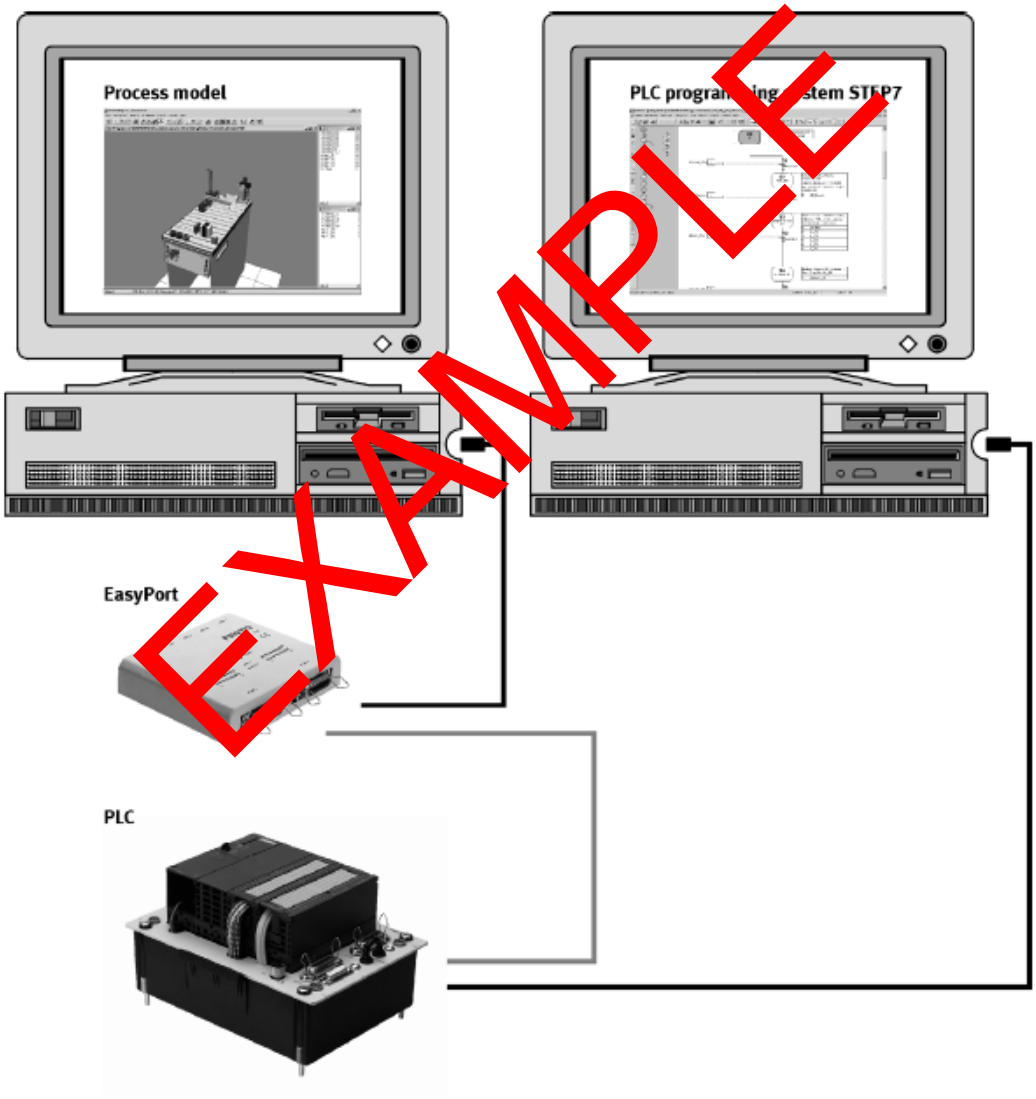
Cosimir PLC

If you are creating and testing your own PLC program, we recommend that you load the programs to an external PLC and have these executed from there.

You can use the Soft PLC S7-PLC SIM as external PLC, if you are programming in STEP 7, in which case you will not require any additional hardware components.

You can however also use any other control programming system, in which case you download the PLC program to your hardware PLC. The exchange of the PLC input/output signals between the process model simulation and your external PLC is effected via the serial interface of the PC and via the EasyPort interface. Also included in the exchange of process signals is the EzOPC program.
The advantage of this configuration is that you can use the PLC and programming system of your choice. Also available for fault finding in the PLC program are the testing and diagnostic functions intended for this purpose in the programming system.

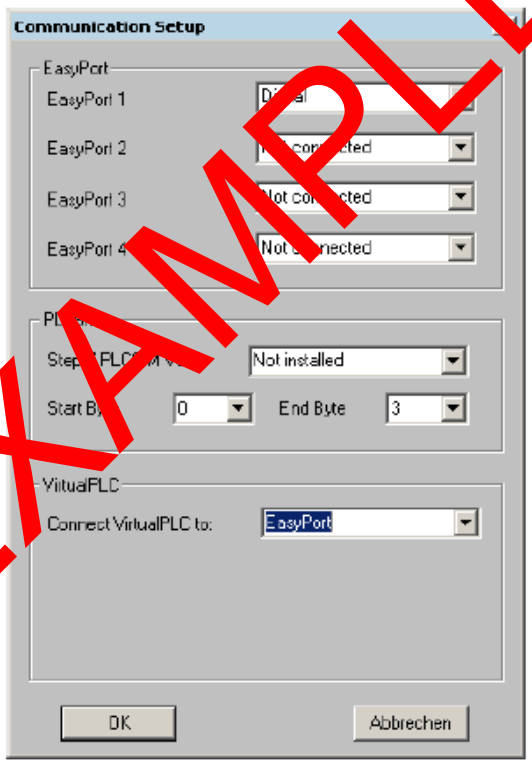
We recommend that you install the simulation software COSIMIR® PLC and the PLC programming system on different computers.



Possible configuration with a hardware PLC and two PCs

The following requirements must be fulfilled in order for the PLC input/output signals to be correctly exchanged:

- When starting EzOPC, both communication users – EasyPort and the process model simulation - must be active. Only then can EzOPC set up the communication link to the two users.
  In the case of EasyPort this means that EasyPort must be connected to the PC via the serial interface and voltage applied to EasyPort.
- The EzOPC program must be correctly configured for the data exchange. Therefore check the configuration as soon as EzOPC is started.



Configuration of EzOPC for data exchange with an external PLC via EasyPort

However, you can also choose a different configuration and install the two software packages on one PC. Your PC will need to be equipped with two serial interfaces if you intend to make use of the testing and diagnostic functions during the process model simulation .

The following can be used as EasyPort interface:

- EasyPort D16 interface box for 16 digital I/O (Order No.. 1676 121)

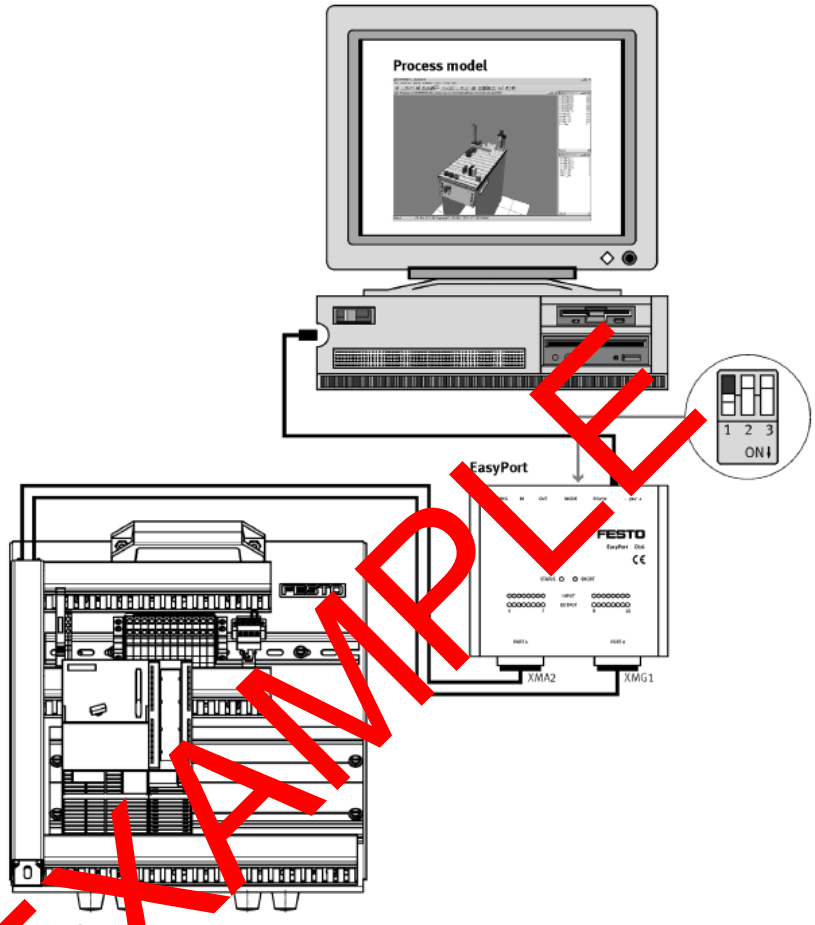
The following data cables are required:

- PC data cable RS232 (Order No. 167 305)
- For PLC EduTrainer of Festo Didactic: I/O data cable with SysLink plugs at both ends to IEEE 488, cross paired (Order No.. 167 106)
- For any PLC: I/O data cable with SysLink plug at one end to IEEE 488 and open cable end sleeves (Order No. 167 122)

The EzOPC program

The EzOPC program organises the exchange of PLC input/output signals between the process model simulation and the external PLC. EzOPC does not access the external PLC signals directly, but via the EasyPort interface.

EzOPC must be installed on your computer. If this is not the case, you will need to install the COSIMIR PLC CD-ROM now. Once the installation has been successfully completed, EzOPC will be automatically called up by COSIMIR PLC as soon as you start the process model simulation.



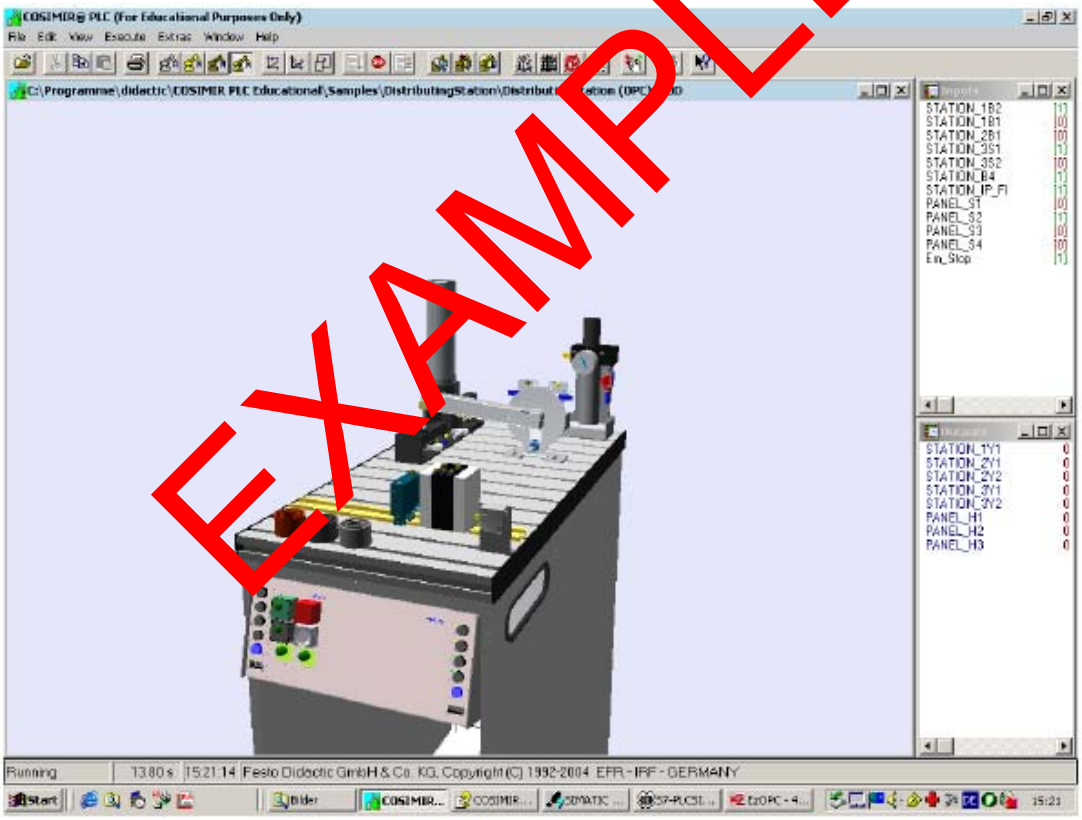
Configuration with PLC board

This is how you control a process model via an external PLC

1. Connect the PC with COSIMIR® PLC to the external PLC via the EasyPort interface.
   - The data cable with Order No. 162 305 connects the serial interface of the PC to the serial interface RS232 of EasyPort.
   - The PLC input/output signals for the process are applied at port 1 of EasyPort.
   - The PLC input/output signals for the control console are transmitted via port 2.

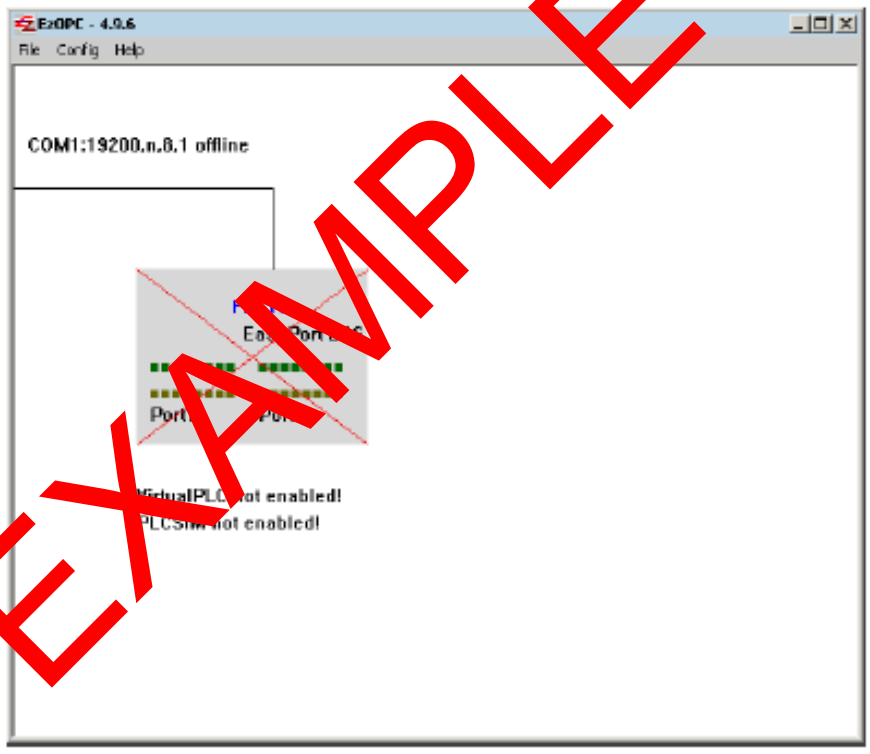
   For the DIP switches under Mode at EasyPort, select the following setting: 1 ON, 2 OFF, 3 OFF.

2. Switch on the power supply for EasyPort.
3. Load the desired process model to COSIMIR® PLC . The file name of the process model must have the ending OPC, since it is to be controlled via an external PLC.
4. Start the simulation of the process model by clicking onto **Start** under **Execute**.
   The EzOPC program is called up automatically when simulation starts. You will see EzOPC displayed in the Start bar.
   If EzOPC is not shown in the Start bar you need to install it now from the COSIMIR® PLC CD-ROM.

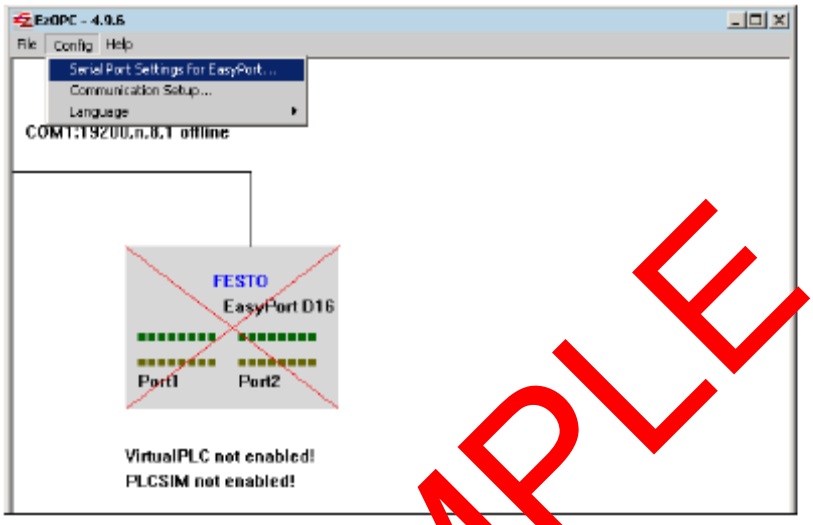


When EzOPC is started, both communication users - EasyPort and the simulation of the process model – must already be active. Only then can the communication link be correctly set up.

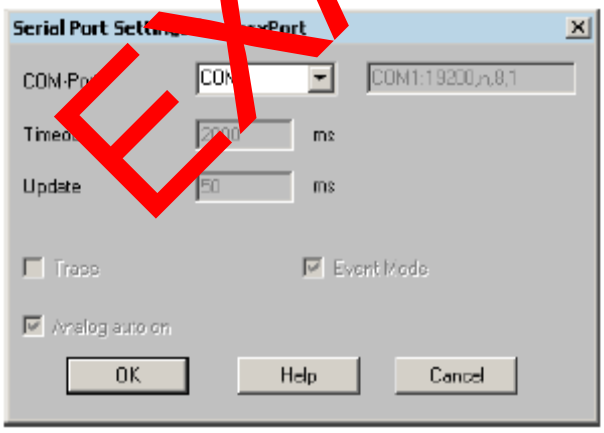
5. Click onto the **EzOPC** button in the Start bar to open the **EzOPC** window, where you configure the communication between COSIMIR® PLC and EasyPort.



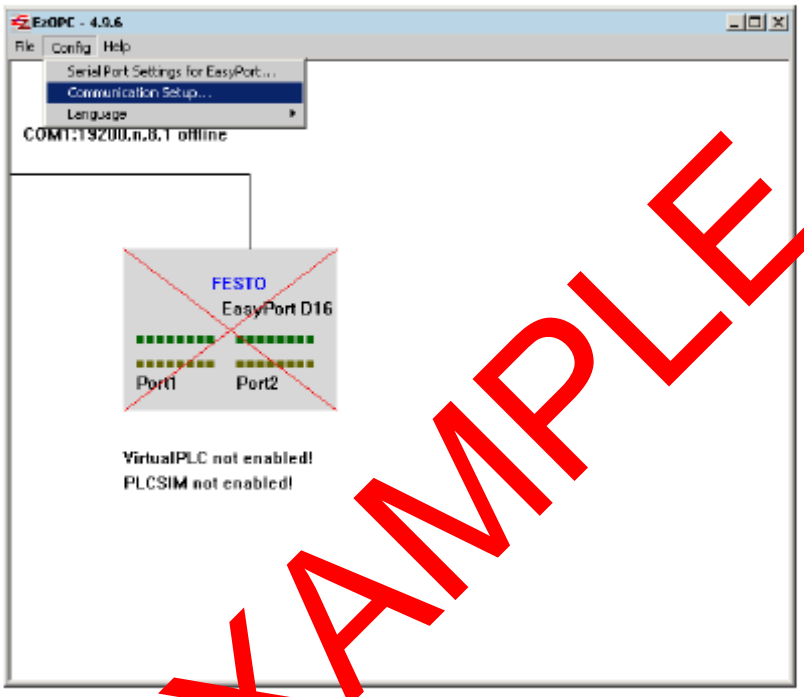
6. Carry out the settings for the serial interface. To do so, click onto **Serial Interface** in the **Configuration** menu.



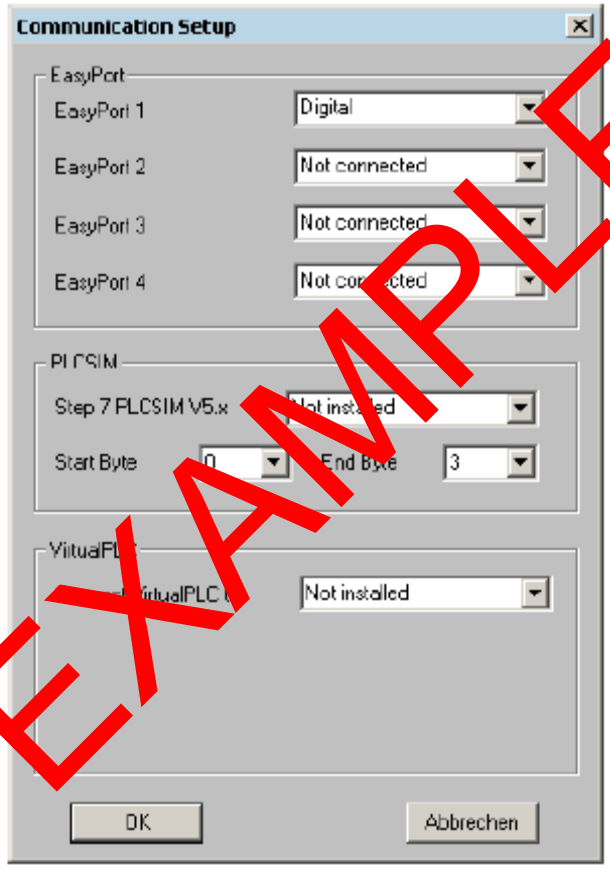
7. Under **COM Port** , enter the serial interface of your PC, to which EasyPort is connected and confirm this setting with **OK**.



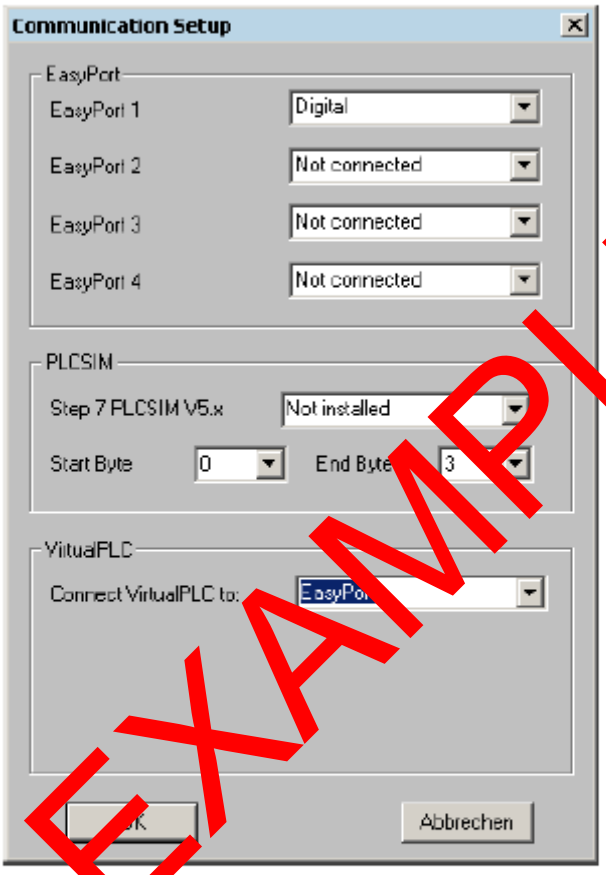
8. Under **Configuration**, click onto **Communication Setup**.



9. This opens the **Communication Setup** window.



10. Carry out the necessary settings.
    Select the entry **EasyPort** in the section VirtualPLC for **Connect VirtualPLC to:** and confirm this with **OK**.



11. Minimise the **EzOPC** window.
12. Download the PLC program to the PLC.
13. Start up the PLC.
14. Start the process model simulation.
15. Operate the process model according to how you have planed and programmed it in the PLC program.

Lab 1- And - OR	
Name:	Date:
And - OR	Sheet 1 of 1

Using the equipment listed create a program to perform the Sequence Description. Name the Program And - OR.

Equipment List

- Programmable Controller
- Simulation Box Connected to First I/O Cable or I/O Port.

Sequence Description

Initial Position

- All Switches in the off position

Sequence

1. Light Bit 0 is to turn on when Switch Bits 0 and 1 are on.
2. Light Bit 1 is to turn on when Switch Bits 2 or 3 are on.
3. Light Bit 2 is to turn on when Switch Bits 0 and 1 are on.
4. Light Bit 3 is to turn off when Switch Bit 4 is on.
5. Light Bit 4 is to turn off when Switch Bits 4 and 5 are on.
6. Light Bit 5 is to turn on when Switch Bits 6 or 7 are on.
7. Light Bit 6 is to turn on when Switch Bit 0 is off and Bit 7 is on.
8. Light Bit 7 is to turn on when Switch Bits 0 and 1 are on and Switch Bits 4 and 6 are off.

Print and hand in.

Lab 2- Memory	
Name:	Date:
Memory	Sheet 1 of 1

Using the equipment listed create a program to perform the Sequence Description.

Equipment List

- Programmable Controller
- Simulation Box Connected to First I/O Cable or I/O Port.

Sequence Description

Initial Position

- All Switches in the off position

Sequence

1. When Switch Bit 1 is on Light Bit 0 (OTE) is to turn on.
2. When Switch Bit 1 is turned off Light Bit 0 is to stay on until Switch Bit 0 is turn on.
3. When Switch Bit 2 is on Light Bit 1 (OTL) is to turn on.
4. When Switch Bit 2 is turned off Light Bit 0 is to stay on until Switch Bit 3 is turned on.

Print and hand in

Lab 3 – Three Motors	
Name:	Date:
Three Motors	Sheet 1 of 1

Using the equipment listed create a program to perform the Sequence Description.

Equipment List

- Programmable Controller.
- Simulation Box Connected to First I/O Cable or I/O Port.

Sequence Description

Initial Position

- All Switches in the off position.
- All Motors (lights) OFF.

Part 1

Sequence

1. Create a program that will control three motors.
2. Each motor will have its own start stop station with memory.
3. There is to be only one motor allowed to run at a time.

Print and hand in.

Part 2

Sequence

1. Modify your program in Part 1 so that any two motors can run at a time.
2. The motors will still be allowed to run individually.

Print and hand in.

Lab 4 – Three Cylinders	
Name:	Date:
Three Cylinders	Sheet 1 of 2

Create a Program for the Easy Veep - Three Cylinders. The program is to use the OTL and OTU instructions. The machine is to run according to the sequence description.

Equipment List

- Programmable Controller.
- Easy Port Connected to First and Second I/O Cable or I/O Port.
- Simulation Box Connected to Third Cable or I/O Port.

Sequence Description

Initial Position

- All cylinders in the retracted position.

Part 1

Sequence

1. The first cylinder extends when the start button (Switch Bit 0) is pressed and stays extended.
2. The second cylinder extends when the first cylinder is fully extended and stays extended.
3. The third cylinder extends when the second cylinder is fully extended.
4. When all three cylinders are fully extended then all three cylinders are to retract at the same time.

Print and hand in.

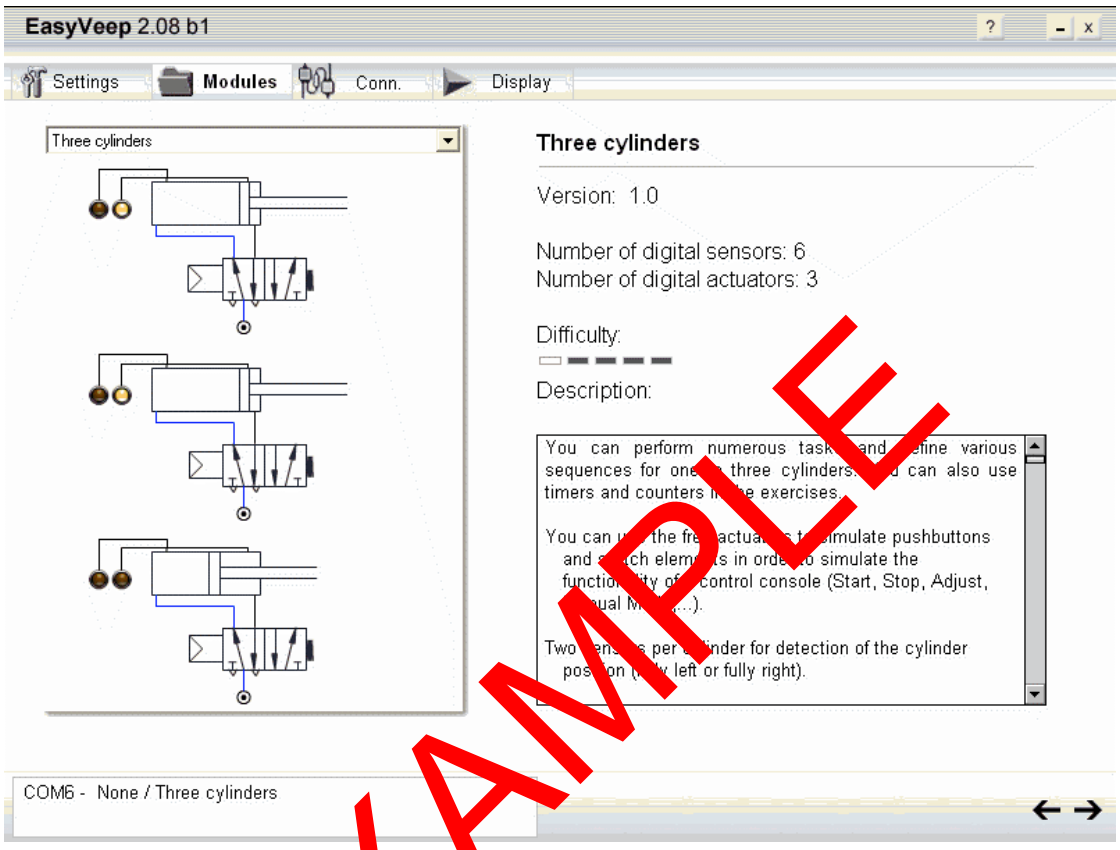
Part 2

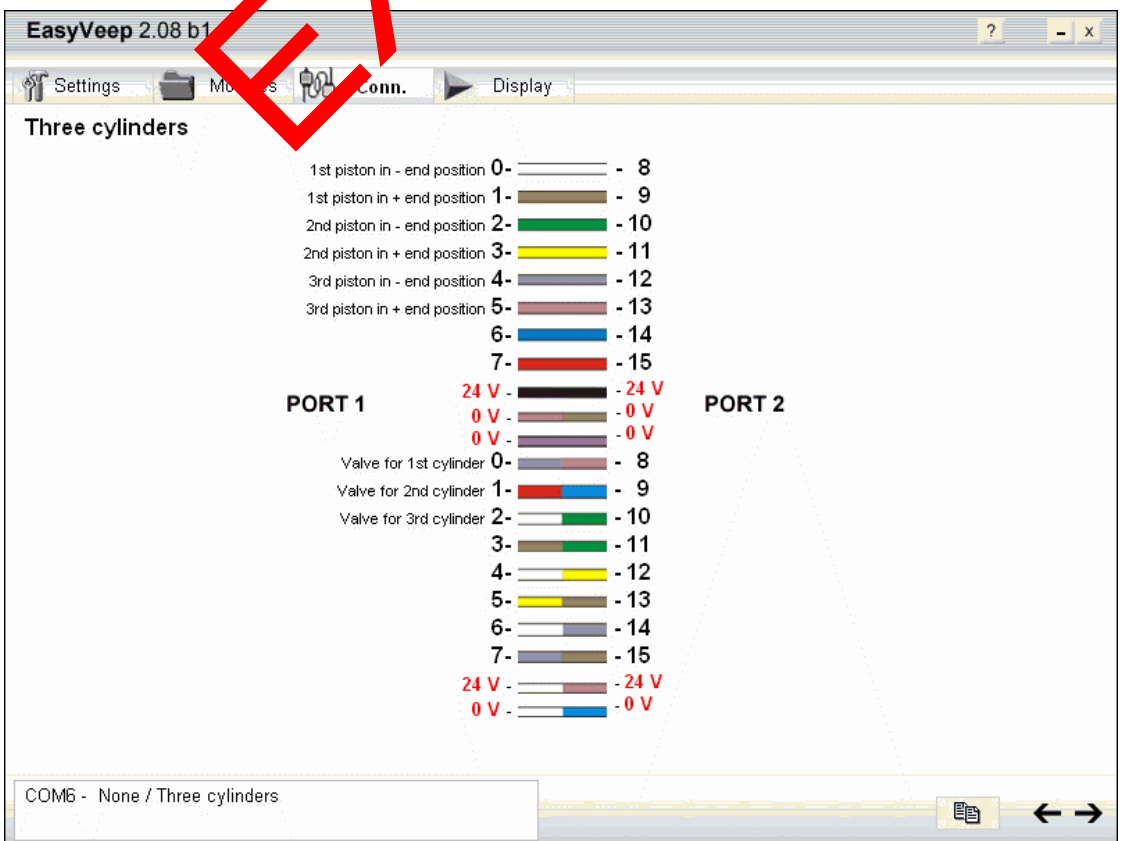
Sequence

1. Change your program so that all logic is done in one rung.
2. Use the same type of instructions and sequence description.

Print and hand in.

Lab 4 – Three Cylinders	
Name:	Date:
Three Cylinders	Sheet 2 of 2





Lab 5 – Three Cylinders 2	
Name:	Date:
Three Cylinders	Sheet 1 of 2

Create a Program for the Easy Veep - Three Cylinders. The program is to use the OTL and OTU instructions. The machine is to run according to the sequence description.

Equipment List

- Programmable Controller
- Easy Port Connected to First and Second I/O Cable or I/O Port.
- Simulation Box Connected to Third Cable or I/O Port.

Sequence Description

Initial Position

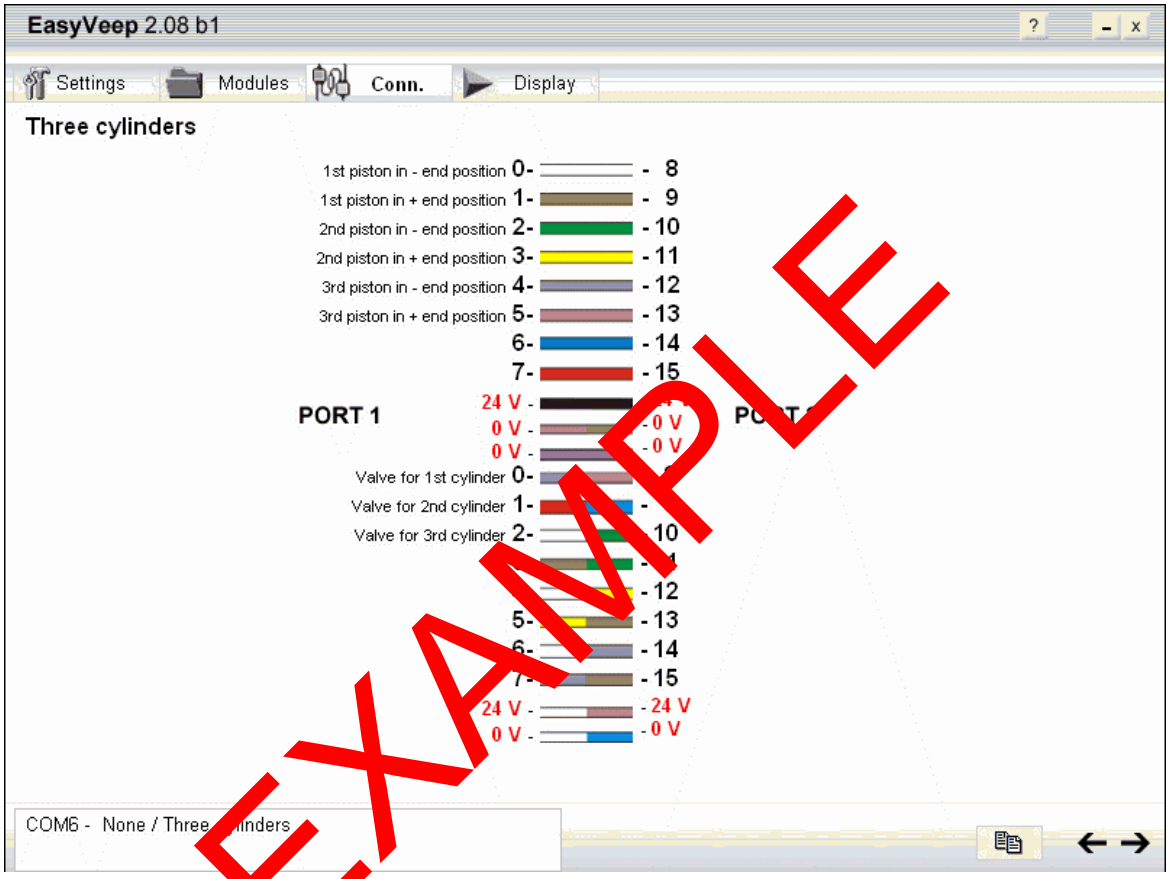
- All cylinders in the retracted position.

Sequence

1. The first cylinder extends when the start signal (Switch Bit 0) is given.
2. The first cylinder will retract when extended sensor is actuated.
3. The second cylinder extends when the first cylinder has fully retracted.
4. The second cylinder will retract when extended sensor is actuated.
5. The third cylinder extends when the second cylinder has retracted
6. The third cylinder will retract when extended sensor is actuated.

Print and hand in.

Lab 5 – Three Cylinders 2	
Name:	Date:
Three Cylinders	Sheet 2 of 2



Lab 6 – Mobile Phone Timer (TON)	
Name:	Date:
Mobile Phone Timer (TON)	Sheet 1 of 2

Create a Program for the Easy Veep - Mobile Phone Timer. The machine is to run according to the sequence description.

Equipment List

- Programmable Controller
- Easy Port Connected to First and Second I/O Cable or I/O Port.

Sequence Description

Initial Position

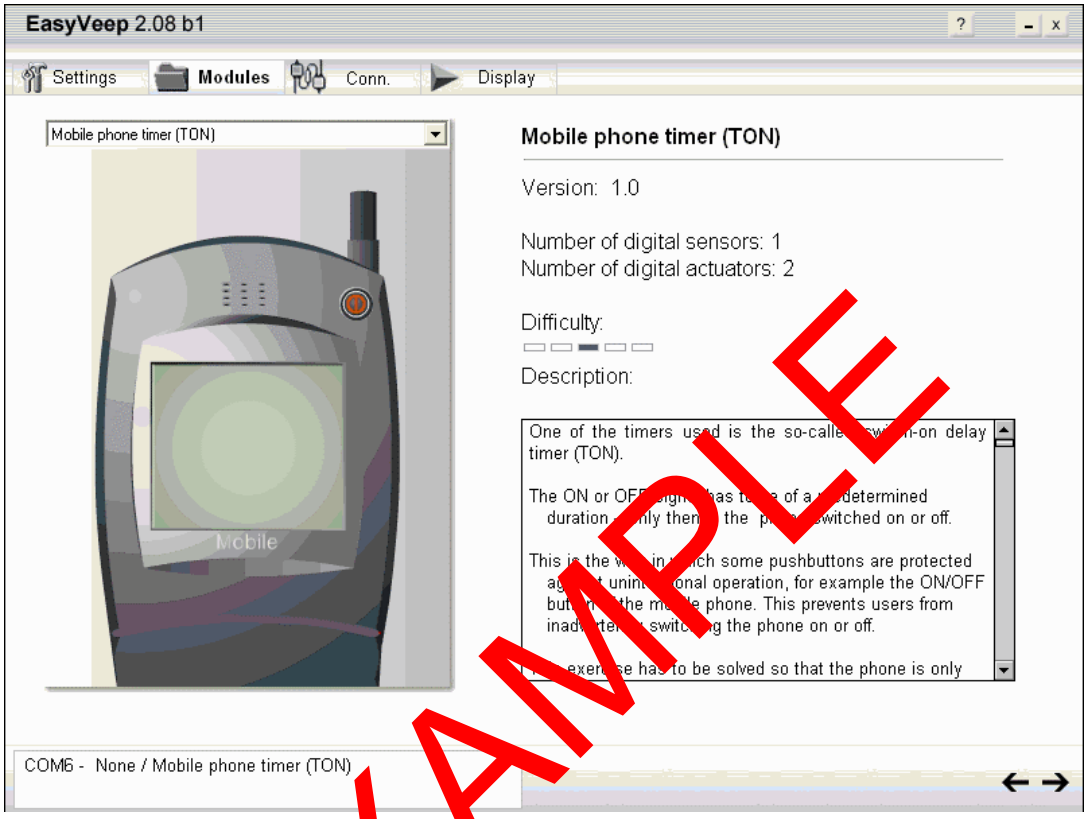
- Phone is Off

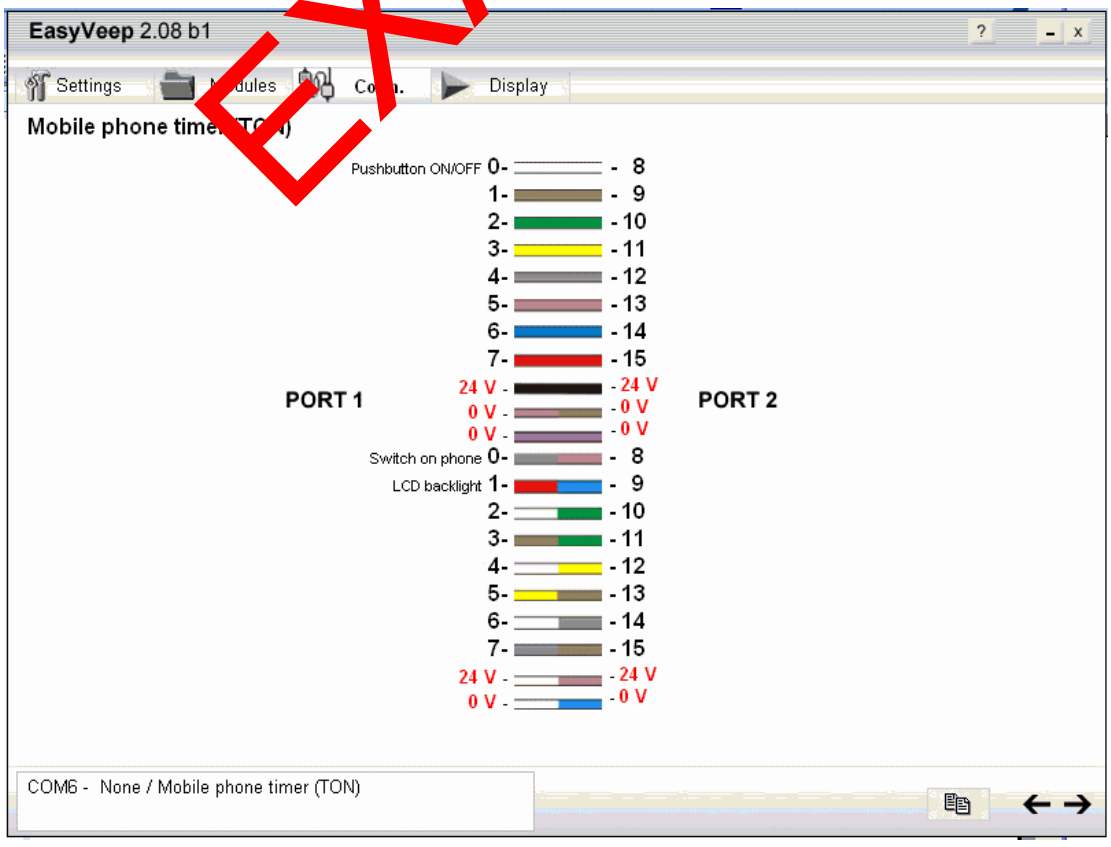
Sequence

1. When the Pushbutton ON/OFF is pressed for 5 sec the Phone and Back light will turn on.
2. After the phone has been on for 5 sec the Back light is to turn off.
3. If the Pushbutton ON/OFF is pressed the Back light is to turn back on.
4. When the Power Button is pressed for 4 sec and the Phone is on. The phone will shut down.

Print and hand in.

Lab 6 – Mobile Phone Timer (TON)	
Name:	Date:
Mobile Phone Timer (TON)	Sheet 2 of 2





Lab 7 – Packaging of Cubes - Counter	
Name:	Date:
Packaging of Cubes - Counter	Sheet 1 of 2

Create a Program for the Easy Veep - Packaging of Cubes - Counter. The machine is to run according to the sequence description.

Equipment List

- Programmable Controller
- Easy Port Connected to First and Second I/O Cable or I/O Port.
- Simulation Box Connected to Third I/O Cable or I/O Port.

Sequence Description

Initial Position

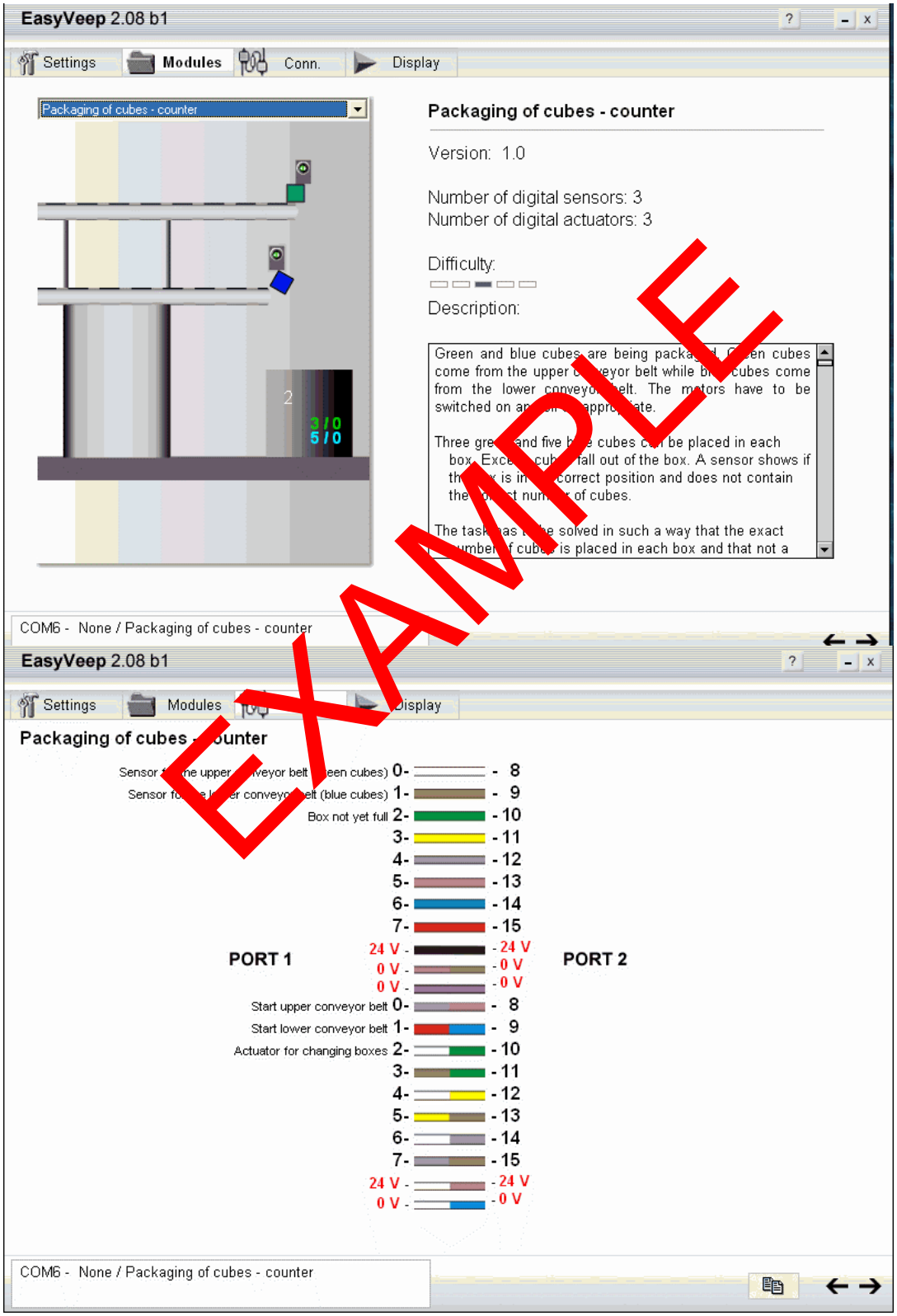
- Upper and Lower Conveyor Belt Stopped.
- Empty Box
- All Switches Off

Sequence

1. The Upper and Lower Conveyors are to start simultaneous by a start switch (Switch Bit 0) and will not stop until the stop switch (Switch Bit 1) is pressed.
2. When the machine is started Light Bit 0 is to flash. Indicating that the machine is active.
3. The Upper Conveyor is to stop feeding green parts into the box after three parts.
4. The Lower Conveyor is to stop feeding blue parts into the box after five parts.
5. After there are 3 green parts and 5 blue parts in the box. The Box Full light (Light Bit 1) is to turn on.
6. The box is to be changed by pressing the new box switch (Switch Bit 2).
7. As long the stop button has not been pressed the conveyors will startup automatically with a new box in place.

Print and hand in.

Lab 7 – Packaging of Cubes - Counter	
Name:	Date:
Packaging of Cubes - Counter	Sheet 2 of 2



Lab 8 – Hot Water Tank	
Name:	Date:
Hot Water Tank	Sheet 1 of 2

Create a Program for the Easy Veep - Hot Water Tank. Use the JSR command to place your heating element into a subroutine so the controller has to call on that portion of the program only when heating is needed. The machine is to run according to the sequence description.

Equipment List

- Programmable Controller
- Easy Port Connected to First and Second I/O Cable or I/O Port.

Sequence Description

Initial Position

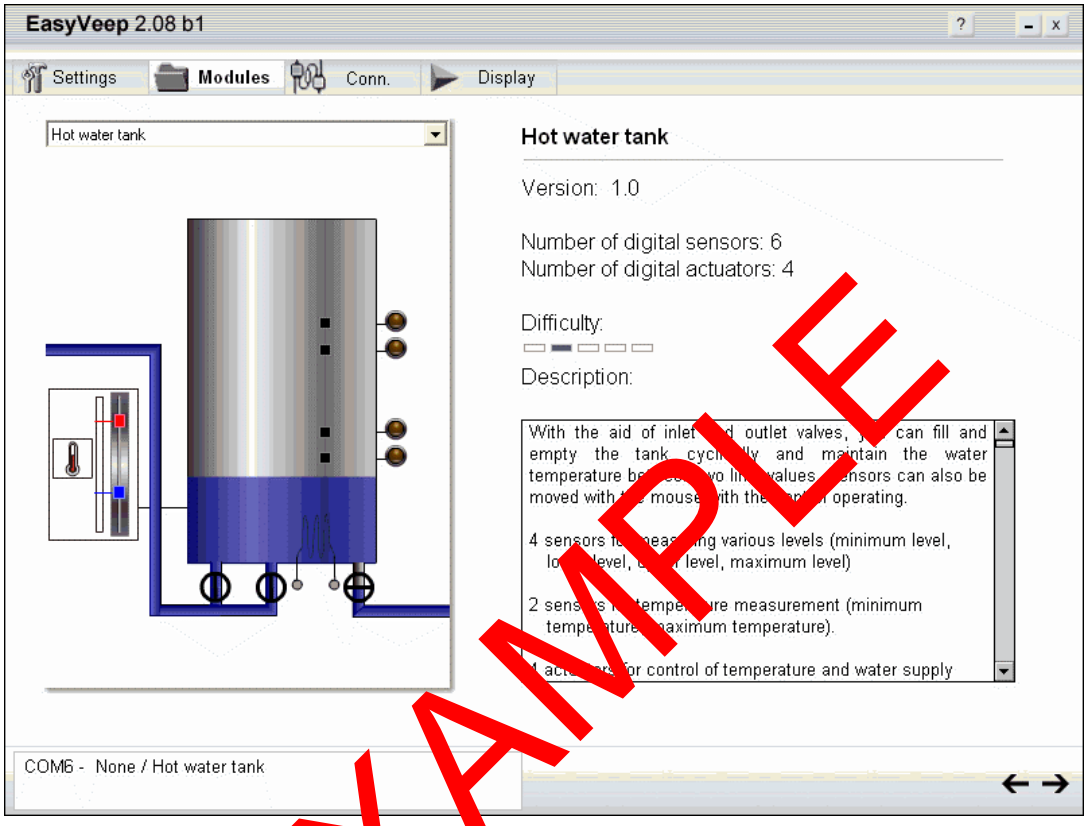
- Heater off
- Empty Tank

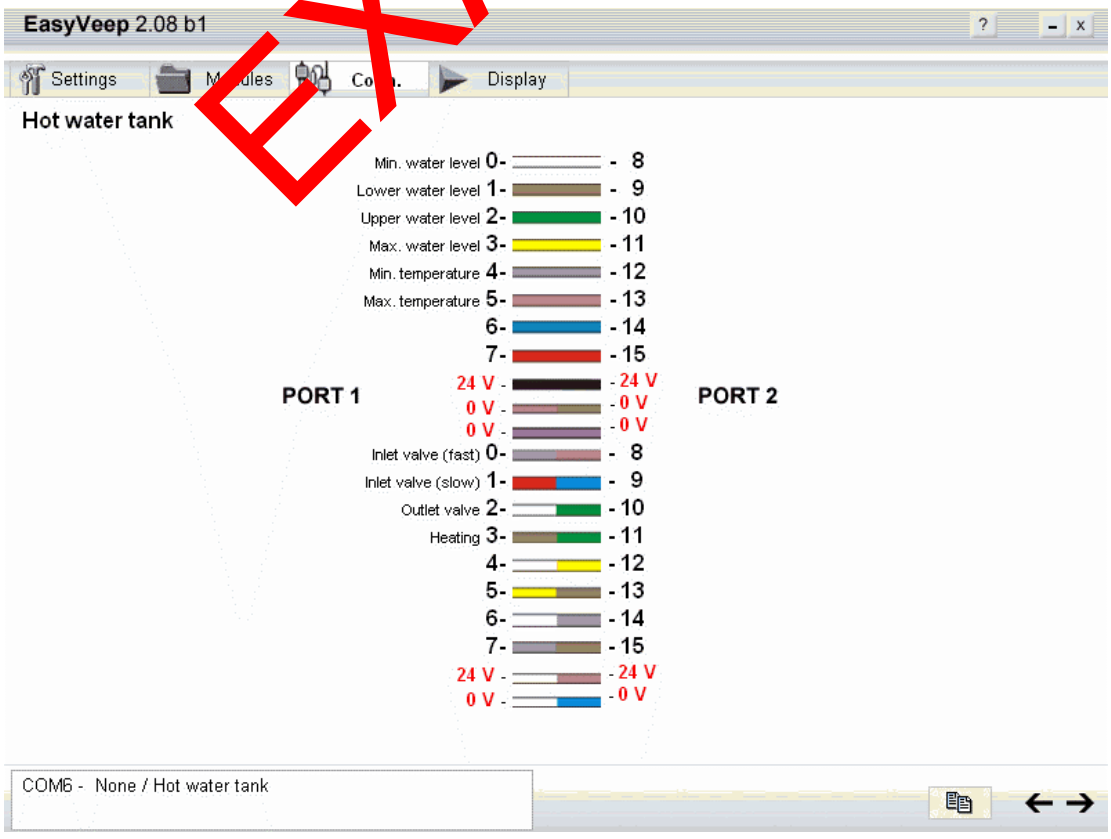
Sequence

1. When the tank is filling the Inlet Valve (fast) and Inlet Valve (slow) are to be on and the Outlet Valve is to be off if the Min Water Lever sensor is not on.
2. When the tank is filling the Inlet Valve (fast) and Inlet Valve (slow) are to be on and the Outlet Valve is to be off if the Upper Water Level is not on.
3. When the tank is filling the Inlet Valve (fast) and the Outlet Valve are to be off and the Inlet Valve (slow) is to be on when the Upper Water Level is on.
4. When the Max. Water Level is triggered the Outlet Valve is to turn on. The Inlet Valve (slow) is to be on also.
5. When the Lower Water Level sensor changes its state, the Outlet Valve is to close and the Inlet Valves fast and slow are to be on.
6. The Heating element is not to turn on until the Min. Water Level is on and the Min Temperature is off.
7. The Heating element is to turn off when the Max Temperature sensor is triggered.

Print and hand in.

Lab 8 – Hot Water Tank	
Name:	Date:
Hot Water Tank	Sheet 2 of 2





Lab 9 – Parking Lot	
Name:	Date:
Parking Lot	Sheet 1 of 2

Create a Program for Easy Veep – Parking Lot. Your program is to use Math instructions for counting no CTU or CTD allowed. The machine is to run according to the sequence description.

Equipment List

- Programmable Controller
- Easy Port Connected to First and Second I/O Cable or I/O Port.
- Simulation Box Connected to Third I/O Cable or I/O Port.

Sequence Description

Start Condition

- No Cars in Parking Lot

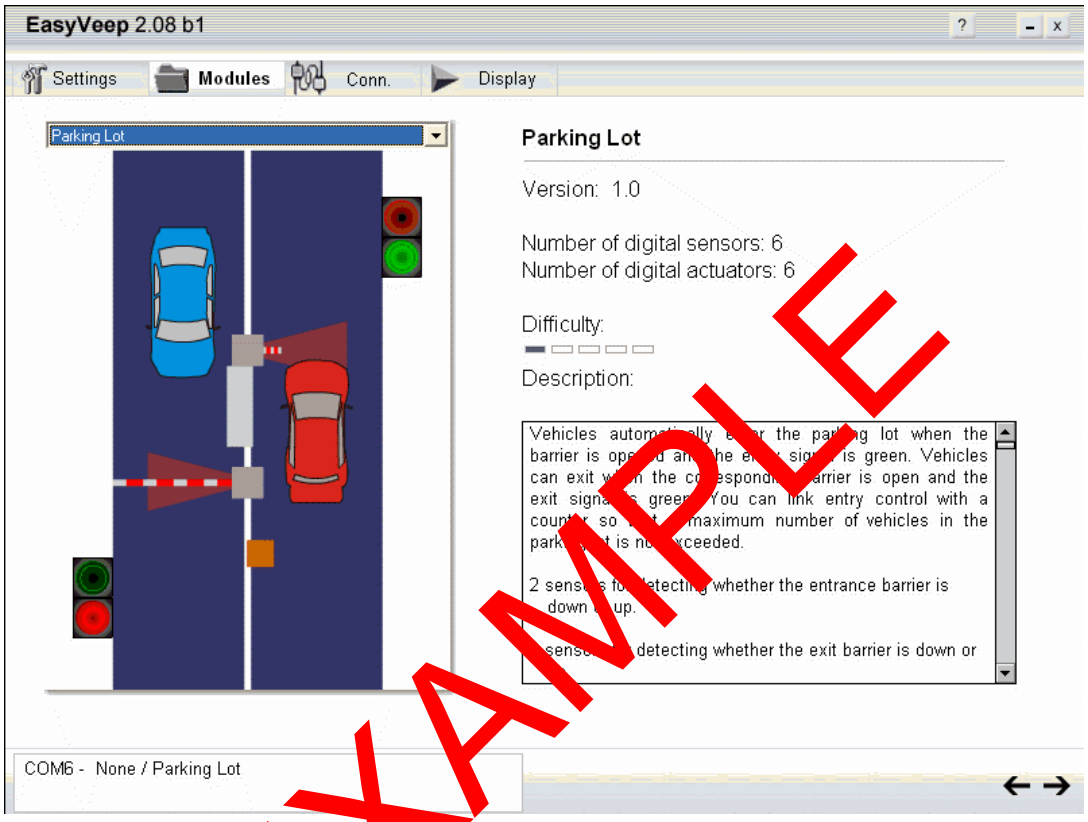
Initial Position

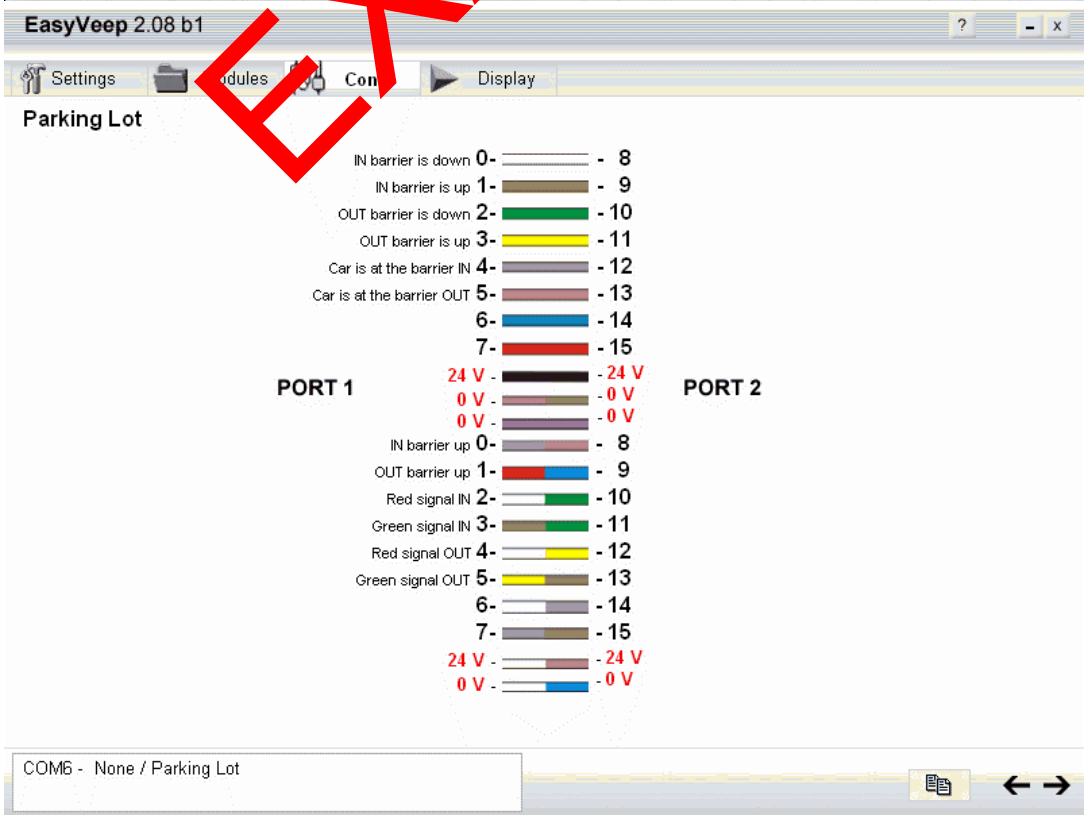
- Enter Barrier Down
- Exit Barrier Down

Sequence

1. Vehicles automatically enter the parking lot when the barrier is opened and the entry is green.
2. Vehicles can exit when the corresponding barrier is open and the exit signal is green.
3. Use Switches Bit 0 (Enter) and Bit 1 (Exit) on the Simulation Box to control when a car can enter or exit.
4. There is to be no more then 5 cars in the parking lot at one time.
5. Use Light Bits 0-4 on the Simulation Box to indicate how many cars are in the parking lot.
6. If there is 5 cars in the parking lot, have Light Bit 5 on the Simulation Box flashes on and off in one second intervals.

Lab 9 – Parking Lot	
Name:	Date:
Parking Lot	Sheet 2 of 2





Lab 10 – Control Panel 2 – Lifting Luggage	
Name:	Date:
Control Panel 2 –Lifting Luggage	Sheet 1 of 2

Create a Program for the Easy Veep - Control Panel 2 – Lifting Luggage.

Pieces of luggage are transported along slides. When a piece of luggage reaches the end of a slide, it is to be lifted on to the next slide by two pneumatic cylinders. The lifting cylinder is a 5/2 way double solenoid valve, the thrust cylinder by a 5/2 way solenoid valve.

The machine is to run according to the sequence description.

Equipment List

- Programmable Controller
- Easy Port Connected to First and Second I/O Cable or I/O Port.

Sequence Description

Start Condition

- A piece of luggage has arrived

Initial Position

- Lifting Cylinder Retracted
- Thrust Cylinder Retracted
- Reset Light On

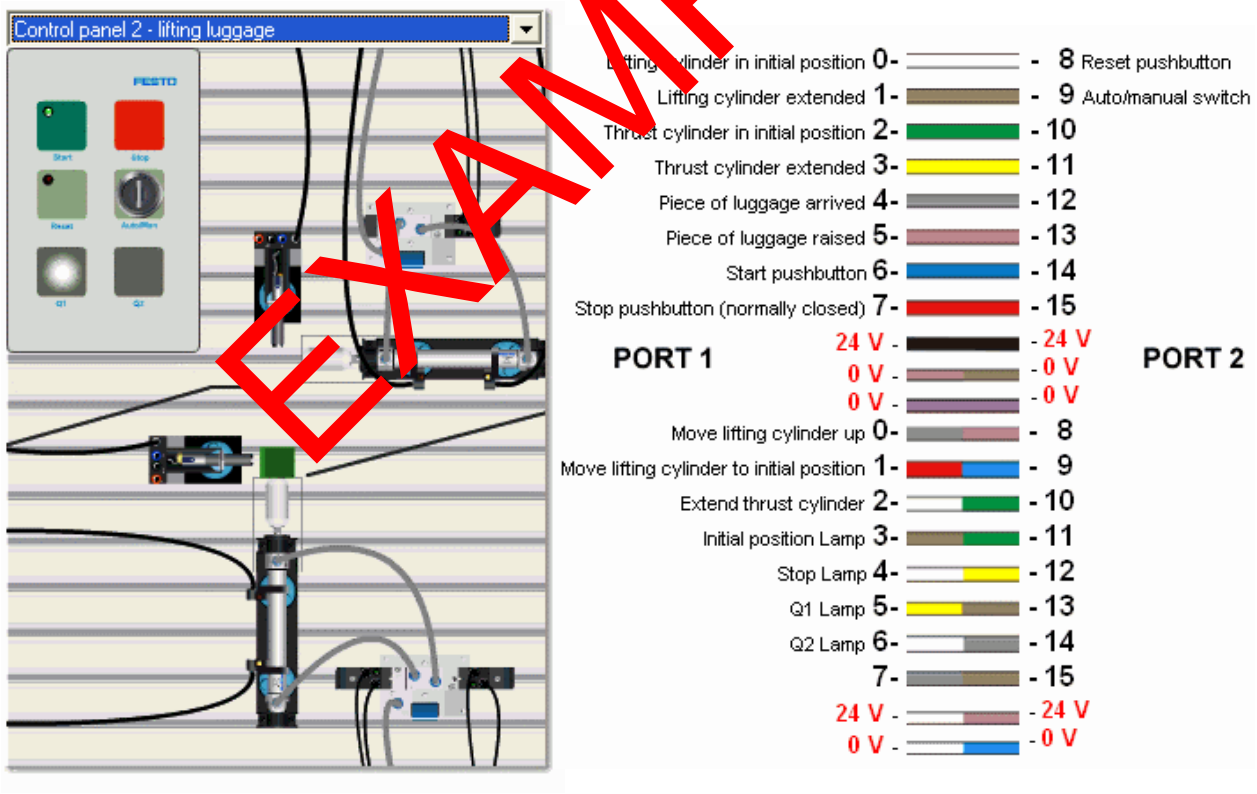
Auto Sequence

1. When the Reset light is on the machine is in a dormant state. Press the Reset PB to activate the outputs. The Reset PB is to also active the Initial position status. The Start light will flash after the outputs are active.
2. Press the Start PB when the Start light is flashing. This will start the Machine cycle. The Q1 light will be illuminated if a piece of luggage has arrived.
3. The Lifting cylinder will raise the part. Q2 light will be illuminated if a piece of luggage is raised.
4. When the part is raised the Thrust cylinder will transport the luggage to the next slide.
5. When the transport is complete the Thrust cylinder will retract.

6. When the Thrust cylinder is retracted the Lifting cylinder will retract.
7. When the Lifting cylinder is retracted the cycle will restart as long as there is another piece of luggage or the Stop PB has not been pressed.
8. If the stop button is pressed the cycle is to finish and then stop. At that point the Start light is to flash. The Start button will need to be pressed to start the auto cycle. If the start button is not pressed after 60 sec. the machine will go into a dormant state shutting off all outputs but the reset light.

Manual Sequence

1. The Machine is to be able to run through its cycle step by step if the Manual SS is on. The next step is trigged by the Start PB.



Lab 11 – Distribution Station	
Name:	Date:
Distribution Station	Sheet 1 of 2

Create a Program for the Cosimir PLC - Distribution Station.

The Distributing station separates work pieces from the stack magazine module. Up to 8 work pieces are stored in the magazine tube of the stack magazine. The fill level of the stack magazine is checked by a one-way light barrier. A double-acting cylinder pushes the work pieces out individually.

The Changer module grips the separated work piece with a vacuum gripper. A vacuum switch detects whether the work piece is properly gripped. Driven by a rotary drive, the arm of changer moves the work piece to the transfer point of the downstream station.

The machine is to run according to the sequence description.

Equipment List

- Programmable Controller
- Easy Port Connected to First and Second I/O Cable or I/O Port.
- Simulation Box

Sequence Description

Start Condition

- Magazine is filled with work pieces.

Initial Position

- Thrust cylinder extended
- Swivel drive in “Magazine” position
- Vacuum off

Sequence

1. If work pieces are detected in the magazine and the start button is pressed, the swivel drive moves to position “Downstream station”.
2. The trust cylinder retracts and pushes a work piece from the magazine.
3. The swivel drive rotates to the “Magazine” position.
4. The vacuum is switched on. When the work piece is securely gripped, a vacuum switch is actuated.
5. The trust cylinder extends and releases the work piece.

6. The swivel drive rotates to the “Downstream Station” position.
7. The vacuum is switched off.
8. The swivel drive swivels to the “Magazine” position.

Input and Output List for the Distribution Station.

Control Console

Actuator	**Output**	**1 signal at actual input results in:**
H1	A1.0	Indicator light Start on
H2	A1.1	Indicator light (Reset)
H3	A1.2	Indicator light (individually assigned, see below)
H4	A1.3	Indicator light (individually assigned, see below)
Sensor	**Input**	**Sensor output has 1 signal when:**
S1	E1.0	Start pushbutton
S2	E1.1	Stop pushbutton (normally closed)
S3	E1.2	Automatic/manual switch
S4	E1.3	Reset pushbutton
Em_Stop	E1.5	EMERGENCY STOP unlatched

Distribution Station

Actuator	**Output**	**1 signal at actual input results in:**
1Y1	A0.0	Ejection cylinder pushes work piece out
2Y1	A0.1	Vacuum on
2Y2	A0.2	Ejector pulse on
3Y1	A0.3	Swivel cylinder to magazine
3Y2	A0.4	Swivel cylinder to downstream station
P_N_FO	-	(not present)
H3	A1.2	Indicator light magazine empty
Sensor	**Input**	**Sensor output has 1 signal when:**
Part_AV		(not present)
1B2	E0.1	Ejection cylinder extended
1B1	E0.2	Ejection cylinder retracted
2B1	E0.3	Work piece gripped (vacuum present)
3S1	E0.4	Swivel cylinder in position magazine
3S2	E0.5	Swivel cylinder in position downstream station
B4	E0.6	Magazine empty

Lab 12 –Testing Station	
Name:	Date:
Testing Station	Sheet 1 of 2

Create a Program for the Cosimir PLC - Testing Station.

The testing station determines the characteristics of inserted work pieces. The sensing module carries out the color sensing of the work piece. A capacitive sensor senses each work piece irrespective of color. A diffuse sensor identifies metallic and red work pieces. Black work pieces are not recognized. A through-beam sensor monitors whether the work space above the work piece retainer is free, prior to lifting the work piece via the lifting module.

The analogue sensor of the measuring module determines the height of the work piece. The output signal is either digitalized with adjustable threshold values via a comparator or can be supplied to a PLC via a connection block using analogue signal processing.

A linear cylinder guides correct work pieces to the succeeding station via the upper air cushion slide. The other work pieces are sorted out on the lower slide.

The machine is to run according to the sequence description.

Equipment List

- Programmable Controller
- Easy Port Connected to First and Second I/O Cable or I/O Port.
- Simulation Box

Sequence Description

Start Condition

- Work piece in work piece retainer

Initial Position

- Lifting cylinder is down
- Ejecting cylinder is retracted
- Air cushion slide is switched off

Lab 12 – Testing Station	
Name:	Date:
Testing Station	Sheet 2 of 2

Sequence

1. To determine the color and material of the work piece.
2. Lifting cylinder to move up.
3. Measurement of work piece height

Test result OK

4. Switch on air cushion slide.
5. Ejecting cylinder to advance.
6. Ejecting cylinder to retract.
7. Air cushion slide to switch off.
8. Lifting cylinder to move down.
9. Initial position.

Test results not OK

10. Lifting cylinder to move d
11. Ejecting cylinder to advance.
12. Ejecting cylinder to r
13. Initial position.

Lab 12 – Testing Station	
Name:	Date:
Testing Station	Sheet 3 of 3

Input and Output List for the Testing Station

Control Console

Actuator	**Output**	**1-Signal at actuator input initiates:**
H1	O1.0	Start indicator light On
H2	O1.1	Initial Position indicator light (reset)
H3	O1.2	Indicator light (individually allocated, see below)
H4	O1.3	Indicator light (individually allocated, see below)
Sensor	**Input**	**1-Signal applied at sensor output if:**
S1	I1.0	Start button
S2	I1.1	Stop button (normally open contact)
S3	I1.2	Automatic/Manual switch
S4	I1.3	Reset button / Reset
Em_Stop	I1.5	EMERGENCY STOP released

Testing Station

Actuator	**Output**	**1-Signal at actuator input initiates:**
1Y1	O0.0	Lifting cylinder to move down
1Y2	O0.1	Lifting cylinder to move up
2Y1	O0.2	Ejecting cylinder to advance
3Y1	O0.3	Air cushion slide On
IP_N_FO	O0.7	Station occupied
Sensor	**Input**	**1-Signal sensor applied at sensor output if:**
Part_AV	I0.0	Work piece available
B2	I0.1	Work piece not black
B4	I0.2	Safety through-beam sensor
B5	I0.3	Work piece height correct
1B1	I0.4	Lifting cylinder up
1B2	I0.5	Lifting cylinder down
2B1	I0.6	Ejecting cylinder retracted
IP_FI	I0.7	Succeeding station free

Lab 13 –Sorting Station	
Name:	Date:
Sorting Station	Sheet 1 of 3

Create a Program for the Cosimir PLC - Sorting Station.

The sorting station sorts work pieces on 3 slides. Work pieces inserted at the conveyor start are detected by a diffuse sensor.

Sensors in front of the stopper detect the work piece characteristics (black, red, metal). The work pieces are sorted onto the appropriate slides via sorting gates, which are moved by means of short-stroke cylinders via a diverting mechanism.

A through-beam sensor monitors the filling level of the slides.

The machine is to run according to the sequence description.

Equipment List

- Programmable Controller
- Easy Port Connected to First and Second I/O Cable or I/O Port.
- Simulation Box

Sequence Description

Start Condition

- No work piece at conveyor start

Initial Position

- Stopper extended
- Branch 1 retracted
- Branch 2 retracted
- Conveyor motor OFF

Lab 13 – Sorting Station	
Name:	Date:
Sorting Station	Sheet 2 of 3

Sequence

1. Work piece detected.
2. Conveyor motor ON.
3. Color / Material identification.

Black work piece detected, deposit on slide at conveyor end.

4. Stopper to retract.
5. Work piece ejected.
6. Idle step.

Metallic work piece detected, deposited on slide in mid conveyor position.

7. Branch 2 to extend.
8. Stopper to retract.
9. Work piece ejected.
10. Conveyor motor OFF.
11. Stopper to advance.
12. Branch 2 to retract.
13. Idle step.

Red work piece detected, deposit on slide at conveyor start.

14. Branch 1 to extend.
15. Stopper to retract.
16. Work piece ejected.
17. Conveyor motor OFF.
18. Stopper to advance.
19. Branch 1 to retract.
20. Idle step.

Input and Output List for the Sorting Station

Control Console

Actuator	Output	1-Signal at actuator input initiates:
H1	O1.0	Start indicator light ON
H2	O1.1	Initial Position indicator light (reset)
H3	O1.2	Indicator light (individually allocated, see below)
H4	O1.3	Indicator light (individually allocated, see below)
Sensor	**Input**	**1-Signal applied at sensor output if:**
S1	I1.0	Start button
S2	I1.1	Stop button (normally closed contact)
S3	I1.2	Automatic/Manual switch
S4	I1.3	Reset button / Reset
Em_Stop	I1.5	EMERGENCY STOP released

Sorting Station

Actuator	Output	1-Signal at actuator input initiates:
K1	OA0.0	Conveyor motor ON
1Y1	O0.1	Branch 1 to extend
2Y1	O0.2	Branch 2 to extend
3Y1	O0.3	Stopper to retract
IP_N_FO	O0.7	Station occupied
H3	O1.2	Slide Full indicator light
Sensor	**Input**	**1-Signal applied at sensor output if:**
Part_AV	I0.0	Work piece available
B2	I0.1	Metallic work piece
B3	I0.2	Work piece not black
B4	I0.3	Slide full
1B1	I0.4	Branch 1 retracted
1B2	I0.5	Branch 1 extended
2B1	I0.6	Branch 2 retracted
2B2	I0.7	Branch 2 extended
IP_FI	-	(not available)

Lab 14 –Handling Station	
Name:	Date:
Handling Station	Sheet 1 of 3

Create a Program for the Cosimir PLC - Handling Station.

The handling station is equipped with a flexible twin-axis handling device. Work pieces inserted in the retainer are detected by means of an optical diffuse sensor.

From there, the handling device retrieves the work pieces by means of a pneumatic gripper. A sensor is integrated into the gripper, which differentiates between 'black' and 'non black' work pieces. The work pieces can be deposited to the various slides according to these criteria.

Different sorting criteria can be defined if the station is combined with other stations. By changing the setting of the mechanical end stops, it is also possible to transfer work pieces to a succeeding station.

The machine is to run according to the sequence description.

Equipment List

- Programmable Controller
- Easy Port Connected to First and Second I/O Cable or I/O Port.
- Simulation Box

Sequence Description

Start Condition

- A work piece is in the retainer

Initial Position

- Linear axis in position ‘Previous Station’.
- Lifting cylinder retracted (gripper up).
- Gripper open.

Lab 14 – Handling Station	
Name:	Date:
Handling Station	Sheet 2 of 3

Sequence

1. The lifting cylinder is extended if a work piece is detected in the retainer and the Start button is pressed.
2. The gripper is closed. The color sensing function ‘Work piece Black’ or ‘Work piece not Black’ is executed.
3. The lifting cylinder is retracted.

Work piece Black.

4. The linear axis approaches the position ‘Slide Black’.
5. The lifting cylinder advances.
6. The gripper is opened and the work piece deposited on the slide.
7. The lifting cylinder retracts.
8. The linear axis moves into the position ‘Previous Station’.

Work piece Red / Silver

9. The linear axis approaches the ‘Slide Red / Silver’ position.
10. The lifting cylinder advances.
11. The gripper is opened and the work piece deposited on the slide.
12. The stroke cylinder retracts.
13. The linear axis moves into the ‘Previous Station’ position.

Lab 14 – Handling Station	
Name:	Date:
Handling Station	Sheet 3 of 3

Input and Output List for the Handling Station.

Control Console

Actuator	Output	1-signal at actuator input initiates:
H1	O1.0	Start indicator light On
H2	O1.1	Initial position indicator light (reset)
H3	O1.2	Indicator light (individually allocated, see below)
H4	O1.3	Indicator light (individually allocated, see below)
Sensor	**Input**	**1-Signal applied at sensor output if:**
S1	I1.0	Start button
S2	I1.1	Stop button (normally closed contact)
S3	I1.2	Automatic/Manual switch
S4	I1.3	Reset button / Reset
Em_Stop	I1.5	EMERGENCY STOP released

Handling Station

Actuator	Output	1-Signal at actuator input initiates:
1Y1	O0.0	Handling to previous station
1Y2	O0.1	Handling to succeeding station
2Y1	O0.2	Advance gripper
3Y1	O0.3	Open gripper
P_N_FO	O0.7	Station occupied
Sensor	**Input**	**1-Signal applied at sensor output if:**
Part_AV	I0.0	Work piece is available
1B1	I0.1	Handling at previous station
1B2	I0.2	Handling at succeeding station
1B3	I0.3	Handling in sorting position
2B1	I0.4	Gripper advanced
2B2	I0.5	Gripper retracted
3B1	I0.6	Work piece is not black
IP_FI	I0.7	Succeeding station free

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