JetWeb

JX6-PROFI

User Information

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1 Safety Instructions

This user information is only valid in connection with the safety instructions and the operating parameters of the higher level control (D-CPU, D-CPU 200, D-CPU 2 or JetControl 647).

This user information will later be replaced by an extended and corrected complete operator's instruction.

In this user information, the functions of the JX6-PROFI expansion module will be described; it will also contain a function description of software version 2.00. This expansion module can only be used in connection with the following controllers or devices:

System Requirements	
Controller	**Starting from version**
D-CPU, D-CPU 200	2.01
D-CPU2	2.19
JetControl 647	2.19
External module *bus* carrier	

These controls will be called "CPU" in the description following.

2 Technical Data

Mechanical and Electrical Specifications	
Power supply	+ 5 V -4 % / + 4%
Connections	Profibus 9.6 kBaud through 12 MBaud
Dimensions (H x W x D in mm)	17 mm x 54 / 51 mm x 120 mm
Power consumption	approx. 2 W
Ground	60 g

3 Overview

JX6-PROFI is a MODULE*bus*-compatible, intelligent interface module enabling the host system, which it is being used in, to access a Profibus-DP field bus as slave.
An ASIC of the SPC3-type acts as interface with the Profibus-DP. Additionally, the module is equipped with a micro controller taking over initialisation and monitoring of the ASIC and providing the CPU with data in a proper form.

This module allows transmission of up to 1024 inputs and 1024 outputs per cycle. It supports baud rates of up to 12 MBaud. The baud rate is recognised and set automatically.

4 Hardware

On the front panel of the JX6-PROFI module a 9-pin SUB-D connector (female), which the Profibus-cable can be connected to, and four LEDs, indicating the different operating states of the module, are located.

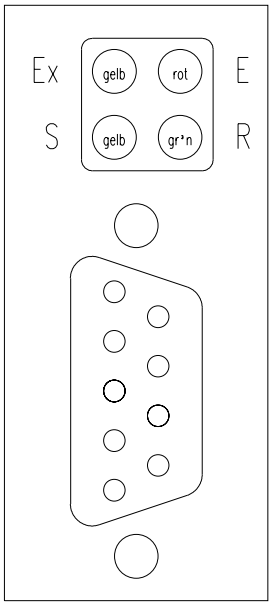


Figure 1 Front Panel

4.1 Pin Assignment

Connector pin assignment complies with DIN 19245. The interface module is galvanically isolated from the controller. The connector housing is connected with the CPU housing, thus providing connection with the equipment grounding potential.

Pin #	Signal Name	Meaning
1	unused	not assigned
2	unused	not assigned
3	B	Data signal not inverted (D+)
4	RTS	Request to Send (high = send)
5	GND	Reference potential 0 V (floating)
6	+5 V	Output 5 V (floating)
7	unused	not assigned
8	A	Data signal inverted (D-)
9	unused	not assigned

A possibly required termination of data lines has to be carried out externally.

Note! When connecting the field bus cable, be sure to use a connector with a metallic housing, and to clamp the shield with the **greatest possible surface area** under the strain relief of the connector.

4.2 Light-Emitting Diodes

The four LEDs indicate the operational states of the firmware and of the Profibus interface chip.

4.2.1 LED 'R' (green)

This LED indicates that the firmware of the JX6-PROFI module has been started successfully. Once the power supply is switched on, the module carries out a self test of its operating system. If the existing OS is recognised as valid, it is started and the green LED is lit.
(please do also refer to the operating system update)

4.2.2 LED 'E' (red)

When the OS firmware of the Profibus module is running, the red LED indicates the status of bit 4 (error bit) in the status register (11y100). If this bit is set (=1), an error has occurred and the LED is lit.
(please do also refer to the operating system update)

4.2.3 LED 'S' (yellow)

The yellow LED (status LED) is used to indicate various status signals.
Once the module is switched on, this LED is flashing with a frequency of about 1 Hertz until the Profibus interface is initialised successfully by setting the configuration registers

11y102, 11y103, and 11y107. Following this procedure, the bits 0, and 1 of the status register (11y100) are set, and the LED goes out.
(please do also refer to the operating system update)

4.2.4 LED 'Ex' (yellow)

Once the JX6-PROFI has been initialised by the CPU, it responds to frames from the Profibus master. The latter parameterises and configures the slave through certain DP-services. If this process is completed successfully, the DP-slave changes over to “data exchange” mode enabling exchange of input and output data. This status is indicated by a steady light of the ‘Ex’-LED and a set bit 3 in the status register.

4.2.5 The LEDs during operating system update

If it is detected during a self test that there is no valid firmware, the three LEDs ‘R’, ‘E’, and ‘S’ are flashing with a frequency of about 2 Hz. In this case, a new operating system must be installed. An operating system update can also be carried out, if a new version is to be installed, although the present operating system is still operable.

During an OS update the ‘Ex’ LED is out, and Profibus operation is not possible.

At the beginning of the operating system transfer, a special loader is installed in the module. During this loading process the LED ‘R’ is out, and LED ‘S’ is lit. The LED ‘E’ is flickering in the rhythm of the data transfer.
Once the loading routine has been transferred successfully, this routine is started, and the two LEDs ‘R’, and ‘E’ are flashing with a frequency of about 2 Hz.
During loading process of the actual OS the LED ‘R’ is out, and LED ‘S’ is lit. The LED ‘E’ is flickering in the rhythm of the data transfer.

While the Flash EPROM is being programmed, the condition of the LEDs is undefined.

5 Software / Programming

The interface between the D_INT and the user program consists of several registers and an I/O range.
The registers serve for configuring the module and for requiring the status information. In the I/O area, the output signals of the Profibus master are mapped as input signals for the CPU controller, and the output signals of the CPU controller are made available to the master as input signals.

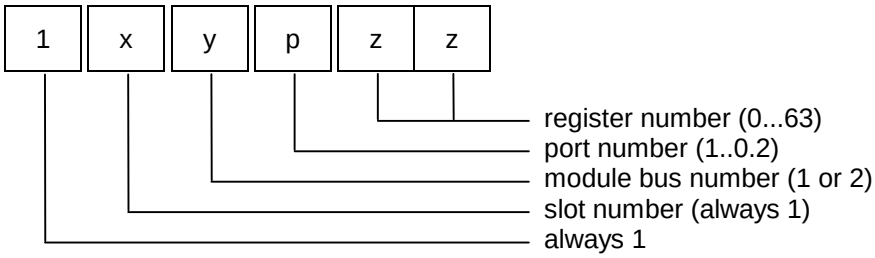
After the controller has been switched on, the number of Profibus input words and Profibus output words has to be set in the registers 11y102, resp. 11y103, before the Profibus interface is initialised by entering the node number into register 11y107. The structure of I/O data is word-wise, so that the effective number of inputs and outputs can be selected in steps of sixteen each. The maximum number of 16 words results in a maximum number of 256 inputs, resp. outputs.
Once the interface has been initialised by entering the node number into the corresponding register, it is no longer possible to change the number of I/O words.

5.1 Register Array

5.1.1 Numbering

As it is the case with registers on controller cards, the numbers of module registers consist of six digits, which are combined as follows:

100000
+ slot number * 10000
+ module number * 1000
+ interface number * 100
+ register number



The slot number (‘x’) is always 1, since, at the moment, only modules on the CPU are supported.
The module number (‘y’) indicates the number of the module socket (1 or 2).
'P’, the number of the interface, is to distinguish between the two register ranges on the respective module. The JX6-PROFI module has only one port, so that this digit is always ‘1’.
Finally, one of the 64 possible registers will be designed by the register number (‘zz’).

Example:
Figure 5 is supposed to be entered into register # 7 (node address) of the module located in socket # 2 (module 2):

```
REGISTER_LOAD (112107, 5)
```

5.1.2 Register Description

Register 11y100: Status register	
Function	**Description**
Read	Present status
Write	illegal
Value range	23-bit-signed integer
Value after reset	224 (0E0hex)

The status register is a **read-only** register. Writing into this register is not permitted. It is bit-coded, i.e. each of the bits indicates a specific state.

Bit Number	State	Meaning
0	0 1	Module is not configured, or parameter is invalid. Valid parameter
1	0 1	Module is not configured, or initialisation error. Profibus chip successfully initialised.
2	0 1	The module is not configured by the Profibus master. Module is parameterised and configured by the master
4	0 1	No error detected. Error; register 11y134 contains an error code.
5	1	always 1
6	1	always 1
7	1	always 1
10	0 1	Initial state or consistent data range are read Consistent data range has been read.
11	0 1	Initial state or consistent data range are written Consistent data range has been written.

Bits 5, 6, and 7 are always set. After power up, all other bits are reset, so that the register contains the value 224 (0E0hex).

During the initialisation process, after register 11y107 has been parameterised, the configuration parameters (quantity of input and output words, node number) are checked for validity. If the parameters are valid, **bit 0** is set. If the parameters are invalid, the process will be aborted, and bit 4 will be set.

Once the check of these parameters has been completed successfully, the module interfacing with the Profibus is initialised. If this initialisation was successful, **Bit 1** will be set, otherwise the process will be aborted, and bit 4 will be set, too.

If the module, following this procedure, is parameterised and configured by the Profibus master via Profibus, it will switch over to the ‘Data Exchange’ state which enables exchange of I/O data between master and slave. This status is indicated by a set **bit 2** (‘Ex’ LED illuminates). The baud rate index for communication on the Profibus can be read out of register 11y133.

If an error has been detected, **bit 4** is set, and the error code is entered into register 11y134.

Register 11y101: Command register	
Function	**Description**
Read	Latest command
Write	New command
Value range	0 … 255
Value after reset	0

By writing into this register, certain actions are triggered on the module.

Command	Meaning
5	Reset Profibus. Following this command, the module no longer participates in actions of the Profibus. The module can be reinitialised by parameterising register 11y107. Once this command has been issued, the application program has to wait at least 50 ms before the JX6-PROFI module can be accessed once again.
6	Reset error bit 4 in the status register. Since the status register is read-only, error messages can be acknowledged through this command.
10	Read a consistent data range out of the Profibus
11	Write a consistent data range into the Profibus

Register 11y102: Amount of Profibus input words	
Function	**Description**
Read	Present amount
Write	New amount
Value range	0 .. 64
Value after reset	4 (64 inputs)

The quantity of input words, which the module makes available to the Profibus master, is defined in this register. Since the input structure is word-wise (16 bit), the number of inputs equals to 16 times the value entered.

Seen from the CPU, this is the number of outputs managed by the JX6-PROFI module. These outputs are addressed by means of output commands or via registers 11y400 through 11y463.

Care must be exercised that the number of inputs is specified before the node address is entered, since afterwards a modification is no longer possible.

Register 11y103: Amount of Profibus output words	
Function	**Description**
Read	Present amount
Write	New amount
Value range	0 .. 64
Value after reset	4 (64 inputs)

The number of output words, which the module makes available to the Profibus master, is defined in this register. Since the output structure is word-wise (16 bit), the number of outputs equals to 16 times the value entered.

Seen from the CPU, this is the number of inputs managed by the JX6-PROFI module. These inputs are addressed by means of output commands or via registers 11y300 through 11y363.

Care must be exercised that the number of outputs is specified before the node address is entered, since afterwards a modification is no longer possible.

Register 11y107: Node Address	
Function	**Description**
Read	Present node address
Write	New node address
Value range	2 .. 128
Value after reset	0

The node address, which the JX6-PROFI module is assigned to in the Profibus, is entered into this register.
By entering values into this register, the Profibus-ASIC (SPC3) is initialised and configured with the values contained in the registers 11y102, and 11y103. From that follows, that these two registers have to be set before the node address is specified.
Once initialisation is completed, a modification of the I/O configuration is possible not until a reset has been carried out using command 5.

Register 11y109: Firmware Version Number	
Function	**Description**
Read	Present version number
Write	illegal
Value range	23-bit-signed integer
Value after reset	Version number * 100

From this register the firmware version number of the JX6-PROFI module can be read out. The value that has been read equals the product of the version number times a hundred. Thus, value 101, for example, refers to version 1.01.

Once the JX6-PROFI module has been powered up, this register indicates, during the self test routine, the version number of the self test routine plus one thousand:

Register 11y109 = 1103
- Version 1.03
- Self test routine

During the loading routine of an OS update, this register indicates the version number of the loading routine plus two thousand:

Register 11y109 = 2103
- Version 1.03
- Loading routine

Register 11y110: I/O address of the consistent receive data	
Function	**Description**
Read	Present I/O address of the consistent receive data
Write	New address
Value range	300 … 363
Value after reset	300

Register 11y111: Address of the consistent receive data	
Function	**Description**
Read	Present address of the consistent receive data
Write	New address
Value range	200 … 263
Value after reset	200

Register 11y112: Width of the consistent receive data	
Function	**Description**
Read	Present width of the consistent receive data
Write	New width
Value range	1 … 64 for data type 1 to 4 1... 32 for data type 5 to 8
Value after reset	10

Register 11y113: I/O address of the consistent transmit data	
Function	**Description**
Read	Present I/O address of the consistent transmit data
Write	New address
Value range	400 … 463
Value after reset	400

Register 11y114: Address of the consistent transmit data	
Function	**Description**
Read	Present address of the consistent transmit data
Write	New address
Value range	200 … 263
Value after reset	230

Register 11y115: Width of the consistent transmit data	
Function	**Description**
Read	Present width of the consistent transmit data
Write	New width
Value range	1 … 64 for data type 1 to 4 1... 32 for data type 5 to 8
Value after reset	10

If, for an application, a data range is to be transmitted consistently via Profibus, this data range can be copied in the slave consistently either into, or from, a separate buffer range with the help of commands being given.
During this process, the receive data are being received by the Profibus master, while the transmit data are being transmitted to the Profibus master.

Consistent transmission and receive data are exchanged between the application program and the Profibus master in the register array of register 11y200 through 11y263. Depending on the set data type, these registers are interpreted as either byte, word, or long. In order to keep the application program as flexible as possible, the register array can be freely selected. For this purpose, there are always three registers available.

- The first register contains the start address in the I/O range,
- the second register contains the start address of the consistent range,
- the third register contains the number of the consistent data registers.

Thus, the receive data are placed starting from register 11y200, while the transmit data are placed starting from register 11y230.
The following illustrations are to explain the interplay of the registers.

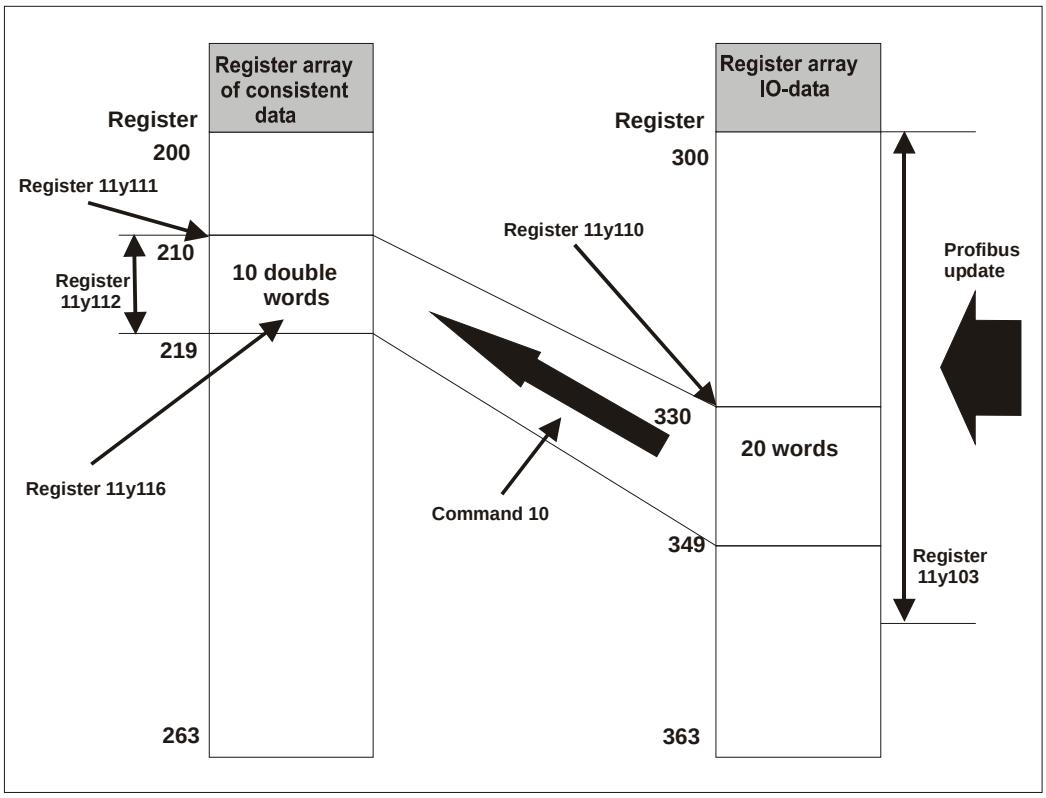


Figure 2 Copying the consistent receive data

The data of the I/O range starting from register 11y330 are copied onto the receive data registers (11y210 through 11y219) when command 10 has been given.

Example:
Receiving of consistent data:
20 register data are read out of the I/O register array starting from register 1xy330 and are written into the register array starting from register 1xy210.

```
; one-time initialising
REGISTER_LOAD (111110, 330)      ; I/O start address
REGISTER_LOAD (111111, 210)      ; address of the consistent data
REGISTER_LOAD (111112, 10)       ; width of the consistent data
REGISTER_LOAD (111116, 6)        ; data type 24-bit-signed integer

; program flow
REGISTER_LOAD (111101, 10)       ; receive data
WHEN
        BIT_SET (111100, 10)     ; data reception has been completed
THEN
COPY (10, 111210, 2000)          ; read out data
```

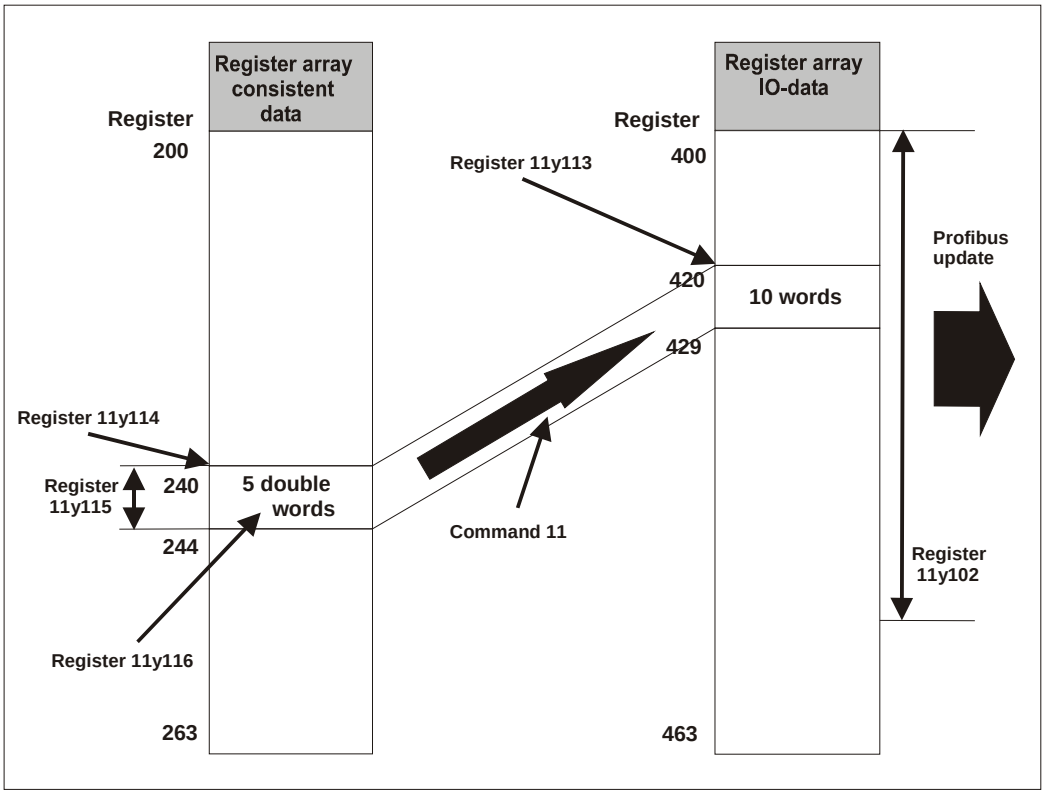


Figure 3 Copying the consistent transmit data

When command 11 is given, the receive data registers (11y240 through 11y244) will be copied into the I/O array starting from register 11y400 and then transmitted.
Access made from the application program to the respective array starting from register 11y420 should not be made any more.

Example:

Transmitting consistent data:

5 register data are read out starting from register 1xy230 and are written into the I/O array starting from register 1xy400.

```
; one-time initialising
REGISTER_LOAD (111113, 420)      ; I/O start address
REGISTER_LOAD (111114, 240)      ; address of the consistent data
REGISTER_LOAD (111115, 5)        ; width of the consistent data
REGISTER_LOAD (111116, 6)        ; data type 24-bit-signed integer

; program flow
COPY (5, 1000, 111240)           ; transmit data
REGISTER_LOAD (111101, 11)       ; transmit data
WHEN
        BIT_SET (111100, 11)     ; Data have been transmitted
THEN
```

The addresses out of register array 11y200 through 11y263 have been made available to the user. The data buffers can be placed within this array.

Register 11y116: Data type of the consistent data	
Function	**Description**
Read	Present data type
Write	Define a new data type
Value range	1 … 8
Value after reset	6

If consistent data are to be transmitted, their interpretation can be set here. This interpretation applies to all values that are to be transmitted or received.

1	unsigned char, byte, 0 ... 255
2	signed char, short integer, -128 ... +127
3	unsigned int, word, 0 ... 65535
4	signed int, -32768 ... +32767
5	unsigned 24-Bit, 0 ... +16777215
6	signed 24-Bit, -8388608 … +8388607
7	unsigned long, 0 ... +4,294,967,295
8	signed long, --2,147,483,648 ... +2,147,483,647

Transfer of the transmit and receive data of the I/O level (register 11y3zz and 11y4zz) will further be carried out by a data width of 16 Bit.

Register 11y132: Status of the DP State machine	
Function	**Description**
Read	Present status of the DP State machine
Write	illegal
Value range	0 … 255
Value after reset	0

This register shows the state of the DP state machine of the Profibus ASIC.

Register value	DP State
0	Wait_Prm
1	Wait_Cfg
2	DATA_EX

This register is only for indicating the status. Writing access to this register is not permitted.

Register 11y133: Recognized Profibus baud rates	
Function	**Description**
Read	Present recognized Profibus baud rates
Write	illegal
Value range	0 … 255
Value after reset	0

As mentioned above, the Profibus baud rate is recognised and set automatically during initialisation. The baud rate detected can be read out from this register.

Register value	Baud rate
0	12 MBaud
1	6 MBaud
2	3 MBaud
3	1.5 MBaud
4	500 kBaud
5	187.5 kBaud
6	93.75 kBaud
7	45.45 kBaud
8	19.2 kBaud
9	9.6 kBaud

This register is only for indicating the status. Writing access to this register is not permitted.

Register 11y134: Error Code	
Function	**Description**
Read	Present error code
Write	illegal
Value range	0 … 255
Value after reset	0

If an error has been detected, and bit 4 in the status register 11y100 has been set, the error type can be read out from this register. The content of this register is valid only in case of a set error bit.

Register value	Error Type
0	No error detected.
1	Wrong node address. Into register 11y107 a value has been entered exceeding the maximum permissible range of 2 .. 128
2	Wrong quantity of I/O words. Into registers 11y102/11y103, a value, exceeding the maximum permissible range, has been entered.
3	ASIC initialisation error. The Profibus interface chip could not be initialised.
4	CPU error. An access error occurred during supply of I/O data to the CPU.

Register 11y135: Status of the watchdog state machine	
Function	**Description**
Read	Present status of the watchdog state machine
Write	illegal
Value range	0 … 255
Value after reset	0

This register shows the status of the watchdog state machine of the Profibus ASIC.

Register value	Watchdog-Status
0	Baud_Search
1	Baud_Control
2	DP_Control

This register is only for indicating the status. Writing access to this register is not permitted.

Register 11y200 through 11y263: Buffer range for consistent data exchange	
Function	**Description**
Read	Present values
Write	Transfer new values
Value range	Dependent on the data type written in register 11y114
Value after reset	0

5.2 I/O Area

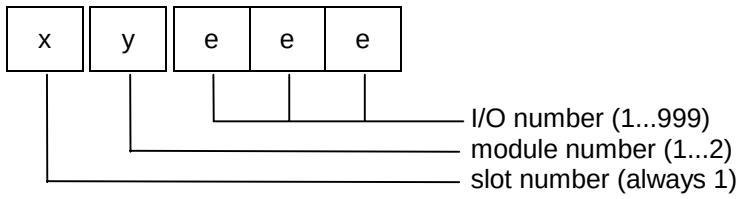
Input and output signals transmitted via Profibus are collected in the I/O area of the JX6-PROFI module.

The JX6-PROFI module establishes connection between the CPU and the Profibus master. Inputs from the Profibus master side are outputs from the CPU user side. Outputs from the Profibus master side are inputs on the CPU side.

The inputs and outputs can either be accessed individually via I/O instructions of the user program or with the help of the JetSym setup screen, or else in groups of sixteen with the help of register overlay.

5.2.1 Access to individual inputs and outputs

Access to inputs and outputs on the Profibus module is possible, in the usual way, through I/O instructions of the SYMPAS programming language. Distinction between Profibus I/O and local I/O is made by numbering of inputs, and outputs.



The I/O number consists of:

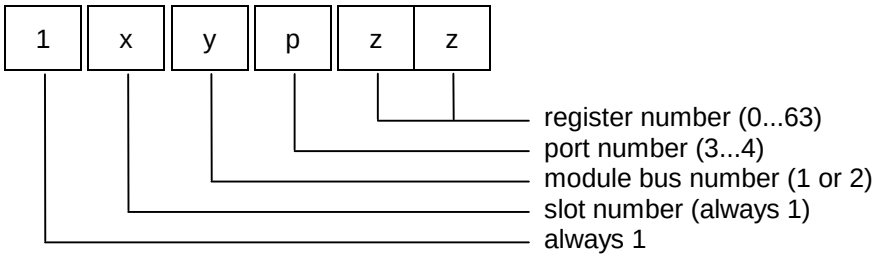
+ slot number * 10000
+ module number * 1000
+ I/O number

Here, the slot number ('x') is always 1, since, at the moment, only Profibus modules on the CPU are supported.
The module number ('y') indicates the module positions on the CPU.
The I/O number of the JX6-PROFI can amount of up to 999.

5.2.2 I/O access by register overlay

As it is the case with the registers mentioned in chapter 3.1, the numbers of module registers that are overlaid with inputs and outputs, consist of six digits, which are combined as follows:

100000
+ slot number * 10000
+ module number * 1000
+ interface number * 100
+ register number



The slot number ('x') is always 1, since, at the moment, only modules on the CPU are supported.
The module number ('y') indicates the number of the module position (1 or 2).
The interface number ('p') is to distinguish the input and output ranges. Inputs (from the CPU's point of view) are concentrated in port 3, the CPU outputs in port 4.
Finally, one of the groups of sixteen will be designed by the register number ('zz').

Receive Registers (Outputs for Profibus-DP)				**Transmit Registers (Inputs for Profibus-DP)**			
Register Number	**Inputs**			**Register Number**	**Outputs**		
11y300	1y001	..	1y016	11y400	1y001	..	1y016
11y301	1y017	..	1y032	11y401	1y017	..	1y032
11y302	1y033	..	1y048	11y402	1y033	..	1y048
11y303	1y049	..	1y064	11y403	1y049	..	1y064
11y304	1y065	..	1y080	11y404	1y065	..	1y080
11y305	1y081	..	1y096	11y405	1y081	..	1y096
11y306	1y097	..	1y112	11y406	1y097	..	1y112
11y307	1y113	..	1y128	11y407	1y113	..	1y128
11y308	1y129	..	1y144	11y408	1y129	..	1y144
11y309	1y145	..	1y160	11y409	1y145	..	1y160
11y310	1y161	..	1y176	11y410	1y161	..	1y176
11y311	1y177	..	1y192	11y411	1y177	..	1y192
11y312	1y193	..	1y208	11y412	1y193	..	1y208
11y313	1y209	..	1y224	11y413	1y209	..	1y224
11y314	1y225	..	1y240	11y414	1y225	..	1y240
11y315	1y241	..	1y256	11y415	1y241	..	1y256
11y316	1y257	..	1y272	11y416	1y257	..	1y272
11y317	1y273	..	1y288	11y417	1y273	..	1y288
11y318	1y289	..	1y304	11y418	1y289	..	1y304
11y319	1y305	..	1y320	11y419	1y305	..	1y320
11y320	1y321	..	1y336	11y420	1y321	..	1y336

Receive Registers (Outputs for Profibus-DP)				Transmit Registers (Inputs for Profibus-DP)			
Register Number	**Inputs**			**Register Number**	**Outputs**		
11y321	1y337	..	1y352	11y421	1y337	..	1y352
11y322	1y353	..	1y368	11y422	1y353	..	1y368
11y323	1y369	..	1y384	11y423	1y369	..	1y384
11y324	1y385	..	1y400	11y424	1y385	..	1y400
11y325	1y401	..	1y416	11y425	1y401	..	1y416
11y326	1y417	..	1y432	11y426	1y417	..	1y432
11y327	1y433	..	1y448	11y427	1y433	..	1y448
11y328	1y449	..	1y464	11y428	1y449	..	1y464
11y329	1y465	..	1y480	11y429	1y465	..	1y480
11y330	1y481	..	1y496	11y430	1y481	..	1y496
11y331	1y497	..	1y512	11y431	1y497	..	1y512
11y332	1y513	..	1y528	11y432	1y513	..	1y528
11y333	1y529	..	1y544	11y433	1y529	..	1y544
11y334	1y545	..	1y560	11y434	1y545	..	1y560
11y335	1y561	..	1y576	11y435	1y561	..	1y576
11y336	1y577	..	1y592	11y436	1y577	..	1y592
11y337	1y593	..	1y608	11y437	1y593	..	1y608
11y338	1y609	..	1y624	11y438	1y609	..	1y624
11y339	1y625	..	1y640	11y439	1y625	..	1y640
11y340	1y641	..	1y656	11y440	1y641	..	1y656
11y341	1y657	..	1y672	11y441	1y657	..	1y672
11y342	1y673	..	1y688	11y442	1y673	..	1y688
11y343	1y689	..	1y704	11y443	1y689	..	1y704
11y344	1y705	..	1y720	11y444	1y705	..	1y720
11y345	1y721	..	1y736	11y445	1y721	..	1y736
11y346	1y737	..	1y752	11y446	1y737	..	1y752
11y347	1y753	..	1y768	11y447	1y753	..	1y768
11y348	1y769	..	1y784	11y448	1y769	..	1y784
11y349	1y785	..	1y800	11y449	1y785	..	1y800
11y350	1y801	..	1y816	11y450	1y801	..	1y816
11y351	1y817	..	1y832	11y451	1y817	..	1y832
11y352	1y833	..	1y848	11y452	1y833	..	1y848
11y353	1y849	..	1y864	11y453	1y849	..	1y864
11y354	1y865	..	1y880	11y454	1y865	..	1y880
11y355	1y881	..	1y896	11y455	1y881	..	1y896
11y356	1y897	..	1y912	11y456	1y897	..	1y912
11y357	1y913	..	1y928	11y457	1y913	..	1y928
11y358	1y929	..	1y944	11y458	1y929	..	1y944
11y359	1y945	..	1y960	11y459	1y945	..	1y960
11y360	1y961	..	1y976	11y460	1y961	..	1y976
11y361	1y977	..	1y992	11y461	1y977	..	1y992
11y362	1y993	..	1y999	11y462	1y993	..	1y999
11y363	1009	..	1024	11y463	1009	..	1024

6 Appendices

History of changes to the manual

Revision #	Date	Name	Description of changes
1.00	29.05.97	sk	First edition for V 1.00
1.12	07.02.2002	gs	Alterations in the operating system version 1.12
1.20	04.06.2002	gs	Data exchange via consistent arrays
1.21	21.06.2002	gs	New illustrations for consistent data exchange
1.22	28.06.2002	gs	Data type default

6.1 Index of Illustrations