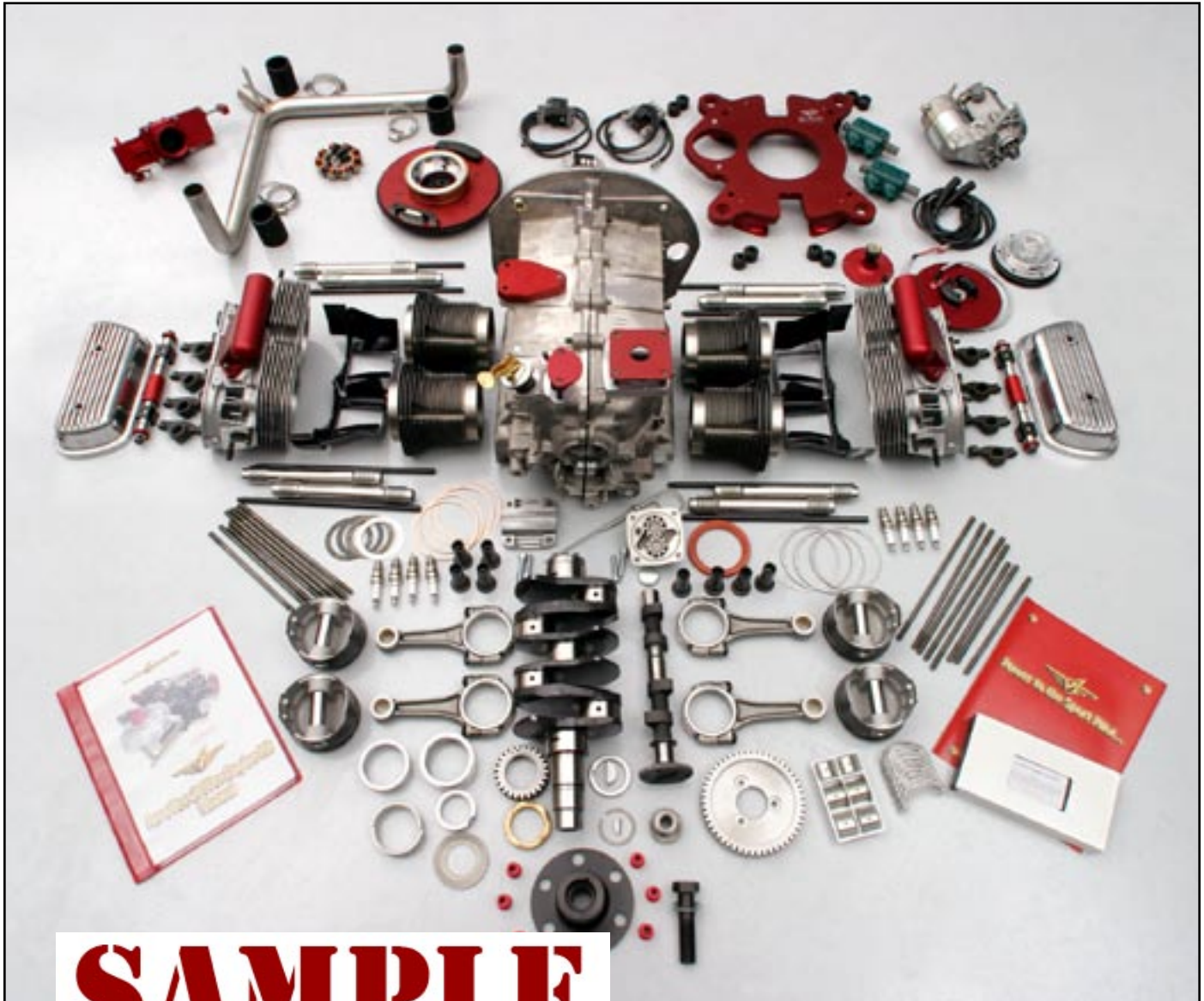


AEROVEE 2.0

ASSEMBLY MANUAL

Rev. D 11/07



SAMPLE

AeroConversions

A Product Line of Sonex Aircraft LLC

Contents

Your feedback is welcome and encouraged as we continue to improve this manual. Please send all comments to tech@sonexaircraft.com. All comments will be reviewed and considered for inclusion in future revisions of this manual.

As always, your success is important to us. If you have any questions while assembling your engine do not hesitate to seek technical support by emailing us at tech@sonexaircraft.com.

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Disclaimer and Limited Warranty

THE EXPERIMENTAL AEROVEE 2.0 ENGINE KIT IS SOLD "AS IS". NO WARRANTY IS EXPRESSED OR IMPLIED!

Sonex Aircraft LLC makes every effort to assure the supplied components of the AeroVee 2.0 Engine Kit meet high quality and durability standards, and warrants to the original purchaser that these components are free of defects in material and workmanship for the period of one year from the date of purchase. This warranty does not apply to damage due directly or indirectly to improper assembly, misuse, abuse, negligence or accidents, repairs or alteration out side our facilities, or lack of maintenance. Due to the experimental nature of the AeroVee 2.0 Engine Kit, the end user is solely responsible for determining suitability of application, assembly, installation and operation.

Sonex Aircraft LLC and its agents will in no event be liable for death, injuries to person or property, or incidental, contingent, special, or consequential damages arising from the use of our product.

Sonex Aircraft LLC and its agents will not be responsible for any incidental or consequential damage including direct or indirect labor, repair, medical, or legal expense in any way attributable to the use of any AeroConversions, Inc. product or to the delay or inconvenience caused by the necessity of replacing or repairing any such item.

Engine Monitoring Instrumentation

Sonex Aircraft LLC requires the use of a the following cockpit-installed engine monitoring instruments in every engine installation: oil pressure, oil temperature, cylinder head temperature (1 minimum), and exhaust gas temperature (1 minimum). Failure to properly monitor your engine may result in severe engine damage which is not covered under this limited warranty.

**EXPERIMENTAL
USE ONLY**

Not TSO'd for Certified Aircraft

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AeroVee 2.0 Engine Kit Documentation

This manual is your primary document for the assembly and operation of your Experimental AeroVee 2.0 Engine Kit. The included assembly DVD is an additional aide, but when there is a discrepancy between this manual and the DVD, the information in this manual takes precedence.

Other AeroConversions Resources

AeroConversions continually improves and monitors its products. It is in your best interest to stay abreast of these improvements and implement them as needed.

AeroConversions Website

AeroConversions, Inc. maintains a website which is continuously updated. Perhaps the most important part of the website for an AeroVee 2.0 builder/operator is the **Service Bulletin** section. You are encouraged to periodically check for Service Bulletins which may affect the performance of your AeroVee engine.

The AeroConversion website is aeroconversions.com

AeroVee Internet Discussion Group

AeroConversions operates an internet discussion group which is open to all owners and enthusiast of the AeroVee 2.0 Engine Kit. Joining this list will get you in touch with other engine owners and is an additional form of mass-communication between AeroConversions, Inc. and its customers.

Information on joining this list is located on the AeroConversions website at aeroconversions.com.

AeroConversions Tech Support

AeroVee owners can receive individual tech support by email or phone. We encourage you to contact us via email first, as this allows us the opportunity to formulate a clear, concise answer to your question.

The email address for tech support is info@aeroconversions.com

AeroConversions' Service Bulletins

AeroConversions, Inc. is committed to providing quality products. We do this through the constant improvement of our AeroVee 2.0 Engine Kit, and also by identifying parts or procedures which we feel require the attention of the existing AeroVee 2.0 Engine Kit fleet.

When we identify parts or procedures which we feel require the attention of AeroVee 2.0 owners, we issue a Service Bulletin.

Required Service Bulletins

A Required Service Bulletin, as the name implies, *must* be complied with. It may be a part or a procedure which we feel must be corrected for the continued use of your engine.

Upon compliance of the Required Service Bulletin, an entry must be made in your engine log book.

Required Service Bulletins are posted on the AeroConversions website, announced on the AeroVee Internet Discussion Group, and mailed to the address of record of each AeroVee 2.0 Engine Kit owner. *It is your responsibility to keep us informed of any address or engine ownership changes, and to check the AeroConversions website for Required Service Bulletins.*

Optional Service Bulletins

An optional Service Bulletin is issue when we identify an area which we feel will contribute significantly to the reliability/longevity of the AeroVee engine. Optional Service Bulletins need not be complied with but we *strongly* encourage all AeroVee 2.0 owners to implement the suggested change/upgrade.

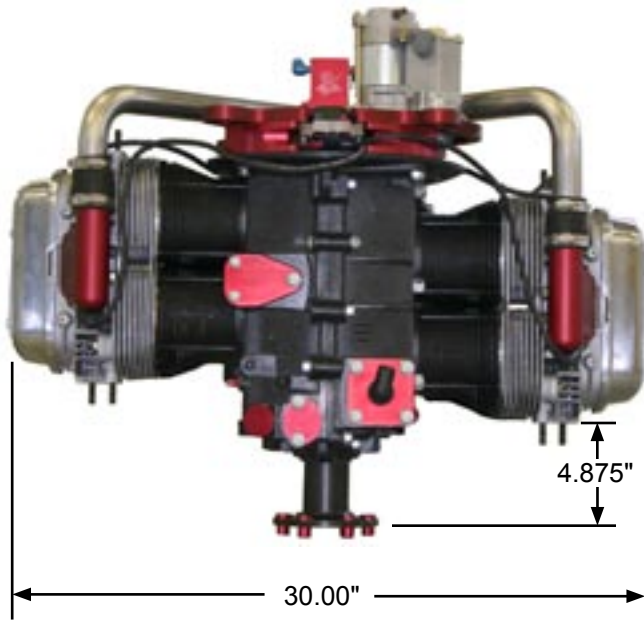
Upon compliance of the Optional Service Bulletin, an entry must be made in your engine log book.

Optional Service Bulletins are posted on the AeroConversions website and announced on the AeroVee Internet Discussion Group. *It is your responsibility to check the AeroConversions website for Optional Service Bulletins.*

Additional Resources

There are many books, magazines, and videos available for the assembly, maintenance, and operation of "Type 1"-based engines. We highly recommend "How to Rebuild Your Volkswagen Air-Cooled Engine" by Tom Wilson (ISBN 978-0-89586-225-9).

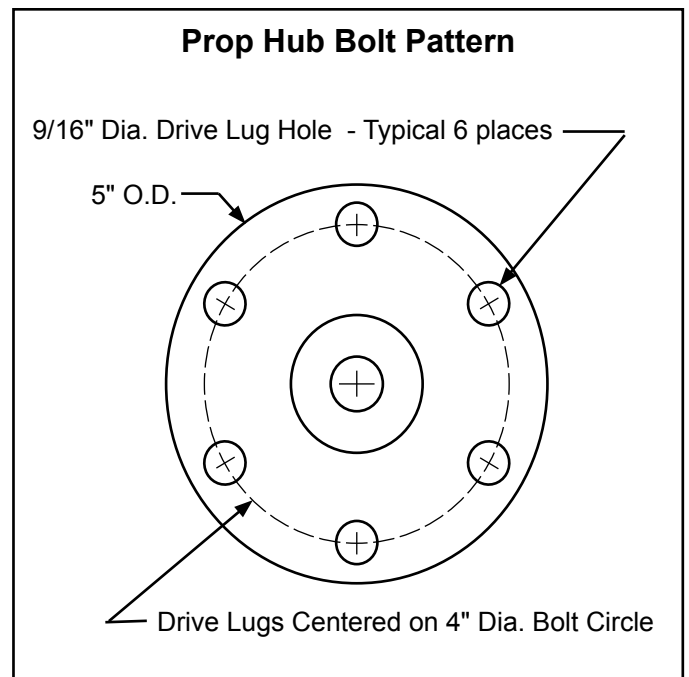
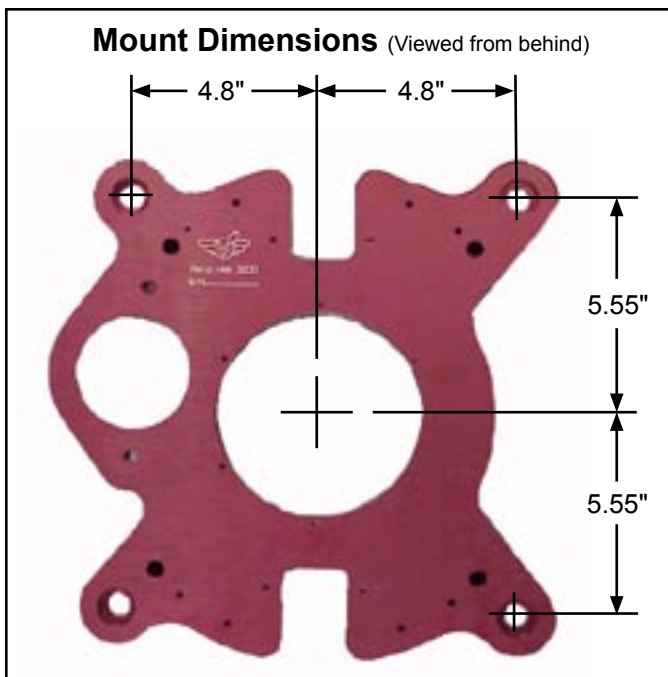
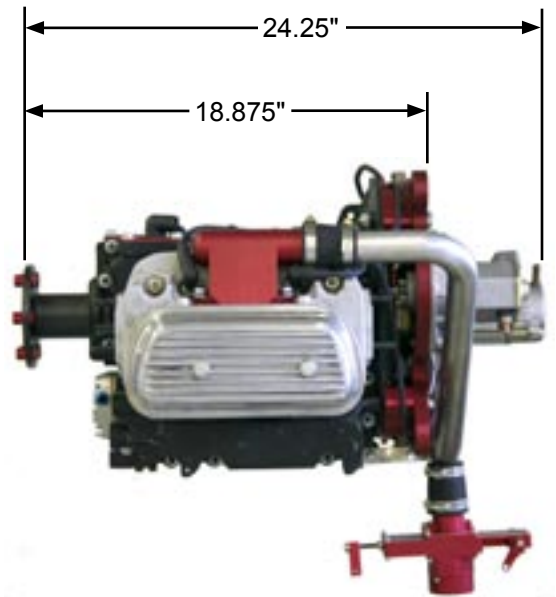
SAMPLE



Weights and Dimensions:

Weight (Less Oil & Exhaust)	160 lbs.
Length.....	24.25"
Width.....	30"
Height.....	20.0625"

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AeroVee 2.0 Assembly Manual

Tools Required:

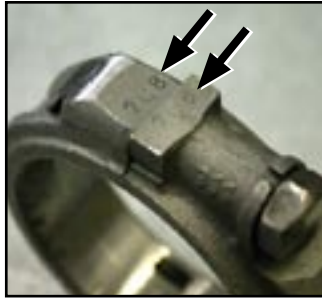
- ___ White Lithium Grease
- ___ Socket Wrench
- ___ 14mm Socket
- ___ "Red" Locktite (High Strength Threadlocker)
- ___ Torque Wrench (25 ft.-lbs. capacity)
- ___ Feeler Gauge

Parts Required:

- ___ ACV-P01-33 Connecting Rods
- ___ ACV-P01-59 Rod Bearing Set
- ___ Crankshaft Assembly

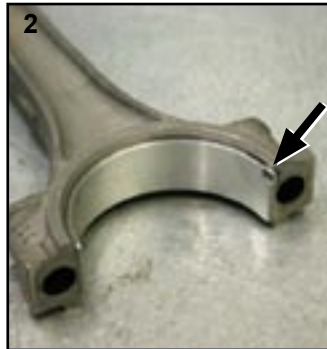
Assembly Instructions:

Note: Both parts of each connecting rod are stamped with a unique number, identifying them as matched parts. The connecting rods *must* be re-assembled as matched parts, with the numbers together as shown in this photograph.



- ___ 1. Remove the nuts from each Connecting Rod (ACV-P01-33) and carefully separate the two parts. Do not scratch or score the machined surface of the connecting rods.

- ___ 2. Wipe the mating surfaces of the connecting rods and bearing halves so they are free of oil and dust. Install the bearing halves (ACV-P01-59) by aligning the tab on each bearing half with the notch in each connecting rod and pressing the bearing halves into place.

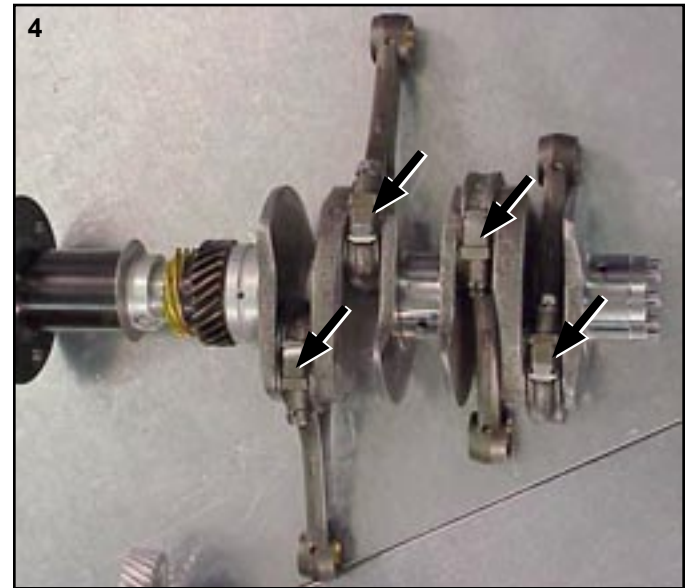
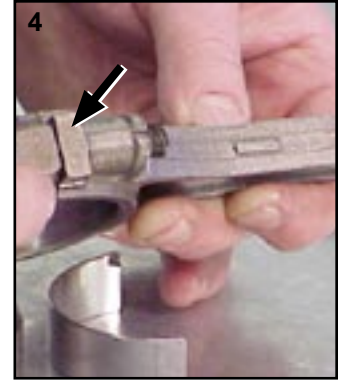


Note: The clearance between the rod bearings and rod journals must be between .002" and .0025". When assembling new parts, as provided in the AeroVee 2.0 kit, the proper clearance is often assumed. When rebuilding an engine using remanufactured parts, this clearance *must* be checked. Detailed instructions for checking this clearance are given in Tom Wilson's book "How to Rebuild Your Volkswagen Air Cooled Engine".

- ___ 3. Apply an even coat of white lithium grease to the exposed surfaces of each bearing half.

CONNECTING ROD ASSEMBLY

- ___ 4. The connecting rods are attached to the crankshaft, as shown in the photo below, with the stamped numbers facing up. **Be sure to re-assemble the connecting rods as matched parts.**



- ___ 5. Apply "Red" Locktite to the threads of each rod bolt and install nuts. Torque each nut first to 8 ft.-lbs., and then to a final torque of 25 ft.-lbs.
- ___ 6. Check each connecting rod for freedom of movement and .005" to .020" side clearance.

SAMPLE

Tools Required:

- __ Socket Wrench
- __ 13 mm Socket
- __ Plastic Mallet
- __ White Lithium Grease
- __ Aviation Form-A-Gasket #3 or Flange Sealant

Parts Required:

- __ ACV-P01-55 Maxi Oil Pump for Oil Cooler
- __ ACV-P01-56 Optional Pump for use without an oil cooler

Assembly Instructions

- __1. Install Oil Pump Gasket and align Pump Housing with oil galley ports.



- __2. Tap oil pump housing into place with a plastic mallet.

- __3. Liberally grease the top gear and install it, making sure it engages the cam.



- __4. Liberally grease and install the free running bottom gear.

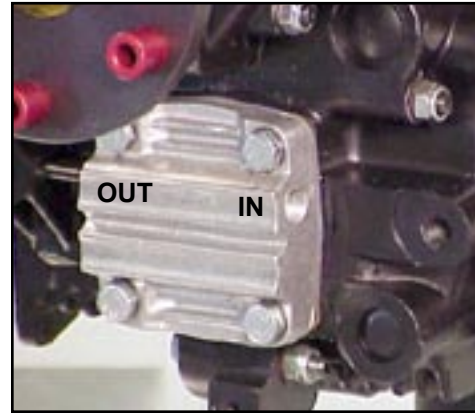
- __5. Apply a very thin coat of Aviation Form-A-Gasket or Flange Sealant to the oil pump cover. Make sure the oil passages are aligned properly.



- __6. Install the 4 mount bolts and torque them to 14 ft-lbs.

Oil Cooler Installation

Installation of an oil cooler is described in the Sonex/AeroVee Firewall Forward manual, included with your engine purchase. All oil cooler installations must use threaded AN fittings and high quality -06 hose.



Operation Without an Oil Cooler

To operate your AeroVee without an oil cooler you must either run a loop of -06 hose from the output side of the pump to the input side of the pump, or replace the entire pump with the optional ACV-P01-56 Straight Pump.

Important: Do not plug the output and input ports with plugs. This will prevent oil flow and cause significant engine damage.

Important: Do not replace the pump cover with a non-ported cover. This will prevent oil flow and cause significant engine damage.

SAMPLE

Tools Required:

- ___ 5/16-18"X 2" Hex Head Cap Screw (not supplied in kit)
- ___ 5/16-18 Nut (not supplied in kit)
- ___ 5/16 Washer (not supplied in kit)
- ___ 5/8"Socket

Parts Required:

- ___ ACV-H01-11 Prop Drive Bushings

Assembly Instructions

- ___1. Insert a prop drive bushing into the prop hub.
- ___2. Insert the bolt through drive bushing with socket as a spacer.
- ___3. Use the bolt, washer, nut and socket to pull the drive bushing into the hub.
- ___4. Repeat for other 5 drive Bushings.



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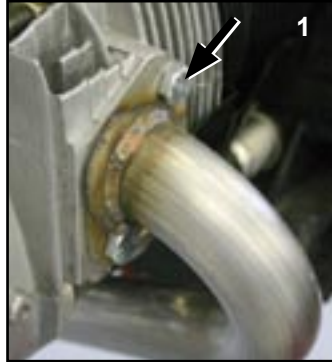
AeroVee 2.0 Assembly Manual

INSTALLING the EXHAUST

Parts Required

- ___ Optional 2-into1 Exhaust Kit (p/n ACV-E01-02)
- ___ Exhaust Gaskets (from ACV-P01-69 gasket kit)

- ___ 1. Using the supplied Exhaust Attach Bolts (ACV-Z01-39), temporarily attach the exhaust manifolds to the cylinder heads *without* exhaust gaskets.



Note: If your cylinder heads have exhaust studs installed they will need to be removed to fit the 2-into-1 exhaust.

Note: The left side exhaust pipe (pilot's side) may contact the super tin and/or cylinder head baffle. The super tin and/or baffle can be reformed as needed to minimize the contact, though some contact is not a concern.

- ___ 2. Slide an extension pipe onto each manifold. It may be necessary to shorten the length of the exhaust manifold if the extensions interfere with the firewall. Do not shorten the expanded portion of the extension pipes.

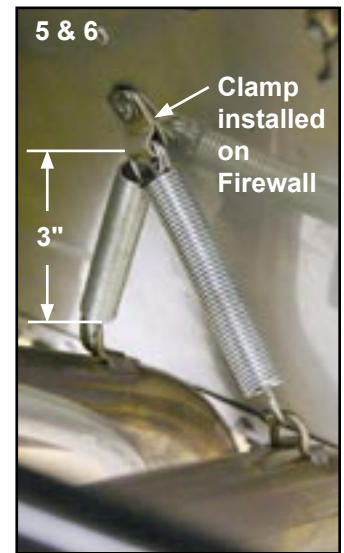


Trim the end of each exhaust manifold (arrow) as needed to get the exhaust extensions to exit the cowl in the desired location.

- ___ 3. After each exhaust manifold has been trimmed to the proper length, remove the manifolds from the cylinder heads and re-install them with new exhaust gaskets (included in the ACV-P01-69 gasket kit).
- ___ 4. Attach a spring between each pair of spring clips. It may be necessary to shorten the springs for your particular installation.



- ___ 5. Attach a loop-type line support clamp (AN742 or equivalent) to the firewall approximately 3" above the spring clips on the exhaust extensions.
- ___ 6. Attach a spring between the support clamp and each exhaust extension. It may be necessary to shorten the springs for your particular installation.



- ___ 7. Trim the ends of the exhaust pipes to final length. The pipes must be long enough to ensure the exhaust gases exit the cowl, yet pipes which extend too far below the cowl will add drag and reduce your airspeed.

SAMPLE

Bringing your engine to life is exciting and rewarding. The following points and procedures will assure the greatest success.

SAFETY FIRST!

- ___ 1. Have one other person on hand for the initial start, but do not invite a crowd.
- ___ 2. Have an approved fire extinguisher available.
- ___ 3. Know your aircraft's cockpit controls.
- ___ 4. Tie the aircraft down securely, set the brakes, and chock the wheels.
- ___ 5. Start the engine using a checklist. The AeroCarb manual includes some sample start-up and shut-down checklists which may be used or adapted to your aircraft.
- ___ 6. Have the correct propeller installed, torqued and tracked. **DO NOT OPERATE THE ENGINE WITHOUT A PROPELLER.**
- ___ 7. Remove loose tools, rags, and debris from the engine and immediate area.

Engine Checks

- ___ 1. Cowl removed.
- ___ 2. Oil in crankcase.
- ___ 3. All parts installed and secured.
- ___ 4. Propeller installed, torqued, and tracked.
- ___ 5. Heads torqued and valves properly adjusted.
- ___ 6. Electronic ignition system static-timed.

Starting the Engine

- ___ 1. Use your start-up checklist to start the engine.
- ___ 2. Immediately upon engine start look for oil pressure. If no oil pressure registers in 5 seconds, turn off the engine and investigate.
- ___ 3. If the engine does not start, investigate the cause (see Troubleshooting section).
- ___ 4. Adjust the timing of the electronic ignition as required. There should be little or no change in RPM when performing a mag check between 1600 and 2000 RPM. A change of more than 50 RPM indicates a timing correction is needed.
- ___ 4. Tune the AeroCarb for optimum engine performance. The tuning procedure is detailed in the AeroCarb manual.
- ___ 5. Limit ground running to the minimum necessary to correct the timing, tune the AeroCarb, assure smooth throttle response, confirm proper oil pressure, and assure no oil leaks.

Important: Extended ground running will overheat the engine and cause serious damage.

Break-in, the First 25 Hours

Proper break-in will help you get the best performance and longest life from your AeroVee engine.

- ___ 1. Limit ground running to what is needed to properly tune the engine and assure no oil leaks.
- ___ 2. Do not "baby" the engine during the first few flights. As soon as possible, climb to a safe altitude over your airfield and run the engine at wide open throttle for at least an hour. This will seat the rings. Monitor the engine temperatures and reduce throttle as needed to keep the engine temperatures "in the green". Step climb as needed. Higher than normal temperatures during the break-in period are to be expected, however, temperatures which exceed the redline or continue to climb must be investigated.
- ___ 3. Change the oil at 1 hour, 5 hours, 10 hours, and 25 hours.
- ___ 4. Adjust the valves at 5 hours, 10 hours, and 25 hours.
- ___ 5. Torque the heads and adjust the valves at 10 hours and 25 hours. Always torque the heads before adjusting the valves.

After 25 hours you should see the engine's temperatures decrease and stabilize and there should be little change in the head torque.

SAMPLE

Minimum Maintenance Interval

1 Hour Accumulated

- ___ Change the oil and wash the oil screen.

5 Hours Accumulated

- ___ Change the oil.
- ___ Adjust the valves (cold engine). See page 28.

10 Hours Accumulated

- ___ Change the oil.
- ___ Torque the heads to 18 foot pounds. Do NOT loosen the nuts prior to torquing them. See page 21 for proper torque sequence. The rocker shaft assemblies must be removed to torque the heads.
- ___ Adjust the valves (cold engine). See page 28. Valves must be adjusted *after* torquing the heads.
- ___ Check all fasteners for tightness and security.

25 Hours Accumulated

- ___ Change the oil and wash the oil screen.
- ___ Torque the heads to 18 foot pounds. Do NOT loosen the nuts prior to torquing them. See page 21 for proper torque sequence. The rocker shaft assemblies must be removed to torque the heads.
- ___ Adjust the valves (cold engine). See page 28. Valves must be adjusted *after* torquing the heads.

Every 25 Hours

- ___ Change the oil.

Every 50 Hours

- ___ Change the oil and wash the oil screen.
- ___ Adjust the valves (cold engine). See page 28.
- ___ Inspect and/or replace air filter.

On Annual Inspection

- ___ Change the oil and wash the oil screen.
- ___ Torque the heads to 18 foot pounds. Do NOT loosen the nuts prior to torquing them. See page 21 for proper torque sequence. The rocker shaft assemblies must be removed to torque the heads.
- ___ Adjust the valves (cold engine). See page 28. Valves must be adjusted *after* torquing the heads.
- ___ Inspect and/or replace air filter.
- ___ Inspect and/or replace spark plugs.
- ___ Check all fasteners for tightness and security.
- ___ Check all hoses for condition, tightness and security.
- ___ Check all wiring for condition and security.
- ___ Perform a leak-down test of each cylinder. 80 psi is normal, anything below 60, or a large deviation between individual cylinders, requires additional investigation.

When to Rebuild Your AeroVee

Experimental engines, such as the AeroVee, have no TBO. As the owner/operator of an AeroVee engine you decide when it will be rebuilt and to what extent.

Signs an engine needs some degree of rebuilding include low compression, loss of power, increased oil usage, and low oil pressure.

Torque Values

Item	Socket	Ft. lbs.	In. lbs.
Large Case Nuts	19mm	25	300
Cam Case Nuts.....	10	120
Small Case Nuts.....	13mm	14	168
Cylinder Head Nuts.....	15mm	18	216
Rocker Arm Nuts	13mm	14	168
Prop Hub Nuts	30mm	70-80.....	840-960
Flywheel Gland Nut.....	36mm	227	2724
Connecting Rod Nuts.....	14mm	25	300
Oil Pump Cover	13mm	14	168
Oil Pan Cover Nuts	10mm	5	60
Rear Unit Mount Bolts.....	17mm	25	300
Prop Bolts/Nuts*	1/2".....	11	132
Spark Plugs	11/16"	22	264

*Refer to the propeller manufacturer's torque specification. In the absence of a manufacturer specification, use these values.

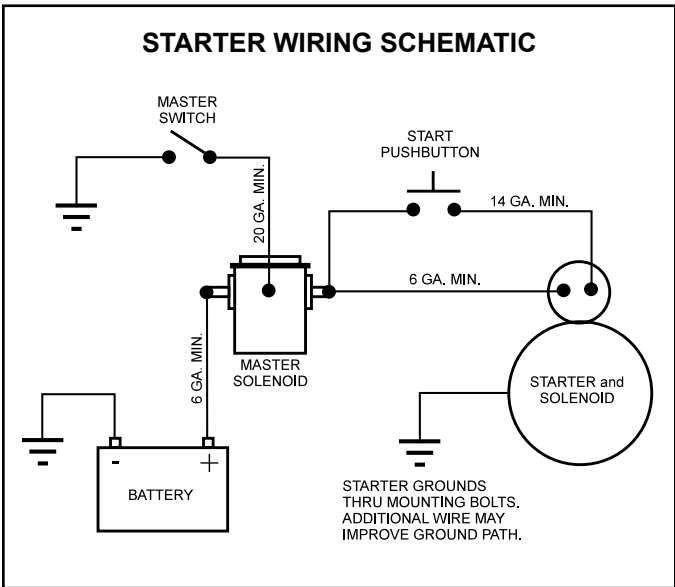
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AeroVee 2.0 Assembly Manual

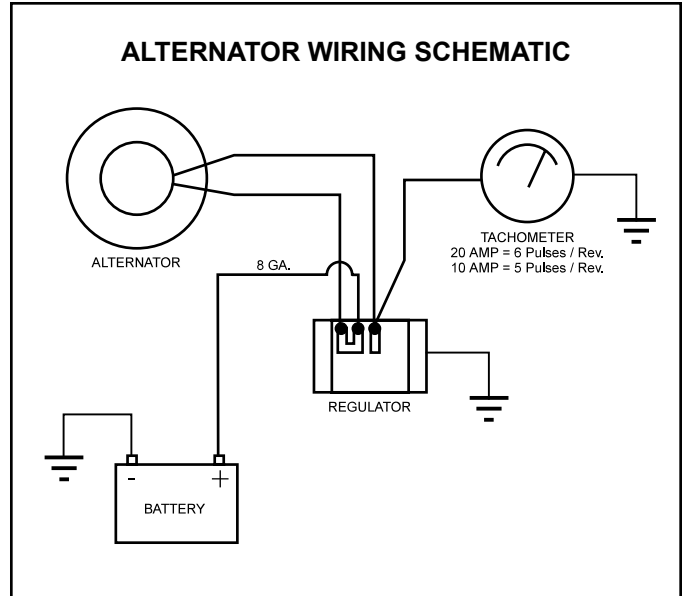
This page is a quick reference of electrical schematics associated with the AeroVee installation. Detailed instructions for each sub-system are provided elsewhere in this manual.

ELECTRICAL SCHEMATICS

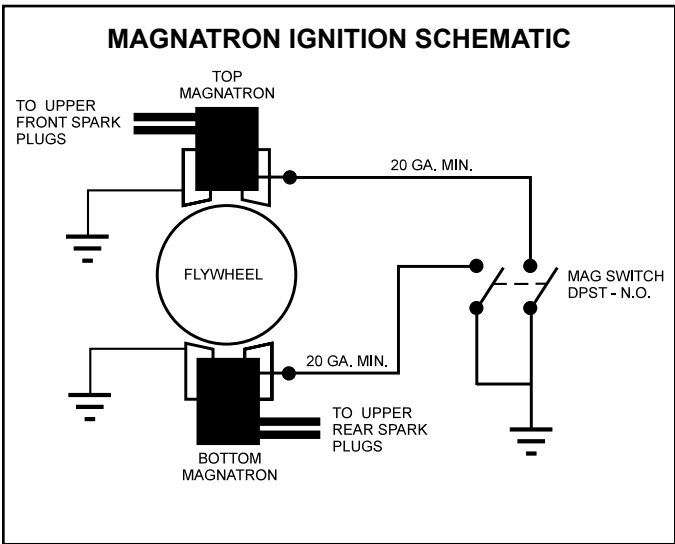
STARTER WIRING SCHEMATIC



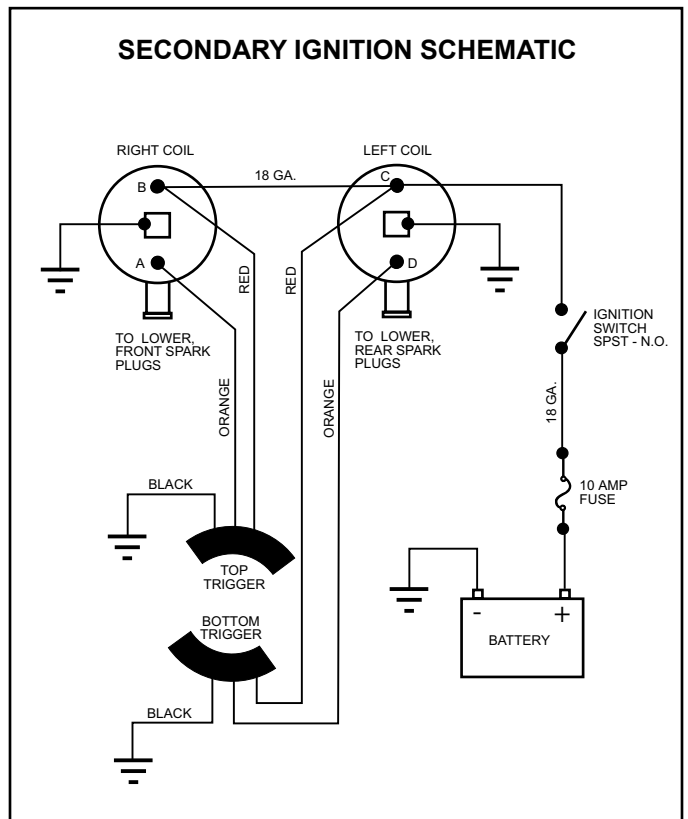
ALTERNATOR WIRING SCHEMATIC



MAGNATRON IGNITION SCHEMATIC



SECONDARY IGNITION SCHEMATIC



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