SIEMENS

SIMATIC

Automation system BRAUMAT/SISTAR*Classic* V5.3 Communication

Manual

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Safety Guidelines

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

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

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

Caution
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Caution
without a safety alert symbol indicates that property damage can result if proper precautions are not taken.

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indicates that an unintended result or situation can occur if the corresponding notice is not taken into account.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

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The device/system may only be set up and used in conjunction with this documentation. Commissioning and operation of a device/system may only be performed by **qualified personnel.** Within the context of the safety notices in this documentation qualified persons are defined as persons who are authorized to commission, ground and label devices, systems and circuits in accordance with established safety practices and standards.

Prescribed Usage

Note the following:

Warning
This device and its components may only be used for the applications described in the catalog or the technical description, and only in connection with devices or components from other manufacturers which have been approved or recommended by Siemens.
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Preface

Purpose of the Manual

In this manual, the installation, administration and configuration of the communication features of BRAUMAT/SISTAR Classic 5.3 are described and it gives you an overview of the following topics:

- Communication Simatic S5
- Communication Simatic S7
- Redundant Bus
- PCU numbers greater 16

This manual is intended for those responsible for configuring, commissioning and servicing automation systems.

Required Basic Knowledge

You require a general knowledge in the field of automation engineering to be able to understand this manual.

In addition, you should know how to use computers or devices with similar functions (e.g programming devices) under Windows 2000 Prof./Windows 2000 Server or Windows XP Prof./Windows Server 2003 operating systems. Since BRAUMAT/SISTAR *Classic* V5.3 is based on the STEP 7 software, you should also know how to operate it. This is provided in the manual "Programming with STEP 7 V5.3".

Please read always the file “readme.wri” to the current version of BRAUMAT/SISTAR*Classic* before an installation of BRAUMAT/SISTAR*Classic* components.

Where is this Manual valid?

This manual is valid for the software package BRAUMAT/SISTAR*Classic*
from Version V5.3 SP2.

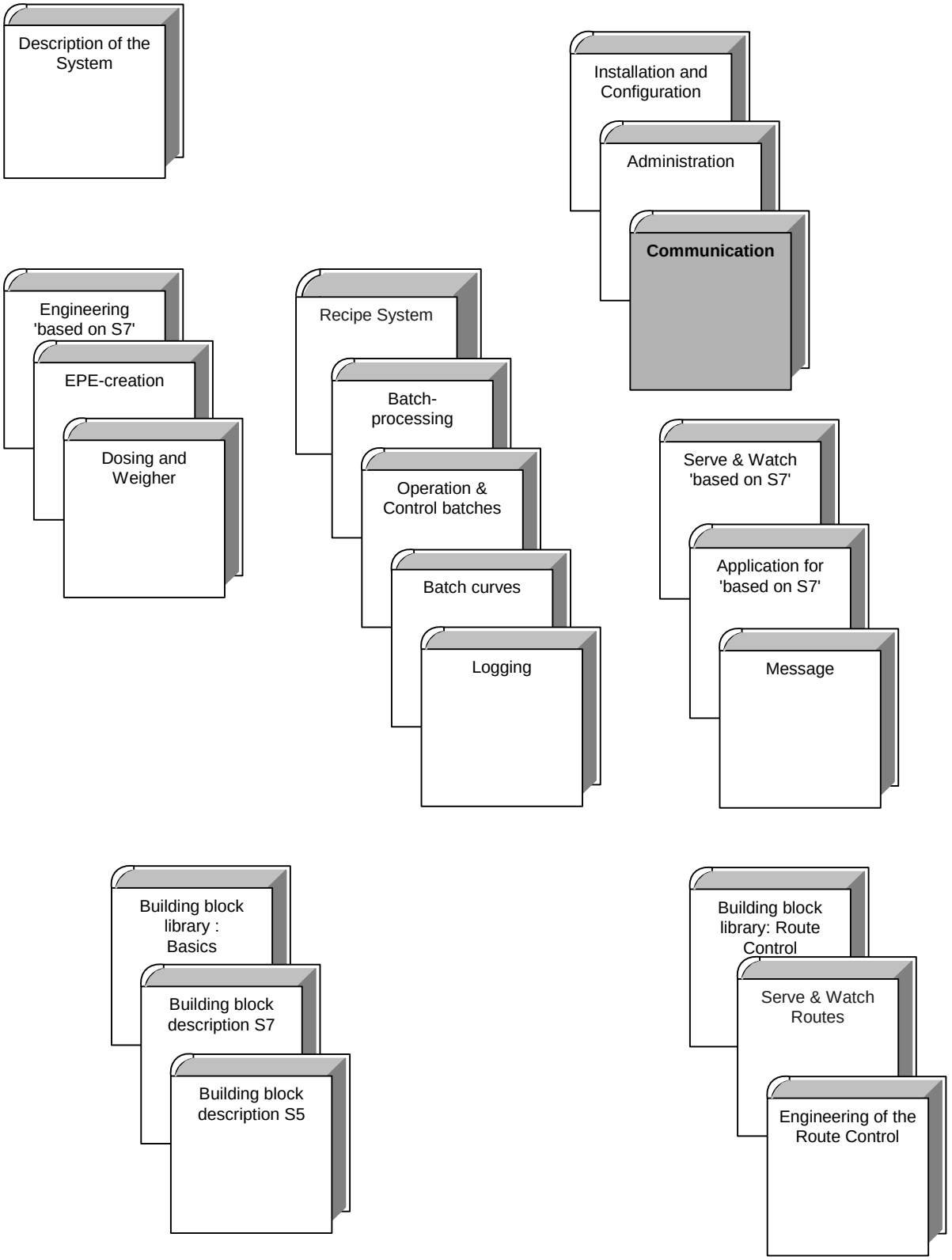
The offered electronic manual is most largely identical with the contents of the on-line help. Due to a technically necessary editorial deadline for the generation of electronic manuals occasionally smaller deviations can give up opposite the on-line helps.

The statements in the on-line helps are primary to those of the manual.

Place of this Documentation in the Information Environment

This manual forms part of the BRAUMAT/SISTAR Classic V5.3 documentation package. The following schematic of the document architecture show the individual manuals as well as their thematic grouping within the entire program package

Document structure



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You will find your contact person at:

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You will find a guide to the technical documentation offered for the individual SIMATIC Products and Systems here at:

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Siemens offers a number of training courses to familiarize you with the SIMATIC S7 automation system. Please contact your regional training center or our central training center in D 90327 Nuremberg, Germany for details:

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- Information on field service, repairs, spare parts and more under "Services".

Contents

1 Coupling S5

1.1 Overview Coupling

There are two possibilities for connecting the IOS's to the PCUs:

- serial coupling
- H1-bus coupling

(see also Chapter 3)

1.1.1 Coupling with SINEC-H1

- The system IOS's and PCUs are linked via the system bus SINEC-H1.
- Each IOS can be coupled to a maximum of 8 PCUs.
- Each PCU can send data to up to 15 partner PCUs.
- The coupling partners are defined during parameter assignment.

The communications processor CP1430(CP143) is employed on the PCU-end, and the Soft-CP driver is used on the IOS end.

Layer7-Coupling (Sinec Technological Function Interface = STF)

The STF-coupling is the standard coupling for data traffic between the IOS and PCU. All data, telegrams, block transfer as well as up-/downloading are sent via this coupling.

An IOS actively establishes an E7-link to every PCU it recognizes. STF variables are defined in connection with this link. Each coupling service applies to one of these variables.

For all the E7-links identical variable names are defined. However, they describe, from connection to connection, different S5-data areas.

1.1.2 Serial Coupling with RK512

Serial coupling is only used for distributed operating stations. The computer interconnection RK512 executes this task.

The communications processor CP524 is employed on the PCU-end while the board DF10 is used on the IOS-end.

The serial coupling describes exclusively 1 data connection from 1 PCU to 1 IOS.

1.2 Cross Coupling level 7 for connecting S5-S5

1.2.1 Cross Coupling and Job Types in general

The purpose of the cross coupling is the data exchange from one PCU to a maximum of 15 other PCUs via H1-bus.

In this subchapter, only the coupling of S5 to S5 PLCs is described.

Coupling tasks can be entered in a data block **DB_job**. Either cyclically or triggered by alarm a transmit job is formed by the job blocks. The transmit job can comprise several tasks depending on the length of the transmission buffer. The transmission buffer **DB_Send** is sent to the coupling partner. Transmissions can be made with or without an acknowledgment. By working with acknowledgment, a counter is incorporated in the first send word. This counter must be sent back by the coupling partner in a response telegram. If the response telegram is not received within a given time, the transmitter repeats the telegram.

The coupling partner enters the receive data in the receive buffer **DB_Rcv** where they are reloaded by the information in the data head.

The received buffer is monitored, i.e. if no receive telegrams are received within a freely selectable period of time via a coupling route, then the interface is declared out of order and the values out of the back-up list **DB Backup** are reloaded.

The following job types are foreseen for data exchange:

- **Type0** Send data block DB
- **Type1** Send data block DX
- **Type2** Fetch data block DB
- **Type3** Fetch data block DX
- **Type4** unit start
- **Type16** exchange time and data via a DB
- **Type17** exchange time and data via a DX

Type 0
Transmit Data Block DB

Function:
The source data are loaded into the transmit buffer and sent to the coupling partner. The coupling partner's receive buffer is reloaded using target information. Triggering takes place on a time basis, set time and real time.

Job Block:				**example**
Word 0	KY	PCU-number	time base	KY 1,1
Word 1	KY	job type	DB-number-target	KY 0,2
Word 2	KF		Target start address	KF 0
Word 3	KF		target length	KF 4
Word 4	KY	job type	DB-number-source	KY 0,2
Word 5	KF		source start address	KF 10

Word 6	KF		spare	KF 0
Word 7	KY	Actual time	set time	KY 0,2

PCU-number describes the coupling partner

Time base:		
Bit 0	100 ms	For times from 1 to 25 seconds.
Bit 1	1 s	For times from 1 to 250 seconds.
Bit 2	60 s	For times from 1 to 250 minutes.
Bit 7		For acknowledgment On/Off
Destination		describes DB/DW/number at coupling partner
Source		describes DB/DW/number of data that should be loaded into the transmit buffer
Set time	1 - 250	time value for cyclical transmission on time basis
Set time	0	It can only be transmitted by alarm using real time
Process time	255	alarm, i.e. transmission is initiated
Process time	1 – 250	actual time value counted up to set time on time basis. Once the set time is reached, transmission is triggered by entering 255.

Example:

In the example the data words 10,11,12,13 from DB2 are sent to PCU1 where they are filed in DB2 data word 0/1/2/3. Transmission is triggered cyclically every two seconds(time basis = seconds; set time with value 2 thus 2 seconds).

Type 1
Transmit Data Block DX

Function:
The source data are loaded into the transmit buffer and sent to the coupling partner (PCU-number). The coupling partner's receive buffer is reloaded using destination information. Triggering takes place on a time basis, set time and real time.

Job Block:				**Example**
Word 0	KY	PCU-number	Time basis	KY 1,1
Word 1	KY	Job type	DX-number-destination	KY 1,2
Word 2	KF		Destination start address	KF 0
Word 3	KF		Destination length	KF 4
Word 4	KY	Job type	DX-number-source	KY 1,2

Word 5	KF		Source start address	KF 10
Word 6	KF		Stand by	KF 0
Word 7	KY	Process time	Set time	KY 0,2

PCU-number **describes the coupling partner.**

Time base:		
bit 0	100ms	For times from 1 to 25 seconds.
bit 1	1 s	For times from 1 to 250 seconds.
bit 2	60 s	For times from 1 to 250 minutes.
bit 7		For acknowledgment on/off.
Target		Describes DX/DW/number with the coupling partner.
Source		Describes DX/DW/number of data that should be loaded into the transmit buffer
Set time	1 - 250 0	Time value for cyclical transmission on time basis can only be transmitted by alarm using real time
Real time	255 1 - 250	Alarm, i.e. transmission is initiated process value counted up to set time on time basis.Once the set time is reached, transmission is triggered by entering 255.

Example:

In the example the data words 10, 11, 12 and 13 from DX2 are sent to PCU1 where they are stored in DX2 data word 0,1,2 and 3. Transmission is triggered cyclically every two seconds (time base = seconds; set time with value 2 thus 2 seconds).

Type 2
Fetch Data Block DB

Function:
The job block is loaded into the transmit buffer and sent to the coupling partner (PCU-number). Using this information the transmit buffer is loaded with data and returned. At the job awarder the receive buffer is unloaded using the destination data. Triggering takes place on a time basis, set time and process value.

Job Block:				**example**
Word 0	KY	PCU-number	Time basis	KY 1,1
Word 1	KY	Job type	DB-number-target	KY 2,2
Word 2	KF		Destination start address	KF 0
Word 3	KF		Destination length	KF 4
Word 4	KY	Job type	DB-number-source	KY 2,2

Word 5	KF		Source start address	KF 10
Word 6	KF		Stand-by	KF 0
Word 7	KY	Process value	Set time	KY 0,2

The PCU-number describes the coupling partner.

Time base:		
Bit 0	100 ms	For times from 1 to 25 seconds
Bit 1	1 s	For times from 1 to 250 seconds
Bit 2	60 s	For times from 1 to 250 minutes
Bit 7		For acknowledgment On/Off

Target describes DB/DB/number where the data from the coupling partner should be entered

Source describes DB/DW/number of data to be transmitted by coupling partner

Set time 1 - 250 time value for cyclical transmission on time basis
0 can only be transmitted by alarm using real time

Real time 255 alarm, i.e. transmission is initiated
1 - 250 actual time value counted up to set time on time basis. Once the set time is reached, transmission is triggered by entering 255.

Example:

In the example a job is sent to PCU 1- to transmit the data words 10,11,12,13 from DB2 and to store them in data words 0/1/2/3 in DB2 in the PCU that gave the order. The order is sent cyclically to PCU 1 every two seconds (time basis = seconds; set time with value 2 thus 2 seconds).

Type 3
Fetch Data Block DX

Function:
The job block is loaded into the transmit buffer and sent to the coupling partner (PCU-number). Using this information the transmit buffer is loaded with data and returned. At the job awarder the receive buffer is unloaded using the target data. Triggering takes place on a time basis, set time and real time.

Job Block:				**example**
Word 0	KY	PCU-number	Time basis	KY 1,1
Word 1	KY	job type	DB-number-target	KY 3,2
Word 2	KF		Destination start address	KF 0
Word 3	KF		Destination length	KF 4

Word 4	KY	job type	DB-number-source	KY 3,2
Word 5	KF		Source start address	KF 10
Word 6	KF		Stand-by	KF 0
Word 7	KY	Process value	Setpoint	KY 0,2

PCU-number **describes the coupling partner**

Time base:		
bit 0	100 ms	For times from 1 to 25 seconds
bit 1	1 s	For times from 1 to 250 seconds
bit 2	60 s	For times from 1 to 250 minutes
bit 7		For acknowledgment On/Off

Target describes DX/DW/number where the data from the coupling partner should be entered

Source describes DX/DW/number of data to be transmitted by coupling partner

Set time 1 - 250 time value for cyclical transmission on time basis
0 can only be transmitted by alarm using real time

Real time 255 alarm, i.e. transmission is initiated
1 - 250 actual time value counted up to set time on time basis. Once the set time is reached, transmission is triggered by entering 255.

Example:

In the example 1 job is sent to PCU 1 - to send the data words 10,11,12 and 13 from DX2 and to file them in data words 0,1,2 and 3 in DX2 in the PCU that gave the order. The order is sent cyclically to PCU 1 every two seconds (time basis = seconds; set time with value 2, thus 2 seconds).

Type 4
Sequencer Start

Function:
In the sequence the corresponding bit is set in DB114 as if the sequence should be started. The source data is loaded into the transmit buffer and sent to the coupling partner (PCU-number). The coupling partner's receive buffer is reloaded using target information. Triggering takes place by an alarm order (set time = 255).

Job Block: (is automatically set up when sequencer start is pending)

Example				
Word 0	KY	PCU-number	Time basis	KY 2,0
Word 1	KY	Job type	Destination sequence no.	KY 4,2
Word 2	KF		Destination start address	KF 0

Word 3	KF		Destination length	KF 6
Word 4	KY	Job type	Source sequence no.	KY 4,2
Word 5	KF		ASTA-type	KF 10
Word 6	KF		ASTA-number	KF 1
Word 7	KY	Process value	Set time	KY 255,0

PCU-number describes the coupling partner

Time basis (irrelevant)

Destination sequence number number of the sequence in the coupling partner

Source sequence number number of the sequence in own PCU (data source)

ASTA-type

type 9 recipe type, recipe number, job number and batch number are from the source sequence.

type 10 recipe type, recipe number, job number and batch number are from the ASTA-data record.

type 11 recipe type from the ASTA data record recipe number and batch number from the week's program job number is the current calendar week.

type 12 recipe type, recipe number and job number are from the ASTA data record batch number of target sequence remains as is

ASTA-number number of the ASTA-data record (data source)

Target time 0 can only be transmitted by alarm using real time

Process value 255 alarm, i.e. transmission is initiated

Example:

In the example 1 job is sent to PCU 2 if sequence 2 should be started. Type 10 is a CIP-sequence start, i.e. recipe number, recipe type, job number and batch number are from the first ASTA-data record. The job is started via DB114 bit 2.1.

Type 16

Time and Date via Data-Block DB

Function:

Date and time are loaded in the send buffer and sent to the coupling partner (PCU-number). The received buffer of the coupling partner is reloaded with the destination information i.e. date and time. It is triggered via time base, target and real time. Date and time are transferred in a different DB.

Job Block:				**example**
Word 0	KY	PCU-number	Time basis	KY 1,2
Word 1	KY	job type	DB-number-destination	KY 16,0
Word 2	KF		Destination start address	KF 0
Word 3	KF		Destination length	KF 0

Word 4	KY	job type	DB-number-source	KY 0,0
Word 5	KF		Source start address	KF 0
Word 6	KF		Stand-by	KF 0
Word 7	KY	actual time	Set time	KY 0,1

The PCU-number describes the coupling partner.

Time base:		
Bit 0	100 ms	For times from 1 to 25 seconds
Bit 1	1 s	For times from 1 to 250 seconds
Bit 2	60 s	For times from 1 to 250 minutes
Bit 7		For acknowledgment on/off

Destination	describes DB/DW/number where the data from the coupling partner should be entered
Source	describes DB/DW/number of data to be transmitted by coupling partner
Set time	1 - 250 time value for cyclical transmission on time basis 0 can only be transmitted by alarm using real time
Process value	255 alarm, i.e. transmission is initiated 1 - 250 actual time value counted up to set time on time basis. Once the set time is reached, transmission is triggered by entering 255.

Example:

In the example an order is sent to PCU 1 - to trigger date and time with the transmission data. Source and target data are not necessary, i.e. the values for time and date are transmitted from DB201 DW91 - 94 (SISTAR – range for actual Time/Date) to DB 201 DW95 – 98 (SISTAR – range for setup actual Time/Date).

(Is Valid for S5 155U.)

The order is sent cyclically to PCU 1 every minute (time basis = minute; set time with value 1 thus 1 minute)

Type 17 **Function:**

Time and Date via Data Block DX

Date and time are loaded in the transmit buffer and sent to the coupling partner (PCU-number). The coupling partner's receive buffer is reloaded using target information, i.e. date and time are set. Triggering takes place on a time basis, set time and real time. Date and time are transmitted from one DX to another.

Job Block:				**example**
Word 0	KY	PCU-number	Time basis	KY 1,2
Word 1	KY	job type	DB-number-destination	KY 17,10
Word 2	KF		Target start address	KF 1

Word 3	KF		Target length	KF 4
Word 4	KY	job type	DB-number-source	KY 17,10
Word 5	KF		Source start address	KF 10
Word 6	KF		Stand-by	KF 0
Word 7	KY	actual time	Set time	KY 0,1

PCU-number describes the coupling partner.

Time base:		
Bit 0	100 ms	For times from 1 to 25 seconds
Bit 1	1 s	For times from 1 to 250 seconds
Bit 2	60 s	For times from 1 to 250 minutes
Bit 7		For acknowledgment on/off

Destination describes DB/DW/number where the data from the coupling partner should be entered

Source describes DB/DW/number of data to be transmitted by the coupling partner

Set time 1 - 250 time value for cyclical transmission on time basis
0 can only be transmitted by alarm using real time

Actual time 255 alarm, i.e. transmission is initiated
1 - 250 actual time value counted up to set time on time basis. Once the set time is reached, transmission is triggered by entering 255.

Example:

In the example an order is sent to PCU 1 - to trigger date and time with the Transmission data. Source data DX 10 DW 10. Line data DX 10 DW 1. The order is sent cyclically to PCU 1 every minute (time basis = minute; set time with value 1 thus 1 minute).

1.2.2 Program Structure

The following blocks in the S5-controller are needed for the cross coupling:

Function Blocks

Are delivered with SISTAR

FB 181	main program cross coupling
FB 182	load transmit buffer
FB 183	unload receive buffer / process back-up list
FB 184	sequencer start

Standard Handling Blocks

S5-115U contained in PLC OS

S5-155U contained BRAUMAT/SISTAR Classic 5.3 System-SW (6ES5872-7CB01)

S5 115 U	S5 155 U	
FB 244	FB 120	Send
FB 245	FB 121	Receive
FB 247	FB 123	Control
FB 249	FB 125	Synchronize

Data Blocks

DB 204	DB_Param	interface parameter assignment
DB 205	DB_Job	job blocks
DB 187	DB_Backup	back-up job blocks
DB 206	DB_Send	transmit buffer
DB 207	DB_Rcv	receive buffer
DB 208	DB_HiDa	auxiliary data

These blocks are processed as followed:

Start	OB20/OB21/OB22	call FB 181 with UPNR 1
100 ms pulse	OB10	call FB 181 with UPNR 10
Cyclical	OB 1	call FB 181 with UPNR UPNR = 0 when cross coupling and coupling to IOS are both handled by same CP-board UPNR = 1 when cross coupling is handled by its own CP- board

1.2.3 DB-Param Structure

DB 204 contains the setups for connections between the PCUs

The datablock has the following structure		
DW0		
DW1		Offset = 15
DW2		DR-length = 15
DW3		Maximum = 15
DW4		Current number of links
DW5		Scratch data
DW6		Scratch data
DW7		Scratch data
DW8		Scratch data
DW9		Scratch data
DW10		Spare
DW11		Length of send- and received buffers
DW12		Number of system data blocks in DB205
DW13		Control bits
	Bit 0	Coupling on/off
	Bit 8	Block automatic interface default
	Bit 15	Fault

DW015 – DW029	Job block for link to PCU 1
DW030 – DW044	Job block for link to PCU 2
DW045 – DW059	Job block for link to PCU 3
DW060 – DW074	Job block for link to PCU 4
DW075 – DW089	Job block for link to PCU 5
DW090 – DW104	Job block for link to PCU 6
DW105 – DW119	Job block for link to PCU 7
DW120 – DW134	Job block for link to PCU 8
DW135 – DW149	Job block for link to PCU 9
DW150 – DW164	Job block for link to PCU 10
DW165 – DW179	Job block for link to PCU 11
DW180 – DW194	Job block for link to PCU 12
DW195 – DW209	Job block for link to PCU 13
DW210 – DW224	Job block for link to PCU 14
DW225 – DW239	Job block for link to PCU 15
DW240 – DW254	Job block for link to PCU 16

Job Block Structure

For each connection there is one job block in the DB containing the connection parameters; return parameters of the standard handling blocks are stored here.

Word 0		**active SSNR**
Word 1	PCU-number	Job number
Word 2		Display word - control bits
Word 3		Display word - length
Word 4		Display word - STF-fault
Word 5		Normal SSNR
Word 6	PCU-number	Job number
Word 7		Pafe Synchron
Word 8		Step sequence
Word 9	PCU-number	Job number
Word 10		Pafe Synchron
Word 11		Step sequence
Word 12		Counter at job in DB 205
Word 13	Counter wait time	Switch over counter
Word 14		Fault bits

1.2.4 DB-Job Structure

The DB 205 includes the PCU to PCU job blocks

Header Information:		
DW0		Type= 1
DW1		Offset= 10
DW2		DR-length = 8

DW3		Maximum = 500
DW4		Current number of jobs
DW5		Upper limit
DW 10 – 4020		Job blocks

Each job includes 8 Words

Word 0	PCU-number	Time basis

Destination information:

Word 1	Job type	DB-number
Word 2		Start
Word 3		Length

Source Information:

Word 4	Job type	DB-number
Word 5		Stand-by
Word 7		Stand-by for length

1.2.5 Structure DB-Backup

The DB187 includes backup job blocks which are processed, if the Receive-buffer of the PCU recognizes a loss of the connection to the partner PCU. On expiration of the predefined timeout in DB-HiDA (DB208) for this connection the backup value transfer takes place. This provides a 'secure state' of the PCU-received data in case of connection losses.

Data Block Header Information:

DW0		**Type = 1**
DW1		Offset = 10
DW2		DR-length = 8
DW3		Maximum = 500
DW4		Current number of jobs

DW 10 - 4020 Job Blocks

Each job consists of 8 Words:

Word 0	**PCU-number**

Destination information

Word 1	**Job type**	**DB-number**
Word 2		start
Word 3		length

Source Information

Word 4	**Job type**	**DB-number**
Word 5		start
Word 7		length

1.2.6 DB-Send Structure

The DB 206 includes the send buffers with a maximum of 16 possible buffers. The length of a transmit buffer is 128 data words at the maximum.

The block has the following structure:

1st user	DW000 to DW127
2nd user	DW128 to DW255
3rd user	DW256 to DW383
4th user	DW384 to DW511
5th user	DW512 to DW639
6th user	DW640 to DW767
7th user	DW768 to DW895
8th user	DW896 to DW1023
9th user	DW1024 to DW1151
10th user	DW1152 to DW1279
11th user	DW1280 to DW1407

12th user	DW1408 to DW1535
13th user	DW1536 to DW1663
14th user	DW1664 to DW1791
15th user	DW1792 to DW1919
16th user	DW1920 to DW2047

Transmit Buffer Structure

Word 0 DL receive acknowledgment DR transmit acknowledgment

Word 1 .. 126 Job blocks

Word 127 End identifier = -1

Job Block Structure

Word 0 job DB-number

Word 1 DW-start

Word 2 Number

Word 3 to number Active data

1.2.7 DB-Rcv Structure

The DB 207 includes the received buffers with a maximum of 16 possible buffers. The length of a receive buffer is 128 data words at the maximum.

1st user	DW000 to DW127
2nd user	DW128 to DW255
3rd user	DW256 to DW383
4th user	DW384 to DW511
5th user	DW512 to DW639
6th user	DW640 to DW767
7th user	DW768 to DW895
8th user	DW896 to DW1023
9th user	DW1024 to DW1151
10th user	DW1152 to DW1279
11th user	DW1280 to DW1407
12th user	DW1408 to DW1535
13th user	DW1536 to DW1663
14th user	DW1664 to DW1791
15th user	DW1792 to DW1919
16th user	DW1920 to DW2047

Receive Buffer Structure

Word 0 DL received acknowledgment DR transfer acknowledgment

Word 1 .. 126 Job blocks

Word 127 End identifier = -1

Job Block Structure

Word 0 job DB-number

Word 1 DW-start

Word 2 Number

Word 3 to number Data

1.2.8 DB-HiDa Structure

The DB208 includes the help buffers which are for internal use of the cross coupling function blocks (FB181 to FB185. The user relevant service-data (DW100 - DW119) are described in the chapter „Parameterizing the cross coupling“. DW191 to DW206 includes the setpoints for backup transfer set by the user. Further data is for information only.

DW001 – 009	Job buffer
DW050 – 059	Scratch data for OB1
DW060 – 064	Time processing
DW065 – 069	Scratch data for OB10
DW071 – 086	Administration of the 16 transmit buffers
DW100 – 119	Service data
DW120 – 139	Data for FB182/183
DW141 – 156	One data word per user to control transmit and receive buffers DL counter for receive buffer DR counter for transmit buffer
DW161 - 176	One data word per user for acknowledgment control DL counter for reception for comparison to DL 141-156
DW180	Scrawl data
DW181 - 189	Edge bits for sequence start, i.e. allocation such as DB114 DW 2 Bit 181.0 = sequence 1 Bit 181.15 = sequence 15
DW190	Scrawl word
DW191 - 206	Load setpoints for back-up values (1 to 32000 sec.) for 16 links
DW210	Identifier alarm
DW211 – 226	Load actual value for back-up values (1 to 32000 sec.) for 16 links

1.3 Cross Coupling Parameter Assignment

Parameters can be assigned to the cross coupling by:

- entering the values in the data blocks by means of a programmer or
- filling out the IOS-masks in the application **Parameterization**

The menue driven application has the advantage of displaying always the rigth words per connection thus preventing input at wrong data words. That mechanism is easier to use, less faulty and is recommended to use

1.3.1 Parameter Assignment using a Programmer

The following inputs must be made:

DB201	DL2	PCU-number
DB204	D13.0	Activate cross coupling
DB204	DW4	Number of links
DB205	DW4	Number of jobs
DB205		Enter jobs
DB187	DW4	Number of back-up jobs
DB187	Enter back-up jobs	Enter back-up jobs
DB208	DW191 - 206	Set time for back-up jobs

Jobs entry using the service function of DB208:

In order to simplify the input and output of cross-coupling jobs with the programmer the DB.HiDA (DB208) includes a service function:

Input of a job

If a job should be set the data word DW100 to zero; then configure the job in DW111 to 118; Finally on writing to DW 100 the job data are accepted

Output of a job

If a job should be read in order to check the configured data, the data word DW100 is supplied according to the following description; (job data is displayed in DW111 to DW118)

DW100	Bit 0	Read job
	Bit 7	Read back-up job
	Bit 15	Write job
	Bit 15	Write back-up job
DW 102		Job block number in DB205/DB187
DW110		Result 1 = o.k 0 = error
DW111-118		Job block

Job Block.:

Word 111	PCU-number	time base

Target Information:

word 112	job type	DB-number
word 113		start
word 114		length

Source Information:

word 115	job type	DB-number
word 116		start
word 117		spare for length

1.3.2 Configuration via the Application 'Configuration'

The configuration via the Application 'Configuration' is menue driven. The relevant Data words are displayed per job, so that the input of wrong data words are prohibited. So that kind of configuration is easier to handle and less error prone and is thus recommended

1.3.2.1 Cross Jobs - Cross-coupling jobs level 7 (S5 – S5)

Cross coupling serves to effect data exchanges between a PCU and a maximum of 16 other PCUs.

In the process data are being transferred from a source block (DB or DX) to a destination data block (DB or DX).

A reception buffer monitors the incoming data. Is the data link declared to be erroneous, the data are transferred from the **stand-by** list.

The time base is stated in the parameter TIMEBASE (second or minute); the setpoint value of the intervals between which the block should be transferred is stated in the parameter TSOLL.

Parameter set: Parameterization PCU

QuerJobs PCU		**DB 205**		**Sets: 200 per PCU max.**
No.	NAME	TYPE Info	Preass.	Comment
1	PCUNR	I8 P S	0	Number of the partners PCU
2	ZTYP	I8 P S	0	Type of target data block 0 = DB / 1 = DX
3	ZDBNR	I8 P S	0	Number of target data block
4	ZDWNR	I16 P S	0	Initial word of target
5	LAENGE	I8 P S	0	Length of job (number of words)
6	QTYP	I8 P S	0	Type of source block 0 = DB / 1 = DX
7	QDBNR	I8 P S	0	Number of source block
8	QDWNR	I16 P S	0	Initial word of source
9	ZeitS	B1 P S	0	Time base for message time 1 = sec.
10	ZeitM	B1 P S	0	Time base for message time 1 = min.
11	TQuit	B1 P S	0	Message acknowledge 1 = On, 0 = Off
12	TSOLL	I8 P S	0	Destination value for message time

Parameter set: Text parameterization IOS

QuerJobs IOS			**Sets: 200 per PCU max.**
No.	Type Info	Preassign.	Comment
1	Z16 P IOS	QuerJob xxx	Cross coupling jobs

1.3.2.2 QuerPCUs - Cross coupling to partner PCU Layer 7 (S5 – S5)

In this block the connection between one PCU to another PCU are determined.

For this it is necessary to put in the job number of CP143/CP1430 along with the PCU number. If the predefined job number is used the automatic preset values should be selected. Here the system enters the right job numbers into the assigned data sets so

configuration errors are eliminated. On each startup of the PCU, the job numbers are preset automatically.

If the job numbers are defined plant specific by the user the automatic preset has to be switched off. After parameterizing the job numbers the PCU must be restarted in order to activate the changes.

Parameter set: Parameterization PCU

QuerPCU PCU		**DB 204**		**data set 0**
No.	NAME	TYPE Info	Preass.	Comment
1	Anz	I16 P S	1	no. of cross couplings
2	Kopp.	B1 P S	1	coupling ON/OFF = 1/0
3	SndRecAll	B1 P S	0	send/receive all ON/OFF = 1/0
4	AutoSp	B1 P S	0	0=automatic preset, 1=manual preset
5	Stoe	B1 P S	0	error coupling, DB length

Parameter set: Parameterization PCU

QuerPCU PCU		**DB 204**		**Sets:16 per PCU max.**
No.	NAME	TYPE Info	Preass.	Comment
1	PCU	I8 P S	0	PCU no. of coupling partner
2	SSNR	I16 P S	232	interface number
3	ANR	I8 P S	0	job number
4	PCU_R	I8 P S	0	PCU number of coupling partner reserve
5	SSNR_R	I16 P S	-1	interface number reserve
6	ANR_R	I8 P S	0	job number reserve
7	PCU_A	I8 P S	0	active PCU no. of coupling partner
8	SSNR_A	I16 P S	-1	active interface number
9	ANR_A	I8 P S	0	active job number

Parameter set: Text parameterization IOS

QuerPCU IOS			**Sets: 16 per PCU max.**
No.	Type Info	Preassign.	Comment
1	Z16 P IOS	QuerPCU xxx	cross coupling jobs

Determining the job number on the CP1430

PCU-No.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	-	51	53	55	57	59	61	63
2	51	-	55	57	59	61	63	65
3	53	55	-	59	61	63	65	67
4	55	57	59	-	63	65	67	69
5	57	59	61	63	-	67	69	71
6	59	61	63	65	67	-	71	73

7	61	63	65	67	69	71	-	75
8	63	65	67	69	71	73	75	-
9	65	67	69	71	73	75	77	79
10	67	69	71	73	75	77	79	51
11	69	71	73	75	77	79	51	53
12	71	73	75	77	79	51	53	55
13	73	75	77	79	51	53	55	57
14	75	77	79	51	53	55	57	59
15	77	79	51	53	55	57	59	61
16	79	53	57	61	65	69	73	77

Determining the job number on the CP1430

PCU-No.	9	10	11	12	13	14	15	16
1	65	67	69	71	73	75	77	79
2	67	69	71	73	75	77	79	53
3	69	71	73	75	77	79	51	57
4	71	73	75	77	79	51	53	61
5	73	75	77	79	51	53	55	65
6	75	77	79	51	53	55	57	69
7	77	79	51	53	55	57	59	73
8	79	51	53	55	57	59	61	77
9	-	53	55	57	59	61	63	51
10	53	-	57	59	61	63	65	55
11	55	57	-	61	63	65	67	59
12	57	59	61	-	65	67	69	63
13	59	61	63	65	-	69	71	67
14	61	63	65	67	69	-	73	71
15	63	65	67	69	71	73	-	75
16	51	55	59	63	67	71	75	-

1.3.2.3 QuerJobsErs - Parameters for Standby Jobs

This block transfers standby values into the destination block (DB or DX) if the receive buffer determines a connection fault to the partner PCU.

Parametersets Block QuerJobsErs

Parameterization PCU

QuerJobsErs PCU		DB187		Sets: max. 60 per PCU
Nr.	NAME	TYPE Info	preset	Comment
1	PCUNR	I8 P S	0	PCU-No. of faulty PCU
2	ZTYP	I8 P S	0	Dest. for standby values: 0=DB, 1=DX
3	ZDBNR	I8 P S	0	Dest for standby values: DB / DX-No.
4	ZDWNR	I16 P S	0	Dest for standby values: start address

5	LAENGE	I8 P S	0	Count DW
6	QTYP	I8 P S	0	Source for standby values: 0=DB, 1=DX
7	QDBNR	I8 P S	0	Source for standby values: DB/DX-No.
8	QDWNR	I16 P S	0	Source for standby values: start address

Textparameterization IOS

QuerJobsErs IOS			**Sets: max. 60 per PCU**
Nr.	Type Info	Preset	Comment
1	Z16 P IOS	ERSA xxx	Block name

1.3.2.4 QuerSteu - Cross coupling control data

In this module the time values are determined, after that in the case of a connection error the substitute values (see ERSA) are accepted.

Parameter set: Parameterization PCU

QuerSteu PCU	**DB 208**		**Sets:1 per PCU max.**
No.	NAME	TYPE Info	Preass.	Comment
1	ST1	I16 P S	0	Load time setpoint substitute values connection 1
2	ST2	I16 P S	0	Load time setpoint substitute values connection 2
3	ST3	I16 P S	0	Load time setpoint substitute values connection 3
4	ST4	I16 P S	0	Load time setpoint substitute values connection 4
5	ST5	I16 P S	0	Load time setpoint substitute values connection 5
6	ST6	I16 P S	0	Load time setpoint substitute values connection 6
7	ST7	I16 P S	0	Load time setpoint substitute values connection 7
8	ST8	I16 P S	0	Load time setpoint substitute values connection 8
9	ST9	I16 P S	0	Load time setpoint substitute values connection 9
10	ST10	I16 P S	0	Load time setpoint substitute values connection 10
11	ST11	I16 P S	0	Load time setpoint substitute values connection 11
12	ST12	I16 P S	0	Load time setpoint substitute values connection 12
13	ST13	I16 P S	0	Load time setpoint substitute values connection 13
14	ST14	I16 P S	0	Load time setpoint substitute values connection 14
15	ST15	I16 P S	0	Load time setpoint substitute values connection 15

Parameter set: text parameterization IOS

QuerSteu IOS			**Sets:1 per PCU max.**
No.	Type Info	Preassign.	Comment
1	Z16 P IOS	QuerSteu xxx	Cross coupling control data

1.4 Cross coupling level 4 for connecting S5-S5 and S5-S7

1.4.1 General

Notes:

- The coupling variant described here serves for connection of S5 with S5 PLCs and S5 with S7 PLCs on behalf of Layer 4 Funktions
- For that the **changed** coupling function blocks of library …\Sis_S5.pcu\qk_s5S7.460\J401QKST.S5D on the BRAUMAT/SISTAR Classic 5.3 Toolset-CD have to be copied to the relevant Simatic S5 projects
- The function blocks FB181-FB184 substitutes the equally named function blocks of the standard library
- The changed coupling blocks serves both for layer 7 communication (see chapter Cross Coupling level 7 for connecting S5-S5) and – via calling the additional function blocks FB151-FB154 – for layer 4 communication
- A **maximum of 16** cross coupling connections are possible here, too.

Coupling tasks can be entered in a data block **DB_job** here too. Either cyclically or triggered by alarm a transmit job is formed by the job blocks. The transmit job can comprise several tasks depending on the length of the transmission buffer. The transmission buffer **DB_Send** is sent to the coupling partner. Transmissions can be made with or without an acknowledgment. When working with acknowledgment, a counter is incorporated in the first send word. This counter must be sent back by the coupling partner in a response telegram. If the response telegram is not received within a given time, the transmitter repeats the telegram.

The coupling partner enters the receive data in the receive buffer **DB_Rcv** where they are reloaded by the information in the data head.

The receive buffer is monitored, i.e. if no receive telegrams are received within a freely selectable period of time over a coupling route, then the interface is declared out of order and the values out of the back-up list **DB Backup** are reloaded.

The following job types are foreseen for data exchange: :

- Type 50 transmit data block DB
- Type 51 transmit data block DX
- Type 52 fetch data block DB
- Type 53 fetch data block DX
- Type 54 Sequencer -start
- Type 66 transmit time and date to a S5
- Type 68 transmit time and date to a S7

Type 50

Transmit data blocks DB

Function:

The source data are loaded into the transmit buffer and sent to the coupling partner. The coupling partner's receive buffer is reloaded using target information. Triggering takes place on a time basis, set time and real time. This job is only possible, if the control that should be connected, will be a S5.

Job Block:

Example:				
Word 0	KY	PCU-Number	Time base	KY 1,0
Word 1	KY	Job type target	Job type source	KY 50,50
Word 2	KF		DB number target	KF 2
Word 3	KF		Target start address	KF 0
Word 4	KF		Target length	KF 4
Word 5	KF		DB number source	KF 2
Word 6	KF		Source start address	KF 10
Word 7	KY	Real time	Set time	KY 0,2

PCU-Nummer describes the coupling partner

Time base:

Bit 0	Min	0= time base sec 1=time base min 1 – 250
Bit 1	Ms	0=time base sec/min 1=time base for 100 ms 1 – 250
Bit 7		For acknowledgment on/off
Target:		describes DB/DW-number at coupling partner
Source:		Describes DB/DW- number of data that should be loaded into the transmit buffer
Set time	1 – 250 0	Time value for cyclical transmission on time basis
Set time	0	can only be transmitted by alarm using real time
Actual Time	255	Alarm, i.e. transmission is initiated by a transmission
Actual Time	1 – 250	Counted up to set time on time basis. Once the set time is reached, transmission is triggered by entering 255..

Example:

In the example data words 10, 11, 12, 13 are sent to PCU1 from the DX2 data words 0/1/2/3. The transmission is started every 2 minutes.in a cylcic way(time base = seconds, budgeted time with value 2, therefore 2 seconds)

Note:

Job type target and job type source can also use other values:

(Send DB in DX for couplings S5/S7 to a S5)

Type 51

Transmit data blocks DX

Function:

The source data are loaded into the transmit buffer and sent to the coupling partner. The coupling partner's receive buffer is reloaded using target information. Triggering takes place on a time basis, set time and real time. This job is only possible, if the control that should be connect, will be a S5.

Job block:

Example:				
Word 0	KY	PCU-Number	Time base	KY 1,0
Word 1	KY	Job type target	Job type source	KY 52,52
Word 2	KF		DX number target	KF 2
Word 3	KF		Target start address	KF 0
Word 4	KF		Target length	KF 4
Word 5	KF		DX number source	KF 2
Word 6	KF		Source start address	KF 10
Word 7	KY	Real time	Set time	KY 0,2

PCU-Number describes the coupling partner

Time base:

Bit 0	Min	0=Time base sec 1=Time base min 1 – 250
Bit 1	Ms	0=Time base sec/min 1=Time base for 100 ms 1 – 250
Bit 7		Acknowlegement On/Off
Target:		describes DX/DW-number at coupling partner
Source:		Describes DX/DW- number of data that should be loaded into the transmit buffer
Set time	1 – 250	Time value for cyclical transmission on time basis
Set time	0	can only be transmitted by alarm using real time

Actual Time	255	Alarm, i.e. transmission is initiated by a transmission
Actual Time	1 – 250	Counted up to set time on time basis. Once the set time is reached, transmission is triggered by entering 255..

In the example data words 10, 11, 12, 13 are sent to PCU1 from the DX2 data words 0/1/2/3. The transmission is started every 2 minutes in a cyclic way. (time base = seconds, budgeted time with value 2, therefore 2 seconds)

Note:
Job-type-target and job-type-source can also use other values
(Transmit DX in DB for coupling S5 to a S5/S7)

Job type 52

Fetch data block DB

Function:

The source data are loaded into the transmit buffer and sent to the coupling partner. The coupling partner's receive buffer is reloaded using target information. Triggering takes place on a time basis, set time and real time. This job is only possible, if the control that should be connected, will be a S5.

Job block:

Example:				
Word 0	KY	PCU-Number	Time base	KY 1,0
Word 1	KY	Job type target	Job type source	KY 50,50
Word 2	KF		DB number target	KF 2
Word 3	KF		Target start address	KF 0
Word 4	KF		Target length	KF 4
Word 5	KF		DB number source	KF 2
Word 6	KF		Source start address	KF 10
Word 7	KY	Real time	Set time	KY 0,2

PCU-Number describes the coupling partner

Time base:

Bit 0	min	0=time base sec 1=time base min 1 – 250
Bit 1	ms	0=time base sec/min 1=time base for 100 ms 1 – 250
Bit 7		Acknowledgement On/Off
Target:		describes DB/DW-number at coupling partner
Source:		Describes DB/DW- number of data that should be loaded into the transmit buffer

Set time	1 – 250	Time value for cyclical transmission on time basis
Set time	0	can only be transmitted by alarm using real time
Actual Time	255	Alarm, i.e. transmission is initiated by a transmission
Actual Time	1 – 250	Counted up to set time on time basis. Once the set time is reached, transmission is triggered by entering 255..

Example:

In the example a job is sent to PCU1 to read from the DB2 the DW 10,11,12,13 and send it back to the DB2 data words 0/1/2/3. The transmission is started every 2 minutes in a cyclic way. (time base = seconds, budgeted time with value 2, therefore 2 seconds)

It is also possible to load values from a DB in a DX.

Job type 53

To fetch data blocks DX

Function:

The source data are loaded into the transmit buffer and sent to the coupling partner. The coupling partner's receive buffer is reloaded using target information. Triggering takes place on a time basis, set time and real time. This job is only possible, if the control that should be connected, will be a S5.

Job block:

Example:				
Word 0	KY	PCU-Number	Time base	KY 1,0
Word 1	KY	Job type target	Job type source	KY 50,50
Word 2	KF		DX number target	KF 2
Word 3	KF		Target start address	KF 0
Word 4	KF		Target length	KF 4
Word 5	KF		DX number source	KF 2
Word 6	KF		Source start address	KF 10
Word 7	KY	Actual time	Set time	KY 0,2

PCU-Number:Describes the coupling partner

Time base:

Bit 0	min	0=Time base sec 1=Time base min 1 – 250
Bit 1	ms	0=Time base sec/min 1=Time base for 100 ms 1 – 250
Bit 7		Acknowledgement On/Off
Target:		describes DX/DW-number at coupling partner

Source:		Describes DX/DW- number of data that should be loaded into the transmit buffer
Set time	1 – 250	Time value for cyclical transmission on time basis
Set time	0	can only be transmitted by alarm using real time
Actual Time	1 – 250	Counted up to set time on time basis. Once the set time is reached, transmission is triggered by entering 255..
Actual Time	255	Alarm, i.e. transmission is initiated by a transmission

Example:

In the example a job is sent to PCU1 to read from the DX2 the DW 10,11,12,13 and send it back to the DX2 data words 0/1/2/3. The transmission is started every 2 minutes in a cyclic way. (time base = seconds, budgeted time with value 2, therefore 2 seconds)

It is also possible to load values from a DB in a DX.

Job type 54

Sequencer Start (Plant section = Sequencer)

Function:

The corresponding bit in ASTA DB is set in the plant section, if a plant section is to be started. The source datas are loaded to the transmit buffer and to the coupling partner. The receive buffer of the coupling partner is reloaded via the target information. The triggering is performed via an alarm job.

Job block: (is stored automatically, when sequencer start is in queue

Example:				
Word 0	KY	PCU-Number	Time base	KY 2,0
Word 1	KY	Job type	Target sequence numberr	KY 54,2
Word 2	KF		Start-target	KF 0
Word 3	KF		Length-target	KF 6
Word 4	KY	Job type	Source sequence number	KY 54,2
Word 5	KF		ASTA-Type	KF 10
Word 6	KF		ASTA-Number	KF 1
Word 7	KY	Real time	Budgeted time	KY 255,0

PCU-Number		**Describes the coupling partner**
Time base		(irrelevant)
Target sequence number		Number of the sequence in the coupling partner

Source sequence number		Number of the sequence in own PCU (data source)
ASTA-Type	Type 9	Recipe type, recipe number, job number and batch number are from the source sequence
	Type10	Recipe type, recipe number, job number and batch number are from the ASTA-data record
	Type 11	Recipe type from the ASTA data record recipe number and batch number from the week's program job number is the current calendar week
	Type 12	Recipe type, recipe number and job number are from the ASTA data record batch number of target sequence remains as is
ASTA-Number		Number of the ASTA-data record (data source)
Set time	0	0 can only be transmitted by alarm using real time
Actual time	255	Alarm, i.e. transmission is initiated

Example:

In the example an order is sent to PCU 2, if sequencer 2 is to be sent. Type 10 is a CIP-sequencer, i.e. recipe number, recipe type, job number and batch number come from the first ASTA- data record. The job is started via ASTA-Start DB bit 2.1.

Notes :

ASTA-Start DB 114

ASTA-data records DB 242

In S5 there are 96 ASTA-data records in DB 242 and the assigned start bits in DB114 DW 2 – 7.

The user can influence the bits in DB114 via the ASTA-interface S672.0 to S683.7.

Construction of the ASTA-data record in DB242

W 0	Reserve
W 1	Reserve
W 2	Reserve
W 3	SEQU
W 4	Type Bit 0 = Status bit
W 5	Source-TA, Target-TA
W 6	Target-PCU
W 7	Year, recipe type
W 8	Recipe number
W 9	Job number
W 10	Batch number

Type 9	Start via a plant section, i.e. the values come from the SEQU data record (DB225/DB246)
Type 11	Start via the weekly programm, i.e. the values come from the weekly programm (DB240)
Type 10/12	Start of a CIP-plant section, i.e. the values have to be entered in the ASTA-data record by the user. Sequencer=0

The value for recipe type and recipe number has to be taken from the target SEQU by entering for type 10,11.

If a new ASTA-startbit comes, a system job is generated.

The transmit buffer is entered due to this job:

DB206 – transmit buffer Old recipe

W 0	Type = 54
W 1	Reserve
W 2	Reserve
W 3	Length = 4
W 4	Starttype 9,10,11,12
W 5	Source-SEQU
W 6	Grade, grade block
W 7	Brew number

DB206 – transmit buffer New recipe

W 0	Type = 54, Target-SEQU
W 1	Reserve
W 2	Length = 6
W 3	Length = 4
W 4	Starttype 9,10,11,12
W 5	Source-SEQU
W 6	Year, recipe type
W 7	Recipe number
W 8	Job number
W 9	Batch number

Receiving data in S5

If this data record comes in a receive buffer DB207 of a S5, it will be examined, if the target SEQU is in step 0 and if there is neither a manual operation nor a continous condition. In case of that, the sequence is started by setting step=0.

Receiving data in S7

If this data record comes in a receive buffer DB987 of a S7, it will be examined, if the target SEQU is in step 0 and if there is neither a manual operation nor a continous condtion. In case of that, the sequence is started by setting step=1.

DB 987 Receive buffer

DBBxx0	Message counter receive
DBBxx1	Message counter transmit
DBBxx2	Type=54
DBBxx3	Target sequence = 1 --- 64
DBWxx4	Reserve
DBWxx6	Number = 6
DBWxx8	Number = 6
DBWx10	Start type e.g. 10
DBWx12	Source SEQU e.g. 0
DBWx14	Year, Recipe type e.g. 123
DBWx16	Recipe number e.g. 456
DBWx18	Job number e.g. 789
DBWx20	Batch number e.g. 101
DBWx22	End identifier -1

In DB988 there is a data record for each plant section. The receive message is entered in this data record. The target sequence is started via this data record.

It will be examined, if there is no manual operation or continous condition. In case of that, the sequence is started by setting step=1.

DB988 XC_RASTA_SR

bSrcPCU Source-PCU-Number

bDestPCU Target-PCU-Nummer

bSrcASTA Source-ASTA

bDestSEQ Target-Plant Section

bYear

bRecipeType

iRecipe

iOrder

iBatch

Main task of the data record is to locate where a plant section is started. Further a plant section is started via this data record.

There is no acknowledgement about success or failure of a sequencer start to the S5.

There could be the following errors:

- Plant Section in manual operation
- No continous conditions
- Plant Section is not in step 0
- Recipe is not available

Therefore the user has to establish a cross coupling job by himself for sending back the plant section state to the coupling partner.

MB656 - 663 or Bits from DB613 i.e. you can send cyclically DB613 to the coupling partner.

Job type 66

Time and date via data block DB to S5

Job type 68

Time and date via data block DB to S7

Function:

Date and time are loaded in the transmit buffer and are sent to the coupling partner (PCU number). The receive buffer of the coupling partner is reloaded by the target information i.e. date and time are controlled. The triggering is performed by time base, set time and actual time. Date and timer are transmitted by a DB in a DB.

Only PCU-number and type (66,68) set time and time base can be entered. The rest of the job values are added automatically.

Job block:

Example:				
Word 0	KY	PCU-Number	Time base	KY 1,0
Word 1	KY	Job type target	Job type source	KY 66,66
Word 2	KF		DB number target	KF 0
Word 3	KF		Target start address	KF 0
Word 4	KF		Target length	KF 0
Word 5	KF		DB number source	KF 0
Word 6	KF		Source start address	KF 0
Word 7	KY	Real time	Set time	KY 0,1

PCU-Number Describes the coupling partner

Time base:

Bit 0	min	0=Time base sec 1=Time base min 1 – 250
Bit 1	ms	0=Time base sec/min 1=Time base for 100 ms 1 –250
Bit 7		Acknowledgement On/Off
Target:		describes DB/DW-number at coupling partner
Source:		Describes DB/DW- number of data that should be loaded into the transmit buffer
Set time	1 – 250 0	Time value for cyclical transmission on time basis can only be transmitted by alarm using real time
Actual Time	255 1 - 250	Alarm, i.e. transmission is initiated by a transmission Counted up to set time on time

		basis. Once the set time is reached, transmission is triggered by entering 255..

Example:

Job type-target = 66 i.e. S5

Job type source= 66 i.e. S5

In the example an order is sent to PCU 1 - to trigger date and time with the transmission data. Source and target data are not necessary, i.e. the values for time and date are transmitted from DB 201 DW 91 - 94 to DB 201 DW 95 - 98. (Valid for S5 155U.) The order is sent cyclically to PCU 1 every minute (time basis = minute; set time with value 1 thus 1 minute)

Job-type-target=68 i.e. S7

Job-type-source = 66 i.e. S5

In the example an order is sent to PCU 1 (S7) - to trigger date and time with the transmission data. Source and target data are not necessary, i.e. the values for time and date are transmitted from DB 201 DW 91 - 94 to DB 701 DBB190-197.

1.4.2 Program Structure

The following blocks in the S5-controller are needed for the cross coupling.

Note:

The function block FB181, FB182, FB183 and FB184 are adjusted blocks of the layer 7 – coupling, which call the function blocks FB151, FB152, FB153 of the layer 4.

Function blocks:

FB 151	Main program Cross coupling – layer 4
FB 152	Assign transmit buffer – layer 4
FB 153	Assign receive buffer – layer 4
FB 181	Main programm Cross coupling – layer 7
FB 182	Assign transmit buffer
FB 183	Dispose receive buffer / process spare list
FB 184	Plant Section start (sequencer start)

Standard-data handling block:

SIMATIC S5-115U	**SIMATIC S5-155 U**	
FB 244	FB 120	SEND
FB 245	FB 121	RECEIVE
FB 247	FB 123	CONTROL
FB 249	FB 125	SYNCHRON

Data blocks:

DB 204	DB_Param: Configuration of the interface
DB 205	DB_Job: Job blocks
DB 187	DB_Spare: Spare job blocks

DB 188	DB_indicator words for CP143/CP1430
DB 206	DB_Send: Transmit buffer
DB 207	DB_Empf: Receive buffer
DB 208	DB_HiDa: auxiliary datas

These blocks are processed as followed:

Start	OB20/OB21/OB22: Call of FB 181 with UPNR 1
100 ms Takt	Call of FB 181 with UPNR 10
Cyclic	OB1 Call of FB 181 with UPNR: UPNR 0 Cross coupling and coupling to PC run via the same CP-module. Cross coupling run via the own CP-module. UPNR 1 Cross coupling run via the own CP-module

1.4.3 Structure DB-Param

The data block DB 204 contains the configuration for the connection between the PCUs.

The data block has the following structure:

DW0	
DW1	Offset = 15
DW2	DS-length = 15
DW3	Maximum = 15
DW4	Current number connections
DW5	Scratch data
DW6	Scratch data
DW7	Scratch data
DW8	Scratch data
DW9	Scratch data
DW11	Length of the transmit or receive buffer
DW12	Number of the system data blocks in DB205
DW13	Control bits Bit 0 Coupling On/Off Bit 8 lock out automatic presetting of interfaces Bit 15 fault
DW 015 - DW 029	Job block for connection to PCU 1
DW 030 - DW 044	Job block for connection to PCU 2
DW 045 - DW 059	Job block for connection to PCU 3
DW 060 - DW 074	Job block for connection to PCU 4
DW 075 - DW 089	Job block for connection to PCU 5
DW 090 - DW 104	Job block for connection to PCU 6

DW 105 - DW 119	Job block for connection to PCU 7
DW 120 - DW 134	Job block for connection to PCU 8
DW 135 - DW 149	Job block for connection to PCU 9
DW 150 - DW 164	Job block for connection to PCU 10
DW 165 - DW 179	Job block for connection to PCU 11
DW 180 - DW 194	Job block for connection to PCU 12
DW 195 - DW 209	Job block for connection to PCU 13
DW 210 - DW 224	Job block for connection to PCU 14
DW 225 - DW 239	Job block for connection to PCU 15
DW 240 - DW 254	Job block for connection to PCU 16

For each of these connections job block is available in the data block DB204.The connection is configured in this job block. The acknowledgements for the standard data handling block are stored here.

Job block Structure:

Word 0	Identifier	Active SSNR
Word 1	PCU-Number	Job number
Word 2		Indicator word control bits
Word 3		Indicator word length
Word 4		Indicator word STF-error
Word 5	Identifier	Normal SSNR
Word 6	PCU-Number	Job number
Word 7		Pafe Synchronous
Word 8	Identifier	Reserve SSNR
Word 9	PCU-Number	Job number
Word 10		Pafe Synchronous
Word 11		Sequencer
Word 12		Pointer on job in DB205
Word 13	Wait	Change meter
Word 14		Error bits

Hint:

Identifier Bit15 = 1 S5 with layer 4 - coupling

Identifier Bit14 = 1 S7 with layer 4 - coupling

Identifier Bit15/14= 0 S5 with layer 7 - coupling

SSNR = 255 Interface is not available

If there is an error in the active interface it will be transferred to the Reserve-interface, if this one is available.

1.4.4 DB-Job Structure

The data block DB 205 contains the job blocks for the cross coupling.

The data block has the following structure:

DW0	TYPE = 1
DW1	Offset = 10
DW2	DS-length = 8
DW3	Maximum = 500
DW4	Current Number Jobs
DW5	Upper limit
DW 10 - 4020	Job blocks

Each job consists of 8 data words:

Word 0	PCU-Number	Time base
Word 1	Job-type-target	Job-type-target

Target information:

Word 2		DB/DX-Number
Word 3		Beginning
Word 4		Length

Source information:

Word 5		DB/DX-Number
Word 6		beginning

Time information:

Word 7	Set time	Actual time

1.4.5 DB-backup structure

The data block DB 187 contains the spare job blocks.

Structure see coupling layer 7

1.4.6 DB-Send structure

The data block DB 206 contains the transmit buffer. There can be available 16 transmit buffer in the data block. The length of a transmit buffer is 128 data words at most.

Structure see coupling layer 7

1.4.7 DB-Empf structure

The data block DB 206 contains the receive buffer. There can be available 16 transmit buffer in the data block. The length of a transmit buffer is 128 data words at most.

Structure see coupling layer 7

1.4.8 DB-HiDa Structure

The data block DB 208 contains the auxiliary datas.

These datas are used to execute the function blocks of the cross coupling FB 181 to FB 185.

The relevance of the service datas (DW 100 – 119) are described in the chapter ‘configuration of the cross coupling’.

In the data words DW 191 to 206 the set time for the spare value are configured.

The rest of the datas are performed to inform the user.

Structure see coupling layer 7

1.5 Cross coupling configuration

The configuration of the cross coupling is performed by:

- Enter the values in the data blocks via a programming unit.
- Filling out the parameterization masks in the application configuration

1.5.1 Configuration with the programming unit

The following entries in the data blocks are available for the function of the cross coupling.

DB 201 DL 2	PCU-Number
DB 204 D 13.0	Switch on cross coupling
DB 204 DW 4	Number of the connections
DB 205 DW 4	Number of the jobs
DB 205	Enter jobs
DB 187 DW 4	Number of spare jobs
DB 187	Enter spare jobs
DB 208 DW 191 - 206	Adjust set time for spare jobs

Note:

Entry of jobs with the service function DB 208.

This function of layer 7 – coupling is not available for layer 4 – coupling

1.5.2 Configuration with application 'Configuration'

Configuration of the cross coupling via the application configuration is menue-assisted. The right data words are always shown per job, so that entries in ‘wrong’ data words are avoided.

…..

1.5.2.1 XC_JOB_SR – Layer 4 (S5-S5 and S5-S7)

Cross coupling serves to effect data exchanges between a PCU and a maximum of 16 other PCUs. Over this variant there may be connected S5 PLCs with S5 PLCs and S5 PLCs with S7 PLCs!

In the process data are being transferred from a source block (DB or DX) to a destination data block (DB or DX).

In the S7 PLC only type DB as destination blocks are supported.

A reception buffer monitors the incoming data. Is the data link declared to be disturbed, the data are transferred from the **stand-by** list.

The time base is stated in the parameter TIMEBASE (second or minute); the setpoint value of the intervals between which the block is to be transferred is stated in the parameter TSOLL.

Hint:

The jobs for the Layer 4 and Layer 7 type are both in DB205 however they have different data structures. On processing the jobs you've got to be aware, if the block 'XC_JOB_SR' (Layer 4) or 'QuerJobs' (Layer 7) has to be employed.

Parameter set: Parameterization PCU

XC_JOB_SR PCU		**DB 205**		**Sets: 200 per PCU max.**
No.	NAME	TYPE Info	Preass.	Comment
1	PCUNR	I8 P S	0	number of the partners PCU
2	ZTYP	I8 P S	0	type of target data block 0 = DB / 1 = DX
3	ZDBNR	I8 P S	0	number of target data block
4	ZDWNR	I16 P S	0	initial word of target
5	LAENGE	I8 P S	0	length of job (number of words)
6	QTYP	I8 P S	0	type of source block 0 = DB / 1 = DX
7	QDBNR	I8 P S	0	number of source block
8	QDWNR	I16 P S	0	initial word of source
9	TIMEBASE	B1 P S	0	time base 0=sec. 1 = min.
10	TIMEBASE1	B1 P S	0	time base 0=sec./min. 1 = 100 msec
11	Tquit	B1 P S	0	message acknowledge 1 = On, 0 = Off
12	TIST	I8 S	0	Actual value for send time
13	TSOLL	I8 P S	0	target value for send time, 0=inactive

Parameter set: Text parameterization IOS

XC_JOB_SR IOS			**Sets: 200 per PCU max.**
No.	Type Info	Preassign.	Comment
1	Z16 P IOS	XC_JOB_SRxxx	cross coupling jobs

1.5.2.2 XC_SJOB_SR Layer 4 (S5 – S5 and S5 – S7)

System jobs are automacticly created by software and are used for acknowledgement and sequencer start.

System jobs may not be applied by the user cause they are present for diagnostic purposes. There are 50 system jobs which are located in DB205 behind the 200 user jobs.

Parameter set: Parameterization PCU

XC_SJOB_SR PCU		**DB 205**		**Sets: 50 per PCU max.**
No.	NAME	TYPE Info	Preass.	Comment
1	PCUNR	I8 P S	0	number of the partners PCU
2	ZTYP	I8 P S	0	type of target data block 0 = DB / 1 = DX
3	ZDBNR	I8 P S	0	number of target data block
4	ZDWNR	I16 P S	0	initial word of target
5	LAENGE	I8 P S	0	length of job (number of words)
6	QTYP	I8 P S	0	type of source block 0 = DB / 1 = DX
7	QDBNR	I8 P S	0	number of source block
8	QDWNR	I16 P S	0	initial word of source
9	TIMEBASE	B1 P S	0	time base 0=sec. 1 = min.
10	TIMEBASE1	B1 P S	0	time base 0=sec./min. 1 = 100 msec
11	Tquit	B1 P S	0	message acknowledge 1 = On, 0 = Off
12	TIST	I8 S	0	Actual value for send time
13	TSOLL	I8 P S	0	target value for send time, 0=inactive

Parameter set: Text parameterization IOS

XC_SJOB_SR IOS			**Sets: 50 per PCU max.**
No.	Type Info	Preassign.	Comment
1	Z16 P IOS	XC_JOB_SRxxx	cross coupling jobs

1.5.2.3 XC_PCU_SR - Layer 4 (S5 – S5 and S5 – S7)

In this block the connection between one PCU to another PCU are determined.

For this it is necessary to put in the job number of CP143/CP1430 along with the PCU number. If the predefined job number is used the automatic preset values should be selected. Here the system enters the right job numbers into the assigned data sets so configuration errors are eliminated. On each startup of the PCU, the job numbers are preset automatically.

The allocation of user specific job numbers is not recommended because the actual job number 81 – 95 and 101 - 115 are calculated by the system

Parameter set: Parameterization PCU

XC_PCU_SR		**DB 204**		**data set 0**
No.	NAME	TYPE Info	Preass.	Comment
1	Anz	I16 P S	0	no. of cross couplings
2	Kopp.	B1 P S	1	coupling ON/OFF = 1/0
3	SndRecAll	B1 P S	0	send/receive all ON/OFF = 1/0
4	AutoSp	B1 P S	0	0=automatic preset, 1=manual preset
5	Stoe	B1 P S	0	error coupling, DB length

Parameter set: Parameterization PCU

XC_PCU_SR		DB 204		Sets:15 per PCU max.
No.	NAME	TYPE Info	Preass.	Comment
1	PCU_A	I8 P S	0	PCU no. of coupling partner
2	S5_SR4_A	B1	0	S5 with Layer 4 coupling
3	S7_SR4_A	B1	0	S7 with Layer 4 coupling
4	SSNR_A	I16 P S	232	interface number
5	ANR_A	I8 P S	0	job number
6	PCU_N	I8 P S	0	PCU number of coupling partner backup
7	SSNR_N	I16 P S	-1	interface number backup
8	ANR_N	I8 P S	0	job number backup
9	PCU_R	I8 P S	0	active PCU no. of coupling partner
10	SSNR_R	I16 P S	-1	active interface number
11	ANR_R	I8 P S	0	active job number

Hints:

Parameters _A: active interface, i.e. data of interface from which the transfer takes place

Parameters _N data of first interface (normal)

Parameters _R data of second interface (backup)

Coupling S5-S5 with Layer 7

Parameter S5_Sxx_x = 0 and S7_Sxx_x = 0

Coupling S5-S5 with Layer 4

Parameter S5_Sxx_x = 1 and S7_Sxx_x = 0

Coupling S5-S7 with Layer 4

For S5 PLC: Parameter S5_Sxx_x = 0 and S7_SR_x = 1

For S7 PLC: Parameter S5_Sxx_x = 1 und S7_SR_x = 0

Job diagnosis:

If a job is not executed, but is exited with an error, the user is provided with further information designed to facilitate error location.

This information can be found under the parameterization application ->Options, Hidden Attributes of the data record for which the information is required.

Parameter set: Parameterization PCU

XC_PCU_SR		DB 204		Sets:15 per PCU max.
No.	NAME	TYPE Info	Preass.	Comment
1	PCU_A	I8 P S	0	PCU no. of coupling partner
2	S5_SR4_A	B1	0	S5 with Layer 4 coupling

3	S7_SR4_A	B1	0	S7 with Layer 4 coupling
4	SSNR_A	I16 P S	232	interface number
5	ANR_A	I8 P S	0	job number
6	PCU_N	I8 P S	0	PCU number of coupling partner backup
7	**S5_SR_R**	**B1**	**0**	**S5-with Layer 4 coupling**
8	**S7_SR_R**	**B1**	**0**	**S7-with Layer 4 coupling**
9	SSNR_N	I16 P S	-1	interface number backup
10	ANR_N	I8 P S	0	job number backup
11	PCU_R	I8 P S	0	active PCU no. of coupling partner
12	**S5_SR4_R**	**B1**	**0**	**S5-with Layer 4 coupling**
13	**S7_SR4_R**	**B1**	**0**	**S7-with Layer 4 coupling**
14	SSNR_R	I16 P S	-1	active interface number
15	ANR_R	I8 P S	0	active job number
16	**ANZW_B**	**I16**	**0**	**Display word controlbits**
17	**ANZW_L**	**I16**	**0**	**Display word length**
18	**ANZW_STF**	**I16**	**0**	**Display word STF identification**
19	**ZUSTAND**	**I8**	**0**	**Status identification**
20	**PAB**	**I16**	**0**	**Pointer to job block in DB205**
21	**TUES**	**I8**	**0**	**Monitoring time send**
22	**TUEU**	**I8**	**0**	**Monitoring time switchover to backup values**
23	**S_FEHL**	**B1**	**0**	**Send error**
24	**E_WERT**	**B1**	**0**	**Backup values loaded**
25	**S_QUIT**	**B1**	**0**	**Error response is missing**
26	**W_QUIT**	**B1**	**0**	**Wait time for response**

Parameter set: Text parameterization IOS

XC_PCU_SR IOS			**Sets: 15 per PCU max.**
No.	Type Info	Preassign.	Comment
1	Z16 P IOS	QuerJob xxx	cross coupling jobs

Determining the job number on the CP1430

PCU-NR	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	-	81 (51)	82 (53)	83 (55)	84 (57)	85 (59)	86 (61)	87 (63)
2	81 (51)	-	83 (55)	84 (57)	85 (59)	86 (61)	87 (63)	88 (65)
3	82 (53)	83 (55)	-	85 (59)	86 (61)	87 (63)	88 (65)	89 (67)
4	83 (55)	84 (57)	85 (59)	-	87 (63)	88 (65)	89 (67)	90 (69)
5	84 (57)	85 (59)	86 (61)	87 (63)	-	89 (67)	90 (69)	91 (71)
6	85 (59)	86 (61)	87 (63)	88 (65)	89 (67)	-	91 (71)	92 (73)
7	86 (61)	87 (63)	88 (65)	89 (67)	90 (69)	91 (71)	-	93 (75)
8	87 (63)	88 (65)	89 (67)	90 (69)	91 (71)	92 (73)	93 (75)	-
9	88 (65)	89 (67)	90 (69)	91 (71)	92 (73)	93 (75)	94 (77)	95 (79)

10	89 (67)	90 (69)	91 (71)	92 (73)	93 (75)	94 (77)	95 (79)	81 (51)
11	90 (69)	91 (71)	92 (73)	93 (75)	94 (77)	95 (79)	81 (51)	82 (53)
12	91 (71)	92 (73)	93 (75)	94 (77)	95 (79)	81 (51)	82 (53)	83 (55)
13	92 (73)	93 (75)	94 (77)	95 (79)	81 (51)	82 (53)	83 (55)	84 (57)
14	93 (75)	94 (77)	95 (79)	81 (51)	82 (53)	83 (55)	84 (57)	85 (59)
15	94 (77)	95 (79)	81 (51)	82 (53)	83 (55)	84 (57)	85 (59)	86 (61)
16	95 (79)	82 (53)	84 (57)	86 (61)	84 (65)	85 (69)	92 (73)	94 (77)

Determining the job number on the CP1430

PCU-NR	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
1	88 (65)	89 (67)	90 (69)	91 (71)	92 (73)	93 (75)	94 (77)	95 (79)
2	89 (67)	90 (69)	91 (71)	92 (73)	93 (75)	94 (77)	95 (79)	82 (53)
3	90 (69)	91 (71)	92 (73)	93 (75)	94 (77)	95 (79)	81 (51)	83 (57)
4	91 (71)	92 (73)	93 (75)	94 (77)	95 (79)	81 (51)	82 (53)	84 (61)
5	92 (73)	93 (75)	94 (77)	95 (79)	81 (51)	82 (53)	83 (55)	85 (65)
6	93 (75)	94 (77)	95 (79)	81 (51)	82 (53)	83 (55)	84 (57)	86 (69)
7	94 (77)	95 (79)	81 (51)	82 (53)	83 (55)	84 (57)	85 (59)	87 (73)
8	95 (79)	81 (51)	82 (53)	83 (55)	84 (57)	85 (59)	86 (61)	88 (77)
9	-	82 (53)	83 (55)	84 (57)	85 (59)	86 (61)	87 (63)	81 (51)
10	82 (53)	-	84 (57)	85 (59)	86 (61)	87 (63)	88 (65)	82 (55)
11	83 (55)	84 (57)	-	86 (61)	87 (63)	88 (65)	89 (67)	83 (59)
12	84 (57)	85 (59)	86 (61)	-	88 (65)	89 (67)	90 (69)	84 (63)
13	85 (59)	86 (61)	87 (63)	88 (65)	-	90 (69)	91 (71)	85 (67)
14	86 (61)	87 (63)	88 (65)	89 (67)	90 (69)	-	92 (73)	91 (71)
15	87 (63)	88 (65)	89 (67)	90 (69)	91 (71)	92 (73)	-	92 (75)
16	81 (51)	83 (55)	85 (59)	87 (63)	89 (67)	91 (71)	93 (75)	-

Advice:

On automatic preset the job number of the Layer7 connection (values in brackets). Is assigned to the connection. The software recognizes by the identification bits 'S5_SR4' or 'S7_SR4' that the Layer 4 connection is to be used.and calculates the real job number for this connection variant.

In the configuration application XC_JOB_SR however the Layer 7 job number ist displayed (values in brackets).

Structure of the Job numbers

Layer 7	Layer 4 – Send	Layer 4 – Receive
No	(No –50)/2 + 81	(No – 50)/2 + 101

Structure of the Ethernet-Address:

08 00 06 01 yy xx

yy = 00 S5-PLC

yy = 07 S7-PLC

xx = PCU-Number as Hexadecimal-Number

Structure of the TSAP:

TSAP-Send	SENDzz, RECVzz	zz=connection number (1..15)
TSAP-Receive	RECVzz, SENDzz	zz=connection number (1..15)

Compilation of important settings

The listed parameters can be tested and adapted most simply with the control application.

DB201 DL2 Own PCU-Number 1 .. 200

DB204 DW255 Own Bus Address 1 – 16

This specification is needed only, when a PCU number > 16 is supposed to be used and therefore the bit 13.1 in the DB204 is set.

DB204 DW4 Number of connections 1 .. 15

Number of job blocks

DB205 DW4 1 .. 200(Max.500)

The number should not be selected too big as cycle time problems may arise.

Number of System job blocks.

DB205 DW12 50

Job 001 – 200 User jobs

Job 201- 250 System jobs

Number of backup job blocks

DB187 DW4 1 .. 200 (Max.500)

Control bits

DB204 Bit 13.0=1 Cross coupling ON

DB204 Bit 13.1=0 automatic setup of connections

DB204 Bit 13.1=1 Bus address in DB204 DW255 and selection of SSNR and PCU-Nr. by the user

1.5.2.4 QuerJobsErs - Parameters for Backup Jobs

Description see Coupling Layer 7

1.5.2.5 QuerSteu – Cross coupling control data

Description see Coupling Layer 7

2 Coupling S7

2.1 General:

The coupling between the IOSes is operated via the Windows Network. The networks and network drives are set up with the aid of the system control -> network. These virtual drives are then used by the system applications.

Both the IOS-PCU coupling and the PCU-PCU coupling can be implemented via

- Industrial Ethernet
- Profibus ***!)**
- MPI.

If Industrial Ethernet is the coupling medium, we recommend using H1 hardware components for the hardware configuration.

In the case of MPI and PROFIBUS as coupling medium, you should use PROFIBUS components for the configuration.

In addition to the PCUs and IOSes, the configuring PCs or PUs can also be connected at the same time.

In order to prevent address collisions in this respect, the following rules apply within MPI, PROFIBUS or Industrial Ethernet buses when assigning addresses:

- **MPI address = PCU number + 10**
- **Profibus address = (PCU number *2) + 40**
- **Industrial Ethernet address = 08.00.06.01.07.xy**
  (xy = PCU number in Hexa format, e.g. for PCU16: 08.00.06.01.07.10)

WARNING:

***!) BRAUMAT/SISTAR Classic 5.3 and later versions do not support the coupling version L2/Profibus. However, the following documentation of INI files and switches still contains some information on this topic.**

When connecting a new system (PCU, PC or PU) to an MPI bus, the default setting of the address is 2. You must therefore ensure that there is no double assignment of addresses.

The following chapter is divided into two sections:

- The first section deals with the coupling between the IOSes and the PCUs. The IOSes use this coupling to request the data they require for visualization. The PCUs send all process-relevant data, such as messages, measurements, step protocols, free protocols, etc., to the respective IOSes.
- The second section describes the cross coupling between the PCUs. This cross coupling enables the PCUs to exchange data with one another.

Cross coupling for 32 PCUs

This cross coubling provides the following features:

- Data exchange from one PCU up to a maximum of 31 different PCUs
- Redundant bus structure with two CP443 is possible
- Only for S7 - to S7 - PLCs
- Maximum Data volume of 400 bytes per Job

Cross coupling with layer 4

This cross coupling has the following functions

- Data exchange from one PCU up to a maximum of 15 different PCUS
- Redundant bus structure with two CP443 possible
- Data transfer from S7 to S7 or S7 to S5 or S5 to S5
- 240 Bytes as maximum data quantity

2.2 IOS - PCU coupling

2.2.1 General:

The setting specifying the coupling via which a connection is to be established between the IOS and the PCUs, is implemented in the SIMATIC Manager under PU-PC interface.

The PCUs to which a connection is to be set up are entered in the System Settings application under PCU settings.
This enters the PCUs in the sys.ini file of the ‘windcs\sys’ directory.

The address settings for the SIMATIC S7 PCUs have been implemented in the S7.ini file under ‘windcs\sys’ directory. These addresses have already been entered correctly in the standard system on delivery.

These addresses only need to be adjusted if a different address configuration is required on the plant. To this purpose, the addresses must be changed in the S7.ini file.

Note:

BRAUMAT/SISTAR Classic 5.3 is now compatible with multiclient mode. This mode has a considerable impact on the S7.INI and SYS.INI files described in this documentation. A configuration tool is now available for user-friendly configuration of a multiclient system. Further information is found in chapter '02_Inst-Konfig' 'Multiclient mode and extended Area.ini'. As a consequence, the 'S7.ini' settings are now partially moved to the 'Area.ini' file.

2.2.2 S7.ini file

The addresses for the SIMATIC S7 PCU can be changed in this file. In addition, you can set whether the coupling is to be implemented via MPI/Profibus or Industrial Ethernet.

Structure of the S7.ini file

[S7]

Slaves=1,2,3
The numbers of the available PCUs are entered here

[PCUx]
There must be a section in the S7.ini file for each PCU entered.

Example for PCU 1:

[PCU1]

Mac_Addr=080006010701
The Industrial Ethernet address is set here.

;L2_Addr=11
This assigns the L2 address for a coupling via MPI or Profibus. ‘;’ means the line is treated as a comment.

Please note! If Industrial Ethernet is implemented as the coupling, the L2 address must always be marked as a comment. If both addresses are entered, the L2 address is given priority and the coupling attempted via this address.

DB_Write_Var=706; write DB706 for Serv1

;DB_Write_Var=707; write DB707 for Serv2

This specifies the communication buffer. One or the other of these lines must be marked as a comment, depending on the server on which the S7.ini file is located.

CPU_Socket=4

This specifies the CPU slot in the SIMATIC S7.

2.3 Cross coupling S7-S7 for 32 PLCs

2.3.1 General

The S7 – S7 coupling can be combined with the layer 4 coupling.

Cross coupling is used for data interchange from a PCU to a maximum of 31 other PCUs via Industrial Ethernet (SINEC H1), PROFIBUS or MPI (MultiProtocol Interface).

A maximum of 288 jobs are available for cross coupling.

As soon as the CP443-1 module is entered in the HW configuration of each of 2 PCUs, coupling is implemented via Industrial Ethernet.

If the CP443-5 module is entered, data interchange is executed via PROFIBUS.

If neither of these modules is available, coupling is handled via the X1 interface of the CPU with MPI.

To enable the coupling between the PCUs to be properly set up, it is necessary to ensure that the project has entered the correct communication CPs in the hardware configuration in SIMATIC Manager. In addition, the connection table must have been edited via these communication CPs. This is factory-implemented in the delivered standard system.

However, if the project is expanded by the addition of further PCUs or communication CPs, this must be checked, whereby it is important to ensure that the connection table is edited again in order to prevent inconsistencies (see chapter, "Configuration of connections").

2.3.2 Configuration of connections (connection table)

The connection table specifies between which PCUs a connection is to be set up.

In the case of the SIMATIC S7 CPU, this connection table is configured via the SIMATIC Manager. In the case of the SIMATIC S7, communication is carried out directly via the firmware. Jobs are assigned between the software and the firmware via their ID number.

The scope of delivery includes a fully functional connection table for the standard configuration. If you are using the default addresses, you do not need to edit this connection table.

To activate the cross coupling you just need to enter the partner PCUs in the XC_PCU.

The connection table only needs amending if the default addresses need to be changed or a connection has to be set up to additional programmable controllers.

The standard configuration of the connection table is configured according to the following rules:

- The configuration must be specified as a bi-directional configuration.
- Local ID = remote PCU number
- The active connection setup is parameterized for the device with the bigger ID.

Example of a connection table for PCU2:

PCU2 (local ID = A) coupled to PCU10 (ID = 2) => PCU10 actively sets up the connection

Please note:
Care must be taken when editing a connection list as there is currently an error which may occur when editing the connection table in SIMATIC Manager. If PCUs and connections are repeatedly changed, deleted and inserted, the connection table may be incorrectly stored, even though it is correctly configured and no error can be detected.

This can only be detected by the fact that some of the configured connections are not set up.

In this instance, the only remedy is to completely delete the connection table and reenter all specifications. This must be done error-free if possible to avoid the need to make deletions and insertions again.

Before deleting PCUs, always delete the connections in the connection table first.

Ethernet-address structure

08.00.06.xx.yy.zz

xx= bus number 01 or 02

yy= 07 = identifier for S7

zz= PCU-number as Hexa-number

Connection-Id structure

1. Connection: ID =PCU-number in Hexa

2. Connection: ID= PCU-number in Hexa + 200 Hexa

Example:

PCU9 is to be connected to PCU17 via 2 CP443.

The following connections in PCU9 are used:

Local-ID	Partner-ID	Partner	Type	Active
9	11	AS_17_MP127	S7-connection	No
209	211	AS_17_MPI27	S7-connection	no

The following connections in PCU17 are used:

Local-ID	Partner-ID	Partner	Type	Active
11	9	AS_09_MP119	S7-connection	yes
211	209	AS_09_MP119	S7-connection	yes

2.3.3 Program Structure - Crosscoupling

The cross coupling is called up in the OB1 cycle and processes the
288 potential jobs. The modules are an integral part of system delivery and appropriately linked in the program.
The following modules are used by the cross coupling:

Function blocks:

FB 680 cross coupling, all connections
FB 681 cross coupling, one connection
FB 682 cross coupling, job search
FB 683 cross coupling, status of partner PCU

FB 685 cross coupling, decrement time

FB 684 cross coupling, plant section start

FC 685 cross coupling, user interface

FC 686 cross coupling, auxiliarly data block user interface
FC 687 cross coupling, status for a job

System function blocks:

SFB 14 GET module (get data)
SFB 15 PUT module (write data)

SFB 22 Status module (query status of a remote partner)

Data blocks:

DB 704 cross coupling connections
DB 705 cross coupling jobs

DB 740 receive ASTA via cross coupling

DB 751 instance DB for cross coupling: 1st connection
DB 752 instance DB for cross coupling: 2nd connection
DB 753 instance DB for cross coupling: 3rd connection
DB 754 instance DB for cross coupling: 4th connection
DB 755 instance DB for cross coupling: 5th connection
DB 756 instance DB for cross coupling: 6th connection
DB 757 instance DB for cross coupling: 7th connection
DB 758 instance DB for cross coupling: 8th connection
DB 759 instance DB for cross coupling: 9th connection
DB 760 instance DB for cross coupling: 10th connection
DB 761 instance DB for cross coupling: 11th connection
DB 762 instance DB for cross coupling: 12th connection
DB 763 instance DB for cross coupling: 13th connection
DB 764 instance DB for cross coupling: 14th connection
DB 765 instance DB for cross coupling: 15th connection

DB766 instance DB for cross coupling: 16th connection

DB767 instance DB for cross coupling: 17th connectionDB768 instance DB for cross coupling: 18th connection

DB769 instance DB for cross coupling: 19th connection

DB770 instance DB for cross coupling: 20th connection

DB771 instance DB for cross coupling: 21th connection

DB772 instance DB for cross coupling: 22th connection

DB773 instance DB for cross coupling: 23th connection

DB774 instance DB for cross coupling: 24th connection

DB775 instance DB for cross coupling: 25th connection

DB776 instance DB for cross coupling: 26th connection

DB777 instance DB for cross coupling: 27th connection

DB778 instance DB for cross coupling: 28th connection

DB779 instance DB for cross coupling: 29th connection

DB780 instance DB for cross coupling: 30th connection

DB781 instance DB for cross coupling: 31th connection

DB450 Determination of the cross coupling length

DB451 1st buffer for datagram 25
DB452 2nd buffer for datagram 25

...

continued up to

DB480 30th buffer for datagram 25
DB481 31st buffer for datagram 25

Configuration:

The Configuration of this cross coupling is realized through the objects XC_PCU_32 and XC_JOB_32.

2.3.4 Parameterization of connections (XC_PCU_32)

Module XC_PCU_32 (DB 704) lets you specify to which partner PCUs a connection should be set up.

To do this, you must enter the number of the partner PCU in this data block, at the same time ensuring that this connection is also described in the connection table.

Please note:
If a PCU no. is changed in the XC_PCU_32 module, it is essential to restart the system in order to make the changed PCU no. effective.

This is a system characteristic of SIMATIC S7 (see system manual):

The addressing parameters are only evaluated when the module is first called up. Thus, the first call establishes the communication relationship (connection) to the remote partner until the next restart.

The easiest way to enter the numbers of the partner PCUs to which a connection is to be set up is by using the parameterization application and selecting module XC_PCU_32.
The following mask appears:

Parameter record: PCU parameterization

XC_PCU_32		**DB 704**		**Records: max. 32 per PCU**
No.	NAME	Type	Value	Comments
1	PCU	I16	0	PCU number
2	ParamError	B1	0	PCU-no. has a wrong DS

By using the text parameterization application and selecting module XC_PCU_32 you can assign each connection a name. Entries are made in the following mask:

Parameter record: IOS text parameterization

XC_PCU_32			**Records: max. 31 per PCU**
No.	TYPE Inf.	Value	Comments
1	Z16 P IOS	XC_PCU_32 xx	Cross coupling to partner PCU

Connection diagnostics

For diagnostic purposes, further information is available to the user on the state of each connection.

This information can be found in the parameterization application, by selecting module XC_PCU_32, and then looking under Options, Hidden Attributes of the data record for which the information is required.
Four more parameters appear in the parameterization mask:

Parameter record: PCU parameterization

XC_PCU_32 PCU	**DB 704**		**Records: max. 32 per PCU**	
No.	NAME	TYPEInf.	Value	Comments
1	PCU	I16	0	PCU number
2	Enable	B1	1	Enables the connection to the PCU
3	ConnID_1	Hexa	0	Local ID from the connectiontable If value = 0, so theID formed automaticly from the PCU-Number. 1. CP443 – Module
4	ConnID_2	Hexa	0	Local ID from the connectiontable If value = 0, there is no automatic Interface switchover 2. CP443 – Module
5	Instance DB	I16	751	Instance DB of SFB GET / PUT / STATUS, is preset automaticly
6	ErrorCode	I16	0	Error IDs: 0 = OK -1 = Instance DB is missing -2 = Instance DB incorrect -3 = PCU no. <= 0
7	PCU_State	I16	0	PCU state: -1 = Connection error 0 = Stop 2 = Run 4 = Hold 5 = Defect

8	PCU_State_ Conn_1	I16	X	PCU state: -1 = Connection error 0 = Stop 2 = Run 4 = Hold 5 = Defect
9	PCU_State_ Conn_2	I16	X	PCU state: -1 = Connection error 0 = Stop 2 = Run 4 = Hold 5 = Defect
10	ParamError	B0	0	PCU-no. has a wrong DS
11	HBParamErr	B0	0	Help-Bit for PCU-no. Has a wrong DS

Note:

PCU_State_Conn_1 and PCU state_Conn_2 receive the operation condition of the partner PCU. It will be slided on the right side in order to read this condition better. If the Partner-PCU is in the condition Run, this condition will be changed therefore from 512 to 2 in a cyclic way.

Note:

With the network configuration one S7 connection must be established per connection. In one PCU this connection must be active, in the other PCU it must be passive.

Suggestion: The PCU with the higher number is active.

The 'local ID' corresponds to the own PCU number as a hexa number.

The 'partner ID' corresponds to the foreign PCU number as a hexa number.

If a second CP443 is used, 200 hexa is added to the normal ID.

Example: Connection PCU 9 to PCU 17 with two units

PCU 9

Connection

Local-ID	Partner-ID	Partner	Type	Aktive
9	11	AS_09_MPI_19	S7-conn.	no
209	211	AS_09_MPI_19	S7-conn.	no

PCU 17

Connection

Local-ID	Partner-ID	Partner	Type	Aktive
11	9	AS_17_MPI_27	S7-conn.	yes
211	209	AS_17_MPI_27	S7-conn.	yes

2.3.4.1 Specification of the PCU-numbers

The cross coupling for RCS expects source- and target-CPU in the same data set. To ensure this, the following values are gone back to.

Record	Buffer	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
REC 01	DB451	02	01	31	30	29	28	27	26	25	24	23	22	21	20	19	18
REC 02	DB452	03	32	01	31	30	29	28	27	26	25	24	23	22	21	20	19
REC 03	DB453	04	03	02	01	31	30	29	28	27	26	25	24	23	22	21	20
REC 04	DB454	05	04	32	02	01	31	30	29	28	27	26	25	24	23	22	21
REC 05	DB455	06	05	04	03	02	01	31	30	29	28	27	26	25	24	23	22
REC 06	DB456	07	06	05	32	03	02	01	31	30	29	28	27	26	25	24	23
REC 07	DB457	08	07	06	05	04	03	02	01	31	30	29	28	27	26	25	24
REC 08	DB458	09	08	07	06	32	04	03	02	01	31	30	29	28	27	26	25
REC 09	DB459	10	09	08	07	06	05	04	03	02	01	31	30	29	28	27	26
REC 10	DB460	11	10	09	08	07	32	05	04	03	02	01	31	30	29	28	27
REC 11	DB461	12	11	10	09	08	07	06	05	04	03	02	01	31	30	29	28
REC 12	DB462	13	12	11	10	09	08	32	06	05	04	03	02	01	31	30	29
REC 13	DB463	14	13	12	11	10	09	08	07	06	05	04	03	02	01	31	30
REC 14	DB464	15	14	13	12	11	10	09	32	07	06	05	04	03	02	01	31
REC 15	DB465	16	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01
REC 16	DB466	17	16	15	14	13	12	11	10	32	08	07	06	05	04	03	02
REC 17	DB467	18	17	16	15	14	13	12	11	10	09	08	07	06	05	04	03
REC 18	DB468	19	18	17	16	15	14	13	12	11	32	09	08	07	06	05	04
REC 19	DB469	20	19	18	17	16	15	14	13	12	11	10	09	08	07	06	05
REC 20	DB470	21	20	19	18	17	16	15	14	13	12	32	10	09	08	07	06
REC 21	DB471	22	21	20	19	18	17	16	15	14	13	12	11	10	09	08	07
REC 22	DB472	23	22	21	20	19	18	17	16	15	14	13	32	11	10	09	08
REC 23	DB473	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	09
REC 24	DB474	25	24	23	22	21	20	19	18	17	16	15	14	32	12	11	10
REC 25	DB475	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11
REC 26	DB476	27	26	25	24	23	22	21	20	19	18	17	16	15	32	13	12
REC 27	DB477	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13
REC 28	DB478	29	28	27	26	25	24	23	22	21	20	19	18	17	16	32	14
REC 29	DB479	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15
REC 30	DB480	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	32
REC 31	DB481	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17

Record	Buffer	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
REC 01	DB451	32	16	15	14	13	12	11	10	09	08	07	06	05	04	03	17
REC 02	DB452	18	17	16	15	14	13	12	11	10	09	08	07	06	05	04	02
REC 03	DB453	19	32	17	16	15	14	13	12	11	10	09	08	07	06	05	18
REC 04	DB454	20	19	18	17	16	15	14	13	12	11	10	09	08	07	06	03
REC 05	DB455	21	20	32	18	17	16	15	14	13	12	11	10	09	08	07	19
REC 06	DB456	22	21	20	19	18	17	16	15	14	13	12	11	10	09	08	04
REC 07	DB457	23	22	21	32	19	18	17	16	15	14	13	12	11	10	09	20
REC 08	DB458	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	05
REC 09	DB459	25	24	23	22	32	20	19	18	17	16	15	14	13	12	11	21
REC 10	DB460	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	06
REC 11	DB461	27	26	25	24	23	32	21	20	19	18	17	16	15	14	13	22
REC 12	DB462	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	07
REC 13	DB463	29	28	27	26	25	24	32	22	21	20	19	18	17	16	15	23
REC 14	DB464	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	08
REC 15	DB465	31	30	29	28	27	26	25	32	23	22	21	20	19	18	17	24
REC 16	DB466	01	31	30	29	28	27	26	25	24	23	22	21	20	19	18	09
REC 17	DB467	02	01	31	30	29	28	27	26	32	24	23	22	21	20	19	25
REC 18	DB468	03	02	01	31	30	29	28	27	26	25	24	23	22	21	20	10
REC 19	DB469	04	03	02	01	31	30	29	28	27	32	25	24	23	22	21	26
REC 20	DB470	05	04	03	02	01	31	30	29	28	27	26	25	24	23	22	11
REC 21	DB471	06	05	04	03	02	01	31	30	29	28	32	26	25	24	23	27
REC 22	DB472	07	06	05	04	03	02	01	31	30	29	28	27	26	25	24	12
REC 23	DB473	08	07	06	05	04	03	02	01	31	30	29	32	27	26	25	28
REC 24	DB474	09	08	07	06	05	04	03	02	01	31	30	29	28	27	26	13
REC 25	DB475	10	09	08	07	06	05	04	03	02	01	31	30	32	28	27	29
REC 26	DB476	11	10	09	08	07	06	05	04	03	02	01	31	30	29	28	14
REC 27	DB477	12	11	10	09	08	07	06	05	04	03	02	01	31	32	29	30
REC 28	DB478	13	12	11	10	09	08	07	06	05	04	03	02	01	31	30	15
REC 29	DB479	14	13	12	11	10	09	08	07	06	05	04	03	02	01	32	31
REC 30	DB480	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	16
REC 31	DB481	16	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01

Procedure with an example:

A connection shall be established between PCU 3 and PCU 4. For the source-PCU 3, column 3 of the table is substantial. Within the table it must be looked for “04”. The line (REC 05) found by this corresponds exactly to the data set, in which, on PCU 3, a 4 has to be set for the target-PCU and on PCU 4, a 3 has to be set for the target-PCU.

Record	Buffer	1	2	3	4
REC 01	DB451	02	01	31	30
REC 02	DB452	03	32	01	31
REC 03	DB453	04	03	02	01
REC 04	DB454	05	04	32	02
REC 05	DB455	06	05	04	03
REC 06	DB456	07	06	05	32

2.3.5 Job parameterization (XC_JOB_32)

A maximum of 288 jobs are available in each PCU. A maximum of 400 bytes can be transferred with each job.

The cross coupling is not active if data block DB 704 (XC_PCU_32) has been deleted or the number of partner PCUs is equal to zero. In this case, processing is interrupted by the function block for the cross coupling.

A job is enabled when a PCU no. is entered and the enable bit is set to 1. The job is then initiated each time the parameterized time has elapsed.

If the PCU no. is zero, this job is not assigned and can be used by the system for a temporary job.
A temporary job is only initiated once. Examples include jobs such as: an ASTA initiation for the start of a plant section in another PCU or the user executing a one-off job using function FC 685 (see chapter, "Temporary jobs").
If all jobs are assigned, it is not possible to initiate a temporary job, i.e. it is not possible to start plant sections of another PCU via the ASTA module.

GET jobs (SFB 14), PUT jobs (SFB 15) and time jobs (PUT Time) are possible.

The areas peripherals, inputs, outputs, flags and data blocks can be used as storage areas for the transmitted and received data. The coding corresponds to the definition for SIMATIC S7:

Table:

Possible coding of storage areas for XC_JOB (Parameters: SrcArea / DestArea / FltSrcArea

Hex-Code	Description
80	Storage area peripherals
81	Storage area inputs
82	Storage area outputs
83	Storage area flags
84	Data block:

The job is processed when the actual time is 0.

If an error is detected when processing the job, the PCU_Error bit is set. If the job has been incorrectly parameterized, this is indicated to the user by the setting of the ParamError bit.

Default values can be specified for GET jobs. These values are transferred to the local storage area if the connection fails (see chapter, "GET jobs").

The easiest way to configure a job in the PCU is by selecting the parameterization application, and then module XC_JOB_32. The following mask appears:

Parameter record: PCU Parameterization

XC_JOB_32 PCU		**DB 705**		**Records: max. 288 per PCU**
No.	NAME	TYPEInf.	Value	Comments
1	PCU	I16	0	No. of partner PCU
2	Type	I8	14	Job types 14=GET, 15=PUT, 16=PUT-TIME
3	Enable	B1	0	Enables job
4	Time	I16	10	Job time in seconds
5	Src	I16	0	Source: 0=P/E/A/M, 1..4095=DB
6	SrcArea	HEXA8	84	Source storage area (see table)
7	SrcByte	I32	0	Byte address of source area
8	NumByte	I16	1	Number of bytes to be transmitted
9	Dest	I16	0	Destination: 0=P/E/A/M, 1..4095=DB
10	DestArea	HEXA8	84	Destination storage area (see table)
11	DestByte	I32	0	Byte address of destination area
12	FltTime	I16	120	GET: Waiting time until default value is transferred
13	FltSrc	I16	0	GET: Source default values: 0=P/E/A/M, 1..4095=DB
14	FltSrcArea	HEXA8	84	GET: Default value area (see table), 0=none
15	FltSrcByte	I32	0	GET: Byte address of default values
16	Conn_1	B1	0	Successful transmission to 1.-connection
17	Conn_2	B1	0	Successful transmission to 2.-connection
18	PCU_Error	B1	0	Partner PCU is not in the run or connection error
19	ParamError	B1	0	Parameterization error

By selecting the text parameterization application and module XC_JOB_32 you can assign each job a name. This makes it easier to find jobs which have already been parameterized. Entries are made in the following mask:

Parameter record: IOS text parameterization

XC_JOB_32			**Records: max. 288 per PCU**
No.	TYPEInf.	Value	Comments
1	Z16 P IOS	XC_JOB_32 xxx	Cross coupling jobs

Job diagnostics

If a job is not executed, but is exited with an error, the user is provided with further information designed to facilitate error location.

This information can be found under the parameterization application, by selecting module XC_JOB, and then looking under Options, Hidden Attributes of the data record for which the information is required.
Further parameters for the job are displayed.

Parameter record: PCU parameterization

XC_JOB_32		DB 705		Records: max. 288 per PCU
No.	NAME	TYPEInf.	Value	Comments
1	PCU	I16	0	No. of partner PCU
2	Type	I8	14	Job types 14=GET, 15=PUT, 16=PUT-TIME
3	Enable	B1	0	Enables job
4	Time	I16	10	Job time in seconds
5	ActTime	I16	10	Current time value
6	JobTime	I16	0	Running time job in sec is entered after finishing the jobs successfully
7	Src	I16	0	Source: 0=P/E/A/M, 1..4095=DB
8	SrcArea	HEXA8	84	Source storage area (see table)
9	SrcByte	I32	0	Byte address of source area
10	NumByte	I16	1	Number of bytes to be transmitted
11	Dest	I16	0	Destination: 0=P/E/A/M, 1..4095=DB
12	DestArea	HEXA8	84	Destination storage area (see table)
13	DestByte	I32	0	Byte address of destination area
14	PCU_State	I16	0	PCU status (see table)
15	LastJobResult	I16	0	0=idle, 2=Run, 4=OK, 8=error
16	LastGetPutRes	I16	0	GET/PUT result (see table)
17	FltTime	I16	120	GET: Waiting time until default value is transferred
18	FltActTime	I16	120	GET: current time value until default value is transferred
19	FltSrc	I16	0	GET: Source default values: 0=P/E/A/M, 1..4095=DB
20	FltSrcArea	HEXA8	84	GET: Default value area (see table), 0=none
21	FltSrcByte	I32	0	GET: Byte address of default values
22	BLKMOV_RET	I16	0	GET: Block transfer 0=OK
23	TmpJob	B1	0	Temporary job: when finished PCU=0, Enable=0
24	Conn_1	B1	0	Successful transmission to 1. Connection
25	Conn_1	B1	0	Successful transmission to 1. Connection
26	PCU_Error	B1	0	Partner PCU is not in the run or connection error
27	ParamError	B1	0	Parameterization error

Diagnostics: of PCU_State

These IDs of the PCU state are passed on by calling the system function block SFB 22 (status).

The ID in the PCU_State parameter has the following meaning:

PCU_State	Description
-1	Connection error

0	PCU is in the operating state Stop
2	PCU is in the operating state Run
4	PCU is in the operating state Halt
5	PCU is in the operating state Defective

Diagnostics States of 'LastGetPutResult' parameter

These states are passed on when calling the system function blocks SFB 14 (GET) and SFB 15 (PUT). In addition, the statuses -1 and 0 are created by the cross coupling function block.

The states have the following meaning:

Status	Description
-1	PCU is in the operating state Stop
0	OK
1	Communication problems, e.g.: - Connection description not loaded (local or remote) - Connection interrupted (e.g. cable, CPU switched off, CP in STOP)
2	Negative acknowledgement from partner device, the function cannot be executed
4	Error in the receive area pointers RD_i relating to data length or data type
8	Access error in the case of the partner CPU
10	Cannot access local user memory, (e.g. accessed DB has been deleted)
11	Warning: New job is ineffective as previous job has not been completed
12	When calling the SFB - an instance DB was specified which does not belong to SFB 14, - the specified DB is a global and not an instance DB - cannot find instance DB (load new instance DB from PU)
20	Not enough memory

2.3.6 GET job

A GET job is used to retrieve data from another PCU and write it to the local storage area.

Default values can be parameterized for this job type. If connection between the PCUs is interrupted, or if the job is aborted for any other reasons (not a parameterization error), the default values are transferred to the destination data on expiry of a specified time.

It is therefore possible to run the PCU in a safe state in the event of a coupling data failure, e.g. by setting setpoint values to zero or resetting the control.

This is the main advantage of a GET job compared to a PUT job. In the case of a PUT job, an error is also detected when the job is aborted, whereby the destination data is in the partner PCU. The PCU which detects the error can no longer access the destination data.

As the PUT job in the partner PCU is processed by the firmware, the PCU has no interface for detecting an error. It is therefore essential for users to monitor this type of job themselves, or to send only 'unimportant data' which cannot endanger operation in the event of failure.

If possible, always use a GET job instead of a PUT job.

If a GET job is aborted, the 'FltTime' time is started in the parameter record of the XC_JOB_32 module. When this time has elapsed, the default values are transferred.

As the job is repeatedly triggered in the parameterized time (Parameter Time), the default values are also repeatedly transferred if a job is aborted and the 'FltTime' time has elapsed.

If the 'FltSrcArea' parameter is set to 0, there are no default values.

Example:

Using a GET job, 200 data bytes are to be retrieved every 5 seconds from PCU 4, data block DB 200, from DBW 800 onwards.

The received data is to be stored in data block DB 400, from DBW 200 onwards.

If the connection fails, the default values are to be transferred 30 seconds later from data block DB 100, from DBW 500 onwards to data block DB 400.

XC_JOB_32		**DB 705**		**Records: max. 288 per PCU**
No.	NAME	TYPEInf.	Value	Comments
1	PCU	I16 P S	4	Get data from PCU 4
2	Type	I8 P S	14	Job type: 14=GET
3	Enable	B1 P S	1	Enables job
4	Time	I16 P S	5	Get data every 5 seconds
5	Src	I16 P S	200	Source DB 200
6	SrcArea	HEXA8 P S	84	Source storage area DB
7	SrcByte	I32 P S	800	Byte address 800 in source DB 200
8	NumByte	I16 P S	200	Transfer 200 bytes
9	Dest	I16 P S	400	Destination DB 400
10	DestArea	HEXA8 P S	84	Destination storage area DB
11	DestByte	I32 P S	200	Byte address 200 in destination DB 400
12	FltTime	I16 P S	30	GET: Waiting time until default value is transferred
13	FltSrc	I16 P S	100	GET: Source default values DB 100
14	FltSrcArea	HEXA8 P S	84	GET: Default value area DB
15	FltSrcByte	I32 P S	500	GET: default value byte address 500 in DB 100
16	PCU_Error	B1 P S	0	Partner PCU is not in the run or connection error
17	ParamError	B1 P S	0	Parameterization error

2.3.7 PUT job

A PUT job is used to write data from a local PCU to another PCU.

Default value transfer is not possible with this job type as the destination data is in the partner PCU in which the job was aborted.

The PUT job is processed by the firmware in the partner PCU. There is no interface to signal an error when data is no longer being received. For this reason, users must monitor this job in the partner PCU themselves and take the appropriate measures in the event of connection failure, e.g. set setpoint values to zero, reset controls, ...

However, in order to ensure that the PUT job in the partner PCU is monitored and the received data are written in a safe state, the easiest solution is to use a GET job in the partner PCU.

Example:

Using a PUT job, 360 data bytes are to be written every 8 seconds to PCU 2, in data block DB 400, from DBW 200 onwards.

The data to be sent is stored in data block DB 200, from DBW 400 onwards.

XC_JOB_32		**DB 705**		**Records: max. 288 per PCU**
No.	NAME	TYPEInf.	Value	Comments
1	PCU	I16 P S	2	Send data in PCU 2
2	Type	I8 P S	15	Job type: 15=PUT
3	Enable	B1 P S	1	Enables job
4	Time	I16 P S	8	Send data every 8 seconds
5	Src	I16 P S	200	Source DB 200
6	SrcArea	HEXA8 P S	84	Source storage area DB
7	SrcByte	I32 P S	400	Byte address 400 in source DB 200
8	NumByte	I16 P S	360	Transfer 360 bytes
9	Dest	I16 P S	400	Destination DB 400
10	DestArea	HEXA8 P S	84	Destination storage area DB
11	DestByte	I32 P S	200	Byte address 200 in destination DB 400
12	FltTime	I16 P S	0	No default values
13	FltSrc	I16 P S	0	No default values
14	FltSrcArea	HEXA8 P S	0	No default values
15	FltSrcByte	I32 P S	0	No default values
16	PCU_Error	B1 P S	0	Partner PCU is not in the run or connection error

17	ParamError	B1 P S	0	Parameterization error

2.3.8 Time job

With a time job, the current time and date of system data block DB 701 in the PCU of the parameterized job is written to system data block DB 701 of the partner PCU so that its time and date are set.

See description `standard cross coupling`

If a time job (type=16) is parameterized, an entry is automatically made for a PUT job to set the time and date in the other PCU. The addresses in the job are preset for system data block DB 701 in accordance with the SIMATIC S7 standard.

The ID for the time job is then changed to type=17.
The user can now adjust the addresses if the current time and date are made available via another data interface.

Example:

Using a time job, the current time and date are to be sent to PCU 8 every 60 seconds where the transmitted values are to be used to set the time.

You can find how to assign system data block DB 701 the current time, date and values required to set the time in the data description of DB 701.

XC_JOB		**DB 705**		**Records: max. 288 per PCU**
No.	NAME	TYPEInf.	Value	Comments
1	PCU	I16 P S	8	Send data in PCU 8
2	Type	I8 P S	17	Job type: 17=time job after presetting
3	Enable	B1 P S	1	Enables job
4	Time	I16 P S	60	Send time every 60 seconds
5	Src	I16 P S	701	Source DB 701
6	SrcArea	HEXA8 P S	84	Source storage area DB
7	SrcByte	I32 P S	182	Byte address 182 in source DB 701: time, date
8	NumByte	I16 P S	8	Transfer 8 bytes
9	Dest	I16 P S	701	Destination DB 701
10	DestArea	HEXA8 P S	84	Destination storage area DB
11	DestByte	I32 P S	190	Byte address 190 in destination DB 701: time, date
12	FltTime	I16 P S	0	No default values
13	FltSrc	I16 P S	0	No default values
14	FltSrcArea	HEXA8 P S	0	No default values

15	FltSrcByte	I32 P S	0	No default values
16	PCU_Error	B1 P S	0	Partner PCU is not in the run or connection error
17	ParamError	B1 P S	0	Parameterization error

2.3.9 Temporary jobs

In contrast to normal jobs, which are repeatedly initiated on expiry of the parameterized time, a temporary job is only initiated once.

An example of a system function which is handled via a temporary job is the start of a plant section in another PCU via the ASTA module.

Users can initiate a temporary job by calling up function FC 685 ‘XC_JOB_USER_IF_FC’ with iMode=1.

The job in FC 685 is assigned the same parameters used for the parameterization of a job in module ‘XC_JOB_32’.

If a temporary job is to be initiated, the jobs are searched for free data records. A job is free if the PCU no. of a data record is set to zero. The temporary job is entered in the first free data record.

If all data records are assigned, a temporary job cannot be initiated, i.e. it is also not possible to start the plant section of another PCU via the ASTA module.

Once the temporary job has been initiated, the PCU no. is set to zero again and the enable bit is reset. This means that the job is free again.

If processing is error-free, function FC 685 is exited with RLO=0, if an error occurred, this setting is RLO=1.

If an error occurred, the error number is passed on to the iRetVal parameter. If execution was error-free, the iRetVal parameter is assigned the number of the processed job. Analysis of the iRetVal parameter is carried out by the user.

iRetVal parameter

The values of the iRetVal parameter have the following meaning:

IRetVal	Description
> 0	Number of processed job
< 0	Error
- 1	Cannot find free job
- 2	‘XC_JOB’ has no data records
- 3	Incorrect iMode (not 1 or 2)
- 4	PCU not in ‘XC_PCU’

Module FC 685 also has a second function (iMode=2) which lets you set the actual time to zero while a job is running, i.e. a job can be initiated immediately. This enables event-dependent triggering of jobs.

Example: initiating a temporary job (iMode=1)

A temporary job is to be initiated.

Function FC 685 is called up for this purpose. FC 685 is assigned the same parameters which would be used to parameterize this job in module ‘XC_JOB’.

The following job is supposed for our example:

Using a GET job, 240 data bytes are to be retrieved from PCU 4, data block DB 200, from DBW 800 onwards.

The received data are to be stored in data block DB 400, from DBW 150 onwards.

CALL FC 685		Call FC 685 'XC_JOB_USER_IF_FC'
lMode	:=1	Initiate temporary job
lJob	:=0	Find free job
lPCU	:=4	Get data from PCU 4
lType	:=14	Job type 14: GET
boEnable	:=1	Enables job
boTmpJob	:=1	Enter temporary job
iSrc_Dtype	:=2	Data type always 2 = byte
iSrc_Area	:=84	Source storage area DB200
iSrc_DB	:=200	Source DB 200
iSrcByte	:=800	Byte address 800 in source DB 200
lSrcBit	:=0	Bit address in source DB always 0
iSrc_Num	:=240	Number of bytes to be transmitted
iDest_Dtype	:=2	Data type always 2 = byte
iDest_Area	:=84	Destination storage area DB400
iDest_DB	:=400	Destination DB 400
iDest_Byte	:=150	Byte address 150 in destination DB 200
iDest_Bit	:=0	Bit address in destination DB always 0
lTime	:=0	Do not enter setpoint time as temporary
iActTime	:=0	Current time = 0, initiate immediately
iRetVal	:=0	Return value of FC 685

Analysis of the RLO and the 'iRetVal' value tells the user whether processing of the FC 685 call was error-free. If an error has occurred, the 'iRetVal' value contains the ID of the cause of the error.

Example: initiating a running job (iMode=2)

A certain event has occurred which means that an existing job, normally repeatedly initiated at parameterized time intervals, is to be initiated immediately and not after the time-period.

To do this, function FC 685 is called up when the event occurs. Only the 'iMode', 'iJob' and 'iPCU' parameters are relevant in FC 685. Specification of all other parameters in FC 685 is irrelevant.

The following job is supposed for our example:

Job 44 has been parameterized in the PCU to interchange data with PCU 7 every 60 seconds. Due to the occurrence of a specific event, this job needs to be initiated immediately and not when the set time-period has elapsed.

Function FC 685 is called up when this event occurs and the ‘iMode’, ‘iJob’ and ‘iPCU’ parameters are assigned.

CALL FC 685		Call FC 685 ‘XC_JOB_USER_IF_FC’
Imode	:=2	Set time to zero
Ijob	:=44	Process job 44
IPCU	:=7	Job for PCU 7
Itype	:=0	irrelevant
BoEnable	:=0	irrelevant
BoTmpJob	:=0	irrelevant
iSrc_Dtype	:=0	irrelevant
iSrc_Area	:=0	irrelevant
iSrc_DB	:=0	irrelevant
IsrcByte	:=0	irrelevant
IsrcBit	:=0	irrelevant
iSrc_Num	:=0	irrelevant
IDest_Dtype	:=0	irrelevant
IDest_Area	:=0	irrelevant
IDest_DB	:=0	irrelevant
IDest_Byte	:=0	irrelevant
IDest_Bit	:=0	irrelevant
Itime	:=0	irrelevant
IactTime	:=0	irrelevant
IretVal	:=0	irrelevant

Analysis of the RLO and the ‘iRetVal’ value tells the user whether the FC 685 call was processed error-free. If an error has occurred, the ‘iRetVal’ value contains the ID of the cause of the error.

2.3.10 Starting a plant section via cross coupling

The ASTA module starts a plant section. The function is specified by parameterizing the data record (see chapter, ‘Blocks’->’ASTA’). The plant section is started by setting the corresponding flag bit (F 672.0 to F 683.7).

If ASTA types 9,10 or 12 are used, the plant section of a remote PCU is started.

In order to start a plant section in a remote PCU, it is necessary to set up the cross coupling between the respective PCUs.

If a plant section is started in a remote PCU, module ‘XC_JOB_32’ is searched for a free job record. A temporary job for the remote PCU is then entered in this free job record. The start parameters are transferred to the remote PCU via the cross coupling. If no free job is available, the start cannot be initiated and an error is output.

The data for starting the plant section is received in the data record assigned to this plant section in module ‘XC_ASTA_RCV’ of the remote PCU. Data record 1 is assigned to plant section 1, data record 2 to plant section 2, ..., data record 64 to plant section 64.

Once the data is received and the start conditions have been checked (see chapter, ‘Blocks’->’ASTA’), the plant section is started. However, if the start conditions are not met, the start is not initiated.

The acknowledgment, either positive or negative, is sent back to the source ASTA in the source PCU where it can be appropriately analyzed by the user.

By using the parameterization application and selecting module XC_ASTA_RCV, you can select the last received start for any plant section.

Parameter record: PCU parameterization

XC_ASTA_RCV		**DB 740**		**Records: max. 64 per PCU**
No.	NAME	TYPEInf.	Value	Comments
1	SrcPCU	I8 P S	0	Source PCU number
2	Status	I8 P S	0	Status: 0 idle, 1..200 active, 253 acknowledgment not possible 254 negative acknowledgment, cannot start 255 error
3	SrcASTA	I8 P S	0	Source ASTA number in source PCU
4	DestSEQ	I8 P S	0	Number of destination plant section
5	Year	I8 P S	0	Year for recipe type, job no., batch no.
6	RecipeType	I8 P S	0	Recipe type
7	Recipe	I8 P S	0	Recipe number
8	Job	I8 P S	0	Job number
9	Batch	I8 P S	0	Batch number

2.3.11 XC_ASTA_RCV - Crosscoupling ASTA Receive

Important:

For this function the user need not produce any configuration. The objects of this class are fully managed by the system. Therefore the following description is for diagnostic purposes only.

In this block the plant section start commands for the 64 possible plant sections are received, which are initiated in conjunktion with the ASTA block and cross coupling.

If the ASTA for a plant section is initiated in one PCU, the data is transferred to another PCU by cross coupling where this data is received at the data sets of the XC_ASTA_RCV block. Data set 1 is assigned plant section 1, data set 2 -> plant section 2 a.s.o.

After receiving the data and examination of the start conditions, (see block ASTA) the plant section is started. If the start conditions are not fulfilled, the plant section remains blocked.

The acknowledge (pos. or neg.) is sent back to the source ASTA.

Parameterset: Parameterization PCU

XC_ASTA_RCV PCU		**DB 740**		**Sets: max. 64 per PCU**
No.	NAME	TYPE	Value	Comment

1	SrcPCU	BYTE	0	Source PCU-Number
2	Status	BYTE	0	Status: 0 idle, 1..200 activ, 253 acknowledge not possible 254 negative acknowledge, Start not possible 255 error
3	SrcASTA	BYTE	0	Source ASTA-Number in source-PCU
4	DestSEQ	BYTE	0	Number of destination-plant section
5	Year	BYTE	0	Year for RTyp, JobNo., BatchNo.
6	RecipeType	BYTE	0	Recepe type
7	Recipe	BYTE	0	Recepe number
8	Order	BYTE	0	Job number
9	Batch	BYTE	0	Batch number

Parameterset: Textparameterization IOS

SEQU IOS			**Sets: max. 64 per PCU**
No.	Typ Info	Value	Comment
1	Z16	SEQU xx	Plant section name

2.3.12 Datagram type 25 of the route control

Minimization of data traffic between the controls is achieved by the implementation of datagram type 25 for the route control. The function attempts to form a group message consisting of such frames in DB451 – DB481. A station receiving such a datagram returns an acknowledgement to the transmitting station.

To ensure proper functioning of these group datagrams, the appropriate dataset must contain the PCU number. This configuration is based on the table in section "2.3.4.1 Specification of the PCU-". Block mode with acknowledgment must be enabled, i.e. data byte 14 = 2 must be set in DB705. You can check or execute this setting by means of this configuration:

"XC_PCU_32/Global Data/Options/Hidden Attributes"

2.4 Cross Coupling layer 4 for S7-S5 Connection

2.4.1 General

The layer-4 -coupling be can combined with the S7-S7 cross coupling.

Cross coupling serves to the data exchange from one PCU up to a maximum of 15 different PCUs via Industrial Ethernet (SINEC H1). There can be a S5 controller as well as a S7 controller for PCUs.

Primarily this coupling should be used for S7-S5 but also S7-S7 or S5-S5 Coupling are possible.

There are available up to a maximum of 320 jobs for the cross coupling. 240 bytes can be transmitted per job.As soon as the CP443-1unit of 2 PCUs is entered in the HW-configuration , it will be coupled via Industrial Ethernet.

It is necessary that the project in the SIMATIC-Manager has entered the correct communication – CPs in the hardware-configuration. Furthermore the connection table must

been processed with these communication-CPS. This case occurs with delivery of the standard-system.

If the project is extended for the PCUs or communication CPs, you have to pay attention. It is also important to process again in order to avoid inconsistencies (see chapter 'configuration of the connections').

Cross coupling via layer 4

This cross coupling has the following function

- Data exchange of a PCU to 15 different PCUs
- Redundant bus structure with two CP443 are possible
- Data transfer from S7 to S7 or S7 to S5
- 240 bytes as maximum data quantity

2.4.2 Configuration of the connections (connection table)

In the connection table there is defined between which PCUs a connection has to be set up. This connection table is configured with the CPU of the SIMATIC S7 by the SIMATIC-Manager.

The communication is performed by the SIMATIC S7 directly via the firmware. The assignment to the jobs between the software and the firmware is performed by the ID-numbers.

With the delivery a reliable connection table for the standard configuration is delivered. With the use of the standard addresses this connection table needn't be processed.

Only for activating of the cross coupling the entry of the partner-PCUs in XC_PCU_SR is needed.

It is only necessary to rework the connection table, if the standard addresses have to be changed or if a connection is to be set up to other programmable controllers.

The standard configuration of the connection table was configured according to the following rules.

- Two connections are nedded between a S/ and a S5 PLC
- One connection for receive has to be set to Active=No
- The second connection for Send has to be set to Active=Yes
- TSAPs for both connections may not be equal
- The amount of data depend on the CP, i.e. even with FC 50/60 there is a maximum of Send 240 and Len 240

H1-Bus

Ethernet address for S7 PCU

Adr = 08 0006 01 07 yy yy = PCU-Number as Hexa-number

Ethernet address for S5 PCU

Adr = 08 0006 01 00 yy yy = PCU-Number as Hexa-number

TSAP for S5 and S7

TSAP = SENDzz

zz =connection number

RECVzz

zz = 01 15

1. CP443 LADDR 3E80 16000

2. CP443 LADDR 3E84 16004

Assignment of the ID on CP443

PCU-NR	1	2	3	4	5	6	7	8	
1	-	31 (1F)	33 (21)	35 (23)	37 (25)	39 (27)	41 (29)	43 (2B)	
2	31 (1F)	-	35 (23)	37 (25)	39 (27)	41 (29)	43 (2B)	45 (2D)	
3	33 (21)	35 (23)	-	39 (27)	41 (29)	43 (2B)	45 (2D)	47 (2F)	
4	35 (23)	37 (25)	39 (27)	-	43 (2B)	45 (2D)	47 (2F)	49 (31)	
5	37 (25)	39 (27)	41 (29)	43 (2B)	-	47 (2F)	49 (31)	51 (33)	
6	39 (27)	41 (29)	43 (2B)	45 (2D)	47 (2F)	-	51 (33)	53 (35)	
7	41 (29)	43 (2B)	45 (2D)	47 (2F)	49 (31)	51 (33)	-	55 (37)	
8	43 (2B)	45 (2D)	47 (2F)	49 (31)	51 (33)	53 (35)	55 (37)	-	**ID-Send**
9	45 (2D)	47 (2F)	49 (31)	51 (33)	53 (35)	55 (37)	57 (39)	59 (3B)	
10	47 (2F)	49 (31)	51 (33)	53 (35)	55 (37)	57 (39)	59 (3B)	31 (1F)	
11	49 (31)	51 (33)	53 (35)	55 (37)	57 (39)	59 (3B)	31 (1F)	33 (21)	
12	51 (33)	53 (35)	55 (37)	57 (39)	59 (3B)	31 (1F)	33 (21)	35 (23)	
13	53 (35)	55 (37)	57 (39)	59 (3B)	31 (1F)	33 (51)	35 (23)	37 (25)	
14	55 (37)	57 (39)	59 (3B)	31 (1F)	33 (21)	35 (23)	37 (25)	39 (27)	
15	57 (39)	59 (3B)	31 (1F)	33 (21)	35 (23)	37 (25)	39 (27)	41 (29)	
16	59 (3B)	33 (1F)	37 (25)	41 (29)	45 (2D)	49 (31)	53 (35)	57 (39)	

Assignment of the ID on CP443

PCU-No	9	10	11	12	13	14	15	16	
1	45 (2D)	47 (2F)	49 (31)	51 (33)	53 (35)	55 (37)	57 (39)	59 (3B)	
2	47 (2F)	49 (31)	51 (33)	53 (35)	55 (37)	57 (39)	59 (3B)	33 (21)	
3	49 (31)	51 (33)	53 (35)	55 (37)	57 (39)	59 (3B)	31 (1F)	37 (25)	
4	51 (33)	53 (35)	55 (37)	57 (39)	59 (3B)	31 (1F)	33 (21)	41 (29)	
5	53 (35)	55 (37)	57 (39)	59 (3B)	31 (1F)	33 (21)	35 (23)	45 (2D)	
6	55 (37)	57 (39)	59 (3B)	31 (1F)	33 (21)	35 (23)	37 (25)	49 (31)	
7	57 (39)	59 (3B)	31 (1F)	33 (21)	35 (23)	37 (25)	39 (27)	53 (35)	
8	59 (3B)	31 (1F)	33 (21)	35 (23)	37 (25)	39 (27)	41 (29)	57 (39)	**ID-Send**
9	-	33 (21)	35 (23)	37 (25)	39 (27)	41 (29)	43 (2B)	31 (1F)	
10	33 (21)	-	37 (25)	39 (27)	41 (29)	43 (2B)	45 (2D)	35 (23)	
11	35 (23)	37 (25)	-	41 (29)	43 (2B)	45 (2D)	47 (2F)	39 (27)	
12	37 (25)	39 (27)	41 (29)	-	45 (2D)	47 (2F)	49 (31)	43 (2B)	
13	39 (27)	41 (29)	43 (2B)	45 (2D)	-	49 (31)	51 (33)	47 (2F)	

14	41 (29)	43 (2B)	45 (2D)	47 (2F)	49 (31)	-	53 (35)	51 (33)	
15	43 (2B)	45 (2D)	47 (2F)	49 (31)	51 (33)	53 (35)	-	55 (37)	
16	31 (1F)	35 (23)	39 (27)	43 (2B)	47 (2F)	51 (33)	55 (37)	-	

Note:

The IDs in the table are valid for the transmit job. The Receive-job has always an ID number higher.

ID for S7

ID= 1 ... 64

Connection	Send (Hexa)	Receive (Hexa)
connection 01:	31 (1F)	32 (20)
connection 02:	33 (21)	34 (22)
connection 03:	35 (23)	36 (24)
connection 04:	37 (25)	38 (26)
connection 05:	39 (27)	40 (28)
connection 06:	41 (29)	42 (2A)
connection 07:	43 (2B)	44 (2C)
connection 08:	45 (2D)	46 (2E)
connection 09:	47 (2F)	48 (30)
connection 10:	49 (31)	50 (32)
connection 11:	51 (33)	52 (34)
connection 12:	53 (35)	54 (36)
connection 13:	55 (37)	56 (38)
connection 14:	57 (39)	58 (3A)
connection 15:	59 (3B)	60 (3C)

Example:

Connection PCU 3 (S7) with PCU 2 (S5) via connection 3

In PCU3 1 send and 1 receive- connections are necessary. The configuration for PCU2 has to be made with the COM Software.

In the connection table (S7 Simatic Manager) for PCU3 the following connections have to be entered.

Send S5-Layer 4

0035 A020 SIMATIC S5 ISO yes

Object characteristics

ID 0035 LAADDR 3E80

Local	Remote
08 00 06 01 07 03	08 00 06 01 00 02
SEND03	RECV03
53 45 4E 44 30 33	52 45 43 56 30 33
length=6	length=6

Receive S5-Layer 4

0036 A020 SIMATIC S5 ISO no

Object characteristics

ID 0036 LAADDR 3E80

Local	Remote
08 00 06 01 07 03	08 00 06 01 00 02
RECV03	SEND03
52 45 43 56 30 33	53 45 4E 44 30 33
length e=6	length =6

2.4.3 Program structure –cross coupling

The cross coupling is called in OB1-cyclus and processes 288 possible jobs. The blocks are part of the system consignment and are linked in the programm correspondently. The following blocks are used by the cross coupling:

Function block:

FC 650 copier

FC 651 main program Cross coupling layer 4

FC 652 Enter transmit buffer layer 4

FC 653 dispose receive buffer layer 4

FC 654 Sequence start

FC 655 Enter job in the system data

FC 656 Process substitute value

FB 741 Sequence cascade starting

System function block:

FC 5 Transmit to 240 bytes

FC 6 Receive to 240 Bytes

FC 50 Transmit more than 240 Bytes

FC 60 Receive more than 240 Bytes

Data block :

DB 984/UDT984 Configuration of the Interface

DB 985/UTD985 Job blocks

DB 986/UTD986 Transmit buffer

DB 987/UTD987 Receive buffer

DB 988 Cross coupling ASTA-starting with UTD741

DB742/UTD742 ASTA

Block call:

100 ms OB35(see hardware configuration)

-> call FC 651 „XC_SR_QK“

iFKT:=100

Process times for individual jobs

Cyclic in OB1

-> call FC 651 „XC_SR_QK“

iFKT:=1

-> FC652,FC653,FC654

-> FC650 copier

-> FC656 Starting of a sequence

User programm

-> call FC655 Job in the system data

For BRAUMAT/SISTAR Classic 5.3 the call for OB1 can be performed in FC2001 or FB1220. The call for OB35 can be performed in FC2019 or FB1222.

Assembly of important settings

The listed parameters can be examined and adapted in the easiest way by the application control.

Specific PCU number	DB701 DBB4	1 .. 200
Amount of the connections	DB984 DBW8	1 .. 15
Offset ID	DB984 DBB11	31 Connection 01 has thereby ID31,32 Connection 02 has thereby ID33,34
Amount connections per cycle which are to be processed	DB984 DBB15 Receive	15
	DB984 DBB17 Senden	15
Amount of the job blocks	DB985 DBW8	1 .. 50 (Max.255) It is not allowed to adjust the amount more due to cycle time problems

Amount of the system blocks	DB985 DBW10	64
Job 01 – 32	DBW20-DBW1811	System jobs for user-FC
Job 33 - 64	DBW1812-DBW3603	system jobs for software
Job 65-...	DBW3604-DBW	User jobs 1 - ...
Amount of the job blocks which are to be processed by cycle	DB985 DBW14	114 i.e. all system jobs and user jobs are processed per cycle. A smaller value results in a smaller cycle time. The jobs, however, are processed slowlier

2.4.4 DB-Param Structure

The data block DB 984 (XC_PCU_SR) contains the configuration for the connection between the PCUs.

The data block hast the following Structure:

DBW0	
DBW2	Offset = 200
DBW4	DS-length = 50
DBW6	Maximum = 15
DBW8	Actual amount =15
DBB10	Control data
	10.0 Presetting due to specific PCU-Number
DBB11	ID-Offset =31
DBB12	Specific PCU-Number from DB701 DBB4
DBB13	Specific connection number 1-16 if PCU > 16
DBB14	Auxiliarly byte Receive
DBB15	Amount Connections per cycle for receiving
DBB16	Auxiliarly byte Transmit
DBB17	Amount Connections per cycle for transmitting
DBB 200 – DBB249	Job block for connection 1
DBB 250 – DBB299	Job block for connection 2
DBB 300 – DBB349	Job block for connection 3
DBB 350 – DBB399	Job block for connection 4
DBB 400 – DBB449	Job block for connection 5
DBB 450 – DBB499	Job block for connection 6
DBB 500 – DBB549	Job block for connection 7
DBB 550 – DBB599	Job block for connection 8
DBB 600 – DBB649	Job block for connection 9
DBB 650 – DBB699	Job block for connection 10
DBB 700 – DBB749	Job block for connection 11
DBB 750 – DBB799	Job block for connection 12
DBB 800 – DBB849	Job block for connection 13
DBB 850 – DBB899	Job block for connection 14
DBB 900 – DBB949	Job block for connection 15

For each of the connection a job block is available in the data block DB 984. The connection is configured in this job block.

Job block Structure:

Word 0	Identifier	PCU-Number
Word 2	ID	ID
Word 4	LADDR	LADDR
Word 6	Identifier	PCU-Number
Word 8	ID	ID
Word 10	LADDR	LADDR
Word 12	Identifier	PCU-Number
Word 14	ID	ID
Word 16	LADDR	LADDR
Word 18		Transmit buffer –DB
Word 20		Transmit buffer – DW
Word 22		Receive buffer – DB
Word 24		Receive buffer – DW
Word 26		Amount Bytes of the buffer
Word 28	Counter Receive message.	Counter Transmit message
Word 30	State bits transmit 30.0 Done 30.1 Error	
Word 32		Error state for transmitting
Word 34	State bits Receive 34.0 Done 34.1 Error	
Word 36		Error state for receiving
Word 38		
Word 40	Sequence start for sending	Maintenance time
Word 42	Waiting for acknowledgement	
Word 44		Pointer on job list

Notes:

Word 0 – 4 Data of the active interface

Word 6 – 10 Data of the first interface

Word 12 – 16 Data of the second interface

Identifier Bit0 = 1 S5 with layer 4 - coupling

Identifier Bit1 = 1 S7 with rangelayer 4 – coupling

With a error in the active interface it will be transferred to the reserve-interface, if this one is available.

2.4.5 DB-Job Structure

The data block DB 985 (XC_JOB_SR and XC_SJOB_SR) contains the job blocks for the cross coupling.

XC_SJOB_SR

1 – 32 Systemblocks for user-FC

1. Systemblock: DBW20 - DBW74

33 – 64 Systemblocks for Software

33. Systemblock: DBW1812 - DBW1866

XC_JOB_SR

65 – 200 (320) user blocks

1. Userblock: DBW3604 – DBW3658

The data block has the following structure:

DBW0	TYPE = 1
DBW2	Offset = 3604
DBW4	DS-Length = 56
DBW6	Maximum = 320
DBW8	Current amount Jobs of the user = 50
DBW10	System jobs = 64
DBW12	Offset to the first job = 20
DBW14	DBW10 + DBW8
DBW20 -	Job blocks

Each job consists of 28 data words:

Byte 0/1	PCU-Number	
Byte 2	Job type	50,51=Send 52,53=Fetch 66,68=Time
Byte 3	Control bits	3.0 Enable 3.1 Parameter-Error 3.2 PCU-Error 3.4 Timebase in ms 3.5 Timebase in min 3.6 acknowledgement 3.7 Temporary Job
Byte 4	Spare	
Byte 5	Target-Area	84=DB
Byte 6/7	Target-DB	DB-Number
Byte 8/9/10/11	Target-DBB	Datenbyte-Number
Byte 12/13	Spare	
Byte 14/15	Amount	Amount of the Bytes
Byte 16	Spare	
Byte 17	Source-Area	84=DB

Byte 18/19	Source-DB	DB-Number
Byte 20/21/22/23	Source-DBB	Databyte-Number
Byte 24/25/26/27	Spare	
Byte 28/29	Budgeted timet	
Byte 30/31	Actual time	
Byte 32/33	Status	
Byte 34/35	Spare	
Byte 36/37	Spare	
Byte 38/39	FltTime	Maintenance time until spare value is loaded
Byte 40/41	FltActTime	Current time
Byte 43	FltQuell-Area	84=DB
Byte 44/45	FltQuell-Db	DB-Number
Byte 46/47/48/49	FltQuell-DBB	Datenbyte-Number
Byte 50/51/52/53	Spare	
Byte 54/55		Return value

2.4.6 DB-Send structure

The data block DB 986 contains the transmit buffer. There can be available 15 transmit buffers at most. The length of a transmit buffer contains 120 data words (240 Bytes) at most.

The data block has the following structure:

1. Station	DBW 000 to DBW 238
2. Station	DBW 240 to DBW 478
3. Station	DBW 480 to DBW 718
4. Station	DBW 720 to DBW 958
5. Station	DBW 960 to DBW 1198
6. Station	DBW 1200 to DBW 1438
7. Station	DBW 1440 to DBW 1678
8. Station	DBW 1680 to DBW 1918
9. Station	DBW 1920 to DBW 2158
10. Station	DBW 2160 to DBW 2398
11. Station	DBW 2400 to DBW 2638
12. Station	DBW 2640 to DBW 2878
13. Station	DBW 2880 to DBW 3118
14. Station	DBW 3120 to DBW 3358
15. Station	DBW 3360 to DBW 3598

Transmit buffer structure:

Word 0	DLReceive acknowledgment	DR Transmit acknowledgement
Word 1 .. 236	Job blocks	
Word 238	End identifier = -1	

Job block structure:

Word 0	Job
Word 1	DB-Number
Word 2	DW-starting
Word 3	Amount of the user data
Word 4 to amount l	User data

2.4.7 DB-Empf Structure

The data block DB 987 contains the Receive buffer. In the data block there can be available up to a maximum of 15 receive buffer. The length of a receive buffer contains up to a maximum of 120 (240 Bytes) data words.

The data block has the following structure:

1.Station	DBW 000 to DBW 238
2. Station	DBW 240 to DBW 478
3. Station	DBW 480 to DBW 718
4. Station	DBW 720 to DBW 958
5. Station	DBW 960 to DBW 1198
6. Station	DBW 1200 to DBW 1438
7. Station	DBW 1440 to DBW 1678
8. Station	DBW 1680 to DBW 1918
9. Station	DBW 1920 to DBW 2158
10. Station	DBW 2160 to DBW 2398
11. Station	DBW 2400 to DBW 2638
12. Station	DBW 2640 to DBW 2878
13. Station	DBW 2880 to DBW 3118
14. Station	DBW 3120 up to DBW 3358
15 Station	DBW 3360 up to DBW 3598

Transmit buffer structure:

Word 0	DL Receive acknowledgement	DR Transmit acknowledgement
Word 1 .. 236	Job blocks	
Word 238	End identifier = -1	

Job block structure:

Word 0		Job
Word 1		DB-Number
Word 2		DW-starting
Word 3		Amount of user data
Word 4 to amount		User data

2.4.8 Configuration of connections (S7 – S7, S7 – S5,and S5 – S5)

In the block XC_PCU_SR (DB 984) is stated, to which partner PCUs should set up a connection. For that, the number of the partner-PCU must be entered in this data block to which a connection is to be set up. Furthermore you have to make sure that the connections are also described in the connection table.

The partner may be a S7- or S5-PLC. Primarily this cross coupling should be used for connection to S5 PLCs. With Send- and Receive-jobs a maximum of 240 Bytes may be transported.

For that the number of the parner PCU has to be entered in this DB. It has to be ensured that this connection is defined in the connection table.

Two interfaces may be configured. If one of them is failing, data transfer takes place over the other interface.

Important:

- The connections to the corresponding Partner-PCUs must have been configured as IOS-connections and the respective CPUs must have been loaded.
- Per Partner-PCU a active connection for sending and a passive connection for receiving is required.
- Connections are activated after a CPU initial Start.
- Industrial Ethernet is used as the Network architecture.
- Per Partner-PCU only one Data record may be stored.
- In a XC_PCU_SR Data record the user has to enter the Number of the desired Partner-PCU as well as its PLC type.
- The ID and LAADR have to correspond to the values of the connection table. (Hardware configuration and Network configuration)

Important note:

The easiest way to enter the partner – PCUs number to which a connection should be set up, is made by the application configuration, reset block XC_PCU_SR.

The following mask appears:

Parameter set: Configuration PCU

Aktive interface

XC_PCU_SR PCU		**DB 984**		**Sets: max.15 per PCU**
No.	NAME	TYPE	Press..	Comment
1	PCU_A	I8	0	PCU number of the partner
2	S5_SR4_A	B1	0	S5 control identifier of the partner
3	S7_SR4_A	B1	0	S7 control identifier of the partner
4	ID_A	I16	XX	ID of the connection
5	LADDR_A	HEXA	XX	Interface address
6	AERROR	B1	0	Error bit

First Interface

XC_PCU_SR PCU		**DB 984**		**Sets : max.15 per PCU**
Nr.	NAME	TYPE	Press..	Comment
7	PCU_N	I8	0	PCU number of the partner

8	S5_SR4_N	B1	0	S5 control identifier of the partne
9	S7_SR4_N	B1	0	S7 control identifier of the partner
10	ID_N	I16	XX	ID of the connection
11	LADDR_N	HEXA	XX	Interface address

Second Interface

XC_PCU_SR PCU		**DB 984**		**Sets : max.15 per PCU**
No.	NAME	TYPE	Press..	Comment
7	PCU_R	I8	0	PCU-number of the partner
8	S5_SR4_R	B1	0	S5-control identifier of the partner
9	S7_SR4_R	B1	0	S7-control identifier of the partner
10	ID_R	I16	XX	ID of the connection
11	LADDR_R	HEXA	XX	Interface address

Via the application text configuration, reset block XC_PCU_SR a name can be assigned to each connection. The entry is performed by the following mask:

Parameter set: text configuration IOS

XC_PCU_SR			**Sets: max. 15 per PCU**
No.	Type Info	Press.	Comment
1	Z16 P IOS	XC_PCU_SR xx	Cross coupling to partner-PCU

Notes:

In DB701 DBB4 the own PCU-Number must be entered

If this PCU-Number must be changed the Parameter ID_A, ID_N and ID_R have to be entered again. This ID have to be used in the send job for this connection. The Receive-job gets the next higher ID.

Connection	**ID-Send**	**ID-Receive**
01	31(1F)	32(20)
02	32(21)	33(22)
03	34(21)	35(22)
04	36(21)	37(22)
05	38(21)	39(22)
06	40(21)	41(22)
07	42(21)	43(22)
08	44(21)	45(22)
09	46(21)	47(22)
10	48(21)	49(22)
11	50(21)	51(22)
12	52(21)	53(22)
13	54(21)	55(22)

14	56(21)	57(22)
15	58(21)	59(22)

The Parameter LADDR_A, LADDR_N and LADDR_R must correspond to the Hardware address of the CP. The following adresses are used with it:

First CP:
16000 (3E80)

Second CP:
16004 (3E84)

In Parameter PCU_A, PCU_N and PCU_R the PCU-Number of the coupling partner has to be entered. If the value = 0, no data transfer takes place over the interface.

Diagnosis of a connection

Further informations about the condition of a connection is available to the user for diagnosis purpose.

These connections can be reseted in the application configuration, reset block XC_PCU_SR, for the data record to which informations are wished, under options, hidden attributes,

Further parameters appear in the configuration mask.

Parameter set: Configuration PCU

XC_PCU_SR PCU		**DB 984**		**Sets: max.15 je PCU**
No.	NAME	TYPE	Press..	Comment
1	PCU_A	I8	0	PCU-Number of the partner
2	S5_SR4_A	B1	0	S5-Control identifier of the partner
3	S7_SR4_A	B1	0	S7-Control identifier of the partner
4	ID_A	I16	XX	ID-of the connection
5	LADDR_A	HEXA	XX	Interface address
6	AERROR	B1	0	Error bitt
7	Aktiv_NOR	B1	0	1. Interface processt
8	Aktiv_RES	B1	0	2. Interface process
9	RECV_C	I8	0	Counter of the receive message
10	SEND_C	I8	0	Counter of the transmit message
11	PCU_N	I8	0	PCU-Number of the partner
12	S5_SR4_N	B1	0	S5-control identifier of the partner
13	S7_SR4_N	B1	0	S7-control identifier of the partner
14	ID_N	I16	XX	ID-of the connection
15	LADDR_N	HEXA	XX	Interface address
16	PCU_R	I8	0	PCU-Number of the partner
17	S5_SR4_R	B1	0	S5-control identifier of the partner s
18	S7_SR4_R	B1	0	S7-control identifier of the partner
19	ID_R	I16	XX	ID of the connection

20	LADDR_R	HEXA	XX	Interface address
21	Send_DB	I16	986	DB of the transmit buffer s
22	Send_DW	I16	XX	First DW of the transmit buffer
23	LEN	I16	240	Max. Amount Bytes in buffer
24	Send_Done	B1	0	Transmitting ready without any errors
25	Send_Error	B1	0	Transmitting ready with errors
26	Send_Status	HEXA	0	State of the connection
27	Recv_DB	I16	986	DB of the receive buffer
28	Recv_DW	I16	XX	First DW of the receive buffer
30	Recv_Done	B1	0	Receive ready without any errorsr
31	Recv_Error	B1	0	Receive ready with errors
32	Recv_Status	HEXA	0	State of the connection
33	Step	I8	0	Step number for transmitting
34	BCount1	I8	0	Waiting until transmitting has been finished.
35	BCount2	I8	0	Waiting until interface has been switched
36	JOB_PTR	I16	0	Pointer for job list
37	JOB_PTR_SEEK	I16	0	Pointer for search in the job list

Note:

Parameter Send_Error and Recv_Error

Here the Errorcodes of the Standard coupling blocks 'Send (FC50)' and 'Receive (FC60)' are entered by the system. A list of codes ca be found in the Manual....

SIMATIC NET

Industrial Communication

NCM S7 for Industrial Ethernet

C79000-xxxxxx-Cyyy

Jobs in the Network configuration

For each PCU which is involved in a Data connection, two jobs have to be created with the network configuration.

Example: PCU3 to PCU2

Connections

Local-ID	Partner-ID	Partner	Type	Activ
0023	A020	SIMATIC S5	ISO	Yes (Send S5 –

				Layer 4)
0024	A020	SIMATIC S5	ISO	No (Receive S5 – Layer 4)

Object properties

ID	LAADR	Local Eth Adr	Remote Eth Adr	Loc.TSAP	Remote TSAP
0023	3E80	08 00 06 01 07 03	08 00 06 01 00 02	SEND03 53 45 4E 44 30 33 Length=6	RECV03 52 45 43 56 30 33 Length=6
0024	3E80	08 00 06 01 07 03	08 00 06 01 00 02	RECV03 52 45 43 56 30 33 Length=6	SEND03 53 45 4E 44 30 33 Length=6

Notes to Ethernet addresses:

08 00 06 01 xx yy

xx=00 Marking for S5

xx=07 Marking for S7

yy= PCU-Number as Hexa-number i.e. PCU10=0A

Important adjustments

The listed parameters can be changed and approved easily with the application 'Control'

Own PCU-Numner	DB701 DBB4	1 - 200
Number of connections	DB984 DBW8	1 - 15
Offset ID	DB984 DBB11	31 Connection 01 has therefore ID31,32 Connection 02 has therefore ID33,34
Number of connections which are to be processed per cycle	DB984 DBB15 Receive	15
	DB984 DBB17 Send	15 On order to minimize the cycle time the number of connections may be adjusted here Drawback: The coupling reaction time is extended
Number of job blocks	DB985 DBW8	1 .. 50 (Max.255) The number must not adjusted too big because of possible cycle time problems
Number of system jobs	DB985 DBW10	64
Job 01 – 32	DBW20-DBW1811	System jobs for user-FC
Job 33 – 64	DBW1812-DBW3603	System for Software

Job 65 - ...	DBW3604-DBW	User jobs 1 – ...
Number of job blocks to be precessed by cycle.	DB985 DBW14	114 i.e. per cycle all System and User Jobs are processed A shorter value causes a lower cycle time but the jobs are processed slower

2.4.9 Configuration of Jobs XC_JOB_SR and XC_SJOB_SR for S7 – S7, S7 – S5, and S5 – S5 connections

XC_SJOB_SR

There are up to a maximum of 64 system jobs available in each PCU. 240 Bytes of data may be transferred per Job.

1 - 32 System blocks for FC655 of the user DB985 starting at DBW 20

33 - 64 System blocks for the software (acknowledgement/ASTA-starting) DB985 starting at DBW1812

XC_JOB_SR

Further 50 system jobs (max. 320) are possible

65 - 114 User job 1-50

DB985 starting at DBW 3604

Cross coupling is inactive, if the data block DB 984 (XC_PCU_SR) was deleted or the number of the partner-PCUs is equal to zero. In this case the function block for the cross coupling breaks up the process.

A job is active, if a PCU-number is entered and the Enable-bit is set to 1. The job is set down again and again after the configured time.

If the PCU-number is equal to zero, the job is not assigned and can be used for a temporary job by the system.

A temporary job is set down only one time. This is e.g. a ASTA-starting for a start of a plant section in a different PCU or the user sets up only one job by the function FC 655. (see chapter 'Temporary job')

If all jobs are assigned, no temporary job can be set down, i.e. no plant section can be started in a different PCUs via the ASTA-block.

Send-jobs, fetch-jobs and time jobs are possible.

Only data blocks are possible as memory area for the transmitted and received data. The coding corresponds to the definition for the SIMATIC S7.

Table: possible coding of the memory area for XC_JOB_SR

(Parameter: SrcArea / DestArea / FltSrcArea

Hex-Code	Description
80	Memory range Periphery
81	Memory range of Inputs
82	Memory range of Outputs
83	Memory range of Flags
84	Data block

Only one coupling with parameter blocks is possible

If a time job (type 66, 68) is entered, a SEND job is created automaticly for adjustment of the Clock in another PCU. The addresses are preset according to the standard for Simatic S7 or S5. Now the user may adapt these addresses, if the actual Time ist supplied by another data interface.

The job is being processed if the actual time is equal to zero. If an error is found , the bit PCU_Error will be set.

If an error is detected on processing the job, the bit PCU_Error is set. The bit 'ParamError' signals parameterization errors to the user

Substitute values may be defined for FETCH jobs which are transferred to the own memory range if the connection fails. If a job is finished with error, the time 'FltTime' is started. After this time has elapsed the substitute values are transferred.

No substitute values exists if parameter 'FltSrcArea' = 0

If the job has been configured incorrectly, this will be displayed by setting the bits ParamError.

Jobs

There are the following job types:

- Send
- Send with acknowledgement
- Fetch
- Fetch with acknowledgement
- Send timer
- Start SEQU

Send-jobs without acknowledgement should be used with priority, as these jobs reaches the fastest data transfer.

Source or target in S7

Only data blocks from 1 to 32000 are possible and data bytes in the range from 0 to 32000.

Source or target in S5

Only data blocks are possible, that means DBs from 1 to 255 or DXs from 1 to 255.

Furthermore the range of data words from 0 to 4098 should be mentioned for S5 PLCs.

The user jobs are performed in a cyclic way, that means there has to preset a time base (ms, sec, min) and a time value (1-200).

With the Send-job data are sent to the coupling processor.

With the Fetch-job a job message is sent to the coupling processor. The coupling processor responds this message with the data message.

With sending timer the job is generated automatically, if PCU, time basis (msec, sec, min), time value (1 – 200) and job type are preset.

Job type = 66 Send timer to S5

Job type = 68 Send timer to S7

The start message for a sequencer is performed by a system job, that means the user must not enter a own job.

Job with acknowledgement

A message with a new transmission message counter is sent to the coupling processor concerning jobs with acknowledgement.

Transmission buffer S7

Byte 0 DBB 0 Message counter

Byte 1 DBB 0 Transmission message counter

Input buffer S7

Byte 0 DBB 0 Message counter

Byte 1 DBB 0 Transmission message counter

Transmission buffer S5

DL 0 Message counter

DR 0 Transmission message counter

Input buffer S5

DL0 Message counter

DR0 Transmission message counter

With receiving a message the transmission message counter of the input buffer will be compared with the message counter of the transmission buffer. If both counters are equal , no acknowledgement message is necessary.

If both counters are inequal the transmission message counter of the input buffer will be transfered in the message counter of the transmission buffer.

A job is created in the system data so that a acknowledgement message will be sent. This system job receives the state ‚send immediately'.

Acknowledgement job S5 to S5	DB205 DW 0 for DB205 DW0
Acknowledgement job S7 to S7	DB985 DBB0,1 for DB985 DBB0,1
Acknowledgement job S5 to S7	DB205 DW 0 for DB985 DBB0, 1
Acknowledgement job S7 to S5	DB985 DBB0,1 for DB205 DW0

System jobs

System jobs are jobs which are created automatically by the software. System jobs are used for the acknowledgement or the sequencer start.

In S7 it is possible to create system jobs from the user program by FC655.

Substitute value

The interface is controlled. An error in a job is found.

- Error from transmission or input function block
- No acknowledgement

The substitute values are processed which are assigned to this connection (PCU number)

Each substitute job has a waiting time. If this time is expired (error is too long available) the values of the substitute value will be transfered to the target datas.

There is a own list with substitue jobs in S5.

In S7 the substitute values are integrated in normal user jobs.

For jobs which should only process the substitute values (no coupling job) the following datas need to be entered:

- PCU, Source type, target-DB, target-DW, amount
- Time basis, substitute time, substitute type, substitute-DB, substitute -DW

Starting of a sequence

S5-Control

There are 96 ASTA-data blocks in DB 242 and the assigned starting bytes in DB114 DW 2 – 7.

The user is able to influence the bytes via ASTA-interface from S672.0 to S683.7.

In the ASTA-data record there is the type9/10, that means starting via a plant section and type11/12 starting via weekly program.

A system job is generated which tries to induce a automatical starting in the plant section via the coupling partner.

The starting of a plant section is only possible if there is no manual operation and no continous condition and the plant section has the step =0.

The plant section is started by setting step=1 in the SEQU data record.

S7-Control

In S7 control there are 96 ASTA data records in DB742. Depending on the SEQU number which need to be started, the assigned XC_ASTA-data record will be loaded.

In the ASTA data record is a target plant section. The XC_ASTA-data record is selected due to the target plant section.

The user can start a plant section in a different PCU via ASTA-flags, if the type is 9,10,12.

A system job is generated which tries to induce a automatic starting of the plant section.

If a input messsage reach the sequencer start, the message datas will be entered in the XC_ASTA data records DB688.

The starting of the plant section is only possible if no manual operation and no continous condition and the plant section is in step=0.

Configuration

The configuration of a job in the PCU is performed in the easiest way by the application Configuration, reset block XC_JOB_SR.

The following mask appears:

Parameter set: Configuration PCU

XC_SJOB_SR PCU **XC_JOB_SR PCU**		**DB 985**		**Sets: 1 – 64 per PCU** **Sets 65 ... per PCU (Standard = 50)**
No.	NAME	TYPE	Press.	Comment
1	PCU	I16	0	No. of the partner-PCU

2	Type	BYTE	14	Job type: 50, 51=SEND, 52, 53=FETCH, 66, 68=TIME
3	Quit	B1	0	Job with acknowledgement of the partner
4	Enable	B1	0	Job release
5	TimeMS	B1	0	Time base ms
6	TimeMIN	B1	0	Time base min
7	Time	I16	10	Job time in sec.
8	Src	I16	0	Source: 0=P/E/A/M, 1..4095=DB
9	SrcArea	HEXA8	84	Source-memory area (see table)
10	SrcByte	I32	0	Byte address of the source memory
11	NumByte	I16	1	Amount of the transferred bytes
12	Dest	I16	0	Target: 0=P/E/A/M, 1...4095=DB
13	DestArea	HEXA8	84	Target-memory area (see table)
14	DestByte	I32	0	Byte-address of the target area
15	FltTime	I16	120	GET: running time until substitute value transfer is performed
16	FltSrc	I16	0	GET: Source Substitute value: 0=P/E/A/M, 1.,.4095=DB
17	FltSrcArea	HEXA8	84	GET: Substitute sector (see table), 0=no
18	FltSrcByte	I32	0	GET: Byte address of the substitute value
19	PCU_Error	B1	0	Partner-PcuU not in Run or Connection error
20	ParamError	B1	0	Configuration error

Table: Parameter Type

Code	Description
50	Send DB (S7/S5)
51	Send DX (S5)
52	Fetch DB (S7,S5)
53	Fetch DX (S7)
66	Time from S7 to S5 send (DB701 -> DB201)
68	Time from S7 to S7 send (DB701 -> DB701)

Table: Parameter TimeMS und TimeMIN

TimeMS	TimeMin	Description
0	0	Time counts the time in secs
1	0	Time the time in Millisecs
0	1	Time counts the time in mins

Parameter Quitt

If the parameter = 1 the Receiver has to send a answer message

For this acknowledge the first data word of the send or receive buffer reserved.

DBB0 Receive receipt

DBB1 Send receipt

If an acknowledge is needed the Send-receipt is incremented. The receiver has to copy that number into the Receive receipt and to send it back.

The transmission is completed, when the receive receipt in the receive buffer equals the send receipt iin the send buffer.

Textconfiguration

Via the application text configuration, selecting block XC_JOB_SR a name can be assigned to each job. This makes the research of jobs which have already been configured easier . The entry performs in the following mask:

Parameter set: text configuration IOS

XC_JOB_SR IOS			Records max. 64 jobs per PCU
Nr.	Type Info	Preset. .	Comment
1	Z16 P IOS	XC_JOB_SR xxx	Cross Coupling system jobs

XC_JOB_SR IOS			Records max. 50 (255) per PCU
Nr.	Typ Info	Vorbes.	Comment
1	Z16	XC_JOB_SR xxx	Cross coupling Jobs

Job diagnosis

If a job is not executed, but finished with a failure, further informations are available to the user in order to make the search for error easier.

These further informations can be selected in the configuration, call block XC_JOB_SR, for the data record, to whic informations are wished, under options, hidden attributes.

There appear further parameters to the job.

Parameter set: Configuration PCU

XC_SJOB_SR PCU XC_JOB_SR PCU		DB 985		Sets: 1 – 64 per PCU Sets 65 ... per PCU (Standard = 50)
No.	**NAME**	**TYPE**	**Pres..**	**Comment**
1	PCU	I16	0	No. of the partner-PCU
2	Type	BYTE	50	Job type: 50, 51=SEND, 52, 53=FETCH, 66, 68=TIME
3	Quit	B1	0	Job with acknowledgement of the partner
4	Enable	B1	0	Job release
5	TimeMS	B1	0	Time base ms
6	TimeMIN	B1	0	Time base min
7	Time	I16	10	Job time in sec.
8	Src	I16	0	Source: 0=P/E/A/M, 1..4095=DB
9	SrcArea	HEXA8	84	Source-memory area (see table)
10	SrcByte	I32	0	Byte address of the source memory
11	NumByte	I16	1	Amount of the transferred bytes
12	Dest	I16	0	Target: 0=P/E/A/M, 1...4095=DB
13	DestArea	HEXA8	84	Target-memory area (see table)
14	DestByte	I32	0	Byte-address of the target area
15	FltTime	I16	120	GET: running time until substitute value transfer is performed

16	FltSrc	I16	0	GET: Source Substitute value: 0=P/E/A/M, 1.,.4095=DB
17	FltSrcArea	HEXA8	84	GET: Substitute sector (see table), 0=no
18	FltSrcByte	I32	0	GET: Byte address of the substitute value
19	PCU_Error	B1	0	Partner-PcuU not in Run or Connection error
20	ParamError	B1	0	Configuration error

2.4.10 Fetch-job

Via a fetch job data are fetched from a different PCU and written on a specific memory area.

For this job type substitute values can be configured. . If the connection between PCUs is interrupted or the job is stopped due to other reasons with errors (no configuration error), the transfer of substitute values will be performed to target data.

For that, there the possiblity arise to drive the PCU in safe condition after the failure of coupling data , e.g. setpoints can be written to zero or the control is put back.

This is the big advantage of a Fetch-job compared with a Send-job. With a Send-job an error is also found, if a job was stopped by an error. However, there are target data in the partner-PCU, which has found the error, but has no access to the target data.

As the Send-job in the parnter-PCU is developed by the firmware, there is no interface for finding an error. The user must supervise this job by himself or he just sends the unimportant data, which can not endanger if they fail.

If a fetch job is finished with an error, the time ‘FltTime’ is started in the parameter set of the block XC_JOB_SR.

If the time expired, the substitute value transfer is performed.

As the job is started again and again (Parameter Time), the substitute value transfer is performed always again after having finished the job with error and time sequence ‘Flt Time’.

If the parameter ‘FltSrcArea’ is equal to 0, there are no substitute values.

A fetch job brings a load of 2 jobs to the data bus:

- Job – Request to the partner PCU
- Job – Partner PCU transmits data

Example :

There should be fetched 200 data bytes every 5 seconds via a fetch job every 5 seconds from PCU 4 from the data block 200 from DBW200.

The received data should be filed in the data block DB 400 from DBW 200.

If there is a failure in the connection, the backup values are to be transferred after a timeout of 30 sec. from the DB 100 starting with DBW 500 ti DB 400

XC_JOB_SR		**DB 985**		**Sets: max. 320 per PCU**
No.	NAME	TYPE Info	Pres..	Comment
1	PCU	I16 P S	4	Fetch data from PCU 4
2	Type	I8 P S	52	Job type: 52=Fetch
3	Quit	B1	0	Job with acknowledgement of the partner
4	Enable	B1 P S	1	Job release

5	Time	I16 P S	5	Fetch data every 5 seconds
6	TimeMS	B1	0	Time base ms
7	TimeMIN	B1	0	Time base min.
8	Src	I16 P S	200	Source-DB
9	SrcArea	HEXA8 P S	84	Source-memory area DB
10	SrcByte	I32 P S	800	Byte address 800 in source DB200
11	NumByte	I16 P S	200	Transfer 200 bytes
12	Dest	I16 P S	400	Target DB 400
13	DestArea	HEXA8 P S	84	Target-memory area
14	DestByte	I32 P S	200	Byte-address 200 in target DB 400
15	FltTime	I16 P S	30	GET: running time until substitute value transfer is performed
16	FltSrc	I16 P S	100	GET: Source Substitute value DB 100
17	FltSrcArea	HEXA8 P S	84	GET: Substitute value Section DB
18	FltSrcByte	I32 P S	500	GET: Substitute value Byte address 500 in DB 100
19	PCU_Error	B1 P S	0	Partner-PCU not in Run or Connection error
20	ParamError	B1 P S	0	Configuration error

Example:

Via a fetch job the time should be loaded from a S5 (DB201/DW91-94) in the DB986 DBB80-87 in a S7.

The data should be updated every 3 seconds.

PCU2 = S5

PCU3 = S7

DB 986

DBW 80	HEXA 5908	Sec, msec
DBW 82	HEXA 1125	hours minute
DBW 84	HEXA 2101	day, week day
DBW 86	HEXA 9906	year, month

Job in S7

```
DBW0    PCU= 2                  (*PCU-number*)
DBB2    Type=52;                (*50,51=Send, 52,53=Fetch, 66,68=TIME*)
DBX3.6  Quitt=0;                (*Job with Quitt-Telegramm*)
DBX3.0  Enable=0;               (*JOB's release*)
DBX3.4  TimeMS=0;               (*Time Base = ms*)
DBX3.5  TimeMIN=0;              (*Time Base = min*)
DBW28   Time=3;                 (*Order time in seconds*)
DBW30   ActTime=0;              (*Current time value*)
DBW6    Src=201;                (*Source: 0=P/I/O/F, 1..4095=DB*)
DBB5    SrcArea=84;             (*Section 84H=DB,80H=P,81H=I,82H=O,83H=F*)
DBD8    SrcByte=91;             (*Source byte address*)
DBW14   NumBytes=8;             (*Number of bytes to send*)
DBW18   Dest=986;               (*Destination: 0=P/I/O/F, 1..4095=DB*)
DBB17   DestArea=84;            (Section84H=DB,80H=P,81H=I,82H=O,83H=F*)
DBD20   DestByte=80;            (*Destination byte address*)
DBW32   PCU_State-00            (*1=Con.error, 0=STOP, 2=RUN, 4=HALT, 5=DEFECT*)
DBW34   LastJobResult=0;        (*0=Idle, 2=Run, 4=OK, 8=Error*)
DBW36   LastGetPutResult=0;     (*1=CPU STOP,0=OK, *)
DBW38   FltTime=0;      (*Wait time for end of reserve value transfer*)
DBW40   FltActTime=0;   (*current time value for reserve value transfer*)
DBW44   FltSrc=0;               (*Source of reserve values: 0=P/I/O/F, 1..4095=DB*)
DBB43   FltSrcArea=0;           (*Section 0=no reserve values, 80H..84H*)
DBD46   FltSrcByte=0            (*Reserve values byte address*)
DBW54   BLKMOV_RET_VAL=0;           (*Reserve values: block transfer 0=o.k.*)
DBX3.7  TmpJob=0;               (*Temp. job, if finished PCU=0, Enable=0*)
DBX3.2  PCU_Error=0;            (*Remote PCU not running or connection error*)
DBX3.1  ParamError=0;  (*GET/PUT/BLKMOV: Parameterization error*)
```

There is the following message transfer

PCU 3 transmits a message with a data requirement .

PCU 2 accepts the data requirement and generates a system job (33-64)
This job receives the transmit release immediately .
Via the job data the transmit buffer is loaded and sent .

PCU 3 receives the data and transfers them to the data target .

The transmit buffer must receive a fetch job every 3 seconds (example connection 3 to a S5)

DB 986 Transmit buffer S7

DBB 480 Message pointer Receive

DBB 481 Message pointer Transmit

DBB 482 Type = 52

DBB 483 Type = 52

DBW 484 DB-Number for the Partner = 986

DBW 486 DW-Number for the Partner = 80

DBW 488 Amount = 4

DBW 490 HEXA 3232 Type=52

DBW 492 DB-Data target 986

DBW 494 DBB-Data target 80

DBW 496 Amount 4 (4data words = 8Bytes)

DBW 498 DB-Data source 201

DBW 500 DW-Data source 91

DBW 502 End identifier -1

DB 207 Receive buffer S5

DL 256 Message pointer Receive

DR 256 Message pointer Transmit

DL 257 Type = 52

DR 257 Type = 52

DW 258 DB-Number for the Partner = 986

DW 259 DW-Number for the Partner = 80

DW 260 Amount = 4

DW 261 DB-Data target l986

DW 262 DBB-Data target l 80

DW 263 Amount 4

DW 264 DB-Data source 201

DW 265 DW-Data source 91

DW 266 End identifier -1

The S5-PLC recognizes the message and generates a system job in DB205 in order to transmit data to PCU3. Based on that system job, the data ist entered into the send buffer.

Word 0 PCU (3) Control bits

Word 1 Target-type =50 Source type =50

Word 2 Target DB=986

Word 3 TargetDW=80

Word 4 Amount=4

Word 5 Source DB=201

Word 6 Source DW=91

Word 7 Real time =255 budgeted time

DB 206 Transmit buffer S5

DL 256	Message pointer Receive	
DR 256	Message pointer Transmit	
DL 257	Type = 50	
DR 257	Type = 50	
DW 258	DB-Number for the Partner = 986	
DW 259	DW-Number for the Partner = 80	
DW 260	Amount = 4	
DW 261	HEXA 5908	Sec, msec
DW 262	HEXA 1125	hours, minute
DW 263	HEXA 2101	day, week day
DW 264	HEXA 9906	year, month,
DW 265	End identifier -1	

DB 987 Receive buffer S7

DBB 480	Message pointer Receive	
DBB 481	Message pointer Transmit	
DBB 482	Type = 50	
DBB 483	Type = 50	
DBW 484	DB-Number for the Partner = 986	
DBW 486	DW-Number for the Partner = 80	
DBW 488	Amount l = 4	i.e. . 4 data words corresponds to 8 Bytes
DBW 490	HEXA 5908	Sec, msec
DBW 492	HEXA 1125	hours, minute
DBW 494	HEXA 2101	day, week day
DBW 496	HEXA 9906	year, month
DBW 498	end identifier -1	

The data are loaded to the data target

DB 986

DBW 80	HEXA 5908	Sec, msec
DBW 82	HEXA 1125	hours, minute
DBW 84	HEXA 2101	day, week day Tag,
DBW 86	HEXA 9906	year, month

In DB986 hour, minute, second must change every 3 seconds.

Note :

A fetch job is always performed with an acknowledgement in S7. It makes sure, that the transmitter waits for the data receive from the coupling partner. Therefore it is not useful to configure the job with acknowledgment bit.

2.4.11 Send-Job

Via a send-job data from the specific PCU is written in a different PCU.

There is no substitute value transfer, as the target data is in the partner-PCU to which the job was executed by errors.

The Send-job is executed in the partner-PCU by the firmware. There is no interface, which displays an error, if the data is not received.

Therefore the user has to supervise this job, if necessary, in the partner-PCU by himself and to take corresponding measures by a failure of this connection, e.g.

Set setpoint to zero, reset triggerings.

Example:

There should be written 100 data bytes in the PCU 2, in the data block DB 400 from DBW 200 every 8 seconds via a transmit-job.

Data which should be sent, are filed in the data block DB 200 from DBW 400.

XC_JOB_SR		**DB 985**		**Sets: max. 320 per PCU**
No.	NAME	TYPE Info	Pres..	Comment
1	PCU	I16 P S	2	Send data in PCU 2
2	Type	I8 P S	15	Job type: 50=Transmit
3	Quit	B1	0	
4	Enable	B1 P S	1	Job release
5	TimeMS	B1	0	Time base ms
6	TimeMIN	B1	0	Time base min
7	Time	I16 P S	8	Transmit data every 8 sec..
8	Src	I16 P S	200	Source DB 200
9	SrcArea	HEXA8 P S	84	Source-memory area DB
10	SrcByte	I32 P S	400	Byte address 400 in thesource DB 200
11	NumByte	I16 P S	100	Transfer 100 bytes
12	Dest	I16 P S	400	Target DB: 400
13	DestArea	HEXA8 P S	84	Target-memory area
14	DestByte	I32 P S	200	Byte-address 200 in the target DB 400
15	FltTime	I16 P S	0	No substitute value
16	FltSrc	I16 P S	0	No substitute value
17	FltSrcArea	HEXA8 P S	0	No substitute value
18	FltSrcByte	I32 P S	0	No substitute value

19	PCU_Error	B1 P S	0	Partner-PCU not in Run or Connection error
20	ParamError	B1 P S	0	Configuration error

2.4.12 Time job

Via a time job the actual time as well as the actual date of the system data block of the PCU, in which the job is configured, are written in the system data block of the partner PCU in that way, that the time and the date are actuated.

Type 66 Transmit from S7 to S5

DB701 DBB 182 ...----------> DB201 DBW 95 ... 8 Bytes

Typ 68 Transmit from S7 to S7

DB701 DBB 182 ...----------> DB701 DBB190 ... 8 Bytes

If a time job (Type066/68) is configured, the entry is performed automatically for a transmit job for actuating the time as well as the date in a different PCU. The address in the job a presetted according to the standard for the SIMATIC S7 or SIMATIC S5.

Example:

The actual time as well as the actual date to the PCU 8 are sent to the PCU 8 via a time-job every 60 seconds.

The occupation of the system-data block DB 701 with the actual time, the actual date and the values, which makes it possible to actuate the time, is taken from the data description of the DB 701.

XC_JOB_SR		**DB 985**		**Sets: max. 320 per PCU**
No.	NAME	TYPE Info	Press.	Comment
1	PCU	I16 P S	8	Transmit data in PCU 8
2	Type	I8 P S	17	Job type: 17=time-job after presetting
3	Quit	B1	0	Job with acknowledgement of the partner
4	Enable	B1 P S	1	Job release
5	TimeMS	B1	0	Time base ms
6	TimeMIN	B1	0	Time base min
7	Time	I16 P S	60	Transmit time every 60 sec.
8	Src	I16 P S	701	Source-DB 701
9	SrcArea	HEXA8 P S	84	Source-memory area
10	SrcByte	I32 P S	182	Byte address 182 in Source-DB 701: time, date
11	NumByte	I16 P S	8	Transfer 8 bytes
12	Dest	I16 P S	701	Target-DB 701
13	DestArea	HEXA8 P S	84	Target-memory area

14	DestByte	I32 P S	190	Byte-address 190 in target DB 701. Time, date
15	FltTime	I16 P S	0	No substitute value
16	FltSrc	I16 P S	0	No substitute value
17	FltSrcArea	HEXA8 P S	0	No substitute value
18	FltSrcByte	I32 P S	0	No substitute value
19	PCU_Error	B1 P S	0	Partner-PCU not in Run or Connection error
20	ParamError	B1 P S	0	Configuration error

2.4.13 Temporary Job

Temporary Jobs is transmitted only one time in contrast to the normal jobs, which are transmitted again and again after the configured time.

A system function, which uses this job, is the start of a plant section in a different PCU via the ASTA block.

The user can transmit a temporary job by the call of the function

FC 685 'XC_JOB_USER_IF_FC' with iMode=1

The job for FC 685 is supplied with the same parameters, which are also used for the configuration of a job in the block 'XC_JOB_SR'.

If a temporary job is transmitted, there will a search for free data records. If the PCU-number for one data record is equal to zero, the job is not occupied. In the first free data records the temporary job is entered.

If all data records are occupied, the temporary job can not transmitted, i.e. there are no starts for plant sections in different PCUs via the ASTA block.

After having transmitted the temporary job the PCU number is written to zero and the Enable-bit is resetted. The job is free again due to this process.

The function FC 685 is left with VKE=0, if the process was without any errors.

If there were any errors, the VKE=1.

In case of an error the error number is passed in the parameter iRetVal. If there was no error, the paraemter iRetVal contains the number of the processing job. The evaluation of the parameter iRetVal is performed by the user.

Via the FC685 a job can be entered in different sections

In the system section	(Job 1 – 32)	iJob=0	iMode=1
In the user section	(Job 65 – 320)	iJob=-1	iMode=1
Any job	(Job 1 – 320)	iJob=1 – 320	iMode=1

Parameter iRetVal

The values of the parameter iRetVal have the following significance :

IretVal	Description
> 0	Number of the processing job

< 0	Error
- 1	No free job found
- 2	'XC_JOB' has no data record
- 3	iMode incorrect (neither 1 nor 2)
- 4	PCU 'XC_PCU' doesn not contain PCU

The block FC 685 has a second function (iMode=2). Via this function the real time can be set to zero with a running job, i.e. the job is transmitted immediately.Therefore a event-dependend triggering is possible.

Example:

Transmit a temporary job (iMode=1)

A temporary job should be transmitted.

The function FC 685 is called for that reason. The FC 685 is supplied with the same parameters, which would also be used for the configuration of this job in the block 'XC_JOB_SR'.

The following job is accepted for the example:

Via a fetch job 120 data bytes are fetched by the PCU 4 from the data blcok DB 200 from DBW 800.

The received data are filed in the data block Db 400 from DBW 150.

CALL FC 655		**Call of 685 'XC_JOB_USER_IF_FC'**
Imode	:=1	Transmit temporary job
Ijob	:=0	Search for free job
IPCU	:=4	Fetch data from PCU 4
Itype	:=53	Job type 53: Fetch
BoEnable	:=1	Release job
BoTmpJob	:=1	Enter temporary job
iSrc_Dtype	:=2	Data type always 2 = Byte
iSrc_Area	:=132	Source-memory area DB 200 132=84H
iSrc_DB	:=200	Source -DB 200
IsrcByte	:=800	Byte- address 800 in Source-DB 200
IsrcBit	:=0	Bit-Address in Source-DB always 0
iSrc_Num	:=120	Amount of the transferred bytes
iDest_Dtype	:=2	Data type always 2 = Byte
iDest_Area	:=132	Target-memory area DB 400 132=84H
iDest_DB	:=400	Target -DB 400
iDest_Byte	:=150	Byte- address 150 in target-DB 200
iDest_Bit	:=0	Bit-address in target-DB always 0
Itime	:=10	Enter budgeted time
IactTime	:=0	Actual time = 0, transmit immediately

BoTms	:=0	Time base ms
BoTsec	:=1	Time base sec
BoTmin	:=0	Time base min
IretVal	:=0	Return value from FC 685

By the evaluation of VKE and the value ‘iRetVal’ the user would find out, if the call of FC 685 was processed without any errors. When an error occurs, the value ‘iRetVal’ contains the identification for the error cause. .

Example:

Transmit a running job (iMode=2)

An available job which is transmitted in configured intervals again and again, should be transmitted immediately after a special event has been occured.

When this event occurs the function FC 685 is called. Only the parameter ‘iMode’, ‘iJob’ are significant for FC 685. The indication of the different parameters for FC 685 are irrelevant.

The following job is accepted for the example:

Job 1 was configured in PCU. This job makes it possible to change data with the PCU 7 every 60 seconds. When the event occurs, this job should be transmitted immediately and not after the time has been running out

When the event occurs, the function FC 685 is called and supplied with the parameter ‘iMode’, ‘iJob’.

The first user job is 65 job in DB985.

CALL FC 685		**Call of FC 685 ‘XC_JOB_USER_IF_FC’**
Imode	:=2	Set time to zero
Ijob	:=65	Process Job 65 = 1. User job
IPCU	:=0	Irrelevant
Itype	:=0	Irrelevant
BoEnable	:=0	Irrelevant
BoTmpJob	:=0	Irrelevant
iSrc_Dtype	:=0	Irrelevant
iSrc_Area	:=0	Irrelevant
iSrc_DB	:=0	Irrelevant
iSrcByte	:=0	Irrelevant
iSrcBit	:=0	Irrelevant
iSrc_Num	:=0	Irrelevant
iDest_Dtype	:=0	Irrelevant
iDest_Area	:=0	Irrelevant
iDest_DB	:=0	Irrelevant
iDest_Byte	:=0	Irrelevant
iDest_Bit	:=0	Irrelevant
iTime	:=0	Irrelevant
iActTime	:=0	Irrelevant
iRetVal	:=0	Irrelevant

By the evaluation of VKE and the value ‘iRetVal’ the user would find out, if the call of FC 655 was processed without any errors. When an error occurs, the value ‘iRetVal’ contains the identification for the error cause. .

2.4.14 Starting plant section by cross coupling

The block ASTA starts a plant section. The functionality is stated by the configuration of the data record. (see capital block, ASTABy setting of the corresponding flag bit (M 672,0 to M 683.7) a plant section is started.

If a ASTA type 9,10 or 12 is used, the plant section will be started in a different PCU.

For this plant section start in a different PCU, the cross coupling must be established between the participating PCUs.

If the start of a plant section is performed in a different PCU, there will be a search for a free job set in the block ‚XC_JOB_SR‘. A temporary job is entered in this free job set for the different PCU. The start parameters are transformed to the different PCU via cross coupling. If no free job is available, no start is performed, but an error is displayed.

After having received the data and examined the condition for the start (see capital block; ASTA), tha plant section is started.

If the conditions for the start are not fulfilled, the start doesn’t occur.

There are 96 ASTA-data records in DB 742 and the assigned start bits in MB672 to MB683 in S7 via which the user has the possiblity to execute the ASTA-start.

ASTA data record structure in DB742

Byte bType	Asta-Type	
Byte bTA	Plant Section Assignment	
Bit boASTA_M	Start flag	
Bit boParamError	Error in data record	
Bit boParamErrorMsg	Transmit message is necessary	
Bit boError	Error with sequence start	
Bit boErrorMsg	Transmit message is necessary	
Bit bo5	Reserve	
Bit boSendRecv	Use Transmit/Receive interface Bit	boF edge-trigger flag
Byte bSrcSeq	Source-plant section	
Byte bRemoteError	Start error in different PCU	
Byte bRemoteOK	Start from a different PCU IO	
Word w	Reserve	
Byte bSrcPCU	Source-PCU number	
Byte bDestPCU	Target PCU-number	
Byte bSrcASTA	Source-ASTA	
Byte bDestSEQ	Target Plant Section	
Byte bYear		
Byte bRecipeType		
Integer iRecipe		
Integer Order		
Integer iBatch		

Asta-Type	
Type 9	Values from the plant section
Type 10	CIP,Source sequence =0, Values from the ASTA data record
Type 12	CIP,Source sequence = 0; Values from the ASTA data record

The value for the recipe type and recipe number must be taken form the target plant section for the type 10, 12.

Via the time dial FB742 ASTA_FB is called, which enter for the ASTA start, recipe type, recipe number, job number and batch number from the assigned plant section in the ASTA data record.

If a start is necessary, FB741 ASTA_START_FB is called (time dial)

A system job 1 – 32 in DB985 is entered for the type 9, 10, 12 in order to create a sequence start.

System job in DB985

```
DBW0    PCU= 2                  (*PCU-number*)
DBB2    Type=54;                (*54=Plant Section start *)
DBX3.6  Quitt=1;                (*Job with Quitt-message*)
DBX3.0  Enable=1;               (*JOB's release*)
DBX3.4  TimeMS=0;               (*Time Base = ms*)
DBX3.5  TimeMIN=0;              (*Time Base = min*)
DBW28   Time=3;                 (*Order time in seconds*)
DBW30   ActTime=0;              (*Current time value*)
DBW6    Src=742;                (*Source: 0=P/I/O/F, 1..4095=DB*)
DBB5    SrcArea=84;             (*Section 84H=DB,80H=P,81H=I,82H=O,83H=F*)
DBD8    SrcByte=xxx;            (*Source byte address*)xxx=Pointer on  Byte in DB742
DBW14   NumBytes=12;  (*Number of bytes to send*)
DBW18   Dest=0;         (*Destination: 0=P/I/O/F, 1..4095=DB*)
DBB17   DestArea=84;            (Section84H=DB,80H=P,81H=I,82H=O,83H=F*)
DBD20   DestByte=0;             (*Destination byte address*)
DBW32   PCU_State-00            (*1=Con.error, 0=STOP, 2=RUN, 4=HALT, 5=DEFECT*)
DBW34   LastJobResult=0;        (*0=Idle, 2=Run, 4=OK, 8=Error*)
DBW36   LastGetPutResult=0;     (*1=CPU STOP,0=OK, *)
DBW38   FltTime=0;      (*Wait time for end of reserve value transfer*)
DBW40   FltActTime=0;   (*current time value for reserve value transfer*)
DBW44   FltSrc=0;               (*Source of reserve values: 0=P/I/O/F, 1..4095=DB*)
DBB43   FltSrcArea=0;           (*Section 0=no reserve values, 80H..84H*)
DBD46   FltSrcByte=0            (*Reserve values byte address*)
DBW54   BLKMOV_RET_VAL=0;           (*Reserve values: block transfer 0=o.k.*)
DBX3.7  TmpJob=1;               (*Temp. job, if finished PCU=0, Enable=0*)
DBX3.2  PCU_Error=0;            (*Remote PCU not running or conn. error*)
```

DBX3.1 ParamError=0; (*GET/PUT/BLKMOV: Parameterization error*)

Coupling to S5

Due to this system job the transmit buffer for a sequence start is entered in FB653. The necessary datas are loaded from DB742 from SrcByte.

DB 986 Example 3: Transmit buffer to S5

DBB 480 Message pointer Receive DBB 481 Message pointer Transmit

DBB 482 Type = 54

DBB 483 Target sequence = xx = 01 ... 64

DBW 484 Reserve but always inequal to zero

DBW 486 Amount = 6

DBW 488 Amount = 6

DBW 490 10 Start type

DBW 492 0 Source plant section

DBW 494 123 Year, recipe type

DBW 496 456 Recipenumber

DBW 498 789 Job number

DBW 500 101 Batch number

DBW 502 End identifier = -1

With receiving such a message, in S5 FB184 tries to start the plant section. It will be examined, if the target plant section is in step 0 and if there is no manual operation and continous operation. If this is the case, the sequence is started by setting step=1. There is no acknowledgement about success or failure of the sequence start to S5.

There could arise the following errors:

- Plant Section in manual operation
- No continous operation
- Plant Section is not in step 0
- Recipe is not available

The user has to establish a cross coupling by himself in order to send back the plant section state to the coupling partner.

SY656 – SY661

DB113 DW 2,DW3,DW4,DW5

i.e. you can send cyclically DB113 DW2 – 5 to the partner.

Coupling to S7

In FB653 the transmit buffer is entered for a sequence start. The necessary datas are stored from DB742 on SrcByte.

DB 986 Exaple 3: transmit buffer to S7

DBB 480 message meter Receive

DBB 481 message meter transmit

DBB 482 Type = 50

DBB 483 Type = 50

DBW 484 DB 988

DBW 486 DW xxx

DBW 488 Amount = 6

Byte 490	bSrcPCU	Source-PCU-Number
Byte 491	bDestPCU	Target-PCU-Number
Byte 492	bSrcASTA	Source-ASTA
Byte 493	bDestSEQ	Target-plant section

Byte 494 bYear

Byte 495 bRecipeType

DBW 496 iRecipe

DBW 498 iOrder

DBW 500 iBatch

DBW 502 end identifier = -1

In S7 FC654 tries to start the plant section by receiving such a message

It is examined if the target plant section is in Step = and if there is neither a manual operation nor a continous condition. In case of that, the sequence is started by step=1.

There is no acknowledgement neither of the success or failure of the sequence start.

There might be the following errors:

- Plant Section in manual operation
- No continous condition
- Plant Section not in step 0
- Receipe is not available

The user has to establish by himself a cross coupling job. This enables him to return the plant section state to the coupling partner

MB656 – MB663

DB713 DW 2,DW3,DW4,DW5

i.e. you can send cyclically DB713 DW2 –5 to the partner

3 Double bus

3.1 General

There can be built up two separated bus systems. Two CP431 must be plugged in a S5-control and two CP443 must be plugged in a S7-control.

In the configuration of the PCUs there is entered a normal as well as a reserve interface.

If an error is found in an interface, it will automatically transferred to a different interface. This interface is active as long as an error will arise and a transfer is performed to the first interface.

3.2 S5 PLC

In S5 the following entries for the reserve interface with the configuration XC_PCU_SR are to be entered.

PCU_R	(*PCU-NR. of the coupling partner Reserve*)
S5_SR4_R	(*S5 with layer4-coupling*)
S7_SR4_R	(*S7 with layer4-coupling*)
SSNR_R	(*interface number: Reserve*)
ANR_R	(*job numberReserve*)

Via Com-Software all jobs must be entered for the CP1430 for the normal interface.

There must also be used other Ethernet-addresses and SSNR.

Declaration:

08 00 06 01 xx yy Bus 1 SSNR=0

08 00 06 02 xx yy Bus 2 SSNR=4

xx=00 = Identifier S5

xx=07 = Identifier S7

yy=node number (Example:Node 32 ...yy = 20)

Edit / Connections / transport connections

Send-Job	ANr. 81 Active no
Read/Write	No

Specific TSAP	6	SEND01
External Ethernet	08 00 06 02 07 03	
External TSAP	6	RECV01

Receive-Job	ANo. 101	Active No.
Read/Write	No	
Specific TSAP	6	RECV01
External Ethernet	08 00 06 02 07 03	
External TSAP	6	SEND01

In DB204 the bit 13.4 must be set up, so that Send-All and Receive-All for both interface card are processed.

3.3 S7 PLC - Layer 4

With S7 the following entries for the backup interface are to be entered with the configuration XC_PCU_SR.

PCU_R (*Backup PCU-No. of the coupling partner *)

S5_SR4_R (*S5 with layer 4-coupling *)

S7_SR4_R (*S7 with layer 4-coupling *)

ID_R (*Reserve interface number . – like normal-Interface*)

LADDR_R (*Reserve interface address 3E84*)

New connections must be entered in the new Ethernet-addresses via Step 7. In case of a dual bus 2 send- and 2 receive - connections are required.

Declaration:

08 00 06 01 xx yy Bus 1

08 00 06 02 xx yy Bus 2

xx=00 = Identifier S5

xx=07 = Identifier S7

yy=Node number (Example: Station 32 ...yy = 20)

Connections for secound bus

Send S5 – Layer 4

Local-ID	Partner-ID	Partner	Type	Active
0035	A020	SIMATIC S5	ISO	yes

Object characteristics

ID 0035 LAADDR 3E80

Local	External

08 00 06 02 07 03 08 00 06 02 00 02

SEND03 RECV03

53 45 4E 44 30 33 52 45 43 56 30 33

length=6 length=6

Receive S5 – Layer 4

Local-ID	Partner-ID	Partner	Type	Active
0036	A020	SIMATIC S5	ISO	no (Receive S5 – Layer 4)

Object characteristics

ID 0036 LAADDR 3E80

Local External

08 00 06 02 07 03 08 00 06 02 00 02

RECV03 SEND03

52 45 43 56 30 33 53 45 4E 44 30 33

length=6 length=6

3.4 S7 PLC - S7-S7 with Get/Put

It is also possible to set up a physically separated double bus via two CP443 modules. (only with update to extended cross coupling)

For S7 the following entries for the reserve interface are to be entered with SISTAR-configuration under XC_PCU_32.

Enable = 1 release Bus 1 und 2

Bus 1 only processes, if ConnID <> 0

ConnID_1 = 0 Bus 1 is processed. ConnID is formed internally from the PCU-number. The Hexa-identifier of the bus number is not displayed.

ConnID_2 = Yxx

0=Bus 2 not processed

If <> 0 , Bus 2 will be processed

Declaration:

Yxx = Hexa-Identifier

Y = Bus Identifier e.g.: 2 i.e. Bus 2

xx = PCU-Numbe e.g.: 20 i.e. PCU=32 (da 32 = 20Hexa)

For both bus connections the following connections must be entered:

Example: Connections for PCU4 to PCU32

S7 Bus	Local-ID	Partner-ID	Partner	Type	Active
1	4	20	AS_4_MPI_14	S7-Con.	Yes
2	204	220	AS_4_MPI_14	S7-Con.	yes

Partner-ID = ConnID with SISTAR-configuration

Active: Yes If partner-ID bigger than local ID

Active: No If partner-ID smaller than local ID

Note:

There can also be used the local-ID 104 and partner-ID 120 for bus 1, i.e. there must be entered these values with the configuration for ConnID_1.

Ids 4 and 20 are used automatically, i.e. no values have to be entered for ConnID_1.

4 PCU-Numbers greater than 16

4.1 General

PCU-numbers in the section 1 to 16 are used as standard. Via cross coupling 15 connections can be provided at the same time. It is possible to use PCU-numbers in the section 1 to 200. Therefore any PCU-numbers can also be assigned to the 15 connections.

In order to make the job easier the tables should: Assignment of the PCUs to the connections is changed.

Example:

PCU5 (S5) should have one connection to PCU2(S5), PCU4(S7), PCU17(S7) and PCU32 (S7) via cross coupling.

PCU17 and PCU32 are assigned to any PCU-connection which are not used.

New table:

Assignment of the PCUs to the connections for S7

Local PCU-Nummer: 05 (S5)

Remote PCU		Send	Receive
Connection 01:	PCU13	81	101
Connection 02:	PCU14	82	102
Connection 03:	PCU15	83	103
Connection 04:	PCU1	84	104
Connection **05:**	**PCU2**	**85**	**105**
Connection **06:**	**PCU17 (3)**	**86**	**106**
Connection **07:**	**PCU4**	**87**	**107**
Connection **08:**	**PCU32 (16)**	**88**	**108**
Connection 09:	PCU6	89	109
Connection 10:	PCU7	90	110
Connection 11:	PCU8	91	111
Connection 12:	PCU9	92	112
Connection 13:	PCU10	93	113
Connection 14:	PCU11	94	114
Connection 15:	PCU12	95	115

The specific Ethernet-address must be changed for the transmit and receive job via Com-Software for the job numbers where the PCU-numbers are more than 16.

PCU 16 08 00 06 01 07 11

PCU 32 08 00 06 01 07 20

New table: Assignment of PCUs to the connections for S7

Local PCU-number: 4 (S7)

Remote PCU		Send	Receive
Connection 01:	PCU14	31 (1F)	32 (20)
Connection 02:	PCU15	33 (21)	34 (22)
Connection 03:	PCU1	35 (23)	36 (24)
Connection 04:	PCU2	37 (25)	38 (26)
Connection 05:	PCU 17 (3)	39 (27)	40 (28)
Connection 06:	PCU 32 (16)	41 (29)	42 (2A)
Connection 07:	PCU5	43 (2B) 44 (2C)	
Connection 08:	PCU6	45 (2D) 46 (2E)	
Connection 09:	PCU7	47 (2F)	48 (30)
Connection 10:	PCU8	49 (31)	50 (32)
Connection 11:	PCU9	51 (33)	52 (34)
Connection 12:	PCU10	53 (35)	54 (36)
Connection 13:	PCU11	55 (37)	56 (38)
Connection 14:	PCU12	57 (39)	58 (3A)
Connection 15:	PCU13	59 (3B) 60 (3C)	

In the connection configuration of the stations PCU17 and PCU32 the Ethernet addresses must be adapted for the IOS connections or the connections must be entered again, if there are not available.

PCU 16 08 00 06 01 07 11

PCU 32 08 00 06 01 07 20

In PCU17 the connection 5 must contain the PCU-number 32 with configuration of the PCU-connections. In PCU32 the connection 4 must contain the PCU-number 17.

With configuration of the jobs the PCU-number 17 and 32 must be used.

Necessary adjustments for PCU-number 1 ... 200

S5 - PLC

In DB201 DL2 the PCU-number must be entered in the section 1 – 200.

In DB204 DW255 the connection number must be entered in the section 1 –16.

(This number corresponds to the old PCU-number from the table)

In DB204 the bit 13 must be set up. The automatic default of the interface for the PCU-number (DB201/DL2) is transferred to the connection number (DB204/DW255) by this bit.

S7 - PLC

In DB701 DBB4 the PCU number must be entered in the section 1 – 200.

In DB984 DBB13 the connection number must be entered in the section 1 – 16.

(This number corresponds to the old PCU-number from the table)

Change under global datas from XC_PCU_SR.

If the connection number is changed, a automatic presetting of the interface will be executed.

The following addresses must be controlled in the hardware configuration, so that the automatic values are correct.

Bus 1 = 3E80 = 16000 1.CP443

Bus 2 = 3F84 = 16004 2.CP443