

Installation Manual

PH3 POWERHALT
AIR INTAKE EMERGENCY SHUT-OFF VALVE



C50287A PH3 AIR INTAKE SHUT-OFF VALVE

WITH POWERGUARD SMART OVERSPEED LIMITER

2017 GM 6.6L DURAMAX

800.663.0096

www.powerhalt.com



INSTALLATION REQUIREMENTS & RECOMMENDATIONS:

Prior to the installation, please read through the requirements and recommendations listed below so you have a clear understanding of your system and the location which you plan to install the shut-off valve.

If you cannot meet these requirements, or are unsure of your system, contact your dealer or PowerHalt representative and we can work with you to overcome your installation constraints and challenges.

A PowerHalt Technical Representative can be reached Monday-Friday 6:00-4:30 (PST) at 800.663.0096

- A 1" clearance is required from the valve to any other components. The valve can be in any orientation.
- Maximum ambient air temperature at the valve should not exceed 120°C.

- All hoses, adapters, and fittings must be suitable for the vibration* of the engine application.

***If unsure of your vibration requirement, contact Pacbrake.**

- Flexible hose gaps should be kept to a minimum and the overall pipe quality and integrity from the shut-off valve to the intake manifold should be confirmed.

NOTE: Failure to ensure this may result in hose collapse during valve activation and possible system leaks, preventing engine shutdown.

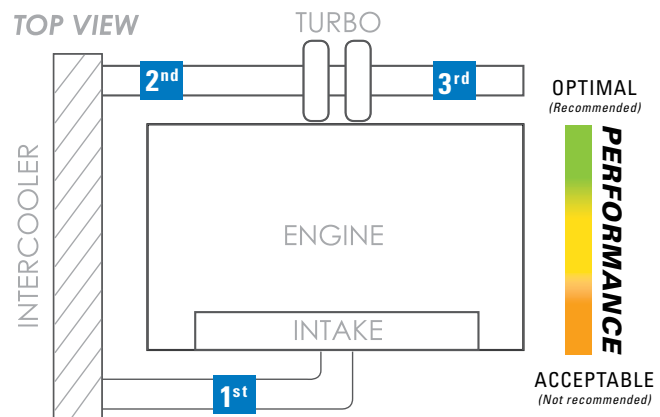
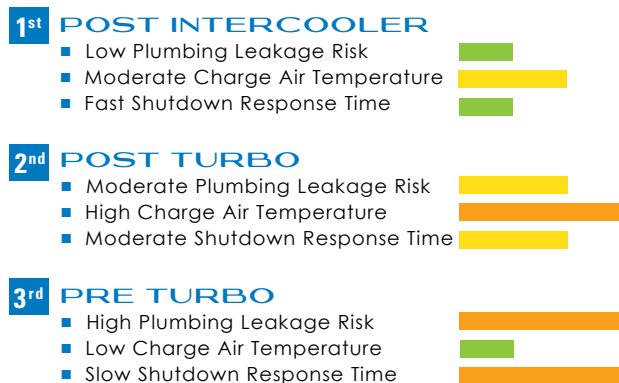
For excessive vibration applications, and installations with long pipe runs, additional support brackets may be required.

- If an air intake flame trap is used, the valve must be installed upstream of the trap.
- Crankcase breather connections to the intake system must be sealed and replaced by an external breather.
- If you need to cut the existing intake piping to allow for the shut-off valve installation, remove the pipe off of the engine and thoroughly clean it to ensure no shavings are present prior to the installation.

NOTE: Failure to do so may result in engine damage caused by foreign debris ingesting into the engine.

- It is highly recommended that the pipe is rolled with a bead to ensure hose fitting retention on both the inlet and outlet sides of the shut-off valve.
- If more than one shut-off valve is installed on one engine it is imperative that the control method is consistent with this requirement, ensuring valve activation is simultaneous for both valves.

In order of preferred location to least preferred



Please ensure that you have all the parts listed in this kit **before** you start the installation.



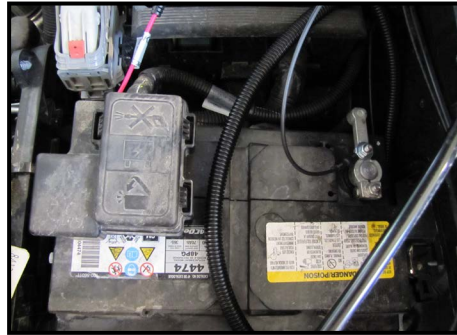
KIT CONTENTS

A	Shut-Off Valve 2.75"	(1)
B	2" Constant Tension Clamps	(4)
C	2.75" Silicone Hose	(1)
D	2.5"-2.75" Silicone Hose Reducer	(1)
E	Tie Straps	(8)
F	Crank Sensor Jumper Harness	(1)
G	PowerGuard Controller	(1)
H	Wiring Harness	(1)
I	Membrane Switch Assembly	(1)
J	Velcro	(1)

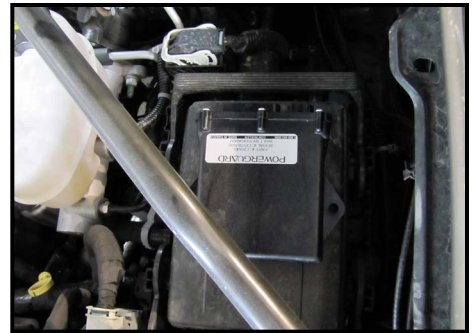
REQUIRED TOOLS

- Drill
- 1 1/8" Unibit or Hole Saw
- Basic Hand Tools
- Torque wrench capable of 0-80 in-lbs
- Wire Strippers & Crimpers
- Electrical Tape
- Soldering Iron
- Cut-Off Saw / Angle Grinder

- 1 Open the hood. Disconnect the batteries.
- 2 **CONTROLLER, SWITCH & WIRING HARNESS INSTALLATION:**
Secure the PowerGuard controller box to the fuse box with supplied Velcro as shown in image 2A.



1A



2A

- 3 Connect the harness connector to the PowerGuard. See image 3A, 3B and 3C.

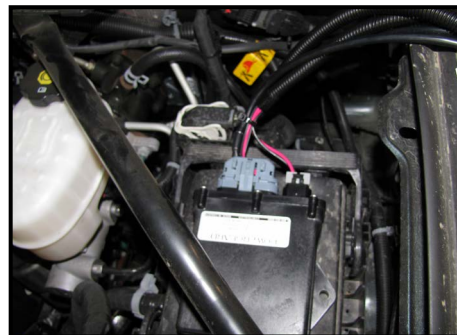


3A



3B

- 4 Route the 3 wire weather pac plug of the Pacbrake harness to the passenger side of the engine compartment. Locate the crank speed connector. See images 4A and 4B.



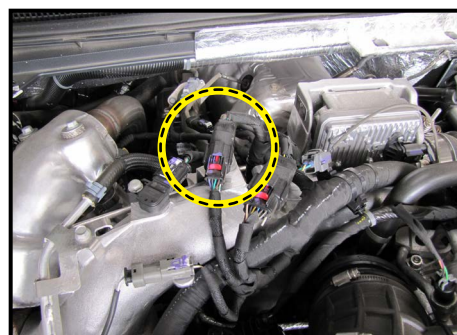
3C

- 5 Unlock and unplug the factory harness connector.

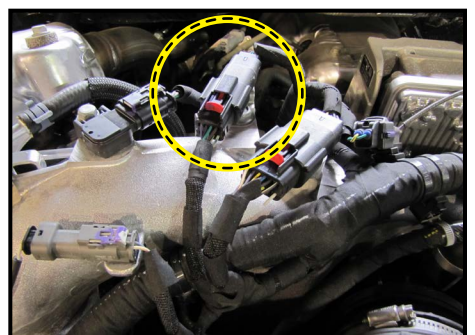
Obtain the supplied crankshaft sensor jumper harness, connect the female connector to the crankshaft sensor and lock.

Connect the factory female connector to the male connector of the jumper harness, and lock.

Secure the harness with the provided tie straps away from any moving parts or high heat sources.



4A



4B

6 Secure all wiring with zip ties.

7 SWITCH INSTALLATION

Locate the desired location for the activation switch in your cab. Image 7A shows the ideal location to mount the switch.

NOTE:

- Activation switch should be as close to driver's side door as possible to allow for shutdown when standing outside of the vehicle
- Consider the dash construction, as the switch requires a single dash wall for install unless the double wall is modified

NOTE:

- The switch must be accessible from the ground outside of the driver's door. Ideally the switch should be to the left of the steering column.
- Dash thickness and construction needs to be understood, ensuring the bolts can extend through the dash.

CAUTION: Ensure vehicle control wiring is clear of switch drill location prior to drilling dash.

INSTALLATION STEPS

A Take out Layout Template* provided (5C).

Cut out and mark drill locations for the switch to ensure accuracy..

B Remove dash panels accordingly in order to access the backside of the dash switch location.

C Drill 1 1/8" hole using uni-bit and 2 - 1/4" holes for fasteners (as per drill template, see picture 5C).

D De-burr holes.

E Install the switch with the supplied hardware.

F Torque the nuts on both bolts to 15-25 in-lbf (1.7-2.8) N•m.

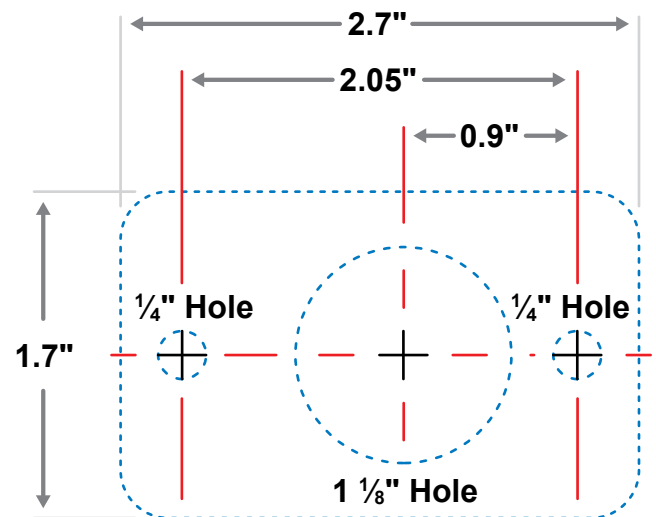
CAUTION: Do not over-torque nuts.

***NOTE:** When printing out the drill template online make sure your printer is not scaling the image or stretching it. Open your print dialogue box and select print at 100% scale.



7A

PH3 DRILL TEMPLATE



7B

8 Route the 6 pin connector on the main harness into the drivers side cab of the truck. Typically you can fish this connector through the main harness boot in the firewall. It may or may not be necessary to slice a small hole in this boot to help fish the connector through.

- 9 Connect the plug inside the cab and secure all wiring.

10 BATTERY CONNECTION:

Route the red fused wire and the black wire with ring terminals to the driver's side battery location.

Connect the black wire to the negative terminal.

Connect the red fused wire to the positive terminal.

NOTE: Ensure the wiring harness routing is secured with provided tie straps and away from any moving parts or high heat sources.



11A



11B

11 VALVE INSTALLATION PREPARATION

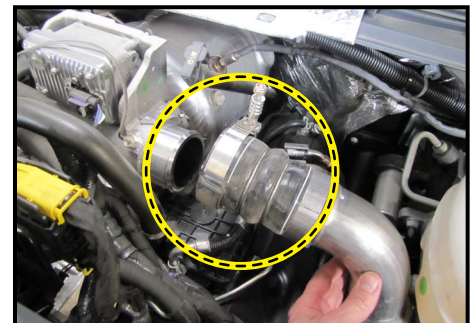
Remove the driver's side charge air cooler (CAC) pipe.

- 12 The CAC pipe is easily removed with a $\frac{7}{16}$ " deep socket and an extra length extension. See image 12A.



12A

- 13 Cut the factory band clamp off of the turbo side of the CAC pipe. Remove the silicone hose and discard. See image 13A.



13A

- 14 Cut approximately $1\frac{1}{8}$ " from the end of the pipe, $\frac{1}{4}$ " back from the second bead. See Image 14A and 14B.



14A



14B

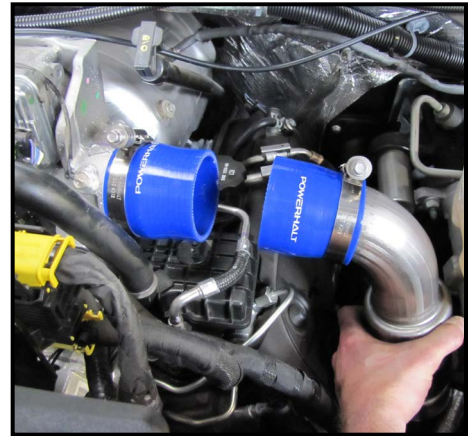
- 15** Attach the 2.5"-2.75" silicone reducer and clamp to the end of the cut pipe.

Slide the reducer over the bead far enough that the band clamp grips fully on the reducer.

Tighten the band clamps, hand tight.

Note: Adjustment of clamps, hoses and valve may be required for final torque

- 16** Attach the straight 2.75" silicone hose onto the turbo outlet. Install the clamp, hand tighten.



17A

- 17** Install the CAC pipes back onto the engine as shown in image 17A. Tighten the original gear clamps back to factory specification.

- 18** Loosely install the band clamps over the silicone hose ends. Install the PowerHalt valve, making note of the flow direction. The actuator plug should be pointing away from the turbo and towards the intercooler.

Tighten the band clamps hand tight.

- 19** Rotate the clamps and the PowerHalt valve into position so that they are not rubbing or touching any other engine components.

Torque all clamps to 75 in-lbs.



20A



20B



20C

- 20** The valve should be positioned as shown in image 20A-20C.

- 21** Connect the sealed plug to the top of the actuator motor on the PH-3 valve. Secure all wiring with provided zip ties. See image 21A.

- 22** Reconnect the batteries.



21A



SWITCH FEATURES

- RESET** Used during the setup procedure. (Has a red LED indicator above the button)
- TRIP** Used for a manual activation (override).
- TEST** Used to test the automatic function and during the setup procedures. (Has a green LED indicator above the button)

23 POWERGUARD SET-UP & TEST PROCEDURE

TO SETUP RPM:

With the engine running, hold the reset and test buttons together for 5 seconds until both LED lights start flashing, and then release both buttons

The controller is now in the set/test mode with 2 options (see below)

FIRST: If your controller is already set for a specific RPM, and you want to change the RPM trip point, press and hold reset for 5 seconds to remove the RPM limit, then the controller will revert to Functional State 1 (from step 17)

SECOND: if your controller has not been set up you will need to do the following steps;

1. Confirm your engine rated RPM value.
2. Determine your desired RPM over speed shutdown RPM value.

NOTE: Pacbrake manufacturing recommends a 20% (min) and 30% (max) over rated Engine RPM setting for shutdown.

EXAMPLE: Engine RPM = 2150 + 20% over speed value = 430 RPM over max rated.

(2150 + 430 = 2580 then take 50% of this value = 1290 RPM.)

3. Increase the truck RPM to 50% of your over speed shutdown value determined in Step 2
4. While at this RPM press the reset button on your PowerHalt switch located in the vehicle cab 4 times.

NOTE:

- There must be less than 2 seconds between presses for the controller to read inputs.
- After presses are complete, the red LED will flash 4 times to confirm programming has been accepted.
- If there was no RPM detected when pressing the reset button, the controller will remove the existing RPM threshold and change to functional state 1 (from step 17)
- If no action is taken while in the set/test mode, after 60 seconds the controller will time out and return to normal function and its most recent RPM threshold.

SETUP PROCEDURE

The PowerHalt is a smart controller that detects diesel engine runaway and immediately stops the engine by triggering the emergency air shut-off valve. The unit has the following states:

UNPROGRAMMED STATE: When you first purchase your kit, the controller's red and green lights will flash in an alternating order to indicate there is no emergency engine shut-off speed programmed.

PROGRAMMED STATE: If an emergency engine shutdown speed has been programmed to the controller's memory, the controller unit will act in the following way:

- **Engine off:** no lights flashing
- **Engine running:** green light flashes every 5 seconds indicating the system is working as intended
- **Valve actuated (manually or automatically):** the emergency shut-off has occurred and the red light on the controller turns on for 5 seconds

SETTING THE EMERGENCY ENGINE SHUT-OFF SPEED

If the controller has no emergency engine shutoff speed programmed, setup is required for the emergency shut-off system to function. The controller uses a setup engine speed and adds a user defined overspeed margin to program the emergency engine shut-off speed.

IMPORTANT: Please consult your engine manufacturer and the relevant safety operating procedures to determine the emergency engine shut-off speed prior to proceeding.

1. With the engine idling, hold down the SET and TEST buttons simultaneously until both lights begin to flash (approximately 5 seconds), then release the buttons
2. Press and release the SET button on the controller to begin monitoring engine speed – the red light will flash rapidly to confirm the engine speed is being monitored
3. Bring the engine to your desired setup engine speed **GRADUALLY**, then return engine to idle.
WARNING: The controller is monitoring for the peak RPM while the engine is brought up to speed – do not exceed your target RPM or you will need to restart this procedure
4. Press the SET button: 1 time to add 10% to the setup engine speed for the emergency engine shut-off speed, 2 times for 20%, 3 times for 30% or 4 times for 100%
5. When the data is saved successfully, the red light will confirm your input by blinking the same number of times the SET button was pressed. If no engine speed is detected, the controller will exit the setup and erase any saved engine speed from the memory
6. Check the controller to verify that programming was successful by confirming that the green light blinks every 5 seconds while the engine is running
7. Document your emergency shut-off speed for future reference

SETUP RPM	PRESS "SET" BUTTON	OVERSPEED MARGIN		EMERGENCY ENGINE SHUTOFF SPEED (SETUP RPM) + (OVERSPEED MARGIN)
		%	RPM	
1800	1 time	10	$1800 \times 0.10 = \mathbf{180}$	$1800 + 180 = \mathbf{1980}$
1800	2 times	20	$1800 \times 0.20 = \mathbf{360}$	$1800 + 360 = \mathbf{2160}$
1800	3 times	30	$1800 \times 0.30 = \mathbf{540}$	$1800 + 540 = \mathbf{2340}$
1800	4 times	100	$1800 \times 1.00 = \mathbf{1800}$	$1800 + 1800 = \mathbf{3600}$

TEST MODE

The test mode ensures that the system's automatic function is working as intended.

1. Hold the SET and TEST buttons simultaneously until both lights begin to flash (approximately 5 seconds), then release both buttons
2. Press then release the TEST button on the controller, the green light will start flashing rapidly and the red light will turn off

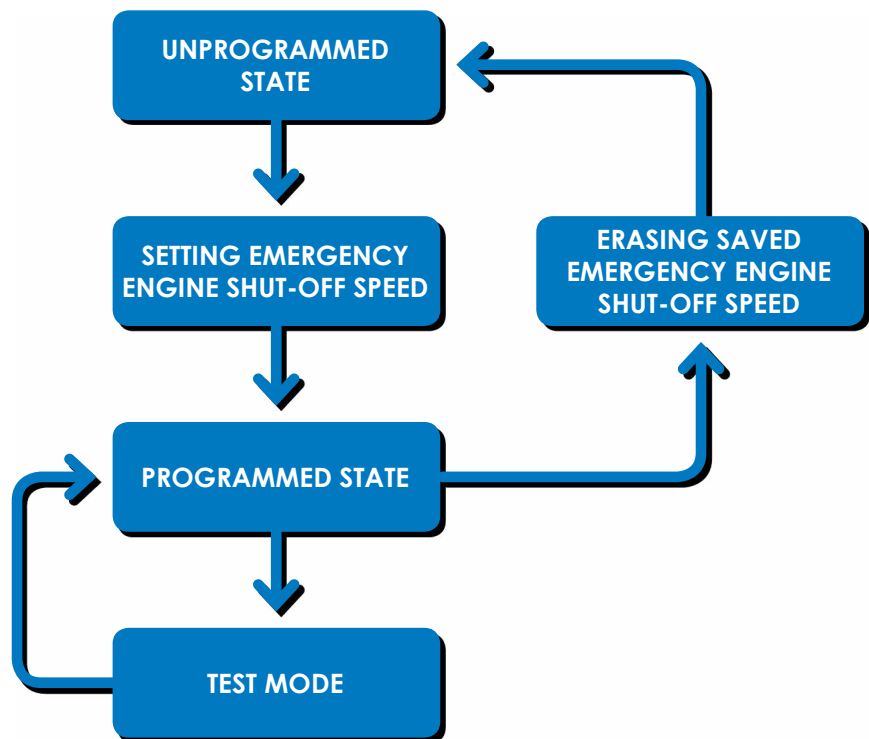
3. Raise the engine speed to HALF of the emergency engine shut-off speed
4. The emergency shut-off valve will actuate to shut down the engine
5. The green light will continue flashing and the red light will illuminate for 5 seconds before returning to Programmed State

NOTE: If the valve activated but the engine failed to shut down, check for leaks in the piping and consult a PowerHalt representative.

ERASING THE EXISTING EMERGENCY ENGINE SHUTOFF SPEED

1. Hold both SET and TEST buttons simultaneously until both lights begin to flash (approximately 5 seconds) before releasing
2. Press and hold the SET button until the red and green lights begin flashing in an alternating order, indicating that memory has been cleared
3. Repeat SETUP PROCEDURES to program a new emergency engine shut-off speed

SYSTEM FUNCTION FLOW CHART



24 POWERGUARD TEST PROCEDURE

TO ENTER TEST MODE:

With the engine running, hold the reset and test buttons together for 5 seconds until both LED lights start flashing, and then release both buttons

Press and release the TEST button to enter into test mode, where the threshold will be reduced to 100% of original RPM, or 50% of threshold

The controller will wait for 60 seconds before reverting back if threshold is not reached.

Increase the RPM to 50% of the threshold, the valve will close and the red LED will illuminate until 0 RPM is detected and either 30 seconds elapses or the TEST button is pressed

Next, the valve will automatically re-open and the red LED will extinguish

25 POST INSTALLATION TESTING

Once the installation is complete, ensuring all steps, schematics and recommendations have been followed, it is now time to test your system

1. Press the red TRIP button and confirm the red LED is illuminated. Wait 30 seconds for the valve to auto reset
2. Start the engine
3. Press the red TRIP button and ensure:
 - The engine stops within a few seconds
 - Hose collapse is not severe
 - No excessive leaks are present in the system

NOTE: *if the engine does not fully shut down check all intake piping and hoses for leaks between the valve and intake system. If the system is sealed and the valve still fails to shut down the engine consult your Pacbrake service representative for support*

4. Once the engine stops wait 30 seconds until the valve automatically re-opens and the red LED turns off
5. Utilize the test mode (in step 8) as per PowerGuard Test Procedure to ensure that the automatic overspeed is functioning properly

26 NORMAL VALVE OPERATION

Automatic function or manual override can be used to shut down the engine during an over speed event

CAUTION: *Do not attempt to start the engine after an over speed condition occurs until the cause is understood and shared with the necessary safety parties.*

NOTE: *Please reference your organizations specific operation procedures and ensure they are in line with the PowerHalt operating instructions and requirements. If there is a discrepancy always follow your site requirements first.*

NOTE: *Please reference your operators pocket guide for operation/test and troubleshooting specifics.*

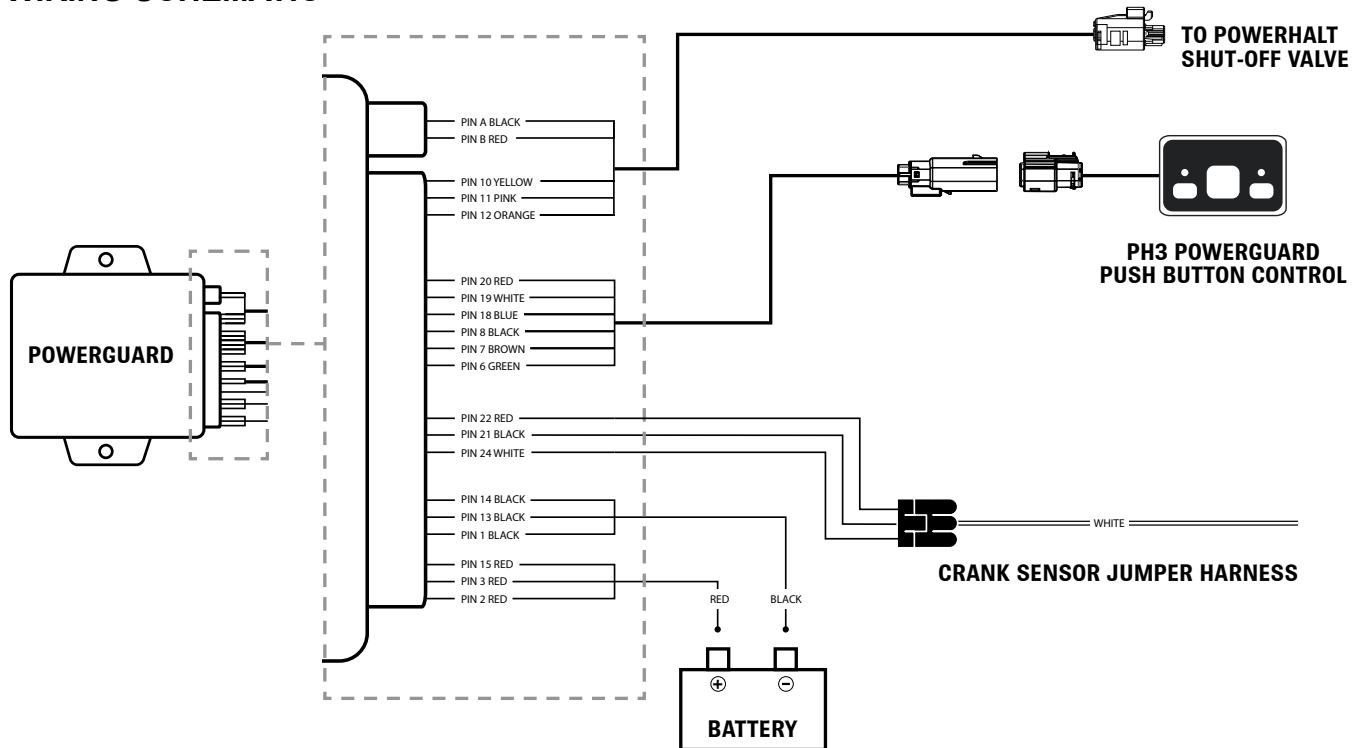
27 VALVE MAINTENANCE REQUIREMENTS

As the PH3 is a maintenance free and self-checking valve, it does not require any specific operator involvement. The PH3 performs an anti-foul cycle every time the engine comes to a stop after a period of running. However if the unit is stored for extended periods, or run for extended periods without pause, it is imperative that the engine run and shut down monthly so that the PH3 valve can perform its anti-foul cycle.

28 MONTHLY INSPECTION REQUIREMENTS

- Inspect all fasteners and clamps to ensure proper torque.
- Inspect all hoses and pipes for signs of wear or vibration related issues.
- Inspect all wiring connections and routing to ensure correct strapping.
- Inspect the membrane switch while the unit is running to ensure the green LED light is flashing every 5 seconds.

WIRING SCHEMATIC

**Customer Service Hours**

Monday to Friday from 6:00 am to 4:30 pm PST

Business Hours of Operation

Monday to Friday from 7:30 am to 4:00 pm PST

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QMI-SAI Global**POWERHALT**

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