

Columbia Engineering Manufacturing Co.

8210 Karlov Avenue ☐ Skokie, Ill. 60076-2736
Phone: 847-677-3468 ☐ FAX: 847-677-8317

Model SCRM Starter Protection Control Relay Module - Specifications

The Model SCRM Relay Module provides several forms of protection for engine starter motors. It replaces the traditional starter motor relay in manually started engine installations and vehicles. In addition to energizing the starter motor solenoid when the starting (Cranking) switch (Key) is operated, it provides several other functions all meant to protect the starter motor from burn out, over heating, or engaging to a running engine.

Operating Functions (Features)

1) Limits Excessive Cranking (Over Cranking Protection):

The unit supervises Starter Motor use by measuring and accumulating the amount of time that the starter motor is energized. The total cranking time is compared with the cranking limit time. If the cranking limit time is exceeded, the unit causes lock-out of the starter motor from further cranking. The lock-out lasts for a specific rest (cool down) period of 120 seconds (two minutes).

2) Variable Cranking Limit Times:

The unit monitors the ambient temperature and compares same to preset limits. The result is selection of one of three preset cranking limit times. These are:

Temperature:	(Fahrenheit):	Up to 0 °F	0 to + 50 °F	Above + 50 °F
	(Centigrade):	Up to -18 °C	-18 to + 10 °C	Above + 10 °C
Crank Limit Time:	(Seconds):	120 Sec.	60 Sec.	30 Sec.
Rest (Cooling) Time:	(Seconds):	120 Sec.	120 Sec.	120 Sec.

After the required two minute rest period, the unit releases the lock-out and allows cranking to resume.

3) Crank Time Memory (Standby):

The unit retains the measured crank time for a period of approximately 7.5 minutes after the last cranking has occurred. This memory is independent of the starting (crank) switch or the run/stop switch. This prevents cancelling the accumulated cranking time or skipping the required rest period.

4) Crank Termination:

The unit measures the frequency from the alternator stator (A.C. Signal tap) and compares it to a preset limit. When the frequency exceeds said limit, it de-energizes the starter solenoid to prevent further cranking. The starter motor remains locked out as long as the engine is running regardless of the position or operation of the starter (cranking) switch.

5) Slow Cranking - Blocked Rotor - Frozen Engine - Low Battery Lock-out:

A second comparison of alternator stator signal frequency against a lower preset limit causes lock-out from further cranking if rolling speed is not achieved within one second of actuation of the starter solenoid.

6) Automatic Module Shutoff (Power-Down):

When the engine is not running, the unit will disconnect itself from the battery supply after the 7.5 minute memory time. This prevents the unit from drawing battery current when the engine is not running.

7) Manual Over-ride:

An optional S.P.S.T switch may be connected to the unit to bypass all of the starter lockout functions. This causes the module to act as a conventional starter relay for emergency purposes.

8) Dual Speed Ranges:

An optional jumper to ground selects a lower speed range for the Crank Termination and the Blocked Rotor lockout functions (4 & 5 above).

9) Reverse Battery Protection:

The module will not be damaged by reverse battery connection to any input pin. All inputs are protected to at least 200 volts.

Construction

The unit is housed in a heavy nickel plated, cold rolled steel case which is hermetically solder-sealed to prevent contamination of the unit by any engine fluids and to prevent tampering or defeating its functions. Connections to the unit are made via a sealed military "MS" type six pin connector. All of the unit's functions are performed by conservatively designed circuitry. All components used are either industrial or military grade. The units are completely tested and adjusted at the factory prior to and after sealing. Mounting is by two 1/4" bolts thru a heavy gage solid baseplate.

Operating Conditions

1.0 Temperature Limits:1.1 Storage and Non-operating: -85 to + 230 °F (-65 to + 110 °C)1.2 Operating Temperature: -65 to + 220 °F (-55 to + 105 °C)2.0 Pressure:2.1 Elevation:2.1.1 Storage and Non-operating: 50,000 feet2.1.2 Operating Pressure: 10,000 feet2.2 Submersion:2.2.1 Storage and Non-operating: 15 feet (7.5 psi)2.2.2 Operating Pressure: Not allowed. Connector must remain clean and dry.3.0 Mounting:3.1 Mounting Position: Operation is independent of orientation. However, mounting with the connector side down is recommended to keep the connector clean and dry.3.2 Location: Engine compartment, or any other location protected from damage and from falling or splashing fluids. Exposure to dripping fluids is acceptable if the connector faces down or is otherwise protected.3.3 Dimensions: The unit has two mounting ears having clearance holes for 1/4" (M6) bolts on 4.0 inch (102mm) centers. The mounting area is 4-5/8 by 3-5/8 inches (118 x 92mm) exclusive of the connector which is at right angles to the mounting center line. The required clearance height is 2-3/4 inches (70mm).

3.4 Mounting Surface & Grounding: The unit ground is via the case. If the mounting surface is not electrical ground, then a separate ground wire or braid must be connected by a ring lug under the mounting bolt(s). The ground connection must be capable of conducting 5.0 amperes.

3.5 Shock and Vibration: Any location suitable for a conventional starter relay is suitable.

3.5.1 Shock:

3.5.1.1 Non-operating: 25 G's, any plane

3.5.1.2 Operating: 10 G's max., any plane

3.5.2 Vibration:

3.5.2.1 Non-operating: 20 G's, any plane (to 2,000 Hz sine)

3.5.2.2 Operating: 10 G's max., any plane

The unit may be mounted on any rigid or suitable surface in a vehicle (wheeled or treaded) or vessel. Mounting directly on the engine is suitable only if the above limitations are met.

3.6 Electrical:

The unit is protected from reverse polarity on every connection. The unit has surge protection suitable for heavy duty applications on every input line. The operation of the unit will not be affected by engine device noise, either conducted or radiated. In high field environments, the wiring to the unit may require shielding. The unit does not produce excessive radiated or conducted transients, noise, or R.F. emissions.

4.0 Electrical Connections and Requirements:

4.1 Ground (Case): The unit requires a negative ground connection capable of 5.0 amperes (#16 AWG or larger). The unit is not suitable for positive ground engines.

4.2 Battery (Pin "B"): The wire size should be suitable for the starter solenoid current. This will be in the range of #14 to #10 AWG.

4.2.1 Battery Polarity: Positive (Negative Ground).

4.2.2 Battery Voltage: 24 Vdc Nominal, 34 Vdc max. long term, 50 Vdc short term.

4.2.3 Battery Current (Drain): The main current draw is the Starter Solenoid (or Starter Contactor) coil draw during cranking (starting). The current consumed internally by the unit is less than 1/2 Amp.

4.2.3.1 Standby (Engine Stopped): 0.50 milliamperes maximum long term drain.

4.2.3.2 Cranking: 0.50 Amps maximum, in addition to the starter solenoid coil current.

4.2.3.3 Resting -or- Engine Running: 0.10 Amps maximum.

4.3 Speed Range Select (Pin "D"): Use #18 AWG (or larger) wire.

4.3.1 Low Frequency Range (18 Hz & 80 Hz): Connect Pin "D" to Ground.

4.3.2 High Frequency Range (27 Hz & 120 Hz): Connect Pin "D" to Battery positive or leave unconnected.

4.4 Speed Frequency Signal (Pin "C"):

4.4.1 Signal Source: The alternator stator winding A.C. tap.

4.4.2 Signal Voltage: 4.0 Vac Minimum, 35 Vac Max. long term, 75 Vac Max. short term.

4.4.3 Signal D.C. Bias: Maximum allowed D.C. voltage is the same as the Battery Voltage, given above (35 Vdc long term, 50 Vdc short term).

4.4.4 Signal Frequency:

4.4.4.1 Low Range: 18 Hz, within 1.0 Seconds, for Crank Enable (Blocked Rotor - Frozen Engine Protection), 80 Hz for Crank Terminate (Engine running).

4.4.4.2 High Range: 27 Hz, within 1.0 Seconds, for Crank Enable (Blocked Rotor - Frozen Engine Protection), 120 Hz for Crank Terminate (Engine running).

4.4.5 Wire Size: #18 AWG (or larger).

4.5 Optional Lock-Out (Emergency) Override Switch (Pin "F"): Wire one side of a normally open (N.O. S.P.S.T.) switch to pin "F". Wire the other side of the switch to Ground. Closing of both the Cranking (Starting) Switch and the emergency Override Switch is required to override the starter protection functions and cause unconditional cranking. Use # 18 AWG (or larger) wire.

4.6 Cranking (Starting) Switch (Pin "A"): Wire one side of the normally open Crank (Start) Switch to pin "A" with the other side of the switch wired to a battery positive (circuit). Use # 18 AWG (or larger) wire.

4.7 Starter Solenoid Coil (Pin "E"): The output from the unit is contact closure from Pin "A" to Pin "E" thru the internal relay contact, to energize the Starter Solenoid or Starter Contactor. Wire Pin "E" to the Solenoid or Contactor coil circuit (terminal). Use the same wire size as used for Pin "A". The wire size should be suitable for the starter solenoid current. This will be in the range of #14 to #10 AWG.

5.0 Technical Specifications

5.1 Dimensions:

5.1.1 Overall Size (inches): 4.62" Long, 3.2" Wide, 2.75" High,
(millimeters): 117,5mm Long, 92,0mm Wide, 70,0mm High.

5.1.2 Total Unit Weight: 2.6 pounds, (1,2 Kilograms).

5.1.3 Mounting Dim's (inches): Two 9/32" holes for 1/4" Bolts on 4.00 inch Centers,
(millimeters): Two 7,1mm holes for M6 Bolts on 101,6mm Centers.

5.2 Connections:

5.2.1 Inputs: Case Ground, Battery, Starting (Crank) Switch, and Alternator Frequency Signal. Optional: Emergency Over-ride Switch, Speed Range (High/Low) jumper.

5.2.2 Outputs: Contact for Starter Solenoid Coil or Starter Relay Coil hot (Positive) lead.

5.2.3 Unit Connector: MS-3102R-22-5P Cylindrical Military Series six pin connector.

Note: Mating connector must be a water resistant type (such as MS-3106R-22-5S) if connector will be exposed to water or engine fluids. See also Mounting Location, above.

5.3 Environmental:

5.3.1 Operating & Storage Temperatures:

5.3.1.1 Storage (Non-operating) Range: -65 to + 110 °C

-85 to + 230 °F

5.3.1.2 Operating Temperature Range: -55 to + 105 °C

-65 to + 220 °F

5.3.2 Pressure: 15 psig to 10,000 Feet.

5.3.3 Shock & Vibration: No false relay contact opening or closures longer than 10 microseconds during tests.

5.3.3.1 Vibration: Sinusoidal; 5 to 55 Hz, 0.06 inch D.A., three planes, over temperature range of -55 °C to + 105 °C, 30 minutes per plane, 90 minutes total test time.

5.3.3.2 Shock: 10 G's, Half Sine, six planes, 4 impacts each (24 total drops).

5.3.4 Water Proofness: No leakage during immersion in salt water for 30 minutes at 6.0 psi vacuum (8.7 psia) followed by 30 minutes at 6.0 psi (20.7 psia) positive pressure, all while operating. No bubbles or false operation. (Unit is Solder Sealed).

5.3.5 E.M.I.: Per Mil-Std-416B, method CE07 (Conducted Emissions).

5.3.6 Corrosion Protection: Case plated with 800 microinches (20 microns) minimum, Bright Nickel per Federal Specification QQ-N-290, Class "I", Grade "D", over Copper Flash.

5.4 Operating Voltage (Over Temperature Range):

5.4.1 16.0 Vdc Minimum, 32.0 Vdc Maximum continuous. 50.0 Vdc for 2.0 seconds Maximum.

5.4.2 Transients per Mil-Std-1275 (24 Volt Vehicle Electrical Systems), no damage.

5.4.3 Relay Operation:

5.4.3.1 Relay Pick-up: 18 Vdc Minimum (12.0 Vdc for Military Version).

5.4.3.2 Relay Drop-out: 9.0 Vdc Minimum (7.0 Vdc Minimum for Military Version).

5.5 Frequency Related Functions (Over Temperature Range):

5.5.1 Locked Rotor/ Frozen Engine Protection (Slow Cranking Lock-out):

5.5.1.1 Low Range (Pin "D" = Ground): 14 to 24 Hz to enable continued cranking.

5.5.1.2 High Range (Pin "D" = Battery or Open): 22 to 45 Hz to enable continued cranking.

5.5.2 Crank Termination (Running Engine Protection):

5.5.2.1 Low Range (Pin "D" = Ground): 70 to 90 Hz to enable continued cranking.

5.5.2.2 High Range (Pin "D" = Battery or Open): 105 to 135 Hz to enable continued cranking.

5.5.3 Alternator Signal Voltage Input:

5.5.3.1 Long Term (Operating): 3.0 Vac Minimum to 50 Vac Maximum, Continuous.

5.5.3.2 Short Term: 80 Vac for 15 Seconds, Maximum.

5.5.3.3 D.C. Bias Voltage: None Required, 50 Vdc Maximum, Continuous, allowed.

5.5.3.4 Maximum Alternator Frequency: 900 Hertz, Continuous.

5.6 Crank Time Control (Over Temperature Range):

5.6.1 Crank Time Memory: 5.0 Minutes minimum, from First Crank.

5.6.2 Module Power Down: 10 .0 Minutes maximum, from Last Crank.

5.6.3 Crank Limit Times: These are the allowed cumulative crank time before the rest period is imposed.

5.6.3.1 Low Temperature Range: 120 to 130 Seconds from -65 °F to + 10 °F (-55 °C to -18 °C).

5.6.3.1 Mid. (Cool) Temperature Range: 60 to 66 Seconds from + 10 °F to + 50 °F (-18 °C to + 10 °C).

5.6.3.1 High (Hot) Temperature Range: 30 to 33 Sec. from + 50 °F to + 220 °F (+ 10 °C to + 105 °C).

5.6.4 Rest (Starter Cool Down) Time: 120 to 130 Seconds.