

Automation Technician

Alternate Titles: Instrument Technician, Instrumentation Technician, Control Technician, Process Control Technician, Instrumentation and Electrical (I&E) Technician, Electrical and Instrumentation (E&I) Technician, and Measurement Technician. Sometimes called Instrument Mechanic, Control Mechanic.

Description: Automation Technicians install, perform start-up/commissioning, maintain, troubleshoot, document and repair a wide variety of industrial instrumentation, electronic monitoring, metering, controlling and signaling devices used in the production of goods and services. They frequently provide input to equipment selection and design.

Sources of Material: Certified Control System Technician Body of Knowledge, Automation Competency Model.

Performance Domains:

- Domain I: Calibration
- Domain II: Loop Checking
- Domain III: Troubleshooting
- Domain IV: Start-Up
- Domain V: Maintenance/Repair
- Domain VI: Project Organization
- Domain VII: Administration

Domain I: Calibration	
Task 1: Obtain all documents needed for device calibration in order to proceed with calibration.	
Knowledge of:	Data sheets Calibration sheets P&ID drawings Loop sheets Site procedures Mechanical and electrical drawings
Skill in:	Interpreting drawings Searching technical information Communication Following site procedures
Task 2: Identify the correct device to be calibrated through documentation and instrument identification systems in order to ensure proper calibration.	
Knowledge of:	Applicable standards Site documentation

Skill in:	Interpreting data sheets Converting unit from metric/English or English/metric
Task 3: Select the correct test equipment through documentation and visual inspection as identified by site calibration procedures in order to correctly calibrate the device.	
Knowledge of:	Electrical and pneumatic test equipment Applicable standards on calibration of test equipment All appropriate procedures Acceptable certifying agencies, companies, etc. Basic measurement units
Skill in:	Obtaining appropriate test equipment Validating certification by matching or locating certification stickers Using hand tools Using test equipment
Task 4: Connect the test equipment to the device as required by manufacturer specifications and site procedures in order to properly and safely calibrate the device.	
Knowledge of:	Fundamentals of pneumatics Fundamentals of electricity Fundamentals of schematic diagrams Basic physics of energy and power Basic physical and chemical properties of matter Basic temperature scales Basic pressure units Basic flow units Basic level Basic conversions All appropriate site procedures Manufacturer specifications
Skill in:	Building a mechanical and electrical circuit, including piping, wiring circuits, and working with live circuits using test equipment Using hand tools Using test equipment Using power sources Using pressure sources
Task 5: Apply input values to the device as specified on instrument data sheet in order to simulate process parameters.	
Knowledge of:	Fundamentals of pneumatics Fundamentals of electricity Fundamentals of schematic diagrams Basic physics of energy and power Basic physical and chemical properties of matter Basic temperature scales Basic pressure units Basic flow units

	<p>Basic level</p> <p>Basic conversions and mathematics</p> <p>Manufacturers specifications</p>
Skill in:	<p>Simulating a mechanical/pneumatic/electrical signal into a device</p> <p>Using/working with high pressure sources, high temperature sources, voltage and current sources, etc.</p> <p>Using hand tools</p> <p>Using test equipment</p> <p>Using power sources</p> <p>Using pressure sources</p>
Task 6: Record "as found" readings on calibration sheets in order to provide a history of the device.	
Knowledge of:	<p>Mathematics</p> <p>Physical sciences</p> <p>Conversions</p> <p>Electronic fundamentals</p> <p>Pneumatic fundamentals</p>
Skill in:	<p>Gathering technical information</p> <p>Writing</p> <p>Applying mathematical units and relationships</p> <p>Selecting required form</p>
Task 7: Compare "as found" readings with the required values as specified by the instrument data sheet in order to identify if the device needs to be adjusted according to allowable tolerances.	
Knowledge of:	<p>Mathematics</p> <p>Physical sciences</p> <p>Conversions</p> <p>Electronic fundamentals</p> <p>Pneumatic fundamentals</p>
Skill in:	<p>Analyzing data</p> <p>Writing</p> <p>Applying mathematical units and relationships</p> <p>Selecting required forms</p>
Task 8: Make adjustments to the device, if necessary, through site calibration procedures in order to ensure accuracy.	
Knowledge of:	<p>Calibration procedures</p> <p>Mathematics</p> <p>Physical sciences</p> <p>Electronic fundamentals</p> <p>Pneumatic fundamentals</p> <p>Electrical fundamentals</p>
Skill in:	<p>Working with tools</p> <p>Reading and interpreting test equipment</p>

	Using power sources (electrical or pressure) Analyzing data
Task 9: Complete all documentation as required in order to update all calibration records.	
Knowledge of:	Calibration procedures Mathematics Physical sciences Electronic fundamentals Pneumatic fundamentals Electrical fundamentals Site documentation procedures
Skill in:	Gathering technical information Writing Applying mathematical units and relationships Selecting required forms Completing calibration sheets
Domain II: Loop Checking	
Task 1: Obtain documents pertaining to the process loop in order to understand all devices and their intended functions.	
Knowledge of:	Instrument symbol and terminology The function of each loop component Loop diagrams Loop checking procedures
Skill in:	Interpreting P&ID symbols Interpreting loop diagrams Following all appropriate procedures
Task 2: Inspect the loop components through visual observation in order to ensure that the components are correctly installed.	
Knowledge of:	Mechanical & electrical fundamentals Loop diagrams Loop components and operations through review of data sheets
Skill in:	Interpreting loop diagrams Interpreting P&IDs Following all appropriate procedures Interconnecting loop components
Task 3: Verify that appropriate utilities are available and operational through visual inspection in order to perform the loop check.	
Knowledge of:	Physical sciences and mathematics DC & AC circuits Mechanical and electrical fundamentals
Skill in:	Interpreting mechanical and electrical drawings Interpreting P&IDs

	Using test/measurement equipment
Task 4: Isolate the process loop from the system by following established site procedures in order to perform the loop check in a safe manner.	
Knowledge of:	Site safety procedures Site loop check procedures Loop diagrams P&IDs
Skill in:	Following all appropriate procedures Using loop diagrams Interpreting P&IDs
Task 5: Simulate a change in the measured variable in order to verify proper loop performance.	
Knowledge of:	Basic physical properties of matter Fundamentals of electricity Function of each loop component Basic temperature, pressure, flow, and level properties
Skill in:	Using test equipment Interpreting loop diagrams Interpreting P&IDs Using test equipment Using hand tools
Task 6: Make necessary corrections in order to bring loop performance within specifications.	
Knowledge of:	Basic physical properties of matter Fundamentals of electricity Function of each loop component Basic temperature, pressure, flow, and level properties
Skill in:	Using test equipment Interpreting specification sheets Interpreting P&IDs Using test equipment Using hand tools Interpreting loop diagrams
Task 7: Complete all documentation as required in order to update all loop records.	
Knowledge of:	All appropriate site documentation All appropriate site procedures Loop diagrams
Skill in:	Using drafting standards Technical writing
Domain III: Troubleshooting	
Task 1: Examine all pertinent documentation in order to identify the proper operation of the control system and devices and to provide a baseline against which to evaluate the	

problem.	
Knowledge of:	P&ID drawings Loop sheets Process control system Front end elements Final elements Systems Site procedures Operating manuals and procedures
Skill in:	Interpreting a loop drawing to identify the devices in a particular loop Interpreting complex technical documents Understanding process control Interpreting P&IDs
Task 2: Identify any discrepancies between observed and proper operation of the control system in order to determine whether a problem exists.	
Knowledge of:	Process control Loop and data sheets P&ID drawings Operating manuals and procedures Problem-solving techniques
Skill in:	Identifying abnormal variations in data or readings from charts, or indicators Identifying malfunctions in equipment and possible causes for these malfunctions Reading technical documents
Task 3: Determine which device or devices of the control system could be causing the observed discrepancies in order to formulate a plan of corrective action.	
Knowledge of:	Process control P&ID drawings Electrical fundamentals Mechanical fundamentals Basic flow, temperature, pressure, and level fundamentals Problem-solving techniques
Skill in:	Developing alternative solutions to a problem Identifying abnormal operating conditions Communication Interpreting P&IDs Interpreting technical documents
Task 4: Isolate each suspected device from the control system by following established site procedures in order to perform troubleshooting in a safe manner.	
Knowledge of:	Process control (how systems are connected and the required components for each system) Safety practices

	Systems (e.g., electronics, pneumatics, mechanical, electrical) Documentation, drawings, & symbol identification
Skill in:	Interpreting drawings Interpreting complex technical documents Following site safety procedures Identification of safety hazards
Task 5: Exercise each device across calibrated range in order to determine proper operation.	
Knowledge of:	Process control Site procedures Use of test equipment Electrical and mechanical systems
Skill in:	Manipulating inputs to a device Interpreting output readings Using test equipment
Task 6: Perform corrective action, if necessary, according to site procedures in order to resolve the problem.	
Knowledge of:	Process control Site procedures Safety procedures Systems (e.g., electronics, pneumatics, mechanical, electrical) Mathematics
Skill in:	Using test equipment Implementing detailed action plans Using hand tools Verifying problem has been corrected Interpreting data and making comparisons Checking for variance/error percentage
Task 7: Complete all documentation as required in order to update all records.	
Knowledge of:	Site documentation procedures
Skill in:	Completing required documentation
Domain IV: Start-Up	
Task 1: Examine all pertinent documentation in order to verify completion of all control systems that are required for start-up.	
Knowledge of:	P&ID drawings Loop, data, and calibration sheets Operation and equipment manuals Site procedures
Skill in:	Interpreting calibration data sheets Interpreting loop sheets Interpreting P&IDs Interpreting, organizing, filing, and establishing order for

	documentation
Task 2: Implement applicable safety practices to be followed in order to ensure that all personnel are informed of the possible hazards during start-up.	
Knowledge of:	Site procedures Process control Systems Safety equipment
Skill in:	Communicating safety practices Demonstrating safety practices
Task 3: Coordinate activities with all personnel involved in order to ensure that all personnel are aware of their responsibilities during start-up.	
Knowledge of:	Systems Basic duties of other disciplines
Skill in:	Communicating problems identified during field walkdowns, calibrations, loops checks, etc. Establishing priorities for start-up Assigning tasks Using hand tools, measuring devices, and test equipment
Task 4: Implement start-up according to site procedures in order to ensure that the system is operating properly.	
Knowledge of:	Site procedures Proper sequencing of start-up plan Task assignments Electrical and mechanical systems Process control
Skill in:	Following site procedures Interpreting a start-up plan Performing task assignments Calibrating, loop checking, and troubleshooting
Task 5: Assist site personnel to identify and correct problems that arise during start-up in order to commission the system.	
Knowledge of:	Tools and test equipment Process control Instruments and loops Operator interface
Skill in:	Using tools and test equipment Calibrating Troubleshooting Communicating with others
Task 6: Complete all documentation as required in order to update all records.	
Knowledge of:	Required documentation Site procedures

Skill in:	Completing documentation
Domain V: Maintenance/Repair	
Task 1: Obtain documents pertaining to the device in order to understand the operation of the device and investigate its performance history.	
Knowledge of:	Calibration and data sheets Site procedures Manufacturer's documents
Skill in:	Interpreting documentation (technical manuals) Interpreting P&IDs Evaluating relevant manuals/drawings for available information
Task 2: Assess the condition of the device through documentation, inspection and testing in order to maintain the device's performance and determine the need for any repairs.	
Knowledge of:	Calibration and data sheets Manufacturer's documents Troubleshooting techniques Basics of instrument device operation
Skill in:	Isolating instruments for active process hazards Using hand tools Using test/calibration equipment Operating calibration equipment which contains historical information
Task 3: If required, remove device from service following all site and safety procedures in order to perform needed repairs.	
Knowledge of:	Site procedures Safety procedures
Skill in:	Operating decontamination equipment Implementing repairs with the required manpower Following instrument repair/replace procedures
Task 4: If required, decontaminate device in accordance with material safety data sheets, site, and safety procedures in order to ensure safe conditions.	
Knowledge of:	Site procedures Safety procedures MSDS documents Manufacturer's documents
Skill in:	Following procedures for decontamination Observing all safety procedures required for process integrity and personnel safety
Task 5: Perform any applicable repairs by following proper procedures in order to return the device to service.	
Knowledge of:	Instrument's operation and maintenance manual Site procedures

	Mechanical fundamentals Electrical fundamentals
Skill in:	Disassembling and reassembling the instrument Following site procedures Using hand tools Repairing the instrument
Task 6: If required, recalibrate the device following site procedures in order to ensure proper operation.	
Knowledge of:	Calibration procedures Electrical fundamentals Mechanical fundamentals Test equipment Site procedures
Skill in:	Using hand tools Using test equipment Following site procedures Following calibration procedures
Task 7: Complete all documentation as required in order to update all device and maintenance records.	
Knowledge of:	Site procedures Calibration procedures
Skill in:	Following procedures Completing documentation
Domain VI: Project Organization	
Task 1: Obtain documents pertaining to the control project in order to understand all requirements of the control project.	
Knowledge of:	Site procedures Safety procedures P&IDs, loop sheets, instrument index, etc
Skill in:	Interpreting technical documents Interpreting P&IDs Interpreting loop sheets Following oral instructions Following written instructions
Task 2: Communicate with necessary personnel in order to define the activities required for control project completion.	
Knowledge of:	Basic duties of other disciplines Project planning Written and oral communication techniques
Skill in:	Communicating Technical writing
Task 3: Participate in control project planning in order to coordinate all resources for the	

project.	
Knowledge of:	Basic duties of other disciplines Project planning Personnel resources Task assignments Start-up
Skill in:	Communication Technical writing Interpreting procedures
Task 4: Supervise all necessary personnel to ensure compliance with site procedures in order to direct the control project in a safe and efficient manner.	
Knowledge of:	Overall project Individual responsibilities Supervision Time management Site procedures
Skill in:	Scheduling Planning Communicating Assessing abilities of personnel Following procedures
Task 5: Monitor all necessary resources in order to control variances from the project plan.	
Knowledge of:	Overall project Site procedures Organizational planning and scheduling techniques
Skill in:	Scheduling Planning Communicating Time management Assessing abilities of personnel Following procedures
Task 6: Complete all documentation as required in order to update all records.	
Knowledge of:	Site procedures P&IDs, loop sheets, etc.
Skill in:	Following procedures Completing documentation
Task 7: Comply with and promote compliance with all applicable codes, standards, and regulations.	
Knowledge of:	Codes, Standards, and Regulations <ul style="list-style-type: none"> ▪ American National Standards Institute (ANSI) ▪ Institute of Electrical and Electronics Engineers (IEEE)

	<ul style="list-style-type: none"> ▪ International Society of Automation (ISA) ▪ International Electro-technical Commission (IEC) ▪ National Electrical Code (NEC) ▪ National Electrical Manufacturers Association (NEMA) ▪ National Fire Protection Association (NFPA) ▪ Other Industry-specific Codes, Standards, and Regulations ▪ Other International Codes, Standards, and Regulations
Skill in:	Interpreting regulations Inspections Continuous improvement
Task 8: Follow all appropriate security procedures and regulations.	
Knowledge of:	Security procedures and regulations Cyber Security <ul style="list-style-type: none"> ▪ Security Programs, Plans, and Policies ▪ System and Network Security Techniques ▪ User Support
Skill in:	Continuous improvement in security Security investigations
Domain VII: Administration	
Task 1: Obtain a current set of site procedures in order to comply with requirements.	
Knowledge of:	Location of site procedures
Skill in:	Procuring information
Task 2: Verify that the instrument index, P&IDs, loop diagrams, etc. are current in order to ensure compliance with site procedures and job specifications.	
Knowledge of:	Latest revisions
Skill in:	Procuring documents Interpreting documents
Task 3: Organize all calibration and data sheets, loop drawings, P&IDs, IOM manuals, instrument location, and installation details in order to maintain compliance with site procedures.	
Knowledge of:	Leadership techniques Organizational methods
Skill in:	Leading others Organizing Communicating
Task 4: Verify that certifications of test equipment and personnel are current and on file in order to ensure compliance with site procedures.	
Knowledge of:	Organizational methods Proper instrument test certification Proper personnel test certification
Skill in:	Reading technical information/manuals Communicating

Task 5: Develop a tracking system for the receipt, storage, and issuing of instruments onsite in order to control resources of the project.	
Knowledge of:	Shipping and receiving Site procedures Methods for instrument identification
Skill in:	Technical writing Observing, inspecting Organizational techniques
Task 6: Review all calibration sheets and completed loop checks in order to ensure accuracy and completeness of the documents.	
Knowledge of:	Communication methods Calibrations sheets and loop drawings
Skill in:	Technical writing Observing, inspecting Organizational techniques
Task 7: Sign off all documentation as complete and accurate in order to comply with site procedures.	
Knowledge of:	Site procedures P&IDs, loop drawings, calibration sheets, etc. Organizational methods
Skill in:	Organizational techniques
Task 8: Generate as-built drawings in order to provide accurate and current drawings.	
Knowledge of:	Drafting techniques P&IDs, loop drawings, etc
Skill in:	Drafting Observing installed work Communicating Technical writing
Task 9: Assemble proper documents in order to archive historical data and to complete the project.	
Knowledge of:	Site procedures Organizational methods
Skill in:	Communicating Organizational techniques