



AEROSPACE RECOMMENDED PRACTICE

ARP 504 C

Society of Automotive Engineers, Inc.
400 COMMONWEALTH DRIVE, WARRENDALE, PA. 15096

Issued 11-15-76
Revised 4-15-80

IGNITION SYSTEM TESTING - METERING AND POWER SUPPLIES

1. PURPOSE

This Aerospace Recommended Practice (ARP) provides a design standard for power supplies applicable to ignition system development testing.

2. SCOPE

This procedure establishes the ignition system power supply design parameters for aeronautical engine ignition system testing.

3. FOR D.C. SYSTEM MEASUREMENTS

- 3.1 Use meters with accuracy of 2% of full scale or ± 1 volt, whichever is less. Use lowest range meters for minimum error readings of mid-scale, or greater.
- 3.2 Use power supplies having not more than 1 volt drop at the terminals when a 10 ampere load is applied. Use a capacitance across the power supply terminals large enough (2000 mfd plus) to ensure meeting ripple requirements of 3.3 and to provide a low impedance return path for the A.C. component that may be developed by the ignition exciters. The power supply shall be capable of being varied over the nominal supply voltage range that will be available to the system so as to allow checking of operation at the design limits of the system.
- 3.3 Use power supplies having A.C. RMS ripple content no greater than 3% of average D.C. level, measured with 10 ampere load.
- 3.4 Power supply circuit accessories such as filters, relays and long power leads should be considered part of the power supply and meet the above requirements.
- 3.5 Locate meters for measuring input characteristics at the input terminal of the system.
- 3.6 Use moving coil type D.C. ammeters with $\pm 2\%$ accuracy for measuring average value of input current. Due to the varying characteristics of the input current over the charging cycle in capacitor discharge type system, the input current should be specific and read as the average of the minimum and maximum meter indications. If an automatic electronic averaging meter is available, it may be used. Digital meters are not recommended due to the varying characteristics. If it is required to measure current peaks, a suitable peak reading instrument may be connected external to the supply.

4. FOR A.C. SYSTEM MEASUREMENTS

- 4.1 Use frequency meters with accuracy of $\pm 1\%$ of full scale. Use lowest range meters for minimum error readings at mid-scale, or greater.

SAE Technical Board rules provide that: "All technical reports, including standards approved and practices recommended, are advisory only. Their use by anyone engaged in industry or trade is entirely voluntary. There is no agreement to adhere to any SAE standard or recommended practice, and no commitment to conform to or be guided by any technical report. In formulating and approving technical reports, the Board and its Committees will not investigate or consider patents which may apply to the subject matter. Prospective users of the report are responsible for protecting themselves against liability for infringement of patents."

ARP 504C

- 2 -

- 4.2 Use electronic true RMS, dynamometer or iron vane type meters with $\pm 2\%$ of full scale accuracy for measuring input current or voltage RMS value. Meters should be calibrated, or accuracy rated, up to the highest frequency to be measured. Due to the varying characteristics of the input current over the charging cycle in capacitor discharge type systems, the input current should be specified and read as the average of the minimum and maximum meter indications. Digital ammeters are not recommended due to this varying characteristic. If it is required to measure current peaks, a suitable peak reading instrument may be connected external to the power supply.
- 4.3 Use power supplies having regulation capable of providing, at the exciter terminal, input frequency and voltage in accordance with applicable ignition system specifications required when ignition load is applied.

5. FOR SELF-CONTAINED TYPE SYSTEM MEASUREMENTS

- 5.1 An engine driven permanent magnet generator (PMG or alternator) provides self-contained A.C. power in this type system to make it self-sufficient (MIL-E-5007D, 3.74 and 3.7.5.2). The generator output frequency and voltage are proportional to engine RPM and are usually specified for ignition system measurements at 100% speed (RPM) and the minimum RPM at which ignition is required.
- 5.2 A power source suitable for self-contained system measurements is shown in Fig. 1, where the generator should be simulated as follows:

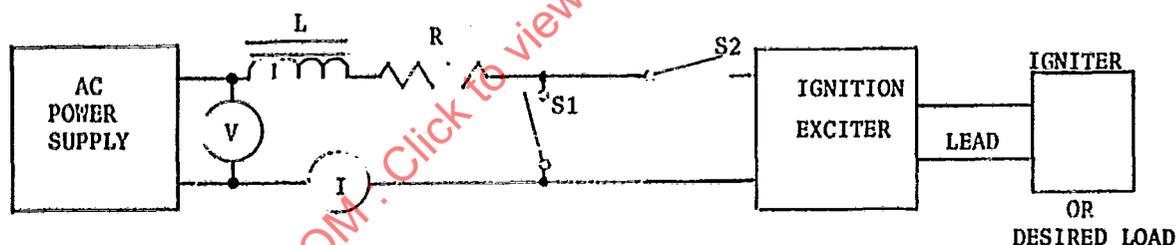


Figure 1

- a) The A.C. supply must be adjusted to the specified generator output voltage(s) at the specified frequency(s) and should have a drop in voltage (at V) of not more than 2%, when S1 is closed and L and R conform to 5.2(b).
- b) Internal impedance of the generator should be simulated by the resistor R and inductor L such that the meter readings of Fig 1 are:
- V = the required generator open circuit voltage(s) at the specified frequency(s).
- I = the required generator short circuit current(s) at the specified frequency(s) and voltage(s), when S1 is closed with S2 open.
- c) Power factor correction using a suitable capacitor across the A.C. power supply terminals may aid in attaining the requirements of 5.2(a) and (b).