cover. Clutch operating cam and gear change ratchets (Fig. TM3-30) are removed with the outer cover.

To remove the gear box inner cover and gears (Fig. TM3-31), remove the complete clutch assembly and unscrew the output sprocket retaining nut. Remove the two screws attaching inner cover to transmission housing and remove the inner cover complete with cam plate, shift forks, gears and shafts.

To remove bearings (3, 12 & 36—Fig. TM3-32), the respective housing should be heated to approximately 100° C (212° F). On all models except 3TA or 5TA, the needle bearing (12) should project 0.073-0.078 inch into the housing. Installation should be accomplished with a drift shown in Fig. TM3-33.

Bushing (5—Fig. TM3-32) should be installed with oil groove toward gear end of output shaft (4). All bushings must be reamed after installation. Refer to the following and Fig. TM3-32 for finished bushing specifications:

Bushing (5)—
diameter ..... 0.752-0.753 in.
Clearance on shaft (7) ..... 0.0020-0.0035 in.
Protrusion ..... 3/8 in.
Bushing (12) for 3TA and 5TA models only—
Diameter ..... 0.6865-0.6885 in.
Bushing (20) for 3TA and 5TA models only—
Diameter ..... 0.689-0.690 in.
Bushing (18)—
diameter ..... 0.689-0.690 in.
Clearance on shaft (15) ..... 0.0015-0.0030 in.

Free length of kick starter spring (22—Fig. TM3-32) is ½ inch. Free length of ratchet springs (3—Fig. TM3-30) is 1 1/16 inches. Free length of springs (8) is 1⅞ inch. Finished diameter of bushing (6) should be 0.623-0.624 inch and shaft (2) should have 0.001-0.003 inch clearance.

The gears and shafts should be assembled in the inner cover as removed. Check operation before installing. Shift forks (28 & 30—Fig. TM3-32) must be installed correctly. To check, shift the cam plate (25) to both extremes (first and fourth gears) and check position of the guide rollers in the cam plate grooves. If shift forks are correctly installed, both rollers will reach both ends of the grooves. If movement of either roller is incorrect, remove shift forks (28 & 30) and exchange places. NOTE: Shift forks are not interchangeable. The rollers for cam plate are offset.

TRIUMPH UNIT CONSTRUCTION 650 AND 750cc TWINS

MODEL	Bonneville T120 Thunderbird 6T Trophy TR6	Bonneville T120V	Bonneville T140V Tiger TR7V
Displacement—cc	649	649	744*
Bore—mm	71	71	76*
Stroke—mm	82	82	82
Number of cylinders	2	2	2
Ignition—			
Spark plug type—Champion	N-4	N-4	N-3
Electrode gap—mm	0.5	0.5	0.635
Inch	0.020	0.020	0.025
Point gap—mm	0.35-0.40	0.35-0.40	0.35-0.40
Inch	0.014-0.016	0.014-0.016	0.014-0.016
Valve clearance (cold)			
Intake—mm	0.05	0.04	0.20
Inch	0.002	0.002	0.008
Exhaust—mm	0.10	0.10	0.15
Inch	0.004	0.004	0.006
Electrical system voltage	**12	12	12
Battery terminal grounded	Positive	Positive	Positive
Tire size—front	†	3.25 x 19	3.25 x 19
Rear	†	4.00 x 18	4.00 x 18
Tire pressure—			
Front—kg/cm²	1.68	1.68	1.68
Psi	24	24	24
Rear—kg/cm²	1.75	1.75	1.68
Psi	25	25	24
Rear chain free play	††	††	††
Number of speeds	4	5	5

*Before serial numbers T140V XH22019 and TR7V AH24044, standard cylinder bore was 75mm and displacement was 724cc.
**Early models are equipped with 6 volt electrical system.
†Various tire sizes have been used including 3.25 x 18, 3.50 x 18, 4.00 x 18, 3.25 x 19 and 3.50 x 19.
††Rear chain free play should be ¾ inch (18mm) with weight on wheels or 1¾ inches (43mm) with motorcycle on center stand.
Illustrations courtesy of Norton Triumph Corp.

MAINTENANCE

SPARK PLUGS. Recommended spark plug for normal use is Champion N58R for T120TT models. Champion N-4 for other 650cc models; Champion N-3 for all 750cc models. Spark plugs are 14mm with ¾ inch reach and heat range may vary depending upon use. Electrode gap should be 0.020 inch (0.5mm) for all 650cc models; 0.025 inch (0.635mm) for 750cc models.

CARBURETOR. Amal Monobloc and Concentric carburetors are used. Bonneville T120 models use two carburetors, all others use one. Refer to the following specification data:

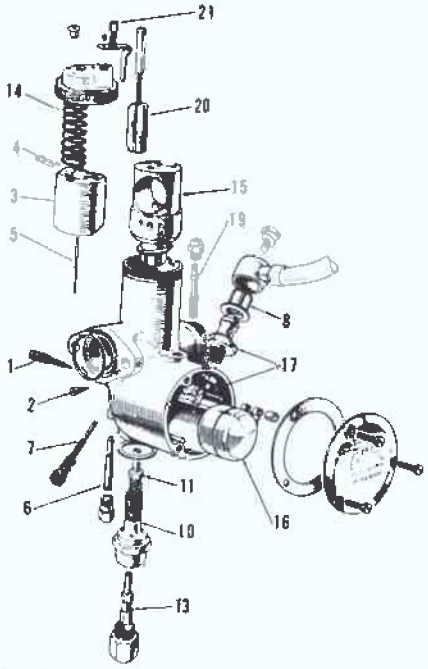


Fig. TM4-1–Exploded view of typical Amal Monobloc carburetor used. Refer to Fig. TM4-2 for view of Amal Concentric float carburetor.

1. Idle mixture needle
2. Jet block screw
3. Throttle slide
4. Clip
5. Valve needle
6. Pilot jet
7. Idle speed stop screw
8. Fuel filter
10. Jet holder
11. Needle jet
13. Main jet
14. Throttle spring
15. Jet block
16. Float
17. Inlet valve
19. Primer
20. Choke valve
21. Cable guide

6T (Serial No. DU101 and up)
Refer to Fig. TM4-1
Model 376/303
Main jet (13) 230
Needle jet (11) 106
Valve needle (5) C
Throttle slide (3) 376/4
Pilot jet (6) 25
Clip (4) in third groove from top of needle (5).

TR6 (Serial No. DU101 to DU5824)
Refer to Fig. TM4-1
Model 376/
Main jet (13) 250
Needle jet (11) 106
Valve needle (5) C
Throttle slide (3) 376/3½
Pilot jet (6) 25
Clip (4) in third groove from top of needle (5).

TR6 (Serial No. DU5825-DU44393)
Refer to Fig. TM4-1
Model 389/97
Main jet (13) 310
Needle jet (11) 106
Valve needle (5) ..... D
Throttle slide (3) 389/3½
Pilot jet (6) 25
Clip (4) in top groove of needle (5).

TR6 (Serial No. DU44394-DU66245)
Refer to Fig. TM4-1
Model 389/239
Main jet (13) 330
Needle jet (11) 106T
Valve needle (5) ..... D
Throttle slide (3) 389/4
Pilot jet (6) 25
Clip (4) in top groove of needle (5).

T120 (Serial No. DU101-DU5824)
Refer to Fig. TM4-1
Model 376/
Main jet (13) 240
Needle jet (11) 106
Valve needle (5) C
Throttle slide (3) 376/3½
Pilot jet (6) 25
Clip (4) in second groove from top of needle (5).

T120 (Serial No. DU5825-DU66245) and T120R (Serial No. DU24875-DU44393)
Refer to Fig. TM4-1
Model 389/203
Main jet (13) 260
Needle jet (11) 106
Valve needle (5) ..... D
Throttle slide (3) 389/3
Pilot jet (6) 25
Clip (4) in third groove from top of needle (5).

T120R (Serial No. DU44394-DU66245) and T120TT (Serial No. DU24875-DU66245)
Refer to Fig. TM4-1
Model 389/95
Main jet (13) 330
Needle jet (11) 106
Valve needle (5) ..... D
Throttle slide (3) ..... 389/3½ or 389/4
Pilot jet (6) 25
Clip (4) in second groove from top of needle (5).

T120R (Serial No. 66246 and up)
Refer to Fig. TM4-2
Model—left 930/10
Right 930/9
Main jet (13) ..... 210 or 220
Needle jet (11) ..... 0.106 or 0.107
Throttle slide (3) ..... 2½ or 3
Pilot jet (6) 20
Clip (4) in second groove from top of needle (5).

T140V (Before Serial No. XH220019)
Refer to Fig. TM4-2
Model—left 930/88
right 930/87
Main jet (13) 210
Needle jet (11) 106
Throttle slide (3) 3
Clip (4) in second groove from top of needle (5).

T140V (After Serial No. XH22018)
Refer to Fig. TM4-2
Model—left 930/93
right 930.92
Main jet (13) 190

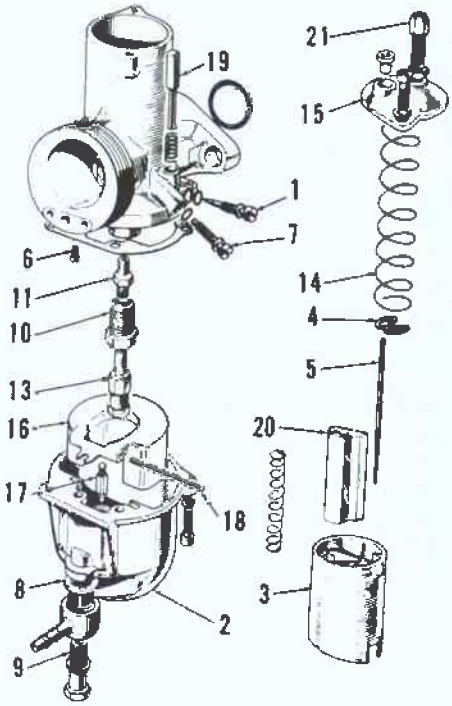


Fig. TM4-2–Exploded view of Amal carburetor with concentric float chamber.

1. Idle mixture needle
2. Float chamber
3. Throttle slide
4. Clip
5. Valve needle
6. Pilot jet
7. Idle speed stop screw
8. Fuel filter
9. Banjo bolt
10. Jet holder
11. Needle jet
13. Main jet
14. Throttle spring
15. Cap
16. Float
17. Fuel inlet needle
18. Float pivot
19. Primer
20. Choke valve
21. Cable adjuster

Needle jet (11) 106
Throttle slide (3) 3
Clip (4) in second groove from top of needle (5).

TR7V
Refer to Fig. TM4-2
Model 930/89
Main jet (13) 280
Needle jet (11) 106
Throttle slide (3) 3½
Clip (4) in second groove from top of needle (5).

On all models, idle mixture is adjusted at needle (1—Fig. TM4-1 or TM4-2). Idle speed is adjusted at screw (7). On models with dual carburetors, the carburetors must be synchronized to open exactly the same amount by adjusting the cable guides (21) at the top of each carburetor. Idle mixture on carburetor is more easily adjusted after disconnecting the spark plug wire from the other cylinder.

IGNITION AND ELECTRICAL. Ignition breaker point gap should be 0.014-0.016 inch for all models. The ignition breaker point cam and advance weights are mounted on the right end of the exhaust camshaft. Ignition timing for the right cylinder is adjusted by moving the breaker point base plate after removing the small

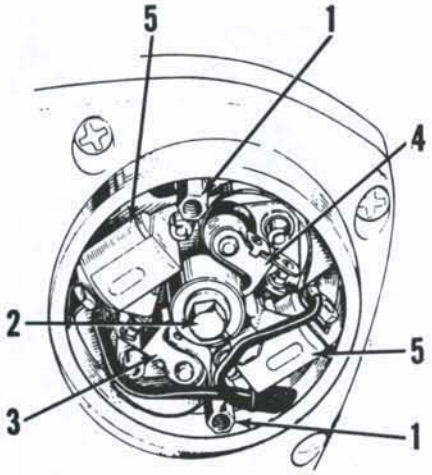


Fig. TM4-4–The ignition cam and advance assembly is mounted on the right end of the camshaft. Black and yellow wire goes to breaker points (3) and black and white wire goes to breaker points (4).

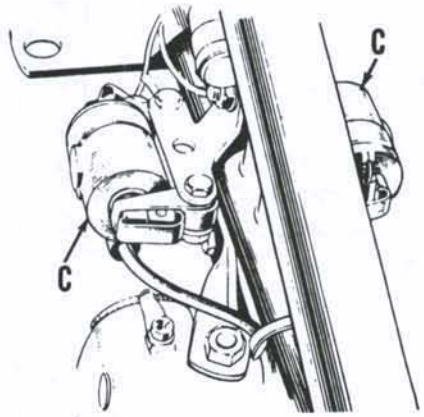


Fig. TM4-7–Coils (C) for models with AC (energy transfer) ignition are different than coils for battery ignition models.

round cover from the right side. It may be necessary to vary the breaker point gap on the second set of breaker points in order to set ignition timing for the left cylinder.

Ignition automatic advance range in camshaft degrees (½ of crankshaft degrees) is stamped on the back of the breaker cam. Standard ignition timing is as follows:

6T (Serial No. DU101-DU5824)
Crankshaft degrees BTDC—
Static ..... 7°
Full advance ..... 35°
Advance range stamped on cam .. 14°
Piston position BTDC—
Static ..... 0.015 inch

6T (Serial No. DU5825-DU44394)
Crankshaft degrees BTDC—
Static ..... 11°
Full advance ..... 35°
Advance range stamped on cam .. 12°
Piston position BTDC—
Static ..... 0.038 inch

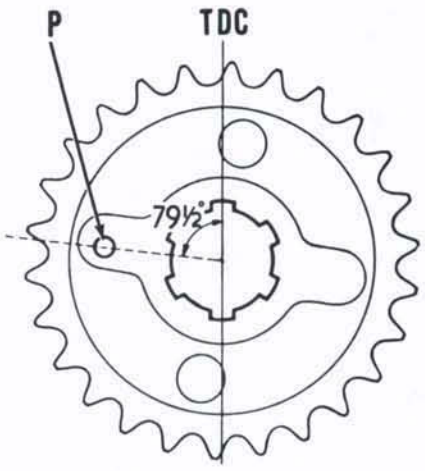


Fig. TM4-8–The peg (P) on the primary drive sprocket should be at approximately 9 o'clock position when the crankshaft is at top dead center (TDC).

TR6 and T120
(Serial No. DU101-DU5824)
Crankshaft degrees BTDC—
Static ..... 11°
Full advance ..... 39°
Advance range stamped on cam .. 14°
Piston position BTDC—
Static ..... 0.038 inch

TR6 and T120 Models with Battery Ignition (Serial No. DU5825 and up)
Static ..... 15°
Full advance ..... 39°
Advance range stamped on cam .. 12°
Piston position BTDC—
Static ..... 0.068 inch

TR6 and T120 Models with Energy Transfer Ignition (Serial No. DU44395 and up)
Crankshaft degrees BTDC—
Static ..... 29°
Full advance ..... 39°
Advance range stamped on cam ....5°
Piston position BTDC—
Static ..... 0.25 inch

TR7Vand T140V
Crankshaft degrees BTDC—
Static ..... 14°
Full advance ..... 38°
Advance range of cam ..... 12°
Piston position BTDC—
Static ..... 0.060 inch (1.5mm)

Full advanced ignition timing should occur at 35° (crankshaft degrees) BTDC for all 6T models; 39° BTDC for all TR6 and T120 models; 38° BTDC for all TR7V and TR140V models. Full advanced ignition timing can be checked using a degree wheel mounted on the right end of exhaust camshaft and a power timing light.

All models are equipped with an alternator mounted at left end of crankshaft which charges the battery (if so equipped) via a full wave rectifier. On later models, current is controlled by a zener diode after being rectified. Clearance between alternator coil poles and rotor should be 0.008 inch minimum all the way around. Rotor retaining nut should be torqued to 30 Ft.-Lbs. (4.1 kg-m) for all 650cc models; 40 Ft.-Lbs. (5.5 kg-m) for all 750cc models. On all models, stator mounting screws should be torqued to 20 Ft.-Lbs. after correctly centered over the rotor. Make certain that stator wires do not rub on the primary chain. On models with AC (energy transfer) ignition, the alternator rotor must be correctly timed to the engine to provide the electrical current for ignition. Models with energy transfer ignition are equipped with special high tension ignition coils shown in Fig. TM4-7 located under the fuel tank.

When assembling models with energy transfer ignition, observe the following: Install the primary drive sprocket with the rotor locating peg at approximately 9 o'clock position when the crankshaft is at top dead center. Refer to Fig. TM4-8. The rotor has three holes marked "S", "M" and "R". The "S" position should be used with full advanced ignition timing at 37° BTDC. The "M" position should be used with 39° BTDC full advanced ignition timing. The "R" position should be used only if full advance ignition timing is set at 41° BTDC.

NOTE: It is important that ignition timing is correctly set in relation to the rotor location. The current generated when the breaker points open may be insufficient to fire the spark plugs if breaker points open too soon or too late. If one set of breaker points is faulty, both cylinders will be affected. If the brown stop light wire is shorted, the engine will not run.

VALVE SYSTEM. The valve clearance should be set with engine cold. On 650cc models, intake clearance should be 0.002 inch (0.05mm) and exhaust clearance should be 0.004 inch (0.10mm). On 750cc models intake clearance should be 0.008 inch (0.20mm) and exhaust should be 0.006 inch (0.15mm). On all models, check the clearance of one valve when the similar valve for other cylinder is a maximum opening. EXAMPLE: Clearance for the inlet valve for the right cylinder should be set when the inlet valve for the left cylinder is fully open.

LUBRICATION. On 650cc models, the engine uses a dry sump lubrication system. On models before serial number DU24874, capacity is 6 pints (2.8 liters); later models have capacity of 7¼ pints (3.4 liters). Use SAE 40 oil

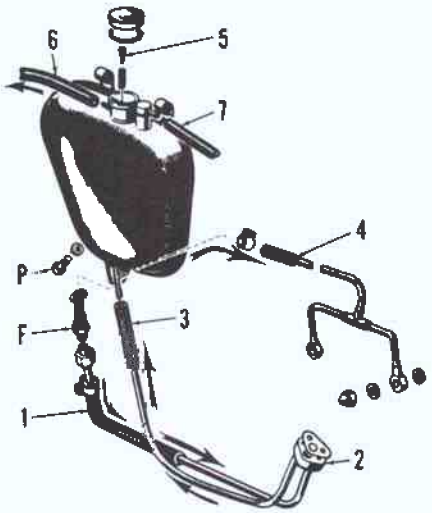


Fig. TM4-9 Drawing of engine reservoir and lines typical of 650cc models.

F. Filter
P. Drain plug
1. Reservoir to pressure pump hose
2. Oil manifold
3. Oil return hose
4. Rocker arm lubricant line
5. Rear chain metering needle
6. Hose to rear chain
7. Breather (vent) hose

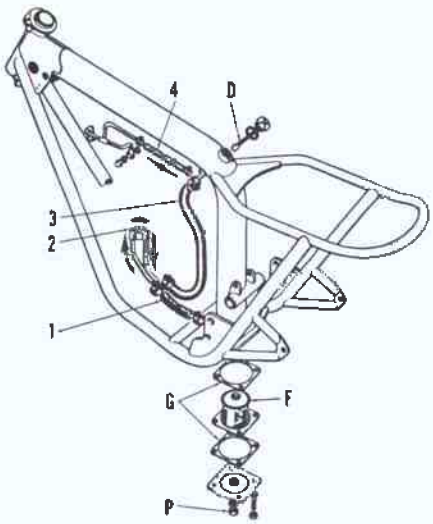


Fig. TM4-9A–Drawing of engine oil lines typical of 750cc models. Frame tube is reservoir.

D. Dipstick
F. Filter
G. Gaskets
P. Drain plug
1. Reservoir to pressure pump hose
2. Oil manifold
3. Oil return hose
4. Rocker arm lubricant line

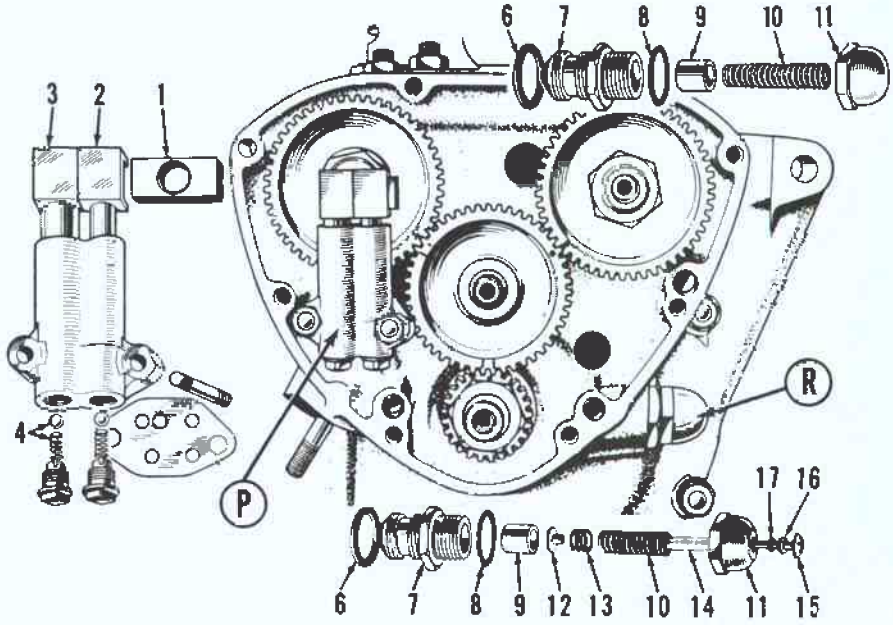


Fig. TM4-10–The oil pump is located at (P) and relief valve at (R). Exploded view of late type relief valve is shown at top and earlier type below.

1. Drive block
2. Pressure plunger
3. Scavenge plunger
4. Check valves
6. Gasket
7. Valve body
8. Gasket
9. Relief valve plunger
10. Spring
11. Cap
12. Nut
13. Auxiliary spring
14. Rubber sleeve
15. Indicator shaft
16. Cover
17. "O" ring

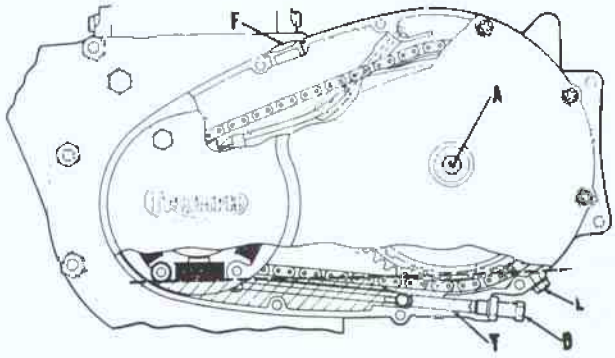


Fig. TM4-11–Primary chain case should be filled to level of plug (L) through top plug (F). The chain tension adjuster is located inside hole for drain plug (D).

above 90 degrees F.; SAE 30 oil from 32 degrees F. to 90 degrees F. Oil level should be maintained 1½ inches (4cm) below filler cap opening of reservoir. Oil reservoir is located on right side under the seat. Remove filter (F—Fig. TM4-9) from reservoir to drain oil and clean filter. The oil should be drained, filters cleaned and reservoir should be filled with new oil every 1500 miles.

On 750cc models, the engine is equipped with a dry sump lubrication system which contains 4.8 pints (2.27 liters). Use SAE 20W/50 multi viscosity motor oil. Oil is contained in the frame tubes which forms the reservoir. Drain oil by removing plug (P—Fig. TM4-9A). The oil should be drained, filter (F) cleaned and reservoir should be filled with new oil every 1000 miles. Oil should be maintained between marks on dip stick (D).

On all models, installation of hoses to and from the reservoir is important. Refer to Fig. TM4-9 and Fig. TM4-9A. Oil is drawn from the reservoir to the pressure pump through hose (1). The scavenge pump delivers oil back to the reservoir from the engine through hose (3). Oil pumped by the scavenge pump is also used to lubricate the rocker arms via hose (4). On some models, oil is metered by valve (5—Fig. TM4-9) and delivered to the rear chain through hose (6). The engine will probably be damaged because of lack of lubrication if hoses are attached incorrectly.

The oil pump is located on the right crankcase half under the timing gear cover and is driven by an eccentric peg on the nut retaining the timing gear to the inlet camshaft. Normal oil pressure is 20-25 psi at idle and 60-65 psi during normal running. Refer to Fig. TM4-10 for exploded view of pump and relief valve. On early models (bottom of Fig. TM4-10), free length of relief valve spring (10) should be 31/32 inch and auxiliary spring (13) should be 9/32 inch long. On models after serial number DU13375, relief valve spring (10—top of Fig. TM4-10) should be 1 17/32 inches long.

On 650cc models, oil in primary chain case should be drained every 1000 miles. The primary chain case should be filled to level of plug (L—Fig. TM4-11) with SAE 20 oil.

On 750cc models, oil in the primary chain case is automatically maintained at correct level by the engine lubricating system. Pour 150cc of engine oil into the chain case before starting engine if chain case has been drained.

On all models, the gear box should be drained every 6000 miles. The gear box should be filled with EP 90 gear lubri-

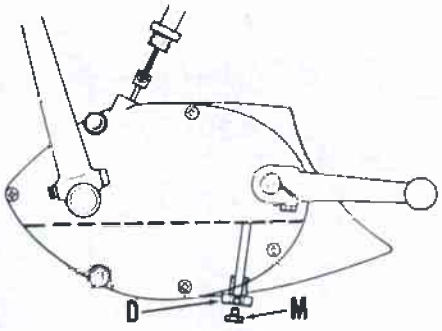


Fig. TM4-12–The gear box oil level plug is shown at (M) and drain plug at (D). Filler plug is located at top near clutch cable.

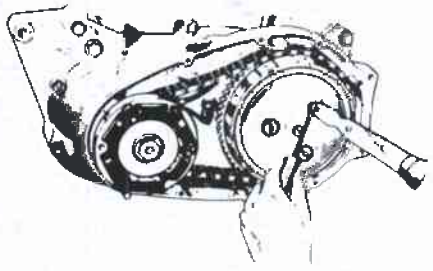


Fig. TM4-13–Clutch spring tension can be adjusted as shown after removing the primary chain cover. Refer to text.

cant until oil begins to flow from the level plug hole. When checking gear box oil level, it is necessary to fill with oil until above the level pipe. Some oil will be inside the pipe when level plug is removed. Refer to Fig. TM4-12.

CLUTCH CONTROLS. To adjust the clutch, remove the plug from the side of primary chain case cover, loosen the locknut and turn the adjusting screw (A—Fig. TM4-11) in until resistance is felt. Back the adjusting screw (A) out 1 turn and tighten the locknut. Adjust the cable guide at hand lever until cable has ⅛ inch free play.

If clutch slips with controls properly adjusted, remove the primary chain case cover and adjust the spring pressure. Initial setting is with adjusting nuts flush with ends of studs. Each nut must be adjusted to provide even spring pressure. To check adjustment of springs, shift transmission to neutral, disengage clutch and operate the kick starter. Check the pressure plate as it turns and make sure it does not wobble. If one section of pressure plate is higher than the rest, turn the spring adjuster near the high spot in and recheck. To turn the adjusting nuts out, it is necessary to hold the springs down as shown in Fig. TM 4-13 to release the locking lug on bottom of nut.

PRIMARY CHAIN. Tension of the primary chain is adjusted by turning adjuster (T—Fig. TM4-11) after removing drain plug (D). Special hexagon headed screwdriver (part No. D496) should be used to turn adjuster (T). The chain should have ½ inch free play as measured through the filler plug hole (F). Make certain that primary chain case is filled to level of plug hole (L) with SAE 20 oil after adjustment is complete.

To remove the primary chain case cover, remove the left exhaust pipe, loosen the rear brake adjuster until the brake pedal is clear of the primary cover and remove the left foot rest. Remove drain plug (D—Fig. TM4-11) and allow primary chain case to drain. Remove the two domed nuts and eight attaching screws, then lift off the chain cover. To remove the primary chain, it is necessary to remove the alternator, then remove the clutch, chain and crankshaft sprocket together.

When assembling, tapered side of spacer (5—Fig. TM4-24) must be installed toward the sprocket. Refer to IGNITION AND ELECTRICAL paragraphs for installing alternator rotor and stator. Make certain that alternator wires can not rub on primary drive chain. Install chain tension adjuster and adjust the chain free play after the chain case cover is installed.

SUSPENSION. Each front suspension unit contains 150cc of oil on all 6T, TR6 and T120 models with internal

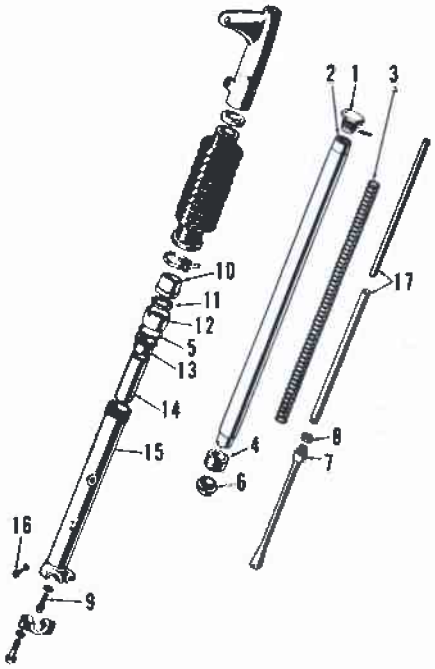


Fig. TM4-14–Exploded view of the front suspension used on early models (before serial number DU5825). Refer to Fig. TM4-15 for later type.

1. Filler plug
2. Tube
3. Spring
4. Bottom bushing
5. Washer
6. Bushing nut
7. Restrictor rod
8. Washer
9. Screw
10. Sleeve nut top
11. Oil seal
12. Seal retainer sleeve nut
13. Top bushing
14. Dampening sleeve
15. Lower tube
16. Drain plug
17. Guide tube

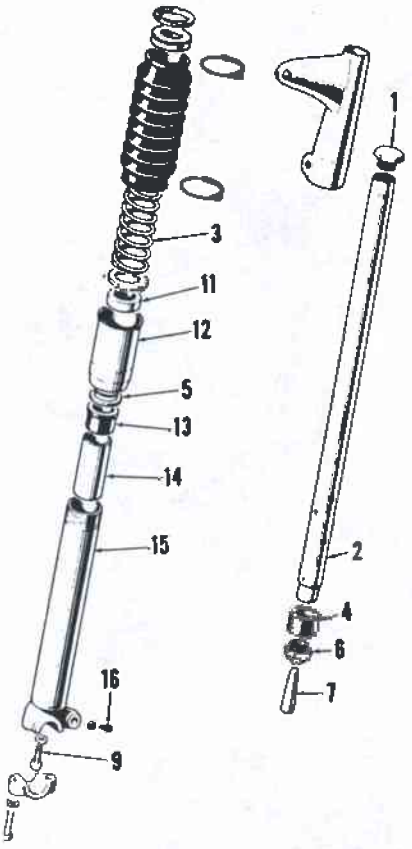


Fig. TM4-15–Exploded view of front suspension used from serial number DC5825 to DU66245. On some models, restrictor valve may be type shown in Fig. TM4-16. Refer to Fig. TM4-14 for legend.

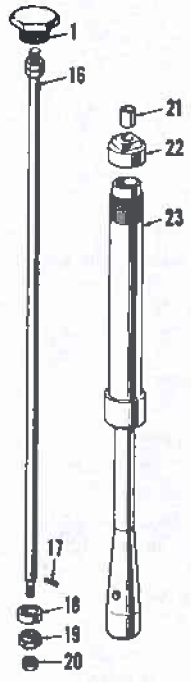


Fig. TM3-16–View of restrictor valve used on some models. Body (23) is attached to lower tube (15–Fig. TM4-15) with screw (9–Fig. TM4-15) and must be removed before disassembling.

1. Filler plug
16. Rod
17. Pin
18. Cup
19. Oil restrictor
20. Nut
21. Bushing
22. Restrictor cap
23. Restrictor body

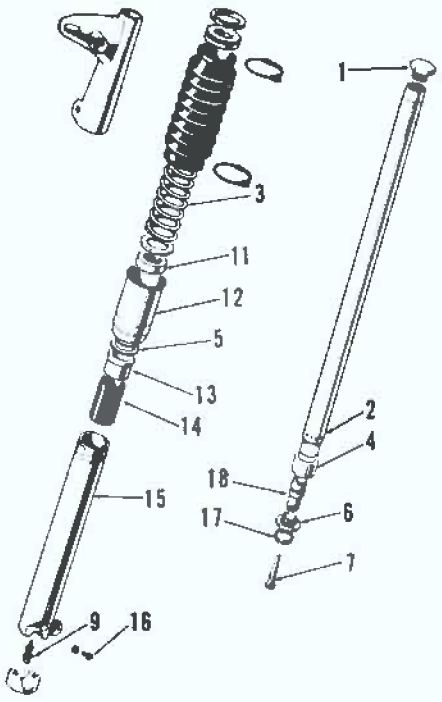


Fig. TM4-17–Exploded view of front suspension used on models from serial number DU66246.

1. Filler plug
2. Tube
3. Spring
4. Bottom bushing
5. Washer
6. Bushing nut
7. Restrictor
9. Screw
11. Oil seal
12. Seal retainer sleeve nut
13. Top bushing
14. Dampening sleeve
15. Lower tube
16. Drain plug
17. Snap ring
18. Shuttle valve

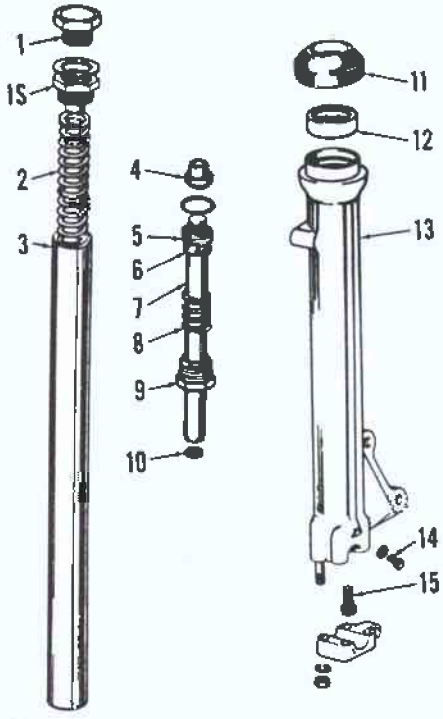


Fig. TM4-18–Exploded view of front suspension unit used on late models.

1. Fork top bolt
1S. Spring seat
2. Inner fork spring
3. Inner fork tube
4. Damper valve nut
5. Damper valve
6. Damper washer
7. Damper tube assembly
8. Recoil spring
9. Inner fork tube end plug
10. Seal for screw (15)
11. Dust cover
12. Oil seal
13. Outer fork tube
14. Oil drain plug
15. Damper tube holding screw

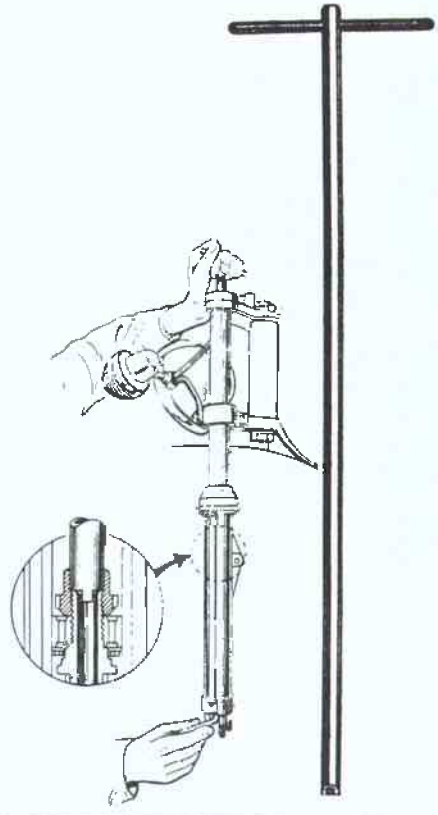


Fig. TM4-18A–A special tool is helpful for holding the damper tube while removing screw.

spring (Fig. TM4-14). On models with external spring (Fig. TM4-15 or Fig. TM4-17), each unit contains 190cc of oil. The late type fork (Fig. TM4-18) used on TR7V and T140V models should contain 200cc of Automatic Transmission Fluid (ATF). Recommended oil for earlier models is SAE 50 oil above 90°F. SAE 30 at temperatures from 60°F. to 90°F., and SAE 20 oil below 60°F. Oil should be drained and filled with correct type at least every 6000 miles. Oil is drained by removing plugs at the bottom of fork lower (sliding) tubes. Forks are filled through the hole in top after removing plug (1—Fig. TM4-14, Fig. TM4-15, Fig. TM4-17 or Fig. TM4-18).

Disassembly and reassembly of late forks is more easily accomplished using the special tool shown in Fig. TM4-18A. The tool holds the damper tube assembly (7—Fig. TM3-18) while removing or installing the Allew screw (14). A 13/16 inch socket with a long extension can be used to hold nut (4) in a similar way if the special tool is not available. Coat threads of spring seat (1A) with "Permatex Super 300"; "Loctite Hydraulic Sealant" or equivalent to prevent leakage.

Rear suspension units are sealed and must be renewed if leaking or damaged.

REPAIRS

CYLINDER HEAD AND VALVES. To remove the cylinder head, remove the fuel tank, coils, top engine supports (stays), rocker caps and rocker arm oil line. On 650cc models, loosen all nine cylinder head screws, remove the five stud nuts and two screws attaching rocker boxes to cylinder head and lift off the rocker boxes. On 750cc models, remove the attaching screws and stud nuts, then remove the rocker hoses. On all models, lift out the push rods and mark for correct assembly in the same location. Remove the exhaust pipes. On 650cc models, remove the five remaining cylinder head retaining screws and lift the cylinder head off.

NOTE: The four cylinder head screws which also attach the rocker boxes are already removed. On 750cc models, remove the ten cylinder head retaining screws and stud nuts. NOTE: Special threaded nuts are used at locations (3, 4, 5 & 6—Fig. TM4-19A).

When the cylinder head is removed, it is necessary to renew the push rod tube oil seals. Refer to the following specification data:

Rocker arm bore
(I.D.) ..... 0.5002-0.5012 in.
Rocker shaft (O.D.) .. 0.4990-0.4995 in.
Valve stem to guide clearance—
Inlet ..... 0.0027-0.0032 in.
Exhaust ..... 0.0032-0.0047 in.
Valve seat and face angle .. 45 degrees
Valve seat width ..... 3/32 in.
Valve springs—type installed
6T Serial No. DU101 and up
Inner-marked ..... Red Spot
Outer-marked ..... Red Spot
TR6 Serial No. DU101-DU24874
Inner-marked ..... White Spot
Outer-marked ..... White Spot
TR6 Serial No. DU24875-DU66245
Inner-marked ..... Red Spot
Outer-marked ..... Red Spot
TR6 Serial No. DU66246 and up
Inner-marked ..... Red Spot
Outer-Marked ..... Green Spot
TR7V
Inner-marked ..... Red Spot
Outer-marked ..... Green Spot
T120 Serial No. DU101-DU24874
Inner-marked ..... White Spot
Outer-marked ..... White Spot
T120 Serial No. DU24875-DU66245
Inner-marked ..... Red Spot
Outer-marked ..... Red Spot
T120 Serial No. DU66246 and up
Inner-marked ..... Red Spot
Outer-marked ..... Green Spot
T140V
Inner-marked ..... Red Spot
Outer-marked ..... Green Spot
Valve spring—specifications
Inner-marked with red spot—
Free length ..... 1 17/32 inches
Number of coils 7¼

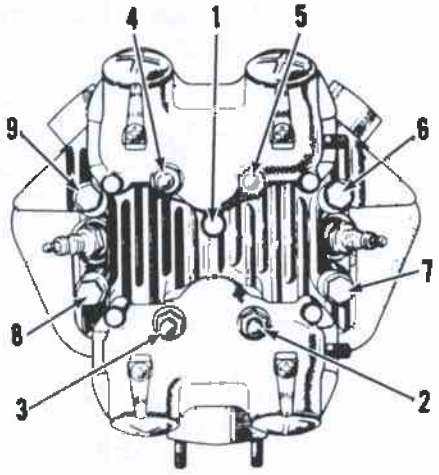


Fig. TM4-19–Cylinder head retaining screws and stud nuts should be tightened in sequence shown for 650cc models. Refer to Fig. TM4-19A for 750cc models.

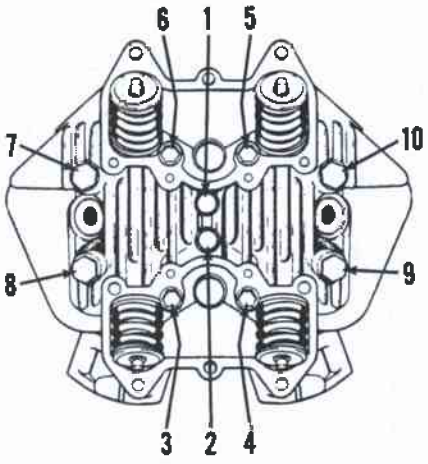


Fig. TM4-19A–Cylinder head retaining screws and stud nuts should be tightened in sequence shown for 750cc models. Special nuts are used at locations (3, 4, 5 & 6) which accept rocker box screws.

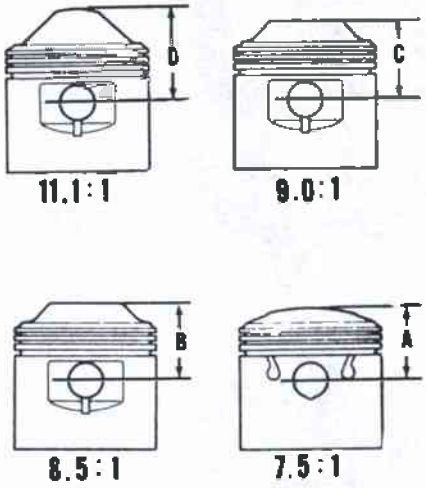
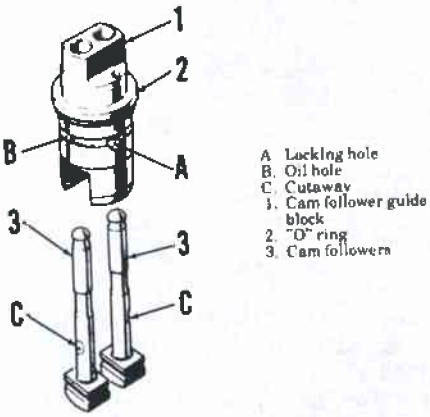


Fig. TM4-20–Triumph pistons can be identified by measuring from center of piston pin bore. Pistons shown are for 650cc models.

A. 1.416-1.424 inches
B. 1.488-1.492 inches
C. 1.498-1.502 inches
D. 1.845-1.849 inches



A. Locking hole
B. Oil hole
C. Cutaway
1. Cam follower guide block
2. "O" ring
3. Cam followers

Fig. TM4-21–On models after serial number DU24874, the exhaust cam followers are pressure lubricated and must be installed with cutaway areas (C) toward outside as shown.

Inner-marked with white spot—
Free length 1⅝
Number of coils 7
Outer-marked with red spot—
Free length ..... 1⅝ inches
Number of coils 5½
Outer-marked with white spot—
Free length ..... 2 1/32 inches
Number of coils 6½

When reassembling, renew the push rod tube oil seals and carefully position the cylinder head making certain that push rod tubes are correctly centered. On 650cc models, start the cylinder head screws (1, 6, 7, 8 & 9—Fig. TM4-19) and install push rods. On 750cc models, install and tighten all ten cylinder head retaining nuts and screws (Fig. TM4-19A). Turn the crankshaft until both inlet push rods are at bottom of travel, then install the rear rocker box and rocker arms assembly. NOTE: Be sure to install the three stud nuts on bottom before installing the screws and stud nuts on top. Turn the crankshaft until both front (exhaust) push rods are at bottom of travel, then install the front rocker box and rocker arms assembly.

On 650cc models, the rocker arm shaft nuts should be tightened to 22 Ft.-Lbs. (3.0 kg-m) torque. Rocker box retaining screw and stud nuts which are ¼ inch size should be tightened to 5 Ft.-Lbs. (0.7 kg-m) torque. The nine cylinder head retaining screws and stud nuts should be tightened in the sequence shown in Fig. TM4-19. Final torque for the 5/16 inch diameter screws (Fig. TM 4-19) should be 15 Ft.-Lbs. and 25 Ft.-Lbs. for the ⅜ inch diameter screws.

On 750cc models, the 5/16 inch cylinder head retaining nuts (1 & 2—Fig. TM4-19A) should be tightened to a torque of 16 Ft.-Lbs. (2.21 kg-m). Tighten the other cylinder head retaining stud nuts and screws (⅜ inch size) to 18 Ft.-Lbs. (2.49 kg-m) torque. Tighten cylinder head retaining hardware evenly and slowly. The ¼ inch size rocker box screws should be tightened to 5 Ft.-Lbs. (0.7 kg-m) torque and the 5/16 inch screws to 10 Ft.-Lbs. (1.38 kg-m). Torque the rocker splindle domed nuts to 22 Ft.-Lbs. (3.0 kg-m).

On all models, refer to the VALVE SYSTEM paragraphs in the Maintenance section for setting valve clearance.

PISTONS, RINGS AND CYLINDERS. Pistons and rings are available in standard size and oversizes. Nominal bore size is 71mm (2.795 inches) for 650cc models, 75mm (2.953 inches) for early 750cc models, 76mm (2.992 inches) for late 750cc models.

Piston Skirt Clearance—
6T (Serial No. DU101-DU5824) ..... 0.0033-0.0043 inch 0.084-0.109mm
6T (Serial No. DU5825-DU44393) .... 0.0016-0.0027 inch 0.041-0.069mm
TR6 (Serial No. DU101-DU44393) .... 0.0033-0.0043 inch 0.084-0.109mm
TR6 (Serial No. DU44394 and up except 11:1 Compression ratio) ..... 0.0046-0.0061 inch 0.117-0.155mm
TR6 and T120 (Serial No. DU44394 and up with 11:1 Compression ratio) ..... 0.0070-0.0084 inch 0.178-0.213mm
T120TT (Before Serial No. DU44393 with 11:1 Compression ratio) ..... 0.0073-0.0083 inch 0.185-0.211mm
T120 (Serial No. DU44394 and up except 11:1 Compression ratio) ..... 0.0046-0.0061 inch 0.117-0.155mm
T120 (Before Serial No. DU44394 except 11:1 Compression ratio) ..... 0.0038-0.0048 inch 0.097-0.122mm
TR7V and T14DV (All 750cc models) ..... 0.0036-0.0042 inch 0.091-0.107mm
Maximum cylinder bore taper or out of round ..... 0.005 inch 0.127mm
Ring side clearance in grooves (650cc)—
Compression rings 0.001-0.003 inch 0.025-0.076mm
Oil control ..... 0.0005-0.0025 inch 0.013-0.064mm
Ring side clearance in groove (750cc)—
Compression rings ..... 0.0015-0.0035 inch 0.0038-0.089mm
Oil control ..... 0.0015-0.0025 inch 0.038-0.063mm
Ring end gap (650cc)—
All rings ..... 0.010-0.014 inch 0.25-0.36mm

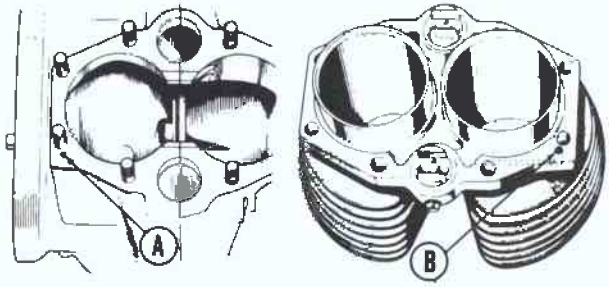


Fig. TM4-22–On later 650cc models, make certain hole in cylinder base gasket is over oil passages (A) in crankcase and (B) in cylinder.

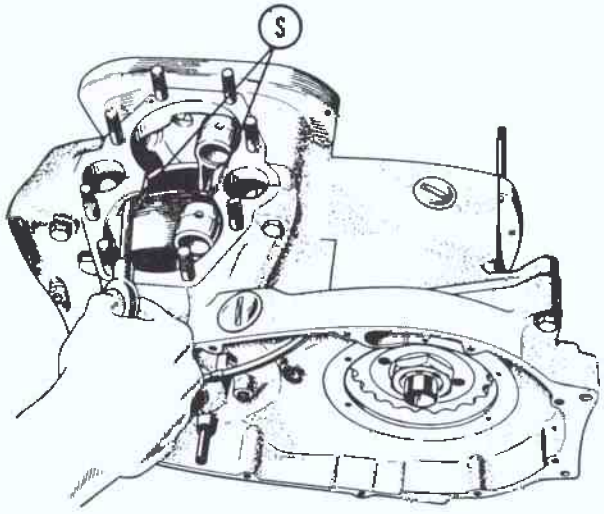


Fig. TM4-23–Make certain that the two screws (S) are removed when separating crankcase halves.

Ring end gap (750cc)—

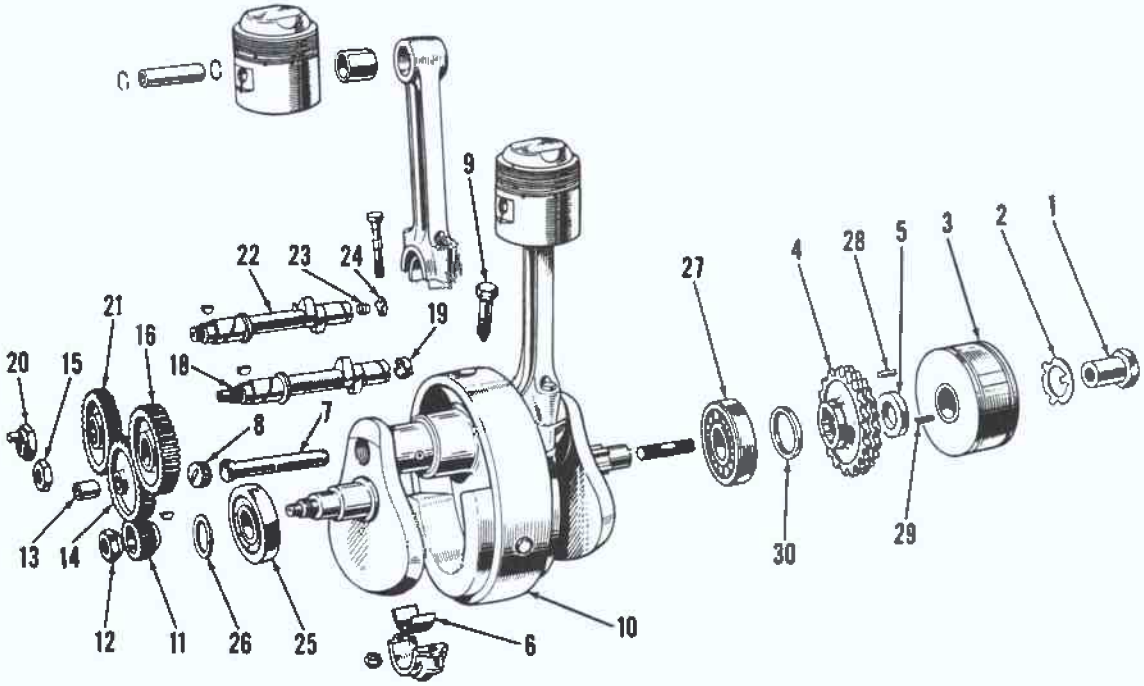
Compression rings	0.008-0.013 inch 0.20-0.33mm
Oil control	0.010-0.040 inch 0.025-1.02mm

When removing or installing the cylinder, a shock absorber mounting rubber or similar rubber block should be wedged between both sets of cam followers. If cam followers are not held in position, they may fall into the crankcase. On models after serial number DU24874, the exhaust cam followers are pressure lubricated. If the exhaust cam follower block is removed, make certain that "O" ring (2—Fig. TM4-21) is positioned around guide block and locking hole (A) is aligned with lock screw hole before pressing into cylinder. Exhaust cam followers (3) should be installed with cut-away faces (C) toward outside. Inlet cam follower block on late models and both guide blocks on earlier models should be similarly pressed into place; however, these are not pressure lubricated and do not have oil holes (B) or cut away sections (C). On late models, make certain that the cylinder base gasket is installed with hole in gasket over the oil passage (A—Fig. TM4-22) in crankcase and oil passage (B) in cylinder.

When installing piston rings on all models, make certain that side of the two compression rings marked "TOP" is toward top of piston. The cylinder retaining nuts should be tightened to 35 Ft.-Lbs. torque.

CRANKSHAFT, CONNECTING RODS AND CAMSHAFTS. To remove the crankshaft or connecting rods, it is necessary to separate the crankcase halves.

Remove the cylinder head, cylinder, ignition base plate, ignition cam, timing gear cover, oil pump and camshaft and crankshaft gears. NOTE: The nuts attaching gear to camshaft are left hand thread. Remove the clutch, alternator (stator and rotor), primary drive sprockets, primary drive chain, gear box cover and transmission gears. Remove engine from the frame and remove the remaining screws and stud nuts joining the crankcase halves. NOTE: Two screws are located at (S—Fig. TM4-23). Connecting rod crankpin standard diameter is 1.6235-1.6240 inches (41.237-41.25mm). Bearing inserts are available in standard size as well as undersizes.



1. Rotor retaining nut
2. Tab washer
3. Rotor
4. Primary drive sprocket
5. Spacer
6. Rod bearing inserts
7. Oil tube
8. Plug
9. Screw (3 used)
10. Flywheel
11. Crankshaft gear
12. Nut
13. Bushing
14. Idler gear
15. Nut
16. Camshaft gear
18. Exhaust camshaft
19. Tachometer drive
20. Oil pump drive nut
21. Camshaft gear
22. Inlet camshaft
23. Spring
24. Rotary breather valve
25. Ball bearing
26. Washer
27. Roller bearing
28. Dowel (Energy transfer ignition only)
29. Key (all except energy transfer ignition)
30. Oil seal

Fig. TM4-24–Exploded view of the crankshaft and camshafts. Nuts (15 & 20) are left hand thread.

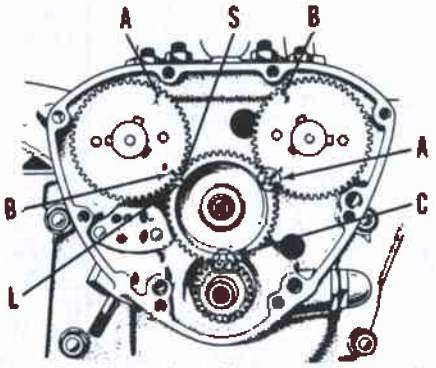


Fig. TM4-25–Camshaft timing marks must be correctly aligned as described in text.

The crankshaft left (drive) side main bearing should be of the roller type. On models before serial number DU13375, early type bearing can be changed to the late roller type without changing any other parts. On models between serial number DU13375 and DU24874, the late type roller bearing can be installed after installing the late type crankshaft timing gear (11—Fig. TM4-24) and washer (26).

When assembling, the projecting tabs on connecting rod bearing inserts should be on same side. The connecting rod nuts should be tightened to the torque. Two types of connecting rod nuts have been used. The early type has a machined finish and should be tightened to 28 Ft.-Lbs. torque (3.87 kg-m). The later, preferred nuts have a dull grey finish for identification and should be tightened to 22 Ft.-Lbs. (3.04 kg-m) torque. The nuts are self locking but the manufacturer also suggested using "Loctite" to prevent loosening.

The three flywheel retaining screws (9—Fig. TM4-24) should be tightened to 33 Ft.-Lbs. (4.6 kg-m) torque. Make certain that the mating surfaces of crankcase halves are clean and smooth. Seal (30) should be installed from inside after removing the roller bearing outer rod. Closed side of seal should be toward main bearings (27). To remove or install main bearings (25 & 27) from crankcase bores, the crankcases should be heated to approximately 100° C. (212° F.).

When installing camshaft timing gears, install gears on shafts using the keyway nearest the correct timing mark on gear. Several different gears have been used, but marks are similar. Early camshaft gears have only one mark and are not interchangable. Late gears have two marks. The "A" mark (Fig. TM4-25) should be used for the exhaust camshaft and the "B" mark for the inlet camshaft. Install the idler gear last making sure that marks are aligned correctly. The slot on crankshaft gear should be between the two long dashes on idler gear as shown at (C). Align the correct dot (A) on exhaust camshaft gear with dot on idler gear. On 6T models, align the correct dot (B) on inlet camshaft gear with short dash (S). On all other models, align inlet camshaft dot (B) with the long dash (L) on idler gear.

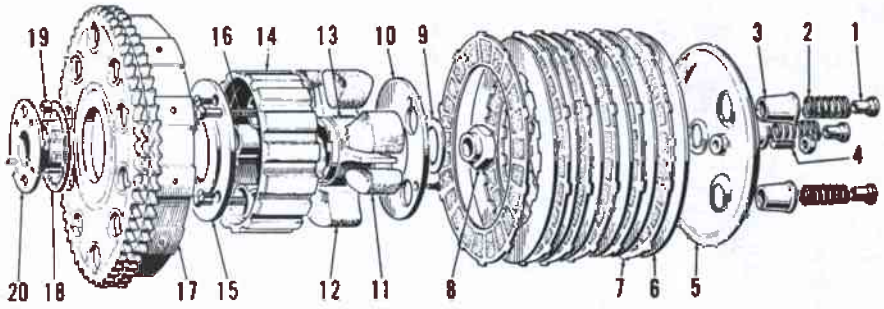


Fig. TM4-27–Exploded view of the clutch assembly. Refer to Fig. TM3-28 for installation of rubber cushions (11 & 12).

1. Spring nuts
2. Springs
3. Spring cups
4. Adjusting screw
5. Pressure plate
6. Driven plate
7. Friction disc
8. Nut
9. Washer
10. Outer cover
11. Rebound rubber cushion (small)
12. Drive rubber cushion (large)
13. Spider
14. Clutch hub
15. Inner cover
16. Spring screws
17. Clutch drum
18. Thrust washer
19. Rollers (20 used)
20. Drive hub

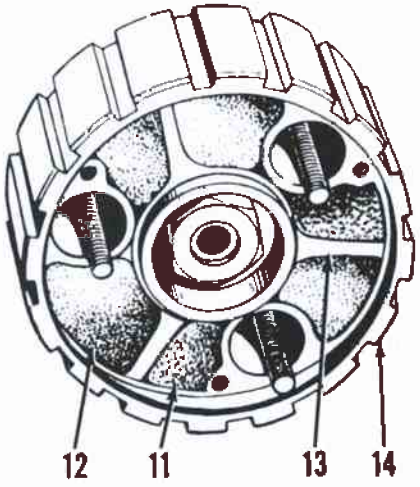
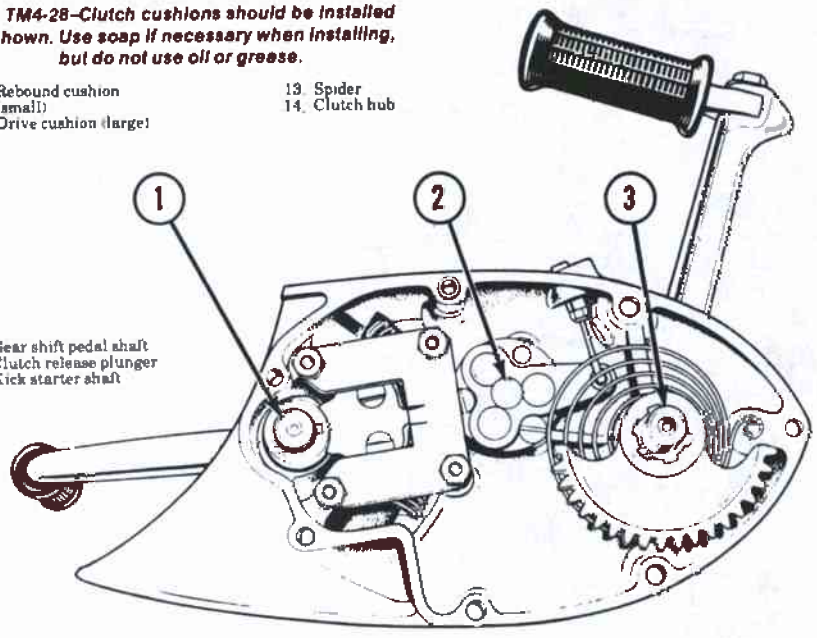


Fig. TM4-28–Clutch cushions should be installed as shown. Use soap if necessary when installing, but do not use oil or grease.

11. Rebound cushion (small)
12. Drive cushion (large)
13. Spider
14. Clutch hub

CLUTCH. Clutch plates can be removed after removing the primary chain case cover and the spring adjusting nuts (1—Fig. TM4-27). Six friction discs (7) and six driven plates (6) are used on all models. To remove the clutch drum and primary chain, it is necessary to remove the alternator rotor and stator, then use special pullers to remove crankshaft primary drive sprocket, clutch drum and primary chain. When removing the clutch drum (17), the special puller which attaches to the drive hub (20) should be used.

When assembling the shock absorber cushions (11 & 12 Fig. TM4-28), use soap to lubricate rubber cushions and make certain that drive and rebound cushions are on the correct sides of spider (13) as shown. NOTE: Do not use oil or grease to lubricate rubber cush-



1. Gear shift pedal shaft
2. Clutch release plunger
3. Kick starter shaft

Fig. TM4-29–View of gear box outer cover. Refer to Fig. TM4-30 for exploded view of the operating assemblies.

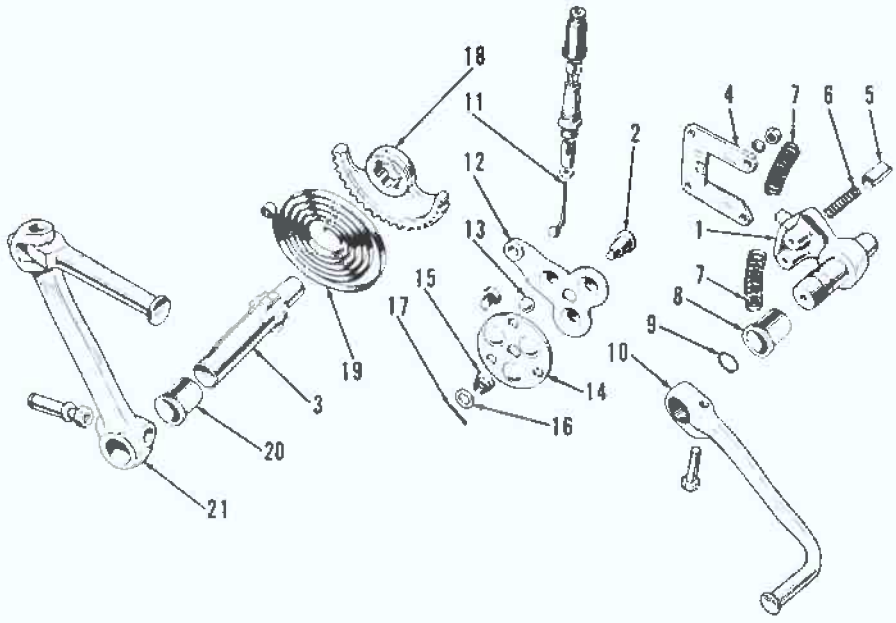


Fig. TM4-30–Exploded view of parts located in the gear box outer cover. Refer to Fig. TM4-29 for assembled view.

1. Gear shift pedal shaft
2. Clutch release plunger
3. Kick starter shaft
4. Guide plate
5. Ratchet pawls (2 used)
6. Ratchet springs (2 used)
7. Pedal return springs
8. Bushing
9. "O" ring
10. Gearshift pedal
11. Connecting link (Before serial number DU66246)
12. Clutch lever
13. Balls (3 used—⅜ in.)
14. Cam plate
15. Spring
16. Washer
17. Cotter pin
18. Kick starter gear
19. Return spring
20. Bushing
21. Kick starter pedal

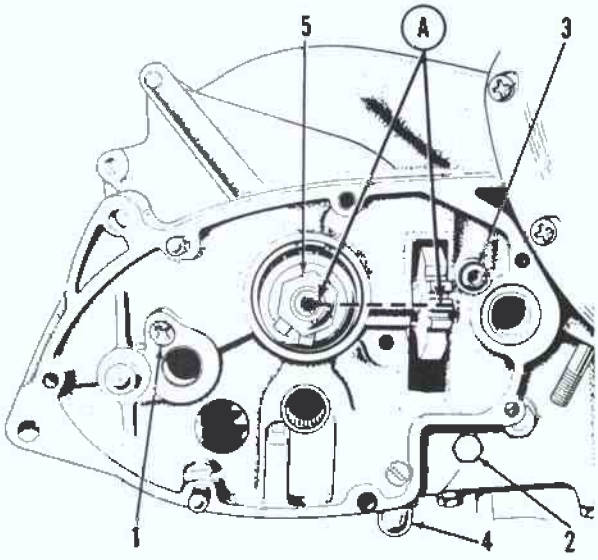


Fig. TM4-32–View of the gear box inner cover installed. Refer to text for removal procedure.

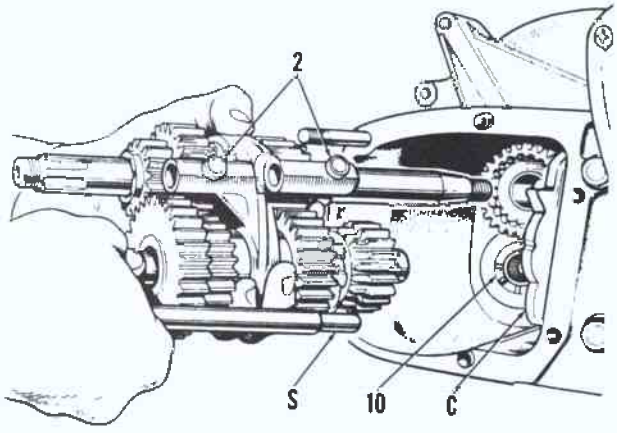


Fig. TM4-33–When removing or installing transmission gears, be careful not to lose thrust washer (10) or rollers (2).

ions. "Loctite" should be used on threads of the three screws attaching outer cover (10—Fig. TM4-27) to the hub (14). Install spacer (5—Fig. TM4-24) with tapered side toward main bearing. Position the crankshaft primary drive sprocket, chain and clutch drum (17—Fig. TM4-27) on shafts at the same time. Washer (9) should be installed with cupped side out toward nut. On models after serial number DU48144, nut (8) is self locking. On earlier models, lock washer should be installed between washer (9) and nut (8) with the long tab engaging hole in spider (13). On all models, nut (8) should be tightened to 50 Ft.-Lbs. (6.9kg-m) torque. On early models, with lock washer, washer should be bent around nut after tightening. Refer to ignition and electrical section when installing the alternator rotor and stator. Refer to the primary drive chain paragraphs for adjusting chain tension.

FOUR SPEED GEAR BOX. To remove the gear box outer cover, remove the exhaust pipe and foot rest from the right side. Loosen clutch cable adjuster and disconnect cable from the actuating spoke. Drain gear box and engage fourth gear. Remove the two nuts and four screws attaching outer cover, then remove the outer cover. Clutch operating cam, kick starter and gear change ratchet (Fig. TM4-29), are removed with the outer cover.

To remove the inner cover, bend the tab washer back and remove nut (5—Fig. TM4-32), then lift off the kick starter ratchet assembly. Unbolt and remove the right rear engine mounting plate. Remove nut (4) and withdraw the detent plunger and spring. Remove the primary chain cover, alternator assembly, primary chain, crankshaft sprocket and the complete clutch assembly. On models before serial number DU24875, disconnect the speedometer cable. Remove the three screws (1, 2 & 3) and remove the inner cover. Remove the shift fork rail then lift out the transmission gears and shafts as shown in Fig. TM4-33. The transmission output shaft and fourth gear (4—Fig. TM4-34) can be bumped out of bearing after the output sprocket (28) is removed.

If needle bearings (11 or 12) are renewed, bearings should be installed as shown in Fig. TM4-35 using a special drift. Bearing (12—Fig. TM4-34) is closed on outside end, bearing (11) is open. When removing and installing bearings (11, 12, 14 & 25), the appropriate case should be heated to 100° C (212° F.). Oil seal (27) should be installed with open side toward the bearing (25) and against snap ring (26).

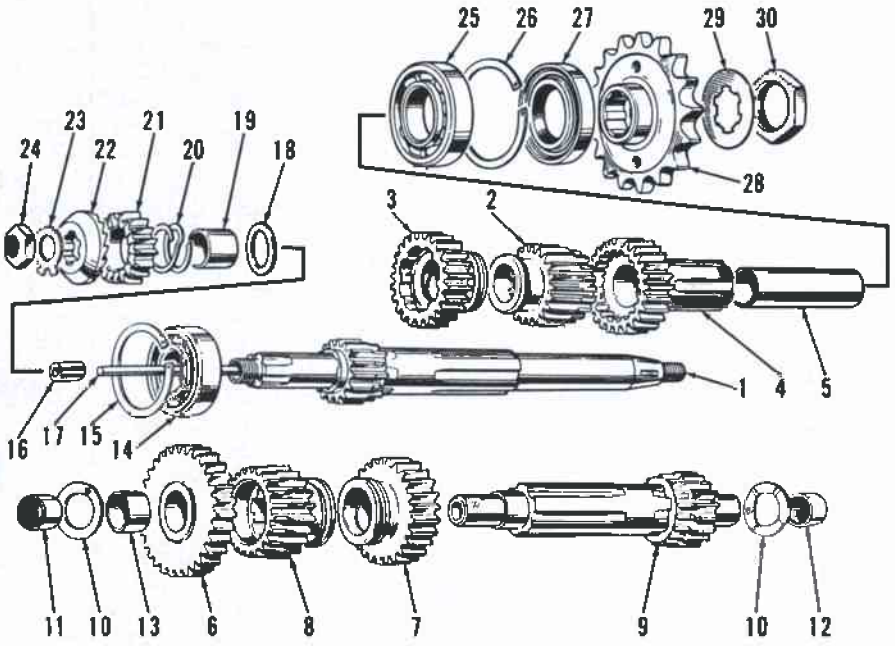


Fig. TM4-34–Exploded view of four speed transmission assembly. Refer to Fig. TM4-33 for assembled view.

1. Input shaft (mainshaft) and first gear
2. Sliding gear (2nd)
3. Sliding gear (3rd)
4. Output shaft and fourth gear
5. Bushing
6. First gear
7. Sliding gear (2nd)
8. Sliding gear (3rd)
9. Counter shaft (layshaft) and drive gear
10. Thrust washers
11. Needle bearing (open)
12. Needle bearing (closed end)
13. First gear bushing
14. Ball bearing
15. Snap ring
16. Clutch rod bushing
17. Clutch rod
18. Washer
19. Sleeve
20. Ratchet spring
21. Kick starter gear
22. Ratchet
23. Tab washer
24. Nut
25. Output shaft bearing
26. Snap ring
27. Oil seal
28. Output sprocket
29. Lock washer
30. Nut

Bushing (5) should be pressed into shaft (4) with oil groove toward teeth on shaft. Bushing should protrude 7/16-inch and must be reamed after installation to provide 0.0032-0.0047 inch clearance on input shaft (1). First gear bushing (13) should have 0.0025-0.0045 inch clearance on counter shaft (9).

When assembling, observe the following: Install the cam plate (C—Fig. TM4-36) and detent plunger (D), spring and nut (N). Turn the camplate until the notch between second and third gears engages detent plunger as shown in Fig. TM4-36. Use grease to stick the thrust washer (10) in position with grooved side out as shown. Stick the rollers (2—Fig. TM4-33) onto forks with grease. Slide the assembled shafts into housing while carefully sliding gears as required to align rollers (2) with grooves in cam plate (C). NOTE: Be careful not to move the camplate when assembling. With parts correctly positioned in housing, slide the shift rail through shift forks with shouldered end (S) toward inside. Use grease to stick thrust washer (10) around bearing (11—Fig. TM4-34) in the inner cover with the grooved side toward gear (6). Coat mating surfaces of inner cover and gear case with sealer, align the center tooth of the gear selector quadrant with center line of transmission input shaft as shown at (A—Fig. TM4-32) and install the inner cover. Install the gear box outer cover temporarily and check for correct shifting. NOTE: If gears can not be shifted correctly, remove the covers and check position of camplate (C—Fig. TM4-36) and quadrant (A—Fig. TM4-32). Install the kickstarter ratchet assembly (18 through 23—Fig. TM4-34) over end of shaft and tighten nut (24) 45 Ft.-Lbs. torque. NOTE: Sleeve (19) may be crushed if nut (24) is over tightened.

When assembling the gear box outer cover, refer to Figs. TM4-29 and TM4-30. The kick starter return spring should be installed with inner end of spring over the spline shown at (L—Fig. TM4-37). Refer to appropriate paragraphs when assembling the clutch and the alternator assemblies. The table on the following page lists details of various transmission parts used in four speed transmission. Refer to Figs. TM4-45, TM4-46, TM4-47, TM4-48 and TM4-49 for explanation of stepped and non-stepped (parallel) shafts; shaved and non-shaft gears;

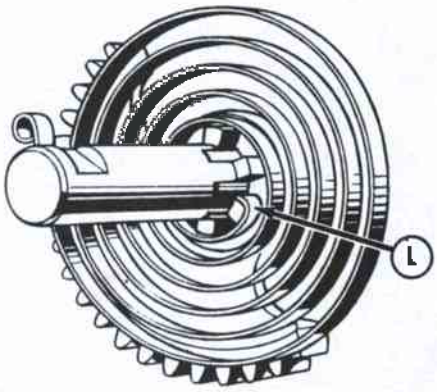


Fig. TM4-37–The kick starter return spring should be installed on spline shown.

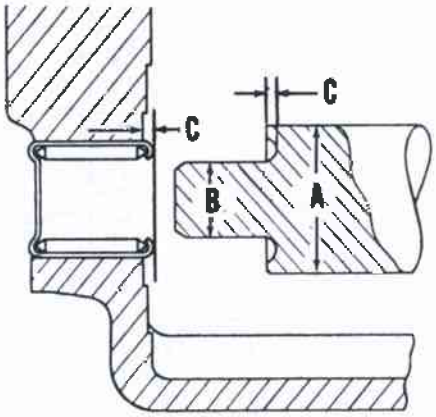
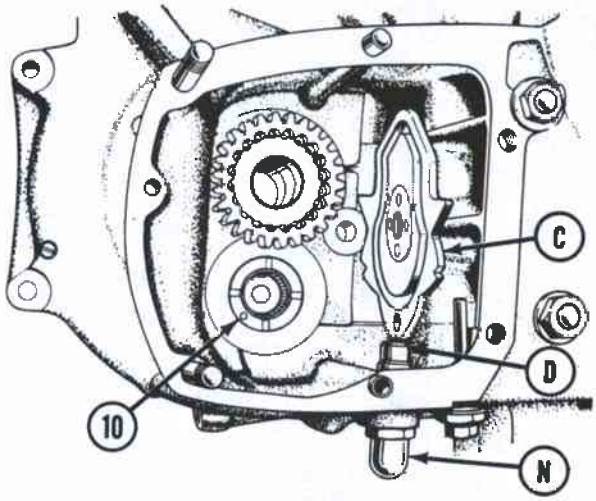


Fig. TM4-35–If needle bearings (11 and 12–Fig. TM4-34) are removed, bearings should be installed using a special drift. The bearings should project 0.073-0.078 inch (C) into the housing.

A. 1¼ inches B. 11/16 inch C. 0.073-0.078 inch

Fig. TM4-36–When assembling four speed transmission, detent plunger (D) should engage notch between 2nd and 3rd gears and the camplate (C) as shown.



Part No.	Description	No. of teeth	Used	Ratio	Details	1st Alternative	2nd Alternative
T914	Mainshaft assembly	16	Up to 1967	Std. and wide	Stepped shaft CEI threads	T2436 M/S + S586/S549 nuts + T2279 spacer	T4158 M/S + T3857 M/S 2 + S586/S549 nuts + T2279 spacer
T916	Mainshaft second	20	Up to early 1969	Std.	Non shaved sliding gear. Small bore	T3857 M/S2 + T4158 M/S + S586/S549 + T2279 spacer	None
T917	Mainshaft third	24	Up to 1968	Std. and wide	Non shaved running gear	T3858 M/S3 (24T) for W.R. up to 1970 and std. to early 1969	T3889 M/S3 (23T) + T4155 L/S + T3890 L/S 3 (22T)
T926	Layshaft low	30	Up to early 1969	Std. and wide	Non shaved bushed running gear	T3862 L/S low	None
T930	Layshaft third	22	Up to early 1969	Std. and wide	Non shaved sliding gear. Small bore	T3860 L/S 3 (22T) + T4155 L/S	T3890 L/S 3 (22T) + T4155 L/S + T3889 M/S3 (23T)
T955	Mainshaft second	21	Up to early 1969	Close	Non shaved sliding gear. Small bore	T4167 M/S 2 + T4173 M/S + S586/S549 + T2279 spacer	None
T957	Mainshaft high	24	Up to 1960	Close	Non shaved small splines non extended bush	None	None
T959	Layshaft assembly	22	Up to 1962	Close	Stepped shaft, non shaved. Plain bushes	None	None
T961	Layshaft low	28	Up to 1968	Close	Non shaved bushed running gear	T4163 L/S low	None
T963	Layshaft second	25	Up to 1968	Close	Non shaved running gear	T4166 L/S 2	None
T964	Layshaft third	23	Up to early 1969	Close	Non shaved sliding gear. Small bore	T4168 L/S 3 + T4162 L/S	None
T968	Mainshaft second	19	Up to early 1969	Wide	Non shaved sliding gear. Small bore	T4161 M/S 2 + T4158 M/S	None
T971	Layshaft assembly	18	Up to 1960	Wide	Stepped shaft non shaved. Plain bushes	None	None
T974	Layshaft second	27	Up to 1968	Wide	Non shaved running gear	T4160 L/S 2	None
T1063	Layshaft assembly	20	Up to 1960	Std.	Stepped shaft non shaved. Plain bushes	None	None
T1065	Layshaft second	26	Up to early 1969	Std.	Non shaved running gear	T3861 L/S 2	None
T1177	Mainshaft assembly	18	Up to 1961	Close	Stepped shaft CEI threads	T2438 M/S + S586/S549 nuts + T2279 spacer	T4173 M/S + T1467 M/S 2 + S586/S549 nuts + T2279 spacer
T1179	Mainshaft third	23	Up to 1968	Close	Non shaved running gear	T4169 M/S 3	None
T1302	Mainshaft high	26	Up to 1963	Std.	Non shaved extended bush. Small splines	T1914 M/S high may be used with 1964/70 sprocket	T3891 M/S high + E7037 plate + E7565 oil seal (Unit construction only)
T1303	Mainshaft high	24	Up to 1963	Close	Non shaved extended bush. Small splines	T1910 M/S high may be used with 1964/70 sprocket	T4172 M/S high + E7037 plate + E7565 oil seal (Unit construction only)
T1304	Mainshaft high	28	Up to 1963	Wide	Non shaved extended bush. Small splines	T2530 M/S high may be used with 1964/70 sprocket	T3657 M/S high + T4159 L/S + T3860 L/S3 + E7037 plate + E7565 oil seal (unit construction only). No alternative 1960—1963
T1608	Layshaft assembly	20	1961—1962	Std.	Stepped shaft incl. speedo drive. Needle roller	T1843 L/S	T4155 L/S + T3890 L/S 3 (No speedo drive)
T1609	Layshaft assembly	22	1961—1962	Close	Stepped shaft incl. speedo drive. Needle roller	T2163 L/S	T4162 L/S + T4168 L/S 3 (No speedo drive)
T1610	Layshaft assembly	18	1961—1962	Wide	Stepped shaft incl. speedo drive. Needle roller	T1844 L/S	T4159 L/S + T3657 M/S high + T3860 L/S 3 + E7037 plate + E7565 oil seal (unit construction). No speedo drive
T1843	Layshaft assembly	20	1963—1967	Std.	Stepped shaft hole for speedo gear	T4155 L/S + T3890 L/S 3 (No speedo drive)	None
T1844	Layshaft assembly	18	1963—1967	Wide	Stepped shaft hole for speedo gear	T4159 L/S + T3657 M/S high + T3860 L/S 3 + E7037 plate + E7565 oil seal (unit construction). No speedo drive	None
T1845	Layshaft assembly	22	1963—1967	Close	Stepped shaft hole for speedo gear	T4162 L/S + T4168 L/S 3 (No speedo drive)	None
T1910	Mainshaft high	24	1964—1967	Close	Non shaved extended bush. Large splines	T4172 M/S high + E7037 plate + E7565 oil seal	None
T1913	Mainshaft high	28	1964—1966	Wide	Non shaved extended bush. Large splines	T2530 M/S high + E7307 plate + E7565 oil seal	T3657 M/S high + T4159 L/S + T3860 L/S 3
T1914	Mainshaft high	26	1964—1967	Std.	Non shaved extended bush. Large splines	T3891 M/S high + E7037 plate + E7565 oil seal	None
T2093	Layshaft assembly	20	1968—early 1969	Std.	Stepped shaft no speedo drive	T1843 L/S	T4155 L/S + T3890 L/S 3
T2060	Layshaft assembly	18	1967—1968	Wide	Stepped shaft. No hole for speedo drive	T1844 L/S	T4159 L/S + T3657 high + T3860 L/S 3 + E7037 plate + E7565 oil seal
T2163	Layshaft assembly	22	1968—early 1969	Close	Stepped shaft. No hole for speedo pinion	T1845 L/S	T4162 L/S + T4168 L/S 3
T2316	Mainshaft high	26	1968—early 1969	Std.	Non shaved extended nose	T3891 M/S	None
T2370	Mainshaft third	23	Early 1969	Std.	Non shaved running gear	T3889 M/S 3	None
T2379	Layshaft third	22	Early 1969	Std.	Non shaved sliding gear. Small bore	T3890 L/S 3 + T4155 L/S	None
T2436	Mainshaft assembly	16	1968—early 1969	Std. and wide	Stepped shaft. U.N.F. threads	T4158 M/S + T3857 M/S 2 Std. ratio T4158 M/S + T4161 M/S 2 Wide ratio	None None
T2438	Mainshaft assembly	18	1968—early 1969	Close	Stepped shaft. U.N.F. threads	T4173 M/S + T4167 M/S 2	None
T2528	Mainshaft high	24	1968—early 1969	Close	Non shaved extended nose. Large splines	T4172 M/S high	None
T2530	Mainshaft high	28	1967—1966	Wide	Non shaved extended nose. Large spline	T3657 M/S high + T4159 L/S + T3860 L/S 3	None
T3657	Mainshaft high	23	1969—1970	Wide	Shaved extended nose. Large spline	(metric module)	None
T3670	Layshaft assembly	15	1969 (H.P. only)	Wide	Stepped shaft (metric module)	None	T4159 L/S + T3860 L/S 3
T3857	Mainshaft second	20	Late 1969—	Std.	Shaved sliding gear. Large bore	None	None
T3858	Mainshaft third	24	1969—	Wide	Shaved running gear	None	None
T3860	Layshaft third	22	Late 1969—	Wide	Shaved sliding gear. Large bore	None	None
T3861	Layshaft second	26	Late 1969—	Std.	Shaved running gear	None	None
T3862	Layshaft low	30	1969—	Std. and wide	Shaved bushed running gear	None	None
T3864	Layshaft assembly	20	Early 1969	Std.	Stepped shaft with shaved gear	T1843 L/S	T4155 L/S + T3890 L/S 3
T3889	Mainshaft third	23	Late 1969—	Std.	Shaved running gear	None	None
T3890	Layshaft third	22	Late 1969—	Std.	Shaved sliding gear. Large bore	None	None
T3891	Mainshaft high	26	Late 1969—	Std.	Extended nose. Shaved gear	None	None
T3893	Mainshaft assembly	16	Early 1969	Std. and wide	Stepped shaft. Shaved gear	T2436 M/S	T4158 M/S + T3857 M/S 2 Std. T4158 M/S + T4161 M/S 2 Wide
T4153	Layshaft assembly	22	Early 1969—	Close	Stepped shaft shaved gear	T1845	T4162 L/S + T4168 L/S 3
T4154	Mainshaft assembly	18	1968—early 1969	Close	Stepped shaft shaved gear	T2438	T4173 M/S + T4167 M/S 2
T4155	Layshaft assembly	20	Late 1969—	Std.	Non stepped shaft shaved gear	None	None
T4158	Mainshaft assembly	16	Late 1969—	Std. and wide	Non stepped shaft shaved gear	None	None
T4159	Layshaft assembly	15	Late 1969—	Wide	Non stepped shaft shaved gear	(metric module)	None
T4160	Layshaft second	27	1969—	Wide	Shaved running gear	None	None
T4161	Mainshaft second	19	Late 1969—	Wide	Shaved sliding gear large bore	None	None
T4162	Layshaft assembly	22	Late 1969—	Close	Non stepped shaft. Shaved gear	None	None
T4163	Layshaft low	28	Early 1969—	Close	Shaved bushed running gear	None	None
T4166	Layshaft second	25	Late 1969—	Close	Shaved running gear	None	None
T4167	Mainshaft second	21	Late 1969—	Close	Shaved sliding gear. Large bore	None	None
T4168	Layshaft third	23	Late 1969—	Close	Shaved sliding gear. Large bore	None	None
T4169	Mainshaft third	23	Early 1969—	Close	Shaved running gear	None	None
T4172	Mainshaft high	24	Late 1969—	Close	Shaved extended nose	None	None
T4173	Mainshaft assembly	18	Late 1969—	Close	Non stepped shaft. Shaved gear	None	None

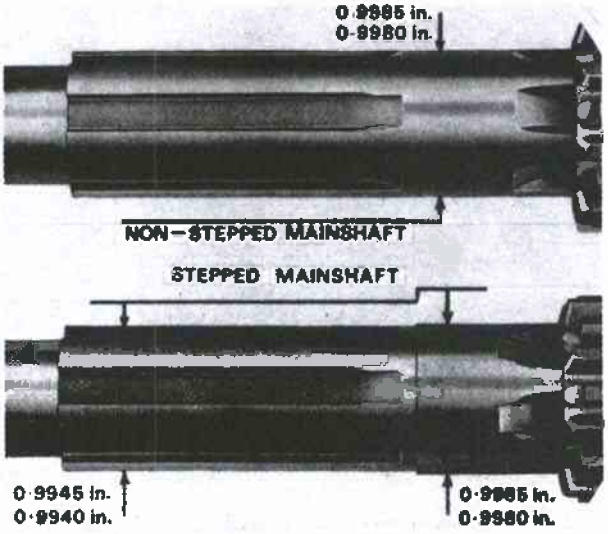


Fig. TM4-45–Views of four speed transmission input shafts (mainshafts) showing differences between non-stepped and stepped types.

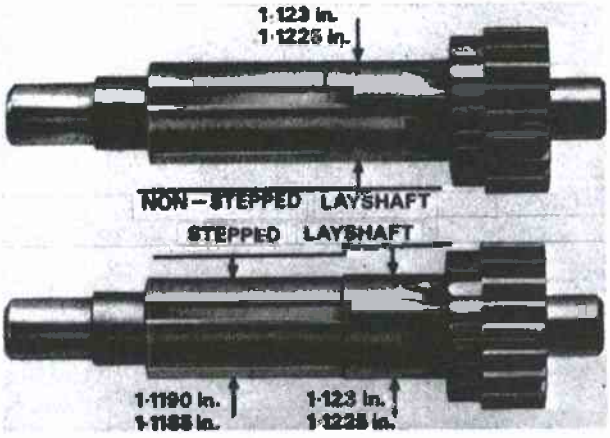


Fig. TM4-46–Views of four speed countershafts (layshafts) showing differences between stepped and non-stepped types.

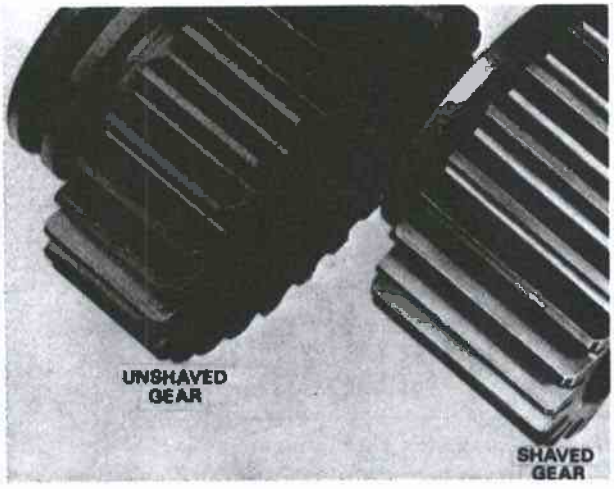


Fig. TM4-47–Views showing differences between unshaved and shaved gears.

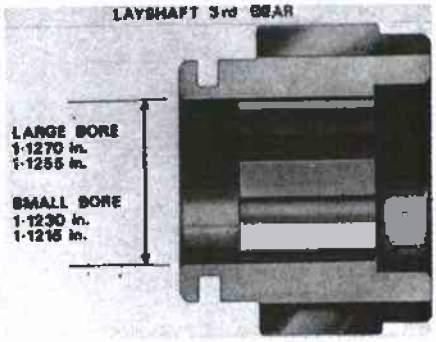


Fig. TM4-48–Cross section drawing of mainshaft second gear with bore diameters for large bore and small bore types.

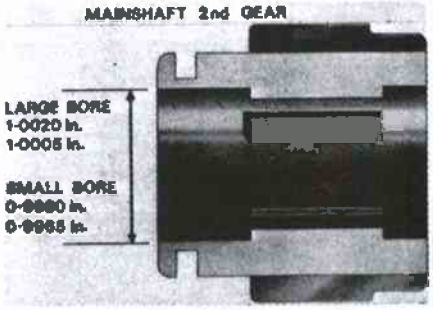


Fig. TM4-49–Cross section drawing of layshaft third gear with bore diameters for large bore and small bore types.

small and large splined gears. Also listed are the dates when used in original production. Some of the improvements incorporated in later production can be installed in earlier transmissions; however, it is extremely important to select the correct combination to ensure proper operation. Small bore gears should never be installed on a non-stepped shaft and large bore gears should never be used on a stepped shaft. Mainshafts have two different types of threads (C.E.I. or U.N.F.). Be sure that the nuts and spacers are correct for the shaft used as well as the gears used. Installing late mainshaft high gears in early transmission may necessitate installing later plate and seal at rear of clutch. The gearbox casting must be modified to change layshaft (countershaft) from plain bushing to needle roller type.

FIVE SPEED GEAR BOX. To remove the gear box outer cover, remove right side exhaust pipe and foot rest. Loosen the clutch cable adjuster and disconnect cable at the hand lever. Remove plug from cover and release the cable from actuating arm. Disconnect cable and housing from gearbox outer cover. Drain gear box and engage fifth gear. Remove the two nuts and four screws that attach cover, then depress kickstarter slightly and remove cover. The clutch operating cam, kick starter and gear change ratchet are removed with cover.

To remove the inner cover, unbolt and remove the right rear engine mounting plate. Bend tangs of lock washer down and remove nut (24—Fig. TM4-52). Remove the three screws (3) and remove cover from dowels.

Remainder of disassembly will depend upon work done. The complete clutch assembly must be removed before input shaft (1—Fig. TM4-50) can be removed. The transmission output sprocket (28) must be removed before output shaft (4) can be removed.

The gearbox or cover should be heated to approximately 100°C. when removing or installing bearings. Refer to Fig. TM4-35 for installing countershaft (layshaft) needle bearings. The bronze thrust washers on the countershaft should be positioned with grooved

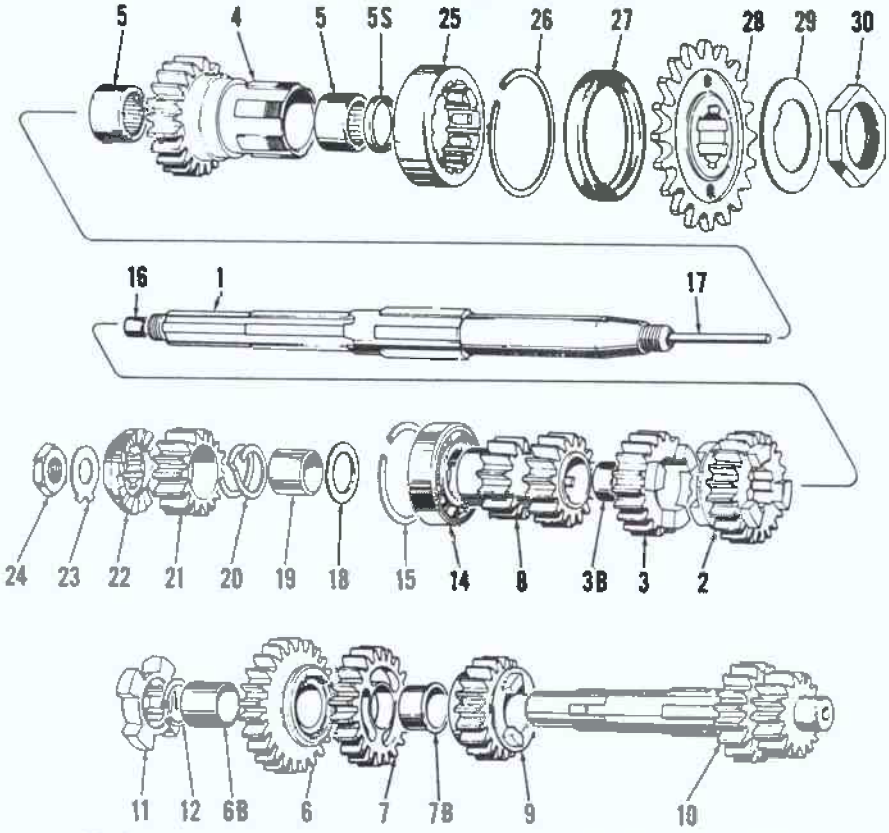


Fig. TM4-50–Exploded view of five speed transmission gears and associated parts.

1. Input shaft (mainshaft)
2. Fourth gear
3. Third gear
3B. Bushing
4. Output shaft and fifth gear
5. Needle roller bearings
5S. Oil seal
6. First gear
6B. Bushing
7. Second gear
8. First and second gear
9. Third gear
10. Countershaft (layshaft) with fourth gear and drive gear
11. First gear drive dog
12. Snap ring
14. Ball bearing
15. Snap ring
16. Clutch rod bushing
17. Clutch rod
18. Washer
19. Sleeve
20. Ratchet spring
21. Kick starter gear
22. Ratchet
23. Tab washer
24. Nut
25. Output shaft roller bearing
26. Snap ring
27. Oil seal
28. Output sprocket
29. Lock washer
30. Nut

surfaces toward gear on shaft (10—Fig. TM4-50) and first gear drive dog (11).

Assemble transmission gears, shafts, shift forks and shift cam with parts in first gear. Install the cover with the top of the second tooth on quadrant aligned with center of foot change spindle bore as shown at (A—Fig. TM4-52).

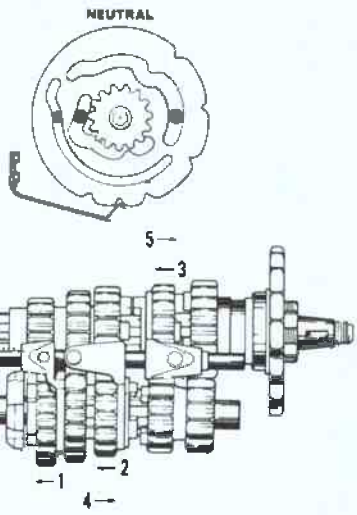


Fig. TM4-51–Drawing of transmission showing positions of shift cam and shift forks in neutral.

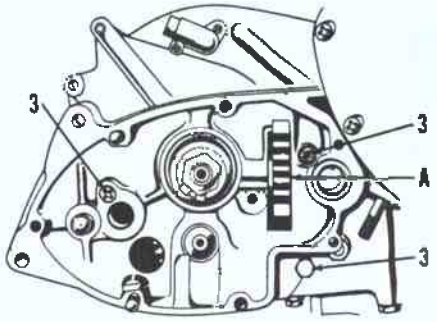


Fig. TM4-52–Drawing of inner cover showing the three screws (3) which attach cover.

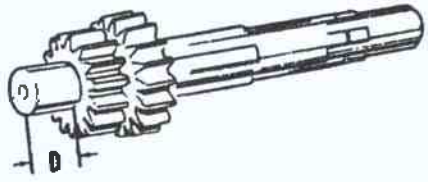


Fig. TM4-53–The fourth speed gear and the drive gear are pressed onto the countershaft (layshaft). Distance (D) must be 0.653-0.655 inch (16.58-16.64mm) and clearance between gears should be at least 0.007 inch (0.18mm).