VOLVO CAR
SERVICE AND PARTS BUSINESS

Technical Journal

TITLE:

Error Frame Finder (EFF)

REF NO:	ISSUING DEPARTMENT:	CAR MARKET:	
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PARTNER: 3 US 7510 Volvo Car USA		ISSUE DATE: 2017-01-31	STATUS DATE: 2017-02-14
FUNC GROUP: 3600	FUNC DESC: Other electrical equipment	Page 1 of 9	

"Right first time in Time"

Attachment

File Name	File Size
EFF_Configurations.zip	0.0029 MB
TJ20402_EFF_Instructions.pdf	4.1596 MB

Vehicle Type

Type	Eng	Eng Desc	Sales	Body	Gear	Steer	Model Year	Plant	Chassis range	Struc Week Range
124							2007-9999		0000850-9999999	200605-999999
134							2011-9999		-	201020-999952
135							2008-9999		0000395-9999999	200720-999999
136							2008-9999		0000400-9999999	200720-999999
155							2015-9999		-	201346-999952
156							2009-9999		0000212-9999999	200836-999999
184							2005-9999		0390000-9999999	200425-999999
234							2017-9999		-	0-0
235							2017-9999		-	0-0
236							2017-9999		-	0-0
256							2016-9999		-	0-0
275							2005-9999		0134000-9999999	200425-999999
285							2005-9999		0459000-9999999	200425-999999
295							2005-9999		0173000-9999999	200425-999999
384							2005-9999		0425000-9999999	200425-999999
533							2007-9999		0000261-9999999	200637-999999

Type	Eng	Eng Desc	Sales	Body	Gear	Steer	Model Year	Plant	Chassis range	Struc Week Range
542							2006-9999		0000590-9999999	200540-999999
544							2004-9999		0000295-9999999	200338-999999
545							2004-9999		0000133-9999999	200347-999999

CSC Customer Symptom Codes

Code	Description
2V	Technician information/Software/Vehicle communication/Not for warranty use

VST Operation Number

DTC Diagnostic Trouble Codes

ECU	DTC	Fault Type
CEM	DF13	Intermittent
CEM	DF14	Intermittent
CEM	DF15	Intermittent
CEM	DF16	Intermittent
CEM	U000111	Intermittent
CEM	U000112	Intermittent
CEM	U000188	Intermittent
CEM	U001011	Intermittent
CEM	U001012	Intermittent
CEM	U001088	Intermittent
CEM	U010000	Intermittent
CEM	U010100	Intermittent
CEM	U010400	Intermittent
CEM	U012100	Intermittent
CEM	U012600	Intermittent
CEM	U012200	Intermittent
CEM	U012800	Intermittent
CEM	U013100	Intermittent
CEM	U013600	Intermittent
CEM	U015100	Intermittent
CEM	U015500	Intermittent
CEM	U015600	Intermittent
CEM	U015900	Intermittent
CEM	U016400	Intermittent
CEM	U016600	Intermittent
CEM	U018100	Intermittent
CEM	U019800	Intermittent
CEM	U019900	Intermittent
CEM	U020000	Intermittent

ECU	DTC	Fault Type
CEM	U020800	Intermittent
CEM	U026400	Intermittent
CEM	U025700	Intermittent
CEM	U025200	Intermittent
CEM	U023687	Intermittent
CEM	U023500	Intermittent
CEM	U023187	Intermittent
CEM	U023000	Intermittent
CEM	U021400	Intermittent
CEM	DF03	Intermittent
CEM	DF04	Intermittent
CEM	DF05	Intermittent
CEM	DF06	Intermittent

Rows beginning with * are modified
Note! If using a printed copy of this Technical Journal, first check for the latest online version.

Text

DESCRIPTION:
The Error Frame Finder (EFF) can be an aid in fault tracing intermittent CAN network problems by providing a visible indication of error frames that are being transmitted on the network when the fault becomes active.

The advantage of using the EFF function is that error frames are usually transmitted on the network before a vehicle symptom can occur. Hence, if the fault is very intermittent in nature, it may be possible, for example, to induce the wiring fault for a short duration by manipulating the vehicle harnesses and connectors. The electrical fault will occur and be detected by the EFF without ever having a vehicle symptom appear.

SERVICE:
See attached instructions. The instructions for setting up the tool have been simplified.

VEHICLE REPORT:
N/A.

To view TJ attachment continue to next page.

	Volvo Cars of North America
	TJ No 20402
	Feb, 2017 Issue 03
Title	**Use and setup of DiCE Error Frame Finder**

DESCRIPTION:

This document describes how to setup and use the Error Frame Finder (EFF).

1. Setting up the SD card
2. Using the EFF
3. Tips on CAN fault tracing with the EFF
4. Tips on CAN fault tracing with a multi-meter

BACKGROUND:

The EFF function can be an aid in fault tracing intermittent CAN network problems by providing a visible indication of error frames that are being transmitted on the network when the fault becomes active. Error frames are transmitted when a critical fault in the network or network wiring (open circuits, short circuits), or defective ("babbling") nodes is detected by a network control module (node).

The advantage of using the EFF function is that CAN error frames are usually transmitted on the network before a vehicle symptom can occur. Therefore, if the fault is intermittent in nature, it may be possible to induce the wiring fault for a short duration by manipulating the vehicle harnesses and connectors. The electrical fault will occur and be detected by the EFF without ever having a vehicle symptom appear.

Detailed fault tracing information will be provided elsewhere in this document.

TOOLS:

Description	Quantity	Part No.
DiCE Unit	**1**	**9513000**
SD Card	**1**	**9513010**

Standard SD card 2GB or less

The SD card must be a standard capacity card 2GB or less such as Volvo part 9513010.
High Capacity and Extra Capacity cards, known as SDHC and SDXC are by far the most common currently available on the market but will not work.
Unfortunately, Standard capacity cards 2GB or less are no longer commonly available on the market.

One card which may still be available:
http://www.officedepot.com/a/products/981239/EDGE-Tech-1GB-Digital-Media-Secure/

Make sure the switch on the card is not in the Locked position.

1. Setting up the SD card

There are three different configuration (.cfg) files depending on the bus setup of the vehicle. The card can only contain one of the files at a time. It should be the only file on the card and must be called 'config'. If the file named is changed, it will not work.

You can choose to prepare 3 different SD cards and label them or you can switch the file on the card as needed.

P1, P2 2005-, P3, SPA: The configuration covers one 125kb bus and one 500kb bus.
(Volvo SD card 9513010 comes pre-loaded with this file)

P1
P2, 2005-
P3
SPA (Only covers Propulsion CAN)

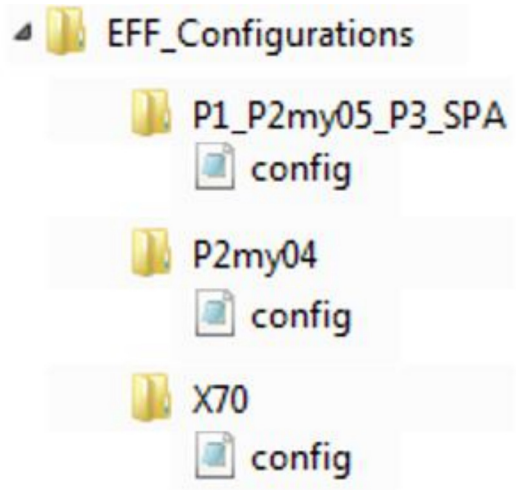
P2 -2004: The configuration covers one 125kb bus and one 250kb bus.

P2, -2004

X70: The configuration covers one K-Line bus and one 250kb bus.

X70, 1999-2000

Unzip the attached Zip file onto any location on your hard drive.
It will give you one main folder that has 3 sub-folders.
Each of those 3 sub-folders contain one file called 'config'
Although they have identical names, the files themselves are different.
The appropriate config file can then be dropped onto the SD card as needed.



2. Using the EFF

After loading the appropriate config file to the SD card, insert it in the DiCE.

Remove the DiCE Bluetooth adapter from the VIDA PC to prevent possible communication conflicts.

Plug the DiCE unit into the vehicle's diagnostic connector and turn on the ignition or start the engine

The following indications are for a normal operating network:

1. **Flashing at 4 sec intervals:** DICE in EFF mode
2. **Flashing or continuously lit:** Data flow on HS CAN
3. **LED not lit** (*Short blue flashes of this LED indicate there are error frames being sent on CAN HS or LS/MS*
4. **Flashing or continuously lit:** Data flow on CAN LS/MS network

3. Tips on CAN fault tracing with the EFF

When using the EFF function of DiCE, there is an indication lamp (blue LED) that flashes if an error frame is discovered on the CAN network. This does not indicate which network section (LS/MS or HS) has a problem, just that there is a problem.

It is possible to drive the vehicle with EFF installed. In this case it is possible that vehicle movement (chassis twisting), engine movement, braking or acceleration can induce the electrical fault that will cause error frames to be sent.

Fault types that can be found with EFF

- Problems with cable harnesses
- Communicating/defective modules
- Connector problems
- Ground connections

Cable harness problems

If the problem is suspected to be a cable problem, start by bending, pulling, or pushing the cable harnesses back and forth and check whether the blue LED starts to flash. If the blue LED starts to flash, the source of the problem has likely been found.

Communicating/defective modules (babbling nodes)

This can be the most difficult type of problem to find. The fault is not currently active if the blue LED is not flashing. Leave the vehicle in key position 2 with a power supply connected and wait. It can take hours and in some cases days before the fault occurs but it usually does occur sooner or later. It may also help to let the network go into sleep mode and wake it up repeatedly to induce the fault.

Once the fault is active, start by removing fuses for the CAN modules (remove module by module) and check when the blue LED stops flashing. When the correct fuse has been found, confirm the fault by inserting the fuse again and checking if the blue LED starts to flash again.

Connector problems

Connect "Error Frame Finder" and if the problem is active, disconnect the suspect connector from module and check if the blue LED stops flashing. If not, check the next connector to another module, etc.

Miscellaneous

Typical behavior of EFF when a problem has occurred:

The blue LED flashes several times at short intervals and then stops and then starts flashing again. EFF can indicate a problem before some symptoms have started to appear on the vehicle.

EFF is best used for detecting CAN faults of intermittent nature. If the network is not operating, use a DVOM and measure network voltage and resistance first.

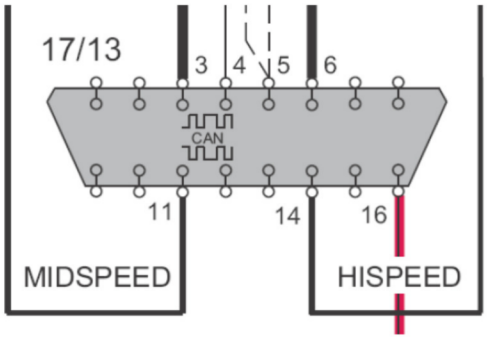
4. Tips on CAN fault tracing using a multi-meter

Types of fault that can be found when measuring using the multi-meter method

When CAN is active and operating correctly, a voltage check of CAN H and CAN L indicates that the network is running correctly from an electrical point of view. If the voltage is too high, this can be an indication that the network is heavily loaded and there are too many messages on the network. In this case the fault may be due to a "babbling node".

HS CAN and LS/MS CAN have two “terminal nodes” that contain terminating resistors that couple the CAN H conductor and the CAN L conductor of each network (check VIDA fault tracing information for the location of terminal nodes in your vehicle). CAN functions correctly only if a terminating resistor is connected. A resistance check of CAN wiring can detect whether there is a permanent cable harness problem, permanent short/open-circuit inside a module, and whether the CAN network is correctly connected.

Measuring CAN resistance and operating voltages using a multi-meter



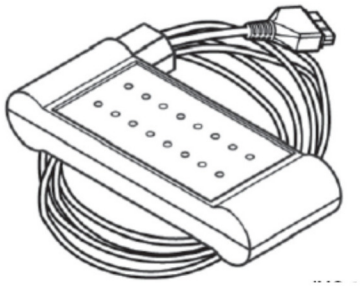
DLC CAN terminals

#16: Power supply

#4 and #5: Ground

#3 and #11: LS/MS network (#3=CAN H, #11=CAN L)

#6 and #14: HS network (#6=CAN H, #14=CAN L)



9513015 is a breakout box for the DLC (reference special tool bulletin #168). This breakout box allows measurement of voltage and resistance at the DLC, and access to a reliable ground point via the DLC.

NOTE: In P2 cars 2004 and earlier, an isolation relay in CEM prevents direct access to CAN through the DLC. Fault trace at any CAN CM with standard breakout box 9511428.

LS/MS Network Voltage Check:

Battery connected, ignition position 2

Measure the voltage between terminals #3 and #11, the normal value should be between 0.55 - 0.90 V

Measure the voltage between terminals #3 and #4, the normal value should be approx. 2.8 V

Measure the voltage between terminals #11 and #4, the normal value should be approx. 2.3 V

HS Network Voltage Check:

Battery connected, ignition position 2

Measure the voltage between terminals #6 and #14, the normal value should be between 0.55 - 0.90 V

Measure the voltage between terminals #6 and #4, the normal value should be approx. 2.8 V

Measure the voltage between terminals #14 and #4, the normal value should be approx. 2.3 V

LS/MS Network Resistance Check:

Ignition OFF, Battery disconnected

Measure the resistance between terminals #3 and #11, value should be approx. 60 Ω

Measure the resistance between terminals #3 and #4 (ground), the value should be >1 kΩ

Measure the resistance between terminals #11 and #4 (ground), the value should be >1 kΩ

Measure the resistance between terminals #3 and #16 (power supply), the value should be >1 kΩ

Measure the resistance between terminals #11 and #16 (power supply), the value should be >1 kΩ

HS Network Resistance Check:

Ignition OFF, Battery disconnected

Measure the resistance between terminals #6 and #14, value should be approx. 60 Ω

Measure the resistance between terminals #6 and #4 (ground), the value should be >1 kΩ

Measure the resistance between terminals #14 and #4 (ground), the value should be >1 kΩ

Measure the resistance between terminals #6 and #16 (power supply), the value should be >1 kΩ

Measure the resistance between terminals #14 and #16 (power supply), the value should be >1 kΩ

NOTE: In P2 cars 2004 and earlier, an isolation relay in CEM prevents direct access to CAN through the DLC. Fault trace at any CAN CM with standard breakout box 9511428. All voltage and resistance values are correct regardless of the location of the test points.