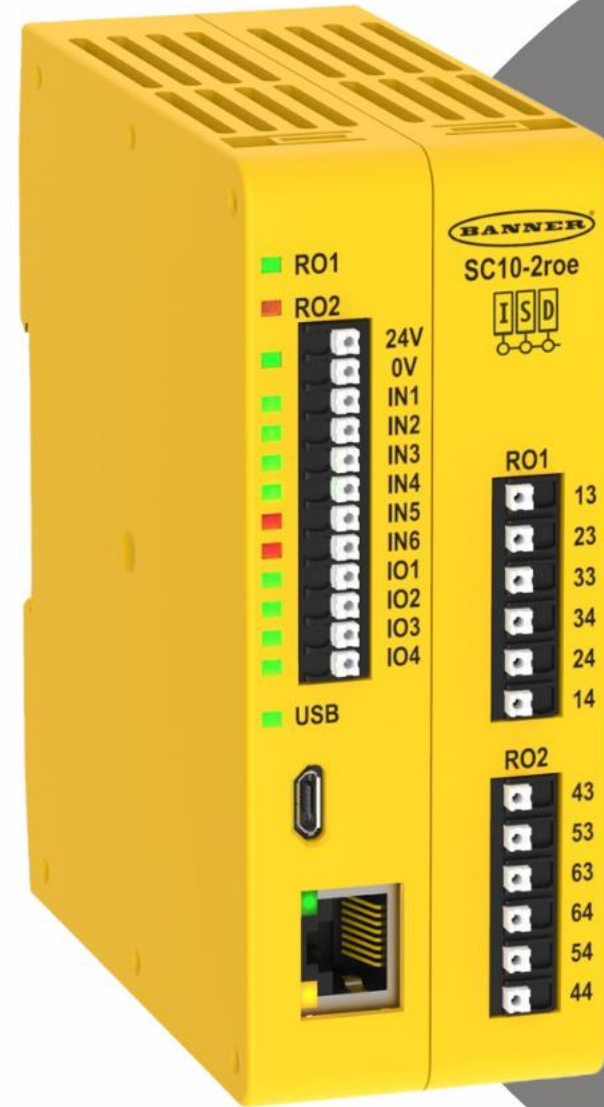


Code  Compile
presents

Safety controller SC10-2roe

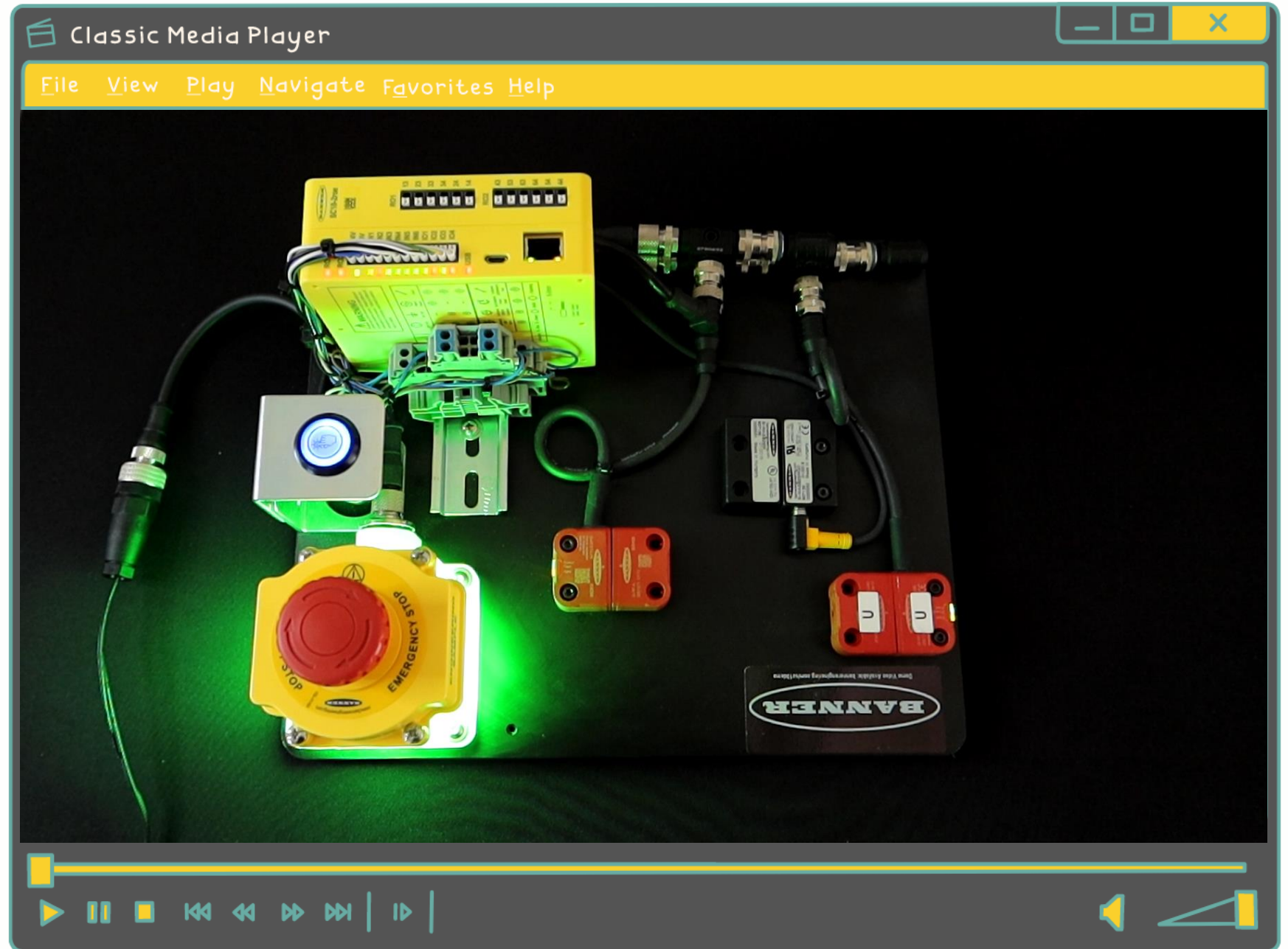
Sponsored by:



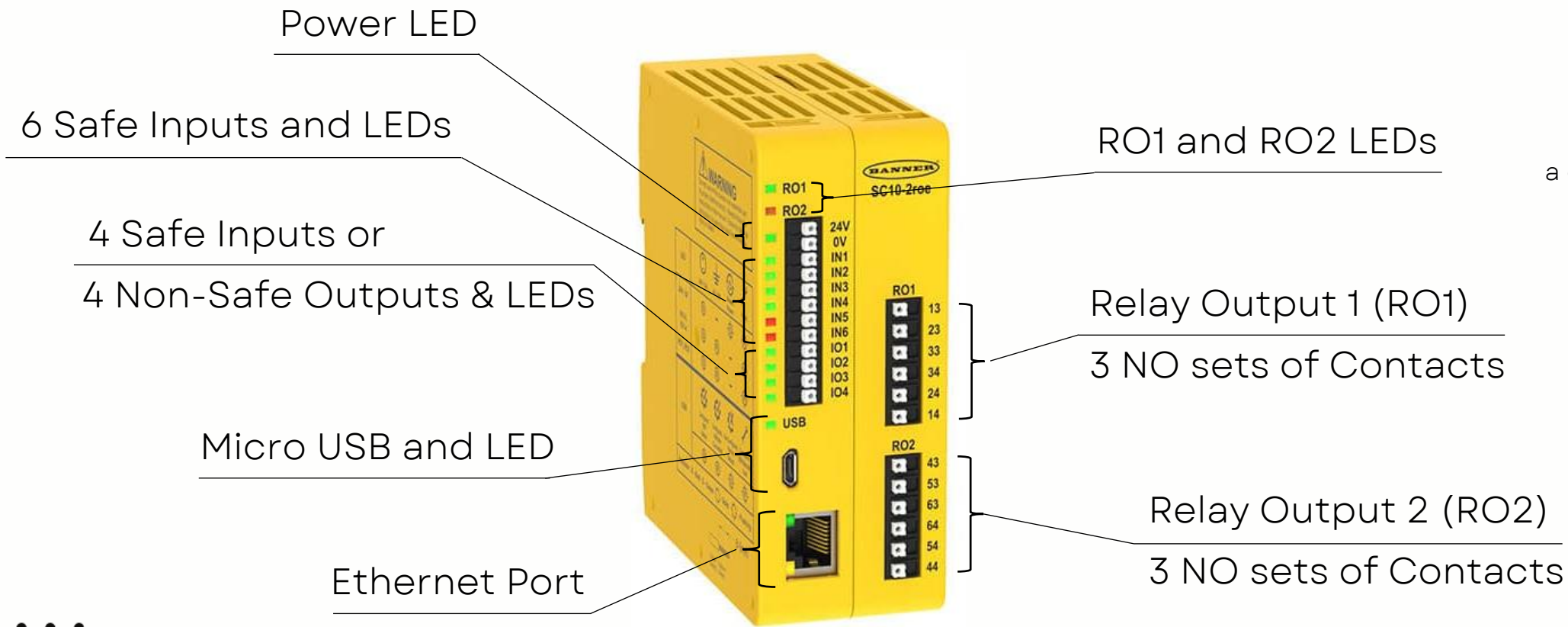
Unboxing Safety controller SC10-2roe



Sponsored by:



Terminals:



Functional Stops

Category 0:
an uncontrolled stop
with immediate
removal of power

Category 1:
a controlled stop with a
delay before power is
removed

Safety
outputs
with
on/off
delay

Key features:



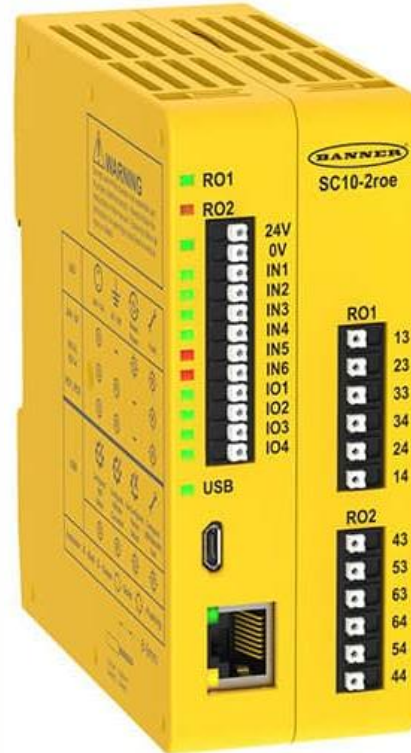
In series diagnostic



Cat 4 safety ratings



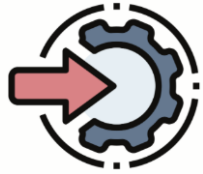
Icon based easy
Programming



256 virtual non-safe
status output



80 virtual non-safe inputs



Supports

EtherNet/IP



Status Outputs and Virtual Status Outputs are not safety outputs and can fail in either the On or the Off state.

Safety Inputs



SSA-EB1PLx-0Dx Series
Emergency Stop
Button with ISD



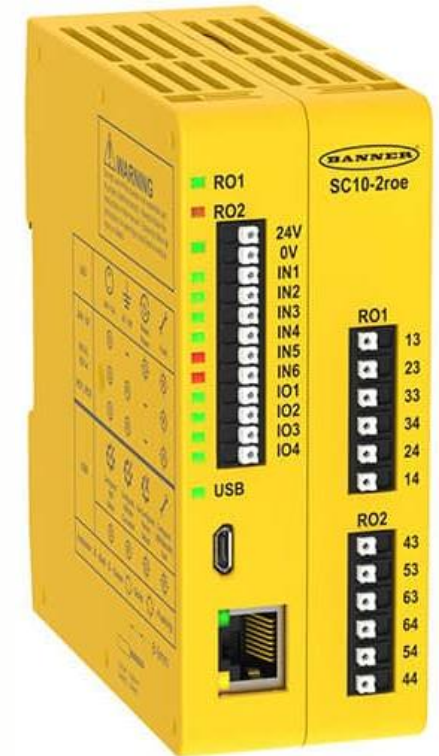
Reed contact technology
SI-Mag Non-contact
Magnetic safety
Interlock switch



With Unique coding
SI-RF Non-contact
RF Safety switch



Programmable multicolor
S22 Pro Touch button



Safety Inputs



SSA-EB1PLx-0Dx Series
Emergency Stop
Button with ISD



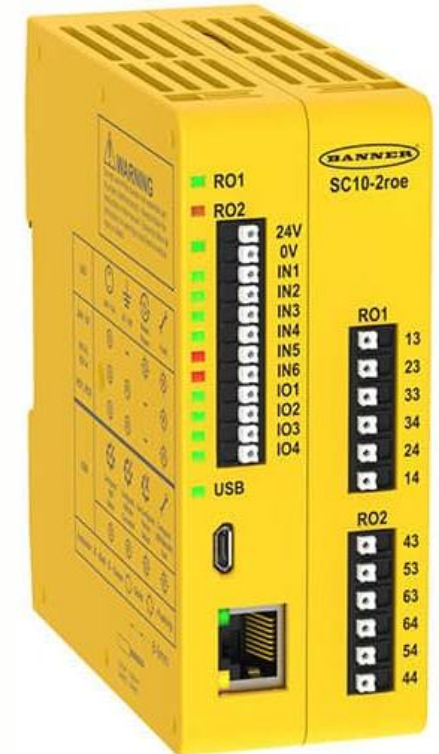
Reed contact technology
SI-Mag Non-contact
Magnetic safety
Interlock switch



With Unique coding
SI-RF Non-contact
RF Safety switch



Programmable multicolor
S22 Pro Touch button

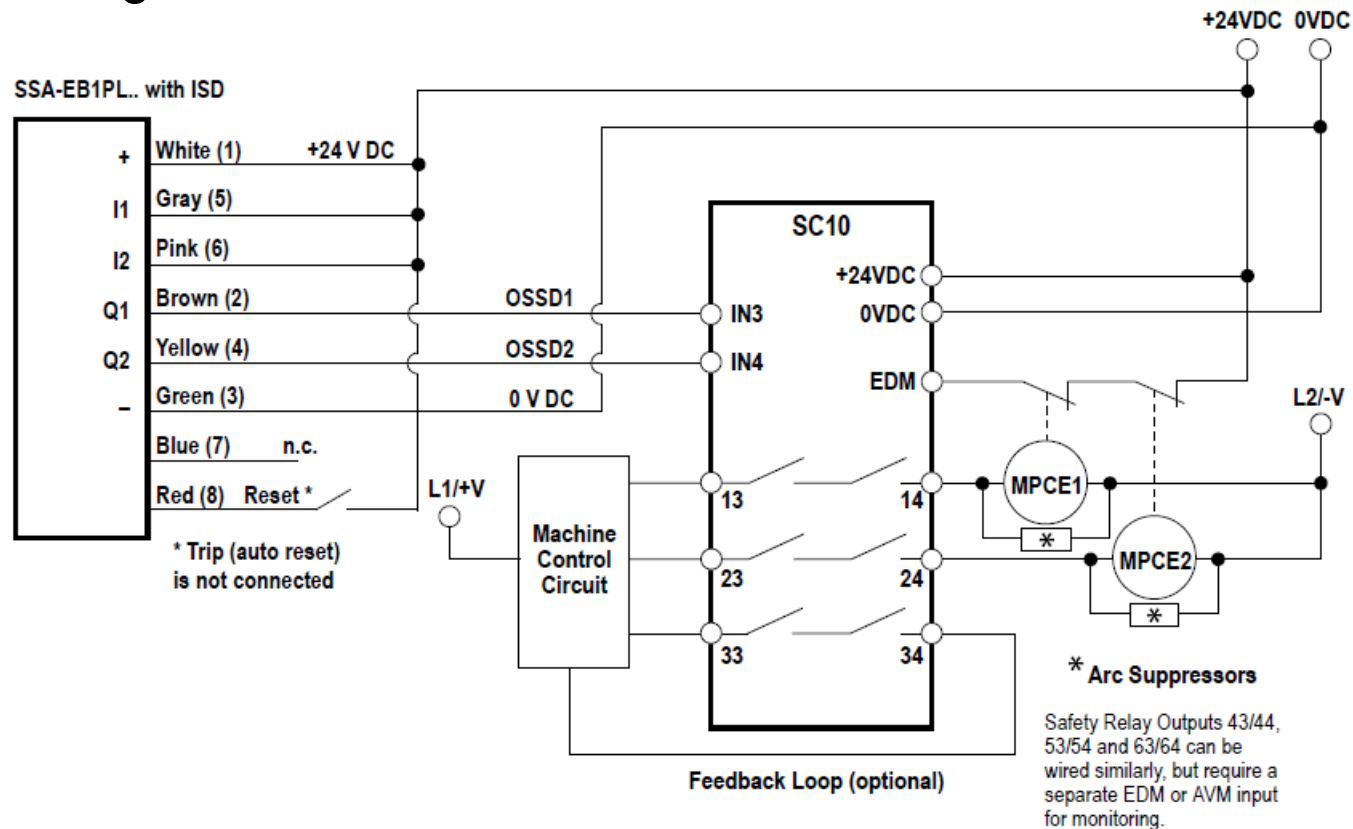


SSA-EB1PLx-ODx Series

Emergency Stop Button



Wiring with SC10 controller

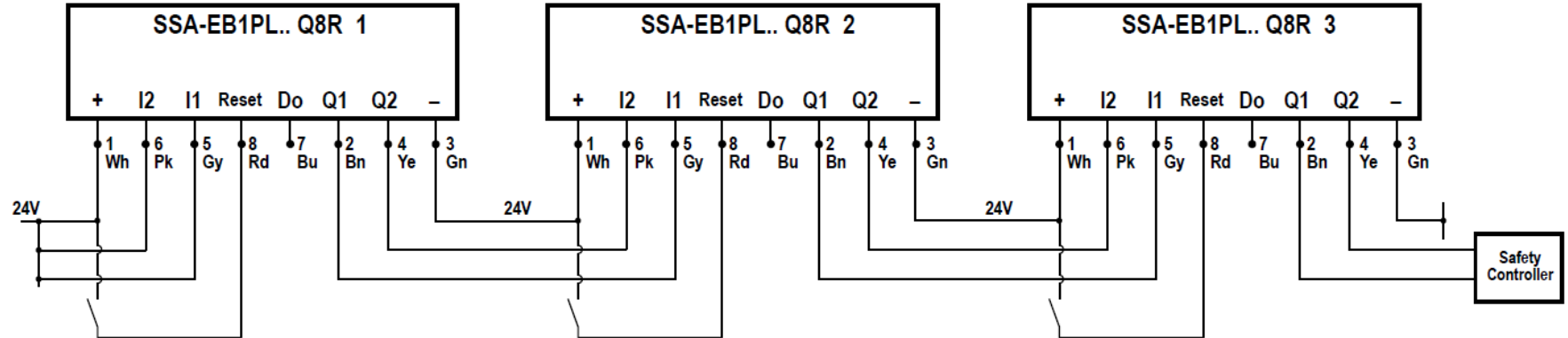


SSA-EB1PLx-ODx Series

Emergency Stop Button



Series connection without ISD

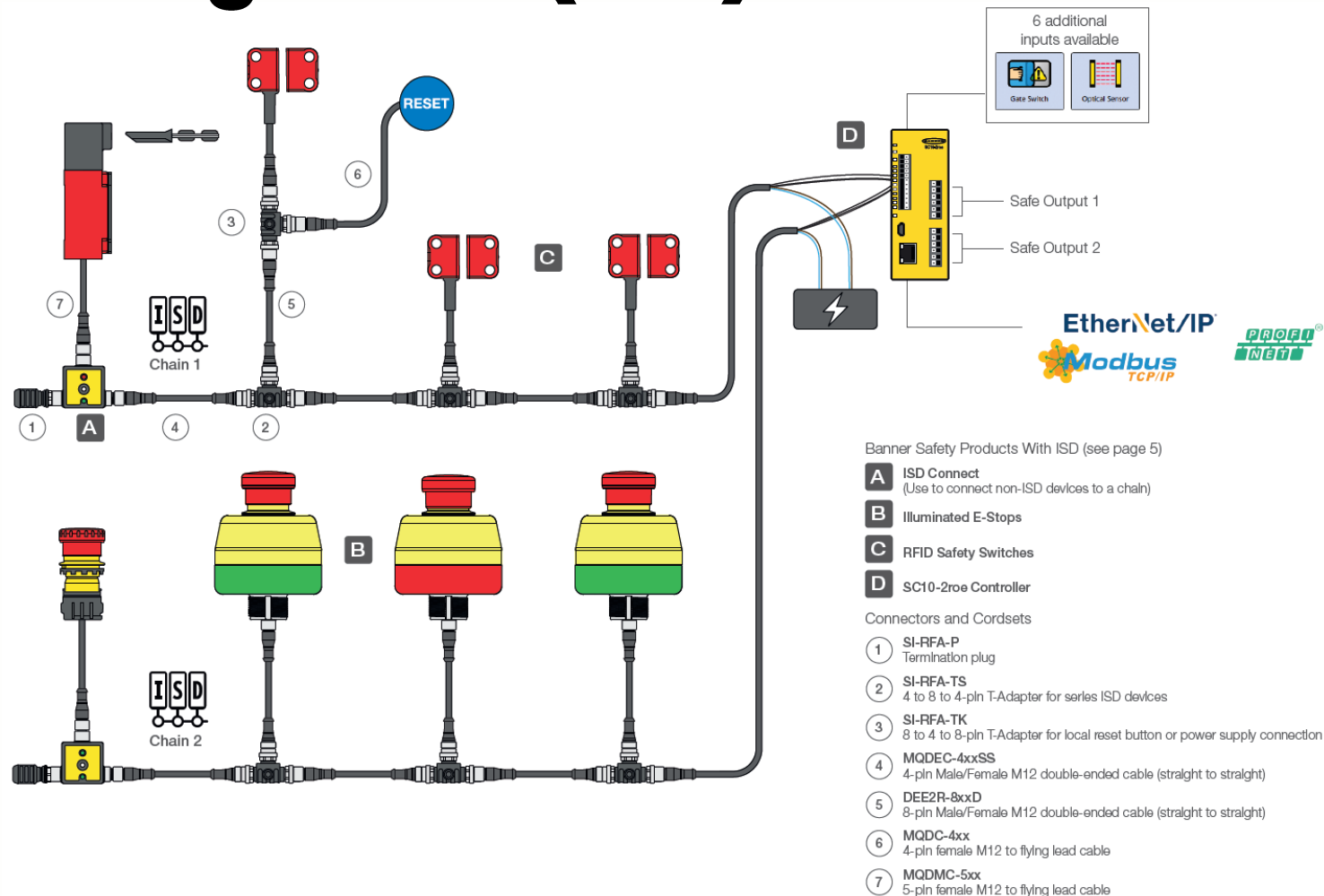


In Series Diagnostic (ISD)

Reduce and simplify wiring

Diagnostic information:

- Wrong order of devices in the chain
- Under voltage in the series connection



Intuitive setup and PLC integration


In Series Diagnostic (ISD)


Prevent or reduce downtime

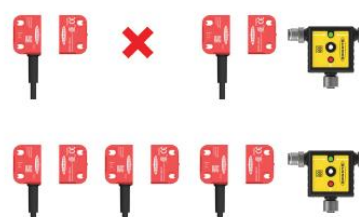
Diagnostic information:

- Button status (Armed, off, faulted)
- Attempt to remove device from the chain

Troubleshooting Made Easy:

Terminator missing 

Actuator not taught 

Wrong number of devices 

Prevent Downtime:


Marginal Alert to check Door 1 for misalignment before it causes downtime

Warning Alert to check E-Stop 1 for low voltage before it causes downtime




Terminator Plug	Name	Status	Alert	Actuator
1	Door 1	On	Marginal	Detected
2	Door 2	Off	Warning	Detected
3	Door 3	Off	Warning	Detected
4	Door 4	Off	Warning	Detected
	M0:Chain 1	Off	Warning	Detected

Terminator Plug	Name	Status	Alert	Actuator
1	EStop 1	Off	Warning	Detected
2	EStop 2	Off	Warning	Detected
3	EStop 3	Off	Warning	Detected
4	EStop 4	Off	Warning	Detected
	M0:Chain 2	Off	Warning	Detected

Up to 32 ISD safety devices in any order per chain

Reduce Downtime: Local operator guidance to activated E-Stop 

Additional uses for ISD

- Rotation/Indexing 
- Tool Identification 
- Position Verification 

Terminator Missing: Actuator not Taught

Chain:1 Device:1

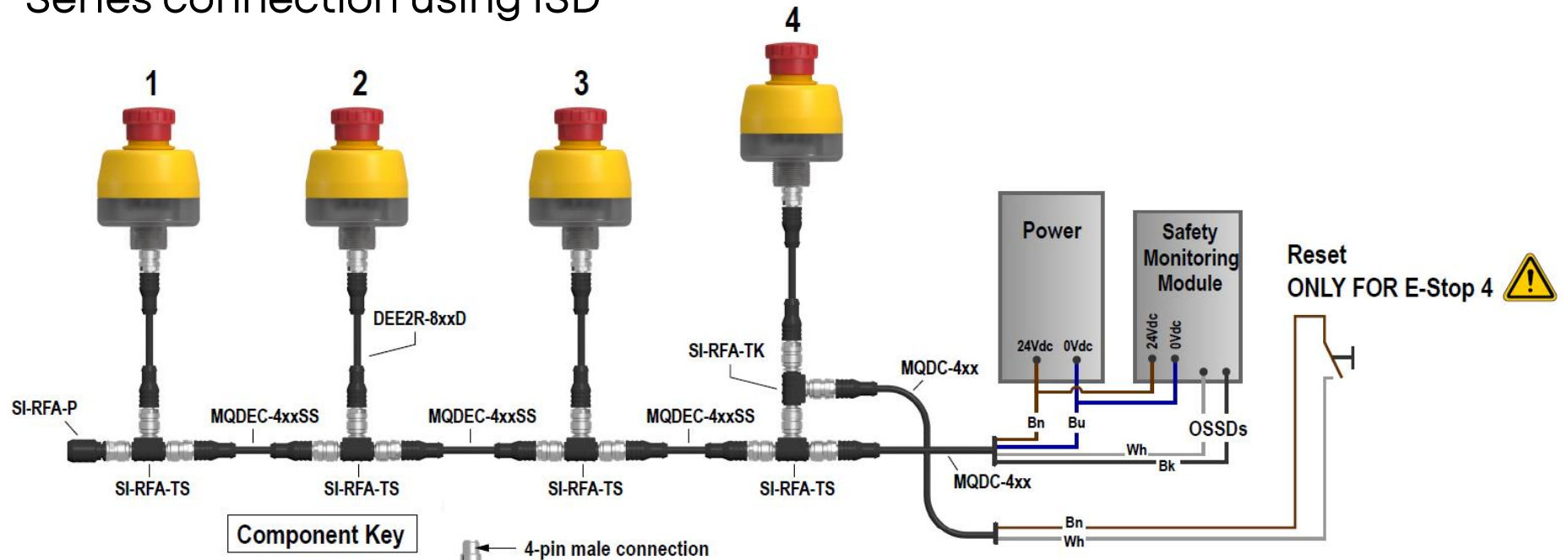
Expected Code	9D1A
Received Code	9D1A
Internal Temperature	75 C
Actuator Distance	13.8 mm
Supply Voltage	21.5 V
Output 1	False
Output 2	False
Actuator Detected	True
Wrong Actuator	False
Marginal Range	True
Input 1	False
Input 2	False
Local Reset Expected	False
Output Error	False
Safety Input Fault	False
ISD Data Error	False
Operating Voltage Error	False
Power Cycle Required	False
Operating Voltage Warning	False
Sensor Not Paired	False
Device	Door Switch
Teach-ins Remaining	0
Number of Voltage Errors	0
Output Switch-off Time	Inactive
Range Warning Count	0
Expected Company Name	0000
Received Company Name	0000
Internal Error A	0000
Internal Error B	0000
Local Reset Unit	False
High Coding Level	True
Cascadable	True
Fault Tolerant Outputs	True

SSA-EB1PLx-ODx Series

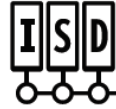
Emergency Stop Button



Series connection using ISD



Safety Inputs



SSA-EB1PLx-0Dx Series
Emergency Stop
Button with ISD



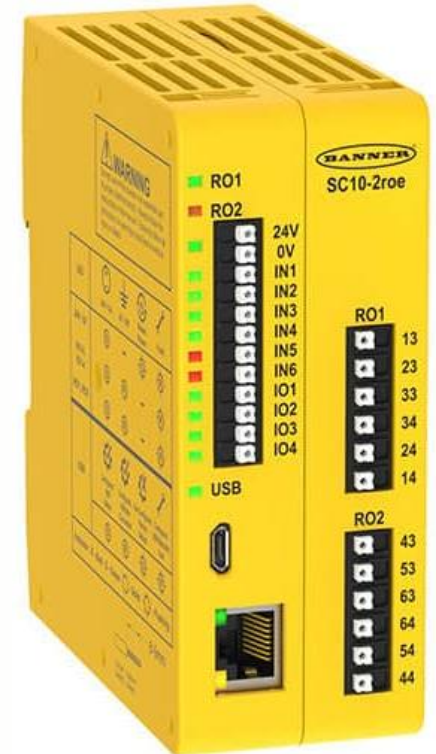
Reed contact technology
SI-Mag Non-contact
Magnetic safety
Interlock switch



With Unique coding
SI-RF Non-contact
RF Safety switch



Programmable multicolor
S22 Pro Touch button
Non-Safety input device

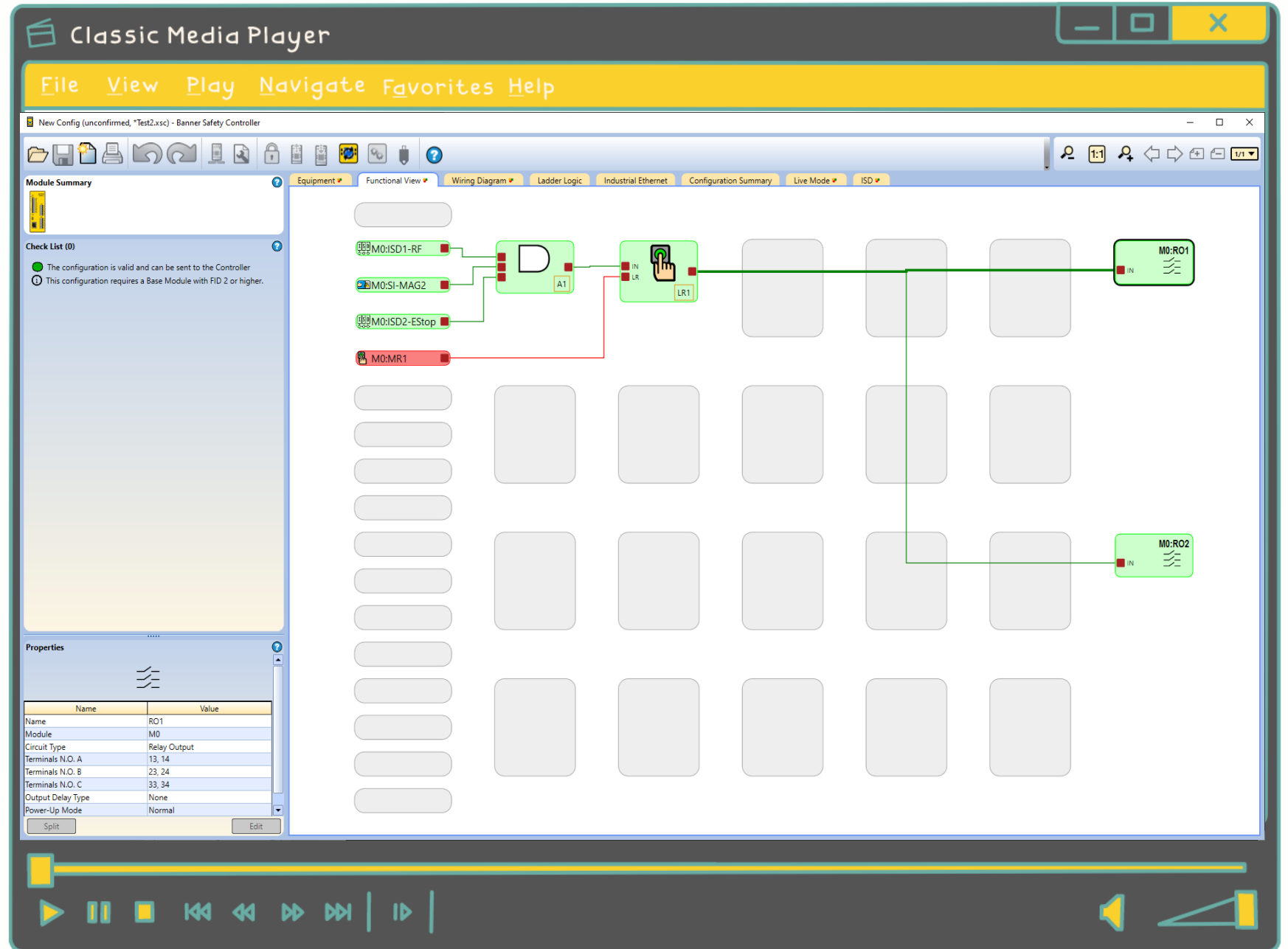


Code  Compile
learning made easy

Interfacing SC10 Safety Controller with PC



Sponsored by:















The screenshot shows the Classic Media Player interface with a wiring diagram for a Banner Safety Controller configuration. The diagram includes the following components and connections:

- Inputs:** M0:ISD1-RF, M0:SI-MAG2, M0:ISD2-EStop, and M0:MR1.
- Logic:** A logic gate (A1) receives inputs from M0:ISD1-RF, M0:SI-MAG2, and M0:ISD2-EStop. Its output is connected to the IN terminal of a relay (LR).
- Relay:** A relay (LR) with a hand icon, connected to the output of the logic gate.
- Outputs:** M0:RO1 and M0:RO2, both connected to the LR terminal.













The Properties panel at the bottom left shows the following table:

Name	Value
Name	RO1
Module	M0
Circuit Type	Relay Output
Terminals N.O. A	13, 14
Terminals N.O. B	23, 24
Terminals N.O. C	33, 34
Output Delay Type	None
Power-Up Mode	Normal













OK Signal













		Status	Alert	Actuator
	Name	On	Marginal	Detected
		Off	Warning	
		Reset	Fault	
1 	Door 1 U			
2 	Door 2 L			
	Chain 1			

Marginal Signal

		Status	Alert	Actuator
	Name	On	Marginal	Detected
		Off	Warning	
		Reset	Fault	
1 	Door 1 U			
2 	Door 2 L			
	Chain 1			

NOT OK Signal

		Status	Alert	Actuator
	Name	On	Marginal	Detected
		Off	Warning	
		Reset	Fault	
1 	Door 1 U			
2 	Door 2 L			
	Chain 1			

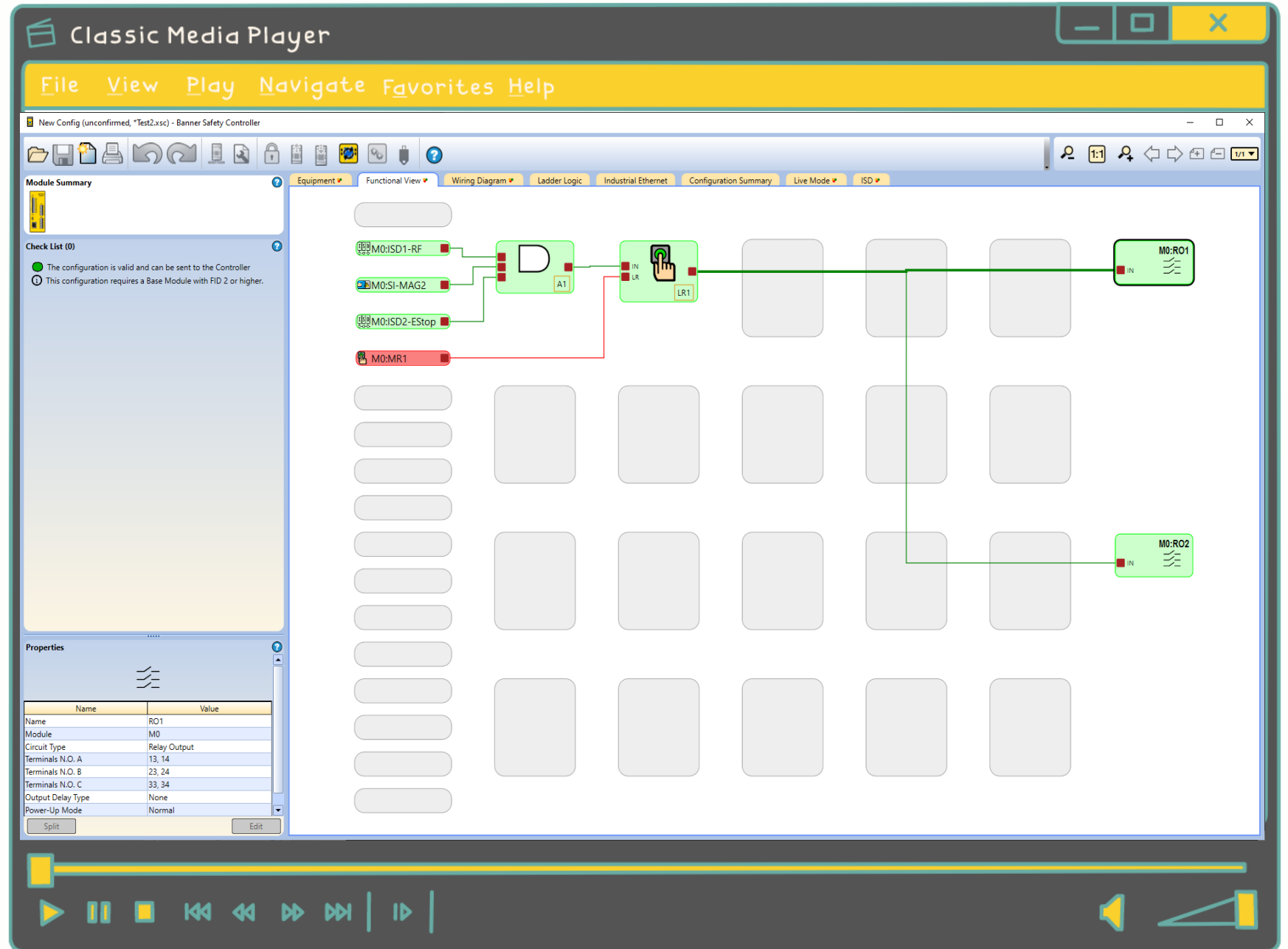
		Status	Alert	Actuator
	Name	On	Marginal	Detected
		Off	Warning	
		Reset	Fault	
1 	Door 1 U			
2 	Door 2 L			
	Chain 1			

Code  Compile
learning made easy

Programming SC10 Safety Controller with PC



Sponsored by:

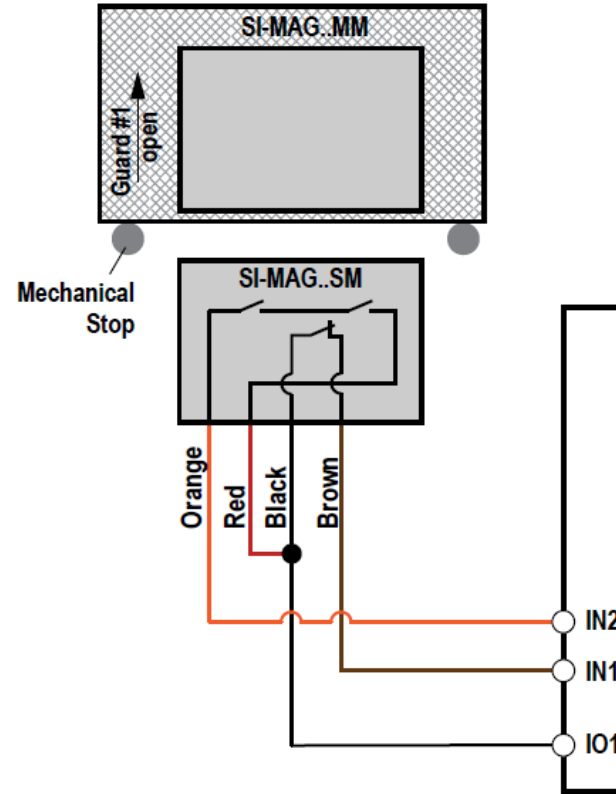
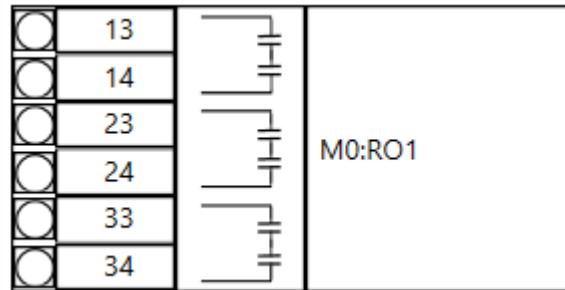
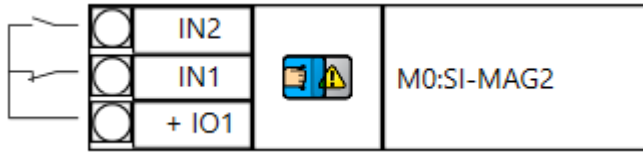


The screenshot shows the 'Classic Media Player' software interface. The title bar reads 'Classic Media Player' and the menu bar includes 'File', 'View', 'Play', 'Navigate', 'Favorites', and 'Help'. The main window displays a wiring diagram for a 'New Config (unconfirmed, *Test2.xsc) - Banner Safety Controller'. The diagram shows a central logic block 'A1' connected to several input modules: 'M0:ISD1-RF', 'M0:SI-MAG2', and 'M0:ISD2-EStop'. A red line connects 'M0:MR1' to the logic block. The logic block is connected to a relay output 'LR1', which is in turn connected to two relay outputs, 'M0:RO1' and 'M0:RO2'. The interface also includes a 'Module Summary' pane on the left, a 'Check List (0)' with a status message, and a 'Properties' table at the bottom left.

Name	Value
Name	RO1
Module	M0
Circuit Type	Relay Output
Terminals N.O. A	13, 14
Terminals N.O. B	23, 24
Terminals N.O. C	33, 34
Output Delay Type	None
Power-Up Mode	Normal

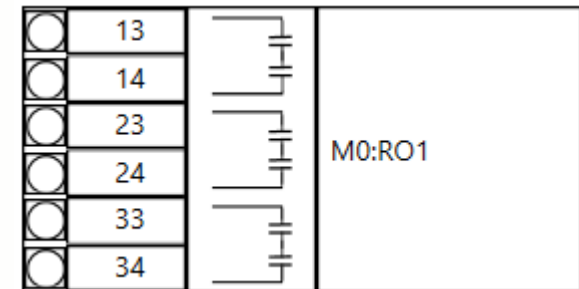
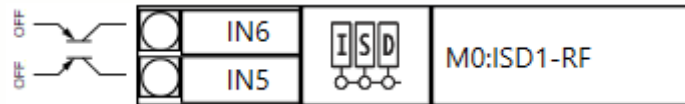
Task 1

Use a magnetic door switch to create a safety circuit for RO1



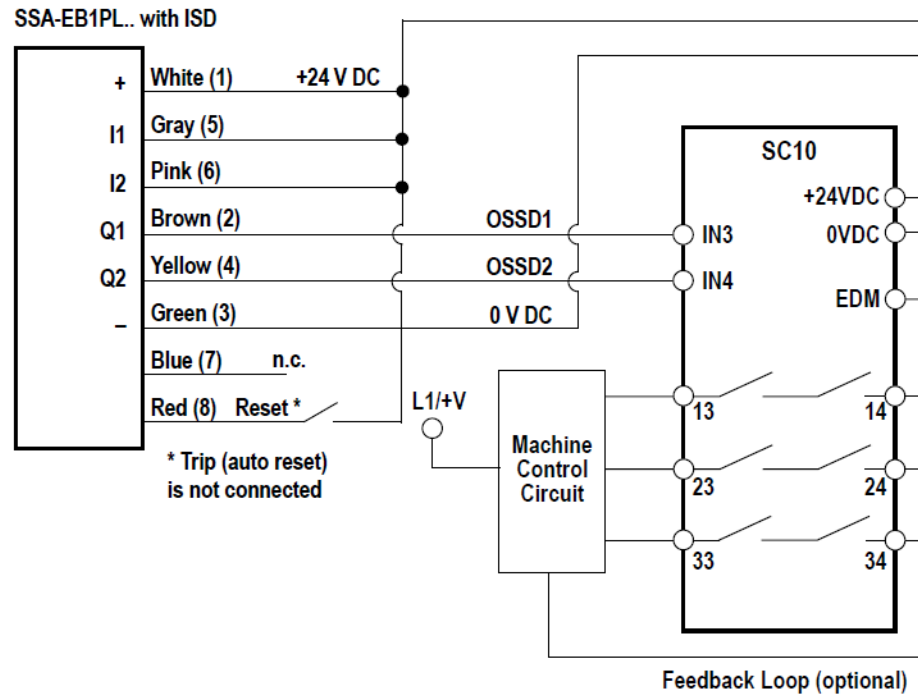
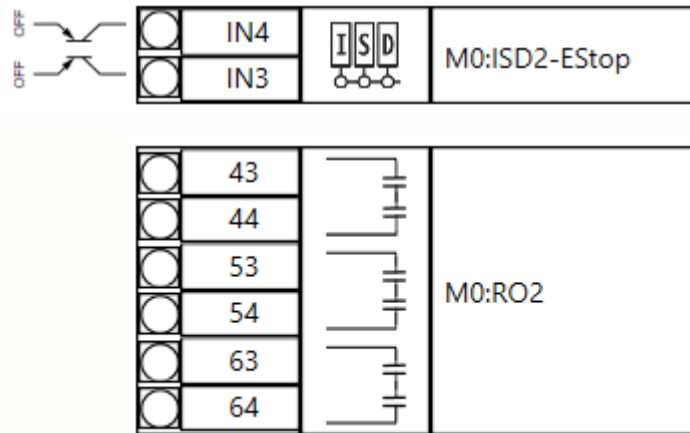
Task 2

Add RF switches in series to the magnetic door switch to create a safety circuit for RO1



Task 3

Use EM-Stop switch to create a safety circuit for RO2



Task 4

Add LR block to the safety circuit and use manual reset switch to reset the LR block.



Add an indication to the manual switch when reset operation is ready

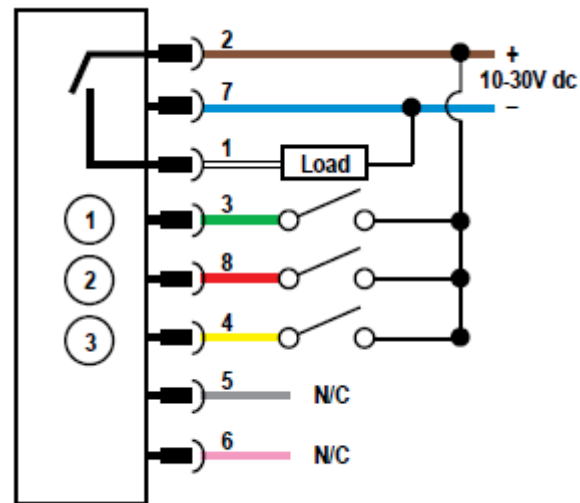


Table 1: RGB Multicolor Color/Function Definition

	Red	Yellow	Green	Cyan	Blue	Magenta	White
Input 1	X	X				X	X
Input 2		X	X	X			X
Input 3				X	X	X	X

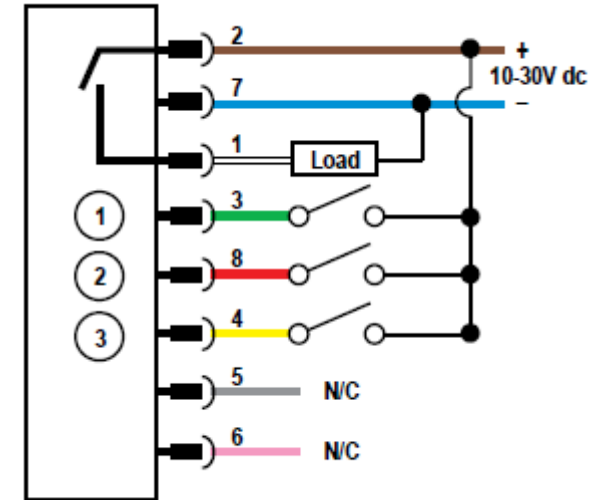
Task 5

Indicate the fault of any inputs by red color indication on the manual reset switch



Table 1: RGB Multicolor Color/Function Definition

	Red	Yellow	Green	Cyan	Blue	Magenta	White
Input 1	X	X				X	X
Input 2		X	X	X			X
Input 3				X	X	X	X



Code  Compile
learning made easy

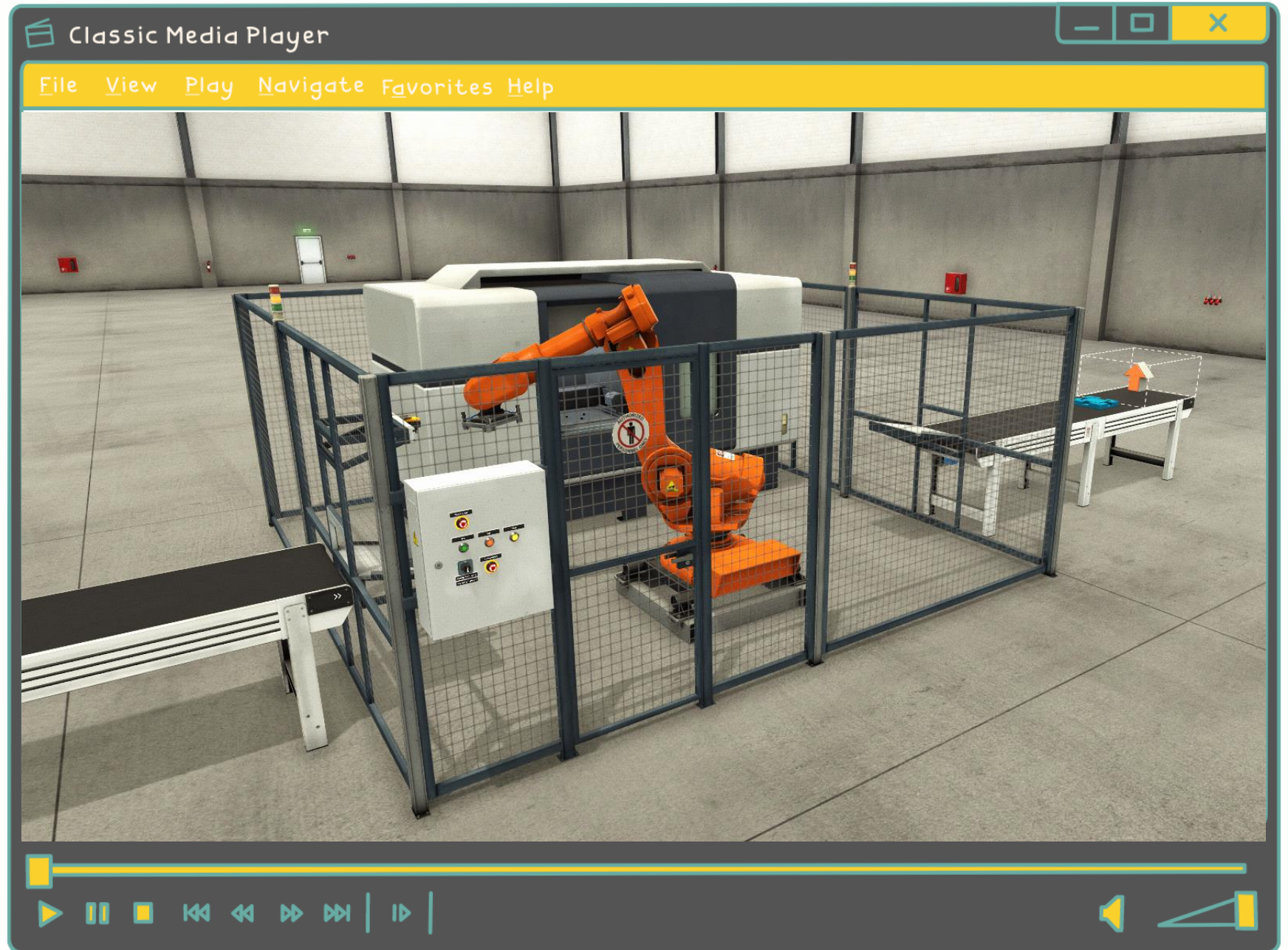
Interfacing with **S7-1200 PLC Controller**



PROFINET



Sponsored by:



Task 1

Setup the PROFINET communication with S7-1200 PLC and organize the information to be read/write in the S7-1200 PLC



Solution

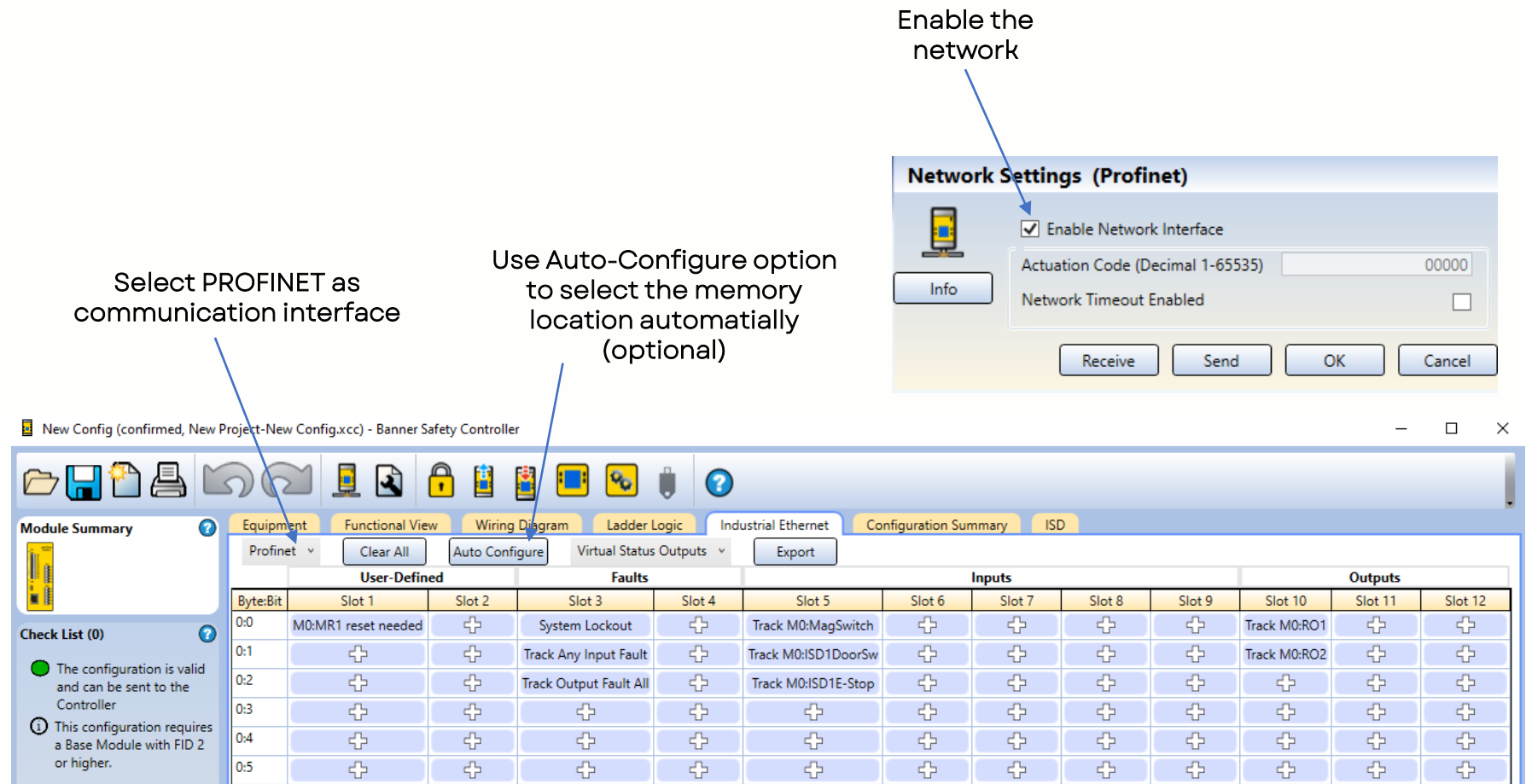
Step 1

Configure the SC10 controller with network settings and download the program to the SC10 controller

Enable the network

Select PROFINET as communication interface

Use Auto-Configure option to select the memory location automatically (optional)



Network Settings (Profinet)

Enable Network Interface

Actuation Code (Decimal 1-65535)

Network Timeout Enabled

Buttons: Info, Receive, Send, OK, Cancel

Module Summary

Check List (0)

- The configuration is valid and can be sent to the Controller
- This configuration requires a Base Module with FID 2 or higher.

Equipment: Profinet

Buttons: Clear All, Auto Configure, Virtual Status Outputs, Export

Byte:Bit	User-Defined				Faults				Inputs				Outputs			
	Slot 1	Slot 2	Slot 3	Slot 4	Slot 5	Slot 6	Slot 7	Slot 8	Slot 9	Slot 10	Slot 11	Slot 12				
0:0	M0:MR1 reset needed	+	System Lockout	+	Track M0:MagSwitch	+	+	+	+	Track M0:RO1	+	+				
0:1	+	+	Track Any Input Fault	+	Track M0:ISD1DoorSw	+	+	+	+	Track M0:RO2	+	+				
0:2	+	+	Track Output Fault All	+	Track M0:ISD1E-Stop	+	+	+	+	+	+	+				
0:3	+	+	+	+	+	+	+	+	+	+	+	+				
0:4	+	+	+	+	+	+	+	+	+	+	+	+				
0:5	+	+	+	+	+	+	+	+	+	+	+	+				

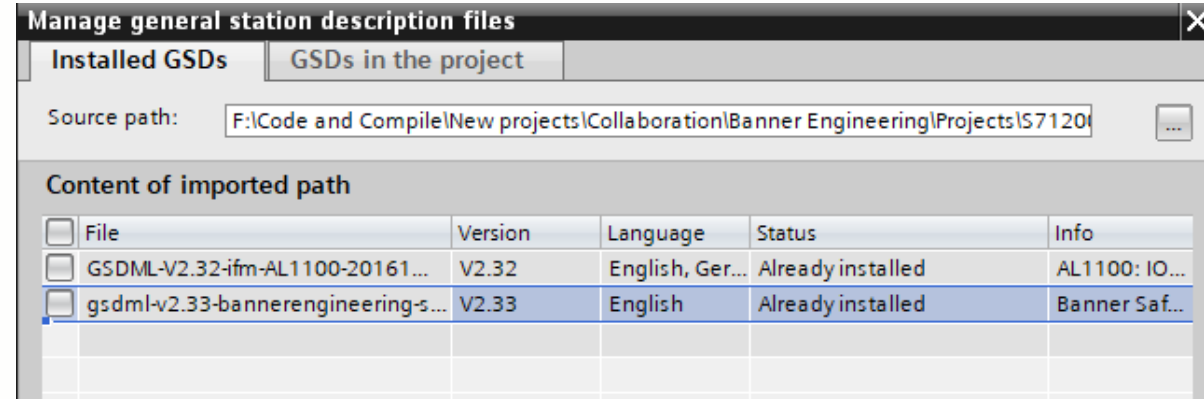
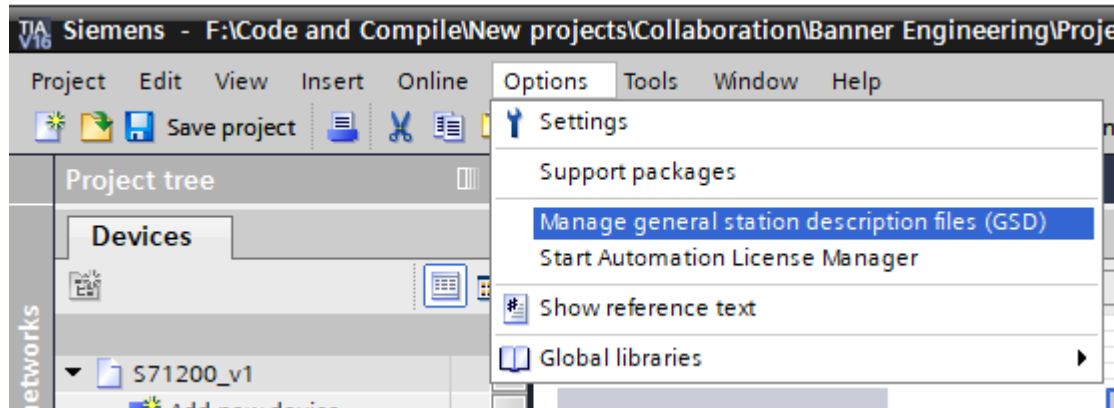
Solution

Step 2

Open TIA Portal and
Install GSD file

The GSD file can be installed from this link:
<https://www.bannerengineering.com/de/de/products/part.806222.html>

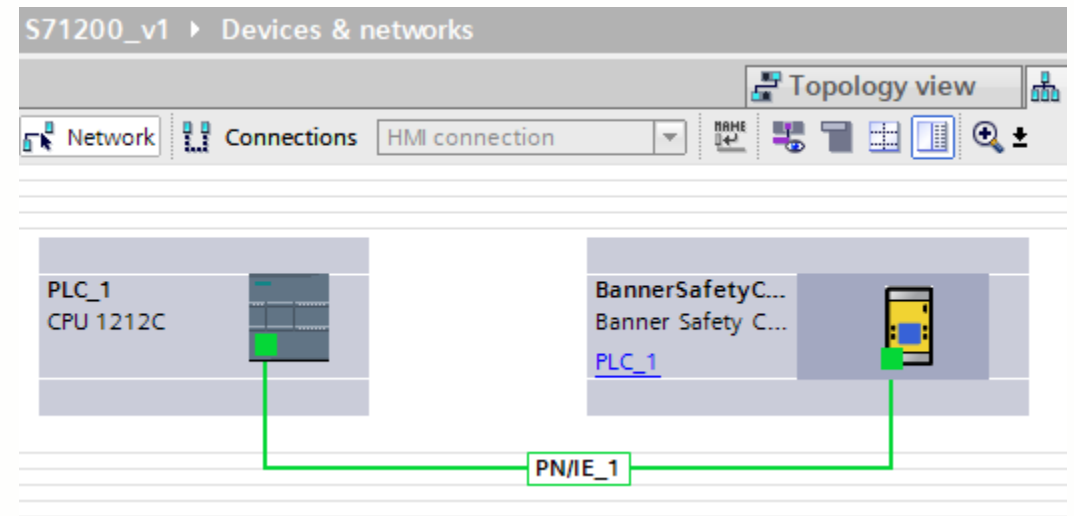
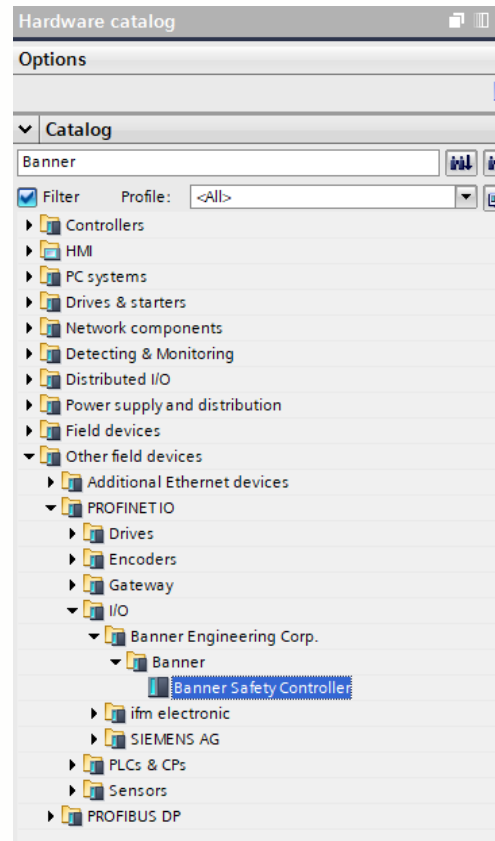
Once installed, you can see the status as
below



Solution

Step 3

Navigate the hardware catalog to insert SC10 controller in the networks



Solution

Step 4

Make PLC tags from the IO of SC10 controller

S71200_v1 ▶ PLC_1 [CPU 1212C AC/DC/Rly] ▶ PLC tags ▶ Banner [8]

Banner				
	Name	Data type	Address	Re
1	SC10_ManualResetRequired	Bool	%I1.0	
2	SC10_RO1Status	Bool	%I37.0	
3	SC10_RO2Status	Bool	%I37.1	
4	PLC_VirtualNonSafetyOutput	Bool	%Q64.0	
5	SC10_MagSwitchStatus	Bool	%I17.0	
6	SC10_DoorSwitchStatus	Bool	%I17.1	
7	SC10_EmStopStatus	Bool	%I17.2	
8	PLC_MuteMagSwitch	Bool	%Q64.1	

S71200_v1 ▶ Ungrouped devices ▶ BannerSafetyController [Banner Safety Controller]

Topology view | Network

BannerSafetyController [Banner Safety Controller]

Device overview

Module	Rack	Slot	I address	Q address	Type
▼ BannerSafetyController	0	0			Banner Safety Cont...
▶ I	0	0 X1			BannerSafetyContr...
4 Status Bytes, Bits 0..31_1	0	1	1...4		4 Status Bytes, Bits ...
4 Status Bytes, Bits 0..31_2	0	2	5...8		4 Status Bytes, Bits ...
4 Status Bytes, Bits 0..31_3	0	3	9...12		4 Status Bytes, Bits ...
4 Status Bytes, Bits 0..31_4	0	4	13...16		4 Status Bytes, Bits ...
4 Status Bytes, Bits 0..31_5	0	5	17...20		4 Status Bytes, Bits ...
4 Status Bytes, Bits 0..31_6	0	6	21...24		4 Status Bytes, Bits ...
4 Status Bytes, Bits 0..31_7	0	7	25...28		4 Status Bytes, Bits ...
4 Status Bytes, Bits 0..31_8	0	8	29...32		4 Status Bytes, Bits ...
4 Status Bytes, Bits 0..31_9	0	9	33...36		4 Status Bytes, Bits ...
4 Status Bytes, Bits 0..31_10	0	10	37...40		4 Status Bytes, Bits ...
4 Status Bytes, Bits 0..31_11	0	11	41...44		4 Status Bytes, Bits ...
4 Status Bytes, Bits 0..31_12	0	12	45...48		4 Status Bytes, Bits ...
8 Bytes Virtual On/Off/ME Da...	0	13		64...71	8 Bytes Virtual On/...
2 Bytes RCD Data_1	0	14		72...73	2 Bytes RCD Data
2 Byte RCD Acutation Code_1	0	15		74...75	2 Byte RCD Acutati...
RCD Data Feedback Register_	0	16	68...69		RCD Data Feedback...
RCD Passcode Feedback Regi.	0	17	70...71		RCD Passcode Feed...

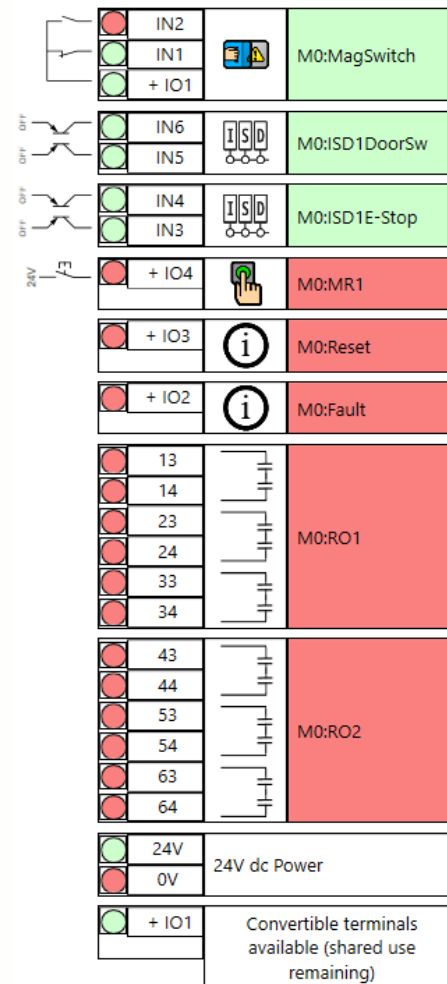
Solution

Step 5

Go Online and verify the signals

S71200_v1 > PLC_1 [CPU 1212C AC/DC/Rly] > PLC tags > Banner [8]

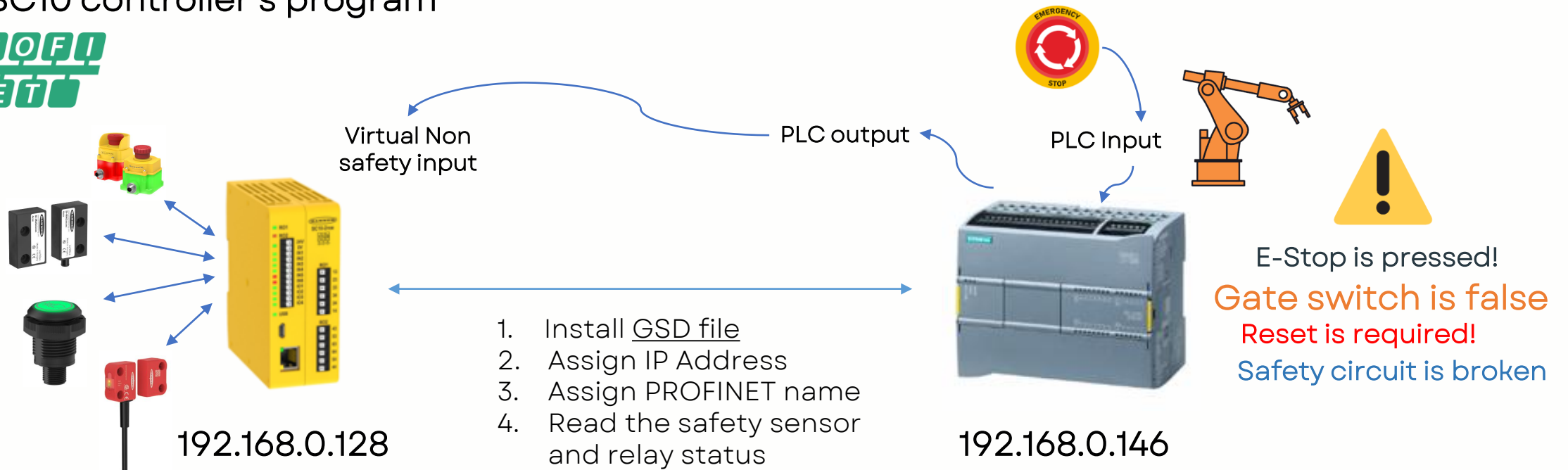
	Name	Data type	Address	Retain	Acces...	Writa...	Visibl...	Monitor value
1	SC10_ManualResetRequired	Bool	%I1.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/> FALSE
2	SC10_RO1Status	Bool	%I37.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/> FALSE
3	SC10_RO2Status	Bool	%I37.1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/> FALSE
4	PLC_VirtualNonSafetyOutput	Bool	%Q64.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/> FALSE
5	SC10_MagSwitchStatus	Bool	%I17.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> TRUE
6	SC10_DoorSwitchStatus	Bool	%I17.1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> TRUE
7	SC10_EmStopStatus	Bool	%I17.2	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> TRUE
8	PLC_MuteMagSwitch	Bool	%Q64.1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/> FALSE
9	<Add new>			<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	



Task 2

Read the PLC output in the SC10 controller as Virtual Non safety inputs . Integrate this signal in the SC10 controller's program

**PROFI
NET**

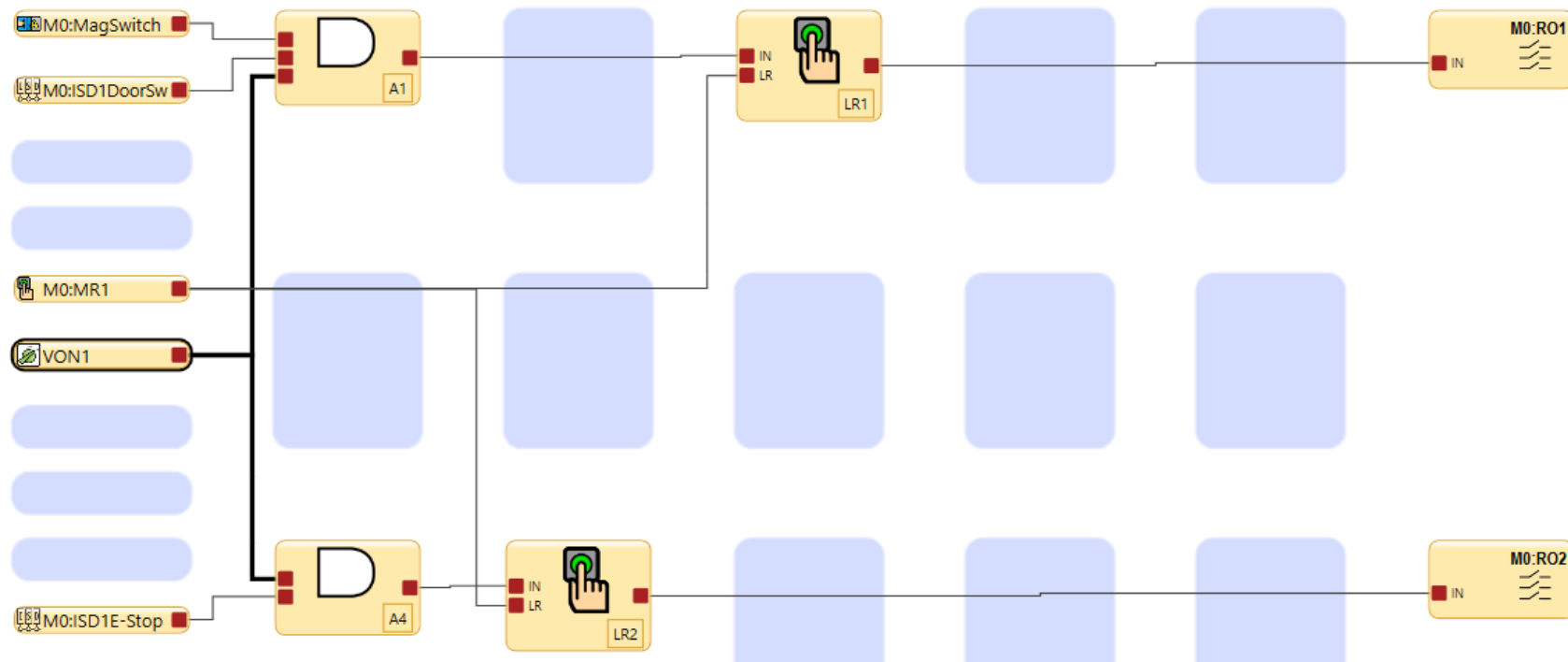


Solution

Step 1

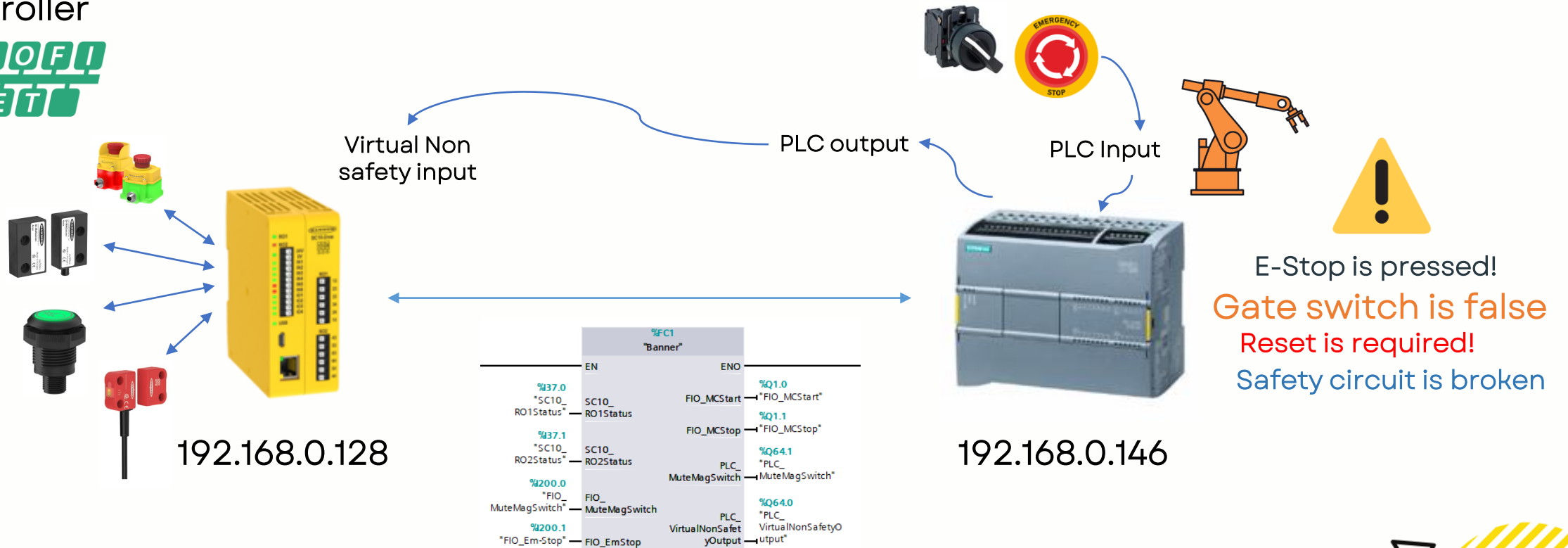
Add virtual non safety signal in the SC10 program and add it as in series with A1 and A4 and blocks

Download the test the circuit



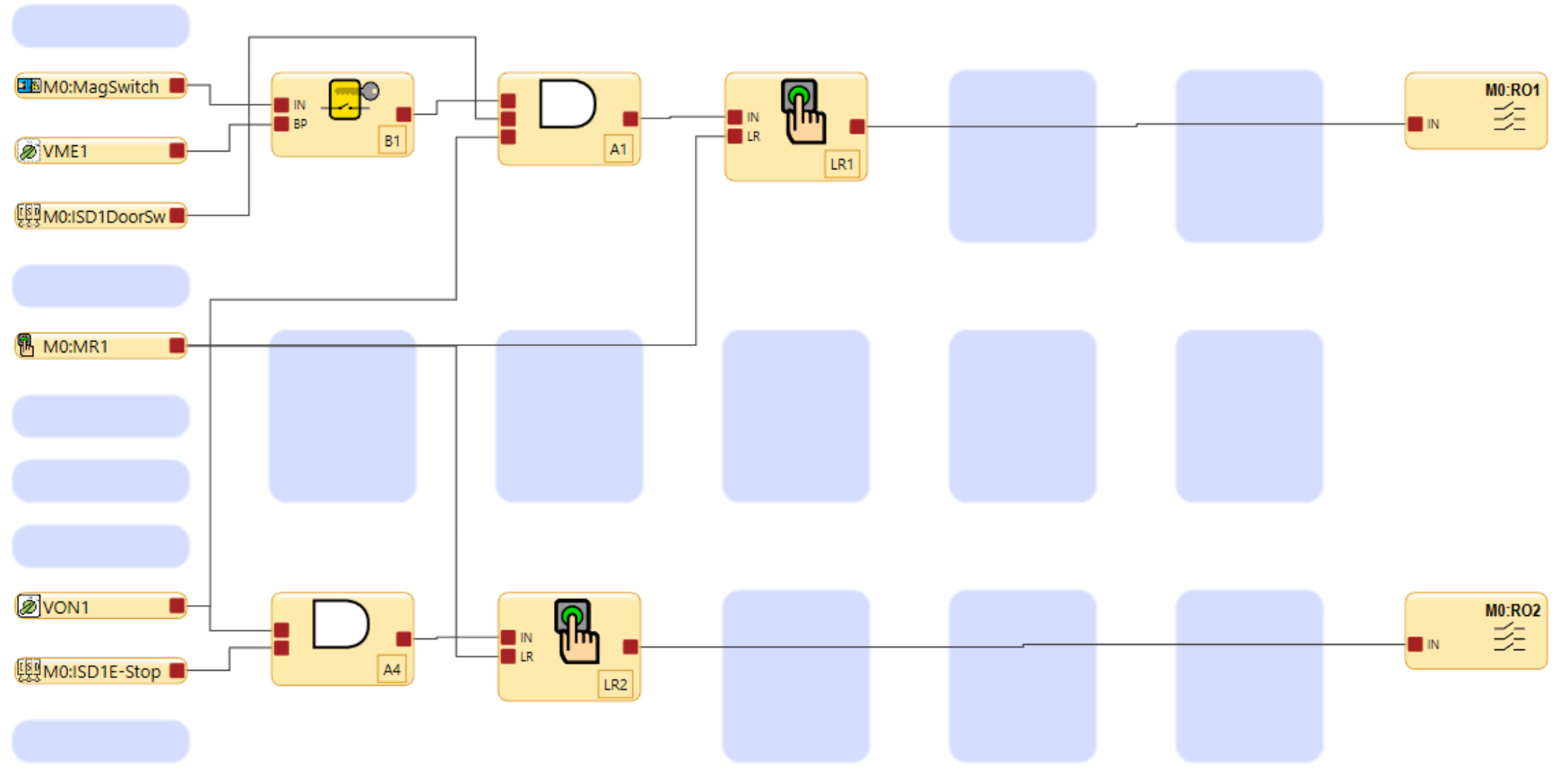
Task 3

Add a bypass signal from the PLC such that it should bypass the magnetic door switch of SC10 controller

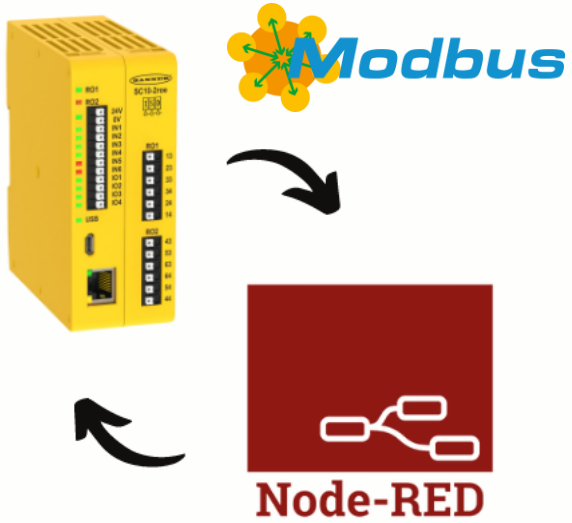


Solution

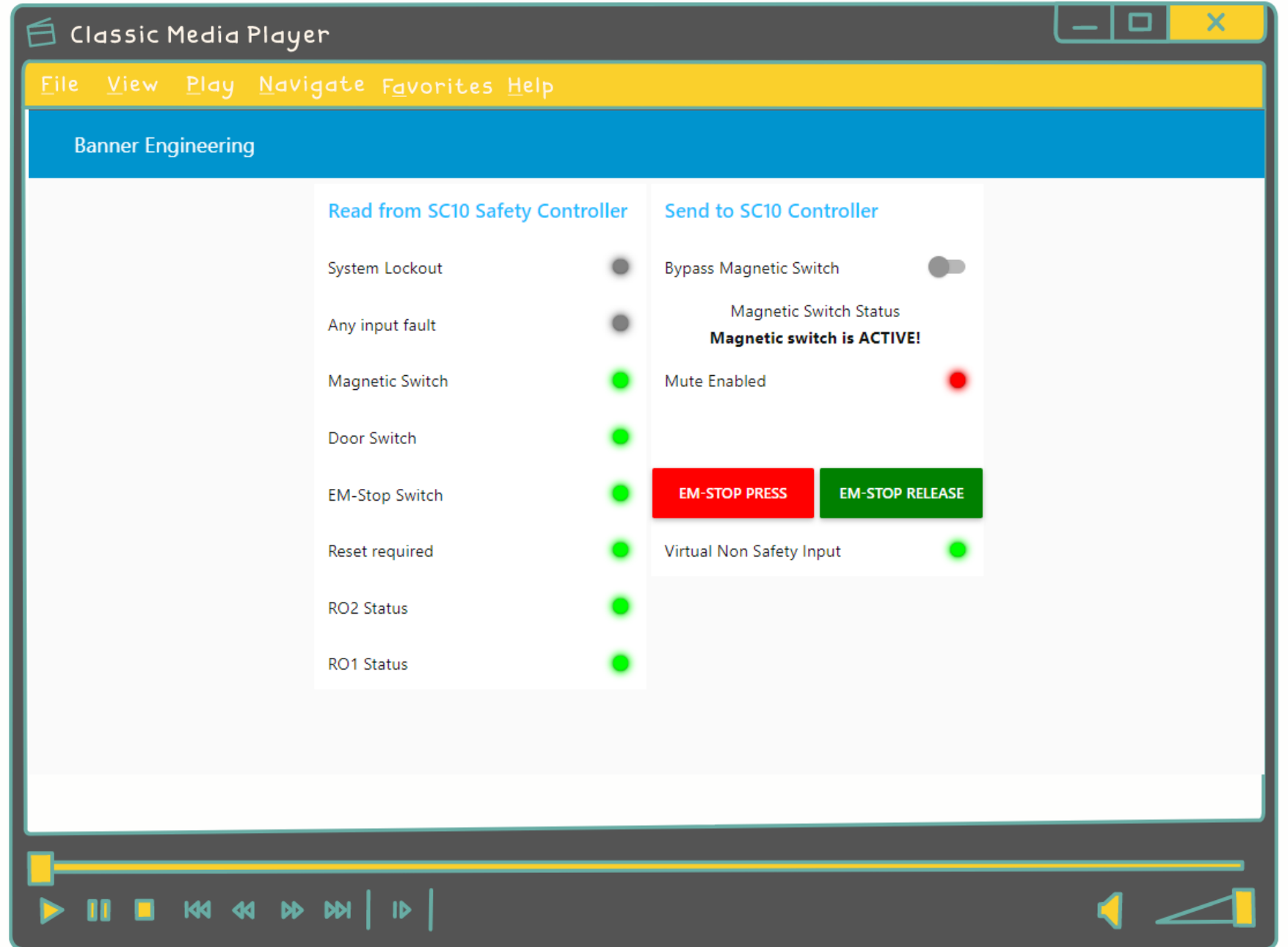
Step 1



Monitoring SC10 on **Node-RED** dashboard

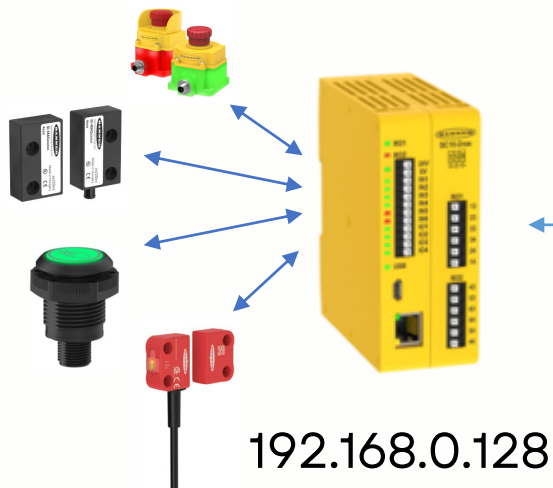


Sponsored by:

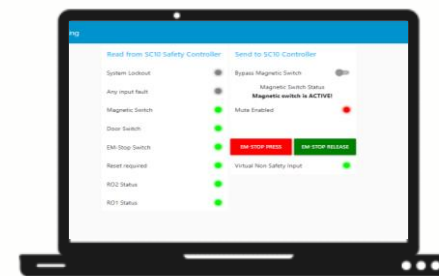


Task 1

Setup the MODBUS communication with Node-RED and read the virtual status outputs of SC10 controller on the dashboard. Simulate the EM-Stop operation and send the bypass magnetic switch command from the dashboard



1. Configure MODBUS address in Banner Safety Controller software
2. Connect to the Node-RED via MODBUS TCP/IP



E-Stop is pressed!
Gate switch is false
Reset is required!
Safety circuit is broken

Solution

Step 1

Connect the MODBUS addresses with function to send over via MODBUS communication.

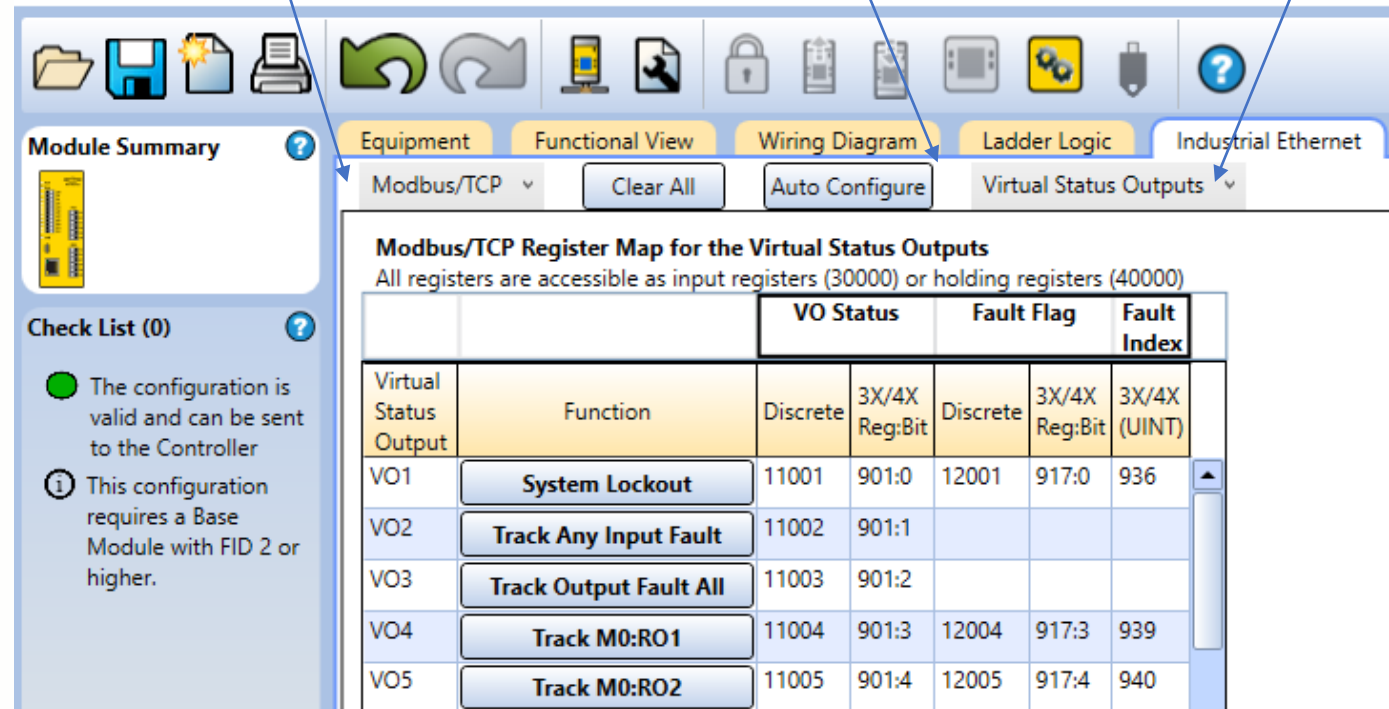
Auto Configure option can be selected which will automatically read all the used function in the program

Select Modbus/TCP as communication interface

Use Auto-Configure option to select the memory location automatically (optional)

Using this drop-down to navigate to Virtual Non-Safety Inputs

New Config (confirmed, New Project-New Config.xsc) - Banner Safety Controller



The screenshot shows the Banner Safety Controller software interface. The 'Equipment' tab is active, and the 'Modbus/TCP' dropdown is selected. The 'Auto Configure' button is highlighted. The 'Virtual Status Outputs' dropdown is also visible. The main area displays the 'Modbus/TCP Register Map for the Virtual Status Outputs' table.

Virtual Status Output	Function	VO Status		Fault Flag		Fault Index
		Discrete	3X/4X Reg:Bit	Discrete	3X/4X Reg:Bit	3X/4X (UINT)
VO1	System Lockout	11001	901:0	12001	917:0	936
VO2	Track Any Input Fault	11002	901:1			
VO3	Track Output Fault All	11003	901:2			
VO4	Track M0:R01	11004	901:3	12004	917:3	939
VO5	Track M0:R02	11005	901:4	12005	917:4	940

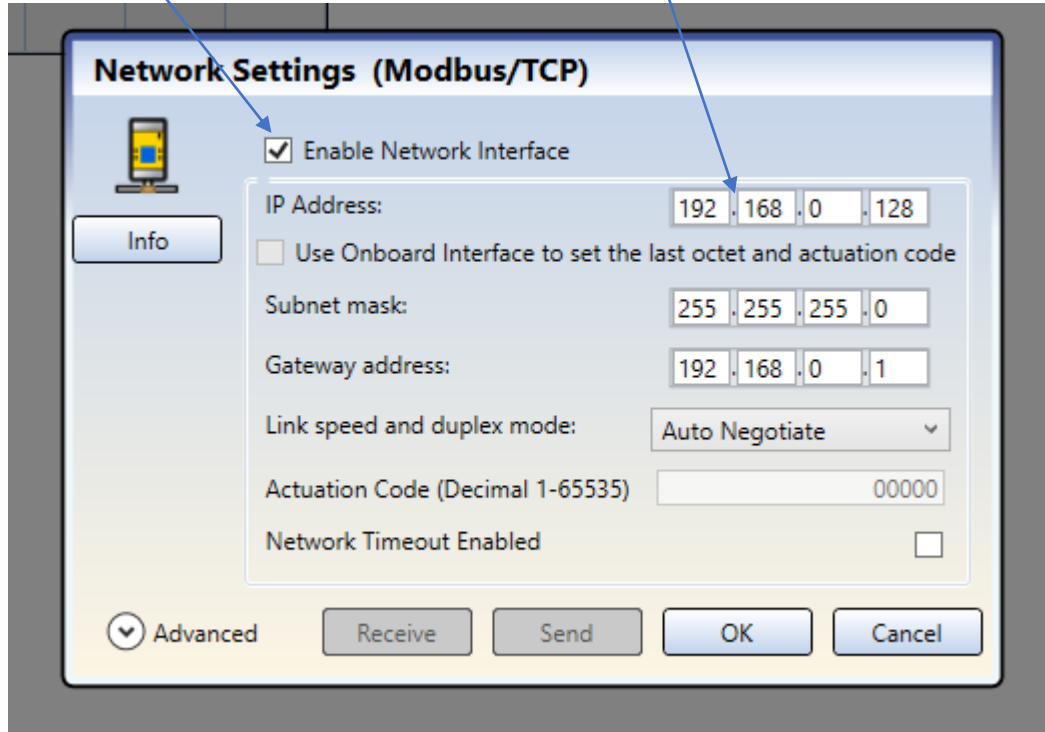
Solution

Step 2

Configure the SC10 controller with network settings and download the program to the SC10 controller

Enable the network

Enter the IP address, subnet mask and the gateway for the SC10 controller



The screenshot shows a 'Network Settings (Modbus/TCP)' dialog box. It features a 'Network Settings (Modbus/TCP)' title bar, a mobile phone icon, and an 'Info' button. The main area contains several settings: 'Enable Network Interface' (checked), 'IP Address' (192.168.0.128), 'Subnet mask' (255.255.255.0), 'Gateway address' (192.168.0.1), 'Link speed and duplex mode' (Auto Negotiate), 'Actuation Code (Decimal 1-65535)' (00000), and 'Network Timeout Enabled' (unchecked). At the bottom, there are buttons for 'Advanced', 'Receive', 'Send', 'OK', and 'Cancel'. Two blue arrows point from external text to the 'Enable Network Interface' checkbox and the IP address field.



Solution

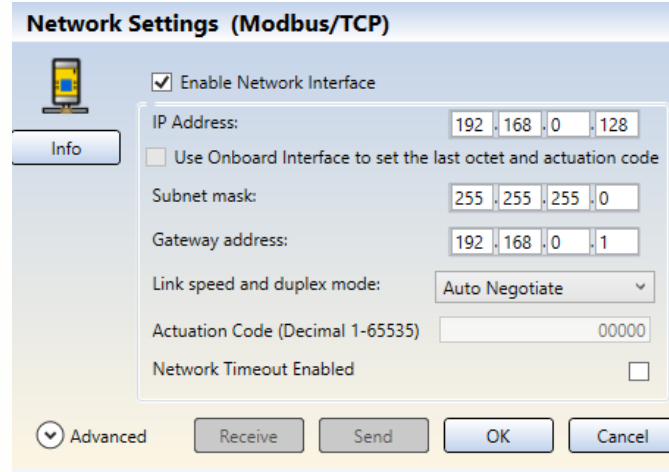
Step 3

Open Node-RED and connect to SC10 controller via MODBUS nodes

IP address: 192.168.0.128

Port: 502

Unit Id: 1



Network Settings (Modbus/TCP)

Enable Network Interface

IP Address: 192 | 168 | 0 | 128

Use Onboard Interface to set the last octet and actuation code

Subnet mask: 255 | 255 | 255 | 0

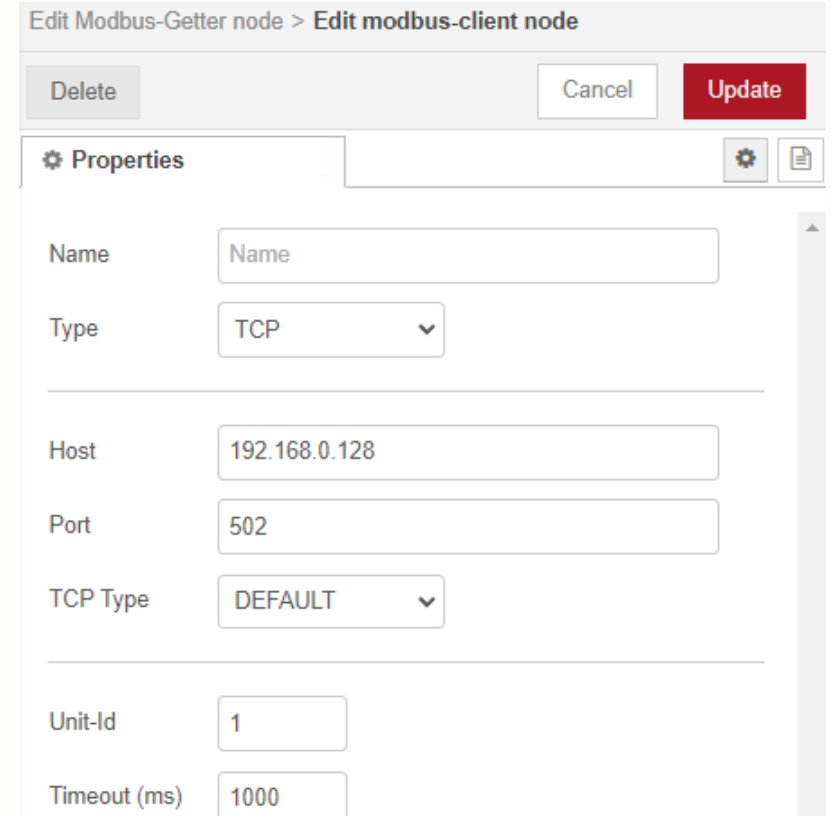
Gateway address: 192 | 168 | 0 | 1

Link speed and duplex mode: Auto Negotiate

Actuation Code (Decimal 1-65535): 00000

Network Timeout Enabled

Advanced Receive Send OK Cancel



Edit Modbus-Getter node > Edit modbus-client node

Delete Cancel Update

Properties

Name: Name

Type: TCP

Host: 192.168.0.128

Port: 502

TCP Type: DEFAULT

Unit-Id: 1

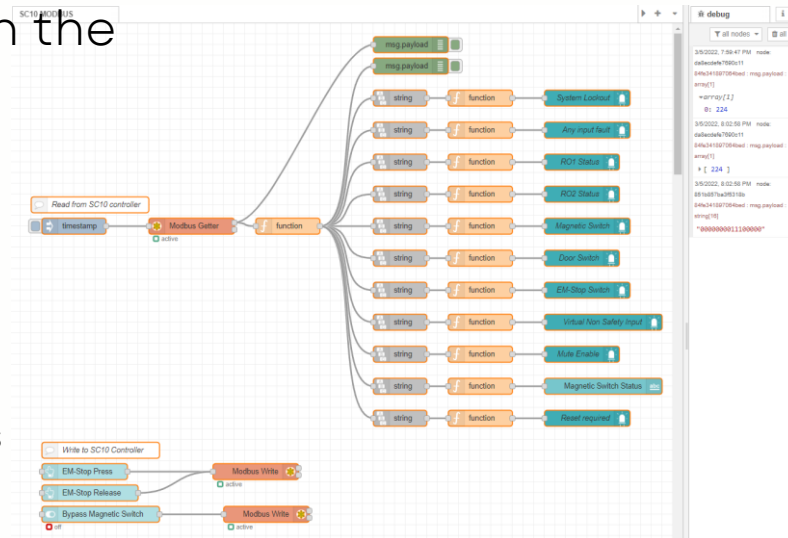
Timeout (ms): 1000



Solution

Step 4

Read the MODBUS addresses and design the dashboard in the Node-RED



Note:
MODBUS addressing in SC10 is 1-based addressing

Read from SC10 Safety Controller	Send to SC10 Controller
System Lockout <input type="checkbox"/>	Bypass Magnetic Switch <input type="checkbox"/>
Any input fault <input type="checkbox"/>	Magnetic Switch Status Magnetic switch is ACTIVE!
Magnetic Switch <input checked="" type="checkbox"/>	Mute Enabled <input checked="" type="checkbox"/>
Door Switch <input checked="" type="checkbox"/>	EM-STOP PRESS EM-STOP RELEASE
EM-Stop Switch <input checked="" type="checkbox"/>	Virtual Non Safety Input <input checked="" type="checkbox"/>
Reset required <input checked="" type="checkbox"/>	
RO2 Status <input checked="" type="checkbox"/>	
RO1 Status <input checked="" type="checkbox"/>	



*Secure your application now!
using Banner safety controller*

Thank you

