

PENNTEX INDUSTRIES

CHARGING SYSTEM MONITOR (14 VOLT)

Installation and Testing

Introduction:

The PennTex Charging System Monitor or CSM is basically an improved voltmeter and an automatic load kill. Its first function is to monitor the battery voltage and alert the driver if the voltage drops too low. It has both a visual (Light Emitting Diode) and an audible indicator (beeper) to alert the driver. The second function is to monitor the alternator/regulator and alert the driver of output failure or overcharging. It has a separate LED for the charging system and also beeps to alert the driver of malfunction. The visual indicators will illuminate to indicate a warning and flash to indicate urgent problems. The beeper has different beep patterns and frequencies, which reflect the urgency of the warnings. The third function is the automatic load kill output. This is an output that is designed to disconnect non-essential electrical loads if the battery voltage drops below 10.8 volts or if the alternator stops working. The loads are automatically reconnected if the condition is corrected and the battery voltage rises above 13 volts for 1 minute.

Installation:

******* DISCONNECT THE GROUND CABLE FROM ALL BATTERIES DURING INSTALLATION. *******

1. Choose a mounting location that is in plain view of driver and has adequate rear clearance. Saw, cut or punch a 2 1/16" diameter hole in the panel.
2. Mount the CSM using the supplied bracket and #10-32 keps nuts. Do not over tighten mounting nuts, as this will break the plastic housing. Instead, apply a small amount of RTV silicone to the mounting nuts to prevent vibrating loose. Do not use permanent thread locking chemicals.
3. Connect the black wire from the CSM to chassis ground. DO NOT connect this to a ground wire that has a high amperage load because the resulting voltage drop will cause false warnings from the CSM. DO NOT assume that a metal bracket in the vehicle is a good chassis ground. Paint and surface treatments or corrosion can cause poor connections.
4. Connect the red wire from the CSM to a source that provides +12 volts when the ignition switch is in the "RUN" and "ACCESORY" positions. DO NOT connect this to a circuit that has a high amperage load because the resulting voltage drop will cause false warnings from the CSM. DO NOT connect this to a constant voltage source.
5. Connect the orange wire from the CSM to the stator tap from the alternator. Most alternators have this available but some OEM alternators that are internally regulated do not use or connect to it in the vehicle wiring harness. Most high output aftermarket alternators that are externally regulated have this available at the regulator's "S" terminal. If the alternator does not have a stator tap then connect the orange wire to the warning lamp wire from the alternator. This should only be done if necessary because the CSM can not detect loose or corroded battery cables unless it is connected to the stator tap! Listed below are common alternators and recommended connections:
 - PennTex & Lestek - stator wire - orange 14 AWG from alternator to "S" terminal of regulator.
 - Powerline - stator wire - white 14 AWG from alternator to "S" terminal of regulator.
 - Amptech - "S" terminal of regulator
 - Leece Neville & Prestolite - (J180 mount) - any one of the 3 screw terminals on the brush/regulator assembly at the rear of the alternator.
 - Ford (95-7) - stator wire - white with black stripe wire that loops in and out of alternator.
 - Ford (Mitsubishi, 215 Amp) - warning lamp wire - light green with red stripe from alternator.
 - GM/Delco - warning lamp wire - brown wire from alternator.
 - Chrysler/Dodge -

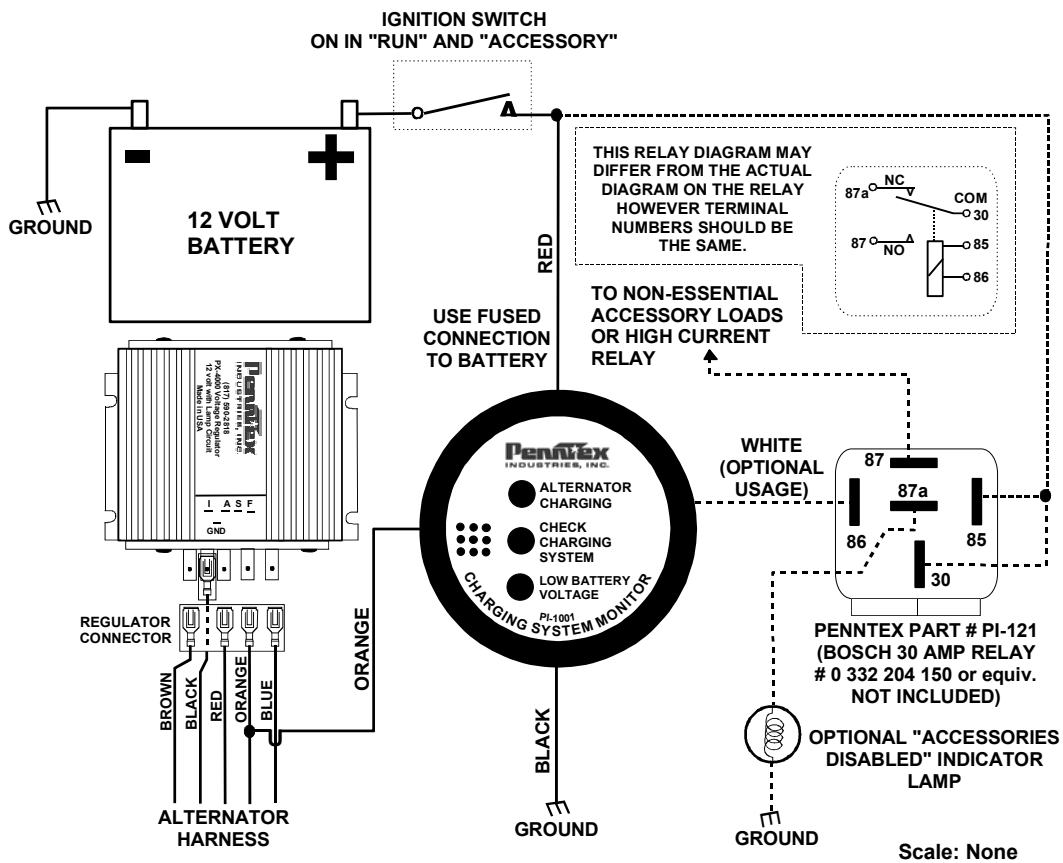
- The white wire from the CSM is the load kill output. This wire can optionally be used to automatically disable non-essential vehicle loads. This will minimize battery discharge if the alternator stops charging or if the load is greater than the alternator's output at idle. Utilization of this feature is recommended because often vehicles are left running unattended. This feature can help prevent towing charges and stranded passengers which would easily pay for the cost of the CSM. If this wire is NOT used then cut any stripped portion of the wire off, tape the end and secure the wire to prevent unintentional shorts. DO NOT connect this wire to +12 volts directly.

Load Kill Relay Connection:

During normal operation the white wire is grounded inside the CSM. When the CSM disables non-essential loads this wire is disconnected from ground and is left floating or open circuit. This wire can sink ¼ Amp. max. and has over current protection. It is designed **only** to drive the coil of a Bosch type automotive relay (PennTex part # PI-121). This relay typically can switch 30-40 amps. If greater current switching is needed then the Bosch relay can be used to drive a larger relay or contactor. DO NOT connect indicator lamps or high current relays directly to the CSM. See the wiring example below.

The load kill feature should **only** be used to disconnect **non-essential** loads such as: A/C, heaters, courtesy lights, audio/video systems, AC inverters, electronic signs, etc.

DO NOT connect to disable: electric doors, chair lifts, 2-way communication equipment, exterior lights, windshield wipers, instrumentation, ECM, sirens, horn, electronic brakes, charging system, or any other equipment that is essential for safety or vehicle operation!!!!



NOTE: Optionally an "ACCESSORIES DISABLED" indicator lamp may be connected between terminal # 87a and ground. This will illuminate when the ignition switch is on and the CSM has disconnected the accessories.

A bypass switch could also be installed from terminal # 86 to ground to override the CSM however this would defeat the "LOAD KILL" feature if inadvertently left on and is not recommended.

7. Secure any loose wires and cables away from sharp edges, moving components and heat sources that could cause damage.

Testing:

1. With the ignition switch in the "OFF" position the LEDs should be off, the beeper should be silent and the optional "ACCESSORY DISABLE" indicator lamp (if installed) should be off.
2. Turn the ignition switch to the "RUN" position but **DO NOT START THE ENGINE!** The CSM should beep once and all three LEDs should light up for 2 seconds. This is the startup self test mode and should occur every time the ignition is switched on. After the initial 2-second startup test, the CSM will go into its normal operating mode.
3. After the 2 second startup test, the "CHECK CHARGING SYSTEM" LED (red) should flash since the engine is not running. The "ALTERNATOR CHARGING" LED (green) should be off for the same reason. If the battery is discharged (voltage < 11.5) then the "LOW BATTERY VOLTAGE" LED (red) may also be on or flashing. The CSM should not beep for 1 minute after the initial beep. This is because it mutes the beeper for the first minute to allow for the engine to start, battery to recharge, and the air intake heaters/glow plugs to turn off. After 1 minute the beeper should start beeping. The beep pattern will depend on which warnings are displayed. See "OPERATION SUMMARY" for details. If the "LOAD KILL" feature is used then the accessory loads should be disabled after 1 minute.
4. Start the engine. If the power is interrupted when starting, then the CSM may reset to the startup test. If the charging system is working properly and the battery is charged then only the "ALTERNATOR CHARGING" LED (green) should be on. Be sure to allow the batteries to recharge adequately after starting. This can take up to 45 minutes or more with severely discharged batteries. The "LOAD KILL" output will reset (accessories on) if the CSM is restarted via ignition switch or if no warnings are active and the battery voltage is greater than 13 volts for 1 minute.

OPERATION SUMMARY:

STARTUP:

When the CSM is first powered up it enters a self-test mode just as the OEM instrumentation does. During this 2-second test, the CSM beeps once and turns on all the LED indicators. For the first minute of normal operation the beeper is muted to allow the engine to start, battery to recharge and the air intake heater and/or glow plugs to turn off.

NORMAL OPERATION w/ NO WARNINGS:

If the charging system is working and the battery voltage is above 11.5 volts then only the "ALTERNATOR CHARGING" LED (green) should be on, the beeper should be silent and the accessories should be enabled.

LOW BATTERY VOLTAGE:

If the battery voltage drops below 11.5 volts then the "LOW BATTERY VOLTAGE" LED (red) will turn on and the beeper will beep once every 60 seconds.

VERY LOW BATTERY VOLTAGE:

If the battery voltage falls below 10.8 volts then the "LOW BATTERY VOLTAGE" LED will flash and the beeper will beep once every 2 seconds. After 1 minute, if the problem still exists then the accessories will be disabled. The accessories will automatically be re-enabled if the charging system is working and the battery voltage rises above 13 volts for 1 minute.

CHARGING SYSTEM STOPS CHARGING:

If the charging system stops charging because of alternator or regulator failure, missing belt or loose wires, then the "ALTERNATOR CHARGING" LED (green) will turn off, the "CHECK CHARGING SYSTEM" LED (red) will flash rapidly and the beeper will beep 5 times every 15 seconds. After 1 minute, if the problem still exists then the accessories will be disabled. The accessories will automatically be re-enabled if the charging system is working and the battery voltage rises above 13 volts for 1 minute.

CHARGING SYSTEM OVERCHARGING:

If the internal stator voltage from the alternator rises above 7.75 volts then the "CHECK CHARGING SYSTEM" LED (red) is turned on and the beeper will beep twice every 60 seconds. This can indicate a loose or corroded battery to alternator cable or a regulator that is overcharging. Loose or corroded battery cables are a common problem that leads to dead batteries and towing fees. Alternators are commonly and mistakenly blamed for this problem. To make matters more complicated, when the alternator is replaced, the connections get cleaned and tightened, fixing the original problem. This leads the mechanic to be convinced that the alternator was indeed the problem since it worked fine after the alternator was replaced. This feature of the CSM can help pinpoint the difference and get the problem fixed in minutes rather than days.

MULTIPLE WARNINGS:

If more than one warning occurs at the same time, then the beeper responds to the highest priority beep pattern.

VERY LOW BATTERY VOLTAGE -	Highest priority
CHARGING SYSTEM STOPS CHARGING -	2nd
LOW BATTERY VOLTAGE -	3rd
CHARGING SYSTEM OVERCHARGING -	Lowest priority