



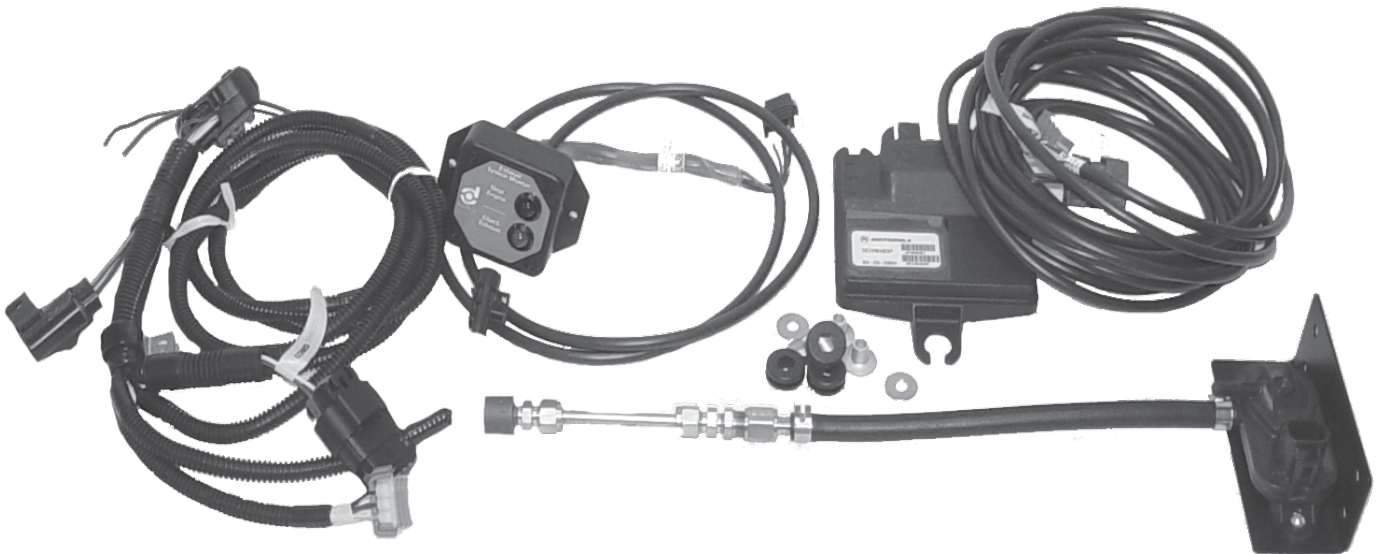
Donaldson
FILTRATION SOLUTIONS

OWNER'S MANUAL

Installation, Operation, and Maintenance Information

Back Pressure Monitor (BPM) for Diesel Particulate Filter Mufflers

Manual No. P480922 Rev 1



This manual is property of the owner. Leave with the unit when installation and start-up are complete. Donaldson Company reserves the right to change design and specifications without prior notice.

Do not make any system modifications or adjustments that would alter the original retrofit installation. Modifications may not meet California ARB Executive Order requirements, be considered illegal devices and may result in denial of warranty coverage.

Consult your Donaldson certified emissions dealer if you have questions regarding the installation, operation, maintenance or warranty.

Illustrations are for reference only as actual product may vary.



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

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Introduction

The Donaldson Back Pressure Monitor (BPM) detects excessive engine backpressure created by the flow restriction of an overloaded emissions control device, such as a diesel particulate filter (DPF). When excessive backpressure is detected, steady and flashing visual warning lights communicate diesel particulate status to the vehicle operator.

Kit Contents

Your Donaldson Back Pressure Monitor (BPM) includes the following parts:

Qty.	Description - P227481
1	1/4" NPT half coupling (P227022)
2	1/4" compression fitting (P229039)
1	1/4" brass barbed fitting (P228515)
1	Mounting bracket (P227483)
1	Steel tube - 6" length (P226618)
2	Hose clamps (P227486)
1	Bracket (P227483)
Qty.	Description - P227482
1	Pressure transducer (P227493)
1	Wire harness - 20 ft. (P227495)
2	Hose clamps
1	5/16" rubber hose - 6 ft. (P228514)
1	In-cab service monitor (P227492)
1	Electronic control unit (ECU) (P227488)
1	Schematic wiring diagram
1	Main wire harness (P224491)
3	Isolators (P228504)
3	Bushing (P228505)
3	Washer (P228506)

*optional: 50' Wire Harness (P227503)

Computer application and PC cable kit no X007999 is also required (sold separately).

Qty.	Description
1	Software for service/maintenance (On-line)
1	PC Cable

Wiring Schematic

Back Pressure Monitor

Part No. P227482

**Pressure transducer included*

In-Cab Service Monitor
Part No. P227492

Purple Wire
to Power
Black Wire
to Ground

Fuse

Electronic Control Unit
Part No. P227488

ECU Wiring Harness
Part No. P227491

ECU Mounts (3)
Part No. P228504 - Rubber Isolator
Part No. P228505 - Bushing
Part No. P228506 - Flat Washer

COM Port for
Computer Diagnostics

20' Wire Harness
Part No. P227495

**Optional 50' Wire Harness - Part No. P227503*

Back Pressure Installation Kit

Part No. P227481

**Pressure transducer NOT included*

Pressure Transducer
Part No. P227493

*This port must be open
and pointing downward*

Rubber Hose
Part No. P228514

Mounting Bracket
Part No. P227483

Hose Clamps
Part No. P227486

Barbed Fitting
Part No. P228515

Compression
Fitting
Part No. P229039

Steel Tube
Part No. P226618

Half Coupling
*(connects to fitting
welded on exhaust pipe)*
Part No. P227022

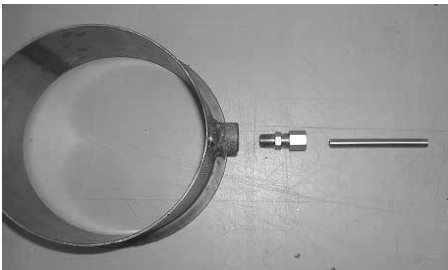
Installation

The following items should be installed in order as presented:
a) Pressure tap, b) pressure transducer, c) Electronic Control Unit (ECU), d) In-Cab Service Monitor and e) Power Connection.

Pressure Tap Installation

Locate the backpressure tap between the turbo charger and the DPF muffler in a straight section of the exhaust pipe. Installation of the tap is as follows:

1. Weld a ¼" NPT half coupling to the pipe. The coupling must be located on the upper half of the pipe. Verify the threads are facing out.
2. Drill a .25" (6mm) diameter hole through the exhaust pipe in the center of the coupling. Temporarily install an ¼" NPT nipple in the coupling to center the drill bit so the coupling threads are not damaged by the drill bit.
3. Install a ¼" compression fitting and ¼" tube to the coupling (see photo). Bend ¼" tube with a tubing bender as necessary to fit under the frame of the vehicle. The tube should have clearance to not rub or interfere with the frame of the vehicle. Check that any condensation in the tubing can drain back into the exhaust pipe.
4. Connect the ¼" tube to the rubber hose with the compression fitting and brass barbed fitting



Pressure Transducer Installation

Locate the pressure transducer at least 3 ft. (1m) from the pressure tap. The pressure transducer must not be located too close to the exhaust or exhaust heat will damage it.

Install the transducer parts as follows:

1. Mount the pressure transducer to the mounting bracket.
2. Mount the bracket (and transducer) to the frame in a suitable location.

NOTE

To prevent water ingestion into the pressure transducer, mount the bracket with transducer so the two bars (shown circled below), point downward.

3. Connect the 5/16" flexible hose to the lower (see circled area in photo below) barbed fitting on the pressure transducer with a hose clamp. This is NOT the "REF" tube.
4. Connect the wire harness from the pressure transducer to the main wire harness for connection to the Electronic Control Unit (ECU) and electronic display box.
5. Connect the other end of the tubing to the muffler connection.




There are two bars on the transducer. With the switch connections facing up, the rubber hose must be mounted to the lower barbed fitting. The other (top) barbed fitting marked "REF" must be left open with no connection.

Electronic Control Unit (ECU) Install

The ECU must be installed in the cab in an area easy to access but not obstructing other components.

1. Disconnect the battery before making any electrical connections to avoid personal injury and to avoid damage to the backpressure monitor.

	CAUTION Disconnect Battery
Disconnect the battery before making any electrical connections to avoid personal injury and to avoid damage to the backpressure monitor.	

2. Mount the ECU using the rubber grommets, aluminum bushings and washers.
3. Connect wire harness and output leads to the display box as illustrated in the schematic wiring diagram (provided in the backpressure monitor box).
4. Last, connect the BPM to 12V keyed power.

In-Cab Service Monitor

The in-cab service monitor alerts the operator when the emissions control device, such as a diesel particulate filter, requires service.

The monitor should be mounted in a location that is clearly visible to the operator during operation of the vehicle.



1. Using the built-in mounting holes on the display, mount the monitor in place.
2. Re-connect the battery and turn the ignition switch on. Confirm that both indicator lights flash three times when ignition switch is on.



Operator and Service Instructions for the In-Cab Service Monitor

During start up, the lights will flash three times as the monitor runs through a self-test. If any light was illuminated prior to engine shutdown, it will continue to be illuminated after the self-test.



Check Exhaust Light

Steady yellow light is key to filter service


It is major advantage in maintenance time and labor to service the filter while the yellow light is illuminated.

The yellow light indicates that the emissions filter is starting to overload. You can continue to operate the vehicle with the yellow light illuminated, but you should service the filter within eight hours of activation.

The yellow light will turn off when the filter/system back pressure drops below 100" H₂O.

Stop Engine Light

Steady Red, avoid whenever possible.

	Caution: Red Light is Illuminated
If the vehicle is in operation and the red STEADY light illuminates, the operator must service the filter within two hours.	

If you avoid servicing the filter and a steady RED light illuminates, the operator must service the diesel particulate filter within two hours.

In order to turn the RED light off after servicing the filter you will need to connect to the Back Pressure Monitor (BPM) via the "COM port" on the on the wiring harness.

Installation Checklist

- ❑ No dips (low spots) in back pressure hose (must have an uphill path to the pressure transducer to avoid water damage)
- ❑ Pressure transducer points downward ($\pm 45^\circ$) to avoid water damage
- ❑ No kinks in the rubber hose
- ❑ In-Cab Display mounted in sight of the driver
- ❑ COMS connection on wiring harness mounted in a location that can be easily accessed by the mechanic
- ❑ All wire harnesses secured at least 6" (152 mm) away from high heat and moving parts
- ❑ All connectors mated securely. Pull on connectors to ensure they are locked into position
- ❑ 12V DC, 10 Amp fuse-protected, keyed power connections
- ❑ Any wires mounted through holes must have hole edges protected by a grommets
- ❑ Wires should be protected in looms
- ❑ Wiring between two members where relative motion can occur should be secured to each member and have enough slack to allow motion without damage to the wire
- ❑ At key up, all three LED lights on the In-Cab Display flash three times
- ❑ Vehicle operators trained on new In-Cab Display and alerts
- ❑ Complete Vehicle Setup: Connect laptop with COMS port and enter information into SECM "Vehicle Setup." (VIN, Diesel Emission Control Strategy [DECS] Serial No., install date, etc.)

NOTE

Once Vehicle Setup information is entered and "Apply" is clicked, the information cannot be changed.

BPM Software & Service Tool

For technicians to properly maintain and diagnose the Donaldson filter, the BPM software and link-up cable is needed (sold separately). The software is compatible with any Donaldson filter emissions monitor. A single software program works for any number of Donaldson BPM or EDM devices.



Service Tool
Link-up Cable

Part No. X007999

Software Installation

Prior to using the service tool, install the software (DCI Console) and USB drivers on the computer that you will use to run the diagnostics.

Software, USB drivers and software install instructions (Adobe Reader PDF document) can be found at the following Donaldson web site address:

www.donaldson.com/en/exhaust/tools/index.html

NOTE

To connect to a computer using the USB port connection, the computer link-up cable (part no X007999) must be purchased separately for the software to work.

Software trouble shooting section is located at the end of this manual.

DCI Console Menu Descriptions



Disconnect - Stops communication using console.

Connection Details - Details of your link-up, does not change.

Vehicle Setup - Records vehicle information, data fields include VIN, mileage, install date and name of installer. Once data fields have been entered, they download with file and cannot be edited.

Inspect Fault Log - Displays the last five recorded faults. Go here to clear faults.

Retrieve Logged Data - Select to download the last 500 hours of exhaust backpressure, temperature and fault code data.

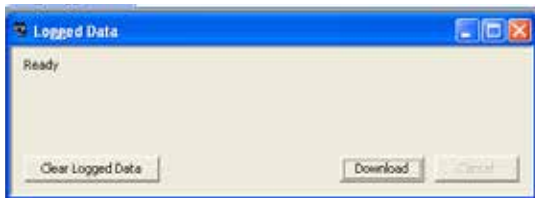
This DCI Console menu will appear after you "Connect." See menu descriptions on the right.

Download Procedure

1. Select "Inspect Fault Log" from the Toolbox Fault and Logged Data menu on the left side of the screen. A "Fault Status" window (example below) will appear listing the past 10 occurred faults. The EDM Fault Explanations Table on the back cover describes problems and corrective actions for Fault IDs.
2. To reset the red light click on "Clear Faults Related to Logging Data" in the lower right hand corner of the "Fault Status" window (not shown).

After faults have been cleared, the steady red light on the In-Cab Display should turn off. The fault history will not clear. It always retains the last five faults and will add to the fault count as more are encountered.

3. To retrieve the logfile for analysis, click on "Retrieve Logged Data" from the Toolbox Fault and Logged Data menu on the left side of the screen.



4. To extract the data, select "Download" to download the backpressure history. A comma separated value file (.csv) will be extracted for you to save on your computer. See the following page for help interpreting the logged data.

TIP

When you are asked to save the file, rename the file so you can recognize it easily; i.e., include vehicle ID or vehicle VIN and date in file name.

5. Click "Disconnect" from the Connections Control menu on the left side of the screen and close DCI Console program.
6. Turn OFF Engine Ignition
7. Disconnect computer link-up cable from BPM.
8. Reinstall the protective cap on the "COMS" connector.

Fault Explanations

Suspected Faults are real time issues the ECU is seeing. It is not until a **Suspected Fault** has occurred for 9 (nine) seconds that it becomes an **Active Fault**.

Active Faults are faults that have occurred long enough that the ECU believes them to be real and are happening in real time. These faults are recorded to the logfile and fault history.

Occurred Faults are faults that have occurred since the last key up. These are useful to view real time while connected using the computer link up tool and software (DCI Console).

The **Fault History** window is a running list of the last 10 faults that have occurred in the system, regardless of key up or fault clearing. The associated temperature and back pressure at the time of fault occurrence will be recorded along with a time stamp.

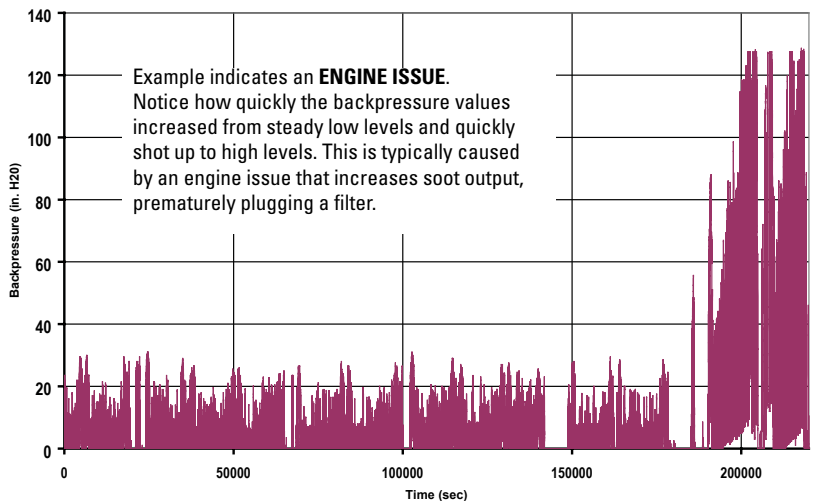
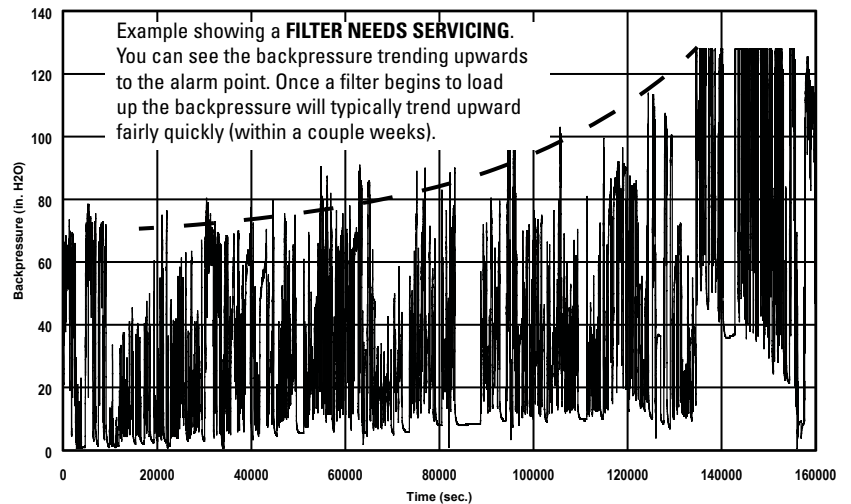
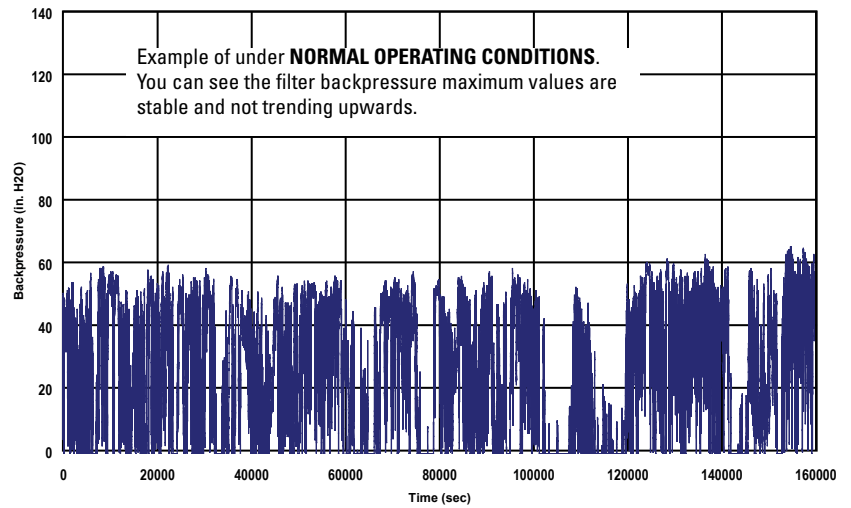
Interpreting the Logfile for Trends & Troubleshooting

Backpressure Interpretation:

Reviewing backpressure versus time to see the historical trend of your filter's backpressure is a good way to troubleshoot frequent plugging issues. You should see relatively level peak backpressure values that over time eventually trend upwards. You can also compare high backpressure levels to fault values. Below are examples of good and bad plots.

Contact Donaldson for help interpreting logfile data.

Backpressure History Graphs - Real Logfile Examples



BPM Software (DCI Console) Error Messages

Not able to connect to SECM. The "drop downs" do not appear on the left side of the DCI Console screen in the tool box menu.



If this messages appears, DCI Console must be reloaded on PC.

Note:

Administrative rights are required on PCs to load and run console.

Software must be loaded as a package with the ".exe" file contained in the same location as the "ecu files" & "ISSetupPrerequisites" folders.

Separation of these files will cause incorrect loading of software.

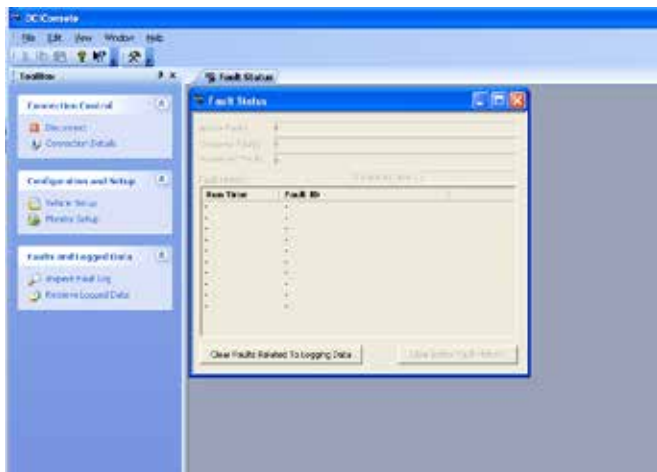
Detailed software install instructions can be found on the web at www.donaldson.com/en/exhaust/tools/index.html



If this messages appears, check the possible causes below.

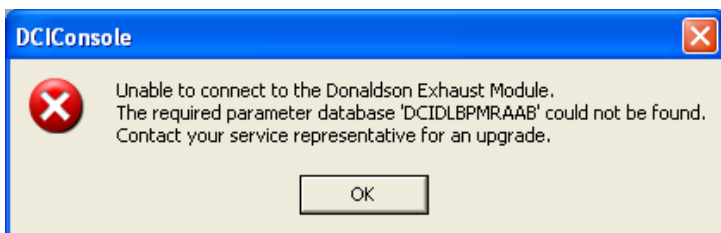
Possible Cause	Remedy
No power to vehicle	Verify that the power is on to the vehicle.
	Verify that the EDM has power. Verify that the connection from the main harness to engine has power. The lights on the monitor box should illuminated solid at key up.
	Verify the in-line fuse is still intact and has not tripped. If so, replace and try to connect.
No communication from SECM to Console.	When connecting, the "CAN" light on the Kvaser cable flashes a few times. This indicates the cable is sending a signal but the SECM is not communicating back.
	If there are no flashes, this is a cable or software issue. Swap out link-up tools and retry. Download new software from the Donaldson website. www.donaldson.com/en/exhaust/tools/index.html
Linked up to wrong port on BP Monitor	Verify that the Linkup tool is connected to the open "COMS" port on the EDM.
Server not running	There should be a picture of a "Satellite" on the bottom, right hand corner of the desktop.
	If the server is not running, restart the computer. Once the PC is restarted open then open DCI Console.
Faulty connection to SECM	Verify the wires in the main harness are not severed, shorted or open.
	Replace the main harness to isolate problem. If problem persists, re-install the original harness.
SECM flashed incorrectly	Verify there is a Donaldson label on the SECM.
Bent or damaged terminals	Replace specific wire harness component.
Incorrect drivers being used	Reinstall DCI Console software from Donaldson web site. www.donaldson.com/en/exhaust/tools/index.html

Able to connect to SECM and "drop downs" appear, however communication between DCI Console and SECM is intermittent and/or can not be established.



Possible Cause	Remedy
Loss of power during linkup with SECM	Verify that the vehicle key is on and there is power to the EDM.
	Verify continuity of the wire harness.
Corrupt DCI Console software	Re-install DCI Console

Not able to connect to SECM. There is a file missing on the hard drive not allowing you to connect to the SECM



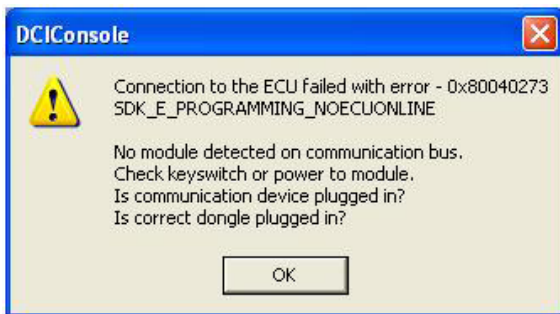
Possible Cause	Remedy
"RAAB.dll" file is not in the appropriate file folder	Re-install DCI Console

Power lost during data download due to engine malfunction or connection to engine.



Possible Cause	Remedy
Power lost during download of data	Verify that the vehicle key is on and there is power to the EDM
	Verify continuity of the wire harness.
	Verify the connections from the linkup tool to SECM. Verify that the EDM is still connected.

Not able to connect to SECM. There is a file missing on the hard drive not allowing you to connect to the SECM



Possible Cause	Remedy
Link-up cable has failed and is faulty.	Inspect the Linkup tool and investigate continuity. Check pins on the Kvaser adapter cable with pins on the male connector end.
	Verify the EDM has power..
	Try linking up to a sister vehicle with a similar EDM.

Frequently Asked Questions

Question	Answer
Filter was plugged, but the lights didn't trip	<ol style="list-style-type: none"> 1. Check power to the SECM, including the in-line fuse and the main harness wiring for continuity. A key up blinking light test will check this. 2. Check the connector to the in-cab display or for a broken display LED bulb. 3. Check to make sure a hole was drilled into the exhaust pipe and that the half coupling has an air tight weld around it. 4. Visually inspect hose and steel lines to make sure they are air tight and undamaged. 5. Make sure there is no dip in the braided steel line to prevent condensation build-up.
After key-up, the In-Cab Display lights do not illuminate steady.	<ol style="list-style-type: none"> 1. Validate the power connection. 2. Check the in-line fuse near the SECM and the in-line fuse where power was connected to see if either has blown. 3. Check the connection between the In-Cab Display harness and the main harness. 4. Check that the BPM was connected to keyed power and not constant power.
"No ECU Found" error while trying to connect with DCI Console software.	<ol style="list-style-type: none"> 1. Make sure the vehicle's key is turned on and the BPM has power to it. (All light illuminate solid on key-up will verify this.) 2. Re-install DCI Console per the software install instructions from DCI Console (at www.donaldsonexhaust.com - Diagnostic Tools).
Password prompted when I try to clear the memory.	<p>"Clear Logged" is only for DCI Engineering purposes and never needs to be cleared. Use "Clear Faults" to reset the BPM faults and clear the lights.</p>
I see both "Battery Sensor Input High" and/or "Battery Sensor Input Low" faults but the power supply to the BPM seems normal (12V DC 10 Amp).	<ol style="list-style-type: none"> 1. Check the vehicle's alternator. When an alternator is beginning to fail it causes voltage spikes that the SECM can sense. 2. Attach your power connection to a less "noisy" source on the vehicle. 3. Check for intermittent power or ground connection.

Fault Identifications (IDs), Problems and Corrective Actions

The table below is your key to understanding the fault descriptions shown in the fault status window in the DCIConsole software.

Fault ID (shown on computer screen)	Monitor Alert Indicator	Problem	Corrective Actions
Back Pressure Sensor Input High	Flashing Yellow	Failed pressure transducer or shorted wire coming from sensor.	1. Test pressure transducer (see test 1 instructions on the next page). 2. Shorted wire between pressure transducer and ECU harness. Test harness for shorts in system (see test 2 instructions on next page).
Back Pressure Sensor Input Low	Flashing Yellow	Failed pressure transducer or detached wire coming from sensor.	1. Test pressure transducer (see test 1 instructions on the next page). 2. Disconnected wire between pressure transducer and ECU harness. Test harness for continuity (see test 2 instructions on next page).
Back Pressure Caution Limit	Solid Yellow	Back pressure has reached caution limit (Yellow Light)	The DPF is nearing a service requirement. Remove, clean and replace at next convenient time.
Back Pressure Warning Limit	Solid or Flashing Red	Back pressure has reached maximum limit (Red Light)	Remove, clean and replace the DPF. Reset the monitor by clearing the faults, as described above.
Battery Sensor Input High	Flashing Yellow	Power from vehicle to ECU voltage is high	Check vehicle battery voltage output and repair. This should be 12 volts DC. This can signal a failing alternator.
Battery Sensor Input Low	Flashing Yellow	Power from vehicle to ECU voltage is low	Check in-line fuse. Check vehicle battery voltage output and alternator output and repair. This should be 12 volts DC.
XDRP Sensor Input High	Flashing Yellow	ECU has experienced an internal malfunction	Clear fault log and retry. If condition persists, replace ECU.
XDRP Sensor Input Low	Flashing Yellow	ECU has experienced an internal malfunction	Clear fault log and retry. If condition persists, replace ECU.

DCIConsole Menu Descriptions

Disconnect - Removes power from the link-up cable.

Connection Details - Details of your link-up, does not change.

Vehicle Setup - Optional (not required). Use as desired for vehicle maintenance. Data fields include VIN, mileage, date field and name of installer. Data does not download with file.

Inspect Fault Log - Displays the last ten recorded faults. Window where you clear logged faults.

Retrieve Logged Data - Select to download the last 50 hours of exhaust backpressure data.

Warranty

Please review the DPF IOM for information regarding the warranty of your system.

Pressure Transducer Testing Procedure

The transducer can be checked using a commercially available pressure calibrator, offered from companies including Fluke. The yellow should trip at around 100" H₂O (7.4" Hg) and the red should trip at about 127" H₂O (9.3" Hg). You must hold this pressure for about 10 seconds before the lights will trip.

Note: This test may trip a flashing yellow with error code "XDRP Sensor Input Low/High". Continue on with test and clear fault when done testing.

Using a digital pump tester, apply a known pressure to the pressure transducer and view the backpressure monitor response. The pressure trip points for the yellow and red lights are listed above.



Donaldson
FILTRATION SOLUTIONS

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IOM P480922 Rev. 1
December, 2012