Cosworth Engineering

BDP-S3 Midget Engine Details

Capacity: 120.5 Cubic inches (1975 cc) Bore 3.543" (90.0 mm) Stroke 3.056" (77.6 mm)

Compression ratio: 13.0 to 1

H.P. Rating: 270 BHP @ 9000 RPM

Torque: 170 lb. ft. @ 6,000/7000 RPM

Cylinder numbering: Front 1-2-3-4 Rear

Important dimensions:

Crankshaft:
End float .002/.011"
Main bearing dia. 2.1260/2.1255"
Crank pin dia. 1,9375/1.9370"

Connection rods: End float (big end) .004/.012"

Jackshaft:
Part # BA0502
End float .003/.007"
Jackshaft pulley is secured to jackshaft with 1 bolt 3/8 unc and BA0510 washer.

It is recommended that Silastic is used under the washer to prevent oil leaks.

Valve timing:
Using EA1 inlet cam and BD4 exhaust cam
Inlet valves fully open 102 deg. A.T.D.C.
Exhaust valves fully open 106 deg. B.T.D.C.

Lap pulleys onto cams. With timing set correctly and belt correctly tensioned. Timing marks on pulley rims should line up horizontally in center of the engine when no. 1 piston is at TDC (firing). If the marks do not line up it is advisable to remark the pulleys so that the engine cam be easily retimed on rebuild.

Valve lift:
.460" less the tappet clearance EA1 inlet cam
.432" less the tappet clearance BD4 exhaust cam

Tappet clearance:
.009/.010" inlet
.012/.013" exhaust

Valve spring: Inlet fitted lenght of outer 1.27"/1.28"
Exhaust fitted length of outer 1.24"/1.25"
Springs should be .015"/.020" off coil bind at full lift.

Ignition: Firing order 1-3-4-2
Lucas Electronic ignition with a standard BDA advance and retard springs. Ignition timing is about 28 degrees BTDC. Timing is set on test with timing light at 4,500 RPM and may vary slightly from engine to engine for maximum performance.

Electrical System:

It is advised that all electrical connections are smeared with silicone grease especially when the engine may be operated in wet conditions.

Sparks Plugs: Champion N82 (Now obsolete) or equivalent - C57 - Champion

Before removing plugs clear all dirt from recess. Use special pliers to remove H.T. leads, but do not pull directly on leads. Use graphite grease on plug threads and torque to 15 lb. ft.. Take care to keep water from the spark plug holes when washing the car and engine.

Tappet Adjustment:

Rotate engine forward to TDC. (cam pulley marks lined up). Remove main camshaft belt having slacked off eccentric pulley to remove tension from belt. (Note: Always refit belts to run in the same direction as before).

Retain tappet up against the cams, preferable by inserting 8 spring clips between adjacent tappets. Remove surplus oil from tappet cambers with syringe and slacken off hex head bolts insuring cam carrier lifts evenly. Carefully lift cam carrier assembly VERTICALLY until clear of the valve stems and shims. Some shims may stick to the tappets and some to the valve stems.

Cylinder Head:

Number bolts 1-5 exhaust side, 6-10 inlet side and then order of tightening is 8,3,7,4,9,2,10,1,6 and 5.*Use anti-suffing paste under nut and bolt heads.

Camshaft Oil Seals:

To prevent failure in service it is recommended that the garter spring is removed, the ends untwisted, degreased and reassembled with Loctite 602.

Cam Carrier:

It is recommend that "Silastic" is used to make an oil tight joint between the cylinder head and cam carrier and that the paper gasket is omitted.

Belt Tension and Valve Timing:

Belt tension should always be set with COLD engine. The tension is adjusted by moving the eccentric idler pulley. To check tension turn the engine in its normal direction TDC number 1 cylinder firing. Tension should be checked midway between the exhaust camshaft pulley and the crankshaft pulley. It is important that each time the tension is being adjusted and checked the engine is brought up to TDC number 1 cylinder firing in its normal direction of rotation. It is essential that the belt is not over-tensioned as this will result in premature tooth failure.

We recommend the use of Burroughs Tension Gauge BT 33-73F and the tension should be set of 110/130 gauge reading. Alternatively a Gates Tension Tester may be used and for ½" belt defection a gauge reading of 11/15 lbs. should be obtained.

On new engine build the camshaft pulleys are marked on the front rims on their horizontal center line. These marks line up in the center with the engine at TDC number 1 cylinder firing. A further mark is on the rear rim of the exhaust camshaft pulley which lines up with a scribed lined on the cover with the engine again set at 28 BTDC number 1 cylinder firing. When checking the timing marks or timings, always turn the engine in its normal direction with the belt correctly tensioned.

The camshaft pulleys are a taper fit on the camshaft and have two ¼" UNC tappet holes to facilitate removal. On new engine build the end of each camshaft and pulley hub face are scribed with a horizonal line in order that the pulleys can be re-fitted in their original position.

Oil System:

See Cosworth drawing for layout of recommended oil system which shows oil pipe sizes etc. Note that pipes into the oil/air separator built into the top of the tank should enter tangentially with the oil scavenge pipe ahead of the engine breather pipe. It is very important that an air separator and anti surge baffle be fitted in the oil tank. (Drawing available on request)

Oil pressure when hot should be 70 psi min. rising to 80-90- psi at normal running speeds. Care must be taken to allow the oil temperature to reach 50'C before exceeding 7,000 rmp otherwise bearing failure may occure due to running at high speed with cold oil.

Maximum premissiable oil temperature is 100 C. measured in the tank.

If the oil pumps are dismantled for any reason, it is essential to check that the shaft turns freely on re-assembly before fitting to the engine. If it is not possible to turn the shaft easily, then the drive gears may suffer. Any dirt in the pumps will have a similar effect.

Rev Limit:

Recommended limit is 9,500 RPM.

Pistons - 1975cc:

Gap on all rings should be .015/.022" when fitted in bore.

It will be necessary to do a trail assembly to check the position of the piston crown relative to the face of the block at TDC. The pistons should be - .002 / + .002 in the bore at TDC so the piston crown will need machining to achieve this.

Exhaust System:

4 x 2.0" O/dia x 27" long into 1 x 2.5" O/dia x 28" long.

Pipe to manufactured in 18SW (.048) tube.

Mufflers creating minimum back pressure are recommended.

Bolt Torques:

Flywheel/crank or drive adaptor	3/8 UNF	50-55 lb.ft.
** Big End		41-42 lb.ft.
**Cyl. head & nuts (Soc Cap HD)	7/16 UNC	62-65 lb.ft. (oil under head)
Main Cap	7/16	60-62 lb.ft.
Cam Pulley	3/8 UNF	20-25 lb.ft.
Jackshaft Pulley - BA0509	3/8 UNC	25-30 lb.ft.
Idler pulley nut/bolt	7/16 UNC	30-35 lb.ft.
Crankshaft pulley	7/16 UNC	35-40- lb.ft.
Cam Carrier/Head	1/4 UNC	8-10 lb.ft.
Water Pump	5/16 UNC	16-18 lb.ft.
Plugs	14 mm	14-16 lb.ft.- Graphite grease on threads.
1/4 Bolts (sump, front cover etc.)		5 - 7 lb.ft.
5/16		10-15 lb.ft.
3/8		20-25 lb.ft.

** Should be fitted with engine oil on threads and Molybdenum disulphide anti-suffing paste under head.

BELT TIMING

Setting or Checking Belt Tension

To set the belt turn the engine in the direction of running rotation until No.1 is at top dead center. We have found the easiest way is to slide the Bourough's gauge in from the front and read the dial from the rear. Position it midway between the exhause cam pulley and the lower idler pulley. The tension cold should be 120 lbs. in the green section of the scale. If taking a reading while the engine is hot the reading will increase to approximately 140 lbs. If it is necessary to adjust the belt always turn the engine through 2 revolutions before rechecking at T.D.C. Always set the belt tension when the enine is cold.

Belt Maintenance

Ensure pulleys are kept clean, dry and that there is no dirt build up between the teeth, particularly on the crank pulley. Inspect belt for any unusual freying or wear patterns every 2 or 3 races.

Starting Procedure

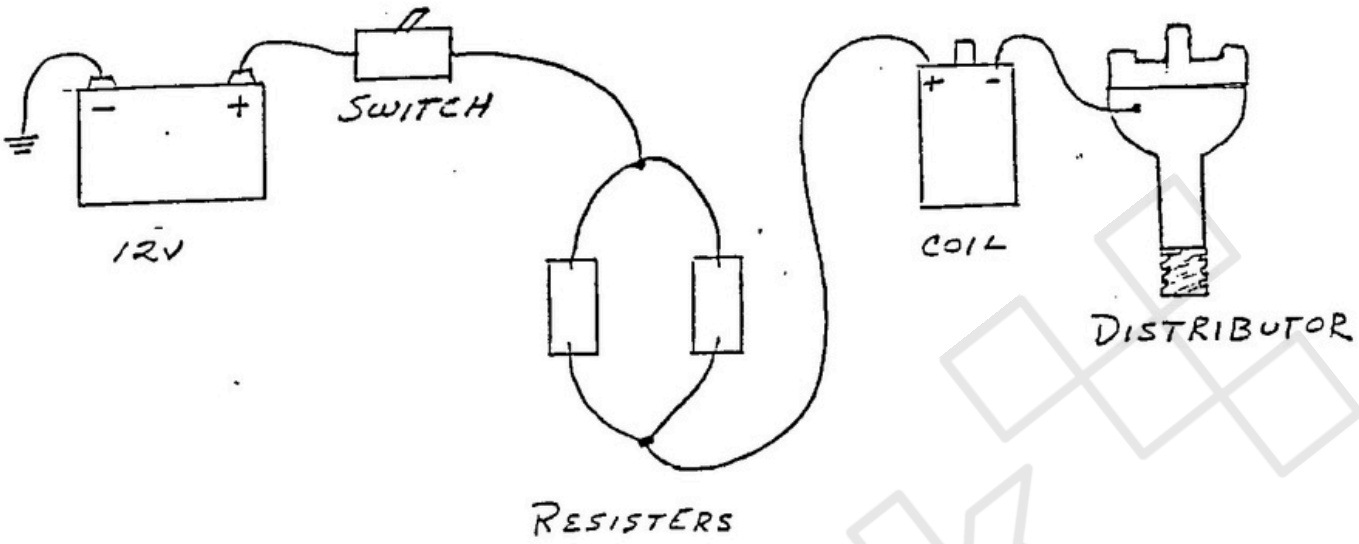
Never push the car backwards while in gear. This could result in the belt jumping timing gears.

MIDGET EXHAUST SYSTEM

Recomended for All Tracks

4 into 1.
1 7/8" primarys x 28" long.
2 1/2" tall pipe x 30" long.
The angle of the collector is recomended to be around 17 degrees.

BDP MIDGET WIRING



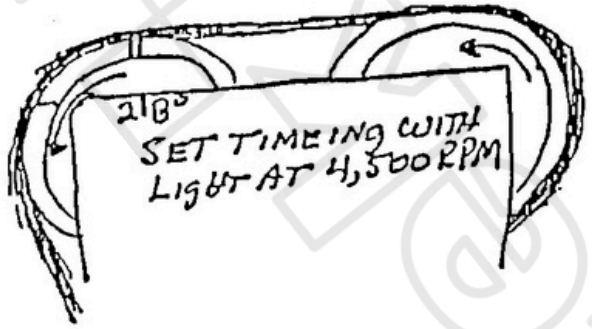
It is suggested that:

1. Battery is mounted in box in rubber and box is mounted on rubber mounts Lord type.
2. Use a gel filled battery.
3. Use a Off Road type switch.
4. Mount coil on rubber mounts.
5. Ground wire to run to frame and motor block.
6. Solder all wiring connectors.
7. Mount dash panel on Lord type rubber mount.
8. Set point and plug cap at .014".
9. Regularly check an spade connectors for looseness as many misfire problems start here.

ELECTRONIC IGNITION

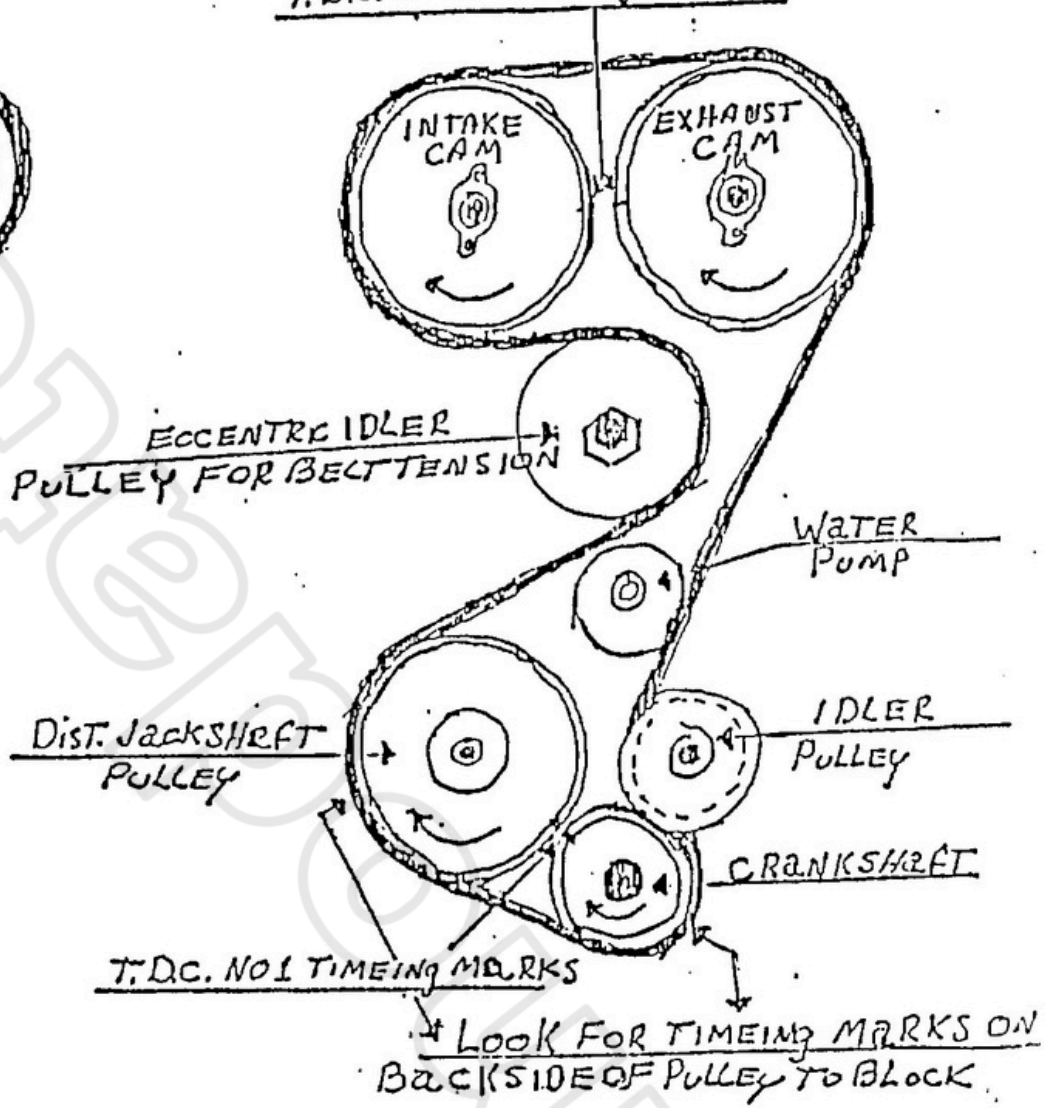
Requires only a 12 volt ignition supply from switch to the positive terminal on the coil. Amplifier box must be grounded to ensure to function correctly.

REAR VIEW

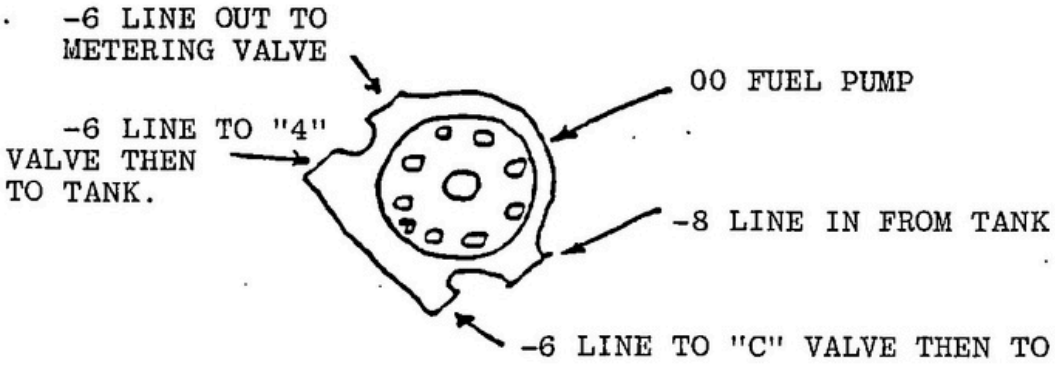


NOTE
ALL TIMEING MARKS MARKED
WITH WHITE POINT

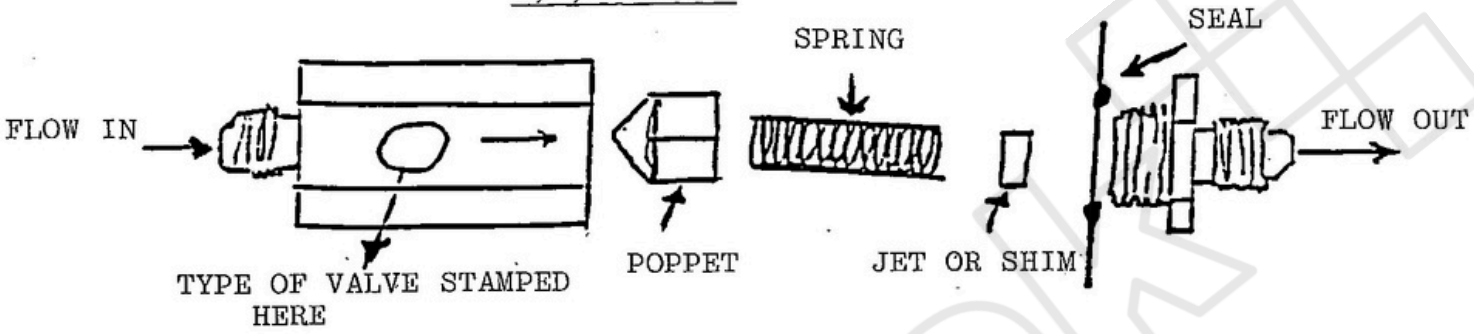
FRONT VIEW



BDP FUEL SYSTEM



4,S,C VALVE



VALVE	SPRING	JET OR SHIM
"4"	.016	JET LARGER TO LEAN SMALLER TO RICHEN
"S"	.028	ADD SHIMS TO RICHEN REMOVE TO LEAN *
"C"	.042	ADD SHIMS TO RICHEN REMOVE TO LEAN *

* SHIMS AVAILABLE .187 & .031 THICK.

VALVE EXPLINATION

"4" VALVE — IS USED TO CONTROL FUEL MIXTURE THROUGH ALL R.P.M. RANGES.

"S" VALVE — REGULATES FUEL FROM CLOSED TO 50% THROTTLE AT HIGH R.P.M. - AS YOU ENTER A CORNER AT HIGH RPM WITH A CLOSED THROTTLE THE "S" VALVE BYPASSES EXCESS FUEL FROM THE FUEL PUMP BACK TO TANK.

"C" VALVE — REGULATES FLOW OF FUEL TO ENGINE AT HIGH R.P.M. (ABOVE 6000 RPM)

COSWORTH AIR FILTER FITTING RECOMONDATIONS

Air horn length can be cut to suit installation in the car. Stock sizes are 6" and 12" long. For top end horsepower 6" long are recommended.
The airfilter back plate should be sandwiched between two pieces of rubber hose clamped to the air horn with hose clamps. The inner clamp to be siliconed or lock-wired to prevent any parts becoming detached.
Ensure the sponge filter is clean but well oiled at all times. An overcover is available to protect the outer sponge.

Air filter kit: CA6050 (less hose and clamps)
Air filter overcover: CA6053