Blackhawk Technical College

Manufacturing Automation Cell (MAC) Project Final Report

Executive Summary

The Manufacturing Automation Cell (MAC) Project at Blackhawk Technical College (BTC), in partnership with Scot Forge, aims to advance manufacturing education by increasing the number of qualified advanced manufacturing technicians. The project takes a multi-layered approach through innovative training, real-world hands-on projects, and lab-based manufacturing opportunities. The core of the project involves designing, building, and integrating a manufacturing automation cell that incorporates Industry 4.0 and Industrial Internet of Things (IIOT) technologies. This initiative directly addresses critical industry needs such as labor shortages, automation, and technology development, as identified in the Forging Industry Technology Roadmap. Despite initial challenges related to facility construction and student staffing, the activities within the scope of the project have been completed, including the assembly and initial setup of the manufacturing cell, development of new curriculum, and collaboration with industry partners.

Project Objectives and Scope

The primary objective of the MAC project is to serve as a catalyst and advance the field of manufacturing education by increasing the pool of qualified advanced manufacturing technicians. This will be achieved through:

- **Work-Based Learning Opportunities:** Providing hands-on experience within an educational institution, allowing students to directly apply classroom knowledge to real-world scenarios.
- **Curriculum Development:** Creating and modifying courses, including four new 1-credit internship courses and an ongoing capstone project, to complement the work-based learning experiences.
- **Industry Collaboration:** Partnering with companies like Scot Forge and leveraging our MAC project Business and Industry Leadership Team (BILT) to ensure curriculum relevance and provide real-world insights.

Key Deliverables and Progress

The project has three main deliverables, with notable progress and challenges identified:

1. Supported Collaboration with Industry Partners

- **Objective:** Engage industry partners in the faculty/student-led design and building of the MAC utilizing Industry 4.0 and IIOT technologies.
- **Progress:** Over the course of the project our MAC Project BILT advisory committee held meetings with nine local companies to discuss design and implementation of the manufacturing cell and the development of curriculum for the work-based learning (WBL) courses.
- The first meeting of the MAC project BILT was held on December 13th, 2024, with additional meetings every one to two months. The last BILT meeting was held on May 9th, 2025.
- Minutes for the advisory meetings can be found in Appendix C at the end of this report.
- When possible, student workers also attended the BILT meetings to participate in those discussions. The student and lab worker team included Rob Hollenbach, Dom Ellis, Spencer Pumphrey, Abram Westrick, Shawn McMahon, and Chris Campos.
- Hiring and retaining student workers was a significant challenge of this project due to students' busy schedules.
- **Relevance to Forging Industry:** Directly addresses "labor shortages, automation, technology development, Industry 4.0, and others" by training technicians in relevant automation equipment and technologies.

2. Creation/Implementation of Credit-Bearing Instructional Coursework

- **Objective:** Develop and implement curriculum based on the manufacturing cell, providing hands-on experience for students.
- **Progress:** The outline, framework, and content for each course has been housed in Blackboard Ultra, the college's learning management system (LMS) where students can access the content including, formative and summative assessments, lab activities, and any supplementary material needed for comprehension.
- The Worldwide Instructional Design System or WIDS is where the "above the line" curriculum is housed including course competencies, objectives, lesson plans, and syllabi. Documents from our WIDS repository are located in Appendix D at the end of this document.
- Drawings and schematics associated with the mini-capstone project that will be completed by students as they work their way through the program are also located in Appendix D at the end of this document.

3. Enhanced Student Recruitment & Retention

- **Objective:** Support a minimum of 20 individuals with a 70% retention rate and 80% completion rate by working with the College's Strategic Enrollment Management Initiative.
- **Progress:** The project team worked to enhance student recruitment & retention by working collaboratively with the College's Student Services, Student Success, and Marketing divisions throughout the duration of the project.
- Throughout the spring 2025 semester faculty from the Mechatronics program areas along with student services staff visited 89% of all high schools within the college's district to share information about the MAC project with the intent to recruit as many new students as possible.
- Our marketing team provided us with informational brochures and swag to provide to the students in attendance.
- Data from our office of Institutional Research and Effectiveness (OIRE) office shows that enrollment in the mechatronics program areas for the fall 2025 semester is up significantly from 2024. New student head count is up 193% from 15 to 29 students. New student credit count is up 203% from 144 credits to 293 credits.
- Retention rate for continuing students is also up from 2024 to 2025 with an increase from 32 to 43 students which equates to approximately 74%.

Project Status

1. Equipment and Facility Progress

- **Conveyors:** Assembled during the fall 2023 semester, with a control cabinet designed and built for automatic or manual conveying of parts. This initial setup then needed to be disassembled and moved to the new facility built at our central campus for our manufacturing division in the fall of 2024. The facility was named the Innovative Manufacturing Education Center or IMEC.
- **Thermoforming Equipment:** In January 2025, the two thermoformers we installed in their final location with power and air to each machine. A mold was designed and 3d printed by our capstone students to allow for the thermoforming operation and production of frisbees.
- **Trim Cell:** Scheduled for delivery by March 11, 2024, was unable to be incorporated immediately due to space constraints at the previous facility. Once the IMEC was

finished in the fall of 2024, the robotic trim cell was delivered and in January 2025, was anchored in its final location with power and air run to the machine. An initial base program was installed in the robot and by the end of April 2025 a final program was uploaded allowing for trimming the thermoformed frisbees to their final shape removing excess plastic.

2. Challenges, Timeline Adjustments, and Justification

- **Facility Relocation:** We sold our Milton, WI campus housing the manufacturing lab to a manufacturing company in the fall of 2023. During this time, we needed to share space with the new owners of the facility while our new facility was under construction. This caused a number of issues and delays in the construction of our MAC project. The primary lab space where the MAC project was to be built was unavailable for use. The areas that were available did not have the footprint required to incorporate the thermoforming equipment or the robotic trim cell.
- **New Facility (IMEC):** Construction delays at the Innovative Manufacturing Education Center (IMEC) prevented occupancy until August 15, 2024, two days before the semester. Lab activities could not start until September 9, 2024, due to the need to set up program-critical equipment first. This further delayed work on the manufacturing cell.
- **Delay Justification (Sept 2024):** Gaining occupancy two days before the semester and not having a functional lab until the fourth week of the semester prevented the necessary progress to complete the project within the initial deadline of December 31st.
- **Extension Request:** A request for an extension until May 31st, 2025, was requested and approved to allow us the full academic year to have students working directly on the MAC in our new facility and the permanent location of the cell.

3. Future Plans

- **Course Offerings:** Over the next four semester each of the four WBL courses will be rolled a semester at a time. Students will have the opportunity to substitute select program courses with these WBL courses along with the mini-capstone project as they move through the program curriculum. Student outcomes will be looked at to inform future changes and improvements.

Budget Allocation

- **FIERF Funding Request:** $57,143, was requested from FIERF with a shared cost of $40,391 from Blackhawk Technical College to support this initiative.

- **Requested Reimbursement:** The total dollars requested from FIERF for reimbursement are $55,982.39. Difficulty in hiring student workers and the availability of the students workers to complete the available hours proved a challenge in spending all of the money allocated to this grant initiative. Additional information on the breakdown of funds can be found in Appendix B.

Conclusion

The MAC Project at Blackhawk Technical College is a vital initiative designed to address critical workforce needs in advanced manufacturing. Despite the significant disruption caused by the new facility's construction and relocation, the project team has demonstrated resilience and adaptability by securing temporary space and managing complex equipment moves. The commitment to integrating Industry 4.0/IIOT technologies and developing hands-on, work-based learning opportunities directly aligns with the needs of the forging industry and broader manufacturing sector. The requested extension to May 31, 2025, was crucial for allowing students a full academic year of direct engagement with the MAC in its permanent location, ensuring the highest quality completion and educational benefit. Despite challenges encountered to utilize all the hours allocated for student workers, the group did an excellent job in completing tasks assigned to them. The project would not have been successful without the hard work of everybody involved in this project. We are excited to see how work-based learning shapes the confidence and skill level of our students and how this may have a positive impact on the need for qualified technicians in the automation sector.

Video Demonstration of the Manufacturing Cell in Action:

MAC Project Capstone Demo Video

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Appendix A: Project Timeline

Activities	1Q1 July - September	1Q2 October-December	1Q3 January-March	1Q4 April-June	2Q1 July-September	2Q2 October-December	2Q3 January-March	2Q4 April-June
BTC will work with Industry Partners to implement the faculty/student-led Manufacturing Automation Cell (MAC) design and build. Students already enrolled in the core programs (Industrial Maintenance Mechanics (IMM) 1-year technical diploma, Electro-Mechanical Technology (EMT) associate degree, Automation Systems Technology (AST) associate degree programs and the Manufacturing Engineering Technology associate degree (MET) program) will take part in the set-up of the initial Cell which will create an opportunity for a hands-on learning experience.	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress	Complete
BTC will collaborate with employer partners and industry experts through our MAC project BILT team. In addition, a 10-20-member Advisory Committee and 40 Stateline Manufacturing Alliance (SMA) committee members, which will have standing committee board meetings, occurring biannually during the duration of the grant through face-to-face and web-conferencing. Additional communication will take place as needed.	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress	In Progress	Complete
In the 2nd half of year 1, the project team will work to further enhance student recruitment & retention by working collaboratively with the College's Student Services and Student Success divisions pursuing strategies gleaned from the College's Strategic Enrollment Management Initiative.							In Progress	Complete
BTC will begin roll-out of MAC project courses in quarter 4 of year 1.							In Progress	Complete

Appendix B: Budget Summary

Sum of FGBTRND_TRANS_AMT	Column Labels									
Row Labels	January	February	March	April	May	September	October	November	December	Grand Total
2204	**4,016.74**	**3,884.79**	**3,332.12**	**4,255.70**	**18,613.60**	**10,135.43**	**2,927.00**	**5,129.07**	**3,687.94**	**55,982.39**
2204-5000-5039-664	**584.50**	**1,344.00**	**899.50**	**1,340.50**	**2,053.50**			**32.50**	**238.00**	**6,492.50**
24					422.50			32.50		455.00
25	584.50	1,344.00	899.50	1,340.50	1,631.00				238.00	6,037.50
2204-5000-5044-664			**-**	**214.50**	**(214.50)**					**-**
24				214.50	(214.50)					-
25			-							-
2204-5000-5057-400	**2,156.00**	**2,156.00**	**2,156.00**	**2,156.00**	**3,234.00**	**6,468.00**	**2,156.00**	**3,234.00**	**2,156.00**	**25,872.00**
25	2,156.00	2,156.00	2,156.00	2,156.00	3,234.00	6,468.00	2,156.00	3,234.00	2,156.00	25,872.00
2204-5000-5077-664					**10,838.04**					**10,838.04**
25					10,838.04					10,838.04
2204-5000-5101-400	**920.33**	**19.55**	**(91.71)**	**186.91**	**560.72**	**2,600.28**	**433.38**	**1,326.93**	**920.33**	**6,876.72**
25	920.33	19.55	(91.71)	186.91	560.72	2,600.28	433.38	1,326.93	920.33	6,876.72
2204-5000-5102-400	**39.06**	**39.08**	**39.08**	**19.54**	**58.61**	**117.18**	**19.54**	**58.61**	**39.07**	**429.77**
25	39.06	39.08	39.08	19.54	58.61	117.18	19.54	58.61	39.07	429.77
2204-5000-5104-400	**6.73**	**6.74**	**6.73**	**3.37**	**10.43**	**20.20**	**3.36**	**10.10**	**6.73**	**74.39**
25	6.73	6.74	6.73	3.37	10.43	20.20	3.36	10.10	6.73	74.39
2204-5000-5105-400	**149.84**	**149.84**	**149.84**	**149.84**	**224.76**	**446.28**	**148.76**	**223.14**	**149.31**	**1,791.61**
25	149.84	149.84	149.84	149.84	224.76	446.28	148.76	223.14	149.31	1,791.61
2204-5000-5105-664					**753.24**					**753.24**
25					753.24					753.24
2204-5000-5106-400	**154.46**	**163.76**	**166.86**	**162.81**	**241.04**	**466.03**	**160.13**	**232.57**	**154.47**	**1,902.13**
25	154.46	163.76	166.86	162.81	241.04	466.03	160.13	232.57	154.47	1,902.13
2204-5000-5106-664				**16.41**	**845.03**			**2.49**	**18.21**	**882.14**
24				16.41	15.92			2.49		34.82
25					829.11				18.21	847.32
2204-5000-5107-400	**5.82**	**5.82**	**5.82**	**5.82**	**8.73**	**17.46**	**5.83**	**8.73**	**5.82**	**69.85**
25	5.82	5.82	5.82	5.82	8.73	17.46	5.83	8.73	5.82	69.85
Grand Total	**4,016.74**	**3,884.79**	**3,332.12**	**4,255.70**	**18,613.60**	**10,135.43**	**2,927.00**	**5,129.07**	**3,687.94**	**55,982.39**

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MAC Project Grant Budget

Line Number

1.0 Administration	Description	Outputs & Activities Number	Amount
Total			$0

2.0 Salaries/Fringes	Description	Outputs & Activities Number	Amount		Banner	Remaining
Rob Hollenbach	Full Time Lab Technican @ 50% of pay (1,040 Hours X $21.00/HR + 34% Fringe = $21,840 + 7,426 = $29,266		$29,266	2204-5000-5057-664	37,016.47	(7,750.47)
	Three Student Workers: 3x(504 hours x $12/per hour ($6,048) + 7.65% fringe ($463)) = $19,533		$19,533	2204-5000-5039-664	6,545.53	12,987.47
	Curriculum Development Costs: 3 credits @ 54 hours per credit ($45/hr x 162 hrs = $7,290 + 14.45% fringe($1,054) = $8,344)		$8,344	2204-5000-5077-664	12,420.39	(4,076.39)
Total			$57,143		55,982.39	1,160.61

3.0 Travel	Description	Outputs & Activities Number	Amount
Total			$0

4.0 Equipment-Major	Description	Outputs & Activities Number	Amount
Total			$0

5.0 Equipment-Minor	Description	Activities	Amount
Total			$0
		Equipment Total	$0

6.0 Software	Description	Outputs & Activities Number	Amount
Total			$0

7.0 Supplies	Description	Outputs & Activities Number	Amount
Total			$0

8.0 Other	Description	Outputs & Activities Number	Amount
Total			$0

9.0 Subtotal		$57,143
	BTC Cost Sharing or Match	
	50% of pay: Fulltime Lab Technician	$29,266
	Curriculum development: 4 courses @ 54 hours per course	$11,125
		$40,391
	Total Project Cost (Line 9.0 + BTC Cost Share)	**$97,534**
	Total Grant Funds Requested	**$57,143**

FY24 Student Workers	Hours	Dollars
334406 Shawn McMahon	32.50	454.83
335484 Chris Campos	2.50	34.99
	35.00	489.82
FY25 Student Workers		
299797 Spencer Pumphrey	146.75	2,054.50
327095 Domnick Ellis	215.50	3,035.21
346700 Abram Westrick	69.00	966.00
	431.25	6,055.71
YTD	466.25	6,545.53

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Appendix C: BILT Minutes

BLACKHAWK TECHNICAL COLLEGE

ADVANCED TECHNOLOGICAL EDUCATION IN MANUFACTURING (ATEM) BILT: MEETING 1

MEETING MINUTES

Date: Friday, Decemeber 13, 2024 | Time: 8-10AM
Location: In-person at Blackhawk Technical College – Main Campus 1505

ATTENDANCE

Industry Partners	BTC Participants
Mike Baker, Prent	Bryan Coddington, Engineering Instructor/MATT Chair
Nicholas Colcord, Frito-Lay	John Dorcey, Automation Instructor
Jordan Conway, Frito-Lay	Dom Ellis, Student Worker
Matt Galli, Westlake Pipe	Ryan Hartter, Lead Mechatronics Instructor
Jakob Hitchcock, Frito-Lay	Colleen Koerth, Workforce & Community Development
Greg Lofgren, Prent	Bill Lobenstein, Industrial Maintenance Instructor
Roger Luessenhop, Frito-Lay	Greg Phillips, Dean of Manufacturing
Bob Oakey, Morse Group	Jeni Ryan, Admin Assistant to MATT Division
Steve Smith, Westlake Pipe	
Jason (J) Upham, Frito-Lay	
Bryan Wackershauser, Scot Forge	

MINUTES

1. **Overview of National Science Foundation (NSF) Grant**
   a. National Science Foundation, 3-year federal grant; 1st for BTC; will apply for a NSF-ATE Project grant once our NSF-ATE Small Scale Project grant has ended.
   b. Goals and Objectives of the grant
      i. Build Manufacturing Cell
      ii. Develop WBL Curriculum
      iii. Validate Effectiveness of WBL Courses
      iv. Enhance Student Recruitment & Retention
   c. Work-based-Learning (WBL) - Developing 4 different work-based-learning opportunities as internship classes
      i. Equipment Operation
      ii. Preventative Maintenance
      iii. Maintenance Troubleshooting
      iv. Integration
   d. Mini Capstone Projects
      i. Electrical – Control Cabinet
      ii. Mechanical – Pneumatic Pusher/Conveyor
2. **Business & Industry Leadership Team (BILT)**
   a. Purpose: To inform the development of work-based-learning curriculum that reflects what students are likely to encounter in industry in order to:

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BLACKHAWK TECHNICAL COLLEGE

ADVANCED TECHNOLOGICAL EDUCATION IN MANUFACTURING (ATEM) BILT: MEETING 2

MEETING MINUTES

Date: Friday, January 24, 2025 | Time: 8-10AM
Location: In-person at Blackhawk Technical College – Main Campus 1402

ATTENDANCE

Industry Partners	BTC Participants
Mike Baker, Prent Andrew Caldwell, Modo 8 Jakob Hitchcock, Frito Lay Jordan Conway, Frito Lay Matt Galli, Westlake Pipe Russ Gleiter, Scot Forge Roger Luessenhop, Frito Lay Nic Marois, Modo8 Clint Ocain, Modo8 Steve Smith, Westlake Pipe	Bryan Coddington, Engineering Instructor/MATT Chair John Dorcey, Automation Instructor Ryan Hartter, Lead Mechatronics Instructor Bill Lobenstein, Industrial Maintenance Instructor Jeni Ryan, Admin Assistant to MATT Division

MINUTES

1. **Updates**
   a. Scholarship Opportunities maybe be difficult 20-30 full time students
      i. Blackhawk Foundation
      ii. NSF S-STEM Grant – add on supplement grant specifically for scholarships
   b. Marketing
      i. Promotional Video – interviews of students, instructors, and some industry members
      ii. Website – video will end up on website
      iii. Magazine - back page
      iv. Flyers – for hs visits
   c. High School Visits
      i. Beloit Memorial – February 7th Senior Seminars
      ii. Janesville next
      iii. Then to the rest of the schools in the district
   d. UW-Stout Automation Leadership Transfer Agreement
      i. Adding Electro-Mechanical Technology degree
      ii. 3 years with us and 1 year online through Stout
      iii. Already have transfer agreement with Manufacturing Engineering and Automated Systems Technology
   e. Internal conversations about items from last meetings

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BLACKHAWK TECHNICAL COLLEGE

ADVANCED TECHNOLOGICAL EDUCATION IN MANUFACTURING (ATEM) BILT: MEETING 3

MEETING MINUTES

Date: Friday, March 7, 2025 | Time: 8-10AM
Location: In-person at Blackhawk Technical College – Main Campus 1402

ATTENDANCE

Industry Partners	BTC Participants
Mike Baker, Prent	Bryan Coddington, Engineering Instructor/MATT Chair
Russ Gleiter, Scot Forge	John Dorcey, Automation Instructor
Jakob Hitchcock, Frito Lay	Ryan Hartter, Lead Mechatronics Instructor
Greg Lofgren, Prent	Bill Lobenstein, Industrial Maintenance Instructor
	Jeni Ryan, Admin Assistant to MATT Division

SUMMARY

Meeting Overview

The meeting focused on updates and discussions related to:

- High school outreach and recruitment efforts
- Presentation strategies for promoting two-year technical education
- Updates on the manufacturing cell project
- Development of troubleshooting documentation
- Internship structure and employability skills
- Preventive maintenance (PM) practices and expectations

Key Updates & Discussions

1. High School Outreach

- Multiple high school visits were conducted (e.g., Beloit Memorial, Clinton, FJ Turner, Milton).
- Presentations focused on the Tech Forward Initiative, scholarship opportunities, and benefits of two-year degrees.
- Mixed student interest observed; some schools showed promising engagement.

2. Presentation Content

- Topics included career pathways, work-based learning, and scholarship details.
- Emphasis on affordability and transfer options to four-year institutions.
- Success in the New Economy video used to illustrate benefits of technical education.

3. Manufacturing Cell Project

- Students are working on a thermoforming project (Frisbee mold).
- Challenges with 3D printing and servo communication faults were discussed.
- Troubleshooting efforts involved manual testing, wiring corrections, and vendor support.
- Students are grouped by skill sets (mechanical, electrical, programming) and working toward a 13-week project timeline.

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BLACKHAWK TECHNICAL COLLEGE

ADVANCED TECHNOLOGICAL EDUCATION IN MANUFACTURING (ATEM) BILT: MEETING 4

MEETING MINUTES

Date: Friday, May 5, 2025 | Time: 8-10AM
Location: In-person at Blackhawk Technical College – Main Campus 1402

ATTENDANCE

Industry Partners	BTC Participants
Greg Lofgren, Prent	Bryan Coddington, Engineering Instructor/MATT Chair
Roger Luessenhop, Frito-Lay	John Dorcey, Automation Instructor
Bryan Wackershauser, Scot Forge	Ryan Hartter, Lead Mechatronics Instructor
	Bill Lobenstein, Industrial Maintenance Instructor
	Jeni Ryan, Admin Assistant to MATT Division

SUMMARY

🎯 **Meeting Purpose**

The meeting focused on:

- Updates on outreach and equipment
- Planning a comprehensive **skills assessment** for students in Electromechanical (EM) and Automation programs
- Preparing for a **capstone student presentation** and lab demonstration

🔔 **Key Updates**

- Outreach efforts expanded to include Harlem High School in Illinois.
- Manufacturing cell is operational; students will present their work and demonstrate it in the lab.
- A screen printer request was denied; labels will be printed for Frisbees instead.

🧪 **Skills Assessment Planning**

The team discussed creating a **baseline and final** assessment to measure student growth over time. The assessment will be given:

1. At program entry
2. After the first year
3. Upon graduation

Blackhawk Technical College

620-996 Work-Based Learning 1- Equipment Operation

Course Outcome Summary

Course Information

Description	Students work as an equipment operator for Blackhawk Manufacturing. The student will be trained how to operate the equipment in the manufacturing cell and learn the sights, sounds, and smells of the equipment and get a feel for when something is running properly or not. Students will also be required to complete "end of shift" reflections on what they have learned.
Career Cluster	Manufacturing
Instructional Level	Associate Degree
Total Credits	1
Total Hours	54

Course History

Revised By	John Dorcey (jdorcey)
Last Approval Date	8/29/2025

Purpose/Goals

The purpose of the Work-Based Learning 1: Equipment Operation course is to prepare students for entry-level industrial roles by developing foundational skills in safe equipment operation, technical communication, and workplace professionalism.

The goal is to ensure trainees can confidently and responsibly operate key production equipment (thermoformer, trim cell, and packaging systems), complete accurate documentation, demonstrate initiative, and begin modeling the behaviors expected of future mentors and technicians in a real-world manufacturing environment.

Target Population

Students enrolled in the ElectroMechanical and/or Automated Systems Technology Degree Programs.

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College Wide Core Abilities

1. **Demonstrate Critical Thinking**
   Status *Active*

   Criteria
   1.1. Evaluate potential solutions using relevant criteria and standards
   1.2. Utilize relevant information gathered from diverse perspectives
   1.3. Define problems clearly and precisely

2. **Demonstrate Diverse and Inclusive Practices**
   Status *Active*

   Criteria
   2.1. Respond appropriately to diverse situations.
   2.2. Model respectful and inclusive interactions
   2.3. Acknowledge the contributions of a diverse society

3. **Demonstrate Effective Communication**
   Status *Active*

   Criteria
   3.1. Use technology to effectively communicate
   3.2. Adapt communication to engage diverse audiences
   3.3. Employ effective communication practices

4. **Demonstrate Professional Use of Relevant Technology**
   Status *Active*

   Criteria
   4.1. Demonstrate proper selection of equipment, tools, and resources to produce desired results
   4.2. Demonstrate safe and secure use of technology
   4.3. Use occupational specific technology in appropriate ways

5. **Demonstrate Professional Work Behaviors**
   Status *Active*

   Criteria
   5.1. Manage time effectively
   5.2. Adhere to policies, procedures, and safety protocols
   5.3. Demonstrate accountability

Course Competencies

1. **Demonstrate Safe Equipment Operation: Trainees operate the thermoformer, trim cell, and packaging systems while following all safety protocols and start-up procedures.**
   Status *Active*

2. **Apply Technical Knowledge to Daily Tasks: Trainees use technical terminology and process understanding to communicate effectively and perform assigned duties.**
   Status *Active*

3. **Document Work Through End-of-Shift Reporting: Trainees complete accurate, detailed shift reports that reflect production data, downtime, and equipment performance.**
   Status *Active*

4. **Exhibit Professional Growth and Initiative: Trainees engage beyond assigned roles by learning from technicians, asking questions, and modeling workplace readiness.**
   Status *Active*

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BLACKHAWK Technical College

Blackhawk Technical College

620-997 Work-Based Learning 2 - Preventative Maintenance

Course Outcome Summary

Course Information

Description	Students will work as a preventive maintenance technician servicing and maintaining the equipment that they operated in WBL 1. The students will be required to complete "end of shift" reflections on what they have learned.
Career Cluster	Manufacturing
Instructional Level	Associate's Degree
Total Credits	1
Total Hours	54

Course History

Revised By	John Dorcey (jdorcey)
Last Approval Date	8/29/2025

Target Population

Students in the Electro-Mechanical and/or Automated Systems Programs.

Textbooks

None

College Wide Core Abilities

1. Demonstrate Critical Thinking
   Status *Active*

Criteria

1.1. Evaluate potential solutions using relevant criteria and standards
1.2. Utilize relevant information gathered from diverse perspectives
1.3. Define problems clearly and precisely

2. **Demonstrate Diverse and Inclusive Practices**
Status *Active*

Criteria

2.1. Respond appropriately to diverse situations.
2.2. Model respectful and inclusive interactions
2.3. Acknowledge the contributions of a diverse society

3. **Demonstrate Effective Communication**
Status *Active*

Criteria

3.1. Use technology to effectively communicate
3.2. Adapt communication to engage diverse audiences
3.3. Employ effective communication practices

4. **Demonstrate Professional Use of Relevant Technology**
Status *Active*

Criteria

4.1. Demonstrate proper selection of equipment, tools, and resources to produce desired results
4.2. Demonstrate safe and secure use of technology
4.3. Use occupational specific technology in appropriate ways

5. **Demonstrate Professional Work Behaviors**
Status *Active*

Criteria

5.1. Manage time effectively
5.2. Adhere to policies, procedures, and safety protocols
5.3. Demonstrate accountability

Course Competencies

1. **Apply Lockout/Tagout procedures in compliance with OSHA 1910.147 before performing maintenance tasks.**
Status *Active*

2. **Analyze equipment condition during preventative maintenance tasks to identify potential failures.**
Status *Active*

3. **Evaluate work completed by documenting findings and recommending follow-up actions in FIIX CMMS.**
Status *Active*

4. **Create a preventative maintenance workflow using SOPs, checklists, and asset history to ensure task accuracy and consistency.**
Status *Active*

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BLACKHAWK Technical College

Blackhawk Technical College

620-998 Work-Based Learning 3 - Maintenance Troubleshooting

Course Outcome Summary

Course Information

Description	Students will complete more advanced maintenance activities such as diagnosing and replacing malfunctioning electrical and mechanical components. The students will be required to complete "end of shift" reflections on what they have learned.
Career Cluster	Manufacturing
Instructional Level	Associate's Degree
Total Credits	1
Total Hours	54

Course History

Revised By	John Dorcey (jdorcey)
Last Approval Date	8/29/2025

Target Population

Students enrolled in the Electro-Mechanical and/or Automated Systems Programs.

Textbooks

None

College Wide Core Abilities

1. Demonstrate Critical Thinking

Status *Active*

Criteria
1.1. Evaluate potential solutions using relevant criteria and standards
1.2. Utilize relevant information gathered from diverse perspectives
1.3. Define problems clearly and precisely

2. **Demonstrate Diverse and Inclusive Practices**
Status *Active*

Criteria
2.1. Respond appropriately to diverse situations.
2.2. Model respectful and inclusive interactions
2.3. Acknowledge the contributions of a diverse society

3. **Demonstrate Effective Communication**
Status *Active*

Criteria
3.1. Use technology to effectively communicate
3.2. Adapt communication to engage diverse audiences
3.3. Employ effective communication practices

4. **Demonstrate Professional Use of Relevant Technology**
Status *Active*

Criteria
4.1. Demonstrate proper selection of equipment, tools, and resources to produce desired results
4.2. Demonstrate safe and secure use of technology
4.3. Use occupational specific technology in appropriate ways

5. **Demonstrate Professional Work Behaviors**
Status *Active*

Criteria
5.1. Manage time effectively
5.2. Adhere to policies, procedures, and safety protocols
5.3. Demonstrate accountability

Course Competencies

1. **Apply systematic troubleshooting methods to diagnose faults in mechanical, electrical, pneumatic, and automated systems.**
Status *Active*

2. **Analyze equipment behavior and system responses to determine the source of operational malfunctions.**
Status *Active*

3. **Evaluate multiple repair solutions based on safety, efficiency, cost, and long-term reliability.**
Status *Active*

4. **Create detailed maintenance documentation and troubleshooting reports using industry-standard terminology and CMMS tools.**
Status *Active*

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BLACKHAWK Technical College

Blackhawk Technical College

620-999 Work-Based Learning 4 - Integration

Course Outcome Summary

Course Information

Description	Students will install and troubleshoot a new piece of equipment for the manufacturing cell to increase it's functionality and level of automation. The students will be required to complete "end of shift" reflections on what they have learned.
Career Cluster	Manufacturing
Instructional Level	Associate's Degree
Total Credits	1
Total Hours	54

Course History

Revised By	John Dorcey (jdorcey)
Last Approval Date	8/29/2025

Target Population

Students enrolled in the Electro-Mechanical and/or Automated Systems Programs.

Textbooks

None.

College Wide Core Abilities

1. Demonstrate Critical Thinking
   Status *Active*

Criteria

1.1. Evaluate potential solutions using relevant criteria and standards
1.2. Utilize relevant information gathered from diverse perspectives
1.3. Define problems clearly and precisely

2. **Demonstrate Diverse and Inclusive Practices**
Status *Active*

Criteria

2.1. Respond appropriately to diverse situations.
2.2. Model respectful and inclusive interactions
2.3. Acknowledge the contributions of a diverse society

3. **Demonstrate Effective Communication**
Status *Active*

Criteria

3.1. Use technology to effectively communicate
3.2. Adapt communication to engage diverse audiences
3.3. Employ effective communication practices

4. **Demonstrate Professional Use of Relevant Technology**
Status *Active*

Criteria

4.1. Demonstrate proper selection of equipment, tools, and resources to produce desired results
4.2. Demonstrate safe and secure use of technology
4.3. Use occupational specific technology in appropriate ways

5. **Demonstrate Professional Work Behaviors**
Status *Active*

Criteria

5.1. Manage time effectively
5.2. Adhere to policies, procedures, and safety protocols
5.3. Demonstrate accountability

Course Competencies

1. **Apply knowledge of mechanical, electrical, and control systems to integrate new components into existing equipment.**
Status *Active*

2. **Analyze system diagrams, PLC logic, and wiring schematics to plan and execute integration tasks.**
Status *Active*

3. **Evaluate system performance after integration to ensure functionality, reliability, and safety compliance.**
Status *Active*

4. **Create integration plans and documentation that support installation, commissioning, and future troubleshooting.**
Status *Active*

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Mini Capstone Project
Culminating Coursework Experience

Overview

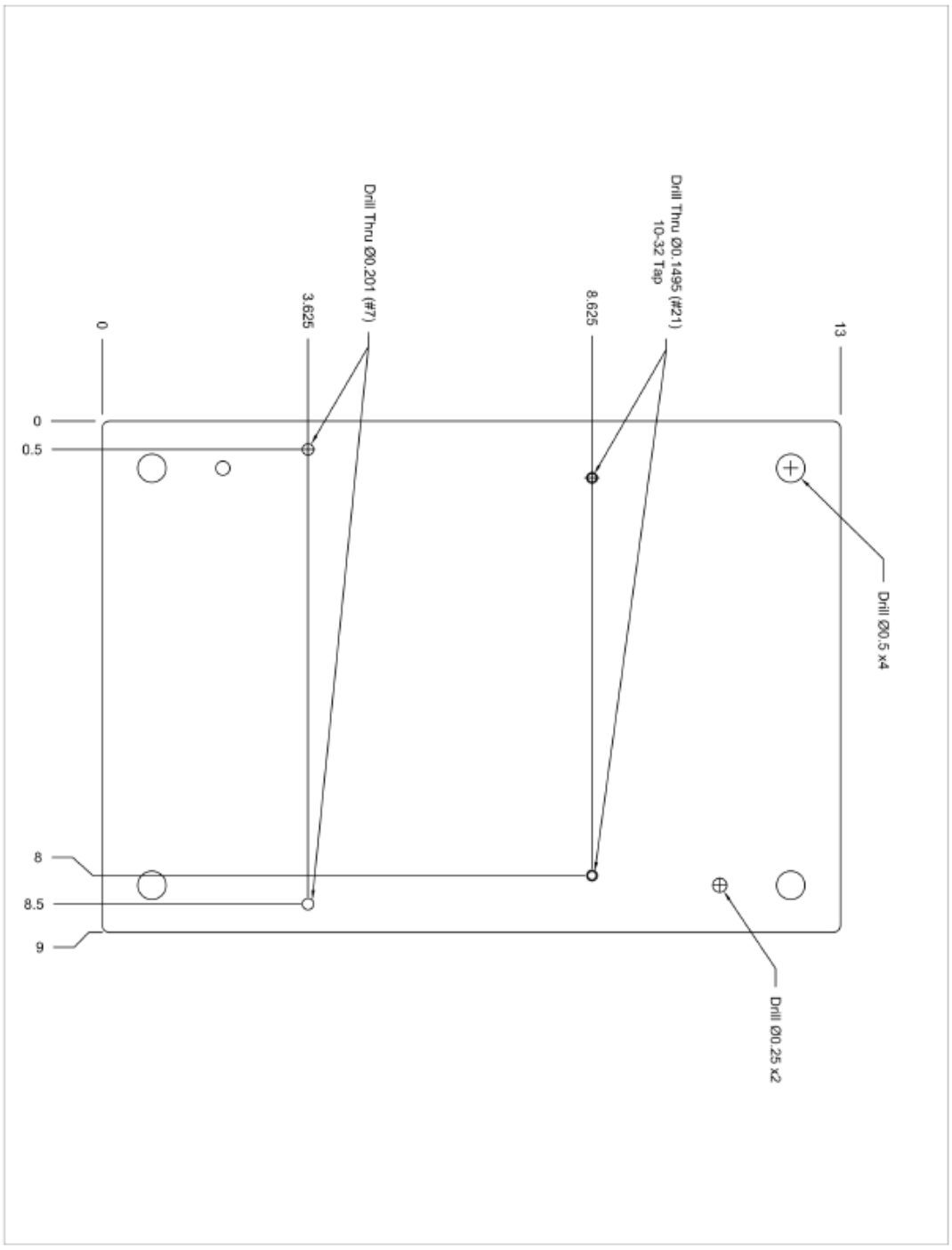
The Mini Capstone Project serves as an applied learning experience, completed throughout the duration of the program. It provides students with an opportunity to connect theoretical knowledge to practical, real-world applications within their field of study.

Purpose

Integrate knowledge and skills gained across coursework
Demonstrate critical thinking, problem-solving, and applied technical ability
Encourage professional communication and project documentation
Prepare students for future capstone or industry-based projects

Expectations

Students will engage in ongoing project development, progressively building their work as new skills are introduced in class. The Mini Capstone emphasizes detail, professionalism, and the ability to connect classroom learning to industry expectations.



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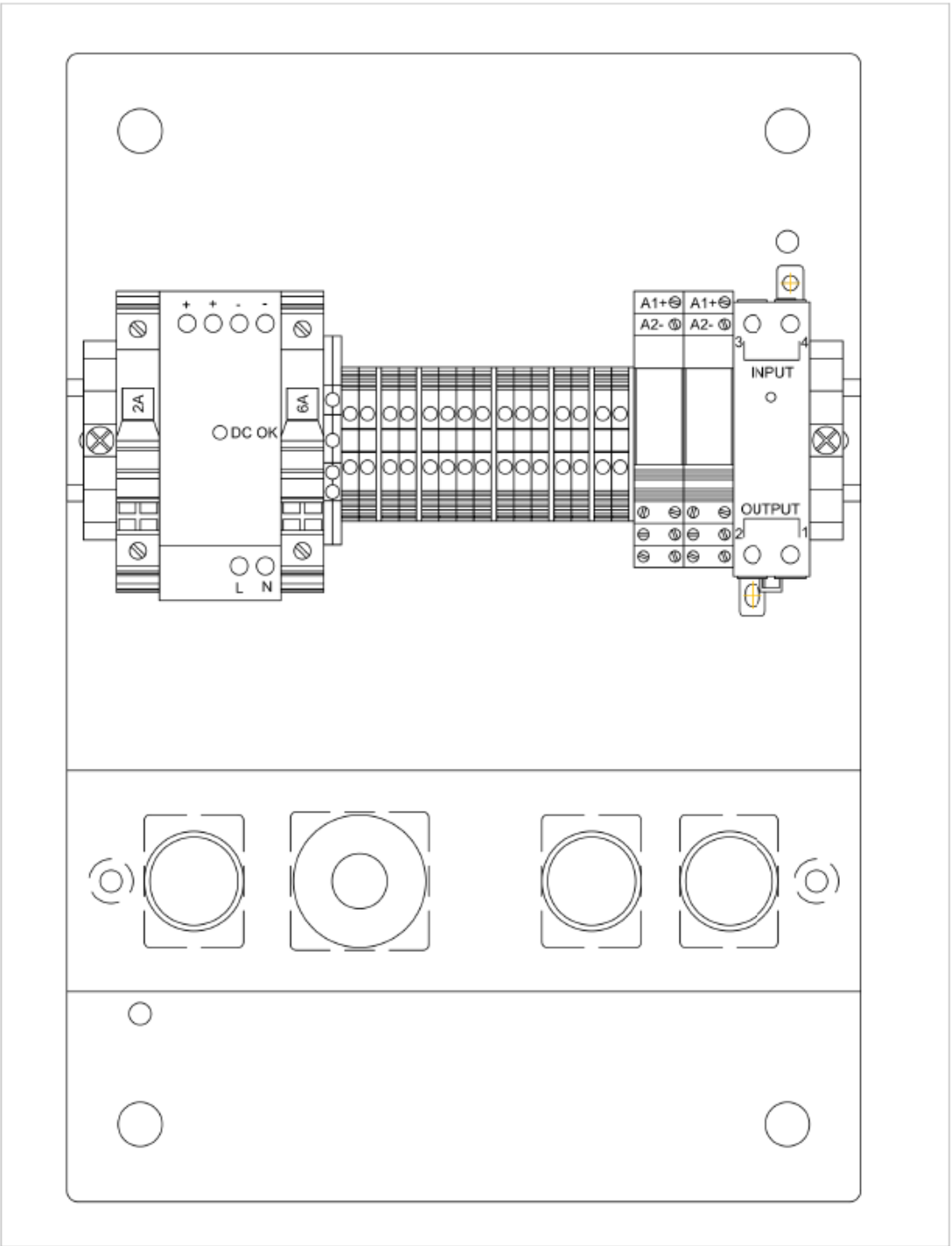

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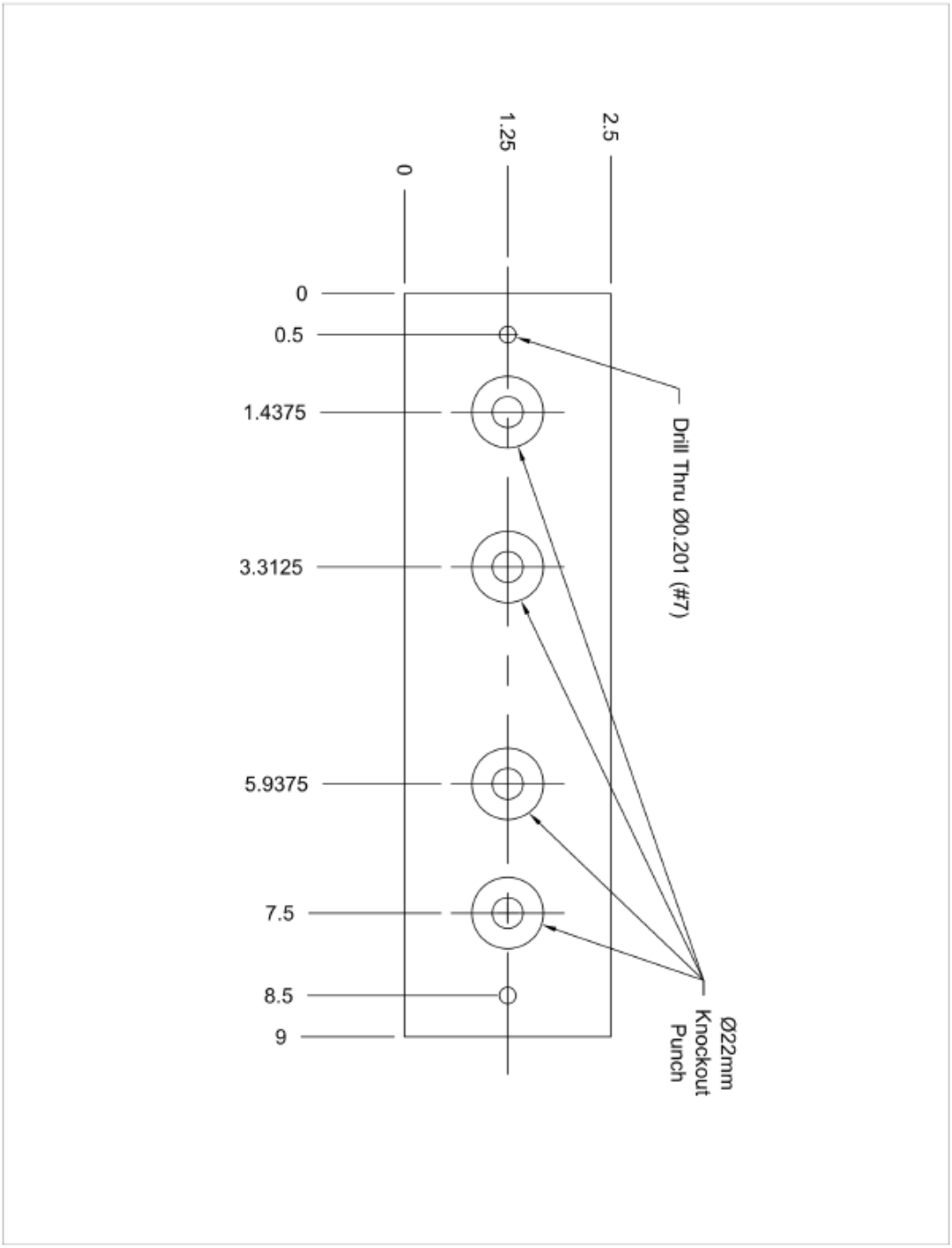

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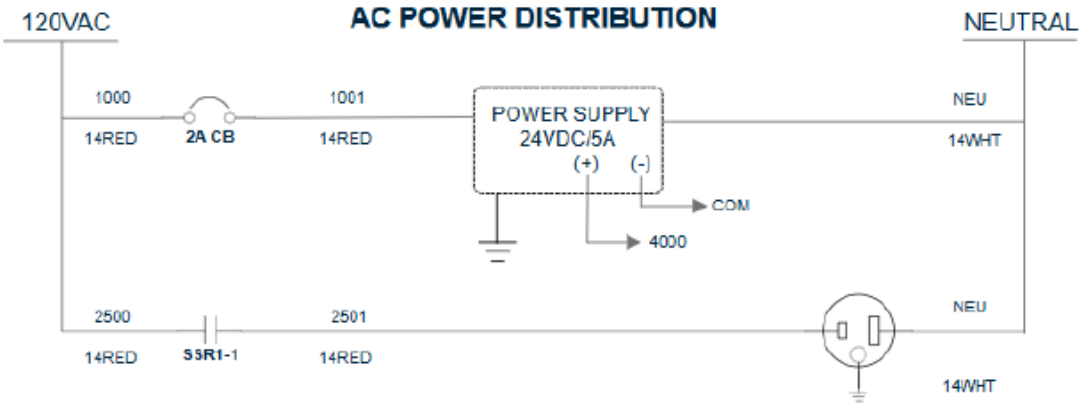

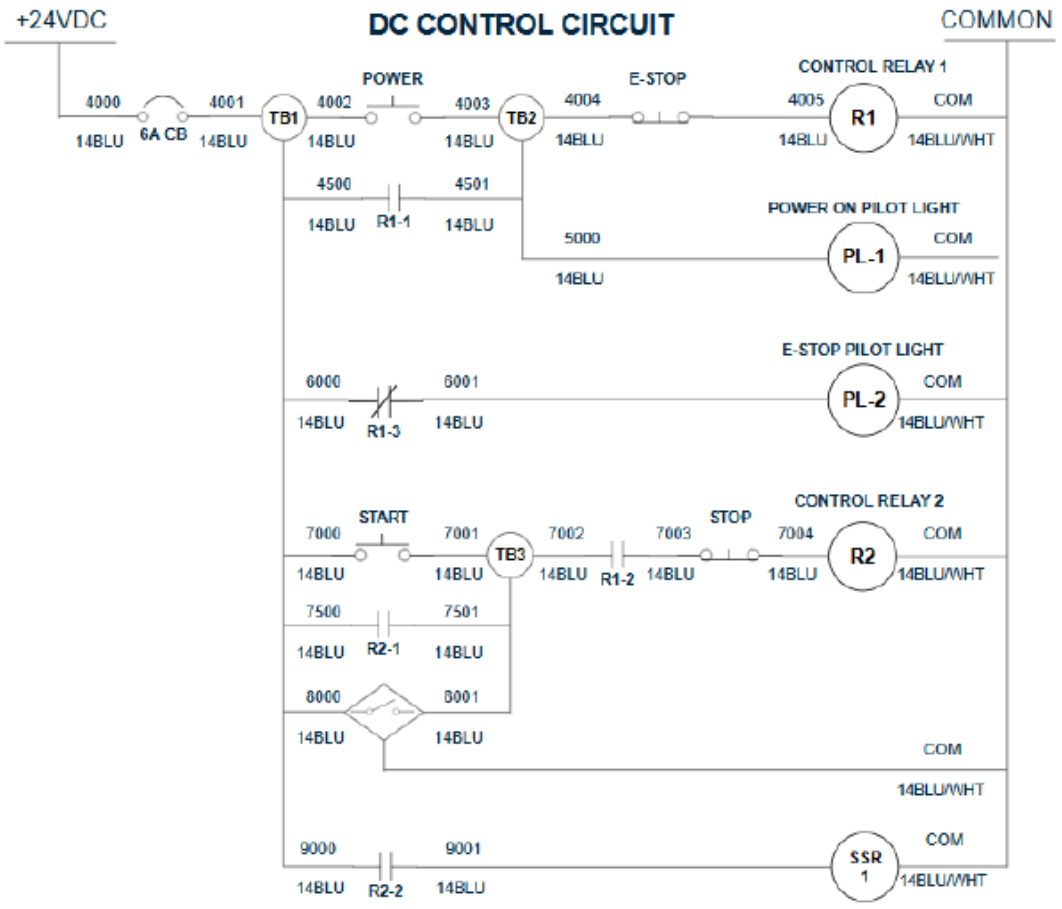

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