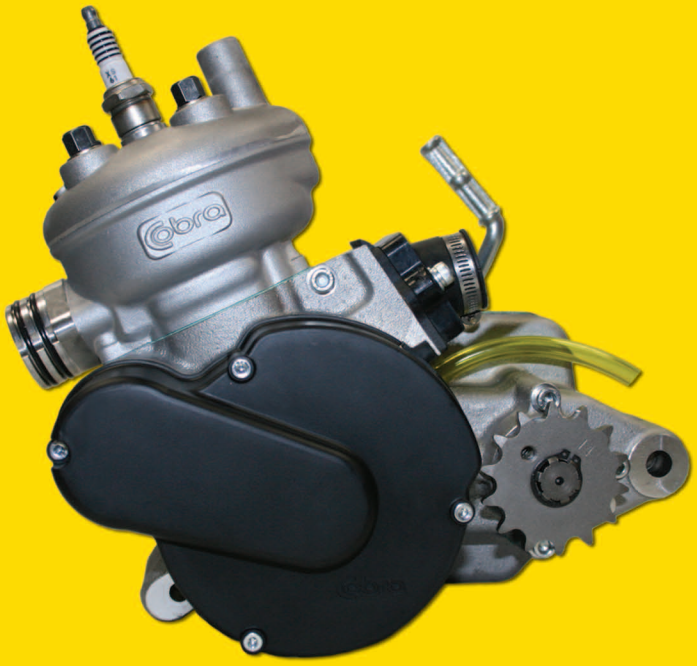
CHAMPIONS START HERE

50cc Auto Engine

2012



Cobra MOTO

Service Owners Parts Tuning

For **parts orders** contact your local dealer

To locate your closest Cobra dealer
log on to
www.cobramotorcycle.com
or call
(517) 437-9100

If you need **technical assistance**
contact your local dealer or call
the Cobra Technical Support Hotline at
(517) 437-9100

Autolite

MOTUL

Cobra Moto, LLC
240 Uran Street
Hillsdale, Michigan 49242

Table of Contents

General Information 3
- Specifications - General 3
- Specifications - Torque Values 4
- Break-In Procedure 5
- Starting Procedure 6

Maintenance 7
- Tips 7
- Schedule 8
- Replacing Transmission / Clutch Lubricant 8
- Air Filter Cleaning 10

Parts 13
- Parts – Air Inlet System 13
- Parts - Carburetor 14
- Parts – Coolant System 15
- Parts – Electrical System 16
- Parts – Engine – Bottom End and Transmission 17
  - Parts – Engine Clutch and Kicker 18
  - Parts – Engine – Water Pump 19
  - Parts – Engine – Top End 20
- Parts – Exhaust System 21

Service 22
- Engine Service 22
  - Base Gasket Selection 23
  - Complete Engine Disassembly Procedure 25
  - Top End Disassembly Procedure 25
  - Splitting the Cases 26
  - Engine assembly 27
- Clutch 29
- Ignition 37
- Cooling System 38
- Fuel & Air System 41
- Exhaust 43

Tuning 45
- Gearing 45
- Carburetion 46

General Information

Specifications - General

Items	ECX50
Engine	
Type	2-stroke, single cylinder, reed valve
Cooling system	Liquid-cooled
Coolant	50/50 antifreeze-coolant / distilled water
Displacement	49.8 cc
Bore and stroke	39 mm x 41.7 mm
Ignition system	PVL analogic
Spark plug	Autolite -
Gap	0.023” – 0.025” (0.58 – 0.64 mm)
Ignition timing	0.040” (1.02 mm) BTDC
Fuel type	High octane pump gasoline
	RACE FUELS ARE NOT RECOMMENDED
Oil type	*Motul 800 2T*
Fuel / oil mix ratios	*Motul 800 2T Off Road*, 50:1 to 63:1
	All other premix oil at 32:1 to 40:1
Carburetion	21 mm Dell’Orto PHBG,
Jet Main / Slow (Pilot)	98 / 55
Slide / Needle	#30 / W-4
Float Height	16mm $\pm$ 0.5mm (0.63” $\pm$ 0.020”)
Transmission	
Speed / ratio	Single / 14/38 T
Chain	104 links 420
Transmission / clutch oil type	*Cobra Venom 3 Shoe Clutch Milk*
Quantity	235 – 350 ml (8 – 12oz)

Specifications - Torque Values

ENGINE Fastener	Torque Value			Size & Remarks
	ft-lb	in-lb	Nm	
Cylinder head nuts	8.8	105	12	M6 x 1.0
Crankcase bolts	8.8	105	12	M6 x 1.0
Spark plug	(SP)	(SP)	(SP)	M14 x 1.25
Stator bolts	2.1	25	2.8	M5 X 0.8
Stator cover bolts	1.7	20	2.3	M4 X 0.75
Clutch cover bolts	5.8	70	7.9	M6 X 1.0
Clutch nut	40	480	54	M10 x 1.25*
Clutch bolts	12	144	16	M6 x 1.0
CFD nut	55	664	75	½" x 20 LHT

Units of mm unless otherwise specified

(G) denotes the use of wicking / bearing retainer (green) thread locking agent to applied to the mating surfaces of the two components but not the threads.

(SP) To apply the proper torque to the spark plug when inserting, one must first screw the spark plug in until the metal gasket ring causes resistance and then turn another 1/8 to ¼ turn.

(R or G) designates that the application requires the use of high strength (red) thread locking agent applied to the threads.

(B) designates that the application requires the use of medium strength (blue) thread locking agent applied to the threads.

Break-In Procedure

Your Cobra ECX50 is a close-tolerance high performance machine and break-in time is very important for maximum life and performance. The ECX50 can be ridden hard after the first ½ hour break-in time.

Cobra recommends *Motul 800 T2* premix oil with high octane pump gas mixed at 50:1 (50 ml oil to 1.3 gallon of gas, or 38ml oil to 1 gallon of gas). Other brands of oil should be mixed at 32:1 for break-in.

CAUTION:
Failure to use proper fuel or oil may result in premature engine wear, or damage to the machine.

Adhering to the following break-in schedule will result in long lasting high performance machine.

- First 5 minute period, operate the bike on the stand with a combination of idle and high RPM operation. (avoid prolonged high RPM but spin the rear wheel good at least once or twice per minute)
- Allow the engine to cool
- Ride for 15 minutes maximum, avoiding prolonged high RPM operation.
- Cool and inspect bike for loose fasteners.
- Next ½ hour of operation, avoid prolonged operation at Wide Open Throttle.
- After 1 hour of operation
    - Check for loose bolts and nuts on the bike and retighten as necessary (proper toque values are listed under Specifications).
    - Clean the carburetor bowl.
    - Change the transmission / clutch lubricant.
- After 8 hours of operation have a Certified Cobra Mechanic change the shock oils.
- Your bike is now ready for the highest level of competition!

NOTE:
During break-in the bike will likely lose some engine coolant through the radiator overflow hose. Losing up to 4 oz (120 ml, ½ cup) is normal. Proper coolant level will cover the top of the radiator cores. Removing the radiator cap and looking inside is the only way to check the coolant level.

⚠ WARNING
Never open the radiator cap of a machine that has a hot or warm engine or one that has recently been ridden. Burning and scalding could occur.

CAUTION:
It is important that the radiator cap is installed correctly and completely otherwise engine damage could occur.

Starting Procedure

Before starting the machine inspect the following:

- Check for proper tire pressure in both tires.
- Observe the chain tension and adjust if necessary.
- Observe the coolant level and fill if necessary.
  Verify that the chain rollers and sliders do not have improper wear.
- Verify that the handlebars are tight.
- Check the throttle for smooth operation and sound closing.
- Check for loose bolts and nuts, and re-torque as necessary.
- Verify that the air filter is clean and properly saturated with oil.
- Insure that the fuel tank contains an adequate volume of fuel / oil mixture to complete the distance required. (High octane pump gas with *Motul 800 2T* premix oil)
- Turn the fuel on by rotating the fuel petcock knob to the vertically downward position (reserve position is horizontally forward)

CAUTION:
For best results from your Cobra Motorcycle use only the recommended fuels. Testing has shown that most ‘race’ fuels actually degrade performance.

⚠ WARNING
Always wear a helmet and other protective riding gear.

When your pre-ride inspection is complete the bike may be started. For a cold engine follow this procedure.

1. Pull up the choke knob and turn it to lock it.
2. Kick start the engine.
3. Rev the engine in short spurts, turning the throttle no more than 1/4 open until the engine will run without the choke.
4. Verify a functional engine shut-off switch by shutting off the engine.
5. Restart the engine and proceed with riding when the engine is sufficiently warm (i.e. the side of the cylinder is warm to touch).

CAUTION:
Never rev an engine full throttle when it's cold or slightly warmed up. Also, for best clutch performance, warm up the bike before taking off.

⚠ WARNING
This is a high performance race motorcycle. Too much application of throttle will likely land your little racer on his or her arse. Fenders can be replaced but bruised egos and other body parts take longer.

CAUTION:
Cobra recommends that you tell your child to take it easy the first couple of minutes in practice until the engine comes up to full operating temperature.

CAUTION:
Make sure your riders' foot is not resting on the foot brake while they are riding.

Maintenance

It is important that you adhere to this maintenance schedule so as to promote the longevity of your Cobra Motorcycle.

Tips

1. Recommended lubricants:
    a. Cobra Clutch Milk is by far the best **auto clutch lubricant.** It is a full synthetic lubricant that has been specifically formulated for Cobra's auto clutch and has;
        - Exceptional film strength over petroleum based oils or synthetic blends.
        - Extreme temperature tolerance.
        - NO frictional modifiers.
        - Dispersant package to keep clutch fibers in suspension so they can be flushed out when the oil is changed.
        - Extremely low viscosity for minimal drag and 'windage'.
    b. *Motul 800 2T Off Road* oil is the recommended **premix oil** because:
        - Its Ester base leaves a film on all parts at all times. No metal to metal startups or corrosion potential.
        - Exception film strength over petroleum based oils or synthetic blends.
        - Easily atomizes and burns completely.
        - Does not fall out of suspension from premix in cold weather.
        - Produces virtually no coking deposits, leaving pistons, rings and heads extremely clean with minimal pipe 'spooge'.
2. Filling your transmission with more than 8.0 oz (235 cc) of lubricant may help to transfer heat from the clutch. Filling with more than 12 oz (295 cc) will degrade performance.
3. The cylinder base gasket has been 'fitted' for your engine. The code number stamped into the engine cases will guide you to what thickness base gasket is required during a common top end service. See the service section of this manual to correspond a code number with a base gasket part number.
4. Evaluate the bikes jetting only after it has been warmed up to race temperatures.
5. A properly maintained machine is safer, faster, and more fun to ride.

6. New chains will stretch on first use. Never install a new chain prior to a race. Always 'break' them in during practice.
7. Your Cobra Motorcycle has a 10 digit VIN (Vehicle Identification Number). The first two digits indicate the model and the seventh indicates the model year (MY).
    a. Example, Acxxxx7xxx is a 2007 MY quad.

Schedule

- Between each ride
    - Check the air filter (clean and re-oil as necessary).
    - Insure the smooth operation of the throttle cable (throttle soundly 'clacks' shut).
    - Check for frayed strands of the throttle cable inside the throttle housing and replace if necessary.
    - Check all nuts and bolts for proper torque and re-torque if necessary.
    - Spray all moving parts with WD40 or other light oil.
    - Insure that the ignition stator and rotor are clean and dry.
- Every 2 hours of operation
    - Replace the transmission oil.
- Every 10 hours of operation
    - Replace the fork oil.
    - Have the shock oil replaced by a Certified Cobra Mechanic.

CAUTION:

1. Because of the amount of heat generated by the clutch and engine during extended periods of riding, it is advisable to remove the ignition cover afterward to allow the ignition to cool off. The heat transfers through the cases and can damage the stator as it cools off because of lack of airflow around the stator.

2. If your kick-starter lever does not return properly, first try loosening the six kick/clutch cover screws ½ turn. Hold the kick lever ½ way down while retightening the six screws starting for the center and working out.

3. Inspect CFD slip torque every 10 hours of riding or replace the friction papers and the load spring (Bellville spring) every 20 hours.

4. Check proper clutch engagement before and after each ride. If the clutch is engaging properly DO NOT feel the need to take the clutch apart to; measure the spring stack, clean the stack, replace the springs, etc... Cobra has worked real hard to make a clutch that is low maintenance and so only take it apart if it NEEDS to be maintained.

Replacing Transmission / Clutch Lubricant

Tools needed:

- Minimum of 235 ml (8 oz) *Cobra Venom 3 Shoe Clutch Milk* (Part # MCMUGF01).

NOTE:
Up to 350ml (12 oz) can be applied without hurting performance.

Procedure:
1. Begin this procedure with a bike that has been ridden more than 5 minutes but less than 10 minutes. It is desired to have the engine warm enough so that the oil is 'runny' but not so hot that there is risk of being burned by the engine or the oil.

⚠ WARNING
Hot oil and hot components on the motorcycle may cause burns.

2. Lean bike against something or set on stand with oil drain hole.
3. Remove the oil drain plug located on the right side of the engine, on the clutch cover, near the brake lever (figure 1).

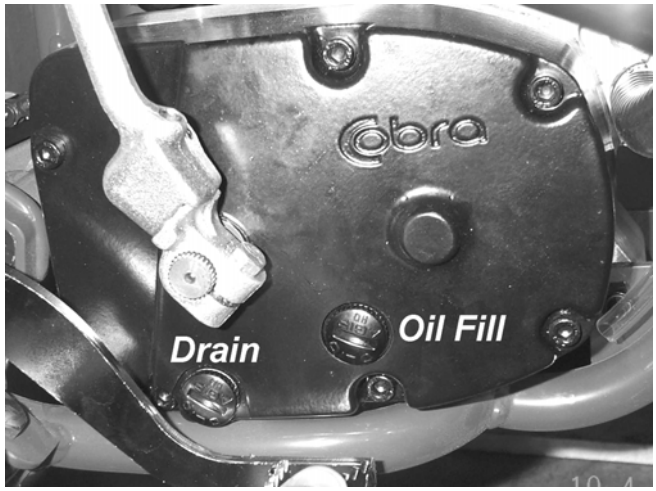


Figure 1

4. After it has drained, reinstall the plug, being sure that the gasket is in place.
5. Reapply oil from oil fill plug 235 cc (8.0 oz) *Cobra Venom 3 Shoe Clutch Milk* thru the oil fill plug.

NOTE:
Putting additional oil, up to 350 ml (12 oz), can help clutch life. More than 350 ml (12 oz) will degrade engine performance.

NOTE:
Lean bike over onto it's left hand side so that the clutch cover is up unless you have a squeeze bottle.

6. Reapply the oil fill plug, hand tight, being sure the gasket is in place.

CAUTION:

Cobra has spent considerable time and money developing the proper lubrication to handle the harsh environment of the automatic clutch and transmission of this motorcycle. Cobra's specially developed *Cobra Venom 3 Shoe Clutch Milk* (Part # MCMUGF01) was formulated to provide superior lubrication and cooling capability over extended periods of time and is the recommended lubricant for your Cobra motorcycle.

Air Filter Cleaning

This Cobra Motorcycle comes with a unique air filter / air boot unit designed to facilitate motorcycle service.

Tools recommended for air filter maintenance:

- Srewdriver
- Foam filter oil

Procedure

1. Removed the filter from the carburetor.
2. Clean the filter with cleaning solvent and then again with hot soapy water.
3. Allow it to dry thoroughly.
4. Saturate with foam filter oil and remove excess.

⚠ WARNING

Do not clean the air filter with gasoline or other highly volatile petroleum product. Cleaning solvent, diesel fuel, or kerosene would be preferred but caution should still be taken.

NOTE:
The biodegradable air filter oils, greases, and cleansers work acceptably with this Cobra Motorcycle.

NOTE:
It is very important to keep the air filter clean and properly oiled with high quality water-resistant foam filter oil. It's very important to oil your filter consistently each time because varied amounts of oil will change your carburetor jetting.

NOTE:
Make sure you change or clean your filter after each moto or significant ride. We recommend carrying three or more filters in your toolbox.

- 1 for practice
- 1 for each moto

CAUTION:
Dusty conditions will require more frequent cleaning.

Frictional Drive (V3 CFD)

The Cobra Frictional Drive (CFD) is essentially an adjustable slip clutch that dissipates torque spikes transmitted from the rear wheel to the rest of the drive line and engine. Instead of these torque spikes potentially damaging internal components, the CFD allows the transmission to slip with respect to the engine. For this to occur, the CFD must function properly by 'slipping' above a minimum torque value.

The safe minimum slip torque of the CFD should be checked every 5 hours of operation, after breakin.

The slip torque value should be above 60 ft-lb (81 Nm) measured at the sprocket.

To properly measure the minimum torque at which the CFD (Cobra Frictional Drive) slips

1. Access the slip clutch by draining the oil and removing the cover exposing the CFD.
2. Brace the CFD gear from turning with a suitable device (Cobra tool EAMU0004 or similar).
3. Install the Sprocket Socket CFD torque checking tool (MCMUTL15) on the sprocket and secure with the supplied screw and ensure that the tool is completely up against the sprocket
4. Verify with a torque wrench applied to the Sprocket Socket that the V3 CFD does not slip below 81 Nm (60 ft-lb) in either direction.
5. If there is slippage below 81 Nm (60 ft-lb) remove the cotter pin and tighten the castle nut on the CFD one more position (it is a left hand thread nut so you must turn it counter clockwise)

CAUTION:
Do not check earlier versions of the CFD with this method! The torque values required at the sprocket would be much higher

HINT:
This V3 CFD torque checking method is possible do to with the chain on. Just put the bike on a stand so that the rear wheel can turn freely.

HINT:
The CFD hubs can be removed with the universal puller (MCMUTL70).

Parts

Parts – Air Inlet System

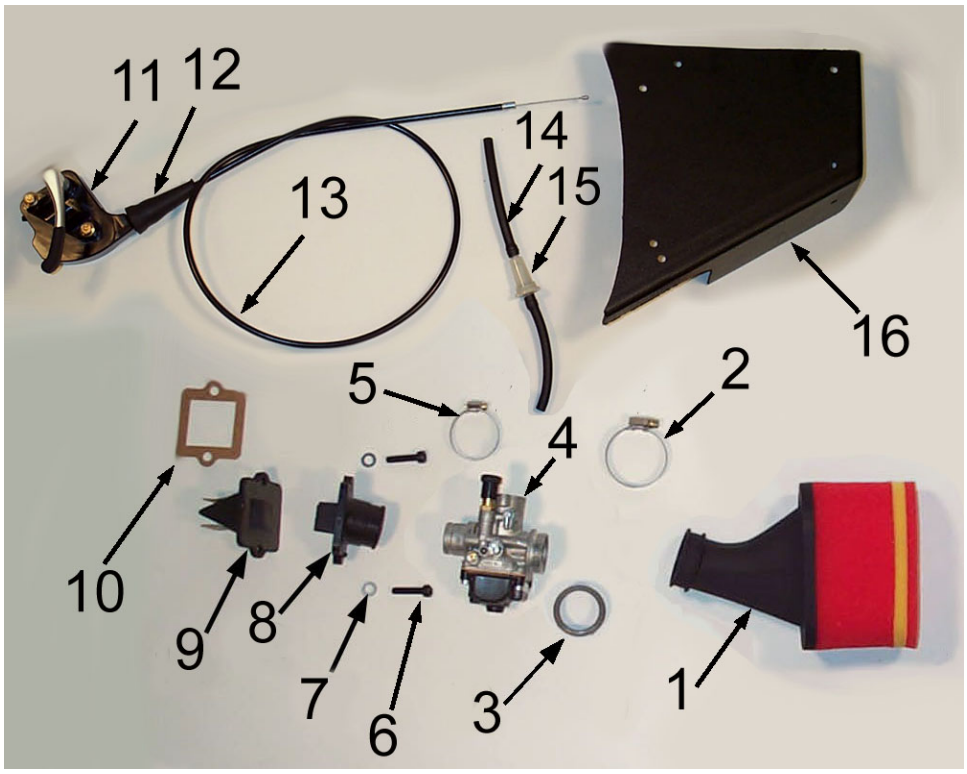


Figure 4

Coolant System		
REF #	PART #	DESCRIPTION
1	RCMU0403	FILTER ASSEMBLY
2	MCKGHO01	HOSE CLAMP – BOOT TO CARB
3	RCCM1301	VELOCITY STACK
4	RAEX0021	CARBURETOR, 21MM DELL'ORTO PHBG
	RCMU0022	VENT HOSE
5	MCKGHO04	HOSE CLAMP – CARB TO MANIFOLD
6	HCBC0625	M6X25 SOCKET HEAD CAP SCREW
7	HCWF0601	6MM FLAT WASHER
8	ECKG0203	INLET MANIFOLD
9	ECKG0202	REED CAGE ASSEMBLY WITH REEDS
NOT SHOWN	ECKG0205	REED REPLACEMENT KIT
10	ZCMU0132	GASKET – REEDS TO ENGINE
11	FCEX0016	THROTTLE, QUAD THUMB STYLE
12	FCPW0004	THROTTLE CABLE END GROMMET
13	RCEX0001	CABLE – THROTTLE, ECX50
14	RCE50001	FUEL LINE 5 INCH
15	FCDC0093	FILTER, FUEL
16	RCEX0019	COVER, AIR FILTER

Parts - Carburetor

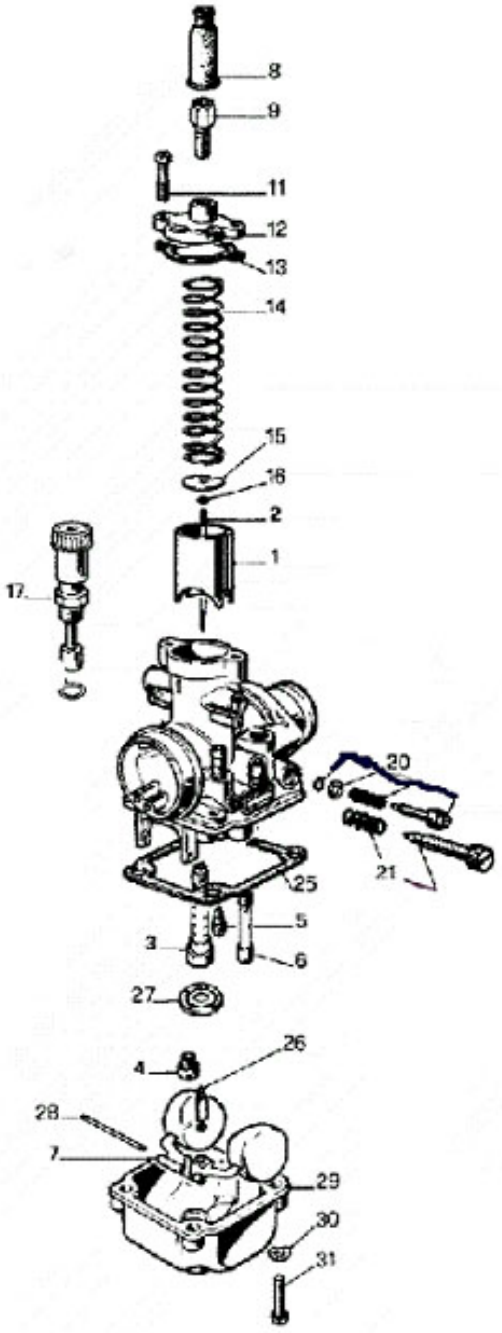


Figure 7

Carburetor		
REF. #	**PART #**	**DESCRIPTION**
1	RCMU0031	CARB SLIDE (30 slide)
2	RCMU0026	NEEDLE (W-4)
3	RCMU0023	ATOMIZER 2.62 AU
4	RCMU00xx	MAIN JET (xx denotes size)
5	RCMU00xx	PILOT JET (xx denotes size)
6		CHOKE JET
7	RCMU0301	FLOAT
8	RCMU0102	RUBBER CABLE CAP SEAL
9	RCMU0003	CABLE ADJUSTOR
11	RCMU0006	TOP CARB SCREW
12	RCMU0106	CARB TOP
13	ZCMU0007	TOP CARB GASKET
14	RCMU0004	SLIDE SPRING
15	RCMU0028	NEEDLE RETAINER PLATE
16	RCMU0007	NEEDLE CLIP
17	RCMU0204	CHOKE ASS'Y. 2001 CM
20	RCMU0009	FUEL MIXTURE SCREW
21	RCMU0011	IDLE ADJUSTMENT SCREW
25	RCMU0103	FLOAT BOWL GASKET
26	RCMU0107	FLOAT NEEDLE
27	RCMU0012	DIFFUSER
28	RCMU0016	FLOAT RETAINER PIN
29	RCMU0108	FLOAT BOWL
30	HCWF0401	WASHER 4MM FLAT
31	RCMU0201	SCREW FLOAT BOWL
NOT SHOWN	RCCM1301	VELOCITY STACK -05
NOT SHOWN	MCKGHO01	CLAMP – CARBURETOR TO FILTER
Not Shown	RCE50001	FUEL LINE
Not Shown	MCMUCL04	HOSE CLAMPS – FUEL LINE
	RCMU0022	VENT HOSE

Parts – Coolant System

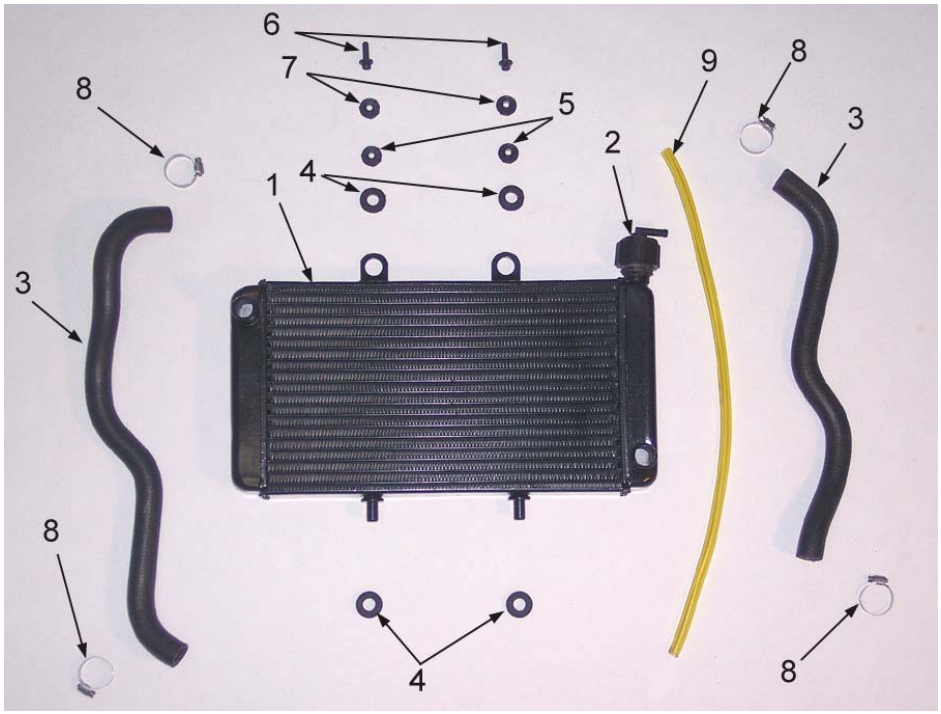


Figure 9

Coolant System		
REF #	PART #	DESCRIPTION
1	FCEX0066	RADIATOR WITH CAP
2	FCMU0020	RADIATOR CAP
3	ECEX0010	RADIATOR HOSE
4	MCEXGR01	GROMMET, RAD MOUNT (4 REQ'D)
5	MCMUGR04	GROMMET, TOP RAD MOUNT (2 REQ'D)
6	HCBF0620	FLANGE HEAD BOLT M6X20 (2 REQ'D)
7	HCWF1478	WASHER RADIATOR MOUNTING
8	MCMUCL07	HOSE CLAMP (4 REQ'D)
9	FCMU0049	RADIATOR OVERLFLOW HOSE
Not Shown	MCMUCL05	HOSE CLAMP, OVERFLOW HOSE

Parts – Electrical System

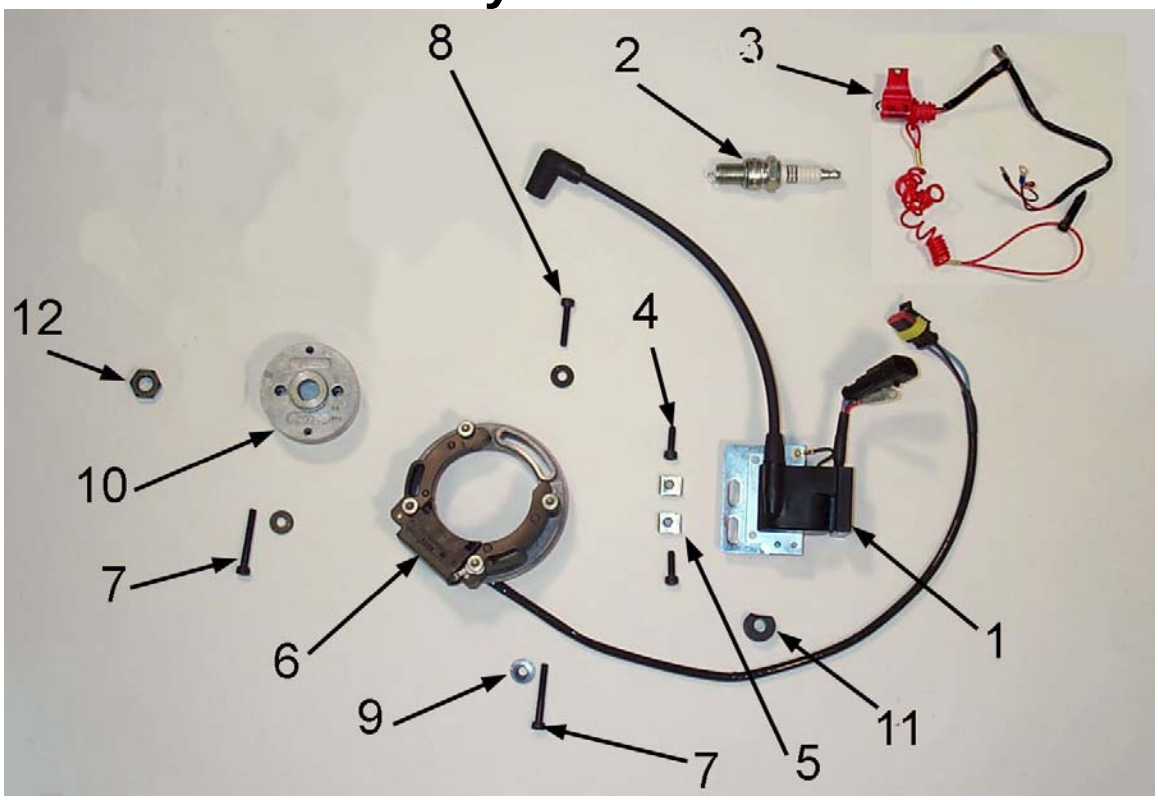
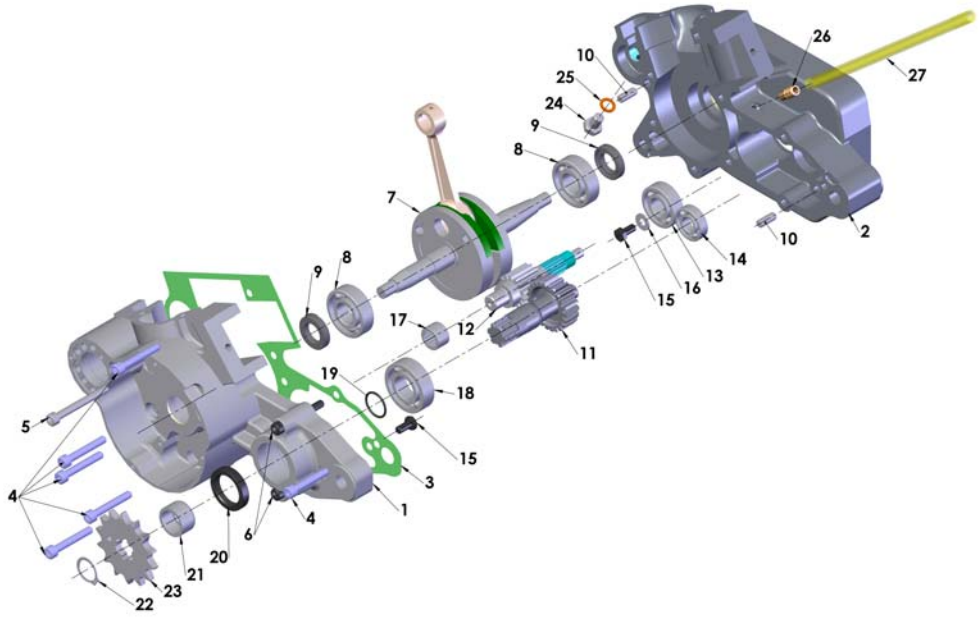


Figure 10

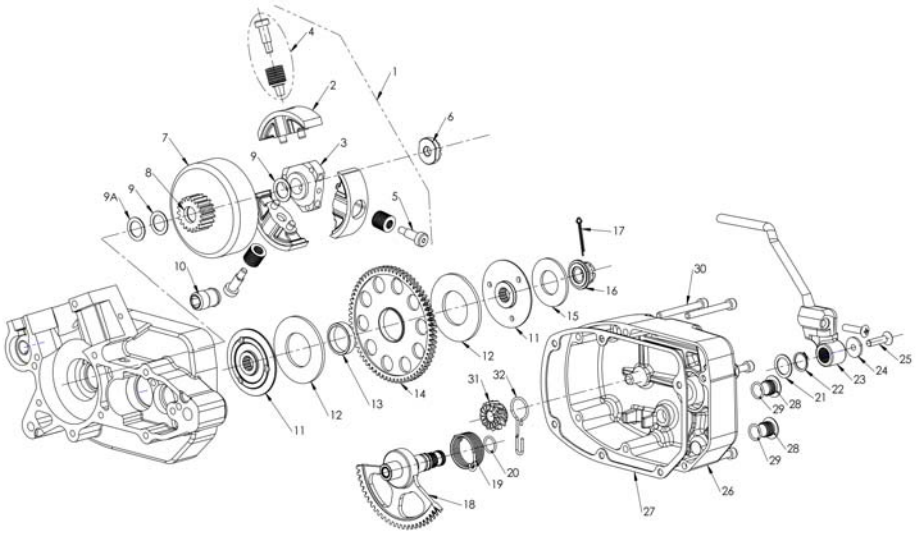
Electrical System		
REF #	PART #	DESCRIPTION
1	IAMU0005	COIL W/SPARK PLUG CAP (3 WIRE)
2	ECMU0065	SPARK PLUG, CHAMPION (8339-1)
2H	ECMU0067	OPTIONAL HOTTER PLUG (8332-1)
2C	ECMU0066	OPTIONAL COLDER PLUG (8904-1)
3	IKEX0001	IGNITION KILL TETHER
4	HCBC0516	SCREW, M5 X 16 (2 PER)
5	HCCN0000	5MM CLIP NUT (2 PER)
6	ICMU0018	STATOR 3 WIRE ANALOG
7	HCBC0535	5mm x 35 SOCKET HEAD CAP SCREW (2 REQ'D)
8	HCBC0525	5mm x 25 SOCKET HEAD CAP SCREW
9	HCWF0504	WASHER FOR STATOR (3 REQ'D)
10	ICMU0006	ROTOR
11	MCKGGR01	GROMMET - STATOR LEAD
12	HCNS1001	NUT 10MM
NOT SHOWN	ICMU0012	WOODRUFF KEY
NOT SHOWN	ECKG0001	IGNITION COVER
NOT SHOWN	ZCKG0101	GASKET, IGNITION COVER
NOT SHOWN	ICMU0017	SPARK PLUG CAP 0 Ω

Parts – Engine – Bottom End and Transmission



Engine Bottom End and Transmission		
REF #	PART #	DESCRIPTION
1	EKCS0003	ENGINE CASE SET W/B&S 50 2010 ECX50
2	EKCS0003	ENGINE CASE SET W/B&S 50 2010 ECX50
3	ZCCS0005	GASKET, CRANKCASE CENTER
4	HCBC0605	6X40MM SOCKET HEAD CAP SCREW (6 REQ'D)
5	HCBC0608	6X55MM SOCKET HEAD CAP SCREW (1 REQ'D)
6	HCBC0606	6X45MM SOCKET HEAD CAP SCREW (2 REQ'D)
7	ECMU0038	CRANKSHAFT
8	ECMU0016	BEARING, CRANKSHAFT
9	ECMU0118	SEAL, CRANKSHAFT
10	HCDP1401	DOWEL (SOLID), ENGINE CASE ALIGNEMENT (2 REQ'D)
11	DECMU0999	OUTPUT SHAFT, TRANSMISSION WITH GEAR
12	ECMU0100	SECONDARY SHAFT, TRANSMISSION WITH GEAR
13	ECMU0001	BEARING, TRANMISSION SECONDARY SHAFT
14	ECKG0031	BEARING OUTPUT SHAFT, RIGHT SIDE
15	HCBH0612	M6X12 HEX HEAD SCREW - BEARING RETAINER (2 PLACES)
16	HCWF0316	WASHER - FLAT
17	ECMU0020L	BEARING, TRANSMISSION PRECISION
18	ECKGBR01	BEARING, TRANSMISSION OUTPUT SHAFT
19	ZCDCOR01	O-RING, SPROCKET SPACER
20	ECMU0072	SEAL, OUTPUT SHAFT
21	ECMU0073	SPACER, SPROCKET
22	ECKGSR03	SNAP RING, SPROCKET
23	PCKG0014	SPROCKET, 14 T
24	HCBH0805	M8X12 SCREW – COOLANT DRAIN
25	HCWC0000	COPPER GASKET
26	ECMU0233	FITTING, CRANKCASE VENT - LARGE
27	ECMU0557	VENT HOSE, CRANKCASE, 9"
28	ECMU0156	SHIM – OUTPUT SHAFT 50'S (MAY NOT BE NEEDED)

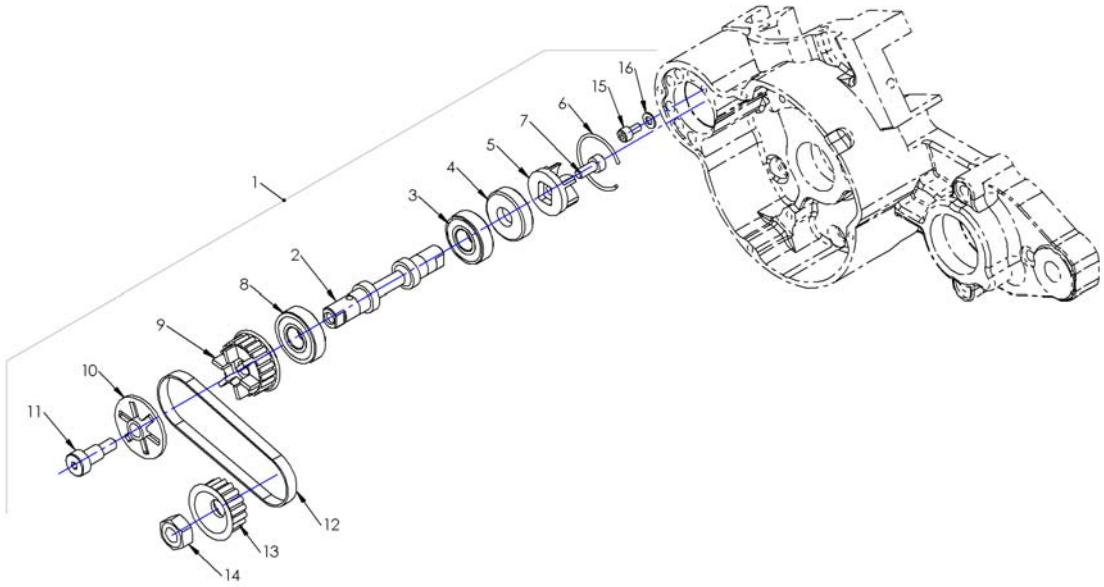
Parts – Engine Clutch and Kicker



Engine – Clutch and Kick Starter		
REF #	PART #	DESCRIPTION
1	CAMU0005	CLUTCH COMPLETE
2	CAMU0013	CLUTCH SHOES (SET OF 3) WITH BOLT & WASHERS
3	CCMU0029	CLUTCH ARBOR
4	CAMU0010	SPRINGS, WASHER & BOLT (SET OF 3)
5	HCBS0004	CLUTCH BOLT (3 REQ'D)
6	ECMU0018	CLUTCH NUT, SPECIAL
7	ECMU00120	CLUTCH BASKET WITH NEEDLE BEARING
8	ECMU0119	CLUTCH BEARING
9	ECMU0040	CLUTCH TO HUB SPACER (0.030", 0.76MM)
9A	ECMU0040T	CLUTCH TO HUB SPACER (THIN – 0.015", 0.38MM)
10	ECMU0132	COOLANT FITTING
KIT	EKMU0005	COMLETE GEAR CFD UPGRADE KIT
KIT	EKMU0006	CFD RFRESH KITW/NUT, SPRING, AND FRICTIONS
11	ECMU0306	SLIP HUB V3 CFD (2) REQ'D
12	ECMU0249	FRICTION MATERIAL V3 CFDTHICK (2) REQ'D
13	ECMU0305	BUSHING V3 CFD 7mm
14	ECMU0301	GEAR V3 CFD
15	ECMU0308	BELLEVILLE SPRING V3 CFD
16	ECMU0307	NUT V3 CFD
17	HCCP0002	COTTER PIN 3/32 X 1 1/2"
	HKCP0001	10 PACK OF COTTER PINS
18	EAMU0001	KICKSTART GEAR & SHAFT
19	ECMU0116	SPRING, KICKSTART
20	ZCMUB014	O-RING KICK SHAFT (2 REQ'D)
21	HCWS1622	SHIM, KICK SHAFT
22	ECDC0036	SNAP RING, KICK SHAFT
23	ECMU0130	KICK LEVER
24	ECMU0250	WASHER - KICK LEVER MOUNTING
25	HCFH0625	6MM X 25 FLANGE HEAD BOLT
26	ECMU0115	CLUTCH COVER
27	ZCMU0030	CLUTCH COVER GASKET
28	ECMU0168	OIL FILL PLUG, ALUMINUM
29	ZCMUB014	O'RING, OIL FILL PLUG
30	HCBC0608	6MM X 55 SOCKET HEAD CAP SCREW (6 REQ'D)
31	ECMU0207	KICKSTART GEAR SMALL

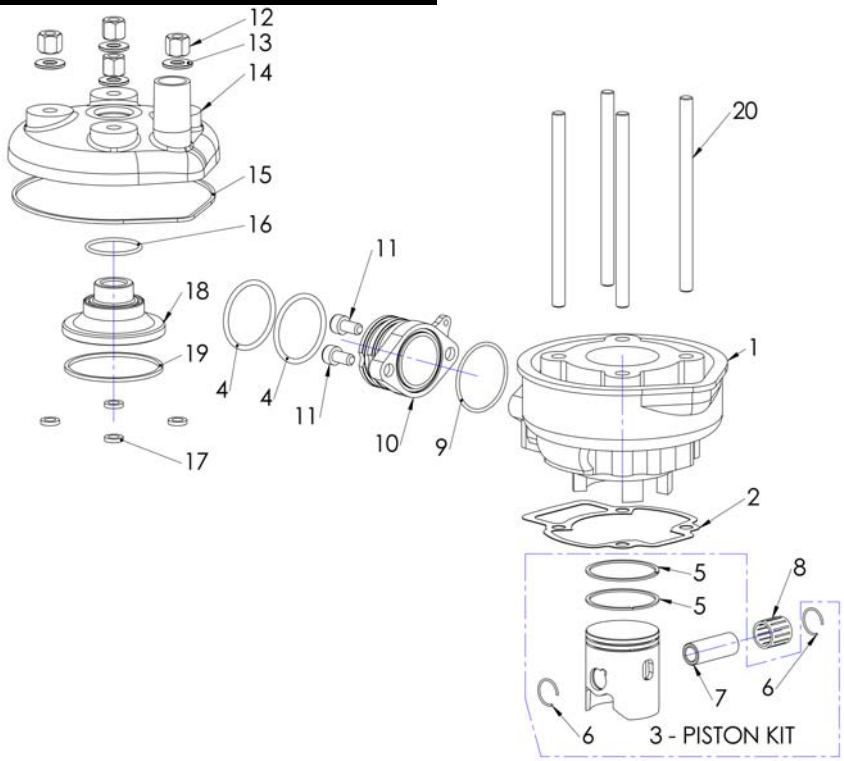
32	ECMUSP01	KICK START DOG SPRING (PAPER CLIP)

Parts – Engine – Water Pump



Engine – Ignition and Water Pump		
REF #	PART #	DESCRIPTION
1	EKMU0011	WATER PUMP KIT WITH IMPELLER
1	EKMU0021	WATER PUMP KIT WITHOUT IMPELLER
2	ECKG0142	SHAFT, WATER PUMP
3	ECKG0072	BEARING, WATER PUMP
4	ECKG0074	SEAL, WATER PUMP SHAFT
5	ECKG0073	IMPELLER, WATER PUMP (ALUMINUM)
6	ECKG0004	RETAINER, WATER PUMP ASSEMBLY (MAY NOT BE NEEDED)
7	HCBC1512	5X12MM SHCS STAINLESS
8	ECMU0167	BEARING –WATER PUMP BIG
9	ECKG0175	WATER PUMP PULLEY, FAN TYPE - DRIVEN
10	ECMU0180	BELT RETAINER
11	HCBS0003	SHOULDER BOLT 6MM
12	ECKG0170	WATER PUMP BELT
13	ECKG0042	WATER PUMP PULLEY, CRANK
14	HCNS1001	NUT 10MM
15	HCBC0408	M4mm x 8 SOCKET HEAD black oxide
16	HCWF0401	4MM WASHER

Parts – Engine – Top End



Engine – Top End		
REF #	PART #	DESCRIPTION
1	ECR50001	CYLINDER KIT (INCLUDES PISTON, RINGS, PIN & CLIPS)
2	ZCKG0501	BASE GASKET 0.015" (0.4mm thick) For other Base Gaskets refer to **Base Gasket Selection** section of this manual
3	ECMU0060x	PISTON KIT ("x" denotes size, AB, A, C, etc…..)
4	ZCMOTE11	O-RINGS – PIPE TO FLANGE (2 REQ'D)
5	ECMU0155	PISTON RINGS (2 PER SET)
6	ECMUSR00	SNAP RING FOR PISTON (2 REQ'D)
7	ECKG0012	WRIST PIN
8	ECMU0077	BEARING, WRIST PIN
9	ZCMUOR07	O-RING, EXHAUST FLANGE
10	ECMU0086	EXHAUST FLANGE
11	HCBC0612	M6X12, EXHAUST FLANGE SCREW (2 REQ'D)
12	HCNS0703	7mm Nut
13	HCWS1401	HARDENED WASHER (4 REQ'D)
14	ECMU0530	CYLINDER HEAD OUTER
15	ZCMUOR02	O-RING, CYLINDER HEAD LARGE
16	ZCMUV024	O-RING CYLINDER HEAD SMALL
17	ZCMUOR10	O-RING CYLINDER STUD (4 REQ'D)
18	ECR50004	CYLINDER HEAD, INSERT
19	ZCMUOR05	O-RING CYLINDER HEAD MEDIUM - YELLOW
20	ECMU0147	STUD, CYLINDER 7mm
NOT SHOWN	ZAKGTE05	TOP END GASKET / O-RING KIT

Parts – Exhaust System

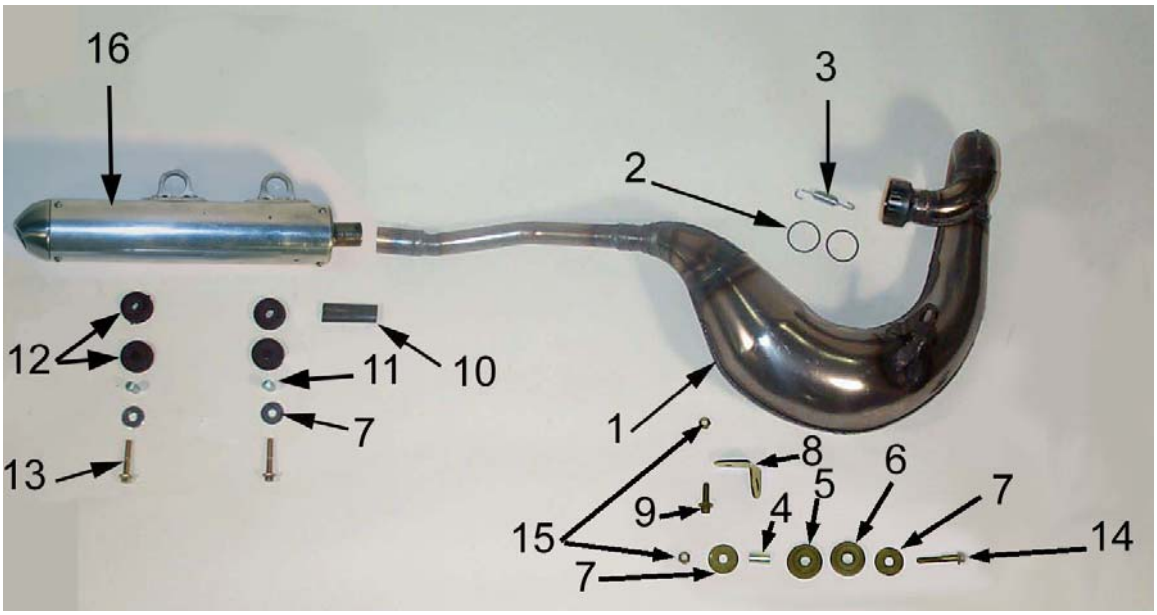


Figure 18

Exhaust System		
REF #	PART #	DESCRIPTION
1	XAE50001	2006 ECX50 EXHAUST PIPE (2 piece)
NOT SHOWN	ZCEX0001	O-RING BETWEEN PIPE SECTIONS
2	ZCMOTE11	HEADER PIPE O-RINGS (2 REQ'D)
3	XCMU0005	EXHAUST SPRING – SHORT (3 REQ'D)
4*	MCMUGR02	PIPE GROMMET SPACER (ONLY AVAILABLE IN MCMUGR02 GROMMET KIT)
5*	MCMUGR02	PIPE GROMMET MALE (ONLY AVAILABLE IN MCMUGR02 GROMMET KIT)
6*	MCMUGR10	PIPE GROMMET FEMALE
7*	HCWF1478	PIPE GROMMET WASHER (2 REQ'D)
NOT SHOWN	MCMUGR02	GROMMET KIT
8	FCEX5003	BRACKET – PIPE MOUNT
9	HCBF0620	M6 X 20 FLANGE HEAD BOLT
10	XCKG0009	PIPE / SILENCER SEAL
11	TCKG0001	SPACER
12	MCMUGR03	GROMMET
13	HCBF0630	M6 X 30 FLANGE HEAD BOLT
14*	HCBF0635	M6 X 35 FLANGE HEAD BOLT
15	HCNL0601	6MM LOCKNUT
16	XCMU0032	SILENCER
NOT SHOWN	XAEX0001	SILENCER – 'STAR' REINFORCED
NOT SHOWN	XCMU0026	KIT SILENCER REPACKING
NOT SHOWN	HCBB0408	M4 X 8 SILENCER SCREW

*Parts are included in MCMUGR02 grommet kit.

Service

Trained technicians with precision gauging and proper assembly fixtures carefully assemble all Cobra engines to specific tolerances. If you feel you have the skills, and the appropriate tools, to perform the following service tasks please follow the instructions closely. The part numbers are listed throughout to help you when ordering parts from your local Cobra dealer.

If you don't feel comfortable with the service work, log on to www.cobramotorcycle.com to find a Cobra dealer or Call 517 437 9100.

Engine Service

One method for determining whether the top end of your engine needs rebuilt is to perform a WOT (Wide Open Throttle) kicking compression test. Before performing the procedure please read the caution notes below.

CAUTION:

- There appears to be a wide range of variability in reading compression gauges across the country.

- The head volume of this Cobra Motorcycle is very small and so requires many kicks ~20 before you establish the most accurate reading possible.

- Because of the geometry of the spark plug used in this Cobra Motorcycle, the adapter used with your compression tester must have a similar volume protruding into the combustion chamber to establish an accurate value.

- Length of hose on the compression tester will affect the reading. The shorter the hose length the more accurate your reading will be.

Because of these difficulties in measuring an *absolute* compression value, a useful *relative* value can be achieved by testing your bike's compression with your own particular gauge after a new top end or when the bike is new so that you know what your particular gauge reads on a 'fresh' engine. When it has dropped to 90% of its original value the engine will be down on power and would benefit from a rebuild. When it's dropped to 80% it really needs rebuilt! Using the table below will help you determine monitor the condition of your top end.

	Engine is Fresh Measured Value	Engine Down on Power Measured Value * 0.9	Engine NEEDS Rebuilt Measured Value * 0.8
Example	110 psi	110 psi * 0.9 = 99 psi	110 psi * 0.8 = 88 psi
Your Values			

Procedure for Compression Testing

1. Shut off the fuel petcock.
2. Install the compression gauge into the spark plug hole.
3. Hold the throttle to wide open, and kick repeatedly (approximately 20 times) or until the gauge reading does not increase in value with each kick.

Base Gasket Selection

Tools required

- 17mm wrench
- 1mm flexible solder material
- measurement calipers

When rebuilding the 'top end' of your Cobra motorcycle, care must be taken to ensure the proper squish clearance. Squish clearance is defined as the minimum distance between cylinder head and piston at TDC, and there are negative effects of either having too much or too little clearance. Since parts like the crank, connecting rod, cylinder head, piston, and crankcases all have varying tolerances, Cobra offers several different base gasket thickness' to ensure that you can always set the squish clearance of your engine to factory specifications.

For base gasket replacement use the code (see figure 21 for location) along with the table on the following page reorder the correct thickness gasket.

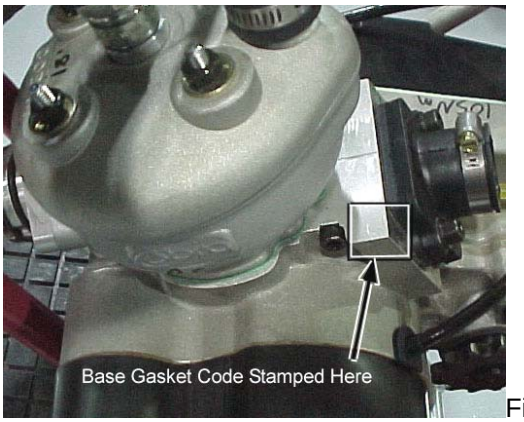


Figure 21

Code	Supplied Base Gasket Thickness		Cobra #
#	mm	inch	Part #
	0.25	0.010	ZCMU0011
3	0.3	0.012	ZCMU0703
4	0.4	0.015	ZCKG0501
5	0.5	0.020	ZCMU0705
6	0.6	0.024	ZCMU0706
7	0.7	0.028	ZCMU0707
8	0.8	0.031	ZCMU0708
1	1.0	0.039	ZCMU0016

NOTE
Tolerances will affect the actual gasket thicknesses.

If during the course of the maintenance more parts than the base gasket are changed, the squish clearance should be measured, and possibly a different base gasket will be required.

The easiest way to measure squish clearance is with 1mm to 1.5mm thick flexible solder wire (available through most popular electronic stores). The process is as follows:

- Assemble the top end of the engine with either; 1) the crankcase stamp recommended base gasket or, 2) if assembling with a new set of cases assemble with a 0.4mm (0.015”) base gasket, and torque the head nuts to the proper torque specifications leaving off the spark plug and ignition cover (piston rings can be left off to ease assembly).
- Carefully insert the solder wire though the spark plug hole, into the cylinder far enough such that the tip of the wire touches the left or right side cylinder wall (not the front or back as the piston will rock more and give incorrect measurement).
- Hold the wire at this position and rotate the crankshaft, by the flywheel nut (or kick lever) three revolutions to ‘smush’ the solder wire.

CAUTION:
If you rotate the flywheel nut in a counterclockwise direction there is a risk of loosening the nut.

- Pull out the wire and measure the solder thickness at the thinnest location near its tip accurately with the thin tips of calipers.
- Adjust base gasket thickness as necessary to get the desired value.

Upon completion, your final assembly squish clearance should agree with the chart below

NOTE:
If you are merely performing a top end service skip ahead to *Top End Disassembly Procedure*.

Complete Engine Disassembly Procedure

1. Remove the magneto cover (4mm hex key)
2. Remove the bolt from the water pump shaft (4mm) and slide off the belt cover and the water pump belt
3. Using a flywheel holding tool and 14 mm socket remove the nut that secures the flywheel.
4. Using the Cobra flywheel / clutch puller (#MCMUTL68), remove the flywheel from the crankshaft.
5. Remove the stator (5mm hex key).
6. Remove the nut holding the large gear to the transmission input shaft (19 mm socket).
7. Remove the special nut / starter gear that holds on the clutch (special tool available, contact your local dealer).
8. With the Cobra flywheel / clutch puller (#MCMUTL68), remove the clutch from the crankshaft (details in Clutch Service portion of this manual).

Top End Disassembly Procedure

1. Remove the cylinder head nuts (11mm).

INSPECTION NOTE:
Inspect the cylinder head for deposits and abrasions.

1. If there are deposits they should be removed
    a. Black oily deposits (indicating a rich mixture or improper oil type/quantity) can be removed with solvent
    b. Crusty deposits (indicating dirt ingestion) can be removed with solvent and may require some scraping.
2. Abrasions
    a. Pitting or erosion indicates detonation and may require cylinder head replacement, also
        i. Retard the ignition timing
        ii. Use a higher octane fuel
    b. Missing chunks or indentations indicate broken hardware or ingested items - replace the cylinder head.

2. Remove the cylinder head outer.
3. Remove the cylinder head insert.
4. Remove the cylinder.

INSPECTION NOTE:
Inspect the cylinder bore for abrasions, deposits, and missing coating.

1. If abrasions: scrapes, scratches, pitting, etc… are found, replace the cylinder.
2. If deposits are all are found
    a. Clean with muratic acid.
    b. Once the deposits are removed, inspect for abrasions and missing surface coating.
        i. If there are abrasions or missing coating, replace.
        ii. If all looks well, the cylinder may be saved.

⚠ WARNING
Muratic acid can be dangerous. Follow the manufacturers instructions closely.

5. Remove the piston clip with a scribe.
6. Remove the piston pin with a piston pin remover.

INSPECTION NOTE:
Inspect the piston for abrasions and deposits on the top and sides and clean or replace as necessary.

INSPECTION NOTE:
Piston ring end gap should be between 0.008” (0.2 mm) and 0.020” (0.5 mm)

Splitting the Cases

1. Remove the fasteners holding the two halves of the crankcase together.
2. Separate the cases with a proper case splitting tool.

CAUTION:
Take caution when handling the crankshaft. It is the main power transfer to the rest of the engine. If it is out of alignment, it will cause premature failure of your bearings which can lead to serious damage to the cylinder as well as the rest of the engine. Do not try to true the crank yourself. Truing the crank should be done professionally.

CAUTION:
- If you split the cases, check the gear tooth faces for chipping & signs of fatigue.
- Check the small needle bearings for fatigue. If the bearings are damaged, the engine cases should be checked to make sure the needle-bearing casing didn't oblong the bearing hole in the case.
- Needle bearings should be replaced every couple months of hard racing.

Engine assembly

CAUTION:
For any seals that are to be installed, apply a light amount of grease to the seals' ID, assembly lube on all bearings and a small amount of Loctite to the OD.

1. Press the three bearings into the respective holes in each case half.
2. Press in the crank seals such that the concave side faces the crank weights.
3. Press in the counter shaft seal (concave side faces inside of transmission)
4. Install the water pump assembly wire ring retainer
5. Press in the water pump assembly
6. Tap both ways axially then verify easy rotation.
7. Inspect the crankshaft for proper true geometry (no more than 0.002 ", 0.05mm, measured at bearing journal area while supported from the ends).

CAUTION:
Insert a 7.05mm (0.278") shim between the crank throws before pressing on the crank.

8. Insert the screws with the proper lengths at locations shown.

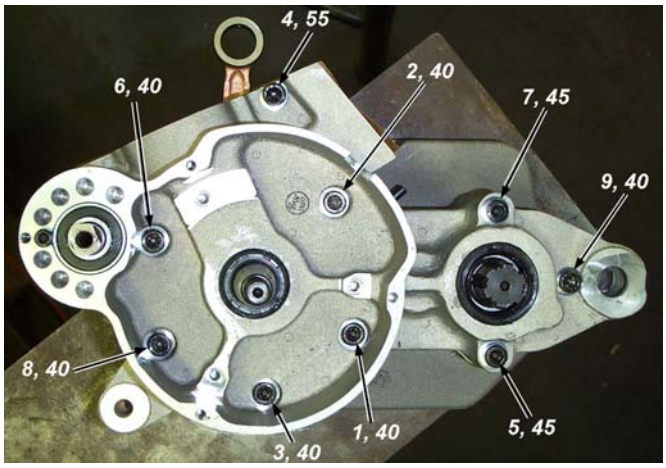


Figure 28

9. Torque to 12 Nm (105 in-lb) in the pattern shown in figure 28.
10. Trim away any excess gasket material if necessary.

NOTE: Check engine mount holes for excess material that may cause problems in engine installation.

11. Install the piston with new wrist pin bearing and, pin and clips.

CAUTION:
Be sure to align the piston such that the arrow on the top piston surface points to the exhaust (front of bike/engine) and put assembly lube on the connecting rod bearing.

12. Install the piston rings.

CAUTION:
Ring end gap should be no less than 0.25 mm (0.010") and no more than 0.64mm (0.025")

13. Install the base gasket.
14. Install the cylinder being sure that the piston rings are properly aligned with the indexing pins.

CAUTION:
Never force the cylinder. If resistance is felt, determine the problem and solve it. Once installed slightly rotate the cylinder back and forth insuring that the rings are properly seated.

15. Install cylinder head insert.

NOTE: A light application of silicone grease can help hold the O-RINGs into position during assembly.

16. Install O-RINGs as shown in figure 29.

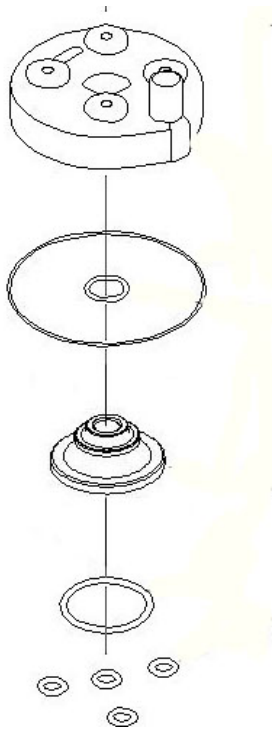


Figure 29

17. Install the cylinder head.
18. Install the washers (with flat side down) and nuts. Torque to 105 in-lb (12 Nm)
19. Install reed and inlet manifold with new gaskets (105 in-lb, 12 Nm
20. Leak check the engine to 20 psi to ensure proper seal.
21. Install stator reinstalling the grommet and wires (snug the bolts).
22. Install the rotor per *Rotor Installation* section, under the *S3: Ignition* portion of this manual.

23. Install the water pump outlet pipe (apply Ultra black Hi-Temp RTV silicon gasket maker to the threads before assembly) before installing the clutch and rotate to a vertical position with the engine resting on a bench
24. Install the CFD.
25. Install the clutch per *Clutch Installation* section in this manual.
26. Install the coolant drain plug with copper washer (11 ft-lb, 15 Nm).
27. Make sure that the exhaust spacer is on the cylinder (53 in-lb, 6 Nm).
28. Install the spark plug with a fresh gasket (to apply the proper torque to the spark plug when inserting, one must first screw the spark plug in until the metal gasket ring causes resistance and then turn another 1/8 to ¼ turn).

Clutch

New in 2011, Cobra improved the clutch washer design. The new washer stacks have taller springs but are overall shorter and have a single thin shim.

These new washer stacks are being double sorted at the factory. They are first sorted by measured height. Secondly, each stack with bolt is sorted by measured engagement force.

Because of this, we have been able to widen the range of stack heights that provide an acceptable clutch 'hit'. The stacks in each stack of three will measure within 0.05mm (0.002").

There are many variables in an automatic centrifugal clutch. These variables are set to world class standards from the factory but will change over time as the components wear, relax, and just plain get used.

Please see the Tuning Clutch portion of this manual for more helpful info.

There are performance characteristics to observe and things to measure.

1) Performance characteristics to observe
    a)Clutch coming in too late
        i) Engine rev's to a high RPM before moving the motorcycle
        ii) Clutch never fully engages on a reasonable straight stretch
        iii) Basket turns blue in short amount of time
    b) Clutch coming in too early
        i) Motorcycle moves too soon when accelerating off idle
        ii) Motorcycle moves but not with much power
        iii) Clutch fully engages before the 'power band' kicks in

2) Things to measure that can have an effect
    a) Spring washer configuration
    b) Spring stack without flat washer
    c) Thickness of flat washer
    d) Individual spring washer thickness
    e) Individual spring washer height

f) Effective bolt shoulder length
g) Shoe thickness (difficult to measure accurately - can only be approximated by the size of the step where it sticks out of the basket)

There is a relationship between observed characteristics with things to measure

If a clutch comes in **too early**, it means that clutch spring stack is **not providing enough force** to keep the shoes from being thrown out to the clutch basket at the proper time with the given shoes, basket, arbor, and bolt. This can be due to:

i) Clutch spring stack is to short
    (1) Wrong configuration
    (2) Sacked out (over stressed) washers
    (3) Too thin a flat shim in the stack
ii) Spring rate too low (wrong configuration with proper stack height)
iii) Clutch arbor shoulder bolt is too long
iv) Clutch shoe radius is to large

If a clutch comes in **too late**, it means that clutch spring stack is **providing too much force** to keep the shoes from being thrown out to the clutch basket at the proper time with the given shoes, basket, arbor, and bolt. This can be due to:

v) Clutch spring stack to tall
    (1) Wrong configuration
    (2) Too thick a flat shim in the stack
vi) Spring rate too high (wrong configuration with proper stack height)
vii) Clutch arbor shoulder bolt is too short
viii) Clutch shoe to small of radius

With the exceptions of component failures, generally two things will occur:

1) The clutch shoes will wear causing the clutch to engage later, and
2) The springs will sack causing the clutch to engage earlier.

Typically the springs will sack at a quicker rate than the shoes will wear, meaning that an un-tampered clutch that worked fine will ultimately hit too early at some time. When this occurs it is easily remedied with a new spring stack **or** a thicker flat shim. Because the shoes have worn, a thinner flat washer may be needed with the fresh new springs to allow proper clutch engagement.

One thing to remember:

If your clutch is hitting fine, don't mess with it!

Factors that affect what the clutch spring stack should be include

1) Amount of wear on shoes (this is difficult to measure and can only be approximated by the step in the shoe where it rides outside the basket - new shoes will not have one, old shoes will have a large one).

2) Effective length of the shoulder on the clutch arbor bolt (see Figure C1). Nominal is 16.00mm (0.630"). As this decreases, the spring stack needs to decrease equally. This can change due to the shoulder bolt 'setting' into the arbor (see C2)

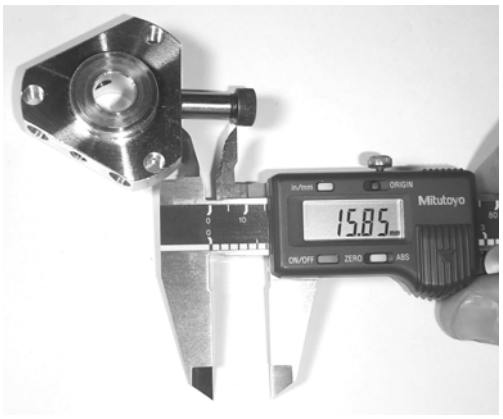


Figure C1

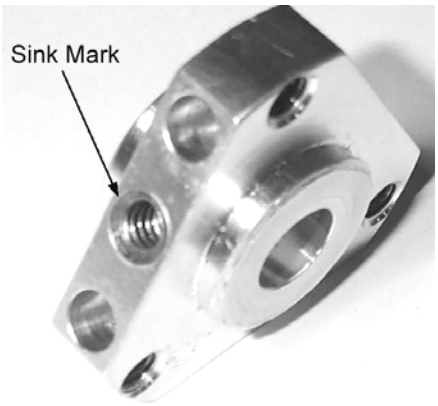


Figure C2

If your effective shoulder length is off, or your shoes are worn, adjust the height of your overall combined spring stack accordingly (i.e. if your effective shoulder length is 0.5mm short of the 16.00 measurement, decrease the overall combined spring stack height by 0.5mm, or if your shoes are worn by 0.5 mm, increase the overall combined spring stack height by 0.5mm).

Frequently asked questions

Q: When should the springs be replaced?
A: When the clutch 'hit' occurs too early or too late.

Q: Should the clutch springs be replaced if the shoes wiggle on the arbor?
A: Not if the clutch is 'hitting' correctly. Don't mess with it

Q: What is the acceptable tolerance on any of the measurements?
A: For the most part that does not matter. Suffice it to say that any efforts to make the three shoes behave identically will make the best performing clutch. Taking extra time to balance the three stacks (shims, springs, bolts, etc…) to as

close to the same length as you are willing to put effort into will result in a better performing motorcycle.

Q: One of my two riders weighs 85 pounds and the other weighs 45 pounds. Should I have their clutches adjusted differently because of their weight?
A: No, there is one best setting and it works for light or heavy riders.

Q: If my clutch basket changes color, should I replace it?
A: If it is blue or purple, replace it. If it is silver or brown, you are fine.

Cobra is now going to greater lengths to ensure that the clutch on your motorcycle is performing the best possible from the shop and so it may have a different clutch stack or shim washer from what you are used to. Please take measurements for knowledge sake but don't blindly restack washers to different heights without first consulting the factory.

Cobra clutch puller assembly:

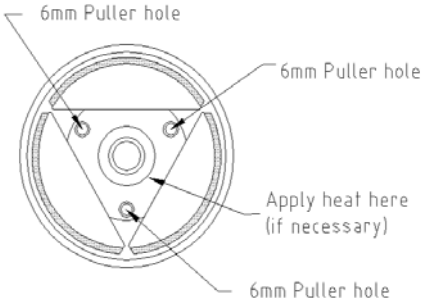


Figure 30

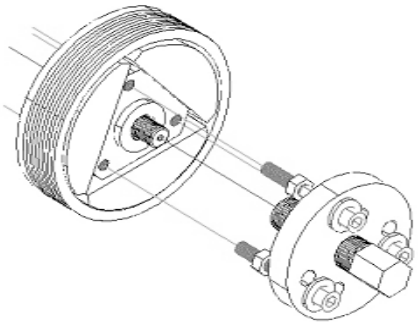


Figure 31 Clutch puller installation

Tools recommended for clutch service:

- Universal clutch puller- a universal puller that pulls the clutch, main drive gear and rotor. (Part # MCMUTL70).
- 5mm T-handle
- Clutch nut removal tool (ECMU0078) & spanner wrench (ECMU0082).
- *Cobra 3 Shoe Clutch Milk* (Part # MCMUGF01).

CLUTCH REMOVAL:

1. Drain the engine transmission oil and remove the clutch cover.
2. Remove the clutch nut (not left hand thread) on the end of the crankshaft with the clutch nut removal tool.
3. Attach the Universal Puller. There are three 6mm clutch puller holes located on the ends of the center hub. (figures 30 & 31) You must use a *draw type puller* to remove the clutch.

CAUTION:

Do not use a jaw type puller or use the 6mm tapped holes as jackscrews or you are likely damage the clutch or drum.

4. If necessary apply heat to the center clutch hub.

CAUTION:
Do not heat the crankshaft threads or the aluminum shoes.

5. Keep tension on the puller as you are heating it.

⚠ WARNING
The clutch will often pop off under tension from the puller and it will be very hot.

CLUTCH WASHER STACKUPS:
Once the clutch is removed, and cool to touch, carefully put it into a vice and remove the center shoulder bolt out of each clutch shoe. You will probably have to heat the center hub again to remove the bolts. Once you get a bolt loosened, carefully remove it with the shoe and observe the way the spring washers are stacked. Clean the washers and bolt if you intend to reuse.

The spring stacks in your 2006 Cobra clutch will contain 11 individual springs and a flat washer configured as a 5 ½ stack. See figure 32. This clutch is designed such that it reconfigured by the customer to achieve different clutch engagements 'hits' by changing washer counts and configurations.

CAUTION:
Generally reassemble the springs as you removed them from the engine or as you received them from Cobra. This will be either a 3, 4 ½ or, 5 stack. If you are unsure call the Cobra Technical Support Group 517-437-9100, and consult the experts.

CLUTCH ASSEMBLY REFERENCE DRAWING		
REF #	**PART #**	**DESCRIPTION**
1	CAMU0013	Set of three shoes, springs, bolts, flat washers & nuts
2	CAMU0010	Set Of three springs, washers, bolts & nuts

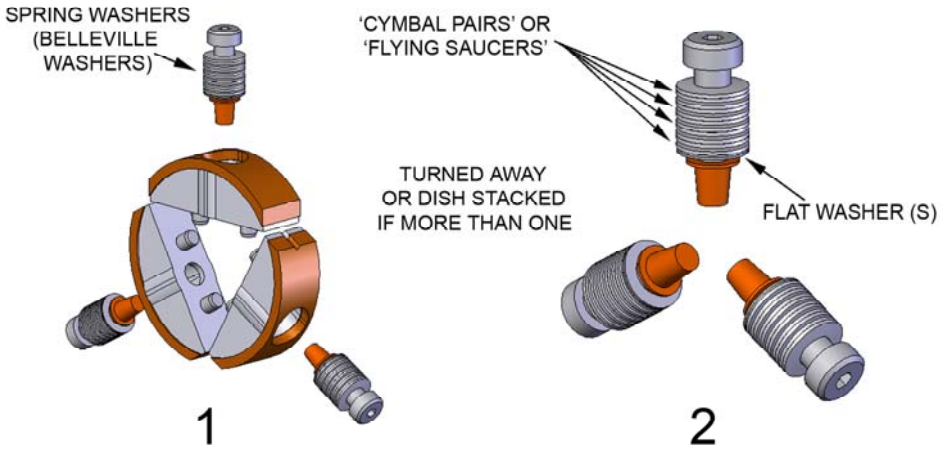


Figure 32 Some configuration of clutch spring stack. Each 'spring' stack contains multiple springs (Belleville washers) - arranged into three, four, or five 'flying saucers', or turned away against the flat washer(s). Shown is the 4 ½ stack.

Stack	Total Springs	Flying Saucers or Cymbal Pairs	Turned Away or Dish Stacked	Std. Flat Washer
5 ½	11	5	1	VARIED

Clutch adjustment washers

Your Cobra comes stock with a single flat washer at the bottom of the spring washer stack. The thickness of that flat washer is 0.031" (0.79mm). Cobra offers several thicknesses of thin adjustment washers that allow clutch engagement tuning. Increasing the flat washer(s) thickness increases the engine speed for clutch engagement thus increasing the abruptness of clutch engagement (harder hit). Conversely, decreasing the flat washer(s) thickness decreases the engine speed for clutch engagement thus decreasing the abruptness of clutch engagement (softer hit).

Part #	Thickness mm (inch)
HKCSM015	1.5 (0.060)
HKCSM012	1.2 (0.047)
HKCSM008	0.8 (0.031)
HKCSM006	0.6 (0.025)
HKCSM005	0.5 (0.020)
HKCSM004	0.4 (0.015)
HKCSM003	0.25(0.010)
HKCSM001	0.12(0.005)

HKAM0022	CLUTCH SHIM KIT

Use the table above to order adjustment washers. Replace the stock washer with the proper combination of adjustment washers that delivers the desired clutch hit.

CAUTION:
It is easy to prematurely damage the clutch and other engine components with improper clutch adjustment. If you are unsure of how to adjust the clutch, by even the slightest, contact the Cobra Technical Support Group before making adjustments.

Clutch shoe wear:

- If the clutch has been slipping and shows signs of glazing, it is best to replace the shoes. We have found that once the shoes are glazed, even if deglazed with emery paper or a file, the performance is reduced.
- The best way to prevent glazing is by not gearing too high, changing the oil as specified and by not blipping the throttle. Every time you blip the throttle, you are working your clutch springs.

CAUTION:
The clutch produces a tremendous amount of heat and when a rider is blipping the throttle. This makes the clutch and clutch springs wear out quicker. This also makes your engine tend to run hotter which decreases engine power and degrades ignition stator efficiency. It is important to train your rider ***NOT*** to be a **throttle 'blipper'**.

CAUTION:
Sludge build-up between the spring washers also keeps the clutch shoe from engaging fully and this will cause the clutch to start to slip. So you will need to clean the sludge out or just replace the spring washers and bolts with new ones. How quickly this sludge builds up depends on how often you **change your oil** and whether your rider is a throttle ‘blipper’.

CLUTCH ASSEMBLY:

1. After cleaning or replacing the spring washers, reassemble the stack up of washers.

CAUTION:
It is also important that all three shoes are stacked the same. (See figure 32)

2. Clean the threads of the stack bolt and the clutch with brake cleaner removing all old thread locking material.
3. Apply high strength thread lock material to the stack bolt and tighten to 12 ft-lb (16 N-m).

CAUTION:
Avoid allowing excess thread lock material to contact the spring washers and the clutch or the clutch is likely to malfunction.

4. Clean the center hole of the clutch and on the tapered section of the crankshaft.

5. Apply a small amount of wicking / bearing retainer (green) thread lock agent to the center tapered section of the crankshaft and taper of clutch arbor.

CAUTION:
Lean the bike / engine such that any excess thread lock agent goes away from the bushing in the clutch drum.

6.Put the clutch back in.
7.Apply high strength thread locking agent to the threads and install the nut and torque to 40 ft-lb (54Nm) with the special socket (see figure 33).

CAUTION:
Use high strength (red) thread locker on the threads of the clutch nut. If you are using an impact socket, just zap it lightly with an air wrench to tighten it because there are only about 4 threads inside the nut and they can be easily stripped. If you are tightening it by hand, you can hold the crank from turning with the clutch removal spanner ECMU0082.

Install the clutch cover tightening the bolts from inside out. (8 or 10 mm socket, 5.8 ft-lb, 7.8 Nm).

INSPECTION NOTE:

a. There must be in / out play in installed clutch, 0.4mm to 1.0 mm (0.015" to 0.040").
b. Excess in/out will cause early crank seal failure.
c. A blue clutch drum is worn out from excessive slippage or improper lubrication.

NOTE:
To ensure proper engagement of the kick gear with the starter nut, tighten the six screws only to the point of being not extremely loose. Using one hand rotate the kick lever to ½ stroke and hold while tightening the six screws completely with the other hand.

8. Fill with oil (235 ml (8.0 oz) Cobra 3 Shoe Clutch Milk (Part # MCMUGF32).

Ignition

Stator care

Stator failure will result from running the bike hot. Following is a list of things that will make your engine run hot.

1. The timing should not exceed the maximum specifications listed.
2. Improper carburetor jetting.
3. Improper spark plug heat range. Never run a hotter plug than the specified spark plug.
4. Clutch slippage. See “CLUTCH” section for causes of slippage.

CAUTION:

- Because of the amount of heat generated by the clutch and engine during extended periods of riding, it is advisable to remove the ignition cover afterward to allow the ignition to cool off. The heat transfers through the cases and can damage the stator as it cools off because of lack of airflow around the stator.

- Ignition will overheat if the gap between the rotor and stator is not large enough. There should be even clearance as the rotor rotates relative to the stator.

- Ignition timing is not adjustable. Changing the ignition timing can degrade performance.

- Make sure connections are free of dirt.

CAUTION:

Advancing the ignition timing will cause the engine to run hotter, in-turn causing power loss, shortened clutch life, and possibly lead to premature stator failure, and can also cause detonation which can lead to premature piston and ring failure.

Tools recommended for timing service:

- Compact motorcycle dial indicator
- Universal clutch puller- a universal puller that pulls the clutch, main drive gear and rotor. (Part # MCMUTL70).

TIMING YOUR IGNITION:

1. Remove the spark plug cap, and sparkplug.
2. Insert the dial indicator into the spark plug hole.
3. Remove the four bolts from the ignition cover.
4. Remove the water pump belt from the rotor and water pump shaft.

5. Turn the crankshaft counterclockwise until it reaches top dead center.
6. Set the dial indicator to zero
7. Turn the crankshaft clockwise until the dial indicator reaches 0.040” (1.02mm) from top dead center.
8. At this position the line on the rotator should align with the center of the stator coil at 5 o'clock position on stator frame. If not loosen the three 5mm bolts to adjust the stator.

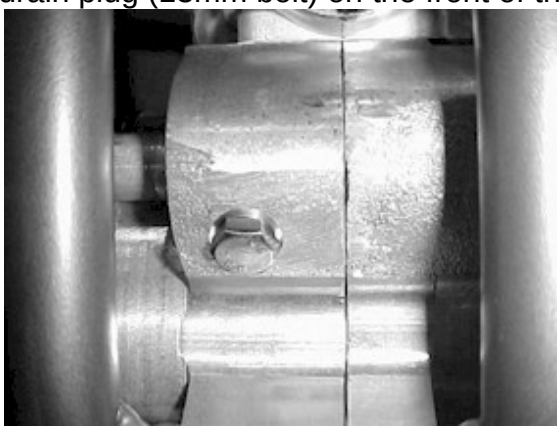
ROTOR INSTALLATION:

1. Torque the nut on the rotor to 30 ft-lb (45 Nm) with high strength (red) thread locking agent.
2. Recheck the timing following the procedure of timing your ignition.
3. Install the water pump belt back on.
4. Bolt the ignition cover back on.
5. Put the spark plug back in, and firmly stick the spark plug cap onto the spark plug..

Cooling System

Radiator fluid removal:

Remove the coolant drain plug (13mm bolt) on the front of the engine cases.



NOTE: Inspect the old coolant for evidence of oil, combustion byproducts (black ‘oil slick’ stuff) or other things that may indicate a problem.

Tools recommended for impeller service:

- Flat head screwdriver
- 13mm- hex wrench
- 3mm hex key
- 4mm hex key
- 5mm hex key
- 8mm hex key
- Water Pump Installation tool
  MCMUTL09, 2009 King
  MCMUTL08, 2009 JR & all older models

- Slide hammer with
    - fitting to thread into threads on end of shaft (M5x1.0)
    - single and double hook ends for removing plastic impeller
- Dead blow hammer

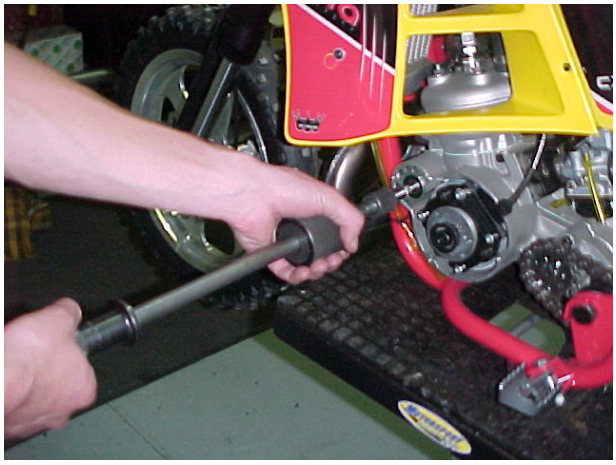
COBRA IMPELLER SERVICE INSTRUCTIONS

1. Remove radiator cap and drain engine coolant as described above.

NOTE:

If the impeller is damaged or broken completely back flush the coolant system to ensure no solid pieces are in the system.

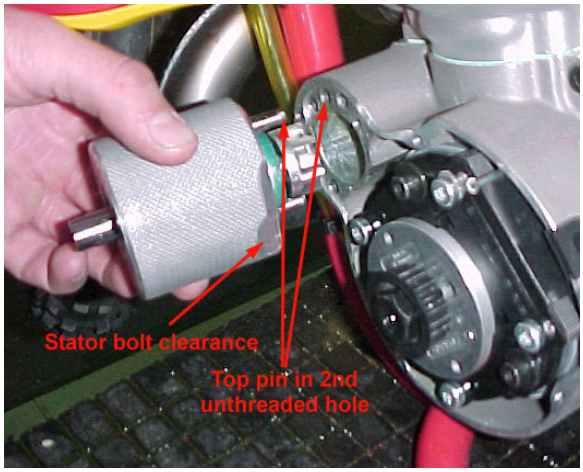
2. Remove ignition cover using a 4mm hex key (four places)
3. Stick a 3mm hex key in the water pump shaft cross hole, and remove belt retainer screw using a 4mm hex key. (Figure 41 - item 1)
4. Remove belt retainer, water pump belt and water pump fan pulley.
5. Remove bearing retainer screw using a 3mm hex key.
6. Thread a slide hammer onto the end of the water pump shaft and remove the assembly.



NOTE:

It is quite common for the older plastic impellers to fall off the end of the shaft during this step of the process if that is the case, then follow the steps at the end of this section to remove the seal and impeller.

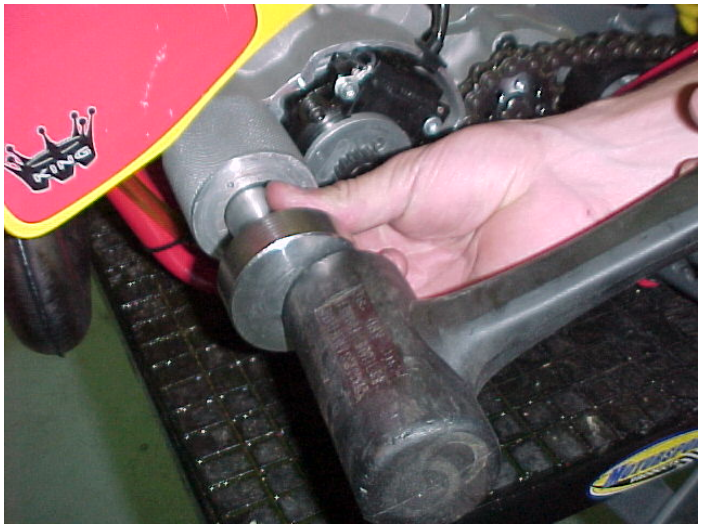
7. Clean any debris or particles from the bore and use some light emery cloth to remove any scratches in the surface that the removal process may have created.
8. Lubricate the bore with grease.
9. Prepare for assembly by installing the water pump assembly into the assembly tool and align the tool with engine case making sure alignment pin is in proper hole.



CAUTION:

Damage may occur if one attempts to install the water pump and the device is not orientated correctly. If the tool does not sit flat against the cases, the orientation of the tool to the engine is not correct. Make sure that the top alignment pin is in the 2nd unthreaded hole, the bottom alignment pin is also in the 2nd unthreaded hole, and that the relief for the stator bolt head is oriented toward the stator.

10. Hold the installation tool firmly against the engine case and tap on the end of the water pump shaft with a dead blow hammer until the insertion punch is needed



11. Continue driving the assembly with the punch until the head is flush.

NOTE:

The insertion punch is 0.010” (0.25mm) longer than the housing so as to seat the water pump assembly just in from the case surface.

12. The assembly is installed properly when the retaining screw can be tightened and it does not cause a bind on the spinning shaft (use medium strength thread lock on the retainer screw).

NOTE:
It may be necessary to tap the water pump shaft in (hammer) and out (with slide hammer) to insure proper free operation of the shaft.

13. Reinstall the pulley, belt and fan cover using a 3mm hex key to stop the rotation of the water pump assembly while tightening with medium strength thread lock to 10 ft-lb (14Nm).
14. Reinstall the cover

NOTE:
Refill the coolant system with 50/50 antifreeze-coolant / distilled water.

CAUTION:
Do not mix Propylene Glycol based coolant / antifreeze solutions with Ethylene Glycol based coolant / antifreeze solutions.

Fuel & Air System

Carburetor:

Tools recommended for carburetor service:

- Small flat head screwdriver
- WD-40
- 8mm socket

Your Cobra is equipped with an adjustable carburetor. Some fine-tuning may be needed according to weather condition and altitude. Proper jetting is ***very*** important for engine performance and engine life. Serious damage to the engine can occur if not properly adjusted.

IDLE ADJUSTMENT:
On the left side of the carburetor, there are two adjustment screws. The larger screw with the knurled head is the idle adjustment screw. To raise the idle, turn the screw in clockwise (in 1/4 turn increments) and rev the engine after each adjustment. To lower the idle, turn the screw counter-clockwise.

TOP END JETTING:
Indications that the engine is running too rich (too much fuel for the air) are:

- Engine not revving out or blubbering at high RPMs.
- Engine will not 'clean out'
- Wet or black spark plug

NOTE: Before changing jetting be sure that the air filter is properly cleaned and has the usual amount of air filter oil. An overly dirty air filter can cause the engine to run rich.

If the engine is running rich on the top end it should be leaned out. Leaning it out can be done by:
1. Changing the main jet to a smaller number.

2. Raising the needle clip (this lowers the jet needle) one notch at a time on the slide.

Indications that the engine is running too lean are:
- Engine cutting out on top end.
- Engine overheating and ultimately seizure.
- White spark plug

CAUTION:
It is much safer to operate the engine slightly rich as opposed to slightly lean. This is because an overly rich engine will just run poorly while an overly lean engine will seize, potentially causing an expensive top end rebuild and a DNF.

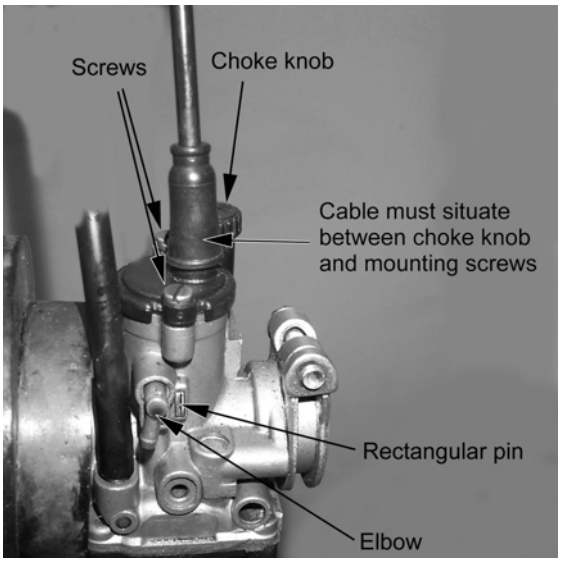
To richen the carburetor:
1. Change the main jet one number at a time (larger).
2. Lower the needle clip (raising the jet needle) one notch at a time until the engine starts to blubber on the top end, then move the clip back up one notch or until you get the blubber out.

FUEL MIXTURE SCREW
The smaller brass screw that is towards the front of the engine is a fuel mixture screw. This screw will also richen and lean your engine more on the bottom and mid-range. In warmer conditions, turn the screw in. In colder conditions, turn the screw out. Be sure to keep the carburetor very clean and make sure you don't have water or dirt in the carburetor bowl. Use automotive carburetor cleaner or WD-40 to clean the carburetor inside and out.

Cleaning the carburetor:

⚠ WARNING
Clean the carburetor in a well-ventilated area, and take care that there is no spark or flame anywhere near the working area; this includes any appliance with a pilot light. Because of the danger of highly flammable liquids, do not use gasoline or low flash-point solvent to clean the carburetor.

1. Make sure the fuel is shut off.
2. Remove the carburetor.
3. Drain the fuel from the carburetor.
4. Disassemble the carburetor.
5. Immerse all the metal parts in a carburetor cleaning solution.
6. After the parts are cleaned, dry them with compressed air.
7. Blow out the fuel passages with compressed air.



8. Assemble the carburetor
9. Install the carburetor onto the motorcycle.

CAUTION:

1. The motorcycle will only operate properly if the carburetor top is installed properly with the mounting screws, cable and choke knob oriented as shown in figure 43.

Reeds:

- The reeds must lay flat on the reed cage.
- If the reed tips aren't lying flat, replace them immediately.
- The reeds must have a tight seal on the reed cage.
- If the reed is damaged in any way, replace it. This means cracks, chips, and ruptures. Anything abnormal, replace the reeds.

Take the reed cage out and hold it up to the light and look in through the cage. If you see light, it is not necessarily a bad thing, but the pedals may need to be replaced. (See figure 44) Bikes have been known to run real well with light visible past the reed tips as long as the jetting proper for the conditions. (See figure 44)

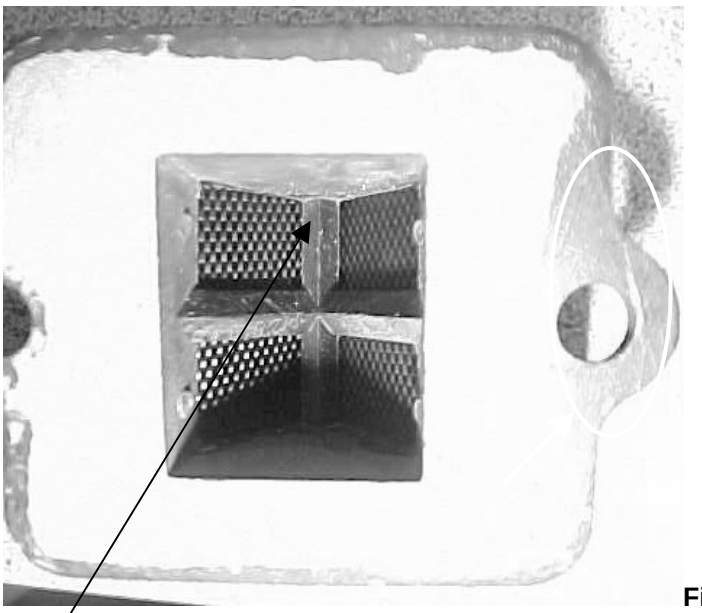


Figure 44

The presence of light may indicate that the reeds should be replaced, or turned over.

Exhaust

The pipe is a crucial element to a motorcycle. Any kinks, dents, or damage done to the pipe will result in a major performance loss.

NOTE:

Be sure to take the pipe off, and any carbon that may be built up. Carbon build up is created from exhaust. Exhaust has oils in it, and the oils cling to the walls of the inside of the pipe. Over a long period of time, the diameter of the pipe will decrease, due to carbon build up. So it is essential to clear the residue.

CAUTION:

It is important to repack the silencer. Signs of your silencer needing to be repacked are:

- The bike is louder than normal.
- A loss of power.

Tuning

Gearing

For a bike with a centrifugal clutch, it's better to be geared too low than too high.

What happens with improper gearing?

- Poor performance
- Not enough top end speed
- No snap
- Over heat clutch
- Premature failure of engine seals, bearings, & electronics
- High clutch wear

Condition	Gear Taller	Gear Lower
Mud		↓↓
Sand		↓
Hills		↓
Hard Pack	↑	
Throttle Blipper (novice)		↓*

*It may be helpful to set up the clutch to hit early for smooth power delivery

Front Sprocket			Rear Sprocket	Gear Ratio
		15	33	2.20
		15	34	2.27
		15	35	2.33
	14		33	2.36
		15	36	2.40
	14		34	2.43
		15	37	2.47
	14		35	2.50
		15	38	2.53
13			33	2.54
	14		36	2.57
		15	39	2.60
13			34	2.62
	14		37	2.64
		15	40	2.67
13			35	2.69
	14	stock	38	2.71
		15	41	2.73
13			36	2.77
	14		39	2.79
		15	42	2.80
13			37	2.85
	14		40	2.86
13			38	2.92
	14		41	2.93
13			39	3.00
	14		42	3.00
13			40	3.08
13			41	3.15
13			42	3.23

Ratio Write © Cobra R&D 2004

Carburetion

Although your Cobra is sent from the factory with the carburetor jetted for optimal performance, you may find it necessary to adjustment your particular jetting due to current weather conditions, altitude, fuel variations, and/or engine modifications.

CAUTION:
Proper jetting is very important for engine performance and engine life.

Symptoms of improper jetting are listed below.

- Symptoms of incorrect oil or oil / fuel ratio
    - Poor acceleration
    - Misfire at low engine speeds
    - Excessive smoke
    - Spark plug fouling
    - Excessive black oil dripping from exhaust system
- Symptoms of too rich a fuel mixture
    - Poor acceleration
    - Engine will not 'rev' out, blubbers on top
    - Misfire at low engine speeds
    - Excessive smoke
    - Spark plug fouling
    - Wet, black, or overly dark spark plug (when removed for inspection)
- Symptoms of too lean a fuel mixture
    - Pinging or rattling
    - Erratic acceleration
    - Same actions as running out of fuel
    - High engine temperature
    - White spark plug (when removed for inspection)

NOTE:
When inspecting the spark plug to evaluate jetting, a properly jetted machine will produce a spark plug that is dry and light tan in color.

Environmental and altitude related mixture adjustments		
Condition	**Mixture will be**	**Required adjustment**
Cold air	Leaner	Richer
Warm air	Richer	Leaner
Dry air	Leaner	Richer
Very humid air	Richer	Leaner
Low altitude	Standard	None
High altitude	Richer	Leaner
Low barometric pressure	Richer	Leaner
High barometric pressure	Leaner	Richer

NOTE:
- Before making any carburetor jetting changes verify that:
    - You are using the proper fuel and oil
    - The fuel is fresh and uncontaminated
    - The oil and fuel have been mixed in the proper ratio
    - The carburetor is clean (no plugged jets)
    - The air filter is properly clean and oiled
    - The float height is within proper specification (proper measuring technique is described later in this section)

NOTE:
Perform all jetting changes on a motorcycle that has been warmed up to proper

operating temperature.

The carburetor on your Cobra motorcycle is quite adjustable. Figure 49 shows its range of adjustment and in particular what adjustable component affects what range of operation (specifically throttle position).

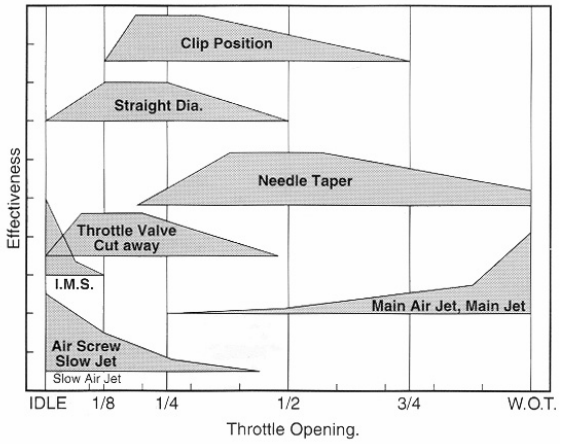


Figure 49

FUEL SCREW ADJUSTMENT: Adjust for maximum idle speed

The fuel adjustment screw is located on the left side of the carburetor. It is the smaller of the two adjustment screws and requires the use of a small flat blade screw driver for adjustment. After adjusting for maximum idle speed, use the idle screw to adjust the desired idle speed.

NOTE:

If the fuel screw requires more than 3 turns out, replace the pilot jet for one that is one size richer (larger number) then readjust the fuel screw.

IDLE ADJUSTMENT: Adjust for desired idle speed

The idle speed screw is located on the left side of the carburetor. It is the larger of the two screws on the side of the carburetor and is unique with its knurled head for easy fingertip adjustment. To raise the idle, turn the screw in, clockwise, (in 1/4 turn increments) and rev the engine after each adjustment. To lower the idle, turn the screw counter-clockwise.

TOP END JETTING: Adjust for clean full throttle acceleration

Jet your top end (main jet) based on the acceleration of your Cobra Motorcycle on the longest straight at the track. Observe any of the lean or rich symptoms (spark plug appearance and bike performance) listed above and change your jetting accordingly.

PART THROTTLE Adjust for desired acceleration

Using an area of the track that allows the rider to operate and mid throttle and transition (accelerate, or 'roll on') from closed, or mostly closed throttle, to a larger throttle opening. Observe the rich and lean symptoms listed above. Adjust the jet needle position by moving the clip from its current position (move the clip higher on the needle to make the bike run leaner, or move the clip lower on the needle to make the bike run richer) to one higher or lower.

.

Troubleshooting

1) **Engine not behaving properly**
    a) Carburetor top is installed backwards (happens a lot)
    b) The carburetor slide indexing pin is missing
2) **Engine is down on power**
    a) Clutch engagement is not set properly
    b) Jetting is incorrect
    c) Silencer needs repacked
    d) Exhaust pipe
        i) Has excess carbon buildup
        ii) Has large dent in it
    e) Compression is low
        i) Piston
        ii) Rings
    f) Reeds are damaged
    g) Ignition timing is incorrect
3) **Engine is excessively loud**
    a) Silencer needs repacking
4) **Engine 'blubbers' at high RPMs**
    a) Jetting too rich
5) **Engine won't start**
    a) Fuel
        i) None in tank
        ii) Is sour or bad
    b) Carburetor is dirty
    c) Ignition
        i) Spark plug fouled
        ii) Spark plug cap off
        iii) Engine Shut-off 'kill' switch is shorted
        iv) Bad electrical ground
        v) Stator winding damaged
    d) Exhaust is plugged
6) **Engine won't idle**
    a) Idle knob needs adjusted
    b) Carburetor jets are dirty

Index

Air Filter 12
  Maintenance 9
Base Gasket Selection 22
Break-In 5
Carburetion
  Specifications 3
Carburetor
  Parts 13
  Service 39
Chassis
  Specification 3
Clutch
  Parts 17
Clutch Lubricant
  Replacing 8
Compression test 21
Cooling System 36
Cylinder head
  torque 4
Electrical
  Parts 15
Engine
  Specifications 3
Exhaust 41
  Parts 20
Fuel System
  Parts list 39
  Service 39
Ignition
  Parts 18
  Service 35
  Timing 35
Jetting
  How To 39
  Stock 3
  Troubleshooting 43
Lubrication
  Recommended 3
Maintenance
  Schedule 7
  Tips 7
Oil
  Recommended 3
Parts
  Bottom End & Transmission 16
  Carburetor 13
  Clutch & Kick Starter 17
  Engine 16
  Ignition & Water Pump 18
  Top End 19
Radiator 14
Reeds 41
  Parts 12
Shock
  Service 45
Spark Plug
  Recommended 3
Specifications 3
  Torque Values 4
Starting 6
Stator
  torque 4
Suspension 45
Throttle 12
Top End
  Parts 19
  Service 21
Transmission
  Specifications 3
Transmission Lubricant
  Replacing 8
Troubleshooting
  General 46
  Jetting 43
VIN reading 7
Water Pump
  Parts 18