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# IGNITION AND STAGING CONTROLLER

The Ignition and Staging Controller (ISC) provides pyrotechnic-firing energy for solid rocket booster engine ignition and launch vehicle/missile staging separation events. The ISC interfaces to standard one-ohm initiators and is NASA standard initiator compliant. The unit is capable of meeting low-voltage initiator current and energy requirements interfacing with extremely long cable lengths. The ISC uses capacitive discharge firing circuitry which eliminates the need for a dedicated pyrotechnic battery simplifying the avionics architecture. The ISC is uniquely dual-fault tolerant and is designed for the highly reliable human-rated NASA Space Launch System (SLS) vehicle. The ISC is designed as a line replaceable unit and its unique modular design allows for configurable firing circuit quantity as needed for specific mission requirements. The ISC may also be used for a wide range of spacecraft pyrotechnic-actuated deployment and separation applications.

| ISC | |
|---|---|
| **POWER/CONSTRUCTION** | |
| Input Power | 35 W standby power dissipation |
| Operating Voltage | 23-to-36 VDC |
| Weight | Up to 45 lb, depending on configuration |
| Size | 16” L x 12” W x 10” H |
| Connectors | MIL-C-38999, series III |
| Operating Temperature | -54 °C to +71 °C (qual) |
| Humidity | Per MIL-STD-810F method 507.4, 240-hour duration |
| Pressure | 15.26 psia-to-0.034 Torr |
| Pyrotechnic Shock | 1,780 Gs @ 1,060 Hz-to-10 kHz |
| Random Vibration | 16.3 grams |
| **INITIATOR FIRING CIRCUIT OUTPUTS (QTY 7)** | |
| Arming Time | 2 seconds for all initiator firing circuits (IFC) |
| Arm Duration | Indefinite |
| Firing Pulse Current | 20 A nominal |
| Max Pulse Duration | 5 ms |
| Firing Current Limit | 22 A |
| Energy Delivery (min) | 185 mJ to a 1 Ω load, 460 mJ to a 2.5 Ω load |
| **28V PRIMARY DISCRETE OUTPUTS (QTY. 3)** | |
| Output High Voltage | 21.2-to-36.0 VDC |
| Output Low Voltage | -1.0 to +1.0 VDC |
| Rated Current | 10 mA |
| Short Circuit Current (max) | 40 mA |
| Response Time (max) | 1 ms |
| Ground Reference | Primary ground |

## KEY FEATURES

- NASA standard initiator compliant (one-ohm interface)
- Capacitive discharge firing circuitry eliminating dedicated battery
- Meets low-voltage initiator current and energy requirements, supporting extremely long cable lengths
- Dual-fault tolerant for high-reliability human-rated launch systems
- Fully configurable firing circuit quantity per mission needs
- Modular, line replaceable unit

## CONFIGURABLE AND PROGRAMMABLE

The ISC provides up to seven, 28V dedicated capacitive-discharge pyrotechnic-firing outputs. These outputs can be individually commanded via MIL-STD-1553 data bus or can be programmed into an automated sequence. The ISC provides discrete outputs to notify ground support equipment of motor ignition.

Health and status telemetry is made available through the 1553 interface including internal temperatures, voltages and currents. Telemetry of initiator output waveform is available for verification of the firing pulse into initiator during flight or into test load during ground operations. Commanded telemetry provides initiator continuity and bridgewire resistance measurement per AFSPCMAN 91-710.

| ISC | |
|---|---|
| **RESISTANCE TEST** | |
| Commandable resistance test for all IFC loads for initiated built-in test | |
| Commandable via 1553 | |
| Accuracy | 0.15 Ω over a range of 0-to-2.8 Ω |
| Maximum current | 20 mA |
| Maximum voltage | 1 VDC |
| Reported in 1553 telemetry | |
| **TELEMETRY FOR ALL IFCS** | |
| IFC armed voltage measurement | |
| ARM, FIRE1 and FIRE2 command monitors | |
| Load resistance | |
| IFC peak current measurement | |
| IFC time above 5 A measurement | |
| IFC time above 15 A measurement | |
| **INTERNAL HEALTH AND STATUS** | |
| Input voltage and current | |
| Secondary supply voltages and currents | |
| Internal reference voltages | |
| Internal temperature | |
| Startup built-in test results | |
| Continuous built-in test results | |

## INITIATOR FIRING CIRCUITS

The ISC provides seven IFCs capable of firing-at-command or in a timed programmable sequence up to 800 ms duration with 0.5 ms resolution. When initiator firing circuits are sequenced together, the ISC provides programmable timing between IFCs via the test/programming interface. Each IFC output is dual-fault tolerant against inadvertent firings for each circuit. The controller features a programmable telemetry stream for startup, continuous and commanded built-in tests. The ISC uses a common chassis with common data acquisition, power supply and digital controller assemblies.

**Ignition and Staging Controller (ISC)**

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