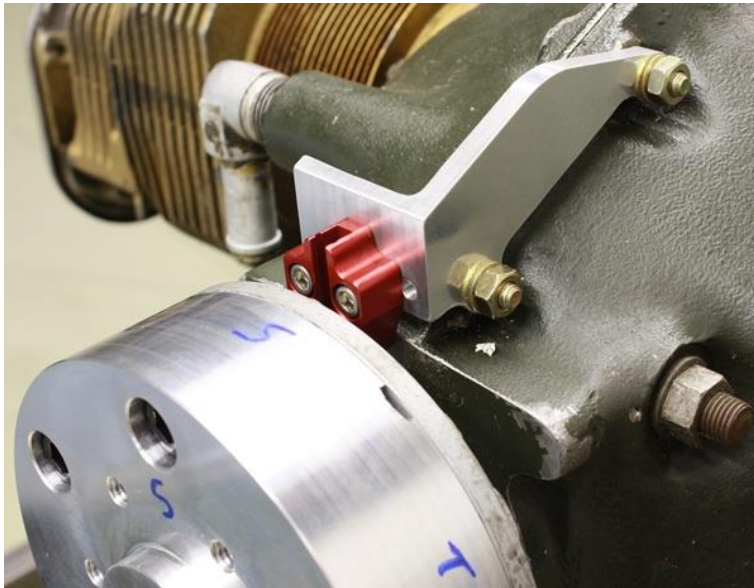


This manual covers the steps to install the SDS EM-5 fuel injection and ignition system components on O-200 engines.

### Hall Sensor and Bracket

Install the red Hall sensor to the supplied bracket using the 10-32 Allen head hardware and lock washers supplied. Tighten to 35-50 inch pounds.

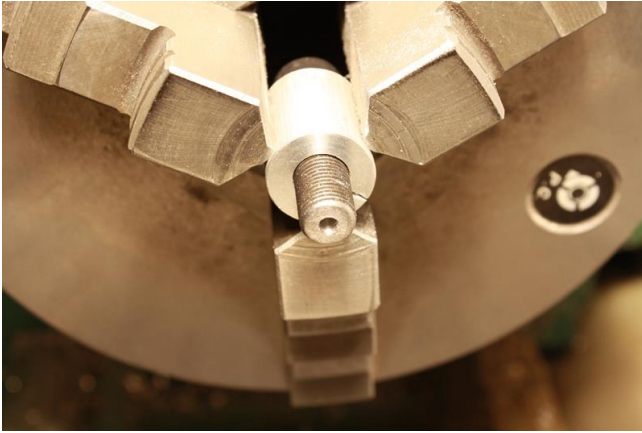
Remove the two front most 1/4" upper crankcase bolts near the prop hub. Place one washer under the bolt heads and of the new supplied bolts and insert from the right side. Place another washer over each bolt, then slide the Hall bracket over the bolts. Add one more washer and then thread the nuts on. Torque to 75-85 inch pounds.



Install the supplied fire sleeve over the sensor cable(s) and bolt the Adel clamp(s) to the Hall bracket to secure the cables in place using a –3 bolt and lock nut through the hole provided at the top of the bracket..

### Magnet Mounting

The magnets are mounted into holes you will drill into 3 of your 6 prop bolt ends using the split bushing fixture supplied in the kit. Slide the prop bolts into the bushing and clamp tightly in a lathe chuck. Drill about .187 deep into the bolt end using a #30 drill. Clean the chips away and insert a magnet to check for about .060 protrusion past the bolt end. Carefully drill incrementally deeper until you get the magnet to protrude this distance. Repeat on 2 of the other bolts.



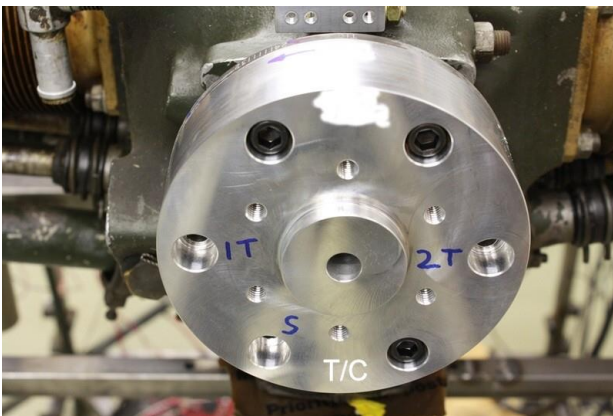
Using the drilling sleeve to clamp prop bolt in lathe chuck

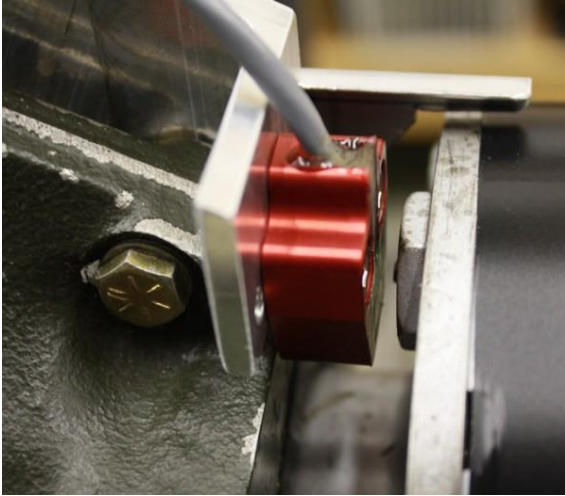
Clean the bolt holes and tips with compressed air and acetone so they are free of chips and oil. Mix up a small amount of 5 minute epoxy and using a piece of 1/16 welding rod, insert a small amount of epoxy into the bolt holes. Using a piece of wooden doweling or aluminum stock (non ferrous material), push 2 of the magnets into the holes with the blue end facing out and one magnet with the blue end facing into the bolts. You should have a small meniscus of epoxy surrounding the magnet.

### **Prop Bolt Placement**

Note the position of the bolts in relation to the T/C mark on the prop flange edge. The ones marked T are for the trigger magnets (blue end facing out). The one marked S is for the synch magnet (blue end facing into the prop bolt). The bolt tips should be approximately flush with the threaded flange bushings, +/- about .015. Place washers under the prop bolt heads until you achieve this measurement when they are fully torqued.

Magnet/ bolt placement on crank flange with crank at TDC 1 (T/C mark lined up with LOWER case split).





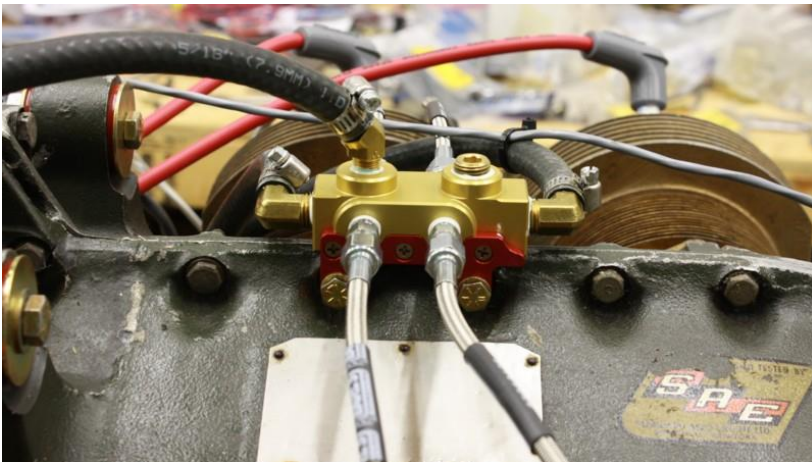
### **Magnet Air Gap**

You should aim for .050- .080 air gap between the tip of the magnets and the red Hall Effect sensor. See the photo below.

### **Fuel Block**

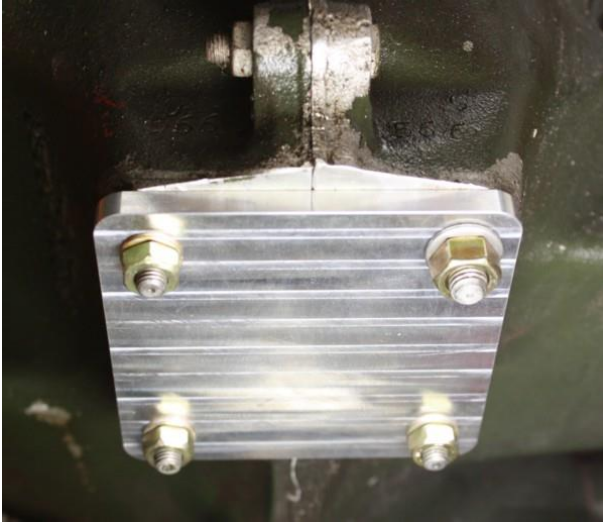
Remove 2 of the top crankcase through bolts as shown the in photo below. Replace the stock bolts with the longer, supplied ones using one washer under the head, then slide the bracket over the bolts, then one more washer and then the nuts. Torque to 75-85 in lbs.

Screw in the supplied fittings as desired using a SMALL amount of Teflon pipe sealant compound Just enough to fill the threads of the fittings). NEVER use silicone (RTV) for sealing fittings! Tighten the fittings until snug and orientated as desired.



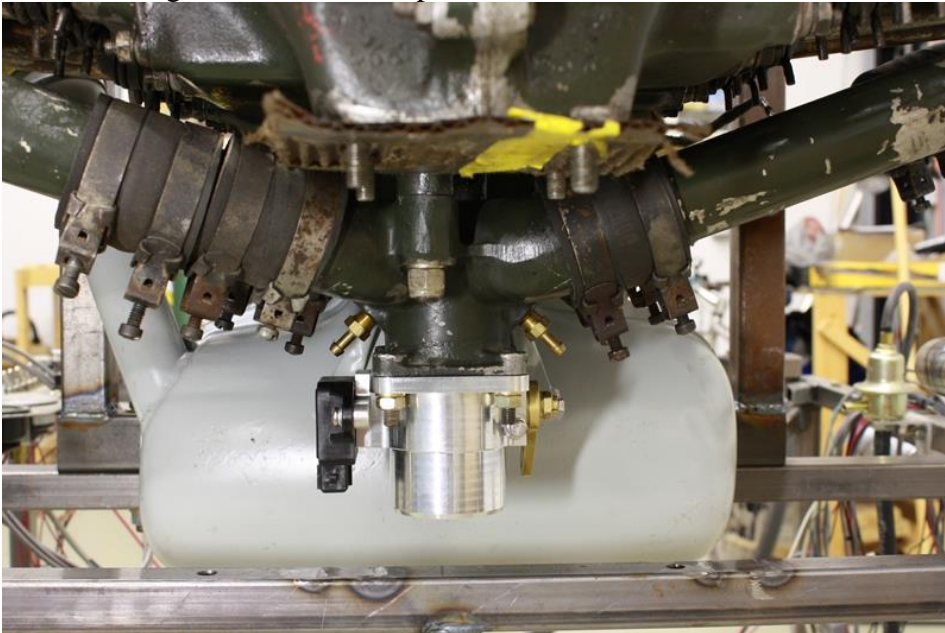
## Vacuum Pump Cover

If you're not using the factory vacuum pump, install the supplied cover. First lightly oil the large sealing O-ring and place it in the cover groove. Carefully slide the cover over the studs, being sure not to disturb the O-ring out of its groove. Tighten the  $\frac{1}{4}$  nuts to 140-160 inch lbs. and  $\frac{5}{16}$  one to 180-220 inch lbs. No sealant is required for this cover.



## Throttle Body/ Intake Manifold

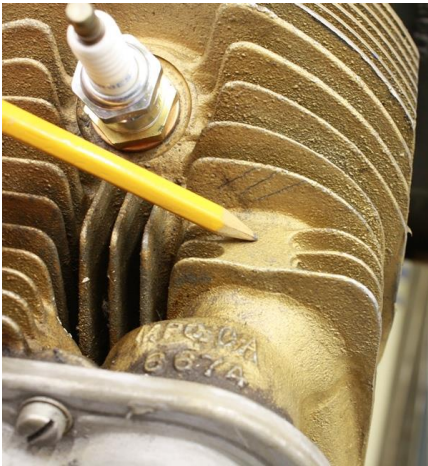
Lightly oil the TB O-ring and nest it in the groove. Noting the photo below, carefully slid the TB over the manifold studs without disturbing the O-ring. Install the washers and nuts and torque to 90-110 inch lbs. Due to the location of the oil sump behind the TB, most throttle linkages will need to loop around and attach to the arm from the front side.



Remove one or both of the stock 1/8 NPT plugs in the intake manifold and install one or both of the supplied brass barb fittings. You will attach supplied vacuum hose here for the MAP sensor and fuel pressure regulator.

### Fuel Injector Mounting

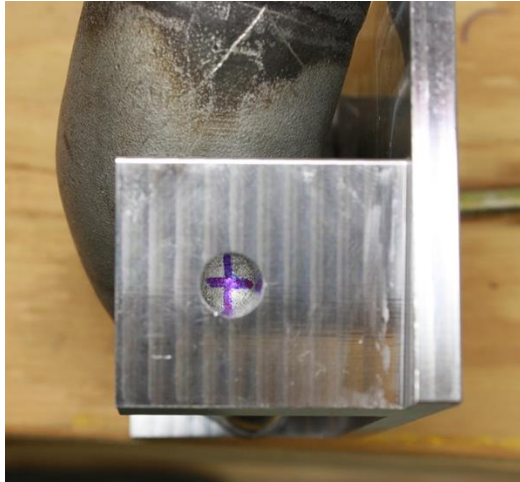
Some O-200 engines have 1/8 NPT plugs in the tops of the heads for primer fittings. See photos below for position. If you have these and enough cowling clearance for the injectors in this position, you can just remove these plugs and screw the injector fittings in here. In some cases, you may have to slightly relieve a small part of the adjacent cooling fin for clearance.



If you don't have these plugs, you will need to remove the aluminum induction elbows bolted to the port openings and drill/ tap them to accept the injector fittings. The following text applies to this case.

Loosen the 2 bolts and 2 hose clamps securing each induction elbow.

Mark the center of each pad as shown below.



Place the elbow in the provided drilling fixture, insert the provided bolts and washers and just snug them enough so you can still move the elbow in the fixture with hand pressure. Center the cross mark in the middle of the drill guide holes as shown.

Carefully tighten the bolts to hold the elbow in the fixture tightly, making sure the marked cross is still in the center of the drilling guide hole.



Clamp the fixture in a vise.

Insert the provided 11/32 drill into a 3/8 hand drill.

Drill straight through the elbow pad with medium speed.



Remove the elbow from the fixture and repeat the procedure on the other 3 elbows.

Coat the provided 1/8 NPT tap with tapping/cutting oil and tap the 11/32 hole you just drilled. Be sure to check the tap for straightness in 2 planes as you tap as shown. Go in about halfway, remove the tap, clean the threads and tap and then thread the 1/8 NPT injector hex adapter into the hole. Slowly tap deeper and try the adapter in the hole frequently until you have about 3 threads left showing on the adapter with heavy finger pressure screwing it in. Do not rush the job or tap too deep or you may ruin the elbows.

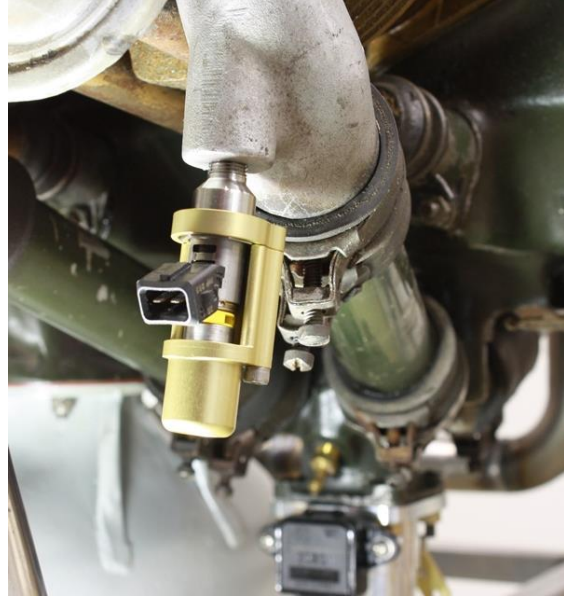


Once you get all 4 elbows tapped, deburr the holes and blow them out thoroughly with compressed air.

Re-install the elbows after cleaning all remnants of the old gaskets from the head and elbow sealing faces. Install the new gaskets provided and tighten the elbow bolts to 75-80 inch lbs.

Install the steel hex adapter with the gold ring into the threaded holes after applying a SMALL drop of blue Locktite 292 to one side of the threads. Torque each adapter/ ring to 80 inch lbs.

Lubricate the 2 injector O-rings lightly with oil and slid the retaining cap over the injector and push the whole assembly into the adapter bore. Install the two 8-32 Allen bolts into the ring threads after applying a TINY drop of blue Locktite 292 to the threads. Get the bolts slightly snug, then rotate the assemblies until they are orientated as you desire. Tighten the Allen bolts.

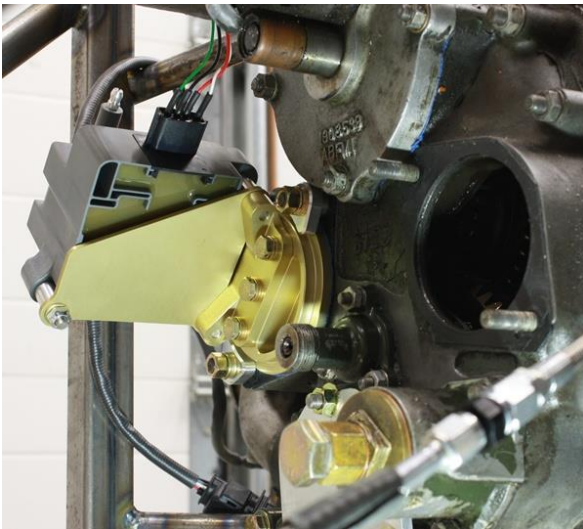


Install the 90 degree fuel fittings into the injector top caps with Teflon thread sealant (Never RTV), tighten and orientate as desired.

### **Coil Pack Mounting**

The coil packs mount in place of the magnetos. Bolt the coil pack bracket to the magneto covers using the bolts provided. Torque to 90-110 inch lbs. And either use 292 blue Locktite or lockwire to secure the bolts.

Apply a LIGHT coating of RTV on the cover faces or use new magneto gaskets. Install the provided standoffs, clamps and nut hardware to secure the coil packs. They may be rotated slightly for clearance from other obstructions. Tighten the nuts to 180-220 inch lbs.





## Spark Plug Adapters

SDS supplies brass 18 to 14mm plug adapters and copper washers. Thread these into the spark plug holes and torque to 25-30 foot lbs. Screw the new spark plugs in and torque to 18-22 foot lbs.

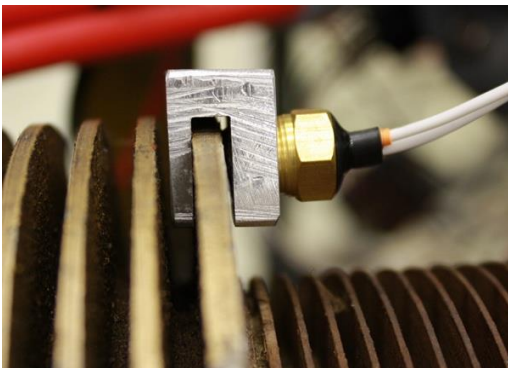
## Fuel lines

The braided fuel lines and 90 degree AN fittings complete the connection to the fuel block and injectors.



## CHT Sensor

Insert the CHT sensor into the CHT mounting block. This is clamped to one of the base heat cooling fins as shown below. Tighten sensor snugly but not so tight as to splay the block.



## **Air Temp Sensor**

The intake air temp sensor can be mounted in the airbox/ air filter area or any location near the throttle body where it will see engine induction airflow. Do not mount into the intake spider due to conduction concerns on hot start situations.

## **Timing Marks**

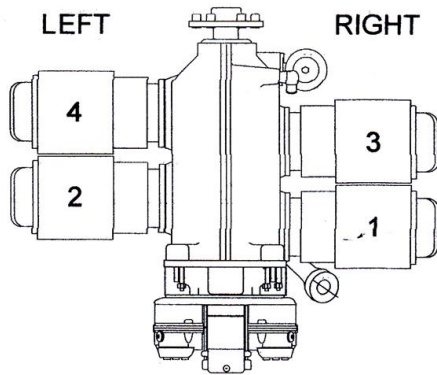
The crankshaft flange has a T/C mark on the edge which indicates TDC 1 when aligned with the LOWER crankcase split as shown. This will be used to set the Magnet Position Value as outlined in the main SDS ignition manual by using a timing light. When doing so, be sure that the timing values are all set to zero in the idle ranges you are checking timing at. After you set the Magnet Position, you can alter your RPM timing values to whatever you desire.



## Coil / Plug Wire Routing

We recommend you connect one coil pack to the top plugs, the other to the bottom plugs.

Use the schematic showing cylinder numbering which follows.



## Wideband Oxygen Sensor Mounting

Your kit comes with a stainless steel boss to mount the O<sub>2</sub> sensor. The sensor needs to be located in the exhaust system so it's at least 12 inches from atmosphere. Drill a 7/8 hole in your exhaust pipe using a hole saw and TIG weld into position. This can be on a single pipe, where a pair collects or where all 4 pipes merge, depending on your exhaust system design.

## ECU Mapping

Your ECU has a base map entered which was derived from our own engine testing so it should allow your engine to start up and run fairly well. Be aware that all engines are slightly different so your map is likely to require more fine tuning by you. Refer to the main manual for instructions on how to do that, using the supplied wideband O<sub>2</sub> sensor.