

NATIONAL CONTROL DEVICES

Fusion Digital Input/Output Quick Start Guide



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Fusion Digital I/O Quick Start Guide

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Notice: Portions of this manual require internet access.

Table of Contents

| | |
|---|---|
| Fusion Digital I/O Quick Start Guide..... | 1 |
| Port Direction | 1 |
| Port 1 Commands (Decimal Format)..... | 4 |
| Port 2 Commands (Decimal Format)..... | 4 |
| Port 1 Commands (Hexadecimal Format)..... | 4 |
| Port 2 Commands (Hexadecimal Format)..... | 4 |
| EEPROM Memory..... | 5 |
| EEPROM Memory Locations | 5 |
| Technical Support | 6 |
| Contact Information..... | 7 |
| Notice:..... | 7 |



Fusion Digital I/O Quick Start Guide

The Fusion® Series is our fourth generation relay controller offering the ultimate relay control solution . . . without exception.

Fusion Series controllers support up to two ports of 8-bit digital input/output, allowing users to read and control 5V digital signals using only a few simple commands. When used for digital input applications, Fusion controllers are capable of reading inputs such as switches, magnet sensors, and other contact closure devices. Digital output makes it easy to control LEDs and some logic circuits at very high speed.

Port Direction

The first step in using the Digital I/O features of Fusion series controllers is a complete understanding of port direction. Each 8-bit port may be configured to read inputs, write outputs, or both in combination. When the port is set to all inputs, eight switches can be read as long as the input does not exceed 0 to 5 Volts DC. When the port is set to all outputs, eight LEDs can be controlled by software, allowing you to turn each LED on or off in any combination. It is easy to mix inputs and outputs, allowing users to read four switches and control four LEDs. Each I/O line on the Fusion controller may be configured to input or output, but you must set the status of all eight I/O lines at one time using a single command. Here's an example:

| | | | | |
|-----|---|-----|---|---------|
| 236 | 2 | 255 | Set I/O Lines 1 to 8 to Input | Rx: 255 |
| 236 | 2 | 0 | Set I/O Lines 1 to 8 to Output | Rx: 0 |
| 236 | 2 | 15 | Set I/O Lines 1-4 to Input, 5-8 to Output | Rx: 15 |

The third byte in the Port Direction command is used to set the digital input or output state of all eight data lines on the I/O port. Here's how you decide what this value should be:

Each I/O bit has a value associated, as shown below:

| | | | | | | | |
|-------|-------|-------|-------|-------|-------|-------|-------|
| IO 8 | IO 7 | IO 6 | IO 5 | IO 4 | IO 3 | IO 2 | IO 1 |
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |



128 64 32 16 8 4 2 1

Each of these 8 bits may be On or Off:

1 = On = Input
0 = Off = Output

If we turn on every other bit, we get this:

| | | | | | | | |
|-------|-------|-------|-------|-------|-------|-------|-------|
| IO 8 | IO 7 | IO 6 | IO 5 | IO 4 | IO 3 | IO 2 | IO 1 |
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
| In | Out | In | Out | In | Out | In | Out |
| 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 128 | 0 | 32 | 0 | 8 | 0 | 2 | 0 |

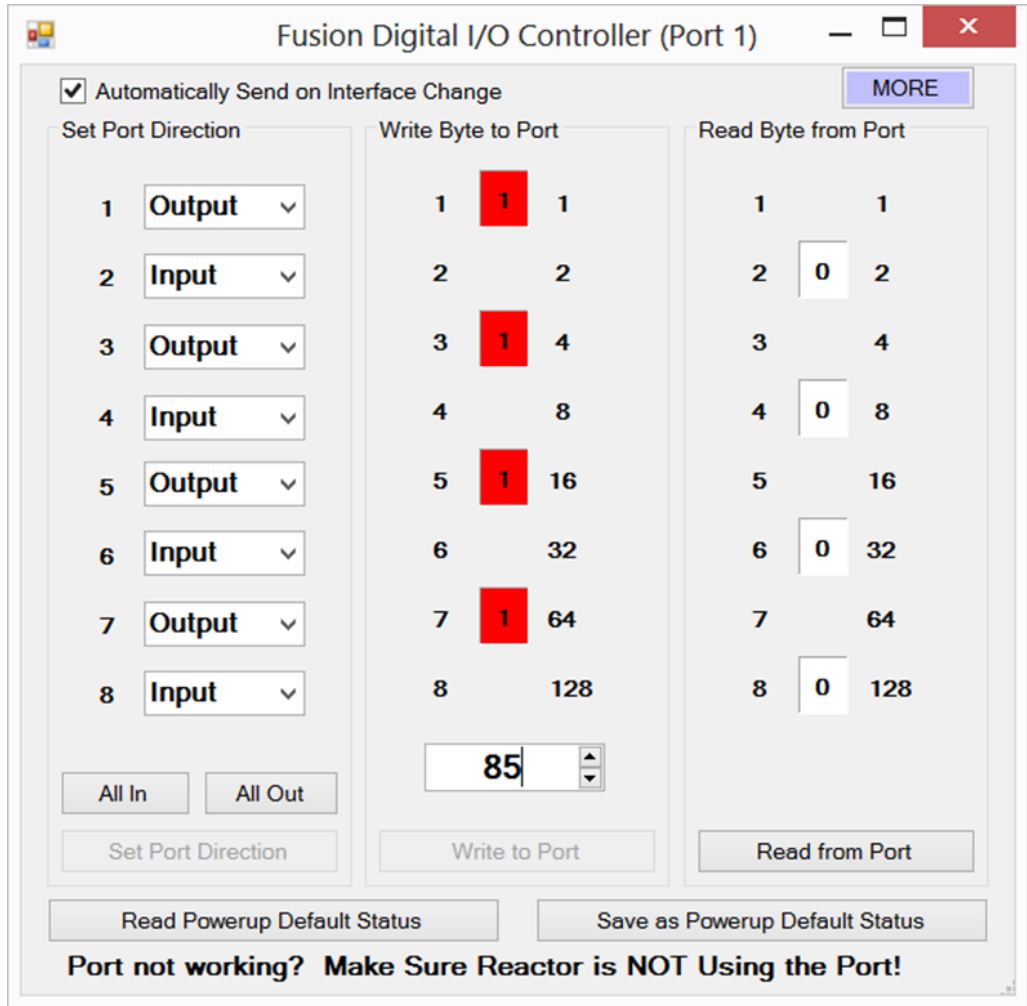
Bits 8, 6, 4, and 2 will be turned on, setting them to input; the other bits will remain off, setting them to output.

Now we add the bits together:

$$128 + 32 + 8 + 2 = 170$$

Now we send the command:

236 2 170 Sets I/O Line 0 to Output
 Sets I/O Line 1 to Input
 Sets I/O Line 2 to Output
 Sets I/O Line 3 to Input
 Sets I/O Line 4 to Output
 Sets I/O Line 5 to Input
 Sets I/O Line 6 to Output
 Sets I/O Line 7 to Input
 Controller responds with: Rx: 170



In the screen shot above, the 8-bit I/O Port was configured for input and output. I/O lines 1, 3, 5, 7 are outputs while I/O lines 2, 4, 6, 8 are set to inputs. The value 85 was written to the port, turning on I/O lines 1, 3, 5, and 7 (these lines can be used to drive LEDs). Inputs 2, 4, 6, and 8 can be used to read switches, and will light RED if the input is high and you click the “Read from Port” button.

Port 1 Commands (Decimal Format)

Value can be any number from 0 to 255, and follows the 8-bit binary standard.

| | | | | |
|-----|---|---------|--|-----------------------|
| 236 | 0 | <Value> | Write Output values to output bits of I/O port | Rx: <OutputValue> |
| 236 | 1 | <Value> | Read Input value from input bits of I/O Port | Rx: <Input Value> |
| 236 | 2 | <Value> | Set Port Direction Command | Rx: <Direction Value> |

Port 2 Commands (Decimal Format)

Value can be any number from 0 to 255, and follows the 8-bit binary standard.

| | | | | | |
|-----|---|---------|---|--|-----------------------|
| 236 | 0 | <Value> | 2 | Write Output values to output bits of I/O port | Rx: <Output Value> |
| 236 | 1 | | 2 | Read Input value from input bits of I/O Port | Rx: <Input Value> |
| 236 | 2 | <Value> | 2 | Set Port Direction Command | Rx: <Direction Value> |

Port 1 Commands (Hexadecimal Format)

Value can be any number from 0 to 255, and follows the 8-bit binary standard.

| | | | | |
|------|------|---------|--|-----------------------|
| 0xEC | 0x00 | <Value> | Write Output values to output bits of I/O port | Rx: <Output Value> |
| 0xEC | 0x01 | | Read Input value from input bits of I/O Port | Rx: <Input Value> |
| 0xEC | 0x02 | <Value> | Set Port Direction Command | Rx: <Direction Value> |

Port 2 Commands (Hexadecimal Format)

Value can be any number from 0 to 255, and follows the 8-bit binary standard.

| | | | | | |
|------|------|---------|------|--|-----------------------|
| 0xEC | 0x00 | <Value> | 0x02 | Write Output values to output bits of I/O port | Rx: <Output Value> |
| 0xEC | 0x01 | | 0x02 | Read Input value from input bits of I/O Port | Rx: <Input Value> |
| 0xEC | 0x02 | <Value> | 0x02 | Set Port Direction Command | Rx: <Direction Value> |



EEPROM Memory

EEPROM Memory stores the state of each port when power is first applied to the controller. Please review the *Fusion EEPROM Quick Start Guide* for complete details.

EEPROM Memory Locations

280 Stores the Direction of Port 1

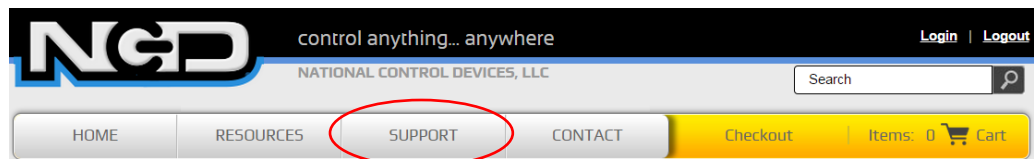
281 Stores the On/Off status of each bit of Port 1

282 Stores the Direction of Port 2

283 Stores the On/Off status of each bit of Port 2

Technical Support

Technical support is available through our website, controlanything.com. **Support** is the way we connect NCD engineers to our customers.



*Click on the **Support** tab at the top of any page on our website to be taken to the **Forum** page. Here you can publicly post or review problems that customers have had, and learn about our recommended solutions.*

Our engineers monitor questions and respond continually throughout the day. Before requesting telephone technical support, we ask that customers please try to resolve their problems through **Support** first. However, for persistent problems, NCD technical support engineers will schedule a phone consultation.



Contact Information

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Notice:

The only authorized resellers of NCD products are

- www.controlanything.com
- www.relaycontrollers.com
- www.relaypros.com

All other websites are not authorized dealers; we have noticed some retailers offering our products fraudulently.