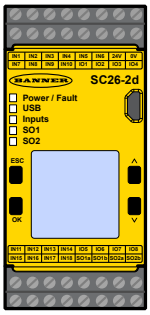
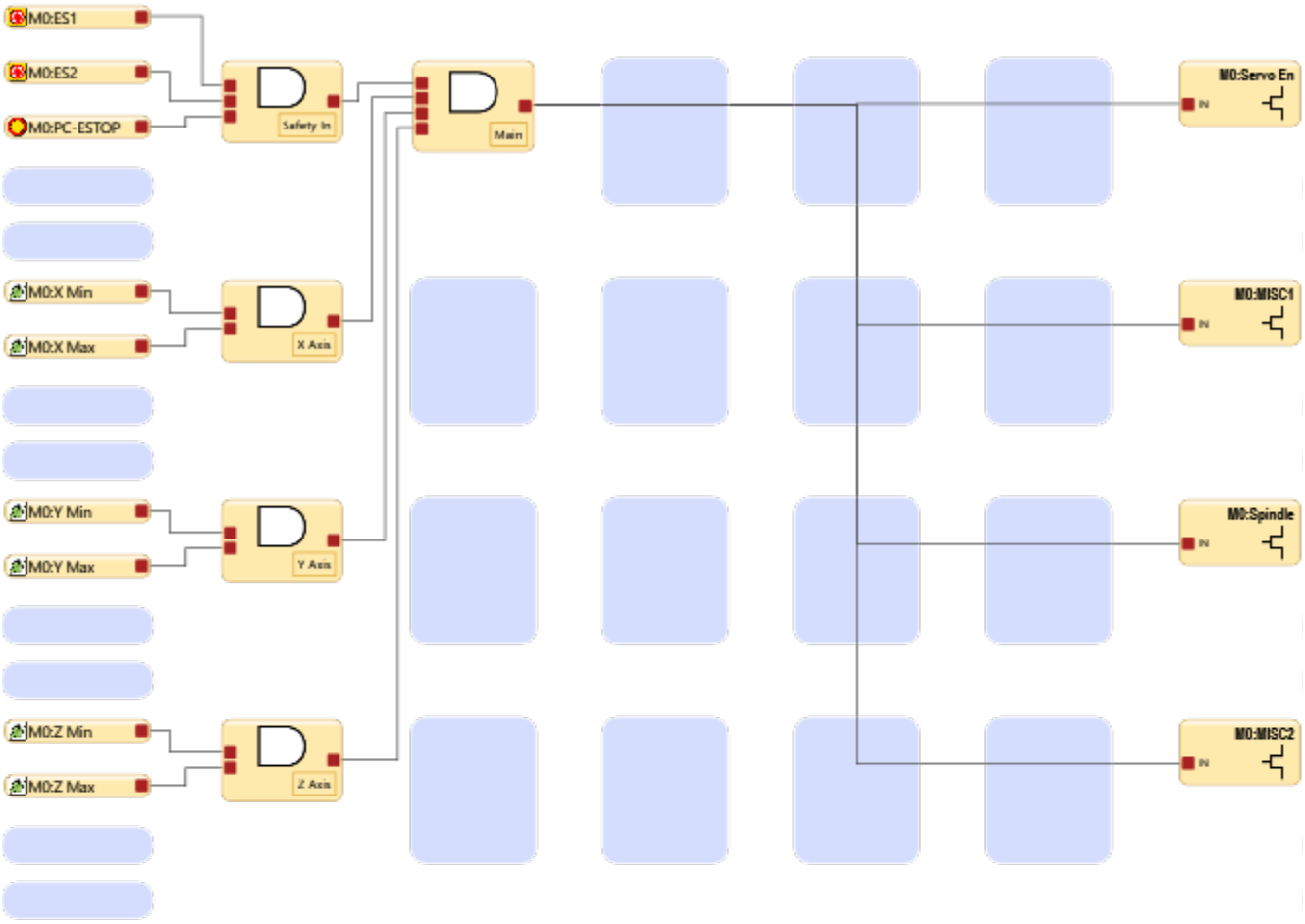



- M0:Servo En
- M0:MISC1
- M0:Spindle
- M0:MISC2
- M0:ES1
- M0:ES2
- M0:PC-ES...
- M0:X Min
- M0:X Max
- M0:Z Min
- M0:Z Max
- M0:Y Min
- M0:Y Max
- M0:BTN-FB
- M0:TWR-R...
- M0:TWR-...
- M0:SERV...

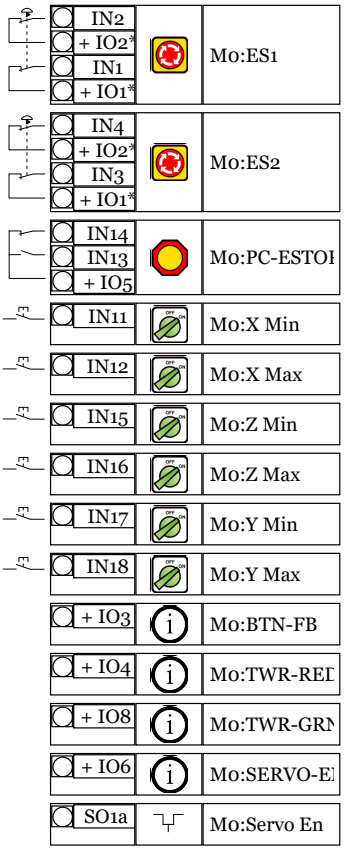

M0:ES1
M0:ES2
M0:PC-ESTOP
Safety In
Main
M0:Servo En
M0:X Min
M0:X Max
X Axis
M0:MISC1
M0:Y Min
M0:Y Max
Y Axis
M0:Spindle
M0:Z Min
M0:Z Max
Z Axis
M0:MISC2

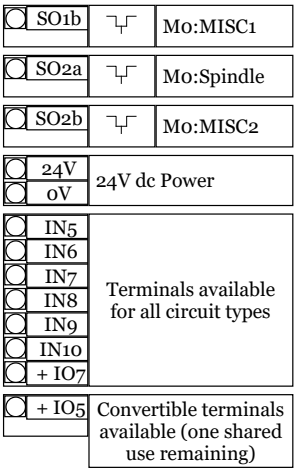
Project: FabLab CNC

Author: Daniel Harmsworth

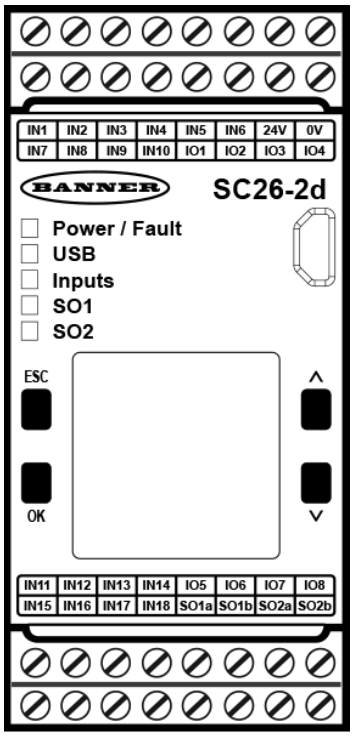
Date: 07/09/2017

Configuration Name: FabLab CNC Mill



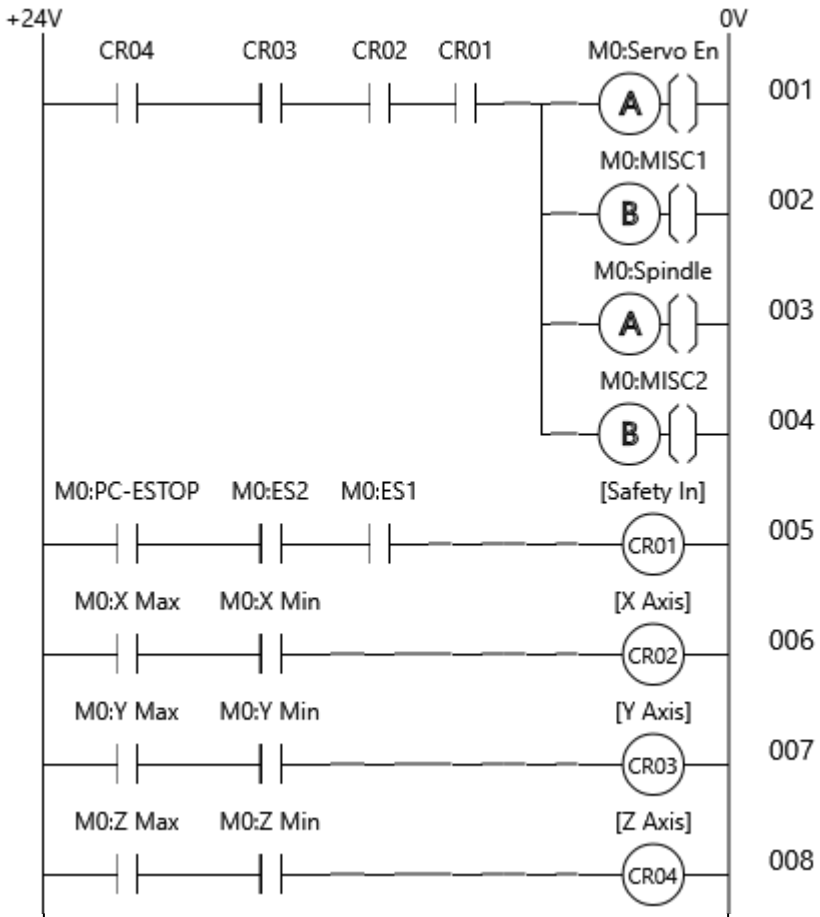




Module Position: 0




Module: Mo:SC26-2d

NOTES:
Symbols are shown using the Stop state signal convention except for Emergency Stop, Rope Pull, Gate Switch, and Safety Mat inputs.
* Indicates terminals are shared by another element


+24V
0V
CR04
CR03
CR02
CR01
M0:Servo En
A
001
M0:MISC1
B
002
M0:Spindle
A
003
M0:MISC2
B
004
M0:PC-ESTOP
M0:ES2
M0:ES1
[Safety In]
CR01
005
M0:X Max
M0:X Min
[X Axis]
CR02
006
M0:Y Max
M0:Y Min
[Y Axis]
CR03
007
M0:Z Max
M0:Z Min
[Z Axis]
CR04
008

## Modules

M0: SC26-2d

## Configuration

| | |
|---|---|
| Name | FabLab CNC Mill |
| Project | FabLab CNC |
| Author | Daniel Harmsworth |
| CRC | unconfirmed |

## M0:SC26-2d Inputs

| **Type:** | **Emergency Stop** |
|---|---|
| Name: | ES1 |
| Module: | M0 |
| Circuit Type: | Dual-Channel 4 terminal |
| Terminals: | IO1, IN1, IO2, IN2 |
| Simultaneity: | Simultaneous |
| Debounce Closed-Open: | 6 ms |
| Debounce Open-Closed: | 50 ms |
| Startup Test: | Disabled |
| Output: | Safety In |
| Safety Outputs: | M0:MISC1, M0:MISC2, M0:Servo En, M0:Spindle |

| **Type:** | **Emergency Stop** |
|---|---|
| Name: | ES2 |
| Module: | M0 |
| Circuit Type: | Dual-Channel 4 terminal |
| Terminals: | IO1, IN3, IO2, IN4 |
| Simultaneity: | Simultaneous |
| Debounce Closed-Open: | 6 ms |
| Debounce Open-Closed: | 50 ms |
| Startup Test: | Disabled |
| Output: | Safety In |
| Safety Outputs: | M0:MISC1, M0:MISC2, M0:Servo En, M0:Spindle |

| **Type:** | **Protective Stop** |
|---|---|
| Name: | PC-ESTOP |
| Module: | M0 |
| Circuit Type: | Complementary 3 terminal |
| Terminals: | IO5, IN13, IN14 |
| Simultaneity: | Simultaneous |
| Debounce Closed-Open: | 6 ms |
| Debounce Open-Closed: | 50 ms |
| Startup Test: | Disabled |
| Output: | Safety In |
| Safety Outputs: | M0:MISC1, M0:MISC2, M0:Servo En, M0:Spindle |

| **Type:** | **On-Off** |
|---|---|
| Name: | X Min |
| Module: | M0 |
| Circuit Type: | Single-Channel 1 terminal |
| Terminals: | IN11 |
| Debounce Closed-Open: | 6 ms |
| Debounce Open-Closed: | 50 ms |
| Output: | X Axis |
| Safety Outputs: | M0:MISC1, M0:MISC2, M0:Servo En, M0:Spindle |

| **Type:** | **On-Off** |
|---|---|
| Name: | X Max |
| Module: | M0 |
| Circuit Type: | Single-Channel 1 terminal |
| Terminals: | IN12 |
| Debounce Closed-Open: | 6 ms |
| Debounce Open-Closed: | 50 ms |
| Output: | X Axis |
| Safety Outputs: | M0:MISC1, M0:MISC2, M0:Servo En, M0:Spindle |

| **Type:** | **On-Off** |
|---|---|
| Name: | Z Min |
| Module: | M0 |
| Circuit Type: | Single-Channel 1 terminal |
| Terminals: | IN15 |
| Debounce Closed-Open: | 6 ms |
| Debounce Open-Closed: | 50 ms |
| Output: | Z Axis |
| Safety Outputs: | M0:MISC1, M0:MISC2, M0:Servo En, M0:Spindle |

| | |
|---|---|
| **Type:** | **On-Off** |
| Name: | Z Max |
| Module: | M0 |
| Circuit Type: | Single-Channel 1 terminal |
| Terminals: | IN16 |
| Debounce Closed-Open: | 6 ms |
| Debounce Open-Closed: | 50 ms |
| Output: | Z Axis |
| Safety Outputs: | M0:MISC1, M0:MISC2, M0:Servo En, M0:Spindle |

| | |
|---|---|
| **Type:** | **On-Off** |
| Name: | Y Min |
| Module: | M0 |
| Circuit Type: | Single-Channel 1 terminal |
| Terminals: | IN17 |
| Debounce Closed-Open: | 6 ms |
| Debounce Open-Closed: | 50 ms |
| Output: | Y Axis |
| Safety Outputs: | M0:MISC1, M0:MISC2, M0:Servo En, M0:Spindle |

| | |
|---|---|
| **Type:** | **On-Off** |
| Name: | Y Max |
| Module: | M0 |
| Circuit Type: | Single-Channel 1 terminal |
| Terminals: | IN18 |
| Debounce Closed-Open: | 6 ms |
| Debounce Open-Closed: | 50 ms |
| Output: | Y Axis |
| Safety Outputs: | M0:MISC1, M0:MISC2, M0:Servo En, M0:Spindle |

## Function Blocks

| | |
|---|---|
| **Type:** | **And** |
| Name: | Safety In |
| Input: | M0:ES1, M0:ES2, M0:PC-ESTOP |
| Output: | Main |

| | |
|---|---|
| **Type:** | **And** |
| Name: | X Axis |
| Input: | M0:X Min, M0:X Max |
| Output: | Main |

| | |
|---|---|
| **Type:** | **And** |
| Name: | Y Axis |
| Input: | M0:Y Min, M0:Y Max |
| Output: | Main |

| | |
|---|---|
| **Type:** | **And** |
| Name: | Z Axis |
| Input: | M0:Z Min, M0:Z Max |
| Output: | Main |

| | |
|---|---|
| **Type:** | **And** |
| Name: | Main |
| Input: | Safety In, X Axis, Y Axis, Z Axis |
| Output: | M0:Servo En, M0:MISC1, M0:Spindle, M0:MISC2 |

## Safety Outputs

| | |
|---|---|
| **Type:** | **Solid-State Output** |
| Name: | Servo En |
| Module: | M0 |
| Circuit Type: | Solid-State-Output 1A |
| Terminals: | SO1a |
| Output Delay Type: | None |
| Power-Up Mode: | Normal |
| Input: | Main |
| AVM0 Monitoring Time Limit: | 50 ms |

| | |
|---|---|
| **Type:** | **Solid-State Output** |
| Name: | MISC1 |
| Module: | M0 |
| Circuit Type: | Solid-State-Output 1B |
| Terminals: | SO1b |
| Output Delay Type: | None |
| Power-Up Mode: | Normal |
| Input: | Main |
| AVM0 Monitoring Time Limit: | 50 ms |

| | |
|---|---|
| **Type:** | **Solid-State Output** |
| Name: | Spindle |
| Module: | M0 |
| Circuit Type: | Solid-State-Output 2A |
| Terminals: | SO2a |
| Output Delay Type: | None |
| Power-Up Mode: | Normal |
| Input: | Main |
| AVM0 Monitoring Time Limit: | 50 ms |

| | |
|---|---|
| **Type:** | **Solid-State Output** |
| Name: | MISC2 |
| Module: | M0 |
| Circuit Type: | Solid-State-Output 2B |
| Terminals: | SO2b |
| Output Delay Type: | None |
| Power-Up Mode: | Normal |
| Input: | Main |
| AVM0 Monitoring Time Limit: | 50 ms |

## Response Times (Scan Time = 2 ms)

**WARNING** **Response Time Differences**

If this configuration was created in a previous version of the Banner PC software (version 2.3 or earlier), response time values may be different. A change in response time may adversely affect the safety protections provided and could result in death or serious injury. If applicable, verify safety distances before continuing.

**WARNING** *** Single Channel Input**

This is a single channel input where a single fault can lead to an increased response time or no response at all and could result in death or serious injury.

| **M0:Servo En** | | |
|---|---|---|
| M0:ES1 | -> | 15ms |
| M0:ES2 | -> | 15ms |
| M0:PC-ESTOP | -> | 59ms |
| M0:X Max | -> | ***15ms** |
| M0:X Min | -> | ***15ms** |
| M0:Y Max | -> | ***15ms** |
| M0:Y Min | -> | ***15ms** |
| M0:Z Max | -> | ***15ms** |
| M0:Z Min | -> | ***15ms** |

| **M0:MISC1** | | |
|---|---|---|
| M0:ES1 | -> | 15ms |
| M0:ES2 | -> | 15ms |
| M0:PC-ESTOP | -> | 59ms |
| M0:X Max | -> | ***15ms** |
| M0:X Min | -> | ***15ms** |
| M0:Y Max | -> | ***15ms** |
| M0:Y Min | -> | ***15ms** |
| M0:Z Max | -> | ***15ms** |
| M0:Z Min | -> | ***15ms** |

| **M0:Spindle** | | |
|---|---|---|
| M0:ES1 | -> | 15ms |
| M0:ES2 | -> | 15ms |
| M0:PC-ESTOP | -> | 59ms |
| M0:X Max | -> | ***15ms** |
| M0:X Min | -> | ***15ms** |
| M0:Y Max | -> | ***15ms** |
| M0:Y Min | -> | ***15ms** |
| M0:Z Max | -> | ***15ms** |
| M0:Z Min | -> | ***15ms** |

| **M0:MISC2** | | |
|---|---|---|
| M0:ES1 | -> | 15ms |
| M0:ES2 | -> | 15ms |
| M0:PC-ESTOP | -> | 59ms |
| M0:X Max | -> | ***15ms** |
| M0:X Min | -> | ***15ms** |
| M0:Y Max | -> | ***15ms** |
| M0:Y Min | -> | ***15ms** |
| M0:Z Max | -> | ***15ms** |
| M0:Z Min | -> | ***15ms** |

## Status Outputs

| **Type:** | **Track Output** |
|---|---|
| Name: | BTN-FB |
| Module: | M0 |
| Circuit Type: | Status-Output |
| Terminals: | IO3 |
| Safety Output: | M0:Servo En |
| Signal Convention: | Active = PNP Off |

| **Type:** | **Track Output** |
|---|---|
| Name: | TWR-RED |
| Module: | M0 |
| Circuit Type: | Status-Output |
| Terminals: | IO4 |
| Safety Output: | M0:Servo En |
| Signal Convention: | Active = PNP Off |

| **Type:** | **Track Output** |
|---|---|
| Name: | TWR-GRN |
| Module: | M0 |
| Circuit Type: | Status-Output |
| Terminals: | IO8 |
| Safety Output: | M0:Servo En |
| Signal Convention: | Active = PNP On |

| **Type:** | **Track Output** |
|---|---|
| Name: | SERVO-ENA |
| Module: | M0 |
| Circuit Type: | Status-Output |
| Terminals: | IO6 |
| Safety Output: | M0:Servo En |
| Signal Convention: | Active = PNP Off |

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