KYSOR

AUDIO / VISUAL ENGINE PROTECTION SYSTEM

SERVICE INSTRUCTIONS

80-333 REL:1-88

wagner
A Division of Allied Systems Company

Installation Instructions

WARNING: Due care and caution must be exercised when ordering and installing a KYSOR Engine Protection System. Failure to follow these Instructions may result in product or vehicle damage and possible serious personal injury.

1. **ALARMSTAT®**
   Install the ALARMSTAT in a 3/8" pipe thread hole in the hottest spot in the water manifold system. NOTE: THE ALARMSTAT MUST BE INSTALLED BETWEEN THE THERMOSTAT AND CYLINDER HEAD.

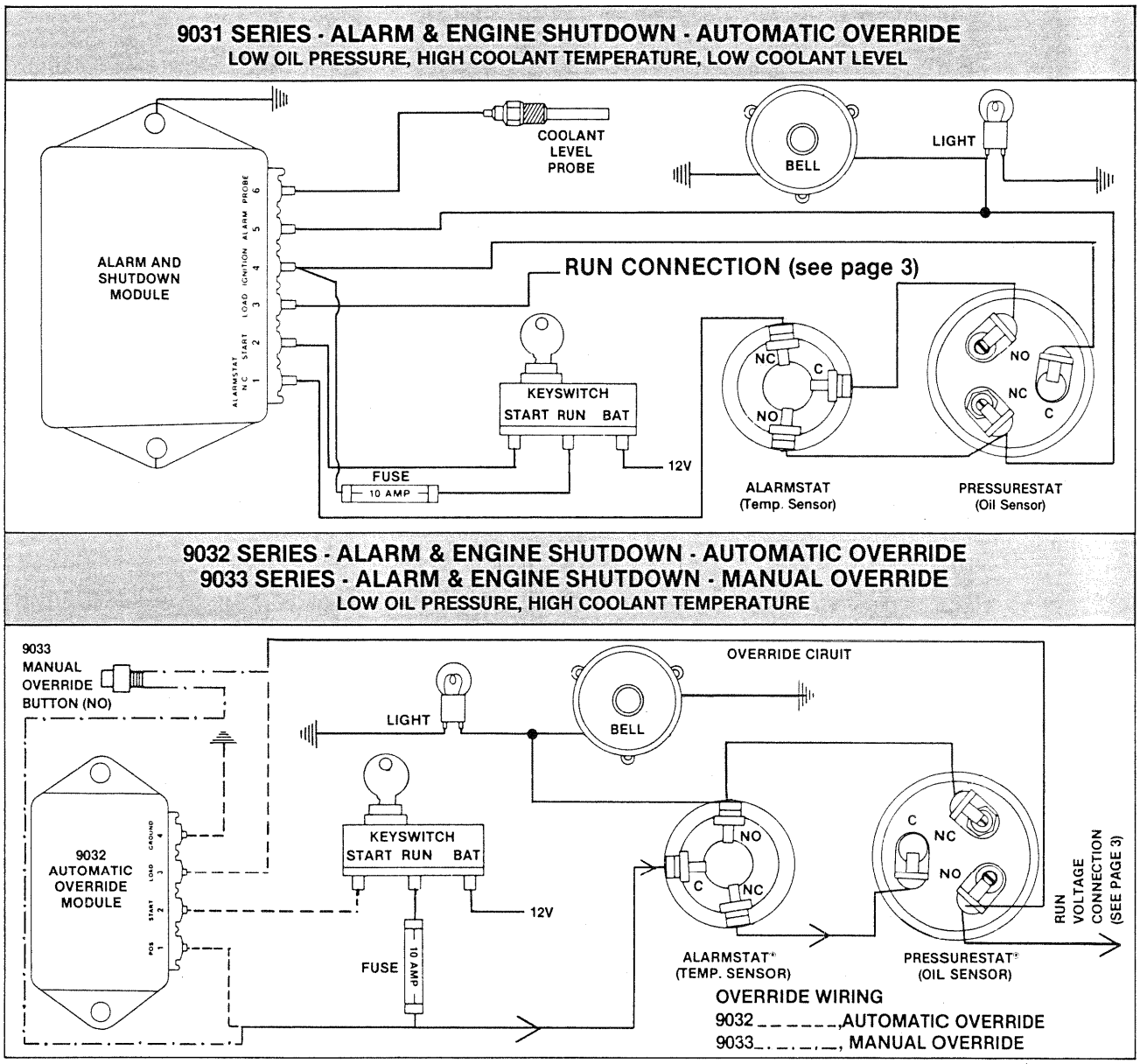
2. **PRESSURESTAT®**
   Install the PRESSURESTAT in the oil pressure gauge line, preferably in the cab for protection against vibration and corrosion to the terminals.

3. **MODULE & OVERRIDES**
   A) 9031 & 9032 - Install the Alarm & Shutdown Module, or the Automatic Override, in a cool, easily accessible, location behind the instrument panel. DO NOT MOUNT IN THE ENGINE COMPARTMENT IF TEMPERATURES EXCEED 165°F.
   B) 9033 - Install the Manual Override in a 5/8" hole in the instrument panel within easy reach of the operator. Attach the "Operating Instructions" label above the button.

4. **WARNING BELL & LIGHT**
   Install the bell in a convenient location in the cab and the light in the instrument panel. Attach the "Warning Plate" to the instrument panel.

5. **COOLANT LEVEL PROBE (9031 Series Only)**
   A) Determine a satisfactory location in the top radiator tank, above internal baffling and as near to the radiator center as possible. The Probe must be located at the correct depth to measure low coolant (usually1" to 1-1/2" below the cold fill level).
   B) For sheet metal tanks; install the Probe Adaptor in a 1" drilled hole and insert the Probe in the adaptor.
   C) For cast tanks: install the Probe directly in a 1/4" pipe thread hole.
   D) Attach the "Caution" label to the radiator top, near the cap.

6. **WIRING INSTRUCTIONS**
   A) Disconnect the batteries to prevent Shorting.
   B) Wire the components by following the wiring diagram, for your Series System, on page 2.
   C) Use color coded #16 gauge 105°C wire.
   D) Place all wiring in loom for protection. Use grommets at firewalls and use wire ties to secure harness.



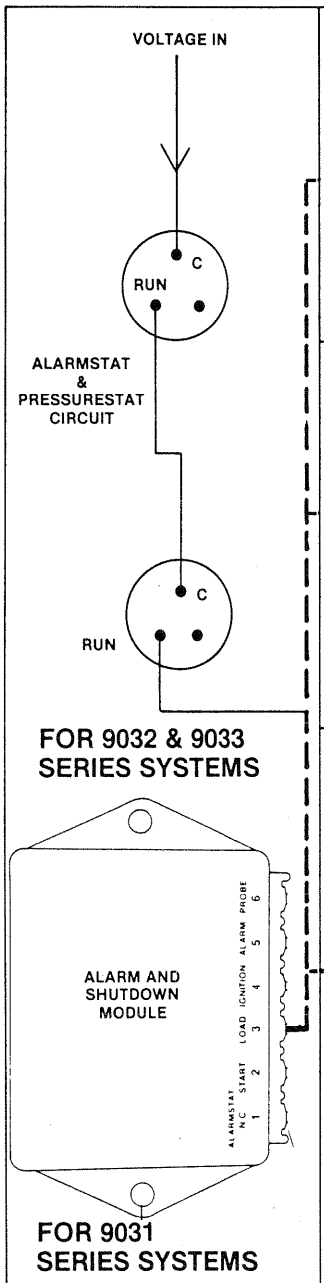
ALARMSTAT & PRESSURESTAT CIRCUIT

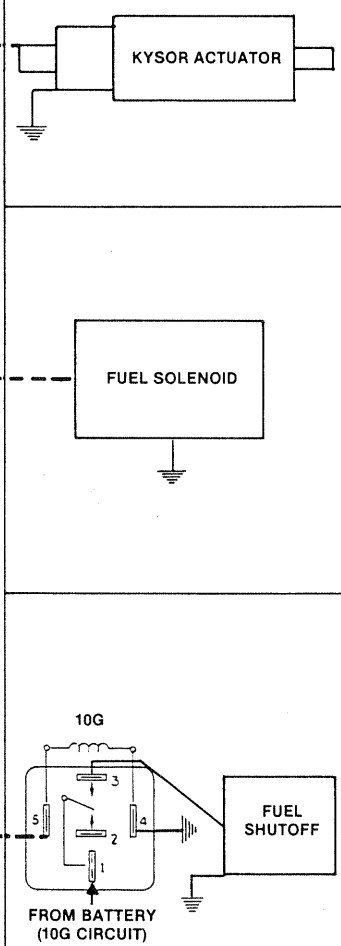
1) With the key switch in the "ON" position and the engine off, the alarms should go on due to lack of oil pressure. If the alarms do not come on, there is usually a broken wire or loose connection in the warning circuit. The fuses or circuit breakers, all connections and circuits between connections should be checked back to find the problem.
2) After the engine has been running for a minimum of 40 seconds, disconnect the wire from the normally open (N.O.) terminal of the PRESSURESTAT, or common (C.) terminal on the ALARMSTAT. The engine should shut down immediately. NOTE: The alarms will go on after shutdown occurs.
3) Restart engine: The engine should run for 20 to 40 seconds before shutdown occurs again.
4) Reconnect the wire removed in step 2. Your ALARMSTAT & PRESSURESTAT circuit is functioning properly.

COOLANT LEVEL PROBE (9031 SERIES ONLY)

1) Radiator water level must be normal before proceeding.
2) Restart the engine and allow to run for a minimum of 40 seconds before proceeding.
3) Disconnect the wire from the Probe. The alarms should come on immediately and engine shutdown should occur in 20 to 40 seconds.
4) Restart engine: Engine should run for 20 to 40 seconds before shutdown. NOTE: The alarms will remain on during this step.
5) Reconnect the wire removed in step 3. Your Probe circuit is functioning properly.

Run Voltage Connections





KYSOR AIR, VACUUM OR HYDRAULIC FUEL SHUTOFF ACTUATOR. Controlled by Normally Open Solenoid Valve (normal = 0 volts). Run Voltage to valve closes it and exhausts air, vacuum or hydraulic pressure so engine runs. Removing Run Voltage opens valve, admitting air, vacuum or hydraulic pressure to cylinder, causing cylinder to operate stop linkage.

COMPATIBLE OEM FUEL SOLENOIDS. On 12 volt systems any fuel solenoid having a resistance of 5 ohms or more is compatible with KYSOR Systems and may be directly connected as shown here. The following solenoids are known to be compatible with KYSOR Systems: CUMMINS (all): 3208 CAT: early American Bosch pumps on IHC DT-466 with integral solenoid: 6.2L DDA: IHC 6.9:

INCOMPATIBLE OEM FUEL SOLENOIDS. These solenoids have resistances of less than 5 ohms and must be relay operated as shown here or replaced with a KYSOR actuator. Known incompatible solenoids are: All Cat, except the 3208; IHC Synchro Start and Detroit Diesel supplied all electric shutoff. The DDA 8.2L and the IHC DT-466 are the most common in this group and can be replaced with a KYSOR actuator. The TRW "ETEC" must also be wired as shown here. Cut the red wire at the ETEC module. Connect one end to relay "C", and the other end to relay "NO".

MODULE: Troubleshooting and operation.
Do all tests in order, regardless of problem.

Insure one or both module mounting ears has a good ground before starting tests.

POST 4

Key OFF: 0 volts; Key ON: 12 volts; Key ON, CRANK ENGINE: 9 volts or more. If voltages at post 4 are not as described above, there is a problem in the keyswitch circuit to post 4. This generally results in a no start condition. If your problem is false shutdown, connect a digital voltmeter to post 4 and monitor voltage while the vehicle is driven over uneven surfaces. If the voltage is not steady, a loose connection in the keyswitch to post 4 circuit is causing the false shutdown.

POST 2

Key OFF: 0 volts; Key ON: 0 volts; Key ON, CRANK ENGINE: 9 volts or more. Post 2, when receiving voltage from the start circuit, activates the override feature for starting purposes. No voltage at post 2 during cranking results in a no start condition. Constant voltage at post 2 (with the key on) will bypass the system and may result in an engine loss. Depending on where the constant voltage is coming from, it may also result in severe starter drive and/or ring gear damage.

POST 1

Key OFF: 0 volts; Key ON, ENGINE STOPPED: 0 volts; Key ON, ENGINE RUNNING: 12 volts. Voltage at post 1, in effect, informs the module that temperature and oil pressure are normal. No voltage at post 1 with the engine running will result in a false shutdown every 30 seconds. If your problem is intermittent false shutdown, connect a digital voltmeter to post 1 and monitor voltage while the vehicle is driven over uneven surfaces. If the voltage is not steady, a loose connection in the ALARMSTAT/PRESSURESTAT circuit or a defective ALARMSTAT/PRESSURESTAT is the cause of the false shutdown.

Move the voltmeter back along the ALARMSTAT/PRESSURESTAT circuit (while driving over uneven surfaces) until a steady reading is obtained at one of the stat connections. When you find a steady reading, whatever is between the steady reading and the last bad reading is the cause. On the other hand, constant voltage at post 1 (with key ON and ENGINE STOPPED) will bypass the system and may result in an engine loss. Constant voltage may be caused by a jumper wire, wiring mistake, short circuit and sometimes by a defective PRESSURESTAT, although this last condition rarely occurs.

POST 6

Post 6 is used to monitor radiator coolant level. Generally, post 6 assumes coolant is OK when it has a ground. If a leak develops and the ground goes away, post 6 interprets this as coolant loss and initiates the low water alarm and shutdown sequence. Voltage measurement with a digital voltmeter is the best troubleshooting technique.

A) Keyswitch Position: OFF
Post 6 Voltage: 0.1 to 0.5
Condition Indicated: Cooling system galvanic action causes this and is a normal condition.

B) Keyswitch Position: ON
Post 6 Voltage: 1.0 to 3.0
Condition Indicated: Normal system, and cooling system is full (on most vehicles, 1.0 to 1.2 volts is common).

C) Keyswitch Position: ON
Post 6 Voltage: 3.5 to 4.2
Condition Indicated: Low coolant.
At 3.5 volts, the low water alarm and shutdown sequence is triggered.

D) Keyswitch Position: ON
Post 6 Voltage: 0.0
Condition Indicated: Wire, post 6 to probe, shorted to ground, OR probe coated with conductive material such as corrosion. System will not protect against low coolant when this occurs (system is bypassed).

E) Keyswitch Position: ON
Post 6 Voltage: 4.7 or more
Condition Indicated: Wire, post 6 to probe, broken or Probe coated with an insulating material such as oil. This condition results in false alarm shutdown every 30 seconds.

If your problem is false alarm and/or shutdown, connect a digital voltmeter to post 6 and monitor voltage while the vehicle is driven over uneven surfaces. If voltage is not steady, the most likely cause is a loose connection in the post 6 to probe circuit. However, unsteady readings may also be caused by marginally low coolant, or by the probe being mounted too high in the cooling system (see probe location recommendations in the Installation Instructions).

POST 5

Post 5 is used to activate the light and bell during low coolant conditions. Disconnect all wires from post 5 before troubleshooting. Operate engine or drive vehicle for at least 30 minutes before assuming post 5 is OK (most failures need about that much operating time before they become evident). When post 6 voltage is below 3.5, post 5 should be at 0 volts. When post 6 voltage is above 3.5, post 5 should be at 11 volts minimum. If either condition fails, the module is defective.

IMPORTANT NOTE: Post 5 is overload protected at 1.5 amps. If, during a low coolant condition, post 5 attempts to activate the alarms and an overload (above 1.5 amps) is present (due to shorts, too many lights, or a defective bell), post 5 will shut the entire module down. There will be no low coolant warning as this happens, and the engine will be shut down immediately. To reset the module, correct the overload, turn the key off, and then on again.

POST 3

Post 3 supplies voltage to the run voltage connection, which is illustrated on page 10 of this guide. When post 3 is ON (12 volts) the engine runs. When post 3 is OFF (0 volts), the engine stops. Post 3 has four functions, depending on conditions.

OVERRIDE FUNCTION: When post 2 receives voltage from the start circuit, post 3 turns on for 20 to 40 seconds. This allows the engine to be started in the absence of oil pressure, and allows a restart after shutdown so that a vehicle may be moved safely off the highway.

ENGINE RUN FUNCTION: 12 volts at post 1 and less than 3.5 volts at post 6 will keep post 3 turned on indefinitely (normal engine conditions).

HIGH TEMPERATURE OR LOW OIL PRESSURE SHUTDOWN FUNCTION: Post 3 will turn off and cause a shutdown whenever the ALARM-STAT or PRESSURESTAT opens and removes voltage from post 1 (this occurs after either the ALARMSTAT or PRESSURESTAT have given, independently, an advance warning. See the ALARMSTAT/PRESSURESTAT circuit section, page **8**, for further information).

LOW COOLANT LEVEL ALARM AND SHUTDOWN FUNCTION: When post 6 voltage exceeds 3.5, post 5 will immediately turn on and give a low coolant level warning. 20 to 40 seconds later, post 3 will turn off and cause an engine shutdown.

POST 3 TROUBLESHOOTING

Bear in mind that post 3 is also overload protected, as is post 5. Post 3 will trip out at about 3 amps if an overload or a short occurs in the run voltage connection. If the short is always present, the engine will not start. If the short is intermittent, you will have intermittent false shutdown problems. After a false shutdown caused by an intermittent short, it will be necessary to turn the keyswitch off and then back on before the engine can be restarted. When a driver reports this situation, you should suspect either a shorted run connection wire, a defective fuel shutoff, or accessories (such as an air dryer) connected to post 3. If false shutdown is the problem, connect

a digital voltmeter to post 3 and monitor voltage while the vehicle is driven over uneven surfaces. At this point, if you have done all the tests in order, you have already verified ground, post 4, post 1 and post 6 so anything wrong at post 3 will be either the module's fault or a problem in the run voltage connection.

You will see one of three conditions at post 3:

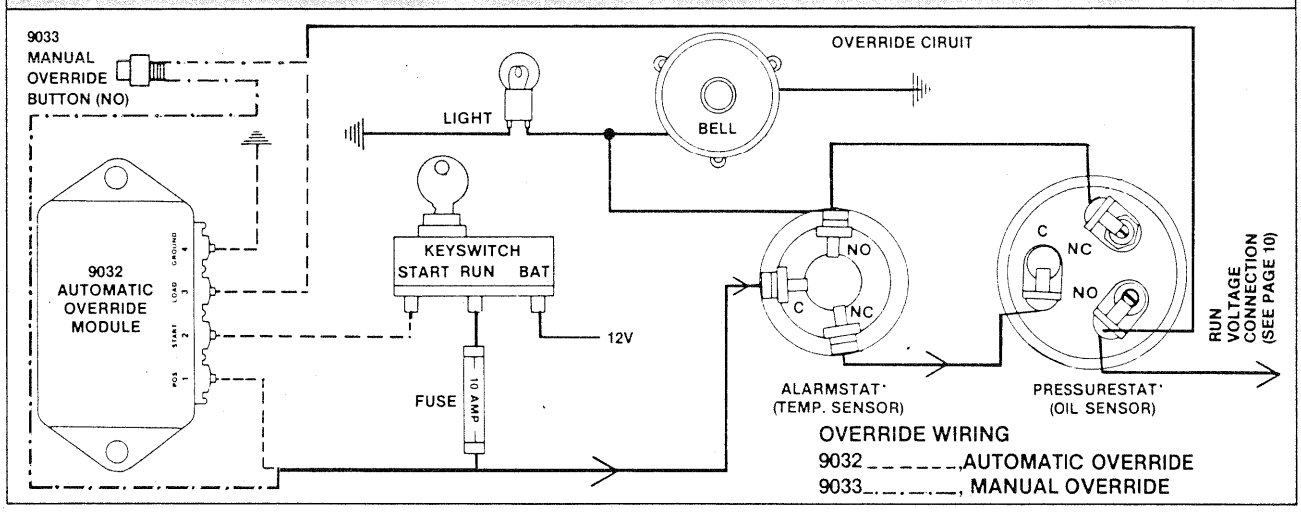
A) Voltage remains steady at 12 volts minimum. In this condition the engine may or may not shut down during the testing. If it does, and voltage at 3 remains OK for a short time after the shutdown, then either the run connection wire has loose connections, or the fuel shut-off is defective. If engine does not shut down during the testing, move voltmeter to run connection and monitor while driving. If voltage remains steady, change the fuel shutoff. If voltage fluctuates, the problem is the wire.

B) Voltage becomes unstable: The engine may or may not shut down. The key word is unstable. When this occurs, the voltage will bounce back and forth between normal and about 6 or 7 volts. It will not go to 0 volts immediately. When this occurs, the module is defective.

C) Voltage drops to 0 quickly: The fuel shutoff or run connection wire is shorting to ground.

Troubleshooting
(SERIES 9032 & 9033)

9032 SERIES - ALARM & ENGINE SHUTDOWN - AUTOMATIC OVERRIDE
9033 SERIES - ALARM & ENGINE SHUTDOWN - MANUAL OVERRIDE
LOW OIL PRESSURE, HIGH COOLANT TEMPERATURE



System Check

9032 Series
Automatic Override

Periodic Functional Check: Disconnect ALARM-STAT "C" wire. Start engine. Engine should run for 20 to 40 seconds then shut down.

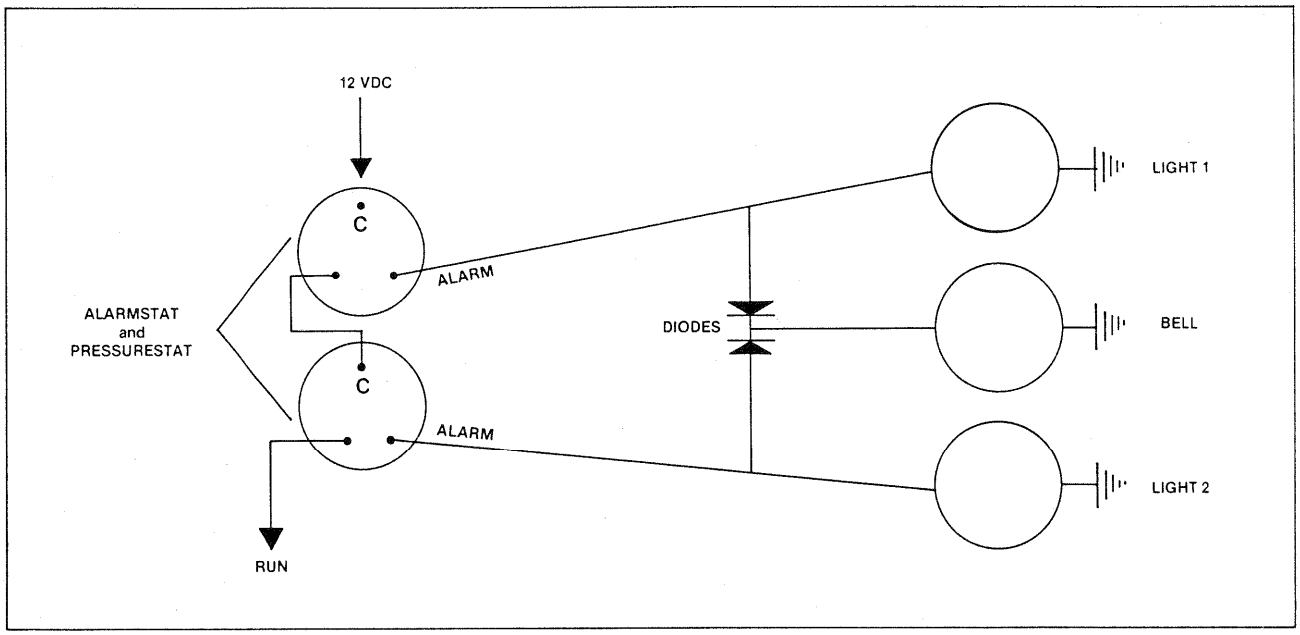
9033 Series
Manual Override

Periodic Functional Check: Attempt to start engine WITHOUT depressing manual override button: Engine should either not start, or it should require excessive cranking time. If engine starts normally, the system is bypassed.

9032 Series Automatic Override	9033 Series Manual Override
1. Automatic Override: a. Function—The override circuit from post 3 to either end of the run connection wire is used to bypass the ALARMSTAT and PRESSURESTAT for starting purposes. b. Troubleshooting/Operation: Post 1—Key OFF—0 volts; Key ON—12 volts; Crank engine—minimum 9 volts. Post 2—Key OFF—0 volts; Key ON—0 volts; Crank engine—minimum 9 volts. Post 3—Override Part Number 1039-33000-03 or 1039-33010-03. Key ON—0 volts; "Bump" the starter—9 to 12 volts for 20 to 40 seconds, then 0 volts. For Override Part Number 1039-05639-01 (Instant On), the same as above, but minimum 11 volts when key is first turned ON, lasting 20 to 40 seconds. Post 4—Grounded (check with ohmmeter). NOTE: The automatic override is used ONLY to start the engine, after shutdown, to move it off the road out of traffic. It has NO alarm or shut-down function. The override is internally protected against overload and will "go dead" if the run connection has less than 5 ohms resistance on a 12 volt system.	1. Manual Override: a. Function—The manual override button is a spring loaded, normally open (NO) switch. Depressing the button closes the switch and connects the keyswitch run terminal to the override circuit. The override circuit is connected to either end of the run connection wire. Therefore, depressing the button bypasses the ALARMSTAT and PRESSURESTAT for engine starting purposes. b. Troubleshooting: Key OFF—both terminals on button at 0 volts. Key ON, button OUT—one button terminal at 12 volts. Key ON, button in—both button terminals at 12 volts. Key ON, button IN— Crank engine—both button terminals at minimum 9 volts.

Alarm Circuit (Light and Bell) - 9032 and 9033 Series

A single warning light and bell is standard. When "false alarms" are the problem, either the ALARMSTAT or the PRESSURESTAT can be at fault. To isolate the problem, disconnect the normally open (NO) wire from the ALARMSTAT and start the engine. If the false alarm is now gone, replace the ALARMSTAT. If the false alarm continues, replace the PRESSURESTAT.



ALARMSTAT & PRESSURESTAT CIRCUIT

Operation and Troubleshooting

All KYSOR Alarm and Shutdown Systems use the ALARMSTAT and PRESSURESTAT so understanding their operation and troubleshooting procedures is essential. Keep in mind the following definitions as you examine the following diagrams. "C" stands for "COMMON" to both switches in a two switch device. "NO" stands for "NORMALLY OPEN" (the switch contacts open BELOW the setpoint). "NC" stands for "NORMALLY CLOSED" (switch contacts closed BELOW the setpoint). The ALARMSTAT and PRESSURESTAT can be wired "ALARMSTAT First" (voltage applied first to the ALARMSTAT), or "PRESSURESTAT First" (voltage applied first to the PRESSURESTAT). This wiring will vary by OEM installation:

9031 System: All OEM installations are "PRESSURESTAT First"

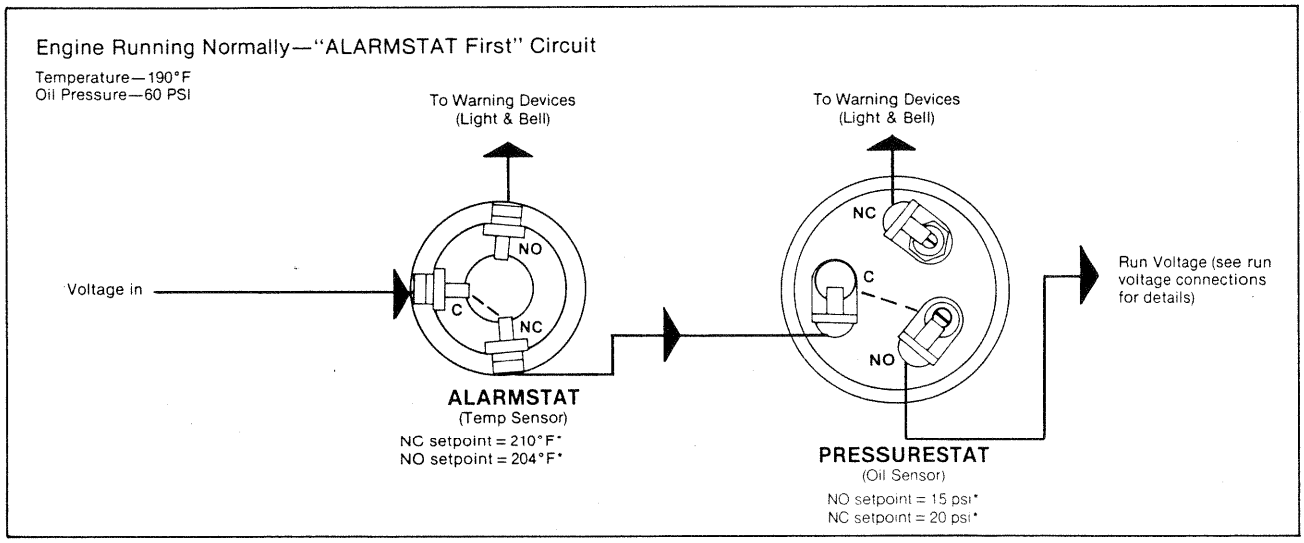
9032 & 9033 System: All OEM installations are "ALARMSTAT First"

The following diagrams illustrate the operation and the wiring of the circuit for ALARMSTAT First (Page 8) and PRESSURESTAT First (Page 9). Both alarm and shutdown functions operate as illustrated in these diagrams for either ALARMSTAT or PRESSURESTAT FIRST.

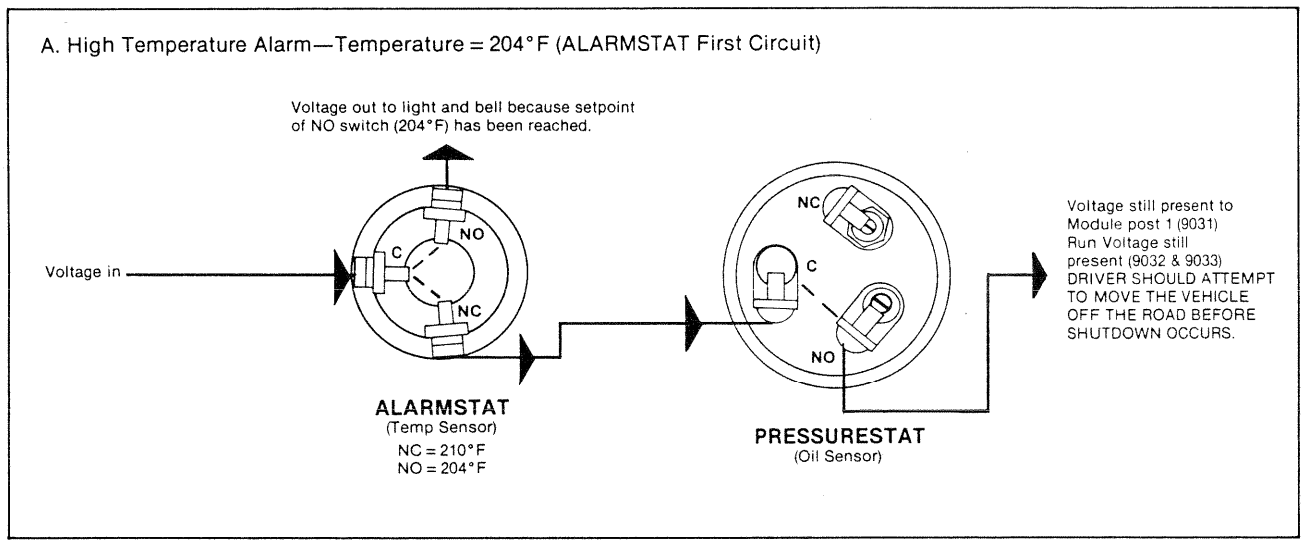
Troubleshooting

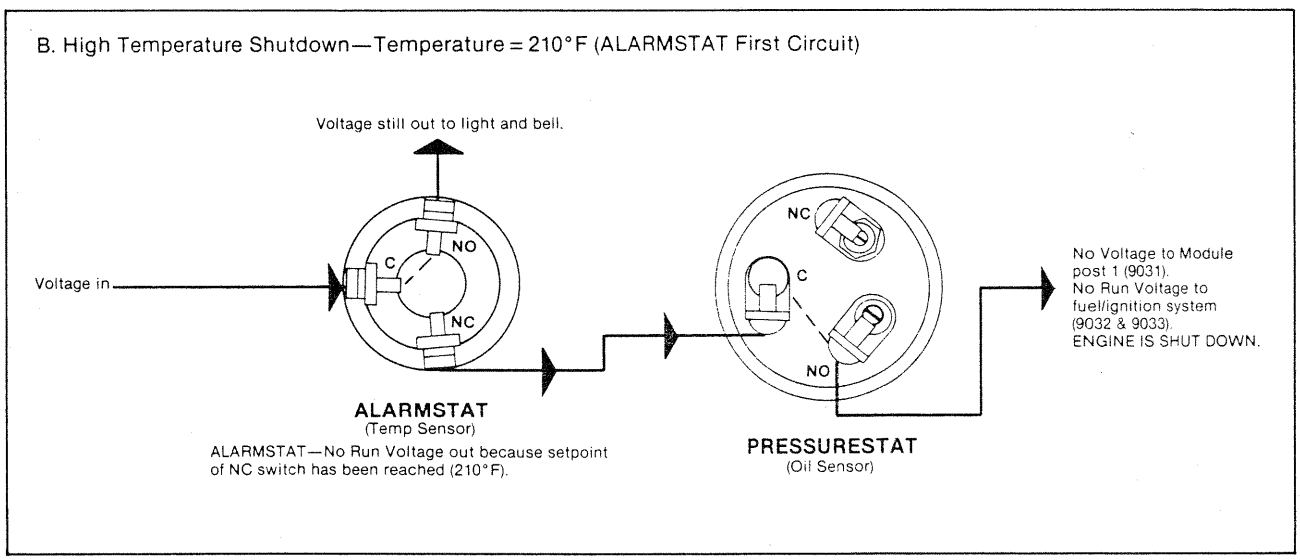
1. Connect a digital voltmeter to the run voltage connection. The leads must be long enough so that the meter may be placed in the cab.

2. Drive vehicle over bumps. Meter should read 12.5 to 15 volts and steady. Low or fluctuating readings indicate problems in the circuit, Move meter connection back along the circuit until faulty wire or stat is found.

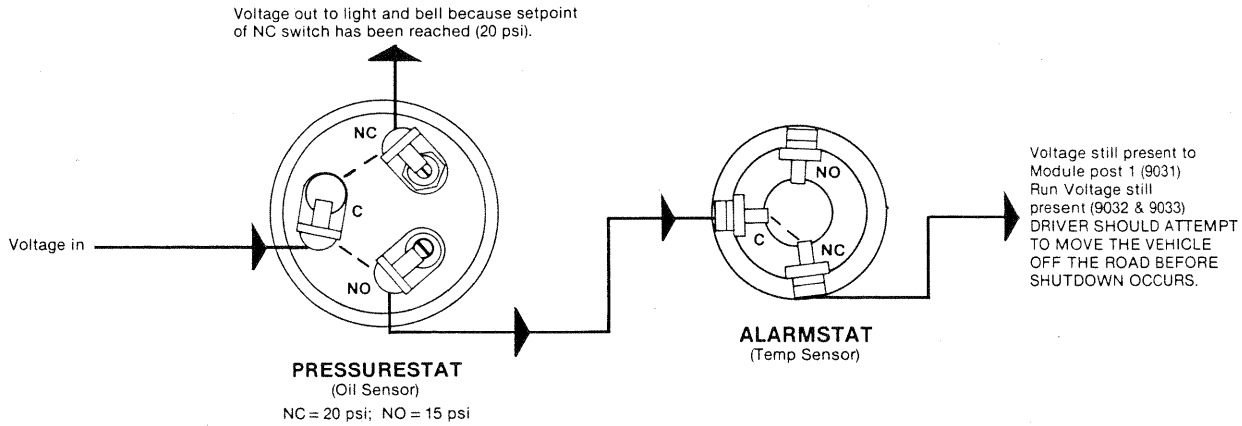


**The setpoints used are for example only. These setpoints will vary by engine make and model See Table 11A and 11B in the Service Parts section of this guide.*

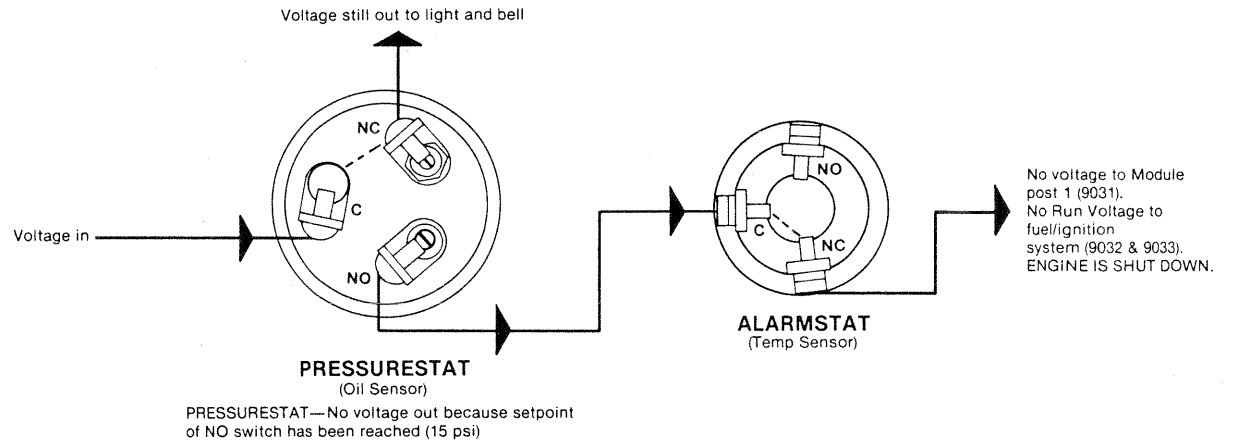




C. Low Oil PSI Alarm—Pressure = 20 psi (PRESSURESTAT First Circuit)



D. Low Oil PSI Shutdown—Pressure = 15 psi (PRESSURESTAT First Circuit)



ALARMSTAT & PRESSURESTAT SETTINGS

PRESSURESTATS®		
ENGINE	PRESSURE SETTING-PSI	
	Alarm	Shutdown
DDA 53, 71 and 92 series;	6	3
CUMMINS 855 cid Big Cam II, III or IV; CUMMINS L-10; CUMMINS 4B and 6B; CAT 3306B	9	5
CAT 3306, 3406 & 3408, CUMMINS 555, 903 & 1150 cid; CUMMINS 855 (previous to Big Cam II);	11	6
CAT 3208TA, 3406B; DDA 6.2L & 8.2L FORD gasoline	15	10
CAT 3208 Naturally Aspirated	20	15

ALARMSTATS®		
ENGINE	TEMPERATURE SETTING°F	
	Alarm	Shutdown
Any diesel engine not listed below.	204	210
CAT 3306B, 3406B; CUMMINS 855 cid Big Cam II, III, or IV; CUMMINS L-10	214	220
CUMMINS 4B & 6B	224	230
CUMMINS 444 IHC DTA-360	219	225