

# Federal Wage System Job Grading Standard for Electrical Equipment Repairing, 2854

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## WORK COVERED

This standard is for grading nonsupervisory jobs involved in troubleshooting, testing, installing, repairing, overhauling, modifying, and maintaining electrical devices, equipment, and components such as automatic alternator synchronizing equipment, amplidyne control units, voltage regulating equipment, generators, actuators, switching and control panels, junction boxes, AC and DC motors, electrical harnesses, transformers, and power amplifiers. Typically, the equipment and components serviced have been removed from aircraft, ships, ground support or industrial equipment, tracked or wheeled heavy duty vehicles, missiles, etc. The work requires knowledge of electrical circuitry, formulas, and principles and their application to the devices, equipment, components, and systems repaired. In addition, some work may require knowledge of electronic circuitry and theory and general mechanical skills and knowledge.

This standard cancels and supersedes the Job Grading Standard for Electrical Equipment Repairer, 2854, issued in August 1974.

## WORK NOT COVERED

This standard does not cover work that primarily involves:

- Work involved in installing, maintaining, troubleshooting, and repairing electrical wiring systems and associated fixtures, controls, and equipment in industrial, institutional, office, and residential buildings, and on ships. (See [Job Grading Standard for Electrician Series, 2805.](#))
- Work involved in installing, maintaining, troubleshooting, overhauling, and repairing aircraft electrical systems and equipment on board aircraft. (See [Job Grading Standard for Aircraft Electrician Series, 2892.](#))
- Work involved in installing, maintaining, troubleshooting, overhauling, and repairing electronic systems and equipment. (See [Job Grading Standard for Electronics Mechanic Series, 2604.](#))
- Work involved in installing, maintaining, testing, and repairing an electrical power plant or overhead and underground primary electrical distribution systems. (See [Job Grading Standard for High Voltage Electrician, 2810.](#))
- Work involved in servicing custodial equipment such as waxing machines, vacuum cleaners, power scrubbing machines, and wall washing machines. (See series definition for [Custodial Equipment Servicing, 4808.](#))
- Work involved in maintaining, adjusting, sharpening, and repairing a variety of tools, safety equipment, and portable power equipment such as hand-held electric power tools that are issued from shop toolroom and equipment areas to production and maintenance workers. (See series definition for [Tool and Equipment Repairing, 4840.](#))

## TITLES

Jobs graded by this standard at grade 9 and above are titled *Electrical Equipment Repairer*.

Jobs graded by this standard below grade 9 (other than helper and intermediate jobs) are titled *Electrical Equipment Worker*.

## GRADE LEVELS

This standard does not describe all possible grades at which jobs might be classified. If jobs differ substantially from the skills, knowledge, or other work requirements described in the standard, they may be graded either above or below the grade levels described based on sound job grading methods.

## HELPER AND INTERMEDIATE JOBS

Helper jobs are graded by the Office of Personnel Management [Job Grading Standard for Trades Helper Jobs](#).

The grade 7 level described in this standard DOES NOT apply to jobs that are part of a planned program of training and development of skills for advancement to a higher grade. Such trainee jobs are covered by the Office of Personnel Management "[Job Grading Standard for Intermediate Jobs](#)." Grade 9 in this standard is to be used as the "full performance" level or grade in applying the Intermediate Job Grading Table.

## NOTES TO USERS

Ongoing technological advancements in the field of electronics have had and will continue to have an impact upon electrical components and devices commonly found in electrical equipment. As a consequence, work within this occupation, in certain work situations, may require knowledge of electronic principles ranging from a practical understanding to a knowledge of general electronic theory. For example, when electro-mechanical controls have been superseded by electronic technology, often the electronic-based devices are so limited in scope of operation and complexity of design that adjustment and repair can be done in accordance with detailed instructions for which little electronics knowledge is required. Typically such work would be graded by the [Job Grading Standard for Electronics Mechanic, 2604](#), at or below grade 8. In other cases, the overall complexity of the unit may be greater, but the electronics knowledge generally does not exceed the grade 10 level as described in the Electronics Mechanic standard. That is, the electronic devices worked on are generally a part of a self-contained and functionally independent unit that would not exceed the complexity described at the grade 10 level in that standard. In accordance with the [Federal Wage System mixed job \(occupation/grade\) job grading policy](#), if both the electrical and electronics work are at the same grade and the electrical work is paramount, the job would continue to be classified to

the 2854 or other appropriate nonelectronics series. Only when electronics knowledge is paramount and/or the work involves installing, troubleshooting, maintaining, and repairing electronics equipment and complete operational systems of the complexity described at grade 11 level in the [2604](#) or other appropriate electronics standard, should it be placed in an appropriate electronics series.

For a detailed discussion of the impact of technological development in electronics and a discussion of computer-controlled automatic test equipment (ATE), refer to the [Introduction to Electronic Equipment Installation and Maintenance Family, 2600](#).

## **ELECTRICAL EQUIPMENT REPAIRING, GRADE 7**

*General:* Grade 7 electrical equipment workers apply established work methods and procedures to perform limited diagnostic checks and to disassemble, repair, reassemble, and test electrical equipment and components that have been removed from ground support or industrial equipment, tracked or wheeled heavy duty vehicles, missiles, aircraft, ships, etc. Many of the components serviced at this level may be more mechanical than electrical and contain only a few switches and wires. Following prescribed procedures, they disassemble equipment such as motors and generators and make electrical and mechanical repairs by replacing or adjusting parts such as coils, armatures, bearings, switches, wiring or insulation, and gears. They assemble, repair, modify, replace, and install electrical quick change assembly components such as electrical cables and wiring harnesses associated with engine and transmission components and test the completed products. They use a variety of test equipment such as voltmeters, ohmmeters, multimeters, growlers, meggers, and specialized test sets to test for shorts, continuity, and defective wiring and connections. They use standard hand tools and micrometers to check for extensive wear of bushings, bearings, and gears. They assist higher grade workers on assignments involving equipment and components of greater complexity than those described above by performing discrete tasks such as routine disassembling, repairing, and reassembling the simpler components and then bench testing them.

*Skill and knowledge:* Grade 7 electrical equipment workers have a practical knowledge of electrical and mechanical principles, and familiarity with pneumatic and hydraulic trade practices. They know how to locate and repair malfunctions and test completed work. They apply knowledge of wire color codes, symbols, layout sheets, wiring diagrams, schematics, technical orders, and manufacturers' specifications to complete assignments. They require a working knowledge of various types and sizes of wires, connectors, and plugs.

Electrical equipment workers at this level use mechanical skills to replace and adjust bearings, brushes, coils, and gears in completing repairs. They are skilled in the operation of common electrical test devices such as ohmmeters, voltmeters, growlers, and meggers to perform basic checks for continuity, resistance, voltage, opens, shorts, insulation breakdowns, and grounds. They have skill in the use of hand tools, soldering and crimping devices, and shop machinery for reworking, balancing, and reassembling items.

*Responsibility:* Grade 7 electrical equipment workers receive work assignments from their supervisor or higher grade worker. Detailed instructions and any necessary schematics, wiring diagrams, or other such references are provided. They work independently on routine and repetitive work assignments. Decisions and judgments are controlled through established procedures and detailed instructions. Routine work assignments are typically carried out with little or no review in progress. They receive detailed instructions from their supervisor on new or unusual assignments. All work is subject to review in progress and upon completion for conformance to standards and job specifications.

*Physical Effort:* Grade 7 electrical equipment workers are frequently required to stand on hard surfaces for extended periods and bend, stoop, and work in tiring and sometimes uncomfortable positions. They frequently lift and carry, unassisted, items that weigh up to 18 kilograms (40 pounds). They are sometimes required to lift and move heavier items with the help of weight handling equipment or with assistance from other workers.

*Working Conditions:* Grade 7 electrical equipment workers typically work in well lighted, heated, and ventilated areas. They are subject to cuts, burns, chemical irritations, strains, electrical shock, and abrasions while repairing and handling equipment. They are exposed to unpleasant conditions from dirt, solvents, fuel, fumes, oil, and grease. They follow prescribed safety practices and use safety equipment such as ear plugs, face shields, gloves, hard hats, glasses, and safety shoes.

## **ELECTRICAL EQUIPMENT REPAIRING, GRADE 9**

*General:* Grade 9 electrical equipment repairers disassemble, repair, modify, assemble, and test a variety of electrical equipment such as AC/DC motors (single, split, and three-phase), generators, starters, voltage regulators, servo mechanisms, alternators, transformers, actuators, power control panels, control sticks, instrument panels, or inverters. Items serviced have been removed by others from ground support or industrial equipment, tracked or wheeled heavy duty vehicles, missiles, aircraft, ships, etc. Repairers at this level rewind motors, generators, transformers, precision coils, and similar components. In comparison to grade 7 workers, who follow established procedures to repair electrical equipment with few switches and wires, grade 9 electrical equipment repairers are more proficient in the independent diagnosis and repair of electrical equipment that typically contain basic electronic components. Grade 9 repairers check fields, armatures, wiring, commutators, and other electrical parts for continuity, voltage drop, ground shorts, opens, and overheating. They check and repair gears and clutches when these and other similar mechanical items are part of the accessory being serviced or repaired; they check shafts for clearance, balance, and warpage; they check the condition of bearings, noise filter capacitors, switches, rectifiers, variable resistors, diodes, relays, and governors according to work order requirements. They repair or replace items such as brushes, seals, bearings, gears, leads, armatures, and control parts. They recondition surfaces, modify if specified, and restore entire unit to serviceable condition. Electrical equipment repairers use standard hand tools and a variety of test equipment such as voltmeters, ohmmeters, growlers, meggers, resistance bridges, and analyzers to test electrical characteristics. They use feeler, depth, tension, and spring gauges; micrometers; and dial indicators to measure clearances, tolerances, and dimensional

characteristics. They make adjustments, set cams or other controls, and perform operational tests of items for specified performance characteristics such as torque, force, voltage, and current consumption or to detect excessive vibration, overheating, surge, or drag.

*Skill and Knowledge:* Grade 9 electrical equipment repairers apply a thorough knowledge of electrical theory such as alternating and direct current flow, conductance, resistance, capacitance, inductance, ohms law, and phasing. They apply a practical understanding of electronics to identify and replace components with obvious visual defects, e.g., a burnt resistor or damaged board, or through basic testing procedures. They apply a knowledge of mechanical theory in the maintenance of bearings, shafts, commutator and slip ring surfaces, fitting and assembly of components, and measurement of travel, torque, and revolutions per minute. They have a working knowledge of pneumatic and hydraulic principles.

Electrical equipment repairers at this level are skilled at disassembling, repairing, reassembling, and testing electrical equipment. They have skill in performing specific checks and tests of coils, resistors, capacitors, potentiometers, relays, solenoids, switches, and related items using electrical and electronic test equipment to measure resistance, voltage, capacitance, and similar characteristics and response of the mechanism to an actuating signal following established test procedures. Grade 9 repairers have skill in setting up and operating computer-controlled automatic test equipment (ATE) and other specialized test equipment to perform pretest and final checkout of electrical equipment.

They have skill in various soldering techniques and in winding and rebuilding armatures, stators, rotors, and coils for electrical motors, generators, alternators, invertors, and transformers. Repairers at this level have skill in making mechanical repairs and adjustments such as replacing springs, bearings, brushes, gears, cams, clutches, and adjusting belts, gears, brakes, clutches or related parts.

*Responsibility:* Grade 9 electrical equipment repairers receive assignments from their supervisor in the form of work orders. Blueprints, schematics, technical data, and engineering instructions are available for reference. They determine the extent of repairs needed and exercise judgment in selecting the methods, techniques, and procedures to use in completing assignments and bench testing completed work. Completed work is either self-certified or inspected by the supervisor or quality control.

*Physical Effort:* Physical effort is the same as that described at the [grade 7 level](#).

*Working Conditions:* Working conditions at this grade level are the same as those described at [grade 7](#).

## **ELECTRICAL EQUIPMENT REPAIRER, GRADE 10**

*General:* Grade 10 electrical equipment repairers test, troubleshoot, modify, repair, and overhaul a variety of complex electrical devices that have been removed from aircraft, missiles, ground support or industrial equipment, ships, tracked or wheeled heavy duty vehicles, etc. The devices serviced are more complex than those described at the grade 9 level and include items such as supervisory control and relaying systems, automatic alternator synchronizing equipment, temperature amplifiers and controls, speed sensing units, selsyn and amplidyne units, or other similar integrated groupings of electrical equipment and related controls containing printed and miniaturized electronic control circuitry. They refer to blueprints, schematics, and engineering and manufacturers' specifications and other such controlling criteria if available and use a variety of test equipment such as voltmeters, frequency meters, transfer impedance meters, ohmmeters, meggers, oscilloscopes, inductance and capacitance testers, frequency counters and specialized test equipment to troubleshoot malfunctions to the lowest circuit element on single or multiple layer printed circuit boards. They repair, modify, and replace defective components using the latest techniques in microsoldering. They prototype and review new overhaul and test procedures on new items being introduced into the workload.

Grade 10 electrical equipment repairers set up and operate computer-controlled automatic test equipment (ATE) to run established and new diagnostic programs in various operational and functional test modes to perform pretest or final checkout of the electrical/electronic and interrelated systems.

*Skill and Knowledge:* Grade 10 electrical equipment repairers apply a thorough knowledge of electrical theory and a knowledge of electronic theory to complete repairs on a variety of complex electrical systems and equipment containing diodes, transistors, and electronic devices in the circuitry. They apply a knowledge of mechanical theory and of pneumatic and hydraulic principles to isolate, repair, or replace faulty components such as hydraulic/pneumatic pressure regulators and hydraulic volume controls on many different types of equipment.

Electrical equipment repairers at this level have skill in troubleshooting entire electrical systems and related equipment, determining cause of malfunction, and making required repairs. They have skill in using test equipment such as oscilloscopes, frequency meters, phase rotation meters, and capacity and impedance bridges to troubleshoot, test, and repair equipment such as AC-DC convertors, DC-AC inverters, and power control panels. They have skill in interpreting technical specifications, schematics, blueprints, and engineering drawings in planning and laying out, and completing the installation, modification, and repair of various electrical systems, circuits, equipment, and controls. They are able to replace diodes, transistors, capacitors, resistors, and printed circuit boards.

*Responsibility:* Grade 10 electrical equipment repairers receive assignments from their supervisor concerning the priority of the systems or equipment to be repaired. They plan the sequence of the work, make determinations concerning the feasibility of repairing the equipment, and refer to prints, diagrams, engineering specifications, and manufacturers' manuals if available.

Completed work is either self-certified by the repairer or inspected by the supervisor or quality control personnel.

*Physical Effort:* Physical effort is the same as that described at the [grade 7 level](#).

*Working Conditions:* Working conditions at this grade level are the same as those described at [grade 7](#).