Triumph

MODEL COVERAGE

250
TR25W

500
T100C, "Trophy Trail"
T100R, "Daytona"

650
TR6R, "Trophy"
TR6C, "Trophy"
T120R, "Bonneville"

750 Twins
TR7V, "Tiger 750"
T140V, "Bonneville 750"

750 Triples
T150, "Trident"
T150V, "Trident"

INDEX

MAINTENANCE

NOTE: *Common maintenance procedures are explained in detail in "General Information."*

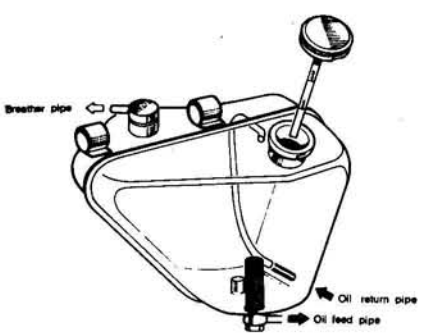
LUBRICATION

Engine

NOTE: *Always change oil when the engine is at operating temperature.*

TR25W

1. Remove the right side-panel.
2. Using a suitable container and funnel to catch the oil, remove the oil tank filter located in the lower right corner of the tank. Clean the filter in solvent.
3. Allow the tank to drain for about five minutes, then lean the machine toward the right side to make sure that all the oil has been removed.
4. Remove the four attaching nuts and the oil sump filter located at the bottom of the crankcase. Also, disconnect the supply and scavenge lines at the crankcase union nut.
5. Wash the sump filter in solvent, then allow it to air dry or blow it dry with compressed air.
6. Reinstall the sump filter and gasket, connect the supply and scavenge lines, and reinstall the oil tank filter.
7. Add the recommended oil to the tank until it reaches the correct level mark on the dipstick. Do not overfill it, as excessive venting will result.
8. Let the engine run for several minutes, then recheck the oil level and top up if necessary.



250 oil tank

500 AND 650

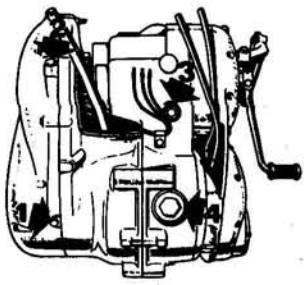
1. Remove the sump drain plug and filter.
2. Thoroughly clean the filter in solvent.
3. Allow the oil to drain for approximately five minutes, then reinstall the filter (with gasket) and the sump drain plug.
4. Remove the oil tank filler cap.
5. Position a container under the oil tank, then remove the tank drain plug or disconnect the feed line.
6. Remove the oil tank filter and clean it thoroughly in solvent.
7. If possible, clean the oil tank with

General Specifications

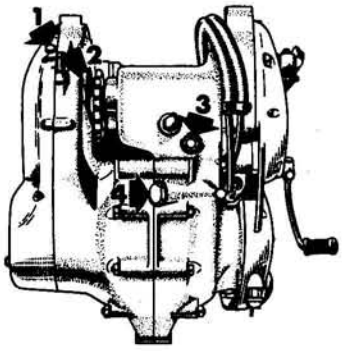
	TR25W	T100C	T100R	TR6R *	TR6C *
DIMENSIONS					
Net weight (lbs)	320.0	337.0	341.0	365.0	365.0
Overall Height (in.)	43.25	38.0	38.0	38.0	38.0
Overall Width (in.)	28.0	26.5	26.5	27.5	27.5
Overall Length (in.)	83.0	83.25	83.25	84.0	84.0
Wheelbase (in.)	53.0	53.5	53.5	55.0	55.0
Seat Height (in.)	32.0	——	——	——	——
Ground Clearance (in.)	8.5	7.5	7.5	6.0	6.0
ENGINE					
Displacement (cc)	250	490	490	649	649
Bore x Stroke (mm)	67 x 70	69 x 65.5 (2)	69 x 65.5 (2)	71 x 82 (2)	71 x 82 (2)
Compression Ratio	10 : 1	9.0 : 1	9.1 : 1	9.0 : 1	9.0 : 1
Carburetor Type and Model	Amal 928/1	②	③	Amal R930/23	Amal R930/23
TRANSMISSION					
Clutch Type	wet, multi-plate	wet, multi-plate	wet, multi-plate	wet, multi-plate	wet, multi-plate
Internal Gear Ratios					
1st	2.65	2.47	2.47	2.44	2.44
2nd	1.65	1.61	1.61	1.69	1.69
3rd	1.24	1.22	1.22	1.24	1.24
4th	1.00	1.00	1.00	1.00	1.00
5th	——	——	——	——	——
Sprockets (no. of teeth)					
Engine	23	26	26	29	29
Clutch	52	58	58	58	58
Gearbox	15	18	18	18	18
Rear Wheel	①	46	46	46	46
CHASSIS					
Front Suspension	rod damper or shuttle valve-type telescopic			shuttle valve-type telescopic	
Rear Suspension	swing arm with hydraulically dampened shocks				
Tire Size: front	3.25 x 18	3.25 x 19	3.25 x 19	3.25 x 19	3.25 x 19
rear	4.00 x 18	4.00 x 18	4.00 x 18	4.00 x 18	4.00 x 18
ELECTRICAL					
System Voltage	12	12	12	12	12
Generator Type	alternator				

	T120R *	T150	TR7V	T140V	T150V
DIMENSIONS					
Net Weight (lbs)	365.0	470.0	402	408	460
Overall Height (in.)	38.0	43.5	38.0	38.0	43.5
Overall Width (in.)	27.5	32.5	33.0	33.0	32.5
Overall Length (in.)	84.0	86.0	87.5	87.5	86.0
Wheelbase (in.)	55.0	56.25	55.0	55.0	56.3
Seat Height (in.)	——	32.0	31.5	31.5	32.0
Ground Clearance (in.)	5.0	6.5	6.0	6.0	6.5
ENGINE					
Displacement (cc)	649	741	747	747	741
Bore x Stroke (mm)	71 x 82 (2)	67 x 70 (3)	76 x 82 (2)	76 x 82 (2)	67 x 70 (3)
Compression Ratio	9.0 : 1	9.0 : 1	8.6 : 1	8.6 : 1	9.5 : 1
Carburetor Type and Model	Amal R930/9 & L930/10	Amal 626	Amal R930/89	Amal L930/92 & R930/89	Amal 626
TRANSMISSION					
Clutch Type	wet, multi-plate	wet, single-plate	wet, multi-plate	wet, multi-plate	wet, single-plate
Internal Gear Ratios					
1st	2.44	2.44	2.59	2.59	2.59
2nd	1.69	1.69	1.84	1.84	1.84
3rd	1.24	1.19	1.40	1.40	1.40
4th	1.00	1.00	1.19	1.19	1.19
5th	——	——	1.00	1.00	1.00
Sprockets (no. of teeth)					
Engine	29	28	29	29	28
Clutch	58	50	58	58	50
Gearbox	18	18	20	20	18
Rear Wheel	46	52	47	47	53
CHASSIS					
Front Suspension	telescopic, hydraulically dampened				
Rear Suspension	swing arm with hydraulically dampened shocks				
Tire Size: front	3.25 x 19	3.50 x 19	3.25 x 19	3.25 x 19	4.10 x 19
rear	4.00 x 18	4.10 x 18	4.00 x 18	4.00 x 18	4.10 x 19
ELECTRICAL					
System Voltage	12	12	12	12	12
Generator Type	alternator				

* Optional 5-speed gearbox available. Ratios: 1st—2.585; 2nd—1.837; 3rd—1.400; 4th—1.192; 5th—1.000.
① Amal 376/273 prior to serial no. H.57083; Amal 628/8 after serial no. H.57083.
② Amal 376/324 and 325 before serial no. H.5708; Amal 626/9 and 10 after serial no. H.5708.
③ Amal 376/324 and 325 before serial no. H.5708; Amal 626/9 and 10 after serial no. H.5708.



500 models
1. Primary chaincase level plug
2. Primary chaincase drain plug and chain tensioner adjustment
3. Gearbox drain and level plug
4. Sump drain and filter plug



650, 750 Twins
1. Primary chaincase level plug
2. Primary chaincase drain plug and chain tensioner adjustment
3. Gearbox drain and level plug
4. Sump drain and filter plug

flushing oil. If it is not available, use kerosine, but make sure all traces are removed before filling the tank with oil.

8. Fill the tank with the recommended lubricant. The correct level is 1½ in. below the filler cap. Do not exceed this level, as excessive venting will result.

9. Allow the engine to run for several minutes, and recheck the oil level, topping it up if necessary.

TR7V, T140V

Note that the oil for these models is carried in the frame backbone. A filter is also fitted at the bottom of the frame oil reservoir.

1. When the engine is warm, remove the hex-head sump drain plug from beneath the engine. This plug houses the sump filter as well.

2. Allow the oil to drain from the sump for at least ten minutes. Clean the sump plug filter in a suitable solvent, check the condition of the gasket, then replace the filter and the drain plug.

3. Remove the oil reservoir filler cap. Remove the drain plug from the center of the base plate at the very bottom of the frame oil reservoir. Allow to drain for at least ten minutes.

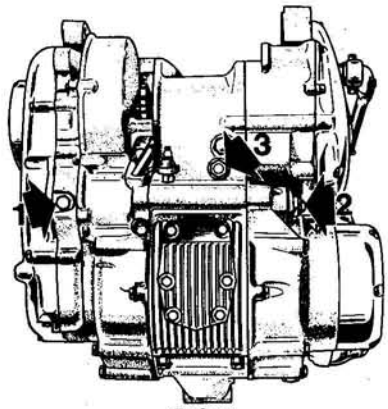
4. Remove the four nuts which secure the cover plate at the bottom of the reservoir, and remove the plate from the studs. Noting the location of the two gaskets (one above the filter base flange, and the other below), clean the filter in a suitable solvent.

5. Flushing the reservoir with kerosene is recommended.

6. The filter gaskets should be replaced. Refit the filter, cover plate, cover plate nuts, and drain plug. Fill the reservoir with the correct amount and recommended grade of oil. Check the oil level after the engine has been run for several miles.

T150, T150V

1. When the engine is warm, remove the six nuts and lockwashers which secure the crankcase sump filter plate to the bottom of the crankcase. Carefully remove the plate. Allow the oil to drain for about ten minutes.



Trident
1. Primary chaincase drain plug
2. Oil filter housing cap
3. Gearbox drain and level plug

2. Clean the sump filter in a solvent. The gaskets on either side of the filter should be replaced upon reassembly. Replace the filter, noting that the pocketed end is towards the rear of the engine. Tighten the nuts gradually and evenly.

3. Remove the oil tank filler cap, and the right side-panel. Drain the oil from the oil tank, then remove the tank oil filter, and wash it in a solvent.

4. Flushing out the oil tank with kerosine is recommended.

5. Remove the cartridge-type main feed oil filter. This is located beneath the large cap nut just below the forward end of the gearbox outer cover. Note that the filter is pulled out with a pair of needle-nosed pliers. There is a spring immediately beneath the cap nut, and an O-ring on the end of the filter. The filter should be replaced every time the oil is changed.

6. When replacing the filter, be sure that the O-ring and the fiber washer are in good condition.

CAUTION: *When the filter is refitted, be sure that the hole in the filter faces inward.*

Refill the oil tank with the correct quantity and recommended grade of oil. Check the level with the dipstick after the engine has run for several miles.

Gearbox

All gearbox components, including the shifter and kick-start mechanisms, are lubricated by oil splash. The oil should be changed at 500 miles in new or reconditioned engines, and at every recommended service interval thereafter.

NOTE: *Drain oil when it is warm.*

TR25W

1. Remove the nylon filler plug and the dipstick from the top of the gearbox.

2. Remove the plug on the bottom of the gearbox and drain the oil.

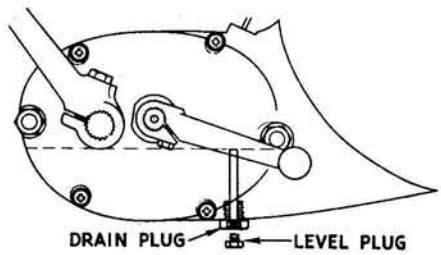
3. After draining, reinstall the plug, making sure that the sealing O-ring is in good condition.

4. Fill the gearbox with the recommended lubricant to the line marked on the dipstick.

OTHER MODELS

1. Remove the transmission drain plug located at the bottom of the gearbox.

2. After letting the oil drain for about ten minutes, reinstall the drain plug, but without the level plug that normally screws into it.



Gearbox drain and level plug

3. Remove the gearbox oil filler plug on the case cover and add fresh oil until it flows out the level plug hole.

4. Reinstall the level plug.

Primary Chaincase

Like the gearbox, the primary chaincase is lubricated by oil bath. On all models, the primary oil supply is contained within the case, where a collection chamber and a feed pipe provide direct lubrication to the primary chain and sprockets.

TR25W

1. On early machines, two of the chaincase securing screws serve as drain and level plugs. On later bikes, a vertical drain plug is provided at the bottom of the case and the forwardmost of the lower chaincase securing screws serves as a level plug.

2. Remove the chain inspection cap on top of the chaincase.

3. Remove the drain plug or screw and level screw.

4. Let the oil drain for about ten minutes, then reinstall the drain plug or screw.

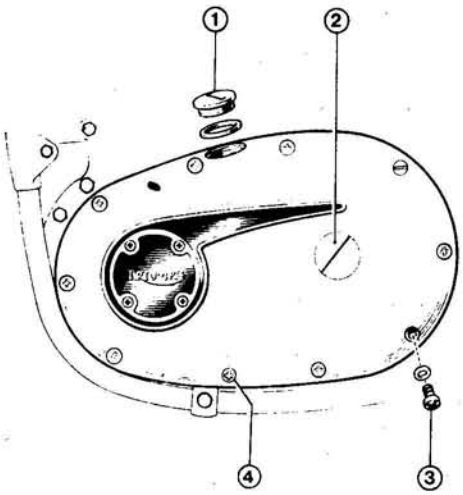
5. Pour the specified amount of the recommended lubricant into the chaincase through the chain inspection cap until it flows out the level screw hole.

6. Reinstall the level screw and chain inspection cap.

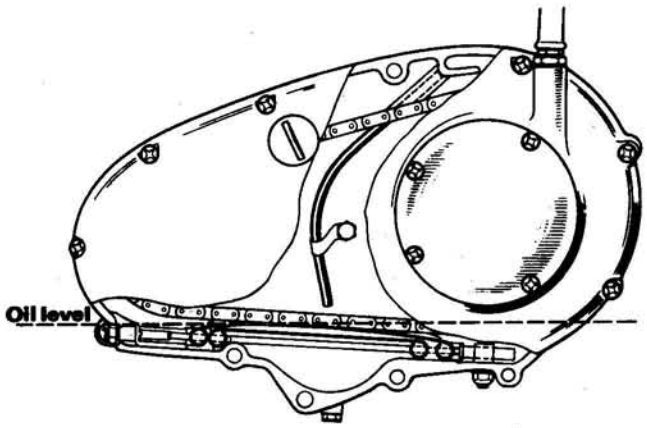
NOTE: *Oil containing molybdenum disulphide or graphite, or oil additives, must not be used in the primary chaincase.*

TWINS

On models after about 1971, the primary chaincase oil is automatically supplied by oil forced through the drive side crankshaft bearing. The level is main-



Early 250 chaincase filler (1), clutch adjustment cap (2), level (3) and drain (4) screws



Chaincase oil level (Trident)

tained by drillings which allow excess oil to re-enter the crankcase.

1. Remove the primary chaincase drain plug. This is also the chain adjuster cover plug. On some 500 models it may be necessary to remove the footpeg, striking it after the bolt is loosened to remove it from its taper.
2. Allow the oil to drain for about 10 minutes. Reinstall the drain plug. On older models, remove the level plug.
3. Remove the filler plug at the top of the case. On the older models, add the correct grade oil until it begins to seep from the level plug hole. Refit the level plug and filler plug.

On the more recent machines, add only about ¼ pint of motor oil. The level will come up to the proper amount as the machine is ridden. Check with the level plug.

T150, T150V

1. The primary chaincase is lubricated by oil forced through the crankshaft bearing as outlined for late-model Twins.
2. After removing the drain plug and allowing several minutes for the oil to drain off, refit the drain plug. Add no more than ½ pint of motor oil. The level will rise as the machine is ridden, and will be maintained at the proper level by drillings in the crankcase.

Front Forks

1. Drain each fork leg separately.
2. Remove the drain bolt at the bottom of the fork slider. Hold the front brake and pump the forks several times to expel all the oil.
3. Refit the drain plug. Remove the filler cap at the top of the fork leg.

NOTE: *On machines with resiliently-mounted handlebars, the handlebars may have to be removed to gain access to the filler caps.*

4. Add the correct amount and type of oil, refit the cap; repeat the procedure with the remaining fork leg.

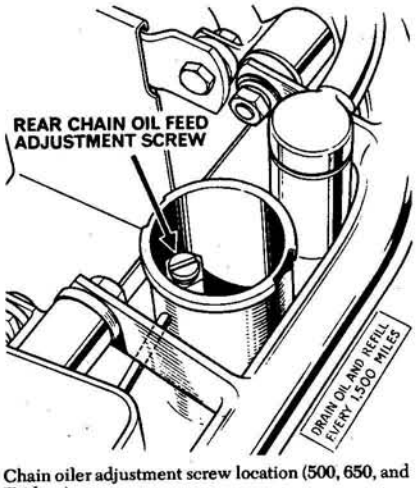
Final Drive Chain

TR25W

Lubrication of the final drive chain is totally dependent on the oil level in the primary chaincase. As the primary chain spins, it throws off the oil fed by the primary case collection chamber. This oil is collected by a small well at the back of the primary case and is then drip-fed to the chain.

500, 650, 750-3

The drive chain on these models is lubricated by means of an overflow tube from the neck of the oil tank. The flow is adjusted by means of a screw with a tapered tip threaded into the oil junction block in the neck of the tank. The screw is accessible after removing the tank filler cap. To increase oil flow to the chain, turn the screw counterclockwise. To decrease flow, turn the screw clockwise.



Chain oiler adjustment screw location (500, 650, and Trident)

750 TWINS

The chain should be lubricated by hand at intervals, depending on conditions. No automatic oiler is fitted.

Grease Nipples

Both the front and rear drum brake cams, and the swinging arm pivot are fitted with grease nipples. The brake cams should be given only one stroke of a hand grease gun; the swinging arm pivot should be greased until the lubricant spurts out the pivot O-rings.

Brake Pedal Spindle

The brake pedal spindle is located on the left, rear, engine mounting plate. Since the operating shaft is exposed to the air, it should be coated with grease to prevent dirt penetration and corrosion.

1. Back off the rear brake rod adjustment until there is plenty of play.
2. Remove the pedal retaining nut and pedal.
3. Clean up the operating shaft and bore of the pedal with fine emery cloth.
4. Apply the recommended grease to the shaft and reinstall the pedal. Make sure you don't forget the spring and washer that accompany the retaining nut.

Wheel and Steering Head Bearings

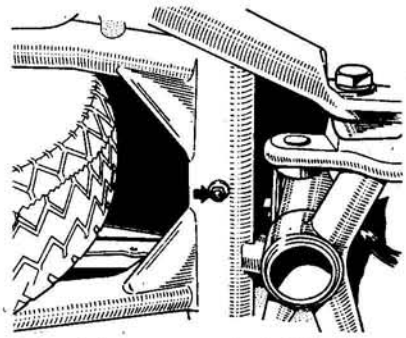
1. These bearings should be packed with a good grade of bearing grease every 12,000 miles.
2. Refer to "Chassis" for removal and installation procedures.

SERVICE CHECKS AND ADJUSTMENTS

Clutch

TR25W, TWINS

1. Run down the clutch cable adjuster(s) until there is plenty of freeplay in the clutch hand lever.



Swing arm grease nipple (650)

2. Remove the clutch adjustment cap on the primary chaincase.

3. Loosen the adjustment nut. Turn the adjusting screw out a few turns, then turn it in until resistance is felt.

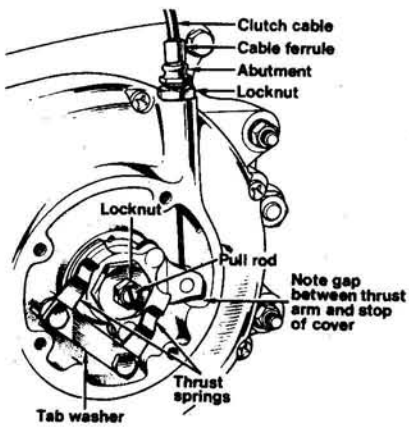
4. At this point, back the adjusting screw off the following number of turns:
TR25W: 1
500: ½
650, 750: 1

5. Tighten the adjusting screw locknut while holding the screw in position. Use the cable adjusters to allow ⅛ in. (3 mm) of freeplay between the clutch hand lever and the lever holder before the clutch begins to disengage.

T150, T150V

1. Remove the four screws which secure the clutch inspection plate to the primary chaincase.

2. Run down the clutch cable adjusters both at the handlebar and the chaincase cover so that there is plenty of slack in the clutch cable.



Trident clutch adjustment

3. Loosen the small locknut on the end of the clutch pull-rod. Then turn the large nut until the proper setting is obtained. This will be not less than 0.005 in. measured between the rear face of the large adjuster nut and the ball bearing in the actuating plate. Be sure that the clutch pull-rod does not turn, and retighten the small locknut. Recheck the setting.

4. Adjust the cable so that there is just a very small amount of freeplay at the handlebar lever.

Primary Chain Adjustment

ALL MODELS

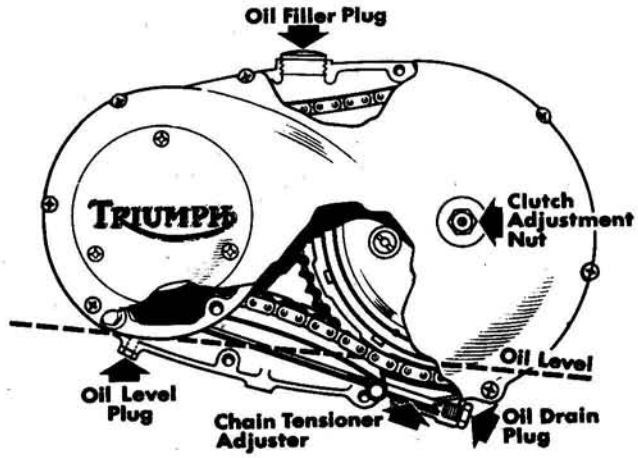
An occasional adjustment is necessary to compensate for chain wear. Excess chain slack is taken up by tightening the tensioner bolt.

1. Remove the primary chaincase filler or inspection cap. Place a pan beneath the chaincase and remove the tensioner plug. On most models, the chaincase oil will drain off.

2. Chain slack should be as follows:
TR25W: ¼ in. (6 mm)
Trident: ½ in. (12 mm)
Others models: ⅜ in. (9.5 mm)

This is total up-and-down movement. If adjustment is necessary, use a screwdriver to turn the tensioner bolt until tension is correct.

3. After refitting the tensioner plug, refer to "Primary Chaincase" lubrication to fill and check oil level.



500 and 650 chaincase

Final Drive Chain

1. Chain slack should be ¾ in. (19 mm) total up-and-down movement measured in the middle of the chain run with the machine on its wheels. With the bike on the center stand, the slack should be 1¾ in. (43 mm).

Measure at the chain's tightest point.

2. If adjustment is necessary, loosen the axle nut and the brake anchor. Move the wheel by turning the adjustment bolts by equal amounts.

3. Apply the rear brake and tighten the axle nuts.

Brakes

DISC BRAKES

1. The brakes are self-adjusting. Maintain the fluid level at ¼ in. below the top of the master cylinder.

2. Brake pads should be replaced when either of them reaches a lining thickness of 1/16 in. (1.6 mm).

FRONT DRUM

1. On single-leading shoe brakes, use the adjuster at the wheel so that the hand lever can be moved about 1 in. (measured at the tip of the lever) before the shoes contact the drum.

2. On twin-leading shoe brakes, hand lever travel should be the same (1 in., measured at the tip of the lever) and is effected by using the adjuster at the hand lever.

REAR DRUM

1. If a change in pedal position is desired, do this before adjusting the brake.

2. Use the adjuster at the end of the brake rod so there is ½ in. (12 mm) of pedal movement before the shoes contact the drum. The measurement should be made with the weight of a rider on the motorcycle.

Periodic Maintenance Intervals

Every 250 Miles
Check oil tank level
Check chain oiler adjustment (where applicable)

Every 1000 Miles
Lubricate cables
Grease swing arm pivot and brake fittings
Remove and clean final drive chain
Check primary chaincase oil (1970 and later)
Change primary chaincase oil (1969 and earlier)

Every 1500 Miles
Change engine oil (650, 750 Twins)

Every 2000 Miles
Lubricate contact breaker

Every 3000 Miles
Check gearbox oil level
Grease brake pedal spindle

Every 4000 Miles
Change engine and primary chaincase oil (500 T150)
Change disposable oil filter element (where applicable)

Every 6000 Miles
Change gearbox oil
Change front fork oil
Repack wheel bearings

Every 12000 Miles
Grease steering head bearings

Recommended Lubricants

Engine and Primary Chaincase
SAE 20W/50, "SE"
SAE 10W/40, "SE"

Gearbox
SAE 90 EP

Front Forks
1972 and later: ATF
1971 and earlier: SAE 10/40
SAE 20W
SAE 30W

Drive Chain
Lubricant designed specially for motorcycle drive chains

Grease Fittings
A high grade chassis grease

Wheel and Steering Head Bearings
A high grade bearing grease

Controls and Cables
Tach and speedometer: chassis grease
Others: light motor oil
graphite or molybdenum disulphide lubricant

TUNE-UP

NOTE: *Common tune-up procedures are explained in detail in "General Information."*

Maintenance Data

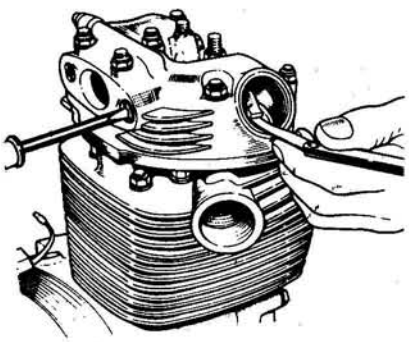
	TR25W	T100C	T100R	TR6R	TR6C	T120R	T150	TR7V	T140V	T150V
FUEL TANK										
(gallon)	3.9	3.6	3.6	4.1	2.9	2.9	5.1	2.5	2.5	4.2
(liter)	14.8	13.5	13.5	15.5	10.9	10.9	19.3	9.5	9.5	15.9
OIL TANK										
(pint)	4.8	7.2	7.2	7.5	7.5	7.5	6.0	4.8	4.8	7.2
(liter)	2.273	3.5	3.5	3.0	3.0	3.0	3.41	2.27	2.27	3.8
GEARBOX										
(pint)	0.6	0.67	0.67	0.875	0.875	0.875	1.25	0.875	0.875	1.5
(cc)	264	375	375	500	500	500	710	500	500	750
PRIMARY CHAINCASE										
(pint)	0.3	0.5	0.5	0.625	0.625	0.625	0.75	0.625	0.625	0.75
(cc)	142	300	300	350	350	350	426	350	350	426
FRONT FORKS (@ leg)										
(pint)	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	—
(cc)	190	190	190	190	190	190	190	190	190	230
TIRE PRESSURE										
front (psi)	16	24	24	24	24	24	24	24	24	26
rear (psi)	16	24	24	24	24	24	28	24	24	28

VALVE ADJUSTMENT

NOTE: *Valves are adjusted when the engine is cold.*

TR25W

1. Remove the spark plug, rocker inspection caps, and rocker spindle plate. Also, put the transmission in gear so that the engine can be easily rotated by turning the rear wheel.
2. Rotate the engine in the normal running direction until the intake valve has just completely closed.



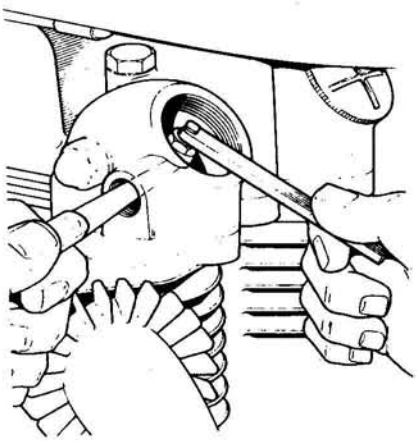
Valve adjustment (250)

NOTE: *This point can be accurately located by feeling the pushrod. When the valve is completely closed, the pushrod will be free to rotate.*

3. The engine is now correctly positioned for checking the exhaust valve clearance. Slide the appropriate feeler gauge between the valve stem and the tappet, and check for a snug slip-fit.
4. If an adjustment is necessary, loosen the rocker spindle locknuts opposite the spindle cover plate. Turn the slotted exhaust valve spindle in a clockwise direction until the rocker arm just touches the valve stem, then turn it back again until the correct clearance is obtained. Tighten up the locknut and recheck the adjustment.
5. Rotate the engine forward again until the exhaust valve is just about to open. This is the correct position for checking the intake valve tappet clearance.
6. Check the clearance with the proper feeler gauge and, if necessary, readjust it to meet specifications. The procedure for adjusting the intake valve clearance is the same as that outlined for the exhaust valve except that the rocker spindle should first be turned counterclockwise, rather than clockwise.

Twins

1. Remove the spark plugs and rocker box inspection caps.



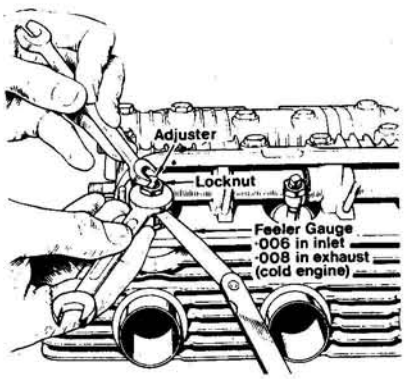
Valve adjustment (500)

2. On 500cc models, remove the large plugs on the side of each rocker box. The feeler gauge is inserted through these holes.
3. Slowly turn the engine over until the left exhaust valve is fully open. Now check the clearance of the right exhaust valve.
4. Insert the proper thickness feeler gauge between the valve stem and rocker arm. The feeler gauge should be a snug slip-fit if the clearance is correct.
5. If adjustment is necessary, loosen the adjuster locknut and turn the adjuster to effect the proper clearance. Hold the adjuster in place and tighten the nut. Recheck the clearance.
6. Turn the engine over so that the right exhaust valve is fully open, then check the adjustment of the left exhaust valve. Repeat this procedure with the intake valves.

NOTE: *If, in an emergency situation, feeler gauges of the proper thickness are not available, clearances can be set approximately by turning the adjuster in until it is finger-tight, then backing it out ¼ turn per 0.010 in. until the given clearance is obtained. Check this setting with a feeler gauge as soon as possible.*

T150, T150V

1. Remove the spark plugs and rocker box inspection caps.
2. Beginning with the intake cam, rotate the engine until two valves are opened by the same amount (approximately 1/16 in.). At this point, with one of the valves just opening and the other just closing, the third valve is correctly positioned for adjustment.



Valve adjustment (Trident)

3. Insert the appropriate feeler gauge and, if necessary, loosen the adjuster locknut and turn the adjuster until a snug slip-fit is obtained. Tighten the locknut and recheck the clearance.
4. Continue rotating the engine until the conditions outlined in step 2 are met for another intake valve. Repeat the procedure on the remaining intake and exhaust valves.
5. Install the spark plugs and rocker box inspection caps.

CONTACT BREAKER POINTS

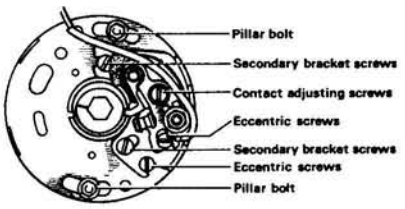
NOTE: *When installing new points, the contact surfaces should be wiped with a solvent to remove any preservative coating.*

TR25W

The contact breaker point assembly is located behind the circular cover on the right side of the engine.

REMOVAL

1. Remove the breaker point cover.
2. Remove the securing nut, nylon



Breaker points (250)

sleeve, and contact breaker lead.

3. Remove the contact adjusting screw, then lift the unit out.

INSTALLATION

Installation is a reversal of the removal procedure. Do not forget to install the fiber washer that fits between the moving point spring and the fixed point backing plate.

GAP ADJUSTMENT

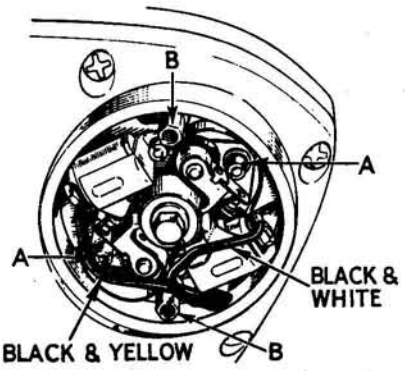
1. Put the transmission in gear and rotate the engine by turning the rear wheel until the nylon heel of the contact breaker is aligned with the scribed mark on the breaker cam.
2. Loosen the contact adjusting screw and turn the eccentric screw until a snug slip-fit is obtained with the appropriate feeler gauge.
3. Tighten the adjusting screw and recheck the gap.

500 (Before H57083)

The point assembly is located behind a circular cover plate on the right side of the engine, and is driven off the right exhaust camshaft.

REMOVAL

1. Remove the points cover and gasket.



Breaker points (500 before H57083): sleeve nuts (A) and pillar bolts (B)

2. Remove the two sleeve nuts ("A" in the illustration), withdraw the points and condenser, and carefully disconnect the primary wire.

INSTALLATION

Installation is the reverse of removal. Add a drop of motor oil to the point pivots before refitting.

GAP ADJUSTMENT

1. Remove the spark plugs.
2. Rotate the engine until the nylon heel of one set of points aligns with the mark scribed on the breaker cam.
3. Insert the appropriate feeler gauge and, if necessary, loosen sleeve nuts "A" (see illustration) and shift the breaker point plate until a snug slip-fit is achieved.
4. Repeat the above for the other set of points.
5. Check to make sure the breaker plate is correctly positioned. The set of points with the black/yellow lead should be situated toward the rear. Also make certain that the pillar bolts are in the center of their adjustment slots.

500 (H57083 and Later), 650, 750 Twin

The points are beneath a cover plate on the right, front side of the engine.

REMOVAL

1. Remove the cover plate.
2. Remove the primary wire terminal nut, and disconnect the wire, noting any insulators and their positions.
3. Remove the contact locking screw and remove the points.

INSTALLATION

Installation is the reverse of removal. Lubricate the pivot with a drop of oil. Note wire connections.

GAP ADJUSTMENT

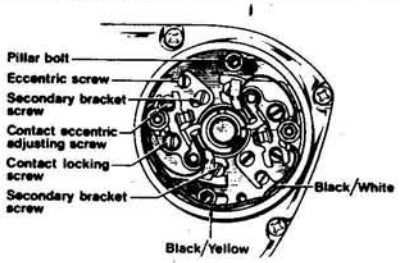
1. Turn the engine over until the scribed mark on the breaker cam aligns with the nylon heel of one of the points.
2. Check the gap with the proper feeler gauge. It should be a snug slip-fit if correct. If adjustment is necessary, loosen the contact locking screw, and turn the contact eccentric adjusting screw until the gap is correct. Tighten the locking screw and recheck gap.
3. Repeat the procedure with the other set of points.

T150, T150V

The procedure for removal, installation, and gapping is the same as outlined for 650 and 750 Twins, above, except that three sets of points must be gapped. Note wire color codes by referring to the accompanying illustration.

IGNITION TIMING

NOTE: *Points should be cleaned and gapped before setting ignition timing.*



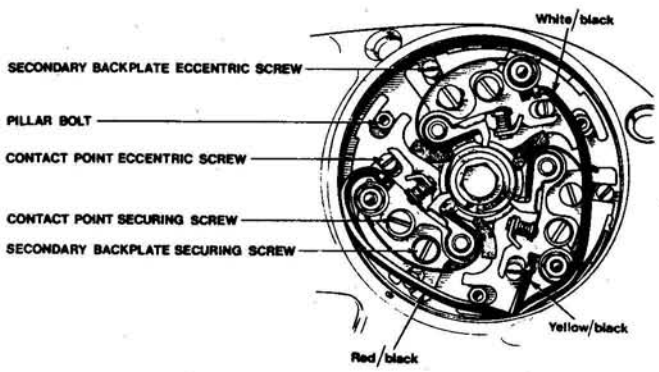
Breaker points (500 after H57082 and other twins)

TR25W

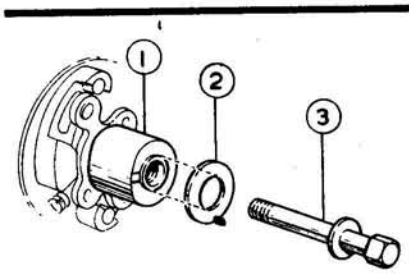
INITIAL PROCEDURE

Before actually setting static timing, the piston must be located at the specified number of degrees before top dead center and the automatic spark advance mechanism must be locked in the fully advanced position.

1. Remove the small inspection cover at the front of the primary chaincase.
2. As can be seen through the aperture, a timing mark is scribed on the face of the alternator rotor and a pointer is mounted at the bottom of inspection hole.
3. Rotate the engine until it is on its compression stroke (i.e., both valves closed), then align the rotor mark and pointer. The piston is now located 37° before top dead center.
4. An alternate method of locating the piston, only possible on later machines, is by using Triumph special plunger and body (no. 61-2915 and 61-D572). Locate the piston on its compression stroke, then rotate the engine gently backward while applying slight pressure to the plunger. The plunger will drop into position, locking the piston at 37° before top dead center.
5. Now that the piston is correctly located, the automatic advance unit must be locked in the fully advanced position. This is necessary because, due to manufacturing tolerances, slight variation in spark timing will occur at one end of the advance curve or the other. In general, it is preferred that this variation does not affect high speed performance; therefore the mechanism should be set at the fully advanced position so that any fluctuations will occur only at idle speeds.
6. Carefully remove the cam central bolt and fit an extra washer on the bolt.



Breaker points (Trident)



Locking the breaker cam (1) with an oversized washer (2) and central bolt (3)

This washer should have a hole just large enough to clear the cam inner bearing (see illustration).

7. Reinstall the bolt, but before tightening it, rotate the cam counterclockwise until the advance weights are fully extended. Hold the weights in this position and tighten the central bolt.

8. After setting the final ignition timing, don't forget to remove the extra washer on the central bolt.

STATIC TIMING

1. With the piston correctly located and the advance mechanism locked in the full advance position, the ignition timing can now be set.

2. Hook up the test or continuity light: one lead to ground, the other to the primary wire terminal or points spring.

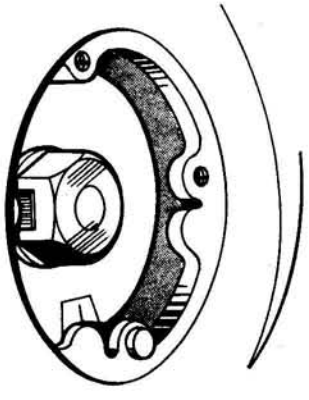
3. Loosen the two secondary bracket screws, and turn the eccentric screw in either direction until the points just open. Tighten the bracket screws.

4. If the points will not open using this method, set the eccentric screw in the middle of its adjustment range. Loosen the two pillar bolts which secure the large points plate, and rotate the entire plate until the points open. Make any necessary fine adjustments with the eccentric screw.

DYNAMIC TIMING

1. Remove the inspection cover at the front of the primary chaincase.

2. Hook up the strobe light. At engines speeds above 3,000 rpm, the mark on the alternator rotor should align with the fitted pointer.



Rotor and stator marks (250)

3. Make any ignition timing adjustments as described in Steps 3-4 under "Static Timing."

500 (Before H57083)

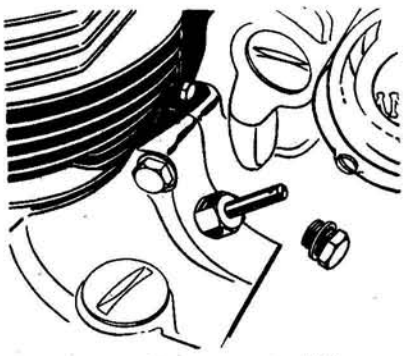
INITIAL PROCEDURE

Before setting ignition timing, the piston must first be positioned at top dead center.

1. Remove the spark plugs and rocker box inspection caps.

2. Put the transmission in gear so that the engine can be rotated by turning the rear wheel.

3. Locate the piston at top dead center, using a dial indicator, Triumph timing plunger and body no. D571/2, or, if necessary, a stick positioned in the spark plug hole. The right cylinder must be on the compression stroke.



Timing plunger is position (500)

STATIC TIMING

1. Remove the automatic advance unit and check the degree range stamped on the back. Make a note for future reference and reinstall the unit. A special extractor must be used to remove the unit.

2. Double the auto-advance range and subtract it from the fully advanced degree figure (38°). This is the correct static setting for the engine. Example:

AUTO-ADVANCE
DEGREE RANGE = 12°
FULLY ADVANCED
2 × 12° = 24°
38° − 24° = STATIC
TIMING

3. If a stick is used to locate top dead center, convert the degree figure into inches or millimeters by using the chart, then scribe a corresponding mark on the stick.

500 Twin Crankshaft Degree Conversion Chart

Crankshaft position (BTDC) Degrees	Piston position (BTDC) in.	mm
7	0.010	0.25
8	0.015	0.38
9	0.020	0.51
10	0.025	0.64
11	0.030	0.76
12	0.035	0.89
13	0.040	1.02
14	0.048	1.22
15	0.055	1.40
16	0.060	1.52
17	0.070	1.78
18	0.080	2.03
19	0.090	2.29
20	0.100	2.54
21	0.110	2.79

4. Fit a degree wheel to the auto advance unit and fasten a pointer to a convenient case cover screw.

5. If a dial indicator or timing plunger was used to locate top dead center, position the degree wheel and/or pointer to read TDC. Then remove the timing plunger (the dial indicator can remain) and carefully rotate the engine until it is at 38° before top dead center (right cylinder on the compression stroke), as indicated by the degree wheel and pointer.

6. Connect a timing light to the right cylinder points (black/yellow primary wire). Rotate the engine backward to a point below the static timing position. slowly approach the prescribed setting and, if necessary, adjust the breaker plate so that the points are just opening when the setting is reached.

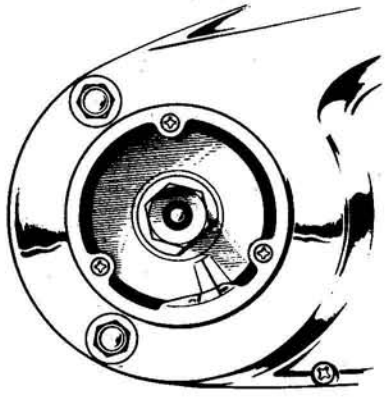
Adjust the timing by rotating the breaker plate after loosening the pillar bolts "B."

7. Rotate the engine forward 360° and repeat the procedure on the second set of points, noting that the main breaker plate must not be disturbed.

NOTE: *To fine-tune the ignition timing, it is permissible to vary the breaker point gap slightly so that both cylinders are timed exactly the same. To advance the spark, open the points approximately 0.001 in. per crankshaft rotation degree.*

DYNAMIC TIMING

After locating top dead center and installing a timing disc as previously described, connect the strobe light on the right cylinder points. If a 6 or 12-volt external power supply is needed, *do not* use the motorcycle battery. AC current pulses in the bike's low tension wiring can trigger the strobe light and lead to incorrect readings.



Rotor and stator timing marks with Adaptor D2014 (500)

Aim the strobe light at the timing disc and rev the engine until the auto advance mechanism is actuated (2,000 rpm). The pointer and 38° BTDC on the disc should be exactly in line. If they are not, loosen the contact breaker-plate pillar bolts and make the necessary adjustment. Repeat the procedure for the other cylinder. Remember that the main breaker plate must not be disturbed after setting the right cylinder.

500 (H57083 and Later)

INITIAL PROCEDURE

These models are fitted with alternator rotor marks and timing plunger stops at TDC and 38° BTDC for each cylinder.

First make sure the auto advance unit is correctly positioned on the camshaft locating peg. Lock the auto advance in the full advance position using a suitably sized washer which will bear on the breaker cam when the bolt is tightened (see illustration). Remove the plugs and rocker box covers.

STATIC TIMING

1. Remove the plug behind and between the cylinders. Turn the engine over slowly in the normal direction of rotation until the right cylinder is on the compression stroke, and close to TDC.

2. Install timing plunger and body Nos. D653/D654 and rotate the engine slowly applying slight pressure to the plunger until it drops into the crankshaft hole. The engine should now be at TDC and the right cylinder should be on the compression stroke. Check that there is clearance at both valves. If not, turn the crankshaft 360° to locate the right cylinder on its compression stroke.

3. Lift out the plunger, and rotate the engine backwards. When the plunger drops for the second time, the piston is at the firing point of 38° BTDC.

4. If no timing plunger is available, the piston can be positioned at the firing point by removing the inspection cap from the front of the primary chaincase. After establishing the right piston at TDC on its compression stroke, turn the engine backwards until the rotor and stator marks align. This will be the full advance firing point.

NOTE: *Later machines have the stator pointer built in, but some earlier models require the use of adaptor No. D2014 which has two marks, "B" and "C." Use the line marked "C."*

5. When the piston is positioned as outlined, a timing or test light should indicate that the right cylinder's points have just opened. The points for the right cylinder have the black/yellow primary wire.

6. If adjustment is necessary, loosen the two pillar bolts, and rotate the entire point plate until the points just open. Tighten the bolts.

7. Turn the engine 360°, engage the plunger or line up the rotor and stator marks to position the piston at 38° BTDC, and check that the left cylinder (black/white primary wire) just open. If they do not, loosen the two secondary bracket screws, and turn the eccentric screw until timing is corrected. Tighten the bracket screws.

NOTE: *If timing has been lost completely, as after rebuilding the engine, it is advisable to set the points plate and the eccentric screws at about the middle of their adjustment range before resetting the timing.*

DYNAMIC TIMING

1. A strobe light can be used by means of the rotor and stator timing marks beneath the plate at the forward end of the primary chaincase.

NOTE: *If the strobe light requires a battery power source, do not use the motorcycle battery.*

2. The marks should align above 2,000 rpm. Check the right cylinder (black/yellow primary wire) first, and adjust the timing, if necessary, by moving the point plate as explained in Step 6, above. Repeat the test with the left cylinder, changing the timing by moving the left cylinder points only as explained in Step 7, above.

650, 750 Twin

1. The procedures are the same as for 500 (H57803 and later) since the points are the same type. Note the following:

2. The plunger and body to be used are D2195/D572.

3. If the machine does not have a stator pointer, use D2014. If dynamic timing is being carried out with this pointer, use line "B."

T150, T150V

The Trident is equipped with one set of points for each cylinder. The firing order is one-three-two. The right (no. one) cylinder point lead is white/black; the center (no. two) red/black, and the left (no. three) yellow/black.

STATIC TIMING

NOTE: *Early model Tridents have three timing marks scribed onto the rotor, 120° apart, each one for a different cylinder. Late models have two sets of timing marks which are distinguished by "A" or "B."*

When timing late engines before Serial No. PG 01603, use the "A" timing marks. For engines after PG 01603, line up the "B" timing marks.

1. Remove the spark plugs and rocker box inspection caps. Put the transmission in gear so that the engine can be rotated by turning the rear wheel.

2. Locate approximate top dead center by rotating the engine until no. 1 piston is at the top of its compression stroke (i.e., both valves closed with clearance at the tappets).

3. Install Triumph timing plunger and body no. D1858, then slowly rotate the engine backward until the plunger locks the crankshaft at 38° BTDC.

4. If the automatic advance unit is not installed, assemble it loosely with an extra washer on the central bolt to lock the cam in the fully advanced position. If it is installed, remove the central bolt and add the extra washer. The washer should have a hole just a little larger than the cam bearing.

5. When the auto-advance unit is fully advanced, the no. 1 cylinder points should just be opening. If this is not the case, loosen the secondary breaker plate screws and shift the plate until the points begin to open.

6. Remove the timing plunger and locate the no. 3 cylinder at TDC on the compression stroke. Rotate the engine backwards until the plunger indicates that the piston is at 38° BTDC. Repeat the procedure outlined above on the no. 3 cylinder points, then again on no. 2 cylinder points.

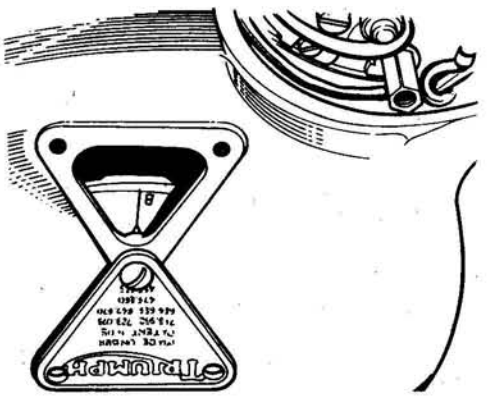
7. Remove the extra washer on the central bolt.

DYNAMIC TIMING

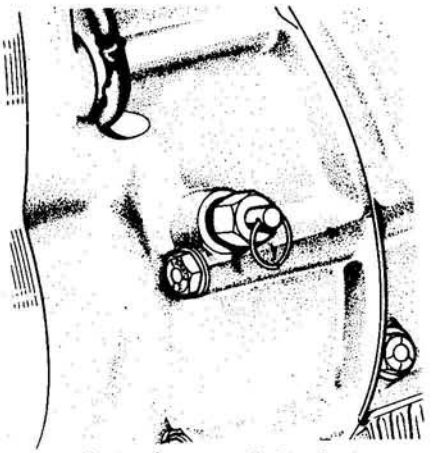
1. Remove the two top screws of the Triumph patent plate on the primary chaincase. Just loosen the bottom screw, as it will serve as a pointer.

2. Remove the ignition inspection plate located at the front of the primary chaincase.

3. Connect the strobe light to the right cylinder as instructed by the strobe man-



Trident timing marks (from Engine No. PG01603)



Timing plunger installed (Trident)

ufacturer. If the unit requires an external power source, *do not* use the motorcycle battery. AC pulses in the machine's low tension wiring can trigger the strobe light and lead to incorrect readings.

4. At engine speeds above 2,000 rpm, one of the three marks on the alternator rotor (exposed by the Triumph patent plate) should line up directly with t bottom plate screw. If adjustment is necessary, loosen the no. 1 point set secondary bracket and shift the plate until the marks are aligned. Tighten the plate securing screws.

5. Repeat the above procedure on no. 2 cylinder (center), then no. 3 cylinder (left).

6. Reinstall the patent and inspection plates.

CARBURETOR ADJUSTMENTS

Idle Speed and Mixture

NOTE: *Make these adjustments when the engine is at operating temperature.*

SINGLE-CARBURETOR

1. Make sure there is some freeplay in the throttle cable so the slide will close fully.

2. Turn the pilot air screw in until it is lightly seated, then back it out 2½ turns. Start the engine. Adjust the idle speed (throttle stop) screw so that the engine idles at about 750 rpm.

3. Make any fine adjustments by turning the pilot air screw in either direction so that an even idle is obtained. It should not be necessary to vary this screw more than ½ turn from the standard setting. If it is, there may be something wrong with the carburetor or engine. Check for fuel blockages, air leaks, etc.

4. Use the throttle cable adjuster to take up most of the slack in the cable. The twist grip should have 10–15° or rotation before the slide begins to rise.

TWIN-CARBURETOR

1. Make sure there is some slack in the main throttle cable so that the slides will close fully.

2. Screw each pilot air screw in gently until it is seated, then back them out 2½ turns.

3. Start the engine. Disconnect one of the spark plug leads and turn the throttle stop screw for the running cylinder in until the engine runs slowly but smoothly on one cylinder.

4. With *both* plug leads connected, rev the engine a few times to clean it out. Then disconnect the *other* plug lead, and turn the throttle stop screw for the running cylinder in until the engine runs slowly but smoothly on the one cylinder.

5. Connect the spark plug lead so that both cylinders will now be running. Idle speed will be very high. Back out each throttle stop screws by equal amounts until an idle speed of 500–750 rpm is obtained.

6. To smooth out the idle, if necessary, turn each pilot air screw in or out by equal amounts. It should not be necessary to turn either of them more than ½ turn. If it is, there is probably a defect in the system: air leaks, fuel flow problem, impure gasoline, etc.

7. Synchronize the throttle slides.

8. Use the adjuster on the main throttle cable so that the slide begin to rise after about 10–15° of twist-grip rotation.

Carburetor Synchronization, Twins

On twin-carburetor models, the throttle slides must be synchronized or one cylinder will lead the other while running. This operation should be carried out after setting the idle speed and mixture.

1. Remove the air cleaner(s).

2. Position a mirror behind the carburetors or reach into the bores with the thumb and index finger of one hand.

3. Twist open the throttle slides, and feel, or watch, as the slides enter the bores. They should begin to enter their respective bores simultaneously.

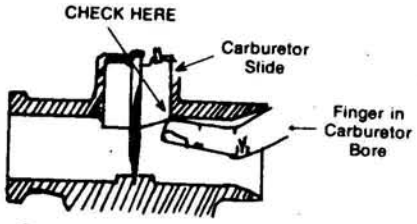
4. An alternate method is to place a finger on each carburetor slide when closed, and then turn the twist-grip slightly. Both slides should begin to lift at the same time.

5. If adjustment is necessary, use the cable adjusters on the top of each carburetor raising or lowering them so the

Tune-Up Specifications

	TR25W	*T100C*	*T100R*	*TR6R*	*TR6C*
CARBURETION			*(See text procedures)*		
VALVES					
Valve Tappet Clearance (cold):					
Intake (in.)	0.008	0.002	0.002	0.002	0.002
Intake (mm)	0.203	0.050	0.050	0.050	0.050
Exhaust (in.)	0.010	0.004	0.004	0.004	0.004
Exhaust (mm)	0.254	0.100	0.100	0.100	0.100
Valve Timing:					
Intake Opens (BTDC)	51°	34°	40°	34°	34°
Intake Closes (ABDC)	68°	55°	52°	55°	55°
Exhaust Opens (BBDC)	78°	48°	61°	55°	55°
Exhaust Closes (ATDC)	37°	27°	31°	34°	34°
IGNITION					
Spark Plug (standard) (Champion)	N3	N4	N4	N3	N3
Spark Plug Gap:					
(in.)	0.020–0.025	0.020	0.020	0.025	0.025
(mm)	0.508–0.635	0.508	0.508	0.635	0.635
Contact Breaker Gap:					
(in.)	0.015	0.015	0.015	0.014–0.016	0.014–0.016
(mm)	0.381	0.381	0.381	0.350–0.400	0.350–0.400
Ignition Timing:					
Crankshaft Position (advanced)	37°	38°	38°	38°	38°
Piston Position (BTDC):					
(in.)	0.342	0.330	0.330	0.415	0.415
(mm)	8.687	8.380	8.380	10.4	10.4

	T120R	*T150*	*TR7V*	*T140V*	*T150V*
CARBURETION			*(See text procedures)*		
VALVES					
Valve Tappet Clearance (cold):					
Intake (in.)	0.002	0.006	0.008	0.008	0.006
Intake (mm)	0.050	0.152	0.20	0.20	0.15
Exhaust (in.)	0.004	0.008	0.006	0.006	0.008
Exhaust (mm)	0.100	0.203	0.15	0.15	0.20
Valve Timing:					
Intake Opens (BTDC)	34°	50°	NA	NA	50°
Intake Closes (ABDC)	34°	64°	NA	NA	64°
Exhaust Opens (BBDC)	55°	67°	NA	NA	67°
Exhaust Closes (ATDC)	34°	47°	NA	NA	47°
IGNITION					
Spark Plug (standard) (Champion)	N3	N3	N3	N3	N3
Spark Plug Gap:					
(in.)	0.025	0.020	0.025	0.025	0.020
(mm)	0.635	0.500	0.635	0.635	0.50
Contact Breaker Gap:					
(in.)	0.014–0.016	0.014–0.016	0.014–0.016	0.014–0.016	0.014–0.016
(mm)	0.350–0.400	0.350–0.400	0.350–0.400	0.350–0.400	0.350–0.400
Ignition Timing:					
Crankshaft Position (advanced)	38°	38°	38°	38°	38°
Piston Position (BTDC):					
(in.)	0.415	0.357	0.415	0.415	0.357
(mm)	10.4	9.07	10.4	10.4	9.07



Checking carburetor synchronization

slide movements match. Allow each adjuster some part in making the adjustment. Do not screw either of them out too much, or that slide may not close fully.

6. Check the adjustment of the throttle cable(s), using the adjuster(s) near the twist-grip so that the slides begin to rise after about 10–15° of grip rotation.

Triples

Due to type of linkage used, throttle slides should be synchronized first. There are two possible methods:

1. Remove the carburetor assembly from the motorcycle. Looking through the engine side of the carburetors, turn the idle speed screw so that one of the slides (any one) is being held open about 0.010 in. Loosen the locknut and turn the adjuster at the top of each carburetor so that the other two slides are open the same amount. Check by opening the throttles and ensuring that all three slides clear the bore at the same time. Be sure the locknuts are tightened.

2. Alternately, check synchronization with the carbs in place on the machine using sight or feel according to the procedure outlined under "Carburetor Synchronization, Twins," above.

3. With the engine at operating temperature, turn each pilot air screw in until lightly seated, then back each out 2½ turns. Start the engine, and use the idle speed screw to set idle at 500 rpm.

4. Use the cable adjuster at the carburetor end to give about 10–15° of twist-grip rotation before the slides begin to rise.

ENGINE AND TRANSMISSION

NOTE: *For engine component inspection and service procedures, refer to "Engine Rebuilding" under the "General Information" section. Triumph engine specifications are given at the end of this "Engine and Transmission" section.*

TR25W

Engine Removal and Installation

1. Remove the fuel tank.
2. Remove the exhaust system by disconnecting the exhaust pipe clamp at the head, and removing the two muffler mounting bolts.
3. Remove the right side-cover and unbolt the skid plate from frame tubes. Drain the oil.
4. Disconnect the valve rocker oil line from the metal T-connection and disconnect the flexible scavenge line from the crankcase line at the rear.
5. Disconnect the alternator, oil pressure switch (if applicable), and contact breaker point leads from their snap connectors at the electrical box. Disconnect the spark plug wire.
6. Remove the carburetor flange nuts and tie the carburetor out of the way. Leave the rubber connecting hose attached to the air filter housing.
7. Disconnect the top engine mount (at the rocker cover).
8. Remove the chainguard front extension and remove the master link from the chain.
9. Disconnect the clutch cable using a suitable box wrench as a lever on the operating arm.
10. Loosen the footpeg mounting bolt and swing the footpeg down.
11. Remove the remaining engine mount bolts. Note that spacers are installed between the engine and frame at the right side of the front and bottom bolts.
12. Remove the rear, engine mounting plate and lift the engine unit out of the frame from the right side.

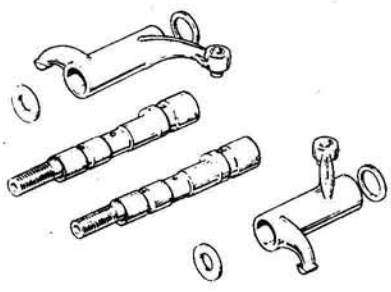
Installation is in reverse order of removal. Be sure to replace the two spacers correctly. Double-check all hardware and electrical connections when completed.

Top End

REMOVAL

On the TR25W, the cylinder head and barrel may be removed with the engine in the frame. The procedure is as follows:

1. Remove the fuel tank.
2. Unbolt the engine mount at the cylinder head and push the bracket up out of the way.
3. Remove the carburetor from the head, leaving it suspended by the throttle cable.
4. Remove the exhaust system by disconnecting the exhaust pipe clamp at the head and removing the two, muffler mounting bolts.
5. Remove the spark plug and disconnect the rocker oil feed line.
6. Rotate the engine until the piston is at top dead center of the compression stroke (both valves closed, clearance at the rocker arms).
7. Remove the six cylinder head nuts; if the head will not move, free it with a rubber mallet.
8. Lift the head, rotate it around the pushrods to clear the frame, and remove it from the engine.



Valve train

9. To remove the barrel, first rotate the engine until the piston is at the bottom of the stroke and then gently lift the barrel off. Steady the piston as the barrel is withdrawn so that it will not be damaged.

10. To remove the piston, it will be necessary to heat it slightly to facilitate removal of the wrist pin. First remove the wrist pin circlips. After the piston is warm, the wrist pin should slide out fairly easily. Mark the front of the piston inside the skirt to facilitate reassembly.

INSPECTION

Refer to "Engine Rebuilding" for service procedures.

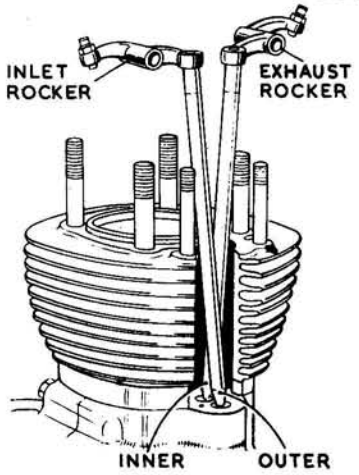
Oversized pistons are available in +0.020 and +0.040 sizes.

If the con rod bush must be replaced, refer to the T100C, T100R engine section for removal and installation procedures. Valve guides are removed and installed in the usual manner. The exhaust valve guide is counterbored at the lower end.

INSTALLATION

1. When installing the piston rings, note that the lower compression ring is marked "TOP" and must be installed in the second groove with this mark facing upwards. The top compression ring is probably chromed.

2. Warm the piston and install it, in correct position, on the connecting rod. Insert the piston pin before the piston has a chance to cool. Install *new* circlips and make sure that they are seated properly. Install a new cylinder base gasket and support the piston with two pieces of wood approximately ½ in. square by 6 in. long. Stagger the ring gaps 120 degrees apart, liberally oil the rings, and install a ring compressor. If a ring compressor is unavailable, it is possible to compress the



Pushrod installation

rings by hand, one at a time, as the barrel is slipped over the piston. Be careful. Slide the barrel over the piston and remove the compressor and wood blocks.

3. Install the two pushrods, noting that the outer one operates the intake valve. The top of the exhaust valve pushrod is painted red for identification, as it is slightly shorter than the intake pushrod. *The pushrods must be positioned correctly.*

4. Install the rocker box on the cylinder head using a new gasket, then torque the nuts to 7 ft lbs. Install a new head gasket and fit the head onto the barrel. Place the pushrod ends into the rocker arm ends, making absolutely sure that they are positioned correctly, as illustrated. Keep a light, downward pressure on the head and rotate the engine until the piston is at top dead center of the compression stroke. In this position both valves will be fully closed (clearance at both rocker arms). Tighten the cylinder head nuts, gradually to the figures given in specifications at the end of this section.

5. Check and adjust valve clearances, etc.

Clutch and Primary Drive

DISASSEMBLY

1. If the engine is mounted in the frame, remove the left-side footpeg and brake pedal.

2. Drain the oil from the primary chaincase remove the screws, and take off the primary drive cover. It may be necessary to tap the cover with a rubber mallet to break it free.

3. Remove the four, clutch-spring retaining nuts and withdraw the pressure plate, springs, and cups.

4. Withdraw the clutch plates.

5. Keep the clutch from turning by applying the rear brake, and remove the clutch center nut (after the locktab has been bent back).

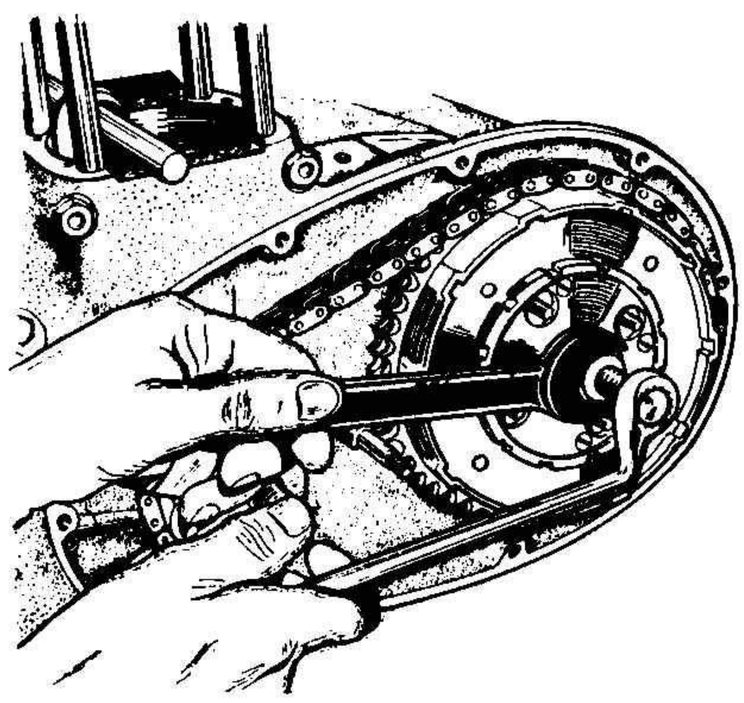
6. Remove the locktab and spacer, and withdraw the clutch pushrod.

7. To remove the clutch completely, it is necessary to remove the alternator. To remove the stator (enclosing the rotor), take off the three mounting nuts, pull the alternator lead through the grommet, and pull the stator off the studs.

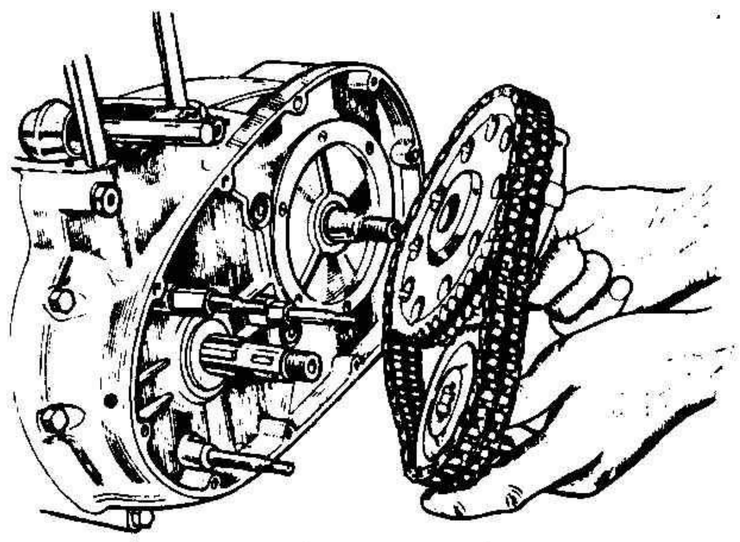
8. Remove the primary chain tensioner, noting that a spacer is installed on the rear stud.

9. Bend back the locktab and unscrew the rotor nut. Remove the rotor, wipe it clean, and store it in a clean place.

10. Use a gear puller to pull the clutch housing off the transmission mainshaft, while at the same time pulling the front sprocket off the engine crankshaft. Note any shims behind the sprocket.



Removing the clutch housing



Installing the primary drive

INSPECTION

1. If the thickness of the friction discs measures less than 0.137 in., they should be replaced.

2. To examine the dampers located in the clutch center, remove the four screws adjacent to the clutch spring housings and pry off the retaining plate. The dampers need not be replaced unless they are visibly damaged or worn. It may be necessary to lubricate them when installing; it is recommended that a liquid detergent be used. *Do not use petroleum-based oil or grease.*

3. The clutch center slots should be smooth and undamaged or jerky clutch engagement will result. Check clutch spring free length, and if less than 1.60 in., replace the springs as a set.

4. The rear sprocket roller bearing is allowed a slight amount of free-play, but, if excessive, the roller should be replaced.

ASSEMBLY

If the sprockets or clutch hub have been replaced it will be necessary to realign the sprockets to avoid excesive primary chain wear. Refer to "Primary Drive Sprocket Alignment." To reinstall the clutch:

1. If the clutch sleeve has been removed, smear it with grease and place the twenty-five bearing rollers in position. Slide the sprocket over the rollers and install the clutch center over the splines of the sleeve.

2. Place the primary chain over the sprockets and position the sprockets on the shafts. Make sure that the transmission mainshaft key is correctly located.

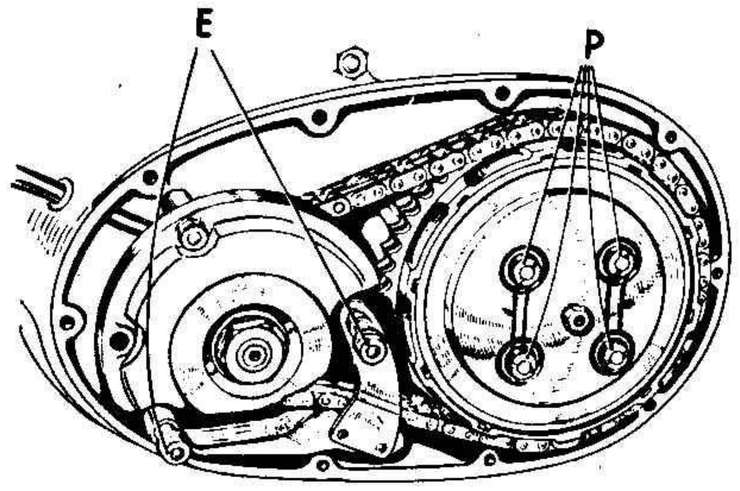
3. Install the clutch center spacer. Make sure that the mainshaft and clutch retaining nut threads are clean and dry. Install a new locktab and apply a small amount of thread-locking compound to the mainshaft threads before installing the retaining nut. Torque the nut to 60–65 ft lb.

4. Install the alternator rotor on the crankshaft with the marks facing out, making sure that the key is located correctly. Install a new locktab, apply a drop of thread-locking compound to the threads, then tighten the retaining nut to 60 ft lbs.

5. Pass the stator lead through the grommet at the front of the crankcase. Fit the stator over the studs and partially tighten the nuts. Check that there is an equal air gap between the rotor and stator at all points using an 0.008 in. feeler gauge. Variations can be corrected by repositioning the stator.

6. To adjust primary chain tension, loosen the rear stator retaining nut and adjust the tensioner to provide ¼ in. freeplay on the top run of the chain midway between the sprockets. Retighten the stator nut.

7. Install the clutch discs and plates, alternately, into the clutch housing, beginning with a disc. Insert the clutch pushrod into the mainshaft.



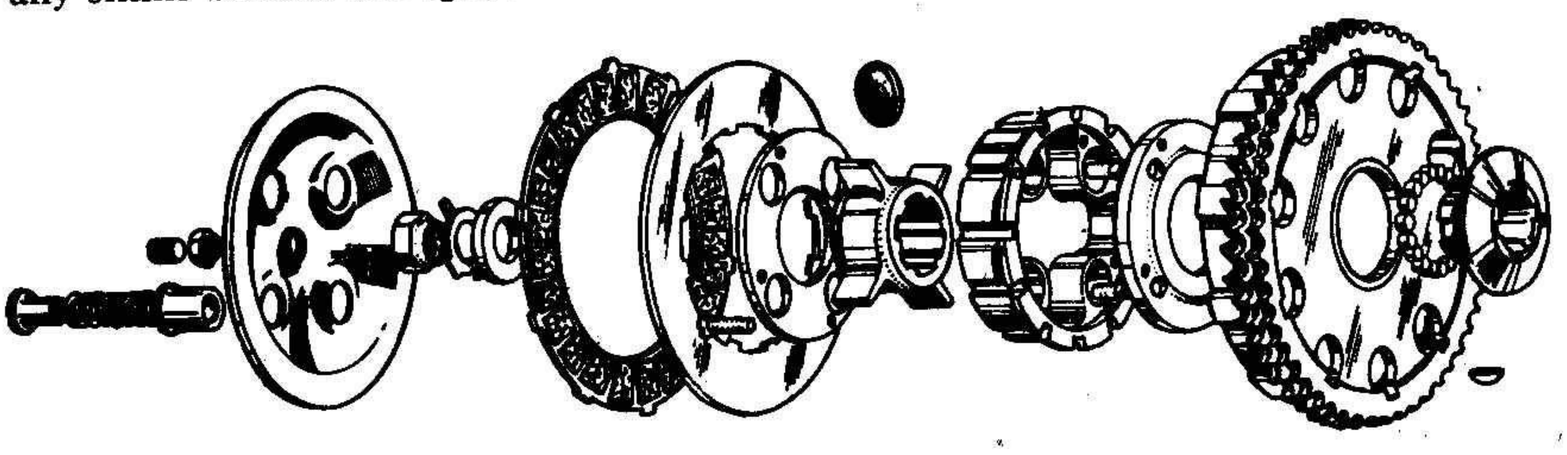
Primary chain (E) and pressure plate (P) adjustment points

8. Install the pressure plate complete with springs and cups. Make sure the spring cup location pips are seated in the slots in the pressure plate.

9. Install and tighten the four spring nuts until the first coil of each spring is just outside of its cup. Improper spring tension will cause excessive pressure at the handlebar lever or clutch slip. Check to see if the springs are tightened evenly by pulling the clutch lever in and kicking the engine over. If any wobble is noticeable at the pressure plate as it turns, tighten or loosen the springs as necessary until it runs true.

10. Adjust the clutch by means of the screw and locknut at the center of the pressure plate so that the clutch operating lever is angled approximately 30° away from the crankcase/side-cover joint.

11. Clean the crankcase and primary cover mating surfaces, apply a thin coat of



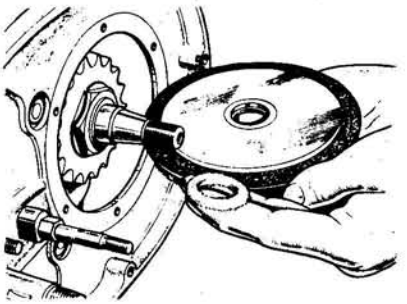
Clutch assembly

gasket cement, and mount the cover using a new gasket. If it is possible to use a torque wrench, tighten the screws to 3.5–4.5 ft lbs.

12. Fill the primary chaincase with oil and adjust the clutch lever free-play if necessary.

Transmission Countershaft Sprocket and Oil Seal

To examine or remove the countershaft final drive sprocket, first remove the six screws that retain the plate surrounding the shaft. Pry the plate loose and remove it with its oil seal, taking note of the felt washer that protects the seal from dirt and grit. Check for oil leakage at the back of the plate and replace the plate oil seal if necessary. Install the seal with the lip facing the countershaft sprocket.



Gearbox sprocket cover and seal

If the sprocket teeth are hooked or if the sprocket is damaged, it should be replaced (along with the drive chain and rear wheel sprocket if it too is worn). To remove the sprocket bend back the lock-tab, apply the rear brake, then unscrew the retaining nut. Disconnect the drive chain and pull the sprocket off the shaft. Examine the countershaft oil seal at this time. If it shows signs of leakage, remove the circlip, pry out the seal, and replace it with a new one. Coat the new seal with oil to facilitate installation. Examine the sprocket boss for wear, which may have been causing the seal to leak. Lightly oil the boss when installing the sprocket to avoid damaging the seal. Torque the sprocket retaining nut to 100 ft lbs. When installing the round plate, make sure the gasket is in good condition or use a new one. A new felt washer should be used behind the oil seal. Make sure that the small boss cast into the rear of the plate is installed in the four o'clock position, or else it will contact the drive chain.

Primary Drive Sprocket Alignment

Assemble and install the clutch unit—without the primary chain—on the transmission shaft. Install the crankshaft sprocket. (The sprocket spacer must be installed with the chamfered end against the sprocket.). Place a straightedge against the sprockets. If the sprockets are aligned properly, the straightedge will make contact both evenly. Shims of different thicknesses are available for installation behind the crankshaft sprocket to correct misalignment.

Transmission and Shifter Mechanism

DISASSEMBLY

1. If the top end has not been disassembled, position the piston at top dead center of the compression stroke to avoid distorting the inner camshaft bushing (due to valve spring pressure) as the inner crankcase cover is removed. Drain the transmission oil at this time.

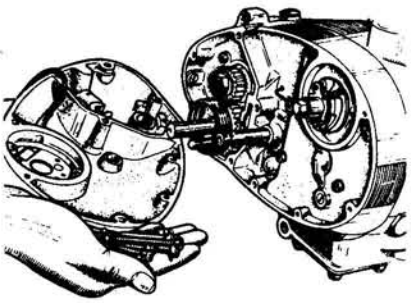
2. Disassemble the primary drive and clutch assembly including the countershaft sprocket, described previously. This is necessary to permit the transmission mainshaft to be withdrawn along with the inner crankcase cover at the right (timing) side of the engine.

3. To remove the right-side outer cover, first take off the kick-start and shift levers. Remove the cover retaining screws, noting that the screws are of different lengths and must be replaced in their original positions.

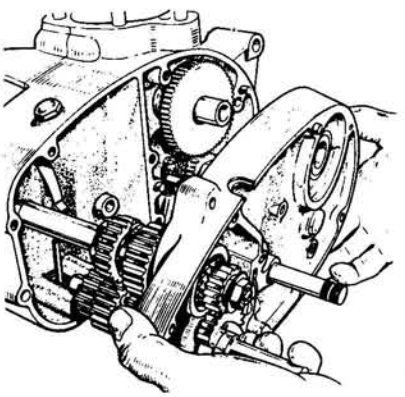
4. Unscrew the kick-start return spring anchor and remove the spring.

5. Remove the ignition advance unit from the inner cover.

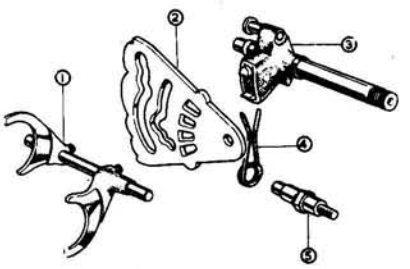
6. Take out the remaining inner cover mounting screws and tap the cover with a rubber mallet to break the joint seal. Withdraw the cover complete with transmission gear cluster. As the cover is removed, exert a slight inward pressure on the end of the camshaft to avoid disturbing the valve timing.



Removing the outer timing cover



Removing the inner timing cover

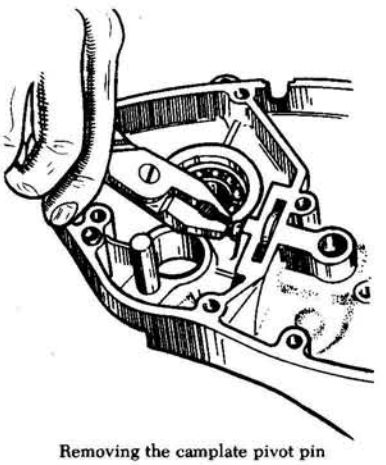


Shifter mechanism

7. Depress the two plungers in the shift linkage quadrant and withdraw the quadrant and spring.

8. Remove the camplate pivot cotter pin from the outside of the cover. Screw one of the small inner cover screws into the pivot and pull the pivot out with a pair of pliers.

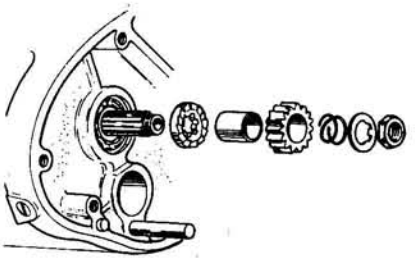
9. Remove the camplate, shift forks, and fork shaft.



Removing the camplate pivot pin

10. Withdraw the countershaft, complete with gear assembly and mainshaft sliding gear. To remove the mainshaft assembly from the cover, unscrew the kick-start ratchet retaining nut and remove the ratchet components from the shaft.

NOTE: *When removing the countershaft gears, note that second gear is retained by a circlip.*



Kickstarter ratchet assembly

11. The two gears remaining on the mainshaft are an interference fit. Remove by clamping the gears in a vise (protected from the jaws with pieces of wood or cloth) and driving the shaft out using a soft metal drift.

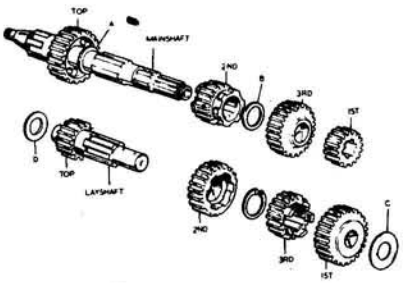
12. If it is desired to remove the left-side transmission bearing from the case, drive the pinion out of the bearing and remove the oil seal. The crankcase should be heated with a propane torch before the bearing is driven out to avoid damage to both the bearing and case.

ASSEMBLY

1. To reinstall the left-side bearing (if removed), heat the crankcase very gently

around the area of the bearing housing, moving the torch slowly and evenly to prevent distortion. Install the bearing and fit a new oil seal.

2. If necessary, install a new inner cover bearing, having first heated the cover in an oven. Use new oil seals in the cover.



Transmission gears

3. Install the camplate with the small mark positioned as shown in the accompanying illustration. Install the camplate pivot and lock in place with a cotter pin.

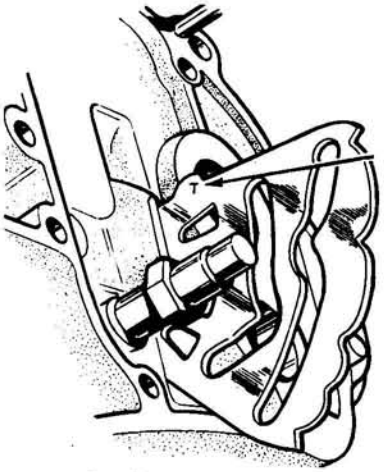
4. Replace the mainshaft gears on the shaft, fit the shaft into the inner cover bearing, install the kick-start ratchet components, and tighten the retaining nut to 50–55 ft lbs. Lock the nut in place with the locktab.

5. Install the kick-start half-gear into the inner cover. Place the cover, with the outside surface down, close to the edge on your workbench so that the half-gear shaft is over the edge but the gear is retained in the cover. Place the countershaft first gear shim over the bearing in the half-gear shaft. Use a small amount of grease to hold it in position.

6. Engage the mainshaft and countershaft first gears and fit the shift fork into the countershaft third gear with the machined (flat) side of the fork up. Engage the roller (button) of the fork in the lower camplate track.

7. Fit the mainshaft second gear with its shift fork (machined side of the fork down) and engage the fork roller in the upper track of the camplate.

8. Insert the shift fork shaft through the forks and into the inner cover. Position the countershaft second gear on the shaft and install the countershaft in the inner cover.

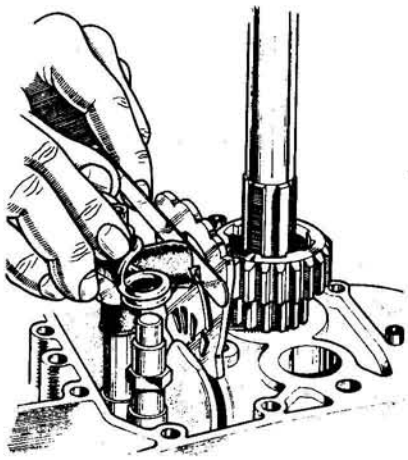


Installing the camplate

9. Place the mainshaft fourth gear thrust washer over the shaft, retaining it with a dab of grease. Install the countershaft thrust washer, making sure that the side with the radius faces the gear.

10. Lubricate all components with motor oil and rotate the shafts to confirm that they are free of binding.

11. If the shift return spring has been removed, it must be reinstalled so that the marked (painted) side of the coil faces the shift quadrant body. If the spring is unmarked, install it in the position in which it appears in the accompanying illustration (in line with the two pins) by trial and error.



Installing the shifter mechanism and return spring

12. Install the shift quadrant assembly into the inner cover, using a flat blade to keep the plungers depressed so they can slide over the camplate.

13. If the inner case, mainshaft, countershaft, or any gears have been replaced, it will be necessary to check end-float of the shafts and adjust if necessary. To accomplish this, mount the inner cover on the crankcase and tighten the screws. Remove the kick-start ratchet assembly and half-gear and the ends of the mainshaft and countershaft will be accessible. Thrust washers of different thicknesses are available to adjust end-float to specification.

14. When all components have been assembled on the inner cover and it is ready to be installed, clean the crankcase and inner cover mating surfaces thoroughly, and apply a thin coat of gasket cement to one of the surfaces. Lubricate the crankshaft oil seal and camshaft end, and mount the cover on the crankcase. Tighten the screws to 3.5–4.5 ft lbs. Check operation of the gears.

15. Install the outer cover, cleaning the mating surfaces and applying gasket cement as above. Install the kick-start and shift levers.

NOTE: *Before the cover is installed, the position of the shift linkage quadrant can be adjusted for smoother gear selection (late models only). Loosen the adjuster locknut and select each gear in turn. If the gears do not engage positively, turn the adjuster screw a little at a time until gear selection is satisfactory. Do not turn the screw more than ¼ turn from vertical in either direction. Tighten the locknut when adjustment is complete.*

16. Install the primary drive and clutch assembly and refill the transmission and primary case with oil.

Bottom End

DISASSEMBLY

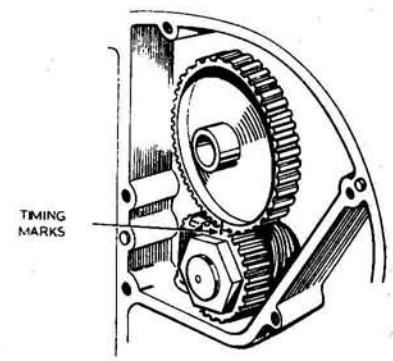
1. Drain the oil from the engine, transmission, and primary case. Remove the engine.

2. Remove the cylinder head, piston, and barrel.

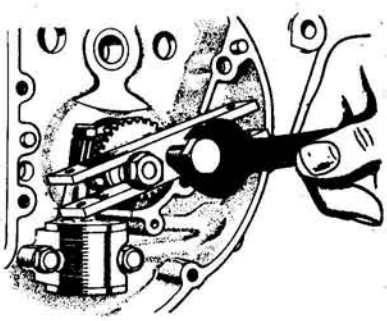
3. Remove the primary drive and clutch assembly.

4. Remove the right-side outer cover and then take off the inner cover, complete with transmission gearset, as described in the preceding section.

5. Note the alignment of the marks on the timing gears and withdraw the upper gear and camshaft, allowing the tappets to fall clear.



Timing gear marks



Removing the crankshaft pinion

6. Insert a bar through the connecting rod small-end, place blocks of wood under the bar to protect the crankcase, and unscrew the nut at the end of the crankshaft. The bar will keep the engine from turning over as the nut is broken free.

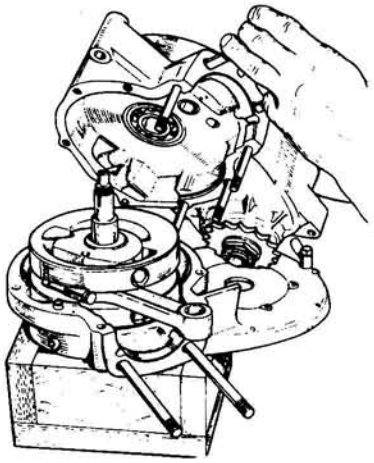
7. Remove the small timing gear with a suitable gear puller.

8. Take off the nut and remove the oil pump drive-gear.

9. From the left side of the crankcase, remove the three bolts at the lower front of the case, the two stud nuts at the center of the case, and the remaining two stud nuts at the cylinder base.

10. Remove the woodruff keys from the crankshaft ends and separate the crankcase halves by tapping with a rubber mallet.

11. Lift away the right crankcase, and remove the crankshaft assembly. Note the number of shims used, if any, between the right-side flywheel and main bearing.



Separating the crankcase halves

MAIN BEARINGS

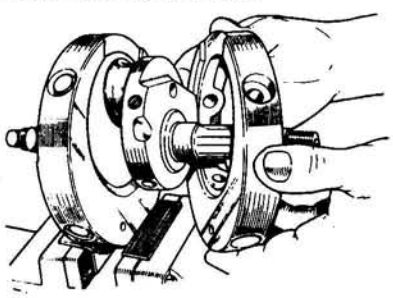
The inner and outer races of the left-side roller bearing are separated as the crankcase halves are split. The outer race can be driven out after the case has been heated in an oven. The inner race, remaining on the crankshaft, can be pulled off using a suitable gear puller. The right-side (timing side) ball bearing assembly can be driven out after heating the case.

New bearings can be installed in the cases in the same manner, after the cases have been heated.

CONNECTING ROD BEARINGS AND CRANKSHAFT ASSEMBLY

The connecting rod can be removed by simply unbolting the bearing cap. Loosen the nuts alternately, a turn at a time, to prevent distortion. To facilitate reassembly, the connecting rod and cap have been marked with a center punch. Note the direction in which the marks face.

Examine the bearing shells and crankpin carefully for signs of wear, scoring, and other damage. If it is necessary to regrind the crankshaft, bearings are available in 0.010, 0.020, and 0.030 in. undersizes. It is very important that the radius at either end of the crankpin is machined to 0.070–0.080 in. when regrinding. Do not attempt to refinish the bearing shells or file the bearing cap mating surfaces to reduce bearing clearances.



Removing a flywheel

If the crankshaft is to be reground, the flywheels must be removed. Loosen the four, short, flywheel retaining bolts (closest to the crankpin) first to avoid distortion. Remove the remaining four bolts and separate the flywheels. Clean the oil sludge trap, located in the right flywheel. Unscrew the plug and clean the passage with solvent and compressed air.

When reinstalling the flywheels, make sure that the flywheel incorporating the sludge trap is fitted on the *right* side. Apply a drop of thread-locking compound to the threads of each flywheel retaining bolt and tighten evenly to 50 ft lbs.

When installing the connecting rod on the crankshaft, make sure that the rod bearing shells are properly located in the connecting rod and cap. The oil hole should face the drive (left) side flywheel. Lubricate the bearing surfaces with fresh engine oil and install the bearing cap, taking note of the position of the punch marks to ensure that the cap is installed in its original position. It is recommended that new connecting rod bolts and nuts be used as a precaution against breakage. Clean the threads, apply a drop f thread-locking compound, and tighten the nuts to 22 ft lbs. Using a pressure oil can, force oil into the passage at the right end of the crankshaft until it is coming out around the connecting rod bearing. This indicates that the oil passages are not restricted and are full of oil.

ASSEMBLY

1. On the TR25W, the crankshaft end-float must be checked. Proceed with step 2, below, omitting the gasket cement. Check crankshaft end-float, disassemble the cases again and add or remove thrust washers as necessary between the flywheel and right-side main bearing to adjust end-float to within 0.002–0.005 in. Then start with step 2 again and follow the remainder of the assembly procedure.

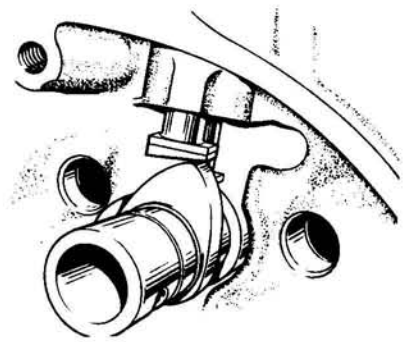
2. Place the crankshaft assembly into the drive-side crankcase. Clean the crankcase mating surfaces and apply a thin coat of gasket cement to the mating surface of one of the cases. Fit the crankcase halves together and install the three bolts and four nuts. Tighten evenly to 16–18 ft lbs.

3. Rotate the crankshaft to make sure that it turns freely. If it does not, the cause of the trouble must be determined and rectified. Look for incorrect main bearing alignment or insufficient crankshaft endplay.

4. Install the small timing gear on the end of the crankshaft, taking care to locate the woodruff key properly. Tighten the retaining nut to 50–55 ft lbs.

5. Install the oil pump drive-gear on the pump shaft using the special locknut (or a suitable replacement) as originally installed.

6. Place the two tappets into their bores with the thinner end of the tappet foot facing forward. Install the camshaft and timing gear unit, with the timing marks aligned, and fit the thrust washer on the end of the camshaft (late models only).



Note position of tappet contact pad

NOTE: *On early engines there are two marks on the camshaft timing gear—a dash and a V. On these engines the dash must be ignored and the marks aligned as illustrated. On later engines that do not have the V mark, simply align the dash marks.*

7. Install the right-side inner cover complete with transmission gearset and install the outer cover.

8. Install the primary drive and clutch assembly.

T100C AND T100R

Engine Removal and Installation

1. Remove the gas tank and disconnect the spark plug leads.

2. Disconnect the battery terminals and the connectors at the two ignition coils.

3. Remove the ignition coils, taking care not to damage the outer casings.

4. Disconnect the snap connectors between the contact breaker assembly and the condensers.

5. Remove the two cylinder-head torque stays.

6. Disconnect the tachometer drive cable.

7. Remove the carburetor(s) complete with air cleaners.

8. Disconnect the rocker oil feed line, taking care not to bend it.

9. Drain the oil tank and disconnect the delivery lines to the engine.

10. Drain the engine sump, primary chaincase, and transmission.

11. Loosen the clutch adjustment at the handlebar, then disconnect and remove the clutch cable.

12. Remove the exhaust header pipes and mufflers.

13. Remove the final, drive-chain master link and withdraw the chain.

14. Disconnect the alternator leads at their snap connectors underneath the engine.

15. Remove the bolts securing the front engines plates and withdraw the plates.

16. Remove the stud securing the bottom of the engine to the frame and the bolt securing the rear engine plates to the transmission case.

17. Have a helper support the engine, then remove the two nuts securing the right rear engine plate to the frame. Re-

move the plate.

18. Remove the left front stud securing the engine torque stay.

19. Remove the right footrest.

20. With the helper, lift the engine out the right side of the machine.

21. Installation is basically a reversal of the removal procedure. Note the following:

a. When the engine is in position in the frame, install the bottom frame bolt first, then install the right rear engine plate and tighten the bolts fingertight only.

b. Install the front, engine mounting plate, then tighten all mounting bolts snugly.

Top End

REMOVAL

The cylinder head and barrel can be removed without taking out the engine.

1. Disconnect the leads from the battery terminals and remove the fuel tank.

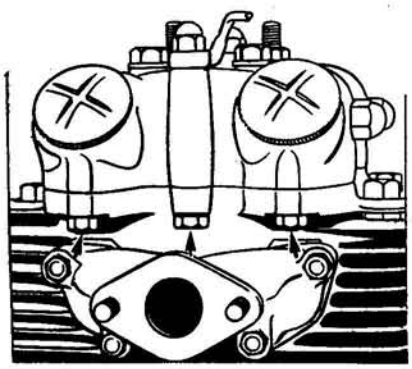
2. Disconnect the high tension cables and wiring harness from the ignition coils, then remove the coils. Take care not to damage the coil outer casings.

3. Remove the cylinder head torque stays.

4. Remove the rocker oil feed line.

5. Remove the two nuts from the studs at the bottom of the exhaust rocker box.

6. Remove the two phillips screws from the top of each rocker box, loosen all eight cylinder head bolts and remove the central head bolts.



Rocker box stud nuts and bolt (500)

7. Remove the exhaust rocker box, then remove the intake rocker box in the same manner. Take care not to lose the six plain washers (one under each bottom securing nut).

8. Remove the pushrods and mark them for reassembly position.

9. Remove the exhaust header pipes.

10. Disconnect the fuel lines and plug the ends. Disconnect the throttle linkage at the carburetor(s).

11. Remove the remaining four cylinder head nuts by turning each one a little at a time in an X pattern.

12. Remove the cylinder head complete with intake manifold(s) and carburetor(s). If the cylinder head is being serviced, rather than being removed to gain access to another part of the engine, remove the intake manifolds and carburetor(s).

13. Remove the pushrod tubes, remembering to replace the rubber seals during assembly.

14. Remove the cylinder head gasket.

15. Wedge a piece of rubber between the intake and exhaust tappets to prevent them from falling into the case when the barrel is removed.

16. Rotate the engine until the pistons are both at TDC, then remove the eight cylinder base nuts and washers.

17. Raise the barrel high enough to stuff some clean, no-lint rags into the case openings. It is also a good idea to fit some kind of rubber protectors over the cylinder studs to prevent damage to the connecting rods when the barrel is removed.

18. Lift off the barrel carefully, supporting the pistons when they are free.

19. Remove and mark the tappets for reassembly.

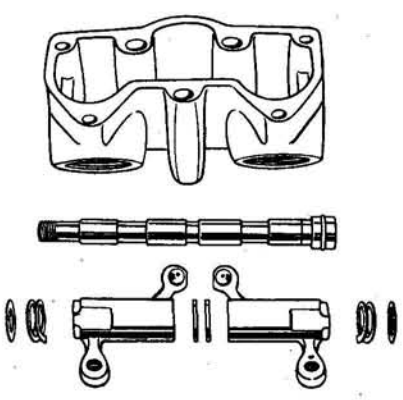
ROCKER BOXES

The rocker spindles can be removed by driving them out with a suitable drift. Once out, the spindles will release the rocker arms and washers. Clean the parts in kerosine or a cleaning solvent, then blow them dry with compressed air. Also blow out the spindle oil drillings with compressed air. Upon reassembly, the spindle oil seals should be replaced.

If the rocker ball pins require replacement, drive them out with a suitable drift and press the new ones in with the drilled flat toward the rocker spindles.

The rocker boxes can be reassembled using a $^{7}/_{16}$ in. x 6 in. bar, ground to a taper at one end. This bar serves as an alignment tool for the spindles. Before beginning assembly, note that two of the washers removed from the spindles have a smaller diameter than the other washers. These are thrust washers and they must be assembled last—against the right inner face of the rocker box.

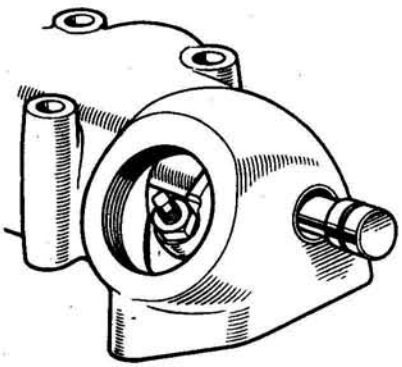
Grease two plain washers and position them on either side of the center bearing boss. Position the left rocker arm, bringing it into line with the alignment bar, and locate the plain washer, spring washer, and thrust washer as shown in the accompanying illustration. Repeat this for the right rocker arm, then oil the spindle and slide it as far into the rocker box as possible. Tap it in the remaining distance with a soft-faced hammer.



Rocker arms and spindle (500)

TAPPETS AND GUIDE BLOCKS

The only wear likely to be apparent on the tappets is at their tips which are plated with Stellite. Over a long period of time, an indentation will be worn in the center of the tip. If the width of this indentation exceeds $^{3}/_{32}$ in., replace the tappet.



Installing the rocker box spindle

Tappet guide block assembly

It is not necessary to remove the press-fit tappet guide blocks to check their condition. Simply insert the tappet and rock it back and forth in the block. There should be little or no lateral play. See specifications for allowable clearances.

CYLINDERS

The difference between the largest and smallest of the six bore measurements must not exceed 0.13 mm (0.005 in.), or reboring is necessary.

PISTONS

1. Remove the inner and outer piston pin retaining circlips, then attach a piston pin removal tool and press out the pin.

2. Lay out and mark the pistons, piston pins, and retaining circlips for reassembly.

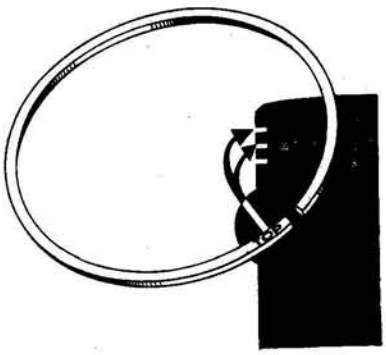
3. Remove the piston rings one at a time by lifting an end of the ring out of its groove and holding a thin piece of metal between it and the piston. Slide the piece of metal around the circumference of the piston while at the same time gently lifting the raised part of the ring upwards.

4. Replacement pistons are available in three oversizes. These sizes and the corresponding recommended cylinder bore sizes are given in a chart at the end of this section.

5. Install the piston rings one at a time over the top of the piston. Note that the two compression rings are marked TOP, which must face upwards when the rings are fitted.

6. Position the piston on the connecting rod.

7. Install one new retaining circlip as a stop, then press the piston pin into position and install another new circlip on the other side.

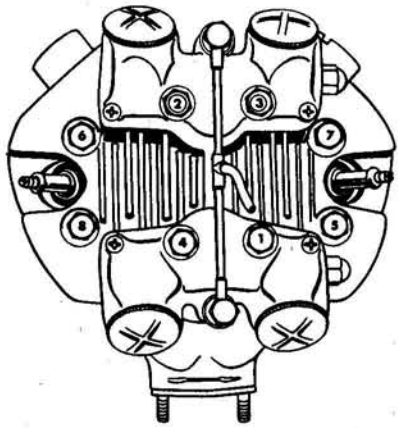


Install compression rings with the "Top" mark facing upwards

NOTE: *It is advisable to heat the piston to 100° C prior to assembly.*

ASSEMBLY

1. Position new guide block O-ring seals at the base of the cylinder block.
2. If it was removed, lightly grease the outside surface of the exhaust guide block, then carefully align the guide block and cylinder locating holes and drive the block into position with Triumph special tool no. Z23 or a suitable drift.
3. Repeat the above step for the intake guide block, then install the locking bolts.
4. After installing the guide blocks, make sure that the exhaust guide block oil drillways are free from obstruction.
5. Install the tappets in the guide blocks after thoroughly lubricating them with oil. Wedge them in position.
6. Install the cylinder base gasket, making certain that the gasket does not obscure the oil feed drillway in the crankcase.
7. Fit ring compressors over the piston rings, then carefully slide the cylinder down over the pistons. Remove the ring compressors as soon as the rings are positioned within the cylinder. Continue lowering the cylinder block and then remove the rags in the crankcase openings as late as possible.
8. Install the cylinder base attaching nuts.
9. Replace or anneal the cylinder head gasket.
10. Clean the mating cylinder head and cylinder surfaces, then grease the gasket and position it on the cylinder.
11. Coat the tappet guide blocks with grease and position the pushrod cover tubes with new O-rings seals.
12. Position the cylinder head and install the four outer and one central head bolt finger-tight.
13. Place a small amount of grease in the bottom cup of each pushrod, then locate the intake pushrods in their respective bores. This will have to be done by "feel."
14. When the pushrods are properly positioned, remove the spark plugs and turn the engine over until both intake pushrods are level and at the bottom of their travel.
15. Install the intake rocker box.
16. Repeat the above procedure for the exhaust rocker box, noting that the central cylinder head bolts should be tightened to torque specifications before tightening the underside securing nuts.
17. Turn the engine over several times to make sure the valves are operating properly, then reinstall the torque stays and secondary ignition coils.
18. Connect the rocker oil feed line, using either new copper washers or annealed, used ones.
19. The remainder of the assembly procedure is a reversal of the disassembly instructions. Adjust valve tappet clearances.



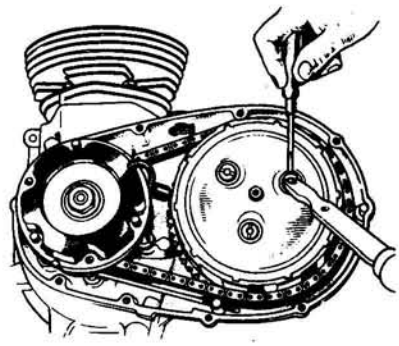
Cylinder head bolt tightening sequence

Clutch

DISASSEMBLY

1. Remove the left exhaust header pipe.
2. Loosen the rear brake adjustment until the pedal drops clear of the primary cover.
3. Remove the left footrest.
4. Drain the oil from the chaincase, then remove the chain tension adjuster.
5. Remove the ten, recessed cover-securing screws and withdraw the cover and paper gasket.
6. Remove the chain tensioner assembly.
7. The clutch pressure plate is held in place by three, slotted adjuster nuts. To remove these nuts, slide a knife or screwdriver blade under the nut and loosen it with Triumph tool no. D364 (supplied with tool kit) or a suitable substitute.

NOTE: *The clutch nuts are fitted with locking tabs which may be sheared off by removal. If so, replace them.*



Removing the clutch nuts

8. Remove the clutch springs, cups, and pressure plate assembly.
9. The clutch plates can be removed with the use of two, narrow, hooked tools made of 1/32 in. wire.

INSPECTION

1. If the thickness of the discs is 0.030 in. (0.75 mm), or more, less than specified, they should be replaced.
2. Check the fit of the plate on the shock absorber unit. There should be little radial clearance.
3. Measure the clutch spring length and compare with specifications. If a spring has shortened by 0.10 in. (2.5 mm) or more, replace the set.

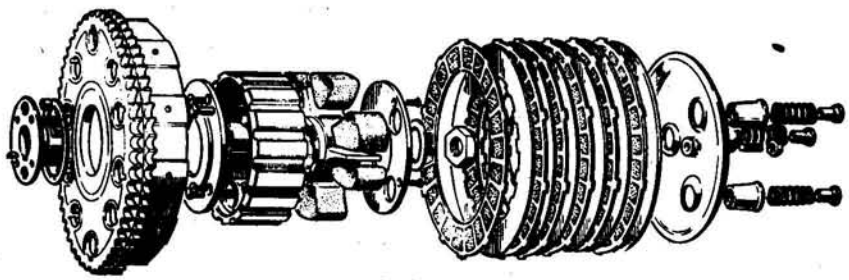
ASSEMBLY

1. Install the clutch plates and discs; the innermost position must be occupied by a bonded plate.
2. Install the cups, pressure plate, springs, and slotted adjuster nuts.
3. True the clutch pressure plate by first tightening the pressure-plate, slotted adjuster nuts until they are even with the clutch pins, and then by kicking the engine over and observing the rotation of the plate, and then making any necessary adjustment until the plate turns evenly. If the plate wobbles even slightly, it must be corrected.

Primary Drive and Clutch Hub

DISASSEMBLY

1. Remove the primary cover as previously described.
2. Remove the clutch assembly as previously described.
3. Disconnect the alternator stator leads at their snap connectors under the engine.
4. Remove the three stator securing nuts and withdraw the stator from over its mounting studs. Unscrew the sleeve nut



Clutch assembly

and then the lead can easily be removed.

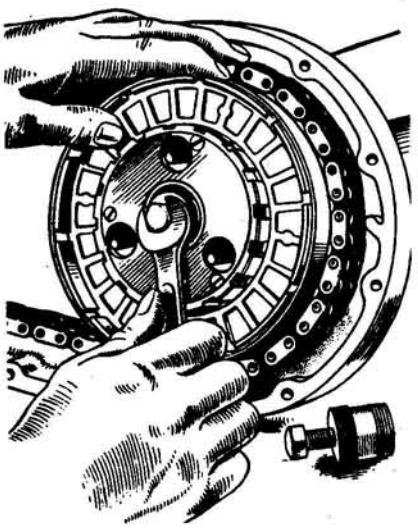
5. Remove the rotor.

6. Remove the rotor key and distance piece.

7. Remove the clutch hub securing nut and cup.

NOTE: *Machines prior to serial no. H49833 have a tab washer and a different cup washer, rather than the self-locking securing nut.*

8. Screw the body of extractor no. Z13 into the clutch hub until it bottoms, then tighten the center bolt until the hub is released.



Removing the clutch housing

9. Assemble extractor no. Z151 and D662/3 on the engine sprocket and tighten its center bolt until the engine sprocket is released.

10. Withdraw the engine sprocket, clutch hub, and primary chain together.

11. Remove the transmission mainshaft key and check the oil seal for leakage.

INSPECTION

1. Inspect the clutch shock absorber for worn rubbers or punctures. They can be removed by prying them out, small rubbers first. Replace as necessary. When reassembling, apply thread-locking compound to the cover plate securing screws.

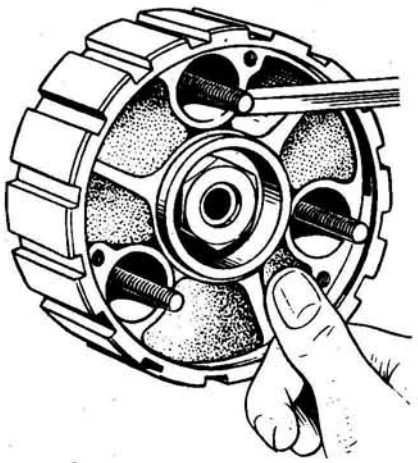
2. First thoroughly clean the primary chain then check it for wear by scribing two marks on a flat surface 12 in. apart, and centering two pivot pins at the scribe marks. Fully compressed, the chain link pivot should line up with the marks; fully stretched, it should not extend more than ¼ in. beyond the marks.

3. Check the fit between the shock absorber spider and the clutch hub splines. The spider should be a push fit on the clutch hub, with no radial movement.

4. Check the fit of the engine sprocket on the crankshaft in the same manner. There should be no radial movement.

5. Check the clutch hub bearing diameter, rollers, and clutch sprocket bearing. Replace any bearing rollers that are pitted or worn. See specifications.

6. Make sure the shock absorber spider is a good fit in the inner and outer



Installing clutch hub rubbers

retaining plates, and that the arms have not excessively scored the inner surface of the retaining plates.

ASSEMBLY

1. Grease the clutch hub and install the thrust washer and twenty of the correct rollers. Do not use ¼ in. x ¼ in. rollers!.

2. Position the hub and press the shock absorber, complete with the three threaded pins, on the hub.

3. Install a new tapered distance collar behind the engine sprocket, with the taper toward the crankshaft main bearing and oil seal.

4. Install the transmission mainshaft key and tap the clutch hub onto its taper.

5. Lubricate the primary chain and lay it over the clutch sprocket.

6. Wrap the chain around the engine sprocket, then position the sprocket on the crankshaft.

7. Place clutch locking tool Z13 in the clutch plate housing, then install the cup washer and self-locking nut. Torque the nut to specifications.

NOTE: *On machines before serial no. H49833, install the tab washer with the long tab in the hole in the shock absorber spider, install the securing nut and bend a tab to lock the nut.*

8. Install the alternator rotor, making sure that the key or locating peg is correctly positioned.

9. Install the alternator stator. Put a 0.008 in. (0.2 mm) feeler gauge between each stator pole and the rotor. Turn over the engine to make sure that the rotor and stator do not touch.

Transmission Countershaft Sprocket

REMOVAL AND INSTALLATION

1. Disassemble the clutch and primary drive as previously described. Remove the sprocket cover.

2. Bend back the tab washer and, while holding the rear brake, remove the sprocket securing nut.

3. Slide off the final drive chain and remove the countershaft sprocket.

4. Make sure the oil seal is in good condition, then lubricate the ground boss of the new sprocket and position it on the transmission mainshaft.

5. Replace the tab washer, screw on the securing nut finger-tight, then, with the chain in place, tighten the nut to torque specifications.

6. Oil the bushing that protrudes from the mainshaft high gear and install the sprocket cover with a new paper gasket.

7. The remainder of installation is a reversal of the removal procedure.

Clutch and Shifter Operating Mechanisms

DISASSEMBLY

1. Remove the right exhaust header pipe and footrest.

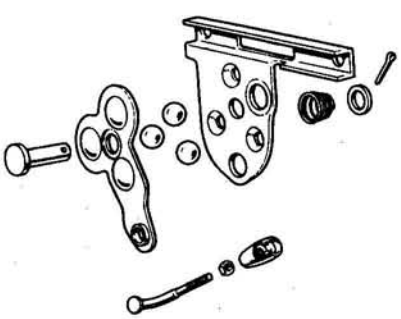
2. Drain the gearbox oil.

3. Disconnect the clutch cable from the actuating lever.

4. Remove the two nuts and four recessed screws that secure the gearbox outer cover. Remove the kick-starter.

5. Hold the gearshift lever in one hand, then tap the cover with a soft-faced mallet until it is free to be removed.

6. Unscrew the two nuts inside the gearbox outer cover and remove the shifter return springs complete with the thrust buttons and distance pieces.



Clutch operating mechanism

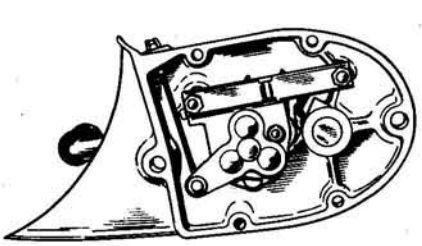
7. Unscrew the countersunk screw that secures the clutch operating mechanism and withdraw the assembly.

8. Remove the shifter lever pinch bolt, remove the lever, and then withdraw the shaft from the cover.

9. Remove the cotter pin from the clutch operating shaft. This will release the clutch operating balls.

10. Remove the two cotter pins and disconnect the plungers and springs from the shifter quadrant.

11. If the shifter spindle bushing requires replacement, heat the outer cover to 100° C and drive it out with a suitable, shouldered drift. Drive in the new bushing before the cover has a chance to cool.

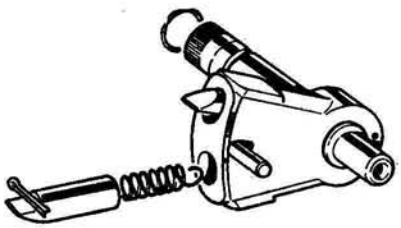


Clutch mechanism installed

NOTE: *A drift for removing and installing the shifter spindle bushing can be made from a piece of ¾ in. diameter bar. Machine the bar to a diameter of ⅝ in. and cut a length of ¾ in.*

ASSEMBLY

1. Install the shifter quadrant springs, plungers, and securing cotter pins, then install a new O-ring on the spindle.
2. Lubricate the spindle and O-ring with oil, then insert the spindle in the cover.
3. Assemble the clutch-operating mechanism balls in their recesses and install the shaft and clutch lever in the order shown in the accompanying illustration. Don't forget to install the spring and washer before replacing the cotter pin.



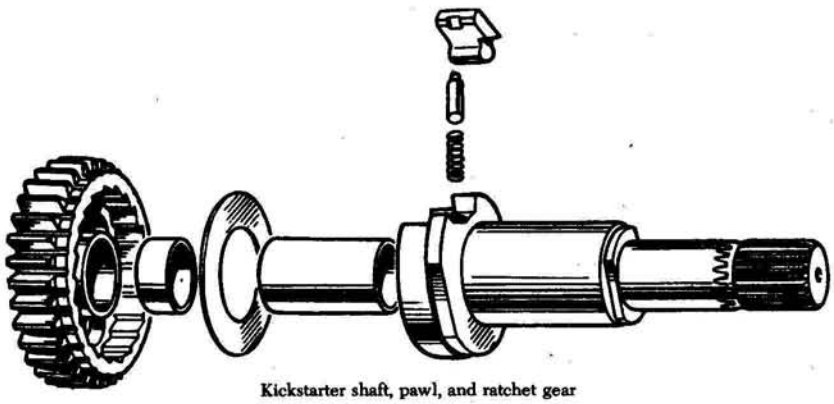
Shifter mechanism

4. Install the distance collar on the end of the shifter quadrant shaft, then install the clutch operating mechanism in the cover and secure it in place with the countersunk screw.
5. Install the distance pieces over the studs, then connect the shifter return springs and thrust buttons. Install the return spring cover plate and tighten the securing nuts.
6. Install the gearbox outer cover with sealant, tighten the securing screws, and install the kick-start lever.
7. Refill the transmission with oil.

Gearbox and Kick-Starter Mechanism

DISASSEMBLY

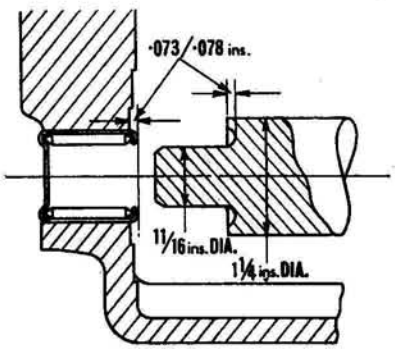
1. Disassemble the primary drive and clutch as previously described. Remove the transmission mainshaft nut and key.
2. Remove the gearbox outer cover, noting that the gearbox should first be positioned in fourth gear.
3. Remove the two inner gearbox cover retaining screws, then remove the entire gearbox assembly by tapping the clutch end of the mainshaft with a mallet.
4. Remove the camplate cotter pin, then withdraw the camplate spindle.
5. Pry off the kick-starter return spring and remove the distance piece. Withdraw the kick-starter spindle.
6. Remove the camplate index plunger and place it aside.
7. Remove the selector fork spindle and disengage the selector forks from the camplate.
8. Remove the layshaft and kick-starter pawl, plunger, and spring.
9. Drive the mainshaft assembly out of the bearing with a soft-faced mallet.
10. Remove the countershaft sprocket as previously described, then drive the mainshaft high gear into the gearbox with a soft metal drift and hammer.
11. To remove the mainshaft right bearing, heat the cover to 100° C and drive it out with a suitable, shouldered drift. Install the new bearing while the cover is still hot. Replace the securing circlip.
12. To remove the high gear bearing on the left side of the machine, pry out the oil seal and remove the retaining circlip. Heat the case around the bearing to 100° C, then drive it out with a suitable, shouldered drift. Install the new bearing while the case is still hot. Replace the oil seal with the lip and spring toward the bearing, then replace the retaining circlip.
13. If it is necessary to replace the mainshaft high gear bushing, press it out with a drift measuring 5.0 x ⅞ in., having ¾ in. of one end machined to 13/16 in. diameter. Install the new bushing with the same drift, making certain the bushing oil groove is at the gear teeth end. The bushing should then be reamed to the size given in specifications.
14. The layshaft right needle roller bearing can be removed by heating the kick-starter spindle to 100° C and tapping it off with a block of wood.
15. The layshaft left needle roller bearing is of the closed-end type and can be removed through the countershaft sprocket cover plate aperture. Heat the case to 100° C and drive the bearing into the gearbox with a suitable drift. Install the new bearing while the case is still hot. A special drift, for which dimensions are given in the accompanying illustration, must be used to install the new bearing.



Kickstarter shaft, pawl, and ratchet gear

ASSEMBLY

1. If all replacement bearings have been installed with new seals and circlips, install the layshaft thrust washer over the needle roller cage, and hold it in position with a dab of grease.
2. Lubricate the mainshaft and layshaft captive gears, then assemble the mainshaft in the inner gearbox cover.
3. Install the plunger, spring, and pawl on the kick-starter spindle, then insert the assembly in the inner gearbox cover and slide the layshaft assembly into the kick-starter bearing. Remember to install the mainshaft distance piece between the mainshaft assembly and the main bearing in the inner cover.
4. Position the selector forks on the shafts as shown in the accompanying illustration and insert the selector fork spindle to hold them in position.



5. Assemble the camplate in the outer cover and locate the selector fork rollers in their camplate tracks.
6. Install the camplate spindle and secure it with a new cotter pin. Install the camplate index plunger and spring.
7. Operate the selector forks manually to make sure that each selector fork is on its appropriate shaft. When the camplate is moved to its full extent, both selector rollers should move to the full extent of the camplate grooves in both directions. If not, the selector forks will have to be disengaged and reversed.
8. Install the distance piece over the kick-starter shaft, then secure the end of the return spring with its retaining screw.

NOTE: *Use a screwdriver to tension the return spring before connecting it and installing the return spring plate.*

9. The remainder of the assembly procedure is a reversal of the disassembly instructions.

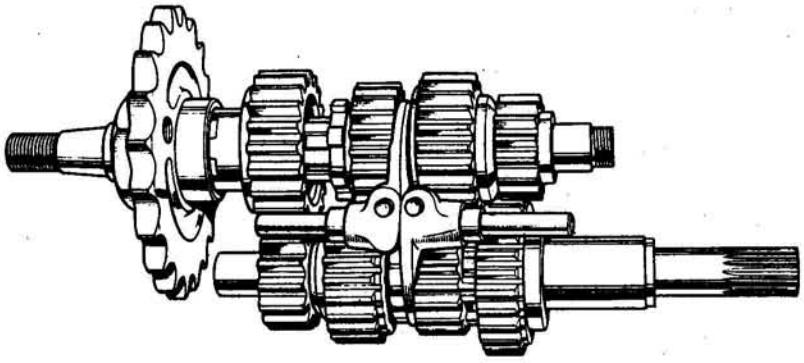
Bottom End

CAMSHAFT SERVICE (ENGINE INSTALLED)

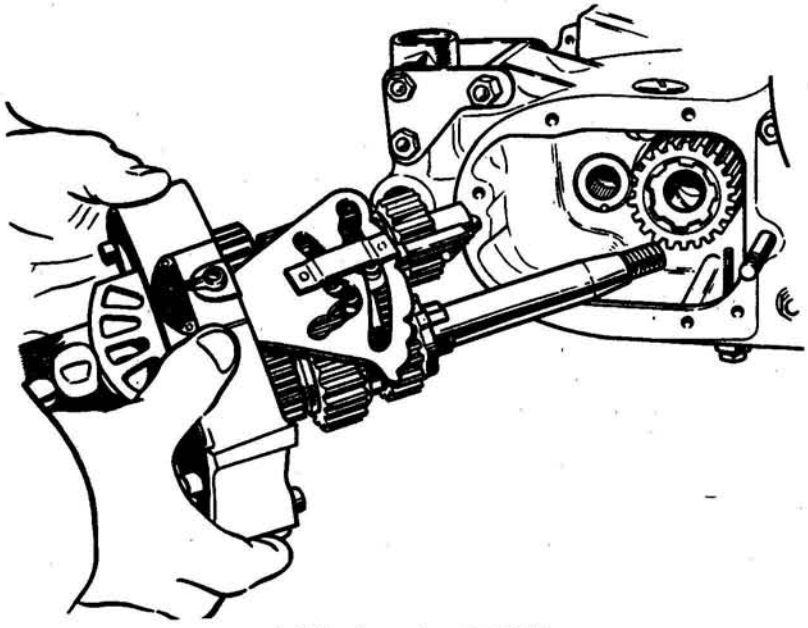
It is not necessary to separate the crankcase halves in order to replace the camshafts.

Removal and Installation

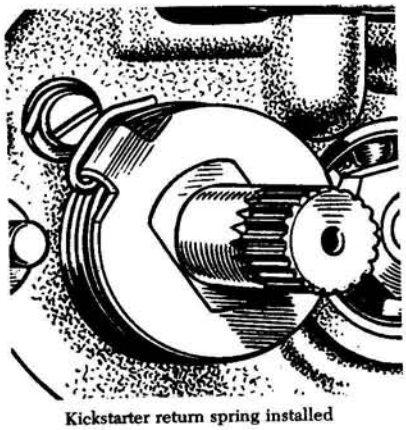
1. Remove the rocker boxes.
2. Remove the timing cover.
3. Remove the oil pump (see "Lubrication Systems"), and temporarily block the crankcase holes to prevent oil spillage. Make sure you remember to open these holes before reinstalling the oil pump.



Gear cluster and shift forks



Installing the gearbox components



Kickstarter return spring installed

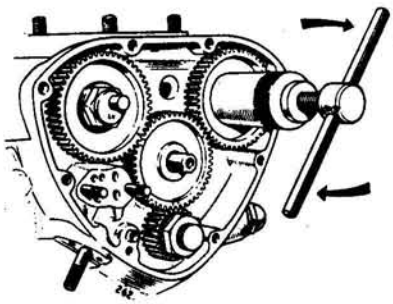
4. Extract the intake and exhaust camwheels. The camshaft retaining plates can now be seen.

5. Carefully pull the camshafts out the right side of the machine. Make sure the breather disc and spring, located behind the intake cam, do not fall into the crankcase. Also, lean the machine to the left when removing the cams so that the cam followers do not fall into the crankcase.

6. Assemble the rotary breather valve and spring to the new intake camshaft, then install both cams, making certain that the slot in the end of the intake cam fully engages the dog on the breather valve.

7. Reinstall the camshaft retainer plates and secure them in place with new screws.

8. The remainder of the assembly procedure is a reversal of the removal instructions.



Removing a camshaft gear

CRANKCASE

Disassembly

1. Remove the primary chaincase cover and disconnect the alternator leads under the engine.

2. Remove the three screws that secure the alternator stator, and pull the stator off its mounting studs. Do not disconnect the leads at this time.

3. Disassemble the clutch and primary drive as previously described. Remove the stator sleeve and withdraw the stator leads.

4. Remove the gearbox outer cover and dismantle the gearbox.

5. Remove the rocker boxes, cylinder head, cylinder barrel, and pistons.

6. Disconnect the clutch cable and remove the carburetor(s).

7. Remove the contact breaker cover and the oil pump, then remove the crankshaft pinion. The camshaft pinions can also be removed at this time.

NOTE: *The crankshaft pinion nut has a right-hand thread, but the camshaft nuts are left-hand threads.*

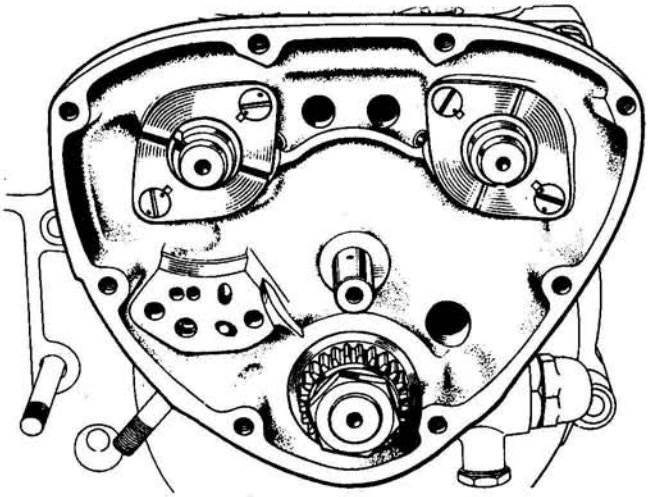
8. Remove what's left of the engine from the frame.

9. Clamp the crankcase firmly in a vise at the bottom mounting lug and remove the bolt and two screws at the cylinder base.

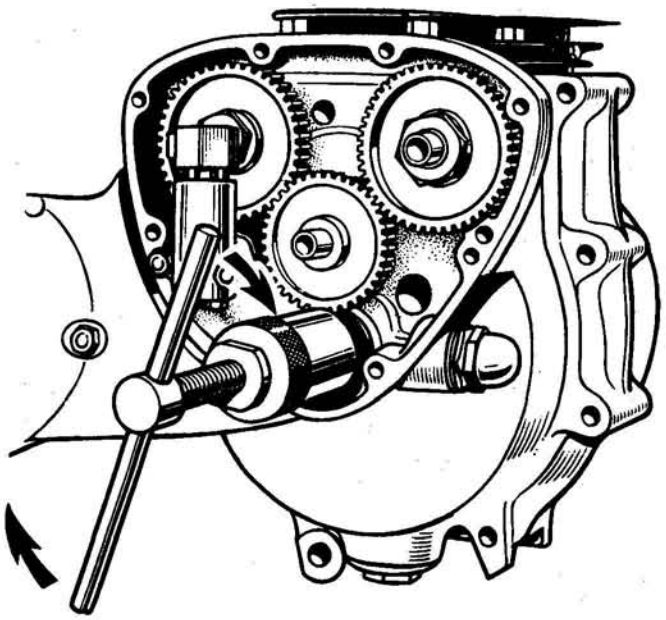
10. Remove the stud at the front of the engine and the two nuts next to the gearbox housing.

11. Attach Triumph extractor no. Z151 and separate the cases.

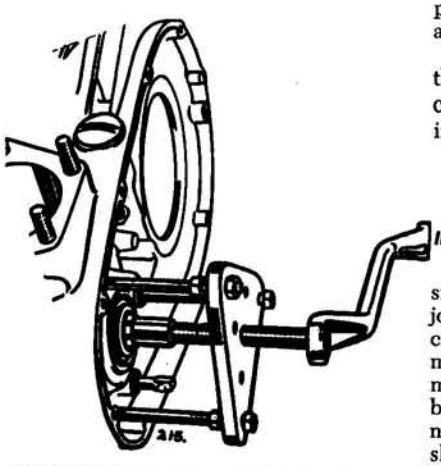
12. After the cases are apart, remove the crankshaft assembly. Remove the



Camwheels removed, revealing camshaft retaining plates



Removing the crankshaft pinion



Separating the case halves with tool no. Z151

breather valve from within the intake camshaft bushing in the left case.

Crankshaft and Connecting Rods

DISASSEMBLY

1. Clamp the crankshaft assembly in a soft-jawed vise and place a rag over any sharp edges to protect the connecting rods.

2. Unscrew the cap retainer nuts a little at a time to avoid distortion, then remove the caps and connecting rods.

NOTE: *The connecting rods, caps and nut are center-punched to facilitate reassembly.*

3. Using a large impact driver, unscrew the oil tube retainer plug from the right end of the big-end journal. If necessary, drill a hole ⅛ in. deep and ⅛ in. in diameter to eliminate the locking effect of the plug center punch.

4. Remove the flywheel bolt next to the big-end journal, then pull out the oil tube with a hooked piece of stiff wire through the flywheel bolt location hole.

5. Thoroughly clean all parts in solvent, then blow them dry with compressed air. Make sure the oil drillways are blown clear.

6. To remove the flywheel, unscrew the two remaining bolts and press the crankshaft out of the right side plain bearing with a five ton press.

NOTE: *Before removing the flywheel, make certain it is marked for reassembly.*

INSPECTION

Inspect the big-end journals for any signs of scoring, etc., and measure the journal diameter. Compare with specifications. Light score marks can be removed with fine grade emery cloth, but make sure all metal filings are removed before reassembly. If the scoring is light, new connecting rod shell bearings should be installed; if the scoring is extensive, the journals should be reground to an appropriate undersize.

NOTE: *The replaceable big-end bearing shells are pre-sized to give the correct dimensions. Under no circumstances should they be scraped, or the connecting rod and cap filed to alter the bearing dimensions.*

ASSEMBLY

1. Position the oil tube in the crankshaft, aligning the flywheel bolt holes with those in the crankshaft. Temporarily install one of the flywheel bolts to secure it in position.

2. Apply thread-locking sealant to the oil tube plug and install it in the crankshaft. Center-punch the crankshaft opposite the slot to lock the plug in position.

3. Heat the flywheel to 100° C, then position it over the crankshaft with the center punch mark to the right. Turn the flywheel through 180° to get it over the crankshaft web, then turn it to the correct position relative to the crankshaft and align the bolt holes.

4. Coat the flywheel bolt threads with a thread-locking sealant, then install and torque them to specifications.

5. If a new or reground crankshaft, or a new flywheel was installed, the assembly should be rebalanced.

6. Check to make sure all the oil drillways are free from obstruction, then install the connecting rods and caps. Torque the retaining nuts to 27 ft lbs.

7. Last, force oil through the crankshaft, right main-bearing journal drillway until it is expelled at both big-end bearings. This will provide assurance that the drillway is free from obstruction.

Camshaft Bushings

The intake and exhaust camshafts run in bronze bushings in the left case and are butted directly into the right case. To remove the bushings in the left case, a tap will be necessary. The ideal size is ⅞ in. diameter x 9 whitworth.

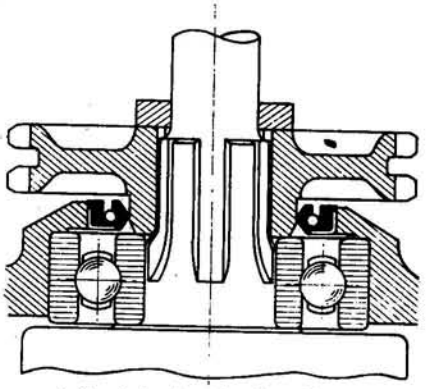
When a good thread has been cut in the bushing, heat the case to 100° C and screw in the appropriate bolt. Grip the bolt in a vise and tap the case with a soft-faced mallet until the bushing is free. The replacement bushings are pre-sized but will require a light reaming to meet specifications. After reaming the new bushings, make sure the crankcase is thoroughly cleaned to remove any metal filings.

Main Bearings

To remove the left main bearing heat the case to 100° C and drive it out with tool no. Z14. The right main bearing prior to H65573 is a bronze bushing, and is removed by first removing the lock plate, heating the case to 100° C, then driving it out with a suitable, shouldered drift. It is advisable to replace the left bearing oil seal while the engine is apart, even if it appears to be in good condition. This is installed with the open face outwards.

To install the left bearing, first make sure that its housing is clean, then heat the case to 100° C and drive the bearing into position with a tubular drift the same size as the bearing outer race. A suitable size would be 2¾ in. diameter x 6 in. long.

To install the right bronze bushing, heat the case to 100° C and then press the bushing into position. Let the case cool, then line-ream the bushing to specifications. Tool no. Z134 is available for this purpose. To use it, the case halves must be assembled and the reamer inserted through the right main bearing, with the



Left main bearing oil seal installation

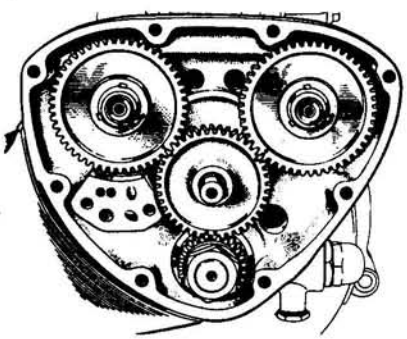
pilot end located in the left main bearing. Reamer Z134 is also available in 0.010, 0.020, and 0.030 undersizes.

After H65573 the right bearing is the ball-type and is removed and installed in the same manner as the left bearing.

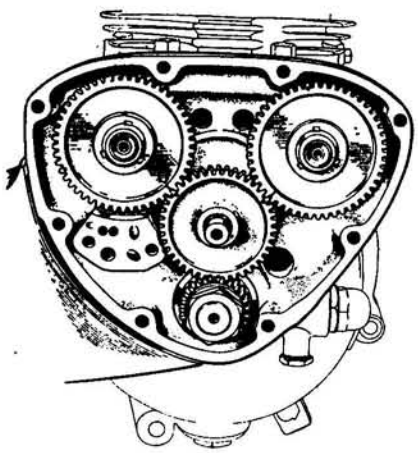
After both bearings have been installed, press the oil seal into the left case, open face outwards.

Assembly

1. Thoroughly clean the mating crankcase halves, giving special attention to the locating dowels.
2. Position the left case on two wooden blocks, lubricate the main bearing and camshaft bushings and then install the breather valve and spring in the intake cam bushing. Assemble both camshafts, making sure the intake cam slot engages the breather valve dog.
3. Carefully install the crankshaft assembly, making sure the fit in the bearing is good.
4. Apply fresh joining compound to the mating surfaces, then position the connecting rods in the center and lower the right case over the crankshaft. When the halves are mated, check to make sure the crankshaft and camshafts are not binding. The crankshaft should rotate freely, while the camshafts should offer only slight resistance.
5. The remainder of the assembly procedure is a reversal of the disassembly instructions. Make sure all timing pinions are correctly located.



Timing marks (T100C)



Timing marks (T100R)

650 AND 750 TWINS

Engine Removal and Installation

TR6R, TR6C, AND T120R

1. Turn off the fuel petcock, then disconnect and plug the fuel lines.
2. Remove the three securing bolts and the fuel tank.
3. Remove the main fuse from its holder, then disconnect the right and left ignition coil leads.
4. Remove the securing bolts and the two ignition coils. Disconnect the oil pressure switch on the timing cover.
5. Remove the attaching nuts and bolts, then remove the front and rear torque stays from the cylinder head.
6. Disconnect the tachometer drive cable from the right-angle gearbox at the front of the engine.
7. Disconnect the throttle cable at the carburetor(s).
8. On single carburetor engines, remove the air cleaner.
9. Remove the carburetor(s).
10. Disconnect the rocker oil feed line, taking care not to bend it excessively.
11. Drain the engine sump, oil tank, and transmission.
12. Disconnect all lines from the oil tank.
13. Back off the clutch adjustment at the handlebar until there is plenty of slack, then disconnect the cable at the operating arm on the right side of the engine.
14. Remove the exhaust headers and mufflers.
15. Disconnect the final drive-chain master link and remove the chain.
16. Disconnect the two generator leads at the bottom of the engine.
17. Remove the front chainguard securing bolt and loosen the rear mounting bolt. Pull the chainguard back several inches to get it out of the way.
18. Remove the four bolts and one nut securing the left and right rear engine-mounting plates. Remove the plates.
19. Remove the nuts and washers from one side of the front upper and lower mounting plates.
20. Remove both right-side rocker boxes.
21. Remove the left lower bolts securing the rear frame to the front frame.
22. Pull out the front upper and lower mounting studs, then lift the engine out the left side of the frame. A helper at this point will greatly reduce the possibility of dropping the engine.

Installation is basically a reversal of the removal procedure. To make sure the wiring harness is properly connected, refer to the appropriate wiring diagram.

TR7V, T140V

1. Shut off the fuel taps, and disconnect the fuel lines. Remove the rubber cap from the top, center, of the gas tank, and remove the sleeve nut below. Take the tank off the frame.
2. Detach the torque stay from the engine by removing the two nuts securing the stay to the cylinder head and removing the bolt and nut from the frame.
3. Disconnect the tachometer cable at the engine.
4. Remove the header pipes and mufflers.
5. Disconnect the oil pressure switch at the timing cover, the clutch cable at the engine, the contact breaker, coil, and alternator leads.
6. Remove the carburetor(s) from the manifold(s) and pull away from the air cleaner.
7. Drain the oil from the frame backbone oil reservoir by means of the drain plug at the very bottom of the reservoir.
8. Disconnect the oil feed line from the bottom of the reservoir, and the oil return line at the top. Disconnect the rocker feed line at the top of the reservoir.
9. Drain the oil from the gearbox and the primary chaincase. Drain the crankcase sump.
10. Disconnect the crankcase breather hoses at the left, rear of the crankcase by loosening the hose clamp screws.
11. Remove the chainguard by removing the securing bolt and loosening the left side bottom shock absorber bolt. Pull the chainguard out of the back of the bike.
12. Remove the drive chain masterlink and disengage the chain from the gearbox sprocket.
13. Remove both footpegs.
14. Remove the two rear engine mounting plates each of which are secured by five nuts and bolts. Remove the bottom and front engine mounting studs. Note the location of the spacers. For both studs, the wide spacer is installed on the right side of the motorcycle.
15. Remove the engine from the left side of the frame.

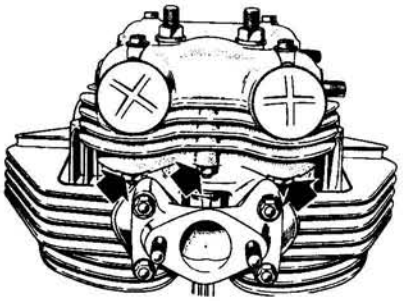
Installation is essentially the reverse of the removal procedure. Refer to the wiring diagrams in the "Electrical Systems" section to insure that all connections are correct. Refer to "Tune-Up and Maintenance" for the proper grades and quantities of oil.

TOP END

Removal

650 TWINS

1. Remove the fuel tank.
2. Disconnect the battery terminal leads.
3. Disconnect and remove the secondary ignition coils, taking care not to damage the alloy cases.
4. Remove the front and rear torque stays.
5. Disconnect the rocker oil feed line, taking care not to bend it excessively.
6. Remove the rocker inspection caps.
7. Remove the three nuts from the securing studs on the underside of the exhaust rocker box.
8. Remove the exhaust rocker box



Exhaust rocker box securing nuts (650, 750 Twin)

outer securing bolts and the central cylinder-head bolts.

9. Remove the intake rocker box in the same manner, noting that the outer securing bolts may have to be loosened only a little at a time because of clearance difficulties.

10. Make sure to collect the six plain washers that fit underneath the securing nuts. They often stick to the cylinder-head flanges.

11. Withdraw and lay out the pushrods so that they can be installed in their original position.

12. Remove the carburetor(s) and the intake manifold.

13. Remove the exhaust header pipes.

14. Loosen the cylinder head nuts, a little at a time, in a cross pattern. Lift off the cylinder head.

15. Remove the pushrod cover tubes and rubber O-ring seals.

16. Check the tappet guide blocks for sharp edges that could cut into the pushrod O-ring seals. Smooth out any of these sharp edges or rough areas with a fine grade emery cloth.

17. Remove the copper cylinder-head gasket.

18. Wedge a piece of rubber between the intake and exhaust tappets to prevent them from falling into the crankcase when the cylinder is removed.

19. Rotate the engine until both pistons are at top dead center, then remove the cylinder block attaching nuts at the base of the block.

20. Carefully lift up the cylinder block and, as soon as there is enough room, stuff some clean lint-free rags into the crankcase openings. At this time it is also advisable to fit rubber protectors (or a suitable substitute) over the cylinder base studs.

21. Remove the cylinder base gasket and make sure the two locating dowels are in position on the crankcase.

22. Remove the tappets from the cylinder block and mark them for reassembly.

23. Invert the cylinder head on a bench, remove the locking bolts, then drive out the tappet guide blocks with a suitable drift. Make sure the intake and exhaust guide blocks are marked for reassembly, as the exhaust block has drilled oilways and the intake block does not.

TR7V, T140V

1. Remove the fuel tank after shutting off the petcocks and disconnecting the fuel lines. Remove the carburetor(s) from the head.

2. Disconnect the wires from the battery terminals. Remove the exhaust pipes and mufflers.

3. Disconnect the rocker feed line by removing the domed nut on each rocker spindle.

4. Remove the torque stay by removing the nut at each rocker box. Remove the torque stay bolt and nut on the frame.

5. Remove the rocker box inspection covers. Also remove the three nuts from the studs beneath each rocker box. Account for the washer on each of the studs.

6. Remove the securing bolts on the opposite side of each rocker box, and finally the two larger securing nuts on top. Remove the rocker boxes from the head.

7. Remove the pushrods and place them in a safe place.

8. There are ten cylinder head nuts and bolts. Loosen each one a single turn at a time until they can be turned easily, then remove them. Lift off the cylinder head.

9. New O-rings must be used on the ends of the pushrod cover tubes. New rocker box gaskets should also be used. Be sure that the rocker box mating surfaces are in good condition before refitting.

Rocker Boxes

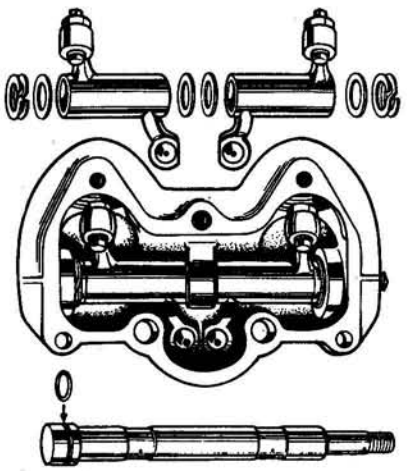
DISASSEMBLY

1. Carefully drive out the rocker spindle, using a soft metal drift.

2. Remove the rocker arms and washers.

3. Remove the rocker oil seals.

4. If the rocker ball pins require replacement, drive them out with a suitable drift, then press in the new ones with the drilled flat toward the rocker spindle.



Rocker box assembly (650, 750 Twin)

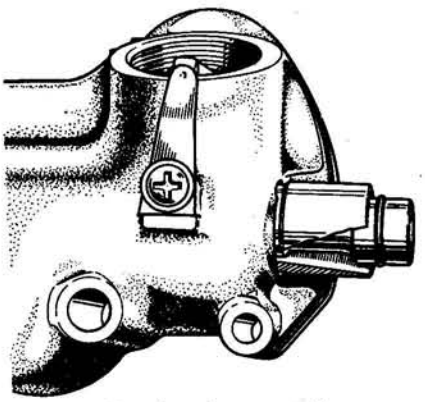
ASSEMBLY

1. Assemble the rocker boxes using Triumph seal compressor D2221 and a 7/16 x 6 in. bolt with one end ground to a taper.

2. Apply grease to two of the plain washers and position them on either side of the center spindle bearing boss.

3. Position the left rocker arm and insert the alignment bolt, then install the outer plain and spring washers.

4. Position the right rocker arm in the same manner.



Installing the rocker arm spindle

5. Install a new oil seal on the spindle, then coat the whole spindle with oil.

6. Slide the spindle into seal compressor no. D2221 (or a suitable replacement) and through the rocker box, pushing the alignment bolt out the other end. The final positioning of the spindle may require a few taps with a hammer and soft metal drift.

Valves and Valve Springs

REMOVAL

1. Compress the valve springs with the spring compressor and remove the split retainers with a narrow, straight-slot screwdriver.

2. Remove each valve and spring, making certain they are marked and matched for reassembly.

NOTE: *The intake and exhaust valves are marked "IN" and "EX," respectively.*

INSTALLATION

1. Assemble the inner and outer springs with the top and bottom cups over the valve guide.

2. Lubricate the valve stem with a little graphite oil, then slide the valve into position.

3. Compress the spring and install the two retainer halves in the exposed groove of the valve stem.

Valve Guides

Triumph engines are equipped with replaceable bronze valve guides. To remove an old guide, use Triumph special tool 61-6013 or fabricate one to the dimensions given. This is a mild steel bar about 5 in. long and 0.5 in. diameter with a 1 in. section at one end machined to 5/16 in. When installing the new guide, first lightly grease the guide then press or drive it into place, using the special tool. When new valve guides have been installed, it will be necessary to recut the valve seats and grind in the valves.

NOTE: *The intake and exhaust valve guides are almost identical in appearance, except in length. The shorter guides are for the intake valves and the longer guides are for the exhaust valves.*

Tappets and Guide Blocks

The only noticeable tappet wear is in the center of the Stellite tip. An indentation greater than 3/32 in. indicates that the tappet should be replaced.

It is not necessary to remove the guide blocks to check wear. Simply rock the tappets in their respective guide block bores and note the amount of lateral freeplay; there should be little or no movement.

Cylinder Barrel

If there is a difference of 0.13 mm (0.005 in.) between any of the bore measurements, the cylinder should be rebored.

Pistons

1. Make sure the crankcase opening edges are covered with lint-free rags to protect the aluminum alloy connecting rod from being damaged.
2. Remove the inner and outer piston pin retaining circlips, then attach a piston pin removal tool and press out the pin.
3. Lay out and mark the pistons, pins, and retaining circlips for reassembly.
4. Remove the piston rings one at a time by lifting an end of the ring out of its groove and holding a thin piece of metal between it and the piston. Slide the piece of metal around the circumference of the piston while at the same time gently lifting the raised part of the ring upwards.
5. Replacement pistons (650) are available in three or four oversizes. These sizes and the corresponding recommended cylinder bore sizes are given in a chart at the end of this section.

TR7V and T140V pistons are available in four oversizes in increments of 0.010 in. Also note that the cylinders and pistons for these models are paired up according to a three-step grading system when the engine is assembled at the factory. There are three sizes "L" (Low), "M" (Medium), and "H" (High).

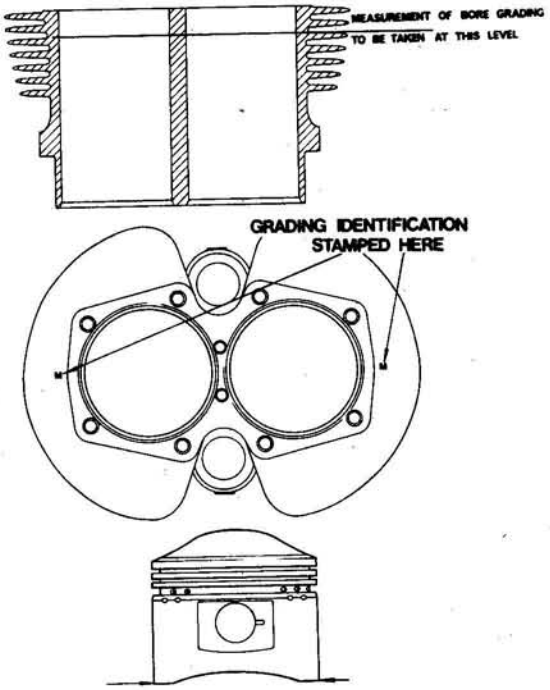
Refer to the accompanying illustrations for cylinder bore and piston skirt measurement points. Then refer to the "Suitable Re-bore Sizes" chart at the end of this section.

6. Install the piston rings one at a time over the top of the piston. Note that the two compression rings are marked "TOP" to ensure correct assembly position. This mark must face upwards when the rings are fitted.
7. Position the piston on the connecting rod.
8. Install one new retaining circlip as a stop, then press the piston pin into position and install another new circlip on the other side.

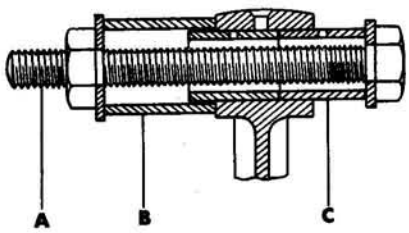
NOTE: *If there is no alternative and the piston pin must be driven into its bore, it is advisable to heat the piston to 100° C prior to assembly.*

Piston Pin and Small End Bushing

Inspect the piston pin for center "step wear," scoring, or burring, then slide it into the small-end connecting rod bushing, and make certain that there is no lateral free-play. If there is, replace the bushing in the following manner:



750 Twin piston and cylinder wear measurement points and cylinder grading marks

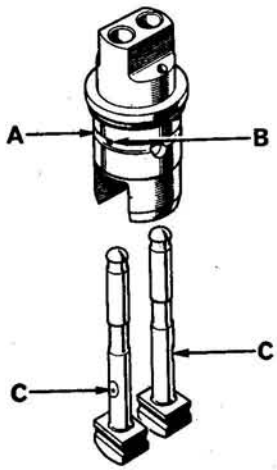


Piston pin bushing replacement: A, bolt; B, tubing collar; C, new bushing

1. Find a threaded bolt approximately 4 in. in length and a piece of tubing 1¼ in. long with an inside diameter of ⅞ in.
2. Place a suitable washer and the new bushing on the bolt, then insert the end of the bolt through the old bushing.
3. Place the piece of tubing over the end of the bolt and screw the nut on finger-tight.
4. Centralize the new bushing and align the oil drillway with that in the old bushing.
5. Now tighten the nut on the bolt and

ASSEMBLY

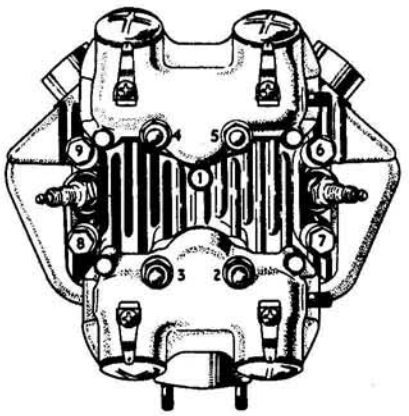
1. Position new guide block O-ring seals at the base of the cylinder block.
2. Lightly grease the outside surface of the exhaust guide block, then carefully align the guide block and cylinder locating holes and drive the block into position with Triumph special tool no. 61-6008 or a suitable drift.
3. Repeat the above step for the intake guide block, then install the locking bolts.
4. After installing the guide blocks, make sure that the exhaust guide block oil drillways are free from obstruction.
5. Install the tappets in the guide blocks as shown in the accompanying illustration, after thoroughly lubricating



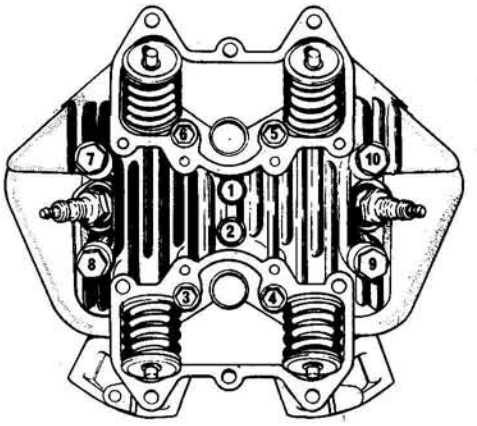
Tappet and guide block (A) oil passage (B, C) alignment

them with oil. Wedge them into position.

6. Install the cylinder base gasket, making certain that the gasket does not obscure the oil feed drillway in the crankcase.
7. Fit ring compressors over the pistons, then carefully slide the cylinder down over the pistons. Remove the ring compressors as soon as the rings are positioned within the cylinder. Continue lowering the cylinder block and then remove the rags in the crankcase openings as late as possible.
8. Install the cylinder base attaching nuts.
9. Replace or anneal the cylinder head gasket.
10. Clean the mating cylinder head and cylinder surfaces, then grease the gasket and position it on the cylinder.
11. Coat the tappet guide blocks with grease and position the pushrod cover



Cylinder head bolt tightening order (650)



Cylinder head bolt tightening order (750 Twin)

tubes with new O-ring seals.

12. Position the cylinder head and install the head nuts and bolts finger-tight.

13. Place a small amount of grease in the bottom cup of each pushrod, then locate the intake pushrods in their respective bores. This will have to be done by "feel."

14. When the pushrods are properly positioned, turn the engine over until both intake pushrods are level and at the bottom of their travel.

15. Install the intake rocker box.

16. Repeat the above procedure for the exhaust rocker box, noting that the central cylinder-head bolts should be tightened to torque specifications before tightening the underside securing nuts.

17. Turn the engine over several times to make sure the valves are operating properly, then reinstall the torque stays and secondary ignition coils.

18. Connect the rocker oil feed line, using either new copper washers or annealed, used ones.

19. The remainder of the assembly procedure is a reversal of the disassembly instructions. Adjust valve tappet clearances.

Clutch

Service procedures are basically the same for the 650 and 750cc twins, except that the larger models have a triplex primary drive chain in place of the duplex chain found on the 650.

DISASSEMBLY

1. Remove the left exhaust header pipe.

2. Loosen the rear brake adjustment until the pedal drops clear of the primary cover.

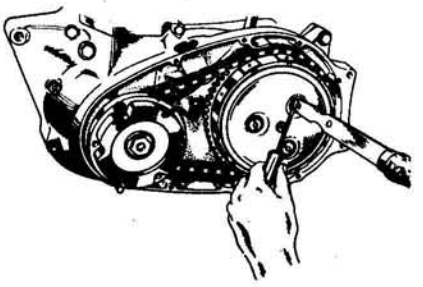
3. Remove the left footrest.

4. Drain the oil from the chaincase, then remove the chain tension adjuster.

5. Remove the ten, recessed, cover-securing screws and withdraw the cover and paper gasket.

6. Remove the chain tensioner assembly.

7. The clutch pressure plate is held in place by three, slotted adjuster nuts. To remove these nuts, slide a knife or screwdriver blade under the nut and loosen it with Triumph tool no. D364 (supplied with tool kit) or a suitable substitute.



Removing the clutch nuts

NOTE: *The nuts are fitted with locking tabs which may be sheared off by removal. If so, replace them.*

8. Remove the clutch springs, cups, and pressure plate assembly.

9. The clutch plates can be removed with the use of two, narrow, hooked tools made of 1/32 in. wire.

INSPECTION

1. If the thickness of the discs is 0.030 in. (0.76 mm), or more, less than specified, they should be replaced.

2. Check the fit of the plate on the shock absorber unit. There should be little radial clearance.

3. Measure the clutch spring length and compare with specifications. If a spring has shortened by 0.10 in. (2.5 mm) or more, replace the whole set.

ASSEMBLY

1. Install the clutch plates and discs, keeping in mind that the innermost position must be occupied by a bonded plate.

2. Install the cups, pressure plate, springs, and slotted adjuster nuts.

3. True the clutch pressure plate by first tightening the pressure-plate, slotted adjuster nuts until they are even with the clutch pins, and then by kicking with engine over and observing the rotation of the plate, and then making any necessary adjustment until the plate turns evenly. If the plate wobbles even slightly, it must be corrected.

Primary Drive and Clutch Hub

DISASSEMBLY

1. Remove the primary cover as previously described.

2. Remove the clutch assembly as previously described.

3. Disconnect the alternator stator leads at their snap connectors under the engine.

4. Remove the three, stator securing nuts and withdraw the stator from over its mounting studs. Unscrew the sleeve nut and then the lead can easily be removed.

5. To remove the rotor, bend back the tab washer, and remove the locknut.

6. Remove the rotor key and distance piece.

7. Remove the clutch hub securing nut and cup.

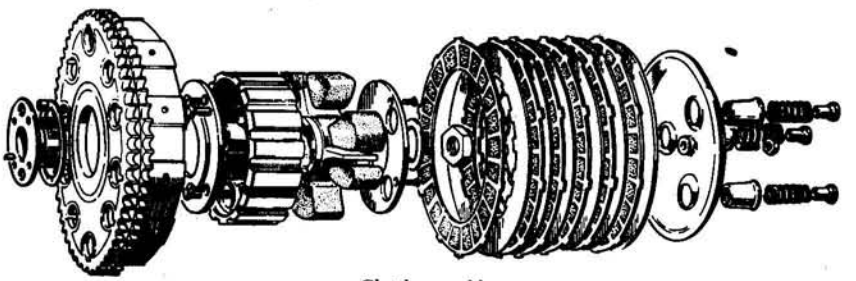
NOTE: *Machines prior to serial no. H49833 have a tab washer and a different cup washer, rather than the self-locking securing nut.*

8. Screw the body of extractor no. Z13 into the clutch hub until it bottoms, then tighten the center bolt until the hub is released.

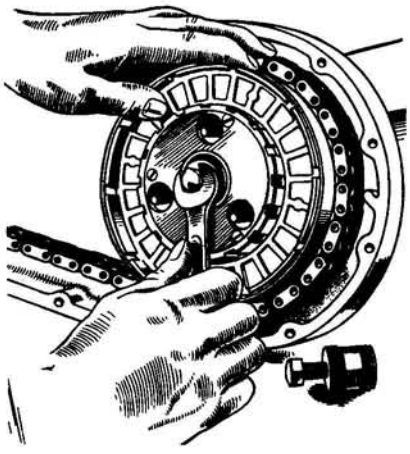
9. Assemble extractor no. Z151 and D662/3 on the engine sprocket and tighten its center bolt until the engine sprocket is released.

10. Withdraw the engine sprocket, clutch hub, and primary chain together.

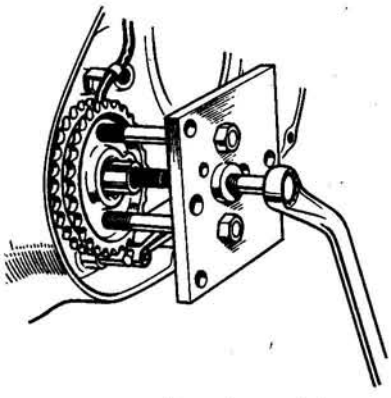
11. Remove the transmission main-



Clutch assembly



Removing the clutch housing



Removing the engine sprocket

shaft key and check the oil seal for leakage.

INSPECTION

1. Inspect the clutch shock absorber for worn rubbers or punctures. They can be removed by prying them out, small rubbers first. Replace as necessary. When reassembling, apply thread-locking compound to the cover-plate securing screws.
2. First thoroughly clean the primary chain then check it for wear by scribing two marks on a flat surface 12 in. apart, and centering two pivot pins at the scribe marks. Fully compressed, the chain link pivot should line up with the marks; fully stretched, it should not extend more than ¼ in. beyond the marks.
3. Check the fit between the shock absorber spider and the clutch hub splines. The spider should be a push fit on the clutch hub, with no radial movement.
4. Check the fit of the engine sprocket on the crankshaft in the same manner. There should be no radial movement.
5. Check the clutch hub bearing diameter, rollers, and clutch sprocket bearing. Replace any bearing rollers that are pitted or worn. See specifications.
6. Make sure the shock absorber spider is a good fit in the inner and outer retaining plates, and that the arms have not excessively scored the inner surface of the retaining plates.

ASSEMBLY

1. Grease the clutch hub and install the thrust washer and twenty of the correct rollers. Do not use ¼ in. x ¼ in. rollers!
2. Position the hub and press the shock absorber, complete with the three threaded pins, on the hub.
3. Install a new tapered distance collar behind the engine sprocket, with the taper toward the crankshaft main bearing and oil seal.
4. Install the transmission mainshaft key and tap the clutch hub onto its taper.
5. Lubricate the primary chain and lay it over the clutch sprocket.
6. Wrap the chain around the engine sprocket, then position the sprocket on the crankshaft.
7. Place clutch-locking tool Z13 in the clutch plate housing, then install the cup washer and self-locking nut. Torque the nut to specifications.

NOTE: *On machines before serial no. H49833, install the tab washer with the long tab in the hole in the shock absorber spider, install the securing nut and bend a tab to lock the nut.*

8. Install the alternator rotor, making sure that the key or locating peg is correctly positioned.
9. Install the alternator stator. Put a 0.008 in. (0.2 mm) feeler gauge between each stator pole and the rotor. Turn over the engine to make sure that the rotor and stator do not touch.
10. The remainder of the assembly procedure is a reversal of the disassembly instructions.

Transmission Countershaft Sprocket

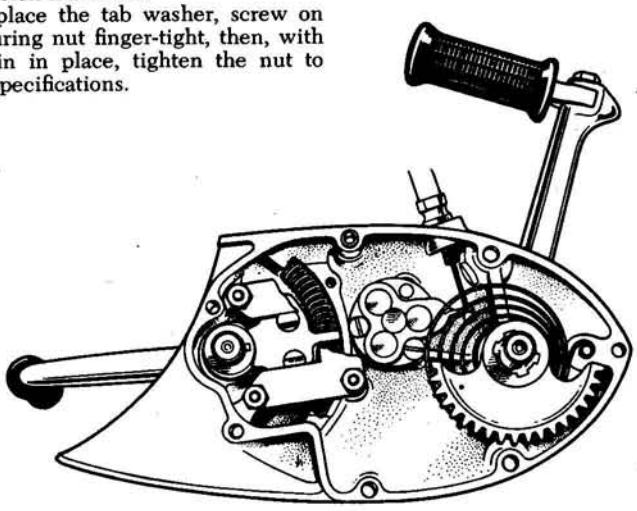
REMOVAL AND INSTALLATION

1. Disassemble the clutch and primary drive as previously described. Remove the sprocket cover.
2. Bend back the tab washer and, while holding the rear brake, remove the sprocket securing nut.
3. Slide off the final drive chain and remove the countershaft sprocket.
4. Make sure the oil seal is in good condition, then lubricate the ground boss of the new sprocket and position it on the transmission mainshaft.
5. Replace the tab washer, screw on the securing nut finger-tight, then, with the chain in place, tighten the nut to torque specifications.
6. Oil the bushing that protrudes from the mainshaft high gear and install the sprocket cover with a new paper gasket.
7. The remainder of installation is a reversal of the removal procedure.

Shifter, Kick-Starter, and Clutch Operating Mechanisms

DISASSEMBLY

1. Remove the right exhaust header pipe.
2. Remove the right footrest.
3. Loosen the clutch cable adjustment at the handlebar lever, then disconnect the cable end from the operating lever in the gearbox outer cover.
4. Drain the gearbox oil into a suitable container.
5. Put the transmission in high gear.
6. Remove the top and bottom nuts and recessed screws that secure the gearbox outer cover. Depress the kick-start lever slightly and tap the cover lightly until it is free.
7. Loosen the kick-starter cotter pin nut a few turns, then drive out the cotter pin.
8. Slide the lever off the shaft and remove the kick-starter quadrant and spring assembly.
9. Apply the rear brake, bend back the tab washer, and remove the kick-starter ratchet pinion securing nut.
10. Remove the pinion, ratchet, spring, and sleeve.
11. If the kick-starter quadrant is to be replaced, drive out the spindle with a suitable drift and hammer. Install the new spindle so that the kick-starter lever location flat is correctly positioned with respect to the quadrant.
12. Remove the shifter foot pedal from the shaft.
13. Remove the guide plate, plunger quadrant, and curved return springs.
14. Remove the two screws that secure the clutch operating mechanism. Remove the securing cotter pin and disassemble the mechanism.



Gearbox outer cover assembled

INSPECTION

Kick-Starter

Inspect the ratchet teeth for burrs, chips, or rounded edges. Make sure the ratchet spring is in good condition and that the thin-walled steel bushing is a clearance fit in the kick-start pinoin. Examine the kick-starter stop peg to make certain it is firmly pressed into the inner cover and is not distorted in any way.

If it is necessary to replace the kick-start spindle bushing, heat the cover to 100° C, then drive out the bushing with a suitable, shouldered drift. Drive in the new bushing while the cover is still hot.

Shifter

If the shifter spindle bushing requires replacement (outer cover), heat the cover surrounding the bushing to 100° C and drive the bushing out with a suitable, shouldered drift. Drive in the new bushing before the cover has a chance to cool.

The inner cover spindle bushing will probably never need replacement, since it suffers an insignificant amount of wear. If it does require replacement, however, it will be necessary to tap the bushing, heat the cover, install an appropriate bolt and then drive it out.

Clutch Operating Mechanism

The clutch operating mechanism is constantly immersed in oil, so wear should be negligible. Inspect the balls for pitting, etc., and make sure they operate smoothly in the plates.

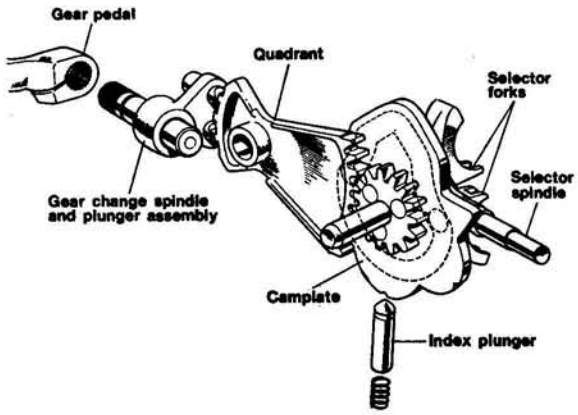
Clutch operating mechanism

ASSEMBLY

1. Assemble and install the clutch operating mechanism, using the accompanying illustration for reference.
2. Install a new rubber O-ring on the shifter spindle and install the spindle in the outer cover bushing, using a few drops of oil to aid installation.
3. Install the two quadrant-return springs, making certain they are correctly located over the step in the cover.

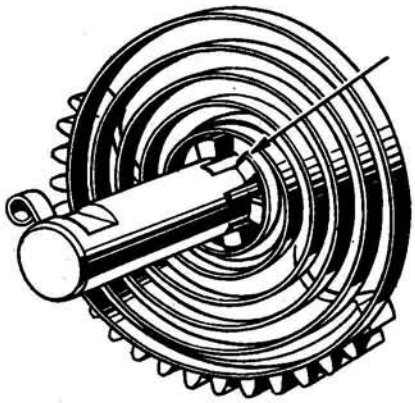
NOTE: *To facilitate connecting of the springs, first install the shifter pedal and clamp it in place, thereby allowing the quadrant to turn and the springs to be compressed.*

4. Install the retainer plate with its four securing nuts and lock washers.
5. Install the plungers and springs, taking care that they don't go springing off somewhere during assembly.
6. Install the kick-starter thin-walled steel sleeve, spring pinion, and ratchet.
7. Install the tab washer and the retaining nut, then torque the nut to specifications and lock it by bending up the washer tab. Do not overtorque the nut as it may cause the thin sleeve to collapse.



Shifter mechanism (4-speed)

8. Connect the return spring to the kick-starter quadrant as shown in the accompanying illustration.
9. Install the spindle in the kick-starter bushing and connect the return spring to the anchor peg at the rear of the cover.
10. Install the oil seal over the spindle and assemble the kick-starter lever and securing cotter pin.
11. Clean the outer cover joining surface and apply fresh sealing compound. Make sure the two locating dowels are in position.



Kickstarter return spring installed

12. Move the kick-starter lever halfway through its stroke, then fit the outer cover on the gearbox.
13. Before installing the remaining parts, make sure the kick-start lever is fully operational and returns to its upright position.
14. The rest of the assembly is a reverse of the disassembly procedure.

Gearbox Service

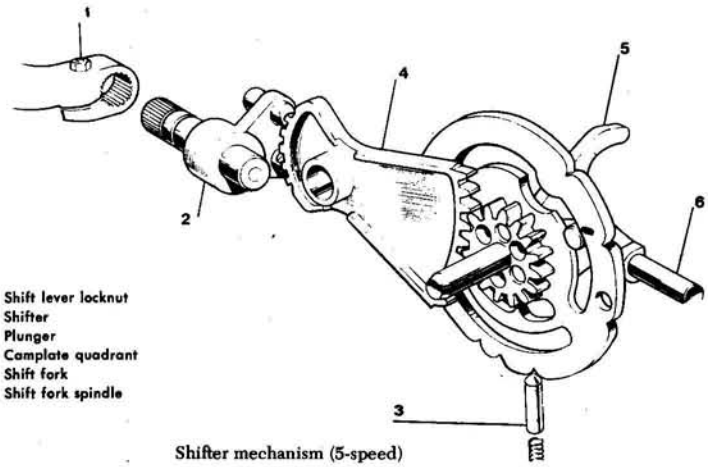
DISASSEMBLY

1. Remove the gearbox outer cover as previously described, leaving the gearbox engaged in high gear.
2. Remove the right rear engine plate.
3. Bend back the tabs on the lockwasher, apply the rear brake, and unscrew the kick-starter pinion ratchet retaining nut from the gearbox mainshaft.
4. Remove the clutch and primary drive as previously described. Don't forget to remove the mainshaft key.

Refer to the appropriate procedures, below, for 4-speed or 5-speed service.

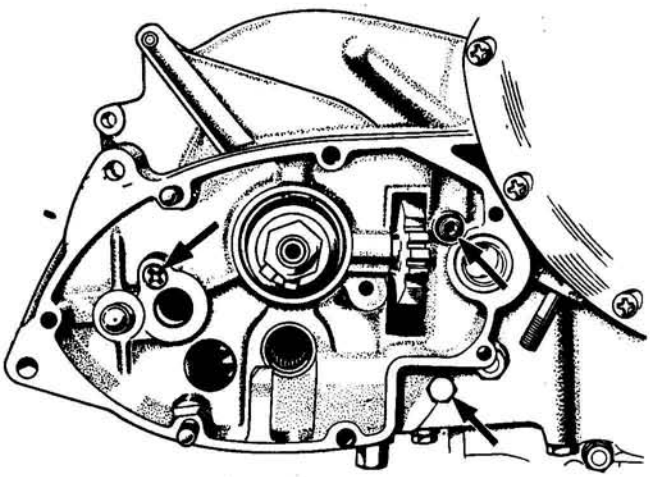
4-Speed:

5. Remove the large dome nut from under the gearbox and withdraw the camplate indexing plunger and spring.
6. Remove the allen screw, phillips screw, and bolt that secure the inner gearbox cover. Tap the cover with a mallet until it is free.
7. Remove the selector fork spindle and then withdraw the mainshaft assembly.
8. Remove the layshaft and remaining gears.
9. Remove the camplate and spindle



1. Shift lever locknut
2. Shifter
3. Plunger
4. Camplate quadrant
5. Shift fork
6. Shift fork spindle

Shifter mechanism (5-speed)



Gearbox inner cover removal

assembly and then remove the two bronze thrust washers located over the needle roller bearings.

10. Remove the circular countershaft sprocket cover from the primary inner cover. Remove the sprocket securing nut.

11. Drive the mainshaft high gear through into the gearbox with a suitable drift. Replace the oil seal.

5-Speed:

5. Remove the allen bolt, phillips screw and bolt and remove the gearbox inner cover, tapping it outward with a softfaced mallet if necessary.

6. Remove the engaging dog pinion from the countershaft. Remove the circlip from the countershaft.

7. Pull out the shift fork rod, then remove the countershaft first gear along with the shift fork.

8. Remove the countershaft second gear, then remove the mainshaft with its first, second, and third gears in position.

9. Take out the mainshaft fourth gear and the countershaft third gear together with the two shift forks.

10. Remove the countershaft fourth and fifth gears.

11. Remove the two thrust washers over the countershaft needle bearings: one on each countershaft bearing.

12. To remove the mainshaft high gear, remove the plate from the inside primary chaincase at the back of the clutch. Bend back the locking plate, and unscrew the sprocket nut. Drive the high gear into the box with a soft-faced mallet or drift.

13. Remove the camplate plunger nut at the bottom of the transmission case, and take out the spring and plunger. Remove the camplate from the gearbox.

14. Carefully inspect the condition of the mainshaft oil seal after removing the gearbox sprocket.

MAINSHAFT BEARINGS

The mainshaft bearings are press-fit into their housings and are retained by spring circlips to prevent sideways motion due to end thrust. To remove the right bearing, remove the circlip, heat the cover to 100° C, and drive the bearing out with a suitable, shouldered drift. Install the new bearing while the cover is still hot. Reinstall the circlip.

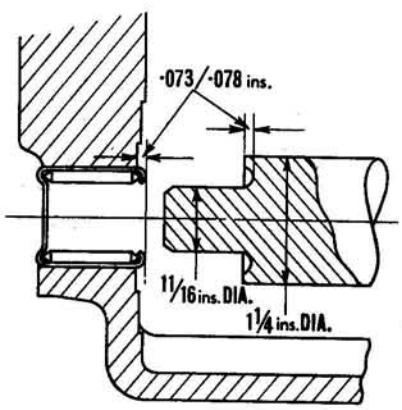
To remove the high gear bearing on the left side, pry out the large oil seal, then remove the retaining circlip. Heat the case around the bearing to 100° C, then drive the bearing out with tool no. Z15 or a suitable, shouldered drift. Install the new bearing while the base is still hot. Install the circlip and press in a new seal.

To replace the high gear bushing, (4-speed transmission) press it out with a suitable, shouldered drift. This drift can be fabricated by machining ¾ in. on one end of a ⅞ in. x 5 in. bar to $^{13}/_{16}$ in. diameter. The bushing must be pressed out from the tooth side of the gear. Install the new bushing in the same manner, making sure the oil groove in the bushing is on the tooth side of the gear. Ream the bushing to the size given in specifications and make sure any filings are removed from the case before reassembly.

LAYSHAFT BEARINGS

Remove the right bearing by heating the cover to 100° C and pressing or driving it out with a drift similar to the one shown in the accompanying illustration. Press in the new bearing, while the cover is still hot, from the inside of the cover until 0.073-0.078 in. of the bearing protrudes, as shown in the accompanying illustration.

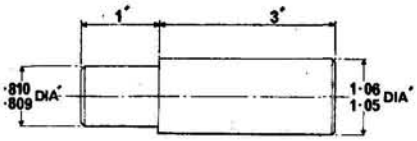
Remove the left bearing by heating the cover housing to 100° C and driving it through into the gearbox with a suitable drift inserted through the countershaft sprocket aperture. Press the new bearing into place while the cover is hot. It must protrude 0.073-0.078 in. inside the gearbox.



Layshaft bearing installation

MAINSHAFT HIGH GEAR BEARINGS (5 SPEED)

The mainshaft high gear is fitted with two caged needle bearings (one in each end). Press them out and in together with a drift of the dimensions shown in the illustration.



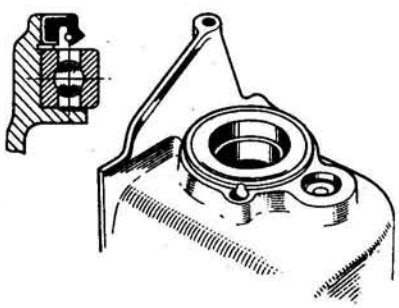
High gear needle bearing drift dimensions

ASSEMBLY

4-Speed

1. Drive a new oil seal up to the main bearing with the lip and spring toward the bearing.

2. Press the high gear into the bearing.



Mainshaft oil seal (4-speed)

3. Lubricate the ground taper of the countershaft sprocket with oil and slide it on to the high gear. Screw on the securing nut finger-tight.

4. Connect the final drive chain over the sprocket, then tighten the securing nut to specifications with tool no. Z63 or a suitable substitute.

5. Lubricate the extended nose of the high gear with oil, then reinstall the sprocket cover with a new paper gasket.

6. Lubricate the camplate spindle and install it in its housing within the gearbox.

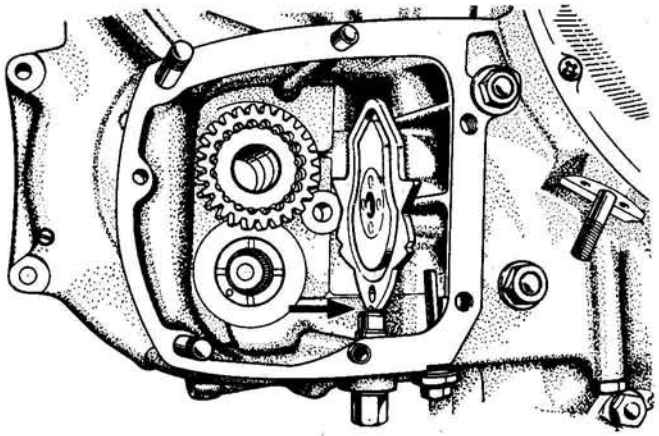
7. Assemble the camplate plunger and spring in the domed retaining nut and screw it into position under the gearbox. Don't forget the fiber washer.

8. Locate the camplate plunger in the notch between second and third gear.

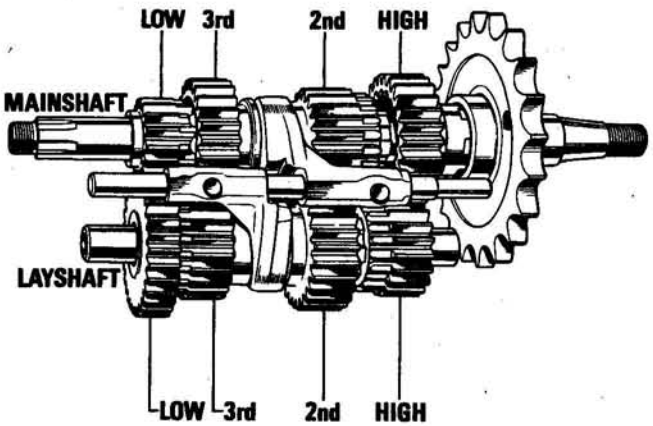
9. Position the thrust washer over the inner needle roller bearing. Coat the washer with grease to hold it in place and note that the grooved surface of the washer should be toward the layshaft.

10. Lubricate the captive mainshaft and layshaft gears, then assemble them in a cluster as shown in the accompanying illustration.

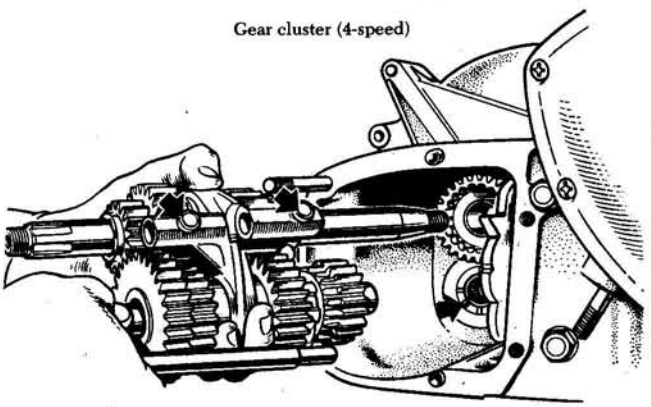
11. Grease the camplate rollers, then position them on the selector forks as shown in the accompanying illustration.



Gearbox assembly with camplate notch between 2d and 3rd gear engaged (4-speed)



Gear cluster (4-speed)



Installing the gearbox components (4-speed)

NOTE: *The selector fork with the smaller radius is for the mainshaft cluster.*

12. Install the mainshaft and layshaft cluster in the gearbox. As the shafts are being located in their respective bearings, the gears should be slid into position and aligned so that the selector fork rollers engage the camplate and the selector forks are approximately aligned.

13. Lubricate the selector fork spindle with oil, then slide it through the forks, shoulder end first, until it is fully situated in the gearbox housing.

14. Make sure the camplate quadrant is moving freely in the inner cover, then position the layshaft thrust washer over the bearing in the inner cover. Hold it in place by smearing it with grease.

15. Thoroughly lubricate all parts in the gearbox with a pressure oil can, then apply fresh sealer to the joining surface of the gearbox. Make sure the two locating dowels are in position.

16. Begin to install the inner cover assembly, and when the joining surfaces are about ¼ in. apart, position the camplate quadrant in the middle point of its travel, and quickly complete the installation. This will align the camplate middle tooth with the mainshaft centerline.

17. Install the gearbox securing screws and nut, then temporarily install the gearbox outer cover assembly and check out the gearbox operation. If there is a problem, chances are the quadrant teeth are not correctly engaged with the camplate pinion.

18. The remainder of the assembly procedure is a reversal of the disassembly instructions.

5-Speed

1. Replace the camplate after lubricating the camplate spindle with some gearbox oil.

2. Refit the mainshaft oil bearing noting that the lip faces the mainshaft bearing. A new oil seal must always be used.

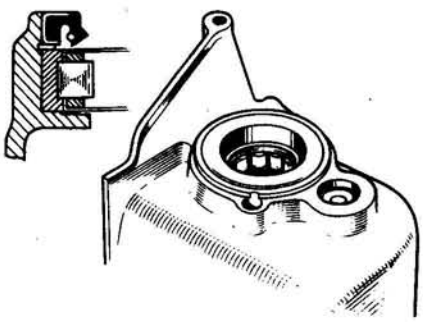
3. Push the mainshaft high gear into the bearing. Put some transmission oil on the tapered boss of the gearbox sprocket and place it on its shaft, in place, then replace the sprocket nut, tightening it by hand for the time being.

4. Run the drive chain over the gearbox sprocket. Apply the rear brake and tighten the sprocket nut as tight as possible.

5. Lubricate the end of the high gear which protrudes into the primary chaincase, and refit the cover plate. A new paper gasket should be used.

6. Replace the thrust washer over the inner needle bearing. The grooved surface of the thrust washer must face the countershaft. The washer may be held in place by smearing the rear surface with a bit of grease.

7. Refer to the accompanying illustration, and set the camplate in the "neutral" position, and refit the cam plunger, spring, and bolt on the bottom of the gearbox.

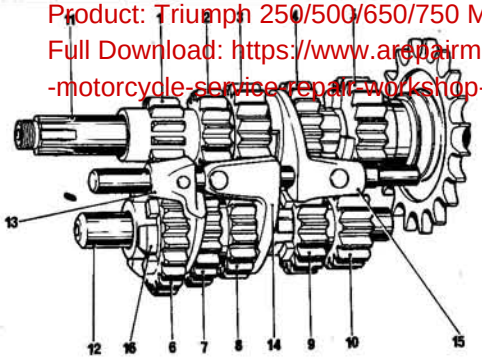


Gear cluster (5-speed)

8. With gearbox oil, lubricate the needle bearing in the high gear and the countershaft bearing. Place the mainshaft high gear onto the mainshaft. Also refit the shift fork to the mainshaft. Note that the three shift forks are all different, and this one has a large engaging pin and no cutaway on the housing.

9. Insert the mainshaft assembly into the high gear, engaging the pin on the shift fork with the camplate groove. Use onto the mainshaft. Also refit the shift fork to the mainshaft. Note that 10. Replace the countershaft with its two highest gears into the gearbox, engaging these gears with their mainshaft counterparts. Note that none of the sliding gear dogs will be engaged if the transmission is set at neutral.

11. Refit the countershaft third gear and its shift fork. This shift fork has a large engaging pin and a cutaway on the housing. Refit the mainshaft third gear



Gearbox mainshaft oil seal and roller bearing (5-speed)

1. 1st gear (Mainshaft)
2. 2nd gear
3. 3rd gear
4. 4th gear
5. 5th gear
6. 1st gear (Countershaft)
7. 2nd gear
8. 3rd gear
9. 4th gear
10. 5th gear
11. Mainshaft
12. Countershaft
13. 1st gear countershaft shift fork
14. 3rd gear countershaft shift fork
15. Mainshaft shift fork
16. Countershaft dog pinion

and engage it with the corresponding countershaft gear.

12. Lubricate the countershaft second gear bushing and replace the gear on the countershaft.

13. Replace the first and second gears onto the mainshaft. Refit the countershaft first gear with its shift fork. Note that this shift fork has the smaller engaging pin.

14. Insert the shift fork rod. Replace the circlip on the end of the countershaft, and replace the engaging dog pinion against the circlip.

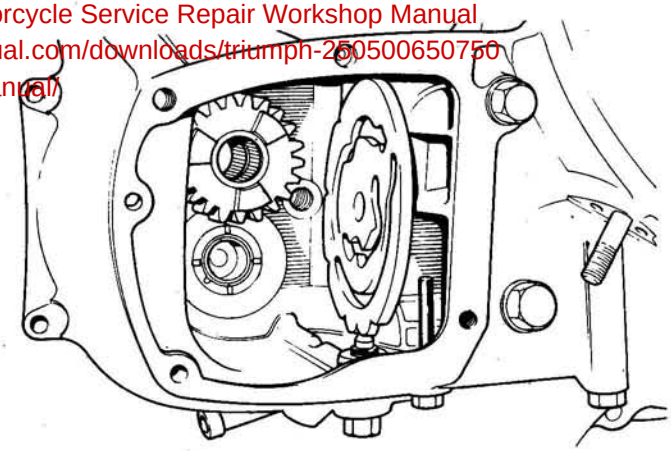
15. Turn the camplate counterclockwise (relative to a rider on the machine), which will place the transmission in first gear. Note that the engaging dog pinion on the countershaft will mesh with the dogs on the countershaft first gear, groove facing the countershaft.

16. Insure that the camplate quadrant operates freely. Replace the thrust washer over the needle bearing for the countershaft in the gearbox cover.

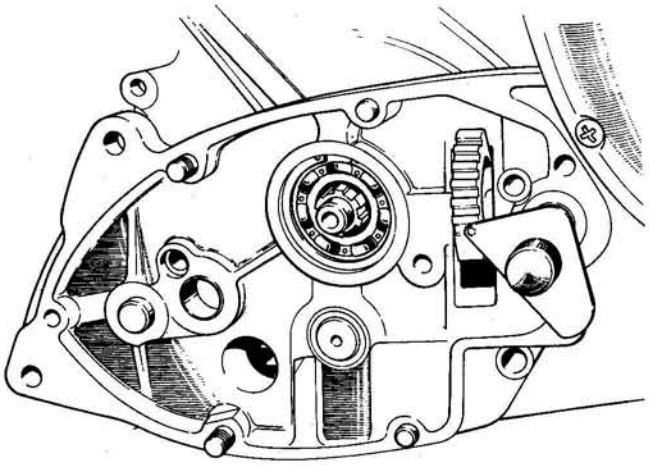
17. Lubricate all moving parts in the gearbox with transmission oil. Apply some gasket compound to the gearbox mating surfaces. Begin refitting the inner cover. When the inner cover is about ¼ in. away from the mating surfaces, position the camplate quadrant as shown using the special tool (60-6128). If not available, line up the top edge of the second tooth on the quadrant with an imaginary horizontal line through the center of the gearshift spindle housing. This housing is at the extreme forward part of the inner cover, and is shown occupied by the special tool in the illustration of the inner cover.

18. Refit the inner cover securing bolt and screws tightening them lightly. Assemble the outer cover and gearshift lever and check that the shifter operates properly. If not, it is probable that the quadrant teeth are not properly engaged with the camplate gear.

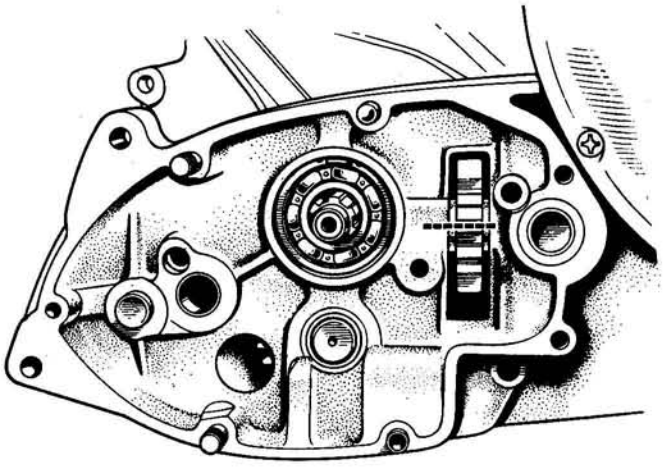
19. Assuming that the shifting is working properly, tighten the inner cover securing bolt and screws, and refit the kick starter assembly, the outer cover, and refill the gearbox and primary chaincase with the correct amounts and grades of oil.



Camplate installed: gearbox in neutral (5-speed)



Refitting the inner gearbox cover (5-speed)



Installing the gearbox inner cover while aligning quadrant

Bottom End

DISASSEMBLY

1. Remove the primary chaincase cover and disconnect the alternator leads under the engine.

2. Remove the three screws that secure the alternator stator, and pull the stator off its mounting studs. Do not disconnect the leads at this time.

3. Disassemble the clutch and primary drive as previously described. Remove the stator sleeve and withdraw the stator leads.

4. Remove the gearbox outer cover and dismantle the gearbox.

5. Remove the rocker boxes, cylinder head, cylinder barrel, and pistons.

6. Disconnect the clutch cable and remove the carburetor(s). Remove the timing cover. Note that the screws are of different lengths.

7. Remove the contact breaker cover and the oil pump, then remove the crank-