

# **NANO-D**

## **Version Update**

### **from Version 2.00 to Version 2.01**



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# 1 Introduction

| Version Update - Survey |   |          |           |
|-------------------------|---|----------|-----------|
| Version                 | Function  | upgraded | corrected |
| V2.01                   | Display instructions<br>cursor position   | ✓        | ✓         |
|                         | Special registers<br>time of generating application program                                       | ✓        |           |
|                         | System bus<br>Festo CPX and SMC terminals integrated<br>Function and Power-Level Terminals JX-SIO | ✓        | ✓         |
|                         | Interfaces for LCD, PC and JETWay<br>monitoring   | ✓        | ✓         |
|                         | User interfaces<br>no "data error" after power on   |          | ✓         |
|                         | User-programmable interface<br>initialization after power on                                      |          | ✓         |
|                         | Networking via JETWay   | ✓        | ✓         |
|                         |   |          |           |
| V2.00                   | System bus  | ✓        | ✓         |
|                         | Special registers   | ✓        |           |
|                         | Display instructions  | ✓        |           |
|                         | Special functions   | ✓        |           |

By updating onto operating system version 2.01, the NANO-D has been equipped with a large number of new functions.

## Important!



While the operating system is being updated, the voltage supply of the NANO-D must not be interrupted.

## 2 Expansions

### 2.1 Display Instructions

If display instructions are to be used in order to output texts and register values via PRIM interface or a JX2-SER1 expansion module, the cursor position must be considered. In front of each display instruction, spaces, dependent on the cursor position, will be output now.

For using display instructions, the following issues must be considered:

- The text that is to be output, must always begin at cursor position 1.
- If the value of the cursor position is greater than 1, spaces will be output as ASCII code 20<sub>hex</sub> up to the start of the text.
- For diverting the display instructions onto the PRIM interface, device "9" must be selected.
- For diverting the display instructions onto the JX2-SER1 expansion module, device "11" must be selected. The module number of the expansion module will be output in register 2838.

#### Example 1: Output on a JX2-SER1 Expansion Module

On a JX2-SER1 module, texts and register contents are output in different ways.

```

SER1 --                                // -- ASCII-sequence in HEX in a JX2-
DISPLAY_TEXT (11, 1, "Hello")         // 48 61 6C 6C 6F
DISPLAY_TEXT (11, 3, "Hello")         // 20 20 48 61 6C 6C 6F

REG_LOAD (1400, 1234)                  // Register for output
REG_LOAD (2810, 0)                     // Quantity of post-comma-places
(default)
REG_LOAD (2812, 8)                     // Field width (default)
REG_LOAD (2816, 0)                     // Sign suppression (default)
SER1 --                                // -- ASCII-sequence in HEX in a JX2-
DISPLAY_REG (11, 1, 1400)              // 20 20 20 20 31 32 33 34
DISPLAY_REG (11, 3, 1400)              // 20 20 20 20 20 20 31 32 33 34




```

## 2.2 System Bus

### 2.2.1 Further modules

Besides modules produced by Jetter AG, modules produced by other manufacturers can also be connected to the system bus of the NANO-D. In general, these modules are handled like a JX-SIO module.

The following modules are supported by a NANO-D of the software version 2.01:

| Further Modules       |  |
|-----------------------|--|
| Manufacturer          | Product Designation  |
| Bürkert GmbH & Co. KG | Valve terminal type 8640<br> Buerkert_UI_100_userinformation  |
| Festo AG & Co.        | CPV10-GE-CO2-8<br>CPV14-GE-CO2-8<br>CPV18-GE-CO2-8<br>CPX-FB14<br> Festo_UI_100_userinformation       |
| SMC Pneumatik GmbH    | SI-unit EX120 - SCA1<br>SI-unit EX121 - SCA1<br>SI-unit EX122 - SCA1<br> SMC_UI_100_userinformation |

Further modules are recognized and commissioned automatically. Another commissioning software will not be needed. For connecting these modules, please consider the operating instructions of the respective manufacturers. In addition, user information has been provided by Jetter AG, in which the operation of these modules being connected to the Jetter system bus is described.

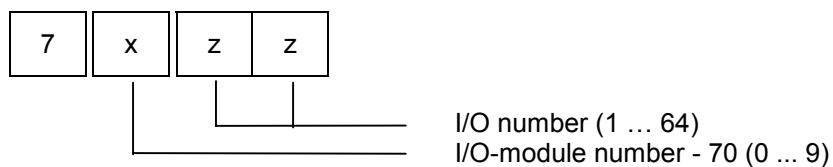
### 2.2.1.1 Registers and I/O Numbers

The inputs and outputs of further modules can be accessed with the help of the I/O instructions of the JetSym language. The registers of these modules can also be accessed with the help of register instructions.

The individual I/Os and registers are distinguished by their numbering.

| I/O and Register Arrays of Further Modules |  |
|--|--|
| Area                                       | Description  |
| IN 7000 ... IN 7999                        | digital inputs                                     |
| OUT 7000 ... OUT 7999                      | digital outputs                                    |
| Reg 5000 ... Reg 5999                      | I/O register overlay of digital and analog inputs  |
| Reg 6000 ... Reg 6999                      | I/O register overlay of digital and analog outputs |
| Reg 7000 ... Reg 7999                      | Registers for configuring and diagnose             |

#### Coding of I/O Numbers



#### Coding of the registers for I/O register overlay and for analog inputs



#### Coding of the registers for I/O register overlay and for analog outputs



**Coding of the registers for configuring and diagnose****2.2.1.2 Module Array**

When a module produced by another manufacturer has been recognized, it will be stored in the module array by an unambiguous code. The module array can be accessed via registers 2015 and 2016.

| Register 2015: Pointer unto a Module Array |                                 |
|--|---------------------------------|
| Function                                   | Description                     |
| Read                                       | selected module                 |
| Write                                      | select a certain module         |
| Value range                                | 0 through amount of I/O modules |
| Value after reset                          | 0                               |



| <b>Register 2016: Module Array</b> |  |
|------------------------------------|--|
| <b>Function</b>                    | <b>Description</b>   |
| Read                               | <p><b>Module Array</b></p> <p>2015 = 0 -&gt;<br/>2016 = amount of modules</p> <p>2015 = 1 -&gt;<br/>2016 = Code of the first module</p> <p>2015 = 2 -&gt;<br/>2016 = Code of the second module</p> <p><b>Code:</b></p> <p><b>JX2-I/O Modules</b></p> <p>0 JX2-OD8<br/>1 JX2-ID8<br/>2 JX2-IO16<br/>3 JX2-IA4<br/>4 JX2-OA4<br/>5 JX2-CNT1<br/>6 JX2-PRN1<br/>7 JX2-SER1</p> <p><b>JX-SIO and further modules</b></p> <p>64 JX-SIO<br/>65 Festo CPV Direct<br/>66 Festo Terminal CPX<br/>67 Buerkert valve terminal type 8640<br/>68 SMC SI-unit EX12# - SCA1</p> <p><b>JX2 slave modules</b></p> <p>128 JX2-SV1<br/>129 CAN-DIMA<br/>130 JX2-SM2<br/>131 JX2-SM1D<br/>132 JX2-PID1<br/>133 JX2-PROFI1<br/>135 JetMove 200 Series<br/>136 JX2-ProfiM<br/>146 JetMove 600 series</p> <p><b>Dummy-modules</b></p> <p>252 JX-SIO dummy-module<br/>253 JX2-Slave dummy-module<br/>254 JX2-I/O dummy-module<br/>255 Not identified</p> |
| Write                              | Illegal  |
| Value range                        | 0 - 255  |
| Value after reset                  | Quantity of expansion modules  |

## 2.2.2 Function and Power-Level Terminals at the JX-SIO

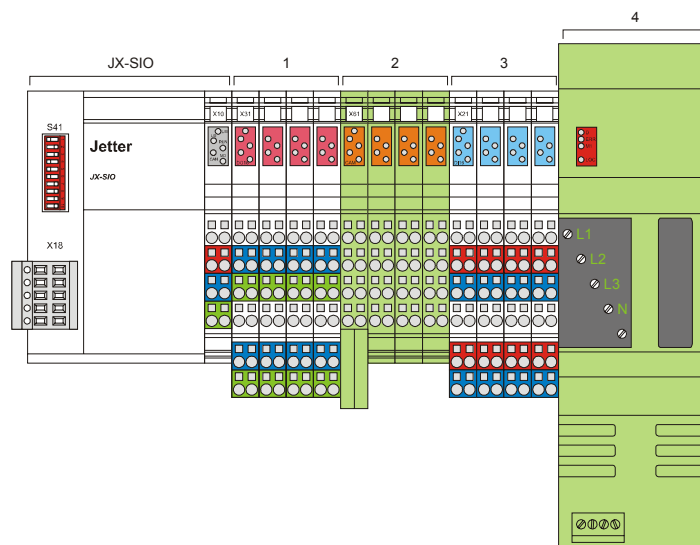
Besides digital and analog I/O terminals, function and power-level terminals can also be connected to the JX-SIO. Below, only the term "function terminal" will be used for both function and power-level terminals.

The following function terminals are supported by the JX-SIO:

- IB IL 400 MLR 1-8A
- IB IL 400 ELR 1-3A
- IB IL 400 ELR R-3A
- INLINE CAM by Deutschmann Automation GmbH

| JX-SIO Function Terminals: Register Survey |                                   |
|--|-----------------------------------|
| Register Number                            | Description                       |
| 7x04                                       | Index of function terminals       |
| 7x05                                       | Status of function terminals      |
| 7x06                                       | Input data of function terminals  |
| 7x07                                       | Output data of function terminals |

The communication between CPU and function terminals has been described in detail in the user information on Smart I/O modules.



**Fig. 1: Smart I/O module with function terminal INLINE CAM and power-level terminal IB IL 400 MLR 1-8A**

## 2.2.3 Special Flags for the System Bus

With the help of a special flag, the NANO-D indicates certain errors. This makes a detailed error analysis possible. After start-up, the NANO-D will clear all special flags.

| Survey of the Special Flags for the System Bus |   |
|--|---|
| Special Flag                                   | Description   |
| 2048   | Timeout at access to a JX2-I/O module   |
| 2049   | Timeout at access to a JX2 slave-module   |
| 2050   | Timeout at access to a JX2-I/O module   |
| 2065   | Error signaling at output driver errors has been activated.   |
| 2067   | Fatal system bus error  |
| 2068   | Errors have accumulated at the system bus interface   |
| 2270   | Timeout at access to a JX-SIO which is not active   |
| 2272   | Access to an unknown JX-SIO-register  |
| 2273   | Access to a register which is not supported by this JX-SIO, e.g. configuration of an analog input, although there is no analog input terminal |
| 2274   | Timeout at JX-SIO monitoring  |
| 2275   | JX-SIO has carried out an internal reset, which means it is not ready for operation   |
| 2276   | Overflow at a read access to a 32-bit register  |

## 2.2.4 Access to JX-SIO Analog Values

Up to now, registers 5x60 through 5x71, as well as registers 6x60 through 6x71 have been written, respectively read, while a REGISTER instruction was being processed.

In order to achieve an increase in performance, the NANO-D reads all analog inputs in the background, when all tasks have been processed. If special flag 2059 has been set, the analog inputs are even read after each task switch.

All changed analog outputs are written to the JX-SIO at the end of a task.

## 2.3 Monitoring the Activities of Interfaces

With the help of two special flags per interface, the activities of any connected communication partner that is communicating with the NANO-D via LCD, PC or JETWay interface, can be monitored through the application program. This way, for example, an enquiry can be made, whether there is still an active connection to an operating and display module existing.

### Note

Monitoring the interface activity by PRIM via special flag is not possible for user-programmable interfaces.

The first special flag will be set by the operating system, when a valid telegram has been received. A monitoring time can be set in a register; it will be started simultaneously with receiving the telegram. Any further telegram will re-start the monitoring time.

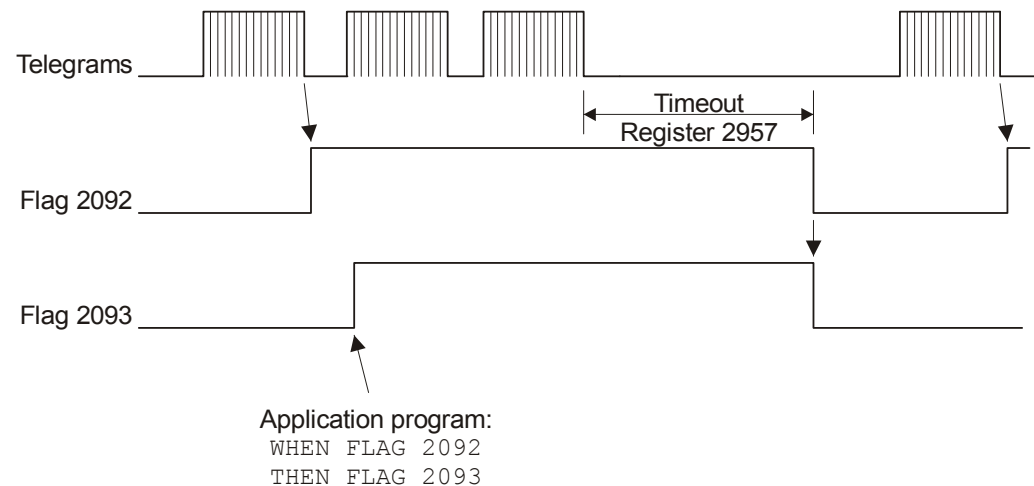
Another special flag can be set by the user. If no valid telegrams are received any more, both special flags will be reset when the monitoring time has elapsed. As the second special flag has not been set by the operating system, the user can check whether the connection had been interrupted for a short time. In this case, the NANO-D would, after an interruption, reset the first special flag only for a short instance and after this set it again immediately.

The monitoring time can be defined via register by the user for each interface individually. By setting the monitoring time to zero, activity monitoring will be switched off.

For activity monitoring, cyclic data exchange on the interface must be active.

If operator panels, such as LCD 9, LCD 34, LCD 19, ... are used, the monitoring time should not be set to less than 200 ms. If values smaller than 200 ms are set, errors might be reported in multi-display mode or in big-sized user interfaces in spite of active communication.

In process monitoring systems – such as VIADUKT or JETLink, as well as in JetSym – the interrogation time can either be set or else communication can be stopped altogether. This must be considered for activity monitoring.



**Fig. 2: Monitoring of the LCD interface**

### 2.3.1 Register for Monitoring the Activities of Interfaces

| <b>Register 2956: Monitoring time of the PC interface</b> |  |
|---|--|
| <b>Function</b>   | <b>Description</b>   |
| Read  | present monitoring time in milliseconds  |
| Write   | new monitoring time in milliseconds<br><br><b>Note</b><br>Monitoring the interface activity is always deactivated for user-programmable (PRIM) interfaces. |
| Value range   | 0 .. 65535   |
| Value after reset   | 0 (no monitoring)  |

| <b>Register 2957: Monitoring time of the LCD interface</b> |  |
|--|--|
| <b>Function</b>  | <b>Description</b>   |
| Read   | present monitoring time in milliseconds  |
| Write  | new monitoring time in milliseconds<br><br><b>Note</b><br>Monitoring the interface activity is always deactivated for user-programmable (PRIM) interfaces. |
| Value range  | 0 .. 65535   |
| Value after reset  | 0 (no monitoring)  |

| <b>Register 2958: Monitoring time of the JETWay interface</b> |  |
|---|--|
| <b>Function</b>   | <b>Description</b>   |
| Read  | present monitoring time in milliseconds  |
| Write   | new monitoring time in milliseconds<br><br><b>Note</b><br>Monitoring the interface activity is always deactivated for user-programmable (PRIM) interfaces. |
| Value range   | 0 .. 65535   |
| Value after reset   | 0 (no monitoring)  |

| <b>Register 10019: Amount of errors on the PC interface</b> |   |
|---|---|
| <b>Function</b>   | <b>Description</b>  |
| Read  | present amount of errors on the PC interface<br><br><b>Note</b><br>The error-counter is not supported, if PRIM interfaces are used. |
| Write   | reset the error count   |
| Value range   | 0 – 65535   |
| Value after reset   | 0   |

| <b>Register 10039: Amount of errors on the LCD interface</b> |  |
|--|--|
| <b>Function</b>  | <b>Description</b>   |
| Read   | present amount of errors on the LCD interface<br><br><b>Note</b><br>The error-counter is not supported, if PRIM interfaces are used. |
| Write  | reset the error count  |
| Value range  | 0 – 65535  |
| Value after reset  | 0  |

Each time a character has been received on the PC and the LCD interface, the NANO-D checks, whether an error has occurred during transmission. The error counts will be incremented by one, if the following errors have occurred:

|                      |   |
|----------------------|---|
| <b>Overrun Error</b> | The UART of the interface received characters, although the receiving buffer had already been full. |
| <b>Parity Error</b>  | The parity of the received character was not correct.   |
| <b>Framing Error</b> | The received character had no valid stop bit.   |

## 2.3.2 Special Flag for Monitoring the Activities of Interfaces

| Special flag 2090 through 2095: |                  | Monitoring the activities of interfaces  |
|---------------------------------|------------------|--|
| Special Flag                    | Interface        | Description  |
| 2090                            | PC interface     | operating system flag<br>0 = no valid telegrams<br>1 = the interface is active |
| 2091                            |                  | user flag<br>0 = no valid telegrams<br>to be set by the user                   |
| 2092                            | LCD interface    | operating system flag<br>0 = no valid telegrams<br>1 = the interface is active |
| 2093                            |                  | user flag<br>0 = no valid telegrams<br>to be set by the user                   |
| 2094                            | JETWay interface | operating system flag<br>0 = no valid telegrams<br>1 = the interface is active |
| 2095                            |                  | user flag<br>0 = no valid telegrams<br>to be set by the user                   |

## 2.4 Time of Generating the Application Program

The programming system JetSym generates a file of the ending \*.end when an application program is converted for the NANO-D. This file can be found in the "debug" directory of the JetSym project.

The time of generating this file will be stored in the application program and will also be transferred to the NANO-D during download. The time of generating the application program, which has been stored in the FLASH, can be read out of registers 2970 through 2974. The time of generating the application program, which can be read out of the registers, corresponds with the date of the \*.end file.

| Survey: Registers: Time of generating the application program which is stored in the FLASH |             |
|--|-------------|
| Register number  | Description |
| 2970   | Minutes     |
| 2971   | Hours       |
| 2972   | Day         |
| 2973   | Month       |
| 2974   | Year        |

### Note



If the function "autoFLASH" has not been activated in the project settings, the generating time written in registers 2970 through 2974 remains unchanged during download. Not before the application program has been transferred from the RAM into the FLASH, the time of generating the application program will be updated.

At start-up, the NANO-D always copies the application program, which has been stored in the FLASH, into the RAM.



## **3 Eliminated Software Bugs**

### **3.1 User Interfaces**

#### **3.1.1 Behavior during Start-Up**

Starting from operating system version 2.00 of the NANO-D, the text "data error" would appear on a connected user interface at power-up. This was mainly dependent on the duration of the power-on delay and did not influence the functioning of the user interface. Starting from operating system version 2.01, the text "P-SPS timeout" will be shown on the user interface, until the initializing phase of the NANO-D has been completed.

#### **3.1.2 JX-SIO Inputs and Outputs**

The digital inputs and outputs of the JX-SIO expansion modules with the I/O numbers 7001 through 7964 can now be read and written via user interface.

### **3.2 Display Instructions**

When registers are mapped onto a JX2-SER1 or a JX2-PRN1 module with the help of `DISPLAY_REG`, the amount of characters to be output will be limited to the field width set in register 2812 "Field width for the display of interregisters".

Up to version 2.00, 10 characters would always be output.

### **3.3 Network Operation**

The NANO-D will only accept a token in a JETWay network, if it has been configured as a master. The token will be passed on among the individual masters belonging to a JETWay network.

### **3.4 Application Program RAM-> FLASH**

Now, the copying process of the application program from RAM into FLASH is interrupted by the NANO-D; this way, further data can be exchanged via serial interfaces.

Especially in the programming system JetSym, setting a long timeout time for the interface will not be necessary.

### **3.5 System Bus**

#### **3.5.1 Erroneous Behavior of the Analog Outputs in Smart I/O Modules**

For Smart I/O modules, erroneous behavior of the analog outputs can be configured. The Smart I/O modules will recognize an interruption of the system bus connection to the NANO-D and will then output the configured values at the analog outputs.

Up to version 3.00, the configuring data would not be transmitted correctly; at the analog outputs value 0000<sub>hex</sub> would always be output.

### **3.6 User-Programmable Interface**

After power-up, registers 10004 "occupancy of the sending buffer" and 10006 "occupancy of the receiving buffer" are set to zero. Up to now, these registers would only be set to zero when configuring of PRIM interfaces was carried out.