

# ASM150 MURPHYMATIC® Micro-controller Installation and Operation Instructions

ASM-92152N  
Revised 01-04  
Section 40 and 75  
(00-02-0198)



Please read the following information before installing. A visual inspection of this product for damage from shipping is recommended before installing. It is your responsibility to have a qualified person install this unit and make sure it conforms to local codes.

## GENERAL INFORMATION

### WARNING

BEFORE BEGINNING INSTALLATION OF THIS MURPHY PRODUCT

- ✓ Disconnect all electrical power to the machine.
- ✓ Make sure the machine cannot operate during installation.
- ✓ Follow all safety warnings of the machine manufacturer.
- ✓ Read and follow all installation instructions.

**CAUTION:** *Certain danger to human and to equipment such as applied in a mobile or marine application may occur if some equipment is stopped without pre-warning. It is therefore, recommended that monitored functions be limited to alarm only or to alarm before shutdown in such applications.*

### Description

The ASM150 is a solid-state, automatic engine controller with automatic start/stop capabilities. The ASM150 operates from a 12 or 24 volt battery. It includes selectable crank and rest cycles, sensing circuit for crank disconnect and overspeed, overcrank, and re-crank protection on false starts. Four LEDs indicate first-out shutdown for: low oil pressure, high temperature, overcrank and overspeed. A fifth LED indicates engine running. The ASM150 mounts flush in a panel and is ideal for small generator or engine panels.

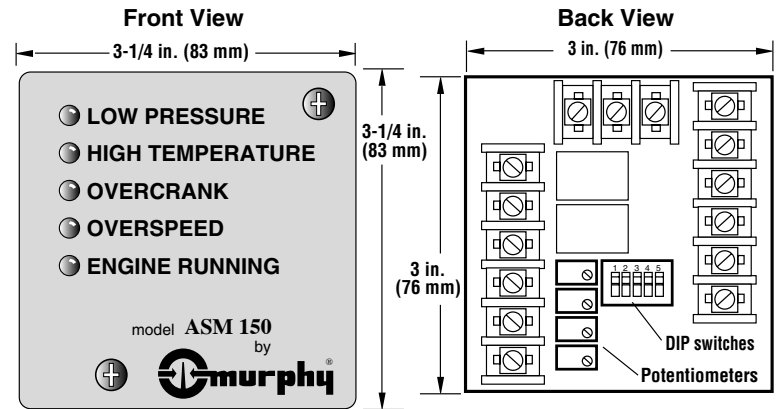
### Specifications

- Power Input:** 12 or 24 VDC.
- Operating Temperature:** -40 to 185°F (-40 to +85°C).
- Inputs:** Ground or positive inputs for high temperature or low pressure sensors.
- Outputs:** 5 A relay for cranking and fuel valve. 300 mA transistor for fault annunciation.
- Cycle Crank Timer:** Up to 8 attempts. Re-Cranks on false starts (fixed 30 sec.).
- Crank/Rest Cycle Timing:** 4 to 25 seconds (adjustable).
- Lockout Time Delay:** 1 to 25 seconds (adjustable). Locks out low oil and high temperature on start-up.
- Crank Disconnect Speed Setting:** From 30 to 8500 Hz.
- Overspeed Trip Point Setting:** From 30 to 8500 Hz.
- Magnetic Pickup Input:** Requires 2V rms minimum.

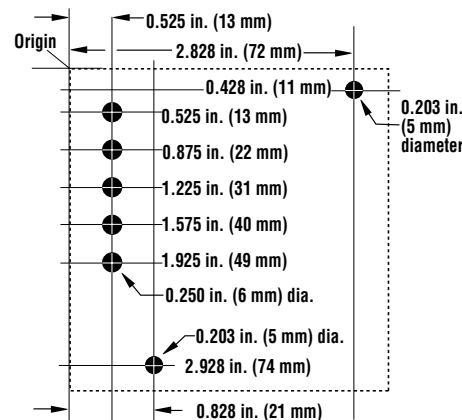
### Installation Accessories

- Tools as needed for module mounting, such as drill and screw driver.
- 10 and 14 AWG (6.0 mm<sup>2</sup> and 2.5 mm<sup>2</sup>) wire for hook up.
- Set of wire termination tools.
- Wire termination; such as spade terminals.

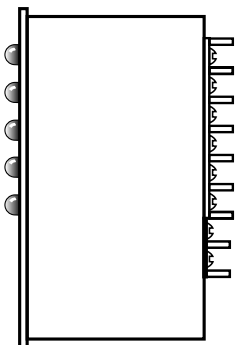
### ASM150 Mounting Dimensions



### Mounting Drill Pattern

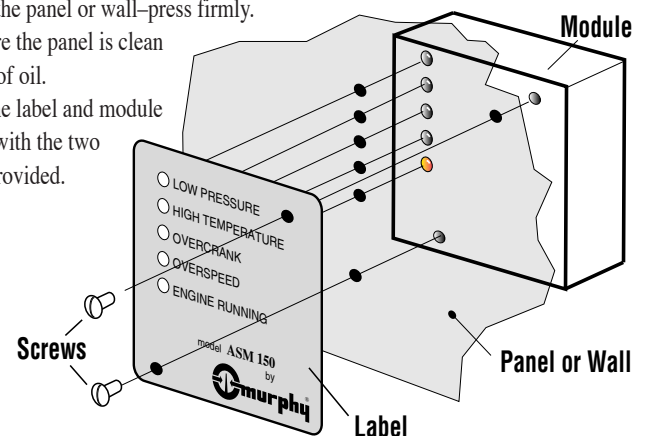


### Side View



### Mounting the ASM150 Module

1. To mount the ASM150 module to your panel or wall, drill five (0.250 in. [6 mm] dia.) holes for LED indicators, and two (0.203 in. [5 mm] dia.) holes for mounting screws. See "Mounting Drill Pattern", above, for dimensions.
2. Insert the ASM150 module from the back of the panel or wall into the pre-drilled holes. See schematic below.
3. Remove the adhesive cover from the back of the ASM150 label and position the label on the panel or wall—press firmly. Make sure the panel is clean and free of oil.
4. Secure the label and module in place with the two screws provided.



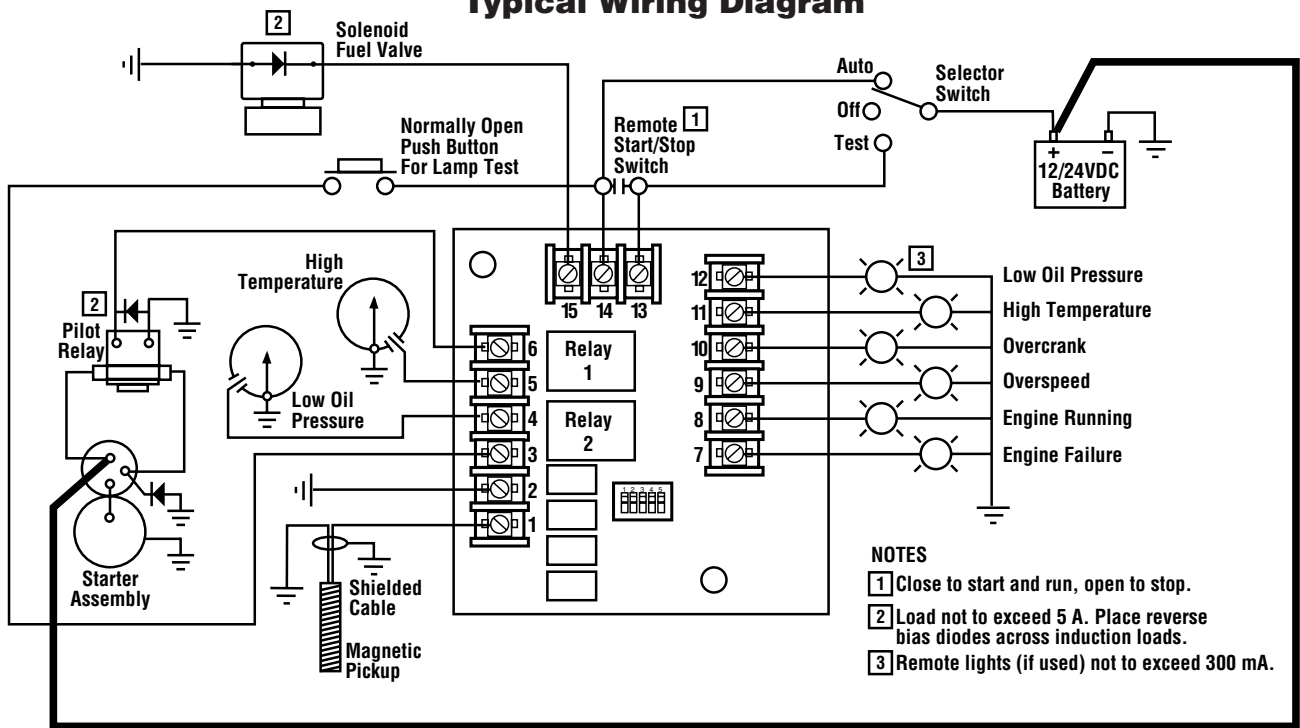
## WIRING THE ASM150

**WARNING:** Disconnect ALL electrical power before beginning the wiring. STOP ALL machinery before performing the hook up. Any load connected to the panel which draws current in excess of 5 Amps MUST be piloted at the load. Do NOT short output to ground.

The ASM150 is a pilot duty device. The outputs are designed for control only.

1. Wire the ASM150, using 14 AWG (2.5 mm<sup>2</sup>) stranded wire. When wiring to terminals 2, 13, and 14 (terminals for the power connections), we suggest using larger wire size (10 AWG [6.0 mm<sup>2</sup>] recommended), this will help to carry necessary power to the unit during an engine start.
2. When hooking the battery positive (+) and ground wires to the ASM150, route them directly from the battery to the unit. This will help reduce electrical noise coupling and avoid voltage losses from other devices.
3. If a standby battery charger is installed, it must be wired directly to the battery, NOT to the ASM150. This could cause electronic "noise" produced by the charger to be coupled into the microprocessor. If the "noise" is severe, erratic operation could occur.
4. Do not route low voltage DC (battery) control wires in the same conduit as high voltage AC wires.
5. Use shielded cable for connecting the magnetic pick up to the ASM150. Ground only one end of the shield (suggest to ground it at the engine).
6. Always place reverse bias diodes across inductive loads (see "Typical Wiring Diagram", Note: 2, below). This increases the contact life and helps eliminate a source of electro magnetic noise.
7. Outputs 6 and 15 are rated for 5 A. Outputs 7, 8, 9, 10, 11, and 12 are rated for 300 mA.
8. Output 7 "Engine Fail IN/OUT" can be used as remote failure output. An external device supplying battery positive (+) to the terminal will cause a shutdown.

### Typical Wiring Diagram



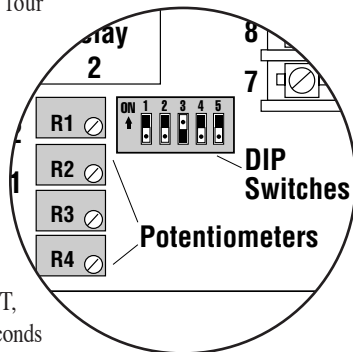
## MAKING ADJUSTMENTS TO THE ASM150

On the back of the ASM150, you will find four (4) potentiometers and five (5) DIP switches for customizing your controller. The four potentiometers are designated as follows:

- R1 = Overspeed Adjustment
- R2 = Crank Disconnect Adj.
- R3 = Crank / Rest Time Adj.
- R4 = Shutdown Lockout Delay Adj.

Please note, the factory default settings are approximately 3750 Hz OVERSPEED, 600 Hz CRANK DISCONNECT, 10 Seconds CRANK/REST, 5 CRANKING ATTEMPTS and 25 Seconds for SHUTDOWN LOCKOUT DELAY.

### ASM150 Module Back View Detail

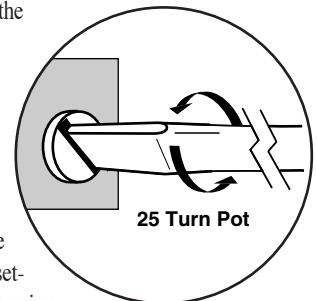


### Overspeed (R1 Pot)

The OVERSPEED adjustment prevents the engine from being damaged if there is a malfunction which causes the engine speed to exceed the recommended speed.

To set the OVERSPEED value, turn the OVERSPEED Pot (R1) fully clockwise and run the engine up to the maximum operating speed. Next, slowly turn the Pot (R1) counterclockwise until the engine shuts down on OVERSPEED. Now, turn Pot (R1) clockwise two turns. This will adjust the OVERSPEED set-point slightly higher than the maximum engine operating speed.

### Potentiometer Detail



**Crank Disconnect (R2 Pot)**

The CRANK DISCONNECT adjustment is used to let the ASM150 know when the engine has started so that it will disengage the starter. First, set the throttle at a slow idle (as slow as the Engine will run while cold, plus 100 or 200 RPM). Now, turn the **Pot (R2)** fully clockwise, loosen the crank wire at **Terminal #6**. Cause the engine to start and immediately disconnect the crank wire (terminal #6) to prevent further cranking. Slowly turn the **Pot (R2)** counter-clockwise until the green light (Engine Running) turns ON. This adjustment must be complete within 90 seconds, or the engine will shut down indicating OVERCRANK. If this happens, simply connect the crank wire (terminal #6), enable starter circuit, manually reset and try again.

**Crank / Rest Time (R3 Pot)**

The CRANK/REST TIME refers to the length of time the ASM150 will crank the engine and then rest the starter between cranks. This time is adjustable between 4 and 25 seconds. To increase the setting, turn the **Pot (R3)** clockwise; to decrease the setting, turn **Pot (R3)** counterclockwise.

**Shutdown Lockout Delay (R4 Pot)**

The SHUTDOWN LOCKOUT DELAY adjustment is used to disregard any signal from the Low Oil Pressure and High Temperature switches. When an engine first starts, there is no oil pressure. Because of this, the SHUTDOWN LOCKOUT DELAY must be set so the engine oil pressure and coolant temperature can reach normal operating ranges. When starting a cold engine, it takes a few seconds for the oil pressure to build up which would cause the unit to shutdown the engine unnecessarily. This is also true with coolant temperature when starting a hot engine. This delay is adjustable between 1 and 25 seconds and begins timing as soon as CRANK DISCONNECT occurs. To increase the setting, turn the **Pot (R4)** clockwise; to decrease the setting, turn **Pot (R4)** counterclockwise.

**Overcrank Adjustments (DIP Switches)**

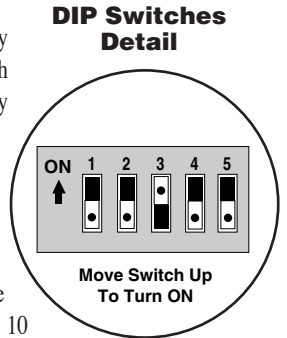
The ASM150 allows you to crank the engine once and signal OVERCRANK if it fails to start, or you can configure it to crank the engine several times before it signals OVERCRANK. See the "DIP Switch Setting Chart" (at right) for the number of cranking attempts you would like to have for your specific application.

If you would like only one crank, move **Switch 4** to **ON**. Remember, that by

switching **Switch 4 ON**, the ASM150 will only crank one time. Now, move **Switch 1** through **Switch 3** to the number you would like to multiply the CRANK/REST TIME by and then add to the CRANK/REST TIME. The formula for calculating single crank time is as follows:  
 Single Crank Time = (Crank/Rest Time x Dip Switch Attempts) + Crank/Rest Time.  
 For example, if **Switch 1** through **Switch 3** were all **OFF** and the CRANK/REST TIME is set to 10 seconds, then the single crank would be 20 seconds because  $(10 \times 1) + 10 = 20$ .

If **Switch 1** through **Switch 3** were all **ON** and the CRANK/REST TIME is set to 10 seconds, then the single crank would be 90 seconds because  $(10 \times 8) + 10 = 90$ . You can also achieve a single crank by setting **Switch 1** through **Switch 4** to **OFF**. However, this single crank can only range between 4 and 25 seconds depending on the setting of the CRANK/REST TIME pot.

If the engine false starts and the ASM150 RE-CRANK's the engine, it will count this as a cranking attempt. This way, if the engine false starts the same number of times as your cranking attempts, then the unit will show OVERCRANK. Please note: **Switch 5** is not used for any function on the ASM150.



**DIP Switch Setting Chart**

**NOTE:** **Switch 5** is not used. Values in the chart are true only when **Switch 4** is in the **OFF** position. When **Switch 4** is in the **ON** position, there will be only one crank attempt.

Crank Attempts	Switch 1	Switch 2	Switch 3
1	OFF	OFF	OFF
2	OFF	ON	OFF
3	ON	OFF	OFF
4	ON	ON	OFF
5	OFF	OFF	ON
6	OFF	ON	ON
7	ON	OFF	ON
8	ON	ON	ON

**SEQUENCE OF OPERATIONS**

**Sequence of Operations with Panel in "Auto"**

When the ASM150 receives an automatic start signal from the remote start contacts, it cranks the engine until CRANK DISCONNECT speed is reached. At this time, the SHUTDOWN LOCKOUT time delay will begin timing and the ENGINE RUNNING light will be lit. It will continue to run until it is no longer needed or a malfunction occurs. The SHUTDOWN LOCKOUT DELAY serves a dual purpose. It causes the ASM150 to disregard the signals to the OIL PRESSURE and WATER TEMPERATURE terminals at engine start-up. It is also a delay which, if the engine false starts before the delay expires, causes the engine to RE-CRANK after a fixed delay (35 seconds), to let the engine stop moving before engaging the starter.

If the engine fails to start after the user adjustable number of crank and rest attempts, the ASM150 will annunciate an OVERCRANK condition on the LED's and lockout the engine from any further start attempts. The OVERCRANK condition can be reset by moving the Test - Off - Auto switch into the "OFF" position and back into the "AUTO" position.

If the engine speed exceeds the OVERSPEED setpoint (user adjustable), the ASM 150 will shut down the engine, and annunciate OVERSPEED as the cause of shutdown on the LED's, and lockout the engine from any further start attempts. The OVERSPEED condition can be reset by moving the Test - Off - Auto switch into the "OFF" position and back into the "AUTO" position.

If a low oil pressure condition occurs while the engine is running, the ASM150 will shut down the engine and annunciate "LOW PRESSURE" on the LED's and lockout the engine from any further start attempts. Please note that the SHUTDOWN LOCKOUT DELAY must have expired to get a shutdown on low oil pressure or high water temperature. This is also reset by moving the Test - Off - Auto switch into the "OFF" position and back into the "AUTO" position.

If a high engine temperature condition occurs while the engine is running and after the SHUTDOWN LOCKOUT DELAY has expired, the ASM150 will shutdown the engine and annunciate "HIGH TEMPERATURE" on the LED's and lockout the engine from any further start attempts. This is also reset by moving the Test - Off - Auto switch into the "OFF" position and back into the "AUTO" position.

**Sequence of Operations with Panel in "Test"**

When the Test - Off - Auto switch is placed in the "TEST" position, an automatic start signal is simulated. Therefore, the controller will operate the same as it does in "AUTO." However, it will continue to run as long as there are no signals from monitored conditions or until the Test - Off - Auto switch is moved to the "AUTO" or "OFF" positions. Keep in mind, it will still shut down the engine if a monitored condition occurs such as low oil pressure or high temperature.

## TROUBLESHOOTING INFORMATION

**WARNING:** Make sure voltage and current requirements are within the ASM150 ratings. Determine the polarity for the application. Use appropriate wire size for voltage and current. Do NOT route/bundle AC POWER wires with any other wiring.

*These instructions will assist in the correction of most problems which you may encounter with the unit. Before checking the list, first check all wiring and connections. If problems persist after the checks, consult any Murphy facility.*

<b>SYMPTOM</b>	<b>CORRECTIVE ACTION</b>
<b>When Test - Off - Auto Switch is placed in the TEST Position, nothing happens.</b>	Check your fuse to make sure it is good. Use a SFE 14 fuse. If good, check with a meter to see that battery (+) is present on middle terminal of toggle switch. Also, confirm voltage is present at terminal 13 when switch is in TEST position.
<b>Starter does not hold in long enough for the engine to start.</b>	Unit is possibly seeing a voltage drop. Ensure that battery is hooked directly to unit, 14 AWG wire is used, and no short circuits are present. Also make sure that the crank disconnect pot (R2) is turned up high enough.
<b>Odd, erratic behavior is noticed.</b>	Check to ensure that all alternator and ignition wiring is routed in a separate wiring loom from the rest of the control wiring. Also, confirm the use of shielded cable for the magnetic pickup. Resistor type spark plug wires and/or RF type spark plugs may be necessary for spark ignition engines.
<b>Unit shuts down on oil pressure soon after start.</b>	Check oil level. Turn up shutdown lockout delay pot (R4) to increase lockout time and give engine time to develop oil pressure.
<b>Unit will not start when remote start / stop contact closes</b>	Move panel mounted Test - Off - Auto switch to the "AUTO" position.
<b>Engine cranks but never starts.</b>	Make sure your fuel valve circuit is wired to terminal 15.
<b>Engine starts but green light blinks on briefly then goes out for 35 seconds. This occurs the same number of times set for crank attempts. Engine is then shutdown on Overcrank.</b>	Verify the number of teeth on flywheel and engine running speed. Using the following formula $RPM \div 60 \times \text{Teeth} = \text{Hertz}$ , determine the engine frequency in hertz. Also, determine the date code and revision number for your ASM150 unit. This information is printed on the side of the module. Call Murphy with this information to further trouble shoot the problem.
<b>Output appears not to function.</b>	Tighten connections to back of ASM150. Usually a good tight torque on the screw will solve this problem. You can verify operation by hooking a lamp to the suspect output. If the light does not come on when it should, call Murphy.

### Warranty

A limited warranty on materials and workmanship is given with this FW Murphy product.  
A copy of the warranty may be viewed or printed by going to [www.fwmurphy.com/support/warranty.htm](http://www.fwmurphy.com/support/warranty.htm)



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