General Description and Principles of Operation

The Kysor warning and engine shutdown system electronically monitors engine oil pressure, coolant temperature, and coolant level. If the oil pressure drops below a preset level, the low oil pressure light comes on, and a warning buzzer sounds. If the oil pressure drops to a preset critical level, the engine shutdown light comes on, and the voltage to the fuel control circuit is interrupted, shutting down the engine.

If engine coolant temperature rises above a preset level, a warning light comes on, and a buzzer sounds. The temperature that triggers the warning light and buzzer varies with engine type. If the temperature continues to rise to critical levels, the engine shutdown light comes on, and the voltage to the fuel control circuit is interrupted, shutting down the engine.

If the coolant level drops below the level of a sensor in the cooling system, the low water level light comes on, and a buzzer sounds. After 30 seconds the system shuts down the engine.

All shutdown features have an automatic override: if it is necessary to move the vehicle to a safe location after a shutdown, just crank the engine—it will run for about 30 seconds and then shut down again.

The Kysor warning and engine shutdown system provides a driver circuit for the temperature gauge. This circuit uses the same temperature sensor as the alarm and shutdown functions.

When the ignition switch is turned on, the engine function light will turn on and the buzzer will sound momentarily.

The warning buzzer is triggered by the start circuit. After the engine is cranked, releasing the start switch activates the buzzer. Therefore, during a normal start, the buzzer sounds after releasing the starter until the engine oil pressure and the air pressure reach normal operating values.

Circuit overload protection is built into the Kysor warning and engine shutdown system. If an overload is detected on an output circuit, that particular circuit shuts down. To restore full function, remove the overload; turn the ignition switch off, then on again. Intermittent shorts in the output circuits will cause intermittent false engine shutdown.
Replacement

1. The warning and shutdown control module is located behind the right-side upper dashboard panel, above the electrical center. Access it by removing the rubber trim piece on the right side of the dashboard and the two screws that connect the dashboard cover to the dashboard.

2. Replace the control module.
   2.1 Disconnect the 15-pin wiring connector from the warning and shutdown control module.
   2.2 Remove the two mounting bolts and the module.
   2.3 Position the new module on the mounting bracket then install the two mounting bolts.
   2.4 Connect the 15-pin wiring connector.

3. Install the dashboard cover and tighten the screws securely; then install the trim piece.
Replacement

HIGH COOLANT TEMPERATURE SWITCH

1. Turn off the ignition switch and let the engine cool. Remove the surge tank cap to release the system pressure.

**WARNING**

Do not drain coolant from a hot engine. Opening the cooling system when the engine and coolant are hot can cause severe personal injury due to scalding by the hot, pressurized coolant.

2. Drain the coolant from the engine.

3. Disconnect wires 18C and 324 from the high coolant temperature switch (see Fig. 1, Fig. 2, Fig. 3, Fig. 4, Fig. 5, Fig. 6, Fig. 7, or Fig. 8); then remove the switch.

4. Install the new switch and tighten it one-half turn past finger-tight. Connect wires 18C and 324 to the switch.

5. Add coolant to the system as needed; then install the cap. Start the engine and check the system to be sure there are no coolant leaks.

LOW COOLANT LEVEL PROBE

1. Turn off the ignition switch and let the engine cool. Remove the surge tank cap to release the system pressure.

**WARNING**

Do not drain coolant from a hot engine. Opening the cooling system when the engine and coolant are hot can cause severe personal injury due to scalding by the hot, pressurized coolant.

2. Drain the coolant from the surge tank.
3. Disconnect wire 173 and the ground wire (if equipped) from the low coolant level probe, located in the inboard side of the surge tank (see Fig. 9), then remove the probe.

4. Install the new probe and tighten it one-half turn past finger-tight. Connect wire 173 and the ground wire (if equipped) to the probe.

5. Add coolant to the system as needed; then install the cap.

6. Start the engine and check that the low coolant level warning light and buzzer do not come on. Check the system to be sure there are no coolant leaks.
LOW OIL PRESSURE WARNING SWITCH

NOTE: The low oil pressure warning switch is located on a tee on the air-oil manifold located behind the left side of the dash panel. Access it by removing the rubber trim piece and the two screws that connect the dashboard cover to the dashboard.

1. Turn off the ignition switch.
2. Disconnect wire 34 from the switch (see Fig. 10, Ref. 2), then remove the switch.
3. Install the new switch and tighten it one-half turn past finger-tight. Connect wire 34 to the switch.

LOW OIL PRESSURE SHUTDOWN SWITCH

NOTE: The low oil pressure shutdown switch is located on a tee on the air-oil manifold located behind the left side of the dash panel. Access it by removing the rubber trim piece and the two screws that connect the dashboard cover to the dashboard.

1. Turn off the ignition switch.
2. Disconnect wire 325 from the switch (see Fig. 10, Ref. 5). Remove the switch.
3. Install the new switch and tighten it one-half turn past finger-tight. Connect wire 325 to the switch.
4. Start the engine and check that the warning light and buzzer shut off when the oil pressure reaches approximately 10 psi (69 kPa). Check the system to be sure there is no oil leakage.
5. Install the dash panel.
5. Install the dash panel.

Fig. 10, Low Oil Pressure Warning and Shutdown Switch
Troubleshooting Procedures

ENGINE PROTECTION FEATURES

The Engine Run switch must be on for the fuel solenoid (or other fuel control) to turn on. The Engine Run switch is controlled by five separate inputs to the Kysor warning and engine shutdown system. The test procedure for each input and an explanation of how each one functions are presented below.

1. **Ignition Switch On**—Connect a voltmeter to the fuel solenoid wire 99, and turn on the ignition switch. The voltmeter should register at least 12 volts for 25 to 35 seconds; then, the voltage should drop to zero.

2. **Starter Engage**—Turn on the ignition switch and measure the voltage as above. After the voltage drops to zero, briefly engage the starter. There should be 12 volts at the fuel solenoid again for 25 to 35 seconds. Then, the voltage should drop to zero. This feature is operated by voltage in wire 150R, which has voltage only when the engine is being cranked.

3. **Coolant Level Sensing**—Disconnect wire 173 from the coolant level sensor in the surge tank. Start the engine. The LOW WTR light and the warning buzzer should be on. The engine should shut down 30 seconds after it starts, and the SHUTDOWN light should come on at the same time.

Reconnect wire 173 to the coolant level sensor. This circuit sends a current through wire 173 to the low coolant sensor. When the circuit is grounded through the coolant, the system interprets this as a normal condition. Excessive coolant loss uncovers the sensor and breaks the circuit to ground. This causes the warning and shutdown control module to turn on the low coolant warning and to shut down the engine. An open circuit in wire 173 causes a false low coolant warning and shutdown. If wire 173 shorts to ground, the protection feature doesn’t operate.

4. **Temperature Sensing**—Disconnect wires 18C and 324 from the temperature switch. Start the engine. The overheat indicator light should be on and the warning buzzer should sound. The engine should shut down 20 to 40 seconds after starting, and the SHUTDOWN light should come on at the same time.

This circuit monitors the temperature switch continuity through wires 324 and 18C. If wire 18C or 324 shorts to ground, the high temperature alarm and shutdown features won’t work. The engine could overheat and would probably be damaged.

IMPORTANT: Perform the temperature sensing test at every scheduled vehicle service to ensure that there are no problems with circuit 18C or 324. Reconnect wires 18C and 324 to the temperature switch.

5. **Low Oil Pressure Sensing**

5.1 **Warning Light**

Disconnect wire 34 from the low oil pressure warning sensor. Start the engine. The low oil pressure light should come on and the warning buzzer should sound. Circuit 34 is ground-seeking at the warning switch, which is normally open. The warning switch opens and interrupts the ground to wire 34 if oil pressure falls below the switch setpoint. When wire 34 loses ground, the oil pressure warning turns on, so an open circuit in wire 34 would cause a false low oil pressure warning. A short to ground in wire 34 would prevent the low oil pressure warning from working. This would occur when the ignition switch is first turned on: the low oil pressure symbol would not light until the starter is engaged. During normal start up, the low oil pressure indicator should light and the buzzer should sound when the key is turned on.

5.2 **Engine Shutdown**

Leave wire 34 disconnected from the low oil pressure warning switch. Disconnect wire 325 from the low oil pressure shutdown switch. Start the engine. The low oil pressure symbol and the buzzer should be on. The SHUTDOWN light should come on 20 to 40 seconds after start up, and the engine should shut down at the same time. Circuit 325 is similar to 34 in that it seeks ground through the normally open shutdown switch; if that ground is lost due to low oil pressure or an open circuit, the Kysor warning and shutdown control module shuts down the engine. If
circuit 325 shorts to ground, the low oil pressure shutdown feature will not work.

Troubleshooting Table

ENGINE PROTECTION FEATURES
For troubleshooting of the Kysor warning and engine shutdown system, see the following table.

Kysor Warning and Engine Shutdown System Troubleshooting

<table>
<thead>
<tr>
<th>Problem</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>The water temperature/oil pressure indicator does not light when engine coolant temperature is high.</td>
<td>Check the indicator bulb, the water temperature switch and wire 18C. See Fig. 1.</td>
</tr>
<tr>
<td>The water temperature/oil pressure indicator does not light when oil pressure is low.</td>
<td>Check the indicator bulb, the low oil pressure switch and wire 34. See Fig. 2.</td>
</tr>
<tr>
<td>The water temperature/oil pressure indicator is on when the oil pressure and coolant temperature are normal.</td>
<td>Check the low oil pressure switch, the water temperature switch, wire 34 and wire 18C. See Fig. 3.</td>
</tr>
<tr>
<td>The engine cranks but will not start. The engine shutdown indicator is on while the starter is cranking.</td>
<td>Check wire 150R, wire 150Q, and wire 373. See Fig. 4.</td>
</tr>
<tr>
<td>The engine shuts down; the engine shutdown indicator is not on as the engine begins to lose rpm.</td>
<td>Check the fuel solenoid relay, fuel pump and wire 373. See Fig. 5.</td>
</tr>
<tr>
<td>The engine shuts down with the water level and engine shutdown indicators on.</td>
<td>Check the coolant level switch and wire 173. See Fig. 6.</td>
</tr>
<tr>
<td>The water level indicator does not come on when the coolant level is low.</td>
<td>Check the coolant level switch and wire 173. See Fig. 7.</td>
</tr>
<tr>
<td>The engine starts, but the engine shuts down after 20 to 40 seconds.</td>
<td>Check the alarmstat, the oil pressure shutdown switch, wire 324 and wire 325. See Fig. 8.</td>
</tr>
<tr>
<td>The engine shutdown indicator does not come on when the engine shuts down.</td>
<td>Check the engine shutdown indicator relay. See Fig. 9.</td>
</tr>
<tr>
<td>The engine shutdown indicator is on, but the engine does not shut down.</td>
<td>Check the engine shutdown relay and wire 373. See Fig. 10.</td>
</tr>
<tr>
<td>The warning buzzer does not sound with high water temperature, but the water temperature/oil pressure indicator does light.</td>
<td>Check the warning buzzer and warning buzzer wiring. See Fig. 11.</td>
</tr>
<tr>
<td>The warning buzzer does not sound with low oil pressure, but the water temperature/oil pressure indicator does light.</td>
<td>Check the warning buzzer and warning buzzer wiring. See Fig. 12.</td>
</tr>
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## Kysor Warning and Engine Shutdown System Troubleshooting

<table>
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<tr>
<th>Problem</th>
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<tr>
<td>The warning buzzer sounds without the water temperature/oil pressure indicator or the water level indicator lighting.</td>
<td>Check the warning buzzer and warning buzzer wiring. See Fig. 13.</td>
</tr>
<tr>
<td>The warning buzzer does not sound and the water temperature/oil pressure indicator does not light briefly after the starter is disengaged.</td>
<td>Check wire 81C. See Fig. 14.</td>
</tr>
<tr>
<td>The warning buzzer does not sound, but the water temperature/oil pressure indicator lights briefly after the starter is disengaged.</td>
<td>Check the warning buzzer and associated wiring. See Fig. 15.</td>
</tr>
</tbody>
</table>
Troubleshooting

Turn the ignition on (engine off). Is the water temperature/oil pressure warning light on?

no

Check the fuse and the bulb. Are both OK?

no

Replace the bulb or fuse. If fuse blows repeatedly, check wire 81C for a short to ground.

yes

Check wire 81C for an open circuit.

Disconnect wire 18C at the water temperature switch. Start the engine and observe the water temperature/oil pressure warning light. Is the water temperature/oil pressure warning light on?

no

With ignition switch on (engine off) measure voltage at wire 18C at the water temperature switch. Is the voltage 5 volts or greater?

no

Check wire 18C between the water temperature switch and the alarm and shutdown control module for a short to ground. If wire 18C is OK, replace the alarm and shutdown control module.

yes

Disconnect the alarm and shutdown control module connector. Turn the ignition switch on and measure voltage at wire 18C at terminal E. Is battery voltage measured?

yes

Replace the alarm and shutdown control module.

no

Check wire 18C between the alarm and shutdown control module and the indicator bulb for an open.

Fig. 1, The Water Temperature/Oil Pressure Indicator Does Not Light When Engine Water Temperature is High
Turn the ignition on (engine off). Is the water temperature/oil pressure warning light on?

no
Check the fuse. Is the fuse OK?

no
Replace the fuse. If the new fuse blows, check wire 81C for a short to ground.

yes
System appears normal. Check for an intermittent open circuit in wire 34 between the alarm and control shutdown module and the indicator bulb.

yes
Jumper wire 34 to ground at the low oil pressure switch. Turn the ignition switch on and observe the water temperature/oil pressure indicator. Is the indicator on?

yes
Replace the low oil pressure switch.

no
With the ignition switch on, measure voltage at wire 34 at the low oil pressure switch. Is the voltage 5 volts or greater?

yes
Disconnect the alarm and shutdown control module connector. With the ignition switch on, measure voltage at wire 34 at terminal “F” of the alarm and shutdown control module connector. Is battery voltage measured?

no
Repair the open circuit in wire 34 between the alarm and shutdown control module and the indicator bulb.

no
Replace the alarm and shutdown control module.

no
Check wire 34 for a short to ground between the low oil pressure switch and the alarm and control shutdown module. If the wire is OK replace the alarm and shutdown control module.

no
Check the bulb. Is the bulb OK?

yes
Replace the bulb.

Fig. 2, The Water Temperature/Oil Pressure Indicator Does Not Light When Oil Pressure is Low
Disconnect wire 34 at the low oil pressure switch. Turn the ignition on (engine off). Is the water temperature/oil pressure warning light on?

- **Yes**
  - Leave wire 34 disconnected. With the ignition switch on, measure voltage at wire 34. Is the voltage 5 volts or greater?
  - **No**
    - Check wire 34 for a short to ground. If wire 34 is OK, replace the alarm and shutdown control module.
  - **Yes**
    - Leave wire 34 disconnected. Disconnect wire 18C at the water temperature switch. Turn the ignition on (engine off). Is the water temperature/oil pressure warning light on?
    - **No**
      - Replace the low oil pressure switch.
    - **Yes**
      - Leave wire 18C disconnected. With the ignition switch on, measure voltage at wire 18C at the water temperature switch. Is voltage 5 volts or greater?
      - **No**
        - Check wire 18C for a short to ground. If wire 18C is OK, replace the alarm and shutdown control module.
      - **Yes**
        - Disconnect the alarm and shutdown control module control unit. Turn the ignition switch on and observe the water temperature/oil pressure indicator. Is the indicator on?
          - **Yes**
            - Check wire 34 and 18C for a short to ground between the alarm and shutdown control module and the indicator bulb.
          - **No**
            - Replace the alarm and shutdown control module.

Fig. 3, The Water Temperature/Oil Pressure Indicator is On When the Oil Pressure and Water Temperature are Normal
Disconnect the alarm and shutdown control module connector. Measure voltage at wire 150R while cranking the engine. Is battery voltage measured?

- yes
- no
  - Repair the open circuit in wire 150R.

With the alarm and shutdown control module connector disconnected and the ignition turned on, measure voltage at wire 150Q. Is battery voltage measured?

- yes
- no
  - Repair the open circuit in wire 150Q.

Check for a good ground at terminals C and N of the alarm and shutdown control module connector. Are both grounds good?

- yes
- no
  - Repair the open ground circuit.

Using a 5 amp fused jumper, connect wires 150Q and 373 at the alarm and shutdown control module connector. Turn the ignition switch on, and observe the shutdown indicator. Is the shutdown indicator off?

- yes
- no
  - Replace the alarm and shutdown control module.
  - Check wire 373 for an open circuit. If the jumper fuse blows check wire 373 for a short to ground.

**Fig. 4, The Engine Cranks But Will Not Start. The Engine Shutdown Indicator is On While the Starter is Cranking**
Note: This symptom indicates the alarm and shutdown control module is not at fault. This symptom could be caused by anything from a serious engine problem to running out of fuel. However, this symptom can be caused by the fuel pump control circuits. Follow this tree to isolate the cause of the problem.

**Disconnected the fuel solenoid relay connector. Turn the ignition switch on. Check for battery voltage at the fuel solenoid relay voltage supply (circuit 30) terminal. Is battery voltage present?**

- **Yes:** Repair open circuit in the voltage supply circuit.
- **No:**

**Check for a good ground at the fuel solenoid relay coil (circuit 86) ground. Is the ground good?**

- **Yes:** Repair the open circuit in the fuel solenoid relay ground wire.
- **No:**

**Using a 5 amp fused jumper, connect relay connector circuits 30 (voltage) and 85 (wire 373) at the fuel solenoid relay. Turn the ignition switch on and observe the engine shutdown indicator. Is the indicator on?**

- **Yes:**
  - The Kysor warning system is functioning normally.
  - Check the fuel solenoid relay.
  - Check wire 99 to the fuel pump solenoid for an open circuit.
  - Check the fuel pump for proper operation.
  - Check for other no-start causes, mechanical and electrical.

- **No:**
  - Repair the open circuit in wire 373 between the alarm and shutdown control module and the fuel solenoid relay.

Fig. 5, The Engine Shuts Down; The Engine Shutdown Indicator is Not On as the Engine Begins to Lose RPM
Jumper the coolant level switch body to ground. Turn the ignition switch on, wait 5 seconds and observe the water level and engine shutdown indicators. Are the indicators on?

- yes
- no

**Replace the coolant level switch with index switch LCP-571 and screw a ground lead to the small screw head on the switch body.**

Jumper wire 173 to ground. Turn the ignition switch on and observe the water level and engine shutdown indicators. Are the indicators on?

- yes
- no

**Check wire 173 for an open circuit. If wire 173 is OK, replace the alarm and control module.**

Replace the coolant level switch with index switch LCP-571.

---

**Fig. 6, The Engine Shuts Down With the Water Level and Engine Shutdown Indicators On**
Leave the coolant level switch connector disconnected. Turn the ignition switch on; then measure the voltage at the 173 wire. Is the voltage 5 volts or greater?

---

Check the 173 wire for a short to ground. If the wire is OK, replace the alarm and engine shutdown control module.

---

Disconnect the alarm and engine shutdown control module. Turn the ignition switch on; then measure the voltage a connector terminal G (wire 150G). Is battery voltage measured?

---

Check the bulb and wire 150G for an open circuit.

---

Disconnect the 173 wire at the coolant level switch. Turn the ignition switch on and wait 5 seconds. Is the low coolant indicator on?

---

Replace the coolant level switch.
Disconnect the 325 wire at the oil pressure shutdown switch. Turn the ignition switch on; then measure the voltage at the 325 wire. Is the voltage 5 volts or greater?

- **Yes**
  - Check the 325 wire for an open. If the wire is OK, replace the alarm and engine shutdown control module.

- **No**
  - Jumper the 325 wire to a known good ground. Start the engine and wait 40 seconds. Does the engine still shutdown?

- **Yes**
  - Replace the oil pressure shutdown switch.

- **No**
  - Reconnect the 325 wire. Disconnect the 324 wire at the alarmstat. Turn the ignition switch on; then measure the voltage at the 324 wire. Is the voltage 5 volts or greater?

- **Yes**
  - Jumper the 324 wire to a known good ground. Start the engine and wait 40 seconds. Does the engine still shutdown?

- **Yes**
  - Replace the alarm and engine shutdown control module.

- **No**
  - Replace the alarmstat.

**Fig. 8, The Engine Starts, But the Engine Shuts Down After 20 to 40 Seconds**
Fig. 9, The Engine Shutdown Indicator Does Not Come On When the Engine Shuts Down

Disconnect the engine shutdown indicator relay. Turn the ignition switch on; then measure voltage at the relay connector 30 circuit. Is battery voltage measured?

yes

no

Check the bulb and 150D wire for an open circuit.

Measure voltage at the relay connector between relay terminal 30 and terminal 87A. Is battery voltage measured?

yes

no

Replace the engine shutdown indicator relay.

Repair the open circuit in the ground wire at the 87A relay connector terminal.

Fig. 10, The Engine Shutdown Indicator is On, But the Engine Does Not Shut Down

Disconnect the engine shutdown indicator relay. Using an ohmmeter, check for a good ground at the relay connector terminal 86. Is there a good ground?

yes

no

Repair the open circuit in wire 86.

Turn the ignition on (engine off); then measure voltage at relay terminal 85. Is battery voltage measured?

yes

no

Replace the engine shutdown indicator relay.

Repair the open circuit in wire 373.
Turn the ignition on (engine off) and wait 5 seconds. Does the warning buzzer activate and then turn off?

no

Replace the warning buzzer.

yes

Check the diode and wiring between the warning buzzer and the water temperature/oil pressure indicator bulb for an open.

Fig. 11, The Warning Buzzer Does Not Sound With High Water Temperature, But the Water Temperature/Oil Pressure Indicator Does Light

Turn the ignition on (engine off) and wait 5 seconds. Does the warning buzzer activate and then turn off?

no

Replace the warning buzzer.

yes

Check the diode and wiring between the warning buzzer and the water temperature/oil pressure indicator bulb for an open.

Fig. 12, The Warning Buzzer Does Not Sound With Low Oil Pressure, But the Water Temperature/Oil Pressure Indicator Does Light
**Troubleshooting**

Turn the ignition on (engine off) and wait 5 seconds. If the warning buzzer activated without the water temperature/oil pressure indicator or water level indicator lighting, check the indicator bulbs. Are they OK?

- **no**
  - Replace the indicator bulbs.

- **yes**
  - Check the wiring between the diodes and the warning buzzer for a short to ground.

*Fig. 13, The Warning Buzzer Sounds Without the Water Temperature/Oil Pressure or the Water Level Indicator Lighting*

Turn the ignition on (engine off). Is the water temperature/oil pressure warning light on?

- **no**
  - Is the fuse OK?
    - **no**
      - Replace the fuse. If fuse blows repeatedly, check wire 81C for a short to ground.
    - **yes**
      - Check wire 81C for an open circuit.

- **yes**
  - Check wire 81C for an intermittent open.

*Fig. 14, The Warning Buzzer Does Not Sound and the Water Temperature/Oil Pressure Indicator Does Not Light Briefly After the Starter is Disengaged*
Turn the ignition on (engine off) and wait 5 seconds. Does the warning buzzer activate and then turn off?

- no
  - Replace the warning buzzer.

- yes
  - Check the wiring between the warning buzzer and the water temperature/oil pressure indicator bulb for an open.

Fig. 15, The Warning Buzzer Does Not Sound, But the Water Temperature/Oil Pressure Indicator Lights Briefly After the Starter is Disengaged
For a wiring diagram of the Kysor warning and engine shutdown system, see Fig. 1.

Kysor Warning and Engine Shutdown System

Specifications

Fig. 1, Wiring Diagram, Kysor Warning and Engine Shutdown System