

OPERATING MANUAL

SPECIFICATIONS:

Displacement 2180 cc

Bore 92 mm

Stroke 82 mm

Compression Ratio 7.8 to 1

Bearing Sizes:

Rod STD

Main STD

Fuel Requirement 91 Octane Min.

Reduction Drive Ratio _____

TORQUE SPECIFICATIONS:

Engine Case Nuts:

Large30 ft. lbs.

Small15 ft. lbs.

Cylinder Head Nuts:

8mm18 ft. lbs.

10mm23 ft. lbs.

Rocker Arm Nuts15 ft. lbs.

Connecting Rod Nuts25 ft. lbs.

TIMING SPECIFICATIONS:

26 Degrees BTC

Valve Clearance - .005 intake

Valve Clearance - .007 exhaust

ASSEMBLY INSTRUCTIONS:

MAGNETO:

Rotate engine until number one (1) cylinder is on top dead center (TDC). Impulse mag until number one (1) wire fires. Red mark on mag should align with red mark on mag drive. Align chisel mark on mag with chisel mark on back plate. This is the correct timing.

INTAKE MANIFOLD:

Slip 90-degree pipes onto intake "Y", then slip 90-degree elbows onto cylinder head. Tighten all hose clamps. Intake "Y" bolts to two bolts in accessory case.

NORMAL ENGINE OPERATING LIMITATIONS:

Cruise R.P.M.....	2800 to 3200 R.P.M.
Maximum R.P.M.	3600 R.P.M.
Minimum Oil Temperature	160 degrees F.
Maximum Oil Temperature	230 degrees F.
Minimum Oil Pressure at Cruise.....	23 P.S.I.
Maximum Oil Pressure at Cruise.....	70 P.S.I.
Cylinder Head Temperature at Cruise	350 to 375 degrees F.
Maximum Cylinder Head Temperature	450 degrees F.
Exhaust Gas Temperature at Cruise.....	1250 degrees F.
Maximum Gas Temperature	1400 degrees F.

MAINTENANCE:

OIL CHANGE:

Three (3) quarts SAE 30, SAE 40,20W50 every 25 hours.

Refer to Chart to determine oil weight depending on temperature.

ADJUST/CHECK VALVES:

Every 50 hours.

SPARK PLUG GAP:

.016 inch Magneto ignition .025 for Battery ignition

VALVE ADJUSTMENT PROCEDURE:

1. Engine must be cold. Do not adjust valves if engine has been run and is still warm. Remove spark plugs.
2. Bring number one (1) cylinder to top dead center (TDC). Watch the rocker arm. When the intake valve closes, the piston will be at bottom dead center (BDC). Rotate engine until piston comes up to TDC. When piston is at TDC on number one (1) cylinder, the prop hub TDC mark should be centered on the split line of you engine case.
3. Loosen up rocker arm adjuster nut with a 13mm wrench. Adjust exhaust .007 and intake .005.
4. Rotate engine until next cylinder is at TDC and repeat procedure. Remember, the piston needs to be at TDC and both valves closed.

STARTING PROCEDURE

For Hand Starting Only Zenith Carburetor

The fuel system is a very important part of the chain. A chain is only as strong as it's weakest link. If in doubt, don't. Be sure to use a fuel strainer like a sediment bowl and screen from a garden tractor, and a Curtis quick drain with a shut off at the tank. A finger strainer should be in the tank outlet.

The prop is bolted in place and set at 10:00 o'clock on compression. With the fuel turned on, switch off and throttle closed, turn backwards to compression and pump three (3) times in warm weather, six (6) to eight (8) times in cooler weather. Below 40 to 45 degrees F, use the choke to prime the engine and when you see gas dripping, it is ready to go. Turn the prop to 10:00 o'clock on compression, turn the mag switch on, stand behind on the left side and pull through. It should start the first pull. This is the best and safest way.

Starting with electric starter. Pull choke on full, turn over 2 to 3 blades, open choke, then turn on mag and start.

STARTING, RUN IN AND PROPER OIL

When starting the engine for the first time, be prepared with the tail tied down and ready to adjust the main carb jet at full throttle. Have some help and adjust to highest R.P.M. then back 1/4 turn. Run for five (5) minutes, and then let the engine cool down. Do this three (3) times for a total of 15 minutes, and then fly.

Use 10W40 for break in. Fly for ten (10) hours. Open the throttle full at times for one (1) minute. After run in time, drain oil and replace with either 10W-40, 20W50, SAE 30, SAE 40 . When the oil starts to get dirty, change oil. This should be a 2000-hour engine except for the leaky valves due to not running for long periods of time. Also, if flown for short periods of time, the oil will be contaminated with water if the oil temperature is not up for at least 1/2 hour or more. This is not an aircraft engine so don't use heavy aircraft oil. It was designed for automotive oil and the lighter oils run cooler.

ENGINE HOOKUPS

Oil Pressure

The oil pressure is threaded into the port at the top front right of the case. It is a 1/8" NPT thread. You can use either a mechanical or electric gauge.

Oil Temperature

The oil temperature gauge port is located in the lower right hand corner of the back plate on the two cylinder engines and in the lower front left hand corner on the four cylinder engines. The port is a 1/2 " NPT on the two cylinder and a 1/4 " NPT on the four cylinder .You use either a mechanical or electric gauge.

Tachometer

The tachometer is hooked directly to the magneto. You can use a Westach model 2AT5-2. It is a self powered tachometer. It doesn't require any power source. Use a 1/4 amp fuse between the magneto and the tachometer on the p-lead side. This is for safety, in case the tachometer shorts out it doesn't kill the engine.

CHT and EGT

CHT and EGT are optional. The CHT probe ring is bolted under the top rear cylinder stud, not the spark plug .EGT probe is placed about 4 " from the exhaust pipe flange.

' ZENITH CARBURETOR ADJUSTMENT PROCEDURE

Model 14992 or 14998

The lower needle with the T-Handle is the main fuel mixture. Turn it clockwise to lean.

The upper needle is the idle mixture. Turn it clockwise to lean.

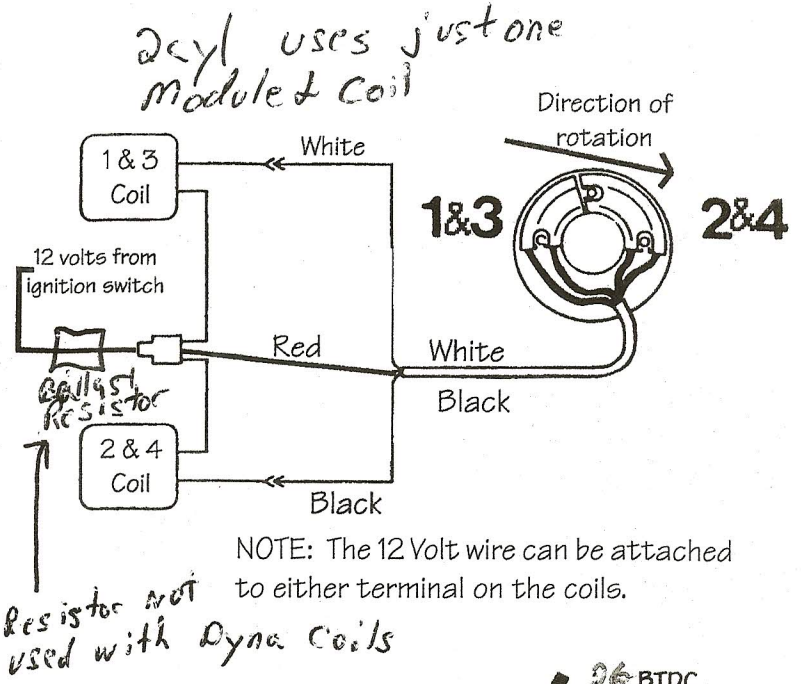
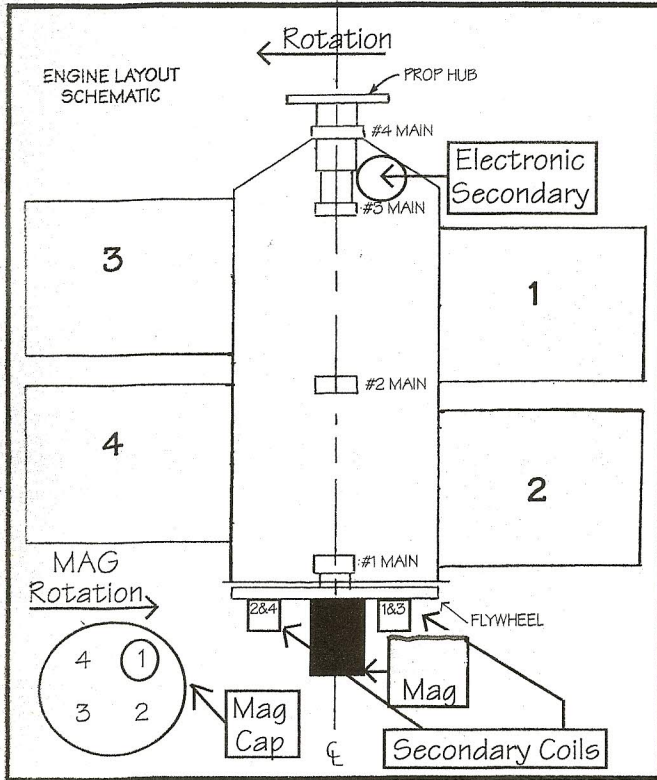
Start by setting the main mixture a 3 to 4 turns out. The idle mixture is set at 1 to 2 turns out.

Run engine at $\frac{2}{3}$ throttle, turn main needle in or clockwise until engine starts to lose RPM. Then turn back or counterclockwise until max RPM is obtained. Then turn $\frac{1}{4}$ turn richer or counterclockwise.

To set the idle mixture, let engine idle for 10 seconds. Then advance the throttle, if engine stumbles and blows black smoke turn the idle mixture screw in or clockwise. The mixture is sensitive so go only a $\frac{1}{8}$ of a turn at a time. If the engine bogs when the throttle is advanced the mixture is lean, so turn the idle mixture screw counterclockwise to richen.

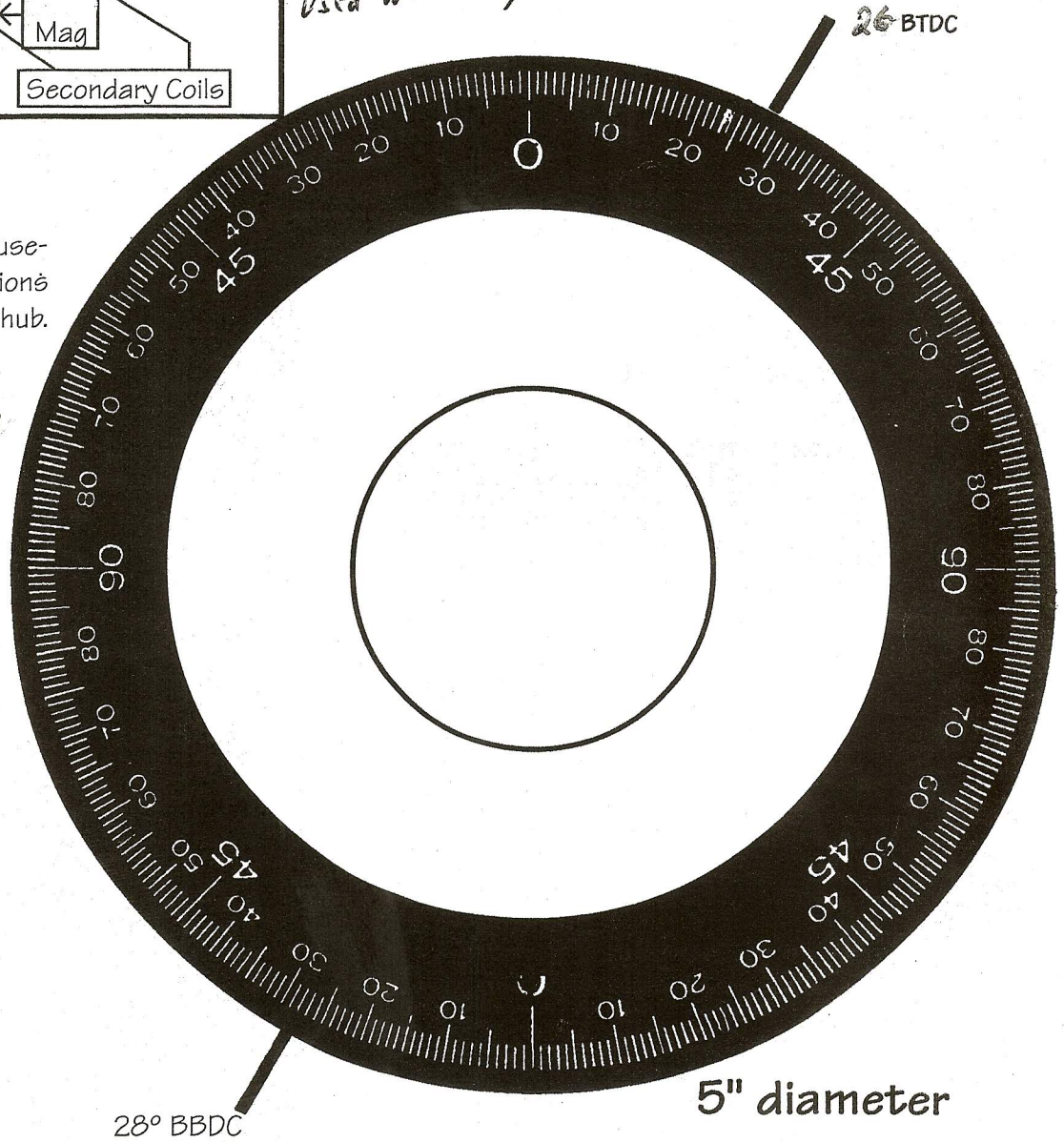
The idle speed should be set at around 1000 rpm. It is set by the idle speed screw on the throttle shaft.

SECONDARY IGNITION WIRING SYSTEM

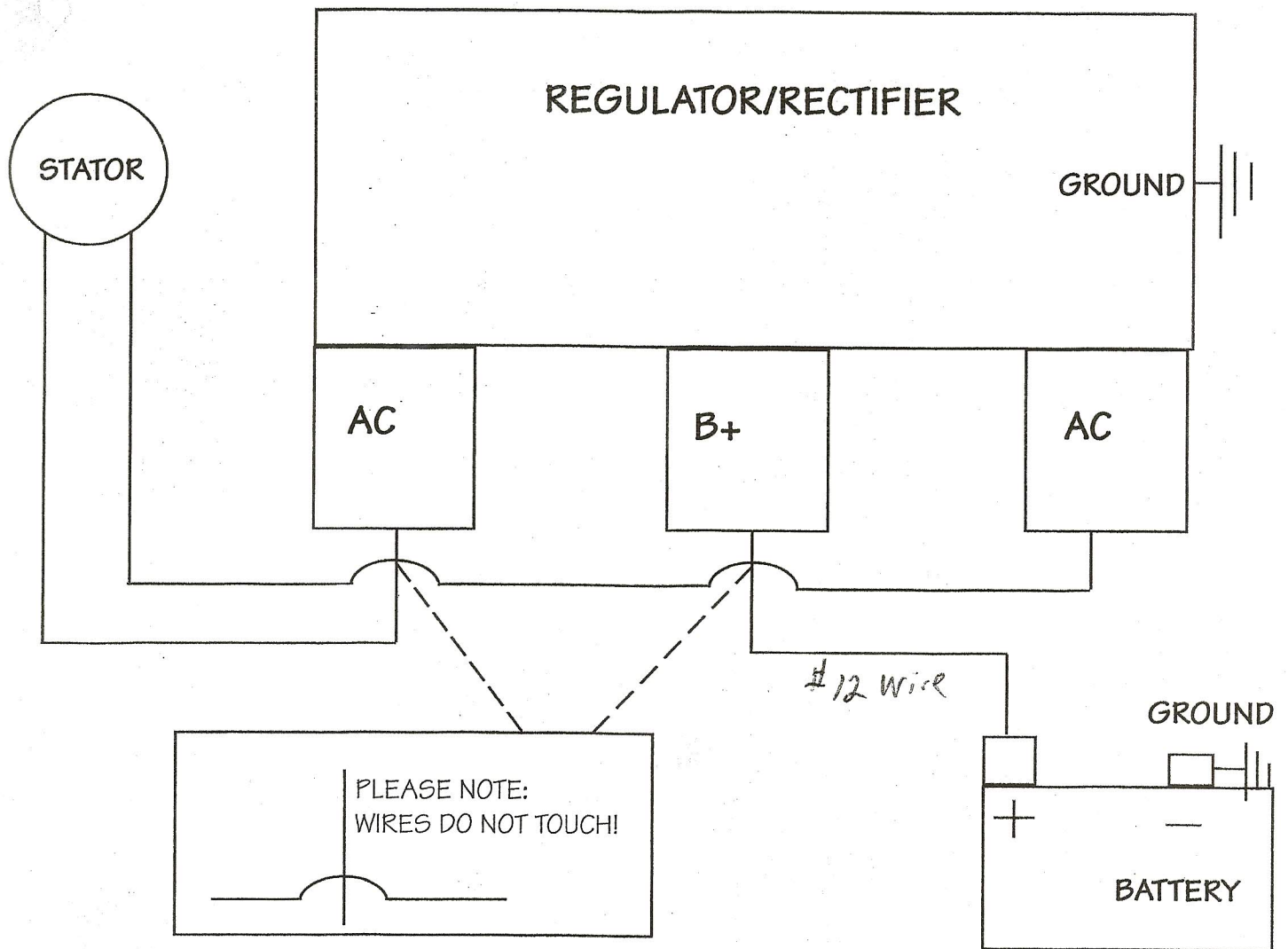


TIMING DISC

The timing disc at right is useful for timing all VW conversions using a 5" diameter prop hub. Use **26° BTDC** for all engines up to 2180cc. This disc is for Slick **2220, 4230** or 4316 magnetos, Bosch 009 Distributor and our Low Height Secondary Ignition System.



INSTRUCTIONS FOR ALTERNATOR HOOK UP



Alternator Test Procedures:

The alternator used inside the Diehl Accessory Case has a rotating magnet ring attached to the flywheel that rotates around a stationary stator mounted to the accessory case. The alternator's output is directly related to the rpm the magnet ring is spinning. At low or idle rpm, you will see a reading of 12V or less on your volt meter, depending upon what electrical loads you have turned on. If you suspect you have an alternator problem do the following checks.

Using your Volt/Ohm Meter, check for continuity between the two white wires that come out of the alternator and the accessory case. If continuity is there, the internal windings of the stator are grounded. The culprit is usually one of the magneto hold down clamp bolts is too long and is grounding out the stator.

Check between the regulator/rectifier's body and the engine case with your Volt/Ohm Meter. You should have

continuity here. If not, you may need to run a wire from the body of the regulator/rectifier to the engine case. If this solves the problem, your firewall may not be grounded to the engine. The Lycoming bushings may be insulating the engine, from the engine mount and thus, the firewall.

The last check involves checking the output of the alternator. Turn your Voltmeter to the AC scale (60V AC). Hook up the red and black test leads from your meter, to the white wires from the alternator. With the engine running at 2500 rpm, you should be reading between 25 and 40 VAC. If this checks out OK, but you still are discharging, check your wiring, especially the switches.

Hook up your volt meter directly to the output of the B+ terminal on the regulator/rectifier and check for voltage. If the regulator rectifier is bad, it is usually a result of excessive heat or a poor ground. The regulator/rectifier has a maximum operational temperature of 190°F.

The viscosity grade of oil is designated by an SAE (Society of Automotive Engineers) standard number. An oil designated SAE 40 has a higher viscosity (greater resistance to flow) than an oil designated SAE 30. Multi-grade oils have an extended viscosity range and can be used in place of a number of single-grade oils. For example, an SAE 10W-30 oil is suitable for use within a range of temperatures that would require three different single-grade oils in order to cover it (SAE 10W, SAE 20W/20, and SAE 30).

Table a lists the proper oil viscosity for VW engines under specific climatic conditions. The SAE viscosity number of the oil should be selected for the lowest anticipated temperature at which engine starting will be required, and not for the temperature at the time of the oil change. Because the temperature ranges of the different oil grades overlap, brief variations in outside temperatures are no cause for alarm.

Table a. Engine Oil Viscosities

