INCH-POUND

MIL-PRF-21480/24(AS)
22 March 2010
SUPERSEDING
MS90325G(AS)
15 February 1980

PERFORMANCE SPECIFICATION SHEET

GENERATOR SYSTEM, ALTERNATING CURRENT INTEGRALLY EXCITED, BRUSHLESS (P-3 AIRCRAFT)

This specification is approved for use by the Naval Air Systems Command and is available for use by all Departments and Agencies of the Department of Defense

The requirements for acquiring the product described herein shall consist of this specification sheet and MIL-PRF-21480.

SCOPE

1. Generator class. The generator is classified as a class W as modified herein.

2. Part or identifying number (PIN). Components that make up the generator systems covered by this specification sheet are identified using the following PIN:

Generator - MS90325-1 (see figure 1)
Generator Control Unit (GCU) – MS90325-4 (see figure 3)
Current Transformer (CT) – MS90325-5 (see figure 4)

APPLICABLE DOCUMENTS

1. Add the following specifications and standards to MIL-PRF-21480:

2.2.1 Specifications and standards. Add the following documents:

MIL-PRF-27617	Grease, Aircraft and Instrument, Fuel and Oxidizer Resistant.
MIL-PRF-83287/1	Indicators, Fault Locating, Flag Indicating, Mechanical Reset.
MS14169	Circular Spline and Adapter Details Engine Driven Accessories.

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MS18056	Mounting flanges for Aircraft Electric Equipment, Circular, 5-, 8-, and 10-inch. (Inactive for new design)

2.3 Non-Government publications. Add the following documents:

SAE-AS5131	Tube End – Beaded, Design Standard. (DoD adopted)
SAE-AS31021	Connector, Receptacle, Electric, Box Mounting, Solder Contacts, AN Type. (DoD adopted)
SAE-AS34521	Connector, Receptacle, Electric, Box Mounting, Rear Release, Crimp Contact, AN Type. (DoD adopted)
SAE-AS25036	Terminal, Lug, Crimp Style, Copper Insulated, Ring Tongue Bell-mouthed, Type II, Class 1 (for 105 °C Total Conductor Temperature). (DoD adopted)

REQUIREMENTS

1. Dimensions and weight. The dimensions of the generating system components shall be as shown on figures 1 through 4 of this specification sheet.

2. Capacity. The rating of the generating system shall be not less than 60/70 kVA. See 3.4.8 and sub-paragraphs as modified herein.

3. Generator system characteristics. The generator system characteristics shall be as shown in table I of this specification sheet.

4. MIL-PRF-21480 variance: The generating system shall comply with MIL-PRF-21480 except as follows:

4.1 The following paragraphs are not applicable:
3.4.2.7.2 Aircraft platform vibration, subparagraphs a, b, c only.
3.4.2.9 Water intrusion and immersion.
3.4.2.10 Chemical, biological, and radiological (CBR).
3.4.2.11 Lightning, electromagnetic pulse, and directed energy weapons.
3.4.4 Explosive atmosphere.
3.4.8.2.1 Motor starting (AC power).
3.4.8.2.2 Emergency overload (AC power).
3.4.9.2.3 Maximum torque.
3.4.9.2.4 Flexible drive.
3.4.9.6.2 Liquid cooling, 3.4.9.6.2 and subparagraphs a through e.
3.5.6 Simultaneous load and speed transients.
3.5.7.5 Overcurrent protection (short circuit AC current limit).
3.5.7.6 Feeder fault, subparagraphs a, b, and c only
3.5.7.8 Bus fault isolation.
3.5.7.9 Waveform protection (extraneous AC distortion and DC content).
3.5.7.10 Arc fault power feeder protection.

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3.5.9 Paralleling.
3.5.10 Generator output characteristics.
4.4 Coolant temperature, subparagraph d only
4.5.3.2 Electrical performance at minimum temperature, subparagraph c only
4.5.3.3 Electrical performance at maximum temperature, subparagraphs g and h only
4.5.6 Load and speed transients.
4.5.8 Phase balance, subparagraphs a, b, and c only
4.5.14 Temperature – Altitude, subparagraph b. Liquid – cooled generator system only
4.5.17 Protective Functions, subparagraph d. Overfrequency protection only
4.5.19 Maximum generator torque.
4.5.23.2.2 Test procedure for non-engine mounted components, subparagraphs a and c only
4.5.26 Rainwater intrusion.
4.5.28.2 Liquid cooled components, paragraph 4.5.8.2 and subparagraphs a and b
4.5.29 Loss of cooling, subparagraph b only
4.5.32 Explosive atmosphere.
4.5.33 Toxicity and fire resistance.
4.5.34 Coolant contamination.
4.5.36 Reliability and maintainability.

4.2 Modify the following paragraphs of MIL-PRF-21480:

3.3.2 Moisture resistance. Add the following to the end of the paragraph: "Externally mounted connector receptacles shall be environment resistant conforming to SAE-AS31021 (class E or class R), or SAE-AS34521 (class W)."

3.4.2.1.1 Blast air-cooled and integral fan-cooled components. Delete the last sentence and substitute: "The altitude limit for continuous operation is 30,000 feet."

3.4.2.1.2 Liquid-cooled and self-cooled components. Delete the last sentence and substitute: "The GCU and CT altitude limit for continuous operation is 30,000 feet."

3.4.2.7.1 Engine vibration. Delete paragraph in its entirety and substitute: "The generator shall withstand the vibration test of 4.5.23.2.1 using the vibration spectrum of MIL-PRF-21480, figure 4. The acceleration spectral density of the functional broadband level (W_0) shall be 0.30 g^2/Hz and the frequency (f_0) of the first narrow band random spike shall be 17 Hz (see 6.6.3.2)."

3.4.2.7.2 Aircraft platform vibration. Delete paragraph in its entirety and substitute: "The GCU and CT shall withstand the vibration of 4.5.23.2.2.b, as modified by this specification sheet using the vibration spectrum of MIL-PRF-21480, figure 6. The acceleration spectral density of the functional broadband level (W_0) shall be 0.010 g^2/Hz and the frequency (f_0) of the first narrow band random spike shall be 68 Hz (see 6.6.3.2)."

3.4.3 Operating position. Add: "The generator shall meet the requirements of MIL-PRF-21480."

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3.4.5 Configuration. Delete first sentence and substitute: "See table I and figures 1 through 4 of this specification sheet for component weights, dimensions and center of gravity requirements. See figure 5 of this specification sheet for the electrical interconnection requirements."

3.4.6 Consolidation of generating system components. Delete the last sentence and substitute: "The generator control unit shall be a separate component from the generator package (see 6.8.9)."

3.4.7.1 Manual system control. Delete the first sentence and substitute: "Manual system control of the AC power source shall be provided by a three-position switch, type II (see 6.8.2b)."

3.4.8.1 Continuous capacity (AC power). Delete paragraph in its entirety and substitute: "The generator AC power source shall be capable of continuously delivering power from no load to full load with balanced and phase load unbalances defined in paragraph 3.5.3, as modified by this specification sheet. During self-cooled operation with load unbalances as defined in 3.5.3, the generator capacity shall be not less 60/70 kVA. During blast-cooled operation with load unbalances defined in paragraph 3.5.3, the generator capacity shall be not less than 60/85 kVA."

3.4.8.2 Overload capacity (AC power). Add the following to the end of the paragraph: "Generator overloads shall be based on the 60 kVA slash rating."

3.4.8.3 Short circuit capacity (AC power). Delete the first two sentences and substitute: "The minimum short circuit current capacity shall be 300 percent of the 60 kVA slash rating (see 6.8.16)." Delete last sentence.

3.4.8.4 Integral control power capacity. Delete the first sentence and substitute: "The generator PMG shall supply all of the integral control power required for generator excitation, control, and GCU DC output, except for aircraft DC power supplied to the GCU connector (pin G) for latching of differential fault protection relays (see 6.8.17)."

3.4.8.4.1 Excitation and control of AC power. Add the following to the end of the paragraph: "A redundant fly-wheel diode shall be incorporated in the GCU to protect the excitation power from voltage transients emitted by the generator exciter field."

3.4.8.4.2 Rating of DC power source. Delete paragraphs (a, b, c) and add:

"a. Rated capacity - The DC power source shall be capable of continuously delivering not less than 1.5 amps from the DC output of the GCU connector (pin a).

b. Overload capacity - The DC power source shall be capable of delivering 3.0 amps for five seconds.

c. Short circuit capacity - The DC power source shall be capable of delivering not less than 5.0 amps into short circuit faults."

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3.4.9.1 Shaft speed. Delete last sentence and substitute: "The generator shaft acceleration and deceleration shall be 1000 rpm per second as shown in table I of this specification sheet."

3.4.9.1.2 Overspeed. Delete paragraph in its entirety and substitute: "The generator overspeed shall be as shown in table I of this specification sheet. The generator shall be capable of operating at overspeed for 5 minutes without mechanical failure or impairing subsequent electrical performance."

3.4.9.2 Mounting and driving provisions. Delete the first two sentences and substitute: "The mounting flange, including twelve holes and nut seats, shall be in accordance with the dimensions of MS18056, 10-inch size (MS90325-1 flange design shall not require the MS18056 provisions for V-band clamp mounting)."

3.4.9.2.1 Shaft spline. Delete the last sentence and substitute : "The generator shall be in accordance with the SAE-AS14169 1 inch size (see figure 2 of this specification sheet)."

3.4.9.2.2 Shear section. Delete second sentence and substitute: "The torque range for shaft shear shall be as shown in table I of this specification sheet."

Add the following paragraph: "3.4.9.2.5 Main bearing failure. The generator design shall incorporate an auxiliary bearing to take over support of the generator rotor upon failure of the primary drive end bearing. To activate the aircraft's generator failure warning light, the generator shall supply a ground connection to pin W of the generator terminal block upon failure of the primary drive end bearing."

3.4.9.3 Electric connections.

Add the following at the end of 4.9.3a: "All generator terminal studs shall be stainless steel with minimum hardness of Rockwell C-34. Terminal block designs shall incorporate insulation barriers between terminal connections with clearance to accommodate installation of SAE-AS25036 wiring lugs as specified."

Add the following at the end of 3.4.9.3b: "The three studs marked as G, P, and W (size 10-32 UNF-3A) shall be not less than 0.468 inches in length with clearance for SAE-AS25036-103 lug installation. The two studs marked as F_0 and F_1 (size 1/4-28 UNF-3A) shall be not less than 0.453 inches in length with clearance for SAE-AS25036-157 lug installation. The three studs marked as T_1, T_2, and T_3 (size 3/8-24 UNF-3A) shall be not less than 0.667 inches in length with clearance for SAE-AS25036-122 lug installation. The three studs marked T_0 (size 3/8-24 UNF-3A) shall be not less than 0.667 inch in length with clearance for SAE-AS25036-125 lugs. A shunting bar connecting the three neutral terminals (T_0) shall be attached to the generator."

3.4.9.4 Direction of rotation. Delete the first sentence and substitute: "The direction of rotation shall be as shown in table I of this specification sheet."

3.4.9.5 Efficiency (heat rejection). Delete the paragraph in its entirety and substitute: "Generator system efficiency at nominal speed with 70 kVA load (0.75 lagging to unity power

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factor) shall be not less than 80 percent. Generator system efficiency at nominal speed with 85 kVA load shall be not less than 77 percent."

3.4.9.6.1a. Air inlet/outlet. Add the following at the end of the paragraph: "See figures 1 and 2 of this specification sheet for Air inlet/outlet requirements."

3.4.9.6.1b. Temperature-altitude rating. Delete the last sentence and substitute: "The rated blast air airflow at 60 kVA shall be 12.6 pounds per minute."

3.4.12 Markings. Delete the third sentence and substitute: "See figures 1 through 3 of this specification sheet for generator, generator control unit and current transformer nameplate locations."

3.5.1.1 Voltage limits for AC power source. Delete figure 10 and substitute figure 6 of this specification sheet. Add the following to the end of the paragraph: "The generator control unit shall be adjusted at room ambient so that the generator delivers 117±0.5 volts at the point of regulation when the generator is operating at no load and 6000 rpm."

3.5.1.2 Voltage limits for DC power source (see 3.4.8.4.2). Delete sentences two through four and substitute: "DC power for external use shall be furnished for maintaining contactors including conditions during short circuits. This DC power shall have the following characteristics: 20 VDC minimum; 30 VDC maximum; and 2 volts peak-to-peak ripple and rated minimum output 2 amperes continuous."

3.5.2 Voltage modulation (AC power source). Delete the paragraph in its entirety and substitute: "The voltage modulation shall not exceed an amplitude of 1.25 volts as measured peak to peak difference between the minimum and the maximum voltage reached during any one second."

3.5.3 Voltage unbalance and phase displacement. Delete the paragraph in its entirety and subparagraphs a, b, and c and substitute: "The percentage of phase load unbalance (see 6.8.13), shall be based on the generator 60 kVA self-cooled capacity. For generator inputs within the specified range for rated output (see 6.8.7), the AC phase voltage unbalance and displacement shall conform to the following:"

a. The AC power source shall conform to the requirements herein with phase load unbalance up to 16.7 percent. For phase load unbalances of 16.7 percent (or less), the phase voltage shall be within the following limits: (1) displacement between phases shall be within phase angle limits of 119º and 121º, excluding harmonics; (2) voltage unbalance between phases shall not exceed 1.5 volts; and (3) the average of all three phase voltage shall remain within the steady state limits of figure 6 of this specification sheet.

b. The AC power source shall conform to the requirements herein with phase load unbalance up to 33.3 percent. For phase load unbalances of 33.3 percent (or less), the phase voltage shall be within the following limits: (1) displacement between phases shall be within phase angle limits of 118º and 122º, excluding harmonics; (2) voltage unbalance between phases shall not

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exceed 3.0 volts; and (3) the average of all three phase voltage shall remain within the steady state limits of figure 6 of this specification sheet.

c. The AC power source shall conform to the requirements herein with phase load unbalance up to 66.7 percent. For phase load unbalances of 66.7 percent (or less), the phase voltage shall be within the following limits: (1) displacement between phases shall be within phase angle limits of 116º and 124º, excluding harmonics; (2) voltage unbalance between phases shall not exceed 5.0 volts; and (3) the average of all three phase voltage shall remain within the steady state limits of figure 6 of this specification sheet.

3.5.4 Voltage waveform (AC power source). Delete the paragraph in its entirety and subparagraphs a and b and substitute: "Under the load and speed conditions for continuous rated output of 3.4.8.1, as modified by this specification sheet (AC load range of 0 to 85 kVA, 0.75 lagging to unity power factor, and speed range of 5,700 to 6,300 rpm), the generator AC phase voltage shall conform to the following requirements:

a. The crest factor of each phase voltage waveform shall be 1.41 ±0.14 (see 6.8.3).

b. The total harmonic distortion content of each phase voltage shall be not greater than 5 percent and no single harmonic shall exceed 3 percent of the fundamental."

3.5.5 Voltage ripple and distortion (DC power source). Delete the first sentence and substitute: "The peak-to-mean ripple amplitude of the GCU DC output voltage shall not exceed 2.0 volts under normal steady state conditions (0.2 amp external DC load). The peak-to-mean ripple amplitude shall not exceed 8.0 volts at rated capacity DC output (1.5 amps external DC load)."

3.5.7.2 Overvoltage protection. In the first sentence, replace figure 14 with figure 6 of this specification sheet. Add the following to the end of the paragraph: "The protective function shall trip within 5 seconds after a three-phase overvoltage of 130 volts rms is applied to the GCU's POR sensing."

3.5.7.3 Undervoltage protection. Delete the paragraph in its entirety and substitute: "The undervoltage protective function shall disconnect the generator from the load bus and de-energize the generator when any phase voltage, line to neutral is below 90 volts for a period of 4 ± 1 seconds. There shall be no protective function of the undervoltage protection when all phase voltages exceed 105 volts."

3.5.7.4b. Frequency protection (class W). Delete the paragraph in its entirety and substitute: "Overfrequency protection is not required. Underfrequency protection shall disconnect the generator from the load bus within one second, when the output frequency of the generator is less than 367 ±3 Hz. The underfrequency protection shall connect the generator to the load bus, within one second, when the frequency is above 383 ±3 Hz."

3.5.7.6 Feeder fault. Add the following to the end of the paragraph: "The feeder fault protection shall deenergize and disconnect the generator from the load bus when the fault current

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on any phase exceeds 35 amperes. The GCU shall incorporate a MIL-PRF-83287/1 feeder fault indicator with external trip indication and mechanical reset capability (M83287/01-22 or equivalent)."

3.10 Reliability. Delete the paragraph in its entirety and substitute: "The generator, GCU, and CT shall have a combined minimum time between failures of 4,000 hours."

3.11 Maintainability. Delete the paragraph in its entirety and substitute: "The generator shall not require any scheduled maintenance other than the minimum 4,000-hour grease lubricated bearing service life requirement of 3.4.9.7. The GCU and CT shall not require any scheduled maintenance."

VERIFICATION:

4.2.2 Qualification inspection tests. Add the following to the end of the paragraph: "There are no additional examinations and test required by this specification sheet. Testing shall be in accordance with MIL-PRF-21480 as modified by this specification sheet."

4.2.3 Qualification retention. Add the following to the end of the paragraph: "There are no additional qualification retention examinations and tests required by this specification sheet. Testing shall be in accordance with MIL-PRF-21480 as modified by this specification sheet."

4.3 Conformance inspection. Add the following to the end of the paragraph: "There are no additional conformance inspection examinations and tests required by this specification sheet. Testing shall be in accordance with MIL-PRF-21480 as modified by this specification sheet."

4.4.2 Test sample. Add the following to the end of the paragraph: "The generating system shall be interconnected as shown on figure 5 of this specification sheet."

4.4.7 Component mounting. Add the following to the end of the paragraph: "The generator and control components shall be in accordance with MIL-PRF-21480."

4.4.9 Generator package input shaft speed. Add the following to the end of the paragraph: The generator nominal speed shall be 5,965 rpm (see table I of this specification sheet)."

4.5.1 Examination of product. Delete the last two sentences and substitute: "Component envelope, geometry, mounting and interface, and weight shall be examined for conformance to MIL-PRF-21480 as modified by 3.4.5 and 3.4.9.2 of this specification sheet. Visual examinations shall be conducted to verify that workmanship and construction conform to 3.4.11 and 3.12 of MIL-PRF-21480 and 3.4.12 as modified by this specification sheet."

4.5.2 Maximum speed for regulation. Delete the fourth sentence and substitute: "Measure DC voltage to determine conformance to 3.5.1.2 as modified by this specification sheet." Add the following to the end of the paragraph: "The maximum speed for regulation shall be 7,200 rpm (see table I of this specification sheet)."

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4.5.3.1 Electrical performance at standard temperature. Delete the last sentence and substitute: "The following tests shall be conducted at 60/70 kVA self cooled and 60/85 kVA blast cooled to determine electrical performance at standard temperature:"

4.5.3.1e. Replace table III of MIL-PRF-21480 with table II of this specification sheet.

4.5.3.2b. Delete second through fourth sentences.

4.5.3.3a. Add the following to the end of the paragraph: "Hot soaking, maximum temperature and maximum continuous temperature for continuous operation shall be in accordance with MIL-PRF-21480."

4.5.3.3c. Add the following to the end of the paragraph: "The maximum continuous temperature for continuous operation shall be in accordance with 3.4.2.1.2 of MIL-PRF-21480, as modified by this specification sheet."

4.5.8 Phase balance. Delete the paragraph in its entirety and substitute: "In conjunction with tests of 4.5.3.1.e, conduct steps 1 through 16 of table II of this specification sheet at nominal speeds with loads at unity and 0.75 lagging power factor. Repeat testing at minimum and maximum rated speeds. Measure AC voltages, phase current, and phase angle to determine conformance to the requirements of 3.5.3 as modified by this specification sheet."

4.5.9 Efficiency (heat rejection). Delete the first two sentences and substitute: "With the generator at nominal speed, measure generator system efficiency at 20 kVA, 70 kVA, and 85 kVA (blast cooled) to determine conformance to the requirements of 3.4.9.5 as modified by this specification sheet."

4.5.10 Short circuit capacity. Delete last sentence.

4.5.12 Electromagnetic emissions and susceptibility. Delete sixth sentence. Delete the last sentence and substitute: "During electromagnetic susceptibility tests, the AC voltage regulation shall remain within the voltage limits of 3.5.1.1, as modified by this specification sheet." Add: Tailoring of the MIL-STD-461 test methods shall be subject qualifying activity approval. The generator system power output feeders, including neutral, shall conform to the RE102 requirement for power input leads, except that the emissions limit shall be relaxed by an additional 10 dB."

4.5.14.a Temperature-altitude. Delete subparagraph 4.5.14.a in its entirety and substitute:

a. Air cooled generator and control components – Delete sentences three and four and add: "The generator (self-cooled, no blast air), GCU, and CTs shall be subjected to the above procedure with the following test conditions during self-cooled operation: (1) 85 ºC at sea level; (2) 85 ºC at 5000 feet; (3) 85 ºC at 10,000 feet; (4) 80 ºC at 20,000 feet and (5) 60 ºC at 30,000 feet. Blast-cooled generator shall be subjected to the above procedure with the following test conditions with blast cooling: (1) 71 ºC at sea level; (2)) 71 ºC at 5,000 feet; (3) 71 ºC at 10,000 feet; (4) 71 ºC at 20,000 feet; and 71 ºC at 30,000 feet."

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4.5.15a. Add the following at the end of the paragraph: "The generator shall be operated at nominal speed and rated load as specified in MIL-PRF-21480."

4.5.17 Protective functions. Modify the subparagraphs of 4.5.17 as follows:

a. Overvoltage protection – In the next to last sentence, replace figure 14 with figure 6 of this specification sheet.

b. Undervoltage protection - Delete the third sentence and substitute: "After increasing the voltage to 105 volts, perform a manual reset and determine conformance to the requirements of 3.4.7.1 and 3.5.7.3, both as modified by this specification sheet. In the next to last sentence, replace figure 14 with figure 6 of this specification sheet.."

c. Underfrequency protection – Delete the last sentence.

4.5.18 Electrical disconnect (safety interlock). Delete the last sentence.

4.5.20.1 Salt-fog. Add the following at the end of the paragraph: "There shall be no evidence of: (1) material degradation such as corrosion; or (2) blistering of paint or degradation of electrical insulation."

4.5.21 Fungus. Add the following at the end of the paragraph: "There shall be no evidence of: (1) direct attack of fungus on the generator system components such as material breaking down due to fungus growth; or (2) damage to fungus-resistant material due to indirect attack. See 2.1.1.1 of MIL-STD-810, test method 508."

4.5.22 Sand and dust. Add the following to the end of the paragraph: "There shall be no evidence of: (1) binding, clogging, seizure or blocking of moving parts; or (2) compromising of protective coatings and seals. See 5.1 of MIL-STD-810, test method 510."

4.5.23 Vibration. Add the following to the end of the paragraph: "The GCU and CTs shall be subjected to vibration levels and durations for category 3."

4.5.23.2 Vibration exposure level and endurance. Add the following to the end of the paragraph: "The endurance level vibration shall be in accordance with MIL-PRF-21480."

4.5.23.2.1 Test procedure for engine and gearbox mounted components. Delete the third sentence and substitute: The f_0 frequency shall be 68 Hz for the specific frequencies of the narrow band spike amplitudes."

4.5.23.2.2b. Delete the fourth sentence and substitute: "The f_0, f_1, and f_2 frequencies shall be 68 Hz, 136 Hz, and 204 Hz, respectively."

4.5.24a. Functional shock. Add the following at the end of the paragraph: "The shock functional level spectrum shall be in accordance with MIL-PRF-21480."

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4.5.24b. Crash hazard shock. Add the following to the end of the paragraph: "The crash hazard level spectrum shall be in accordance with MIL-PRF-21480."

4.5.28 Endurance. In the last sentence, replace table VII of MIL-PRF-21480 with table III of this specification sheet.

4.5.28.1 Air cooled components. In the first sentence, replace table VII of MIL-PRF-21480 with table III of this specification sheet.

4.5.30 Spline wear examination. Add the following to the end of the paragraph: "See table I and figure 1 of this specification sheet."

4.5.31 Input shaft shear. Delete the last sentence and substitute: "Verify that the torque required to break the shear section is within the torque range of 3.4.9.2.2 as modified by this specification sheet."

4.5.35 Acceleration (inertia loads). Delete the paragraph in its entirety and substitute: "All systems components shall be subjected to the acceleration tests of MIL-STD-810, method 513, procedures I and II. The test level for all directions in procedure I (Structural Test) shall be accomplished using an acceleration of 13.5g. The g level shall be applied along three mutually perpendicular axes in two opposite directions along each axis. The test time duration in each axis shall be at least one minute following centrifugal stabilization. At the conclusion, the protective functions tests of 4.5.17 as modified by this specification sheet shall be conducted to verify that the generator system performance can meet the requirements of 3.5.7 of MIL-PRF-21480. There shall be no mechanical structural failures due to the applied acceleration. For procedure II (Operational test), the required acceleration level for all directions shall be 9.0g. The 9.0g shall be applied along the mutually perpendicular axes in two opposite directions along each axes. The test time duration in each axis shall be at least one minute following centrifugal stabilization and the system components shall be operated at continuously at full load during the test."

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TABLE I. Generator system characteristics and requirements.

Generator system characteristic	Requirement
Generator voltage (three-phase AC, four-wire, wye-connected):	
Voltage at generator terminals (line-to-neutral / line-to-line)	120/208 Vrms
Point of regulation voltage setting (no load at 6,000 rpm)	117.0 ±0.5 Vrms
Generator AC output capacity in kilo-volt-amperes (kVA):	
Power factor for rated output	0.75 lagging to 1.00
Self-cooled rating	60/70 kVA
Blast-cooled rating	60/85 kVA
Air inlet temperature range for rated output at sea level altitude	-40 °C to +52 °C
Rated airflow for blast-cooled 60/85 kVA output (+52 °C; sea level)	20 lbs per minute
Generator speed range for rated output (380 to 420 Hz)	5,700 – 6,300 rpm
Generator nominal rated speed (397.7 Hz)	5,965 rpm
Maximum speed for regulation (480 Hz)	7,200 rpm
Overspeed	9,000 rpm
Input shaft acceleration/deceleration (maximum)	1,000 rpm per second
Component weights (maximum):	
Generator weight	108.00 lbs
Generator Control Unit (GCU) weight	6.50 lbs
Current Transformer (CT) weight	2.75 lbs
Generator overhung moment (maximum)	730 inch-lbs
Shaft shear torque	4,100 – 4,600 inch-lbs
Generator rotation (viewed from drive end)	Counterclockwise
Permanent magnet generator (PMG):	
PMG single-phase AC voltage (rated speed; 72 VA PMG output)	40 Vrms
PMG nominal AC output in Volt-Amperes (VA)	72 VA
PMG AC frequency at nominal rated speed	596.6 Hz
Integral control DC power (rated speed; continuous output):	
GCU DC to exciter field with 85 kVA AC output	20 VA (nominal)
GCU DC external output to main load contactor coil (hold)	16 VA (nominal)
GCU dissipation (control, protection, and internal impedance)	36 VA (nominal)
Integral control DC power (overload output for 5 seconds):	
GCU DC to exciter field with 180 kVA three-phase AC short	100 VA (±10 VA)
GCU DC external overload to load contactor coil (pickup)	65 VA (nominal)
GCU DC external fault capacity (5 amps, minimum)	85 VA (minimum)

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TABLE II. Phase unbalance test conditions (see 3.5.3, 4.5.3.1e and 4.5.8 as modified by this specification sheet).

Step	Percent phase load unbalance	Phase load (kVA) A-N	B-N	C-N	Cooling mode
1	0	0	0	0	Self
2	16.7	3.4	0	0	Self
3	33.3	0	6.67	0	Self
4	66.7	0	0	13.33	Self
5	0	3.4	3.4	3.4	Self
6	16.7	6.67	3.4	3.4	Self
7	33.3	3.4	13.33	3.4	Self
8	66.7	3.4	3.4	20	Self
9	0	6.67	6.67	6.67	Self
10	16.7	13.33	6.67	6.67	Self
11	33.3	6.67	20	6.67	Self
12	0	13.33	13.33	13.33	Self
13	16.7	20	13.33	13.33	Self
14	0	16.67	16.67	16.67	Self
15	16.7	16.67	20	16.67	Self
16	0	20	20	20	Self

NOTE: This table replaces table III of MIL-PRF-21480.

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TABLE III. Endurance schedule for air cooled generator systems (see 4.5.28 and 4.5.28.1 of MIL-PRF-21480).

Step	Time (minutes)	Input speed (rpm)	Altitude (1,000 feet)		Temperature (°C)		Cooling Mode	Airflow (pounds per minute)	AC load (kVA)
			Generator	GCU & CT	Generator (air inlet)	GCU & CT (ambient)			
1	30	5,700	Sea level	Sea level	0	0	Self	1/	70
2	30	5,965	5	5	-10	-5	Self	1/	70
3	120	5,965	15	7	-30	-15	Blast	17.4	85
4	60	5,965	35	10	-65	-35	Blast	14.6	85
5	60	5,965	20	8	-40	-20	Blast	16.0	85
6	120	5.965	10	5	-20	-10	Blast	18.0	85
7	30	6.300	5	5	-10	-5	Self		70
8	30	5,700	Sea level	Sea level	25	35	Self	1/	70
9	30	5,965	5	5	15	30	Self	1/	85
10	120	5,965	15	7	-5	20	Blast	17.4	85
11	60	5,965	35	10	-45	-5	Blast	14.6	85
12	60	5,965	20	8	-20	15	Blast	16.0	85
13	120	5.965	10	5	5	25	Blast	18.0	85
14	30	6,300	5	5	15	30	Self	1/	70
15	15	5,700	Sea level	Sea level	80	71	Self	1/	60
16	30	5,965	Sea level	Sea level	52	52	Self	1/	70
17	30	5,965	5	5	40	40	Self	1/	70
18	120	5,965	15	7	20	30	Blast	17.4	85
19	60	5,965	35	10	-20	25	Blast	14.6	85
20	60	5,965	20	8	10	30	Blast	16.0	85
21	120	5,965	10	5	30	35	Blast	18.0	85
22	30	6,300	5	5	40	40	Self	1/	70

NOTE: 1/ Forced airflow not required when generator is operating in self-cooled mode.
This table replaces table VII of MIL-PRF-21480.

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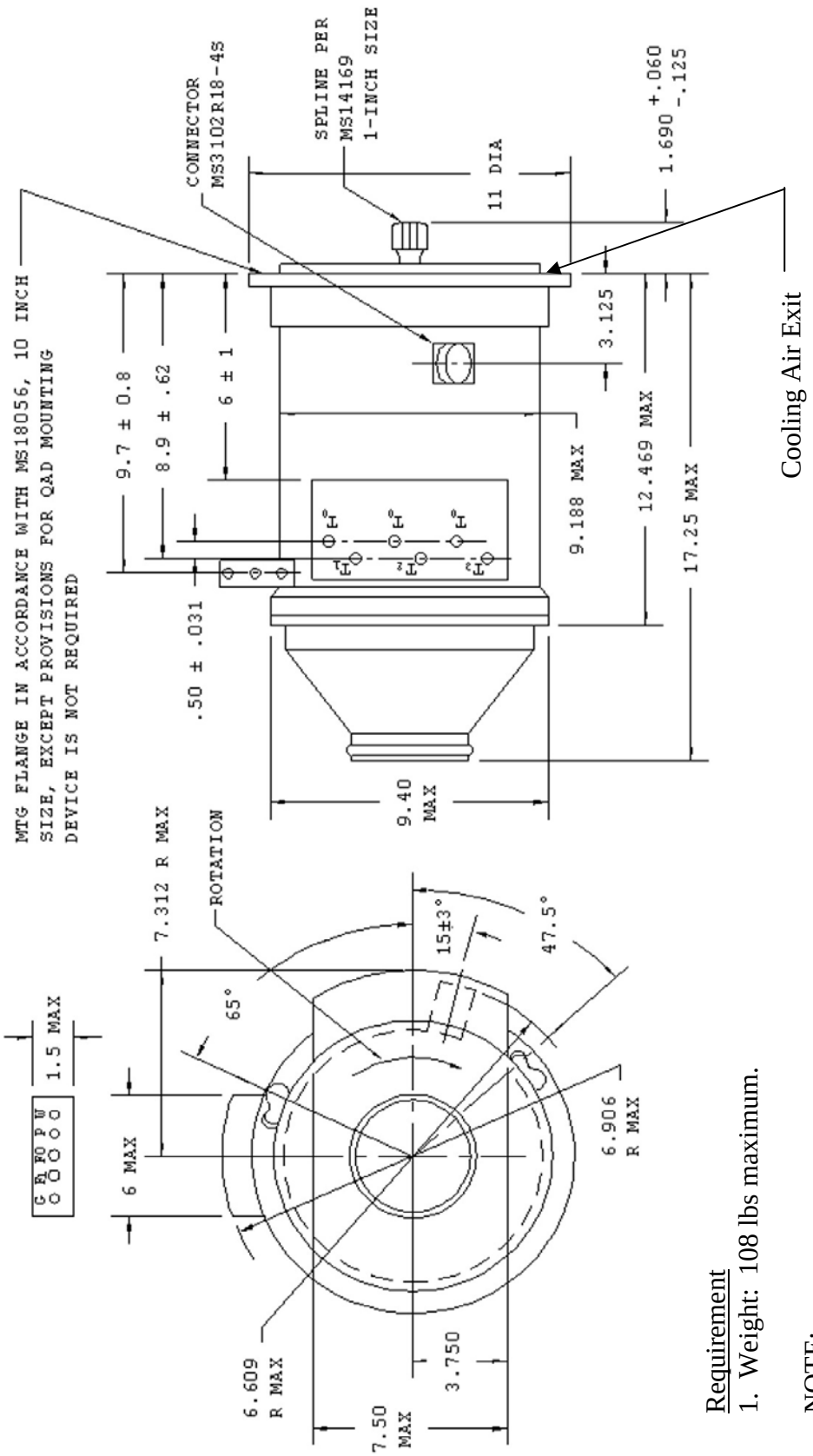


FIGURE 1. Generator (MS90325-1).

WEIGHT 108 LBS MAX

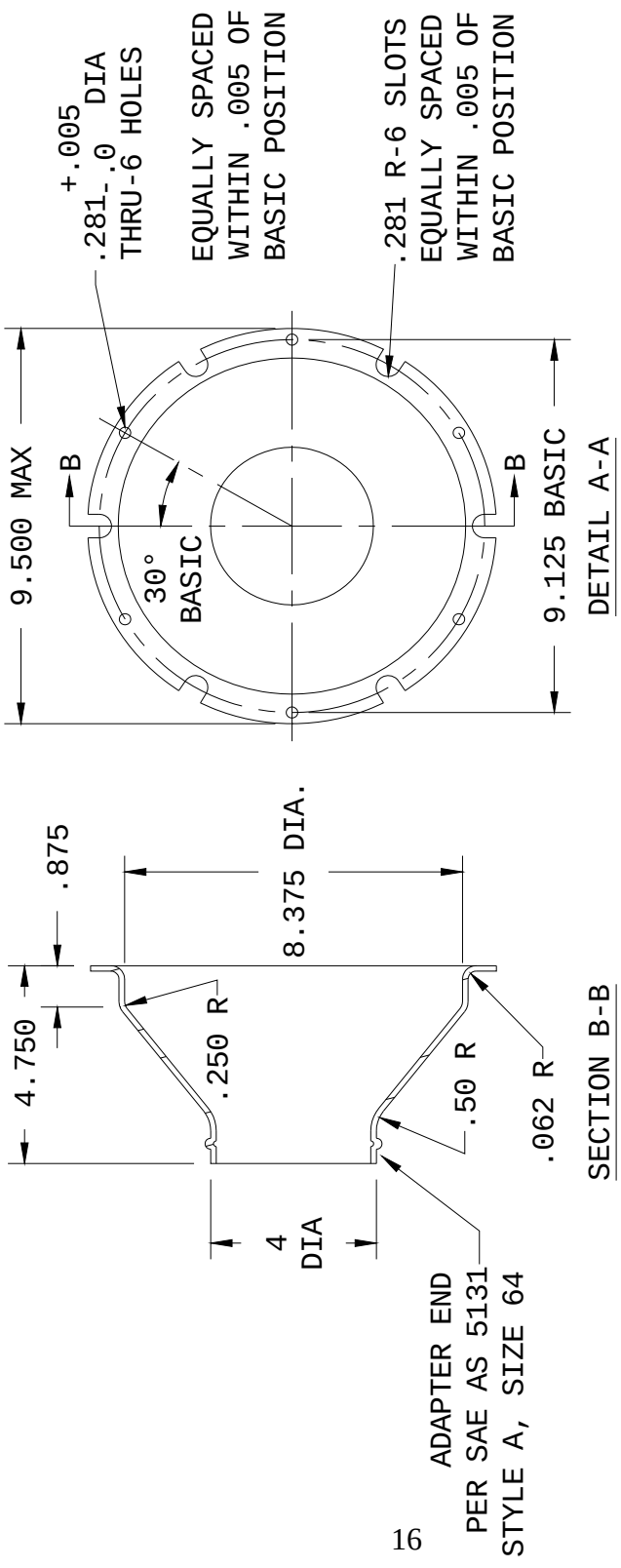
Requirement

1. Weight: 108 lbs maximum.

NOTE:

1. Dimensions are in inches.

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NOTES:
1. Dimensions are in inches.

FIGURE 2. Generator air inlet.

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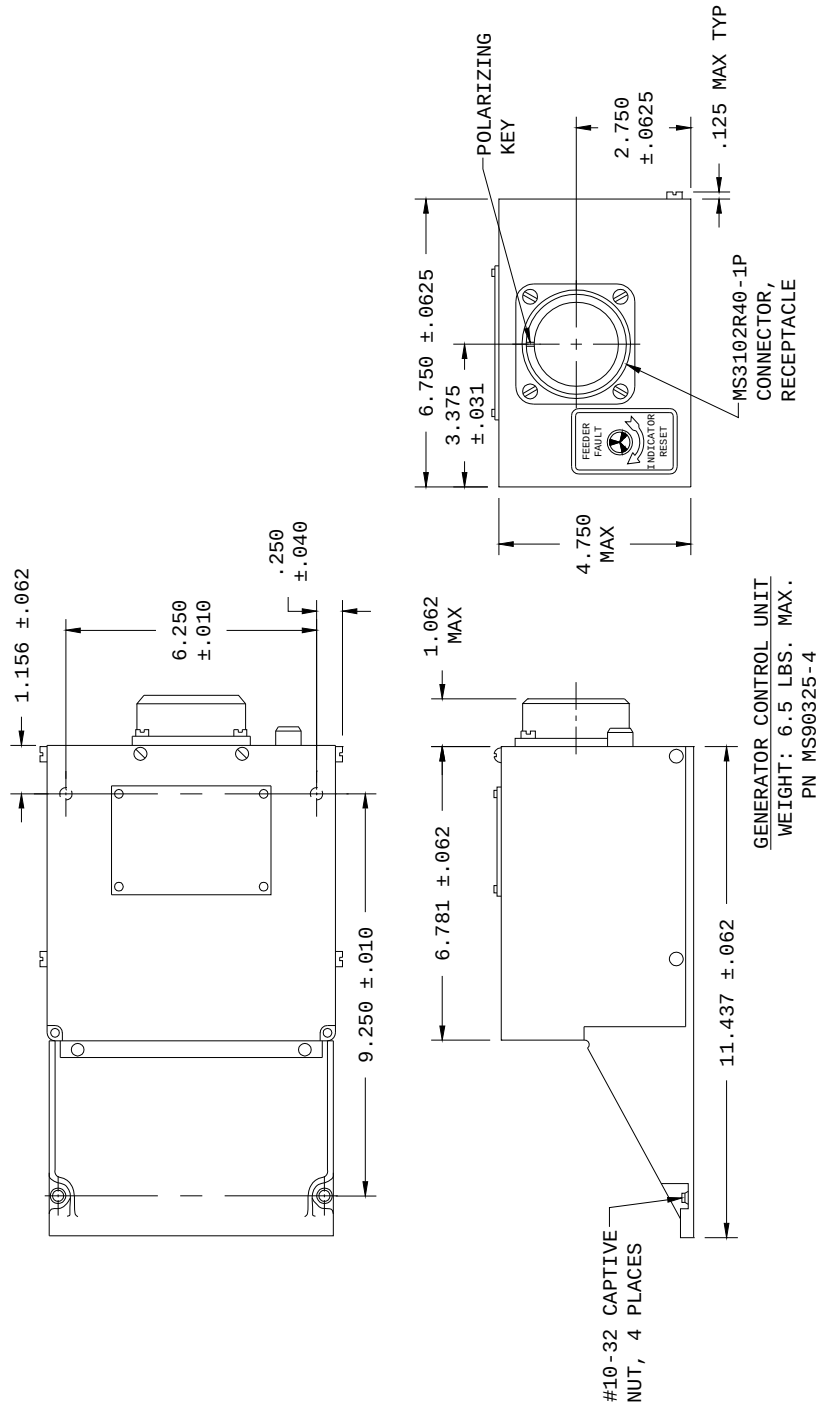
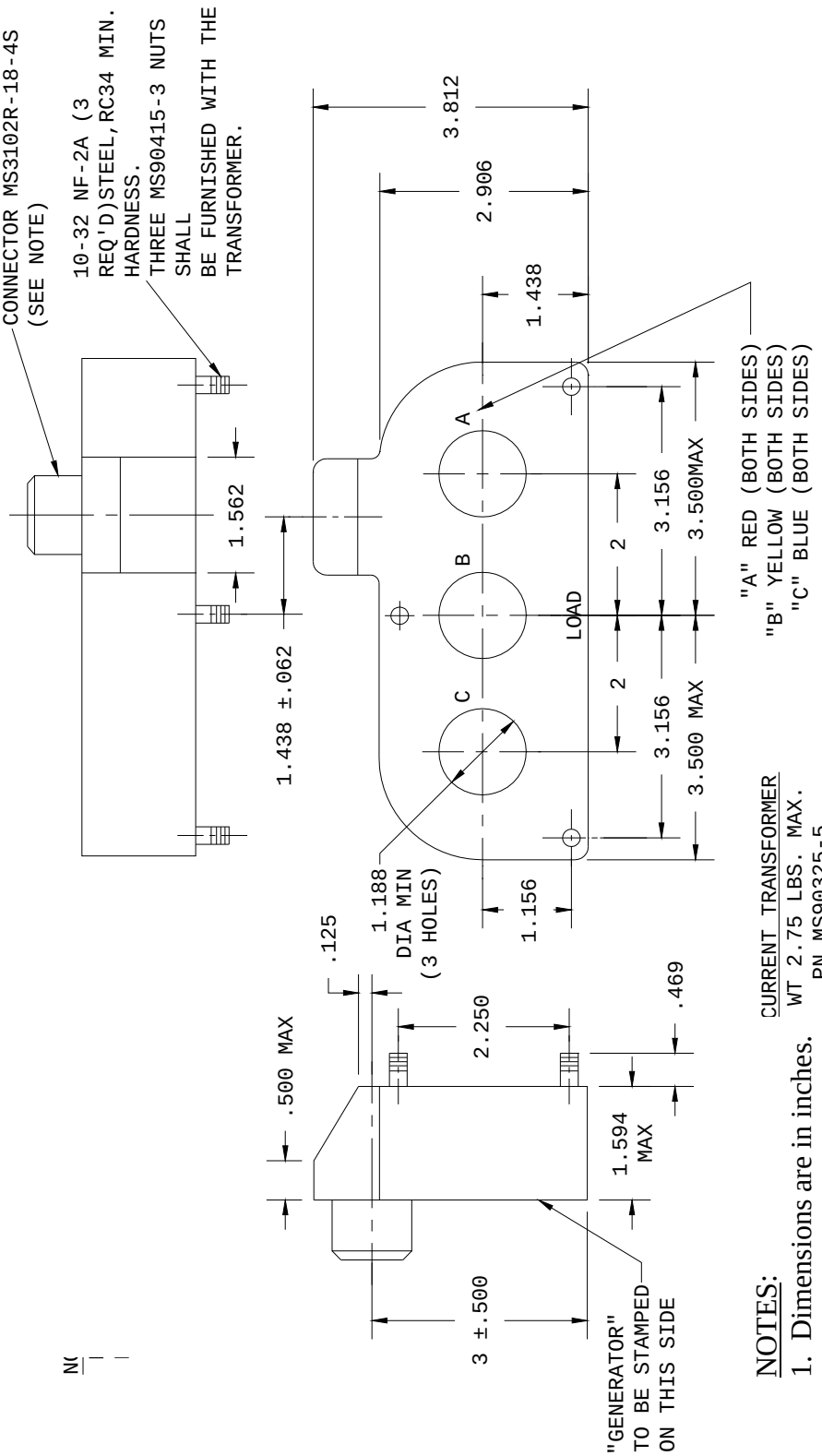


FIGURE 3. Generator control unit (MS90325-4).

NOTE:
1. Dimensions are in inches.

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NOTES:
1. Dimensions are in inches.
2. Provisions, adjacent to receptacle, for electric plug safety wire.

FIGURE 4. Current transformer (MS90325-5).

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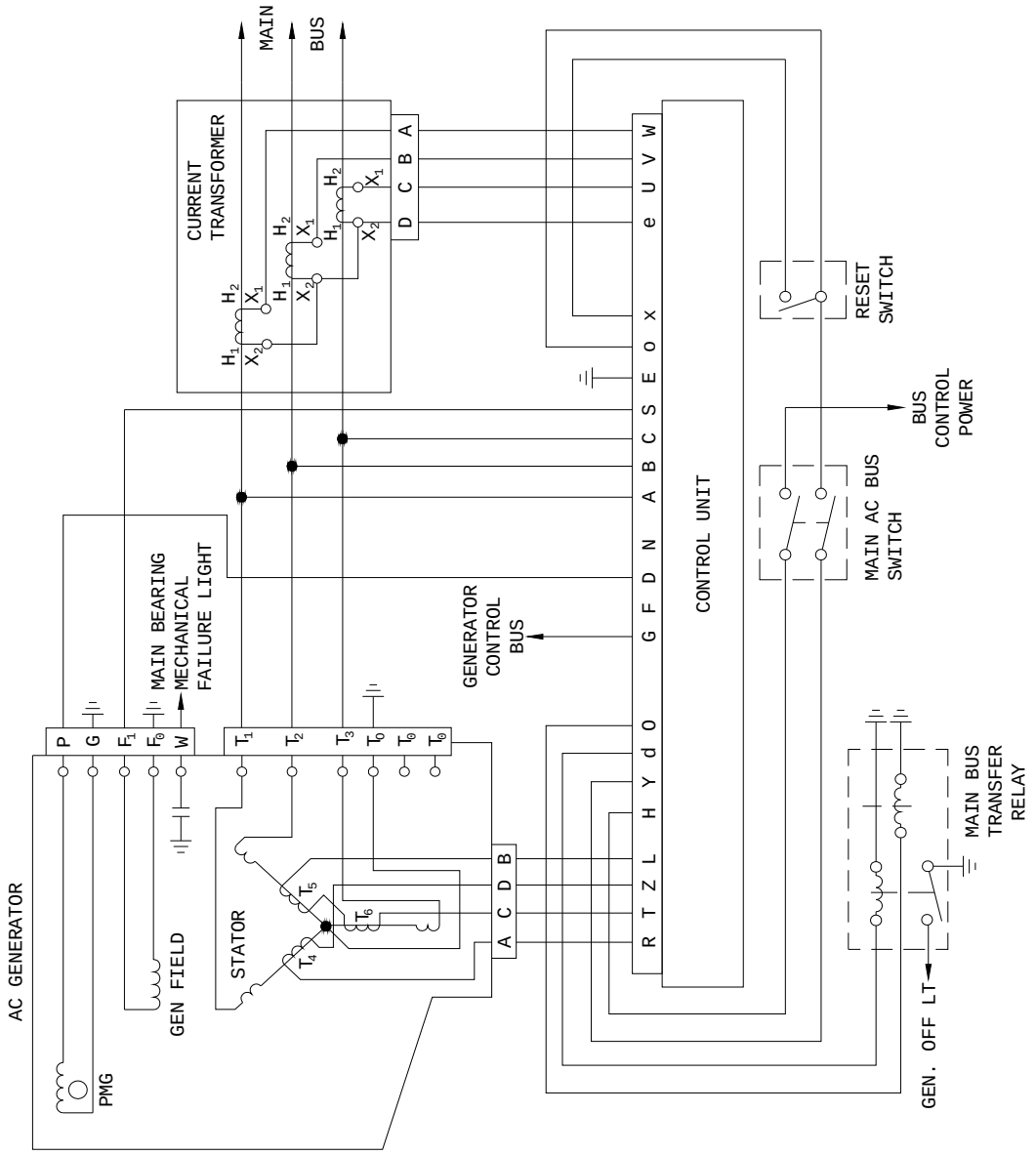
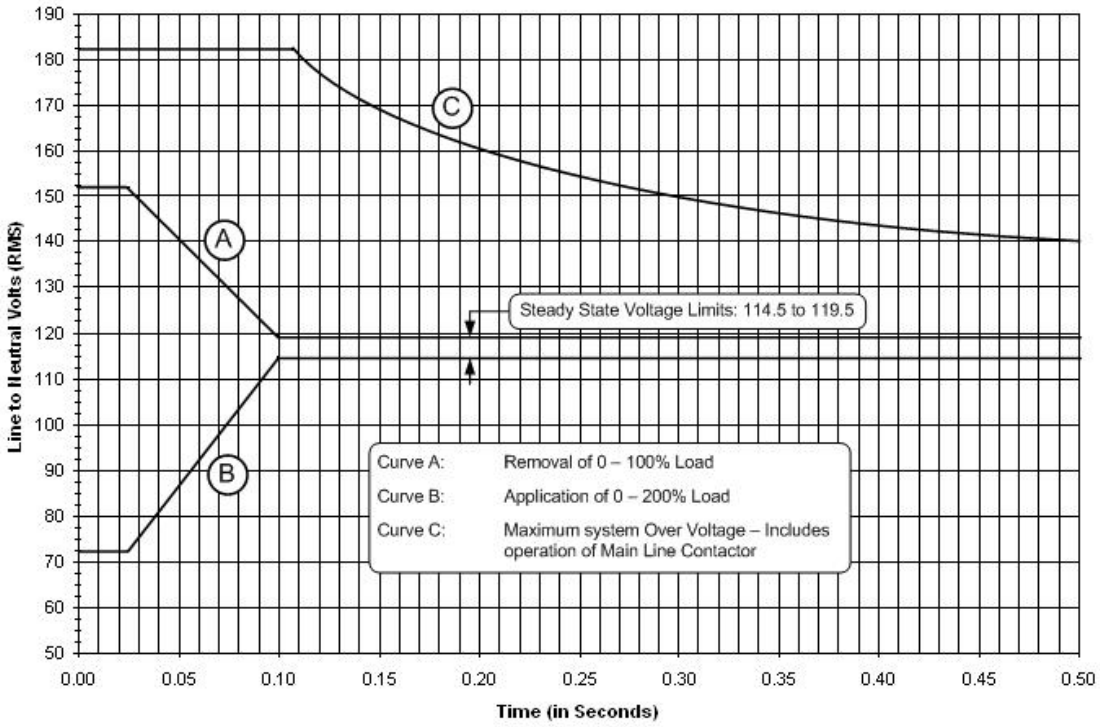


FIGURE 5. Generator system wiring interconnection diagram.

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Curve A: Maximum voltage transient upon removal of any load up to rated continuous load.
Curve B: Maximum voltage transient upon application of any load up to 200 percent rated load.
Curve C: Maximum system over voltage – includes operation of mainline contactor.

NOTE: Steady State limits are the RMS average of the three-phase voltages.

FIGURE 6. Normal voltage limits for AC power source (see 3.5.1.1 as modified by this specification sheet).

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CONCLUDING MATERIAL

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Navy - AS

Preparing activity:
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(Project 6115-2010-001)

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