CREATE Faculty Training on CBE Learning

Created by Tom Wylie, 6/20/23

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CREATE Faculty Training on CBE Learning

Training topics for this training session:

1. Review the CREATE Project Goals
2. Electrical Prints and Troubleshooting Course
3. Review the Planning Documents for the PLC1 conversion
4. Progress so far on the 3 courses
5. Learning Thread
6. Faculty Professional Development
7. Increasing effectiveness, access and efficiency of technical courses
    a. What are different learning objects
    b. What is Open Educational Resources
    c. Practice quizzes, Assessments

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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

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Website to get Sample Documents:

Handouts for the Workshop is available at the Project Website:

https://ate.is/Scaling_CBE

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Questions on Project Videos:

1. How does Terra want to handle videos in Canvas?
    a. YouTube link and/or Raw MP4 in LMS?
2. Do you want to have a YouTube channel for project videos?
3. How do you want to handle Closed Caption?
4. What support can the IT department give the project?

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Why is Terra doing the CREATE Project?

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.

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CREATE: Goal #1

Goal 1: **Curriculum Development; enhance three courses of the TSCC PLC program to improve students' competency AND access by conversion to a CBE hybrid mobile access model.**

Objective 1.1: ***Align the curriculum and skills required for the three automation courses:***

Objective 1.2: ***Convert the three redesigned technical courses from the TSCC PLC Certificate to a hybrid/flipped classroom model*:**

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CREATE: Goal #2

Goal 2: **Provide TSCC faculty Professional Development with the skills required to convert their courses to a CBE hybrid mobile access model.**

Objective 2.1: ***Develop the faculty skillset to convert existing technical courses to a CBE hybrid mobile access model and effectively teach these courses.***

Activity 2.1.2: ***Prepare faculty to utilize OER material for instruction and develop online learning objects (videos & simulations):***

Activity 2.1.3: ***Prepare faculty to deliver instruction within a hybrid/flipped classroom model:***

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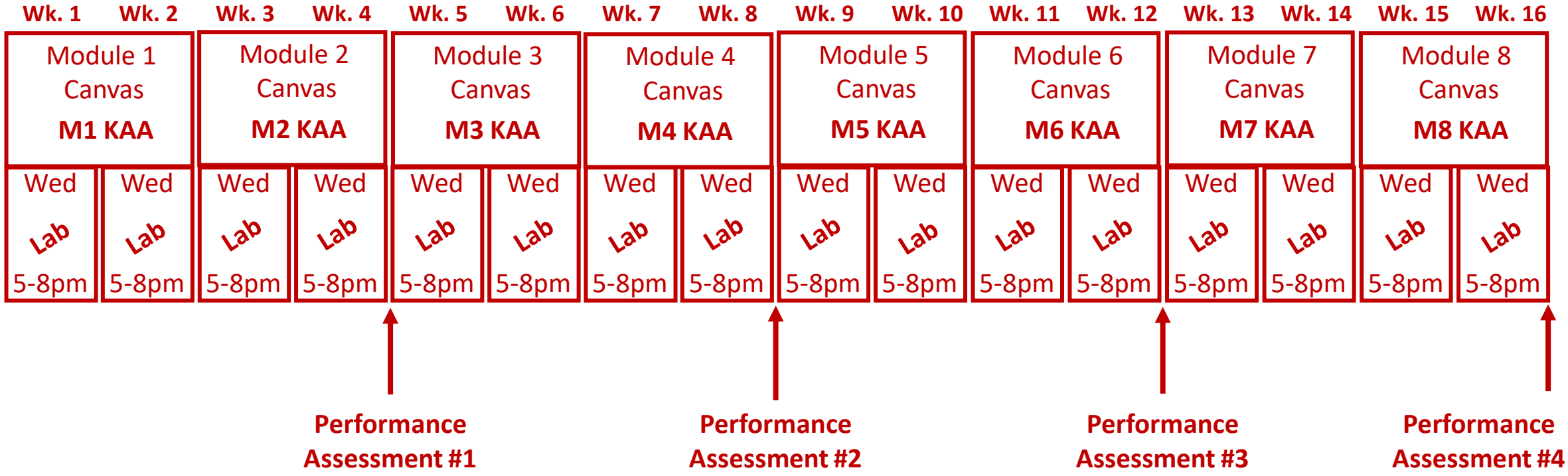
What is Competency-Based Education (CBE)?

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.

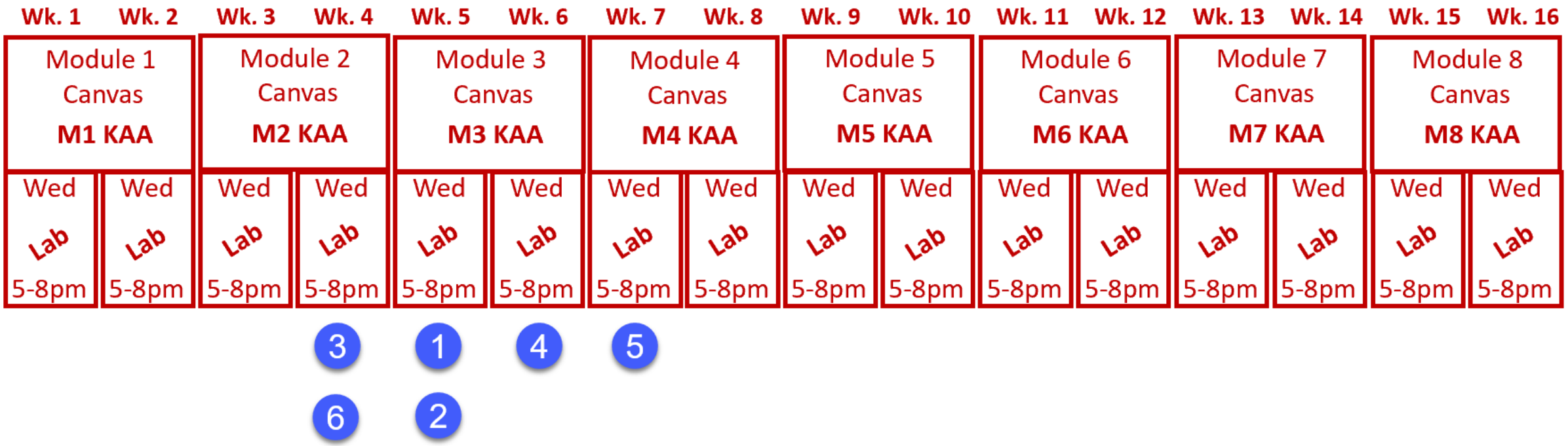
Competency-based Hybrid PLC Course:



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

Pace is set by student learning and completion

Competency-based Hybrid PLC Course:



Pace is set by student learning and completion

All students finish with the same level of learning

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2 Parts to the CREATE Project

Faculty Prof. Dev.

Develop Faculty Skillset:
*Convert technical courses to a CB/Hybrid model
*Effectively teach the CB/Hybrid courses

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*Utilize OER material for teaching
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  *Videos, simulations & PPT/PDF
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Prog. Controller 1	Mike & Scott
Prog. Controller 2	Mike & Scott
Elect. Troubleshoot	

Course Conversion:
*Re-Align the Curriculum
*Convert the courses to a competency-based/hybrid model

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NSCC Electrical Prints & Troubleshooting

Module 0 – Overview of Industrial Technologies Hybrid Course Model

Module 1 – Troubleshooting Electrical Circuits I (Festo AC/DC Training Units)

Module 2 – Troubleshooting Electrical Circuits II (Festo AC/DC Training Units)

Module 3 – Pneumatic Symbols and Circuits (Festo didactic pneumatics equipment)

Module 4 – PLC Operation & Troubleshooting (AB CompactLogix & ControlLogix)

Module 5 – Pneumatic Circuits Controlled by Electrical/PLC Circuits

Module 6 – Robotic Operations & Troubleshooting (Fanuc)

Module 7 – Variable Frequency Drives: Operation and Troubleshooting (PF525)

Module 8 – Safety Circuits and Devices (Safety relays, Safety Controllers & Safety PLCs)

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Silos and Systems

*Most colleges put their technical topics into silos, teaching one technology in a technical course: CAD, Electronics, Motors Control, PLC1, PLC2, Pneumatics and Hydraulics, to name just a few.

*Most colleges do this, sometimes to meet transfer requirements. It has been this way from the beginning.

*Our students get a job as a Maintenance Technician, and they must work on systems, combining PLC, Electrical, HMI, Pneumatics, Instrumentation, etc. Most companies have moved to multi-craft Technicians, so they must work on many technologies that work together to make a system.

*A few colleges are purchasing systems for students to learn from. These are great to show students how signals flow, and to enhance troubleshooting skills.

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The AMTEC Training Unit at HFCC:

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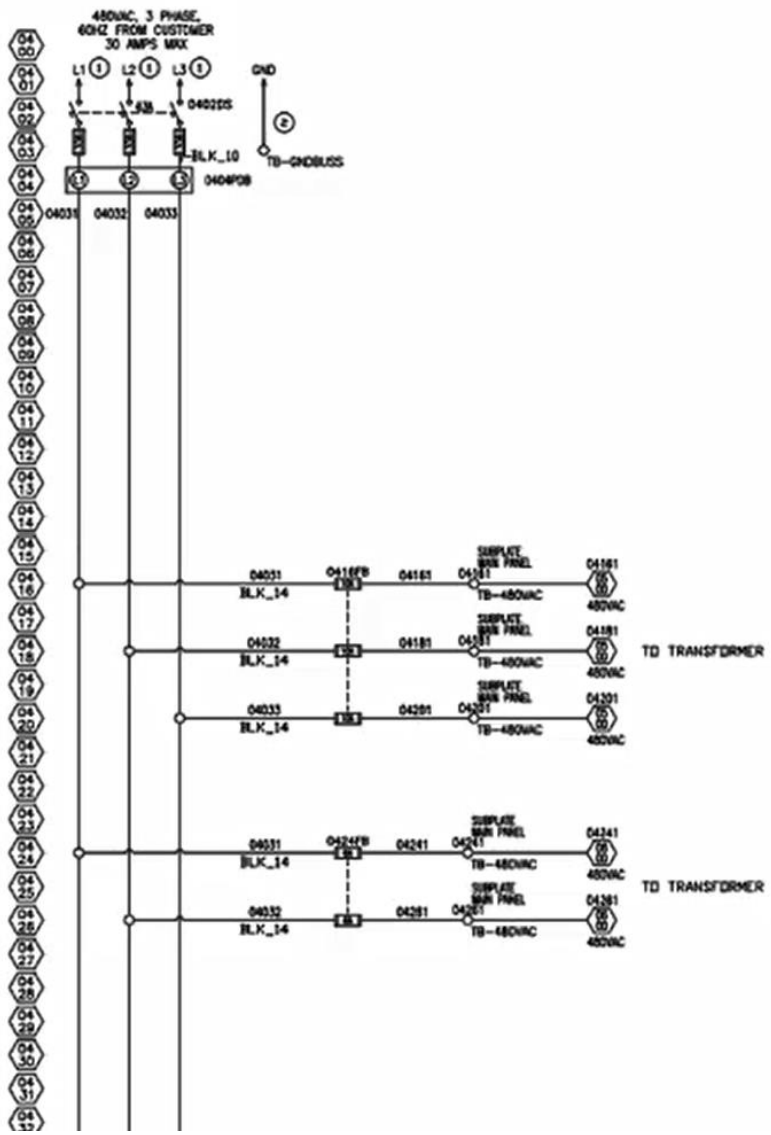
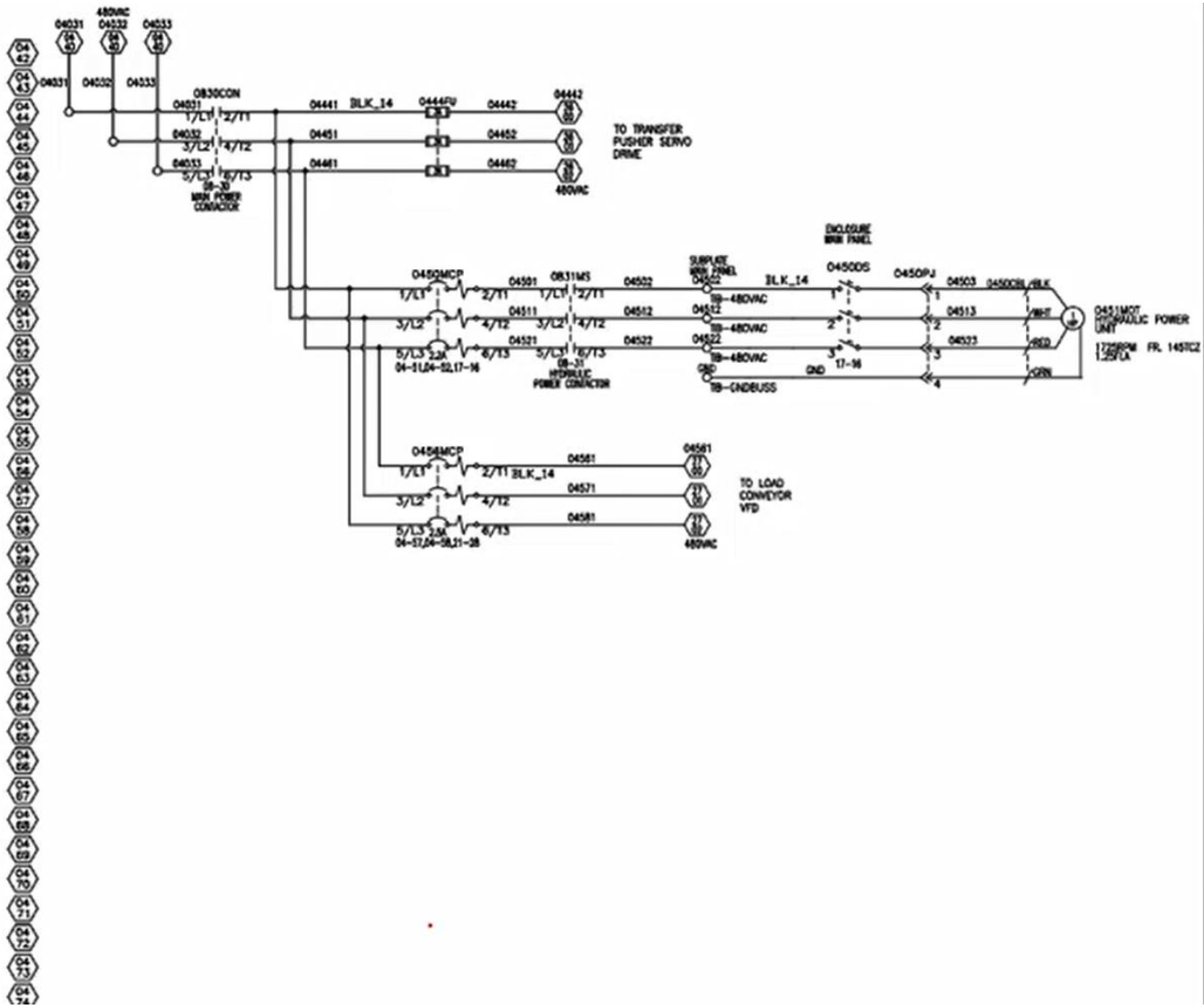
The AMTEC Training Unit Electrical Prints:





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Variable Frequency Drives

Process Logic Controller

Human Machine Interface/Controls

Safety Circuits

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Polaris HOT Skid Training Unit South Ark CC:

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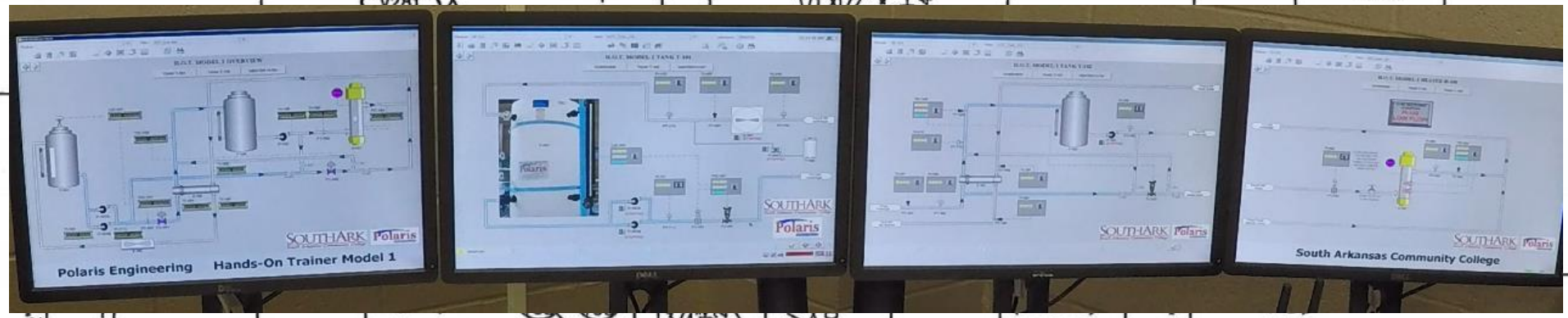

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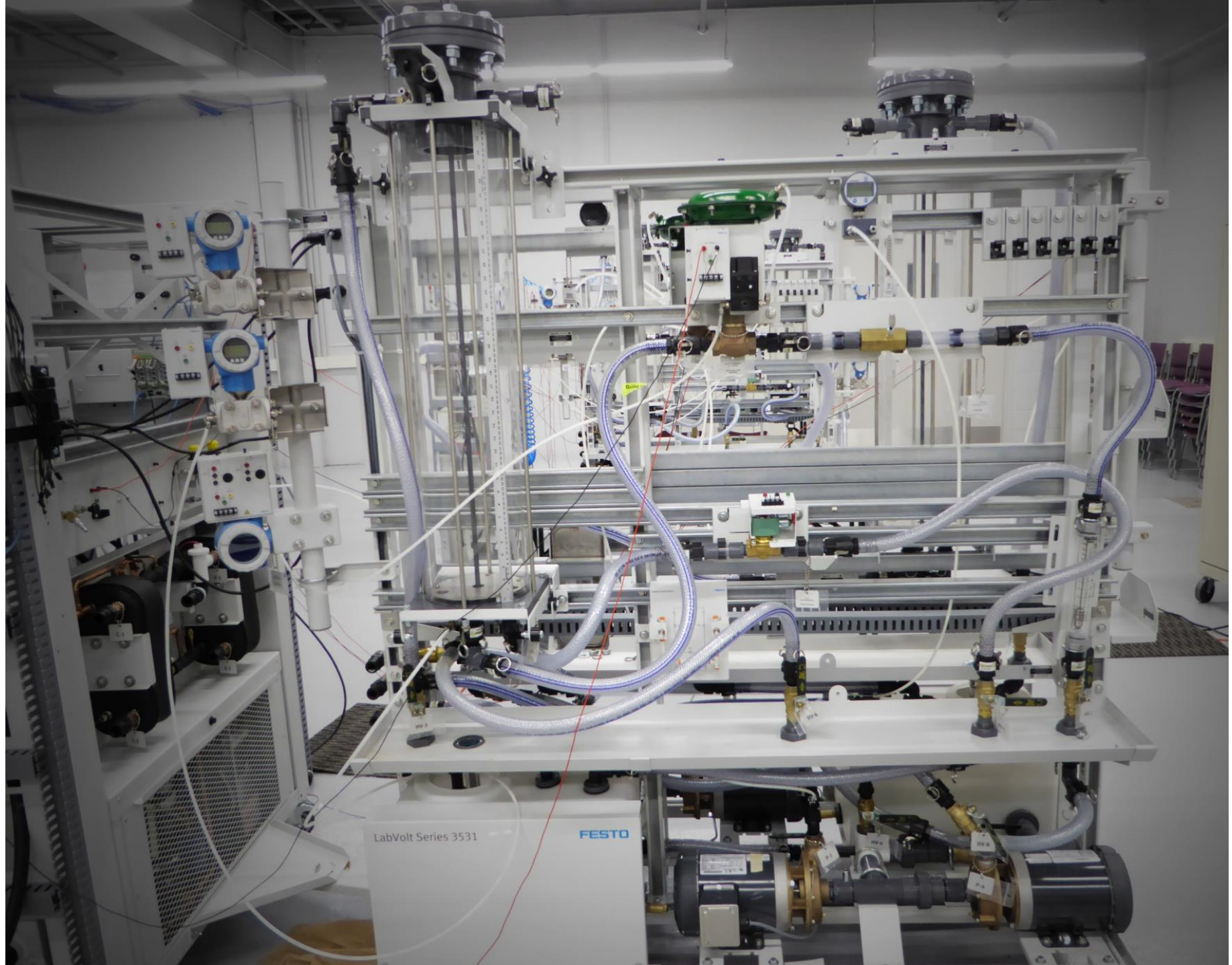

480 VOLTS
AM-CERT CELL #2

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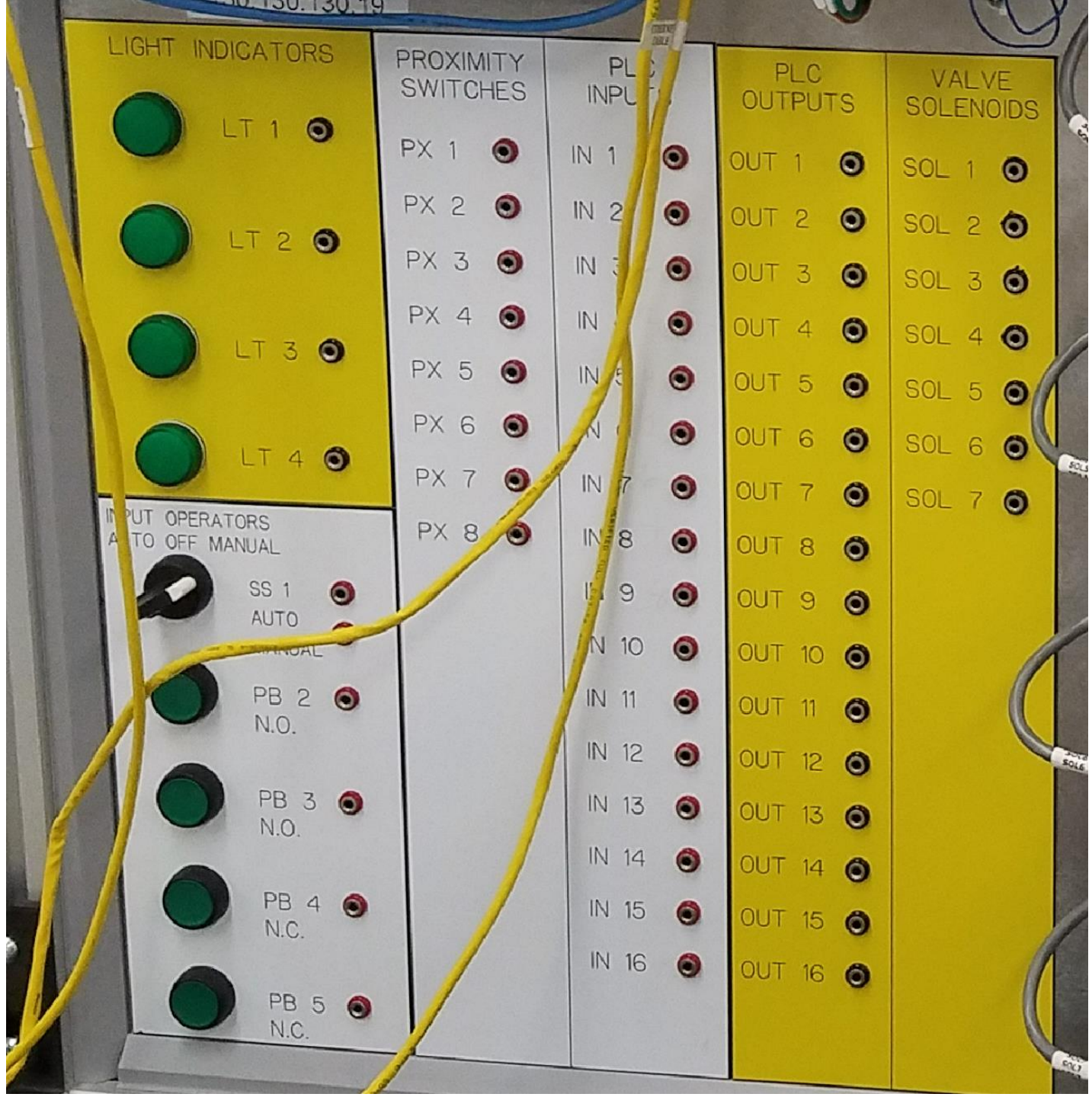

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What are topics/technologies that Terra should have in their troubleshooting course?

1. ?????
2. ?????
3. ?????
4. ?????
5. ?????
6. ?????
7. ?????
8. ?????
9. ?????
10. ?????
11. ?????
12. ?????

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Elect. Troubleshoot	

Course Conversion:
*Re-Align the Curriculum
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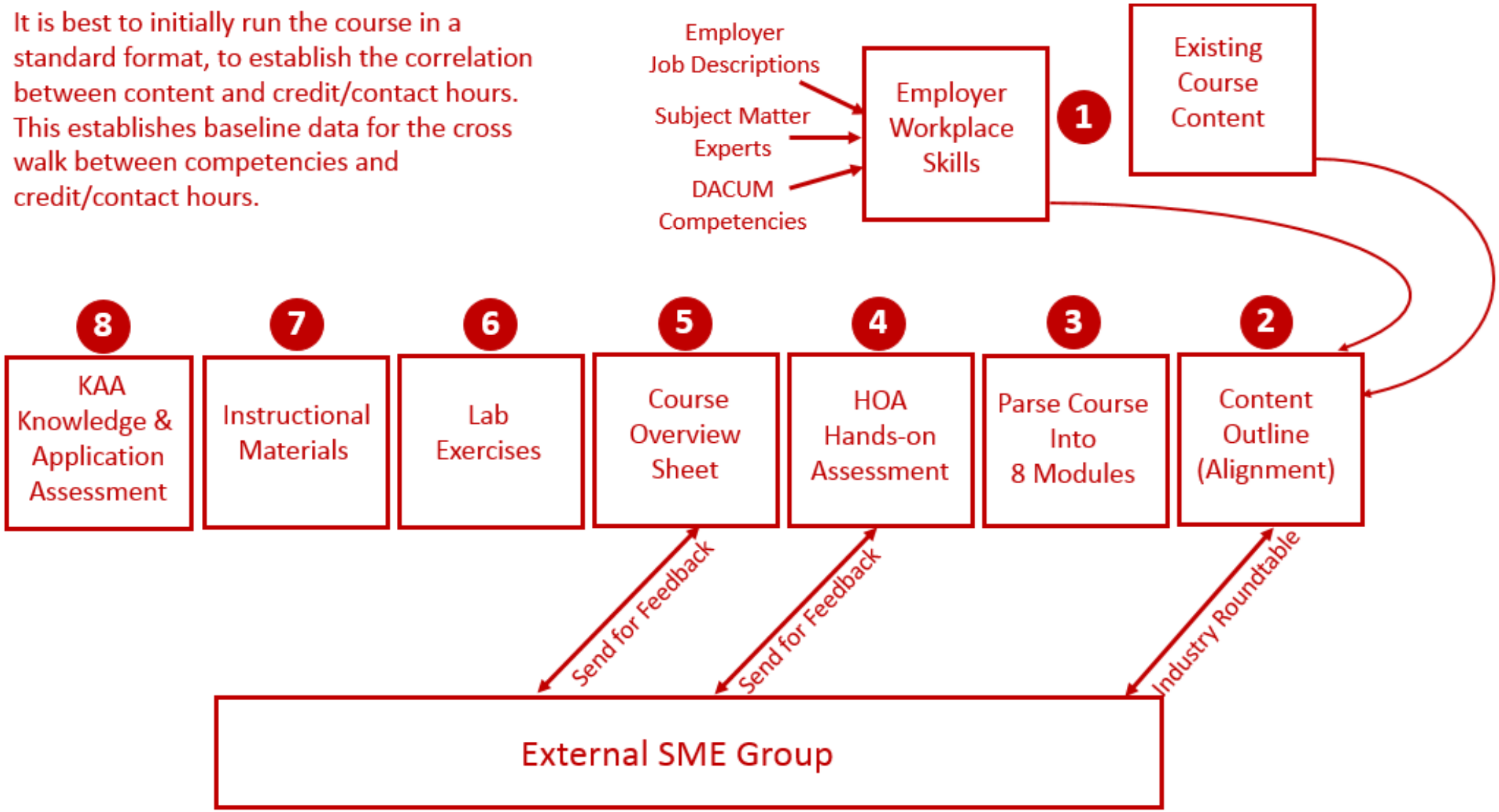
Reverse Design:

It is best to initially run the course in a standard format, to establish the correlation between content and credit/contact hours. This establishes baseline data for the cross walk between competencies and credit/contact hours.



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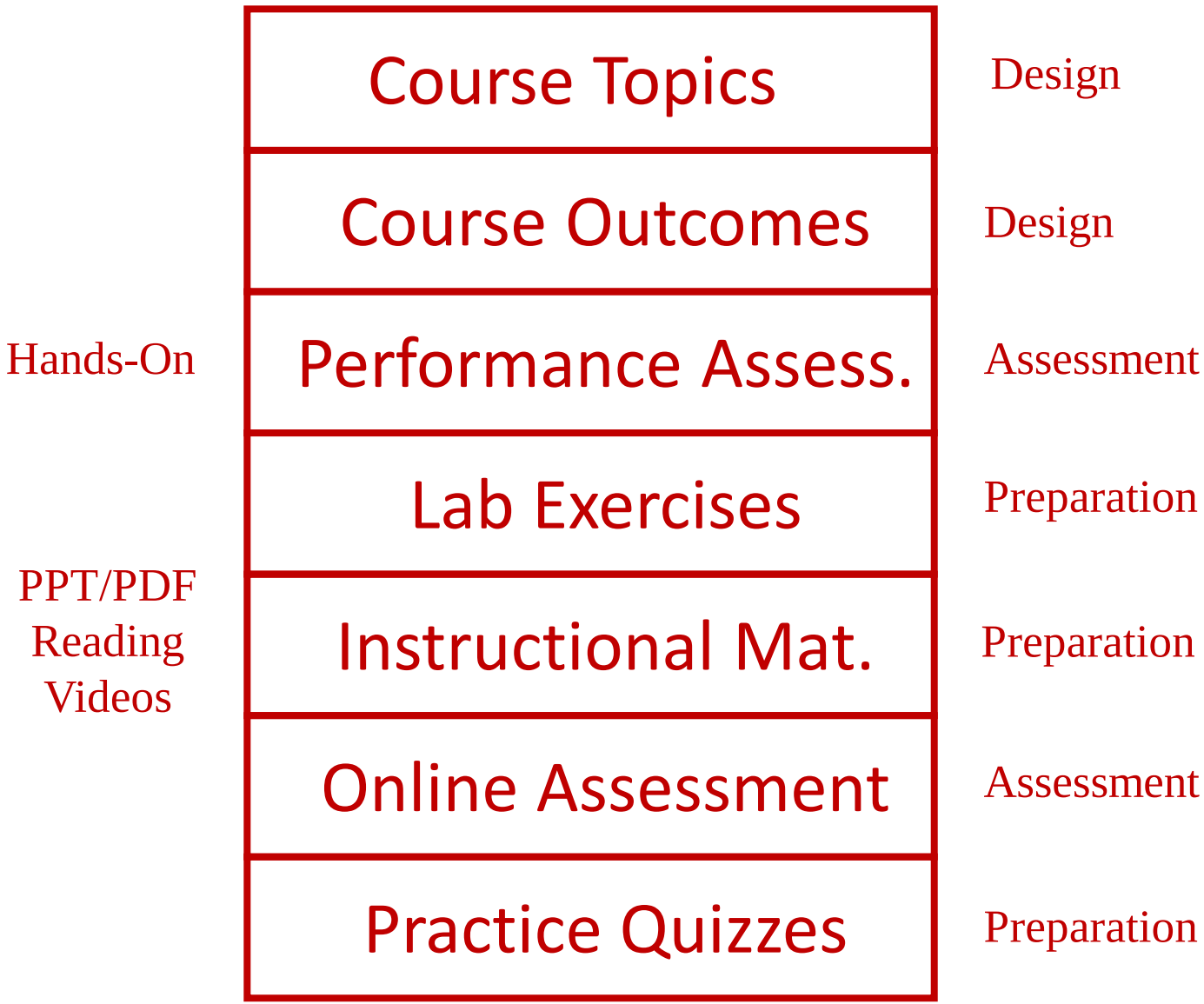
Thread of Learning:



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Why Make a Change in your Course(s)?

Course Improvements: Effectiveness, Access & Efficiency

Questions every Faculty should ask themselves:

***What takes most of my time in the Classroom?**

***What takes most of my time in the Lab?**

***What concepts do students have trouble grasping?**

***How do I know that each student really know and can do what they say they know/can do?**

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What have other Faculty answered?

Over the past 3 years I have taught/consulted with about 140 technical faculty from around the country (2 & 4 year faculty), Apprenticeship Program faculty, and private company trainers. Here are a few of their answer:

1. Grading tests
2. Grading labs
3. 5-6 groups of students, and repeating showing each group how to do something
4. Trying to write down the steps to putting parameters into a PF70 drive
5. 4 types of relays, contactors, starters and always getting questions on hold-in contact, auxiliary contacts, coil connectors
6. Showing the class how to create a project with Logix Designer, then them forgetting by the time they do it and I have to repeat myself 20 times a night
7. Having to repeat numerous times how the product flows in a Piping & Instrument Diagram, and then the students forget after they leave class. I have to go through it again during the next class.
8. Hard to teach troubleshooting in a course

What consumes most of the Terra Faculty time?

1. ?????
2. ?????
3. ?????
4. ?????
5. ?????
6. ?????
7. ?????
8. ?????
9. ?????
10. ?????
11. ?????
12. ?????

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What could be implemented to improve a Course?

1. Videos
2. Lab Exercises
3. Tests in Canvas (versus P/P tests)
4. Support material (vendor manuals)
5. Informational documents (PPT/PDF or Word/PDF)
6. Simulation
7. Formative assessments with feedback
8. Performance Tests (Lab Tests)

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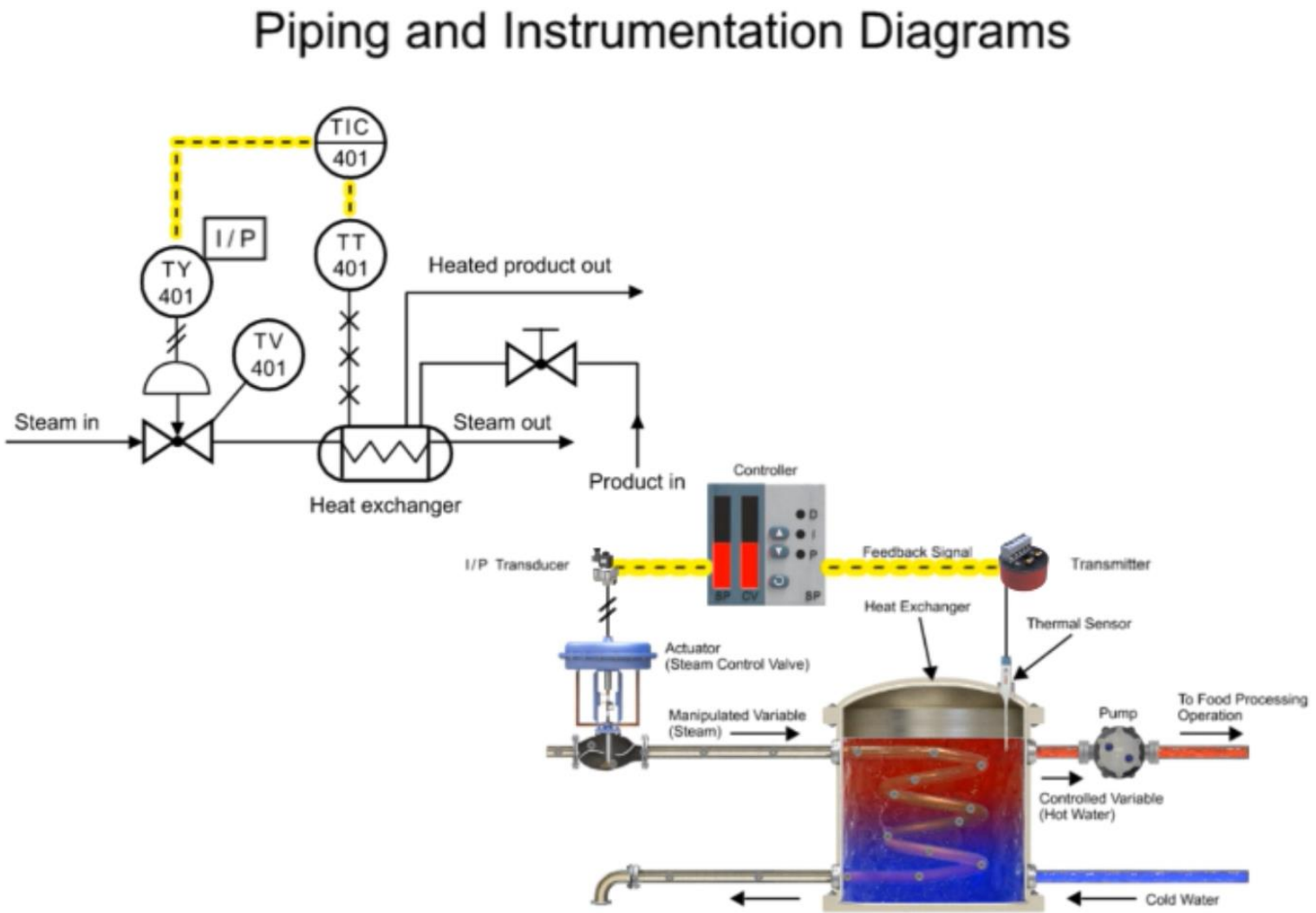
Building a Learning Object:

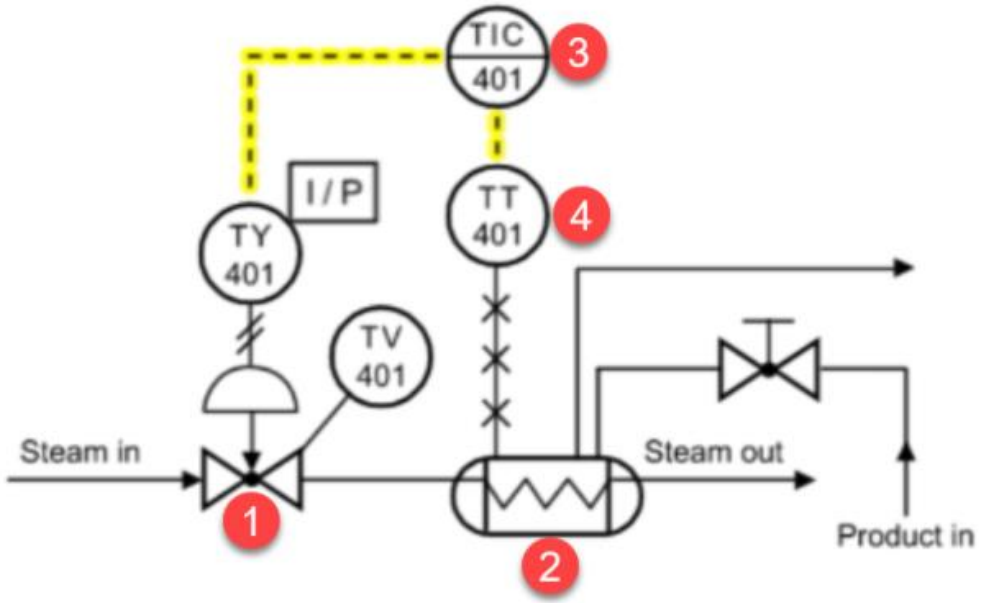
In the next week, could each of you identify a course that could be improved on, and sketch out what type of learning object you would like to create, and Mike or myself can work with you to create it. No presentations, no pressure; just a way of better learning how to apply this information into a curricular change.

Many good Videos at EngineerTech.Org



Download Embeddable Simulation with Interactive Quiz Questions:
bit.ly/1IspWI8

Assess the students on information within Learning Object



2. In this Piping & Instrument Diagram, which device is the heat exchanger?
   a. 1
   b. 2
   c. 3
   d. 4

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Sample Videos:

Video on YouTube: Tom Wylie, Explanation of Lab 2.3 Circuit 1 082420, 8/26/20: https://youtu.be/2JBei-qTphY

Video on YouTube: Tom Wylie, Explanation of Lab 2.3 Circuit 2 082420, 8/26/20: https://youtu.be/cmM_Ao7VlG8

Video on YouTube: Tom Wylie: Video_PF525 taking the unit apart, 3/11/17: https://youtu.be/ljyYZv3n6r8

Video on YouTube: Tom Wylie: PF525_how to disable the reverse button 031617, https://youtu.be/p1J0-9CDUyg

Video on YouTube: Tom Wylie: PF525 _Navigating and Resetting the Drive, 2/13/17: https://youtu.be/tfBWFKO5nlo

Video on YouTube: Jim Boone, Roboguide demo of PLC230 Lab 7 with audio, 11/5/20: https://youtu.be/8T2yVps2TXg

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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

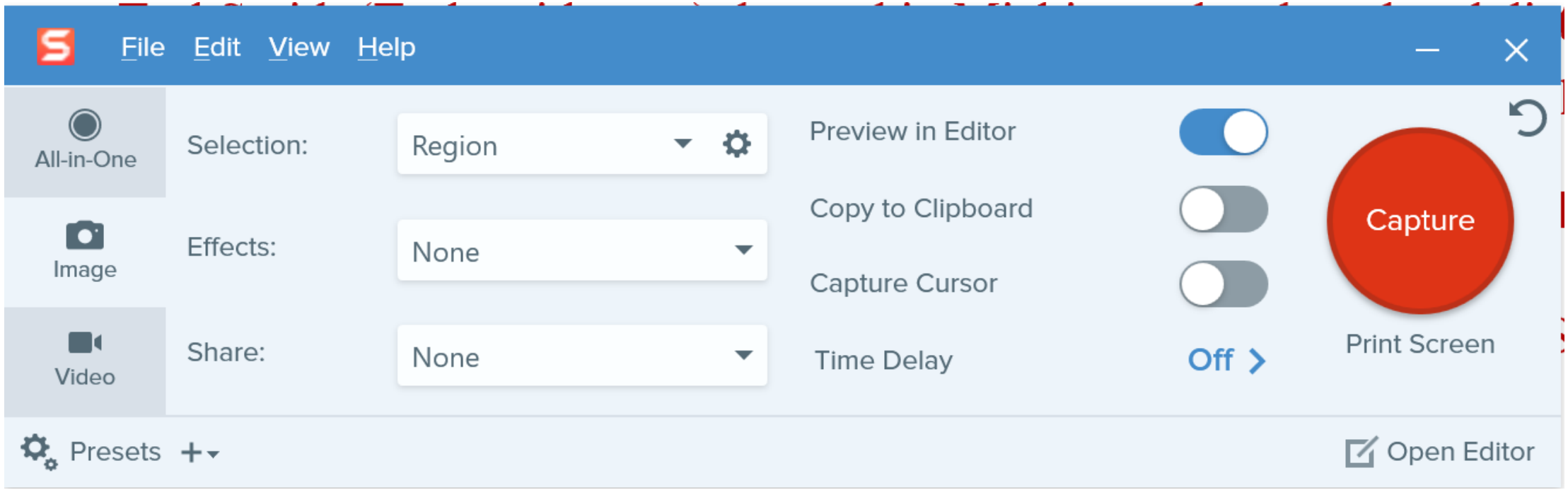
Camtasia 2019 Recorder

Camtasia 2019

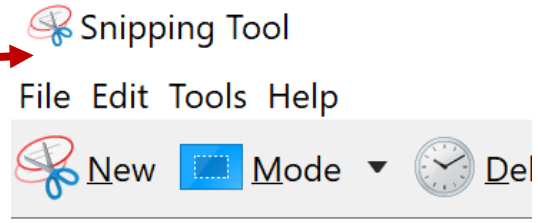
Microsoft PPT

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.



Windows 10 Snipping Tools



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Four Primary Applications for Snagit

1. Capture a portion of a screen and save as a .PNG file or to clipboard

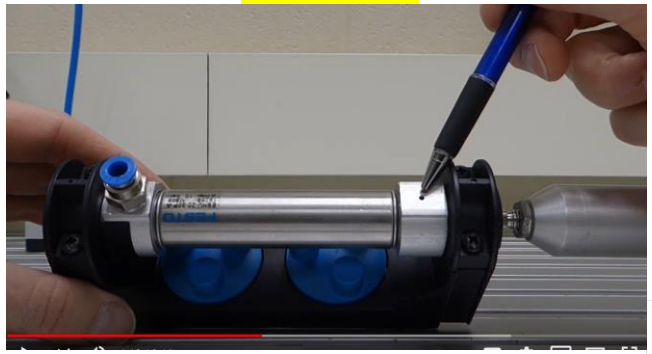
2. Record video from an existing video. I sometimes use this if I am recording something from a recording on a website that I want to save, or I am capturing an important video on YouTube, just as a backup in case they pull it down and I need to create one from scratch.

3. Capture a panoramic scrolling image. This is if I have a PDF that I want to backup, but the properties will not allow a download or to print it. I will scroll down through the document and save as a PDF. Always follow good legal practices.

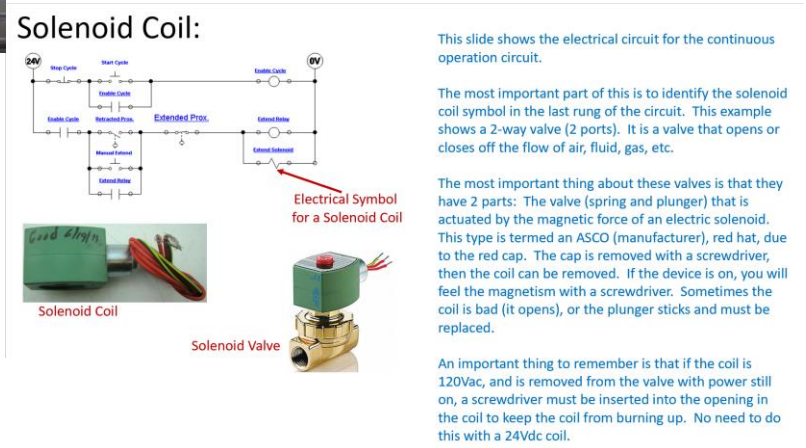
4. Capture a block of text from the screen and "grab text" which will use OCR (Optical Character Recognition) and copy all and paste into a document so I can edit the text. I find old labs I created 10 years ago and I do not have the original files. Instead of re-typing them in, I use Snagit to capture the text as an object and convert it to editable text.

Learning Objects the User Navigates

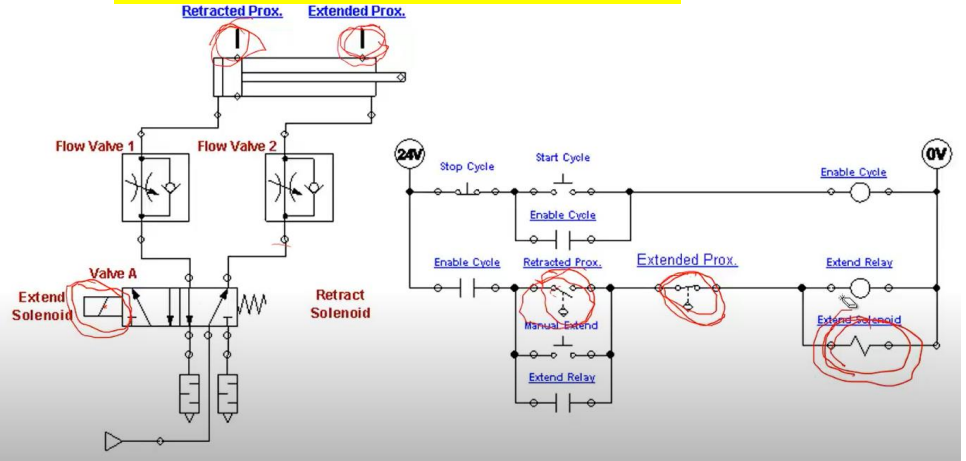
Videos



PPT/PDFs



Voice over PPT Video



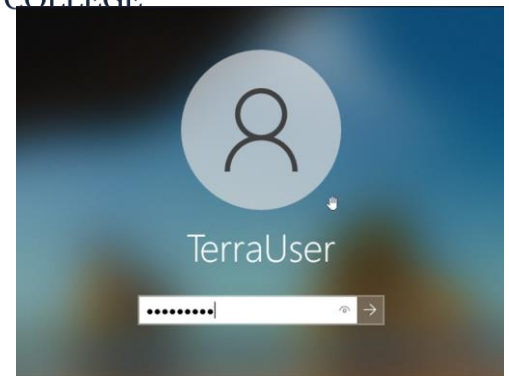
Independent Learning Objects are posted in an LMS for student access. These objects can be viewed in any sequence. The upper left graphic shows a video that was shot with a camera, explaining a single acting pneumatic cylinder.

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

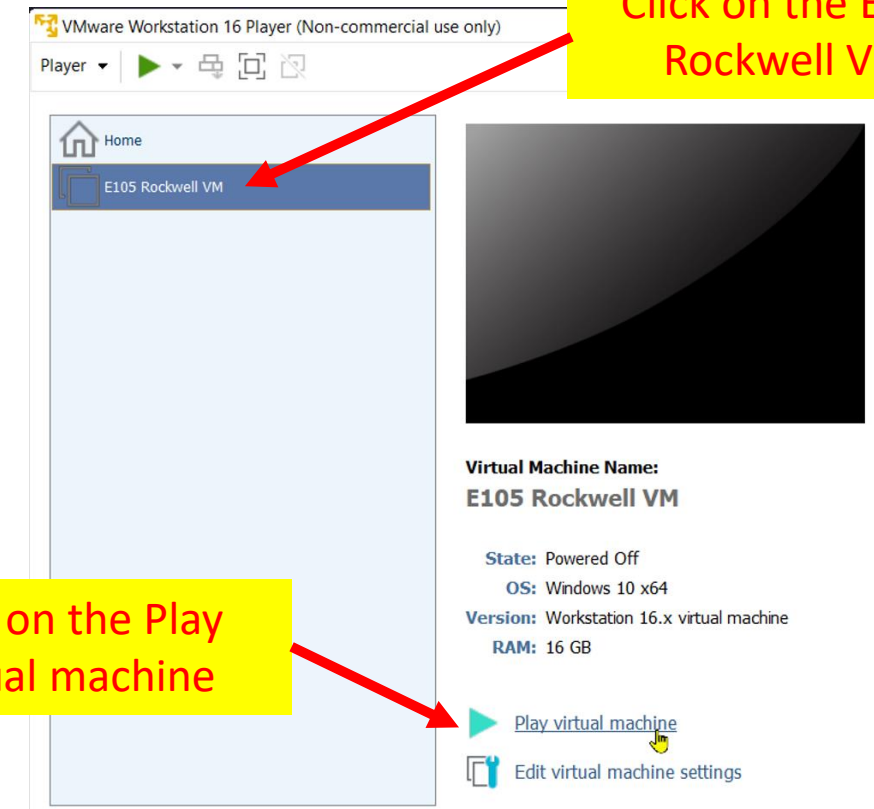
The bottom graphic is a voice over PPT, where the graphic was put into PPT, then annotated with a stylus on the computer touch screen.

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

Terra Virtual Machines (VMs) cont.:



User: TerraUser
Pwd: T3rra@User



Click on the E105 Rockwell VM

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.

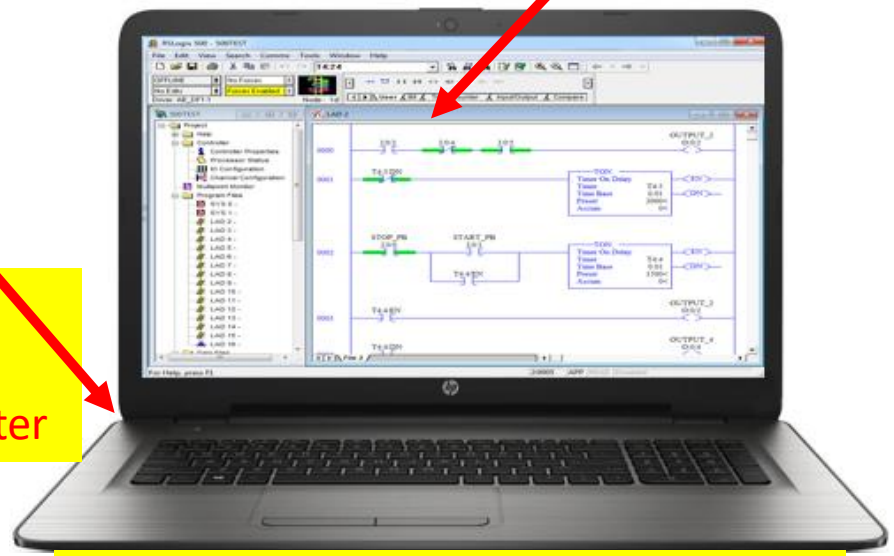
Click on the E105 Rockwell VM

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

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

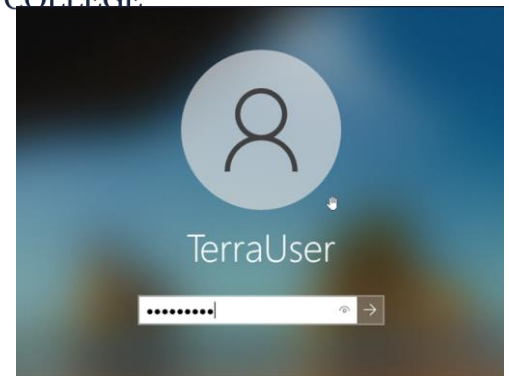
Rockwell Software created a Windows-based software application (RSLinx) that will be used to communicate with Allen Bradley PLCs, as well as PLC programming software for all Allen Bradley PLCs:

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

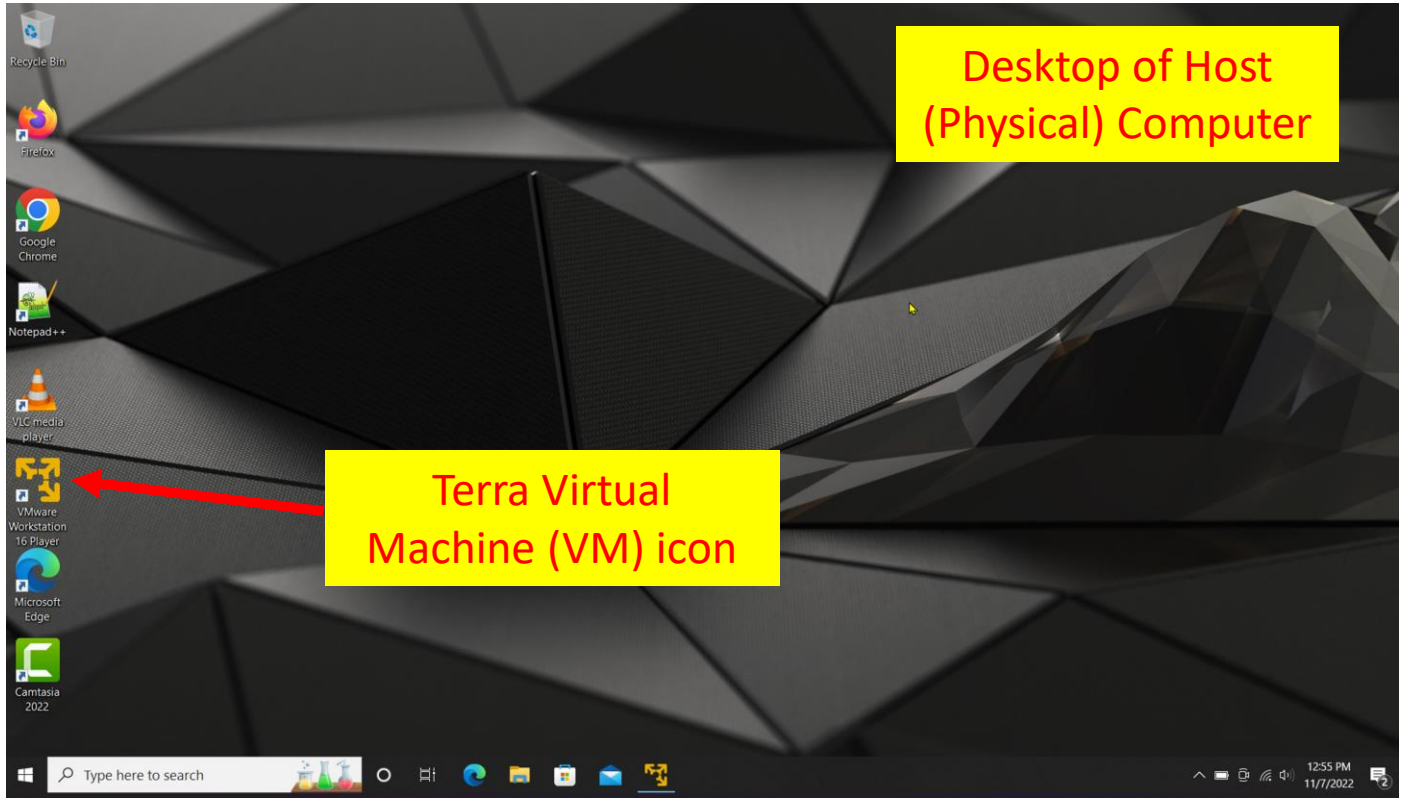
In an industrial environment these software packages are typically installed on a laptop, so the computer can be taken out to machine to connect to a PLC for troubleshooting a system.

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



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.

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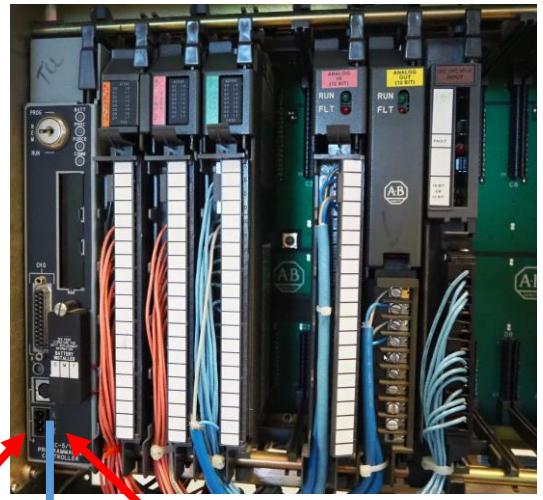
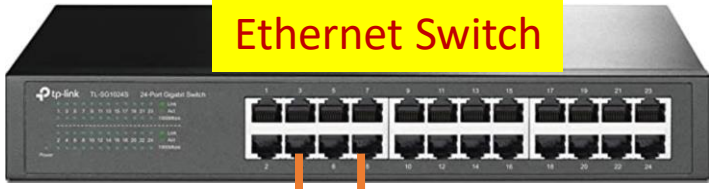
ControlLogix Gateway:



Ethernet Module
10.10.10.29

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

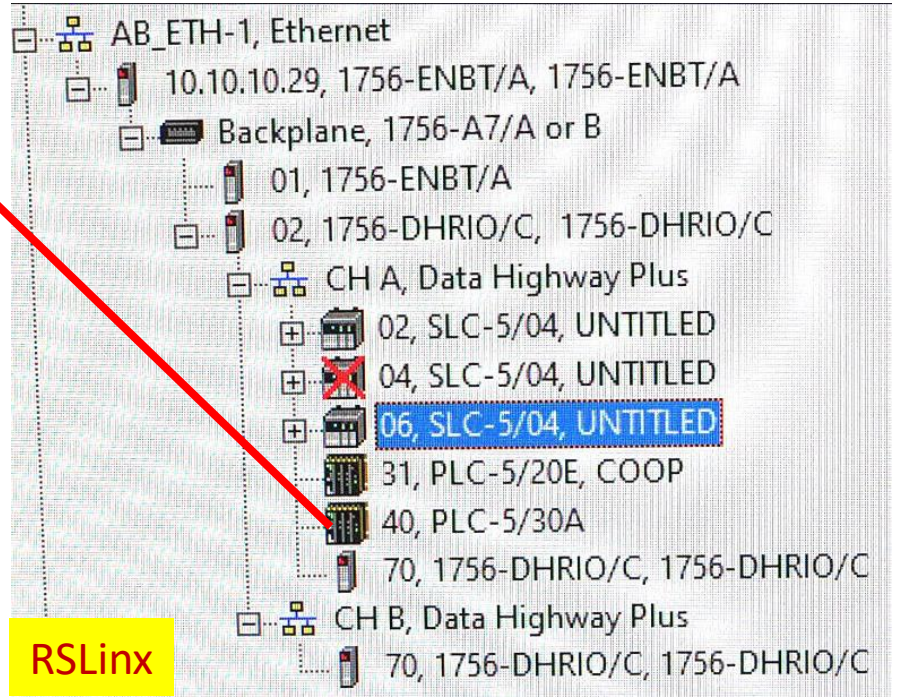
Ethernet Switch



DH+

DH+ Sta. 40

Ethernet



RSLinx

Ethernet
10.10.10.5

Computer in PLC Lab

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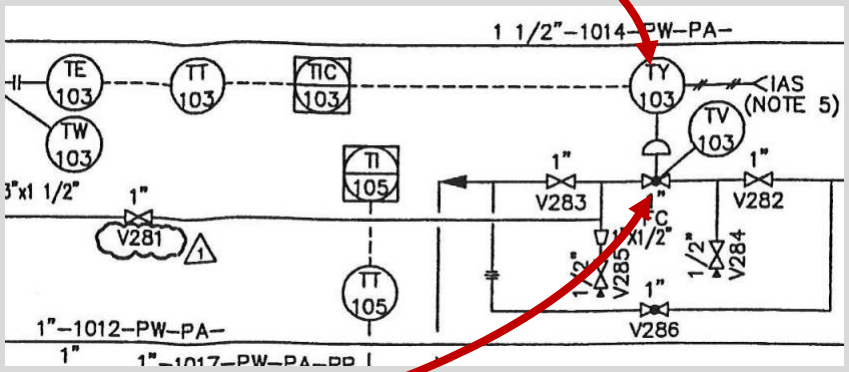
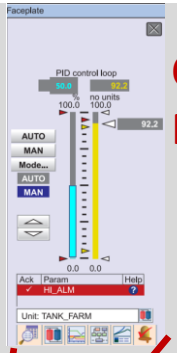
Interpreting a P&ID to the actual hardware:

Digital Valve Controller (I/P)



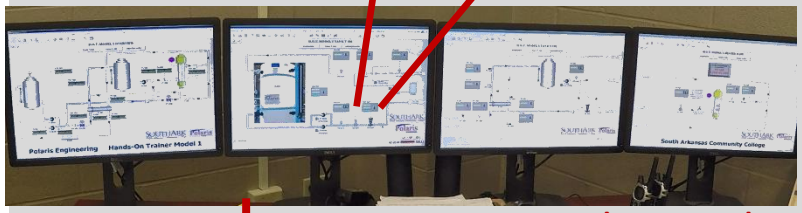
TCV-103 Control Valve

Signal Flow in a Distributed Control System:



Controller Faceplate

50%



Control Console

50%

Delta V DCS System

12 mA

DVC6200 (I/P)

9 psi

1/2 Open

70 psi

Charge Tank

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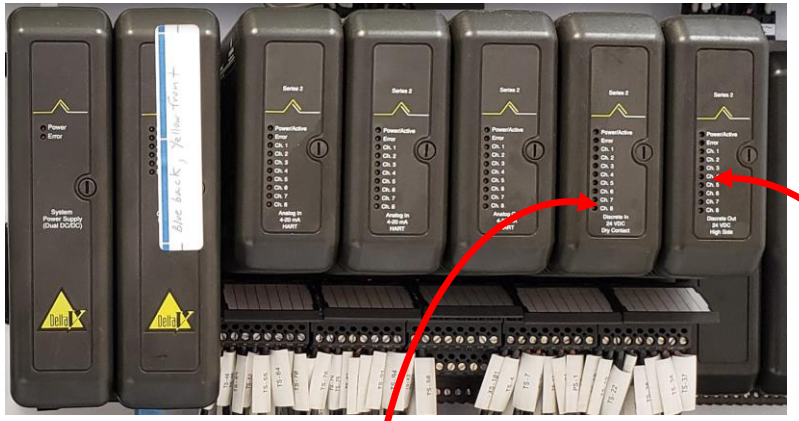
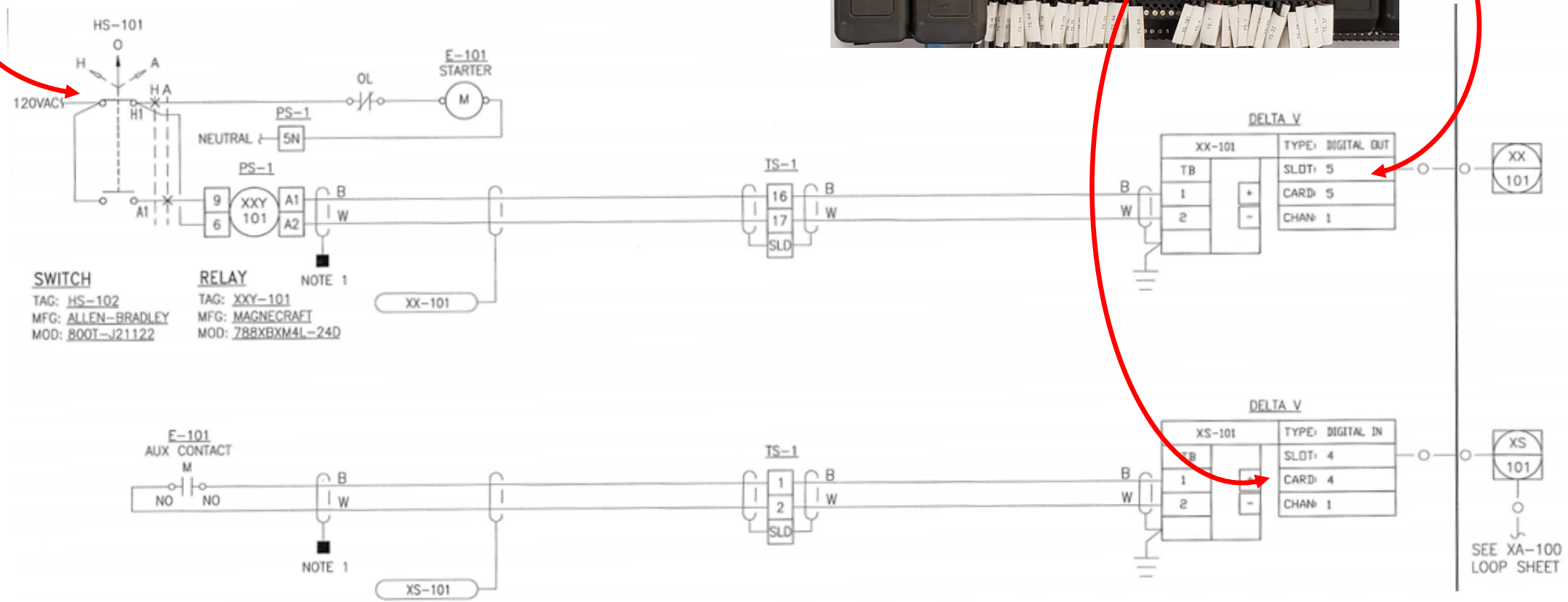
Prints to Hardware:

Card Slot: 1 2 3 4 5





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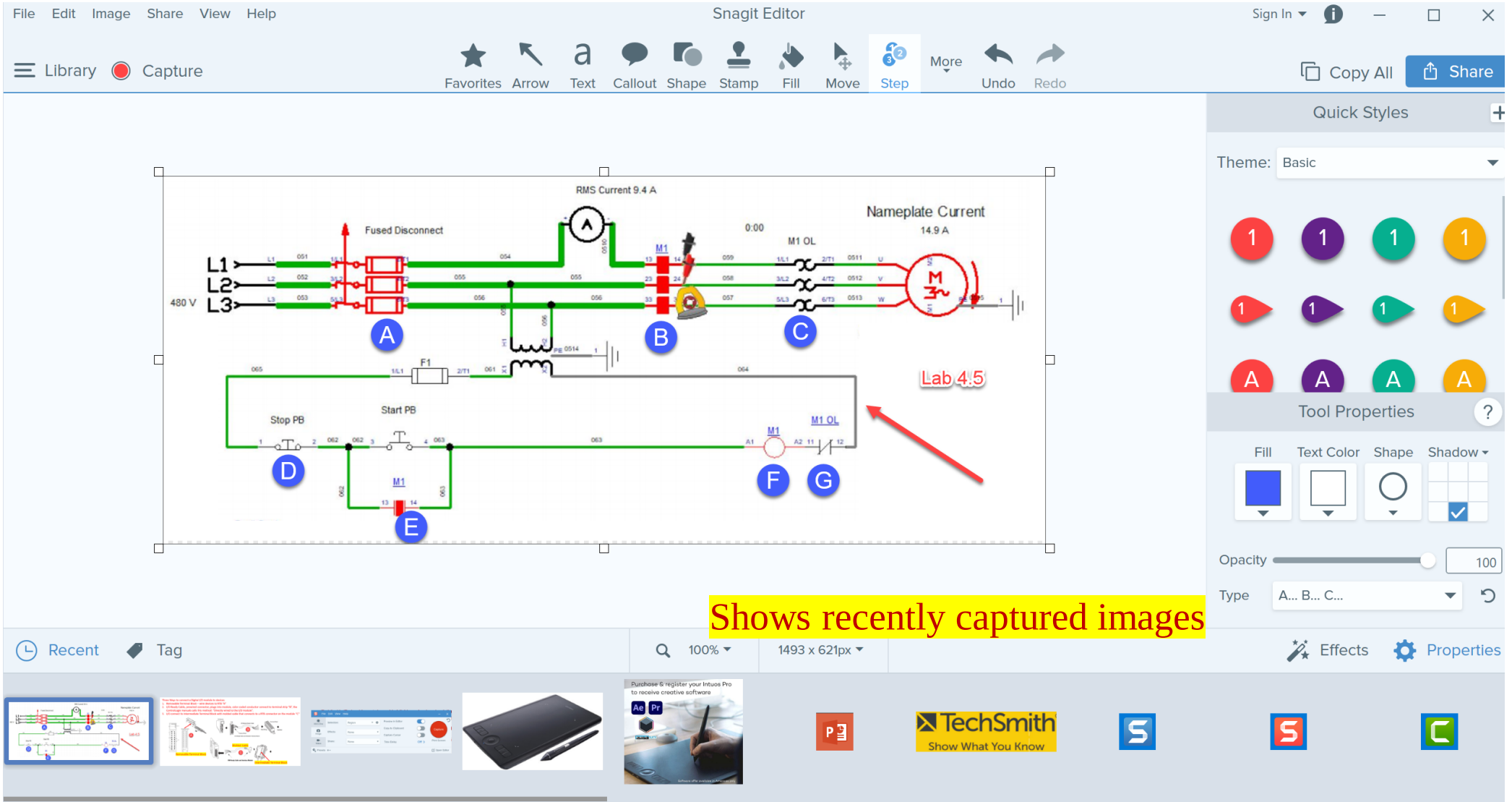
GoPro Recording of Video:

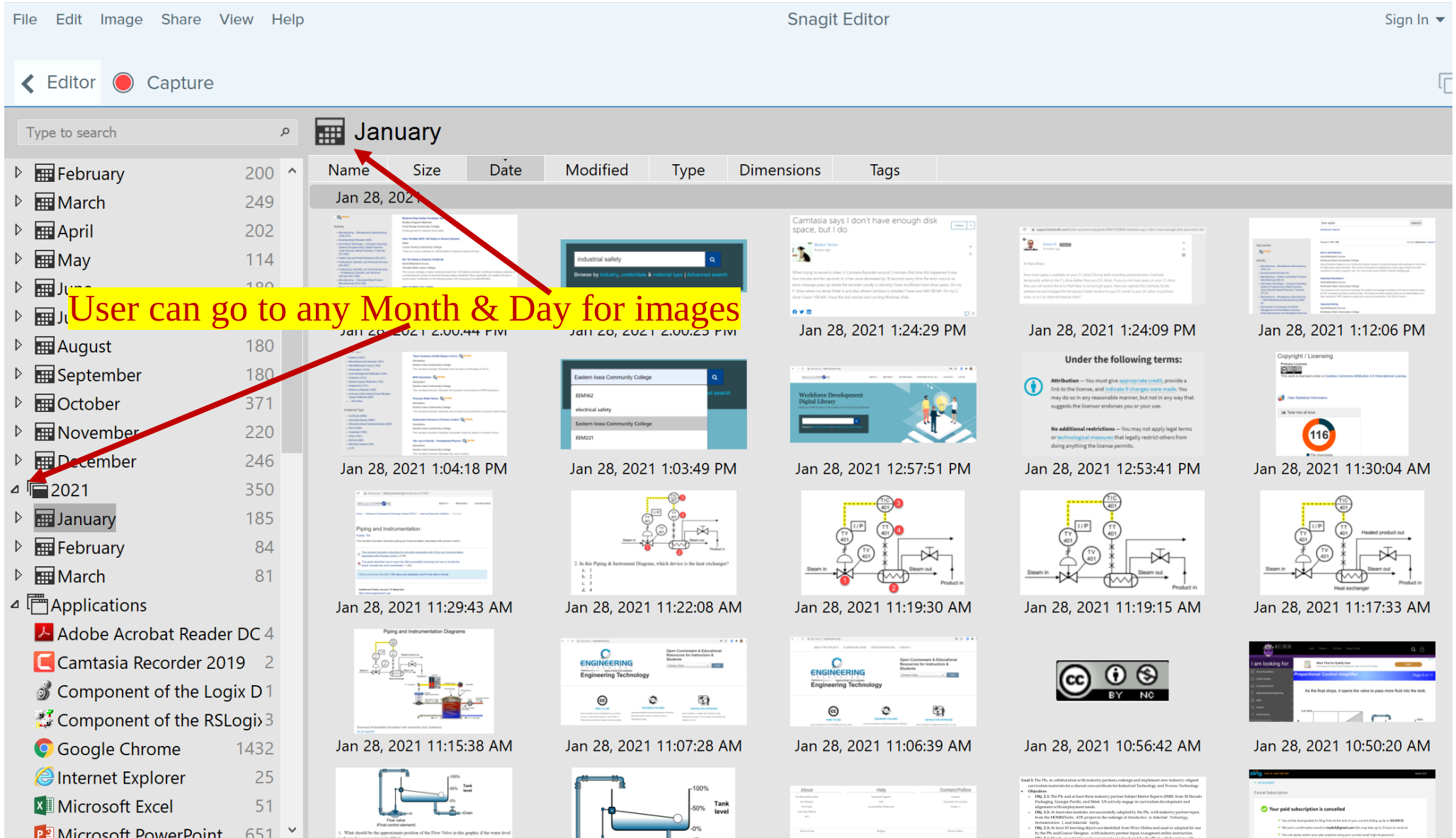
TechSmith Snagit 2019 Editor:

Tools to modify the image



Shows recently captured images

TechSmith Snagit Editor Library

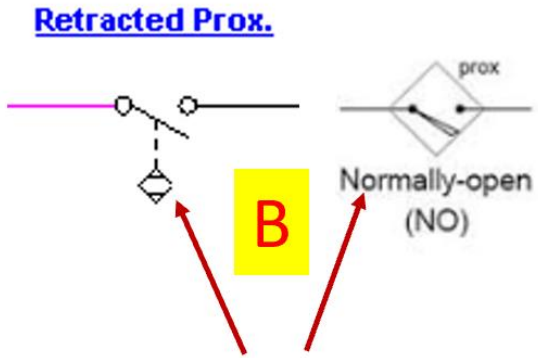


User can go to any Month & Day for images

Creating a PDF Focused Learning Object:

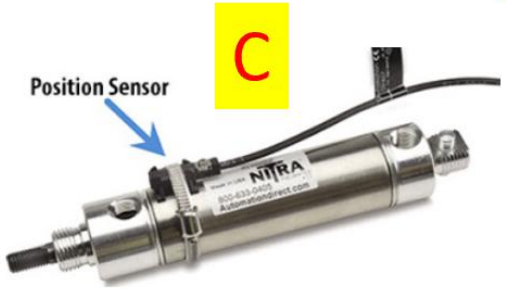
Proximity Sensors/Switches:

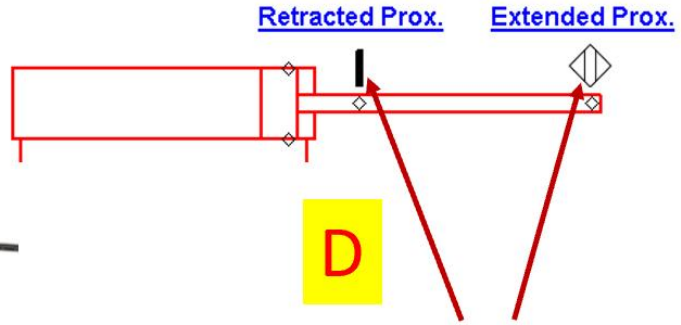
Commercial proximity sensor/switches



Proximity Switch in an electrical circuit

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





Proximity Sensor in a pneumatic circuit

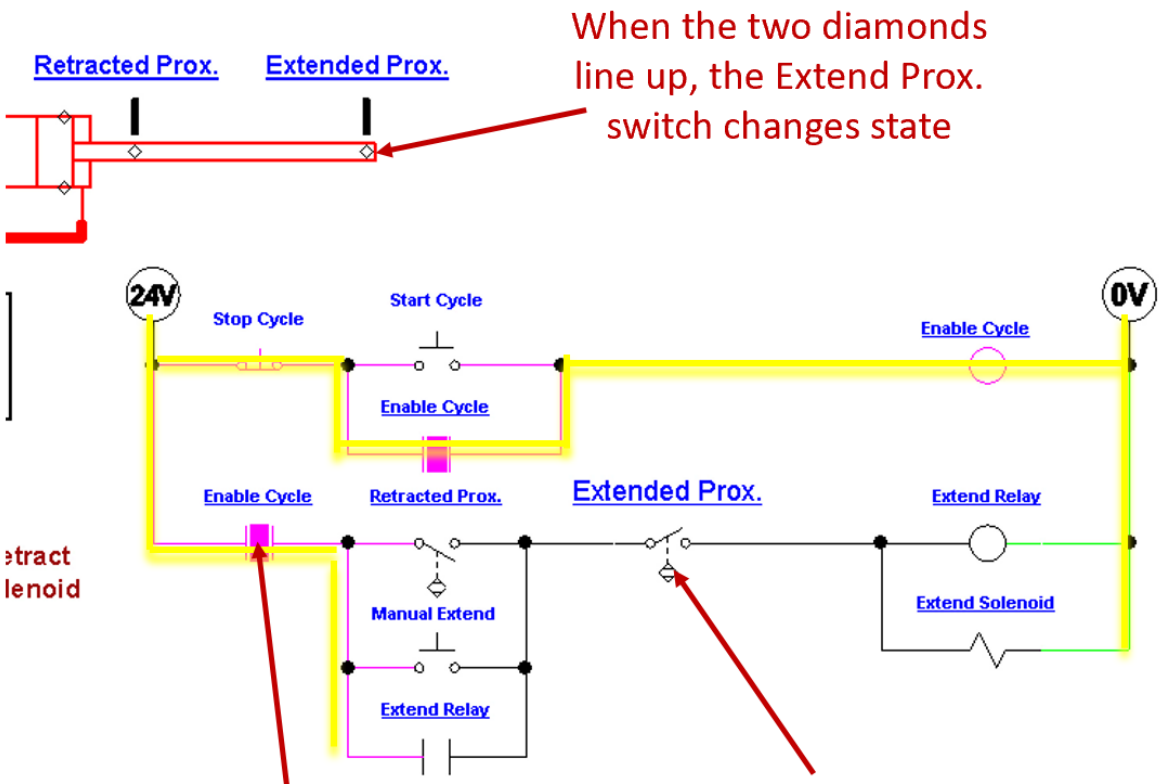
Proximity switches are devices that sense a part without touching it. A limit switch will touch a part, but a proximity switch senses it. The confusing part of this is that there is one symbol for a pneumatic circuit, and a different symbol for an electrical circuit. The reality is that these are the 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:

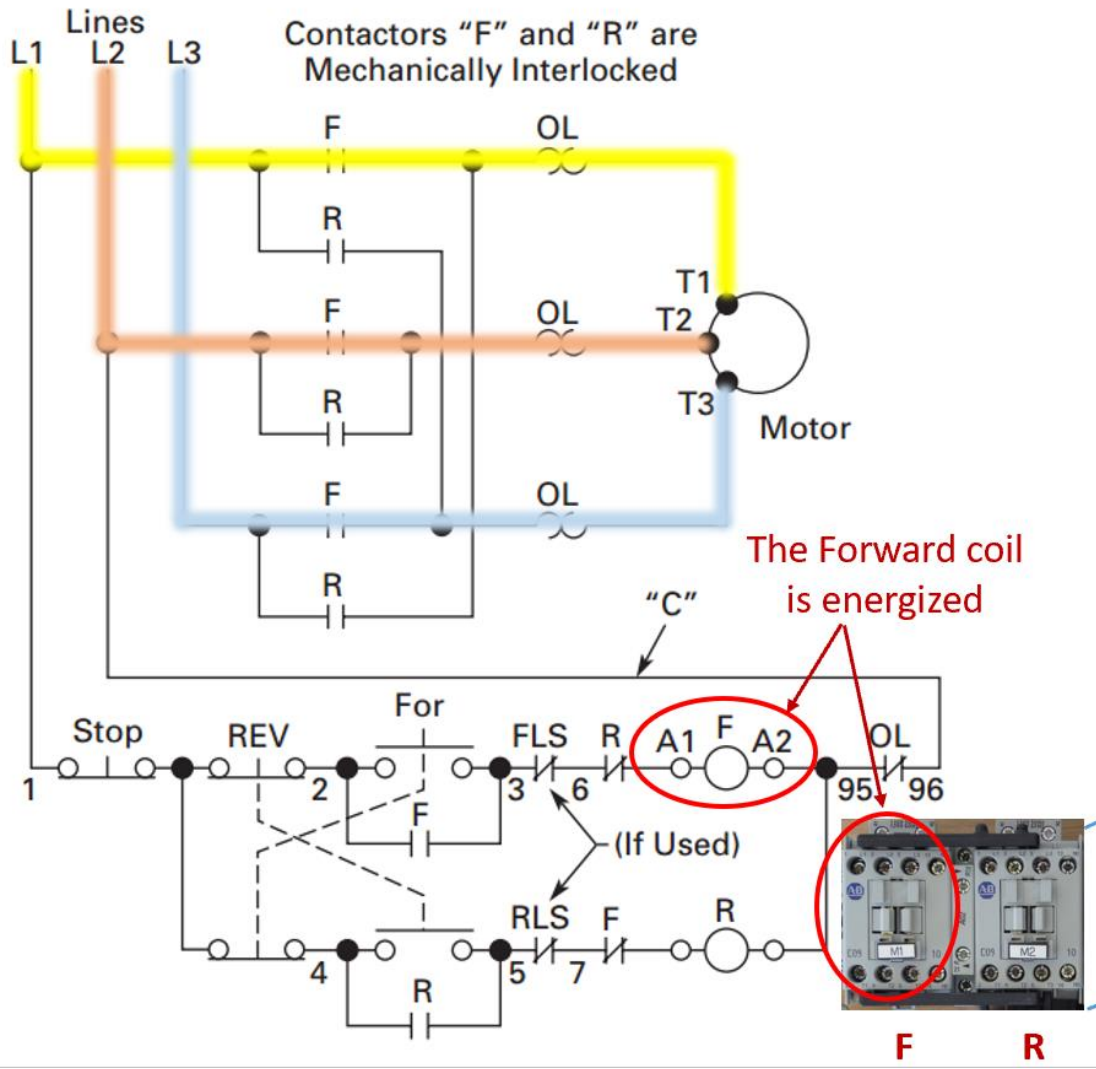
Electrical circuit operation:



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.

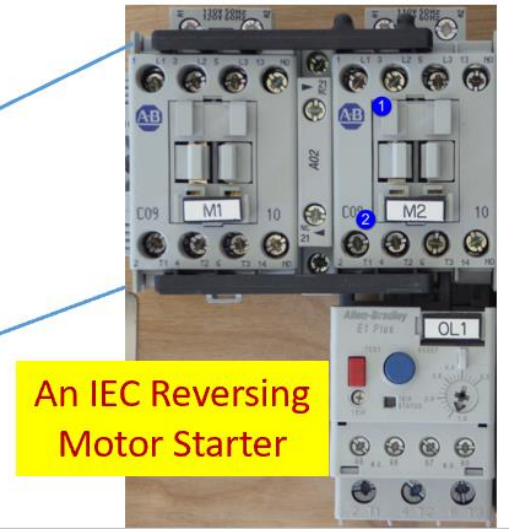
Creating a PDF Focused Learning Object:

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.



An IEC Reversing Motor Starter

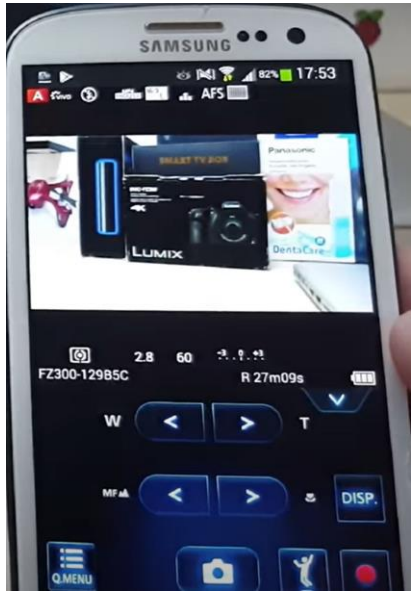
Cameras for Creating Videos:

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



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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

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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 Cards: GigaBytes

SD to USB Interface

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GoPro Cameras:

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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)

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This Concludes this Instructional Document

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