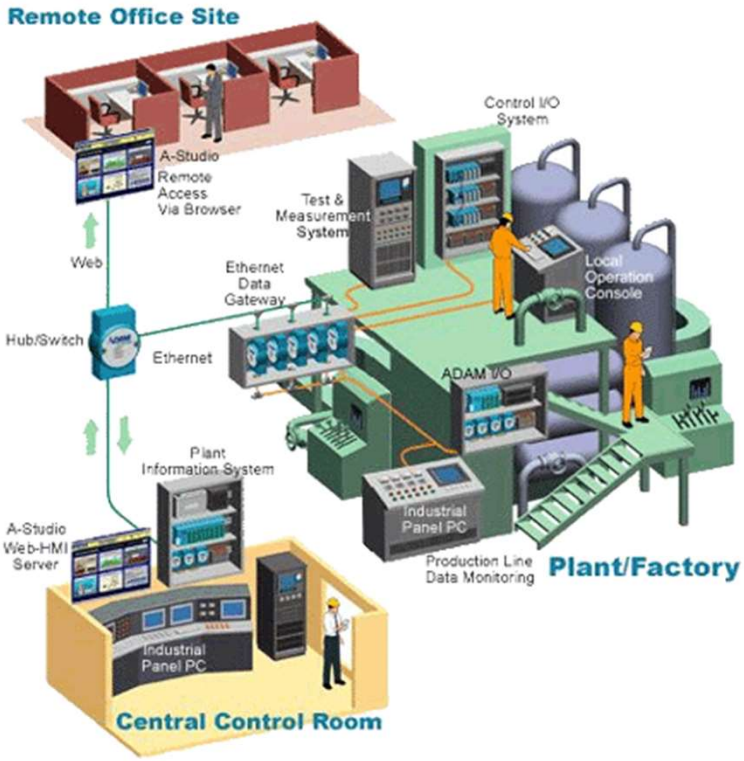
INDUSTRIAL INTERNET OF THINGS (IIOT) AND SCADA

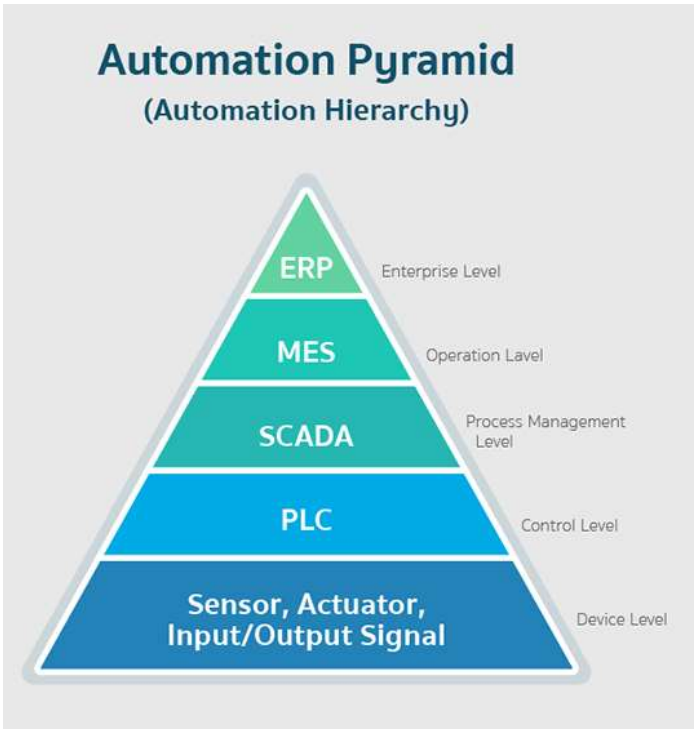
- จากหัวใจหลักของอุตสาหกรรม 4.0 คือ การสื่อสาร และการรวบรวมข้อมูล ซึ่งในอุตสาหกรรมมีสองแนวทาง คือ
  - การประยุกต์อุปกรณ์ IOT เข้ามาใช้งานร่วมกับเครื่องจักรอุตสาหกรรมที่มีอยู่แล้ว เพื่อเพิ่มความสามารถให้เครื่องจักรสามารถสื่อสารและจัดส่งข้อมูลเข้าระบบฐานข้อมูลได้ เพื่อลดกระบวนการในการจดบันทึก
  - การเปลี่ยนอุปกรณ์และเครื่องจักรใหม่ ที่มีมีความสามารถในการสื่อสาร
  - การใช้งานโปรแกรมจัดการแบบสำเร็จรูป เช่น โปรแกรม SCADA ซึ่งสะดวก แต่มีค่าใช้จ่ายสูง
  - การใช้งานโปรแกรมแบบ Open Source ซึ่งไม่มีค่าใช้จ่าย แต่ต้องใช้บุคคลากรที่ความรู้และเข้าใจ
- การรวบรวมข้อมูลในกระบวนการผลิตในรูปแบบดิจิตอล จะส่งผลให้การวิเคราะห์ข้อมูลได้อย่างรวดเร็ว และความถูกต้อง ซึ่งจะช่วยทั้งในด้านการควบคุมการผลิต การจัดการคลังสินค้า และด้านการตรวสอบเครื่องจักร การบำรุงรักษา การลด downtime และต้นทุน และประสิทธิภาพในการทำงาน

Industrial Automation Control

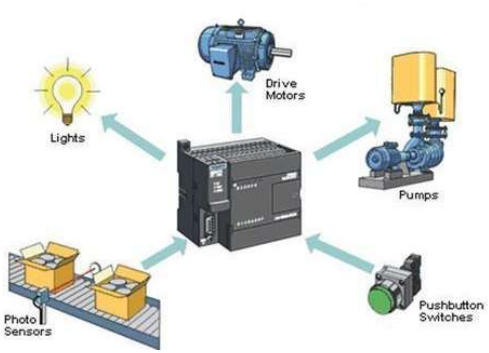
PLC – Programmable Logic Controller
HMI – Human Machine Interface
SCADA – Supervisory Control and Data Acquisition
DCS – Distributed Control System

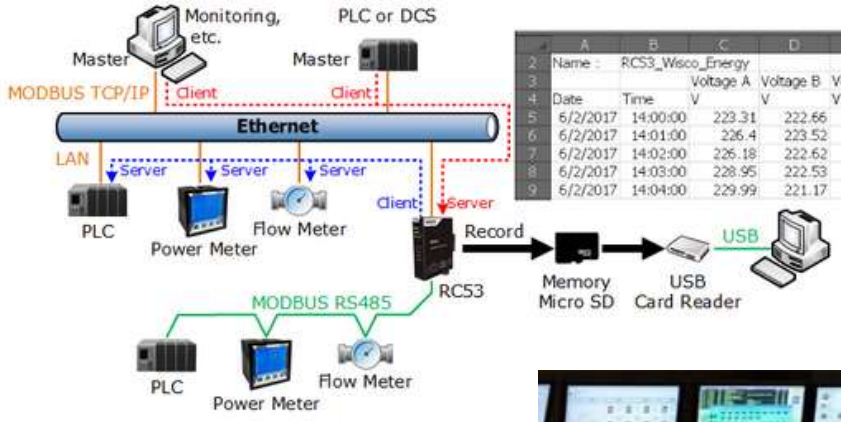


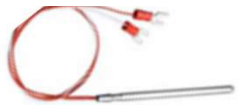
https://electricaltrends.com/2017/03/21/10-trends-industrial-automation-and-control-market/



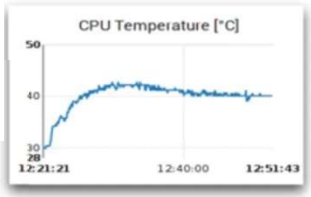
Protocol	Level	Common Applications
ModBus	Device	Manufacturing, Electric Utility
Profibus	Device	Process Industry
DeviceNet	Device	Manufacturing
DNP 3.0	Device	Electric Utility SCADA
BACNet	Control	HVAC Control, Building Automation
ControlNet	Control	Manufacturing
ARCNet	Supervisory	Office Automation, Gaming
Ethernet/IP	Supervisory	Office Automation, Internet

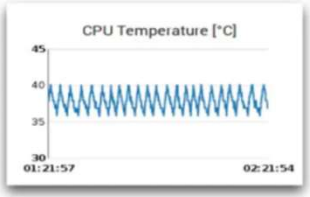


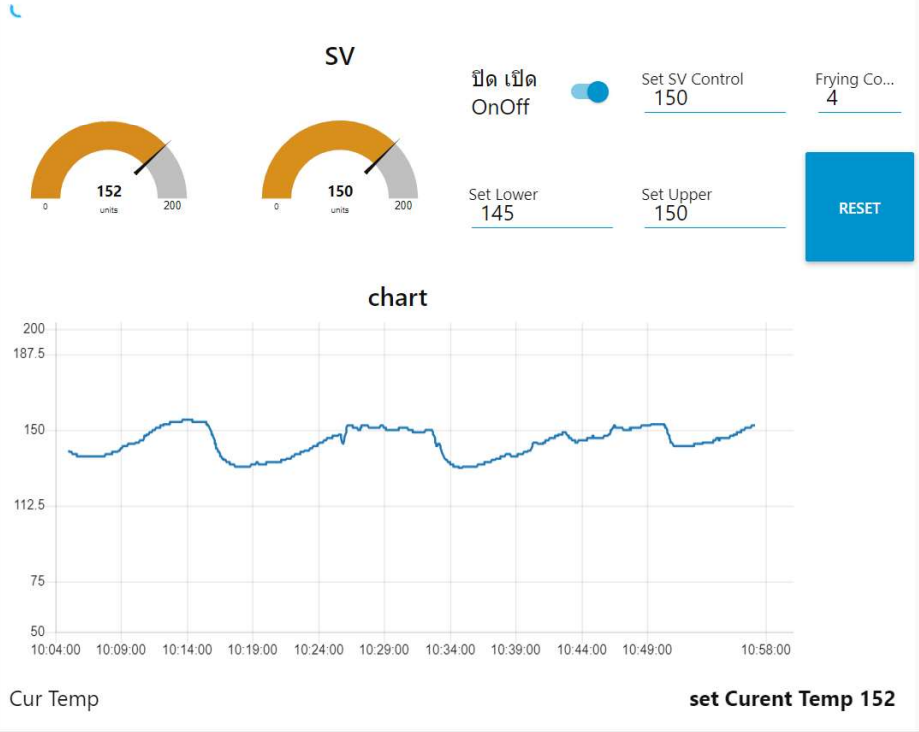




PID control VS On/Off control

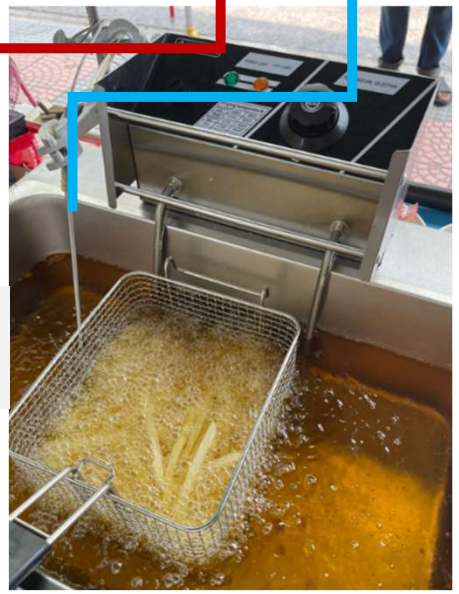




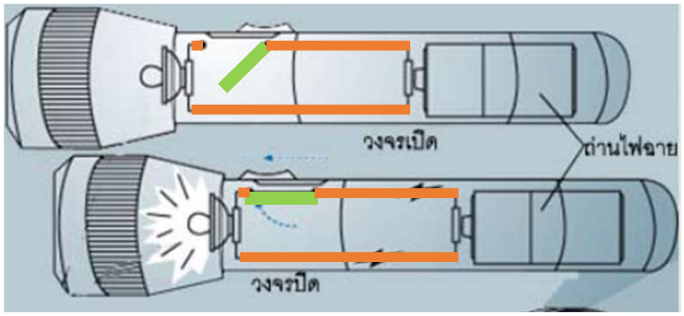


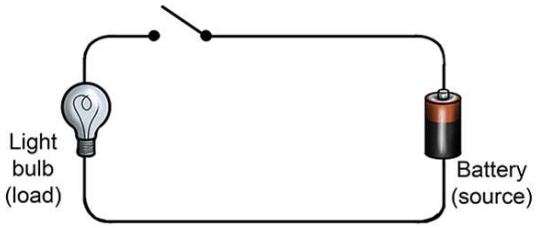
Rs485

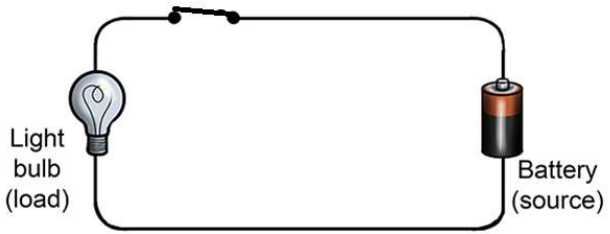
Modbus RTU



การควบคุมสวิตช์ Switch Control

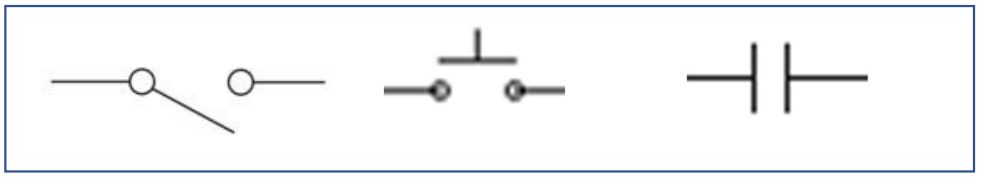






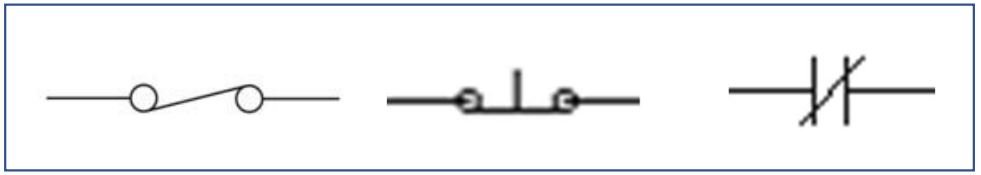
วงจรเปิด (Open Circuit)

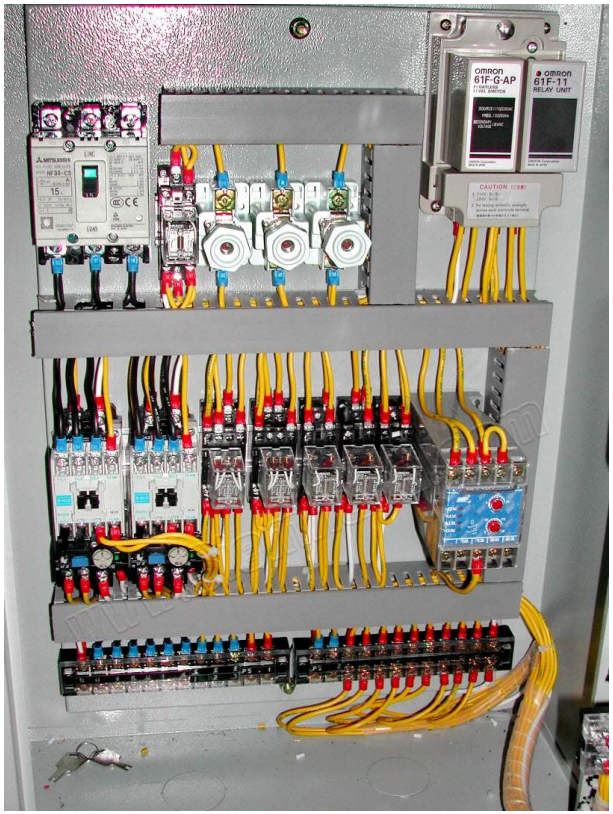
- กระแสไฟฟ้าไม่สามารถไหลผ่านได้ ทำให้อุปกรณ์ไม่ทำงาน
- หน้าสัมผัสไม่เชื่อมต่อกัน (Open Contact)

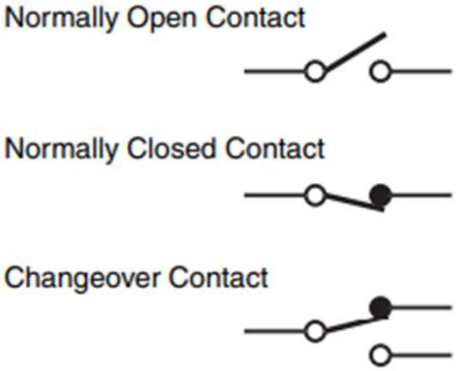


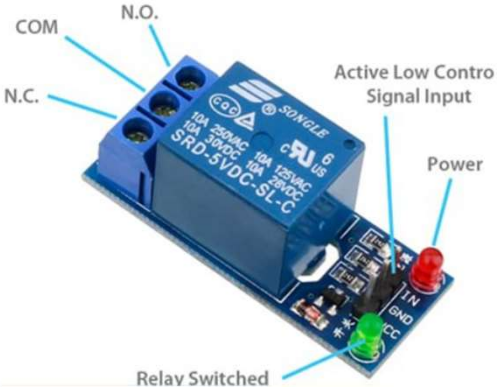
วงจรปิด (Close Circuit)

- หน้าสัมผัสเชื่อมต่อกัน (Close Contact)
- กระแสไฟฟ้าไหลในวงจรได้ ทำให้อุปกรณ์ทำงาน




omron
61F-G-AP
omron
61F-11
RELAY UNIT


Normally Open Contact
Normally Closed Contact
Changeover Contact


COM
N.O.
N.C.
Active Low Contro
Signal Input
Power
Relay Switched
SONGLE
SRD-5VDC-SL-C
IN
GND
VCC

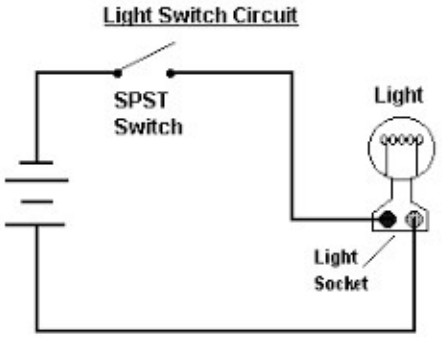

TIMER

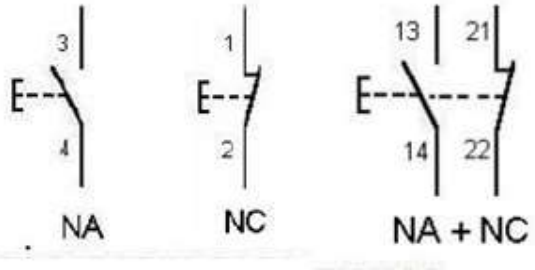

NO


MODEL
S-T10
MITSUBISHI

หมุนปุ่มมาทาง MAN สั่งเปิดปิดจากสวิทช์หน้าตู้

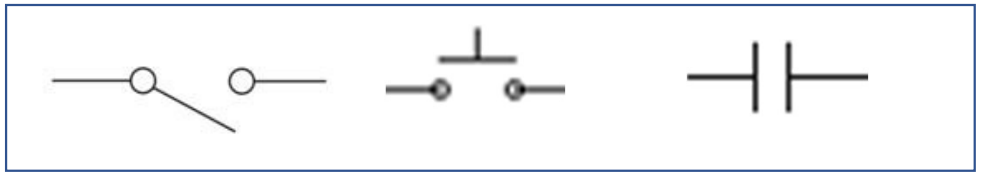
หมุนปุ่มมาทาง AUTO รอเวลาที่ตั้งไว้จาก timer





วงจรเปิด (**Open Circuit**)

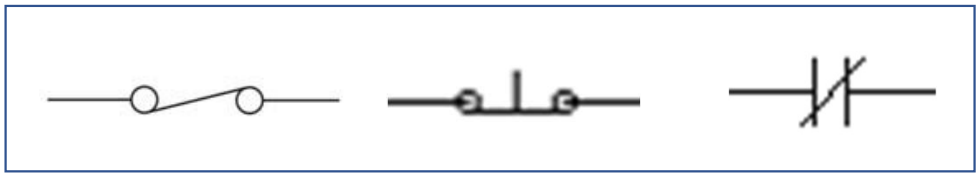
- กระแสไฟฟ้าไม่สามารถไหลผ่านได้ ทำให้อุปกรณ์ไม่ทำงาน
- หน้าสัมผัสไม่เชื่อมต่อกัน (Open Contact)



A Normal Open contact (NO)

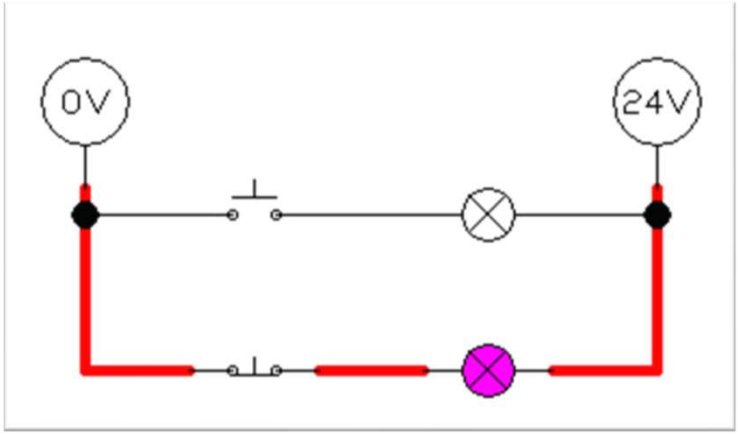
วงจรปิด (**Close Circuit**)

- หน้าสัมผัสเชื่อมต่อกัน (Close Contact)
- กระแสไฟฟ้าไหลในวงจรได้ ทำให้อุปกรณ์ทำงาน

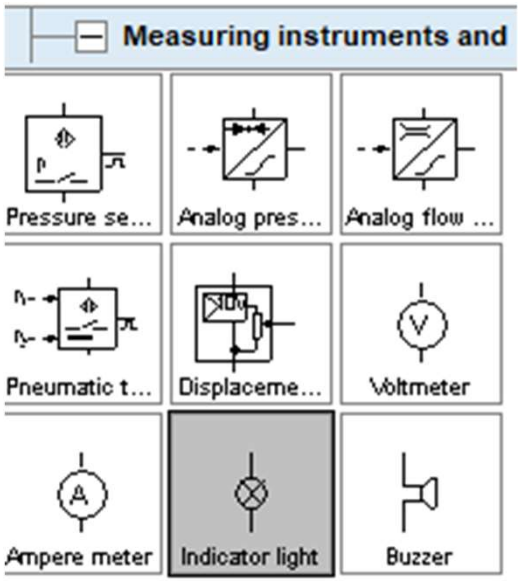


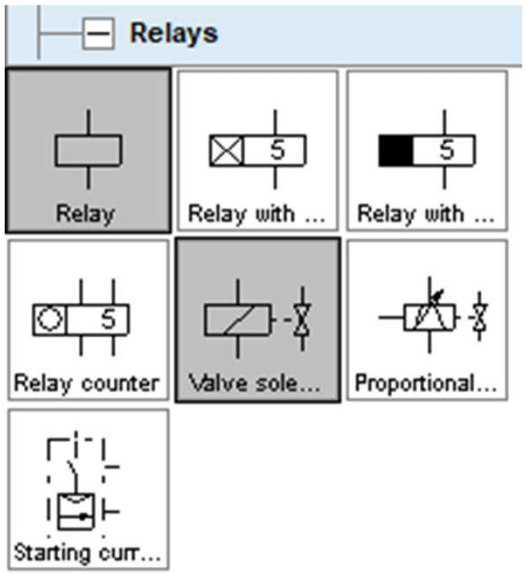
A Normal Closed contact (NC)

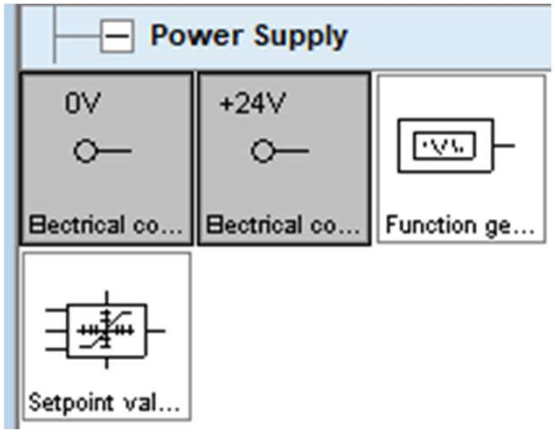
ปกติหน้าสัมผัสเปิด

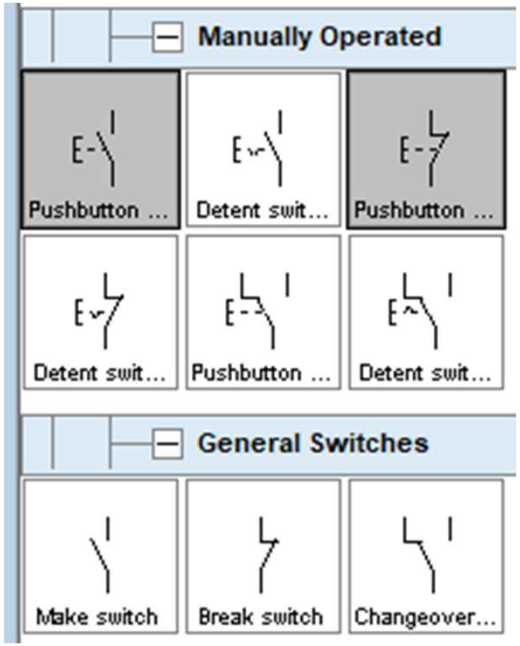


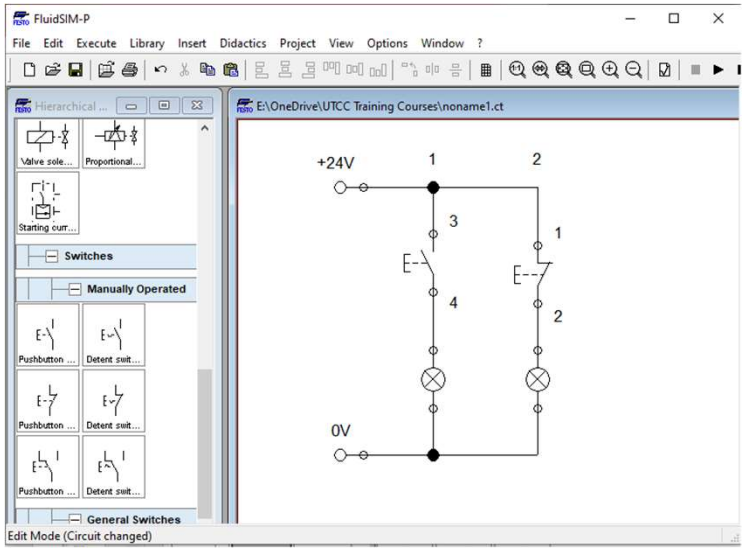
ปกติหน้าสัมผัสปิด

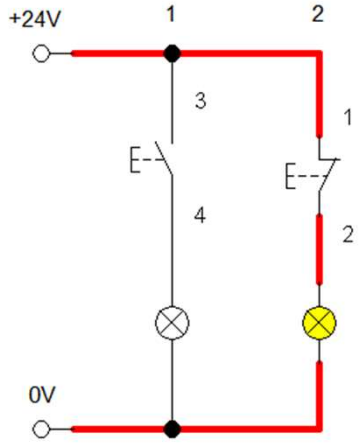

Measuring instruments and
Pressure se...
Analog pres...
Analog flow ...
Pneumatic t...
Displaceme...
Voltmeter
Ampere meter
Indicator light
Buzzer


Relays
Relay
Relay with ...
Relay with ...
Relay counter
Valve sole...
Proportional...
Starting curr...

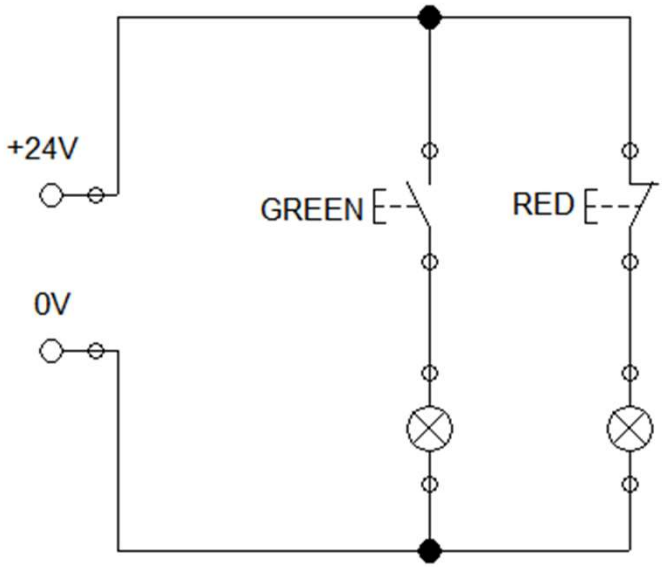

Power Supply
0V
+24V
Electrical co...
Electrical co...
Function ge...
Setpoint val...

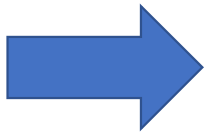

Manually Operated
Pushbutton ...
Detent swit...
Pushbutton ...
Detent swit...
Pushbutton ...
Detent swit...
General Switches
Make switch
Break switch
Changeover...

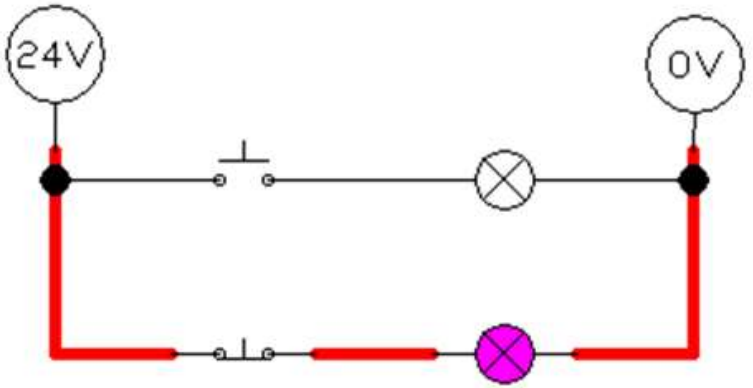

FluidSIM-P
File Edit Execute Library Insert Didactics Project View Options Window ?
Hierarchical ...
Switches
Manually Operated
General Switches
E:\OneDrive\UTCC Training Courses\noname1.ct
+24V
0V
1
2
3
4
Edit Mode (Circuit changed)

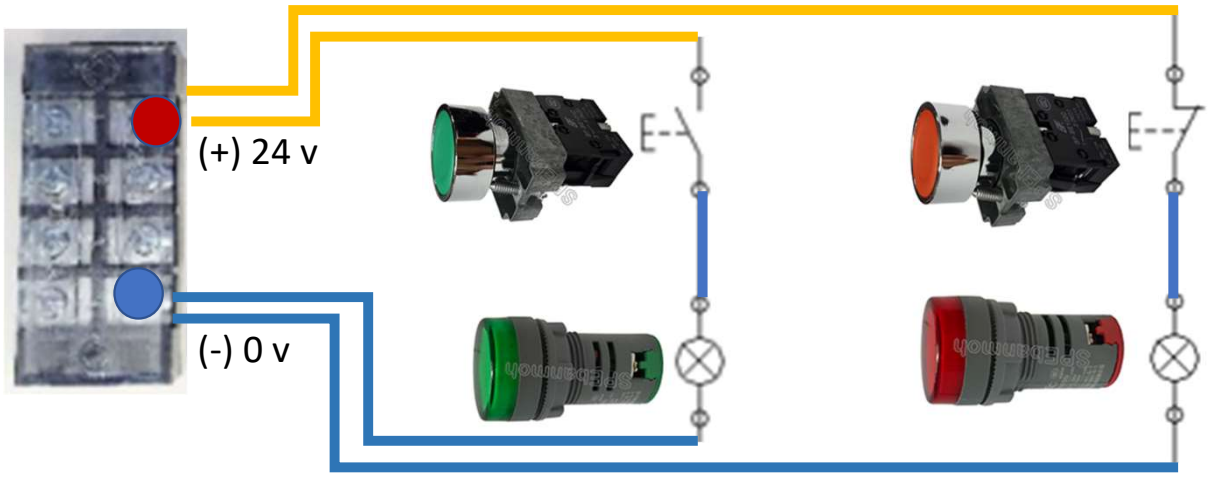

+24V
1
2
3
4
0V

Basic 01 - Switch Control (NO-NC) youtube

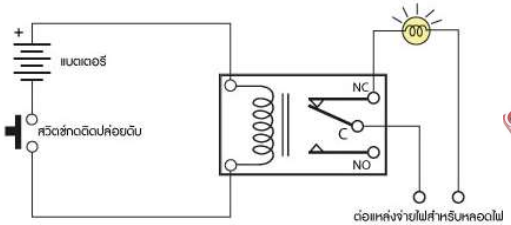


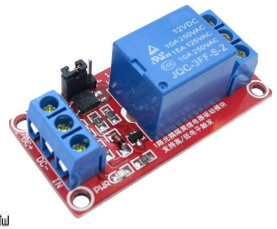


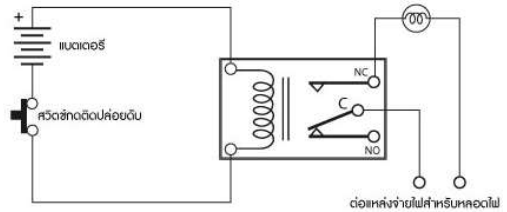


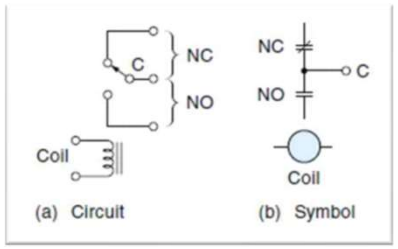


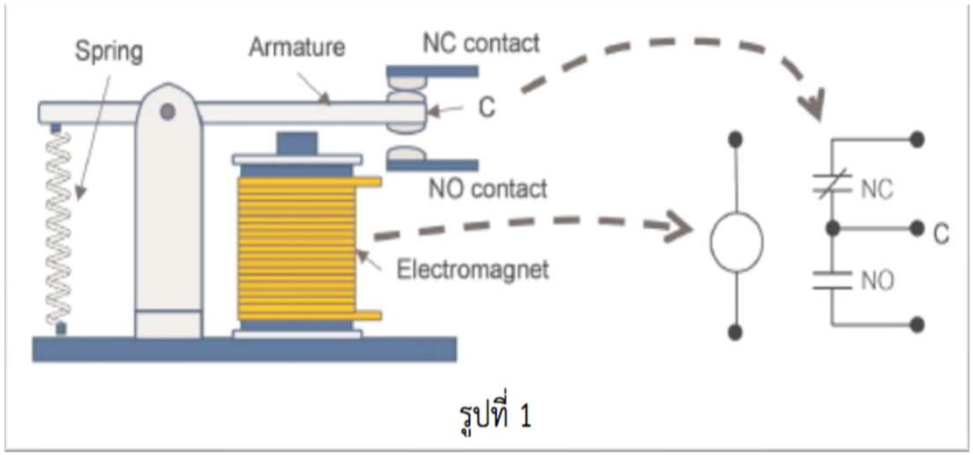
รีเลย์ Relay (สวิตช์ ที่ใช้กระแสไฟฟ้าในสั่งงาน หน้าสัมผัสเปิดปิด)

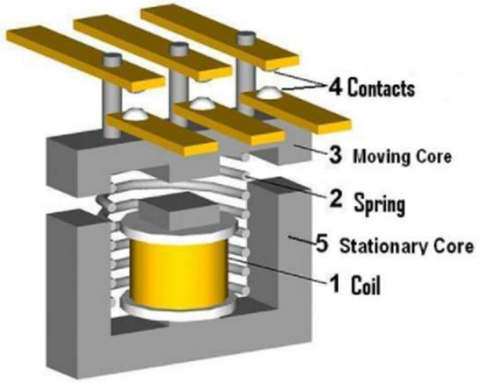


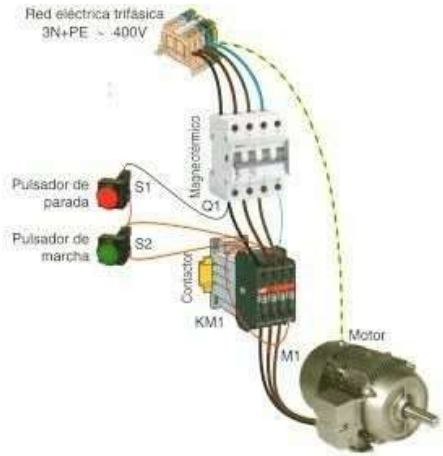






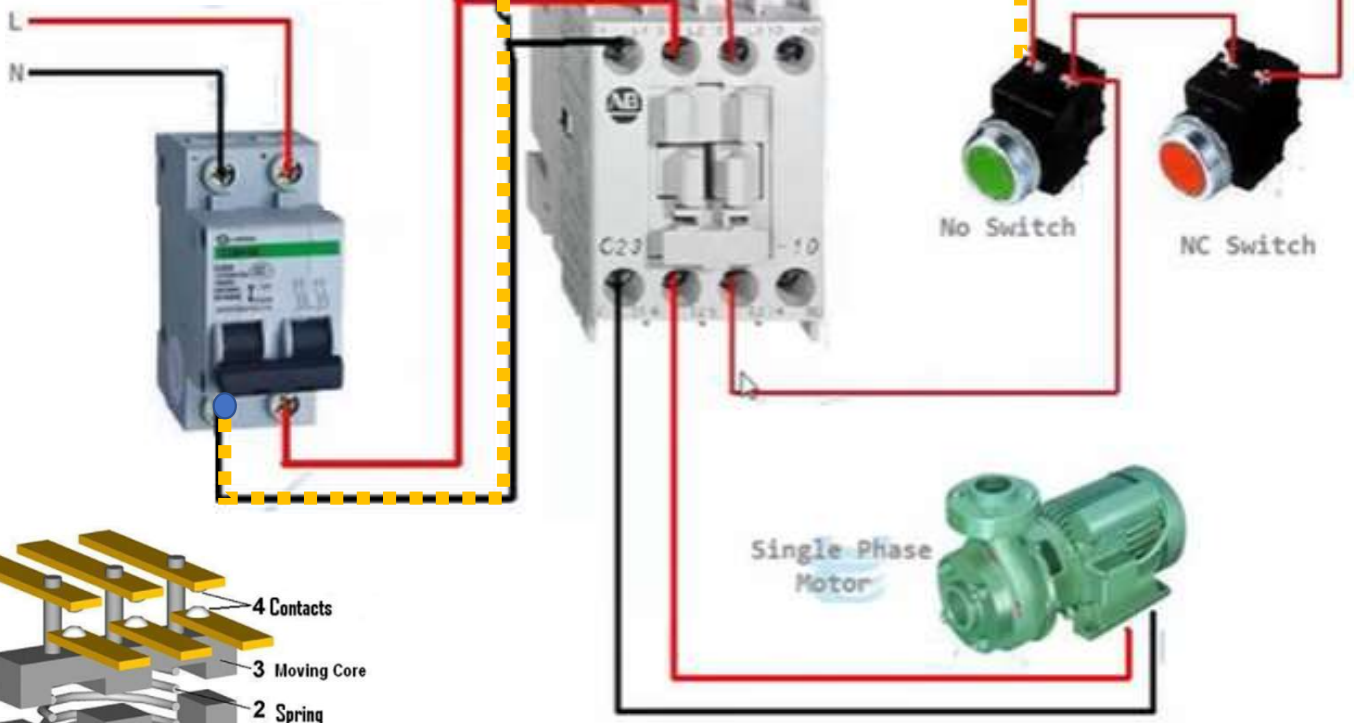


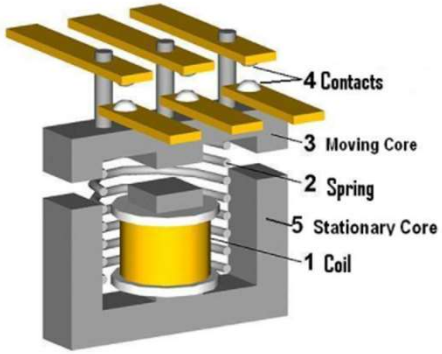





MODEL
MSO-T10
S-T10
MITSUBISHI

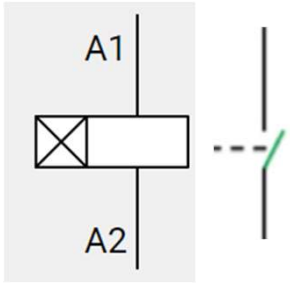

A1
A2
1
3
5
13
2
4
6
14

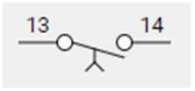

L
N
Contactor
No Switch
NC Switch
Single Phase
Motor

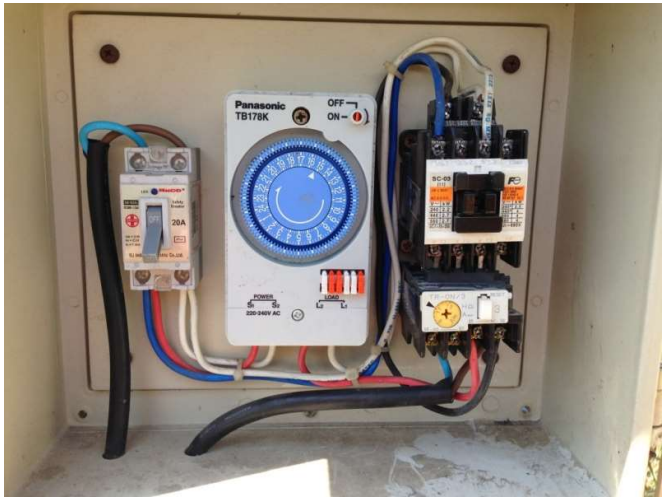

4 Contacts
3 Moving Core
2 Spring
5 Stationary Core
1 Coil

ตัวตั้งเวลา

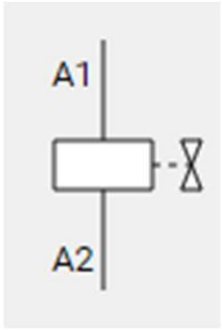
Timer

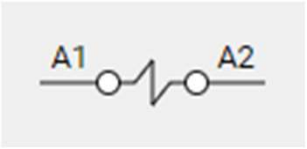




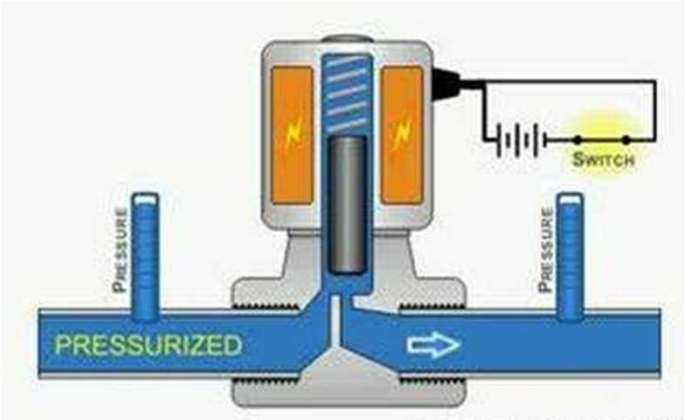


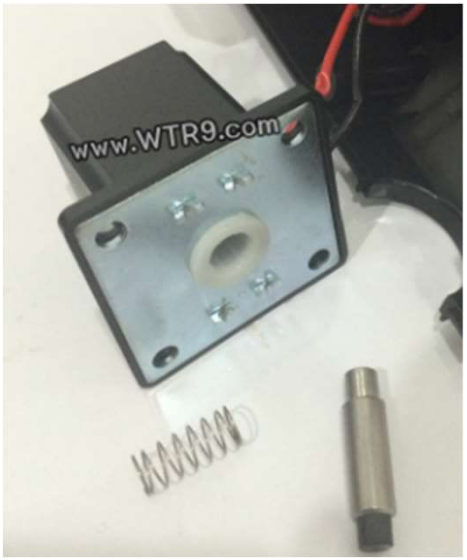
Solenoid Valves

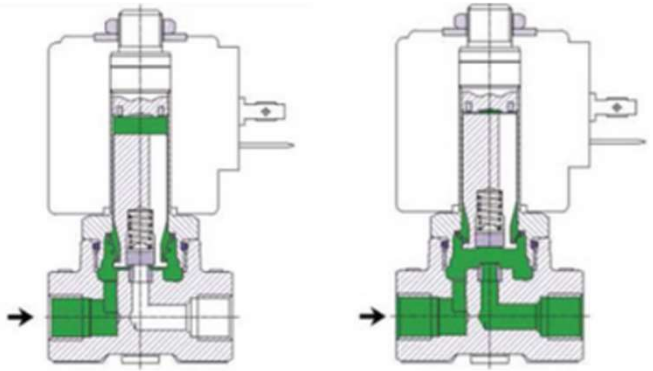




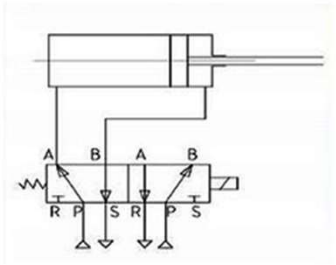
ระบบรดน้ำอัตโนมัติ 4 โซน

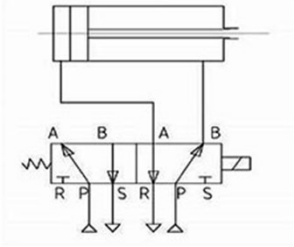


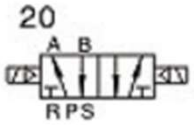


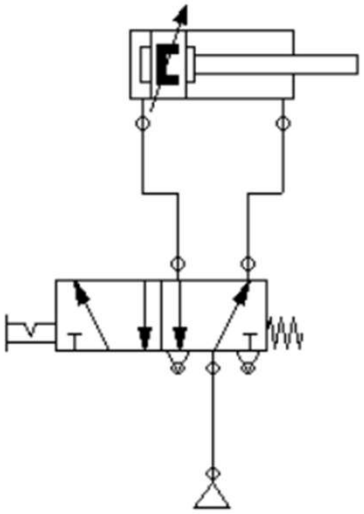


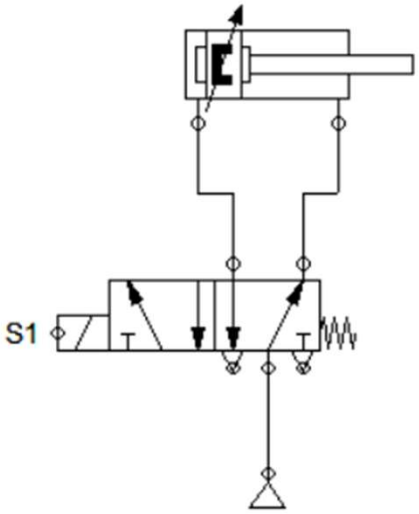
Solenoid Valves

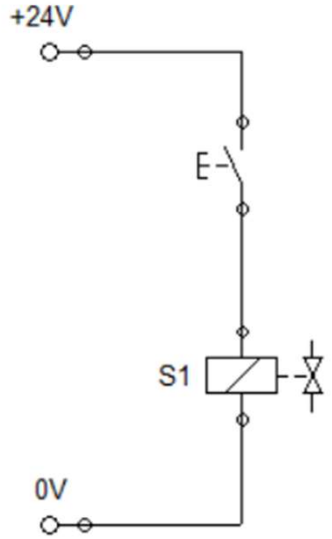


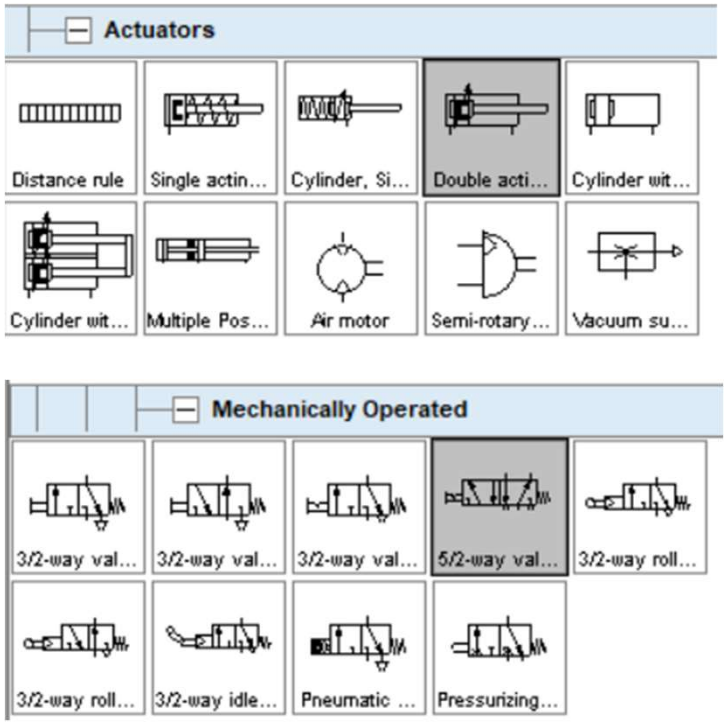


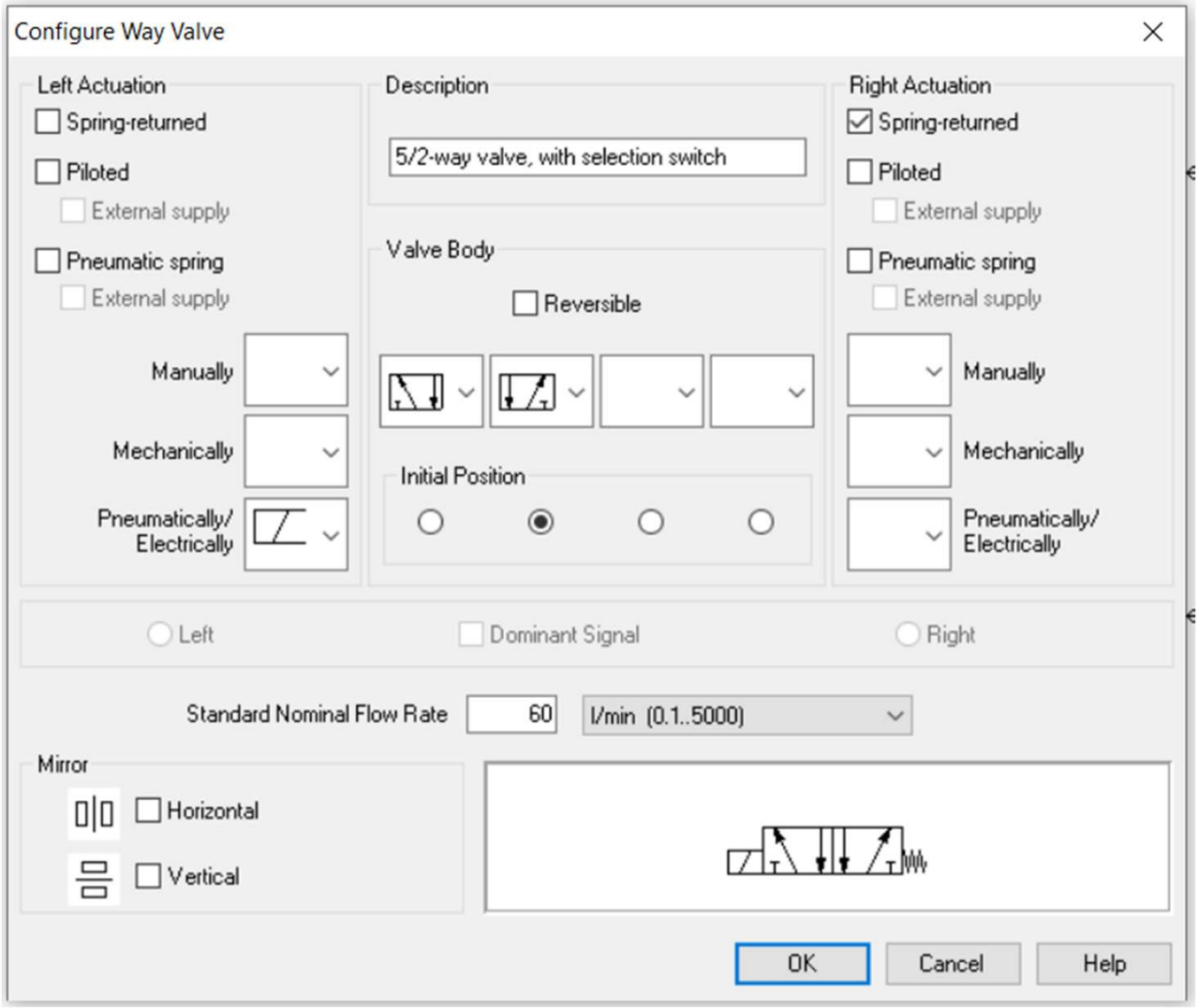


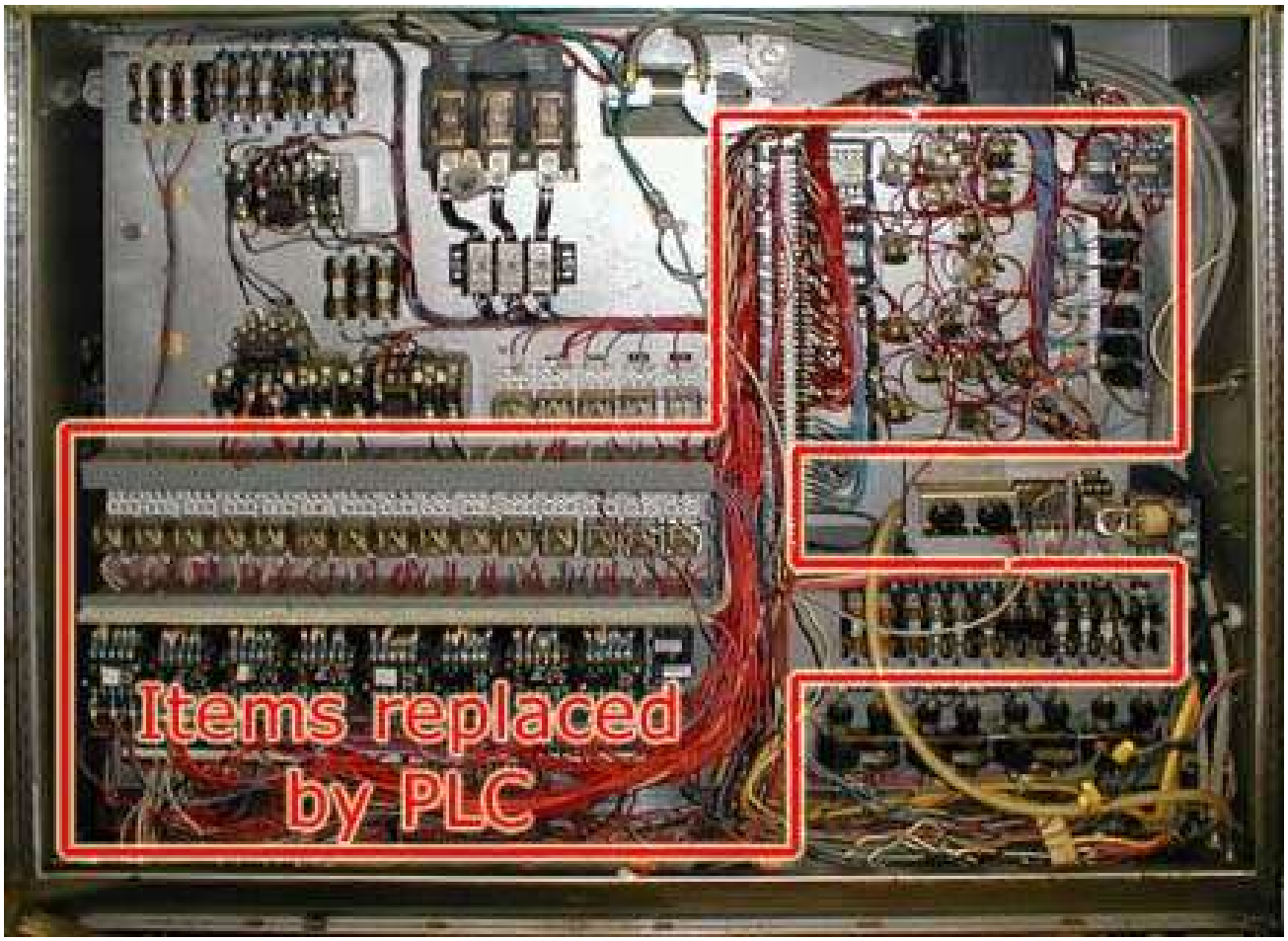


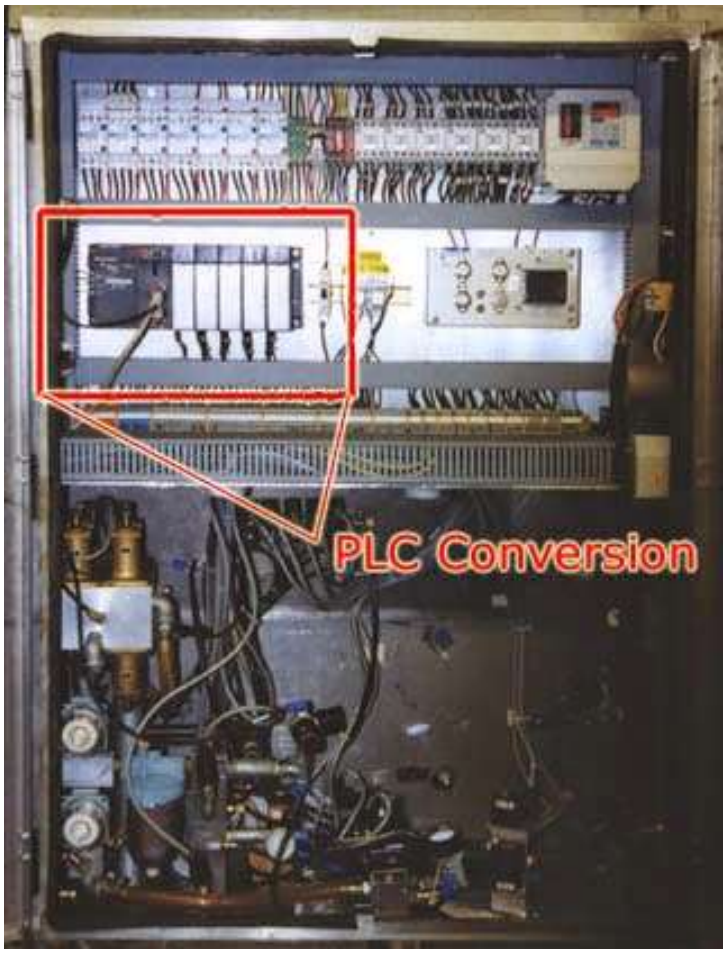




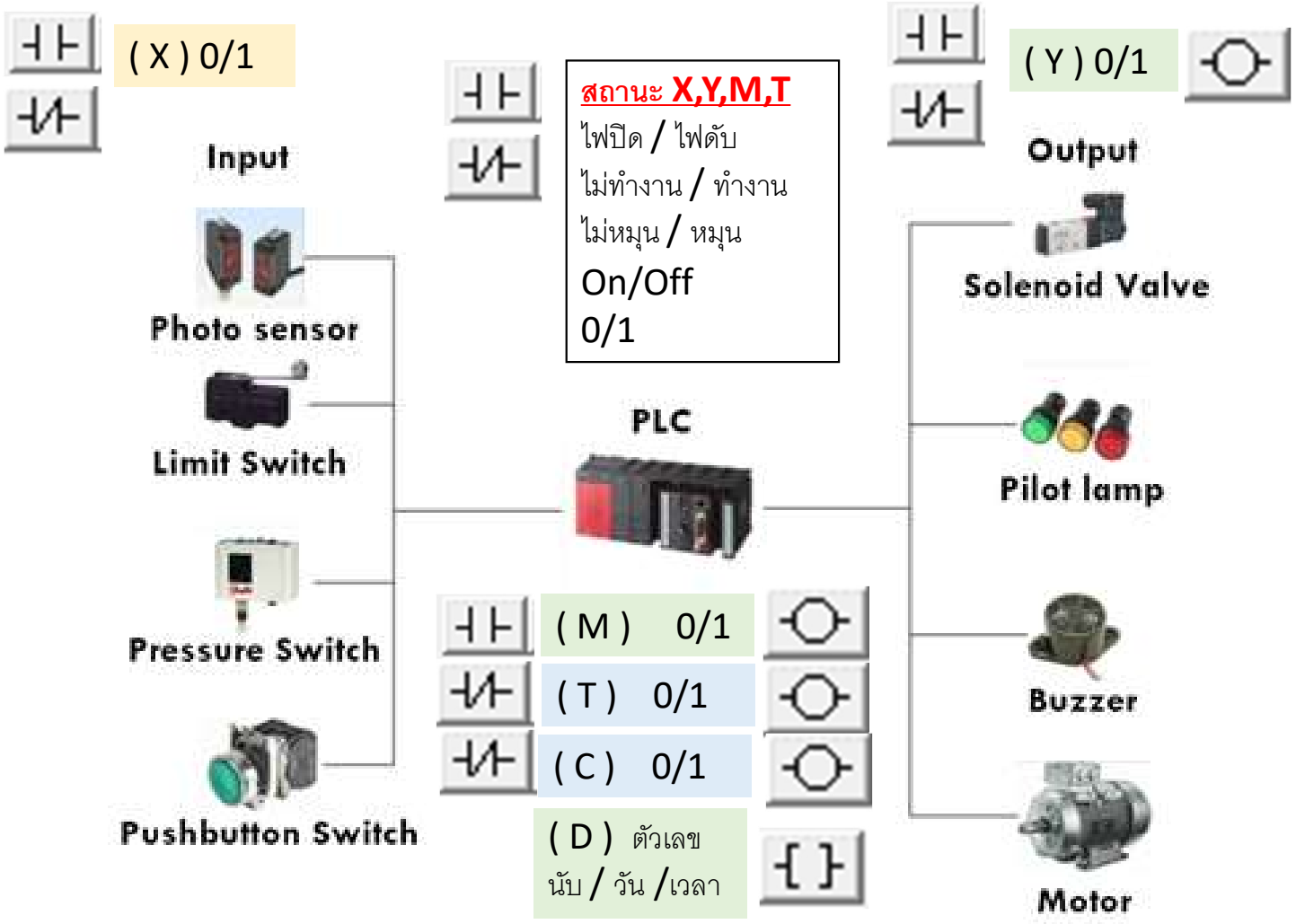

Actuators
Distance rule
Single actin...
Cylinder, Si...
Double acti...
Cylinder wit...
Cylinder wit...
Multiple Pos...
Air motor
Semi-rotary...
Vacuum su...
Mechanically Operated
3/2-way val...
3/2-way val...
3/2-way val...
5/2-way val...
3/2-way roll...
3/2-way roll...
3/2-way idle...
Pneumatic ...
Pressurizing...


Configure Way Valve
Left Actuation
Spring-returned
Piloted
External supply
Pneumatic spring
External supply
Manually
Mechanically
Pneumatically/ Electrically
Description
5/2-way valve, with selection switch
Valve Body
Reversible
Initial Position
Right Actuation
Spring-returned
Piloted
External supply
Pneumatic spring
External supply
Manually
Mechanically
Pneumatically/ Electrically
Left
Dominant Signal
Right
Standard Nominal Flow Rate
60
l/min (0.1..5000)
Mirror
Horizontal
Vertical
OK
Cancel
Help

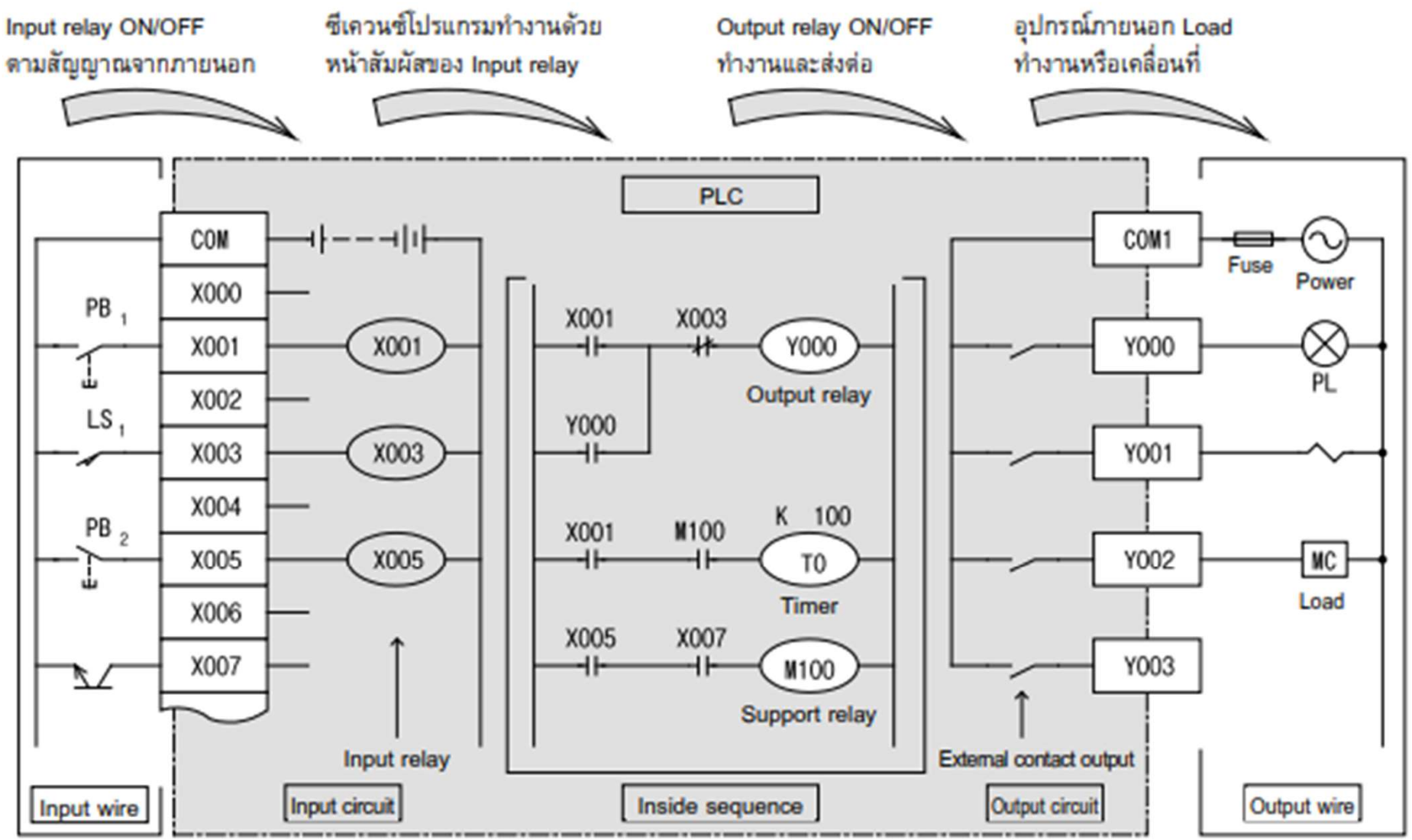

Items replaced
by PLC


PLC Conversion

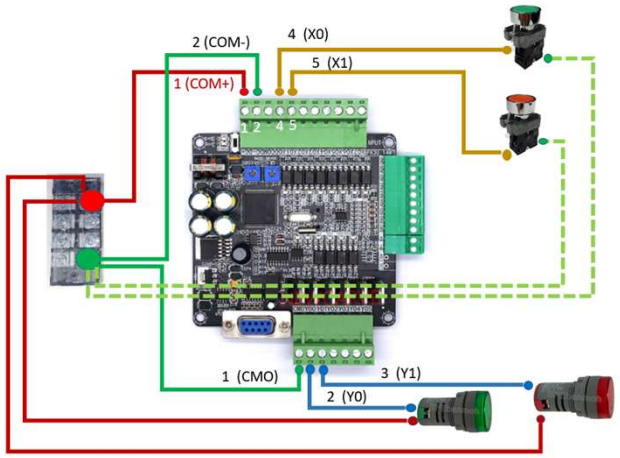
PLC (Programable Logic Control)



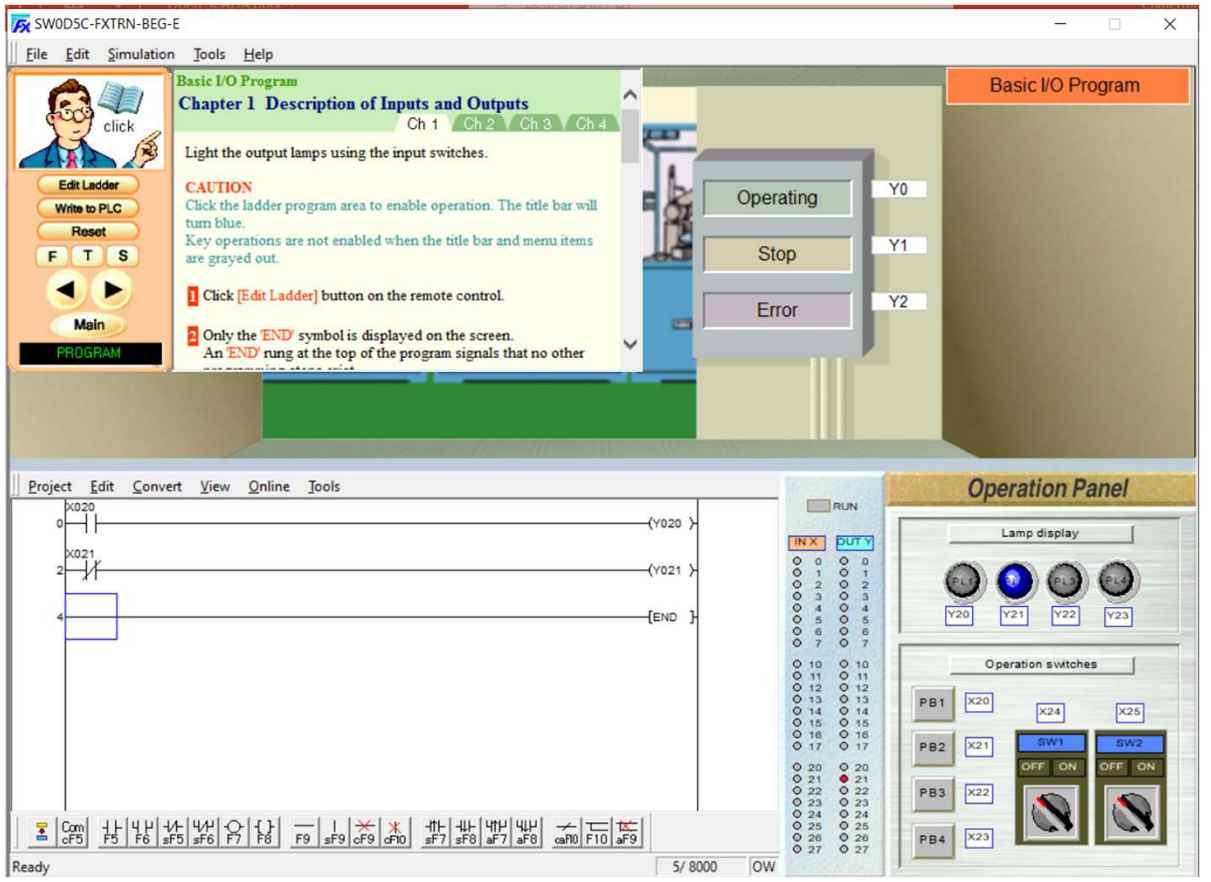
(X) Input
(Y) Output
(M) Mem Relay
(T) Timer
(C) Counter
(D) Memory


Input relay ON/OFF
ตามสัญญาณจากภายนอก
ซีเควนซ์โปรแกรมทำงานด้วย
หน้าสัมผัสของ Input relay
Output relay ON/OFF
ทำงานและส่งต่อ
อุปกรณ์ภายนอก Load
ทำงานหรือเคลื่อนที่
PLC
COM
X000
X001
X002
X003
X004
X005
X006
X007
PB 1
LS 1
PB 2
X001
X003
X005
Input relay
X001
X003
Y000
Output relay
Y000
X001
M100
K 100
T0
Timer
X005
X007
M100
Support relay
External contact output
COM1
Y000
Y001
Y002
Y003
Fuse
Power
PL
MC
Load
Input wire
Input circuit
Inside sequence
Output circuit
Output wire


MITSUBISHI
FXsu-16M


2 (COM-)
4 (X0)
5 (X1)
1 (COM+)
1 2 4 5
1 (CMO)
3 (Y1)
2 (Y0)


[A] Let's Learn the FX Series PLC!
[B] Let's Study the Basics
[C] Easy Does It!
[D] Beginner Challenge
[E] Intermediate Challenge
[F] A
B-1. Basic I/O Program
Learn input and output programs.
B-2. Standard Program
Learn a latched output program and SET/RST program.
B-3. Control Precedence Program
Learn an interlock program which controls conflicting operations.
B-4. Reading the Input Status
Learn how to initiate instructions at the detection of rising or falling edge of a pulse.

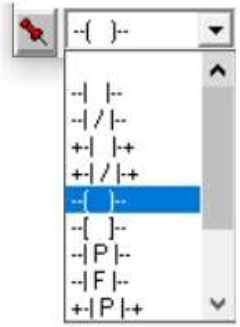

SW0D5C-FXTRN-BEG-E
File Edit Simulation Tools Help
Basic I/O Program
Chapter 1 Description of Inputs and Outputs
Ch 1 Ch 2 Ch 3 Ch 4
Light the output lamps using the input switches.
CAUTION
Click the ladder program area to enable operation. The title bar will turn blue.
Key operations are not enabled when the title bar and menu items are grayed out.
1 Click [Edit Ladder] button on the remote control.
2 Only the 'END' symbol is displayed on the screen.
An 'END' rung at the top of the program signals that no other
Edit Ladder
Write to PLC
Reset
F T S
Main
PROGRAM
Basic I/O Program
Operating
Stop
Error
Y0
Y1
Y2
Project Edit Convert View Online Tools
X020
X021
Y020
Y021
END
RUN
IN X
OUT Y
Operation Panel
Lamp display
Y20
Y21
Y22
Y23
Operation switches
PB1
PB2
PB3
PB4
X20
X21
X22
X23
X24
X25
SW1
SW2
OFF ON
Ready
5/ 8000
OW

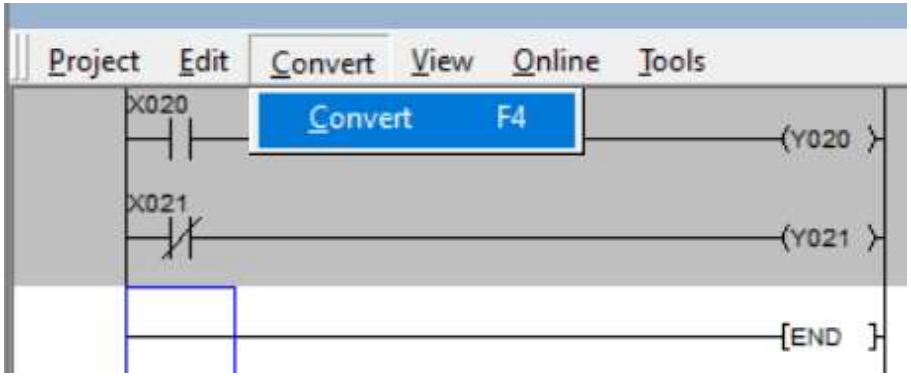

click
Edit Ladder

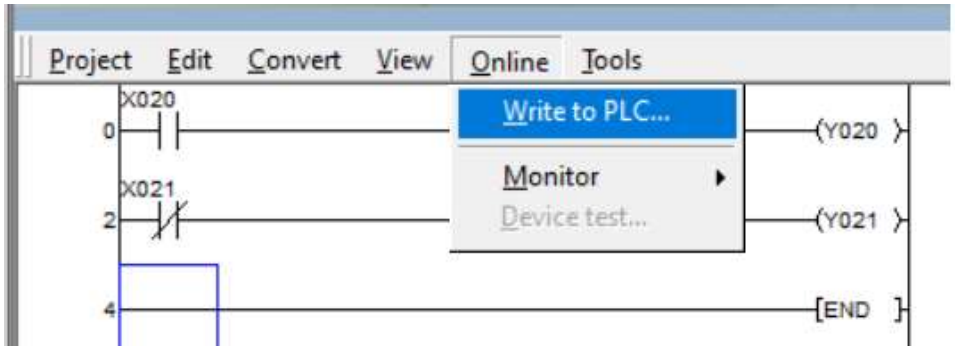

F5
F6
sF5
sF6
F7
F8

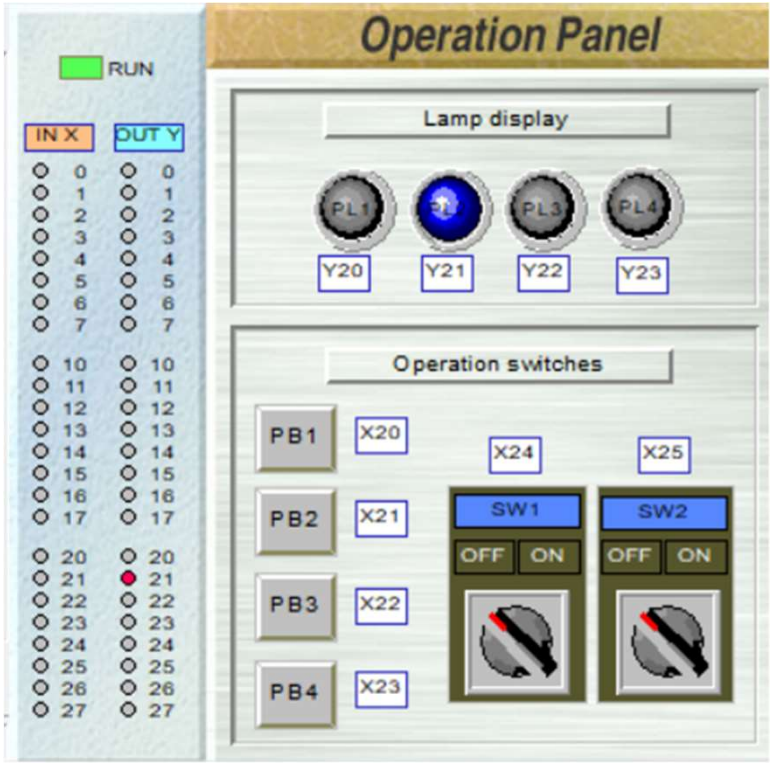

Enter symbol
X20
OK
Cancel


Y20
X21
Y21

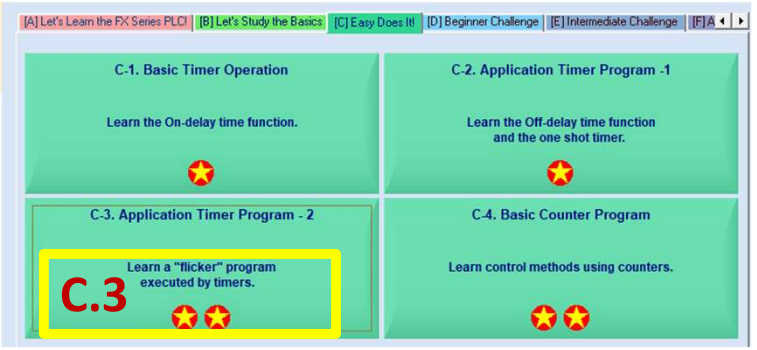


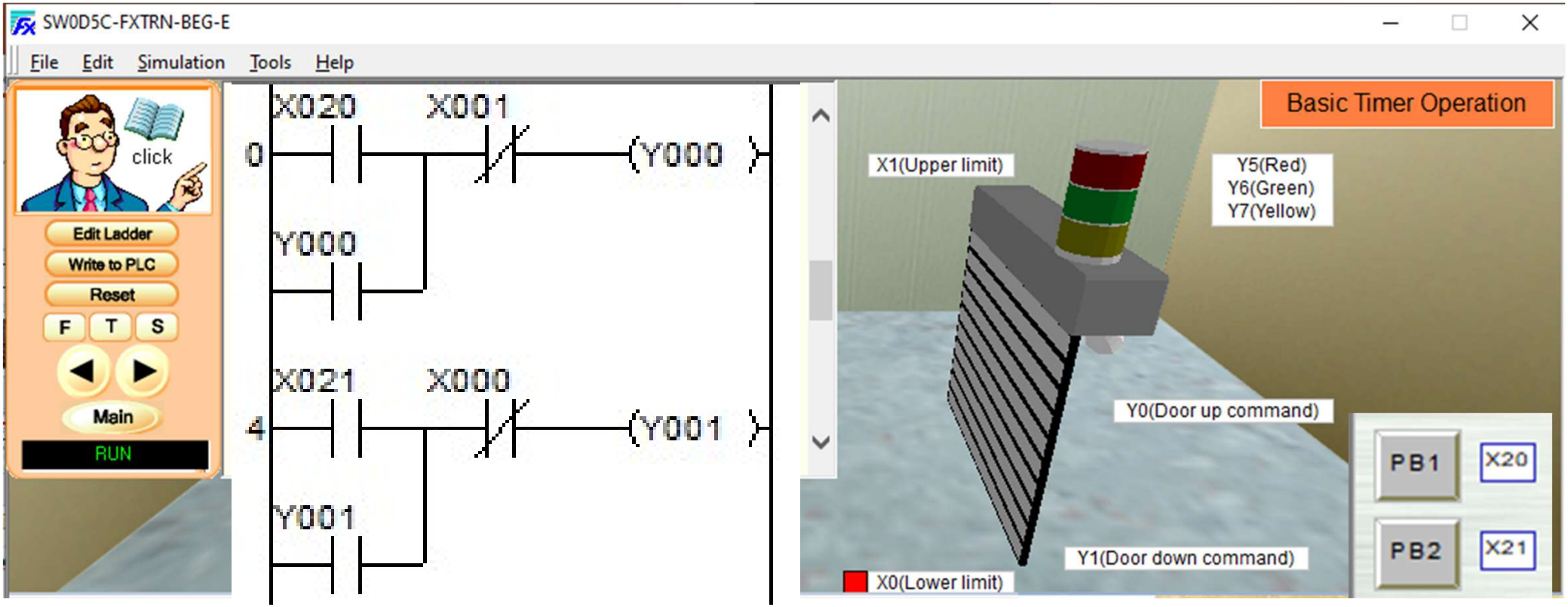

Project
Edit
Convert
View
Online
Tools
X020
Convert F4
(Y020)
X021
(Y021)
[END]


Project
Edit
Convert
View
Online
Tools
X020
Write to PLC...
Monitor
Device test...
(Y020)
X021
(Y021)
[END]

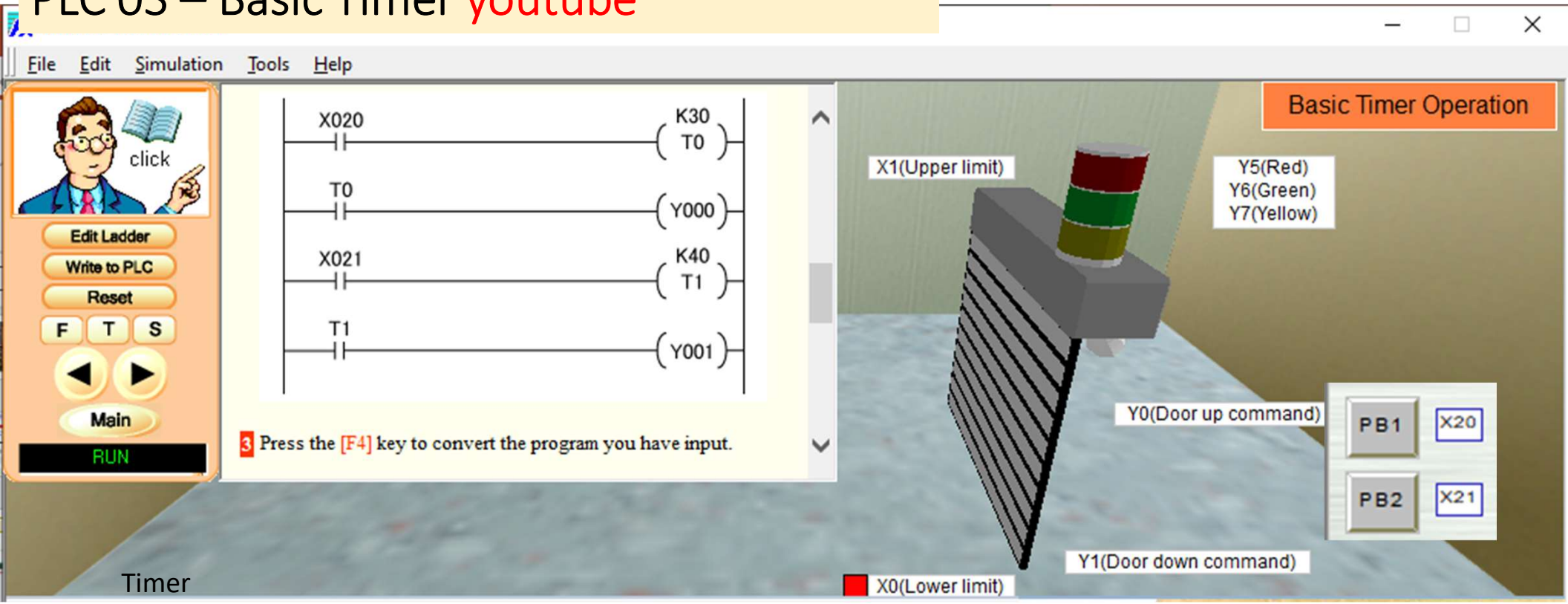

RUN
IN X
OUT Y
Operation Panel
Lamp display
PL1
PL2
PL3
PL4
Y20
Y21
Y22
Y23
Operation switches
PB1
PB2
PB3
PB4
X20
X21
X22
X23
X24
X25
SW1
SW2
OFF
ON
OFF
ON

PLC 04 – Open and Close Door YouTube

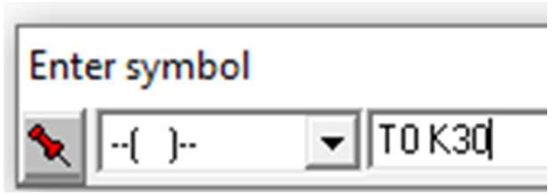


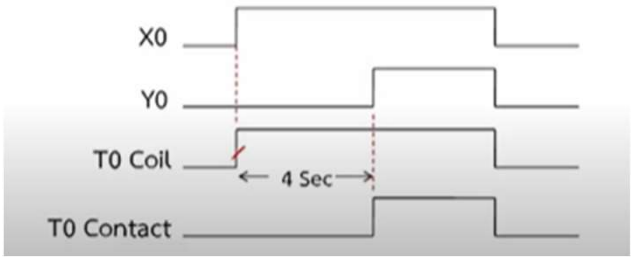


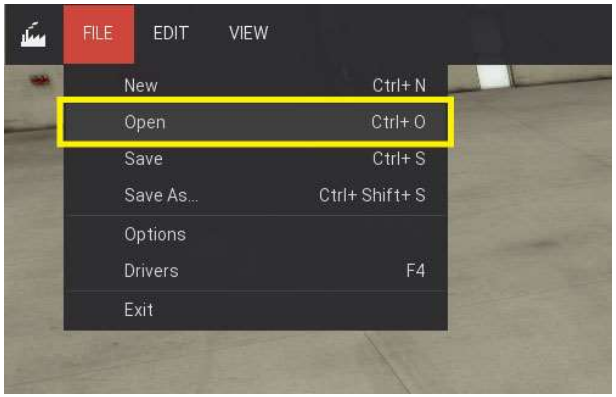
PLC 03 – Basic Timer youtube

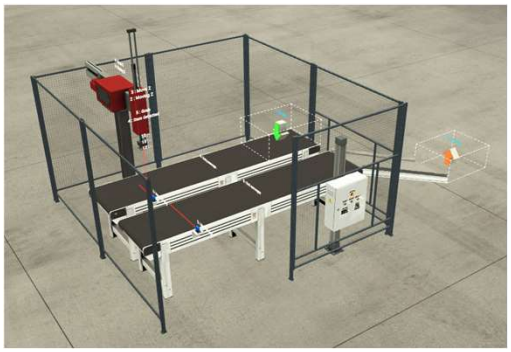


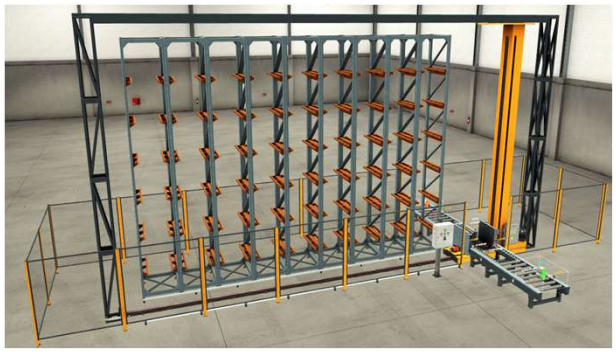
Timer

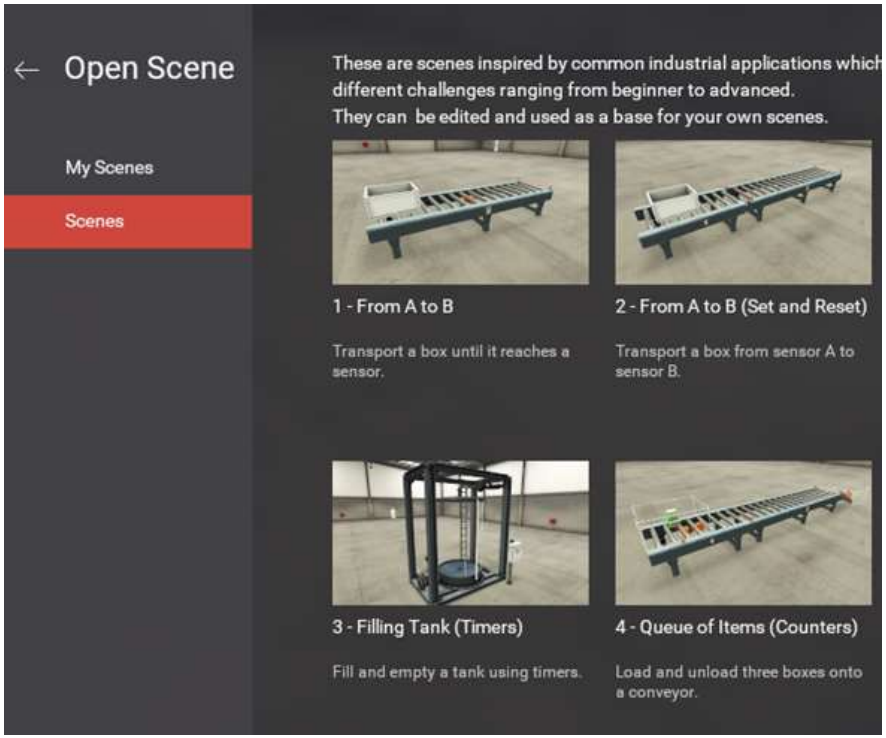





FILE
EDIT
VIEW
New Ctrl+ N
Open Ctrl+ O
Save Ctrl+ S
Save As... Ctrl+ Shift+ S
Options
Drivers F4
Exit

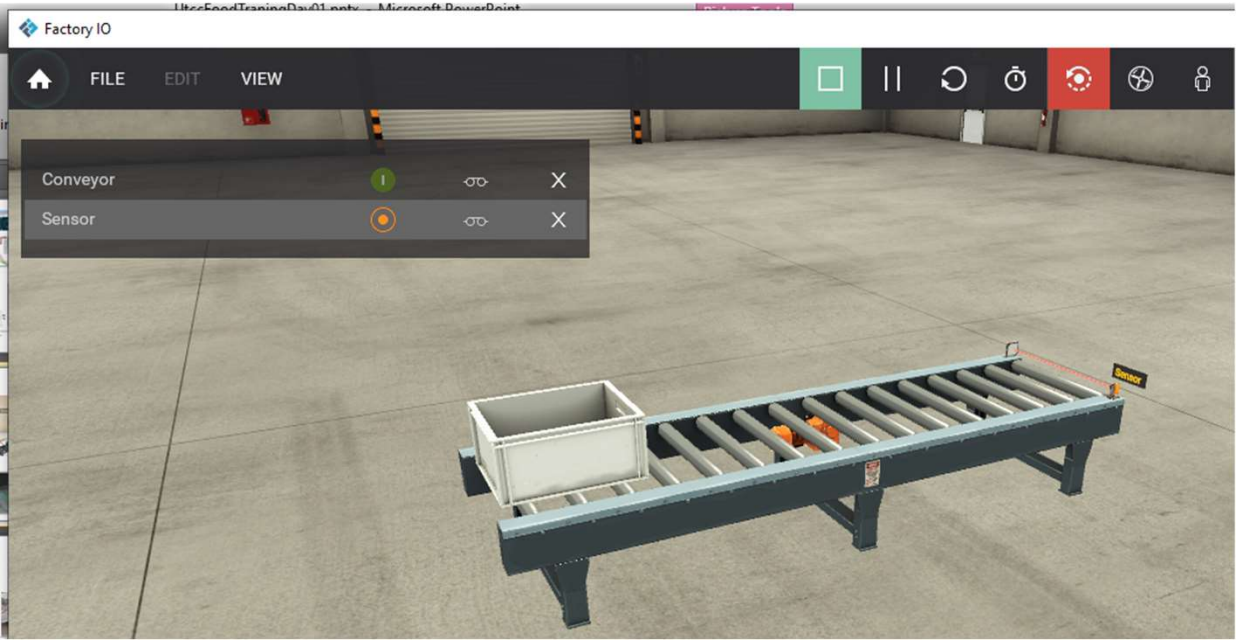


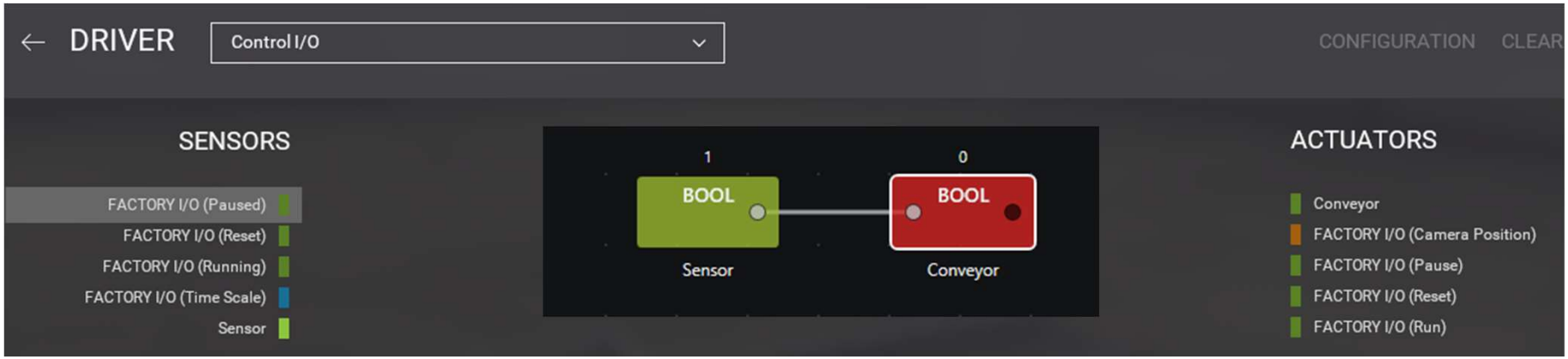


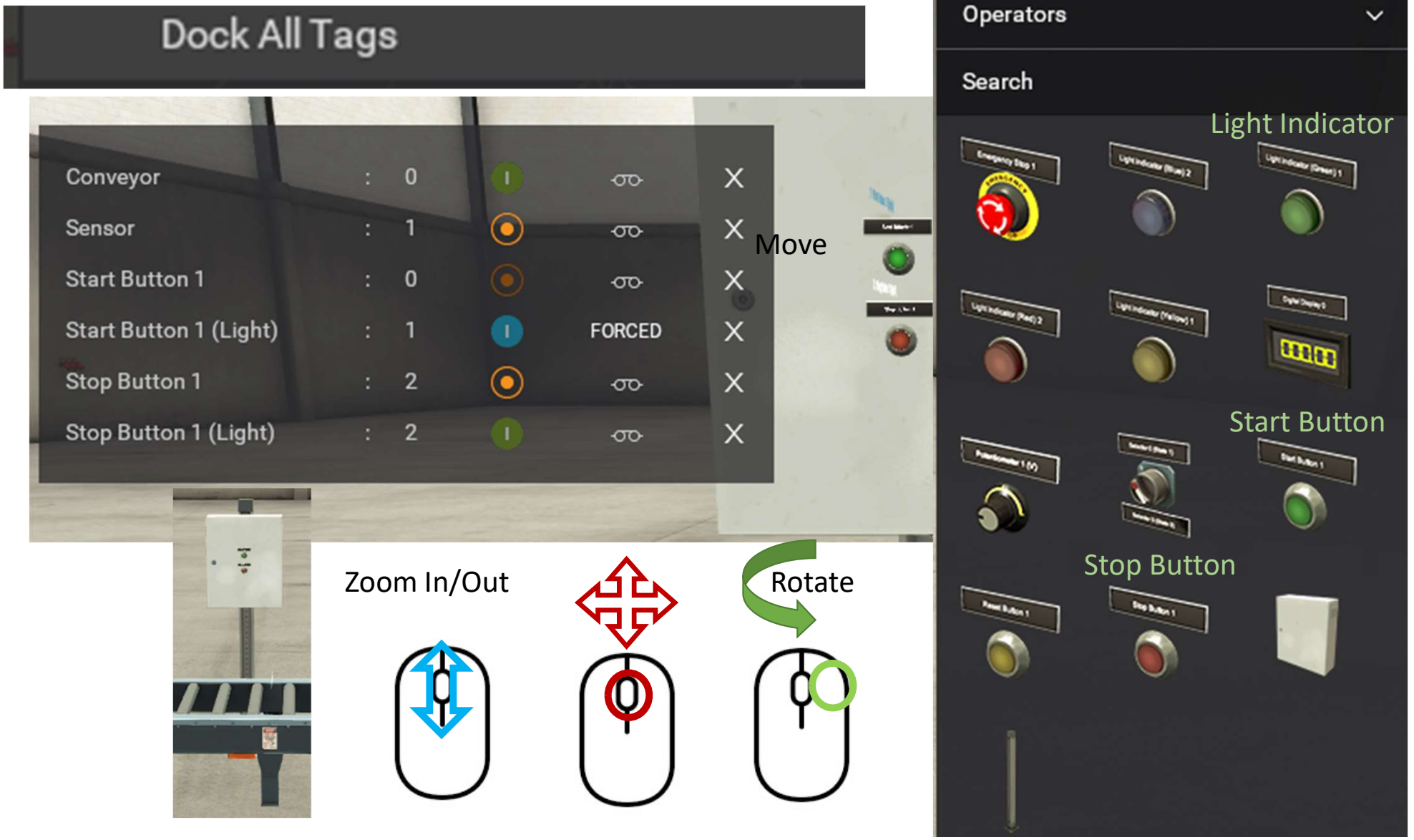

Open Scene
My Scenes
Scenes
These are scenes inspired by common industrial applications which
different challenges ranging from beginner to advanced.
They can be edited and used as a base for your own scenes.
1 - From A to B
Transport a box until it reaches a sensor.
2 - From A to B (Set and Reset)
Transport a box from sensor A to sensor B.
3 - Filling Tank (Timers)
Fill and empty a tank using timers.
4 - Queue of Items (Counters)
Load and unload three boxes onto a conveyor.

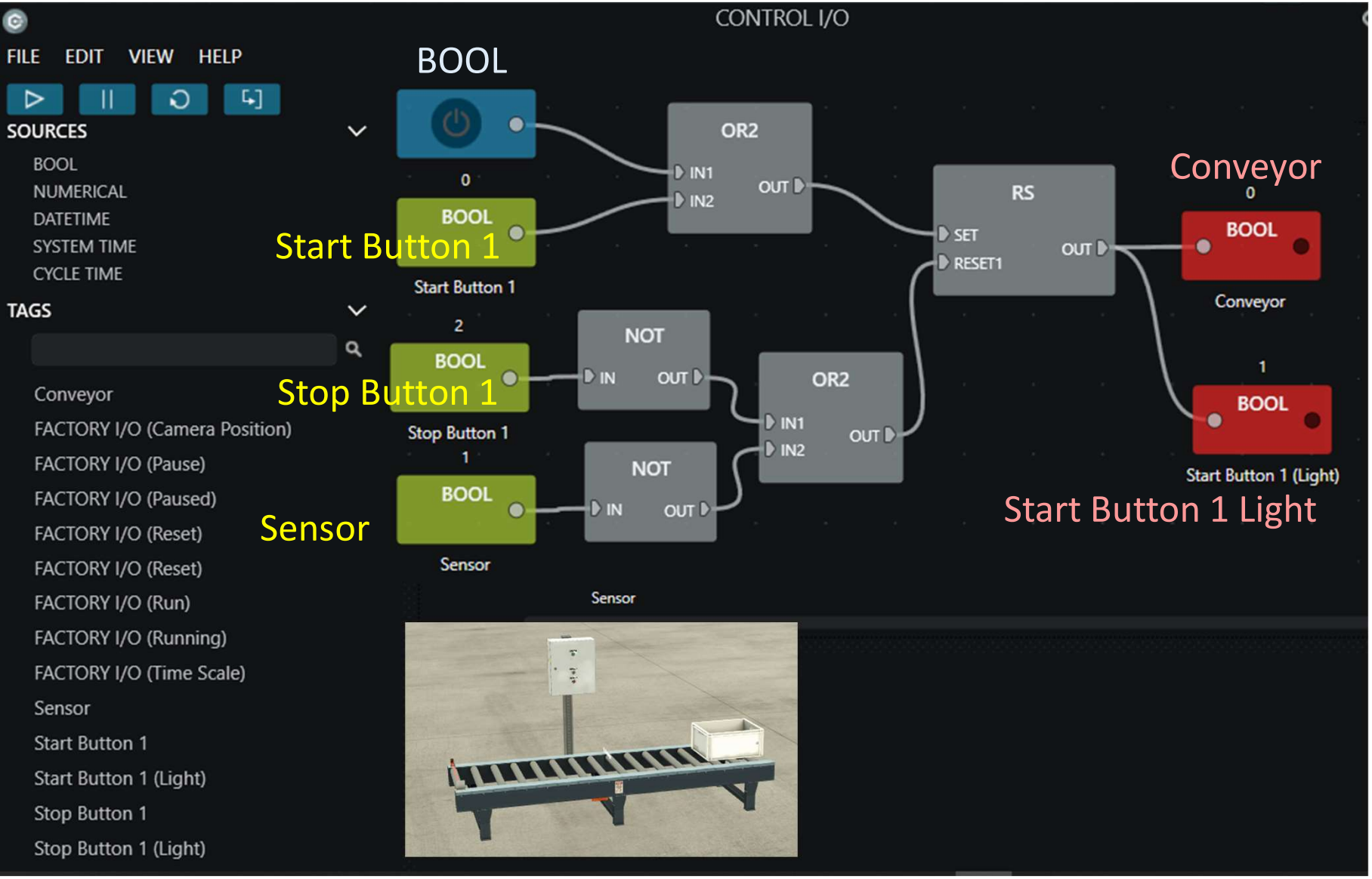
Basic Control with Machine Simulator (FactoryIO)

YouTube FactoryIO - 03 Basic Control I/O



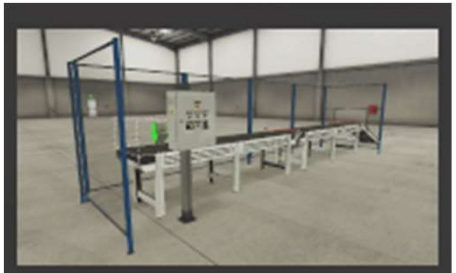



Dock All Tags
Conveyor : 0
Sensor : 1
Start Button 1 : 0
Start Button 1 (Light) : 1 FORCED
Stop Button 1 : 2
Stop Button 1 (Light) : 2
Move
Zoom In/Out
Rotate
Operators
Search
Light Indicator
Start Button
Stop Button


CONTROL I/O
FILE
EDIT
VIEW
HELP
SOURCES
BOOL
NUMERICAL
DATETIME
SYSTEM TIME
CYCLE TIME
TAGS
Conveyor
FACTORY I/O (Camera Position)
FACTORY I/O (Pause)
FACTORY I/O (Paused)
FACTORY I/O (Reset)
FACTORY I/O (Reset)
FACTORY I/O (Run)
FACTORY I/O (Running)
FACTORY I/O (Time Scale)
Sensor
Start Button 1
Start Button 1 (Light)
Stop Button 1
Stop Button 1 (Light)
BOOL
0
BOOL
Start Button 1
Start Button 1
2
BOOL
Stop Button 1
Stop Button 1
1
BOOL
Sensor
Sensor
OR2
IN1
IN2
OUT
NOT
IN
OUT
NOT
IN
OUT
OR2
IN1
IN2
OUT
RS
SET
RESET1
OUT
Conveyor
0
BOOL
Conveyor
1
BOOL
Start Button 1 (Light)
Start Button 1 Light
Sensor
Start Button 1
Sensor
FUNCTION BLOCKS
ARITHMETIC
COUNTERS
EXTRA
LOGICAL
AND2
AND4
FTRIG
JK
NOT
OR2
OR4
ROL
ROR
RS
RTRIG
SHL
SHR
SR
XOR2
XOR3

OR2
RS
NOT

YouTube FactoryIO - 04 Counter

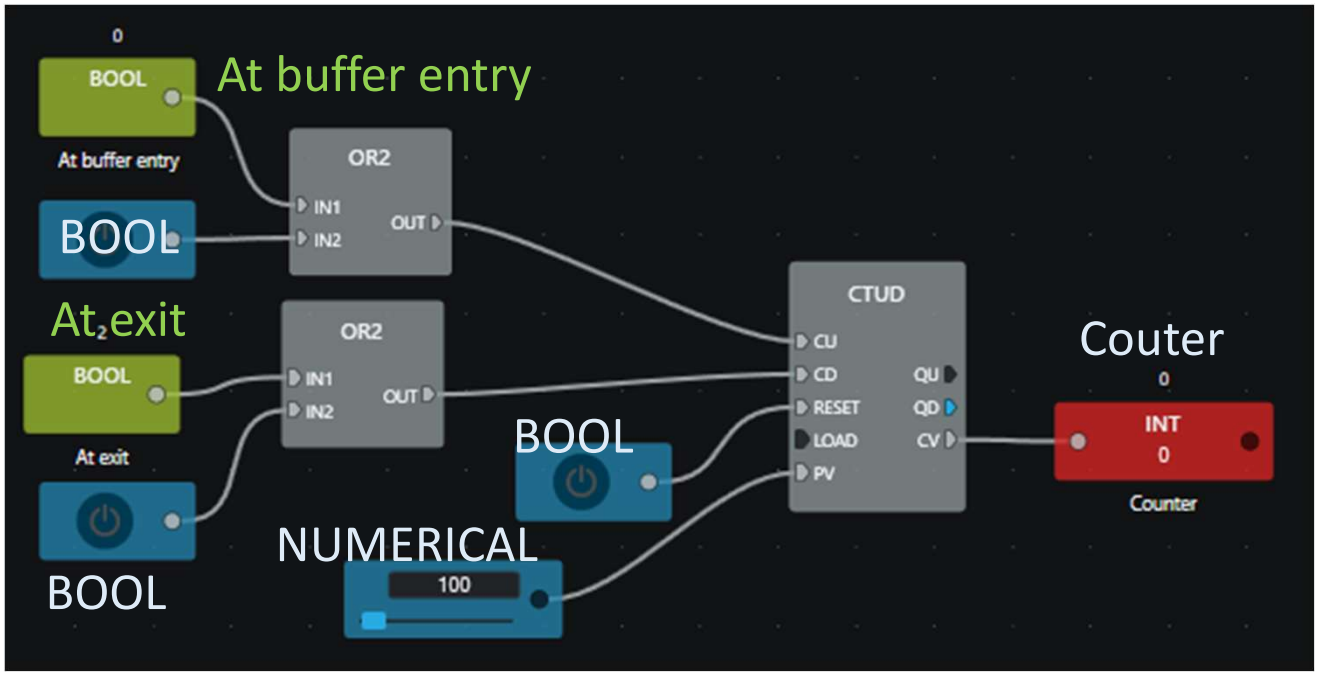


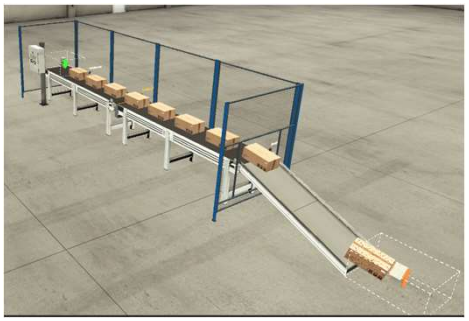
Buffer Station

Buffer and separate up to five boxes.

← DRIVER | Control I/O

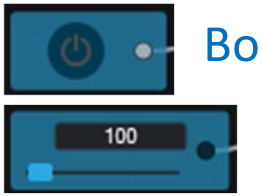
At buffer entry		
At buffer exit		
At exit		
Auto		
Buffer conveyor	2.8	FORCED
Buffer Vel.	0.0	
Counter	0	
Emergency stop		
Emitter		FORCED
Exit conveyor	2.8	FORCED





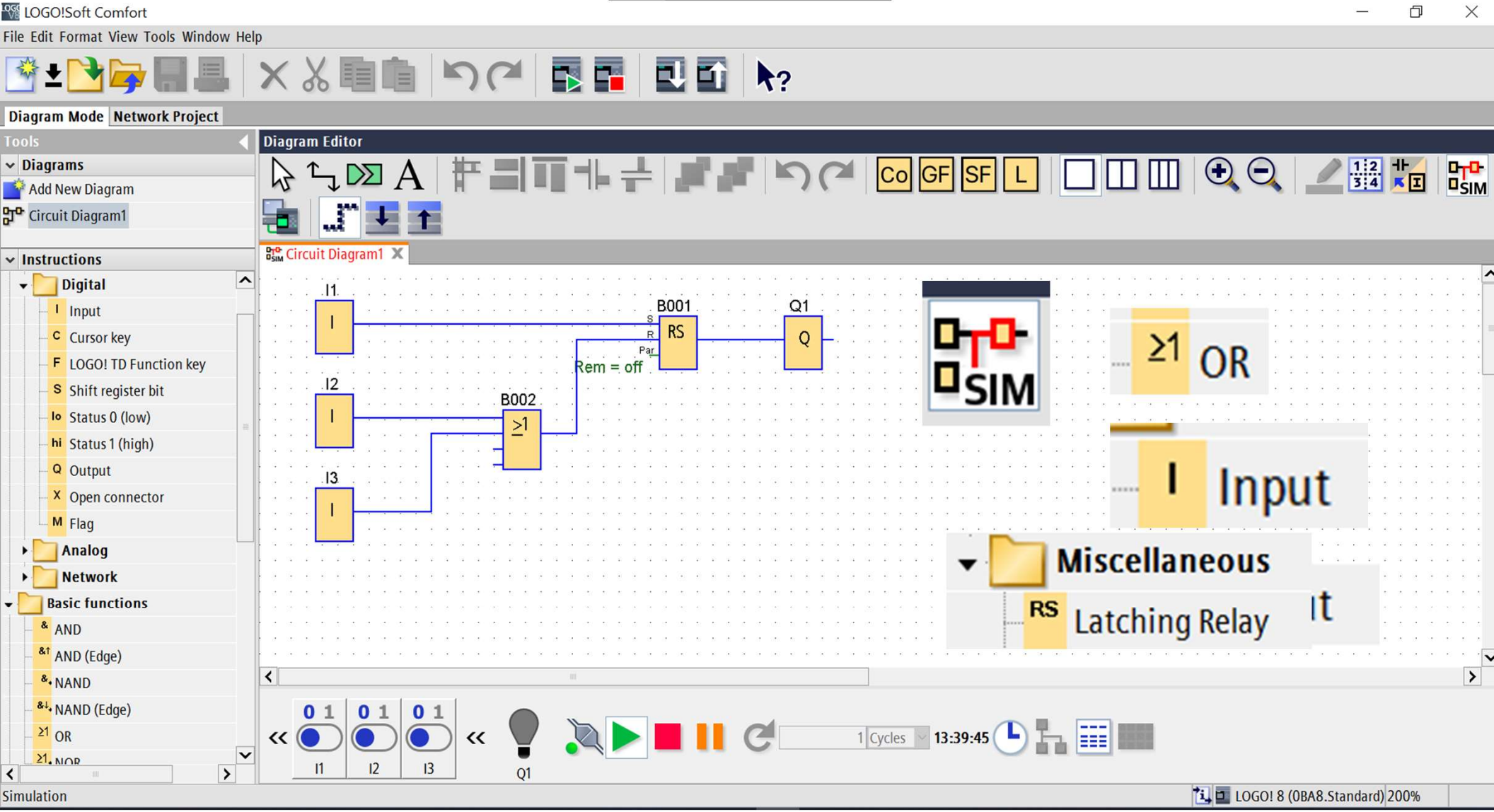
SOURCES

- BOOL
- NUMERICAL
- DATETIME
- SYSTEM TIME
- CYCLE TIME

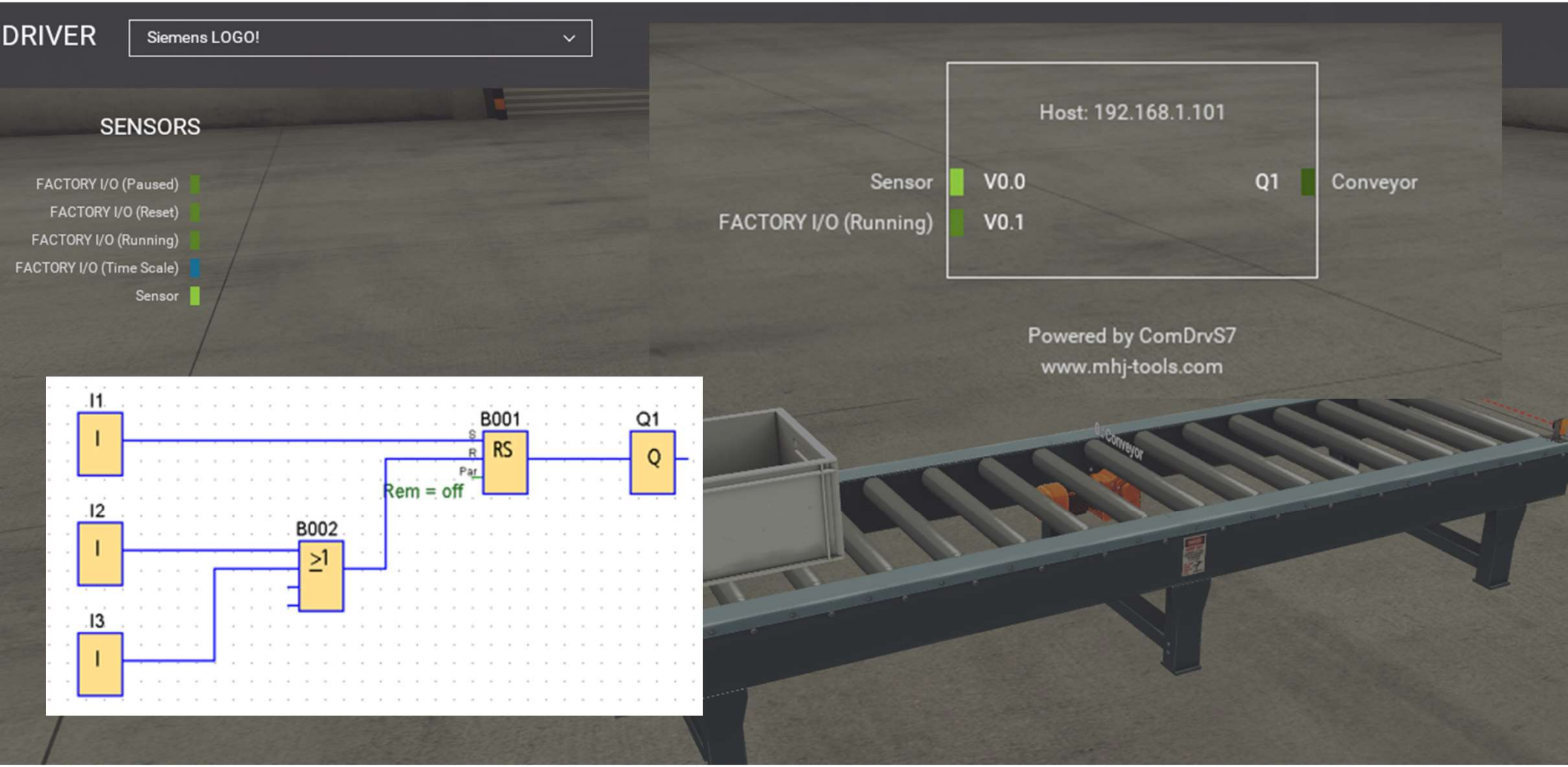


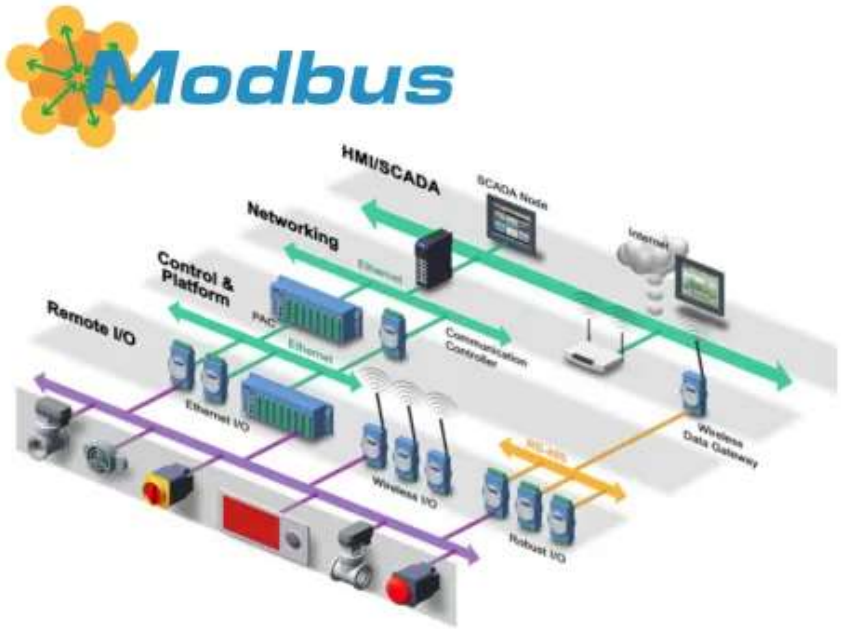
Bool

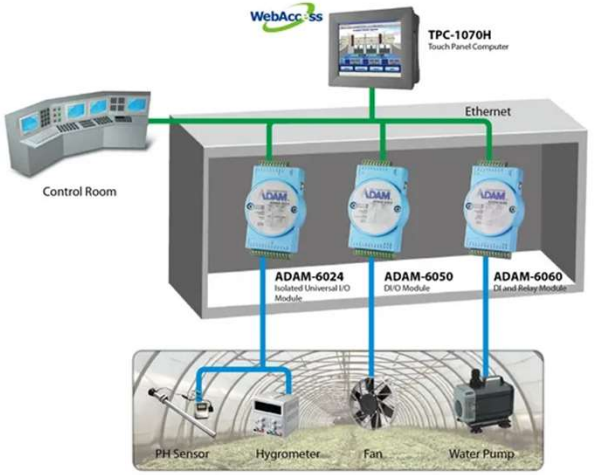
MUNERICAL

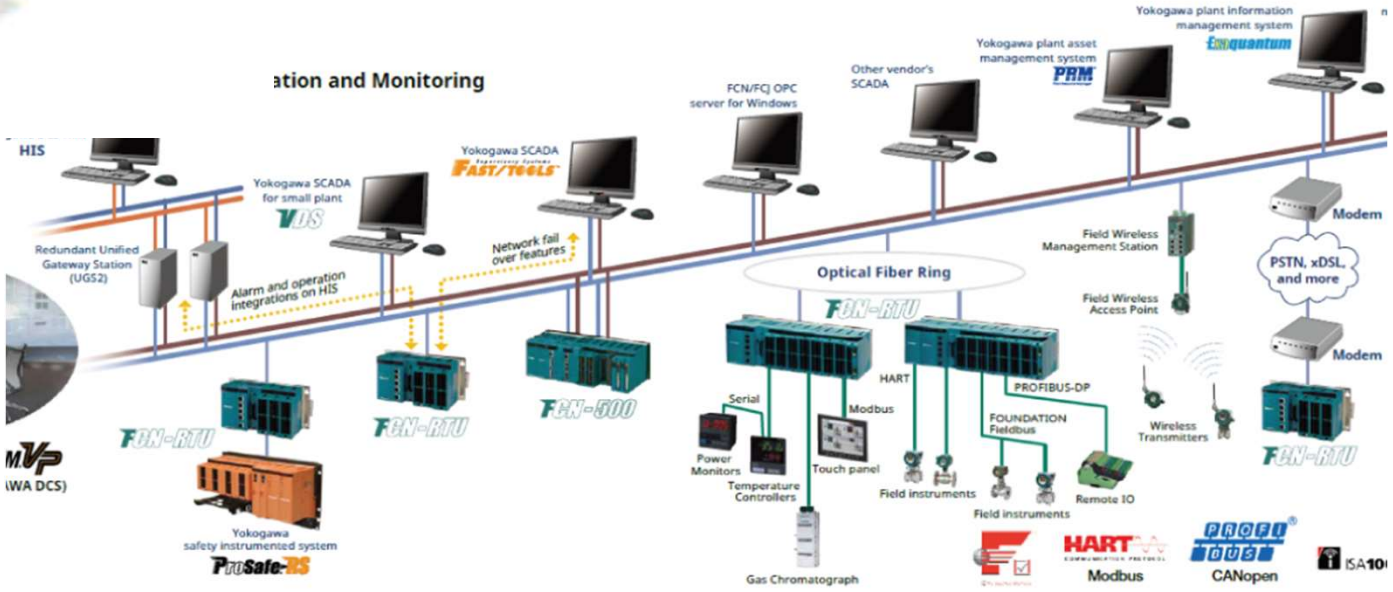

LOGO!Soft Comfort
File Edit Format View Tools Window Help
Diagram Mode
Network Project
Tools
Diagrams
Add New Diagram
Circuit Diagram1
Instructions
Digital
Input
Cursor key
LOGO! TD Function key
Shift register bit
Status 0 (low)
Status 1 (high)
Output
Open connector
Flag
Analog
Network
Basic functions
AND
AND (Edge)
NAND
NAND (Edge)
OR
Diagram Editor
Circuit Diagram1
I1
I2
I3
B001
RS
S
R
Par
Rem = off
B002
≥1
Q1
Q
SIM
≥1 OR
I Input
Miscellaneous
RS Latching Relay
1 Cycles
13:39:45
Simulation
LOGO! 8 (0BA8.Standard) 200%

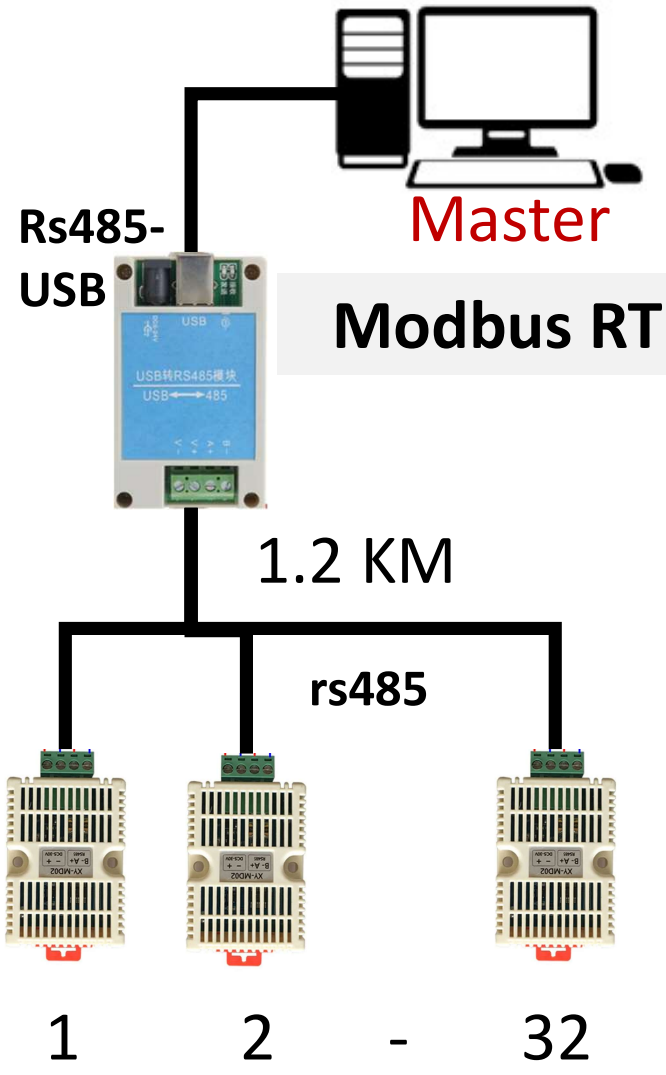

LOGO! 8 (0BA8.Standard)


DRIVER
Siemens LOGO!
SENSORS
FACTORY I/O (Paused)
FACTORY I/O (Reset)
FACTORY I/O (Running)
FACTORY I/O (Time Scale)
Sensor
Host: 192.168.1.101
Sensor
V0.0
FACTORY I/O (Running)
V0.1
Q1
Conveyor
Powered by ComDrvS7
www.mhj-tools.com
I1
I
I2
I
I3
I
B001
RS
S
R
Par
Rem = off
B002
≥1
Q1
Q
Conveyor


Modbus
HMI/SCADA
SCADA Node
Networking
Internet
Control & Platform
PAC
Ethernet
Communication Controller
Remote I/O
Ethernet I/O
Wireless I/O
Wireless Data Gateway
RS-485
Robust I/O

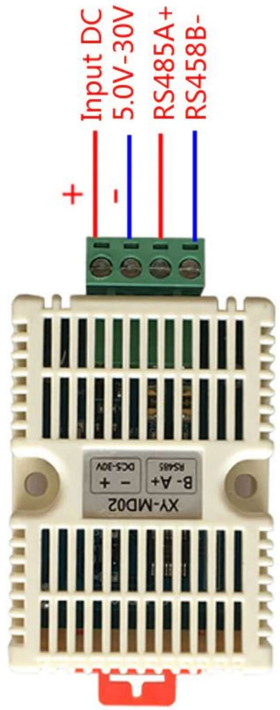

WebAccess
TPC-1070H
Touch Panel Computer
Ethernet
Control Room
ADAM-6024
Isolated Universal I/O Module
ADAM-6050
DI/O Module
ADAM-6060
DI and Relay Module
PH Sensor
Hygrometer
Fan
Water Pump

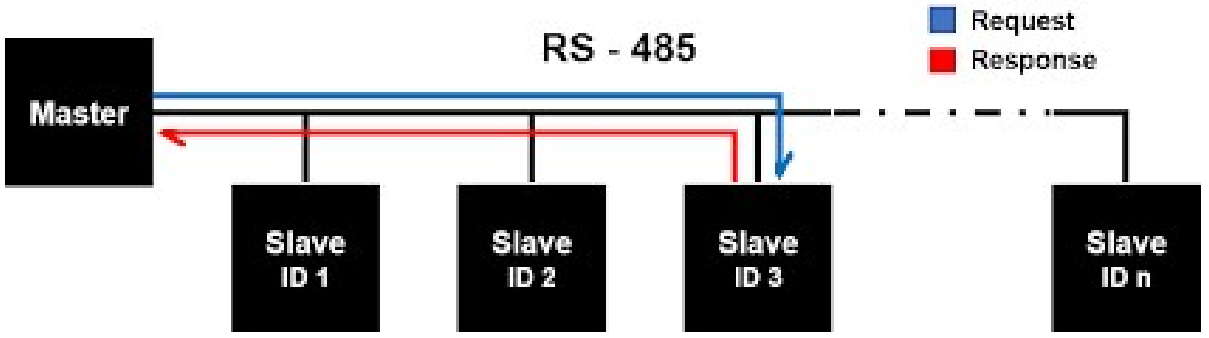

ation and Monitoring
HIS
Yokogawa SCADA for small plant
VDS
Yokogawa SCADA
FAST/TOOLS
FCN/FCJ OPC server for Windows
Other vendor's SCADA
Yokogawa plant asset management system
PRM
Yokogawa plant information management system
Exaquantum
Redundant Unified Gateway Station (UGS2)
Alarm and operation integrations on HIS
Network fail over features
Optical Fiber Ring
FCN-RTU
FCN-500
Field Wireless Management Station
Field Wireless Access Point
Modem
PSTN, xDSL, and more
Serial
Modbus
HART
PROFIBUS-DP
FOUNDATION Fieldbus
Power Monitors
Temperature Controllers
Touch panel
Field instruments
Remote IO
Wireless Transmitters
Gas Chromatograph
Yokogawa safety instrumented system
ProSafe-RS
(WA DCS)
HART
Modbus
CANopen



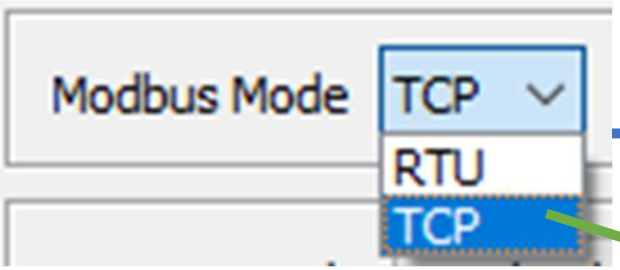
Modbus Protocol	
Function Code	
Command Register	Funciotn
0x03	Read keep register
0x04	Read input register
0x06	Write a single keep register
0x10	Write more keep registers

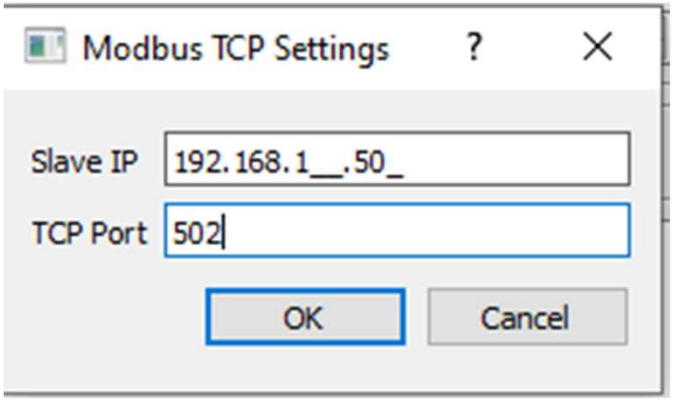
Register Type	Register Address	Register Contents
Input Register	0x0001	Temperature
	0x0002	Humidity
Keep Register	0x0101	Device Address

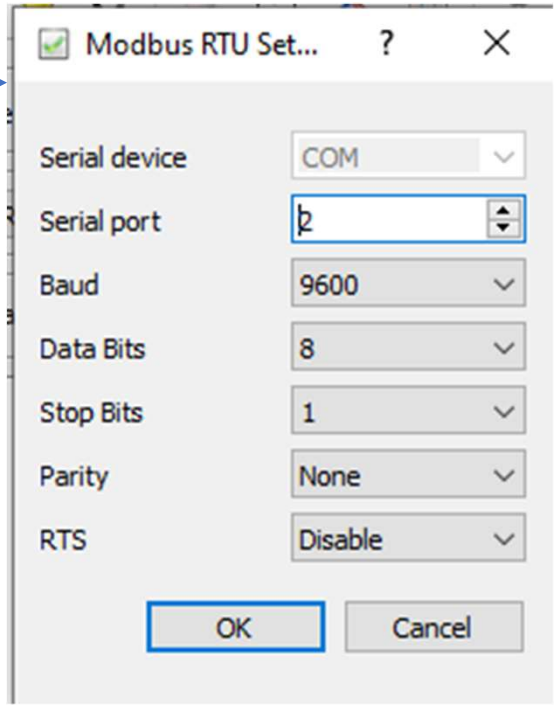


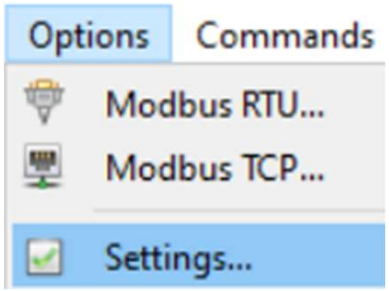


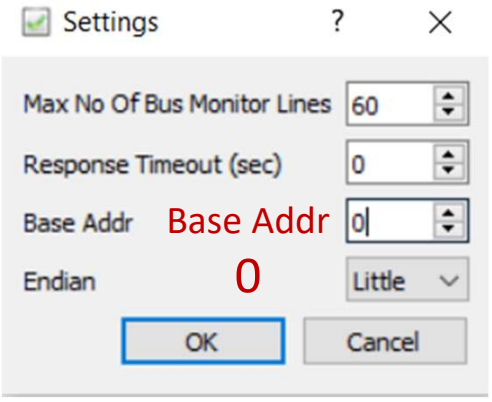
การใช้งานโปรแกรม QModMaster (Modbus Master)

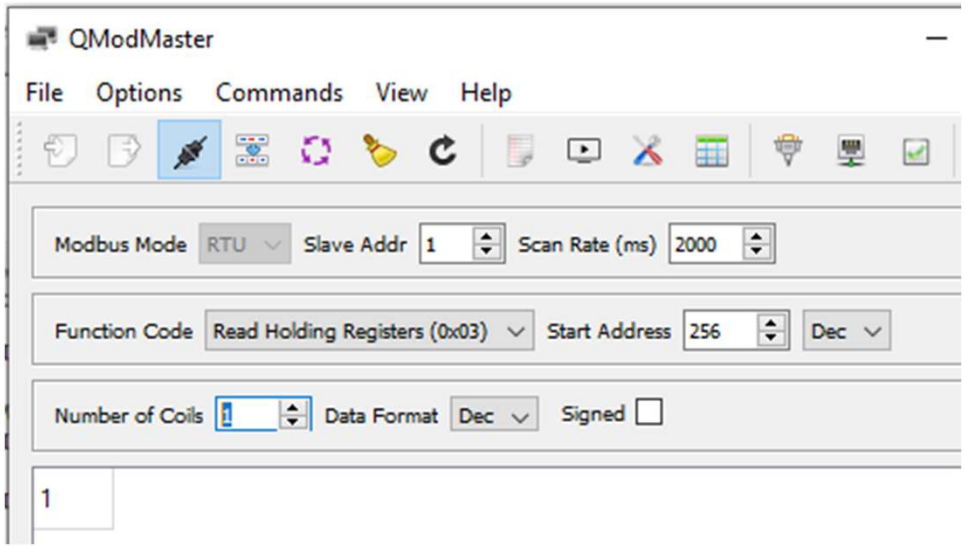




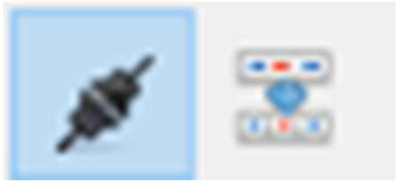




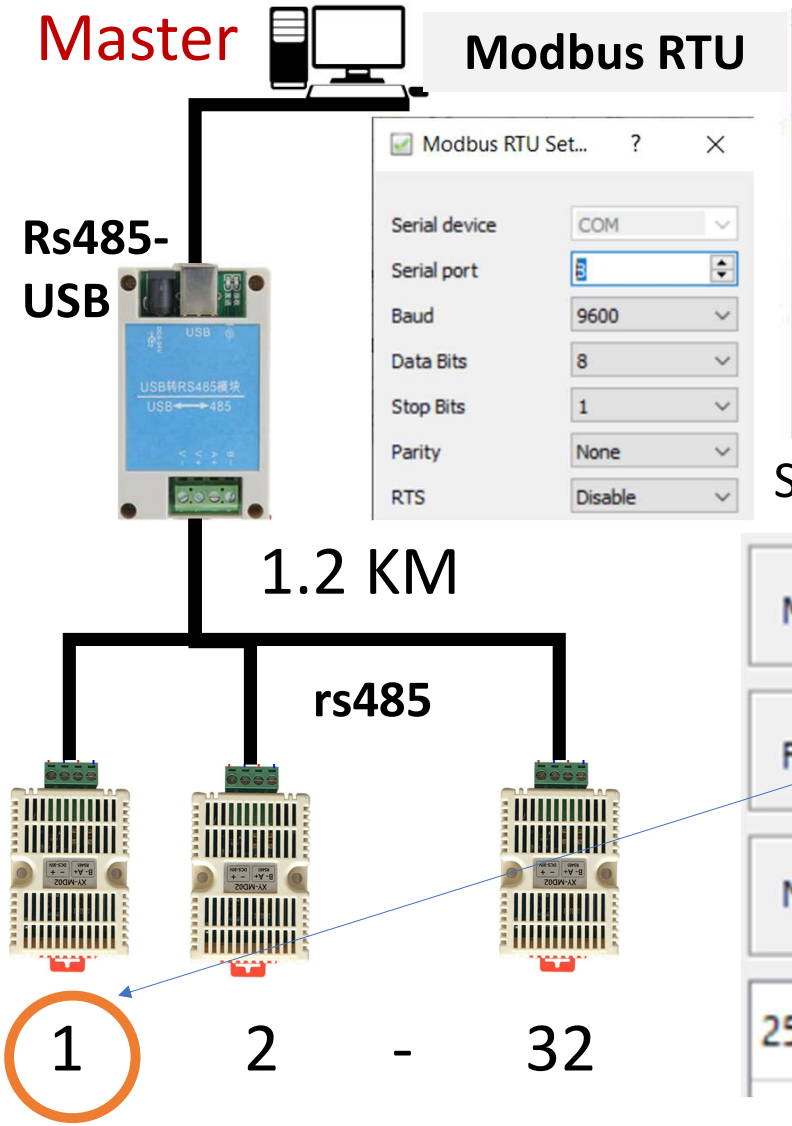




Connect/Disconnect

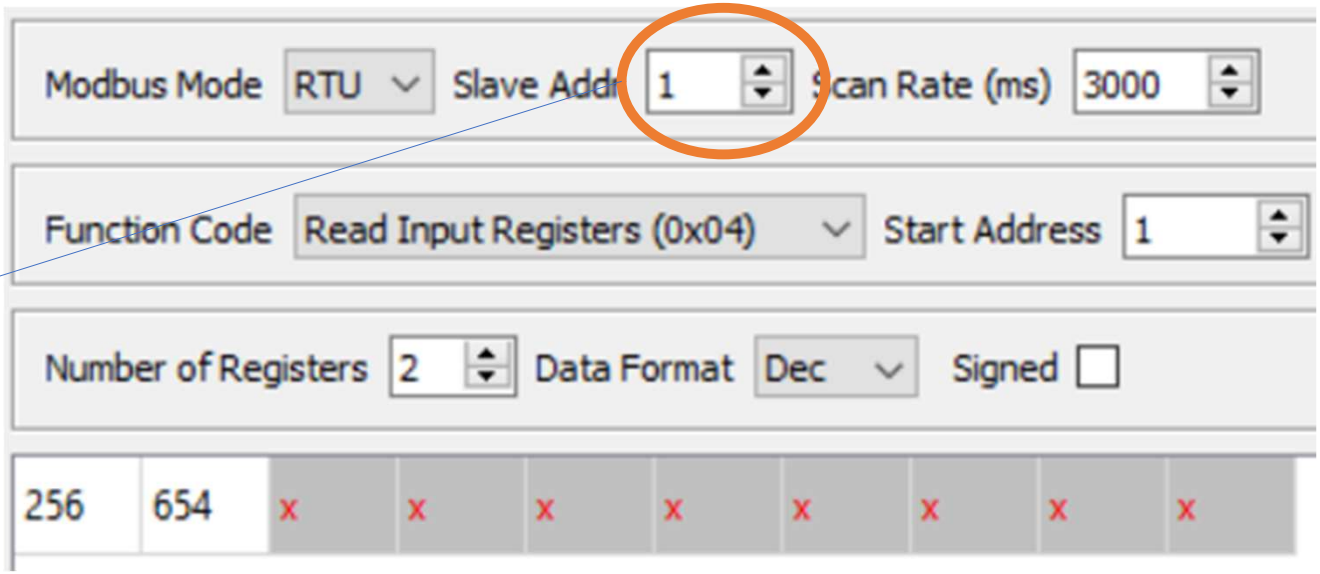


Send Command



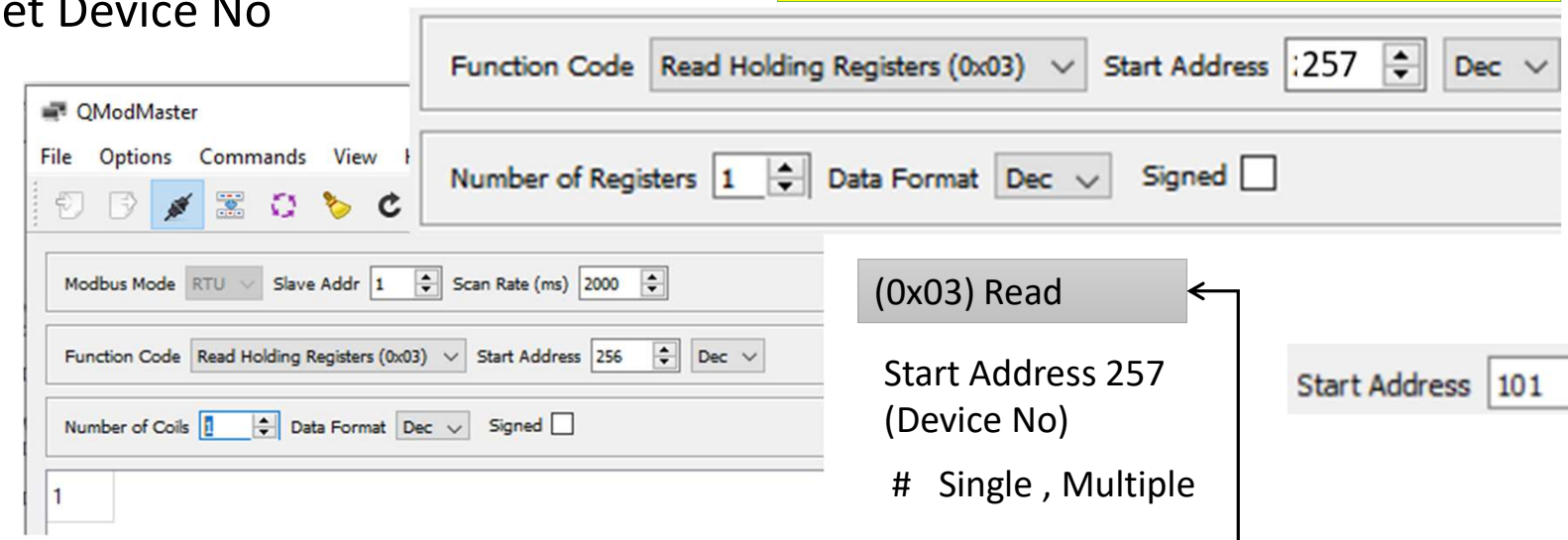
Register Type	Register Address	Register Contents
Input Register	0x0001	Temperature
	0x0002	Humidity
Keep Register	0x0101	Device Address

Serial Port ? Baud 9600 Data Bits 8 Stop Bits 1 Parity None



YouTube Modbus – 02 QModMaster

Set Device No

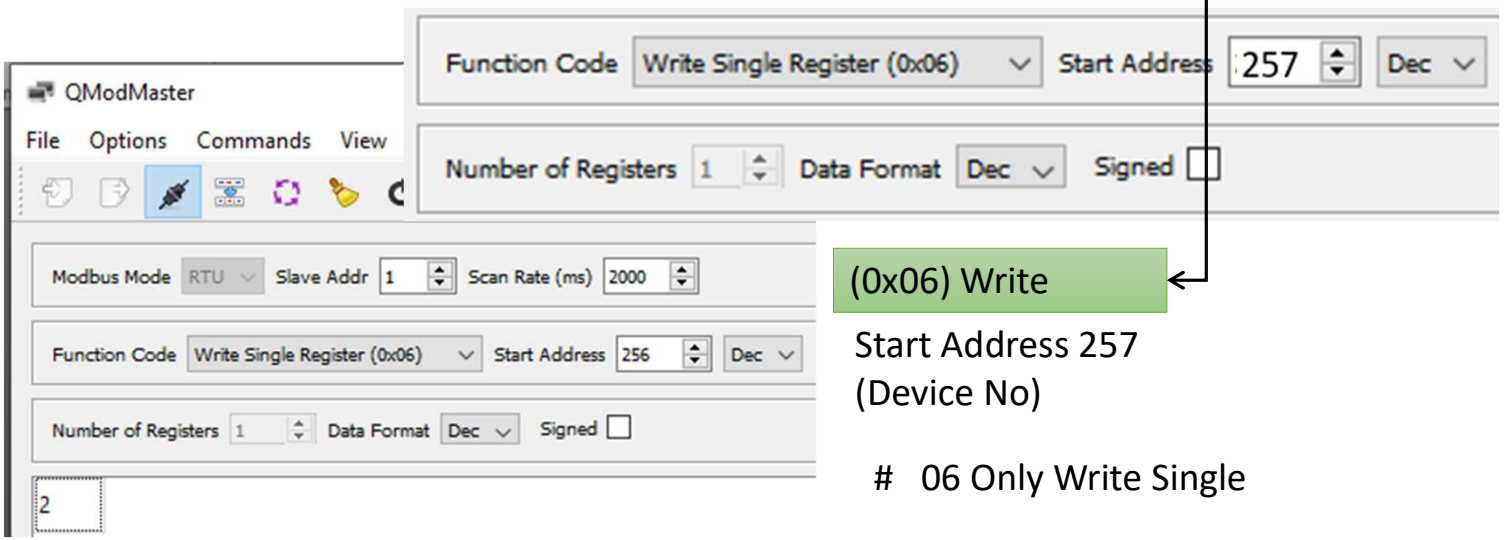


(0x03) Read

Start Address 257
(Device No)

\# Single , Multiple

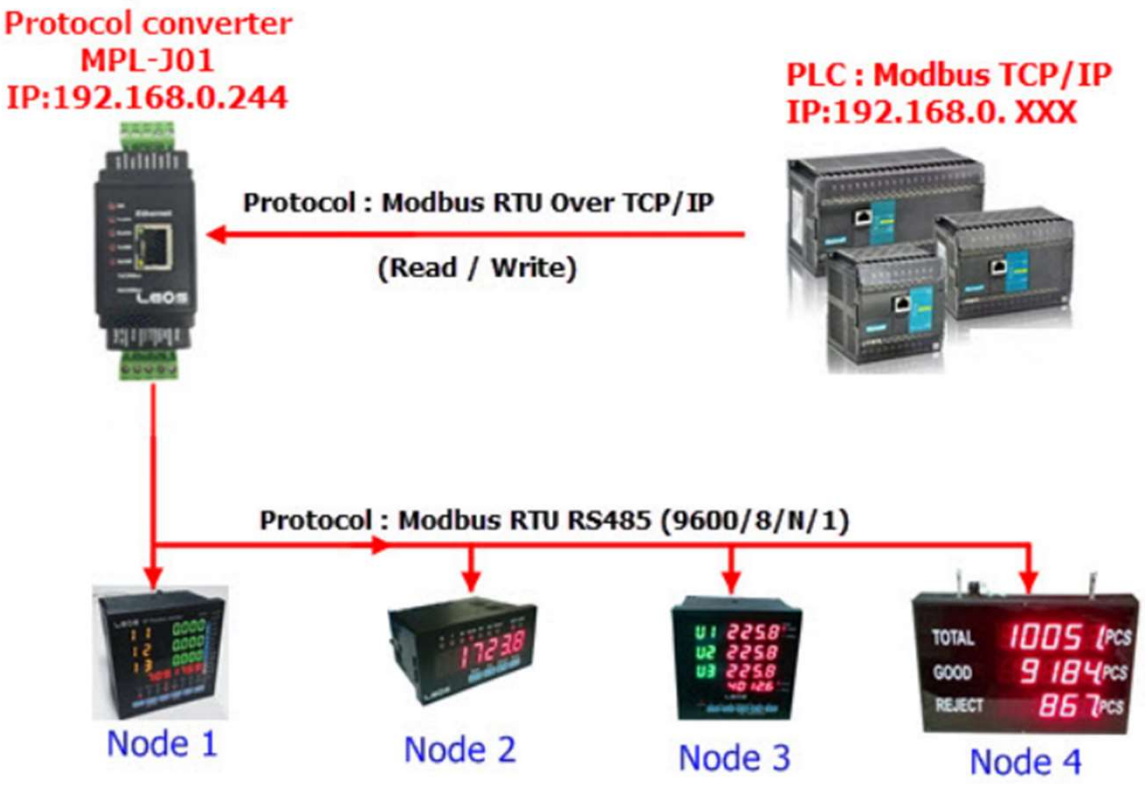
Start Address 101 Hex



(0x06) Write

Start Address 257
(Device No)

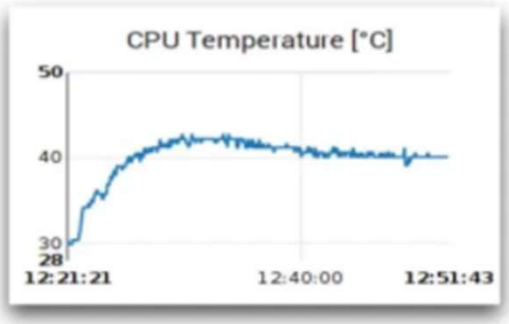
\# 06 Only Write Single

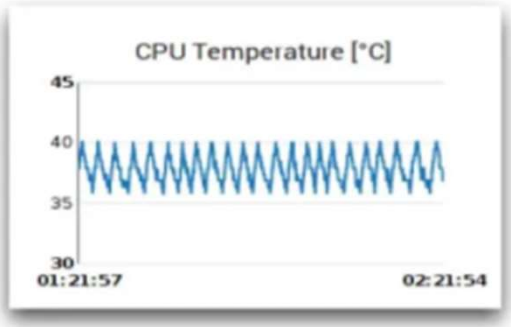

Protocol converter
MPL-J01
IP:192.168.0.244
PLC : Modbus TCP/IP
IP:192.168.0. XXX
Protocol : Modbus RTU Over TCP/IP
(Read / Write)
Protocol : Modbus RTU RS485 (9600/8/N/1)
TOTAL
GOOD
REJECT
Node 1
Node 2
Node 3
Node 4

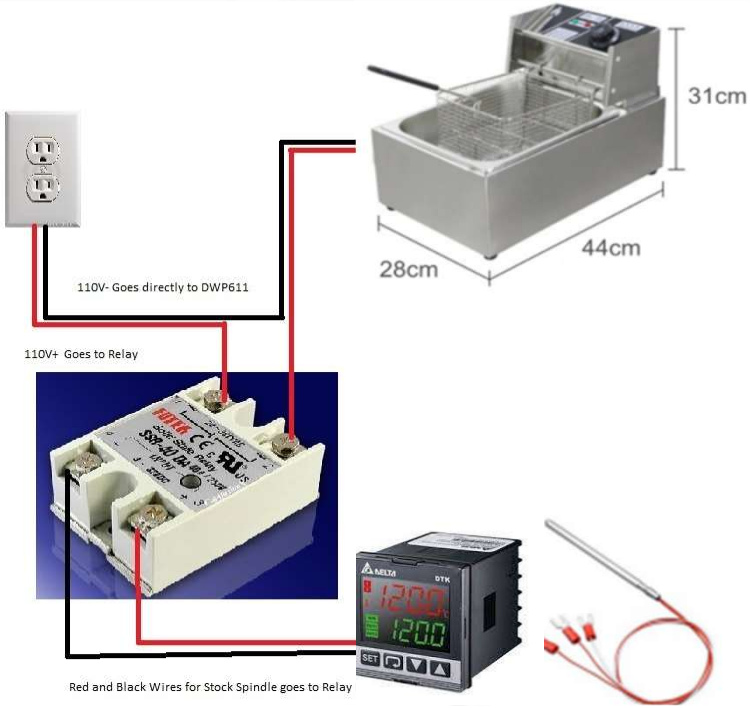
Temperature PID Control

[DTK4848V12]

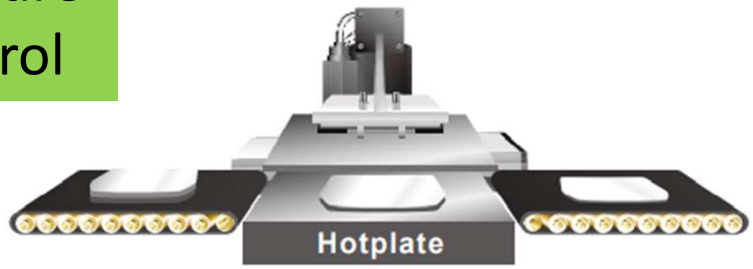
PID control VS On/Off control

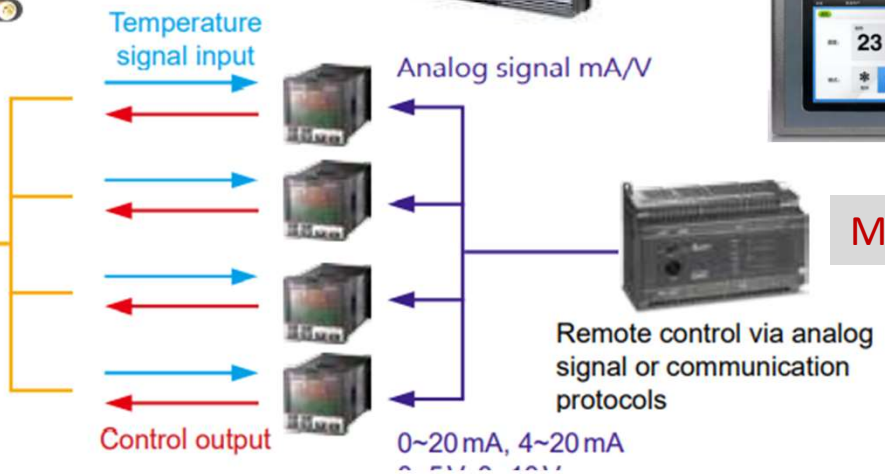






Temperature PID Control





■ Point-to-point Control (Proportional Output mA/V)

Sets the Present Value by point-to-point control.

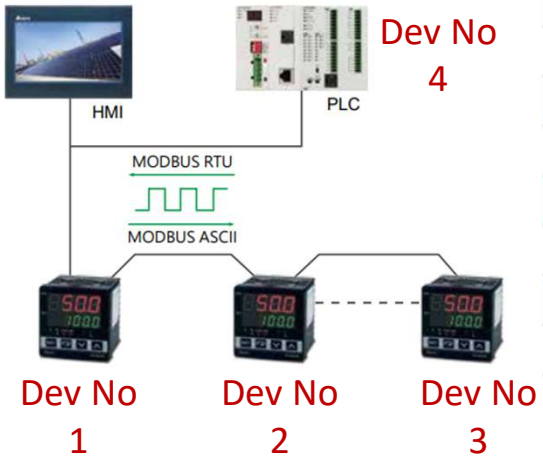
Delta Temperature Controller Model :DTK4848V12

RS-485 Communication

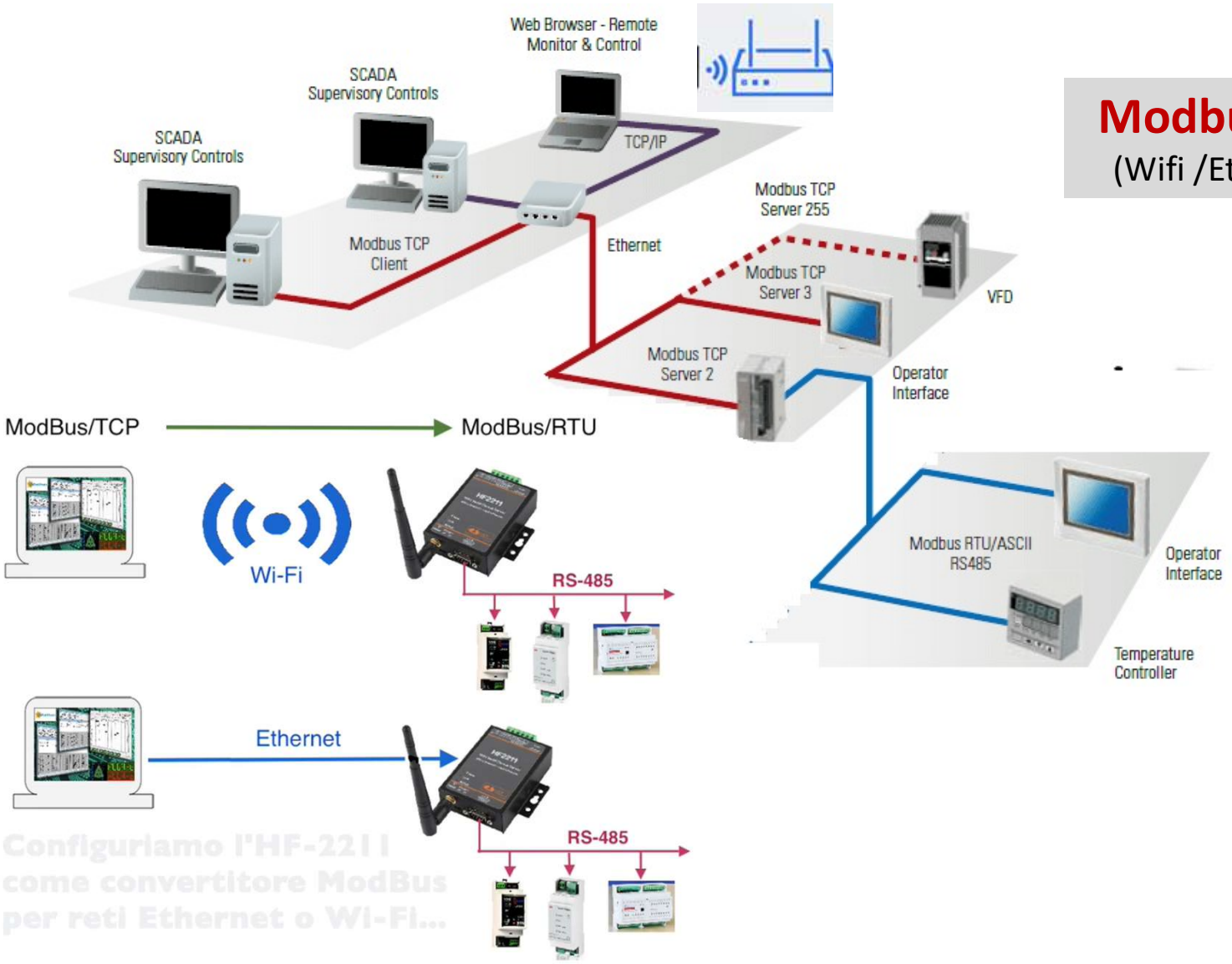
DT3 supports baudrate 2,400 to 38,400 bps, MODBUS ASCII/RTU protocol, function code 03H and reads maximum 8 words from the register.

Address	Content	Definition
1000H	Present value (PV)	Measuring unit: 0.1 scale. The following values read mean error occurs. 8002H: Temperature not yet acquired 8003H: Not connected to sensor 8004H: Incorrect sensor
1001H	Set value (SV)	Measuring unit: 0.1 scale
1002H	Upper limit of temp. range	Cannot exceed the default value
1003H	Lower limit of temp. range	Cannot fall below the default value
1005H	Control mode	0: PID, 1: ON/OFF, 2: Manual, 3: FUZZY
1006H	Heating/ Cooling control	0: Heating/Heating, 1: Cooling/Heating, 2: Heating/Cooling, 3: Cooling/Cooling
1007H	1st Heating/ Cooling control cycle	0.1 ~ 99 sec.
1008H	2nd Heating/ Cooling control cycle	0.1 ~ 99 sec.
1009H	Proportional band (PB)	0.1 ~ 999.9
100AH	Ti value	0 ~ 9999
100BH	Td value	0 ~ 9999
1012H	Read/write Output 1 volume	Unit: 0.1%, only valid in manual control mode
1013H	Read/write Output 2 volume	Unit: 0.1%, only valid in manual control mode

Master ⟷ Slave 1 - 4

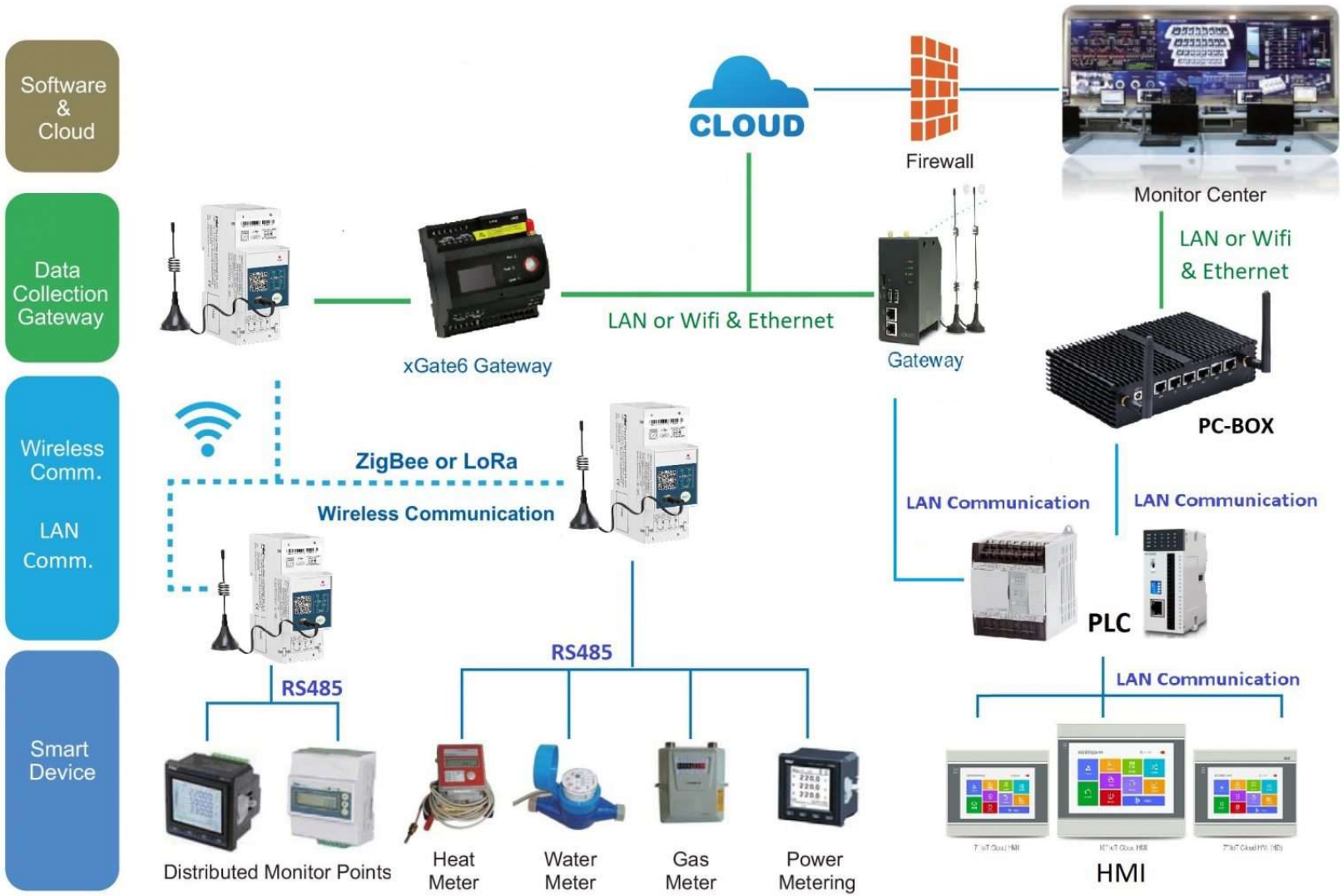


Modbus TCP
(Wifi /Ethernet)



Modbus RTC

Configuriamo l'HF-2211 come convertitore ModBus per reti Ethernet o Wi-Fi...


Software & Cloud
Data Collection Gateway
Wireless Comm.
LAN Comm.
Smart Device
CLOUD
Firewall
Monitor Center
LAN or Wifi & Ethernet
xGate6 Gateway
LAN or Wifi & Ethernet
Gateway
LAN or Wifi & Ethernet
PC-BOX
ZigBee or LoRa
Wireless Communication
LAN Communication
LAN Communication
PLC
RS485
RS485
LAN Communication
Distributed Monitor Points
Heat Meter
Water Meter
Gas Meter
Power Metering
HMI

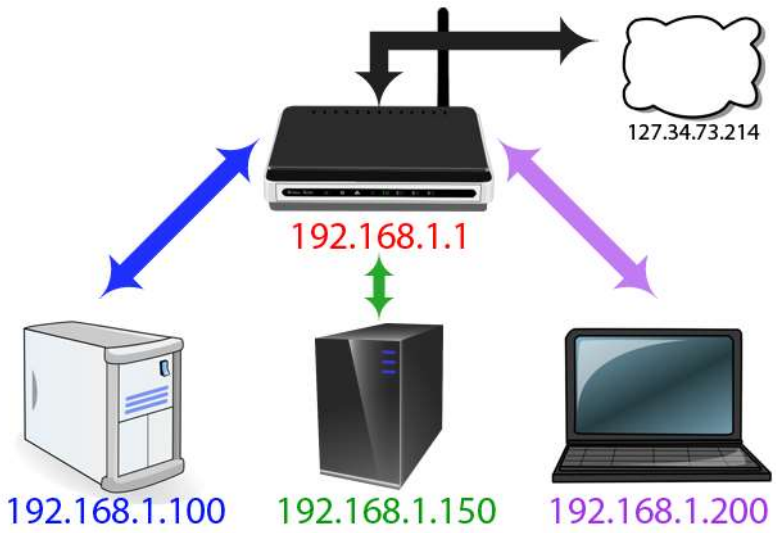
http://www.hi-flying.com/

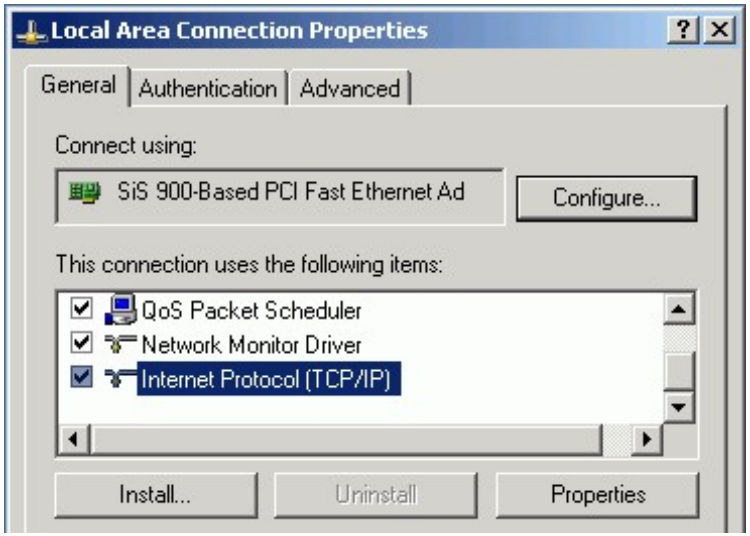
https://www.youtube.com/watch?v=iSv0HaSmPRo

Elfin Series Assembly Drawing

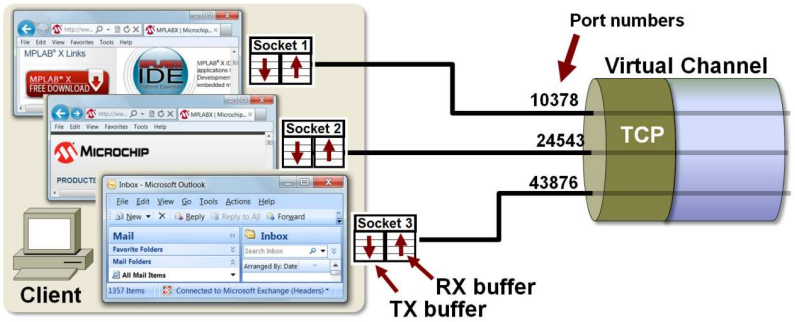
IP Address
192.168.1.1
Subnet Mask
255.255.255.0

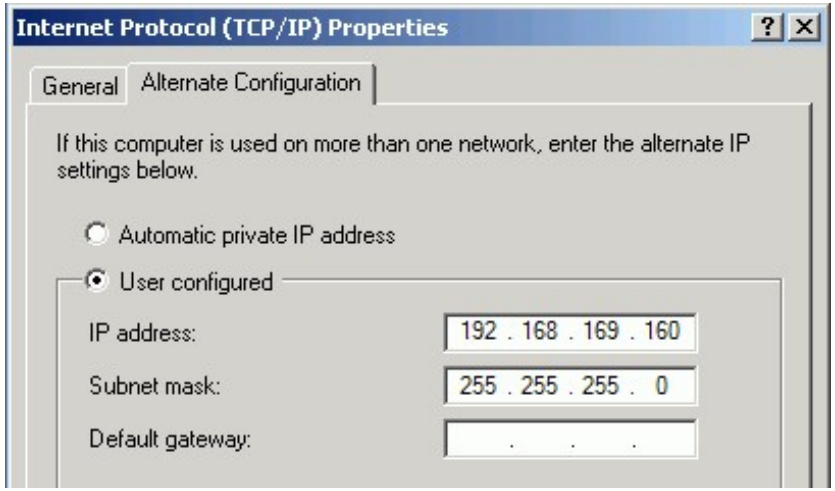
192.168.1.xxx
192.168.1.150
192.168.1.100
192.168.1.200





IP : Port





Cmd: ipconfig

การใช้งานโปรแกรม SimModbus 2

Modbus Devices Simulator
(Simulating Modbus Client/Slave)





MODBUS Eth. TCP/IP PLC - Simulator (port: 502)

Connected (0/10) : (received/sent) (0/0) Serv. listening. Rx: Tx:

Address: H D I/O | Holding Regs (40000(| Fmt: decimal +/- | Prot: MODBUS TCP/IP | Clone | Loc

Coil Outputs (000000)
Digital Inputs (100000)
Analog Inputs (300000)
Holding Regs (400000)
Extended Registers

Address	+0	+1	+2	+3	+4	+5	+6	+7	+8
400001-400010	0			0	0	0	0	0	0
400011-400020	0			0	0	0	0	0	0
400021-400030	0			0	0	0	0	0	0
400031-400040	0	0	0	0	0	0	0	0	0
400041-400050	0	0	0	0	0	0	0	0	0
400051-400060	0	0	0	0	0	0	0	0	0
400061-400070	0	0	0	0	0	0	0	0	0
400071-400080	0	0	0	0	0	0	0	0	0
400081-400090	0	0	0	0	0	0	0	0	0
400091-400100	0	0	0	0	0	0	0	0	0
400101-400110	0	0	0	0	0	0	0	0	0
400111-400120	0	0	0	0	0	0	0	0	0
400121-400130	0	0	0	0	0	0	0	0	0
400131-400140	0	0	0	0	0	0	0	0	0
400141-400150	0	0	0	0	0	0	0	0	0

Ethernet TCP/IP Settings

Status: Supporting 10 simultaneous connections.

OK
Cancel

Local IP: Chalermchon19

Remote IP: IP Your Com (127.0.0.1)

Server settings

Server connections: 10

Port (502): 502 — Port 502

Alternate port: 501

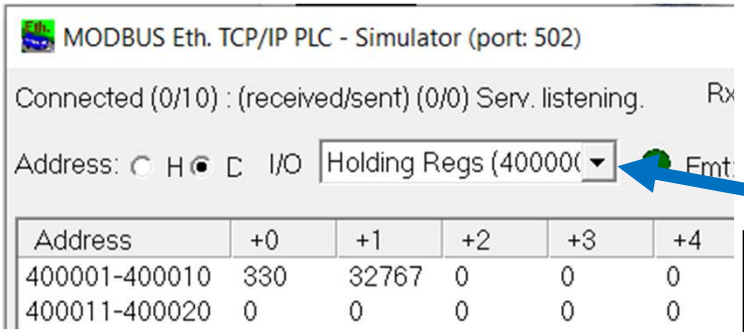
Socket Timeout (sec): 100 (10 to 1000 sec)

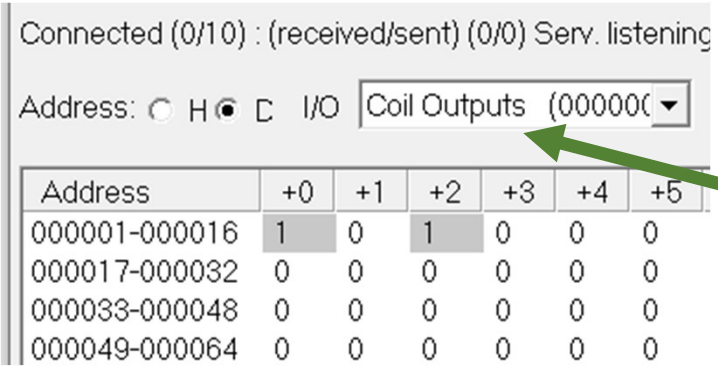
Responsiveness (ms): 0 (0 to 10 000 ms)

Load register values at startup.

การใช้งานโปรแกรม SimModbus 2 จำลอง Modbus Memory Device (TCP)

Slave Addr (ID) 1 2 3 4 5 6





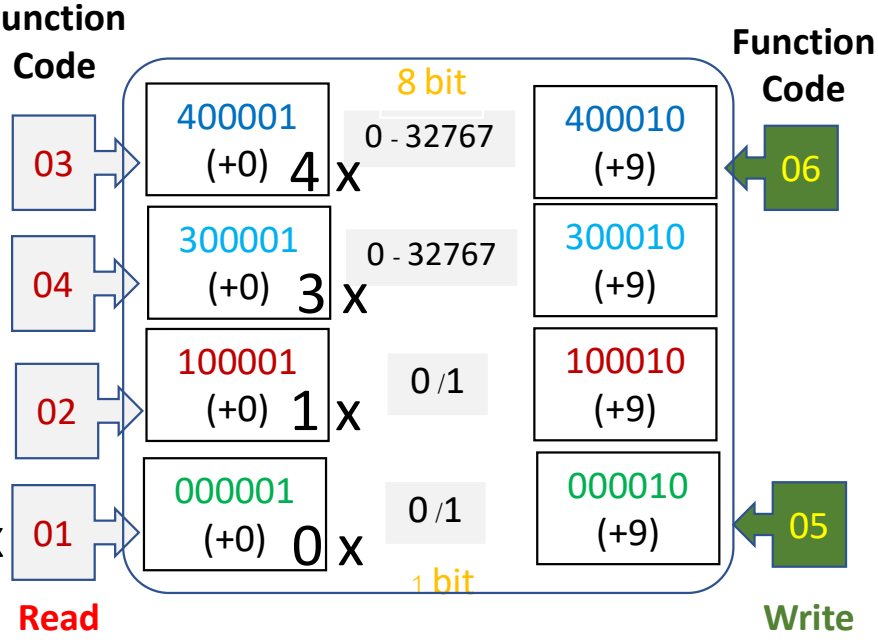
400000 – 465535
Holding Reg 4x0

300000 –365535
Analog Input 3x0

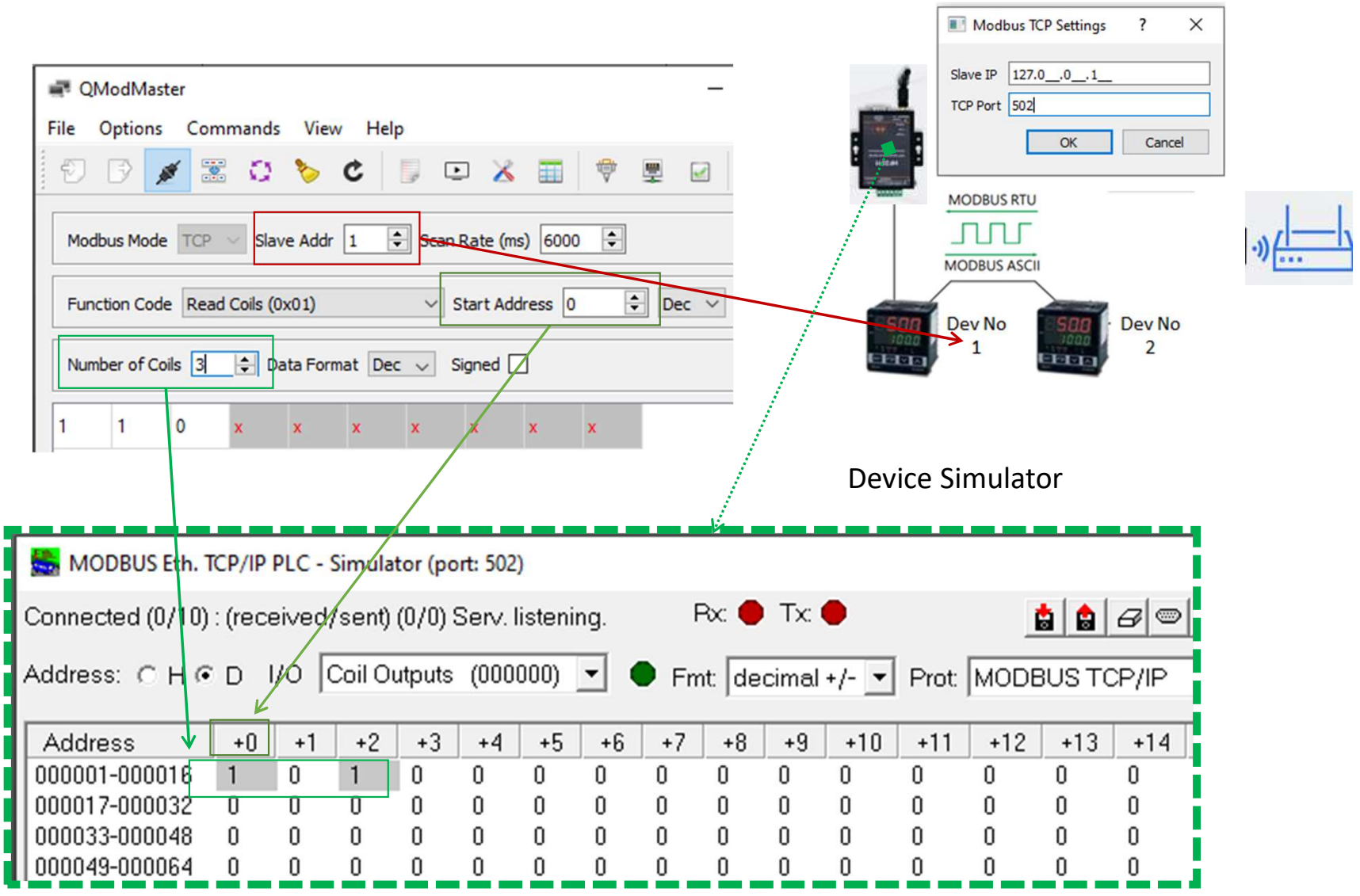
100000 -> 165535
Digital Input 1x0

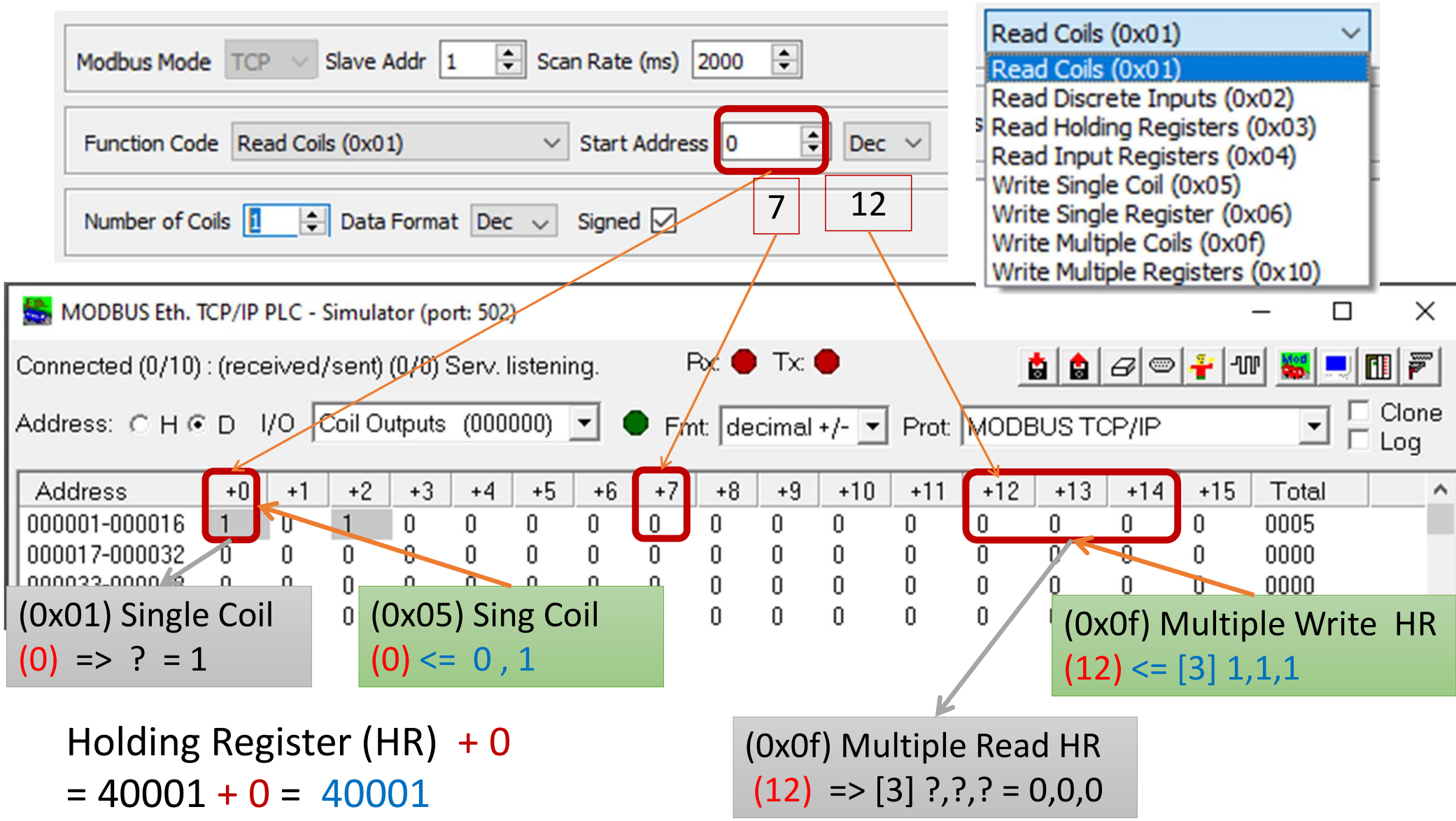
000001 - 065535
Coil Output 0x0

0x



หน่วยความจำเก็บข้อมูลภายในอุปกรณ์


QModMaster
File Options Commands View Help
Modbus Mode TCP
Slave Addr 1
Scan Rate (ms) 6000
Function Code Read Coils (0x01)
Start Address 0
Dec
Number of Coils 3
Data Format Dec
Signed
1 1 0 x x x x x x x
Modbus TCP Settings
Slave IP 127.0__.0__.1__
TCP Port 502
OK
Cancel
MODBUS RTU
MODBUS ASCII
Dev No 1
Dev No 2
Device Simulator
MODBUS Eth. TCP/IP PLC - Simulator (port: 502)
Connected (0/10) : (received/sent) (0/0) Serv. listening.
Rx:
Tx:
Address: H D I/O
Coil Outputs (000000)
Fmt: decimal +/-
Prot: MODBUS TCP/IP
Address +0 +1 +2 +3 +4 +5 +6 +7 +8 +9 +10 +11 +12 +13 +14
000001-000016 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0
000017-000032 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
000033-000048 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
000049-000064 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0


Modbus Mode
TCP
Slave Addr
1
Scan Rate (ms)
2000
Function Code
Read Coils (0x01)
Start Address
0
Dec
Number of Coils
1
Data Format
Dec
Signed
7
12
Read Coils (0x01)
Read Coils (0x01)
Read Discrete Inputs (0x02)
Read Holding Registers (0x03)
Read Input Registers (0x04)
Write Single Coil (0x05)
Write Single Register (0x06)
Write Multiple Coils (0x0f)
Write Multiple Registers (0x10)
MODBUS Eth. TCP/IP PLC - Simulator (port: 502)
Connected (0/10) : (received/sent) (0/0) Serv. listening.
Rx:
Tx:
Address:
H
D
I/O
Coil Outputs (000000)
Fmt:
decimal +/-
Prot:
MODBUS TCP/IP
Clone
Log
Address
+0
+1
+2
+3
+4
+5
+6
+7
+8
+9
+10
+11
+12
+13
+14
+15
Total
000001-000016
1
0
1
0
0
0
0
0
0
0
0
0
0
0
0
0
0005
000017-000032
0
0
0
0
0
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0
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0
0000
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0000
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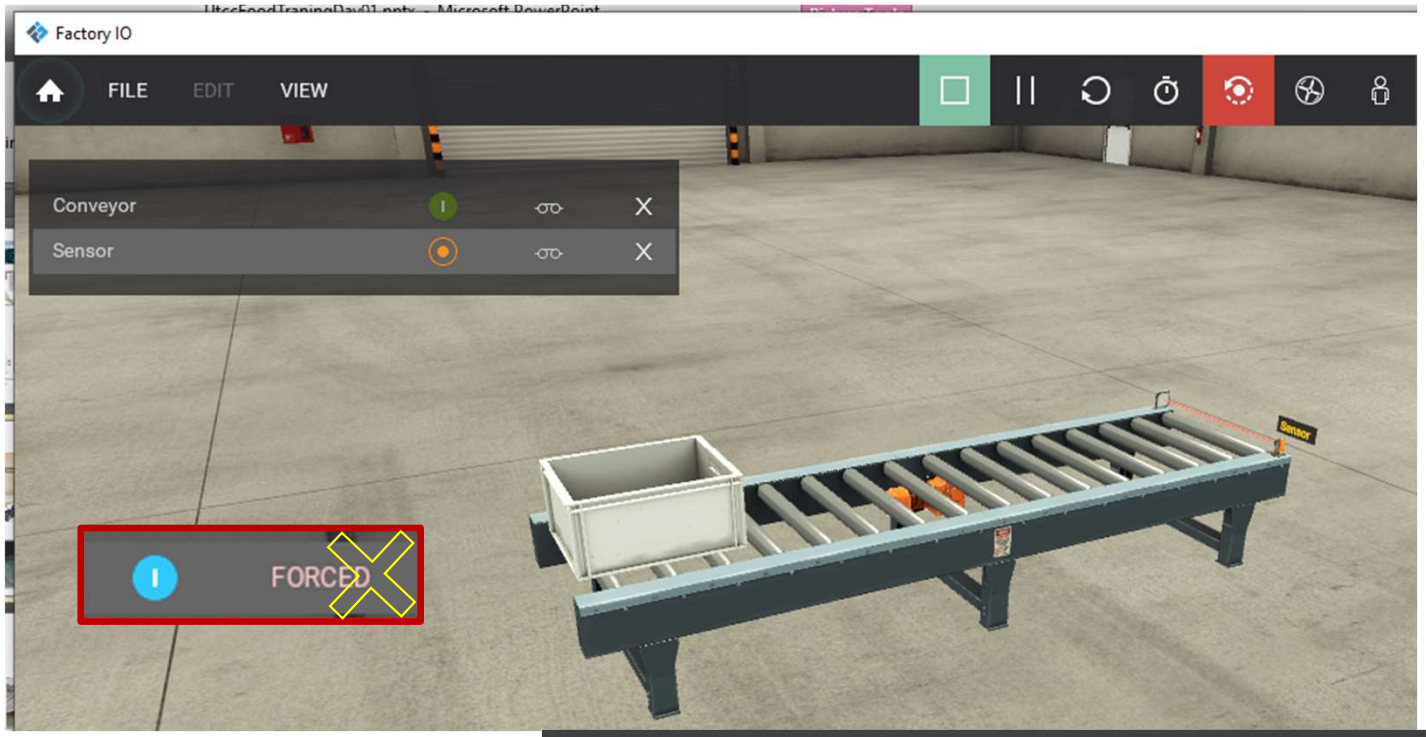
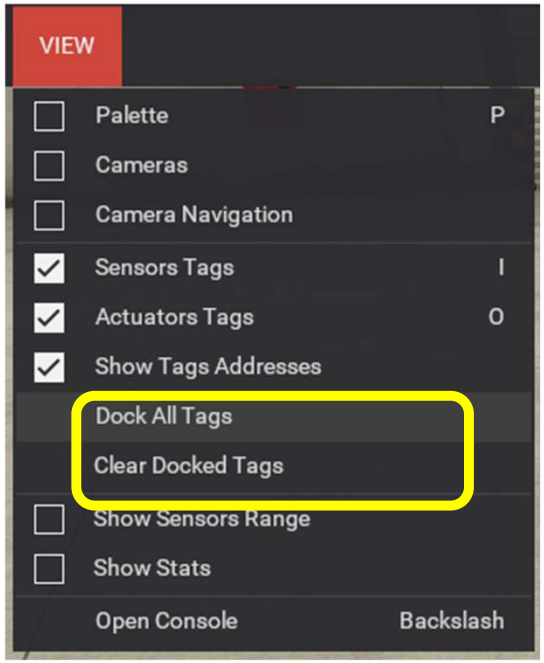
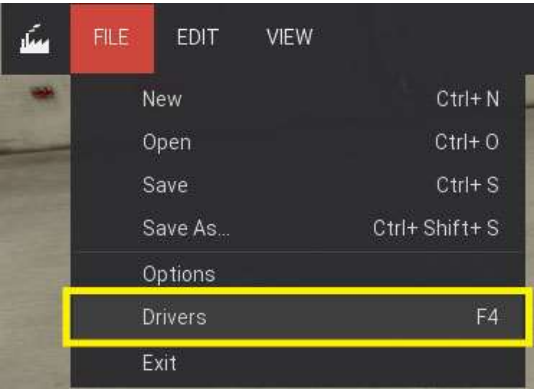
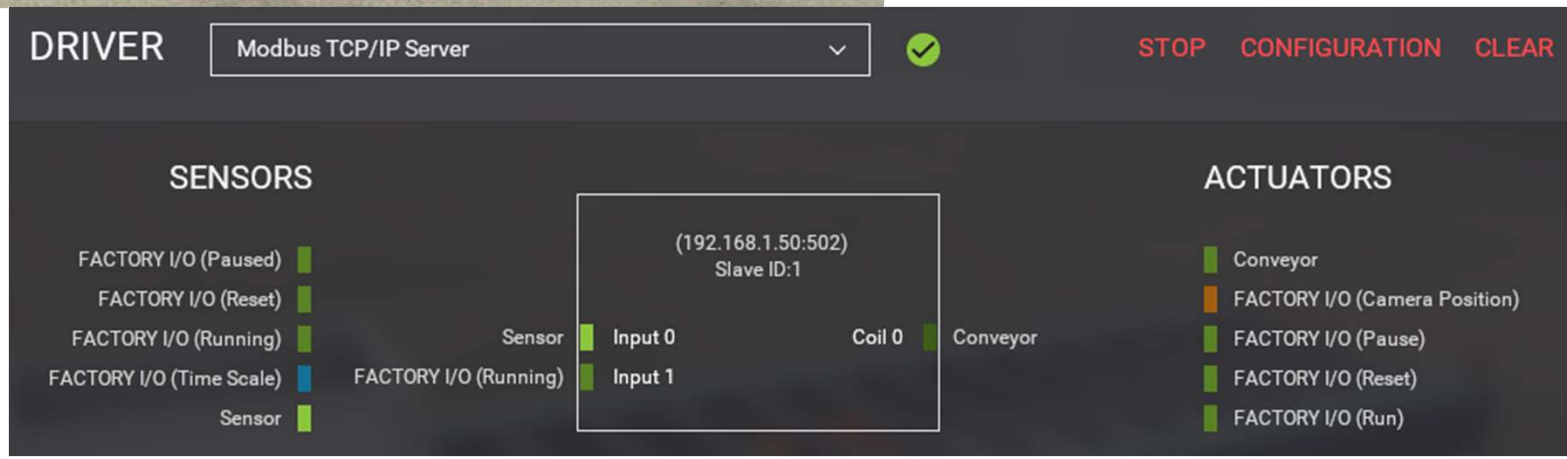
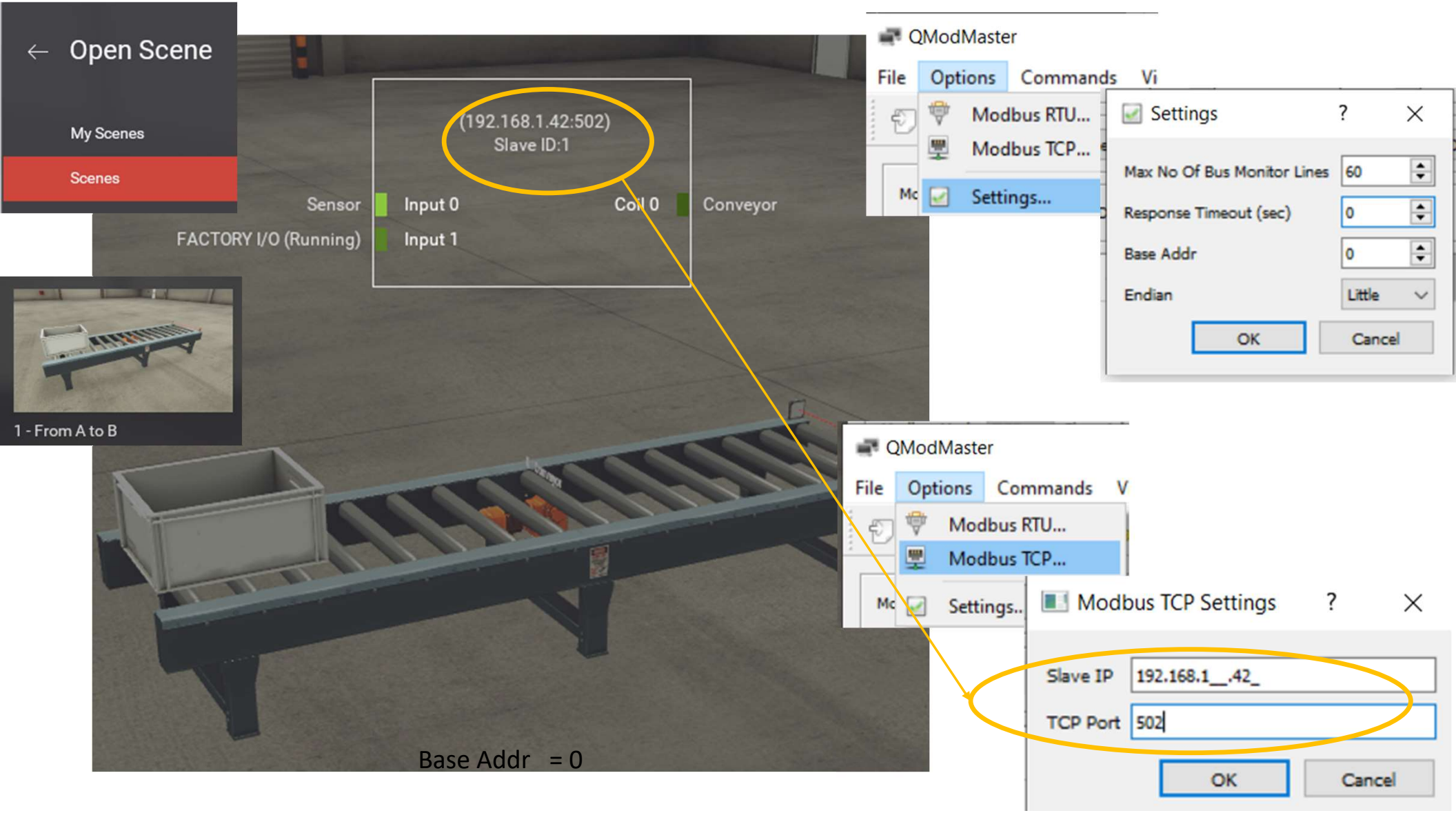
0
0
0
0
0
0
0
(0x01) Single Coil
(0) => ? = 1
(0x05) Sing Coil
(0) <= 0 , 1
(0x0f) Multiple Write HR
(12) <= [3] 1,1,1
Holding Register (HR) + 0
= 40001 + 0 = 40001
(0x0f) Multiple Read HR
(12) => [3] ?,?,? = 0,0,0

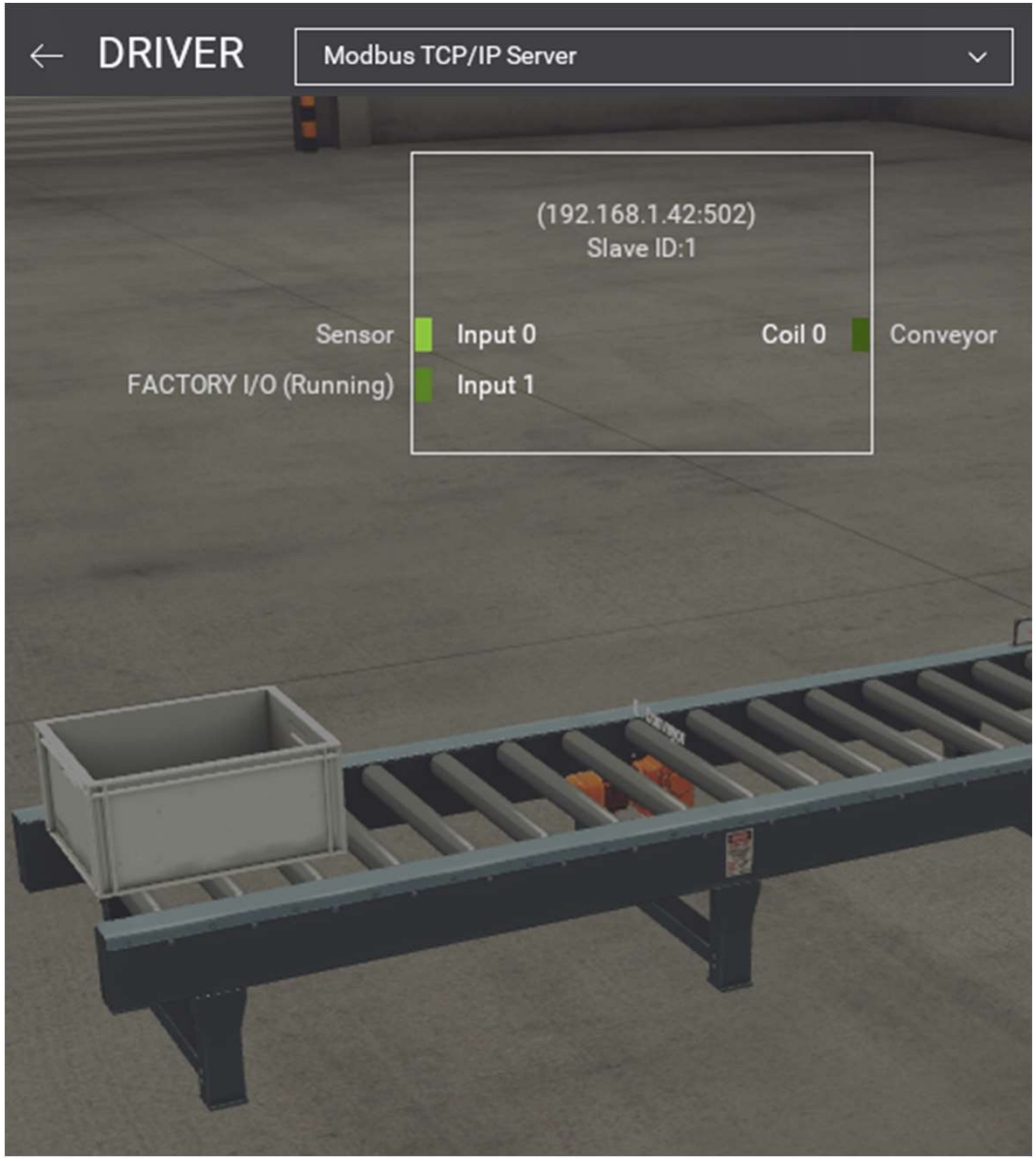

Factory IO
FILE
EDIT
VIEW
Conveyor
Sensor
FORCED

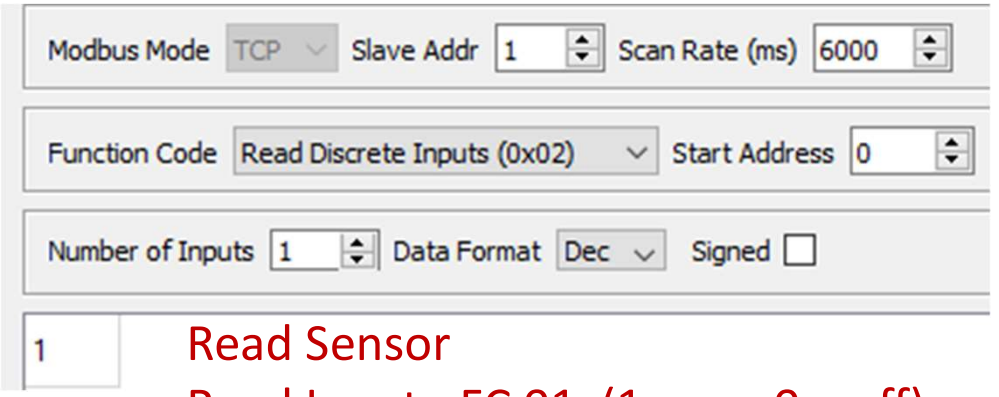

VIEW
Palette P
Cameras
Camera Navigation
Sensors Tags I
Actuators Tags O
Show Tags Addresses
Dock All Tags
Clear Docked Tags
Show Sensors Range
Show Stats
Open Console Backslash


FILE
EDIT
VIEW
New Ctrl+ N
Open Ctrl+ O
Save Ctrl+ S
Save As... Ctrl+ Shift+ S
Options
Drivers F4
Exit

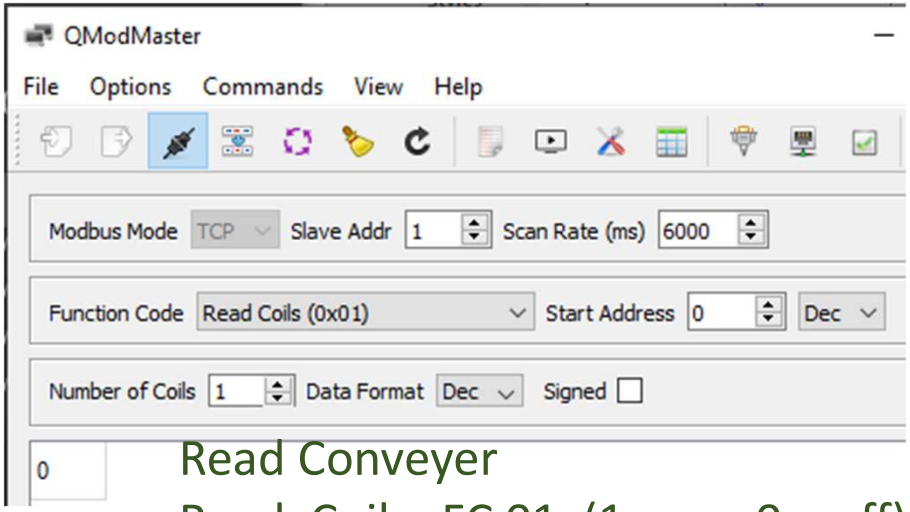

DRIVER
Modbus TCP/IP Server
STOP
CONFIGURATION
CLEAR
SENSORS
FACTORY I/O (Paused)
FACTORY I/O (Reset)
FACTORY I/O (Running)
FACTORY I/O (Time Scale)
Sensor
(192.168.1.50:502)
Slave ID:1
Sensor
Input 0
Input 1
FACTORY I/O (Running)
Coil 0
Conveyor
ACTUATORS
Conveyor
FACTORY I/O (Camera Position)
FACTORY I/O (Pause)
FACTORY I/O (Reset)
FACTORY I/O (Run)


Open Scene
My Scenes
Scenes
1 - From A to B
(192.168.1.42:502)
Slave ID:1
Sensor
Input 0
Coil 0
Conveyor
FACTORY I/O (Running)
Input 1
QModMaster
File
Options
Commands
Vi
Modbus RTU...
Modbus TCP...
Settings...
Settings
Max No Of Bus Monitor Lines
60
Response Timeout (sec)
0
Base Addr
0
Endian
Little
OK
Cancel
QModMaster
File
Options
Commands
V
Modbus RTU...
Modbus TCP...
Settings...
Modbus TCP Settings
Slave IP
192.168.1__.42_
TCP Port
502
OK
Cancel
Base Addr = 0

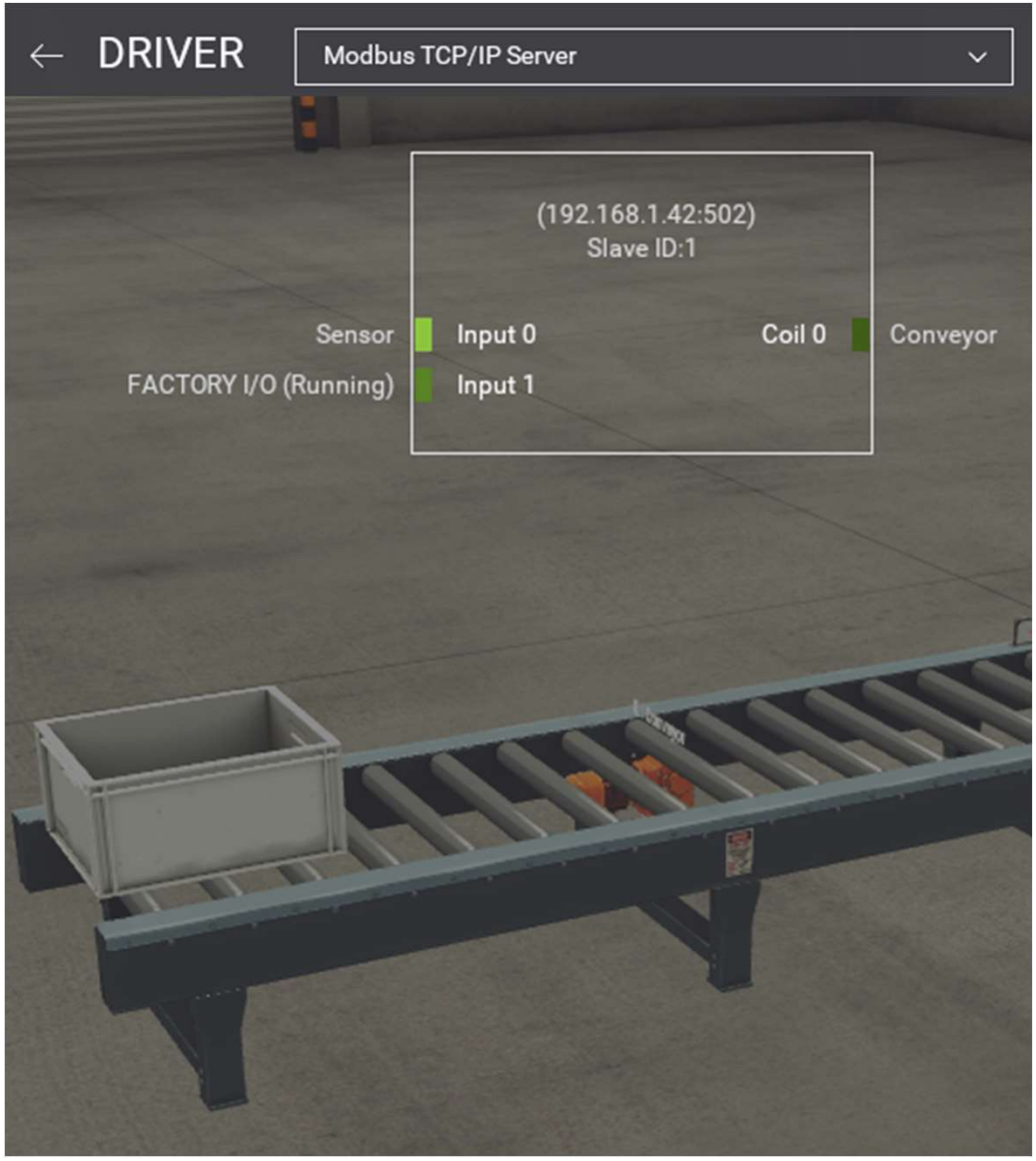


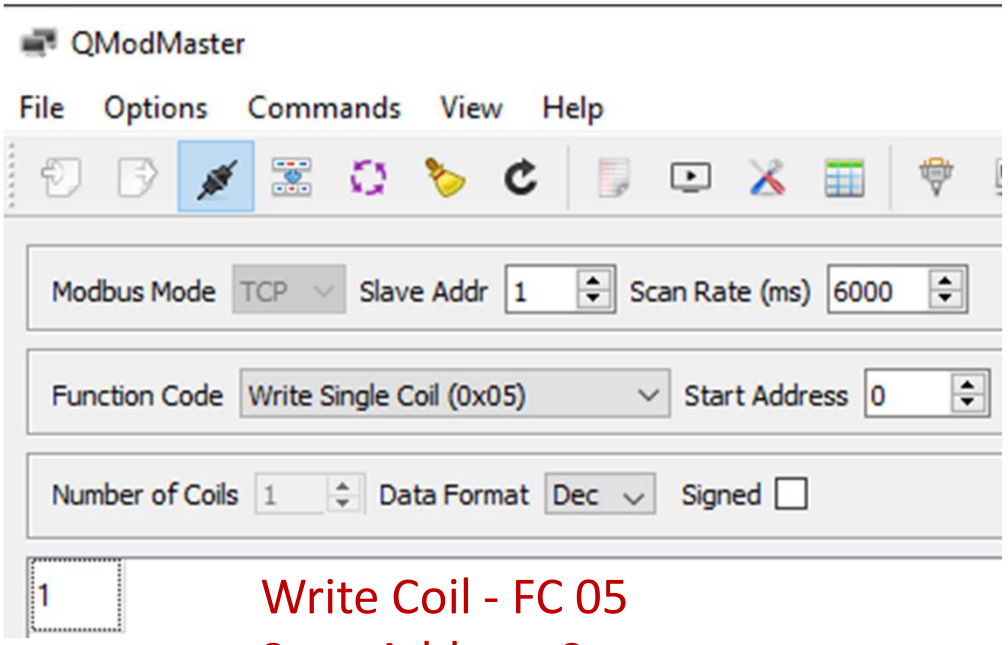


Read Sensor
Read Input - FC 01 (1 = on, 0 = off)
Start Address 0 Number of Input 1



Read Conveyer
Read Coil - FC 01 (1 = on, 0 = off)
Start Address 0 Number of Input 1



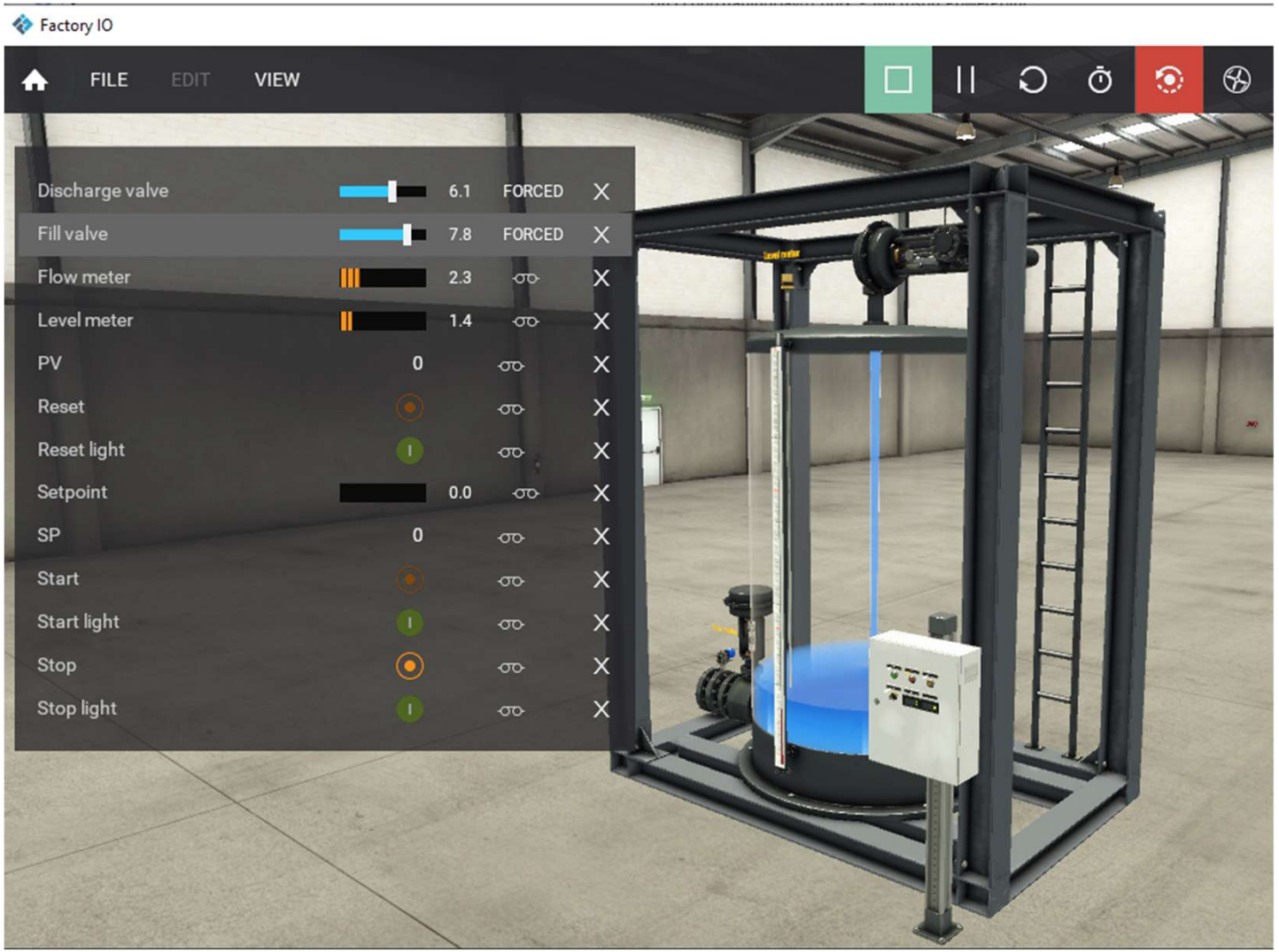


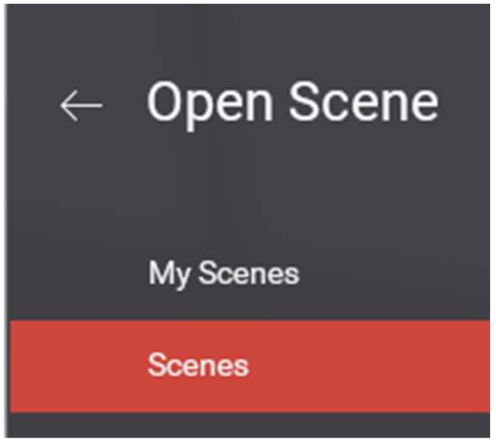
Write Coil - FC 05
Start Address 0

(1 = on, 0 = off)

Write 0 Stop , 1 Start

Advanced Control with Machine Simulator (FactoryIO)





Level meter — Input Reg 0
Flow meter — Input Reg 1

Discharge valve 5.0
Fill valve 5.0
Flow meter 3.7
Level meter 5.6

Modbus Mode: TCP | Slave Addr: 1 (1) | Scan Rate (ms): 6000
Function Code: Read Input Registers (0x04) | Start Address: 0 (0)
Number of Registers: 2 (2) | Data Format: Dec | Signed: ☐

591 | 384 | x | x | x

+0 +1

Modbus TCP Settings
Slave IP: 192.168.1__.50_
TCP Port: 502
OK | Cancel

SENSORS

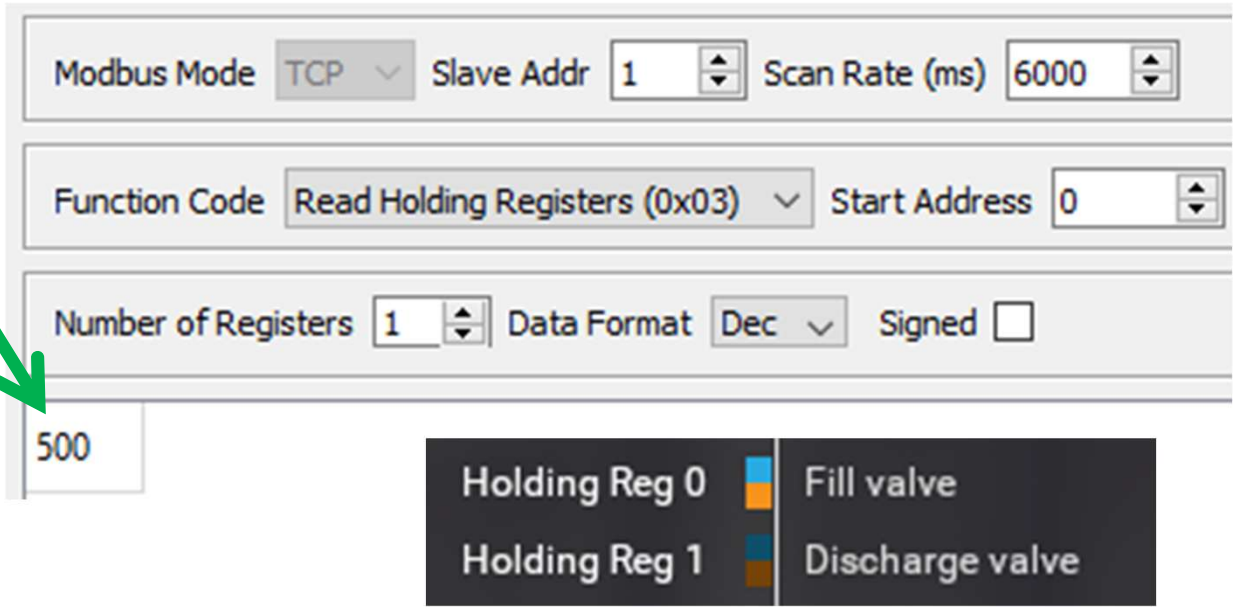
FACTORY I/O (Paused)
FACTORY I/O (Reset)
FACTORY I/O (Running)
FACTORY I/O (Time Scale)
Flow meter
Level meter
Reset
Setpoint
Start
Stop

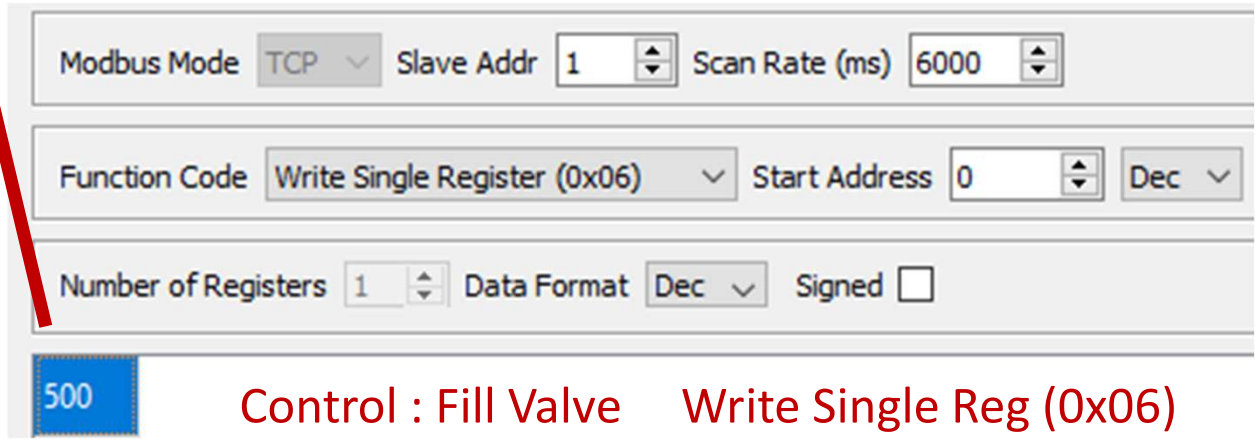
(192.168.1.50:502)
Slave ID:1

Start — Input 0 — Coil 0 — Start light
Reset — Input 1 — Coil 1 — Reset light
Stop — Input 2 — Coil 2 — Stop light
FACTORY I/O (Running) — Input 3 — Holding Reg 0 — Fill valve
Level meter — Input Reg 0 — Holding Reg 1 — Discharge valve
Flow meter — Input Reg 1 — Holding Reg 2 — SP
Setpoint — Input Reg 2 — Holding Reg 3 — PV

FACTORY I/O (Camera Position)
FACTORY I/O (Pause)
FACTORY I/O (Reset)
FACTORY I/O (Run)
Fill valve
PV
Reset light
SP
Start light

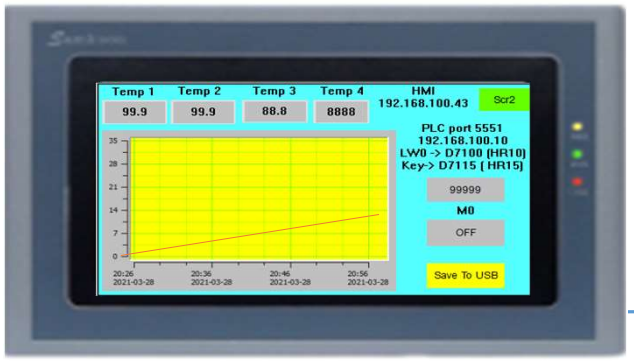
FC 03 Read / FC 06 Write Single (HR) - Read Fill Valve Read Holding Reg (0x03)





Control : Fill Valve Write Single Reg (0x06)

HMI 192.168.100.43



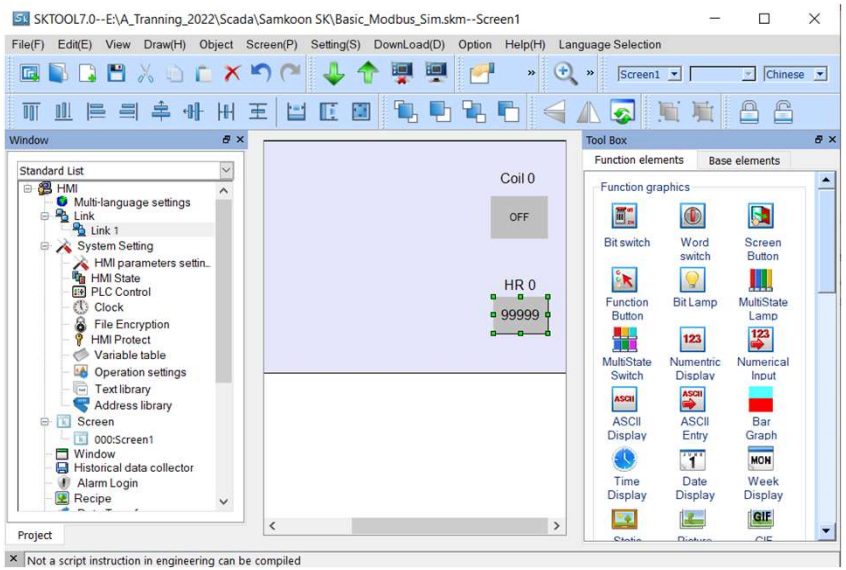
PLC 192.168.100.10

Modbus TCP

PLC 192.168.100.11

Modbus RTU

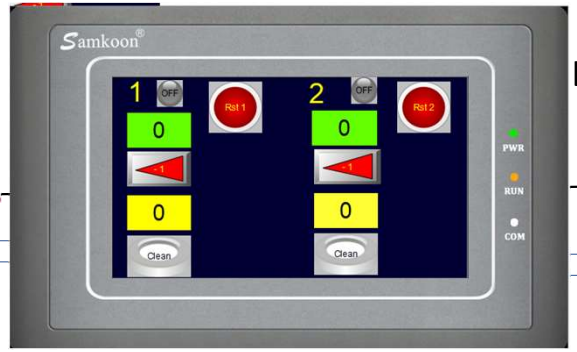
Rs485
Modbus
RTU



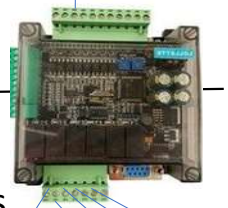
SAMSOOK SK043HS

SKTOOL 7

HMI 192.168.100.43



Low Cost PLC



Rs485
Modbus
RTU

Modbus TCP

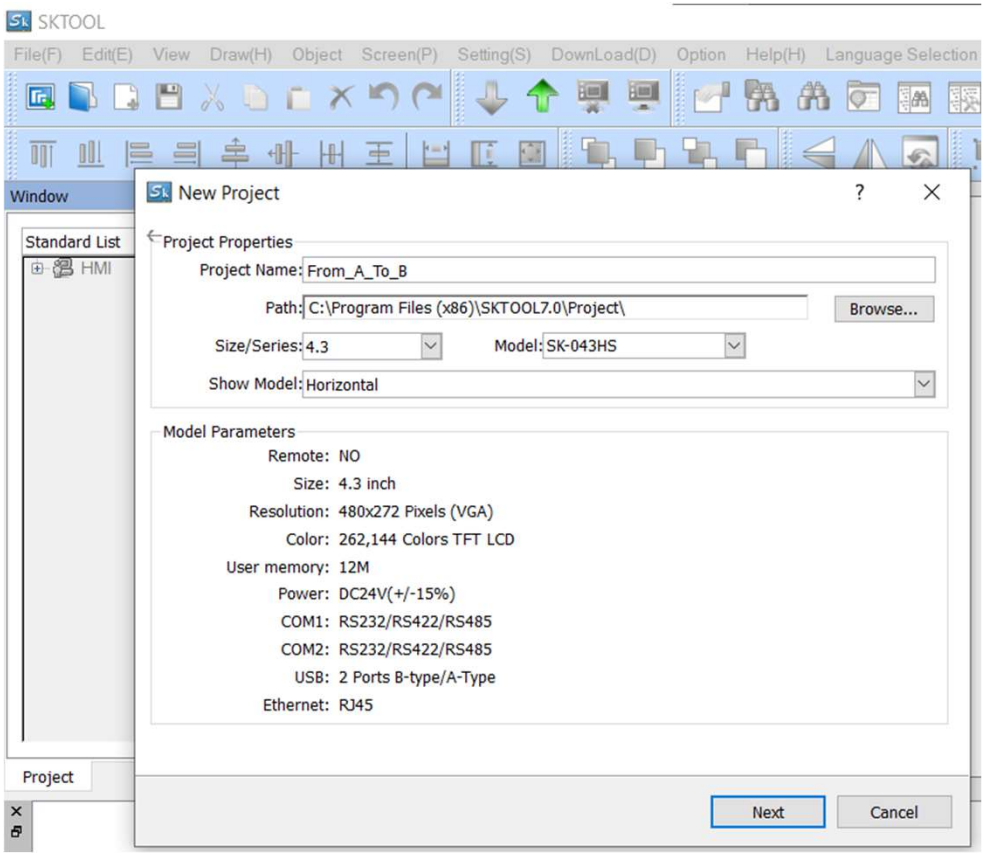
Open Source (Free Cost)

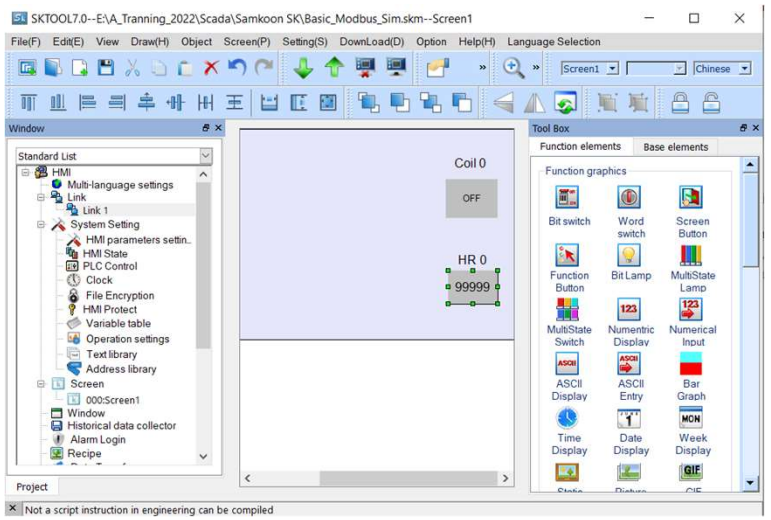
Opale Switch 1		Opale Switch 2	
Target:	680	Target:	2127
Actual:	680	Actual:	1290
Difference:	0	Difference:	837
Opale Switch 4		**Packing 1/2**	
Target:	0	Target:	1436
Actual:	0	Actual:	1360
Difference:	0	Difference:	76

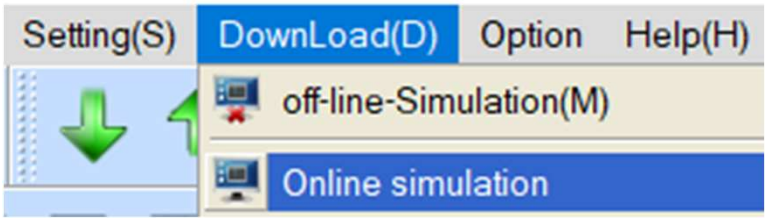
PC 192.168.100.10

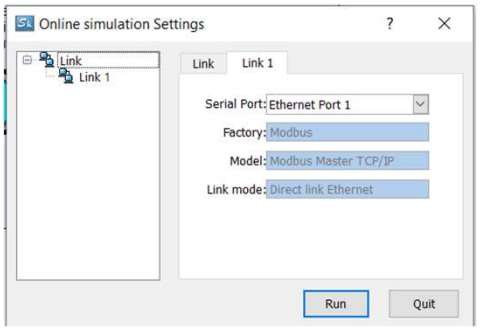
SAMSOOK SK043HS

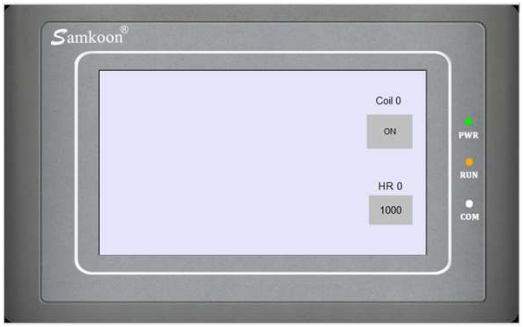
SKTOOL 7

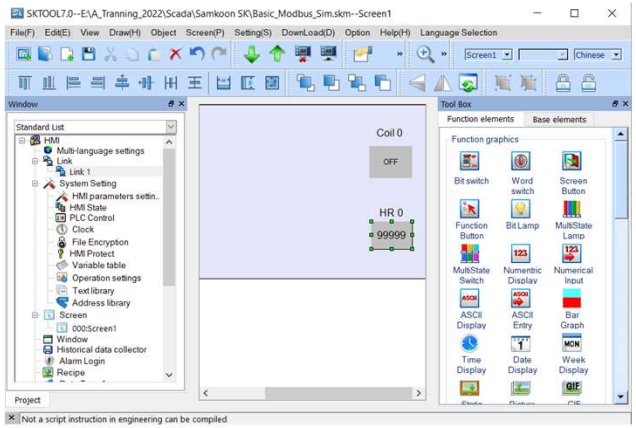










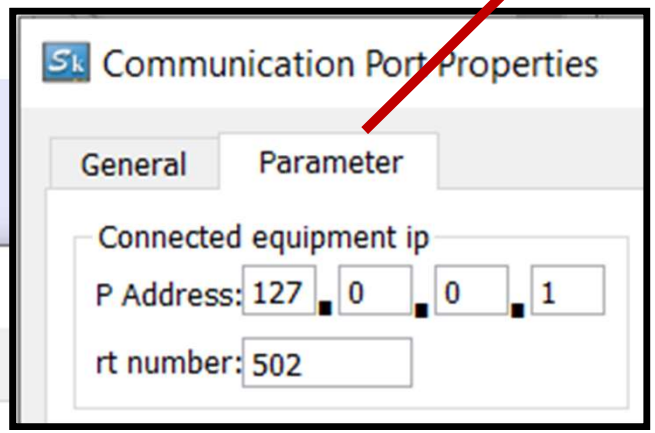


MODBUS Eth. TCP/IP PLC - Simulator (port: 502)

Connected (0/10) : (received/sent) (22781/22781) Serv. lis Rx: Tx:

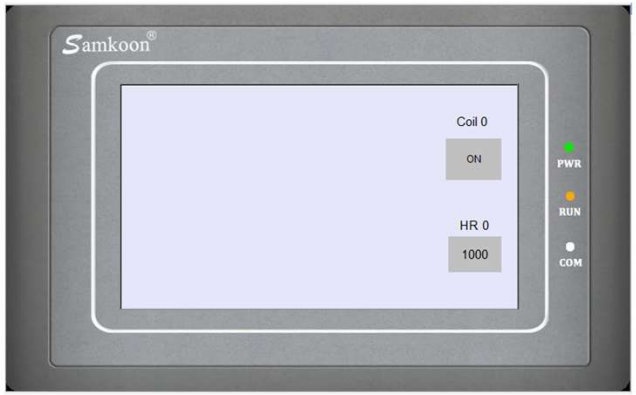
Address: H I/O Holding Regs (40000(Fmt: decimal +/- Prot: MODBUS TCP/IP

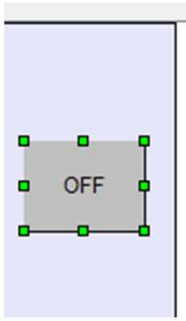
Address	+0	+1	+2	+3	+4
400001-400010	1000	0	0	0	0
400011-400020	0	0	0	0	0



Connection Service
Modbus -
Modbus Master TCP/IP

HMI Sim IP : 127.0.0.1





Bit switch

Standard

Link 1

0x 0

MODBUS Eth. TCP/IP PLC - Simulator (port: 502)

Connected (0/10) : (received/sent) (3/3) Serv. listening

Address: H D I/O Coil Outputs (000000

Address	+0	+1	+2	+3	+4	+5
000001-000016	0	0	0	0	0	0

Address	+0	+1	+2	+3	+4	+5	+6
000001-000016	1	0	0	0	0	0	0

Tool Box

Function elements | Base elements

Function graphics

Bit switch | Word | Screen

Function: Invert

Mode: Invert / Inching / Set OFF / Set ON

Bit Button

element type

Bit Switch

ID: BB0000

View

OFF

Prompt

Function: ON / OFF status monitoring

Genaral | Appearance | Advanced | Visibility

State: 1 0

Shape

Border Color:

FG Color:

BG Color:

Pattern: Solid

Function

Function: Invert

Mode: Press execute

Write Address: 0x1

Offset

Monitor

Monitor Add

Monitor Address: 0x1

Script

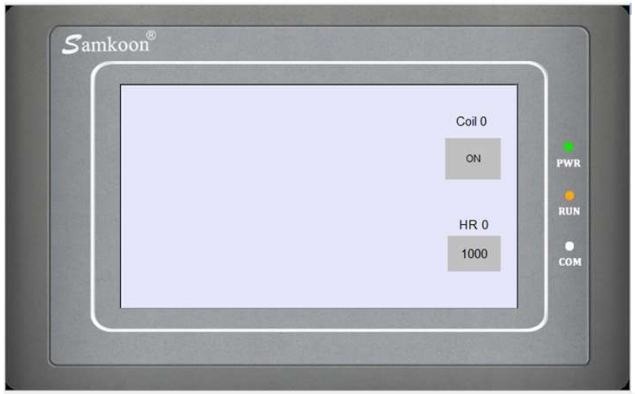
Use Script

Address Entry

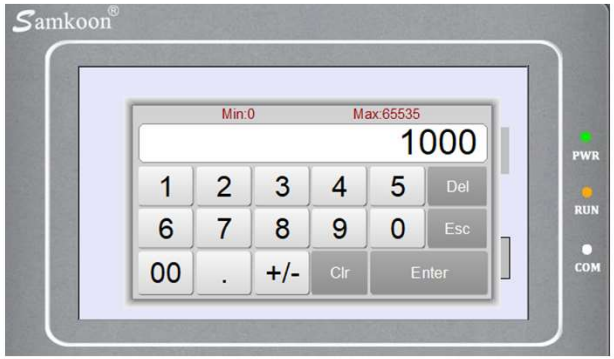
Standard

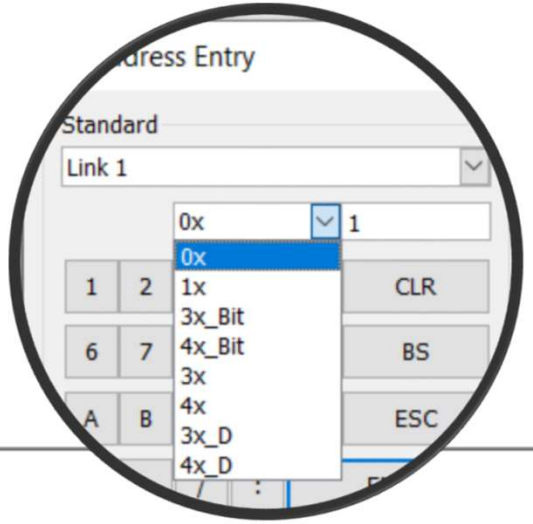
Link 1

0x 1



Numerical Input

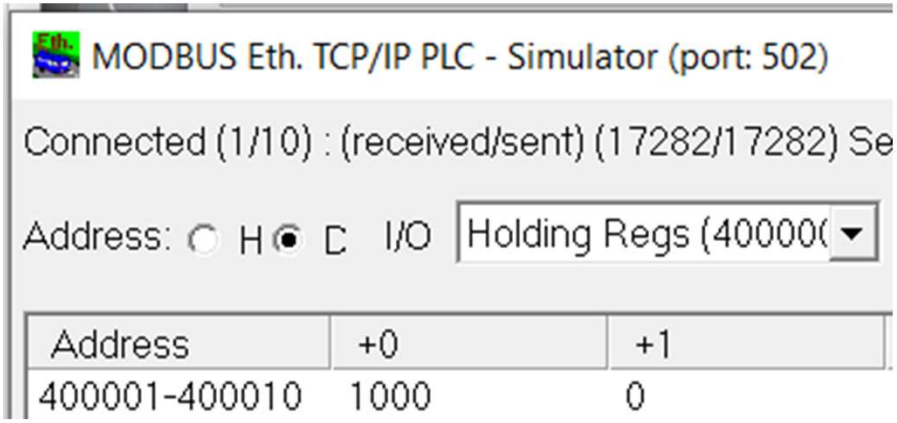


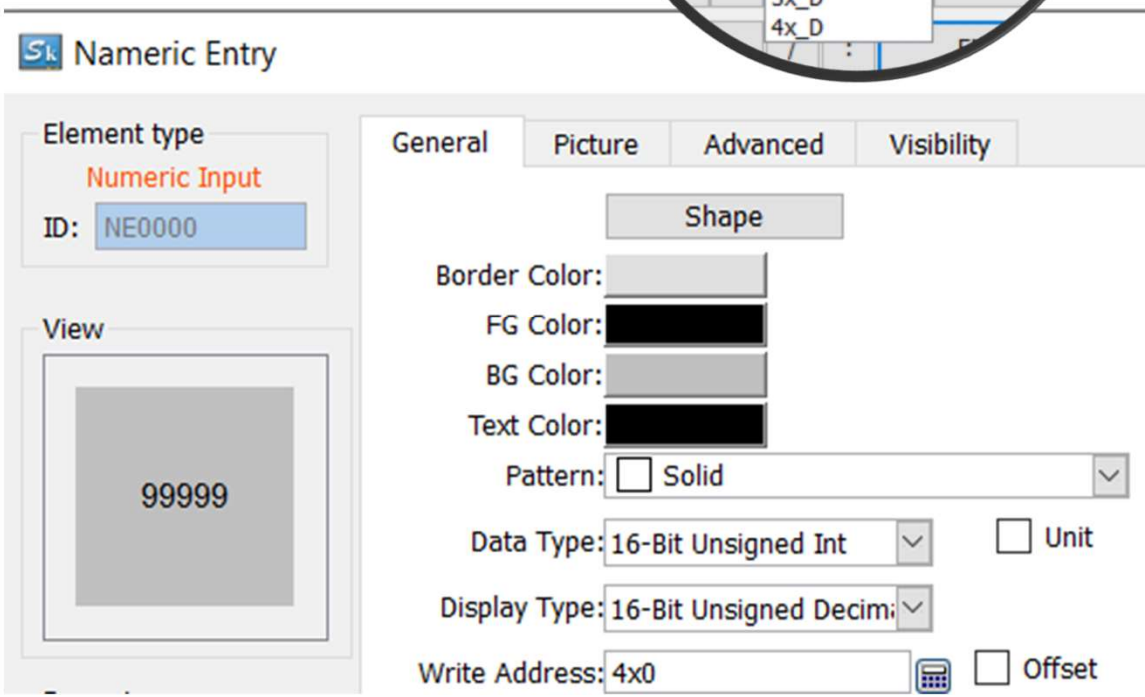


Standard

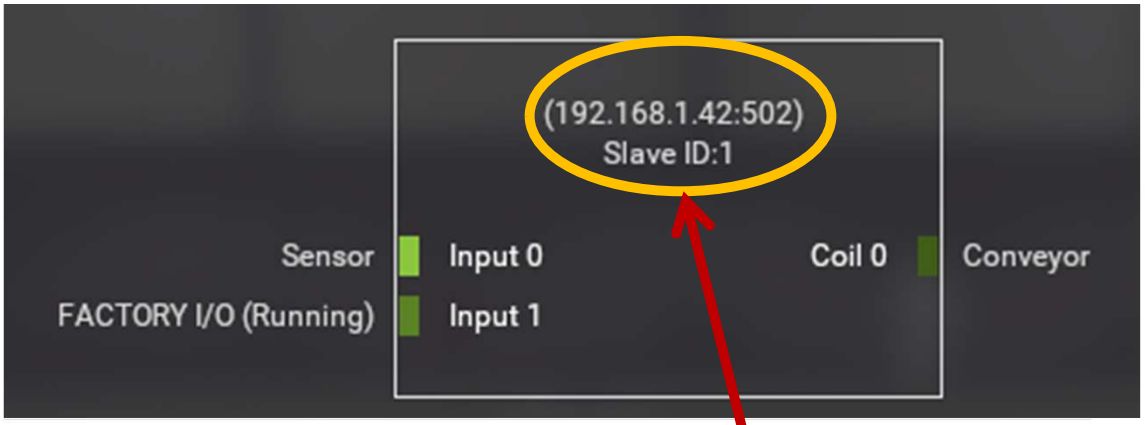
Link 1

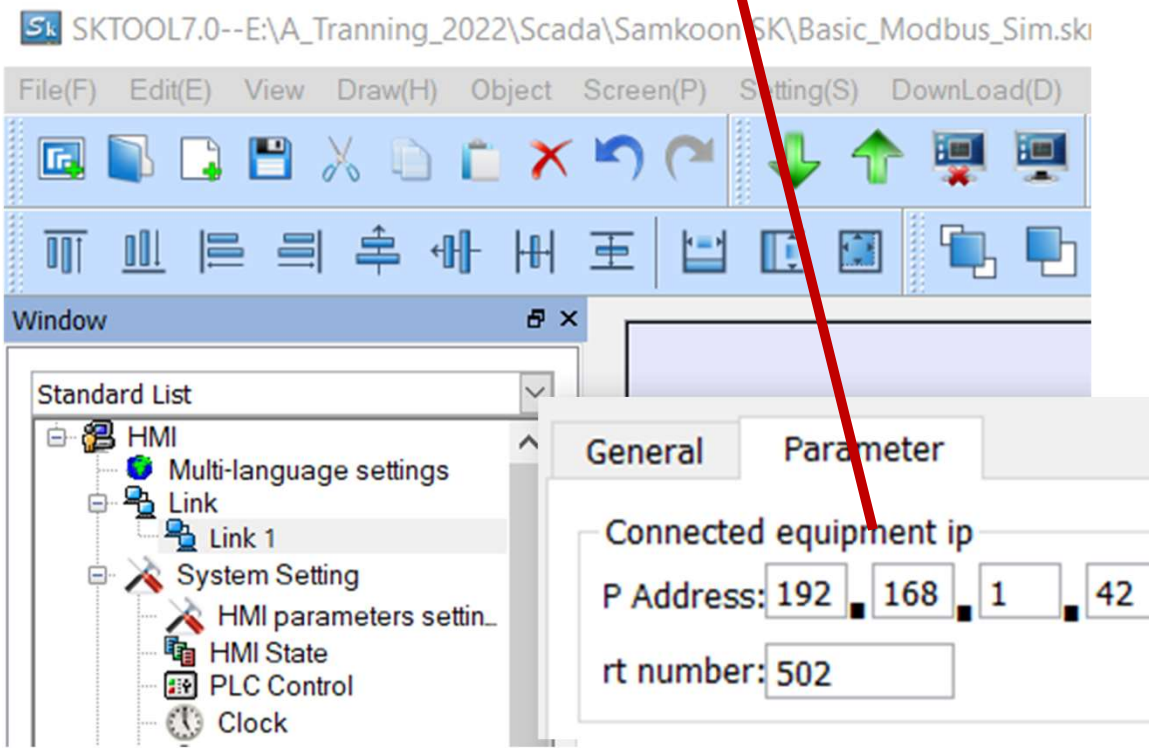
4x 0





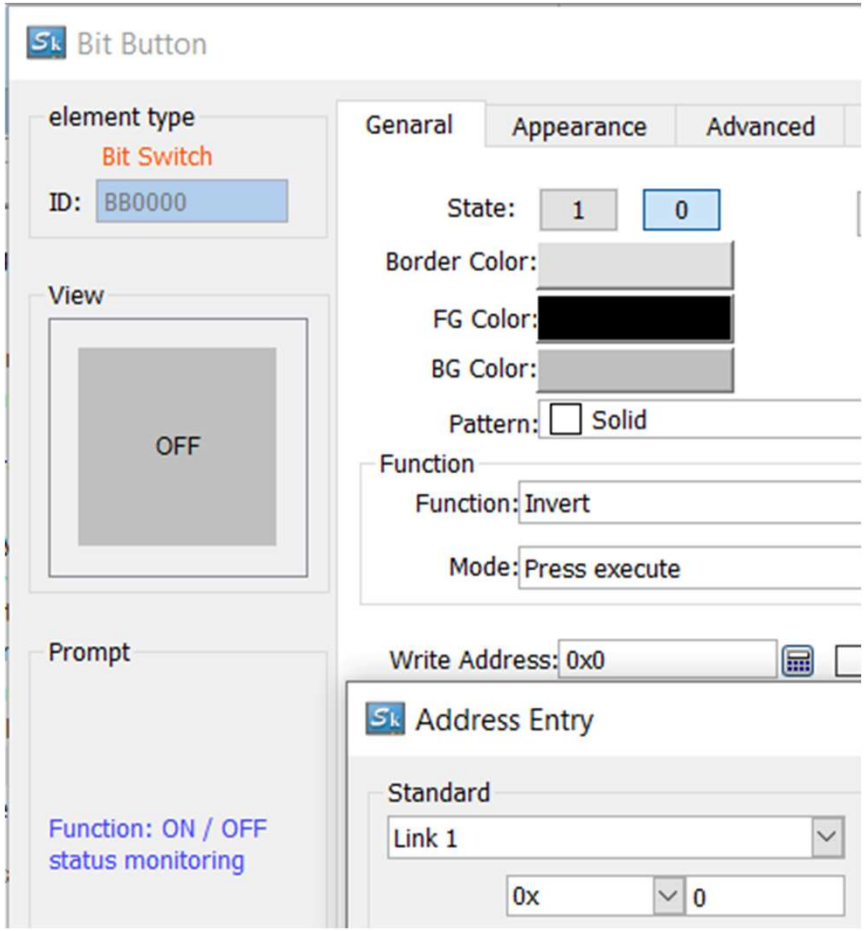
DRIVER | Modbus TCP/IP Server





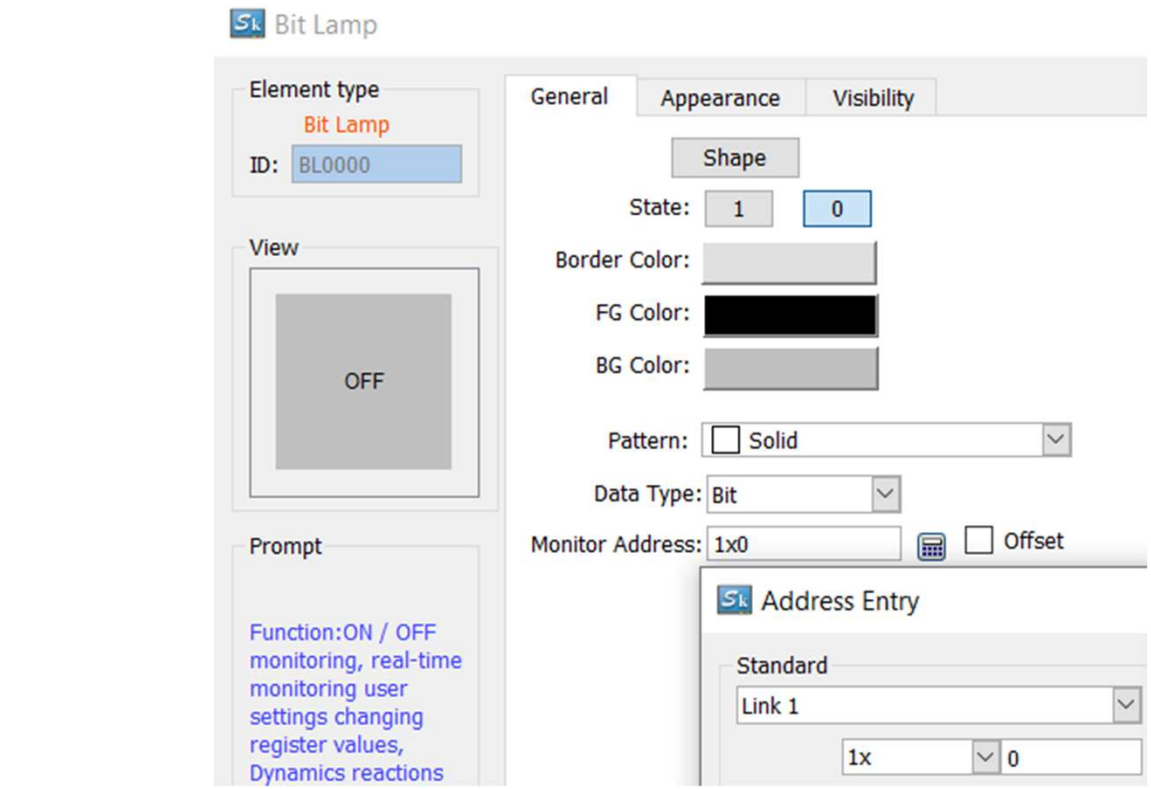
Bit switch

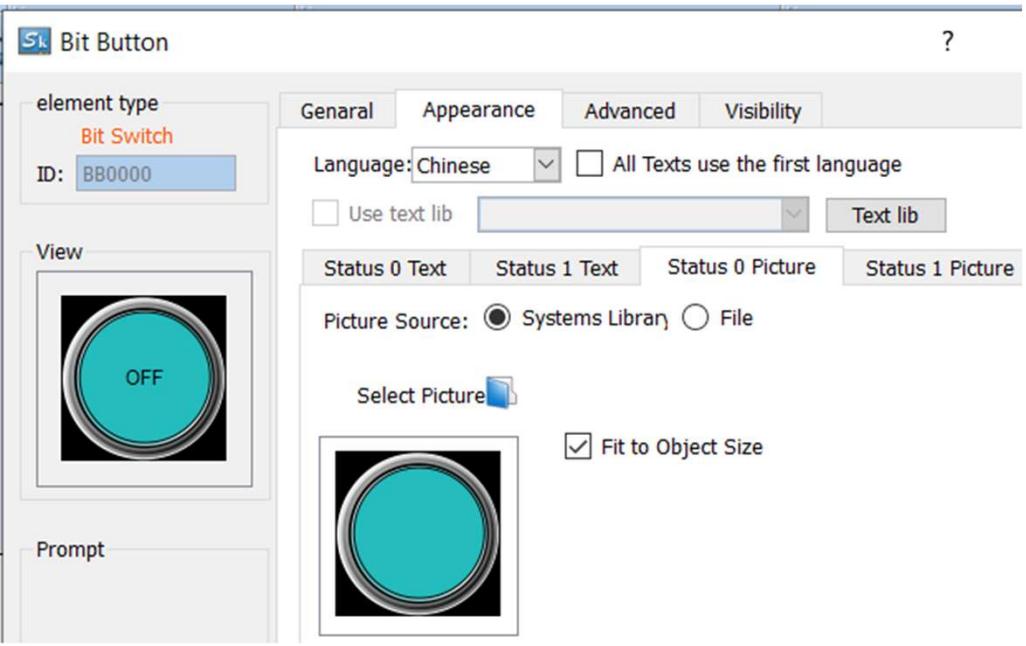
Conveyer
Read Coil 0
Coil Outputs 0



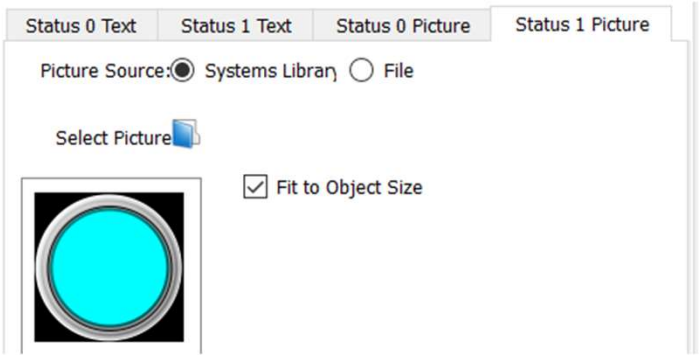
Bit Lamp

SENSOR
Read Discrete Input 1
Digital Inputs 1

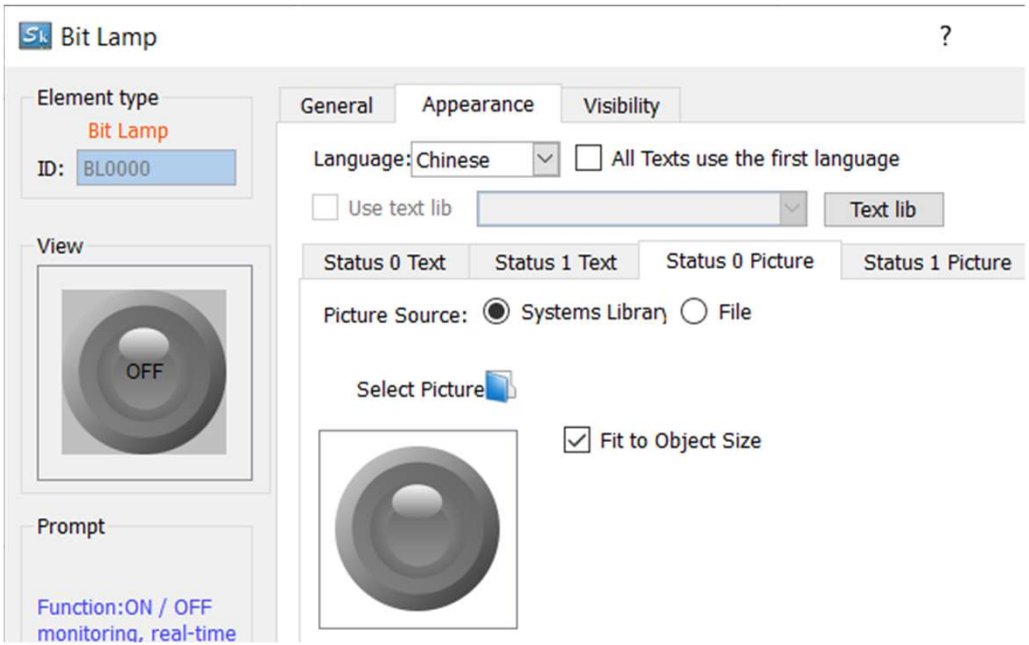




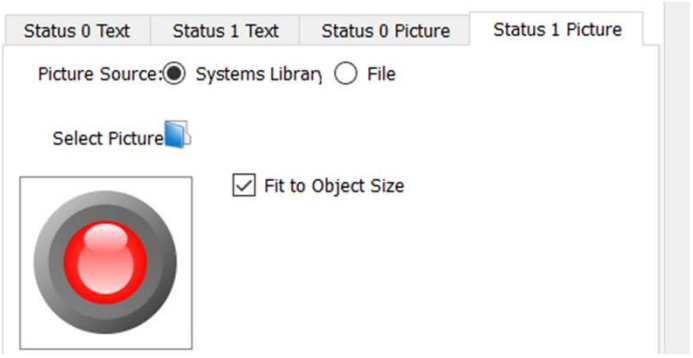
Bit switch



Conveyer
Read Coil 0
Coil Outputs 0

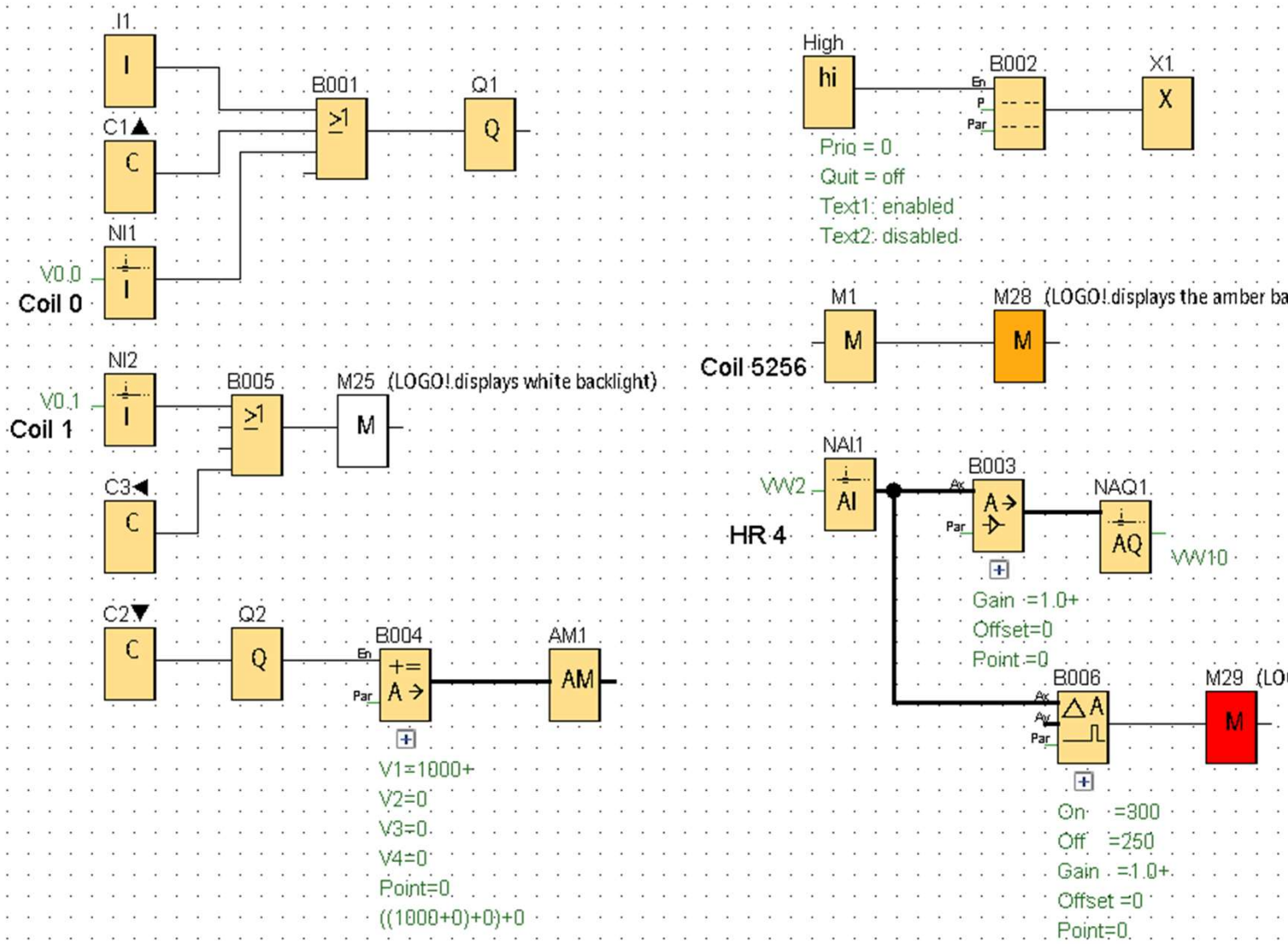


Bit Lamp



SENSOR
Read Discrete Input 1
Digital Inputs 1

1 E:\A_Tranning_2022\PLC\Logo 8 Seimens\...\Modbus_Msg01.snp



192.168.1.101

Networking | Sharing

Connect using:

Fortinet Virtual Ethernet Adapter (NDIS 6.30)

Configure...

This connection uses the following items:

- Client for Microsoft Networks
- File and Printer Sharing for Microsoft Networks
- VirtualBox NDIS6 Bridged Networking Driver
- QoS Packet Scheduler
- FortiClient NDIS 6.3 Packet Filter Driver
- Bridge Driver
- Internet Protocol Version 4 (TCP/IPv4)

Install... | Uninstall | Properti

Description

Transmission Control Protocol/Internet Protocol. The defa wide area network protocol that provides communication across diverse interconnected networks.

Network and Internet › Network Connections ›

Organize

- Bluetooth Network Connection — Disabled — Bluetooth Device (Personal Ar...
- Ethernet — Network cable unplugged — Fortinet Virtual Ethernet Adap...
- fortissl — Disconnected — PPPoP WAN Adapter
- vEthernet (Default Switch) — Enabled — Hyper-V Virtual Ethernet Ada...
- VirtualBox Host-Only Network — Disabled — VirtualBox Host-Only Ethernet...
- Wi-Fi — wjeab2016_5G — Intel(R) Wi-Fi 6 AX201 160MHz

Internet Protocol Version 4 (TCP/IPv4) Properties

General

You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.

- Obtain an IP address automatically
- Use the following IP address:

IP address: 192 . 168 . 1 . 200

Subnet mask: 255 . 255 . 255 . 0

Default gateway: . . .

Set IP
192.168.1.200

Modbus address space

Address Type	Range	Mapped Modbus Address	Direction	Unit
I	1 - 24	Discrete Input (DI) 1 - 24	R	bit
Q	1 - 20	Coil 8193 - 8212	R/W	bit
M	1 - 64	Coil 8257 - 8320	R/W	bit
V	0.0 - 850.7	Coil 1 - 6808	R/W	bit
AI	1 - 8	Input Register (IR) 1 - 8	R	word
VW	0 - 850	Holding Register (HR) 1 - 425	R/W	word
AQ	1 - 8	Holding Register (HR) 513 - 520	R/W	word

Offset -1

Q1 = Coil (8193-1) = Coil 8192

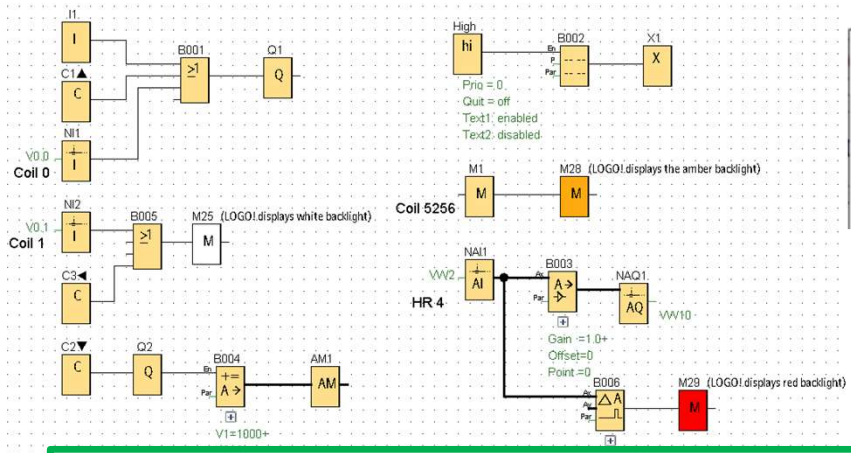
M1 = Coil (8257-1) = Coil 8256

Offset /2

VM1 = HR0

VM2 =HR1

VM4 =HR2



Modbus TCP Settings

Slave IP 192.168.1__.101

TCP Port 502

Modbus Mode TCP Slave Addr 1 Scan Rate (ms) 3000

Function Code Write Single Coil (0x05) Start Address 1

Number of Coils 1 Data Format Bin

1

Modbus Mode TCP Slave Addr 1 Scan Rate (ms) 3000

Function Code Read Coils (0x01) Start Address 0

Number of Coils 8 Data Format Bin

0	1	0	0	0	0	0	0	x	x

Offset -1
Q1 = Coil 0

Modbus Mode TCP Slave Addr 1 Scan Rate (ms) 3000

Function Code Write Single Coil (0x05) Start Address 8256

Number of Coils 1 Data Format Bin

1

Modbus Mode TCP Slave Addr 1 Scan Rate (ms) 3000

Function Code Read Holding Registers (0x03) Start Address 0

Number of Registers 8 Data Format Dec Signed ☐

512	333	0	0	0	333	0	0	x	x

Offset /2
VM2 =HR1
VM4 =HR2

Modbus Mode TCP Slave Addr 1 Scan Rate (ms) 3000

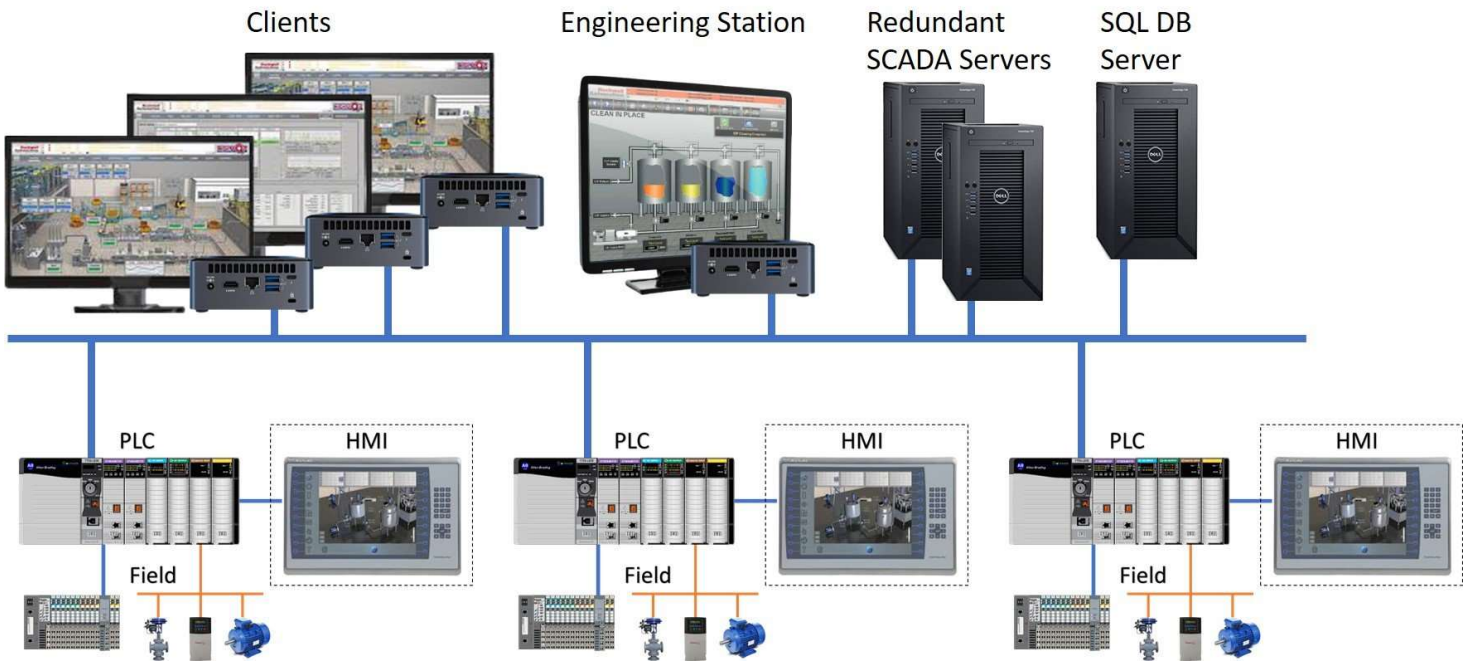
Function Code Write Single Register (0x06) Start Address 1

Number of Registers 1 Data Format Dec Signed ☐

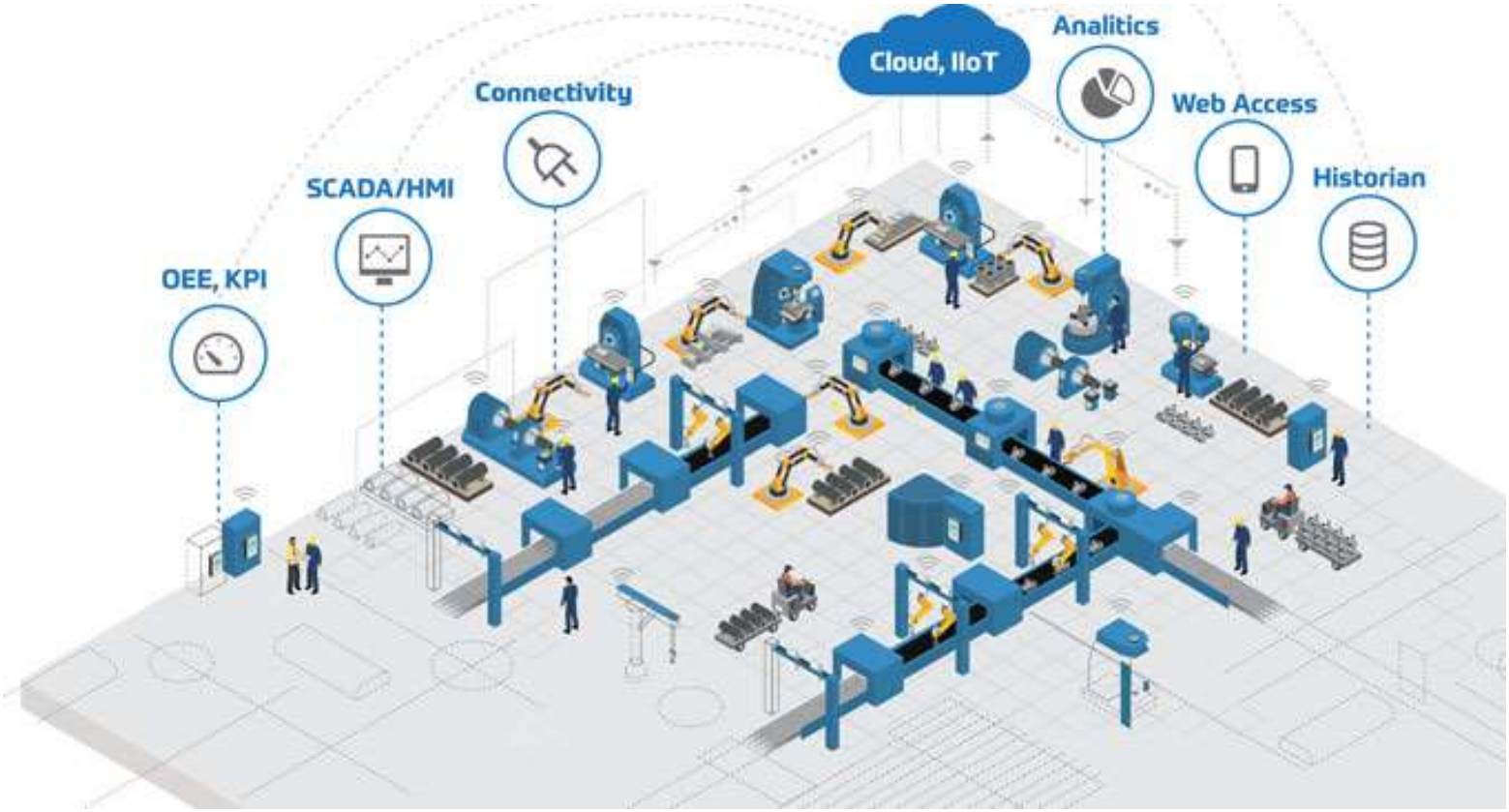
333

WHAT IS SCADA

- The utilization of Supervisory Control and Data Acquisition (SCADA)



IIOT & Industrial 4.0

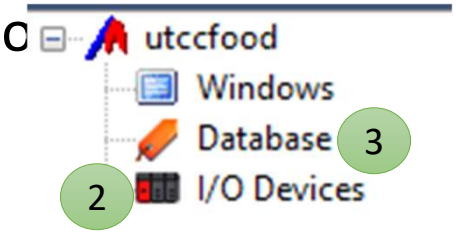


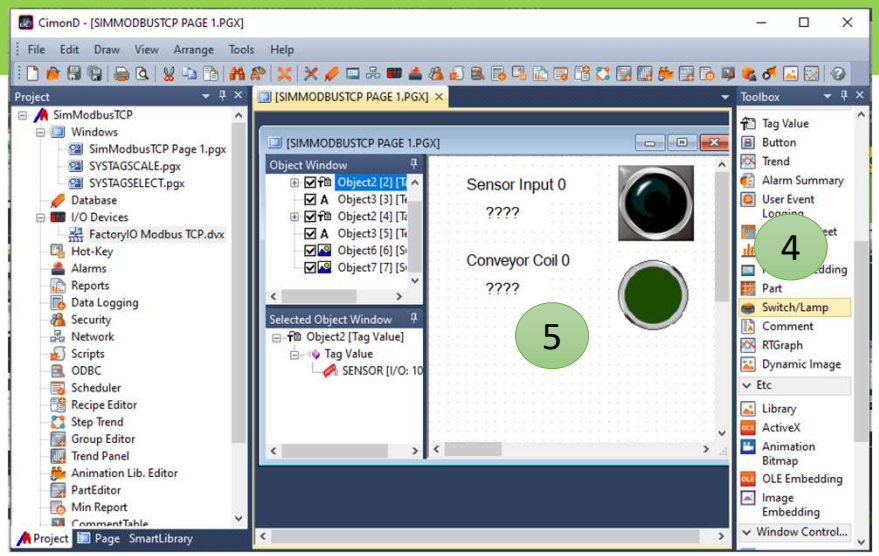
https://www.tdsthailand.com/industrial/detail.php?i=12

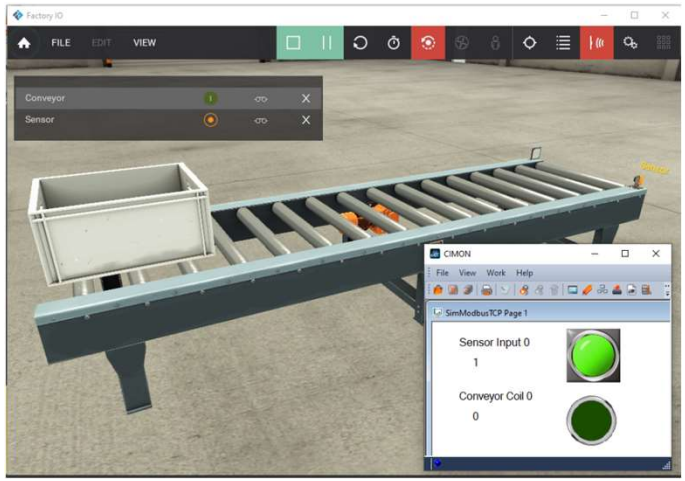
YouTube SCADA - 02 FactoryIO

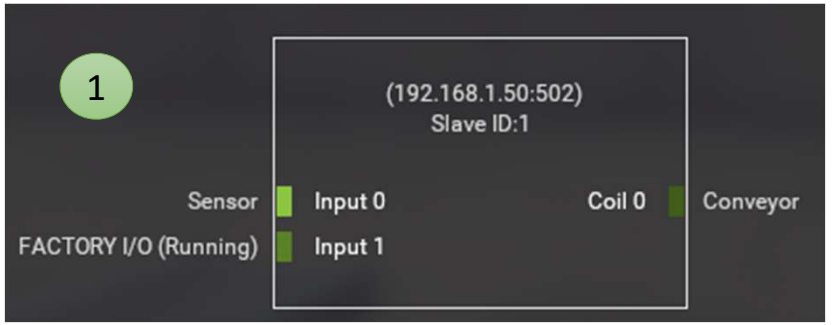
SCADA Demo

- Cimo



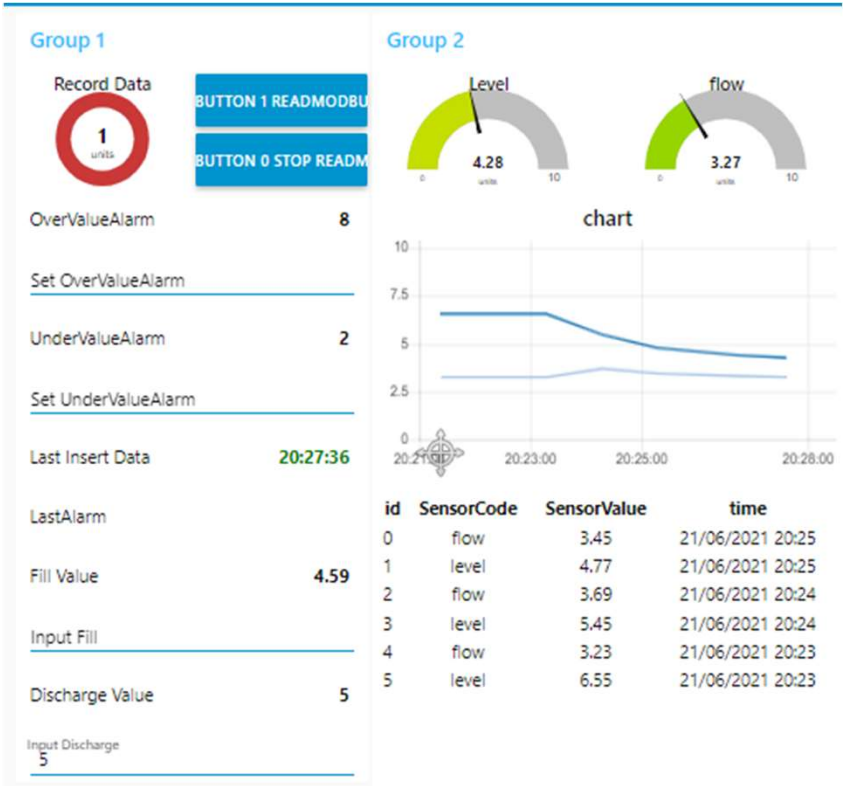






Youtube Node-Red Level Control

Node-Red Control FactoryIO (Advanced Level Control Dashboard)



id	SensorCode	SensorValue	time
0	flow	3.45	21/06/2021 20:25
1	level	4.77	21/06/2021 20:25
2	flow	3.69	21/06/2021 20:24
3	level	5.45	21/06/2021 20:24
4	flow	3.23	21/06/2021 20:23
5	level	6.55	21/06/2021 20:23

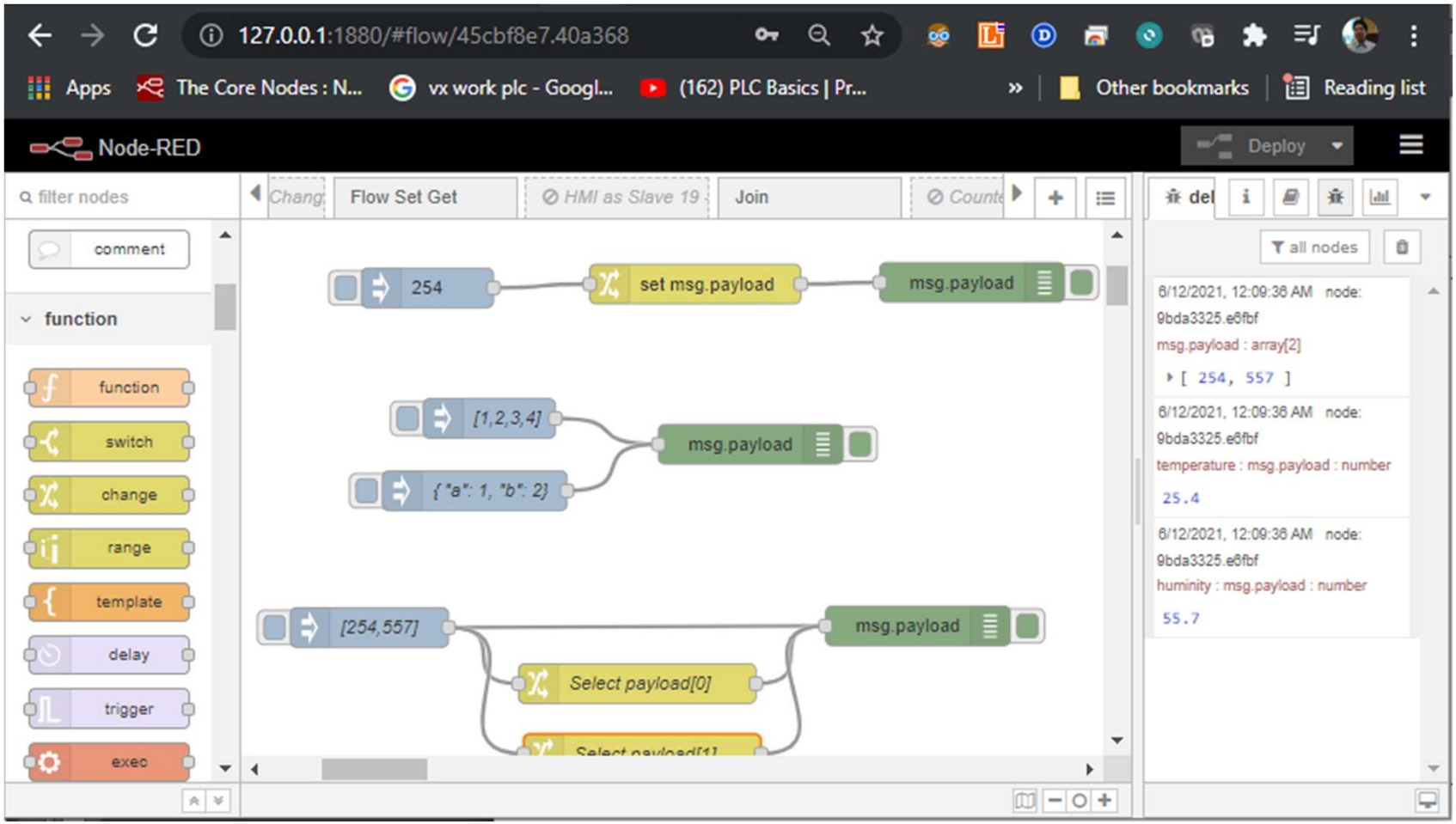
UtccFoodIotCodes/Node-Red/Node-Red Level Control.json

Node-Red

- *Node-RED is a programming tool for wiring together hardware devices, APIs and online services in new and interesting ways.*
- Cmd
  - Node-red

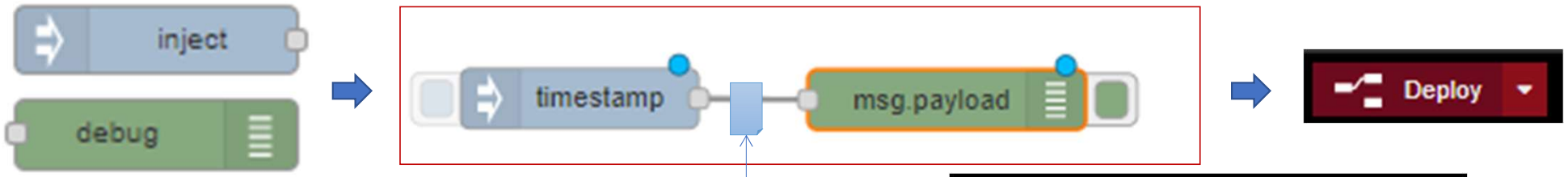
- http://localhost:1880
- 127.0.0.1:1880

Node-RED is a programming tool for wiring together hardware devices, APIs and online services in new and interesting ways.



Basic Nodes

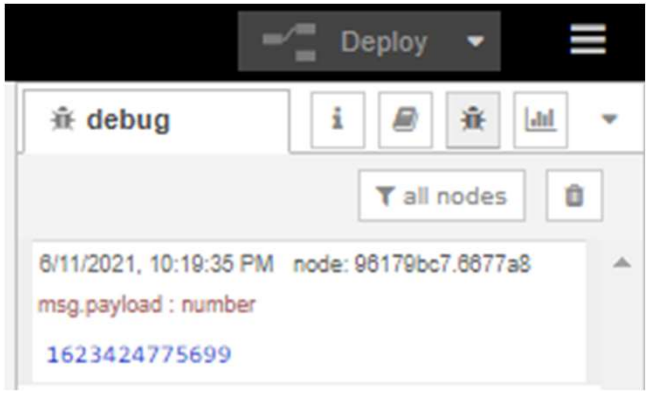
- Input Node นำข้อมูลเข้า node-red
- Function Node กำหนดการทำงาน เปลี่ยนแปลงค่า
- Output Node แสดงผลข้อมูลในรูปแบบต่าง




```
{
   "_msgid": "12345",
   "payload": "..."
   "topic": "..."
}
```

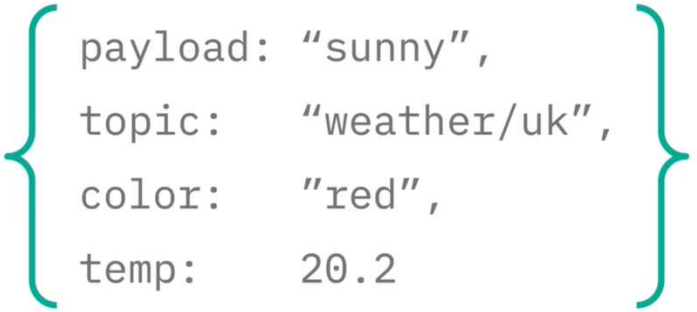
msg
- payload
- topic

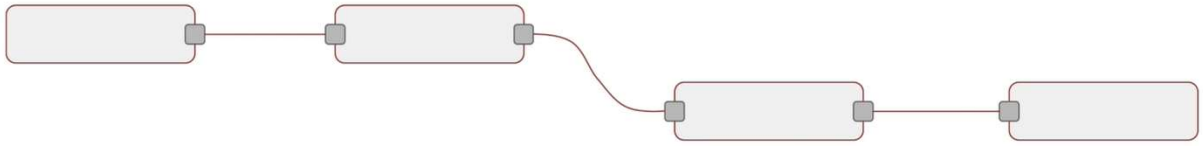
JSON Object



JSON Object (Data Transfer)

- Boolean - true, false
- Number - eg 0, 123.4
- String - "hello"
- Array - [1,2,3,4]
- Object - { "a": 1, "b": 2}
- Null





JSON Object Examples

ชื่อตัวแปร ค่าตัวแปร

{ "name " : "John"} ข้อความ

{ "age " : 30 } ตัวเลข

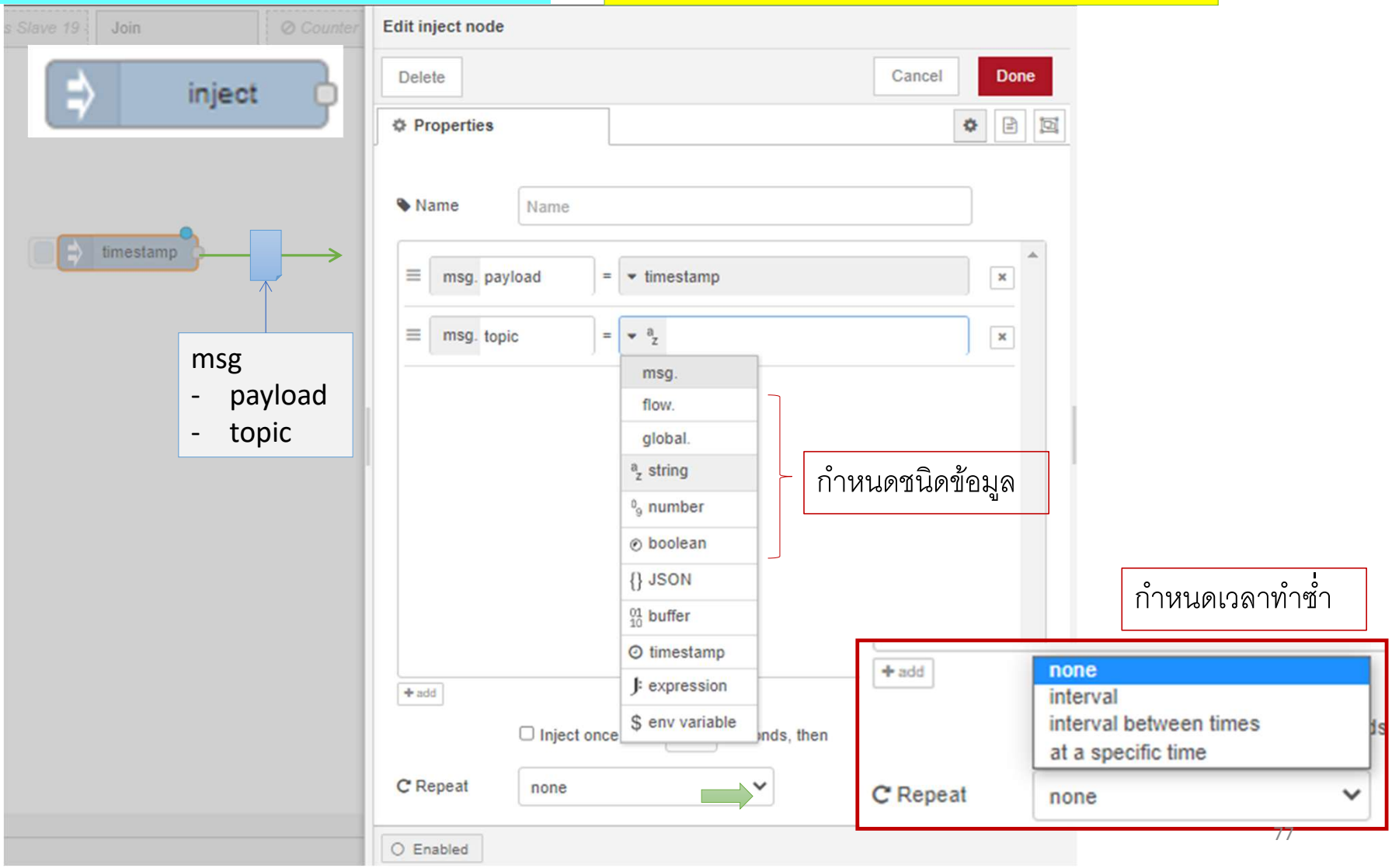
{"name " : "John " , "age " : 30 } หลายตัวแปร

Array Object

[{ "name":"John", "age":30 } , { "name“ : "jenny", "age":22 }]

payload and **topic** properties (default)

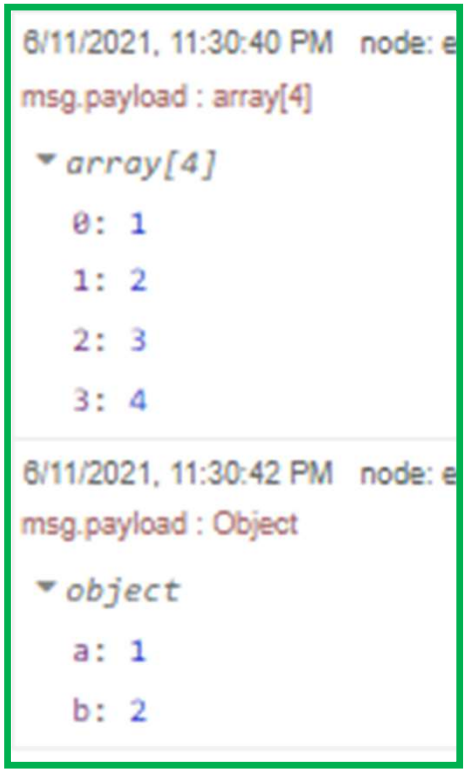
YouTube Node-Red - 01 Basic Debug

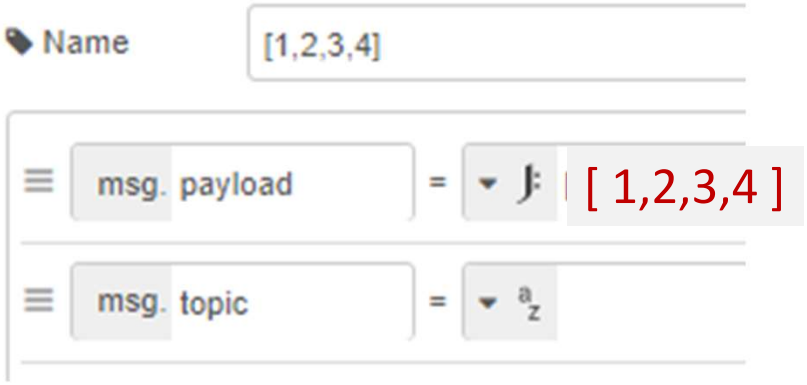


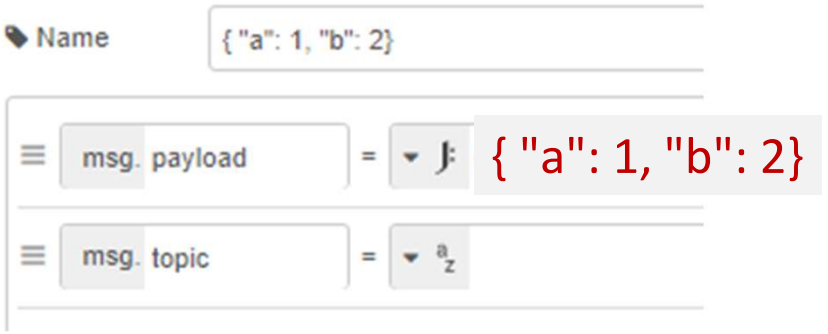
กำหนดค่า payload และการแสดงค่า Debug

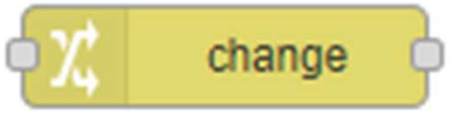
JavaScript Types

boolean : true / false
number : 123
string : "hello"
array : [1, 2, 3, 4]
object : { "color": "red" }

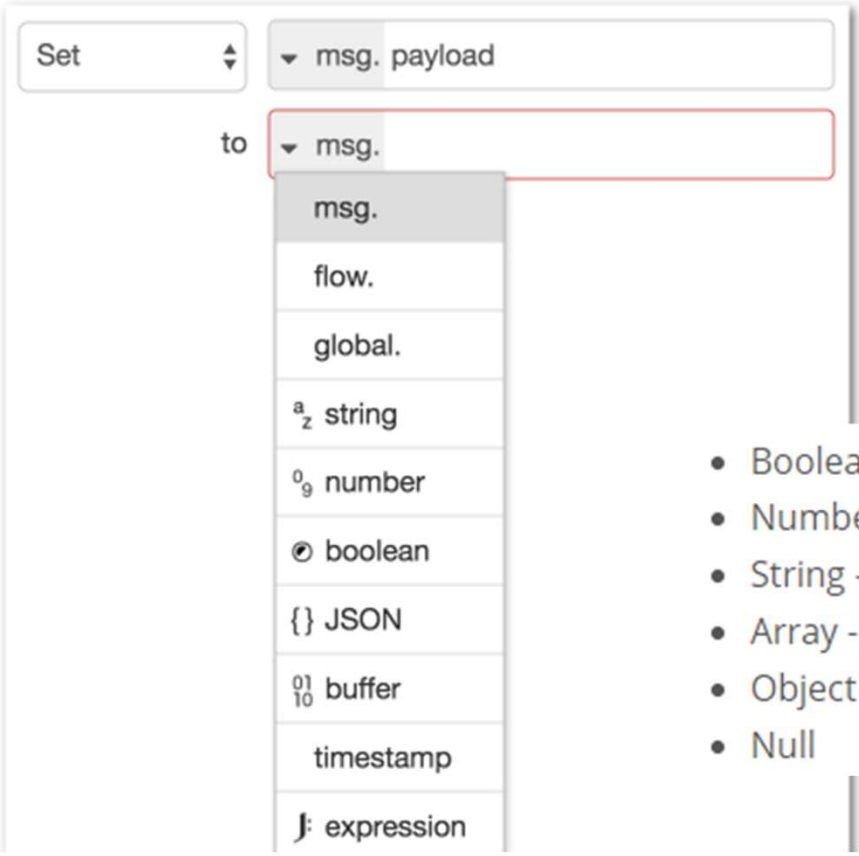








- `Set` a property to a value,
- `Change` a String property by performing a search and replace,
- `Delete` a property,
- `Move` a property.

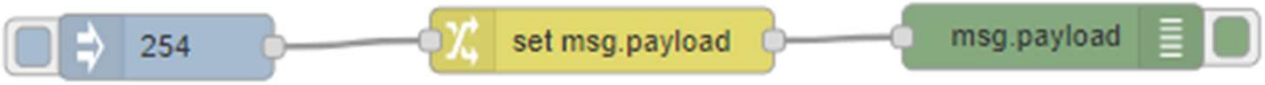


- Boolean - `true`, `false`
- Number - eg `0`, `123.4`
- String - `"hello"`
- Array - `[1,2,3,4]`
- Object - `{ "a": 1, "b": 2}`
- Null

```
{
    "payload": {
        "temperature": 90,
        "temperature_c": 32.22222
    }
}
```

Change กำหนดค่า payload / 10

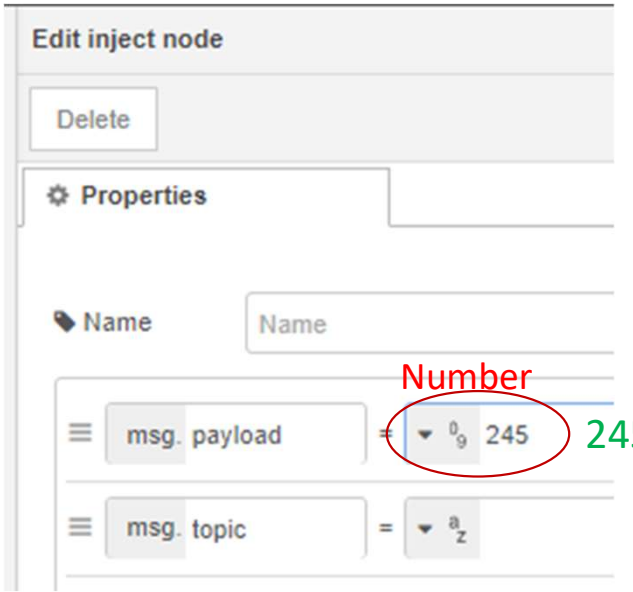
GitHub Node-Red - 02 Basic Change



payload (254) - input

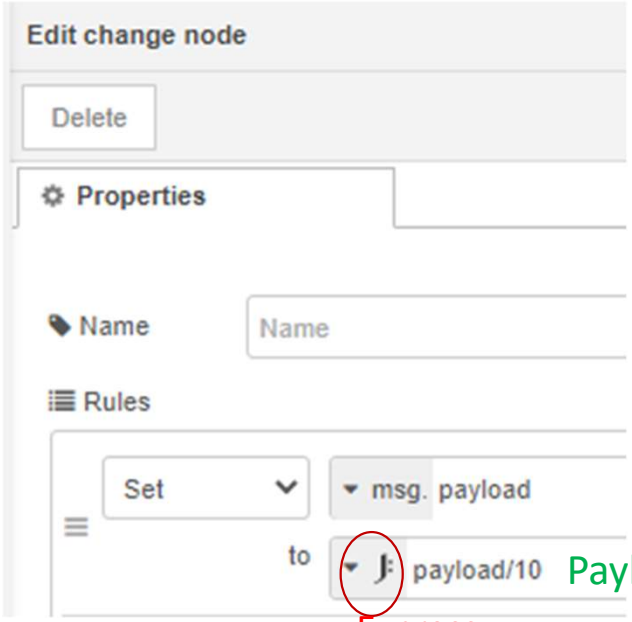
Change (254/10)

Payload 25.4 - output



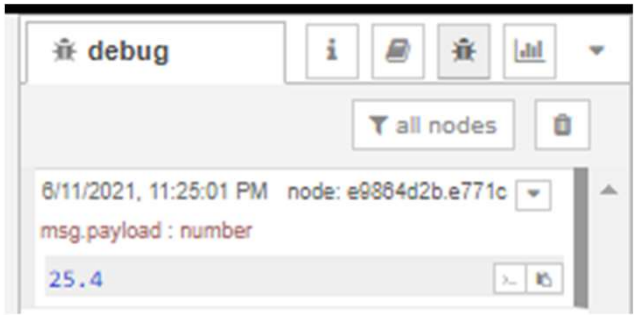
Number

245

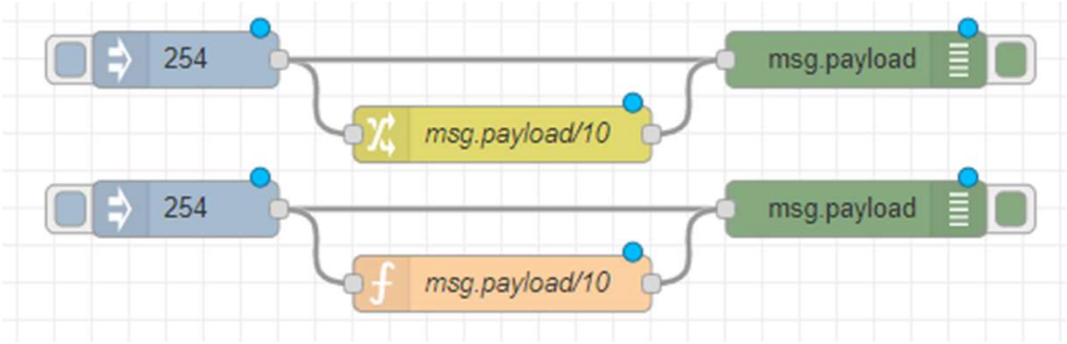


Payload/10

Express

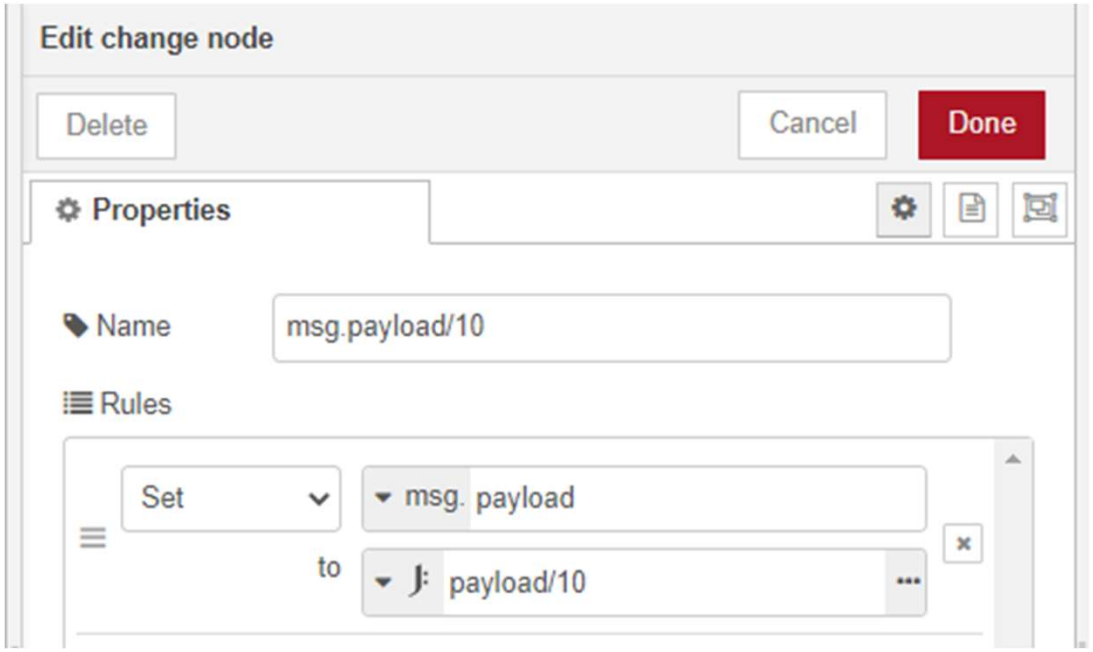


https://github.com/chalermchonv/UtccFoodIotCodes/tree/main/Node-Red

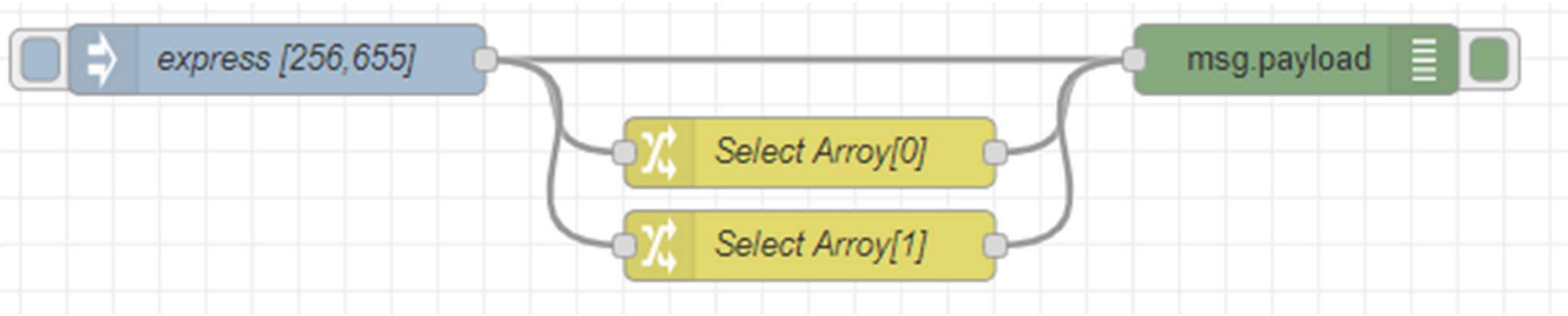


6/16/2021, 9:25:53 PM node: 1d98376f.4e0a19
msg.payload : number
254

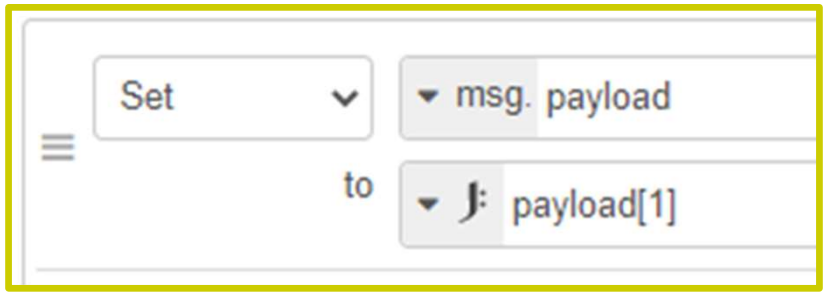
6/16/2021, 9:25:53 PM node: 1d98376f.4e0a19
msg.payload : number
25.4

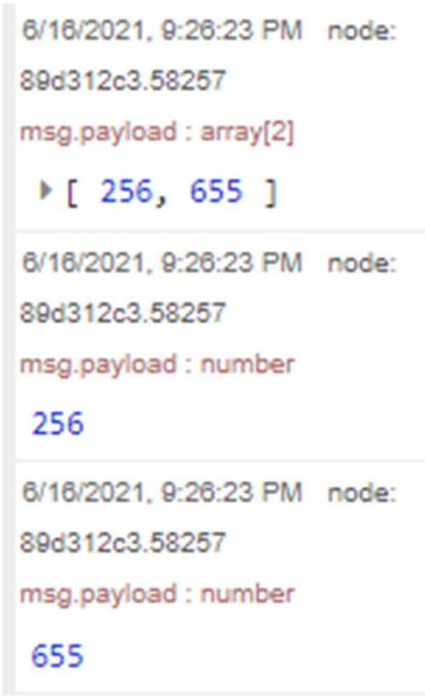


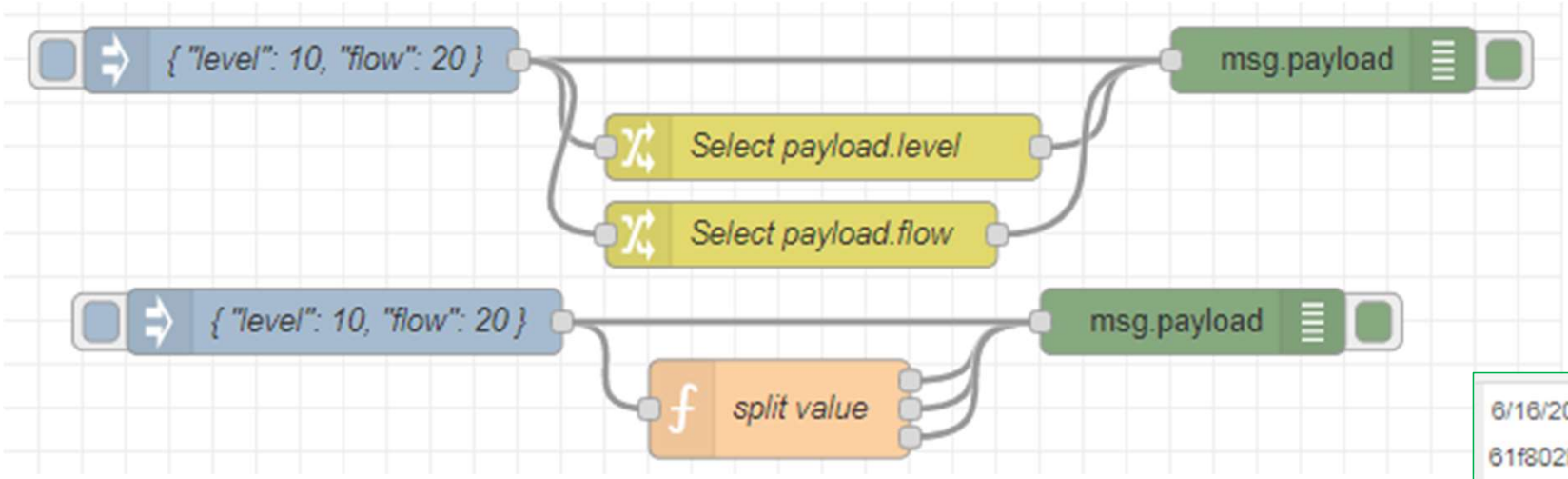

```
msg.payload = msg.payload/10
;return msg;
```

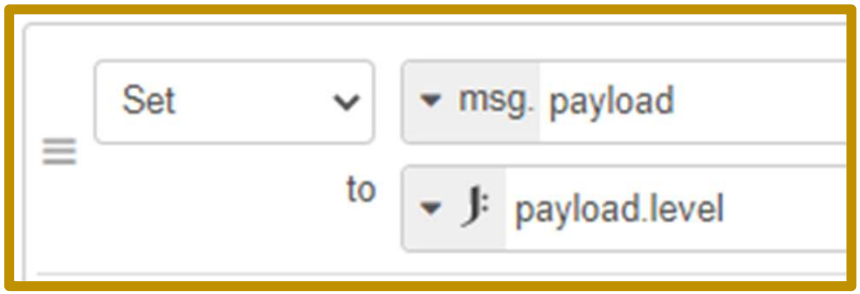

express [256,655]
Select Arroy[0]
Select Arroy[1]
msg.payload

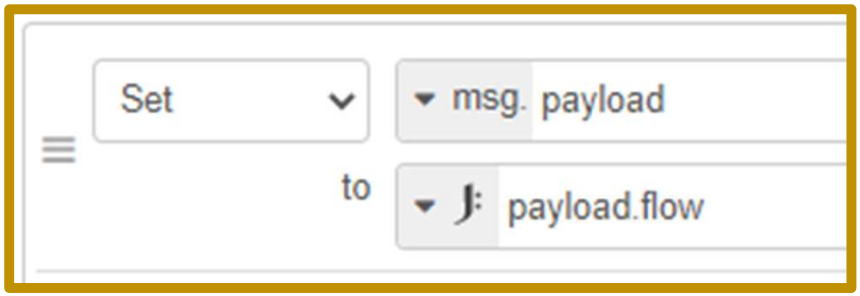

Set
msg. payload
to
payload[0]

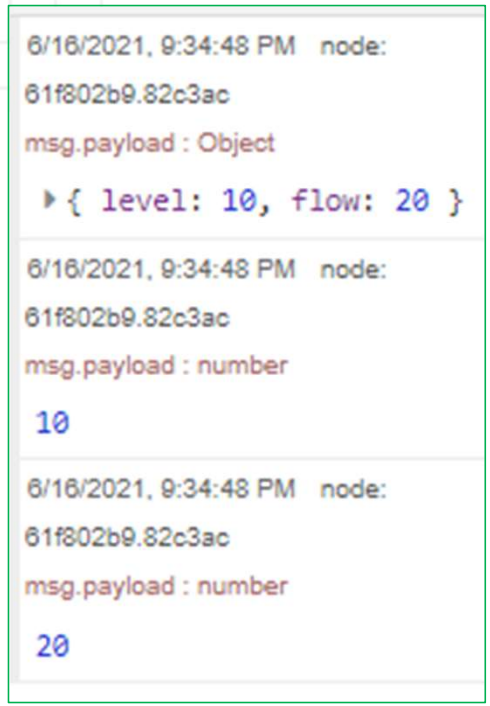

Set
msg. payload
to
payload[1]


6/16/2021, 9:26:23 PM node:
89d312c3.58257
msg.payload : array[2]
[256, 655]
6/16/2021, 9:26:23 PM node:
89d312c3.58257
msg.payload : number
256
6/16/2021, 9:26:23 PM node:
89d312c3.58257
msg.payload : number
655


{ "level": 10, "flow": 20 }
msg.payload
Select payload.level
Select payload.flow
{ "level": 10, "flow": 20 }
msg.payload
split value

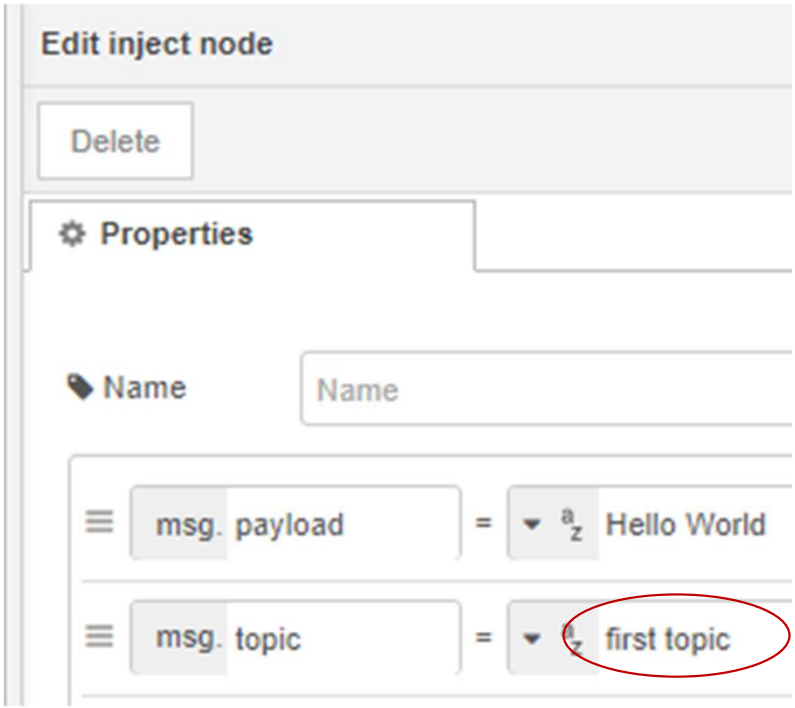

Set
msg. payload
to
payload.level

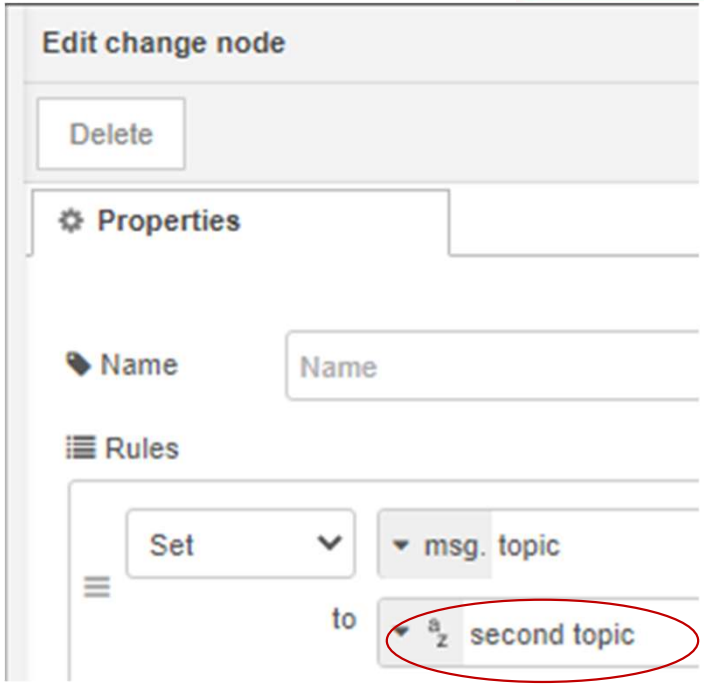

Set
msg. payload
to
payload.flow


6/16/2021, 9:34:48 PM node:
61f802b9.82c3ac
msg.payload : Object
{ level: 10, flow: 20 }
6/16/2021, 9:34:48 PM node:
61f802b9.82c3ac
msg.payload : number
10
6/16/2021, 9:34:48 PM node:
61f802b9.82c3ac
msg.payload : number
20

Change กำหนดค่า topic

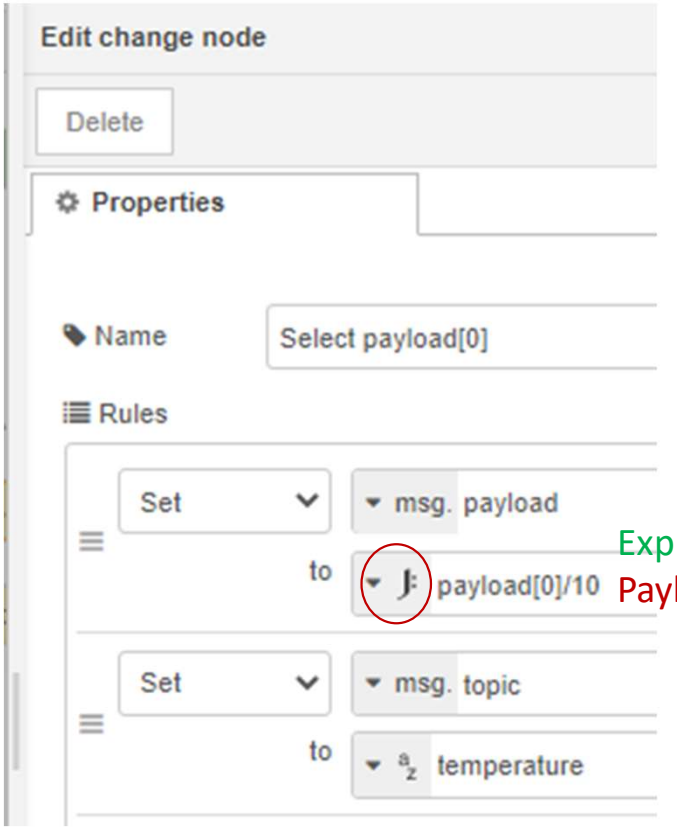
GitHub Node-Red - 02 Basic Change



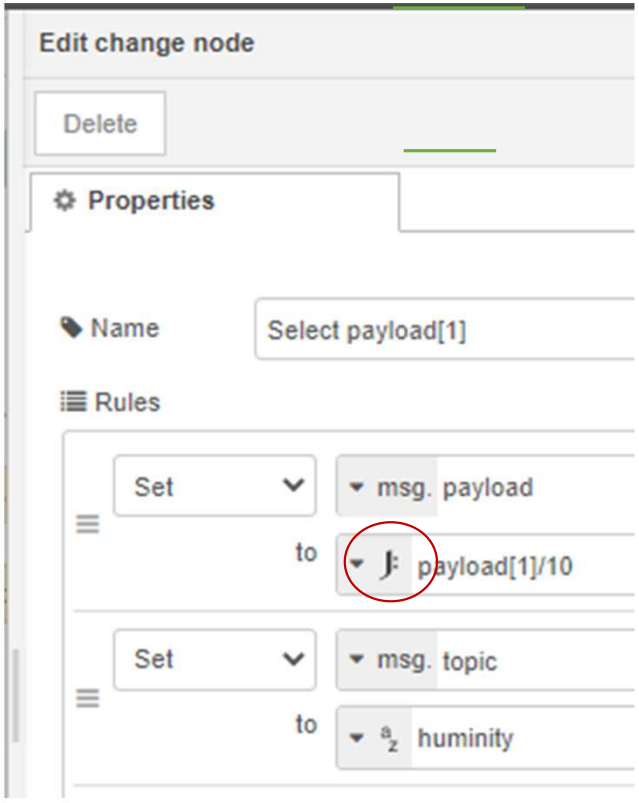


แยกค่าเป็น สองทางและกำหนด **topic** ใหม่ GitHub Node-Red - 02 Change-Function

payload[0] , payload[1]



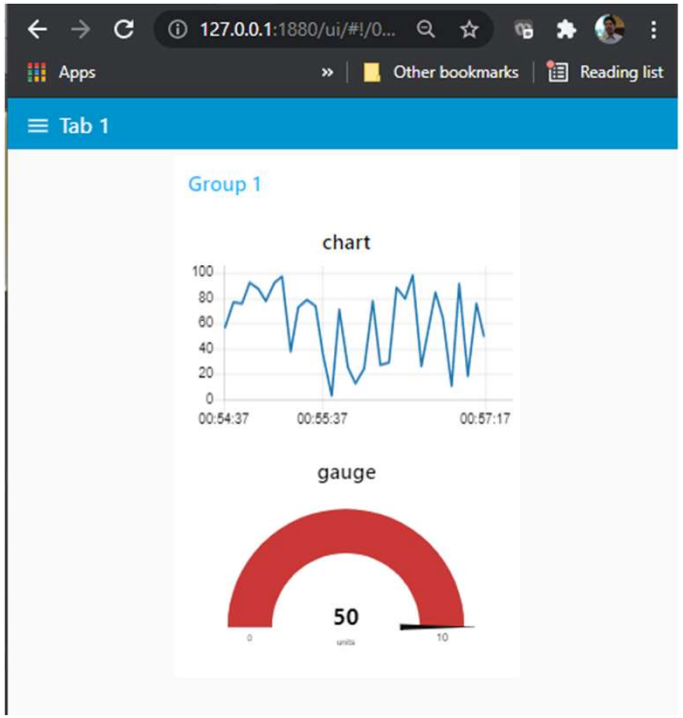
Express
Payload[0]/10



Express
Payload[1]/10

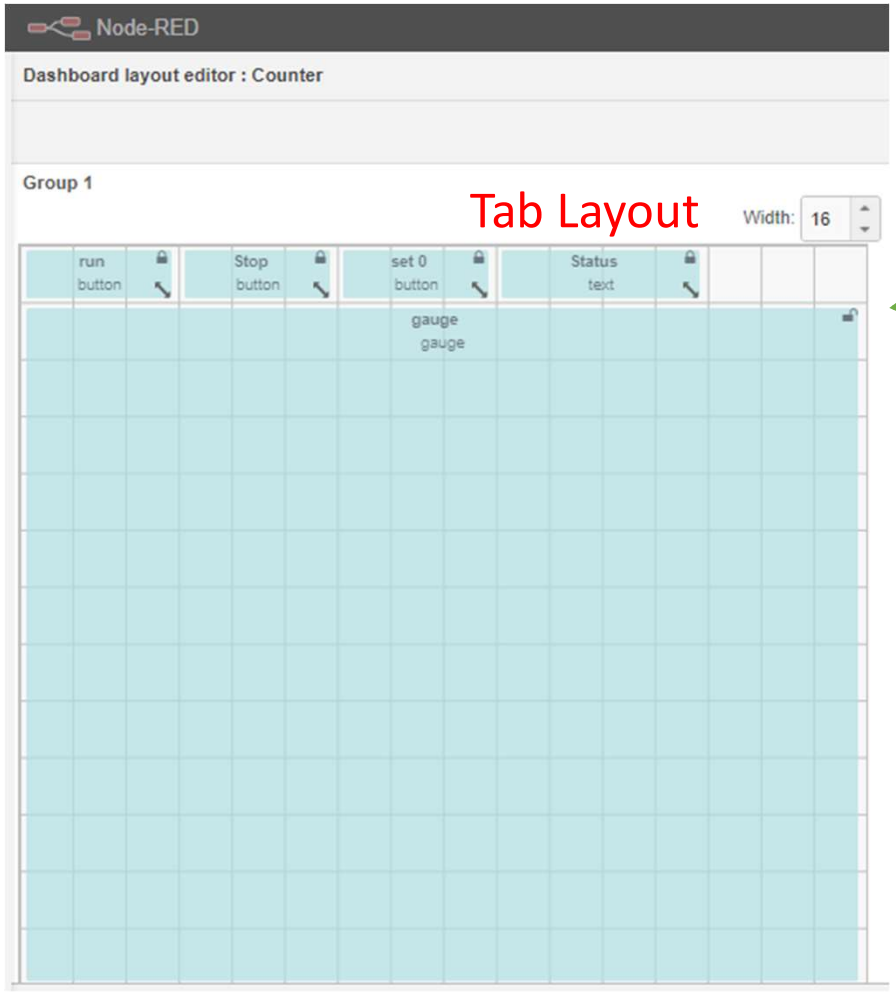
Dashboard Module

http://127.0.0.1:1880/

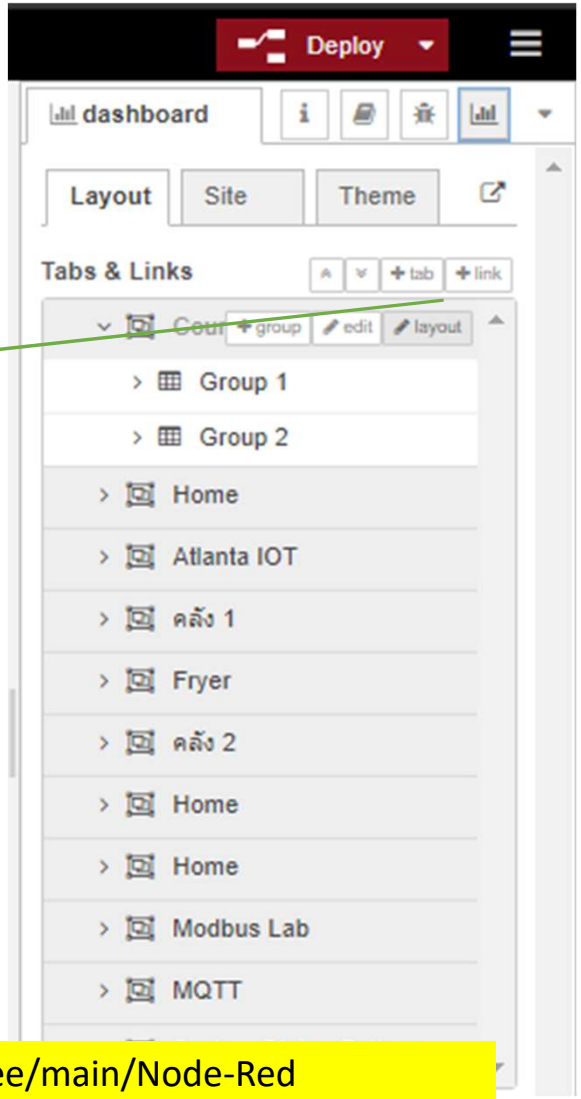


สร้าง Tab และ Group เพื่อกำหนดพื้นที่แสดง

GitHub Node-Red 03 Basic Dashboard



Tab Layout

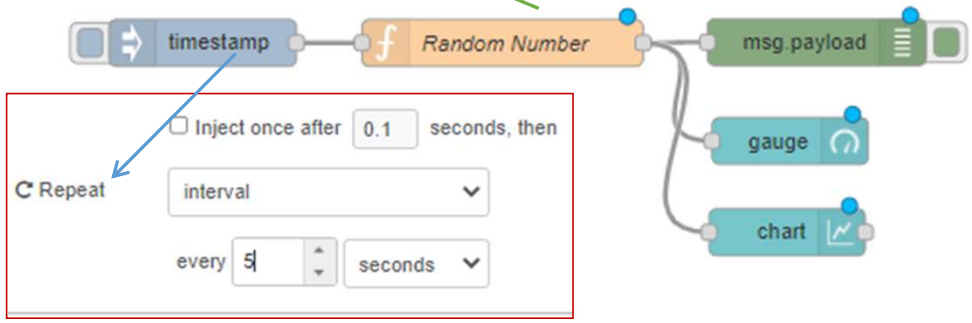


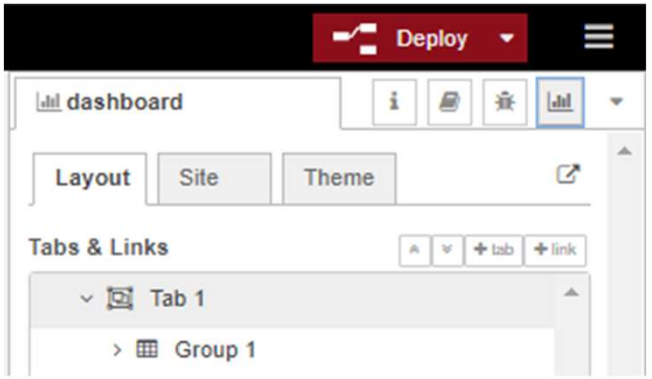
https://github.com/chalermchonv/UtccFoodIotCodes/tree/main/Node-Red

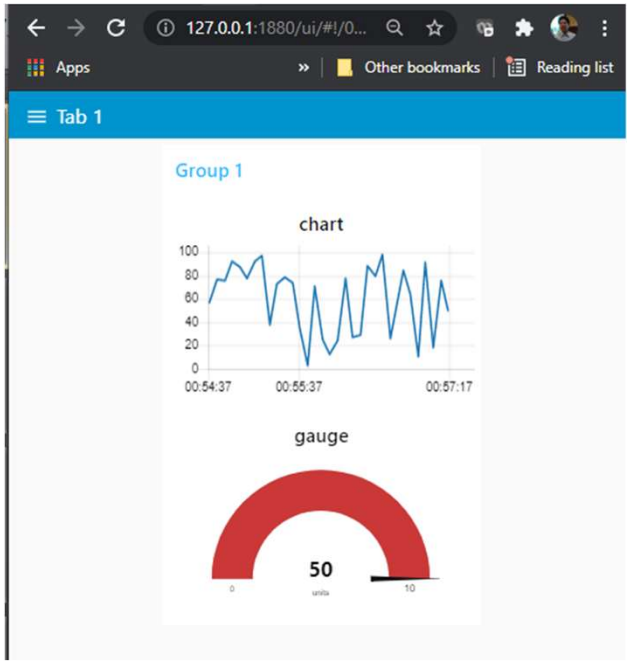
Basic Dashboard Control

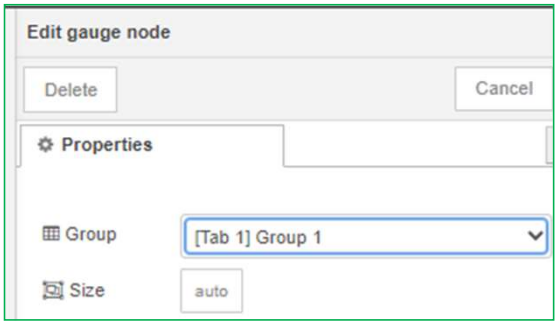
GitHub Node-Red 03 Basic Dashboard

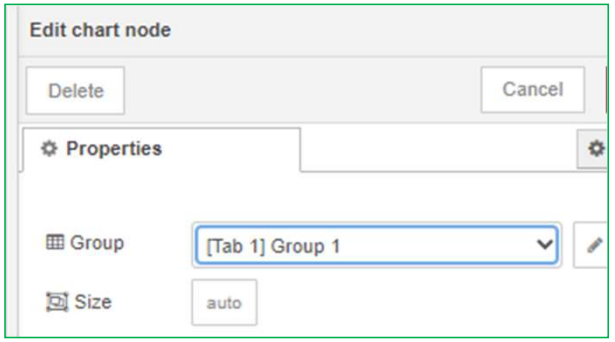
```
msg.payload = Math.round( Math. Random() *100)
return msg;
```

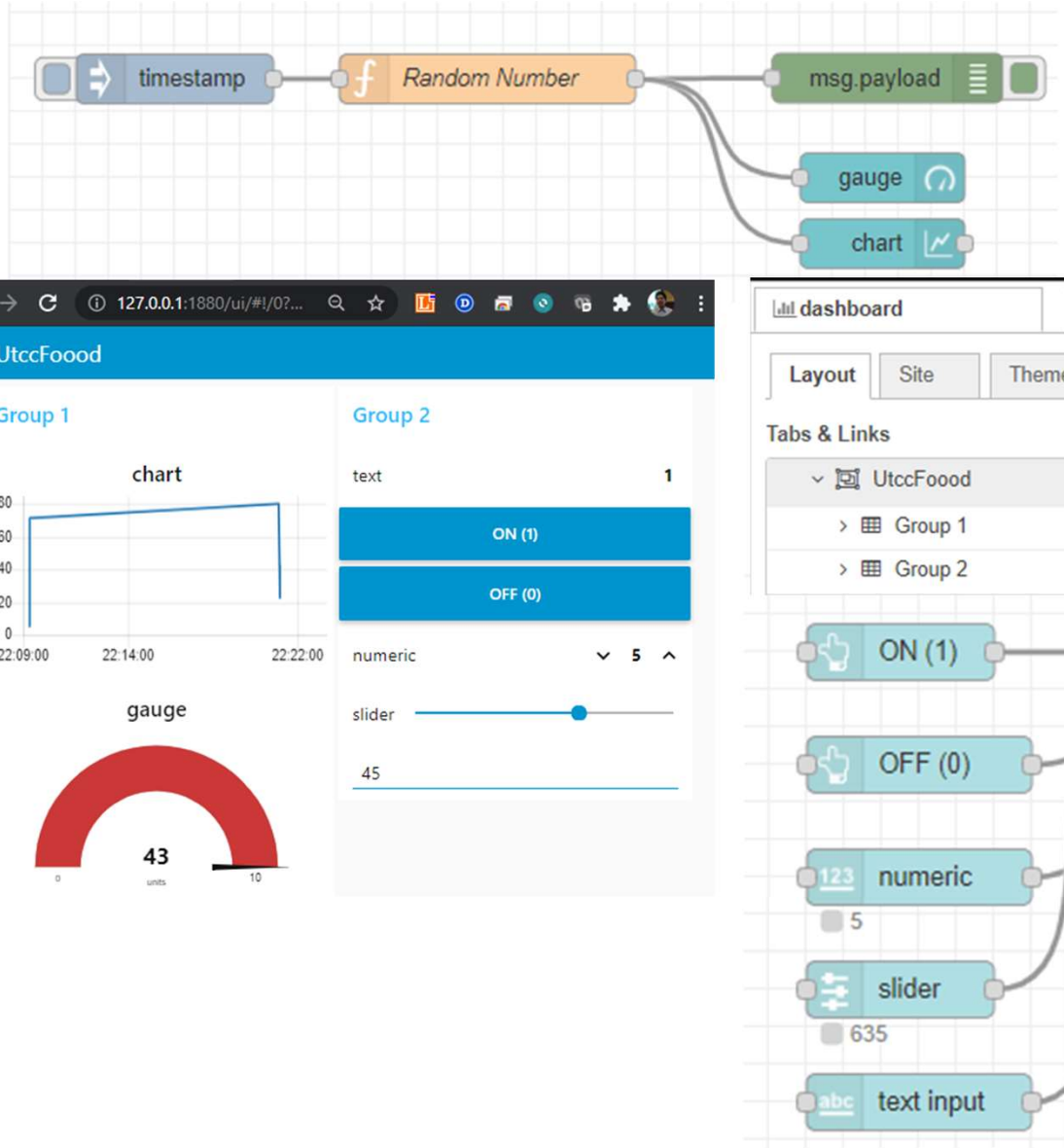






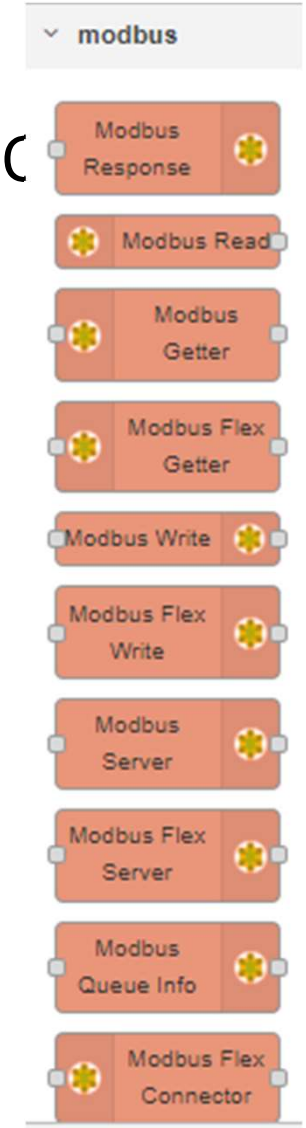


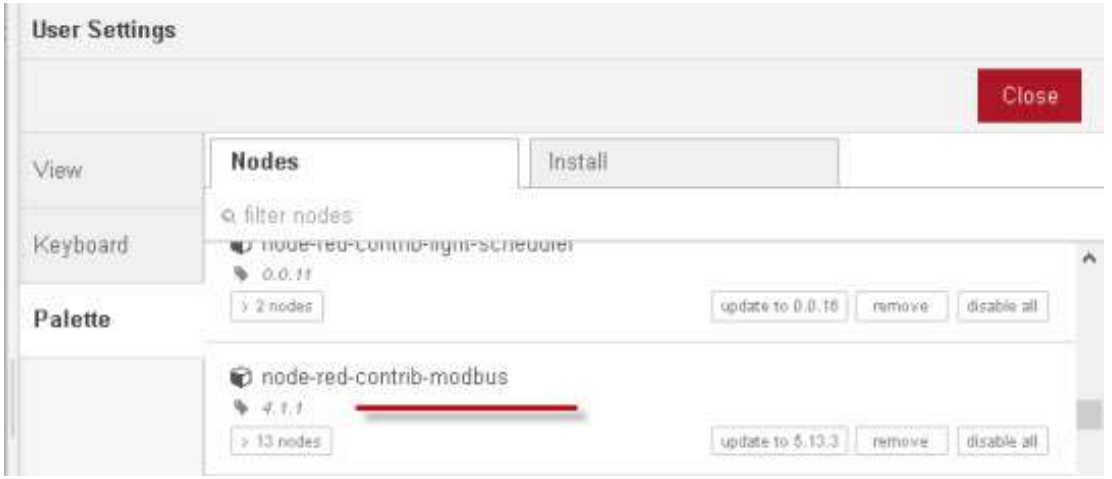



timestamp
Random Number
msg.payload
gauge
chart
127.0.0.1:1880/ui/#!/0?...
UtccFoood
Group 1
chart
80
60
40
20
0
22:09:00
22:14:00
22:22:00
gauge
43
0
10
Group 2
text
1
ON (1)
OFF (0)
numeric
5
slider
45
dashboard
Layout
Site
Theme
Tabs & Links
+ tab
+ link
UtccFoood
Group 1
Group 2
ON (1)
text
OFF (0)
numeric
5
slider
635
text input

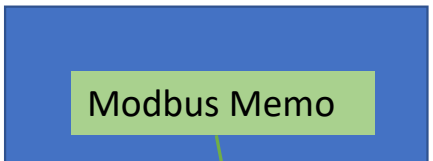
YouTube Node-Red 04 Modbus

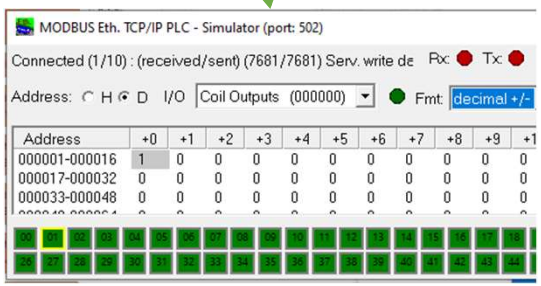
Mc

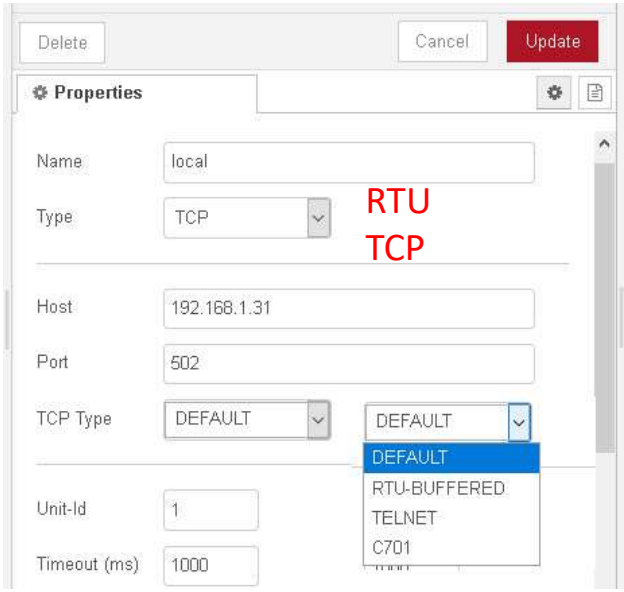


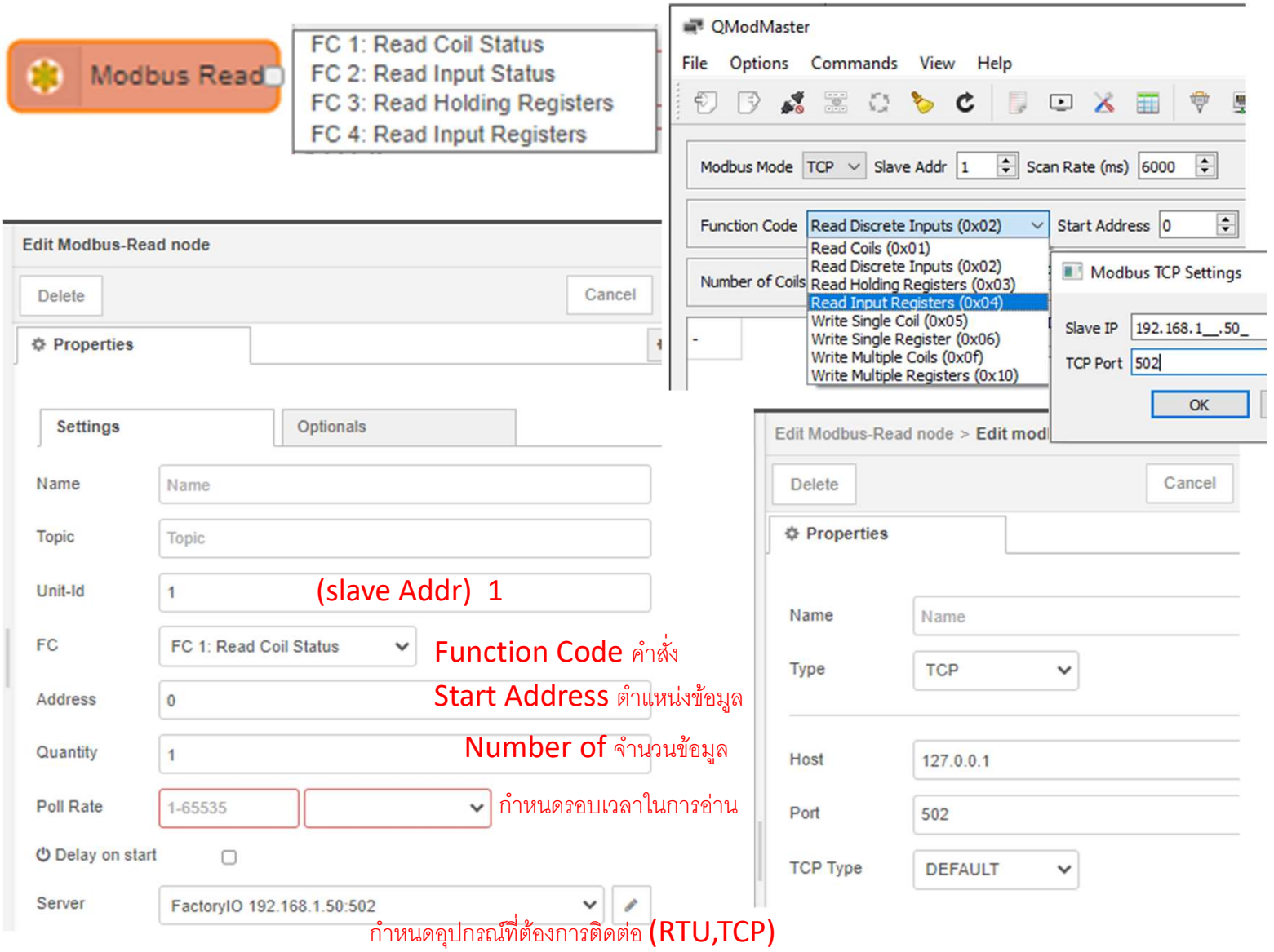


Sensor , Machine, PLC,HMI

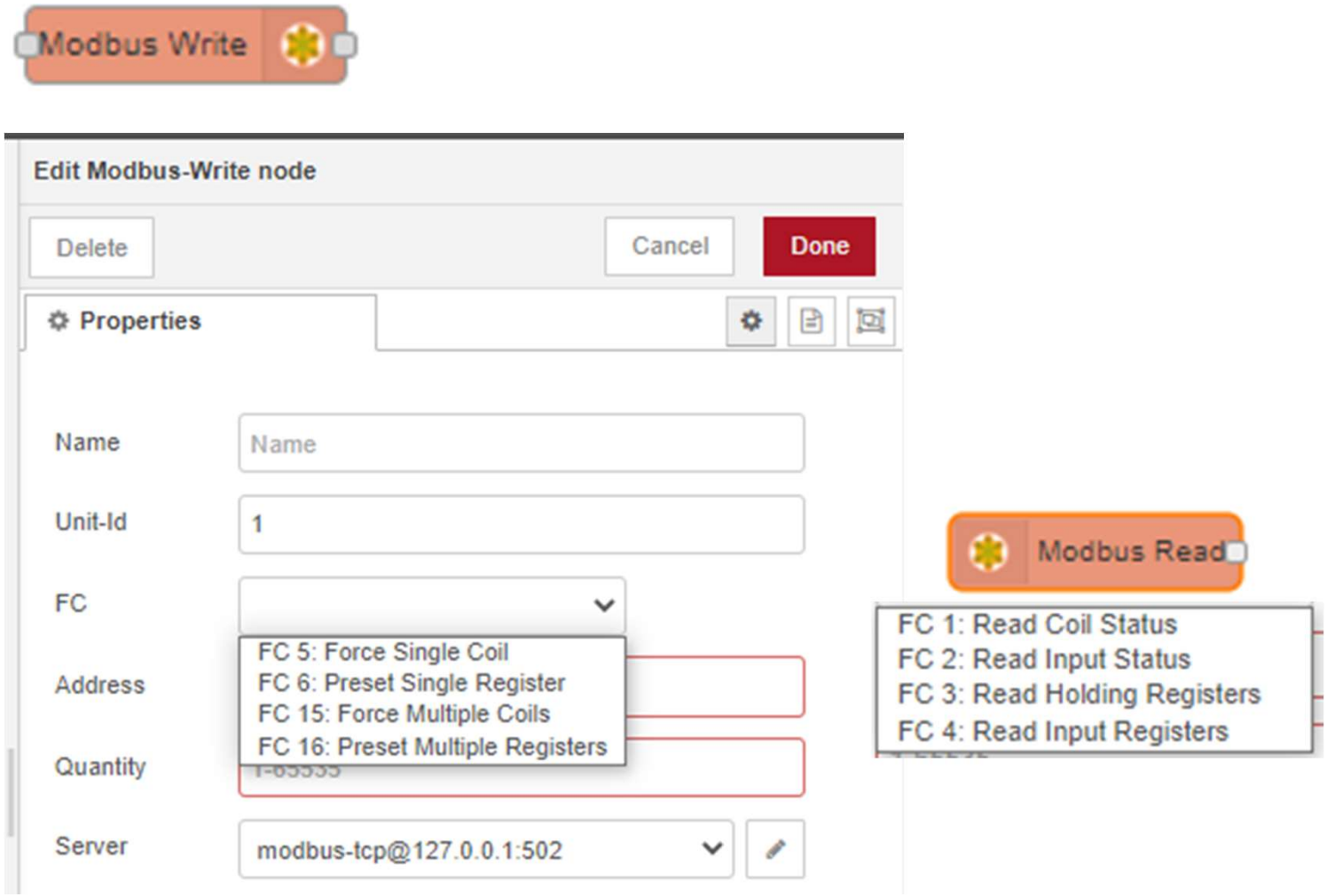




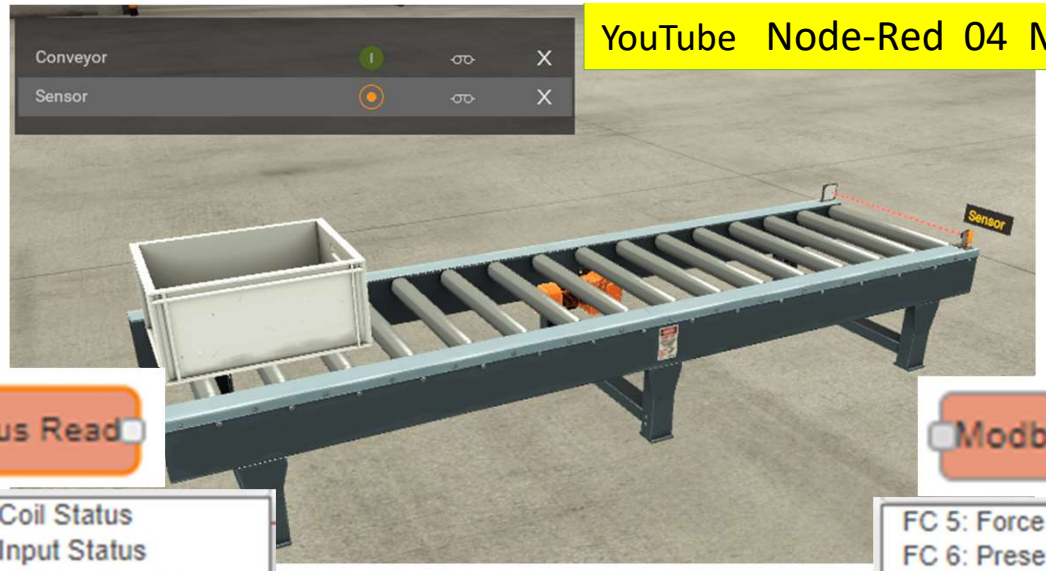



Modbus Read
FC 1: Read Coil Status
FC 2: Read Input Status
FC 3: Read Holding Registers
FC 4: Read Input Registers
QModMaster
File Options Commands View Help
Modbus Mode TCP Slave Addr 1 Scan Rate (ms) 6000
Function Code Read Discrete Inputs (0x02) Start Address 0
Number of Coils
Read Coils (0x01)
Read Discrete Inputs (0x02)
Read Holding Registers (0x03)
Read Input Registers (0x04)
Write Single Coil (0x05)
Write Single Register (0x06)
Write Multiple Coils (0x0f)
Write Multiple Registers (0x10)
Modbus TCP Settings
Slave IP 192.168.1__.50_
TCP Port 502
OK
Edit Modbus-Read node
Delete
Cancel
Properties
Settings
Optionals
Name
Topic
Unit-Id 1
(slave Addr) 1
FC FC 1: Read Coil Status
Function Code คำสั่ง
Address 0
Start Address ตำแหน่งข้อมูล
Quantity 1
Number of จำนวนข้อมูล
Poll Rate 1-65535
กำหนดรอบเวลาในการอ่าน
Delay on start
Server FactoryIO 192.168.1.50:502
กำหนดอุปกรณ์ที่ต้องการติดต่อ (RTU,TCP)
Edit Modbus-Read node > Edit mod
Delete
Cancel
Properties
Name
Type TCP
Host 127.0.0.1
Port 502
TCP Type DEFAULT

YouTube Node-Red 05 Modbus



YouTube Node-Red 04 Modbus FactoryIO



Modbus Read

FC 1: Read Coil Status
FC 2: Read Input Status
FC 3: Read Holding Registers
FC 4: Read Input Registers

คำสั่ง FC 1 (Re

Modbus Write

FC 5: Force Single Coil
FC 6: Preset Single Register
FC 15: Force Multiple Coils
FC 16: Preset Multiple Registers

Factory IO

ควบคุมจาก Server (Master) ภายนอก (Note-Red , QModMaster, PLC, HMI)

DRIVER Modbus TCP/IP Server START CONFIGURATION CLEAR

SENSORS

FACTORY I/O (Paused)
FACTORY I/O (Reset)
FACTORY I/O (Running)
FACTORY I/O (Time Scale)
Sensor

Input

(192.168.1.50:502)
Slave ID:1

Sensor
I/O (Running)

Input 0
Input 1

Coil 0

Output -Coil

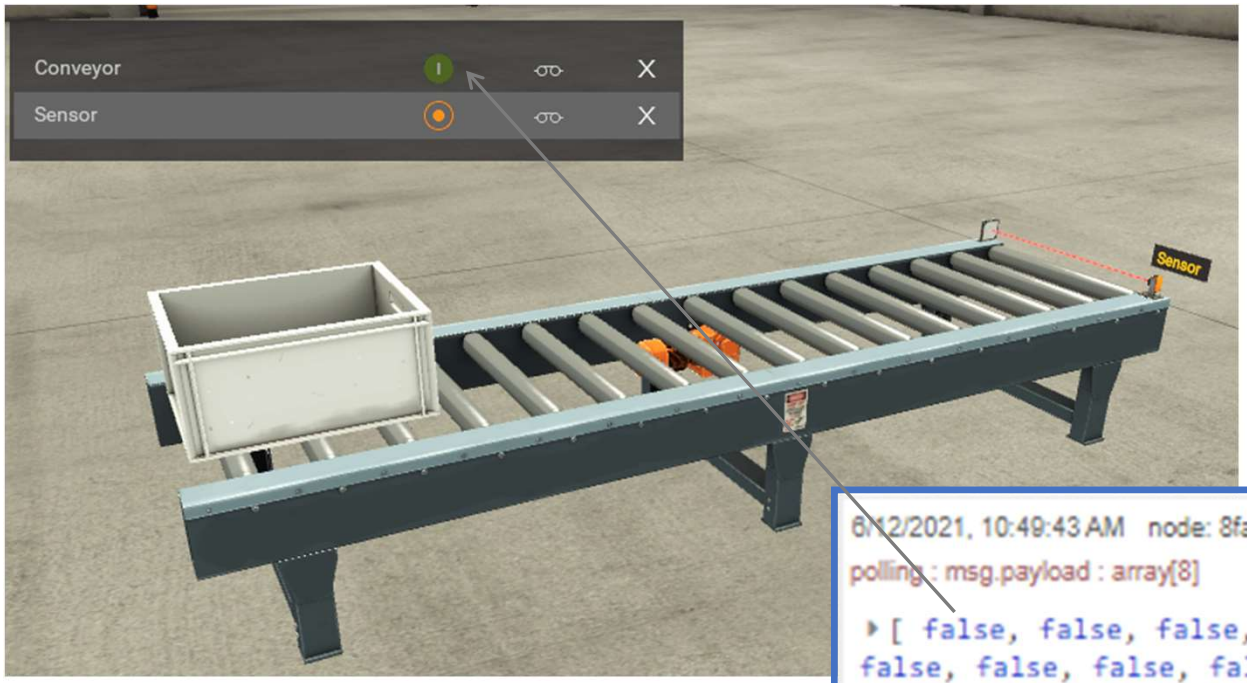
Conveyor

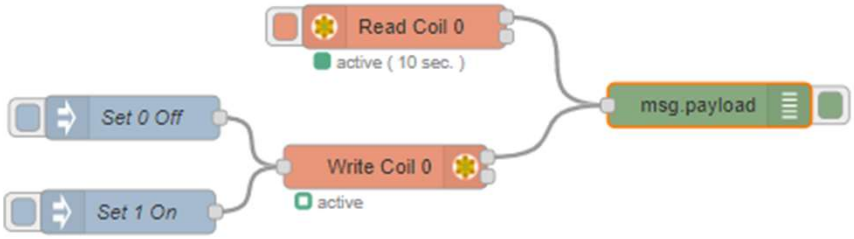
FC 1 (Read)
FC 5 (Write)

FC 2 (Read only)

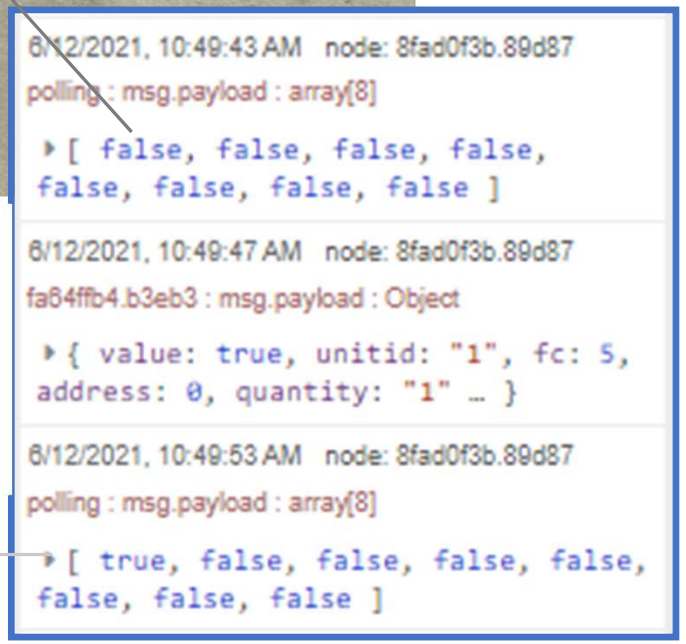
ACTUATORS

Conveyor
FACTORY I/O (Camera Position)
FACTORY I/O (Pause)
FACTORY I/O (Reset)
FACTORY I/O (Run)

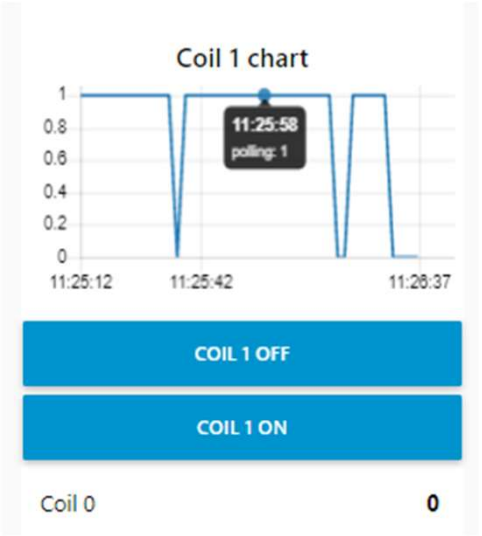

Conveyor
Sensor
Sensor

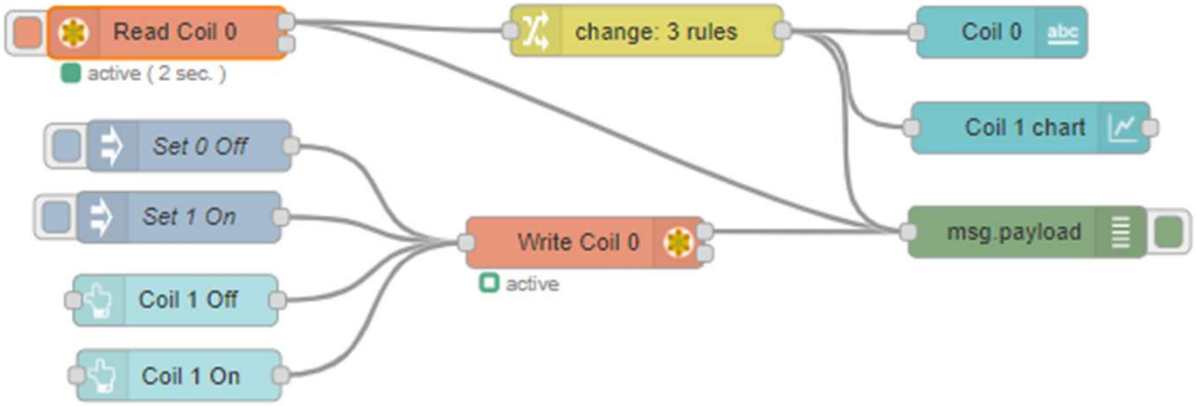

Read Coil 0
active (10 sec.)
Set 0 Off
Set 1 On
Write Coil 0
active
msg.payload

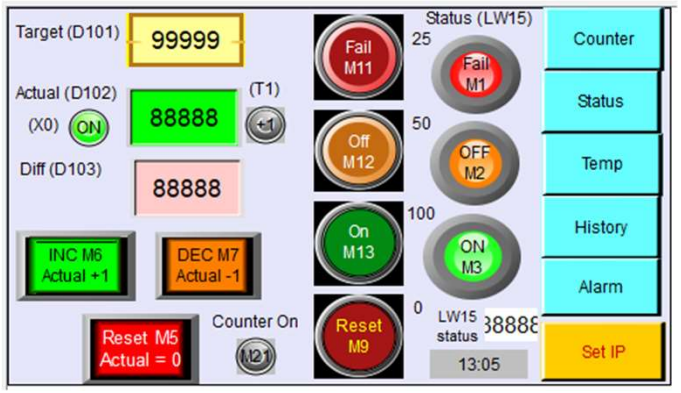

Conveyor
Sensor

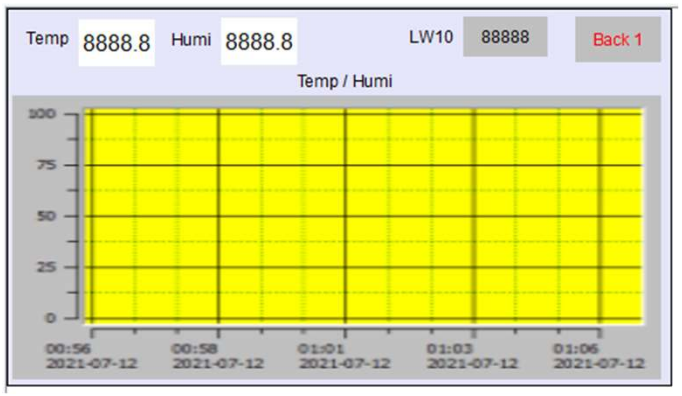

6/12/2021, 10:49:43 AM node: 8fad0f3b.89d87
polling : msg.payload : array[8]
[false, false, false, false, false, false, false, false]
6/12/2021, 10:49:47 AM node: 8fad0f3b.89d87
fa84ffb4.b3eb3 : msg.payload : Object
{ value: true, unitid: "1", fc: 5, address: 0, quantity: "1" … }
6/12/2021, 10:49:53 AM node: 8fad0f3b.89d87
polling : msg.payload : array[8]
[true, false, false, false, false, false, false, false]

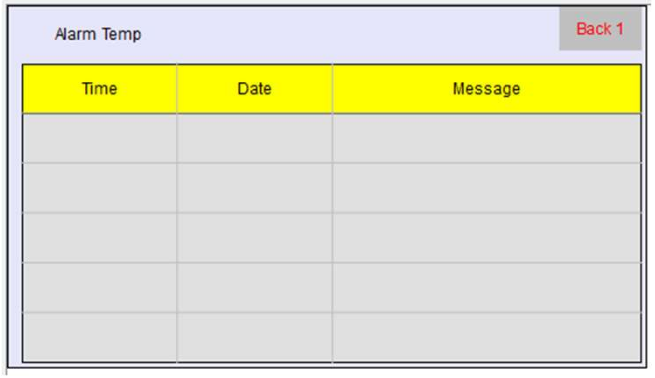

Conveyor
Sensor
Sensor


Coil 1 chart
1
0.8
0.6
0.4
0.2
0
11:25:58
polling: 1
11:25:12
11:25:42
11:26:37
COIL 1 OFF
COIL 1 ON
Coil 0
0


Read Coil 0
active (2 sec.)
change: 3 rules
Coil 0
abc
Coil 1 chart
Set 0 Off
Set 1 On
Write Coil 0
active
msg.payload
Coil 1 Off
Coil 1 On

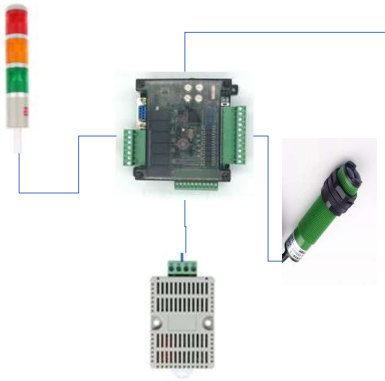






การประยุกต์อุปกรณ์ในโครงการ

- ระบบนับจำนวนสินค้าที่ผลิตแบบ Real time และบันทึกลงระบบฐานข้อมูล
- ระบบบันทึกสถานการณ์ทำงานของเครื่องจักร และการแจ้งซ่อมเครื่องจักร
- ระบบบันทึกอุณหภูมิคลังสินค้า และระบบแจ้งเตือนสภาวะ



127.0.0.1:1880/ui/#!/0?socketid=tMQcABhX3uLK8BONAAAA

HMI TCP Slave

Counter Group

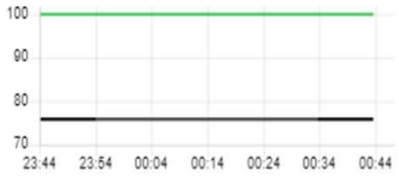
REFRESH

Target 100

Actual 76

Diff 24

Target and Actual chart



Input New Target 100

SET TARGET

Status

Status Fail

Status chart

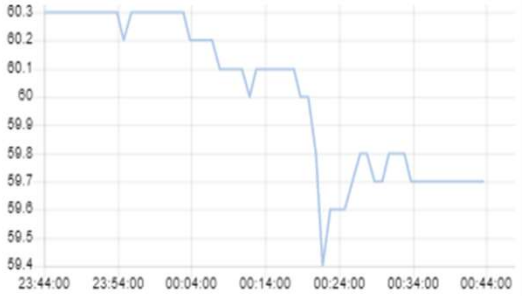
Temp Humi Group

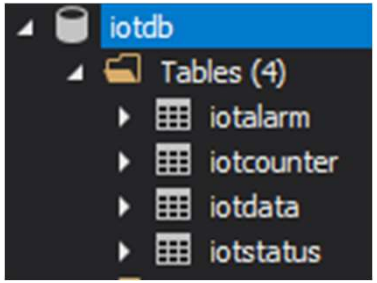
Temp gauge

Temp chart

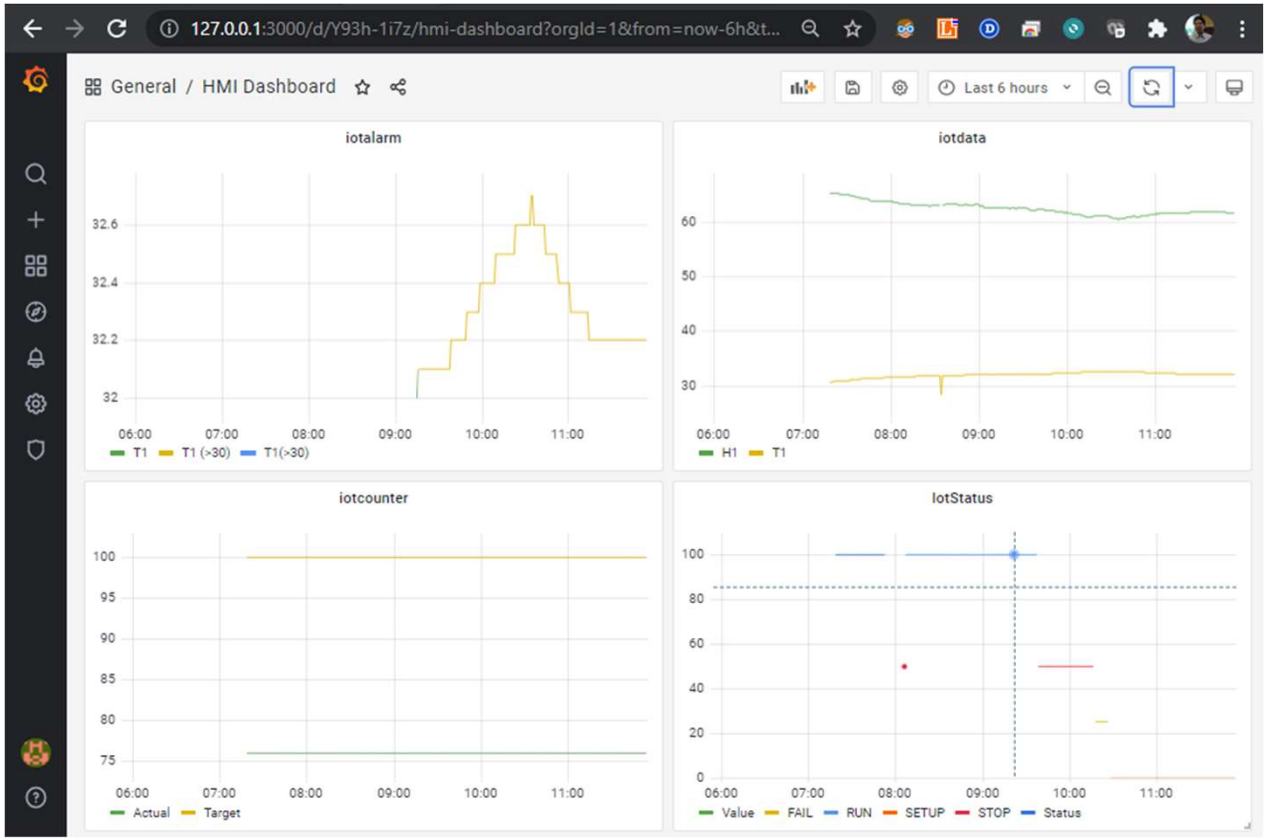
Humi gauge

Humi chart



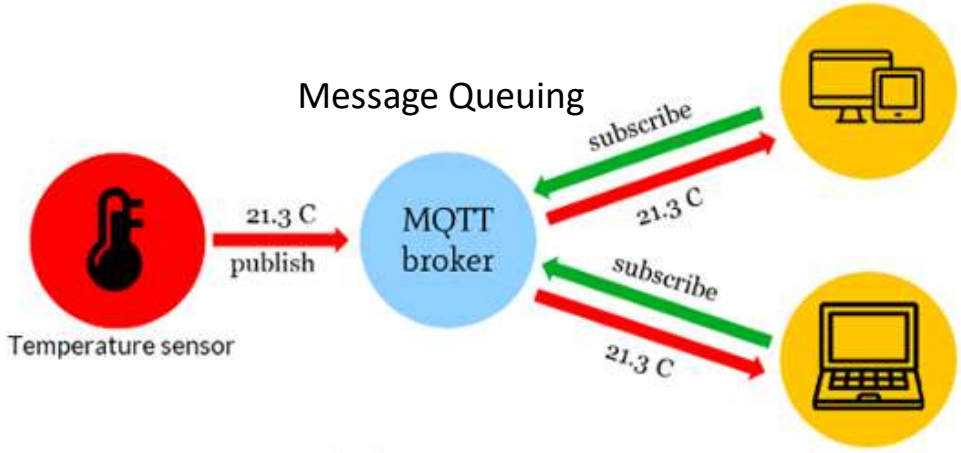


id INT(11)	time TIMESTAMP	metric VARCHAR(55)	value FLOAT	iot VARCHAR(55)
85	12/07/2021 23:59:50	Target	100	HMI
86	12/07/2021 23:59:50	Actual	76	HMI
88	13/07/2021 0:00:50	Target	100	HMI
89	13/07/2021 0:00:50	Actual	76	HMI
91	13/07/2021 0:01:50	Target	100	HMI
92	13/07/2021 0:01:50	Actual	76	HMI
94	13/07/2021 0:02:50	Target	100	HMI
95	13/07/2021 0:02:50	Actual	76	HMI
97	13/07/2021 0:03:50	Target	100	HMI
98	13/07/2021 0:03:50	Actual	76	HMI
100	13/07/2021 0:04:50	Target	100	HMI
101	13/07/2021 0:04:50	Actual	76	HMI
103	13/07/2021 0:05:50	Target	100	HMI
104	13/07/2021 0:05:50	Actual	76	HMI



MQTT Protocol

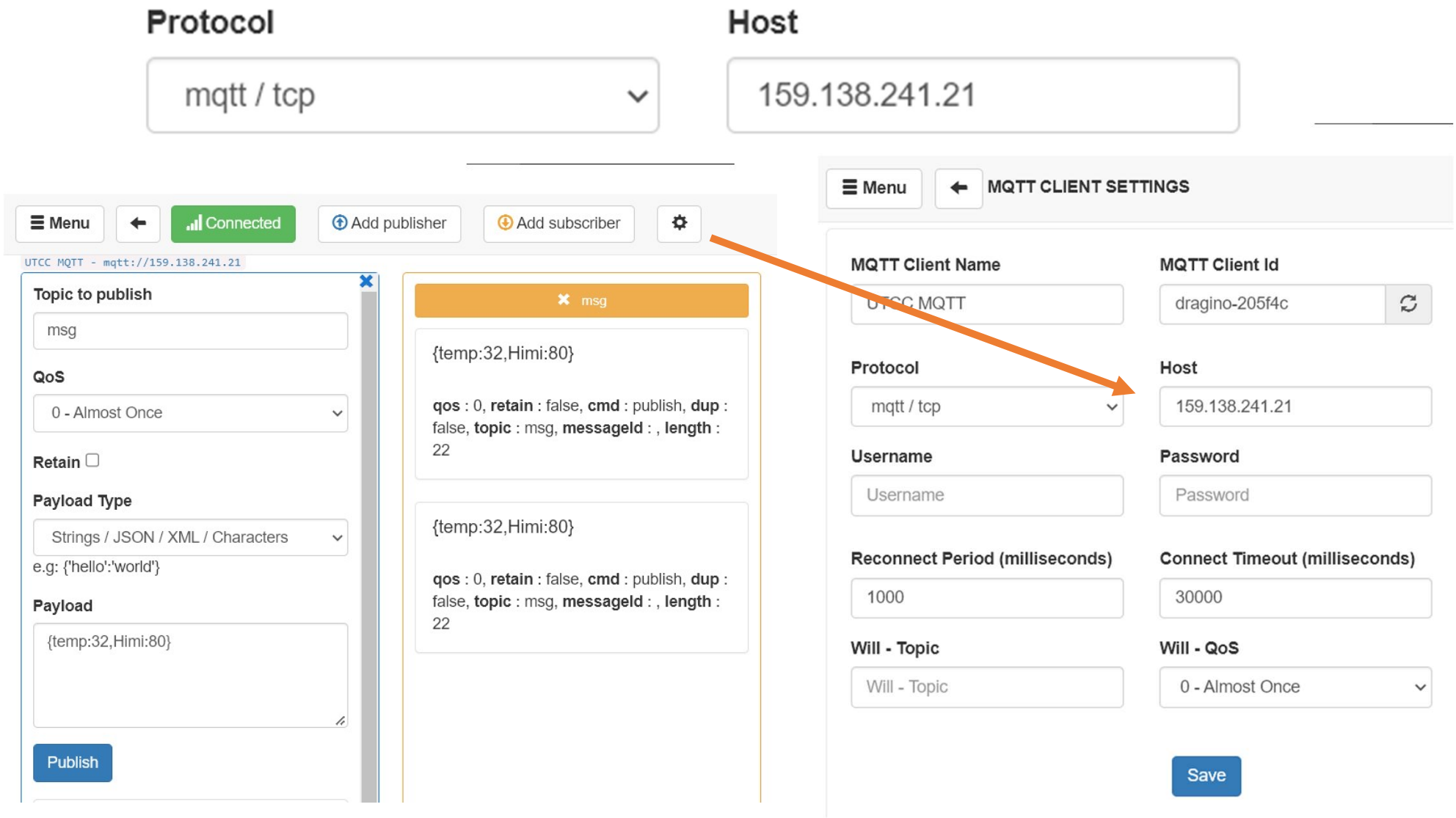
- การส่งข้อความ (publish) ผู้ส่ง (อุปกรณ์ IOT, Software)
- ผู้บริการรับส่งข้อความ (MQTT broker) ตัวกลาง Server , Cloud
- การรอรับข้อความ (subscribe) ผู้รับ (อุปกรณ์ IOT, Software)



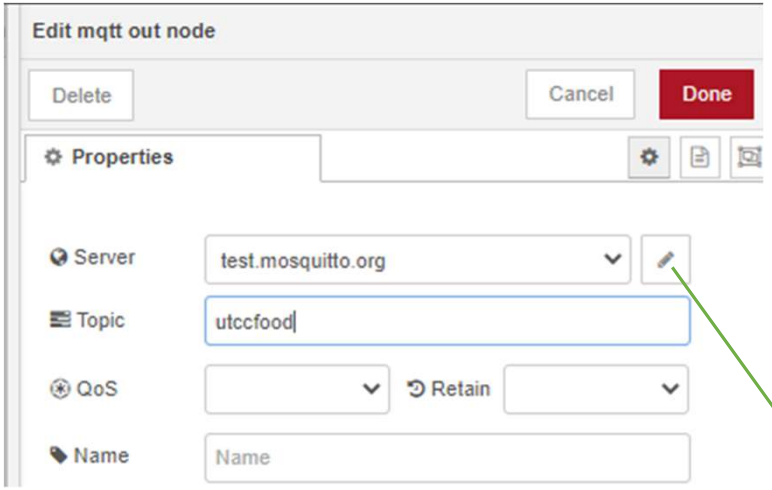
Schematic data flow from sensor (machine) to devise (machine)

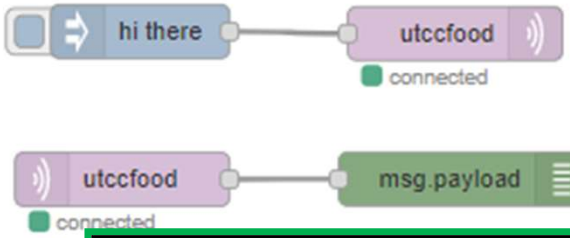
Mobile , PC ,PLC,IOT

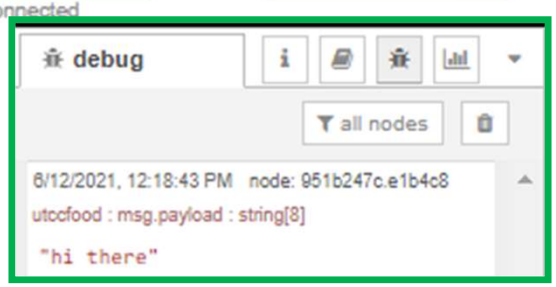
- สามารถรับ และส่ง ได้ในอุปกรณ์เดียวกัน
- เป็นการสื่อสารสองทาง

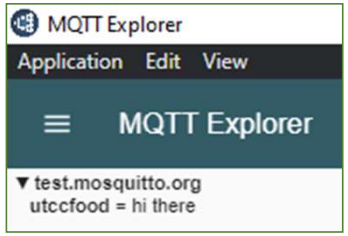

Protocol
mqtt / tcp
Host
159.138.241.21
Menu
Connected
Add publisher
Add subscriber
UTCC MQTT - mqtt://159.138.241.21
Topic to publish
msg
QoS
0 - Almost Once
Retain
Payload Type
Strings / JSON / XML / Characters
e.g: {'hello':'world'}
Payload
{temp:32,Himi:80}
Publish
msg
{temp:32,Himi:80}
qos : 0, retain : false, cmd : publish, dup : false, topic : msg, messageId : , length : 22
{temp:32,Himi:80}
qos : 0, retain : false, cmd : publish, dup : false, topic : msg, messageId : , length : 22
Menu
MQTT CLIENT SETTINGS
MQTT Client Name
UTCC MQTT
MQTT Client Id
dragino-205f4c
Protocol
mqtt / tcp
Host
159.138.241.21
Username
Username
Password
Password
Reconnect Period (milliseconds)
1000
Connect Timeout (milliseconds)
30000
Will - Topic
Will - Topic
Will - QoS
0 - Almost Once
Save

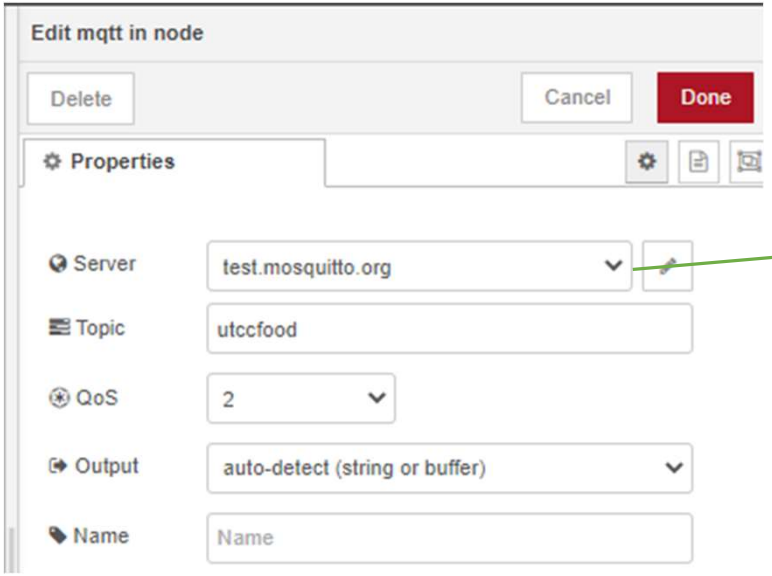
YouTube MQTT 02 Node-Red

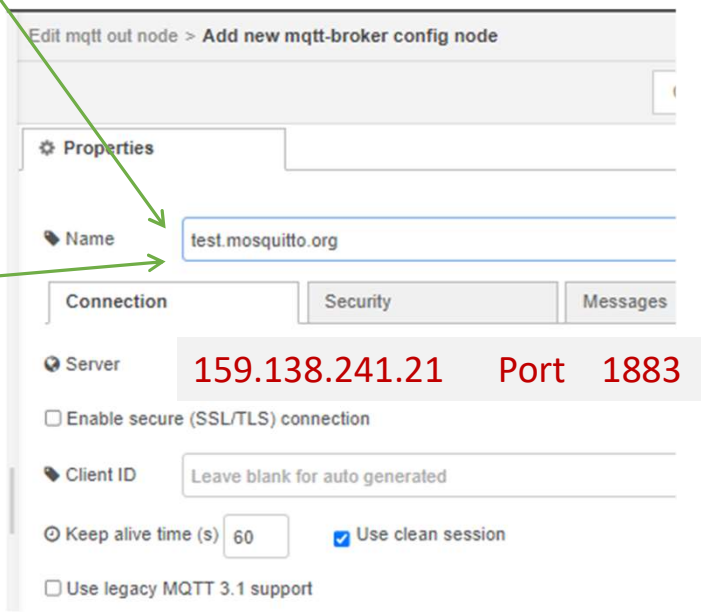






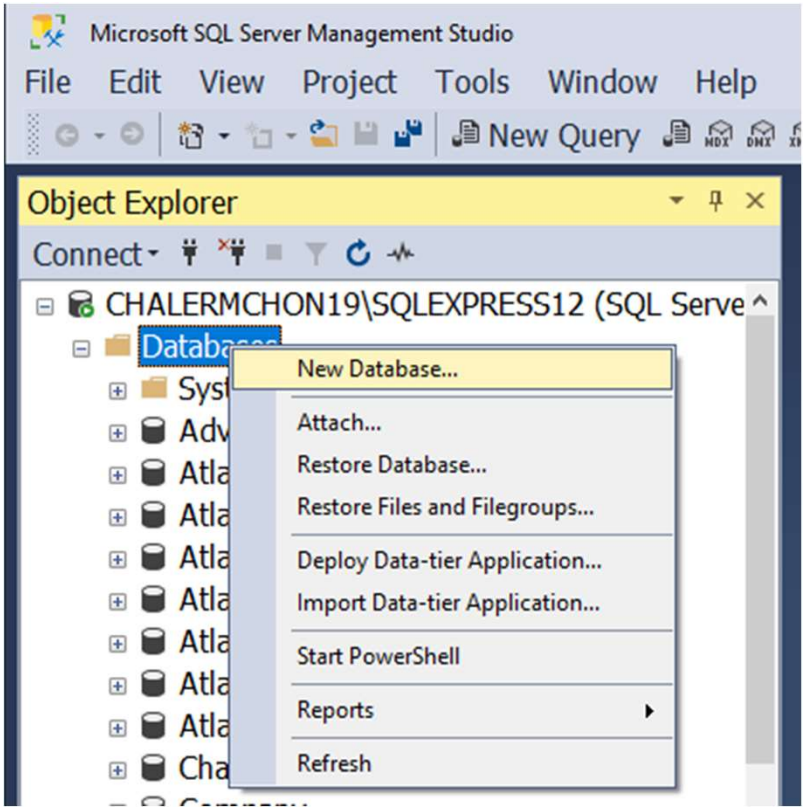




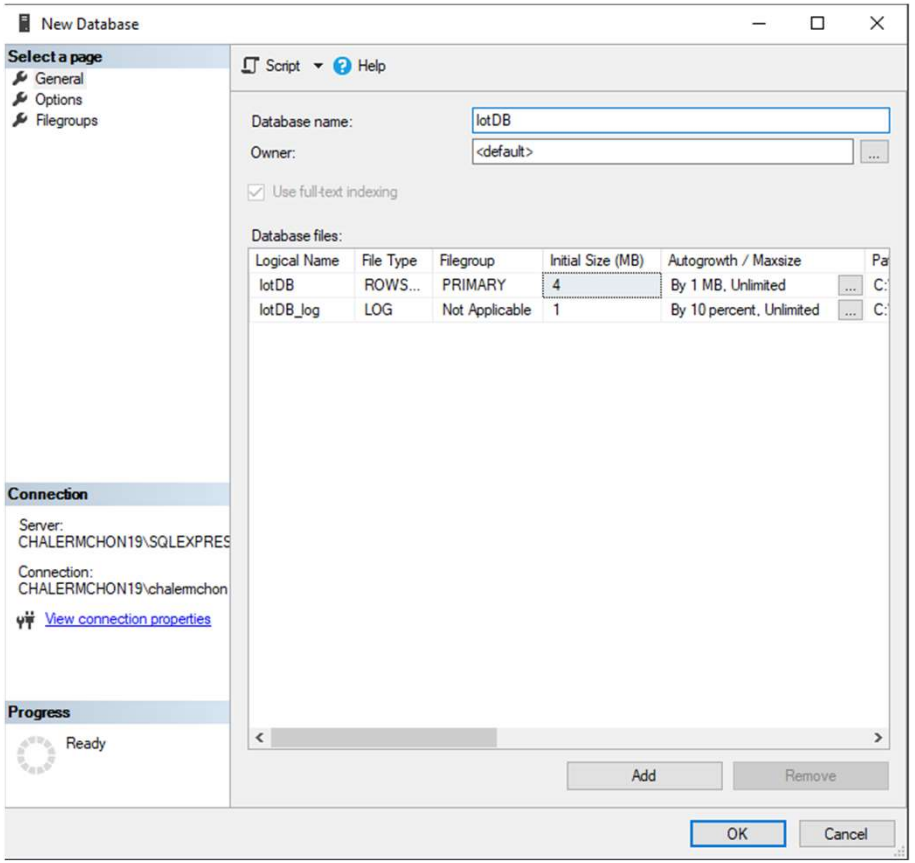


YouTube MsSQL 01

สร้างระบบฐานข้อมูลใหม่ (Mssql)

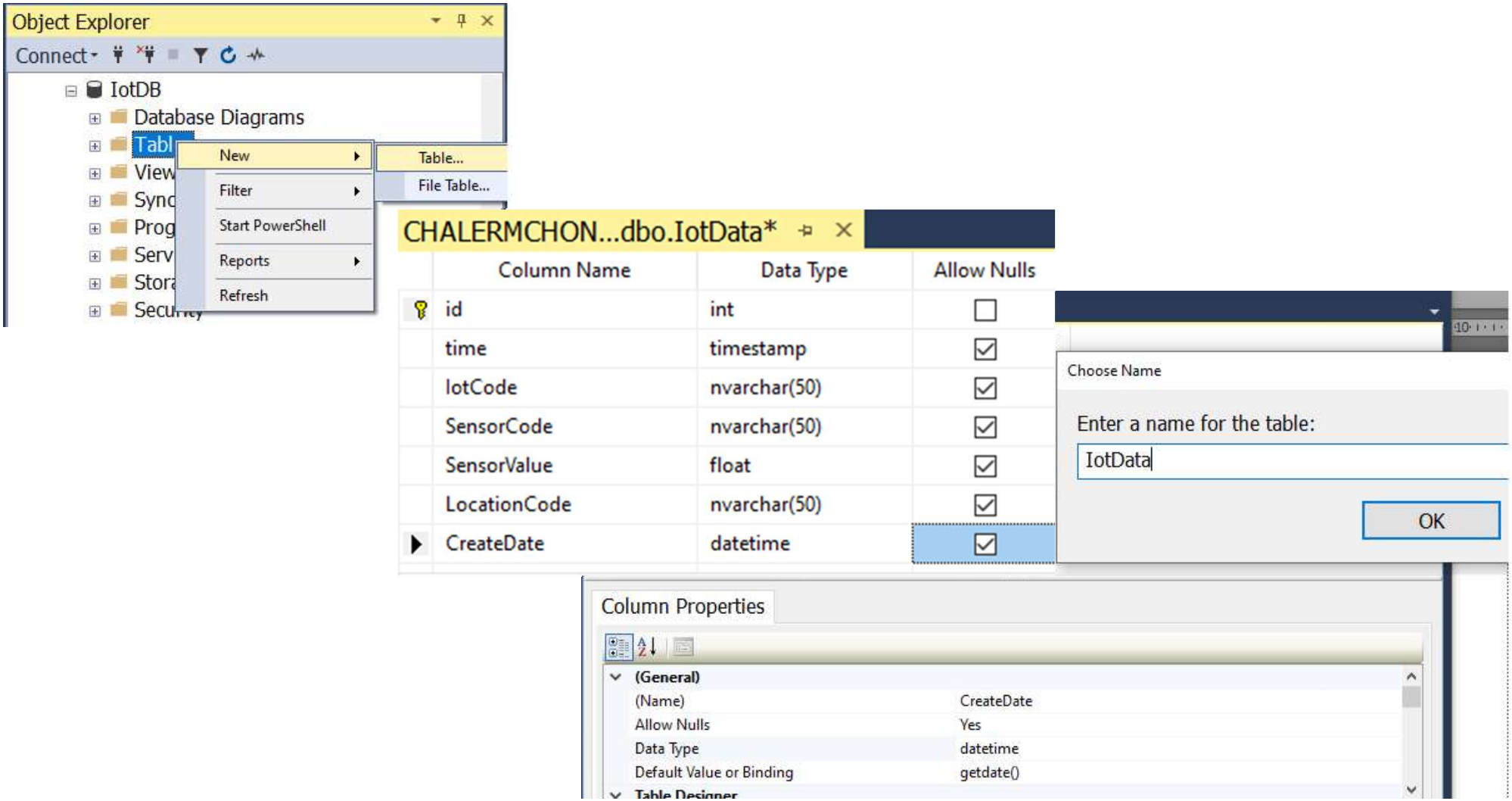


สร้างฐานข้อมูลใหม่ (IotDB)



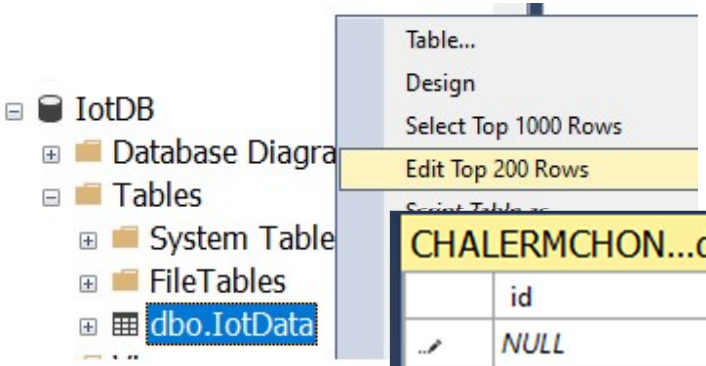
สร้างตารางข้อมูลใหม่ ใน IotDB

YouTube MsSQL 01



Insert New Data

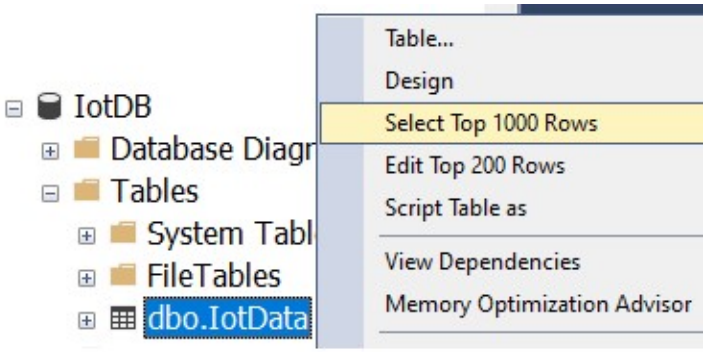
YouTube MsSQL 01



CHALERMCHON...dbo.IotData

	id	time	IotCode	SensorCode	SensorValue	LocationCode	CreateDate
	NULL	NULL	iot01	t01	25.4	wh01	NULL
*	NULL	NULL	NULL	NULL	NULL	NULL	NULL

Select Data (Sql)



SQLQuery1.sq...rmchon (57))

```
/****** Script for SelectTopNRows command from SSMS  ******/
SELECT TOP (1000) [id]
      ,[time]
      ,[IotCode]
      ,[SensorCode]
      ,[SensorValue]
      ,[LocationCode]
      ,[CreateDate]
  FROM [IotDB].[dbo].[IotData]
```

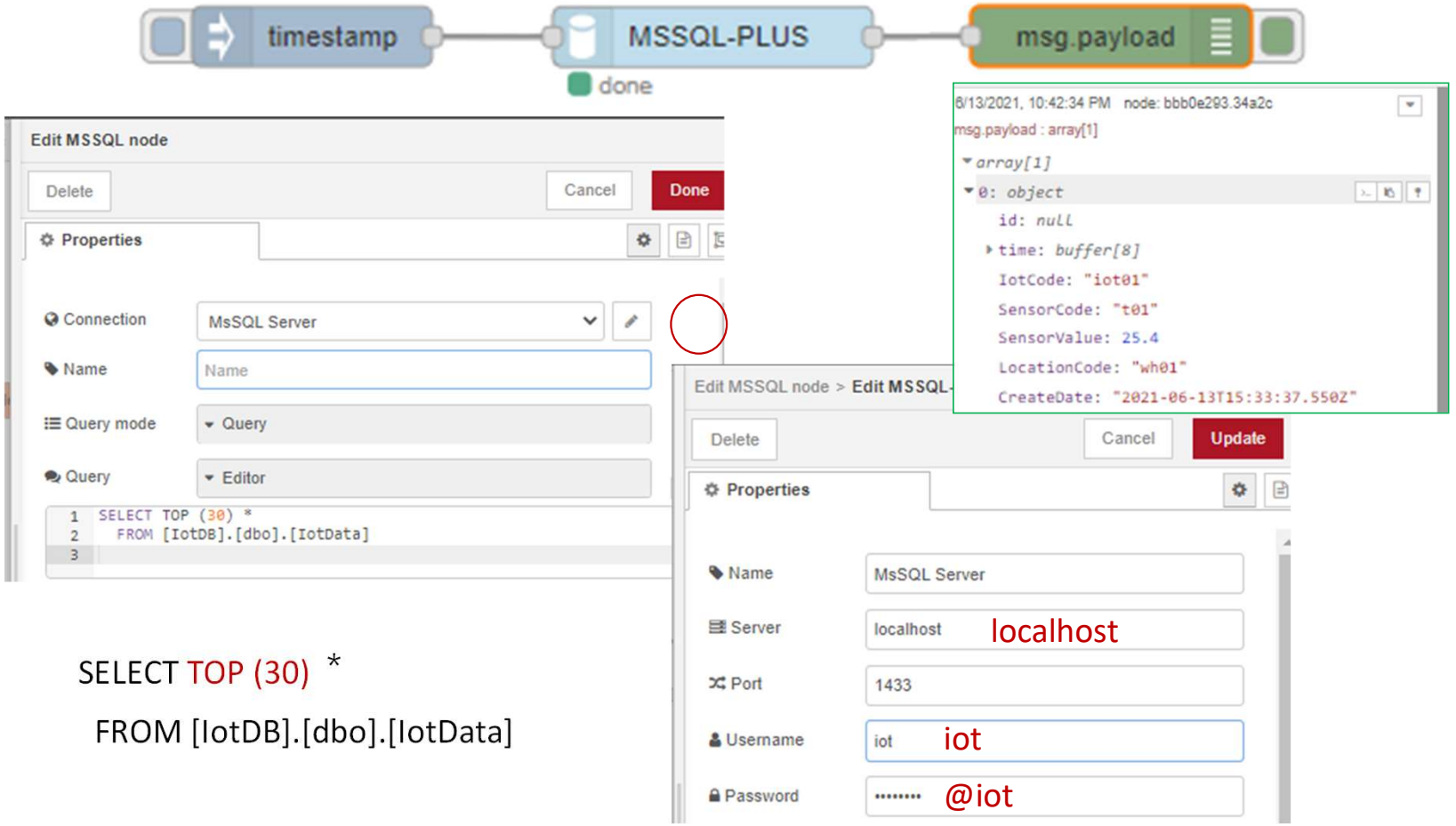
95 %

Results Messages

	id	time	IotCode	SensorCode	SensorValue	LocationCode	CreateDate
1	NULL	0x00000000000007D1	iot01	t01	25.4	wh01	2021-06-13 22:33:37.550

YouTube MsSQL 02 Node Red

Select IotData table by Node-Red

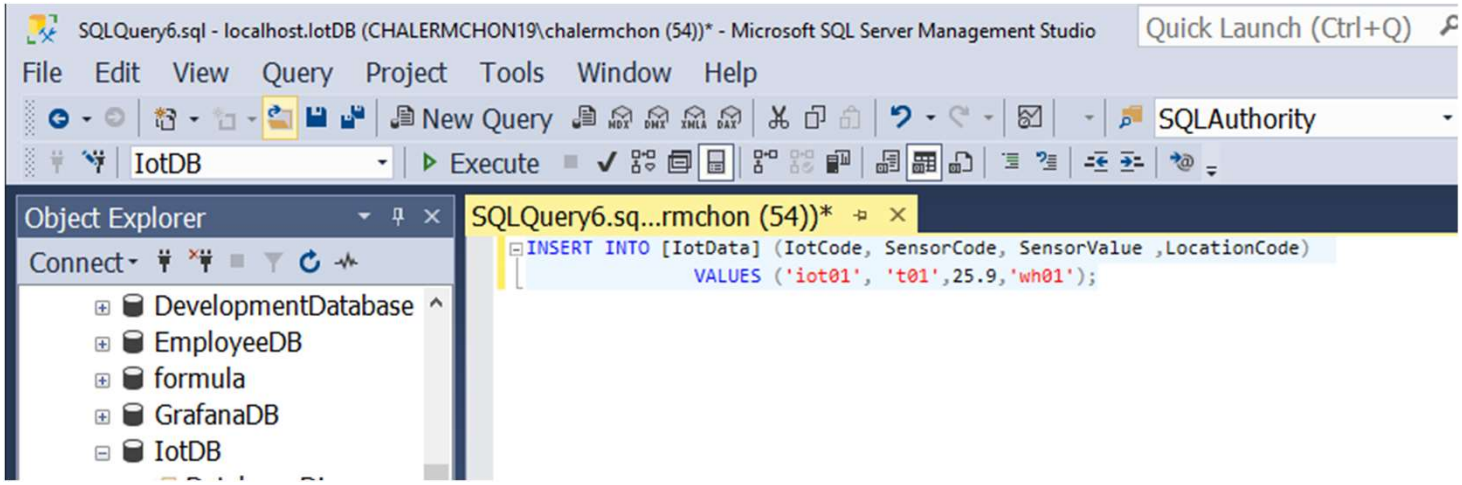


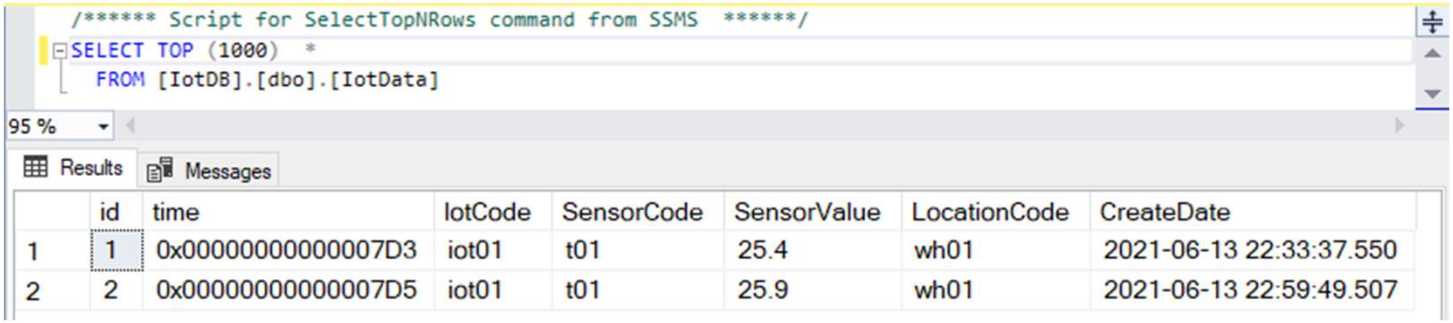
SELECT TOP (30) *

FROM [IotDB].[dbo].[IotData]

YouTube MsSQL 02 Node Red

```
INSERT INTO [IotData] (IotCode, SensorCode, SensorValue ,LocationCode)
        VALUES ('iot01', 't01',25.9,'wh01');
```

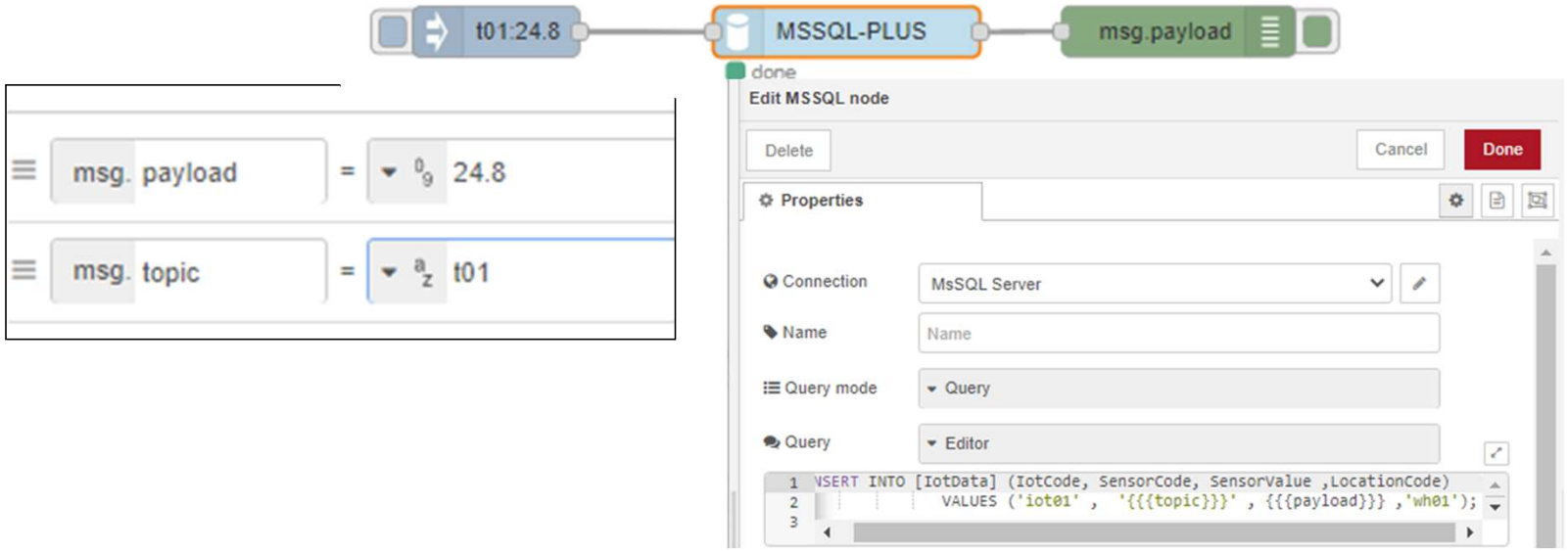




	id	time	IotCode	SensorCode	SensorValue	LocationCode	CreateDate
1	1	0x00000000000007D3	iot01	t01	25.4	wh01	2021-06-13 22:33:37.550
2	2	0x00000000000007D5	iot01	t01	25.9	wh01	2021-06-13 22:59:49.507

YouTube MsSQL 02 Node Red

Insert IotData by topic and payload



INSERT INTO [IotData] (IotCode, SensorCode, SensorValue ,LocationCode)
VALUES ('iot01‘ , ‘{{{topic}}}’ , {{{payload}}} ,’wh01’);

Results | Messages

	id	time	IotCode	SensorCode	SensorValue	LocationCode	CreateDate
1	1	0x00000000000007D3	iot01	t01	25.4	wh01	2021-06-13 22:33:37.550
2	2	0x00000000000007D5	iot01	t01	25.9	wh01	2021-06-13 22:59:49.507
3	3	0x00000000000007D6	iot01	t01	25.9	wh01	2021-06-13 23:04:37.707
4	4	0x00000000000007D7	iot01	t01	24.8	wh01	2021-06-13 23:10:22.693

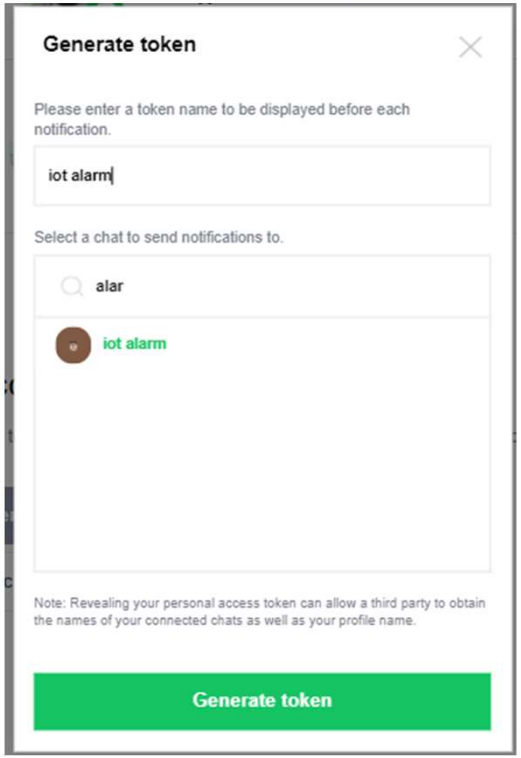
Line Notify

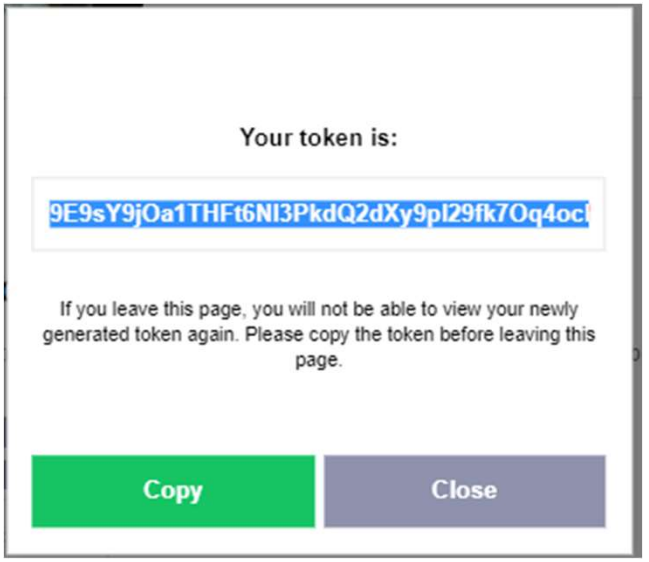
Generate access token (For developers)

By using personal access tokens, you can configure notifications without having to add a web service.

Generate token

LINE Notify API Document

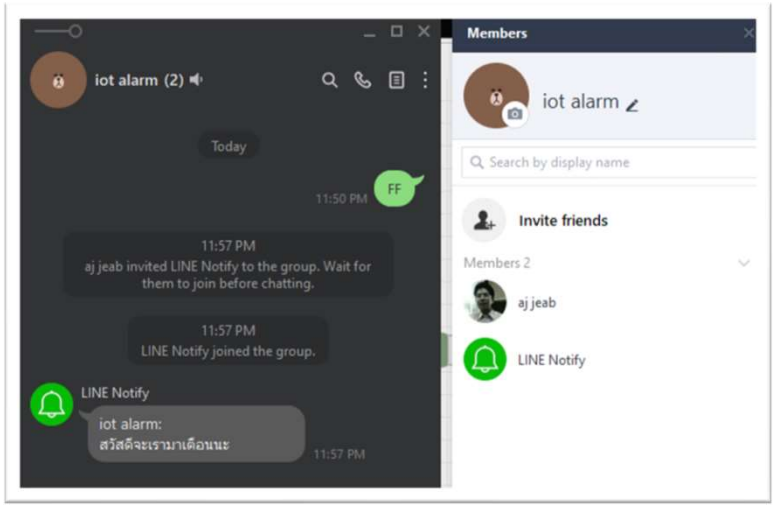


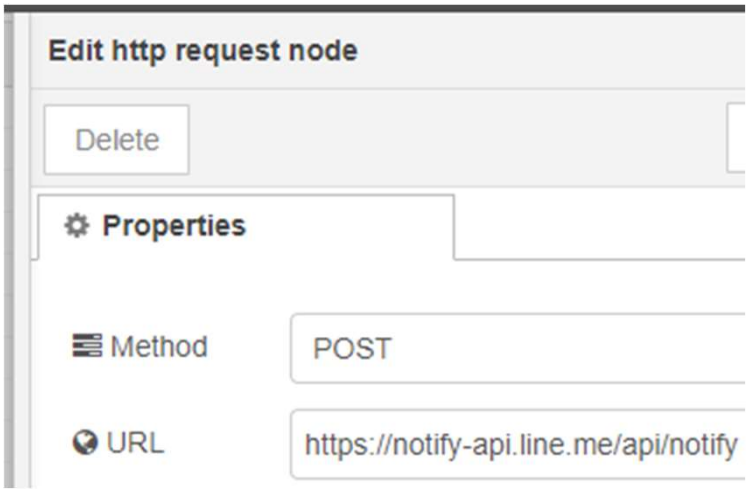


9E9sY9jOa1THFt6NI3PkdQ2dXy9pl29fk7Oq4ocNxcA


```
msg.headers = {'content-type':'application/x-www-form-urlencoded'
      ,'Authorization':'Bearer YourLineToken'};
msg.payload = {"message":"alarm " + msg.payload };
return msg;
```

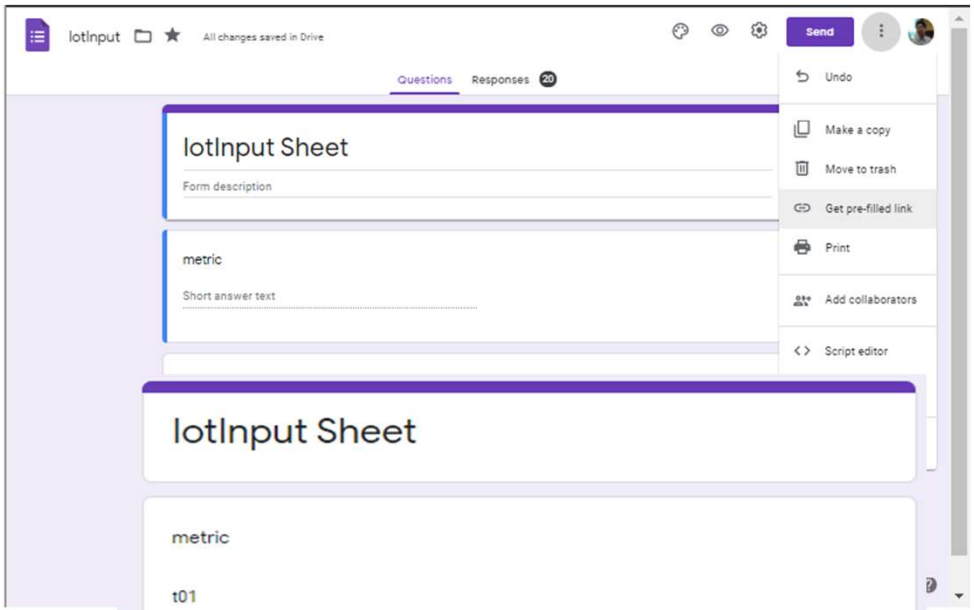
msg.headers = {'content-type':'application/x-www-form-urlencoded','Authorization':'Bearer 9E9sY9jOa1THFt6NI3PkdQ2dXy9pl29fk7Oq4ocNxcA'};
msg.payload = {"message":"alarm " + msg.payload };
return msg;

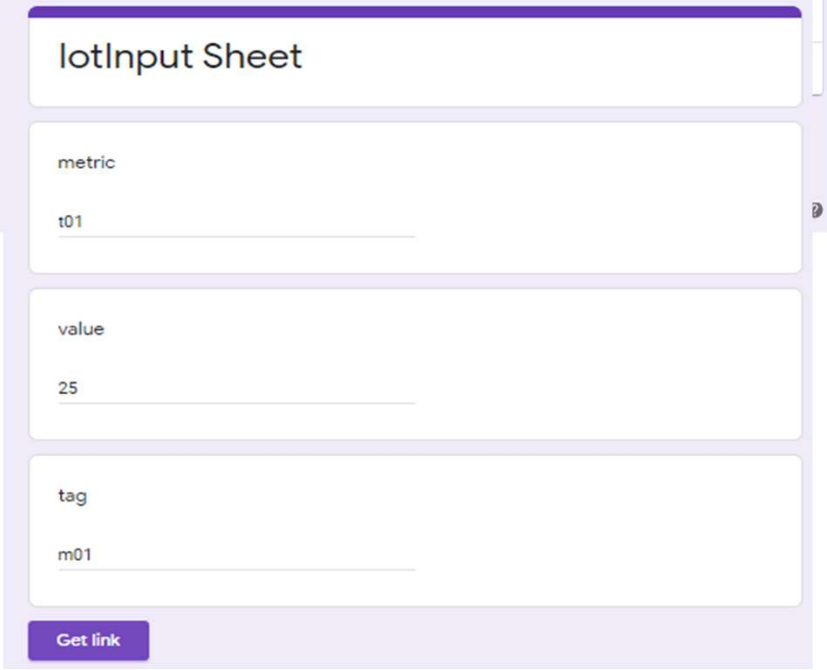


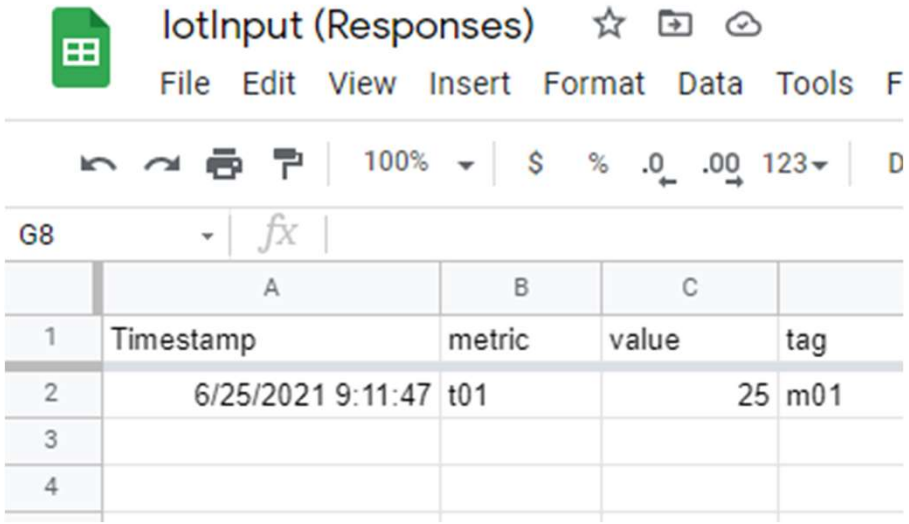


https://notify-api.line.me/api/notify

Create Google Form and Google Sheet

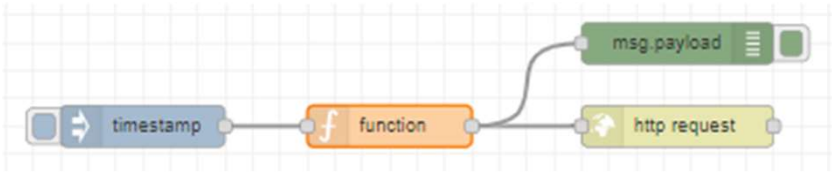






	A	B	C	
1	Timestamp	metric	value	tag
2	6/25/2021 9:11:47	t01	25	m01
3				
4				

https://docs.google.com/forms/fromyourgoogleform
/viewform?usp=pp_url&
entry.179783227=t01
&entry.1383307148=25
&entry.981248842=m01



https://docs.google.com/forms/fromyourgoogleform/viewform?usp=pp_url&entry.179783227=t01
&entry.1383307148=25
&entry.981248842=m01

```
var max = 30 ;
var min = 20;
var ranv = Math.round(Math.random()*(max-min)) + min;
msg.payload = {"metric":'t01',"value": ranv,"tag": 'm01'};
return msg;
```

viewform => formResponse

https://docs.google.com/forms/d/e/1FAIpQLSfCHBjMEH2KKtr-k15SwKM9GZXb1o4KY_JpzF_OClW4RYcMhw/formResponse?usp=pp_url&entry.179783227={{{payload.metric}}}&entry.1383307148={{{payload.value}}}&entry.981248842={{{payload.tag}}}