CREATE Faculty Training on CBE Learning

Created by Tom Wylie, 12/20/22

CREATE Faculty Training on CBE Learning

Training topics for this training session:

1. Traditional courses versus Competency-based hybrid courses

2. Process of converting a traditional course to a hybrid format

3. Traditional and competency-based assessment models

4. Performance Assessments: Examples and Execution

5. Knowledge & Application Assessments: Examples

6. Grading Model – Standards set by Dean and Grant Personnel

7. Overview of Module 1 of the PLC1 Course:

    a. Module description and Outcomes, Learning Sequence Sheet

    b. Learning objects, Lab Exercises, KAA study guides

    c. Practice quizzes, Assessments

CREATE Faculty Training on CBE Learning

Training topics continued:

8. Introduction to creating Learning Objects

       a. PowerPoint

       b. Converting PPT to PDF

       c. Voice over PPT

       d. Creating videos with a camera

       e. Creating a screen CAM video to show how to use software

Please Read This

This document is to overview the methods of data communications for legacy (MicroLogix, SLC-500 and PLC-5) and modern-day PLC and PAC (CompactLogix & ControlLogix) systems. For more in depth and accurate information on any of these topics, visit ab.com, or perform a google search with a standard internet browser.

C R E A T E

Creating **R**elevant**,** **E**ffective and **A**ccessible **T**echnical **E**ducation

Students to develop more applicable **Hands-On Technical Skills** than in previous courses

NSF uses the phrase: Developing a **More Qualified Technician**

Reduce the Product Variance: Which means that all students in the PLC courses will have the same learning experience, no matter who the Instructor is. All the base level material is found in the LMS.

What is Competency-Based Education (CBE)?

Competency-based Education consists of two components:

*Mastery of Skills - The CBE course is typically parsed into modules, with knowledge assessments in each module that must be passed at an acceptable level, and Performance Assessments that must be passed at 100% (mastery).

*Flexible Pacing - Student will progress through a course at their pace of learning (and of course mastery). Some students will finish early, and some will take a little longer.

Traditional PLC Course:

Wk. 1	Wk. 2	Wk. 3	Wk. 4	Wk. 5	Wk. 6	Wk. 7	Wk. 8	Wk. 9	Wk. 10	Wk. 11	Wk. 12	Wk. 13	Wk. 14	Wk. 15	Wk. 16
Mon Lecture 5-8pm	Mon Lecture 5-8pm	Mon Lecture 5-8pm	Mon Lecture 5-8pm	Mon Lecture 5-8pm	Mon Lecture 5-8pm	Mon Lecture 5-8pm	Mon Lecture 5-8pm	Mon Lecture 5-8pm	Mon Lecture 5-8pm	Mon Lecture 5-8pm	Mon Lecture 5-8pm	Mon Lecture 5-8pm	Mon Lecture 5-8pm	Mon Lecture 5-8pm	Mon Lecture 5-8pm
Wed Lab 5-8pm	Wed Lab 5-8pm	Wed Lab 5-8pm	Wed Lab 5-8pm	Wed Lab 5-8pm	Wed Lab 5-8pm	Wed Lab 5-8pm	Wed Lab 5-8pm	Wed Lab 5-8pm	Wed Lab 5-8pm	Wed Lab 5-8pm	Wed Lab 5-8pm	Wed Lab 5-8pm	Wed Lab 5-8pm	Wed Lab 5-8pm	Wed Lab 5-8pm

Test #1

Test #2

Final

EET 2440, 4 Cr. Hr., 96 contact hours (6 hrs./week for 16 weeks)

Students & Faculty make 32 trips to campus for this semester course

3 Written or Online Knowledge-based Assessments, and possibly projects

Pace is set by the Instructor

Traditional Course Pacing:

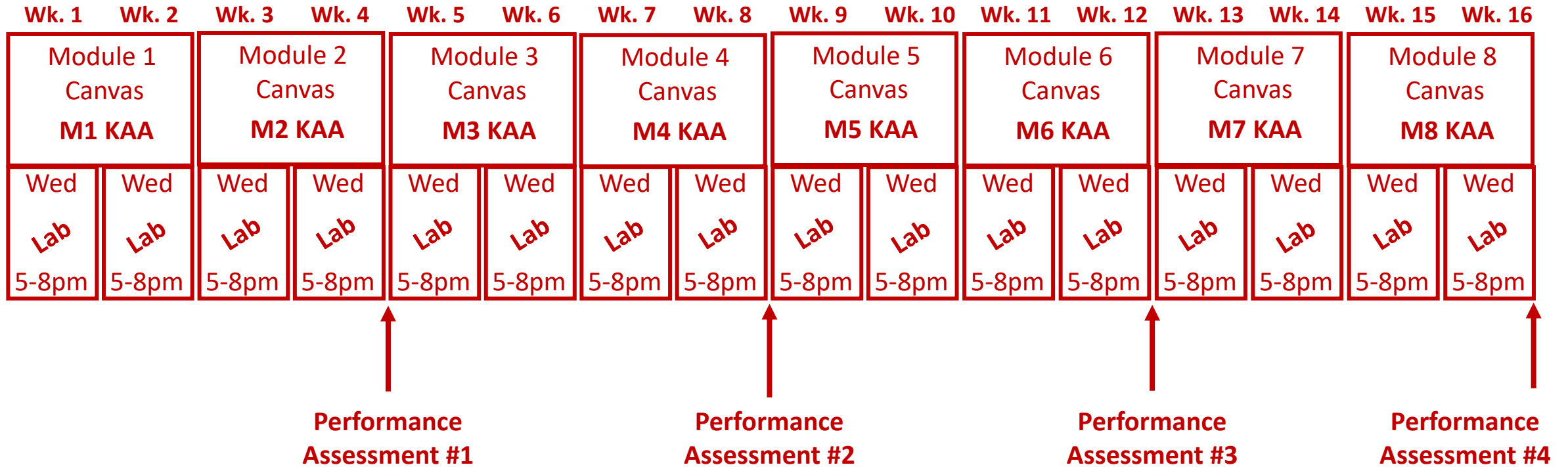| Wk. 1	Wk. 2	Wk. 3	Wk. 4	Wk. 5	Wk. 6	Wk. 7	Wk. 8	Wk. 9	Wk. 10	Wk. 11	Wk. 12	Wk. 13	Wk. 14	Wk. 15	Wk. 16
Mon Lecture 5-8pm	Mon Lecture 5-8pm	Mon Lecture 5-8pm	Mon Lecture 5-8pm	Mon Lecture 5-8pm	Mon Lecture 5-8pm	Mon Lecture 5-8pm	Mon Lecture 5-8pm	Mon Lecture 5-8pm	Mon Lecture 5-8pm	Mon Lecture 5-8pm	Mon Lecture 5-8pm	Mon Lecture 5-8pm	Mon Lecture 5-8pm	Mon Lecture 5-8pm	Mon Lecture 5-8pm
Wed Lab 5-8pm	Wed Lab 5-8pm	Wed Lab 5-8pm	Wed Lab 5-8pm	Wed Lab 5-8pm	Wed Lab 5-8pm	Wed Lab 5-8pm	Wed Lab 5-8pm	Wed Lab 5-8pm	Wed Lab 5-8pm	Wed Lab 5-8pm	Wed Lab 5-8pm	Wed Lab 5-8pm	Wed Lab 5-8pm	Wed Lab 5-8pm	Wed Lab 5-8pm

1

2   Pace is set by the Instructor

3   Pace is the same with all students

4

5   Learning/Grade is variable

6

Competency-based Hybrid PLC Course:

Wk. 1	Wk. 2	Wk. 3	Wk. 4	Wk. 5	Wk. 6	Wk. 7	Wk. 8	Wk. 9	Wk. 10	Wk. 11	Wk. 12	Wk. 13	Wk. 14	Wk. 15	Wk. 16
Module 1 Canvas **M1 KAA**		Module 2 Canvas **M2 KAA**		Module 3 Canvas **M3 KAA**		Module 4 Canvas **M4 KAA**		Module 5 Canvas **M5 KAA**		Module 6 Canvas **M6 KAA**		Module 7 Canvas **M7 KAA**		Module 8 Canvas **M8 KAA**	
Wed **Lab** 5-8pm	Wed **Lab** 5-8pm	Wed **Lab** 5-8pm	Wed **Lab** 5-8pm	Wed **Lab** 5-8pm	Wed **Lab** 5-8pm	Wed **Lab** 5-8pm	Wed **Lab** 5-8pm	Wed **Lab** 5-8pm	Wed **Lab** 5-8pm	Wed **Lab** 5-8pm	Wed **Lab** 5-8pm	Wed **Lab** 5-8pm	Wed **Lab** 5-8pm	Wed **Lab** 5-8pm	Wed **Lab** 5-8pm

Performance Assessment #1

Performance Assessment #2

Performance Assessment #3

Performance Assessment #4

Students & Faculty make 16 trips to campus for this semester course

Pace is set by student learning and completion

Competency-based Hybrid PLC Course:

	Wk. 1	Wk. 2	Wk. 3	Wk. 4	Wk. 5	Wk. 6	Wk. 7	Wk. 8	Wk. 9	Wk. 10	Wk. 11	Wk. 12	Wk. 13	Wk. 14	Wk. 15	Wk. 16
	Module 1 Canvas M1 KAA		Module 2 Canvas M2 KAA		Module 3 Canvas M3 KAA		Module 4 Canvas M4 KAA		Module 5 Canvas M5 KAA		Module 6 Canvas M6 KAA		Module 7 Canvas M7 KAA		Module 8 Canvas M8 KAA	
	Wed Lab 5-8pm	Wed Lab 5-8pm	Wed Lab 5-8pm	Wed Lab 5-8pm	Wed Lab 5-8pm	Wed Lab 5-8pm	Wed Lab 5-8pm	Wed Lab 5-8pm	Wed Lab 5-8pm	Wed Lab 5-8pm	Wed Lab 5-8pm	Wed Lab 5-8pm	Wed Lab 5-8pm	Wed Lab 5-8pm	Wed Lab 5-8pm	Wed Lab 5-8pm

3 1 4 5

6 2

Pace is set by student learning and completion

All students finish with the same level of learning

Assessment Models:

Traditional Assessment Model:

Test #1

Test #2

Test #3

Knowledge
Paper or
Online
10 Point Sys.
A-F Grade

Competency-based Assessment Model:

M1 KAA	**Performance**
M2 KAA	**Assessment #1**
M3 KAA	
M4 KAA	**Performance**
	Assessment #2
M5 KAA	
M6 KAA	**Performance**
M7 KAA	**Assessment #3**
M8 KAA	
	Performance
	Assessment #4

Knowledge
Paper or
Online
80% min.
A, B, or F

Skills
Hands-on
100% min.

Consistency in Instructional Materials:

Consistency is an important thing to the students at NSCC. Not only are all the documents built in a standard format, but also the LMS course layout is an important standard.

LMS formatting is especially critical. At NSCC, many students did not have great experience taking online courses (primarily Gen Ed), since every Instructor would setup a course differently. The standardization in our LMS was a best practice in our student focus groups.

Learning Objects have a specific format in PPT and Word, with text colors, margins, headers, etc.

Learning Objects:

Textbooks typically take a scatter gun approach to learning, covering multiple types of hardware and software. Textbooks are expensive (sold by the pound), but if you can find a good book, adopt it.

Textbooks Vendors have really stepped up their game with course packs that include PowerPoints and test banks.

Learning Objects take a more focused approach to learning, where faculty can customize to match hardware and software in the lab environment.

Learning Objects the User Navigates

Videos

PPT/PDFs

Voice over PPT Video
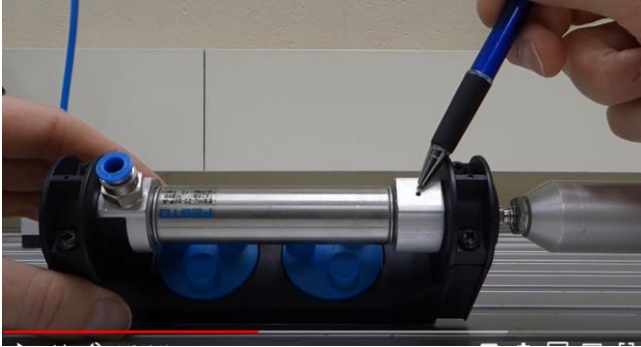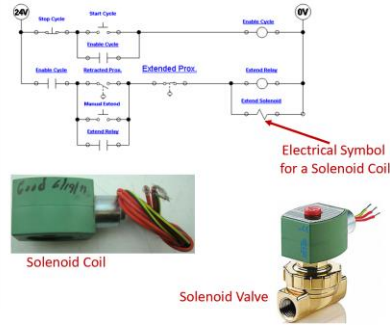
Solenoid Coil:

This slide shows the electrical circuit for the continuous operation circuit.

The most important part of this is to identify the solenoid coil symbol in the last rung of the circuit. This example shows a 2-way valve (2 ports). It is a valve that opens or closes off the flow of air, fluid, gas, etc.

The most important thing about these valves is that they have 2 parts: The valve (spring and plunger) that is actuated by the magnetic force of an electric solenoid. This type is termed an ASCO (manufacturer), red hat, due to the red cap. The cap is removed with a screwdriver, then the coil can be removed. If the device is on, you will feel the magnetism with a screwdriver. Sometimes the coil is bad (it opens), or the plunger sticks and must be replaced.

An important thing to remember is that if the coil is 120Vac, and is removed from the valve with power still on, a screwdriver must be inserted into the opening in the coil to keep the coil from burning up. No need to do this with a 24Vdc coil.
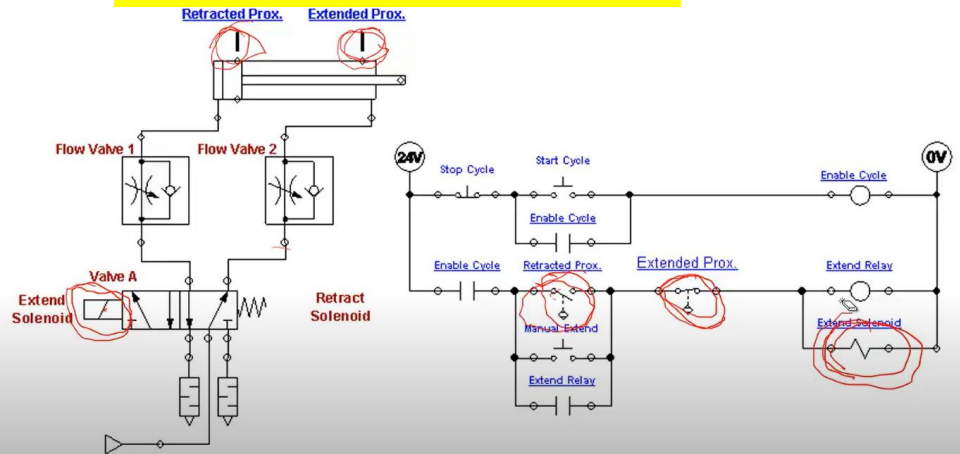
Independent Learning Objects are posted in an LMS for student access. These objects can be viewed in any sequence. The upper left graphic shows a video that was shot with a camera, explaining a single acting pneumatic cylinder.

The middle graphic is a PPT that will be converted to a PDF, then posted in the LMS.

The bottom graphic is a voice over PPT, where the graphic was put into PPT, then annotated with a stylus on the computer touch screen.

All of these objects can be viewed on a smart phone, phablet, tablet or computer screen.

Overview of PLC Software:

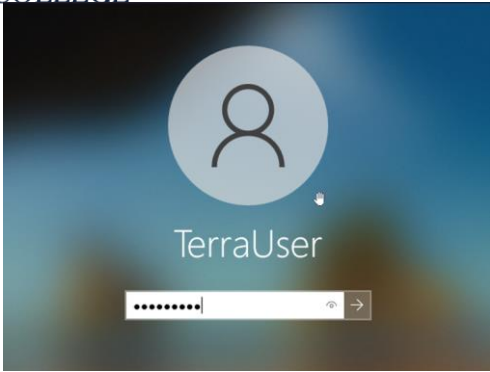RSLogix 500 PLC Programming Software is installed on the computer

Ethernet Connectivity between the SLC-5/05 processor and the computer
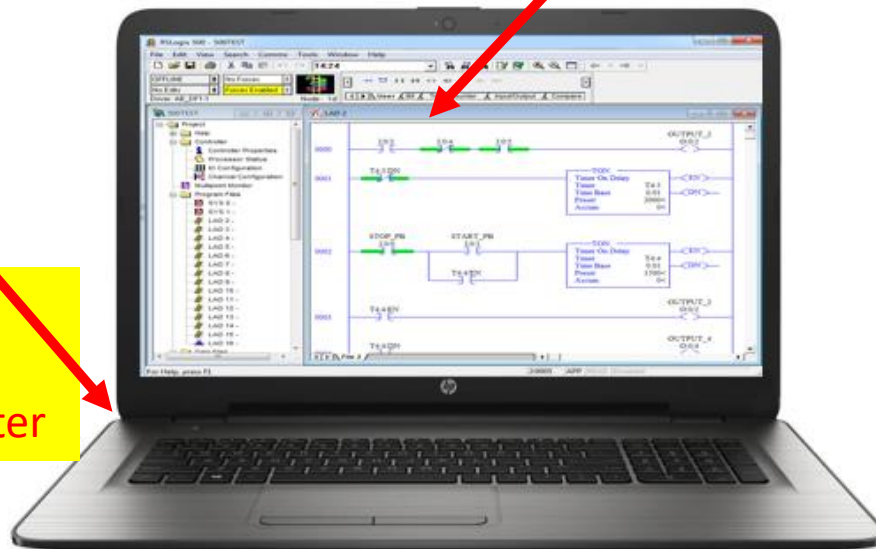
A Windows based computer with the Rockwell Software loaded becomes a PLC Programming Panel

Rockwell Software created a Windows-based software application (RSLinx) that will be used to communicate with Allen Bradley PLCs, as well as PLC programming software for all Allen Bradley PLCs:

RSLogix 500 – MicroLogix and SLC-500s
RSLogix 5 – PLC-5s
Studio 5000 – CompactLogix & ControlLogix

In an industrial environment these software packages are typically installed on a laptop, so the computer can be taken out to machine to connect to a PLC for troubleshooting a system.

All of these software packages will be installed on the computers in the Terra PLC lab. It is important to understand how to use the software to communicate, program and troubleshoot a PLC system. These software packages are expensive for companies to purchase ($1,000-$2,000 per package) and are copy protected, so students will need to come to campus to use this software. The Terra licensing agreement does not allow students to install this software on their computers at home.

Terra Virtual Machines (VMs):

User: TerraUser
Pwd: T3rra@User

Desktop of Host (Physical) Computer

Terra Virtual Machine (VM) icon

When working in the Terra PLC lab, it important to understand that the college has the Rockwell Software PLC applications loaded on a virtual machine (virtual computer) that is actually inside of the physical (host) computer that is on desks in the PLC lab. This practice allows the Terra IT department to load the Rockwell Software on a VM, then copy it to the computers in the PLC lab, versus loading all the applications on each machine. The operation is the same using the applications on a VM, as it is using the applications that were installed on a computer.
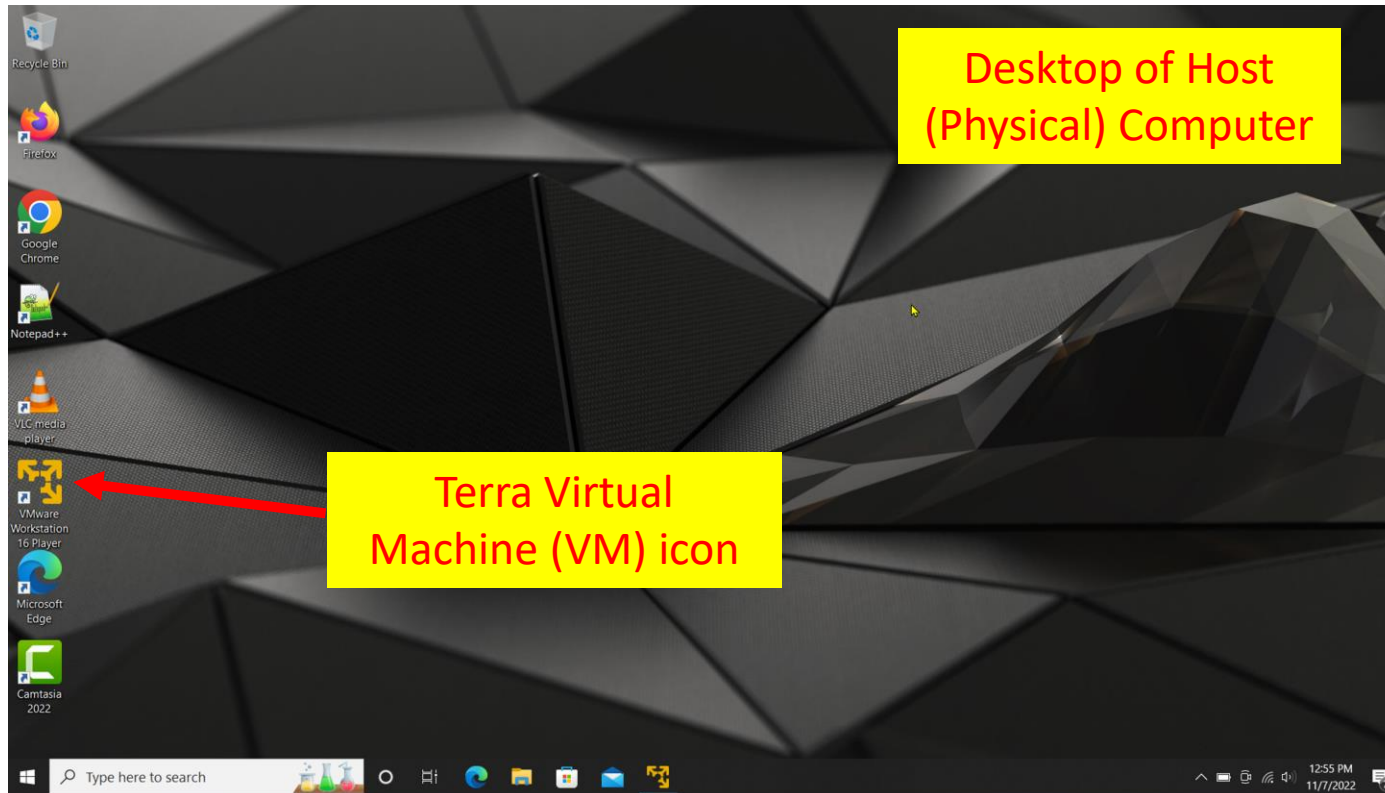
The important thing to remember is that there are two logins, which are both the same.
The student must first log into the physical computer with the username and password as shown in the upper right of this graphics (also on the white board in the PLC lab).

After logging into the physical computer, the student will then need to double click on the virtual machine icon (lower graphic), which is named: VMWare Workstation 16 Player.

Terra Virtual Machines (VMs) cont.:

User: TerraUser
Pwd: T3rra@User

Click on the E105 Rockwell VM

VMware Workstation 16 Player (Non-commercial use only)

Player ▾ | ▶ ▾ | 中 | ⬚ | ⬚

🏠 Home

▢ E105 Rockwell VM

Virtual Machine Name:
E105 Rockwell VM

State: Powered Off
OS: Windows 10 x64
Version: Workstation 16.x virtual machine
RAM: 16 GB

▶ Play virtual machine

▢ Edit virtual machine settings
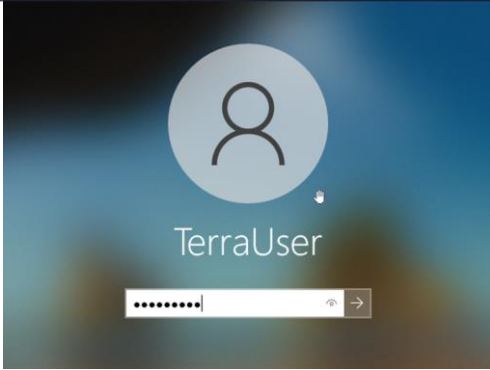
Click on the Play virtual machine

The next step is to login to the virtual machine. It will take some time before the VM fills the desktop. A Windows screen will appear. Click on the desktop and a login box will show up as shown in the upper left of this graphic. Use the same login credentials for the VM that you did for the physical computer login.

The VM Workstation 16 Player application opens.

Click on the E105 Rockwell VM

Then click the "Play virtual machine" link (shown in the lower portion of the graphic).

ControlLogix Gateway:

Ethernet Module
10.10.10.29

DH+/RIO Module
Ch A, DH+ Sta. 70

DH+

DH+ Sta. 40

Ethernet Switch
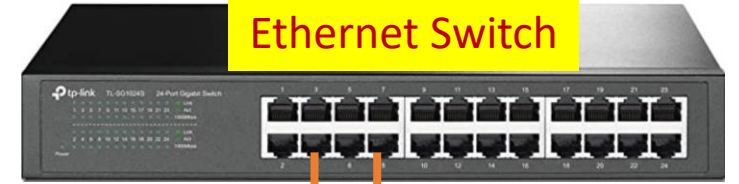
Ethernet

Ethernet
10.10.10.5

Computer in PLC Lab

AB_ETH-1, Ethernet
    10.10.10.29, 1756-ENBT/A, 1756-ENBT/A
        Backplane, 1756-A7/A or B
            01, 1756-ENBT/A
            02, 1756-DHRIO/C, 1756-DHRIO/C
                CH A, Data Highway Plus
                    02, SLC-5/04, UNTITLED
                    04, SLC-5/04, UNTITLED
                    06, SLC-5/04, UNTITLED
                    31, PLC-5/20E, COOP
                    40, PLC-5/30A
                    70, 1756-DHRIO/C, 1756-DHRIO/C
                CH B, Data Highway Plus
                    70, 1756-DHRIO/C, 1756-DHRIO/C
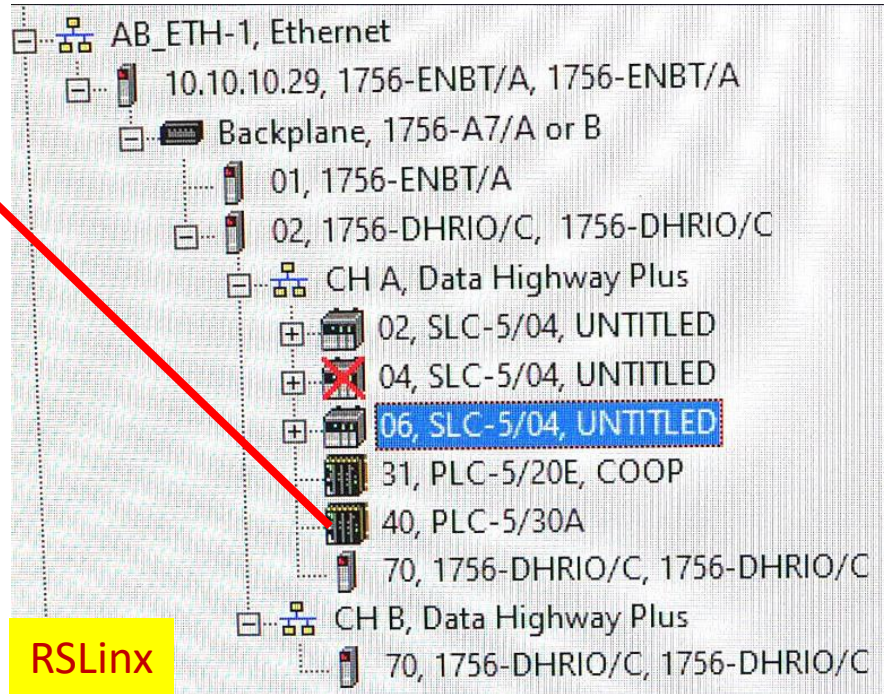
RSLinx

Cameras for Creating Videos:

One of the common tools that our Industrial Technology Instructors use is a simple Panasonic Point and Shoot camera. It is small with a zooming lens, with a removeable SD card, and a very sensitive internal microphone. The inverting tripod allows us to position the camera upside down to shoot onto an object or whiteboard (laying on a desktop). One of the most powerful features is the Panasonic Image app that runs on the smartphone. The camera has its own WiFi portal, thus the phone connects to it, then the image app controls the camera zooming, taking photos and taking videos. The SD card is removed then put into a port on the computer where it is then transferred to the HD, and produced with the Camtasia Producer software.

Panasonic Lumix Point & Shoot   Inverting Tri-Pod   Panasonic Image Smart Phone App
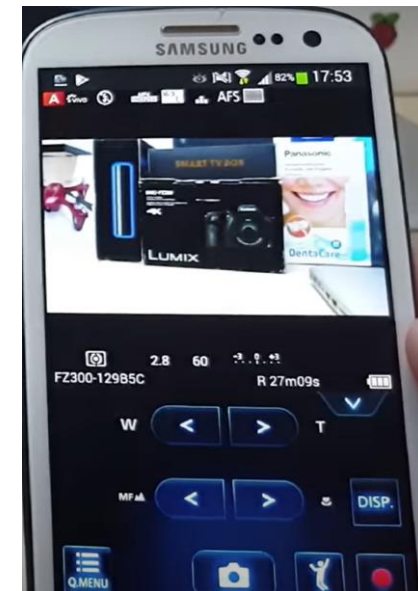
Cameras for Creating Videos:

I also use a high-end camera when I need to use different lenses, use different lighting filters and want higher quality images and videos. This is primarily if I am doing something for a vendor who needs a little higher quality than for instruction. I can get UHD 4K video quality. Usually, $700+. It also has a removeable SD.

Olympus E-M10 Mark III

SD Cards for Recording Videos and Images:

The SD cards will be used in most cameras to store the videos and pictures that are taken with the camera. I seldom use an SD less than 128GB in size, because they will fill up quickly. Remove the SD from the camera and connect it to the computer, to load the videos and images, so you can use the software tools to develop the learning objects

SD to USB Interface

SD Cards: GigaBytes

GoPro Cameras:

ORDRO Cameras:

EP8 Luxury Package

FPV Vlog Camera + Card Reader + 64G SD Card + White box + Remote Control

New ORDRO EP8 FPV Wearable Action 4K POV Camcorder Vlog Camera for Youtuber Cam

🇺🇸 **$279.99** ◆   🇺🇸 ~~$369.99~~ ◆

Specification	
Use Mode	2
Field of View	130°
Smartphone App	OD Cam
Resalution	4K 60fps/30fps/2.7K 30fps/1080P/720P/480P
Battery	Standard (90 min)

GoPro Recording of Video:

Software used to Create Objects

TechSmith (Techsmith.com), located in Michigan, developed and distributes Snagit and Camtasia. These products are targeted toward Faculty. They are simple to use and give immediate results. Snagit is an image or video capture software, and Camtasia is a product with multiple uses, but in the end it produces high quality videos. MP4 is the preferred video format for creating instructional videos. MS PowerPoint is the other key software that is needed to create illustrated graphics and animations. Google Slides does not have all of the features that MS PowerPoint has.

Snagit 2019

Snagit 2019 Editor

Camtasia 2019 Recorder

Camtasia 2019

Microsoft PPT

TechSmith Snagit 2019 (Capture):

This is the interface for Snagit capture. The user can designate a hot key such as the "PrtSc" key (Print Screen), which will bring up the cross hairs for capture.

File	Edit	View	Help

All-in-One

Image

Video

Selection: Region

Effects: None

Share: None

Preview in Editor

Copy to Clipboard

Capture Cursor

Time Delay   Off >

Capture

Print Screen

Presets +

Open Editor
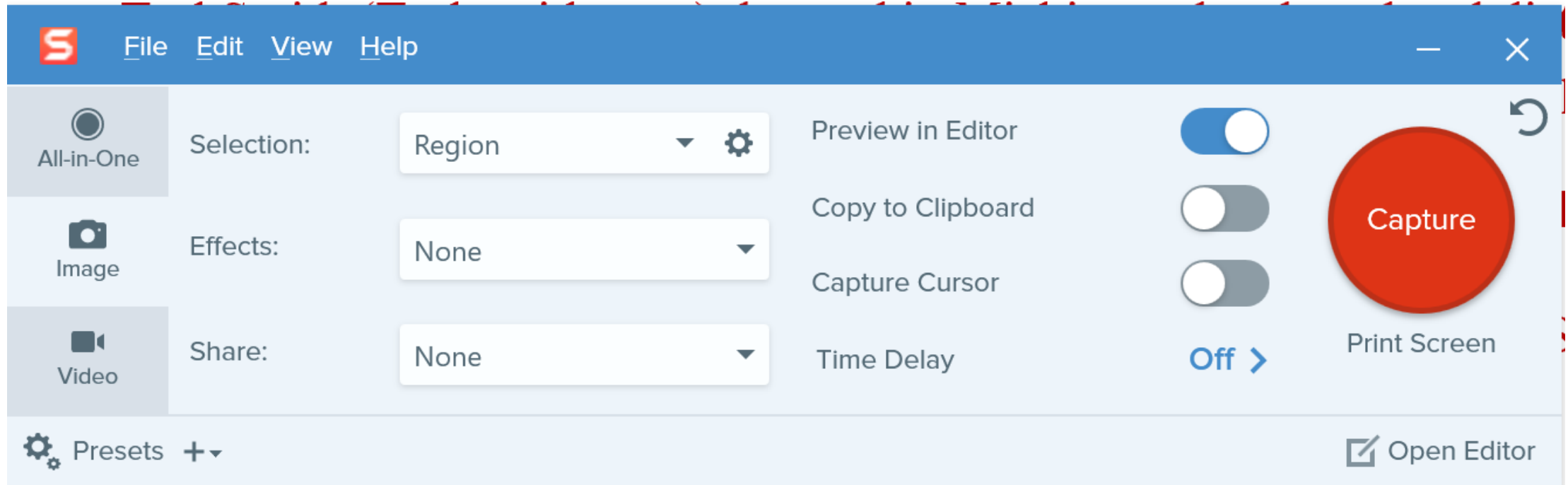
Windows 10 Snipping Tools

Snipping Tool

File Edit Tools Help

New   Mode ▼   Del
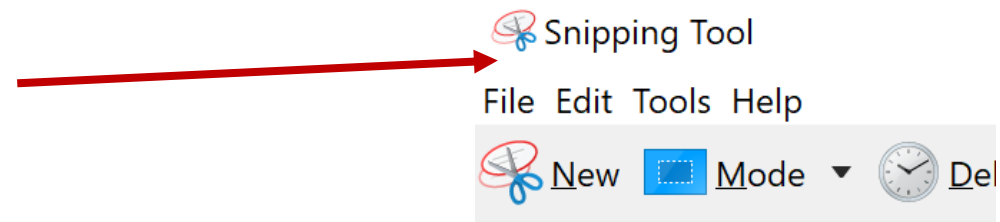
TechSmith Snagit 2019 Editor:

Tools to modify the image

Shows recently captured images

TechSmith Snagit Editor Library

User can go to any Month & Day for images

Proximity Sensors/Switches:

A

Commercial proximity sensor/switches

Retracted Prox.

B

Normally-open (NO)

prox

Proximity Switch in an electrical circuit

Proximity sensor mounted on a cylinder, sensing a magnet on the piston

C

Position Sensor

Retracted Prox.   **Extended Prox.**

D

Proximity Sensor in a pneumatic circuit
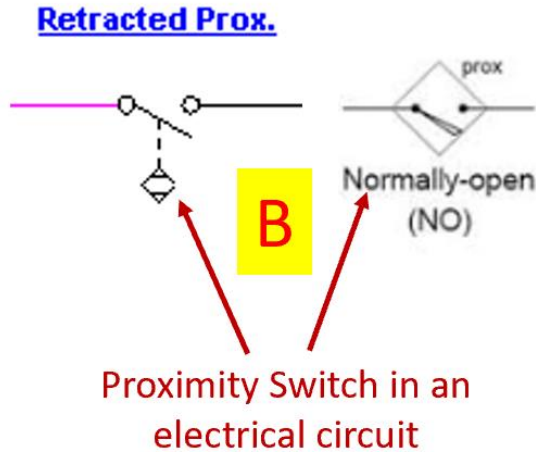
Proximity switches are devices that sense a part without touching it. A limit switch will touch a part, but a proximity switch senses it. The confusing part of this is that there is one symbol for a pneumatic circuit, and a different symbol for an electrical circuit. The reality is that these are the same device. In graphic A, two proximity switches are shown. They have the sensor on the head (blue part) and the switch internally.

Graphic B shows the two different electrical symbols for proximity switches.

Graphic C shows a magnetic sensor that senses a magnet that is built into the piston of the cylinder. When the cylinder is fully extended, the proximity switch will actuate. Graphic D shows something very similar with a graphic from Automation Studio. Notice that there are two symbols for the proximity sensor on the pneumatic print.

There are two types of proximity sensor: inductive and capacitive. An inductive senses metal, and a capacitive senses non-metals.
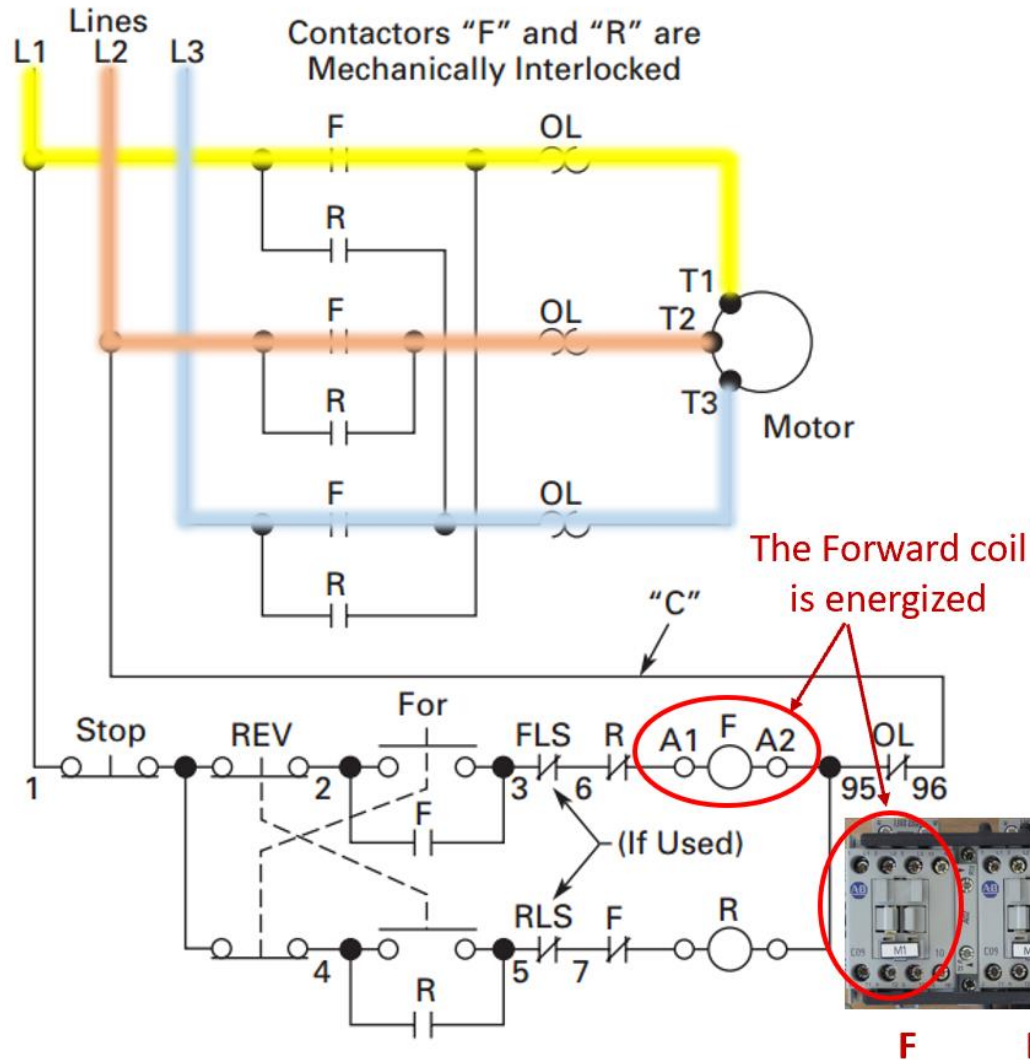
Creating a PDF Focused Learning Object:

Electrical circuit operation:

When the two diamonds line up, the Extend Prox. switch changes state

If a contact shows a purple block between the two contacts, the contact is passing power

When the two diamonds above line up, the Extend Prox. switch will open, dropping out the Extend Relay and Solenoid
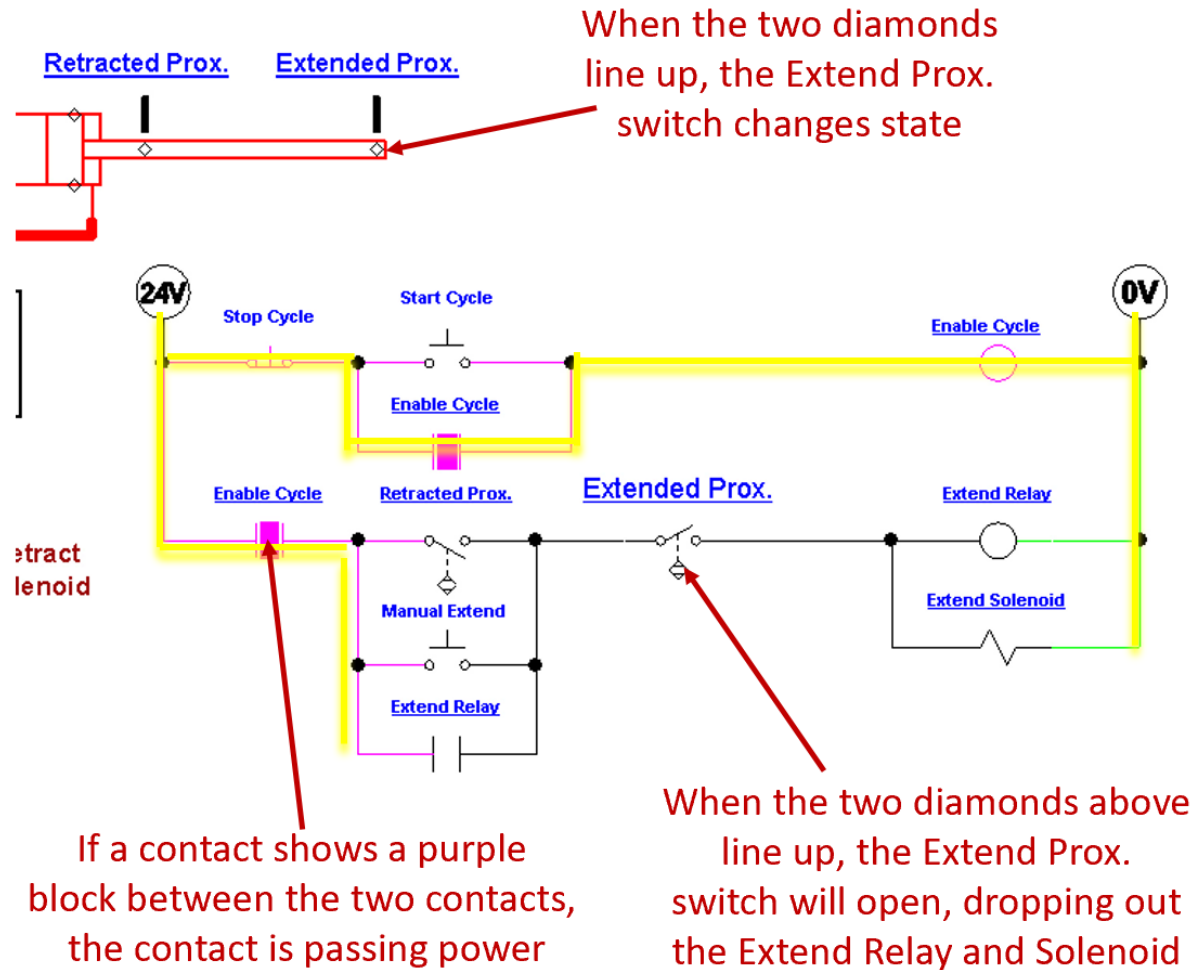
This graphic will give a further in depth explanation of the electrical circuit.

This slide shows that the cylinder rod is fully extended, which actuated the Extend Prox switch. This will open the switch in the last rung of the electrical circuit, which will in turn drop out the Extend Relay and Extend Solenoid coils. This will cause the 5/2 valve to shift back to the default position (due to the spring return), which will start retracting the cylinder.

Forward Power Flow

In this illustration, assume that the "F" (Forward) contactor coil is pulled in, which will close the power contacts of the Forward contactor. This will connect L1 to T1, L2 to T2, and L3 to T3; through the three "F" power contacts.

Let us assume that this is the forward direction. In a later slide, we will look at an installation will use a mechanical, and two electrical interlocks to make sure that the "F" coil and the "R" coil are not energized at the same time.

The Forward coil is energized

An IEC Reversing Motor Starter
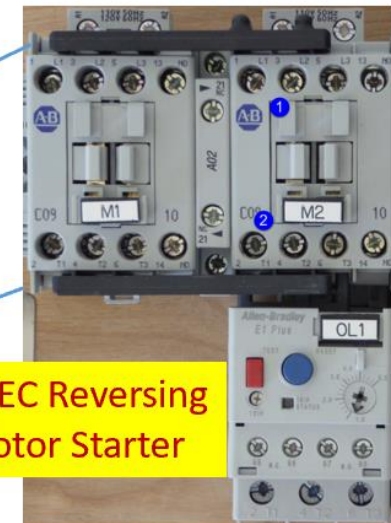
TechSmith Camtasia Recorder

This software is used to capture the screen of the computer, as well as the voice of the faculty that is creating the video. This can be used to create a video on how to use software that a student will have to learn to use. Camtasia recorder can also be used to do a voice over PowerPoint video, using a stylus on the computer screen, or on a Wacom Tablet to annotate on the screen.

F9 Starts the Recording, and can be used to pause the recording

F10 is used to stop the recording, then it automatically starts Camtasia 2019 (Producer) with the recording
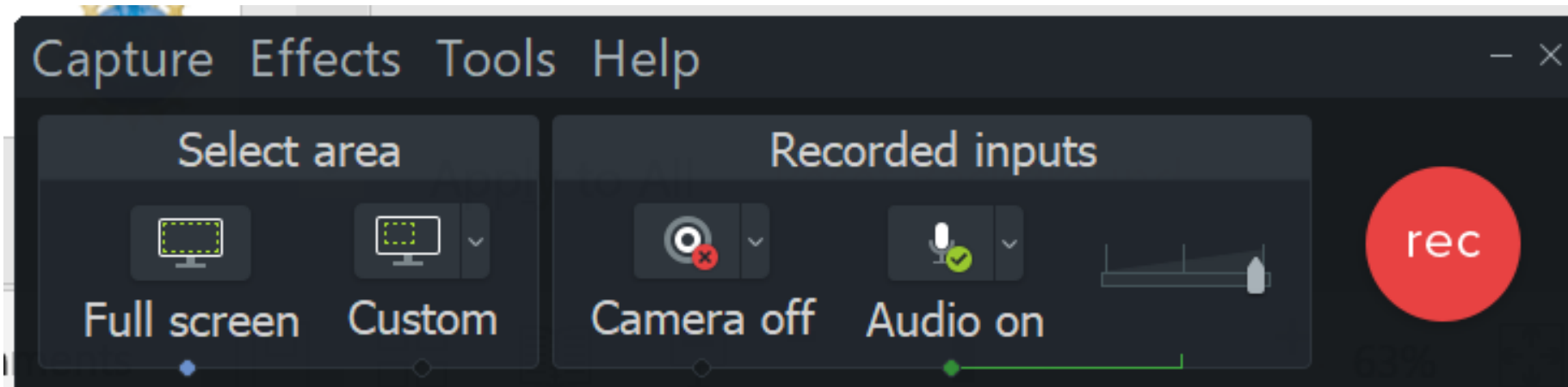
TechSmith Camtasia Producer

Camtasia (Producer) is used to add effects to an MP4 video, edit (or splice) videos, and most of all, to compress the video into a smaller file that can be uploaded to YouTube, or loaded into an LMS for students to download. A smaller file in the LMS minimizes delays for the student, and smaller files take less time for YouTube videos.

Three types of Video Learning Objects:

Created with a camera:
(Example: How to do something in the lab)

Computer Screen CAM:
(Example: How to use CAD or PLC Software)

Voice Over PowerPoint:
(Example: Explaining the symbols on a schematic)

Camtasia 2019 Recorder

Camtasia 2019 Recorder

Camtasia Producer 2019

Camtasia Producer 2019

Camtasia Producer 2019

Explaining 5/2 Valves.MP4
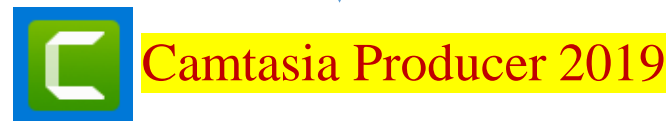
Moving RSLinx in Virtual Backplane.MP4

Explanation of Lab 6.2 circuit.MP4

Load the MP4 into the LMS for students to download and view:

OR

Upload the MP4 to YouTube, then insert Link into the LMS for students to view:

**Camtasia Producer compresses the MP4 to a smaller file size, making uploading and downloading more efficient.

Annotating on the Screen in Camtasia

WACOM is a company that makes a digitizing tablet that connects to the computer via USB or Bluetooth. The tablet allows the user to draw on the screen of a computer that is not a touchscreen. Many touchscreen computers come with a stylus for drawing on the screen, instead of using a Wacom Tablet.

Purchase & register your Intuos Pro to receive creative software

Software offer available in Americas only

Annotating on the Screen in Camtasia Recorder

The WACOM tablet, or stylus on a touchscreen will allow the Faculty to draw on a picture, similar to drawing on a whiteboard.
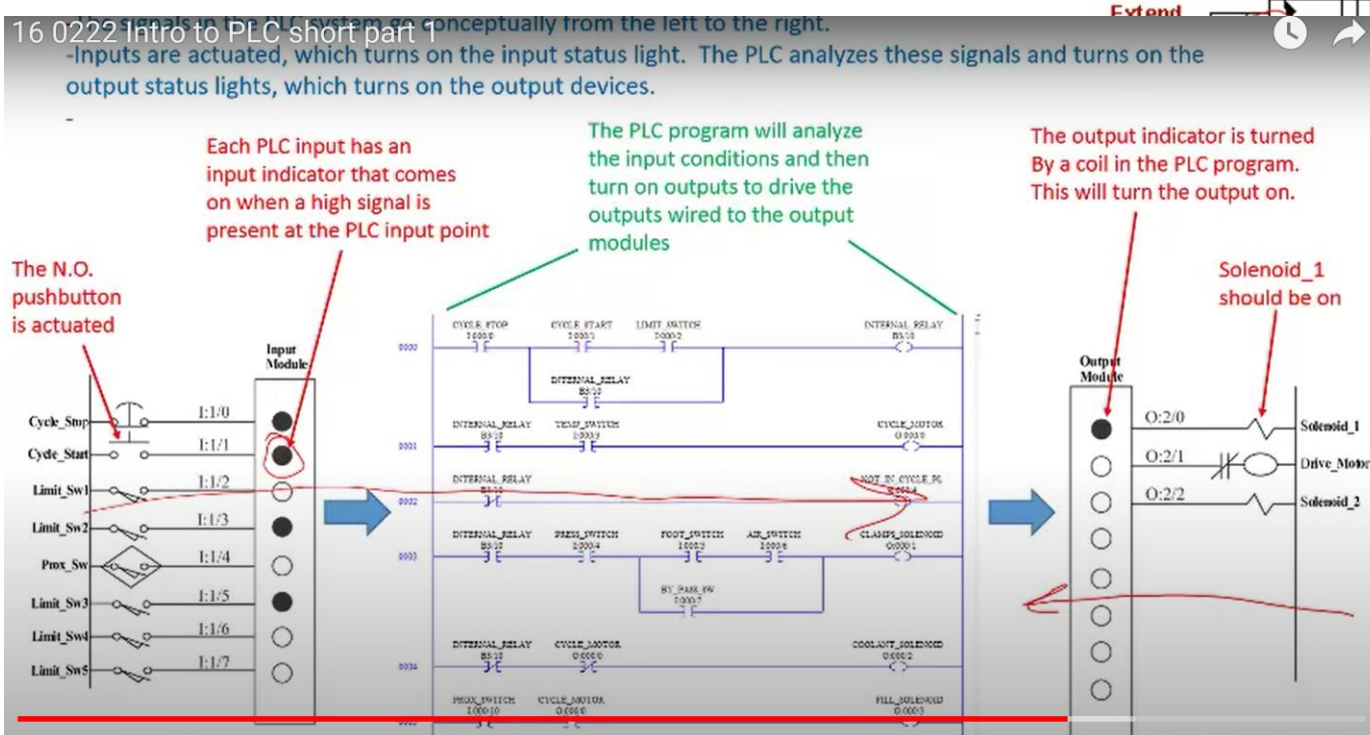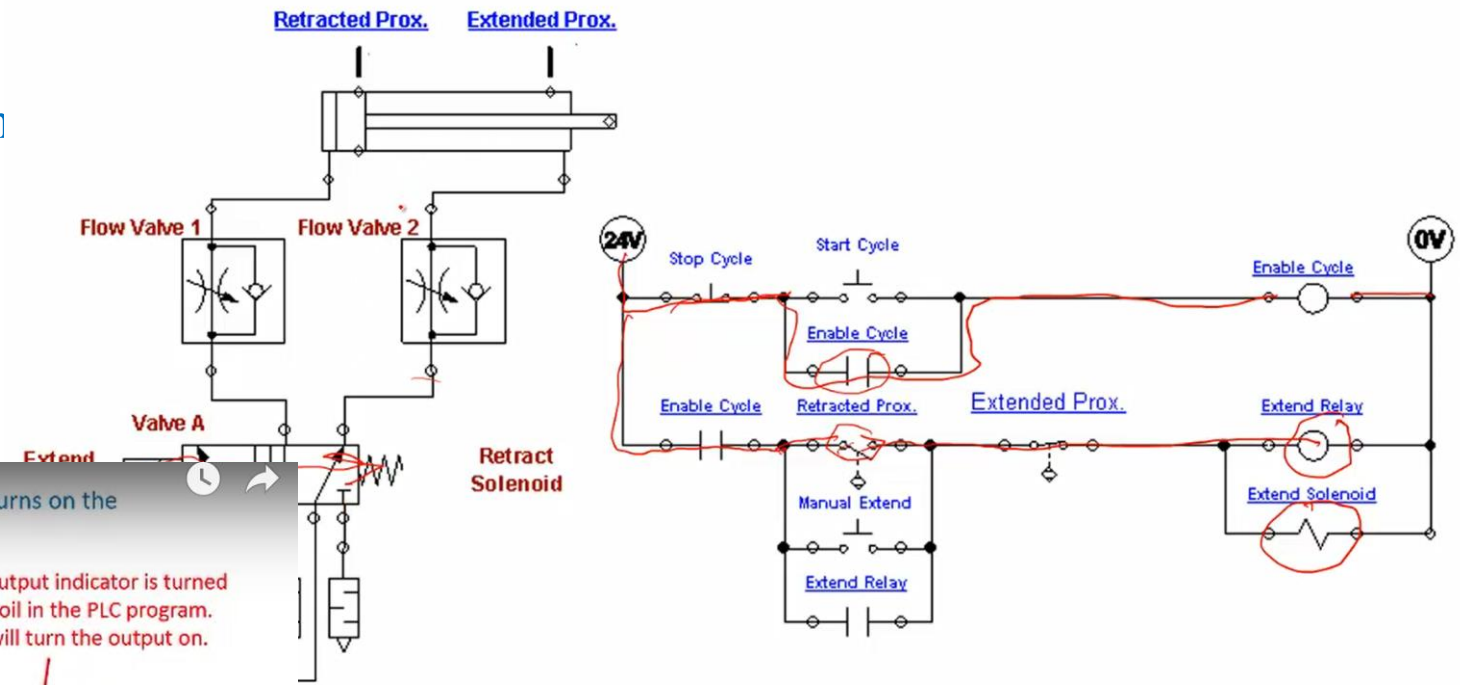
This Concludes this Instructional Document