INCH-POUND
MIL-PRF-62576A
13 March 1997
SUPERSEDING
MIL-R-62576
19 January 1988
(See 6.7)

# PERFORMANCE SPECIFICATION

# REGULATOR, ENGINE GENERATOR

This specification is approved for use by all Departments and Agencies of the Department of Defense.

## 1. SCOPE

1.1 Scope. This specification covers a solid state regulator utilizing electronic devices to regulate the voltage and current of the 28 volt (V), direct current (dc) generator (see 6.1).

1.2 Classification. The solid state regulators are of the types listed below:

| | |
|---|---|
| Type I | - Regulator (Drawing 11631857) to operate with 28 V, 25 ampere (A), dc generator. |
| Type II | - Regulator (Drawing 12257823) to operate with 28 V, 300 A, dc generator. |
| Type III | - Regulator (Drawing 11672403) to operate with 28 V, 300 A, dc generator. |

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: U.S. Army Tank-automotive and Armaments Command, ATTN: AMSTA-TR-E/BLUE, Warren, MI 48397-5000, by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document, or by letter.

AMSC N/A FSC 2920

## 2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirement documents cited in sections 3 and 4 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation (see 6.2).

SPECIFICATIONS

DEPARTMENT OF DEFENSE

| | |
|---|---|
| MIL-T-704 | - Treatment and Painting of Material. |
| MIL-B-11188 | - Batteries, Storage: Lead-Acid. |
| MIL-F-13927 | - Fungus Resistance Test Automotive Components. |
| MIL-G-62061 | - Generator, Engine, Accessory, 28 volt DC, Rated Output 300 Amps. |
| MIL-B-62346 | - Battery, Storage: Lead-Acid (Low Maintenance) Type 6TL. |

STANDARDS

DEPARTMENT OF DEFENSE

| | |
|---|---|
| MIL-STD-202 | - Test Methods for Electronic and Electrical Component Parts. |
| MIL-STD-461 | - Electromagnetic Interference Emission and Susceptibility Requirements for the Control. |
| MIL-STD-462 | - Electromagnetic Interference Characteristics, Measurement of. |
| MIL-STD-1184 | - Electrical Components for Automotive Vehicles; Waterproofness Tests. |

2.2.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation.

NUCLEAR REGULATORY COMMISSION (NRC)

Code of Federal Regulations (CFR) - Title 10, Parts 30 and 40.

(Copies of the Code of Federal Regulations (CFR) are available from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.)

DRAWINGS

ARMY

| | |
|---|---|
| 7355736 | - Generator, 28 V dc, 25 A. |
| 10950808 | - Generator, 28 V dc, 25 A. |
| 11631857 | - Regulator, Engine Generator, 28 V dc 25 A, Solid State. |
| 11672403 | - Voltage Regulator, Dual Current Limit, Solid State. |
| 12257823 | - DC Solid State Regulator. |

(Copies of these drawings are available from the U.S. Army Tank-automotive and Armaments Command, ATTN: AMSTA-TR-E/BLUE, Warren, MI 48397-5000.)

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted are those listed in the issue of the DoDISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DoDISS are the issues of the documents cited in the solicitation (see 6.2).

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI/SAE AS478 - Identification Marking Methods (DoD Adopted).

(Application for copies should be addressed to American National Standards Institute, 11 West 42nd Street, New York, NY 10036.)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products (AASHTO M111) (DoD Adopted).

| | |
|---|---|
| ASTM A653 | - Standard Specification for Sheet Steel, Zinc Coated (Galvanized) (Galvanealed) by the Hot Dip Process. |
| ASTM A924 | - Standard Specification for General Requirements for Sheet Steel, Metallic-Coated by the Hot Dip. |
| ASTM B117 | - Standard Practice for Operating Salt Spray (Fog) Apparatus (DoD Adopted). |

(Application for copies of ASTM publications may be obtained from the American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.)

GENERAL MOTORS CORPORATION

| | |
|---|---|
| GM 9540P | - Accelerated Corrosion Test. |

(Copies of GM publications may be obtained from General Motors Corporation, c/o Global Engineering, 15 Inverness Way, Englewood, CO 80112.)

2.4 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

## 3. REQUIREMENTS

3.1 First article. When specified (see 6.2), a sample shall be subjected to first article inspection in accordance with 4.4.

3.2 Materials. Materials shall be as specified herein, and on applicable drawings, standards and specifications. When the material used is not specifically covered in any of the referenced documents, it shall withstand the temperature range encountered within the component for which it is intended for use. There shall be no change in physical or chemical properties resulting in calibration or operation that fall outside the limits specified herein (see 4.7.1).

3.2.1 Dissimilar metals. Except where necessary to complete an electrical circuit, contact between dissimilar metals, which would encourage galvanic action, shall be avoided.

3.2.2 Hazardous materials. Asbestos, cadmium, and radioactive material shall not be used in this item. Radioactive material is defined by CFR, Title 10, Parts 30 and 40, and other radioactive material in which the specific activity is greater than 0.002 microcuries per gram or the activity per item equals or exceeds 0.01 microcuries.

3.3 Environmental conditions.

3.3.1 High temperature.

3.3.1.1 Type I. The regulator shall operate at a temperature of 225° ±5° (107° ±3°C), except that the output voltage shall be 26.4 ±0.8 V and the output current shall be 22 ±2A (see 4.7.16.1.1).

3.3.1.2 Types II and III. The regulator shall operate at a temperature of 215° ±5°F (101° ±3°C), except that the output voltage shall be 26.5 ±0.7 V (see 4.7.16.1.2).

3.3.2 Low temperature.

3.3.2.1 Type I. The regulator shall operate at a temperature of -65° ±5°F (-54° ±3°C) and the output voltage shall be 29.6 ±0.8 V and the output current shall be 35 ±3A (see 4.7.16.2.1.).

3.3.2.2 Types II and III. The regulator shall operate at a temperature of -65° ±5°F, and the output voltage shall be 29.5 ±0.7 V (see 4.7.16.2.2).

3.3.3 Vibration. The regulator shall not be damaged nor performance degraded after exposure to vibration levels encountered during regulator operation (see 4.7.16.3).

3.3.4 Shock. The regulator shall not be damaged nor performance degraded after exposure to shock levels encountered during regulator operation (see 4.7.16.4).

3.3.5 Corrosion resistance. The regulator shall evidence no corrosion that would adversely affect performance after being subjected to a salt spray (see 4.7.16.5).

3.3.6 Fungus resistance. The regulator shall not support microbial growth that would adversely affect performance after being exposed to fungi (see 4.7.16.6).

3.3.7 Waterproofness. The regulator shall show no evidence of leakage nor performance degradation after being submerged in water (see 4.7.16.7).

3.4 Recycled, recovered , or environmentally preferable materials. Recycled, recovered, or environmentally preferable materials should be used to the maximum extent possible provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs (see 6.3.4).

3.5 Design and construction.

3.5.1 Configuration. Configuration construction shall conform to applicable drawings specified herein (see 6.2).

3.5.1.1 Type I. The regulator shall be fabricated and assembled in accordance with Drawing 11631857 (see 4.7.1 and 4.7.2).

3.5.1.2 Type II. The regulator shall be fabricated and assembled in accordance with Drawing 12257823 (see 4.7.1 and 4.7.2).

3.5.1.3 Type III. The regulator shall be fabricated and assembled in accordance with Drawing 11672403 (see 4.7.1 and 4.7.2).

3.5.2 Threaded surfaces. The thread form, class and the number of threads per inch shall be as specified on the applicable drawings (see 4.7.2).

3.5.3 Polarity. The regulator shall be designed to operate with a negative-grounded, electrical system and shall be internally case grounded (see 4.7.2).

3.5.4 Mounting position. The regulator shall be designed to operate when mounted in any position and without the use of shock absorbing material or equipment (see 4.7.2.).

3.5.5 Weight.

3.5.5.1 Type I. Not applicable.

3.5.5.2 Type II. The regulator shall not be more than 19 pounds (lbs) (8.6 kilograms (kg)) (see 4.7.3).

3.5.5.3 Type III. The regulator shall not be more than 16 lbs (7.3 kg) (see 4.7.3).

3.6 Reliability.

3.6.1 Reliability. Quantitative reliability numbers are to be determined by Government reliability engineers prior to finalizing the contract.

3.6.2 Endurance.

3.6.2.1 Type I. The regulator shall withstand 2000 hours of operation under the load, speed and temperature conditions specified herein without servicing, adjustment or replacement parts (see 4.7.17.1).

3.6.2.2 Types II and III. The regulator shall withstand 1000 hours of operation under the load, speed and temperature conditions specified herein without servicing, adjustment or replacement parts (see 4.7.17.2.).

3.7 Test equipment. Existing Government or commercial test equipment used in conjunction with the test item shall be identified along with the requirement for compatibility between the item and the test equipment.

3.8 Transportation. The appropriate packaging shall be applied for domestic and/or overseas destinations (see 5.1).

3.9 Performance.

3.9.1 Electrical system.

3.9.1.1 Reverse current ($I_R$). The reverse current shall be as specified in 3.9.1.1.1 and 3.9.1.1.2 when measured between regulator and batteries (see 4.7.4).

3.9.1.1.1 Type I. $I_R$ shall be 5 milliamperes (mA) maximum.

3.9.1.1.2 Types II and III. $I_R$ shall be 30 mA maximum. For type III only, this requirement shall be met with pin "E" of the battery connector grounded and ungrounded.

3.9.1.2 Transient voltage.

3.9.1.2.1 Type I. The regulator shall meet the abnormal system requirements, except that the steady state voltage shall be no greater than 30 V and the transient voltage shall be no greater than 80 V (see 4.7.14.1 and 4.7.5). Subsequent to the testing of 4.7.14.1; the regulator shall meet the requirements of 4.7.5.

3.9.1.2.2 Types II and III. The regulator shall not sustain damage when subjected to the abnormal condition of applying 100 V square wave pulse to the output and 70 V square wave pulse to the input (see 4.7.14.2). Subsequent to the tests of 4.7.14.2, the regulator shall meet the requirements of 4.7.5. For type III only, this requirement shall be met with pin "E" of the battery connector grounded and ungrounded.

3.9.1.3 Load switching.

3.9.1.3.1 Type I. The regulator shall meet the abnormal system requirements, except that the steady state voltage shall be no greater than 30 V, the transient voltage shall be no greater than 80 V, and the peak to peak ripple voltage shall be no greater than 5 V (see 4.7.15.1). Subsequent to the testing of 4.7.15.1, the regulator shall meet the requirements of 4.7.5.

3.9.1.3.2 Types II and III. Not applicable.

3.9.1.4 Voltage regulation ($E_R$).

3.9.1.4.1 Type I. The regulator shall establish and maintain output voltage at 28.5 ±0.7 V throughout the generator speed range of 2000 to 8000 revolutions per minute (rpm) (see 4.7.5.1).

3.9.1.4.2 Types II and III. The regulator shall establish and maintain regulated voltage at 28 ±0.7 V over a load range of 25 to 350 A and generator speed range of 2400 to 8000 rpm as shown in figures 1 and 9. Overshoot and undershoot limits and time to re-establish and maintain regulated voltage shall conform to limits on figure 1. The fundamental frequency of the voltage waveforms shall be greater than 100 Hertz (Hz) (see 4.7.5.2 and 4.7.5.3). For type III only, this requirement shall be met with pin "E" of the battery connector grounded and ungrounded.

3.9.1.5 Voltage ripple.

3.9.1.5.1 Type I. Not available.

3.9.1.5.2 Types II and III. The regulator output voltage waveform shall have the following limitations. The ac peak to peak ripple voltage shall be no more than 7 V. With batteries connected, the peak ripple voltage shall be no greater than 4 V, except that excursions of less than 1 millisecond (ms) may exceed 4 V (see 4.7.6). For type III only, this requirement shall be met with pin "E" of the battery connector grounded and ungrounded.

3.9.1.6 Current regulation.

3.9.1.6.1 Type I. With generator operating at 2400 to 8000 rpm, the regulator shall maintain output current of 25 A at 28.5 ±1.5 V (see 4.7.7.1).

3.9.1.6.2 Types II and III (pin E ungrounded). With the generator operating over the speed range of 2400 to 8000 rpm, the regulator shall provide the following control (see 4.7.7.2 and 4.7.7.3):

a. No less than 350 A shall be maintained within the voltage regulation range of 28 ±0.7 V.
b. The regulator shall limit the generator output current within the limits shown in figure 2.
c. The regulator shall attain stable current regulation in the current limit mode within 0.3 seconds of load application.
d. The regulator shall attain stable voltage regulation upon load release within 0.3 seconds after entering the lower voltage regulation limit (27.3 V) shown in figure 3.

e. In the current limit mode, the frequency of oscillation of the dc voltage shall have a period of less than 14 ms (T as shown in figure 3) and a peak-to-peak value (V as shown in figure 3) of less 10 percent (%) of the dc voltage.

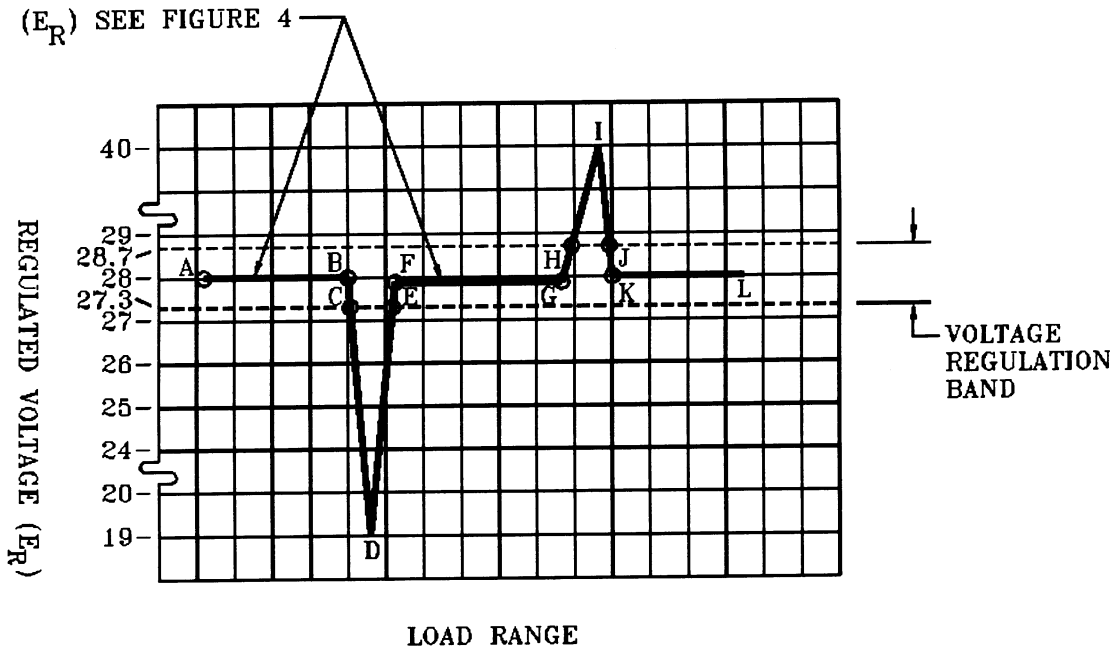
3.9.1.6.3 Type III (pin E grounded). With the generator operating at 3000 rpm, the regulator shall provide the following control (see 4.7.7.4 and 4.7.7.5):

a. No less than 100 A shall be maintained within the voltage regulation range of 28 ±0.7 V.
b. The regulator shall limit the generator output current within the limits shown in figure 2.
c. The regulator shall attain stable current regulation in the current limit mode within 0.3 seconds of load application.
d. The regulator shall attain stable voltage regulation upon load release within 0.3 seconds after entering the lower voltage regulation limit (27.3 V) shown in figure 3.
e. In the current limit mode, the frequency of oscillation of the dc voltage shall have a period of less than 14 ms (T as shown in figure 3) and a peak-to-peak value (V as shown in figure 3) of less 10 percent (%) of the dc voltage.

3.9.1.7 Overvoltage.

3.9.1.7.1 Type I. Not applicable.

3.9.1.7.2 Types II and III. The regulator generator system shall be protected from any failure in the regulator which will cause the regulator to go “full on”. The overvoltage portion of the regulator shall react to deactivate the generator when the system voltage reaches a value of 33 ±1 V. Overvoltage reaction time shall be not less than 0.25 second and not more than 1 second. Reset shall be manual and located on the regulator (see 4.7.8.1 and 4.7.8.2). For type III only, this requirement shall be met with pin “E” of the battery connector grounded and ungrounded.




(A-B) - BATTERY LOAD ONLY PRIOR TO LOAD APPLICATION

( B ) - POINT OF LOAD APPLICATION

(C-E) - VOLTAGE UNDERSHOOT RECOVERY TIME

( D ) - UNDERSHOOT VOLTAGE

(F-G) - REGULATED VOLTAGE (ER) DURING APPLIED LOAD (STEADY STATE)

( G ) - POINT OF LOAD DISCONNECTION

(H-J) - VOLTAGE OVERSHOOT RECOVERY TIME

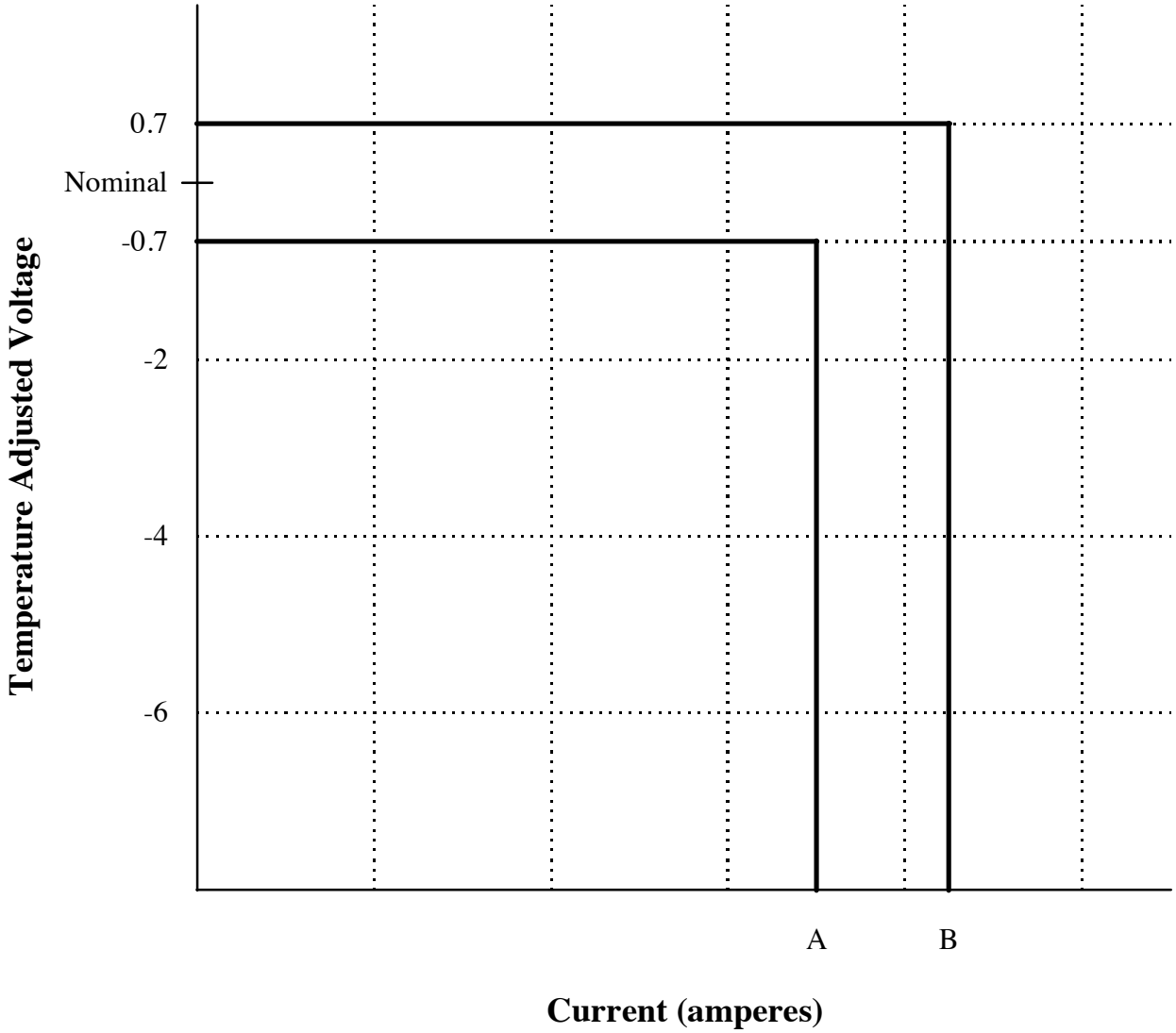
( I ) - OVERSHOOT VOLTAGE

(K-L) - BATTERY VOLTAGE AFTER LOAD DISCONNECT

(C-E) - MAX. TIME LIMIT - 0.125 SEC

(H-J) - MAX. TIME LIMIT - 0.300 SEC

FIGURE 1. Voltage regulation limits




| | Type II | Type III (pin E ungrounded) | Type III (pin E grounded) |
|---|---|---|---|
| Point A | 350 A | 350 A | 100 A |
| Point B | 420 A | 420 A | 180 A |

FIGURE 2. Current limit curve, Types II and III regulators.

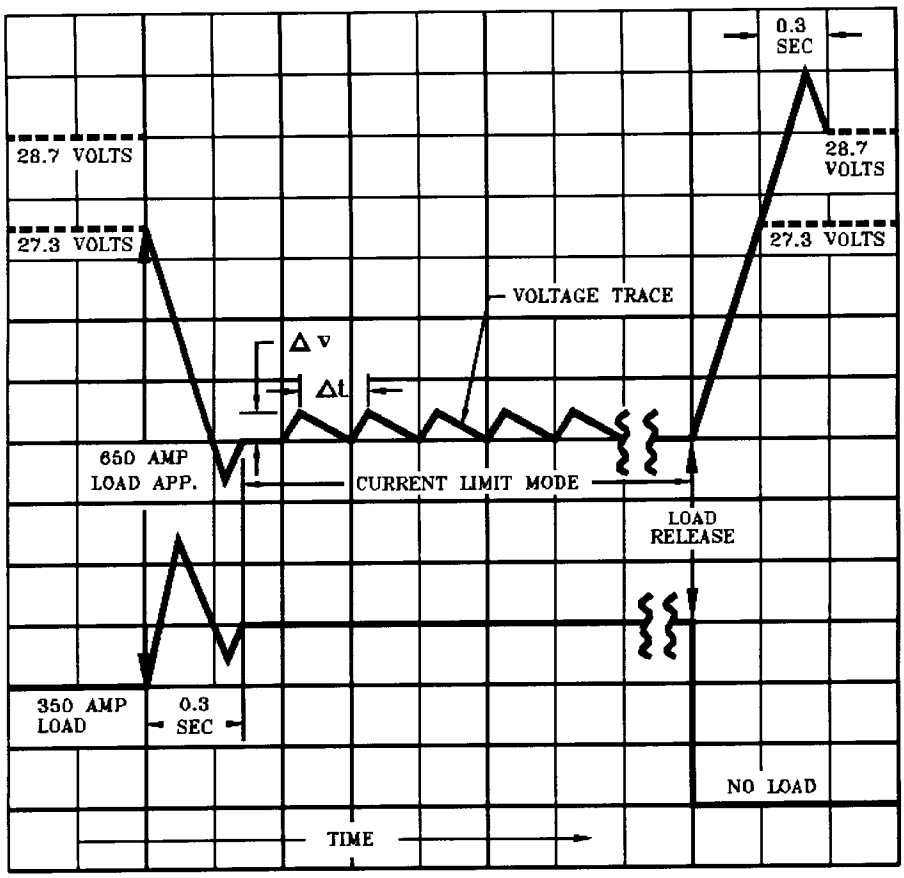



FIGURE 3. Current and voltage recovery time.

3.9.1.8 Field excitation. The regulator shall be activated and boot-strapped to regulation when the generator residual voltage reaches the value specified in 3.9.1.8.1 and 3.9.1.8.2 (see 4.7.9).

3.9.1.8.1 Type I. The residual voltage shall be no more than 1.5 V.

3.9.1.8.2 Types II and III. The residual voltage shall be no more than 0.7 V. For type III only, this requirement shall be met with pin "E" of the battery connector grounded and ungrounded.

3.9.1.9 Effective field circuit resistance.

3.9.1.9.1 Type I. The regulator resistance at all times shall be no greater than 2 ohms (see 4.7.10).

3.9.1.9.2 Types II and III. Not applicable.

3.9.1.10 Negative voltage operation.

3.9.1.10.1 Type I. Not applicable.

3.9.1.10.2 Types II and III. The regulator shall not be damaged by the application of negative voltage (see 4.7.11). For type III only, this requirement shall be met with pin "E" of the battery connector grounded and ungrounded.

3.9.1.11 Field circuit.

3.9.1.11.1 Type I. Not applicable.

3.9.1.11.2 Types II and III. The regulator shall be protected against any inductive energy that may be applied as a result of opening switch $S_1$ shown in figure 4 (see 4.7.12). For type III only, this requirement shall be met with pin "E" of the battery connector grounded and ungrounded.

3.9.1.12 Reverse battery polarity.

3.9.1.12.1 Type I. The regulator shall protect the generating system against damage by opening the circuit and shall prevent reversal of generator polarity (see 4.7.13).

3.9.1.12.2 Type II. Not applicable.

3.9.1.13 Short circuit protection.

3.9.1.13.1 Type I. Not applicable.

3.9.1.13.2 Types II and III. Regulator circuitry shall be provided to prevent damage to internal components in the event of a short circuit from pin "D" or "H" of the generator connector to ground during normal regulator operations (see 4.7.18). For type III only, this requirement shall be met with pin "E" of the battery connector grounded and ungrounded.

3.9.1.14 Generator accessory sensing circuit.

3.9.1.14.1 Type I. Not applicable.

3.9.1.14.2 Types II and III. Pin "H" of the generator connector shall be capable of supplying 0.5 A at a voltage not exceeding 250 mV below the regulated system output voltage ($E_R$) over the operating temperature range of the regulator. (see 4.7.19). For type III only, this requirement shall be met with pin "E" of the battery connector grounded and ungrounded.

3.10 Electromagnetic interference (EMI). The regulator shall limit emissions for Tactical Vehicle Components as specified in 3.10.1 and 3.10.2 (see 4.7.16.8).

3.10.1 Radiated emissions. The radiated emissions shall meet the requirements of RE102 except that the frequency range shall be 150 kilohertz (kHz) to 10 gigahertz (Ghz) (see 4.7.16.8).

3.10.2 Conducted emissions. On a 28 V dc, 50 A lead of the split load, the conducted emissions shall meet the requirements of CE102 of MIL-STD-461 except that the frequency range shall be 50 kHz to 50 mHz (see 4.7.16.8).

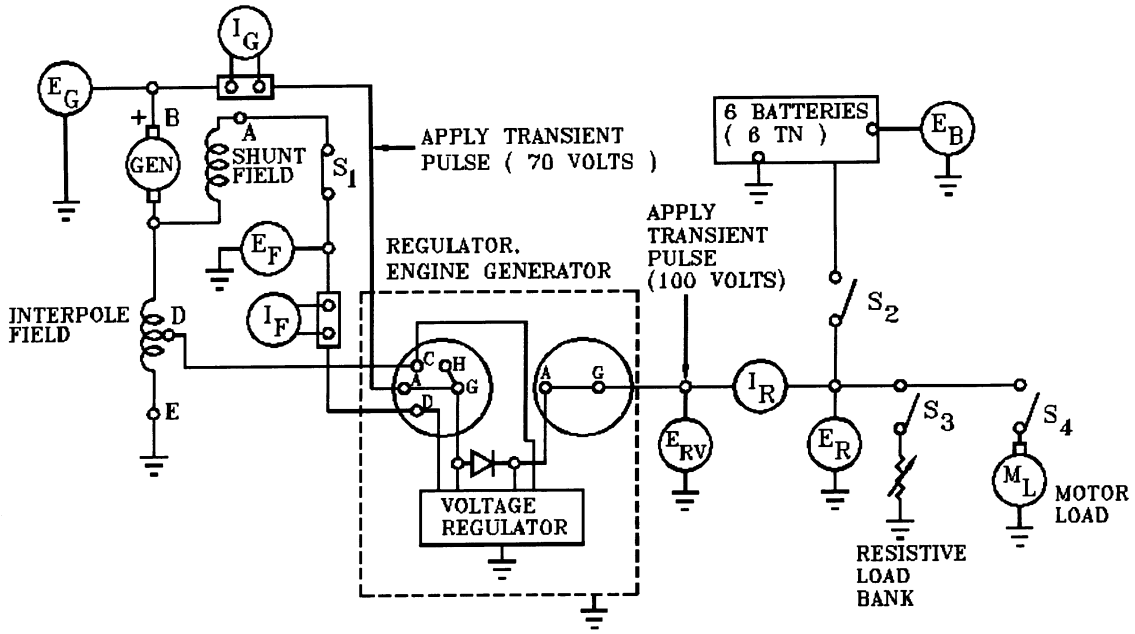
3.11 Finishes. All metallic surfaces shall be treated for corrosion resistance using the appropriate processes that lead to painting as required to meet the performance of this specification (see 4.7.1.1 and 4.7.2).

3.12 Identification and marking.

3.12.1 Marking. Identification markings shall conform with ANSI/SAE AS478.

3.12.2 Nameplate. A nameplate shall be attached to the regulator housing in the manner specified on the applicable standard or drawing. The legend contained on the plate shall include the following (see 4.7.2):

a. Regulator
b. 28 V dc
c. Manufacturer's identification
d. Serial number
e. Military part number
f. Federal stock number
g. Manufacturer's part number
h. Date of manufacture
i. Contract number
j. US




TEST READINGS REQUIRED

| | | |
|---|---|---|
| $I_G$ - GEN AMPS | $E_B$ - BATTERY VOLTS | $S_1$ - SWITCH USED DURING FORDING MS39061-1 OR EQUAL |
| $E_G$ - GEN VOLTS | $E_R$ - REGULATED VOLTAGE | |
| $E_F$ - GEN FIELD VOLTS | $E_{RV}$ - RIPPLE VOLTAGE | $R_L$ - RESISTIVE LOAD BANK |
| $I_F$ - GEN FIELD AMPS | $I_R$ - REVERSE CURRENT | (SEE 4.7.7.2) |

FIGURE 4. Test circuit.

3.13 Workmanship. Workmanship shall be of a quality which assures a product free of burrs, rust, scratches, chips, sharp edges, loose or defective connectors, cracked insulation, faulty soldering, or other defects which adversely affect serviceability or appearance (see 4.7.2).

4. VERIFICATION

4.1 Inspection equipment. Unless otherwise specified in the contract (see 6.2), the contractor is responsible for the provision and maintenance of all inspection equipment necessary to assure that supplies and services conform to contract requirements. Inspection equipment must be capable of repetitive measurements to an accuracy of 10% of the measurement tolerance, except as indicated in tables I and II.

TABLE I. Measuring instrument tolerances for preproduction test.

| Measuring instrument | Accuracy | |
|---|---|---|
| | Type I | Type II |
| Voltmeter dc | ±0.25% | ±0.35% (40 V- full scale) |
| Ammeter dc | ±0.5% (multi-range) | ±0.5% (600 A - full scale) |
| Tachometer | ±1% | ±1% |
| Milliammeter | ----- | ±0.5% (600 mA full scale) |
| Oscilloscope | ±3% | ±3% |

TABLE II. Measuring instrument tolerances of conformance and control test.

| Measuring instrument | Accuracy | |
|---|---|---|
| | Type I | Type II |
| Voltmeter dc | --- | ±0.15 V |
| Ammeter dc | --- | ±3.0 A |
| Tachometer | --- | ±50 rpm at 1900 rpm |
| | --- | ±200 rpm at 10 000 rpm |
| Milliammeter | --- | ±5.0 mA |
| Oscilloscope | --- | ±3% |

4.2 Classification of inspections. The inspection requirements specified herein are classified as follows:

a. First article inspection (see 4.4).
b. Conformance inspections (see 4.5).

4.3 Inspection conditions. Unless otherwise specified (see 6.2), all inspections shall be conducted under the following conditions:

a. Air temperature: 73 ±18°F (23 ±10°C)
b. Barometric pressure: 28.5 ±2 in. (7.1 ±0.5 kilopascals (kPa)) mercury (Hg)
c. Relative humidity: 50 ± 30%

4.3.1 Type I. Unless otherwise specified herein, the test circuit shall include the regulator, battery, and generator. The generator employed in the test circuit shall conform to Drawing 7355736 or Drawing 10950808. The battery shall consist of two 12 V batteries conforming to type 2 HN of MIL-B-11188. The two batteries shall be connected in series. Batteries shall be fully charged (see 6.3.2.1) and shall be kept at room temperature.

4.3.2 Types II and III. The test circuit as shown in figure 4 shall include the regulator, mounted on a horizontal plane, battery and generator. The generator used in the test circuit shall conform to MIL-G-62061. The batteries shall consist of six 12 V batteries conforming to type 6 TL of MIL-B-62346. The six batteries shall be connected in series-parallel. Batteries shall be fully charged (see 6.3.2.2), and kept at room temperature.

4.3.3 Apparatus. In addition to standard measuring equipment (see tables I and II and the applicable test specification), the test apparatus shall include chambers for conducting low temperature -80°F (-62°C), high temperature +225°F tests and a submersion tank.

4.4 First article inspection. Unless otherwise specified (see 6.2), the Government shall select four regulator assemblies produced under the production contract for first article inspection. The selected regulators shall be subjected to the first article tests specified in table III and in the order listed in table IV. Approval of the first article sample by the Government shall not relieve the contractor of his obligation to supply assemblies that are fully representative of those inspected as a first article sample. Any changes or deviation of the production units from the first article sample shall be subject to the approval of the contracting officer (see 3.1).

4.4.1 First article inspection failure. Deficiencies found during, or as a result of, first article inspection shall be cause for rejection of the first article sample until evidence has been provided by the contractor that corrective action has been taken to eliminate the deficiency. Any deficiency found during, or as a result of, first article inspection, shall be evidence that all items already produced prior to completion of the first article inspection are similarly deficient unless contrary evidence satisfactory to the contracting officer is furnished by the contractor. Such deficiencies on all items shall be corrected by the contractor. The Government will not accept products until first article inspection is completed to the satisfaction of the Government.

4.5 Conformance inspections.

4.5.1 Sampling. Sampling requirements, if any, shall be specified in the contract (see 6.2).

4.5.2 Examination. For examination purposes, defects shall be classified as listed in table V.

4.5.3 Tests. Samples selected in accordance with 4.5.1 shall be subjected to the conformance tests as specified in table III, and in the order listed in tables VI and VII.

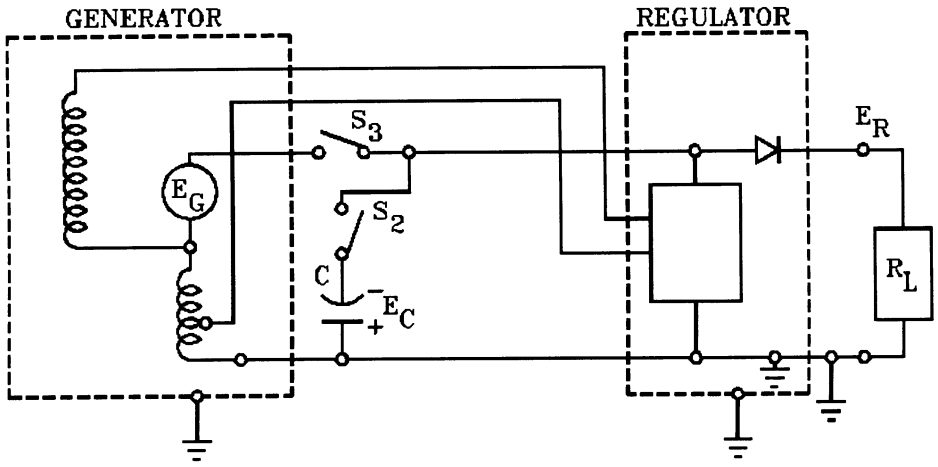



FIGURE 5. Test circuit.

TABLE III. Classification of inspections.

| Title | Requirement | Inspection | First article | | Conformance | | |
|---|---|---|---|---|---|---|---|
| | | | | | Examination | Tests | |
| | | | 1/ | 2/ | | 1/ | 2/ |
| Materials and construction | 3.2, 3.2.1, 3.2.2, and 3.11 | 4.7.1 | X | | | | |
| Defects (see table V) | 3.5.1 thru 3.5.4, 3.11 | 4.7.2 | X | | X | | |
| Weight | 3.5.5 | 4.7.3 | X | | | | |
| Reverse current | 3.9.1.1 | 4.7.4 | X | | | X | |
| Voltage regulation | 3.9.1.4 | 4.7.5.1 | X | | | X | |
| | | 4.7.5.2 | | X | | | X |
| Voltage ripple | 3.9.1.5 | 4.7.6 | X | | | | |

TABLE III. Classification of inspections - Continued.

| Title | Requirement | Inspection | First article | | Conformance | | |
|---|---|---|---|---|---|---|---|
| | | | | | Exami- | Tests | |
| | | | 1/ | 2/ | nation | 1/ | 2/ |
| Current regulation | 3.9.1.6 | 4.7.7.1 | X | | | X | |
| | | 4.7.7.2 | | X | | | |
| Overvoltage | 3.9.1.7 | 4.7.8 | X | | | | X |
| Field excitation | 3.9.1.8 | 4.7.9 | X | | | | X |
| Effective field circuit resistance | 3.9.1.9 | 4.7.10 | X | X | | | |
| Negative voltage operation | 3.9.1.10 | 4.7.11 | X | X | | | X |
| Field circuit | 3.9.1.11 | 4.7.12 | X | X | | | |
| Reverse battery polarity | 3.9.1.12 | 4.7.13 | X | X | | | |
| Short circuit protection | 3.9.1.13 | 4.7.18 | | X | | | |
| Generator accessory sensing circuit | 3.9.1.14 | 4.7.19 | | X | | | |
| Transient voltage | 3.9.1.2 | 4.7.14.1 | X | | | | |
| | | 4.7.14.2 | | X | | | |
| Load switching | 3.9.1.3 | 4.7.15 | X | X | | | |
| High temperature | 3.3.1 | 4.7.16.1.1 | X | | | | |
| | | 4.7.16.1.2 | | X | | | |
| Low temperature | 3.3.2 | 4.7.16.2.1 | X | | | | |
| | | 4.7.16.2.2 | | X | | | |
| Vibration | 3.3.3 | 4.7.16.3 | X | X | | | |
| Shock | 3.3.4 | 4.7.16.4 | X | X | | | |
| Corrosion resistance | 3.3.5 | 4.7.16.5 | X | X | | | |
| Fungus resistance | 3.3.6 | 4.7.16.6 | X | X | | | |
| Waterproofness | 3.3.7 | 4.7.16.7.1 | X | | | X | |
| | | 4.7.16.7.2 | | X | | | X |
| Electromagnetic interference | 3.10 | 4.7.16.8 | X | X | | | |
| Endurance | 3.6.2 | 4.7.17 | X | X | | | |

1/ Type I regulator.
2/ Types II and III regulator.

TABLE IV. Sequence of first article inspection.

| Test | Paragraph | Sample | | | |
|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 |
| Reverse current | 4.7.4 | X | X | X | X |
| Voltage regulation | 4.7.5 | X | X | X | X |
| Voltage ripple | 4.7.6 | X | X | X | |
| Current regulation | 4.7.7 | X | X | X | |
| Field excitation | 4.7.9 | X | X | X | |
| High temperature | 4.7.16.1 | | X | X | |
| Low temperature | 4.7.16.2 | | X | X | |
| Endurance | 4.7.17 | X | | | |
| Vibration | 4.7.16.3 | | X | X | |
| Shock | 4.7.16.4 | | X | X | |
| Waterproofness | 4.7.16.7 | X | X | X | |
| Corrosion resistance | 4.7.16.5 | | X | | |
| Transient voltage | 4.7.14 | | X | X | |
| Overvoltage | 4.7.8 | X | X | X | |
| Fungus resistance | 4.7.16.6 | | | X | |
| Electromagnetic interference | 4.7.16.8 | | | | X |
| Field circuit | 4.7.12 | X | X | X | |
| Negative voltage operation | 4.7.11 | X | X | | |
| Short circuit protection | 4.7.18 | X | X | X | |
| Generator accessory sensing circuit | 4.7.19 | X | X | X | |

TABLE V. Classification of defects.

| Category | Defect | Method of examination |
|---|---|---|
| Critical | None | |
| Major: | | |
| 101 | Assembly incomplete (see 3.5). | Visual |
| 102 | Nonconformance in design and construction (see 3.5.3 and 3.5.4). | Visual |
| 103 | Dimensions affecting interchangeability, out of tolerance (see 3.5.4, 3.5.1). | SIE 1/ |

TABLE V. Classification of defects - Continued.

| Category | Defect | Method of examination |
|---|---|---|
| 104 | Finish, improper application (see 3.11). | SIE |
| 105 | Identification marking improper (see 3.12). | Visual |
| 106 | Faulty workmanship affecting performance (see 3.2). | Visual |
| Minor: | | |
| 201 | Dimensions not affecting interchangeability, out of tolerance (see 3.5.1). | Visual |
| 202 | Faulty workmanship affecting appearance (see 3.13). | Visual |

1/ SIE = Standard Inspection Equipment.

TABLE VI. Sequence of conformance tests (type I).

| Test | Paragraph |
|---|---|
| Reverse current | 4.7.4 |
| Voltage regulation | 4.7.5 |
| Current regulation | 4.7.7 |
| Waterproofness | 4.7.16.7 |

TABLE VII. Sequence of conformance tests (types II and III).

| Test | Paragraph |
|---|---|
| Voltage regulation | 4.7.5 |
| Current regulation | 4.7.7.2 |
| Generator accessory sensing circuit | 4.7.19 |
| Overvoltage | 4.7.8 |
| Field excitation | 4.7.9 |
| Negative voltage operation | 4.7.11 |
| Waterproofness | 4.7.16.7 |

4.6 Failure. Failure of any assembly to pass any of the specified conformance tests shall be cause for Government to refuse acceptance of the production quantity represented, until action taken by the contractor to correct defects and prevent recurrence has been approved by the Government.

4.7 Methods of inspection.

4.7.1 Materials and construction. Conformance to 3.2, 3.2.1, 3.2.2, 3.5.1 through 3.5.5.2 and 3.11 shall be determined by inspection of contractor records providing proof or certification that design, construction, processing, and materials conform to requirements.

Applicable records shall include drawings, specifications, design data, receiving inspection records, processing and quality control standards, vendor catalogs and certifications, industry standards, test reports, and rating data.

4.7.1.1 Finishes. All materials that are cleaned, coated, plated, primed and or painted shall conform with MIL-T-704 (see 3.11).

4.7.2 Defects. Conformance to 3.3.2, 3.5.1 through 3.5.4 and 3.11 through 3.13 shall be determined by examination for the defects listed in table V. Examination shall be visual, tactile, or by measurement with standard inspection equipment.

4.7.3 Weight (types II and III). To determine conformance to 3.5.5.2, the regulator shall be weighed.

4.7.4 Reverse current. To determine conformance to 3.9.1.1, the stabilized regulator (see 6.3.1) shall be connected to the test circuit with the generator operating at sufficient speed to deliver charging current to the battery. The maximum value of the reverse current shall be observed on the ammeter or milliammeter. Five test cycles shall be observed.

4.7.5 Voltage regulation.

4.7.5.1 Type I. To determine conformance to 3.9.1.4.1, the operationally stabilized regulator (see 6.3.1.1) shall be connected in the test circuit. During the test, the resistance load shall be applied and removed suddenly. Observations shall be made of the output voltage while the regulator is being subjected to the following test procedure.

a. Increase generator speed from zero, and operate generator at 2000 rpm with resistance load at zero.
b. With generator at 2000 rpm, add resistance load to establish a total load of 20 amps.
c. Increase generator speed to 5000 rpm and maintain the 20 A load.
d. With generator at 5000 rpm, remove the resistance load.
e. Increase generator speed to 8000 rpm with resistance load at zero.
f. With generator at 8000 rpm, add resistance load to establish a total load of 20 A.
g. Decrease generator speed to 2000 rpm and maintain the 20 A load.
h. With generator at 2000 rpm, remove the resistance load.
j. Increase generator speed to 8000 rpm with resistance load at zero.

4.7.5.2 Types II and III(first article). To determine conformance to 3.9.1.4.2, the temperature stabilized regulator (see 6.3.1.2) shall be connected in the test circuit. During the test, the resistance load shall be applied and removed suddenly. The change in load shall be

accomplished in 10 ms maximum time. Tripping of overvoltage reset due to quick reaction shall constitute failure. Observation shall be made of the output voltage while the regulator is being subjected to the following test procedure.

| | RPM | Load(A) |
|---|---|---|
| a. | 2400 ±50 | 25 |
| | 2400 ±50 | 100 |
| | 2400 ±50 | 350 |
| b. | 5500 ±110 | same sequence as in (a) |
| c. | 8000 ±160 | same sequence as in (a) |

$E_R$ to be measured on any recording device having a bandwidth of 5 kilohertz or greater in order to obtain the time and amplitude as shown in figure 1.

4.7.5.3 Types II and III (conformance). The generator shall be operated at 5500 rpm with a 350 A load. The regulated voltage shall be determined with the regulator at an ambient temperature of 80 ±15°F under the following conditions.

| RPM | Load (A) |
|---|---|
| 2400 ±50 | Battery load only |
| 2400 ±50 | 350 |
| 8000 ±160 | Battery load only |
| 8000 ±160 | 350 |

4.7.6 Voltage ripple (types II and III). To determine conformance to 3.9.1.5.2, using the test procedure specified in 4.7.5.2 and 4.7.5.3, the output voltage waveform at the regulator output shall be measured with an oscilloscope as shown in figure 4. Repeat the procedure with batteries disconnected.

4.7.7 Current regulation.

4.7.7.1 Type I. To determine conformance to 3.9.1.6.1, with the regulator operationally stabilized (see 6.3.1.1), the generator operating at 5000 rpm, and the battery disconnected from the test circuit, the resistance load shall be adjusted to establish current regulation. The resistance load shall be further adjusted until the voltage output has been reduced from a maximum voltage 28 V at -65°F (-54°C), 27 V at 77°F (25°C), and 25 V at 225°F (107°C) to 6V. An ammeter shall be observed to verify current reading. Below 18V, only the maximum current limit value shall apply (38 A at -65°F, 30 A at 77°F, and 24 A at 225°F). The procedure shall be repeated except that the battery shall be connected in the test circuit and the ammeter shall be observed for current reading at 25 V.

4.7.7.2 Types II (first article) and III (pin E ungrounded). To determine conformance to 3.9.1.6.2a and b, the regulator shall be operated, without batteries connected, at a generator speed at 2400 rpm. Resistive loads of 0.08, 0.07, 0.06, 0.05, 0.04, 0.03, and 0.028 ohms shall be applied and generator current ($I_G$) shall be recorded for each of the seven loads. To determine conformance to 3.9.1.6.2c, d and e, a 0.028 ohm resistive load shall be suddenly applied and released. Load application time and load release time shall not exceed 10 ms. Repeat this test at 5500 rpm and 8000 rpm.

4.7.7.3 Types II (conformance) and III (pin E ungrounded). To determine conformance to 3.9.1.6.2, the regulator shall be operated, without batteries connected, with the generator speed at 5500 rpm. $I_G$ shall be recorded with a 0.08 ohm load applied and again with a 0.028 ohm applied.

4.7.7.4 Type III (pin E grounded) (first article). To determine conformance to 3.9.1.6.3a and b, the batteries shall be operated, with pin E of the battery connector grounded, without batteries connected, at a generator speed of 3000 rpm. Resistive loads of 0.28, 0.20, 0.17, 0.14, 0.11 and 0.09 ohms shall be applied and generator current (Ig) shall be recorded for each of the six loads. To determine conformance to 3.9.1.6.3c, d and e, a 0.09 ohm resistive load shall be suddenly applied and released. Load application time and load release time shall not exceed 10 ms.

4.7.7.5 Type III (pin E grounded) (conformance). To determine conformance to 3.9.1.6.3, the regulator shall be operated, with pin E of the battery connector grounded, without batteries connected, with the generator speed at 3000 rpm. Ig shall be recorded with a 0.28 ohm load applied and again with a 0.09 ohm applied.

4.7.8 Overvoltage.

4.7.8.1 First article. To determine conformance to 3.9.1.7.2, the regulator shall be connected to a dc power supply. The voltage shall be increased from 28 V by application of a step voltage of approximately 6 V. The voltage level and reaction time shall be measured.

4.7.8.2 Conformance. To determine conformance to 3.9.1.7.2, the regulator shall be connected to a dc power supply. With 32 V applied, the overvoltage protection circuit shall not activate. With 34 V applied, the overvoltage protection circuit shall activate.

4.7.9 Field excitation. To determine conformance to 3.9.1.8, the regulator shall be connected in the circuit of figure 4 with batteries disconnected, S1 open and the generator operating at constant speed. An external power supply shall be momentarily connected to the generator field with its polarity reversed. This momentary connection shall be repeated until the residual voltage is less than 0.7 V. The residual voltage shall be measured. The regulator shall excite and bootstrap to its nominal output when S1 is closed.

4.7.10 Effective field circuit resistance (type I). To determine conformance to 3.9.1.9, the operationally stabilized regulator shall be connected in the test circuit with battery disconnected. The generator speed shall be gradually increased from zero to produce a field current of 0.8 A in the unregulated mode and a load current adjusted to 18 A. The field current and generator-to-field voltage drop shall be measured and the effective field circuit resistance shall be determined.

4.7.11 Negative voltage.

4.7.11.1 Negative voltage operation (types II and III) (first article). To determine conformance to 3.9.1.10.2, the regulator shall be operated until temperature stabilization. Then it shall be subjected to the following test procedure using the test circuit shown in figure 6 (batteries shall be fully charged).

a. Arrange the test set-up as shown on the circuit diagram on figure 6 with S1, S2, and S3 open.
b. Close S2 for 1 to 5 seconds, then open S2.
c. Close S3 with generator at 2400 $\pm$50 rpm. Observe generator output ($I_G$), which should be less than 200 A. If $I_G$ indicates 200 A or more, open S3 and discontinue test due to failure. If $I_G$ does not exceed 200 A, close S1 and test regulator in accordance with 4.7.7.2, 4.7.8 and 4.7.5.2.
d. Open S1, S2, and S3 . Lock generator to prevent rotation (rotation less than 10 rpm is permissible). Close S3 and reverse the polarity of V2 for 10 seconds, then return polarity to normal. Repeat step (c) and determine that output is as specified. Momentary excursion of $I_g$ beyond 200 A is permissible.

NOTE: Steps (b) and (c) test for ability to withstand reverse generator operation. Step (d) tests the ability to withstand reverse slave battery operation.

4.7.11.2 Negative voltage operation (conformance). To determine conformance to 3.9.1.10, the regulator shall be subjected to the following test procedure using the test circuit of figure 6:

a. Close S2 from 1 to 5 seconds, then open.
b. Lock the generator to prevent rotation (rotation of less than 10 rpm is permissible). Close S3 and reverse the polarity of V2 for 10 seconds. Return polarity to normal.

NOTE: Step (a) tests for ability to withstand reverse generator operation. Step (b) tests for ability to withstand reverse slave battery operation.

4.7.12 Field circuit (types II and III). To determine conformance to 3.9.11.2, the regulator shall be tested as follows:

a. With the generator operating at 2400 rpm in the circuit shown on figure 4 with a 30 A load, switch S1 shall be opened and closed 5 times. The load shall be increased to 400 A and the procedure repeated.
b. Procedure (a) shall be repeated with the generator operating at 8000 rpm.

4.7.13 Reverse battery polarity. To determine conformance to 3.9.1.12, the regulator shall be connected in the test circuit. With the generator inoperative, the battery polarity shall be reversed and a voltage applied in increments from maximum voltage to a minimum of 6 V. During the tests, checks for open circuit shall be made.

4.7.14 Transient voltage.

4.7.14.1 Type I. To determine conformance to 3.9.1.2.1, the regulator shall be connected in the test circuit with the battery disconnected and the generating system inoperative. A negative voltage pulse of 100 V, square wave, of 50 ms duration, shall be applied to the regulator output terminal, once every 2 seconds, equally spaced, for a period of 10 minutes. The test shall then be repeated, except that the voltage pulse shall be positive and the period shall be 5 minutes. At the conclusion of this test, the regulator shall pass the tests of 4.7.4 through 4.7.7.

4.7.14.2 Types II and III. To determine conformance to 3.9.1.2.2, the regulator shall be disconnected from the test circuit as shown in figure 4 and stored for 24 hours at 215° $\pm$5°F. It shall then be tested in an ambient temperature of 215° $\pm$5°F as follows. A voltage pulse of 100 V, square wave, not more than 160 microseconds rise time, of 50 ms duration shall be applied to the regulator output terminal once every 6 seconds, equally spaced for a period of 3 hours. The test shall be repeated except that a voltage pulse of 70 V shall be applied to the input terminal of the regulator.

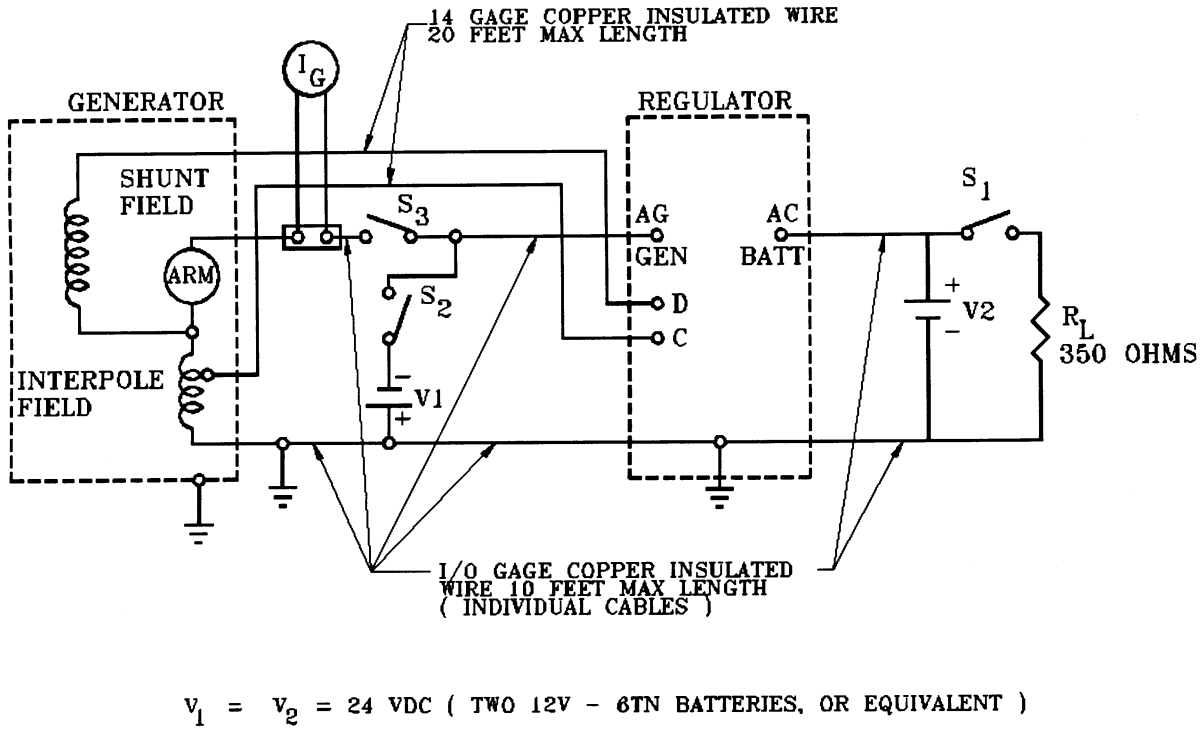



FIGURE 6. Negative voltage circuit.

4.7.14.2.1 Negative transient voltage. The regulator shall be temperature stabilized at 215° ±5°F for a period of one hour before being subjected to five cycles of the following two-step test procedure, using the test circuit shown in figure 5. Steps one and two shall constitute a cycle and the cycle shall be repeated five times.

Step 1:
a. Capacitor C shall be charged to a voltage ($E_C$) of 595 ±5 V.
b. Switch $S_2$ shall be closed ($E_C$ is applied to the input terminal of the regulator) for a period of 6 seconds and then opened.

Step 2:
a. With the generator running at a speed between 2400 and 3000 rpm, switch $S_3$ shall be closed for 1 minute minimum.
b. Capacitor C shall be charged to an $E_C$ of 595 ±5 V and switch $S_2$ closed for a period of 6 seconds minimum.
c. Open all switches.

4.7.15 Load switching.

4.7.15.1 Type I. To determine conformance to 3.9.1.3.1, the regulator shall be connected in the test circuit with the battery disconnected. With the generator speed at 5000 rpm, the resistance load shall be adjusted to deliver a current regulated load of 28 V at -65° F, 27 V at 77°F and 25 V at +225°F. The load shall be switched on for one second, off for one second, and repeated for a period of 15 minutes. Load switching time shall be 1.5 ±0.5 ms. At the conclusion of this test, the regulator shall pass the test of 4.7.4, 4.7.5.1 and 4.7.7.1.

4.7.15.2 Types II and III. Not applicable.

4.7.16 Environmental conditions.

4.7.16.1 High temperature.

4.7.16.1.1 Type I. To determine conformance to 3.3.1.1, the regulator shall be stored for 24 hours in an ambient temperature of 225 ±5°F. With ambient temperature maintained at 225 ±5°F, the regulator shall be tested to verify meeting requirements of 3.9.1.8, 3.9.1.12, 3.9.1.2.1, and 3.9.1.3.1. While remaining at the same ambient temperature and connected in the test circuit, the regulator shall function continuously with a field current of 0.75 A for one-half hour at each of the following conditions:

a. Output voltage of 25 V in the current regulated mode.
b. Load current of 12.5 A in the voltage regulated mode. Then the regulator shall be returned to an ambient room temperature of 77° ±15°F and tested as specified in 4.7.12, 4.7.4., 4.7.5.1 and 4.7.7.1.

4.7.16.1.2 Types II and III. To determine conformance to 3.3.1.2, the regulator shall be stored for 24 hours in an ambient temperature of 215 ±5°F. With ambient temperature maintained at 215 ±5°F, the regulator shall function continuously for 4 hours while the generator speed and output load are adjusted to produce 2400 rpm and 400 A. While remaining at the same ambient temperature, the regulator shall be tested as specified in 4.7.4, 4.7.5, 4.7.8, 4.7.9, 4.7.11 and 4.7.14. The regulator shall be returned to an ambient temperature of 80° ±5°F and tested as specified in 4.7.4, 4.7.7.2.1, and 4.7.8.

4.7.16.2 Low temperature.

4.7.16.2.1 Type I. To determine conformance to 3.3.2.1, the regulator shall be stored for 24 hours in an ambient temperature of -80° ±5°F. The regulator shall then be tested in the following order in an ambient temperature of -65° ±5°F in accordance with 4.7.4 4.7.5, 4.7.6, 4.7.9, 4.7.10, 4.7.13, 4.7.14.1 and 4.7.15.1.

4.7.16.2.2 Types II and III. To determine conformance to 3.3.2.2, the regulator shall be stored for 24 hours in an ambient temperature of -80° ±5°F. After stabilizing for 4 hours at -65° ±5°F, the regulator shall function continuously for 1 hour while the generator speed and output load are adjusted to produce 2400 rpm and 400 A. While remaining in an ambient temperature of -65° ±5°F, the regulator shall be tested as specified in 4.7.4, 4.7.5, 4.7.8, 4.7.9, 4.7.11, and 4.7.14. The regulator shall be returned to an ambient temperature of +80° ±5°F and tested as specified in 4.7.4, 4.7.7.2.1, and 4.7.8.

4.7.16.3 Vibration. To determine conformance to 3.3.3, the regulator shall be tested in accordance with MIL-STD-202, method 204D , condition A, except that the sweep time shall be performed 24 times. At the conclusion of this test, the regulator shall pass the tests of 4.7.4 through 4.7.7.

4.7.16.4 Shock. To determine conformance to 3.3.4, the regulator shall be tested in accordance with MIL-STD-202, method 213B, condition A. At the conclusion of this test, the regulator shall pass the tests of 4.7.4 through 4.7.7.

4.7.16.5 Corrosion protection. The regulator shall be fabricated from compatible materials with resistance to corrosion equal to or exceeding that provided by hot dip galvanized 1010 steel in accordance with ASTM A123, with a minimum zinc coating thickness of G45 to G55 (nominal 2 mils) on steel sheet less than 0.0625 in. thick, 2.5 mils on steel sheet greater than 0.0625 in. thick or 0.75 mil on pre-galvanized steel sheet 0.0625 in. thick, or 0.75 mil on pre-galvanized steel sheet 0.065 in. or less in accordance with ASTM A924, which refers to ASTM A653 thickness G60. A representative regulator shall be capable of meeting or exceeding the corrosion resistance provided by a zinc galvanized sample (as described above) when subjected to the accelerated corrosion test (ACT) ASTM B117, 200 hours exposure. At the conclusion of the ACT, the regulator shall pass the tests of 4.7.4 through 4.7.7.

4.7.16.6 Fungus resistance. To determine conformance to 3.3.6, the regulator shall be tested in accordance with MIL-F-13927, class 1, except that the period of exposure shall be a continuous 90 days. At the conclusion of this test, the regulator shall pass the tests of 4.7.4 through 4.7.7.

4.7.16.7 Waterproofness. To determine conformance to 3.3.7, the regulator shall be tested as specified herein.

4.7.16.7.1 Type I (nonoperational). The regulator shall be tested in accordance with MIL-STD-1184 for class 2, type II, except that tap water shall be used instead of a salt water solution. Electrical operation during submersion is not required. At the conclusion of this test, the regulator shall pass the tests of 4.7.4 through 4.7.7.

4.7.16.7.2 Types II and III (operational) first article. The regulator shall be tested in accordance with MIL-STD-1184 for class 2, type II, except 10 pounds per square inch (psi) pressure and 10 psi vacuum shall be applied. During submersion, the regulator shall be subjected to 10 psig for a period of 5 minutes. The regulator while submerged shall be operable and shall be tested in accordance with 4.7.5.2 during the pressure and vacuum tests phases.

4.7.16.7.3 Types II and III (nonoperational) conformance. For conformance tests, non-operating regulators shall be tested in accordance with MIL-STD-1184, class 2, type II, except 10 psi pressure shall be applied for a period of 1 minute.

4.7.16.8 Electromagnetic interference. To determine conformance to 3.10, the regulator shall be tested in accordance with MIL-STD-462 and figure 7.

4.7.17 Endurance.

4.7.17.1 Type I. To determine conformance to 3.6.2.1, the regulator shall function continuously when cycled in accordance with figure 8 at 24 cycles per hour for 2000 hours. Each 1000 hour test period shall be divided into time-temperature periods; and each time-temperature period shall be divided between different resistance loads as specified in table VIII. After each 1000 hour test period, the regulator shall pass the test of 4.7.15.1 and 4.7.4 through 4.7.7.

TABLE VIII. Endurance test sequence.

| Time (hours) | Temperature (°F) | Resistance load | |
|---|---|---|---|
| | | One-half of time temperature period (amperes) | One-half of time temperature period (amperes) |
| 190 | 225 | 18 | 4 |
| 190 | 77 | 23.5 | 4 |
| 50 | -65 | 29 | 4 |
| 140 | 0 | 27 | 4 |
| 190 | 77 | 23.5 | 4 |
| 240 | 160 | 20 | 4 |

4.7.17.2 Types II and III. To determine conformance to 3.6.2.2, the regulator shall be cycled at 18 cycles per hour for 1000 hours. The 1000 hours shall be divided into 500 hours with generator operating at 2400 rpm. 300 hours at 4000 rpm, 150 hours at 6000 rpm and 50 hours at 8000 rpm. A cycle shall consist of generator operation for 25 seconds each at battery load, 100 A, 200 A, 300A, 400 A, followed by a reduction to 300 A, 200 A, 100 A and then at battery load. At the conclusion of this test, the regulator shall pass the tests of 4.7.4 through 4.7.7.

4.7.18 Short circuit protection. To determine conformance to 3.9.1.13, with the regulator connected and operating in the test circuit shown on figure 4; pin "D" of the generator connector shall be connected to ground and this connection shall be maintained for ten (10) seconds minimum. The ground connection shall be removed, the reset switch shall be depressed, and this test shall be repeated for pin "H" of the generator connector. Subsequent to this test the regulator shall meet the requirements of 4.7.5.

4.7.19 Generator accessory sensing circuit. To determine conformance to 3.9.1.14, a resistive load shall be connected to pin "H" and the regulator shall be operated in the test circuit of figure 4. With a minimum of 0.5A load current on pin "H", the voltage on pin "H" shall be observed and recorded to be within the specified limits.

## 5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of materiel is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Department or Defense Agency, or within the Military Department's System Command. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

## 6. NOTES

6.1 Intended use. The regulators covered by this specification are intended for use in 28 V dc nominal electrical systems equipped with charging generators. The regulators are intended for use on tactical and combat military vehicles and industrial applications.

6.2 Acquisition requirements. Acquisition documents must specify the following:

a. Title, number, and date of this specification.
b. Issue of DoDISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.2.1 and 2.3).
c. When first article is required (see 3.1).
d. Title, number, and date of the applicable drawing (see 3.5.1).
e. If responsibility for inspection equipment should be other than as specified (see 4.1).
f. If inspection conditions should be other than as specified (see 4.3).
g. If sample size for first article inspection should be other than as specified (see 4.4).
h. If sampling is required (see 4.5.1).
i. Packaging requirements (see 5.1).

6.3 Definitions.

6.3.1 Stabilized regulator.

6.3.1.1 Type I. A temperature stabilized regulator is defined as a regulator which has operated for one hour with the generator speed adjusted to 3000 rpm and the load adjusted to 12.5 A (see 4.7.5.1).

6.3.1.2 Types II and III. A temperature stabilized regulator is defined as a regulator which has been operated for 30 minutes with the generator speed adjusted to 2400 rpm, the load adjusted to 175 A and at ambient room temperature (see 4.7.5.2).

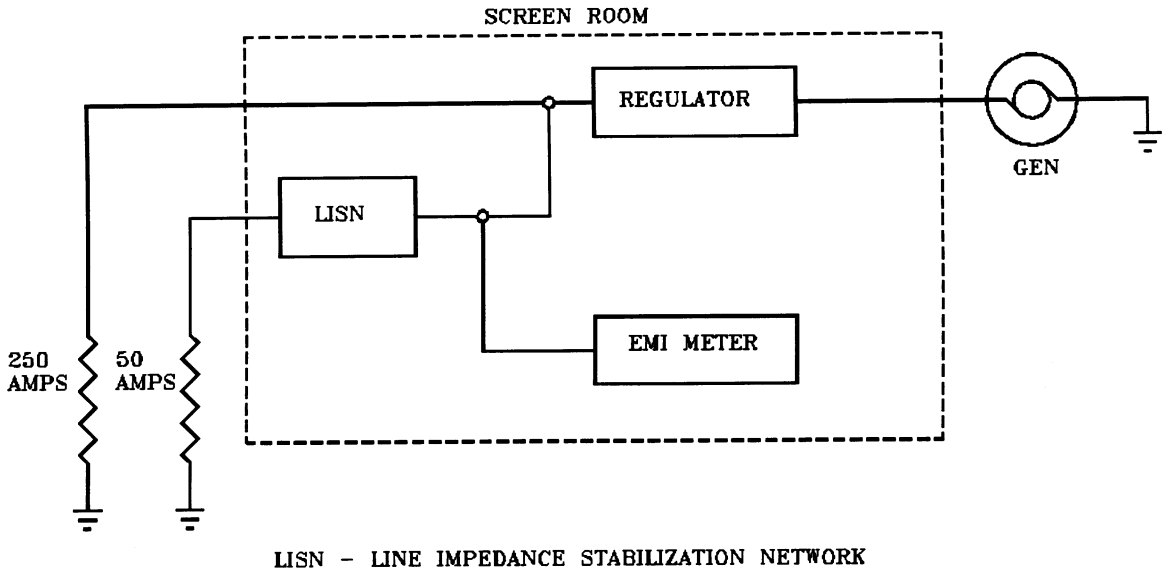



FIGURE 7. Electromagnetic interference tests.

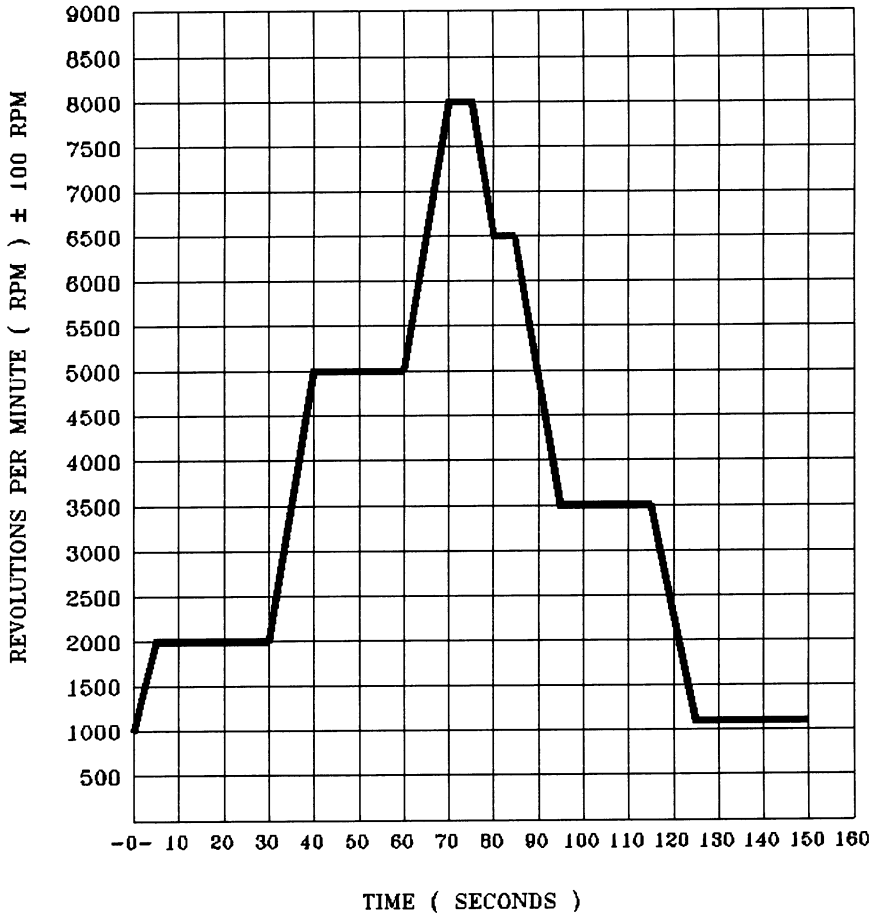



FIGURE 8. Endurance cycle.

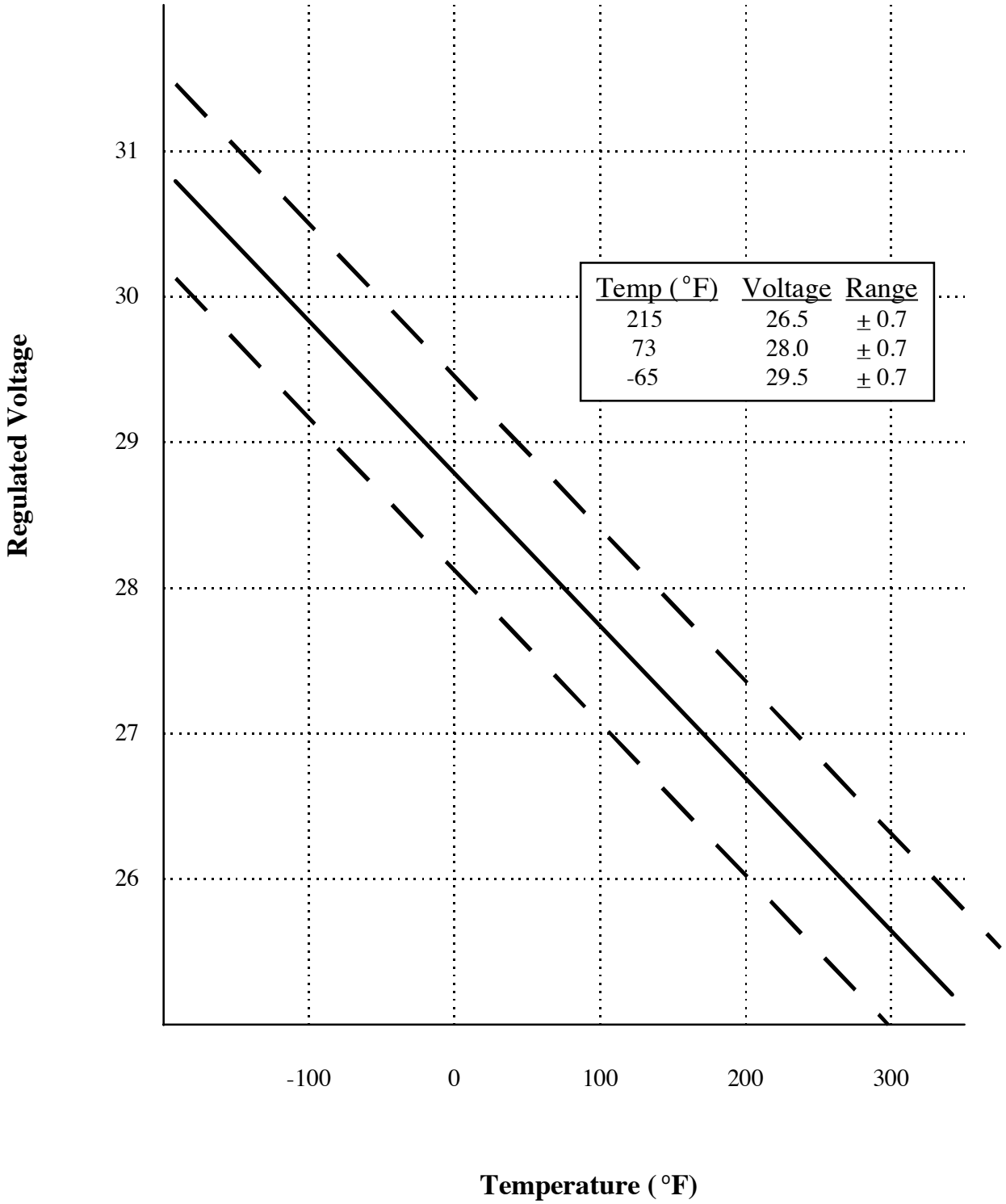



Figure 9. Temperature compensated voltage.

6.3.2 Fully charged battery.

6.3.2.1 Type I. For the purposes of the test procedures in this specification, a fully charged battery is defined as a battery having a current consumption of not more than 2 A at 28 V at ambient room temperature (see 4.3.1).

6.3.2.2 Types II and III. For the purposes of the test procedures in this specification, a fully charged battery is defined as a battery having a current consumption of not more than 4 A at 28 V at ambient room temperature (see 4.3.2).

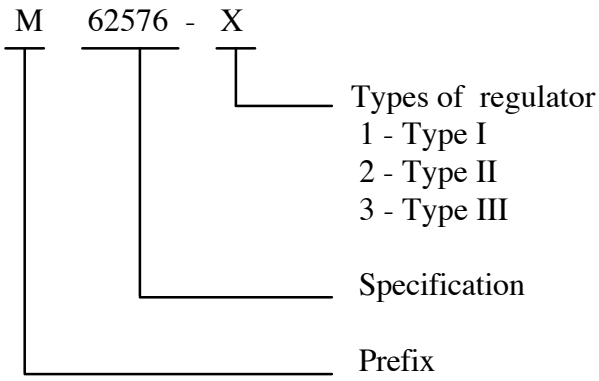
6.3.3 Load current. Load current, for purposes of this specification, should be considered as that current from generator and regulator to batteries and resistive load (see figure 4).

6.3.4. Recovered materials. "Recovered materials" means materials that have been collected or recovered from solid waste (see 6.3.5).

6.3.5 Solid waste. "Solid waste" means (a) any garbage, refuse, or sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility; and (b) other discarded material, including solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations, and from community activities. It does not include solid or dissolved material in domestic sewage, or solid or dissolved material in irrigation return flows or industrial discharges which are point sources subject to permits under section 402 of the Clean Water Act, (33 U.S.C. 1342 et seq.) or source nuclear, or byproduct material as defined by the atomic Energy Act of 1954 (42 U.S.C. 2011 et seq.) (Source: Federal Acquisition Regulations, section 23.402).

6.4 Cross-reference of classification. Type I regulator replaces the cancelled regulator specification MIL-R-62067(AT), type II regulator replaces the cancelled regulator specification MIL-R-62104(AT), and type III regulator replaces the cancelled ATPD 2062.

6.5 Part or Identifying Number (PIN). The PIN to be used for regulators acquired to this specification are created as follows:




6.6 Subject term (key word) listing.

DC voltage
Steady state voltage
Voltage controller

6.7 Supersession data. This specification supersedes MIL-R-62067B(AT), dated 18 September 1974, MIL-R-62104C(AT), dated 21 March 1979, and ATPD 2062, Amendment 2, dated 5 January 1983.

Custodians:
Army - AT
Navy - YD1

Review Activities:
Army - AV
DLA - CS

Preparing Activity:
Army - AT

(Project 2920-0460)

# STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.

2. The submitter of this form must complete blocks 4, 5, 6, and 7.

3. The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

| **I RECOMMEND A CHANGE:** | **1. DOCUMENT NUMBER** MIL-PRF-62576A | **2. DOCUMENT DATE (YYMMDD)** 970313 |
|---|---|---|

**3. DOCUMENT TITLE** REGULATOR, ENGINE GENERATOR

**4. NATURE OF CHANGE** *(Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)*

**5. REASON FOR RECOMMENDATION**

**6. SUBMITTER**

| a. NAME *(Last, First, Middle Initial)* | b. ORGANIZATION | |
|---|---|---|
| c. ADDRESS *(Include Zip Code)* | d. TELEPHONE (Include Area Code)<br>(1) Commercial<br>(2) AUTOVON *(if applicable)* | **7.DATE SUBMITTED** (YYMMDD) |

**8. PREPARING ACTIVITY**

| a. NAME COMMANDER<br>U.S. ARMY TANK-AUTOMOTIVE AND ARMAMENTS COMMAND | b. TELEPHONE *Include Area Code)*<br>(1) Commercial (810) 574-8745<br>(2) AUTOVON 786-8745 |
|---|---|
| c. ADDRESS *(Include Zip Code)*<br>ATTN: AMSTA-TR-E/BLUE<br>Warren, MI 48397-5000 | **IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT:**<br>DEFENSE QUALITY AND STANDARDIZATION OFFICE<br>5203 Leesburg Pike, Suite 1403, Falls Church, VA 22401-3466<br>Telephone (703) 756-2340 AUTOVON 289-2340 |