

DEALER TRAINING

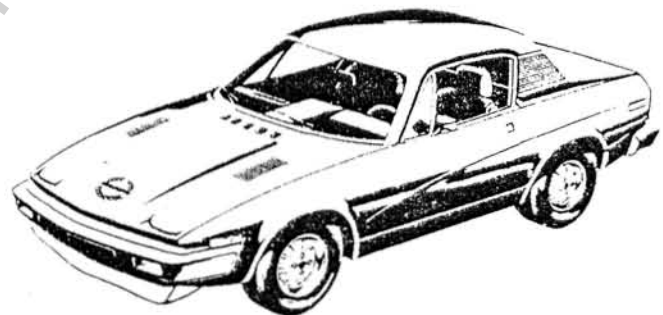


PARTS & SERVICE DIVISION

AID NO.: S1069

SUBJECT: 3500 V8

MODEL: ROVER 3500
TRIUMPH TR8



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Provided Courtesy Triumph Wedge Owners Association
<http://www.triumphwedgeowners.org>

P R E F A C E

The information contained in this booklet is provided as an easy reference guide for technicians. More detailed information will be available in the appropriate Workshop Manual.

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S1069

GENERAL DESCRIPTION

The 3500 engine is a 90° V8 of 215 cu in. (3531 cc) capacity.

Originally of GM design Jaguar Rover Triumph has made numerous improvements in manufacturing techniques which, coupled with many years of experience, has produced an engine of extreme reliability.

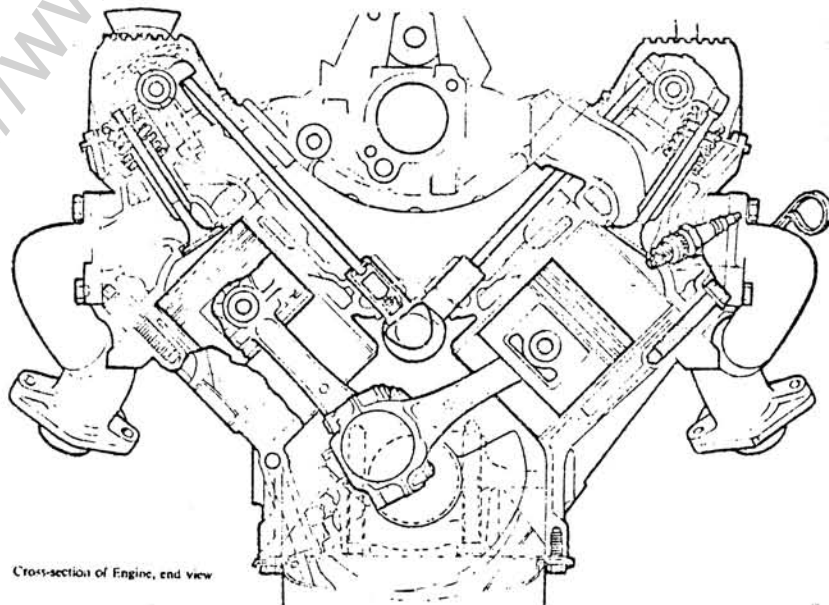
The cylinder block is cast aluminum with two banks of four cylinders each which form a 90° angle.

The crankshaft is supported by five main bearings, the end float being taken by the center bearing thrust surfaces. The connecting rods are forged steel with aluminum alloy pistons fitted with two compression and one coil control ring.

The cylinder heads are also an aluminum casting with renewable iron valve seat inserts. The valves are arranged in line and operate at an angle of 10° above the cylinder bore center line. The camshaft is located between the two banks of cylinders above the crankshaft. The camshaft runs in 5 bearings which are of different diameters to facilitate camshaft removal. The largest diameter being at the front. The camshaft is driven by a duplex chain. No chain tensioner is required.

The overhead valves are operated by means of hydraulic lifters which ensure quiet engine running and maintain adjustment at the correct clearance.

Lubrication of the engine is by means of a pressure fed oil system which incorporates an oil pump located in base of the timing chain cover and an external full flow oil filter.



Cross-section of Engine, end view

NEW FEATURES AND COMPARISON WITH EARLY 3500 V8

New cylinder heads with larger valves and stronger single valve springs.

New front cover with extra support for oil pump drive shaft and swivel coupling to distributor drive. No oil thower. New oil pump with deeper gears for more capacity while the pump cover is unchanged. Nominal oil pressure is 28 lbf/in.² at 2000 rpm, engine warm.

New distributor and oil pump drive gear to suit increased capacity of oil pump and to provide more lubrication for gears and timing chain. New front bearing for camshaft to improve oil supply to timing chain and gears. Revised distance piece and key to improve oil supply to timing chain and gears.

New type oil filter. New high volume water pump to provide greater circulation. New pistions and thinner rings.

The camshaft is also redesigned. Although it looks the same as the old type, it is no longer phosphated.

The hydraulic tappets have weaker plunger springs to allow a higher RPM and are now phosphated.

ENGINE STRIP AND REBUILD

REMOVE AIR PUMP (WHERE FITTED) - ALTERNATOR - POWER STEERING PUMP.

REMOVE VACUUM AND COOLING SYSTEM HOSES FROM MANIFOLD.

REMOVE AIR INJECTION LINES AND RELIEF VALVE (WHERE FITTED):

REMOVE INLET MANIFOLD.

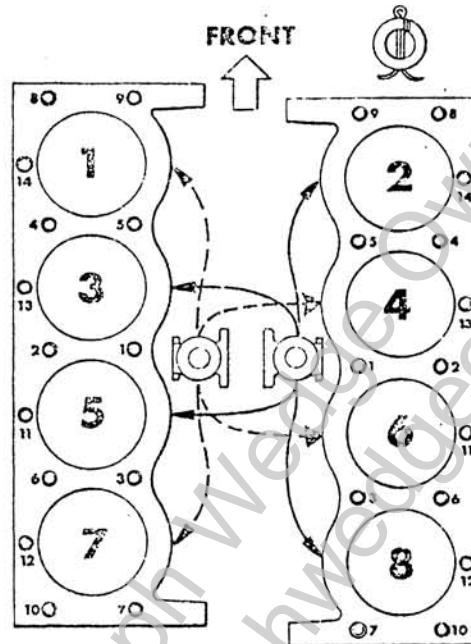
INLET MANIFOLD - 9/16 socket (bolts slotted under carburetors, where fitted). The inlet manifold is a one piece aluminum casting. Coolant circulates from the cylinder heads through passages at the front end of the manifold. The thermostat and thermal transmitter for the temperature gauge and the brake vacuum connection are housed in the manifold.

INLET MANIFOLD GASKET - Corrugated metal type, and must be renewed each time it is removed. When fitting new gasket, new gasket seals should be fitted. Smear both sides with silicon grease, fit in position ensuring that the ends of the seals are fitted correctly in the notches formed between the cylinder head and cylinder block.

Coat the cylinder head, the inlet manifold and the manifold gasket around the water passage joints with Permatex or other non-hardening sealer.

Inlet manifold gasket should be fitted with the "FRONT" to the front of the engine, and the slotted bolt hole to the right-hand front.

Fit the metal clamps but do not tighten the clamp bolts until after tightening the inlet manifold bolts. The bolts must be coated with 3M product EC 776 which is a lubricant/sealant.



FIRING ORDER 18436572

REMOVE ROCKER COVERS AND ROCKER SHAFTS.

ROCKER SHAFTS

To ensure correct alignment of the rocker shaft oilways, the notch in one end of the rocker shaft must be uppermost and towards the front of the engine on the right-hand bank and (uppermost) towards the rear of the left-hand bank.



ROCKERS

Two different rocker arms are used. They must be fitted so that the valve ends of the arms slope away from rocker support pedestals shaft.

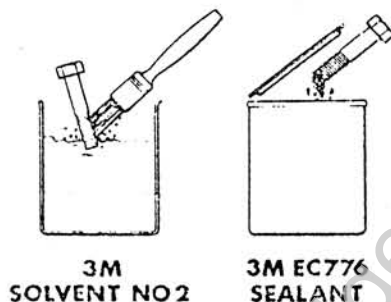
NOTE: If new rocker arms are being fitted, ensure that the protective coating is removed from the oil feed hole and push rod seat.

REMOVE PUSHRODS AND CYLINDER HEADS 5/8 SOCKET.

CYLINDER HEADS

Interchangeable from new, but once fitted must remain in their respective positions. If both cylinder heads are being removed, mark them L.H. and R.H. ensure that they are refitted in their original position.

Slacken cylinder head bolts evenly. After removal the bolts should immediately be wire brush washed in solvent. If the bolts cannot be cleaned immediately, it is essential that they be stored in a tray of trichorethylene, otherwise the sealant/lubricant used on previous assembly will tend to air harden, making subsequent replacement very difficult.



Examine bolts and renew any showing signs of elongation. If three or more have been elongated, all the bolts must be renewed.

Fit new cylinder head gaskets with the word "TOP" uppermost.

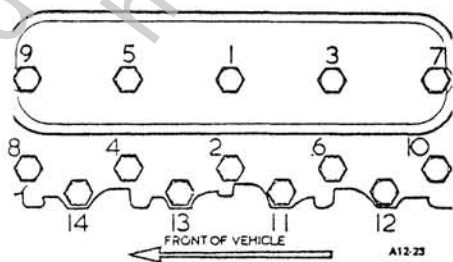
Do NOT use any sealant, gaskets are coated with lacquer.

Clean the threads of the cylinder head bolts, then coat them with thread lubricant/sealant 3M-EC776.

Damage to the aluminum cylinder block threads may result if bolts are not coated with "EC 776" prior to installation, also a false torque reading may be obtained.

Locate the long, medium and short bolts in position.

Tighten the bolts a little at a time in the sequence shown. Final torque is 45 lbs/ft for the outer row and 70 lbs/ft for inner row.



Uneven tightening of the cylinder head bolts can cause distortion of the cylinder bores resulting in compression loss, gasket failure and excessive oil consumption.

CYLINDER HEAD REFACING

To check if the cylinder head has previously been re-surfaced, a measurement must be taken from the step in the combustion chamber to the head face. The minimum distance must be 0.250". Normal production tolerances will allow 0.010 0 0.015" to be machined from the face before the minimum tolerance is reached. No more than 0.015" may be removed. Always machine both heads by the same amount.

VALVES

Valve stem oil seals are not fitted.

As the valve opens, the clearance between the valve stem and guide becomes less, due to the tapered valve stem, thus restricting oil from passing down the guide.

In order to maintain the correct clearance between valve stem and guide it is most important that the valve guide fitted height is maintained.

Improper hydraulic tappet operation may result if valve and seat are refinished to the extent that the valve stem is raised more than the dimension given.

The measurement is taken from the valve spring seat surface of the cylinder head to the end of the valve stem.

To reduce the valve stem height, either grind off the end of the valve stem, or fit new parts as required.

VALVE GUIDES

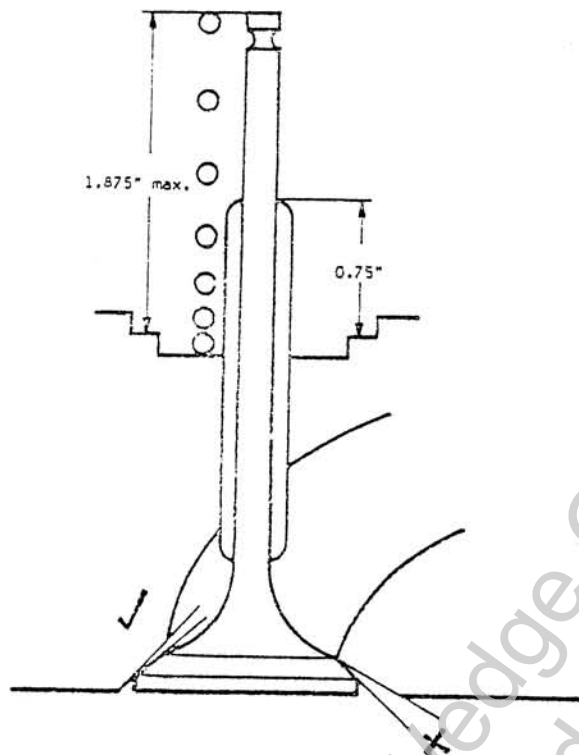
If valve guides need replacing they should be driven out using valve guide remover 274401.

Service valve guides are 0.001" larger on the outside diameter for interference fit.

Lucricate and install new guide from top of cylinder head using valve guide replacer 600959 and distance piece 605774.

Drive the valve guide into the cylinder head until the replacer tool contacts the distance piece.

The fitted guide must stand 0.075" above the valve spring seat.



VALVE SEATS

Valve seat inserts are replaceable. For details see appropriate workshop manual.

Correct valve seat angle $46^{\circ} \pm 1/4^{\circ}$.

Correct valve face angle $45^{\circ} \pm 1/4^{\circ}$.

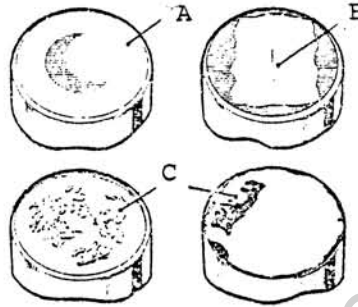
REMOVE TAPPETS

The tappets are non-serviceable.

Renew tappet assembly if body is roughly scored or grooved, or oil hole extends through the wall which would permit oil leakage from the lower chamber. Inspect the cam contact surface of the tappets.

Tappets must rotate and a circular wear pattern as in illustration "A" is normal. "B" shows the square wear pattern of a non-rotating tappet. In the center of this pattern is usually a slight depression. A tappet showing this pattern should be renewed and checked to ensure that it is free to revolve in the cylinder block.

Fit new tappets if the cam contact surface is excessively worn or damaged as in "C".



The tappets and push-rods must always be refitted in their original sequence.

Note: Tappet noise can be expected on initial starting up after an overhaul due to oil drainage from the tappet assemblies. If excessive noise is apparent after an overhaul, run the engine at approximately 2,500 rev/min for a few minutes, by which time the noise should have been eliminated.

During high engine speeds of approximately 5500 - 6000 rev/min the tappet movement is too fast for the complete replacement of the oil which is lost and this causes the oil in the tappet to froth. This in turn restricts the opening of the valves and the engine performance begins to fall off, hence the engine will resist over revving.

The purpose of the plunger spring is to push the plunger up the body and so keep the push rod in position until the oil enters the tappet and takes over from the spring.

REMOVE OIL PAN (1/2" SOCKET)

Reinforcing plate at rear. Note oil baffle and oil pump pick up position. Two extended studs on left side support oil cooler lines.

REMOVE DISTRIBUTOR, FRONT PULLEY AND TIMING COVER KEEPING BOLTS IN POSITION.

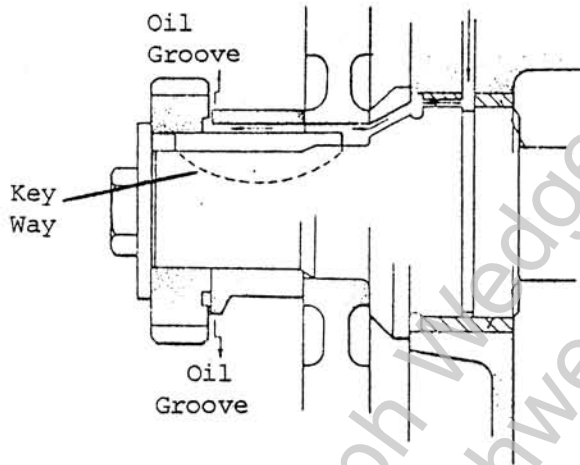
REMOVE TIMING CHAIN.	FRONT PULLEY	15/16" SOCKET
	TIMING COVER	1/2" SOCKET

TIMING CHAIN AND GEARS

An inverted tooth type chain is fitted in conjunction with a sintered iron crankshaft chain wheel. The camshaft chain wheel is made of aluminum alloy with nylon covered teeth to reduce noise.

CAUTION: Do not rotate the crankshaft after chain is removed if rocker shafts are fitted, otherwise the valve gear and pistons will be damaged.

CAUTION: The space between the key and keyway acts as an oilway for lubrication of the drive gear. Ensure that the key is seated to the full depth of the keyway. The overall dimension of the shaft and key must not exceed 1.187". The key top face should also be parallel to camshaft face.



REMOVE CAMSHAFT.

CAMSHAFT

The camshaft is positioned centrally in the cylinder block and is supported by five bearings.

CAUTION: Do not damage the bearings when withdrawing the camshaft as the camshaft bearings are not serviceable.

REMOVE PISTONS.

PISTONS AND RINGS

Pistons are aluminum alloy with "W" slot skirt.

The piston rings are arranged as follows:

No. 1	Compression ring	Chrome faced
No. 2	Compression ring	Stepped to "L" shape, marked "T" or "TOP"
Oil Ring Type		Perfect circle, type 98, consists of two chrome faced rings with spacer

PISTON GRADING

Z	Nominal to 0.003 in.
A	0.0003 to 0.0006 in.
B	0.0006 to 0.0009 in.
C	0.0009 to 0.0012 in.
D	0.0012 to 0.0015 in.

NOTE: A single standard piston 0.001" oversize is available for service purposes. Should it be necessary to fit a new piston to a standard bore, the bore must be bored to accommodate the piston with correct clearances as per data in workshop manual.

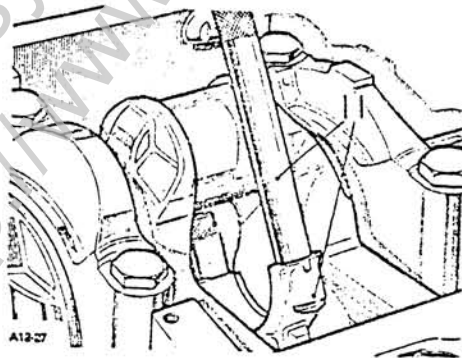
WRIST PINS

The piston wrist pins are a press fit in the small end of the connecting rod. This type of assembly is known as semifloating and a special tool # 605350 is used to remove and replace the wrist pins whenever the pistons are removed from the connecting rods.

CONNECTING ROD/PISTON REMOVAL

After removing a connecting rod cap, screw guide bolts, part #605351, onto connecting rod bolts.

Push the connecting rod and piston assembly up the cylinder bore and withdraw it from the top. Retain the connecting rod and piston assemblies in sequence with their respective caps.



CONNECTING ROD/PISTON REFITTING

Locate the applicable crankshaft journal at B.D.C.

Place the bearing upper shell in connecting rod. Screw guide bolts 605351 onto connecting rod, retaining bearing shell. Insert connecting rod and piston assembly. The domed boss on the connecting rod must face towards the front of the engine on the right-hand bank of cylinders and towards the rear on the left-hand bank. When two opposite connecting rods are fitted the bosses will face inwards towards each other. When locating the connecting rod cap, the rib on the cap should be on the same side as the domed boss on the rod.

CONNECTING ROD BEARINGS

The use of Plastigauge will facilitate the checking of bearing to crankshaft clearance. The correct clearance with new or overhauled components is 0.0006 (6 ten thousands) to 0.0022 in. (22 ten thousands).

If a bearing has been in service it is advisable to fit a new bearing if the clearance exceeds 0.003 in. Bearings are available in standard and .020" undersize.

CONNECTING ROD CAP BOLTS

When fitting the connecting rod caps, the bi-hexagon nuts are tightened to the specified torque figure of 30 to 35 lbs/ft. Nuts are fitted without washers and should be oiled before being tightened.

A self locking action is provided by the elasticity or stretching of the bearing cap bolts. This action will be destroyed by over-tightening the nut.

Provided the correct torque is not exceeded, it should not be necessary to replace any of the nuts or bolts during the rebuilding procedure.

CRANKSHAFT AND BEARINGS

The crankshaft is supported by five main bearings.

When refitting the main bearing shells, ensure that the shells with the oil holes and oil grooves are fitted to the cylinder block. The shells fitted in the main bearing caps have plain surfaces.

Crankshaft bearings are available in standard size and .020 undersize.

The flanged center main bearing shell controls the crankshaft end-float which is 0.004 to 0.008 inches.

CRANKSHAFT REAR OIL SEAL

A lip type seal is employed and located in the recess formed by the cylinder block and rear main bearing cap.

Main bearing cap side seals of cruciform design are fitted into grooves in the sides of the cap.

FITTING NEW SEALS

After fitting new main bearing cap side seals, they will protrude approximately 1/16 in. above the face of the bearing cap. DO NOT CUT LENGTH.

The seals will be compressed when the sump is fitted.

Apply a sealer to the rearmost half of the rear main bearing cap parting face or, if preferred, to the equivalent area on the cylinder block.

CAUTION: Do not handle the seal lip at anytime; visually check that it is not damaged and ensure that the outside diameter remains clean and dry. Press the seal into the recess.

FLYWHEEL

To prevent incorrect assembly the flywheel bolts are offset.

When refitting the flywheel, before finally tightening the bolts, rotate the flywheel against the direction of engine rotation to take up any clearance.

Tighten bolts to 54 lbs/ft.

SPIGOT BEARING (MANUAL GEARBOX ONLY)

Drive in a new spigot bearing, using a suitable madrel, until it is either flush with or not more than 1/16 in. below the end face of the crankshaft. Measure the spigot bearing inside diameter "B" and if necessary ream it to the following dimensions:

0.7504"	+0.001 "
	-0.000 "

LUBRICATION SYSTEM

This is a wet sump, pressure fed system, having normal pressure of 28 lbs/in² at 2,000 rpm. (hot).

OIL FILTER

A full flow type oil filter is fitted.

CAUTION: Do not delay fitting a new filter otherwise the oil pump may drain and require priming with vaseline before restarting the engine.

OIL PUMP

The oil pump housing is an integral part of the timing gear cover. If the housing has become scored or if the clearance between the gears and the face of the gear housing pocket is out, the timing gear cover will have to be renewed.

To check the clearances, place a straight edge across the gears. The clearance between the straight edge and the front cover should be more than 0.0018 in. If less than quoted figures, check front cover for wear.

During reassembly, the oil pump gear pocket must be fully packed with vaseline. Other greases must not be used. Failure to carry out the above operation may result in the oil pump not priming itself when the engine starts.

The oil pump drive now has a support cast into the timing cover.

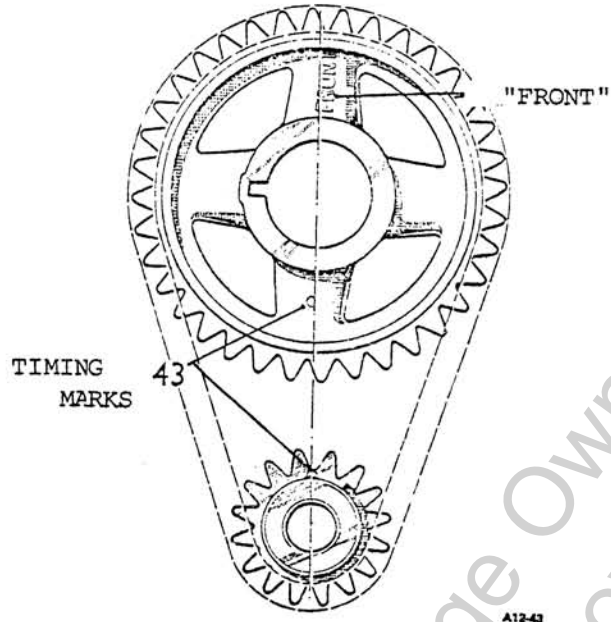
VALVE TIMING

Set the engine - number one piston at TDC. Temporarily fit the camshaft gear with the marking "FRONT" outward. (If gear is not marked, the chamber should be fitted towards the engine).

Turn the camshaft until the mark on the gear is at the six o'clock position, then remove gear without disturbing the camshaft setting.

Locate timing gears into chain with timing marks aligned.

Engage chain and gears onto camshaft and crankshaft key locations.



Check that timing marks are in line.

Fit the spacer with the flange outward.

Fit distributor drive gear ensuring that the annular grooved side is fitted to the rear.

Locate timing cover in position. Torque 40-45 lbs.

Clean the threads of the timing cover securing bolts, then coat them with thread lubricant/sealant Loctite 242 by dipping the first three threads into this solution. Tighten securing bolts. Torque 23 lbs/ft for the bolts which secure the timing cover only and 17 lbs/ft for the bolts which also secure the water pump.

Refit crankshaft pulley. Torque 150 lbs/ft.

EXHAUST MANIFOLD - REFITTING

Locate the manifold on the engine.

Gaskets are used with TR8.

Fit manifold with locking tabs, tighten bolts evenly to 16 lbs/ft.

ENGINE TUNING DATA

Engine - 3500

Type	V8
Firing order	1, 8, 4, 3, 6, 5, 7, 2 .
No. 1 cylinder	Front Left - Left bank numbered odd - Right bank numbered even
Cylinder bore	89.90 mm (3.5 in)
Crank stroke	71.12 mm (2.8 in)
Capacity	3528 cm ³ (215 in ³)
Compression ratio	8.1:1
Cylinder pressures at 15°C (60°F) ambient temperature 150 to 200 rev/min	9.5 kgf/cm ² (135 lbf/in ²)
Idle speed	800 ± 50
Fast idle	Variable
Location of timing marks	Crankshaft damper with pointer on timing cover
Valve timing:	
Inlet opens	30° B.T.D.C.
closes	75° A.B.D.C.
Exhaust opens	68° B.B.D.C.
closes	37° A.T.D.C.
Spark plugs type	N12Y
Spark plug gap	0.80 mm (0.030 in)
Distributor:	
Make - type	Lucas 35 DE8
Rotation - viewed on rotor	Clockwise
Centrifugal advance	See 86.35.00
Pick-up air gap	0.36 to 0.41 mm (0.014 to 0.016 in)
Coil	Lucas 22C12
Ballast resistor	9 BR