CALIBRATION TECHNICIAN (ELECTRICAL/ELECTRONIC)

APPENDIX A

O*NET CODE 17-3023.01

This training outline is a minimum standard for Work Processes and Related Instruction. Changes in technology and regulations may result in the need for additional on-the-job or classroom training.

The Calibration Technician tests, calibrates, maintains, and repairs electrical, mechanical, electromechanical, and electronic measuring, recording, and indicating instruments and equipment for conformance to established standards.

WORK PROCESSES

Approximate Hours

A. Testing Calibration Instruments and Equipment **1000**

1. Receiving oral and/or written assignments.
2. Familiarizing self with established national and international standards.
3. Planning sequence of testing, using blueprints, schematics, technical manuals, procedures, specifications, manufacturers' websites.
4. Setting up test equipment and conducting tests on the performance and reliability of electronic, mechanical, structural, electro-mechanical, pneumatic equipment. Using pressure test gauges. Using electronic test equipment such as:
    a. Computers
    b. Oscilloscopes
    c. Multimeters
    d. Frequency counters and generators
    e. Multi-function calibrators
    f. Polyranger and multi-point recorders
    g. Master and portable potentiometers
    h. Timers
    i. Gauge blocks
5. Measuring parts of calibration instruments and equipment for conformity with specifications, using micrometers, calipers, other precision instruments, and masters.

6. Analyzing and converting test data, using math formulas, and reporting results and proposed modifications and adjustments.
7. Recording work done, by entering data into computer and affixing label to equipment.
8. Monitoring environmental laboratory conditions, such as temperature and humidity to ensure work is being done within acceptable ranges.

B. Calibrating Instruments and Equipment **2500**

1. Planning schedule of calibration procedures; entering scheduling data into computer.
2. Receiving oral and/or written assignments.
3. Planning sequence of calibration, using blueprints, schematics, technical manuals, procedures, specifications, customer requirements.
4. Being aware of environmental factors such as temperature, vibration, electrical noise.
5. Setting up standard and special purpose lab equipment to calibrate other instruments and test equipment. Using calibration jigs, fixtures, and required standards.
6. Standardizing the performance and operation of component parts and circuitry, to national or international standards:
    a. Performing physical/mechanical calibration
    b. Performing electrical/electronic calibration
    c. Performing pneumatic calibration
    d. Performing optical/dimensional calibration (optional)
    e. Performing environmental/chemical calibration (optional)
    f. Performing electro optics calibration (optional),
    g. Performing calibration/analysis on Automated Test Equipment (optional)
    h. Performing radiac calibration (optional)
    i. Performing flow calibration (optional)
    j. Performing temperature calibration (optional)
    k. Performing transmitter calibration (optional)

7. Determining capability of master calibrations; recognizing when recalibration is too sophisticated to be done in-house and must be sent out.
8. Deriving formulas to solve problems in measurements and calibrations
9. Writing calibration reports; documenting work done.
10. Setting up recalibration cycles based on time, use, and instrument capability.

C. Troubleshooting and Repairing Instruments and Equipment **3500**

1. Receiving oral and/or written assignments.
2. Securing and using applicable schematics, procedures, equipment manuals, other technical documents.
3. Calibrating instruments and equipment.
4. Aligning and balancing component parts and circuitry.
5. Disassembling instruments and equipment, as needed, using hand tools.
6. Inspecting components for defects.
7. Removing, testing, repairing or replacing at the pc board, electronic component, or mechanical level such elements as: analog, digital, transistors, LED's, integrated circuits, motors, power supplies, relays, solenoids, limit switches, logic controllers, sensors, styli, drives, resistors, capacitors. Being aware of static electricity damage to integrated circuits
8. Using hand tools and equipment such as: soldering irons, air pencils, taps and dies, mini-lathe, drill press, surface lapping tools, wrist grounding strap.
9. Reassembling instruments and equipment.
10. Recalibrating instruments and equipment.
11. Updating schematics and technical data when circuitry or system has been changed or modified.
12. Recording work done by entering data into computer and by affixing label to equipment.
13. Recognizing when repair is too sophisticated to be done in-house. Recognizing when repair is too costly to be feasible.
14. Training others in proper operation of all metrology equipment.

15. Performing preventive maintenance on test apparatus and peripheral equipment. Maintaining and analyzing history of maintenance.

D. Installing and Aligning Metrology Equipment **250**

1. Receiving oral and/or written assignment.
2. Securing and using applicable schematics, procedures, equipment manuals, or other technical documents.
3. Performing optical alignments to equipment.
4. Programming and configuring microprocessor-based metrology equipment.
5. Determining calibration requirements for new precision measuring equipment.
6. Writing preliminary calibration procedures.

E. Assisting in Development of Nonstandard Apparatus **250**

1. Sketching plans for developing jigs, fixtures, instruments, and related nonstandard apparatus.

F. Assisting Engineers, Supervisors, Other Technical Staff **500**

1. Assisting in formulating test, calibration, repair and evaluation plans and procedures to maintain precision accuracy of measuring, recording, and indicating instruments and equipment.
2. Assisting manufacturers' service reps and service engineers during installation and repair of metrology equipment.
3. Training production/inspection employees in proper use of calibration equipment.
4. Recommending new lab standards requirements.
5. Participating in quality audits.

Approximate Total Hours **8,000**

Some materials in this training outline have been taken from the publication *Metrology/Precision Measurement: Competencies & Skills Profile*, prepared by the Higher Education and Advanced Technology Center at Lowry in Colorado. The project was supported, in part, by the National Science Foundation. We gratefully acknowledge the permission to use these materials.

Apprenticeship work processes are applicable only to training curricula for apprentices in approved programs. Apprenticeship work processes have no impact on classification determinations under Article 8 or 9 of the Labor Law. For guidance regarding classification for purposes of Article 8 or 9 of the Labor Law, please refer to https://dol.ny.gov/public-work-and-prevailing-wage

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APPENDIX B

RELATED INSTRUCTION

Safety

1. Proper Use of Personal Protective Equipment
2. Blood Borne Pathogens
3. Lockout/Tagout Procedures
4. Familiarization with MSDS for all Chemicals Used in this Trade
5. Proper Use, Storage, Disposal of Work-Related Chemicals
6. Safe Handling of High Pressure and Combustible Gases and Liquids (if applicable)
7. Safely Working with Radioactive Devices (if applicable)
8. Safely Working with Lasers (if applicable)
9. First Aid – minimum of 6.5 hours every 3 years
10. Sexual Harassment Prevention Training – must comply with section 201-g of the Labor Law

Blueprints, Schematics, Technical Manuals

1. Reading Electrical and Mechanical Blueprints
2. Reading Electronic Schematics
3. Reading Technical Manuals
4. Basic Electro-Mechanical Sketching

Mathematics

1. College-level Algebra
2. Analytical Geometry

Computer Skills

1. Introduction to Personal Computer Hardware
2. Introduction to Computer Operating Systems
3. Introduction to Computer Programming
4. Introduction to Software Applications
5. Introduction to the Internet

Trade Theory and Science

1. Mechanics (Static and Dynamic)
2. Theory of Electricity
3. Electronics Theory
4. Electronic Circuit Analysis
5. Metrology
6. Measurement Principles
7. Chemistry
8. Physics
9. Statistical and Quality Control Methods
10. Optics
11. Thermodynamics
12. Solid State Devices
13. Troubleshooting Techniques
14. Introduction to ISO, ANSI, IEC, AALA, ASTM, SAE, NIST Standards (optional)

Communication Skills

1. Oral and Written Communication Skills
2. Team Working Skills
3. Assertiveness Training (optional)

Other Courses

Industrial History and Labor Relations (20 hours)

1. History & Background (6 hours, 1st year)
2. Current Laws and Practices (14 hours, 2nd year)

144 hours of Related Instruction are required for each Apprentice for each year.

Appendix B topics are approved by New York State Education Department.