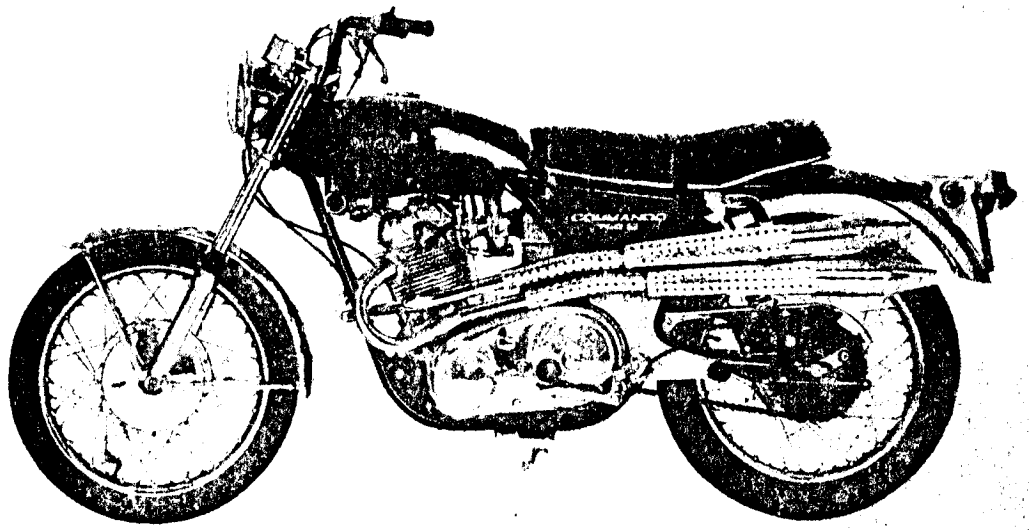
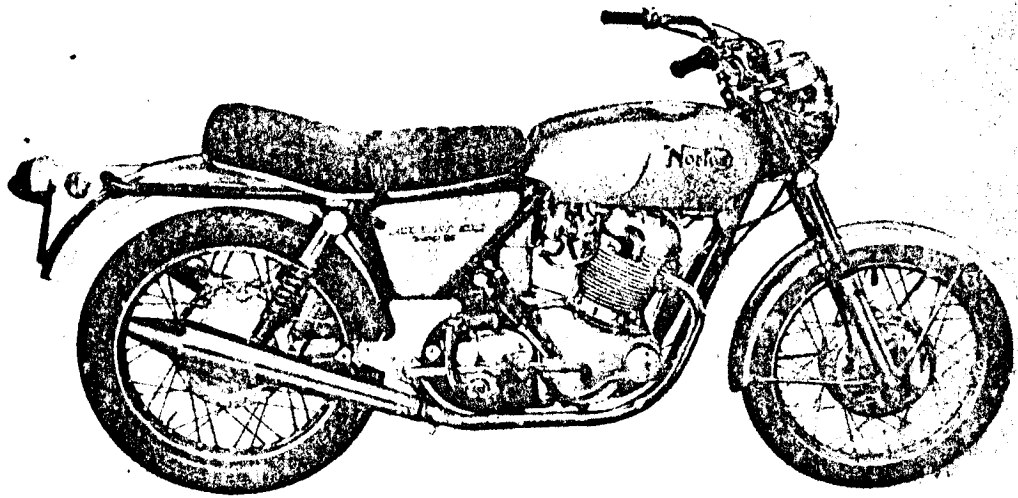
Norton
Commando 750
"S" Type and Roadster
Riders handbook





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INTRODUCTION

The Norton Commando is precision built, designed for the discerning rider who desires the ultimate in high speed motorcycling. IT IS NOT SUITABLE FOR THE ATTACHMENT OF A SIDECAR.

In the construction of the Commando only materials of the highest quality are used, manufacture and assembly being carried out by skilled craftsmen with the care and attention to detail necessary in the production of machines capable of such high performance.

The well proven 750 cc engine, the result of many years' development, is rubber mounted in a lightweight frame of entirely new design, which ensures superb road holding and smoothness of operation.

Attention has been given to accessibility and maintenance is reasonably simple, most of the servicing being well within the capabilities of the average owner.

This Handbook is intended to provide the owner with the general details of the machine and the instructions necessary to carry out routine maintenance. To ensure the utmost reliability and to maintain the machine in peak condition, these instructions should be carefully observed.

The Handbook does not include information necessary to carry out dismantling for major overhauls. For information of this kind a Workshop Manual is available.

When fitting replacement parts, it is important to use only components manufactured or approved by Norton Villiers Ltd. The full engine number must be quoted to ensure correct identification and prompt supply.

Technical Data

Engine number: Stamped on crankcase.
Gearbox number: Stamped on gearbox shell.

Frame number: Stamped on left-side frame head lug.

Engine

Bore: 2·875 in. (73 mm).
Stroke: 3·503 in. (89 mm).
Capacity: 45 cu.in. (745 cc).
Compression ratio: 8·9 : 1.
Engine peak rpm: 6,500.

WARNING:
DO NOT EXCEED 7,000 RPM.
except for short periods.
Rocker clearances (cold):
Inlet: 0·006 in. (0·15 mm).
Exhaust: 0·008 in. (0·2 mm).

Electrical

Ignition timing BTDC:
Fully advanced: 28° (engine stationary).
Contact breaker points gap:
0·014/0·016 in. (0·35/0·4 mm).

Spark plug: Champion N6Y.
Spark plug gap:
0·023–0·028 in. (0·59–0·72 mm).

Gear ratios

21-tooth gearbox sprocket: (optional)

Top	4·35.
Third	5·35.
Second	7·42.
First	11·18.

19-tooth gearbox sprocket: (standard)

Top	4·84.
Third	5·9.
Second	8·25.
First	12·4.

Chain sizes

Primary: $\frac{3}{8}$ in. Triplex (92 pitches).

Rear: $\frac{5}{8}$ in. by $\frac{3}{8}$ in.
21-tooth gearbox sprocket: 99 pitches.
19-tooth gearbox sprocket: 98 pitches.

Capacities

(Fuel tank: $2\frac{1}{4}$ Imp (2·7 US) gallons (10·2 litres).
Oil tank: 5 Imp (6 US) pints (2·8 litres).

Gearbox: 1 Imp (1·2 US) pint (0·57 litre).
Primary chaincase: 200 cc (7 fl.oz).
Front forks: 150 cc ($5\frac{1}{2}$ fl.oz) each leg.

Carburettors

Type: Amal 930 (twin).
Main jet: 220.

Throttle valve: No. 3.
Needle jet: 0·107.
Needle position: Middle notch.

Dimensions

Overall length: 88 in. (223 cm).
Overall width: 26 in. (65 cm).
Ground clearance: 6 in. (15·24 cm).
Weight: 409 lb (185·5 Kilos).

Wheelbase: $56\frac{3}{4}$ in. (144·1 cm).
Seat height (rider seated):
31 in. (78·7 cm).

Tyres

Front: 3·00 by 19 in. ribbed WM2 wheel rim.
Rear: 3·50 by 19 in. GP WM2 wheel rim.
Tyre pressures:
Front: 26 lb/psi (1·83 Kg/sq cm).
Rear: 26 lb/psi (1·83 Kg/sq cm).

Note

Do not fit tyres other than the stated types and sizes or the handling of the machine may be adversely affected.

Larger section tyres may also foul the mudguards (fenders) and stays.

Recommended lubricants

Efficient lubrication is of vital importance and it is false economy to use cheap grades of oil. When buying oils or grease, it is advisable to specify the brand as well as the grade, and as an additional precaution, to buy from sealed containers.

Engine

Ambient temperature above 50°F (10°C) use S.A.E. 20/50 or straight S.A.E.50.
Ambient temperature above 32°F (0°C) use S.A.E. 20/50 or straight S.A.E.30.
Ambient temperature below 32°F (0°C) use S.A.E. 10/30 or straight S.A.E. 20.
The following brands are recommended:
Mobiloil
Castrol
Energol
Essolube
Shell
Regent Advanced Havoline

Gearbox

Ambient temperature above 32°F (0°C): EP 90
Ambient temperature below 32°F (0°C): S.A.E. 30

Primary chain

As for engine.

Swinging arm bushes

S.A.E. 140.

Hubs and frame parts

Mobilgrease MP
Castrolease LM
Energrease C3
Regent Marfax Multipurpose
Shell Retinax A. or C.D.
ESSO Multipurpose

Teledraulic front forks

Mobiloil Arctic (S.A.E. 20)
Castrolite (S.A.E. 10W–30)
Energol (S.A.E. 20)
Essolube 20 (S.A.E. 20)
Shell X–100 Motor Oil 20/20W (S.A.E. 20)

Rear chain

Regent S.A.E. 20.
Mobilgrease MP
Esso Fluid Grease
Energrease A.O.
Castrolease Grease Graphited.
Regent Marfax Multipurpose.
Shell Retinax A or C.D.

Fuel

Fuel of not less than 99 octane (or 4 Star British rating) should be used.

Lubrication chart

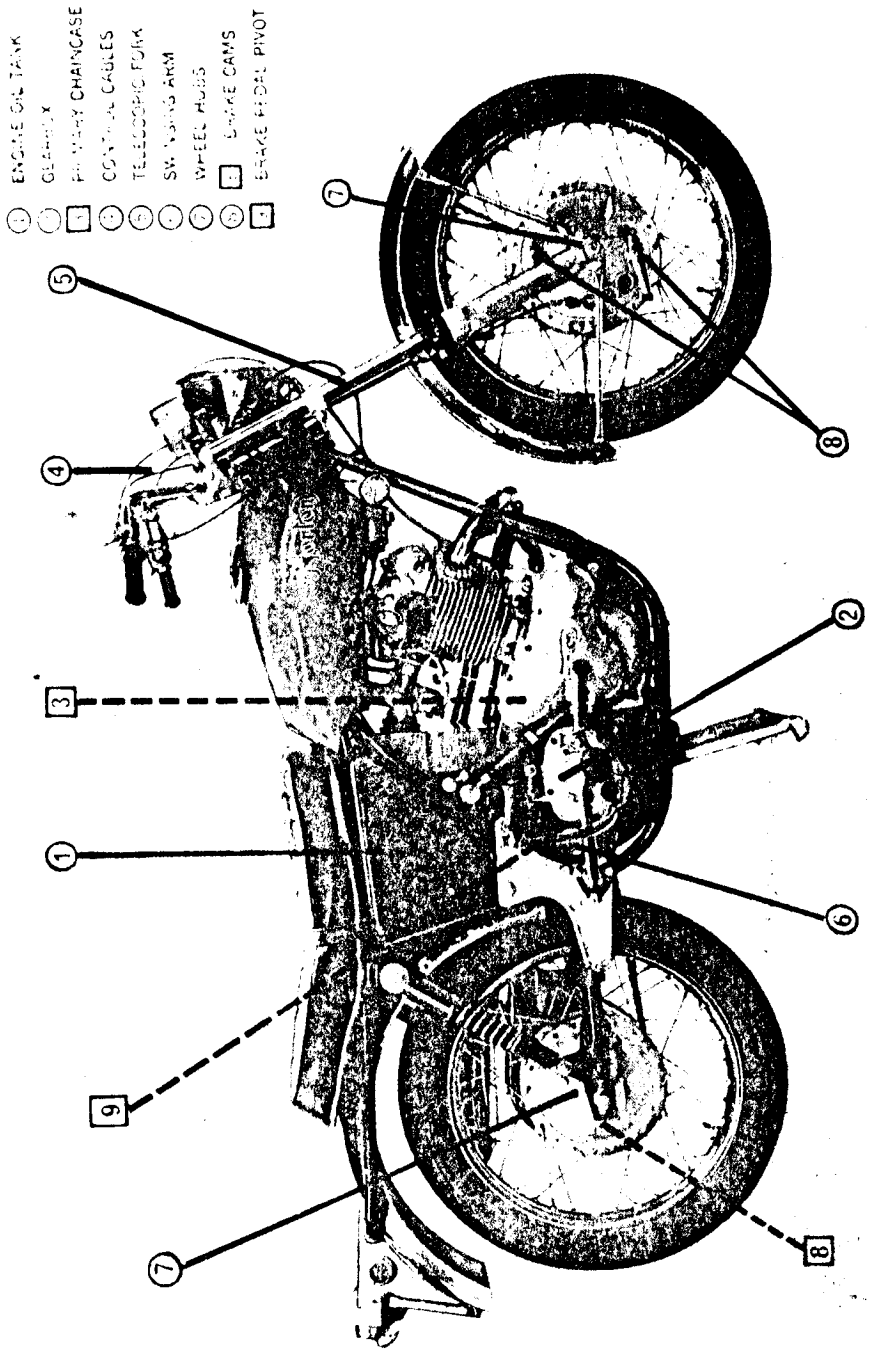

ILLUSTRATION 1

Controls

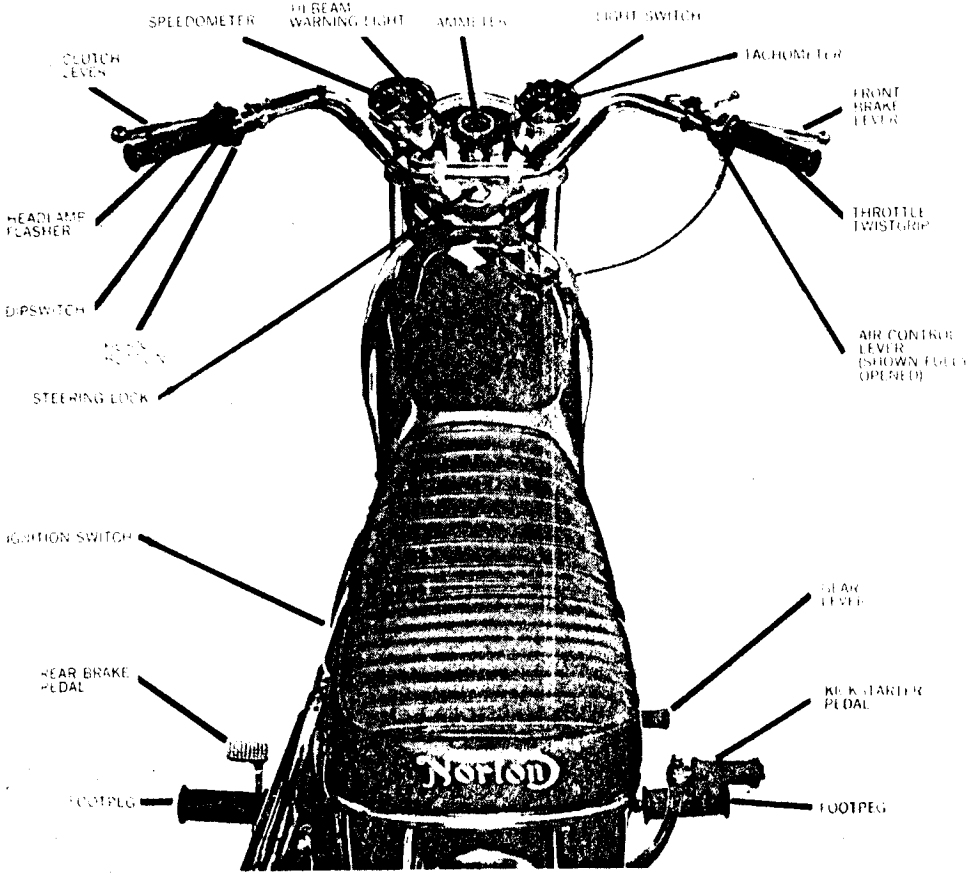

ILLUSTRATION 2

Taking over a new machine

Before running the engine, spend a few minutes going over the layout of the controls and instruments. Sit astride the machine and adjust the control levers and handlebars to give the most comfortable riding position. Make sure that the oil tank, gearbox and primary chaincase are filled to the correct levels and that the battery is topped up.

Normally these preparations will be carried out by the dealer. The manner in which the various levels are indicated is described below.

Engine oil tank

The oil tank content is indicated on a dip stick incorporated in the tank filler cap which is removed by turning the cap anti-clockwise.

Access to the tank filler cap is made by releasing the two hand discs retaining the the riders seat, raising the seat and moving it backwards.

Before filling fresh oil, run the engine for three to four minutes to clear excess oil in the crankcase, observing the oil circulating through the cap in the oil tank filler orifice.

Allow the oil to settle in the tank, then fill sufficient oil of a recommended grade until the correct oil level is shown on the dip stick. The oil level should not exceed the "H" mark or fall below the "L" on the dip stick.

Oil tank cover

The oil tank cover which houses the tool kit can be removed by turning the DZUS twist key anti-clockwise and pulling the key downwards as far as it will go. The key will be found on the right side of the cover behind the frame tube.

With the catch released, pull the right side of the cover outways and lift the cover away from its anchorage on the frame tubes.

Gearbox

An oil level plug is fitted in the gearbox cover. *(See illustration 3).*

To check level, remove plug *(illustration 3 item B)* whereupon oil should seep gently out if level is correct. If topping up is necessary, remove the filler cap *(illustration 3, item C)* and replenish with correct grade of oil until the oil begins to seep from the level plug orifice. Replace the filler cap and the level plug.

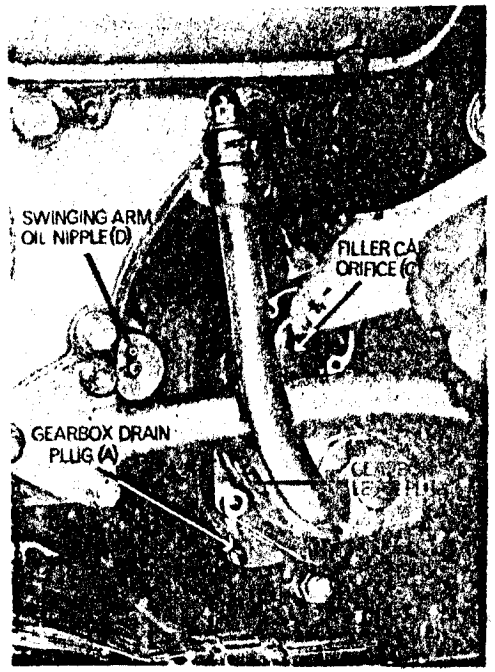

ILLUSTRATION 3

Primary chaincase

An oil level plug is fitted in the primary chaincase outer cover. *(See illustration 4).*

To check level, remove plug *(illustration 4, item B)* whereupon oil should seep gently out if level is correct. If topping up is necessary, remove the filler cap *(illustration 4, item C)* and replenish with correct grade of oil until the oil begins to seep from the level plug orifice. Replace the filler cap and the level plug.

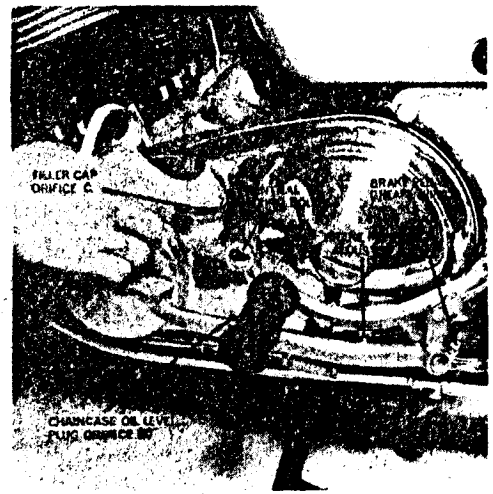

ILLUSTRATION 4

Battery

For access to the battery remove oil tank cover as described para. oil tank cover, page 9. To remove battery – slide the rubber retaining band sideways off the battery – detach the metal anchorage. Take off the two battery cables. Electrolyte level is embossed on battery case visible on the left side of the battery casing *(see illustration 5).*

ILLUSTRATION 5

Controls and instruments

(See illustration 2).

Throttle twistgrip

This is mounted on the right handlebar and controls the throttle opening and, therefore, the engine speed. An adjuster is provided in the cable to vary the amount of backlash between the twistgrip control and the junction box to the twin carburettors. A spring-loaded friction adjusting screw is located in the twistgrip body.

Carburettor air control

Mounted on the right handlebar with the front brake lever this controls the carburettor air slides. For cold starting the control can be closed to provide a rich mixture by moving lever away from rider, but should be fully open for normal running with the engine at its normal working temperature.

Clutch control

The clutch lever is on the left handlebar and when pulled inward with a gear engaged, disengages the drive between the engine and the rear wheel. A knurled cable-adjusting screw is provided to adjust cable backlash.

Front brake lever

Mounted on the right handlebar, the front brake lever has a knurled cable-adjusting screw.

Headlamp dipper switch, flasher and horn button

These are located on the left handlebar. The two-way switch controls the headlamp dipped beam. The green button is the flasher switch and the horn is operated by the red button.

Fuel taps

These are beneath the fuel tank on each side. The right-side tap is 'Reserve'.

Lighting switch

Located at the top of the headlamp shell, the switch has three positions: 1. All lights off; 2. Pilot, tail and instrument lights on; 3. Head, tail and instrument lights on.

Steering lock

This is mounted on the handlebar lug. The lock is operated by a key and effective only with the handlebars turned fully to the right.

Ignition switch

The switch is attached on the left side of the machine and is operated by a key which can only be withdrawn when the ignition is switched off. When the key is turned clockwise, the ignition is switched on and the key locked in position. Always switch off and remove the key when leaving the machine.

Gearchange lever

The lever is on the gearbox on the right side of the machine and operates the positive-stop mechanism which returns the lever to a central position when foot pressure is released after each gear change. The neutral position is between first and second gears. Downward movement of the lever selects the higher gears, upward movement selects the lower gears. An indicator is fitted.

The lever is attached to the spindle on splines and can be repositioned to suit individual requirements.

Kick starter pedal

This is on the right side of the machine.

Rear brake pedal

The rear brake pedal is on the left side footrest and can be adjusted for height to suit the rider. *(Illustration 4 P.10).*

Stop lamp switch

Fitted under the rear brake pedal, the switch is operated by direct contact with the pedal. A second stop lamp switch is incorporated with the front brake cable (Export models only)

Speedometer

The speedometer records road speed in miles per hour or kilometres per hour (Continental models only.)

Tachometer

Driven by cable from the camshaft, the tachometer records engine speed in revolutions per minute.

Ammeter

The ammeter is fitted in the top of the headlamp and indicates the charge rate from the alternator or the discharge rate from the battery.

Tools

The tool kit issued with each new machine is placed in a compartment inside the oil tank cover.

Driving

This motorcycle incorporates an entirely new frame and special mountings for the engine unit to provide an exceptionally smooth ride. However, some vibration will still be experienced at lower rpm and can be immediately eliminated by a change of speed or gear.

Starting the engine

Ensure the gear lever is in the neutral position. (Gear indicator registers with N on indicator plate.)

Switch on the ignition – turn on the left-hand fuel tap.

If the engine is cold depress the carburettor ticklers to flood the carburettors. Do not overflood or starting will be difficult and do not jab the ticklers sharply up and down as this will eventually damage the floats. Close the air control lever.

Open the throttle a little and give a firm downwards swing on the kick starter pedal using the whole weight of the body. After the engine has started, open the air lever as soon as the engine temperature permits.

When restarting with the engine at working temperature it should not be necessary to close the air lever or flood the carburettors.

If starting is difficult owing to flooding, switch off the ignition and turn off the fuel tap. Operate the kickstarter briskly a few times with the air and throttle controls open to clear excess fuel from the combustion chambers. Switch on the ignition, turn the fuel tap on and start in the normal manner.

Gear changing

To move away from rest, pull the clutch lever and engage first gear by lifting the gear lever upward as far as possible. When the gear is felt to engage, allow the gear lever to return to its normal position. Gently and smoothly release the clutch lever and at the same time open the throttle slightly to give the power necessary to move off.

To change to a higher gear, accelerate gently then close the throttle, pull the clutch lever and press the gear lever downward to select the next gear. Release the gear lever and the clutch lever and open the throttle. Select the gears in this manner until top gear is reached.

When changing down to a lower gear, the throttle should be opened slightly so that the engine speed is increased to keep in step with the lower gear ratio.

Use of the gearbox

The gearbox should be used intelligently to keep the engine running smoothly with the least possible stress. The gear ratios are carefully chosen to meet the characteristics of the engine. The rider should at all times select the most suitable gear for the prevailing conditions.

Do not slip the clutch to control road speed.

Running in

In the process of manufacture the best possible materials are used and all machined parts are finished to a very high standard but it is still necessary to allow the moving parts to 'bed in' before subjecting the engine to maximum stresses. The future performance and reliability of the engine depends on the care and restraint exercised during its early life.

For the first 500 miles throttle openings should be limited to about one third of twist grip movement and the cruising speed should be varied as much as possible within this limit. Provided the engine is not allowed to labour, the actual road speed is relatively unimportant, but throttle control should be smooth and the gearbox used to the full to enable the engine to cope with the prevailing conditions without undue stress. This will also assist in 'running in' the gearbox components. At all times avoid violent acceleration.

After this initial period, the amount of throttle opening can be increased progressively but the cruising speed should still be varied. Full throttle should not be used until the machine has covered at least 1,000 miles and even then only for short bursts until 1,500 miles has been covered, whereupon maximum performance may be sought whenever desired.

During the 'running in' period, a certain amount of adjustment will be necessary as the components bed in. Attention should be given to valve rocker adjustment, chain tension, contact breaker points gap and brakes, all of which tend to settle down. *(See Maintenance Instructions)*

Do not allow the oil tank level to fall too low, as with the reduced amount in circulation the oil will become unduly hot.

Free Service

All owners of new COMMANDO motorcycles are entitled to a FREE SERVICE AND INSPECTION at 500 miles, or, at latest, three months after taking delivery.

This service is arranged by the supplying dealer.

The INSPECTION AND SERVICE consists of:

(a) Check, and, if necessary, adjust:
- (1) Rocker clearance.
- (2) Contact breaker points.
- (3) Ignition timing (due to nylon heel settling down).
- (4) Spark plug.
- (5) Clutch.
- (6) Chains.
- (7) Wheel bearings.
- (8) Brakes.
- (9) Forks and steering head races.
- (10) Alignment of wheels.
- (11) Tyre pressures.

(b) Tighten all external nuts and bolts, including cylinder head nuts.

(c) Top-up battery and check all lighting equipment.

(d) Clean out carburettors and check for correct idling.

(e) Adjust all cables.

(f) Grease all nipples.

(g) Drain oil system. Clean filter and refill.

(h) Check oil level in primary chaincase.

(i) Top-up gear box.

(j) Test machine on the road.

It should be noted that whilst the service, time and labour are entirely without charge, all materials including oils and replacements must be paid for.

Routine maintenance

		See page Number
Weekly	Check tyre pressures	5
Every two weeks	Check battery electrolyte level	32
Every 250 Miles	Check engine oil tank level	9
Every 1,000 Miles	Check primary chaincase oil level	10
	Adjust rear chain	25
	Lubricate all control cables	
	Adjust both brakes	31
Every 2,500 Miles	Check timing and adjust contact breaker points	21/24*
	Clean spark plugs and set gaps	23
	Change primary chaincase oil	18
	Check clutch adjustment	27
	Check primary chain adjustment	25
	Change engine oil	17
	Clean crankcase oil filter	18
	Clean and adjust rear chain	25
	Check gearbox oil level	9
	Grease rear brake pedal pivot	7
	(and illustration 4 on P.10)	
Every 5,000 Miles	Change gearbox oil	18
	Change oil in forks	19*
	Check steering head bearing adjustment	26*
	Clean contact breaker points	21*
	Lubricate contact breaker cam and auto advance unit	21*
	Grease brake expander lever (one stroke of grease gun)	7
	Check and adjust valve rocker clearances	20*
	Check and adjust camshaft chain	22*
	Fit new air filter element	28
	Dismantle and clean both carburetters	28
	Lubricate swinging arm bushes	19
Every 10,000 Miles	Re-pack wheel bearings with grease	*
	Check front and rear rubber engine mountings for side play (*see Workshop Manual*)*	

See Table of Recommended Lubricants on Page 6.

*FOR RIDERS WITHOUT MECHANICAL EXPERIENCE IT IS RECOMMENDED THAT THE SERVICES MARKED * ARE CARRIED OUT BY A NORTON DEALER

Changing engine oil

(*See illustrations 6 & 7*).

The oil tank should be drained when the oil is warm – after a short run – when it will flow more freely. Have available a piece of material to catch oil drained (see illustration 6).

Remove the oil feed pipe fixing nut which incorporates the filter. Remove also the crankcase drain plug (illustration 7 item A). Use a suitable receptacle to catch oil drained.

Replace the feed pipe fixing nut and crankcase drain plug (see para. oil filter) and firmly tighten.

Fill fresh oil to the dip stick level run the engine to check oil circulating – a short period will elapse before oil is returned from the sump after draining.

Stop the engine, allow oil in tank to settle – recheck oil level with dip stick.

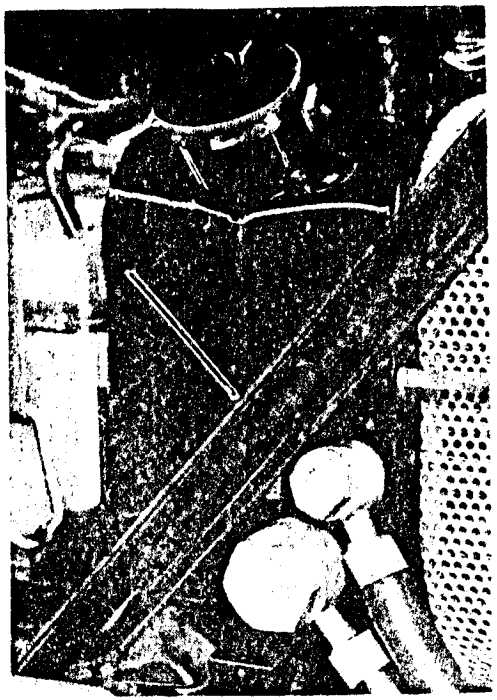

ILLUSTRATION 6

ILLUSTRATION 7

Oil filters

(See illustrations 6 & 7).

A coarse mesh metal filter is incorporated with the oil feed pipe fixing nut, which should be cleaned at 2,500 miles intervals – and when the oil is changed.

An additional filter is incorporated in the crankcase drain plug, the filter element is detachable, retained by a circlip. The filter dismantled for cleaning is shown in illustration 8.

Use a correctly fitting spanner – to avoid damage to the hexagon flats – when removing or refitting the drain plug.

ILLUSTRATION 8

Changing gearbox oil

(See illustration 3 on P.9).

The gearbox oil should be changed after a run so that the warm oil flows more freely. Remove the filler cap, drain plug (A) and level plug (B) and drain the oil into a suitable container. Replace the drain plug and fill the gearbox through the filler cap orifice (C) until oil runs from the level plug hole. Allow the surplus oil to drain off and replace the level plug and filler cap.

Changing oil in the primary chaincase

(See illustration 4 on P.10).

Remove the footrest and place a metal tray under the chaincase. Unscrew the central fixing bolt (A) and break the joint to allow the oil to drain into the tray. Wash out the case with clean paraffin. Refit the outer case and remove the filler cap, and level plug (B). Pour fresh oil into the filler cap orifice (C) until it begins to run from the level plug hole. Allow the surplus to drain off and refit the level plug and filler cap. Refit the footrest.

Changing oil in the front forks

(See illustration 9).

Under normal conditions the front forks will require no servicing other than an occasional change of oil and adjustment of the steering head bearing. Should the oil level become low it will be indicated by excess movement of the forks, but only after considerable mileage.

Each fork leg is provided with a drain screw and each leg should be treated separately. Remove the drain screw, take care not to lose the small fibre sealing washer. Take the machine off the stand, apply the front brake and move the forks up and down to expel the oil. Allow a few minutes for draining and repeat the operation with the other leg. Whilst draining the right fork leg, the forks should be turned on full right lock. Conversely for draining the left fork leg.

Refit the drain screws, place the machine on the centre stand. Remove handlebars to improve accessibility.

Unscrew the large filler plug at the top of each leg, remove the speedometer and tachometer and pull the front wheel to expose the springs.

Support the wheel with a block of wood to hold the springs clear. Using two spanners, unscrew the filler plugs from the damper rods.

Remove the wooden block and allow the forks to extend fully. Pour in a measured 150 cc (5½ fl.oz) of oil into each leg. Because of the springs inside the main tubes the oil will be slow to run down.

Expose the springs again and before refitting the filler plugs to the damper rods ensure that their locknuts are screwed down to the bottom end of the thread on the rod. Lock the filler plugs and locknuts together then screw in and tighten the filler plugs.

ILLUSTRATION 9

Lubricating swinging arm bushes

(See illustration 3 on P.9).

For lubrication purposes, a grease nipple (D) is used on the plate covering the right side of the swinging arm bush housing.

To maintain the oil content, use a grease gun filled with S.A.E. 140 oil, inject oil sufficient to fill the cavity every 5,000 miles.

Engine and ignition system

Rocker clearances

The rocker clearances are measured by feeler gauges inserted between the end of the valve stem and the rocker adjusting screw. First remove the fuel tank by disconnecting the two fuel pipes. Release the two milled discs securing the rider's seat – draw the seat backwards to clear the frame and lift off.

The fuel tank is attached to the frame by two nuts at the front and a rubber band fixing at the rear.

Remove the front tank fixing nuts, disconnect rear rubber fixing – the tank can now be removed.

Remove the spark plugs and the three rocker covers on the cylinder head.

By means of the kick-starter pedal, rotate the engine until the left side inlet valve is fully open. With a 0·006 in. (0·15 mm) feeler gauge, check the rocker clearance of the right side inlet valve. If adjustment is necessary, slacken the right side rocker adjusting screw locknut (A) and screw the adjuster (B) out a couple of turns. Place the feeler gauge between the adjuster and the end of the valve stem and screw the adjuster in until it just nips the feeler gauge. Tighten the locknut and withdraw the gauge. It should not be tightly gripped but should slide easily through the gap.

Rotate the engine until the right side inlet valve is fully open and adjust the left side inlet valve in the same way.

Adjust the exhaust valve rocker clearances in the same sequence but using a 0·008 in. (0·2 mm) feeler gauge.

ILLUSTRATION 10

Contact breaker points

(See illustration 11).

The Lucas 6CA distributor contains a separate contact set for each cylinder. Each contact set has its own mounting plate held to the circular base plate by two screws (A), each mounting plate being provided with a slot into which an eccentric headed adjusting screw (B) is fitted. When the securing screws are slackened, rotation of the eccentric screw moves the mounting plate in relation to the ignition cam. This permits a very accurate setting of ignition timing for each cylinder.

Another eccentric headed screw (C) is located in a slot in each fixed contact plate and provides adjustment for the contact breaker points.

The baseplate is secured by two screws in elongated holes. To advance the timing move the baseplate clockwise. To retard, move the baseplate anti clockwise.

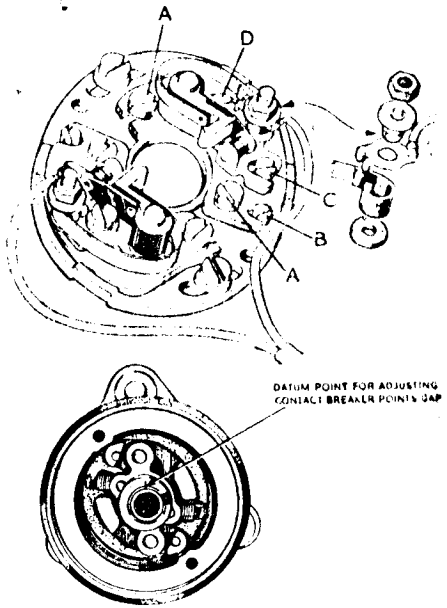

ILLUSTRATION 11

Adjusting the contact breaker points gap

Remove the spark plugs so that the engine can be rotated easily by means of the kick start pedal. An examination of the cam will reveal a small mark adjacent to the slot. This mark assists in obtaining a uniform gap for each cylinder.

Rotate the engine until the nylon heel of the moving contact registers with this mark and the points will be in the fully open position. Using a 0·015 in. (0·38 mm) feeler gauge check the gap. If the adjustment is correct, the gauge will be an easy sliding fit. When adjustment is necessary, release the fixed contact plate locking screw (D), rotate the eccentric screw (C) until the correct gap is obtained. Retighten the locking screw. Adjust the other contact set in a similar manner.

Maintenance

Every 5,000 miles (8,000 kilometres) the contact breaker points should be examined to determine their condition. Remove the nut securing the contact breaker spring to the anchor post and lift off the spring heel, together with the terminals, insulating bush and the insulating washer. Remove the fixed contact plate locking screw and take off the fixed contact plate.

Points which are slightly burnt or pitted can be smoothed with a fine carborundum stone and afterwards cleaned with a brush moistened in petrol or white spirit; if they are badly affected they should be renewed.

Before reassembly, smear the contact breaker pivot post and the cam very sparingly with Retinax 'A' grease and when reassembling ensure that the insulating washer, contact breaker spring, terminal and insulating bush are fitted in the order shown in *illustration 11* and that the terminal tags are inside the curve of the spring.

Auto advance unit

The auto advance unit automatically and progressively advances the ignition timing as the engine speed increases and returns it to the fully retarded or static position when the engine stops.

To expose the mechanism, it is necessary to remove the contact breaker plate complete, but before doing so mark the exact position of the plate so that when it is refitted the timing is not disturbed.

Remove the contact breaker plate fixing screws and take off the plate complete with the contact sets. Ensure that the springs of the auto advance unit are intact with the taper loops attached to the pins. Check the automatic action by turning the cam by hand to the fully advanced position in which the bob weights will be fully extended. When the cam is released, the springs should return the bob weights to the static position. The longest weight location pin must be in the radiused range slot marked 12°.

Lubricate the mechanism sparingly. Do not over lubricate as an excess of oil may reach the contact breaker points. If the contact breaker plate has been removed from its original position without being marked, the ignition timing should be checked and reset when the plate has been refitted.

Engine camshaft chain

(See illustrations 12 and 13)

Have available timing cover gasket 06.1092.

To examine, or adjust camshaft chain, the timing cover must be removed by:–

Disconnect oil union for rocker box oil pipe from timing cover.

Remove cap covering contact breaker cover (two screws).

Remove contact breaker base plate – with wires attached (two hexagon bolts).

Remove auto advance unit – use extractor bolt 06.0934.

Remove 12 screws securing cover. Tap lightly the joint face to break seal, withdraw the cover.

When the cover is removed, oil will seep from drilling in crankcase. Use a timing cover screw (A) to blank off drilling (see illustration 12).

The camshaft chain (illustration 13) is provided with a slipper tensioning device (A). To adjust the chain, release the two nuts (B) securing the slipper, and move as required. The permissible amount of free up and down movement measured in the centre run of this chain is $\frac{1}{16}$".

Check chain tension in more than one position.

Retighten the two tensioner nuts when the correct adjustment has been made.

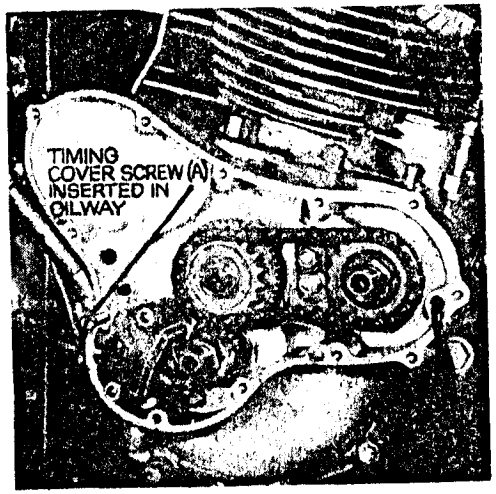

ILLUSTRATION 12

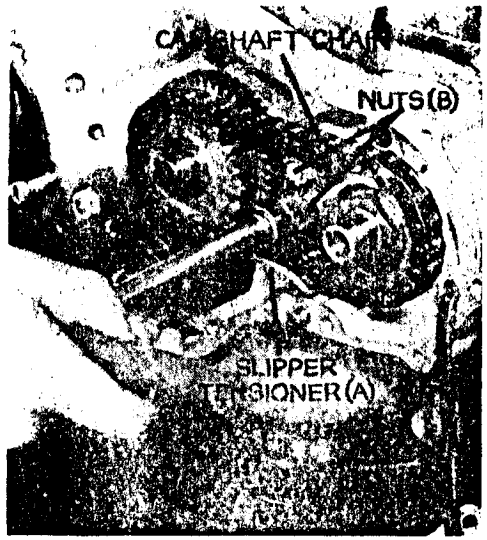

ILLUSTRATION 13

Refitting the timing cover

Use a new gasket to guard against oil leakage. Put back the timing cover, firmly tighten the 12 screws.

Remove inspection cap on primary chain case to expose indicator plate.

Position the engine on the drive side cylinder until the machined mark on the rotor registers with 28° on indicator plate.

Insert the auto unit with the rivets for the bob weights in line with the two screw holes for the contact breaker cover – the slot in the cam face should be at approximately 9 o'clock.

Fit the contact breaker base plate – yellow and black lead is for the drive side cylinder.

Reset ignition timing as described on page 24.

Spark plug

It is most important to use the correct grade of spark plug, as a spark plug with a low heat factor can cause pre-ignition and subsequent damage to the engine *(see Technical data on P.4)*.

To avoid damage to the insulator, use the plug spanner provided in the tool kit to remove and refit the spark plug, which should be firmly tightened to ensure a gas tight joint.

To adjust or reset the spark plug gap, this is effected by bending the earth, or side wire, which is ductile.

Before refitting the plugs, see that the sealing washers are sound, and clean the threads of the spark plug body.

A smear of graphite grease applied to the threads of the plug will assist in subsequent removal.

Ignition timing

(See illustration 14).

To check or reset the ignition timing, a timing indicator plate is attached to the outer portion of the primary chaincase, with a corresponding mark on the rotor for the alternator which is exposed by removing the screwed cap adjacent to the indicator plate. Timing can be checked with the engine stationary, or with the engine running by using a Stroboscope.

Engine stationary

Remove both spark plugs.

Remove inspection cap on chaincase.

Remove contact breaker cover – check and adjust contact breaker points as described on Page 21.

Temporarily lock auto advance unit in the full advanced position by:

removing the central fixing bolt.

Take off the washer for this bolt, replace it with one with a hole large enough to clear the central portion of the unit to bear on the cam when the central bolt is tightened.

Replace the central bolt with washer – hold the auto unit in the full advanced position – tighten the bolt.

Rotate the engine until the machined mark on the rotor registers with the 28° on the indicator plate. If the timing is correct – the contact points should commence to separate.

The exact point of separation can be determined by inserting a strip of very thin paper between the points. The points will grip the paper when closed – by moving the engine slowly, a light pull on the paper will indicate the exact point of separation. Safeguard against a shred of the paper being trapped between the points.

As an alternative, use a low wattage bulb and holder with a short length of wire soldered to the bulb body with a second length of wire attached to the bulb connection, with crocodile clips attached to the ends of both wires.

Connect one wire to the contact breaker spring of the points that is being checked the second wire should be attached to a suitable earth point on the engine.

Switch on the ignition and by moving the engine, the bulb will light immediately the contact points separate.

To adjust the timing, refer to sub heading 'Contact Breaker Points' (Page 21).

Remove central fixing bolt – discard washer temporarily used – fit the bolt with its original washer and tighten.

Engine running

To check the timing with a Stroboscope see instructions in the Workshop Manual.

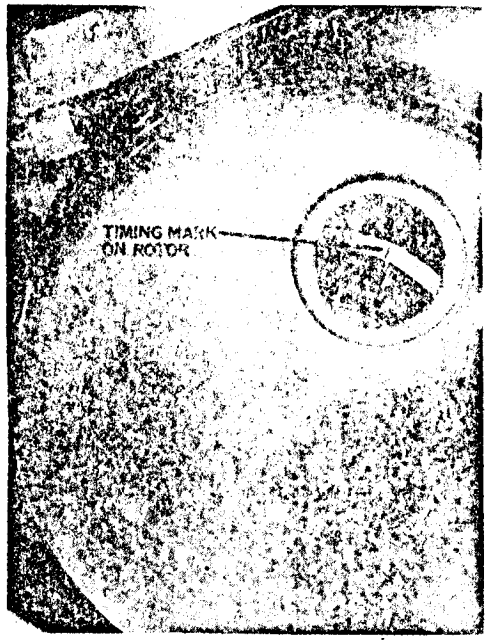

ILLUSTRATION 14

NOTE: A special service washer 06-0949 is available to temporarily lock the auto advance unit whilst the ignition timing is being checked.

Transmission

(See illustrations 4 & 6).

Adjustment of primary chain

The primary drive from the engine to the gearbox is by triplex chain; as the chain operates in an oil bath, long life and reliability are ensured provided that correct adjustment is maintained and the chaincase oil level maintained by topping up at regular intervals. If the chain is too tight the engine and gearbox bearings will be overloaded, and if the chain is too loose there will be excessive wear of both the chain and the sprockets: in either case maladjustment will cause excessive transmission noise.

Tighten the primary chain by:

Slacken nut *(illustration 6, item B)* on right-hand side of gearbox top fixing bolt.

Slacken front nut (C) on the adjusting eye bolt. (Two or three turns.)

Remove filler cap from primary chaincase *(illustration 4, item C)*.

Tighten the rear nut *(illustration 6, item D)* on adjusting eye bolt until, with the finger through the filler cap orifice, it can be felt that the chain is dead tight. Then slack off the rear nut and carefully tighten the forward nut until there is a total up and down movement of $\frac{3}{8}$ in. Then securely tighten the rear nut to lock the assembly. Check the adjustment in more than one position of the chain and adjust, as above, at tightest place.

It is important that these instructions to over tighten and then slack off are carefully followed.

Tighten nut on gearbox top fixing bolt.

Replace chaincase filler cap.

Adjustment of rear chain

(See illustration 15).

Slacken the rear wheel spindle nuts (A) and release the chain adjuster locknuts (B). Pull downward on the bottom run of the chain to bring the spindle hard up against the adjusters (C). Move each adjuster an equal amount until, with a rider seated, there is a total up and down movement, measured in the centre of the chain run, of $\frac{3}{4}$ to 1 in. (19·05 to 25·4 mm). Tighten the chain adjuster locknuts and the wheel spindle nuts.

Check rear brake adjustments. (See Page 31).

If the chain has covered a considerable mileage it may have worn unevenly; the adjustment should be checked at the tightest part of the chain run.

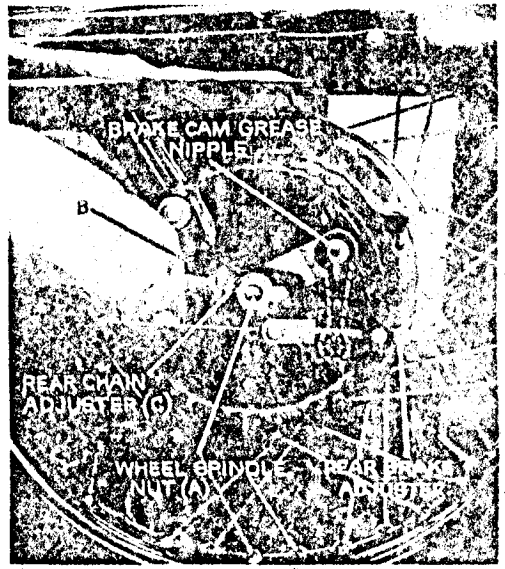

ILLUSTRATION 15

Front forks and rear suspension

Steering head adjustment

(See illustration 16).

If there is play in the steering head bearings the movement which takes place when the front brake is applied and when the machine is ridden over rough roads will quickly damage the bearings.

To check the adjustment, support the machine under the crankcase so that the front wheel is clear of the ground. Stand astride the front wheel, grasp the fork legs and attempt to move them backwards and forwards. Any play in the bearings will be detected by movement at the joint between the steering head and the fork.

To adjust, slacken off the top nut (A) and release the fixing nuts (B) of the two clamping studs which pass through the fork crown to clamp the fork tubes. The top nut is more accessible if the handlebars are removed. Tighten the adjusting nut (C) located below the handlebar lug a little at a time until the play is taken up without causing friction. The forks should swing freely from side to side. Retighten the top nut and the clamping stud nuts and refit the handlebars.

Test the machine on the road and if the adjustment is correct the machine should steer perfectly. If the adjustment is too tight, the machine will tend to 'roll'.

Rear suspension

The Girling rear suspension units are sealed units filled with oil on assembly. They should require no further attention: if a grating noise develops when the suspension is working, a smear of grease should be applied through the bottom of the chromed suspension covers to the outside of each spring.

A cam-ring adjuster is provided to raise the base of the springs into three alternative positions to suit varying loads. The 'soft' or normal solo position is when the adjuster is rotated as far as possible in an anti clockwise direction when viewed from above.

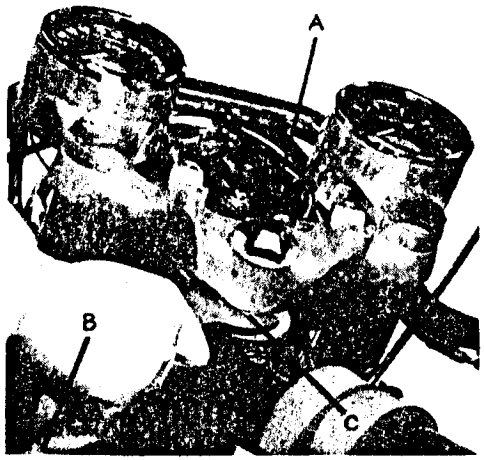

ILLUSTRATION 16

Clutch

(See illustrations 3 & 17).

The diaphragm spring clutch is mounted on the gearbox mainshaft and operated by a push rod which passes through the hollow mainshaft.

The clutch operating lever is controlled by the handlebar lever. Movement imparted to the push rod by the operating lever causes the clutch plates to separate.

The clutch plates are compressed by a circular diaphragm spring, thereby ensuring an even distribution of spring pressure.

To enable the clutch to operate satisfactorily, there must be a little free movement between the operating lever to which the clutch cable is attached and the push rod, in addition to the $\frac{3}{16}$ in. to $\frac{1}{4}$ in. of free play in the clutch cable itself.

If this free play is absorbed by the friction plates settling down, clutch slip will develop. Conversely, if the free play is excessive, the clutch plates will not separate, causing clutch drag.

To ensure that this free movement exists slacken off the clutch cable adjuster at the handlebar end as far as possible and then take off the filler cap *(illustration 3 item C)* on the gearbox outer cover.

With the index finger, move the operating lever to which the clutch cable is connected inside the kick starter case to and fro, which will indicate whether there is a slight movement or otherwise.

If no movement exists, remove the clutch inspection cap on chaincase *(illustration 17)* and release the nut (B) on the gearbox mainshaft, then turn the screw (C) gently in an anti clockwise direction until movement is felt on the operating lever. Then turn screw (C) in a clockwise direction until it is felt that the screw just touches the push rod.

Now unscrew the screw (C) one third of a turn and holding it in this position, retighten the lock nut (B). This will ensure that there is the specified amount of movement between the clutch operating mechanism and the push rod.

Finally unscrew the clutch cable adjuster at the handlebar end leaving $\frac{3}{16}$ in. to $\frac{1}{4}$ in. free movement between the cable outer casing and the adjuster.

WARNING: Do not attempt to dismantle the Diaphragm Spring Clutch without the proper tools as serious personal injury could result. (Refer to the Workshop Manual.)

ILLUSTRATION 17

Carburettors

The Commando is fitted with twin Amal concentric carburettors type 930.

The carburettor settings and jet sizes shown in the technical data have been determined after long tests to obtain maximum performance consistent with good petrol consumption.

It should not be necessary to alter the carburettor settings unless the machine is operating at altitudes over 3,000 feet above sea level.

An instructional leaflet issued by Messrs. Amal (list No. 117/3) is issued with each new Commando and describes the function of the carburettors and the method of tuning.

Synchronising the twin carburettors

It is most important that both throttle slides should operate simultaneously, and where a variation takes place as a result of lost motion in the throttle control cables, synchronisation should be restored by following the details given on Page 8 of the Amal leaflet.

Cleaning the carburettors

The float bowl on each carburettor is retained by two screws, which when removed will enable the bowl to be removed for cleaning.

Air filter

(See illustration 18).

To remove and replace air filter element:

Take out the two bolts securing the air filter front plate.

Remove the return pipe fixing nut on oil tank (the smallest of the two hexagons).

Lever outwards at the bottom the front filter plate.

Take out the element on the right side (see illustration 18).

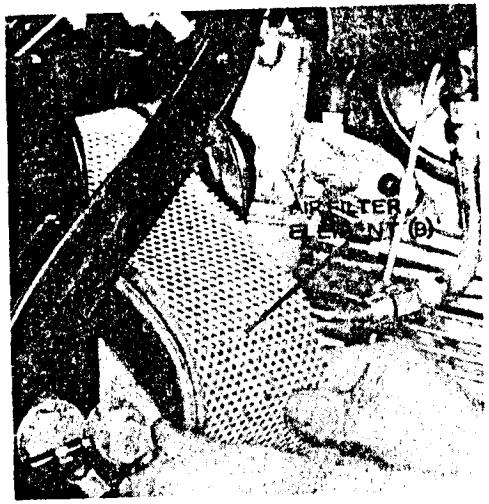

ILLUSTRATION 18

Wheels

Removal of front wheel

(See illustrations 19 & 20).

Support the machine with the front wheel well clear of the ground. Disconnect the brake cable by removing the clevis pin (A) *(illustration 20)* at the operating lever (B) and unscrewing the adjuster (C) from the brake plate. Slacken the fork end clamping nut *(illustration 19, item A)* and remove the wheel spindle nut *(illustration 20, item D)*. Take the weight of the wheel in one hand and withdraw the wheel spindle using a tommy bar in the spindle hole.

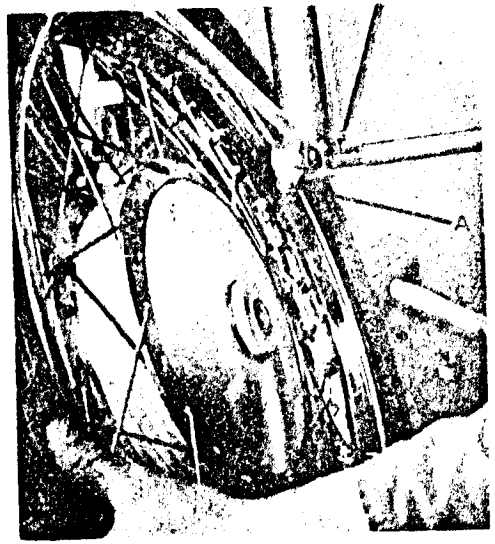

ILLUSTRATION 19

Refitting front wheel

Reassemble in the reverse order. Grease the wheel spindle when refitting and make sure that the torque stop *(illustration 20, item F)* is properly engaged. Before tightening the fork end clamping nut, compress the forks a few times to centralise the spindle. Do not overtighten the nut as there is a danger of fracturing the lug. Reconnect and adjust the brake cable. If the fork motion is stiff, slacken the spindle nut and fork end clamping nut and move the forks up and down to allow the fork tubes to take up alignment. Retighten the nuts.

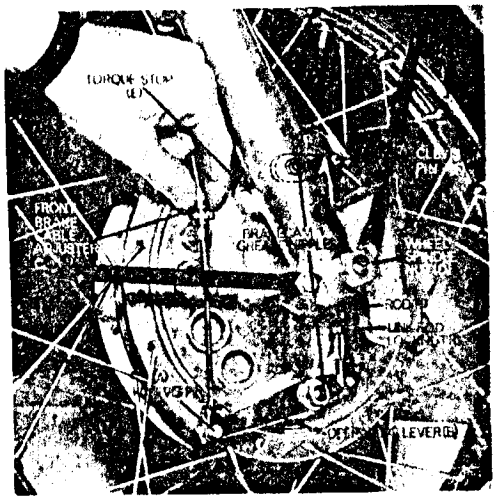

ILLUSTRATION 20

Removal of rear wheel

(See illustration 21).

The rear wheel is removed by detaching it from the brake drum, leaving the drum, rear sprocket and chain in position.

Disconnect the speedometer drive cable (A) and remove the rubber plugs (B) which give access to the rear wheel sleeve nuts (C). Remove the nuts and unscrew and withdraw the right hand wheel spindle (D). The spacer (E) and speedometer drive gearbox (F) will come away as the spindle is withdrawn. If the wheel is difficult to remove use a lever between the wheel and the brake drum.

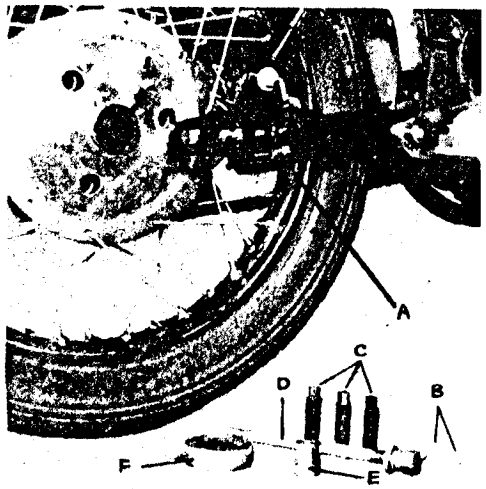

ILLUSTRATION 21

Refitting rear wheel

When refitting the wheel turn the brake drum so that one of the three studs is approximately in line with the pivoted fork tubes and so facilitate passing the bearing boss on the hub past the other two studs. Fit the wheel to the studs, tighten the sleeve nuts and replace the rubber plugs.

Fit speedometer drive gearbox – exercise care to engage the two drive dogs with the two slots in hub bearing ring.

Position the spacer – fit the wheel spindle with its washer then fully tighten.

Brakes

Front brake adjustment

(See illustration 20 on P.29).

A cable adjuster is provided at the handlebar lever and another at the brake drum (C). The link rod is correctly set on assembly and should not be interfered with unnecessarily.

To set the rod, take out the top clevis pin (F) and with the help of an assistant pull both operating levers until the shoes are in contact with the drum. Slacken the link rod locknut (G) and screw the rod (H) in or out until, with the shoes still in contact with the drum, the clevis pin can be refitted, then retighten the link rod locknut. Subsequent adjustment should be carried out on the cable adjuster.

The clevis pins should be replaced if they become excessively worn, otherwise the efficiency of the brake will be impaired.

The front brake air scoop entry and outlet are intentionally blanked off by sealing plates. For additional cooling in a hot climate or for track racing, these plates can be removed.

Use suitable washers under the screw heads to secure the metal gauze mesh.

Rear brake adjustment

(See illustration 22).

The rear brake is adjusted by means of the cable adjuster at the operating lever. When the brake is fully applied the operating lever should be approximately in the position shown in broken lines in the illustration. If excessive brake lining wear brings the lever past this position and there is no adjustment left, the brakes should be relined.

After adjustment the wheels should rotate freely. Any tendency to bind will dissipate power and promote heat which will adversely affect the efficiency of the brakes.

N.B. The rear brake is cable operated because the rear wheel assembly is secured to the engine cradle which has special mountings. Under no circumstances should this cable operation be altered to rod operation.

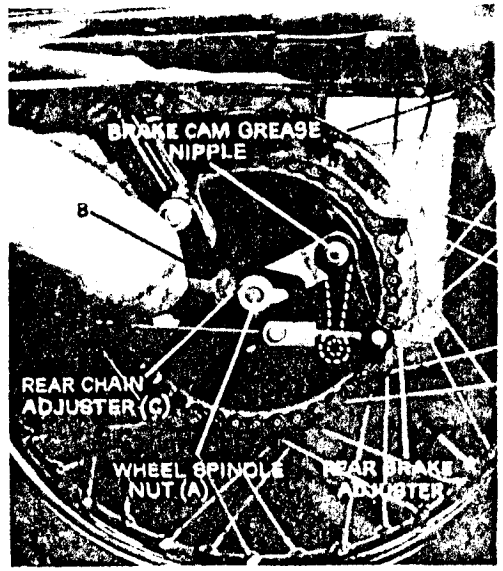

ILLUSTRATION 22

Electrical equipment

Capacitor ignition

The advantage of the capacitor ignition with which the Commando is fitted, over coil ignition is that the machine can be used either with or without the battery. In either case, starting and lighting is equally effective, supplementary accessories such as parking lights being excepted.

Two separate ignition coils are attached to the front of the frame. There are two contact-breaker sets operated by the camshaft, the points of each set can be adjusted individually for gap and in relation to the ignition cam. The condensers are remote mounted on the ignition coils.

Capacitor (Lucas 2MC)

The capacitor is an electrolytic *(illustration 5, item A)* polarised type and it is important that the correct wiring connections are made. The connections are dissimilar in size, the $\frac{3}{16}$ in. (4·76 mm) connector being the positive ground terminal with the connection rivet marked in red. The $\frac{1}{4}$ in. (6·35 mm) double terminal is the negative. The capacitor must always be fitted with the terminals downwards.

A faulty capacitor may not be apparent when the battery is connected in circuit and it is advisable to check periodically that it is serviceable by disconnecting the battery. The machine should start in the usual manner and full lights should be available with engine running.

Alternator (Lucas RM21)

The alternator consists of a rotor and stator, the rotor being driven from the drive end of the crankshaft. The whole assembly is housed within the primary chaincase. The stator windings are in bonded resin and need no attention except to check the snap connectors.

Rectifier (Lucas 40972A)

The rectifier converts the alternating current generated by the alternator into direct current for charging the battery. It requires no attention except to ensure that the fixing nut is tight. The nuts holding the plates together must on no account be interfered with as their tension has been carefully set during manufacture to give the best possible rectifier performance. The rectifier is attached to the rear of the frame and is accessible when the seat is removed.

Battery (Lucas PUZ5A)

The 12 volt positive-earthed battery has a capacity of 8 ampere/hours. At two week intervals, more frequently in hot climates, the level of the electrolyte should be checked. If necessary, add distilled water to maintain the level indicated on the side of the transparent battery case. Do not use tap water as this may contain impurities harmful to the battery. Never use a naked light when examining the cells. *(illustration 5 P.10)*.

If the machine is to be out of use for a lengthy period, have the battery fully charged and give it a short refreshing charge at 1 ampere about every two weeks. This will suffice to keep the battery in serviceable condition. When the battery is fully charged, the specific gravity of the electrolyte should be 1·270/1·290 at 60° F (16° C).

The battery terminals must never be reversed, otherwise the equipment will be damaged.

All [illegible]s are issued with a dry charge[illegible] [illegible]ompany cannot accept res[illegible] [illegible]n parts caused by acid

Running with battery disconnected

Before running the machine with the battery disconnected, the battery negative lead must be insulated to prevent it shorting to earth on any part of the machine.

Fuses

A 35 amp. fuse *(illustration 5, item B)* is fitted in the negative battery lead close to the battery terminal.

Zener diode

(Located on right side footrest plate).
When the battery is in a low stage of charge, the zener diode allows current from the alternator to reach the battery until it becomes fully charged, when the current is diverted to the zener diode. The heat generated at the diode is conducted away by means of finned aluminium heat discs.

If an electrical load such as the lighting system is switched on, a reduced amount of current flows through the diode, the balance being diverted to feed the load. If the load is heavy enough, the diode will become virtually non conductive and the whole of the current generated by the alternator will go to meet the demands of the battery and equipment.

If the zener diode is disturbed it is important that the fixing nut is tightened to a torque loading of not more than 28 in/lbs and not less than 24 in/lbs. In addition the seating face must be true and free from burrs.

Light Bulbs

Headlamp (SS700P)

Lucas 12 volt 50/40 watt pre-focus No. 446.

The type of bulb fitted may be varied to suit the lighting regulations of different countries.

To gain access to the bulb, unscrew the front headlamp rim fixing screw at the top of the rim. Take off the front rim and light unit, removing the upper part first. Remove the adaptor by pressing inward and turning to the left. The bulb can now be taken out

Parking light

Lucas 12 volt 6 watt No. 989.

Remove the light unit assembly as described above. The bulb holder is a push fit in the reflector.

Hi-beam warning light

Lucas 24 volt 2 watts No. 281.

Remove the light unit assembly as described above. The bulb holder is a push fit in its housing. To remove the bulb press in and turn

Stop/tail lamp

Lucas 12 volt 6/21 watts No. 679.

Remove the lens by unscrewing the two retaining screws. The bulb has offset securing pins to ensure correct location in the bulb holder. To remove the bulb press in and turn.

Speedometer bulb

12 volt 2·2 watts L643.

Tachometer bulb

12 volt 2·2 watts L643

Tracing troubles

Engine fails to start, or is difficult to start, may be due to:

Ignition not switched on.
Water on high-tension coils or contact breaker.
Moisture on spark plugs.
Oiled up, or fouled, spark plugs.
Throttle opening too large.
Carburettor pilot jet choked.
Air lever in open position or bad air leak at carburettor joints.
Lack of fuel because of insufficient flooding
Lack of fuel because pipe, or tap, obstruction
Excessive flooding of carburettor (with hot engine only).
Valve not seating properly.
Contact points dirty.
Incorrect contact point gap.

Engine misfire may be due to:

Defective or oiled spark plugs.
Defective engine-to-frame earth wire.
Defective spark plug wire.
Incorrect contact point gap.
Contact breaker points loose.
Oil on contact breaker points.
Rocker adjustment incorrect.
Partially obstructed petrol supply.
Disconnected carburettor balance pipe.

Loss of power may be due to:

Faulty spark plugs.
Lack of oil in tank.
No rocker clearance, or too much clearance.
Weak or broken valve spring.
Sticky valve stem.
Valve not seating properly.
Brakes adjusted too closely.
Badly fitting or broken piston rings.
Punctured carburettor float.
Engine carbonised.
Bad air leak between carburettor and head or manifold.

Engine overheats may be due to:

Lack of proper lubrication. (Quality or quantity of oil).
Faulty spark plugs.
Air control to carburettor out of order.
Punctured carburettor float.
Engine carbonised.
Weak valve springs
Pitted valve seats.
Worn piston rings.
Ignition setting incorrect.
Automatic timing control faulty.

Engine stops suddenly may be due to.

No petrol in tank, or choked petrol supply. Vent hole in petrol tank filler cap choked.
Choked main jet.
Water in carburettor float chamber.
Oiled up or fouled spark plugs.
Water on high tension coils or spark plugs.
Loose coil connections.

Excessive petrol consumption

Excessive petrol consumption may be due to:

Leaks in the petrol feed system. (Damaged fibre washers, loose union nuts on piping, defective float needle action.)
Incorrect ignition setting. (Ignition not advanced sufficiently.)
Defective valve action.
Incorrect use of air control lever.
Moving parts of carburettor badly worn. (Only possible after very considerable mileage.)
Bad air leak at carburettor junction or inlet manifold joint.

Steering unsatisfactory

Incorrect steering head adjustment (too tight or excessively slack).
Pitted steering head ball races resulting from loose adjustment.
Wheels out of alignment.
Front and/or rear tyre tread not correctly manipulated to run true with wheel (causes handlebar oscillation at low road speed).

Abnormal tyre wear

Abnormal tyre wear may be due to:

Incorrect tyre pressure.
Wheels not in alignment.
Harsh driving methods. (Misuse of acceleration and braking.)

This handbook is designed to enable the owner to get the best out of his NORTON motorcycle. Your nearest Norton dealer will be ready to help with service and advice.