JetWeb

JX6-INT1

Function Description

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1 Safety Instructions

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

This preliminary information will later be replaced by an extended and corrected complete function description.

In this preliminary version, the functions of the JX6-INT1 expansion module will be described; it will also contain a function description of software version 1.20. 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	

2 Technical Data

2.1 Specifications

Mechanical and Electrical Specifications	
Power supply	+5V -4% / +4% +15V -10% / +0% -15V 0% / +10%
Connections	2 interfaces can be configured as RS232, RS485, RS422
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

2.2 Pin Assignment

Interface 1			
PIN	**RS232**	**RS422, RS485/4**	**RS485/2**
2	Transmit data Txd		
3	Receiving data Rxd		
4	RTS (Output)		
5	CTS (Input)		
7	GND	GND	GND
8		Sender D+	Data D+
9		Sender D-	Data D-
10		Recipient+	RTS+
11		Recipient-	RTS-

Interface 2			
PIN	**RS232**	**RS422, RS485/4**	**RS485/2**
15	Transmit data Txd		
16	Receiving data Rxd		
17	RTS (Output)		
18	CTS (Input)		
19	GND	GND	GND
20		Sender D+	Data D+
21		Sender D-	Data D-
22		Recipient+	RTS+
23		Recipient-	RTS-

Further Connections	
PIN	
1	occupied, do not connect
24	occupied, do not connect
25	occupied, do not connect

3 Special Protocols

The individual protocols can always be applied to both interfaces. Various special protocols can be combined.

The usage of the following protocols has been provided for:

1	PRIM
2	Bar code
3	unused
4	reserved
5	JETWay Multimaster
6	Wipotec
7	reserved
8	Mettler
9	3964R
10	JETWay Remote Scan
11	HPGL
12-19	unused

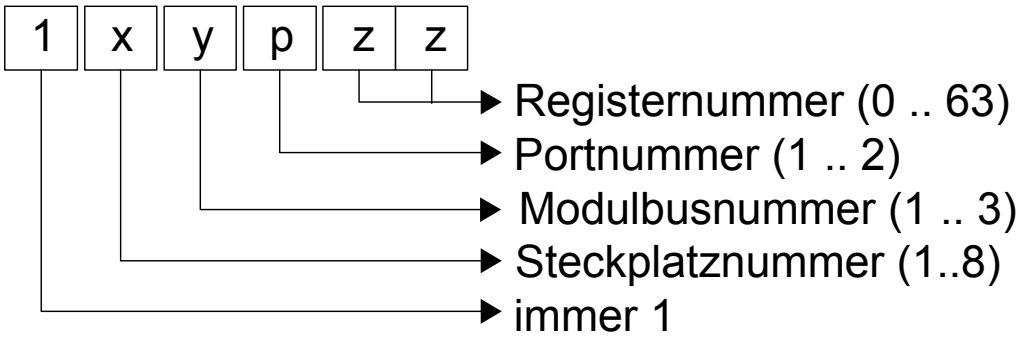
4 Software / Programming

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. The inputs and outputs being used for the RemoteScan are represented in the I/O range.

4.1 Register Array

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 bus number * 1000
+ interface number * 100
+ register number



The slot number (‘x’) is 1 to 8, as either the CPU or a controller can be inserted there.
The module bus number (‘y’) is to mark the number of the slot for the module bus (on the CPU1 it is 1 to 2, on the controller it is 1 to 3).
'P’, the number of the interface, is to distinguish between the two register ranges on the respective module. The JX6-INT1 module is equipped with two interfaces, so that this number is 1 to 2.
Finally, one of the 64 possible registers will be designed by the register number (‘z’).

Example:
Number 16 is to be written into register 7 (interface configuring) of interface 1 in module slot 2 of the CPU.

```
REGISTER_LOAD (112107, 16)
```

At the moment, the module will only function in connection with the DELTA-CPU, DELTA-CPU2 and JetControl 64x (position 1).

5 Register Definition (All Protocols)

5.1.1 Register 1xyp00: Status register

Read	Present state: State of the interface
Write	acknowledge the status
Value range	23-bit-signed integer
Value after reset	0

The status register is bit coded, i.e. a certain condition is indicated by each bit. Only individual bits can be written into by the user.

Bit Number	State	Comment
0	1	Overflow error FIFO
1	1	Parity error at reception
2	1	Frame error at reception
3	1	Receiving buffer overflow
4	1	Sending buffer overflow
6	0	Condition of the CTS (RS232) connection external device is ready to receive
7	0	Condition of the RTS (RS232) connection JX6-INT1 is ready to receive
8	0 1	Transmission is permitted Transmission has been interrupted (command 5)

5.1.2 Register 1xyp01: Command register

Read	Latest command
Write	Command to the interface
Value range	0 .. 255
Value after reset	0

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

Command	Comment
1	Set RTS connection to 1 (for RS232 only) Signalise "JX6-INT1 is not ready to receive"
2	Set RTS connection to 0 (for RS232 only) Signalise "JX6-INT1 is ready to receive"
3	Clear receiving buffer
4	Clear sending buffer
5	Interrupt transmission
6	Enable transmission

5.1.3 Register 1xyp02: Sending buffer

Read	character written last
Write	Write the character into the sending buffer, or transmit immediately
Value range	0 .. 255 (8-bit format) 0 .. 127 (7-bit format)
Value after reset	0

If the sending buffer has been cleared, the character written into this register will be transmitted immediately. If there are characters in the sending buffer, the character will be written into the buffer. If the sending buffer is full already (register 1xyp03 = 128), the character entered first will get lost.

5.1.4 Register 1xyp03: Sending Buffer Filling Level

Read	Number of characters in the sending buffer
Write	illegal
Value range	0 .. 255
Value after reset	0

5.1.5 Register 1xyp04: Receiving buffer with immediate clearing of the character that has been read

Read	Reg 1xyp06 > 0: character received next Reg 1xyp06 = 0: not defined
Write	illegal
Value range	0 .. 255 (8-bit format) 0 .. 127 (7-bit format)
Value after reset	0

When characters are received, they will, in the first instance, be stored temporarily in a receiving buffer. This procedure is similar to the transmission of characters for speed adjustment. When a character is read out of the receiving buffer via register 1xyp04, the buffer will be cleared of the character, which means it can not be read a second time. Yet, this way, the subsequent character stored in the buffer can be read.
Reading out of this register does only make sense, if the receiving buffer filling level register (1xyp06) is greater zero.

5.1.6 Register 1xyp05: Receiving buffer without immediate clearing of the character that has been read

Read	Reg 1xyp06 > 0: character received next Reg 1xyp06 = 0: not defined
Write	illegal
Value range	0 .. 255 (8-bit format) 0 .. 127 (7-bit format)
Value after reset	0

When a character is read out of the receiving buffer via register 1xyp05, the buffer will not be cleared of the character, which means it can be read a second time.
Reading out of this register does only make sense, if the receiving buffer filling level register (1xyp06) is greater zero.

5.1.7 Register 1xyp06: Receiving buffer filling level

Read	present filling level
Write	illegal
Value range	0 .. 255
Value after reset	0

The characters that are coming in via serial interface are stored temporarily in the receiving buffer, until they are fetched by the SYMPAS program. In the receiving buffer, 128 characters max. can be stored. If further characters are received, the oldest characters will be dropped, while bit 3 in the status register will be set.

5.1.8 Register 1xyp07: Interface Configuration

Read	present configuration
Write	set the interface
Value range	0 .. 255
Value after reset	16 (RS232, 8,n,1)

Bit Number	State	Comment
1,0	0,0 0,1 1,0 1,1	RS232 RS485/4 RS422 RS485/2
2	x	reserved
3	0 1	no handshake RTS/CTS handshake (for RS232 only)
5,4	0,0 0,1 1,1	7 bit, 2 stop bit 8 bit, 1 stop bit 7 bit, 1 stop bit

	1,0	9 bit, 1 stop bit (JETWay protocol)
7,6	0,0 0,1 1,1	no parity even parity odd parity

When the handshake (bit 3 = 1) is activated, the condition of a CTS connection is checked before a character is sent. Via this input, the external device can report its readiness to receive to the JX6-INT1 module. If the external device is not ready to receive any characters (CTS = 1), the characters will remain in the sending buffer of the JX6-INT1 module and will not be sent, until readiness to receive has been signalised by the CTS. For reception from the external device, the JX6-INT1 module will use the RTS signal, in order to show readiness to receive. If the received characters are not fetched by the PASE program, the RTS line will be set to 1 by the JX6-INT1 module, as soon as there is a capacity of less than 16 characters in the receiving buffer. The external device should stop the transmission then. If there is a capacity for more than 32 characters in the receiving buffer, the RTS output will be set to zero again, while the JX6-INT1 module will signalise readiness to receive again.

5.1.9 Register 1xyp08: Baud rate

Read	set baud rate
Write	setting a new baud rate
Value range	0 .. 11
Value after reset	6

Setting	Baud rate
0	150
1	300
2	600
3	1200
4	2400
5	4800
6	9600 (default)
7	19200
8	38400
9	57600
11	115200

5.1.10 Register 1xyp09: Protocol version number

The version number of selected protocol can be read out of this register. 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.

Value range	23-bit-signed integer
Value after reset	version number * 100

If the JX6-INT1 module is in the self test routine after switching on, the version number of the self test routine plus one thousand is displayed by this register.

Register 1xyp09 = 1103
- 03 — Version 1.03
- 1 — Self test routine

If the JX6-INT1 module is in the loading routine during the operating system update, the version number of the loading routine plus two thousand is displayed by this register.

Register 1xyp09 = 2103
- 03 — Version 1.03
- 2 — Loading routine

After the self test and loading routine, the version register will show the version number of the selected protocol.

5.1.11 Register 1xyp10: Protocol

Read	presently set protocol
Write	setting a new protocol
Value range	1 .. 20
Value after reset	1 (free protocol, PRIM)

Setting	Protocol
1	PRIM
2	Bar code
4	reserved
5	JETWay Multimaster
6	Wipotec
7	reserved
8	Mettler scales
9	3964 ®
10	JETWay Remote Scan
11	HPGL
12 - 20	Capacity for further protocols

5.1.12 Register 1xy162: Start-up version number

From this register the start-up version number of the JX6-INT1 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.

Read	present start-up version number
Write	illegal
Value range	23-bit-signed integer
Value after reset	version number * 100

5.1.13 Register 1xy163: Version number of the module

The version number of the JX6-INT1 module can be read out of this register. The indicated value equals to the version number times hundred. Thus, value 101, for example, refers to version 1.01.

Read	present version number of the module
Write	illegal
Value range	23-bit-signed integer
Value after reset	version number * 100

6 Special Protocol: Wipotec Scales

With the help of the protocol software on the JX6-INT1 module for communication with the WIPOTEC weighing cell it is possible to write values into the weighing cell or to read out of it by only little programming effort in the user program belonging to the CPU. For this purpose, the "secured ASCII protocol" (frame protocol) is used for data exchange.

As the firmware for the scales is based on the 'free protocol' of the JX6-INT1 module, only the additional registers and functions are described in the following documentation.

6.1 Register Description

6.1.1 Register 1xyp00: Status register

The status register is bit coded, i.e. a certain condition is indicated by each bit. Only individual bits can be written into by the user.

Read	Present state: State of the interface
Write	acknowledge the status
Value range	23-bit-signed integer
Value after reset	0

Bit Number	State	Comment
16	1	Command processing is finished At the beginning of a writing or reading activity by writing into command register 1xyp01, this bit, as well as bits 17 to 23 will be cleared. If the processing of this command is finished (on the usual way or due to an error), bit 16 will be set. If the bit has been recognized as having been set, an error that could have occurred, or some status information can be queried via bits 17 to 23. Bits 17 and 19 to 22 are only valid, if bit 16 has been set!
17	1	Timeout error This bit will be set, if no answer is sent by the weighing cell within a certain time. 1. When command register 1xyp01 is written into, a command will be sent to the scales by the JX6-INT1 module. The scales have to send a response within 200 ms (fixed time). If, after this time, a response has not arrived yet, the JX6-INT1 module will repeat the query up to two times. If after this there is still no response, the command will be cancelled by transmitting the 'EOT' signal to the scales. 2. If commands 'T' and 'W' have been given, the scales will send the reply no sooner than when standstill has been reached. If no standstill can be reached, the command will be cancelled by the INT5 transmitting 'EOT' after a time that can be set in register 1xyp20.
18	1	Wait for a response After a command has been sent to the weighing cell by the JX6-INT1, and after the command has been received by the weighing cell, bit 18 will be set. The JX6-INT1 will wait, until a response has been received by the scales. After receiving the complete response, bit 18 will be reset again.
19	1	Cancelling of the command by the scales If transmission is terminated by the scales sending the 'EOT' signal, bit 19 will be set together with bit 16.
20	1	Formatting error An error has been found in the response telegram sent by the scales.
22	1	Autotara In the reply string that is transmitted by the weighing cell, autotara has been signalled.
23	1	Standstill In the reply string that is transmitted by the weighing cell, standstill has been signalled.

6.1.2 Register 1xyp01: Command register

By writing into the command register, the respective command frame that is to be sent to the scales will be put together on the JX6-INT1 module, bits 16 to 23 will be cleared, while the telegram will be transmitted to the scales. After this, the response from the scales will be waited for by the JX6-INT1 module. The result will be available for transfer in the status register in bits 16 to 23 and in registers 1xyp11 and further.

The following commands that have been defined at the moment activate the queries given (the description of the commands for the weighing cell can be taken from the respective scales manual):

Read	Latest command
Write	Command to the interface
Value range	0 .. 255
Value after reset	0

Command	Comment	Command
10	Calibration	C
11	Request for individual weight	G
12	Request for weight reports after ring-buffer transit	N
13	Automatic adjustment of the initial load	O
14	Saving the parameters	S
15	Taring during standstill	D
16	Request for weight during standstill	W
17	Obligatory zeroing	Z
18	Reading the weighing cell identification code The identification code will be made available in the receiving buffer.	KV
19	Transmit and read the parameters for the filling algorithm	KF
20	Transmit and read only coarse and fine threshold values for the filling algorithm	KF
21	The process status of the filling algorithm is read and made available in the receiving buffer.	?
23	Filling parameters are read back and stored in registers 1xyp11 to 1xyp19.	KF
24	The serial number of the weighing cell will be read and written into register 1xyp42. The load range of the weighing cell will be read and written into register 1xyp43.	KV
25	The ring buffer time will be read out of register 1xyp32 and transmitted to the weighing cell. After this, the value will be read back out of the weighing cell and stored in register 1xyp32.	R
26	The standstill range will be read out of register 1xyp33 and transferred to the weighing cell. After this, the value will be read back and stored in register 1xyp33. The value of the load variation range will be read and written into register 1xyp34.	KB
27	The filter coefficient and the filtering order are read out of register 1xyp35 and 1xyp36 and transmitted to the weighing cell. After this, both will be read back and stored in registers 1xyp35 and 1xyp36.	Q0
28	The present temperature of the weighing cell is read out and stored in register 1xyp37.	A
29	The adjustment weight that is needed will be read and stored in register 1xyp38.	e
30	The software recognition code of the weighing cell will be read and written into register 1xyp39.	KS
31	The time T19 will be read out of register 1xyp40 and transmitted to the weighing cell. After this, the value will be read back and stored in register 1xyp40.	z
32	The change of weight, as well as the sequence status are read out by the weighing cell. The change of weight is stored in register 1xyp41, while the sequence status is stored in the receiving buffer.	d

6.1.3 Register 1xyp09: Wipotec-version number

The version number of the Wipotec protocol can be read out of this register. 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.

Value range	23-bit-signed integer
Value after reset	version number * 100

6.1.4 Register 1xyp10: Protocol

Read	presently set protocol
Write	setting a new protocol
Value range	1 .. 20
Value after reset	1 (free protocol, PRIM)

For the Wipotec scales, the protocol containing number 6 must be entered.

The interface is initialised as follows:
RS422, 8 bit/characters, 1 stop bit, odd parity.
The value written in register 1xyp07 in the scales mode is 210.

6.1.5 Register 1xyp11: Filling parameter T14

Read	presently set time T14
Write	set the new time
Value range	0 ... 8388607
Value after reset	0

The times for the filling algorithm must be entered in milliseconds [ms].

6.1.6 Register 1xyp12: Filling parameter T15

Read	presently set time T15
Write	set the new time
Value range	0 ... 8388607
Value after reset	0

The times for the filling algorithm must be entered in milliseconds [ms].

6.1.7 Register 1xyp13: Filling parameter T16

Read	presently set time T16
Write	set the new time
Value range	0 ... 8388607
Value after reset	0

The times for the filling algorithm must be entered in milliseconds [ms].

6.1.8 Register 1xyp14: Filling parameter T17

Read	presently set time T17
Write	set the new time
Value range	0 ... 8388607
Value after reset	0

The times for the filling algorithm must be entered in milliseconds [ms].

6.1.9 Register 1xyp15: Filling parameter T18

Read	presently set time T18
Write	set the new time
Value range	0 ... 8388607
Value after reset	0

The times for the filling algorithm must be entered in milliseconds [ms].

6.1.10 Register 1xyp16: Filling parameter coarse threshold

Read	presently set coarse threshold
Write	set new load
Value range	0 ... 8388607
Value after reset	0

The weight must be entered in milligram [mg].
The value is transmitted as a floating point decimal number in the 'gram' [g] unit.

6.1.11 Register 1xyp17: Filling parameter fine threshold

Read	presently set fine threshold
Write	set new load
Value range	0 ... 8388607
Value after reset	0

The weight must be entered in milligram [mg].
The value is transmitted as a floating point decimal number in the 'gram' [g] unit.

6.1.12 Register 1xyp18: Filling parameter nominal load

Read	presently set nominal load
Write	set new load
Value range	0 ... 8388607
Value after reset	0

The weight must be entered in milligram [mg].
The value is transmitted as a floating point decimal number in the 'gram' [g] unit.

6.1.13 Register 1xyp19: Filling parameter optimising factor

Read	presently set factor
Write	set the new factor
Value range	0 ... 8388607
Value after reset	0

The optimising factor is to be entered in %.

6.1.14 Register 1xyp20: Time monitoring for command 15 and 16

Read	presently set monitoring time
Write	select new monitoring time
Value range	0 (OFF) to 255 s
Value after reset	0

While standstill values are being required, standstill can possibly not be achieved. If the INT5 is waiting for a standstill value, a maximum time can be defined, after which the standstill value must have been reported by the scales. When the set time has expired, the command will be interrupted by transmitting 'EOT', while bits 16 and 17 are set in the status register.
The time is set in seconds [s].
When the register content is 0, time monitoring will not be carried out.

6.1.15 Register 1xyp21: Error message sent by the weighing cell

Read	Error message sent by the scales
Write	not useful
Value range	-8388608 ... 8388607
Value after reset	0

As a reply to a command, the weighing cell has sent back an error message. Just as the bits in the status register, the contents of register 1xyp21 is only valid, if bit 16 has been set.

6.1.16 Register 1xyp22: Response value sent by the weighing cell

Read	Response value sent by the weighing cell
Write	not useful
Value range	-8388608 ... 8388607
Value after reset	0

Depending on the respective command, a load value or a DAC value will be sent back by the weighing cell. DAC values are displayed directly; load values are displayed in milligram [mg].
The contents of register 1xyp22 are only valid, if bit 16 has been set and if register 1xyp21 = 0.

6.1.17 Register 1xyp26: Number of receive data

Read	present number of receive data
Write	not useful
Value range	0 ... 64
Value after reset	0

The number of characters forming the receive string can be read out of this register.

6.1.18 Register 1xyp27: Receive data

Read	present receive data
Write	not useful
Value range	0 .. 255
Value after reset	0

Dependent on the respective command, the response sent by the weighing cell contains the PLC I/O or the weighing cell identification code as an ASCII string.
The received characters can be read out of this register. The JX6-INT1 module will automatically increment the internal index and will supply the next register value at the next reading out process.

6.1.19 Register 1xyp28: Receive data without automatic incrementing

Read	present receive data
Write	not useful
Value range	0 .. 255
Value after reset	0

The function of this register is similar to the function of register 1xyp27. When register 1sm28 is read, the internal index of the JX6-INT1 module will not be incremented automatically, though. This is not useful, if, for example, if the data are to be checked in the setup mode. If register 1xyp27 is to be displayed here, the data index will run through to its end, as the internal index is incremented during each reading process.

6.1.20 Register 1xyp29: Receive data index

Read	present data index
Write	set a new data index
Value range	0 ... 63 (maximum = number of receive data - 1)
Value after reset	0

The internal index of the JX6-INT1 module serves for intermediate storage of the values, that have been read via registers 1xyp27 and 1xyp28, is displayed here.

6.1.21 Register 1xyp32: Ring buffer time

Read	presently set ring buffer time
Write	set the new ring buffer time
Value range	0 to 9999 ms
Value after reset	0

After giving command 25, the present ring buffer time will be read out of register 1xyp32 and transmitted to the weighing cell. After this, the ring buffer time that has been read out by the weighing cell will be read back and stored in register 1xyp32. The unit that is used in the register is [ms], which means that value 1000 in register 1xyp32 stands for 1 sec.

6.1.22 Register 1xyp33: Standstill range

Read	presently set standstill range
Write	set the new standstill range
Value range	0 ... 8388607
Value after reset	0

When command 26 has been given, the standstill range will be transmitted to the weighing cell. After this, the standstill range that has been read out by the weighing cell will be read back and stored in register 1xyp33. The unit that is used in the register is [mg], which means that value 1000 in register 1xyp33 stands for 1.0 g.

6.1.23 Register 1xyp34: Load change range

Read	presently set load change range
Write	set the new load change range
Value range	0 ... 8388607
Value after reset	0

When command 26 has been given, the load change range will be read out of the weighing cell and will be stored in register 1xyp34.

6.1.24 Register 1xyp35: Filter coefficient

Read	presently set filter coefficient
Write	set the new filter coefficient
Value range	0 ... 8388607
Value after reset	0

After giving command 27, the present value that has been read out of register 1xyp26 will be transmitted to the weighing cell. After this, the value that has been received by the weighing cell will be read back and will be stored in register 1xyp35.

6.1.25 Register 1xyp36: Filtering sequence

Read	presently set filtering sequence
Write	set the filtering sequence
Value range	0 ... 8388607
Value after reset	0

After giving command 27, the present value that has been read out of register 1xyp36 will be transmitted to the weighing cell. After this, the value that has been received by the weighing cell will be read back and will be stored in register 1xyp36.

6.1.26 Register 1xyp37: Temperature of the weighing cell

Read	present temperature of the weighing cell
Write	not useful
Value range	-8388608 ... 8388607
Value after reset	0

When command 28 has been given, the present temperature value will be read out of the weighing cell and will be stored in register 1xyp37. Value 236 stands for a temperature of 23.6 °C.

6.1.27 Register 1xyp38: Adjustment weight of the weighing cell

Read	presently set adjustment weight
Write	not useful
Value range	0 ... 8388607
Value after reset	0

When command 29 has been given, the present value of the adjustment weight will be read out of the weighing cell and will be stored in register 1xyp38. The unit that is used in the register is [mg], which means that value 1000 in register 1xyp38 stands for 1.0 g.

6.1.28 Register 1xyp39: Software identification of the scales

Read	Software identification of the scales
Write	not useful
Value range	0 ... 8388607
Value after reset	0

After giving command 30, the present value of the software identification will be read out of the weighing cell. Value 114 stands for version 1.14 of the weighing cell software.

6.1.29 Register 1xyp40: Filling parameter T19

Read	presently set time T19
Write	set the new time T19
Value range	0 ... 8388607
Value after reset	0

After giving command 31, the present value T19 will be transmitted to the weighing cell. This value will be read out of register 1xyp40 and then transmitted to the weighing cell. After this, the value will be read back out of the weighing cell and will be stored in register 1xyp40.

6.1.30 Register 1xyp41: Change of load

Read	present change of load
Write	not useful
Value range	-8388608 ... 8388607
Value after reset	0

When command 32 has been given, the present load change will be read out of the weighing cell and will be stored in register 1xyp41.

6.1.31 Register 1xyp42: Serial number of the scales

Read	present serial number
Write	not useful
Value range	-8388608 ... 8388607
Value after reset	0

When command 24 has been given, the serial number will be read out of the weighing cell and will be stored in register 1xyp42.

6.1.32 Register 1xyp43: Weighing range

Read	presently set weighing range
Write	not useful
Value range	-8388608 ... 8388607
Value after reset	0

When command 24 has been given, the present weighing range will be read out of the weighing cell and will be stored in register 1xyp43.

7 Special Protocol for Mettler Scales

With the help of the protocol software on the JX6-INT1 module for communication with the METTLER weighing cell it is possible to send commands to the weighing cell or to read out of it. The programming effort in the application program of the CPU is relatively low. For this purpose, the scales must be set to the unit 'g'. As the firmware for the scales is based on the 'free protocol' of the JX6-INT1 module, only the additional registers and functions are described in the following documentation.

By standard, the Mettler protocol is controlled by means of hardware handshake. The scales must be set to hardware handshake. For this purpose, the following wiring must be carried out, as will be shown in the example of the PB153 Mettler scales:

D-Int		Mettler-Waage
3	RxD	2
2	TxD	3
7	Gnd	5
4	RTS	4
5	CTS	6

7.1 Register Description

7.1.1 Register 1xyp00: Status register

The status register is bit coded, i.e. a certain condition is indicated by each bit. Only individual bits can be written into by the user.

Read	Present state: State of the interface
Write	acknowledge the status
Value range	23-bit-signed integer
Value after reset	0

Bit Number	State	Comment
16	1	Wait for a response When the JX6-INT1 module has received a command, bit 16 will be set. The module will transmit the command to the scales; then it will delay, until it has received a response from the scales. After receiving the complete response or a character that cannot be interpreted, bit 16 will be reset again. Special feature: For long-term measurement, bit 16 will remain set, as characters that are transmitted by the scales will constantly be waited for.
17	1	Timeout If a value greater than 0 is written into register 1xyp15, while a response from the scales is waited for by the JX6-INT1 module, bit 17 will be set, if, after expiry of the timeout-time, no character has arrived. Bit 17 will be cleared, if a new command is entered, or if a response is being waited for by the board, and if a certain character has arrived.
18	1	Command processing is finished

		At the beginning of a writing or reading activity by writing into command register 1xyp01, bits 17 to 23 will be cleared. If execution of this command has been finished correctly, bit 18 will be set.
19	1	Command has been executed successfully. If, after correct execution of the command (bit 18) bit 19 has not been set, the command could not be executed correctly by the scales, because, for example, it was occupied with calibration, or because the value exceeded the permitted range. If, during long-term measurement, a character has been received that cannot be interpreted, bit 19 will be cleared; it will not be set again, before a complete measuring value has been received and interpreted successfully.
20	1	Over-range The scales have responded to the command by '+' indicating over-range.
21	1	Underrange The scales have responded to the command by '-' indicating underrange.
22	1	Standstill value The measuring value received last has been marked as a standstill value.
23	1	Continuous measuring The JX6-INT1 module is in the continuous measuring mode.

7.1.2 Register 1xyp01: Command register

By writing into the command register, the respective command telegram that is to be sent to the scales will be put together on the JX6-INT1 module, bit 16 will be set, while bits 17 to 23 will be cleared. The telegram will be transmitted to the scales. After this, the response from the scales will be waited for by the JX6-INT1 module. The result will be available for transfer in the status register in bits 16 to 23 and in registers 1xyp11 and further.
Continuous measuring carried out by the scales must have been completed, if a command < 17 is to be transmitted to the scales.
The following commands that have been defined at the moment activate the enquiries that have been made (the description of the commands for the scales can be taken from the respective scales manual):

Read	Latest command
Write	Command to the interface
Value range	0 .. 255
Value after reset	0

Command	Comment	Command
10	Read the calibration settings	C0
11	Write the calibration settings	C0 x x
12	Calibration corresponding to the settings of the scales	C1
13	Calibration with external weight	C2
14	Calibration with internal weight	C3
15	Zeroing	Z
16	Request for weight during standstill	S
17	Start continuous measuring	SIR
18	Stop continuous measuring	SI

19	Stop in case of over- or under-range	-
20	Do not stop in case of over- or under-range	-

7.1.3 Register 1xyp09: Mettler version number

The version number of the Mettler protocol can be read out of this register. 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.

Value range	23-bit-signed integer
Value after reset	version number * 100

7.1.4 Register 1xyp10: Protocol

Read	presently set protocol
Write	setting a new protocol
Value range	1 .. 20
Value after reset	1 (free protocol, PRIM)

For the Mettler scales, the protocol containing number **8** must be entered.

7.1.5 Register 1xyp11: Calibration mode

Read	present condition of the calibration mode
Write	definition of a new calibration mode
Value range	0...3
Value after reset	0

The calibration mode is bit coded. After giving command 10, the settings of the scales can be read here. For giving command 11, the settings to be sent must be entered here.

Bit Number	State	Comment
0	0	Calibration mode = manual
0	1	Calibration mode = auto
1	0	Calibration mode = internal calibration load
1	1	Calibration mode = external calibration load

7.1.6 Register 1xyp12: Calibration Load

Read	value of the calibration load
Write	not useful
Value range	-8388608 ... +8388607
Value after reset	0

After giving command 10, the settings of the calibration load can be read here.

Example: If the scales transmit "200,000 g" as calibration load, value 200,000 will be written into register 1xyp12 after this.

7.1.7 Register 1xyp13: Latest weighing result

Read	latest weighing result
Write	not useful
Value range	-8388608 ... +8388607
Value after reset	0

Each weighing result that has been received will be written into this register. If the scales have been set to 'g' with 3 post-comma places, the unit for register 1xyp13 is 'mg'.

7.1.8 Register 1xyp14: Latest standstill value

Read	latest standstill value
Write	not useful
Value range	-8388608 ... +8388607
Value after reset	0

In this register, each weighing result will be written, that has been designated by the scales as a standstill value. If the scales have been set to 'g' with 3 post-comma places, the unit for register 1xyp14 is 'mg'.

7.1.9 Register 1xyp15: Timeout time

Read	present timeout time
Write	define a new timeout time
Value range	0 ... 16383
Value after reset	0 = timeout monitoring has been deactivated

In this register, a timeout time can be set in multiples of 1 ms. In case of reset value 0, timeout recognition is deactivated. If a value greater 0 has been entered, the timeout can be queried from bit 17 of the status register. When a timeout has been recognized, only bit 17 will be set, while the JX6-INT1 module will continue processing the frame.

7.1.10 Register 1xyp16: Decimal positions

Read	present number of decimal positions
Write	new number of decimal positions
Value range	1 ... 7
Value after reset	3

In this register, the number of decimal positions will be defined. The register must be adjusted according to the setting of the scales.

8 Special Protocol Dust 3964R

With the help of the 3964(R) procedure, together with the interfacing function 512 (RK512), a Siemens or any other compatible controller will be able to communicate with the JX6-INT1 module. In this case, the transport layer, together with telegram build-up and clearing, will be described by the 3964(R) procedure. The data level of the telegram will be described by the RK512 function of the telegram.
The communication with the Siemens protocol 3964(R) can take place for the CPU in the background via the JX6-INT1 module, while only the partner is actively transmitting, respectively reading, data, or if it is transparently processed by the PASE program.
As the protocol firmware is based on the 'free protocol' of the JX6-INT1, only the additional registers and functions are described in the following documentation.

Operating Modes:

1. Slave Operation

The communication partner will become activated by itself, will send new data and request data from the JX6-INT1 module.
The JX6-INT1 module will recognize these frames, process the data and make them available in various registers.
When the background operation mode has been activated, the operating system will recognize by the bits in the status register of the JX6-INT1 module that such a frame has been received completely. After this, registers that have been received from the JX6-INT1 module will be copied into controller-internal registers.
In case of data enquiry, the operating system will recognize that such an enquiry has been received; then, the required registers will be copied into the JX6-INT1 module. After this, the module will be informed that the data have been made available and that the answering process can be started.
The background mode is only available in the CPU.

2. Master operation

The PASE program will cause the JX6-INT1 module to transmit data or to "fetch" data from the communication partner. The JX6-INT1 module will not start up automatically, as transmission will be controlled by the program. Background processing has not been provided.
The transmission buffer must be filled by the PASE program. Transmission to the slave will be started by giving the respective command.
The same way data will be requested. When the reply data arrive, the JX6-INT1 module will react the same way, as if it were a slave receiving a data frame of another master (data can be saved via background). A bit in the status register will signalise to the program that the response has been saved.

Description of the Registers

The DUST 3964(R) protocol will be activated by writing value **9** into **register 1xyp09.** After reset, value 1 (free protocol is activated) will be written into the register by default.

8.1 Register Description

8.1.1 Register 1xyp00: Status register

The status register is bit coded, i.e. a certain condition is indicated by each bit. Only individual bits can be written into by the user.

Read	Present state: State of the interface
Write	acknowledge the status
Value range	23-bit-signed integer
Value after reset	0

Bit Number	State	Comment
16	1	Receive data on the JX6-INT1 are available. Receive data on the JX6-INT1 are available and can be fetched by the CPU. This can be carried out in the background without a PASE program.
17	1	Request for transmission data: Transmit data have been required and must be transferred from the CPU to the JX6-INT1. This can be carried out in the background without a PASE program.
18	1	Receive data are available on the CPU. The data received from the partner have been transmitted to the CPU by the JX6-INT1 module. This can be evaluated by the PASE program, in order to recognize the arrival of new data. Bit 18 will be cleared again by giving command 24.
19	1	Data have been transmitted. The data to be transmitted to the partner by the JX6-INT1 module have been transferred. Bit 19 will be cleared again by giving command 24.

8.1.2 Register 1xyp01: Command register

Read	Latest command
Write	Command to the interface
Value range	0 .. 255
Value after reset	0

Command	Comment
20	Background operation: Receive data have been read completely. Status bit 16 is cleared, while status bit 18 is set.
21	Background operation: Transmit data have been transferred to the JX6-INT1 completely. Status bit 17 is cleared, while the frame is transferred.
22	Master operation: Transmit request of data to the slave
23	Master operation: Transmit data telegram to the slave
24	Clear bit 18 and bit 19
26	Transmit via transmit window

	The values written in the transmit window are written in the sending buffer and the frame is transmitted.

8.1.3 Register 1xyp09: Dust version number

The version number of the DUST protocol can be read out of this register. 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.

Value range	23-bit-signed integer
Value after reset	version number * 100

8.1.4 Register 1xyp10: Protocol

Read	presently set protocol
Write	setting a new protocol
Value range	1 .. 20
Value after reset	1 (free protocol, PRIM)

For the DUST protocol, number **9** must be entered.

8.1.5 Register 1xyp11: Protocol Error

Read	last protocol error
Write	clearing a protocol error
Value range	0 ... 65535
Value after reset	0

At the moment, the errors listed below can be recognized by the protocol and stored in this register. The value of the error will remain until it is overwritten by another error, or until it will be overwritten with zero by the PASE program.

4	register address not in permissible range (1xyp17 min range, 1xyp18 max range)
5	telegram not defined
1000	timeout waiting acknowledge telegram from slave
1010	timeout waiting for checksum
1011	wrong checksum
1012	timeout between two characters
1013	internal puffer overflow, last character = DLE
1014	no ETX at end of telegram
1015	internal puffer overflow
1020	timeout start-DLE from partner while sending telegram
1021	no DLE/NAK as response to STX while sending
1022	timeout end-DLE from partner while sending telegram
1023	no DLE/NAK at end from partner while sending telegram
1030	telegram not worn out (pending bit 16 or bit 17)
1031	no start STC/NAK from partner
1032	no start STX/NAK as acknowledge from partner
1034	error message in acknowledge telegram form slave

8.1.6 Register 1xyp12: Maximum character delay time

Read	present character delay time
Write	define a new character delay time
Value range	0 ... 65535
Value after reset	500 (in milliseconds)

The time between receiving one character and the next is controlled by the Siemens protocol. This character delay time can also be set via register 1xyp12. The default value is 0.5 seconds.

8.1.7 Register 1xyp13: Maximum DLE (Data Link Escape) delay time

Read	present DLE delay time
Write	define a new DLE delay time
Value range	0 ... 65535
Value after reset	2500 (in milliseconds)

Maximum delay time, until the partner has got to react with DLE at the beginning/at the end of the frame. The default value is 2.55 seconds.

8.1.8 Register 1xyp14: Maximum number of transmission repetitions

Read	present number of transmission repetitions
Write	defining a new number of transmission repetitions
Value range	0 ... 255
Value after reset	4

If the JX6-INT1 module tries to transmit a frame, the number of attempts that are to be made in case of failed connections, can be set in this register.

8.1.9 Register 1xyp15: Type of transfer data

Read	present data type
Write	define a new data type
Value range	1 ... 8
Value after reset	3 (unsigned int)

If certain values are to be transmitted, their interpretation can be set here. This interpretation applies to all values of the telegrams that are to be transmitted or received.

	unsigned char, byte, 0 ... 255
2	signed char, short integer, -128 ... +127
3	unsigned int, word, 0 ... 65535 (default)
4	signed int, -32768 ... +32767
	unsigned long, 0 ... +4,294,967,295 Only 24-bit data can be addressed by the PASE program.
8	signed long, -2,147,483,648 ... +2,147,483,647 Only 24-bit data can be addressed by the PASE program.

Transfer on telegram level generally takes place in 16 bit data width.

8.1.10 Register 1xyp16: 3964-Configuration

Read	present configuration
Write	define a new configuration
Value range	0 ... 1
Value after reset	0 (without test sum)

The Siemens protocol can be used with or without a test sum:

0 without test sum (default)
1 with test sum

8.1.11 Register 1xyp17: Lower limit for register addressing

Read	present lower limit
Write	define a new lower limit
Value range	0 ... 20479
Value after reset	0

Here, the range can be defined, in which registers are allowed to be received/transmitted. If value 100 is written into this register, only registers containing value 100 or a value greater 100 can be sent/received. If there is a register value in a frame that is outside this defined range, the frame will be refused, while error 4 is reported.

8.1.12 Register 1xyp18: Upper limit for register addressing

Read	present upper limit
Write	define a new upper limit
Value range	0 ... 20479
Value after reset	20479

Here, the range can be defined, in which registers are allowed to be received/transmitted. If value 400 is written into this register, only registers up to value 400 can be sent/received. If there is a register value in a frame that is outside this defined range, the frame will be refused, while error 4 is reported.

8.1.13 Register 1xyp19: Priorities for the establishing of connections

Read	present priority
Write	define a new priority
Value range	0 ... 1
Value after reset	0 (low priority)

Here, the priority of the JX6-INT1 module for establishing connections can be defined:

0 low priority (default)
1 high priority

8.1.14 Register 1xyp20: First sending address

Read	present first sending address
Write	define a new first sending address
Value range	0 ... 65535
Value after reset	0

First register, for which data are sent or required by the master.

8.1.15 Register 1xyp21: Number of transmit data

Read	present number of transmit data
Write	defining a new number of transmit data
Value range	0 ... 128 at data type = byte or word 0 ... 64 at data type = long
Value after reset	0

8.1.16 Register 1xyp22: Transmit data

Read	transmit data that have been entered
Write	Write transmit data to the JX6-INT1
Value range	-8388608 ... +8388607
Value after reset	0

The data that have to be sent must be written in this register. Starting with the first register that is to be sent (register 1xyp20), the number of registers to be sent (value in register 1xyp21) must be entered. The JX6-INT1 module will automatically increment the internal index for temporary storage. In master mode, the parameters "first transmit register" and "number of transmit data" must have been set correctly beforehand.

8.1.17 Register 1xyp23: Transmit number of transmissions for transmission via transmit window

Read	present number of transmissions
Write	change the number of transmissions
Value range	0 ... 32
Value after reset	0

The number of data transmissions that are to be made out of the transmit window is to be written into this register. See register 1sm400 ff.

8.1.18 Register 1xyp24: Data index for transmission

Read	present data index
Write	set a new data index
Value range	0 ... 127 (maximum = number of transmit data - 1)
Value after reset	0

Here, the internal index of the JX6-INT1 module will be displayed, which will automatically be incremented, when the values of the registers that are to be sent are transmitted.

8.1.19 Register 1xyp25: First receiving address

Read	present first receiving address
Write	define a new first receiving address
Value range	0 ... 20479
Value after reset	0

The first register, for which a new value has been received or requested from the slave.

8.1.20 Register 1xyp26: Number of receive data

Read	present number of receive data
Write	define a new number of receive data
Value range	0 ... 128 at data type = byte or word 0 ... 64 at data type = long
Value after reset	0

8.1.21 Register 1xyp27: Receive data

Read	present receive data
Write	not useful
Value range	-8388608 ... +8388607
Value after reset	0

The received data can be read out of this register. Starting from the first register that has been received (register 1xyp25), the number of received registers (value in register 1xyp26) must be read out. The JX6-INT1 module will automatically increment the internal index and will supply the next register value at the next reading out process.

8.1.22 Register 1xyp28: Receive data without automatic incrementing

Read	present receive data
Write	not useful
Value range	-8388608 ... +8388607
Value after reset	0

The function of this register is similar to the function of register 1xyp27. When register 1sm28 is read, the internal index of the JX6-INT1 module will not be incremented automatically for intermediate saving of the values, though. This is not useful, if, for example, if the data are to be checked in the setup mode. If register 1xyp27 is to be displayed here, the data index will run through to its end, as the internal index is incremented during each reading process.

8.1.23 Register 1xyp29: Receive data index

Read	present data index
Write	set the new data index
Value range	0 ... 127 (maximum = number of receive data - 1)
Value after reset	0

The internal index of the JX6-INT1 module serves for intermediate storage of the values, that have been read via registers 1xyp27 and 1xyp28, is displayed here.

8.1.24 Register 1sm300: First byte in the receiving window

First byte of the receiving buffer for DEBUGGING. Out of this and the following registers, the first 32 byte of the receiving buffer can be read.
Registers 1sm300 through 1sm331 have been assigned to port 1, while registers 1sm332 through 1sm363 have been assigned to port 2.

8.1.25 Register 1sm400: First byte in the transmit window

First byte of the sending buffer for DEBUGGING. In this and the following registers, a transmission telegram of 32 byte max. can be put together and transmitted by giving command 26.
Registers 1sm400 through 1sm431 have been assigned to port 1, while registers 1sm432 through 1sm463 have been assigned to port 2.

8.2 Background mode

In background mode, the operating system must be informed of the slot number for the JX6-INT1 module. For this purpose, the port number must be written into the background register as will be described below.
For background mode, the DELTA-CPU, version 2.16, will be needed.

8.2.1 Register 62160: Slot 1 for background mode

Read	present slot 1
Write	define the new slot 1
Value range	0, 111 ... 832
Value after reset	0

0 means that the background mode has been deactivated.

8.2.2 Register 62161: Slot 2 for background mode

Read	present slot 2
Write	define the new slot 2
Value range	0, 111 ... 832
Value after reset	0

0 means that the background mode has been deactivated.

8.2.3 Register 62162: Slot 3 for background mode

Read	present slot 3
Write	define the new slot 3
Value range	0, 111 ... 832
Value after reset	0

0 means that the background mode has been deactivated.

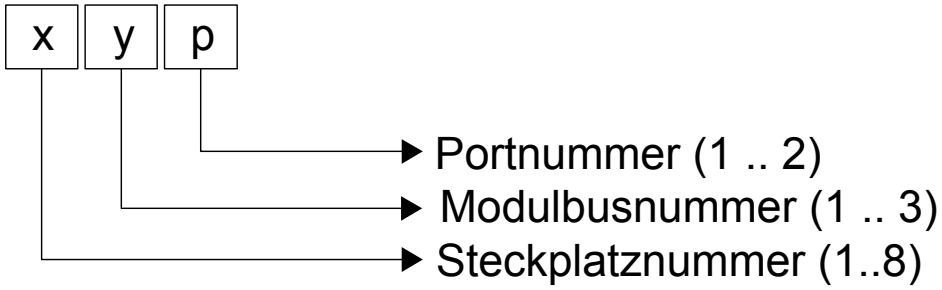
8.2.4 Register 62163: Slot 4 for background mode

Read	present slot 4
Write	define the new slot 4
Value range	0, 111 ... 832
Value after reset	0

0 means that the background mode has been deactivated.

8.2.5 Design of the slot for background mode

For background mode, the slot number of the JX6-INT1 module must be written into the background registers. The slot number consists of the following elements:



For initialising, the following program code can be used:

8.2.6 Priority of the background mode

With the help of special flag 2116, the priority of the background mode can be changed.

FLAG 2116	
0	Call-up of the background query after each task
1	Call-up of the background query only after task 0
Value after reset	0

8.2.7 Functioning of the background mode

```
REGISTER_LOAD (112110, 9)       ;activate 3964
REGISTER_LOAD (112115, 3)       ;data type unsigned word
REGISTER_LOAD (112116, 1)       ;3964R, with test sum
REGISTER_LOAD (112117, 0)       ;lower limit register 0
REGISTER_LOAD (112118, 400)     ;upper limit of register 400
REGISTER_LOAD (62160, 121)      ;JX6-INT1 in slot 121
```

The instructions may only be run through once when the CPU is started. In the example, the first interface of the JX6-INT1 module on the CPU has been placed on module bus port no. 2.

After giving these instructions, communication can take place via 3964R (with test sum) through the first interface with 9600 Baud, 8 data bits, 1 stop bit, without parity. In background mode, 128 data byte max. (123 data words, 61 data longs) can be sent (FETCH from S5 side), respectively received (SEND from S5 side) in a TGM. Depending on the data evaluation (data type, register 1xyp15), these are written into/read out of the respective registers.

If, for evaluation, "byte" or "short integer" is called up, each data word will be transferred to 2 PASE registers. In case of evaluation "Long", 2 data words are transferred to 1 PASE register.

The CPU operating system will process the following JetSym program in the "background" (the JetSym program need not be programmed by the user):

```
IF
        BIT_SET (1xyp00, 16)
 THEN
        RECEIVE_JX6_INT
IF
        BIT_SET (1xyp00, 17)
 THEN
        SEND_D_INT
```

The functions RECEIVE-D-INT and SEND_D_INT roughly look like this:

```
DEF_FUNCTION "RECEIVE_D_INT"
        Parameters: None
        Local variables: rAmount, rPointer

        REGISTER_LOAD (rAmount, @1xyp26)]
        REGISTER_LOAD (rPointer, @1xyp25)
        ; The data index is ready on 0
LABEL Loop
        REGISTER_LOAD (@rPointer), @(1xyp27)]
        REG_DEC(rAmount)
        REG_INC(rPointer)
 IF
        REG(rAmount)
 THEN
        GOTO Loop
 THEN
        REGISTER_LOAD (1xyp01, 20)          ; Ready
        RETURN
END_DEF

DEF_FUNCTION "SEND_D_INT"
        Parameters: none
        Local variables: rAmount, rPointer

        REGISTER_LOAD (rPointer, @1xyp20)
        REGISTER_LOAD (rAmount, @1xyp21)
        ; Data index ready on 0
LABEL Loop
        REGISTER_LOAD (1xyp22, @@rPointer)]
        REG_DEC(rAmount)
        REG_INC(rPointer)
 IF
        REG(rAmount)
 THEN
        GOTO Loop
 THEN
        REGISTER_LOAD (1xyp01, 21)          ; Ready
        RETURN
END_DEF
```

8.3 Master operation

8.3.1 Transmit data telegram to the slave

For initialising, the following program code can be used:

```
        REGISTER_LOAD (1xyp09, 9)          ;activate 3964
        REGISTER_LOAD (1xyp15, 3)          ;Data type unsigned word
        REGISTER_LOAD (1xyp16, 1)          ;3964R, with test sum
```

A data frame will be transmitted to the slave the following way: When the data frame has been acknowledged by the slave, bit 19 will be set in the status register. In master operation with transmit-telegram, the background mode cannot be applied.

```
        REGISTER_LOAD (1xyp20, 2000)       ; erste Sendeadresse
        REGISTER_LOAD (1xyp21, 5)          ; Anzahl Sendedaten
        REGISTER_LOAD (1xyp24, 0)          ; transmission index
        REGISTER_LOAD (1xyp22, rValue1)    ; transmit data
        REGISTER_LOAD (1xyp22, rValue2)
        REGISTER_LOAD (1xyp22, rValue3)
        REGISTER_LOAD (1xyp22, rValue4)
        REGISTER_LOAD (1xyp22, rValue5)
        REGISTER_LOAD (1xyp01, 23)         ; transmit data telegram
WHEN
        BIT_SET (1xyp00, 19)
        OR
        REG 1xyp11
THEN
IF
        REG 1xyp11
THEN
        ; error handling
ELSE
        REGISTER_LOAD (1xyp01, 24)         ; clear bits 18 and 19
```

8.3.2 Call for data telegram from the slave

For initialising, the following program code can be used:

```
        REGISTER_LOAD (1xyp09, 9)          ; activate 3964
        REGISTER_LOAD (1xyp15, 3)          ; data type unsigned word
        REGISTER_LOAD (1xyp16, 1)          ; 3964R, with check sum
```

A data frame will be requested from the slave the following way: When the data frame has been transmitted by the slave, bit 16 will be set in the status register. A background mode cannot be applied in master operation, if the register range of the slave is unequal to the register range of the master.

```
        REGISTER_LOAD (1xyp25, 2000)       ; addressing in the slave
        REGISTER_LOAD (1xyp26, 5)          ; amount of receive data
        REGISTER_LOAD (1xyp01, 22)         ; request data telegram
WHEN
        BIT_SET (1xyp00, 16)               ; see background mode
THEN
        REGISTER_LOAD (rPointer, 2000)
        REGISTER_LOAD (rAmount, 5)
        ; Data index ready on 0
LABEL Loop
        REGISTER_LOAD (@(rPointer), @(1xyp27)     ; receive data
        REG_DEC (rAmount)
IF
        REG rAmount
THEN
        GOTO Loop
THEN
        ; ready
```

For the background mode, one of the background registers must be set accordingly. After successful processing in background mode, bit 18 in the status register must be queried by the user program.

9 Special Protocol Remote Scan

9.1 I/O Range for Remote Scan

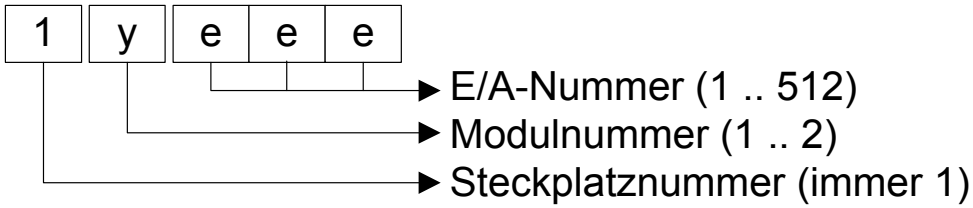
In the I/O range of the JX6-INT1 module, the inputs and outputs that have been transmitted by Remote Scan are combined.

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. Access to the I/O range is only possible, if the JX6-INT1 module is on the CPU.

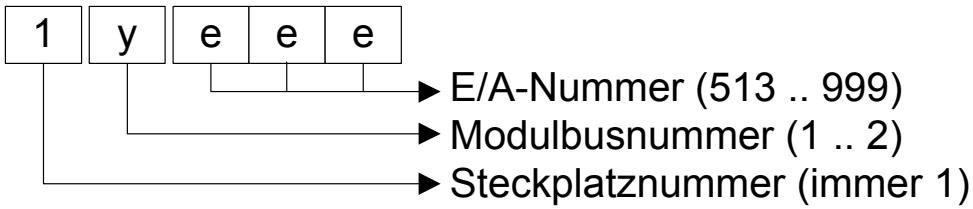
9.1.1 Access to individual inputs and outputs

Access to the inputs and outputs of the JX6-INT1 module can be made as usual with the help of the I/O instructions in the JetSym language. JX6-INT1 I/O and local I/O can be distinguished by the input and output numbering.

9.1.2 Input and output access to port 1



9.1.3 Input and output access to port 2



The I/O number consists of:

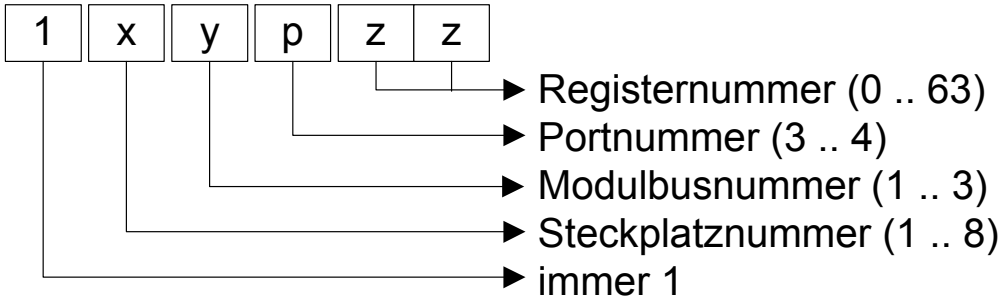
10000
+ module bus number * 1000
+ I/O number

The module bus number ('y') marks the module bus slot on the CPU. The I/O numbers 1 through 512 of the JX6-INT1 are assigned to port1, the I/O numbers 513 through 999 are assigned to port2.

9.1.4 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 bus number * 1000
+ interface number * 100
+ register number



The slot number ('x') is 1 to 8. The module bus number (y) is to mark the number of the module bus slot (1 to 3). The interface number ('p') is to distinguish the input and output ranges. The inputs have been united in port 3, the outputs in port 4. Finally, one of the groups of sixteen will be designed by the register number ('z').Register numbers 0 through 31 have been assigned to port 1, register numbers 32 to 63 have been assigned to port 2.

Input and output overlay							
Register number	**Inputs**			**Register number**	**Outputs**		
1xy300	1y001	..	1y016	1xy400	1y001	..	1y016
1xy301	1y017	..	1y032	1xy401	1y017	..	1y032
1xy302	1y033	..	1y048	1xy402	1y033	..	1y048
1xy303	1y049	..	1y064	1xy403	1y049	..	1y064
1xy304	1y065	..	1y080	1xy404	1y065	..	1y080
1xy305	1y081	..	1y096	1xy405	1y081	..	1y096
1xy306	1y097	..	1y112	1xy406	1y097	..	1y112
1xy307	1y113	..	1y128	1xy407	1y113	..	1y128
1xy308	1y129	..	1y144	1xy408	1y129	..	1y144
1xy309	1y145	..	1y160	1xy409	1y145	..	1y160
1xy310	1y161	..	1y176	1xy410	1y161	..	1y176
1xy311	1y177	..	1y192	1xy411	1y177	..	1y192
1xy312	1y193	..	1y208	1xy412	1y193	..	1y208
1xy313	1y209	..	1y224	1xy413	1y209	..	1y224
1xy314	1y225	..	1y240	1xy414	1y225	..	1y240
1xy315	1y241	..	1y256	1xy415	1y241	..	1y256
1xy316	1y257	..	1y272	1xy416	1y257	..	1y272
1xy317	1y273	..	1y288	1xy417	1y273	..	1y288
1xy318	1y289	..	1y304	1xy418	1y289	..	1y304
1xy319	1y305	..	1y320	1xy419	1y305	..	1y320
1xy320	1y321	..	1y336	1xy420	1y321	..	1y336

1xy321	1y337	..	1y352	1xy421	1y337	..	1y352
1xy322	1y353	..	1y368	1xy422	1y353	..	1y368
1xy323	1y369	..	1y384	1xy423	1y369	..	1y384
1xy324	1y385	..	1y400	1xy424	1y385	..	1y400
1xy325	1y401	..	1y416	1xy425	1y401	..	1y416
1xy326	1y417	..	1y432	1xy426	1y417	..	1y432
1xy327	1y433	..	1y448	1xy427	1y433	..	1y448
1xy328	1y449	..	1y464	1xy428	1y449	..	1y464
1xy329	1y465	..	1y480	1xy429	1y465	..	1y480
1xy330	1y481	..	1y496	1xy430	1y481	..	1y496
1xy331	1y497	..	1y512	1xy431	1y497	..	1y512
1xy332	1y513	..	1y528	1xy432	1y513	..	1y528
1xy333	1y529	..	1y544	1xy433	1y529	..	1y544
1xy334	1y545	..	1y560	1xy434	1y545	..	1y560
1xy335	1y561	..	1y576	1xy435	1y561	..	1y576
1xy336	1y577	..	1y592	1xy436	1y577	..	1y592
1xy337	1y593	..	1y608	1xy437	1y593	..	1y608
1xy338	1y609	..	1y624	1xy438	1y609	..	1y624
1xy339	1y625	..	1y640	1xy439	1y625	..	1y640
1xy340	1y641	..	1y656	1xy440	1y641	..	1y656
1xy341	1y657	..	1y672	1xy441	1y657	..	1y672
1xy342	1y673	..	1y688	1xy442	1y673	..	1y688
1xy343	1y689	..	1y704	1xy443	1y689	..	1y704
1xy344	1y705	..	1y720	1xy444	1y705	..	1y720
1xy345	1y721	..	1y736	1xy445	1y721	..	1y736
1xy346	1y737	..	1y752	1xy446	1y737	..	1y752
1xy347	1y753	..	1y768	1xy447	1y753	..	1y768
1xy348	1y769	..	1y784	1xy448	1y769	..	1y784
1xy349	1y785	..	1y800	1xy449	1y785	..	1y800
1xy350	1y801	..	1y816	1xy450	1y801	..	1y816
1xy351	1y817	..	1y832	1xy451	1y817	..	1y832
1xy352	1y833	..	1y848	1xy452	1y833	..	1y848
1xy353	1y849	..	1y864	1xy453	1y849	..	1y864
1xy354	1y865	..	1y880	1xy454	1y865	..	1y880
1xy355	1y881	..	1y896	1xy455	1y881	..	1y896
1xy356	1y897	..	1y912	1xy456	1y897	..	1y912
1xy357	1y913	..	1y928	1xy457	1y913	..	1y928
1xy358	1y929	..	1y944	1xy458	1y929	..	1y944
1xy359	1y945	..	1y960	1xy459	1y945	..	1y960
1xy360	1y961	..	1y976	1xy460	1y961	..	1y976
1xy361	1y977	..	1y992	1xy461	1y977	..	1y992
1xy362	1y993	..	1y999	1xy462	1y993	..	1y999
1xy363	-	..	-	1xy463	-	..	-

Inputs and outputs 1 through 512 have been assigned to port 1, inputs and outputs 513 through 999 have been assigned to port 2.

9.2 Register Description

9.2.1 Register 1xyp00: Status register

The status register is bit coded, i.e. a certain condition is indicated by each bit. Only individual bits can be written into by the user.

Read	present condition of the interfaces
Write	acknowledge the status
Value range	23-bit-signed integer
Value after reset	0

Bit Number	State	Comment
16	1	Input data are valid. After activating the scan by giving command 14, bit 16 should be waited for, before the inputs are accessed in the user program.
17	1	The scan cycle has been activated. Inputs are read, outputs are written.
21	1	A timeout error has occurred.
22	1	A test sum error has occurred.
23	1	An error message sent by the slave has been received.

9.2.2 Register 1xyp01: Command register

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

Read	Latest command
Write	Command to the interface
Value range	0 .. 255
Value after reset	0

Command	Comment
10	Deactivate all outputs. All output registers are set to zero by giving this command.
11	Activate all outputs. All output registers are set to one by giving this command.
13	Scan STOP. After giving this command, no outputs will be written to the network slaves and no inputs will be called up. Bit 17 in the status register will be reset.
14	Scan START. After selecting the "Remote Scan" mode via register 1xyp10, the output registers must be properly assigned first. Then the Scan cycle can be started by giving this command.

9.2.3 Register 1xyp09: Remote-Scan version number

The version number of the Remote Scan protocol can be read out of this register. 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.

Value range	23-bit-signed integer
Value after reset	version number * 100

9.2.4 Register 1xyp10: Protocol

Read	presently set protocol
Write	setting a new protocol
Value range	1 .. 20
Value after reset	1 (free protocol, PRIM)

For the JETWay Remote Scan, the protocol containing number **10** must be entered.

9.2.5 Register 1xyp12: Latest slave number

Read	Number of the latest network slave
Write	Defining the network number of the latest slave
Value range	2 .. 25
Value after reset	2

The Scan function starts with processing in the slave that has been given network number 2. In **ascending and complete order of the network numbers,** the following slaves will be processed, until the network number of this register has been reached. After this, the next cycle will be started again at number 2.

Example: In a network containing three ”Remote D32”, network numbers 2, 3 and 4 must be entered by the remotes. This means that 4 must be written into register 1xyp12.

9.2.6 Register 1xyp13: Timeout register

Read	present timeout time
Write	Set the monitoring time
Value range	1 .. 65535
Value after reset	25 (25ms)

The monitoring time for a network access must be set here. If, after accessing a network slave, no answer has arrived on the JX6-INT1 after the set time, and if accessing has been repeated the set number of times, bit 21 will be set in the status register, while register 1xyp14 will receive the network number of the slave. The time is to be entered in multiples of 1 millisecond.

9.2.7 Register 1xyp14: Number of repetitions

Read	Number of repetitions in case of a network error
Write	New number of repetitions
Value range	0 .. 255
Value after reset	0

When a network error occurs, register xyp15 will be incremented, while network access will repeated as often as has been defined in register 1xyp19. Even, if network access could not be finished successfully, the corresponding error bit will be set in the status register.

9.2.8 Register 1xyp15: Total number of network errors

Read	Total number of network errors
Write	only clearing makes sense
Value range	0 .. 65536
Value after reset	0

With each network error that has occurred, this register will be incremented. Setting the error bits 21 to 23 will not be carried out, unless the number of repetitions set in register 1xyp14 has been successful.

9.2.9 Register 1xyp16: Number of network errors

Read	Number of network errors
Write	Delete the number of errors
Value range	0 .. 65535
Value after reset	0

When a network error occurs, network access will repeated as often as has been defined in register 1xyp14. Even, if network access could not be finished successfully, the corresponding bit will be set in the status register, which will be incremented by 1.

9.2.10 Register 1xyp17: Slave network number in case of an error

Read	Slave network number in case of an error
Write	not useful
Value range	0 .. 25
Value after reset	0

In case of a network error, the number of the network slave will be written in the register, where the error has occurred.

9.2.11 Register 1xyp18: Output configuring

Read	presently set output configuring
Write	define a new output configuring
Value range	-8388608 .. +8388607 (bit-coded)
Value after reset	-1 (all bits have been set)

This register is bit coded. Each bit of this 24-bit register is assigned to the setting of one slave. A set bit (= 1) in this register means, that input conditions are taken from this slave, while output conditions will be written. When a bit has been cleared, only the inputs will be written.
Independently from this register, a network slave will occupy the number of inputs and outputs that has been set in register 1xyp19.

The following assignment applies:
Bit 0 Slave no. 2
Bit 1 Slave no. 3
... ...
Bit 23 Slave no. 25

9.2.12 Register 1xyp19: Number of inputs and outputs

Read	presently set number of inputs and outputs
Write	set a new number of inputs and outputs
Value range	-8388608 .. +8388607
Value after reset	0 (all bits have been cleared, only slaves of 16)

This register is bit coded. Each bit of this 24-bit register is assigned to the setting of one slave. The number of inputs and outputs that have been occupied by the respective network slave can be written into this register. 16 or 32 inputs and outputs can be occupied by one slave. One set bit stands for 32 I/O, one cleared bit stands for 16 I/O.
Please make sure that the number of I/Os is not exceeded! Per interface, there are 512 I/Os available.

9.2.13 Register 1xyp20: Dummy list

Read	presently set dummy list
Write	set a new dummy list
Value range	-8388608 .. 8388607
Value after reset	0 (all bits have been cleared)

This register is bit coded. Each bit of this 24-bit register is assigned to the setting of one slave.
A cleared bit (= 0) in this register means, that input conditions are taken from this slave, while probably output conditions will be written. When a bit has been set (=1), this (Dummy) module will not be addressed.
Independently from this register, a network slave will occupy the number of inputs and outputs that has been set in register 1xyp19.
The following assignment applies:

Bit 0 Slave no. 2
Bit 1 Slave no. 3
Bit 23 Slave no.25

9.2.14 Register 1xy300 to 1xy363 : Input registers

Read	Conditions of the inputs 1 to 999
Write	not useful
Value range	0 .. 65535
Value after reset	0

The input registers are assigned to the two interfaces of the JX6-INT1 as follows:

Port 1	1xy300 through 1xy331
Port 2	1xy332 through 1xy363

Each of these registers contains 16 inputs; which can be read out by the corresponding network slaves in cyclic mode.

The following assignment applies:
Register 1xy300 Inputs 1 through 16
Register 1xy301 Inputs 17 through 32
etc.

In this case, bit 0 refers to input 1, while bit 15 refers to input 16.
Before the inputs are called up in the user program, bit 16 should have been set in the status register first, when command 14 has been given.

9.2.15 Register 1xy400 to 1xy463 : Output registers

Read	Conditions of the outputs 1 to 999
Write	Activating one or several outputs
Value range	0 .. 65535
Value after reset	0

The output registers are assigned to the two interfaces of the JX6-INT1 as follows:

Port 1	1xy400 through 1xy431
Port 2	1xy432 through 1xy463

Each of these registers contains 16 outputs; which can be read out by the corresponding network slaves in cyclic mode.

The following assignment applies:
Register 1xy400 Outputs 1 through 16
Register 1xy401 Outputs 17 through 32
etc.

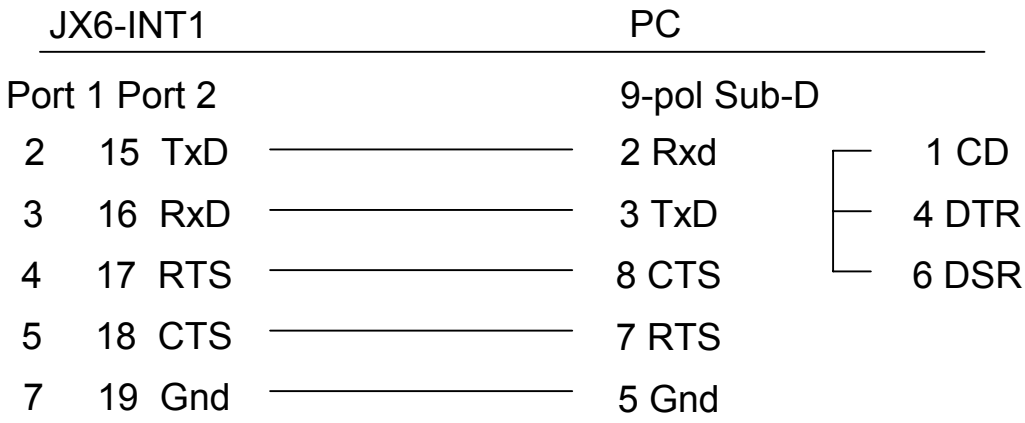
In this case, bit 0 refers to output 1, while bit 15 refers to output 16.

10 Special Protocol HPGL

The HPGL protocol is a special software for the interface module JX6-INT1. It serves for interpreting the plotter language HP-GL. The same specification registers as apply for the free protocol PRIM apply to the interfaces as well.

In the protocol, the individual commands are separated by semicolon or some similar punctuation mark, while the individual parameters are separated by comma.
The HPGL protocol is initialised by 9600, 8, n, 1 and hardware flow control. Please mind that the PC software must have the same interface configuration. If the hardware-flow control has not been activated in both participants, a reception overflow can occur.

The following cable must be used to connect the JX6-INT1 with the PC:



10.1 Register Description

10.1.1 Register 1xyp00: Status register

Read	Present state: State of the interface
Write	acknowledge the status
Value range	23-bit-signed integer
Value after reset	0

The status register is bit coded, i.e. a certain condition is indicated by each bit. Only individual bits can be written into by the user.

Bit Number	State	Comment
16	1	a valid command has been received The JX6-INT1 module has received a valid command, which has been made available in registers 1xyp11 ff.

10.1.2 Register 1xyp09: HPGL version number

The version number of the HPGL protocol can be read out of this register. 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.

Value range	23-bit-signed integer
Value after reset	version number * 100

10.1.3 Register 1xyp10: Protocol

Read	presently set protocol
Write	setting a new protocol
Value range	1 .. 20
Value after reset	1 (free protocol, PRIM)

For the HPGL protocol, number **11** must be entered.

For initialisation, the interface will be set to RS232, 8 bit, 1 stop bit, no parity, 9600 baud and hardware handshake.

10.1.4 Register 1xyp11: HP-GL Command

Read	command received last
Write	acknowledge the command
Value range	0 ... 255
Value after reset	0

When bit 16 has been set in the status register, the next command can be read here. After reading register 1xyp, bit 16 will be cleared and not be set again, before the next valid command has been given.
Some HP-GL commands can be transmitted by the external device either with or without any parameters. For these HP-GL commands, various values can be read out of this register, depending on whether they have been received with or without a parameter. The following rule applies:

- Command without a parameter: Value < 100
- Command with a parameter: Value >= 100.

The following commands will be interpreted:

HP-GL Command	Register value	Comment
SP	0/100	Select Pen
AA	1/101	Arc absolute
AR	2/102	Arc relative
PA	3/103	Plot absolute
PR	4/104	Plot relative
PD	5/105	Pen down
PU	6/106	Pen up
CI	7/107	Circle
AE [1)]	8/108	Outside angle
IE [1)]	9/109	Inside angle
IN	255	Init

1) This is not part of HPGL.

10.1.5 Register 1xyp12: X-coordinate / radius / speed

Read	present X-coordinate / radius / speed
Write	clear the value
Value range	-8388608 ... +8388607
Value after reset	0

Depending on the command written into register 1xyp11, the first parameter will be read here.

10.1.6 Register 1xyp13: Y-Coordinate/Connector number

Read	present Y-Coordinate/connector number
Write	clear the value
Value range	-8388608 ... +8388607
Value after reset	0

Depending on the command written into register 1xyp11, the second parameter will be read here.

10.1.7 Register 1xyp14: Angle

Read	present angle
Write	clear the value
Value range	-8388608 ... +8388607
Value after reset	0

Depending on the command written into register 1xyp11, the third parameter will be read here.

10.1.8 Register 1xyp16: Factor for the X-value

Read	present factor for the X-value
Write	Define a new factor for the X-value
Value range	-8388608 ... +8388607
Value after reset	1000 (corresponds to 1)

In this register, a factor of the scaling 1000 can be defined for the X-value. The product of the X-value * register 1xyp16 must not become greater than 31 bit.

10.1.9 Register 1xyp17: Offset for the X-value

Read	present offset for the X-value
Write	define a new offset for the X-value
Value range	-8388608 ... +8388607
Value after reset	0

In this register, an offset can be defined for the X-value.

10.1.10 Register 1xyp18: Factor for the Y-value

Read	present factor for the Y-value
Write	define a new factor for the Y-value
Value range	-8388608 ... +8388607
Value after reset	1000 (corresponds to 1)

In this register, a factor of the scaling 1000 can be defined for the Y-value.
The product of the Y-value * register 1xyp18 must not become greater than 31 bit.

10.1.11 Register 1xyp19: Offset for the Y-value

Read	present offset for the Y-value
Write	define a new offset for the Y-value
Value range	-8388608 ... +8388607
Value after reset	0

In this register, an offset can be defined for the Y-value.

10.1.12 Register 1xyp20: Speed at connector 1

Read	present speed at connector 1
Write	define a new speed at connector 1
Value range	0 ... 65535
Value after reset	0

In this register, a speed value can be assigned to connector 1. This value will appear in register 1xyp12, when the HP-GL command "SP1" has been received.

10.1.13 Register 1xyp21: Speed at connector 2

Read	present speed at connector 2
Write	define a new speed at connector 2
Value range	0 ... 65535
Value after reset	0

In this register, a speed value can be assigned to connector 2. This value will appear in register 1xyp12, when the HP-GL command "SP2" has been received.

10.1.14 Register 1xyp22: Speed at connector 3

Read	present speed at connector 3
Write	define a new speed at connector 3
Value range	0 ... 65535
Value after reset	0

In this register, a speed value can be assigned to connector 3. This value will appear in register 1xyp12, when the HP-GL command "SP3" has been received.

10.1.15 Register 1xyp23: Speed at connector 4

Read	present speed at connector 4
Write	define a new speed at connector 4
Value range	0 ... 65535
Value after reset	0

In this register, a speed value can be assigned to connector 4. This value will appear in register 1xyp12, when the HP-GL command "SP4" has been received.

10.1.16 Register 1xyp24: Speed at connector 5

Read	present speed at connector 5
Write	define a new speed at connector 5
Value range	0 ... 65535
Value after reset	0

In this register, a speed value can be assigned to connector 5. This value will appear in register 1xyp12, when the HP-GL command "SP5" has been received.

10.1.17 Register 1xyp25: Speed at connector 6

Read	present speed at connector 6
Write	define a new speed at connector 6
Value range	0 ... 65535
Value after reset	0

In this register, a speed value can be assigned to connector 6. This value will appear in register 1xyp12, when the HP-GL command "SP6" has been received.

10.1.18 Register 1xyp26: Timeout time

Read	present timeout time
Write	define a new timeout time
Value range	0 ... 65535
Value after reset	1000 (1s)

During this time (in multiples of 1 ms), the following sign must have been received, otherwise the protocol interpreter will be reset. ”0” means that timeout monitoring has been deactivated.

10.1.19 Register 1xyp27: Number of decimal places for the definition of an angle

Read	present number of decimal places for the definition of an angle
Write	defining a new number of post comma places
Value range	0 ... 4
Value after reset	0

Here, the number of interpreted decimal places for the definition of an angle can be defined. If a value contains less than the decimal places defined here, the missing decimal places will be added.

Example:

Value 3 has been written into register 1xyp27; string "AA1234,3456,12.5;" has been received. Thus, in register 1xyp14, value 12500 can be read for the angle.

11 SPECIAL PROTOCOL Multimaster Coupling

Based on the JETWay field bus (RS485), register values can be exchanged by up to 16 participants without occupying the CPU. In this case, a register range can be defined in each of the participants, which will be copied in cyclic mode by one or several other participants into a freely selectable range.
A significant feature added to the former JETWay field bus is the multimaster-ability. Each participant that has been set to multimaster mode will pass on all registers of the defined range to all slaves that have been set up; then it will pass on control over the bus to the subsequent network participant.

As the multimaster firmware is based on the 'free protocol' of the INT, only the additional registers and functions are described in the following documentation.

As has been mentioned above, the RS485 interface will be used. For that reason, the signal lines of all network participants will be connected in parallel. In the case of RS485 connections, GND connections need not be linked with one another. This will only become necessary, if the GND potentials differ by more than 7 V.

Node 1	Node 2	Node 3
D+	D+	D+
D-	D-	D-
Gnd	Gnd	Gnd

11.1 Register Description

11.1.1 Register 1xyp00: Status register

The status register is bit coded, i.e. a certain condition is indicated by each bit. Only individual bits can be written into by the user.

Read	Present state: State of the interface
Write	acknowledge the status
Value range	23-bit-signed integer
Value after reset	0

Bit Number	State	Comment
16	0	JX6-INT1 is the network slave
16	1	JX6-INT1 is the network master
17	0	there is no cyclic transmission of register values. In multimaster mode, only the bus control will be passed on. (Setting after reset)
17	1	Cyclic register transmission. It will be set after giving command 10.
18	0	Transfer direction: Register contents of the selected range will be written into the slaves. (Setting after reset)
18	1	Transfer direction: Register contents of the selected range will be read out of the slave.
19	0	Monomaster mode: The control over the bus remains with the JX6-INT1, so it is not passed on. (Setting after reset)
19	1	Multimaster mode: After all registers of the selected area have been transmitted to all chosen slaves, control over the bus is passed on. It will be set after giving command 15.
20	0	Registers are transmitted individually
20	1	The registers are passed on as a register block. It will be set after giving command 17.
21	1	A timeout error has occurred.
22	1	A test sum error has occurred.
23	1	An error message sent by the slave has been received.

Bits 16 through 23 are set to 0 by activating the multimaster mode.

11.1.2 Register 1xyp01: Command register

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

Read	Latest command
Write	Command to the interface
Value range	0 .. 255
Value after reset	0

Command	Comment
10	Activate cyclic register transfer.
11	Deactivate cyclic register transfer.
12	Write a register range to the slave(s).
13	Read a register range out of the slave(s).
14	Set the monomaster mode: These commands are only executed in network participant number 1.
15	Set the multimaster mode: These commands are only executed in network participant number 1.
17	Switching on transmission of register blocks
18	Switching off transmission of register blocks

- Transmission of register blocks (command 17):
  By giving this command, the transfer mode of the defined register range can be changed to transfer of register sets. If more than 4 registers are to be transferred, transfer speed will be increased remarkably by this means. After activating, the registers will be transferred one by one.

11.1.3 Register 1xyp09: Version number of the multimaster

The version number of the multimaster protocol can be read out of this register. 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.

Value range	23-bit-signed integer
Value after reset	version number * 100

11.1.4 Register 1xyp10: Protocol

Read	presently set protocol
Write	setting a new protocol
Value range	1 .. 20
Value after reset	1 (free protocol, PRIM)

For the JETWay Multimaster, the protocol containing number **5** must be entered.

11.1.5 Register 1xyp11: Individual network address

Read	actual network address
Write	setting a new network address
Value range	0 .. 16
Value after reset	0

Every network address may only appear once in a network; assigning the same address to two or more participants is not permitted.
A participant of network address 1 must be available! This participant will take over the bus control, in case a participant possessing the token is separated from the bus. If the multimaster mode is made use of, the addresses must be assigned in ascending order, starting with 1.
Internal initialising can be carried out by writing into the network address.

11.1.6 Register 1xyp12: Network address of the next master

Read	present next master
Write	define the next master
Value range	0...16
Value after reset	0

In multimaster mode, after data transfer to the slaves in the slave list, the token will be passed on to the participant of the number that has been written into register 1xyp12. If this token transfer does not function, an attempt will be made to pass on the token to the next but one participant. If the participant address exceeds the value of register 1xyp19, a new start will be made at participant address 1.

11.1.7 Register 1xyp13: Slave-list

Read	present slave-list
Write	define a new slave list
Value range	0...65535
Value after reset	0

This register is bit coded. In this register it can be determined, which network slaves are to be integrated into cyclic register transfer. A set bit means that the defined registers will be transferred to the respective slave.
There exist the following relations:

Bit 0 → Address 1
Bit 1 → Address 2
Bit 15 → Address 16

Example:
Certain registers are to be transferred to the participants having got the addresses 3, 6, 14 and 15. This means that bits 2, 5, 13 and 14 must be set. The value that must be written into the register is 24612.

11.1.8 Register 1xyp14: Beginning of the local register range

Read	register number of the beginning of the register range
Write	define the beginning of the register range
Value range	20...63
Value after reset	20

11.1.9 Register 1xyp15: End of the local register range

Read	register number of the end of the register range
Write	define the end of the register range
Value range	20...63
Value after reset	20

11.1.10 Register 1xyp16: Beginning of the register range in the slave

Read	register number of the beginning of the register range
Write	define the beginning of the register range
Value range	20...63
Value after reset	20

As has been mentioned above, the register contents that are on the JX6-INT1 module, can be transferred to the registers of another module with the help of the multimaster protocol of the INT5.

Writing into registers:
If the JX6-INT1 module acts as master and if cyclic register transfer is enabled, the module transmits the register contents of an area, which is defined in registers 1xyp14 and 1xyp15, to a register area of a network slave, the starting number of which is specified in register 1xyp16.

Example:
Reg. 1xyp14 = 30
Reg. 1xyp15 = 39
Reg. 1xyp16 = 50

The contents of the 10 INT5 registers 1xyp30 to 1xyp39 are copied into registers 50 to 59 of the slaves that have been defined in register 1xyp13. In case the slave is also a JX6-INT1 module with master-master protocol, the transmitted values can be read from registers 1xyp50 through smp59 by the CPU that is on the JX6-INT1 module
Read the registers:
If the JX6-INT1 module master and the cyclic register transfer have been activated, the module will fetch the register contents of a certain range out of a slave. The start-register number of this range has been defined in register 1xyp16. The register contents that have been taken from this register range will be stored in a local register range that has been defined in registers 1xyp14 and 1xyp15.

Example:
Reg. 1xyp14 = 30
Reg. 1xyp15 = 39
Reg. 1xyp16 = 50

The contents of the 10 registers of a network slave that have got the numbers 50 through 59 will be written into registers 1xyp30 to 1xyp39.

11.1.11 Register 1xyp17: Slave-timeout

Read	present timeout
Write	set a new timeout
Value range	0...65535
Value after reset	50 (50ms)

If the JX6-INT1 is a network master, a response to each command that has been transmitted to a network slave will be expected. If the slave does not transmit a response during the time that has been set here, the transmission will be terminated, an error message will be sent and bit 21 will be set in the status register.
In multimaster mode, the participant that has got network address 1 will check the communication on the bus. If after 3 * timeout time a master telegram still cannot be received on the bus, the respective participant will generate a new token and will restart the bus communication.
All modules that are working in multimaster mode should be set to the same timeout time.
The timeout time is set in multiples of 1 ms.

Register 1xyp17 should contain the same values for all network nodes.

11.1.12 Register 1xyp18: network number in case of an error

Read	network number in case of an error
Write	delete the network number
Value range	0...16
Value after reset	0

When a transmission error has occurred, this register will be defined by the network number of the addressed participants.

11.1.13 Register 1xyp19: present highest network address

Read	present highest network address
Write	setting a new highest network address
Value range	0...16
Value after reset	16

The network address of the participant that has got the highest address must be written here. As the network control is always passed on to the next participant, this participant must determine, when the control is to be passed on to a participant

Register 1xyp19 should contain the same values for all network nodes.

11.1.14 Register 1xyp20 - 1xyp63: Transmission register

Read	Value of the transmission register
Write	New value of the transmission register
Value range	23-bit-signed integer
Value after reset	not defined

These registers are used for transmission purposes. Depending on the set mode of transmission, the registers to be transmitted can be written into, or the transmitted registers can be read-out from these registers.

11.2 Multimaster example program:

The following order should be followed to initialise a bus node:

```
REGISTER_LOAD (1xyp10, 5)          ; multimaster protocol
REGISTER_LOAD (1xyp11, 1)          ; here: network address: 1
REGISTER_LOAD (1xyp12, 2)          ; network address of next master: 2
REG 1xyp13                         ; slave list: to slaves 2, 3, 4, registers
=                                  ; are to be written.
b 00000000000000000000001110
REGISTER_LOAD (1xyp14, 30)         ; start of individual register range
REGISTER_LOAD (1xyp15, 39)         ; end of individual register range
REGISTER_LOAD (1xyp16, 30)         ; start of register range in the slave
REGISTER_LOAD (1xyp17, 50)         ; timeout time
REGISTER_LOAD (1xyp19, 5)          ; highest network address
REGISTER_LOAD (1xyp01, 12)         ; command: register transfer
REGISTER_LOAD (1xyp01, 17)         ; activate transfer of blocks
REGISTER_LOAD (1xyp01, 15)         ; activate multimaster-mode for number 1
REGISTER_LOAD (1xyp01, 10)         ; activate register transfer
```

Now, the data can be written in order to be transferred; the received data can be read.

```
COPY (10, 100, 1xyp30)             ; write transmit data
DELAY (FirstCycle)                 ; now, all data are valid
LABEL Schleife
REGISTER_LOAD (200, @1xyp40)       ; process receive data from other network
                                   ; nodes
REGISTER_LOAD (1xyp33, @103)       ; write the altered transmit data
.....
GOTO Loop
```

12 Special Protocol: Barcode

If, in a barcode protocol, a chain of 'printable' characters in ASCII code has been received, it will be converted into a compact string in text variable format and made available in the JX6-INT1 registers. At the same time, figures will be converted into numeric values.
Control characters will be eliminated from the receive string. They can only be defined as start- and end-of-transmission characters of the frame.
The maximum number of printable characters is 37.
When a string of digits has been received, it will be converted into binary values, in order to be further processed as numeric values in the PASE-program directly. For this, six successive digits will be united in one register. A new numeric value will also be made up, if a non-numeric digit is part of the string of digits.

Format of a text variable:

As 8 bit are sufficient for displaying an ASCII character, three characters can be stored in a 24-bit PASE-register. The first register of a compact string of this kind will be interpreted individually. In the least significant byte of this register (bits 0 .. 7), the amount of characters of this string will be defined; in the medium byte (bits 8 .. 15), the way if displaying the string will be defined; in the highest significant byte (bits 16 .. 23), the first character of the string will be written. The subsequent register contains the second character in its lowest significant byte; the medium byte contains the third character and so on.

12.1 Register Description

12.1.1 Register 1xyp00: Status register

Read	Present state: State of the interface
Write	acknowledge the status
Value range	23-bit-signed integer
Value after reset	0

The status register is bit coded, i.e. a certain condition is indicated by each bit. Only individual bits can be written into by the user.

Bit Number	State	Comment
16	1	Receive the complete protocol In order to find out with the help of the PASE program, whether a barcode has been received completely and is available to be read, this bit will be set, as soon as the end of the transmission has been confirmed. In the 'freely running operating mode' (see bit 18), bit 16 will be reset automatically, when transmission of the next protocol is started. Otherwise it can be cleared by a BIT_CLEAR instruction or by giving command 19 from the PASE program.
17	1	Timeout error The maximum time span until complete transmission of the frame can be set in register 1xyp14. Time monitoring starts at the first signal of a transmission. If transmission has not been completed during the set time, the JX6-INT1 will terminate the receiving process and set bit 17.
18	1	Operating mode for receiving If this bit has not been set ('0'), all frames will be (freely) converted immediately and written into the registers listed below. If this bit and if bit 16 have been set ('1'), all further frames will be stored temporarily by the barcode reader. If bit 16 (by giving command 10) is reset by the PASE-program, the subsequent barcode – which might already have been stored in the receiving buffer in the meantime – will be converted. This bit must neither be set nor cleared directly.

12.1.2 Register 1xyp11: Command register

Read	command received last
Write	acknowledge the command
Value range	0 ... 255
Value after reset	0

Command	Comment
10	Bits 16 and 17 of the status register will be cleared.
12	The freely running operating mode will be blocked. After giving this command, a complete barcode must have been received (bit 16 is set) and bit 16 must, by receiving command 10, be reset by the PASE-program. Now, the subsequent barcode can be converted into the compact string. A set bit 18 will indicate this operating mode.
13	The JX6-INT1 is set to the freely running operating mode by this bit. All incoming frames will be converted immediately. Bit 18 will be set to 0.

12.1.3 Register 1xyp09: Barcode-version number

The version number of the barcode protocol can be read out of this register. 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.

Value range	23-bit-signed integer
Value after reset	version number * 100

12.1.4 Register 1xyp10: Protocol

Read	presently set protocol
Write	setting a new protocol
Value range	1 .. 20
Value after reset	1 (free protocol, PRIM)

For the barcode protocol, number **2** must be entered.

For initialisation, the interface will be set to RS232, 7 bit, 2 stop bits, no parity and 9600 baud.

12.1.5 Register 1xyp11: Start signal

Read	present start signal
Write	define a new start signal
Value range	0 ... 255 (8-bit format) 0 ... 127 (7-bit format)
Value after reset	2 (STX)

Value 0 means: There has no start signal been defined.

12.1.6 Register 1xyp12: End signal

Read	present end signal
Write	define a new end signal
Value range	0 ... 255 (8-bit format) 0 ... 127 (7-bit format)
Value after reset	3 (ETX)

Value 0 means: There has no end signal been defined.

12.1.7 Register 1xyp13: Number of characters in the barcode

Read	expected number of characters
Write	Setting a new number of characters
Value range	1 ... 37
Value after reset	1

The value of this register will only be checked, if no end signal has been defined.

12.1.8 Register 1xyp14: Timeout time

Read	present timeout time
Write	setting a new timeout time
Value range	0 ... 16384 (out of ... 16.384 s)
Value after reset	0 (OFF)

The maximum time span until complete transmission of the frame can be set in register 1xyp14. Time monitoring starts at the first signal of a transmission. If transmission has not been completed during the set time, the JX6-INT1 will terminate the receiving process and set bit 17. The time value is entered in milliseconds.

12.1.9 Registers 1xyp32 through 1xyp44: Barcode-string

Read	present barcode string
Write	not useful
Value range	3 bytes per register
Value after reset	0

In these registers, the received barcode has been stored in the compact format of a text variable (format definition see above). These 13 registers can contain 37 characters max.

12.1.10 Register 1xyp45: Amount of barcode numbers

Read	amount of numbers in the barcode received last
Write	not useful
Value range	0 ...7
Value after reset	0

The amount of characters forming the register numbers (starting from register 1xyp46) can be read out of this register. Each number can consist of up to 6 characters.

12.1.11 Registers 1xyp46 through 1xyp52: Barcode figures

Read	presently used barcode figures
Write	not useful
Value range	0 ... 999999
Value after reset	0

The barcode is split up into entries of up to 6 characters each written into registers 1xyp46 through 1xyp52.

Example:
Barcode = 9876543210.

Register 1xyp45 = 2
Register 1xyp46 = 987654
Register 1xyp47 = 3210

13 File Revision

2	altered: Gerd Seher on: 03.09.1999	
3	altered: Gerd Seher on: 06.09.1999	RemoteScan Reg. 1sm300-1sm363
4	altered: Gerd Seher on: 13.09.1999	Protocol version numbers
5	altered: Gerd Seher on: 18.10.1999	Dust: Example programs with register numbers
6	altered: Gerd Seher on: 05.11.1999	Wipotec: Reg7=210
7	altered: Gerd Seher on: 26.11.1999	Mettler pin occupation had been designed for PASE-E
8	altered: Gerd Seher on: 21.01.2000	Master-master protocol has been integrated Dust: RK512 has been integrated. PRIM: Configuration 9 bit 1xypzz naming has been introduced. Wipotec: Instruction registers RemoteScan Reg19 512 I/O
9	altered: Gerd Seher on: 17.08.2000	1sm163 -> 1xy163
10	altered: Gerd Seher on: 19.09.2000	Example program S61: LR 1xyp10 with 5
11	altered: Gerd Seher on: 21.09.2000	new I/O table has been taken over
12	altered: Gerd Seher on: 06.12.2000	HPGL cable has been integrated
13	altered: Gerd Seher on: 26.01.2001	Remote-Scan Reg 18: Reference to Reg 17 has been changed into reg 19.
14	altered: Gerd Seher on: 13.02.2001	Protocols that have not been implemented eliminated from the protocol overview.
15	altered: Gerd Seher on: 23.04.2001	Chapter 8.2.5: at example 1xyp12
16	altered: Gerd Seher on: 26.04.2001	New headlines because of Word
17	altered: Gerd Seher on: 29.05.2001	Master-Master: 1xyp17: Bit 17>21
18	altered: Gerd Seher on: 05.06.2001	Register 1xy162
19	altered: Gerd Seher on: 03.01.2002	Barcode protocol has been integrated
20	altered: Gerd Seher on: 27.03.2002	Alteration in naming: JX6-INT1
21	altered: Gerd Seher on: 28.08.2002	JetSym programs