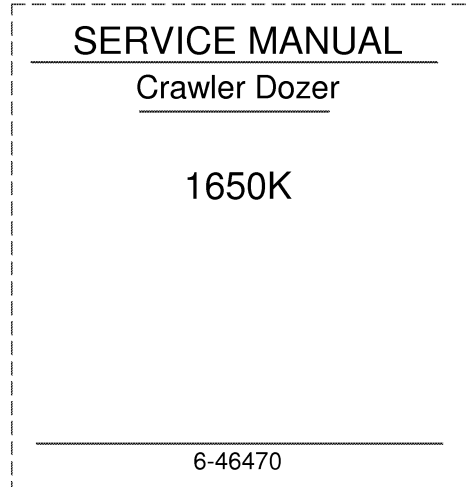


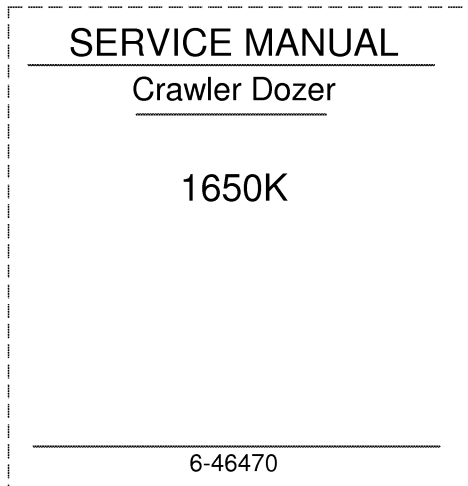
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2. Slide into pocket on Binder Spine.

TYPE 1-4



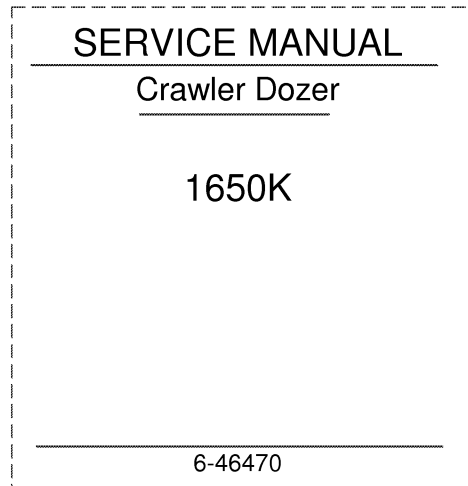
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TYPE 1-4



1. Trim along dashed line.
2. Slide into pocket on Binder Spine.

TYPE 1-4



1. Trim along dashed line.
2. Slide into pocket on Binder Spine.

TYPE 1-4

1650K

CRAWLER DOZER

Service Manual

Print No. Bur 6-46470



THIS ALERT SYMBOL SIGNALS IMPORTANT MESSAGES INVOLVING YOUR SAFETY.

Read and heed carefully the safety instructions listed and follow the precautions recommended to avoid potential risks and to safeguard your health and your safety.

You will find this symbol in the text of this Manual referred to the following key words:

WARNING - Cautions directed to avoid improper repair interventions involving potential consequences for the safety of the personnel performing the repairs.

DANGER - These warnings qualify specifically potential dangers for the safety of the operator or other persons directly or indirectly involved.

IMPORTANT NOTICE

All maintenance and repair interventions explained in this Manual **must be performed exclusively by the Service Organisation of the Manufacturer**, observing strictly the instructions explained using, whenever necessary, the recommended specific tools.

Whoever performs the operations reported without following exactly the precautions is responsible on his own, for the damages that may result.

Neither the Factory nor any Organisations in its Distribution Network, including but not limited to national, regional or local distributors, are responsible for any liability arising from any damage resulting from defects caused by parts and/or components not approved by the Factory for use in maintaining and/or repairing products manufactured or merchandised by the Factory.

In any case, no warranty of any kind is made or shall be imposed with respect to products manufactured or merchandised by the Factory, when failures are caused by the use of parts and/or components not approved by the Factory.

AVOID ACCIDENTS

Most accidents, whether they occur in industry, on the farm, at home or on the road, are caused by the failure of some individuals to follow simple and fundamental safety rules and precautions. For this reason **MOST ACCIDENTS CAN BE PREVENTED** by recognising the real cause and doing something about it before the accident occurs.

Regardless of the care used in the design and construction of any type of equipment, there are many conditions that cannot be completely safeguarded against without interfering in the reasonable accessibility and efficient operation.

A careful operator is the best insurance against an accident. The complete observance of one simple rule would prevent many serious accidents.

The rule is simple: never attempt to clean, lubricate or maintain a machine while it is in motion.



WARNING

Prior to engaging in any maintenance, adjustment or repair operation on machines having hydraulically, mechanically, and/or cable controlled equipment (such as shovels, loaders, dozers, excavators etc.) be certain the equipment is lowered to the ground.

If it is necessary to have the equipment partially or fully raised to gain access to certain items, be sure the equipment is suitably supported by means other than the devices used for controlling the equipment.

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Hello dear friend!

Thank you very much for reading.

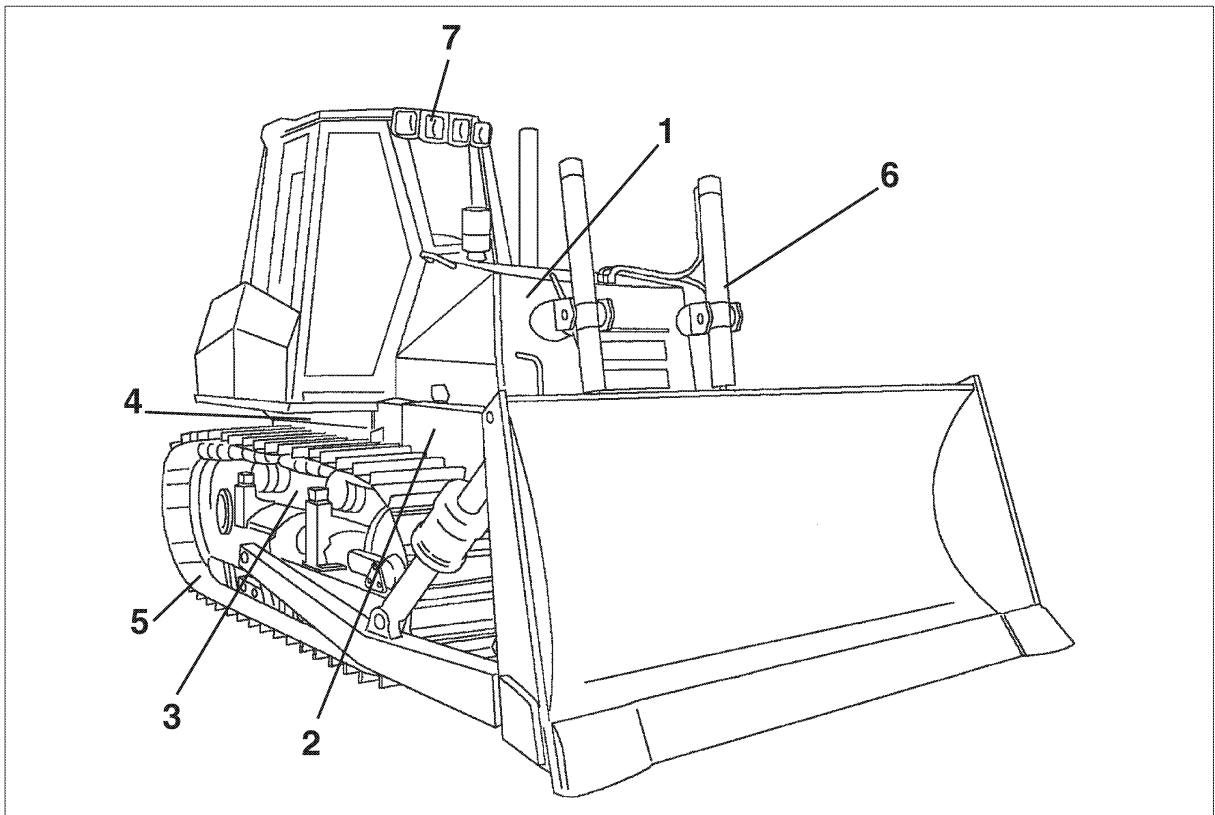
Enter the link into your browser.

The full manual is available for immediate download.

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SECTION 0
GENERALITIES

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WARNING

Study carefully this Manual before starting, operating, maintaining, fuelling or servicing the machine.

Read and heed all safety rules before any intervention.

SAFETY RULES

- Do not allow unauthorised personnel to operate service or maintain this machine.
- Do not wear rings, wrist watches, jewellery, loose or hanging apparels, such as ties, torn clothing, scarves, unbuttoned or unzipped jackets that can catch on moving parts. Wear proper safety equipment as recommended for the job. Examples: hard hat, heavy gloves, ear protection, safety glasses or goggles, reflector vests, respirator. Consult your employer for specific safety equipment requirements.
- Keep operator's compartment, stepping points, grab-rails and handles clear of foreign objects, oil, grease, mud or snow accumulation to minimise the danger of slipping or stumbling. Clean mud or grease from shoes before attempting to mount or operate the machine.
- Do not jump on or off the machine. Keep two hands and one foot, or two feet and one hand in contact with step grab rails and handles at all times.
- Do not use controls or hoses as hand holds when climbing on or off machine. Hoses and controls are movable and do not provide a solid support. Also, controls may be inadvertently moved causing accidental machine or equipment movement.
- Never attempt to operate the machine or its tools from any position other than seated in the operator's seat.
- Keep head, body, limbs, hands and feet inside operator's compartment at all times, to reduce exposure to hazards outside the operator's compartment.
- Be careful of slippery conditions on stepping points, hand rails, and on the ground. Wear safety boots or shoes that have a high slip resistant sole material.
- Do not leave the machine until it is completely stopped.
- Check the seat safety belt at least twice a year. If there are signs of wear or fraying or other signs of weakness that could lead to failure, replace it.
- Check brakes, steering and attachment controls before moving. Advise the proper maintenance authority of any malfunctioning part or system.
- Be sure all protective guards or panels are in place, and all safety devices provided are in place and in good operating conditions.
- Be sure exposed personnel in the area of operation are clear of the machine before moving it or its attachments. **WALK COMPLETELY AROUND** the machine before mounting. Sound horn.
- Before starting machine, check, adjust and lock the operator's seat for maximum comfort and control of the machine.
- Fasten your seat belt (when provided).
- Obey all flag signals and signs.
- Due to the presence on the machine of flammable fluids, never check or fill fuel reservoirs or batteries near open flames, smoking materials or sparks.
- **REMEMBER THAT STARTING FLUID IS FLAMMABLE.** Follow strictly the recommendations printed on containers and in the Operation and Maintenance Manual.
- **DO NOT PUNCTURE OR BURN CONTAINERS.**
- Containers must be stored in fresh, well ventilated places, out of reach of unauthorised persons. Follow strictly the instructions provided by the Manufacturer.
- Never use these products near open flames, smoking materials or sparks.

STARTING

- **NEVER START NOR OPERATE AN UNSAFE MACHINE.** Before operating a machine, always ensure that any unsafe condition has been satisfactorily remedied.

OPERATION

- Do not run the engine of this machine in closed areas without proper ventilation to remove deadly exhaust gases.
- Roll Over Protective Structures are required on loaders, dozers, graders, excavators. **NEVER OPERATE** machines without ROPS.
- Make sure the Operator's compartment is free of foreign objects, especially if not firmly secured. Never use the machine to transport objects, unless proper securing points are provided.

SAFETY RULES

- Check monitoring instruments at start-up and frequently during operations. In case the brake pressure gauge shows a pressure lower than the minimum operating pressure, stop immediately the machine .
- DO NOT CARRY RIDERS ON MACHINE
- Study and familiarise with escape routes alternate to normal exit routes.
- Seat belts are required by current regulations to be provided with Roll Over Protection Structures or cabs. Keep safety belts fastened around you during operation.
- For your personal protection, do not climb on or off machine while machine is in motion.
- Make sure that exposed persons in the area of operation are clear of the machine, before starting the engine and operating the equipment. Sound horn. Obey all indications provided by flags and signals.
- NEVER COAST the machine down grades and slopes with the transmission in neutral or neutralised.

Choose and shift into the most appropriate gear to keep the speed required, thus preventing any loss of control.
- Do not operate machinery in a condition of extreme fatigue or illness. Be especially careful towards the end of working shift.
- Do not operate machine with brakes out of adjustment.
- Operate the machine at speeds slow enough to ensure complete control at all times.
- Travel slowly over rough terrain, on slopes or near drop-offs, in congested areas or on ice or slippery surfaces.
- When backing, always look to where the machine is to be moved. Be alert to the position of exposed personnel. DO NOT OPERATE if exposed personnel enter the immediate work area. STOP THE MACHINE.
- Maintain a safe distance from other machines. Provide sufficient clearance for ground and visibility conditions. Yield right-of-way to loaded machines.
- Maintain clear vision of areas of travel or work. Keep cab windows clean and repaired.
- When machines are operating in tandem, the pusher (rear) must be equipped with the appropriate deflectors to protect the unit in front from the air stream coming from the radiator.
- When pulling or towing through a cable or chain, do not start suddenly at full throttle; take-up slack carefully.

Inspect carefully for flaws or troubles before using.
- Avoid kinking chains or cables. Do not pull through a kinked chain or cable to the high stresses and possibility of failure of the kinked area. Always wear heavy gloves when handling chains or cables.
- Be sure chains and cables are anchored and the anchor points are strong enough to handle the expected load. Keep exposed personnel clear of anchor points and cables or chains.
- DO NOT PULL UNLESS OPERATOR'S COMPARTMENT OF MACHINES INVOLVED ARE PROPERLY GUARDED AGAINST POTENTIAL CABLE OR CHAIN BACKLASH.
- Be alert to soft ground conditions close to newly constructed walls. The fill material and weight of the machine may cause the wall collapse under the machine.
- In darkness, check area of operation carefully before moving in with machine. Use all lights provided. Do not move into area of restricted visibility.
- If engine has a tendency to stall for any reason under load or idle, report this for adjustment to proper maintenance authority immediately. Do not continue to operate machine, until condition has been corrected.
- On machines supplied with suction radiator fans, be sure to periodically check engine exhaust parts for leaks, as exhaust fumes are dangerous to the operator.
- In case of closed type cabs, always keep an opening with the outside, to ensure a constant air circulation.
- Operators must know thoroughly the performances of the machine they are operating. When working on slopes or near sudden level drops of the terrain, avoid areas where ground is loose or soft since rolling-over or loss of control of machine could result.
- Where noise exposure exceeds 90 dBA for 8 hours, wear approved ear protection.
- When counterweights are provided, do not work machine if they have been removed.
- Overtaking manoeuvres must be performed only when absolutely necessary and unavoidable. Beware of possible uneven terrains, poor visibility conditions, the presence of other machinery or persons out of sight.
- Operate the machine at a speed adequate to the working conditions in the site and slow enough to ensure complete control at all times.
- Never use the machine as a work platform or scaffolding, nor other inappropriate operations (i.e. pushing railway cars, trucks or other machines).
- Be alert of people in the operating area of the machine.
- When operating a machine, know in advance what clearances will be encountered, overhead doors, cables, pipes, bearing load limitations of ground, bridges, floors or ramps.

SAFETY RULES

- When roading, find-out what conditions are likely to be encountered, clearances, traffic congestion, type of road surfacing, etc. Beware of fog, smoke or dust elements that obscure visibility.
- When crossing gullies or ditches, move at an angle with reduced speed after ensuring ground conditions will permit a safe traverse.
- Explore the working area to identify potential risks such as: slopes, overhangs, pits, demolition rubble, fires, ravines, ditches, soft terrain, heavy traffic, crowded parking areas, closed ambients. In such conditions, proceed with extreme care.
- Whenever possible, avoid going over obstacles such as rough terrain, rocks, logs highly irregular ground, steps, ditches, railroad tracks. When obstructions must be crossed, do so with extreme care at an angle, if possible. Reduce speed, shift-down. Ease up to the break over point, pass the balance point slowly on the obstruction and ease down on the other side.
- In steep down-hill operation, do not allow engine to over-speed. Select proper gear before starting down grade.
- Avoid side hill travel, whenever possible. Drive up and down the slope. Should the machine slipping sideways, turn it immediately downhill.
- The grade of slope you should attempt will be limited by factors such as condition of the ground, load being handled, type of machine, speed of machine and visibility.
- There is no substitute for good judgement when working on slopes.
- Avoid operating equipment too close to an overhang or high wall, either above or below the machine. Be on the look-out for caving edges, falling objects and slides. Beware of concealment by brush and undergrowth of these danger.
- When pushing-over trees, the machine must be equipped with proper overhead guarding. Never allow a machine to climb up on the root structure particularly while the tree is being felled. Use extreme care when pushing over any tree with dead branches.
- When pushing trees with dead limbs, proceed with extreme care. Avoid brush piles, logs or rocks.
- NEVER DRIVE OVER THEM or other surface irregularities that brake traction with the ground, especially when on slopes or near drop-offs.
- Be alert to avoid changes in traction conditions that could cause loss of control. DO NOT DRIVE on ice or frozen ground conditions when working the machine on steep slopes or near drop-offs.
- Working in virgin and rough terrains is characterised by the presence of all the perils and risks listed above. In these conditions, it is emphasised the danger represented by large tree limbs (possibly falling on the machine), large roots (acting as a leverage under the machine when up-rooted causing the roll-over of the unit) etc..

STOPPING

- When the machine is stopped for whatever reason, follow the instructions of chapters "**Stopping the machine**" and "**Stopping the engine**" of the Operation and Maintenance Instruction Manual.
- Always remember to position the transmission drive control in neutral and engage the control lock to secure the machine.
- The parking brake is automatically set, when the transmission safety lever is lowered.
- NEVER LEAVE THE MACHINE UNATTENDED with the engine running.
- Always, before leaving the operator's seat and after making sure all people are clear of the machine, slowly lower the attachments or tools flat to the ground in a positive ground support position.
- Return the controls to rest position. Place the gearshift lever in neutral. Disconnect the master switch and extract the key.
- Park in a non- operating and no-traffic area or as instructed. Park on firm level ground if possible. Where not possible, position machine at a right angle to the slope, making sure there is no danger of uncontrolled sliding movements.
- If parking in traffic lanes cannot be avoided, provide appropriate flags, barriers, flares and signals as required. Also provide advance warning signals in the traffic lane of approaching traffic.
- Keep head, body, limbs, feet, fingers or hands away from bucket, blade or ripper when in raised position.
- Always disconnect the master switch before any intervention (i.e. cleaning, repairing, maintaining, refuelling etc.). Do the same when parking for prolonged periods of time to avoid accidental or unauthorised starting.
- Never lower attachments or tools other than seated in operator's seat. Sound horn. Make sure area near the attachment is clear. Lower the attachment slowly. DO NOT USE FLOAT POSITION of hydraulic system.

SAFETY RULES

- Place master switch in **OFF**, securely block the machine and lock it every time you leave it unattended. Return keys to authorised security. Heed all shut-down operations of the Operation and Maintenance Instruction Manual are followed.
- Never attempt to operate the machine or its tools from any position other than seated in the operator's seat.
- When maintenance operations require moving hydraulically operated attachments by means of machine's hydraulic system remember that all manoeuvres must be made only when seated in the operator's seat. Before starting machine or moving attachment or tools, set brakes, sound horn and call for an all clear. Raise attachment slowly.

MAINTENANCE

GENERALITIES

- Before operating or performing any intervention on the machine:
 - read carefully all the rules contained by this Manual;
 - read and obey all safety related plates and instructions located on the machine.
- Do not allow unauthorised personnel to perform any maintenance operation. Do not perform maintenance operation without prior authorisation. Follow all recommended maintenance and service procedures.
- Keep operator's compartment free of all loose objects that are not properly secured.
- Do not wear rings, wrist watches, jewellery, loose or hanging apparels, such as ties, torn clothing, scarves, unbuttoned or unzipped jackets that can catch on moving parts. Wear proper safety equipment as recommended for the job. Examples: hard hat, heavy gloves, ear protection, safety glasses or goggles, reflector vests, respirator. Consult your employer for specific safety equipment requirements.
- Do not use controls or hoses as hand holds when climbing on or off machine. Hoses and controls are movable and do not provide a solid support. Also, controls may be inadvertently moved causing accidental machine or equipment movement.
- Do not jump on or off the machine. Keep two hands and one foot, or two feet and one hand in contact with step grab rails and handles at all times.
- Do not perform any service operation on the machine with a person seated in the operator's compartment, unless he is an authorised operator co-operating in the operation to be performed.
- Keep operator's compartment, stepping points, grab-rails and handles clear of foreign objects, oil, grease, mud or snow accumulation to minimise the danger of slipping or stumbling. Clean mud or grease from shoes before attempting to mount or operate the machine.
- Keep shoes free of mud or grease before climbing or driving the machine.
- Always block booms or parts of the machine which must be raised to perform interventions under them with external devices. Do not allow persons to move into the vicinities nor standing under equipment not being blocked. Unless you are totally sure about your safety, avoid staying under raised equipment, even in case it is blocked.
- Do not place the body, limbs or fingers into sharp articulation uncontrolled openings of the machine and without proper protections, unless they are blocked in a safe manner.
- Never perform interventions with engine running, except as called for in a Manual. Do not wear loose clothing or jewellery near moving parts.
- When servicing or maintenance require access to areas that cannot be reached from the ground, use a ladder or step platform that meet local and national regulations, to reach the service point. If such ladder or platform are not available, use the machine hand holds and steps as provided. Perform all service or maintenance carefully.
- Shop and/or field service platforms or ladders must be constructed and maintained in accordance with local and national regulations.
- Disconnect batteries and tag all controls according to current regulations to warn that work is in progress. Block machine and all attachments that must be raised according to current regulations.
- Due to the presence of flammable fluids, never check or fill fuel tanks, batteries, nor use starting fluid near lighted smoking materials or open flames.
- Brakes are inoperative when manually released for servicing. Provisions must be made to maintain control of the machine by blocking or other means.
- The fuel filling nose must be kept constantly inside the filling neck. Keep this contact from the beginning to the end of the fuelling operation to avoid the possibility that sparks due to static electricity are generated.
- Use only designated towing or attaching points. Use care in making attachments. Make sure pins and/or locks are secure before pulling. Stay clear of drawbars, cables or chains under load.

SAFETY RULES

- To move a disabled machine, use a trailer or a low-boy, if available. In case towing is needed, use all necessary signals required by local and national regulations, and follow the directions provided in this Manual.
- To load/unload a machine from transporter, choose a level surface ensuring firm support to the wheels of truck or trailer. Use strong access ramps, with adequate height and angle. Keep surface free of mud, oil or slippery materials.
- Anchor the machine securely to the bed of truck or trailer and block wheels or tracks with appropriate wedges.
- Never align holes with fingers or hands; always use appropriate aligning tools.
- Eliminate all sharp edges and burrs from re-worked parts.
- Use only approved grounded auxiliary power sources for heaters, chargers, pumps and similar equipment to reduce the hazards of electrical shocks.
- Lift and handle heavy parts with a lifting device of proper capacity. Be sure parts are supported by proper slings and hooks. Use lifting eyes if provided. Watch-out for people in the vicinity.
- Never pour gasoline or diesel fuel into open, wide and low containers. Never use gasoline, solvent or other flammable fluid to clean parts. Use exclusively qualified, non-flammable, non-toxic commercial solvents.
- When using compressed air for cleaning parts, use safety glasses with side shields or goggles. Limit pressure to 2 bar, in accordance with local and national regulations.
- Do not run the engine in closed areas without proper ventilation to remove deadly exhaust fumes.
- Do not smoke or permit any open flames or spark near when re-fuelling or handling flammable materials.
- Do not use an open flame as a light source to look for leaks or for inspection anywhere on the machine.
- Make sure that all mechanic's tools are in good conditions. NEVER USE tools with mushroomed heads or frayed. Always wear eye protections.
- Move with extreme care when working under the machine, its attachments and or on or near them. Always wear protective safety equipment as required, such as hard hat, goggles, safety shoes, ear plugs.
- When performing operations requiring running of the engine, have a qualified operator in the operator's seat at all times with the mechanic on sight. Place the transmission in neutral and set the brakes and safety lock.
- KEEP HANDS AND CLOTHING AWAY FROM MOVING PARTS.
- For field service, move machine to level ground, if possible, and block it. If work on an incline is absolutely necessary, first block machine and its attachments securely, then move it to level ground as soon as possible.
- Do not trust worn and /or kinked chains and cables: do not use them for lifting or pulling operations. To handle them, always use heavy gloves.
- Be sure chains and cables are anchored and the anchor points are strong enough to handle the expected load. Keep exposed personnel clear of anchor points and cables or chains.
- No bystanders are allowed near the hooking points, chains or cables.
- DO NOT PULL UNLESS OPERATOR'S COMPARTMENT OF MACHINES INVOLVED ARE PROPERLY GUARDED AGAINST POTENTIAL CABLE OR CHAIN BACKLASH.
- Keep the area where maintenance operations are performed CLEAN and DRY. Eliminate immediately all water and oil spillages.
- Do not pile oily or greasy rags; they represent a fire hazard. Store in closed metal container.
- Before starting machine, check, adjust and lock the operator's seat for maximum comfort and control of the machine. Be sure exposed personnel in the area of operation are clear of the machine before moving it or its attachments. Sound horn.
- Rust inhibitors are volatile and flammable Use only in well ventilated areas. Keep open flames away - DO NOT SMOKE - Store containers in a cool well ventilated place, secure against unauthorised personnel.
- Do not carry loose objects in pockets that might fall unnoticed into open compartments.
- Wear proper protective equipment such as safety goggles or safety glasses with side shields, hard hat, safety shoes, heavy gloves when metal or other particles are apt to fly or fall.
- Wear welders protective equipment such as dark safety glasses, helmets, protective clothing, gloves and safety shoes, when welding or burning. Wear dark safety glasses near welding zones. DO NOT LOOK AT ARC WITHOUT PROPER EYE PROTECTION.
- Know your jacking equipment and its capacity. Be sure the jacking point used on the machine is appropriate for the load to be applied. Be sure the support of the jack at the machine and under jack is appropriate and stable.

SAFETY RULES

- The load lifted by jacks is always dangerous: it is necessary to transfer loads to appropriate blocking as a safety measure, before proceeding with service or maintenance work, according to local or national regulations.
- Steel cables are frayed after prolonged use; always wear appropriate protections (heavy gloves, goggles etc.).
- Handle all parts carefully. Keep hands and fingers away from structures, gears or moving parts. Use and wear always the appropriate protections
- Compressed air systems can have water deposits created by moisture condensation due to changes of atmospheric conditions. If required, discharge deposits, as instructed.

STARTING

- Do not run the engine in closed areas without proper ventilation to remove deadly exhaust fumes.
- Do not place head, body, limbs, feet, hands or fingers, near rotating fans or belts. Be especially alert near pusher fans.

ENGINE

- Loosen the radiator cap very slowly, to release pressure from the system, before removing it. All coolant level top-ups must be performed with engine OFF.
- Avoid that flammable materials touch exhaust parts. Should this be possible, provide the necessary protections.
- Do not run engine when refuelling and use care if the engine is hot due to the increased possibility of a fire if fuel is spilled.
- Never attempt to check or adjust fan belts when engine is running.
- Do not adjust engine fuel pump when machine is moving.
- Do not lubricate the machine with engine running.
- Do not run the engine with air intakes, door or protections open.

ELECTRICAL SYSTEM

- Disconnect batteries prior to any intervention on machine or electrical system (cleaning, repair, maintenance).
- Should booster batteries be used, remember to connect both ends of the booster cables in the proper manner (+) with (+) and (-) with (-). Avoid short-circuits of the terminals. Follow thoroughly the instructions of this Manual.
- Before any intervention, make sure that the main switch is OFF.
- BATTERY GAS IS HIGHLY FLAMMABLE. Leave battery box open to improve ventilation when recharging batteries. Never check charge by placing metal objects across the posts. Keep sparks or open flames away from batteries. Do not smoke near battery to guard against the possibility of causing an explosion.
- Before any intervention, make sure that there are no fuel or electrolyte leakages; eliminate them before proceeding with further work. When recharging batteries in closed ambients, make sure that there is appropriate ventilation to prevent possible accidental explosions due to the accumulation of gases generated during the recharge.

HYDRAULIC SYSTEM

- Fluid escaping under pressure from a very small hole can be almost invisible and can have sufficient force to penetrate the skin. Use a piece of cardboard or wood to search for suspected pressure leaks. DO NOT USE HANDS. If injured by escaping fluid, see a doctor at once. Serious infection or reaction can develop if proper medical treatment is not administered immediately.
- Stop the engine and release all pressures in the system before removing panels, housings, plugs or covers.
- In case pressures must be measured, use instruments of adequate capacity. Always follow the recommended procedures.

SECTION 1

ENGINE

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1.2	DESIGN FEATURES	3
1.3	SERVICEABILITY	8
1.4	SECURING THE ENGINE TO THE FRAME	9

For the disassembly, inspection, overhaul and re-assembly of the series B engine, please refer to print no. 604.02.272 (English)

The main specifications and data of the engine installed on 1650K are listed here below

1.1 GENERAL SPECIFICATIONS OF SERIES B ENGINE

1.1.1. ENGINE MAIN SPECIFICATIONS

6BT 5.9

Number of cylinders	6
Bore	102 mm (4 in)
Stroke	120 mm (4.72 in)
Total displacement	5.88 litres (1.55 US Gal)
Net flywheel power (DIN 6270)	140 HP/104 kW
Net flywheel power (SAE J1349)	104 kW
Net flywheel power (ISO 9249)	104 kW
Net flywheel power (EEC 80/1289)	104 kW
Engine weight dry less flywheel and electrical equipment	399 kg (880 lbs)
Firing order	1-5-3-6-2-4
Idle speed	950 rpm
Maximum no-load speed	2300 rpm
Maximum torque speed	1600 rpm
Maximum power speed	2100 rpm
Maximum torque	600 Nm at 1600 rpm
Clearance between valves and rocker arms	
Intake	0.25 mm (0.009 in)
Exhaust	0.51 mm (0.020 in)
Compression ratio	17.5 : 1
Direction, seen from the front side of engine	clockwise
Air intake	turbo charged
Lubrication system	
Lube pressure at low idle	0.69 bar (10 psi)
Lube pressure at setting speed	2.07 bar (30 psi)
Cooling system	
Coolant capacity	9 litres (2.38 US Gal)
Setting of thermostat	
Start	83° C (181° F)
Maximum opening	95° C (203° F)
Radiator cap pressure with system at 104 °C (220 °F)	1.03 bar (14.9 psi)
Air intake system	
Maximum allowable restriction on intake at rated speed and load with clogged cartridge	635 mm H ₂ O
Exhaust system	
Maximum allowable restriction on intake at rated speed and load	76.2

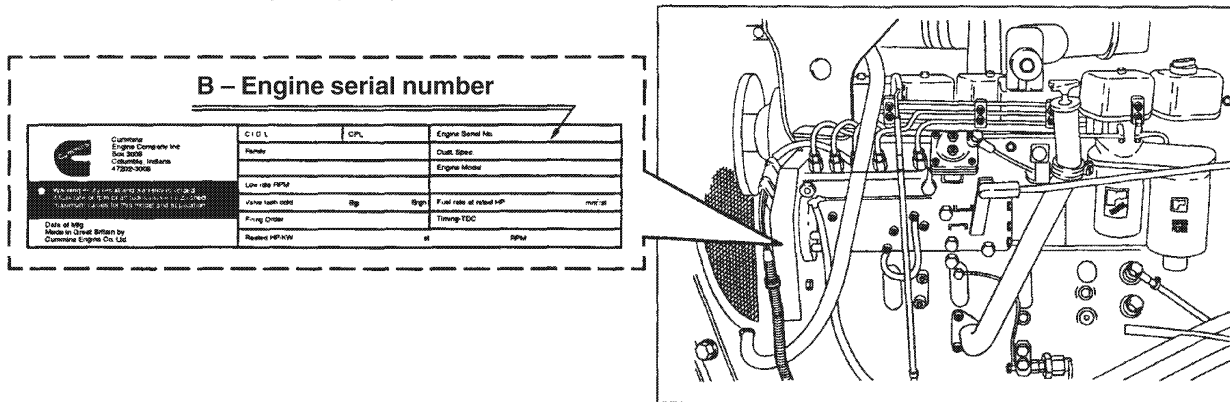
1.1.2 Engine identification

Engine data plate

The engine data plate includes identification data and other important information relative to the engine.

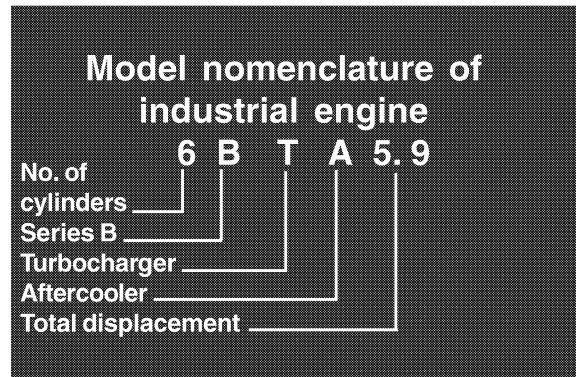
Always have the following engine data available when communicating with a Cummins authorised repair Centre. The information on the data plate are essential when ordering spare parts.

To order parts it is necessary to specify
 Serial number of the engine (E.S.N.)
 Check list of the parts (CPL)



Engine are designated as follows:

The first digit indicates the number of cylinders, the letter to follow identifies the series of the engine, the remaining alpha digits indicate the air intake (T = turbo charged) and the last digits indicate the total displacement in litres.



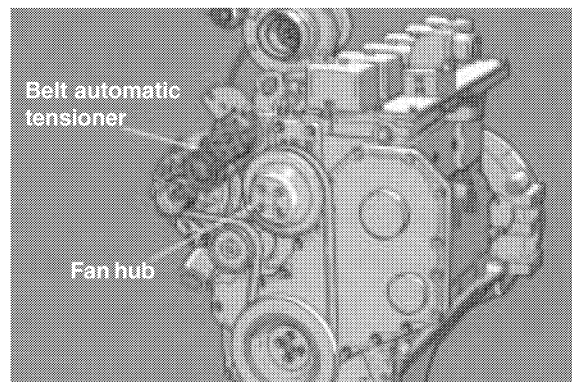
The total displacement of the engine is 5.88 litres (1.55 US gal), the bore is 102 mm (4.01 in) and the stroke 120 mm (4.72 in).
 The firing order is the same as for all other 6-cylinder, in-line Cummins engines, 1-5-3-6-2-4.

Specifications of engine 6B 5.9

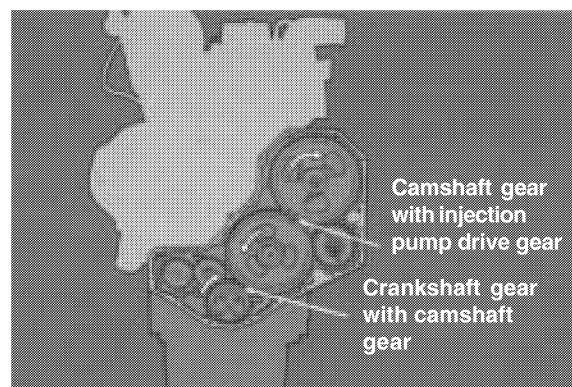
Total displacement	litres 5.88	(1.55 US gal)
Bore	mm 102	(4.01 in)
Stroke	mm 120	(4.72 in)
Firing order	1-5-3-6-2-4	

1.2 DESIGN FEATURES

An automatic belt tensioner is used to provide a correct tension. On series B a variety of mounting positions for fan hubs and belt tensioners usable for auto, industrial and marine applications are available. This front view of the engine illustrates a belt driven fan hub.

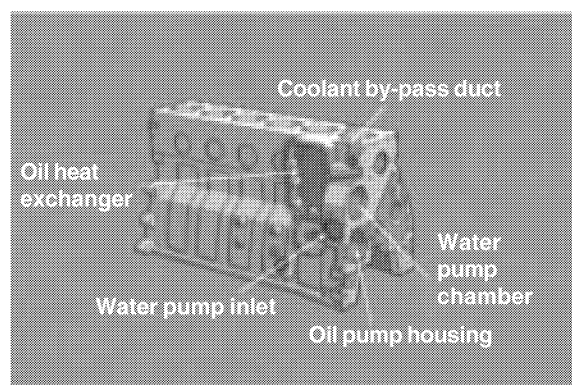


This is the gear train available on Series B engines. All gears are hardened and of an helicoidal teeth type for strength and silent operation. The alignment with reference marks is used between crankshaft gear and camshaft gear. On engines equipped with rotary injection pumps, the timing alignment occurs between the injection pump gear and the camshaft gear. Engines equipped with in-line injection pump do not require a timing between injection pump and camshaft.



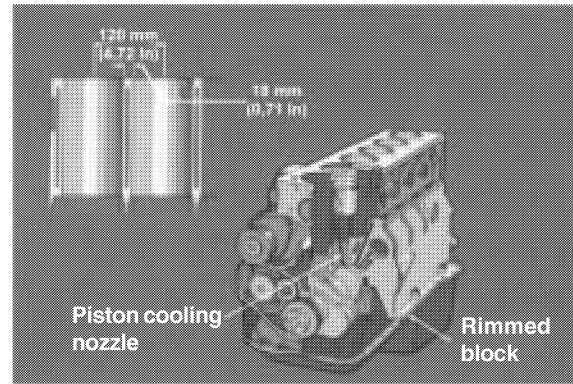
The cylinder block incorporates several innovative design features. The block casting includes arrangements for:

- Oil heat exchanger housing;
- Water pump intake;
- Oil pump housing;
- Water pump chamber;
- Coolant by-pass duct.

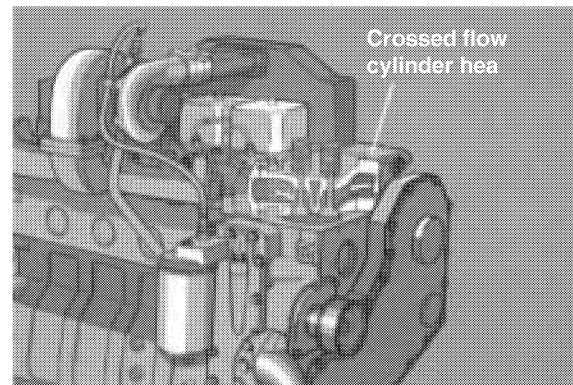


Other design features of the cylinder block casting require:

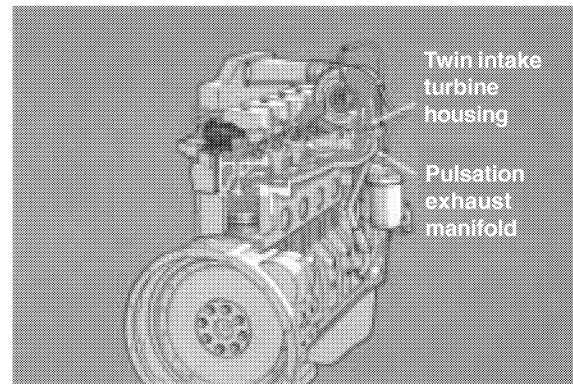
- A block design with a rim for higher strength;
- Bored cylinders for pistons with 120 mm (4.72 in) centre to centre distance and 18 mm (0.71 in) cylinder, so that space is provided to a dry sleeve, if required by service interventions;
- Piston cooling.



The cylinder head is a single piece designed for a crossed flow with two valves per cylinder. This feature maintains the exhaust energy, cooling slightly, the short exhaust gaps.

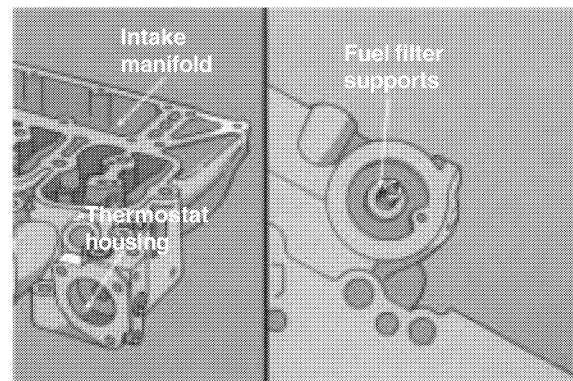


An exhaust manifold of a pulsation type coupled to the turbine housing with twin intake is used to improve the efficiency of the engine.

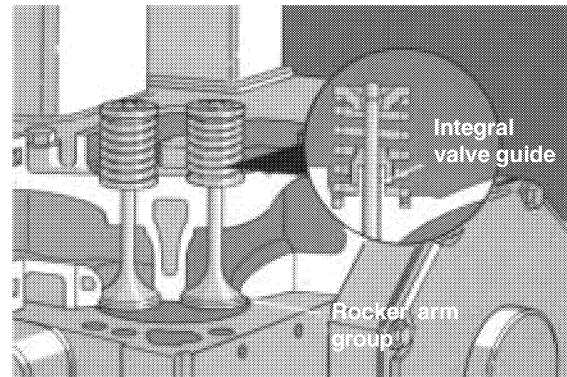


The design of the cylinder head includes:

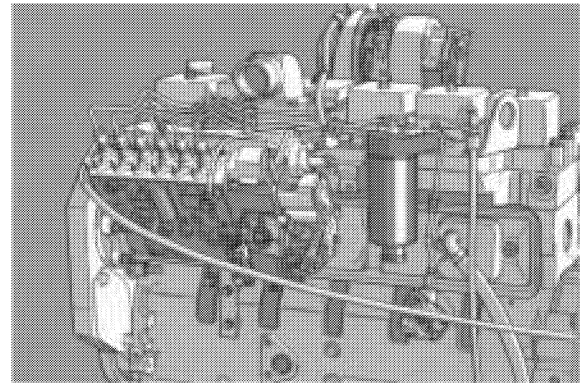
- Integral intake manifold
- Integral thermostat housing
- Integral fuel filter housing



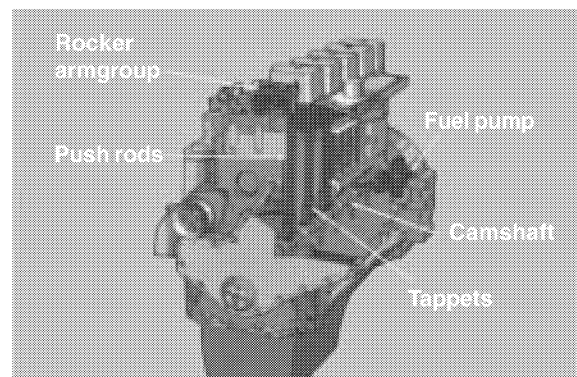
An additional design feature of the cylinder head includes cast integral valve guides and hardened valve seat surfaces. Service parts and procedures are available for grinding operations and installation for valve guides.



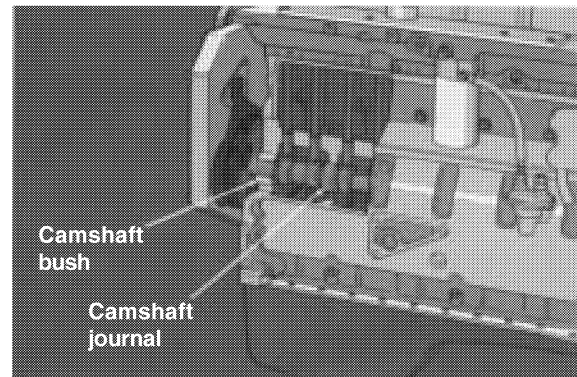
The length of the injection pump requires the repositioning of the fuel filter toward the rear of the engine. This is possible by using a distance filter support.



The timing is composed of a camshaft, tappets, push rods and rocker arm group. Besides the intake and exhaust valve cams, the camshaft has a special cam to power the fuel pump.

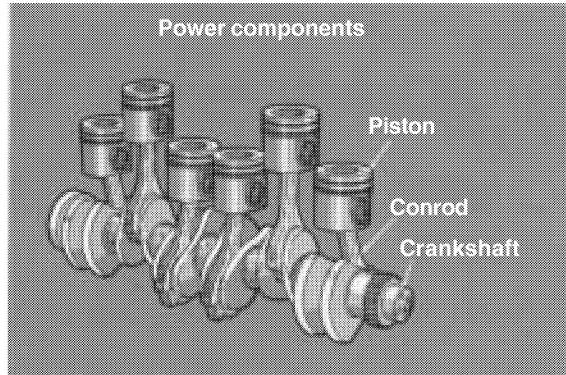


A single bush of the camshaft, located in the first shaft bore, is used to support the axial thrust of the accessory drives. The remaining journals turn in the camshaft bores in the cast iron block. Service bushes and the procedure to grind and install bushes for all journals of the camshaft are available.

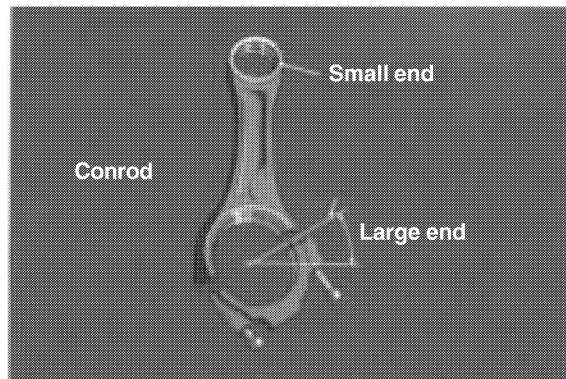


The power components of the engine are distinguished for special features

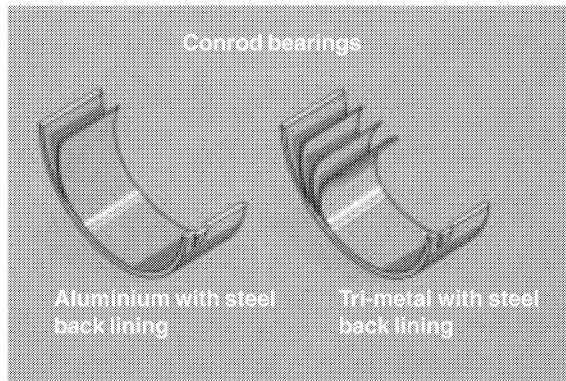
- Piston
- Conrods
- Crankshaft



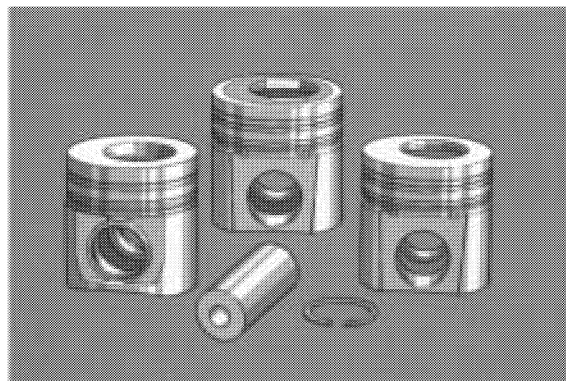
The conrod is of an angled split type. This design allows having the largest possible big end, to provide strength and long life. The design of the angled split employs a larger surface bearing, thus improving the wear resistance. A piston ceiling oil jet lubricates the bush of the conrod small end.



Naturally aspirated engines use aluminium conrod bearings lined, at the rear, by steel, whereas turbo charged engines use tri-metal bearings lined at the back by steel. Service bearings are of the tri-metal type with steel back lining.

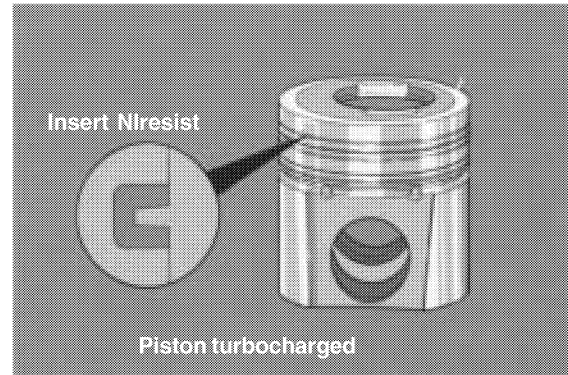


Emissions, applications and power settings determine the type of pistons to be installed on the engine. Similar features of the pistons are a high turbulence top chamber, a free floating pin held by circlips and cast aluminium bodies.

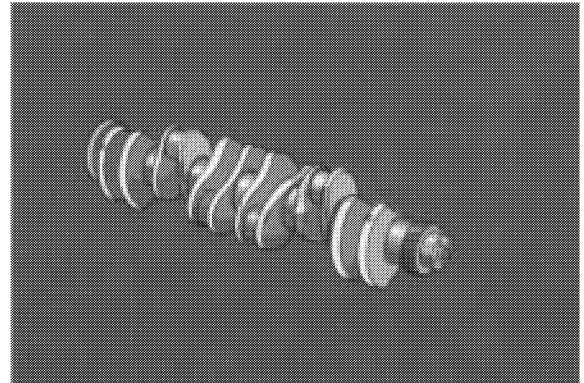


Turbocharged engines use pistons with three ring seats. a single high nickel content insert with a Keystone profile ensures optimised anti-wear features to the upper ring seat. The most powerful turbocharged engines use an anodised lining on the piston face and on the head to increase life.

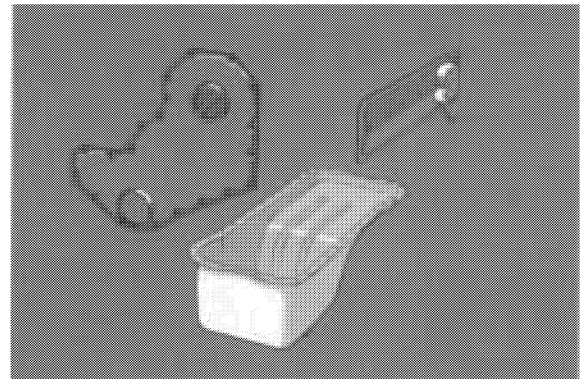
Always check the spare part numbers or be sure about the right configuration of the piston to be used as a replacement.



The crankshaft is an integral steel forged balanced component. Crossed inner drillings provide lubrication to the conrod bearings. The main and conrod journals are significantly larger than competitive engine crankshafts.

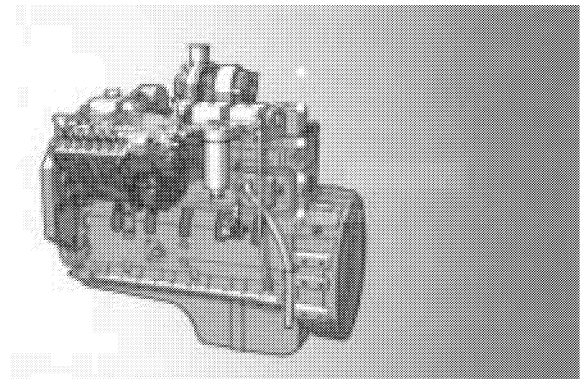


Another technical feature is the use of pressed steel parts to reduce the engine weight. These light components include the timing gear cover, valve cover with breather group and engine sump.



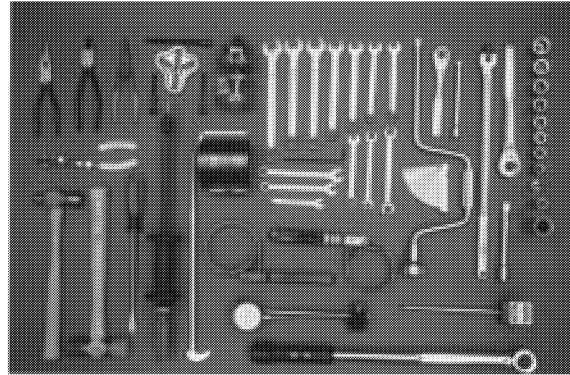
The design objectives are:

- Simplicity
- Reliability
- Durability
- Reduction of components
- Better serviceability



1.3 SERVICEABILITY

No special tools are required for routine overhauls on series b engines. The tools required are those illustrated hereby.



No special repair/rebuild procedures are required for series B engines. Normal high quality standards applicable for engines of similar power are adequate.

Rebuilding procedure:

- Disassembly
- Replacement of worn parts
- Grinding the valves
- De-glassing of sleeve walls
- Cleaning the cylinder head and cylinder block
- Re-assembly

The Cummins engine Company developed repair tools usable to maintain, overhaul and repair series B engines: Please refer to CUMMINS Manuals to troubleshoot failures and to define the tooling.

Repair tools



Suggest:

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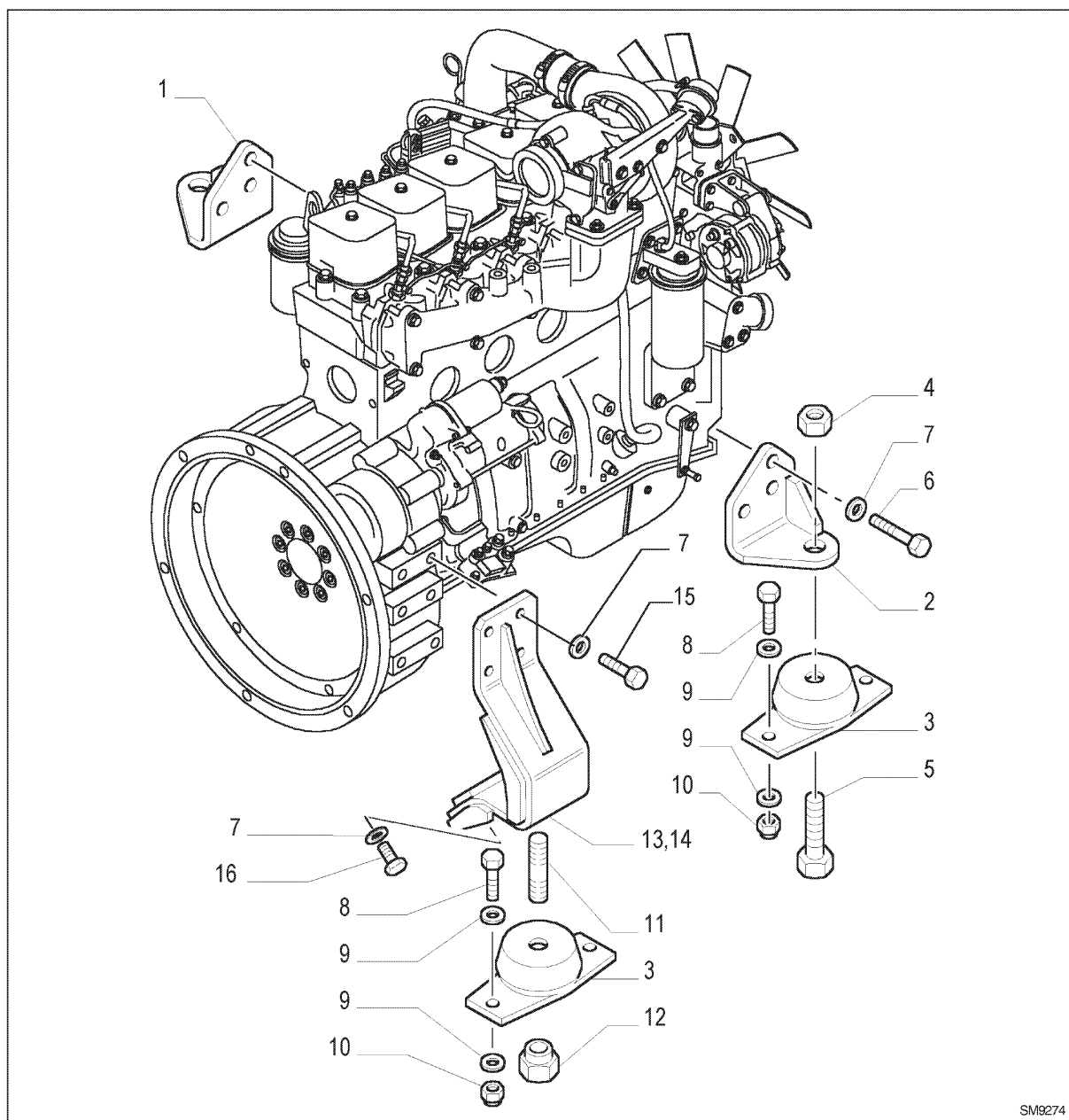
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1.4 SECURING THE ENGINE TO THE FRAME



SM9274

N.	Description	Tightening torque	N.	Description	Tightening torque
1	L. h. support		9	Washer 16x30x3	
2	R. h. support		10	Nut 16x1.5x18	
3	Block		11	Stud	47.5 to 52.5 daNm (350.31 to 387.19 ft lbs)
4	Nut 24x2x28		12	Nut	
5	Screw 24x2x80	41 to 45 daNm (302.38 to 331.88 ft lbs)	13	Support - rear left	
6	Screw 12x1.75x30	17 to 18.5 daNm (125.38 to 136.44 ft lbs)	14	Support - rear right	
7	Washer 12x24		15	Screw 12x1.75x40	
8	Screw 16x1.5x50	32.5 to 35.5 daNm (239.69 to 261.81 ft lbs)	16	Screw 12x45	

Carefully read personal and machine SAFETY PRECAUTIONS (at the beginning of this manual)

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