TECHNICAL NOTES SERIES

JOWETT JAVELIN – PA, PB, PC, PD & PE
JOWETT JUPITER – SA & SC

Above: The part of the right-hand side crankcase-half, which generated the subject of these Technical Notes. In this photo, the horizontal crack was the crack that appeared two days after the cylinder head had been tightened. See Figure 1. The vertical crack aligned with the stud thread reveals a Recoil thread insert, a previous attempt at a thread repair.

– PART XII –

ENGINE CRANKCASE REPAIR TECHNIQUES

These Technical Notes Should Be Used In Conjunction With Part VIII

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With assistance from Neil Moore, JCC (NZ).

Revised – TBA

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SECTION 1.

Introduction

Figure 1.

Shown in *Figure 1*, left above, is the crack at the RHS crankcase half that appeared two days after the cylinder head had been tightened in place. Note that the coolant inlet tube weld assembly had been installed prior to the cylinder head studs' sequence of tightening in three stages. Also, note that the crack has appeared slightly outboard of where such cracks usually appear. At the time, this was mystifying.

Crankcase Repair Preparation

First, an attempt was made to carry out a repair, with the cylinder head remaining in place. The crack, as revealed externally, was grooved out and the repair weld gave the impression that the welded area was sound. This was not so, because as soon as coolant water was poured into the radiator, there was a cascade of leaking water at the cylinder head gasket area close to where welding had been carried out.

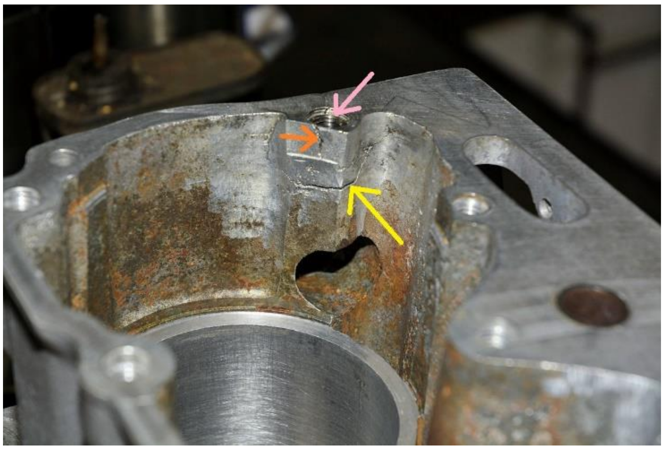


Figure 2.

After the cylinder head was removed, inspection showed that damage due to cracking, was a great deal more than expected. *Figure 2* shows the extent of the crack damage, with the yellow arrow indicating the initially visible crack. The orange arrow indicates a further crack aligned with the threaded stud hole. This crack was through both sides of the threaded hole. The pink arrow shows that a Recoil® thread insert had been fitted at some time. A decision was quickly made to completely dismantle the engine so that appropriate repairs could be effected. It was decided to make an entirely fresh start.

Before any repair work could commence, a set of new cylinder head studs were machined from stainless steel rod. During the engine's first assembly it had been noticed that the cylinder head studs protruded through the nuts by differing amounts. The extreme case was where a number 4 stud finished up well below the outer surface of the nut. To resolve this concern, cylinder head stud dimensions were carefully measured and given individual part numbers. The format used was, as per the example: **Part No. 50636-2L** where:

50636-	The original Jowett part number.
2	The number of the stud as shown in the Maintenance Manual tightening sequence.
L	Indicates LHS crankcase half.

Using this method created an individual part number for each cylinder head stud, to successfully accommodate the differing lengths of the proposed studs. The reason for the different length requirement was due to the 0.125" counter-bore onto the crankcase, that supports the stud shank, being at various depths due to stripped threads and Recoil thread insert installation. After calculating all of the stud lengths, except for the Number 1 oil feed stud, a zip-top plastic bags were labelled with the appropriate identifying part number for each stud.

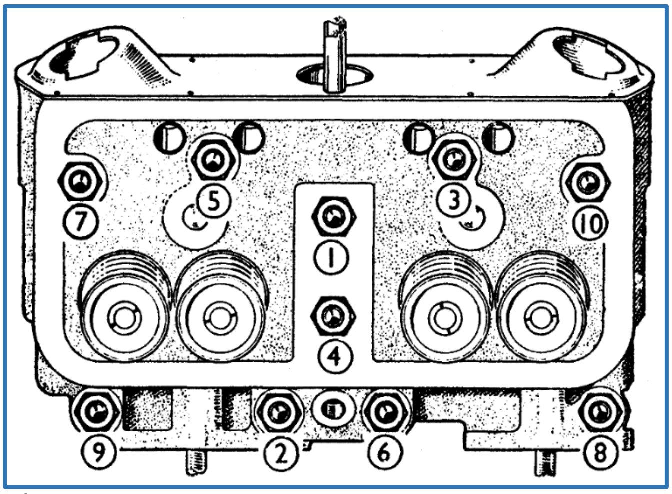


Figure 3.

Appendix (i) shows how the calculations were made and then, not to scale, sketches for each stud were made.

A decision was made, early on, to adopt a Jowett Engineering Ltd. modification to the cylinder heads studs at number 10 (LHS) and number 7 (RHS). The modification calls for an extension of the studs' length where they thread into the crankcase, right through the coolant inlet ports and into the inner sides of those ports. This calls for special studs with 3⅛" total thread length that screws into the crankcase. At the point where the studs pass through the coolant ports, the threads are machined to the thread's root diameter to present less restriction for coolant flow into the engine. *Figure 4* shows a photo of such a cylinder head stud. The portion of the stud that screws into the crankcase is at LHS of *Figure 4*. These studs were used in late PE engines, and in those works reconditioned engines supplied by Jowett Engineering Ltd. until 1963.

Figure 4.

SECTION 2.

Commencing The Repair

Before taking the RHS crankcase half to a machine shop, the Recoil thread insert had to be removed. This was not at all easy, because a stud had been previously installed with Loctite® Studloc™ 263 that had been used to hold the stud in place. It was necessary to remove the insert in case of drama while cutting away the parent metal in preparation for weld build-up. Recoil do make a special tool for insert removal, however, the tool that is suitable for removing a ⅜" BSF insert, had to be modified to be able to be used inside the counter-bore in the crankcase which meant that it had to be modified to suit ⅜" and lesser sized inserts only. Once modified and a tail end of the insert had been exposed, it was gripped securely with slim pointed self-grip pliers and wound out of the crankcase.

The Machining Operation

The crankcase half was set up on the table of a large milling machine. Once located in position, *Figure 5*, it was clamped in place so that milling away the cracked metal could commence. A large cutter was fed into the affected area until there was clean, original metal.

Figure 5.

This is where matters became interesting. In a portion where the original crack had one end, there was an enclosed chamber, about the size of a small pea, that most likely resulted from the original pouring of the casting. It was probably a starting point for the crack. The gaseous chamber can be seen, to the right of, and above the mill cutter in *Figure 6*, towards the push rod port.

Figure 6.

Parent metal was carefully removed with different shaped mill cutters, until there was only clean metal for the weld repair activity.

Once the inside of the coolant jacket wall had been cleaned up, attention was concentrated on the crack where it was revealed at the outside the crankcase. The material was cut away from the original, unsuccessful, weld repair along the threaded hole, see *Figure 7*.

Figure 7.

Once the weld preparation had been completed, the weld material was laid down larger than was strictly necessary, to allow machining for the cylinder liner and its lip to pass through and into the home position.

Final Machining Operations

After the welding task had been completed, the crankcase half was again set up on the milling machine table and a fly-cutter was used to machine the clearance diameter recess for the outer lip of the cylinder liner. Then the rest of the excess weld material was machined so that the liner could be seated in its bore in the crankcase half. Once this operation was completed, the mill table was positioned so that, after fitting the cylinder head on four studs and tightening down, a drilling jig sleeve could be inserted to guide the tapping size drill.

For this operation, we had to assume that the cylinder head stud holes (threaded) were drilled at right angles to the crankcase joint face. A long series $^{21}/_{64}$" diameter drill was used to deep drill through the coolant inlet port into the parent metal beyond the port opening. Then, the ⅜" BSF long-series tap was employed to cut the deep thread, using copious amounts of cutting fluid. A small tap wrench was placed over the square drive end of the tap and a centre pilot was used in the mill head's collet holder, to engage with the counter bore in the end of the thread tap's shank, to hold it vertical while the thread was being cut. The new tap worked perfectly. After the thread cutting had been completed, a ⅜" mill bit was used to cut the 0.125" counter bore for the stud's shank. Thus we had a successful repair.

Modifying The LHS Crankcase half

The plan, initially, was to carry out the modification in the home workshop. This required a degree of patient work for preparing for the deep drilling operation. First of all, the bench drill had to be accurately set up so that the table was in a level plane and at right angles to the drilling machine's post. The table face required a degree of adjustment. The arm assembly for the table features an adjustable ½" locking bolt so that the level can be set. In the lower face of the arm there is a ¼" adjustable setscrew that facilitates the adjustment for true square, i.e. a try square sitting on the table and positioned on the table, so the drill's pedestal pillar is at exact right angles to the table – in both planes. See *Figure 8*. The set-up involves a fair amount of trial and error at the radial clamping bolt and the adjuster setscrew, while maintaining the table is a level position. A very small adjustment for final fine tuning. After initial set up, it is best to leave and come back later for a final check and, maybe, further adjustment.

Figure 8.

The LHS crankcase half did not require welding and, therefore, was a good candidate for the home workshop to save some costs. There was a snag that had to be overcome. It was soon discovered that the commercial tap size drill for the ⅜" BSF thread, $^{21}/_{64}$" diameter, was not able to pass through the existing thread, so that a deeper hole could be drilled. Investigation soon revealed that a Recoil thread insert had been installed to repair yet another stripped thread. This was all very well, but a slightly smaller thread diameter, 0.3181" suggested that the tapping size drill, at 0.3281" diameter would act as a broach entering the Recoil thread insert. This would have caused serious problems. This situation left just two options and, because the parent metal was aluminium the deeper thread was being tapped into, meant that a slightly smaller drill could be used, The first option would be to use an 8 mm long-series drill bit, thus providing 0.003" (or three-thou) running clearance. The other option would have been a letter 'O' size drill bit that would have provided 0.002" running clearance, likely a bit tight with drill flutes rotating inside a Recoil thread insert.

A new, second cut, ⅜" BSF thread tap was carefully run through the Recoil insert's thread, very carefully using the quarter turn to cut and then half a turn backwards using copious amounts of cutting fluid. Great care needs to be taken with such a task, too much haste could result in the insert continuing on through the hole. Finally the insert was finished, ready for an 8 mm drill bit to pass through. All through this exercise, a stud could be threaded into the hole, a bit disconcertingly tight at first, but nice and snug at the finish. It was a good feeling to have a good result for a change.

Deep Drilling The Crankcase

First, and most important, a good quality long series drill bit must be used. A suitable drill bit can be obtained from a good industrial supplies type of shop. A & A Industrial Supplies in Bayswater, Victoria are a very good shop for such engineering needs. Do not be tempted by cheap imitations from places like Bunnings Warehouses. Only use drill bits from a well-known brand, such as Sutton – for accuracy and long life.

While on the subject, the long series thread tap must also be of good quality. Fortunately, the shop could obtain one off the shelf from their supplier. This was a most pleasant surprise indeed. The expectation was that a special tap would need to be made for the customer, at great expense. The cost of the ⅜" BSF long-series tap, from Sutton, was just $80.00.

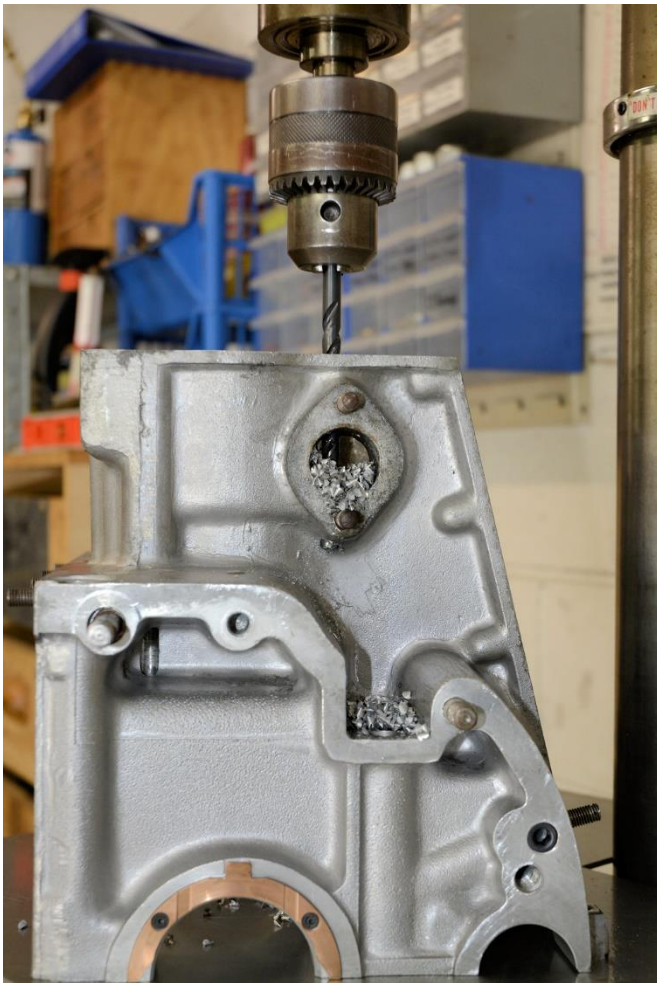


Figure 9.

After the 8 mm diameter drill bit breaks through into the coolant inlet port, as shown in *Figure 9*, great care must be taken while feeding the drill into the far side of the port. Very gently apply enough feed pressure to allow the drill bit to establish a round hole in the parent metal. Once the drill bit is established and is making a clean cut, continue drilling until it breaks through the side of the coolant inlet flange. The reason for allowing the hole to break through, is to permit thorough cleaning away of drill and tap swarf. It also prevents air being compressed as the stud is installed.

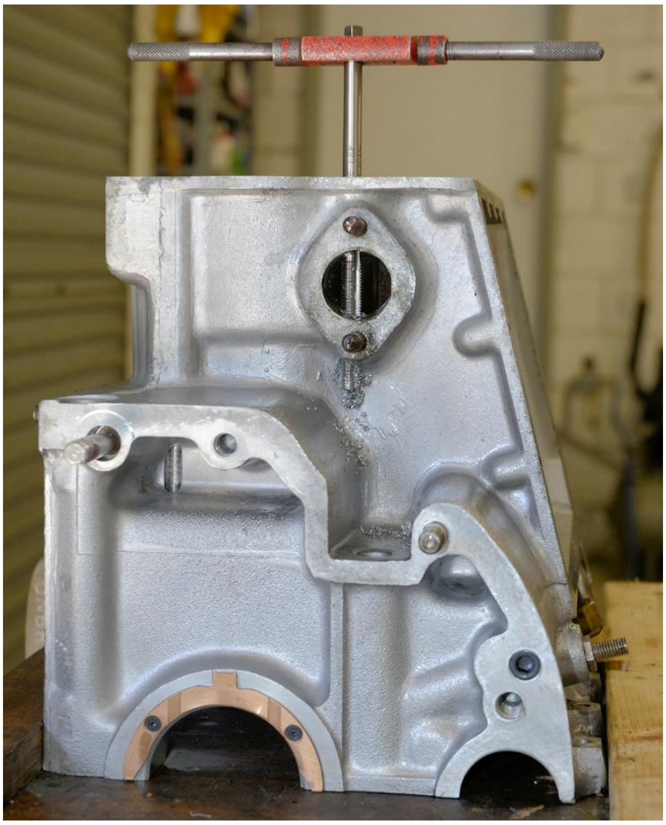


Figure 10.

Figure 10, shows the long series tap being used to cut the ⅜" BSF thread into the far side of the coolant port. Note that the thread of the tap is still engaged with the outer portion of the crankcase, thus forming a continuous thread for the studs to follow into their home position.

Figure 11.

Figure 11, shows a stud being installed. This was a very satisfying experience.

Note: The crankcase half, is shown in *Figure 11*, placed on a wooden work surface, this is important to help prevent damage to the crankcase joint face and, also note that the crankcase half is located by two pieces of scrap dressed timber clamped to the work bench to prevent the crankcase half from sliding during the thread cutting process.

These extended studs will be final-installed using Loctite 518 as the sealant/retainer to prevent coolant migration. Once the studs are installed, excess Loctite 518 should be wiped away with a rag soaked in methylated spirits, the end of the stud, where it protrudes, can then be sealed with a covering formed from Permatex Cold Weld. The exclusion of air from the area will allow the Loctite 518 to properly cure for perfect sealing and stud retention.

SECTION 3.

Thread-coil Insert Repairs

Most commonly, repairs using thread coil inserts such as Helicoil and Recoil brands are used to repair stripped threads. Typically, these coil inserts (that have been supplied with an installation kit) have been significantly shorter than the depth of threads in the crankcase halves. Crankcases have been found with two short coil inserts to make up the depth of the original thread. This practice can be disastrous, because as a stud is threaded into the pair of coils, should there be any resistance to the stud, the inner end of the outer coil insert can climb over the lead coil's trailing edge, thereby making a very effective obstruction for the stud being screwed home. Attempting to unscrew the stud can be made very difficult due to the self-locking effect of the two partially overlapping coils. Fortunately for us, currently, longer thread ⅜" BSF coils are readily available from Recoil, that can be suitable for cylinder head stud installations.

In cases where two short coils have been installed, and the lead edge has ridden over the first coil's tail, it is advisable to extract the two thread coils using sharp instruments and a good pair of pointed nosed pliers to wind the coils out of the crankcase. Attempts to 'clean-up' the coil overlap with a ⅜" BSF thread cutting tap, usually end up with a broken tap, mainly due to the self-locking action of the thread coils.

By far the easiest option is to winkle out a short thread coil and, providing the coil's thread is deep enough, simply install a longer coil using the supplied tool. It is a good idea to count the thread pitch (20 threads per inch) in the hole, and then count the same number on the Re-coil thread-coil, and if necessary, use a sharp pair of side cutters to nip off the excess coils. If the thread is deep enough to accommodate a full length thread-coil with room to spare, care must be taken to ensure that there is the required 0.125" counter-bore, as the coil is wound into place. With ⅛" counter-bores the original cylinder head studs should be of consistent height above the cylinder head gasket surface.

APPENDIX (i)

Stud Length Calculations

It should be noted that the depth of the drilled holes in the crankcase sets can vary by quite significant amounts, mostly, due to repair work carried out by repairers who, over the years, may not have had much experience with regard to working on engines with aluminium crank-cases. Too often, oil leaks at joints, such as at the rear timing cover and at the cylinder head gaskets, attempts have been made to effect repairs by setting the securing hardware tighter than specified in the Jowett Javelin and Jupiter Maintenance Manual.

This type of repair methodology often ends with a degree of distress, generated by wholly stripped-out threads in the crankcase.

Because thread repairs have been carried out in differing ways, the length of the cylinder head studs can easily be noted. An engine should be carefully examined before removing the cylinder heads. One obvious giveaway of trouble ahead, is the situation where uneven amounts of stud threads are protruding from the cylinder head nuts, or, finish up below the outer surfaces of the nuts. This can be a little bit deceptive, because there could well be some thinner nuts used in the engine's previous overhaul activities. All cylinder head nuts are thicker than the standard ⅜" BSF nuts used by Jowett Cars Limited. It is understood that later engines of PD, PE and Jowett Engineering reconditioned engines featured even thicker cylinder head nuts and, in some cases, longer cylinder head studs to accommodate them.

The majority of crankcases feature stud holes that have been counter-bored to accommodate the ⅜" diameter of the stud's shank. It appears to be the case that the factory counter-bore depth is ⅛" (0.125"), however on used crankcases, the depth can be anywhere between 0.125" to, in one instance, 0.536". That may seem to be alarming, but with the state of some repairs, the ⅜" clearance bore can be deep because thread-coil inserts that are too short have been used in a previous repair. Hence the great variance of stud protrusion seen on some engines. It is heartening to know that steps can be taken to correct the sunk studs disorder.

Calculations For Dedicated Studs

A suggested method of calculating stud dimensions is shown at Appendix (ii).

In some cases, deeper cylinder head stud counter-bores will have to be used. There is a procedure for measuring the drillings for the studs, the counter-bore depth, cylinder head gasket thickness, the dimension of the cylinder heads between the gasket face and the faces where the washers seat, the washer thickness and the cylinder head nut thickness – plus a degree of excess to cope with the studs settling into the crankcase as they are tightened home. Say, 0.125" for this.

Using the following system, it should be noted that every cylinder head stud could be of an individual length. This depends on the state of the crankcase and, very likely, who has been there before. The tables shown in Appendix (ii) can be used for making the necessary cylinder head stud length calculations.

First, the crankcase halves must be thoroughly cleaned, all sealant residue must be cleaned from gasket surfaces prior to taking any measurements. Place a crankcase half on a clean wooden surface, so that it stands on its joint face. Examine each thread carefully and, if appropriate, use a 'bottoming' ⅜" BSF tap to ensure that the thread does reach the inner end of the hole. Use compressed air to clean out any metal particles that may have gathered inside the threaded hole.

It is best to have a good quality Vernier gauge and a suitable straight edge for taking measurements in accordance with the tables shown. Also, it is a good idea to have an electronic calculator at hand. If using a digital Vernier gauge, make sure that its battery makes good contact inside its housing. Confusing readings can be the result of poor electrical contacts. A hint, in the battery compartment, prise upwards the negative contact and insert under it a small piece of self-adhesive drought excluder foam. This will help the battery make a sound electrical supply. Gently push the battery into place and install its cover. Be sure to take measurements, one crankcase half at a time, starting with the left hand side, in the following sequence of steps:

1. Making use of the cylinder head nuts' tightening sequence, see *Figure 3*, commence by carefully measuring the overall depth of Number 2's threaded hole from the gasket surface to the inner end of the hole. Write this dimension into the top table box for stud number 2.
2. It is a good idea to thread a clean, free-running, nut on to a long thread ⅜" BSF setscrew with its flat face towards the thread end of the bolt. Grind the end of the bolt's thread flat. Insert the bolt into the counter-bore and spin the nut towards the gasket face until it just makes contact. Measure the distance from the bolt's thread end to the underside of the nut. This is the depth of the counter-bore. Write it in the box below the first entry.
3. Use the calculator to subtract value recorded in Step 2, from that recorded at Step 1. This will provide the calculated thread length in the crankcase. Write the calculated thread depth into the next box provided.
4. Place the LHS cylinder head, with its gasket face down, onto an absolutely flat surface.

   Five stud drillings are located within the rocker cover (call them medium length studs, the centre stud, No. 4 in the sequence, is called the long stud) and four drillings are located just above the exhaust manifold (call these the short studs). The spot-facings for the short studs have been found to vary by up to 0.012"

   Use the Vernier gauge to accurately measure the depth of the drilling through the cylinder head. Add to this dimension the thickness of the cylinder head gasket. Record the sum in the next box.
5. Measure the thickness of the cylinder head nuts and record the dimension in the next box.
6. Carry out the same procedure for the plain washers.
7. Then, in the next box, write in 0.125" for stud protrusion above cylinder head nuts.
8. Using the calculator, add up the entries for Steps1, 4, 5, 6 and 7. The sum of this calculation gives the overall length of the cylinder head stud.

   Note: The calculation at Step 3 provides the length of the ⅜" BSF thread that screws into the crankcase.
9. The drilled valve gear oil feed stud (No. 1) is kept in its original form, it seats against the flared oil feed pipe and does not have a counter-bore.

10. Continue the measuring process for the remaining 17 cylinder head studs

Note 1: The dimensions shown in the charts provide an example of the variances that can be found in one crankcase set.

Note 2: When taking measurements for stud No. 4, at the same location for both crankcase halves, an extra dimension is required. This is the distance between the cylinder head gasket surface and the boss for the stud adjacent to the two cylinder liner bores. Use a known straight edge and, with the Vernier gauge, measure from the top face of the straight edge to the stud's boss. Note the dimension and then subtract the depth of the straight edge. Record the sum on the box provided for this at stud No. 4.

Note 3: After recording all dimensions, accurate sketches can be made for each stud, for a machine shop to work from. See Appendix (iii).

APPENDIX (ii)

Stud Measurement And Calculation Tables

Note: 'Stud – Sequence No.' heading refers to the stud location in the crankcase set, as per the cylinder head nuts' tightening arrangement as shown in the *Maintenance Manual*, see *Figure 3.* The dimensions shown in blue, below, are those calculated on the subject crankcase. It is suggested that they are deleted and then the pages printed for personal use while carrying out this exercise. 'Left Hand Side' and 'Right Hand Side' headings refer to which crankcase half. With engine viewed from the driver's seat.

Stud – Sequence No. 2.	Left Hand Side	Right Hand Side
Stud Hole Depth in Crankcase	1.102"	0.981"
Counter-bore Depth	0.125"	0.205"
Calculated Thread Depth	0.977"	0.776"
Cylinder Head C/W Gasket	2.675"	2.675"
Nut	0.513"	0.513"
Washer	0.051"	0.051"
Protrusion	0.125"	0.125"
Stud Length (Overall)	4.466"	4.345"

Stud – Sequence No. 3.	Left Hand Side	Right Hand Side
Stud Hole Depth in Crankcase	1.250"	1.199"
Counter-bore Depth	0.146"	0.147"
Actual Thread Depth	1.104"	1.052"
Cylinder Head C/W Gasket	3.193"	3.193"
Nut	0.513"	0.513"
Washer	0.051"	0.051"
Protrusion	0.125"	0.125"
Stud Length (Overall)	5.132"	5.081"

Stud – Sequence No. 4.	Left Hand Side	Right Hand Side
Stud Hole Depth in Crankcase	1.381"	1.352"
Counter-bore Depth	0.198"	0.537"
Actual Thread Depth	1.183"	0.815"
Cylinder Head C/W Gasket	3.193"	3.193"
Ctr. Stud Boss To Head Face	2.419"	2.409"
Nut	0.513"	0.513"
Washer	0.051"	0.051"
Protrusion	0.125"	0.125"
Stud Length (Overall)	7.682"	7.643"

Stud – Sequence No. 5.	Left Hand Side	Right Hand Side
Stud Hole Depth in Crankcase	1.409"	1.407"
Counter-bore Depth	0.143"	0.154"
Actual Thread Depth	1.266"	1.316"
Cylinder Head C/W Gasket	3.193"	3.193"
Nut	0.513"	0.513"
Washer	0.051"	0.051"
Protrusion	0.125"	0.125"
Stud Length (Overall)	5.291"	5.289"

Stud – Sequence No. 6.	Left Hand Side	Right Hand Side
Stud Hole Depth in Crankcase	0.905"	0.947"
Counter-bore Depth	0.137"	0.151"
Actual Thread Depth	0.768"	0.796"
Cylinder Head C/W Gasket	2.675"	2.675"
Nut	0.513"	0.513"
Washer	0.051"	0.051"
Protrusion	0.125"	0.125"
Stud Length (Overall)	4.787"	4.829"

Stud – Sequence No. 7.	Left Hand Side	Right Hand Side
Stud Hole Depth in Crankcase	1.321"	3.251" (Modified)
Counter-bore Depth	0.150"	0.125"
Actual Thread Depth	1.171"	3.126"
Cylinder Head C/W Gasket	3.193"	3.193"
Nut	0.513"	0.513"
Washer	0.051"	0.051"
Protrusion	0.125"	0.125"
Stud Length (Overall)	5.203"	7.133"

Stud – Sequence No. 8.	Left Hand Side	Right Hand Side
Stud Hole Depth in Crankcase	1.403"	1.421"
Counter-bore Depth	0.128"	0.151"
Actual Thread Depth	1.275"	1.270"
Cylinder Head C/W Gasket	2.675"	2.675"
Nut	0.513"	0.513"
Washer	0.051"	0.051"
Protrusion	0.125"	0.125"
Stud Length (Overall)	4.767"	4.785"

Stud – Sequence No. 9.	Left Hand Side	Right Hand Side
Stud Hole Depth in Crankcase	1.425"	1.362"
Counter-bore Depth	0.381"	0.177"
Actual Thread Depth	1.044"	1.185"
Cylinder Head C/W Gasket	2.675"	2.675"
Nut	0.513"	0.513"
Washer	0.051"	0.051"
Protrusion	0.125"	0.125"
Stud Length (Overall)	4.789"	4.726"

Stud – Sequence No. 10.	Left Hand Side	Right Hand Side
Stud Hole Depth in Crankcase	3.125" (Modified)	1.376"
Counter-bore Depth	0.107"	0.125"
Actual Thread Depth	3.018"	1.253"
Cylinder Head C/W Gasket	3.193"	3.193"
Nut	0.513"	0.513"
Washer	0.051"	0.051"
Protrusion	0.125"	0.125"
Stud Length (Overall)	7.007"	5.258"

APPENDIX (iii)

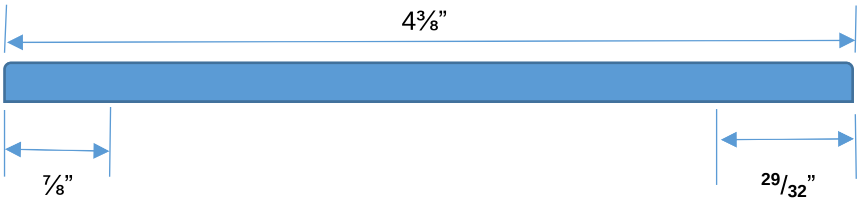
Cylinder Head Studs For Left Hand Crankcase

Note: The drawings set out below are not to any set scale. **Do not scale from these sketches**. The reason for the variety of thread and stud shank lengths is because the subject crankcase used for this *Technical Notes Series XXXV*, has been poorly treated by unknowledgeable repairers in the past. Once a set of standard cylinder head studs has been established, then the lengths will be arranged in sets as shown in the Jowett Javelin and Jupiter Spare Parts Catalogue.

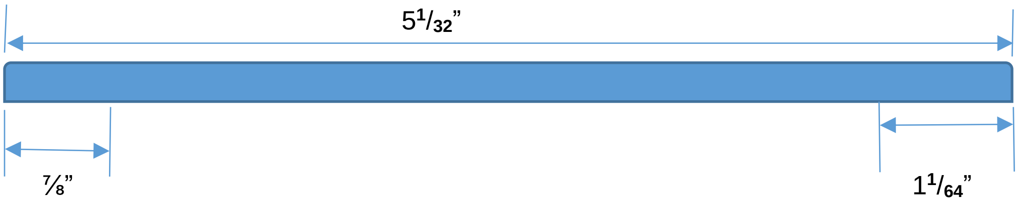
It should also be noted that the valve gear lubricating oil feed stud, Part Number 50638, has been retained in its original form.

Stainless steel has been employed in an attempt to reduce corrosion and the effects of chemical reactions between steel and aluminium.

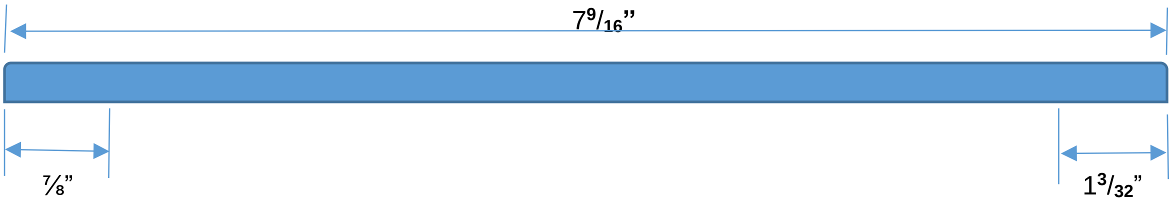
Part No. 50636-2L Head Stud (2) – LHS (Below) – 1 off required



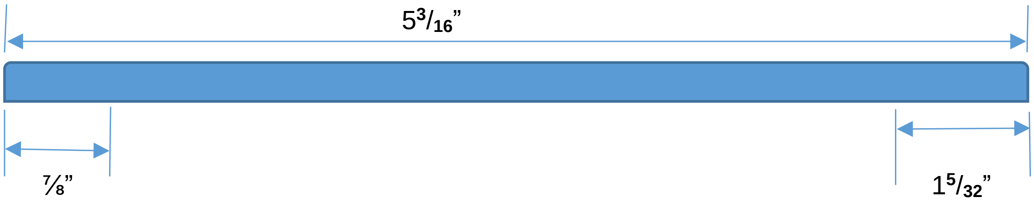
Part No. 50637-3L Head Stud (3) LHS (Below) – 1 off required



Part No. 52110-4L Centre Head Stud (4) – LHS (Below) – 1 off required



Part No. 50637-5L Head Stud (5) LHS (Below) – 1 off required



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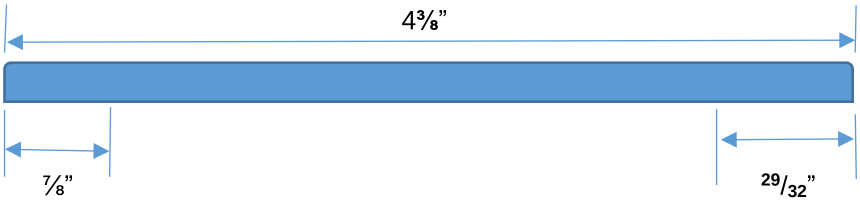
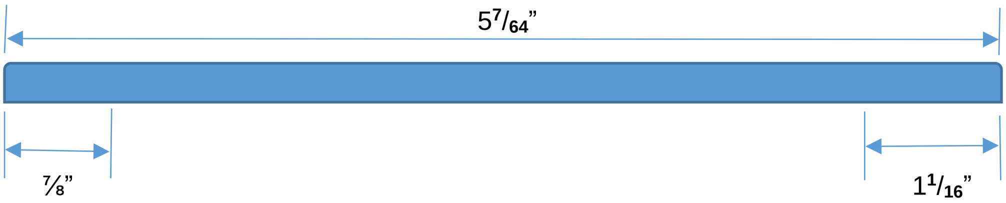
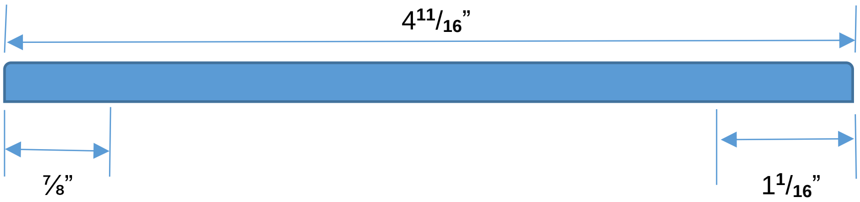


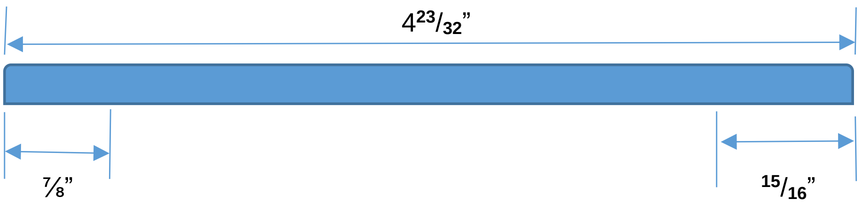
Part No. 50637-7L Head Stud (7) LHS (Below) – 1 off required



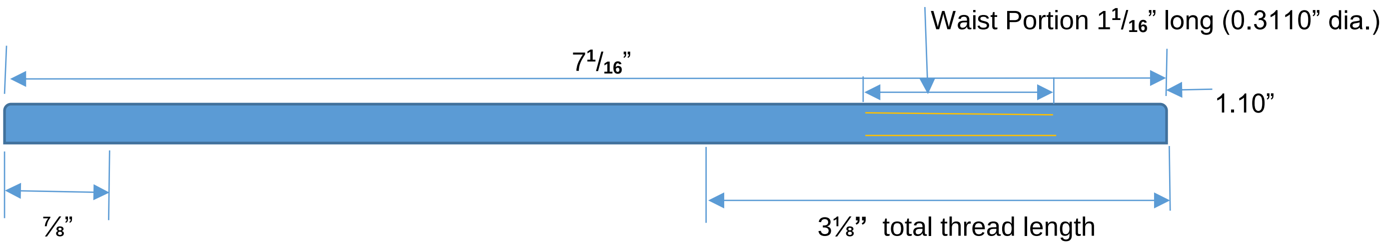
Part No. 50636-8L Head Stud (8) LHS (Below) – 1 off required



Head Stud (9) LHS Part No. 50636-9L (Below) – 1 off required

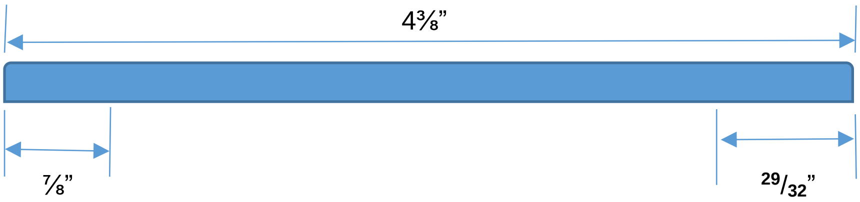


Part No. 50637-10L-M Head Stud (10) LHS (Below) – 1 off required



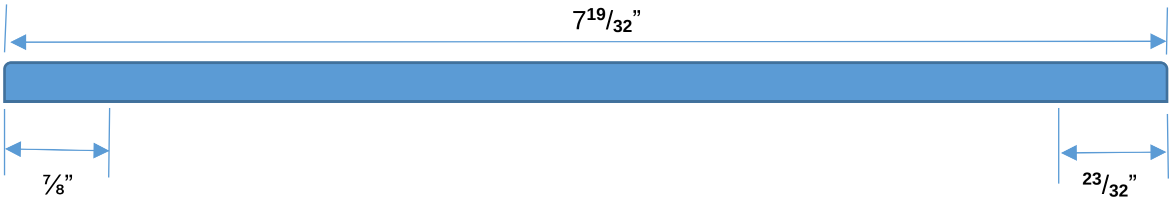
Cylinder Head Studs For Right Hand Crankcase

Part No. 50636-2R Head Stud (2) RHS (Below) – 1 off required

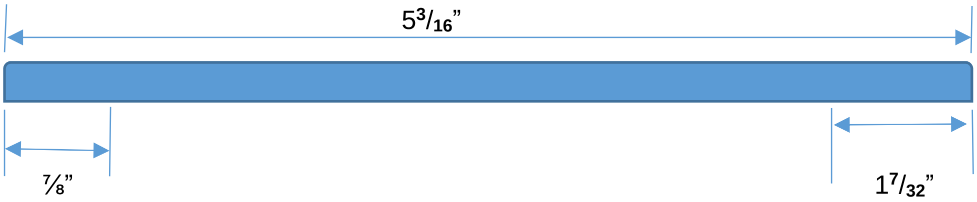


Part No. 50637-3R Head Stud (3) RHS (Below) – 1 off required

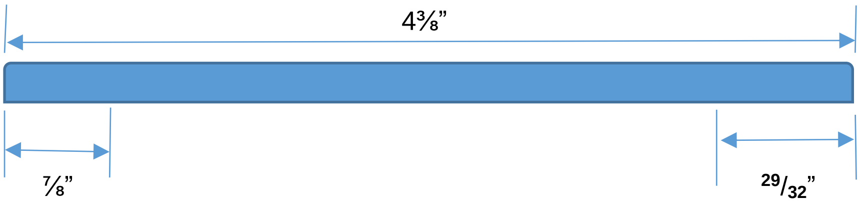
Part No. 52110-4R Centre Head Stud (4) RHS (Below) – 1 off required



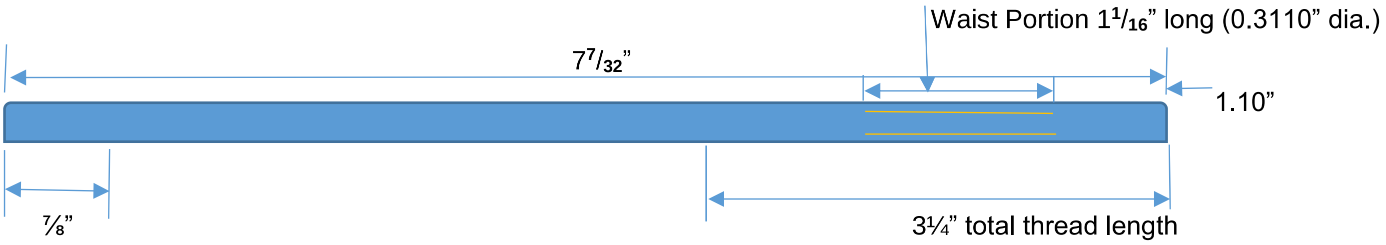
Part No. 50637-5R Head Stud (5) RHS (Below) – 1 off required



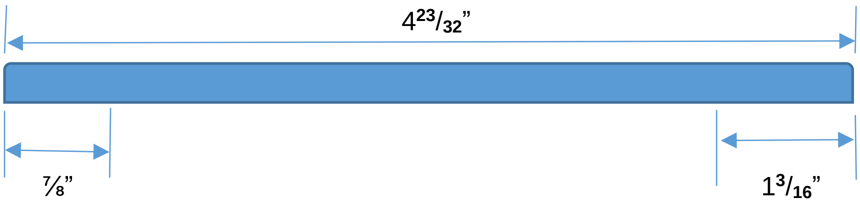
Part No. 50636-6R Head Stud (6) RHS (Below) – 1 off required



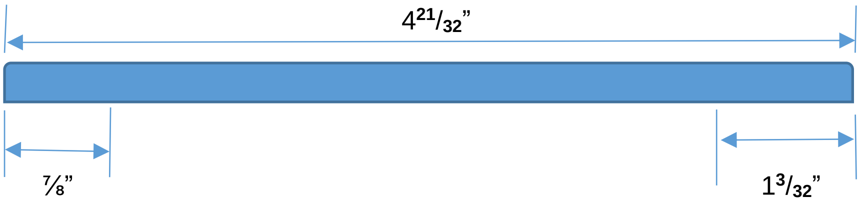
Part No. 50637-7R-M Modified Head Stud (7) RHS (Below) – 1 off required



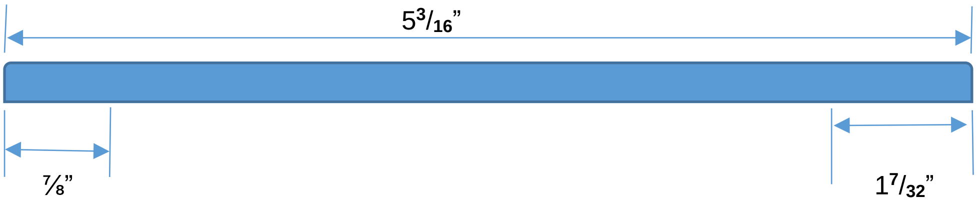
Part No. 50636-8R Head Stud (8) RHS (Below) – 1 off required



Part No. 50636-9R Head Stud (9) RHS (Below) – 1 off required



Part No. 50637-10R Head Stud (10) RHS (Below) – 1 off required



Special Notes:

1. Stud Material – Stainless steel, high tensile, to successfully endure a torque value of 37 lb. ft.(50.2 Nm).
2. Stud shank diameter – ⅜” diameter. Overall length of studs is shown above each rectangle.
3. The ⅞” dimensions at LH end are length of ⅜” BSF thread for cylinder head nuts.
4. The RH dimensions are length of ⅜” BSF thread for threading into aluminium crankcase.
5. The 3¼” dimension is length of ⅜” BSF thread for threading through coolant inlet (modified stud). This stud will require machining at the portion where the thread passes through the coolant inlet port. The machined length is $1^{1}/_{16}$”, has a radius at each end and this means commencement of machined diameter of 0.3110” at 1.10” from RH end of stud in drawing above. Machining to 0.3110” diameter to be carried out after the 3¼” thread has been cut, i.e. the thread is continuous, so that it screws freely into the inboard side of the coolant inlet port.
7. Please machine a 45° x $^{1}/_{16}$” chamfer at each end.

Cylinder Head Stud Length Verification

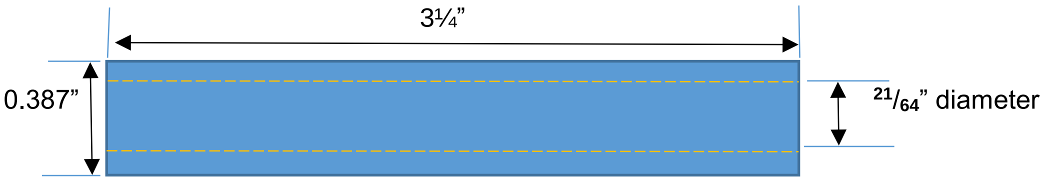
Once all of the studs had been machined, they were sorted into labelled plastic bags for holding unril required for engine assembly work. The bags were clearly marked (**Part No. 50637-10R**), with the Part Number being the original Part Number, the ‘10R’ component being the tightening sequence (10) and the ‘R’ denoting which crankcase half where the stud will be installed. A number of the studs are unique, this is the prime reason for the careful label marking for each bag.

APPENDIX (iv)

Modified Stud Drilling Guide Sleeve

Sleeve Dimensions

Outside Diameter – 0.387”, Inside Diameter $^{21}/_{64}$”, being the commercial tap diameter for ⅜” BSF thread cutting. DO NOT SCALE.

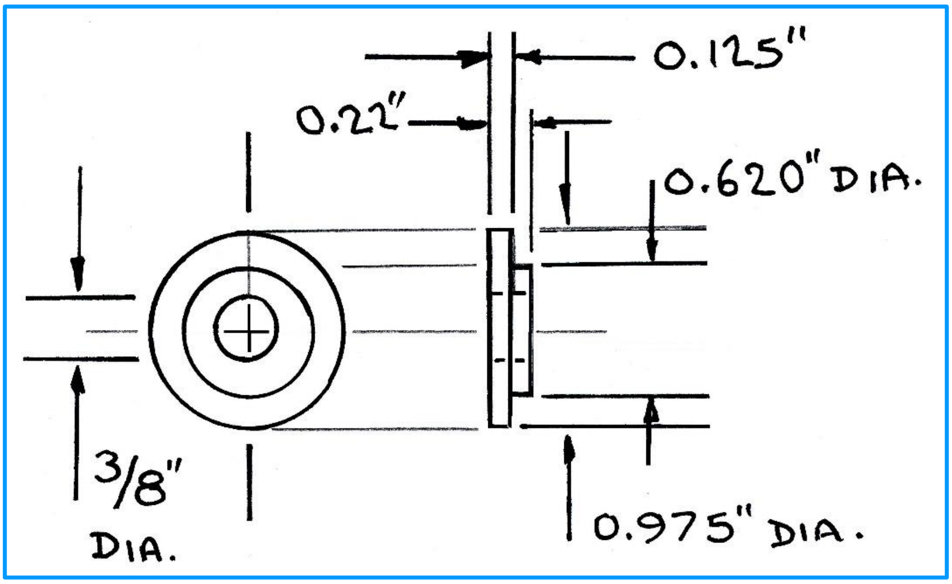


Material – Mild steel, de-burr at both ends.

APPENDIX (v)

Number 4 Head Stud – Stepped 'O' Ring Collar

The Number 4 cylinder head stud hole in the cylinder head has a counter bore for a rubber seal ring ('O' ring). The sketch below shows the dimensions for a collar that will squeeze the 'O' ring so that it forms a coolant-tight seal. Two collars per engine are required.



Stepped 'O' Ring Collar

This sketch is not to scale. Material – Mild Steel, please machine six off.

ACKNOWLEGMENTS

These *Technical Notes* were developed with the assistance of Neil Moore (JCC-NZ) and Brian Holmes (JCCA) for which grateful thanks are due.

Mike Allfrey – Jowett Technical Notes Series Writer.
Jowett Car Club Of Australia Inc.