

PCS 91.OMR

english

One does not refer in the manual explicitly to the devices of the PCS plus/win series, the description applies to all devices. With differentiations between the equipment series the following allocations apply:

PCS topline	=	micro/mini:	PCS 009, PCS 090, PCS 095, PCS 095.1, PCS 095.2
		midi:	PCS 900, PCS 950, PCS 950c, PCS 950q, PCS 950qc,
		maxi:	PCS 9000/9100
PCS plus	=	micro/mini:	PCS 009 plus, PCS 090 plus, PCS 095 plus
		midi:	PCS 950 plus, PCS 950c plus, PCS 950q plus,
			PCS 950qc plus
PCS win	=	micro/mini:	PCS 009 win, PCS 090 win, PCS 095 win
		midi:	PCS 950 win, PCS 950c win, PCS 950q win,
			PCS 950qc win

Systeme Lauer GmbH & CoKG
Postfach 1465
D-72604 Nürtingen

Operator reference manual: PCS 91.MIT
Version: 04. Februar 2003
Person responsible: Zoch

Operating manuals, reference manuals, and software are protected by copyright. All rights remain reserved. The copying, duplication, translation, conversion in the whole or into parts are not permitted. An exception applies to making a copy of the own use.

- We reserve the right make changes to the reference manual without prior notice.
- We can not guarantee the accuracy of the programs and data stored on the diskette and the fault-free state of this information.
- Since diskette represent manipulatable data media, we can only guarantee the physical completeness. The responsibility is limited to a replacement.
- At any time, we welcome suggestions for improvements and remarks on errors.
- The agreement also applies to the special appendices to this reference manual.

Microsoft, MS, MS DOS, Windows, Windows 95, Windows NT and the Windows logo are either registered trademark or trademarks of the Microsoft Corporation in the USA and/or other countries.
SIMATIC and STEP are registered trademarks of the Siemens AG.

The remaining designations in this document can be brand names who`s use by parties for their purposes can violate the rights of the owners.

Notes for the user

Please read the manual before beginning and keep the manual for later use.

Target group

The manual has been conceived and written for users who are experienced in the use of PCs and automation technology.

Typographical conventions

[KEY]	Keys that are to be pressed by the user are given in square brackets, e.g [CTRL] or [DEL]
<i>Courier</i>	On-screen messages are given in the Courier font, e.g. C:\>
Courier bold	Keyboard input to be made by the user are given in Courier bold, e.g. C:\>DIR
<i>Italics</i>	Names of buttons to be pressed, menus or other on-screen elements and product names are given in italics.

Pictograms

The manual uses the following pictograms to highlight certain text passages:



Danger!
Possibly dangerous situation. Injury to persons can be the result.



Attention!
Possibly dangerous situation. Property damages can be the result.



Tips and supplementary notes

Table of Contents

Notes for the user	0-3
Quality and support	0-5
Safety regulations	0-6
Norms	0-7
A Omron-Expander Driver	A-1
A1 Primary commissioning	A-1
A1.1 Variables of the omron driver	A-2
A1.2 Failure corrective action	A-4
A2 Description of the plc / operating software	A-6
A2.1 Plc settings - lateral	A-6
A2.2 Description of the operating software	A-7
A2.3 Cycle time extension	A-7
A2.4 Implementing the plc software	A-8
A2.5 Program integration	A-8
A3 Communication	A-9
A3.1 PCS data transfer / link unit	A-11
A4.1 PLC packet length / timeout	A-13
A5 Programmlisting	A-14
B Omron-Direct Driver	B-1
B1 Primary commissioning	B-1
B1.1 Variables of the omrondir driver	B-2
B1.2 Commissioning	B-3
B1.3 Failure corrective action	B-5
B1.4 Fault messages of the driver	B-7
B2 Description of the plc/oper.software	B-9
B2.1 PLC lateral settings	B-9
B2.2 Description of the operating software	B-10
B2.3 Cycle time extension	B-11
B2.4 Implementation of the plc software	B-12
B2.5 Program integration	B-12
B3 Communication	B-13
B3.1 Pcs / link unit data transfer	B-15
B5 Program listing	B-16
B4.1 Program example	B-18
C Omron-Selectiv Driver	C-1
C1 Primary commissioning	C-1
C1.1 Variables of the driver	C-2
C1.2 Commissioning	C-5
C1.3 Failure corrective action	C-6
C1.4 Error messages of the driver	C-8
C2 Description of the PLC/Handling software	C-9
C2.1 Settings on the PLC side	C-10
C2.2 Description of the handling software	C-12
C2.3 Prolongation of scan time/response time	C-13
C2.4 Implementation of the PLC software (sync)	C-15
C2.5 Program integration (sync only)	C-15
C3 Communication	C-16
C3.1 Data transfer PCS / link unit	C-18
C4 Program listing	C-19
C4.1 Program example	C-20
Index	i-1

Quality and support

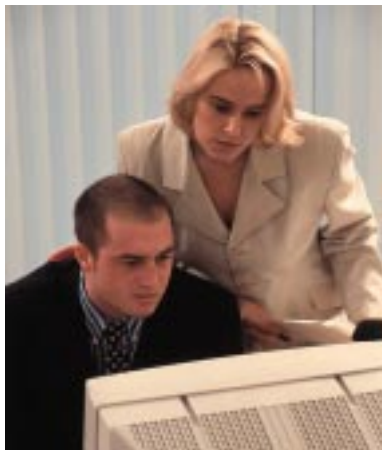


In our company, quality comes first. From the electronics component up to the finished device, the quality assurance test competently and comprehensively.

National and international test standards (ISO, TÜV, Germanischer Lloyd) are the basis.

Within 48 hours, every device passes a 100% check and continuous test under worst case conditions at changing temperatures (0...50°C) and test voltages.

A guarantee for maximum quality.



Our products not only feature a maximum economic efficiency and reliability but also a comprehensive complete service.

You not only receive demo devices but we rather make specialists available who support you in person with your first application.

Qualified user consultation by competent sales engineers is obvious for us.

Our support is for you for the side with advice and deed every day.



We set up training programs and technical training for you in our modern training center or alternatively also in your house.

Request the current training catalog.



From the consultation up to the user support, from the hotline up to the service, from the reference manual up to the training and all covering and individual service for the entire product line is waiting for you.

Whenever you need us, we are there for you: dynamically, creatively and enormously efficiently. With the entire experience of a world-wide successful enterprise.

Telephone

07022/9660-132, -231, -230

eMail

support@systeme-lauer.de

Web site

www.lauer-systeme.net

Systeme Lauer Active Area

(Download of Software, driver, manuals, Forum...)

Safety regulations

This reference manual contains the most important remarks in order to safely operate the device.

- This operator's guide, particularly the safety remarks are to be noted by all persons working with the device.
- Furthermore, the rules and regulations for the accident prevention applying to the application location are to be observed.
- Use as directed. The device is designed for the application in the industrial area.
- The device is manufactured to the state of the art and the official safeguarding regulations. Nevertheless, due to the application, dangers or impairments can result to the machine or to material assets.
- The device meets the requirement of the EMC guidelines and harmonized European standards. Any hardware-related modification of the system can influence the EMC behavior.
- The device may not be used without special protective measures in the hazardous area and in plants requiring a special monitoring.
- Do not heat up the buffer batteries. Danger of explosion. Serious burning can be the result.
- The installation and operation may only be performed by trained personnel.
- The operating voltage of the device may only be in the specified ranges.
- You find information on this on the type plate and in the specifications of this reference manual.

Norms

The device is constructed using up-to-date technologies and fulfils the requirements of the following guidelines and norms:

- Compliant with the EMC Directive 89/336/EEC and the German law on electro-magnetic compatibility
- Interference compliant with the generic requirements norm EN 50081-2 and product norm EN 55022:
- Measurement of the conducted interference voltage as per EN 55022
- Measurement of the radiated radio interference field power as per EN 55022 class A
- Interference immunity in compliance with generic requirements norm EN 50082-2 and product norm EN 61000-6-2:
 - Electro-static discharge (ESD) as per with EN 61000-4-2
 - High-frequency electromagnetic fields as per EN 61000-4-3 and ENV 50204
 - Fast transient interference (burst) as per EN 61000-4-4
 - Surge voltages as per EN 61000-4-5
 - High-frequency conducted fields as per EN 61000-4-6
 - Voltage dips and short-term interruptions as per EN 61000-4-11

The assembly and connection instructions contained in this documentation must be followed.

Conformity of this equipment is confirmed by the CE logo.
The EC declaration of conformity can be requested from:

Systeme Lauer GmbH & Co KG
P-O-Box 1465
D-72604 Nürtingen

A Omron-Expander Driver

A1 Primary commissioning

Delimitation

It is assumed that a successful parameterization of the PCS as described in chapter 3 of the PCS 091/991 manual has been carried out. This appendix deals exclusively with the application of the PCS 090 in connection with a PLC control of the SYSMAC C-Series (C20H, C28H, C40H, C200H, C1000H, C2000H and C2000) of the OMRON company. It is assumed that you are already acquainted with the SYSMAC specific terms.

The communication block W0..W255 is the standard norm DM500..DM755.

Required Equipment and Accessories

The following products are required in order to operate a PLC with an already parameterized PCS:

The Systeme Lauer Company:

1. The PCS operator panel itself (parameterized with demo090 and Omron driver).
2. The connection cable PCS 746 (as of C200H) to connect the PCS to the PLC using the V24 interface. In order to control C20H, C28 and C40H, it is necessary to furnish a cable (see chapter 3.2 in this appendix).
3. This appendix (PCS 91.OMR)
4. Diskette PCS 91.OMR with operating components and example.

Furthermore, the following will also be required:

The Omron company:

5. A PLC from the SYSMAC C-Series (C20H, C28H, C40H, C200H, C1000H, C2000H or C2000).
6. As of the control C200H a host link is required in addition: C200H LK201 for C200H, or 3G2A5 LK201 EV1 for C1000H, C2000H and C2000.
7. An IBM compatible computer with SYSMAC-PMD software.

...and adequate power supply for all these components.

A Omron-Expander Driver

A1.1 Variables of the omron driver

On configuring the PCS 090 (refer to chapter 3.1 main part) there is a transfer in the application program together with data, as well as a selected driver. The following variables are to be set for the OMRON driver under the menu heading driver:

Name	Function	Default	Min. val.	Max. val.	Unit
AA	PLC Pck. length/timeout	80	0	175	1/100s
AB	Number of repeats	0	0	254	
AC	DIL AC setting				
AD	DIL AD setting				
AE	DIL AE setting				
AF	DIL AF setting				
AG	Pos. send/reception bin	8	0		9

PLC Packet Length/Timeout During the PCS - PLC communication there is a continual exchange of data. The timeout period is the monitoring time between the data packets. Whereby an internal calculation is made from the PLC packet length* 1/ 100 ms plus 800ms. Should there be a fault, it will appear as follows in the PCS 090: „COMMUNICATION ERROR : TIMEOUT!“

Number of Repeats On reception of an incorrect data packet, a request for a fresh one is made. The maximum number of repeats that can be set is between 0..254. If the variable AB = 0, then a maximum of one repeat only will be permitted. After a correct packet has been received, counting is done from the beginning. After having exceeded the maximum number of repeats, the flashing text „COMMUNICATION ERROR : TOO MANY REPETITIONS !“ is displayed.

DIL Setting The combination arising from DIL 5 and 6 can be occupied with selective settings. Here they are:

Setting	Baudrate	Interface	Def. Parameter
1	19200	TTY	
2	9600	TTY	
3	4800	TTY	
4	1200	TTY	
5	19200	V24	AF *)
6	9600	V24	AE *)
7	4800	V24	AD *)
8	1200	V24	AC *)
		RS422	

*) Footnote: The default parameter is loaded if you haven't specified any other parameters in the PCSPRO program. However you can also occupy the variables AC-AF with other settings (1..8). Double as well as multiple occupancy is possible.

A Omron-Expander Driver

The connection between the parameter and DIL switches position 5 and 6 is presented in the following:

Parameter	DIL5	DIL6
AC	OFF	OFF
AD	ON	OFF
AE	OFF	ON
AF	ON	ON

Position of Sending/Reception Bin Through the PLC operational software, the sending / reception bin position is preconditioned to be set to DM800..830, as well as DM850..880. This corresponds to the default setting. With the PCS 090, the sending and reception bin can be laterally set to a multiple of 100. Whereby the operating software must be appropriately adapted.

For example: with the prerequisite of "5", the reception bin would be DM500..530 and the sending bin DM550..580.

Procedure

As you can select one of several drivers for the PCS 090, you should load the accompanying example program together with the OMRON driver into the PCS 090 (see chapter 3.1, main part and chapter 1.3 of this appendix). Be careful to adhere to the allocation of the interface parameters to the DIL switches of the PCS 090 and set the DIL switches to the required setting of the interface.

1. Set the DIL switches 5 and 6 on the PCS 090 in such a way that the interface is set to 9600 baud and V24 (see chap. 1.3 of this appendix). Furthermore the DIL switches 8 and 9 should be in the OFF position.
2. When using a SYSMAC C20H, C28H or a C40H, the default settings between DM 920 and DM 923 must be activated. As of the C200H control onwards, the DIL switch settings on the link unit assembly must be controlled.

When using a C200H, the link unit is C200-LK201:

Settings on Rear Side

Settings on Front Side

DIP-SWITCH: 1...4 auf

ON SW 1,2,4: auf Stellung 0
SW 3: auf Stellung 5

CTS-SELECTOR: auf Stellung 0 V

(9600 Baud)

And with the control C1000H, C2000H, C2000 the link unit 3G2A5-LK201-EV1:

Settings on the Rear Side:

I/O port selector:	on RS-232C
Synchronization:	on Internal
Termination resistance switch:	on OFF
CTS selector:	on 0V (always ON)
SW 1:	DIL 1...7 on OFF, DIL 8 on ON
SW 2:	DIL 5...8 on OFF
	DIL 1,2,3,4 (0 = OFF, 1 = ON)
	1 0 1 0 9600 Baud

A Omron-Expander Driver

3. Switch off the supply voltage to the PLC and plug in the link unit into any particular socket in your subrack.
4. Provide the PLC with electric voltage and transfer the program „PCS090“, that was delivered at the same time on a diskette, into the PLC with the aid of your SYSMAC-PMD software.
5. Connect the RS232C interface of the link unit with the PCS 090 using the cable PCS 746. When controlling with C20H, C28H or C40H, a cable must be furnished corresponding (9 pin JD-plug).
6. Now supply the PCS with operating voltage. The following must now appear on the PCS.
7. Switch the SYSMAC PLC into the RUN or monitor mode; if this has not already been done. Now the 'RUN LED' of the PLC must illuminate and the 'ERR-LED' at the PCS 090 must fade out.



Attention!

Should one of the referred to points not apply, then a fault analysis must be carried out.

The control of the PCS through writing and reading of the corresponding DM's (here DM500..DM755) can now be simulated at the PLC. If the connection is interrupted, then bit 13 will be implemented by DM503. Pressing the [CLR] key of the PCS recommences the communication.

Various texts, diverse variables, menus as well as message and HELP texts are filed in the PCS. Whereupon it is possible to test manually all the functions with the programming panel or with the menu headings „Set Data“ in the PLC service program.

A1.2 Failure corrective action

Here is a list of the faults most commonly occurring during primary commissioning:

1. The DIL switch no. 8 is on ON. If this is set, the PCS after having been switched on waits for the communication with the PC, which is merely required for testing purposes. Remedial action: switch off DIL switches and restart the PCS. This is done with a snappy switch-off or a brief suppression of the RESET key above the DIL switches.
2. The DIL switches position is incorrect or the DIL switches have been incorrectly allocated (see chapter 1.3).
3. The PLC moves into RUN, but in fact the PCS ERR LED doesn't extinguish itself. If this LED doesn't go out after the 2. attempt, then PLC to PCS connection; sender and reception must be checked over. A further cause for failure can be an inappropriate programming of the sender / reception bin position.

A Omron-Expander Driver

4. A failure is registered in DM503, if there is a value > #0000. In this case the failure must be found in the PLC to PCS connection. It is possible that the cable is defect.
5. Interference in communication through electrical and magnetic factors usually causes a breakdown in communication over a long period of time. These interferences are usually caused by frequency conversion. An internal variable makes it possible to determine the reliability of the connection (see Internal Variables).

Remedial Possibilities

- Lay the cable protective covering of the communication cable on both sides of a metallized plug casing as well as on pin 1. Earth the PCS 090 casing as well as the PLC bus board with a lead which has a protective shield at least 10 times thicker than the average.
- Take care to ensure that you have good bonding to the PCS 090 casing on the one hand and to the PLC bus board on the other one! Remember that a copper earthing strap has a better HF conductivity on account of its larger surface area, than normal flexible wire.
- Avoid at all cost the emergence of high frequency interference as this is very difficult to attenuate. Although there is a potential segregation between the PLC and the PCS caused by an optoelectronic coupler, the potential segregation is nevertheless ineffective with rapid transients, as even optoelectronic couplers possesses a limiting coupling capacity.
- Make sure you have fixed distribution voltage points. To simplify this the power supply is to be free of potential!
- If there is much interference in the supply voltage, it is recommendable to use your own power supply for the PCS 090 (24 volt, 10 VA). It should possess the appropriate interference filters. 0 volt can then be linked directly to the PCS 090 with earth wire.
- There should be at least a distance of 200 mm from the source of interference for both the PCS 090 and the communication cable. This especially applies to inductances and frequency converters.
- Depending on circumstances, sporadic interferences can be rectified by several repetitions. The number of repetitions can be programmed with the driver variable.
- A reduction in the baud rate can only be considered when all these measures have proved to be of no avail. This must be allowed in the system parameter area as of DM900 (C20H, C28H and C40H) or the DIL switch settings to the link unit (as of C200H). Furthermore the DIL switches 5 and 6 of the PCS are to be set appropriately to the driver variables AC-AF.

A Omron-Expander Driver

A2 Description of the plc / operating software

A2.1 Plc settings - lateral

Depending on the PLC you use, settings are necessary either in the system area of the PLC (C20H, C28H and C40H) or directly at the link unit.

CXXH

With the CXXH, it is recommended to have a default setting with up to maximum of 9600 baud. If the baud rate is to be lowered, then the DM921 (bit 0..7) must be correspondingly adapted.

Possible settings:

Val.	Baud rate
2	1200 baud
4	4800 baud
5	9600 baud (default)

C200H

A communications interface „Link Unit“ must be inserted with these controls. The link unit is not bound to a particular socket. The switch settings are to be made as follows; each according to the SYSMAC-PLC! When using a C-200H in connection with the link unit C200H-LK201:

Settings on the Rear Side:

DIP-SWITCH: 1...4 auf ON
CTS-SELECTOR: on position 0 V

Settings on the Front Side:

SW 1,2,4: on Position 0
SW 3: on baud rate:
Position 2 1200 baud
Position 4 4800 baud
Position 5 9600 baud
Position 6 19200 baud

When using a C-1000H, C-2000H, C-2000 with the link unit 3G2A5-LK201-EV1:

Settings on the Rear Side:

I/O port selector:	on RS-232C
Synchronization:	on Internal
Termination resistance switch:	on OFF
CTS selector:	on 0V (always ON)
SW 1:	DIL 1...7 on OFF, DIL 8 on ON
SW 2:	DIL 5...8 on OFF
	DIL 1,2,3,4 dep on baud rate
(0 = OFF, 1 = ON)	0 0 0 1 1200 baud
	0 1 1 0 4800 baud
	1 0 1 0 9600 baud
	0 0 1 0 19200 baud

A Omron-Expander Driver

A2.2 Description of the operating software

The accompanying PLC software regulates the data traffic between the data marker area DM 500 and the sender and reception bin (EF: DM800...830; SF: DM850...880).

The whole communication between the user program and the PCS is undertaken by the data marker area DM500...755.

The PCS is continually reading and writing the sender and reception bin. The user has no contact with either the sender or the reception bin. He/she must be aware that these data markers are reserved and may not be overwritten!

The software not only puts these data markers at your disposal, but also the DM756...761 as „smudge markers“. These data markers can likewise be applied by the user as „smudge markers“. However, it is to be born in mind that these may not be interrupted by the interrupt program!

In order that you have an overall picture as to which marker, jump labels (JMPxx), subprogram numbers (SBNxx) and time (TIM xxx) are to be applied from the software, we have drawn up this brief outline for you:

Description	Application
DM500...755	Transfer block (communication block)
DM756...761	Smudge markers (words)
DM800...830	Reception bin (data from the PCS 230)
DM850...880	Sender bin (data to the PCS 230)
9914, 9915	Markers for timer start and subprogram call
JMP 00,49	Jump labels
TIM 511	Timer for Timeout (torn cable etc.)
SBN 48	Subprogram (regulates entire communication)
SBN 47	Subprogram (for fresh start)
SBN 46	Subprogram (for loss of communication)
SBN 45	Subprogramm (edits sender /reception bin)

A2.3 Cycle time extension

The throughput time of the subprogram SBN 48, which regulates the whole communication, depends on the specifications of the maximum packet length in the PCS. If this given number is large, then the cyclical specifications 5, 6, 8 and 9 (see chapter 3.4) are contained in every data packet. That is to say, 15 word data + lengths of specification 5, are cyclically exchanged. Every specification requires a head with the addition of one word. As the sender and reception bin has a length of a maximum of 31 words, then a maximum of 29 words can be transferred per cycle. The first word in the reception station contains a packet number. The second word contains the number of received words. Every other task can be left aside for the average calculation as they only appear individually.

The throughput time of the subprogram SBN 98 with the C200H amounts to an average of circa 20 milliseconds. This can be influenced by limiting the packet length.

A Omron-Expander Driver

A2.4 Implementing the plc software

1. Switch off the PLC.
2. Plug the link unit into any slot you wish to (applies only to C200H onwards).
3. Supply the PLC with current and switch into the programming mode.
4. Transfer the PLC program with the help of the SYSMAC-PMD software.
5. Switch the PLC to the monitor mode.

If the error #2000 appears in the DM503 (timeout, i.e. the PCS is not connected), then the implementation has been successfully completed.

A2.5 Program integration

If you create your PLC program on the basis that you use the SYSMAX-PMD programming software, then the following scheme is to be recommended:

Copy the PLC program into the library catalogue of the PMD software. It is usually „SYSMAC/LIB/“: the PLC program consists of 4 files supplied on the accompanying diskette under the name of „PCS91.EXP“.

Write own PLC program, taking into consideration the occupied timer, DM's, markers, JMP's, and SBN's.

With the command SBS (91) 48, the communication program for the PCS must be called once during the cycle.

Before calling the subprogram SBN 48, all the values read in through the PCS must be restored in the corresponding DM's of the delivery area DM500 to 755. After calling the subprogram SBN 48, all the values adjusted through the PCS must be written back into the appropriate marker.

At the end of your own main program, i.e. the subprogram, load the library program PCS91.EXP with the aid of the editor using the key combination [ESC], [4], [0], [7] (program collection). When you are asked what is the file name of the program collection, then specify the entire directory as well as the file name. In most cases this is „\SYSMAC\LIB\PCS91.EXP“. Then press the function key [F4] (an isolated case). Set the cursor to NW#2. Press [F6] (copy) and using the key, [arrow downwards], hoist until NW#6 and confirm with [ENTER]. Thereafter press the key [F10] twice, and enter the key combination [ESC], [3], [0], [3] (insert puffer). The last network then automatically retains the end of the program (command „END (01)“).

A Omron-Expander Driver

Besides this, specific customer preoccupancy prerequisites are to be inserted in 2 places, in the event of a request being made:

- 1: specific customer preoccupancy demands for new start (SBN 47)
- 2: specific customer preoccupancy demands if an error (SBN 46)

These positions in the list are marked with stars in the commentary!

With a new run, the PCS operates on the assumption that:

- 0 has been selected for the default text.
- All the menus must be quitted before being switched off, otherwise they have to be started up fresh.
- All the keys and DIL switches are transferred in one go after new run start.

This start-up behaviour is to be born in mind, should the preoccupancy of the file markers be between 500 and 755.

A3 Communication

Communication cable PCS 746

Connection between PLC and PCS

The connection is made with a 3 wire lead (RXD, TXD, GND). Using the controls C20H, C28H and C48H, a 9 pin JD-connector is to be applied instead of a 25 pin JD-connector. The pin occupancy is identical. The PCS 746 cable is fitted with a 25 pin connector.

PCS	Male connector 25 pin.	PIN	Cable PCS 746	PIN	Male connector 9 or 25 pin.	PLC
	RTS	4 >		5 >	CS	
	CTS	5 <		4 <	RS	
	TXD	2 >		2 >	SD	
	RXD	3 <		3 <	RD	
	GND	7 <		7 <	SG	
	Screen	1		1	Screen	
		Hood		Hood		

A Omron-Expander Driver

An interruption in the connection to be given further evaluation, will be marked out in the PCS as well as in the failure word DM503.

PLC Male connector	Female connector 15 pin.	Cable	Male connector 9 pin.	Link unit female connector
RDA	11		9	SDA
RDB	4		5	SDB
SDA	9		6	RDA
SDB	2		1	RDB
Screen	1 Hood		7	FG

Screening of the Communication Cable

The shield should be connected to the metalized connector (plug) shell on both sides. Should non-metalized connector case be used, then the shield can still be connected to pin 1. However it is not to be recommended because of the subsequent emergence of technical interference. It is really better if the data lead is completely protected by the shield! With double sided earthing, however, it is to be noted that in circumstances such as earth potential displacement, it is necessary to have an equipotential bonding conductor of at least 10 times the cross-section of the shield. This is to prevent compensating current flowing away over the cable shield! This is especially important if the PCS and the PLC are not connected to the same earthing point, as in the case for example, when the PCS and the PLC are not housed in one switch cabinet!

A Omron-Expander Driver

Configuration cable PCS 733

Connection between the PC and the PCS

PCS	Female connector 25 pin	PIN	Cable PCS 733	Male connector	PC 25 pin	PC 9 pin
	DSR	6		DTR	20	4
	RTS	4		CTS	5	8
	CTS	5		RTS	4	7
	TXD	2		RXD	3	2
	RXD	3		TXD	2	3
	GND	7		GND	7	5
	Screen	1		1	Screen	
		Hood		Hood		

A3.1 PCS data transfer / link unit

Data traffic with the control is done in packets. Each packet consists of at least one subpacket, which has a clearly defined task to perform. The validity of each packet is checked over by both the PCS as well as the PLC, i.e. the link unit.

Construction

Using ongoing communication the PCS conveys orders to the link unit in the following manner:

```
'@00WD0800xxxxxyyy'  COMMAND  (DATA)  COMMAND  (DATA) ..FCS>'*<CR>
```

By means of this command, the 'yyyy' words as of DM900 are written into the reception bin of the PLC. This must be positively quitted by the link unit. If this is the case; the received answer being: '@00WD00<FCS>*<CR>', the PCS can collect the answer from the order being edited by the PLC. The answer is commissioned by the PCS in the following form: '@00RD0850xxxx<FCS>*<CR>'. With this command the PCS expects a series of files as of DM850.

The faultless answer of the link unit is built up in the following manner:

```
'@00RD00'  ALL ANSWER FILES ..<FCS>'*<CR>
```

If there is a faulty answer from the PLC, i.e. the link unit, the PCS 090 agains tries to send off the previous order. Should the forthcoming answer be again received in a defect condition, as manner further attempts will be then carried out as have been programmed as permissible until the correct answer is received. If the permissible number of attempts is exceeded, the following failure text will appear in the display „COMMUNICATION ERROR - TOO MANY REPETITIONS!“. This means that the PCS connection or link unit to the PLC has been laid down in an surrounding where there is heavy interference. Refer also to the failure corrective action A1.5.

A Omron-Expander Driver

The PCS decides which tasks have to be put into a packet. This decision is made depending on the maximum packet length and the priority of each task. Each task has a specific start priority. Organization of the priorities ensures that no task is lost. The specified packet length is determined by the words, including the command. Whereby there is no difference made between PCS files (written) and the answer files (read). Each word requires a 4 ASCII character (bytes), e.g. „0F00“ with serial transfer.

TASK	PRIOR.	LENGTH	START CRITERIA
1. Write key status	8	3	if a key is pressed or released
3. Reset message bit	7	2	activate by CLR on deletion characteristic 2
4. Write nominal PLC value	6	2..9	always when the nominal value is adjusted and the input field is relinquished
5. Read actual value		5	2..24 *)in the priorities 0..6, 12 continuous, otherwise with fresh presentation in display
6. Read message bits	4	max.9	continuous (if not blocked off)
7. Send PCS status	4	5	when adjustments
8. LED's, LED blinker,	3	4	continous (if not blocked) Read save and display characteristics
9. Read command word	3	3	continuous

*) Depends on the number of variables in the display as well as on the compactness of the addresses. If the addresses are not compact, then one head will be required for each non-compact variable. (1 word).

A Omron-Expander Driver

A4.1 PLC packet length / timeout

The maximum packet length can be set with the driver parameter 'AA'.
Value area: 0...175, default value: 80

This specification limits the number of tasks that can be put into a packet. That again influences the throughput time of the PLC program as well as the PLC cycle time.

Considerable delays can arise with tasks which have a lower start priority if the packet length is reduced to a very small value (0..5) and the PLC cycle time is extended.

When you have a baud rate of 19200 and the SYSMAC is C-200H, a reduction of the number of packets to 0 (1 packet) causes a cycle time curtailment of approximately 10 ms. With no variable in the display and all transmissions, such as LED's, message bits, are released.

Furthermore the timeout time is influenced with this parameter. This is calculated according to the following schema: Timeout time = 800 ms + variable 'AA' * 10 ms. s

A5 Programmlisting

A Omron-Expander Driver

```

LD      25506
XFER    (70)  DM760*   DM758   *DM757   Read ?
CLC     (41)
ADD     (30)  DM757   DM760   DM757   If yes: then transfer data
MOV     (21)  #0      DM760           from transfer block to sender bin.
JME     (05)  0
LD      25313
CMP     (20)  DM760   #0           Lead in SF pointer and set
LD NOT  25506
JMP     (04)  0                  worked out subpack
LD      25313
CMP     (20)  DM759   #20           otherwise:
LD      25506
                                           Has subpack been worked out ?
                                           If yes, then jump !

                                           Write ?
                                           If yes, then recopy files from reception
                                           bin
                                           into transfer block.
MOV     (21)  *DM756   *DM758
LD      25313
CMP     (20)  DM759   #40           Recopy
LD      25506
                                           and ?
                                           If yes, join datas from reception bin with
                                           those
                                           of the transfer block log logical and and
                                           write back

LD      25313
CMP     (20)  DM759   #80           or ?
LD      25506
                                           If yes, then join log logical or and set
                                           back files from
                                           reception bin with those in transfer block

ORW     (35)  *DM756   *DM758   *DM758
LD      25313
INC     (38)  DM756
INC     (38)  DM758
DEC     (39)  DM760
DEC     (39)  DM800
JME     (05)  0
JME     (05)  49
RET     (93)
NETWORK

PRM      #00004PCS-START   ROUTINE FOR PREOCCUPANCY; INITIATED BY FRESH START !
SBN      (92)  47
LD      25313
OUT      9914
MOV     (21)  #0      DM503
MOV     (21)  #FC8    DM513
RET     (93)
NETWORK
                                           Start timer
                                           reset error
                                           Preoccupy command word (#0FC8)
                                           *****
                                           Implement here additional specific machine
                                           occupancies e.g. nominal value variables !
                                           *****

PRM      #00005PCS-NOTF   ROUTINE FOR EMERGENCIES, INITIATED IF
                                           COMMUNICATION FAILURE

SBN      (92)  46
LD      25313
ORW     (35)  DM503   #2000   DM503   Set error bit !
MOV     (21)  #0      DM504
MOV     (21)  #0      DM505
RET     (93)
NETWORK
                                           *****
                                           Set important nominal values here
                                           for emergencies !
                                           *****

NETWORK

PRM      #00006PRG_ENDPROGRAM  END - NETWORK

END      (01)
NETWORK
                                           End mark of whole program !

```


B Omron-Direct Driver

B1 Primary commissioning

Delimitation

It is assumed that a successful parameterization of the PCS Topline has been carried out as described in the manual PCSPRO. This appendix deals exclusively with the assignment of the PCS Topline in connection with a PLC control of the SYSMAC C-series (C20H, C28H, C40H, C60H, C200H, C1000H, C2000H and C2000) from the Omron company.

It is expected that you already know the special SYSMAC terms.

However there are terms used deviating from this, such as DM+xx. While the PCS can communicate through a parameterized file marker area, the offset xx must be added in addition to the start address of the file marker area; for example 500; if the file marker area is DM500..563 (default). The following formula shows the calculation of the file marker number:

$$\text{DM-Number PLC} = \text{Word no. PCS} + \text{DM-Start address}$$

For example if the DM number of the PLC has a value of 14 (W14), then there must be a DM-start address of 500= DM514.

In the following chapter there is a brief outline of the user interface between the PCS and the PLC.

Required Equipment and Accessories

The following products are required in order to operate a PLC with an already parameterized PCS:

The Systeme Lauer Company:

1. The PCS operator panel itself having been already parameterized with demo090.pcs or demo095.pcs, as well as „OMRONDIR“ - driver.
2. The connection cable PCS 746 as of C200H to connect the PCS to the PLC with the V24 interface. Using the controls C20H, C28H, C40H and C60H, a cable must be fixed up (see chapter 3.1 in this appendix).
3. This appendix (PCS 91.16 DIR)
4. Diskette PCS 91.OMR with operating software components and example.

In addition the following are also required:

The Omron company:

5. A PLC of the SYSMAC C-series (C20H, C28H, C40H, C60H, C200H, C1000H, C2000H oder C2000).
6. As of the controls C200H the addition of a host link unit; C200H LK201 for C200H, or 3G2A5 LK201 EV1 for C1000H, C2000H and C2000.
7. An IBM compatible computer installed with the SYSMAC-PMD software.

...an adequate power supply for all the components.

B Omron-Direct Driver

B1.1 Variables of the omrondir driver

On configuring the PCS, there is a transfer of the data record as well as a selected PLC driver. The following variables have to be set for the OMRONDIR driver. When using the programming software PCSPRO you must set the variables under the menu button driver parameter having previously selected the OMRON control:

Name	Function	Default	Min. Val.	Max. Val.	Unit
AA	Timeout	300	50	1000	1/100s
AC	DIL AC Setting	_____	see DIL setting	_____	_____
AD	DIL AD Setting	_____	see DIL setting	_____	_____
AE	DIL AE Setting	_____	see DIL setting	_____	_____
AF	DIL AF Setting	_____	see DIL setting	_____	_____
AL	Start address (DM)	500	0	969	
AM	End address (DM)	563	29	998	

Timeout „AA“

Throughout the PCS to PLC communication there is a ongoing exchange of data. The timeout period is the monitoring time between two data exchange cycles. If there is a fault, it appears in the PCS display as „COMMUNICATION ERROR : TIMEOUT !“.

Please note that when this value is increased, the „TIMEOUT“ in the PLC, (timer constant value, in the example #40 for timer T510) should also be raised.

The value depends to the size of the used data field and the cycle time of the PLC. The set default value (3s) takes into consideration a transfer of 256 words.

DIL „AC..AF“ Setting

The DIL 5 and 6 combination allow themselves to be occupied with selected settings. Note that this DIL switch is only read when being switched on. The possible settings are:

Setting	Baudrate	Interface	Defaultparameter
1	19200	TTY	
2	9600	TTY	
3	4800	TTY	
4	1200	TTY	
5	19200	V24	AF *)
6	9600	V24	AE *)
7	4800	V24	AD *)
8	1200	V24	AC *)
9	19200	RS422	
10	9600	RS422	
11	4800	RS422	
12	1200	RS422	

*) Footnote: The default parameters are loaded if you don't specify any other programs in the PCSPRO. However you can occupy the other variables AC-AF with other settings (1..8). Therefore double or multiple occupancies are also possible.

B Omron-Direct Driver

The connection between the parameter and the DIL switch positions 5 and 6 are presented in the following:

Parameter	DIL5	DIL6
AC	OFF	OFF
AD	ON	OFF
AE	OFF	ON
AF	ON	ON

Start address and End address The user interface which is required for the communication PCS to PLC can be determined by the variables AL; start address; and AM; end address. At least 31 words are necessary for communication. They are WO to W29, and for synchronisation purposes, W30.

Recommendation On account of the reaction time it is recommended to keep the data area that has to be transferred as small as possible.
Put as far as possible, file variables in the lower word range (starting from W30). Maximum usage of the transfer range (256 words) causes the reaction time of ca. 2 seconds. In the most favourable circumstances; i.e. 30 words; this is around 500..1000 ms.

Observation Starting with the operating versions (PCS 090) PG 090.201.6, the set driver variables for communications that have not yet been started, can be checked by simultaneously pressing the „HLP“ and „CURSOR DOWN“ keys. With the PCS 095, this is possible with the first version.

B1.2 Commissioning

As you can choose one of several drivers for the PCS 090/095, you should load the accompanying example program; demo090.pcs, or demo095.pcs; together with the OMRON - „Direct“ - driver into the PCS with the help of the programming software PCSPRO. The following description is given on the basis that you leave the driver unaltered; default value: and that the PCS has already been parameterized.

1. Set the DIL switches 5 and 6 at the PCS in such a way that the interface is set to 9600 baud and V24. (Default: DIL5=OFF, DIL6=ON). Furthermore the DIL switch 8 should be OFF.
2. On applying a SYSMAC C20H, C28H, C40H or C60H the default setting of the PLC (DM 920 to DM 923) must be activated. From the control C200H onwards, the DIL switch settings on the link unit assembly group, have to be controlled in addition.

When using a C200H, the link unit is C200-LK201:

Settings on the Rear Side:	Settings on the Front Side:
DIP-SWITCH: 1...4 on ON	SW 1,2,4: on position 0
	SW 3: on position 5
CTS-SELECTOR: on position 0 V	(9600 Baud)

B Omron-Direct Driver

And with the controls C1000H, C2000H, C2000 the link unit is 3G2A5-LK201-EV1:

Settings on the Rear Side:

I/O port selector:	on RS-232C
Synchronization:	on Internal
Termination resistance switch:	on OFF
CTS selector:	on 0V (always ON)
SW 1:	DIL 1...7 on OFF, DIL 8 on ON
SW 2:	DIL 5...8 on OFF
	DIL 1,2,3,4 (0 = OFF, 1 = ON)
	1 0 1 0 9600 Baud

3. Switch off the supply voltage of the PLC and plug in the link unit to any socket in your sub-rack.
4. Switch on the power for the PLC and with the assistance of your software SYSMAC-PMD, transfer the program „P91_16“, that was also delivered on the diskette, into your PCS.
5. Connect the RS231C interface of the link unit to the PCS, using the cable PCS 746. If you are using the controls C20H, C28H, C60H or C40H, then a cable is to be furnished as described in chapter 3.1: - 9 pin JD-connector.
6. Now supply the PCS with current. The following must now appear on the PCS:

WINDOW ASSEMBLY MANUAL OPERATION
AUTO HAND STRT VER PDAT FORM SERV QUIT

7. If it has not already been done, switch the SYSMAC-PLC into the RUN or Monitor Mode. Now the RUN-LED of the PLC must illuminate and the ERR-LED on the PCS 090 must fade out.



Attention!

If any of the referred points don't apply, then an error analysis (chapter 1.5) must be carried out.

Driving the PLC by writing and reading the corresponding DMs; in this case DM500..DM563; can be simulated at the PLC.



Note!

Take note of the following at all costs!

The data access to words of the combined communication area must be done in a synchronized manner.

That means that either the PLC or the PCS can have access to the data at any one time but not simultaneously.

B Omron-Direct Driver

In the example on hand, the subprogram 47 is called. This is the time span during which the PLC may read and write data. Therefore a small PLC program is necessary for the simulation. A small example is in the chapter „Exemplary Programs“.

If the synchronisation is ignored, it can happen that the PCS again overwrites an actual value previously written by the PLC, with the former value or, in another example, one of the PLC written variables (nominal value) is still not complete.

B1.3 Failure corrective action

Here is a list of faults that most commonly occur during commissioning:

1. The DIL switch no. 8 is in the ON position. If this is set, then the PCS, after having been switched on, waits for the communication with the PC, which is primarily required for checking purposes. Remedy: switch off the DIL switch and restart the PCs with a quick switch-off or a brief activation of the RESET key above the DIL switch.
2. The DIL switch is incorrect or the DIL switch was incorrectly allocated.
3. The AG moves to RUN, but the ERR-LED at the PCS doesn't fade out. If the LED doesn't fade out after a 2nd attempt, then the PLC to PCS connection is to be checked over (sender or reception lead). A further cause for failure can be on account of an inappropriate sender / reception bin position.
4. In the DM503, a failure is registered when the value is >#0000. In this case the fault can be found in the PLC - PCS connection. More than likely the cable is defect.
5. Electrical and magnetic interference to communication usually causes a breakdown in communication after a long period of time has elapsed. These interferences are usually caused by frequency convertors. Using an internal variable, it is possible to access the reliability of the connection (see Internal Variables).
6. Communication is taking place, but after an elapse of time the following message appears on the screen.

```
===== COMMUNICATION ERROR =====
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
```

The PCS / PCL connection is laid down through an environment full of interference. The length of the cable is too long (see appendix on cable quality). The earthing precautions are inadequate. The driver parameter „AA“ is too small. The operating software has been applied too late. An internal variable „ZX“, gives information on the reliability of the communication.

B Omron-Direct Driver

Remedial Possibilities

- Lay the cable protective covering of the communication cable on both sides of the metalized plug casing as well as on pin 1. Earth the PCS casing as well as the PLC bus board with a lead which has a protective shield 10 times thicker than the average.
- Take care to ensure that you have good bonding to the PCS casing on one hand and to the bus board on the other one! Remember that a copper earthing strip has a better HF conductivity on account of its larger surface area, than normal flexible wire equipment.
- Avoid at all costs the emergence of high frequency interference as this is very difficult to attenuate. Although there is a potential segregation between the PLC and the PCS caused by an opto-electronic coupler (only TTY or RS422), the potential segregation is nevertheless ineffective with rapid transients, as even opto-electronic couplers possess a limited coupling capacity.
- Make sure you have definite distribution voltage points. To simplify this the power supply has to be free of potential!
- If there is much interference in the supply voltage, it is recommendable to use your own power supply for the PCS (24 Volt, 10 VA). With the PCS 095, a power supply of at least 24 volts, is to be used. It should possess the appropriate interference filters. Now link 0 volt directly to PCS with the earth wire.
- The PCS and the communication cable should be at a distance of at least 200 mm from the source of interference. This especially applies to inductances and frequency converters.
- A reduction in the baud rate can only be considered when all these measures have proved to be of no avail. This must be allowed in the system parameter area as of DM900 (C20H, C28H, C40H and C40H) or DIL switch settings to the link unit as of C200H. Furthermore the DIL switches 5 and 6 of the PCS are to be set appropriate to the driver variables AC-AF.

B Omron-Direct Driver

B1.4 Fault messages of the driver

If a communication fault occurs between a PCS and the PLC, a fault bit in the PLC after the completion of a timer run, is set in word 3, in this case bit 13.

Furthermore a flashing failure text appears in the PCS display with the flashing „ERR“-LED. This text is always the same in the first displayed line.

```
===== COMMUNICATION ERROR =====
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
```

In the second line, depending on the failure, the following text appears:

TIMEOUT!:

This text appears when the timeout timer has completed its run in the PCS. Possible reasons for this are: fractured cable, interference in the environment, the timeout has been too closely dimensionated (driver variable „AA“) or the timer parameter (TIM510) in the PLC has been occupied with too small a value. There is also the possibility that the operating component in the PLC has not been called early enough. These times have to be checked out, especially if the PLC cycle is large.

PLC NOT RUNNING!:

This text appears when the PLC is in the programming mode. The user program is therefore being activated.

A further cause for fault is an incorrectly set baud rate or interface type (PLC or PCS lateral).

Remedies for sporadically occurring breakdowns:

If you should have sporadic breakdowns in communication, then you will be able to automatically restart following the command sequence (attached to the example on the diskette).

LD	25313	Always log. 1!
OUT	9912	(RSET)

If there should be a cable fracture, then you are able to ascertain this through the set marker 9913 (EROR) and instigate the appropriate reactions (eventually alarm). The alarm bit EROR is automatically set back as soon as the first faultless data exchange takes place.

B Omron-Direct Driver

Fault Word W3= Dm+3

The PLC detected communication faults are registered here. At the moment only bit 12 of this word is occupied. If this bit is set, then the PLC has discovered a timeout. A timeout can be ascertained through an rundown timer (in the example T510). It could have been caused by the following: cable rupture, environmental interference, a too small defined value for the PCS driver variable „AA“ or the PLC timer. Bear in mind that the operating software should be called into use for every PLC cycle.

The fault word W3 appears as follows:

Bit	15	14	13	12	11	10	9	8
W3	-	-	Time-out	-	-	-	-	-
Fehlerwort								

Bit	7	6	5	4	3	2	1	0
W3	-	-	-	-	-	-	-	-
Fehlerwort								

B Omron-Direct Driver

B2 Description of the plc/oper.software

B2.1 PLC lateral settings

Whatever PLC you decide to use, it will be necessary to have settings either in the system area of the PLC (C20H, C28H, C60H and C40H) or directly at the link unit.

CXXH

If using the CXXH, it is advisable to use the default setting with a maximum of 9600 baud. If the baud rate is to be lowered, then the DM921 (bit 0..7) must be correspondingly adapted.

Possible settings:

Val.	Baud rate
2	1200 baud
4	4800 baud
5	9600 baud (default)

As of C200H

A communication interface „Link Unit“ must be applied in addition with this control. The link unit is not bound to a particular socket. The switch settings depending on the SYSMAC-PLC are to be applied as follows!

When using a C-200H in connection with the link unit C200H-LK201:

Settings on the Rear Side:	Settings on the Front Side:
DIP-SWITCH: 1...4 on ON	SW 1,2,4: on position 0 SW 3: depending on baud rate:
CTS-SELECTOR: on position 0 V	Position 2 1200 baud Position 4 4800 baud Position 5 9600 baud Position 6 19200 baud

And when using a C-1000H, C-2000H, C-2000 with link unit 3G2A5-LK201-EV1:

Settings on the Rear Side:

I/O port selector:	on RS-232C
Synchronization:	on Internal
Termination resistance switch:	on OFF
CTS selector:	on 0V (always ON)
SW 1:	DIL 1...7 on OFF, DIL 8 on ON
SW 2:	DIL 5...8 on OFF
(0 = OFF, 1 = ON)	DIL 1,2,3,4 acc. each baud rate
	0 0 0 1 1200 Baud
	0 1 1 0 4800 Baud
	1 0 1 0 9600 Baud
	0 0 1 0 19200 Baud

B Omron-Direct Driver

B2.2 Description of the operating software

The accompanying PLC operating software regulates the synchronisation between the PLC and the data marker area DM500...563. If the situation or the size of the data area is altered, then the operating software must be correspondingly adapted.

The whole communication between the user program and the PCS is developed in a special subprogram SBN 47 with the data marker area DM500...563. The editing of the data area with regard to the PLC user is permitted in this „time slot“.

The PCS is continually reading and writing about the synchronisation procedure of the data area.

The following marker, jump labels (JMP xx), subprogram numbers (SBN xx) and timer (TIM xxx) are used from the operating software.

Description	Application
DM500...563	Transfer block (communication area), DM500..503 are freely available for the operating software
DM564	Synchronisation word (access rights PCS-PLC)
9912	RSET; communication start after fault
9913	EROR; communication fault outlet
9914, 9915	Help marker for the operating software
JMP 00	Jump label
TIM 510	Timer for timeout (cable rupture etc.)
SBN 47	Subprogram (PLC - right of access)
SBN 48	Subprogram (for new start; INIT)
SBN 49	Subprogram (for communication breakdown;COFF)

As the PLC and the PCS cannot have simultaneous access to data, synchronisation must follow. The time is determined here as to how long the PCS, respectively the PLC can have access.

Two bit markers; 9912 and 9913; have special significance in the operating software:

9912 Reset Marker

This marker is only utilized in case of fault arising. Thereby the communication can be automatically restarted. In this instance the marker only has to have log 1 assigned to it.

Example: LD 2513
 OUT 9912

9913 Error Marker

In case the communication cannot be maintained upright for any reason whatever; perhaps there has been a cable rupture; this marker is set after the timeout - timer (here T510) has completed its run. As soon as the first faultless data packet has been received from the link unit, it will automatically reset itself. This is a possibility to release an alarm.

Synchronisation Process

Access to the data area must be regulated. This is done with the synchronisation word. The synchronisation word is always the word

B Omron-Direct Driver

following after the firmly filed end address (driver parameter AM).

For example if the end address is DM563, the synchronisation word is DM564.

After the PLC has been supplied with current, #FF00 is to be written on the synchronisation word. In this way the PCS begins with the first data exchange cycle.

The PLC recognizes the right of access, in that the high byte of the synchronisation word is inverted and compared with the low byte of the same word.

If there is a difference on comparing these two values, then the PLC may have access to the data area (here DM500..563). When the PLC has completed the editing, the low byte is simply inverted and written on the high byte.

The PCS now recognizes that it can have access to the data area.

The run of this process is to be found on the diskette.

In addition there is also a timer integrated which can detect a breakdown in communication such as a cable rupture.

Summary

If the inverted low byte = high byte, then the PLC user may not edit the data area.

If the inverted low byte \neq high byte, then the PLC user may edit. Finally write the low byte on the high byte in order to allow the PCS access to the data area.

B2.3 Cycle time extension

The extension of the cycle time through the operating software is minimal. With a C200H, ca 3 ms is measured, whereby 2 ms alone through the connecting-up of the communication is to be born in mind. If monitoring for a cable rupture (T510) is dispensed with, then the operating software can be further reduced. The entire cycle time; C200H, without extension devices, an input assembly group, an outlet assembly group and a link unit; amounts to max. 7 ms with loaded operating software and current communication.

B Omron-Direct Driver

B2.4 Implementation of the plc software

1. Switch off the PLC
2. Plug in the link unit into any particular socket (only as of C200H)
3. Supply the PLC with current and switch it into the programming mode
4. Transfer the PLC program with the help of the SYSMAC-PMD
5. Switch the PLC into the monitor mode

If the fault #200 appears in the DM503 after 4s (timeout, ie. the PCS is not connected up), then the implementation has been successfully completed.

B2.5 Program integration

Assuming you use the programming software SYSMAC-PMD, then the following scheme is to be recommended when creating your PLC program:

- PLC program: Copy 4 data from the accompanying diskette under the title of „P91_16..“ into the library catalogue of the PMD software (mostly „SYSMAC\LIB“).
- Write own PLC program, taking into consideration the occupied timer, DM's , marker, JMP's, SBN's.
- At the end of your main program, load the library program PCSP90_16 with the aid of the editor using the key combination [ESC], [4], [0], [7], (program collection). When you are asked what the file name of the program collection is, then specify the entire directory as well as the file name. In most cases this is „\SYSMAC\LIB\PCS91.EXP“. Then press the function key [F4] (an isolated case). Set the cursor to NW#6 and confirm with [ENTER]. There after press the key [F10] twice, and enter the key combination [ESC], [3], [0], [3], (insert puffer). The last network automatically retains the end of the program (command „END (01)“).
- If the program before the operating software is a subprogram, then the first network of the operating software should also be formulated as a subprogram and cyclically called up from the software.
- Formulate the subprogram SBN 47 (PCS drive).

Extend the program according to customer specific specifications:

- 1: Specific customer preoccupancy demands for new start (SBN 48)
- 2: Specific customer preoccupancy demands for error start (SBN 49)

With a new run, the PCS operates on the assumption that:

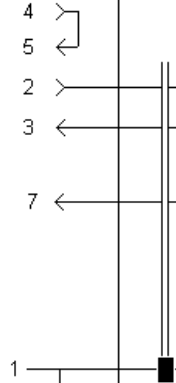
- 0 is selected for the default text
- All menus are switched of before turning off, otherwise they must be started new.
- All the keys and DIL switches are transfered after restart.

B Omron-Direct Driver

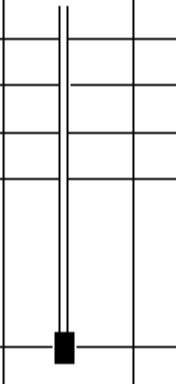
B3 Communication

Communication cable PCS 746 Connection between the PLC and the PCS

The connection is made with a 3 wire lead (RXD, TXD, GND). With the controls C20, C28, C40H and C60H, a 9 pole JD-connector/plug instead of a 25 pole JD-connector/plug. The pin placement is identical. The PCS 746 cable is fitted with a 25 pin connector.

PCS	Male connector 25 pin.	PIN	Cable PCS 746	PIN	Male connector 9 or 25 pin.	PLC
	RTS	4		5	CS	
	CTS	5		4	RS	
	TXD	2		2	SD	
	RXD	3		3	RD	
	GND	7		7	SG	
	Screen	1		1	Screen	
		Hood		Hood		

An interruption in the connection to be given further evaluation, will be marked out in the PCS as well as in the fault word DM503.

PLC Male connector	Female connector 15 pin.	Cable	Male connector 9 pin.	Link unit female connector
RDA	11		9	SDA
RDB	4		5	SDB
SDA	9		6	RDA
SDB	2		1	RDB
Screen	1		7	FG
	Hood			

B Omron-Direct Driver

Screening of the Communication Cable

The shield should be connected on both sides to the metalized connector shell. If non-metalized connector shells are used, then the shield can also be connected to pin 1. However it is not to be recommended because of the subsequent emergence of technical interference and therefore it is really better if the data lead is completely protected by the shield! If the circumstance arises where you have earth potential displacement with double sided earthing, it is necessary to have an equipotential bonding conductor or at least 10 times the cross-section of the shield. The reason for this is that compensating current should not flow away over the cable shield! This is particularly the case if the PCS and the PLC are not connected to the same earthing point, as for example, if the PCS and PLC are housed separately instead of in one cabinet!

Configuration cable PCS 733

The connection between the PC and the PCS

PCS	Female connector 25 pin	PIN	Cable PCS 733	Male connector	PC 25 pin	PC 9 pin
	DSR	6		DTR	20	4
	RTS	4		CTS	5	8
	CTS	5		RTS	4	7
	TXD	2		RXD	3	2
	RXD	3		TXD	2	3
	GND	7		GND	7	5
	Screen	1		1	Screen	
		Hood		Hood		

B Omron-Direct Driver

B3.1 Pcs / link unit data transfer

Data traffic with the control takes place in packets. Every packet is checked to see if it is alright (checksum). This applies whether it be from the PCS or from the PLC, respectively the link unit.

Construction

First of all the PCS reads the entire data area with the command '@00RDxxxxyyy<FCS>*<CR>'.

In so far as the PLC (link unit) has understood the command, it replies with the readable data.

```
'@00RD00' ALL THE READ DATA.... <FCS>' '* '<CR>
```

If there is a faulty reply from the PLC, i.e. link unit, the PCS again tries to send out the previous order. Sometimes this happens so often until the timeout is exhausted. Should the timeout period be exceeded, a fault text flashes in the display „COMMUNICATION ERROR - TIMEOUT !“. In this case the connection PCS - PLC, i.e. link unit, is either laid down in surroundings with much interference or the timeout period is dimensionated too small (refer here to failure corrective action).

Now the PCS checks over the last read word (synchronisation word). If the PLC has written the inverted low byte on the high byte, then it evaluates the answer data and finally writes the entire data area back into the PLC. This takes place with the command:

```
'@00WDxxxxdddd' ALL THE WRITEN DATA.... <FCS>' '* '<CR>
```

The written data as of the address 'xxxx' words is written in the data area of the PLC with this command. This must be positively quitted by the link unit. If this is the case (received answer: '@00WD00<FCS>*<CR>'), the PCS again reads the data area and the procedure begins from the beginning again.

B Omron-Direct Driver

B5 Program listing

```

PRM          #00001
LD           25313
CMP      (20) DM503 #2000
LD           25506
AND          9912
OUT          9914
LD NOT      25506
AND          9915
TIM          510 #40
LD           25315
OR           9914
SBS      (91) 48
MOV      (21) #0 DM503
MOV      (21) #FF00 DM564
LD           TIM510
MOV      (21) #2000 DM503
MOV      (21) #FF DM564
ORW      (35) 99 #200099
SBS      (91) 49
OUT          9915
ANDW      (34) DM564 #FF00 DM500
word
MVN      (22) DM564 DM501
ASL      (25) DM501
ASL      (25) DM501
ASL      (25) DM501
ASL      (25) DM501
ASL      (25) DM501
ASL      (25) DM501
ASL      (25) DM501
CMP      (20) DM500 DM501
LD NOT      25506
JMP      (04) 0
LD           25313
SBS      (91) 47
ANDW      (34) DM564 #FF DM500
ORW      (35) DM500 DM501 DM564
LD           25314
OUT          9915
OUT          9913
JME      (05) 0
NETWORK

PRM          #00002
SBN      (92) 48
LD           25313
MOV      (21) #FC8 DM513
MOV      (21) #80 DM514
RET      (93)
NETWORK

PRM          #00003
SBN      (92) 49
LD           25313
MOV      (21) #0 DM504
MOV      (21) #0 DM505
MOV      (21) #0 DM523
RET      (93)

```

Fault word <> 0 and
 RSET (9912)
 = 9914
 Fault word = 0 and
 Timer in action
 = Timer flag (0->1
 (transfer triggered off)
 First cycle or
 reset after fault ?, then
 preoccupancy (INIT) and
 fault word = 0 and
 synchronisation word
 (start communication)
 Timeout completed ?, then
 fault word = KH2000 and
 synchronisation word
 (end of communication) and
 set EROR (9913) and
 emergency setting (COFF)
 25313 on log. 1
 = Timer operating
 High byte synchronisation
 Invert synchronisation
 word and shift 8 times to the left
 Compare
 if no difference, then
 jumpL
 Access right for user
 Low byte inverted after high byte !
 Timeout timer trigger after!
 Reset fault bit EROR !
 INIT: customer specific
 preoccupancy
 COFF: Emergency occupancy
 if communication break

B Omron-Direct Driver

NETWORK

PRM #00004

SBN (92) 47

RET (93)

END (01)

NETWORK

Access right for user !

B Omron-Direct Driver

B4.1 Program example

The following example is intended to be a source of inspiration and is not to be found on the diskette. Accepting that the marker occupancy has been selected at random, the example therefore adapts itself appropriately.

MENU CALL

In this example the call of the menus 1..7 and keys [F1] to [F7] are shown. These menus can be quitted with the assistance of the [F8] key. The keys in word 4 are reflected in the LED word 10.

```
PRM          #00004
SBN   (92)   47
LD           25313
MOV   (21)   DM504 DM510
MOV   (21)   DM504 98
LD           9815
ANDW   (34)  DM514 #FF80 DM514
ORW    (35)  DM514 #1    DM514
LD           9814
ANDW   (34)  DM514 #FF80 DM514
ORW    (35)  DM514 #2    DM514
LD           9813
ANDW   (34)  DM514 #FF80 DM514
ORW    (35)  DM514 #3    DM514
LD           9812
ANDW   (34)  DM514 #FF80 DM514
ORW    (35)  DM514 #4    DM514
LD           9811
ANDW   (34)  DM514 #FF80 DM514
ORW    (35)  DM514 #5    DM514
LD           9810
ANDW   (34)  DM514 #FF80 DM514
ORW    (35)  DM514 #6    DM514
LD           9809
ANDW   (34)  DM514 #FF80 DM514
ORW    (35)  DM514 #7    DM514
LD           9808
ANDW   (34)  DM514 #FF80 DM514
RET    (93)
END    (01)
NETWORK
```

C Omron-Selectiv Driver

C1 Primary commissioning

Delimitation

The driver manual on hand relates exclusively to the use of the PCS topline in connection with a programmable controller of the SYSMAC C series (C20-C60K, C20-C60H, C200H, C1000H, C2000H, C2000, CV500, CV1000 or CQM-1) of Omron.

The SYSMAC specific terminology is assumed to be known.

Additionally, terms like DM+xx are used. Since the PCS is able to communicate in a parameterizable data flag range, the offset xx must be added to the start address of the data memory range, e.g. 500, if the data memory range DM 500 ... 755 has been parameterized (default). The following formula shows how the data memory address is calculated:

DM address of the programmable controller = word no. PCS + DM start address.

Example: If the DM address of word 14 (W14) has a DM start address of 500 = DM514.

Required Equipment and Accessories

To operate a PLC with an already parameterized PCS, the following is required:

Products by Lauer Systeme:

1. The PCS operating console itself (parameterized with a demo example demoxxx.pcs and the „Host Link selective“ driver = „OMRESDIR.DRV“).
2. The interconnecting cable PCS 746 (as of C200H) for the PCS-SYSMAC connection via the RS 232c interface. For the controllers C20-60K and C28-C60H a cable must be specifically made up.
3. This appendix
4. Diskette PCS 91.OMR with handling modules (required only when synchronous operation is selected).

Products by Omron:

5. A programmable controller of the SYSMAC C series (C20-C60K, C20-C60H, C200H, C1000H, C2000H, C2000, CV500, CV1000 or CQM-1).
6. As of controller C200H: an additional Host Link unit: C200H LK201 for the C200H, or 3G2A5 LK201 EV1 for the C1000H, C2000H and C2000. For the C20-C60K series a Host Link unit 3G2C7 LK201 is required (for settings refer to the OMRON specifications).
7. An IBM or compatible PC with the SYSMAC-PMD software installed.
... plus power supplies for all components.

C Omron-Selectiv Driver

C1.1 Variables of the driver

When configuring the PCS both the data set and a selectable programmable controller driver are copied. With the „Host Link selective“ = „OMRSEDIR.DRV“ driver, the following variables need to be set. When using the PCSPRO programming software the variables must be set under „Driver Parameters“ in the menu (first select the Omron controller „Host Link selective“):

Name	Function	Default	Min. val	Max. val.	Unit
AA	Timeout	100	50	1000	1/100s
AC	DIL setting AC	_____		see DIL setting	_____
AD	DIL setting AD	_____		see DIL setting	_____
AE	DIL setting AE	_____		see DIL setting	_____
AF	DIL setting AF	_____		see DIL setting	_____
AL	Start address (DM)	500	0	9970(9951)	
AM	End address (DM)	755	29(48)	9999	
AJ	Number of tasks	1	1	255	

The values in brackets apply to the PCS 900.

Timeout „AA“

Taking this parameter, two timeout periods are determined, i.e. monitoring of the serial communication and in „synchronous“ mode additionally monitoring of the synchronization process.

The indicated value relates to the synchronization timeout. The communication timeout can be calculated by dividing the indicated value by two.

Using the default value will give the following periods:

Synchronization timeout: 1000 ms = 1 s

Communication timeout: 500 ms = 0.5 s

The ongoing communication timeout is indicated by the error message (flashing text on the PCS display):

„===== COMMUNICATION ERROR =====
: COMMUNICATION TIMEOUT OR RECEIVE ERROR!“.

The ongoing synchronization timeout is indicated by the flashing text:

„===== COMMUNICATION ERROR =====
: SYNCHRONIZATION TIMEOUT!“

Increasing this value is required, if your programmable controller scan time is too long which is indicated by an error text appearing briefly (accompanied by an acoustic signal) and disappearing again.

The combination of DIL 5 and 6, only selectable settings are allowed. Please note that these DIL switches are only read during powering on.

C Omron-Selectiv Driver

Possible settings are as follows:

Setting	Baud rate	Interface	Default parameter
1	19200	TTY	NOSYNC
2	9600	TTY	NOSYNC
3	4800	TTY	NOSYNC
4	1200	TTY	NOSYNC
5	19200	RS232	NOSYNC AF *)
6	9600	RS232	NOSYNC AE *)
7	4800	RS232	NOSYNC AD *)
8	1200	RS232	NOSYNC AC *)
9	19200	RS422	NOSYNC
10	9600	RS422	NOSYNC
11	4800	RS422	NOSYNC
12	1200	RS422	NOSYNC
13	19200	TTY	SYNC
14	9600	TTY	SYNC
15	4800	TTY	SYNC
16	1200	TTY	SYNC
17	19200	RS232	SYNC
18	9600	RS232	SYNC
19	4800	RS232	SYNC
20	1200	RS232	SYNC
21	19200	RS422	SYNC
22	9600	RS422	SYNC
2	34800	RS422	SYNC
24	1200	RS422	SYNC

*) Note: The default parameters are loaded if you fail to enter other parameters in the PCSPRO program. However, you may assign other settings (1 ... 24) to the variables AC ... AF. Dual or multiple assignments are also possible.

The table below gives the correlation between parameters and DIL switch settings 5 and 6:

Parameter	DIL5	DIL6
AC	OFF	OFF
AD	ON	OFF
AE	OFF	ON
AF	ON	ON

SYNC/NOSYNC

The difference between asynchronous (NOSYNC) and synchronous communication (SYNC) is discussed in the section „Description of programmable controller/handling software“.

Starting address „AL“

Interface required for the communication between the PCS and the programmable controller can be determined by the variables AL (start address) and AM (end address). To enable communication, a minimum number of words is necessary depending on the PCS system used. PCS 090/095: minimum of 30 words; PCS 900: 49 words. With PCSPRO, the start address can be set in the starting menu only!

C Omron-Selectiv Driver

End address „AM“

Interface required for the communication between the PCS and the programmable controller can be limited by the variable AM (end address). To enable communication, a minimum number of words is necessary depending on the PCS system used. PCS 090/095: minimum of 30 words; PCS 900: 49 words. When using a controller C20 ... C60K, a maximum of 64 words (0 ... 63) can be used. With PCSPRO, the end address can be set in the starting menu only!

Number of tasks „AJ“

Parameter can be used to set the number of tasks per transmission cycle to the programmable controller. The default setting is one task. The advantage of this setting is that the management of priorities integrated in the PCS has full effect. For instance, the transmission of the keys has the highest start priority. This is to ensure that any keyboard stroke is logged in the programmable controller as soon as possible. Other tasks such as message bits and actual values will have to wait and be dealt with later on. In case you do not want this setting, you can increase the number of tasks.

Effects

You reflect the key word onto the LED word. If you depress the key briefly, you may find that in the programmable controller the keystroke bit is set and reset before the LEDs are read by the PCS. To avoid this, the number of tasks must be set for instance to 50. Subsequently, the LEDs are read with logical 1 for at least one cycle.

Note

As from operating system version (PCS 090) PG 090.201.6, the set driver variables can be monitored before communication is started by simultaneously pressing the „HLP“ and „DOWN ARROW“ keys. With the PCS 095 this is possible as from the first version, with the PCS 900 as from „PCSPRO V0.E“.

C Omron-Selectiv Driver

C1.2 Commissioning

Since you have a choice of drivers for the PCS to pick from, you should load the supplied demo program (demo090.pcs, demo095 or demo900.pcs) into the PCS along with the OMRON „Host Link selective“ driver using the PCSPRO programming software. The description below assumes that the driver parameters are left unchanged (default values) and that the PCS has been parameterized.

1. Set the DIL switches 5 and 6 on the PCS so that the interface is set to a baud rate of 9600 and „RS232 NOSYNC“ (default: DIL5=OFF, DIL6=ON). Furthermore, set DIL switch 8 to OFF.
2. When using a SYSMAC C20H, C28H, C40H or C60H, the default settings of the programmable controller (DM 920 to DM 923) must be activated. With controller C200H and later, the DIL switch settings on the Link Unit Module also need to be checked.

The correct Link Unit for the C200H is the C200-LK201:

Settings on the Rear Side:	Settings on the Front Side:
DIP-SWITCH: 1...4 on ON	SW 1,2,4: on position 0
	SW 3: on position 5
CTS-SELECTOR: on position 0 V	(9600 baud)

For the controllers C1000H, C2000H, C2000 use the Link Unit 3G2A5-LK201-EV1:

Setting on the Rear Side::

I/O port selector:	on RS-232C
Synchronization:	on internal
Termination resistance switch:	on OFF
CTS selector:	on 0V (always ON)
SW 1:	DIL 1...7 on OFF, DIL 8 on ON
SW 2:	DIL 5...8 on OFF
	DIL 1,2,3,4 (0 = OFF, 1 = ON)
	1 0 1 0 9600 baud

3. C200H and following: Switch off the power supply of the programmable controller and install the Link Unit on any slot in the chassis.
4. Connect the RS232C interface of the Link Unit to the PCS with cable PCS 746. For the controllers C20H, C28H, C60H and C40H, a cable must be specifically made up in accordance with section 3.1 (9-pin JD connector).
5. Then switch on the power supply of the PCS. The PCS must now read:

WINDOW ASSEMBLY MANUAL OPERATION
 AUTO HAND STRT VER PDAT FORM SERV QUIT

C Omron-Selectiv Driver

6. Switch the SYSMAC programmable controller to RUN or monitor mode if it is not in this mode already. Now the RUN LED should be on and the ERR LED should go out.



Warning!

If any of the above item does not apply, a fault analyse must be performed.

The PCS drive can now be simulated by writing and reading the appropriate DM values (i.e. DM500 ... DM755).

C1.3 Failure corrective action

Here is a list of the most frequently errors occurring during the initial startup:

1. DIL switch no. 8 is in ON position. In this case the PCS, upon switching on, expects communication with the PC (transfer program) which is used for inspections only. Remedial action: Switch off the DIL switch and restart the PCS (either by disconnecting the unit for a short time or depressing the RESET key placed above the DIL switch).
2. Wrong DIL switch setting or DIL switches are incorrectly assigned (refer to section „Variables of the driver“).
3. The AG does go to RUN, but the ERR LED at the PCS does not go out. If it does not go out after a second attempt, check the connection between the programmable controller and the PCS (sending or reception line).
4. Interference of the communication through electrical or magnetic fields often cause a communication breakdown after some time. Such interferences are usually caused by frequency converters. An internal variable allows for an estimation of the reliability of the connection (refer to Internal Variable „ZX“).
5. The communication does start, but after a while you read the message:

===== COMMUNICATION ERROR =====

XX

The connection between the PCS and the programmable controller has been routed in a high-noise environment, the cable is too long (this depends on the cable quality), grounding is insufficient or the driver parameter „AA“ too small. An internal variable („ZX“) gives information about the reliability of the communication.

C Omron-Selectiv Driver

Remdial Possibilities

- Put the cable shield of the communication cable both to a metallized connector hood and to pin 1 at both ends. Connect the PCS housing and the programmable controller bus board to ground by a cable having at least 10 times the cross section of the shield.
- Look for good frame-ground connection to the PCS housing and to the programmable controller bus board. Bear in mind that, due to its large surface, copper grounding strips have a much higher RF conductivity than conventional stranded hook-up wire.
- Keep out as far as possible, high-frequency interferences because they are extremely difficult to attenuate. There is a potential separation between programmable controller and PCS by optocouplers (in TTY or RS422 mode only), but these are ineffective with fast transients because opto-couplers also exhibit some coupling capacity (though it is quite small).
- Make sure that all reference points for the supply voltages are univocal. To achieve this, ensure that the power supply unit is at zero potential.
- If the supply voltage has a high level of interference, it is recommended to use a separate power supply for the PCS 090 (24 V, 10 VA). For the PCS 095/900, use a power supply unit of at least 24 V, 15 VA with built-in noise filters. 0 V can be connected directly to the PCS by a grounded conductor.
- The PLC and the communication cable should have a minimum distance of 200 mm from any noise source, in particular where inductivities and frequency converters are concerned.
- If none of these measures leads to the desired success, you should consider reducing the baud rate which needs to be defined in the system parameter range starting with DM 900 C20H, C28H, C40H and C60H) or by DIL switch settings at the Link Unit (C200H and later). Additionally, the DIL switches 5 and 6 of the PCS must be set in accordance with the driver variables AC-AF.

C Omron-Selectiv Driver

C1.4 Error messages of the driver

If a communication error occurs between a PCS and the programmable controller, the PCS display will show a flashing error text and the „ERR“ LED is blinking. The first line of this text is always the same:

```
===== COMMUNICATION ERROR =====  
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
```

Depending on the type of error, the second line will display:

COMMUNICATION TIMEOUT OR RECEIVE ERROR!:

This text is displayed, for instance, when the timeout timer for the communication within the PCS has run out („Communication Timeout“). One possible cause could be a wire break.

This error also occurs, however temporarily, if the PCS or the communication cable are in an environment with a high noise level („Receive Error“). The error text disappears, when the programmable controller responds again.

SYNCHRONIZATION TIMEOUT!:

This text can be activated only in synchronous mode (SYNC). It is displayed, if the synchronization word (programmable controller handling software) is not called on time or not at all. Another possible cause is an insufficient driver parameter „AA“ (Timeout).

PLC NOT RUNNING!:

This text is displayed when the programmable controller is in programming mode. The user program is, therefore, not executed.

C Omron-Selectiv Driver

C2 Description of the PLC/Handling software

General Information

Communication with the programmable controller is done in a communication range comprising a maximum of 256 words.

The PCS accesses data flags by reading and writing operations.

The start address of the communication range is freely selectable through the driver parameter „AG = start address“. In the default setting the communication range starts at DM 500.

Communication takes place in two different modes:

NOSYNC

Asynchronous access

In this mode, the programmable controller and the PCS have access to the data range at any time. This mode has advantages and disadvantages as compared with synchronous access.

Advantages:

- Stroke PCS -> keystroke bit in the programmable controller is set), am required.
- Controller is only slightly prolonged (only Hostlink service time). at any time.

Disadvantages:

- By the programmable controller overwriting a set point is not possible. if there is no more than one message bit set in a message word. Failure to observe this may cause the loss of messages due to overwriting.
- Variables must not be located in the same word, otherwise information may be lost. Because data were captured in different programmable controller cycles. In the programmable controller.
- The set (synchronized) from the programmable controller, otherwise bit information contained in word 36 may be lost.

C Omron-Selectiv Driver

SYNC

Synchronous access

In this mode, the programmable controller and the PCS access the data range alternately at specific times. Access is controlled via a synchronization word (word 3). This mode has advantages and disadvantages as compared with synchronous access.

Advantages:

- By overwriting a set point with the programmable controller is possible on behavior 2.
- Variables may be in the same word.
- use due to the synchronization they proceed from the same programmable controller cycle.
- the programmable controller by use of a timer which is post-triggered by writing the synchronization word.
- Setting the clock of PCS 900 is possible.

Disadvantages:

- CS -> keystroke bit in the programmable controller is set) are longer due to writing and reading the synchronization word and waiting for the acknowledgement by the programmable controller.
- Time is required. However, this is very short and does not greatly influence the programmable controller scan time.
- Programmable controller scan time (Hostlink service time only). Only at a specified time. This increases the amount of processing in the programmable controller.

C2.1 Settings on the PLC side

Depending on the type of programmable controller used, settings need to be made either in the system data area of the programmable controller (C20H, C28H, C60H and C40H) or directly at the Link Unit. For the controllers not listed refer to the appropriate OMRON manual.

CXXH

The CXXH setting (max. 9600 baud) is recommended. To decrease the baud rate, DM921 (bit 0 ... 7) must be set correspondingly.

Possible settings:

Value	Baud rate
2	1200 baud
4	4800 baud
5	9600 baud (Default)

C Omron-Selectiv Driver

C200H up

By this controllers, an additional communication interface, the so-called „Link Unit“, must be used. The Link Unit does not require a specific slot. Depending on the SYSMAC programmable controller, the required switch settings are as follows:

Use of a C200H in combination with the Link Unit C200H-LK201:

Setting on the Rear Side:	Setting on the Front Side:
DIP-SWITCH: 1...4 on ON	SW 1,2,4: on position 0 SW 3: depending on the baud rate
CTS-SELECTOR: on position 0 V	Position 2 1200 baud Position 4 4800 baud Position 5 9600 baud Position 6 19200 baud

For the controllers C1000H, C2000H, C2000 in combination with the Link Unit 3G2A5-LK201-EV1:

Settings on the Rear Side:

I/O port selector:	on RS-232C
Synchronization:	on Internal
Termination resistance switch:	on OFF
CTS selector:	on 0V (always ON)
SW 1:	DIL 1...7 on OFF, DIL 8 on ON
SW 2:	DIL 5...8 on OFF
	DIL 1,2,3,4 depending of the baud rate
(0 = OFF, 1 = ON)	0 0 0 1 1200 baud 0 1 1 0 4800 baud 1 0 1 0 9600 baud 0 0 1 0 19200 baud

C Omron-Selectiv Driver

C2.2 Description of the handling software

The supplied programmable controller handling software (OMRSDIR*.*) is required only if you select the SYNC mode. It controls the synchronization between a PCS and the parameterizable PCS data flag range DM500 ... 755. If you wish to change the data range, the handling software must be adapted accordingly.

The entire communication between the user program and the PCS must be handled in a special sub-program SBN 47 in the data flag range DM500 ... 755. Within this „time slot“, the data range may be edited by the user of the programmable controller.

The PCS reads and writes the data range continuously by synchronization. The handling software uses the following flags, jump labels (JMP xx), sub-program numbers (SBN xx) and timers (TIM xxx):

Denomination	Use
DM500...755	Transfer range (communication range)
DM502	Error word communication
DM503	Synchronization word (access rights PCS-PLC)
9914	Error flag (e.g. wire break)
9915	Auxiliary flag (for handling software)
JMP 00	Jump label
TIM 510	Timer for Timeout (wire break etc.)
SBN 47	sub-program (PLC access right)
SBN 48	sub-program (for restart; INIT)
SBN 49	sub-program (for communication failure; COFF)

Since the programmable controller and the PCS may not access data simultaneously, a synchronization is required. This determines the times when the PCS and the programmable controller have access.

The bit flag (9914) has a special meaning within the handling software:

9914 ERROR-Flag

If communication can not be maintained for some reason (e.g. wire break) after timer timeout (here: T150). Once the first error-free data packet has been received by the Link Unit, the flag is automatically reset. This is one way of triggering an alarm.

Operation of the synchronization

Synchronization is only necessary, if the SYNC mode is activated. In this mode, the access to the data range must be controlled. This is done by means of a synchronization word. The synchronization word is word 3 relative to the start address.

In the example, the end address is DM500. Thus, the synchronization word is DM503.

After powering up the programmable controller and the PCS, the PCS starts the first data exchange cycle. Subsequently, the PCS writes a value other than zero to the synchronization word.

By this way, the programmable controller identifies the access right. The programmable controller may now access the data range (here: DM500 ... 755). When the programmable controller has finished processing, the complete synchronization word or just its high byte are written to zero.

On the diskette, this operation has been realized (program: OMRSDIR*.*). Additionally, a timer capable of detecting a communication failure (e.g. wire break) is integrated into the program.

C Omron-Selectiv Driver

Summary

If the high byte of word 3 = 0, the data range may not be changed by the user of the programmable controller.

If the high byte of word 3 \neq 0, the data range may be changed by the user of the programmable controller. Subsequently, write the value zero at least to the high byte of word 3 to enable access to the data range by the PCS.

C2.3 Prolongation of scan time/response time

Prolongation of the PLC scan time Prolongation of the programmable controller scan time caused by the handling software (only necessary in SYNC mode) is negligible. With a C200H, 3 ms were measured (2 ms are alone required for connecting the communication cable). The overall scan time (C200H, no expansion units, one input module, one output module and a Link Unit) with the handling software loaded and ongoing communication is 7 ms maximum.

Response time

To give you a response time overview, several times were measured with a PCS 090. You can read the „time key -> programmable controller output“, i.e. keystroke until the output of the programmable controller is set to logical 1, as well as the „key -> LED“, i.e. keystroke until the keystroke bit is reflected on the LED. These two times are measured with varying baud rates, operating modes (SYNC/NOSYNC), number of tasks (driver variable AJ) and enabling of transmission into word 13 (command word A), without any variables and with the maximum number of variables (8 separate double-word variables, i.e. no adjacent addresses). A C200H (CPU01) with a digital output module OC222 and Link Unit C200H-LK201 was used.

C Omron-Selectiv Driver

DW13 Hex	Number of variables	Baud rate	Operating mode	„AJ“	Key->progr.contr. output [ms]	Key->LED [ms]
0000	none	19200	NOSYNC	1	60 .. 120	-
0080	none	19200	NOSYNC	1	60 .. 120	170.. 420
0FC8	none	19200	NOSYNC	1	60 .. 120	170.. 500
0FC8	8 x BIN-2 getr.	19200	NOSYNC	1	60 .. 420	170.. 800
0000	none	19200	NOSYNC	50	60 .. 120	-
0080	none	19200	NOSYNC	50	60 .. 180	170.. 420
0FC8	none	19200	NOSYNC	50	60 .. 250	300.. 600
0FC8	8 x BIN-2 getr.	19200	NOSYNC	50	60 .. 700	400.. 900
0000	none	9600	NOSYNC	1	60 .. 120-	-
0080	none	9600	NOSYNC	1	60 .. 120	170.. 420
0FC8	none	9600	NOSYNC	1	60 .. 120	170.. 550
0FC8	8 x BIN-2 getr.	9600	NOSYNC	1	60 .. 500	170..1000
0000	none	9600	NOSYNC	50	60 .. 120	-
0080	none	9600	NOSYNC	50	60 .. 180	200.. 450
0FC8	none	9600	NOSYNC	50	60 .. 280	350.. 650
0FC8	8 x BIN-2 getr.	9600	NOSYNC	50	60 .. 750	400..1200
0000	none	19200	SYNC	1	120 .. 270	-
0080	none	19200	SYNC	1	120 .. 270	270.. 600
0FC8	none	19200	SYNC	1	120 .. 300	270.. 950
0FC8	8 x BIN-2 getr.	19200	SYNC	1	120 .. 700	270..1200
0000	none	19200	SYNC	50	200 .. 300	-
0080	none	19200	SYNC	50	250 .. 400	500.. 700
0FC8	none	19200	SYNC	50	350 .. 600	600..1000
0FC8	8 x BIN-2 getr.	19200	SYNC	50	850 ..1500	1750..2250
0000	none	9600	SYNC	1	120 .. 300	-
0080	none	9600	SYNC	1	120 .. 300	300.. 750
0FC8	none	9600	SYNC	1	120 .. 350	300.. 950
0FC8	8 x BIN-2 getr.	9600	SYNC	1	120 .. 750	300..1750
0000	none	9600	SYNC	50	200 .. 300	-
0080	none	9600	SYNC	50	300 .. 500	600.. 800
0FC8	none	9600	SYNC	50	400 .. 700	700.. 1200
0FC8	8 x BIN-2 getr.	9600	SYNC	50	1000 ..1800	2000..2700

C Omron-Selectiv Driver

C2.4 Implementation of the PLC software (sync)

1. Switch off the programmable controller.
2. Install the Link Unit on any slot (only C200H and later).
3. Power on the programmable controller and switch it to programming mode.
4. Load the programmable controller program by means of the SYSMAC PMD software.
5. Switch the programmable controller to monitor mode.

If after one second the error #2000 (timeout, i.e. the PCS is not connected) is displayed in DM502, the implementation is successfully completed.

C2.5 Program integration (sync only)

Under the precondition that you use the SYSMAC PMD software, the following proceeding is recommended to generate of your own programmable controller program:

- PLC program (4 files on the supplied diskette PCS91.DIR with the denomination „OMRSDIR.*.*“) into the library directory of the PMD software (usually „SYSMAC\LIB“).
- Controller program taking into consideration the assigned timers, DM's, flags, JMP's, SBN's (refer to section 2.2).
- The ram, also load the library program OMRSDIR by means of the editor using the key combination [ESC], [4], [0], [7] (program suite). When prompted for the file name of the program suite, enter the entire directory and the file name (usually „\SYSMAC\LIB\OMRSDIR“). Then press function key [F4] (single). Position the cursor on NW#1. Press [F6] (copy), „pull down“ to NW#4 using the [Down arrow] key and confirm by pressing [ENTER]. Then press key [F10] twice and enter the key combination [ESC], [3], [0], [3] (include buffer). The last network automatically includes the end of program (command „END (01“).
- Handling software is a sub-program, the first network of the handling software should also be specified as a sub-program and called cyclically by your software. PCS drive).

Extend the program according to the application.

1: for the restart (SBN 48)

2: for possible errors (SBN 49)

After cold restart, the PCS assumes the following:

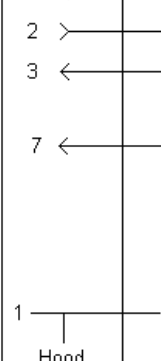
- The report text is 0.
- Before switching off, otherwise they have to be restarted and DIL switches are transferred once after a cold restart.
- This startup behavior must be taken into consideration for the presetting of the data flags 500 ... max. 755.

C Omron-Selectiv Driver

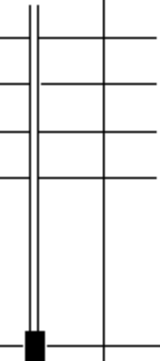
C3 Communication

Communication cable PCS 746 Connection between the programmable controller and the PCS

The connection is made using a 3-core cable (RXD, TXD, GND). For the controllers C20H, C28H, C40H and C60H a 9-pin JD connector is to be used instead of the 25-pin JD connector. The pin assignment is identical. The cable PCS 746 is supplied with a 25-pin connector.

PCS	Male connector 25 pin.	PIN	Cable PCS 746	PIN	Male connector 9 or 25 pin.	PLC
	RTS	4 >		> 5	CS	
	CTS	5 <		< 4	RS	
	TXD	2 >		> 2	SD	
	RXD	3 <		< 3	RD	
	GND	7 <		< 7	SG	
	Screen	1 Hood		1 Hood	Screen	

The interruption of the connection is logged in the PCS and in the error word (in the example DM503) for further analysis.

PLC Male connector	Female connector 15 pin.	Cable	Male connector 9 pin.	Link unit female connector
RDA	11		9	SDA
RDB	4		5	SDB
SDA	9		6	RDA
SDB	2		1	RDB
Screen	1 Hood		7	FG

C Omron-Selectiv Driver

Screening of the communication cable

The shield should be connected at both ends to a metallized connector hood. If non-metallized connector hoods are used, the shield can alternatively be connected to pin 1. However, this is not recommended for interference reasons because the data lines should be covered completely by the shield. As a result of the grounding at both ends, you must consider that (due to possible ground potential changes) a potential compensation line is required having at least 10 times the cross section of the shield (because compensating currents should not drain off through the cable shielding). This is particularly important when the PCS and the programmable controller do not connect to a common ground. This may be the case, if the PCS and the programmable controller are not housed within the same cabinet.

Configuration cable PCS 733

Connection between the programmable controller and the PCS

PCS	Female connector 25 pin	PIN	Cable PCS 733	Male connector	PC 25 pin	PC 9 pin
	DSR	6		DTR	20	4
	RTS	4		CTS	5	8
	CTS	5		RTS	4	7
	TXD	2		RXD	3	2
	RXD	3		TXD	2	3
	GND	7		GND	7	5
	Screen	1		1	Screen	
		Hood		Hood		

C Omron-Selectiv Driver

C3.1 Data transfer PCS / link unit

The data communication with the controller is done in packets. Each packet is checked both by the PCS and the programmable controller or the Link Unit (Checksum..).

Building

The PCS reads and writes only the relevant data ranges.

To read data, the PCS sends the command:

```
`@00WD00' <FCS> ' * ' <CR>
```

If the programmable controller has received the command, it responds:

```
`@00WD00' requested read data' <FCS> ' * ' <CR>
```

To write data, the PCS sends the command:

```
`@00WDxxxxdddd' ALL WRITE DATA.... <FCS> ' * ' <CR>
```

If the programmable controller has received the command, it responds:

```
`@00WD00' <FCS> ' * ' <CR>
```

C Omron-Selectiv Driver

C4 Program listing

```

PRM          #00001

LD           9915          Timer is active.
TIM          510   #40      = Timer flag (0->1 Transition triggers later.)
CMP (20)    DM503   #0
LD NOT      25506
AND         9914          Communication start after error
OR          25315          or first cycle
SBS (91)    48            Presettings (INIT) and
MOV (21)    #0   DM502     error word = 0
LD          TIM510         Timeout ?, then
MOV (21)    #2000 DM502     Error word = KH2000 and
ORW (35)    99   #4000 99  setting of EROR (9914) and
SBS (91)    49            emergency assignments (COFF)
LD          25313 logical 1
OUT         9915          = Timer active
CMP (20)    DM503   #0     Comparison
LD NOT      25506          If no difference, then
JMP (04)    0             jump
LD          25313
SBS (91)    47            Access right for then user
MOV (21)    #0   DM503     Set synchronization word to zero
LD          25314
OUT         9915          Post-triggering of the timeout timer !
OUT         9914          Reset error bit EROR !
JME (05)    0
NETWORK

PRM          #00002

SBN (92)    48            INIT: Customized presetting

Example PCS 090:
LD 25313
MOV (21)    #FC8   DM513
MOV (21)    #80DM514

RET (93)
NETWORK

PRM          #00003

SBN (92)    49            COFF: Emergency assignments, if communication fails

Example PCS 090/095:
LD 25313
MOV (21)    #0 DM504
MOV (21)    #0 DM505
MOV (21)    #0 DM523

RET (93)
NETWORK

PRM          #00004

SBN (92)    47            Access right for the user !
RET (93)
END (01)
NETWORK

```

C Omron-Selectiv Driver

C4.1 Program example

The following example (designed only for PCS 090/095) is intended to be a suggestion and is not included on the diskette. Since the flag assignment is arbitrary in this example, an adaptation would be necessary in any case.

MENU CALL

Calling menus (1..7) is demonstrated in this example (keys [F1] to [F7]). Key [F8] is used to terminate menus. The keys in word 4 are reflected onto LED word 10.

```
PRM          #00004
SBN   (92)   47
LD           25313
MOV   (21)   DM504 DM510
MOV   (21)   DM504 98
LD           9815
ANDW   (34)  DM514 #FF80 DM514
ORW    (35)  DM514 #1    DM514
LD           9814
ANDW   (34)  DM514 #FF80 DM514
ORW    (35)  DM514 #2    DM514
LD           9813
ANDW   (34)  DM514 #FF80 DM514
ORW    (35)  DM514 #3    DM514
LD           9812
ANDW   (34)  DM514 #FF80 DM514
ORW    (35)  DM514 #4    DM514
LD           9811
ANDW   (34)  DM514 #FF80 DM514
ORW    (35)  DM514 #5    DM514
LD           9810
ANDW   (34)  DM514 #FF80 DM514
ORW    (35)  DM514 #6    DM514
LD           9809
ANDW   (34)  DM514 #FF80 DM514
ORW    (35)  DM514 #7    DM514
LD           9808
ANDW   (34)  DM514 #FF80 DM514
RET    (93)
END    (01)
NETWORK
```

Index

Symbole

9912 Reset Marker	B-10
9913 Error Marker	B-10
9914 ERROR-Flag	C-12

A

As of C200H	B-9
Asynchronous access	C-9

B

Building	C-18
----------------	------

C

C200H	A-6
C200H up	C-11
Communication Cable PCS 746	B-13
Communication cable PCS 746	A-9, C-16
COMMUNICATION ERROR	B-5, C-2
COMMUNICATION TIMEOUT	C-2
Configuration cable PCS 733	A-11, B-14, C-17
Construction	A-11, B-15
CXXH	A-6, B-9, C-10

D

Defaultparameter	B-2, C-3
Delimitation	A-1, B-1, C-1
DIL	C-3
DIL „AC..AF“ Setting	B-2
DIL Setting	A-2
DIL switch	A-4

E

Effects	C-4
End address	B-3
End address „AM“	C-4
End adress	B-2
Endadresse	C-2
ERR LED	A-4

F

Fault Word W3= Dm+3	B-8
---------------------------	-----

G

General Information	C-9
---------------------------	-----

N

NOSYNC	C-9
Number of Repeats	A-2

Number of tasks „AJ“	C-4
----------------------------	-----

O

Observation	B-3
Operation of the synchronization	C-12

P

PLC NOT RUNNING!	B-7
PLC Packet Length/Timeout	A-2
Position of Sending/Reception Bin	A-3
Procedure	A-3
Programmlisting	A-14, B-16, C-19
Prolongation of the PLC	C-13

R

RECEIVE ERROR	C-2
Recommendation	B-3
Remdial Possibilities	C-7
Remedial Possibilities	A-5, B-6
Required Equipment and Accessories	A-1, B-1, C-1
Response time	C-13

S

Start address	B-3
Startadresse	B-2
Starting address „AL“	C-3
SYNC	C-10
SYNC/NOSYNC	C-3
Synchronisation Process	B-10
Synchronous access	C-10

T

Timeout	B-2
Timeout „AA“	B-2, C-2
TIMEOUT!	B-7

Index