

Job Grading Standard for Electronic Measurement Equipment Mechanic, 2602

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INTRODUCTION

This standard provides the occupation definition, titling instructions, and grading criteria for nonsupervisory jobs in the Electronic Measurement Equipment Mechanic, 2602, for Federal Wage System (FWS) and other trades, craft, and labor pay plans.

This standard is divided into three parts. Part I contains occupational information applicable to Federal work covered by this standard without regard to pay plan or job grading system. Part II provides the criteria for jobs graded in accordance with FWS Key Ranking Jobs used to create the grade framework for FWS jobs. Part III will include explanatory material about the development of this standard and will be added after this draft is finalized.

The term “Federal Wage System” or “FWS” denotes the major job grading system and pay structure for trades, craft, and labor work in the Federal Government. Some agencies have replaced the FWS pay plan indicators with agency-unique pay plan indicators. References to Federal Wage System and Wage Grade (WG) have been omitted from much of this job grading standard.

Coverage

This job grading standard covers nonsupervisory jobs involved in the testing, maintenance, repair, calibration, and installation of electronic measurement equipment, instruments, and test stations.

Cancellation of Existing Job Grading Standard

Issuance of this job grading standard supersedes the current standard, as described in the following table:

Previous Standard	Action Taken
Electronic Measurement Equipment Mechanic 2602	<ul style="list-style-type: none"> Supersedes the standard for Electronic Measurement Equipment Mechanic, 2602, last revised September 1974.

PART I – OCCUPATIONAL INFORMATION

Part I is intended for use by all agencies in evaluating trades, craft, and labor work in the Electronic Measurement Equipment Mechanic, 2602. It provides the definition, titling instructions, and detailed information for this occupation.

General Occupation Determination Guidelines

For a variety of reasons, selection of the correct occupation for a job is essential to the human resources management process. For example, qualification requirements used in recruiting and organizational structure are often designed with consideration of the occupation.

Determining the correct occupation is usually apparent by reviewing the assigned duties and responsibilities and then comparing them to the general occupational information and definition provided by the standard. Generally, the occupation determination is based on the primary work of the job, the highest level of work performed, and the paramount skill and knowledge required to do the work. Normally, it is fairly easy to make this decision. However, in other instances, determining the correct occupation may not be as obvious.

When a job requires the performance of regular and recurring work in two or more occupations (mixed jobs), select the occupation involving the highest skill and qualification requirements for the job.

Use the following guidelines to determine the appropriate occupation when the work matches more than one job. It is sometimes difficult to determine which particular occupation predominates. In such situations, apply the guidelines below in the order listed to determine the correct job.

- **Paramount skill and knowledge required.** Although there may be several different kinds of work in the job, most will have a paramount skill and knowledge requirement. The paramount skill and knowledge is the most important type of knowledge or experience required to do the work.
- **Reason for the position's existence.** The primary purpose of the job or management's intent in establishing the job is an indication of the appropriate occupation.
- **Organizational mission and/or function.** Jobs generally align with the mission and function of the organization to which they are assigned.
- **Recruitment source.** Supervisors and managers can help by identifying the occupation that provides the best qualified applicants to do the work. This is closely related to the paramount skill and knowledge required.

Although the work of some jobs may require applying related skill and knowledge in maintenance, repair, testing, reconditioning, calibration, certification, and installation of electronic measurement equipment, instruments, and consoles, the Electronic Measurement Equipment Mechanic, 2602, may not be the appropriate occupation. The [Additional Occupational Considerations](#) section of this standard provides examples where the work may

involve applying related skill and knowledge, but not to the extent it warrants placement in this occupation.

Additional information may be found in the U.S. Office of Personnel Management (OPM) publication [Introduction to the Federal Wage System Job Grading System](#).

Occupational Information

ELECTRONIC MEASUREMENT EQUIPMENT MECHANIC, 2602		<u>Qualification Standard</u>
Occupation Definition	<p>This occupation covers nonsupervisory jobs involved in the testing, maintenance, repair, calibration, certification, and installation of electronic test, measurement, and diagnostic equipment (TMDE) used for precise measurement of a variety of electrical and electronic values, quantities, and relationships.</p> <p>Electronic measurement equipment work requires knowledge and practical application of electronic principles to support measurement and control equipment, measurement instruments, and test stations. The work also requires the ability to perform precise measurement of electrical and electronic values, quantities, and relationships.</p> <p>Electronic measurement equipment work also requires skill and knowledge in:</p> <ul style="list-style-type: none"> • operating a variety of electronic test equipment; • using tools of the trade to rewire equipment, solder connections, and fabricate and assemble test equipment, cables, programmers, and adapters according to manufacturers' specifications; and • using computer systems and software to operate automated testing and calibration systems and to document results. 	
Titling	<p>Title 5, United States Code, requires OPM to establish authorized official job titles within occupations. These include a basic title (e.g., Electronic Measurement Equipment Mechanic) that may be appended with one or more prefixes and/or suffixes. Agencies must use the official job titles for human resources management, budget, and fiscal purposes.</p> <p>The official basic title for jobs in this occupation at grade 10 or above or the equivalent is <i>Electronic Measurement Equipment Mechanic</i>.</p> <p>Helper and Intermediate</p> <ul style="list-style-type: none"> • If the work involves assisting journey level electronic measurement equipment mechanics, refer to the <u>Federal Wage System Job Grading Standard for Trades Helper Jobs</u>. • If the work involves training or development of skills associated with electronic measurement equipment mechanic work, refer to the <u>Federal Wage System Job Grading Standard for Intermediate Jobs</u>. Grade 11 in this job grading standard is to be used as the “journey level” in applying the Intermediate Job Grading Table. 	

(continued)

ELECTRONIC MEASUREMENT EQUIPMENT MECHANIC, 2602 (continued)

Titling (continued)

Supervisors and Leaders

- Add the suffix “Supervisor” to the basic title when the agency determines the job is supervisory. If the job is covered by the Federal Wage System refer to the [Federal Wage System Job Grading Standard for Supervisors](#) for additional titling and grading information.
- Add the suffix “Leader” to the basic title when the agency determines the job is a leader. If the job is covered by the Federal Wage System refer to the [Federal Wage System Job Grading Standard for Leader WL/NL](#) for additional titling and grading information.

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Impact of Automation

Automation and computer technologies affect the way work is accomplished. Electronic Measurement Equipment Mechanics use computers and operate automated test equipment to perform a wide variety of maintenance and repair tasks. They also use computers to research and obtain up-to-date manufacturers' manuals and documentation to assist in repairing the equipment and in troubleshooting malfunctions. They enter, store, and retrieve testing data in multiple formats.

Although employees in this occupation use computers to perform basic work processes, knowledge of the rules and processes to perform the work remains the paramount subject matter knowledge required. The automation tools involved and the skill required to use them generally replace or supplement work methods and techniques previously performed through manual or machine-enhanced processes. Positions in this occupation may require knowledge of the applications of information technology (IT) to the assignment area and skill in the use of IT software and hardware systems, but they are not directly involved in developing, delivering, or supporting IT systems, applications, and services. Although computers are used to facilitate work within this occupation, the use of automation does not change the primary purpose of the work. Proper classification of positions within this and other trade, craft, and labor occupations is based on the relevant knowledge and skills required to perform the primary duties of the position, i.e., maintaining and repairing electronic measurement equipment.

Additional Occupational Considerations

Some jobs may include work requiring skill and knowledge typically associated with the Electronic Measurement Equipment Mechanic, 2602. In some cases, a closer look at the work may reveal placement in this occupation may not always be appropriate. The [General Occupation Determination Guidelines](#) section of this standard offers guidance on selecting the most appropriate occupation.

The following table provides examples of work similar to that performed by electronic measurement equipment mechanics, but not to the extent the paramount skill and knowledge required would warrant placement in the Electronic Measurement Equipment Mechanic, 2602.

If Work Involves...	See This Standard:
Operating test equipment such as tube testers, oscilloscopes, ohmmeters, voltmeters, signal generators, and oscillators; and performing electrical tests on radio, telephones, and radar equipment.	Electronics Mechanic, 2604
Troubleshooting, repairing, and maintaining automatic or semiautomatic card or tape programmed checkout equipment or integrated electronic systems, such as fire control, flight/landing control, bombing-navigation, and electronic warfare or other multiple integrated electronic systems.	Electronic Integrated Systems Mechanic, 2610
Calibrating and certifying electronic and physical/dimensional test, measurement, and reference equipment, when the primary purpose of the work is calibration.	Appropriate occupation in the Instrument Work Family, 3300
Planning and fabricating complex research and prototype instruments that are made from a variety of materials and used to detect, measure, record, and regulate heat, pressure, speed, vibration, and other areas of interest to scientific, engineering, or medical personnel.	Instrument Making, 3314

(continued)

Additional Occupational Considerations (continued)	
If Work Involves...	See This Standard:
Troubleshooting, repairing, calibrating, and installing mechanical, electrical, and/or pneumatic instruments, test equipment, and functionally related assemblies, data processing equipment, and controls.	<u>Instrument Mechanic, 3359</u>
Installing and maintaining electronic equipment when this is an integral part of the engineering testing, analysis, alignment, and performance evaluation of complex electronic systems or solving engineering problems of site election, systems integration, and modification of the equipment to adapt to novel site characteristics.	<u>Electronics Technical, 0856</u>
Examining services, materials, and products that are processed, manufactured, or repaired by workers performing trade or craft work to determine that the physical and operating characteristics are within acceptable standards, specifications, or contractual requirements.	<u>Job Grading Standard for Inspectors</u>

Crosswalk to the Standard Occupational Classification

The U.S. Office of Management and Budget requires all Federal agencies to use the Standard Occupational Classification (SOC) system for statistical data reporting purposes when collecting occupational data. The Bureau of Labor Statistics uses SOC codes for the National Compensation Survey and other statistical reporting. The U.S. Office of Personnel Management (OPM) and other Federal agencies maintain a “crosswalk” between OPM authorized occupational series and the SOC codes to serve this need. This requirement and these SOC codes have no effect on the administration of any Federal human resources management system. The information in this table is for informational purposes only and has no direct impact on grading jobs covered by this job grading standard. The SOC codes shown here generally apply only to nonsupervisory jobs in these occupations. As changes occur to the SOC codes, OPM will update this table. More information about the SOC is available at <http://stats.bls.gov/soc>.

Federal Occupational Series and Position Titles and Their Related Standard Occupational Classification System Codes

Federal Occupational Series	Standard Occupational Classification Code Based on Occupational Series	Job Title	Standard Occupational Classification Code Based on Job Title
Electronic Measurement Equipment Mechanic, 2602	49-2090 : Miscellaneous Electrical and Electronic Equipment Mechanics, Installers, and Repairers	Electronic Measurement Equipment Mechanic	49-2090 : Electronic Measurement Equipment Mechanic

PART II – GRADING INFORMATION

Part II provides grading information for use in determining the appropriate grade of nonsupervisory jobs in the Electronic Measurement Equipment Mechanic, 2602. These grading criteria are applicable to Federal Wage System jobs. You will find more complete instructions for evaluating jobs in the following OPM publications: [Introduction to the Federal Wage System Job Grading System](#) and the [Operating Manual for the Federal Wage System](#).

General Job Grading Guidelines

Jobs are graded by a method requiring consideration of the total job including:

- its purpose and relationship to other jobs;
- analysis of the work done and its requirements; and
- determination of the correct grade by comparison with the grade definitions in an appropriate job grading standard.

For trades, craft, and labor work, four factors are considered in grading jobs:

- **Skill and Knowledge** – Covers the nature and level of skill, knowledge, and mental application required in performing assigned work. Jobs vary in such ways as the kind, amount, and depth of skill and knowledge needed, as well as in the manner, frequency, and extent to which they are used.
- **Responsibility** – Covers the nature and degree of responsibility involved in performing work. Jobs vary in responsibility in such ways as the complexity and scope of work assigned, the difficulty and frequency of judgments and decisions made, the kind of supervisory controls, and the nature of work instructions and technical guides used.
- **Physical Effort** – Covers the physical effort exerted in performing assigned work. Jobs vary in such ways as the nature, degree, frequency, and duration of muscular effort or physical strain experienced in work performance.
- **Working Conditions** – Covers the hazards, physical hardships, and working conditions to which workers are exposed in performing assigned work.

Determining Grade Levels

This standard describes work at grades 10, 11, and 12. It does not describe all possible levels at which jobs might be established. You may grade jobs differing substantially from the level of skill, knowledge, and other work requirements described in this standard above or below these grade levels by applying sound job grading principles.

Helper and Intermediate Jobs

Use the U.S. Office of Personnel Management's [Federal Wage System Job Grading Standard for Trades Helper Jobs](#) and [Federal Wage System Job Grading Standard for Intermediate Jobs](#) to grade helper and intermediate jobs in Electronic Measurement Equipment Mechanic, 2602.

Supervisor and Leader Jobs

Use the U.S. Office of Personnel Management's [Federal Wage System Job Grading Standard for Supervisors](#) and [Federal Wage System Job Grading Standard for Leader WL/NL](#) to grade supervisor and leader jobs in Electronic Measurement Equipment Mechanic, 2602.

Grade Level Descriptions

ELECTRONIC MEASUREMENT EQUIPMENT MECHANIC, GRADE 10	
Grade 10 Level Description	<p>General: Grade 10 electronic measurement equipment mechanics maintain, troubleshoot, repair, overhaul, modify, test, and calibrate a variety of portable or installed electronic test equipment such as oscilloscopes, spectrum analyzers, digital voltmeters, multimeters, radio frequency power meters, phase meters, signal and function generators, frequency counters, inductance capacitance resistance analyzers, power supplies, and other specialized equipment. The units serviced at this level are usually self-contained and functionally independent, and can be serviced while separated from test stations.</p> <p>At this level, the mechanics work independently on routine assignments or as a member of a team on more difficult tasks. They apply a working knowledge of electronic principles and knowledge of how circuits and assemblies function together. The items serviced at this level usually contain circuits designed to generate, receive, modify, amplify, measure, or display an electronic signal and transform it into measurable units. The mechanics at this level perform functional tests in accordance with cyclical inspection requirements and repair reported operating deficiencies and defective parts.</p> <p>Grade 10 mechanics make repairs, adjust or replace parts, and apply modifications to the various circuits or wiring in accordance with technical directives and instructions. The mechanics must be skilled in tracing defects that are difficult to locate because of the large number of circuits within the limited space of the units serviced. They determine the repairs needed and perform the work with little or no advice.</p> <p>Mechanics at this level use a variety of precision measurement standards and instruments such as generators, oscilloscopes, and analyzers to perform functional tests and calibration of electronic test equipment serviced. They work with published technical directives and equipment specifications which outline specific alignment and calibration procedures. They use drawings, prints, schematics, and wiring diagrams to locate defective components and perform repairs. Mechanics at this level work under general supervision and complete assignments in accordance with established techniques and procedures.</p> <p>Skill and Knowledge: Electronic measurement equipment mechanics at this level exercise skill in:</p> <ul style="list-style-type: none"> • reading and interpreting clearly defined technical information contained in schematics, manufacturers' specifications, fault isolation aids, and calibration procedures; • troubleshooting equipment to localize defects; • operating a variety of test equipment such as oscilloscopes, signal and frequency counters, digital voltmeters, multimeters, spectrum analyzers, and other specialized equipment;

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ELECTRONIC MEASUREMENT EQUIPMENT MECHANIC, GRADE 10 (continued)

- isolating and checking intermediate components for correct values, and performing precise measurement of parameters such as timing, duration, frequency, amplitude, and phasing at various test points;
- making adjustments to potentiometers, capacitors, and coils related to characteristics such as gain, distortion, linearity, and sensitivity;
- repairing, adjusting, or replacing parts and installing modifications to the various circuits or wiring in accordance with technical directives and instructions;
- using computer equipment and software to maintain records and run automated tests; and
- using basic hand and power tools, such as wire strippers, screwdrivers, hand drills, files, and soldering irons, to repair, align, and assemble equipment.

Electronic measurement equipment mechanics at this level apply a working knowledge of:

- electronic principles involved in generating and measuring values such as voltage, current, impedance, capacitance, frequency, and induction; and
- schematic symbols and color codes to identify the value, tolerance, and location of components.

Responsibility: At this level, the mechanics work independently or as a member of a team. They receive work assignments from the supervisor or higher-graded worker in the form of written or oral instructions which specify the equipment to be serviced. Grade 10 mechanics determine the nature of the trouble and the extent of repairs required. They make repairs and align, test, and calibrate equipment with little or supervisory review of their work in progress or upon completion.

Grade 10 mechanics work with a variety of specifications, procedures, and instructions to maximize the performance of equipment within the framework of the manufacturer's design. The supervisor or higher-graded worker is usually available to provide technical advice and assistance on unusual or very difficult problems that deviate from standard work practices or equipment specifications. Completed work is reviewed by the supervisor to ensure it meets accepted trade practices. Work is also subject to periodic audit by quality assurance staff to ensure conformance with prescribed accuracy and sensitivity requirements.

Physical Effort: The work assignments require light to moderate physical effort. The mechanics frequently lift, carry, or otherwise handle items weighing up to 50 pounds (23 kilograms) independently, and occasionally in excess of 50 pounds with the help of weight handling equipment or with assistance from other workers. They work in a sitting position for extended periods of time, and frequent standing, walking, bending, reaching, and stooping is required.

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Grade 10 Level Description (continued)

ELECTRONIC MEASUREMENT EQUIPMENT MECHANIC, GRADE 10 (continued)

Grade 10 Level Description (continued)

Working Conditions: The mechanics normally work in clean, well-lighted, heated, and ventilated areas, but may work at remote user locations under variable conditions. They are exposed to the possibility of electric shock, burns from electrical or radio frequency energy or hot solder, and cuts and bruises. Workers may be required to wear appropriate safety gear such as protective eyewear, and/or may work within clean room environments where special garments including head coverings, shoe coverings, and gloves are required.

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ELECTRONIC MEASUREMENT EQUIPMENT MECHANIC, GRADE 11

Grade 11 Level Description

General: Grade 11 mechanics service a variety of equipment which is integrated with other electronic equipment or composed of collectively assembled satellite components and assemblies to operate as a complete information gathering unit, as compared to the self-contained and functionally independent units serviced by mechanics at the grade 10 level. Grade 11 mechanics repair, maintain, and calibrate items such as oscilloscopes; spectrum, network, and logic analyzers; digital voltmeters; multimeters; radio frequency power meters; phase meters; signal and function generators; frequency counters; inductance capacitance resistance analyzers; power supplies; and other specialized systems equipment.

Grade 11 mechanics test, troubleshoot, repair, overhaul, modify, install, and calibrate a variety of standard and nonstandard equipment with a minimum of guidance or procedures. The items serviced are more difficult to repair and maintain at this level because, in addition to generating, measuring, and displaying elements as described at the grade 10 level, they contain circuits and assemblies which perform multiple functions such as reception and simulation, amplification and integration, digital and analog conversion, or a variety of other functions required to evaluate parameters of interest in major electronic, electrical, or electromechanical systems. The mechanics work without detailed procedures or instructions and apply more comprehensive trade knowledge of electronic principles than described at the grade 10 level to set up and operate equipment under actual or simulated operating conditions, and to troubleshoot and isolate malfunctions to major blocks of circuitry.

They perform repairs which are often complicated by critical tolerances or accuracies and common circuit elements that perform multiple functions and require fabrication of replacement parts and adjustment and alignment of related circuits to ensure the equipment is functioning properly.

At this level, the mechanics make modifications and test and calibrate in accordance with instructions and procedures which are often vague and incomplete. As a result, the mechanics must often develop and implement techniques for use on specific equipment. They must also use sound judgment in achieving specified assurances, sensitivities, and precise tolerances. The mechanics use a variety of technical electronic data contained in manufacturer specifications, schematics, and maintenance procedures. They make independent judgments in determining the work sequence, selecting and using trade tools, and testing and measuring instruments. They work under general supervision and may be required to provide technical assistance and guidance to lower-graded workers.

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ELECTRONIC MEASUREMENT EQUIPMENT MECHANIC, GRADE 11 (continued)

Skill and Knowledge: Electronic measurement equipment mechanics at this level exercise skill in:

- reading, interpreting, and applying a variety of technical electronic data such as schematic symbols, wiring diagrams, tables and charts, mathematical expressions and formulae, calibration procedures, and color codes used in the trade;
- troubleshooting to identify defective circuit components and elements such as multi-layered boards and integrated circuits and modules, using signal tracing, current and resistance checks, and waveform analysis;
- isolating malfunctions and checking performance characteristics of special or unique test panels or mockups;
- replacing or repairing defective parts and components;
- fabricating cables or installing circuits, and components to change or extend the range and improve the stability of equipment serviced;
- making major modifications to instruments and equipment in accordance with instructions and procedures;
- utilizing electronic circuits to measure electronic or electrical quantities to determine the performance characteristics and accuracy of other instruments and equipment;
- judging the impact of repairs on related integrated devices and performing further adjustments and alignments;
- using computer systems and software to isolate defects in a variety of standard and nonstandard equipment, and to maintain records and control documents; and
- using a variety of hand and power tools such as drills, saws, and heat guns, as well as tools used at [grade 10](#).

Electronic measurement equipment mechanics at this level apply a comprehensive knowledge of:

- operating electronic principles related to equipment which is:
 - integrated with other devices; and
 - complicated by a variety of multicomponent assemblies and devices with intricate functional relationships;
- production and utilization of oscillations over a broad range of frequencies;
- signal and wave form behavior, distortion, and amplification;
- pulse, trigger, and synchronization techniques;
- digital/analog processing and data conversion techniques;
- a variety of display and indication methods;
- methods of signal modulation and electromagnetic radiation;
- methods and techniques of precise measurement of electrical and electronic quantities and relationships, such as standing wave ratio, power, impedance, reactance, and attenuation; and
- established techniques and methods to test, repair, align, and calibrate a wide variety of test equipment.

(continued)

Grade 11 Level Description (continued)

ELECTRONIC MEASUREMENT EQUIPMENT MECHANIC, GRADE 11 (continued)

Grade 11 Level Description (continued)

Responsibility: Mechanics at this level are provided written or oral instructions, blueprints, or sketches of the item or system to be installed or repaired. They work in accordance with available drawings, specifications, or technical orders, and must often develop diagrams and sketches for equipment where specifications are vague and incomplete. These mechanics personally inspect the equipment to identify the work to be done, plan their own work, or devise a plan for others to follow. Mechanics at this level make templates when necessary. They select, use, or prescribe methods, materials, and machines most appropriate for the assigned project.

Grade 11 mechanics may be responsible for providing technical guidance and assistance to lower-graded workers. Completed work is subject to spot check by the supervisor to ensure compliance with accepted trade practices. Work is also subject to periodic audit by quality assurance staff to ensure conformance with prescribed accuracy and sensitivity requirements.

Physical Effort: Physical effort is the same as that described at [grade 10](#).

Working Conditions: Working conditions are the same as those described at [grade 10](#).

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ELECTRONIC MEASUREMENT EQUIPMENT MECHANIC, GRADE 12

General: At this level, the work involves the maintenance and repair of unusually complex precision measurement equipment, instruments, and instrumentation systems with a minimum of available instructions. The servicing of equipment at this level is complicated by frequent engineering changes such as in design, construction, operating specifications, and special servicing procedures. The items serviced at this level are more difficult to repair and maintain than those described at the grade 11 level, because they are usually custom-built, unconventional, or one-of-a-kind devices used in support of research, experimental, or testing activities. Grade 12 mechanics analyze and isolate component malfunctions in equipment similar to that described at the grade 11 level. In addition, the grade 12 mechanics perform design changes and major modifications to standard and unconventional precision measurement equipment to improve the range or provide new capabilities to identify phenomena or parameters of interest in industrial, marine, airborne, ground support, or research and development test equipment applications.

Grade 12 Level Description

Grade 12 mechanics select, modify, set-up, calibrate, install, and operate a variety of precision measurement equipment including special test stations and mockups in support of laboratory tests or prototype and first-article acceptance and calibration tests. They work with specifications and procedures which are often vague and incomplete as a result of the unique equipment applications at this level. Grade 12 mechanics must apply advanced trade knowledge to improvise trade techniques for maintenance and repairs. The items serviced at this level are more complex than those described at the grade 11 level because, in addition to simulating, measuring, and processing electronic quantities and values, they are designed or modified to measure additional values such as infrared radiation, temperature, gas, vacuum, and other parameters of interest in laboratory test applications. Grade 12 mechanics apply greater judgment and higher level skills and knowledge than grade 11 mechanics. For example, while working from a broad outline of a test objective, they determine or recommend the proper methods to record the performance characteristics of the device, and select and modify the required precision measurement instruments. Typical of the scope of modifications performed at this level are the addition of new circuits, controls, wiring, or units with very critical tolerances or operating characteristics. The mechanics assist in the developmental testing of equipment such as radio, radar, communication, fiber optic, countermeasures, traffic control, guidance, and other systems and devices. They monitor or operate the precision measurement instruments, analyze malfunctions which occur during the tests, and perform necessary corrective actions.

The mechanics coordinate their efforts with technical or professional personnel on matters affecting equipment performance and test objectives.

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ELECTRONIC MEASUREMENT EQUIPMENT MECHANIC, GRADE 12 (continued)

Skill and Knowledge: Electronic measurement equipment mechanics at this level exercise skill in:

- using the full complement of precision electronic reference standards and complex special test panels to isolate defects complicated by a variety of critical absolute or percentage tolerance values and relationships of factors such as:
 - bandwidth;
 - frequency response;
 - gain;
 - sensitivity;
 - attenuation;
 - noise level;
 - time delay;
 - power;
 - linearity; and
 - modulation;
- analyzing circuits and preparing or interpreting detailed diagrams and schematics to effectively troubleshoot, repair, maintain, and calibrate integrated systems;
- performing operational checkout, malfunction analysis, and preventative maintenance to ensure instruments and equipment serviced at this level are in optimal condition for accuracy and reliability of finished test results;
- improvising in the use of precision measurement equipment and the application of trade techniques to solve unusual problems related to factors such as:
 - obsolete equipment;
 - testing environment;
 - interference from other frequency-generating equipment; and
 - location and density of circuitry;
- using computer systems and software to isolate defects in unconventional specialized equipment, develop schematics and diagrams, and maintain records and work control documents; and
- using tools similar to those described at [grade 11](#).

Electronic measurement equipment mechanics at grade 12 apply a thorough knowledge and understanding of:

- the design, construction, function, and end-use application of a variety of highly complex, unconventional, custom-built precision measurement equipment used in connection with research, experimental, or testing activities;
- electronic theory to calculate pulses and waveforms and trace relationships in the signal flow; and

(continued)

Grade 12 Level Description (continued)

ELECTRONIC MEASUREMENT EQUIPMENT MECHANIC, GRADE 12 (continued)

- innovations of the trade to perform major modifications to general purpose or common, commercially-manufactured test equipment.

Responsibility: Grade 12 mechanics exercise significantly more judgment and independence in determining the methods and techniques required to solve unusually complex maintenance and repair problems than grade 11 mechanics. They independently judge the impact modifications and use of special test devices may have on tracing malfunctions, achieving test objectives, and ensuring proper alignment of integrated devices contained in the highly complex equipment serviced at this level. They determine the work sequence and special or nonstandard trade techniques required, and prescribe methods, materials, and procedures to be used by lower-graded workers. For example, they develop detailed schematics and drawings for use by lower-graded workers in the repair and maintenance of one-of-a-kind equipment.

Grade 12 mechanics are responsible for applying significantly greater judgments and decisions than grade 11 mechanics. They must keep abreast of technological changes in the occupation and provide technical guidance and assistance to lower-graded workers. These mechanics coordinate their work with technical and professional personnel. Completed projects are often accepted without further review as prototypes or experimental devices, or for manufacture as a standard item.

Physical Effort: The physical effort is the same as that described at [grade 10](#).

Working Conditions: Working conditions are the same as those described at [grade 10](#).

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Grade 12 Level Description (continued)