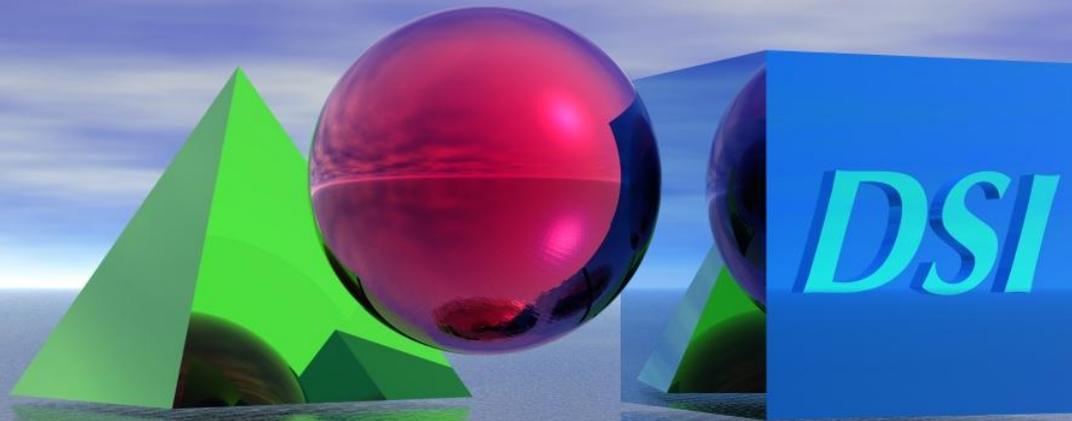


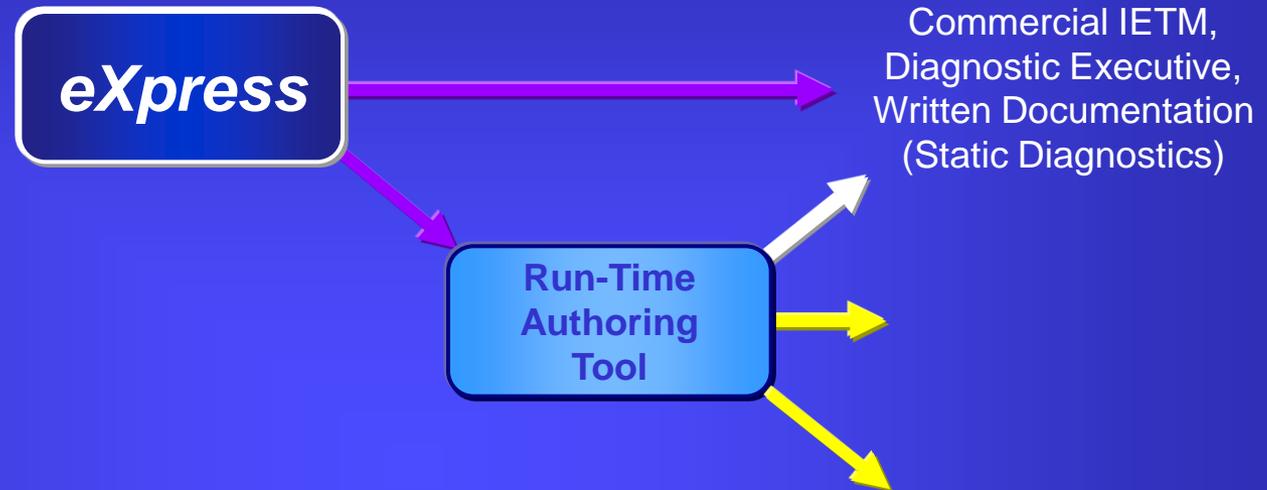
eXpress Diagnostic Deployment

IETM Environment



DSI International
May, 2011

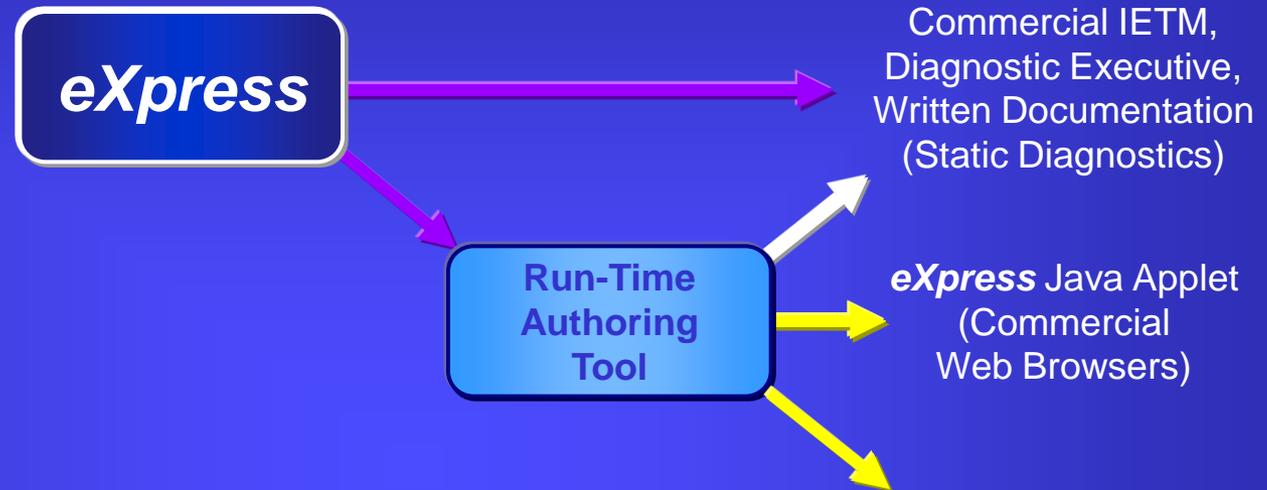
eXpress Diagnostic Deployment – IETM Environment



Run-Time Authoring Tool

- ❖ Reads DiagML files from **eXpress**
- ❖ Provides options for customizing the display of exported data
- ❖ Publishes data for **eXpress** Java Applet, DSI Workbench, and custom solutions
- ❖ Facilitates the mapping of regions in alternative views to elements in the design
- ❖ Supports creation of test/repair procedures

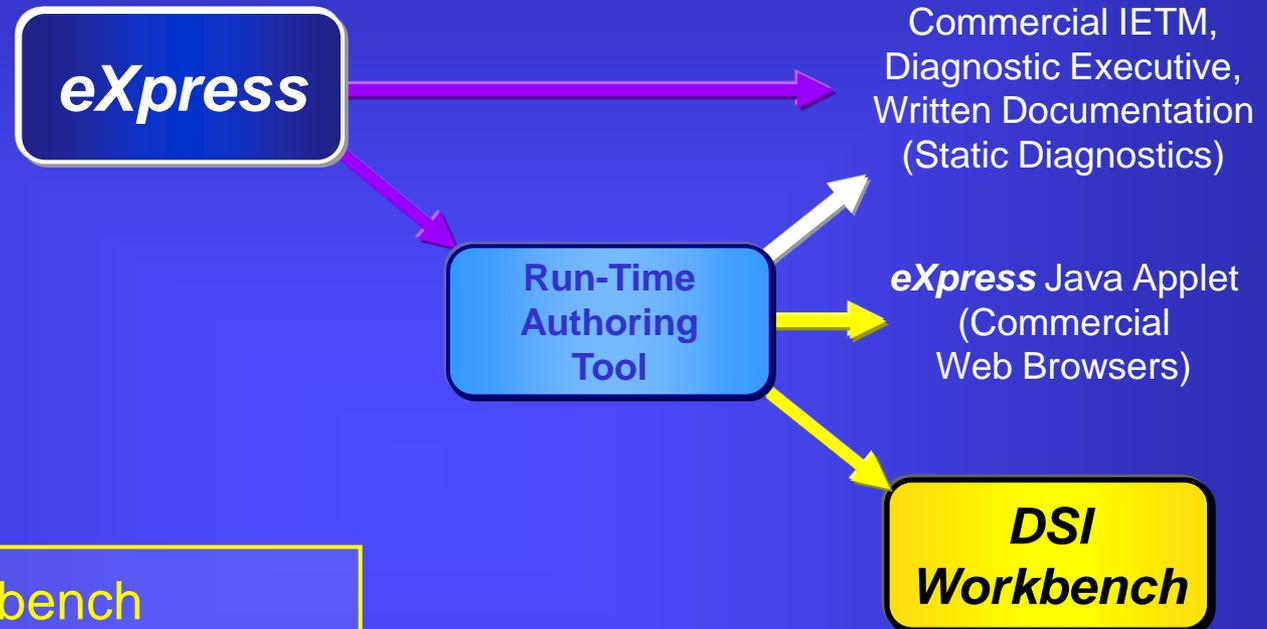
eXpress Diagnostic Deployment – IETM Environment



eXpress Java Applet

- ❖ Runs in any Web Browser
- ❖ Allows **eXpress** data to be shared with individuals who do not have **eXpress**
- ❖ Provides hierarchical display of objects, nets, functions, failure modes, tests and diagnostic trees
- ❖ Replicates the exact appearance of model drawings in **eXpress**

eXpress Diagnostic Deployment – IETM Environment



DSI Workbench

- ❖ Designed to be used by technicians
- ❖ Allows **eXpress** diagnostics to be deployed in production & maintenance environments
- ❖ Highly customizable (alternative design views, detachable/movable windows, automation options, test/repair procedures)
- ❖ Support for diagnostic sessions, health monitoring, integration with test equipment

eXpress Diagnostic Deployment – IETM Environment

The screenshot displays the eXpress software interface for an automotive braking system. The main window shows a table of parts with the following columns: Object Abbreviation, Cost (in US Dollars), LCN, Part Number, Reliability (MTBF), Time, and Description. The 'Left Front Caliper' (Object Abbreviation 29) is highlighted in blue. The table lists various components such as FS Line, Fuse, GF Sense, IGN Sw, L-F Wheel, L-R Wheel, LF Brk Pist, LF Caliper, LF CKV, LF In SV, LF Out SV, LF Rotor, LF Sen Conn, LF Tone Ring, LFI Pad, LFO Pad, LFWSS, LR Brk Pist, LR Bulb, LR Caliper, LR CKV, LR In SV, LR Out SV, LR Rotor, LR Sen Conn, LR Tone Ring, LRI Pad, and LRO Pad95.

Object Abbreviation	Cost (in US Dollars)	LCN	Part Number	Reliability (MTBF)	Time	Description
22 FS Line	20.00	06544	CE150.67359	89.29 days	30 min	Front Supply Line
23 Fuse	1.00	06655	O321725305	178.57 days	5 min	Fuse
24 GF Sense	100.00	00355		4.89 years	30	G Force Sensor
25 IGN Sw	35.00	0324	P711281 kit	2.44 years	1 hr	Ignition Switch
26 L-F Wheel	120.00	00254	WS1614	47.62 days	45 min	Left Front Wheel (Tire)
27 L-R Wheel	120.00	0240	WS1614	47.62 days	45 min	Left Rear Wheel (Tire)
28 LF Brk Pist	65.00	1200	W0133-1819918 R - A118B4613BS F set	53.57 days	1.5 hr	Left Front Brake Hydraulic Piston
29 LF Caliper	73.00	3688	W0133-1819918 R - A118B4613BS F set	119.05 days	1.5 hr	Left Front Caliper
30 LF CKV	30.00	001212	B3246075	178.57 days	30 min	Left Front Check Valve
31 LF In SV	45.00	10222	B3246075	178.57 days	30 min	Left Front Inlet Solenoid Valve
32 LF Out SV	45.00	02555	B3246075	178.57 days	30 min	Left Front Outlet Solenoid Valve
33 LF Rotor	90.00	033554	W0133-1819918 R - A118B4613BS F set	89.29 days	2 hr	Left Front Brake Rotor
34 LF Sen Conn	15.00	014125	MIBRAB11	4.89 years	30 min	Left Front Speed Sense Connector
35 LF Tone Ring	60.00	025545	P15K1298 kit	297.62 days	2 hr	Left Front Tone Ring
36 LFI Pad	25.00	02254	P15K1298 kit	857.14 hours	2 hr	Left Front Inner Brake Pad
37 LFO Pad	25.00	02545	P15K1298 kit	857.14 hours	2 hr	Left Front Outer Brake Pad
38 LFWSS	40.00	02254	MIBRAB11	71.43 days	1 hr	Left Front Wheel Speed Sensor
39 LR Brk Pist	65.00	025747	W0133-1819918 R - A118B4613BS F set	53.57 days	1.5 hr	Left Rear Brake Hydraulic Piston
40 LR Bulb	2.00	025441	GW LED ASSYBL	87.5 days	5 min	Left Rear Brake Light Bulb
41 LR Caliper	73.00	01155	W0133-1819918 R - A118B4613BS F set	119.05 days	1.5 hr	Left Rear Caliper
42 LR CKV	30.00	022255	B3246075	178.57 days	30 min	Left Rear Check Valve
43 LR In SV	45.00	35541	B3246075	178.57 days	30 min	Left Rear Inlet Solenoid Valve
44 LR Out SV	45.00	0225	B3246075	178.57 days	30 min	Left Rear Outlet Solenoid Valve
45 LR Rotor	90.00	08775	W0133-1819918 R - A118B4613BS F set	89.29 days	2 hr	Left Rear Brake Rotor
46 LR Sen Conn	15.00	06544	MIBRAB11	4.89 years	30 min	Left Rear Speed Sense Connector
47 LR Tone Ring	60.00	06655	P15K1298 kit	297.62 days	2 hr	Left Rear Tone Ring
48 LRI Pad	25.00	00355	P15K1298 kit	857.14 hours	2 hr	Left Rear Inner Brake Pad
49 LRO Pad95	25.00	0324	P15K1298 kit	857.14 hours	2 hr	Left Rear Outer Brake Pad

Add any additional data to be used during diagnostics and maintenance.

eXpress Diagnostic Deployment – IETM Environment

The screenshot displays the eXpress software interface for diagnostic deployment. The left pane shows a 'Diagnostic Study' tree with various tests and fault groups. The right pane shows a schematic diagram of a brake system with components like L-F Brake Pads, L-F Rotor, L-F Caliper, L-F Wheel, L-F Tire, and various sensors and actuators. Below the diagram are 'Isolation Statistics' tables.

Multiple Fault Statistics				Fault Group Summary Statistics	
FG Size	Count	FP	Cum	Probability of Detection	Probability of Isolation
1	77	81.04	81.04	97.34%	81.04%
2	10	8.97	90.00		
5	2	7.22	97.22	Expected Fault Group Size	1.55
7	7	2.16	99.38	Isolation Effectiveness	64.46
8	1	0.62	100.00		

Calculate diagnostics within **eXpress**.

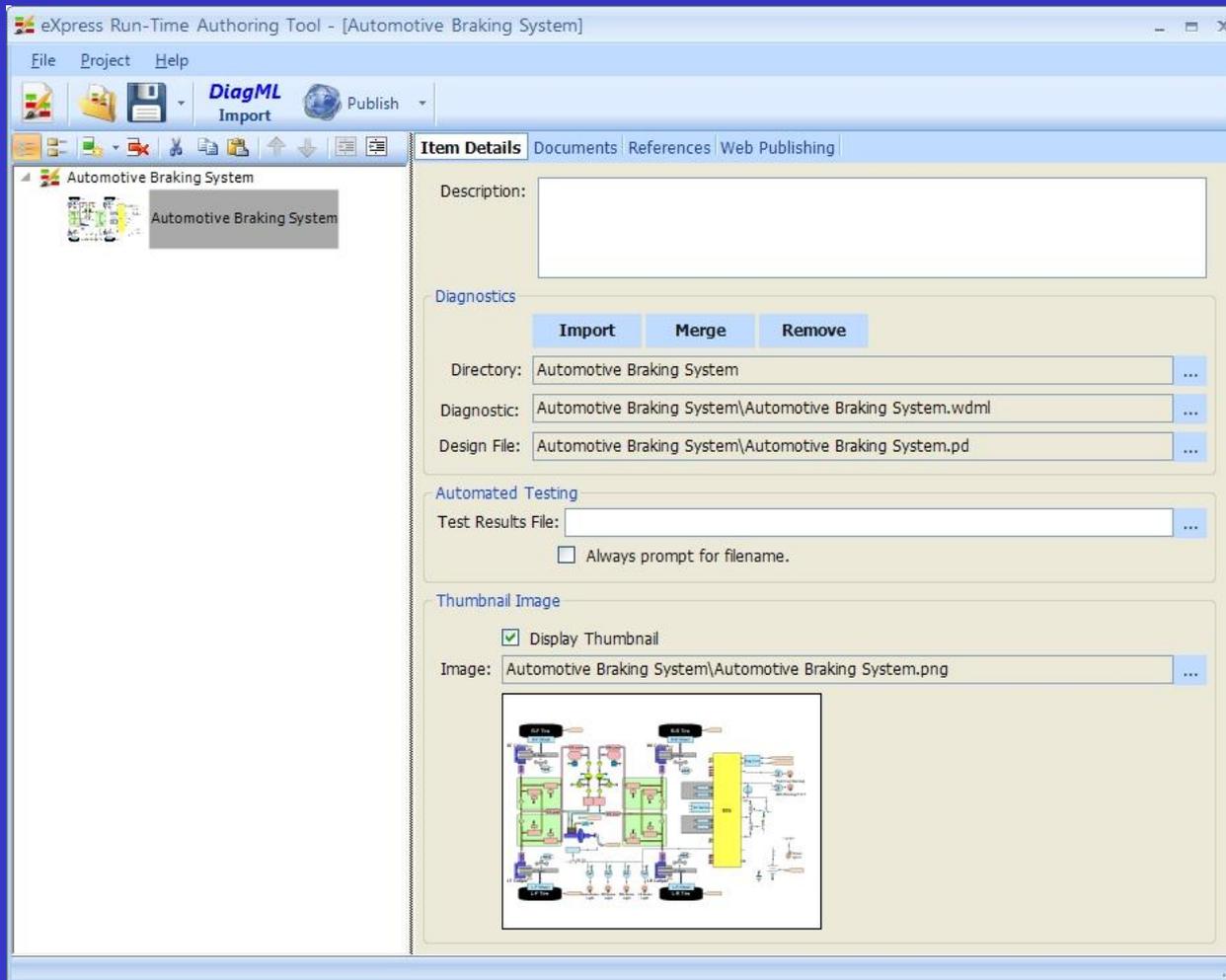
eXpress Diagnostic Deployment – IETM Environment

The screenshot displays the eXpress software interface for diagnostic design. The main window is titled "eXpress - [DiagnosticsDoc1:1]". The left pane shows a "Diagnostic Study" tree with various tests and fault groups. The central area is a diagnostic network diagram showing components like "LF Squealer", "LF Rotor", "L-F Wheel", "L-F Tire", "Dash Bulb", and "Dash Bra Light". A "DiagML Options" dialog box is open, showing settings for exporting the design to a DS1 Workbench. The dialog includes sections for Design Data, I/O Objects, Annotations, Functions, and Failure Modes, with checkboxes for various options. A "Fault Group Summary Statistics" table is visible in the bottom right corner.

Fault Group Summary Statistics	
Probability of Detection	97.34%
Probability of Isolation	81.04%
Expected Fault Group Size	1.55
Isolation Effectiveness	64.46

Export the diagnostic design using the **eXpress** DiagML export.

eXpress Diagnostic Deployment – IETM Environment



Import the DiagML data from **eXpress** into the Run-Time Authoring Tool.

eXpress Diagnostic Deployment – IETM Environment



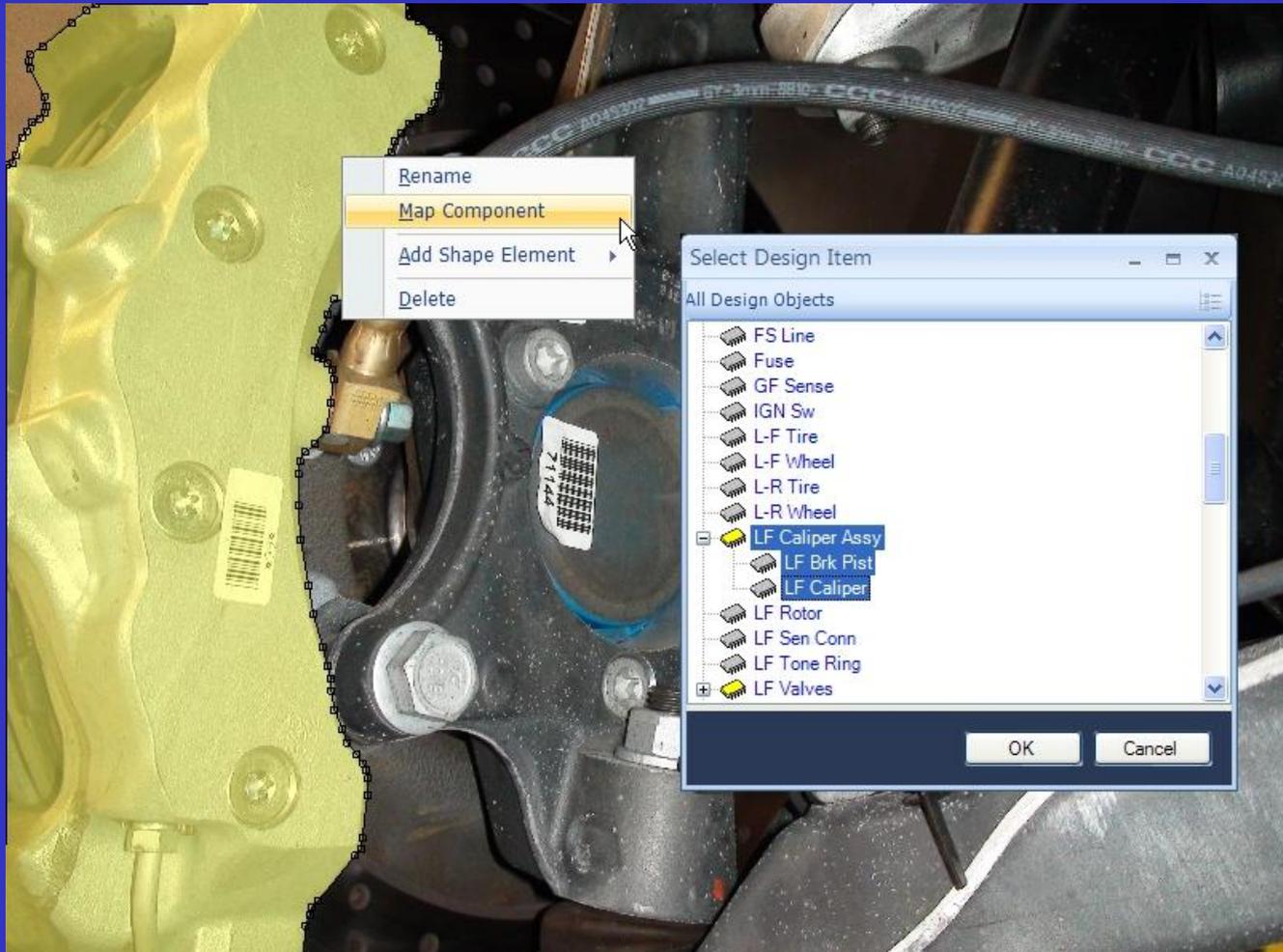
Attach documents as alternative views for DSI Workbench.

eXpress Diagnostic Deployment – IETM Environment



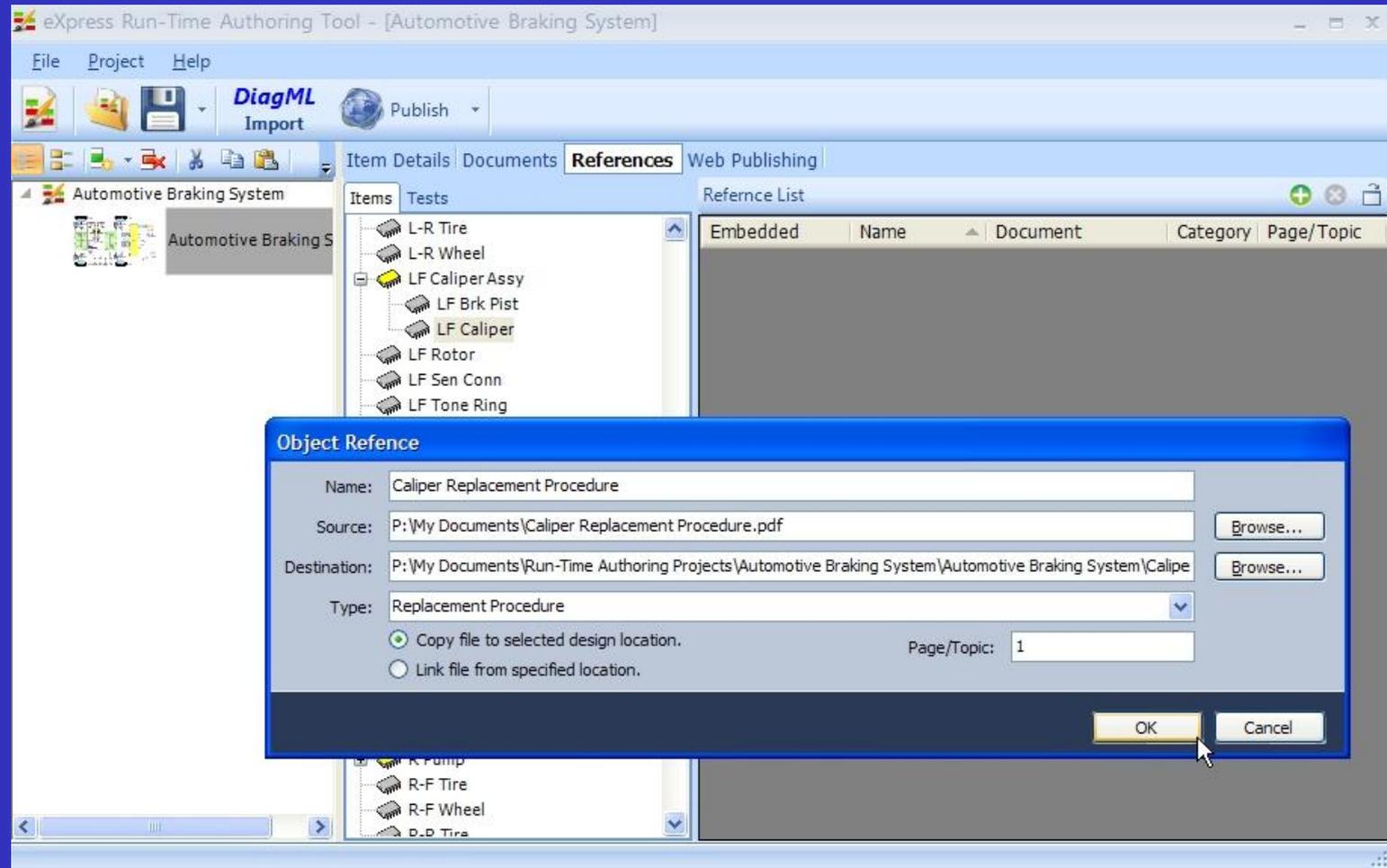
Trace objects on the alternative views for mapping to design objects.

eXpress Diagnostic Deployment – IETM Environment



Map highlighted regions to the diagnostics by selecting the corresponding object(s) in the design.

eXpress Diagnostic Deployment – IETM Environment



Add additional document and procedure references to objects and tests.

eXpress Diagnostic Deployment – IETM Environment

Restart Session

Pass Fail

Back

Fault Group # 78
Replace 1 Item

Fault Group # 78:
Replace LF Caliper Assy

Current Isolation Sequence

Test Name	Cost	Time	Result
Test 1-0:Braking Responsiveness	0	0.004167	Passed
Test 2-0:Hydraulic Leak Test	0	0.016667	Passed
Test 3-0:Automobile Start Test	0	0.004167	Passed
Test 4-0:ABS LED Lit	0	0	Passed
Test 5-0:LR Squealer Test	0	0	Passed
Test 6-0:LF Squealer Test	0	0	Failed
Test 6-1:LF Brake Pads - Inspection	15	0	Passed
Test 6-2:LF Brake Rotor - Inspection	15	0.333333	Passed

Primary Suspects

Suspect Item	Repair Cost	Repair Time	Failure Probability
LF Caliper Assy	\$73.00	1.50	0.010106
LF Caliper			
Caliper Wear non-linear			
Caliper Wear beyond limit			

Automotive Braking System

127%

Braking Assy

14%

LF 3-Position S

LF CKV

LF In SV

LF Brk Pist

LF Pad

LF Rotor

LFO Pad

LF Caliper

LF Squeal

L-F Wheel

Dash Bulb

RR Bulb

RW Bulb

View isolated fault within DSI Workbench.

eXpress Diagnostic Deployment – IETM Environment

The screenshot displays the DSI Workbench software interface. The main window is titled "Diagnostic Status View" and shows a "Test Session" for an "Automotive Braking System". The test results table is as follows:

Test Name	Cost	Time	Result
Test 1-0:Braking Responsiveness	0	0.004167	Passed
Test 2-0:Hydraulic Leak Test	0	0.016667	Passed
Test 3-0:Automobile Start Test	0	0.004167	Passed
Test 4-0:ABS LED Lit	0	0	Passed
Test 5-0:LR Squealer Test	0	0	Passed
Test 6-0:LF Squealer Test	0	0	Failed
Test 6-1:LF Brake Pads - Inspection	15	0	Passed
Test 6-2:LF Brake Rotor - Inspection	15	0.333333	Passed

The "Primary Suspects" table shows the following entry:

Suspect Item	Repair Cost	Repair Time	Failure Probability
LF Caliper Assy	\$73.00	1.50	0.010106

The "Current Isolation Sequence" shows a tree view with "LF Brk Pis" expanded to show "LFI Pad" and "LFO Pad". A context menu is open over "LFI Pad" with options: "Referenced Documents" (selected), "Views Containing Object", and "Properties".

An Adobe Reader window titled "Caliper Replacement Procedure.pdf" is open, displaying the following content:

Tools Needed

- 1 C clamp 6 " will work just fine
- 1 set of hex bits or allen wrenches (I prefer the bits that fit on the end of a ratchet)
- 1 set of sockets in 3/8 drive and 1/4 drive
- 1 medium hammer
- 1 pair medium vise grips
- 1 set jack stands
- 1 jack
- 1 Tube of Anti Seize (I prefer the copper based stuff from permetex)
- 1 tube of disk brake quite. (blue stuff in tube to reduce brake squeal)
- 1 Can of Brake Cleaner
- 1 Bottle of dot 3 brake fluid

Parts Needed

- Calipers... I recommend replacing both at the same time. Although not necessary I just prefer to do it this way. They are not very expensive at your super Autoparts.
- Brake Pads ...When replacing calipers, definitely replace the pads too. They are not expensive and even the better pads are usually under 20 bucks.
- Brake line compression washers. Not a necessity but I prefer to replace them. You will need 4 them. Short list huh

Procedure

1. First jack up the car and place on jack stands.
2. Remove both front wheels and set to the side.

Select the repair or replacement procedure for the isolated fault group items.

eXpress Diagnostic Deployment – IETM Environment

The screenshot displays the DSI Workbench software interface, which is used for vehicle diagnostics. The interface is divided into several panes:

- Restart Session:** Shows a "Fault Group # 34" with the instruction "Replace 5 Items". The items listed are: Replace FS Line, Replace RS Line, Replace FR Line, Replace RR Line, and Replace Master Cyl.
- Current Isolation Sequence:** A table listing test results:

Test Name	Cost	Time	Result
Test 1-0:Automobile Start Test	1	0.01667	Passed
Test 2-0:Diagnostic code input tests	5	0.000556	Passed
Test 3-0:ABS LED Lit	1	0.000556	Passed
Test 4-0:Spongy Breaking	1	0.01667	Failed
Test 4-1:Check Rear Pump Flow	70	0.01667	Passed
Test 4-2:Check Front Pump Flow	70	0.01667	Passed
Test 4-3:Spongy Air in the line tests	15	0.33333	Failed

- Primary Suspects:** A table listing suspected failure items with their repair costs and times:

Suspect Item	Repair Cost	Repair Time	Failure Probability
FS Line	\$20.00	0.50	0.013622
RS Line	\$20.00	0.50	0.013622
FR Line	\$20.00	0.50	0.007169
RR Line	\$20.00	0.50	0.007169
Master Cyl	\$110.00	2.50	0.003656

- Diagnostic Status View:** Shows a close-up image of a brake assembly with a green diagnostic light.
- Automotive Braking System:** A schematic diagram of the braking system showing the ECU, master cylinder, and various valves connected to the front and rear wheels.
- ABS System (Isometric):** A 3D isometric view of the ABS components, including the master cylinder, hydraulic modulator, and speed sensors.
- Maintenance Manual:** A page from the maintenance manual showing a detailed hydraulic diagram of the ABS actuator, including check valves, pressure holding valves, pressure reduction valves, and reservoirs.

Open multiple views and design details windows in DSI Workbench.