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**diesel head repair**

**Instruction Manual  
&  
Parts List**

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G M C DETROIT DIESEL ENGINES

HEAD REPAIR TOOLS - GENERAL

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REPAIR OF CRACKS BETWEEN VALVE SEATS

FOR SERVICING THE INJECTOR SEAT AREAS OF THE G M C DETROIT DIESEL ENGINE HEADS, IRONTITE HAS THE FOLLOWING TOOLS:

- 1 - INJECTOR SLEEVE REMOVAL TOOL TO REMOVE THE OLD INJECTOR SLEEVE,
- 2 - CASTING REPAIR TOOLS FOR REBUILDING THE CASTING AT THE INJECTOR HOLE AREA, AND
- 3 - SLEEVE INSTALLATION TOOLS FOR INSTALLING NEW INJECTOR SLEEVES.

THE SLEEVE REMOVAL TOOL (646210) SERVICES ALL OF THE CURRENT SERIES ENGINES; 53, 71, 92, 50, 60 AND 8.2.

THE CASTING REPAIR KIT (641000) SERVICES THE 53, 71 AND 92 SERIES ENGINES, AND

THE SLEEVE INSTALLATION KITS:

KIT NO. 646100 SERVICES THE 53,71 AND 92 SERIES HEADS

KIT NO. 647100 SERVICES THE 50 & 60 SERIES HEADS AND

KIT NO. 648100 SERVICES THE 8.2 SERIES HEADS.

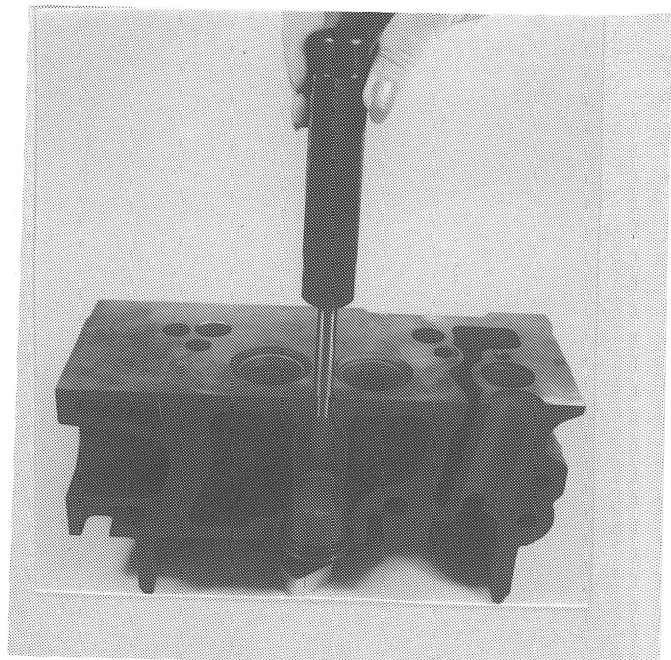


#### PRELIMINARY REMOVAL OF OLD INJECTOR SLEEVES

BEFORE COMMENCING THE SERVICE WORK ON THE ENGINE, WHETHER TO REBUILD THE INJECTOR AREA OF THE CASTING OR TO INSTALL NEW INJECTOR SLEEVES, THE OLD INJECTOR SLEEVES MUST FIRST BE REMOVED.

PLACE THE TIP END OF THE REMOVAL TOOL (646210) IN THE FACE END OF THE SLEEVE AS SHOWN IN THE PICTURE OPPOSITE. THE TOOL HAS A BUILT IN PILOT THAT FITS NEATLY INTO THE END OF THE SLEEVE.

HOLD THE TOOL FIRMLY IN PLACE AND TAP IT WITH A HAMMER TO DRIVE THE OLD SLEEVE OUT.



INJECTOR SEAT AREA REPAIR TOOLS

THE TOOLS SHOWN HERE ARE DESIGNED FOR USE IN REBUILDING THE INJECTOR SEAT AREAS OF G M C 53, 71 AND 92 ENGINE HEADS WHEN THE INJECTOR AREA HAS DEVELOPED CRACKS OR REQUIRES REBUILDING DUE TO SUCCESSIVE RESURFACING OF THE FACE OF THE HEAD OR FOR OTHER REASONS.

|                          |   |                          |                          |                          |                               |
|--------------------------|---|--------------------------|--------------------------|--------------------------|-------------------------------|
| <u>GAGE</u>              | <u>COMBINATION<br/>COUNTERBORE<br/>&amp; TAPERED REAMER</u> | <u>TAPERED<br/>TAP</u>   | <u>TAP<br/>DRIVER</u>    | <u>TAPERED<br/>PLUGS</u> | <u>TAPER LENGTH<br/>DRILL</u> |
|                          |   |                          |                          |                          |                               |
| 641120                   | 641210  | 530780                   | 693330                   | 260780                   | 641320                        |
| WITH<br>HANDLE           | END   | <u>DRIVING<br/>ARBOR</u> | <u>GUIDE<br/>BUSHING</u> | <u>SEAT<br/>CUTTER</u>   | <u>G M C<br/>COUNTERSINK</u>  |
| <u>DRILL<br/>BUSHING</u> | <u>FACING<br/>COUNTERBORE</u>                               |                          |                          |                          |                               |
| 641310                   | 641330  | 611410                   | 641430                   | 641420                   | 641450                        |
| <u>WITH PILOT</u>        | <u>WITH PILOT</u>   | <u>WITH GAGE</u>         | <u>FINGER</u>            | <u>COMPLETE KIT</u>      | 641000                        |
|                          |   |                          | 699100                   | <u>COMPLETE KIT</u>      | 641000                        |
| 641340                   | 641340  | 699100                   |                          |                          |                               |

**STEP 1 - REMOVE THE OLD INJECTOR SLEEVES**

USING THE G M C SLEEVE REMOVER (646210) REMOVE THE OLD INJECTOR SLEEVES FROM THE INJECTOR HOLES. (SEE PAGE 1)

**STEP 2 - CLEAN OUT THE INJECTOR SEATS IN THE CASTING**

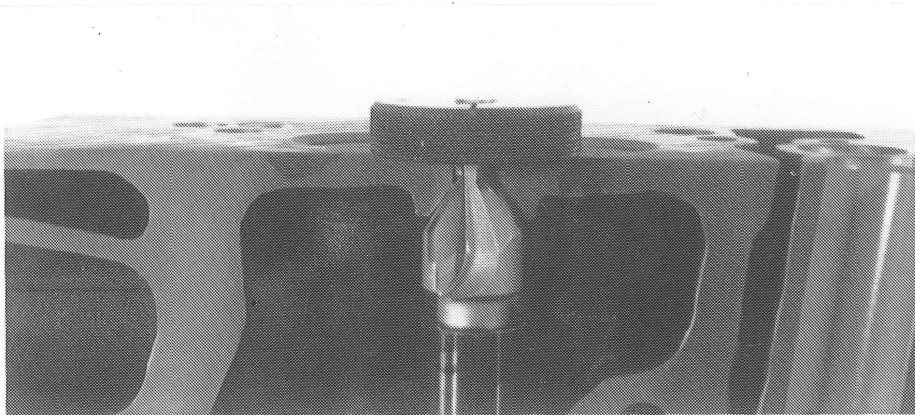
USING THE CASTING SEAT CUTTER (641420), WITH THE DRIVING ARBOR (611410) AND GUIDE BUSHING (641430), REAM OUT THE SEATS AT THE BOTTOM OF THE INJECTOR HOLES.

THIS WILL CLEAN OUT ANY ACCUMULATIONS AND CORROSION IN THE SEATS SO THAT THE DEPTH OF THE SEAT CAN BE MEASURED ACCURATELY.

**STEP 3 - MEASURE THE DEPTH OF THE CLEANED INJECTOR SEATS**

THE DEPTH OF THE SEAT IN THE CASTING IS MEASURED BY USING THE SEAT CUTTER GAGE (641120) IN CONJUNCTION WITH THE DIMENSIONAL PILOT ON THE END OF THE SEAT CUTTER (641420).

INSERT THE SEAT CUTTER (641420) INTO THE INJECTOR SEAT WITH THE DIMENSIONAL PILOT AT THE END OF THE CUTTER PROTRUDING THROUGH THE HOLE IN THE CASTING. NOW PLACE THE GAGE (641120) ON THE FACE OF THE HEAD WITH THE FLAT SIDE DOWN AGAINST THE FACE OF THE HEAD AND THE HOLE IN THE GAGE OVER THE DIMENSIONAL PILOT AS SHOWN IN THIS PICTURE.



NOTE THAT THE GAGE HAS TWO STEPS ON THE UPPER SIDE. IF THE TIP OF THE DIMENSIONAL PILOT PROTRUDES ABOVE THE UPPER STEP, THEN THE SEAT OF THE CASTING IS TOO CLOSE TO THE FACE OF THE HEAD AND THE INJECTOR SEAT IN THE CASTING NEEDS TO BE REBUILT.

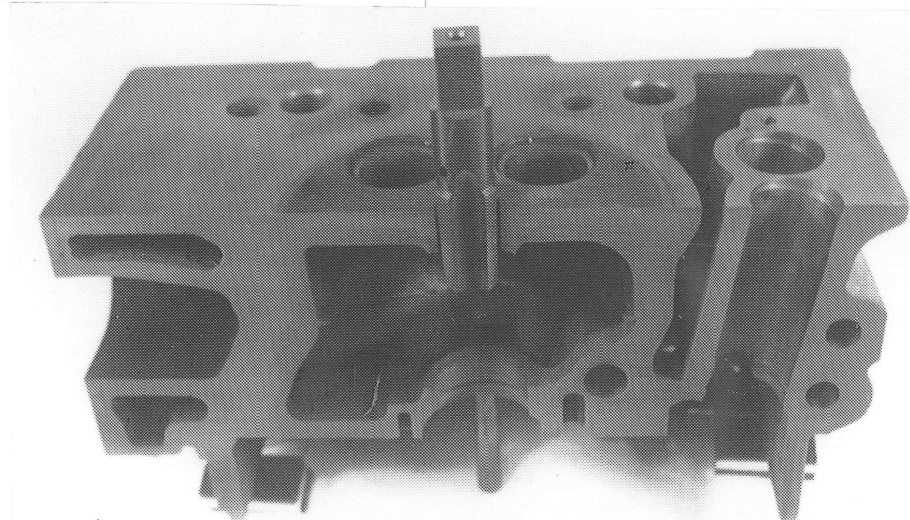
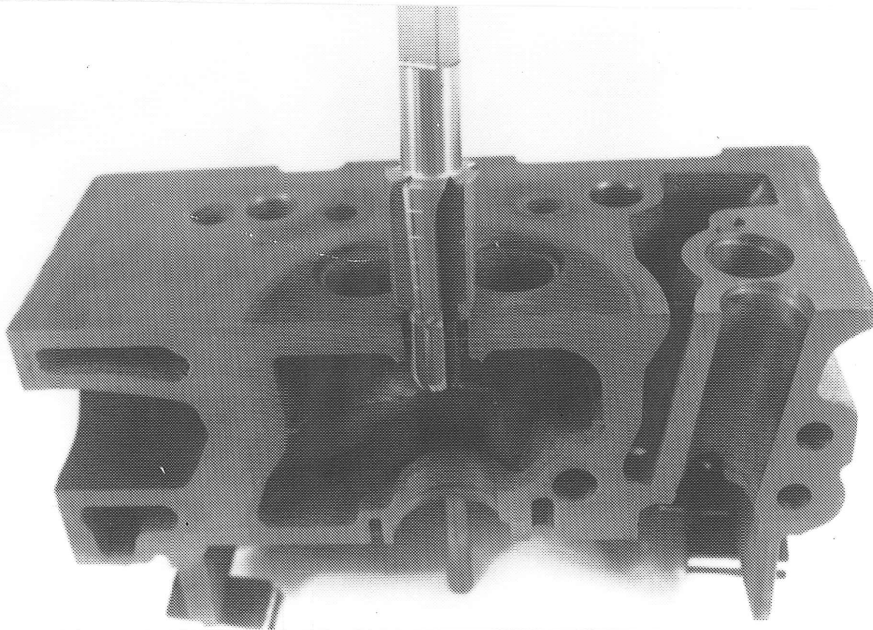
IN EVALUATING THE DEPTH OF THE INJECTOR SEAT ALLOWANCE MUST BE MADE FOR ANY RESURFACING OF THE FACE OF THE HEAD THAT WILL BE DONE LATER IN THE REBUILDING PROCESS.

STEP 4 - REAMING AND TAPPING THE INJECTOR HOLE

BEFORE REAMING AND TAPPING THE INJECTOR HOLE, CHECK THE FACE OF THE CASTING CAREFULLY TO SEE IF THERE ARE ANY SMALL CRACKS THAT WILL EXTEND BEYOND THE PERIMETER OF THE REPLACEMENT "G" PLUG THAT WILL BE USED TO REBUILD THE CASTING HOLE AREA. IF ANY SUCH SMALL COLLATERAL CRACKS APPEAR, THEN BEFORE REAMING AND TAPPING THE HOLE THESE COLLATERAL CRACKS SHOULD BE STRESS-RELIEVED BY DRILLING SMALL HOLES AT THE EXTREMITIES OF THE CRACKS.

NOW, USING THE COMBINATION COUNTERBORE AND TAPERED REAMER (641210) AND COMING IN FROM THE FACE SIDE OF THE HEAD, REAM OUT THE INJECTOR HOLE. OPERATE THE REAMER AT ABOUT 60/80 RPM AND REAM DOWN UNTIL ABOUT 1/2" TO 3/4" OF THE CUTTING FLUTES REMAIN ABOVE THE SURFACE OF THE HEAD. KEEP THE REAMER WELL LUBRICATED AT ALL TIMES.

THEN USING THE IRONTITE TAPERED "G" TAP (530780) TAP OUT THE REAMED HOLE FOR THE INSTALLATION OF AN IRONTITE "G" PLUG. KEEP THE TAP WELL LUBRICATED AT ALL TIMES PREFERABLY WITH IRONTITE TAP-O.

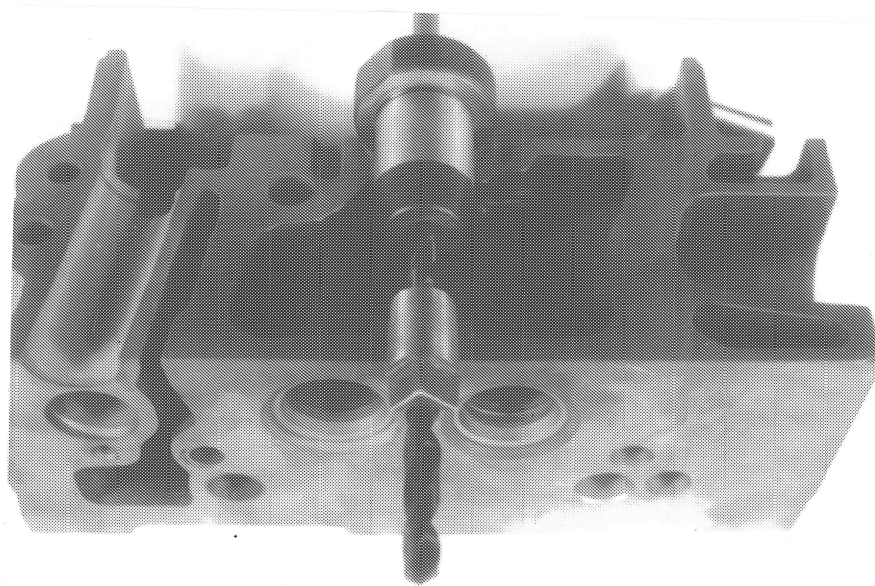
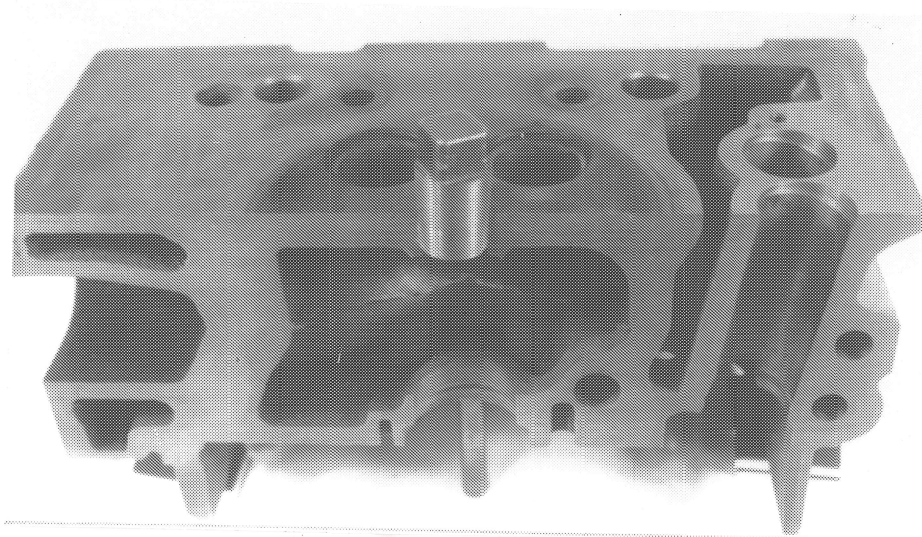


G M C 53, 71 & 92 DIESEL ENGINES  
REBUILDING THE CASTING INJECTOR SEAT

**STEP 5 - INSTALLING AND DRILLING THE REPLACEMENT PLUG**

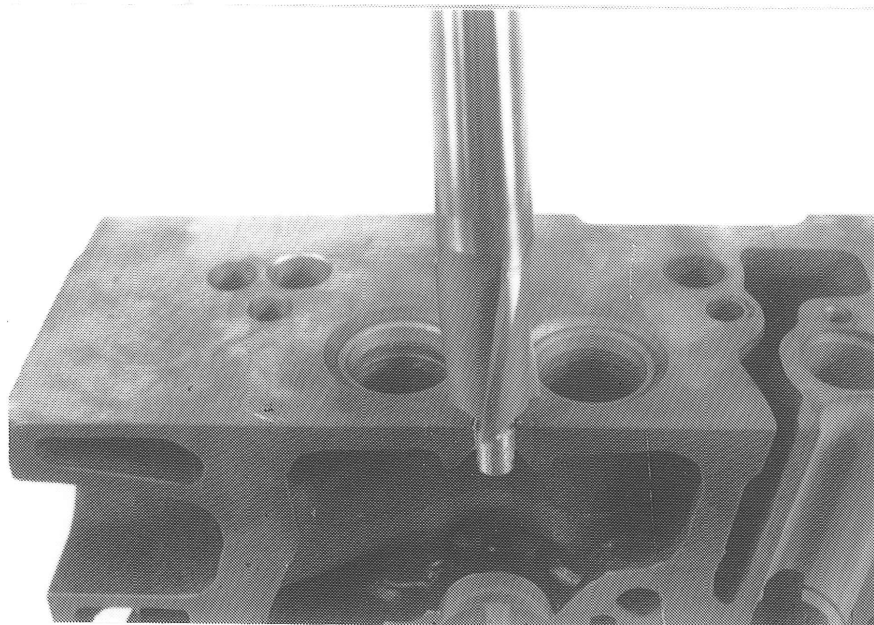
DIP THE IRONTITE "G" PLUG (260780) IN IRONTITE CERAMIC SEAL AND BRUSH CERAMIC SEAL IN THE TAPPED INJECTOR HOLE. THEN TORQUE IN THE "G" PLUG, USING ABOUT 145/150 FOOT POUNDS OF TORQUE.

WHEN THE PLUG HAS BEEN TORQUED IN PLACE, TURN THE HEAD OVER AND, USING THE TAPER LENGTH DRILL (641320) WITH THE DRILL BUSHING (641310), DRILL THE PLUG ALL THE WAY THROUGH.



STEP 6 - FACING OFF THE OUTER END OF THE REPLACEMENT PLUG

TURN THE FACE OF THE HEAD BACK UP AND FACE OFF THE UPPER PROTRUDING END OF THE REPLACEMENT PLUG, USING THE COUNTERBORE (641330) WITH PILOT (641340). FACE OFF THE PLUG DOWN TO ABOUT 1/16" ABOVE THE FACE OF THE HEAD.



NOW PEEN THE OUTER RIM OF THE PLUG, ALWAYS PEENING AWAY FROM THE CENTER OF THE PLUG.

IF THE HEAD IS TO BE RESURFACED LATER, THEN BRING THE END OF THE PLUG DOWN TO ABOUT 1/32" ABOVE THE FACE OF THE HEAD AND LET THE REST BE REMOVED BY THE RESURFACING OF THE FACE OF THE HEAD.

IF LATER RESURFACING IS NOT CONTEMPLATED, THEN AT THIS TIME FINISH OFF THE END OF THE PLUG, BRINGING IT DOWN SMOOTH EVEN WITH THE FACE OF THE HEAD.

STEP 7 - CHECK FOR AND REPAIR ANY COLLATERAL CRACKS

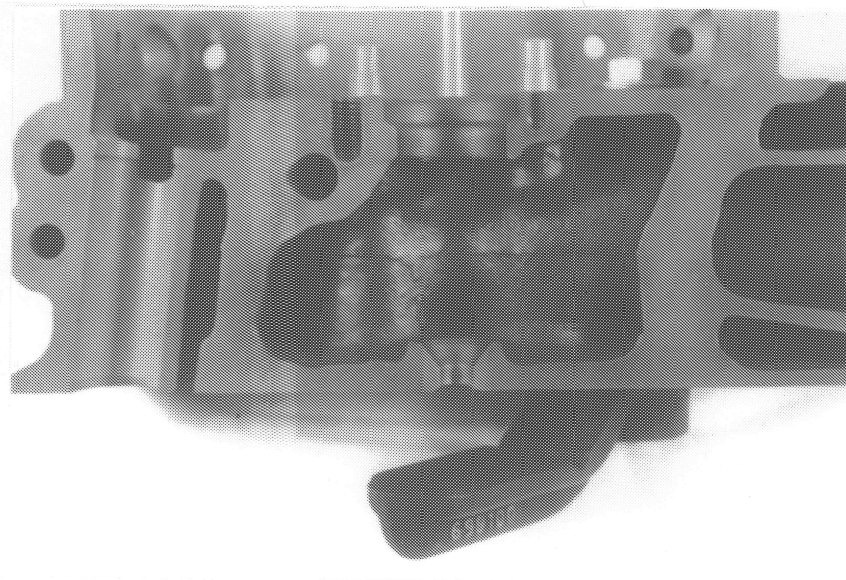
AT THIS POINT, AFTER THE INSTALLATION OF THE REPLACEMENT PLUG, IF THERE ARE ANY COLLATERAL CRACKS THAT EXTEND BEYOND THE PERIMETER OF THE REPLACEMENT PLUG, THESE CRACKS SHOULD BE REPAIRED, USING THE REGULAR IRONTITE CRACK REPAIR SYSTEM WITH IRONTITE A-235 PLUGS (210235).

ON COMPLETION OF THESE REPAIRS MAKE CERTAIN THAT THE SURFACE OF THE HEAD IS SMOOTHLY FINISHED OFF.

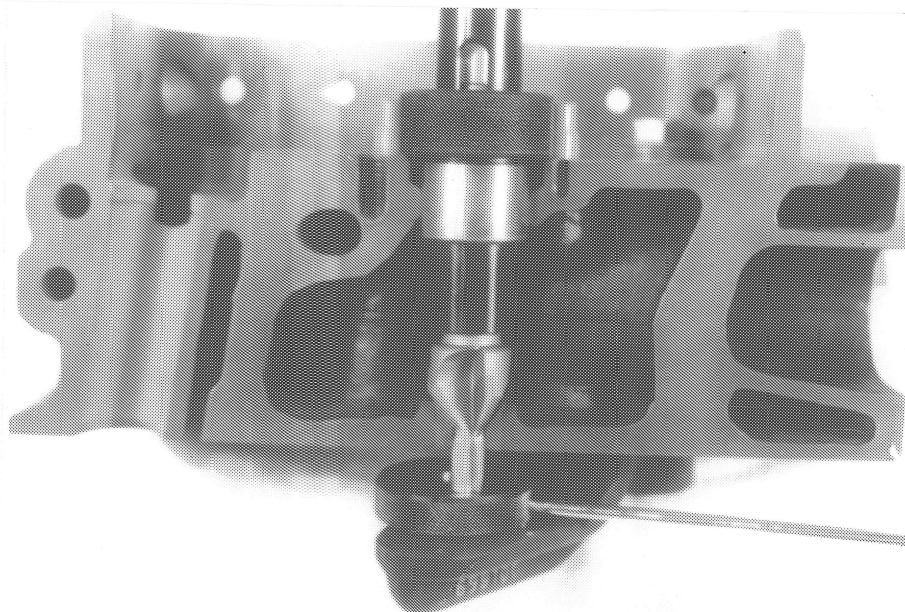
**STEP 8 - CUTTING THE NEW INJECTOR SEAT IN THE CASTING**

IN CUTTING THE NEW INJECTOR SEAT IN THE CASTING, CUTTING IT TO THE CORRECT DEPTH IS VERY IMPORTANT. THE DEPTH OF THE SEAT IS DETERMINED BY A COMBINATION OF THE DIMENSIONAL PILOT AT THE END OF THE CASTING SEAT CUTTER AND THE GAGE FINGER (699100) AND THE SEAT CUTTER GAGE (641120)

ATTACH THE GAGE FINGER (699100) TO THE FACE SIDE OF THE HEAD AS SHOWN HERE WITH THE FLAT SURFACE OF THE GAGE FINGER DIRECTLY BELOW THE INJECTOR HOLE AT THE FACE OF THE HEAD.



NOW POSITION THE SEAT CUTTER GAGE (641120) ON THE FLAT SURFACE OF THE GAGE FINGER WITH THE UPPER STEP ON THE GAGE DIRECTLY BELOW THE INJECTOR HOLE AS SHOWN HERE.



G M C 53, 71 & 92 DIESEL ENGINES  
REBUILDING THE CASTING INJECTOR SEAT

IF SUBSEQUENT RESURFACING OF THE FACE OF THE HEAD IS CONTEMPLATED, BEFORE STARTING TO CUT THE SEAT IN THE CASTING ALLOWANCE MUST BE MADE FOR THE RESURFACING BY SHIMMING UP THE GAGE ON THE FACE OF THE GAGE FINGER.

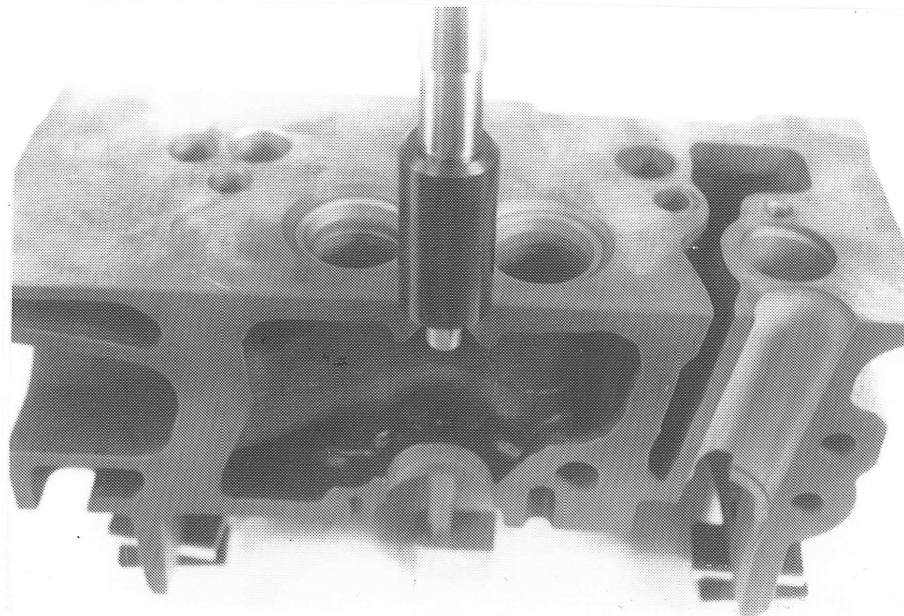
WITH THE GAGE FINGER AND GAGE IN PLACE DIRECTLY BELOW THE INJECTOR HOLE, INSERT THE CUTTER (641420) WITH DRIVING ARBOR (611410) AND GUIDE BUSHING (641430) DOWN INTO THE INJECTOR HOLE WITH THE DIMENSIONAL PILOT AT THE END OF THE CUTTER PROTRUDING BELOW THE FACE OF THE HEAD TOWARD THE UPPER STEP OF THE GAGE.

KEEPING THE SEAT CUTTER WELL LUBRICATED AT ALL TIMES AND OPERATING THE CUTTER AT ABOUT 60/80 RPM, CUT THE SEAT IN THE CASTING UNTIL THE DIMENSIONAL PILOT AT THE END OF THE CUTTER BOTTOMS ON THE UPPER STEP OF THE GAGE, AS SHOWN IN THE PRECEDING PICTURE. THIS WILL GIVE THE CORRECT DEPTH TO THE SEAT IN THE CASTING.

WHERE IT MAY NOT BE CONVENIENT TO USE THE GAGE FINGER, IRONTITE HAS AVAILABLE 1" PARALLELS WHICH CAN BE PURCHASED EITHER IN SETS OF 2 (611140) OR SETS OF 3 (651314) PARALLEL BARS.

**STEP 9 - CHAMFERING THE FACE SIDE OF THE INJECTOR HOLE**

USING THE SPECIAL G M C COUNTERSINK (641450) CHAMFER THE FACE SIDE OF THE NEW INJECTOR HOLE IN PREPARATION FOR SUBSEQUENTLY FLARING IN A NEW INJECTOR SLEEVE. CAUTION SHOULD BE USED SO THAT THE DOWNWARD PRESSURE ON THE TOOL DOES NOT CUT THE CHAMFER BELOW THE SURFACE OF THE FACE OF THE HEAD. WHEN THE CHAMFER IS AT THE CORRECT DEPTH, THE WIDTH OF THE CHAMFER AT THE FACE OF THE HEAD SHOULD BE 1/2".



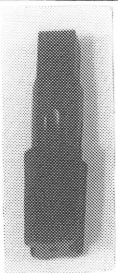
WATER DIRECTOR MODIFICATION IN CERTAIN 71 AND 92 ENGINE HEADS

ON SOME OF THE 71 AND THE EARLY 92 ENGINE HEADS A LARGER TWO-PIECE WATER DIRECTOR NEEDS TO BE REPLACED WITH A SMALLER ONE-PIECE UNIT. THIS CHANGE INVOLVES REBUILDING THE CASTING AT THE WATER DIRECTOR HOLE TO GIVE THE CASTING MORE STRENGTH AND MINIMIZE THE CRACKING BETWEEN THE WATER DIRECTOR HOLE AND THE ADJOINING BOLT HOLE.

- 1 - FIRST REMOVE THE EXISTING TWO-PIECE WATER DIRECTOR.
- 2 - USING AN IRONTITE G-OVERSIZE TAP (530840) THREAD THE WATER DIRECTOR HOLE IN THE CASTING.
- 3 - TORQUE A SPECIAL IRONTITE G-OVERSIZE SHORT PLUG (260855) INTO THE TAPPED HOLE, USING ABOUT 60/70 POUNDS TORQUE.
- 4 - USING THE COUNTERBORE (641330) WITH PILOT (649095), FACE THE PROTRUDING END OF THE SPECIAL PLUG DOWN TO WITHIN ABOUT 1/16" OF THE FACE OF THE HEAD.
- 5 - PEEN THE OUTER EDGE OF THE PLUG, ALWAYS PEENING AWAY FROM THE CENTER OF THE PLUG. BE CAREFUL NOT TO BURR THE HOLE IN THE PLUG.
- 6 - FINISH OFF THE PROTRUDING END OF THE PLUG DOWN SMOOTH WITH THE SURFACE OF THE FACE OF THE HEAD.
- 7 - PLACE THE REPLACEMENT SMALLER ONE-PIECE DIRECTOR (649150) ON THE END OF THE INSTALLATION TOOL (649100) AND DRIVE THE DIRECTOR DOWN INTO THE HOLE IN THE PLUG. THE SHOULDER ON THE INSTALLATION WILL STOP THE DIRECTOR JUST FLUSH WITH THE FACE OF THE HEAD.

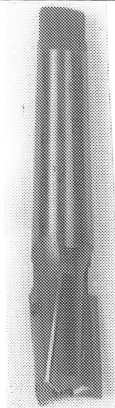
IN POSITIONING THE SMALLER DIRECTOR, BE SURE THAT THE TWO NOZZLE HOLES ARE POINTING IN THE SAME DIRECTION AS THE TWO NOZZLE HOLES IN THE TWO-PIECE DIRECTOR JUST REMOVED.

G-OVERSIZE TAP



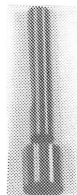
530840

COUNTERBORE



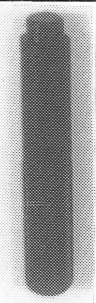
641330

PILOT



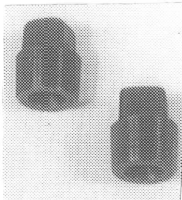
649095

INSTALLATION TOOL



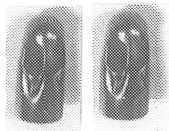
649100

G-OVERSIZE SHORT PLUGS

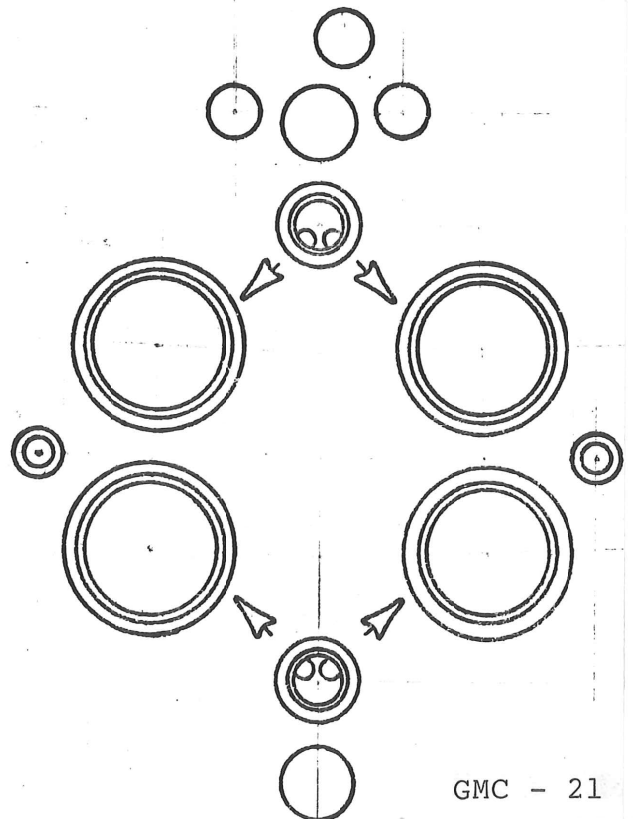


260855

REPLACEMENT ONE-PIECE DIRECTORS



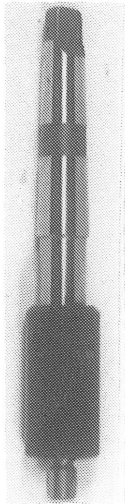
649150



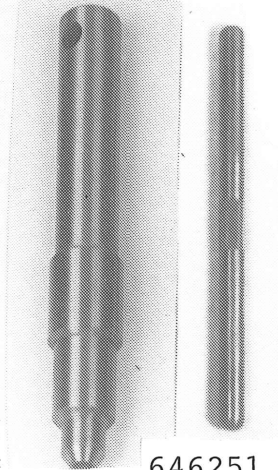
G M C DETROIT DIESEL ENGINES

SLEEVE INSTALLATION TOOLS FOR G M C 53, 71 & 92 ENGINE HEADS

| <u>INJECTOR HOLE COUNTERSINK</u> | <u>INSTALLATION TOOL (WITH HANDLE)</u> | <u>INSTALLATION TOOL PILOT AND DOWEL PIN</u> | <u>INSTALLATION TOOL TIP REAMER</u> | <u>FITTINGS FLARING STUD</u> | <u>END FACER</u> |
|----------------------------------|--|--|-------------------------------------|------------------------------|------------------|
|----------------------------------|--|--|-------------------------------------|------------------------------|------------------|

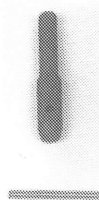


641450



646251

646250



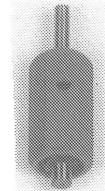
646260  
646265



646300



646310



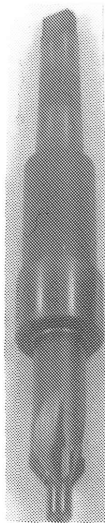
646410

OPTIONAL SLEEVE TOOLS

SLEEVE BODY REAMER

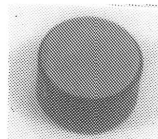
ALTERNATE SLEEVE INSTALLATION TOOL

SLEEVE SEAT CUTTER



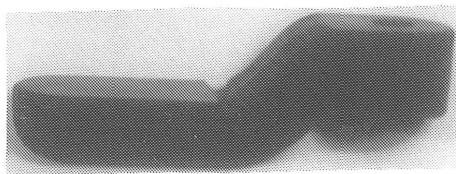
646450

SEAT CUTTER GAGE

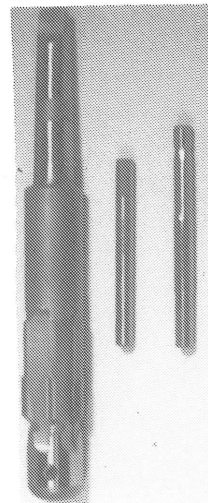


646455

GAGE FINGER



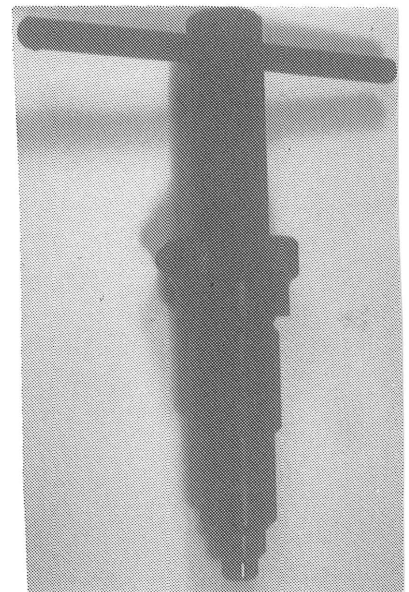
699100



646350

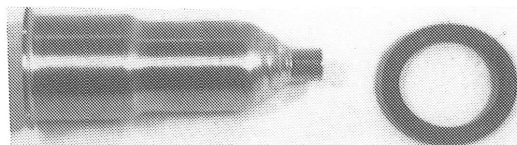
PILOT 646351

TIP REAMER 646355



646255

INJECTOR SLEEVE & O-RING



INJECTOR SLEEVES    O-RINGS

REGULAR    649531    BUNA    649532

HEAVY DUTY    649571    VITON    649533

COMPLETE KIT

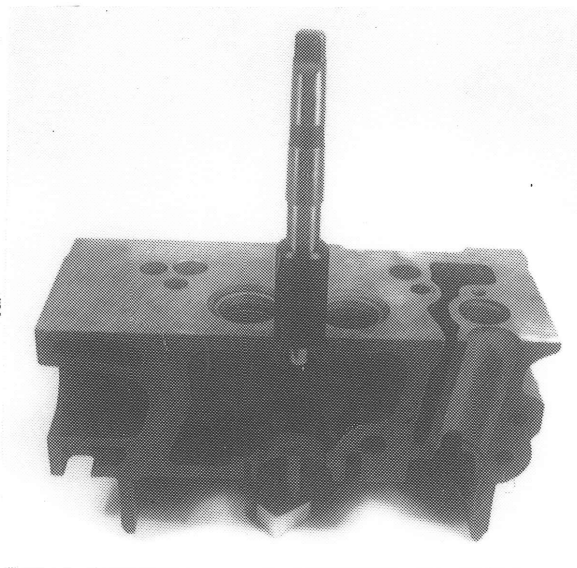
646100

**STEP 1 - CHAMFER THE FACE END OF THE INJECTOR HOLE**

IF THE FACE OF THE HEAD HAS BEEN RESURFACED, IT IS NECESSARY TO CHAMFER THE FACE END OF THE INJECTOR HOLE TO PREPARE IT FOR THE FLARING OF THE TIP OF THE INJECTOR SLEEVE. EVEN IF THE FACE OF THE HEAD HAS NOT BEEN RESURFACED THE CHAMFER AT THE FACE END OF THE INJECTOR HOLE SHOULD BE CLEANED FOR THE FLARING OF THE TIP OF THE SLEEVE.

FOR THIS CHAMFERING, USE THE SPECIAL COUNTERSINK CUTTER (641450) WHICH HAS BEEN SPECIALLY DESIGNED WITH A BUILT IN STOP TO AVOID CUTTING THE CHAMFER TOO DEEP.

IF IT APPEARS THAT EXCESSIVE DOWNWARD PRESSURE MAY HAVE BEEN APPLIED TO THE CHAMFERING TOOL, CHECK THE CHAMFER. AT THE FACE OF THE HEAD, THE CHAMFER SHOULD BE 1/2" IN WIDTH.



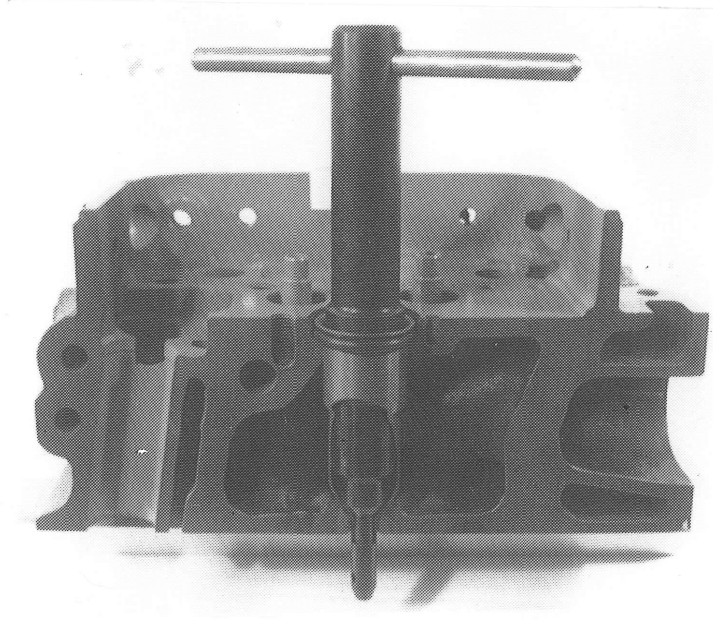
**STEP 2 - INSTALLING THE NEW INJECTOR SLEEVE**

FIRST LUBRICATE THE INJECTOR SLEEVE O-RING WITH IRONTITE CERAMIC SEAL AND THEN INSERT THE O-RING INTO THE TOP OF THE INJECTOR HOLE. WHILE THE BUNA O-RINGS ARE ACCEPTABLE FOR THE 53 AND 71 SERIES, THE 92 SERIES REQUIRE THE VITON O-RINGS WHICH WILL WITHSTAND THE HIGHER TEMPERATURES.

INSERT THE INSTALLATION TOOL (646250) INTO THE NEW SLEEVE AND THEN SCREW THE TOOL PILOT (646260) INTO THE END OF THE INSTALLATION TOOL.

USING THE PILOT AS A GUIDE, INSERT THE NEW SLEEVE INTO THE CASTING INJECTOR HOLE.

TAP THE INSTALLATION TOOL LIGHTLY WITH A MALLET TO MAKE SURE THAT THE SLEEVE BOTTOMS IN THE INJECTOR HOLE.



INSTALLING INJECTOR SLEEVES  
IN G M C 53, 71 & 92 ENGINE HEADS

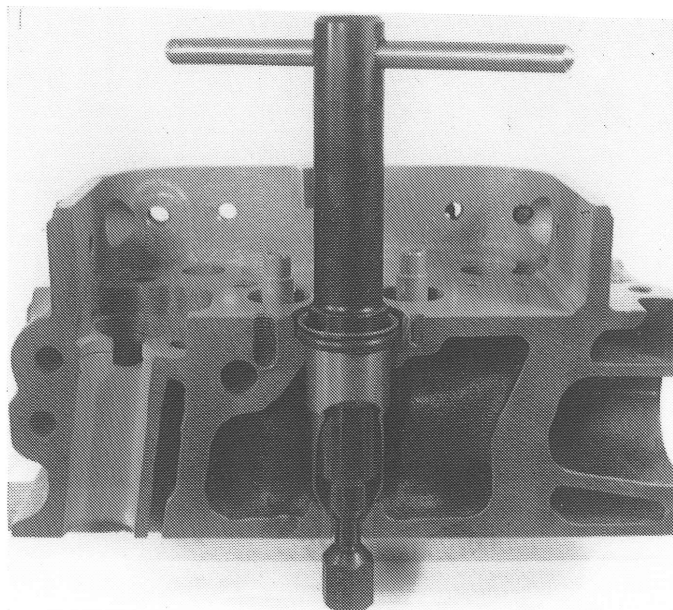
STEP 3 - FLARING THE END OF THE INJECTOR SLEEVE

WITH THE INSTALLATION TOOL (646250) STILL IN PLACE IN THE SLEEVE, REMOVE THE PILOT (646260) AND SCREW THE FLARING STUD (646310) INTO THE END OF THE INSTALLATION TOOL.

CONTINUE TO SCREW IN THE FLARING STUD UNTIL THE TIP OF THE SLEEVE IS FLARED OUT. KEEP THE FLARING STUD WELL OILED OR GREASED AND USE ABOUT 35-40 FOOT-POUNDS OF TORQUE.

DO NOT USE AN IMPACT WRENCH ON THE FLARING STUD.

AFTER FINISHING THE FLARING, TAP THE INSTALLATION TOOL LIGHTLY AND RETORQUE THE FLARING STUD.

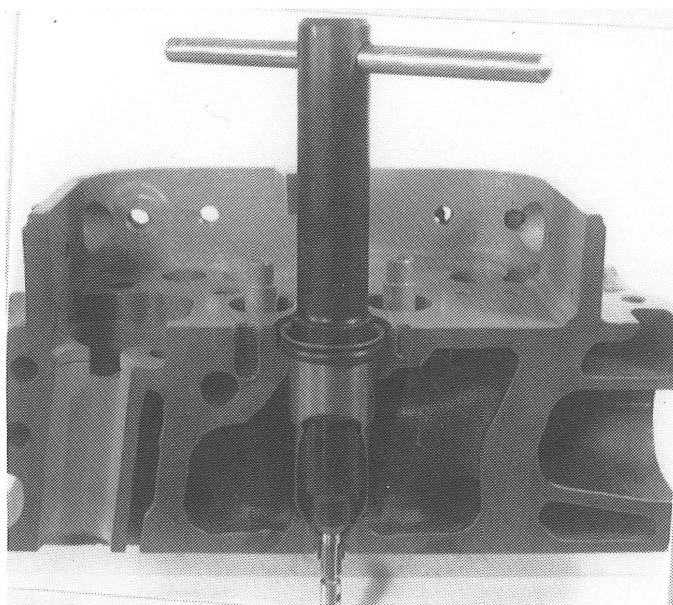


STEP 4 - REAMING THE TIP OF THE INJECTOR SLEEVE

REMOVE THE FLARING STUD FROM THE END OF THE INSTALLATION TOOL AND REMOVE THE TOOL FROM THE SLEEVE.

NOW SCREW THE TIP REAMER (646300) INTO THE END OF THE INSTALLATION TOOL AND RE-INSERT THE TOOL INTO THE INJECTOR SLEEVE.

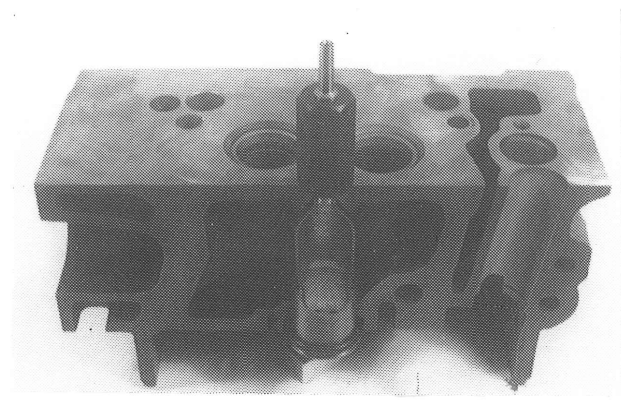
REAM OUT THE TIP OF THE SLEEVE AS SHOWN IN THE PICTURE TO THE RIGHT, KEEPING THE TIP REAMER WELL LUBRICATED AT ALL TIMES WITH IRONTITE TAP-O.



**STEP 5 - FACING OFF THE TIP OF THE SLEEVE**

USING THE END FACER (646410) WITH A DRILL MOTOR OPERATING AT ABOUT 1,000 RPM, FACE OFF THE TIP END OF THE SLEEVE.

THE END FACER HAS A BUILT-IN STOP TO AVOID CUTTING BELOW THE FACE OF THE HEAD.



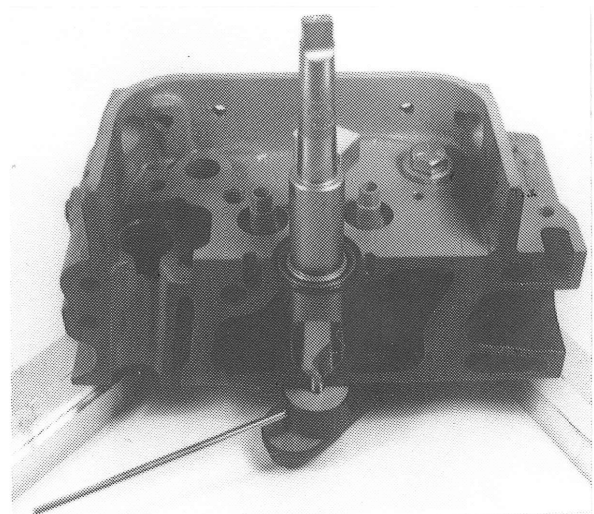
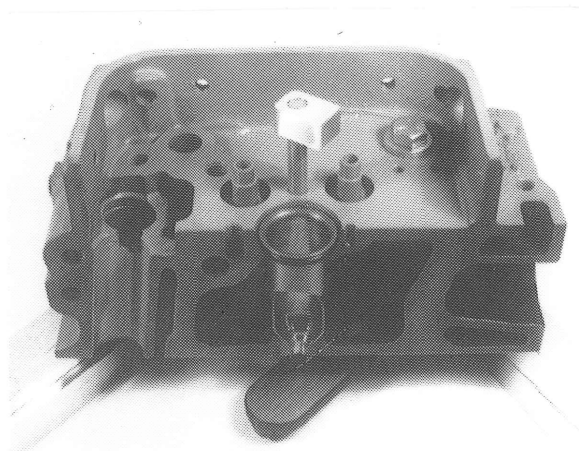
**STEP 6 - CUTTING THE SEAT IN THE NEW INJECTOR SLEEVE**

IN CUTTING THE SEAT IN THE NEW INJECTOR SLEEVE, CUTTING THE SEAT TO THE CORRECT DEPTH IS VERY IMPORTANT.

THE SLEEVE CUTTER (646450) IS DESIGNED WITH DIMENSIONAL PILOT AT THE END OF THE CUTTER. THE DEPTH OF THE SEAT IS CONTROLLED BY THE COMBINATION OF THE GAGE FINGER, SEAT CUTTER GAGE AND THIS DIMENSIONAL PILOT.

AT THE OUTSET, AFFIX THE GAGE FINGER TO THE FACE SIDE OF THE HEAD SO THAT THE FLAT SURFACE OF THE GAGE FINGER IS DIRECTLY BELOW THE INJECTOR SLEEVE AS SHOWN IN THE PICTURE TO THE LEFT BELOW.

THEN PLACE THE SEAT CUTTER GAGE (646455) ON THE FLAT SURFACE OF THE GAGE FINGER DIRECTLY BELOW THE INJECTOR SLEEVE AS SHOWN IN THE PICTURE BELOW TO THE RIGHT.





INSTALLING INJECTOR SLEEVES  
IN G M C 53, 71 & 92 ENGINE HEADS

STEP 6 - CUTTING THE SEAT IN THE NEW INJECTOR SLEEVE (CONT.)

NOW, WITH THE GAGE FINGER AND THE SEAT CUTTER GAGE IN PLACE DIRECTLY BELOW THE TIP OF THE INJECTOR SLEEVE, BRING THE SLEEVE SEAT CUTTER (646450) DOWN INTO THE INJECTOR SLEEVE UNTIL THE DIMENSIONAL PILOT AT THE END OF THE CUTTER PROTRUDES BELOW THE FACE OF THE HEAD TOWARD THE SEAT CUTTER GAGE.

KEEPING THE SEAT CUTTER WELL LUBRICATED AT ALL TIMES AND OPERATING THE CUTTER AT ABOUT 65 TO 90 RPM, CUT THE SEAT IN THE SLEEVE UNTIL THE DIMENSIONAL PILOT AT THE END OF THE CUTTER BOTTOMS ON THE TOP SURFACE OF THE SEAT CUTTER GAGE. THIS WILL GIVE THE CORRECT DEPTH TO THE SEAT IN THE SLEEVE.

IN SUBSEQUENT RESURFACING OF THE FACE OF THE HEAD IS CONTEMPLATED, THEN, BEFORE STARTING TO CUT THE SEAT IN THE SLEEVE, ALLOWANCE MUST BE MADE FOR THE RESURFACING BY SHIMMING UP THE SEAT CUTTER GAGE ON THE FACE OF THE GAGE FINGER.

BE VERY CAREFUL IN CUTTING THE SEAT NOT TO SPIN THE SLEEVE.



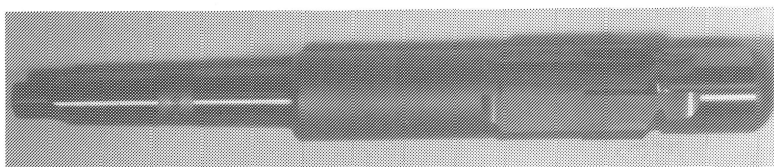
INSTALLING INJECTOR SLEEVES  
IN G M C 53, 71 & 92 ENGINE HEADS

OPTIONAL SLEEVE BODY REAMER

MOST INJECTOR SLEEVES USED TODAY FOR THESE ENGINES ARE PRE-REAMED IN THE BODY OF THE SLEEVE. HOWEVER, SOME SLEEVES IN USE ARE NOT PRE-REAMED. ACCORDINGLY, THEY MUST BE BODY REAMED DURING THE INSTALLATION PROCESS.

FOR THIS PURPOSE IRONTITE HAS DESIGNED A SLEEVE BODY REAMER:

REAMER

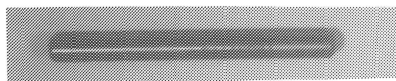


646350

THIS REAMER HAS A PILOT WHICH HELPS INSERT THE TOOL INTO THE INJECTOR SLEEVE.

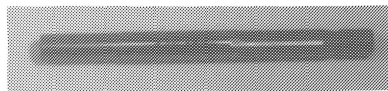
IT ALSO HAS A TIP REAMER WHICH FITS IN THE END OF THE TOOL IN THE PLACE OF THE PILOT AND PERMITS THE SIMULTANEOUS REAMING OF THE BODY OF THE SLEEVE AND THE TIP OF THE SLEEVE.

PILOT



646351

TIP REAMER



646355

THIS BODY REAMER SHOULD BE OPERATED AT ABOUT 50 RPM WITH A SLOW FEED TO MINIMIZE THE RISK OF SPINNING THE SLEEVE. IT SHOULD BE KEPT WELL LUBRICATED AT ALL TIMES.

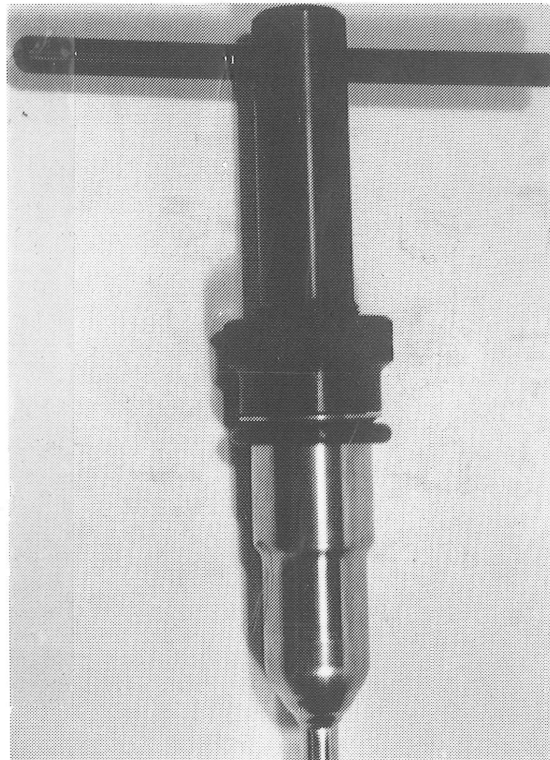
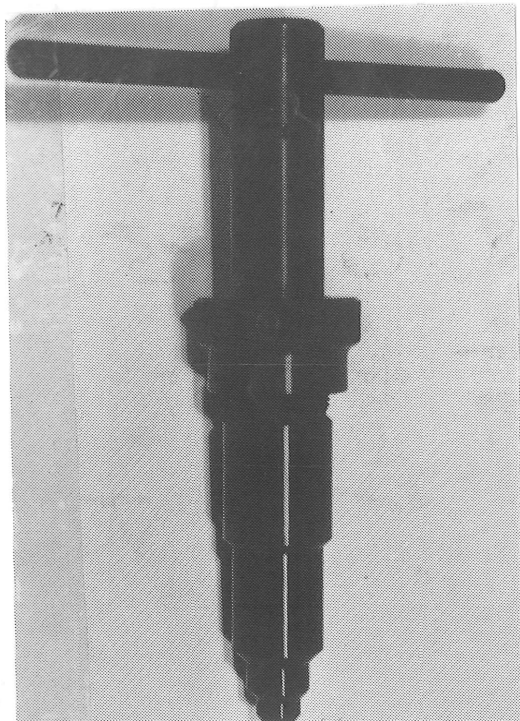
ALTERNATE OPTIONAL SLEEVE INSTALLATION TOOL

IN RESPONSE TO A PROBLEM OF CERTAIN G M C INJECTOR SLEEVES STRETCHING TOO MUCH AND EVEN CRACKING AT THE NOSE, IRONTITE HAS DEVELOPED AN OPTIONAL ALTERNATE SLEEVE INSTALLATION TOOL FOR GMC SLEEVES FOR G M C 53, 71 & 92 ENGINE HEADS.

THIS OPTIONAL INSTALLATION TOOL (646255) IS THREADED ON THE BODY OF THE TOOL JUST ABOVE THE TOP OF THE SLEEVE AND A NUT IS PROVIDED WHICH CAN BE POSITIONED TO LIMIT THE STRETCHING OF THE SLEEVE TO A PREDETERMINED AMOUNT.

POSITION THIS NUT WITH A FEELER GAGE TO SEPARATE THE TOP OF THE SLEEVE AND THE BOTTOM OF THE POSITIONING NUT BY ABOUT .008/.010. THEN, WHEN EXERTING DOWNWARD PRESSURE ON THE INSTALLING TOOL, AND IN TURN ON THE SLEEVE, THERE WILL BE A LIMITED AMOUNT OF STRETCHING OF THE SLEEVE BEFORE THE TOP OF THE SLEEVE BEGINS TO BEAR THE DOWNWARD PRESSURE. THIS PREVENTS EXCESSIVE STRETCHING OF THE SLEEVE AND POSSIBLE SPLITTING OF THE TIP OF THE SLEEVE.

THE PICTURES BELOW SHOWS THE ALTERNATE INSTALLATION TOOL (646255) AND THE TOOL WITH A SLEEVE ON THE TOOL READY TO BE INSTALLED.



INJECTOR SLEEVE TOOLS FOR G M DETROIT DIESEL SERIES 50 AND 60 ENGINES

SLEEVE  
REMOVER



646210

SLEEVE INSTALLATION  
TOOL



647250

INJECTOR  
SLEEVE  
WITH  
O'RING



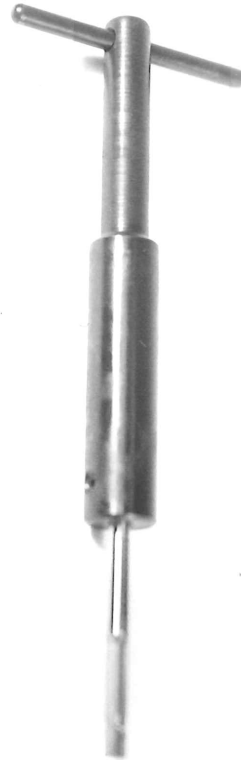
647531

FLARING  
STUD



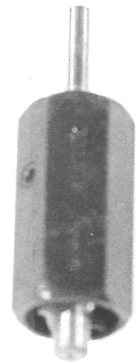
646310

TIP REAMER



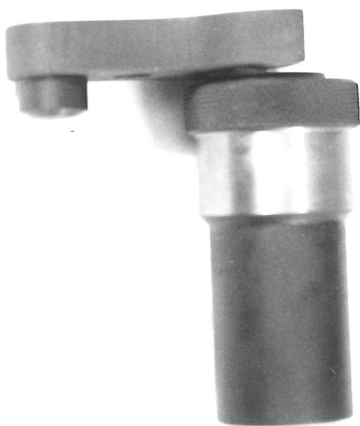
647440

SLEEVE  
END  
FACER



646410

GUIDE BUSHING  
ASSEMBLY



647430

SEAT  
CUTTER



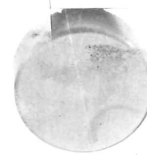
647450

CUTTER  
DRIVER



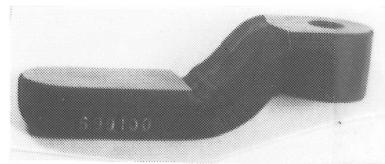
611410

SEAT CUTTER GAGE



647655

GAGE FINGER



699100  
COMPLETE KIT

TIP  
PROTRUSION  
GAGE



647460  
647100

REPLACING A WORN INJECTOR SLEEVE

1 - REMOVING THE WORN INJECTOR SLEEVE

WITH THE SLEEVE REMOVER (646210) KNOCK THE WORN INJECTOR SLEEVE OUT OF THE INJECTOR SLEEVE HOLE AND CAREFULLY CLEAN OUT THE INJECTOR HOLE BEFORE INSTALLING THE NEW SLEEVE.

2 - INSTALLING THE NEW INJECTOR SLEEVE IN THE INJECTOR HOLE

WITH THE O-RING IN PLACE ON THE SLEEVE, PLACE THE SLEEVE OVER THE PILOT (646260) ONTO THE END OF THE INSTALLATION TOOL (647250). INSTALL THE INSTALLATION TOOL DOWN INTO THE INJECTOR HOLE AND TAP IT TO MAKE SURE THAT THE SLEEVE HAS BOTTOMED IN THE INJECTOR HOLE. THEN LOCK THE INSTALLATION TOOL TIGHTLY IN PLACE WITH THE SLEEVE INSTALLATION TOOL BODY CLAMP (647270) AND THE LOCKING CLAMP BOLT.

REMOVE THE PILOT AT THE END OF THE INSTALLATION TOOL AND INSTALL THE FLARING STUD (646310) IN THE END OF THE TOOL. THE TIP OF THE SLEEVE MAY BE TIGHT AND IT MAY BE NECESSARY TO THREAD THE FLARING STUD UP THROUGH THE TIP OF THE SLEEVE. CONTINUE TORQUEING THE FLARING STUD UP, USING ABOUT 30 FOOT/POUNDS OF TORQUE, UNTIL THE END OF THE SLEEVE IS FULLY FLARED. GREASE OR ANTI-SEIZE ON THE THREADS OF THE FLARING STUD MAY BE HELPFUL IN FLARING OUT THE END OF THE SLEEVE.

WHEN THE SLEEVE HAS BEEN FULLY FLARED OUT, REMOVE THE FLARING STUD AND THEN REMOVE THE INSTALLATION TOOL TO PREPARE THE SLEEVE FOR CUTTING THE SEAT.

3 - PREPARING THE SLEEVE FOR CUTTING THE SEAT

INSTALL THE GUIDE BUSHING (647430) IN THE INJECTOR HOLE AND HOLD IT IN POSITION WITH THE GUIDE BUSHING CLAMP (647436) LOCKING THE POSITION CLAMP TIGHTLY WITH THE LOCKING BOLT, USING, IF NECESSARY, AS MUCH AS 8 TO 10 FOOT/POUNDS OF TORQUE ON THE CLAMP LOCKING BOLT. WITH THE REAMER DRIVER ASSEMBLY (647440 INCLUDES REAMER 646355) DOWN IN THE GUIDE BUSHING, REAM OUT THE BOTTOM END OF THE INJECTOR SLEEVE.

NOW FACE OFF THE BOTTOM END OF THE SLEEVE WITH THE SLEEVE END FACER (646410).

**4 - CUTTING THE SEAT IN THE NEW INJECTOR SLEEVE**

FIRST INSTALL THE GAGE FINGER (699100) ON THE HEAD WITH THE SMOOTH FACE OF THE GAGE FINGER DIRECTLY BELOW THE INJECTOR HOLE. THEN POSITION THE SEAT CUTTER GAGE (647655) ON THE SMOOTH FACE OF THE GAGE FINGER DIRECTLY BELOW THE INJECTOR HOLE.

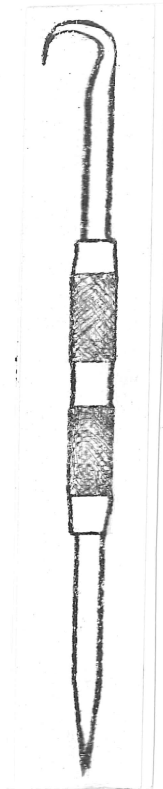
USING THE SEAT CUTTER (647450) WITH THE DRIVING ARBOR (611410) DOWN THROUGH THE GUIDE BUSHING INTO THE INJECTOR HOLE, CUT THE SEAT IN THE BOTTOM OF THE SLEEVE UNTIL THE PILOT ON THE END OF THE SEAT CUTTER STOPS ON THE TOP SURFACE OF THE CUTTER GAGE (647655). WHEN CUTTING THE SEAT RUN THE CUTTER AT ABOUT 200 RPM. AS A FURTHER CHECK ON THE DEPTH OF THE SEAT IN THE SLEEVE, REMOVE THE SEAT CUTTER FROM THE GUIDE BUSHING AND PLACE THE TIP PROTRUSION GAGE (647460) DOWN INTO THE INJECTOR SEAT. THE TIP OF THE PROTRUSION GAGE SHOULD BE SHORT OF THE SURFACE OF THE HEAD BY ".000 TO .008".

**INJECTOR SLEEVE****REMOVAL AND INSTALLATION TOOLS****FOR DETROIT DIESEL 50 & 60 ENGINES**

|        |   |
|--------|---|
| 647100 | COMPLETE KIT  |
| 646210 | SLEEVE REMOVAL TOOL   |
| 647250 | SLEEVE INSTALLATION TOOL ASSEMBLY<br>INCLUDES TOOL PILOT (646260) |
| 646310 | SLEEVE FLARING STUD   |
| 647430 | GUIDE BUSHING ASSEMBLY  |
| 647440 | TIP REAMER DRIVER ASSEMBLY  |
| 646410 | SLEEVE END FACER  |
| 699100 | GAGE FINGER   |
| 647655 | SEAT CUTTER GAGE WITH HANDLE                                      |
| 611410 | DRIVING ARBOR FOR SEAT CUTTER                                     |
| 647450 | SEAT CUTTER (CARBIDE TIPS)  |
| 647460 | TIP PROTRUSION GAGE   |

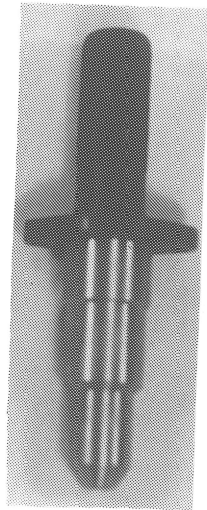
SLEEVE INSTALLATION TOOLS FOR G M C 8.2 ENGINE HEADS

BUTTON  
HOOK  
PICK



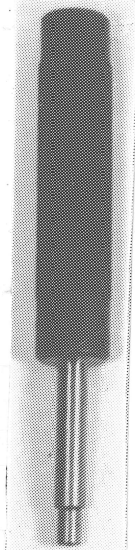
648212

SLEEVE  
INSTALLATION  
TOOL



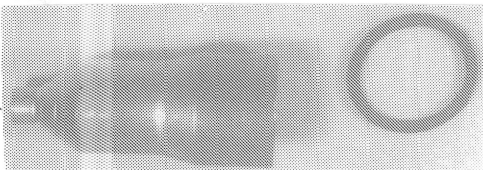
648250

REMOVAL TOOL



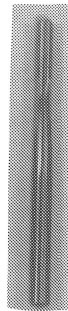
646210

INJECTOR SLEEVE  
AND O-RING



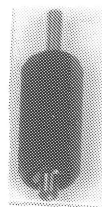
INJECTOR SLEEVE 649835  
VITON O-RING 649833

TIP  
EXPANDER



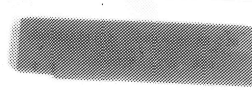
648310

END FACER



646410

FLAT  
TIP PROTRUSION  
GAGE



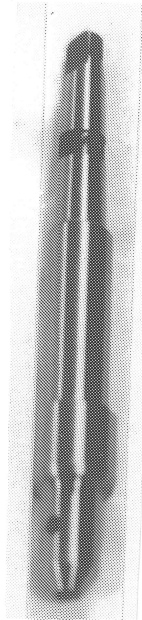
648182

TIP  
REAMER



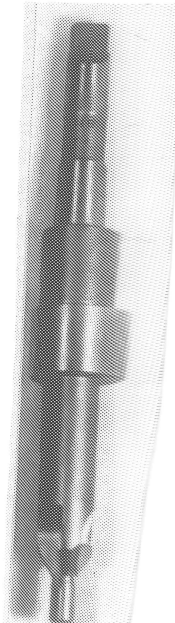
648300

TIP  
REAMER  
DRIVER



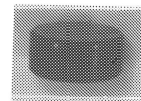
648305

SLEEVE  
SEAT  
CUTTER



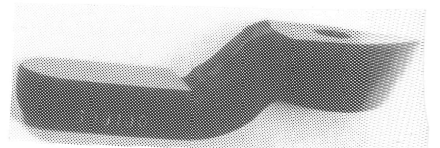
648450

SEAT CUTTER GAGE



648455

GAGE FINGER



699100

COMPLETE KIT

648100

**STEP 1 - CLEAN OUT THE O-RING GROOVE IN THE INJECTOR HOLE**

THE INJECTOR SLEEVE IS REMOVED IN THE SAME MANNER AS WITH THE G M C 53, 71 & 92 SERIES HEADS - SEE PAGE 1.

HOWEVER, THERE IS AN O-RING GROOVE IN THE INJECTOR HOLE IN THE 8.2 HEAD. WITH THE OLD SLEEVE HAVING BEEN REMOVED, IT IS NECESSARY TO CLEAN OUT A RESIDUAL SMALL COPPER RING THAT IS LEFT IN THIS O-RING GROOVE.

A BUTTON HOOK PICK (648212) IS PROVIDED FOR THIS PURPOSE.

**STEP 2 - INSTALLING THE NEW INJECTOR SLEEVE**

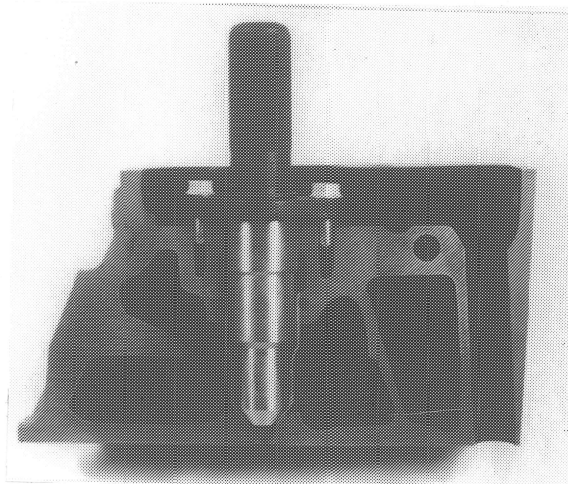
LUBRICATE AN INJECTOR O-RING AND INSTALL IT IN PLACE IN THE O-RING GROOVE THAT HAS JUST BEEN CLEANED OUT.

WITH THE 8.2 SERIES ENGINE, IT IS NECESSARY TO USE THE VITON O-RING (649833) TO WITHSTAND THE HIGH TEMPERATURE.

PLACE THE INJECTOR SLEEVE ON THE END OF THE INSTALLATION TOOL (648250) AND INSERT THE SLEEVE INTO THE INJECTOR HOLE. TAP THE TOOL GENTLY TO MAKE SURE THE SLEEVE BOTTOMS ON THE INJECTOR HOLE.

WITH THE 8.2 SERIES ENGINE, IT IS NECESSARY TO HOLD THE NEW SLEEVE FIRMLY IN PLACE WHILE COMPLETING THE INSTALLATION PROCESS. THIS IS DONE WITH A LOCKING RING AND TWO STUD BOLTS.

**INSTALLATION TOOL**



WITH THE NEW SLEEVE IN POSITION IN THE INJECTOR HOLE AND FIRMLY LOCKED THERE WITH THE LOCKING RING, THE SLEEVE INSTALLATION CAN PROCEED.

**STEP 3 - EXPANDING THE TIP OF THE INJECTOR SLEEVE**

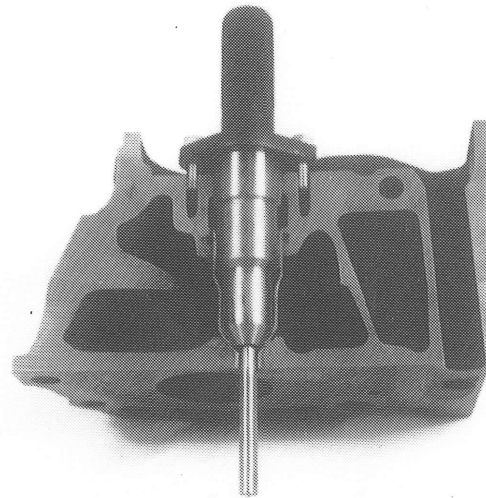
THE SLEEVE TIP EXPANDER IS A SPECIALLY DESIGNED SWAGING TYPE OF EXPANDING TOOL (648310).

FIRST INSERT THE SMALLER END OF THE EXPANDER INTO THE HOLE IN THE END OF THE INSTALLATION TOOL.

NOW, ROTATE THE TIP EXPANDER WITH A DRILL MOTOR OPERATING AT ABOUT 1200 RPM AND BRING THE EXPANDER UP SLOWLY INTO THE INSTALLATION TOOL UNTIL THE EXPANDER BOTTOMS IN THE HOLE IN THE INSTALLATION TOOL.

THIS SWAGING PROCESS WILL EXPAND THE TIP OF THE INJECTOR SLEEVE INTO THE SMALL GROOVE IN THE NOSE OF THE INJECTOR HOLE IN THE CASTING.

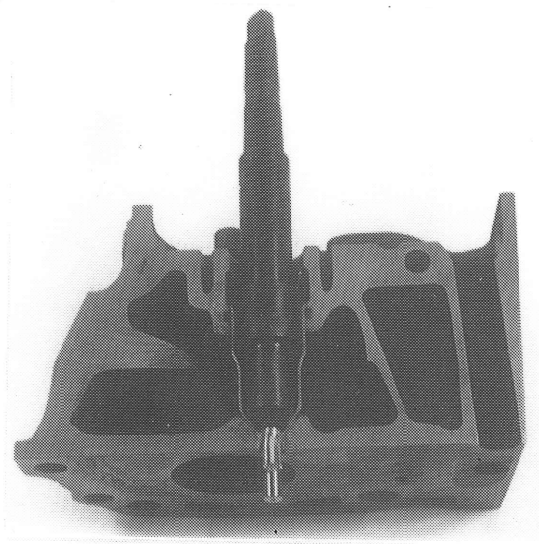
NOW, REMOVE THE TIP EXPANDER AND THEN THE INSTALLATION TOOL.



**STEP 4 - REAMING OUT THE TIP OF THE INJECTOR SLEEVE**

INSERT THE TIP REAMER (648300) IN THE END OF THE TIP REAMER DRIVER (648305) AND INSERT THE DRIVER WITH TIP REAMER INTO THE INJECTOR SLEEVE VERY CAREFULLY.

REAM OUT THE TIP OF THE SLEEVE, OPERATING THE TIP REAMER DRIVER AT ABOUT 100 RPM. KEEP THE TIP REAMER WELL LUBRICATED AT ALL TIMES.

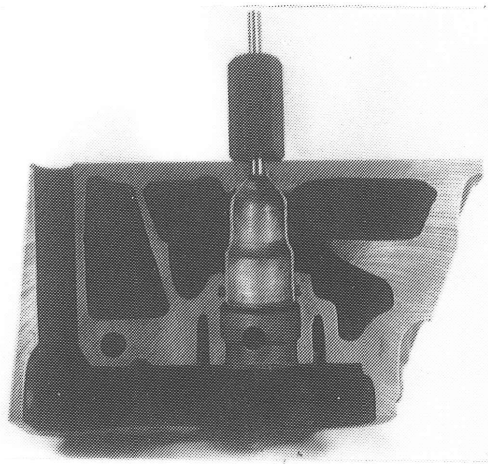


**STEP 5 - FACING OFF THE TIP END OF THE SLEEVE**

FREQUENTLY THE EXPANDING OF THE TIP OF THE SLEEVE WILL LEAVE SMALL BITS OF THE SLEEVE PROTRUDING ABOVE THE FACE OF THE HEAD.

IF THIS OCCURS, FACE OFF THE END OF THE SLEEVE, USING THE END FACER (646410). BRING THE END FACER IN FROM THE FACE SIDE AND OPERATE IT WITH A DRILL MOTOR RUNNING AT ABOUT 1200 RPM.

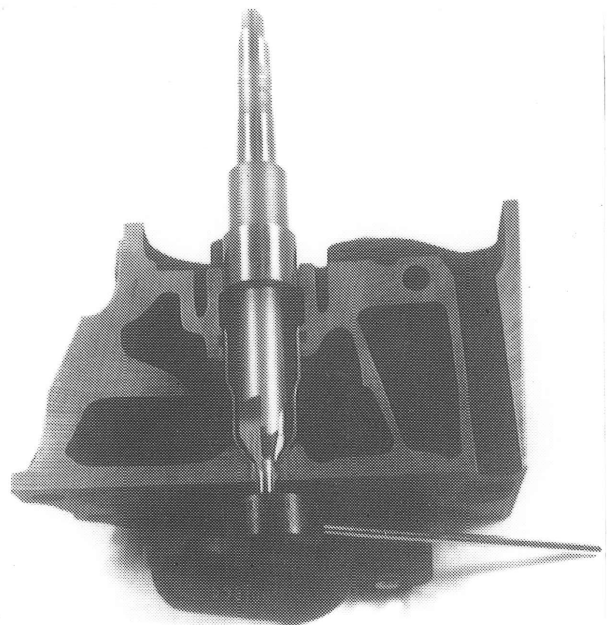
THE END FACER HAS A BUILT-IN STOP TO KEEP IT FROM CUTTING INTO THE FACE OF THE HEAD ADJACENT TO THE INJECTOR HOLE.



**STEP 6 - CUTTING THE SEAT IN THE NEW INJECTOR SLEEVE**

HERE AGAIN THE DEPTH OF THE SEAT CUT IN THE NEW INJECTOR SLEEVE IS OF UTMOST IMPORTANCE. LIKEWISE THE SLEEVE SEAT CUTTER HAS A DIMENSIONAL PILOT AT THE END AND THE DEPTH OF THE SEAT CUT IS GOVERNED BY THE COMBINATION OF THE GAGE FINGER, SEAT CUTTER GAGE AND THIS DIMENSIONAL PILOT.

POSITION THE GAGE FINGER (699100) AND THE SEAT CUTTER GAGE (648455) DIRECTLY BELOW THE INJECTOR SLEEVE HOLE AS SHOWN IN THE PICTURE.

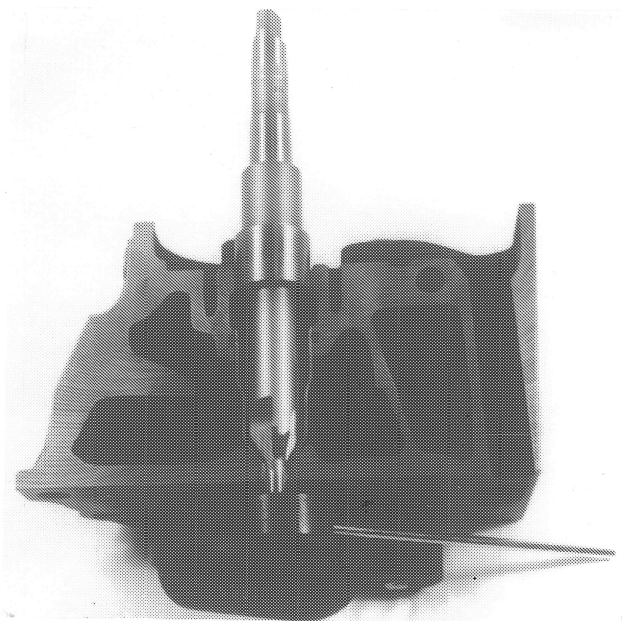


**STEP 6 - CUTTING THE SEAT IN THE NEW INJECTOR SLEEVE (CONT.)**

NOW BRING THE INJECTOR SLEEVE SEAT CUTTER (648450) DOWN INTO THE INJECTOR SLEEVE UNTIL THE DIMENSIONAL PILOT AT THE END OF THE CUTTER PROTRUDES BELOW THE FACE OF THE HEAD TOWARD THE SEAT CUTTER GAGE.

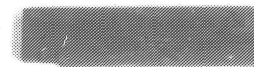
KEEPING THE SEAT CUTTER WELL LUBRICATED AT ALL TIMES AND OPERATING THE CUTTER AT ABOUT 300/400 RPM BRING THE CUTTER DOWN UNTIL THE DIMENSIONAL PILOT ON THE END OF THE CUTTER BOTTOMS ON THE TOP SURFACE OF THE SEAT CUTTER GAGE. THIS WILL GIVE THE CORRECT DEPTH TO SEAT IN THE SLEEVE.

IN SUBSEQUENT RESURFACING OF THE FACE OF THE HEAD IS CONTEMPLATED, THEN, BEFORE STARTING TO CUT THE SEAT IN THE SLEEVE, ALLOWANCE MUST BE MADE FOR THE RESURFACING BY SHIMMING UP THE SEAT CUTTER GAGE ON THE FACE OF THE GAGE FINGER.

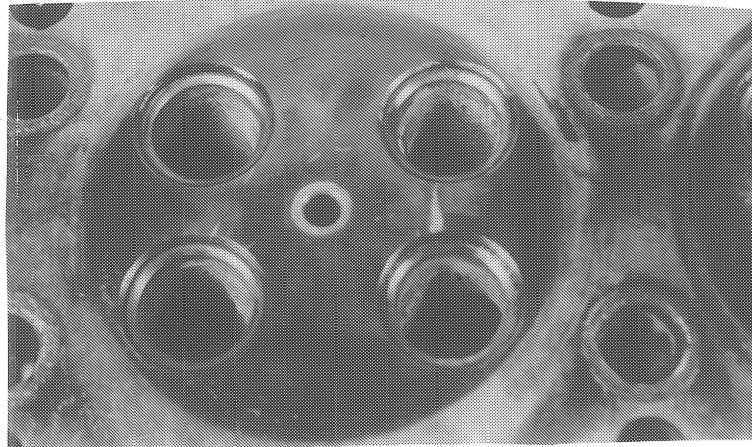


THE SLEEVE INSTALLATION KIT ALSO INCLUDES A FLAT TIP PROTRUSION GAGE (648182). AFTER THE SLEEVE INSTALLATION PROCESS IS COMPLETED AND THERE IS A MANDREL AND INJECTOR IN PLACE IN THE SLEEVE, USE THIS FLAT GAGE TO CHECK THAT THE TIP PROTRUSION IS SATISFACTORY.

PLACE THE FLAT GAGE ON THE FACE OF THE HEAD IN THIS MANNER. THE INJECTOR TIP SHOULD PROTRUDE AT THE FACE OF THE HEAD ABOVE THE LOWER STEP ON THE GAGE BUT NOT ABOVE THE UPPER STEP.



AS SHOWN IN THE PHOTO BELOW, SOME DIESEL ENGINES HAVE A TENDENCY TO DEVELOPE CRACKS ON THE FACE OF THE HEAD BETWEEN THE VALVE SEATS. THE REPAIR OF THESE CRACKS IS USUALLY TROUBLESOME BECAUSE THE CRACKS OFTEN RUN DOWN INTO THE VALVE SEAT AREA.



TO ASSIST IN REPAIRING THESE CRACKS, IRONTITE HAS AVAILABLE SPECIAL PLUGS WITH HOLES DRILLED IN THE LOWER ENDS OF THE PLUGS AND SLOTS CUT IN THE HEADS OF THE PLUGS. THE HOLES ARE TO AVOID BLOCKING THE FLOW OF WATER BETWEEN THE VALVES IN THE WATER JACKET AREA. THE SLOTS ARE TO HELP ALIGN THE PLUGS CORRECTLY:

'53 ENGINE

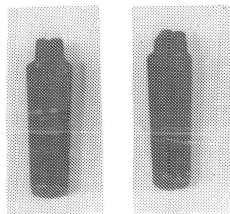
'71 ENGINE

'92 ENGINE

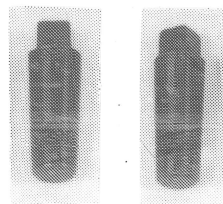
C-1 SPECIAL PLUGS

D-1 SPECIAL PLUGS

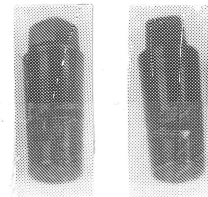
E-1 SPECIAL PLUGS



260424



260494



260594

WITH EACH OF THESE PLUGS THE RESPECTIVE C, D AND E TAPERED REAMERS AND TAPERED TAPS ARE USED, SUBJECT TO SPECIAL MODIFICATIONS DESCRIBED BELOW.



## REPAIR OF CRACKS BETWEEN VALVE SEATS ON DIESEL ENGINE HEADS

### PRELIMINARY CHECK FOR COLLATERAL CRACKS

AT THE OUTSET, BEFORE BEGINNING THE REPAIR OF A CRACK BETWEEN THE VALVE SEATS, CHECK CAREFULLY DOWN THE VALVE SEAT AREA TO DETERMINE HOW FAR DOWN THE CRACKS RUN. FREQUENTLY IT MAY BE NECESSARY TO SUPPLEMENT THIS SPECIAL PLUG WITH ADDITIONAL PLUGS ALONGSIDE THE VALVE SEAT AREA.

HOWEVER, AT THIS TIME THE ONLY STEPS TO BE TAKEN WITH RESPECT TO THESE COLLATERAL CRACKS THAT RUN DOWN INTO THE VALVE SEAT AREA ARE TO DRILL HOLES AT THE LOWER ENDS OF THESE CRACKS TO RELIEVE THE STRESS AND STOP THE CRACKS FROM RUNNING FURTHER DOWN THE VALVE SEAT AREA.

THE REPAIR OF THESE COLLATERAL CRACKS WILL BE DEFERRED UNTIL AFTER THE SPECIAL PLUG IS INSTALLED. AT THAT TIME REPAIR THESE CRACKS USING THE IRONTITE A-200 AND A-235 CRACK REPAIR PLUGS IN THE NORMAL MANNER, ANGLING THE PLUGS DOWN INTO THE VALVE SEAT AREA.

### INSTALLATION OF THE SPECIAL PLUGS

GENERALLY, IN INSTALLING THESE SPECIAL PLUGS YOU ARE GOING INTO A BLIND HOLE AND SPECIAL STEPS MUST BE TAKEN TO MAKE SURE THAT THE PLUGS GET A GOOD TIGHT FIT.

WITH EACH OF THE PLUGS USE A DRILL BEFORE REAMING WHICH IS SLIGHTLY SMALLER THAN THE SIZE NORMALLY USED FOR THAT SIZE PLUG:

FOR C-1 PLUGS - USE A 3/8" DRILL - 510424

FOR D-1 PLUGS - USE A 7/16" DRILL - 510494

FOR E-1 PLUGS - USE A 35/64" DRILL - 510594

IN ADDITION TO USING THE SLIGHTLY SMALLER DRILL, MILL ABOUT 1/4" OFF THE END OF THE REAMER AND OFF THE END OF THE TAP. THIS WILL ALLOW THE SPECIAL PLUGS TO GO DEEP ENOUGH TO CLEAR THE SPECIAL WATER HOLE IN THE END OF THE PLUG.

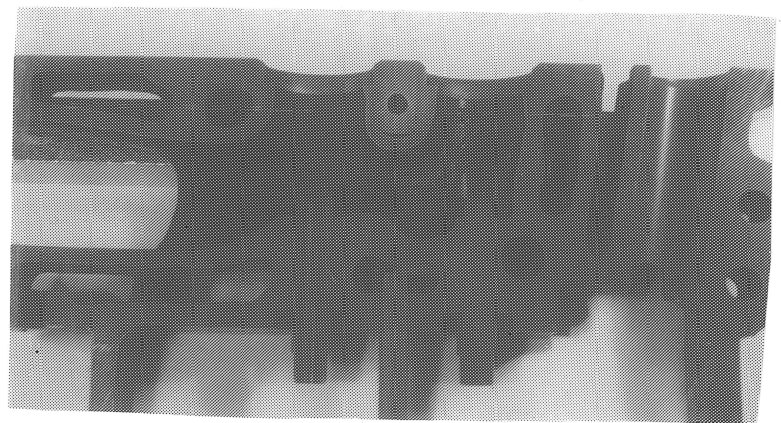
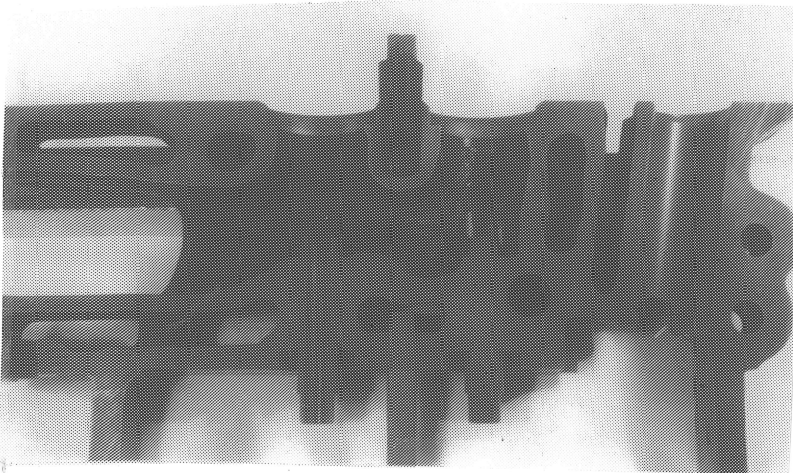
IN INSTALLING THESE SPECIAL PLUGS DIP THE PLUG IN IRONTITE CERAMIC SEAL AND THEN BRUSH CERAMIC SEAL IN THE TAPPED HOLE. NOW TORQUE THE PLUG.

IN GOOD AND TIGHT BUT ALWAYS ENDING WITH THE SLOT IN THE HEAD OF THE PLUG RUNNING IN THE DIRECTION OF THE WATER FLOW IN THE WATER JACKET.

THEN CUT OFF THE HEAD OF THE PLUG, PEEN IT WELL AND RESURFACE THE FACE OF THE CASTING.

AT THIS STAGE REPAIR ANY COLLATERAL CRACKS THAT APPEARED DOWN THE VALVE SEAT AREA.

THE PICTURES BELOW SHOW A D-1 SPECIAL PLUG INSTALLED IN A HEAD AND A CUTAWAY OF A FINISHED JOB. NOTE HOW THE HOLE IN THE PLUG ALLOWS THE WATER FLOW TO CONTINUE WITHOUT INTERRUPTION.





REPAIR OF CRACKS BETWEEN VALVE SEATS  
ON DIESEL ENGINE HEADS

LIST OF PARTS REQUIRED FOR THE THREE SIZES OF SPECIAL PLUGS

WHEN USING C-1 SPECIAL PLUGS:

|        |                   |
|--------|-------------------|
| 260424 | C-1 SPECIAL PLUGS |
| 510424 | 3/8" DRILL        |
| 520420 | C TAPERED REAMER  |
| 530420 | C TAPERED TAP     |

WHEN USING D-1 SPECIAL PLUGS:

|        |                   |
|--------|-------------------|
| 260494 | D-1 SPECIAL PLUGS |
| 510494 | 7/16" DRILL       |
| 520490 | D TAPERED REAMER  |
| 530490 | D TAPERED TAP     |

WHEN USING E-1 SPECIAL PLUGS:

|        |                   |
|--------|-------------------|
| 260594 | E-1 SPECIAL PLUGS |
| 510594 | 35/64" DRILL      |
| 520590 | E TAPERED REAMER  |
| 530590 | E TAPERED TAP     |







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