

Robot Programming

Course Outcome Summary

Course Information

Project Type	Course
Organization	Madison Area Technical College
Developers	Peter S. Dettmer
Development Date	4/26/2010
Revised By	Peter S. Dettmer
Revised Date	10/29/2010
Course Number	10-620-168
Instructional Level	Two-Year Technical Diploma
Instructional Area	Electromechanical Technology
Division	Technical
Department	Electromechanical Technology
Total Credits	2

Description

Prepares the learner to identify the component parts of a robot; describe teach pendant and robot functions; power up the robot control in proper sequence; jog in Joint and Cartesian movement; establish robot axis soft limits; identify axis movements; navigate the teach pendant to set up the robot for desired movement; demonstrate working knowledge of arm speed and inching control; define the Frames of reference used by the coordinate system; create multiple Tool Frames; create a program file; write a functional motion instruction; edit an existing program; demonstrate the use of a wait statement; demonstrate the use of a Call statement; demonstrate the use of an Output statement; and upload and download program memory files.

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Textbooks

FANUC Robotics. *Handling Tool Application Programming*. FANUC Robotics. FANUC Robotics. **Edition:** Rev. A. **Unit Price:** 87.00. **Pages:** 469. **Source:** FANUC Robotics. **Miscellaneous:** part# MATAGHAND1007CE Rev. A..

Learner Supplies

USB Flash Drive. **Manufacturer:** Any. **Quantity:** 1. **Price:** 10. **Source:** Many.

Exit Learning Outcomes

Core Abilities

- A. Critical thinking
- B. Communication
- C. Science and Technology

Competencies

1. Develop a power up procedure for a robot from a complete shutdown

Linked Core Abilities

Science and Technology

You will demonstrate your competence:

- o by answering questions related to specific learning objectives
- o by describing the contents of ANSI/RIA R15.06-1999
- o by starting a program from complete shutdown
- o by completing lab performance activities

Your performance will be successful when:

- o you identify all components of a robot cell that are part of the power-up sequence
- o you correctly identify the purpose of a Risk assessment per ANSI/RIA R15.06-1999
- o you run a program in automatic mode
- o you correctly describe safety considerations related to operating a robot cell
- o you describe the correct sequence for powering up a cell
- o you recognize and resolve alarms that would inhibit robot cell operations

Learning Objectives

- a. Identify all components of the cell that are part of the power-up sequence
- b. Elaborate on ANSI/RIA Standard R15.06-1999
- c. Recognize the main components of the robot
- d. Identify all safety considerations related to operating the cell
- e. Describe the correct sequence for powering up the cell
- f. Recognize alarms that would inhibit cell operation

2. Determine controller settings for basic robot operations

Linked Core Abilities

Science and Technology

You will demonstrate your competence:

- o by completing lab performance activities
- o by answering questions related to specific learning objectives
- o by identifying types of frames used in robot operations
- o by completing FANUC Robotics web based eLearn module "Frames"

Your performance will be successful when:

- o you correctly identify all four types of frames used in robot operations
- o you set up a jog frame using the 3-point method
- o you set up a tool frame by using the direct entry method
- o you select frames for programming your robot
- o you set the axis limits for all axis
- o you successfully complete the FANUC Robotics web based eLearn module "Frames"

Learning Objectives

- a. Demonstrate tool frame set-up procedures
- b. Explain the World frame set-up
- c. Demonstrate user frame set-up procedures
- d. Exercise general purpose I/O set-up procedures
- e. Explain axis limit settings

3. Explain usage of Input and Output signals

Linked Core Abilities

Communication

Science and Technology

You will demonstrate your competence:

- o by answering questions related to specific learning objectives
- o by completing FANUC Robotics web based eLearn module "Input/Output"
- o by completing lab performance activities
- o by listing the major types of Inputs and Outputs
- o by demonstrating general purpose I/O set up procedures

Your performance will be successful when:

- o you identify Digital, Analog, Robot and Group as major types of I/O
- o you demonstrate forcing a digital I/O point in an executing program
- o you utilize a robot I/O point in an executing program
- o you monitor a group I/O point in a program
- o you successfully complete FANUC Robotics web based eLearn module "Input/Output"
- o you simulate an analog I/O point in a program

Learning Objectives

- a. Identify devices and equipment interfacing with robot systems
- b. Describe Robot I/O settings
- c. Examine Digital I/O settings
- d. Describe Analog I/O settings
- e. Identify Group I/O settings

4. Manage a Material Handling program using a teach pendant

Linked Core Abilities

Critical thinking

Science and Technology

Communication

You will demonstrate your competence:

- o by completing lab performance activities
- o by describing types of End-Of-Arm-Tooling
- o by completing FANUC Robotics web based eLearn module "Program Instructions"
- o by describing registers
- o by listing various programming instructions
- o by adding program instructions
- o by modifying programs
- o by answering questions related to specific learning objectives
- o by completing FANUC Robotics web based eLearn module "Modifying a program"

Your performance will be successful when:

- o you create a new program
- o you differentiate between pneumatic and mechanical gripper End-Of-Arm-Tooling
- o you correctly use data registers in a program to repeat a program 4 times
- o you successfully complete FANUC Robotics web based eLearn module "Program Instructions"
- o you successfully complete FANUC Robotics web based eLearn module "Modifying a program"
- o you successfully execute a program with a position register instruction
- o you demonstrate proper usage of JMP/LBL
- o you successfully use the CALL statement in a program
- o you successfully create a new program
- o you delete a program
- o you copy a new program
- o you perform background edits
- o you demonstrate using a SELECT statement to CALL another program
- o you demonstrate adding a REMARK comment to a program

- o you successfully integrate a WAIT statement into a program
- o you insert 4 blank lines into a program
- o you copy and past 3 lines within a program
- o you renumber Positional IDs in a program
- o you correctly demonstrate usage of the 6 "Paste" options

Learning Objectives

- a. Identify methods for selecting a Teach Pendany Program to run
- b. Demonstrate methods for running a program from the Teach Pendant
- c. Explain options to modify motion instructions
- d. Describe how to stop exectution of a teach pendant program
- e. Demonstrate how to create a new teach pendant program
- f. Demonstrate how to test a teach pendant program

5. Explain MACROs commands and usage

Linked Core Abilities

Communication

Science and Technology

You will demonstrate your competence:

- o by completing FANUC Robotics web based eLearn module "Macro Commands"
- o by answering questions related to specific learning objectives
- o by completing lab performance activities

Your performance will be successful when:

- o you successfully complete FANUC Robotics web based eLearn module "Macro Commands"
- o you create a Macro program
- o you assign a Macro program to a TP key
- o you execute a Macro program from a TP key
- o you execute a Macro program from the manual functions screen

Learning Objectives

- a. Demonstrate how to create a MACRO program
- b. Explain usage for a MACRO program
- c. Execute a MACRO program
- d. Assign a MACRO program to a hard key

6. Execute production operations

Linked Core Abilities

Communication

Science and Technology

You will demonstrate your competence:

- o by answering questions related to specific learning objectives
- o by completing FANUC Robotics web based eLearn module "Robot Setup for Production Operations"
- o by completing lab performance activities

Your performance will be successful when:

- o you set the "Enable UI signals" to TRUE in the system config menu
- o you can differentiate between "Teaching" and "Auto" mode
- o you place a program into Production
- o you run a program from a UOP cycle start signal
- o you successfully complete FANUC Robotics web based eLearn module "Robot Setup for Production Operations"

Learning Objectives

- a. Demonstrate how to jog the robot in each coordinate system
- b. Explain how to manipulate I/O through the Teach Pendant
- c. Explain how to set-up and use Program Adjust
- d. Demonstrate how to place a program into Production mode
- e. Differentiate between jog systems for a specific accuracy requirements

7. **Recover from common program and robot faults**

Linked Core Abilities

Critical thinking

Science and Technology

You will demonstrate your competence:

- o by completing lab performance activities
- o by answering questions on written examinations
- o by working with system variables
- o by identifying types of errors codes

Your performance will be successful when:

- o you are able to display the alarm screen during events
- o you recover from overtravel alarms
- o you correctly describe the differences between the five types of error codes listed in the system variable "\$ER_SEV_NOAUTO"
- o you are able to locate the explanation for an error code in the user manual
- o you modify the system variable to allow the Deadman switch to automatically reset any faults (\$DMAURST)

Learning Objectives

- a. Demonstrate how to clear servo alarm faults
- b. Identify and clear external Inputs preventing program execution
- c. Illustrate how to modify system variables
- d. Demonstrate how to correct programming faults

8. **Manage individual programs and files**

Linked Core Abilities

Science and Technology

You will demonstrate your competence:

- o by completing lab performance activities
- o by completing FANUC Robotics web based eLearn module "File Manipulation"
- o by answering questions related to specific learning objectives

Your performance will be successful when:

- o you successfully transfer a program from your laptop to the controller using a USB flash drive
- o you backup and restore a program on the Teach Pendant
- o you successfully complete FANUC Robotics web based eLearn module "File Manipulation"
- o you set the Backup device
- o you backup and restore the controller memory

Learning Objectives

- a. Demonstrate how to manage programs in the Teach Pendant
- b. Describe how to set up port settings on the Controller
- c. Explain backup and restore procedures of Teach Pendant program
- d. Explain backup and restore procedures of controller memory
- e. Determine how to set the default device