

Industrial Control Work-Cell Reference Sheet (Siemens)

Overview

The Industrial Control Work-Cell trainer and a connected PLC allow many of the control requirements of an industrial plant to be explored.

Software installed on a remote programming computer allows ladder logic programs to be entered, downloaded to the PLC, and used to control the various trainer elements.

Setting the Manual Override on the control panel switch to the '1' position allows the trainer to be driven using the Manual Control switches. Sensor lamps always provide an indication of the current sensor status.



Software Installation

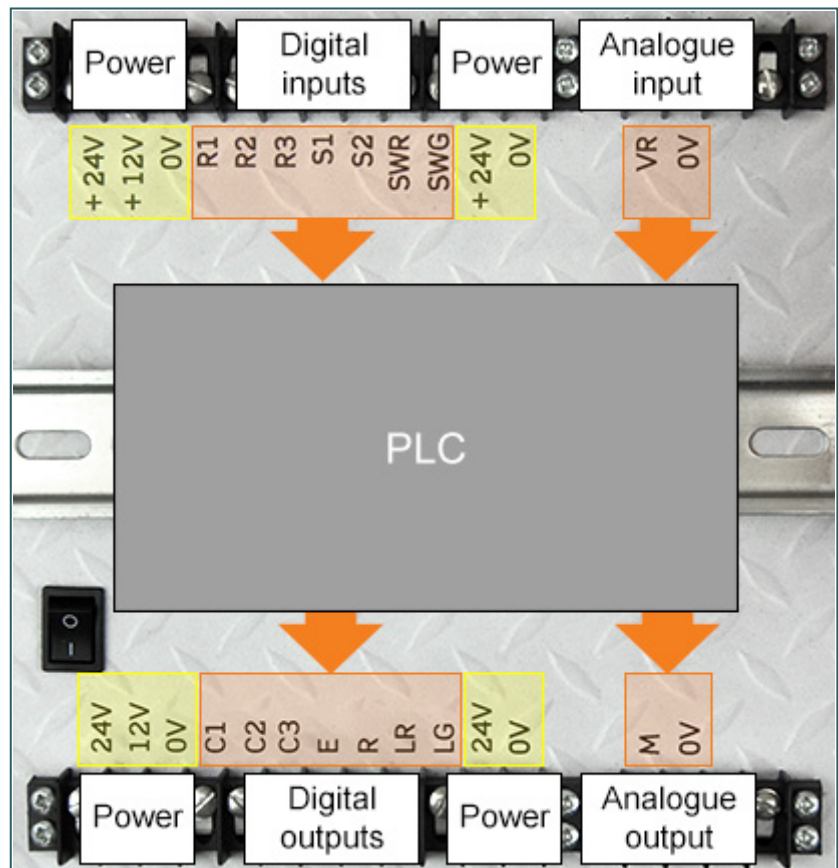
Installation of the software onto a remote programming computer and the connection of this computer to the PLC are covered in the software reference sheet.

PLC Connections

For the PLC to control the various elements of the work-cell trainer, its inputs and outputs must be connected to the appropriate terminals on the trainer.

In addition, the power requirements of the PLC are taken from terminals on the trainer.

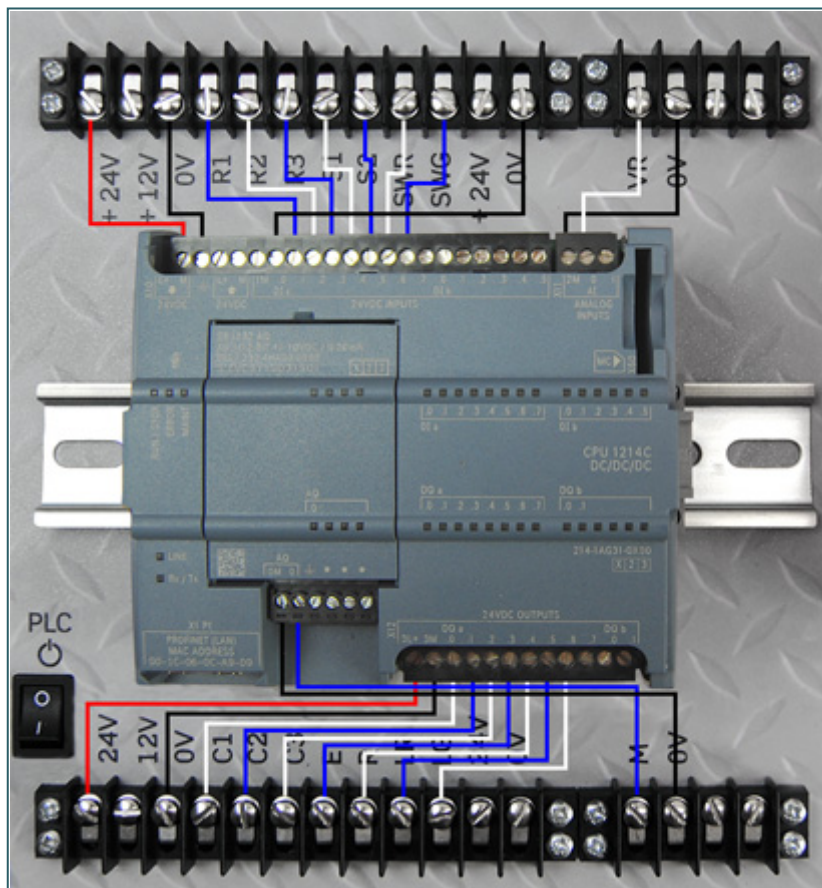
The following sections identify the individual connections for specific PLCs.



Siemens S7 1200 Connections

Model: CPU 1214C
DC/DC/DC with SB1232
analogue output module

Connecting the Siemens
PLC to the trainer:



Upper Terminal Strip - PLC Inputs and Power Connections

Trainer	Siemens PLC	Description
+24V	24V DC L+	24 V DC input power source
+12V		<i>Not connected</i>
0V	24V DC M	0 V DC input power source
R1	Dla 0	Cylinder reed switch 1 active
R2	Dla 1	Cylinder reed switch 2 active
R3	Dla 2	Cylinder reed switch 3 active
S1	Dla 3	Optical beam sensor 1 not broken
S2	Dla 4	Optical beam sensor 2 not broken
SWR	Dla 5	Red button pressed
SWG	Dla 6	Green button pressed
+24V		<i>Not connected</i>
0V	Dla 1M	Digital 0 V reference
VR	AI 0	Analogue dial control (0-27648)
0V	AI 2M	Analogue 0 V reference

Lower Terminal Strip - PLC Outputs and Power Connections

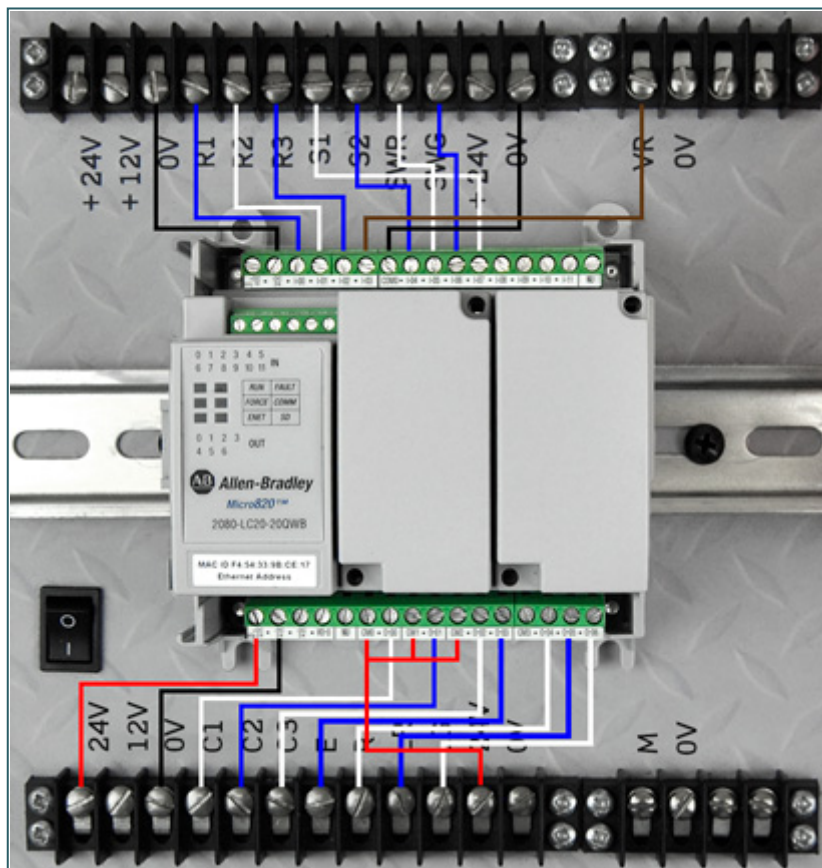
Trainer	Siemens PLC	Description
24V	3L+	24 V source for outputs
12V		<i>Not connected</i>
0V	3M	0 V reference for outputs
C1	DQa 0	Activate cylinder 1
C2	DQa 1	Activate cylinder 2
C3	DQa 2	Activate cylinder 3
E	DQa 3	Enable conveyor
R	DQa 4	Reverse conveyor
LR	DQa 5	Illuminate red lamp
LG	DQa 6	Illuminate green lamp
24V		<i>Not connected</i>
0V		<i>Not connected</i>
M	AQ 0	Analogue motor speed control (0-27648)
0V	AQ 0M	Analogue 0 V reference

The supplied wire set has terminal connections on each end and different coloured wires to make the wiring easier. Use a flat bladed screwdriver and ensure that power is switched off when connecting/disconnecting the unit.

Allen Bradley Micro820 Connections

Model: CPU 2080-LC20-20QWB

Connecting the Allen Bradley PLC to the trainer:



Upper Terminal Strip - PLC Inputs and Power Connections

Trainer	Allen Bradley PLC	Description
+24V		Not connected
+12V		Not connected
0V	-DC24	0 V reference for inputs I-00 to I-03
R1	I-00	Cylinder reed switch 1 active
R2	I-01	Cylinder reed switch 2 active
R3	I-02	Cylinder reed switch 3 active
S1	I-07	Optical beam sensor 1 not broken
S2	I-04	Optical beam sensor 2 not broken
SWR	I-05	Red button pressed
SWG	I-06	Green button pressed
+24V		Not connected
0V	COM0	0 V reference for inputs I-04 to I-11
VR	I-03	Analogue dial control (0-4095)
0V		Not connected

Lower Terminal Strip - PLC Outputs and Power Connections

Trainer	Allen Bradley PLC	Description
24V	+DC24	24 V DC input power source
12V		<i>Not connected</i>
0V	-DC24	0 V DC input power source
C1	O-00	Activate cylinder 1
C2	O-01	Activate cylinder 2
C3	O-02	Activate cylinder 3
E	O-03	Enable conveyor
R	O-04	Reverse conveyor
LR	O-05	Illuminate red lamp
LG	O-06	Illuminate green lamp
24V	CM0, CM1, CM2, CM3	Common 24 V DC connection for relay outputs O-00 through O-06
0V		<i>Not connected</i>
M	VO-0	Analogue motor speed control (0-4095)
0V	-DC24	Analogue 0 V reference

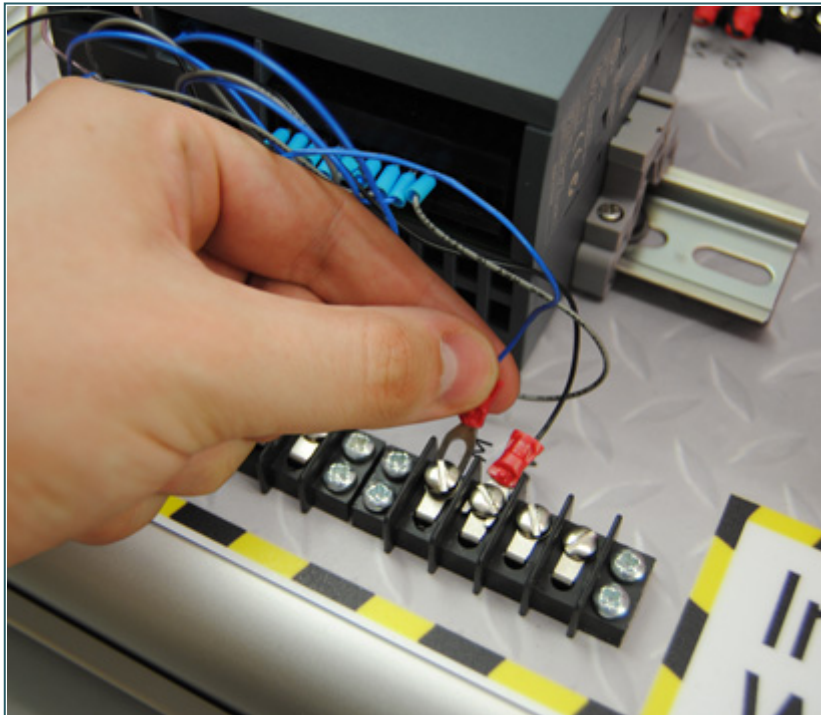
The supplied wire set has terminal connections on each end and different coloured wires to make the wiring easier. Use a flat bladed screwdriver and ensure that power is switched off when connecting/disconnecting the unit.

Connecting/Disconnecting the Analogue Motor Control

The conveyor motor has three controls:

- Enable (E) – Start/Stop the conveyor motor
- Reverse (R) – Control the direction of the conveyor
- Speed (M) – Control the speed of the conveyor motor

Speed control of the conveyor requires more complex programming, so some practical tasks require the analogue speed control connection to be removed. Use a screwdriver to remove the connection from the **M** terminal block.



With the analogue connection removed and the motor enabled, the conveyor will run at full speed.

For practical tasks that use the analogue speed control, simply reconnect the wire.

Switching On and Off

The trainer has an external 12V supply that must be connected to the power input socket on the right side of the trainer.

The switch alongside the power input controls power to the main unit, including the internal electronics and the devices on the trainer, such as the motor and lamps.

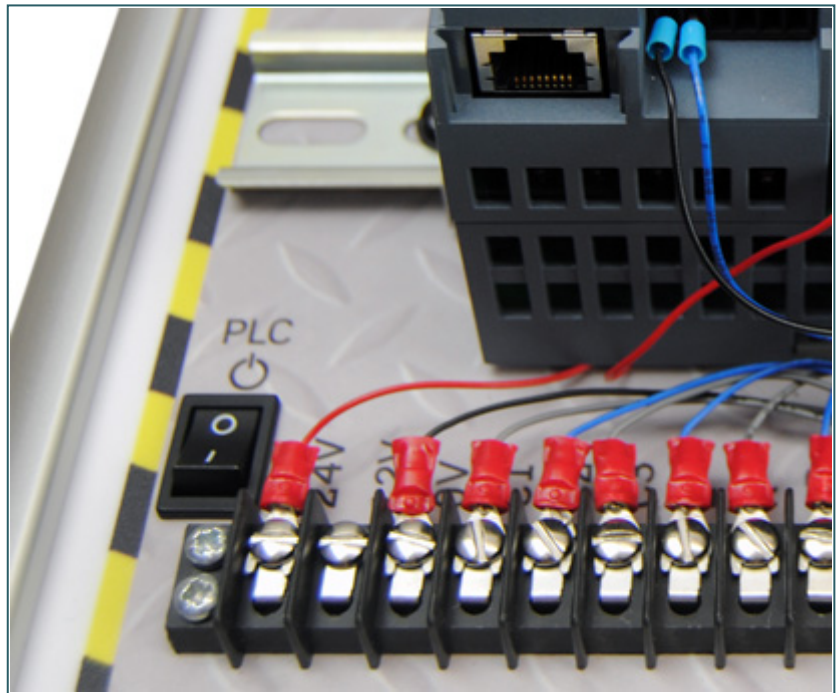


Note: The bank of four fault insertion switches to the right of the USB port should be in the down position for normal operation.

Once power is applied and the unit is switched on, the Manual Control panel can be used to control the trainer by switching to Manual Override mode. (Refer to the section on 'Sensor Status and Manual Control' for more information.)

This switch on the top panel controls power to the attached PLC unit.

With a PLC attached and this switch in the on position, the PLC will control the unit (unless the Manual Override switch has been activated).



Air Supply and Pressure Reservoir

Connect the air supply from the pressure reservoir to the trainer.

A pressure of 0.2 bar is sufficient to work the cylinder pistons.



To pressurise the system, push down on the pressure reservoir handle and turn it counter-clockwise until the handle releases.

Pump the handle until the required pressure is reached.

Push the handle fully down and turn it clockwise to lock it in the down position.

Safety: When you have finished with the air supply reservoir you must depressurise it. To do this, pull the release valve on the reservoir (situated opposite to the air hose). **NEVER** unscrew the top of the reservoir without making sure that it is depressurised first.



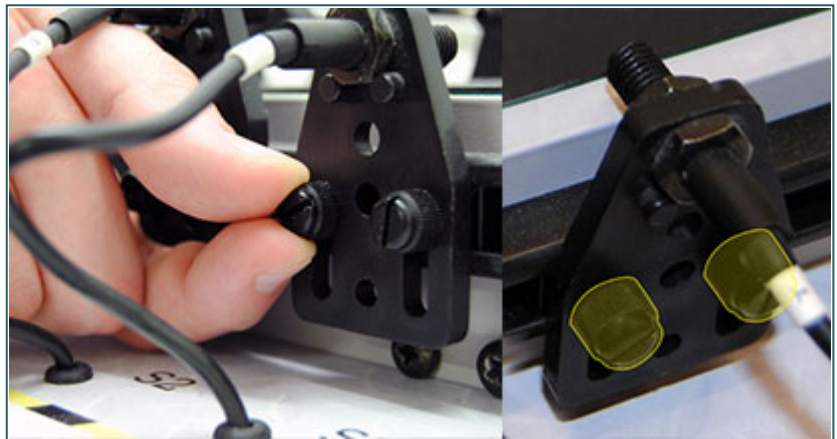
Altering the Optical Beam Sensor Height

Each optical beam sensor consists of an infrared transmitter on one side of the conveyor and an infrared receiver on the opposite side. When correctly aligned, the receiver can be used to detect when the infrared beam is broken.

The height of the beam can be set to two positions, low and high. In the low position, both short and tall parts are detected. In the high position, only the tall parts are detected.

The transmitters (T) and receivers (R) are attached to the conveyor casing with thumb screws. Their height can be independently altered by loosening the screws and moving the sensor brackets up or down.

Both the transmitter and receiver of each sensor set should be changed simultaneously. After adjusting the position of the sensors, use the Sensor Status indicator lamps to ensure that the pair are correctly aligned before (and after) tightening the thumb screws. With a sensor beam uninterrupted, the corresponding indicator lamp should be illuminated.



Sensor Status and Manual Control

Sensor Status

The control panel on the trainer displays the current sensor status at all times using a series of lamps.

Sensor	Sensor Status Indication
SWR	Red button pressed
SWG	Green button pressed
S1	Optical sensor 1 beam not broken
S2	Optical sensor 2 beam not broken
R1	Cylinder 1 extended
R2	Cylinder 2 extended
R3	Cylinder 3 extended



Manual Control

When the manual override switch is set to position 1, the trainer is controlled purely from the set of switches in the control panel section.

Manual Control	Action
LR	Illuminate red lamp
LG	Illuminate green lamp
E	Enable conveyor motor
R	Reverse conveyor motor
C1	Extend cylinder 1
C2	Extend cylinder 2
C3	Extend cylinder 3

In manual mode the VR dial controls the conveyor speed.

When manual override is switched off (0), the control switch positions are ignored and control returns to the PLC.