

PARTS & SERVICE NEWS

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| REF NO. | AA01227 |
| DATE | November 6, 2001 |

SUBJECT: M11 PT[®]/STC INJECTOR CUP CAVITATION MODIFIED CENTRY[®] KIT INSTRUCTIONS

PURPOSE: To introduce Field Fix for M11 PT/STC injector cup cavitation.

APPLICATION: PC400LC-6LC Hydraulic Excavator Serial Number A80001 and UP
PC400HD-6LC Hydraulic Excavator Serial Number A80001 and UP
WA450-3L Wheel Loader Serial Number A30001 and UP

FAILURE CODE: A1K8FE

DESCRIPTION:

This Parts and Service News introduces the M11 PT/STC production electronics STC kit for injector cup cavitation prevention. The kit can be used on existing M11 engines in the field for fixing injector cup cavitation issues.

The electronic STC module, which contains the module and the programming key, part number is determined based on the rated engine speed, the flywheel teeth, and the mechanical STC switch point. The switch point is determined by the CPL number. The module operates on a 12 or 24 VDC system.

The installation hardware kit must be ordered separately. Select kit, Part No. 1315 934 H91 (24 VDC systems)

To replace a module that has failed in the field, order Part No. 1315 866 H1. This part number includes the electronic STC module and service literature but does not include a calibration key. Once the failed module has been removed from the engine and the new module completely installed, remove the calibration key from the failed module's harness, and install it on the new module's harness. This will calibrate the new module after the engine has been keyed on.

Injector cup cavitation is a failure mode that, over time, can result in an engine symptom of excessive black smoke and/or poor fuel economy. Engines with high engine speed and a rapidly varying load duty cycle, such as excavators, tend to be more prevalent in experiencing this type of failure. The cavitation in the injector cups is found to be caused by the engine operating at other than normal timing conditions when going from engine-rated speed to high idle. This is caused by a slow rail pressure decay rate, which corresponds to a slow response time of the hydromechanical STC switch.

At other than normal timing, the metering chamber temperature, internal to the injector, is elevated, increasing the vapor pressure of the fuel. This results in vapor bubble formation and cavitation damage when the bubbles collapse at the bottom of the injector cup.

The kit has addressed this issue with the addition of an electronic STC valve. The electronic STC valve, along with the other kit components, allows for a much quicker transitional timing response time in the high-speed varying load applications by utilizing two switch points based on rail pressure and engine speed. To control the oil flow (which controls advanced or normal timing) to the STC injectors, an electronic step timing control (STC) module with harness, rail pressure sensor, engine speed sensor, and electronic STC valve is included.

Parts List

| Table 1 Electronic STC Module Kit Part Numbers | | | | | |
|---|---------------|-------------------------------|--------------------|-------------------------|-----------------------|
| Part Description | Models | CPL Number | Part Number | STC switch Point | Flywheel Teeth |
| Installation hardware kit | PC400LC/WA450 | ALL | 1315 934 H91 | ** | ** |
| Module Kit | PC400LC | 1308 849 H91/ 1306 475 H91 | 1315 992 H91 | 23 psi | 118 |
| Module Kit | WA450 | 1306 523 H91 | 1315 993 H91 | 27 psi | 103 |

| Table 2 CPL/STC Information | |
|------------------------------------|-------------------------------|
| CPL | STC Valve Switch Point |
| 1310 993 H91 | 27 psi |
| 1308 849 H91 | 23 psi |
| 1306 523 H91 | 27 psi |
| 1306 475 H91 | 27 psi |

| Table 3 Electronic STC Installation Hardware Kit Part Numbers | |
|--|-----------------------|
| Installation Hardware Kit Part Numbers | System Voltage |
| 1315 934 H91 | 12 VDC |



Figure 1 Engine Dataplate, (1) Field Fix Location

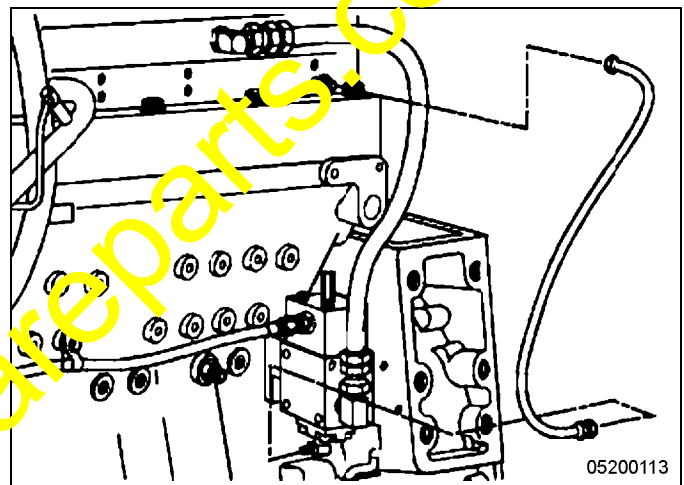
Note: A complete wiring diagram and kit layout is supplied on the last page of this document.

Modified CENTRY® System Installation Procedure

Removal

Remove the rail pressure sensor line that connects the hydromechanical STC valve to the cylinder head and discard.

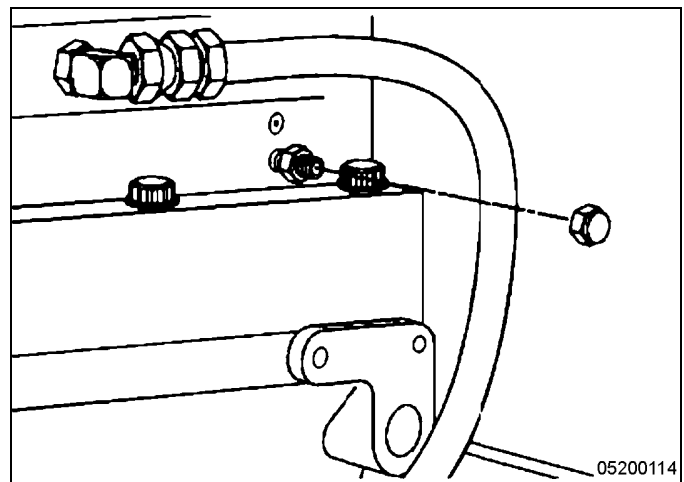
NOTE: Leave the fitting (from the rail pressure line) in the cylinder head.



Install the cap on the fitting that the rail pressure line was connected to, located on the cylinder head.

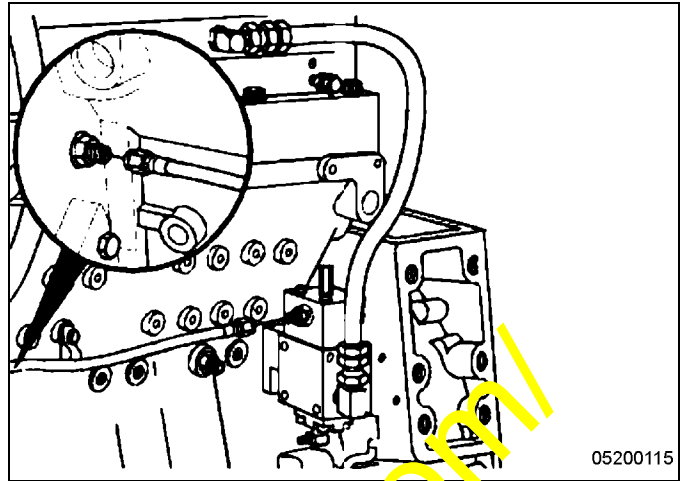
Tighten the cap.

 Torque Value **36 N•m [27 ft-lb]**




Remove the oil drain line that connects the hydro-mechanical STC valve to the front cover and discard.

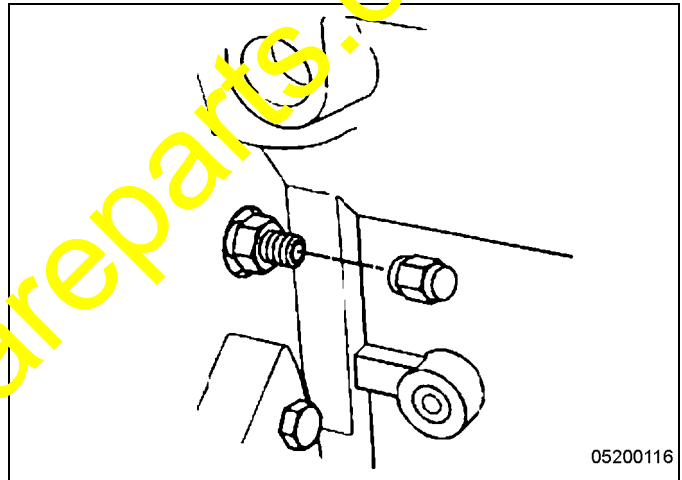
NOTE: Leave the fitting from the oil drain line in the front cover.



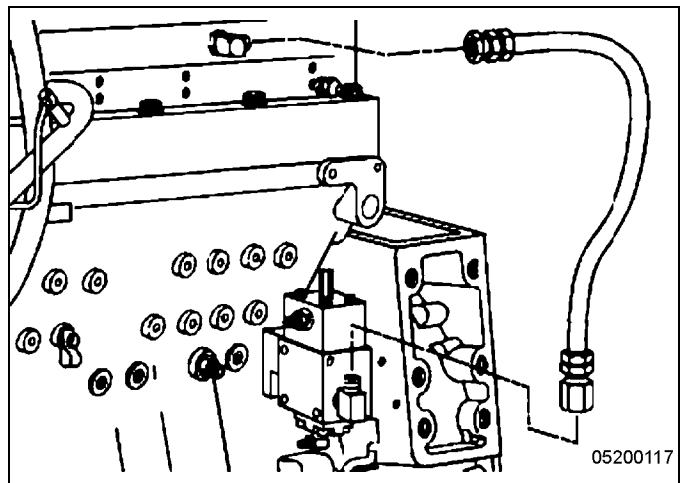
Install the cap on the fitting that the oil drain line was connected to, located on the front cover.

Tighten the cap.

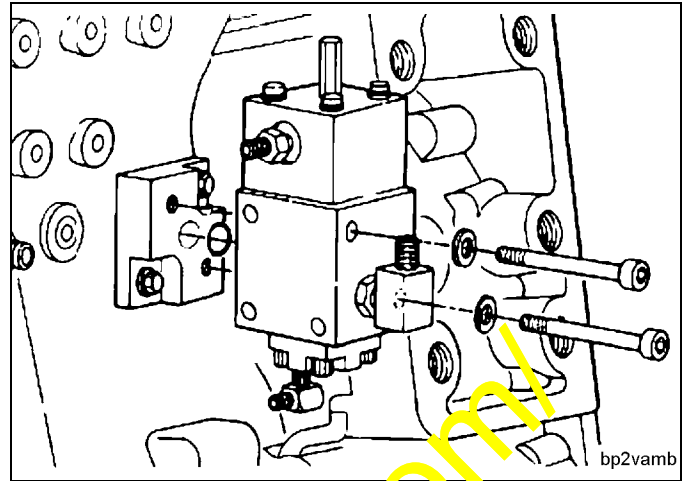
 **N•m** Torque Value: **36 N•m [27 ft-lb]**



Remove the oil feed line from the hydro-mechanical STC valve.



Remove the hydromechanical STC valve from the engine.




Install

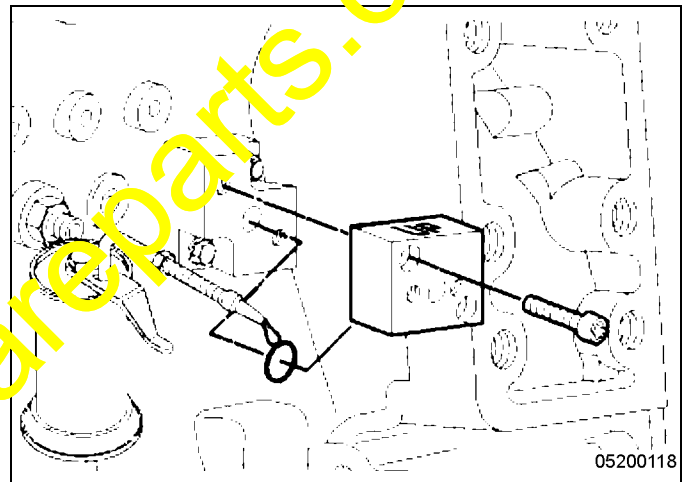
Lubricate the O-ring. Place the o-ring in the STC adapter block O-ring groove on the block.

Install the STC adapter block onto the block using two capscrews and washers and finger-tighten the capscrews.

NOTE: Make sure the word TOP is stamped on the adapter block and is facing upward when the adapter block is installed onto the engine.

Tighten the capscrews.


 **N•m** Torque Value: **43 N•m [31 ft-lb]**

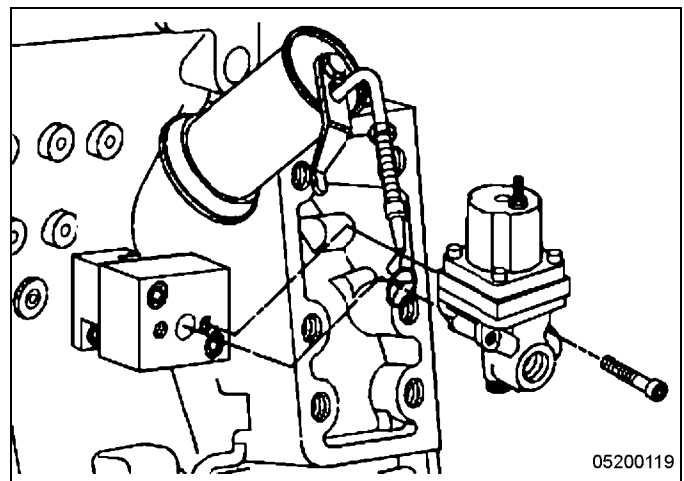


Lubricate the O-ring. Place the O-ring into the groove in the STC shutoff valve assembly (12 VDC) or shutoff valve (24 VDC).

Install the STC shutoff valve assembly onto the adapter block using two capscrews; flat washers; and lock washers. Finger-tighten the capscrews.

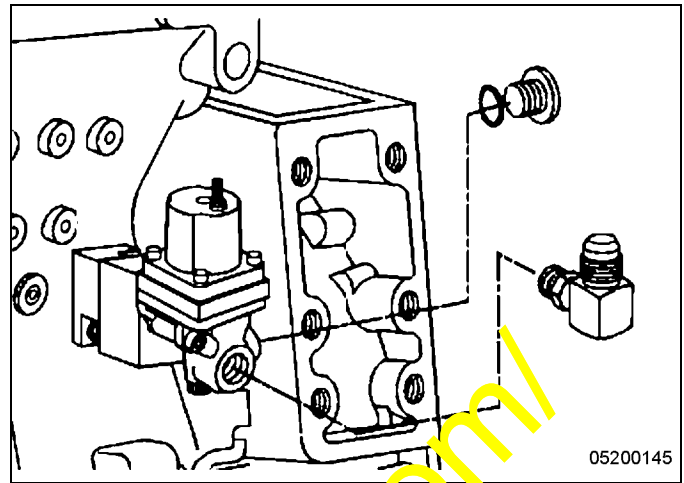
Tighten the capscrews.

 **N•m** Torque Value: **9 N•m [84 in-lb]**

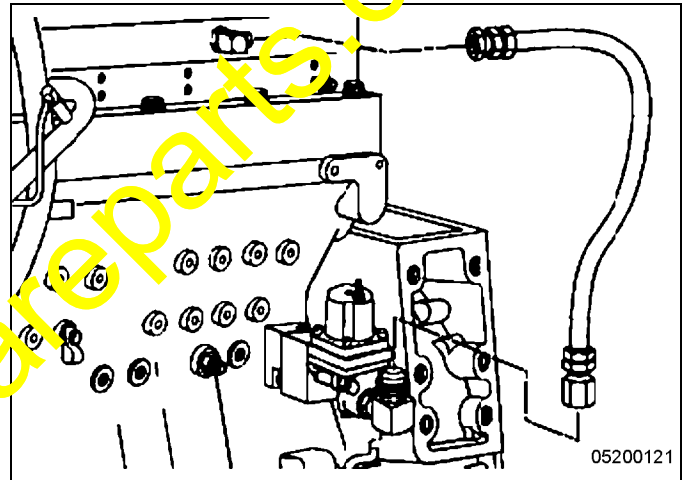


Install a 90-degree elbow check valve onto the fuel shutoff valve assembly.

Install plug onto the fuel shutoff valve assembly.

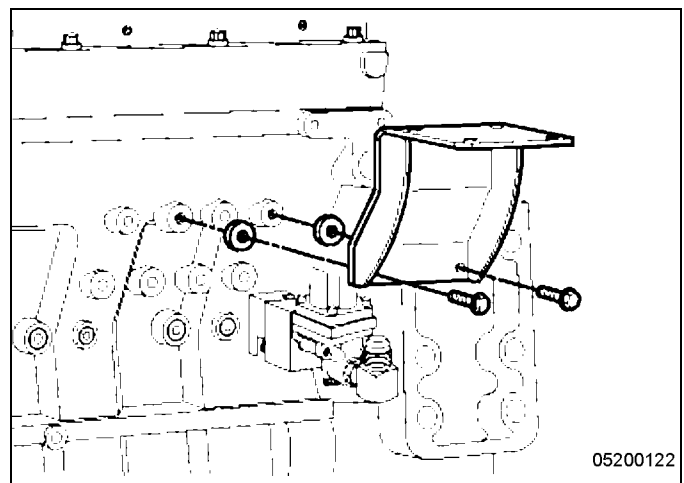


Connect the flexible oil feed line to the 90-degree elbow check valve.




Remove the old fuel filter head bracket.

NOTE: On applications that do not have the fuel filter bracket, this step can be omitted.

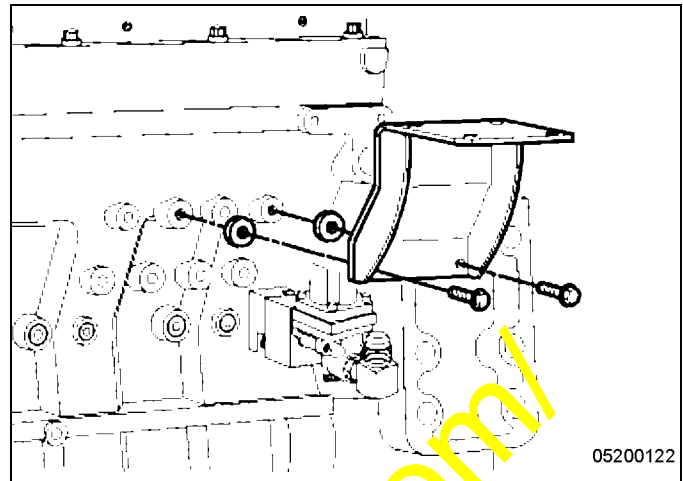


Install the new fuel filter head bracket. This redesigned bracket will allow for and support the extra weight of the CENTRY[®] ECM and the ECM mounting bracket.

Tighten the capscrews.


 **N•m** Torque Value: **47 N•m [35 ft-lb]**

NOTE: Extra spacers will possibly be needed to allow clearance between this bracket and the engine block.

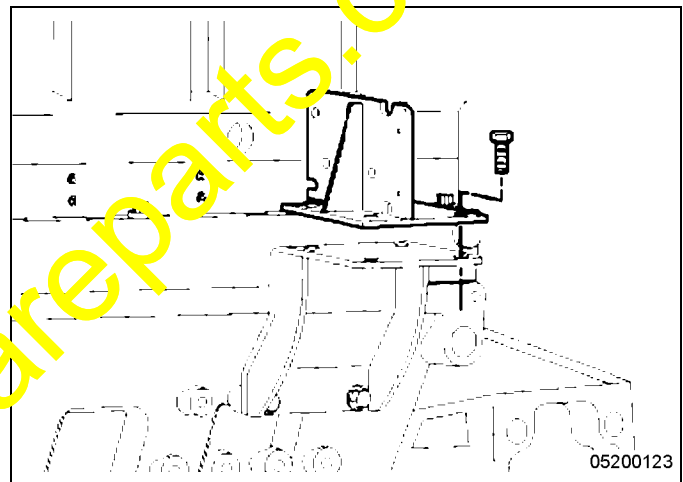


Install the CENTRY[®] ECM bracket onto the top of the fuel filter head bracket using capscrews.

Tighten the capscrews.

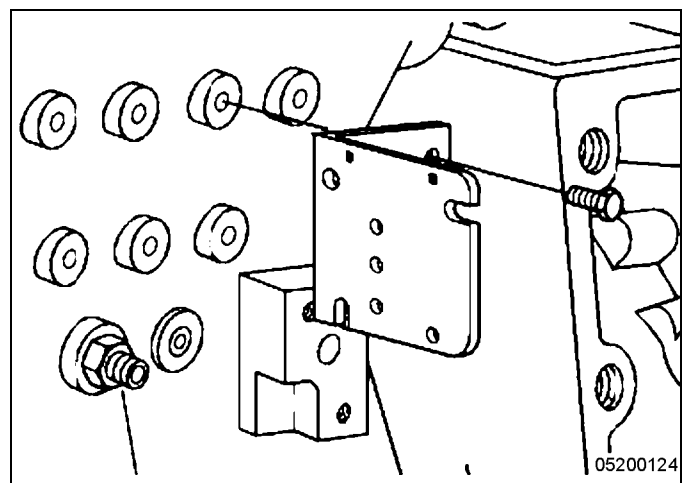
 **N•m** Torque Value: **41 N•m [30 ft-lb]**

NOTE: If this specific fuel filter head option is not used, use washer and nut.




If the application does not use the fuel filter option, then an alternate option to mount the ECM will be selected.

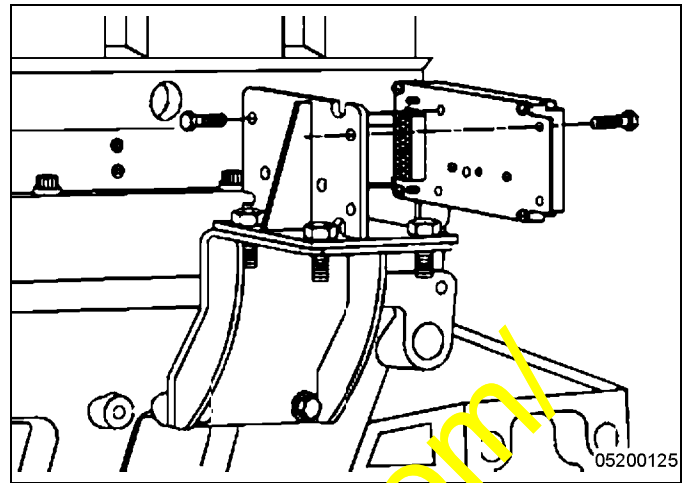
ECM bracket must be remote-mounted as close as possible to the location illustrated in order to allow the wiring harness connectors to reach their intended components, such as the rail pressure sensor, engine speed sensor, power and ground, and so forth.



Install the ECM (24 VDC) onto the bracket using capscrew and capscrew.

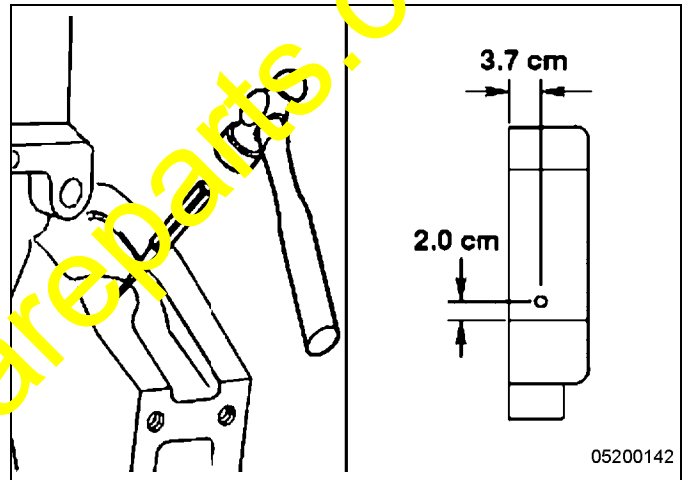
Tighten the capscrew.

 **N•m** Torque Value: **11 N•m [101 in-lb]**



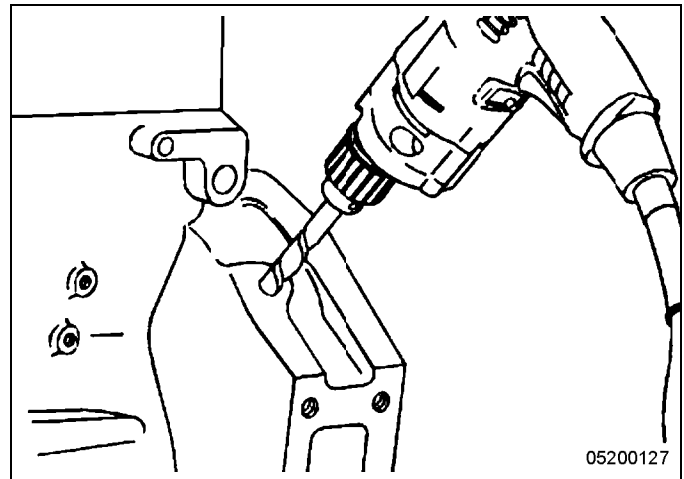
Mark and center-punch engine speed sensor hole in the flywheel housing using the illustration.

NOTE: If the engine already has a properly tapped hole in the flywheel housing, this step and the following drill-and-tap steps can be omitted.



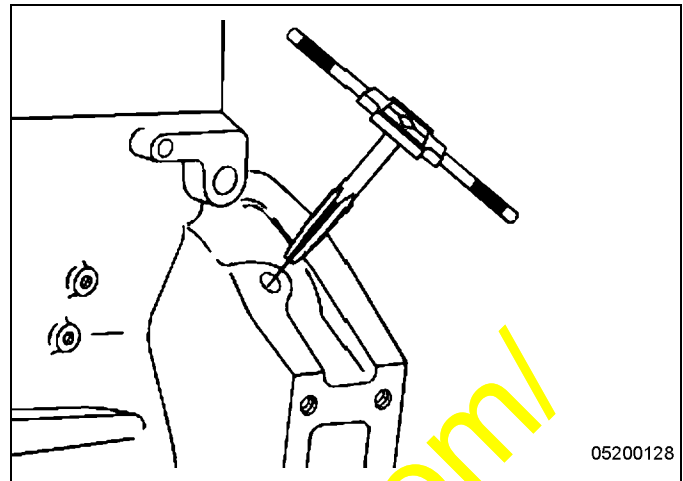
11/16-Inch Drill Bit

Drill an 11/16-inch hole in the flywheel housing that was center-punched in the previous step.



3/4-Inch x 16 Starter Tap

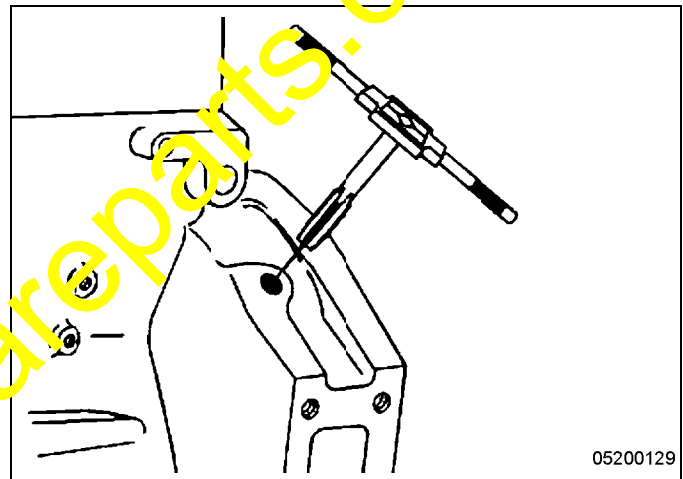
Tap the hole drilled in the previous step.



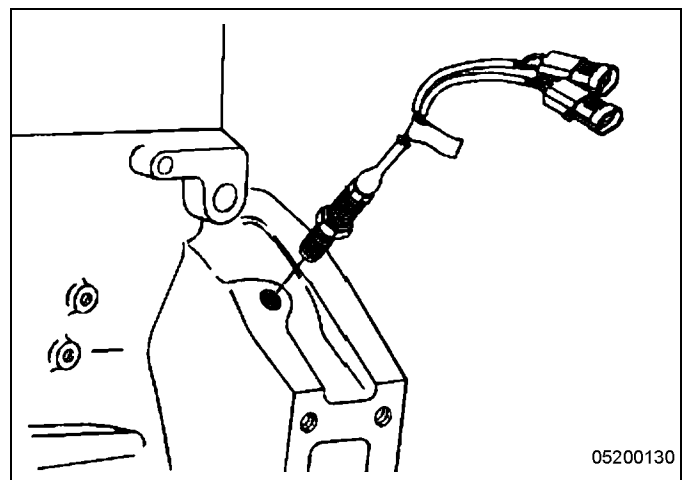
3/4-Inch x 16 Bottom Tap

Retap the hole that was tapped in the previous step.

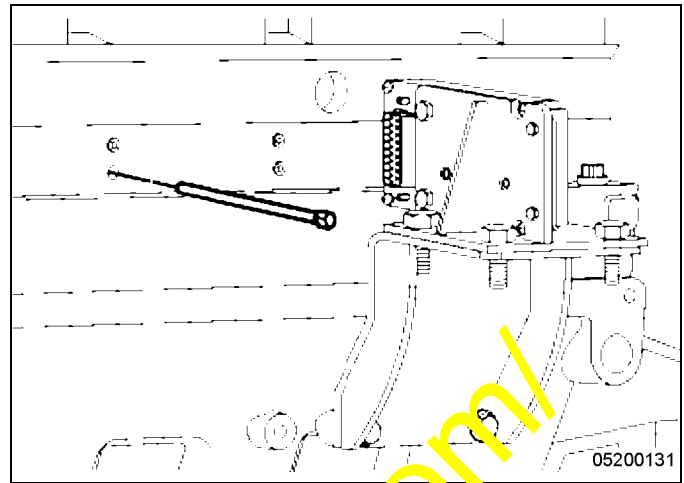
NOTE: This step is completed because the starter tap meets the flywheel prior to completing the hole-threading process.



Install the engine speed sensor into the flywheel housing. Refer to the CELECT™ Plus Troubleshooting and Repair Manual, Bulletin No. 3666130, Procedure 019-031, for the installation procedure.




Remove the 1/8-inch pipe plug and stinger from the cylinder head bottom hole, and install special nylon stinger.




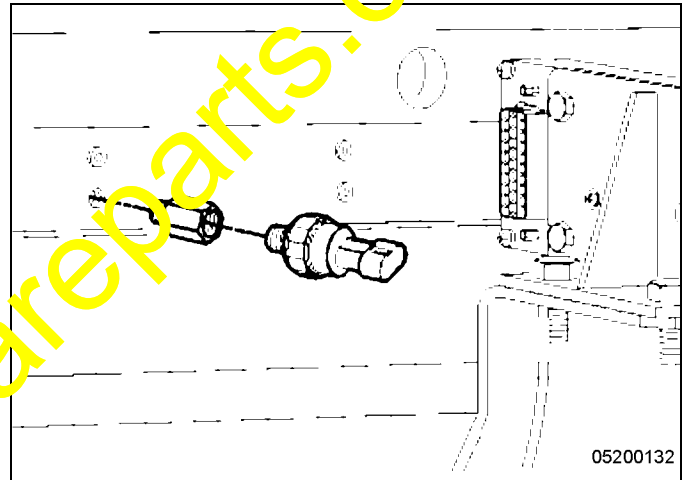
Install the fuel rail pressure sensor adapter and the fuel rail pressure sensor into the cylinder head.

Tighten fuel rail pressure sensor adapter.

 **N•m** Torque Value: **20 N•m [177 in-lb]**

Tighten the fuel rail pressure sensor.

 **N•m** Torque Value: **14 N•m [123 in-lb]**

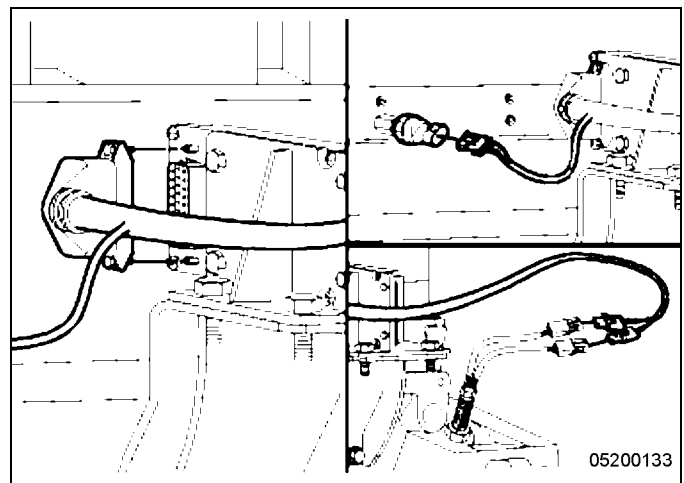


Install wiring harness to the CENTRY™ ECM.

Tighten the wiring connector capscrews.


 **N•m** Torque Value: **6.7 N•m [6 in-lb]**

Connect the wiring harness to the rail pressure sensor and the secondary engine speed sensor.

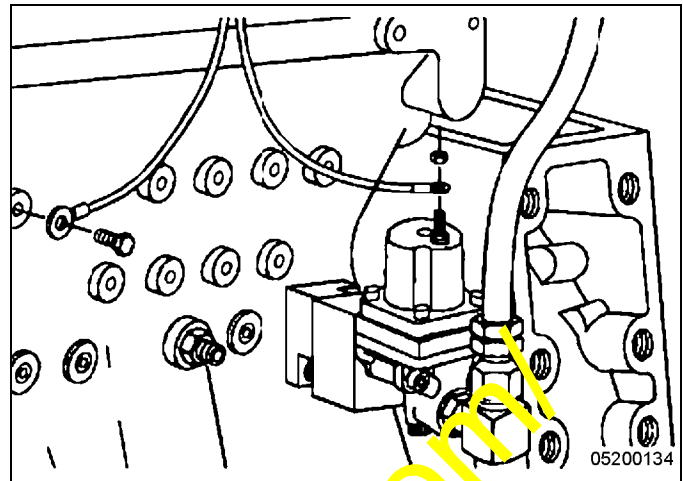


Connect the harness 3-foot one-ring terminal lead to the STC fuel shutoff valve.

Tighten the nut.


 Torque Value: **3 N•m [26 in-lb]**

Ground the large ring terminal to an appropriate engine block ground.



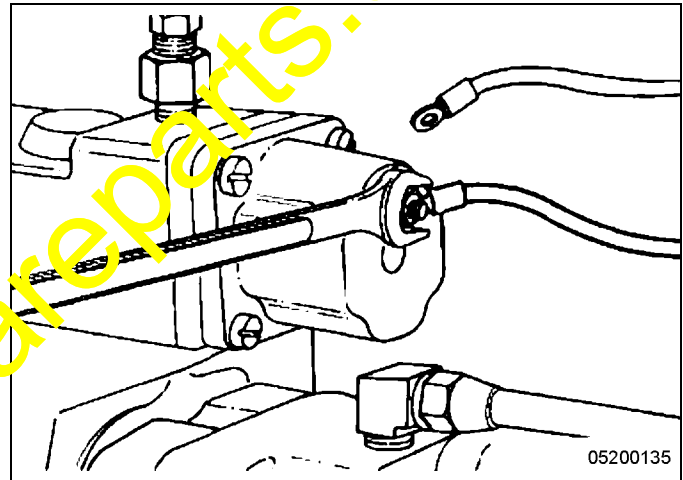
Connect the 4-foot one-ring terminal ring to the engine fuel pump shutoff valve.

Tighten the nut.

 Torque Value: **3 N•m [26 in-lb]**

There are now two wires on the engine fuel pump shutoff valve solenoid.

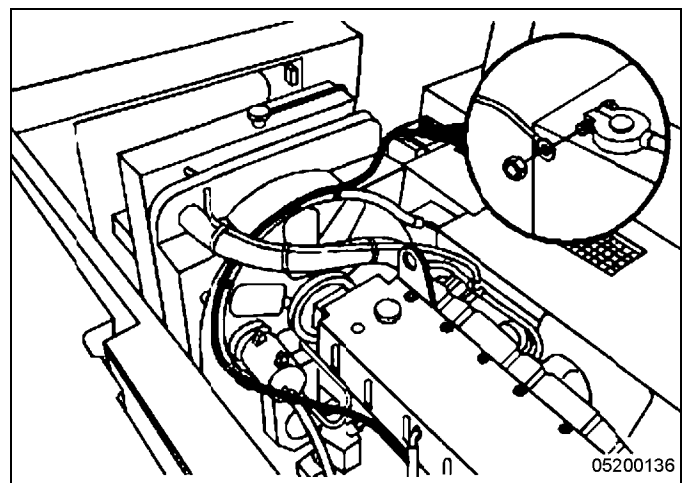
NOTE: This is where the kit will receive 24-VDC supply power.



Route the negative (-) black 20-foot one-ring terminal lead around the radiator, and connect it to the battery ground.

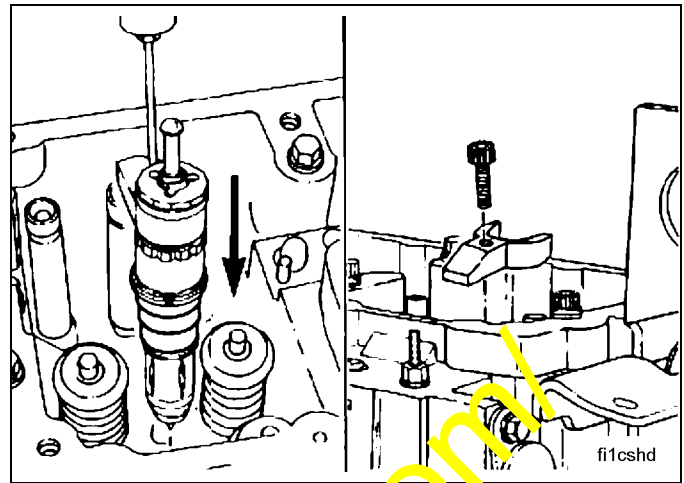
NOTE: The routing of the negative (-) terminal lead will possibly differ on some applications.

Route the harness and all leads clear of moving objects and secure using tie wrap.



Install a set of new injectors using the 8- or 10-hole cup configuration that was removed from the engine. This will make sure that the injectors will not have any unseen cavitation damage internal to the injector cup at the time of kit installation.

| CPL Injector Part No. Description |
|---|
| 1306 475 H91 1307 007 H91 8-hole cup, 13-degree spray |
| 1308 849 H91 1307 007 H91 8-hole cup, 13-degree spray |
| 1306 523 H91 1310 105 H91 8-hole cup, 13-degree spray |

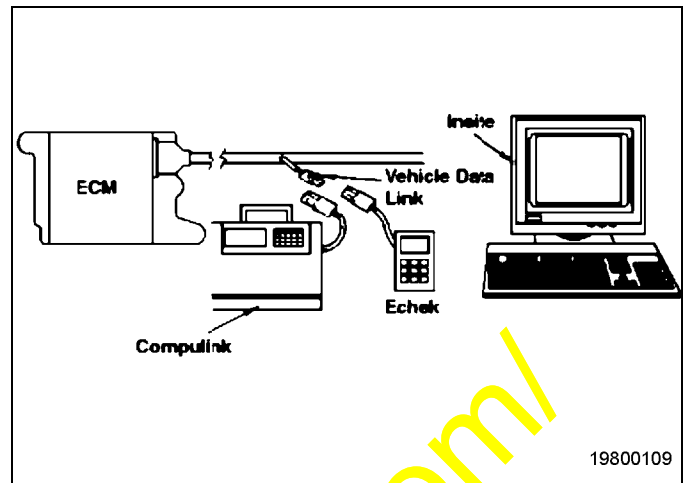


Connect the laptop computer loaded with the latest version of INSITE and ESDN to the 2-pin Weather-Pack connector on the kit harness.

NOTE: An INLINE I adapter, Part No. 3824938, 9-pin cable, Part No. 3162850 or Part No. 3824594, and a 25-pin to a 2-pin Weather-Pack with a male power adapter, Part No. 3824438, will be used.

Using ESDN, download the correctly modified CENTRY[®] calibration for the application. Use the table below for details on the correct calibration selection.

| ECM Code | System Voltage | Number of Flywheel Teeth |
|----------|----------------|--------------------------|
| A02020 | 12-VDC | 103 |
| A02021 | 12-VDC | 118 |
| A02022 | 24-VDC | 103 |
| A02023 | 24-VDC | 118 |



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Using INSITE™ for CENTRY®, Bulletin No. 3885793, or Compulink™, Bulletin No. 3666080, adjust the calibration for each application. Parameters that will possibly need to be adjusted, under adjustments ("features", "parameters", and "STC"), are STC rail speed threshold and STC rail pressure threshold 1.

STC rail speed threshold must be set 25 rpm above rated speed of the engine. For 2000-rpm rated applications, set to 2025 rpm; for 2100-rpm rated applications, set to 2125 rpm.

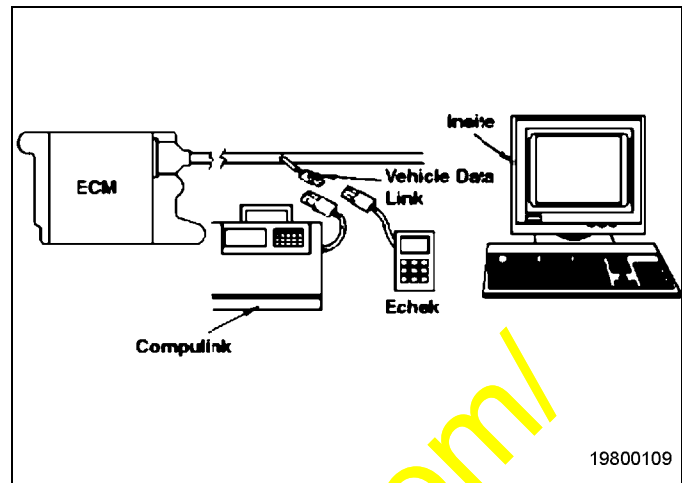
NOTE: STC rail speed threshold must not be set below the rated speed of the engine. If the rail speed is set below the rated speed of the engine, cylinder pressure limits as well as emissions regulations can't possibly be exceeded or violated.

STC rail pressure threshold 1 will be set to match the hydromechanical lower switch-point setting of the STC valve that was removed from the engine. The value will be either 23 or 27 psi, depending on the valve.

NOTE: INSITE™ for CENTRY® can also be used to troubleshoot this modified system for the following rail pressure, speed sensor, and wiring harness-related fault codes.

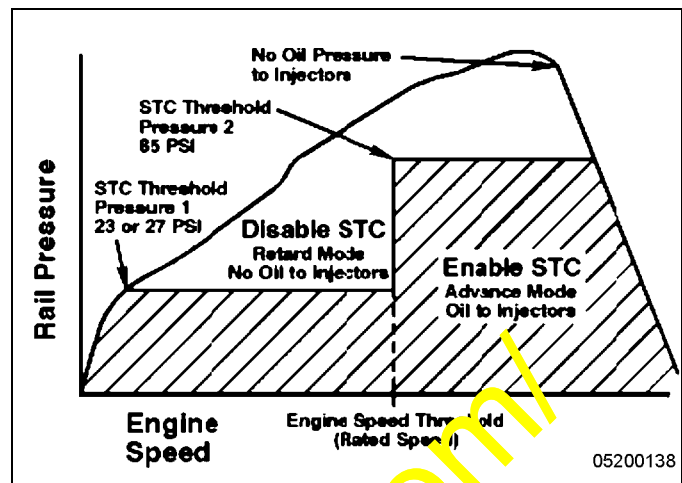
Using service tool, ST464-2 (nose adapter assembly), and a pressure gauge, plumb the oil feed line that sends engine oil to the overhead, and check the operation of the electronic STC valve under various loads and speeds to make sure the valve is switching.

Use the graph in the step on the next page

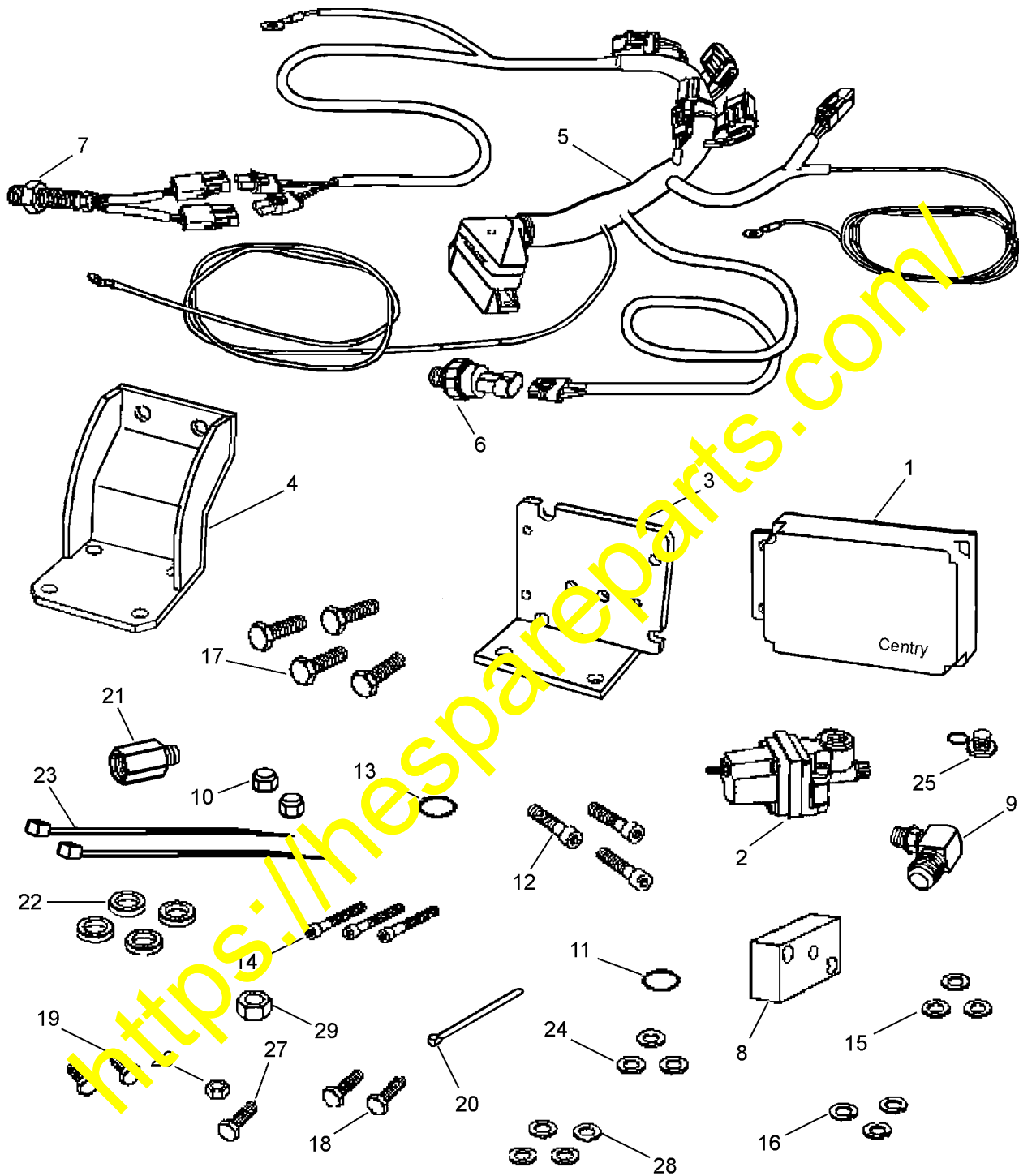


Using INSITE™ for CENTRY®, Bulletin No. 3885793, or Compulink™ Bulletin No. 3666080, view the rail pressure and engine speed to make sure reasonable inputs are being reflected for each sensor. If they are not, troubleshoot each newly installed sensor.

NOTE: For example, when the rail pressure is below the STC rail pressure threshold 1, the engine will be in advance and have oil pressure to the tappet. When the rail pressure is above the STC rail pressure threshold 1 and below rated speed, the engine will be in retard, and no oil pressure will be at the tappet. See illustration for advance and retard conditions.



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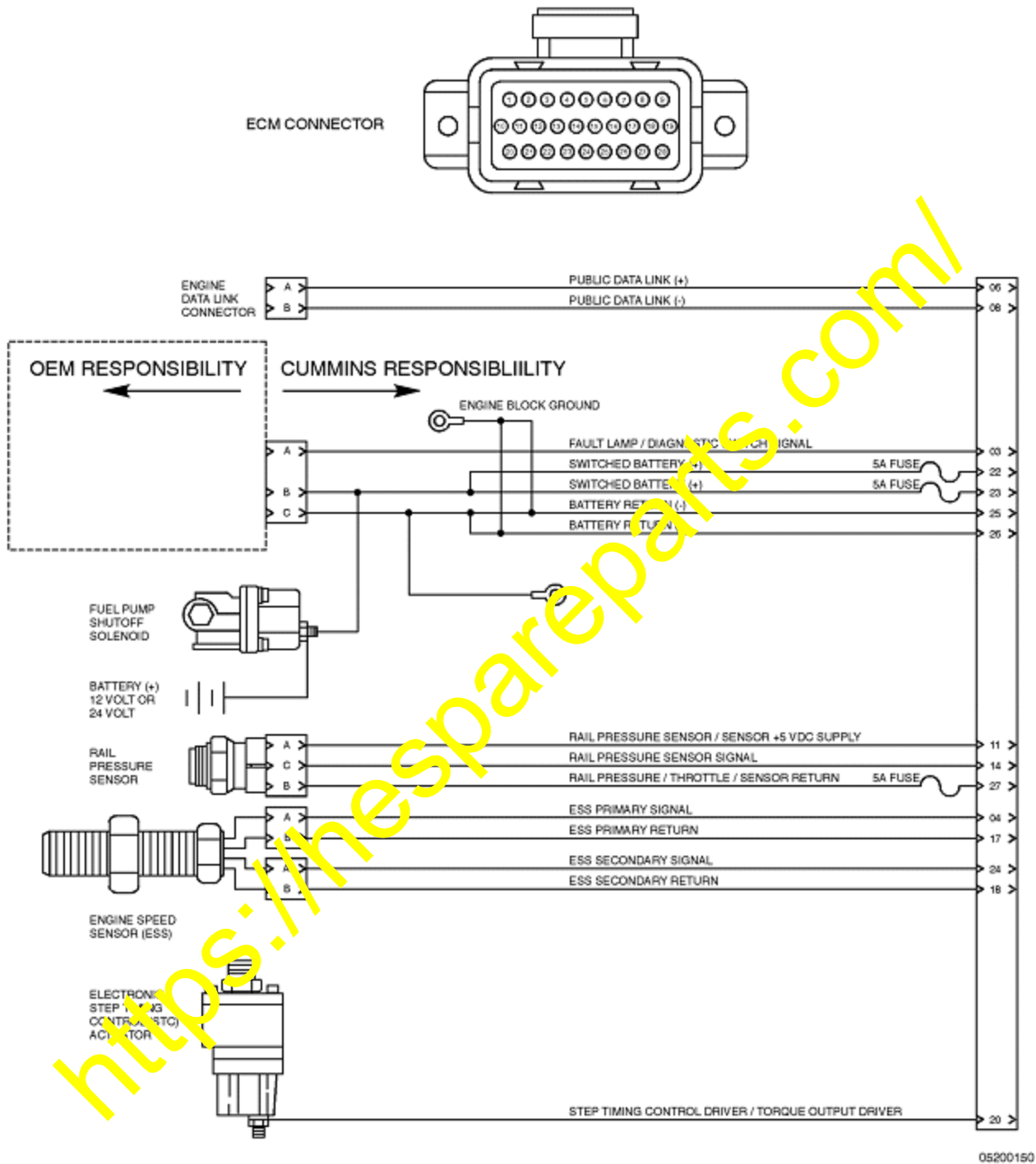


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M11 PT®/STC Cup Cavitation Modified CENTRY® Kit

M11 PT/STC Injector Cup Cavitation Kit Bill of Materials

| Reference No. | Komatsu Part No. | Qty | Description |
|---------------|------------------|-----|--|
| | 1315 934 H91 | 1 | 24-VDC kit |
| 1 | NSS | 1 | Module, electronic (24-VDC kit only) |
| 2 | 1315 886 H91 | 1 | Shutoff valve assembly (24-VDC kit only) |
| 3 | NSS | 1 | Bracket, ECM mounting |
| 4 | NSS | 1 | Bracket, fuel filter mounting |
| 5 | NSS | 1 | Harness, wiring |
| 6 | 1315 881 H91 | 1 | Sensor, rail pressure |
| 7 | 1315 865 H1 | 1 | Sensor, engine speed |
| 8 | 1315 885 H1 | 1 | Adapter, block |
| 9 | 1307 066 H1 | 1 | Valve, check |
| 10 | 1296 401 H1 | 2 | Cap, threaded |
| 11 | 1310 689 H1 | 1 | O-ring |
| 12 | NSS | 3 | Capscrew, Allen head (one extra) |
| 13 | 117740 | 1 | O-ring |
| 14 | 1238 069 H1 | 3 | Capscrew, Allen head (one extra) |
| 15 | 1240 005 H1 | 3 | Washer (one extra) |
| 16 | 1238 480 H1 | 3 | Lock washer (one extra) |
| 17 | 1026 47 H4 | 4 | Capscrew, hexagon |
| 18 | 1238 011 H1 | 2 | Screw, hexagon |
| 19 | 1294 627 H1 | 2 | Screw, hexagon |
| 20 | 1315 883 H1 | 1 | Insert, nylon |
| 21 | 1315 882 H1 | 1 | Connector, female |
| 22 | 1238 177 H1 | 4 | Spacer |
| 23 | NSS | 25 | Cable tie |
| 24 | 1246 490 H1 | 3 | Washer (one extra) |
| 25 | 1307 999 H91 | 1 | Plug |
| 26 | 1238 088 H1 | 1 | Nut, hexagon |
| 27 | NSS | 2 | Screw, hexagon |
| 28 | 1238 117 H1 | 4 | Washer |
| 29 | 1239 902 H1 | 4 | Nut, hexagon |
| | NSS | 1 | Installation instructions |



M11 PT[®]/STC Injector Cup Cavitation Modified CENTRY[®] Kit Wiring Diagram