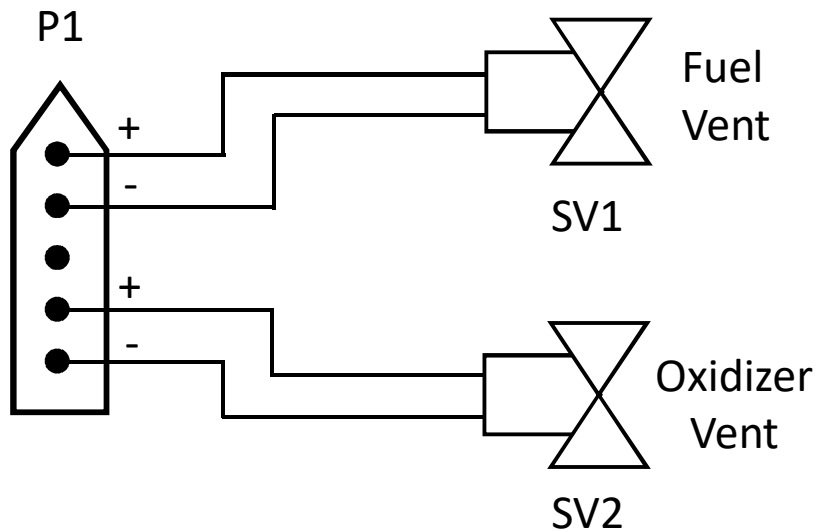


FAR/Mars Competition Rocket Emergency Depressurization System (REDS) Independent Valves

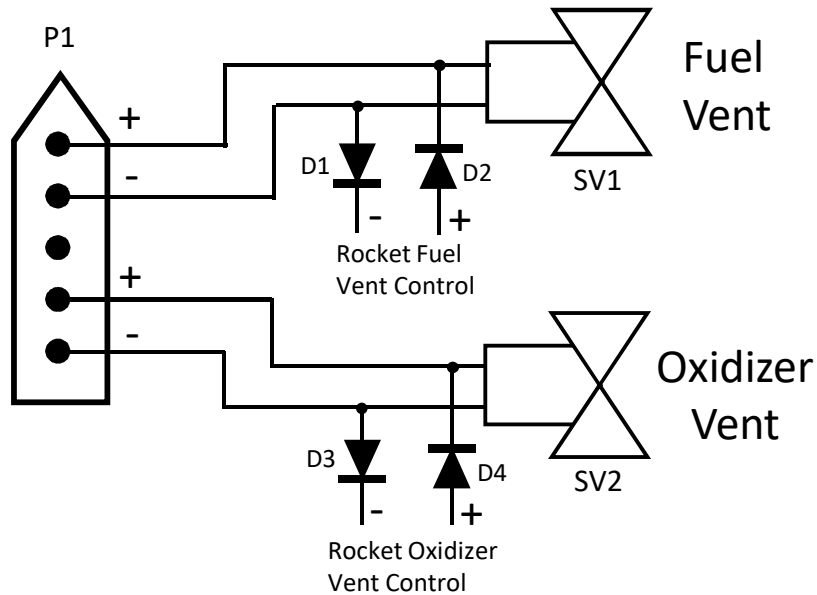


The pin-housing P1 shall be mounted or retained pointing aft or up to a 45° from the body of the rocket, anywhere along the body of the rocket.

Ref Des	Description	Part Number	Vendor
P1	Push-In Power Connector, 5-Poles, Pin Housing, 0.062" Pin, 250-Vac, 5-Adc	69295K97	McMaster-Carr
P1-Pins Quantity 4	Pin, 250-Vdc, 5-Adc, 0.062", 24-18 Gauge Wire	69295K112	McMaster-Carr
SV1 & SV2	Solenoid Valve, Body Orifice 1/32", MOPD: 1000-psi, 24-Vdc, 1/8"-FNPT, Plunger & O-Ring Seals PTFE	A2011-T-T0-C204	Gems Sensor & Controls

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FAR/Mars Competition Rocket Emergency Depressurization System (REDS) Shared Valves

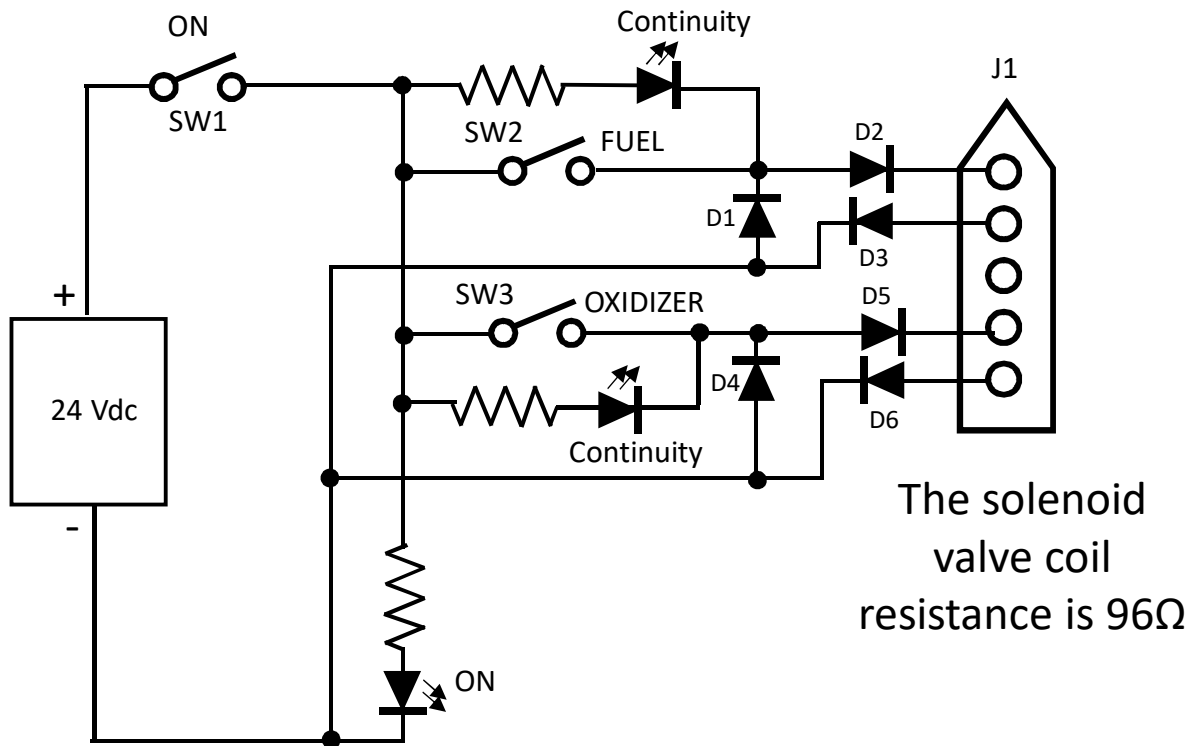


The pin-housing P1 shall be mounted or retained pointing aft or up to a 45° from the body of the rocket, anywhere along the body of the rocket.

Ref Des	Description	Part Number	Vendor
P1	Push-In Power Connector, 5-Poles, Pin Housing, 0.062" Pin, 250-Vac, 5-Adc	69295K97	McMaster-Carr
P1-Pins Quantity 4	Pin, 250-Vdc, 5-Adc, 0.062", 24-18 Gauge Wire	69295K112	McMaster-Carr
SV1 & SV2	Solenoid Valve, Body Orifice 1/32", MOPD: 1000-psi, 24-Vdc, 1/8"-FNPT, Plunger & O-Ring Seals PTFE	A2011-T-T0-C204	Gems Sensor & Controls
D1-D4	General Purpose Diode, 1kV, 1A, DO41	1N4007-TPMSCT-ND	Digi-Key

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FAR/Mars Competition Rocket Emergency Depressurization System (REDS) Test Set



Ref Des	Description	Part Number	Vendor
J1	Push-In Power Connector, 5-Poles, Sleeve Housing, 0.062" Pin, 250-Vac, 5-Adc	69295K5	McMaster-Carr
J1-Sleeves Quantity 4	Sleeves, 250-Vdc, 5-Adc, 0.062", 24-18 Gauge Wire	69295K115	McMaster-Carr
SW1-3	Toggle Switch, Single-pole, Single-Throw		
D1-6	General Purpose Diode, 1kV, 1A, DO41	1N4007-TPMSCT-ND	Digi-Key

November 30, 2017

March 10, 2020

REDS Rocket Emergency Depressurization System

Objective – A standalone system that allows for emergency tank depressurization prior to launch.

Overview – The Rocket Emergency Depressurization System (REDS) allows a REDS Operator to remotely depressurize the rocket prior to launch. Each REDS equipped tank has a vent valve that is wired independently of all other rocket systems to a REDS Plug mounted in a designated area on the rocket exterior. A REDS Pigtail connects the REDS Plug to a ground mounted REDS Junction Box. The REDS Junction Box is connected to the REDS Control Box in a bunker.

During a normal launch the REDS Pigtail disconnects from the REDS Plug as the rocket ascends the launch rail.

During a launch pad emergency the REDS Operator uses the REDS Control Box to open the vent valve and depressurize the rocket.

The REDS Control Box or a similar REDS Test Set can be used to demonstrate vent valve response prior to rocket pressurization.

The following is an over view of the REDS subcomponents and their operation.

Vent Valve – The vent valve should be of a standard voltage, operate within a defined amperage range, and stay open if the rocket power is removed and REDS is activated. There are at least three vent valve options:

1. A specific vent valve part number is mandated by the launch site.
2. A list of vent valve part numbers is mandated by the launch site and the rocket team selects one for their application.
3. A list of vent valve requirements such as voltage, amperage, opening time, and vent line diameter is provided by the launch site and the rocket team verifies vent valve compliance.

The REDS can be installed on an existing vent valve before or after the rocket arrives at the launch site. The existing vent valve wiring would be modified with an independent REDS wiring harness from the vent valve to the REDS Plug. Either the original rocket harness or the REDS wiring harness will be able to open the vent valve. In theory this could be as simple as splicing a REDS wire harness into the existing rocket wire harness with diodes to prevent feedback to either branch of the vent valve power system. The REDS wire harness could be taped to the exterior of the rocket body.

The original and REDS wire harnesses should be separated to prevent electrical failure of one from adversely impacting the other.

The vent valve could port to the interior or exterior of the rocket as the rocket team desires. Consideration could be given to installing a short pipe section modified to act as a whistle to the vent valve exit port to provide an aural indication of tank venting.

REDS Plug – The REDS Plug will be mounted within a designated area of the rocket to allow the REDS Pigtail to connect to the REDS Junction Box. For example, the REDS Plug mount could be specified as 90 degrees clockwise from the rocket launch rail when looking down on the rocket and vertically from the bottom of the rocket up to 5 feet above ground level.

The REDS Plug will be a friction fit type plug with a specified wiring schematic. The REDS Plug will be mounted within a specified orientation, for example within 30 degrees of the vertical axis.

The REDS Plug could be mounted in a variety of ways, for example:

1. Mounted on the bottom of the rocket.
2. Mounted externally in a fairing.
3. Mounted internally with the plug exposed for REDS Pigtail hook.
4. Mounted internally with a door that closes after the REDS Pigtail is pulled.

REDS Pigtail - The upper end of the REDS Pigtail will connect with the REDS Plug and the lower end will connect to the REDS Junction Box via a threaded clamshell or cannon-plug type connector. The intent is for the upper end of the REDS Pigtail to disconnect from the REDS Plug during launch and the REDS Pigtail to be prevented from being an airborne hazard by the lower connector on the REDS Junction Box.

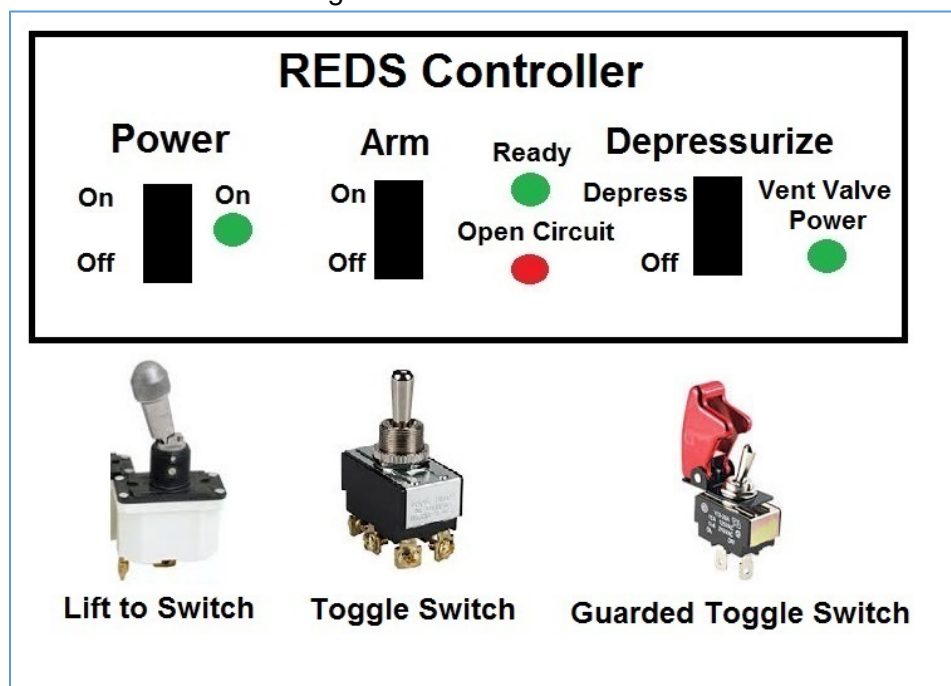
The REDS Pigtail is disposable and may be reused or replaced after every launch as required. Reuse will require a visual inspection and continuity check. The REDS Pigtail length could be varied to optimize the rocket interface or be of a standard length for ease of fabrication and use.

A used REDS Pigtail would provide an appropriate souvenir of a successful launch.

REDS Junction Box - The RDS Junction Box provides a rocket motor exhaust resistant structure to mount the REDS Pigtail mating plugs. The REDS Pigtail mating plugs could be mounted so that they face away from the launch site to minimize damage due to rocket motor exhaust.

REDS Control Box – The REDS Control Box allows the REDS Operator to arm, check and activate REDS as required. An example of a possible REDS Control Box is shown in figure 1.

Figure 1 REDS Control Box



The Power Switch is a lift-to-switch toggle that provides power to the Arm Switch. The first green light illuminates if power is available and the Power Switch is On.

The Arm Switch is a simple toggle switch that provides power to the Depressurize Switch and applies low voltage, low current power through the REDS and vent valve wiring as a continuity check. If continuity exists the second green light illuminates. Note that this is not definitive as a short anywhere in the wiring could show continuity even though vent valve operation may not be possible.

The Depressurize Switch is a guarded switch which provides electrical power to the vent valve when selected On. The third green light illuminates when the Depressurize Switch is in the On position, it does not verify vent valve position. The switch returns to Off position when the guard is closed. The REDS Control Box cannot close the vent valve.

Note that the REDS power supply (not shown) must accommodate the voltage drop from the REDS Control Box to the REDS Junction Box.

REDS Test Set – A REDS Test Set could provide the ability to verify REDS and vent valve operations prior to loading the rocket on the launch rail. The REDS Test Set is similar to the REDS Control Box except it has the ability to close the vent valve. The REDS Test Set could be battery powered for ease of use. An example of a possible REDS Test Set is shown in figure 2.

Figure 2 REDS Test Set

