.

The index numbers are specified by the MAP configurator during the configuration phase.

DW6: Type index:

Local identifier for the type of variable which is to be read for the communication partner.

The type indices are specified by the MAP configurator during the configuration phase.

DW7: Destination field type:

DW7 indicates the field type of the destination storage area in which the data, which is read by the communication partner, is to be filed.

Permitted:

- 004DH = Marker area

- 0044H = Data module

- 0043H = Data field

- 0064H = Data buffer

DW8: Field index:

Data module number if the data-module field type has been specified in DW7, otherwise: not relevant.

DW9: Byte offset

Address offset in the specified destination data area.

9.3.2.2   Write Service

DW5: Index:

Local identifier for the variable which is to be written for the communication partner.

The index numbers are specified by the MAP configurator during the configuration phase.

DW6: Type index:

Local identifier for the type of variable which is to be written for the communication partner.

The type indices are specified by the MAP configurator during the configuration phase.

DW7: Source field type:

DW7 indicates the field type of the source storage area from which the data, which is to be transmitted to the communication partner, is to be retrieved.

Permitted:

- 004DH = Marker area

- 0044H = Data module

- 0043H = Data field

- 0064H = Data buffer

DW8: Field index:

Data module number if the data-module field type has been specified in DW7, otherwise: FFFFH.

DW9: Byte offset

Address offset in the specified source data area.

9.3.2.3   Information Report Service

DW5: Index:

Local identifier for the variable which is to be written for the communication partner.

The index numbers are specified by the MAP configurator during the configuration phase.

DW6: Type index:

Local identifier for the type of variable which is to be written for the communication partner.

The type indices are specified by the MAP configurator during the configuration phase.

9.3.3   VMD Support Services

DW4	ST (Status)	ID (Identify)	SS (Set Status)	US (Unsolicited Status)
DW5	-	-	-	-
DW6	-	-	-	-
DW7	Destination field type	Destination field type	Physical status	Physical status
DW8	Field index	Field index	Local detail	Local detail
DW9	Byte offset	Byte offset	-	-
DW10 to DW15	-	-	-	-

9.3.3.1   Status Service

This service reads out the device and user status of the communication partner.
The read data consists of the Logical status (2 bytes), the Physical status (2 bytes) and the Local detail (16 bytes).

The Logical status contains information on the status of the MAP interface for the communication partner:

0: Ready to communicate (State Changes allowed)
   All services can be used normally.

1: Not ready to communicate (No State Changes allowed)
   Services which modify the status of the VMD are not permitted.

2: Limited number of services (Limited Services are permitted)
   At least the following services are supported by the server:

   - Initiate   - Identify

   - Abort   - Status

   - Reject   - Conclude

The Physical status provides a general overview of the operating status of the physical device:

0: Operational

1: Partially operational

2: Not operational

3: Maintenance required

The Local Detail can be used specific to the application.
In this service the R500MAP interface module encodes the operating
mode of the assigned ZS.
The length of the read data is max. 20 bytes.
These bytes are written by the R500MAP interface module into the desti-
nation data area specified by the parameters DW7 to DW9 as follows:

Local Detail				Physical Status	Logical Status
Free	ZS mode	Free	Free		
Byte 19--Byte 7	Byte 6	Byte 5	Byte 4	Byte 3 and 2	Byte 2 and 1

If the Status service of an R500MAP interface module responds, the op-
erating mode of the assigned ZS is received in Byte 6 of the Local detail:

ZS in Stop mode: Byte 6 = 10D

ZS in Run mode: Byte 6 = 11D

DW7: Destination field type:

DW7 indicates the field type of the destination storage area in which the
data, which is read by the communication partner, is to be filed.

Permitted:

- 0044H = Data module

- 0043H = Data field

- 0064H = Data buffer

DW8: Field index:

Data module number if the data-module field type has been specified in
DW7, otherwise: FFFFH.

DW9: Byte offset

Address offset in the specified destination data area

9.3.3.2   Identify Service

This service, which identifies a VMD, reads out data on the manufacturer and type of VMD device.
The read data is a visible string data type.
The length is application-specific and can be a maximum of 96 characters (Vendor name: 64, Model name: 16, Revision: 16).

DW7: Destination field type:

DW7 indicates the field type of the destination storage area in which the data, which is read by the communication partner, is to be filed.

Permitted:

- 0044H = Data module

- 0043H = Data field

- 0064H = Data buffer

DW8: Field index:

Data module number if the data-module field type has been specified in DW7, otherwise: FFFFH.

DW9: Byte offset

Address offset in the specified destination data area

9.3.3.3   Set Status Service

This service transfers the local status of the device and user from the PLC program to the R500MAP interface module.
The Set Status Service is a local service which is not specified in the MAP. The status can individually specified by any ZS (VMD) which processes communication with the R500MAP interface module. Assignment to the particular VMD is implemented by the Communication Reference (CR).

DW7: Physical Status

The Physical Status provides a general overview of the operating status of the physical device:

0: Operational

1: Partially operational

2: Not operational

3: Maintenance required

DW8: Local Detail

The Local Detail can be used specific to the application.

DW8 corresponds to Bytes 4 and 5 of the Local Detail.

9.3.3.4   Unsolicited Status Service

This service automatically signals the status of the device and user to the communication partner.

DW7: Physical Status

The Physical Status provides a general overview of the operating status of the physical device:

0: Operational

1: Partially operational

2: Not operational

3: Maintenance required

DW8: Local Detail

The Local Detail can be used specific to the application.

10 R5CON Function Module

The R5CON function module monitors the centralised jobs. It provides the PLC program with status and error messages concerning jobs which were transferred to the R500MAP interface module by the R5REQ function module.

The R5CON module must acknowledgement each initiated job. A job with the same job number cannot be initiated until the acknowledgement has been read out.

There are several options available, according to which the R5CON module can acknowledge jobs:

- A job can be acknowledged by requesting a specific job number.

- A job can be acknowledged, without specifying the job number, by requesting the job which has the highest job number of all the jobs which have still not been acknowledged.

- All jobs which were processed error-free and the first faulty job can be acknowledged simultaneously.

Parameterisation:

The R5CON function module has two input and three output parameters:

P0		P2
	R5CON	P3
P1		P4
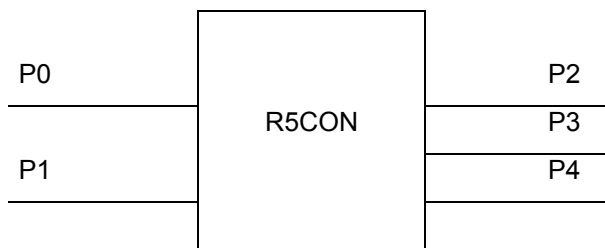
10.1   Input Parameters:

P0	(Word)	Interface card number according to R5INIT
P1	(Word)	Job number or wildcard

P0: Number of the interface card according to R5INIT:

15 8	7 0
Number of the interface card	00000000

The HIGH byte indicates the number of the interface card, 0 to 4, according to the specification in the R5INIT. The LOW byte should contain zero.

P1: Job number:

Permitted entries:

- Job numbers from 0 to 7FFFH or

- The FFFFH and FFFFEH wildcards

By specifying a job number 0 to 7FFFH, the user selects a job for which he would like an acknowledgement. A specific job is therefore monitored. The specified job number is mirrored in the P2 output parameter.

If the FFFEH wildcard is specified as the job number, the R5CON function module acknowledges all jobs (specific to the R500MAP interface module designated by P0) which ended error-free up to this point in time.
If jobs also ended with errors, the R5CON module also acknowledges the faulty job with the highest job number and returns its status and error codes in the output parameters. Any other faulty jobs are not acknowledged by this R5CON call-up.
If no job has ended, FFFFH is signalled back in the P2 output parameter.
If only error-free jobs have ended, these are all acknowledged and FFFEH is signalled back in the P2 output parameter.

If the FFFFH wildcard is specified in the P1 parameter, the R5CON module acknowledges the job, which was processed by the R500MAP interface module, and whose acknowledgement has still not been retrieved. If this applies to several jobs, the job with the highest job number is acknowledged. The job number is then entered in the P2 output parameter. All other jobs are not acknowledged.

10.2   Output Parameters:

P2	(Word)	Job number
P3	(Word)	Job information
P4	(Word)	Error message

P2: Job number:

The R5CON module writes the job number of the job which has status and error codes in the P3 and P4 output parameters to this parameter.
If an explicit job number was specified in P1, this job number is mirrored in P2.
If no job has ended according to parameterisation P1 = FFFFH, FFFFH is signalled back to P2 as the job number.
If there is no faulty job according to parameterisation P1 = FFFEH, and one or more jobs ended without an error message, FFFEH is signalled back to P2.

P3: Job information:

15	8	7	0
Job status		PLC response	

The current processing status of the job is indicated in the P3 HIGH byte:

P3 HIGH byte	Meaning
00H	Job ended error-free The PLC response in the LOW byte = 0 in this case
01H	Job is in the R500MAP job queue The PLC response in the LOW byte is not relevant in this case.
02H	Job is being processed by the R500MAP interface module The PLC response in the LOW byte is not relevant in this case.
03H	Job ended with error(s) In this case the P3 LOW byte contains the recommended PLC response and P4 contains the detailed error message.
04H	No job with this job number is being processed The PLC response in the LOW byte is not relevant in this case.

PLC response in the P3 LOW byte:
If a job ended with an error, the P3 LOW byte contains a code which provides the user with a suitable procedure to deal with the error. The PLC response is not valid until the job has ended.

P3 LOW byte	Meaning
00H	No response required, error-free operation
01H	Repeat the call-up of the R5CON function module
02H	Reload the R5CON function module in the PLC program
03H	Correct R5REQ parameters DW3 to DW15
04H	Rerun the program cycle on the R5INIT function module
05H	Rerun the program cycle on the R5REQ function module
06H	Reserved, not relevant for the R500MAP
07H	Reserved, not relevant for the R500MAP
08H	Check configuration data
09H	Repeat job
0AH	Check R5CON call-up parameter
10H	Repeat job, terminated by the PLC program
20H	Reserved, not relevant for the R500MAP
30H	Re-establish connection with the Initiate Service
40H	Reset module, restart-up sequence required
50H	Undefined error code, no response possible

P4: Error message:

```
15                    8 7                    0
┌──────────────────────┬──────────────────────┐
│     Error class       │      Error code       │
└──────────────────────┴──────────────────────┘
```
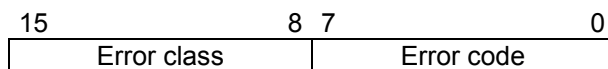
If an error occurs, i.e. P3 HIGH byte = 03, the detailed error code is in P4.
These codes usually only require interpretation during the start-up sequence or when a service is implemented. The error messages are output also via the trace interface when the protocol monitor is activated.
The error word indicates the error class in the HIGH byte and the error code in the LOW byte.
Those error messages, which are generated by the MAP protocol software of the R500MAP interface module, are specified in the English language, thereby facilitating reference to the MAP specification:

Error class	Error code	Meaning
0		VMD STATE PROBLEMS
	1	VMD state conflict
	2	VMD operational problem
	3	Domain transfer problem
	4	State machine ID invalid
	5	Other
1		APPLICATION REFERENCE PROBLEMS
	0	Other
	1	Application unreachable
	2	Connection lost
	3	Application reference invalid
	4	Context unsupported
2		DEFINITION PROBLEMS
	0	Other
	1	Object undefined
	2	Invalid address
	3	Type unsupported
	4	Type inconsistent
	5	Object attribute inconsistent
3		RESOURCE PROBLEMS
	0	Other
	1	Memory unavailable
	2	Processor resource unavailable
	3	Mass storage unavailable
	4	Capability unavailable
	5	Capability unknown
4		SERVICE PROBLEMS
	0	Other
	1	Primitives out of sequence
	2	Object state conflict
	3	PDU size
	4	Continuation invalid
	5	Object constraint conflict
5		SERVICE PREEMT PROBLEMS
	0	Other
	1	Timeout
	2	Deadlock
	3	Cancel
6		TIME RESOLUTION PROBLEMS
	0	Other
	1	Unsupportable time resolution
7		ACCESS PROBLEMS
	0	Other
	1	Object access unsupported
	2	Object non-existent
	3	Object access denied
	4	Object invalidated

Error class	Error code	Meaning
8		INITIATE PROBLEMS
	0	OTHER
	1	Version incompatible
	2	Max. segment insufficient
	3	Max. services outstanding calling insufficient (max_pend_req)
	4	Max. services outstanding calling insufficient (max_pend_resp)
	5	Service CCB insufficient
	6	Parameter CCB insufficient
	7	Nesting level insufficient
9		CONCLUDE PROBLEMS
	0	Other
	1	Further communication required
A		CANCEL PROBLEMS
	0	Other
	1	Invoke ID unknown
	2	Cancel not possible
C		OTHER PROBLEMS
D		VARIABLE ACCESS PROBLEMS
	0	Object invalidated
	1	Hardware fault at access time
	2	Object temporary unavailable
	3	Object access denied
	4	Object undefined
	5	Invalid address
	6	Type not supported
	7	Type inconsistent
	8	Object attributes inconsistent
	9	Object access not supported
	A	Object non-existent
64H		ERROR CODES FOR GENERAL PROVIDER (Service-Request)
	1	Channel state Association state is not ok for the requested operation
	2	Bad channel number
	4	PDU longer then max. negotiated
	5	Too many outstanding requests
	6	Indication control pointer not active
	7	Remote AR name unknown
	8	Local AR name unknown
	9	Invalid object identifier encountered
	A	Could not send a PDU
65H		ERROR CODES FOR PAIRED PRIMITIVE INTERFACE
	1	No request control structures available

Error class	Error code	Meaning
66H		ERROR CODES FOR REQUEST CONTROL BLOCK
		(Service confirmation (-))
	1	Confirm PDU parse error
	2	Peer rejected
	3	Error response received
	4	Connection terminated
	5	Opcode/invoke ID mismatch
	6	Cancel state
	7	Association request rejected
	8	Associate response parameters
	9	User rejected associate confirm
	B	Initiate parameter
	10H	Read response parameter
	11H	Could not send response
67		ERROR CODES FOR VIRTUAL MACHINE IN-TERFACE
	1	Variable name unknown
	2	Type name unknown
	3	Variable address problem
	C	Cancel state
	E	Remote type problem
	10H	Too many items
	11H	Data Conversion
	12H	Unsupported indication parameter
	13H	Indication parameter problem
	15H	Invalid object scope
	16H	Variable list not supported
	17H	Variable select index
	18H	Not named variable
	19H	MMS opcode
	1AH	Access result failure
F0H		ALI ERRORS
	1	Service cancelled locally from R500MAP
	2	Request timeout
	3	Invalid com_ref
	4	Invalid service
	5	Invalid object index
	6	Invalid object scope
	7	Invalid type index
	8	Invalid type scope
	9	Invalid type name
	A	Invalid field type
	B	Invalid field index
	C	Invalid field offset
	D	Internal communication error
	E	Channel not active
	F	Channel state conflict
	10H	Channel operation conflict

Error class	Error code	Meaning
<u>FFH</u>		<u>FUNCTION MODULE ERROR CODES</u>
	0	Reserved for R500/R500P
	1	Interface card not initialised (R5INIT)
	3	Job number invalid
	4	No job being processed
	5	Interface card number invalid
	6	No SFL entry for the interface card
	7	Wrong block address
	30H	Communications fault, signalled by R500MAP
	31H	Communications fault, signalled by ZS
	D0H	Reserved for R500/R500P
	D1H	Reserved for R500/R500P

11 R5IND Function Module

If required, the R5IND function module can be linked to the PLC program. The R5IND function module provides the PLC program with information on peripheral jobs and Exceptions.
If this type of information is unnecessary, the R5IND is not required. The function of the R500MAP interface module depends on whether or not the R5IND function module has been linked.
When the R5IND function module is called up, the R500MAP ring buffer is read out which contains a maximum of eight messages. consisting of eight words each. If the ring buffer is not read out by the R5IND module, the old messages contained in the ring buffer will be overwritten by new messages. The R5IND function module, if used, should only be called up once in a PLC cycle.

Parameterisation:

The R5IND function module has four input and two output parameters.

```
  P0 ─────────┌───────────────┐
  P1 ─────────│               │
              │     R5IND     │      P4
  P2 ─────────│               │─────────
  P3 ─────────│               │      P5
              └───────────────┘─────────
```
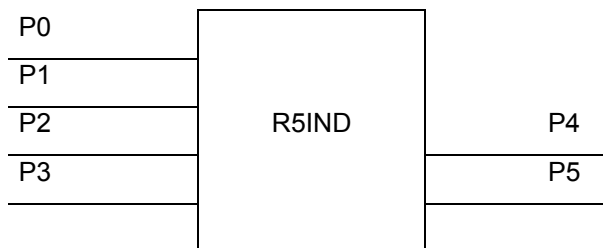
11.1   Input Parameters

P0	(Word)	Data type
P1	(Word)	Data type attribute
P2	(Word)	Address offset
P3	(Word)	Interface card number according to R5INIT

Parameters P0 to P2:

The R5IND parameters, P0 to P2, create a pointer to the start of a data area into which the messages are to be written via the implemented Services/Exceptions. As the max. number of messages which can be recorded is 8, the data area must be eight by eight, i.e. 64 words long.

P0: The type of data area is specified in this parameter.

Possible entries are:

- 44H for data module,

- 43H for data field and

- 64H for data buffer

P1: If the data-module type is specified in the P0 parameter, the data-module number is specified in this parameter, otherwise: FFFFH.

P2: The start address (byte offset) of the selected data area is specified in this parameter.

P3: Number of the interface card according to R5INIT:

15 8	7 0
Number of the interface card	00000000

The HIGH byte indicates the number of the interface card, 0 to 4, according to the specification in the R5INIT function module. The LOW byte must contain zero.

11.2   Output Parameters

P4	(Word)	Result
P5	(Word)	Number

P4: Result:

15	8	7	0
PLC response		Status/Error code	
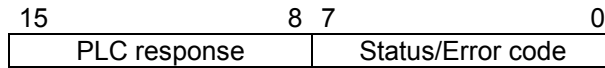
This parameter provides the user with programming and parameterisation errors when the R5IND function module is called up.

P4 code	Meaning
0000H	Input parameters correct; there are some messages
0001H	Input parameters correct; there are no messages
0202H	Reserved for R500
0203H	Channel not initialised; rerun program cycle on R5INIT
0204H	The specified DM is not available
0205H	The specified data area is too short
0306H	P3 is invalid: wrong interface card number
0307H	P2 is invalid: wrong byte offset
0308H	P1 is invalid: wrong DM no.

When P4 = 0001H, the job-specific data in the indicated data area is not relevant.

The coding of the messages in P4 enables a recommendation to be retrieved from the HIGH byte regarding the PLC response:

P4 HIGH byte	Recommended PLC response
00H	No response, correct operating conditions
01H	Repeat FM call-up, temporary status
02H	Modify PLC program, programming error
03H	Modify input parameters, parameterisation error

P5: Number:

This parameter indicates how many messages have been written from the R5IND function module to the indicated data area. The entries are contiguous and sequential.
Adequate space must be reserved in the indicated data area for eight job-specific message blocks, consisting of eight words each in which the parameters of the peripheral jobs and Exceptions are filed by the function module.

11.3   Explanation of Parameters in the Message Block

The parameters, P0 to P2, create a pointer to the start of a data area into which the R5IND function module writes the parameters of the maximum eight identified messages. Each message is specified by eight parameter words. These parameter words are designated in DW0 to DW7 (see below), even though they can be located at any address in the DM, DF or DB.

DW0: Communication Reference

In this parameter the R5INIT function module enters the number of the communication reference via which the the peripheral job was processed by the R500MAP interface module.

DW1: Service / Exception

The implemented Service or the entered Exception is designated in this parameter.
This word entry is ASCII-coded. Capital letters and/or their codes are used:

DW1	MAP Service / Exception
IN	Initiate
AB	Abort
RJ	Reject
CO	Conclude
CA	Cancel
EX	Exception
RE	Read
WR	Write
GV	Get_Var_Access Attributes
ST	Status
ID	Identify
US	Unsolicited Status

DW2 to DW7:

The job parameters, DW2 to DW7, depend on the MAP service specified in DW1.

11.3.1   Environment and General Management Services

DW1	IN (Initi-ate)	AB (Abort)	RJ (Re-ject)	CO (Con-clude)	CA (Can-cel)	EX (Excep-tion)
DW2	-	Locally generated	Detected here	-	-	Error num-ber
DW3	-	-	Reject class	-	-	-
DW4	-	-	Reject code	-	-	-
DW5 to DW7	-	-	-	-	-	-

11.3.1.1 Initiate Service

A connection has been set up by a communication partner. Job-specific parameters are not transferred to DW2 – DW7 for this service.

11.3.1.2 Abort Service

An existing connection to a communication partner has been terminated.

DW2: Locally generated:

This parameter indicates whether a connection was terminated locally or by the communication partner:

DW2	Meaning
0000H	Abort was actuated by the communication partner
0001H	Abort was locally actuated

11.3.1.3 Reject Service

The R500MAP interface module rejected an invalid PDU with the Reject Service.

DW2: Detected here:

This parameter indicates whether the error was identified locally or re-motely.

DW2	Meaning
0000H	Remote (FALSE)
does not equal 0	Local (TRUE)

DW3: Reject class

This parameter indicates the Reject class.

DW4: Reject code:

This parameter indicates the Reject code.

Reject class	Reject code	Meaning
1		CONFIRMED REQUEST PDU PROBLEMS
	0	Other
	1	Unrecognised service
	2	Unrecognised modifier
	3	Invalid Invoke ID
	4	Invalid argument
	5	Invalid modifier
	6	Maximum services outstanding exceeded
	7	Maximum segment length exceeded
	8	Maximum recursion exceeded
	9	Value out of range
2		CONFIRMED RESPONSE PDU PROBLEMS
	0	Other
	1	Unrecognised service
	2	Invalid Invoke ID
	3	Invalid result
	4	Maximum segment length exceeded
	5	Maximum recursion exceeded
	6	Value out of range
3		CONFIRMED ERROR PDU PROBLEMS
	0	Other
	1	Unrecognised service
	2	Invalid Invoke ID
	3	Invalid service error
	4	Value out of range
4		UNCONFIRMED ERROR PDU PROBLEMS
	0	Other
	1	Unrecognised service
	4	Invalid argument
	8	Maximum recursion exceeded
	9	Value out of range
5		PDU ERROR PROBLEMS
	0	Unknown PDU type
	1	Invalid PDU
6		CANCEL REQUEST PDU PROBLEMS
	0	Other
	1	Invalid Invoke ID
7		CANCEL RESPONSE PDU PROBLEMS
	0	Other
	1	Invalid Invoke ID
8		CANCEL ERROR PDU PROBLEMS
	0	Other
	1	Invalid Invoke ID
	2	Invalid service error
	3	Value out of range

Reject class	Reject code	Meaning
9		CONCLUDE REQUEST PDU PROBLEMS
	0	Other
	1	Invalid result
0AH		CONCLUDE RESPONSE PDU PROBLEMS
	0	Other
	1	Invalid result
0BH		CONCLUDE ERROR PDU PROBLEMS
	0	Other
	1	Invalid service error
	2	Value out of range

11.3.1.4 Conclude Service

An existing connection was terminated by the Conclude Service. This service does not indicate other parameters DW2 – DW7.

11.3.1.5 Cancel Service

A running communications job was cancelled. This service does not indicate other parameters DW2 – DW7.

11.3.1.6 Exception

An event/error has occurred. This message usually applies to all communication references and is then signalled to each VMD (ZS). In this case the DW0 parameter, Communication Reference, has the value FFFFH. If the event cannot be assigned to a CR, the DW0 parameter contains the relevant CR number.

DW2: Error number:

DW2 HIGH byte	DW2 LOW byte	Meaning
68H		ERROR CODES FOR MMS EXCEPTIONS
	1	Could not send REJECT
		A protocol error was detected but MMS-EASE could not send a Reject PDU
	2	Board driver exception
	3	Unknown LLP Event Code
	4	Memory Allocation
		A memory allocation error occurred while the virtual machine was attempting to allocate memory for a data structure
	5	Runtime Type
		A runtime Type definition error was detected by the virtual machine. This may result from an invalid variable type definition or if the user program overwrites the runtime type definition
	6	LLP Event Queue
	7	MMS Indication Control Queue
		The MMSREQ_IND queue has overflowed
	8	MMS Confirm Control Queue
		The MMSREQ_PEND queue has overflowed
	9	Internal MMS-EASE
69H		ERROR CODES FOR ACSE / LLP Exceptions
	1	Receive
	2	Listen
	3	Receive Disconnect
	4	Stop Listen
	5	Associate Request
	6	Associate Response
	7	Release Response
	8	Release Request
	9	Send Request
	AH	Debug Level Set

11.3.2   Variable Access Services

DW1	RE (Read)	WR (Write)	GV (Get_Var_Access Attributes)
DW2	Index	Index	Index
DW3	Type index	Type index	Type index
DW4 to DW7	-	-	-

11.3.2.1 Read Service

The object designated by the DW2 parameter, Index, has been read.

DW2: Index:

Local identifier for the read variable.
The index numbers are specified by the MAP configurator during the con-figuration phase.

DW3: Type index:

Identifier for the type of read variables.
The type indices are specified by the MAP configurator during the configu-ration phase.

11.3.2.2 Write Service

The object designated by the DW2 parameter, Index, has been written.

DW2: Index:

Local identifier for the written variables.

The index numbers are specified by the MAP configurator during the con-figuration phase.

DW3: Type index:

Identifier for the type of written variables.
The type indices are specified by the MAP configurator during the configu-ration phase.

11.3.2.3 Get Variable Access Attributes

The specification of the local communication object designated by the DW2 parameter, Index, has been read.

DW2: Index:

Local identifier for the variable whose specification has been read.
The index numbers are specified by the MAP configurator during the configuration phase.

DW3: Type index:

Identifier for the type of variables whose specification has been read.
The type indices are specified by the MAP configurator during the configuration phase.

11.3.3   VMD Support Services

DW1	ST (Status)	ID (Identify)	US (Unsolicited status)
DW2	-	-	Physical status
DW3	-	-	Local detail
DW4	-	-	Local detail
DW5	-	-	Local detail
DW6	-	-	Local detail
DW7	-	-	Local detail

11.3.3.1 Status Service

The local devices/user status has been read out by a communication partner. This service does not transfer other parameters DW2 to DW7.

11.3.3.2 Identify Service

The local identification string has been read out by a communication partner. This service does not transfer other parameters DW2 to DW7.

11.3.3.3 Unsolicited Status Service

The communication partner has automatically signalled its own status.

DW2: Physical status:

This parameter contains the Physical status of the communication partner.
The Physical status provides a general overview of the operating status of the communication partner:

0: Operational

1: Partially operational

2: Not operational

3: Maintenance required

DW3 to DW7: Local detail

The Local detail is transferred in parameters DW3 to DW7.
The Local detail can be specified according to the application.

12 MAP Configurator

The Bosch MAP configurator is a user-friendly software tool for configuring the R500MAP interface module.
The configurator is crucial for configuring the R500MAP interface module.

The MAP configurator runs in MS-Windows$^{\circledR}$ on AT industrial-standard computers.

The initial installation is implemented in MS-Windows$^{\circledR}$ by calling up the supplied **setup.exe** program.

12.1   Function Overview

The MAP configurator supports the complete configuration of the R500MAP interface module:

- the network topology is defined by the graphic operator interface,

- the communication references and communication objects are menu-driven,

- additional data types, which are specific to the system, can be applied and the stack parameter can be modified.

- network-wide consistency checks and

- application of complete documentation also implemented by the MAP configurator.

- configuration-oriented operating mode is supported by suitable directory structures.

- presettings exist for all important parameters,

- the configuration data is transferred to the R500MAP interface module by a file transfer program integrated in the configurator.

- the user-friendly Windows-On-line Help option is available for all configurator functions. The Help option provides a complete description of the configurator and its functions.

To load the configuration data the MAP configurator (COM1) is interfaced with the R500MAP interface module via the Bosch standard programming-unit K16 cable, Bosch no. 107054956.

$^{\circledR}$ Windows is a registered trademark of the MICROSOFT CORP. INC.

12.1.1 Configuration Example

Below is an example of the procedure for configuring a MAP interface between two CL400/CL500 modules via the R500MAP interface modules:

1. Specify project name and optional data for the project under the **Project** and **New** menu options.

2. Switch to **Segment level** via the **View** menu.

3. Activate the **Process node** menu by double clicking at any point on the network segment.

4. Select the **Node name** and device type (**master record**).

5. Similarly specify the second communication partner at any point on the network segment.

6. Open the **Process node** menu by double clicking on the symbol of one communication partner in the segment window.

7. Adjust the network and station addresses via the **Addresses** option.

8. The required VMDs, corresponding to the ZS module numbers (SC table), are applied and processed in the **Process object dictionary** menu option.

9. Leave the **Process node** menu and select the second communication partner in the segment window; also assign addresses and VMDs to the second communication partner.

10. Create a communication reference in the **Process associations** menu option and, if required, adjust with **Edit**.

11. Switch from the **Process node** base menu to **Process object dictionary** and

12. Specify the communication objects with **Variable**, **Recreate** and **Edit**.

13. After editing a variable, assign the desired communication references with **Cross reference**.

14. Similarly define the communication objects of the second communication partner.

15. Start the network-wide consistency check via **Project** and **Consistency** and note the resulting messages.

16. Create the complete documentation with **Project** and **Document**.

17. Switch back to **Process node** by double clicking on a communication partner in the segment level.

18. Connect the MAP configurator (COM1) to the corresponding R500MAP (PG/COM4) module via Bosch cable K16.

19. Switch the R500MAP interface module off-line and wait until the R500MAP interface module displays the off-line identifier **.I**.

20. Load the configuration data with **Transfer** and wait until the R500MAP interface module displays the load identifier **.L**.

21. Similarly load the configuration data for the second R500MAP interface module.

22. Switch the R500MAP interface module **on-line**.

A complete description of the configurator can be found in the on-line documentation.

13 Specifications

Module:	R500MAP
Supply and current input 5 volts	 typically: 1.8 A
Operating temperature Storage temperature	5 to 55 degrees Celsius -25 to 60 degrees Celsius
Degree of protection	IP20 according to DIN 40050
Humidity rating	RH1 according to IEC 65A-4
Mechanical load in off-line mode in on-line mode, i.e. approx. 40 sec. after Power ON or Reset	 10 Hz to 55 Hz: 0.25 g according to IEC 65A 10 Hz to 57 Hz, 0.075 g
Dimensions	Double-width module
Max. number of R500MAP inter- face modules in one CL400/CL500 system	5
Interfaces	• IEEE 802.3 Ethernet via AUI connector • V.24/20 mA PG/COM4 • COM1 • COM2

14 Example

The following printout is an example of a program which indicates how the standard function modules communicate via an R500MAP interface module:

```
+----------------------------------------------------------------------+
| PLC    Documentation    Bosch    CL400/CL500  Version 3.20  Date:  8 Sep. 1993 |
| Project: SYSTEC/ZS1      File: SYS_ZS1.TXT              Page:        1 |
+----------------------------------------------------------------------+

Documentation cover page
------------------------

Lists according to symbol file SYSTEC.S5S

Symbol file : SYSTEC.S5S
Print file  : SYS_ZS1.TXT
Header file :
Printer type: ASCII_DR

List parameters in presetting:
         - Statement list of graphic rendition
         - Output RG number
         - 80 characters per line
         - Symbolic operands
         - With line commentary
         - With symbol commentary
         - Symbol commentary at end of page
         - Symbol commentary, byte/word addr. on
         - With parameter list
         - With commentary from parameter list
         - With network overview list
         - With network header
         - One network per page




Contents
------------------
OB1    OB1      .......................................................    2
OB5    OB5      .......................................................    3
OB7    OB7      .......................................................    4
PB0    R5REQ    .......................................................    5
PB1    R5CON    .......................................................    5
PB2    R5INIT   .......................................................    5
PB4    SYSTEC1  .......................................................    6
PB6    CR_CHECK .......................................................    9
PB7    R5IND    .......................................................   10
```

```
+----------------------------------------------------------------+
| PLC   Documentation    Bosch   CL400/CL500  Version 3.20  Date:  8 Sep. 1993 |
| Project: SYSTEC/ZS1     File: OB1.P50       (OB1)   Page:         2 |
+----------------------------------------------------------------+

       DEF     DF2,-auftstrt

       ;Start time for initialisation wait loop after network ON:
1      L    W  K60.2,A
       PZ:  1
2      U    B  -log0
3      SV      A,-netzini
       PZ:  2
4      U    B  -rinetz
5      SV      A,-netzini

       ;Start time for initialisation loop after Stop/Run:
6      L    W  K3.2,A
       PZ:  3
7      U    B  -log0
8      SV      A,-runini
       PZ:  4
9      U    B  -rirun
10     SV      A,-runini

       ;in the first cycle transfer start info from start-up OM to the
       ;job bit array:
11     SPI     -nostart
12     L    W  -auftstrt,A
13     T    W  A,-auftr_0
           -nostart

       ;Call up program module for the transmit jobs:
14     BA      -SYSTEC1


       ;Call up module for connection monitor:
15     BA      -CR_CHECK

       ;Query cycle-time special marker:
16     L    W  SM22,C
17     L    W  SM24,D

18     BA      -DM10

       ;Loop for realistic cycle time (approx. 16 ms):
19     L    W  K10000D,A
           -M
20     DEC  W  A,1
21     SPN     -M

22     PE


 -CR_CHECK PB6
 -DM10      DM10
 -SYSTEC1   PB4
 -auftr_0   M0.0
 -auftstrt  DF2
 -log0      SM30.3
 -netzini   T0
 -rinetz    SM20.7
 -rirun     SM20.0
 -runini    T1
```

```
+------------------------------------------------------------------+
| PLC    Documentation    Bosch    CL400/CL500  Version 3.20  Date:  8 Sep. 1993 |
| Project: SYSTEC/ZS1      File: OB5.P50          (OB5)      Page:        3 |
+------------------------------------------------------------------+

      DEF     DF0,-initfehl
      DEF     DF2,-auftstrt

      ;Initialisation of the R500M:
1     BA      -R5INIT,6
      P0   W   K10D       ;the R500M_EN 0 is module no. 10 in the SC table
      P1   W   KFFFFH     ;no R500x 1
      P2   W   KFFFFH     ;no R500x 2
      P3   W   KFFFFH     ;no R500x 3
      P4   W   KFFFFH     ;no R500x 4
      P5   W   -initfehl

      ;Set job array to Initiate:
      ;as non-remanent operands cannot be preset during
      ;remanent operation, the start info is temporarily stored
      ;in the data field:
2     L    W   K0000000001B,A
3     T    W   A,-auftstrt
4     PE

-R5INIT   PB2
 -auftstrt DF2
 -initfehl DF0


+------------------------------------------------------------------+
| PLC    Documentation    Bosch    CL400/CL500  Version 3.20  Date:  8 Sep. 1993 |
| Project: SYSTEC/ZS1      File: OB7.P50          (OB7)    Page:        4 |
+------------------------------------------------------------------+
DEF     DF0,-initfehl
      DEF     DF2,-auftstrt

      ;Initialisation of the R500M:
1     BA      -R5INIT,6
      P0   W   K10D       ;the R500M_EN 0 is module no. 10 in the SC table
      P1   W   KFFFFH     ;no R500x 1
      P2   W   KFFFFH     ;no R500x 2
      P3   W   KFFFFH     ;no R500x 3
      P4   W   KFFFFH     ;no R500x 4
      P5   W   -initfehl

      ;Set job array to Initiate:
      ;as non-remanent operands cannot be preset during
      ;remanent operation, the start info is temporarily stored
      ;in the data field:
2     L    W   K0000000001B,A
3     T    W   A,-auftstrt
4     PE

 -R5INIT   PB2
 -auftstrt DF2
 -initfehl DF0

+------------------------------------------------------------------+
| PLC    Documentation    Bosch   CL400/CL500  Version 3.20  Date:  8 Sep. 1993 |
| Project: SYSTEC/ZS1      File: R5REQ.P50        (PB0)    Page:        5 |
+------------------------------------------------------------------+

Internal function module, Version 1.4


+------------------------------------------------------------------+
| PLC    Documentation    Bosch   CL400/CL500  Version 3.20  Date:  8 Sep. 1993 |
| Project: SYSTEC/ZS1      File: R5CON.P50        (PB1)    Page:        5 |
+------------------------------------------------------------------+

Internal function module, Version 1.3


+------------------------------------------------------------------+
| PLC    Documentation    Bosch   CL400/CL500  Version 3.20  Date:  8 Sep. 1993 |
| Project: SYSTEC/ZS1      File: R5INIT.P50       (PB2)    Page:        5 |
+------------------------------------------------------------------+

Internal function module, Version 1.3
```

```
+----------------------------------------------------------------+
| PLC   Documentation    Bosch  CL400/CL500  Version 3.20  Date:  8 Sep. 1993 |
| Project: SYSTEC/ZS1     File: SYSTEC1.P50      (PB4)   Page:         6 |
+----------------------------------------------------------------+
;Job bit array for R5REQ:

     ;F E D C B A 9 8 7 6 5 4 3 2 1 0
     ;X X X X X X X X X X X X X X X X
     ;             I I I I I I I I I_Initiate CR0
     ;             I I I I I I I I___not used
     ;             I I I I I I I_____not used
     ;             I I I I I I_____not used
     ;             I I I I I_____not used
     ;             I I I I I_____not used
     ;             I I I I_____not used
     ;             I I I_____not used
     ;             I I_____Write over CR0
     ;             I_____not used

DEF     SM31.7,-gleich

     ;Wait for time for initialisation of the R500M_EN:
     PZ: 1
1    U    B  -netzini
2    O    B  -runini
3    BEB

     ;Job start:
4    BA       -R5REQ,6
     P0   W  K44H       ;Data type identifier, 44H=DM, 64H=DB, 43H=DF
     P1   W  K60D       ;DM no. for job-spec. parameters
     P2   W  K0D        ;Start address in DM for job-spec. parameters
     P3   W  -auftr_0   ;Job bit array
     P4   W  -feh_req   ;Error message
     P5   W  -erbitreq  ;Result bit array

     ;Reset job array:
5    L    W  K0,A
6    T    W  A,-auftr_0          ;Job bit array
7    L    W  K1234H,A

     ;Query Initiate result for CR0 (Job 0):
8    BA       -R5CON,5
     P0   W  K0000H
     P1   W  K0H
     P2   W  -auftrnr
     P3   W  -status
     P4   W  -fehler
9    L    W  -status,A

10   SWAP W  A

     ;Did job end error-free? --> Status word=0?
11   VGLA BY K0000H,A
     PZ: 2
12   U    B  -gleich
13   S    B  -ini0ok

     ;For iniok, start Variable Access Job 8 via CR0:
14   S    B  -auftr_8
;If error occurs, repeat connection set-up: Status BL=03 ?
15   VGLA BY K03H,A   ;*********************************************
     PZ: 3
16   U    B  -gleich

 -R5CON    PB1
 -R5REQ    PB0
 -auftr_0  M0.0
 -auftr_8  M1.0
 -auftrnr  M6.0
 -erbitreq M4.0
 -feh_req  M2.0
 -fehler   M10.0
 -gleich   SM31.7
 -ini0ok   M12.0
 -netzini  T0
 -runini   T1
 -status   M8.0
```

```
+----------------------------------------------------------------------+
| PLC   Documentation    Bosch   CL400/CL500  Version 3.20  Date:  8 Sep. 1993 |
| Project: SYSTEC/ZS1    File: SYSTEC1.P50    (PB4)   Page:         7   |
+----------------------------------------------------------------------+
17   S    B  -auftr_0

     ;test for status and errors: ==================================
18   SPI      -noerrini
19   L    W  -status,C
20   L    W  -fehler,D
21   T    W  C,-test1
22   T    W  D,-test2
        -noerrini
23   L    W  -test1,D
24   L    W  -test2,D
     ;==========================================================

     ;If the connection has already been set up, initiate productive services:
25   L    W  -fehler,B
26   VGLA BY K03H,A
27   SPN      -ug0
28   VGLA W  K6401H,B
29   SPN      -ug0
     PZ:  4
30   U    B  -log1
31   S    B  -ini0ok
32   S    B  -auftr_8
33   R    B  -auftr_0
        -ug0

     ;Query result for Job 8:
34   BA       -R5CON,5
     P0   W  K0000H
     P1   W  K8D
     P2   W  -auftrnr
     P3   W  -status
     P4   W  -fehler

     ;Monitor job processing and restart
     ;when ends:
35   L    W  -status,A
36   SWAP W  A

     ;If error occurs, repeat, except if the connection is lost:
37   VGLA BY K03,A
     PZ:  5
38   U    B  -gleich
39   S    B  -auftr_8

     ;test for status and errors: ==================================
40   SPI      -noerr
41   L    W  -status,C
42   L    W  -fehler,D
43   T    W  C,-test3
44   T    W  D,-test4
        -noerr
45   L    W  -test3,D
46   L    W  -test4,D
     ;==========================================================
;Check that processing is error-free, then count Good jobs:
47   VGLA BY K00H,A
     PZ:  6
48   U    B  -gleich
49   =    B  -a8ok
;Count Good jobs:
50   SPI      -noinca8

 -R5CON    PB1
 -a8ok     M12.1
 -auftr_0  M0.0
 -auftr_8  M1.0
 -auftrnr  M6.0
 -fehler   M10.0
 -gleich   SM31.7
 -ini0ok   M12.0
 -log1     SM31.1
 -status   M8.0
 -test1    M14.0
 -test2    M16.0
 -test3    M18.0
 -test4    M20.0
```

```
+--------------------------------------------------------------------+
| PLC   Documentation    Bosch   CL400/CL500  Version 3.20  Date:  8 Sep. 1993 |
| Project: SYSTEC/ZS1     File: SYSTEC1.P50      (PB4)   Page:       8 |
+--------------------------------------------------------------------+
```

```
51   L    W   -a8inc,A
52   INC  W   A,1
53   T    W   A,-a8inc
             -noinca8

     ;Check whether the connection is still set-up:
54   L    W   -status,C
55   VGLA W   K0330H,C
     PZ:  7
56   U    B   -gleich
57   R    B   -ini0ok
58   R    B   -auftr_8
59   S    B   -auftr_0

60   BE


 -a8inc    M22.0
 -auftr_0  M0.0
 -auftr_8  M1.0
 -gleich   SM31.7
 -ini0ok   M12.0
 -status   M8.0
```

```
+-----------------------------------------------------------------------+
| PLC   Documentation    Bosch   CL400/CL500  Version 3.20  Date:  8 Sep. 1993 |
| Project: SYSTEC/ZS1     File: CR_CHECK.P50     (PB6)    Page:       9  |
+-----------------------------------------------------------------------+


1   BA        -R5IND,6
    P0   W  K44H       ;Data type 44H = Data module
    P1   W  K12D       ;Data type attribute 12D = DM12
    P2   W  K0D        ;Offset address in DM: 0
    P3   W  K0000H     ;Module number of the interface in the HIGH byte
    P4   W  -ind_erg
    P5   W  -ind_anz

    ;Query whether there are any messages:
2   L    W  -ind_erg,A
3   VGLA W  K0H,A
    PZ:  1
4   U    B  -gleich
5   BEI

    ;Query how many messages there are:
6   L    W  -ind_anz,C

    ;Address and read services from message blocks:
7   BA        -DM12
8   L    W  K0802H,B
         -loop
9   L    W  [B],A

    ;Service = Abort ?
10  VGLA W  K'AB',A
    PZ:  2
11  U    B  -gleich
12  SPB     -ind

    ;Service = Conclude ?
13  VGLA W  K'CO',A
    PZ:  3
14  U    B  -gleich
15  SPB     -ind

    ;Address next message block:
16  ADD  W  K16D,B

    ;Decrement message counter:
17  DEC  W  C,1

    ;Have all message blocks been browsed?
18  BEZ
19  SP      -loop

        -ind

    ;Set job for Initiate, as Abort or Conclude was identified:
20  L    W  K1D,D
21  T    W  D,-auftr_0

22  BE


 -DM12      DM12
 -R5IND     PB7
 -auftr_0   M0.0
 -gleich    SM31.7
 -ind_anz   M26.0
 -ind_erg   M24.0



+-----------------------------------------------------------------------+
| PLC   Documentation    Bosch   CL400/CL500  Version 3.20  Date:  8 Sep. 1993 |
| Project: SYSTEC/ZS1     File: R5IND.P50        (PB7)    Page:      10  |
+-----------------------------------------------------------------------+
```

Internal function module, Version 1.1

```
+------------------------------------------------------------------+
| PLC    Documentation    Bosch   CL400/CL500  Version 3.20  Date:  8 Sep. 1993 |
| Project: SYSTEC/ZS1    File: SYSTEC.S5S              Page:       1 |
+------------------------------------------------------------------+
```

Documentation cover page

```
Symbol file : SYSTEC.S5S
Print file  : SYM_ZS1.TXT
Header file :
Printer type: ASCII_DR
```

List parameters in presetting:
          - Several forms per page
          - Compact

Contents

```
+------------------------------------------------------------------+
| PLC    Documentation    Bosch   CL400/CL500  Version 3.20  Date:  8 Sep. 1993 |
| Project: SYSTEC/ZS1    File: SYSTEC.S5S              Page:       2 |
+------------------------------------------------------------------+
```

```
+----------+----------+-----------------------------+-----+-------+-----------+
| DM no.   |  Name    |          Commentary         | R/E |Length |           |
+----------+----------+-----------------------------+-----+-------+-----------+
| DM   60  | DM60     |Job parameter                |  R  |  512  |           |
+----------+----------+-----------------------------+-----+-------+-----------+
```

```
+----------------------------------------------------------------------+
|  PLC   Documentation    Bosch   CL400/CL500  Version 3.20  Date:  8 Sep. 1993 |
|  Project: SYSTEC/ZS1    File: SYSTEC.S5S           Page:      3       |
+----------------------------------------------------------------------+


+----------------------------------------------------------------------+
| DM  60 Name: DM60    Commentary: Job parameter        RAM/EPROM: R |
+---------+--------+------+---+--------------------------------------+---+
|   No.   | Symbol | Type |Sgn|             Data field               | F |
+---------+--------+------+---+--------------------------------------+---+
|  D    0 |init_cr0|Word  | N |FFFF                                  | H |
|  D    2 |        |Word  | N |0000                                  | H |
|  D    4 |Auftr_0 |Word  | N |0                                     | D |
|  D    6 |        |Word  | N |1                                     | H |
|  D    8 |        |Ascii | N |IN                                    |   |
|  D   10 |        |Word  | N |                                      | H |
|  D   12 |        |Word  | N |                                      | H |
|  D   14 |        |Word  | N |                                      | H |
|  D   16 |        |Word  | N |                                      | H |
|  D   18 |        |Word  | N |                                      | H |
|  D   20 |        |Word  | N |                                      | H |
|  D   22 |        |Word  | N |                                      | H |
|  D   24 |        |Word  | N |                                      | H |
|  D   26 |        |Word  | N |                                      | H |
|  D   28 |        |Word  | N |                                      | H |
|  D   30 |        |Word  | N |                                      | H |
|  D   32 |frei_1  |Word  | N |FFFF                                  | H |
|  D   34 |        |Word  | N |0                                     | H |
|  D   36 |Auftr_1 |Word  | N |1                                     | D |
|  D   38 |        |Word  | N |1                                     | H |
|  D   40 |        |Ascii | N |                                      |   |
|  D   42 |        |Word  | N |                                      | H |
|  D   44 |        |Word  | N |                                      | H |
|  D   46 |        |Word  | N |                                      | H |
|  D   48 |        |Word  | N |                                      | H |
|  D   50 |        |Word  | N |                                      | H |
|  D   52 |        |Word  | N |                                      | H |
|  D   54 |        |Word  | N |                                      | H |
|  D   56 |        |Word  | N |                                      | H |
|  D   58 |        |Word  | N |                                      | H |
|  D   60 |        |Word  | N |                                      | H |
|  D   62 |        |Word  | N |                                      | H |
|  D   64 |frei_2  |Word  | N |FFFF                                  | H |
|  D   66 |        |Word  | N |0                                     | H |
|  D   68 |Auftr_2 |Word  | N |2                                     | D |
|  D   70 |        |Word  | N |1                                     | H |
|  D   72 |        |Ascii | N |                                      |   |
|  D   74 |        |Word  | N |                                      | H |
|  D   76 |        |Word  | N |                                      | H |
|  D   78 |        |Word  | N |                                      | H |
|  D   80 |        |Word  | N |                                      | H |
|  D   82 |        |Word  | N |                                      | H |
|  D   84 |        |Word  | N |                                      | H |
|  D   86 |        |Word  | N |                                      | H |
|  D   88 |        |Word  | N |                                      | H |
|  D   90 |        |Word  | N |                                      | H |
|  D   92 |        |Word  | N |                                      | H |
|  D   94 |        |Word  | N |                                      | H |
|  D   96 |frei_3  |Word  | N |FFFF                                  | H |
|  D   98 |        |Word  | N |0                                     | H |
|  D  100 |Auftr_3 |Word  | N |3                                     | D |
|  D  102 |        |Word  | N |1                                     | H |
|  D  104 |        |Ascii | N |                                      |   |
|  D  106 |        |Word  | N |                                      | H |
|  D  108 |        |Word  | N |                                      | H |
|  D  110 |        |Word  | N |                                      | H |
|  D  112 |        |Word  | N |                                      | H |
|  D  114 |        |Word  | N |                                      | H |
|  D  116 |        |Word  | N |                                      | H |
|  D  118 |        |Word  | N |                                      | H |
|  D  120 |        |Word  | N |                                      | H |
|  D  122 |        |Word  | N |                                      | H |
|  D  124 |        |Word  | N |                                      | H |
|  D  126 |        |Word  | N |                                      | H |
|  D  128 |frei_4  |Word  | N |FFFF                                  | H |
|  D  130 |        |Word  | N |0                                     | H |
|  D  132 |Auftr_4 |Word  | N |4                                     | D |
|  D  134 |        |Word  | N |1                                     | H |
|  D  136 |        |Word  | N |                                      | H |
|  D  138 |        |Word  | N |                                      | H |
|  D  140 |        |Word  | N |                                      | H |
|  D  142 |        |Word  | N |                                      | H |
|  D  144 |        |Word  | N |                                      | H |
+---------+--------+------+---+--------------------------------------+---+
```

```
+-----------------------------------------------------------------+
| PLC   Documentation    Bosch   CL400/CL500  Version 3.20  Date:  8 Sep. 1993 |
| Project: SYSTEC/ZS1    File: SYSTEC.S5S           Page:     4    |
+-----------------------------------------------------------------+
```

```
+-----------------------------------------------------------------+
| DM   60 Name: DM60    Commentary: Job parameter      RAM/EPROM: R |
+---------+--------+------+---+--------------------------------+---+
|   No.   | Symbol | Type |Sgn|            Data field          | F |
+---------+--------+------+---+--------------------------------+---+
| D   146 |        | Word | N |                                | H |
| D   148 |        | Word | N |                                | H |
| D   150 |        | Word | N |                                | H |
| D   152 |        | Word | N |                                | H |
| D   154 |        | Word | N |                                | H |
| D   156 |        | Word | N |                                | H |
| D   158 |        | Word | N |                                | H |
| D   160 | frei_5 | Word | N | FFFF                           | H |
| D   162 |        | Word | N | 0                              | H |
| D   164 | Auftr_5| Word | N | 5                              | D |
| D   166 |        | Word | N | 1                              | H |
| D   168 |        | Ascii| N |                                |   |
| D   170 |        | Word | N |                                | D |
| D   172 |        | Word | N |                                | D |
| D   174 |        | Word | N |                                | H |
| D   176 |        | Word | N |                                | H |
| D   178 |        | Word | N |                                | H |
| D   180 |        | Word | N | 0000                           | H |
| D   182 |        | Word | N | 0000                           | H |
| D   184 |        | Word | N |                                | H |
| D   186 |        | Word | N |                                | H |
| D   188 |        | Word | N |                                | H |
| D   190 |        | Word | N |                                | H |
| D   192 | frei_6 | Word | N | FFFF                           | H |
| D   194 |        | Word | N | 0                              | H |
| D   196 | Auftr_6| Word | N | 6                              | D |
| D   198 |        | Word | N | 1                              | H |
| D   200 |        | Ascii| N |                                |   |
| D   202 |        | Word | N |                                | H |
| D   204 |        | Word | N |                                | H |
| D   206 |        | Word | N |                                | H |
| D   208 |        | Word | N |                                | H |
| D   210 |        | Word | N |                                | H |
| D   212 |        | Word | N | 0000                           | H |
| D   214 |        | Word | N | 0000                           | H |
| D   216 |        | Word | N |                                | H |
| D   218 |        | Word | N |                                | H |
| D   220 |        | Word | N |                                | H |
| D   222 |        | Word | N |                                | H |
| D   224 | frei_7 | Word | N | FFFF                           | H |
| D   226 |        | Word | N | 0                              | H |
| D   228 | Auftr_7| Word | N | 7                              | D |
| D   230 |        | Word | N | 1                              | H |
| D   232 |        | Ascii| N |                                |   |
| D   234 |        | Word | N |                                | H |
| D   236 |        | Word | N |                                | H |
| D   238 |        | Word | N |                                | H |
| D   240 |        | Word | N |                                | H |
| D   242 |        | Word | N |                                | D |
| D   244 |        | Word | N | 0000                           | H |
| D   246 |        | Word | N | 0000                           | H |
| D   248 |        | Word | N |                                | H |
| D   250 |        | Word | N |                                | H |
| D   252 |        | Word | N |                                | H |
| D   254 |        | Word | N |                                | H |
| D   256 |writecr0| Word | N | FFFF                           | H |
| D   258 |        | Word | N | 0000                           | H |
| D   260 | Auftr_8| Word | N | 8                              | D |
| D   262 |        | Word | N | 1                              | H |
| D   264 |        | Ascii| N | WR                             |   |
| D   266 |        | Word | N | 110                            | D |
| D   268 |        | Word | N | 2                              | H |
| D   270 |        | Word | N | 44                             | H |
| D   272 |        | Word | N | 0004                           | H |
| D   274 |        | Word | N | 0                              | D |
| D   276 |        | Word | N | 0000                           | H |
| D   278 |        | Word | N | 0000                           | H |
| D   280 |        | Word | N |                                | H |
| D   282 |        | Word | N |                                | H |
| D   284 |        | Word | N |                                | H |
| D   286 |        | Word | N |                                | H |
| D   288 | frei_9 | Word | N | FFFF                           | H |
| D   290 |        | Word | N | 0                              | H |
+---------+--------+------+---+--------------------------------+---+
```

```
+---------------------------------------------------------------+
| PLC   Documentation   Bosch   CL400/CL500  Version 3.20  Date:  8 Sep. 1993 |
| Project: SYSTEC/ZS1    File: SYSTEC.S5S           Page:      5  |
+---------------------------------------------------------------+

+---------------------------------------------------------------+
| DM   60 Name: DM60     Commentary: Job parameter      RAM/EPROM: R |
+---------+--------+------+---+------------------------------------+---+
|  No.    | Symbol | Type |Sgn|              Data field            | F |
+---------+--------+------+---+------------------------------------+---+
| D   292 |Auftr_9 |Word  | N |9                                   | D |
| D   294 |        |Word  | N |1                                   | H |
| D   296 |        |Word  | N |                                    | H |
| D   298 |        |Word  | N |                                    | H |
| D   300 |        |Word  | N |                                    | H |
| D   302 |        |Word  | N |                                    | H |
| D   304 |        |Word  | N |                                    | H |
| D   306 |        |Word  | N |                                    | H |
| D   308 |        |Word  | N |                                    | H |
| D   310 |        |Word  | N |                                    | H |
| D   312 |        |Word  | N |                                    | H |
| D   314 |        |Word  | N |                                    | H |
| D   316 |        |Word  | N |                                    | H |
| D   318 |        |Word  | N |                                    | H |
| D   320 |frei_10 |Word  | N |FFFF                                | H |
| D   322 |        |Word  | N |0                                   | H |
| D   324 |Auftr_10|Word  | N |10                                  | D |
| D   326 |        |Word  | N |1                                   | H |
| D   328 |        |Word  | N |                                    | H |
| D   330 |        |Word  | N |                                    | H |
| D   332 |        |Word  | N |                                    | H |
| D   334 |        |Word  | N |                                    | H |
| D   336 |        |Word  | N |                                    | H |
| D   338 |        |Word  | N |                                    | H |
| D   340 |        |Word  | N |                                    | H |
| D   342 |        |Word  | N |                                    | H |
| D   344 |        |Word  | N |                                    | H |
| D   346 |        |Word  | N |                                    | H |
| D   348 |        |Word  | N |                                    | H |
| D   350 |        |Word  | N |                                    | H |
| D   352 |frei_11 |Word  | N |FFFF                                | H |
| D   354 |        |Word  | N |0                                   | H |
| D   356 |Auftr_11|Word  | N |11                                  | D |
| D   358 |        |Word  | N |1                                   | H |
| D   360 |        |Word  | N |                                    | H |
| D   362 |        |Word  | N |                                    | H |
| D   364 |        |Word  | N |                                    | H |
| D   366 |        |Word  | N |                                    | H |
| D   368 |        |Word  | N |                                    | H |
| D   370 |        |Word  | N |                                    | H |
| D   372 |        |Word  | N |                                    | H |
| D   374 |        |Word  | N |                                    | H |
| D   376 |        |Word  | N |                                    | H |
| D   378 |        |Word  | N |                                    | H |
| D   380 |        |Word  | N |                                    | H |
| D   382 |        |Word  | N |                                    | H |
| D   384 |frei_12 |Word  | N |FFFF                                | H |
| D   386 |        |Word  | N |0                                   | H |
| D   388 |Auftr_12|Word  | N |12                                  | D |
| D   390 |        |Word  | N |1                                   | H |
| D   392 |        |Word  | N |                                    | H |
| D   394 |        |Word  | N |                                    | H |
| D   396 |        |Word  | N |                                    | H |
| D   398 |        |Word  | N |                                    | H |
| D   400 |        |Word  | N |                                    | H |
| D   402 |        |Word  | N |                                    | H |
| D   404 |        |Word  | N |                                    | H |
| D   406 |        |Word  | N |                                    | H |
| D   408 |        |Word  | N |                                    | H |
| D   410 |        |Word  | N |                                    | H |
| D   412 |        |Word  | N |                                    | H |
| D   414 |        |Word  | N |                                    | H |
| D   416 |frei_13 |Word  | N |FFFF                                | H |
| D   418 |        |Word  | N |0                                   | H |
| D   420 |Auftr_13|Word  | N |13                                  | D |
| D   422 |        |Word  | N |1                                   | H |
| D   424 |        |Word  | N |                                    | H |
| D   426 |        |Word  | N |                                    | H |
| D   428 |        |Word  | N |                                    | H |
| D   430 |        |Word  | N |                                    | H |
| D   432 |        |Word  | N |                                    | H |
| D   434 |        |Word  | N |                                    | H |
| D   436 |        |Word  | N |                                    | H |
+---------+--------+------+---+------------------------------------+---+
```

```
+------------------------------------------------------------------+
| PLC   Documentation   Bosch   CL400/CL500  Version 3.20  Date:  8 Sep. 1993 |
| Project: SYSTEC/ZS1   File: SYSTEC.S5S              Page:       6 |
+------------------------------------------------------------------+


+------------------------------------------------------------------+
| DM  60 Name: DM60    Commentary: Job parameter         RAM/EPROM: R |
+---------+--------+------+---+------------------------------------+---+
|   No.   | Symbol | Type |Sgn|            Data field               | F |
+---------+--------+------+---+------------------------------------+---+
| D   438 |        | Word | N |                                    | H |
| D   440 |        | Word | N |                                    | H |
| D   442 |        | Word | N |                                    | H |
| D   444 |        | Word | N |                                    | H |
| D   446 |        | Word | N |                                    | H |
| D   448 | frei_14| Word | N | FFFF                               | H |
| D   450 |        | Word | N | 0                                  | H |
| D   452 | Auftr_14| Word| N | 14                                 | D |
| D   454 |        | Word | N | 1                                  | H |
| D   456 |        | Word | N |                                    | H |
| D   458 |        | Word | N |                                    | H |
| D   460 |        | Word | N |                                    | H |
| D   462 |        | Word | N |                                    | H |
| D   464 |        | Word | N |                                    | H |
| D   466 |        | Word | N |                                    | H |
| D   468 |        | Word | N |                                    | H |
| D   470 |        | Word | N |                                    | H |
| D   472 |        | Word | N |                                    | H |
| D   474 |        | Word | N |                                    | H |
| D   476 |        | Word | N |                                    | H |
| D   478 |        | Word | N |                                    | H |
| D   480 | frei_15| Word | N | FFFF                               | H |
| D   482 |        | Word | N | 0                                  | H |
| D   484 | Auftr_15| Word| N | 15                                 | D |
| D   486 |        | Word | N | 1                                  | H |
| D   488 |        | Word | N |                                    | H |
| D   490 |        | Word | N |                                    | H |
| D   492 |        | Word | N |                                    | H |
| D   494 |        | Word | N |                                    | H |
| D   496 |        | Word | N |                                    | H |
| D   498 |        | Word | N |                                    | H |
| D   500 |        | Word | N |                                    | H |
| D   502 |        | Word | N |                                    | H |
| D   504 |        | Word | N |                                    | H |
| D   506 |        | Word | N |                                    | H |
| D   508 |        | Word | N |                                    | H |
| D   510 |        | Word | N |                                    | H |
+---------+--------+------+---+------------------------------------+---+
```