

Maintenance Manual and Instruction Book

FOR

The Unapproachable

Norton

REGD. TRADE MARK

MOTOR CYCLE

Models No. 50, ES2, 88, 99,
650, Sports Specials
750 Atlas and 750 Scrambler

Publication P106/P

NORTON VILLIERS LIMITED

NORTON MATCHLESS DIVISION

PLUMSTEAD ROAD, WOOLWICH
LONDON, S.E.18, ENGLAND

Telephone: WOOLwich 1223

1967 Models

CHECKING IGNITION TIMING

For accuracy, the use of a degree plate mounted on the drive side crankshaft to record piston movement, is essential. As an alternative the piston movement can be measured before the cylinder head is re-fitted by using a straight edge on the top face of the cylinder and the use of a short steel rule. The use of a timing rod inserted through the spark plug aperture will be less accurate by reason of the steep angle of the spark plug in relation to the piston crown. First ensure that the point gap for both cylinders is between .014" to .016" at full separation. To adjust the gap release the slotted pillar nut that fixes the small plate with a screwdriver. Use the screwdriver between the edge of the plate and the inside diameter of the contact breaker housing which will move the plate in the required direction. See that the pillar nut is secure when the gap is correct. Take out the left side spark plug also the inlet valve rocker cover. Rotate the engine until the left side inlet rocker goes down and comes up again—the piston will be approximately at the top of the firing stroke. Use a short length of stiff wire through the spark plug hole in contact with the piston crown—rock the engine backwards and forwards to determine when the piston is on the extreme top dead centre position—then set the degree plate with its pointer to register with the zero mark—turn the engine backwards to the extent of eight degrees on the degree plate when the points on the TOP contact set should start to separate. A piece of cigarette paper inserted between the points—when with a light pull on the paper will indicate when the points are about to separate. Eight degrees on the degree plate is equal to .022" in piston travel. The ignition timing for the full advanced position is given in the technical data. The timing given above is with the auto unit in the fully retarded position.

NOTE: If non regular pistons are fitted with a higher compression ratio the ignition must be retarded to prevent detonation.

ADJUSTING THE IGNITION TIMING

The base plate for the contact breaker is moveable, by reason of the two slots in the plate to allow adjustment. To move the base

plate, release the two cheese headed screws, which secure the plate—the cam for the contact breaker runs clockwise—looking at the contact breaker—to advance the timing—the base plate is moved counter clockwise.

REMOVING THE BASE PLATE

Take out the two cheese headed screws—disconnect the two wires from the snap connector—the base plate can now be taken away.

NOTES ON IGNITION TIMING

The instructions given to check the ignition timing with the auto advance unit in the retarded position, is satisfactory providing the machine has not covered considerable mileage, for under these circumstances there is a possibility that wear has taken place on the limit stops for the auto unit. This would give a greater range of ignition advance if the ignition timing is checked or set with the auto unit in the full retarded position. To check the timing in the full advance position, take out the bolt in the centre of the contact breaker, use a radio type screwdriver in the slot in the outer edge of the cam, turn the cam with the screwdriver clockwise to get the full advance position. See data for details.

FINDING TOP DEAD CENTRE

With the timing cover removed, the top dead centre position of both pistons can be decided by the position of the timing mark on the sprocket for the camshaft. If this mark is positioned to exactly 12 o'clock, both pistons will be on the top of the stroke.

CAPACITOR IGNITION SYSTEM

The advantage of the capacitor ignition system over the regular coil ignition system is to enable the machine to be used—either with—or without the battery. Starting the engine and lighting is equally effective with or without the battery—excluding supplementary accessories such as parking lights etc. Two separate ignition coils attached to the back of the battery compartment with the ignition switch attached to the oil tank top fixing bolt. The capacitor is mounted on the underside of the tool tray. Two separate contact breakers—the contact points for

each contact breaker can be adjusted individually for a balanced firing point—are used in the system.

HOW THE SYSTEM WORKS

The large valve capacitor stores energy impulses from the alternator and supplies the ignition coils with sufficient energy to the spark plugs for easy starting and running at all speeds throughout the operating range of the engine.

The Zener diode takes care of the voltage output from the alternator, the battery is connected across the ammeter to a positive ground connection, when in use.

The wiring diagram shows all connections also the rectifier.

THE CAPACITOR 2MC

The capacitor is an electrolytic-polarised type. It is important that the correct wiring fittings are made, despite the fact that the capacitor connections are dissimilar in size. The small lucar connector $\frac{3}{16}$ inch is the POSITIVE—ground terminal. The rivet on this connection is marked with red paint to identify. The double terminal $\frac{1}{4}$ inch is the NEGATIVE terminal.

SPECIAL NOTE

The capacitor must always be fitted with the terminals DOWNWARDS.

The efficiency of the capacitor can be verified with the use of a voltmeter with a scale reading of at least 12 volts, also a fully charged 12 volt battery.

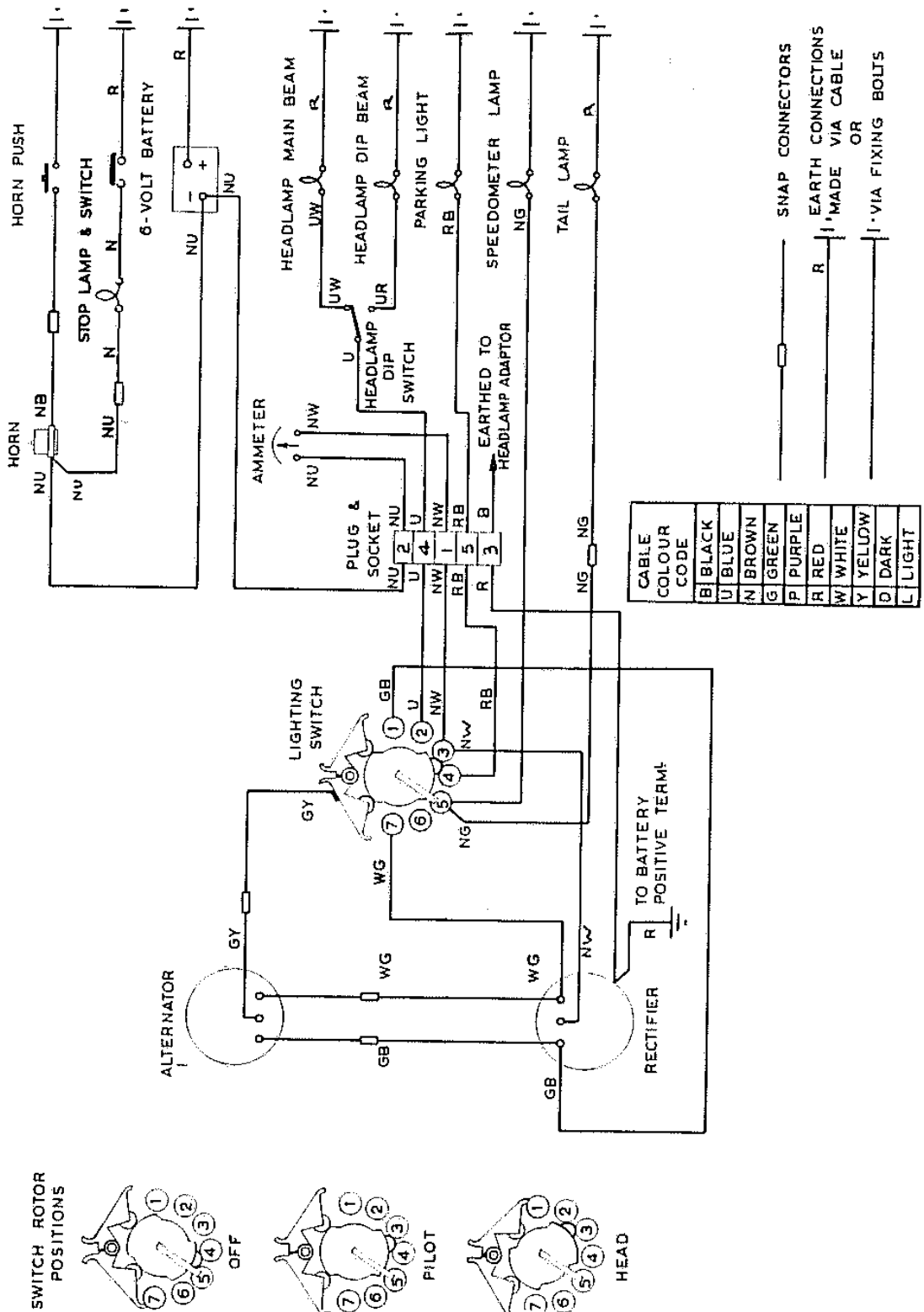
Connect the battery across the capacitor terminals—POSITIVE to positive and NEGATIVE to negative and leave for five minutes.

When the charging period is completed—take off the two battery wires and use the 12 volt battery properly connected—an instantaneous reading of 8 volts will indicate if the capacitor is serviceable or otherwise.

REMOVING THE BATTERY

With this equipment, if the battery is removed it is vital to insulate the negative battery lead to avoid shorting to engine or chassis. Failure to do so will render the capacitor beyond further use. The part number for the capacitor is 541 700 09. A defective capacitor cannot be detected when the battery is in circuit. To check, take off the battery cables—to determine if the engine will run also with full lights.

ELECTRICAL WIRING DIAGRAM for models ATLAS and 650



W 549 52304

Capacitor-Ignition System

The advantage of the capacitor-ignition system over the regular coil-ignition system is that the machine can be used either with or without the battery. Starting the engine and lighting is equally effective with or without the battery, supplementary accessories such as parking lights excepted. Two separate ignition coils are attached to the frame. There are two separate contact breakers and the points for each contact breaker can be adjusted individually for a balanced firing point. The capacitor is attached to the rear frame alongside the battery.

The large-volume capacitor stores energy impulses from the alternator and supplies the ignition coils with sufficient energy for easy starting and high-speed running.

The Zener diode takes care of the voltage output from the alternator and, when in use, the battery is connected across the ammeter to a positive ground connection.

The wiring diagram shows all connections including the rectifier.

Capacitor 2MC

The capacitor is an electrolytic-polarised type and it is important that the correct wiring fittings are made, despite the fact that the capacitor connections are dissimilar in size. The $\frac{3}{16}$ in. connector is the positive ground terminal. The rivet on this connection is marked with red paint. The $\frac{1}{4}$ in. double terminal is the negative.

The capacitor must always be fitted with the terminals **DOWNWARDS**.

The efficiency of the capacitor can be verified with the use of a fully charged 12-volt battery and voltmeter. Connect the battery across the capacitor terminals, **POSITIVE** to **POSITIVE** and **NEGATIVE** to **NEGATIVE**, and leave for five minutes.

When the charging period is complete take off the two battery wires and use the 12-volt battery properly connected. An instantaneous reading of 8 volts will indicate that the capacitor is serviceable.

Battery Lucas (PUZ5A)

A 12-volt system with a positive ground connection is used. The battery capacity is 8 ampere/hour rating.

Filling the battery

The specific gravity of the electrolyte must be corrected according to the shade temperature. At 80°F and below add one part of acid (1.835 SG) to 2.8 parts of distilled water to obtain a filling solution with a specific gravity of 1.270 at 60°F.

Where the shade temperature is above 80°F the acid-to-water ratio must be 1.4 to give a specific gravity of 1.270 at 60°F.

Dry-charged batteries are given a four-hour charge at 1.5 to 2.5 amperes.

Battery maintenance

Check the electrolyte level every 14 days and top up with distilled water to the level of the separator guard. If a visible level is not used keep the top of the battery and terminals clean. If the machine is out of service for any length of time recharge the battery every 14 days until each cell is gassing freely. This replaces energy lost during the inactive period.

Removing battery

With this equipment, if the battery is removed it is important to insulate the negative battery lead to avoid shorting to the engine or the frame, which would make the capacitor unserviceable. The part number for the capacitor is 541 700 09. A defective capacitor cannot be detected when the battery is in circuit. To check, take off the battery cables and see if the engine will run with full lights.

Checking ignition timing

For accuracy, use a pointer attached to some part of the engine and a degree plate mounted on the drive-side crankshaft, to record piston movement. Alternatively the piston movement can be measured before the cylinder head is refitted by using a straight edge on the top face of the cylinder and a short steel rule. The method of inserting a timing rod through the spark-plug aperture will be less accurate because of the steep angle of the spark-plug hole in relation to the piston crown.

First ensure that the contact-breaker point gap for both cylinders is between .014 in. to .016 in. If the gap needs adjusting release the pillar nut that fixes the small plate with a screwdriver and with the screwdriver between the edge of the plate and the inside diameter of the contact-breaker housing move the plate in the required direction. Secure the pillar nut when the gap is correct.

Take out the left-side spark plug and the inlet-valve rocker cover. Rotate the engine until the left-side inlet rocker goes down and comes up again. The piston will then be approximately at the top of the firing stroke. Insert a short length of stiff wire through the spark-plug hole until it is in contact with the piston crown. Rock the engine backwards and forwards to determine when the piston is at top dead centre position and set the degree plate so that the pointer registers zero. Turn the engine backwards eight degrees on the degree plate, at which stage the points on the **top** contact set should start to separate.

A simple method of checking the point of separation is to place a cigarette paper between the points. The moment at which the paper can be withdrawn without tearing is the point of separation. Eight degrees on the degree plate is equal to .022 in. in piston travel. The ignition timing for the fully advanced position is 32° or 8.69 mm (.343 in.) B.T.D.C. The timing given above is with the auto unit in the fully retarded position.

Note: If non-regular pistons are fitted, giving a higher compression ratio, the ignition must be retarded to prevent detonation.

Adjusting ignition timing

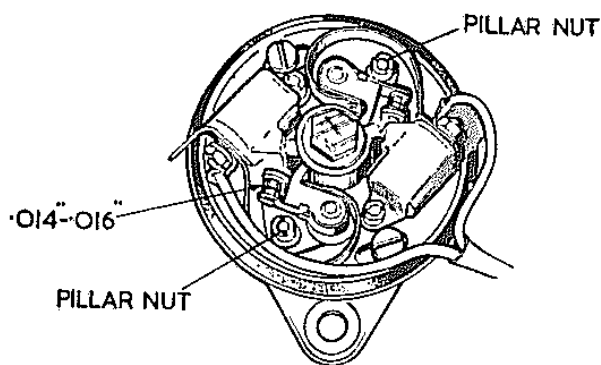
Two slots in the contact-breaker base plate enable adjustments to be made, the plate being free to move on releasing the two cheese-headed screws. The contact-breaker cam runs clockwise looking at the contact breaker. To advance the timing move the base plate anti-clockwise and to retard it move the plate clockwise.

Removing base plate

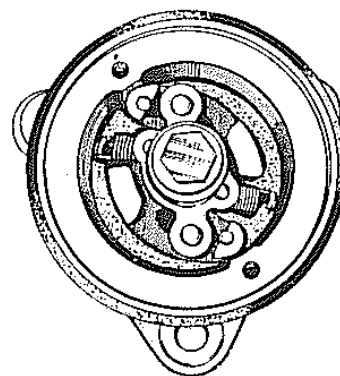
To remove the base plate, take out the two cheese-headed screws and disconnect the two wires from the snap connector.

Ignition timing - auto-advance unit

The instructions on checking the ignition timing with the auto-advance unit in the retarded position are satisfactory provided the machine has not covered considerable



Contact-breaker assembly



Auto-advance unit

mileage, in which case there is a possibility that wear will have taken place on the auto-unit limit stops. This would give a greater range of ignition advance if the ignition timing is checked or set with the auto unit in the fully retarded position. To check the timing in the fully advanced position take out the bolt in the centre of the contact breaker and, with a radio-type screwdriver in the slot in the outer edge, turn the cam clockwise to the fully advanced position.

Finding top dead centre

With the timing cover removed, the top dead centre position of both pistons can be decided by the position of the timing mark on the small pinion. If this is positioned at 12 o'clock both pistons will be on the top of their stroke.

Contact-breaker assembly

There are two sets of contact points with a separate H.T. coil for each cylinder. The contact-breaker housing is attached to the timing-side crankcase and houses the automatic timing control.

Note: If the contact-breaker plate or housing is removed the yellow and black wire attached to the top contact set goes to the left-side coil mounted on the rear-frame down tube. The H.T. cable from the left-side coil goes to the left-hand or drive-side cylinder. See electrical section for maintenance.

Refitting contact-breaker cover

Two insulated strips are attached to each condenser and are bent to cover and insulate the condenser terminals to avoid shorting out when the cover is fitted. Make sure that both strips are correctly positioned before fitting the cover. The cable entry is below the housing.

Contact breaker

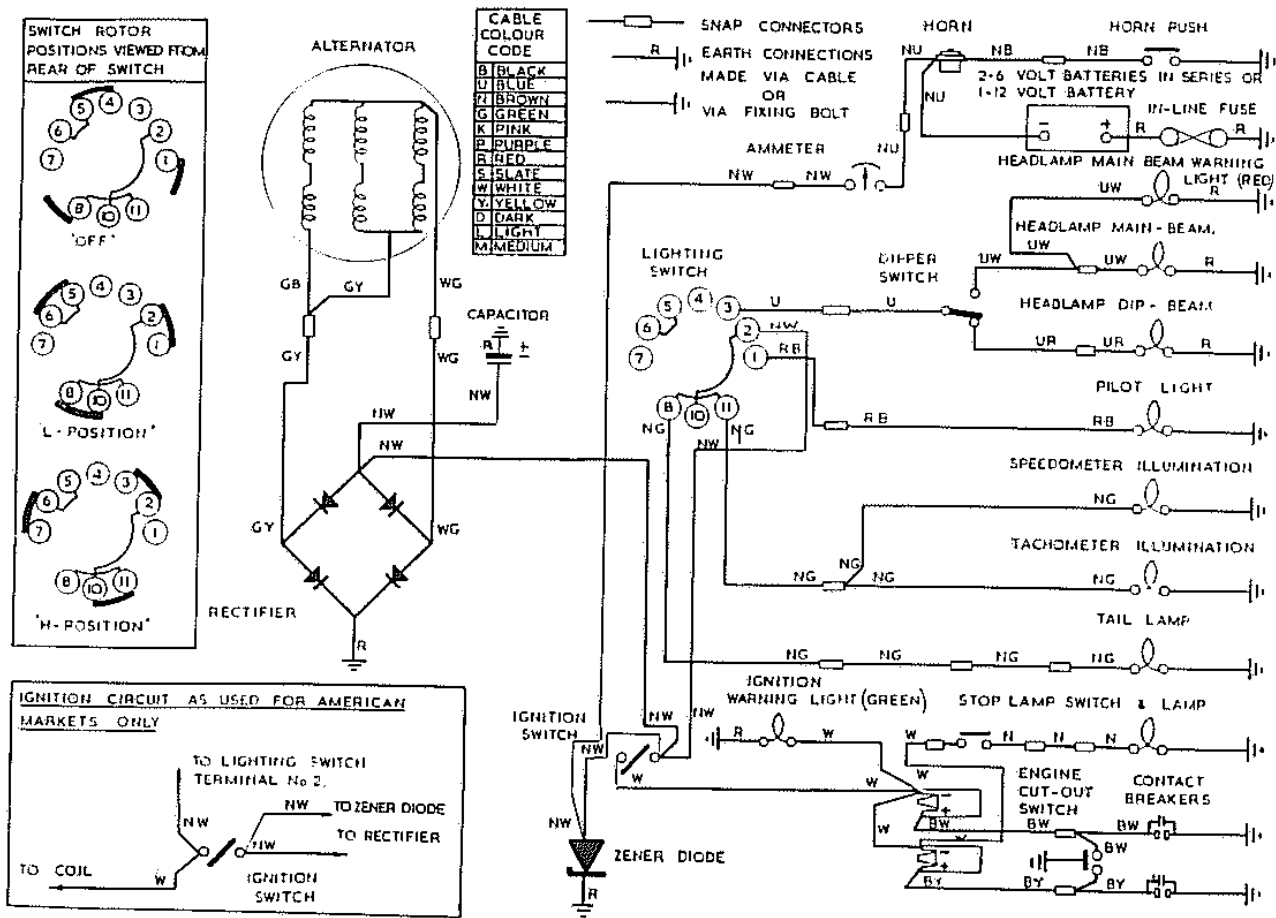
A few drops of light oil applied periodically on the felt wick will lubricate the cam. Apply a few drops behind the base plate to lubricate the auto mechanism. Check the condenser pillar nuts for security.

Removing drive sprocket

To remove the chain sprocket, which is a parallel fit on the contact-breaker shaft, push out the spring pin which passes through the sprocket and shaft.

To remove automatic control

The cam and automatic control can be withdrawn after removing the drive sprocket, cover and the two screws in the slots in the contact-breaker base plate. To remove the cam, take out the central bolt and with a draw bolt in the thread separate the cam from the taper shaft.



Wiring diagram

Lucas Model 6CA Contact Breaker

From engine number 124372 onwards a redesigned Lucas contact breaker is fitted. 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 the ignition timing for each cylinder.

Another eccentric headed screw (C), which is made of brass for easier identification, is located in a slot in each fixed-contact plate and provides adjustment for the contact-breaker points gap.

To adjust the contact-breaker points gap

Remove the sparking plugs so that the engine can be rotated easily. An examination of the cam will reveal a small mark adjacent to the slot which assists in obtaining a uniform gap for each cylinder.

Rotate the engine and when the fibre heel of the moving contact registers with this mark the points will be in the fully open position. Using a .015 in. feeler gauge, check the gap. If the adjustment is correct, the gauge should be an easy sliding fit. When adjustment is necessary, release the fixed contact-plate locking screw (D) and rotate the eccentric adjusting screw (C) until the correct gap is obtained. Retighten the locking screw.

Adjust the other set of contact-breaker points in a similar manner.

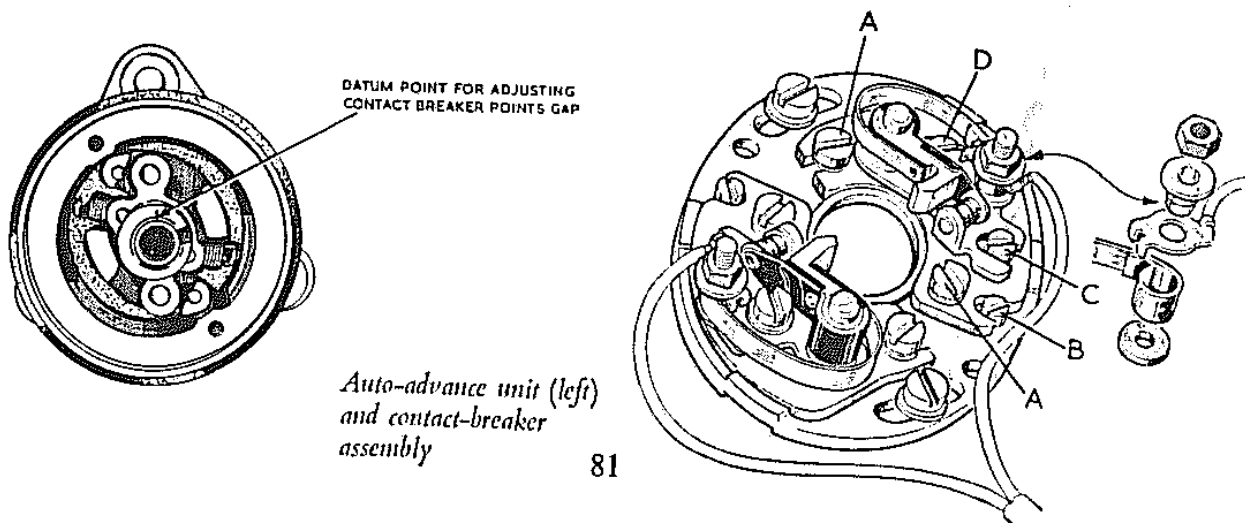
Checking the ignition timing

Before checking the ignition timing, the contact-breaker points should be adjusted and the tension of the ignition timing chain checked. The ignition timing can be checked in the static or fully retarded position (8° of crankshaft rotation or .022 in. [.56 mm] of piston travel) but if the engine has covered a considerable mileage, the limit stops of the auto-advance unit may have worn, making it advisable to check the timing at fully advance (32° of crankshaft rotation or .343 in. [8.69 mm] of piston travel). To lock the auto-advance unit in the fully advanced position, remove the central fixing bolt and replace the washer with one having a hole large enough to fit over the cam post and bear on the cam. Replace the bolt loosely, turn the cam to the fully advanced position and tighten the bolt.

Do not forget to refit the original washer after the timing has been checked.

For accuracy, use a degree plate mounted on the drive-side crankshaft, with a pointer attached to a convenient part of the engine to record the crankshaft rotation.

Remove the sparking plugs and the inlet-rocker cover. Rotate the engine until the right-side inlet valve opens and closes again. The right-side piston will then be rising on



the compression stroke. Insert a short length of stiff wire through the sparking-plug hole to make contact with the piston crown. Rotate the engine and, by observing the movement of the wire, determine the exact position of top dead centre. Without moving the crankshaft from this position, set the degree plate and the pointer to zero. Turn the engine backwards 32° on the degree plate, at which point the top set of contacts should be just opening.

A simple method of checking the precise opening point is to insert a cigarette paper between the points. When the points are fully closed the paper will be gripped tightly and if pulled gently will come away as the points separate. Ensure that no shreds of paper adhere to the points. If slight adjustment is required, slacken the two contact-breaker-plate securing screws (A) and rotate the eccentric screw (B) until the points are just breaking. Rotate the engine until the other cylinder is 32° from top dead centre on the compression stroke and check the bottom set of points in a similar manner.

If the timing is considerably out, it may be necessary to move the baseplate within the limit of the elongated fixing screw holes. If so, final adjustment should be made on each contact set as described above.

An alternative method of checking the timing is to use a clock gauge to record piston movement with the cylinder head removed. Fit the gauge to the cylinder block with the stylus in contact with the piston crown. Obtain the exact position of top dead centre by observing the movement of the dial pointer as the piston rises and falls and set the dial face to zero.

The engine can be timed on either cylinder and as a guide the drive-side piston is on the compression stroke when the timing mark on the half-time pinion is at 12 o'clock from the cylinder centre line. In this case the bottom set of points will be firing.

Turn the engine backwards until the movement of the dial pointer indicates that the piston has descended .343 in. Check the opening of the contact-breaker points as described above. An alternative method of determining the precise opening point is to use a low wattage 12-volt bulb with a lead soldered to the body of the bulb and another lead attached to the bulb connection. Connect one lead to the contact-breaker spring and the other to a convenient earth point on the engine. With the ignition switched on the bulb will light up at the instant the points separate.

The Condensers

The two condensers are now remote mounted and enclosed in a waterproof case.

Maintenance

Every 5,000 miles 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 terminal, 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 should be dressed 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 grease and when reassembling ensure that the insulating washer, contact-breaker spring, terminal and insulating bush are fitted in the order shown in the sketch and that the terminal tags are inside the curve of the spring.