



Saf-T-Liner C2

Familiarization

TBB Training Program 8050rev2010



Foreword

Training Manual Use

This training manual is intended for while use while attending a Saf-T-Liner C2 Training Program.

Continuous improvements in our products and service procedures may make some of the information in this manual obsolete or invalid.

Current Manufacturer's Publications

Always refer to current, approved, Manufacturer's Publications when servicing Freightliner, LLC and Thomas Built Buses.

Training materials are for reference only.



Course Contents

Overview 1

Electronic Resources 2

Electrical - Multiplex 3

Electrical - Components 3

Electrical - ICU Dash 3

Electrical - Options 3

Chassis 4

Body 5

Body - Glass 5

Safety Options 6

Maintenance 7

Course Content:

What do you expect to get out of this course?

Course Goal:

Provide accurate product information and suggest procedures to facilitate the diagnosis and repair of the product.



Overview **1**

Systems



Overview

Freightliner Group Numbers – method used to organize data for all product lines

Example: Group 54 contain electrical information,
 Group 42 Brakes
 Group 83 HVAC

Group 01 – Engine

- MBE 900 Mercedes/Benz 900 series 190-250 hp
- C7 Caterpillar 190-250 hp – **Prior to 2007 release**
- Cummins 6.7 liter 200-260 hp – **2007 engines**

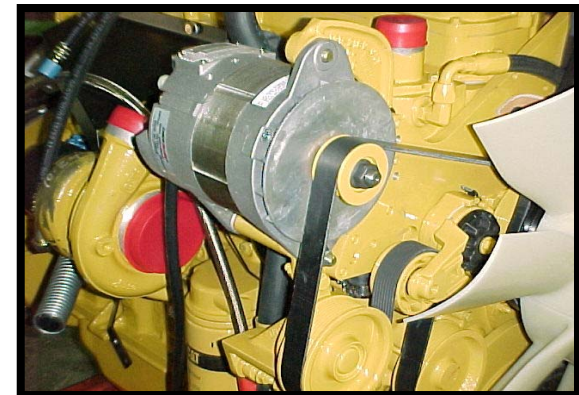
Overview

Group 13 – Air Compressor

- WABCO 15.5 cfm standard on MBE
- Bendix 15.9 cfm standard on C7

Group 15 – Alternator & Starter

- Pad mounted
- 145 – 270 amp
- Delco and Leece Neville
- Delco 38MT starter



•Group 20 – Engine Cooling/Radiator

- Behr 805 sq. in radiator standard
- 870 sq in optional

Overview

Group 26 – Transmission

- Allison 2000 standard
- Allison 3000, Eaton and Mercedes manual options



Old Column mounted Shifter



Current "T" Handle Shifter

Group 31 – Frame

- 5/16 X 3 X 10 1/8 inch C channel steel

Overview

Group 32 – Suspension

Front

- 6,000 lb springs standard
- Shocks standard
- Replaceable wear pads



Rear

- 16,000 lb. multi-leaf spring standard
- Optional to 23,000 lbs
- Optional AirLiner 21,000 and 23,000 lbs

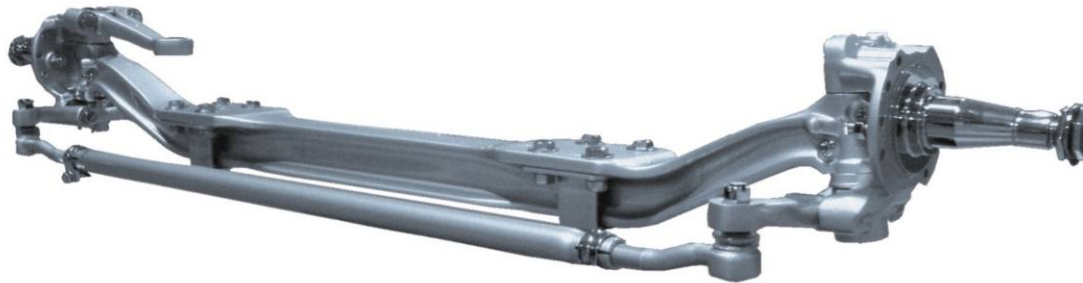
Overview

Group 33 – Front Axle

- AAC and Meritor
- 6,000 lb standard

Group 35 – Rear Axle

- AAC
- 13,000 lb standard
- 12 ratios available



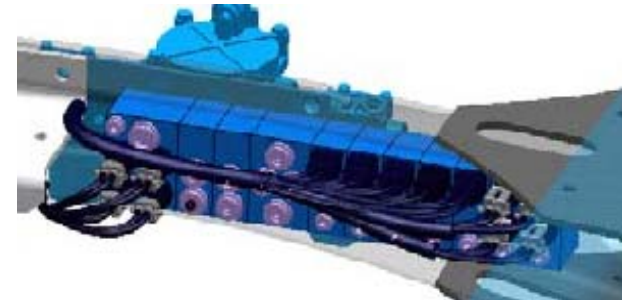
Group 46 – Steering

- TRW-THP45 gear box standard
- Increased steering pressure

Overview

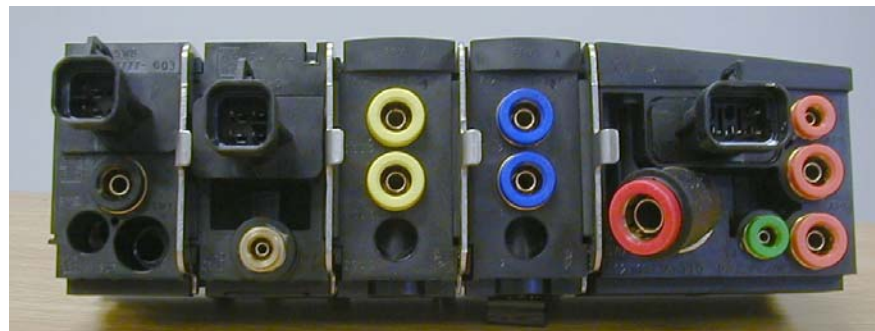
Group 40 – Wheels & Tires

- Hub piloted wheels standard
- Michelin and Goodyear tires



Group 42 – Brakes

- Air brake system supplied by Bosch, Bendix, WABCO
- Hydraulic brakes with WABCO ABS
- The air system utilizes the AMU (Air Management Unit)



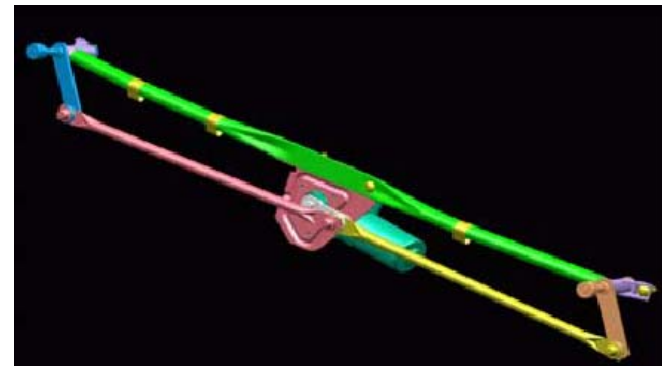
Overview

Group 54 – Electrical, Instruments & Controls

- Body/chassis combined in integrated multiplexed system
- Three PDMs with mini fuses and micro relays
- All have BHM, CHM and SHM modules
- EXM may be required by options selected
- Additional modules for Engine, Trans & ABS
- Modules use J1939 communication

Group 82 – Wiper

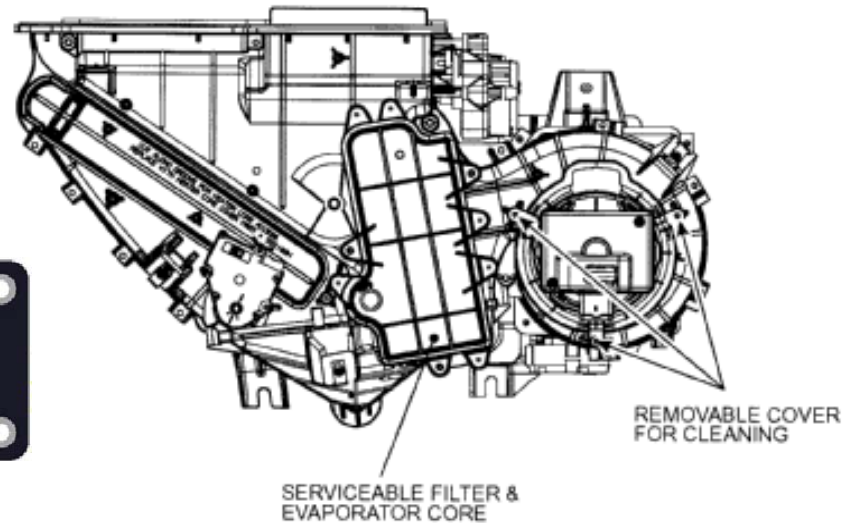
- Single motor drives both wipers
- 4 bolt mounting easily removed



Overview

Group 83 – HVAC

- Driver's/defroster is blended air type system using integrated electronic controls



- Passenger heaters are Bergstrom under seat and RED Dot stepwell heaters



Electronic Resource **2**

www.accessfreightliner.com

Parts Pro
EZ Wiring
Service Pro

www.thomasbusonline.com

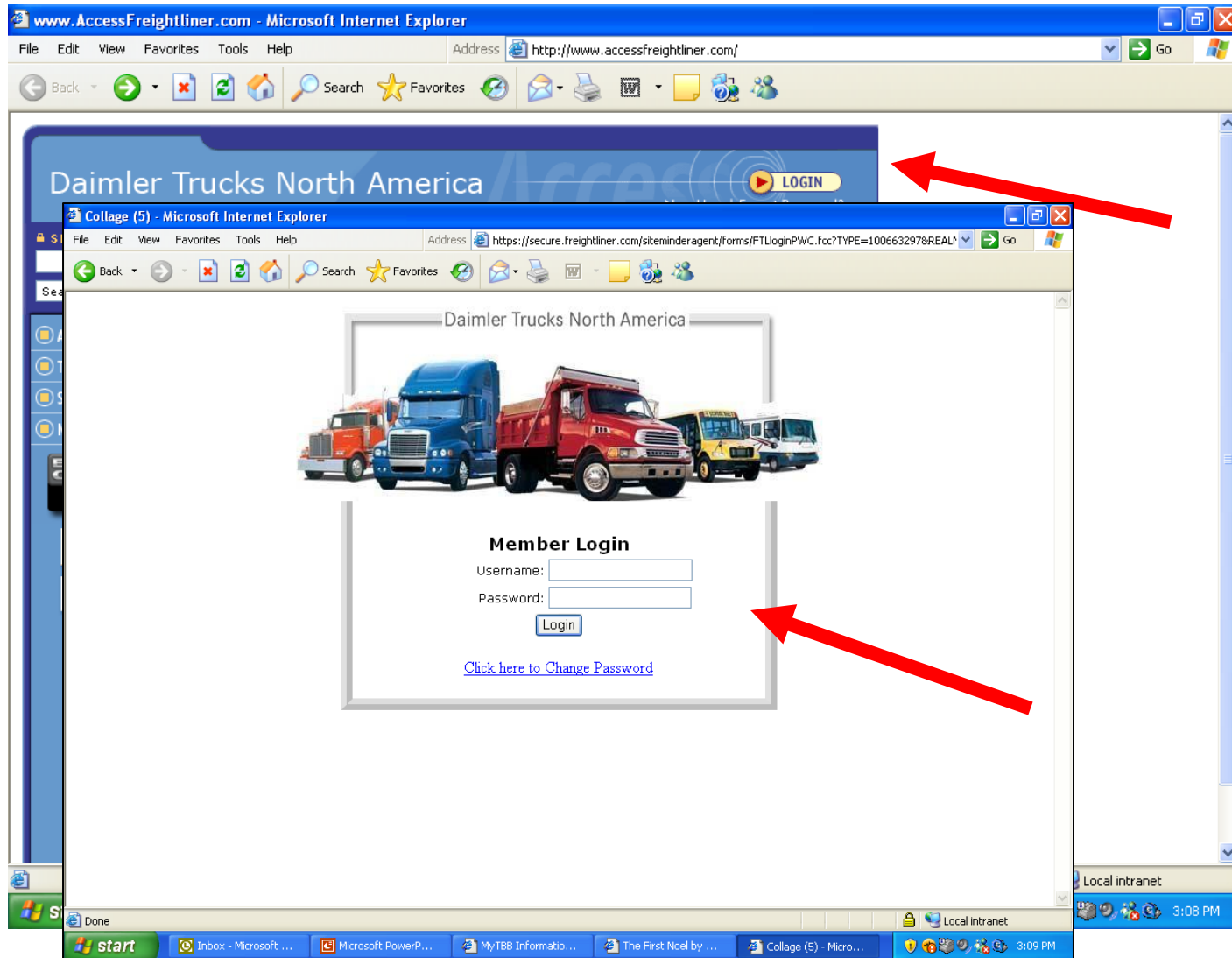
Product Support Bulletin
Manuals
Parts/Drawings



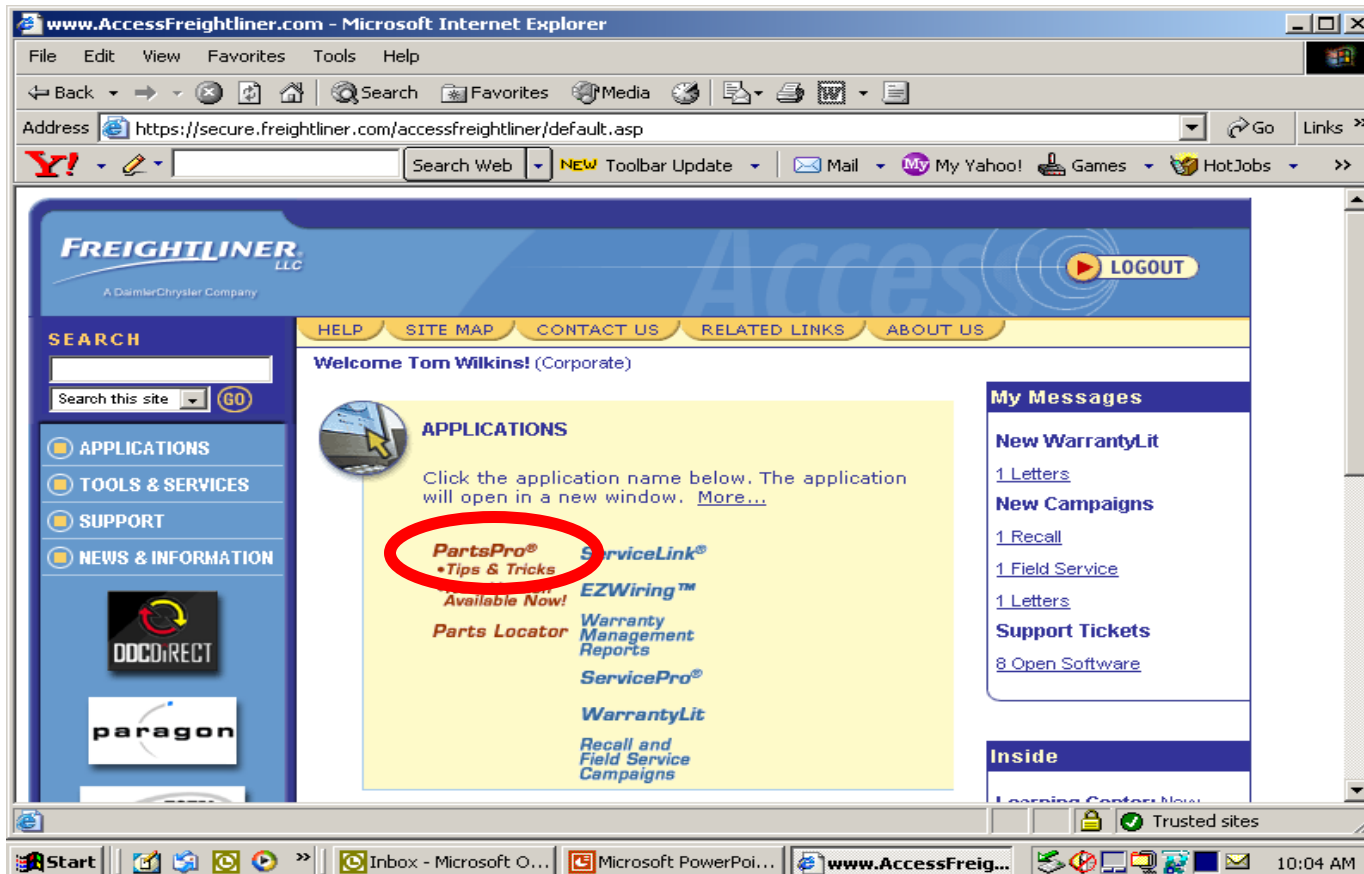
Electronics - Serviceability

Tooling / Resources

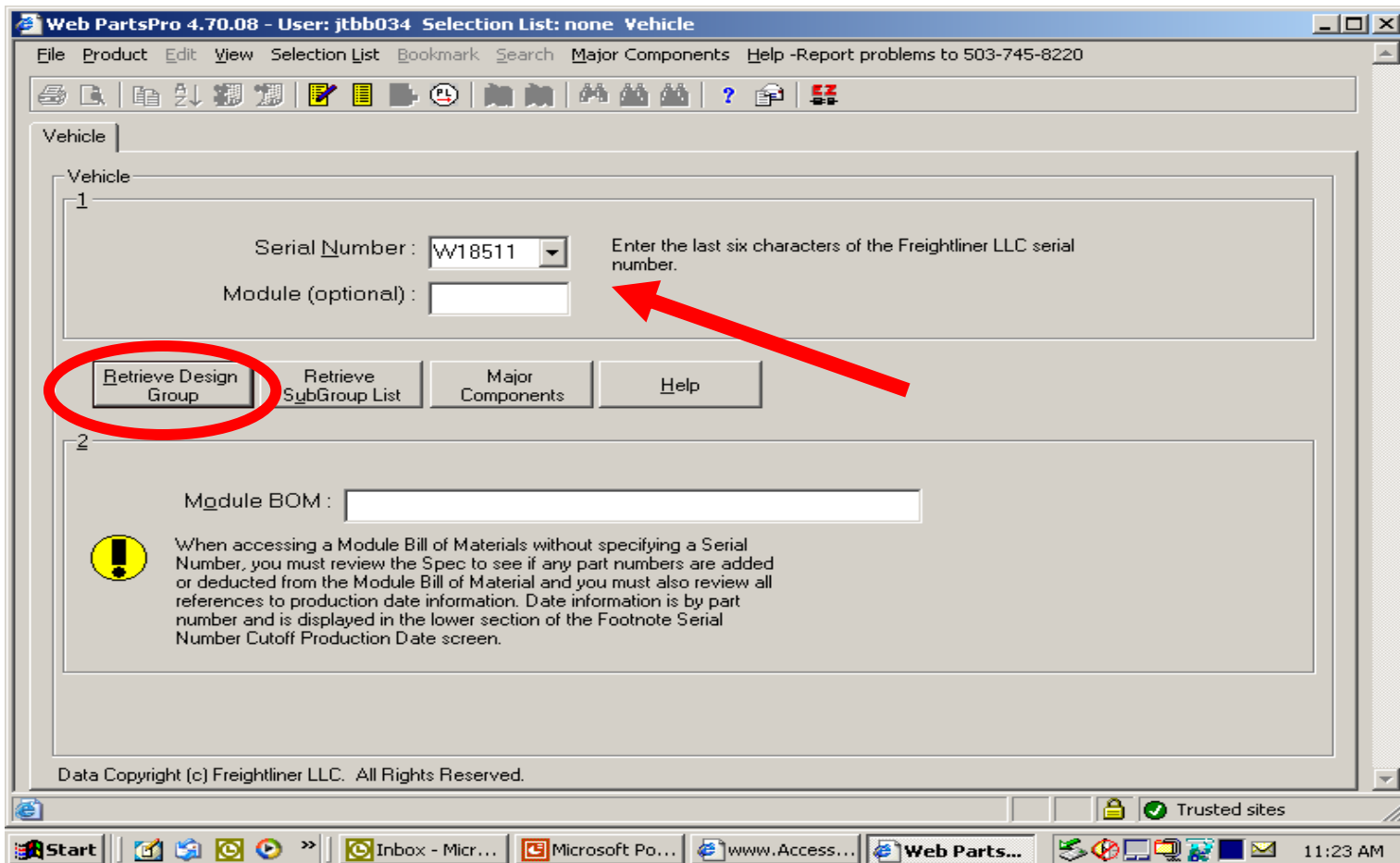
- **Freightliner Site**
 - Parts Pro – Freightliner parts
 - Service Pro – Service information
 - EZ Wiring – Freightliner & Thomas diagrams
 - Service Lit and ServiceLink (Optional)



1. Click on the Parts Pro icon
2. Enter the last six digits of the vin#.



3. Click on the Retrieve Group Design



Web PartsPro 4.70.08 - User: jtbb034 Selection List: none Vehicle

File Product Edit View Selection List Bookmark Search Major Components Help -Report problems to 503-745-8220

Vehicle

Vehicle 1

Serial Number: W18511

Module (optional):

Enter the last six characters of the Freightliner LLC serial number.

Retrieve Design Group Retrieve SubGroup List Major Components Help

2

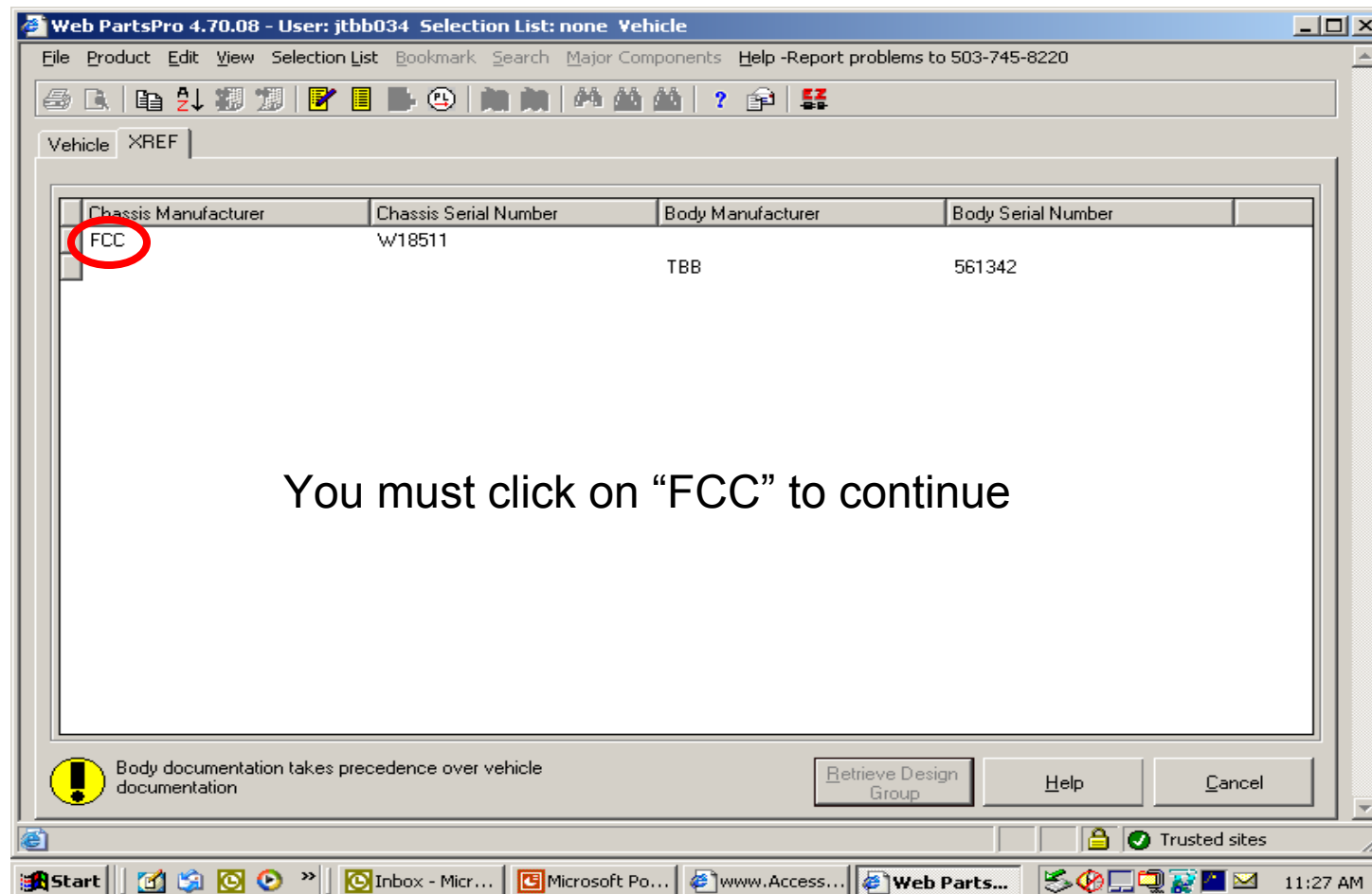
Module BOM:

When accessing a Module Bill of Materials without specifying a Serial Number, you must review the Spec to see if any part numbers are added or deducted from the Module Bill of Material and you must also review all references to production date information. Date information is by part number and is displayed in the lower section of the Footnote Serial Number Cutoff Production Date screen.

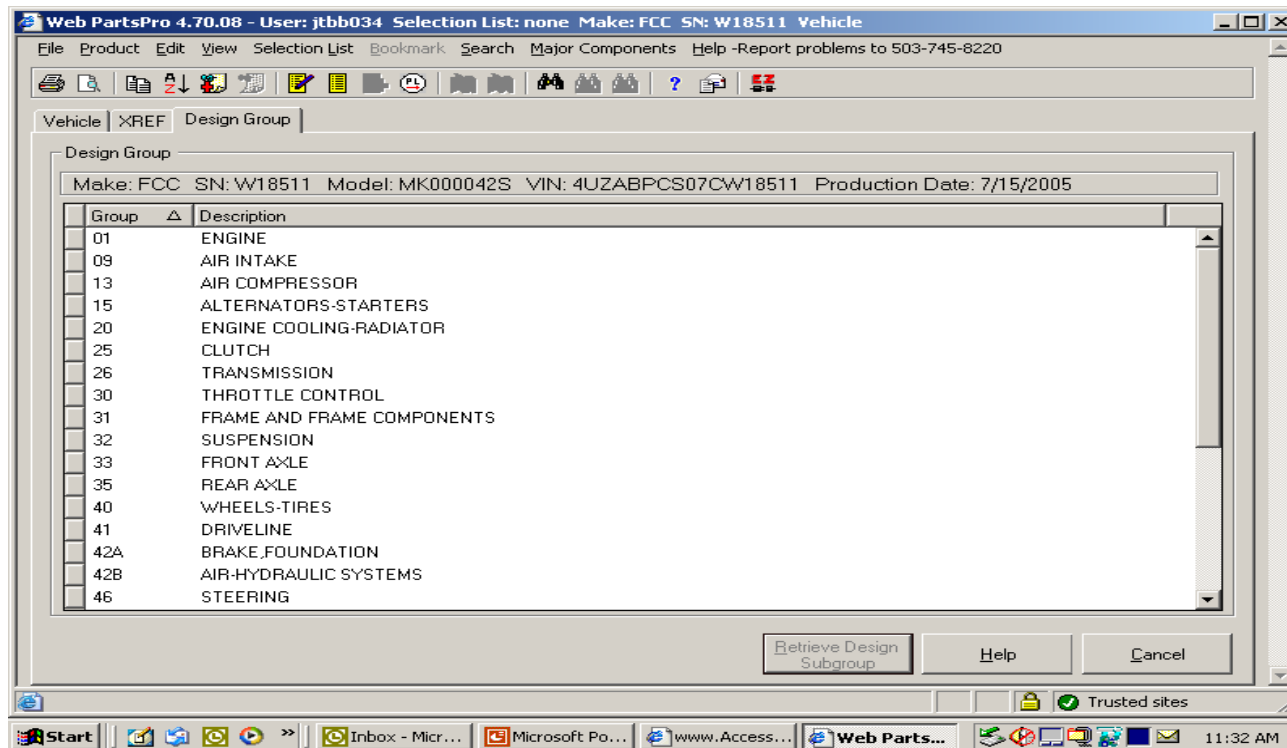
Data Copyright (c) Freightliner LLC. All Rights Reserved.

Start | Inbox - Micr... | Microsoft Po... | www.Access... | Web Parts... | 11:23 AM

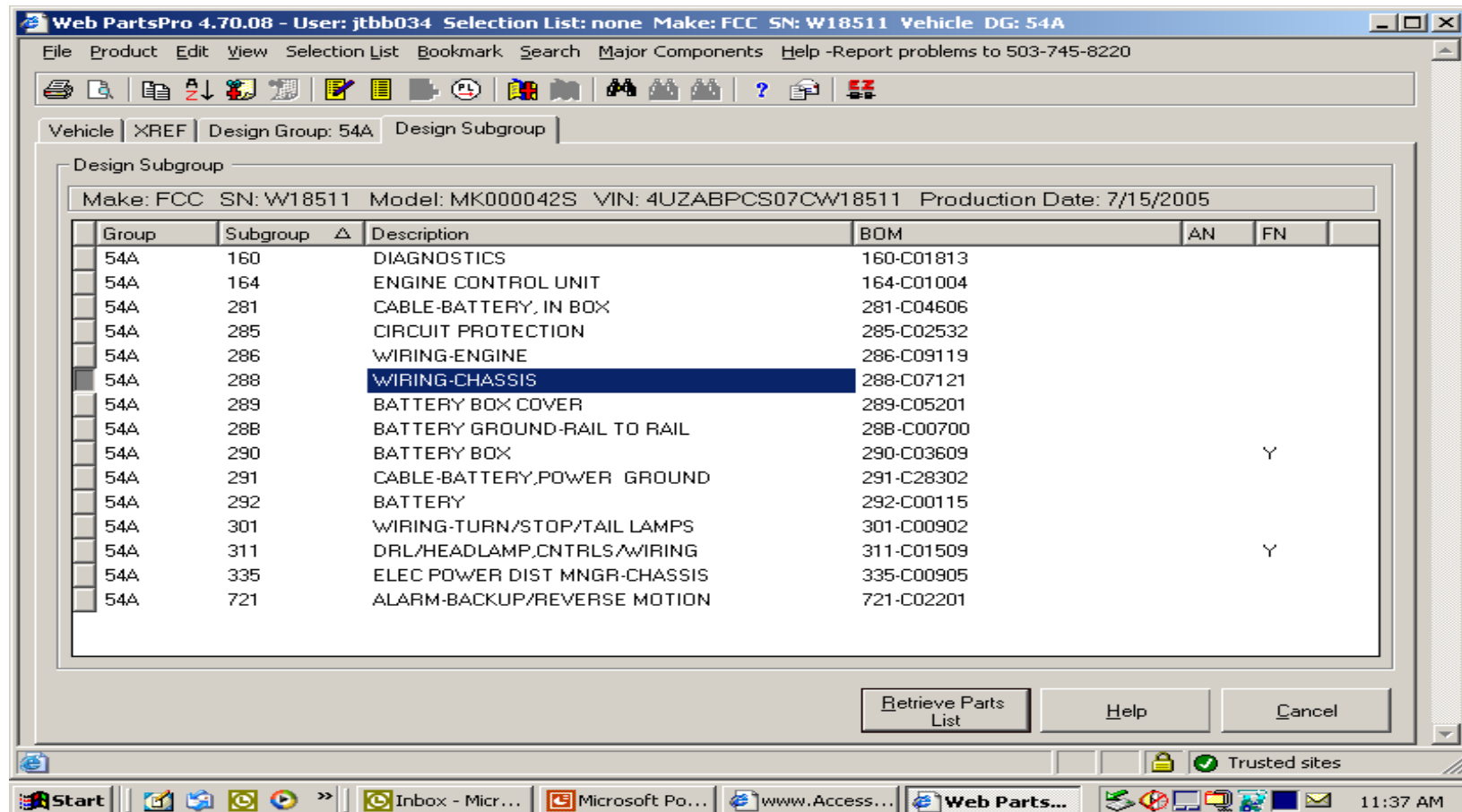
4. For chassis parts, Click on FCC



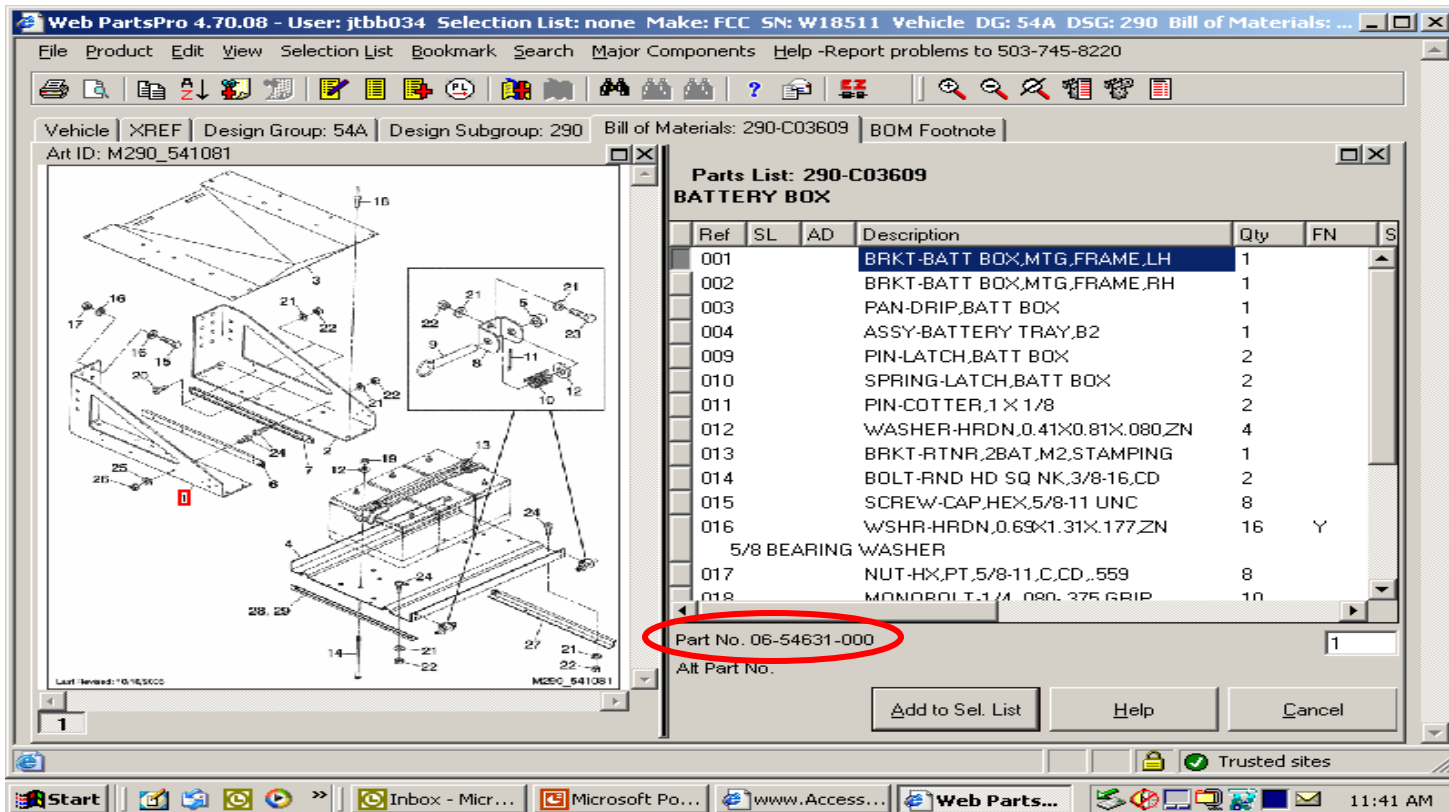
5. Freightliner parts are organized by Group number and Module number
6. Click on the desired Group Number
7. Click on Retrieve Design Subgroup



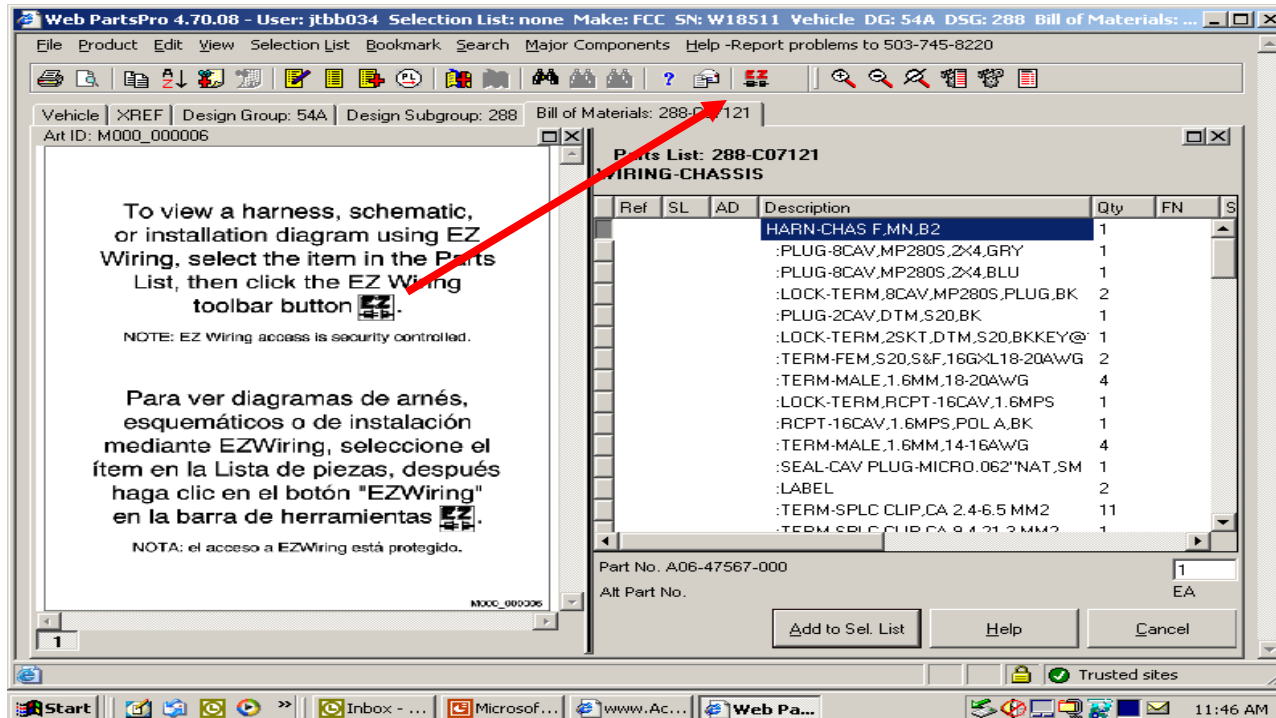
8. Click on desired Subgroup
9. Click Retrieve Parts List



- ## 11. Part number is found below list



12. Drawings can be viewed by clicking on electrical description of harness assembly, schematic or installation drawing
13. Click on EZ on toolbar at top





Example - Parts Pro

Web PartsPro 4.90.10 - User: qwtbg202 Selection List: none Vehicle

File Product Edit View Selection List Bookmark Search Major Components Help -Report problems to 503-745-8220

Vehicle


1


Serial Number : Enter the last six characters of the Freightliner LLC serial number.

Module (optional) :

2

Module BOM :

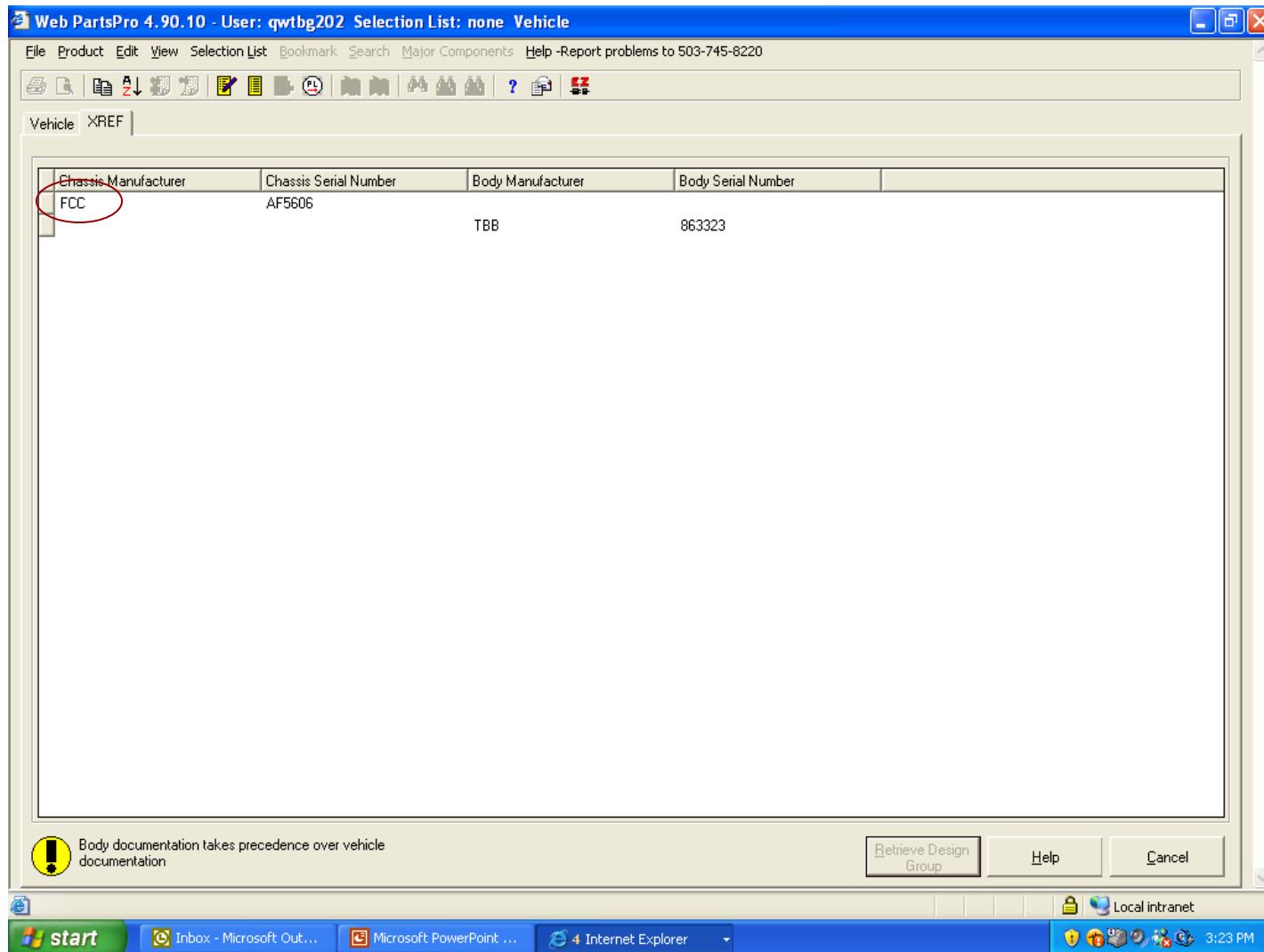
 When accessing a Module Bill of Materials without specifying a Serial Number, you must review the Spec to see if any part numbers are added or deducted from the Module Bill of Material and you must also review all references to production date information. Date information is by part number and is displayed in the lower section of the Footnote Serial Number Cutoff Production Date screen.



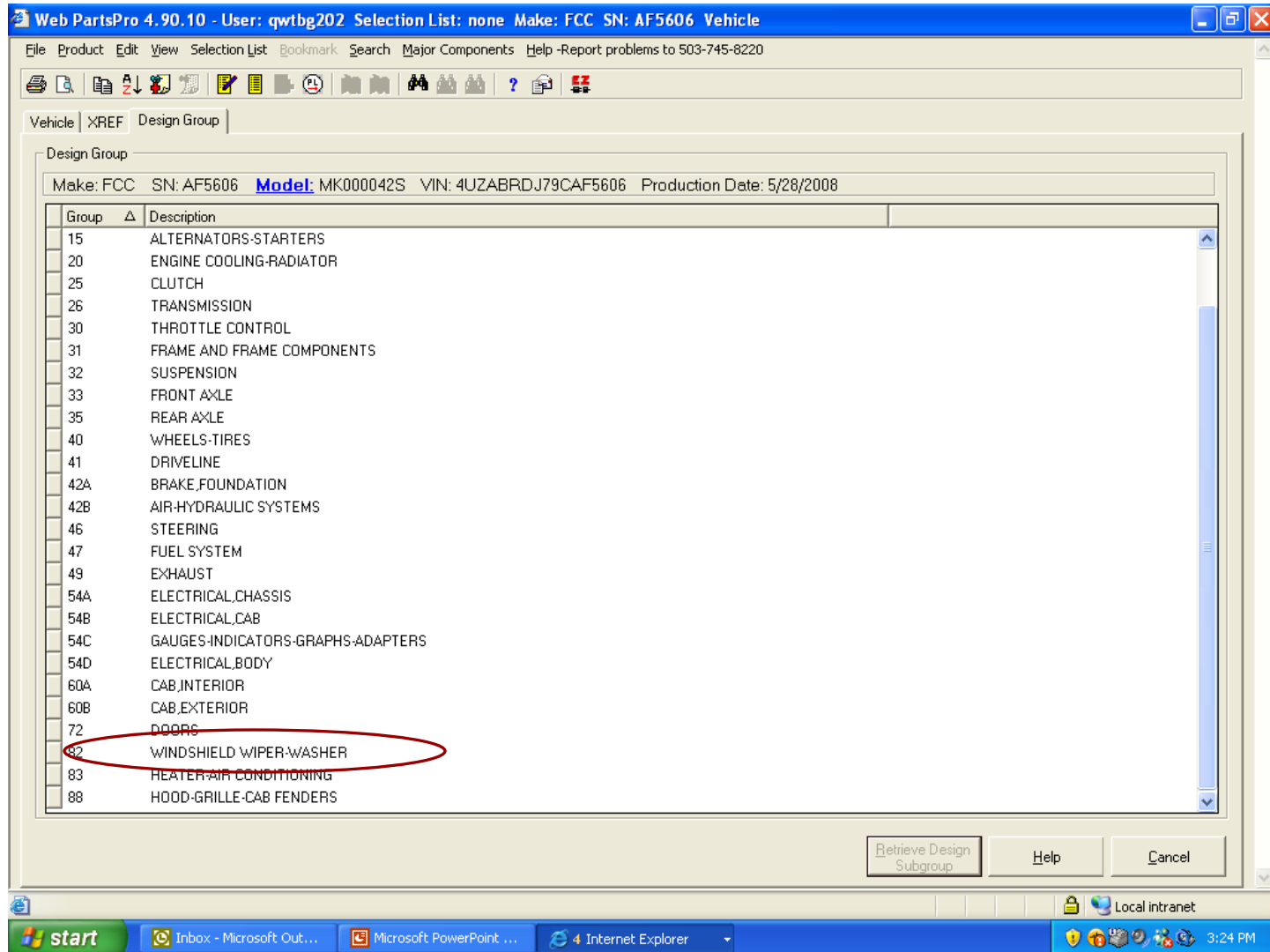
Data Copyright (c) Freightliner LLC. All Rights Reserved.

start | Inbox - Microsoft Out... | Microsoft PowerPoint ... | Internet Explorer | Local intranet | 3:23 PM

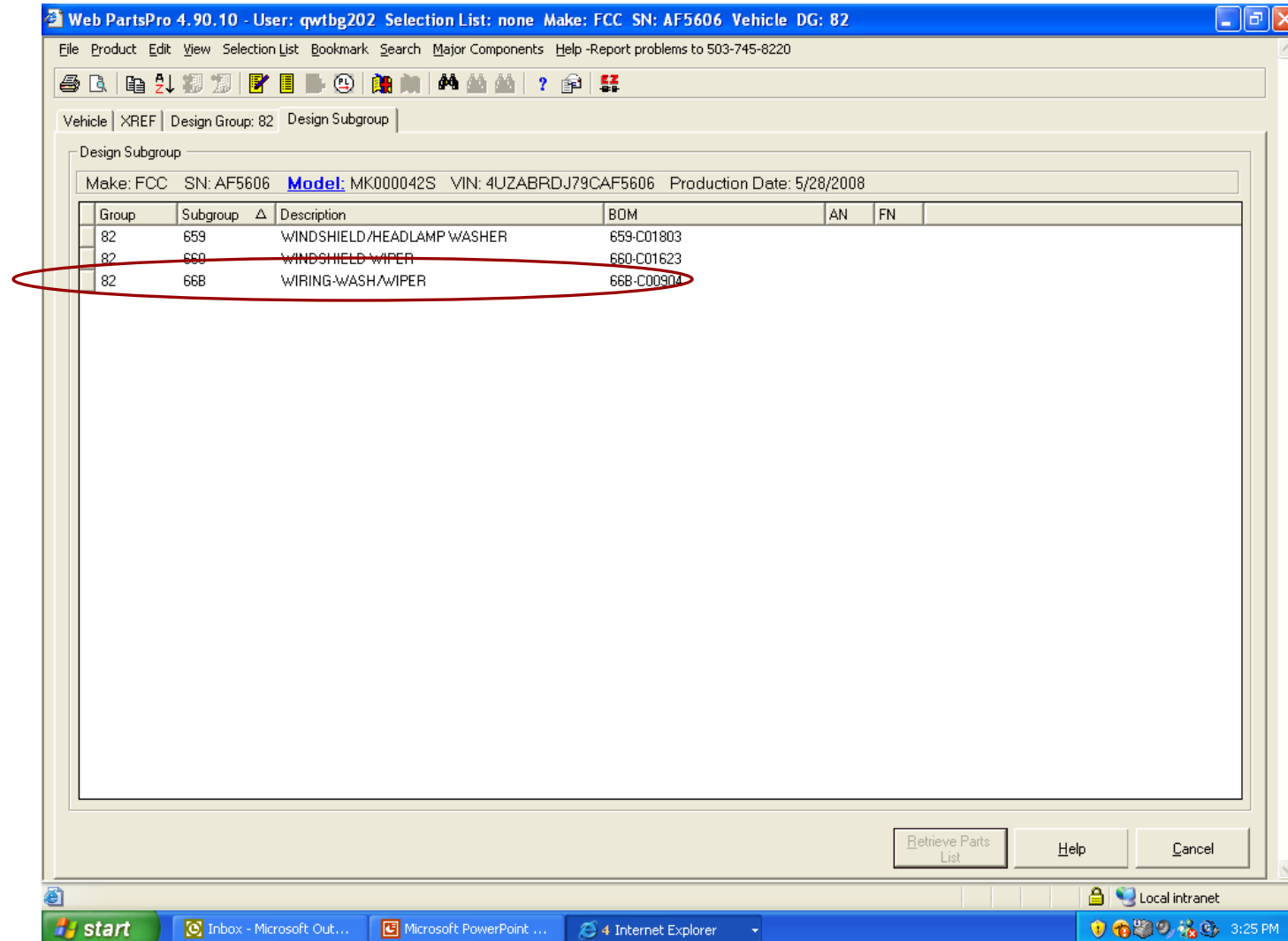
Example - Parts Pro



Example - Parts Pro



Example - Parts Pro



Web PartsPro 4.90.10 - User: qwtbg202 Selection List: none Make: FCC SN: AF5606 Vehicle DG: 82

File Product Edit View Selection List Bookmark Search Major Components Help -Report problems to 503-745-8220

Vehicle XREF Design Group: 82 Design Subgroup

Design Subgroup

Make: FCC SN: AF5606 [Model: MK000042S](#) VIN: 4UZABRDJ79CAF5606 Production Date: 5/28/2008

Group	Subgroup	Description	BOM	AN	FN
82	659	WINDSHIELD/HEADLAMP WASHER	659-C01803		
82	660	WINDSHIELD WIPER	660-C01623		
82	668	WIRING-WASH/WIPER	668-C00904		

Retrieve Parts List Help Cancel

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Example - Parts Pro

Web PartsPro 4.90.10 - User: qwtbg202 Selection List: none Make: FCC SN: AF5606 Vehicle C00904


File Product Edit View Selection List Bookmark Search Major Components Help -Report problems to 503-745-8220

Vehicle XREF Design Group: 82 Design Subgroup: 66B Bill of Materials: 66B-C00904
Art ID: M000_000006 Parts List: 66B-C00904

Close Screen

To view a harness, schematic, or installation diagram using EZ Wiring, select the item in the Parts List, then click the EZ Wiring toolbar button .

NOTE: EZ Wiring access is security controlled.

Para ver diagramas de arnés, esquemáticos o de instalación mediante EZWiring, seleccione el ítem en la Lista de piezas, después haga clic en el botón "EZWiring" en la barra de herramientas .

NOTA: el acceso a EZWiring está protegido.

Parts List: 66B-C00904
WIRING-WASH/WIPER

Ref	SL	AD	Description	Qty	FN	SN	AN	Part No	Alt Pa
			ASSY-KIT HARN.FW,MOD 66B	1				A06-62157-66B	
			:LABEL	1				PAC R62979	
			ASSY-KIT HARN.CHAS,MOD 66B	1				A06-63657-66B	
			:LABEL	1				PAC R62979	
			HARN-WIPE.FW,OL,07,B2	1				A06-64291-000	
			:DWG-SEAL-CABLE,METRI-PACK,1W...	R				23-12497	
			:PLUG-6CAV,RS,MSEP8295 06120,GY	1				23-13152-600	
			:DWG-CONN-ADDON,AFL,FCI,YN,F...	R				23-13154	
			:DWG-TERM-MOL,FCI,YN,ITT,SUM	R				23-13211	
			:DWG-TERM-PAC GT SER	R				23-13212	
			:DWG-TERM-PAC METRI-PACK SER	R				23-13213	
			:DWG-SEAL-TERM MISC,YN,MSE,FCI	R				23-13217	
			:DWG-SEAL-CAVITY PLUG	R				23-13218	
			:DWG-CONN-ADDON,PAC,TPA,CPA	R				23-13302	
			HARN-WIPE,CHAS,OL,WASH,07,B2	1				A06-64292-000	
			:DWG-TERM,FEM,56SER	R				23-11192	
			:DWG-TERM,MALE,56SER	R				23-11193	
			:DWG-SEAL-CABLE,METRI-PACK,1W...	R				23-12497	
			:PLUG-2CAV,56,PAC0293781,BK	1				23-13145-200	
			:DWG-TERM-PAC GT SER	R				23-13212	
			:DWG-SEAL-CAVITY PLUG	R				23-13218	
			:DWG-CONN-ADDON,PAC,TPA,CPA	R				23-13302	
			PARM-WIPE,STD CTRL,07,B2	1				26-02089-003	
			WRG-WIPER,07,B2	R				G06-63513-000	

Part No.
Alt Part No.

Add to Sel. List Help Cancel

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Example - Parts Pro

Web PartsPro 4.90.10 - User: qwtbg202 Selection List: none Make: FCC SN: AF5606 Vehicle DG: 82 DSG: 66B Bill of Materials: 66B-C00904

File Product Edit View Selection List Bookmark Search Major Components Help -Report problems to 503-745-8220

Vehicle: XREF Design Group: 82 Design Subgroup: 66B Bill of Materials: 66B-C00904

Parts List: 66B-C00904
WIRING-WASH/WIPER

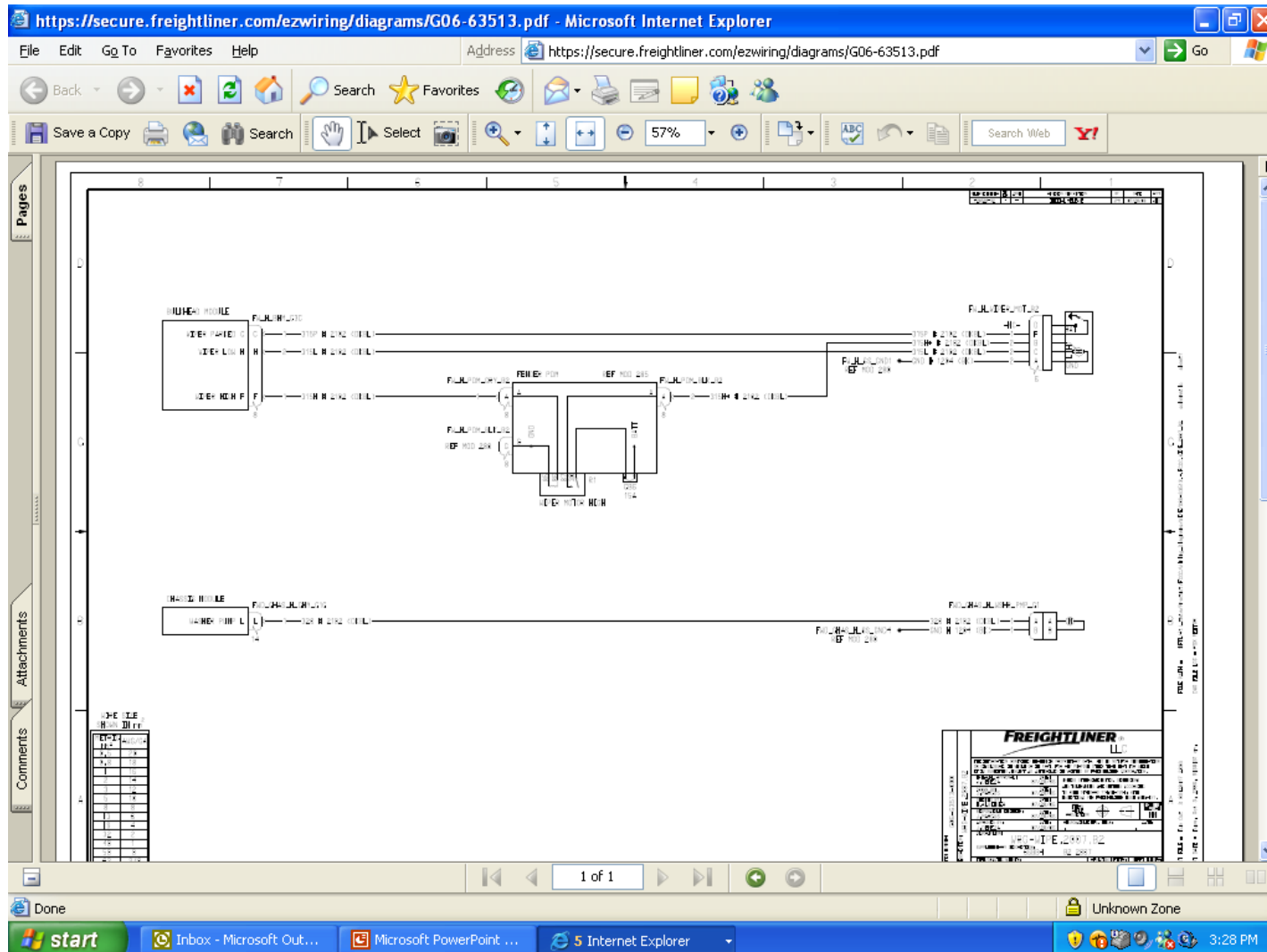
Ref	SL	AD	Description	Qty	FN	SN	AN	Part No	Alt Part No
			ASSY-KIT,HARN,FW,MOD 66B	1				A06-62157-66B	
			:LABEL	1				PAC 067979	
			ASSY-KIT,HARN,CHAS,MOD 66B	1					
			:LABEL	1					
			HARN-WIPE,FW,OL,07,B2	1					
			:DWG-SEAL-CABLE,METRI-PACK,1W...	R					
			:PLUG-6CAV,RS,MSEP8295 06120,GY	1					
			:DWG-CONN-ADDON,AFL,FCI,YN,F...	R					
			:DWG-TERM-MOL,FCI,YN,ITT,SUM	R					
			:DWG-TERM-PAC GT SER	R					
			:DWG-TERM-PAC METRI-PACK SER	R					
			:DWG-SEAL-TERM MISC,YN,MSE,FCI	R					
			:DWG-SEAL-CAVITY PLUG	R					
			:DWG-CONN-ADDON,PAC,TPA,CPA	R					
			HARN-WIPE,CHAS,OL,WASH,07,B2	1					
			:DWG-TERM,FEM,56SER	R					
			:DWG-TERM,MALE,56SER	R					
			:DWG-SEAL-CABLE,METRI-PACK,1W...	R					
			:PLUG-2CAV,56,PAC02973781,BK	1					
			:DWG-TERM-PAC GT SER	R					
			:DWG-SEAL-CAVITY PLUG	R					
			:DWG-CONN-ADDON,PAC,TPA,CPA	R					
			HARN-WIPE,STD-CTRL,07,B2	1					
			WRG-WIPER,07,B2	R					

Part No.
Alt Part No.

Show Artwork Add to Sel. List Help Cancel

“Right Click” on part number

Example - Parts Pro

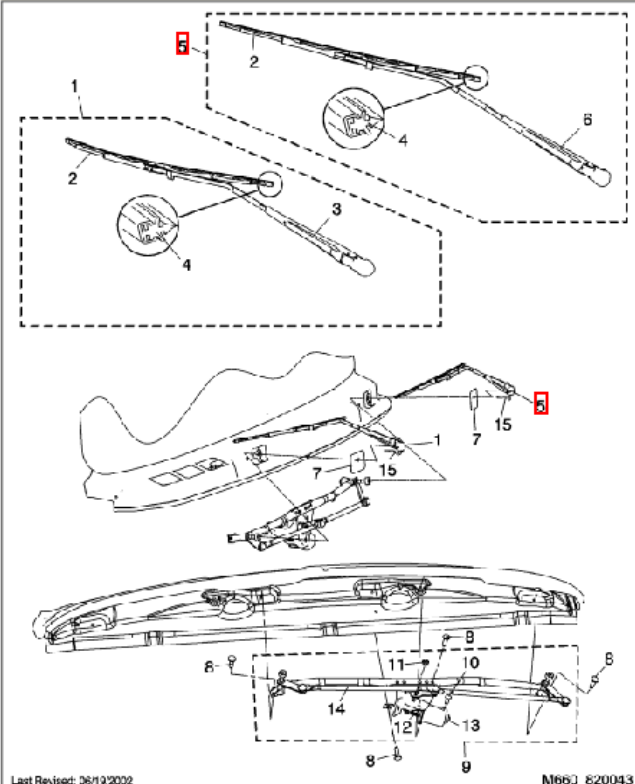


Example - Parts Pro

Web PartsPro 4.90.10 - User: qwtbg202 Selection List: none Make: FCC SN: AF5606 Vehicle DG: 82 DSG: 660 Bill of Materials: 660-C01623

File Product Edit View Selection List Bookmark Search Major Components Help -Report problems to 503-745-8220

Vehicle | XREF | Design Group: 82 | Design Subgroup: 660 | Bill of Materials: 660-C01623 | BOM Footnote
Art ID: M660_820043 Parts List: 660-C01623



Parts List: 660-C01623
WINDSHIELD WIPER

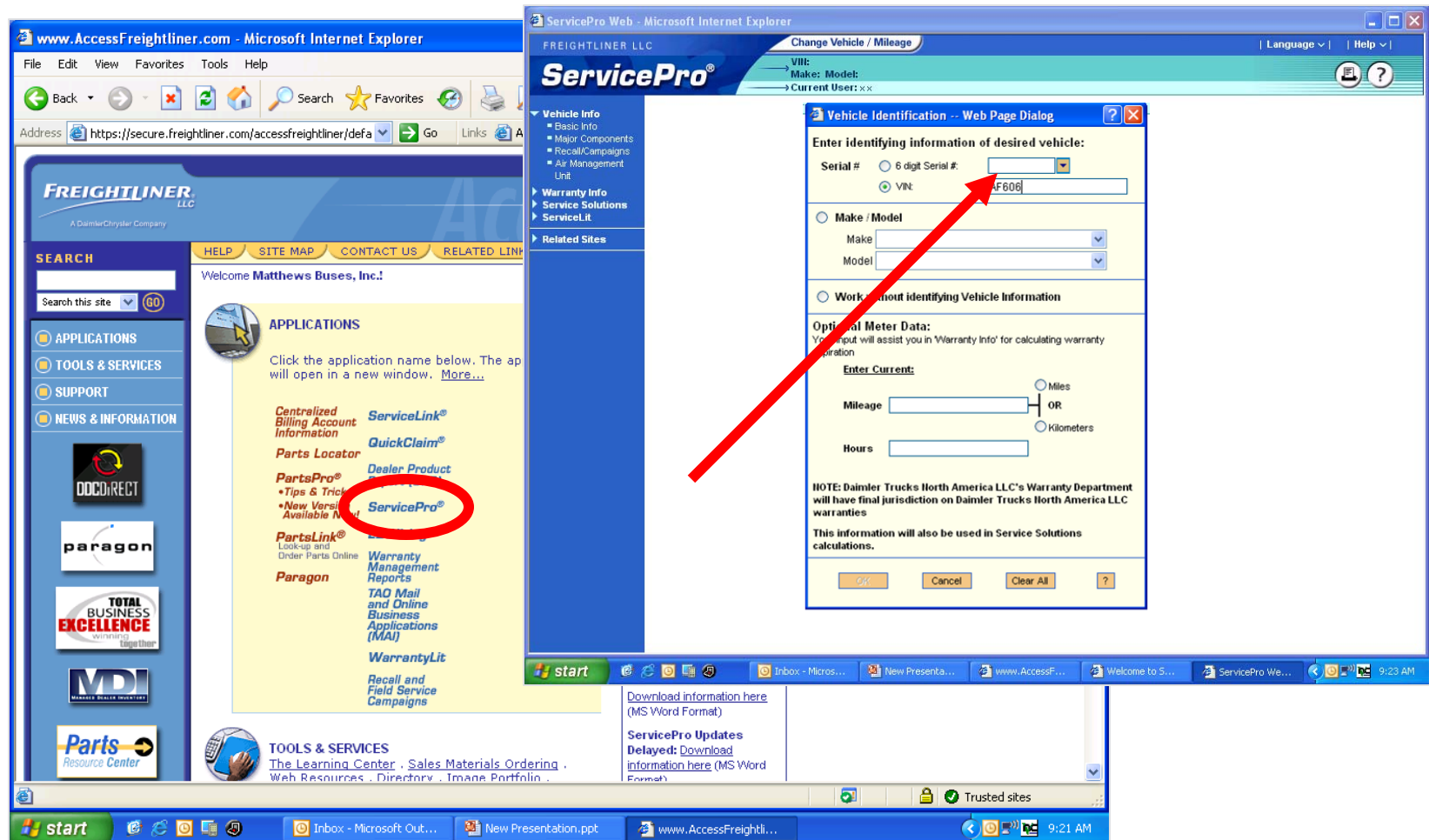
	Qty	FN	SN	AN	Part No
& BLADE	0				A22-52081-008
PER,22 INCH	1				A22-51163-001
SHIELD WIPER,LHD	1	Y			A22-52082-003
ARM FOR A LEFT HAND DRIVE VEHICLE					
EFILL (2 PER)	1				TRI F90705 186
& BLADE,LHD	0				A22-52091-008
PER,22 INCH	1				A22-51163-001
EFILL (2 PER)	1				TRI F90705 186
SHIELD WIPER	1				A22-52811-003
	2				22-57461-000
T,M8,20,ZN,BLK	4				23-13128-720
ASSY-1PCE,LHD	1				A22-57802-001
	3				TRI F78892
ING NUT	1				TRI F59859
	1				TRI 90672 112
	1				TRI F91498 182
ASSY	1				TRI F78716 239
,LHD,M2	R				D22-52331-000

Part No. A22-52091-008
Alt Part No.

Add to Sel. List Help Cancel

Local intranet

1. Enter VIN number of chassis

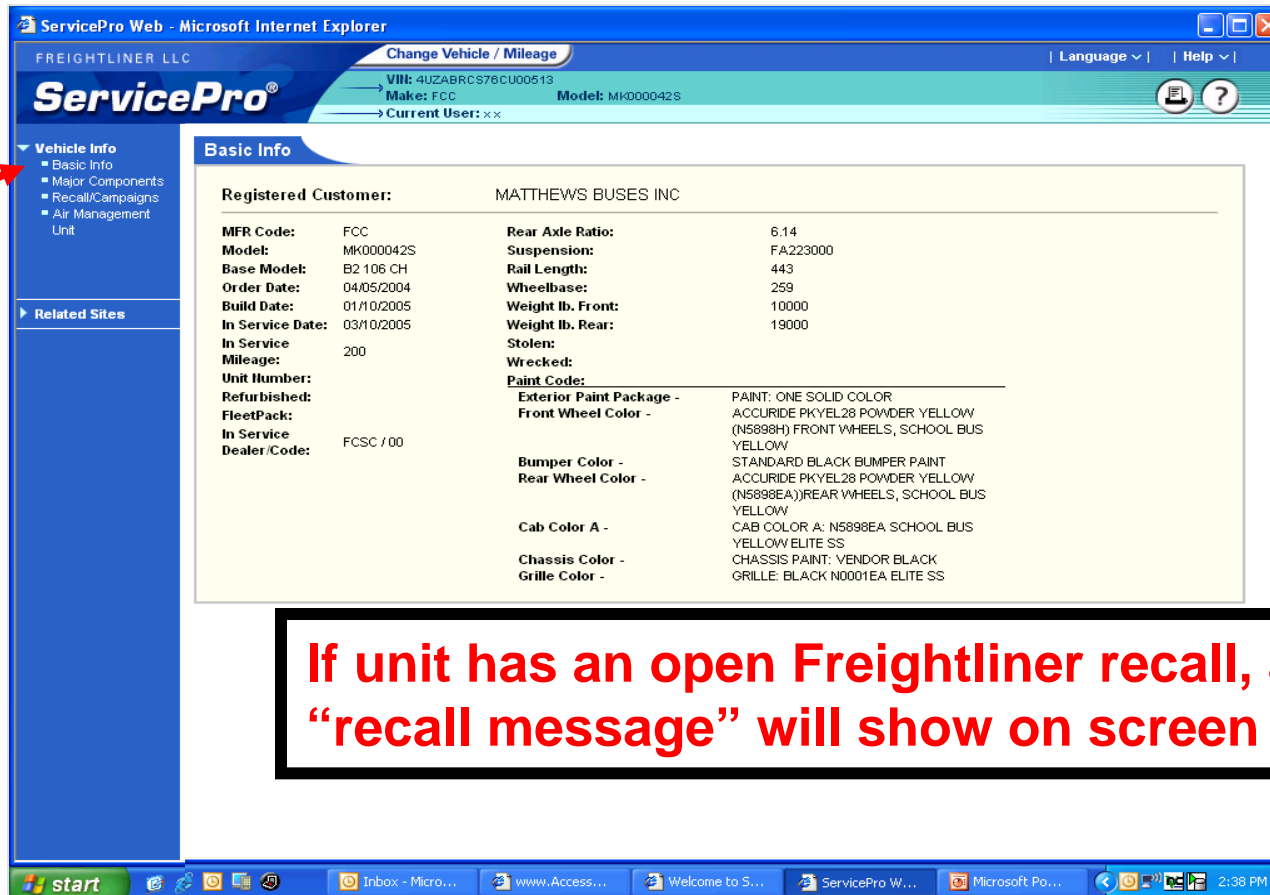


The screenshot displays two overlapping web browser windows. The background window is the 'www.AccessFreightliner.com' site, which features a navigation menu on the left with categories like 'APPLICATIONS', 'TOOLS & SERVICES', and 'SUPPORT'. The 'ServicePro' link in the 'APPLICATIONS' section is circled in red. The foreground window is the 'ServicePro Web' application, titled 'FREIGHTLINER LLC ServicePro'. It shows a 'Vehicle Identification' dialog box with the following fields:

- Serial #**: A dropdown menu set to '6 digit Serial #' and a text input field containing 'F606'.
- Make / Model**: Two dropdown menus for 'Make' and 'Model'.
- Optional Meter Data**: Fields for 'Mileage' and 'Hours', with radio buttons for 'Miles' and 'Kilometers'.

A red arrow points from the 'ServicePro' link in the background window to the 'VIN' radio button in the foreground dialog box. The bottom of the screenshot shows the Windows taskbar with various open applications and the system clock at 9:21 AM.

2. Basic Information displays automatically



ServicePro Web - Microsoft Internet Explorer

FREIGHTLINER LLC

ServicePro®

Change Vehicle / Mileage

VIN: 4U2ABRC876CU00513
Make: FCC Model: MK000042S
Current User: xx

Language | Help

Vehicle Info

- Basic Info
- Major Components
- Recall/Campaigns
- Air Management Unit

Related Sites

Basic Info

Registered Customer: MATTHEWS BUSES INC

MFR Code:	FCC	Rear Axle Ratio:	6.14
Model:	MK000042S	Suspension:	FA223000
Base Model:	B2 106 CH	Rail Length:	443
Order Date:	04/05/2004	Wheelbase:	259
Build Date:	01/10/2005	Weight lb. Front:	10000
In Service Date:	03/10/2005	Weight lb. Rear:	19000
In Service Mileage:	200	Stolen:	
Unit Number:		Wrecked:	
Refurbished:		Paint Code:	
FleetPack:		Exterior Paint Package -	PAINT: ONE SOLID COLOR
In Service Dealer/Code:	FCSC / 00	Front Wheel Color -	ACCURIDE PKYEL28 POWDER YELLOW (N5898H) FRONT WHEELS, SCHOOL BUS YELLOW
		Bumper Color -	STANDARD BLACK BUMPER PAINT
		Rear Wheel Color -	ACCURIDE PKYEL28 POWDER YELLOW (N5898EA) REAR WHEELS, SCHOOL BUS YELLOW
		Cab Color A -	CAB COLOR A: N5898EA SCHOOL BUS YELLOW ELITE SS
		Chassis Color -	CHASSIS PAINT: VENDOR BLACK
		Grille Color -	GRILLE: BLACK N0001EA ELITE SS

If unit has an open Freightliner recall, a “recall message” will show on screen

3. Major Components show S/N and oil type

YSN: AF5606 - ServicePro Web - Microsoft Internet Explorer

DAIMLER TRUCKS NORTH AMERICA LLC

ServicePro®

Change Vehicle / Mileage

VIN: 4U2ABRDJ79CAF5606 Related VIN: TBBBODY 1863323
 Make: FCC Model: MK000042S Related VIN mfr: TBB
 Current User: dave kepple

Language | Help

Vehicle Info

- Basic Info
- Major Components**
- Recall/Campaigns

Vehicle Specific

- Warranty Info
- Service Solutions
- ServiceLit

Related Sites

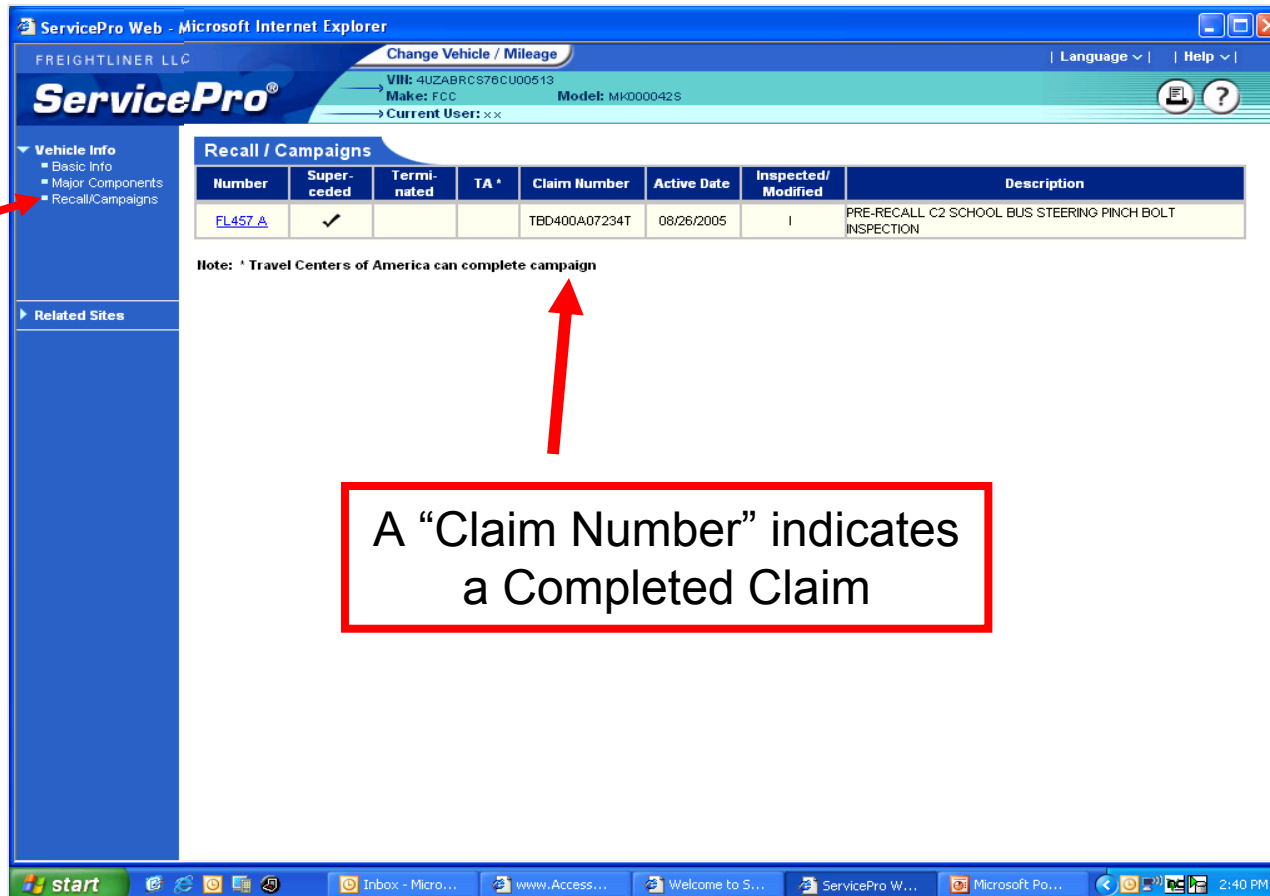
Major Components

Key Code: FT1949 Synthetic Lube: Yes*

Component Description	Manufacturer Code	Manufacturing Facility	Model Number \ Model Description	Serial Number
Engine	MBE		926/ MBE900	926961S0013219
Aftertreatment Device				SMM012573
Diesel Particulate Filter				SMM012573
Diesel Oxidation Catalyst				SLC012573
Main Transmission	ALI		3000PTS	6510804688*
Front Axle Forward/Single	MBA		F100-3N	739912-A201332
Rear Axle Forward/Single	MBA		ARS230-4	742621-A033471*
Steering Gear				EN3896
Body	1BM	THOMAS BUILT SCHOOL BUS 341T		

* Synthetic lubricant is contained in the Main Transmission, Rear Axle Forward/Single

4. Recall / Campaigns show current status



ServicePro Web - Microsoft Internet Explorer

FREIGHTLINER LLC

Change Vehicle / Mileage

Vehicle: 4U2ABRC876CU00513
Make: FCC Model: MK000042S
Current User: xx

Language | Help

ServicePro®

Vehicle Info
Basic Info
Major Components
Recall/Campaigns

Related Sites

Recall / Campaigns

Number	Super-ceded	Terminated	TA *	Claim Number	Active Date	Inspected/Modified	Description
FL457 A	✓			TBD400A07234T	08/26/2005	I	PRE-RECALL C2 SCHOOL BUS STEERING PINCH BOLT INSPECTION

Note: * Travel Centers of America can complete campaign

A "Claim Number" indicates a Completed Claim

5. Air Management Unit – Information

YSN: W18682 - ServicePro Web - Microsoft Internet Explorer

FREIGHTLINER LLC

ServicePro®

Change Vehicle / Mileage

VIN: 4U2ABRC07CW18682 Related VIN: TBBODY 1553009
 Make: FCC Model: M4000042S Related VIN mfr: TBB
 Current User: xx

Language | Help

Vehicle Info

- Basic Info
- Major Components
- Recall/Campaigns

Vehicle Specific

- Air Management Unit**
- Electronic Comp Inquiry (ECI)

Related Sites

Air Management Unit

Mfg Loc	Part No.	Part Number Description	Parent Module
AMU01	A12-19776-010	MOD-CENTRL SW,3 SW,AIR	486-C02102
AMU02	A12-19772-285	VLV ASSY,PRESS PROT,85PSI,2 PT	46D-C01416
AMU03	A12-19772-255	VLV ASSY,PRESS PROT,55PSI,2 PT	46D-C01416
AMU04	A12-19779-003	VLV ASSY-SOL,NC,3 WAY,YEL,AMU	27F-C00905
AMU05	A12-19777-003	ASY-PARKOPT SW,B3,1 SW,NO PSG	486-C02102

Note: Air Management Unit (AMU) part numbers, listed in order, correspond to AMU modules from right to left, when facing front of AMU.



start | Inbox - Microsoft O... | www.AccessFreigh... | Welcome to Service... | YSN: W18682 - Ser... | 8:27 AM



Electronics – Service Pro

VSN: AF5606 - ServicePro Web - Microsoft Internet Explorer

DAIMLER TRUCKS NORTH AMERICA LLC

ServicePro®

Change Vehicle / Mileage

VIII: 4UZABRDJ79CAF5606 Related VIII: TBBODY 1863323
Make: FCC Model: MK000042S Related VIII mfr: TBB
Current User: dave keppler

Language | Help

Vehicle Info
Basic Info
Major Components
Recall/Campaigns

Vehicle Specific
Air Management Unit
Electronic Comp Inquiry (ECI)

Warranty Info
Claims History
Registration
Warranty Coverage
Parts/Labor Lookup

Service Solutions
ServiceLit

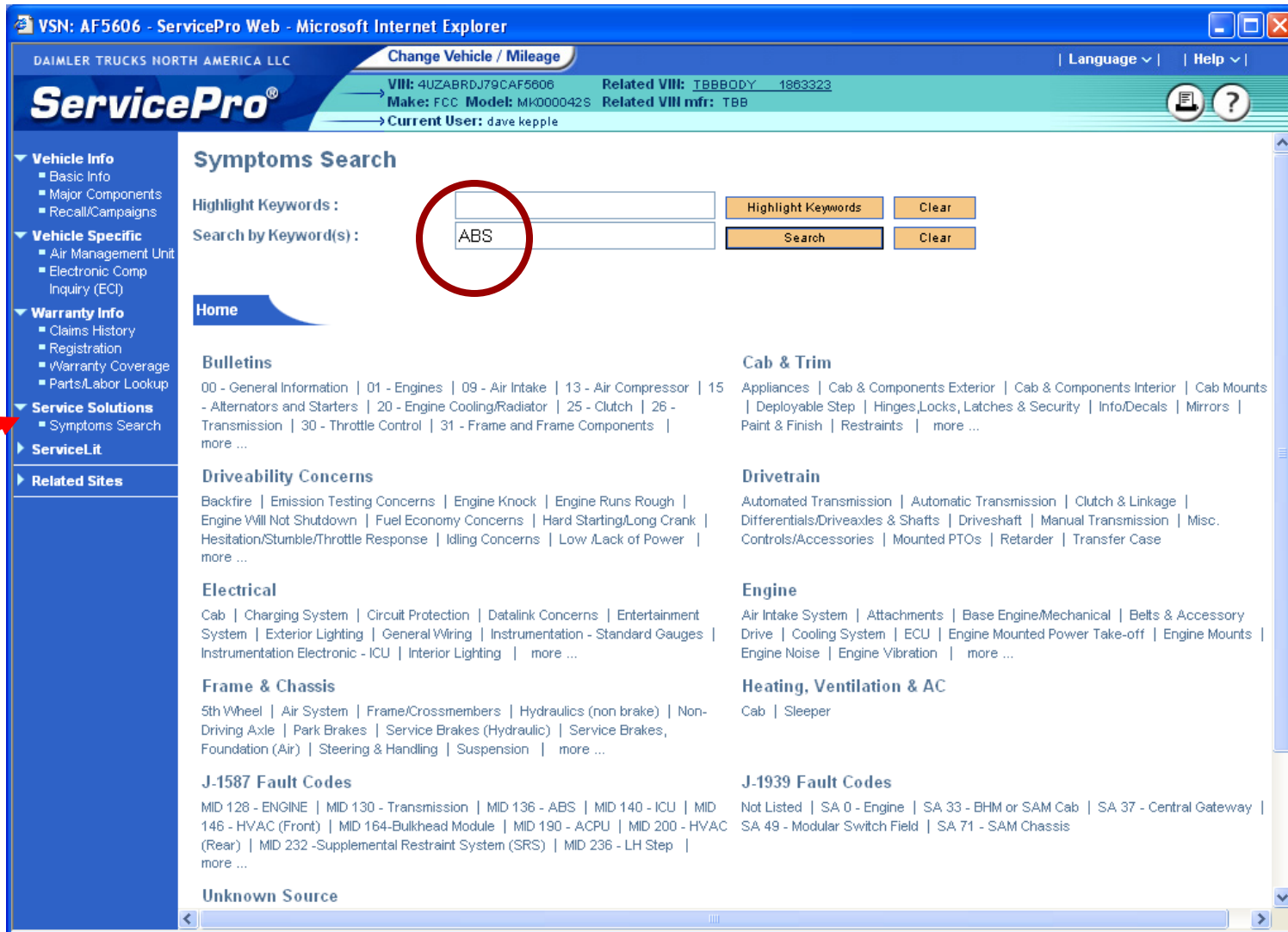
Related Sites

Vehicle In Service Date: 8/4/2008
Trade Term Effective Date:

Vehicle Mileage: Meter Data Not Entered
Trade Term Expire Date:
Warranty Coverage: SCHOOL BUS CHASSIS
Ordered Vocation: SCHOOL BUS SERVICE
Registered Vocation: SCHOOL BUS SERVICE
Contract Comment:

Warranty Coverage

System	Length of Warranty	Limit of Warranty	Deductible	Extended Coverage	Pay Rate
BRIGHTWORK E X P R E D	6	UNLIMITED MI UNLIMITED KM	0.00		Part: 100.00% Labor: 100.00% Handling: 100.00% Outside: 100.00%
CORROSION E X P R E D	6	UNLIMITED MI UNLIMITED KM	0.00		Part: 100.00% Labor: 100.00% Handling: 100.00% Outside: 100.00%
<u>BASIC CHASSIS</u>	12	UNLIMITED MI UNLIMITED KM	0.00		Part: 100.00% Labor: 100.00% Handling: 100.00% Outside: 100.00%
<u>BATTERIES</u>	12	100000 MI 161000 KM	0.00		Part: 100.00% Labor: 100.00% Handling: 100.00% Outside: 100.00%
CHASSIS PAINT E X P R E D	6	UNLIMITED MI UNLIMITED KM	0.00		Part: 100.00% Labor: 100.00% Handling: 100.00% Outside: 100.00%
PAINT E X P R E D	6	UNLIMITED MI UNLIMITED KM	0.00		Part: 100.00% Labor: 100.00% Handling: 100.00% Outside: 100.00%
					Part: 100.00%



VSN: AF5606 - ServicePro Web - Microsoft Internet Explorer

DAIMLER TRUCKS NORTH AMERICA LLC

Change Vehicle / Mileage

VIN: 4UZABRDJ79CAF5606 Related VIN: TBBODY 1863323
 Make: FCC Model: MK000042S Related VIN mfr: TBB
 Current User: dave kepple

Language | Help

ServicePro

- Vehicle Info
 - Basic Info
 - Major Components
 - Recall/Campaigns
- Vehicle Specific
 - Air Management Unit
 - Electronic Comp Inquiry (ECI)
- Warranty Info
 - Claims History
 - Registration
 - Warranty Coverage
 - Parts/Labor Lookup
- Service Solutions**
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- Related Sites

Symptoms Search

Highlight Keywords:

Search by Keyword(s):

Highlight Keywords Clear
Search Clear

Home

Bulletins

00 - General Information | 01 - Engines | 09 - Air Intake | 13 - Air Compressor | 15 - Alternators and Starters | 20 - Engine Cooling/Radiator | 25 - Clutch | 26 - Transmission | 30 - Throttle Control | 31 - Frame and Frame Components | more ...

Driveability Concerns

Backfire | Emission Testing Concerns | Engine Knock | Engine Runs Rough | Engine Will Not Shutdown | Fuel Economy Concerns | Hard Starting/Long Crank | Hesitation/Stumble/Throttle Response | Idling Concerns | Low Lack of Power | more ...

Electrical

Cab | Charging System | Circuit Protection | Datalink Concerns | Entertainment System | Exterior Lighting | General Wiring | Instrumentation - Standard Gauges | Instrumentation Electronic - ICU | Interior Lighting | more ...

Frame & Chassis

5th Wheel | Air System | Frame/Crossmembers | Hydraulics (non brake) | Non-Driving Axle | Park Brakes | Service Brakes (Hydraulic) | Service Brakes, Foundation (Air) | Steering & Handling | Suspension | more ...

J-1587 Fault Codes

MID 128 - ENGINE | MID 130 - Transmission | MID 136 - ABS | MID 140 - ICU | MID 146 - HV/AC (Front) | MID 164-Bulkhead Module | MID 190 - ACPU | MID 200 - HV/AC (Rear) | MID 232 -Supplemental Restraint System (SRS) | MID 236 - LH Step | more ...

Unknown Source

Cab & Trim

Appliances | Cab & Components Exterior | Cab & Components Interior | Cab Mounts | Deployable Step | Hinges,Locks, Latches & Security | Info/Decals | Mirrors | Paint & Finish | Restraints | more ...

Drivetrain

Automated Transmission | Automatic Transmission | Clutch & Linkage | Differentials/Driveaxles & Shafts | Driveshaft | Manual Transmission | Misc. Controls/Accessories | Mounted PTOs | Retarder | Transfer Case

Engine

Air Intake System | Attachments | Base Engine/Mechanical | Belts & Accessory Drive | Cooling System | ECU | Engine Mounted Power Take-off | Engine Mounts | Engine Noise | Engine Vibration | more ...

Heating, Ventilation & AC

Cab | Sleeper

J-1939 Fault Codes

Not Listed | SA 0 - Engine | SA 33 - BHM or SAM Cab | SA 37 - Central Gateway | SA 49 - Modular Switch Field | SA 71 - SAM Chassis

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Text Search Results




ABS Search Home


☐ Within These Results ☒ New Search

Results : 1-25 26-31

Score	Solution Documents
100%	434: ABS POWER TO TRAILER
90%	1788: FS65 ABS Warning Lamp
72%	834: Cluster displays 'No Data', gauges not working, unable to connect to Servicelink all caused by J1587 datalink fault.
70%	2171: Brake Rotor Corrosion FS65
70%	3221: ABS Warning Lamp Flashes After Cranking Engine
67%	2270: ISB 02 Exhaust Brake w/ ABS Interrupt Operation & Function
56%	3446: ABS Light On During Cold Weather Start
53%	207: Troubleshooting Wabco D Hyd ABS-Business Class
53%	696: INTRO TO PLC4TRUCKS AND THE NEW DASH MOUNTED TRAILER ABS LAMP REQUIREMENT
53%	350: BENDIX ABS, EC-16/EC-17 ANTI-LOCK MODULE PROGRAMMING, HOLD A MAGNET AT RESEST PART OF MODULE UNTIL LITES FLASH
53%	1182: ICU displays fault code 136 s254 07
50%	3354: ABS Retarder Relay Short To Ground Code (136 s013 06)
40%	910: ABS Warning Light On Due to Bad Ground
	500: MULTIPLE ABS SENSOR FAILURES NEW SENSOR AVAILABLE

 Solution Content - Microsoft Internet Explorer



 Search Results

Rate this Solution: [good](#) [bad](#)

434: ABS POWER TO TRAILER Close

ABS POWER TO TRAILER

VEHICLES:

ALL

ISSUE:

How is the ABS power transferred to the trailer (Green 7wire cord or Yellow ISO cord)?

SOLUTION:

If the vehicle is equipped with the GREEN (ABS) cord, the center BLUE wire is an ignition activated auxiliary 12 volt supply (on some vehicles this may have an inline switch.. Refer to Service Bulletin 54-97 for proper wiring). This can be used to supply power to the ABS system if wired properly.

Definition:

The GREEN cord referred to as the 7-wire or ABS cord, is the cord that supplies lighting signals to the trailer. The cord differs for the old RED or Black 7-wire cord in it's construction. The Green cord has larger gauge wires to support the ABS function this includes the WHITE (ground) wire which has an 8 gauge wire, the RED (Stop lamp) and BLUE (AUX / ABS) both 10 gauge wires, and the black, brown, yellow and green which are 12 gauge wires.

The YELLOW International Standards Organization (ISO) cord is provided to carry a verity of functions. Its ends are different eliminating the possibility of plugging into the wrong receptacle, however the cord make up is the same. If ABS is powered through this cord it comes through pin 7, the ABS lamp through pin 3 and ground through pin 1.

Electronics – Service Pro

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DAIMLER TRUCKS NORTH AMERICA LLC

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Language | Help

ServicePro

Full-Text Search Keyword: Search Reset Keyword

Group	Section	Subject	PDF	Date	Status
Saf-T-Liner C2 School Bus Workshop					
00 - General Information					
01 - Engine					
09 - Air Intake					
13 - Air Compressor					
15 - Alternators and Starters					
20 - Engine Cooling Radiator					
25 - Clutch					
26 - Transmission					
30 - Throttle Control					
31 - Frame and Frame Components					
32 - Suspension					
33 - Front Axle					
35 - Rear Axle					
40 - Wheels and Tires					
41 - Driveline					
42 - Brakes					
46 - Steering					
47 - Fuel					
49 - Exhaust					
54 - Electrical, Instruments, and					
72 - Door					
75 - Body					
82 - Windshield Wipers and					
83 - Heater and Air Conditioner					
83 - Heating and Air Conditioning					
88 - Hood, Grille, and Cab Fenders					
91 - Seats and Restraint Systems					
98 - Paint					

Open All Close All

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 Major Components
 Recall/Campaigns
 Vehicle Specific
 Warranty Info
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 ServiceLit
 Technical Manuals
 Driver's
 Maintenance
 Workshop/Service
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 Bulletins
 Service Bulletins
 Parts Technical
 Bulletins
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Change Vehicle / Mileage

Language | Help

VIII: 4UZA8RDJ79CAF5606 Related VIII: TBBBDDY 1863323
Make: FCC Model: MK000042S Related VIII mfr: TBB
Current User: dave kepple

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- Vehicle Info
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 - Major Components
 - Recall/Campaigns
- Vehicle Specific
- Warranty Info
- Service Solutions
- ServiceLit
 - Technical Manuals
 - Driver's
 - Maintenance
 - Workshop/Service Manuals
 - Bulletins**
 - Service Bulletins
 - Parts Technical Bulletins
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Service Bulletins

English Title Search Keyword: Search Reset Keyword
Spanish Full-Text Search Search Bulletin Text: Enter one or more keywords separated by 'and' or 'or' (no quotes). Then press the 'search' button.
French

Bulletin Name	Make	Model	Date	
00-1 - Validity List	Thomas Built	Saf-T-Liner_C2	Jul08	Revised
20-2 - Changing of Air Fitting Type to Fix Engine Fan Control Air Leaks	Thomas Built	Saf-T-Liner_C2	Jul08	New
47-1 - Davco Fuel Pro 382 and Diesel Pro 232/233 Fuel/Water Separator Testing	Thomas Built	Saf-T-Liner_C2	May08	
26-3 - Allison Transmission Fluid Specification	Thomas Built	Saf-T-Liner_C2	Mar08	
60-2 - Dash Cracks Around MV-3 Brake Valve	Thomas Built	Saf-T-Liner_C2	Mar08	
00-2 - Service Publications Price List	Thomas Built	Saf-T-Liner_C2	Feb08	
49-2 - EPA07 Aftertreatment Device Visor Label	Thomas Built	Saf-T-Liner_C2	Feb08	
49-3 - Diesel Particulate Filter (DPF) Status Light On, EPA07 Engines	Thomas Built	Saf-T-Liner_C2	Jan08	
42-2 - Reservoir Internal/External Check Valve	Thomas Built	Saf-T-Liner_C2	Jan08	
32-2 - AirLiner Suspension Air-Spring Bag Misalignment Troubleshooting	Thomas Built	Saf-T-Liner_C2	Jan08	
01-2 - EPA07 MBE900 Engine Oil Dipstick Markings	Thomas Built	Saf-T-Liner_C2	Dec07	
46-1 - Adjustable Steering Column Release Pedal	Thomas Built	Saf-T-Liner_C2	Dec07	
32-1 - AMU Norgren Double-Check Valve Does Not Seal Completely	Thomas Built	Saf-T-Liner_C2	Oct07	
26-2 - Fretting Corrosion On SmartShift™ Wiring	Thomas Built	Saf-T-Liner_C2	Jul07	
54-9 - Unintended Wiper Cycling Caused by Turn-Signal-Switch Wiring Corrosion	Thomas Built	Saf-T-Liner_C2	Jun07	
54-7 - ICU3/GX Display of "Page Two" Fault Codes	Thomas Built	Saf-T-Liner_C2	May07	
01-1 - Dealer Input on EPA07 Engine Issues	Thomas Built	Saf-T-Liner_C2	May07	
83-2 - A/C System Receiver-Dryer Replacement Guidelines	Thomas Built	Saf-T-Liner_C2	Oct06	
42-1 - Automatic Slack Adjusters Adjustment Caution	Thomas Built	Saf-T-Liner_C2	May06	
00-3 - Washing Delivered Vehicles to Reduce Road Salt Corrosion	Thomas Built	Saf-T-Liner_C2	Feb06	
33-1 - Tie-Rod and Drag-Link Ball-Stud Cover Deterioration	Thomas Built	Saf-T-Liner_C2	Nov05	
54-4 - Battery Drain Overlay Harness	Thomas Built	Saf-T-Liner_C2	Oct05	
20-1 - Auxiliary Heater Switch Does Not Hold	Thomas Built	Saf-T-Liner_C2	Sep05	
54-3 - Caterpillar C7 Auto High Idle	Thomas Built	Saf-T-Liner_C2	Sep05	
54-6 - Power Outlet Polarity Reversed	Thomas Built	Saf-T-Liner_C2	Sep05	
83-1 - Use Only Approved Refrigerants	Thomas Built	Saf-T-Liner_C2	Aug05	
54-1 - Using the Correct Port Cable for the Data Link Adapter	Thomas Built	Saf-T-Liner_C2	Sep04	

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Electronics - Serviceability

Tooling / Resources

- **Thomas Built Bus Site**
 - Thomas Parts
 - Service information
 - All Technical Information for Thomas




www.thomasbusonline.com

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Documents / Reporting Tools

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- [03-10-08 - TBB Undercoating Policy](#)
- [03-10-08 - Pre-Delivery Inspection Form revised](#)
- [03-06-08 - PSB Body Index C2 13, Bulletin 3R, Types of Product Service Bulletins](#)
- [02-29-08 - Recall 07V-137 Brake Pedal Interference](#)
- [02-26-08 - PSB Body Index C2 1, Bulletin 9R2 One-Piece Driver's Window](#)
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TBB News Bulletin - Windows Internet Explorer

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TBB News Bulletin

Thomas BUILT BUSES

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TBB News

- 11-16-07 - PSB Index C2 2, Bulletin 12, AG2 Door Leaf Bracket released.
- 11-16-07 - PAB074 SERVICE DOOR LIGHT D250-07 FOR C2
- 11-14-07 - PSB Body Index 12, Bulletin 10 Rusting Surge Tanks/Discolored Coolant
- 11-08-07 - PSB Body Index 02, Bulletin 26R3, Cracks in Trim Around Emergency Exit & Lift Doors released.
- 11-07-07 - PSB Body Index 2, Bulletin 51R2, Hex Shaft Breakage released.
- 11-02-07 - PAB073 GM CHASSIS ALERT
- 11-01-07 - PAB072 SERVICE DOOR LIGHT D250-07
- 10-29-07 - PAB071 SAFEGUARD LAP SHOULDER FLEX SEAT
- 10-26-07 - PAB070 CANADIAN D250 REQUIREMENTS
- 10-25-07 - PSB Chassis Index 20, Bulletin 45, Elect Harness Re-routing released.
- 10-23-07 - PAB069 HEATING ELEMENT STOP SIGNAL
- 10-19-07 - Start/End Dates added-PSB Body Index C2 9, Bulletin 3A, Bulkhead Accessory
- 10-17-07 - PAB068 BODE ADA SINGLE LIFT DOOR
- 10-17-07 - PAB068 BODE ADA SINGLE LIFT DOOR
- 10-11-07 - PAB067 SAF-T-LINER C2 NEW DASH & CABINET

1 2 3 4 5 6 7 8 9 10 ...

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Registrations - Microsoft Internet Explorer

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Thomas BUILT BUSES Registrations

Search By...
☒ VIN ☐ Body No ☐ Registration#

Enter Search Criteria:
9CAF5606

Registration Form

Unit Information

VIN:	4UZABRDJ79CAF5606	Body No:	863323	Registration#:	1552491
Order No:	17259	In Service Date:		Registration Date:	6/14/2008
Bus Type:	S	Model:	T	Plant:	B
Chassis No:	96348	Chassis Mfg:	FLNER	Chassis Model:	B2 106
Body Start:	6/10/2008	Chassis Start:		Demo:	
Engine S/N:	92696180013219	Trans Serial#:	6510804688	Engine Type:	
Seat Plan:	<input type="button" value="X"/> 311783	Bus Length:	341TS	Wheelbase:	279

Customer Info:

Customer Number:	39	State:	WV	Zip Code:	25401
Customer Name:	BERKELEY COUNTY SCHOOLS				
Customer Address:	88 HARLEN SP. RD				
City:	MARTINSBURG	Registration Status:	C		
Signature:	N				

Done Local intranet

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News Alert

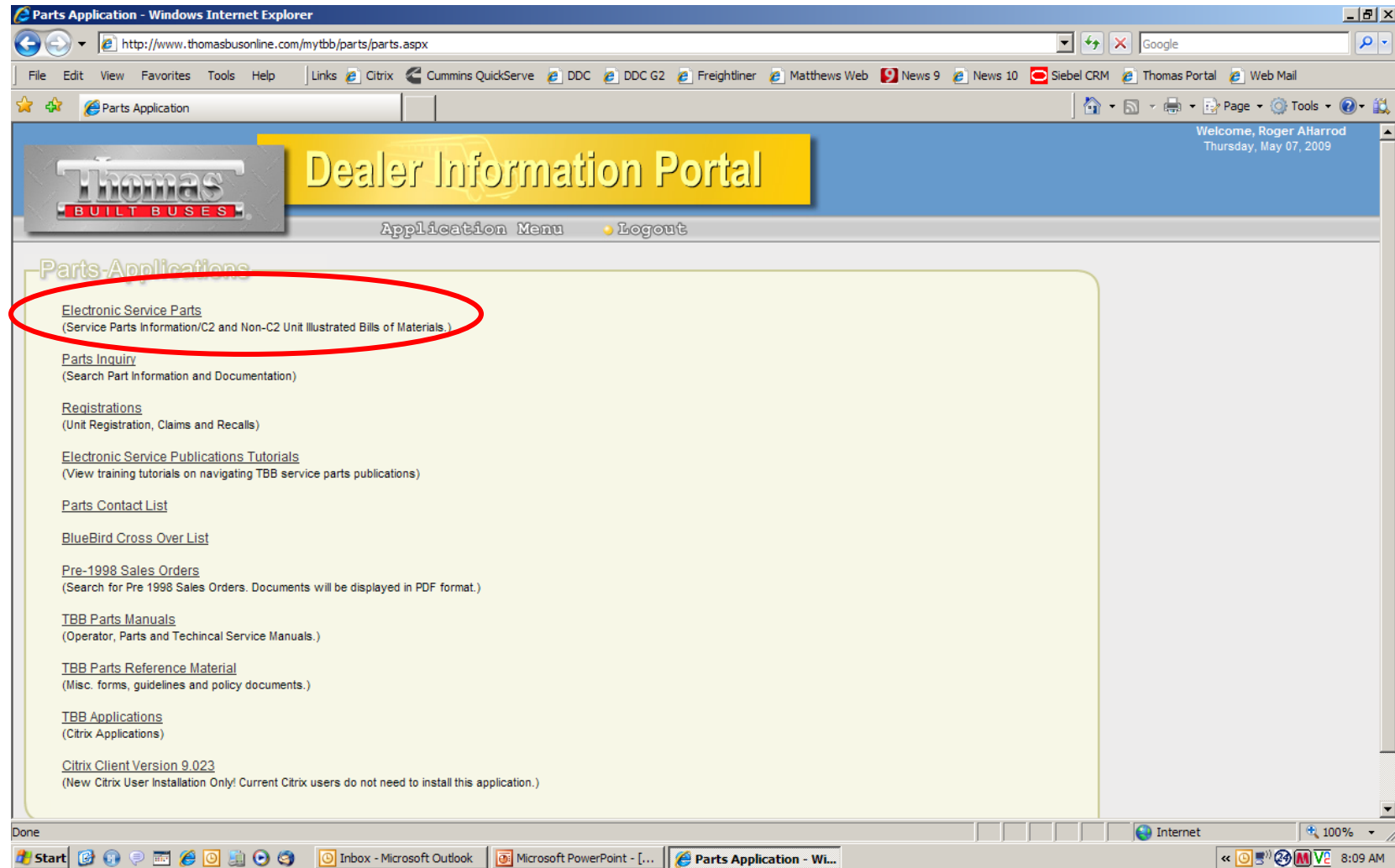
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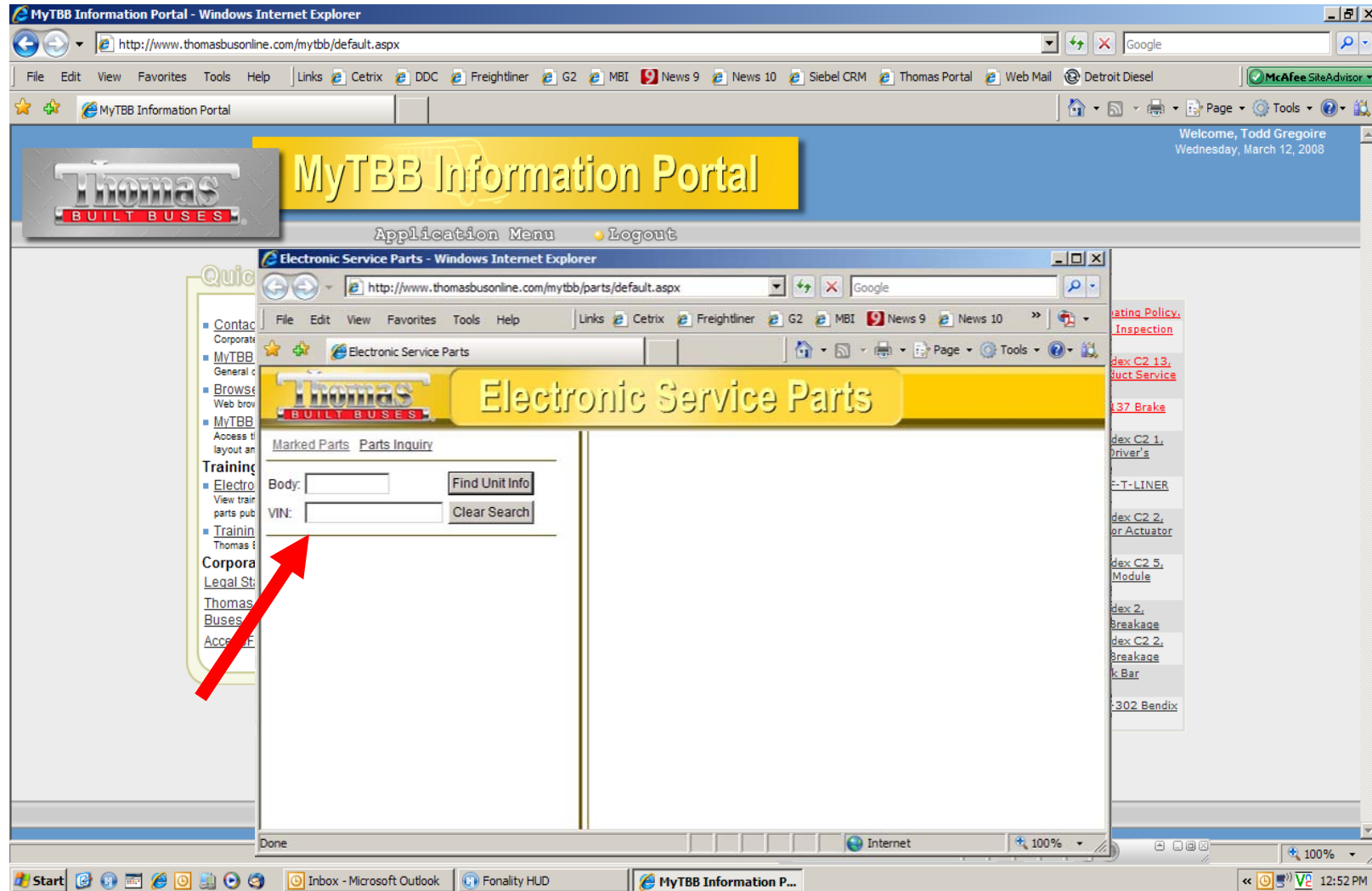


Electronics - Parts





Electronics - Parts







Areas shown on left

ELEC- parts & circuits

LAYOUT- as shown

LIGHTS- parts used, drawings

MODULE- parts used, drawings

OPERATION- instructions

Electronics - Parts

Electronic Service Parts - Microsoft Internet Explorer

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Thomas BUILT BUSES

Dealer Information Portal

Body Serial # - 863323
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D402904341 ELEC-LPS STOP/TAI/TUR/REV

Level	Status	Part#	Qty	Uom	Part Description	Make Mark Parts
1	A	125730	1	EA	HARNESS OVERLAY- STOP-TURN-TAIL-REVERSE, C2	B +

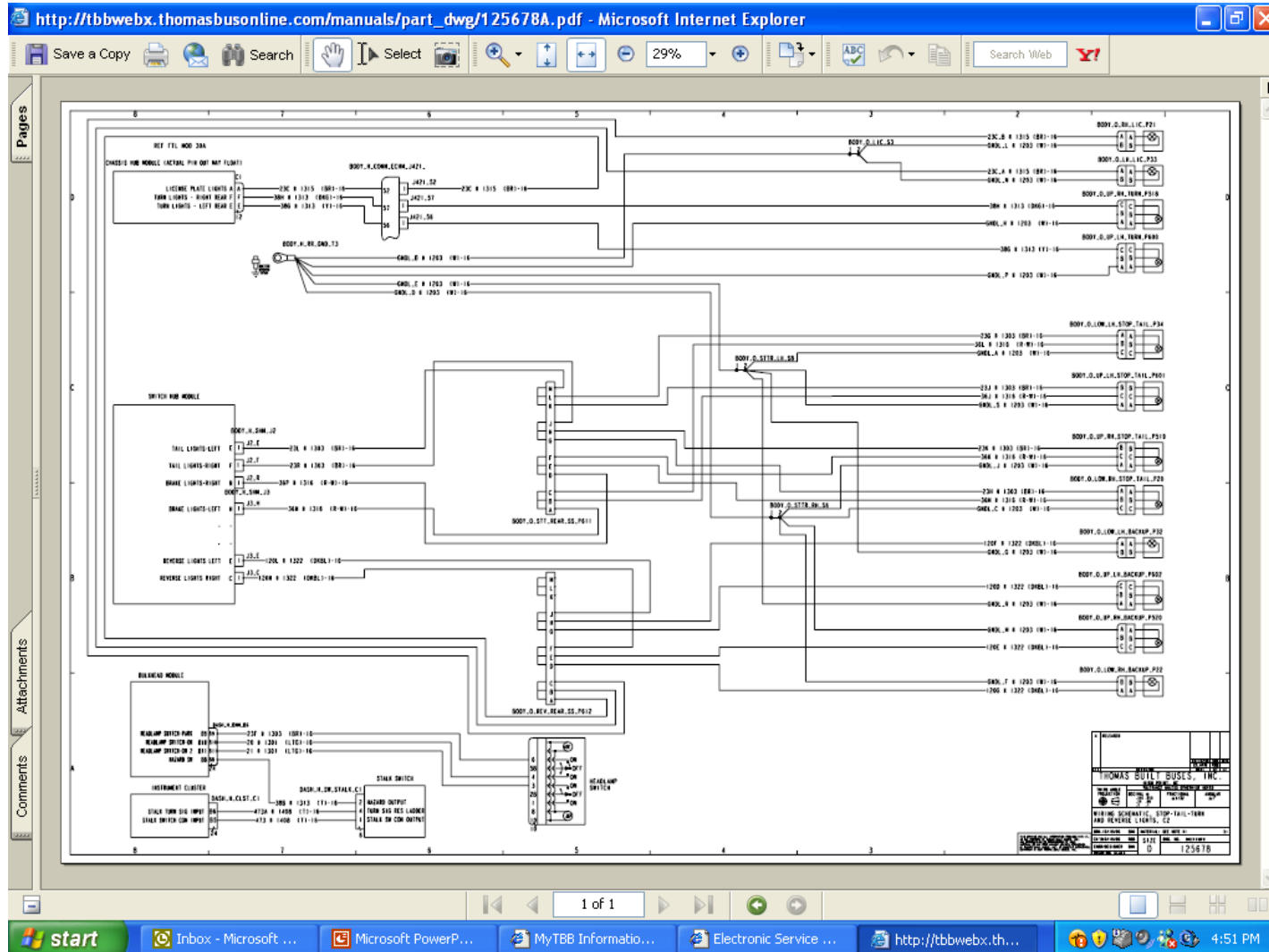
Parts Documents: [View PDF](#) [Download](#)

Vendor Part: TBB 125730

Ref ID	Assm Part#	Vendor Sub Parts Documents:	View PDF	Download
	125678A	WIRING SCHEMATIC, BRAKE-TAIL-TURN-REVER		
	125723A	CHART-HARNESS OVERLAY, BRAKE-TURN-TAIL		

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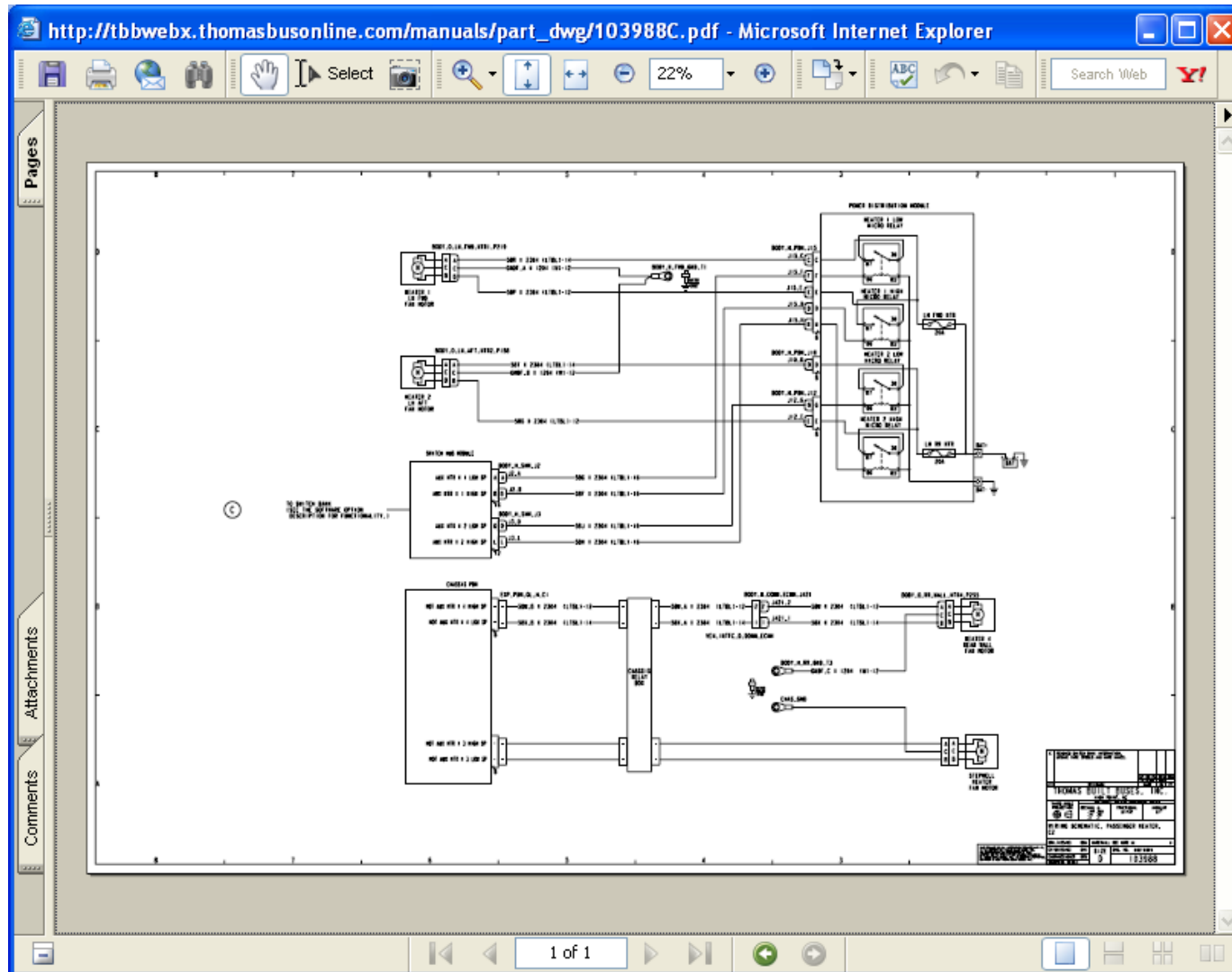
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D607100010 ELEC-HTR U/ SEAT POS 10

Level	Status	Part#	Qty	Uom	Part Description	Make	Mark	Parts																														
1	P	104727	1	EA	ILLUSTRATION - COMPONENT ASSY, RELAY, FUSE, AND BUSHING	M	+																															
Parts Documents: View PDF Download																																						
104727 ILLUSTRATION																																						
2	A	100036	1	EA	MINI FUSE, BLADE STYLE, 20 AMP, FAST ACT	B	+																															
2	A	102072	2	EA	RELAY, MICRO-AD SPST 4 PIN 20A	T	+																															
2	A	52001043	1	EA	BUSHING-SNAP, 1 1/4" MTG. HOLE,	T	+																															
1	A	105402	1	EA	HARNESS OVERLAY, PASSENGER HEATER, REAR	B	+																															
Parts Documents: View PDF Download																																						
Vendor Part: TBB 105402																																						
<table border="1"> <thead> <tr> <th>Ref ID</th> <th>Assm Part#</th> <th>Vendor Sub</th> <th>Parts Documents:</th> <th>View PDF</th> <th>Download</th> </tr> </thead> <tbody> <tr> <td></td> <td>101604C</td> <td></td> <td>CHART-HARNESS OVERLAY, PASSENGER HEATER</td> <td></td> <td></td> </tr> <tr> <td></td> <td>101604D</td> <td></td> <td>CHART-HARNESS OVERLAY, PASSENGER HEATER</td> <td></td> <td></td> </tr> <tr> <td></td> <td>103988B</td> <td></td> <td>WIRING SCHEMATIC, PASSENGER HEATER, C2</td> <td></td> <td></td> </tr> <tr> <td></td> <td>103988C</td> <td></td> <td>WIRING SCHEMATIC, PASSENGER HEATER, C2</td> <td></td> <td></td> </tr> </tbody> </table>									Ref ID	Assm Part#	Vendor Sub	Parts Documents:	View PDF	Download		101604C		CHART-HARNESS OVERLAY, PASSENGER HEATER				101604D		CHART-HARNESS OVERLAY, PASSENGER HEATER				103988B		WIRING SCHEMATIC, PASSENGER HEATER, C2				103988C		WIRING SCHEMATIC, PASSENGER HEATER, C2		
Ref ID	Assm Part#	Vendor Sub	Parts Documents:	View PDF	Download																																	
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	103988C		WIRING SCHEMATIC, PASSENGER HEATER, C2																																			

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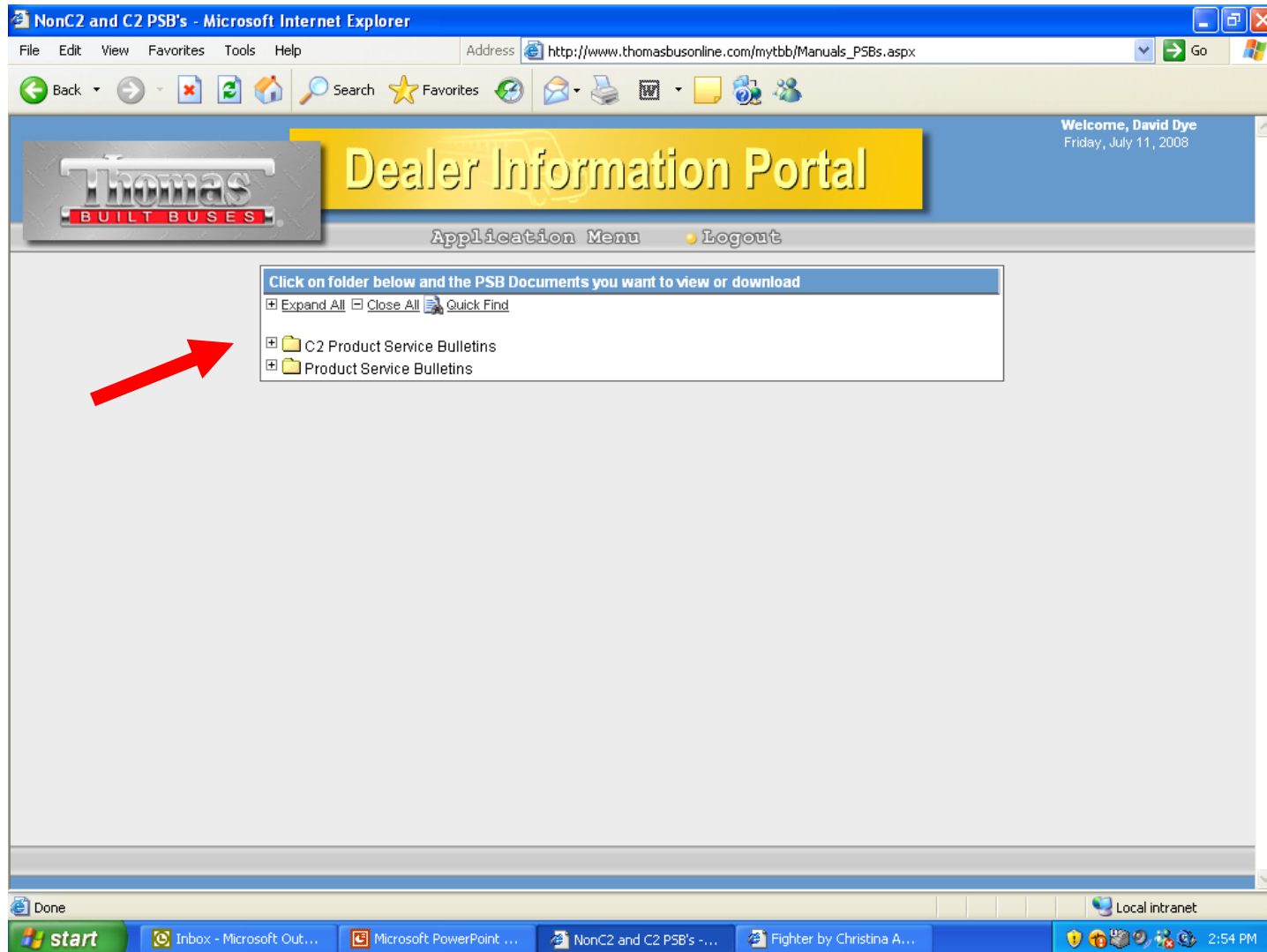
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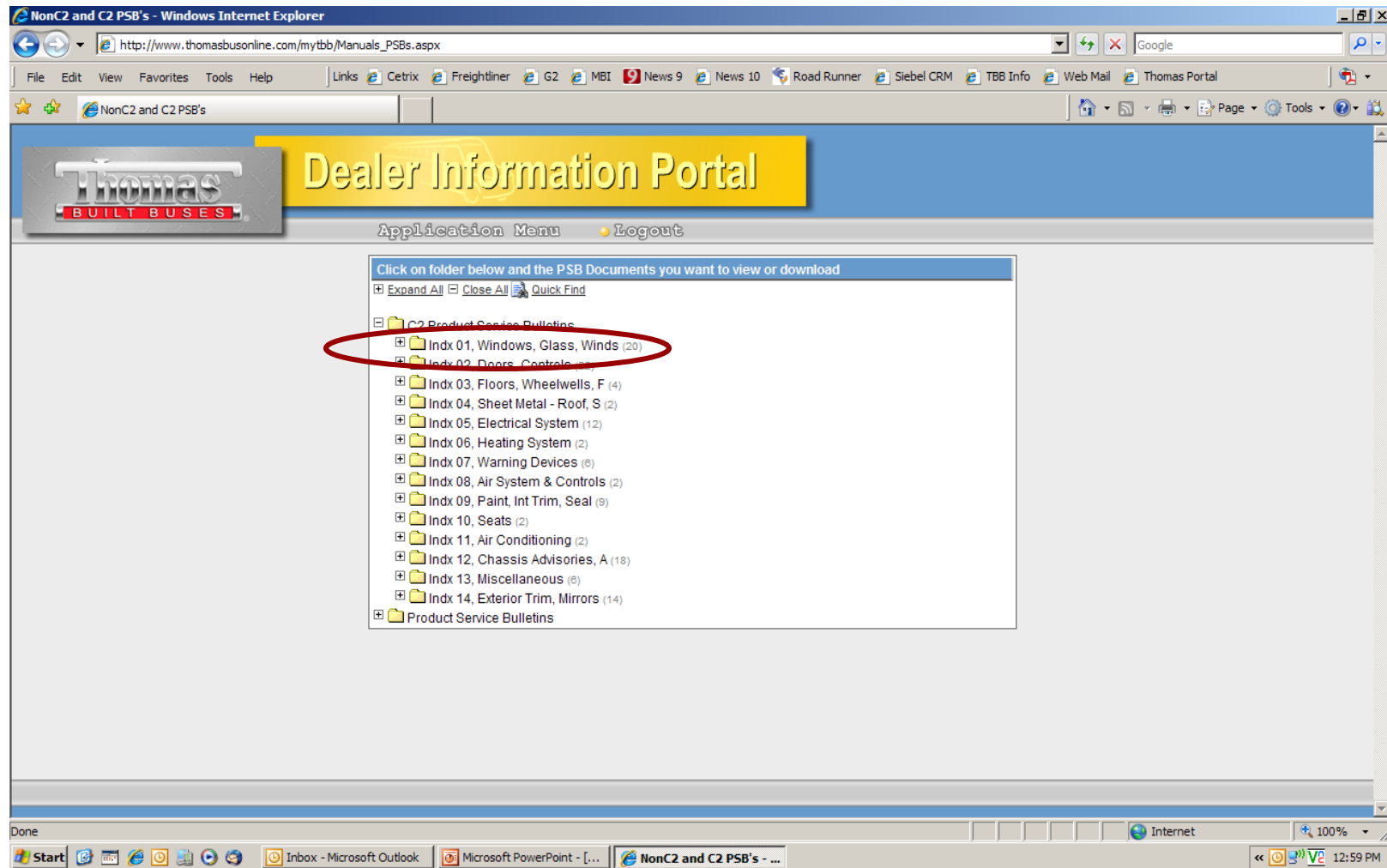


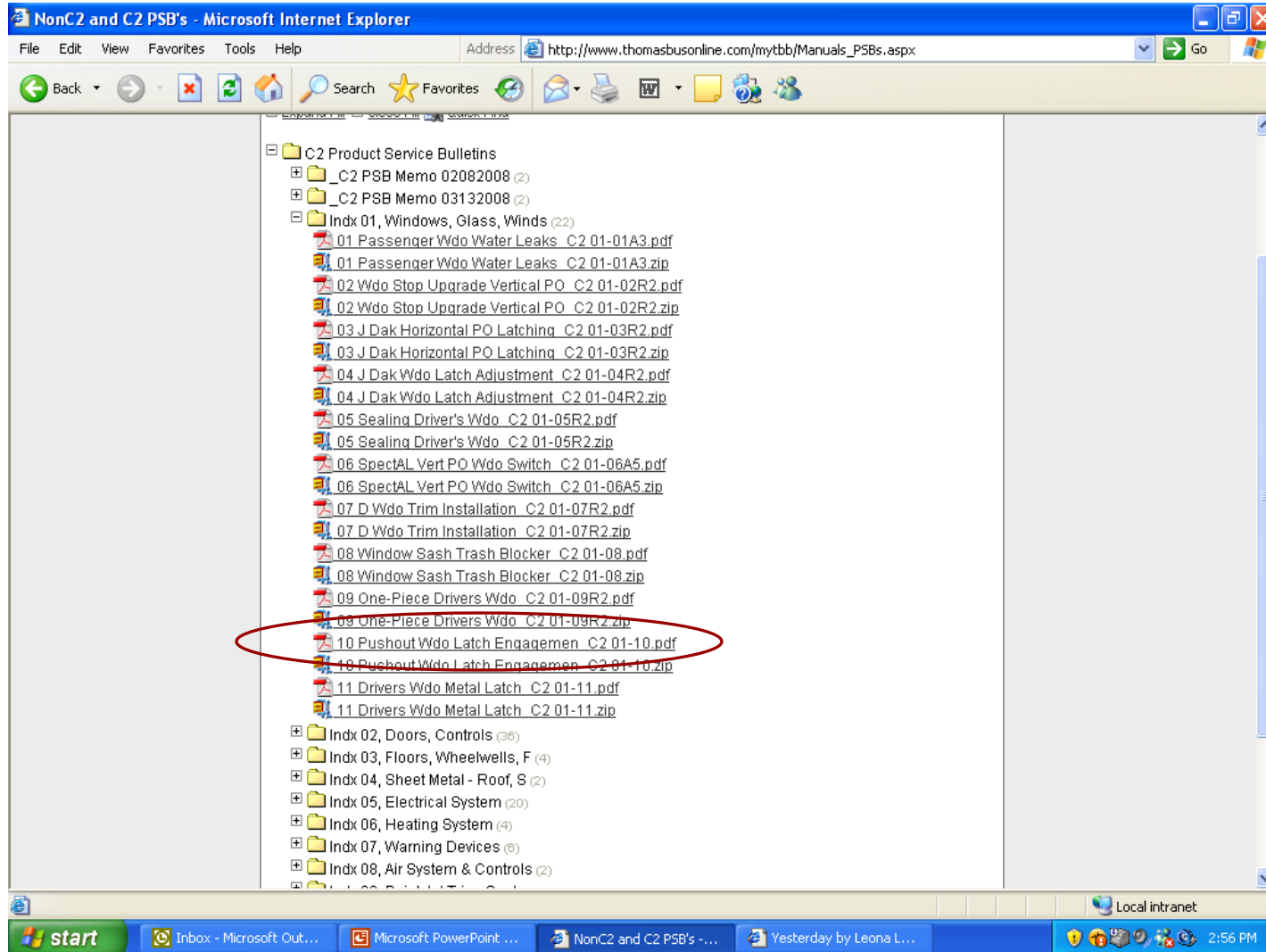
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BODY

MODEL: C2

SUBJECT: DRIVER'S WINDOW METAL LATCH

DATE: NOVEMBER 21, 2008

INDEX: C2 1

PAGE: 1 OF 2

BULLETIN: 11R

This service bulletin supersedes Index C2 1, Bulletin 11 to extend the warranty period until April 30, 2009, which will allow sufficient time for the repairs to be made. This PSB should be performed and the and warranty claims submitted by this date.

Reports have been received that Driver's windows are not staying latched. The new Metal Latch Kit, #TBB THSP 15004 will keep the windows latched during transit. This bulletin will affect units beginning with Body #661330 on 4/24/06. For those who experience the problem, it is recommended to replace the plastic latches with the metal latches.

1 of 2

Done Unknown Zone

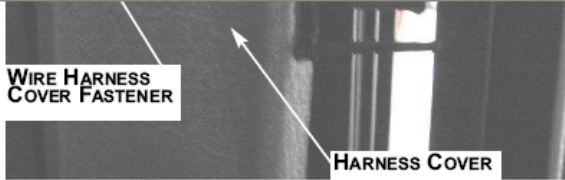
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WIRE HARNESS COVER FASTENER

HARNESS COVER

Figure 3



REARWARD LATCH REPLACEMENT

Figure 4

7. Using screws removed in Steps 1 and 2, re-attach vertical window extrusion and harness cover.

MATERIALS REQUIRED:

<u>PART NUMBER</u>	<u>QTY.</u>	<u>DESCRIPTION</u>
TBB THSP 15004	1	Metal Latch Kit, Driver's Window

WARRANTY STATUS:

WITHIN PROVISIONS OF TBB STANDARD WARRANTY - **WARRANTY PERIOD EXTENDED UNTIL APRIL 30, 2009**

WARRANTY CODE: 7409

SRT: 45-54, **TIME ALLOWANCE - 0.3 HRS.**

QC: V01

2 of 2

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Welcome, Roger AHarrod
Tuesday, November 20, 2007

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 - MVP-EF 2006 (8)
 - MVP-ER (40)
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Electrical 3

J1939 - Multiplexing

Multiplexing

Sending multiple electronic messages through the same path at the same time

Messages are varying voltage values generated by different computers in binary digital language

Body & Chassis are integrated together creating a total vehicle electrical system

Electrical – Multiplex

MECHANICAL – ‘Old school’ transmissions with kickdown linkages and governor weights.



Things can be seen & touched; diagnose by eyeball and intuition.

ELECTRICAL – I/Os interacting with a vehicle through wiring & relays.



Multi-meter or test light needed to tell what's active and what's not.

ELECTRONICS – Engines & Transmissions - Basic information links & diagnostics, plus simple items like throttle position.



Use of hand-held service tools like the Pro-Link to read out fault codes.

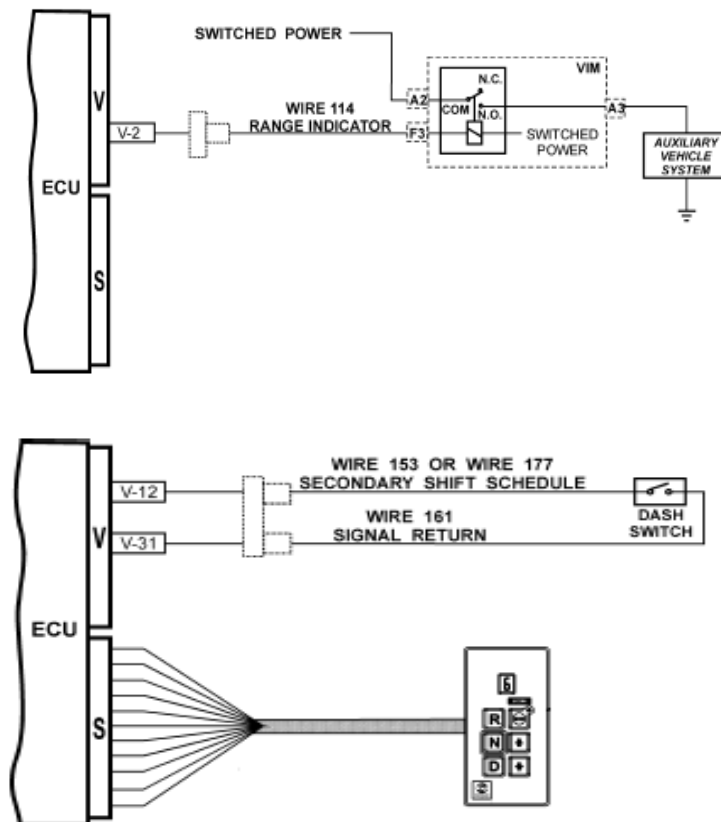
CONTROL NETWORKS – Lots of information sharing & interaction, devices controlling each other.



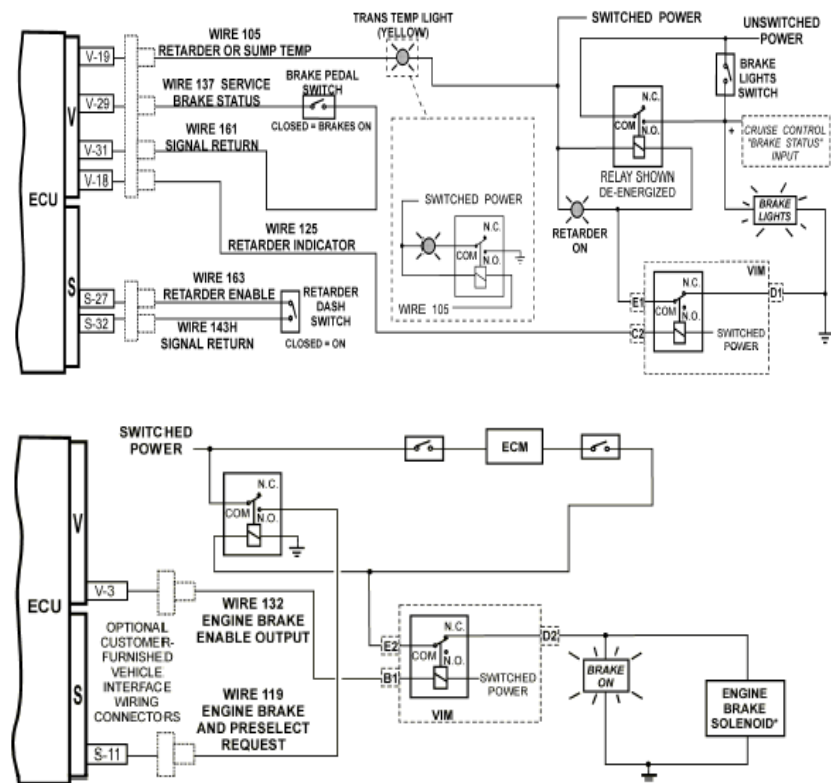
PC-based tools, harder to determine cause & effect, who's controlling whom.

Electrical – Multiplex

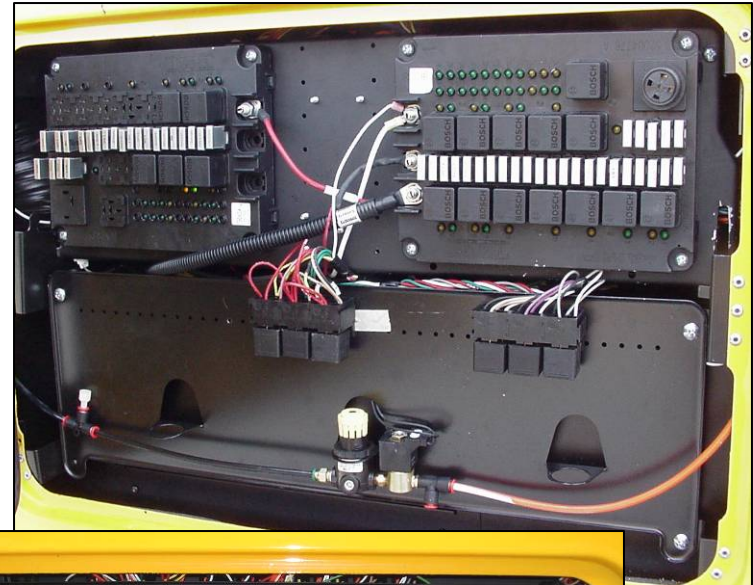
Without Multiplex each function requires their own wires, switches, sensors and relays.



The more complex the functions, the more wires and relays necessary for them to operate.



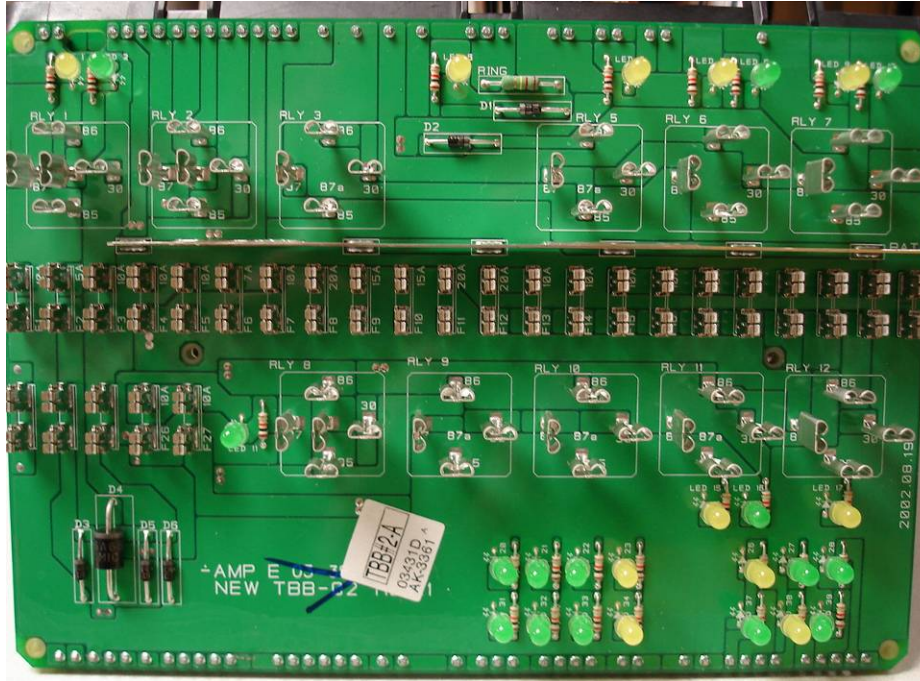
Electrical – Multiplex



This is WITHOUT Multiplex

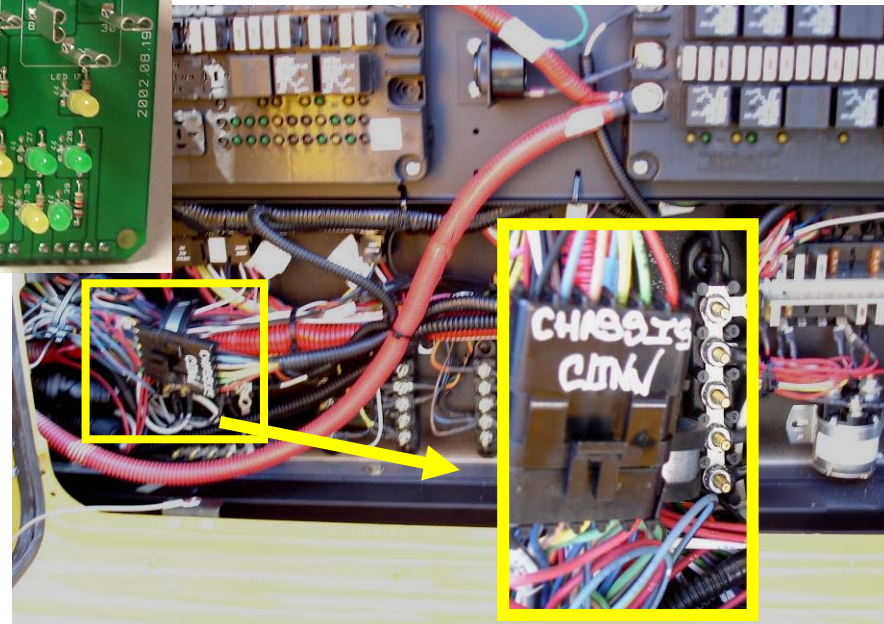


Electrical – Multiplex

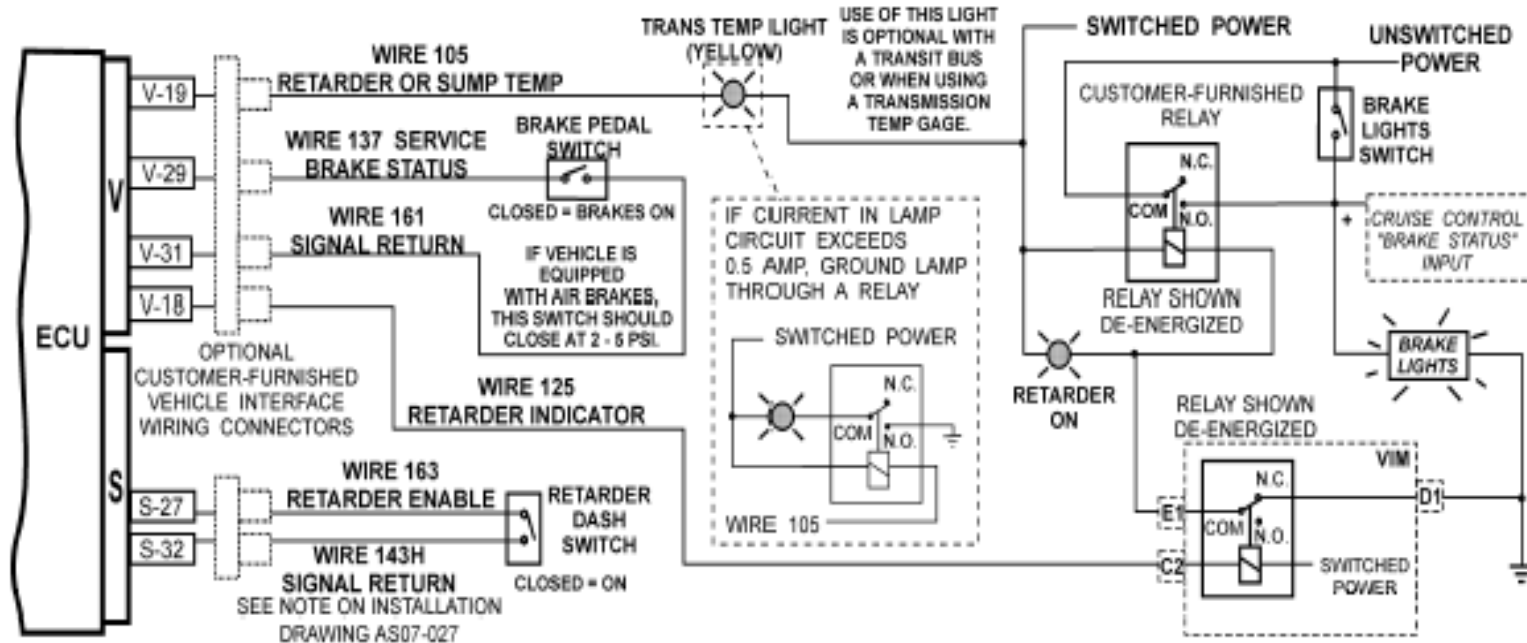


Circuit Boards, Diodes, Resistors, Relays, Fuses & lots of Exposed Connections

Lots of luck if you lost the sheet with explains which diode means what!

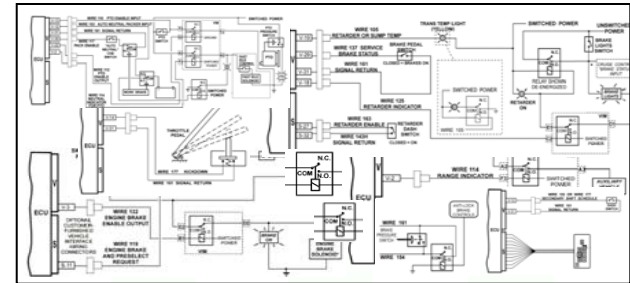


Integrating all these components in vehicles means lots of **Hardware, Wires, Switches, Sensors & Relays.**

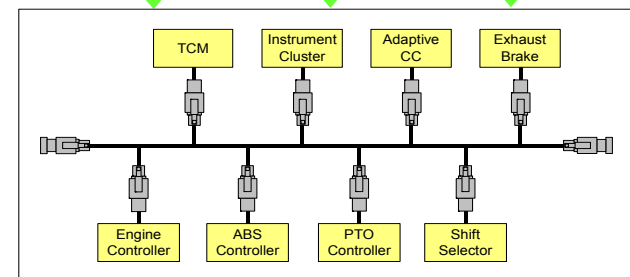


Wouldn't it be Great if we could:

- Reduce the amount of wiring.
- Eliminate redundant sensors.
- Simplify vehicle manufacturing. (COST)
- Reduce the failures in a system & simplify troubleshooting.
- Add new functions with little change.

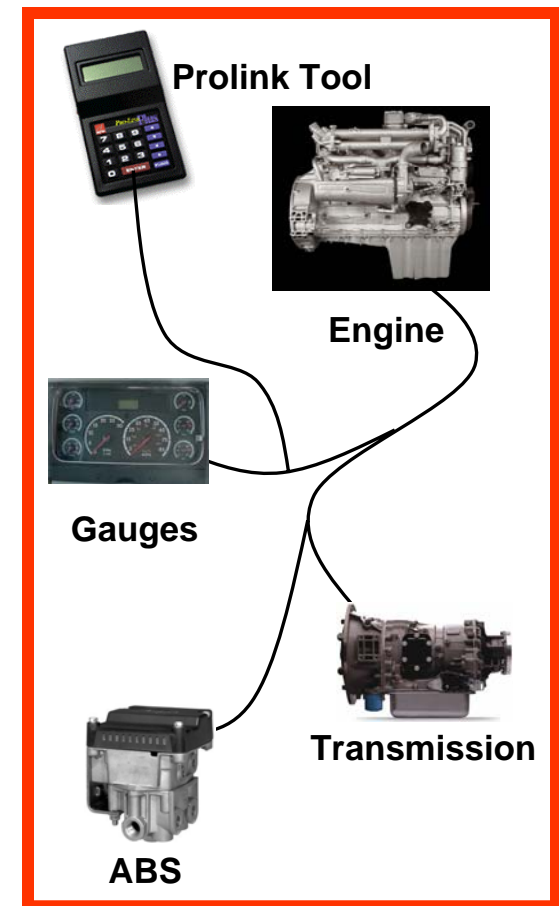


Multiplex can help with all of these!



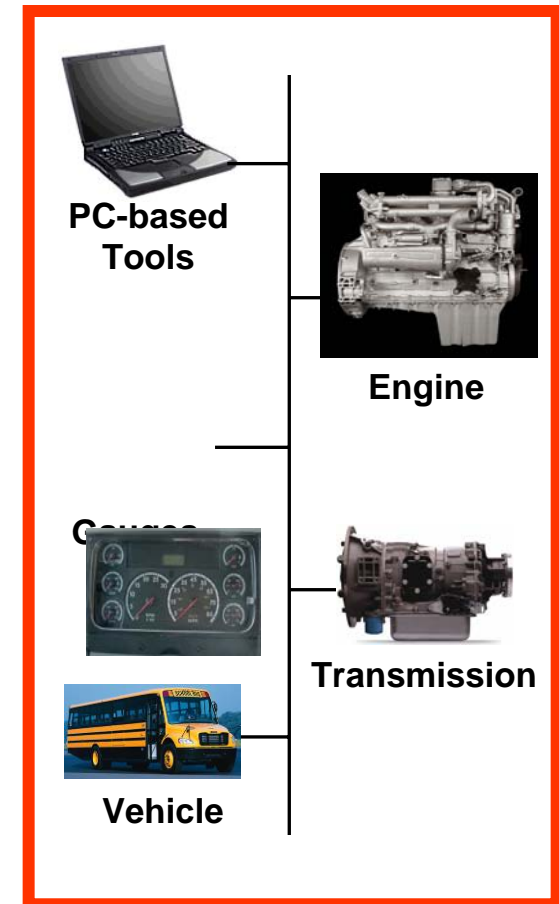
SAE J1708 / J1587

- First came into use around 1988.
 - J1708 is the hardware specification; it defines the physical datalink -- microchips, wires, etc.
 - J1587 is the communication protocol; defines messages and parameters.
 - 'Point-to-point' wiring; no significant restrictions.
 - Two major drawbacks:
 - × Destructive communication
 - × Slow -- 9600 baud rate
 - J1587 is still used today to...
 - × Communicate information ("eng speed is...")
 - × Calibrate and troubleshoot (service tools)
-



SAE J1939

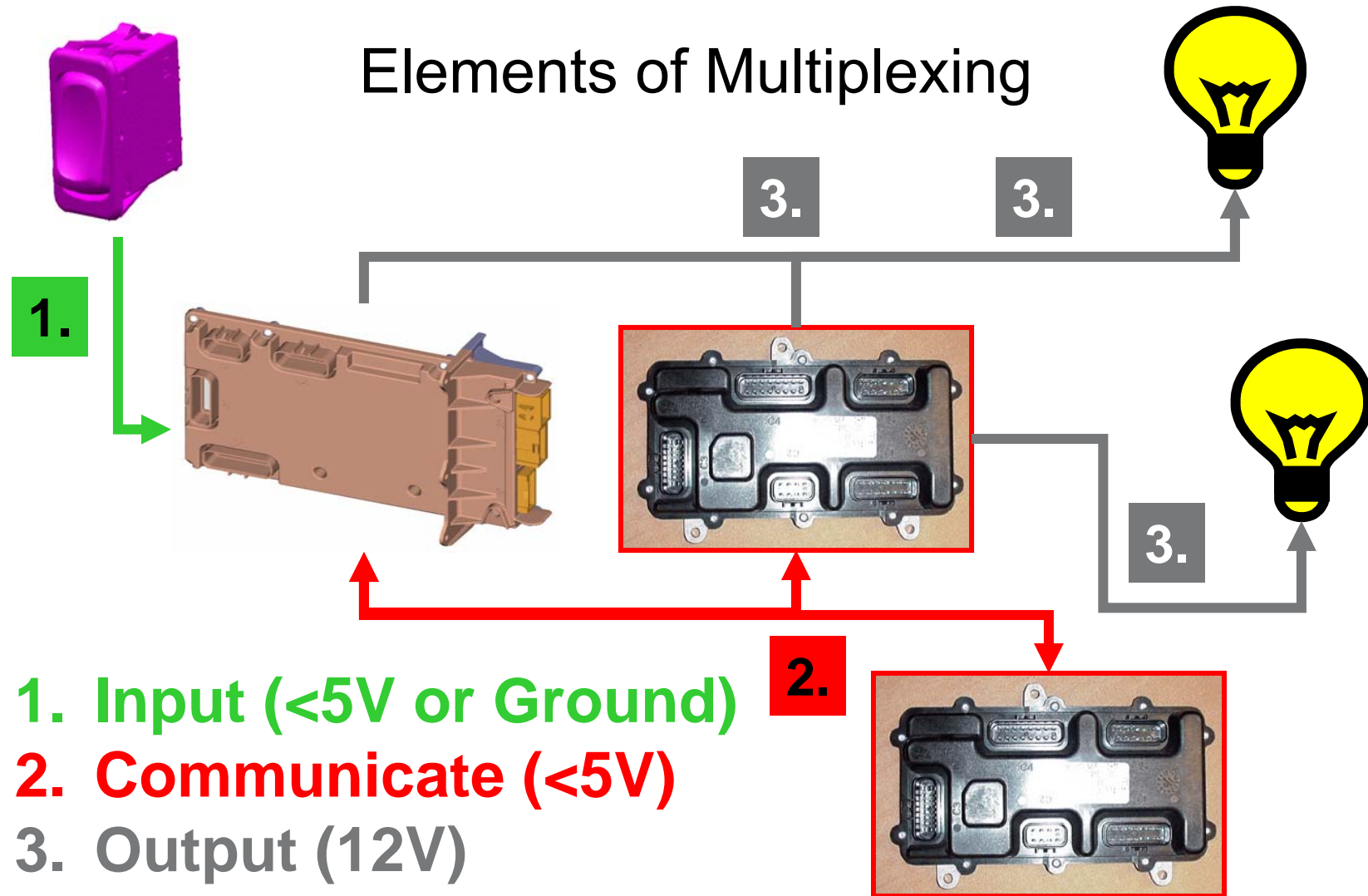
- Established by SAE in 1994.
- J1939 is a series of documents that define everything about the protocol; hardware, messaging and overall datalink structure.
- Key benefits:
 - ✓ Over 25x faster than J1587 (250Kb vs. 9.6Kb)
 - ✓ Message arbitration (NO destructive collisions)
 - ✓ Intelligent error detection by the hardware.
- Because of the higher speed, a linear network is used; there are more wiring requirements than J1708.



Elements of Multiplexing

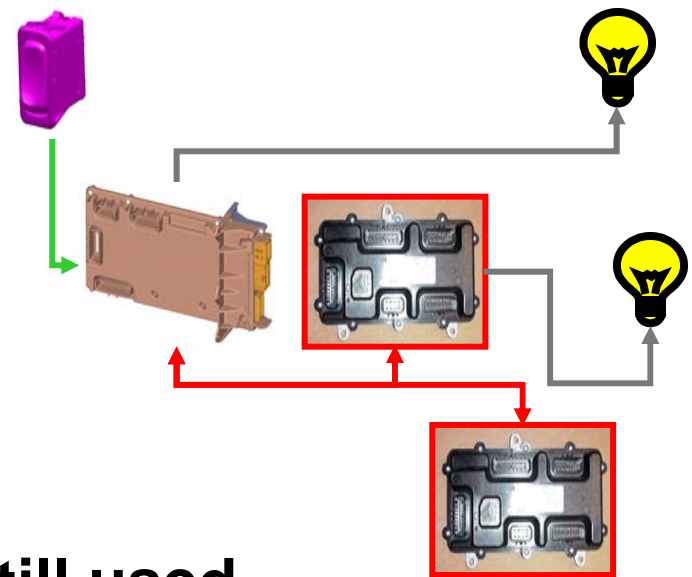
1. Collecting data / information (Inputs)
concerning driver / vehicle requests
 2. Communicating requests for action
among system components
 3. Control devices responding to requests
with power to do work (Outputs)
-

Electrical – Multiplex



Parameters, used by Multiplex, set the options used by the system. This “programming” also allows for the elimination of other option controllers:

- DRL module
- Weldon flasher
- Light monitor
- Child reminder
- Signal stat



Strobe Power Pac is still used

Controlling the Output – FET's

The Modules contains **FETs** (Field Effect Transistors).

FET is the switch / relay for the circuit. They connect the chassis power to the output, typically located in grounded side of circuit.

FETs are current load specific. Too much load will result in disconnecting / opening the circuit.

Larger loads are switched by Relays controlled by FETs.

Monitoring Driver Requests

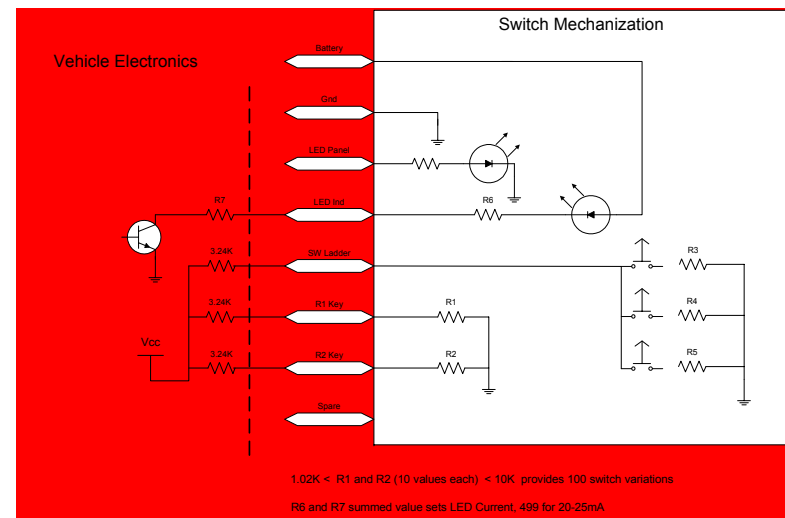


“Inputs”



Smart Switches

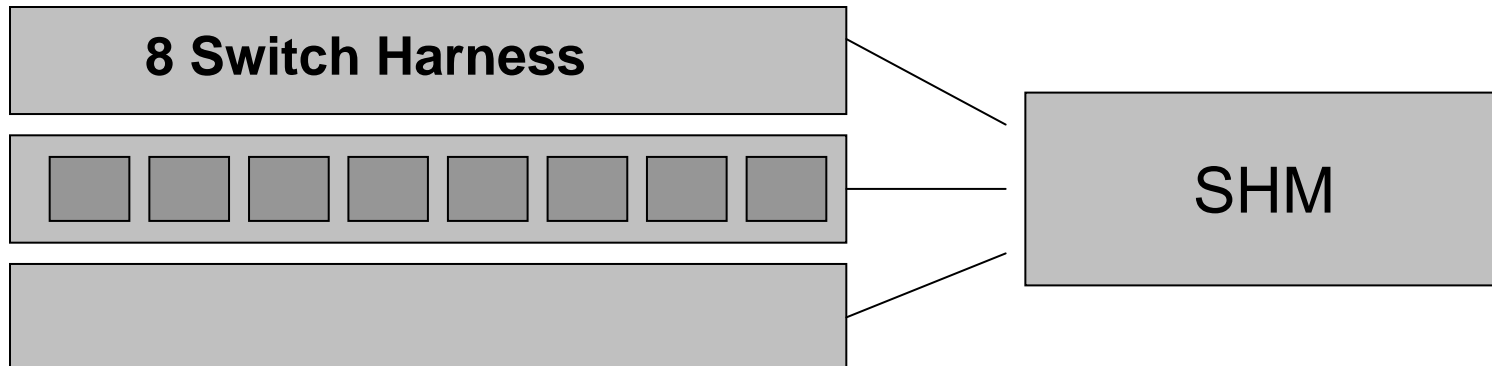
- Unique resistance ID
- Will operate in any position that is hard-wired to its monitoring module (Driver Panel or Dash)
- Operates like a sensor-changes in reference voltage



103524

Monitoring

Each switch **MUST** be found 8 times every second



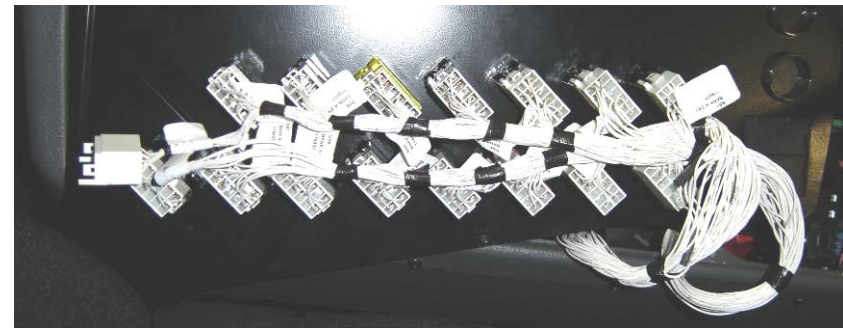
- Switch placement does not dictate circuit operation
- Not carrying consumer load

Electrical – Multiplex

- Driver Panel harnesses (3) are same part number
- 24 Switches to the SHM
- 5 Switches to the BHM (Dash)



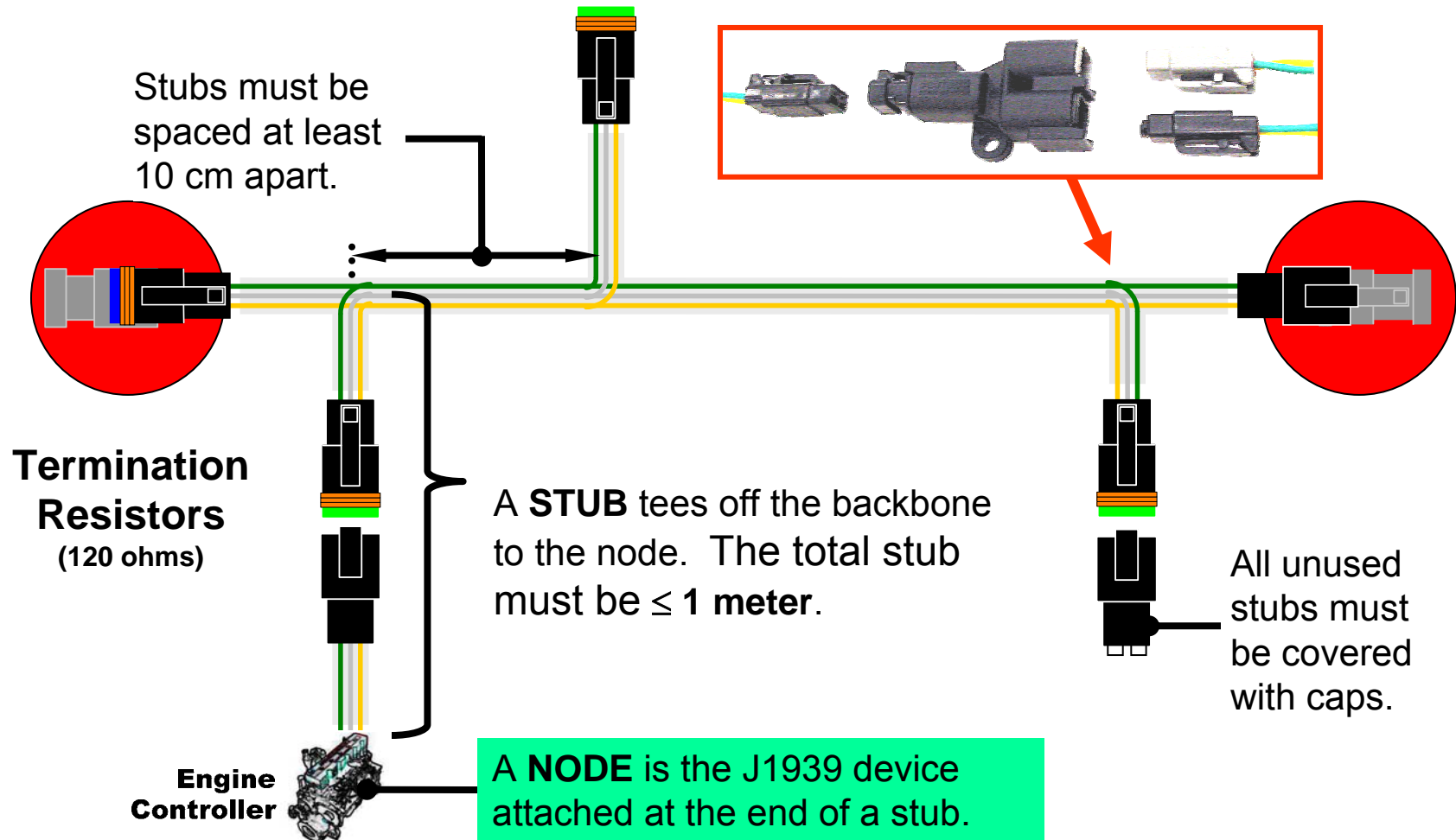
Panel Blank



Panel must be removed to
change switches

Electrical – Multiplex

The J1939 Backbone (Stubs and Nodes)



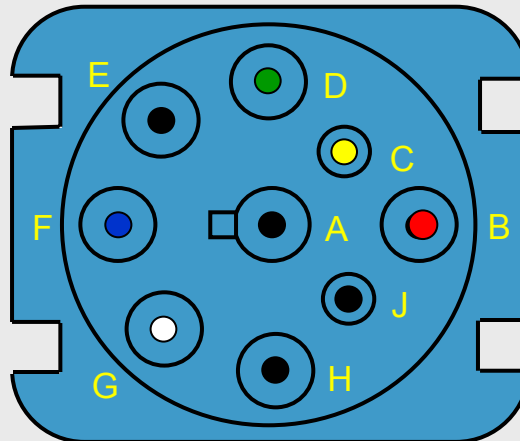
Electrical – Multiplex

- J1939 harness connecting all Modules
- Does not power a consumer / load

**Yellow and
Green wires**



J1939-13 Service Connector



A = Ground

B = +12 Volt (**Unswitched**)

C = **J1939 High** (Yellow)

D = **J1939 Low** (Green)

E = **J1939 Shield**

F = J1587 + (typ. Blue)

G = J1587 – (typ. White)

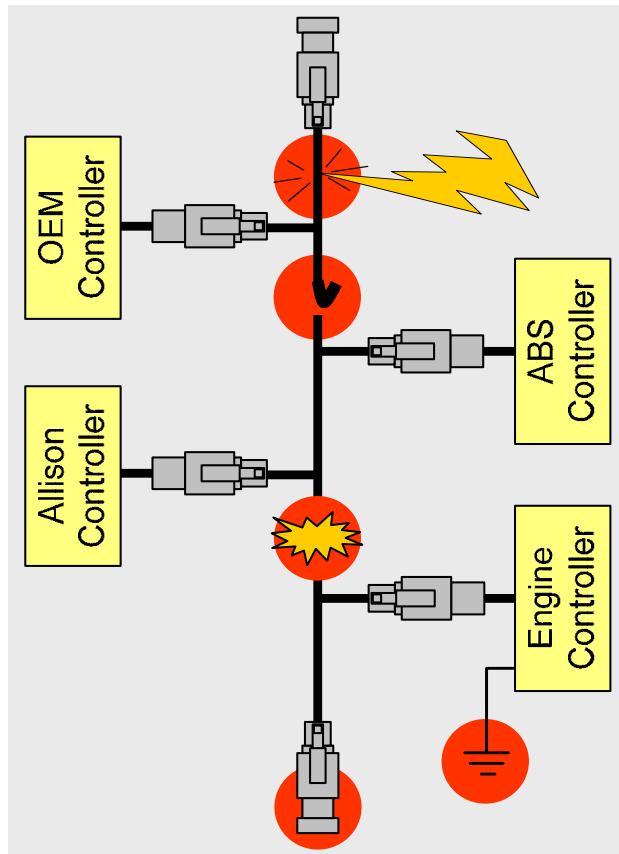
H = Diagnostic CAN +

J = Diagnostic CAN -



12 volt pin is an **UNSWITCHED** supply. Some component controllers require cycling of the ignition switch during the reflash or reprogramming process. If service tool power is lost during a key switch cycle, the controller being programmed may 'lock up'!

Wiring-Related Failures



Potential situations:

- **OPEN CIRCUITS** Green or Yellow wires or both, in the backbone or in a stub
- **SHORT CIRCUITS** Green or Yellow wires to battery, ground, or each other
- **INDUCTED NOISE**
- **GROUND SHIFTS** between controllers
- **TERMINATION RESISTORS** missing or incorrectly positioned

What Can a Multi-Meter Do?

OHMMETERS have several uses:

- ✓ TERMINATION RESISTANCE – **With all controllers powered off**, it will read $\sim 60\Omega$ across Green & Yellow wires of the backbone if two 120Ω resistors are present. (pins C & D on the diagnostic connector)
- ✓ **How do we power off all controllers??**
- ✓ Okay to test with controllers connected to the backbone; their impedance is *much* higher than 60Ω ; reading not affected.
- ✓ CONTINUITY TESTS can be used to detect and track down open- or short-circuits in the backbone or stubs.



What Can a Multi-Meter Do?

VOLTMETERS can show datalink activity, but...

- ✘ Can't tell if the activity is happening *correctly*. Datalink voltages change *extremely* fast, causing readings to float.
- ✘ It takes a more advanced service tool to interrogate the datalink - it takes a computer to talk to a computer.
- ✘ However.....at the Diagnostic Connector
 - ✘ Pin C to Ground ~ 2.5 to 3.5 volts
 - ✘ Pin D to Ground ~ 1.5 to 2.5 volts
 - ✘ At least you can verify that there are no shorts!



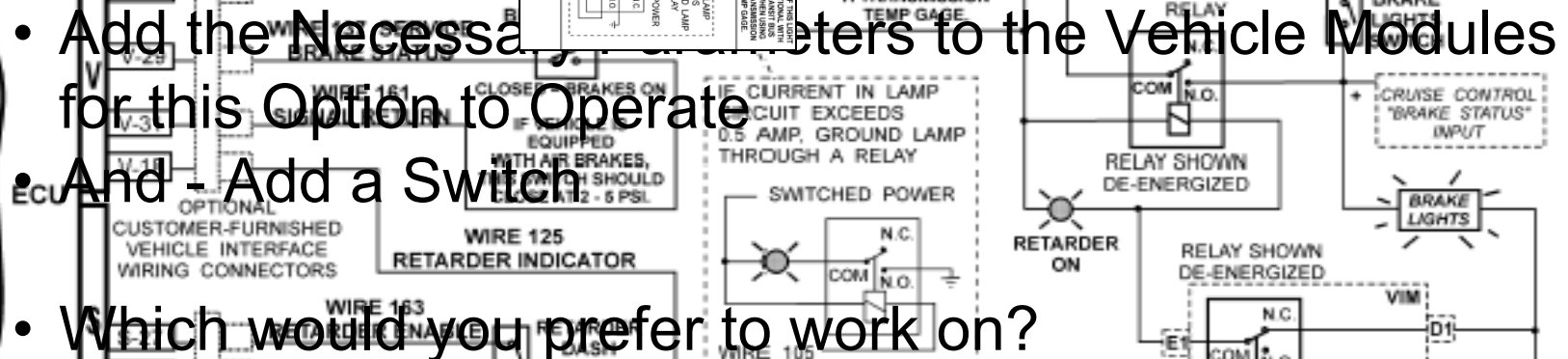
Parameter Problems



- Instances where parameters problems arise:
 - ✗ At Freightliner (building) or Thomas Buses (modifying).
 - ✗ At the Dealer (components replaced or updated).
- If a function worked **before something was updated**, either a customer-programmable value has been changed, a new one added, or something in the new software functions differently.

Some Other Parameter Issues

- Function not set up for J1939
- 'Transmission Type', engine governor
- J1939 not activated

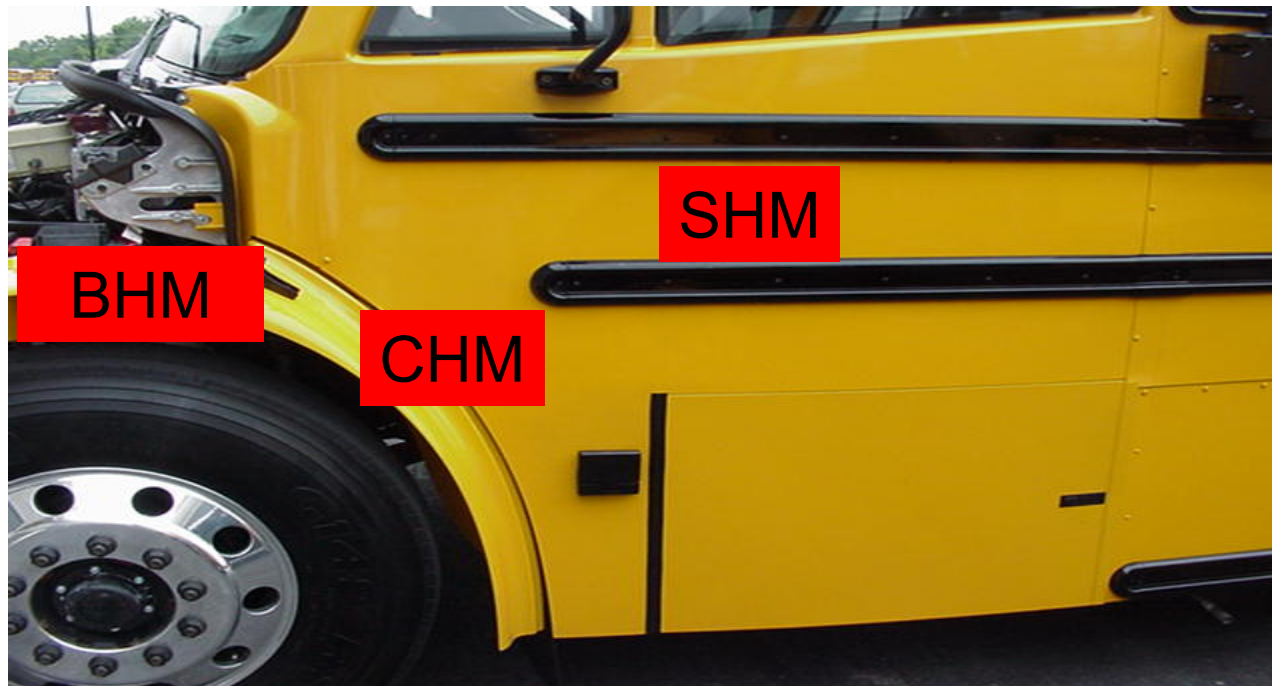




Electrical 3

Primary Components

Electrical Multiplex Components

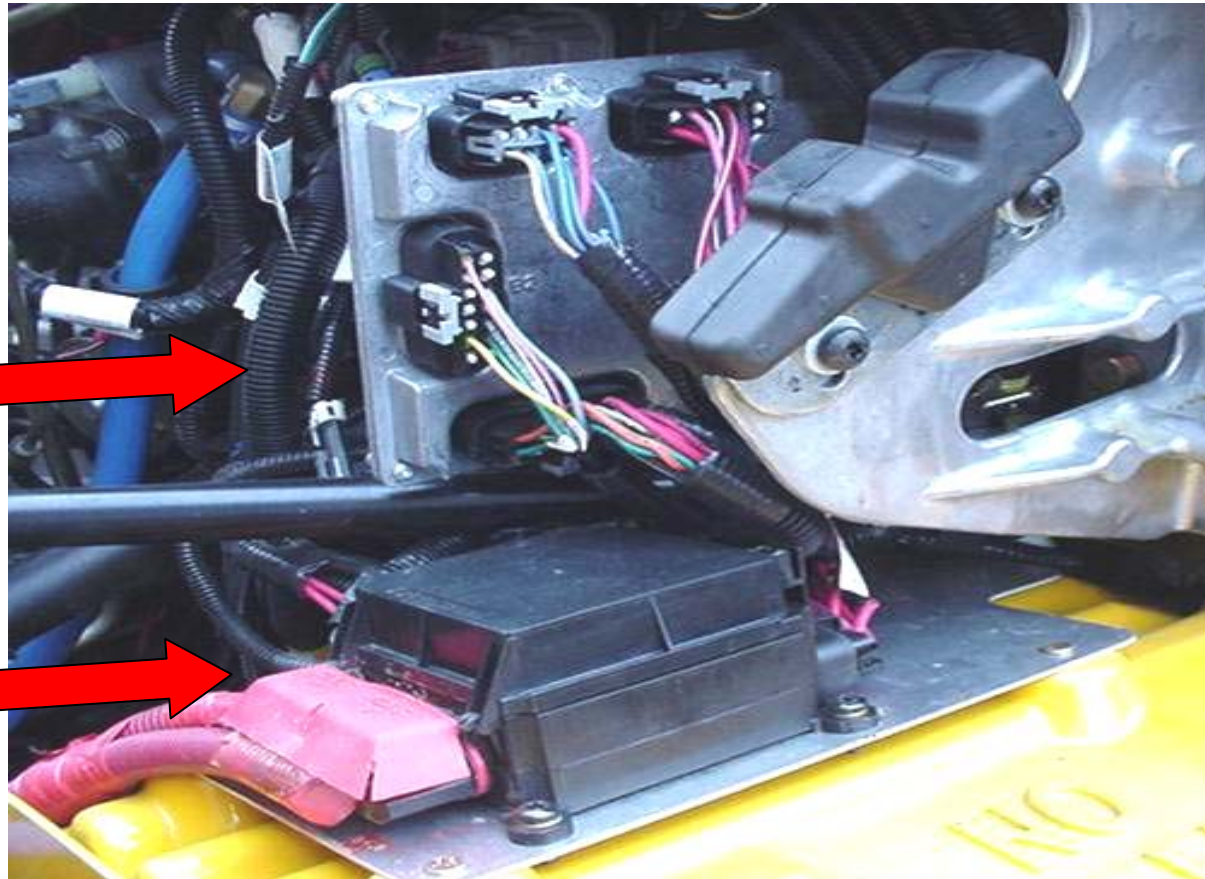


- Three primary modules are required on all C2's
- Additional modules are required as necessary

Electrical Multiplex Components

Bulkhead Module
BHM

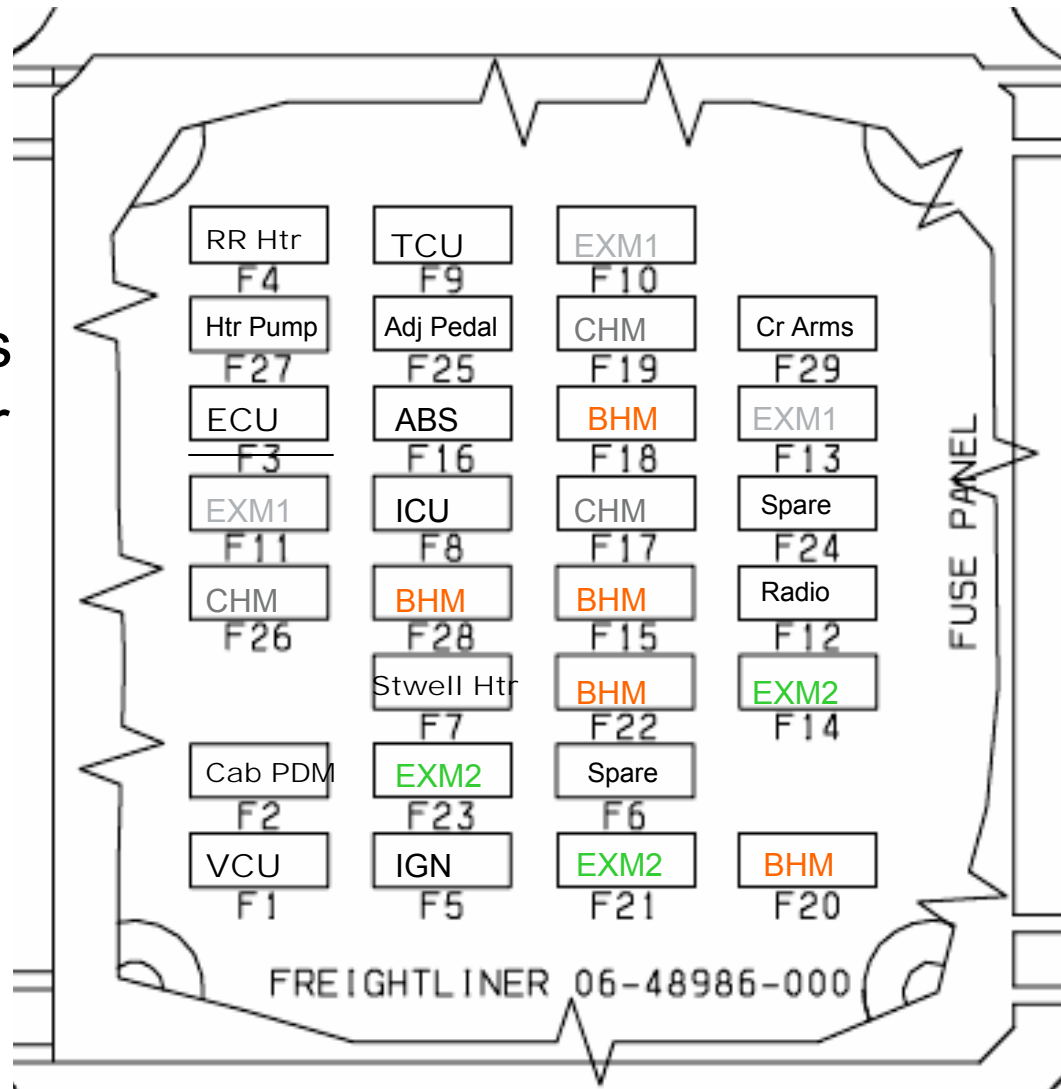
Power Dist. Module
"Chassis" **PDM**



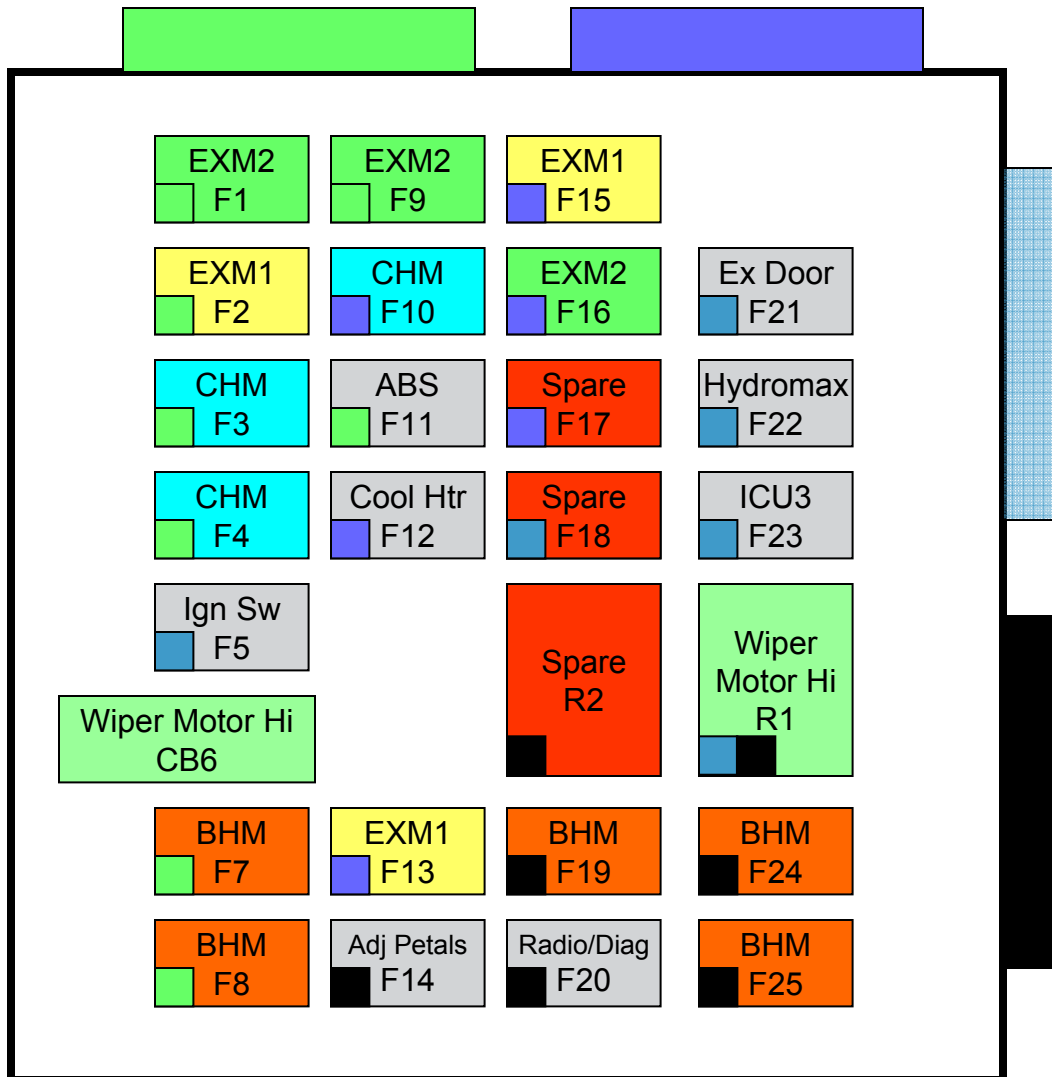
Electrical Multiplex Components

Chassis PDM has
Multiple Inputs for
each Chassis
Mounted Module

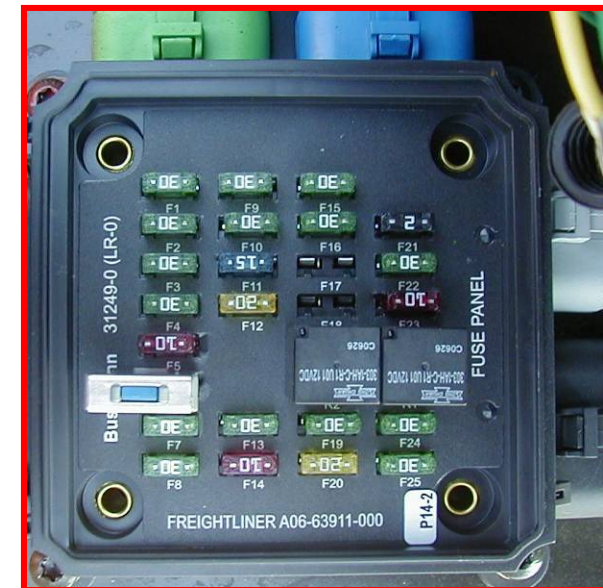
Prior to '07 Engines



Electrical Multiplex Components



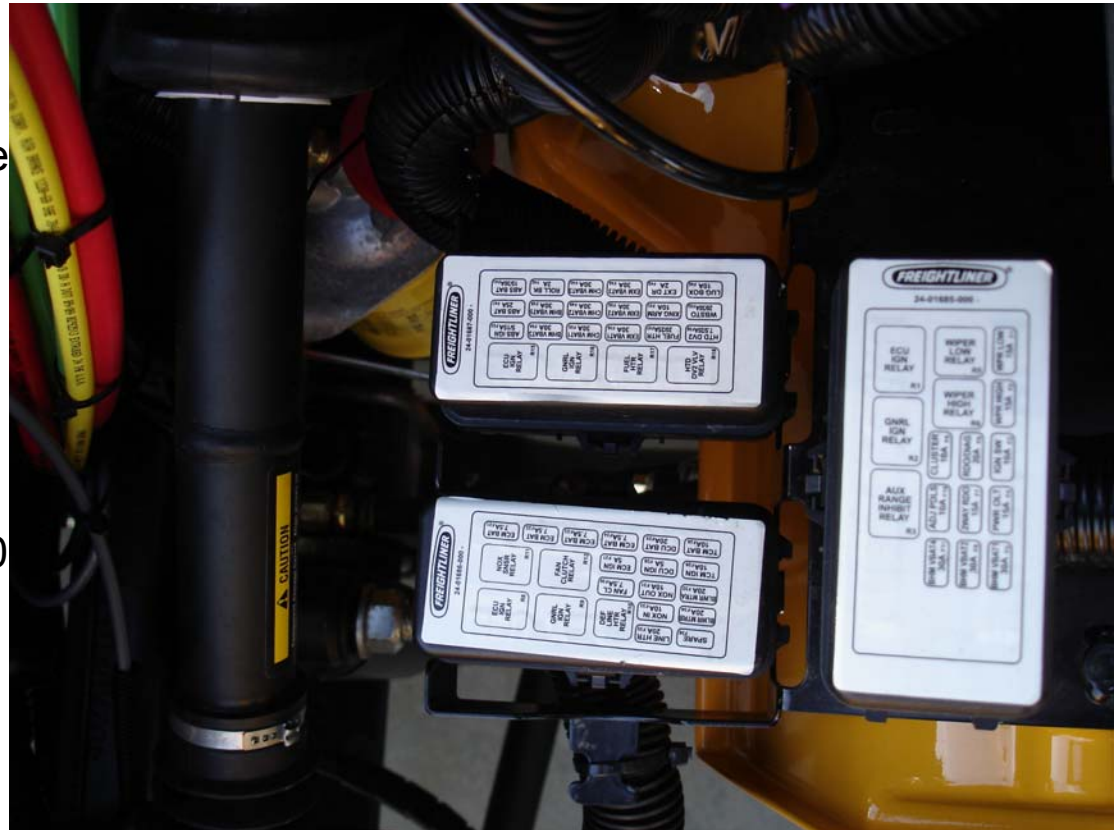
'07 Chassis PDM



G06-63504 A06-63911

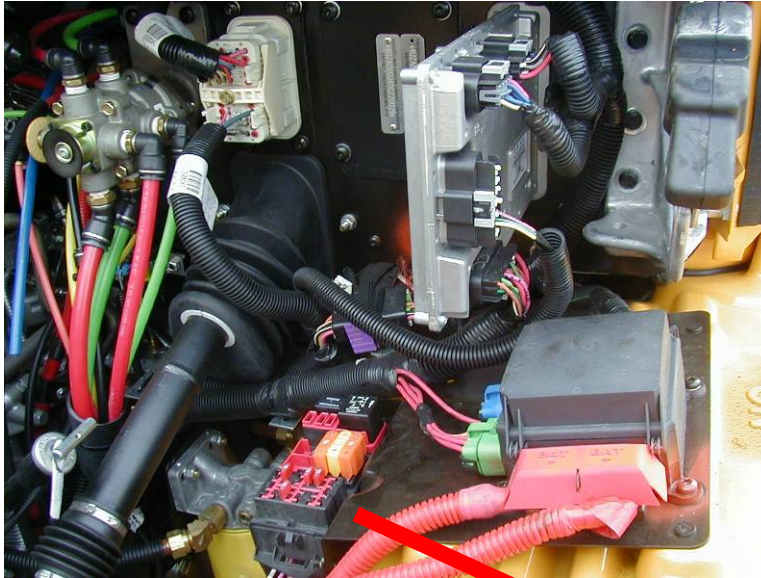
2010 Fender PDM change

- Now use FRC Fuse Relay Centers
- IP-67 rated which means they are dust proof and water proof to 3 feet
- Can be grouped for ease of troubleshooting
- Standard tools used to work on
- Same product as on Type D 2010

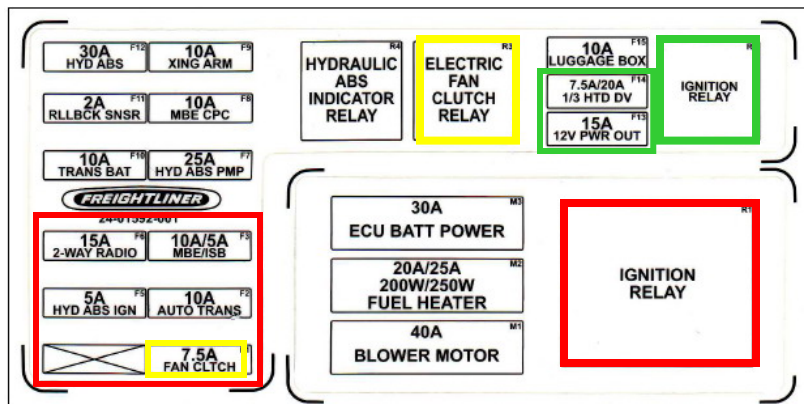


G0673427 Drawing

Electrical Multiplex Components

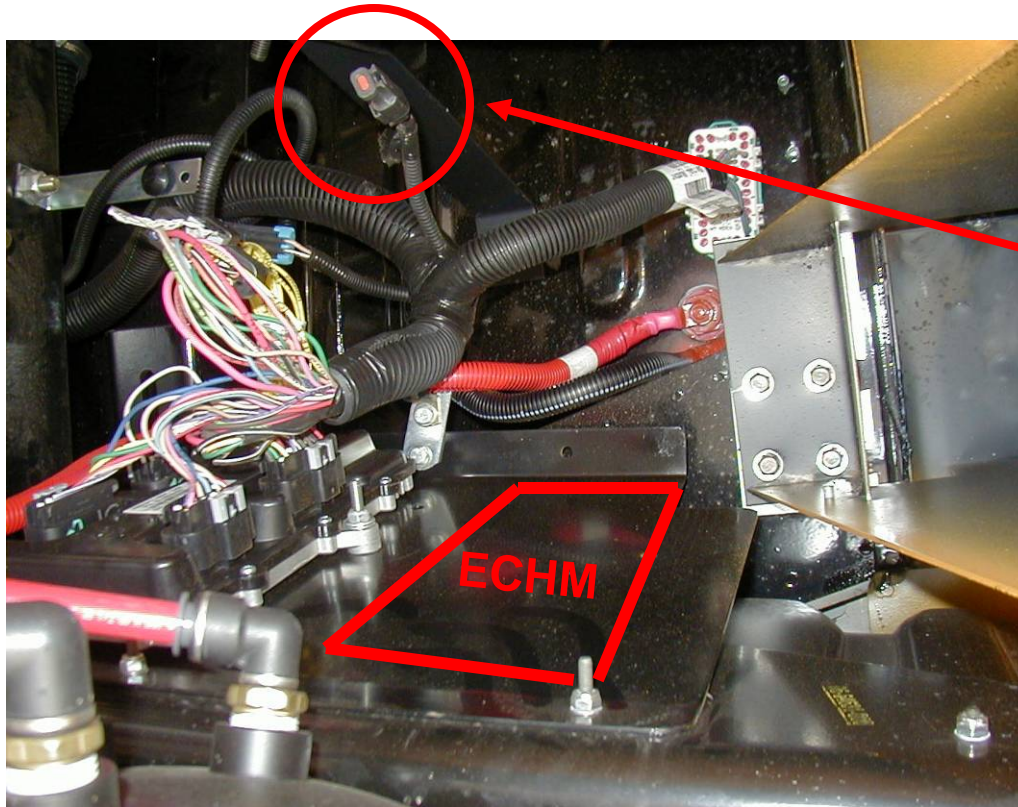


Power Dist. Module
“Engine” **PDM**



(24-01592-001)

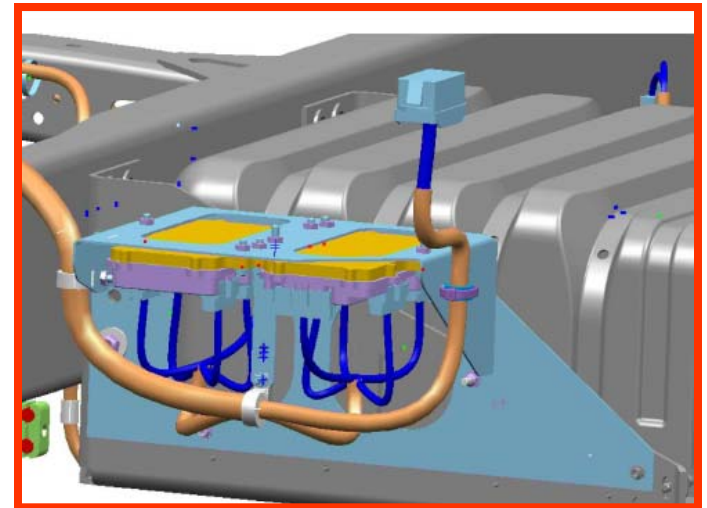
Electrical Multiplex Components



Termination Resistor

Chassis Module **CHM**

Expansion Module **ECHM**



Electrical Multiplex Components

Instrument Cluster Unit
ICU3

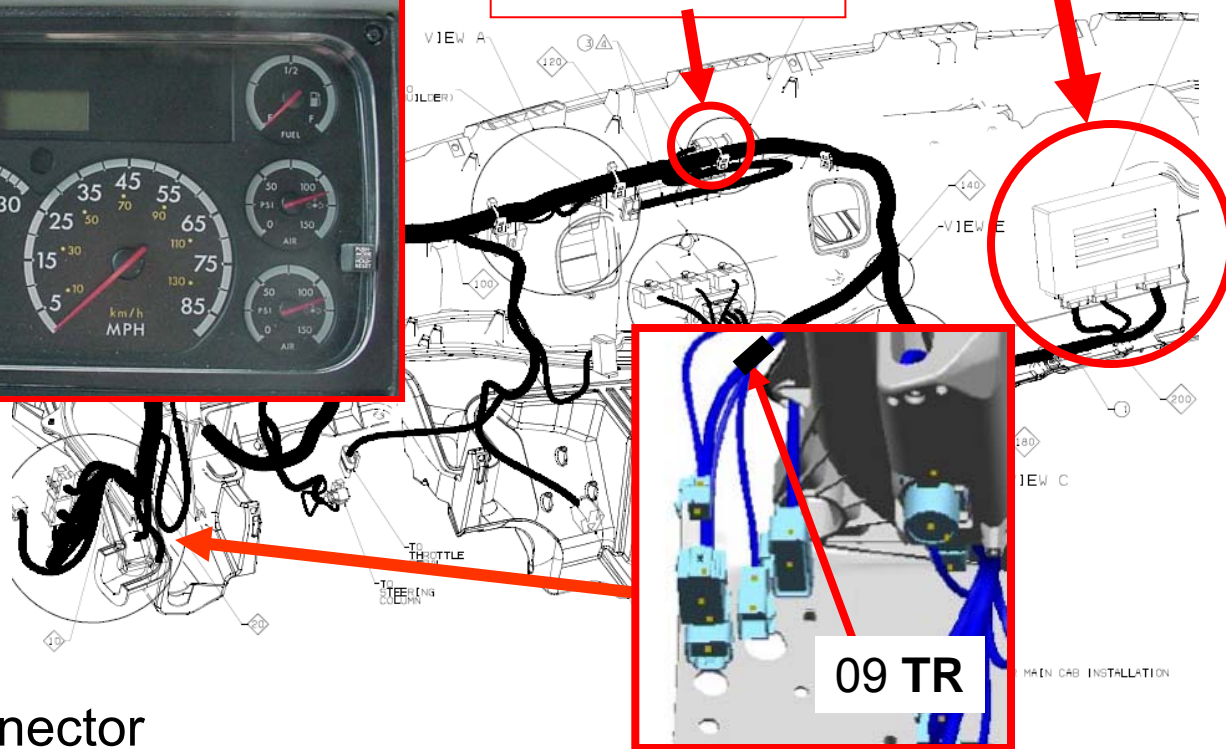


Diagnostic Connector



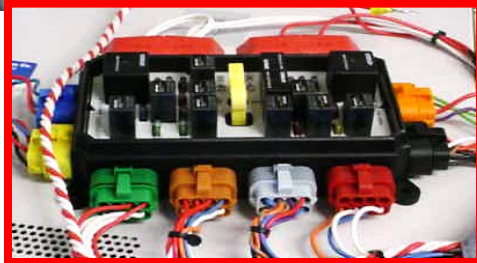
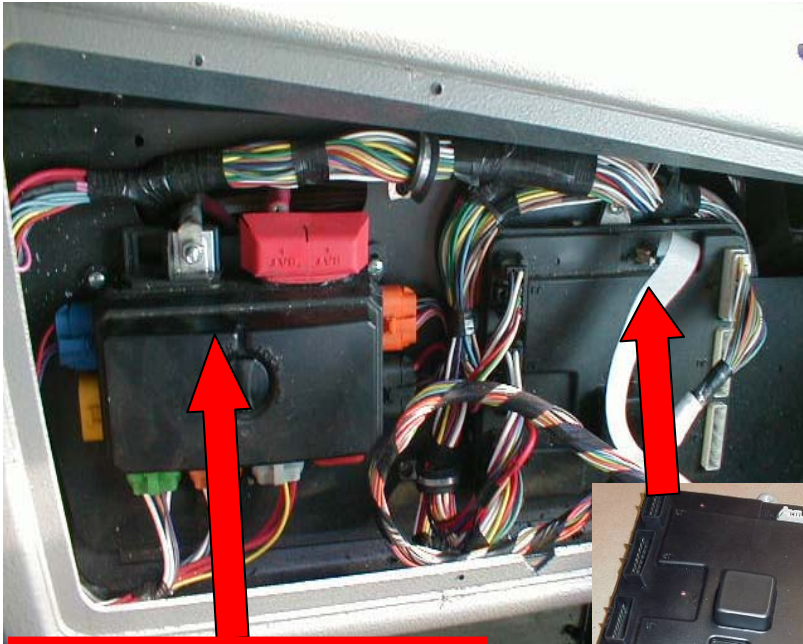
Termination
Resister - **TR**

Mercedes
Central Powertrain Controller
MBE CPC



D06-65779

Electrical Multiplex Components



“Smart Switches”

Switch Hub Module - **SHM**

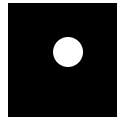
Cab Power Distribution Module
“**Cab**” **PDM**

Electrical Multiplex Components

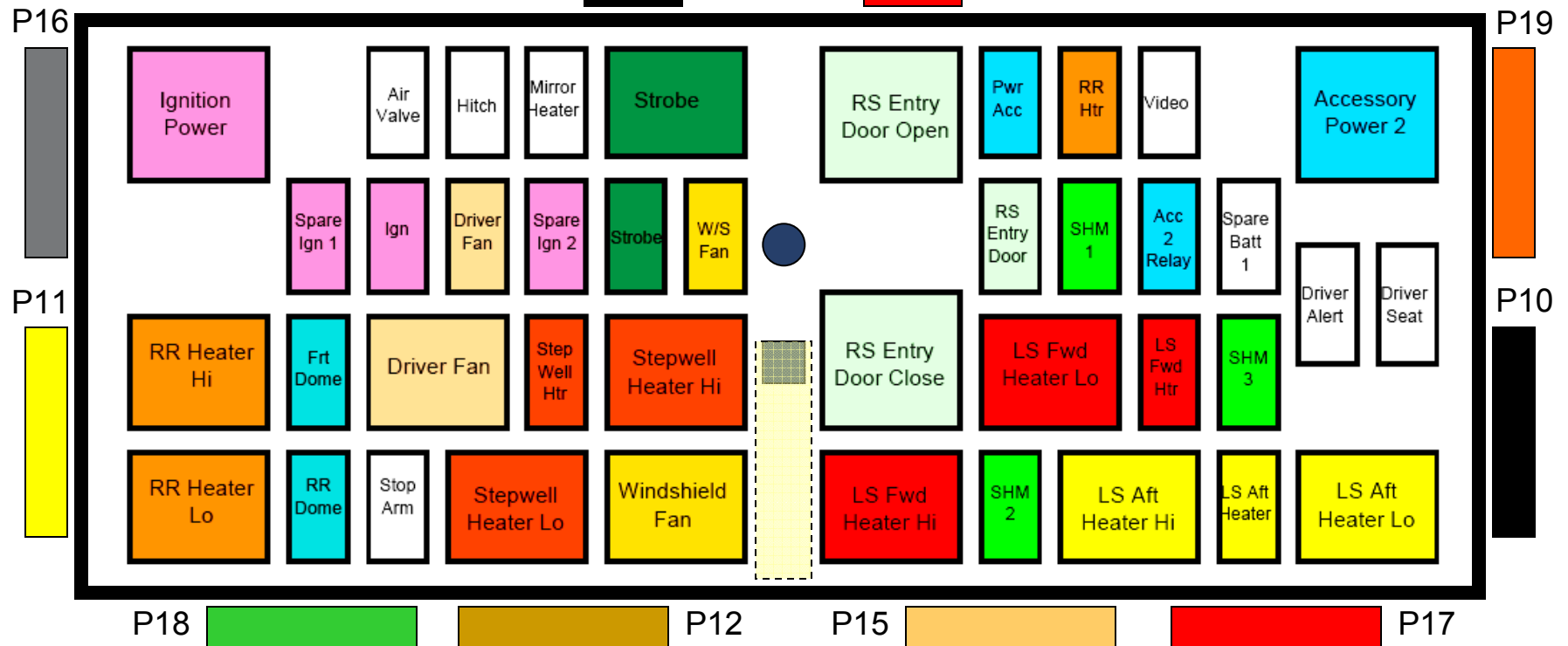
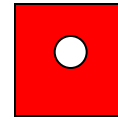


07 "Cab" PDM

BAT -



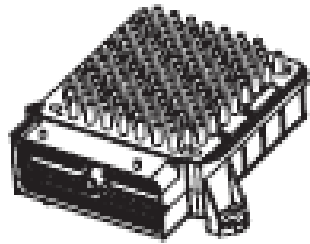
BAT +



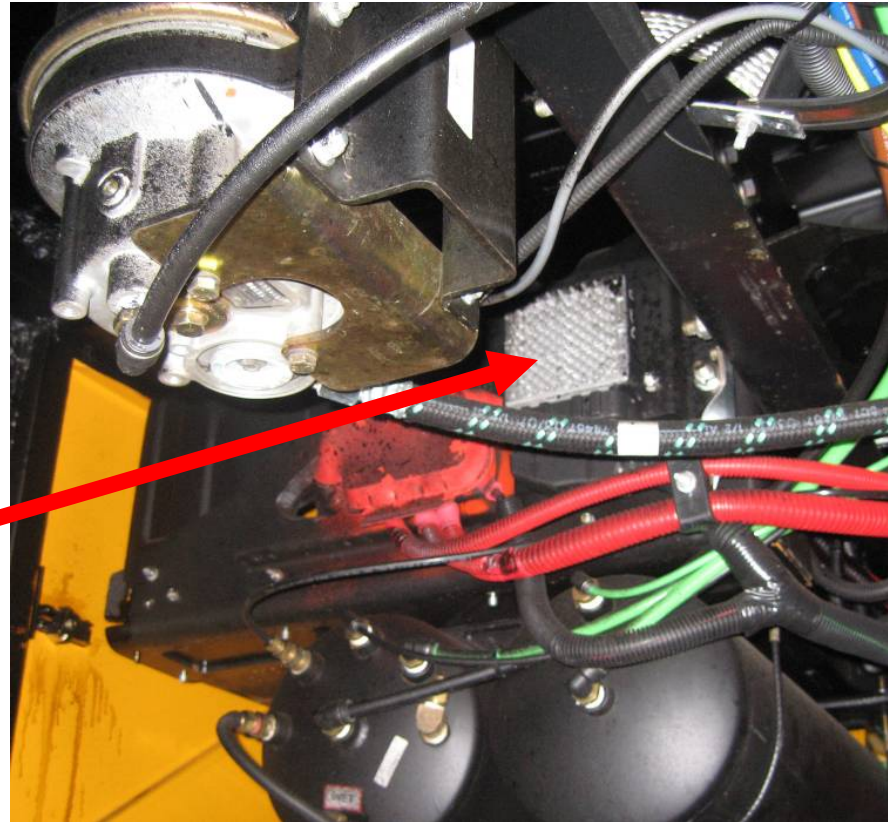
Electrical Multiplex Components



Mega Fuse Junction Block

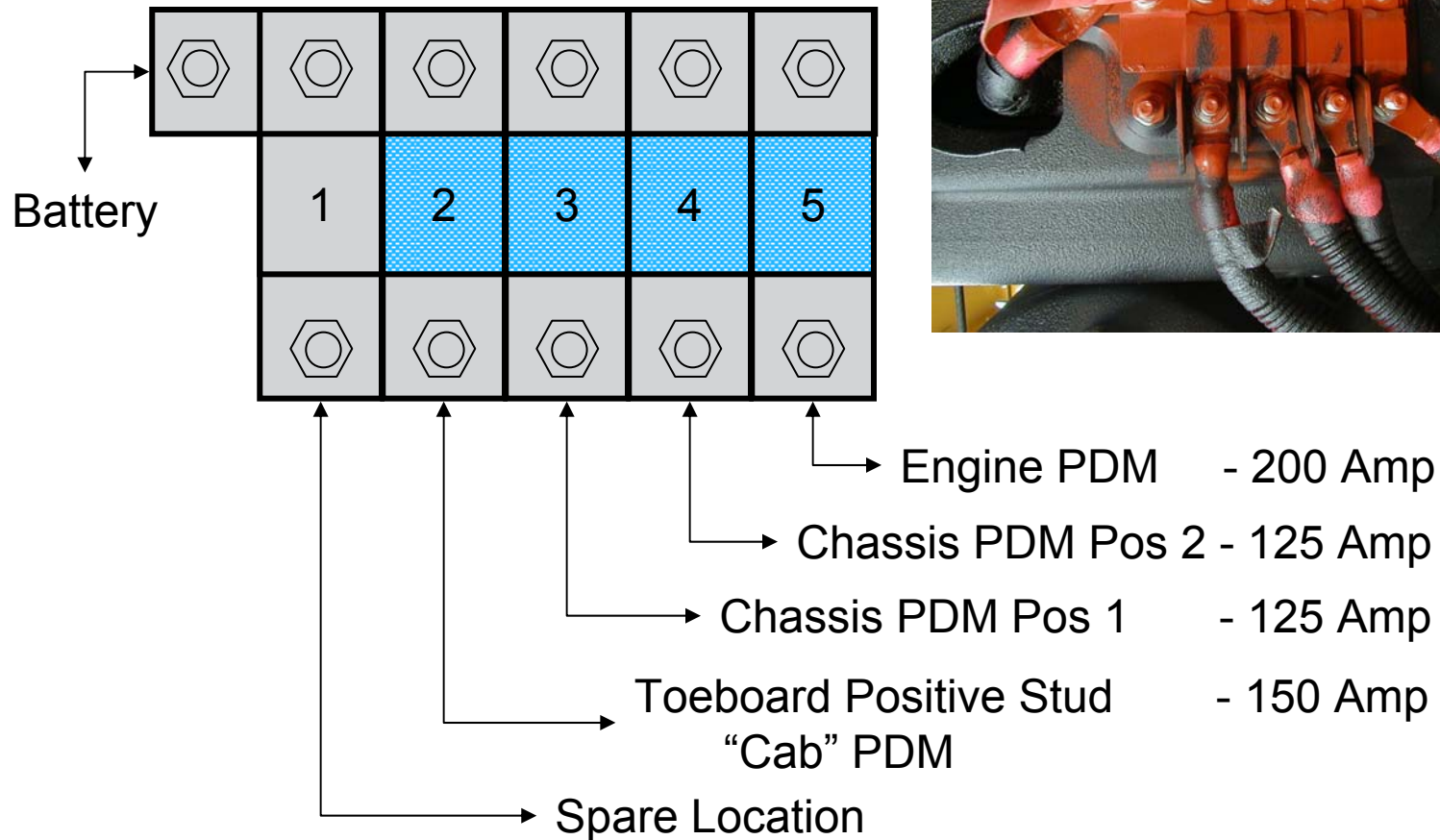


Transmission Control Module
TCM



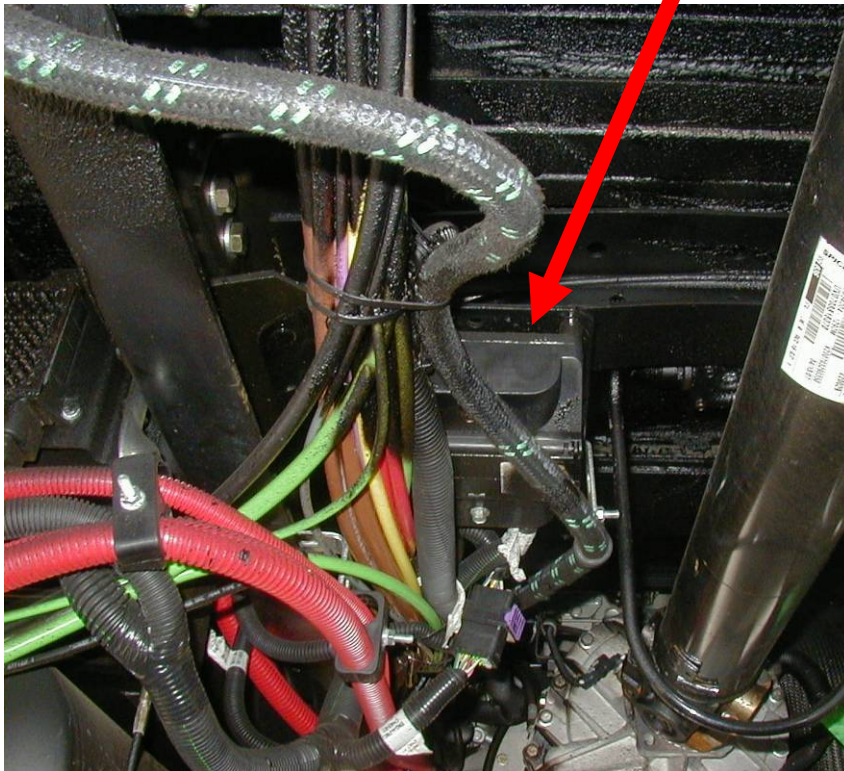
Electrical Multiplex Components

Mega Fuse Junction Block

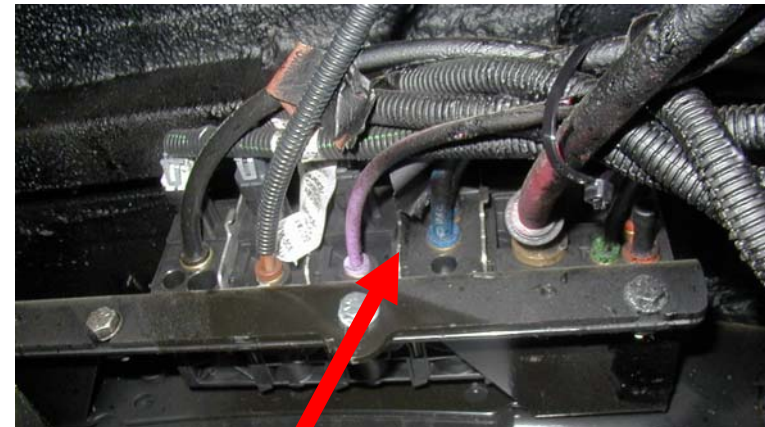


Electrical Multiplex Components

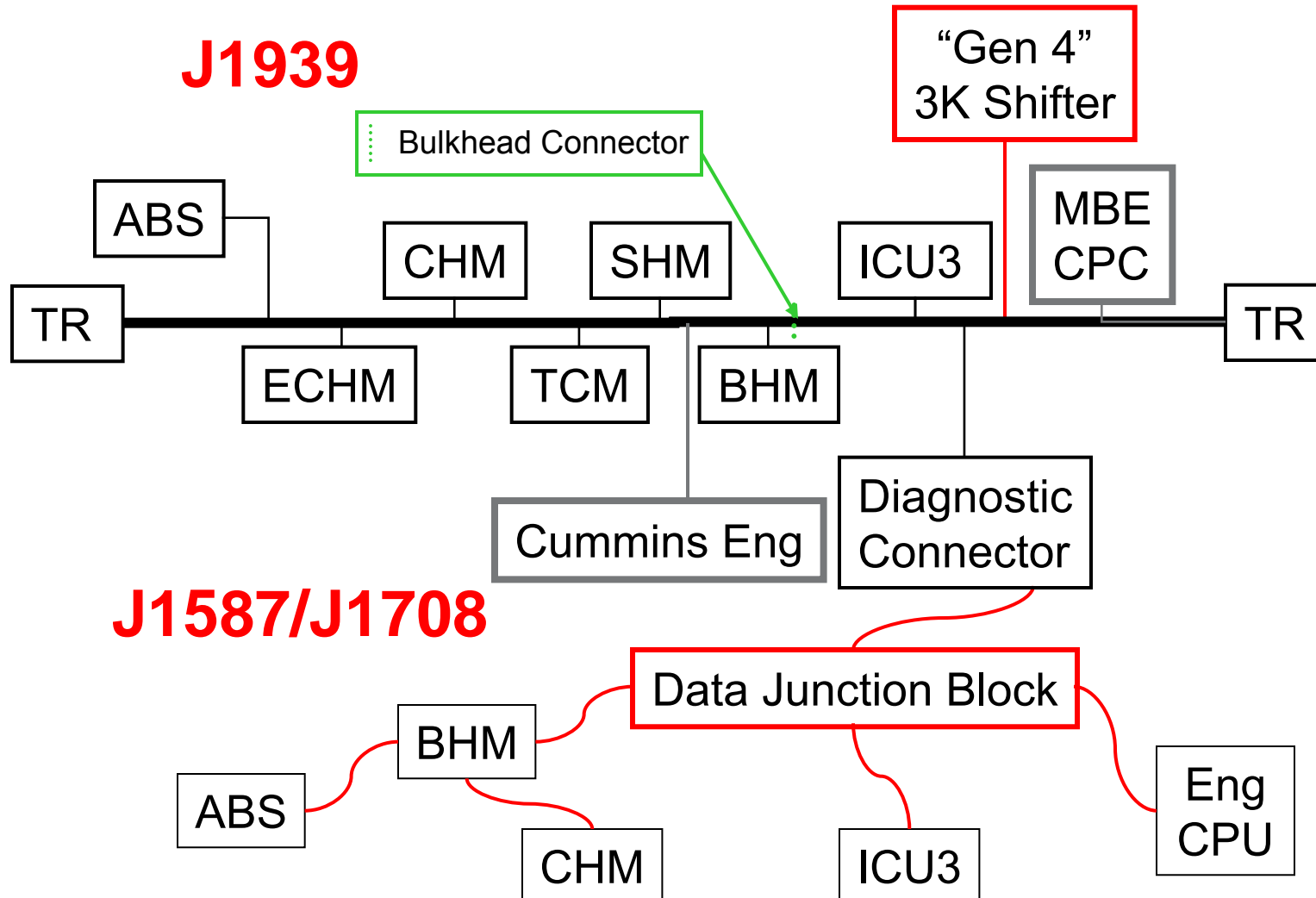
ABS Module



Air Management Unit - **AMU**

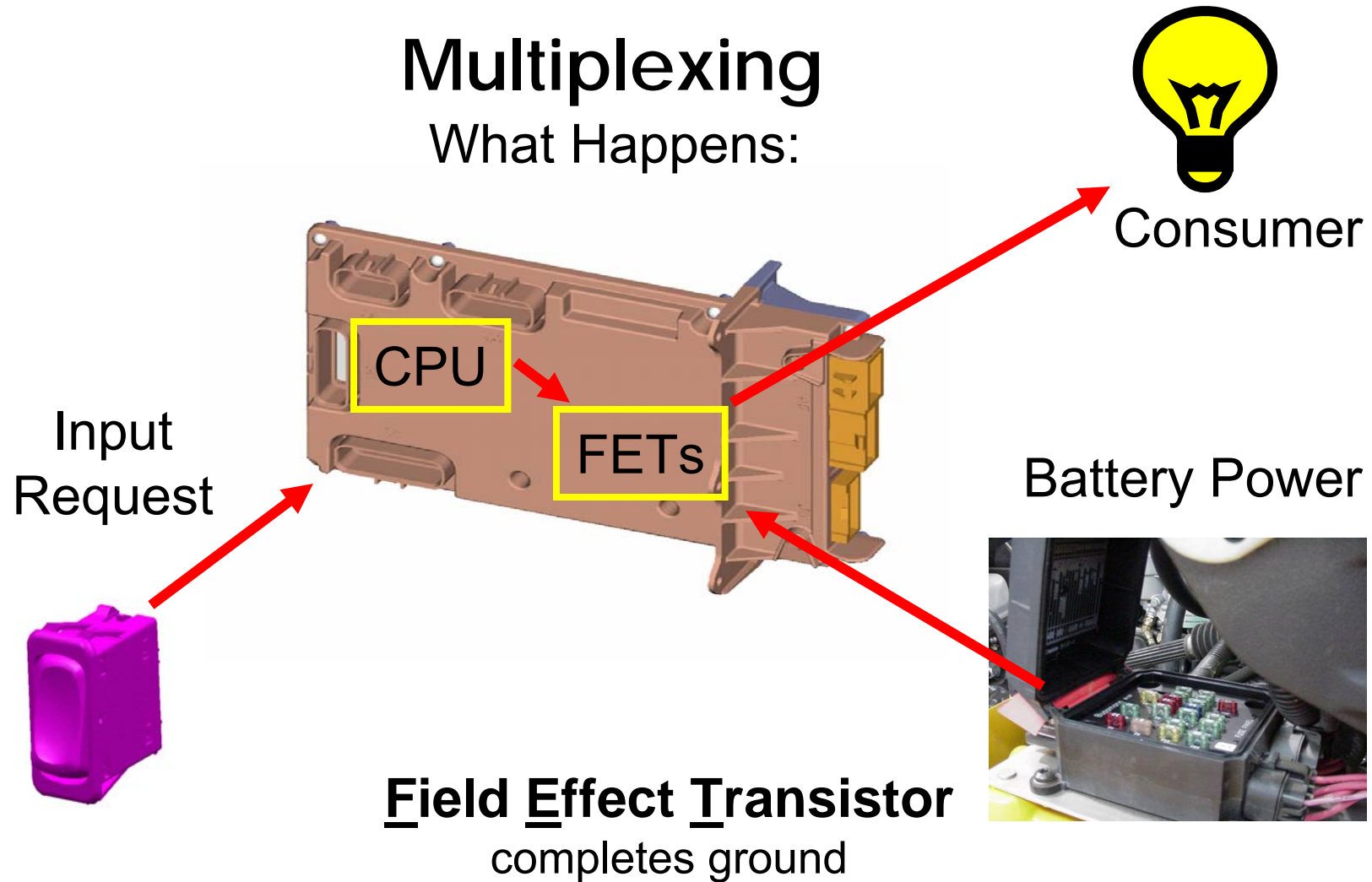


Electrical Multiplex Components



Multiplexing

What Happens:



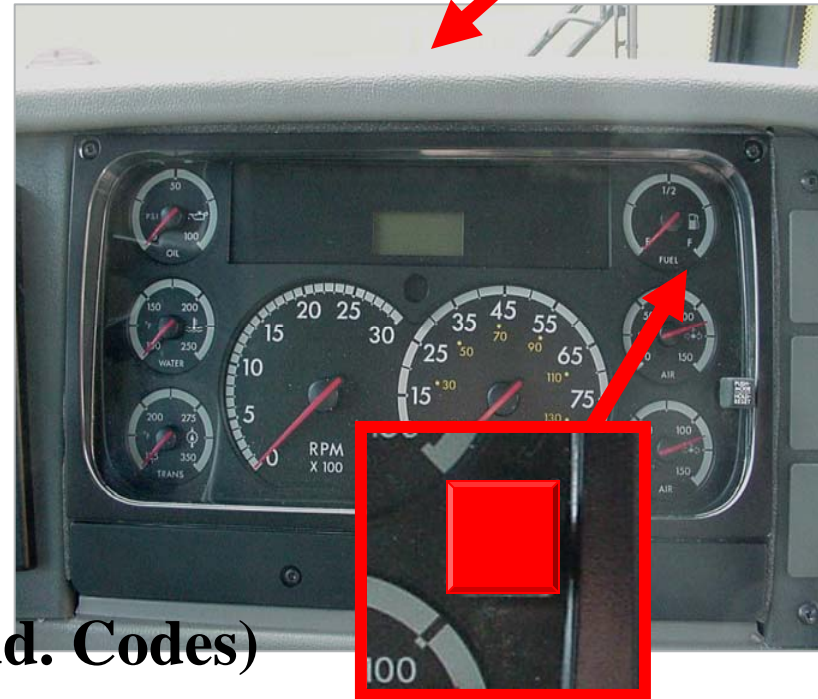
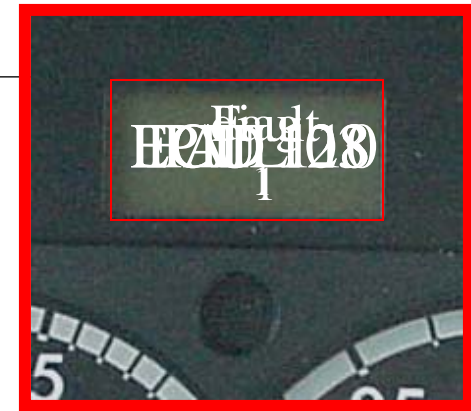


Electrical 3

Using the ICU Dash Diagnostics

Electrical – Dash

1. Set Park Brake
2. Turn Key to “ON”
3. LED Screen will Show MID #s of Active Fault Codes If Present
4. Push & Release Button to See “diag x” (x = # faults)
5. Push & Hold Button to See “Fault 1”
6. “P & R” Button for MID,PID/SID & FMI



(Repeat Steps 5 & 6 for Add. Codes)



Electrical – Dash

- This Example Code was: 128 110 03
 - MID 128 – Engine
 - PID 110 – Engine Coolant Temperature
 - FMI 03 – Sensor Voltage Above Normal
- The Engine Diagnostic Manual Defines this as:
 - Engine Coolant Temp Sensor – Open Circuit
(or)
 - The Sensor is Un-Plugged or Circuit Broken



Electrical – Dash

What are these numbers? 128 110 03

MID Which System is Having Problems

128 Engine System (Cat, Cummins, Mercedes)

PID/SID Which Part/Area Has the Problem

110 Engine Coolant Temperature

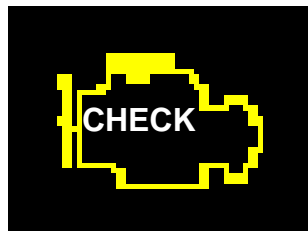
FMI Identifies the Component's Problem

03 Sensor Voltage Above Normal

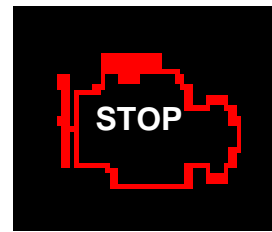
(SAE J1587)

Fault Codes

Stop Engine / Check Engine Lights



Amber Warning Lamp



Red Stop Lamp

Fault Lamps will illuminate when the engine is running or while driving when an Active fault is detected in the engine's electronic system.



- **Amber Warning Lamp (On)**
 - Most Sensor Faults
 - Engine is Operational
 - Continue to Use as Necessary

With a Derate in Horsepower

- Low Oil Pressure
- Coolant Temperature High
- Various EGR Codes



- Amber Warning Lamp (On)**
 - **Red Stop Lamp (On) & Derate**
 - Very High Coolant Temperature
 - Very Low Oil Pressure
 - Low Coolant Level



Electrical 3

Adding/Changing Options



Electrical – Options

Body-Electrical-Adding Options

First Questions: Is this option offered by TBB?

If No:

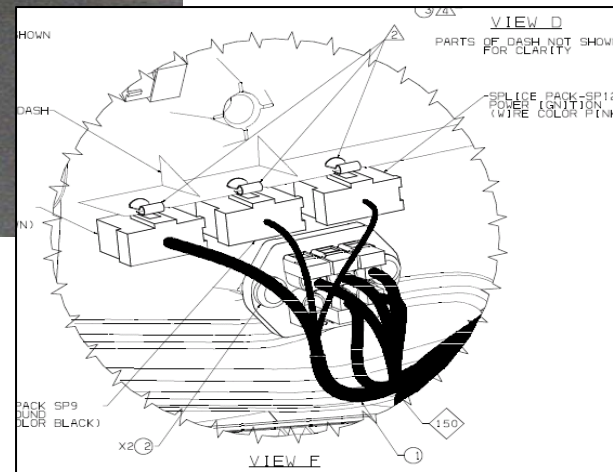
1. Is this to be installed in the inside or outside?
2. Does the option work on direct battery power or switched power?
3. How many AMPs are required?

Dash Mounted 10 AMP Consumer

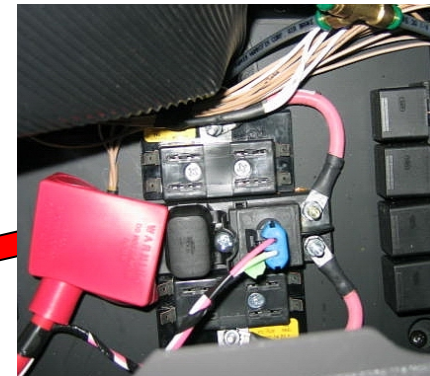
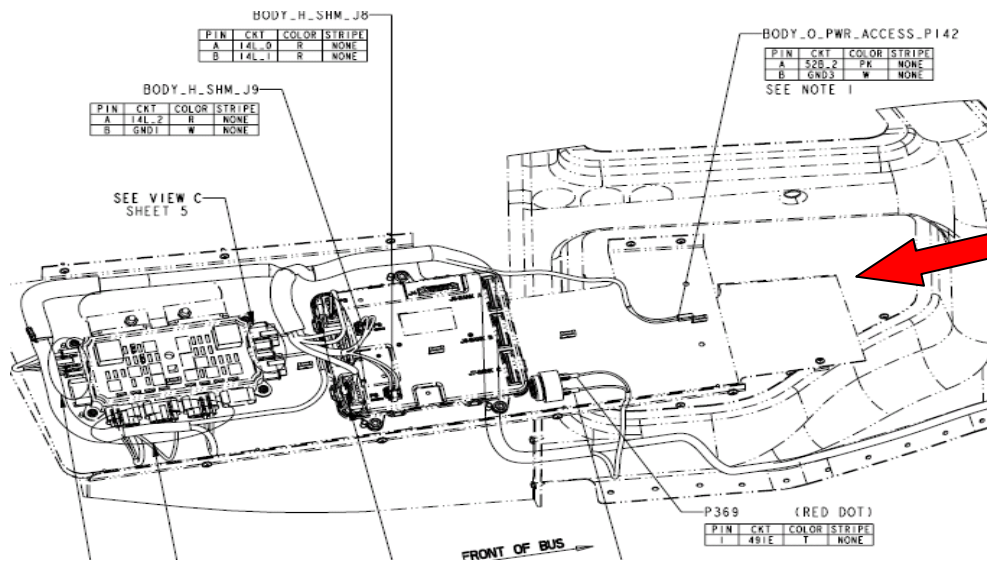


Prior to '07

- Switched Power
- Ground
- Illumination



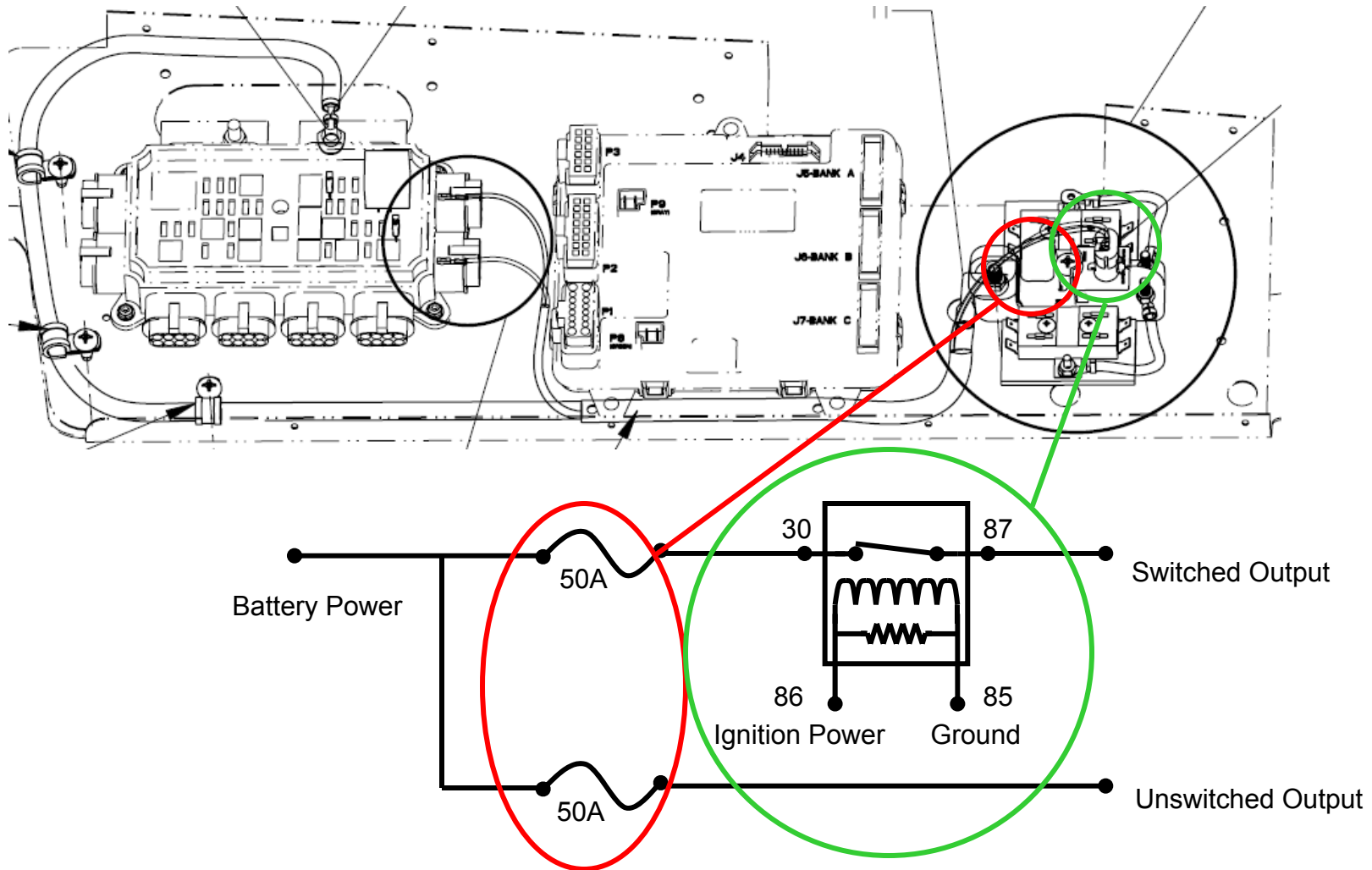
A06-47579 D06-49099



50 AMP Option Center

Under Switches at Driver's Left

Electrical – Options



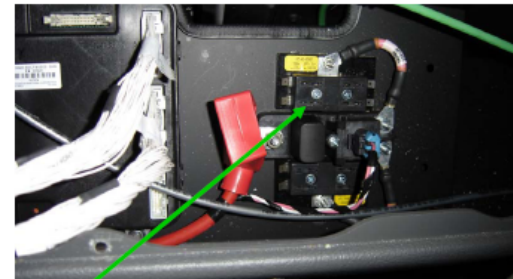
122132

122641

- Do Not Connect to Wires Randomly
- Over-current demand will result in immediate circuit shutdown
- Always Add Fuses to Protect Your Option

Before you Add Accessories !

This C2 is equipped with an accessory power supply module under the driver's left switch panel.



Fuses must be installed in the blocks before the lugs are energized. The upper 4 are ignition activated. The lower four are always activated.

Customer Notice



Electrical – Options

Body-Electrical-Adding Options

Could have ordered this option TBB factory installed?

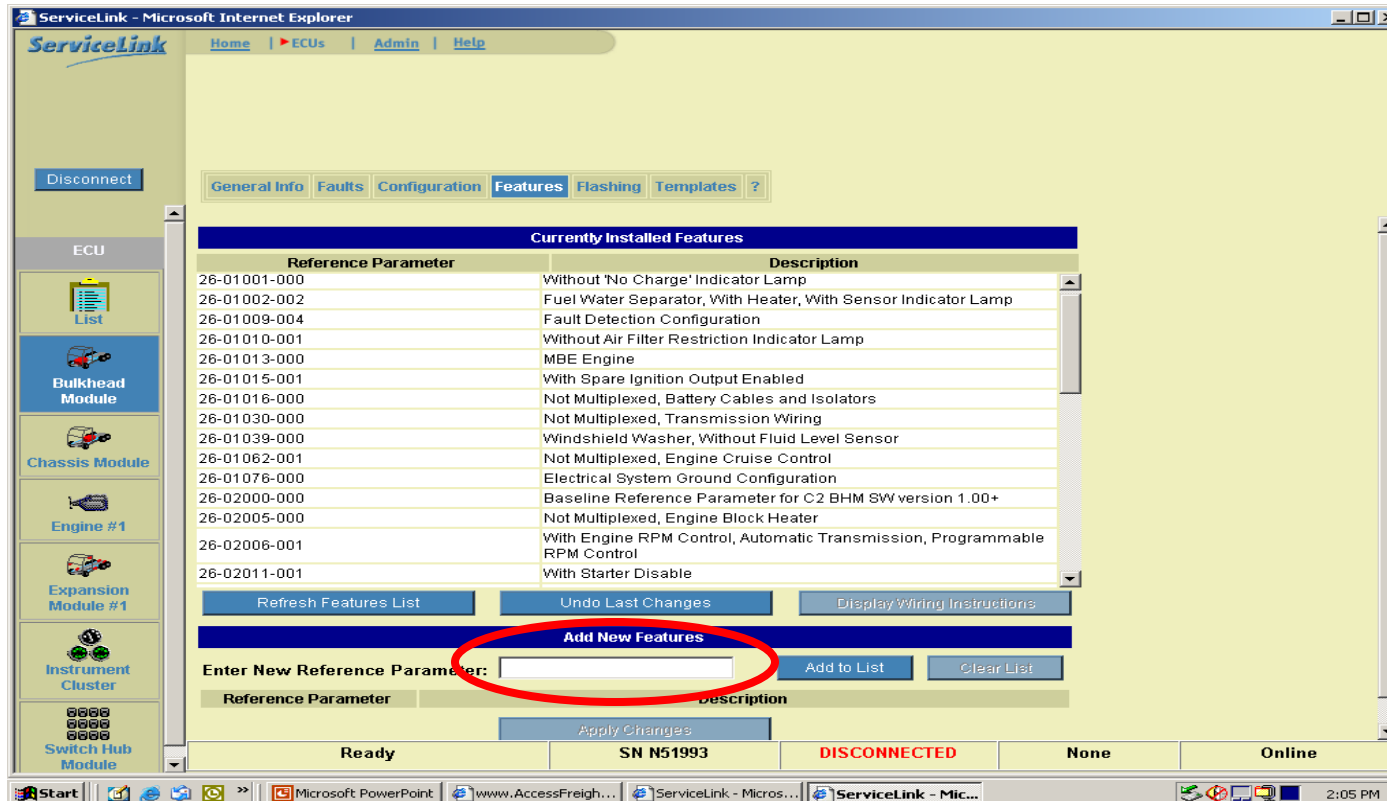
If YES

Process:

1. Contact your local Thomas dealer
2. We will then:
 1. Obtain the option number which describes what it contains and how it behaves
 2. Obtain option installation and schematic drawings
 3. Install all required parts
 4. Use ServiceLink to add/change feature

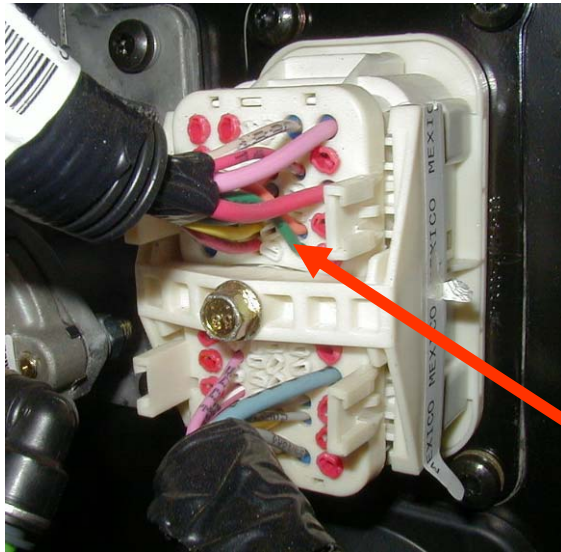
114530 Child Reminder 123101

Electrical – Options



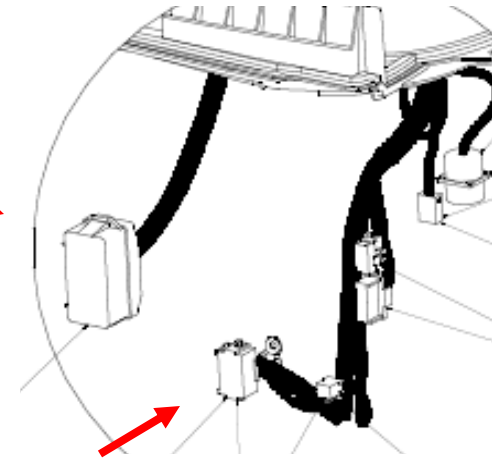
- Service Link is used to change option behavior
- Dealer must contact TBB for feature number

Electrical – Options

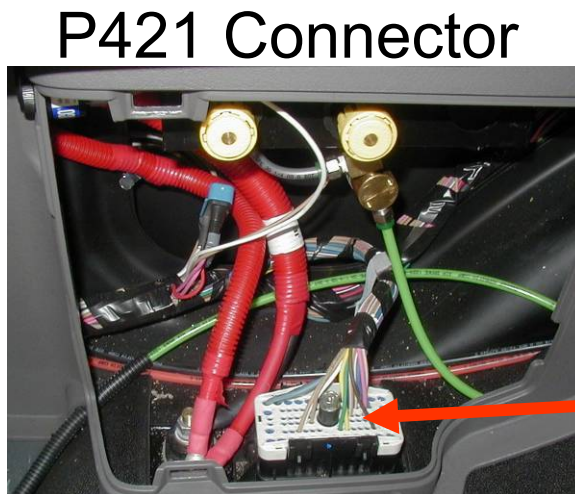


Bulkhead
Connector

Backbone Wires



P152 connector
(viewed from engine side)



P421 Connector

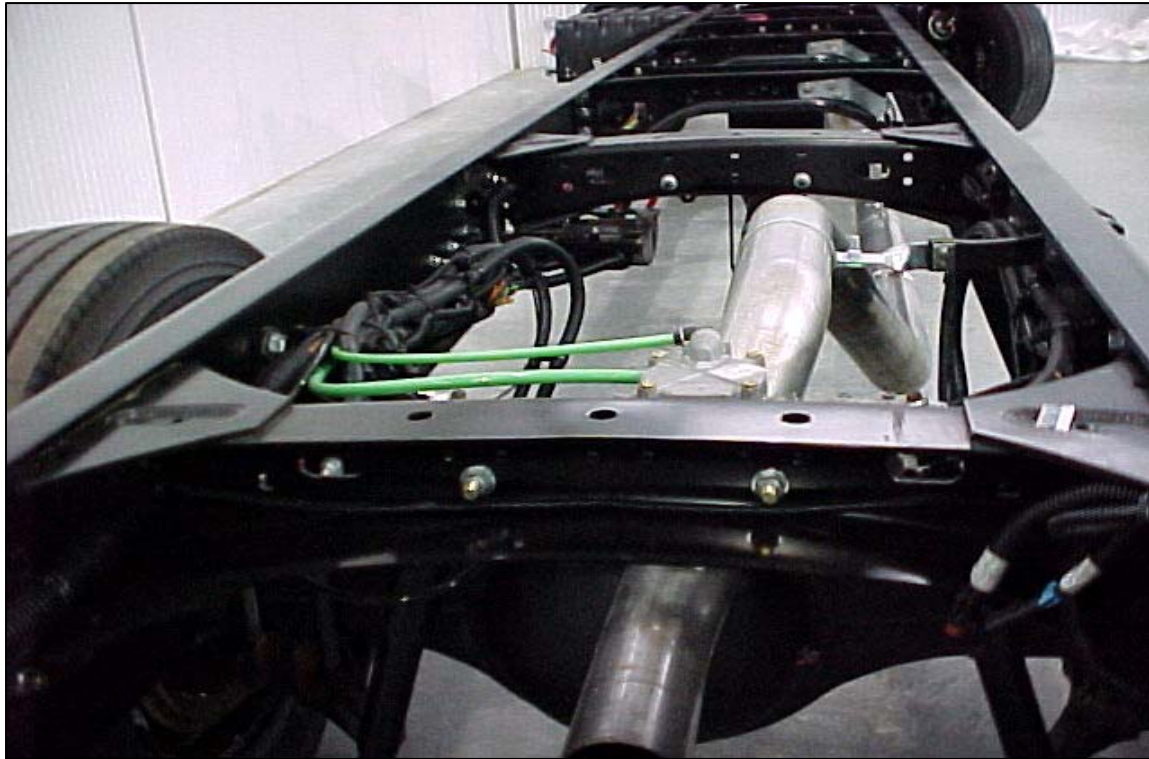
**Body Interface
Connectors**

D06-49938,9



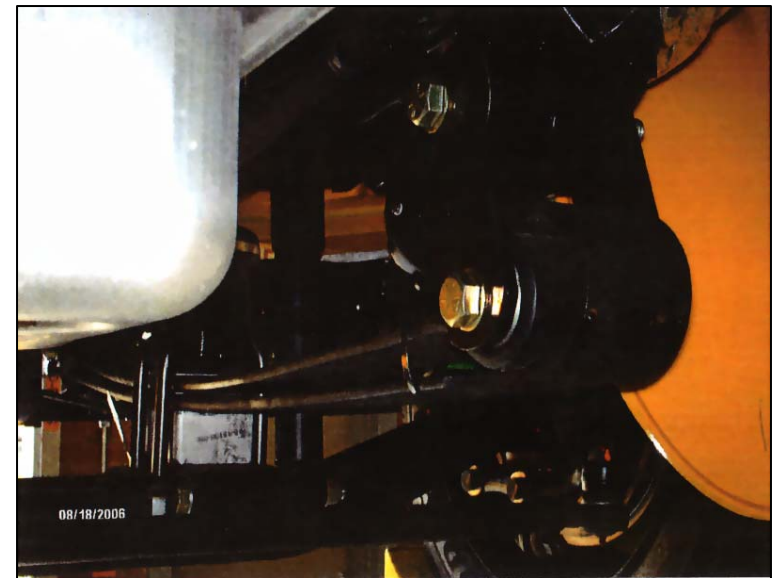
Chassis 4

Chassis – Cross Members



- 7 ½" x 33 ½"
- Stamped & fabricated
- Powder coated finish

- Std equipment with 7k suspension w/ 8k [Front Axle](#)
- 2 leaf taper leaf design with rear shackles provides lower spring rates
- Rubber bushings in spring eyes
- Improved ride characteristics
- [Rear Axle](#) available in 19k, 21k & 23k ratings
- 52" flat leaf design with radius leaf
- 2 stage spring that takes advantage of soft spring rate when bus is unloaded
- Spring rate increases as suspension is loaded



Chassis – Fuel Tank



- Between The Rails Fuel Tank
- 35, 60 & 100 gallon

Chassis – Battery Box



- Pull out access
- Chassis mounted

SBT 54-10 Battery Box Slides Replacement

VRLA Batteries

Valve-Regulated Lead-Acid “Gel” Batteries

- 100% Maintenance Free
- Sealed – Spill Proof/Leak Proof
- Faster Recharging
- Longer Life
- Eliminates:
 - Spills
 - Gassing
 - Terminal Corrosion
 - Checking Electrolyte Levels
- Std on all orders 10/8/08
- Requires a Regulated Charger
 - Regulated 14.4 to 14.6 DCV



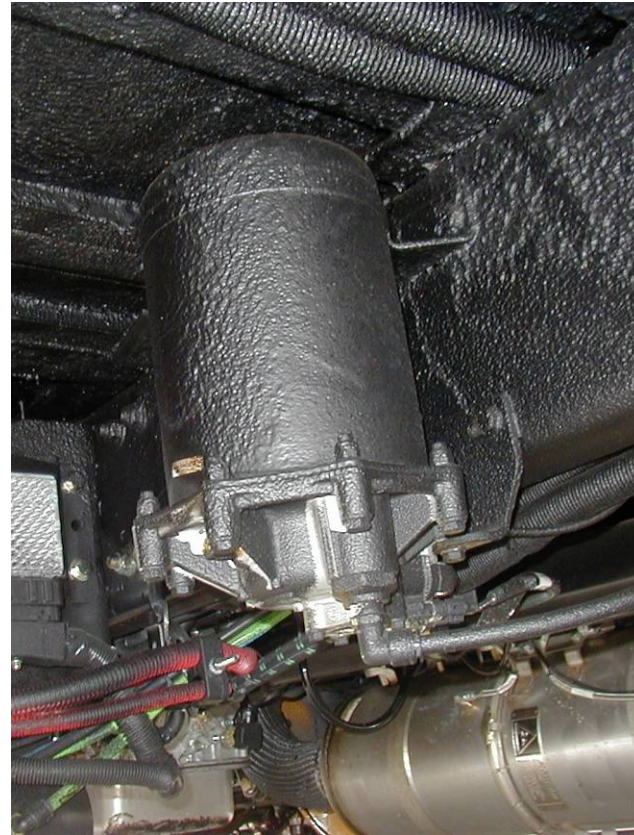
SBU 54-28

SBU 54-228

Chassis – Air Dryer

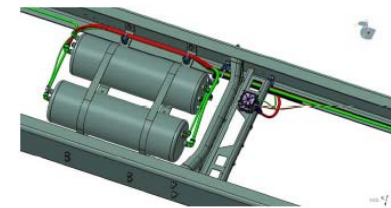
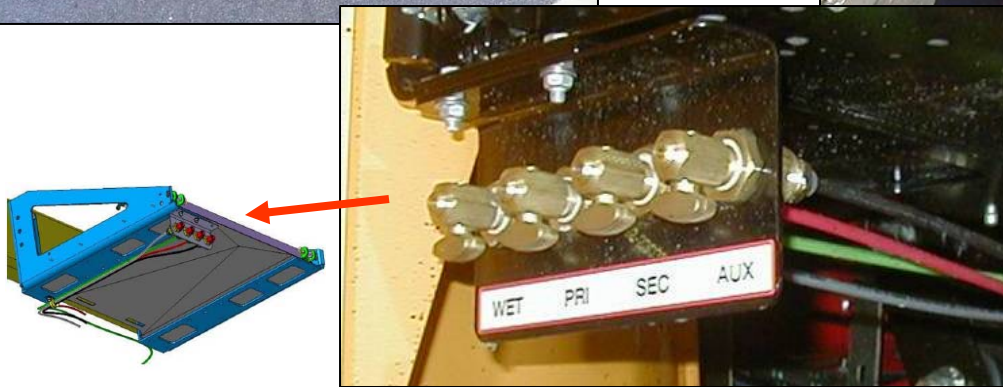
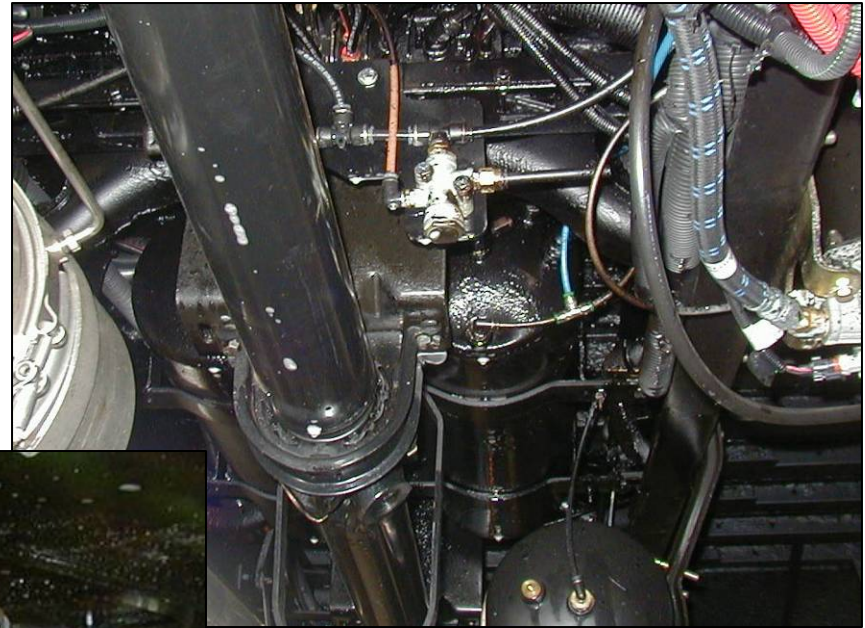
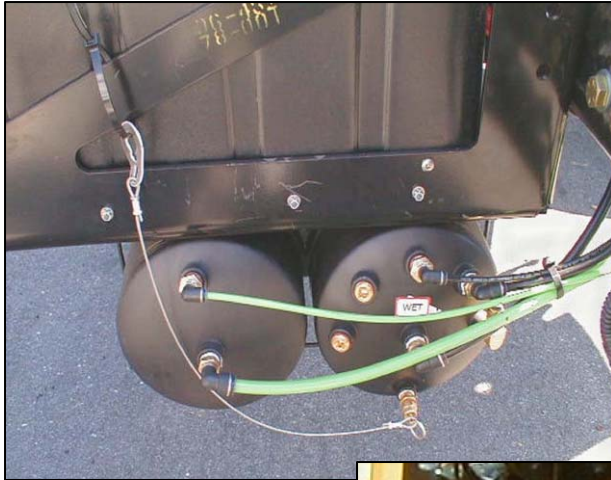


Prior to 2007



2007 Behind Battery Box

Chassis – Air Tanks



- Previously mounted beneath battery box
- Moved to between the frame rails - Q2 '09



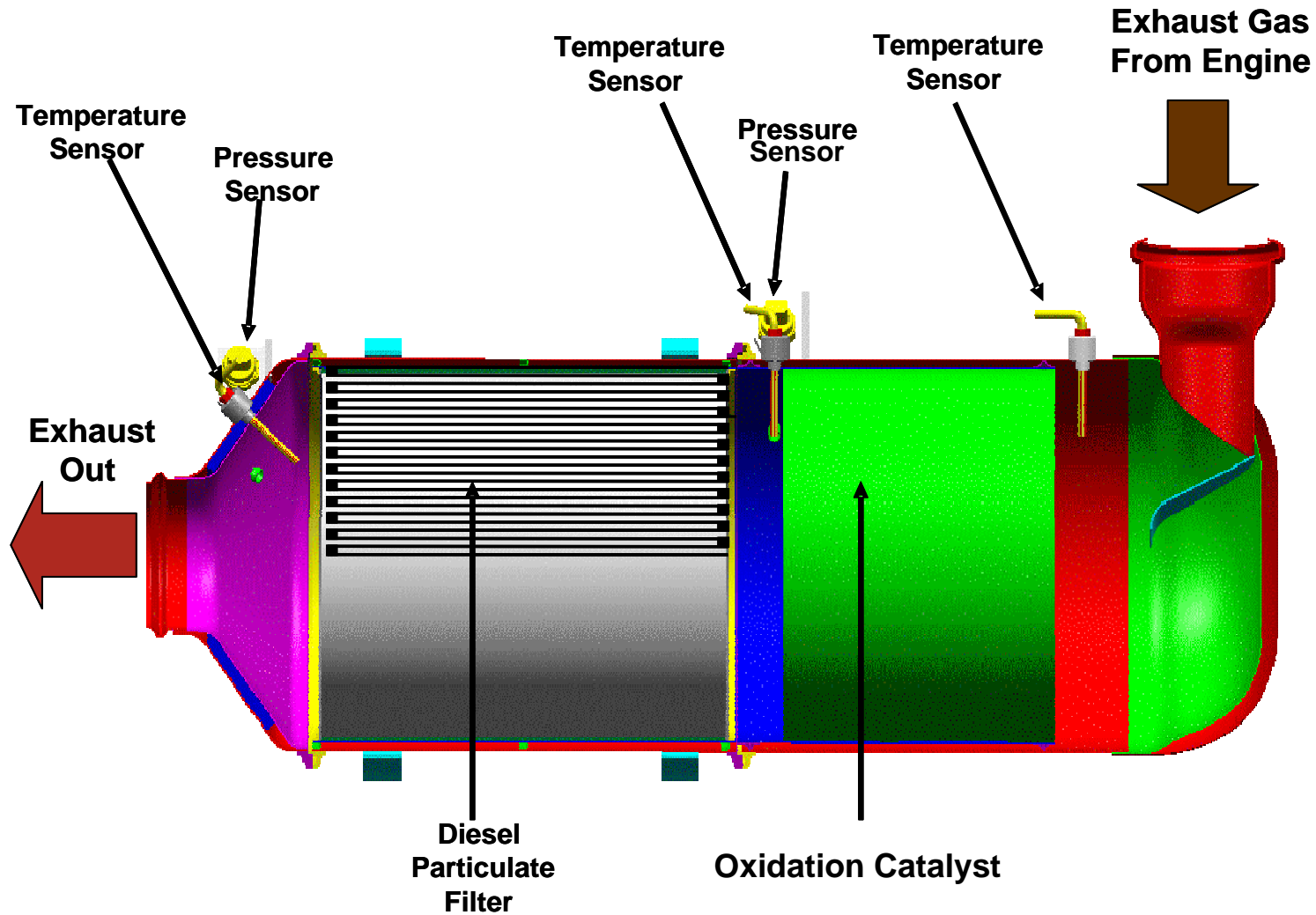
2007 Engines

MBE

<u>HP</u>	<u>Torque</u>	<u>Transmission</u>
• 190	520 @ 1200	2500PTS
• 210	520 @ 1200	2500PTS
• 210 HT	620 @ 1200	2500PTS
• 230	620 @ 1200	2500PTS
• 250	660 @ 1200	3000PTS

Cummins

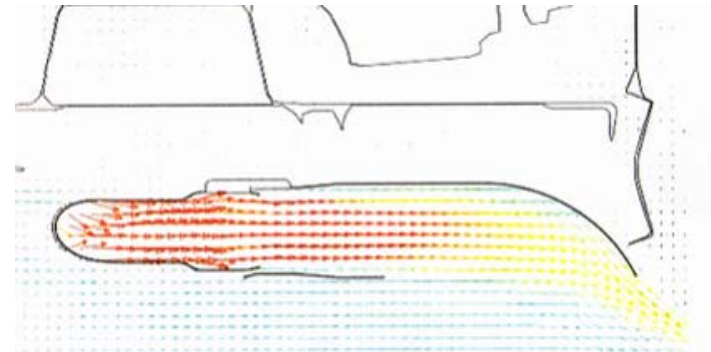
<u>HP</u>	<u>Torque</u>	<u>Transmission</u>
• 200	520 @ 1600	2500PTS
• 220	560 @ 1600	2500PTS
• 240	620 @ 1600	2500PTS
• 260	620 @ 1600	2500PTS






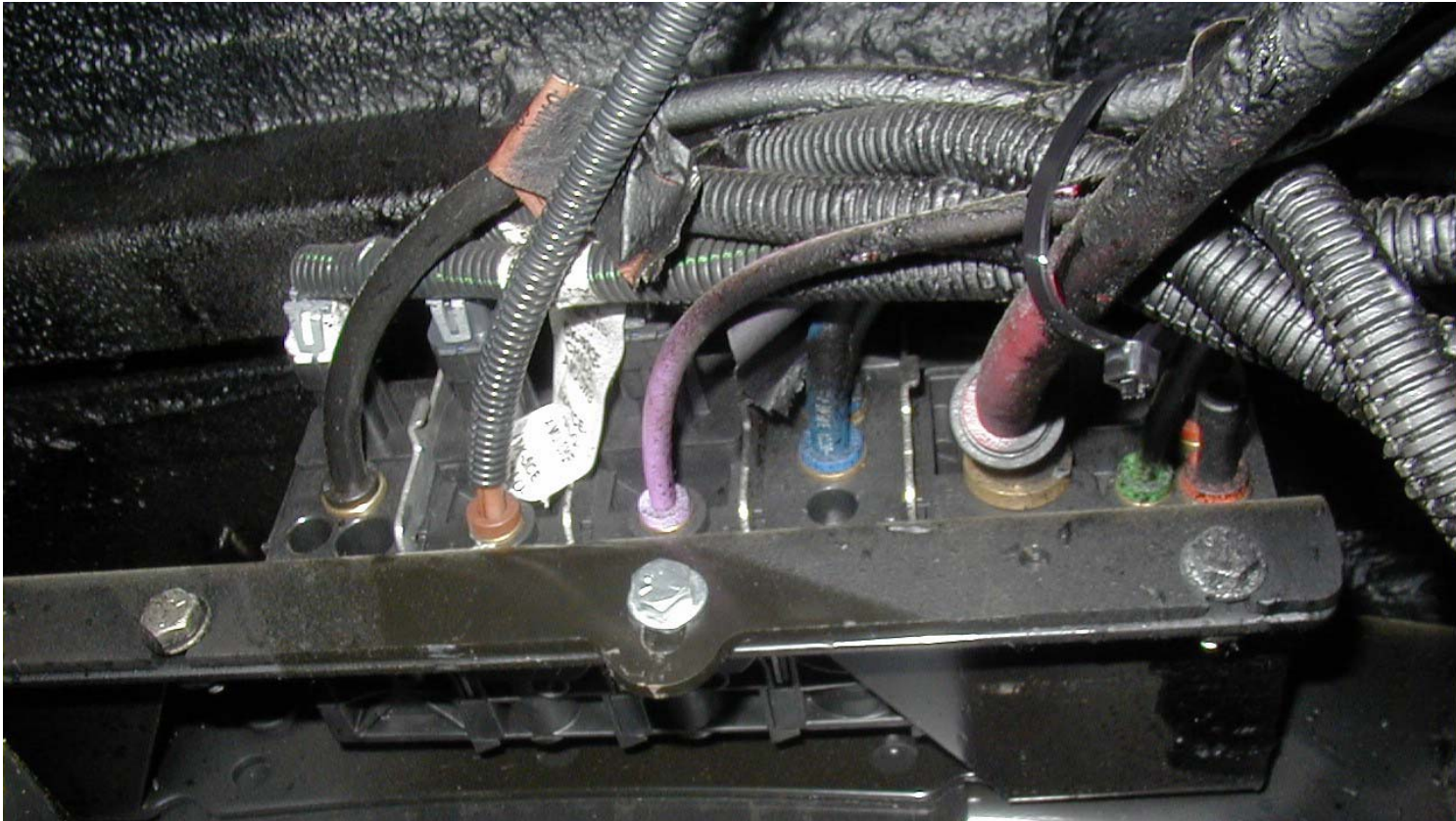
- Lowers exhaust regeneration temperature
- Located street side under bumper



04-24971-000

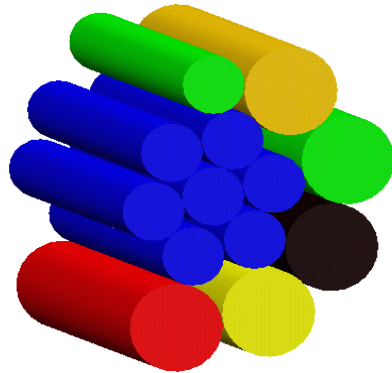


CHECK ENGINE	Amber Warning Lamp (AWL)	Indicates a fault with the engine controls.	Truck can be driven to end of shift. Call for service.
STOP ENGINE	Red Stop Lamp (RSL)	Indicates a major engine fault that may result in engine damage. Engine derate and / or shutdown sequence will be initiated.	Move the truck to the nearest safe location and shutdown the engine. Call for service
	DPF Regeneration Lamp	Solid yellow indicates a manual regeneration is required. Blinking yellow and derate or shutdown are possible if back pressure exceeds limits. Blinking yellow during high idle regeneration	Truck may be driven to end of shift. Call for service. Blinking light indicates attention required now.
	Hot Exhaust Temperature Lamp (HET)	Lamp may be red or yellow. Indicates exhaust temperature is above a preset limit. Illuminates during regeneration process if speed below 30 mph and during high idle regeneration	Truck may be driven. If lamp remains illuminated for an extended period – longer than 40 minutes call for service.
	Malfunction Indicator Lamp (MIL)	Yellow lamp Indicates a failure of an Emission Control device. May illuminate at the same time as the Amber Warning Lamp	Truck may be driven to end of the shift. Call for service.

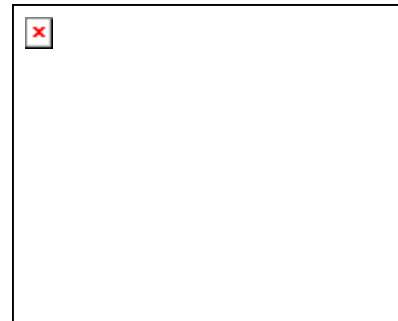


- Mounted on cross member just rear of transmission
- EPA 2010 units will not have an AMU

Typical Air Bundle In Rail

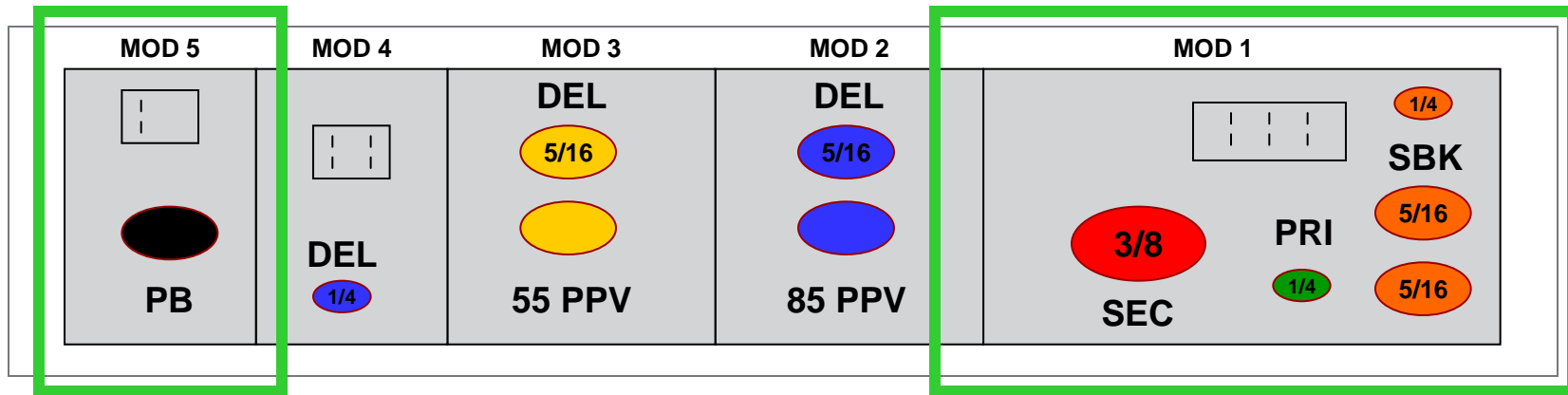


without AMU



with AMU

Chassis – AMU



MODULE 1

The 1/4 **Green** air line is the Primary Low Air Signal

The 1/4 **Orange** air line is the Service brake signal for on/off switch

The 5/16 **Orange** positions are not used

The 3/8 **Secondary** Air port is the Supply Air to the AMU for all the modules.

This Module contains both Low Pressure Switches and Brake Switch. (Air Horn also)

This Module is the END CAP and can only be in this position. (Right viewed from Front of Vehicle.)

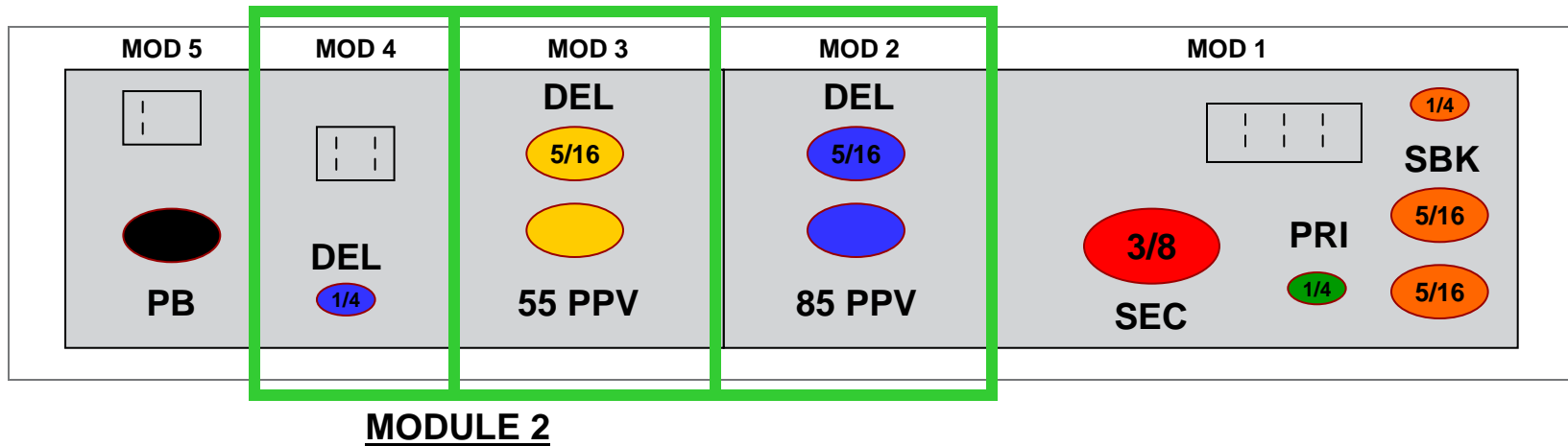


MODULE 5

This Module contains the Park Brake Switch.

This Module is the END CAP and can only be in this position. (Left viewed from Front of Vehicle.)

Chassis – AMU



This Module is the 85 PSI Pressure Protection Valve.

ORDER IS CRITICAL!!

The 5/16 air line is the Supply to the Vehicle Suspension and Accessory Tank.

MODULE 3

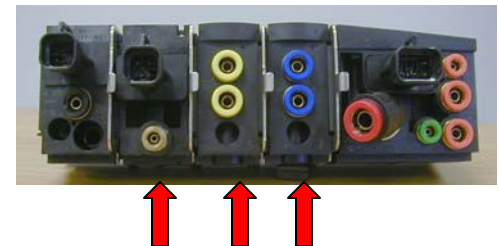
This Module is the 55 PSI Pressure Protection Valve. (Optional)

The 5/16 air line is the Supply to the Vehicle Accessory Tank.

MODULE 4

This Module is an Air Control Solenoid controlling the Air Applied Options on the Vehicle.

There will be as many Solenoids as required by the Accessories used on the Vehicle.



Air Management Unit

https://secure.freightliner.com - ServicePro Web - Microsoft Internet Explorer

FREIGHTLINER LLC

Change Vehicle / Mileage

VIN: 4U2ABPC07CW18511
Make: FCC Model: MH000042S
Current User: mike oody

Language | Help

ServicePro

- Vehicle Info
 - Basic Info
 - Major Components
 - Recall/Campaigns
 - Air Management Unit
- Warranty Info
- Service Solutions
- ServiceLit
- Related Sites

Mfg Loc	Part No.	Part Number Description	Parent Module
AMU01	A12-19776-010	MOD-CENTRL SW,3 SW,AIR	486-C02181
AMU02	A12-19772-285	VLV ASSY,PRESS PROT,85PSI,2 PT	46D-C01523
AMU03	A12-19772-255	VLV ASSY,PRESS PROT,55PSI,2 PT	46D-C01523
AMU04	A12-19779-003	VLV ASY-SOL,NC,3 VWAY,YEL,AMU	27F-C00905
AMU05	12-18203-002	V-INVERSION,25 OPEN/40 CLOSE	882-C03202
AMU06	12-18201-001	VLV-DBL CK MOD,-06SUP,-04DEL	882-C03202
AMU07	12-18202-001	V-RELAY/SV1,AMU,21 OPEN,11 SHUT	882-C03202
AMU08	A12-19777-001	ASSY-PRK/OPT SW,B1,1 SW,W/PSG	486-C02181
AMU09	A12-19779-004	VLV ASY-SOL,NC,3 VWAY,ORANG,AMU	882-C03202
AMU10	12-18204-002	AMU ENDBLK,-6,PPV PSG	882-C03202

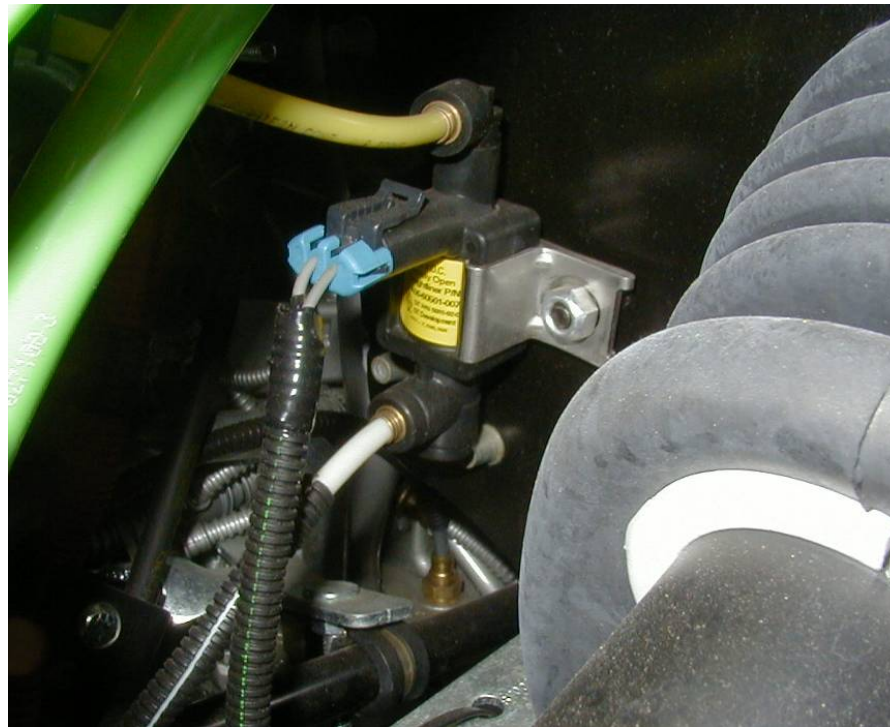
Note: Air Management Unit (AMU) part numbers, listed in order, correspond to AMU modules from right to left, when facing front of AMU.

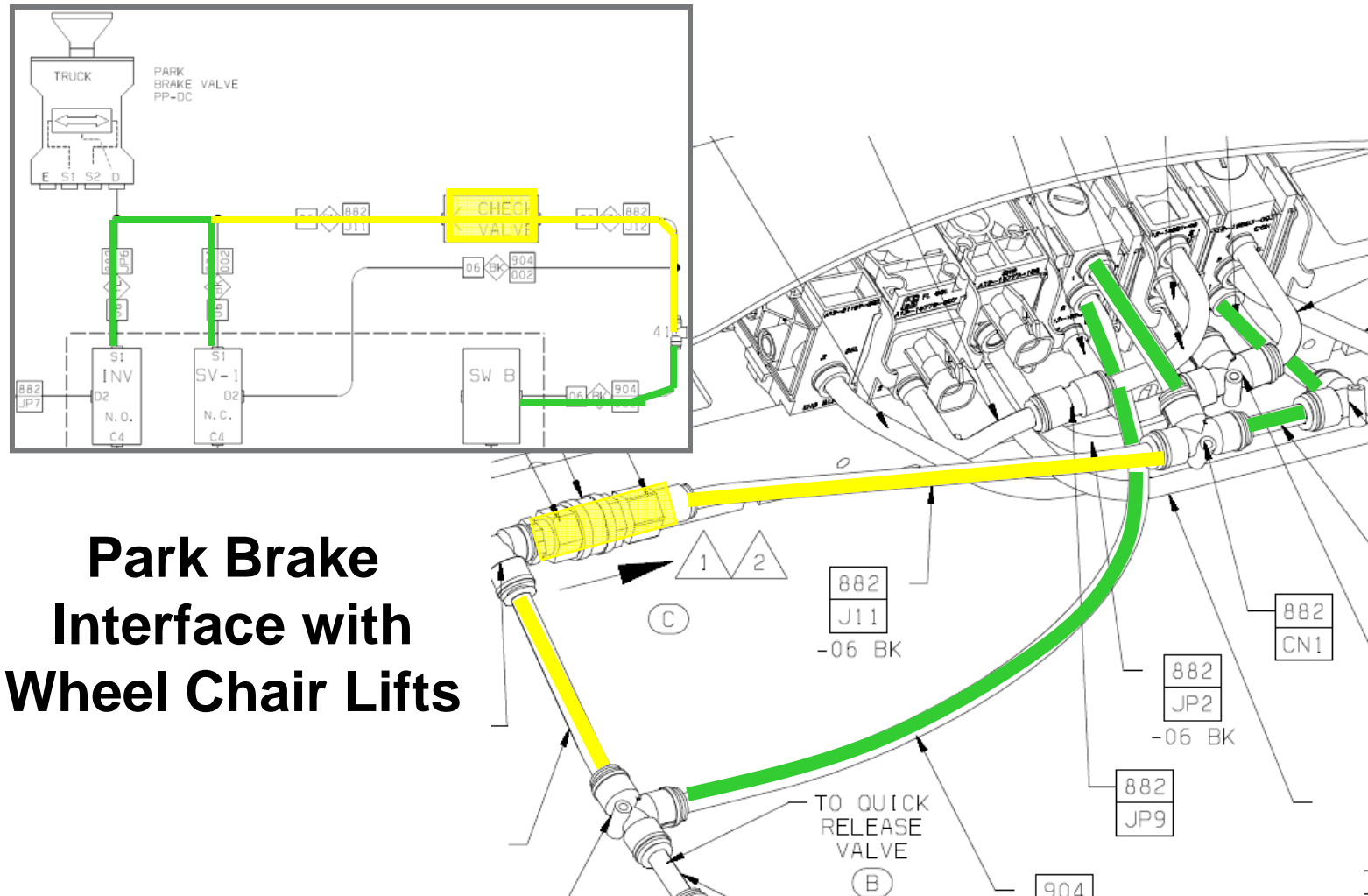
https://secure.freightliner.com/servicepro/vehAirManifold.asp

start | Internet | 9:24 PM

AMU part numbers listed in Service Pro

Fan Clutch Solenoid





Park Brake Interface with Wheel Chair Lifts

D12-21296 D12-21905 D12-21906



Chassis – AMU

AMU INFORMATION

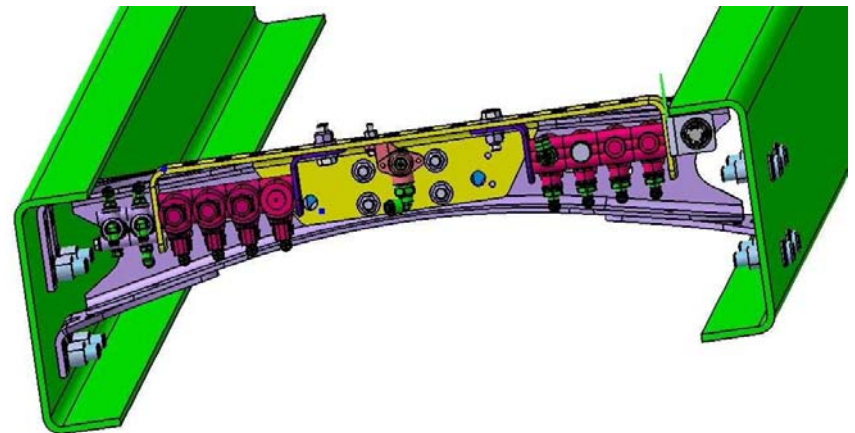
- For diagnostic testing please refer to section 42.19, 300 in the workshop manual
- Follow the instructions for what components you are testing.
- Remember if a audible air leak is heard from the AMU you must drain all the air in the primary and secondary air tanks before any work is performed.
- If you are removing components or air lines caution must be exercised, to replace the items in the same order & locations they were removed.

Section 42.19

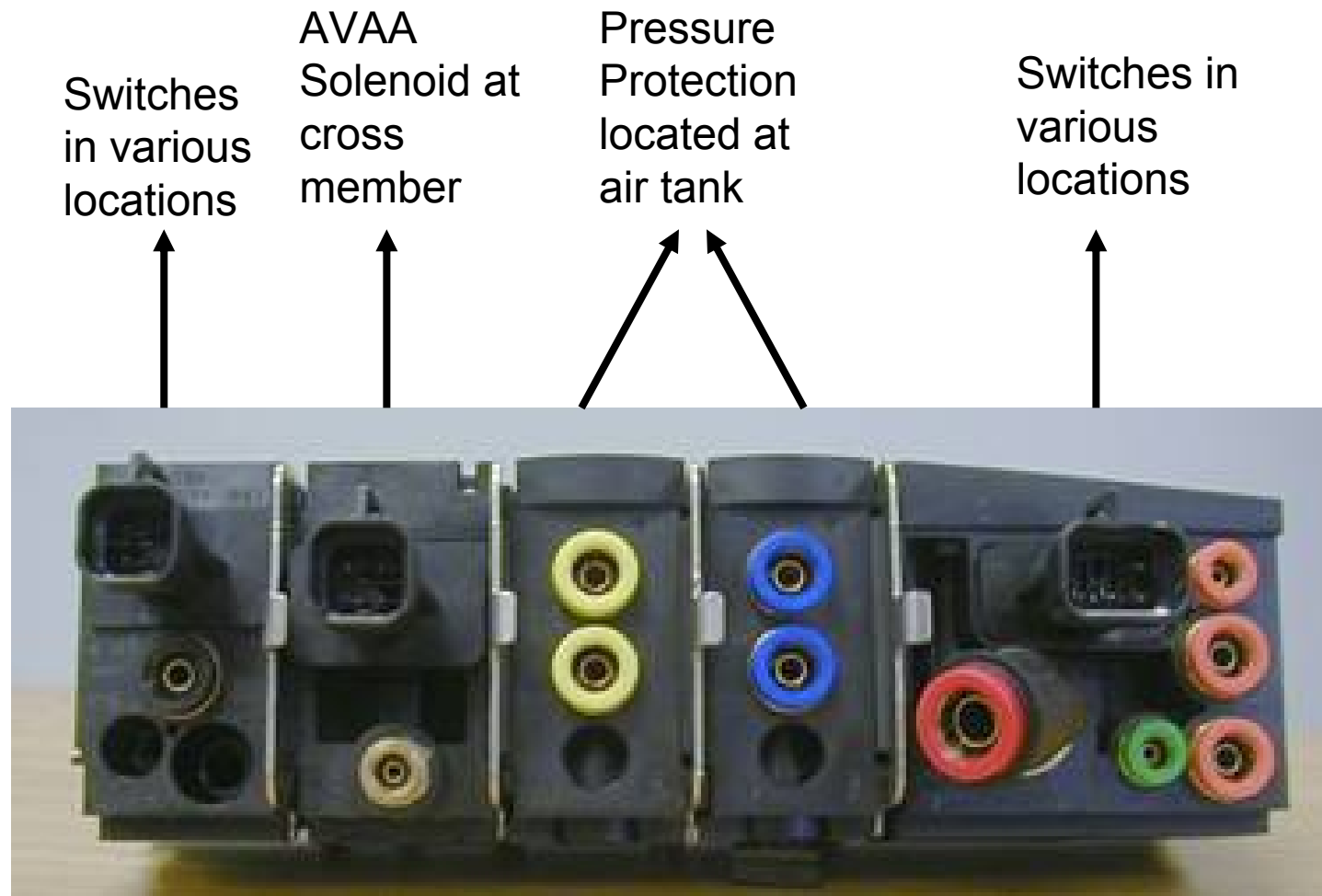
AVAA System for 2010 Accessory Air Valve Assembly



- The solenoids **if needed** will be mounted in the old AMU location on the cross member
- These solenoids will be for air operated options only
- There will be many buses that do not contain any of these solenoids
- The pressure switches will be located in various places around the bus

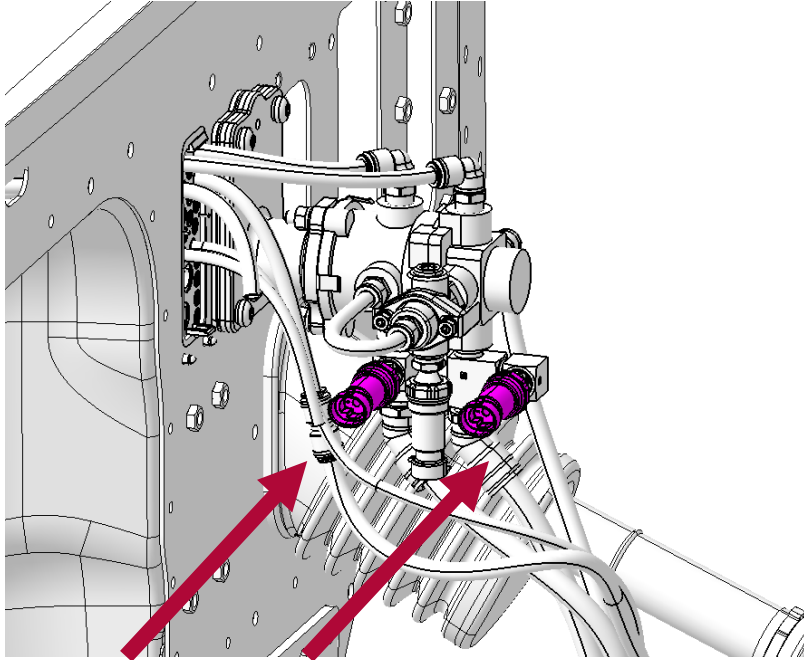


AAVA, What changes and where does it go?

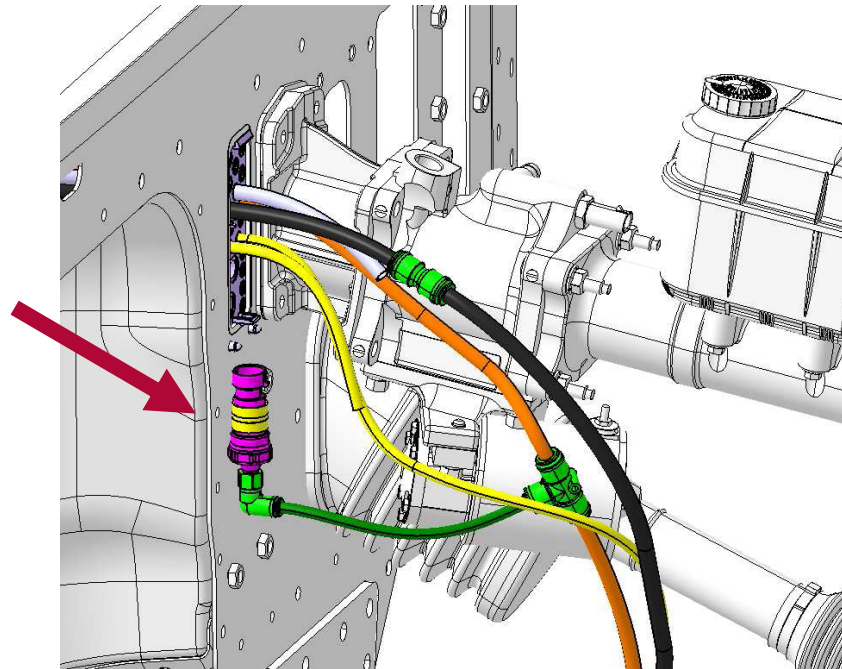


Low Air Pressure switch locations

Air Brake

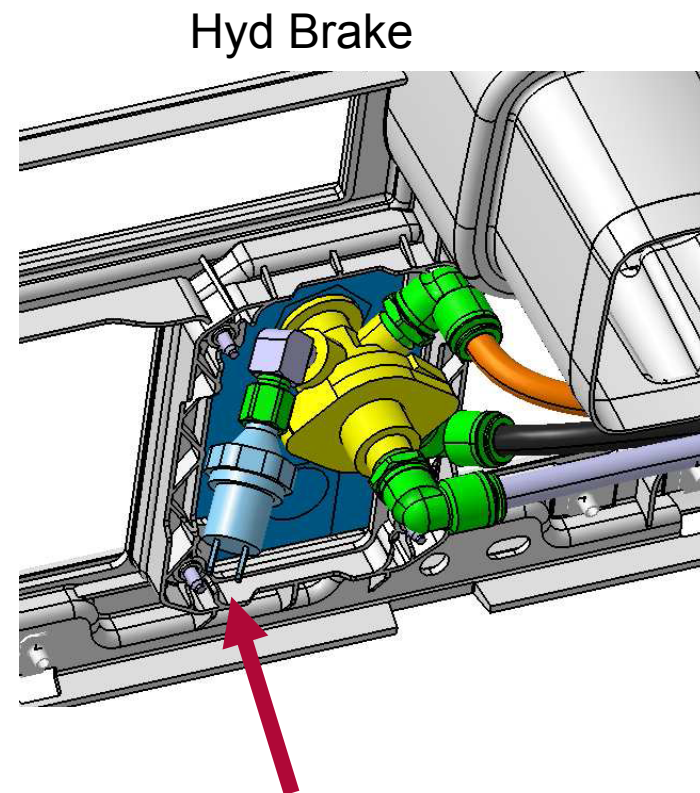
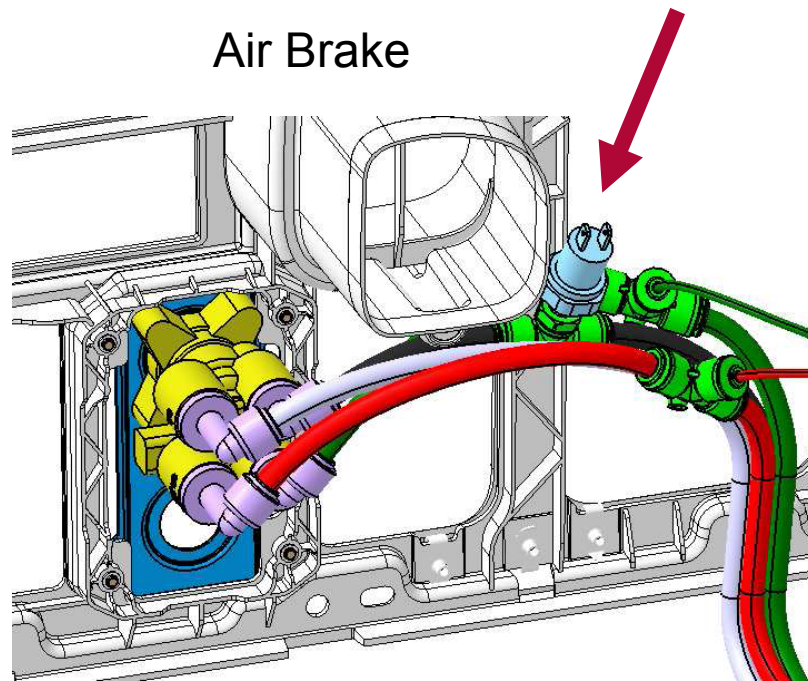


Hyd Brake



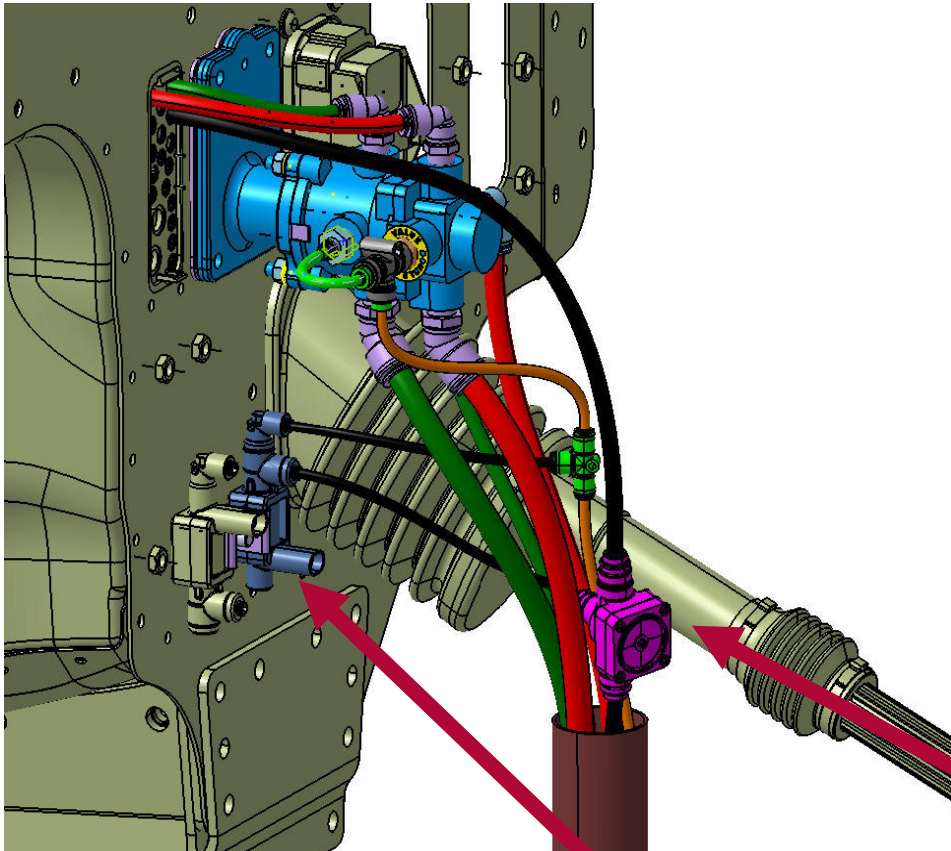
D1224185 install and
G0676709 drawing

Park Brake pressure switch locations

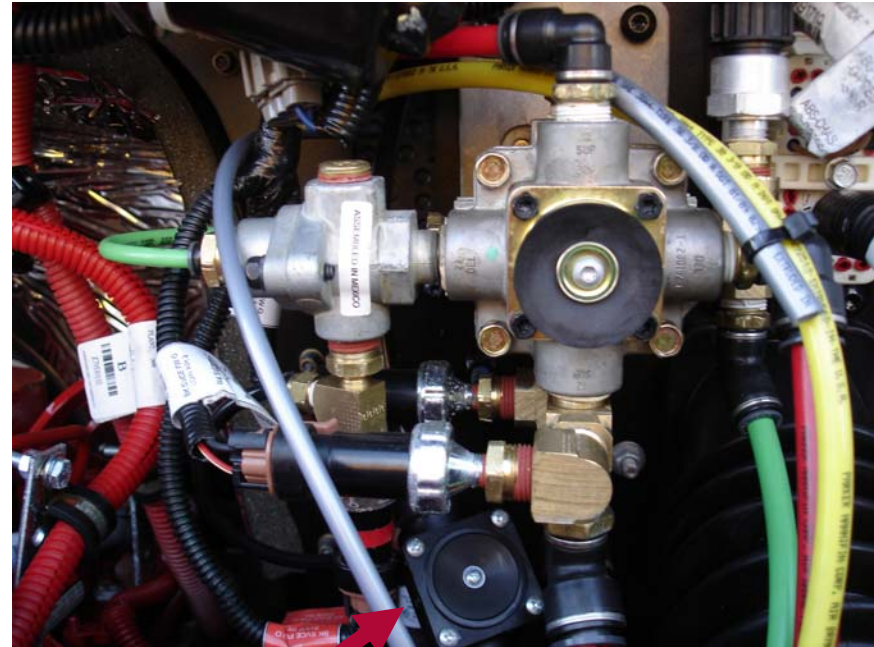


D1224161 drawing

Park Brake Interlock – Air Brake



Solenoid



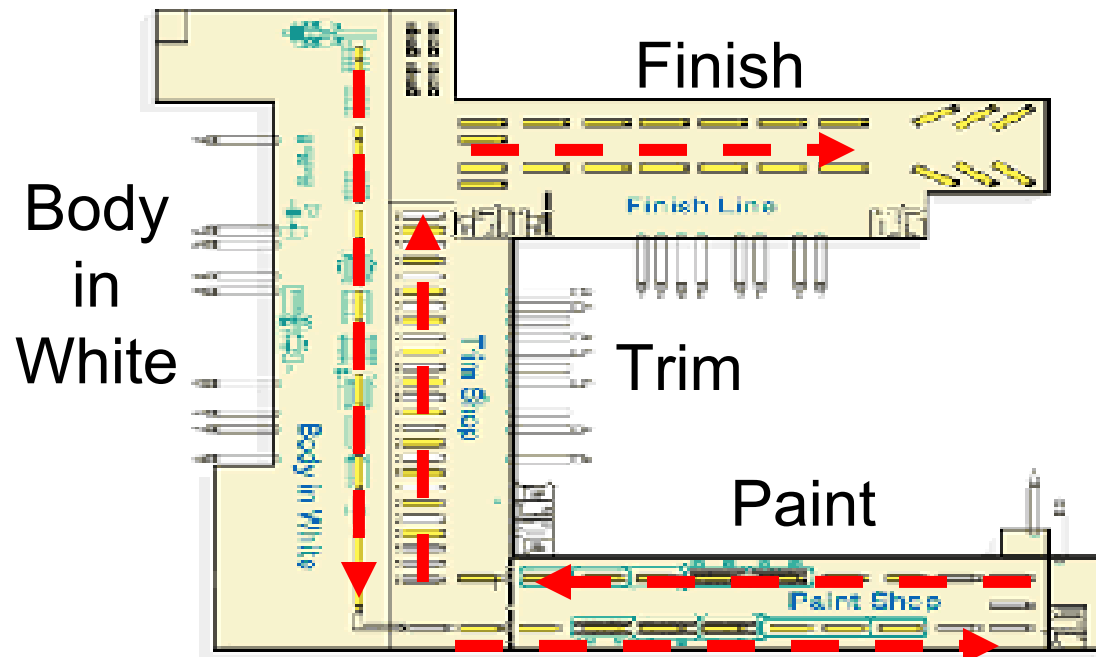
Interlock Valve

D1223025 & D1223024



Body 5

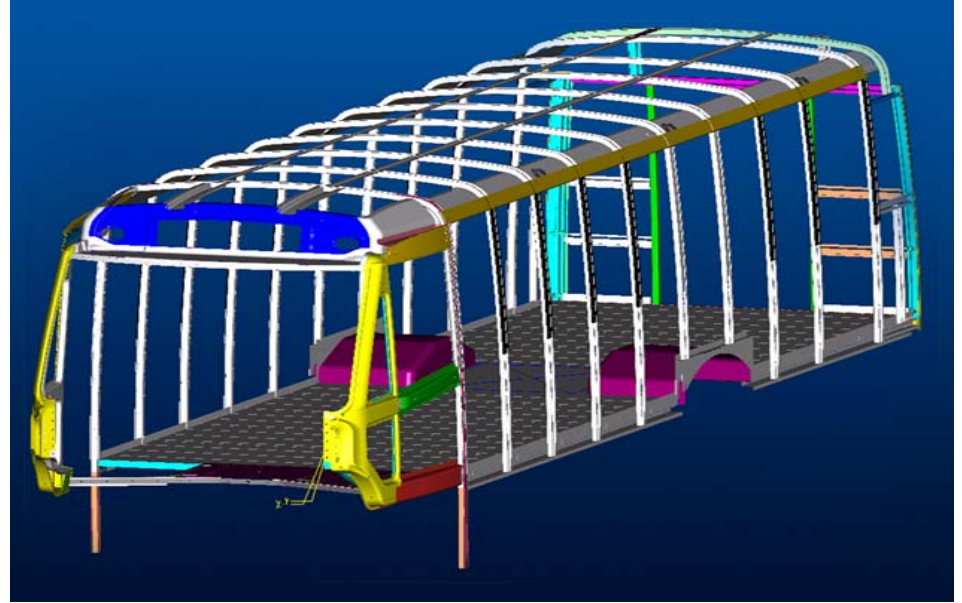
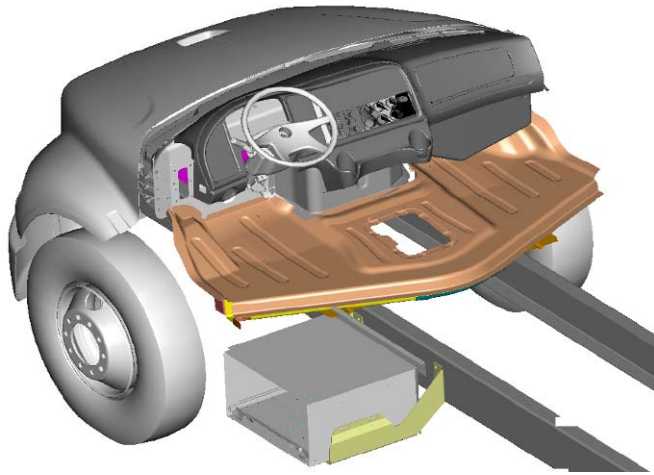
Saf-T-Liner C2 Manufacturing Plant



- 275,000 sq ft of production space
- Just in Time assembly process
- Robotic equipment
- Electronically controlled conveyer system



Body

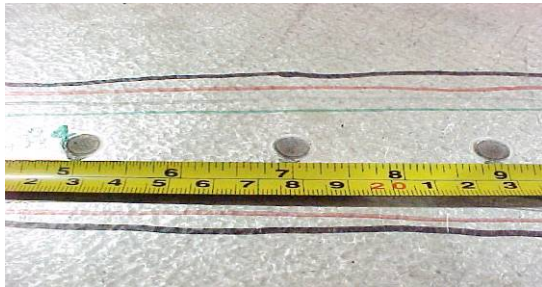
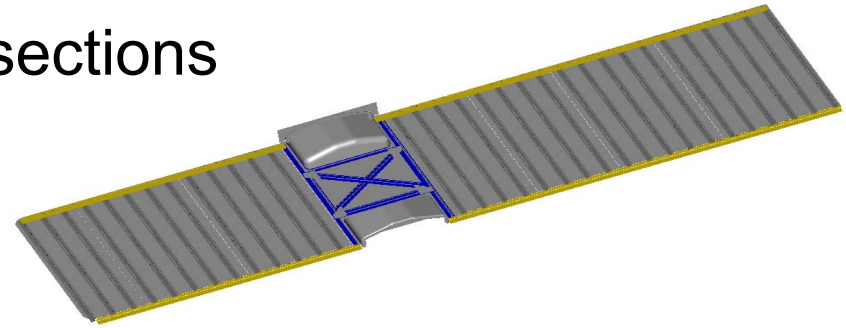


B2 chassis by FCCC w/ Thomas Saf-T-Net Construction

Body design of structural elements and fastening methods that act in concert to carry body and chassis loads while reducing material stress and strain.

Body - Floor

- Made from three separate sections
- 14 gauge Galvalume steel
- $\pm 1/32$ inch front to rear



- Robotically $3/8$ " welds every 2"
- Sections are lap joints

- One piece stamped wheel well
- 16 gauge spot welded steel
- Low profile



Body - Floor



- Z-channel cross members are 11 gauge, Galvanneal 10" centers and extend the complete width of floor
- Fir plywood flooring is nailed to assembled floor

Body - Rafter

- Cold bending
- Top hat design 14 gauge Galvanneal steel
- Hydraulic punched holes for consistent assembly



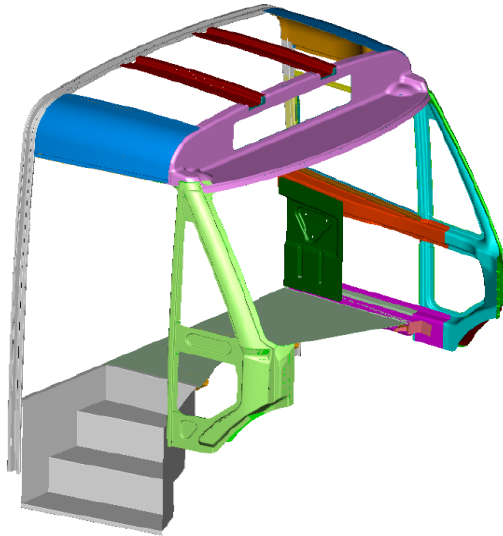
- Pre bent to accept internal crash rails
- Pillasters attached with SPRs
- Pre drilled for headlining and wiring

Body – Rafter Installation

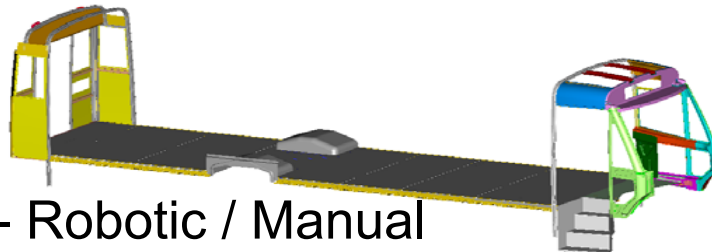
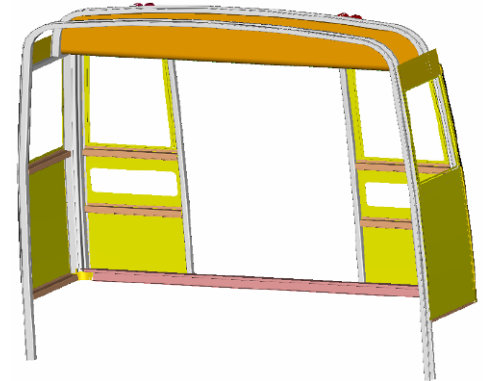


- Fixtures hold rafters square & leveled to floor
- Rafters extend below floor level
- Manually welded in place

Body - End Caps



- Welded boxed steel elements
- Welded 14 gauge boxed Galvanneel steel
- Includes first & last rafter
- Design allows for wiring paths



- Welding - Robotic / Manual
- Adhesive application
- Fasteners: SPR, Huck bolts, steel screws, rivets



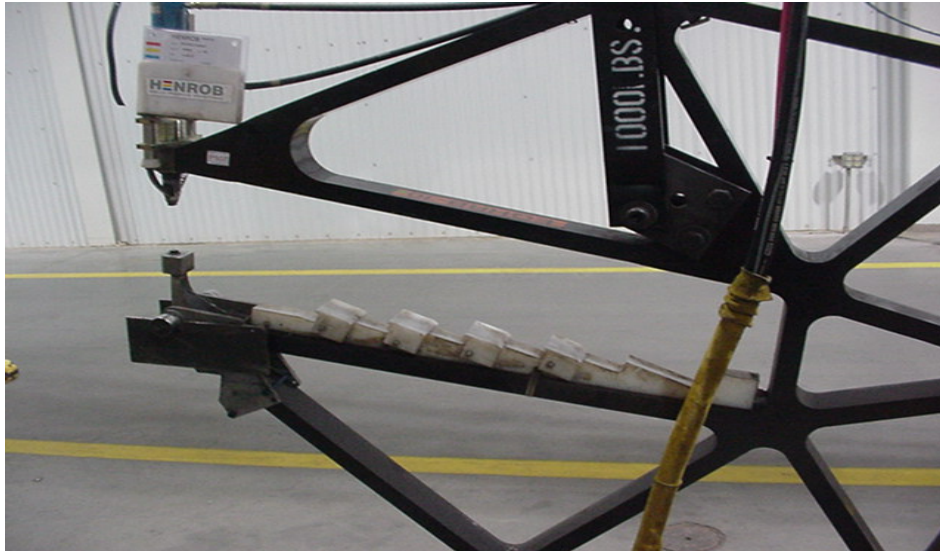
Body - Roof



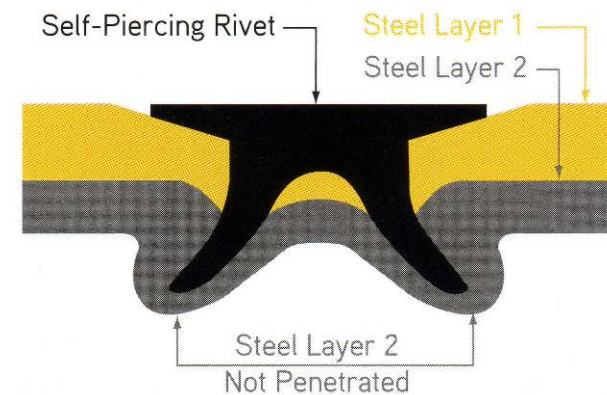
- Urethane applied to rails
- Installed complete w/
 - External header-drip rail
 - Internal header



SPR = Self Piercing Rivets

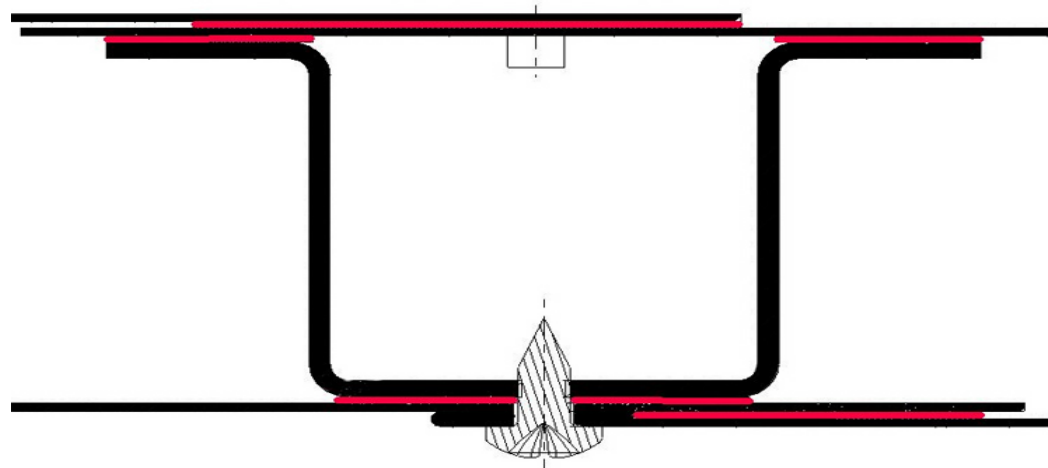


- SPRs do not pierce bottom layer
- **Not** available for field repairs



Body - Adhesive

- Using adhesives to reduce the number of mechanical fasteners while increasing joint strength
- 65% reduction in number of mechanical fasteners



- Apply a 1/2 " X 1/2" bead of adhesive - compressed it forming a 2" by .030mm layer
- 10:1 ratio

Tension Strength Comparison



- C2 design is 1.9 times stronger



Body - Adhesive

Product Kits	Surface Prep	Working Time	Fixture Time	Includes:
Loctite™ #100428	Unpainted	30 min	30 min	1 Cartridge 1 Mixing Nozzle
		(At 70 °F)		
Plexus™ #MA1130GB	Unpainted, <u>Primed</u> , <u>De-glossed</u>	30 min	<u>60</u> min	2 Cartridges 6 Mixing Nozzles
		(At 70 °F)		

As the ambient temperature increases, working and fixture time decrease

Methacrylate - 6 month shelf life

**Pneumatic applicator gun
PGMix490AirHP**

Body – Side Assembly



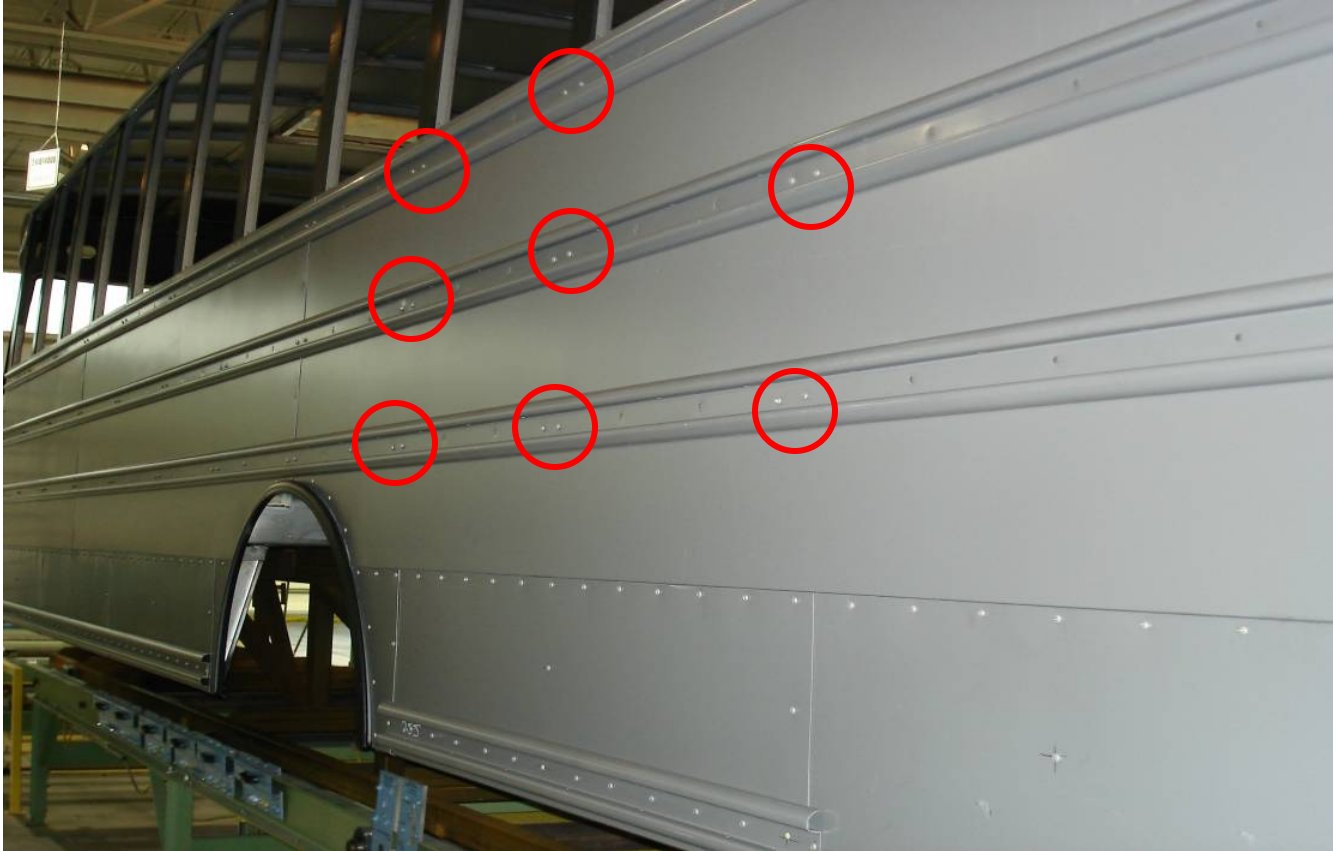
- Each exterior side is pre assembled
- Side sheets & rails SPRs and adhesive

Body – Side Skirt



- Welded skirt flanges

Body - Sides



Sides attached to skeleton with adhesive
& steel screws to the rafters

Just how strong is this construction??



Autotron

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Utilizing **induction heating** for safe **flameless windshield removal**, **side molding removal**, and the safe removal of SMC panels and other adhesive bonded automotive parts!

Remove all types of automotive glass quickly without knives or wire!




Quickly remove side moldings with adhesive intact! Reuse original OEM tape!

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The Autotron 3300-3 is the most powerful, safe, versatile & complete induction heating system available to collision repair, automotive recycling facilities and other automotive professionals.

Check out these rugged design features:

- Compact size measurements: only 9" x 9" x 14"
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- Powder coated steel chassis

3 Heating Attachments included, along with a training DVD & Owner's Manual.





Other Accessories available:





www.autotronheater.com

Body Panel & Glass Removal



INDUCTION INNOVATIONS, INC.
Flameless™ Heat Systems
Specializing in High Performance Induction Heating Tools for the Automotive Aftermarket

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- Attachment Details
- Accessories



Metal Bond Adhesives

The innovator of the INDUCTOR®, the patented magnetic induction heat system.

The INDUCTOR® uses high frequency magnetic fields (Heat Inductors) to heat-release any type of adhesive bonded to metal in just seconds.

Remove:

- Bonded glass
- Bonded SMC panels
- Metal bond adhesives
- Weather stripping
- Common bond lines
- Body side moldings
- Vinyl graphics
- Hail dents
- Vapor barriers
- Sound pads



www.theinductor.com

Video

Body-in White Completed – Ready for Paint



Body - Paint



Entire body is robotically painted

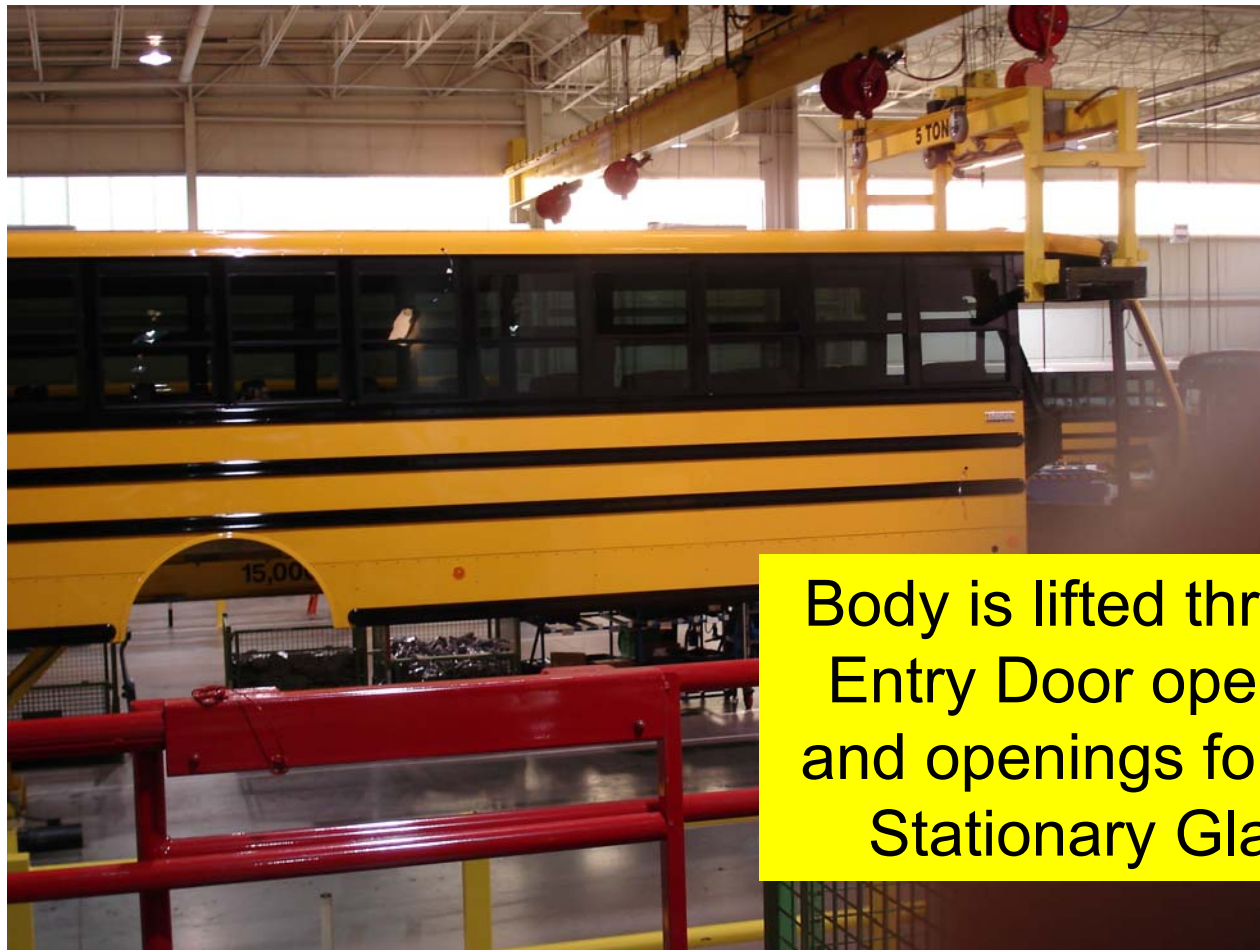
Body - Interior



- Body moves sidewise to each station
- Wiring, insulation, interior sheets, head lining, hatch, window, seat rail, floor cover, heaters, seats

Body - Mounting

Body Mounting to Chassis



Body is lifted through
Entry Door opening
and openings for The
Stationary Glass

Stationary Glass Installation



- Robot applies urethane to glass and transports it to line

Body - Exterior



- Moving floor belt
- Stationary glass, exterior lights, mirrors, arm, entrance door

Battery Box for 2010

- New and improved battery box
- Engineered for more rigidity
- Dual steel hinges with stainless steel pins
- Wrap around design for cleaner fit
- Matches height of the side skirt
- Went into production with EPA2010 models and Mercedes transition units



Doors – Side & Rear Exit

- **Side Doors** can be 30, 40 or 50 inches wide
- Lift equipped
- Hinged on forward side
- Glass is bonded
- Standard door prop



- **Rear Door** is 38.31 wide with bonded glass
- Two hinges with five $\frac{1}{4}$ fasteners
- Fasteners thread into blind inserts
- Do not over torque



AG2 – Entrance Door

- Welded aluminum frame
- Black powder coated
- 4 piece bonded glass
- Redesigned actuators
- Improved Vandalocks and releases

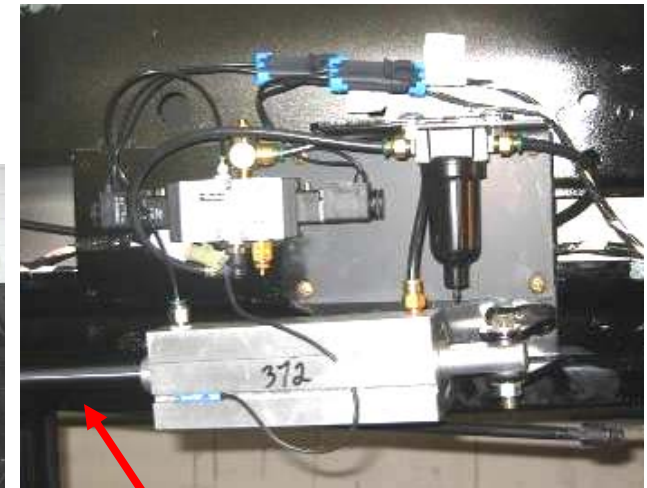
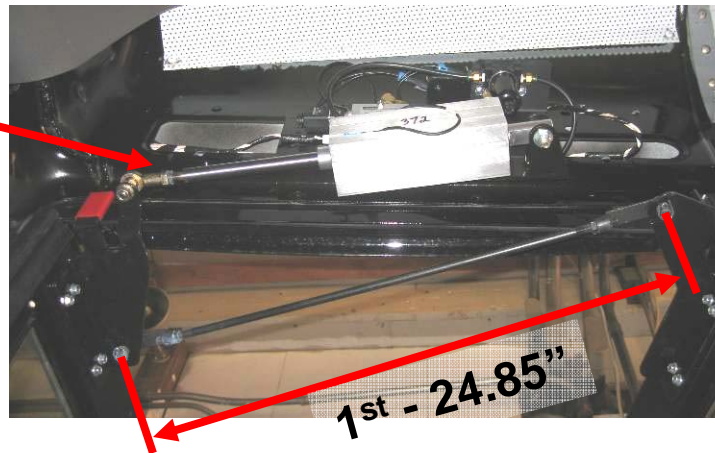


AG2 – Entrance Door



**2nd – Dump air.
Closed, adjust
until doors close
against step**

**3rd – Verify
opening > 24"**



**Rod has 5.5" Full Travel
Bottoms in Both Positions**

Drivers Storage Area



Standard Left Side



**Optional Center Mt
P/N 136942**



Body - Glass 5



Windows & Glass - Bonded



Glass – Stationary / Windshield

DO NOT REMOVE UNLESS GLASS IS LEAKING OR BROKEN
Always wear gloves and safety glasses

- All flush urethane bonded
- Field repair is “hot-applied” procedure requiring a minimum of 1 hour due to heating
- Bus must remain still for 30 minutes after repair to allow for curing and adhesion

Required Tooling:

- Electric urethane saw
- Two suction cups
- Caulking gun
- Lint-free towels
- Urethane oven (2 tubes)
- Urethane scraper
- Alcohol free glass cleaner





Glass – Stationary / Windshield

1. Place two tubes of Urethane in a urethane oven at 185° F for 1 hour.
2. Remove frame gasket from interior perimeter of glass.
3. Cover interior area to protect and isolate any broken pieces of glass. For windshield, attach suction cups.
4. Working from the interior, use the urethane saw leaving the bead at top for last. Take care not to damage the pinch weld.
5. Clean up as necessary using a scraper trim the urethane bead to 1-2 mm thick. Remove any loose bead.
6. Clean the replacement glass using lint-free towels wiping in one direction only. Pay close attention to ceramic coating perimeters.
7. Apply activator to both surfaces and let set 10 minutes.
8. Trim the plastic applicator tip for the urethane to the appropriate size. Windshields are $\frac{1}{2} \times \frac{1}{2}$. All others are $\frac{1}{4} \times \frac{1}{4}$.
9. Following the old bead path, apply an uniform bead of urethane to the pinch weld.
10. Install the replacement glass, spacing evenly in the cavity. Apply pressure and hold in place for one minute.

DO NOT MOVE BUS FOR 30 MINUTES

Windows – Split Sash



Aluminum

Replaceable Latches



- Replace entire assembly
- Upper and lower glass is bonded
- Designed to flex to curve of body

Windows – Split Sash-Push Out



Replacement
Metal clip
available for
Older Design

TBB THSP 15004

Light Changes

New Generation LEDs

- Fewer Components
- Brighter LED's
- Optional strobe or flash function
- Mfg by Weldon Technologies



Strobe / Flash
Switch Cover

New Inner Fenders

Rear Axle Inner Fender



Water Intrusion - BHM Area

Grommet added to Left Wiper Arm Hole to Keep Water from BHM



Before



Grommet Added



Implementation Date - 06/16/08

Part Number 22-65420-000



Safety Options 6

Drivers Seat Heated Option

- National Seat offers
- Dual zone heating for the lower back and seating area.
- Built in thermostat for controlled comfort.
- Two settings, high and low for desired level of warmth.
- Two 22" x 11" carbon fiber heating strips provide quick and even heat distribution.
- Available in type C and type D buses





- Roof Hatches – Econo, ProLo, Power Vent
- Walkgates – Single pole
- Stop signs – Air/electric

- Available front, center and rear positions
- Single door 50" openings
- Provided by Maxon, Braun and Ricon



Safety Options

Warning Lights



- LED or incandescent
- Bonded with urethane



Mechanically Fastened Warning
Lamps

August 2009

Crossing Gate



- Access motor from inside right side of front bumper
- Check regularly for proper operation and stowing
- Keep arm and housing free of debris

Engine Brakes

- Driver Selected
- Controlled by ABS
- Economical Option
- Brake Savings Benefit



Mercedes



Cummins

Hatch



No screws through roof, fasteners on inner ring



Safety Options

Safety Hatch Installation

1. Remove hatch lid from frame by unscrewing only one bolt holding the plungers in and pull to opposite plunger out of hinge. Catch the springs.
2. Put fixture through roof opening and lay on top of bus.
3. Remove backing form adhesive on the hatch assembly and place hatch through the opening. Center hatch over opening. Lightly position the hatch with the hinge facing the front of the bus. Try to avoid positioning on top of any rivets. **DO NOT APPLY PRESSURE UNTIL THE HATCH IS CORRECTLY POSITIONED.**
4. Wire up the switch.
5. Install the trim ring on the inside of the bus.
6. Install two clamps; one clamp in the front and one in the rear on center of the bus and hatch. Next install two clamps per side. Apply 15 lbs. of pressure between the roof sheet and the entire mounting surface. Maintain pressure for a minimum of 30 seconds.
7. Using the hatch frame as a guide drill .191-.201 size holes through the trim ring.
8. Remove clamps and reattach the hatch lid.
9. Open and close hatch. Check for proper decals and ensure seams are water tight. Verify buzzer sounds when open.

Safety Options

Stop Arm



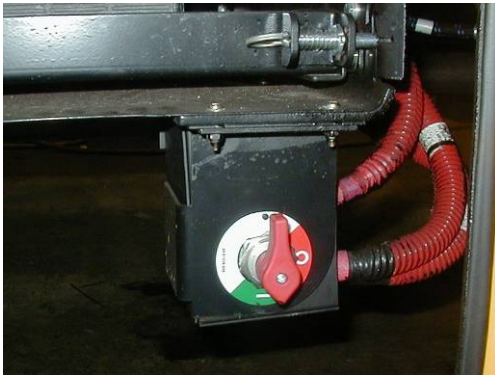
Electric or Pneumatic

Safety Options

C2 Right-Side Mirrors



400 Amp Battery Cutoff Switch





Automatic Tire Chains

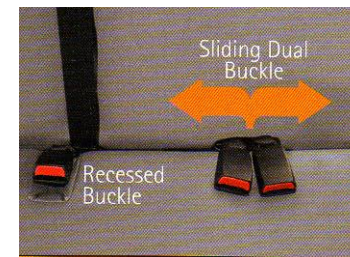
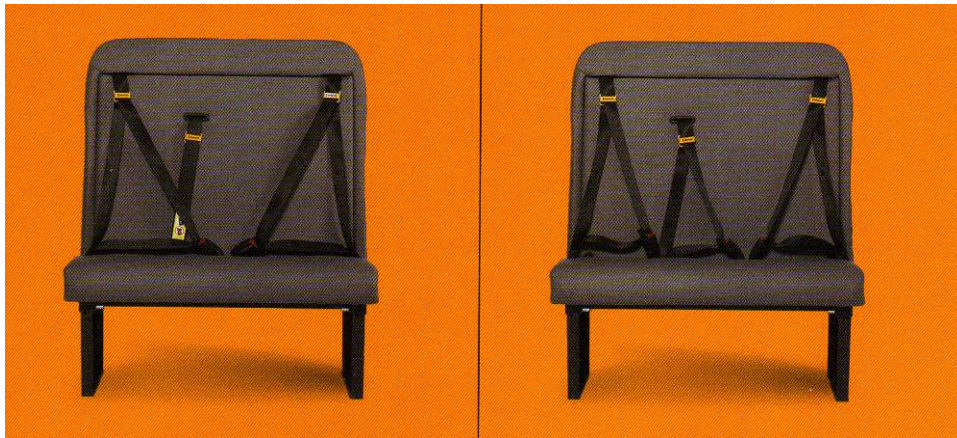
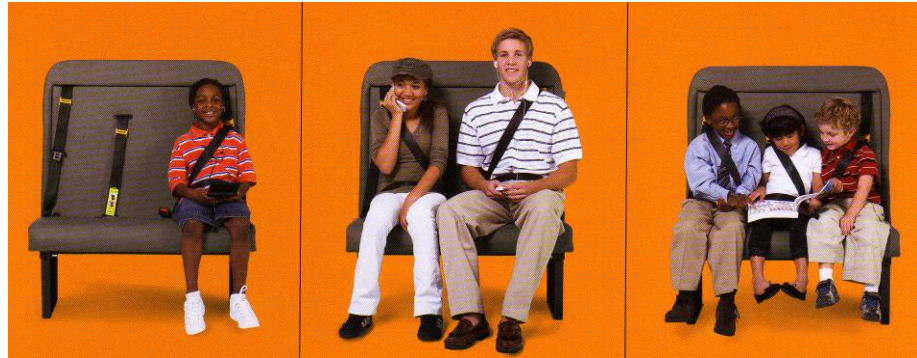


www.onspot.com

Video

Safety Options

SafeGuard FlexSeat™



www.safeguardseat.com

Video



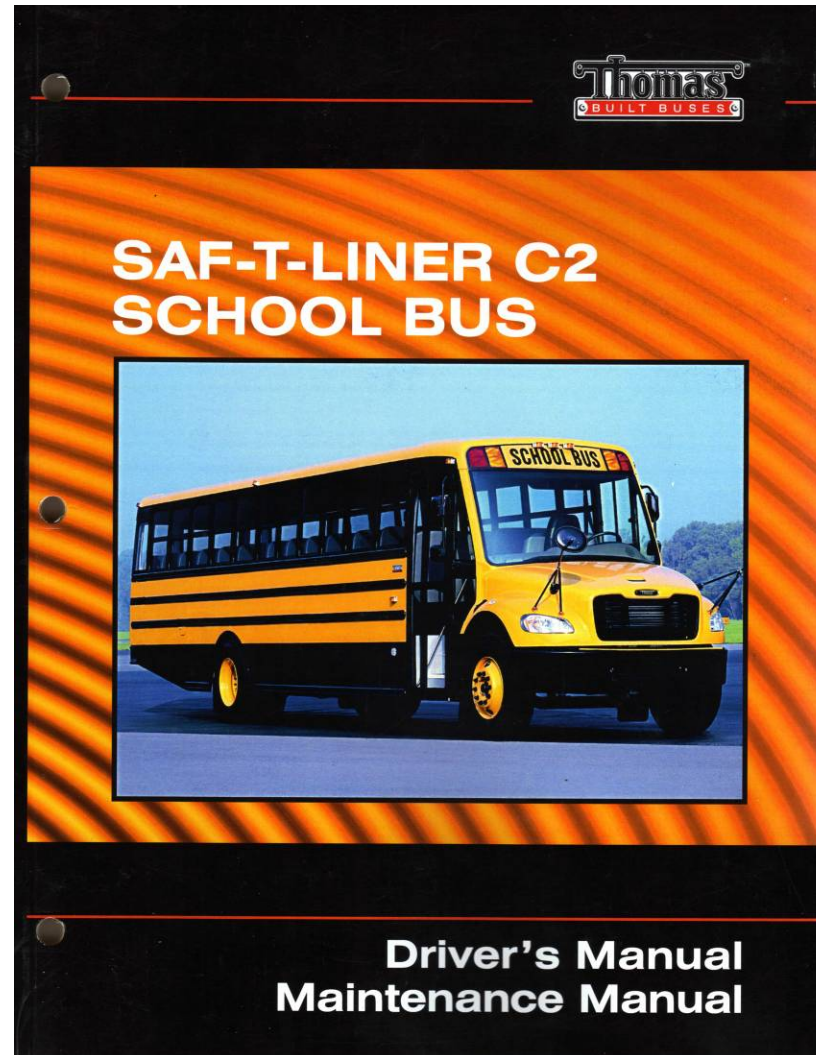
Maintenance 7



Maintenance Schedule

Schedule I –
< 20,000 miles/year

Schedule II –
> 20,000 miles/year





Maintenance Schedule

General Information

00

Overview of Maintenance Operations: 00-05

Maintenance Operations for Groups 00 through 33						
Maintenance Operation No.	Title of Maintenance Operation	Maintenance Intervals				
		IM	M1	M2	M3	M4
00-12	M1 Lubrication and Fluid Level Check	*	*	*	*	*
00-13	M2 Lubrication and Fluid Level Check	*	*	*	*	*
01-01	Engine Drive Belt Inspection				*	*
01-02	Engine Support Fastener Check				*	*
09-01	Air Cleaner Element Replacement*				*	*
13-01	Air Compressor Inspection		*	*	*	*
15-01	Alternator, Battery, and Starter Check				*	*
20-01	Radiator Cap Inspecting		*	*	*	*
20-02	Radiator Pressure Flushing and Coolant Changing				*	*
20-03	Fan Drive Inspecting (Noise Emission Control)		*	*	*	*
20-04	Coolant Heater Checking, Webasto		*	*	*	*
25-01	Eaton® Fuller® Clutch Release Bearing Lubrication	*	*	*	*	*
25-02	Eaton Fuller Clutch Release Cross-Shaft Lubrication	*	*	*	*	*
25-03	Clutch Hydraulic Fluid Level Checking	*	*	*	*	*
25-04	Clutch Hydraulic Fluid Changing	*	*	*	*	*
26-01	Manual Transmission Oil Level Checking	*	*	*	*	*
26-02	Eaton Fuller Transmission Fluid Changing and Magnetic Plug Cleaning†	*	*	*	*	*
26-03	Allison and Eaton Fuller Transmission Breather Checking	*	*	*	*	*
26-04	Eaton Fuller Transmission Air Filter/Regulator Element Cleaning	*	*	*	*	*
26-05	Allison Transmission Fluid and Filter Changing	*	*	*	*	*
26-06	Mercedes-Benz Transmission Fluid Changing and Magnetic Plug Cleaning	*	*	*	*	*
26-07	Mercedes-Benz Transmission Leak Checking	*	*	*	*	*
31-01	Frame Fastener Torque Checking	*	*	*	*	*
32-01	Suspension Inspection	*	*	*	*	*
32-02	Suspension Lubrication	*	*	*	*	*
32-03	Suspension U-Bolt Torque Check	*	*	*	*	*
33-01	Kingpin Lubrication	*	*	*	*	*
33-02	Tie Rod End Lubrication	*	*	*	*	*
33-03	Draw Key Nut Inspection	*	*	*	*	*
33-04	Tie Rod End Inspection	*	*	*	*	*

* Replace the primary air cleaner element when the intake-air restriction indicator reaches the maximum restriction. See Group 99.

† Change petroleum-based lubricants at M2 (including M3, M4, and M5). Change synthetic lubricants at M5 only.

Table 4, Maintenance Operations for Groups 00 through 33

00

General Information

Overview of Maintenance Operations: 00-05

Maintenance Operations for Groups 35 through 83						
Maintenance Operation No.	Title of Maintenance Operation	Maintenance Intervals				
		IM	M1	M2	M3	M4
35-01	Axle Lubricant Level Checking	*	*	*	*	*
35-02	Axle Breather Checking	*	*	*	*	*
35-03	Axle Lubricant Changing and Magnetic Plug Cleaning	*	*	*	*	*
40-01	Wheel Nut Checking	*	*	*	*	*
41-01	Driveline Inspection	*	*	*	*	*
41-02	Driveline Lubrication	*	*	*	*	*
42-01	Air Brake System Valve Inspection	*	*	*	*	*
42-02	Bendix AD-9 Air Dryer Desiccant Replacement	*	*	*	*	*
42-03	Governor D-2A Checks	*	*	*	*	*
42-04	Bosch Hydraulic Brake System Inspection	*	*	*	*	*
42-05	Bendix AD-IP Air Dryer Desiccant Replacement	*	*	*	*	*
42-06	Haldex and Gunitz Slack Adjuster Lubrication	*	*	*	*	*
42-07	Meritor Camshaft Bracket Lubrication	*	*	*	*	*
42-08	Meritor Slack Adjuster Lubrication	*	*	*	*	*
42-09	Air Dryer AD-9 and AD-IP Checks	*	*	*	*	*
42-10	Brake Lines and Fitting Inspection, Hydraulic Brakes	*	*	*	*	*
42-11	Brake Pedal Linkage and Mounting Plate Inspection	*	*	*	*	*
42-12	Air Brake Inspection and Leakage Test	*	*	*	*	*
46-01	Drag Link Inspection	*	*	*	*	*
46-02	Power Steering Fluid Change	*	*	*	*	*
46-03	Power Steering Fluid Level Inspection	*	*	*	*	*
46-04	Power Steering Gear Lubrication	*	*	*	*	*
46-05	Drag Link Lubrication	*	*	*	*	*
46-06	Power Steering Filter Change	*	*	*	*	*
47-01	Fuel Tank Band Nut Tightening	*	*	*	*	*
47-02	Fuel/Water Separator Element Replacing	*	*	*	*	*
47-03	Inline Fuel Strainer Replacing, MBE900 Engine	*	*	*	*	*
47-04	Fuel Sender Checking	*	*	*	*	*
49-01	Exhaust System Inspection (Noise Emission Control)	*	*	*	*	*
72-01	Door Seals Lubrication	*	*	*	*	*
83-01	Air Conditioner Inspection	*	*	*	*	*
83-02	Air Filter Replacement*	*	*	*	*	*

* Replace the HVAC air filter at the recommended interval or every six months.

Table 5, Maintenance Operations for Groups 31 through 83

Maintenance Manual Pages 00/5-00/6



Maintenance - Initial

- Lubrication and Fluid Level Check
- Frame Fastener Torque Checking
- Suspension U-Bolt Torque Check
- Draw Key Nut Inspection
- Axle Breather Checking
- Air Brake System Valve Inspection
- Haldex & Gunite Slack Adjuster Lubrication
- Meritor Slack Adjuster Lubrication
- Power Steering Fluid Level Inspection
- Power Steering Gear Lubrication
- Drag Link Lubrication
- Fuel Tank Band Nut Tightening
- Door Seal Lubrication

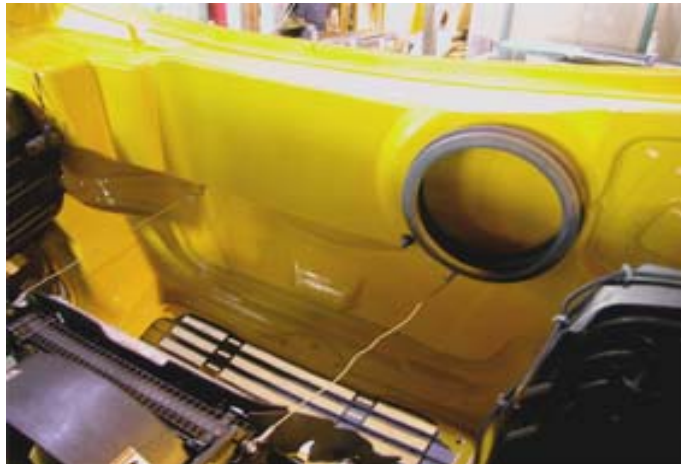
Maintenance – Hood

Service Access



- 15 lbs of force to open hood
- Always use hand hold to open
- Removable 4 bolt grill

Maintenance – Hood



INSPECT

- Integrated intake
- Sealing gasket to air cleaner
- Integrated drains

Maintenance – LH-side Access



- Power steering reservoir
- Steering gear linkages
- Fuel filters
- Centrifugal oil filter



- Fuel/water separator
- Oil dipsticks
- Windshield wiper motor and linkage

Maintenance – RH-side Access



- Radiator surge tank
- Air cleaner / restriction indicator
- Oil filter

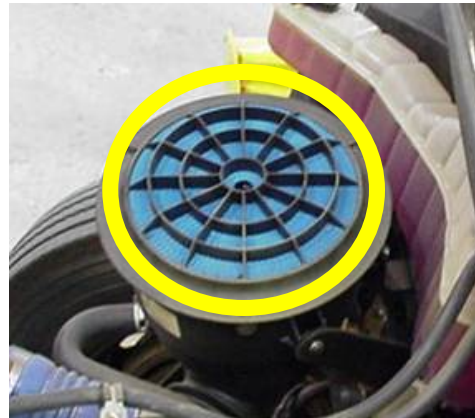


- Windshield washer reservoir
- Heater cutoff valves
- Crossing control arm

Maintenance – Air Cleaner



Replace the element at the service interval or when the restriction indicator signals red (see Section 09 in Workshop)



Always place a cover over the air cleaner when the hood is open to keep from exposing the element to contamination

Maintenance – Engine

CHECK ALL LEVELS DAILY

Lube Oil & Lube, Fuel, Coolant Filters	15K Miles / 6 Months
Coalescing Filter (Cummins Engine)	60K Miles / 24 Months
Air Filter (Paved Roads)	12 Months
Coolant Flush (15K - Test)	60K Miles / 24 Months
Overhead Adj.	150K Miles / 48 Months
DEF & DPF Filters	200K Miles



Install Fuel Filters “DRY”



Maintenance – Engine

•Main Oil Filter:

- **MBE 6 Cyl A0001801709**
- **MBE 4 Cyl A0001801609**
- **Cummins LF3970**
- **Cat 1R1807**

•Centrifugal Oil Filter:

- **MBE 6 Cyl 9061810086**

•Fuel Filter:

- **MBE A0000901551**
- **'07 MBE A0000902751**
- **Cummins FS19855**
- **Cat 1R0751**

•Coolant Filter:

- **MBE WF2077**
- **Cummins FF5632**

•Coolant:

- **GM-6038 / ASTM 4965 / RP329**

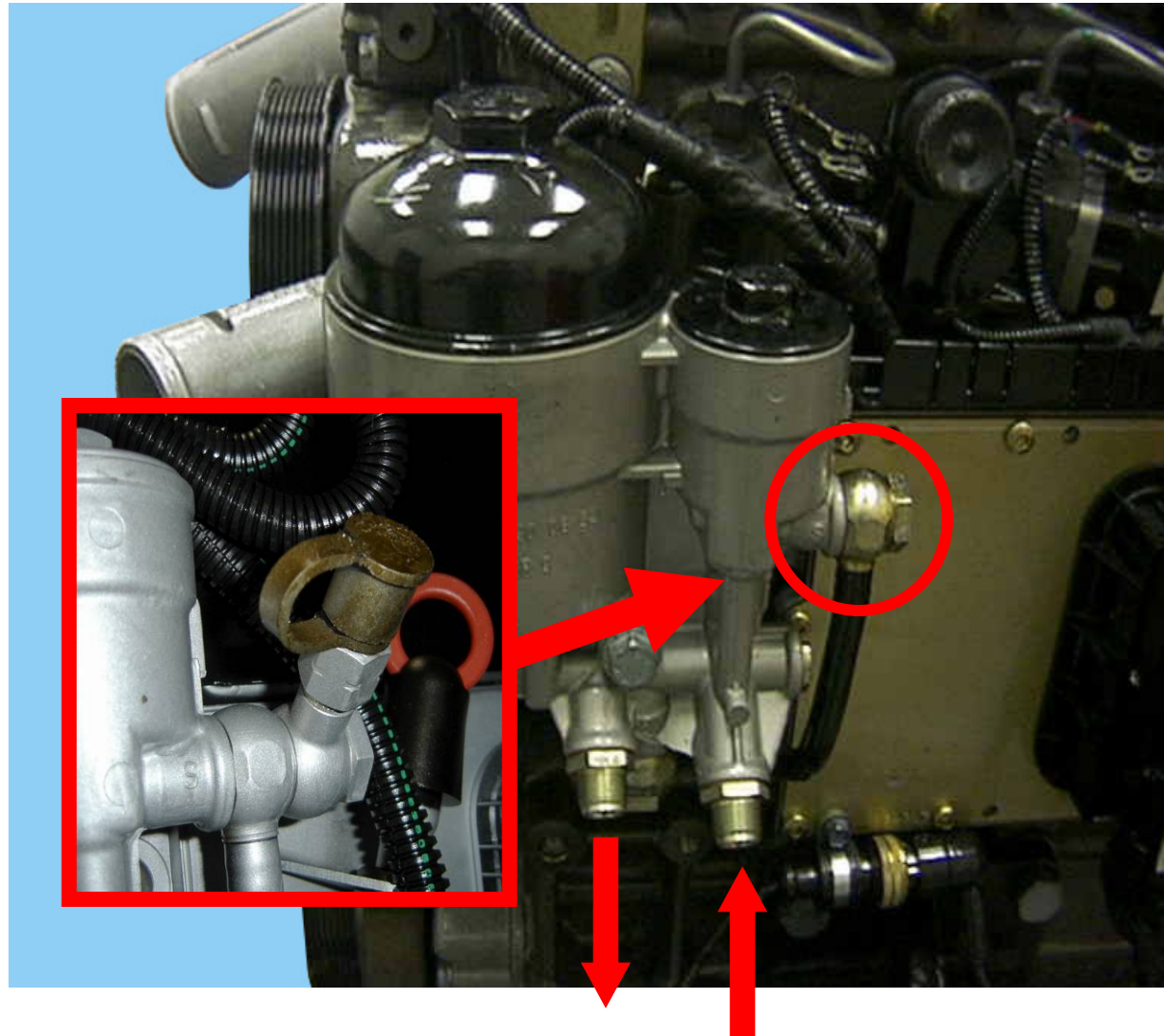
•Oil:

- **15W-40 API CJ-4**
- **CES 20081 (Cummins)**

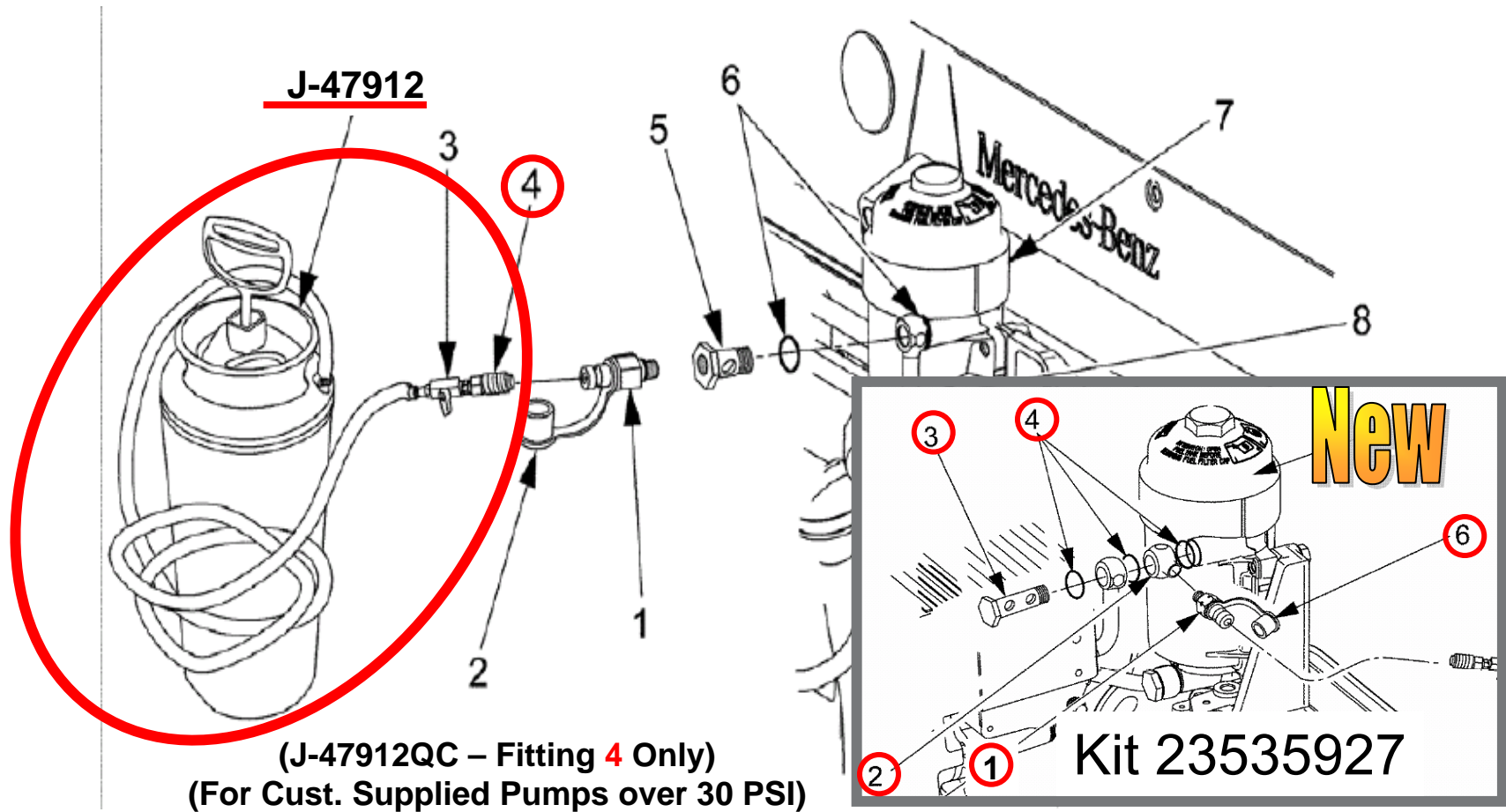
•Fuel:

- **ULSD**

Maintenance – Engine



Fuel Priming System



Standard '07 Fuel Filter Assembly

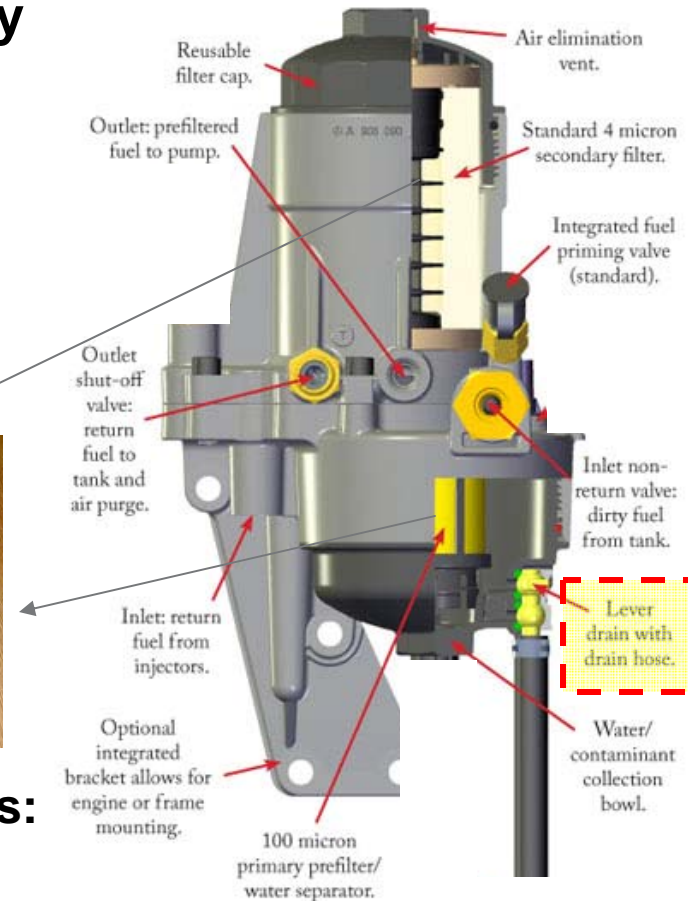
- Primary & secondary filtration
- Fuel water separation
- One compact assembly
- Engine mounted for easy access
- 4 micron fuel filter
- Quick connect fuel primer fitting

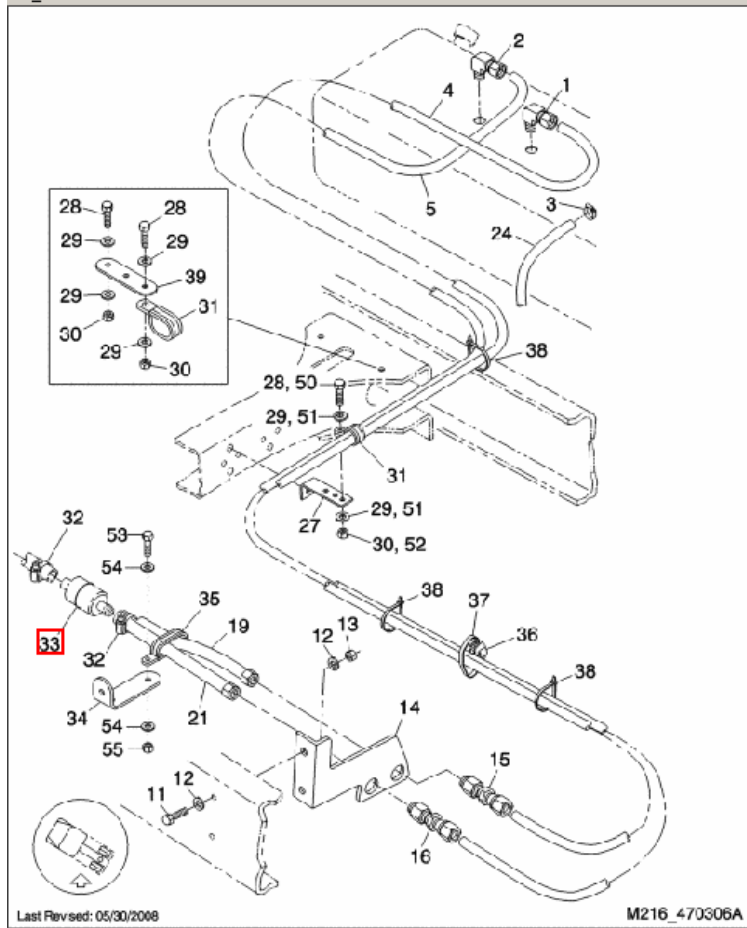
A0000902751
Filter Kit



Fuel Filter **Optional Package** Includes:

- Fuel heater
- Hand priming pump
- Water-In-Fuel Sensor





Inline Fuel Filter – MBE only

New Style – RAI 025 RAC 10



Old Style – FG FF 5289

Cummins ISB

Fuel Filters



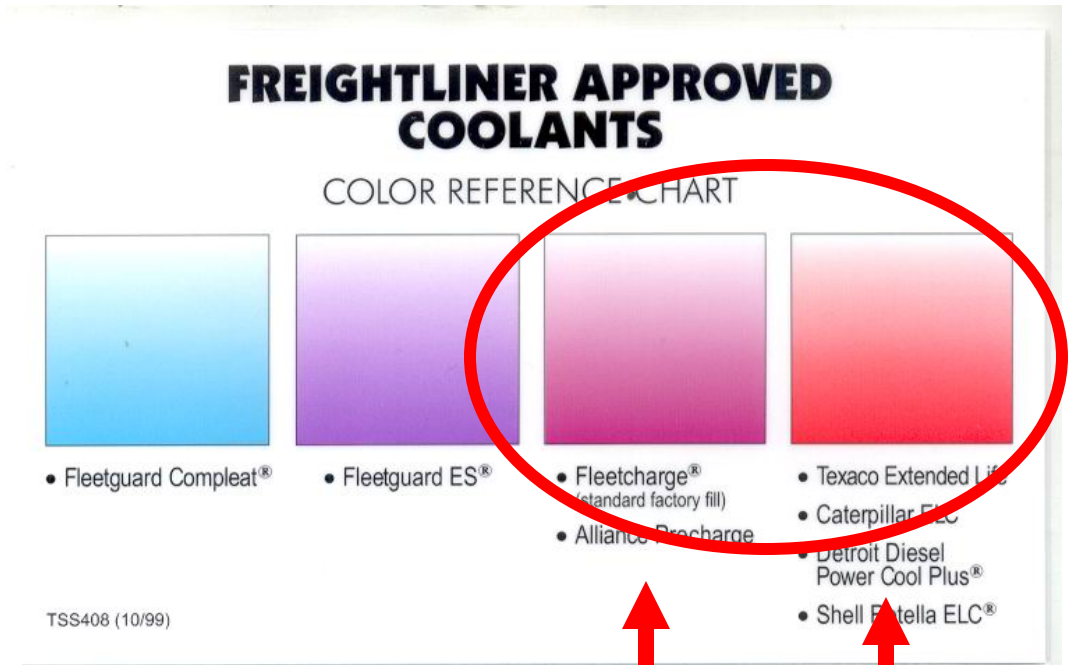
Oil Filter



Coalescing Filter

Maintenance – Engine

- Coolant:
 - Long Life –Freightliner
 - OWI ALAWS3 Gal
 - OWI ALAW51 55 Gal
 - Extended Life - DDC
 - 23519396 Gal
 - 23519398 55 Gal



**Test Strips
TS 100**

**SCA Additive
23507855 Pint**



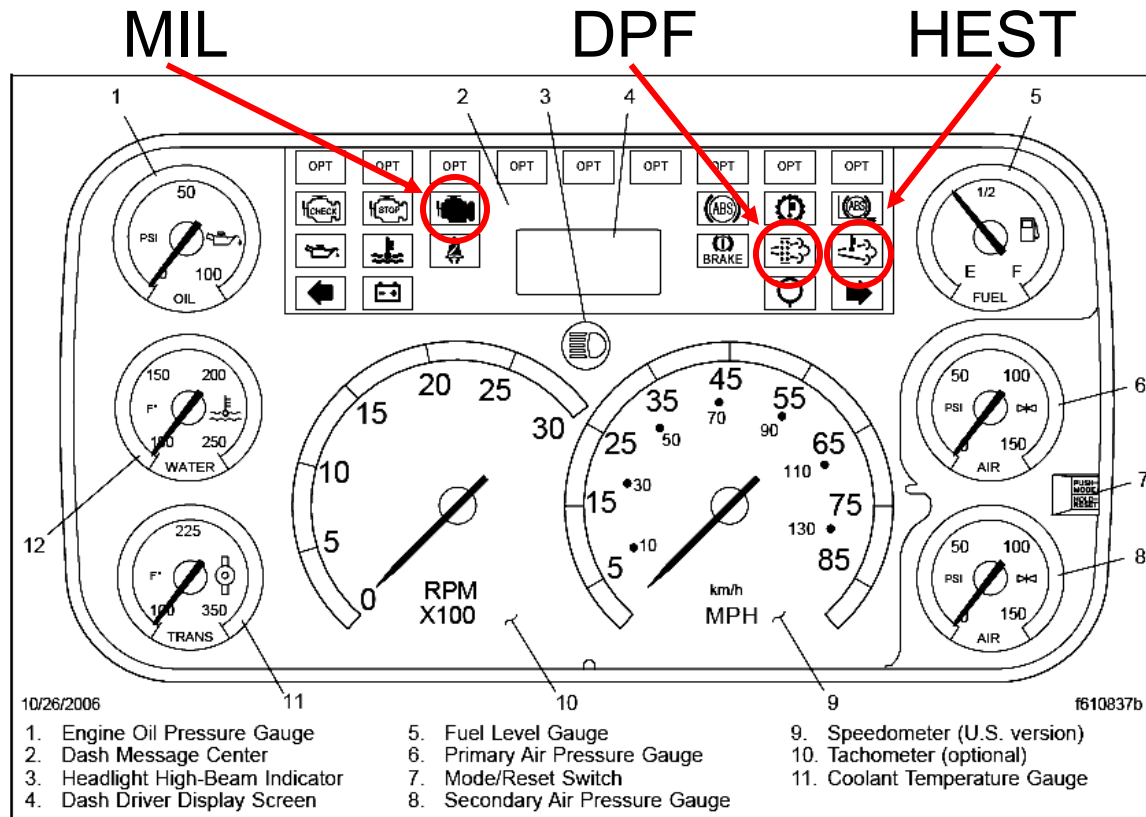
Maintenance – Coolant

Factory Fill

- Old World Industries
- Meets GM-6038 / ASTM 4965 / RP329 spec
- Consult Bill Record To Verify

Recommendations

- Use 50/50 fully formulated premix as top-off
- Select and follow a maintenance procedure that compliments your coolant chemistry and operating conditions
- Keep written records
- Use laboratory testing to determine coolant life



HEST – High Exhaust System Temp - Normal Indicator
DPF – Diesel Particulate Filter - Regeneration Necessary
MIL – Malfunction Indicator Lamp - Call Dealer

Stationary Regeneration



Parked Regeneration Procedure

The engine should be fully warmed up (coolant temperature should be above 185F)

Engine must be at slow idle (cannot be in Fast Idle or PTO Mode)

The transmission must be in neutral

Set the park brake (cycle the park brake OFF to ON)

Press and release the clutch pedal (if configured)

Hold the DPF Switch to the ON position for five (5) seconds and release (engine speed will increase and DPF Lamp will go out)

Initiate/Cancel
Regeneration



The regeneration will take approximately 20-40 min.






The regeneration is complete when the engine returns to low idle and the DPF lamp remains off.

If the DPF lamps comes back on the regeneration failed. (Contact the Customer Support Center)

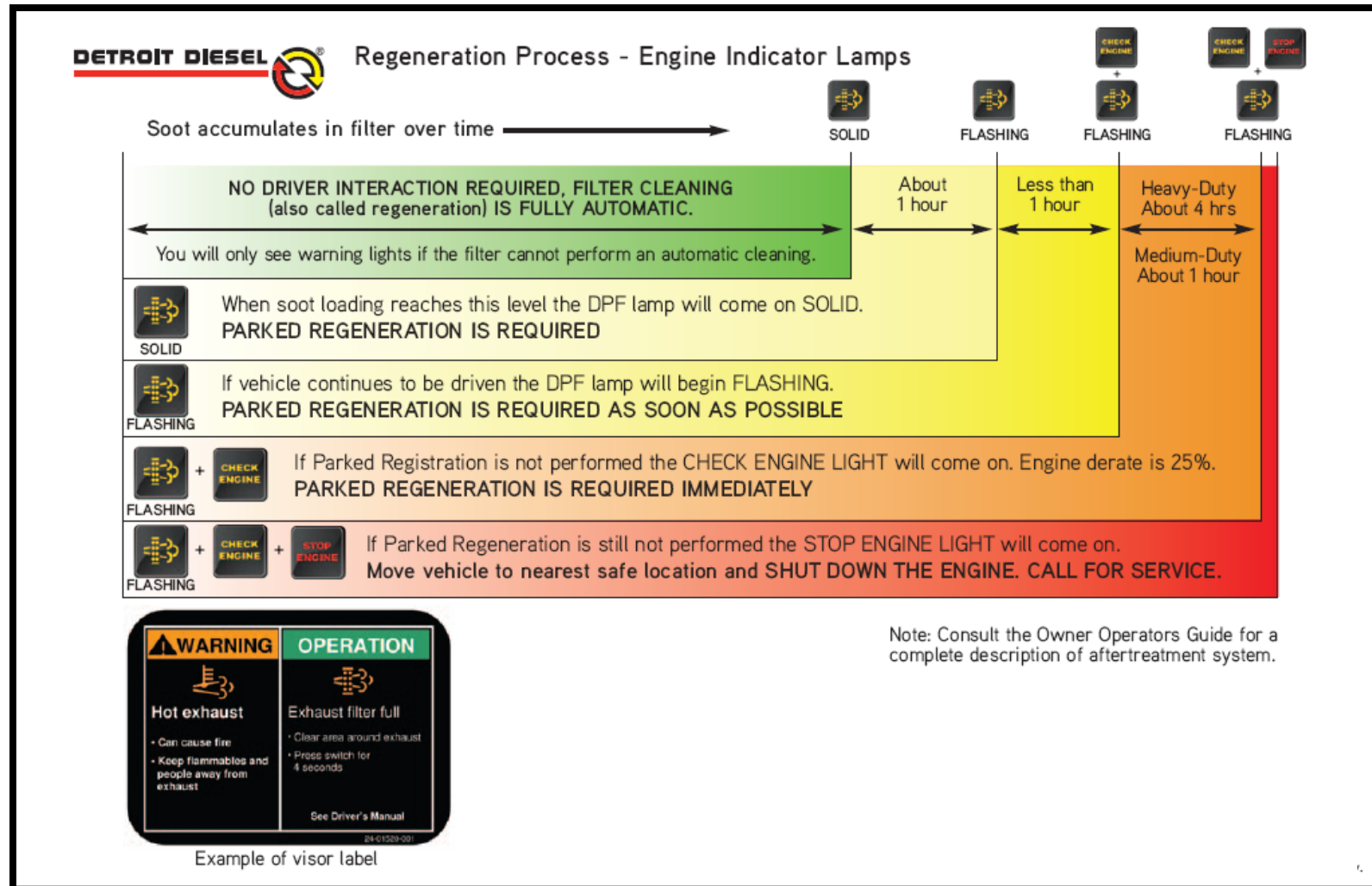
To Cancel a Parked Regeneration hold the DPF Switch to the ON position for five (5) seconds and release.

A Parked Regeneration will stop if the key is turned to the off position, the truck is put into gear or the parking brake is released.

Engine Indicator Lamps – Driver Actions

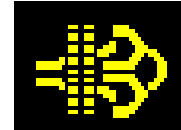
INDICATOR LAMP	DESCRIPTION	DRIVER ACTION
Amber Warning Lamp (AWL) 	Indicates a fault with the engine controls.	Vehicle can be driven to end of shift. Call for service.
Red Stop Lamp (RSL) 	Indicates a major engine fault that may result in engine damage. Engine derate and/or shutdown sequence will be initiated.	Move the vehicle to the nearest safe location and shutdown the engine. Call for service
DPF Regeneration Lamp 	Solid yellow indicates a parked regeneration is required. Blinking yellow, derate and/or shutdown are possible as soot load continues to increase. Lamp will shut off during parked regeneration.	Lamp solid – parked regeneration required. Lamp flashing – parked regeneration required immediately.
High Exhaust System Temperature Lamp 	This is an information indicator. It indicates exhaust temperature is above a preset limit and the unit is operating at low vehicle speed. Lamp is yellow.	Vehicle can be driven.
Malfunction Indicator Lamp (MIL) 	Yellow lamp Indicates a failure of an Emission Control device. May illuminate at the same time as the Amber Warning Lamp.	Vehicle can be driven to end of the shift. Call for service.

Stationary Regeneration



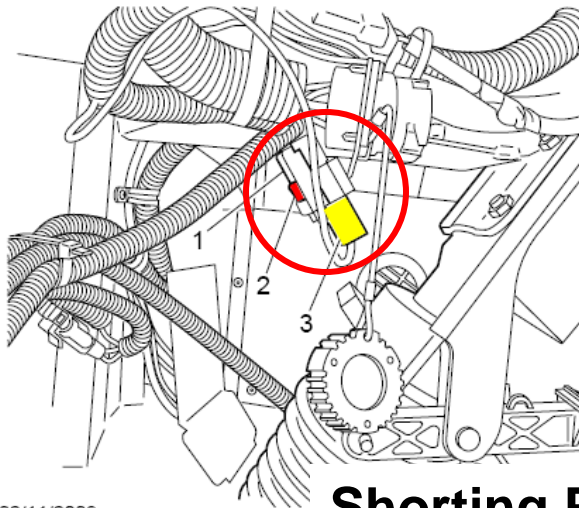
Stationary Regeneration

- When the DPF lamp illuminates, regeneration must be completed within the next 4 - 8 hours.
- Regeneration Procedures:
 - Regeneration Lamp must still be illuminated
 - Set Park Brake
 - Turn off all High Idle Systems
 - Transmission must be in neutral
 - Vehicle speed must be 0
 - Apply Service Brake and cycle the Parking Brake off and then back on, release Service Brake (*Mercedes only*)
 - Technician activates the Regen Switch or pulls the Shorting Plug (> 5 secs)
- Once initiated, this regeneration takes roughly 35 min.





Plug Location



Shorting Plug

02/11/2009

1. Primary Lock
2. Secondary "Red" Lock
3. Plug



**Stationary Regeneration
Switch**

Optional Fast Engine Heat: Mercedes Engine

- Fast Idle Activated
- Split Injection Activated
- Intake Throttle is Modulated
- Exhaust Flap is Closed

Engine at Idle
Park Brake Engaged
Coolant < 153°F

Shuts off @ 158°F and
Activates again < 153°F



CHECK FLUID LEVELS DAILY

- w/ **TES295** Fluid:
 - 2K 150K/48M
 - 3K 300K/48M
- Filters:
 - 2K 50K/24M
 - 3K 75K/36M



- Both – Initial 5K



- w/ **Dexron** Fluid:
 - 2K 50K/24M
 - 3K 25K/12M
- Filters:
 - 2K 50K/24M
 - 3K 25K/12M
- Both – Initial 5K

Revised 9/06



Maintenance – Transmissions

•Filters:

- 2K:

- **Spin-On 29539579**
- **Filter Magnet 29535617**
- **Deep In-Pan 29537966**

- 3K:

- **Filter Kit (2) 29537067**

•Fluid:

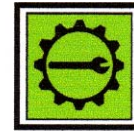
- **TES-295**

•NSBU Switches:

- **29540479 – 2 plug**
- **29541852 – 1 plug**
- **J-41364-A Adj. Tool**

Allison '09 Prognostics

2000 Series
Dash Lamp



- **Oil Life Monitor**

- Indicator or Lamp remains illuminated for 2 minutes after Drive is selected
- Change transmission fluid.

- **Filter Life Monitor**

- Indicator or Lamp remains flashing for 2 minutes after Drive is selected.
- Change transmission filter(s)


- **Transmission Health Monitor**

- Indicator or Lamp remains illuminated at all times during vehicle operation.
- Clutch system may have exceeded specified limits.

3000 Series
Indicator




Allison '09 Prognostics 3000 Series



Up/Down Arrow Buttons		Mode ID	Readout
1st Press	Oil Level Sensor	OL	OL OK, OL LO xx, OL HI xx
2nd Press	Oil Life Monitor	OM	99 down to 0 Oil Life Remaining
3rd Press	Filter Life Monitor	FM	OK, LO
4th Press	Trans Health Monitor	TM	OK, LO, NA
5th Press	Diagnostic Codes	d#	d1 P xx xx

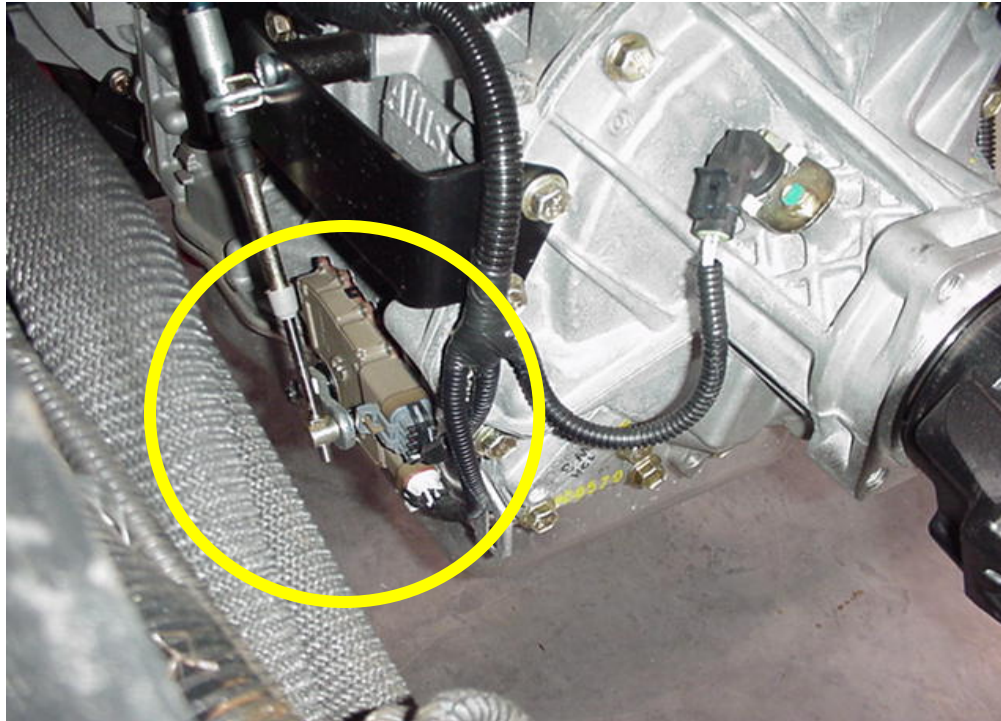
Accessing Prognostic via the 3000 Shifter



- Oil Life Monitor
- Filter Life Monitor
- Transmission Health Monitor

Resetting procedures vary with model

Maintenance – Trans Linkage

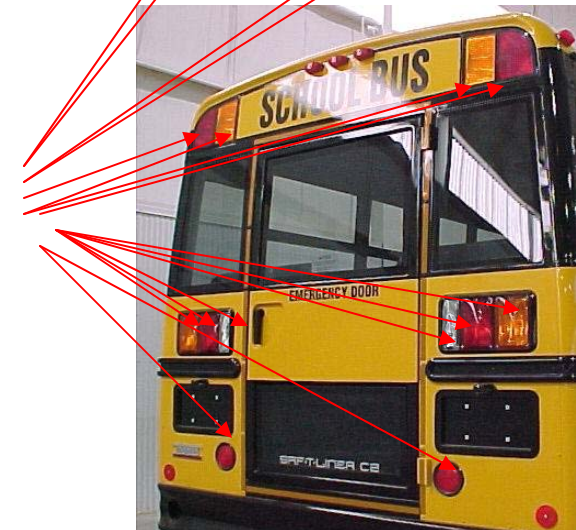


For earlier Allison 2000 PTS Transmission
Check linkage and NSBU switch adjustment

D07-19453

Bulb Check (Automatic)

- Set Parking Brake
- Key Off / Hazard Switch On
- Pull Turn Signal Stalk Back to “Flash to Pass” & Hold Back
- Cycle Key “Off” to “Acc” 3 Times
- Release Turn Signal Stalk
- Review Lights / Crossing Arm / Stop Signs (Clockwise from Front)
 - Look out for the Crossing Arm!!
- Test Complete at Horn Blow



!



Maintenance – Bulb Check

Front

- Clearance Lights Flash
- **Drivers Side**
 - Yellow Warning Light
 - Red Warning Light
 - Park Light Hood
 - Turn Signal Hood
 - Headlight Low Beam
 - Headlight High Beam
 - Crossing Gate - Option
- **Entry Door Side**
 - Headlight Low Beam
 - Headlight High Beam
 - Park Light Hood
 - Turn Signal Hood
 - Yellow Warning Light
 - Red Warning Light
- Clearance Lights Flash – Rotate *

Entry Door Side

- Side Directional
- Clearance Lights Flash
- Strobe - If Optioned
- Clearance Lights Flash – Rotate *

Rear

- **Entry Door Side**
 - Red Warning Light
 - Yellow Warning Light
 - Yellow Turn Signal
 - Upper Tail Light
 - Upper Brake Light
 - Back Up Light
 - License Plate Lights
 - Lower Tail Light
 - Lower Brake Light
- **Drivers Side**
 - Red Warning Light
 - Yellow Warning Light
 - Yellow Turn Signal
 - Upper Tail Light
 - Upper Brake Light
 - License Plate Lights
 - Lower Tail Light
 - Lower Brake Light
- Clearance Lights Flash – Rotate *

Drivers Side

- Side Directional
 - Stop Arm Deploys
 - Clearance Lights Flash
 - Side Directional
 - Horn Honks
 - Hazards Begin
 - Pre Trip Complete
- } Occurs Twice

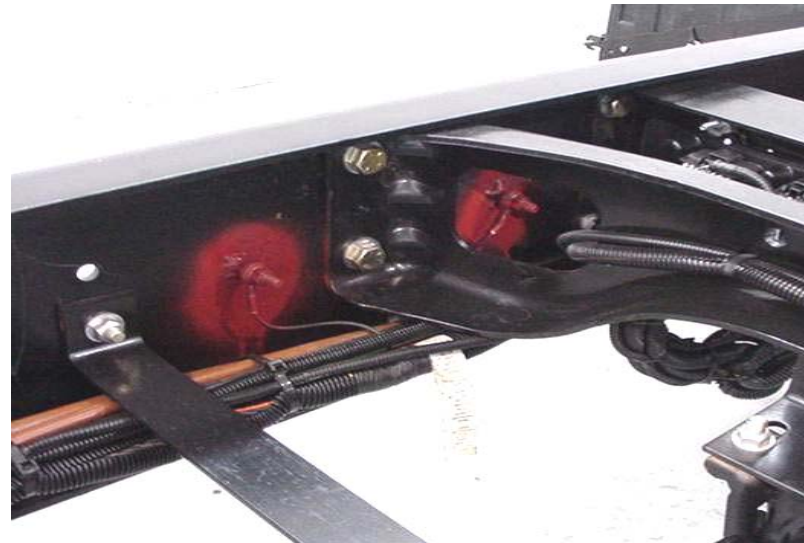
* Always Rotate Clockwise around Bus

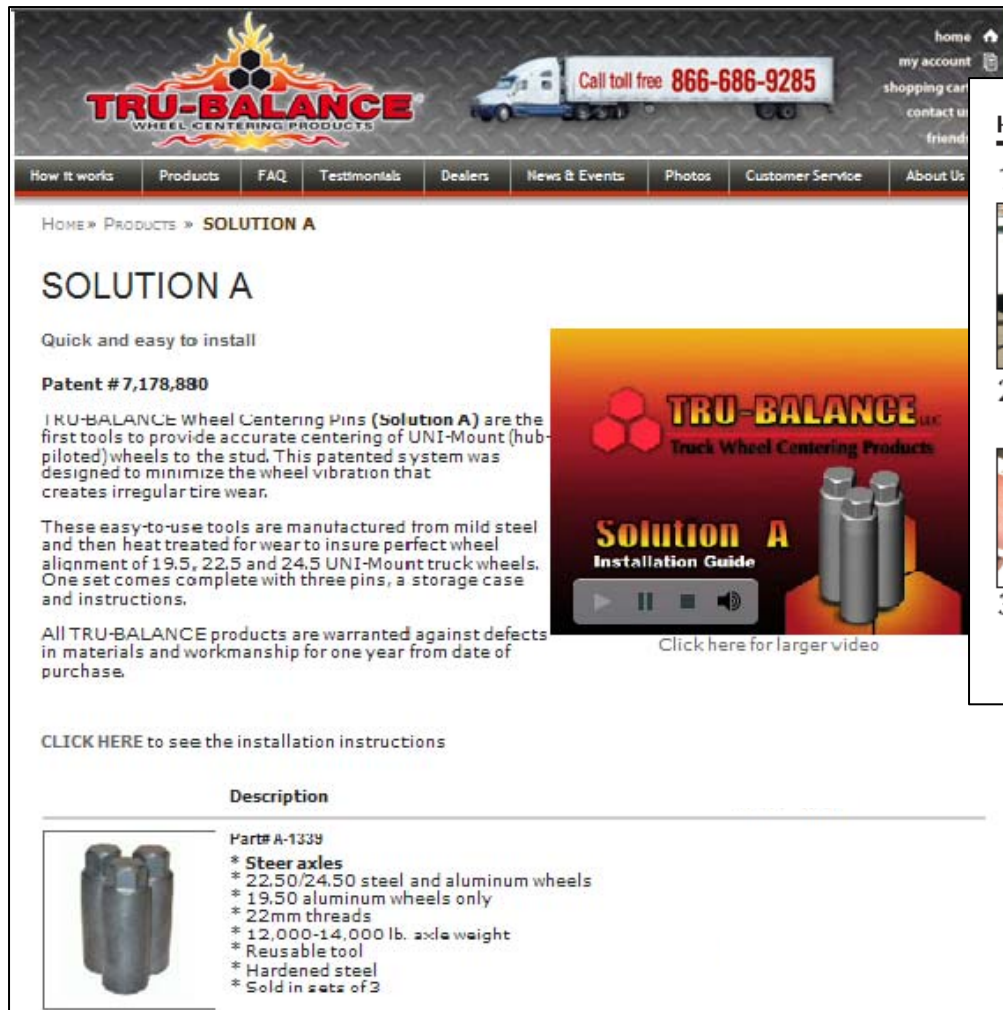
Batteries

- Inspect cables and connections
- Load test

Grounds

- Inspect, test and repair





TRU-BALANCE
WHEEL CENTERING PRODUCTS

Call toll free 866-686-9285

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HOME » PRODUCTS » **SOLUTION A**

SOLUTION A

Quick and easy to install

Patent # 7,178,880


TRU-BALANCE Wheel Centering Pins (**Solution A**) are the first tools to provide accurate centering of UNI-Mount (hub-piloted) wheels to the stud. This patented system was designed to minimize the wheel vibration that creates irregular tire wear.

These easy-to-use tools are manufactured from mild steel and then heat treated for wear to insure perfect wheel alignment of 19.5, 22.5 and 24.5 UNI-Mount truck wheels. One set comes complete with three pins, a storage case and instructions.

All TRU-BALANCE products are warranted against defects in materials and workmanship for one year from date of purchase.

Click here for larger video

CLICK HERE to see the installation instructions

Description	
	Part# A-1339
	* Steer axles
	* 22.50/24.50 steel and aluminum wheels
	* 19.50 aluminum wheels only
	* 22mm threads
	* 12,000-14,000 lb. axle weight
	* Reusable tool
	* Hardened steel
* Sold in sets of 3	

How to Use Your Tru-Balance Centering Pins

1 Wear safety glasses!



2 Jack up the vehicle until the tire is off the ground. Always use adequate jack stands.



3 Lubricate tool and install Tru-Balance tool at 12-4-8 o'clock positions. **DO NOT USE AN IMPACT WRENCH.**



4 Install wheel with Tru-Balance in place.



5 Install 7 wheel nuts and lightly tighten.

6 Remove Tru-Balance tools and replace with the 3 remaining nuts.

7 Tighten all nuts to wheel/stud manufacturer's specifications.

Care of Tru-Balance Tool

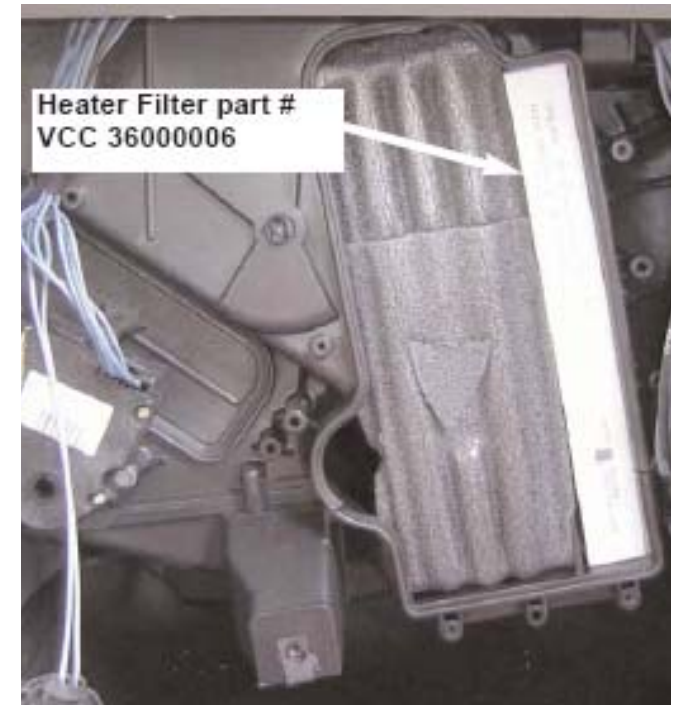
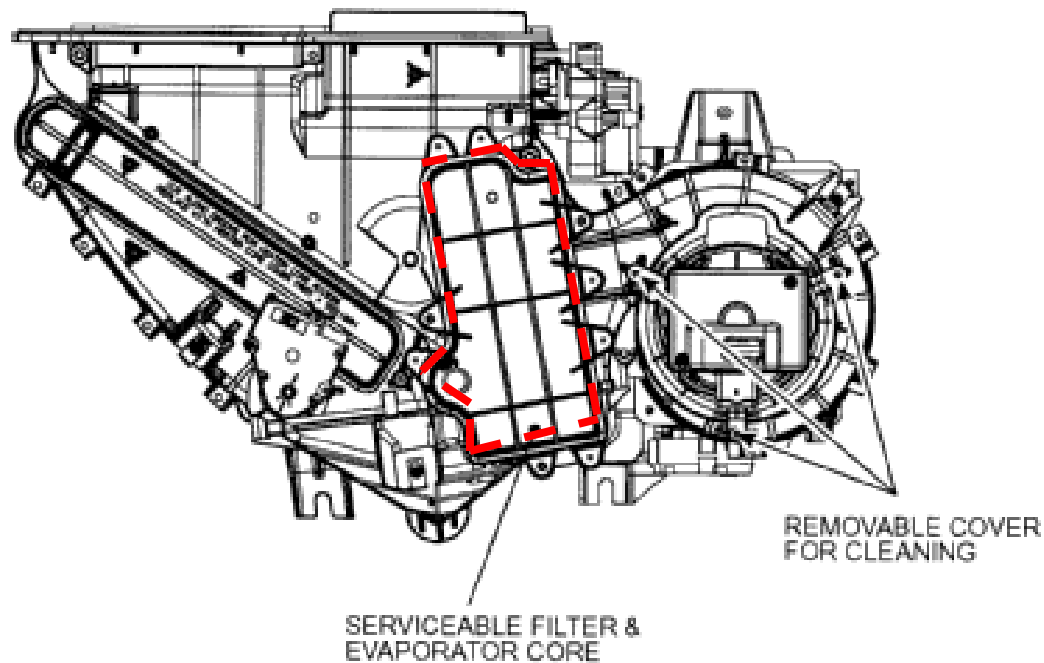
Always follow the truck, wheel and wheel manufacturer's recommended mounting and install procedures.

- **DO NOT USE AN IMPACT WRENCH.** Use of impact wrench will damage tool and void the warranty.
- Do not force into wheel stud hole.
- Do not use tool to correct study threads.
- Do not use on Budd style wheels.
- Remove Tru-Balance tool before moving truck.
- Tru-Balance is not responsible for improper use of tool.

www.tru-bal.com

Maintenance – HVAC

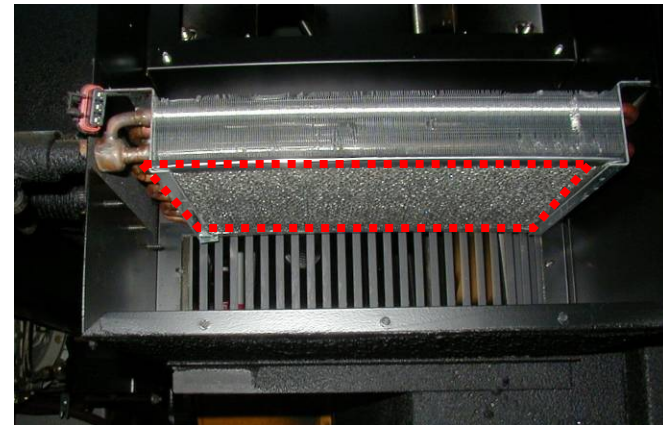
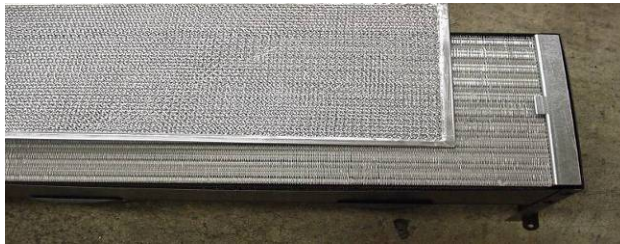
Dash HVAC Filter



Current Filter is ABP N10G 36000006

Maintenance – HVAC

- Passenger & Stepwell heaters have aluminum filters
- Inspect and / or clean filters every 30 days
- Inspect / tighten hose clamps after 30 days and routinely thereafter



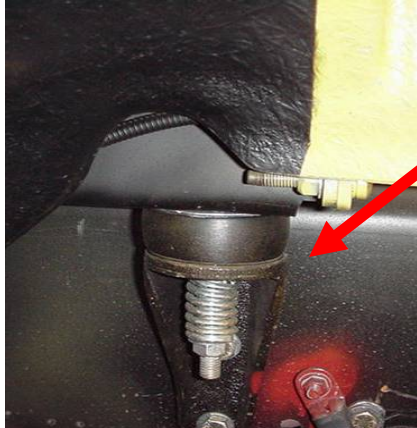
Maintenance – Head Lights

Head Light Aiming

1. Park bus 25 feet from wall to front bumper
2. Measure up to center of headlight
3. Measure up from floor and mark wall with same dimension
4. Turn on headlights and adjust to focus on line



Maintenance – Fasteners



- Check spring tension after 30 days and every 6 months thereafter
- Check torque after 30 days and every 6 months thereafter



- Check torque on body clips after 30 days and every 6 months thereafter
- Torque 35-50 ft/lbs

Front Wheel Hop

Maintenance – Fasteners

Seat Bolts



Check torque on mounting bolts after 30 days
and every and every 90 days thereafter



Maintenance – Doors & Floors

- Open and close all exits - confirm buzzer operation
 - Operate entrance door - confirm 24" minimum opening
 - Operate lift
 - Confirm buzzer operation
 - Check fluids
 - Check deploy and stow
-
- Keep flooring clean and free of abrasive debris
 - During first 30 days, rinse often with clean water
 - Apply wax after 30 days



Evaluation 8



Training Evaluation

Instructor: _____

Date: ____/____/20____

1. Student handouts were? (Only if applies)

<i>Excellent</i>		<i>Good</i>		<i>Poor</i>
1	2	3	4	5

2. Presentations, and/or video were?

<i>Excellent</i>		<i>Good</i>		<i>Poor</i>
1	2	3	4	5

3. Shop demonstrations were? (Only if applies)

<i>Excellent</i>		<i>Good</i>		<i>Poor</i>
1	2	3	4	5

4. Would you recommend this class to others?

<i>Definitely</i>		<i>To Some</i>		<i>No</i>
1	2	3	4	5

5. Did the class provide the expected instruction?

<i>Yes</i>		<i>Somewhat</i>		<i>No</i>
1	2	3	4	5

6. What was your overall impression of the course?

<i>Excellent</i>		<i>Good</i>		<i>Poor</i>
1	2	3	4	5

7. Do you feel that what you've learned will help you do your job better?

<i>Help A Lot</i>		<i>Help Some</i>		<i>No Help</i>
1	2	3	4	5

8. The length of the course was?

<i>Too Long</i>		<i>Just Right</i>		<i>Too Short</i>
X	X	X	X	X

9. The pace of the presentation was?

<i>Too Fast</i>		<i>Just Right</i>		<i>Too Slow</i>
X	X	X	X	X

10. The amount of shop time was? (Only if applies)

<i>Too Much</i>		<i>Just Right</i>		<i>Not Enough</i>
X	X	X	X	X

11. If you were to make changes, what would they be?

Circle the answer which most closely reflects your opinion