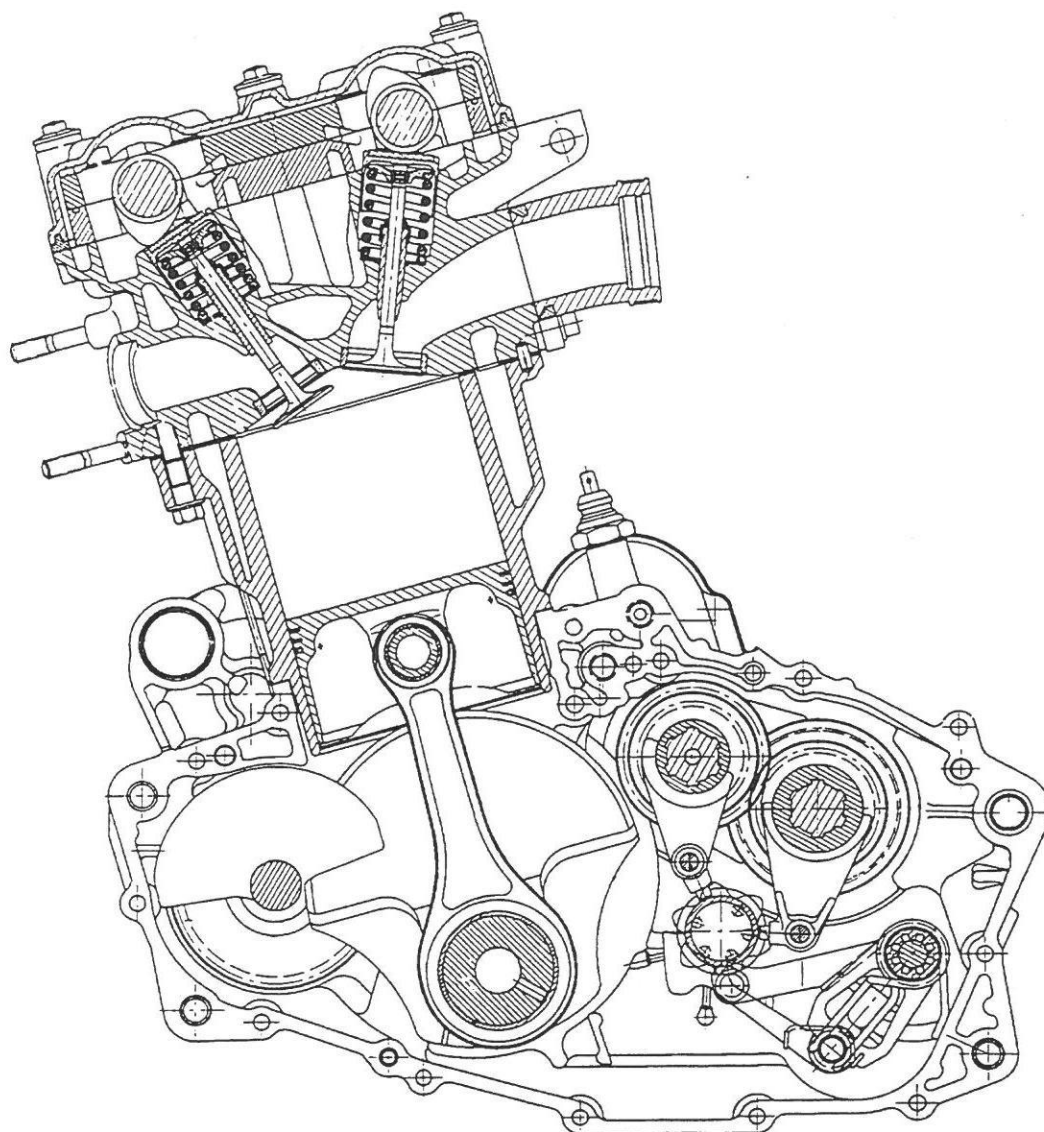


Training Seminar F 650



BMW of North America, Inc.
Motorcycle Service

F 650 Training - Two Days

Day One

09:00 am - 09:40 am

Coffee & Donuts
Students free to look over the
F 650 motorcycle, engine & tools

09:45 am- 12:00 am

Introduction to Systems Overview.
F 650 data & F 650 ST data
F 650 & F 650 Market Positioning
Tool Kits
 Set up
 Additional
Tools - hands on
Engine, Crankcase breather, Camshaft
& Head, Oil Circuit Overviews

12:00 Noon - 12:50 pm

Lunch courtesy BMW NA

12:50 pm - 02:30 pm

Cooling circuit, Clutch, Gearbox, Rear
Wheel & Chain, Ignition System
Carburetor Overview

02:30 pm - 02:45 pm

Break

02:45 pm - 05:00 pm

Exhaust, Frame & Suspension,
Motorcycle Electric Overviews
Electrical testing - hands on
Technical Data
Maintenance Schedules
 PDI
 600, 6,000, 12,000 &
 annual

F 650 Training - Two Days

Day Two

08:30 am - 10:30 am	Engine in Detail A, B, C, D Piston & Cylinder, Crankshaft & Balance Shaft, and Cylinder Head Torque, Gearbox, Alternator, Ignition System, Frame Details Disassemble the Engine - hands on
10:30 am - 10:45 am	Break
10:30 am - 12:00 am	Reassemble the Engine - hands on
12:00 Noon - 12:50 pm	Lunch courtesy of BMW NA
02:50 pm - 02:30	Reassemble the Engine - hands on
02:30 pm - 02:45 pm	Break
02:45 pm - 05:00 pm	Rear wheel and Chain in detail Rear Swing Arm Rear wheel and Chain - hands on Carburetors in detail Carburetor adjustment -hands on Front Suspension in Detail

F 650 Introduction

1. Brief Description
Panels
2. F 650 / F 650 ST
3. Market Positioning
4. Tools
Set up Kit
Additional Tools
5. Engine Overview
6. Crankcase Breather Overview
Crankcase Breather Notes
7. Cylinder Head Overview
8. Lubrication Circuit Overview
9. Cooling Circuit Overview
Cooling Notes
10. Clutch Overview
Clutch Notes
11. Gear box Overview
12. Rear Wheel and Chain Drive Overview
13. Ignition System Overview
14. Constant Depression Carburetor Overview
15. Exhaust System Overview
Exhaust Notes
16. Frame & Suspension Overview
17. Motorcycle Electrics
18. Technical Data

19. Maintenance Schedules:

PDI

600

6,000

12,000

Annual

20. Engine in Detail (A)

(B)

(C)

(D)

21. Piston & Cylinder Details

22. Crankshaft / Balance Shaft Details

23. Cylinder Head Torque Details

24. Gearbox Details

25. Alternator Details

26. Ignition System Details
Notes

27. Frame Details

28. Rear Drive Details

29. Rear Swing Arm Details

30. Carburetor Details
Cold State
Idle and By-pass system
Main Jet System

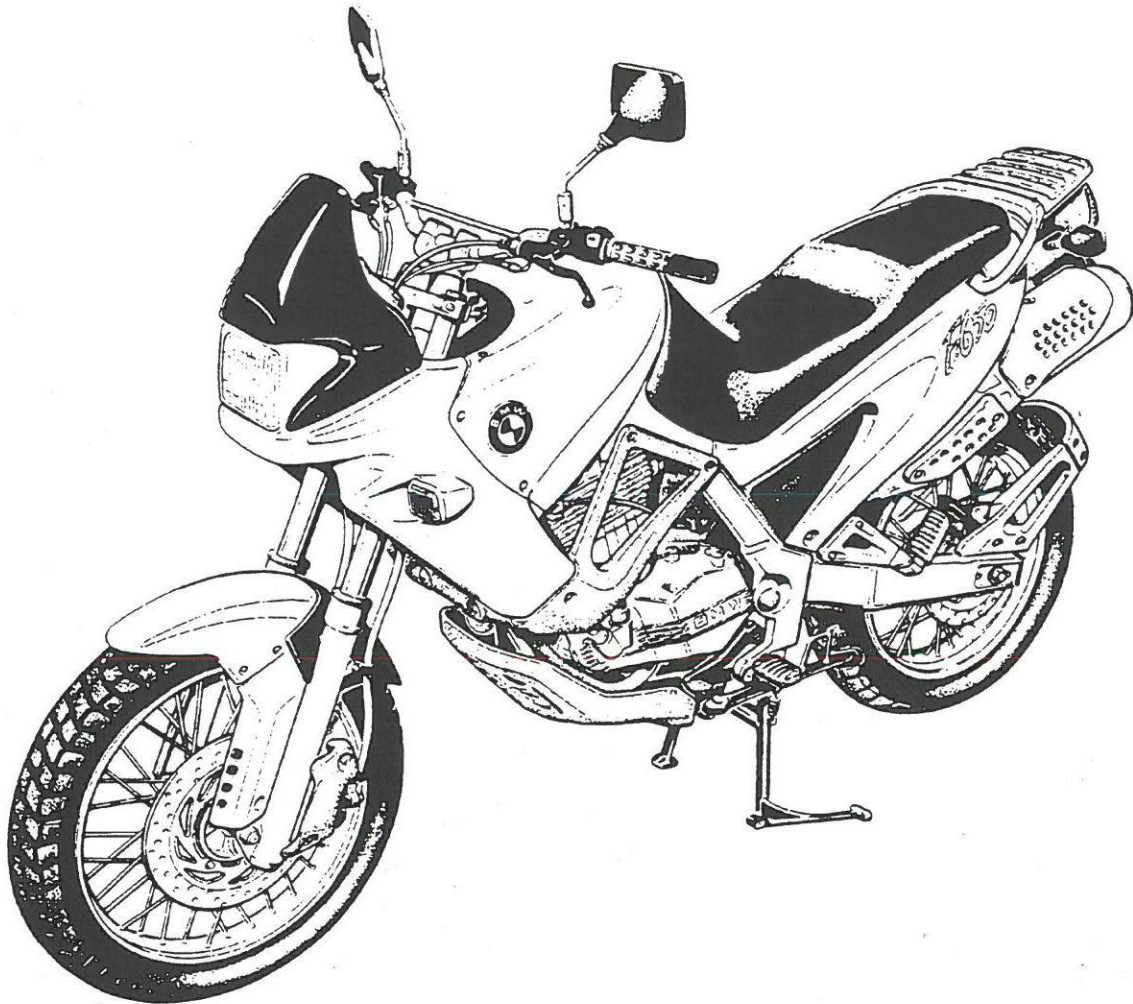
31. Front Suspension Details

32. Uncrating & Set up Details

33. Engine Disassembly Order

34. Student Information

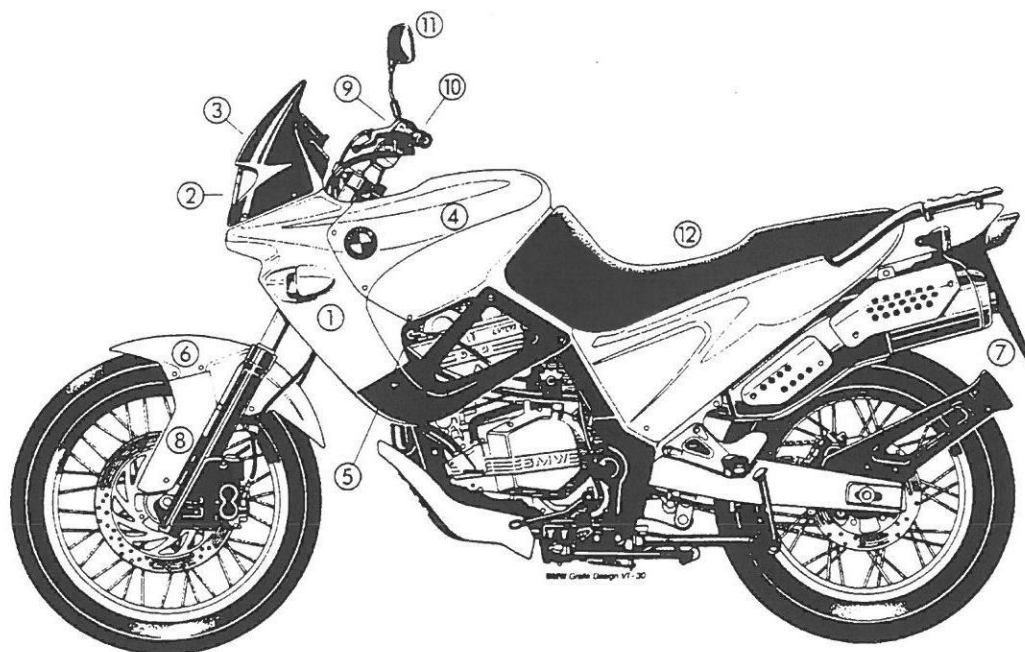
F 650 - Brief Description



The new BMW F 650 is a link with BMW's long tradition of building single-cylinder motorcycles. BMW's first single-cylinder model was the R 39, designed as a sports bike and produced from 1925 onwards. Another very significant single-cylinder BMW motorcycle was the R 24, dating from 1948, which played a major part in rendering the post-war population mobile again. BMW's last single-cylinder model until now was the R 27, which remained in production until 1966.

Now BMW is introducing the new F 650, incorporating modern technology and developed in cooperation with other major systems suppliers: Aprilia in Italy for the frame, panels and suspension, Rotax in Austria for the engine, and BMW for the technical concept and styling. The new model can therefore be regarded as Europe's first genuine cross-border motorcycle project.

F 650 - Panels



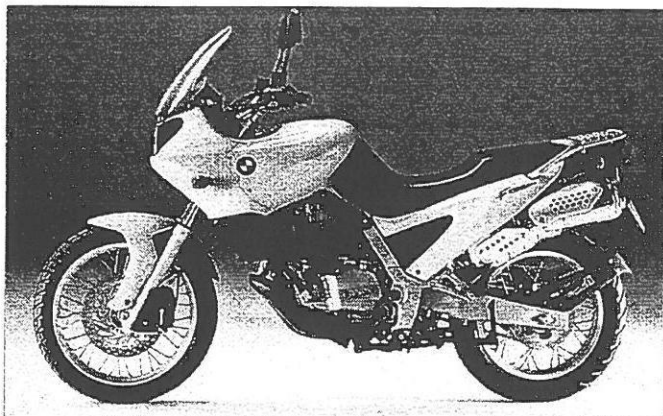
The F 650 is provided with a half fairing (1) rigidly attached to the frame into which the headlight (2) and windscreen (3) are integrated. The polyethylene fuel tank is under a cover (4), and holds 17.5 liters of fuel, including a reserve volume of 2 liters. Fuel is supplied to the two carburetors through a tap (5) in an easily accessible position at the bottom left of the fuel tank. The front wheel is provided with a short mudguard (6); the rear wheel has a separate polyamide deflector (7) bolted to the two sides of the swing arm. Additional plastic shields (8) are provided for the telescopic fork slider tubes (standard model only).

All painted panel on the F.650 are made from polypropylene, a highly tough and ductile material.

The handlebar (9), of steel tube, is ergonomically shaped. It is 880 mm wide, with an additional lateral stiffening strut. Additional weights (10) are inserted at the handlebar ends in order to reduce vibration. The mirrors (11) are also attached to the handlebar and afford an excellent rearward field of view.

The dualseat (12) has resilient supports to reduce vibration; it is 710 mm long and therefore provides adequate seating for two people.

The locks of the one key system used on the F 650 are operated by a key that can be inserted either way up.



F650

Color Choices: Flame Red / Black
Deep Black / Orange

Seat Height: 31.5 inches

Seat Height: 29.5 inches

Engine: 652 cc / 48 bhp @ 6,500 rpm / 57 Nm of torque @ 5,200 rpm

Service Interval: 600 mile, then 6,000 miles minor / 12,000 miles major

Warranty: Three Year, 36,000 mile Limited Warranty

Fuel: Premium Unleaded (motorcycle equipped with CAT)

Gearbox: 5-speed

Tires: Enduro - 19 Front
Enduro - 17 Rear

Ground Clearance: 7.08 inches
(with 190 pound rider)

Weight: 420 pounds (818 pounds gross weight limit)

Distinguishing Features:

Enduro style handlebar

Dealer Installed Options:

Higher windshield for more protection

Street handlebar

Engine protection loops
Luggage rack
Cases (city cases or special integral cases)
Top case
Power socket
Lowered suspension kit
Heated handlebar grips

F650

Orlando / Black (red-orange color)
idnight Blue / Black

30.9 inches

28.9 inches
(with low suspension kit - a dealer installed option)

Street - 18 Front
Street - 17 Rear

6.10 inches

Lower, sporty shield (high shield can be fitted).

Note: Some options may not be fully available on date of launch, though every effort will be made to have full stock of all accessories from the first shipment day.

F 650 & F 650 ST Market Positioning

F 650

BMW created an entirely new market segment with the design of the F 650, a successful combination of Fun and Enduro ... with major emphasis on Fun! The re-engineered F 650 model for the 1997 model year retains this appearance and thereby solidifies the virtue of the "Funduro" design. Since its launch in 1993, almost 30,000 units have been sold world-wide. This level of success proves that BMW has put its faith in the correct combination of strong features: the single-cylinder engine with its excellent touring and passenger capabilities, the low seat, agile handling and exemplary collection of functional accessories. In short: Made by BMW!

F 650 ST

The single-cylinder enthusiast who prefers riding in the city or along twisty country roads with impressive touring and passenger capability need look no further, the F 650 ST is here. Lower seat height and "softer" street trim differentiate the ST from the Enduro. The Enduro potential is still there, but with the excellent running-gear qualities of the F 650, converted into more "fun potential" for the city and country roads. The F 650 ST contains design features which highlight the fresh "fun character" of this single-cylinder bike.

F 650 Dealer Set Up Tools

Part Number	Tool	Usage	Application	Set Up Kit	Dealer Cost
00 0 590	Tool Board			Y	177.40
11 4 604	Adapter	Repair	Oil Gauge Adapter	Y	11.25
11 6 540	Drift	Repair	Water Pump Seal	Y	14.15
11 6 570	Fixing Screws	Maintenance	Lock Crank at TDC	Y	0.46
12 5 500	Handle	Repair	R&R Ignition Cover	Y	7.40
12 5 510	Extractor	Repair	R&R Magnet Wheel	Y	15.10
13 1 600	Sp Screw Driver	Maintenance	RT. Angle to adjust CO	Y	73.60
17 5 510	Adapter	Repair	Pressure Test Adapter	Y	8.35
18 0 610	Adapter	Maintenance	CO Testing/Adjustments	Y	14.25
31 4 880	Sp. Socket	Maintenance	Upper fork bridge nut	Y	22.60
31 6 500	Support Ring	Repair	Removing Steering Bearing	Y	16.60
31 6 510	Distance Ring	Repair	Installing Steering Bearing	Y	2.29
36 6 600	Impact Drift	Maintenance	Wheel bearing drift	Y	6.35
36 6 617	Balance Axle	Special Repair	Rear Wheel Balance Shaft	Y	150.00
Total Set Up Kit Price			TOTAL FOR DEALER KIT		519.80

F 650 Complete Tool List

				Set	Dealer
Part Number	Tool	Usage	Application	Up	Cost
00 0 590	Tool Board			Y	177.40
11 4 604	Adapter	Repair	Oil Gauge Adapter	Y	11.25
11 6 540	Drift	Repair	Water Pump Seal	Y	14.15
11 6 570	Fixing Screws	Maintenance	Lock Crank at TDC	Y	0.46
12 5 500	Handle	Repair	R&R Ignition Cover	Y	7.40
12 5 510	Extractor	Repair	R&R Magnet Wheel	Y	15.10
13 1 600	Sp Screw Driver	Maintenance	RT. Angle to adjust CO	Y	73.60
17 5 510	Adapter	Repair	Pressure Test Adapter	Y	8.35
18 0 610	Adapter	Maintenance	CO Testing/Adjustments	Y	14.25
31 4 880	Sp. Socket	Maintenance	Upper fork bridge nut	Y	22.60
31 6 500	Support Ring	Repair	Removing Steering Bearing	Y	16.60
31 6 510	Distance Ring	Repair	Installing Steering Bearing	Y	2.29
36 6 600	Impact Drift	Maintenance	Wheel bearing drift	Y	6.35
36 6 617	Balance Axle	Special Repair	Rear Wheel Balance Shaft	Y	150.00
Total Set Up Kit Price			TOTAL FOR DEALER KIT		519.80
00 1 530	Safety Stand	Maintenance	Auxiliary Stand	N	142.50
00 1 540	Jack	Special Repair	R&R Engine	N	345.40
11 0 640	Engine Mount	Special Repair	Adapter to Engine Stand	N	162.00
11 6 500	Removal Tool	Special Repair	Counter Wheel-Crankshaft	N	76.10
11 6 510	Bushing	Repair	Ring Compressor	N	27.00
11 6 520	Press. Plate	Repair	Valve Spring tool	N	26.25
11 6 550	Drift	Special Repair		N	10.75
11 6 530	Adapt. Plate	Repair	Valve Spring base	N	26.25
11 6 560	Extractor Tool	Repair	Remove Engine Ball Bearing	N	63.35
11 6 580	Piston Pin Drift	Repair	Piston pin & clip R&R	N	34.40
11 6 590	Drift	Special Repair	R&R Valve Guides	N	10.80
11 6 610	Removal Plug	Special Repair	Removing Main Bearing Shells	N	11.25
11 6 620	Impact Drift	Special Repair	Installing Main Bearing Shells	N	36.10

F 650 Complete Tool List

11 6 630	Fixing Pin	Special Repair	Gears in Fixed Position	N	13.71
11 6 650	Drift	Repair	R&R Valve Seals	N	9.60
17 5 500	Special Pliers	Special Repair	Hose Clamps	N	75.00
21 4 600	Driving Stop	Repair	Holding Plate-clutch	N	22.85
21 4 610	Extractor	Repair	Remove Needle Bearings	N	89.25
21 4 620	Bushing	Repair	Seal Guide/protector	N	4.55
21 4 630	Drift	Repair	Seal Installing Drift	N	10.20
21 4 640	Impact Drift	Repair	Installing Needle Bearings	N	19.90
23 4 500	Pliers	Special Repair	R&R Gear Circlips	N	54.40
23 4 540	Bushing	Special Repair	Installing Seal Bushing	N	9.00
23 4 550	Impact Drift	Special Repair	Installing Seal-Main Shaft	N	17.30
33 5 650	Drift with Bushings	Repair	R&R Fork Bearings	N	83.10
33 6 600	Drift	Repair	Driving out Swing-Arm Bearings	N	18.40
33 6 610	Drift & Dist. Sleeve	Repair	Driving in Swing-Arm Bearings	N	49.30
33 6 620	Drift	Repair	Driving out Pivot Bearings	N	14.35
33 6 630	Drift & Dist. Sleeve	Repair	Driving in Pivot Bearings	N	31.00
36 6 610	Puller Support	Repair	Ft. Wheel Bearing	N	14.35
46 5 607	Mandrel	Repair	Used with 46 5 600 Frame Gauge	N	67.25
46 5 608	Conical Adapter	Repair	Used with 46 5 600 Frame Gauge	N	24.60
46 5 609	Adapter	Repair	Used with 46 5 600 Frame Gauge	N	80.15
46 5 611	Shaft	Repair	Used with 46 5 600 Frame Gauge	N	9.65
46 5 612	Disk Adapter	Repair	Used with 46 5 600 Frame Gauge	N	8.00
51 0 520	Drill Bushing				10.00
11 6 535	Support Plate				72.00
Sub Total Additional tools					1780.06
Total F-650 Tools					2299.86

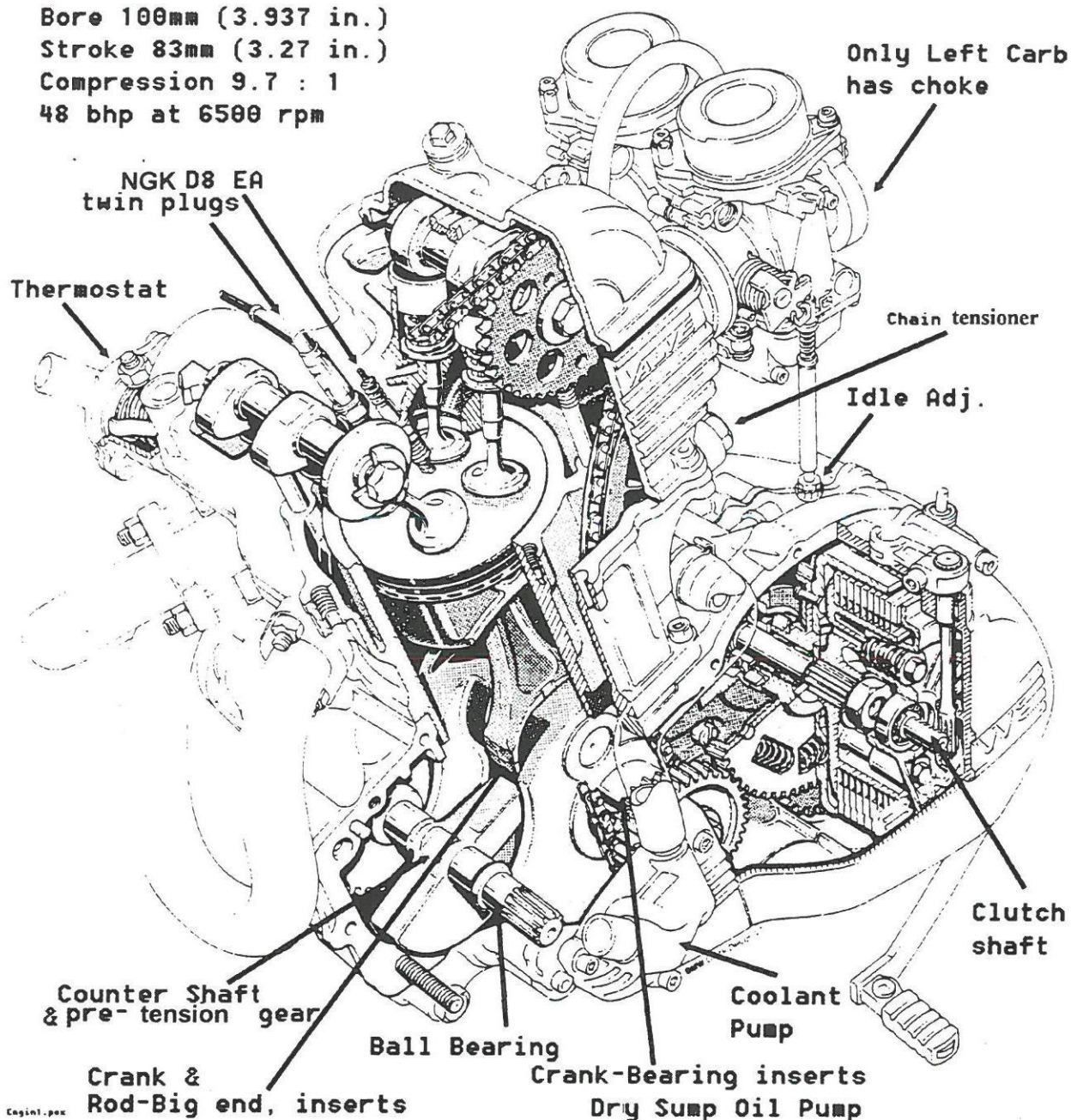
F 650 Engine

Bore 100mm (3.937 in.)

Stroke 83mm (3.27 in.)

Compression 9.7 : 1

48 bhp at 6500 rpm



Engintl.pex

The F 650 uses a new water-cooled single-cylinder four-stroke engine with four valves, a balance shaft, and dry sump lubrication. The valves are operated through bucket-type tappets from two camshafts in the cylinder head, which are driven by a roller timing chain. This chain is kept taut by a hydraulic tensioner which needs no routine maintenance.

The engine fuel air mixture is supplied by two constant-depression carburetors of 33 mm internal diameter.

The ignition system is all-electric, with battery and high-tension condenser called BHKZ. Ignition timing is governed by engine speed.

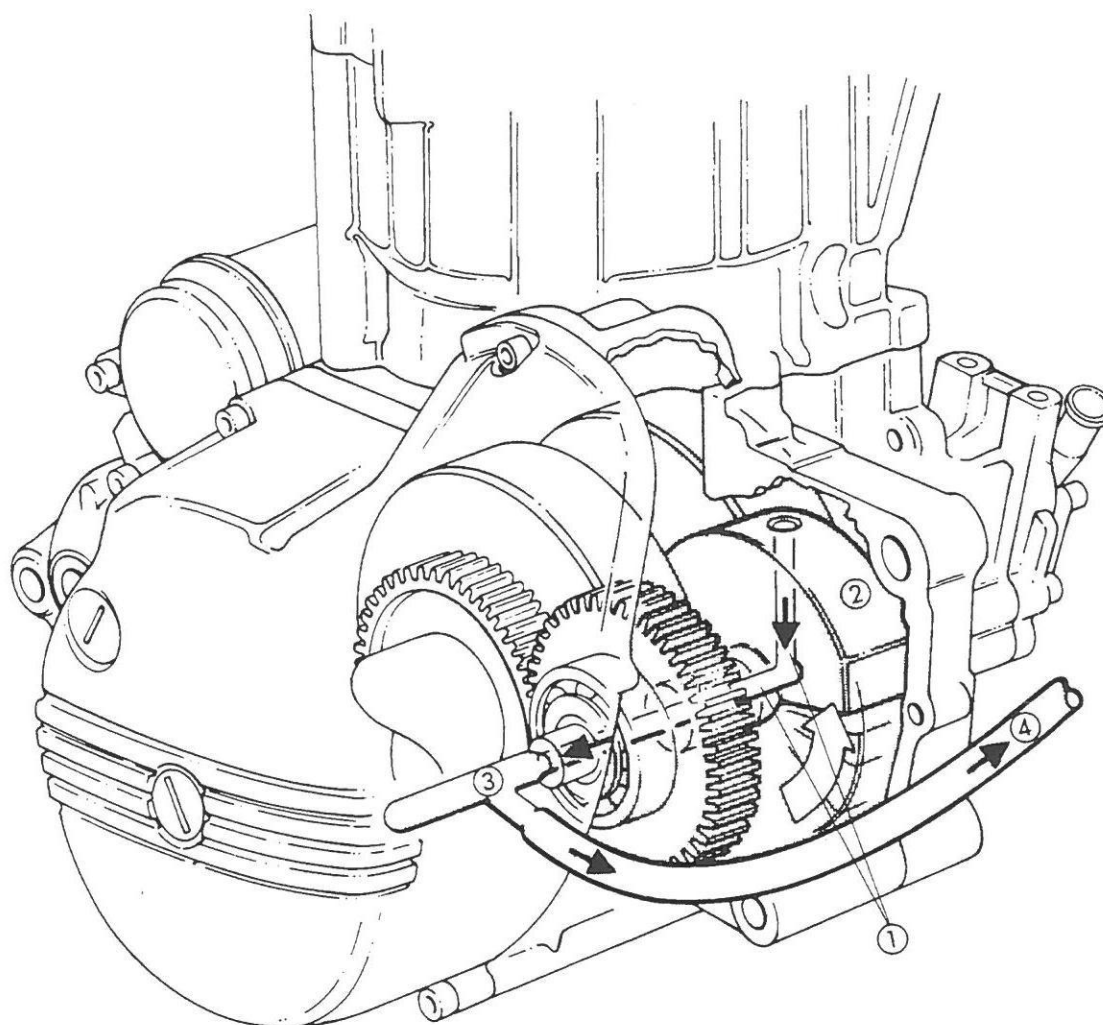
The 5-speed gearbox with wet-clutch runs in an oil bath. It is mounted on the engine's left side (looking forward), driven by the gearbox input shaft.

The crankshaft is of heat-treated and nitrided steel. It runs in two insert type main bearings.

The right-hand main carries the permanent magnet alternator, which is rated at 280 watts.

The transmitter for the inductive ignition sensor is also mounted on the circumference of the alternator rotor. The clutch and the alternator are protected by covers bolted to the crankcase. The F 650's single-piece connecting rod is forged from heat-treated steel and runs on a plain bearing on the crankpin. The cast light alloy piston is of full slipper-skirt pattern, 100 mm in diameter, and has three piston rings. The bore of the light alloy cylinder has a high-strength, low-wear nickel-silicon coating to ensure long life. The engine's balancing shaft turns in 2 deep-groove ball bearings and is driven by gears directly from the crankshaft at a ratio of 1:1. The input gear on the balancing shaft is of pre-tensioned pattern, to eliminate backlash at the gear teeth. The use of a balancing shaft in the F 650's engine minimizes the vibration typical of a single-cylinder, and this greatly enhances ride comfort.

F 650 - Crankcase Breather



The F 650 engine's crankcase breather operates through special drilled passages (1) in the balancing shaft (2).

Vapors and pressure enter the balancing shaft through a bore on the surface of the counter weight. The oil particles in these fumes are flung back into the crankcase by the centrifugal force generated by the balancing shaft as it rotates. The remaining gases, without the residual oil content, enter the axial drill-way in the right-hand half of the balancing shaft and flow from the stub end of this shaft into a chamber in the alternator cover (3) from here, it is conveyed by a flexible hose (4) to the air cleaner housing and returned to the air intake system as a precaution against environmental pollution.

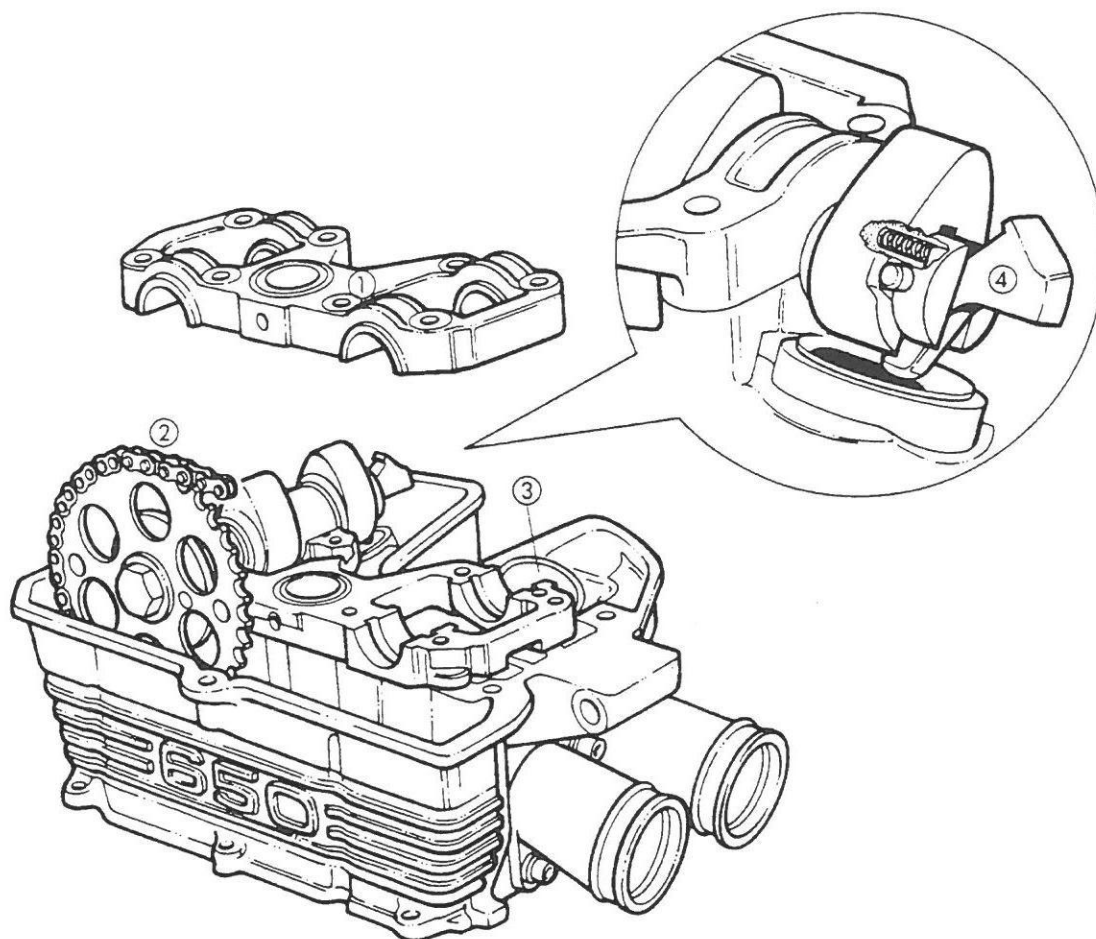
F 650 Crankcase Breather

Crankcase breather vent into air box

Air box has an oil drain (capped) carburetor side of the filter

Air box has water drain on unfiltered side of filter

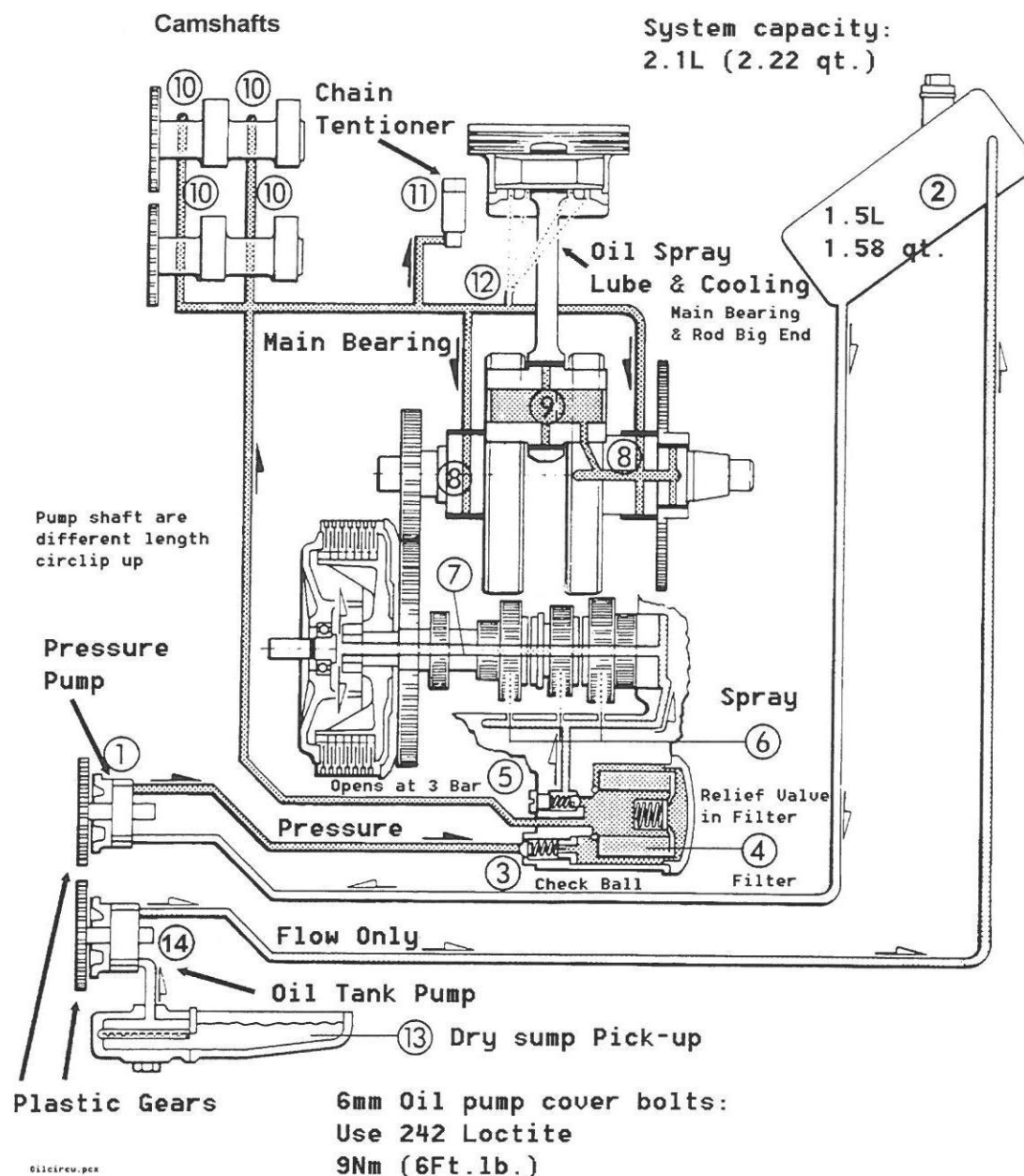
F 650 - Cylinder Head



The F 650's four-valve cylinder head is a light alloy chill casting. A two-piece aluminum camshaft carrier (1) is bolted to the cylinder head, and contains the plain bearings in which the two camshafts run. The camshafts are driven at a ratio of 2:1 from the crankshaft, by a roller chain (2). The valves are operated directly through bucket-type tappets (3) on top of which are shim discs (K model) to permit valve clearances to be adjusted.

To make starting this large single-cylinder engine easier, a centrifugal controlled decompression mechanism (4) is integrated into the exhaust camshaft. This operates according to engine speed, using a bob weight with a control cam. At the engine's starting speed (280-300 rpm), the control cam is in its rest position and extends into the pitch circle of the valve operating cams. This prevents one exhaust valve from closing completely, so that the engine cannot build up its maximum cylinder compression. When the engine is rotating at more than starting speed, centrifugal force builds up and pulls the control cam out of the exhaust cam pitch circle so that the valve can close completely. This decompression mechanism reduces the load on the starter motor. Engine idle speed: 1300 rpm.

F 650 Lubricating Oil Circuit

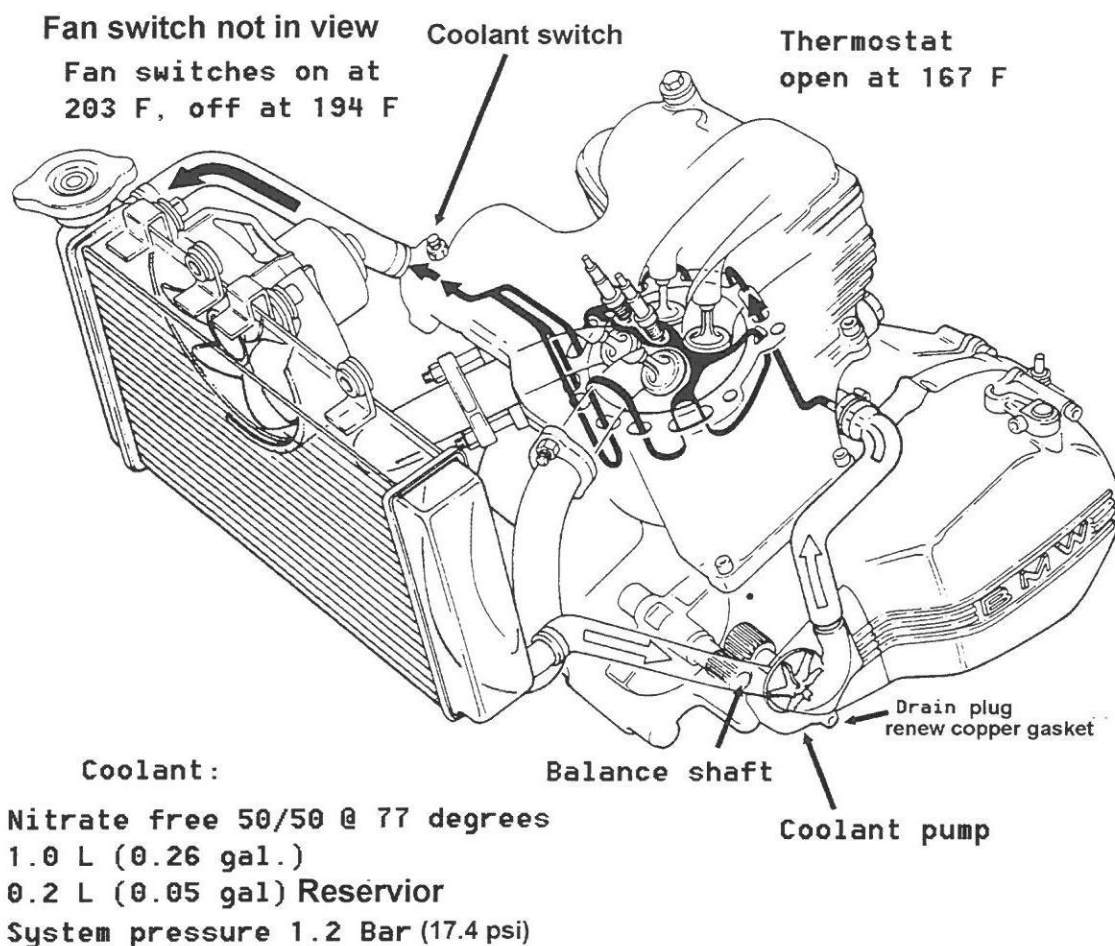


The F 650 engine uses the dry sump lubricating principle. This needs 2 oil pumps, one to deliver oil and one to scavenge the engine. The delivery pump (1) obtains oil from the tank (2) in the motorcycle's frame, through a non-return valve (3) leading to the oil filter (4). After leaving the filter, the oil is divided into high-pressure and low-pressure flows. This takes place at a spring-loaded ball valve (5), which opens the low-pressure circuit when oil pressure had reached approx. 3 bar (43.5 lb./sq. in.). The low oil-pressure circuit supplies oil passages (6) in the crankcase leading to the shift gears in the gearbox, and also the clutch by way of a passageway (7) in the gearbox input shaft.

The high-pressure circuit supplies the main bearings (8), the rod big end bearing (9), the camshaft bearings (10), the hydraulic timing chain tensioner (11) and a spray jet (12) to cool the underside of the piston crown and lubricate the rod small-end bearing. From the engine's sump (13), the scavenge pump (14) returns the oil to the oil tank. The use of dry sump lubrication improves the motorcycle's ground clearance, since the bulk of a wet sump under the engine is avoided.

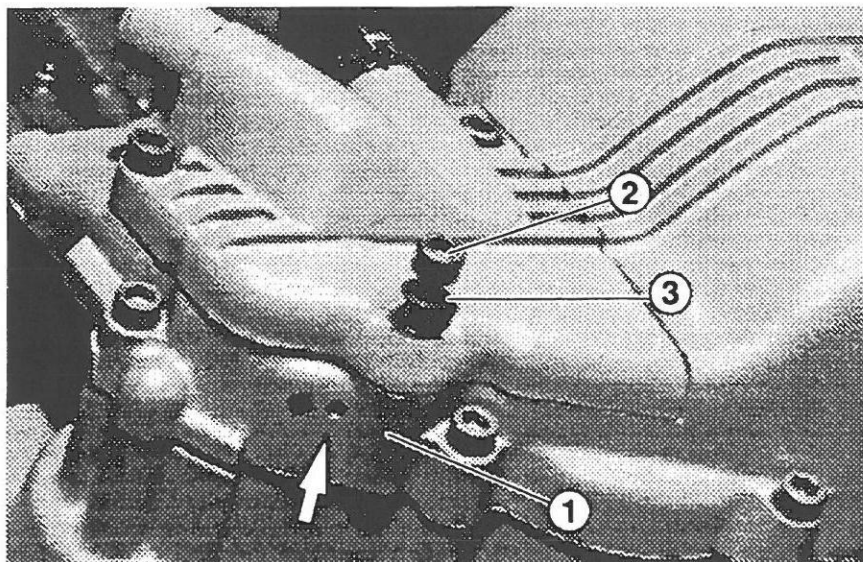
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F 650 Engine Cooling Circuit



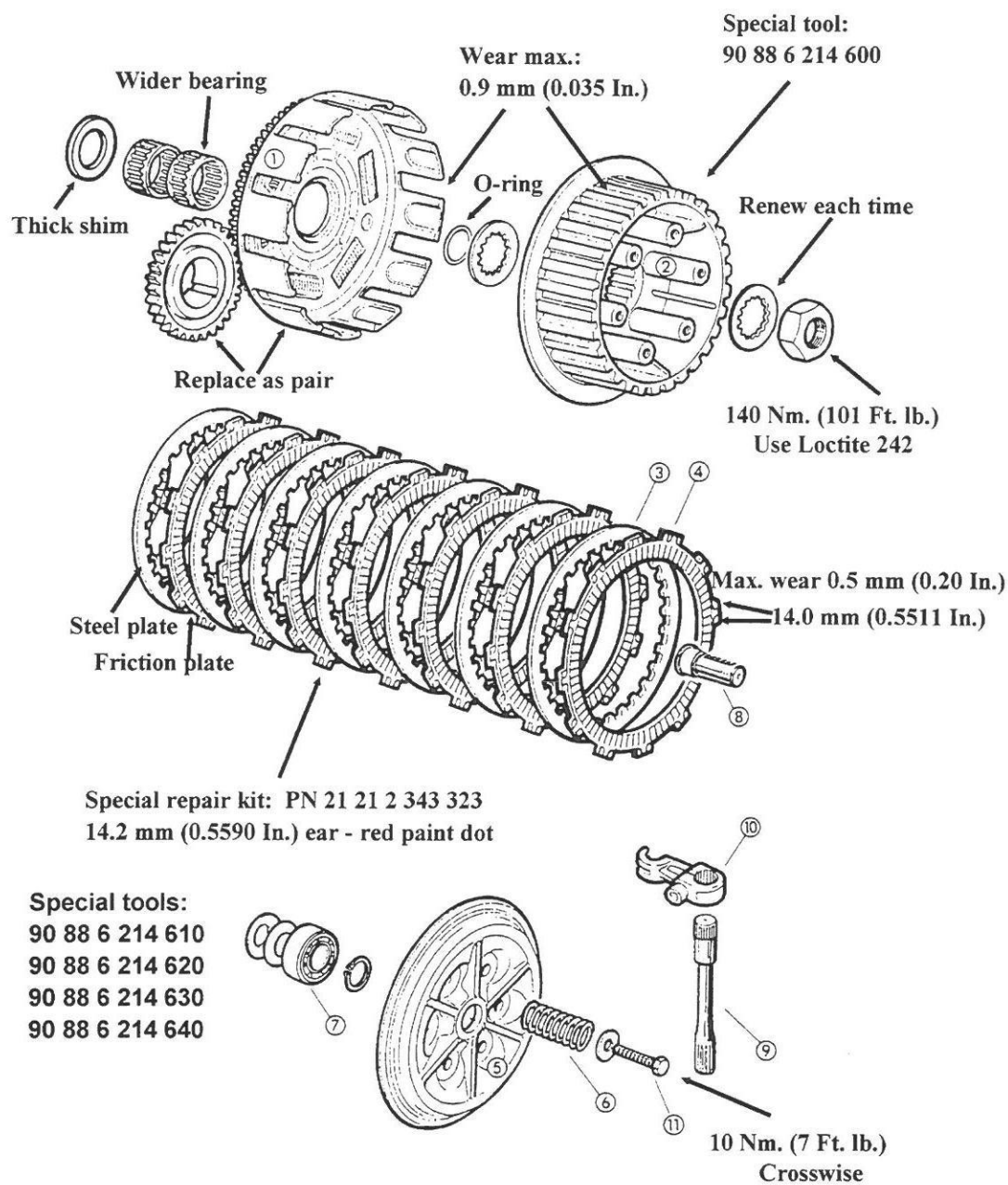
The F 650 engine is liquid-cooled. The coolant circulates through jackets in the cylinder and cylinder head, and through a radiator. A centrifugal-type water pump is driven by gears from the balancing shaft. When the engine is still warming up, the flow of coolant is reduced by a thermostat with an expandable element, which opens fully at approx. 75°C (167°F). This form of coolant temperature control avoids the need for the bypass circuit found on other systems, which prevents the coolant from circulating through the radiator until the engine's normal operating temperature has been attained. If coolant temperature of 95°C (203°F) is reached while the bike is being ridden, the cooling system's auxiliary electric fan is switched on. This cuts out again when the coolant temperature has fallen to below 90 °C (194 °F).

F 650 Engine Cooling Notes



- 1 Engine crankcase cover
 - Arrow - Coolant weep hole
- 2 Coolant drain plug
- 3 Use new copper washer and Loctite 242 on thread each time off.
 - Copper washer 11 14 2 343 240

F 650 Clutch



The F 650 is fitted with a Multi-plate clutch running in an oilbath and integrated into the crankcase.

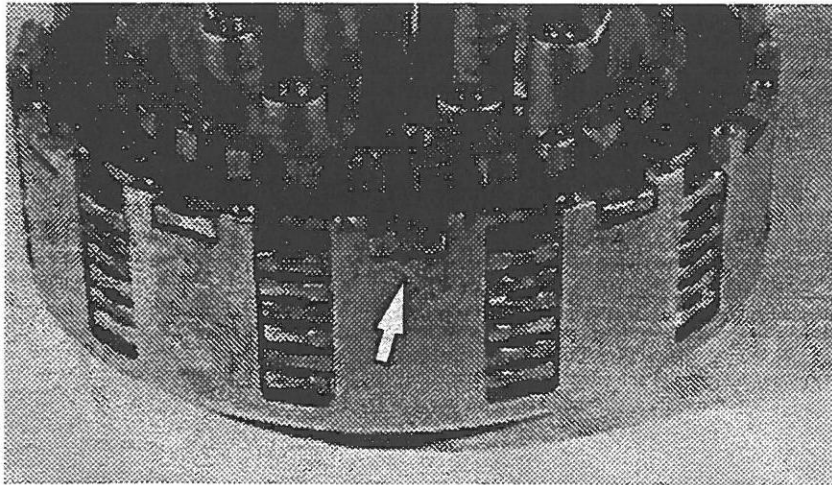
The Multi-plate clutch consists of the following components:

- Clutch cage with primary gear teeth and torque reaction dampers (1)
- Clutch hub (2)
- Steel plates (3)
- Friction-lined plates (4)
- Clutch pressure plate (5)
- Coil springs (6)
- Withdrawal bearing (7)
- Withdrawal head (8)
- Withdrawal shaft (9)
- Withdrawal lever (10)

The clutch cage is permanently connected to the crankshaft by the primary gear teeth. It contains the steel and friction-lined plates, which can move axially. The steel plates are internally splined and therefore driven by the clutch hub. The friction-lined plates have external splines which are connected to the clutch cage. The clutch pressure plate at the end of this plate cluster contains coil springs which compress the plates together. The clutch pressure plate is bolted (11) to the hub. In this way, the drive is transmitted from the crankshaft to the gearbox input shaft.

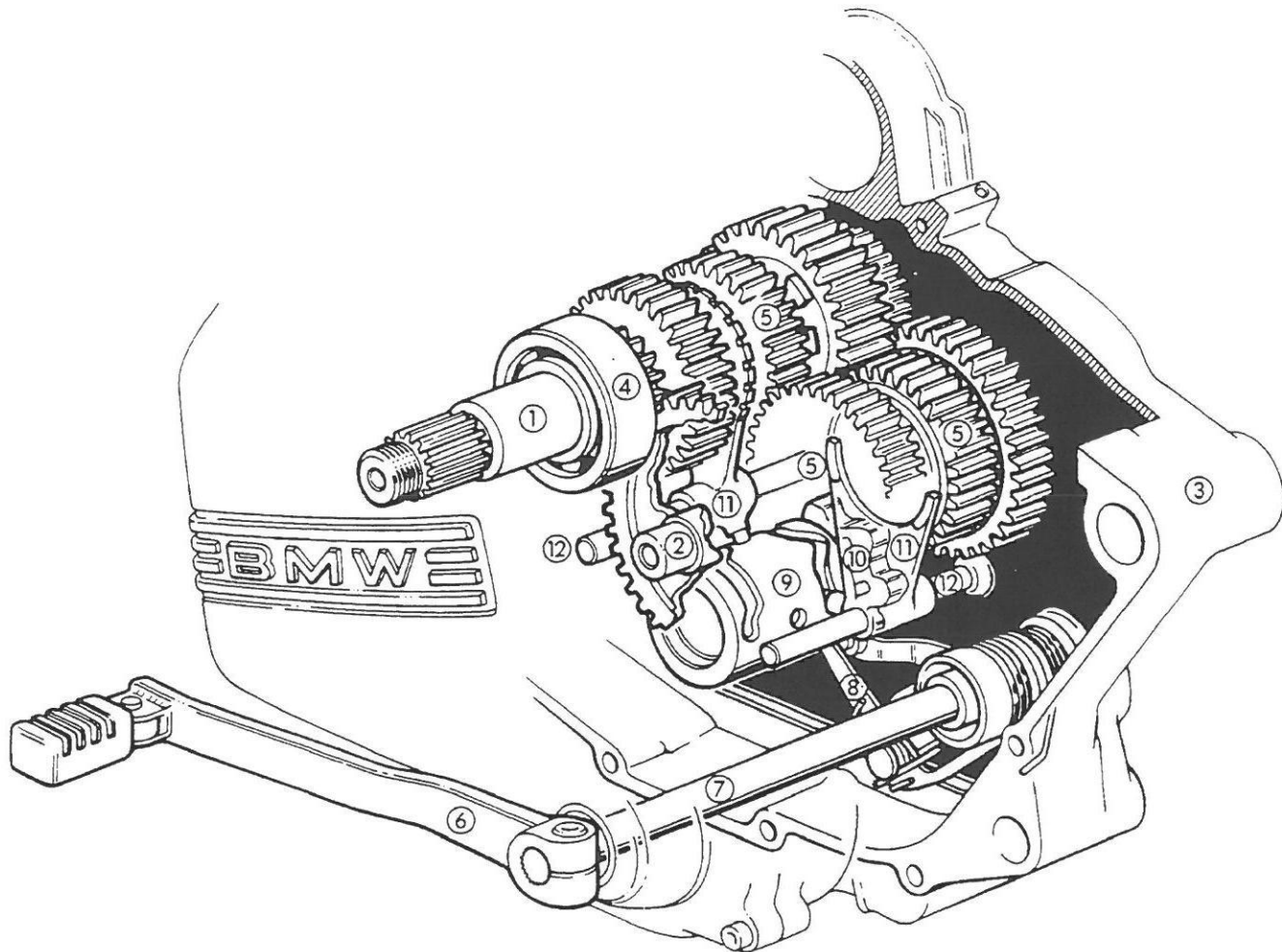
When the withdrawal lever is operated, the withdrawal shaft and the withdrawal head located in the pressure plate overcome the spring loading on the plate cluster and move the pressure plate away allowing the plates to slip.

F 650 Clutch Notes



On later models the last plate has a special location as shown.

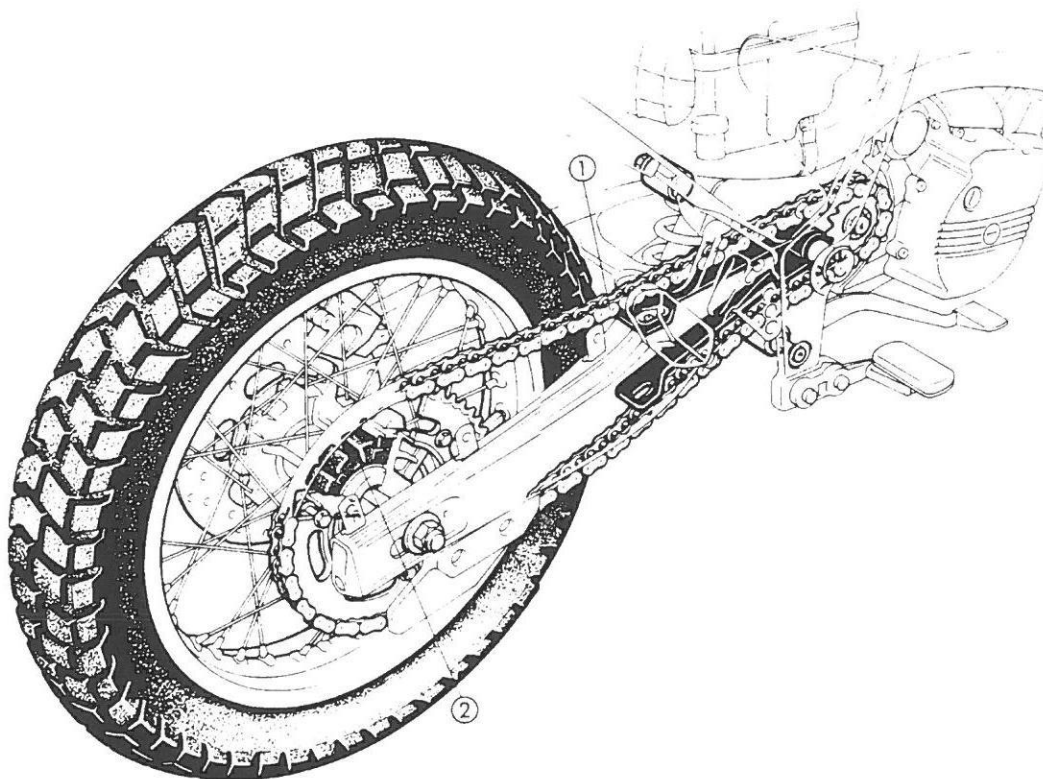
F 650 Gearbox



The F 650s five speed gearbox is of the two shaft pattern (1 & 2) and is integrated into the crankcase (3). The gearbox input and output shafts run in deep-groove ball bearings (4) and carry the shift gears (5). The selector drum (9) is pedal operated (6) by way of the selector shaft (7) and shift pawls (8). A segmental disc with shaft contour (10) locates the drum in the precise gear engagement positions. The shift forks (11) pivot on steel shafts (12) and are actuated by cam tracks on the selector drum. The forks slide the shift gears along the input and output shafts to obtain the various ratios.

Group 27

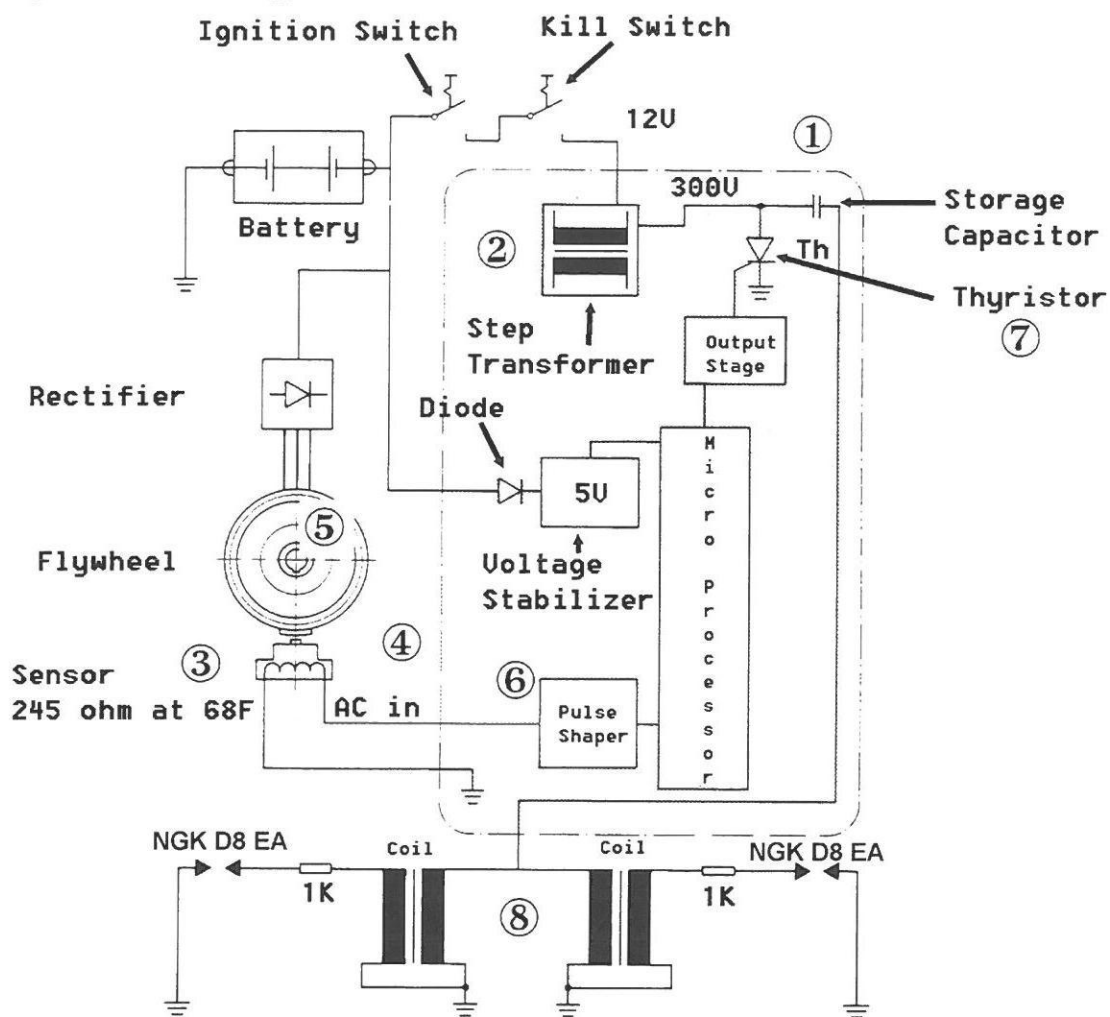
F 650 Rear Wheel / Chain Drive



The rear wheel of the F 650 is driven by an O-ring roller chain (1), providing a final drive ration of 2.937 : 1 (16/47 teeth). The chain is of a special type for drive purposes, with a lifetime lubricant packing retained by O-rings between the rollers and the outer chain plates.

This construction principle reduces routine maintenance and care of the chain to a minimum. If properly looked after, the O-ring incurs very little wear. The rear wheel chain sprocket carrier incorporates rubber shock damping elements (2) to compensate for the effect of load reversals.

F 650 Ignition System



Coil:
Primary 0.3 ohm
Secondary 9K

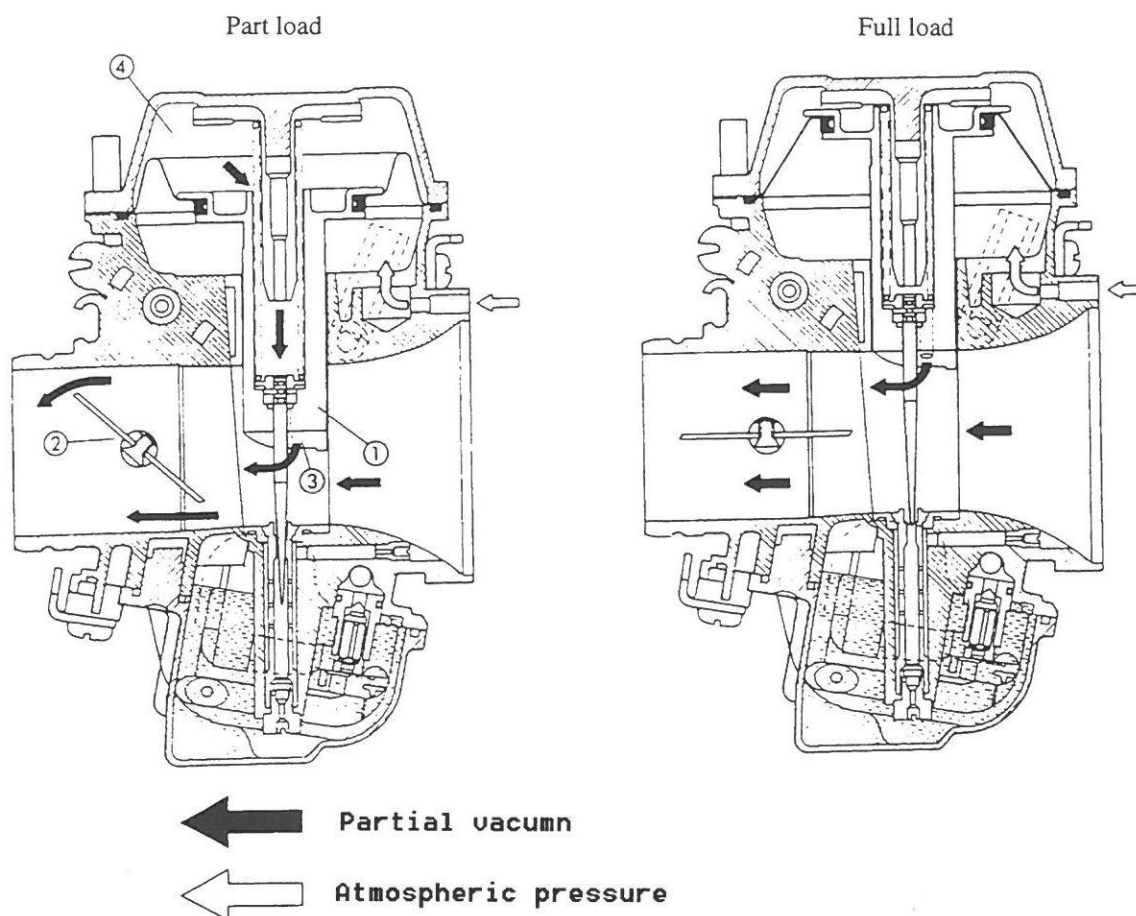
25K to 30K Volts
at the plugs

Engine timing:
10 to 27 degrees

The F 650 engine is equipped with a battery and condenser high-tension ignition system (German abbreviation: BHKZ). This has electronically controlled timing, dependent on engine speed.

The high-tension condenser ignition system stores ignition energy in the electrical field of a capacitor (1) (traditionally referred to as a condenser on motor vehicles). The condenser can be charged up to approximately 300 Volts. This charge is generated by a voltage transformer (2) integrated into the control unit. An inductive transmitter (3) generates the impulse by means of a transmitter element (4) on the outside of the alternator rotor (5). This impulse is converted in a separate stage (6) of the microcomputer. The impulse is processed and the speed-dependent ignition timing calculated in the microcomputer. At the moment of ignition, a thyristor (7) is rendered conductive by an impulse from the microcomputer, where upon the energy stored in the condenser is discharged instantaneously into the primary side of the transformers (8). The results in a secondary-side high-tension voltage of approximately 25,000 V being developed. Since the secondary voltage rises extremely rapidly in the BHKZ circuit, reaching its peak value after only approximately 10 μ s, the ignition spark is always formed between the electrodes of the spark plug; in the event of contaminated spark plugs, the amount of ignition energy discharged is considerably less. This freedom from sensitivity to current leakage on the secondary side is a major advantage of the high-tension condenser principle. Another advantage of the BHKZ is that the ignition voltage is equally high at all speeds. Since the F 650 engine, with its 100 mm cylinder bore, has a large diameter combustion chamber, the flame propagation paths in the fuel-air mixture are also relatively long. To ensure reliable ignition and optimum flame passage through the mixture in all operating conditions, the F 650 uses two spark plugs, each supplied from its own ignition transformer. This form of ignition system ensures high performance with low initial energy requirements, better combustion in the part-load operating range and, as a result, optimum exhaust emission levels.

F 650 BST 33 Constant-depression Carburetor



- ① Throttle slide
- ② Throttle butterfly
- ③ Air passage
- ④ Chamber

The combustion mixture for the F 650 engine is obtained from two Type BST 33 Constant-depression carburetors, with an internal diameter of 33 mm. Intake air is drawn in under the dual seat on the right side of the motorcycle. This air is filtered by and easily accessible foam element. The intake air silencer has a volume of 6.5 liters (1.71 Gal.) Great attention was paid during its design to avoiding any undue air flow restrictions to ensure optimum engine power and torque.

A feature of the BST carburetor is its semi-circular flat throttle slide (1). It keeps the barrel of the carburetor relatively short, with good flow properties which in turn improves the power flow from the engine. Plastics have been used to and increased extent to keep the weight of the BST carburetor low.

The two carburetors used on the F 650 are identical in pattern, and possess the following internal systems:

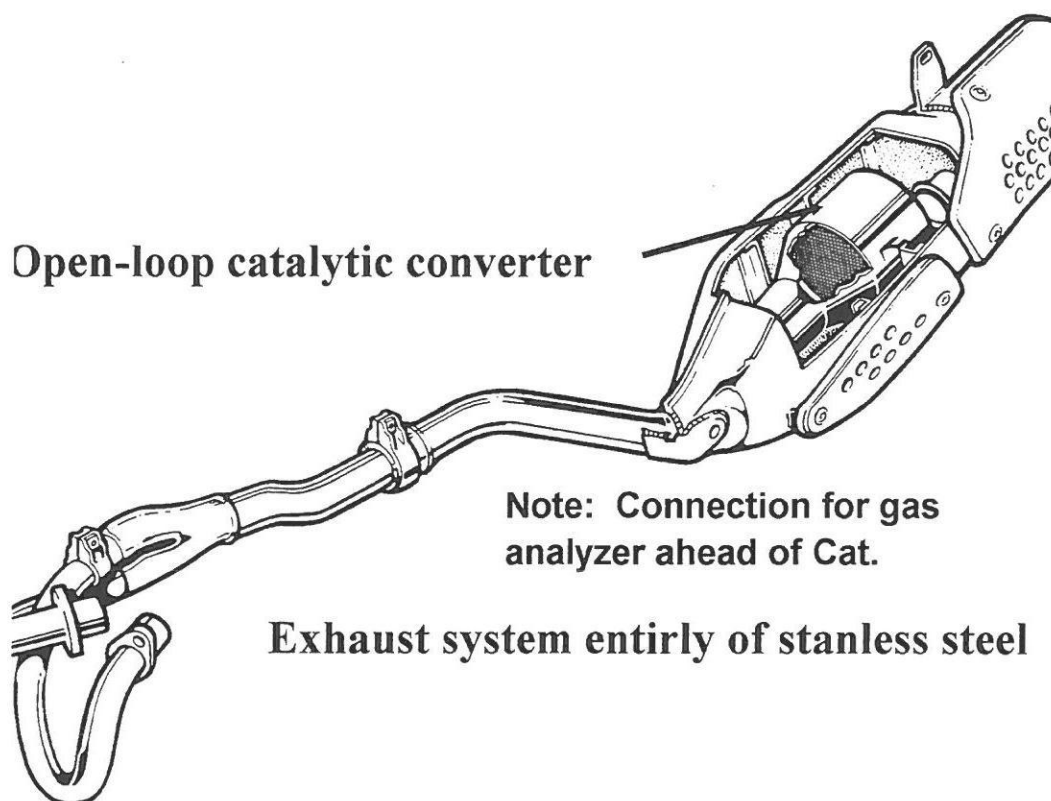
- a) Idle and bypass system
- b) Main system
- c) Cold start system (left-hand carb only)

The carburetors are actuated by a cable leading from the handlebar to the left carburetor. The right carburetor is coupled to the throttle butterfly shaft of the left carburetor by a connecting link.

The cold starting device is adjustable and is operated by a cable linked from the left carburetor to the choke lever on the left handlebar.

When the twist-grip is turned, the BST carburetor's throttle butterfly (2) is operated, not the throttle slide directly. As the throttle butterfly opens, air flows past the lower edge of the throttle slide. This is the zone of maximum vacuum in all positions of the throttle slide. There is a passage (3) at the bottom of the throttle slide, leading to a chamber(4) above the slide which is sealed off by a diaphragm. Air can be drawn out of this passage so that atmospheric pressure reaching the space below the diaphragm through another passage can lift the diaphragm and also the throttle slide, which is attached to it. When the force tending to lift the throttle slide is equal to the weight of the slide and the force exerted by the return spring, the limit of slide movement is reached; this can be equivalent to any given load setting, depending on the engine speed and the throttle butterfly opening. In other words, from the flow velocity through the barrel of the carburetor.

F 650 Exhaust System



The F 650s exhaust system is entirely made from corrosion-resistant stainless steel. Its design pays particular attention to optimizing engine power and torque. The rear silencer (muffler) is of combined absorption and resonator type, with a volume of 7.5 liters.

An open-loop catalytic converter (standard equipment in the US), fitted in the first chamber of the rear silencer, is available for the F 650 as an optional extra. The metal-base catalytic converter, measuring 70 x 74.5 mm, is coated with the precious metals platinum and palladium. The catalytic converter has a cell density of 47 per square centimeter. The open-loop catalytic converter achieves the following rates of conversion:

- Uncombusted hydrocarbons (HC): 50 percent
- Nitrogen oxides (Nox): 60 percent
- Carbon monoxide (CO): 60 percent

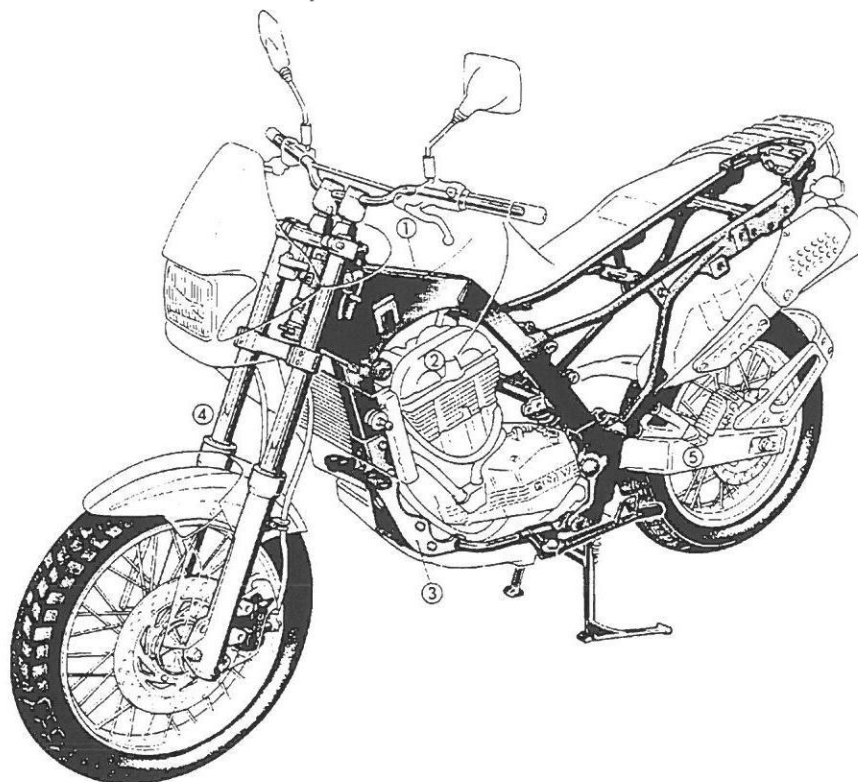
Measured power output, torque, fuel consumption and noise emission data are identical for motorcycles with and without a catalytic converter, and the carburetor settings and component sizes are also the same.

There is an up-stream tap for Exhaust gas testing.

F 650 Emission System Notes

- Open Loop Cat
- Disconnect the SAS and use the up-stream tap to adjust CO

F 650 Frame & Suspension



The F650 has a single loop frame made from square section steel tube. The upper section (1) of the frame also acts as a reservoir holding 1.5 liters of oil for the dry sump engine lubricating circuit. The engine (2) forms a load bearing element inside the frame, which has a bolted on lower section (3) to provide additional stiffness.

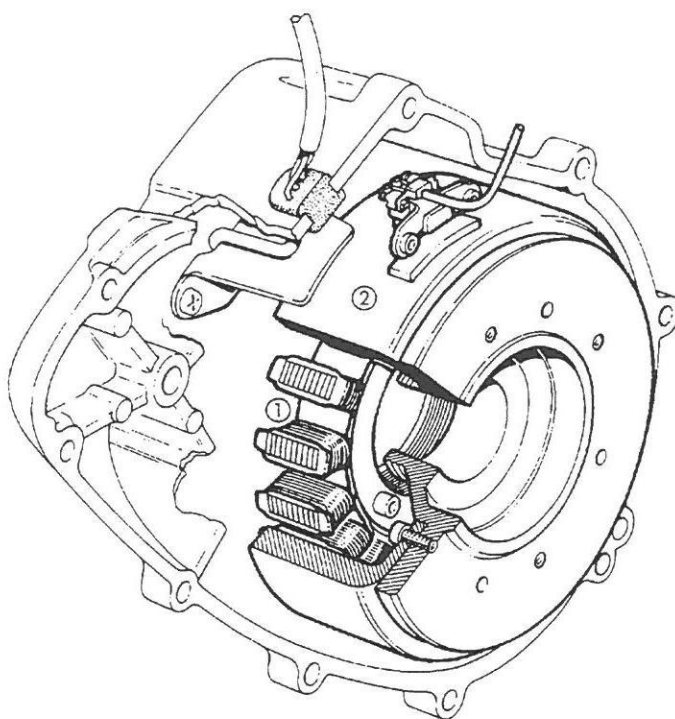
The front suspension consists of a conventional telescopic fork (4) with fixed tubes of 41 mm diameter and a total travel of 170 mm. The rear suspension uses a delta box swing arm (5) welded from individual sheet steel elements. The total travel is 165 mm. This particular swing arm construction principle ensures high rigidity and low weight. The centrally installed rear suspension strut has 40 stage adjustable spring pre-load and continuously variable rebound damping. Spring pre-load adjustment is by means of a hydraulic mechanism with a control knob on the left side of the motorcycle. The rebound damping adjusting screw is at the lower left of the suspension strut, above the lower pivot lug. The suspension strut's lower pivot point is connected by a lever system to the rear wheel swing arm. The kinematics of this lever system result in a progressive suspension rate.

The wheels have steel spokes and are of 2.15 - 19 size at the front and 3.00 - 17 size at the rear. They are fitted with tube type tires of size 100/90 - 19 57 S at the front and 130/80 - 17 65 S at the rear.

F 650 Motorcycle Electrics

The F 650 has a 12 volt electrical system, which supplies the following components and functions:

- Electric starter
- Headlight (low and high beams)
- Tail light and brake light
- Turn signals
- Horn
- Battery charging



The F 650s engine drives an alternator (1) with a permanent magnet rotor (2) as a source of electrical energy. This alternator has a rated output of 280 watts. The charging voltage is kept constant at 14 V + / - 0.5 V by an external voltage regulator installed under the dualseat. The motorcycle's battery has a rated capacity of 12 Amp/h. The F 650 engine's starter motor, rated at 0.9 kW, drives the crankshaft through reduction gears and a freewheel mechanism integrated into the alternator rotor.

F 650 / F 650 ST- Technical Data

Engine:	Water cooled single-cylinder 4-stroke engine with 4 valves operated by bucket tappets, double overhead camshafts and dry sump
Displacement, effective	652 cc
Power output	48 hp at 6500/min
Max, torque	57 Nm at 5200/min
Engine speeds: Max. Idle	7500 rpm 1300 $\pm$ 100 rpm
Bore / Stroke	100 mm / 83 mm
Stroke/bore ratio	0.83
Compression ratio	9.7 : 1
Fuel Grade	Super unleaded 95 (RON) 85 (MON)
Included angle between valves	20 degrees
Inlet valve diameter	36 mm
Exhaust valve diameter	31 mm
Valve timing (at zero valve clearance)	Inlet opens 17 degrees before TDC Inlet closes 45 degrees after BDC Exhaust opens 47 degrees before BDC. Exhaust closes 15 degrees after TDC.
Engine oil volume	2.1 liters
Oil filter	Micronic paper-element
Oil pump	2 trochoidal pumps
Oil circuit operating pressure	3 bar

Cooling System:	Forced circulation with centrifugal pump and thermostat control. Auxiliary electric fan.
Pump delivery rate	20 liters/min.
Thermostat valve starts to open at	75 degrees C
Auxiliary fan cut in temperature	95 degrees C
Auxiliary fan cut out temperature	90 degrees C
Pressure in cooling system (max)	1.2 bar
Coolant volume	1.2 liters
- amount in tank included in above	0.2 liter
Antifreeze mixing ratio	50:50
Frost resistance down to	-25 degrees C

Clutch:	Multi plate, in oil bath
Primary reduction ratio	1.946 : 1 / (37/72)

F650 - Technical Data

Gearbox:	Dog-clutch shift, 5 speeds, integrated into crankcase.
	Ratios:
	1st: 2.75 : 1
	2nd: 1.75 : 1
	3rd: 1.31 : 1
	4th: 1.05 : 1
	5th: 0.88 : 1

Rear wheel drive:	Endless O-ring chain, secondary reduction ratio 2.937 : 1 (16/47 teeth)
-------------------	---

Mixture Preparation:	2 Type BST 33 B316 constant depression carburetors.
Main jet:	Size: 140
Main air jet:	0.6
Jet needle:	5E04-4
Needle jet:	0-2
Throttle butterfly:	105
Idle jet:	41.3
Idle air jet:	1.5
Diameter of bypass bores:	3 x 0.8
Diameter of idle mixture outlet bores:	0.8

Alternator:	With permanent magnet rotor; 14 V, 280 W
-------------	--

Starter motor:	Permanent magnet motor, driving crankshaft through Sprag clutch & freewheel.
Rating:	0.9 kW
Reduction ratio:	1:32
Spark plugs	NGK D8 EA 0.024 - 0.028 in.
Fuses: Minifuse flat	7.5 A, 15 A, and 20 a
Bulbs: head light	H4 halogen 12 V 60/55 W
Park light	12 V 4 W
Tail / Brake light	12 V 21/5 W
Dash lights	12 V 3 W

F 650 - Technical Data

Front Brake:	Hydraulically operated single disc brake with two piston floating caliper and angular pad wear compensation.
Brake disc diameter:	300 mm
Brake disc thickness:	5 mm
Piston diameter in brake caliper:	30 / 32 mm
Master cylinder piston diameter:	13 mm
Brake pads:	Ferodo Ferit I / D 450 FF

Front Suspension:	Hydraulically damped telescopic fork.
Total travel:	170 mm
Fixed tube diameter:	41 mm
Steering lock angle:	42 degree to left and right

Rear Suspension:	Delta box swing arm, pivoting on needle roller bearings, with progressive action lever system and central spring strut.
Length of swing arm:	540 mm
Total travel at wheel:	165 mm

Wheels:	F650 / F 650 ST
Rim section:	WM (for tube tires)
Front wheel size:	21.5 x 19"MT / 2.50 x 18 MT
Rear wheel size:	3.00 x 17"MT / 3.00 x 17 MT

Tires: (tube type)	
Front tire size:	100/90x19 57 S / 100/90x8 56
Rear tire size:	130/80x17 65 S / 130/80x17 65
Tire pressures cold:	Front Rear
1 up	26.1 psi 27.6 psi
2 up	26.1 psi 36.3 psi
Tread depth	0.08 in.

F 650 Technical Data

Frame:	Single-loop box/tubular frame made from square-section steel and flat plate, with bolted on lower frame members: Engine forms a load bearing element in the frame. The upper section is the oil tank.
Steering lock angle	45 degrees
Front wheel castor with rider	F 650 4.56 in. / F 650 ST 3.94 in.
Suspension:	
Front	Telescopic fork with stabilizer
Total travel fixed tube	6.69in. 41 mm (1.61 in.)
Rear	Central spring strut actuated by pivoting lever. Spring base point and rebound-phase dampening continuously adjustable.
Total travel at wheel	F 650 6.50 in. / F 650 ST 4.72
Position of type plate	Rived to frame under the seat
Location of frame number	on right steering head.

Rear Brake:	Hydraulically operated, with single piston floating caliper.
Brake disc diameter:	240 mm
Brake disc thickness:	5 mm
Piston diameter in brake caliper:	34 mm
Master cylinder piston diameter:	11 mm
Brake pads:	Ferodo Ferit 1 / D 450 FF

Dimensions & Weights:	F 650 / F650 ST
Overall length:	2180 mm (85.8 in.) / 2160 mm (85.0 in.)
Width over handlebar ends:	880 mm (34.7 in.) / 840 mm (33.1 in.)
Height to top of windscreen:	1220 mm (48.0 in.)
Wheelbase: (normal load)	1480 mm (58.3 in.) / 1465 (57.7 in.)
Height of seat:	800 mm (31.5 in.) / 785 mm (30.9 in.)
Ground clearance: (normal load)	180 mm (7.09 in.) / 155 mm (6.10 in.)
Unladen weight, ready for road (tank full):	191 kg (421 lb.)
Gross weight limit:	371 kg (818 lb.)
Turning circle	14 ft. 9 in.
Performance:	with 35 kW engine: 163 km/h
Acceleration, 0 - 100 km/h	6.2 s (8.2 s)
Average fuel consumption (ISO test) - at constant 90 / 120 km/h:	3.8 l (3.8 l) / 5.3 l (6.3 l)

F 650 Technical Data

Top speed:	
Rider crouched	104 mph
Two up	95 mph
Fuel tank capacity	4.62 gal.
Reserve	0.53 gal.
Fuel consumption per ISO 7118	
At steady 56 mph	62 mpg
At steady 75 mph	44 mpg
Engine Oil:	Brand-name HE oil, API classification SF, SG or SH; the suffixes CD or CE are permitted; or brand-name HD of CCMC classification G4 or G5; the suffix PD2 is permitted.
Engine oil content with filter	4 qt. 2.97
Maximum oil consumption	0.1 l per 62 mi.
Battery post grease	BMW Lube #10
Telescopic fork oil	BMW fork oil
Oil change <i>fork</i>	0.63 qt. <i>600 cc. 650 wasp</i>
Brake fluid	DOT 4
Engine coolant	1.06 qt. Main tank
Nitrite-free	0.21 qt. Expansion tank

BMW NA Motorcycle Group

Maintenance Schedule

F 650 / ST



Customer Name	Serial Number / Mileage	BMW Pre-delivery check
Repair Order Number	Mechanic Signature	
Inspect crates on receipt for signs of damage		☐
Motorcycle: - unpack / complete QEW fax if needed for missing items / damage - check scope of delivery - install front wheel - complete - clean		☐
Battery: - remove - add battery acid - charge - grease the terminal posts - re-install (mark date)		☐
Check complete specification delivery: - tools - handbooks and documents (including warranty information) - keys - optional extras		☐
Check tire pressure - Set at ____ PSI Front ____ PSI Rear		☐
Fuel the motorcycle full tank of fuel for customer delivery)		☐
Safety/operating check as final inspection: - idle speed - clutch, gear shifting - steering - front and rear brakes - telltale and warning lights, instruments, lighting and signalling equipment - adjust the headlight - test ride, visual quality check		☐

BMW NA Motorcycle Group Maintenance Schedule F 650 / ST



Customer Name	Serial Number / Mileage	BMW Inspection 600 Miles	BMW Service 6,000 Miles	BMW Inspection 12,000 Miles	BMW Annual Service
Repair Order Number / Date	Mechanic Signature				
Flat rate unit	F 650	35	39	45	18
Change engine oil when engine is warm, renew oil filter element ¹⁾		☐	☐	☐	☐
Clean oil filter in oil tank		☐	☐	☐	
Change oil in telescopic fork				☐	
Check coolant, top up if necessary ³⁾		☐	☐	☐	
Change coolant (every two years)					☐
Adjust valve clearance		☐	☐	☐	
Renew spark plugs			☐	☐	
Clean intake air filter ²⁾			☐	☐	
Clean fuel tap			☐	☐	
Check clutch clearance, adjust if necessary		☐	☐	☐	
Grease rear brake pedal			☐	☐	
Check spoke tension, retighten if necessary ⁴⁾		☐	☐	☐	
Check brake pads and discs for wear, renew if necessary ³⁾			☐	☐	
Check brake calipers, connections and lines of brake system with regard to function, leaks, damage and correct position; repair/renew as required ³⁾			☐	☐	
Check front/rear brake fluid level, top up if necessary ³⁾					
Change brake fluid ⁴⁾					☐
Check wheel bearings, renew if necessary ³⁾				☐	
Check chain, sprocket and pinion, renew if necessary ^{3) 4)}			☐	☐	
Check chain tension, adjust if necessary ³⁾		☐	☐	☐	
Check battery acid level, top up with distilled water, if necessary ^{3) 4)}					☐
Clean and grease battery terminals					☐
Check steering bearing, adjust ³⁾ , renew if necessary ³⁾		☐	☐	☐	
Grease side support, center stand			☐	☐	
Check tightness of nuts and bolts securing engine, frame, exhaust, swinging fork pivot, suspension linkages and front/rear axles		☐	☐	☐	
Check CO-value, adjust if necessary ⁵⁾		☐	☐	☐	
Check idle speed, adjust if necessary		☐	☐	☐	
Final inspection together with checking road traffic/functional safety:					
- clutch, gear shifting		☐	☐	☐	☐
- steering					
- front and rear brakes					
- condition of tires and wheels, tire pressure					
- lighting and signalling equipment, telltale, warning lights and instruments					
- test ride, visual quality check					

¹⁾ for short-distance driving or outside temperatures below 0 °C every three months, every 1,800 miles at the latest
²⁾ under conditions of heavy dirt or dust exposure, clean air intake filter every 6,000 miles, inspect every 1,800 miles
³⁾ invoiced as a separate item
⁴⁾ more often for extreme off-road use
⁵⁾ motorcycles with open loop catalysts

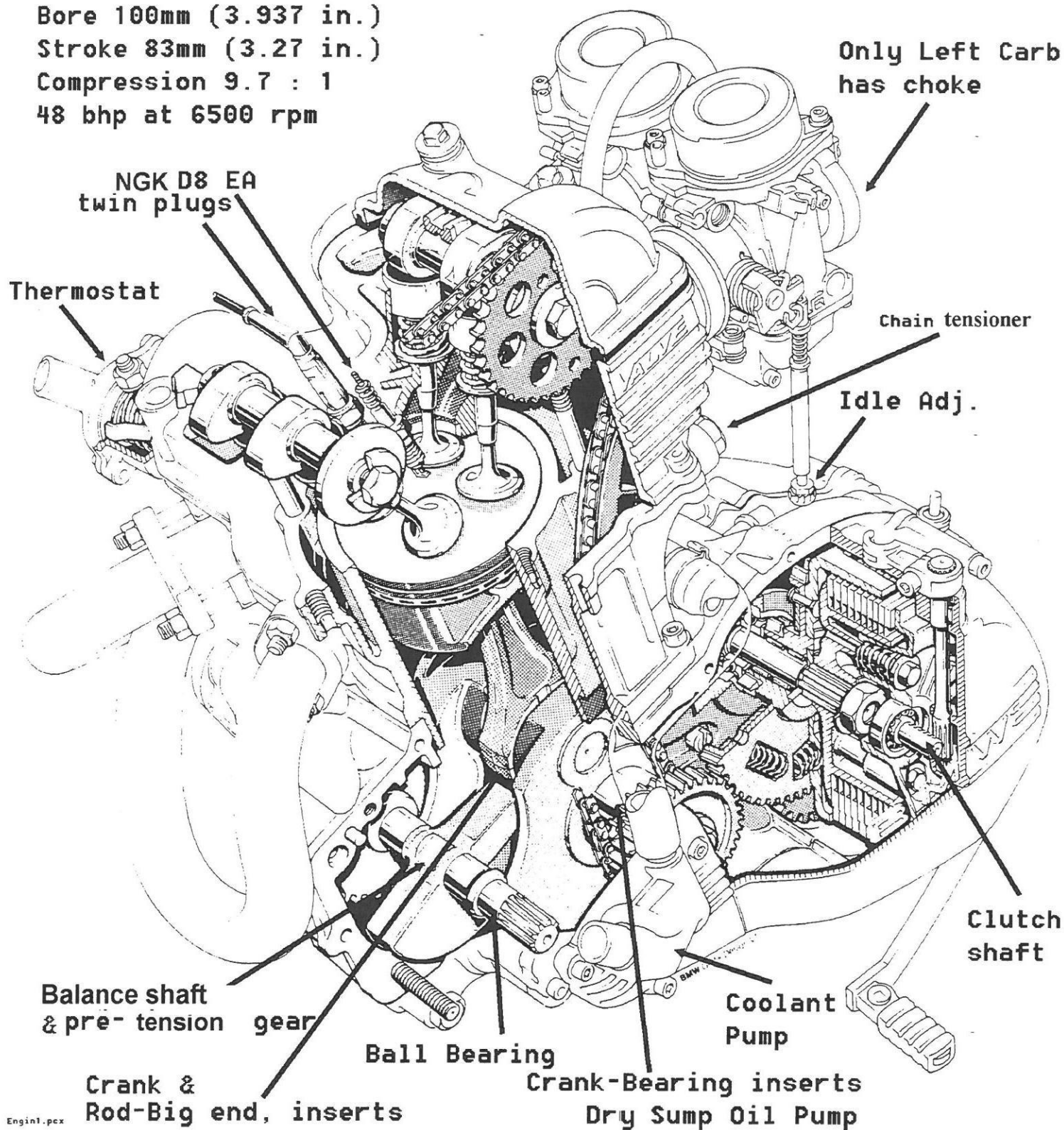
F 650 Engine (A)

Bore 100mm (3.937 in.)

Stroke 83mm (3.27 in.)

Compression 9.7 : 1

48 bhp at 6500 rpm



F 650 Engine (B)



180 Nm (130 Ft. lb.)
use Loctite 242 on

180 Nm (130 Ft. lb.)
use Loctite 242 on
threads and crank taper

18 coil AC generator

Starter clutch

180 Nm (130 Ft. lb.)
use Loctite 242

Throw out bearing

Shift shaft

Tachometer
drive gear

Front sprocket - 16 tooth
Metal and rubber to reduce
noise

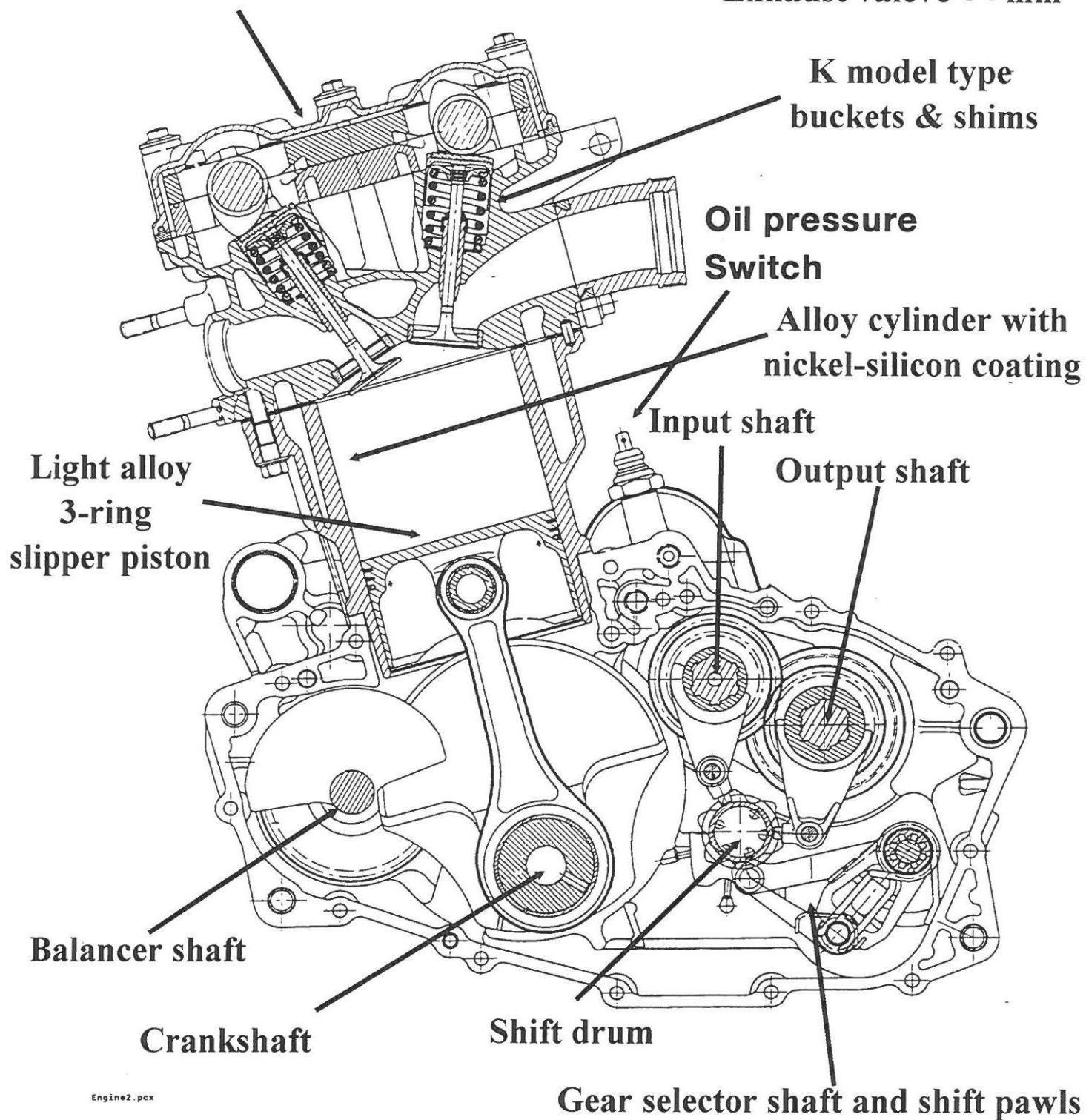
F 650 Engine (c)

Two peice camshaft,
plain bearing support

Valve angle = 20 degrees

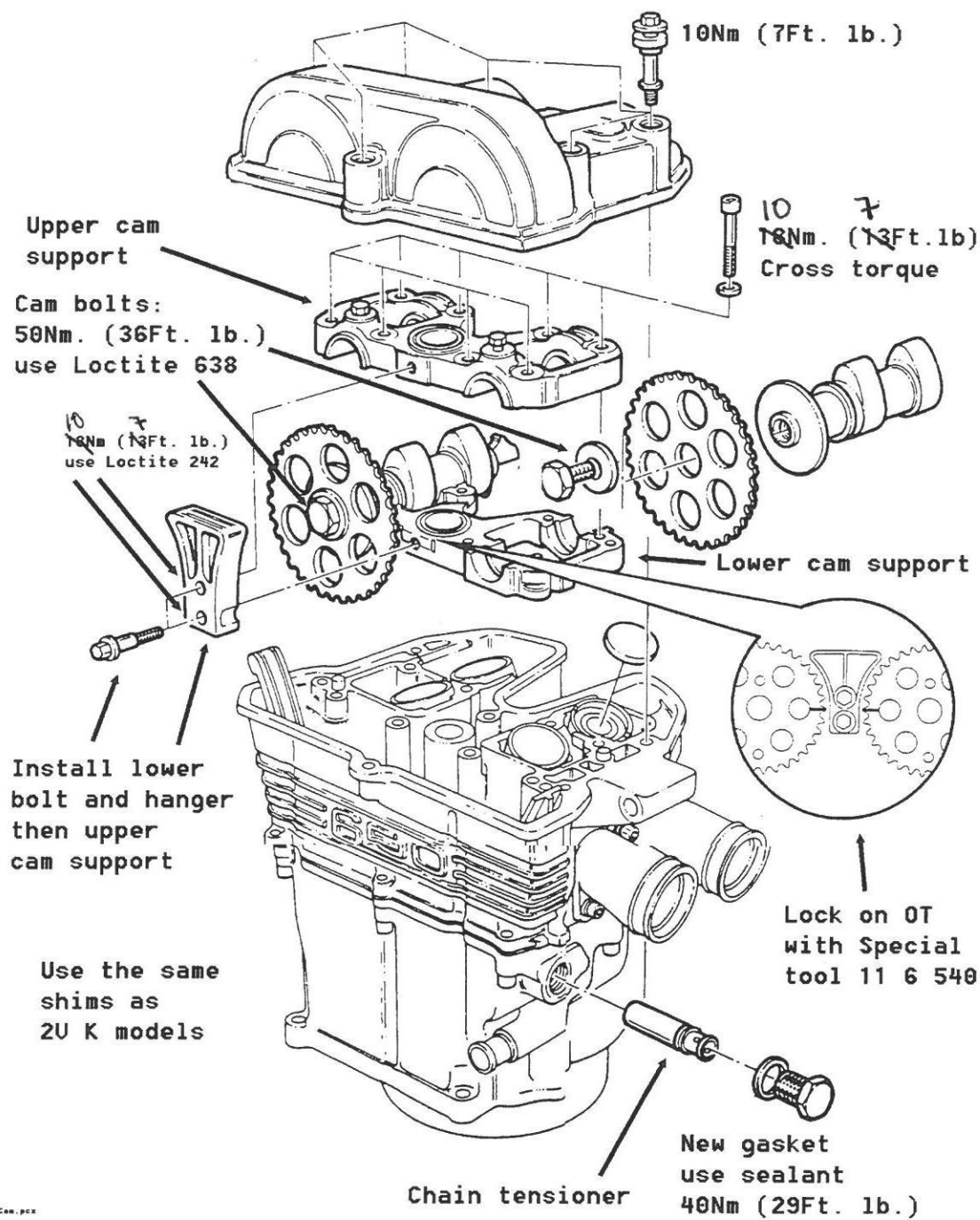
Intake valve 36 mm

Exhaust valeve 31 mm



F 650 Engine (D)

F 650 Camshafts with Decompression



F 650 Piston & Cylinder

Piston clearance:
 0.024-0.040 mm
 (0.0009-0.0015 In.)

Piston wear limit:
 0.1 mm (0.0039 In.)

Special tool:
 90 88 6 116 510

A piston 99.94 mm
 B piston 99.95 mm
 New piston can install
 either direction

Reinstall as it was
 for matched wear patterns

22 mm (0.866 In.)

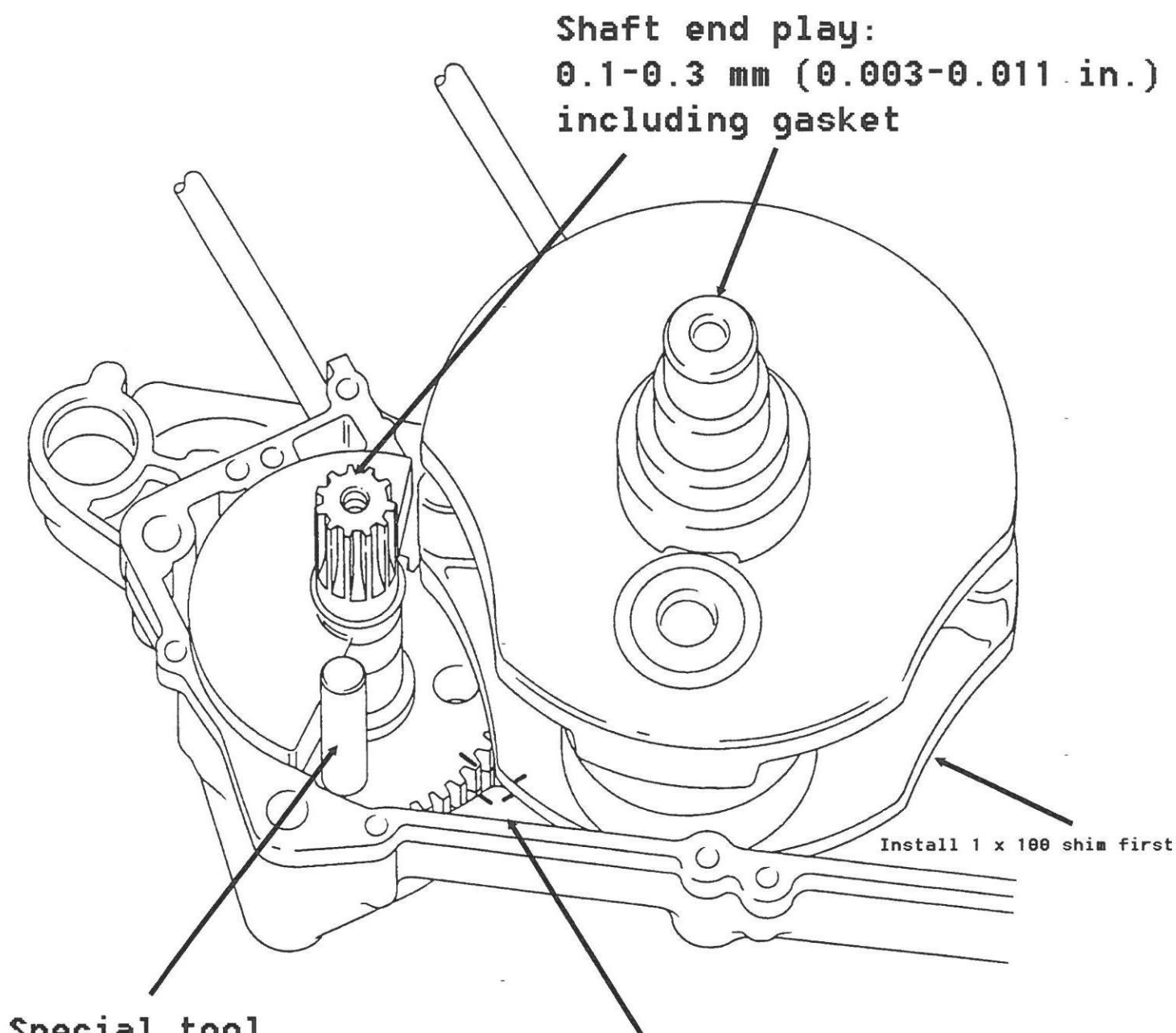
Oil

Circlip installs
 opening down
 Special tool
 90 88 6 116 980

10 Nm (7 Ft. lb.)

Install gasket dry
 (paper)

F 650 Crankshaft/Balance Shaft



Assembly marks crankshaft,
balance shaft, & housing

Choice of 4 shims to set end play:

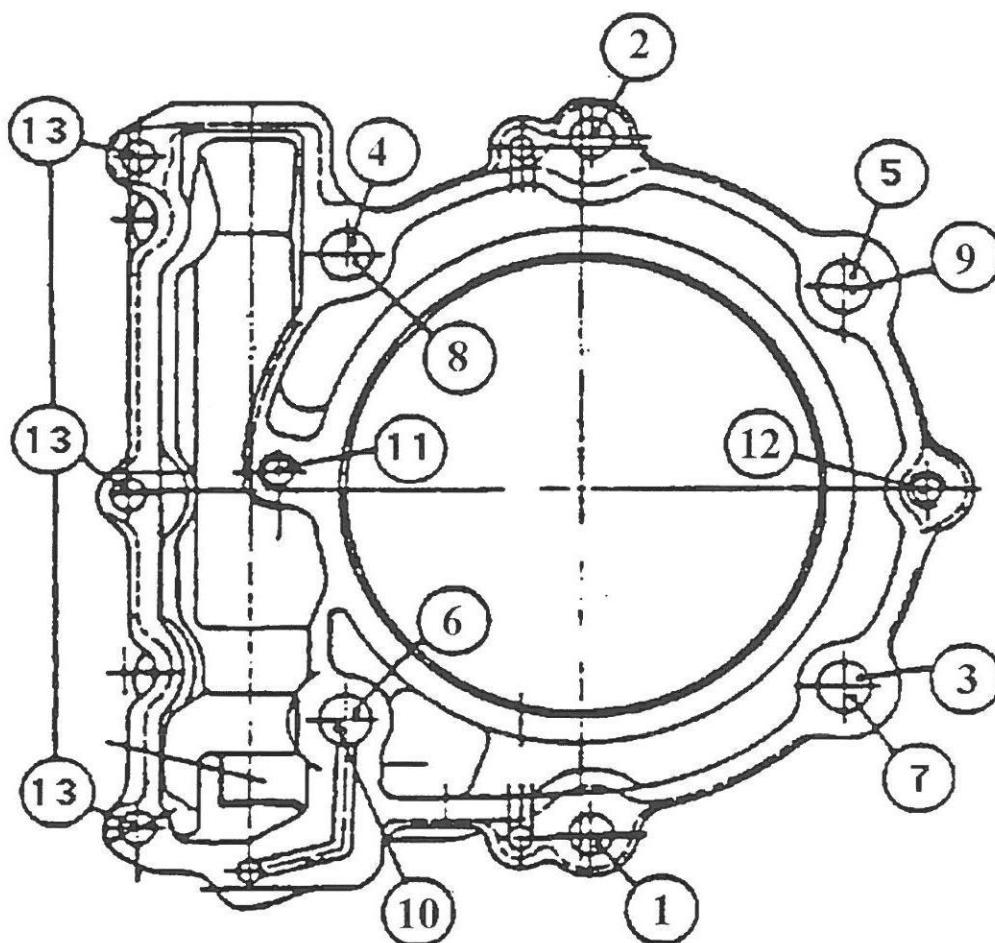
1.00 mm

1.25 mm

1.50 mm

1.75 mm

F 650 Cylinder Head Torque and Torque Pattern



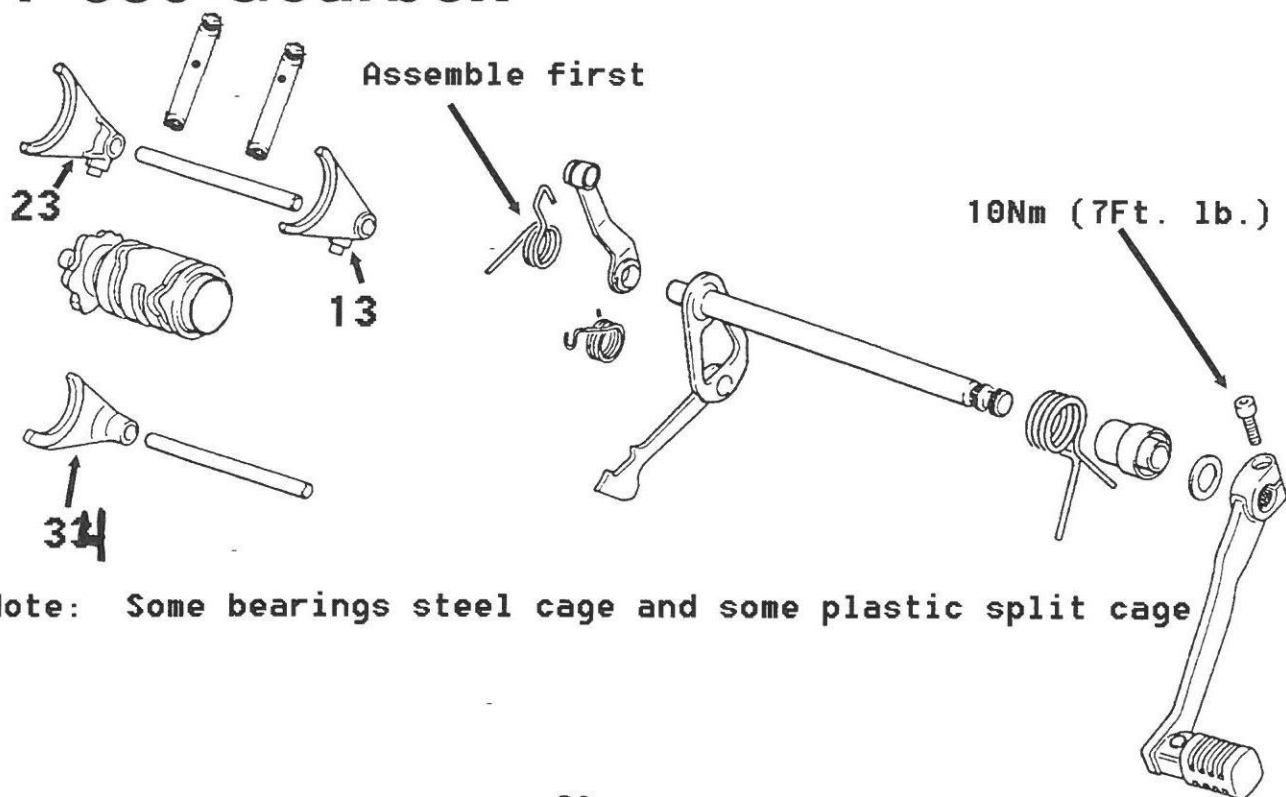
Assemble finger tight, then follow the chart below for torquing the head.

Torque order	Nut/bolt size	Newton-meter	Foot pounds
1	M8	28	20
2	M8	28	20
3	M10	20	14
4	M10	20	14
5	M10	20	14
6	M10	20	14
7	M10	50	36
8	M10	50	36
9	M10	50	36
10	M10	50	36
11	M8	28	20
12	M8	28	20
13 (3x)	M6	10	7
14	M8	28	20
15	M8	28	20
16	M8	28	20

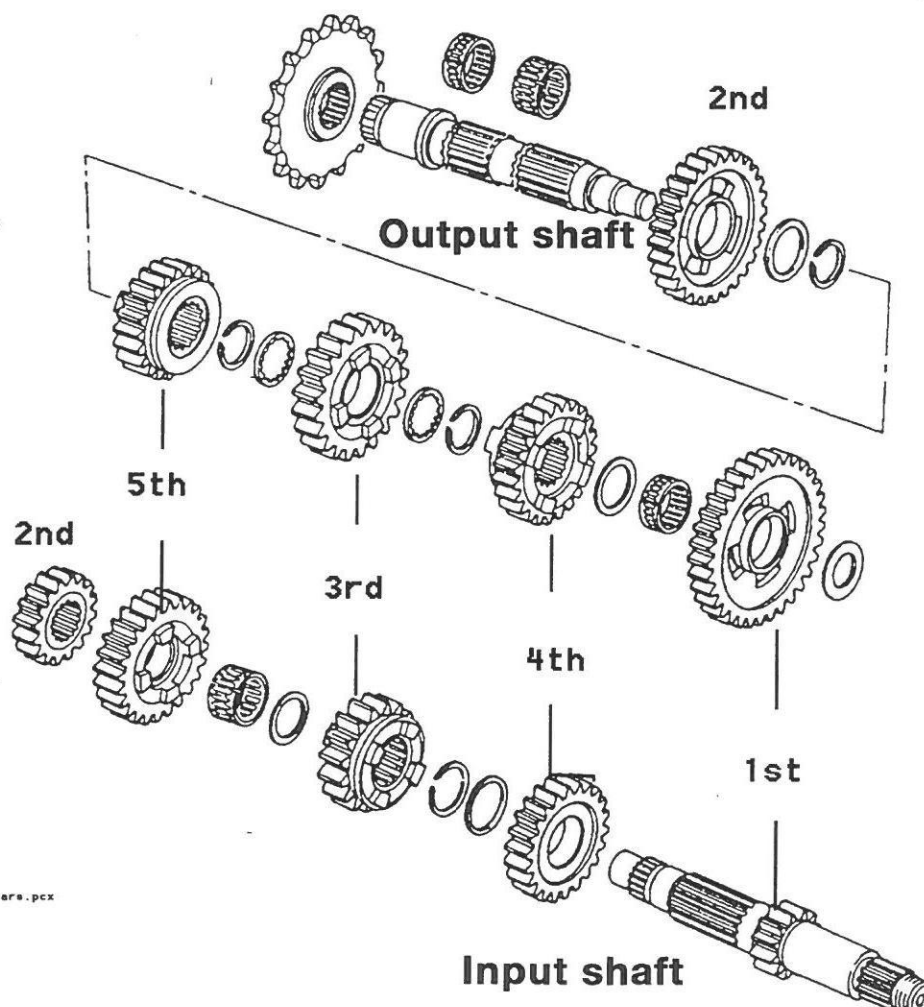
f650ht

This supersedes Repair Manual

F 650 Gearbox



Note: Some bearings steel cage and some plastic split cage



F 650 Alternator

14V 280W

Permanent Magnet A/C Generator

Crankshaft driven

AC output: Max. 100V
@ 3,000 rpm 60-80V

Tests-phase to phase
(12 coils) 0.6 ohm

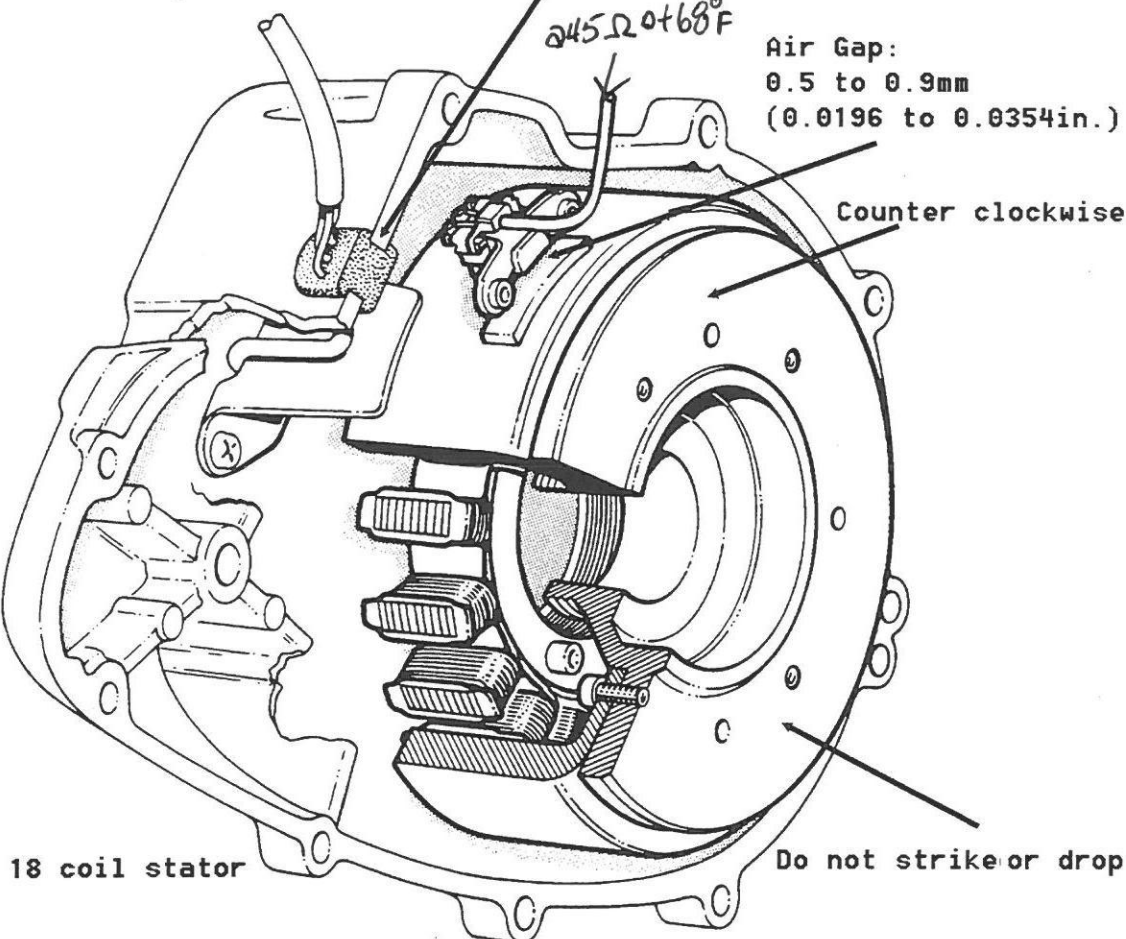
Phase to ground
0 ohm

Use sealant

$245\Omega \pm 68^\circ F$

Air Gap:
0.5 to 0.9mm
(0.0196 to 0.0354in.)

Counter clockwise



18 coil stator

Do not strike or drop

Ign. Sensor Tests:

Starter rpm (280-300) 0.1V AC

@ 1,300 0.3V

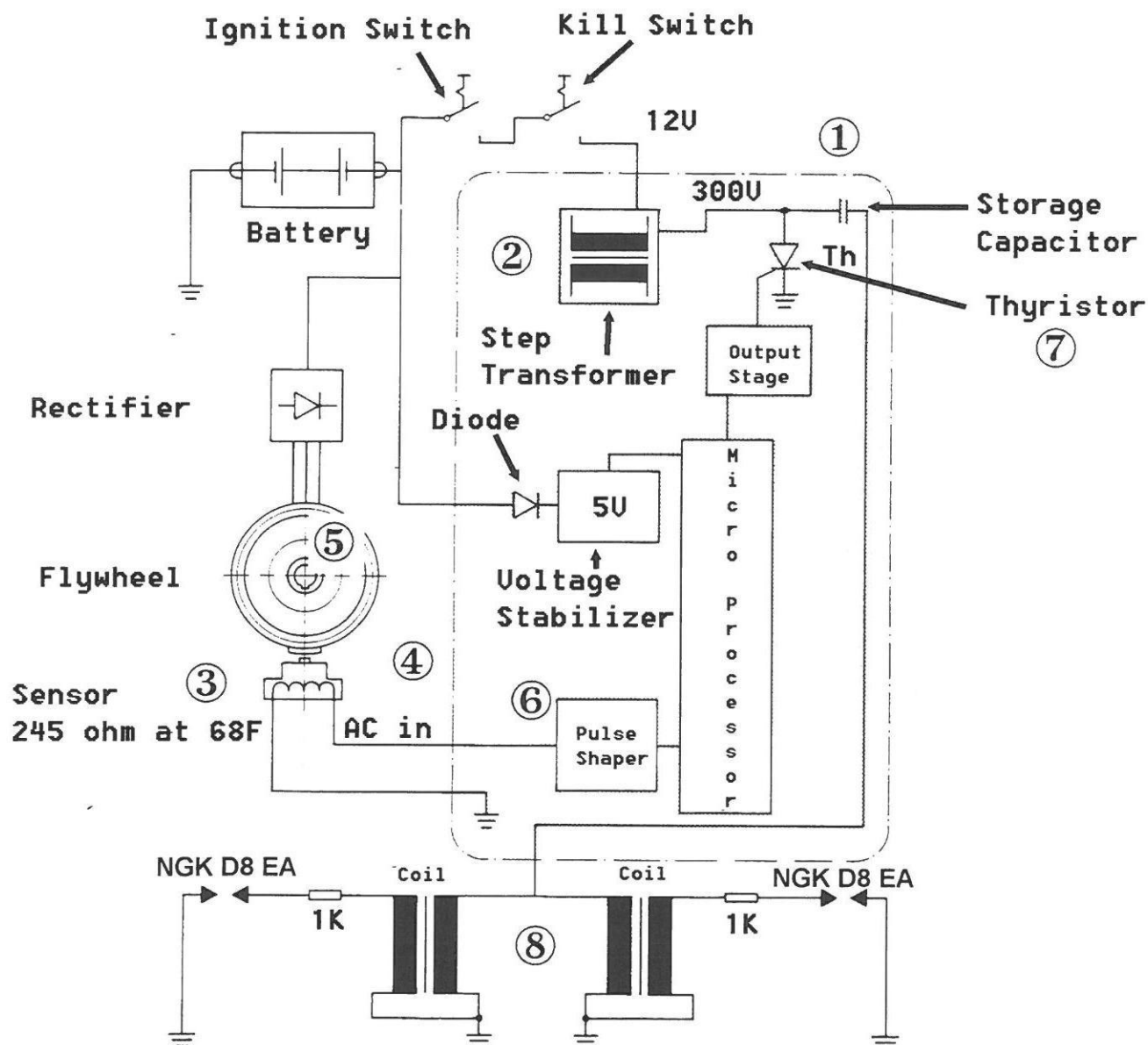
@ 6,000 1.0V

Caution-If electric welding

Caution-avoid high rpm unloaded

alter.pca

F 650 Ignition System



Coil:
Primary 0.3 ohm
Secondary 9K

25K to 30K Volts
at the plugs

Engine timing:
10 to 27 degrees

F 650 Ignition Notes

The control unit reduces the timing at 4000 rpm to reduce noise (80 DB noise law in Europe)

Do not crank starter for more than 5 seconds at a time, allow the crank to come to a full stop. (safety built into Ignition Control Unit)

Open loop Cat and SAS System

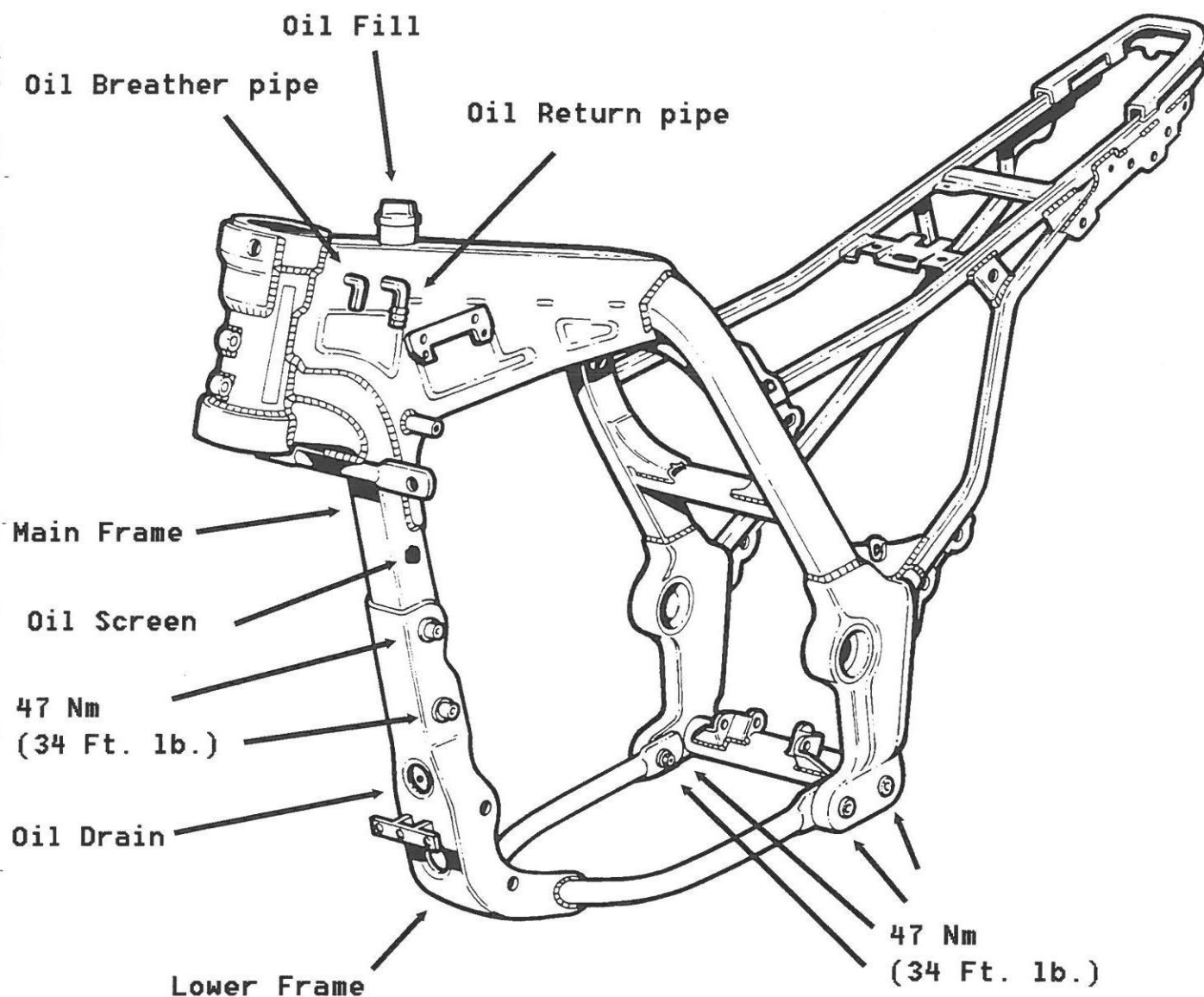
Charcoal canister

CO can be adjusted-disconnect SAS, use down stream tap

Idle speed 1300 rpm-below noise from camshaft decompression

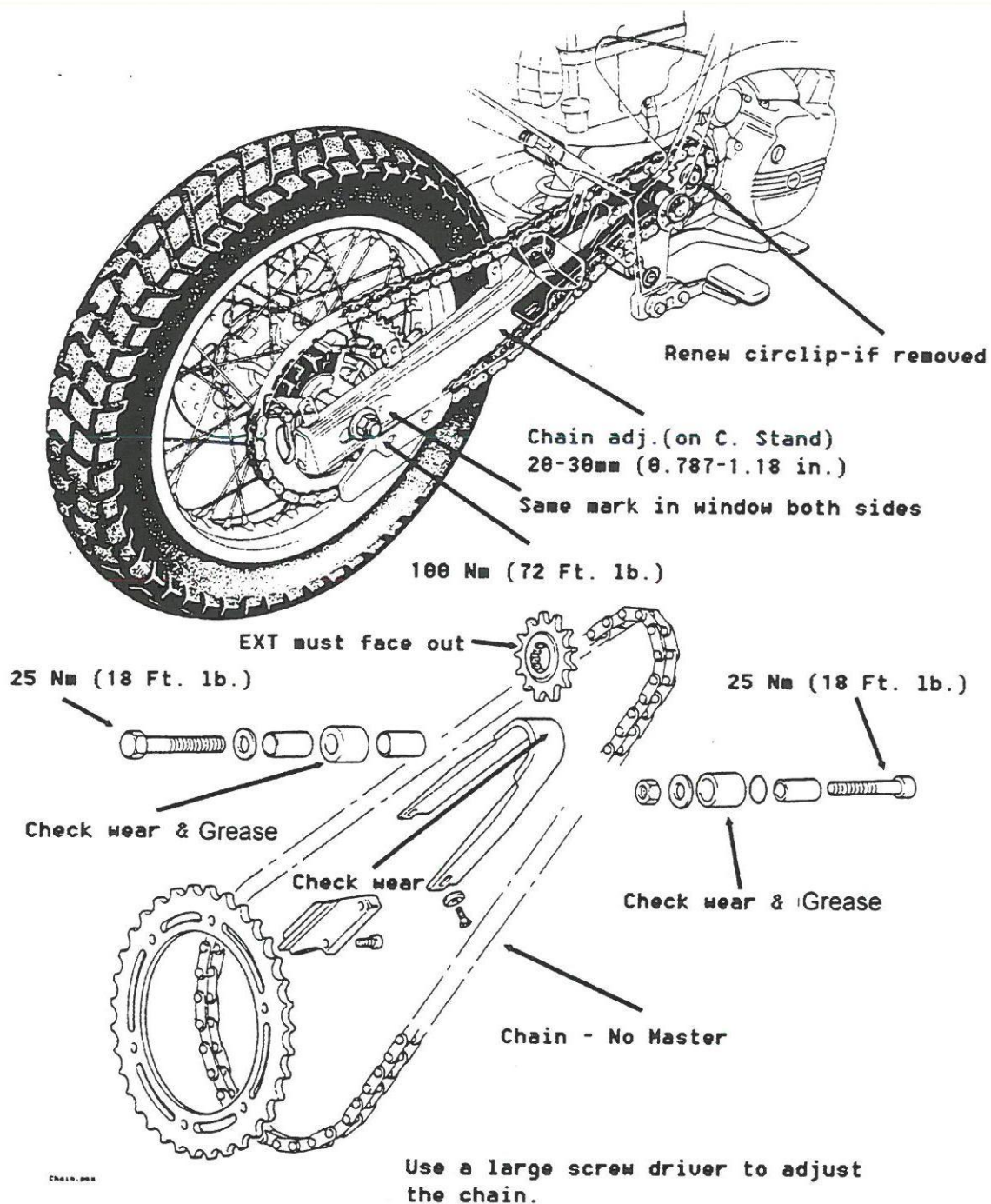
F 650 Frame

Oil Tank Capacity:
1.5 L (1.58 qt.)

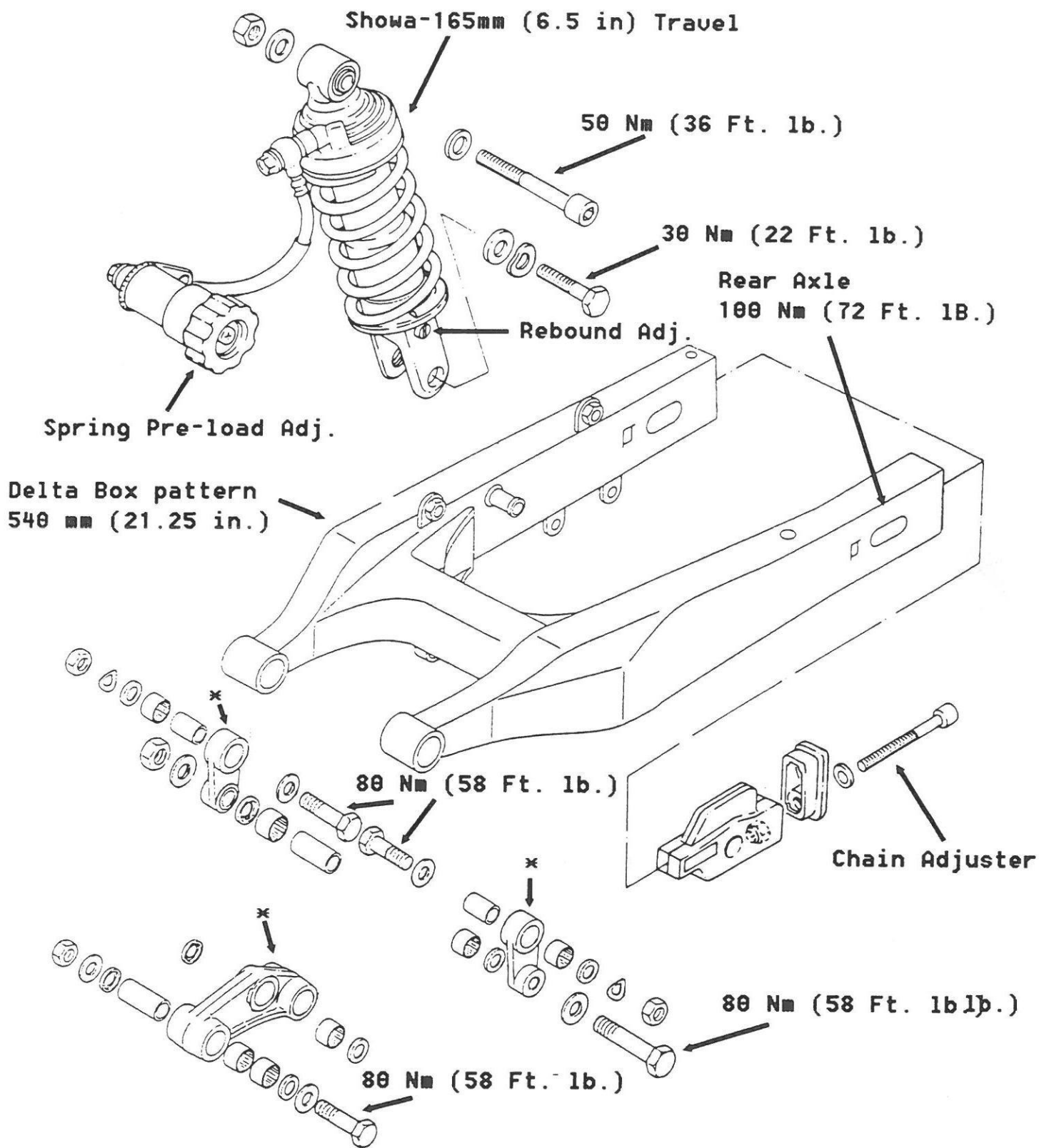


Frame is ST54 Steel
Do NOT straighten frames.

F 650 Rear Drive System



F 650 Rear Swing Arm

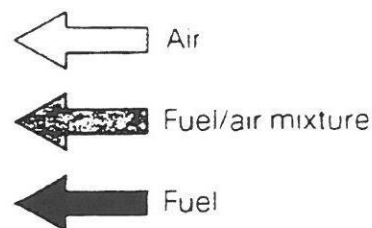
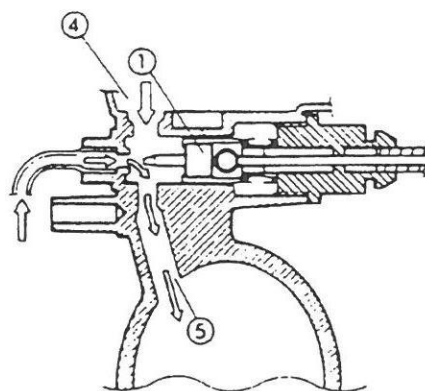
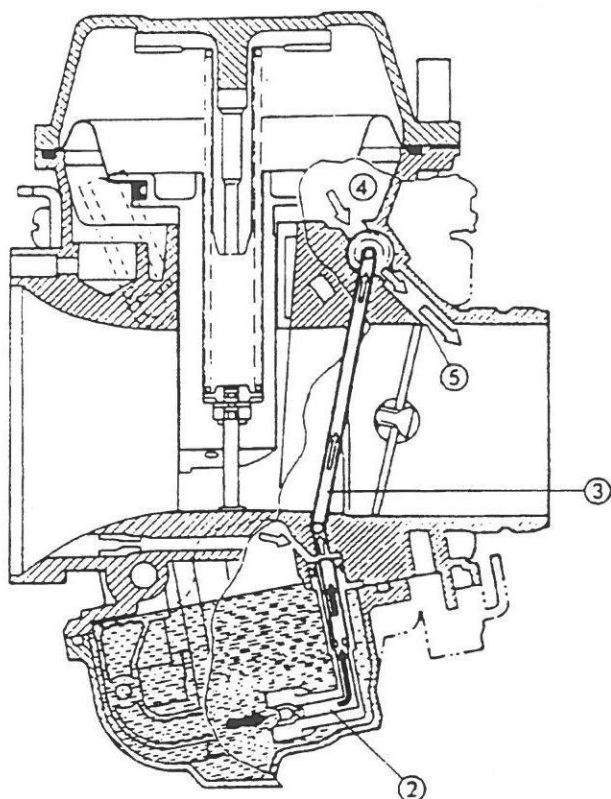


Swing.pcx

* Lowering Kit

F 650 BST Carburetor (Cold Start System)

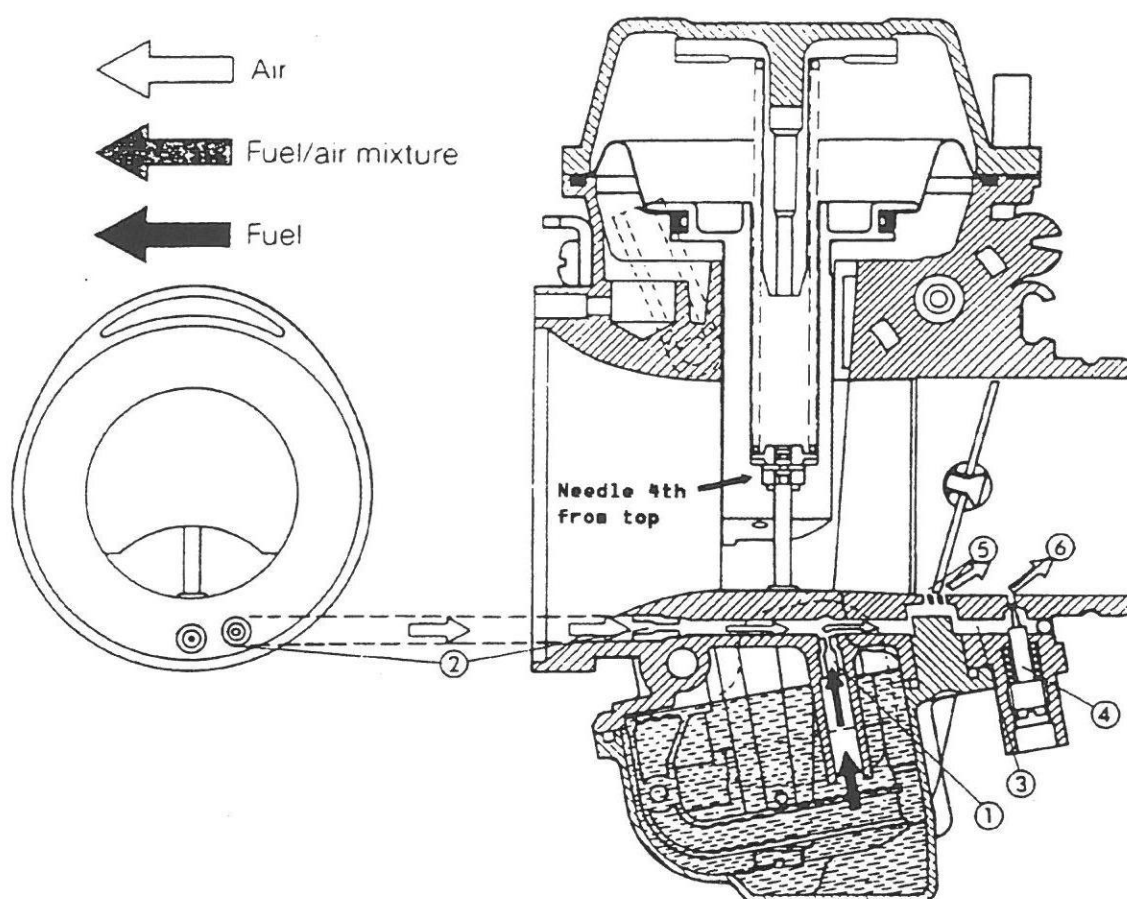
When the plunger (1) of the starting mechanism is pulled up by the choke cable, fuel reaches the starting system from the float chamber. The amount of fuel is determined by the starting fuel jet (2). This fuel is pre-atomized with air from the float chamber, passes into the starting fuel tube (3) and from there reaches the starting plunger. At this time it is mixed with additional air from the space (4) from under the throttle slide diaphragm, to produce the rich fuel-air mixture needed to start a cold engine. This mixture passes through the discharge passage (5) into the carburetor barrel.



- ① Plunger
- ② Starting Fuel Jet
- ③ Starting Fuel Tube
- ④ Space
- ⑤ Discharge Passage

F 650 BST 33 Constant-depression Carburetor (Idle and bypass system)

The idle/bypass system produces the necessary fuel-air mixture when the throttle butterfly is closed or only slightly open. Fuel is metered into the system by the idle jet (1) and mixed with the metered supply of air from the idle air jet (2). The resulting fuel-air mixture passes through the idle mixture passage (3) to the idle mixture regulating screw (4). Part of the idle mixture then flows through the bypass passage (5) into the barrel of the carburetor. The remainder of the idle mixture is metered through the idle mixture regulating screw before also passing through a passage as the final regulated fuel-air mixture.



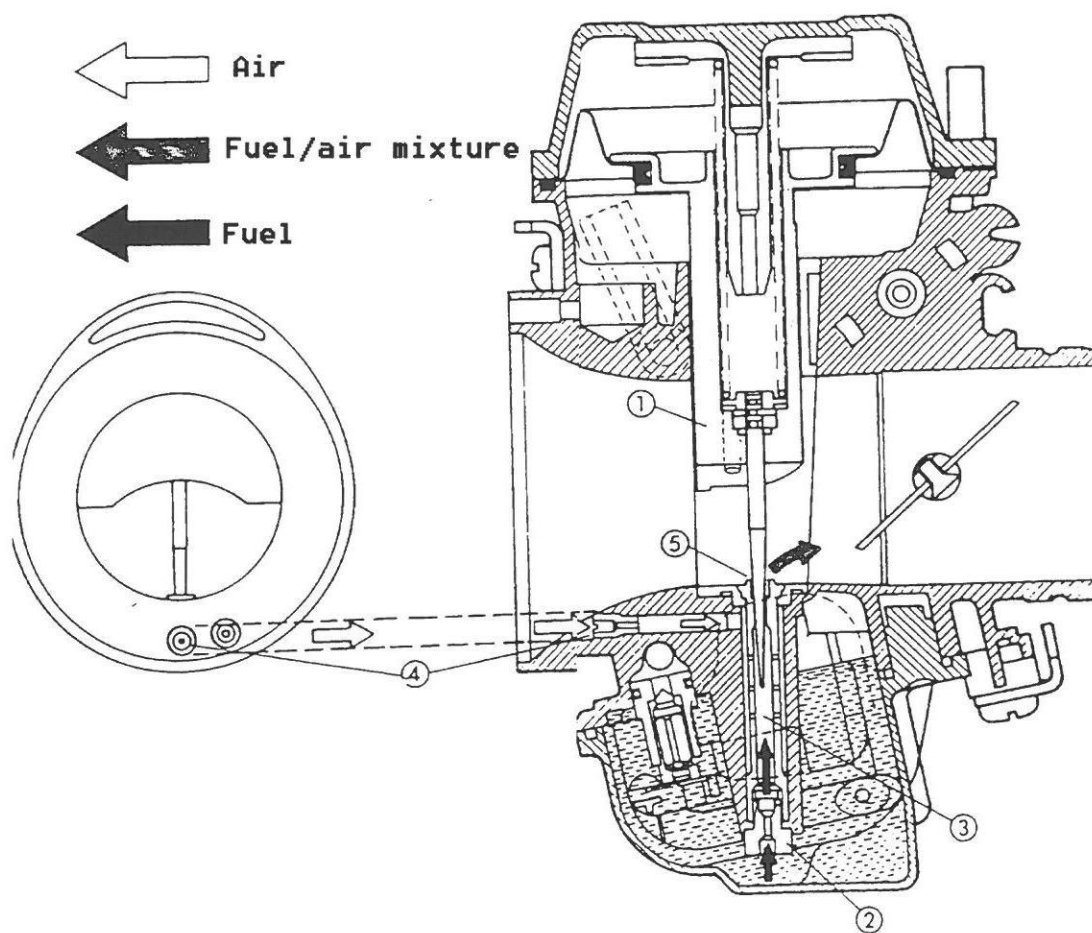
- ① Idle jet
- ② Idle air jet
- ③ Idle mixture passage
- ④ Mixture regulating screw
- ⑤ Bypass passages
- ⑥ Regulated mixture

Mixture regulating screw basic setting:
 right carburetor 3-4 turns out
 left carburetor 2-3 turns out
 perform CO adjustments on the left carb.
 CO value 2.5% -0.5

F 650 BST Carburetor

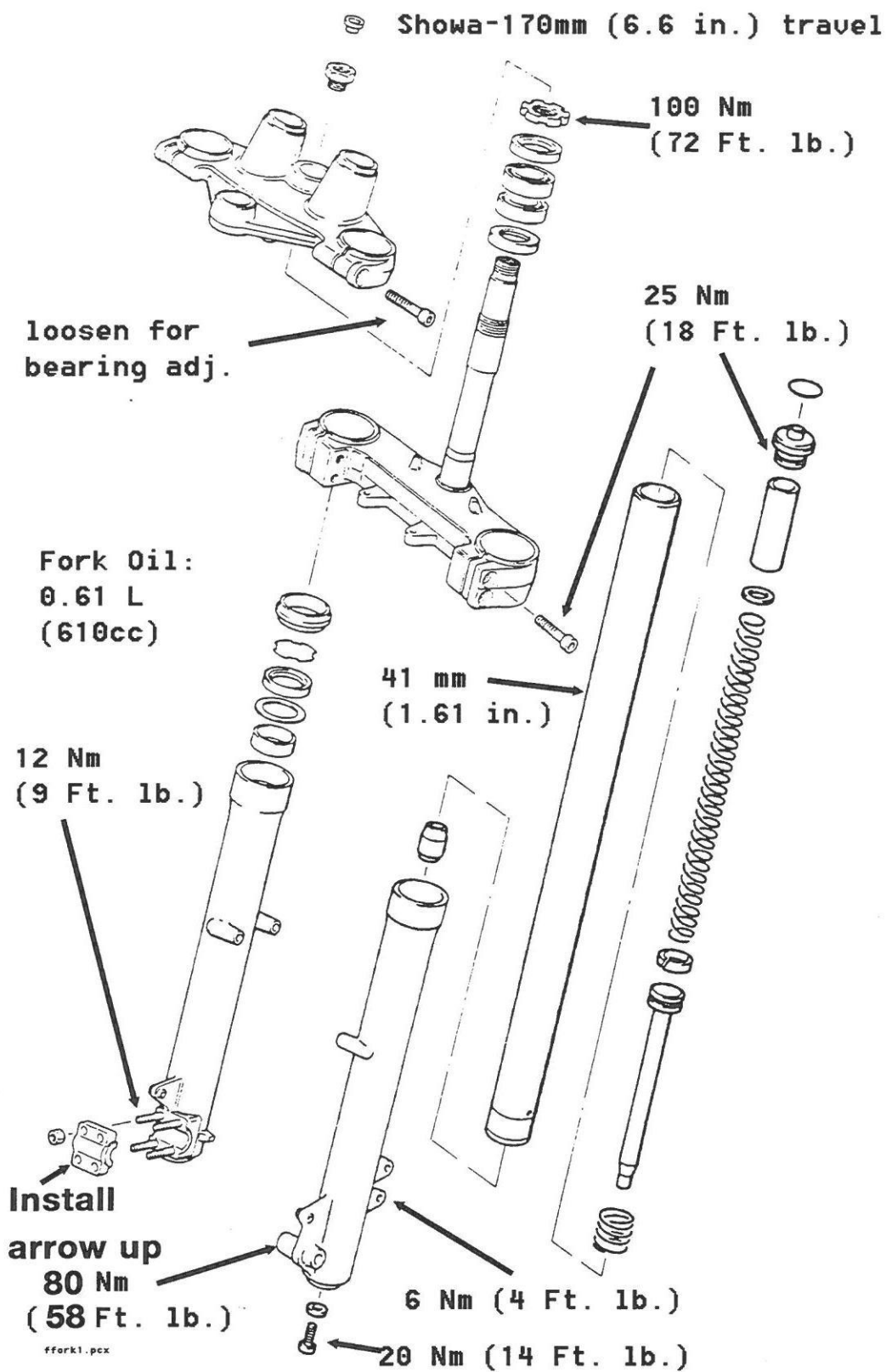
When the throttle butterfly is opened, engine speed increases and with it the vacuum in the barrel of the carburetor. This has the effect of lifting the throttle slide (1). Fuel is then metered through the main jet (2) and supplied to the jet needle (3), where it is mixed with air metered in through the main air jet (4). This atomized volume of mostly fuel & some air emerges from the needle jet through the ring shaped gap (5) opened up by the rising jet needle, and mixes with the large air-flow in the carburetor barrel.

In the part-load operating range, the ring-shaped gap between the needle jet and its jet needle determines the amount of fuel metered into the intake air flow. At full throttle the amount of fuel is determined mostly by the main jet; after $\frac{3}{4}$ throttle the jet needle does not influence the fuel.



- ① Throttle Slide
- ② Main Jet
- ③ Needle Jet
- ④ Main Air Jet
- ⑤ Tapered Gap

F 650 Front Suspension



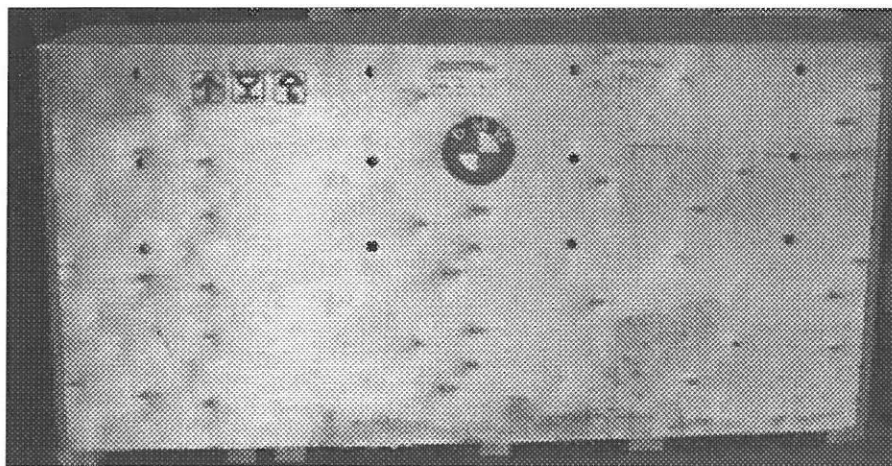


F 650 / F 650 ST

Uncrating
Pre-Delivery Inspection (PDI)

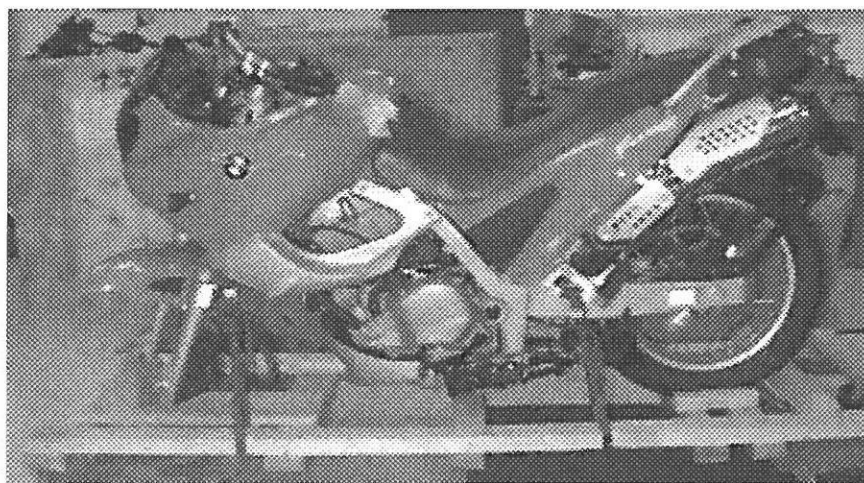
BMW Motorcycle Service
N-U-X-1 8/96

F 650 Uncrating \ Setup



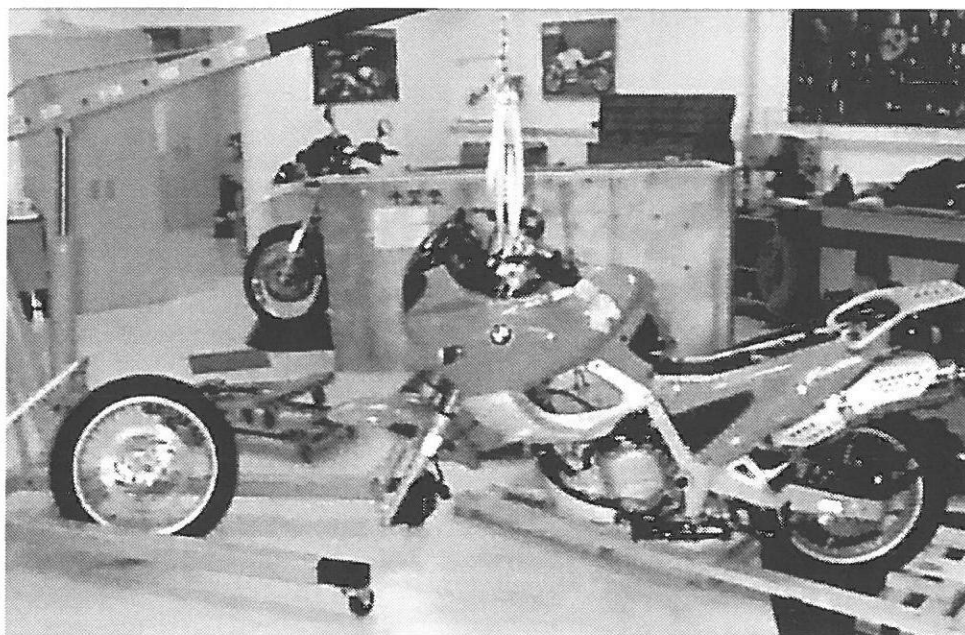
The crate is wood all around with metal corners. Write a work order for uncrating and set up. Inspect the crate for damage. If damaged, note the same on the truckers bill of lading, and notify the trucking co. in writing. Remove the paperwork from the end of the crate, in the package you will find the Quality Early Warning fax form (QEW). This is used to report damage and missing parts to BMW NA. Start a vehicle file. Place a copy of the work order and the paperwork from the end of the crate in the vehicle file. ~~Record the key code in the vehicle file.~~

Remove the top of the crate and inspect the condition of the bike. Remove the front wheel and the enclosed packaging containing the mirrors and bar end weight. Remove the end of the crate facing the front end of the bike. Spread the remainder of the crate like a clam shell, prying the crate sides away from the base of the crate. If parts are missing - complete the QEW fax form and sent it to your Dealer Service Specialist. Fax number (201) 307 9360. *add screws in tool kit*

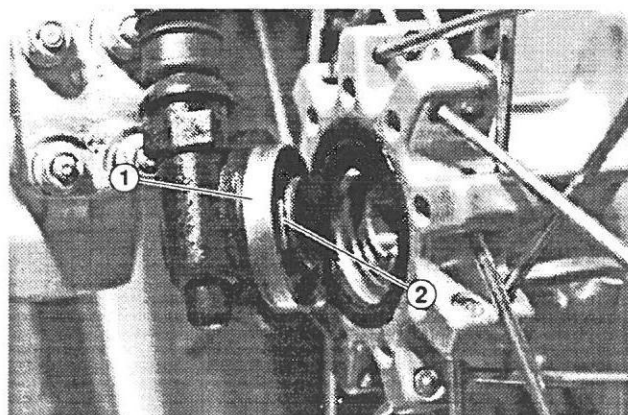


The bike comes with the front wheel off, strapped in with four straps.

F 650 Uncrating \ Setup



Use a lift to secure the bike and remove the 4 hold-down straps. The handle bars are tight, no work required. Clean the front disk and install the front wheel. The front wheel goes in without removing the brake caliper.



Each time the front wheel is removed grease the axle and the contact surface of the sealing ring (1) and the speedometer drive (2) with Lube #10. Part Number 07 55 1 467 614.

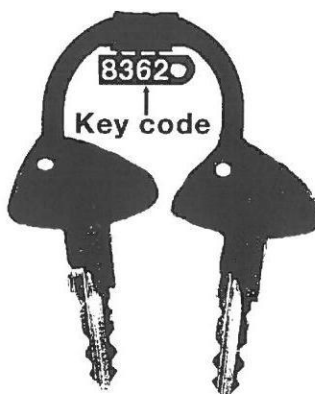
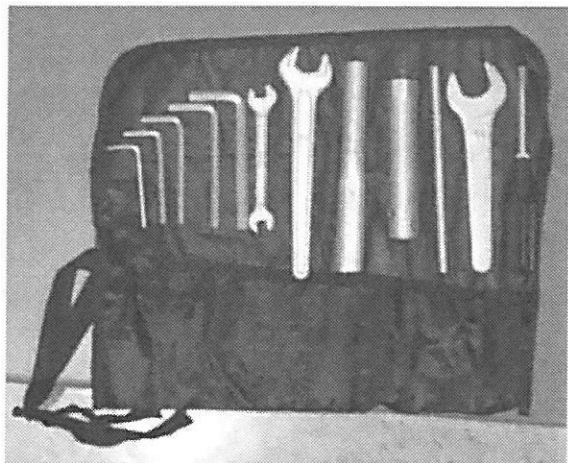
Torque: Axle 80 Nm (58 Ft. lb.) Clamping nuts (arrow up on clamp) 12 Nm (7 Ft. lb.)



Install both mirrors and the right side bar end weight.

Bar weight torque: 10 Nm (7 Ft. lb.)

F 650 Uncrating \ Setup



Check the completeness of the tool kit. Ensure the Riders Manual and Service and Technical booklet are present with the bike. The Consumers Warranty Information booklet comes in the packet on the end of the crate, place this with the other manuals. The bike comes with two keys, separate the keys and record the key code in the vehicle file.

Clean the motorcycle and do the Pre-Delivery Check. Record this service on the PDI sheet (MCS-072). Fill in the information on the inside cover of the Service and Technical booklet. Rubber stamp and sign the PDI check list box on page 8.

Pre-Delivery Inspection (PDI)



- Remove the left battery panel (two allen bolts) to gain access to remove the battery. Disconnect the positive and negative battery connections.
- Remove one 6 mm hex nut on the battery bracket.
- Remove the battery and fill to max. mark with acid.
- Allow to stand for 4 hours, then charge at 10% of the capacity the battery. (AH).

- Top off with distilled water to max. mark.

Pre-Delivery Inspection (PDI)

- Punch the date on the battery.
- Reinstall the battery. (Coat terminals with Lube #10).
- Set the clock.

- Check the tire pressure:

	One up		Two Up
Front	26.1 psi (1.8 bar)	Front	26.1 (1.8 bar)
Rear	27.6 psi (1.9 bar)	Rear	36.3 (2.5 bar)

- Fill the fuel tank with fuel.

Note: When starting do not hold the start button for over 5 seconds, allow the crankshaft to come to a full stop between starts.

Check the operation of the following:

- Idle speed (1300 +100)
- Clutch, gear shifting
- Steering
- Front and rear brakes
- Tail light, stop light, and turn signals
- Adjust the headlight
- Test ride (14 - 16 miles)

F 650 Delivery

Using the riders and technical manuals for assistance go over the following with the customer.

- Side stand does not pop up automatically
- When the side stand is down the engine will not start
- Before checking the engine oil, the engine must be off for 15 minutes
- Show how to remove and install the seat
- Show where the tool kit is stowed
- Go over - controls and dash lights
- Go over - running in (break in) operation
- Go over - operation of starting with the choke (do not crank for more than 5 seconds without letting the crankshaft come to a full stop)
- Go over - not warming up at a stand still
- Ensure the customer inspects the fit and finish of the motorcycle

BMW NA Motorcycle Group Maintenance Schedule F 650 / ST



Customer Name	Serial Number / Mileage	BMW Pre-delivery check
Repair Order Number	Mechanic Signature	
Inspect crates on receipt for signs of damage		☐
Motorcycle: - unpack / complete GEW fax if needed for missing items / damage - check scope of delivery - install front wheel - complete - clean		☐
Battery: - remove - add battery acid - charge - grease the terminal posts - re-install (mark date)		☐
Check complete specification delivery: - tools - handbooks and documents (including warranty information) - keys - optional extras		☐
Check tire pressure - Set at ____ PSI Front ____ PSI Rear		☐
Fuel the motorcycle full tank of fuel for customer delivery)		☐
Safety/operating check as final inspection: - idle speed - clutch, gear shifting - steering - front and rear brakes - telltale and warning lights, instruments, lighting and signalling equipment - adjust the headlight - test ride, visual quality check		☐

F 650 Engine Disassembly Order

(Engine out of bike,)

Rocker cover

Engine on OT

Starter motor

Water Pump cover with hose attached

Crankcase button

Remove chain tensioner

Install crank pin 116 570

Remove chain support

Remove 8 - 6mm x 45 bolts in cam support plate

Remove top cam support plate

Remove cams (do not break torque on cam bolts)

Remove lower cam support

Remove front chain guide rail

Remove head nuts (4 - 8 mm nuts)

Remove 3 upside down 6 mm bolts (6 mm x 30)

Remove 4 hex bolts (2 up, 2 down)

Remove cylinder base bolts 6 mm

Remove cylinder and piston

Flip engine to alternator side

Remove Circlip & sprocket (Note: later engine has nut)

Remove O-ring

Remove alternator cover (tool 12 5 500)

Remove thrust washer and spacer for shaft (page 11.32)

Remove double gear and large washer together

Remove gasket

Remove ignition sensor

Remove large nut (Bent washer)

Remove magnetic flywheel (tool 12 5 510)

Remove freewheel gear with turning motion

Remove oil filter cover and oil filter

Remove two black 6 mm bolts in oil filter canister

Remove tow long 6 mm in starter gear area

Remove 9 - 6 mm x 45 bolts around engine case

Flip engine to clutch side

Remove all 6 mm bolts from case (10 - 6 mm, 2 two with copper gasket)

Remove cover

Remove tacho drive

Remove clutch hex bolts crosswise

Remove pressure plate and release bearing and head

Remove clutch nut (tool 21 4 600)

Remove clutch basket, needle bearings, and washer (taller bearing goes to top)

Remove Nut from chain gear
 Remove chain rail
 Remove gear and chain
 Remove tachometer drive gears
 Remove Circlips on oil drive gears
 Remove gears and pins (same)
 Remove oil pump cover screws (3 ea.) both the same
 Remove both oil pumps (one large one small)
 Remove engine case (dead blow hammer)
 Remove shims from shafts
 Remove shift shaft, shift drum, and shift forks

Turn engine to normal running position to remove input and output shafts (dead blow)

Turn engine back to remove the crankshaft and balance shaft

Show how to disassemble the hidden Circlip from the trans shaft

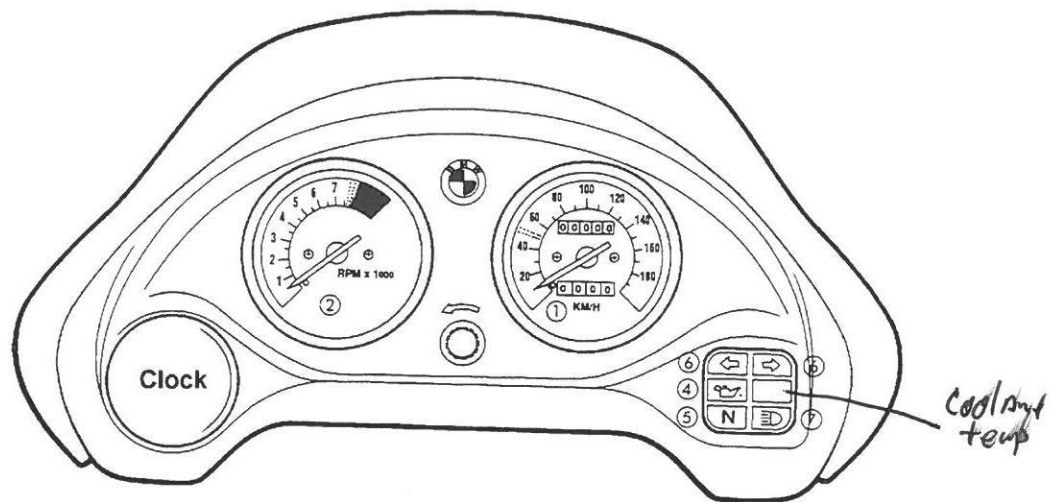
Re assemble in reverse order, don't forget to place the engine in normal position to install the input and output shafts.

Use special tool on balance shaft split gear (tool 11 6 630)

Show balance timing and crankshaft timing with housing timing.

Do not forget to install the chain rail when installing the chain drive and chain

The F 650s rider can refer to the following instruments and displays:



- a speedometer (1) driven mechanically from the front wheel by a flexible shaft
- a revolution counter (2) driven mechanically by a flexible shaft from the engine's intermediate oil pump gear.
- a clock (3)
- telltale or warning lights for:
 - oil pressure (4)
 - neutral selected at gearbox (5)
 - turn indicators (6)
 - high beam (7)

The following functions are performed by the F 650s handlebar controls:

Left handlebar:

- turn indicators
- headlight dip switch & headlight flasher
- horn

Right handlebar:

- starter button
- emergency stop ("kill switch")

- continuously adj.-cold start control

The F 650 is fitted with a high output rectangular headlight.