ACRO ASSOCIATES INC. 900R

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MODULAR SOLENOID CONTROLLER

FEATURES

- HIGH OUTPUT DRIVE: 5.0A
- 150 WATT DRIVE POWER
- SUPPLY RANGE: +8V TO +32V
- FOOTPRINT: 64.8MM×43.2MM×24.8MM
- WEIGHT: 25 GRAMS
- PWM OUTPUT: 25.0KHZ
- INTEGRATED CURRENT SENSOR
- REVERSE VOLTAGE PROTECTION
- INTERNAL FLYBACK DIODE
- OPTO-ISOLATED TRIGGER PORT
- UPGRADABLE SOLENOIDFX FIRMWARE
- MULTI-COLOR DIAGNOSTIC LED
- ADAPTIVE PULSE AND HOLD TECHNOLOGY
- PACKAGING: ECONOMICAL PANEL MOUNT PCB

DESCRIPTION

The 900R is a control module designed for interfacing high-performance solenoid actuators to computer systems and digital logic. It operates from a single 8 to 32 volt DC supply. The user interface consists of an opto-isolated differential input port that can be directly wired to relays, transistor logic, digital I/O boards, and PLCs. The trigger port can be wired for either active-low or active-high operation, depending on the application. The 900R also provides a multi-color diagnostic LED.

The 900R contains a low-side FET power switch employing a pulse-width modulated (PWM) output. PWM operation conserves energy and reduces waste-heat production. This module is optimized for driving inductive electromechanical devices. The load is internally clamped; an external fly-back diode is not required. An integrated microprocessor analyzes load current for additional power savings and short-circuit protection. The 900R is also protected against power reversal on its supply pins.

A factory-programmable socketed ROM stores the controller's configuration matrix. The solenoid manufacturer provides this data, which dictates pulse-and-hold levels, inrush current control parameters, and fault behavior. The ROM technique allows fast turn-around on small quantities, and provides for an upgrade path if the users' needs change.

TABLE 1: 900R PINOUT DESCRIPTION

Pin#	Name	Description	Wire Code
J1-1	$Trig_-$	Active Low Trigger Input.	White/Black
J1-2	$Trig_+$	Active High Trigger Input; 2-10 Volts between $Trig_+$ and $Trig_-$ activates the device.	White
J1-3	V_{ss}	System ground pin.	Black
J1-4	V_{cc}	Positive supply pin. Operating range is +8V to +32V.	Red
J2-1	$Load_-$	Connects negative side of load.	Blue/Black
J2-2	$Load_+$	Connects positive side of load.	Blue

APPLICATION

High performance DC solenoids are generally operated with either 12 or 24 volt power supplies. Pin J1-4 should be connected to the positive post on the power supply. Pin J1-3 should be connected to the ground post. J2-1 should be connected to the negative lead of the solenoid and J2-2 to the positive. Note that most DC solenoids are not sensitive to polarity, so J2-1 and J2-2 may be reversed without consequence. To activate the solenoid, apply 2 to 10 volts between $Trig_+$ and $Trig_-$ ($10V > Trig_+ - Trig_- > 2V$). To deactivate the solenoid either prevent current from flowing into $Trig_+$ and out $Trig_-$ or let Trig+ = Trig-. Note that since the trigger port is optically isolated to 5kV, the signals into it need not be referenced to the 900R power supply.

APPLICATION (Continued)

Powering the trigger port initiates a pulse-and-hold cycle. This begins by supplying the load with an initial high-power pulse that is sufficient for activation. The pulse continues until it is either cut short by the adaptive logic, or T_{PULSE} elapses. At this point, the Hold State begins. In the Hold State, the controller operates the power switch in PWM mode and the reduced duty cycle, specified by the 900R's configuration matrix, maintains the solenoid's energized position. When power is removed from the trigger port, the power switch is shut off and the cycle ends.

DIAGNOSTIC INDICATOR

The diagnostic indicator LED is red when the 900R is powered up and inactive. It is orange during the initial high power pulse, and is green during the hold cycle. A flashing red LED indicates device shutdown and an alternating red/green LED indicates a cancelled hold cycle. See Table 2 for the configuration parameters.

ELECTRICAL INTERFACE

The module's electrical interface consists of two 2.54mm pitch, gold-plated, 0.64mm square-pin headers with friction locks. The package has a total pin count of six, with four pins on J1 and two pins on J2. J1 (mating connector is AMP 641237-4) connects the unit to the power supply and trigger signal. J2 (mating connector is AMP 641237-2) connects the unit to the load. See Tables 1 and 3 for detailed pin assignments and electrical characteristics.

PACKAGING

The module is an OEM style printed circuit board, appropriate for panel mounting inside of an equipment enclosure. Four 12.7mm plastic hex standoffs, with #4-40 internal threads, are provided for mounting. Nylon washers and stainless-steel screws for attaching the standoffs to the board are included. The user must supply hardware for attaching the standoffs to their enclosure. See Figure 1 for a device footprint.

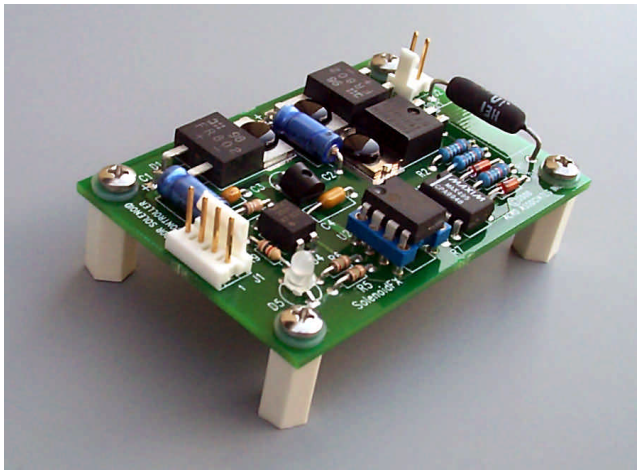

FIGURE 1: 900R FOOTPRINT

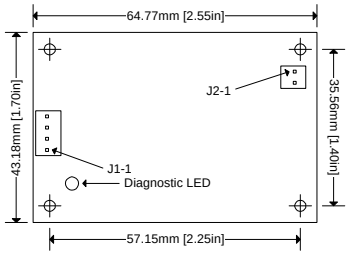

TABLE 2: CONFIGURATION MATRIX

Name	Min	Typ	Max	Units	Description
T_{PULSE}	—	200	2000	ms	The maximum length of the initial high power pulse. This pulse may be shortened by the adaptive logic if the inrush current peaks and then decreases by at least I_{Δ}. Maximum pulse power in Watts is $P_{PULSE} = \frac{\left[\frac{(V_{CC} - 0.5) \times R_{LOAD}}{R_{LOAD} + 0.122}\right]^2}{R_{LOAD}}$ Where R_{LOAD} is the resistance of the load in Ohms. Typical values for P_{PULSE} are between 16 and 100 Watts.
X_{DUTY}	0.00	0.25	0.50	—	Duty cycle for the Hold State. Hold power is $P_{HOLD} = X_{DUTY}^{\ 2} \times P_{PULSE}$ Typical values for P_{HOLD} are between 2 and 7 Watts.
I_{Δ}	0.00	0.75	5.00	A	Current differential for adaptive pulse and hold algorithm.
I_{MAX}	0.00	3.00	5.00	A	Maximum instantaneous current. Load currents above this value will cause the device to shutdown.
I_{PWMLO}	0.00	0.20	5.00	A	Minimum hold current. If the PWM pulse amplitudes fall below this value, the hold cycle will be cancelled. At this point, the user must toggle the trigger port input to start another pulse and hold cycle.
I_{PWMHI}	0.00	1.00	5.00	A	Maximum hold current. If PWM pulse amplitudes exceed this value, the hold cycle will be cancelled.

TABLE 3: ELECTRICAL CHARACTERISTICS

Sym	Min	Typ	Max	Units	Characteristic
T_{OP}	-35	—	60	°C	Operating temperature
T_{STG}	-50	—	100	°C	Storage temperature
V_{CC}	8	—	32	V	Operating voltage
I_{CC}	—	20	60	mA	Standby current (power switch off)
V_{TRIG}	-5	—	10	V	Trigger input voltage ($Trig_+$ - $Trig_-$)
I_{TRIG}	—	2	9	mA	Trigger input current
V_{ON}	2	—	10	V	Trigger activation voltage
P_{PULSE}	—	72	150	W	Pulse mode output power
P_{HOLD}	—	5	37.5	W	Hold mode output power
I_{LOAD}	—	3	5	A	Load current
F_{OSC}	24.0	25.0	26.5	kHz	PWM output frequency
V_{RESET}	—	V_{ss}	—	V	V_{cc} start voltage to ensure error bit cleared and device reset
I_{FAULT}	—	—	100	A	Current during load fault (100ms max)