PRIMARY DEVELOPERS:
Glenn Wisniewski – Corporate Trainer, Henry Ford College
Wes Bye – Mechatronics SME, Pontiac Coil

Mechapracticum Outline

Welding

Topic: Welding

Estimated completion time: 16 hours

Purpose:

The purpose of this Mechapracticum is for the participant to demonstrate their ability to produce acceptable and stable welds as prescribed in this document.

Instructional Outcomes:

The participant will demonstrate the application of their skill and knowledge in the following topical areas:

- Welding
- Machine Tool
- Drill Press
- Safety

Instructions to Students

The Mechatronic Technician, in the course of employment, can expect to encounter the need to fabricate a proximity switch mounting bracket or similar structural support. This need may arise due to a process change or because of an equipment damaging mishap. Such circumstances might require the part to be completed as quickly as possible to return the machinery to service.

Consequently, the student will demonstrate the ability to create and install a bracket to support and accurately position a proximity switch.

A simulated mounting rail and sliding Nylon block with a proximity switch target, figure 1 will be provided for the student to examine and measure, and will serve as a fixture for testing the completed bracket, similar in construction to figure 2. Variation in design from fixture 2 is permitted.

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Reference drawings of the mounting rail and base and the sliding Nylon block with the embedded steel target will also be available.
A functional, powered proximity switch will be provided for final testing.

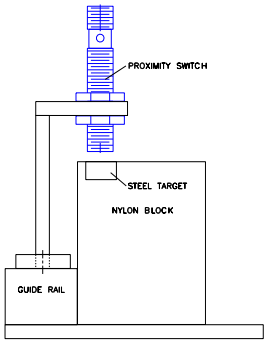

Figure 1

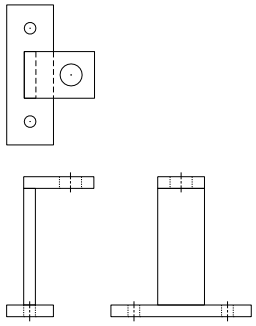

Figure 2

Procedure

- The student will measure the fixture, or use fixture and sliding block reference drawings, and select appropriate lengths of precut stock, to prepare a working drawing of a bracket that will position a proximity switch to be tripped as the block slides below the face of the switch.
- The student will lay out and drill three holes in the details per prepared print.
- The student will position and weld the details together per the prepared print.
- The student will mount the bracket on the fixture and adjust the proximity switch for proper operation.

Student Presentation

- The student shall demonstrate and describe the function and operation of the proximity switch as the nylon block is slid along the rail.
- The student will discuss the virtues and shortcomings of the weld quality of his or her bracket.

Safety

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The student will demonstrate all safety practices learned previous instruction.

Instructions to Evaluator:

Evaluation of work habits

- The student must be observed to employ proper safety equipment and practices during the construction of the bracket.
- The student must be observed to exhibit proper use, care, handling and storage of tools and cleanup of the work area during and after fabrication work.

Evaluation of completed bracket

- Functionality (Proximity Switch positioning accuracy)
  A reference mark on the guide rail will indicate the required trip point as the nylon block is slid along the guide rail. Some tuning can be accomplished by positioning the proximity switch vertically with its mounting nuts.
- Mounting hole position accuracy - the bracket must align with the mounting holes on the fixture without binding as the mounting screws are installed.
- Perpendicularity/flatness of details after welding - accurate positioning and minimal warping is desired.
- Deflection resistance/weld integrity - with the bracket mounted on the fixture, the bracket will be flexed vertically up and down by a fixed distance with a purpose-built tool at the proximity switch mounting hole.
- Weld appearance - absence or presence of weld cracks, bubbles, voids or slag inclusions.
- Surface finish: Absence or presence of excessive dents, burrs, beads or sharp edges.

Required Equipment and Materials:

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- Measuring tools
- Drill press or Vertical Mill with vise
- Center punch and ball peen hammer
- Center or spotting drill
- F (.257”) drill bit
- 12mm drill bit
- C-clamps
- Fixturing blocks
- Stick, MIG, TIG or Oxy/acetylene welding torch
- Appropriate filler rod
- Test Fixture
- Test Fixture assembly drawings, dimensioned
- Proximity Switch and power source
- Materials, ¼” by 1” and 2”, 1018 cold rolled steel in a variety of precut lengths

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Rubrics:

Mechapractica Rubric	Student Name	Date
MAT2 Introduction to Gas/Arc/MIG/TIG Welding		

	Design	PTS	(A) Highly Proficient	(B) Competent	(C) Partially Competent/Developing	(D) Limited	(E) Major Improvement Required	Possible points	Ratings A - E	Points Awarded
1	Select appropriate materials & create design.		Design accurately dimensioned & drawn. Completely understandable if another person had to build from the design		Design adequate - critical dimensions in place		Missing or inaccurate critical dimensions, weak structure, inappropriate materials selected			
	Fabrication	**PTS**	**(A) Highly Proficient**	**(B) Competent**	**(C) Partially Competent/Developing**	**(D) Limited**	**(E) Major Improvement Required**	**Possible points**	**Ratings A - E**	**Points Awarded**
2	Layout & prepare details for drilling		accurate layout & center punch		Approximate spacing & centering		Inaccurate location			
3	Drill required holes		all holes drilled on location		minor location deviation - minor compensation may be required		major location deviation - rework or modification may be required			
4	Preparation for welding		details accurately fixtured		details adequately fixtured - compensation may be required		inadequate fixturing - locational accuracy & quality of finished welds may be questionable			
5	Welding		Exemplary welds with excellent penetration & surface finish		Welds adequate to hold details together, but bubbles, voids & inclusions may be present		Welds inadequate to ensure integrity of assembly.			

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	Safety	PTS	(A) Highly Proficient	(B) Competent	(C) Partially Competent/Developing	(D) Limited	(E) Major Improvement Required	Possible points	Ratings A - E	Points Awarded
6	Safe Work Practices	25	Used appropriate PPE; practiced common safety practices		Most safety practices used		Demonstrated unsafe working practices			
7	Safety Attitude	25	Work practices demonstrated safety consciousness in all procedures; looked out for safety of others		Most of the time worked safely and showed some concern for safety of others		Dangerous worker; did not look out for safety of others			
8	Machining safety	25	Guards & safe work holding used on drill press or mill		Had to be prompted		Dangerous worker; did not look out for safety of others			
	PRODUCT EVALUATION	**PTS**	**(A) Highly Proficient**	**(B) Competent**	**(C) Partially Competent/Developing**	**(D) Limited**	**(E) Major Improvement Required**	**Possible points**	**Ratings A - E**	**Points Awarded**
9	Safe product	10	Product was deburred so could be handled safely		Minor deburring problems; but overall safe		Ouch			
10	Durability, reliability and load appropriate	25	Bracket would function and survive harsh conditions		Bracket would function & survive all normal conditions encountered in its application		Bracket might function, but could be expected to fail if subjected to minor impact or sustained normal vibration.			
11	Function	25	Product met the needs of the problem presented		Will basically work		Will not serve the needs of the problem			

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	WORK HABITS	PTS	(A) Highly Proficient	(B) Competent	(C) Partially Competent/Developing	(D) Limited	(E) Major Improvement Required	Possible points	Ratings A - E	Points Awarded
12	Work Attitude	15	Alert to finding and correcting problem		Honestly attempted to find and correct problems		Showed frustration in finding and correctly problem			
13	Work Procedure	25	Always followed standard procedures; demonstrated planning and organization skills in correcting the problem		Complied with standard procedures; Showed some plan and organization in working		Did not follow standard procedures; Disorganized and slipshod methods;			
14	Professionalism	20	Work showed pride in accomplishment		Tried hard and shows promise		Work lacks praiseworthy factors			
15	Self-confidence	15	Appeared comfortable and posed when performing tasks		Fairly self-confident; occasionally disconnected		Hesitant, timid, uncertainty			
16	Knowledge of job	25	Has an exceptionally thorough knowledge of the job		Has good knowledge but needed coaching		Has inadequate knowledge of job			
						Total Possible Points				
						Score of Total Points				
						Final Grade Percent				
						Final Letter Grade Mechapractica				

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