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**TRIO**
MOTION | TECHNOLOGY

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| **Subject:** | **Registration on the MC4N** |

# APPLICATION NOTE

## 1. Registration on MC4N

The registration on the MC4N is more flexible than on previous controllers. Digital axis can have up to 8 registration events assigned and the reference encoder can have up to 2. The following chapters list the commands required, more information on the existing commands can be found in the Trio Technical Reference Manual v7.6 and newer as well as the TrioBASIC help files of Motion Perfect.

To arm registration with the reference encoder input you need to use REGIST(20…).

To arm hardware registration with a digital axis and its physical inputs you need to use REGIST(20…).

To arm time based registration you need to use the REGIST(21…).

### 1.1. Commands

#### 1.1.1. REGIST(mode, channel, source, edge, window [,quantity, table_start])[1]

##### 1.1.1.1. REGIST(20, channel, source, edge, window [,quantity, table_start])

Mode 20 is used to set the hardware registration inputs A or B on the reference encoder. Alternatively A or B can be replaced with the Z mark. A and B are completely independent.

If the optional parameters quantity and table_start are used then a set of registration positions can be stored in the table. REG_POS and REG_POSB will still store the latest registration position of the corresponding channel.

| channel: | 0 | Selects channel A. |
|---|---|---|
| | 1 | Selects channel B. |
| | 0…511 | Digital input selection when source set to 4. |
| | 16…32 | Bits 16 to 32 to select digital input when Digital Input Window enabled (window option 3 and 4) |

| source: | 0 | Selects the first 24V input. |
|---|---|---|
| | 1 | Selects the Z mark. |
| | 2 | Selects the second 24V input. (if available) |
| | 4 | Selects any digital input as source, used on any axis. |
| edge: | 0 | Rising edge |
| | 1 | Falling edge |
| window: | 0 | No windowing |
| | 1 | Position must be inside OPEN_WIN..CLOSE_WIN. |
| | 2 | Position must be outside OPEN_WIN..CLOSE_WIN. |
| quantity | 1 - TSIZE | Quantity of registration captures to store in the TABLE. |
| table_start | 0 -TSIZE | Start position in the TABLE for the registration positions. |

### 1.1.1.2. REGIST(21, channel, source, edge, window [,quantity, table_start])

REGIST mode 21 is used to arm the time based registration, which is ideal for digital drives (Ethercat and RTEX).

This mode operates with the parameters R_MARK(channel), R_REGPOS(channel) and R_REGISTSPEED(channel).

If the optional parameters quantity and table_start are used then a set of registration positions can be stored in the table. R_REGPOS will still store the latest registration position.

| channel: | 0…7 | This is the registration channel to be used (range 0..7) |
|---|---|---|
| | 16…32 | Bits 16 to 32 to select digital input when Digital Input Window enabled (window option 3 and 4) |
| source: | source + 256 | Physical input assigned to the logical channel. |
| edge: | 0 | rising edge |
| | 1 | falling edge |
| window: | 0 | no windowing |
| | 1 | position must be inside OPEN_WIN..CLOSE_WIN |
| | 2 | position must be outside OPEN_WIN..CLOSE_WIN |
| quantity | 1 - TSIZE | Quantity of registration captures to store in the TABLE |
| table_start | 0 -TSIZE | Start position in the TABLE for the registration positions |

### 1.1.2. REG_INPUTS

Used to assign the registration inputs to an axis on the reference encoder input.

| Bits | Function |
|------|----------|
| 3:0 | Input select for registration channel A<br>0000 = Built-in Input 0<br>0001 = Built-in Input 1<br>0010 = Built-in Input 2<br>0011 = Built-in Input 3<br>0100 = Built-in Input 4<br>0101 = Built-in Input 5<br>0110 = Built-in Input 6<br>0111 = Built-in Input 7 |
| 7:4 | Input select for registration channel B<br>0000 = Built-in Input 0<br>0001 = Built-in Input 1<br>0010 = Built-in Input 2<br>0011 = Built-in Input 3<br>0100 = Built-in Input 4<br>0101 = Built-in Input 5<br>0110 = Built-in Input 6<br>0111 = Built-in Input 7 |

The default channels assignment is set out as below.

| Axis | Channel A | Channel B |
|------|-----------|-----------|
| 0 | 0 | 4 |

### 1.1.3. MARK

True when registration event occurs[1]

### 1.1.4. MARKB

True when second registration event occurs[1]

### 1.1.5. R_MARK(channel)

True when the registration event occurs on specified channel

### 1.1.6. REG_POS

Position at which registration event occurs[1]

### 1.1.7. REG_POSB

Position at which second registration event occurs[1]

### 1.1.8. R_REGPOS(channel)

Position at which registration event occurs on a specified channel

### 1.1.9. REGISTSPEED[1]

Speed at the time of the registration event

### 1.1.10. REGISTSPEEDB[1]

Speed at the time of the second registration event

### 1.1.11. R_REGISTSPEED(channel)

Speed at the time of the registration event on the specified channel

### 1.1.12. REGIST_CONTROL[1]

Read or set the low level bit pattern in the control register

### 1.1.13. OPEN_WIN[1]

First position of the window which will be used in the registration event

### 1.1.14. CLOSE_WIN[1]

Second position of the window which will be used in the registration event

# 2. Registration Options

Up to 2 registration channels can be assigned per axis on the Built-in encoder port.

Up to 2 registration channels can be assigned per axis on digital input axes (Ecat and Rtex) on those drives having hardware registration inputs. Note in case of Ethercat the drive must support Touch Probe for the registration inputs.

The Z mark can be used for registration for its own axis in any of the above cases. Note in case of Ethercat the drive must support Touch Probe for Z mark registration.

Up to 8 registration events can be armed per axis on a Digital axis using the registration inputs of the MC4N. Note this 8 events are shared among all axes, if the 8 events are assigned to a single axes, there will not be more available events for other axes until those events are triggered, so that they could be assigned again.

# 3. Current Limitations

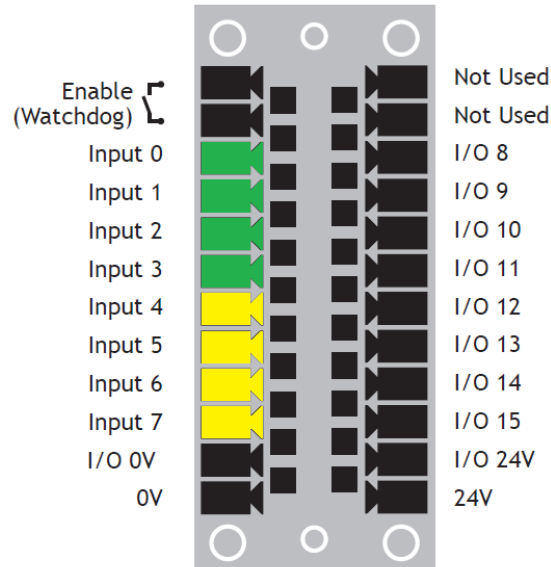Only 2 registration channels can be assigned to the Built-in reference encoder input.

Windowing is only configurable per axis, so you cannot have 2 registration events armed on one axis with different windows.

***IMPORTANT*

Note that just the first 4 inputs of the built-in IO connector have fast opto-couplers for fast registration. Therefore, using any of the first 4 inputs for registration (either REGIST 20 or REGIST 21) will be more accurate.

Having said that, when arming registration on the built-in encoder port, it makes sense to change the second channel default registration input to any of the first 4 with the REG_INPUTS command:

```
BASE(reference_encoder)
REG_INPUTS = $01
```

Enable (Watchdog) ⌐_  | Not Used
Input 0 | Not Used
Input 1 | I/O 8
Input 2 | I/O 9
Input 3 | I/O 10
Input 4 | I/O 11
Input 5 | I/O 12
Input 6 | I/O 13
Input 7 | I/O 14
I/O 0V | I/O 15
0V | I/O 24V
| 24V

Inputs 0 - 3 have fast opto-couplers for use as axis registration inputs. Inputs 4-7 may also be used as registration inputs.

2k7 on inputs 0 - 3
6k8 on all other inputs

Optical Input Signal — Input Pin

I/O 0V
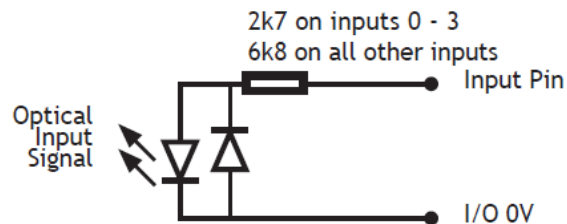
# 4. Examples

## 4.1. Digital axis examples

### 4.1.1. Time based registration channel 2, raising edge.

```
REGIST(21, 2, 0, 0)
```

### 4.1.2. Hardware registration channel A (drive registration input), raising edge

```
REGIST(20, 0, 0, 0)
```

### 4.1.3. Time based registration channel 2, falling edge and windowing

```
OPEN_WIN=180
CLOSE_WIN=270
REGIST(21, 2, 1, 1)
```

### 4.1.4. Time based registration channel 3, and Z mark registration channel A, raising edge

```
REGIST(21, 3, 0, 0)
REGIST(20, 0, 1, 0)
```

### 4.1.5. Time based registration channel 1, and input 3 to open enable the window.

```
REGIST(21, 1 + 65536 + 131072, 0, 0, 3)
```

**4.1.6. Time based registration channel 1 and 2, using input 1 for both registration events in two different axis.**

```
BASE(1)
REGIST(21, 1, 0, 0, 0)
BASE(2)
REGIST(21, 2, 256+1, 0, 0)
```

## 4.2. Built-in encoder port examples

Once the registration inputs have been assigned the REGIST command works as per any controller.

### 4.2.1. Assigning channel to an axis

```
REG_INPUTS AXIS(0)= $30 'Assigns registration input 0 and 4 to axis 0
```

### 4.2.2. Arming 2 registration inputs

```
REGIST(20, 0, 0, 0) 'Arms registration A as rising edge
```

```
REGIST(20, 1, 0, 1) 'Arms registration B as a falling edge
```

# 5. References

Further information can be found in the following documents.

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[1] Trio Technical Reference Manual version 7.6