

# Open Invitational Door Strut Comparison



## A Comparison Between Four Different Aftermarket Replacement Door Struts and De Lorean DMC-12 Original Equipment

*Comparison and Compilation by:*

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## **Introduction**

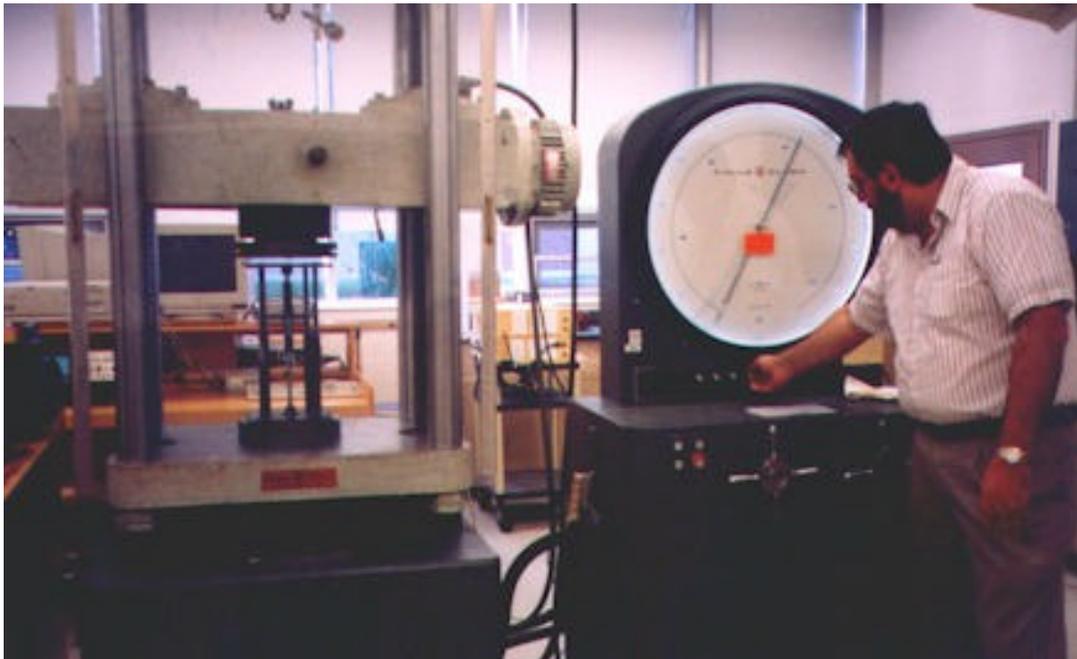
This study was performed to compare various door struts available for use as replacement equipment for the De Lorean DMC-12 automobile. The open invitation to participate in the study was extended to all vendors supplying De Lorean parts. Four different vendors volunteered their door struts to participate in the testing. This report represents the data compiled in the study.

## **Disclaimer and Terms of Use**

Every attempt was made to ensure the accuracy of the data collected. Regardless, the data is presented as is, with no warranty. By reading this document, you agree to indemnify and hold harmless, Rick Gendreau, Bob Arredondo, and New Hampshire Technical Institute from any damages arising from the use of this information. This is a "no whining" comparison. In participating, vendors agreed to waive the right to complain about the results. This report is not intended to convey professional advice; it is a general guide only. Although it can be used as an aid in the selection of door struts, it is not meant to replace common sense.

## **Acknowledgment**

The collection of compression test data would not have been possible without the cooperation of Bob Arredondo, Head of New Hampshire Technical Institute's Mechanical and Manufacturing Engineering Technology Department. As an expert in tensile, shear, and compressive testing of a variety of materials, his skill in operating NHTI's precision testing equipment was indispensable.

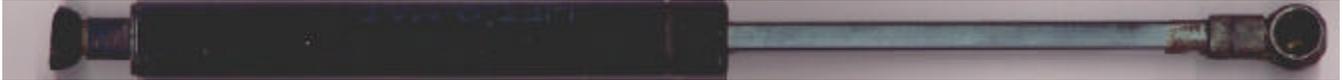


**Thank you, Professor Arredondo**

## General Description of Tested Struts

De Lorean Motor Center of Garden Grove, California, De Lorean Motor Company of Houston, Texas, P. J. Grady of West Sayville, New York, and Special T Auto of Dallas, Texas are the four vendors who have agreed to have their struts compared.

### Stabilus Lift-O-Mat



This is the original equipment door strut supplied with the car, as shipped from the factory. It is used as a baseline for comparison, and is correct by definition. The Stabilus Lift-O-Mat has a black cylinder, a black upper ball stud, silver-grey lower ball stud, and a chromium plated piston. This part is no longer available as replacement equipment.

### De Lorean Motor Center



The De Lorean Motor Center door strut is distinguishable by a black piston rod. Other than the color of the piston rod, it resembles Original Equipment rather closely in look, geometry, and performance. It has a black cylinder, a black upper ball stud, black lower ball stud, and a black chromium plated piston.

### DMC Houston



The DMC Houston door strut is distinguishable by its screw-on zinc plated ball studs and its relatively short piston rod. It has a black cylinder, and a chromium plated piston.

### P. J. Grady



The P. J. Grady door strut closely resembles Original Equipment in look, geometry and performance. It has a black cylinder, a black upper ball stud, yellow-toned lower ball stud, and a chromium plated piston.

### Special T Auto



The Special T Auto door strut closely resembles Original Equipment in look, geometry and performance. It has a black cylinder, a black upper ball stud, yellow-toned lower ball stud, and a chromium plated piston.

## Comparison Data

The four vendor-supplied struts and the Stabilus Lift-O-Mat were compared on the basis of

- Extended length (length when the strut is unloaded)
- Compressed length (length when the strut is compressed as far as it can be)
- Piston Stroke (the difference between extended length and compressed length)
- Force at Full Extension (force required to begin to compress the strut)
- Force at Full Compression (force required to hold a strut in the fully compressed state)

Additionally, non-numeric data was collected about construction details such as finish, color, and so on.

	Stabilus Lift-O-Mat (Original Equipment)	De Lorean Motor Center	DMC Houston	P. J. Grady	Special T Auto
<b>Extended length (inches)</b>	14.29	14.33	14.33	14.26	14.28
<b>Compressed length (inches)</b>	8.74	8.63	9.33	8.89	8.89
<b>Piston stroke (inches)</b>	5.55	5.70	5.00	5.37	5.39
<b>Force, relaxed (pounds)</b>	not available	260	280	265	290
<b>Force, compressed (pounds) (note 1.)</b>	not available	445	440	405	435
<b>Piston diameter</b>	10mm	10mm	10mm	10mm	10mm
<b>Ball stud attachment, upper</b>	welded	unsure, looks welded	screw-on	unsure, looks welded	unsure, looks welded
<b>Ball stud attachment, lower</b>	crimped	unsure, looks welded	screw-on	unsure, looks welded	unsure, looks welded
<b>Finish, cylinder body</b>	black enamel	black enamel	black enamel	black enamel	black enamel
<b>Finish, piston</b>	chromium plate	chromium plate, black	chromium plate	chromium plate	chromium plate
<b>Finish, upper ball stud</b>	black anodized	black anodized	zinc electroplate	black anodized	black anodized
<b>Finish, lower ball stud</b>	unsure	black anodized	zinc electroplate	unsure, looks like yellow chromate	unsure, looks like yellow chromate
<b>Prelubricated ball studs</b>	not applicable	yes	no	yes	yes
<b>Retaining clips included</b>	not applicable	no	no	no	yes

Note 1: To prevent damage to the strut bushings, compressed state pressure measurements were taken 2mm shy of complete compression.

## Technical Drawings

Following are five technical drawings describing the fit of the five different struts in a 1982 De Lorean DMC-12, VIN 11472, which was used as a test bed and case study.

The drawings show each strut as installed, in both the open and closed states for the passenger side door.

Drawing 1: Stabilus Lift-O-Mat

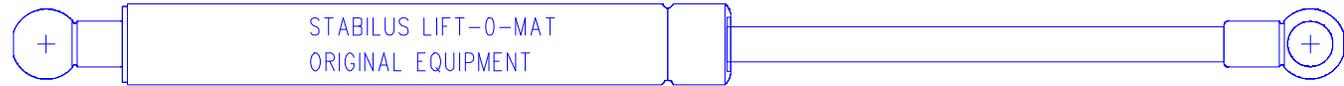
Drawing 2: De Lorean Motor Center

Drawing 3: DMC Houston

Drawing 4: P. J. Grady

Drawing 5: Special T Auto

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EXTENDED LENGTH	14.29
COMPRESSED LENGTH	8.74
PISTON STROKE	5.55
FORCE AT FULL EXTENSION	Not available due to strut age
FORCE AT FULL COMPRESSION	Not available due to strut age
NOTES:	THIS ORIGINAL EQUIPMENT STRUT WAS USED AS A BASELINE FOR COMPARISON.

strut upper mounting point

door hinge pivot axis

DOOR OPEN  
(passenger door, rear view)

open length  
14.29

strut lower mounting point

DOOR CLOSED  
(passenger door, rear view)

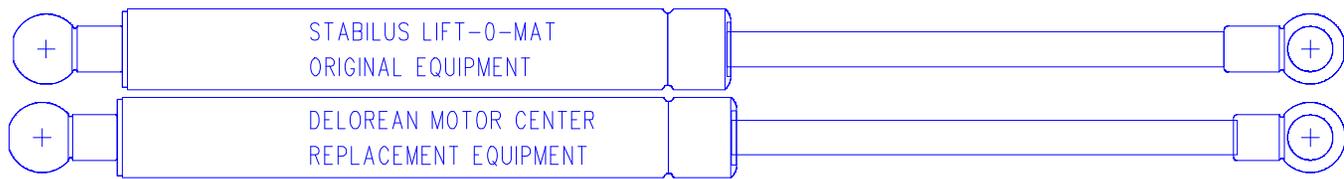
STABILUS LIFT-O-MAT  
ORIGINAL EQUIPMENT

closed length  
9.19

0.45 clearance

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES		DMC-12 Door Strut Comparison Case Study: VIN 11472	
APPROVALS	DATE	Door Geometry with Stabilus Lift-O-Mat Original Equipment	
DRAWN Rick Gendreau	07/31/02		
CHECKED			
RESP'ABLE			
INFO ENG		SCALE 1 TO 1	REV. 1
QUAL ENG			SHEET 1 OF 5

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EXTENDED LENGTH	14.33
COMPRESSED LENGTH	8.63
PISTON STROKE	5.70
FORCE AT FULL EXTENSION	260 lb.
FORCE AT FULL COMPRESSION	445 lb.
NOTES:	THIS STRUT CLOSELY RESEMBLES ORIGINAL EQUIPMENT IN GEOMETRY AND OVERALL APPEARANCE. BALL ENDS ARE PRE-LUBRICATED. THIS STRUT IS DISTINGUISHABLE BY ITS BLACK CHROMIUM PLATED PISTON.

strut upper mounting point

door hinge pivot axis

DOOR OPEN  
 (passenger door, rear view)

strut lower mounting point

open length  
 14.33

DOOR CLOSED  
 (passenger door, rear view)

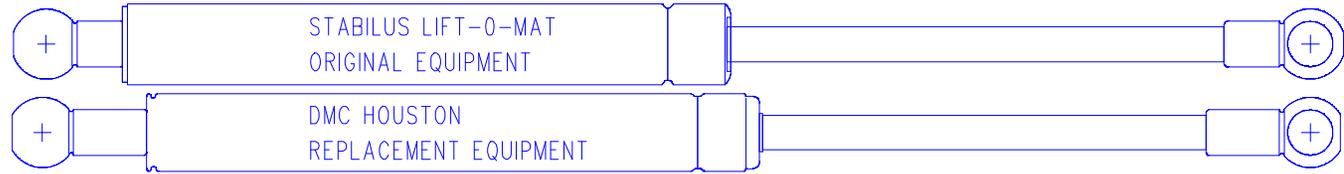
DELOREAN MOTOR CENTER REPLACEMENT EQUIPMENT

closed length  
 9.19

0.56 clearance

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES		DMC-12 Door Strut Comparison Case Study: VIN 11472	
APPROVALS	DATE	Door Geometry with DeLoorean Motor Center Replacement Equipment	
DRAWN Rick Gendreau	07/31/02		
CHECKED			
RESP'ABLE			
INFO ENG		SCALE 1 TO 1	REV. 1
QUAL ENG			SHEET 2 OF 5

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EXTENDED LENGTH	14.33
COMPRESSED LENGTH	9.33
PISTON STROKE	5.00
FORCE AT FULL EXTENSION	280 lb.
FORCE AT FULL COMPRESSION	440 lb.
NOTES:	THE DMC HOUSTON DOOR STRUT DEVIATES SIGNIFICANTLY FROM ORIGINAL EQUIPMENT, AND SHOULD NOT BE INSTALLED TO SUPPORT DOORS IN WHICH THE "CLOSED LENGTH" DIMENSION IS LESS THAN 9.33 INCHES. AS THE "CLOSED LENGTH" DIMENSION VARIES FROM CAR TO CAR, DEPENDING ON MANUFACTURING TOLERANCES AND VEHICLE WEAR AND TEAR, THE "CLOSED LENGTH" SHOULD BE MEASURED ON A DOOR BY DOOR BASIS PRIOR TO THE INSTALLATION OF THIS STRUT.

strut upper mounting point

door hinge pivot axis

DOOR OPEN  
 (passenger door, rear view)

strut lower mounting point

open length  
 14.33

REPLACEMENT EQUIPMENT  
 DMC HOUSTON

DOOR CLOSED  
 (passenger door, rear view)

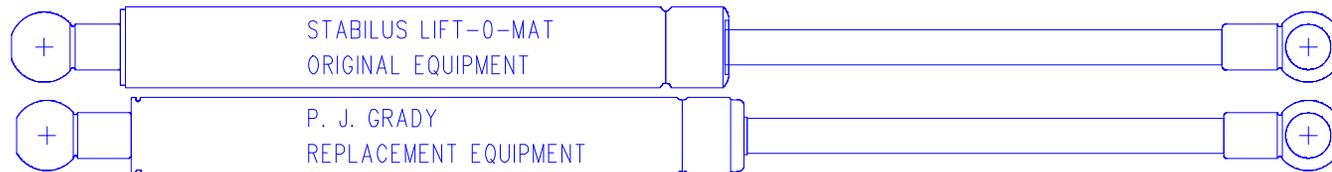
REPLACEMENT EQUIPMENT  
 DMC HOUSTON

9.19  
 closed length

-0.14 interference

APPROVALS		DATE		DMC-12 Door Strut Comparison Case Study: VIN 11472	
DRAWN	Rick Gendreau	DATE	07/31/02	Door Geometry with DeLorean Motor Company (Replacement Equipment)	
DESIGNED					
RESP ENG					
INFO ENG		SCALE	1 TO 1	REV.	1
DRAWL ENG				SHEET	3 OF 5

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EXTENDED LENGTH	14.26
COMPRESSED LENGTH	8.89
PISTON STROKE	5.37
FORCE AT FULL EXTENSION	265 lb.
FORCE AT FULL COMPRESSION	405 lb.
NOTES:	THIS STRUT CLOSELY RESEMBLES ORIGINAL EQUIPMENT IN GEOMETRY AND OVERALL APPEARANCE. BALL ENDS ARE PRE-LUBRICATED. LABELING IS COMPREHENSIVE

strut upper mounting point

door hinge pivot axis

DOOR OPEN  
(passenger door, rear view)

strut lower mounting point

open length  
14.26

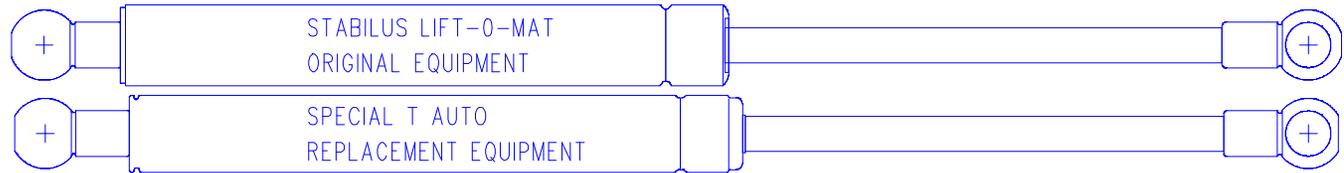
DOOR CLOSED  
(passenger door, rear view)

0.30 clearance

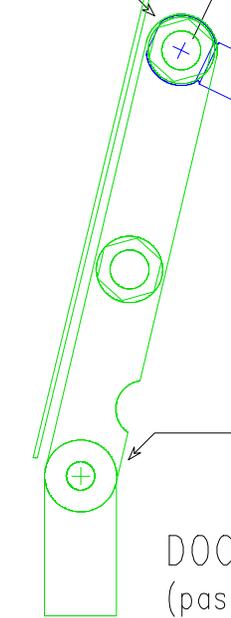
closed length  
9.19

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES		DMC-12 Door Strut Comparison Case Study: VIN 11472	
APPROVALS	DATE	Door Geometry with P. J. Grady Replacement Equipment	
DRAWN Rick Gendreau	07/31/02		
CHECKED			
RESP'ABLE			
INFO ENG		SIZE C	ENG. NO.
QUAL. ENG		SCALE 1 TO 1	REV. 1
			SHEET 4 OF 5

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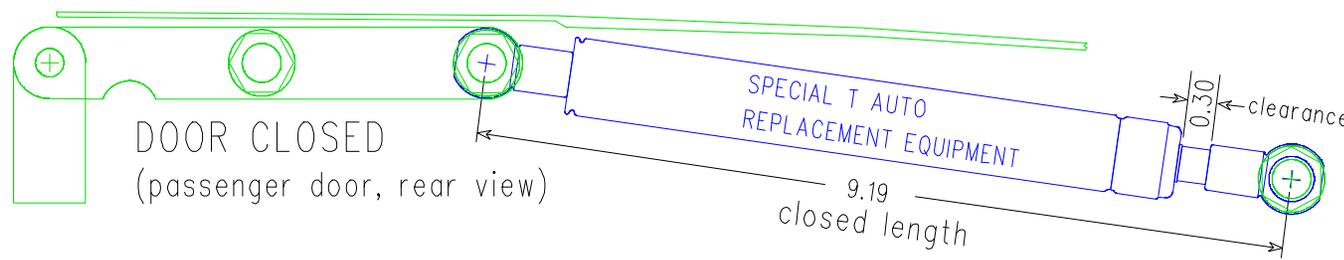
strut upper mounting point



open length  
14.28

EXTENDED LENGTH	14.28
COMPRESSED LENGTH	8.89
PISTON STROKE	5.39
FORCE AT FULL EXTENSION	290 lb.
FORCE AT FULL COMPRESSION	435 lb.
NOTES:	THIS STRUT CLOSELY RESEMBLES ORIGINAL EQUIPMENT IN GEOMETRY AND OVERALL APPEARANCE. BALL ENDS ARE PRE-LUBRICATED. RETAINER CLIPS WERE INCLUDED.

strut lower mounting point



UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES		DMC-12 Door Strut Comparison Case Study: VIN 11472	
APPROVALS	DATE	Door Geometry with Special T Auto Replacement Equipment	
DRAWN Rick Gendreau	07/31/02		
CHECKED			
RESP'ABLE			
INFO ENG		SCALE 1 TO 1	REV. 1
QUAL ENG			SHEET 5 OF 5

## Summary

There was no clear "winner" in the comparison. Three of the four struts tested, the De Lorean Motor Center strut, the P. J. Grady strut, and the Special T Auto strut, compared favorably with original equipment in terms of geometry, construction, and appearance.

All three of the above struts featured prelubricated ball studs, which were all locked in the correct rotational orientation for installation. Each of the three struts had subtle differences that set it apart from the others; the De Lorean Motor Center strut had the longest piston stroke of all struts measured, and had a recessed bushing like Original Equipment, the P. J. Grady strut was superlatively packaged and conscientiously labeled, and the Special T Auto strut came with retaining clips preinstalled. The P. J. Grady and Special T Auto strut bear a strong physical resemblance to Original Equipment. Mechanically, the De Lorean Motor Center strut also bears a strong physical resemblance to Original Equipment; only the black piston rod sets it apart visually. Either of these three door struts seems to be a suitable replacement for Original Equipment.

The DMC Houston strut deviates significantly from Original Equipment. Its piston stroke is significantly shorter than Original Equipment, and the three other struts tested. An unfortunate effect of this is that, when installed on some cars, the DMC Houston strut could bottom out before the door is completely closed, causing deformation of the lower strut mounting posts when the door is fully closed. Before installing this strut, compatibility of the strut to the car geometry should be verified by measurement. Failure to do so will expose the car to risk of damage.