

Application-Oriented Manual

JX3 System

60882017

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1 Engineering a JX3 station

JX3 station	A JX3 station consists of a JX3-BN-xxx bus node, a JC-3xx controller or a JC-4xx controller and JX3 peripheral modules connected to it.	
Number of connectable JX3 modules	The possible number of JX3 modules depends on the following parameters: <ul style="list-style-type: none"> ▪ Maximum number of JX3 modules ▪ Maximum data exchange rate ▪ Maximum power consumption 	
Tools	As a tool for determining the number of JX3 modules that can be connected the Excel file ix3-sysbus_configurator_xxx_e is available.	
JX3 system bus configurator - Download	Jetter AG provide the JX3 system bus configurator on their homepage http://www.jetter.de . You can find the JX3 system bus configurator for download at <i>Downloads - Expansion modules - JX3 modules - JX3 system bus</i> .	
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1.1 Limitations to be taken into account when engineering a JX3 station

Introduction

This chapter covers the following limitations of a JX3 station:

- Maximum number of JX3 modules
- Maximum data interchange rate
- Maximum power consumption

Take all three limitations into account when engineering a JX3 station and match the JX3 peripheral modules considering all limiting factors. If you need more JX3 peripheral modules for your plant, you can expand it by means of JX3-BN-xxx.

JX3 system bus configurator

The JX3 system bus configurator assists you in detecting limitations through engineering a real JX3 station.

In this case, enter the amount of your JX3 modules into an Excel file. The JX3 system bus configurator calculates the possibility of the above named limitations.

There are two Excel sheets **JX3 systembus data** and **JX3 systembus power**.

JX3 systembus data

Here, the maximum number of JX3 modules and maximum data interchange rate is determined.

configuration of JX3-station (data)		
total number of modules		
In-size of JX3-station		
Out-size of JX3-station		
module name	description	number
JX3-AI4	Analog Input Module	
JX3-AO4	Analog Output Module	11
JX3-CNT	Counter Module	
JX3-DI16	Digital Input Module	
JX3-DIO16	Digital Input/Output Module	
JX3-DMS2	Strain Gage Module	0
JX3-DO16	Digital Output Module	3
JX3-MIX1	Multi-Purpose Expansion Module	0
JX3-MIX2	Multi-Purpose Expansion Module	
JX3-THI2-RTD	Pt100/Pt1000 Temperature Measurement	
JX3-THI2-TC	Thermocouple Temperature Measurement	

The following fields marked red convey the following meaning:

- **Total number of modules**
The maximum number of 16 JX3 modules per JX3 station has been exceeded.
- **IN size of JX3 station**
The aggregated input factor has been exceeded.

▪ **OUT size of JX3 station**

The aggregated output factor has been exceeded.

JX3 systembus power

Here, the maximum number of JX3 modules and maximum power consumption is determined.

configuration of JX3-station (power)		
number of Modules		
JC-3xx/JX3-BN-ETH		
JX3-BN-CAN		
JX3-PS1		
module name	description	number
JX3-AI4	Analog Input Module	
JX3-AO4	Analog Output Module	
JX3-AO4 Current	Analog Output Module (in Current Mode)	6
JX3-CNT	Counter Module	
JX3-DI16	Digital Input Module	
JX3-DIO16	Digital Input/Output Module	0
JX3-DMS2	Strain Gage Module	
JX3-DO16	Digital Output Module	0
JX3-MIX1	Multi-Purpose Expansion Module	
JX3-MIX2	Multi-Purpose Expansion Module	
JX3-THI2-RTD	Pt100/Pt1000 Temperature Measurement	
JX3-THI2-TC	Thermocouple Temperature Measurement	

The following fields marked red convey the following meaning:

▪ **Number of modules**

The maximum number of 8 JX3 modules connected to JC-3xx, JC-4xx, JX3-BN-xxx, or JX3-PS1 has been exceeded.

Integrate the JX3-PS1 in your JX3 station.

▪ **JC-3xx/JX3-BN-ETH**

The power consumption of the JX3 modules which are directly connected to a JC-3xx, JC-4xx or a JX3-BN-ETH is too high.

Insert a JX3-PS1 into your JX3 station.

▪ **JX3-BN-CAN**

The power consumption of the JX3 modules which are directly connected to a JX3-BN-CAN is too high.

Insert a JX3-PS1 into your JX3 station.

▪ **JX3-PS1**

The power consumption of the JX3 modules which are directly connected to a power supply module JX3-PS1 is too high.

Insert a JX3-PS1 into your JX3 station.

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Limitations of the maximum number of modules

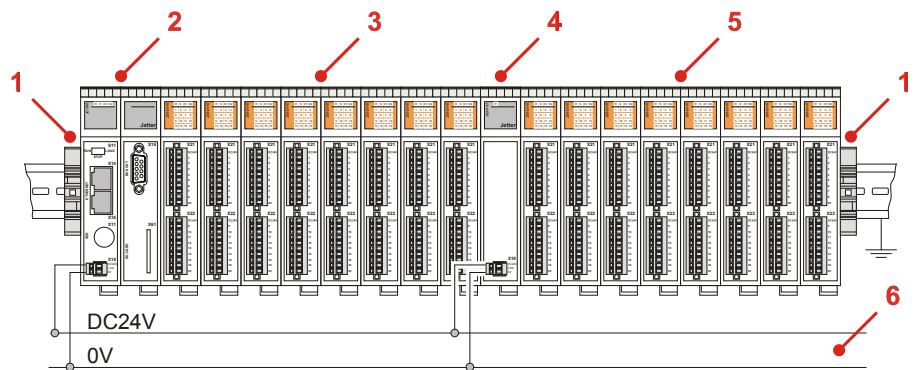
Limited maximum number

The maximum number of JX3 peripheral modules per JX3 station is limited. The following rule applies:

- Up to 16 JX3 peripheral modules can be integrated into a JX3 station.
- You can directly connect up to eight JX3 peripheral modules to a JC-3xx/JC-4xx controller.
- Downstream the eighth JX3 peripheral module you must insert a JX3-PS1 power supply module.
- In addition, you can connect up to eight JX3 peripheral modules to a JX3-PS1 power supply module.

Fully equipped JX3 station

The following illustration shows a JX3 station with a JC-3xx controller and 16 JX3 peripheral modules. Downstream the eighth JX3 peripheral module a JX3-PS1 power supply module has been inserted.



Number	Part	Description
1	End clamp for the DIN rail	For securing JX3 modules on the DIN rail
2	JC-3xx	Controller and power supply for the first eight JX3 peripheral modules
3	JX3 peripheral modules	Eight JX3 peripheral modules
4	JX3-PS1	Power supply module for the next eight JX3 peripheral modules
5	JX3 peripheral modules	Eight JX3 peripheral modules
6	Power supply lines DC 24 V and 0 V	Logic voltage supply for all modules of the JX3 station

Limitations of the modules' data exchange rates

Introduction

There are two options for connecting remote peripheral modules: via JX3-BN-CAN using the JX2 system bus protocol, or via JX3-BN-ETH using the Ethernet system bus protocol. JX3 modules of a JX3 station exchange data either with a JC-3xx/JC-4xx controller, or with bus node modules JX3-BN-CAN and JX3-BN-ETH. The maximum number of input and output data and of JX3 peripheral modules in a JX3 system is limited.

Evaluation of input and output factors

The following table lists the factors for input and output data.

- Add the input factor of all modules used and calculate the aggregated input factor.
- Add the output factor of all modules used and calculate the aggregated output factor.
- Compare the aggregated factor for inputs/outputs with the allowed maximum factor:

$$\sum InputData_{max} = \sum n_{Peripheral\ modules} \cdot Factor_{per\ module} \leq 88$$

$$\sum OutputData_{max} = \sum n_{Peripheral\ module} \cdot Factor_{per\ module} \leq 88$$

where $n \leq 16$.

Peripheral module	Input factor per module	Output factor per module
JX3-AI4	10	0
JX3-AO4	2	8
JX3-CNT	10	0
JX3-DI16	4	0
JX3-DIO16	4	2
JX3-DMS2	10	0
JX3-DO16	2	2
JX3-MIX1	16	6
JX3-MIX2	16	6
JX3-THI2-RTD	10	0
JX3-THI2-TC	10	0

Devices not to be taken into account

The following devices are not taken into account when calculating the aggregated input/output factor:

- Controller JC-3xx/JC-4xx
- Bus node JX3-BN-ETH
- Bus node JX3-BN-CAN
- Power supply module JX3-PS1

JX3 station - Maximum configuration

The table below lists the maximum allowed number of modules and the aggregated factor of input data and output data.

Maximum number of peripheral modules	Aggregated input factor	Aggregated output factor
16	88	88

Engineering steps

To engineer a JX3 station, proceed as follows:

Step	Action	
1	Do not exceed the maximum number of 16 modules per JX3 station.	
2	Calculate the aggregated input factor by adding the input factor per module. Example: 2 JX3-DI16 and 8 JX3-AI4 modules are connected to a controller JC-3xx. 2 JX3-DI16 with input factor 4 makes 8; 8 JX3-AI4 with input factor 10 makes 80 => aggregated factor is 88.	
3	Calculate the aggregated output factor by adding the output factor per module. Example: 2 JX3-DI16 and 8 JX3-AI4 modules are connected to a controller JC-3xx. 2 JX3-DI16 with input factor 0 makes 0; 8 JX3-AI4 with input factor 0 makes 0 => aggregated factor is 0.	
4	If then ...
	... the aggregated input factor makes 88, the JX3 station is fully equipped.
	... the aggregated output factor makes 88, the JX3 station is fully equipped.
	... the number of peripheral modules is 16, the JX3 station is fully equipped.

If one of the three values has been exceeded, a new JX3 station must be added. For this, apply a bus node, e.g. a JX3-BN-ETH.

1 Engineering a JX3 station

Example

You want to connect 11 JX3-AO4 and 5 JX3-THI2-RTD to a controller JC-3xx.

Input factors in our example

Quantity	Module	Input factor per module	Aggregated factor
11	JX3-AO4	2	22
5	JX3-THI2-RTD	10	50

Aggregated input factor	72
--------------------------------	-----------

Output factors in our example

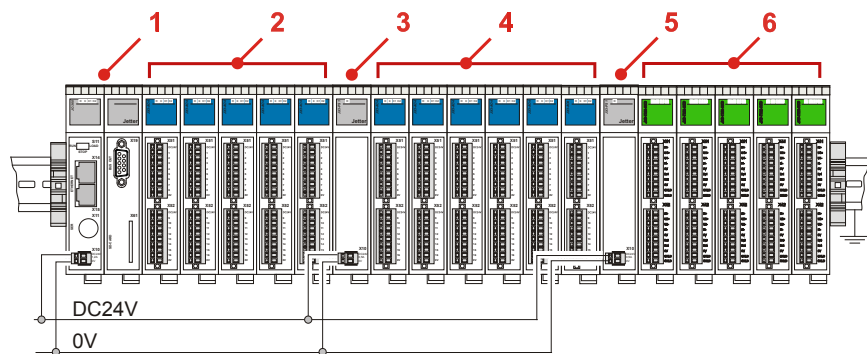
Quantity	Module	Output factor per module	Aggregated factor
11	JX3-AO4	8	88
5	JX3-THI2-RTD	0	0

Aggregated output factor	88
---------------------------------	-----------

Conclusion of I/O factor calculation

You can engineer the JX3 station out of 11 JX3-AO4 and 5 JX3-THI2-RTD as described below. One JX3 station will be sufficient.

Depending on the view on the power consumption unit, you must mount a JX3-PS1 after a certain number of JX3 modules as is shown in the illustration.



Number	Part	Description
1	JC-3xx	Controller
2	JX3-AO4	Modules 1 to 5 supplied by JC-3xx (1)
3	JX3-PS1	Power supply module
4	JX3-AO4	Modules 6 to 11 supplied by JX3-PS1 (3)
5	JX3-PS1	Power supply module
6	JX3-THI2-RTD	Modules 12 to 16 supplied by JX3-PS1 (5)

Limitation depending on the power consumption of the modules

Introduction

JX3 modules of a JX3 station are supplied with logic voltage either by a JC-3xx/JC-4xx controller, or a JX3-BN-xxx bus node, or a JX3-PS1 power supply module. Each of these modules is able to supply up to 8 downstream JX3 modules with logic voltage.

Certain JX3 modules, however, have a higher power consumption which may reduce the number of JX3 modules that can be connected to one JX3 station. Depending on the power consumption, you must equip the JX3 station with additional power supply modules JX3-PS1.

Allowed power consumption

The following table shows the allowed power consumption of JX3 modules connected to the right (downstream) of the power supply module.

Power Supply Module	Power consumption P_{24V}	Power consumption P_{5V}
JC-3xx/JC-4xx	18 W	6 W
JX3-BN-ETH	18 W	6 W
JX3-BN-CAN	22 W	6 W
JX3-PS1	24 W	6 W

Devices not to be taken into account

The following devices are not taken into account when calculating power consumption:

- Controller JC-3xx/JC-4xx
 - Bus node JX3-BN-ETH
 - Bus node JX3-BN-CAN
 - Power supply module JX3-PS1
-

1 Engineering a JX3 station

Engineering steps

To engineer a JX3 station, proceed as follows:

Step	Action	
1	Gather the following information from the technical data contained in the manual of your JX3 module: <ul style="list-style-type: none"> ▪ Current consumption from the logic voltage of the JX3 system bus: I_{5V} ▪ Current consumption from the additional voltage of the JX3 system bus: I_{24V} 	
2	Calculate the power consumption of the JX3 modules: $P_{5V} = 5V \cdot I_{5V}$ $P_{24V} = 24V \cdot I_{24V} + \frac{P_{5V}}{0.85}$	
3	Add the power consumption of JX3 modules included in the JX3 station. Start with the first JX3 module connected to the JC-3xx/JC-4xx controller, or to the JX3-BN-xxx bus node.	
4	Check whether the allowed power consumption has been exceeded.	
5	If then ...
	... the allowed power consumption P_{5V} has been reached, insert a JX3-PS1 power supply module upstream the next JX3 module.
	... the allowed power consumption P_{24V} has been reached, insert a JX3-PS1 power supply module upstream the next JX3 module.
	... 8 JX3 modules have been connected insert a JX3-PS1 power supply module upstream the next JX3 module.
...	... 16 JX3 modules have been connected the JX3 station is fully equipped.

Example

You want to connect 11 JX3-AO4 and 5 JX3-THI2-RTD to a controller JC-3xx. Check by taking the following steps how the JX3 station must be engineered to keep power consumption from exceeding the permitted value.

Step	Action
1	Determine the current consumption of the JX3 module JX3-AO4 given in the technical data: <ul style="list-style-type: none"> ▪ Current consumption from the logic voltage of the JX3 system bus: 70 mA ▪ Current consumption from the additional voltage of the JX3 system bus: 120 mA
2	Calculate the power consumption of an JX3-AO4: $P_{5V} = 5V \cdot 70mA = 0.35W$ $P_{24V} = 24V \cdot 120mA + \frac{0.35W}{0.85} = 3.29W$

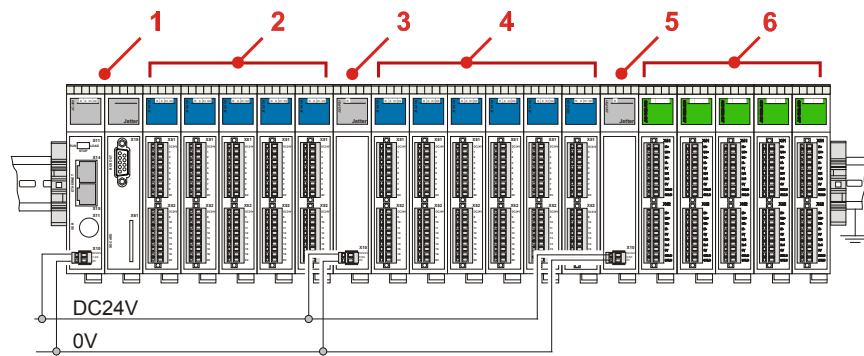
Step	Action				
3	Add the power consumption of n JX3-AO4: $\sum P_{5V} = n \cdot P_{5V}$ $\sum P_{24V} = n \cdot P_{24V}$				
⇒	For 11 JX3-AO4 modules, the aggregated power consumption is as follows: $\sum P_{5V} = 11 \cdot P_{5V} = 3.85W$ $\sum P_{24V} = 11 \cdot P_{24V} = 36.2W$				
4	Check for permitted power consumption.				
	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;">For JC-3xx:</th> <th style="width: 50%;">For JX3-PS1:</th> </tr> </thead> <tbody> <tr> <td> $\sum P_{5V} \leq 6W$ $\sum P_{24V} \leq 18W$ </td> <td> $\sum P_{5V} \leq 6W$ $\sum P_{24V} \leq 24W$ </td> </tr> </tbody> </table>	For JC-3xx:	For JX3-PS1:	$\sum P_{5V} \leq 6W$ $\sum P_{24V} \leq 18W$	$\sum P_{5V} \leq 6W$ $\sum P_{24V} \leq 24W$
For JC-3xx:	For JX3-PS1:				
$\sum P_{5V} \leq 6W$ $\sum P_{24V} \leq 18W$	$\sum P_{5V} \leq 6W$ $\sum P_{24V} \leq 24W$				
⇒	The number of JX3-AO4 modules is limited by the power consumption at 24 V: For JC-3xx: $n = \frac{\sum P_{24V}}{P_{24V}} = \frac{18W}{3.29W} = 5.47 \Rightarrow 5$ For JX3-PS1: $n = \frac{\sum P_{24V}}{P_{24V}} = \frac{24W}{3.29W} = 7.29 \Rightarrow 7$				
5	This module lets you directly connect up to 5 JX3-AO4 to a JC-3xx/JC-4xx. Then, insert a JX3-PS1. Then, you can connect the remaining 6 JX3-AO4 to this JX3-PS1.				
6	Determine the current consumption of the JX3 module JX3-THI2-RTD given in the technical data: <ul style="list-style-type: none"> ▪ Current consumption from the logic voltage of the JX3 system bus: 210 mA ▪ Current consumption from the additional voltage of the JX3 system bus: 0 mA 				
7	Calculate the power consumption of an JX3-THI2-RTD: $P_{5V} = 5V \cdot 210mA = 1.05W$ $P_{24V} = 24V \cdot 0mA + \frac{1.05W}{0.85} = 1.24W$				
8	Add the power consumption of n JX3-THI2-RTD: $\sum P_{5V} = n \cdot P_{5V}$ $\sum P_{24V} = n \cdot P_{24V}$				
⇒	For 5 JX3-THI2-RTD modules, the aggregated power consumption is as follows: $\sum P_{5V} = 5 \cdot P_{5V} = 5.25W$ $\sum P_{24V} = 5 \cdot P_{24V} = 6.2W$				

1 Engineering a JX3 station

Step	Action			
9	Check for permitted power consumption.			
	<table border="1" style="width: 100%;"> <thead> <tr> <th style="width: 50%;">For JC-3xx/JC-4xx:</th> <th style="width: 50%;">For JX3-PS1:</th> </tr> </thead> <tbody> <tr> <td> $\sum P_{5V} \leq 6W$ $\sum P_{24V} \leq 18W$ </td> <td> $\sum P_{5V} \leq 6W$ $\sum P_{24V} \leq 24W$ </td> </tr> </tbody> </table>	For JC-3xx/JC-4xx:	For JX3-PS1:	$\sum P_{5V} \leq 6W$ $\sum P_{24V} \leq 18W$
For JC-3xx/JC-4xx:	For JX3-PS1:			
$\sum P_{5V} \leq 6W$ $\sum P_{24V} \leq 18W$	$\sum P_{5V} \leq 6W$ $\sum P_{24V} \leq 24W$			
⇒	<p>The number of JX3-THI2-RTD modules is limited by the power consumption at 5 V:</p> <p>For JC-3xx and JX3-PS1:</p> $n = \frac{\sum P_{5V}}{P_{5V}} = \frac{6W}{1.05W} = 5.71 \Rightarrow 5$			
10	Insert one JX3-PS1 per 5 JX3-THI2-RTD.			

Engineering the JX3 station - Option 1

Engineer the JX3 station in our example which is equipped with eleven JX3-AO4 modules and five JX3-THI2-RTD modules as shown below:



Number	Part	Description
1	JC-3xx	Controller
2	JX3-AO4	Modules 1 to 5 supplied by JC-3xx (1)
3	JX3-PS1	Power supply module
4	JX3-AO4	Modules 6 to 11 supplied by JX3-PS1 (3)
5	JX3-PS1	Power supply module
6	JX3-THI2-RTD	Modules 12 to 16 supplied by JX3-PS1 (5)

Engineering the JX3 station - Option 2

There is also the option of connecting two JX3-THI2-RTD directly to the first JX3-PS1 and to connect the remaining three JX3-THI2-RTD to the second JX3-PS1.

$$\sum P_{5V} = 6 \cdot P_{5V \text{ JX3-AO4}} + 2 \cdot P_{5V \text{ JX3-THI2-RTD}} = 2.1W + 2.1W = 4.2W \leq 6W$$

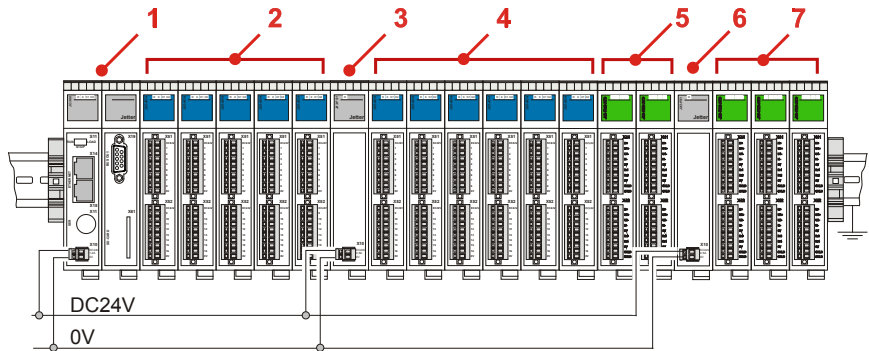
$$\sum P_{24V} = 6 \cdot P_{24V \text{ JX3-AO4}} + 2 \cdot P_{24V \text{ JX3-THI2-RTD}} = 19.7W + 2.5W = 22.2W \leq 24W$$

Regarding power consumption, you can even connect three JX3-THI2-RTD to the first JX3-PS1.

$$\sum P_{5V} = 6 \cdot P_{5V \text{ JX3-AO4}} + 3 \cdot P_{5V \text{ JX3-THI2-RTD}} = 2.1W + 3.15W = 5.25W \leq 6W$$

$$\sum P_{24V} = 6 \cdot P_{24V \text{ JX3-AO4}} + 3 \cdot P_{24V \text{ JX3-THI2-RTD}} = 19.7W + 3.8W = 23.5W \leq 24W$$

Yet, the maximum number of eight modules which can be connected to a JX3-PS1 will then be exceeded.



Number	Part	Description
1	JC-3xx	Controller
2	JX3-AO4	Modules 1 to 5 supplied by JC-3xx (1)
3	JX3-PS1	Power supply module
4	JX3-AO4	Modules 6 to 11 supplied by JX3-PS1 (3)
5	JX3-THI2-RTD	Modules 12 and 13 supplied by a JX3-PS1 (3)
6	JX3-PS1	Power supply module
7	JX3-THI2-RTD	Modules 14 to 16 supplied by JX3-PS1 (6)

2 Register and I/O numbers with a JX3 station

Introduction

Controllers and modules produced by Jetter AG offer a host of functions which can be accessed by the user via registers. A unique number is assigned to each register and each digital input or output.

Applying a register number

Register numbers are applied in the following cases:

- You want to read or write to a module register in the JetSym setup.
 - You want to declare a module register a variable in the JetSym application program.
 - You want to declare a module register a tag in JetViewSoft
-

Applying an I/O number

I/O numbers are applied in the following cases:

- You want to read from a digital input in the JetSym setup.
 - You want to read or write to a digital output in the JetSym setup.
 - You want to declare a digital input or output a variable in the JetSym application program.
 - You want to declare a digital input or output a tag in JetViewSoft.
-

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Registers and module registers

Module registers - Definition

Module registers are the data interface of a JX3 module. Module registers let you read process, configuration and diagnostics data from the JX3 module, or write such data to it.

- The module register number within a module is unique.
- This unique register number lets you access a specific module register within the system.

Registers - Definition

There are several ways to access registers directly:

- From an application program
- From the JetSym setup pane
- From a visualization application

The register number within the system is unique.

Definition - Global Node Number

The Global Node Number (GNN) is an ID number to identify Jetter controllers (e.g. controllers, bus nodes) within an Ethernet network.

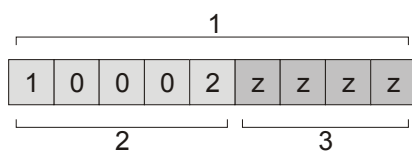
- The GNN within a network has to be unambiguous for each Jetter device.
- The JetSym Hardware Manager automatically assigns the GNN during configuration.
- The value range of the GNN within a project is 000 ... 199.
- The controller has always got GNN 000.

Example: Module registers

Registers - Example

Module register 9 lets you access the OS version of a JX3-AI4 module:

A JX3-AI4 module is connected to a controller JC-4xx. The module number of this module is 2.



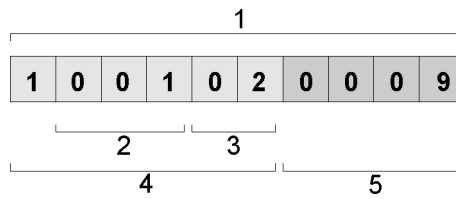
Number	Element	Description
1	Register number	Can be used to directly access the register
2	Register prefix	10002: Assigned to the first JX3 module connected to a JC-4xx controller
3	Module register number	zzzz = 0009: OS version of the JX3-AI4

In the setup pane of JetSym you can directly read out the operating system version 1.2.0.0 from register number 100020009.

	Name	Number	Content	Type
40	100020009	100020009	1.2.0.0	
41				
42				

Example: Registers on the Ethernet system bus

A JX3-AI4 module is connected to a bus node JX3-BN-ETH. The module number of the JX3 module is 2. The bus node has got the ID (GNN) 001.



Number	Element	Description
1	Register number	Can be used to directly access the register
2	Bus node ID, GNN	001: ID of the first JX3-BN-ETH
3	Module number	02: The first JX3-I/O module connected to the JX3-BN-ETH
4	Register prefix	100102
5	Module register number	0009: OS version of the JX3-AI4

In the setup pane of JetSym you can directly read out the operating system version 1.4.0.0 from register number 1001020009.

	Name	Number	Content	Type
1	1001020009	100102000	1.4.0.0	
2				

2 Register and I/O numbers with a JX3 station

Register and I/O numbers of JX3 modules connected to a JC-4xx

Module numbers in a JX3 station

To determine I/O module numbers within a JX3 station, proceed as follows:

- Count the module numbers left-to-right, starting with 1.
- Leave out the power supply module JX3-PS1.

Register numbers for JX3 modules

Register numbers for JX3 modules connected to a JC-4xx consist of the following elements:

1	0	0	x	x	z	z	z	z
---	---	---	---	---	---	---	---	---

Element	Meaning	Value range
xx	Module number of the module within the JX3 station	02 ... 17
zzzz	Module register number	0000 ... 9999

I/O numbers for JX3 modules

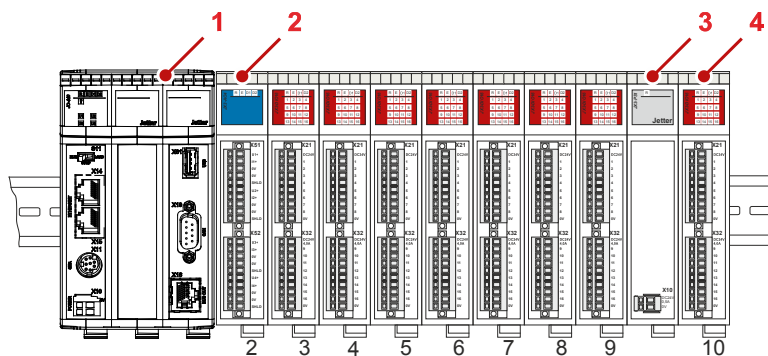
I/O numbers for JX3 modules connected to a JC-4xx consist of the following elements:

1	0	0	0	0	x	x	z	z
---	---	---	---	---	---	---	---	---

Element	Meaning	Value range
xx	Module number of the module within the JX3 station	02 ... 17
zz	Module-specific I/O number	1 ... 16

Example

Several JX3 modules are connected to a JC-4xx controller.



Number	Module	Module number	Register	I/O
1	JC-4xx	1	Refer to documentation on JC-4xx	
2	JX3-AO4	2	10002zzzz	1000002zz
3	JX3-PS1	-	-	-
4	JX3-DIO16	10	10010zzzz	1000010zz

Register and I/O numbers of JX3 modules connected to a JX3-BN-ETH

Global Node Numbers on the Jetter Ethernet system bus of a JX3-BN-ETH

JetSym Hardware Manager assigns a Global Node Number to the bus node JX3-BN-ETH on the Jetter Ethernet system bus.

Register numbers for JX3 modules

The register number for JX3 modules at the Ethernet bus node consists of the following elements:

1	n	n	n	x	x	z	z	z	z
---	---	---	---	---	---	---	---	---	---

Element	Meaning	Value range
nnn	Global Node Number of the JX3-BN-ETH on the Ethernet system bus	001 ... 199
xx	Module number of the module within the JX3 station	02 ... 17
zzzz	Module register number	0000 ... 9999

I/O numbers for JX3 modules

The I/O number for JX3 modules connected to an Ethernet bus node consists of the following elements:

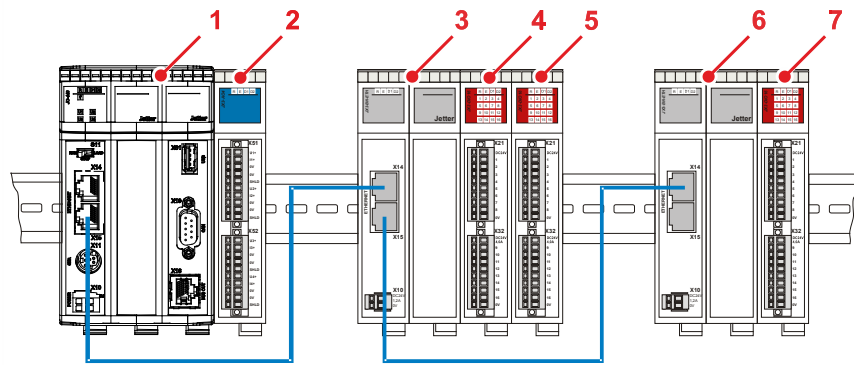
1	n	n	n	0	1	x	x	z	z
---	---	---	---	---	---	---	---	---	---

Element	Meaning	Value range
nnn	Global Node Number of the JX3-BN-ETH on the Ethernet system bus	001 ... 199
xx	Module number of the module within the JX3 station	02 ... 17
zz	Module-specific I/O number	1 ... 16

2 Register and I/O numbers with a JX3 station

Example

Two bus nodes JX3-BN-ETH are connected to a JC-4xx controller.



Number	Module	Module number	GNN	Register	I/O
1	JC-4xx	1	-	Refer to JC-4xx manual	
2	JX3-AO4	2	-	10002zzzzz	1000002zz
3	JX3-BN-ETH	-	1	Refer to JX3-BN-ETH manual	
4	JX3-DIO16	2	-	100102zzzzz	10010102zz
5	JX3-DIO16	3	-	100103zzzzz	10010103zz
6	JX3-BN-ETH	-	2	Refer to JX3-BN-ETH manual	
7	JX3-DIO16	2	-	100202zzzzz	10020102zz

Register and I/O numbers of JX3 modules connected to a JX3-BN-ETH

Global Node Numbers of a JX3-BN-ETH on the Jetter Ethernet system bus

The JetSym Hardware Manager assigns Global Node Numbers to the bus node JX3-BN-ETH on the Jetter Ethernet system bus.

Register numbers for JX3 modules

The register number for JX3 modules at the Ethernet bus node consists of the following elements:

1	n	n	n	x	x	z	z	z	z
---	---	---	---	---	---	---	---	---	---

Element	Description	Value range
nnn	Global Node Number of a JX3-BN-ETH on the Ethernet system bus	001 ... 199
xx	Module number of the module within the JX3 station	02 ... 17
zzzz	Module register number	0000 ... 9999

I/O numbers for JX3 modules

The I/O number for JX3 modules connected to an Ethernet bus node consists of the following elements:

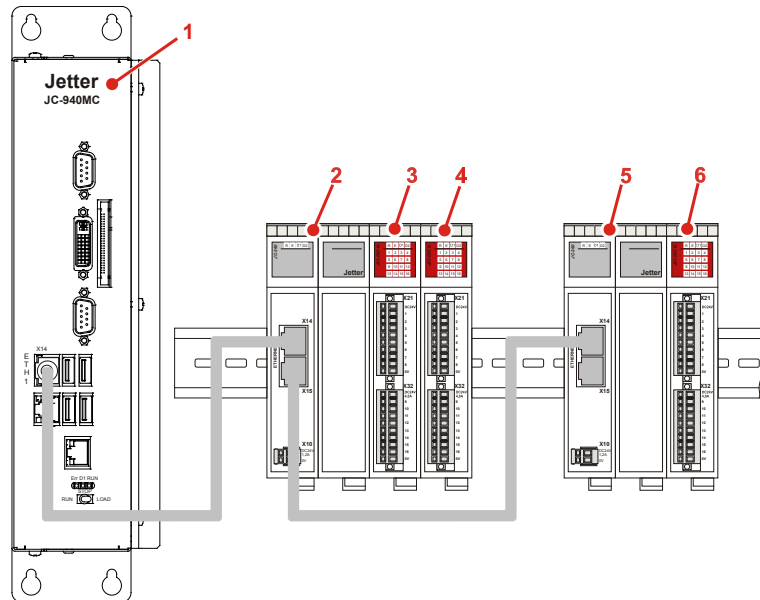
1	n	n	n	0	1	x	x	z	z
---	---	---	---	---	---	---	---	---	---

Element	Description	Value range
nnn	Global Node Number of a JX3-BN-ETH on the Ethernet system bus	001 ... 199
xx	Module number of the module within the JX3 station	02 ... 17
zz	Module-specific I/O number	1 ... 16

2 Register and I/O numbers with a JX3 station

Example

Two bus nodes JX3-BN-ETH are connected to a JC-940MC controller.



Number	Module	Module number	GNN	Register	I/O
1	JC-940MC	1	0	Refer to documentation on JC-940MC	
2	JX3-BN-ETH	-	1	Refer to documentation on JX3-BN-ETH	
3	JX3-DIO16	2		100102zzzz	10010102zz
4	JX3-DIO16	3	-	100103zzzz	10010103zz
5	JX3-BN-ETH	-	2	Refer to documentation on JX3-BN-ETH	
6	JX3-DIO16	2	-	100202zzzz	10020102zz

Register and I/O numbers of JX3 modules from the JX3-BN-ETH perspective

Application example

Explicit data transfer using `NetCopy()`.

Module numbers in a JX3 station

To determine module numbers in a JX3 station, proceed as follows:

- Count the JX3-I/O modules left-to-right, starting with 1.
- Leave out the power supply module JX3-PS1.

Register numbers for JX3 modules

From the perspective of the Ethernet bus node, the register number consists of the following elements:

1	0	0	x	x	z	z	z	z
---	---	---	---	---	---	---	---	---

Element	Description	Value range
xx	Number of the module within the JX3 station	02 ... 17
zzzz	Module register number	0000 ... 9999

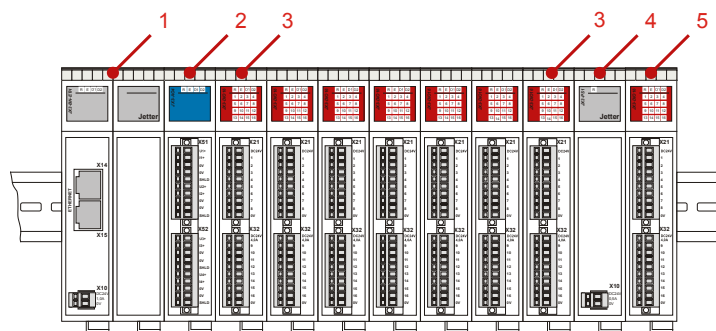
I/O numbers for JX3-modules

From the perspective of the Ethernet bus node, the I/O number consists of the following elements:

1	0	0	0	0	x	x	z	z
---	---	---	---	---	---	---	---	---

Element	Description	Value range
xx	Number of the module within the JX3 station	02 ... 17
zz	Module-specific I/O number	1 ... 16

Example of a JX3 station at a JX3-BN-ETH



Number	Module	Module number	Register	I/O
1	JX3-BN-ETH	1	Refer to JX3-BN-ETH manual	
2	JX3-AO4	2	10002zzzz	1000002zz
3	JX3-DIO16	3 ff.	10003zzzz	1000003zz
4	JX3-PS1	-	-	-
5	JX3-DIO16	10	10010zzzz	1000010zz

3 JX3 system bus

Introduction JX3 modules are directly connected to the JX3 system bus of the controllers JC-3xx, JC-4xx, or bus node JX3-BN-xxx. The JX3 system bus supports different modules. Access to these modules is completely transparent.

Configuration The JX3 system bus needs not be configured. The controllers JC-3xx, JC-4xx, and the bus node JX3-BN-xxx are able to automatically detect and commission connected modules.

Connectable modules

- JX3 modules except for JX3-COM-xxxx modules

Contents

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Module array and module codes of connected modules	30
Dummy modules on the JX3 system bus	32
JX3 system bus - Description of non-volatile registers.....	33
Register description - Modules detected on the JX3 system bus	34
Register description - Error handling on the JX3 system bus	35
Register description - Timeout intervals on the JX3 system bus.....	37
Register description - Versions of JX3 system bus drivers	38

Module array and module codes of connected modules

Module array

A unique module code is assigned to each module that is connected to the JX3 system bus. The controllers JC-3xx, JC-4xx, and the bus node JX3-BN-xxx enter all modules detected during initialization into the module array.

Modules are entered into the module array in the following order:

- As connected
- JX3-PS1 modules are not entered into the module array.

Registers - Overview

Register	Description
R 100002015	Index to module array
R 100002016	Module array R 100002015 = 0: Number of modules R 100002015 = 1: Module code of the first module etc.

Reading the module array

The module array is accessed indirectly.

Step	Action
1	Enter the number of the module in the module array into R 100002015 <i>Index to Module Array</i> .
2	Read out the module code from R 100002016 <i>Module Array</i> .

Module codes of JX3 modules

Module code	Module	Description
300	JX3-DI16	16 digital inputs
301	JX3-DIO16	16 digital inputs and 8 digital outputs
302	JX3-DO16	16 digital outputs
303	JX3-AI4	4 analog inputs
304	JX3-AO4	4 analog outputs
305	JX3-MIX1	Multi-purpose module
307	JX3-THI2-RTD	2 inputs for resistance thermometers
308	JX3-CNT	Universal counter module
310	JX3-MIX2	Multi-purpose module
312	JX3-THI2-TC	2 inputs for thermocouples
316	JX3-DMS2	2 inputs for strain gages
340	JX3-AI4-EI	4 analog inputs with galvanic isolation
341	JX3-THI2-RTD-EI	2 inputs for resistance thermometers with galvanic isolation
342	JX3-THI2-TC-EI	2 inputs for thermocouples with galvanic isolation

Module codes - Dummy modules

Module code	Module	Description
251	I/O dummy module	-

Dummy modules on the JX3 system bus

Dummy modules

A dummy module is a module on the JX3 system bus that actually does not exist. When assigning I/O module numbers, the controller JC-3xx, JC-4xx, and the bus node JX3-BN-xxx treat dummy modules as if they were existing modules.

Dummy modules allow the user to insert a nonexistent module between existing modules.

Registers - Overview

The value contained in the register for dummy module configuration is non-volatile. Any changes become effective only after the module has been re-initialized.

Register	Description
R 100002023	I/O dummy modules

Allowed dummy modules

- JX3 modules

Configuring dummy modules

Step	Action
1	Modify the dummy module configuration within the controller via R 100002023.
2	Switch the controller off.
3	Then, switch the controller on. Result: The controller or bus node has initialized the JX3 system bus taking into account the configured dummy modules. Information from the dummy modules can be retrieved via module array.

R 100002023

Dummy modules

Module register properties

Values	1 ... 65535 (bit-coded) Bit 0 -> module 2 Bit 1 -> module 3 ... Bit 15 -> module 17 Bit = 1: Module may exist Bit = 0: Dummy module
Value after reset	65535 (all modules may exist)

JX3 system bus - Description of non-volatile registers

Introduction

Non-volatile registers let you configure the JX3 system bus. Any changes to a non-volatile register will not take effect before reboot.

R 100002023

I/O dummy modules

Each bit in this register represents an I/O module on the JX3 system bus.

Meaning of the individual bits

Bit 0 Configuration of I/O module 2

0 = I/O module is a dummy module

1 = I/O module is not a dummy module

Bit 1 Configuration of I/O module 3

0 = I/O module is a dummy module

1 = I/O module is not a dummy module

etc. Configuration of I/O module 4 ... 17

0 = I/O module is a dummy module

1 = I/O module is not a dummy module

Module register properties

Value after reset Non-volatile; factory setting: 65535

Takes effect Next time when the controller is launched

R 100002034

Number of retries

This register lets you set the number of retries in accessing the JX3 modules. Before you make changes to this value consult the hotline at Jetter AG.

Module register properties

Values 1 ... 5

Value after reset Non-volatile; factory setting: 1

Takes effect Next time when the controller is launched

Register description - Modules detected on the JX3 system bus

R 100002013

Number of detected I/O modules

The controllers JC-3xx, JC-4xx, and the bus node JX3-BN-xxx enter the sum of the following I/O modules into this register:

- JX3-I/O modules
- I/O dummy modules

Values

0 ... 16	Number of I/O modules
----------	-----------------------

Module register properties

Type of access	Read only
----------------	-----------

Value after reset	Amount of connected JX3-I/O modules
-------------------	-------------------------------------

R 100002015

Index to module array

This index lets you select the module array entry contained in R 100002016.

Values

0	R 100002016 contains the number of modules connected to the JX3 system bus.
---	---

1 ... 16	R 100002016 contains the module code that has been entered into the module array by the controller.
----------	---

R 100002016

Module array

This register value reflects the module code that has been selected in R 100002015 *Index to module array*.

Module register properties

Type of access	Read only
----------------	-----------

Value after reset	Amount of connected JX3-I/O modules
-------------------	-------------------------------------

Register description - Error handling on the JX3 system bus

R 10000000

Bus status

The controllers JC-3xx, JC-4xx, and the bus node JX3-BN-xxx enter into this register the status of the JX3 system bus.

Meaning of the individual bits

Bit 15 Bus status

1 = Data exchange takes place via JX3 system bus.

Module register properties

Type of access	Read access
----------------	-------------

Value after reset	Depending on the initialization state
-------------------	---------------------------------------

R 100002008

JX3 system bus - Error registers

If an error on the JX3 system bus occurs, the controllers JC-3xx, JC-4xx, and the bus node JX3-BN-xxx enter its cause into this register.

Meaning of the individual bits

Bit 3 Error

1 = At least one JX3 module has caused an error.

Bit 16 Fatal error

1 = A fatal, non-recoverable error has occurred on the JX3 system bus. Data exchange has been terminated.

Module register properties

Type of access	Only 0 can be entered.
----------------	------------------------

Value after reset	Depending on the initialization state
-------------------	---------------------------------------

R 100002011

Number of the I/O module where the error has occurred

If during communication with an I/O module an error occurs, the controller enters the number of the I/O module into this register. An error might occur in the following cases:

- Read/write access to process data of JX3 modules
- Read/write access to module registers of a JX3 module

Values

2 ... 17	Number of the JX3 I/O module
----------	------------------------------

Module register properties

Type of access Only 0 can be entered.

R 10002111

Register number of the module where the error has occurred

If during communication with an I/O module an error occurs, the controller enters the number of the module register into this register. An error might occur in the following cases:

- Read/write access to module registers of a JX3 module

Values

-1 ... 9999 Module register number of the JX3 module

Module register properties

Type of access Only 0 can be entered.

Value after reset -1

Register description - Timeout intervals on the JX3 system bus

R 100002764**Timeout interval for register access to JX3 modules**

The response to register access to JX3 modules must be within the configured timeout interval:

- JX3 modules

Values

1 ... 255 [ms]	Timeout in milliseconds
----------------	-------------------------

Module register properties

Value after reset	15 [ms]
-------------------	---------

Register description - Versions of JX3 system bus drivers

Introduction

Apart from information on the OS version of the controllers JC-3xx, JC-4xx, and the bus node JX3-BN-xxx there is also additional version information for identifying the JX3 system bus driver.

R 100002000

Version of the JX3 system bus interface

Module register properties

Type of access	Read only
----------------	-----------

Data type	IP format
-----------	-----------

R 100002072

Version of the JX3 system bus driver

Module register properties

Type of access	Read only
----------------	-----------

Data type	IP format
-----------	-----------

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