135A-TRC-99-001

PERFORMANCE TESTING FOR FMVSS 135
Passenger Car Brake Systems

Ford Motor Company
1997 Ford Taurus LX, 4-Door Sedan
TRC No. 333

TRANSPORTATION RESEARCH CENTER INC.
10820 State Route 347
East Liberty, Ohio 43319

Final Report Completed: May 28, 1999

FINAL REPORT

Prepared Under Contract No. : DTNH22-9-C-00

U.S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration
Safety Assurance
Adaptive Devices Research Team
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Washington, DC 20590
Attn: Carl Ragland

Prepared for the Department of Transportation, National Highway Traffic Safety Administration, under Contract No. DTNH22-95-C-01000.

Prepared By Randy Lauder

Approved By

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Contract Technical Manager, Office of Vehicle Safety Compliance

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16. ABSTRACT:

Performance tests were conducted on the subject 1997 Ford Taurus LX, 4-Door Sedan, in accordance with selected specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-135-00 for the determination of FMVSS 135 performance with various hand controls fitted. Test focus was not vehicle compliance, but comparison of the performance of five different hand controls relative to the performance of the standard foot controlled system.

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1.0 INTRODUCTION

Tests were conducted on a 1997 Ford Taurus LX manufactured by Ford Motor Company, to determine brake performance with FMVSS 135 "Passenger Car Brake Systems" with various hand controls installed. All NHTSA selected tests were conducted in accordance with the U.S. D.O.T., NHTSA Laboratory Procedure TP 135-00 and/or the corresponding TRC test procedure which was submitted to NHTSA for their approval. The test procedure was clearly described in the submitted document and has not been repeated in this report.

All stops were performed manually.

All tests were conducted by TRC personnel using the following TRC facilities:

7.5-Mile Test Track
Vehicle Maximum Speed
Burnish
Hot Performance
Recovery Performace

Skid Pad
Cold Effectiveness Stops
High Speed Effectiveness Stops
Stops with Engine Off
Failed Antilocks
Failed Hydraulic Circuits
Brake Power Assist Unit Inoperative

Average PFC during the test period was 0.89 utilizing the ASTM E1337 w/E1336 tire method.

The test vehicle was ABS equipped. Therefore, the Wheel Lock Sequence and Adhesion Utilization Tests were not performed.

2.0 Scope

The National Highway Traffic Safety Administration's (NHTSA) Adaptive Devices Research Team contracted Transporation Research Center Inc. (TRC) to perform brake tests utilizing five different Hand Control systems. The tests were performed to NHTSA specified sections of Federal Motor Vehicle Safety Standard (FMVSS) 135 "Light Vehicle Brake Systems."

3.0 Objective

From October 1998 through March 1999, TRC conducted FMVSS 135 brake tests for NHTSA. The tests were performed utilizing a 1997 Ford Taurus to determine if, with the various hand controls installed, the vehicle would comply with the performance parameters of selected sections of FMVSS 135.

4.0 Approach

NHTSA obtained and delivered to TRC five hand control systems. The hand control systems allowed the driver to control throttle and service brake functions by utilizing only the motions of the left hand and arm. TRC installed each hand control system per the instructions provided with each system.

NHTSA obtained from Bob Chapman Ford, in Marysville, Ohio, a local dealer, and delivered to TRC, a late model 1997 Ford Taurus LX. The Taurus' selection could be construed as a fairly common, affordable and available vehicle. Upon receipt, TRC thoroughly inspected the vehicle and ensured all of vehicle's systems were in good operating condition. Additionally, and immediately prior to initiating testing, TRC obtained and installed new original equipment specification tires.

TRC obtained from Anderson Ford, in Bellefontaine, Ohio, a local dealer, new brake linings and rotors for each test. The part numbers, edge codes and stampings for the linings and rotors were checked before the parts were accepted. Physical dimensions of the brake components were also measured. These checks were performed to ensure that the foundation brakes for each test would be within production tolerances and approximately the same.

TRC performed a total of six tests. The first test was performed without utilizing hand controls. Rather, the vehicle was tested in the normal fashion utilizing standard foot controls. This was the baseline test in which data for the subsequent had control test could be compared.

For the first (baseline) test, the test vehicle's foundation brake components were renewed, the instrumentation and sensor wiring installed, the test vehicle weighed and ballast added to the test vehicle's placard gross vehicle weight rating (GVWR). The instrumentation was

calibrated and the dynamic tests performed. At the conclusion of the baseline test, the foundation brakes were inspected, removed and then renewed. The first hand control was installed and the baseline tests repeated. After that point, one hand control unit would be removed, another installed and the foundation brakes removed, inspected and renewed. Instrumentation and ballast was not removed to allow consistency from one test to another.

Due to software issues regarding the data acquisition and later, weather concerns, the test took place over an expanded length of time. Testing began in October of 1998 and was completed in March of 1999. The ambient conditions through that time span ranged from mild fall/spring weather to moderate winter weather. Once the data acquisition issues were solved and the weather improved, the testing went fairly quickly, with most of the testing occurring during February and March of 1999.

The focus of testing was the comparison of the various hand control's operation relative to foot control operation and whether or not the vehicle equipped with hand controls could comply with selected sections of FMVSS 135. Additionally, NHTSA requested subjective opinions relative to the hand controls' ease or difficulty of use and installation. This was NHTSA's initial testing of hand controls. Therefore, expectations were unknown. However, hand controls had been utilized within the public domain for sometime, seemingly, with relative success. It was unknown whether or not a vehicle equipped with hand controls could meet selected dynamic performance requirements of a brake standard, such as FMVSS 135.

The summary table includes the best (shortest) stop and associated pedal effort value for each test section. The values can be used to compare the foot applied baseline test to the hand control tests. It must be noted that only in a few instances either the foot-controlled or the hand-controlled tests failed one of the selected tests.

One will also note the maximum allowable force for each hand control is different. For each hand control, the maximum allowable applied braking forces were determined by first measuring the distance from the center of the service brake lever's upper pivot/attachment point to the center of the service brake's foot pedal pad. Next, the centerline at which each hand brake's actuation rod's swivel joint was clamped to the service brake lever (typically, just above the foot pedal pad) to the service brake's upper pivot/attachment point was also measured. From those measurements a force moment ratio could be established thereby equating the amount of force applied to the various hand control's service brake arm attachment point that would equal 500N applied at the foot pad center. For Graphic, see Appendix D. Since the point at which each hand control set's service brake actuation rod affixment point was slightly different, so then was each hand control set's calculated maximum allowable application force.

Additionally, in Appendix K one will find the hand grip force versus the pedal arm force. Though the focus was the force applied to the service brake control lever, this graph demonstrates a force applied normal to the approximate center of each hand grip control versus the force applied to the service brake control lever, both with and without, brake system power assist.

In most cases, the brake actuation rod from the hand control to the service brake lever was not parallel to the longitudinal axis of the service brake control lever. Instead, a slight angle existed at the point of attachment between the longitudinal axis of the service brake lever and the actuation control rod. The angle's magnitude, without any application force, was generally quite small. Additionally, as the hand control would move through its range of travel/actuation, the angle would become even smaller, or parallel the longitudinal axis of the service brake lever. This small angle was judged to be insignificant, and was not considered when calculating each hand control's maximum allowable applied force.

List of NHTSA provided hand controls:

Hand Control (HC) #1 – Sure Grip, mfg. by:
Howell Ventures Ltd.
4850 Route 2 Hwy
Upper Kingsclear
New Brunswick, Canada
(506) 363-5289
Fax 1-800-506-6666

Hand Control (HC) #2 – Ultra-Lite XL, mfg. by:
Drive-Master Co., Inc.
9 Spielman Road
Fairfield, New Jersey 07004-3403
1-937-808-9709

Hand Control (HC) #3 – Monarch Mark I-A, mfg. by:
Manufacturing and Production Services Corp.
7948 Ronson Road
San Diego, Ca. 92111
(619) 292-1423
(800) 243-7034

Hand Control (HC) #4 – CT-100 Rotary Hand Operated Driving Control, mfg. by:
Wells-Engberg
P.O. Box 6388
Rockford, Illinois 61125

Hand Control (HC) #5 – 3500 Series Hand Control, mfg. by:
Mobility Products & Design
2800 Northwest Boulevard
Minneapolis, MN 55441-2625
(800) 488-7688

5.0 Summary

Shortest (corrected) stopping distance without wheel lock or exceeding the maximum pedal force.

	135 Req. (m)	Foot Control (baseline) (m)	Hand Control #1 (m)	Hand Control #2 (m)	Hand Control #3 (m)	Hand Control #4 (m)	Hand Control #5 (m)
Vehicle Maximum Speed @ LLVW	N/A	170.9 km/h	N/A	N/A	N/A	N/A	N/A
S7.1 Burnish @ GVWR-Perform 200 stops	200	200 Stops	200	200	200	200	200
S7.5 Cold Effectiveness @ GVWR	70	54.5	54.3	51.5	53.4	54.0	51.7
S7.6 High Speed Effectiveness @ GVWR	138.9	102.2	98.3	95.7	96.8	95.8	112.3
S7.7 Stops with Engine Off @ GVWR	70	54.4	54.9	53.9	55.5	54.9	52.2
S7.5 Cold Effectiveness @ LLVW	70	52.2	56.0	53.3	51.3	51.1	51.9
S7.6 High Speed Effectiveness @ LLVW	138.9	100.9	103.4	95.1	93.2	90.7	91.2
S7.8 Antilock Functional Failure @ LLVW	85	57.4	52.7	55.3	57.3	57.6	57.8
S7.8 Antilock Functional Failure @ GVWR	85	62.2	56.5	60.5	61.6	58.3	55.4
S7.11 Power Assist Unit Inop. @ GVWR	168	181.3	176.1	165.4	173.5	171.9	151.6
S7.13 Heating Snubs @ GVWR	N/A	15 Snubs	15	15	15	15	15
S7.14 Hot Performance @ GVWR Note: Requirement distance is variable, Depending on Cold Effectiveness performance.	83.7	67.8	67.8	61.4	61.4	58.5	56.8
S7.15 Brake Cooling @ GVWR	N/A	4 Stops	4 Stops	4 Stops	4 Stops	4 Stops	4 Stops
S7.16 Recovery Performance @ GVWR	73.2	59.6	62.3	54.3	56.5	59.9	57.4
S7.17 Final Inspection (Cursory)	N/A	Good	Good	Good	Good	Good	Good

The above shortest stopping distance table's corresponding maximum applied effort.

	135 Req. (N)	Foot Control (baseline) (N)	Hand Control #1 (N)	Hand Control #2 (N)	Hand Control #3 (N)	Hand Control #4 (N)	Hand Control #5 (N)
Maximum Allowable *Calculated* Pedal Effort for Each Hand Control	N/A	N/A	667	620	620	611	638
S7.1 Burnish @ GVWR	ADJ.	52 Avg.	58 Avg.	91 Avg.	59 Avg.	62 Avg.	52 Avg.
S7.5 Cold Effectiveness @ GVWR	500	496.6	612.2	533.7	580.8	522.9	614.8
S7.6 High Speed Effectiveness @ GVWR	500	492.1	406.4	389.4	492.2	596.7	553.2
S7.7 Stops with Engine Off @ GVWR	500	465.4	481.3	430.2	511.2	603.8	605.2
S7.5 Cold Effectiveness @ LLVW	500	486.2	616.5	591.5	588.7	597.0	406.1
S7.6 High Speed Effectiveness @ LLVW	500	391.2	644.1	537.7	401.5	597.3	596.0
S7.8 Antilock Functional Failure @ LLVW	500	165.7	220.1	220.5	215.9	211.4	227.1
S7.8 Antilock Functional Failure @ GVWR	500	234.3	286.8	235.7	239.6	233.3	254.8
S7.11 Power Assist Unit Inop. @ GVWR	500	497.9	651.0	590.2	619.7	593.7	633.8
S7.13 Heating Snubs @ GVWR	ADJ.	53 Avg.	56 Avg.	55 Avg.	61 Avg.	59 Avg.	60 Avg.
S7.14 Hot Performance @ GVWR	ADJ. – 500	271.9	443.0	365.9	339.2	352.2	528.7
S7.15 Brake Cooling @ GVWR	ADJ.	53 Avg.	60 Avg.	62 Avg.	63 Avg.	72 Avg.	62 Avg.
S7.16 Recovery Performance @ GVWR	ADJ. – 500	443.9.	564.0	464.0	381.7	440.5	497.4

With the exception of the Power Assist Unit Inoperative and Hot Performance at GVWR for HC #1, the baseline and hand control tests met the specified performance requirements of the FVMSS 135.

For the Power Assist Unit Inoperative, the baseline and hand control systems were operated at or very near the maximum allowable control force effort throughout the stops. Therefore, one could assume that the test vehicle itself might not be capable of complying with this test.

6.0 Test Procedure

NHTSA contracted TRC to perform FMVSS 135 "Light vehicle brake systems" brake tests on a passenger car equipped with hand controls. NHTSA wished to determine if a vehicle equipped with hand controls could satisfy various elements of FMVSS 135. NHTSA directed TRC to perform only certain sections of dynamic brake testing. No tests were performed regarding vehicle warning lamps, master cylinder capacities or other static tests. The sections of FMVSS 135 that NHTSA directed TRC to exclude are:

Section 7.2	"Wheel Lock Sequence"
Section 7.3	"ABS Performance"
Section 7.4	"Adhesion Utilization - Torque Wheel"
Section 7.9	"Variable Brake Proportioning System Function Failure"
Section 7.10	"Hydraulic Circuit Failure"
Section 7.12	"Parking Brake"
Section 7.17	"Final Inspection"

TRC erred by not performing Section 7.8 "Antilock Functional Failure" in the correct sequence. Therefore, those stops were performed after the normal sequence of tests on hand control set #5 had been completed. For all the Antilock Functional Failure stops, the foundation brakes of test #5 were utilized. Since it was already installed in the vehicle, hand control test #5 was done first, followed by the foot-controlled, baseline test, then hand controls #4, #3, #2 and #1, in that order.

To perform the tests, TRC first inspected the test vehicle to assure all systems were functioning nominally. Next, the vehicle was prepared by installing the required parameter sensors and digital acquisition equipment. The thermocouples were inserted in the brake linings, and the linings and rotors installed on the test vehicle. Each set of brake rotors and linings were carefully inspected to insure the part numbers were correct. Additionally, each set was rudimentarily measured to see if any part was significantly different than another. The parts were also visually inspected to observe differences. The result of these brake component checks was that no major discrepancies were observed. The brake parts were, within production tolerances, the same test to test.

Next the instrumentation was calibrated. A comprehensive calibration was performed before and after each hand control set and the baseline foot controlled test. A less comprehensive calibration was performed at the beginning and end of each test day.

Following calibration the test vehicle was loaded with sandbags to duplicate the curb plus four hundred pounds of the required lightly loaded vehicle weight (LLVW). The LLVW and the location of the sandbags were recorded. The vehicle was then loaded with sandbags to the vehicles gross vehicle weight rating (GVWR). The GVWR weight and location of the sandbags were

recorded. Noting the location of the sandbags allowed the same weight condition to be accurately duplicated from test to test.

The final preparation item for the test vehicle was the installation of new original equipment specification tires. Tire pressures for all tests were adjusted per the vehicle placard.

TRC had performed FMVSS 135 compliance testing for NHTSA for a year prior to performing this hand control test. TRC used the same type of instrumentation, procedures and methods utilized in that testing. For the hand control tests, NHTSA specified which FMVSS 135 test sections were to be performed and which to be excluded. The tests that were performed were:

Section 7.1	"Burnish"
Section 7.5	"Cold Effectiveness @ GVWR"
Section 7.6	"High Speed Effectiveness @ GVWR"
Section 7.7	"Stops with Engine Off @ GVWR"
Section 7.5	"Cold Effectiveness @ LLVW"
Section 7.6	"High speed Effectiveness @ LLVW"
Section 7.8	"Antilock Functional Failure @ LLVW"*
Section 7.8	"Antilock Functional Failure @ GVWR"*
Section 7.11	"Power Brake Assist Unit Inoperative @ GVWR"
Section 7.13	"Heating Snubs @ GVWR"
Section 7.14	"Hot Performance @ GVWR"
Section 7.15	"Brake Cooling @ GVWR"
Section 7.16	"Recovery Performance @ GVWR"

Of the six total tests performed, the first to take place was the foot-controlled test, which was used as the baseline, or comparator, test. The initial test section of the foot-control test was the "Maximum Speed" test. Prior to performing the "Maximum Speed" test, the test vehicle load was adjusted to the LLVW condition. The "Maximum Speed" test was then performed, and then only at the beginning of the foot-control test. It was not repeated during subsequent hand-control tests.

After the "Maximum Speed" test, the vehicle's weight was readjusted to GVWR. The "Burnish" was then performed. Following the "Burnish", with the exception of Section 7.8 "Antilock Functional Failure @ LLVW/GVWR", the remainder of the tests followed the above section sequence. As noted earlier, TRC erred by not performing Section 7.8, "Antilock Functional Failure", in the correct sequence. Therefore, those stops were performed after the normal sequence of tests on hand control set #5 had been completed. For all the Antilock Functional Failure stops, the foundation brakes of test #5 were utilized. Since it was already installed in the vehicle, hand control test #5 was done first, then the foot-controlled test, followed in order by hand controls #4, #3, #2 and #1.

In performing the foot-controlled and the hand controlled-tests, initial speed and brake temperatures, actual and corrected stopping distances, peak and average decelerations, peak and average pedal efforts, and wheel lock data for the dynamic tests were digitally recorded. Additionally, as a backup from visual displays, the driver manually recorded many of these parameters. The driver also subjectively noted deviation from the lane, stability, and noise. The test vehicle was ABS equipped

and excluding the burnish, heating snubs and hot performance stops, the driver rapidly and fully depressed the service brake/hand control for each stop. This allowed the ABS to control the character of the stop. During antilock functional failure tests, the driver modulated the service brake/hand control to obtain the shortest stopping distance without inducing wheel slide. To keep the test vehicle within a 12-foot lane, the driver performed steering corrections, as necessary.

Following the completion of the test sequence on the foot-controlled test, the brake system components were inspected. The inspection was a cursory one, only looking for readily observable anomalies. None of the six post-test inspections revealed an abnormalities of the inspected brake components.

Following the foot-controlled baseline test inspection, the road wheels were removed, the used brake linings and rotors were removed, new ones installed and the road wheels re-installed. Then the first hand control was installed. This test performance, component removal and replacement scenario were repeated for the remaining four hand-controlled tests.

For the installation of each hand control, the technician followed the provided instructions as closely as possible. After each hand control installation, the technician responsible for the installation provided a synopsis regarding installation ease or difficulty, if any, involved. See Appendix N.

Similarly, the driver provided a synopsis relating their impression of each hand control's ease or difficulty of use and wrote comparisons of each. See Appendix M. Information regarding the driver's physical characteristics are presented in Appendix L.

APPENDIX A

Vehicle Specifications

DATA SHEET 1 - VEHICLE INFORMATION

VEHICLE SPECS

Year:	1997	NHTSA No:	333
Make:	FORD	GVWR (Kg):	2141.8992
Model:	TAURUS LX	GAWR Front(Kg):	1168.4736
Body Style:	4-DOOR SEDAN	GAWR Rear(Kg):	984.7656
Mfr. Date:	08/96	Wheelbase (mm):	2762.25
VIN:	1FALP53S8VA108330	Odometer: Start:	30855 End: 31339

BUSES ONLY

Chassis Mfg.:	N/A
Sereal No.:	N/A
No. of Seats:	N/A
Manufacture Date:	N/A

Engine Type:	GASOLINE,24 VALVE,V6,DOHC,SFI,PISTON.		
Displacement:	3.0 LITER	Tire Size:	P205/65R15 92T
Engine Hspwr:	N/A	Tire Type:	AMERI*G4S,M&S,STEEL BELTED RAI
Idle Speed(rpm):	775	Tire Mfr.:	GENERAL
Transmission Type:	AUTOMATIC 3-SPEED W/OD	GVWR Front Press.(kpa):	227.53
No. of Axles:	2	GVWR Rear Press.(kpa):	227.53

BRAKE APPLY SYSTEM

Brake Series:	Front:DISC Rear:DISC	Power Assist Unit:	YES
Brake Actuation (Hydr. Circuit Split):	DIAGONAL	Pwr Unit w/Accumulator:	NO
		Pwr Asst./Pwr Unit w/Backup:	NO
Power Unit:	VACUUM	Variable Prop. System:	NO
Anti-Skid unit Mfr:	BOSCH	Anti-Skid Device:	YES
Parking Mechanism:	YES		
Type of Parking Unit:	AUTOMATIC TRANSMISSION W/ PARK DETENT.		
Mstr Cylinder Dia(mm):	0.00	Pedal Ratio:	2.93 : 1

FRONT SYSTEM BRAKE COMPONENT MATERIALS AND CONSTRUCTION:

BRAKE TYPE:	DISC	Material:	CAST IRON
Drum Construction:	N/A	LF Drum Shoe Cage Dia.(mm):	0.00
Disc Construction:	INTEGRAL CAST, VENTED	RF Drum Shoe Cage Dia.(mm):	0.00
Front Brake Dia.(mm):	275.87	LF Drum Dia. RESET(mm):	0.00
Fr Disc Thickness(mm):	25.83	RF Drum Dia. RESET(mm):	0.00

FRONT BRAKE COMPONENT DIMENSIONS AND CODES:

	Inboard (Primary)	Outboard (Secondary)
Width(mm):	50.70	50.67
Length(mm):	118.29	118.24
Thickness(mm):	11.00	11.00
Lining Code/Color:	AK NS171H FF	AK NS171H FF
Hyd. Piston Dia.(mm):	0.00	

DATA SHEET 1 - (CONTINUED)

REAR SYSTEM BRAKE COMPONENT MATERIALS AND CONSTRUCTION:

BRAKE TYPE: DISC
Material: CAST IRON
Drum Construction: N/A
LR Drum Shoe Cage Dia.(mm): 0.00
Disc Construction: INT.CAST UNVENT
RR Drum Shoe Cage Dia.(mm): 0.00
Lining Construction: BONDED
LR Drum Dia. RESET(mm): 0.00
Rear Brake Dia.(mm): 256.51
RR Drum Dia. RESET(mm): 0.00
Rr Disc Thickness(mm): 13.92

REAR BRAKE COMPONENT DIMENSIONS AND CODES:

Inboard (Primary)		Outboard (Secondary)	
Width(mm):	26.85	Width (mm):	26.87
Length(mm):	93.22	Length (mm):	93.22
Thickness(mm):	11.07	Thickness (mm):	11.02
Lining Code/Color:	BBA 2006TB EE	Lining Code/Color:	BBA 2006TB EE
Hyd Piston Dia (mm):	0.00		

OTHER COMPONENT INFORMATION:

Friction-type Park Brake: N/A
Non-Service Brake Type
Parking Brake: FOOT-OPERATED

NOTE: If at any time after the test series has begun, any brake system part requires replacement or the brake system requires adjustments other than permitted in burnish and reburnish procedures, discontinue testing and notify the COTR immediately.

Technician: Karen Easterday KAREN EASTERDAY Date: 6-28-99

Quality Assurance: KEN WEBSTER

DATA SHEET 4 - EQUIPMENT REQUIREMENTS (S5)

SERVICE BRAKE SYSTEM (S5.1)

Vehicle equipped with a service brake system acting on all wheels? YES

Wear Adjustment (S5.1.1):
Service Brakes are compensated for wear by means of a system of automatic adjustment? YES
Describe: DISC BRAKE - AUTOMATIC CLEARANCE TAKE-UP.

Wear Status (S5.1.2):
Wear status of service brakes is indicated by:
(A) Acoustic or optical device? NO
Describe: N/A
(B) Visual check outside or under vehicle? NO
Describe: N/A

PARKING BRAKE SYSTEM (S5.2)

Vehicle equipped with a parking brake system of a friction type with solely mechanical means to retain engagement: YES

CONTROLS (S5.3)

(A) Service brakes activated by means of a foot control? YES
(B) Parking brake control is independent of the service brake control? YES
(C) Parking brake control is hand or foot operated? YES
(D) ABS, if equipped, cannot be manually disabled? YES

DATA INDICATES COMPLIANCE: N/A

COMMENTS:

Tester/Technician: Karen Easterday KAREN EASTERDAY Date: 6-28-99

Quality Assurance: KEN WEBSTER

APPENDIX B

Vehicle Weights

DATA SHEET 3 - VEHICLE WEIGHT

VEHICLE: FORD 1997 TAURUS 4-DOOR SEDAN NHTSA No. 333 Date: 10/22/98

Tire Pressure(cold): Front (kpa) 228 Rear (kpa) 228
Odometer: Start 30855 End 31339
Scale(s) Used: TRC Toledo Scales

NOTE: GVWR, LLVW and axle weights to be measured within +0% and -1%.

GVWR/GAWR INFORMATION
(From Veh. Certification Label)

GVWR(Kg): 2142
GAWR Front(Kg): 1168
GAWR Rear(Kg): 985

UNLOADED VEHICLE WEIGHT(UVW)

L Front(Kg): 494 L Rear(Kg): 281
R Front(Kg): 499 R Rear(Kg): 272
T Front(Kg): 993 T Rear(Kg): 553
Total UVW(Kg): 1547

TARGET LIGHT LOADED WEIGHT(LLVW):

NOTE 1: LLVW = UVW+181.4Kg
NOTE 2: Weight distributed in front passenger seat area.
NOTE 3: Neither axle load at LLVW less than at UVW; ballast as required.

L Front(Kg): 540 L Rear(Kg): 322
R Front(Kg): 549 R Rear(Kg): 318
T Front(Kg): 1089 T Rear(Kg): 640
Total LLVW(Kg): 1728

ACTUAL LIGHT LOADED WEIGHT(LLVW):

L Front(Kg): 540 L Rear(Kg): 322
R Front(Kg): 549 R Rear(Kg): 318
T Front(Kg): 1089 T Rear(Kg): 640
Total Actual Test LLVW(Kg): 1728

Load: Driver/Observer 68(Kg) + Instru.29(Kg) + Ballast 84(Kg) = 181.44(Kg)

FULLY LOADED TEST WEIGHT (ACTUAL GVWR)

NOTE 1: Vehicle loaded so axle loads proportional to GAWR shown previously.
NOTE 2: But no axle weight to be less than at LLVW.
NOTE 3: If weight on any axle at LLVW exceeds the axle's proportional share of the GVWR, the load required to reach GVWR is placed so that the weight on that axle remains the same as at LLVW.

L Front(Kg): 576 L Rear(Kg): 494
R Front(Kg): 585 R Rear(Kg): 485
T Front(Kg): 1161 T Rear(Kg): 980
Total Fully Loaded GVWR(Kg): 2141

Load: Driver/Observer 68(Kg) + Instru. 29(Kg) + Ballast 181(Kg)= 279(kg)

Technician: Karen Easterday KAREN EASTERDAY Date: 6-28-99

Quality Assurance: Ken Webster KEN WEBSTER

APPENDIX C

Instrumentation

INSTRUMENT CALIBRATION (12 MONTH MAXIMUM INTERVAL)

VEHICLE: 1997 Ford Taurus LX; TRC NO.: 333 ; DATE: 10/22/98

INSTRUMENT	SERIAL NUMBER	CALIBRATION DATE	NEXT CALIBRATION
Data Acquisition System - Link Engrg.	2030	01/12/99	01/12/00
Computer – Dell CPi D266XT/Link Engrg.	70442	01/12/99	01/12/00
Software - Link Engrg. Rev Data	TRC Propr.	NA	NA
LF Torque Wheel	Not Utilized		
RF Torque Wheel	Not Utilized		
LR Torque Wheel	Not Utilized		
RR Torque Wheel	Not Utilized		
LF Slip Ring	Not Utilized		
RF Slip Ring	Not Utilized		
LR Slip Ring	Not Utilized		
RR Slip Ring	Not Utilized		
Applied Force Transducer – Key 1538-02	157	Each Test	Each Test
Assorted Pipe-Handle Steel Weights	Not Available	10/06/98	10/06/99
Hand Transducer – Sensor Devel. 10118	169755	Each Test	Each Test
LF Hydraulic Pressure Transducer	Not Utilized		
RF Hydraulic Pressure Transducer	Not Utilized		
LR Hydraulic Pressure Transducer	Not Utilized		
RR Hydraulic Pressure Transducer	Not Utilized		
Accelerometer - Setra (+ or - 15 g)	791029	Each Test	Each Test
ADAT Doppler Radar Sensor DSR-6/1aa	140.0027	Each Test	Each Test
Wind Velocity - Campbell Scientific	J2255	05/01/98	05/01/99
Ambient Temperature Gauge - Campbell	P3420015	05/01/98	05/01/99
LF Brake Thermocouple - Temprel/Link	T52-0B-24K	Ea. Test w/Link	Ea. Test w/Link
RF Brake Thermocouple - Temprel/Link	T52-0B-24K	Ea. Test w/Link	Ea. Test w/Link
LR Brake Thermocouple - Temprel/Link	T52-0B-24K	Ea. Test w/Link	Ea. Test w/Link
RR Brake Thermocouple - Temprel/Link	T52-0B-24K	Ea. Test w/Link	Ea. Test w/Link
Lock-up Detection System	TRC Propr.	Each Test	Each Test

APPENDIX D

Maximum Lever Force Calculations

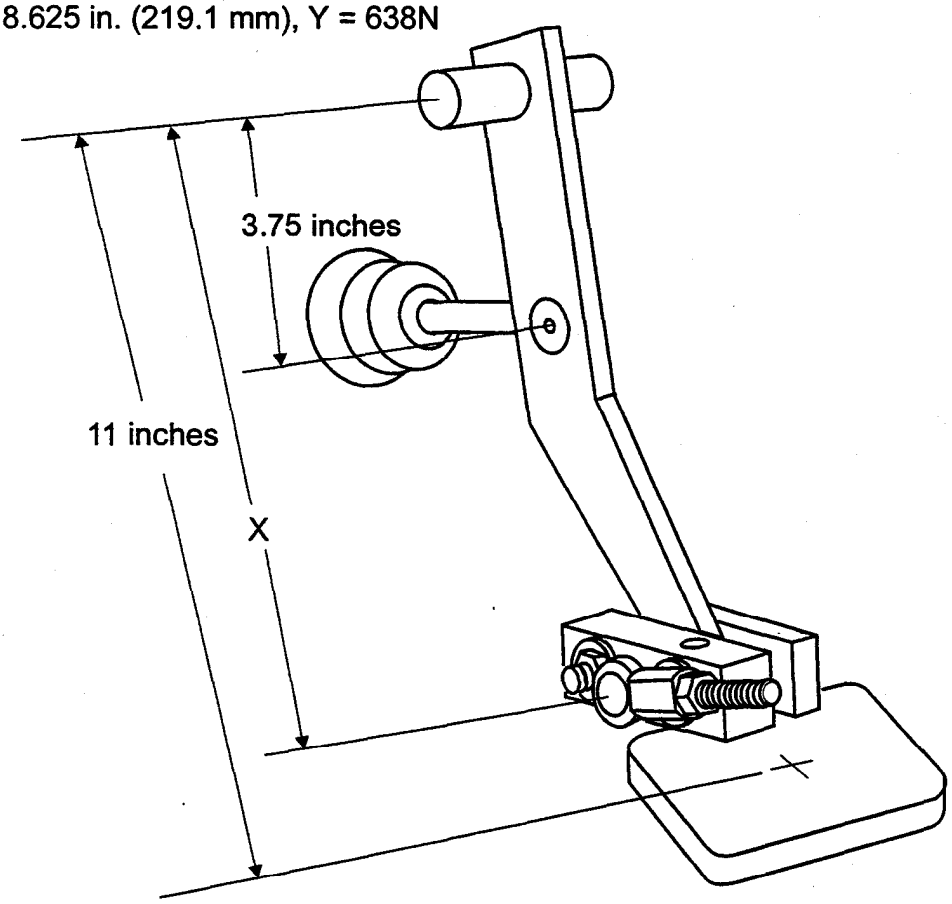
1997 FORD TAURUS LX
HAND CONTROL TESTS

CALCULATIONS FOR TARGET MAXIMUM SERVICE BRAKE LEVER FORCE

FMVSS 135 maximum allowable force as applied to the center of the service brake control is 500 Newtons (N)

500N x 11 in. = X in. x YN
YN = [500N x 11 in. (279.4 mm)] / X in.

HC #1 = X = 8.25 in. (209.6 mm), Y = 667N
HC #2&3 = X = 8.875 in. (225.4 mm), Y = 620N
HC #4 = X = 9 in. (228.6 mm), = Y = 611N
HC #5 = X = 8.625 in. (219.1 mm), Y = 638N



X = Distance from the center line of the service brake lever pivot/attachment point to the centerline of the handbrake actuator's attachment clamp. Distance varied somewhat between the different hand controls.

APPENDIX E

Test Data
Foot Controlled Baseline

Tested from 10/22/98 to 11/26/98

DATA SHEET 5 - VEHICLE MAX SPEED

VEHICLE: FORD 1997 TAURUS 4-DOOR SEDAN NHTSA No. 333 Date: 10/22/98

Ambient Temperature: 11.11°C Wind Velocity: 17.70(KM/H)
Road PFC:94 Wind Direction: 291°
Odometer: Start ***(Km) End ***(Km)

TEST WEIGHT: Total (Kg): 1728 Front (Kg): 1089 Rear (Kg): 640

ESTABLISH VEHICLE MAXIMUM SPEED

VEHICLE LOAD: LLVW IBT: N/A
GEAR: Drive DECEL RATE: N/A
PEDAL FORCE: N/A WHEEL LOCKUP: N/A
TEST SPEED: Maximum attainable from a standing start in 3.2 km. INTERVAL: N/A

1. Ballast Vehicle to LLVW
2. Accelerate at a maximum rate from a standing start for a distance of 3.2 km on a level surface.
3. Repeat in opposite direction.
4. Record speed attained in each direction and use the average of the two runs.

	DIRECTION	MAX SPEED (km/h)		Time 0 - 100 KPH (seconds)
		Visual	Recorded	
Run No. 1	South	170.9	170.9	10.18
Run No. 2	North	170.9	170.9	9.79

AVERAGE = 170.9

COMMENTS: INV DATA, Section 0001, 11/23/98, 11:11:13

Performed only during this baseline/foot apply test

This vehicle maximum speed test was not repeated for hand control tests.

Tester/Technician: Karen Easterday KAREN EASTERDAY Date: 6-28-99

Quality Assurance: KEN WEBSTER

Vehicle: 1997 FORD
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

NHTSA NUMBER: 333

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 11/16/98

DATA SHEET 10 - BURNISH AT GVWR

Testing Conditions: INV DATA, Section 0002, 11/16/98, 11:20:40

Weather Conditions: Wind: Start Odo.: End Odo.:

Schedule:
Initial Brake Temperature Less Than 100°C
Initial Speed 80 km/h to zero
200 stops with transmission in gear

Performance Requirements:
Interval between runs: Time necessary to reduce IBT to 100 C° OR 2 km distance, whichever occurs first.
Constant decel rate: 3.0 m/s^2
Pedal force adjusted to maintain constant decel.
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	AVG. DECEL (m/sec^2)
1	80.63	53	58	48	54	73.54	56.07	2.83
10	79.89	106	129	142	146	65.37	49.94	2.69
20	80.50	115	129	128	135	65.87	50.29	2.55
30	79.71	101	128	122	124	68.83	51.19	3.15
40	80.13	98	128	121	125	63.44	46.33	2.19
50	80.06	102	114	93	98	69.00	49.03	2.82
60	79.80	92	121	134	148	64.12	45.90	2.78
70	79.24	100	128	130	134	75.44	55.10	2.86
80	80.05	101	118	111	127	73.56	49.04	2.41
90	79.54	97	123	127	142	77.24	51.45	2.84
100	79.98	102	127	131	134	72.29	50.59	2.87
110	79.84	106	121	124	127	70.26	47.46	2.81
120	80.10	98	129	100	103	67.28	52.57	2.78
130	80.24	103	130	113	119	67.40	51.50	2.91
140	80.37	108	122	125	136	71.23	50.07	3.05
150	80.36	101	128	126	129	70.66	46.79	2.78
160	79.20	102	124	112	123	67.37	47.58	2.77
170	80.19	98	114	102	112	84.24	55.41	2.61
180	80.36	97	108	121	135	81.94	58.04	2.80
190	80.09	102	114	127	131	69.42	52.36	2.85
200	80.48	100	115	126	124	64.72	46.42	2.86

BRAKE ADJUSTMENT

Schedule:
Adjust service brakes; record procedure and amount adjusted.

Left Front:	DISC	NONE
Right Front:	DISC	NONE
Left Rear:	DISC	NONE
Right Rear:	DISC	NONE

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

NHTSA NUMBER: 333

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 11/23/98

DATA SHEET 11 - COLD EFFECTIVENESS AT GVWR

Testing Conditions: INV DATA, Section 0015, 11/23/98, 14:20:11

Weather Conditions: 56°F Wind: 7 mph 291° Start Odo.: 31219 End Odo.: 31246

Schedule:
Initial Brake Temperature 65 - 100 C
Initial Speed 100 km/h to zero
6 stops with transmission in neutral

Performance Requirements:
One Stop with:
Stopping Distance less than 70m
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	99.52	75	79	61	72	54.6	55.2	447.52	257.90	10.31	5.93
2	99.96	81	84	61	74	54.4	54.5	496.58	244.83	11.04	5.70
3	100.19	87	94	73	92	54.4	54.2	504.11	279.60	11.77	5.81
4	89.95	86	95	69	87	53.4	65.9	474.13	252.52	11.16	5.99
5	100.17	84	84	72	91	54.9	54.7	434.86	213.63	11.72	4.61
6	99.44	83	94	69	87	54.2	54.8	438.16	294.41	10.41	5.90

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	NOX	SOUTH	YES
5	-	NOX	SOUTH	YES
6	-	NOX	SOUTH	YES

Corrected Distances are used to determine shortest stopping distance.

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

NHTSA NUMBER: 333

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 11/24/98

DATA SHEET 12 - HIGH SPEED EFFECTIVENESS AT GVWR

Testing Conditions: INV DATA, Section 0020; 11/24/98, 08:56:29

Weather Conditions: 47°F Wind: 7 mph 182° Start Odo: 31255 End Odo: 31266

Schedule:
Initial Brake Temperature: 65-100°C
Initial Speed: 80% max km/h, not greater than 160km/h
6 stops with transmission in gear

Performance Requirements:
One Stop with:
Stopping Distance less than: **138.9 meter**
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	136.27	85	97	74	88	105.9	106.6	561.02	343.24	9.84	6.33
2	135.25	72	90	66	64	101.3	103.6	563.62	364.71	10.73	6.37
3	136.07	71	88	81	88	102.3	103.3	499.25	333.70	10.59	7.03
4	134.78	76	98	84	82	99.7	102.6	538.47	330.50	11.56	6.27
5	136.16	76	94	72	72	101.5	102.4	464.19	186.55	12.82	3.86
6	136.57	77	93	74	70	102.0	102.2	492.10	265.53	10.14	5.60

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	NOX	SOUTH	YES
5	-	NOX	SOUTH	YES
6	-	NOX	SOUTH	YES

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

NHTSA NUMBER: 333

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 11/24/98

DATA SHEET 13 - STOPS WITH ENGINE OFF AT GVWR

Testing Conditions: INV DATA, Section 0025, 11/24/98, 10:41:53

Weather Conditions: 42°F Wind: 10 mph 141° Start Odo.: 31269 End Odo.: 31274

Schedule:
Initial Brake Temperature: 65-100°C
Initial Speed 100 km/h to zero
6 stops with transmission in neutral

Performance Requirements:
One Stop with:
Stopping Distance less than **70m**
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	100.22	71	80	64	57	61.8	61.5	445.72	262.60	11.24	5.34
2	100.04	82	103	76	68	55.3	55.3	457.79	271.59	13.43	5.80
3	99.61	83	96	75	68	54.2	54.6	457.26	236.78	11.30	5.46
4	99.55	84	97	76	72	54.2	54.7	623.21	297.64	12.14	6.03
5	100.21	83	96	75	68	54.6	54.4	465.44	312.91	10.32	6.36
6	99.44	80	97	76	69	55.1	55.7	467.30	282.70	13.65	5.92

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	NOX	SOUTH	YES
5	-	NOX	SOUTH	YES
6	-	NOX	SOUTH	YES

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

NHTSA NUMBER: 333

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 11/24/98

DATA SHEET 14 - COLD EFFECTIVENESS AT LLVW

Testing Conditions: INV DATA, Section 0030, 11/24/98, 12:44:53

Weather Conditions: 52°F Wind: 16 mph 144° Start Odo.: 31277 End Odo.: 31282

Schedule:
Initial Brake Temperature: 65-100°C
Initial Speed 100 km/h to zero
6 stops with transmission in neutral

Performance Requirements:
One Stop with:
Stopping Distance less than 70m
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	100.07	65	74	63	66	57.5	57.4	327.42	240.15	10.06	7.59
2	100.06	77	87	61	63	53.2	53.2	530.59	385.13	11.79	7.96
3	99.68	83	94	56	57	53.4	53.7	464.74	387.86	10.94	8.23
4	99.90	83	100	52	52	53.5	53.6	455.03	344.06	10.82	8.08
5	99.08	80	97	48	46	52.7	53.7	465.67	384.56	11.13	8.28
6	100.64	72	90	43	39	52.8	52.2	486.24	387.01	12.33	8.32

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	NOX	SOUTH	YES
5	-	NOX	SOUTH	YES
6	-	NOX	SOUTH	YES

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

NHTSA NUMBER: 333

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 11/24/98

DATA SHEET 15 - HIGH SPEED EFFECTIVENESS AT LLVW

Testing Conditions: INV DATA, Section 0035, 11/24/98, 13:24:16

Weather Conditions: 55°F Wind: 16 mph 158° Start Odo.: 31282 End Odo.: 31293

Schedule:
Initial Brake Temperature: 65-100°C
Initial Speed: 80% max km/h
6 stops with transmission in gear

Performance Requirements:
One Stop with:
Stopping Distance less than **138.9m**
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	135.50	57	76	38	34	100.0	101.8	440.77	298.74	11.22	8.15
2	136.53	67	86	39	36	101.1	101.4	557.84	396.67	11.10	8.04
3	135.53	74	92	37	36	99.2	100.9	391.82	300.94	11.50	8.21
4	135.96	79	94	36	37	103.9	105.0	433.23	327.30	14.19	7.85
5	135.59	78	89	40	43	102.3	104.0	434.91	348.67	10.60	8.02
6	136.92	83	97	41	41	101.4	101.1	454.16	358.43	11.16	8.03

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	NOX	SOUTH	YES
5	-	NOX	SOUTH	YES
6	-	NOX	SOUTH	YES

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

NHTSA NUMBER: 333

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 03/18/99

DATA SHEET 16 - ANTILOCK FUNCTIONAL FAILURE AT LLVW

Testing Conditions: INV DATA, Section 0040, 03/18/99, 14:31:13

Weather Conditions: 39°F Wind: 18 mph 285° Start Odo.: 33318 End Odo.: 33323

Schedule:
Initial Brake Temperature: 65-100°C
Initial Speed 100 km/h to zero
6 stops with transmission in neutral

Performance Requirements:
One Stop with:
Stopping Distance less than **85m**
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	100.16	66	64	53	51	71.7	71.5	144.93	113.77	8.93	5.70
2	100.96	79	75	47	46	58.5	57.4	165.72	125.54	9.10	6.76
3	99.42	92	87	48	51	58.3	59.0	140.54	108.73	9.58	6.40
4	100.07	87	85	43	45	62.1	62.0	136.09	108.31	8.98	5.99
5	100.06	90	86	45	46	58.6	58.5	134.93	103.95	9.22	6.30
6	99.55	93	89	41	42	57.7	58.2	167.41	119.62	9.88	6.72

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	NOX	SOUTH	YES
5	-	NOX	SOUTH	YES
6	-	NOX	SOUTH	YES

How was the ABS failure induced: REMOVED FUSE FROM FUSE PANEL LOCATED UNDER DASHBOARD.

Is brake system indicator lamp activated: YES (X) NO ( )

Vehicle not equipped with variable proportioning valve. Data Sheet 17 not included.

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

NHTSA NUMBER: 333

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 03/18/99

DATA SHEET 22 - ANTILOCK FUNCTIONAL FAILURE AT GVWR

Testing Conditions: INV DATA, Section 0070, 03/18/99, 13:22:12

Weather Conditions: 38°F Wind: 19 mph 288° Start Odo.: 33310 End Odo.: 33315

Schedule:
Initial Brake Temperature 65-100°C
Initial Speed 100 km/h to zero
6 stops with transmission in neutral

Performance Requirements:
One Stop with:
Stopping Distance less than **85m**
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	99.99	76	75	77	67	64.5	64.5	467.36	327.92	9.38	6.57
2	99.84	93	90	77	71	59.4	59.5	321.27	193.39	9.08	5.95
3	99.63	86	83	61	59	61.7	62.2	234.28	149.90	8.95	6.11
4	99.45	91	86	60	59	62.6	63.3	171.64	129.41	8.54	6.18
5	100.33	90	81	57	56	65.8	65.4	254.06	148.76	8.67	6.12
6	100.18	91	82	57	55	64.4	64.2	203.82	138.00	9.22	5.98

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	LFX-END	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	NOX	SOUTH	YES
5	-	NOX	SOUTH	YES
6	-	NOX	SOUTH	YES

How was the ABS failure induced: REMOVED FUSE FROM FUSE PANEL LOCATED UNDER DASHBOARD.

Is brake system indicator lamp activated: YES (X) NO ( )

Vehicle not equipped with variable proportioning valve. Data Sheet 23 not included.

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

NHTSA NUMBER: 333

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 11/24/98

DATA SHEET 24 - BRAKE POWER UNIT OR PWR ASSIST UNIT IN/OP AT GVWR

Testing Conditions: INV DATA, Section 0080, 11/24/98, 15:12:15

Weather Conditions: 43°F Wind: 3 mph 174° Start Odo.: 31296 End Odo.: 31310

Failure Simulation: Disconnect primary source of power.

Method of rendering inoperative: Remove Engine Vacuum Hose at Booster

Schedule:
Initial Brake Temperature 65-100°C
Initial Speed 100 km/h to zero
6 stops with transmission in neutral

Performance Requirements:
One Stop with:
Stopping Distance less than **168m**
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	99.65	72	88	61	58	193.7	195.0	508.59	478.71	3.13	2.33
2	99.01	71	82	68	74	195.3	199.2	544.70	479.31	2.81	2.24
3	101.17	84	95	77	83	175.9	171.9	518.03	478.84	2.97	2.45
4	99.42	81	90	67	71	184.9	187.1	496.92	474.99	2.83	2.33
5	100.03	88	96	71	74	181.4	181.3	497.87	479.41	3.74	2.44
6	99.95	86	94	67	69	174.0	174.1	503.08	489.57	3.07	2.51

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	NOX	SOUTH	YES
5	-	NOX	SOUTH	YES
6	-	NOX	SOUTH	YES

Is the brake system indicator lamp activated: YES (X) NO ( )

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 227.5 (Kpa)
Rear Cold Tire Pressure: 227.5 (Kpa)

NHTSA NUMBER: 333

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 11/26/98

DATA SHEET 26 - HEATING SNUBS AT GVWR

Testing Conditions: INV DATA, Section 0090, 11/26/98, 10:58:57

Schedule:
Conduct 15 snubs from 120 Km/h or 80% Vmax, whichever is slower, to 1/2 of initial speed.
Attain required decel in 1 second and maintain that decel.
Interval between snubs is 45 seconds and WOT to initial speed.

Performance Requirements:
Initial IBT for first snub is 55-65°C
Maintain 3.0 m/s/s deceleration
Vehicle Must stay in lane of 3.5m

SNUB #	AVG. DECEL (m/sec^2)	Time Between Snubs (second)	AVG. PEDAL FORCE (N)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	INIT SPD (kph)
1	3.01	--NA--	50.43	64	65	58	58	120.38
2	3.39	54	50.68	112	120	94	101	120.43
3	3.11	38	44.40	163	169	139	150	119.66
4	2.84	45	47.37	196	206	179	196	120.42
5	2.94	46	49.57	220	237	215	239	121.27
6	2.92	46	50.50	237	256	246	268	120.28
7	2.85	43	52.63	253	274	269	293	119.71
8	3.08	44	62.86	267	291	287	308	120.62
9	3.10	46	55.38	279	300	297	318	120.42
10	2.96	44	52.80	292	311	304	324	119.99
11	2.89	46	56.73	303	314	310	328	120.77
12	2.97	45	56.30	311	323	316	333	121.32
13	2.84	47	49.77	313	328	319	334	120.72
14	3.02	43	55.93	316	337	323	339	121.23
15	2.94	45	51.40	319	336	328	343	119.85

STOP #	DRIVER VEHICLE SNUB COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)			
1	-	NOX	NORTH	YES
2	-	NOX	EAST	YES
3	-	NOX	EAST	YES
4	-	NOX	SOUTH	YES
5	-	NOX	SOUTH	YES
6	-	NOX	SOUTH	YES
7	-	NOX	WEST	YES
8	-	NOX	WEST	YES
9	-	NOX	NORTH	YES
10	-	NOX	NORTH	YES
11	-	NOX	NORTH	YES
12	-	NOX	EAST	YES
13	-	NOX	SOUTH	YES
14	-	NOX	SOUTH	YES
15	-	NOX	SOUTH	YES

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

NHTSA NUMBER: 333

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 11/26/98

DATA SHEET 27 - HOT PERFORMANCE AT GVWR

Testing Conditions: INV DATA, Section 0095, 11/26/98, 11:10:13

Schedule:
Make 2 stops from 100 kph
Pedal Force: 1st stop is done with an average force less than the average recorded in the shortest GVWR Cold Effectiveness stop.
2nd stop is done with a force less than 500 N.
No Lock-Up allowed longer than 0.1 sec above 15 km/h.
Distance Requirements are based on the following:
shortest stop in Data Sheet 11 is: 1
Initial speed of stop: 99.44 (kph)
Actual distance of stop: 54.2 (meter)
Average pedal force: 294.4 (N)

Performance Requirements:
Stop Number 1 must be less than: **83.7 (meter)**
In addition the stopping distance for at least one of the of the two hot stops must be less than: **89 (meter)**

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	100.42	331	349	336	353	98.1	97.2	271.91	140.07	7.14	5.23
2	99.45	340	361	338	354	73.0	73.8	273.76	216.96	7.74	6.27

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)			
1	-	NOX	WEST	YES
2	-	NOX	WEST	YES

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

NHTSA NUMBER: 333

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 11/26/98

DATA SHEET 28 - BRAKE COOLING STOPS AT GVWR

Testing Conditions: INV DATA, Section 0100, 11/26/98, 11:12:57

Schedule:
Initial Brake Temperature:
Achieved on completing Hot Performance
Initial Speed 50 km/h to zero
4 stops with transmission in gear

Performance Requirements:
Constant Decel rate: 3.0 m/s/s
Pedal force adjusted as necessary
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	AVG. DECEL (m/sec^2)	AVG. PEDAL FORCE (N)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)
1	50.41	3.20	55.98	296	302	291	306
2	50.64	3.07	54.68	239	234	242	257
3	50.69	2.84	53.48	194	190	204	219
4	50.39	3.09	51.53	160	159	175	191

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock up -	Direction of Stop -	Stay in Lane)
1	- NOX	NORTH	YES
2	- NOX	NORTH	YES
3	- NOX	NORTH	YES
4	- NOX	EAST	YES

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

NHTSA NUMBER: 333

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 11/26/98

DATA SHEET 29 - RECOVERY PERFORMANCE AT GVWR

Testing Conditions: INV DATA, Section 0105, 11/26/98, 11:20:20

Weather Conditions: Wind: Start Odo.: End Odo.:

Schedule:
Make 2 stops from 100 kph
Pedal Force: 1st stop is done with an average force less than the average recorded in the shortest GVWR Cold Effectiveness stop.
2nd stop is done with a force less than 500 N.
No Lock-Up allowed longer than 0.1 sec above 15 km/h.
Distance Requirements are based on the following:
shortest stop in Data Sheet 11 is:Stop1
Initial speed of stop: 99.44 (kph)
Actual distance of stop: 54.2 (meter)
Average pedal force: 294.4 (N)

Performance Requirements:
One of the two stops must be within the following limits:
Upper limit of corrected stopping distance: **73.2 (meter)**
Lower limit of corrected stopping distance: **39.4 (meter)**

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	100.11	137	139	158	173	65.0	64.8	187.32	136.79	8.66	7.58
2	99.47	151	163	167	187	59.0	59.6	443.85	363.06	9.86	7.95

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)		
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

APPENDIX F

Test Data

Hand Control #1
Howell Ventures Limited
Sure-Grip

Tested from 12/15/98 to 12/29/98

Vehicle: 1997 FORD
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

NHTSA NUMBER: 333

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 12/15/98

DATA SHEET 10 - BURNISH AT GVWR

Testing Conditions: INV DATA, Section 0002, 12/15/98, 09:47:44

Weather Conditions: Wind: Start Odo.: End Odo.:

Schedule:
Initial Brake Temperature Less Than 100°C
Initial Speed 80 km/h to zero
200 stops with transmission in gear

Performance Requirements:
Interval between runs: Time necessary to reduce IBT to 100 C° OR 2 km distance, whichever occurs first.
Constant decel rate: 3.0 m/s^2
Pedal force adjusted to maintain constant decel.
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	AVG. DECEL (m/sec^2)
1	79.46	39	61	55	57	77.01	52.84	2.46
10	80.06	104	116	177	146	99.02	75.72	2.98
20	79.66	111	112	148	142	97.50	61.36	2.94
30	79.10	106	104	129	132	91.38	58.67	3.22
40	79.45	108	127	125	134	75.72	53.26	3.08
50	79.86	109	111	123	132	79.31	48.57	2.94
60	80.12	105	108	127	132	84.80	59.20	2.89
70	80.93	90	98	92	84	95.74	58.94	2.97
80	79.91	112	114	133	136	84.54	55.23	2.90
90	79.58	105	108	137	135	74.53	53.62	2.73
100	79.13	107	115	129	133	75.84	54.34	2.97
110	79.78	109	112	124	131	83.61	59.74	3.06
120	79.76	107	103	144	143	79.10	52.57	2.88
130	79.29	101	99	112	115	83.91	61.64	2.78
140	80.05	98	101	118	123	106.06	63.67	2.84
150	78.76	97	102	122	122	88.03	56.95	3.07
160	80.41	98	96	119	112	88.77	60.30	2.85
170	79.56	95	102	119	117	89.04	69.88	3.12
180	79.60	98	103	123	119	92.24	58.77	3.03
190	79.91	100	97	112	106	100.59	58.09	3.08
200	79.93	94	102	118	120	105.43	72.51	3.20

BRAKE ADJUSTMENT

Schedule:
Adjust service brakes; record procedure and amount adjusted.

Left Front:	DISC	NONE
Right Front:	DISC	NONE
Left Rear:	DISC	NONE
Right Rear:	DISC	NONE

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

NHTSA NUMBER: 333

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 12/16/98

DATA SHEET 11 - COLD EFFECTIVENESS AT GVWR

Testing Conditions: INV DATA, Section 0015, 12/16/98, 13:12:14

Weather Conditions: 38°F Wind: 7 mph 260° Start Odo.: 31623 End Odo.: 31629

Schedule:
Initial Brake Temperature 65 - 100 C
Initial Speed 100 km/h to zero
6 stops with transmission in neutral

Performance Requirements:
One Stop with:
Stopping Distance less than 70m
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	100.56	67	63	56	49	60.6	60.0	591.60	329.90	10.01	5.90
2	99.47	87	81	69	67	57.3	57.9	592.70	372.65	9.95	5.63
3	101.24	88	81	67	67	55.6	54.3	612.19	368.20	11.74	5.57
4	100.97	93	83	72	71	56.0	54.9	597.36	380.92	9.87	5.45
5	99.41	78	74	59	55	140.7	142.4	649.54	199.73	11.85	3.20
6	100.08	75	68	54	45	58.6	58.5	524.53	363.39	10.18	5.85

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	NOX	SOUTH	YES
5	-	Computer continued to log after stop.		
6	-	NOX	SOUTH	YES

Corrected Distances are used to determine shortest stopping distance.

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

NHTSA NUMBER: 333

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 12/18/98

DATA SHEET 12 - HIGH SPEED EFFECTIVENESS AT GVWR

Testing Conditions: INV DATA, Section 0020, 12/18/98, 11:40:00

Weather Conditions: 40°F Wind: 29 mph 164° Start Odo: 31650 End Odo: 31665

Schedule:
Initial Brake Temperature: 65-100°C
Initial Speed: 80% max km/h, not greater than 160km/h
6 stops with transmission in gear

Performance Requirements:
One Stop with:
Stopping Distance less than: **138.9 meter**
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	135.93	79	83	72	71	101.8	102.9	750.40	466.08	10.68	6.79
2	136.31	77	91	70	63	97.7	98.3	406.44	341.72	10.89	6.55
3	136.74	88	93	69	61	106.3	106.3	348.98	284.98	9.44	6.38
4	135.54	71	86	67	58	100.2	102.0	513.93	390.89	11.18	7.22
5	135.87	66	81	56	50	98.2	99.4	734.61	380.65	11.72	6.26
6	136.03	61	75	52	46	105.2	106.2	627.93	424.92	11.79	6.51

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	NOX	SOUTH	YES
5	-	NOX	SOUTH	YES
6	-	NOX	SOUTH	YES

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

NHTSA NUMBER: 333

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 12/18/98

DATA SHEET 13 - STOPS WITH ENGINE OFF AT GVWR

Testing Conditions: INV DATA, Section 0025, 12/18/98, 14:28:34

Weather Conditions: 41°F Wind: 24 mph 161° Start Odo.: 31666 End Odo.: 31671

Schedule:
Initial Brake Temperature: 65-100°C
Initial Speed 100 km/h to zero
6 stops with transmission in neutral

Performance Requirements:
One Stop with:
Stopping Distance less than **70m**
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	99.52	62	84	54	47	60.3	60.9	432.62	359.42	9.31	5.96
2	100.24	60	79	58	49	61.5	61.2	388.47	314.71	9.19	5.86
3	100.05	77	92	69	64	57.8	57.7	529.21	375.84	9.44	6.10
4	99.87	78	95	72	67	57.4	57.6	358.98	263.07	9.50	5.86
5	100.30	76	93	76	67	55.3	54.9	481.30	326.56	9.75	5.92
6	99.89	72	91	75	66	56.7	56.9	569.90	382.41	10.16	6.01

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)		
1	- NOX	SOUTH	YES
2	- NOX	SOUTH	YES
3	- NOX	SOUTH	YES
4	- NOX	SOUTH	YES
5	- NOX	SOUTH	YES
6	- NOX	SOUTH	YES

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

NHTSA NUMBER: 333

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 12/28/98

DATA SHEET 14 - COLD EFFECTIVENESS AT LLVW

Testing Conditions: INV DATA, Section 0030, 12/28/98, 14:24:54

Weather Conditions: 37°F Wind: 5 mph 148° Start Odo.: 31682 End Odo.: 31690

Schedule:
Initial Brake Temperature: 65-100°C
Initial Speed 100 km/h to zero
6 stops with transmission in neutral

Performance Requirements:
One Stop with:
Stopping Distance less than **70m**
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	100.70	77	77	55	50	63.5	62.6	588.32	426.87	9.17	5.60
2	99.54	92	91	49	51	58.7	59.2	597.19	392.22	9.52	5.96
3	100.40	84	84	44	51	57.0	56.5	631.93	421.57	10.62	6.09
4	98.94	76	71	48	53	58.6	59.8	604.19	426.66	10.05	6.54
5	100.24	84	87	46	49	56.3	56.0	616.53	404.69	9.99	6.05
6	99.11	91	91	46	48	56.2	57.2	534.54	365.85	10.46	6.39

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	NOX	SOUTH	YES
5	-	NOX	SOUTH	YES
6	-	NOX	SOUTH	YES

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

NHTSA NUMBER: 333

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 12/28/98

DATA SHEET 15 - HIGH SPEED EFFECTIVENESS AT LLVW

Testing Conditions: INV DATA, Section 0035, 12/28/98, 15:17:03

Weather Conditions: 38°F Wind: 8 mph 127° Start Odo.: 31693 End Odo.: 31706

Schedule:
Initial Brake Temperature: 65-100°C
Initial Speed: 80% max km/h
6 stops with transmission in gear

Performance Requirements:
One Stop with:
Stopping Distance less than **138.9m**
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	136.80	76	81	54	52	110.7	110.6	459.69	386.51	10.72	6.81
2	135.73	87	86	59	59	104.9	106.5	417.36	311.09	11.21	6.41
3	136.62	81	83	53	57	106.0	106.2	680.38	440.35	12.08	6.74
4	135.28	84	87	56	61	104.9	107.2	635.34	411.98	13.26	6.47
5	136.48	88	89	54	63	104.8	105.2	559.26	389.14	10.93	6.64
6	135.19	86	87	54	63	101.1	103.4	644.12	418.65	11.31	6.69

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	NOX	SOUTH	YES
5	-	NOX	SOUTH	YES
6	-	NOX	SOUTH	YES

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

NHTSA NUMBER: 333

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 03/23/99

DATA SHEET 16 - ANTILOCK FUNCTIONAL FAILURE AT LLVW

Testing Conditions: INV DATA, Section 0040, 03/23/99, 10:23:28

Weather Conditions: 36°F Wind: 8 mph 157° Start Odo.: 33413 End Odo.: 33418

Schedule:
Initial Brake Temperature: 65-100°C
Initial Speed 100 km/h to zero
6 stops with transmission in neutral

Performance Requirements:
One Stop with:
Stopping Distance less than **85m**
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	98.29	81	81	83	71	65.7	68.1	200.19	149.13	11.37	5.49
2	100.02	88	89	71	63	52.7	52.7	220.07	153.14	9.98	6.83
3	100.57	92	93	66	54	61.2	60.5	223.18	138.59	11.14	5.92
4	99.10	83	91	53	43	53.0	54.0	208.57	152.81	11.35	7.09
5	98.83	80	88	46	40	55.1	56.4	218.34	128.09	9.88	6.25
6	100.09	76	84	44	35	55.1	55.0	248.69	138.39	10.26	6.41

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	-	LFX-INIT	SOUTH	YES
4	-	NOX	SOUTH	YES
5	-	NOX	SOUTH	YES
6	-	NOX	SOUTH	YES

How was the ABS failure induced: REMOVED FUSE FROM FUSE PANEL UNDER DASHBOARD.

Is brake system indicator lamp activated: YES (X) NO ( )

Vehicle not equipped with variable proportioning valve. Data Sheet 17 not included.

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

NHTSA NUMBER: 333

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 03/22/99

DATA SHEET 22 - ANTILOCK FUNCTIONAL FAILURE AT GVWR

Testing Conditions: INV DATA, Section 0070, 03/22/99, 13:31:31

Weather Conditions: 31°F Wind: 7 mph 160° Start Odo.: 33398 End Odo.: 33410

Schedule:
Initial Brake Temperature 65-100°C
Initial Speed 100 km/h to zero
6 stops with transmission in neutral

Performance Requirements:
One Stop with:
Stopping Distance less than **85m**
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	100.24	69	69	73	69	64.9	64.6	397.49	255.09	9.72	6.21
2	99.50	90	87	73	74	66.2	66.8	248.46	173.05	8.80	5.98
3	100.86	63	71	77	64	57.5	56.5	286.80	238.75	9.62	6.61
4	100.62	74	82	81	68	71.2	70.3	218.11	157.58	9.36	5.63
5	99.81	85	88	83	78	63.3	63.5	215.13	153.67	9.21	5.84
6	100.21	89	93	80	76	61.7	61.4	292.59	160.53	9.53	5.69

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	LFX-INIT	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	NOX	SOUTH	YES
5	-	NOX	SOUTH	YES
6	-	NOX	SOUTH	YES

How was the ABS failure induced: REMOVED FUSE FROM FUSE PANEL UNDER DASHBOARD.

Is brake system indicator lamp activated: YES (X) NO ( )

Vehicle not equipped with variable proportioning valve. Data Sheet 23 not included.

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

NHTSA NUMBER: 333

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 12/29/98

DATA SHEET 24 - BRAKE POWER UNIT OR PWR ASSIST UNIT IN/OP AT GVWR

Testing Conditions: INV DATA, Section 0080, 12/29/98, 08:51:22

Weather Conditions: 33°F Wind: 15 mph 143° Start Odo.: 31714 End Odo.: 31726

Failure Simulation: Disconnect primary source of power.

Method of rendering inoperative: Remove Engine Vacuum Hose at Booster

Schedule:
Initial Brake Temperature 65-100°C
Initial Speed 100 km/h to zero
6 stops with transmission in neutral

Performance Requirements:
One Stop with:
Stopping Distance less than **168m**
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	99.62	68	77	71	64	190.4	191.8	660.58	592.74	2.93	2.30
2	99.84	71	83	70	62	184.5	185.1	662.01	600.73	2.92	2.38
3	99.91	78	90	69	58	180.7	181.0	663.15	611.20	3.03	2.44
4	100.91	77	91	67	56	179.4	176.1	651.03	616.74	3.19	2.46
5	99.60	79	93	69	56	183.9	185.4	657.43	588.85	3.03	2.41
6	99.98	73	89	66	51	175.8	175.9	670.75	623.77	3.16	2.53

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	NOX	SOUTH	YES
5	-	NOX	SOUTH	YES
6	-	NOX	SOUTH	YES

Is the brake system indicator lamp activated: YES (X) NO ( )

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 227.5 (Kpa)
Rear Cold Tire Pressure: 227.5 (Kpa)

NHTSA NUMBER: 333

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 12/29/98

DATA SHEET 26 - HEATING SNUBS AT GVWR

Testing Conditions: INV DATA, Section 0090, 12/29/98, 10:32:51

Schedule:
Conduct 15 snubs from 120 Km/h or 80% Vmax, whichever is slower, to 1/2 of initial speed.
Attain required decel in 1 second and maintain that decel.
Interval between snubs is 45 seconds and WOT to initial speed.

Performance Requirements:
Initial IBT for first snub is 55-65°C
Maintain 3.0 m/s/s deceleration
Vehicle Must stay in lane of 3.5m

SNUB #	AVG. DECEL (m/sec^2)	Time Between Snubs (second)	AVG. PEDAL FORCE (N)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	INIT SPD (kph)
1	5.77	--NA--	164.96	57	53	47	39	120.24
2	3.43	47	57.99	122	113	103	98	119.72
3	3.19	45	47.13	164	160	146	137	119.28
4	3.19	45	48.47	196	197	186	174	119.51
5	2.91	44	46.74	219	225	225	208	120.34
6	2.73	45	42.58	239	243	259	238	119.63
7	2.87	47	58.56	255	258	281	258	119.18
8	2.78	44	60.26	273	268	296	276	120.49
9	2.87	45	62.03	291	278	311	293	121.40
10	2.94	44	58.92	309	284	319	305	119.91
11	2.99	45	62.96	322	294	332	311	121.15
12	2.97	47	57.06	326	294	336	317	119.72
13	3.11	43	59.79	326	307	341	318	120.70
14	2.95	45	60.32	323	311	343	319	119.80
15	3.00	47	57.63	321	316	348	324	120.57

STOP #	DRIVER VEHICLE SNUB COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)			
1	-	NOX	EAST	YES
2	-	NOX	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	NOX	SOUTH	YES
5	-	NOX	WEST	YES
6	-	NOX	WEST	YES
7	-	NOX	NORTH	YES
8	-	NOX	NORTH	YES
9	-	NOX	NORTH	YES
10	-	NOX	EAST	YES
11	-	NOX	EAST	YES
12	-	NOX	SOUTH	YES
13	-	NOX	SOUTH	YES
14	-	NOX	SOUTH	YES
15	-	NOX	WEST	YES

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

NHTSA NUMBER: 333

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 12/29/98

DATA SHEET 27 - HOT PERFORMANCE AT GVWR

Testing Conditions: INV DATA, Section 0095, 12/29/98, 10:44:03

Schedule:
Make 2 stops from 100 kph
Pedal Force: 1st stop is done with an average force less than the average recorded in the shortest GVWR Cold Effectiveness stop.
2nd stop is done with a force less than 500 N.
No Lock-Up allowed longer than 0.1 sec above 15 km/h.
Distance Requirements are based on the following:
shortest stop in Data Sheet 11 is: 1
Initial speed of stop: 99.44 (kph)
Actual distance of stop: 54.2 (meter)
Average pedal force: 294.4 (N)

Performance Requirements:
Stop Number 1 must be less than: **83.7 (meter)**
In addition the stopping distance for at least one of the of the two hot stops must be less than: **89 (meter)**

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	100.27	328	322	360	329	68.1	67.8	443.01	306.38	8.95	4.95
2	99.10	332	333	359	331	63.7	64.9	278.34	235.07	9.17	5.61

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)		
1	-	NOX	WEST	YES
2	-	NOX	NORTH	YES

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

NHTSA NUMBER: 333

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 12/29/98

DATA SHEET 28 - BRAKE COOLING STOPS AT GVWR

Testing Conditions: INV DATA, Section 0100, 12/29/98, 10:46:58

Schedule:
Initial Brake Temperature:
Achieved on completing Hot Performance
Initial Speed 50 km/h to zero
4 stops with transmission in gear

Performance Requirements:
Constant Decel rate: 3.0 m/s/s
Pedal force adjusted as necessary
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	AVG. DECEL (m/sec^2)	AVG. PEDAL FORCE (N)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)
1	50.22	2.87	67.98	289	280	304	284
2	50.09	2.80	59.19	239	221	251	240
3	50.81	3.39	64.99	197	179	211	206
4	50.02	2.94	57.12	160	153	182	179

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock up - Direction of Stop - Stay in Lane)			
1	-	NOX	NORTH	YES
2	-	NOX	NORTH	YES
3	-	NOX	EAST	YES
4	-	NOX	SOUTH	YES

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

NHTSA NUMBER: 333

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 12/29/98

DATA SHEET 29 - RECOVERY PERFORMANCE AT GVWR

Testing Conditions: INV DATA, Section 0105, 12/29/98, 10:53:57

Weather Conditions: Wind: Start Odo.: End Odo.:

Schedule:
Make 2 stops from 100 kph
Pedal Force: 1st stop is done with an average force less than the average recorded in the shortest GVWR Cold Effectiveness stop.
2nd stop is done with a force less than 500 N.
No Lock-Up allowed longer than 0.1 sec above 15 km/h.
Distance Requirements are based on the following:
shortest stop in Data Sheet 11 is:Stop1
Initial speed of stop: 99.44 (kph)
Actual distance of stop: 54.2 (meter)
Average pedal force: 294.4 (N)

Performance Requirements:
One of the two stops must be within the following limits:
Upper limit of corrected stopping distance: **73.2 (meter)**
Lower limit of corrected stopping distance: **39.4 (meter)**

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	100.37	139	138	163	161	62.8	62.3	563.95	310.87	10.56	5.73
2	100.73	156	159	169	174	63.5	62.6	463.44	299.29	12.40	5.57

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)		
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

APPENDIX G

Test Data

Hand Control #2
Drive-Master Co., Inc.
Ultra-Lite XL

Tested from 2/02/99 to 02/08/99

Vehicle: 1997 FORD MOTOR CO. NHTSA NUMBER: 333
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 02/02/99

DATA SHEET 10 - BURNISH AT GVWR

Testing Conditions: INV DATA, Section 0002, 02/02/99, 10:54:27

Weather Conditions: 37°F Wind:15 mph 262° Start Odo.: 31766 End Odo.: 32051

Schedule:
Initial Brake Temperature Less Than 100°C
Initial Speed 80 km/h to zero
200 stops with transmission in gear

Performance Requirements:
Interval between runs: Time necessary to reduce IBT to 100 C° OR 2 km distance, whichever occurs first.
Constant decel rate: 3.0 m/s^2
Pedal force adjusted to maintain constant decel.
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	AVG. DECEL (m/sec^2)
1	78.95	76	76	66	79	83.04	64.14	2.72
10	79.18	88	92	117	138	101.69	71.66	2.92
20	78.91	108	109	119	141	89.02	62.18	2.71
30	80.37	100	108	104	130	94.87	71.71	3.15
40	79.99	88	97	84	106	99.39	64.74	3.01
50	80.28	114	109	111	141	87.58	67.13	2.97
60	79.73	104	102	99	114	81.58	55.92	3.22
70	79.78	103	113	100	113	107.32	67.21	3.23
80	79.85	103	100	93	108	83.08	56.84	2.80
90	80.09	91	94	83	103	78.96	56.14	2.86
100	80.69	108	109	107	130	76.57	57.32	3.19
110	81.03	103	104	114	126	82.40	50.60	2.92
120	80.40	96	104	112	116	86.05	60.49	3.08
130	80.30	104	107	109	112	75.02	53.05	2.84
140	79.67	102	107	107	113	82.11	60.12	3.33
150	80.96	86	102	84	98	82.07	62.99	2.99
160	79.79	91	101	104	122	83.85	64.80	2.90
170	80.48	89	84	96	122	96.56	71.29	2.99
180	80.19	88	88	82	101	100.25	63.69	2.94
190	80.46	93	92	96	113	106.74	76.47	2.98
200	79.78	90	82	97	111	95.74	76.71	2.90

BRAKE ADJUSTMENT

Schedule:
Adjust service brakes; record procedure and amount adjusted.

Left Front: DISC DISC BRAKE NO ADJUSTMENT REQUIRED
Right Front: DISC DISC BRAKE NO ADJUSTMENT REQUIRED
Left Rear: DISC DISC BRAKE NO ADJUSTMENT REQUIRED
Right Rear: DISC DISC BRAKE NO ADJUSTMENT REQUIRED

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD MOTOR CO. NHTSA NUMBER: 333
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 02/05/99

DATA SHEET 11 - COLD EFFECTIVENESS AT GVWR

Testing Conditions: INV DATA, Section 0015, 02/05/99, 09:01:24

Weather Conditions: 25°F Wind: 9 mph 146° Start Odo.: 32060 End Odo.: 32068

Schedule:
Initial Brake Temperature 65 - 100 C
Initial Speed 100 km/h to zero
6 stops with transmission in neutral

Performance Requirements:
One Stop with:
Stopping Distance less than **70m**
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	99.82	76	77	65	77	56.3	56.5	473.41	256.58	9.06	5.42
2	99.74	77	81	67	77	53.4	53.6	534.16	314.49	9.74	5.73
3	100.48	83	88	72	84	52.4	51.9	489.59	281.96	10.87	5.57
4	100.71	81	84	68	79	52.2	51.5	533.73	338.88	10.66	5.96
5	99.73	83	87	75	89	52.9	53.2	567.19	284.29	10.82	5.02
6	99.39	86	89	74	87	54.4	55.1	523.63	264.16	10.07	5.46

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	NOX	SOUTH	YES
5	-	NOX	SOUTH	YES
6	-	NOX	SOUTH	YES

Corrected Distances are used to determine shortest stopping distance.

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD MOTOR CO. NHTSA NUMBER: 333
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 02/05/99

DATA SHEET 12 - HIGH SPEED EFFECTIVENESS AT GVWR

Testing Conditions: INV DATA, Section 0020, 02/05/99, 10:21:36

Weather Conditions: 29°F Wind: 9 mph 165° Start Odo: 32073 End Odo: 32083

Schedule:
Initial Brake Temperature: 65-100°C
Initial Speed: 80% max km/h, not greater than 160km/h
6 stops with transmission in gear

Performance Requirements:
One Stop with:
Stopping Distance less than: **138.9 meter**
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	136.61	69	75	56	57	95.5	95.7	389.35	292.22	10.58	6.19
2	136.46	72	80	59	58	97.1	97.4	472.48	259.75	11.28	5.52
3	135.61	71	77	58	55	96.1	97.7	527.94	325.01	10.34	6.00
4	134.93	70	79	57	54	95.4	97.9	439.59	253.51	10.46	5.99
5	136.22	73	83	62	57	96.3	97.0	449.94	322.53	10.23	6.43
6	135.58	73	78	64	62	97.8	99.5	445.96	240.64	10.33	6.20

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	NOX	SOUTH	YES
5	-	NOX	SOUTH	YES
6	-	NOX	SOUTH	YES

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD MOTOR CO. NHTSA NUMBER: 333
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 02/05/99

DATA SHEET 13 - STOPS WITH ENGINE OFF AT GVWR

Testing Conditions: INV DATA, Section 0025, 02/05/99, 12:08:22

Weather Conditions: 33°F Wind: 6 mph 196° Start Odo.: 32085 End Odo.: 32092

Schedule:
Initial Brake Temperature: 65-100°C
Initial Speed 100 km/h to zero
6 stops with transmission in neutral

Performance Requirements:
One Stop with:
Stopping Distance less than 70m
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	99.73	85	85	60	58	55.3	55.6	327.33	225.01	9.64	5.63
2	99.03	90	91	66	66	53.8	54.9	304.18	213.26	9.61	5.75
3	100.99	77	79	54	51	55.2	54.2	421.99	238.54	9.44	5.58
4	101.45	76	79	55	56	56.0	54.4	337.27	216.09	9.29	5.52
5	99.49	93	92	66	68	53.9	54.5	411.06	261.36	9.24	5.54
6	100.09	87	89	62	64	54.0	53.9	430.17	272.76	9.62	5.55

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	NOX	SOUTH	YES
5	-	NOX	SOUTH	YES
6	-	NOX	SOUTH	YES

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD MOTOR CO. NHTSA NUMBER: 333
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 02/05/99

DATA SHEET 14 - COLD EFFECTIVENESS AT LLVW

Testing Conditions: INV DATA, Section 0030, 02/05/99, 13:23:26

Weather Conditions: 35°F Wind: 10 mph 152° Start Odo.: 32095 End Odo.: 32100

Schedule:
Initial Brake Temperature: 65-100°C
Initial Speed 100 km/h to zero
6 stops with transmission in neutral

Performance Requirements:
One Stop with:
Stopping Distance less than 70m
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	100.10	69	75	47	51	53.6	53.5	465.72	336.34	10.15	5.91
2	99.88	80	87	44	46	53.3	53.5	408.59	261.75	11.84	6.01
3	99.27	86	93	42	42	54.3	55.1	437.20	263.69	11.27	5.77
4	99.49	92	91	39	40	53.2	53.8	547.65	357.02	13.21	5.92
5	99.89	74	81	32	32	53.2	53.3	591.50	338.47	13.30	6.01
6	102.31	88	92	38	39	90.2	86.2	573.03	254.80	11.58	4.67

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	NOX	SOUTH	YES
5	-	NOX	SOUTH	YES
6	PREMATURE TRIGGER	NOX	SOUTH	YES

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD MOTOR CO. NHTSA NUMBER: 333
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 02/05/99

DATA SHEET 15 - HIGH SPEED EFFECTIVENESS AT LLVW

Testing Conditions: INV DATA, Section 0035, 02/05/99, 13:57:08

Weather Conditions: 35°F Wind: 16 mph 132° Start Odo.: 32100 End Odo.: 32111

Schedule:
Initial Brake Temperature: 65-100°C
Initial Speed: 80% max km/h
6 stops with transmission in gear

Performance Requirements:
One Stop with:
Stopping Distance less than **138.9m**
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	134.29	58	67	28	27	91.7	95.1	537.65	317.87	12.46	6.56
2	136.23	83	91	41	39	97.3	98.0	487.67	286.12	11.19	6.44
3	135.67	84	89	39	38	97.1	98.6	572.26	143.93	14.02	2.91
4	135.53	83	81	51	55	94.1	95.7	575.03	327.33	12.62	6.63
5	134.88	81	85	44	44	93.8	96.4	516.68	304.31	13.90	6.55
6	137.69	75	84	41	37	96.9	95.5	523.13	360.92	12.29	6.54

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	NOX	SOUTH	YES
5	-	NOX	SOUTH	YES
6	-	NOX	SOUTH	YES

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD MOTOR CO. NHTSA NUMBER: 333
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 03/22/99

DATA SHEET 16 - ANTILOCK FUNCTIONAL FAILURE AT LLVW

Testing Conditions: INV DATA, Section 0040, 03/22/99, 10:27:42

Weather Conditions: 32°F Wind: 15 mph 279° Start Odo.: 33385 End Odo.: 33390

Schedule:
Initial Brake Temperature: 65-100°C
Initial Speed 100 km/h to zero
6 stops with transmission in neutral

Performance Requirements:
One Stop with:
Stopping Distance less than **85m**
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	100.28	77	74	68	67	59.8	59.5	208.74	163.03	9.78	6.67
2	99.63	94	83	59	64	54.9	55.3	220.50	153.46	9.65	6.90
3	99.35	94	84	56	56	55.3	56.1	217.98	147.66	9.70	6.55
4	101.07	82	73	40	41	57.3	56.1	204.93	157.46	9.93	7.03
5	99.45	78	70	32	34	55.5	56.1	208.80	161.57	11.27	6.76
6	99.44	82	75	33	37	57.7	58.3	216.26	147.59	10.02	6.16

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	NOX	SOUTH	YES
5	-	LFX-MID	SOUTH	YES
6	-	LFX-MID&END	SOUTH	YES

How was the ABS failure induced: REMOVED FUSE FROM FUSE PANEL UNDER DASHBOARD.

Is brake system indicator lamp activated: YES (X) NO ( )

Vehicle not equipped with variable proportioning valve. Data Sheet 17 not included.

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD MOTOR CO. NHTSA NUMBER: 333
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 03/22/99

DATA SHEET 22 - ANTILOCK FUNCTIONAL FAILURE AT GVWR

Testing Conditions: INV DATA, Section 0070, 03/22/99, 09:38:23

Weather Conditions: 31°F Wind: 15 mph 296° Start Odo.: 33377 End Odo.: 33382

Schedule:
Initial Brake Temperature 65-100°C
Initial Speed 100 km/h to zero
6 stops with transmission in neutral

Performance Requirements:
One Stop with:
Stopping Distance less than **85m**
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	101.01	81	81	80	77	72.9	71.4	257.46	195.52	8.50	5.73
2	99.70	91	85	69	73	74.4	74.8	245.47	177.34	8.69	5.74
3	100.19	88	81	56	62	60.3	60.1	278.36	215.03	8.89	6.36
4	100.44	87	80	53	58	63.8	63.2	238.18	189.43	8.64	6.21
5	100.64	78	70	44	46	67.0	66.1	220.26	170.08	8.45	5.98
6	99.76	85	74	52	52	60.3	60.5	235.70	156.74	8.93	5.61

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	-	LFX-END	SOUTH	YES
4	-	NOX	SOUTH	YES
5	-	LFX-MID	SOUTH	YES
6	-	NOX	SOUTH	YES

How was the ABS failure induced: REMOVED FUSE FROM FUSE PANEL UNDER DASHBOARD.

Is brake system indicator lamp activated: YES (X) NO ( )

Vehicle not equipped with variable proportioning valve. Data Sheet 23 not included.

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD MOTOR CO. NHTSA NUMBER: 333
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 02/05/99

DATA SHEET 24 - BRAKE POWER UNIT OR PWR ASSIST UNIT IN/OP AT GVWR

Testing Conditions: INV DATA, Section 0080, 02/05/99, 15:11:42

Weather Conditions: 36°F Wind: 15 mph 137° Start Odo.: 32114 End Odo.: 32120

Failure Simulation: Disconnect primary source of power.

Method of rendering inoperative: Remove Engine Vacuum Hose at Booster

Schedule:
Initial Brake Temperature 65-100°C
Initial Speed 100 km/h to zero
6 stops with transmission in neutral

Performance Requirements:
One Stop with:
Stopping Distance less than **168m**
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	99.48	60	67	45	48	197.1	199.1	590.18	517.65	3.00	2.17
2	99.56	76	84	58	60	192.9	194.6	584.37	503.77	3.17	2.07
3	100.77	78	93	63	64	201.2	198.1	548.60	497.53	3.09	2.07
4	98.49	77	92	63	64	165.8	171.0	590.18	526.89	3.24	2.40
5	100.13	81	94	66	65	165.8	165.4	590.18	546.22	3.26	2.46
6	101.13	81	93	68	66	193.2	188.9	590.14	492.48	3.07	2.24

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	NOX	SOUTH	YES
5	-	NOX	SOUTH	YES
6	-	NOX	SOUTH	YES

Is the brake system indicator lamp activated: YES (X) NO ( )

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD MOTOR CO. NHTSA NUMBER: 333
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 227.5 (Kpa)
Rear Cold Tire Pressure: 227.5 (Kpa)

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 02/08/99

DATA SHEET 26 - HEATING SNUBS AT GVWR

Testing Conditions: INV DATA, Section 0090, 02/08/99, 10:25:20

Schedule:
Conduct 15 snubs from 120 Km/h or 80% Vmax, whichever is slower, to 1/2 of initial speed.
Attain required decel in 1 second and maintain that decel.
Interval between snubs is 45 seconds and WOT to initial speed.

Performance Requirements:
Initial IBT for first snub is 55-65°C
Maintain 3.0 m/s/s deceleration
Vehicle Must stay in lane of 3.5m

SNUB #	AVG. DECEL (m/sec²)	Time Between Snubs (second)	AVG. PEDAL FORCE (N)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	INIT SPD (kph)
1	3.55	--NA--	84.38	54	51	44	41	118.76
2	3.54	47	70.67	106	94	82	84	118.99
3	3.60	45	59.96	148	134	124	130	120.06
4	3.04	44	45.51	182	167	166	171	119.69
5	2.94	45	55.62	210	193	197	211	120.33
6	2.98	45	52.65	228	213	225	248	119.76
7	2.99	45	54.52	249	227	250	266	120.30
8	2.81	45	49.36	261	241	271	282	119.72
9	2.97	45	54.13	276	251	282	299	120.37
10	2.89	45	62.55	285	259	291	308	120.18
11	2.94	45	59.01	297	265	298	317	120.42
12	2.98	45	55.64	306	272	304	321	120.72
13	3.05	45	63.13	309	275	312	326	120.33
14	3.17	45	56.83	307	276	314	334	120.77
15	2.99	45	51.85	304	274	315	332	119.99

STOP #	DRIVER VEHICLE SNUB COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)			
1	-	NOX	NORTH	YES
2	-	NOX	EAST	YES
3	-	NOX	EAST	YES
4	-	NOX	SOUTH	YES
5	-	NOX	SOUTH	YES
6	-	NOX	SOUTH	NOX
7	-	NOX	WEST	YES
8	-	NOX	NORTH	YES
9	-	NOX	NORTH	YES
10	-	NOX	NORTH	YES
11	-	NOX	EAST	YES
12	-	NOX	EAST	YES
13	-	NOX	SOUTH	YES
14	-	NOX	SOUTH	YES
15	-	NOX	SOUTH	YES

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD MOTOR CO. NHTSA NUMBER: 333
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 02/08/99

DATA SHEET 27 - HOT PERFORMANCE AT GVWR

Testing Conditions: INV DATA, Section 0095, 02/08/99, 10:36:31

Schedule:
Make 2 stops from 100 kph
Pedal Force: 1st stop is done with an average force less than the average recorded in the shortest GVWR Cold Effectiveness stop.
2nd stop is done with a force less than 500 N.
No Lock-Up allowed longer than 0.1 sec above 15 km/h.
Distance Requirements are based on the following:
shortest stop in Data Sheet 11 is: 4
Initial speed of stop: 100.71 (kph)
Actual distance of stop: 52.2 (meter)
Average pedal force: 338.3 (N)

Performance Requirements:
Stop Number 1 must be less than: **80.3 (meter)**
In addition the stopping distance for at least one of the of the two hot stops must be less than: **89 (meter)**

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	99.30	314	281	324	343	60.6	61.4	365.86	282.42	9.18	5.38
2	98.80	333	296	333	348	60.8	62.2	432.18	326.92	9.18	5.40

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)		
1	-	NOX	WEST	YES
2	-	NOX	WEST	YES

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD MOTOR CO. NHTSA NUMBER: 333
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 02/08/99

DATA SHEET 28 - BRAKE COOLING STOPS AT GVWR

Testing Conditions: INV DATA, Section 0100, 02/08/99, 10:39:10

Schedule:
Initial Brake Temperature:
Achieved on completing Hot Performance
Initial Speed 50 km/h to zero
4 stops with transmission in gear

Performance Requirements:
Constant Decel rate: 3.0 m/s/s
Pedal force adjusted as necessary
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	AVG. DECEL (m/sec^2)	AVG. PEDAL FORCE (N)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)
1	50.17	2.53	63.09	277	267	277	288
2	50.44	2.81	55.43	219	215	228	238
3	50.52	2.73	66.26	181	176	192	202
4	50.17	2.97	60.62	152	146	164	174

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock up	Direction of Stop	Stay in Lane)	
1	-	NOX	NORTH	YES
2	-	NOX	NORTH	YES
3	-	NOX	NORTH	YES
4	-	NOX	EAST	YES

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD MOTOR CO. NHTSA NUMBER: 333
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 02/08/99

DATA SHEET 29 - RECOVERY PERFORMANCE AT GVWR

Testing Conditions: INV DATA, Section 0105, 02/08/99, 10:46:22

Weather Conditions: 32°F Wind: 9 mph 154° Start Odo.: 32130 End Odo.: 32148

Schedule:
Make 2 stops from 100 kph
Pedal Force: 1st stop is done with an average force less than the average recorded in the shortest GVWR Cold Effectiveness stop.
2nd stop is done with a force less than 500 N.
No Lock-Up allowed longer than 0.1 sec above 15 km/h.
Distance Requirements are based on the following:
shortest stop in Data Sheet 11 is:Stop4
Initial speed of stop: 100.71 (kph)
Actual distance of stop: 52.2 (meter)
Average pedal force: 338.9 (N)

Performance Requirements:
One of the two stops must be within the following limits:
Upper limit of corrected stopping distance: **70.3 (meter)**
Lower limit of corrected stopping distance: **38.2 (meter)**

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	99.61	134	131	152	161	55.1	55.6	411.36	251.00	11.40	5.66
2	100.10	141	138	156	168	54.5	54.3	463.95	253.78	11.78	5.93

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)		
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

APPENDIX H

Test Data

Hand Control #3
Manufacturing and Production Services Corp.
Monarch Mark I-A

Tested from 02/15/99 to 02/17/99

Vehicle: 1997 FORD MOTOR CO. NHTSA NUMBER: 333
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 02/15/99

DATA SHEET 10 - BURNISH AT GVWR

Testing Conditions: INV DATA, Section 0002, 02/15/99, 08:24:13

Weather Conditions: 45°F Wind:12 mph 202°

Start Odo.: 32165 End Odo.: 32423

Schedule:
Initial Brake Temperature Less Than 100°C
Initial Speed 80 km/h to zero
200 stops with transmission in gear

Performance Requirements:
Interval between runs: Time necessary to reduce IBT to 100 C° OR 2 km distance, whichever occurs first.
Constant decel rate: 3.0 m/s^2
Pedal force adjusted to maintain constant decel.
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	AVG. DECEL (m/sec^2)
1	79.82	83	93	74	71	110.02	75.60	3.23
10	80.75	102	113	147	137	95.70	62.91	2.95
20	80.66	109	108	127	135	76.43	61.12	3.03
30	80.00	97	113	119	139	95.57	55.61	2.90
40	80.82	99	116	117	133	80.55	58.46	3.13
50	80.61	102	108	107	131	90.39	66.83	3.12
60	80.06	95	112	107	127	97.23	60.62	2.77
70	80.55	102	113	103	120	85.14	29.70	1.52
80	80.45	106	106	116	134	91.22	52.98	2.45
90	80.51	97	112	115	129	91.88	49.16	2.43
100	80.36	103	116	112	127	83.74	62.58	2.94
110	80.79	109	109	102	129	91.95	61.52	3.05
120	80.04	97	111	91	101	75.90	58.53	2.88
130	80.15	102	114	111	124	76.43	57.80	3.04
140	80.50	105	108	116	124	83.97	57.40	2.94
150	80.24	92	103	97	111	90.01	63.03	3.04
160	79.44	99	108	118	126	85.29	60.87	2.96
170	80.02	105	106	117	119	81.47	60.67	3.02
180	79.99	97	108	118	116	84.66	58.01	3.09
190	79.98	100	111	117	119	73.03	52.39	2.77
200	79.88	104	116	114	121	89.71	58.97	3.06

BRAKE ADJUSTMENT

Schedule:
Adjust service brakes; record procedure and amount adjusted.

Left Front: DISC DISC BRAKE NO ADJUSTMENT REQUIRED
Right Front: DISC DISC BRAKE NO ADJUSTMENT REQUIRED
Left Rear: DISC DISC BRAKE NO ADJUSTMENT REQUIRED
Right Rear: DISC DISC BRAKE NO ADJUSTMENT REQUIRED

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD MOTOR CO. NHTSA NUMBER: 333
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 02/16/99

DATA SHEET 11 - COLD EFFECTIVENESS AT GVWR

Testing Conditions: INV DATA, Section 0015, 02/16/99, 10:49:08

Weather Conditions: 49°F Wind: 15 mph 198° Start Odo.: 32430 End Odo.: 32437

Schedule:
Initial Brake Temperature 65 - 100 C
Initial Speed 100 km/h to zero
6 stops with transmission in neutral

Performance Requirements:
One Stop with:
Stopping Distance less than 70m
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	100.96	72	85	63	55	58.1	57.0	510.13	314.50	9.89	5.86
2	99.82	80	91	63	61	53.2	53.4	580.83	327.53	10.68	5.41
3	99.73	66	74	59	67	54.3	54.6	614.12	341.88	14.53	5.46
4	100.14	77	83	62	68	54.6	54.5	585.15	381.08	11.21	6.08
5	100.37	83	87	63	69	54.2	53.8	627.71	375.54	10.38	5.77
6	100.13	88	93	64	69	53.6	53.5	600.47	429.66	10.98	6.01

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	NOX	SOUTH	YES
5	-	NOX	SOUTH	YES
6	-	NOX	SOUTH	YES

Corrected Distances are used to determine shortest stopping distance.

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD MOTOR CO. NHTSA NUMBER: 333
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 02/16/99

DATA SHEET 12 - HIGH SPEED EFFECTIVENESS AT GVWR

Testing Conditions: INV DATA, Section 0020, 02/16/99, 13:06:44

Weather Conditions: 54°F Wind: 12 mph 183° Start Odo: 32440 End Odo: 32449

Schedule:
Initial Brake Temperature: 65-100°C
Initial Speed: 80% max km/h, not greater than 160km/h
6 stops with transmission in gear

Performance Requirements:
One Stop with:
Stopping Distance less than: **138.9 meter**
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	136.25	88	88	63	68	102.4	103.1	374.14	288.49	11.56	6.11
2	1.27	99	92	66	71	1204.2	******.	452.92	27.18	11.88	0.09
3	135.56	93	93	62	54	100.5	102.2	408.49	204.70	12.64	3.99
4	135.49	85	88	62	55	96.4	98.1	483.95	284.73	11.69	4.93
5	136.04	86	89	63	58	97.3	98.3	548.40	368.66	10.46	5.97
6	136.40	82	84	58	56	96.4	96.8	492.15	372.05	11.57	6.41

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	N/A	FALSE TRIGGER	NO DATA
3	-	NOX	SOUTH	YES
4	-	NOX	SOUTH	YES
5	-	NOX	SOUTH	YES
6	-	NOX	SOUTH	YES

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD MOTOR CO. NHTSA NUMBER: 333
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 02/16/99

DATA SHEET 13 - STOPS WITH ENGINE OFF AT GVWR

Testing Conditions: INV DATA, Section 0025, 02/16/99, 14:12:26

Weather Conditions: 55°F Wind: 14 mph 159° Start Odo.: 32450 End Odo.: 32456

Schedule:
Initial Brake Temperature: 65-100°C
Initial Speed 100 km/h to zero
6 stops with transmission in neutral

Performance Requirements:
One Stop with:
Stopping Distance less than **70m**
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	100.71	83	88	59	56	61.6	60.7	500.69	357.79	8.92	5.37
2	99.77	82	88	64	63	60.3	60.6	511.62	322.31	9.11	5.17
3	99.75	82	91	69	69	57.8	58.1	522.06	362.45	9.22	5.86
4	99.84	87	96	72	75	60.6	60.8	440.26	299.68	8.72	5.34
5	100.42	84	90	63	74	56.9	56.5	479.46	307.66	9.36	5.57
6	100.08	92	96	68	79	55.6	55.5	511.16	304.70	10.41	5.41

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	NOX	SOUTH	YES
5	-	NOX	SOUTH	YES
6	-	NOX	SOUTH	YES

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD MOTOR CO. NHTSA NUMBER: 333
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 02/17/99

DATA SHEET 14 - COLD EFFECTIVENESS AT LLVW

Testing Conditions: INV DATA, Section 0030; 02/17/99, 09:16:12

Weather Conditions: 30°F Wind: 11 mph 284° Start Odo.: 32469 End Odo.: 32474

Schedule:
Initial Brake Temperature: 65-100°C
Initial Speed 100 km/h to zero
6 stops with transmission in neutral

Performance Requirements:
One Stop with:
Stopping Distance less than **70m**
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	100.43	87	89	46	47	57.9	57.4	500.34	362.27	9.02	5.95
2	99.22	95	93	39	41	52.8	53.6	562.97	400.12	10.20	6.17
3	100.20	86	81	29	32	55.1	54.8	469.00	360.08	10.22	6.15
4	99.89	90	86	28	33	54.8	54.9	480.37	335.25	11.28	6.47
5	100.42	92	88	28	36	51.7	51.3	588.66	394.47	10.44	6.37
6	101.16	94	89	28	35	52.6	51.4	635.61	391.74	10.59	6.39

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	NOX	SOUTH	YES
5	-	NOX	SOUTH	YES
6	-	NOX	SOUTH	YES

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD MOTOR CO. NHTSA NUMBER: 333
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 02/17/99

DATA SHEET 15 - HIGH SPEED EFFECTIVENESS AT LLVW

Testing Conditions: INV DATA, Section 0035, 02/17/99, 09:48:30

Weather Conditions: 31°F Wind: 8 mph 261° Start Odo.: 32474 End Odo.: 32482

Schedule:
Initial Brake Temperature: 65-100°C
Initial Speed: 80% max km/h
6 stops with transmission in gear

Performance Requirements:
One Stop with:
Stopping Distance less than **138.9m**
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	134.91	79	74	24	32	92.3	94.8	480.70	353.40	13.33	7.07
2	136.73	86	80	26	32	96.4	96.4	453.92	319.47	11.81	6.63
3	136.41	84	86	26	29	95.7	96.2	433.31	351.44	11.01	7.14
4	133.43	90	92	27	32	99.1	104.1	445.08	334.09	10.65	6.93
5	136.83	88	91	27	32	93.3	93.2	401.51	294.21	10.60	6.71
6	134.50	86	87	26	32	91.8	94.9	494.22	397.49	11.58	7.23

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	NOX	SOUTH	YES
5	-	NOX	SOUTH	YES
6	-	NOX	SOUTH	YES

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD MOTOR CO. NHTSA NUMBER: 333
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 03/19/99

DATA SHEET 16 - ANTILOCK FUNCTIONAL FAILURE AT LLVW

Testing Conditions: INV DATA, Section 0040, 03/19/99, 14:25:42

Weather Conditions: 41°F Wind: 7 mph 337° Start Odo.: 33363 End Odo.: 33369

Schedule:
Initial Brake Temperature: 65-100°C
Initial Speed 100 km/h to zero
6 stops with transmission in neutral

Performance Requirements:
One Stop with:
Stopping Distance less than **85m**
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	99.90	65	64	61	53	59.4	59.5	209.15	162.52	10.13	6.60
2	99.78	89	85	62	62	57.1	57.3	215.94	157.59	10.12	6.91
3	99.58	83	86	49	50	60.3	60.8	191.80	128.32	9.89	6.33
4	99.71	83	83	42	48	58.4	58.7	193.78	130.44	10.84	6.48
5	99.14	86	88	43	48	56.5	57.5	176.56	124.74	9.62	6.42
6	99.59	89	88	44	49	58.9	59.4	148.05	117.85	9.38	6.47

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	LFX-MID	SOUTH	YES
5	-	NOX	SOUTH	YES
6	-	NOX	SOUTH	YES

How was the ABS failure induced: REMOVED FUSE FROM FUSE PANEL UNDER DASHBOARD.

Is brake system indicator lamp activated: YES (X) NO ( )

Vehicle not equipped with variable proportioning valve. Data Sheet 17 not included.

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD MOTOR CO. NHTSA NUMBER: 333
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 03/19/99

DATA SHEET 22 - ANTILOCK FUNCTIONAL FAILURE AT GVWR

Testing Conditions: INV DATA, Section 0070, 03/19/99, 13:02:51

Weather Conditions: 39°F Wind: 4 mph 320° Start Odo.: 33355 End Odo.: 33361

Schedule:
Initial Brake Temperature 65-100°C
Initial Speed 100 km/h to zero
6 stops with transmission in neutral

Performance Requirements:
One Stop with:
Stopping Distance less than **85m**
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	100.81	70	76	81	71	62.6	61.6	239.55	204.01	9.65	6.13
2	100.00	73	79	70	66	65.2	65.2	206.17	152.46	9.03	6.03
3	99.97	82	86	67	68	66.7	66.7	275.34	170.11	9.49	6.15
4	98.15	81	88	58	65	65.7	68.2	193.02	143.52	8.73	6.08
5	99.89	84	90	58	68	63.9	64.1	207.89	146.89	8.88	6.23
6	100.16	72	78	42	53	62.0	61.8	197.29	149.74	9.29	5.96

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	-	LFX-INIT	SOUTH	YES
4	-	NOX	SOUTH	YES
5	-	NOX	SOUTH	YES
6	-	NOX	SOUTH	YES

How was the ABS failure induced: REMOVED FUSE FROM FUSE PANEL UNDER DASHBOARD.

Is brake system indicator lamp activated: YES (X) NO ( )

Vehicle not equipped with variable proportioning valve. Data Sheet 23 not included.

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD MOTOR CO. NHTSA NUMBER: 333
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 02/17/99

DATA SHEET 24 - BRAKE POWER UNIT OR PWR ASSIST UNIT IN/OP AT GVWR

Testing Conditions: INV DATA, Section 0080, 02/17/99, 11:12:35

Weather Conditions: 31°F Wind: 10 mph 269° Start Odo.: 32485 End Odo.: 32493

Failure Simulation: Disconnect primary source of power.

Method of rendering inoperative: Remove Engine Vacuum Hose at Booster

Schedule:
Initial Brake Temperature 65-100°C
Initial Speed 100 km/h to zero
6 stops with transmission in neutral

Performance Requirements:
One Stop with:
Stopping Distance less than **168m**
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	101.47	76	81	41	41	205.7	199.7	602.58	516.12	14.66	9.24
2	99.51	69	73	47	56	180.4	182.1	660.74	505.45	3.36	2.10
3	99.44	86	87	57	67	178.7	180.7	610.26	535.13	2.99	2.21
4	100.38	84	83	52	58	172.9	171.6	623.25	541.28	3.14	2.28
5	99.54	91	90	56	63	171.9	173.5	619.73	532.34	3.14	2.28
6	99.34	91	88	54	61	166.4	168.7	652.33	520.71	3.37	2.30

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	NOX	SOUTH	YES
5	-	NOX	SOUTH	YES
6	-	NOX	SOUTH	YES

Is the brake system indicator lamp activated: YES (X) NO ( )

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD MOTOR CO. NHTSA NUMBER: 333
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 227.5 (Kpa)
Rear Cold Tire Pressure: 227.5 (Kpa)

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 02/17/99

DATA SHEET 26 - HEATING SNUBS AT GVWR

Testing Conditions: INV DATA, Section 0090, 02/17/99, 15:12:11

Schedule:
Conduct 15 snubs from 120 Km/h or 80% Vmax, whichever is slower, to 1/2 of initial speed.
Attain required decel in 1 second and maintain that decel.
Interval between snubs is 45 seconds and WOT to initial speed.

Performance Requirements:
Initial IBT for first snub is 55-65°C
Maintain 3.0 m/s/s deceleration
Vehicle Must stay in lane of 3.5m

SNUB #	AVG. DECEL (m/sec^2)	Time Between Snubs (second)	AVG. PEDAL FORCE (N)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	INIT SPD (kph)
1	3.58	--NA--	75.13	54	62	48	54	121.12
2	3.38	49	56.52	103	116	84	103	120.43
3	3.04	43	50.48	146	161	125	153	121.75
4	2.80	46	51.31	184	201	165	196	120.32
5	2.88	45	54.10	213	229	201	232	120.50
6	2.83	44	57.55	236	249	231	257	120.87
7	2.97	45	63.40	255	262	252	284	120.98
8	3.04	44	64.63	271	272	271	298	120.93
9	2.94	46	54.73	284	278	285	306	120.98
10	2.97	45	63.24	299	292	296	316	121.62
11	3.01	45	72.04	313	303	304	323	120.04
12	2.86	46	62.50	316	313	308	327	118.72
13	2.87	45	61.57	321	323	316	331	120.11
14	3.11	45	76.23	319	324	318	332	121.49
15	3.11	44	69.58	322	326	324	335	120.30

STOP #	DRIVER VEHICLE SNUB COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	NOX	WEST	YES
5	-	NOX	WEST	YES
6	-	NOX	NORTH	YES
7	-	NOX	NORTH	YES
8	-	NOX	NORTH	YES
9	-	NOX	EAST	YES
10	-	NOX	SOUTH	YES
11	-	NOX	SOUTH	YES
12	-	NOX	SOUTH	YES
13	-	NOX	WEST	YES
14	-	NOX	WEST	YES
15	-	NOX	NORTH	YES

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD MOTOR CO. NHTSA NUMBER: 333
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 02/17/99

DATA SHEET 27 - HOT PERFORMANCE AT GVWR

Testing Conditions: INV DATA, Section 0095, 02/17/99, 15:23:31

Schedule:
Make 2 stops from 100 kph
Pedal Force: 1st stop is done with an average force less than the average recorded in the shortest GVWR Cold Effectiveness stop.
2nd stop is done with a force less than 500 N.
No Lock-Up allowed longer than 0.1 sec above 15 km/h.
Distance Requirements are based on the following:
shortest stop in Data Sheet 11 is: 4
Initial speed of stop: 100.71 (kph)
Actual distance of stop: 52.2 (meter)
Average pedal force: 338.3 (N)

Performance Requirements:
Stop Number 1 must be less than: **80.3 (meter)**
In addition the stopping distance for at least one of the of the two hot stops must be less than: **89 (meter)**

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	99.23	333	326	326	341	66.3	67.4	335.65	231.14	8.29	4.95
2	100.05	352	334	324	342	61.4	61.4	339.17	280.66	8.65	5.09

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)			
1	-	NOX	NORTH	YES
2	-	NOX	NORTH	YES

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD MOTOR CO. NHTSA NUMBER: 333
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 02/17/99

DATA SHEET 28 - BRAKE COOLING STOPS AT GVWR

Testing Conditions: INV DATA, Section 0100, 02/17/99, 15:26:44

Schedule:
Initial Brake Temperature:
Achieved on completing Hot Performance
Initial Speed 50 km/h to zero
4 stops with transmission in gear

Performance Requirements:
Constant Decel rate: 3.0 m/s/s
Pedal force adjusted as necessary
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	AVG. DECEL (m/sec^2)	AVG. PEDAL FORCE (N)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)
1	50.72	2.54	62.14	279	251	260	279
2	50.72	2.76	62.07	224	204	222	242
3	50.67	2.62	59.02	178	172	188	207
4	50.40	2.87	71.08	144	151	160	177

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock up	Direction of Stop	Stay in Lane)
1	- NOX	EAST	YES
2	- NOX	EAST	YES
3	- NOX	SOUTH	YES
4	- NOX	SOUTH	YES

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD MOTOR CO. NHTSA NUMBER: 333
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 02/17/99

DATA SHEET 29 - RECOVERY PERFORMANCE AT GVWR

Testing Conditions: INV DATA, Section 0105, 02/17/99, 15:33:30

Weather Conditions: 32°F Wind: 10 mph 264° Start Odo.: 32495 End Odo.: 32516

Schedule:
Make 2 stops from 100 kph
Pedal Force: 1st stop is done with an average force less than the average recorded in the shortest GVWR Cold Effectiveness stop.
2nd stop is done with a force less than 500 N.
No Lock-Up allowed longer than 0.1 sec above 15 km/h.
Distance Requirements are based on the following:
shortest stop in Data Sheet 11 is:Stop4
Initial speed of stop: 100.71 (kph)
Actual distance of stop: 52.2 (meter)
Average pedal force: 338.9 (N)

Performance Requirements:
One of the two stops must be within the following limits:
Upper limit of corrected stopping distance: **70.3 (meter)**
Lower limit of corrected stopping distance: **38.2 (meter)**

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAI FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	99.94	129	139	148	163	56.5	56.5	381.71	265.70	11.66	5.85
2	98.83	149	167	154	171	58.8	60.2	419.32	254.21	10.81	5.57

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)		
1	-	NOX	SOUTH	YES
2	-	NOX	WEST	YES

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

APPENDIX I

Test Data

Hand Control #4
Wells-Engberg
CT-100 Rotary Hand Operated Driving Control

Tested from 02/26/99 to 03/05/99

Vehicle: 1997 FORD MOTOR CO. NHTSA NUMBER: 333
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 02/26/99

DATA SHEET 10 - BURNISH AT GVWR

Testing Conditions: INV DATA, Section 0002, 02/26/99, 11:04:05

Weather Conditions: 33°F Wind:21 mph 307°

Start Odo.: 32527 End Odo.: 32790

Schedule:
Initial Brake Temperature Less Than 100°C
Initial Speed 80 km/h to zero
200 stops with transmission in gear

Performance Requirements:
Interval between runs: Time necessary to reduce IBT to 100 C° OR 2 km distance, whichever occurs first.
Constant decel rate: 3.0 m/s^2
Pedal force adjusted to maintain constant decel.
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	AVG. DECEL (m/sec^2)
1	80.66	69	69	59	67	92.61	64.05	3.23
10	80.03	96	98	132	147	73.62	61.04	2.93
20	80.64	108	112	113	120	66.00	47.60	2.94
30	80.13	103	104	119	123	84.57	51.37	3.12
40	80.81	99	103	112	113	77.49	22.24	0.75
50	79.73	104	105	112	112	78.85	60.47	3.16
60	80.76	99	103	106	110	73.09	50.18	2.91
70	81.37	114	118	102	100	90.03	46.27	2.48
80	79.79	96	102	123	112	91.42	54.05	2.59
90	80.09	86	89	90	95	111.04	68.33	2.92
100	80.34	94	99	101	120	93.29	66.37	3.09
110	79.79	87	88	94	103	109.31	62.95	2.80
120	80.30	133	131	107	112	89.67	10.83	0.32
130	80.47	97	95	94	94	100.94	66.17	3.05
140	80.17	94	87	86	86	86.01	65.08	2.96
150	79.90	100	98	95	97	82.69	60.95	2.90
160	79.91	113	108	94	102	78.60	58.89	2.88
170	80.22	94	92	96	97	85.55	60.49	3.05
180	80.18	98	103	103	101	87.54	58.60	2.89
190	80.15	89	91	94	87	77.84	57.47	2.77
200	80.60	87	91	108	96	102.40	69.60	3.06

BRAKE ADJUSTMENT

Schedule:
Adjust service brakes; record procedure and amount adjusted.

Left Front: DISC DISC BRAKE NO ADJUSTMENT REQUIRED
Right Front: DISC DISC BRAKE NO ADJUSTMENT REQUIRED
Left Rear: DISC DISC BRAKE NO ADJUSTMENT REQUIRED
Right Rear: DISC DISC BRAKE NO ADJUSTMENT REQUIRED

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD MOTOR CO. NHTSA NUMBER: 333
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 03/01/99

DATA SHEET 11 - COLD EFFECTIVENESS AT GVWR

Testing Conditions: INV DATA, Section 0015, 03/01/99, 14:29:00

Weather Conditions: 34°F Wind: 15 mph 306° Start Odo.: 32792 End Odo.: 32798

Schedule:
Initial Brake Temperature 65 - 100 C
Initial Speed 100 km/h to zero
6 stops with transmission in neutral

Performance Requirements:
One Stop with:
Stopping Distance less than 70m
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	100.29	84	83	68	72	56.6	56.3	545.50	367.29	9.76	5.60
2	99.64	87	81	63	68	53.6	54.0	522.94	311.59	9.83	5.78
3	100.32	92	79	62	68	53.4	53.0	629.59	407.71	11.46	6.10
4	100.47	88	73	58	64	154.8	153.3	604.10	211.58	10.53	3.12
5	99.88	91	77	59	69	53.6	53.8	624.27	364.23	12.47	5.95
6	100.49	76	61	43	52	54.6	54.1	557.73	368.95	10.41	5.73

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	-	NOX	SOUTH	NOX
4	-	NOX	SOUTH	YES
5	-	NOX	SOUTH	YES
6	-	NOX	SOUTH	YES

Corrected Distances are used to determine shortest stopping distance.

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD MOTOR CO. NHTSA NUMBER: 333
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 03/04/99

DATA SHEET 12 - HIGH SPEED EFFECTIVENESS AT GVWR

Testing Conditions: INV DATA, Section 0020, 03/04/99, 13:23:26

Weather Conditions: 35°F Wind: 12 mph 218° Start Odo: 32831 End Odo: 32843

Schedule:
Initial Brake Temperature: 65-100°C
Initial Speed: 80% max km/h, not greater than 160km/h
6 stops with transmission in gear

Performance Requirements:
One Stop with:
Stopping Distance less than: **138.9 meter**
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	AVG. DECEL (m/sec²)
1	137.16	83	78	59	64	112.4	111.7	564.76	377.38	6.09
2	136.34	96	90	63	70	99.4	99.9	628.85	373.93	5.98
3	136.78	89	87	56	62	361.0	360.7	576.06	194.97	3.48
4	136.64	86	77	60	57	289.2	289.6	427.29	169.55	4.23
5	136.04	86	77	63	64	94.9	95.8	598.69	371.48	6.93
6	135.86	91	87	65	60	94.6	95.8	596.70	349.80	7.32

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock up - Direction of Stop - Stay in Lane)			
1	-	COMPUTER CONTINUED TO LOG.		
2	-	NOX	SOUTH	YES
3	-	COMPUTER CONTINUED TO LOG.		
4	-	COMPUTER CONTINUED TO LOG.		
5	-	NOX	SOUTH	YES
6	-	NOX	SOUTH	YES

Sensitivity of the hand control caused 3 false triggers #1, #3, #4

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD MOTOR CO. NHTSA NUMBER: 333
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 03/05/99

DATA SHEET 13 - STOPS WITH ENGINE OFF AT GVWR

Testing Conditions: INV DATA, Section 0025, 03/05/99, 08:24:42

Weather Conditions: 32°F Wind: 6 mph 90° Start Odo.: 32852 End Odo.: 32858

Schedule:
Initial Brake Temperature: 65-100°C
Initial Speed 100 km/h to zero
6 stops with transmission in neutral

Performance Requirements:
One Stop with:
Stopping Distance less than 70m
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	101.03	77	73	56	57	61.5	60.3	572.94	453.80	8.43	6.44
2	100.18	87	86	62	66	58.2	57.9	545.37	433.75	8.89	6.63
3	100.38	94	92	66	71	55.5	55.1	600.02	426.29	8.89	6.50
4	100.08	91	88	63	70	55.4	55.3	586.79	477.63	9.40	6.99
5	99.95	89	86	59	67	144.2	144.3	583.18	213.89	9.25	3.40
6	99.73	89	84	58	70	54.6	54.9	603.76	490.22	9.37	7.21

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	NOX	SOUTH	YES
5	-	COMPUTER CONTINUED TO LOG.		
6	-	NOX	SOUTH	YES

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD MOTOR CO. NHTSA NUMBER: 333
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 03/05/99

DATA SHEET 14 - COLD EFFECTIVENESS AT LLVW

Testing Conditions: INV DATA, Section 0030, 03/05/99, 09:33:11

Weather Conditions: 36°F Wind: 9 mph 143° Start Odo.: 32861 End Odo.: 32866

Schedule:
Initial Brake Temperature: 65-100°C
Initial Speed 100 km/h to zero
6 stops with transmission in neutral

Performance Requirements:
One Stop with:
Stopping Distance less than 70m
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	99.45	74	70	63	69	52.6	53.2	552.86	423.51	10.23	7.28
2	98.89	89	83	62	69	50.0	51.1	597.03	400.18	11.42	6.76
3	99.93	93	92	57	63	51.7	51.7	599.26	393.75	11.93	6.40
4	99.02	85	84	47	52	51.6	52.6	655.56	429.57	10.91	6.81
5	99.85	92	88	44	51	51.5	51.7	628.52	429.97	11.00	6.62
6	99.32	89	87	42	48	50.6	51.3	648.07	426.96	11.71	6.75

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	NOX	SOUTH	YES
5	-	NOX	SOUTH	YES
6	-	NOX	SOUTH	YES

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD MOTOR CO. NHTSA NUMBER: 333
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 03/05/99

DATA SHEET 15 - HIGH SPEED EFFECTIVENESS AT LLVW

Testing Conditions: INV DATA, Section 0035, 03/05/99, 10:06:05

Weather Conditions: 37°F Wind: 12 mph 149° Start Odo.: 32866 End Odo.: 32873

Schedule:
Initial Brake Temperature: 65-100°C
Initial Speed: 80% max km/h
6 stops with transmission in gear

Performance Requirements:
One Stop with:
Stopping Distance less than **166.4m**
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	138.53	64	64	34	38	98.7	116.2	549.88	349.87	12.28	6.87
2	137.46	79	84	40	41	93.0	111.3	587.42	410.29	11.69	7.21
3	135.92	82	86	39	38	95.1	116.3	569.10	393.05	12.02	7.18
4	137.00	79	93	41	39	91.1	109.6	597.27	417.44	13.05	7.60
5	134.28	83	92	43	40	91.1	114.1	588.32	427.68	12.33	7.50
6	135.25	75	87	41	37	89.7	110.8	601.97	432.92	13.06	7.43

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	NOX	SOUTH	YES
5	-	NOX	SOUTH	YES
6	-	NOX	SOUTH	YES

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD MOTOR CO. NHTSA NUMBER: 333
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 03/19/99

DATA SHEET 16 - ANTILOCK FUNCTIONAL FAILURE AT LLVW

Testing Conditions: INV DATA, Section 0040, 03/19/99, 10:22:36

Weather Conditions: 32°F Wind: 8 mph 340° Start Odo.: 33340 End Odo.: 33346

Schedule:
Initial Brake Temperature: 65-100°C
Initial Speed 100 km/h to zero
6 stops with transmission in neutral

Performance Requirements:
One Stop with:
Stopping Distance less than **85m**
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	99.55	69	68	65	54	62.4	63.0	207.74	155.42	9.34	5.95
2	100.37	93	91	65	58	58.0	57.6	211.38	155.32	10.32	6.68
3	100.14	76	76	52	46	61.4	61.2	209.76	154.42	11.37	6.19
4	99.72	91	91	56	49	61.2	61.5	184.74	136.16	9.16	6.20
5	100.90	91	93	51	43	79.0	77.7	169.86	115.55	9.85	5.74
6	100.04	91	93	48	44	134.6	134.5	229.61	81.05	9.91	3.57

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	NOX	SOUTH	YES
5	-PREMATURE TRIGGER	LFX	SOUTH	YES
6	-	COMPUTER CONTINUED TO LOG.		

How was the ABS failure induced: REMOVED FUSE FROM FUSE PANEL UNDER DASHBOARD.

Is brake system indicator lamp activated: YES (X) NO ( )

Vehicle not equipped with variable proportioning valve. Data Sheet 17 not included.

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD MOTOR CO. NHTSA NUMBER: 333
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 03/19/99

DATA SHEET 22 - ANTILOCK FUNCTIONAL FAILURE AT GVWR

Testing Conditions: INV DATA, Section 0070; 03/19/99, 08:51:21

Weather Conditions: 31°F Wind: 10 mph 344° Start Odo.: 33332 End Odo.: 33337

Schedule:
Initial Brake Temperature 65-100°C
Initial Speed 100 km/h to zero
6 stops with transmission in neutral

Performance Requirements:
One Stop with:
Stopping Distance less than **85m**
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	100.01	80	87	84	72	62.1	62.1	370.84	247.60	8.93	5.64
2	100.46	89	94	76	69	63.0	62.4	273.78	196.94	8.98	6.19
3	100.23	79	92	61	59	65.3	65.0	224.37	149.45	8.38	5.39
4	99.46	82	96	58	59	57.7	58.3	233.26	178.94	9.05	6.21
5	100.12	76	87	51	49	60.3	60.2	244.95	181.56	8.96	6.16
6	100.60	72	81	43	43	70.1	69.3	229.18	154.09	8.72	5.70

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	LFX-INIT	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	NOX	SOUTH	YES
5	-	LFX-END	SOUTH	YES
6	-	NOX	SOUTH	YES

How was the ABS failure induced: REMOVED FUSE FROM FUSE PANEL UNDER DASHBOARD.

Is brake system indicator lamp activated: YES (X) NO ( )

Vehicle not equipped with variable proportioning valve. Data Sheet 23 not included.

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD MOTOR CO. NHTSA NUMBER: 333
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 03/05/99

DATA SHEET 24 - BRAKE POWER UNIT OR PWR ASSIST UNIT IN/OP AT GVWR

Testing Conditions: INV DATA, Section 0080, 03/05/99, 12:54:00

Weather Conditions: 42°F Wind: 21 mph 148° Start Odo.: 32876 End Odo.: 32884

Failure Simulation: Disconnect primary source of power.

Method of rendering inoperative: Remove Engine Vacuum Hose at Booster

Schedule:
Initial Brake Temperature 65-100°C
Initial Speed 100 km/h to zero
6 stops with transmission in neutral

Performance Requirements:
One Stop with:
Stopping Distance less than **168m**
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	99.24	74	75	74	80	179.2	182.0	608.20	528.57	2.93	2.33
2	99.21	79	81	75	73	187.0	190.0	593.49	508.98	2.98	2.15
3	98.76	84	91	78	76	166.3	170.5	654.47	539.50	3.18	2.42
4	100.02	84	89	79	77	176.7	176.6	596.70	524.49	3.11	2.29
5	99.61	84	86	76	76	170.6	171.9	593.72	539.50	2.98	2.33
6	99.60	76	75	70	69	177.3	178.7	600.22	542.88	3.06	2.30

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	NOX	SOUTH	YES
5	-	NOX	SOUTH	YES
6	-	NOX	SOUTH	YES

Is the brake system indicator lamp activated: YES (X) NO ( )

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD MOTOR CO. NHTSA NUMBER: 333
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 227.5 (Kpa)
Rear Cold Tire Pressure: 227.5 (Kpa)

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 03/05/99

DATA SHEET 26 - HEATING SNUBS AT GVWR

Testing Conditions: INV DATA, Section 0090, 03/05/99, 14:01:22

Schedule:
Conduct 15 snubs from 120 Km/h or 80% Vmax, whichever is slower, to 1/2 of initial speed.
Attain required decel in 1 second and maintain that decel.
Interval between snubs is 45 seconds and WOT to initial speed.

Performance Requirements:
Initial IBT for first snub is 55-65°C
Maintain 3.0 m/s/s deceleration
Vehicle Must stay in lane of 3.5m

SNUB #	AVG. DECEL (m/sec²)	Time Between Snubs (second)	AVG. PEDAL FORCE (N)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	INIT SPD (kph)
1	2.89	--NA--	66.88	60	58	39	46	119.75
2	3.17	49	65.55	108	106	73	84	119.29
3	3.26	44	48.49	152	147	108	122	119.38
4	3.24	44	52.03	183	183	145	159	119.97
5	3.05	45	51.10	204	206	180	203	120.14
6	2.80	45	54.85	220	221	212	234	120.52
7	2.99	45	50.77	233	232	238	258	121.19
8	2.89	45	61.84	261	248	258	275	120.61
9	3.06	44	60.08	277	262	273	292	119.88
10	3.01	45	70.79	278	274	286	301	120.14
11	3.08	46	63.30	291	281	293	307	120.84
12	2.87	44	67.08	302	288	302	313	120.59
13	3.05	45	64.09	308	296	305	317	120.12
14	3.16	44	61.94	308	297	309	318	121.05
15	2.96	46	68.73	301	293	311	317	119.20

STOP #	DRIVER VEHICLE SNUB COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)			
1	-	NOX	NORTH	YES
2	-	NOX	EAST	YES
3	-	NOX	EAST	YES
4	-	NOX	SOUTH	YES
5	-	NOX	SOUTH	YES
6	-	NOX	SOUTH	YES
7	-	NOX	WEST	YES
8	-	NOX	WEST	YES
9	-	NOX	NORTH	YES
10	-	NOX	NORTH	YES
11	-	NOX	NORTH	YES
12	-	NOX	EAST	YES
13	-	NOX	EAST	YES
14	-	NOX	SOUTH	YES
15	-	NOX	SOUTH	YES

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD MOTOR CO. NHTSA NUMBER: 333
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 03/05/99

DATA SHEET 27 - HOT PERFORMANCE AT GVWR

Testing Conditions: INV DATA, Section 0095, 03/05/99, 14:12:57

Schedule:
Make 2 stops from 100 kph
Pedal Force: 1st stop is done with an average force less than the average recorded in the shortest GVWR Cold Effectiveness stop.
2nd stop is done with a force less than 500 N.
No Lock-Up allowed longer than 0.1 sec above 15 km/h.
Distance Requirements are based on the following:
shortest stop in Data Sheet 11 is: 5
Initial speed of stop: 99.70 (kph)
Actual distance of stop: 62.6 (meter)
Average pedal force: 266.0 (N)

Performance Requirements:
Stop Number 1 must be less than: **97.7 (meter)**
In addition the stopping distance for at least one of the of the two hot stops must be less than: **89 (meter)**

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	85.09	301	291	309	315	452.8	625.4	425.17	65.32	9.60	1.21
2	99.31	280	277	294	297	57.7	58.5	352.16	241.40	9.41	6.26

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)			
1	-PREMATURE TRIGGER	NOX	SOUTH	YES
2	-	NOX	WEST	YES

#1 false trigger

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD MOTOR CO. NHTSA NUMBER: 333
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 03/05/99

DATA SHEET 28 - BRAKE COOLING STOPS AT GVWR

Testing Conditions: INV DATA, Section 0100, 03/05/99, 14:16:10

Schedule:
Initial Brake Temperature:
Achieved on completing Hot Performance
Initial Speed 50 km/h to zero
4 stops with transmission in gear

Performance Requirements:
Constant Decel rate: 3.0 m/s/s
Pedal force adjusted as necessary
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	AVG. DECEL (m/sec^2)	AVG. PEDAL FORCE (N)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)
1	49.70	2.83	70.52	238	244	250	254
2	49.63	2.94	69.36	195	199	207	212
3	49.64	2.92	77.09	168	169	179	184
4	49.20	2.75	70.72	146	148	157	162

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock up - Direction of Stop - Stay in Lane)			
1	-	NOX	NORTH	YES
2	-	NOX	NORTH	YES
3	-	NOX	NORTH	YES
4	-	NOX	EAST	YES

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD MOTOR CO. NHTSA NUMBER: 333
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 03/05/99

DATA SHEET 29 - RECOVERY PERFORMANCE AT GVWR

Testing Conditions: INV DATA, Section 0105, 03/05/99, 14:23:31

Weather Conditions: 45°F Wind: 18 mph 152° Start Odo.: 32886 End Odo.: 32904

Schedule:
Make 2 stops from 100 kph
Pedal Force: 1st stop is done with an average force less than the average recorded in the shortest GVWR Cold Effectiveness stop.
2nd stop is done with a force less than 500 N.
No Lock-Up allowed longer than 0.1 sec above 15 km/h.
Distance Requirements are based on the following:
shortest stop in Data Sheet 11 is:Stop5
Initial speed of stop: 99.70 (kph)
Actual distance of stop: 62.6 (meter)
Average pedal force: 266.0 (N)

Performance Requirements:
One of the two stops must be within the following limits:
Upper limit of corrected stopping distance: **85.2 (meter)**
Lower limit of corrected stopping distance: **45.1 (meter)**

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	98.88	132	137	146	150	58.5	59.9	440.54	305.89	9.72	6.47
2	100.03	142	151	157	164	64.8	64.7	420.72	254.29	10.13	6.13

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)		
1	-	NOX	EAST	YES
2	-	NOX	SOUTH	YES

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

APPENDIX J

Test Data

Hand Control #5
Mobility Products & Design
3500 Series Hand Control

Tested from 03/12/99 to 02/17/99

Vehicle: 1997 FORD MOTOR CO. NHTSA NUMBER: 333
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 03/12/99

DATA SHEET 10 - BURNISH AT GVWR

Testing Conditions: INV DATA, Section 0002, 03/12/99, 08:26:18

Weather Conditions: 33°F Wind: 4 mph 354°

Start Odo.: 32923 End Odo.: 33183

Schedule:
Initial Brake Temperature Less Than 100°C
Initial Speed 80 km/h to zero
200 stops with transmission in gear

Performance Requirements:
Interval between runs: Time necessary to reduce IBT to 100 C° OR 2 km distance, whichever occurs first.
Constant decel rate: 3.0 m/s^2
Pedal force adjusted to maintain constant decel.
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	AVG. DECEL (m/sec²)
1	79.12	38	49	79	48	100.08	66.31	3.00
10	80.44	91	118	184	122	76.38	58.42	3.23
20	80.58	99	107	190	122	66.51	49.08	3.13
30	80.07	100	100	163	111	65.38	48.48	3.01
40	80.11	97	96	152	110	74.36	50.90	2.96
50	79.67	89	90	142	103	75.95	46.09	3.06
60	80.05	83	83	155	96	76.42	47.49	2.97
70	81.05	77	82	156	97	84.20	52.89	3.14
80	80.01	98	93	151	108	74.69	48.38	2.93
90	79.97	98	92	126	103	84.90	52.99	2.99
100	81.28	91	88	127	105	89.50	53.55	3.04
110	80.46	84	92	114	83	78.87	56.23	2.95
120	80.86	94	94	175	119	73.27	48.61	2.99
130	80.43	91	92	163	110	82.65	53.38	3.02
140	80.43	87	92	143	102	73.13	57.49	3.16
150	80.98	88	89	113	89	77.28	53.45	2.90
160	80.09	83	93	145	114	82.38	54.78	3.11
170	80.05	90	92	143	123	71.88	52.49	3.07
180	80.57	86	89	140	116	67.77	50.17	2.79
190	80.33	89	89	127	112	69.36	49.81	2.90
200	79.62	105	100	137	116	72.44	48.75	3.10

BRAKE ADJUSTMENT

Schedule:
Adjust service brakes; record procedure and amount adjusted.

Left Front: DISC DISC BRAKE NO ADJUSTMENT REQUIRED
Right Front: DISC DISC BRAKE NO ADJUSTMENT REQUIRED
Left Rear: DISC DISC BRAKE NO ADJUSTMENT REQUIRED
Right Rear: DISC DISC BRAKE NO ADJUSTMENT REQUIRED

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD MOTOR CO. NHTSA NUMBER: 333
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 03/15/99

DATA SHEET 11 - COLD EFFECTIVENESS AT GVWR

Testing Conditions: INV DATA, Section 0015, 03/15/99, 10:02:32

Weather Conditions: 31°F Wind: 6 mph 7° Start Odo.: 33192 End Odo.: 33198

Schedule:
Initial Brake Temperature 65 - 100 C
Initial Speed 100 km/h to zero
6 stops with transmission in neutral

Performance Requirements:
One Stop with:
Stopping Distance less than **70m**
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	100.49	77	87	81	60	56.4	55.9	563.22	439.00	9.64	6.51
2	100.61	62	74	56	47	54.6	53.9	617.55	400.33	11.00	6.19
3	100.19	64	79	57	53	53.0	52.8	622.91	417.05	11.59	6.36
4	99.48	66	80	66	71	51.4	51.9	637.08	468.83	12.50	7.44
5	100.57	71	89	71	76	52.3	51.7	614.83	400.17	12.37	6.55
6	99.03	69	87	66	69	53.1	54.1	660.92	428.07	10.70	6.35

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	NOX	SOUTH	YES
5	-	NOX	SOUTH	YES
6	-	NOX	SOUTH	YES

Corrected Distances are used to determine shortest stopping distance.

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD MOTOR CO. NHTSA NUMBER: 333
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 03/15/99

DATA SHEET 12 - HIGH SPEED EFFECTIVENESS AT GVWR

Testing Conditions: INV DATA, Section 0020, 03/15/99, 13:13:22

Weather Conditions: 37°F Wind: 5 mph 353° Start Odo: 33201 End Odo: 33215

Schedule:
Initial Brake Temperature: 65-100°C
Initial Speed: 80% max km/h, not greater than 160km/h
6 stops with transmission in gear

Performance Requirements:
One Stop with:
Stopping Distance less than: **138.9 meter**
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	137.31	89	86	71	68	107.0	106.1	444.89	344.22	10.35	7.08
2	137.00	84	87	88	95	93.7	93.3	559.61	339.51	11.28	6.82
3	137.69	73	81	84	91	101.7	100.3	601.49	396.79	11.30	6.80
4	137.50	73	84	92	92	94.0	92.9	553.22	423.28	12.04	7.69
5	136.21	80	82	68	58	98.7	99.4	556.56	392.22	11.18	7.31
6	135.91	81	86	91	87	94.5	95.6	655.69	472.51	12.28	7.65

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	NOX	SOUTH	YES
5	-	NOX	SOUTH	YES
6	-	NOX	SOUTH	YES

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD MOTOR CO. NHTSA NUMBER: 333
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 03/16/99

DATA SHEET 13 - STOPS WITH ENGINE OFF AT GVWR

Testing Conditions: INV DATA, Section 0025, 03/16/99, 10:55:08

Weather Conditions: 41°F Wind: 11 mph 201° Start Odo.: 33224 End Odo.: 33229

Schedule:
Initial Brake Temperature: 65-100°C
Initial Speed 100 km/h to zero
6 stops with transmission in neutral

Performance Requirements:
One Stop with:
Stopping Distance less than **70m**
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	99.91	70	81	62	59	60.6	60.7	454.90	367.55	9.42	6.33
2	100.06	87	94	76	68	53.5	53.5	606.81	454.77	10.15	7.26
3	100.04	81	85	67	55	53.7	53.6	536.39	334.24	10.68	6.20
4	99.43	79	84	64	57	63.6	64.3	442.84	323.80	10.46	6.75
5	98.42	88	92	69	63	52.6	54.3	553.26	444.66	10.36	7.02
6	99.55	86	89	66	63	51.8	52.2	605.22	414.64	11.13	6.91

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	NOX	SOUTH	YES
5	-	NOX	SOUTH	YES
6	-	NOX	SOUTH	YES

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD MOTOR CO. NHTSA NUMBER: 333
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 03/16/99

DATA SHEET 14 - COLD EFFECTIVENESS AT LLVW

Testing Conditions: INV DATA, Section 0030, 03/16/99, 12:44:30

Weather Conditions: 48°F Wind: 10 mph 206° Start Odo.: 33231 End Odo.: 33241

Schedule:
Initial Brake Temperature: 65-100°C
Initial Speed 100 km/h to zero
6 stops with transmission in neutral

Performance Requirements:
One Stop with:
Stopping Distance less than **70m**
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	99.43	72	84	68	61	52.7	53.4	597.53	407.35	13.23	6.57
2	100.33	84	91	64	54	54.9	54.5	607.84	424.51	13.04	6.44
3	84.90	89	98	58	51	200.5	278.2	605.09	186.21	12.69	3.07
4	99.17	79	84	45	38	53.3	54.2	625.24	449.20	11.19	6.84
5	100.25	83	82	62	56	52.2	51.9	406.12	308.33	11.20	7.06
6	100.30	89	87	52	48	52.6	52.3	572.48	318.14	12.41	6.68

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	PRE-MATURE TRIGGER.	NOX	SOUTH	YES
4	-	NOX	SOUTH	YES
5	-	NOX	SOUTH	YES
6	-	NOX	SOUTH	YES

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD MOTOR CO. NHTSA NUMBER: 333
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 03/16/99

DATA SHEET 15 - HIGH SPEED EFFECTIVENESS AT LLVW

Testing Conditions: INV DATA, Section 0035, 03/16/99, 14:06:28

Weather Conditions: 50°F Wind: 10 mph 205° Start Odo.: 33241 End Odo.: 33249

Schedule:
Initial Brake Temperature: 65-100°C
Initial Speed: 80% max km/h
6 stops with transmission in gear

Performance Requirements:
One Stop with:
Stopping Distance less than **138.9m**
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	136.81	72	69	43	36	94.1	94.0	553.49	389.19	12.57	7.25
2	137.06	86	82	36	33	91.7	91.2	596.01	426.40	12.33	7.21
3	135.20	89	86	34	33	91.7	93.8	606.85	432.70	11.91	6.85
4	133.78	76	72	28	27	90.9	95.0	569.10	427.33	12.62	7.17
5	136.34	87	87	33	34	98.2	98.7	603.50	419.08	12.47	6.80
6	134.28	79	81	29	33	88.5	91.8	596.67	459.94	13.45	7.27

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	NOX	SOUTH	YES
5	-	NOX	SOUTH	YES
6	-	NOX	SOUTH	YES

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD MOTOR CO. NHTSA NUMBER: 333
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 03/17/99

DATA SHEET 16 - ANTILOCK FUNCTIONAL FAILURE AT LLVW

Testing Conditions: INV DATA, Section 0040, 03/17/99, 14:12:02

Weather Conditions: 676°F Wind: 21 mph 190° Start Odo.: 33296 End Odo.: 33301

Schedule:
Initial Brake Temperature: 65-100°C
Initial Speed 100 km/h to zero
6 stops with transmission in neutral

Performance Requirements:
One Stop with:
Stopping Distance less than **85m**
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	99.30	81	86	73	68	67.6	68.5	250.63	164.14	9.48	6.03
2	100.27	89	92	62	59	58.1	57.8	227.10	158.37	10.24	6.31
3	99.48	93	89	56	51	63.6	64.3	196.62	148.27	8.91	6.31
4	100.09	87	86	49	48	66.6	66.5	242.28	154.46	10.20	5.50
5	99.05	88	87	49	49	64.8	66.0	246.22	152.47	9.69	6.12
6	99.70	94	92	52	52	73.3	73.7	197.25	130.^3	9.97	5.68

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	LFX-INIT	SOUTH	YES
5	-	NOX	SOUTH	YES
6	-	NOX	SOUTH	YES

How was the ABS failure induced: REMOVED FUSE FROM FUSE PANEL UNDER DASHBOARD.

Is brake system indicator lamp activated: YES (X) NO ( )

Vehicle not equipped with variable proportioning valve. Data Sheet 17 not included.

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD MOTOR CO. NHTSA NUMBER: 333
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 03/17/99

DATA SHEET 22 - ANTILOCK FUNCTIONAL FAILURE AT GVWR

Testing Conditions: INV DATA, Section 0070, 03/17/99, 13:16:54

Weather Conditions: 64°F Wind: 25 mph 189° Start Odo.: 33289 End Odo.: 33293

Schedule:
Initial Brake Temperature 65-100°C
Initial Speed 100 km/h to zero
6 stops with transmission in neutral

Performance Requirements:
One Stop with:
Stopping Distance less than **85m**
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	100.05	72	76	80	64	71.6	71.6	395.62	236.18	8.90	5.64
2	99.62	85	88	74	64	62.4	62.8	336.86	201.39	9.30	6.16
3	100.03	82	84	68	57	55.5	55.4	254.77	175.61	9.37	6.00
4	99.74	89	89	66	58	66.8	67.1	291.39	184.85	9.28	6.05
5	100.67	93	89	64	58	69.3	68.4	289.41	179.98	9.22	5.24
6	99.21	91	92	66	59	57.2	58.1	272.54	174.15	9.59	5.78

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	NOX	SOUTH	YES
5	-	LFX-INIT	SOUTH	YES
6	-	NOX	SOUTH	YES

How was the ABS failure induced: REMOVED FUSE FROM FUSE PANEL UNDER DASHBOARD.

Is brake system indicator lamp activated: YES (X) NO ( )

Vehicle not equipped with variable proportioning valve. Data Sheet 23 not included.

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD MOTOR CO. NHTSA NUMBER: 333
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 03/17/99

DATA SHEET 24 - BRAKE POWER UNIT OR PWR ASSIST UNIT IN/OP AT GVWR

Testing Conditions: INV DATA, Section 0080, 03/17/99, 09:35:32

Weather Conditions: 53°F Wind: 12 mph 217° Start Odo.: 33258 End Odo.: 33263

Failure Simulation: Disconnect primary source of power.

Method of rendering inoperative: Remove Engine Vacuum Hose at Booster

Schedule:
Initial Brake Temperature 65-100°C
Initial Speed 100 km/h to zero
6 stops with transmission in neutral

Performance Requirements:
One Stop with:
Stopping Distance less than **168m**
Pedal force between 65N and 500N
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	100.27	63	74	57	53	174.9	174.0	636.77	559.39	3.18	2.32
2	100.39	81	89	60	56	163.7	162.5	637.17	579.94	3.20	2.53
3	99.35	83	98	65	59	158.2	160.3	629.91	570.06	3.32	2.59
4	99.65	89	93	61	54	160.8	161.9	634.02	566.95	3.34	2.61
5	98.66	94	96	60	52	153.3	157.5	640.75	568.44	3.44	2.65
6	100.18	93	93	59	49	152.2	151.6	633.76	580.97	3.48	2.68

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES
3	-	NOX	SOUTH	YES
4	-	NOX	SOUTH	YES
5	-	NOX	SOUTH	YES
6	-	NOX	SOUTH	YES

Is the brake system indicator lamp activated: YES (X) NO ( )

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD MOTOR CO. NHTSA NUMBER: 333
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 227.5 (Kpa)
Rear Cold Tire Pressure: 227.5 (Kpa)

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 03/17/99

DATA SHEET 26 - HEATING SNUBS AT GVWR

Testing Conditions: INV DATA, Section 0090, 03/17/99, 10:48:03

Schedule:
Conduct 15 snubs from 120 Km/h or 80% Vmax, whichever is slower, to 1/2 of initial speed.
Attain required decel in 1 second and maintain that decel.
Interval between snubs is 45 seconds and WOT to initial speed.

Performance Requirements:
Initial IBT for first snub is 55-65°C
Maintain 3.0 m/s/s deceleration
Vehicle Must stay in lane of 3.5m

SNUB #	AVG. DECEL (m/sec²)	Time Between Snubs (second)	AVG. PEDAL FORCE (N)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	INIT SPD (kph)
1	3.64	--NA--	85.93	63	58	52	41	120.17
2	3.48	47	61.44	112	109	91	83	119.01
3	3.24	45	51.56	153	162	129	134	119.56
4	3.03	46	55.77	184	201	167	182	120.51
5	3.01	44	58.52	207	228	206	221	120.40
6	2.90	44	53.59	226	249	241	253	120.10
7	2.72	46	49.64	241	261	267	277	118.41
8	2.89	47	62.70	252	266	282	289	119.49
9	2.91	43	58.56	268	276	298	304	119.02
10	2.99	44	66.01	286	283	306	314	119.77
11	2.86	46	60.94	298	286	313	323	118.97
12	3.05	45	67.21	306	294	321	327	120.10
13	2.85	45	65.32	311	304	326	332	120.40
14	2.99	46	67.64	308	313	332	335	119.38
15	3.12	45	66.15	304	317	336	337	120.02

STOP #	DRIVER VEHICLE SNUB COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)			
1	-	NOX	NORTH	YES
2	-	NOX	EAST	YES
3	-	NOX	EAST	YES
4	-	NOX	SOUTH	YES
5	-	NOX	SOUTH	YES
6	-	NOX	SOUTH	YES
7	-	NOX	WEST	YES
8	-	NOX	NORTH	YES
9	-	NOX	NORTH	YES
10	-	NOX	NORTH	YES
11	-	NOX	NORTH	YES
12	-	NOX	EAST	YES
13	-	NOX	SOUTH	YES
14	-	NOX	SOUTH	YES
15	-	NOX	SOUTH	YES

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD MOTOR CO. NHTSA NUMBER: **333**
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 03/17/99

DATA SHEET 27 - HOT PERFORMANCE AT GVWR

Testing Conditions: INV DATA, Section 0095, 03/17/99, 10:59:04

Schedule:
Make 2 stops from 100 kph
Pedal Force: 1st stop is done with an average force less than the average recorded in the shortest GVWR Cold Effectiveness stop.
2nd stop is done with a force less than 500 N.
No Lock-Up allowed longer than 0.1 sec above 15 km/h.
Distance Requirements are based on the following:
shortest stop in Data Sheet 11 is: 5
Initial speed of stop: 99.70 (kph)
Actual distance of stop: 62.6 (meter)
Average pedal force: 266.0 (N)

Performance Requirements:
Stop Number 1 must be less than: **97.7 (meter)**
In addition the stopping distance for at least one of the of the two hot stops must be less than: **89 (meter)**

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	101.38	313	332	349	348	59.1	57.5	592.90	418.85	8.99	6.12
2	100.25	293	307	326	323	57.1	56.8	528.74	339.11	11.84	6.04

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up -	Direction of Stop -	Stay in Lane)
1	-	NOX	WEST	YES
2	-	NOX	WEST	YES

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD MOTOR CO. NHTSA NUMBER: 333
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 03/17/99

DATA SHEET 28 - BRAKE COOLING STOPS AT GVWR

Testing Conditions: INV DATA, Section 0100, 03/17/99, 11:02:45

Schedule:
Initial Brake Temperature:
Achieved on completing Hot Performance
Initial Speed 50 km/h to zero
4 stops with transmission in gear

Performance Requirements:
Constant Decel rate: 3.0 m/s/s
Pedal force adjusted as necessary
No Lock-Up allowed longer than 0.1 sec above 15 km/h
Vehicle Must stay in lane of 3.5m

STOP #	INIT SPD (kph)	AVG. DECEL (m/sec^2)	AVG. PEDAL FORCE (N)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)
1	50.05	2.74	69.46	249	272	288	288
2	49.90	3.21	59.35	216	217	244	246
3	50.51	2.75	59.12	181	173	202	209
4	50.48	2.87	61.61	157	147	177	181

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock up - Direction of Stop - Stay in Lane)		
1	- NOX	NORTH	YES
2	- NOX	NORTH	YES
3	- NOX	NORTH	YES
4	- NOX	EAST	YES

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

Vehicle: 1997 FORD MOTOR CO. NHTSA NUMBER: 333
Make: TAURUS
Model: LX
Body Style: 4-DOOR SEDAN
Front Cold Tire Pressure: 228 (Kpa)
Rear Cold Tire Pressure: 228 (Kpa)

Transportation Research Center, Inc.
10820 State Route 347
East Liberty, Ohio 43319

Date Tested: 03/17/99

DATA SHEET 29 - RECOVERY PERFORMANCE AT GVWR

Testing Conditions: INV DATA, Section 0105, 03/17/99, 11:09:48

Weather Conditions: 57°F Wind: 13 mph 221° Start Odo.: 33265 End Odo.: 33283

Schedule:
Make 2 stops from 100 kph
Pedal Force: 1st stop is done with an average force less than the average recorded in the shortest GVWR Cold Effectiveness stop.
2nd stop is done with a force less than 500 N.
No Lock-Up allowed longer than 0.1 sec above 15 km/h.
Distance Requirements are based on the following:
shortest stop in Data Sheet 11 is:Stop5
Initial speed of stop: 99.70 (kph)
Actual distance of stop: 62.6 (meter)
Average pedal force: 266.0 (N)

Performance Requirements:
One of the two stops must be within the following limits:
Upper limit of corrected stopping distance: **85.2 (meter)**
Lower limit of corrected stopping distance: **45.1 (meter)**

STOP #	INIT SPD (kph)	LEFT FRONT IBT (°C)	RIGHT FRONT IBT (°C)	LEFT REAR IBT (°C)	RIGHT REAR IBT (°C)	ACTUAL DISTANCE (meter)	CORRECTED DISTANCE (SAE 299) (meter)	MAX. PEDAL FORCE (N)	AVG. PEDAL FORCE (N)	MAX. DECEL (m/sec²)	AVG. DECEL (m/sec²)
1	100.12	143	137	170	170	58.0	57.9	444.23	254.01	11.79	6.11
2	99.72	147	159	189	178	57.1	57.4	497.35	286.03	12.02	6.20

STOP #	DRIVER VEHICLE STOP COMMENTS (Wheel Lock-Up - Direction of Stop - Stay in Lane)			
1	-	NOX	SOUTH	YES
2	-	NOX	SOUTH	YES

DATA INDICATES COMPLIANCE: YES (X) NO ( )

Driver: KAREN EASTERDAY Observer: NONE
Recorded Data Processed by: CHUCK JENKINS Date:
Approving Laboratory Official: KEN WEBSTER Date:

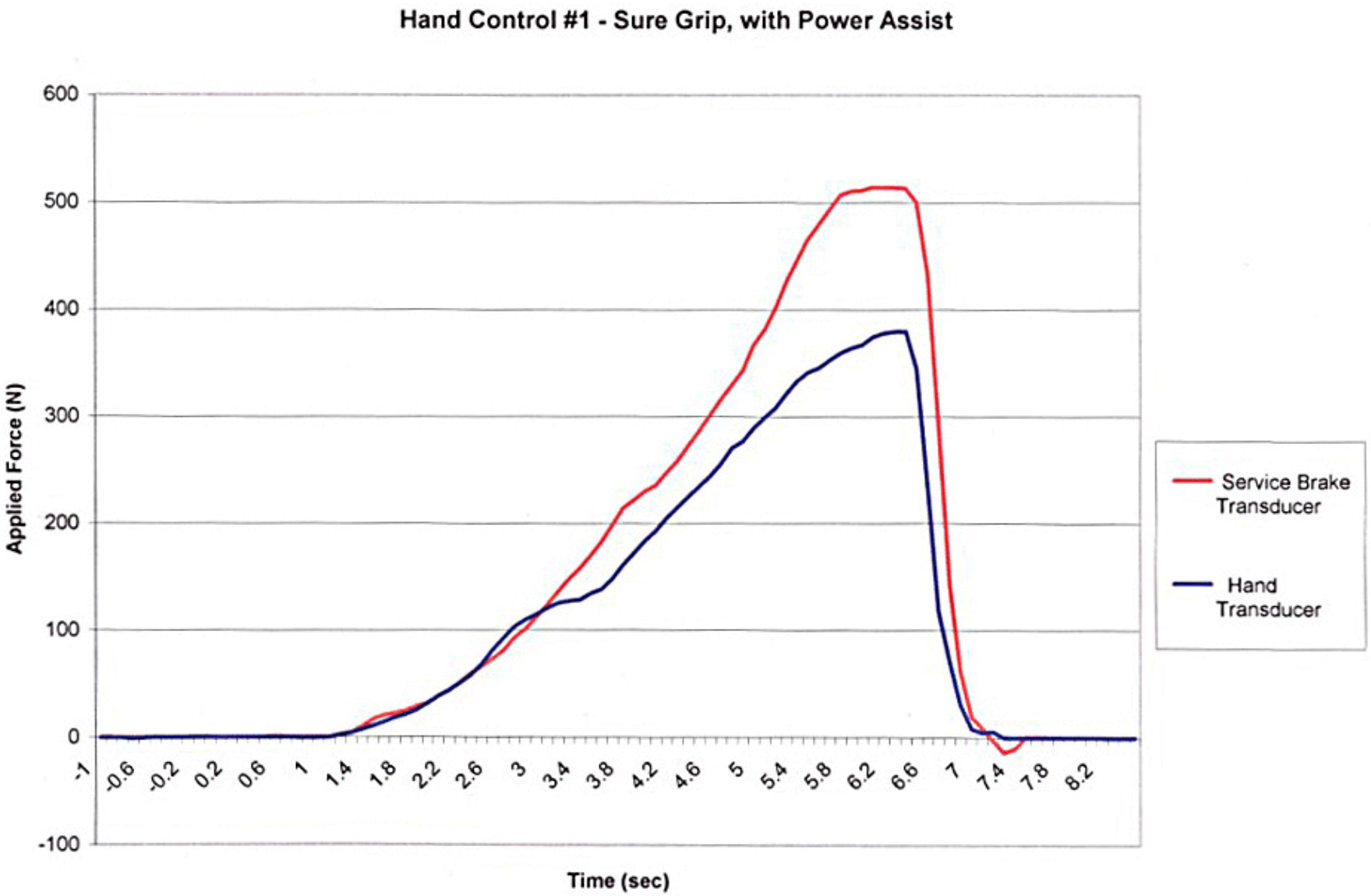
APPENDIX K

Hand Force vs. Service Brake Lever Force

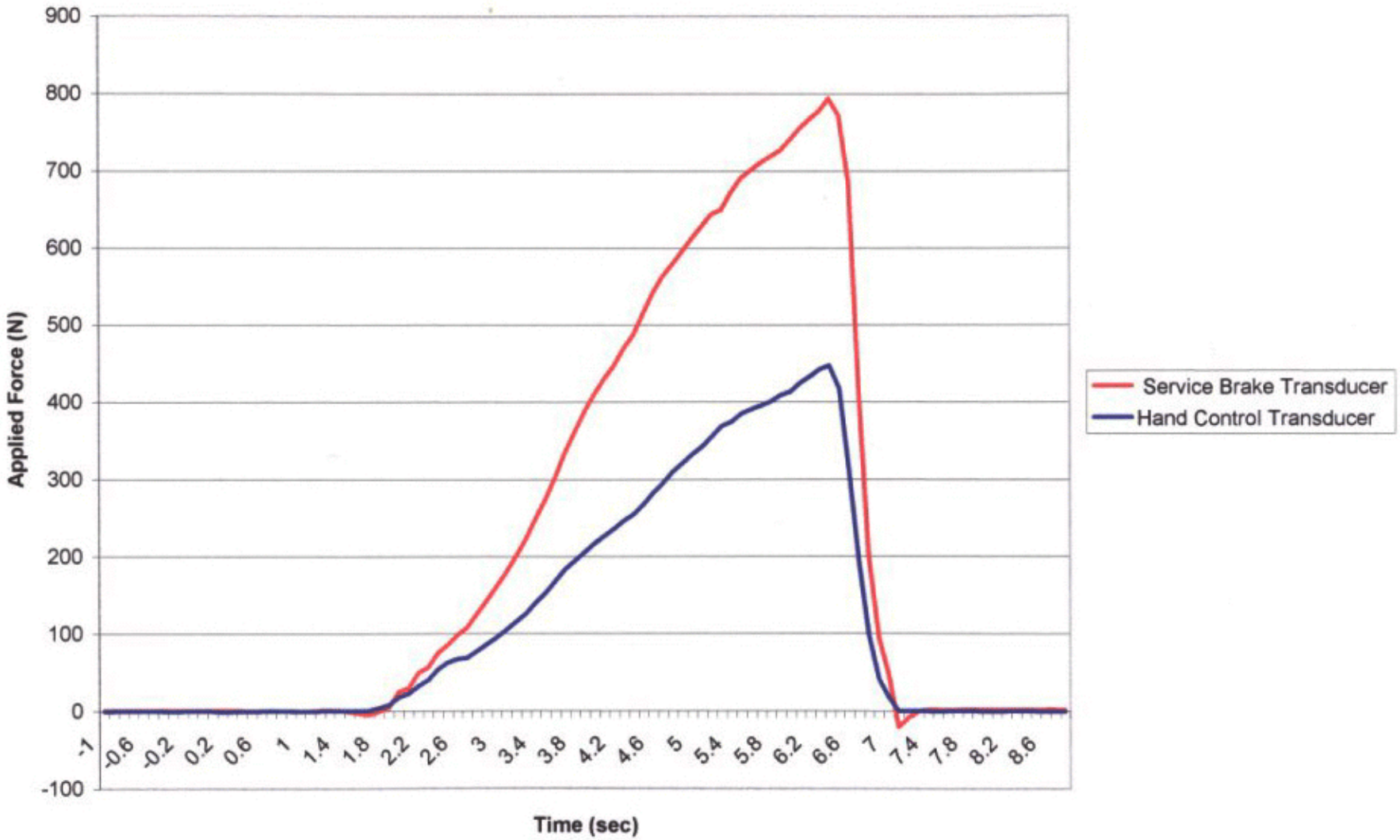
[Editor's Note]

The curves shown in this Appendix are intended to allow the reader to convert the recorded "foot" pedal efforts, located in the body of the test data – Appendices E through J – to a corresponding approximate "hand" applied value.

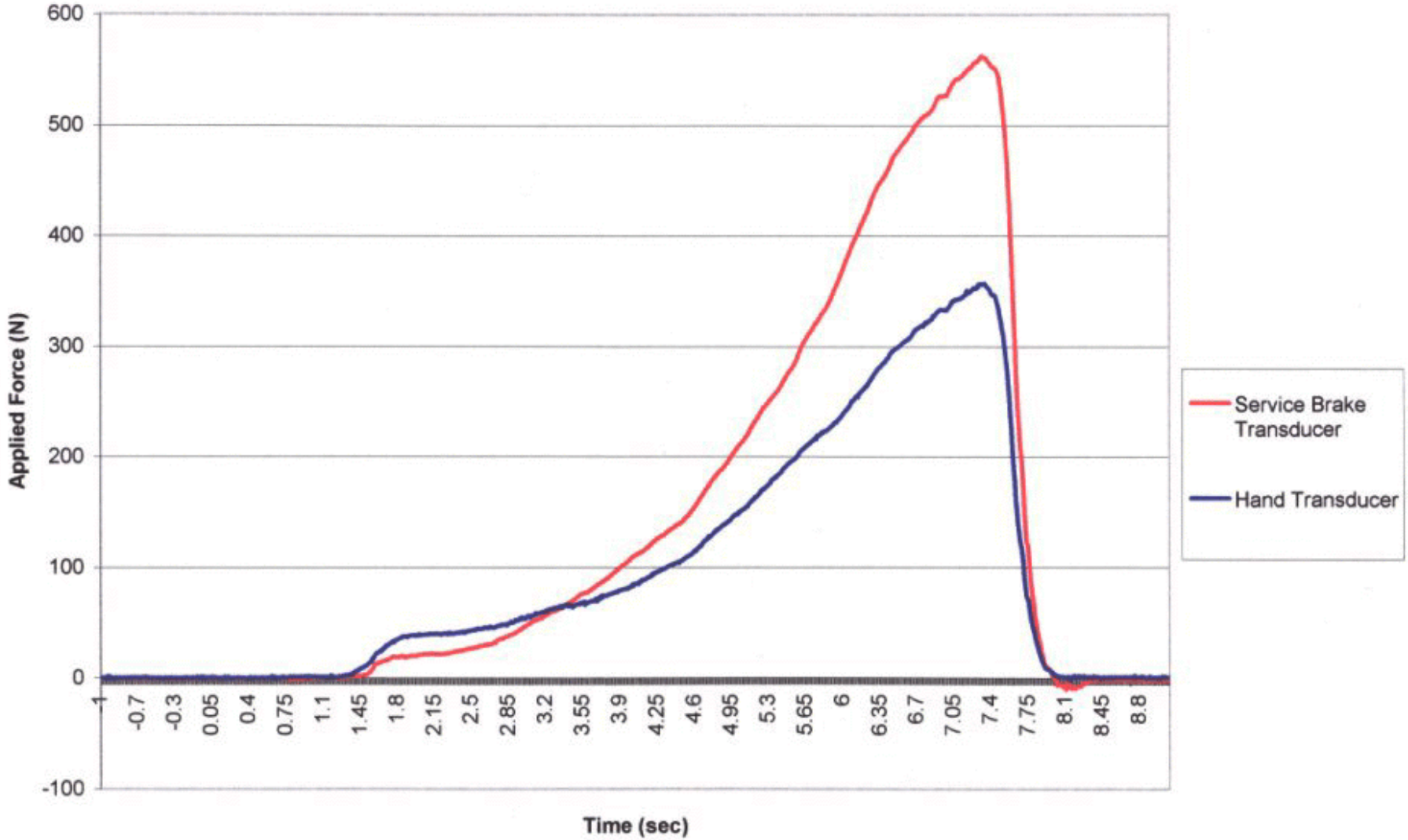
These curves were generated with the hand control mounted in its test-use position in the test vehicle. The contractor measured to the center of what he regarded as the typical hand placement for each hand control. At that point, a small-faced, foot force transducer was affixed, oriented toward the driver. The driver would then apply a steadily increasing force normal to the hand control lever with her left palm to an approximate force of 500N. For the engine "on" applications, the engine was revved up several times prior to an application to maximize vacuum assist in the booster. For the engine "off" applications, the service brake was applied several times to deplete the booster assist.

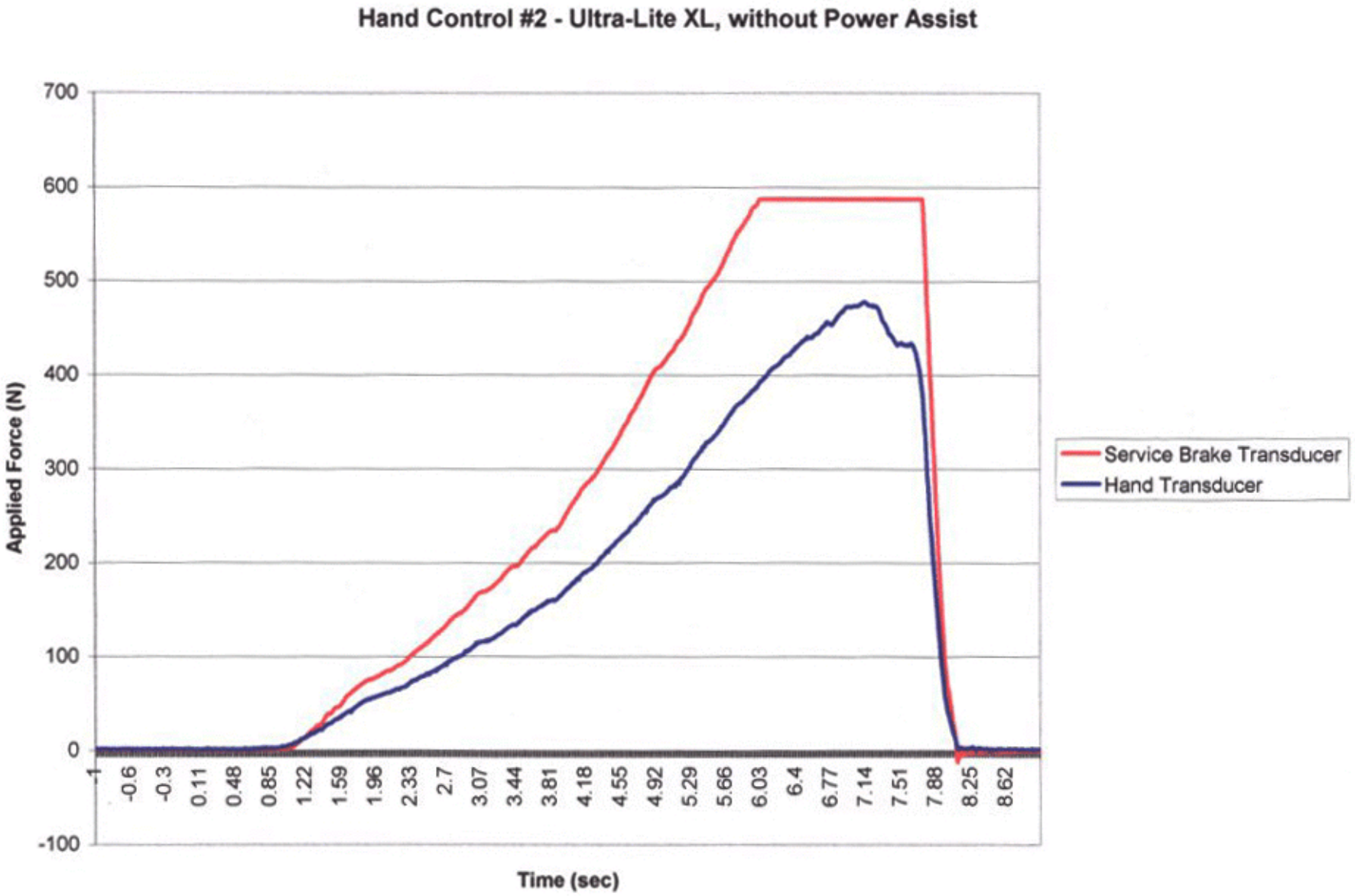

Hand Control #1 - Sure Grip, with Power Assist
Applied Force (N)
600
500
400
300
200
100
0
-100
-1
-0.6
-0.2
0.2
0.6
1
1.4
1.8
2.2
2.6
3
3.4
3.8
4.2
4.6
5
5.4
5.8
6.2
6.6
7
7.4
7.8
8.2
Time (sec)
Service Brake Transducer
Hand Transducer

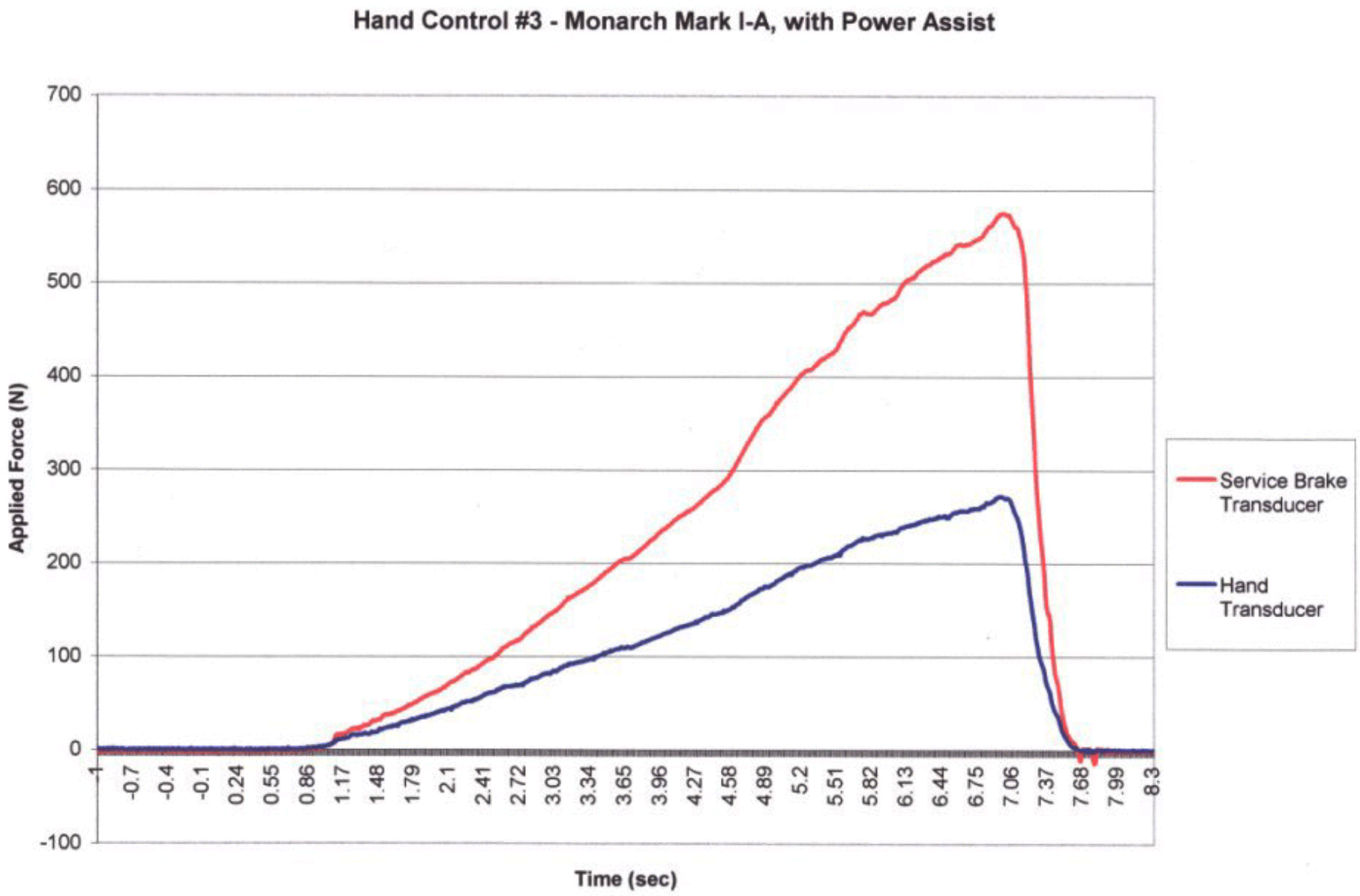
Hand Control #1 - Sure Grip, without Power Assist

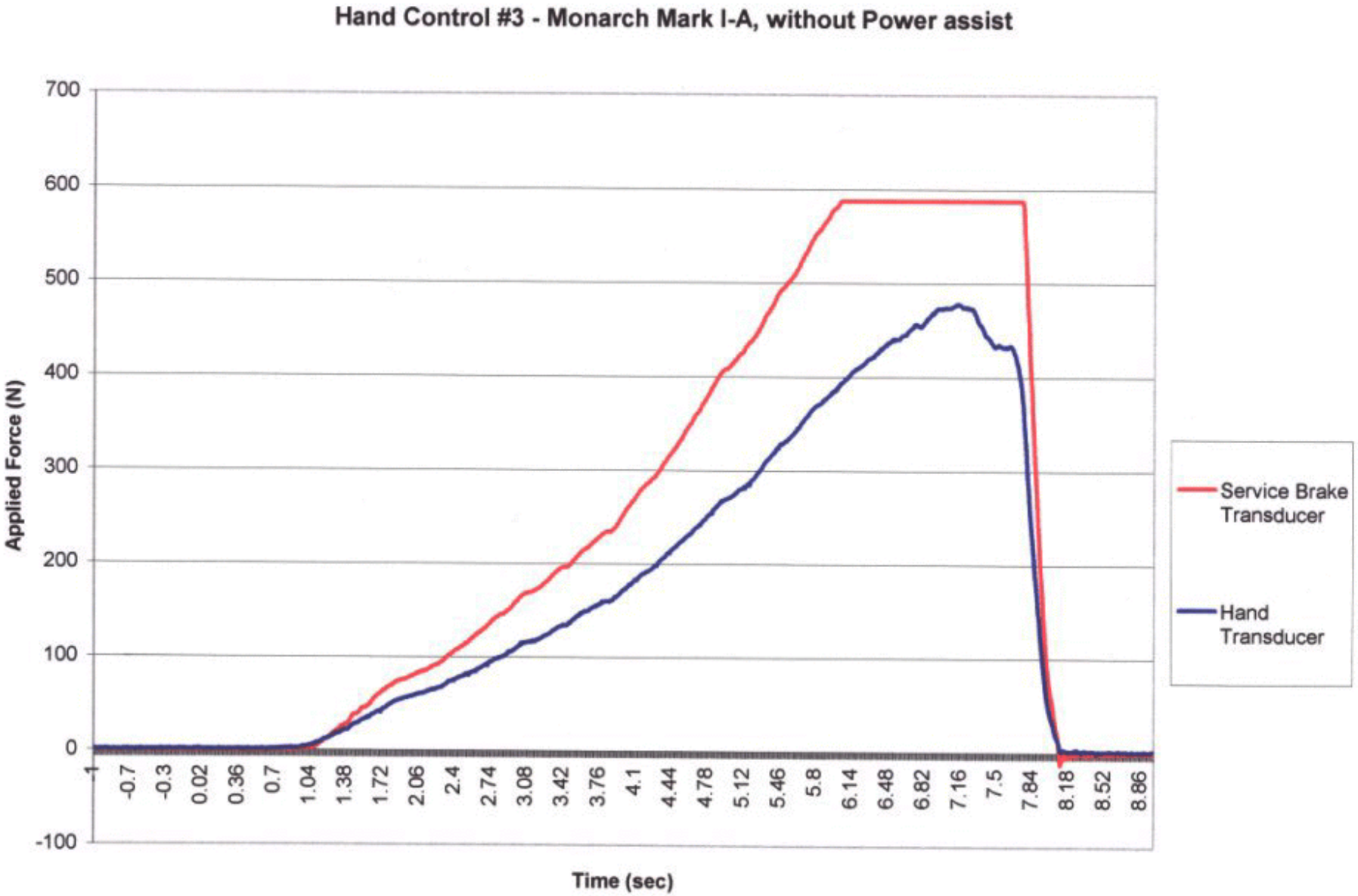


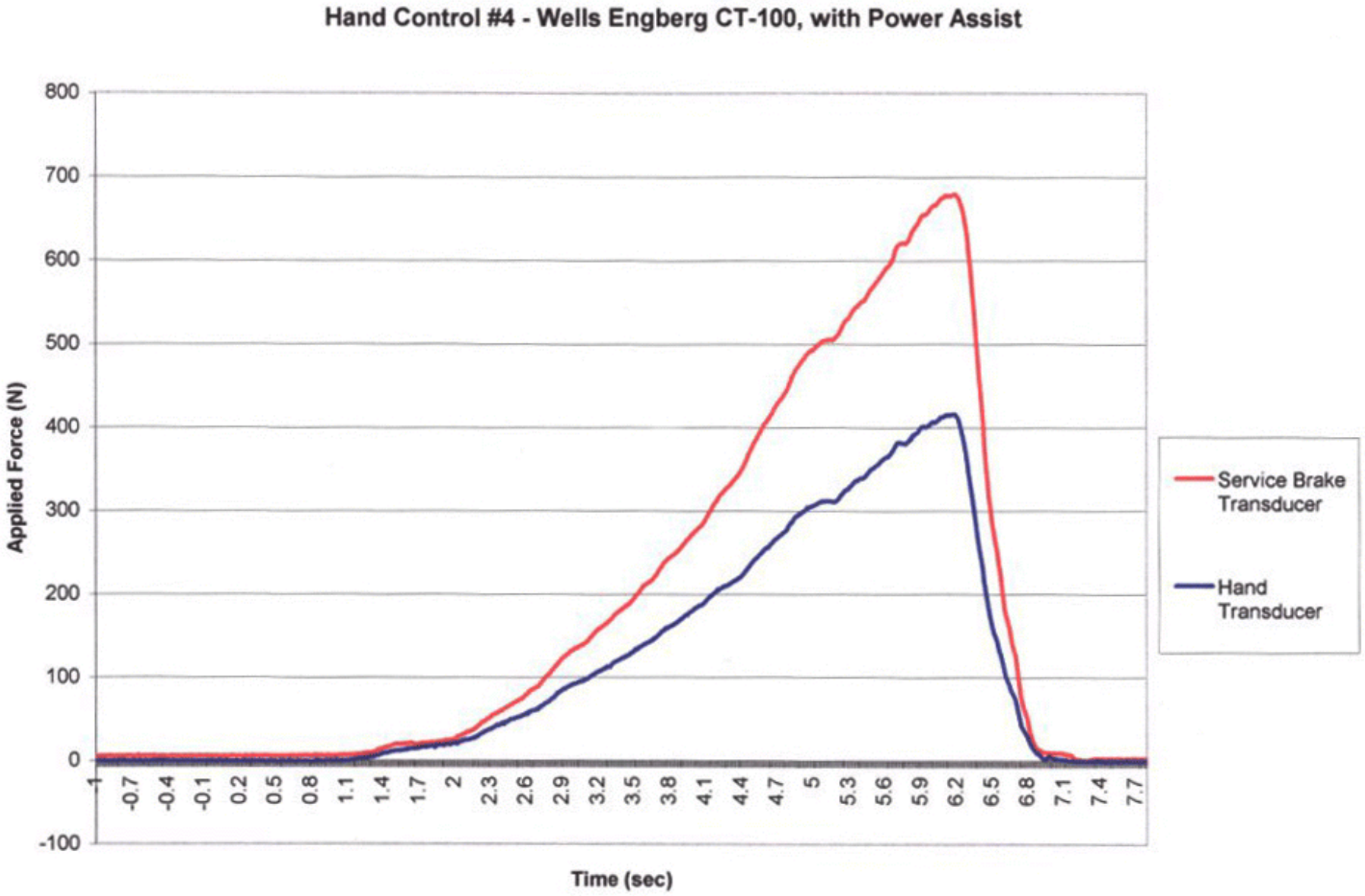
Hand Control #2 - Ultra-Lite XL, with Power Assist



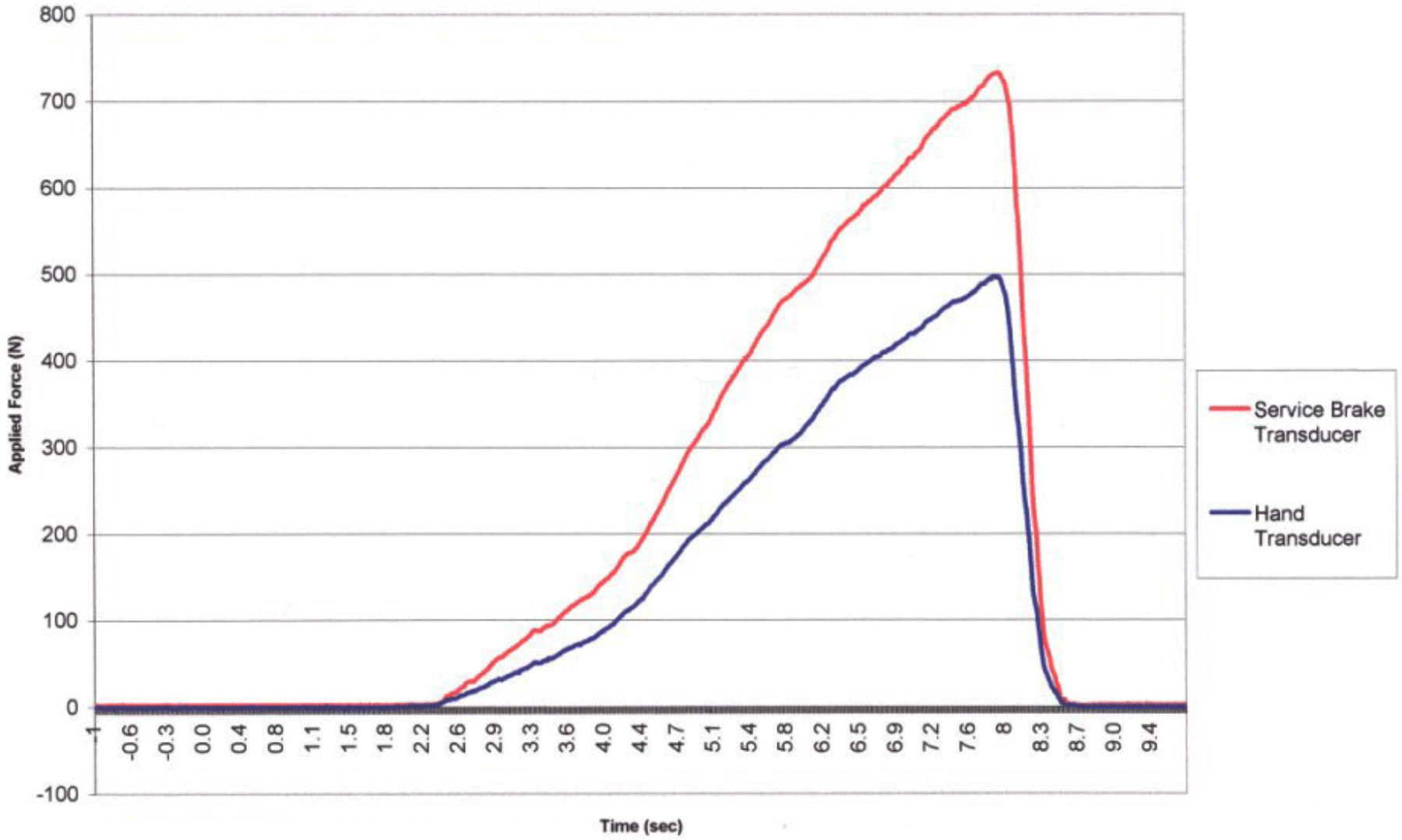

Hand Control #2 - Ultra-Lite XL, without Power Assist
Applied Force (N)
700
600
500
400
300
200
100
0
-100
-1
-0.6
-0.3
0.11
0.48
0.85
1.22
1.59
1.96
2.33
2.7
3.07
3.44
3.81
4.18
4.55
4.92
5.29
5.66
6.03
6.4
6.77
7.14
7.51
7.88
8.25
8.62
Time (sec)
Service Brake Transducer
Hand Transducer

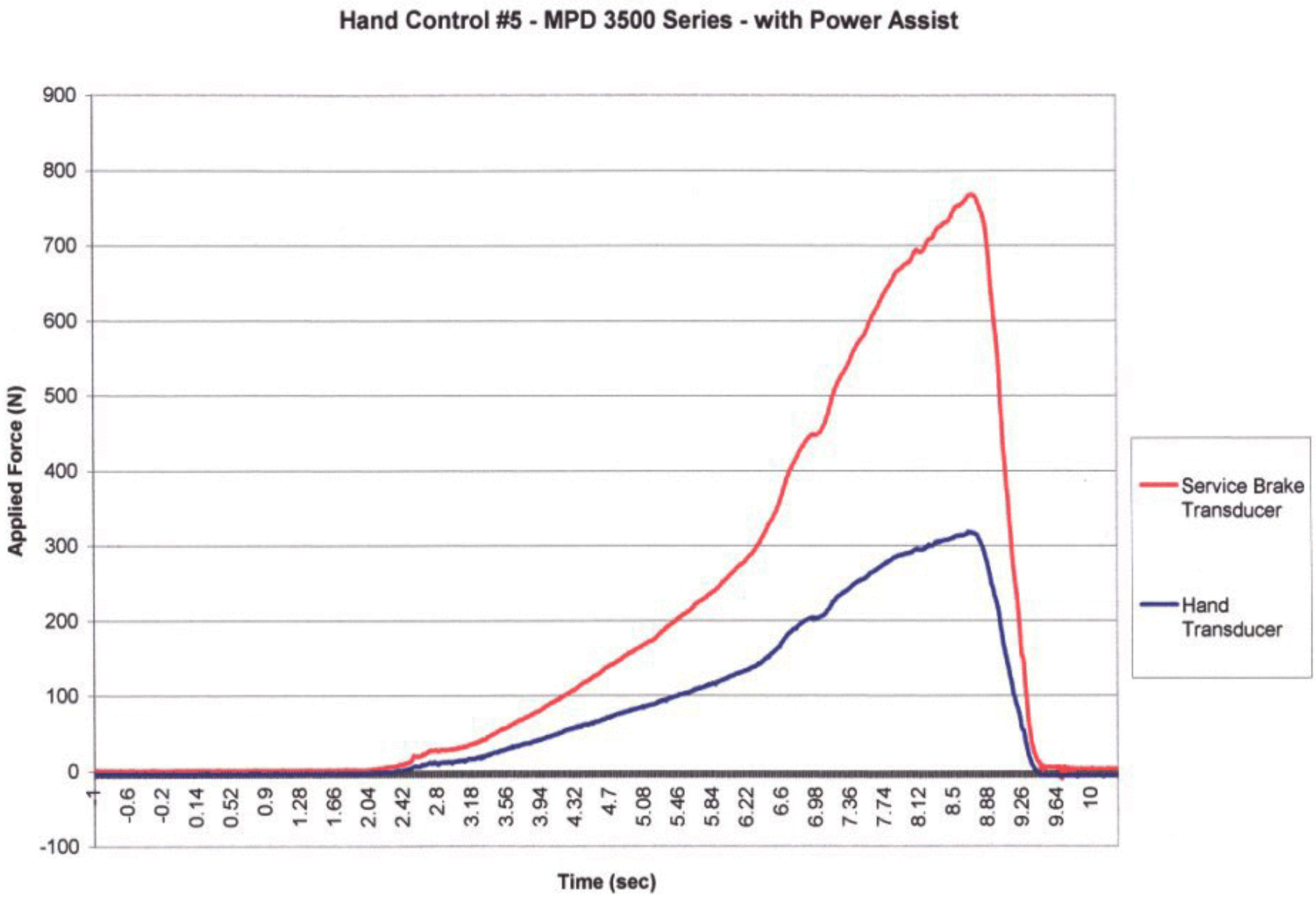

Hand Control #3 - Monarch Mark I-A, with Power Assist
Applied Force (N)
700
600
500
400
300
200
100
0
-100
-1
-0.7
-0.4
-0.1
0.24
0.55
0.86
1.17
1.48
1.79
2.1
2.41
2.72
3.03
3.34
3.65
3.96
4.27
4.58
4.89
5.2
5.51
5.82
6.13
6.44
6.75
7.06
7.37
7.68
7.99
8.3
Time (sec)
Service Brake Transducer
Hand Transducer


Hand Control #3 - Monarch Mark I-A, without Power assist
Applied Force (N)
700
600
500
400
300
200
100
0
-100
-1
-0.7
-0.3
0.02
0.36
0.7
1.04
1.38
1.72
2.06
2.4
2.74
3.08
3.42
3.76
4.1
4.44
4.78
5.12
5.46
5.8
6.14
6.48
6.82
7.16
7.5
7.84
8.18
8.52
8.86
Time (sec)
Service Brake Transducer
Hand Transducer

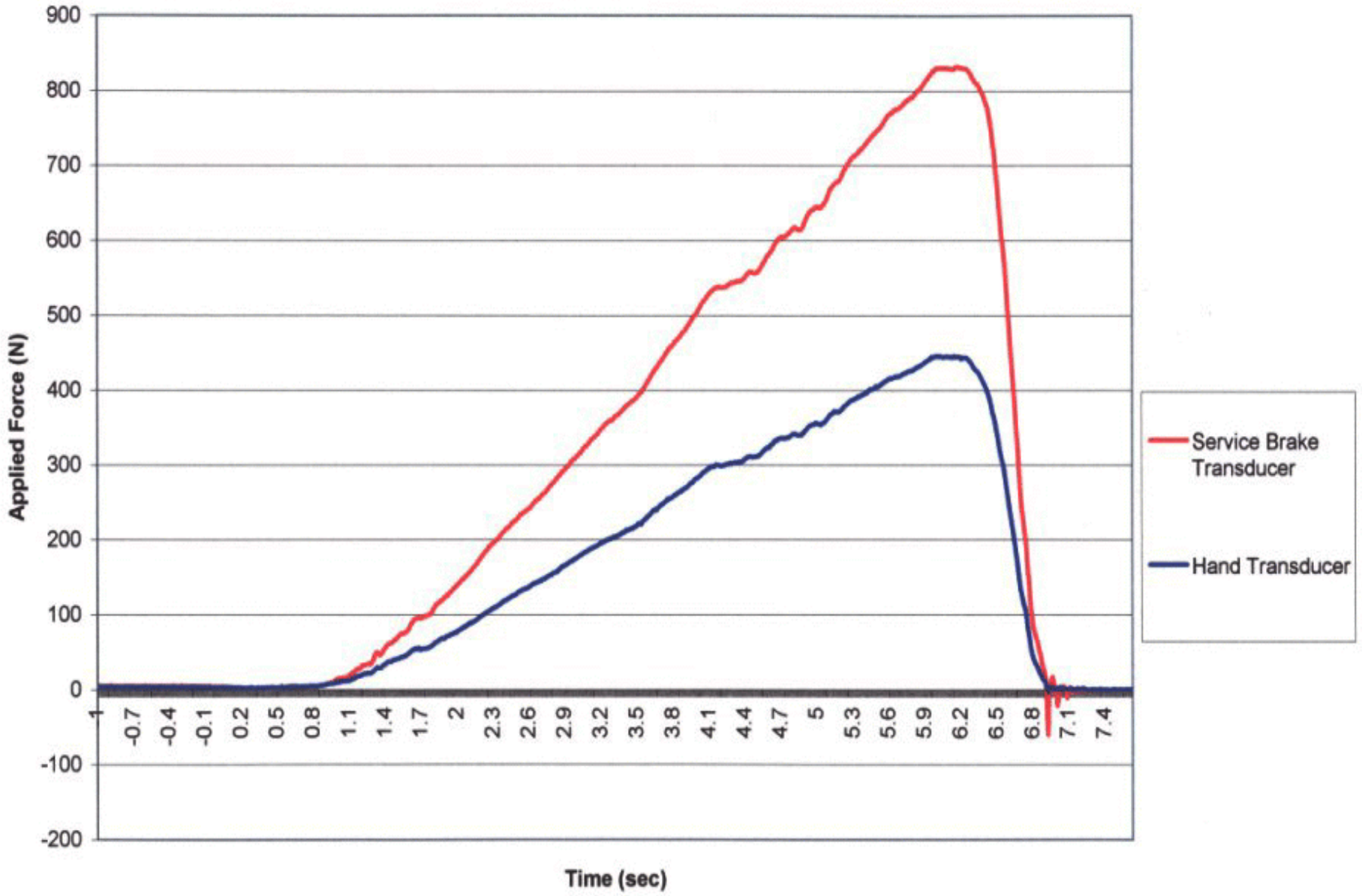

Hand Control #4 - Wells Engberg CT-100, with Power Assist
Applied Force (N)
800
700
600
500
400
300
200
100
0
-100
-1
-0.7
-0.4
-0.1
0.2
0.5
0.8
1.1
1.4
1.7
2
2.3
2.6
2.9
3.2
3.5
3.8
4.1
4.4
4.7
5
5.3
5.6
5.9
6.2
6.5
6.8
7.1
7.4
7.7
Time (sec)
Service Brake Transducer
Hand Transducer

Hand Control #4 - Wells Engberg CT-100, without Power Assist



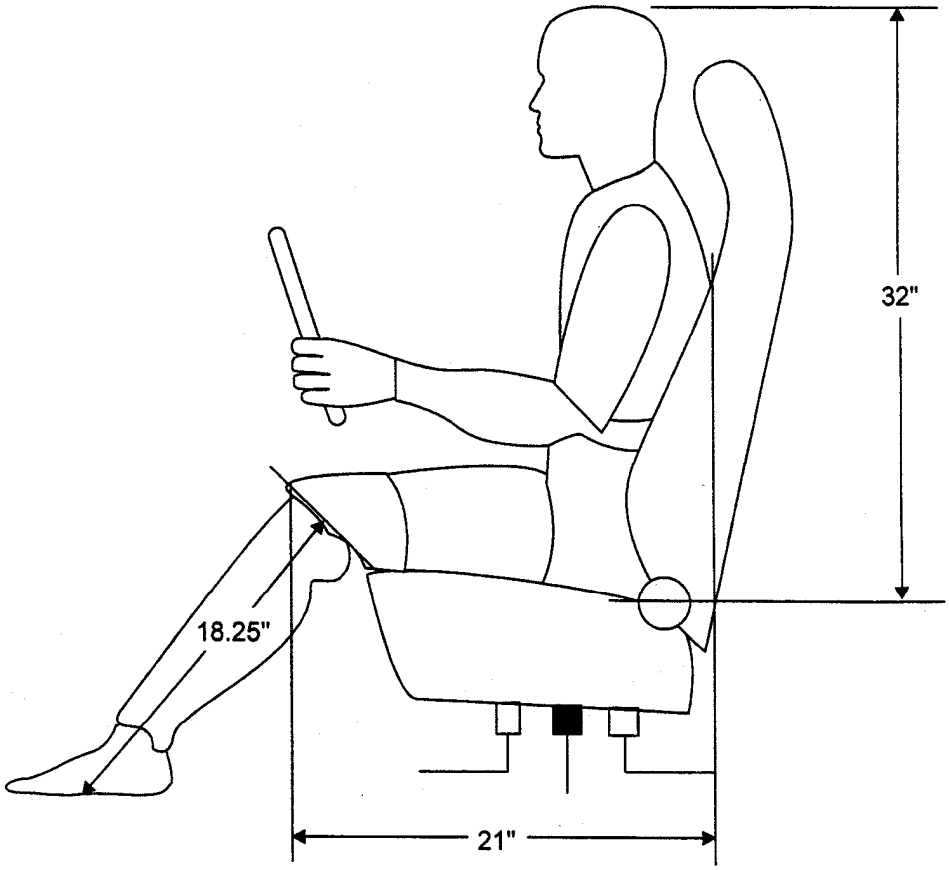

Hand Control #5 - MPD 3500 Series - with Power Assist
Applied Force (N)
900
800
700
600
500
400
300
200
100
0
-100
-1
-0.6
-0.2
0.14
0.52
0.9
1.28
1.66
2.04
2.42
2.8
3.18
3.56
3.94
4.32
4.7
5.08
5.46
5.84
6.22
6.6
6.98
7.36
7.74
8.12
8.5
8.88
9.26
9.64
10
Time (sec)
Service Brake Transducer
Hand Transducer

Hand Control #5 - MPD 3500 Series, without Power Assist



APPENDIX L

Driver Information



DRIVER INFORMATION

1. Height = 5' 6 1/2" (1689 mm)
2. Weight = 150 lbs (68 kg)
3. Gender = Female
4. Seated in the vehicle: Upper leg length from the knee to the seat back cushion: 21" (533mm)
5. Seated in the vehicle: Lower leg length for the knee to the floor with the foot flat on the floor:
   20 1/4" (514 mm) with the leg perpendicular to the floor
   18 1/4" (464 mm) with the leg at an angle to the floor
6. Seated in the vehicle: Torso length from the seat bottom cushion to the top of the head: 32" (813 mm)
7. Arm length from the back of the shoulder to the tip of the longest finger: 31 3/4" (806mm)

DUMPOS.CDR

APPENDIX M

Driver's Subjective Comments

[Editor's Note]

The reader should note that the following are the subjective comments of one driver and (as noted on page i) the opinions stated here are those of the author(s) and do not constitute a policy statement by the National Highway Traffic Safety Administration.

While she is a professional driver, she is not familiar with the operation of adaptive driving equipment. Her statement, "The control seemed back ward to me. Pulling back toward the driver to accelerate seemed wrong." stems from this unfamiliarity. This is the standard arrangement for hand controls, so that any inadvertent forward motion by the driver (e.g. loss of balance) results in braking the vehicle rather than acceleration.

Hand Control Test #1

Karen Easterday

Sure-Grip
1997 Ford Taurus LX
Unit # 333

With the hand control installed and properly adjusted, I would bump my knees when entering or leaving the vehicle.

The control seemed backward to me. Pulling back toward the driver to accelerate seemed wrong. On a riding mower the operator pulls back to apply the brake, we pull back to stop a horse, and also to stop a motorcycle. To push forward to apply the brake was very uncomfortable.

The position of the hand control was such that when the driver had to use two hands on the steering wheel, there was not enough room between the control and the steering wheel for the driver to wrap his or her hand around the wheel without the knuckles hitting the hand control. The hand control also caught the sleeve of a shirt or jacket when making a turning maneuver or just placing the left hand on the steering wheel in the normal hand position.

A vehicle without cruise control would be very difficult to drive with this hand control installed. To turn on the turn signal , the headlights, or the wipers, the driver must let go of the accelerator.

Karen Easterday

Hand Control Test #2
Ultra-Lite XL Hand Control
1997 Ford Taurus LX
Unit 333

This hand control when properly installed and adjusted, was in the way when entering and exiting the vehicle. I bumped my knees on it constantly.

The gas chain on the hand control seemed like a cheap way of working the accelerator. It looked to me like a good place for a failure to occur, especially if the owner did not have periodic maintenance performed on the unit.

There was no "play" in the handle of the control, which was all right when braking, but when accelerating, it was all or nothing. I found that if I placed my thumb on the steering wheel and used the ends of my fingers to pull back on the handle, I made a much smoother acceleration.

Pushing forward to brake and pulling back to accelerate seems backward to me. I would prefer pulling back to stop.

There was plenty of clearance between the hand control and the steering wheel for the driver to use both hands on the steering wheel without raking knuckles.

Without cruise control the driver must let go of the accelerator in order to use the turn signal, headlights, and the windshield washer/wipers.

Karen Easterday

Hand Control Test # 3
Monarch Mark 1A
1997 Ford Taurus LX
Unit 333

The hand control was properly installed and adjusted. There was insufficient clearance between the steering wheel and the hand control.

The owner's manual contained a warning in bold type stating: "The MONARCH MARK 1A IS DESIGNED SO GAS AND BRAKE CAN BE APPLIED AT SAME TIME." The manual stated that this ability was sometimes helpful when starting on severe grades or to dry the brakes in ice or high water conditions. My personal opinion is that this was unsafe. With no clearance between the hand control and the steering wheel, I almost hit something backing out of the garage because my left hand contacted the hand control and caused it to accelerate. Most cars are equipped with automatic transmissions that will hold on a grade with minimal brake application, so I saw no need to apply the gas and brake at the same time.

This accelerator pulls down, which made it further away from the steering wheel and the turn signal. Without cruise control, the driver must release the accelerator to engage the windshield washer/wipers, turn signal, and the headlights.

Accelerating with a down motion made the acceleration smoother.

Karen Easterday

Hand Control Test # 4
CT-100 Rotary Hand Operated Driving Control
1997 Ford Taurus LX
Unit 333

The hand control was installed and properly adjusted. There was space for the driver to enter and exit the vehicle without bumping legs and knees.

The leverage bar allowed the driver to make smoother accelerations, but I found that if driver was using cruise control and needed to make a panic stop, the leverage bar was in the way and very painful to the palm of the hand. The pain would also cause the driver to release the brake and maybe hit what he or she was trying to avoid.

With this control it was possible to accelerate and to brake at the same time. I believe this was a dangerous thing. The accelerator worked like a motorcycle throttle, with a twist grip, so when driving in traffic without cruise control, if the driver needed to make a quick brake application, he or she must roll his or her hand forward and then apply the brake by pressing toward the dash. This would take entirely too much time.

Pushing toward the dash to apply the brake seemed backward to me.

With the twist grip to accelerate, it was almost impossible to use the turn signal without letting go of the accelerator, so cruise control was a must, especially for changing lanes on the freeway. Driver must let go of the throttle to turn on the lights or operate the windshield wipers/washers.

Karen Easterday

Hand Control Test # 5
3500 Series Hand Control
1997 Ford Taurus LX
Unit # 333

With the hand control installed and properly adjusted, there was not much room for me to enter and exit the vehicle without bumping my knees. However, there was plenty of clearance at the steering wheel. I could make turns with both hands on the wheel without bumping my hand or knuckles.

This control was very stable, not a lot of "play". Accelerations were smooth, and when braking, I was able to maintain a constant decel.

I did not feel comfortable pushing forward on the lever to brake. Pulling down toward the floor to accelerate was all right, but this enabled the driver to accelerate and brake at the same time. I believed this to be unsafe. In an emergency situation it would be very easy to apply the brake while still accelerating. Time would also be a factor in an emergency as the driver must let up on the accelerator before applying the brake. With the downward movement to accelerate, it put the driver's hand even farther from the turn signals, windshield washer/wiper, and the headlight control. There was a sticker on the hand control that read: "The car or van must have power steering and brakes, with automatic transmission." I think cruise control was a must with this control because of the inaccessibility of the turn signals, etc.

Driver's Subjective Comparison
Of All Hand Control Utilized
1997 Ford Taurus LX
Unit # 333

Sure Grip

The Sure Grip was my least favorite of the five hand controls that I tested. The material on the handle of this control had a sticky feel to it that would adhere to anything that touched it. While just brushing the back of my hand against it, the control would stick to my hand.

This control was not as stable as most of the others. There was a lot of free play in the lever.

This control was the worst one for bumping knees and legs when entering and exiting the vehicle.

Ultra-Lite XL

The Ultra-Lite XL was another knee bumper, but there was plenty of room for the driver's hands on the steering wheel.

This control was much more stable than the previous one, which made smooth accelerations more difficult.

Monarch Mark 1A

The Monarch Mark 1A was the first one I tested that allowed the driver to accelerate and brake at the same time. I believe this was a safety issue and a very dangerous design. During a panic stop, the driver must let the handle return to its normal position and then apply the brake. This required too much time.

There was very little clearance between the hand control and the steering wheel. The down motion to accelerate did make accelerations smoother.

CT-100 Rotary Hand Operated Driving Control

The CT-100 Rotary Hand Operated Driving Control left more room for the knees without bumping them when entering and exiting the vehicle.

This was another control that allowed the driver to accelerate and brake at the same time. As I stated previously, I believed this was a safety issue and very dangerous.

I did not like the twist grip with the leverage bar. The leverage bar made acceleration smoother, but it was in the way when braking.

3500 Series Hand Control

The 3500 Series Hand Control was the one I would choose if I had to have a hand control installed in my own vehicle. It was the most stable of all the controls I tested. It appeared that a lot more thought went into the design. There was a place on the lever to put a dimmer switch and horn button within thumb reach. The handle was much more comfortable than the previous controls.

There was plenty of room to enter and exit the vehicle without bumping the knees and legs and the control was far enough away from the steering wheel to make full turns with both hands on the wheel.
The only thing I did not like about this control was that the driver could accelerate and brake at the same time.

During the anti-lock failure portion of the FMVSS 135 test, there was no wheel lock allowed; but since we were using hand controls, we wanted to know if the driver would be able to exert enough force for wheel lock, and once they did, could they modulate the brake. I found that with the hand control, I was able to get wheel lock and modulate with each hand control that we tested.

Karen Easterday

APPENDIX N

Installation Technician's Subjective Comments

[Editor's Note]

The reader should note that the following are the subjective comments of one technician and (as noted on page i) the opinions stated here are those of the author(s) and do not constitute a policy statement by the National Highway Traffic Safety Administration.

While he is a professional mechanical technician, he is not familiar with the installation or operation of adaptive driving equipment. The purpose of including these subjective comments on installation is to give manufacturers feedback on how their installation manuals are perceived by a professional technician.

Hand Control #1

Manufactured and distributed by Howell Ventures Ltd.
4850 Route 2 Hwy
Upper Kingsclear
New Brunswick, Canada
(506) 363-5289
Fax 1-800-506-6666

Sure Grip System

December 1, 1998

Installation was very simple with this system; the manual was fairly easy to follow. The only omission noted in the manual was alteration of the knee bolster. However, it did make note that some alteration was going to be needed in general. After installation was completed, the unit was test-driven and seemed to function properly. The pedal action was good and the performance of the unit was straightforward.

The alteration to install the pedal force transducer was very minimal. It required just two adapter bolts to be made and one long nut to be installed. The difference could be made up in the rod adjustment length, so no alteration of the actual designed unit was breached.

Installation Technician,
Michael A. Picker

Hand Control #2

Drive-Master Co., Inc.
9 Spielman Road
Fairfield, New Jersey 07004-3403
1-937-808-9709

Ultra-Lite XL Hand Control

Installation comments for the Ultra-Lite Hand Control unit:

This unit was installed following the manual instructions on January 20, 1999.The directions for the bracket installation were somewhat vague for this particular vehicle. After reading over all directions and familiarizing oneself with the various components, the unit installation began. The proper amount of parts was included with the unit and the bracket installed fairly easily. Time-consuming and critical adjustments were made to ensure proper functioning. The smooth and threaded portions of the unit's brake rod were each shortened by 1 7/8 inches to allow for the addition of the pressure transducer used to measure the brake force. After installation the unit was test-driven. The unit performed as was specified in the accompanying manual.

Installation Technician

Michael A. Picker

Hand Control #3

Manufacturing and Production Services Corp.
7948 Ronson Road
San Diego, Ca. 92111
(619) 292-1423
(800) 243-7034

Monarch Mark 1A

The hand control was installed according to manual instructions on February 12, 1999.

After reading and following the manual's directions, the installation went without a problem, except for one. Per the instruction manual, the bracket was to be bolted up to the steering column support. The existing bolts on the column were not long enough. Also, they were in a pocket-type fitting which did not allow for the bracket to be bolted flush against the support bracket. To fix the problem, long nuts were used.

After the successful installation, operation instructions were followed and the unit performed as described in the manual. The test drive showed the unit to be acceptable as designed.

Installation Technician

Michael A. Picker

Hand Control #4

Wells-Engberg
P.O. Box 6388
Rockford, Illinois 61125

CT-100 Rotary Hand Operated Driving Control

On February 23, 1999, the unit was installed following the clear instructions provided in the manual. The accelerator pedal linkage installation was somewhat difficult because of the car design; however, the manual's description made process go well.

The unit preformed as described in the manual.

The only modifications necessary were to shorten the brake control tube by 2.75 inches and to use adapter bolts to accommodate the transducer.

Installation Technician

Michael Picker

Hand Control #5

Mobility Products & Design
2800 Northwest Boulevard
Minneapolis, MN 55441-2625
(800) 488-7688

3500 Series Hand Control

Installation of the hand control was straightforward as set forth in the manual. The installation was performed on 3-9-99.

After reading and familiarizing oneself with the manual, the installation went without a problem except for one. The brackets needed to install the unit, as stated in the manual, were not the ones sent with it. After contacting the technical support line, new brackets were sent.

The replacement brackets received were not the ones specified by the technician at the customer support line; universal brackets were shipped instead. The instructions in the manual were clear and the installation went well. The unit operated as was described in the manual.

The only alteration needed to accept the pressure transducer was the shortening of the brake rod. The unit accepted the changes with no problems by using the adjustments provided. The vehicle was driven to test the installation. The performance of the unit was acceptable and as designed; all was ok.

Installation Technician

Michael A. Picker

APPENDIX O

Manufacturers' Installation Instructions

Hand Control #1

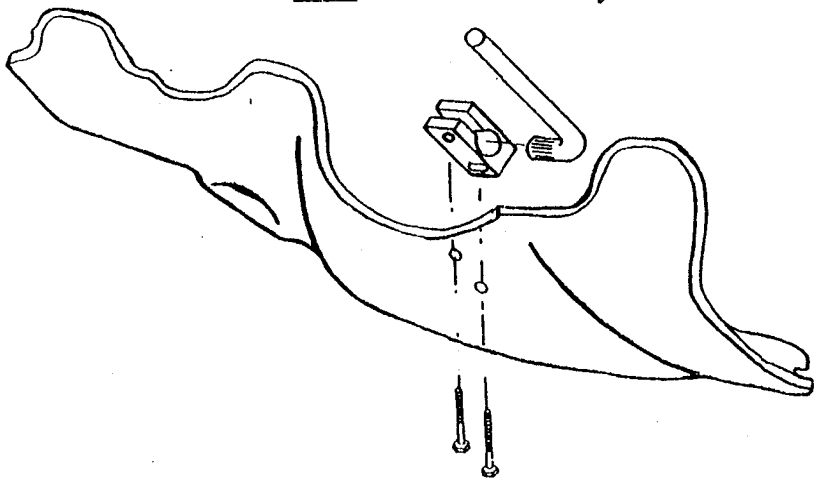
Howell Ventures Ltd.

Sure Grip

EXAMPLES OF CLAMPING BLOCK ONLY INSTALLATION

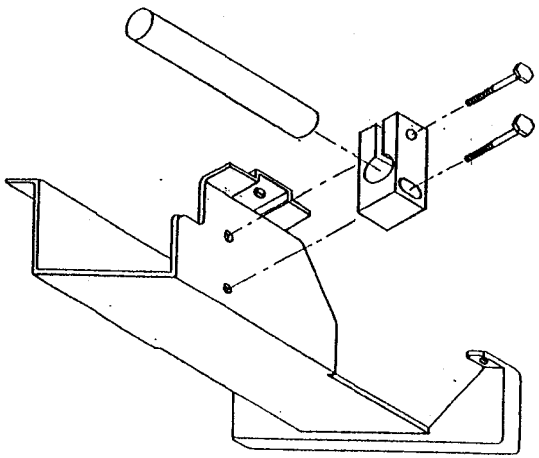
KNEE BOLSTER

NOTE: **<u>Steel</u> Knee Bolster Only**



By drilling two (2) holes in the Knee Bolster or Steering Column Bracket, the clamping block can be attached securely without a base plate.

STEERING COLUMN SUPPORT BRACKET



SURE GRIP

SERVICE BULLETIN

NEW BRACKET INFORMATION

- DESIGN
- PACKAGING/SHIPPING
- "CLAMPING BLOCK ONLY" INSTALLATIONS

SURE GRIP PACKAGING CHANGES

All SURE GRIP Hand Control Systems will be shipped with the universal clamping block only. Please specify base plate on your order if required. Base plates are priced separately but will be shipped with the SURE GRIP as specified.

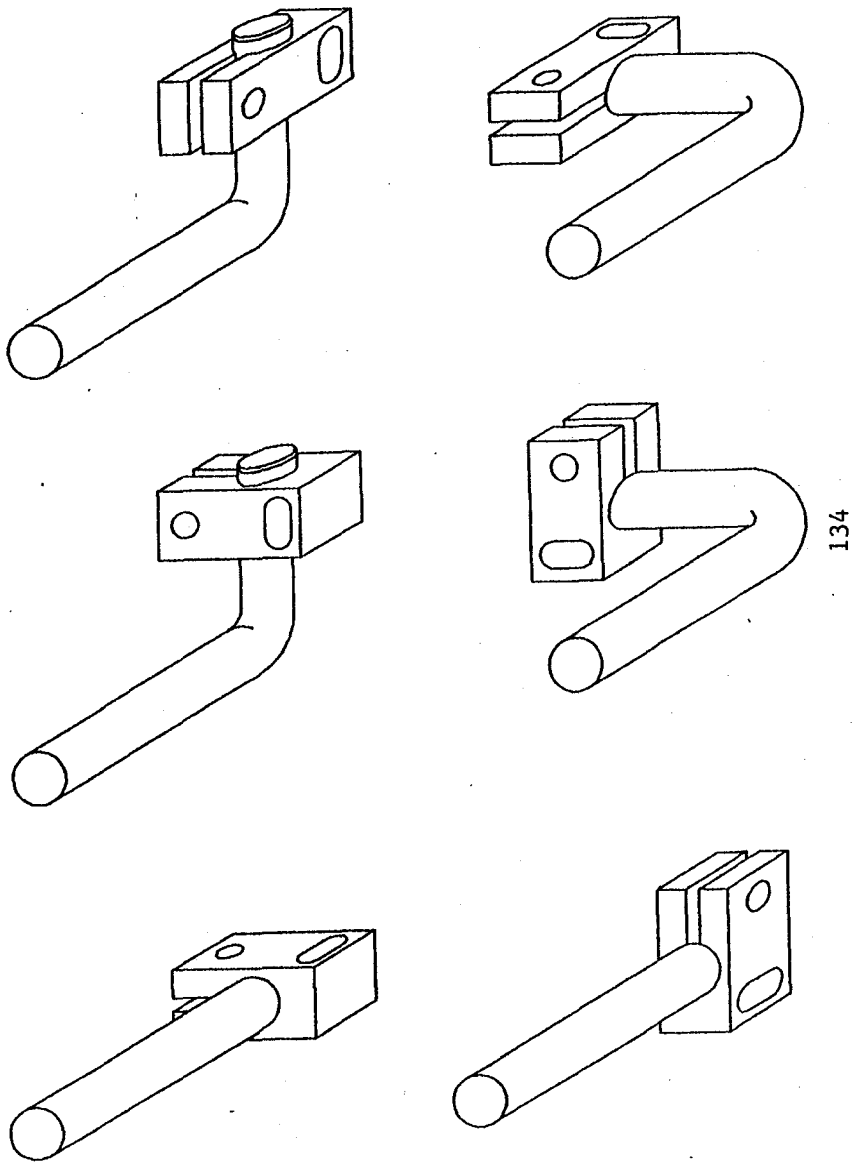
Many new vehicles allow streamlined installation by mounting directly to lower dash sub-frames or steering column support brackets. This means base plates are not required.

Mounting design research is ongoing as dictated by vehicle design changes.

Input from our dealers regarding stallation, bracket design or promotion of SURE GRIP is greatly appreciated.

KEITH HOWELL
President
Howell Ventures Ltd.

SUPPORT ROD & CLAMPING BLOCK EXAMPLES



"L" support rod can be shortened or cut and used straight.

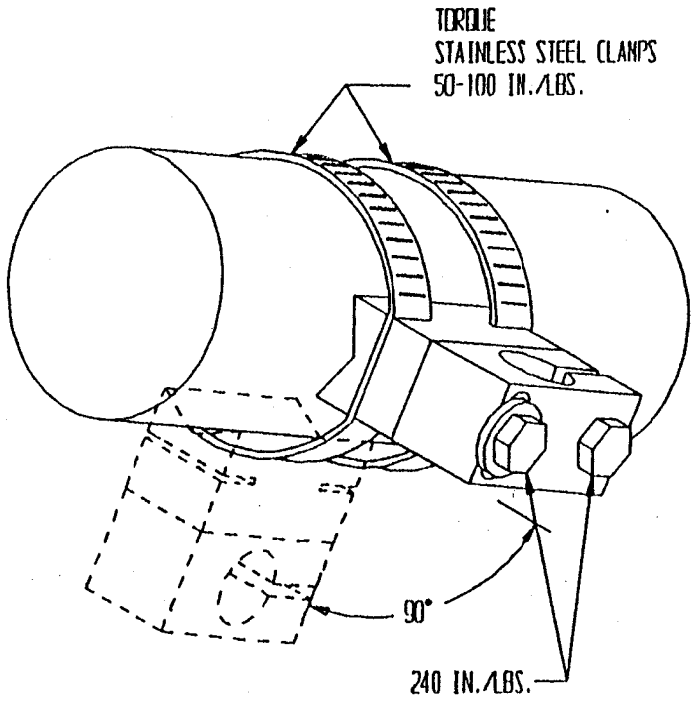
STEP 1: INSTALL MOUNTING BRACKET

Examine the steering column below the dashboard for a possible location of the mounting bracket. The dash panel and any air conditioning ducts may have to be removed. The vehicle wiring harness and connectors may need to be moved slightly. The most commonly used brackets are the clamp on and bolt on universals. If these are not appropriate, further auxiliary brackets are available.

CLAMP ON UNIVERSAL BRACKET

Mount clamp on universal bracket as shown using stainless steel clamps provided. Lightly tighten until final position is determined, then final tighten to 60-100 in.lbs. Do not exceed.

Bracket can be placed anywhere from the bottom of column to the right side of column. Trough and arc of 90 degrees.



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PARTS LIST

ASM	ITEM	HOWELL VENTURES PART #	MPD PART #	DESCRIPTION	QTY
A107				Main Body Assembly	1
	1	7SA116	69207-000	Handle	1
	2	7SA113	69208-000	Control Arm	1
	3	7SA112	69209-000	Control Arm Tube	1
	4	7SA114	69206-000	Throttle Lever	1
	5	7SA111	69214-000	Support Tube	1
	6	7F116	86021-000	1/4" Spring Pin	1
	7	7F115	84005-000	3/8" Set Screw	1
	8	7F103	83019-000	3/8" Locknut	1
	9	7SA119	69210-000	3/8" Cap	1
	10	7SF105	83011-000	1/4" Locknut	1
	11	7SA118	69211-000	1/4" Cap	1
	12	7F107	80019-000	1/4" Bolt - 20 x 1"	1
	13	7F105	83011-000	1/4" Locknut	1
A104			Gas Tube		
	14	4F117	69203-000	1/4" Rod End	1
	15	4SA101	69212-000	Gas Tube	1
A105				Gas Rod Assembly	
	16	5F102	83002-000	3/8" Nut	2
	17	5SA103	69213-000	3/8" Rod	1
	18	5F104	83001-000	1/4" Nut	1
	19	5F118	69201-000	1/4" Ball Joint	1
	20	5SA105	69200-000	Gas Bracket	1
	21	5F114	84029-000	1/4" Set Screw	2
		5F122	69205-000	Return Spring	1
A101	22	A101	69215-000	Support Rod	1
A103	23	A103	69216-000	Brake Tube	1
A106				Brake Rod Assembly	
	24	5F102	83002-000	3/8" Nut	1
	25	6RAW125	69217-000	3/8" Threaded Rod	1
	26	5F102	83002-000	3/8" Nut	1
	27	6F119	69202-000	3/8" Ball Joint	1
	28	6F103	69218-000	3/8" Locknut	1
	29	6F110	69219-000	1/2" U Bolt	1
	30	6SA107	69204-000	Brake Bracket	1
	31	6F106	83006-000	1/2" Nut	1
	32	6F111	82004-000	1/2" Lock Washer	2
	33	7F125	84031-000	#10 x 3/16" Set Screw	2

STEP 1: INSTALL MOUNTING BRACKET

Examine the steering column below the dashboard for a possible location of the mounting bracket. The dash panel and any air conditioning ducts may have to be removed. The vehicle wiring harness and connectors may need to be moved slightly. The most commonly used brackets are the clamp on and bolt on universals. If these are not appropriate, further auxiliary brackets are available.

CLAMP ON UNIVERSAL BRACKET

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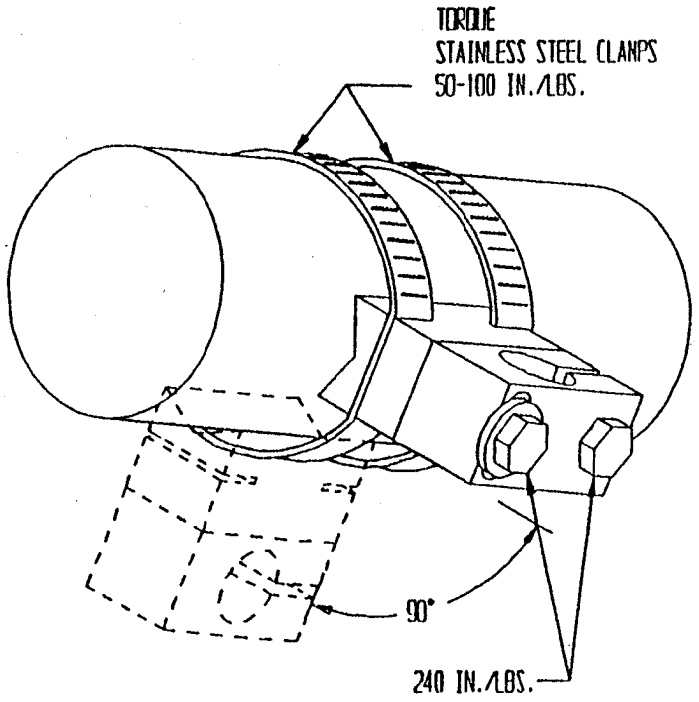
Bracket can be placed anywhere from the bottom of column to the right side of column. Trough and arc of 90 degrees.



PARTS LIST

ASM	ITEM	HOWELL VENTURES PART #	MFD PART #	DESCRIPTION	QTY
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	6	7F116	86021-000	1/4" Spring Pin	1
	7	7F115	84005-000	3/8" Set Screw	1
	8	7F103	83019-000	3/8" Locknut	1
	9	7SA119	69210-000	3/8" Cap	1
	10	7SF105	83011-000	1/4" Locknut	1
	11	7SA118	69211-000	1/4" Cap	1
	12	7F107	80019-000	1/4" Bolt - 20 x 1"	1
	13	7F105	83011-000	1/4" Locknut	1
A104				Gas Tube	
	14	4F117	69203-000	1/4" Rod End	1
	15	4SA101	69212-000	Gas Tube	1
A105				Gas Rod Assembly	
	16	5F102	83002-000	3/8" Nut	2
	17	5SA103	69213-000	3/8" Rod	1
	18	5F104	83001-000	1/4" Nut	1
	19	5F118	69201-000	1/4" Ball Joint	1
	20	5SA105	69200-000	Gas Bracket	1
	21	5F114	84029-000	1/4" Set Screw	2
		5F122	69205-000	Return Spring	1
A101	22	A101	69215-000	Support Rod	1
A103	23	A103	69216-000	Brake Tube	1
A106				Brake Rod Assembly	
	24	5F102	83002-000	3/8" Nut	1
	25	6RAW125	69217-000	3/8" Threaded Rod	1
	26	5F102	83002-000	3/8" Nut	1
	27	6F119	69202-000	3/8" Ball Joint	1
	28	6F103	69218-000	3/8" Locknut	1
	29	6F110	69219-000	1/2" U Bolt	1
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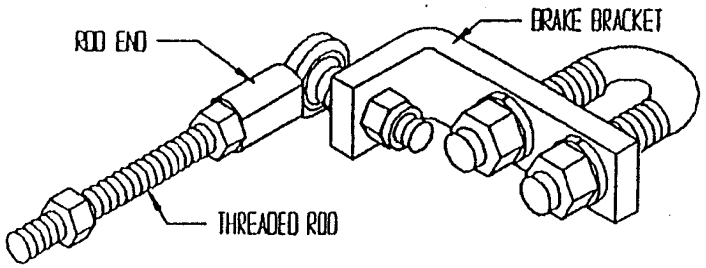
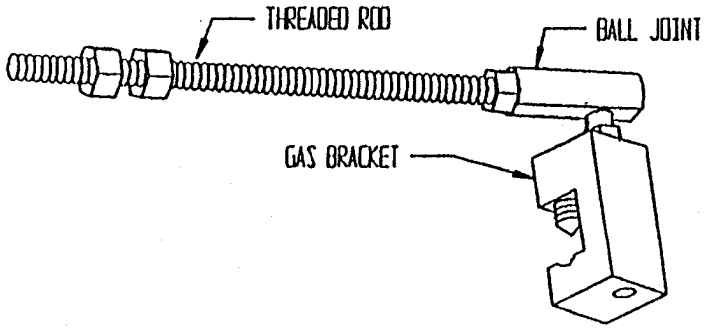
	31	6F106	83006-000	1/2" Nut	1
	32	6F111	82004-000	1/2" Lock Washer	2
	33	7F125	84031-000	#10 x 3/16" Set Screw	2

5. Brake Rod Assembly is made up of: 3/8" Threaded Rod, 3/8" Ball Joint, Brake Bracket and has the following hardware:
(2) 3/8" Nuts, 3/8" Locknut, U BolT,
(2) 1/2" Lockwashers, and (2) 1/2" Nuts.



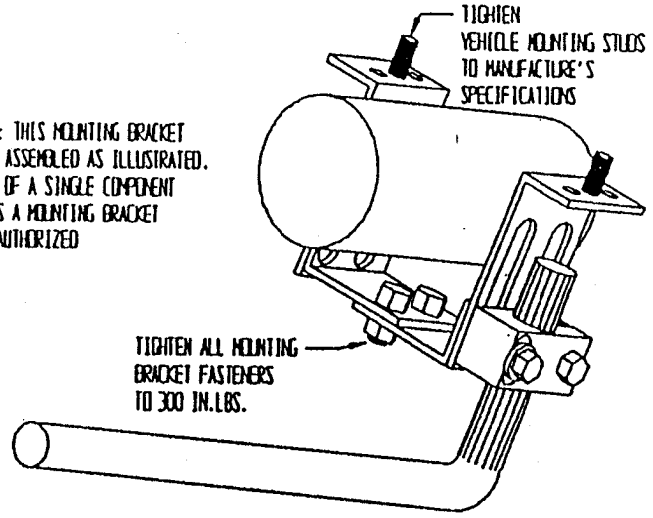
6. Gas Rod Assembly is made up of:
3/8" Threaded Rod, 1/4" Ball Joint, Gas Bracket and has the following hardware: 1/4" Nut, (2) 3/8" Nuts, (2) 1/4" Set Screws. (Also Includes return Spring and Hose Clamp not shown here).



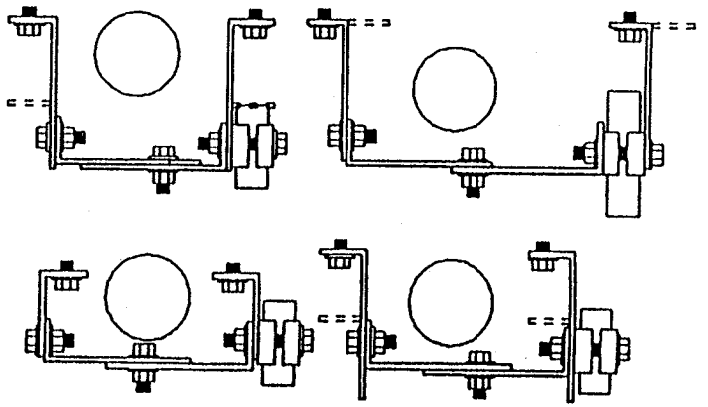
Column Mounting Brackets. There are several different kinds; the most popular are Universal Clamp On and Universal Bolt On. These are shown in step one next page.

BOLT ON UNIVERSAL BRACKET

Remove nut and washer from vehicle stud or bolt on one side of steering column bracket. Using lockwasher provided mount bracket leg to steering column bracket with existing fasteners. Repeat for other leg. After bracket height is determined, short bracket legs may be used. Tighten all bolts to 300 in.lbs.

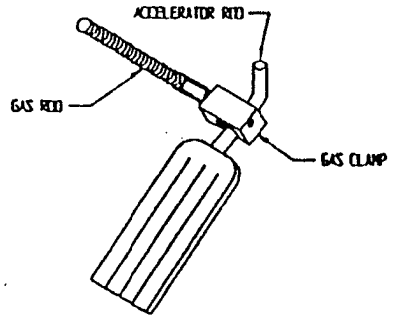


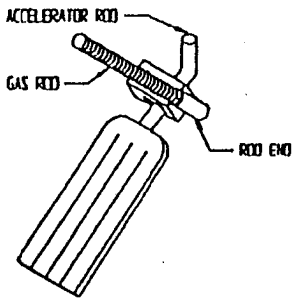
POSSIBLE MOUNTING COMBINATIONS



STEP 2: MOUNT GAS ROD ASSEMBLY

Attach the gas clamp to the rod supporting the gas pedal, keeping it as clear as possible from the pedal, so that the non-handicapped driver will have unobstructed access to the pedal. Gas rod is assembled for installation on the left side of pedal. To place on the right side of pedal remove gas bracket from ball joint and reinsert ball joint into other side of bracket. Make sure gas rod assembly does not come in contact with any portion of the floor.





After determining correct position of gas clamp, remove clamp, and using dents made by set screw points, drill (2) 1/8" diameter x 1/8" deep holes. Replace clamp making sure set screw points enter holes (See Figure 1A).

On "U" shaped pedal arms, remove gas bracket from ball joint. Drill a 1/4" diameter hole in arm, and insert ball joint into hole. Fasten with a 1/4" locknut. Make sure the linkage will not interfere with operation of gas pedal (See Figure 1B).

FIGURE 1 A

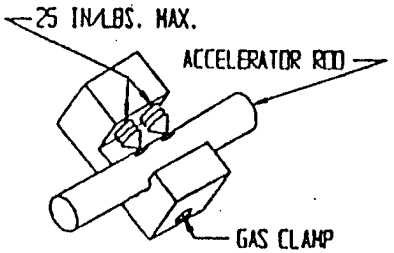
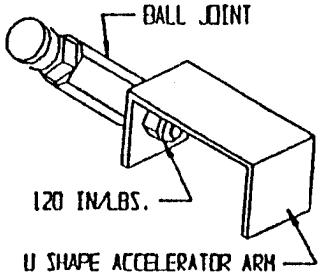


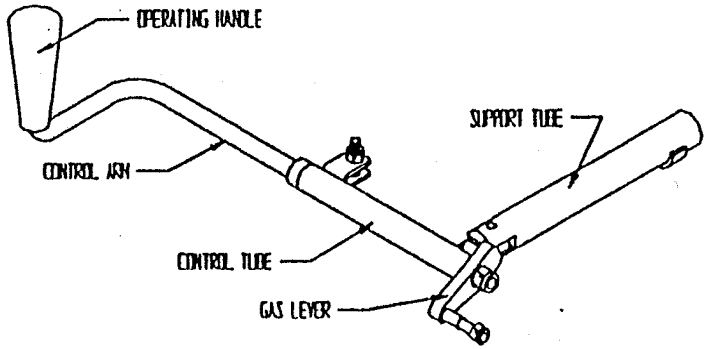
FIGURE 1 B



PARTS OF THE SURE GRIP

The Sure Grip has seven main components. The following diagrams shows the components and the terminology used to describe the individual parts. Check to make sure you have all the parts on hand before installing.

1. Main Body is made up of: Handle, Control Arm, Control Tube, Gas Tube, Gas Lever, Support Tube, and has the following hardware: 1/4" locknut, 1/4" bolt and locknut, 1/4" spring pin, (2) 3/8" set screws.



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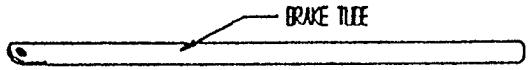
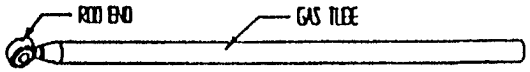
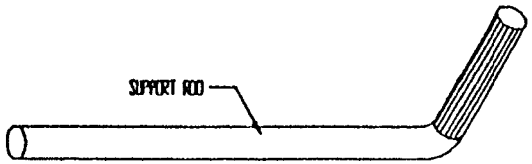
2. Brake Tube.



3. Gas Tube is made up of: Gas Tube and 1/4" Rod End.



4. Support Rod.



INSTALLATION INSTRUCTIONS

These instructions are intended for dealer use only.

The SURE GRIP is a fairly easy hand control to install. The following pages will give you a good understanding of how the SURE GRIP is assembled, the terminology used to describe the parts, how the parts relate to each other, and the adjustability of the hand control.

Most vehicles contain decorations such as panels and trim around the dashboard area and accessories such as air conditioning. Therefore it is often necessary to remove and/or trim those panels and ducts to obtain the necessary clearances. The installation and adjustment of the hand controls has become more complicated. For this reason an experienced and specially trained person must perform the installation.

All warranties may be voided if not installed by a specially trained person.

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WARNING FOR MODIFIED OR CUSTOMIZED VEHICLES

Installation of SURE GRIP hand controls on modified vehicles is NOT AUTHORIZED.

Modified means changes not made or authorized by the vehicle's manufacturer; These are as follows:

Oversized, undersized or untreaded tires,
Modified suspension systems,
Additional or modified carburetors or linkages,
Small steering wheels not supplied by the vehicle's manufacturer,
Or changes that tend to make the vehicle difficult or dangerous to drive. VEHICLE MUST MEET ALL MOTOR VEHICLE SAFETY STANDARDS.

P 3: MOUNT BRAKE ROD ASSEMBLY

Mount brake rod assembly as shown in figure 1 below. Do not use on vehicles that have the brake pedal arm coming up through the floor. Mount the brake clamp as close to the pedal as possible making sure there is adequate clearance from the floor. Tighten to torque specifications shown.

Place U bolt around arm of brake pedal and insert into brake clamp. Position on brake arm as close to the pedal as possible. Using 1/2" lockwashers and nuts, fasten and torque to 300 in.lbs.

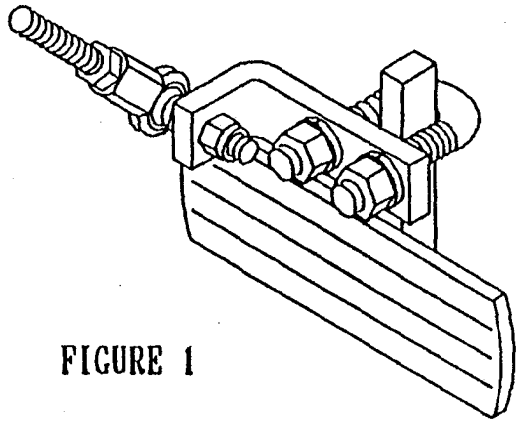


FIGURE 1

AUXILIARY BRAKE BRACKET

There are two ways you can mount this bracket (see figure 1). Remove brake bracket from ball joint on the brake rod assembly and insert ball joint into auxiliary brake bracket. Option A: Place the two halves of the bracket as close to the pedal as possible. Use (2) 5/16" bolts, 5/16" lockwashers & nuts, to bolt the two halves together. Torque to 260 in.lbs. Option B: Remove pedal rod and drill (2) 9/32" diameter holes in brake pedal as shown. Place the brackets on the underside of the pedal. Use (2) 1/4" bolts, lockwashers, and nuts to bolt bracket to pedal. Torque to 60 in.lbs. Cut holes in pedal pad, if necessary.

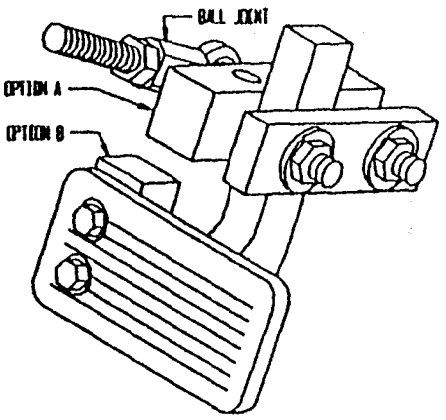
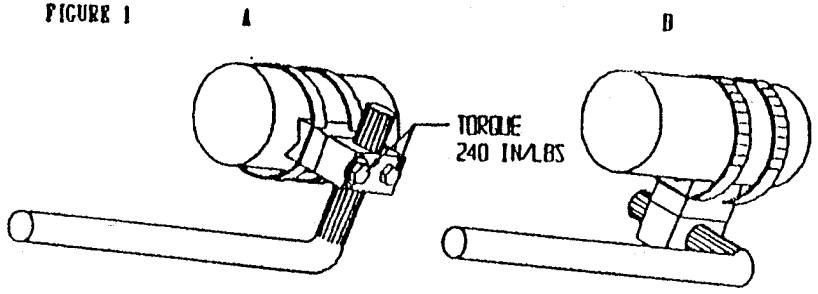


FIGURE 1

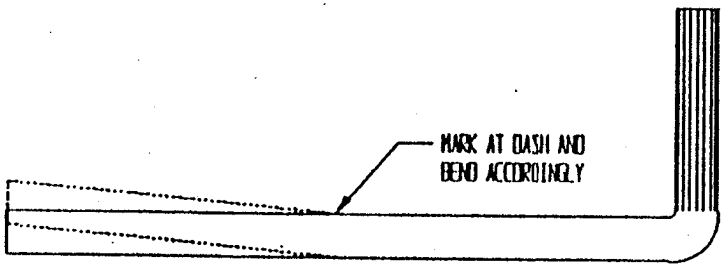
STEP 4: SUPPORT ROD

The support rod is the key to making a good installation. It is important to get the support rod to conform to the profile of the steering column and dash. Depending on the location of the column bracket, insert the short end of the support rod into the mounting bracket. Make sure the support rod goes through the full depth of the mounting bracket (You may have to shorten this end in order to get the support rod close to the steering column). The support rod should always be placed on the right side of the steering column (See Figure 1A & B). Lightly tighten bolts on the mounting bracket until final position is determined, then final tighten to 240 in.lbs.

FIGURE 1



In some application it may be required to bend the support rod to acheive correct profile. This can be done by marking the support rod where it meets the underside of dash. Remove from column bracket and place in vice and bend accordingly. NOTE: A slight bend is all that is required.



2. You should have someone with you to help you observe the next few steps. Position your hand on the operating handle and using a forward motion apply the brakes. Do this a few times making sure the gas pedal is not moving. Your seat should be adjusted to let you fully apply the brakes without rotating your shoulder off the seat and your arm should not be fully extended.

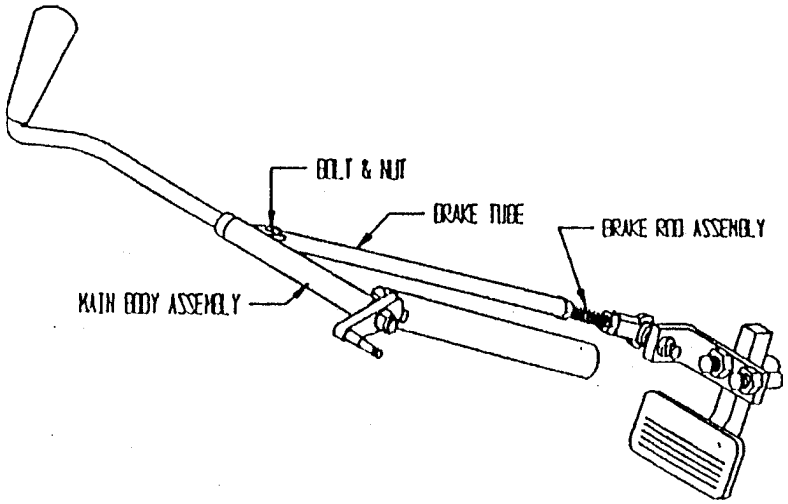
3. Now apply the gas by pulling back and down as in a rocking motion. Check to see if you are applying brake when you apply the gas. Go from brake to gas several times, this should be a fluid motion, until you feel comfortable with the operation.The SURE GRIP operating handle is designed to be located fairly close to the steering wheel. You should be able to slide your hand across the top of the handle, while maintaining pressure on the gas, to reach the turn signals and dimmer switch. You should also be able to have good hand control with the steering wheel while maintaining pressure on the gas. You will get more comfortable and confident with these features as you use and experiment with various hand positions and the operating handle of the control.

4. Now that you know that the SURE GRIP operates, start your engine. Keep the vehicle in park and let the engine warm up. Go through steps 2 & 3 several times again, this time listening to the RPM of the engine. Make sure you are not applying brakes when you apply gas, and are not applying gas when you apply the brakes. These motions should be learned well enough that you no longer have to think about your hand and arm movements. You will only be aware of the desired reaction that you want from your vehicle.

5. Now you are ready for a test drive. Take it easy and start out slow. Find out how much pressure is required to apply the brakes and gas. Try to be smooth and coordinated in your movements. Start and stop until you feel you are confident and have complete control of the vehicle. You should practice in an isolated area if possible. If you do not have a valid drivers license, you should go to a driver training school. Most cities have at least one school now. Most states and provinces require restrictions on drivers licenses to operate a motor vehicle with hand controls. Remember driving is a privilege, not a right. Drive courteously and defensively. Avoid situations which might require rapid manouvers or panic stops. Stay calm and enjoy your SURE GRIP, happy motoring and may God bless you.

STEP 6: INSTALL BRAKE TUBE

The handle of the control is held in position by the brake tube. Thread the brake tube onto the threaded rod of the brake rod assembly. Place top portion of tube into bracket on the main body assembly and insert 1/4" bolt to hold in place. When final adjustment is made place 1/4" locknut on 1/4" bolt and tighten to 60 in.lbs. Thread 3/8" nut up the threaded rod until it touches tube. Tighten nut to tube.



INTRODUCTION

The SURE GRIP automotive hand control was developed to allow physically challenged persons to drive their own vehicles. This hand control can be used by most people who can steer a vehicle safely and confidently. The SURE GRIP has been ergonomically designed with the following features in mind:

- Light touch movements to reduce fatigue.
- Comfortable arm position.
- Hand in neutral position.
- Easy access to signals & accessories.
- Smooth transition from gas to brakes and back again.
- Attractive vinyl finish to enhance appearance.

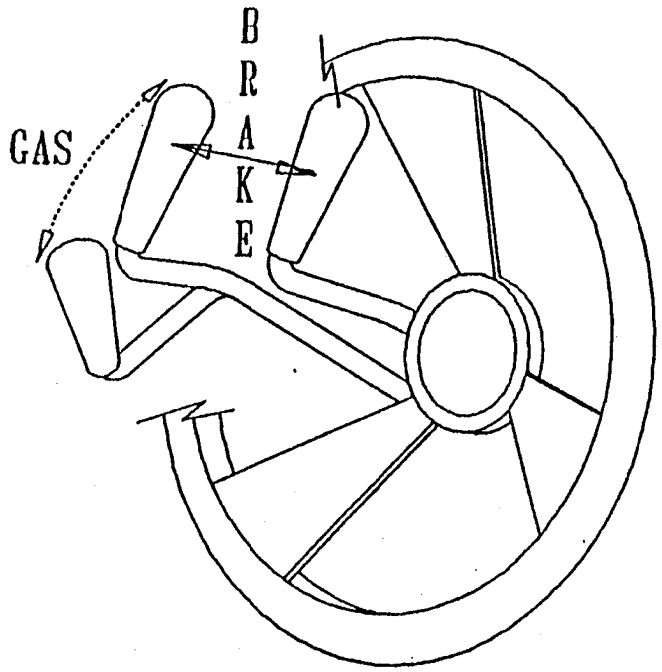
The SURE GRIP gives you all you ever wanted from a hand control. With all of these features, and more, you can enjoy years of trouble free motoring.

Your vehicle should be in good working order with special attention being given to the brakes, making sure they are adjusted properly, and the gas pedal, making sure all linkages are working smoothly. The vehicle must be equipped with power steering, power brakes and automatic transmission only.

Before attempting to install the SURE GRIP read all instructions carefully and study the parts drawing. You should become familiar with the terminology used to describe the different parts of the Sure Grip, how it is assembled and the relationship between the parts.

To perform the installation you should have an electric drill of 3/8" capacity, drill bits, open end wrenches, socket set, side cutters, screw drivers, allen wrenches, pliers and a torque wrench. Any modification of the dash board or air conditioning ducts will require a hack saw or a metal cutting hole saw.

The performance of the SURE GRIP depends completely on how well the installation is done. Take your time and do an excellent job. The SURE GRIP is fully adjustable and is able to meet almost any installation problem.



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OPERATING INSTRUCTIONS

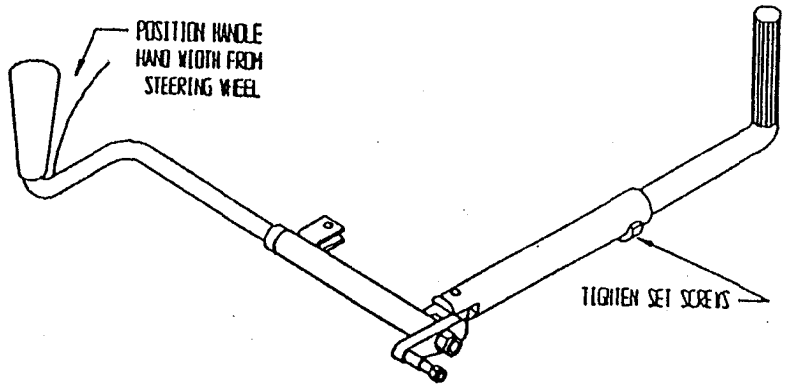
The SURE GRIP hand control incorporates a new method of operation which is less fatiguing and allows for greater control of the vehicle. When properly installed the SURE GRIP will give the operator positive control of the brake and accelerator. The brakes are applied by a forward motion towards the dash board. The gas is applied by pulling back and down as in a rocking motion (See diagram). This style of operation allows for a very smooth transition from gas to brake and back to gas.

Now that you have a SURE GRIP properly installed and adjusted to your requirements it is time for you to familiarize yourself with the operation of the hand control. The following instructions will help you in getting acquainted with the SURE GRIP.

1. Seat yourself in the drivers seat, adjust the seat so that you are comfortable and can reach the hand control and steering wheel comfortably. Fasten your seat belt. DO NOT start the engine at this time.

STEP 5: INSTALL MAIN BODY

Install the main body by sliding the support tube over the support rod and lightly tighten one set screw to hold in position.



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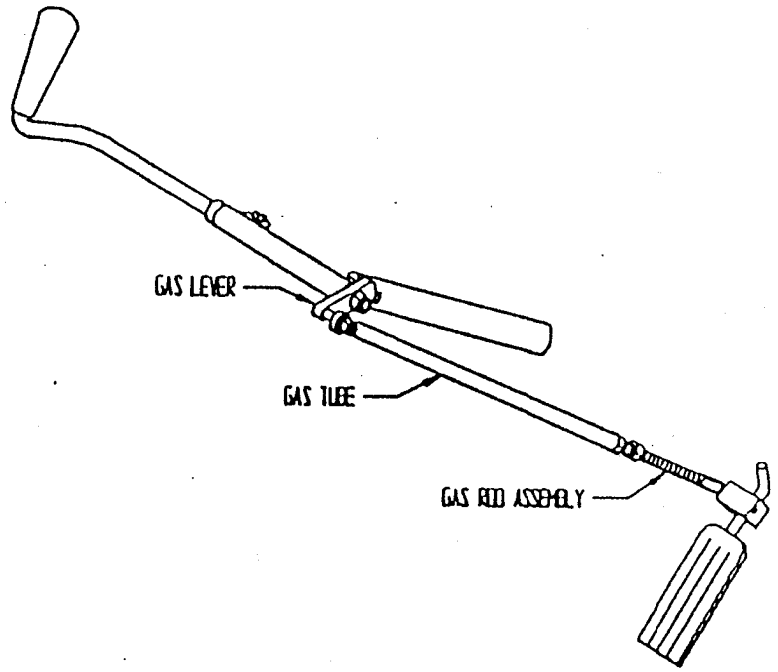
STEP 7: INSTALL GAS TUBE

Install gas tube by sliding tube over the threaded rod of the gas rod assembly. Attach the rod end to the gas lever and hold in place with a 1/4" locknut. Holding the handle of the control in the neutral position, thread the nuts up the threaded rod until contact with tube. Start engine, adjust nuts so there is no play in the operating handle and engine dos not rev. Lock the nuts back to back when final position is determined.



NOTE: A spring may need to be attached to the gas rod assembly to keep the operating handle in position and the engine at an idle. Attach the spring to the threaded rod with a hose clamp about 1 1/2" away from ball joint. Attach the other end to the dashboard. Loosen a screw and wrap end of spring around screw and retighten.

STEP 8: FINAL CHECK-OUT

1. Physically check adequate tightness of all fasteners. Observe all torque specifications. Do not assume anything is tight.

2. Is operating handle close enough to steering wheel so driver can grasp both handle and steering wheel at same time? Will handle clear all door handles?

3 Does the handle return to the neutral position when gas is applied? Make sure vehicle is not idling too fast.

4 Check that brake light switch is not actuated by control (except when brakes are applied). With engine running, push control handle forward firmly and apply brakes hard. Make sure brake rod doesn't rub dash or anything else.

5 Check that when full brakes are applied, that gas lever will clear back of steering wheel.

6. Test drive vehicle yourself. Be careful!! Check if the vehicle will go into passing gear. Be sure controls do not interfere with any foot pedal operation for a non-handicapped person.

7 Has customer been given complete instructions on how to operate the Sure Grip?

8. Has customer been made aware of returning within one week of installation for an installation check-out?

9. Fill out and return warranty registration card.

When everything checks out, all vinyl coated parts of the SURE GRIP should receive an application of vinyl cleaner.

Once installed and adjusted, the SURE GRIP requires very little maintenance to continue operating smoothly for years. You should advise customer to visually inspect all connections yearly, and keep the hand control clean

SURE GRIP

Installation Instructions

And

Parts List

Manufactured and distributed by Howell Ventures Ltd.
4850 Route 2 Hwy
Upper Kingsclear
New Brunswick, Canada
(506) 363 - 5289
fax 1 - 800 -506 - 6666

Hand Control #2

Drive-Master Co., Inc.

Ultra-Lite XL

DRIVE-MASTER CO., INC.
9 SPIELMAN ROAD
FAIRFIELD, NEW JERSEY 07004-3403
1-973-808-9709

ULTRA-LITE XL HAND CONTROL INSTALLATION INSTRUCTIONS (11/97)

WARNING:
IT IS RECOMMENDED THIS ADAPTIVE EQUIPMENT SHOULD ONLY BE INSTALLED IN A VEHICLE IF THE END USER POSSESSES ONE OF THE FOLLOWING:

1. A valid restricted driver's license indicating adaptive equipment required.
2. An adaptive equipment evaluation from a rehabilitation or driver education center.
3. A physician's prescription for adaptive equipment.
4. Certification of compliance with other applicable state driving laws or restrictions.

NOTICE: End users who do not have a valid restricted driver's license should have driver training through an approved education program before using this equipment and should obtain a valid restricted driver's license. UNDER NO CIRCUMSTANCES should improperly licensed drivers use this equipment.

Drive-Master Co., Inc. assumes NO LIABILITY for improper licensing or use.

ALL INSTRUCTIONS MUSI BE FOLLOWED TO VALIDATE WARRANTY. PRIOR TO INSTALLATION, CAREFULLY READ ALL INSTRUCTIONS TWICE AND BECOME FAMILIAR WITH ALL DIAGRAMS. FOLLOW INSTALLATION INSTRUCTIONS STEP BY STEP. OBSERVE THE RECOMMENDED NUT, BOLT, AND SCREW TORQUE TIGHTENING VALUES GIVEN IN THE QUALITY CONTROL CHECK LIST AND TORQUE VALUES ON PAGE 17.

THIS ADAPTIVE EQUIPMENT IS DESIGNED FOR INSTALLATION ONLY ON VEHICLES EQUIPPED WITH AUTOMATIC TRANSMISSION, POWER BRAKES AND POWER STEERING, ALL OF WHICH MUSI BE IN PROPER WORKING ORDER.

WARRANTY WILL NOT APPLY TO ANY DRIVE-MASTER EQUIPMENT WHICH HAS BEEN ALTERED, SUBJECTED TO MISUSE, ABUSE, NEGLECT, ACCIDENT, NATURAL DISASTER, IMPROPER INSTALLATION, OR LACK OF MAINTENANCE.

ALL INSTRUCTIONS AND WARNING LABELS MUST BE OBSERVED.

Drive-Master Co., Inc. reserves the right to discontinue sales to parties that do not follow the warnings contained herein.

PARTS LIST *, **:

XL-A. BRAKE ASSEMBLY
- A1. Right side bar w/drilled holes
- ** A2. Left-side bar w/threaded holes, threaded adjustment and nut
- A3. Bolts
- ** A4. Brake toe piece

XL-B. STEERING COLUMN CLAMP ASSEMBLY
- B1/2. Clamp body/sliding "V" block
- B3. Main bolt
- B3A. Lock nut
- B4. Saddle w/bolt and locking washer
- B5. Strap
- B6. Caravan clamp
- B7. L Bracket assembly
- B8. FWD clamp
- B9. 1997 E-150 clamp & mounting assembly

XL-C. SUPPORT ROD, COMPLETE WITH HEAD
- CU. Universal style
- CSU. Special universal style
- CS. Straight
- CA1. Angled 3" (most Fords & GM)
- CA2. Angled 6" (most Chrysler)

XL-D. HANDLE ASSEMBLY
- D1. Handle
- D2. Stop nut (Items D2 and D3 must be replaced if unit is
- D3. Cotter pin disassembled or transferred to another vehicle)

XL-E. BRAKE PUSH ROD ASSEMBLY
- ** E1. Threaded adjustment w/swivel bearing connector
- E2. Locking nut
- E3. Gas chain attaching collar w/screw
- E4. Tubing

XL-G. HANDLE EXTENSION ASSEMBLY
- G1. Grip
- G2. Handle Extension

XL-H. GAS PEDAL CLAMP ASSEMBLY **

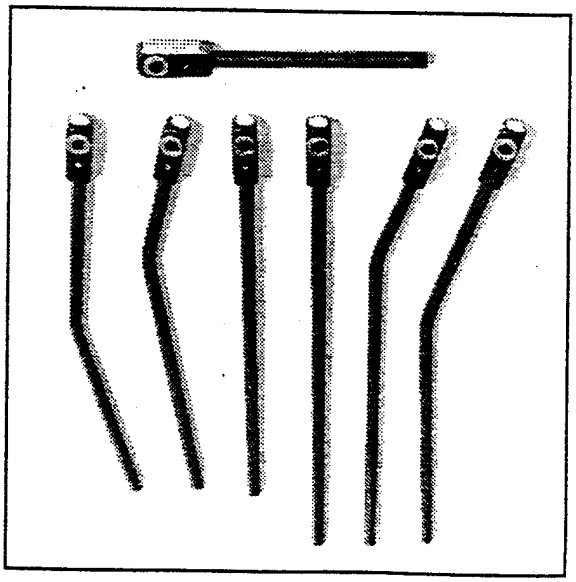
XL-I. GAS PUSH ROD ASSEMBLY
- I1. 12" push rod
- I2. Ball joint (2)

XL-J. PIVOT BOLT HANGER ASSEMBLY

XL-K. GAS CROSS ARM TO CHAIN

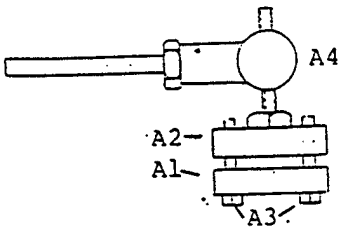
XL-L. GAS CROSS ARM FOR BALL JOINT

XL-M. GAS CHAIN

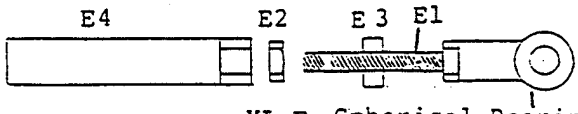


* Please order parts by part number. Preface ALL part numbers with XL
** Parts are available ONLY as an assembled unit.

XL-A Brake Assembly

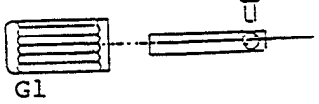


XL-E Brake Push Rod Assembly

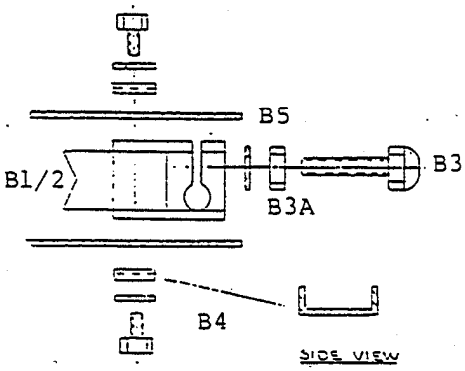


XL-F Spherical Bearing Connecto

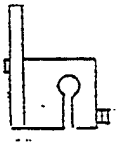
XL-G Handle Extension



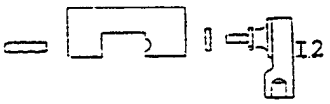
XL-B Steering Column Clamp Assembly



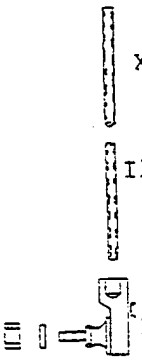
FWD Clamp



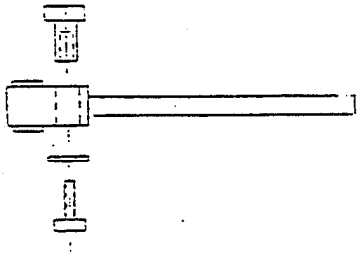
XL-H Gas Pedal Clamp Assembly



XL-I Gas Push Rc Assembly



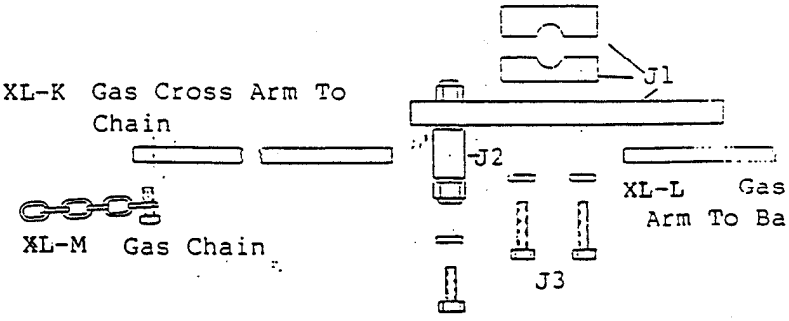
XL-C Support Rod Complete w/head



XL-J Pivot Bolt Hanger Assembly

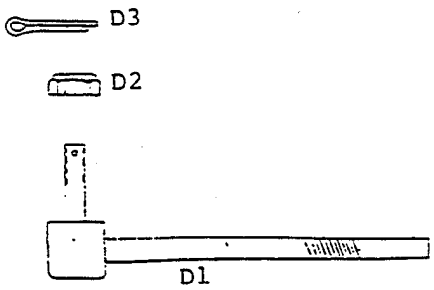
XL-K Gas Cross Arm To Chain

XL-M Gas Chain

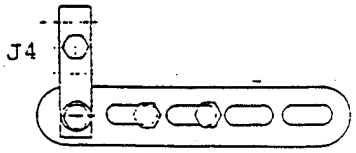


XL-L Gas Cross Arm To Ball Jo

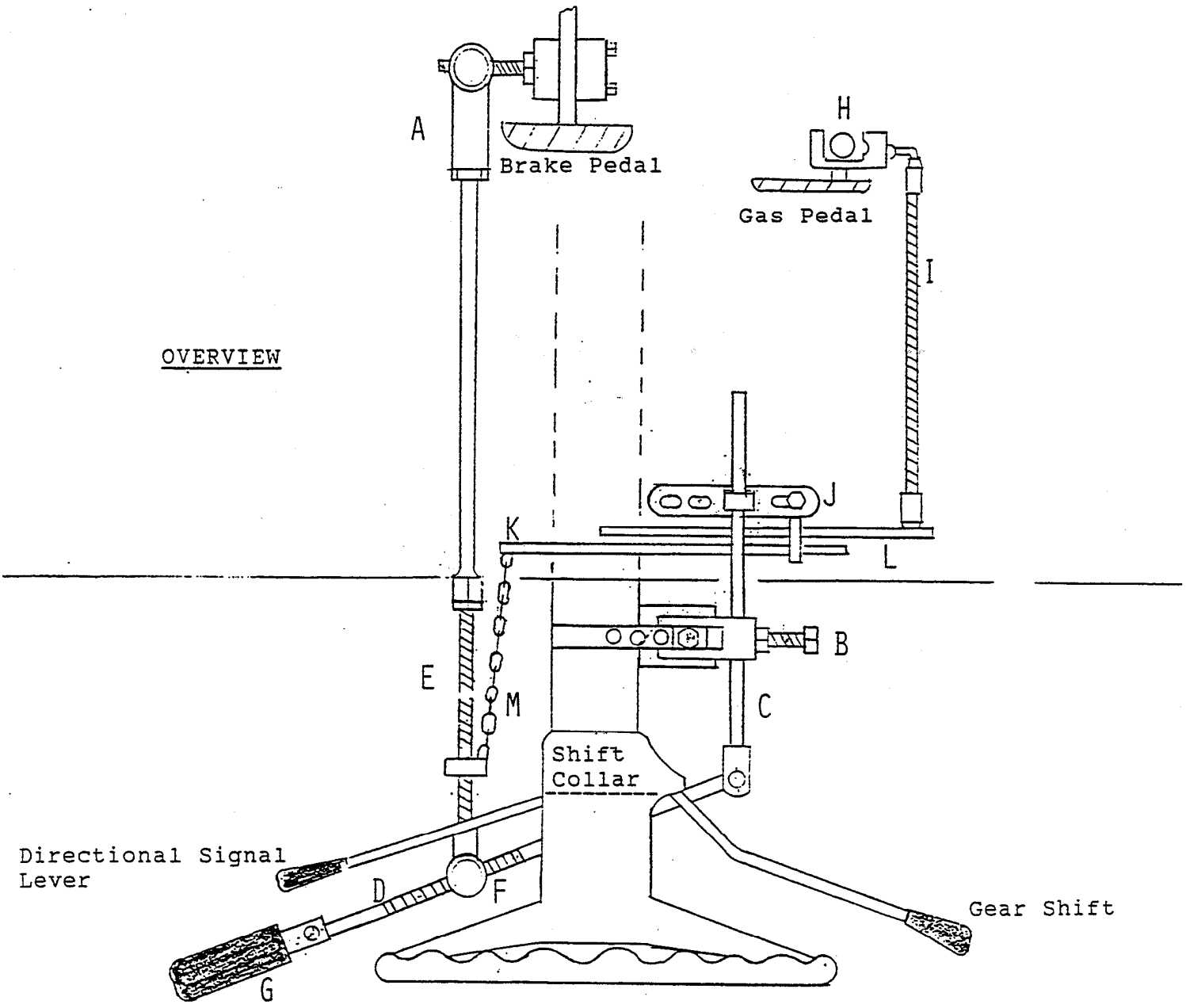
XL-D Handle Assembly

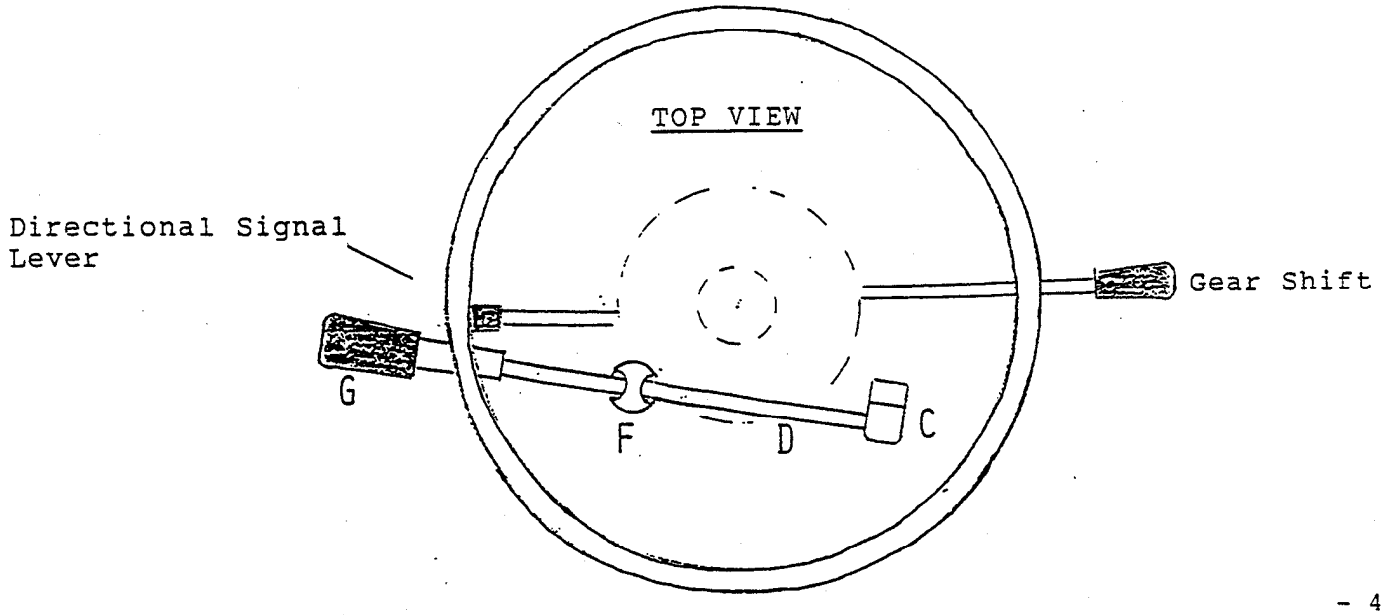


XL-J Underside View With Pivot to Lef



Drive-Master XL Parts Placement Diagram





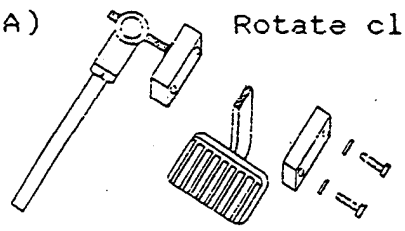
If you have specified year, make, and model, all the proper parts will have been included in your shipment. If, however, you are transferring a hand control, please call Drive-Master for the correct parts. All instructions herein refer to left hand installations only. Special parts and instructions will be shipped to those needing right hand installation.

IF, AT ANY POINT, YOU HAVE A QUESTION, CALL DRIVE-MASTER (973-808-9709) AND ASK FOR ASSISTANCE FROM THE HAND CONTROL DEPARTMENT.

Step 1 - Item A Brake Assembly: Install brake assembly (A) on shaft above brake pedal pad with brake toe piece (A4) to the left of the shaft. If it is necessary to adjust position of the connector (A4), loosen and remove the assembly from the pedal shaft. Rotate the brake bracket assembly in the connector to move it to the left or right. DO NOT ATTEMPT TO REMOVE THE THREADED ROD FROM THE BRAKE ASSEMBLY.

Refer to the diagram below for proper positioning of brake assembly (A).

(A) Rotate clockwise/counterclockwise for left/right positioning

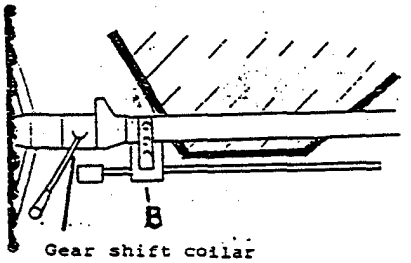


Step 2 - Item B Steering Column Clamp: Depending upon the type of vehicle you ordered the hand control for, you will have received one of 6 (six) clamp styles. You will have either the standard steering column clamp (B) and strap (B5); the FWD clamp (B8) which attaches to the steering column with the bolts supplied; the long or short V (B1/2); the Caravan clamp (B6); the L Bracket and hardware (B7) or the 1997 E150 clamp and mount assembly (B9). Note: FWD clamps apply only to some GM vehicles; not all front wheel drive vehicles require this part.

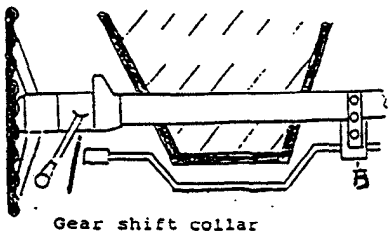
Standard steering column clamp (B) installation: Recommended location for the steering column clamp varies from model to model and year to year. Therefore, we can only give you guidelines and examples. Use your own good judgement and common sense or call us if there is a problem.

DRIVE-MASTER ULTRA-LITE XL HAND CONTROL INSTALLATION INSTRUCTIONS cont'd:

Refer to the diagram below for suggested placement of steering column clamp



Gear shift collar



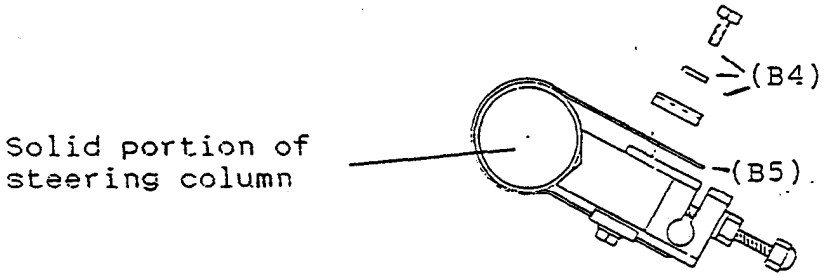
Gear shift collar

On some vehicles, there is room in front of the dashboard - mount clamp (B) there. Otherwise, you will always find a few inches of clear solid column somewhere between the firewall and/or just down the column from a wiring harness. Sometimes it may be necessary to slip the 1" stainless steel strap (B5) underneath some wires or control cables. NEVER put the strap or clamp so it pinches ANYTHING against the solid column. NEVER install the strap provided, or any other strap, on the gear shift collar.

Position the clamp body (B1/2) at 3 or 4 o'clock with the milled slot facing UP. Put the strap (B5) around the column and attach each end of it UNDER each of the two saddles (B4); one on the top and one on the bottom. Pull as tightly as possible around the steering column. Tighten saddle bolts (B4) completely at this time. Take up any slack in the strap by GENTLY tightening the horizontal main bolt (B3) to expand the clamp. Leave snug for now - TIGHTEN COMPLETELY LATER.

Refer to the diagram below for proper positioning of steering column clamp (B) on the steering column.

CAUTION: DO NOT OVERTIGHTEN STRAP CLAMP. SOME FOREIGN CAR STEERING COLUMNS CAN BE CRUSHED. IE.: VOLVO AND OTHERS.

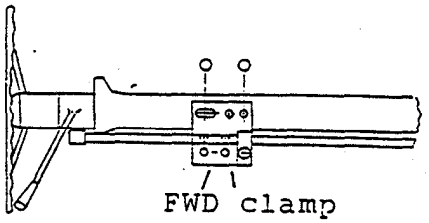


On small Fords - Tempo, Escort, Topaz, Lynx, EXP. - remove panel covering dash below steering column. DO NOT replace dash panel after installing the hand control as it will prevent proper action of the hand control. On some models there is a metal brace for the dash panel. To allow for free movement of the hand control, it will be necessary to cut off this brace. It will be easier if you perform these operations before going on to the next installation step.

FWD Clamp Installation:

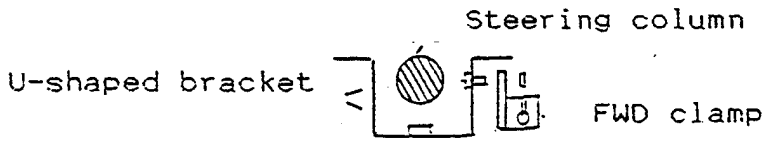
The clamp is mounted on the car's steering column support bracket located directly behind the dashboard face. The two gold colored metric bolts (13mm heads) on the right side must be removed. Our mounting plate should then be attached using the longer bolts we have supplied. DO NOT tighten completely until support rod (C) is in place (Step 3). Refer to the diagram below for proper placement of FWD clamp.

FWD clamp mounted on steering column support bracket:



Clamp will be mounted to the U-shaped bracket holding the steering column to the dash. Remove the plastic wiring harness cover. Insert the bolts supplied through the U-shaped bracket from the INSIDE (closest to the column) to the OUTSIDE (away from the column).

FWD clamp mounted on U-shaped column bracket:



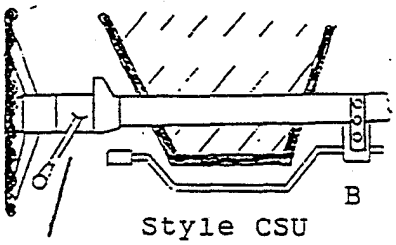
REGARDLESS OF VEHICLE IN WHICH THE STEERING COLUMN CLAMP IS BEING INSTALLED, REMEMBER - THIS IS THE ANCHOR THAT HOLDS THE WHOLE DEVICE IN PLACE. IT DESERVES SPECIAL ATTENTION. BE CERTAIN THAT THE CLAMP IS SECURE, DOES NOT CRUSH ANY WIRES OR CABLES, AND IS NOT INSTALLED ON THE GEAR SHIFT COLLAR OR IN A POSITION WHERE IT WILL INTERFERE WITH THE GEAR SHIFT SYSTEM.

CAUTION: BE CAREFUL WHEN USING STRAP CLAMP IN 1996 CHRYSLER. STRAP CAN RUB AGAINST MOVEABLE END OF SHIFT CABLE AND SNAP PLASTIC GUIDE.

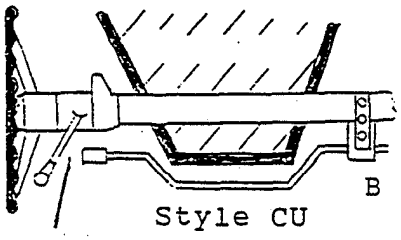
TO CHECK CABLE OPERATION: APPLY PARKING BRAKE. CHECK CAREFULLY AFTER INSTALLATION. SHIFT VEHICLE WITH KEY ON AND OBSERVE MOVEMENT OF CABLE (WITH VEHICLE ENGINE NOT RUNNING).

Step 3 - Item C Support Rod: Depending upon the type of vehicle you ordered the hand control for, you will have received one of seven (7) standard support rod styles. If you are reinstalling the hand control from another vehicle it may be necessary to call Drive-Master for the correct support rod style. Examples of the seven support rod styles as they might appear installed in a vehicle are illustrated below.

Basic support rod (C) styles:



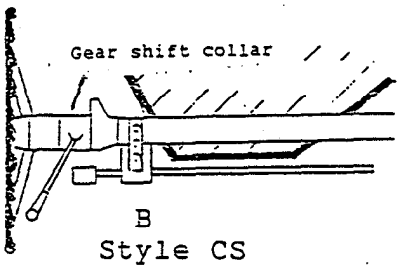
Style CSU



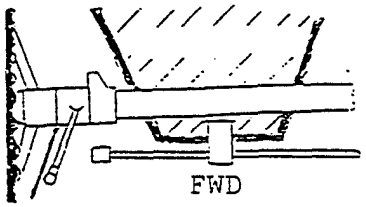
Style CU

Gear shift collar

Gear shift collar



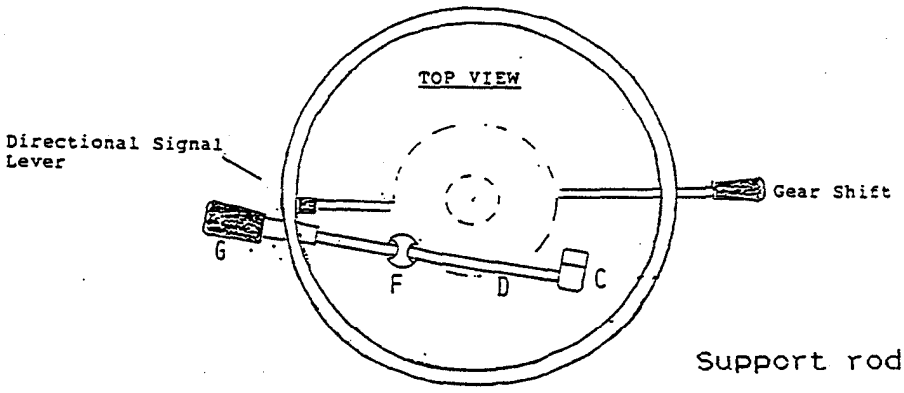
Style CS



Gear shift collar Style CA

Insert your support rod (C) into the steering column clamp clamp. The support rod (C) should come out from under the dashboard as close as possible to the bottom edge of the dashboard and should extend to a point just below and slightly forward of the pivot point of a column mounted gear selector. IT SHOULD NOT INTERFERE WITH FULL MOVEMENT OF THE SHIFT LEVER, THE IGNITION KEY OR SWITCH NOR SHOULD IT RUB ON THE STEERING COLUMN SURROUND.

Support rod head positioning:



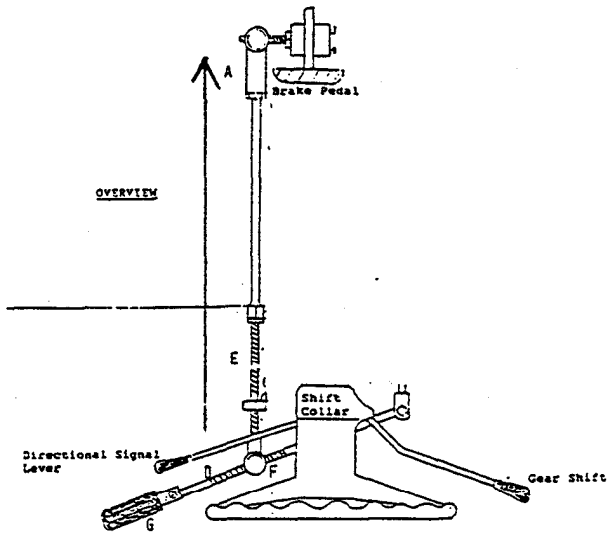
Support rod head

Set emergency brake and temporarily insert handle (D) into support rod (C) head. Put gear shift into lowest gear so that when you tighten the steering column clamp (B) or the FWD clamp, you will insure your handle and support rod head will not interfere with the gear shift. This will also allow you to position the handle (D) under the column cowl by the directional signal lever.

Finish tightening steering column clamp (B); saddle bolts (B4) IF NOT TIGHTENED PROPERLY, STRAP WILL STRETCH; main clamp bolt (B3) and locking nut (B3A), or finish tightening the center bolt of your FWD clamp. CHECK YOUR WORK CAREFULLY.

Steps 3 and 4 - Items D., A., and E. Handle Assembly, Brake Push Rod Assembly, and Brake Toe Piece: The brake toe piece (A4) slides into Brake tube (E4). Insert handle (D1) into support rod (C) head - again do not tighten the nut (D2) on the handle at this time. Now you can see where the connector (F) should be positioned on the handle to give the most direct push for braking action. See diagram below for proper placement of parts.

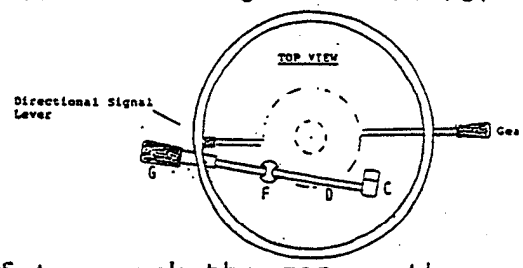
Placement of handle assembly (D), brake push rod assembly (E), and connector (F) and toe piece assembly (A).



Remove the handle (D) from the support rod head (C) and thread it into connector (F). Reinsert the handle into the support rod head and hand tighten the stop nut (D2). Do not fully tighten the nut or use the cotter pin (D3) at this time.

Step 5 - Item G Handle Extension: Attach handle extension (G) so it reaches just past the rim of the steering wheel. See diagram below for proper positioning.

Proper position of handle extension (G) and rim of steering wheel:



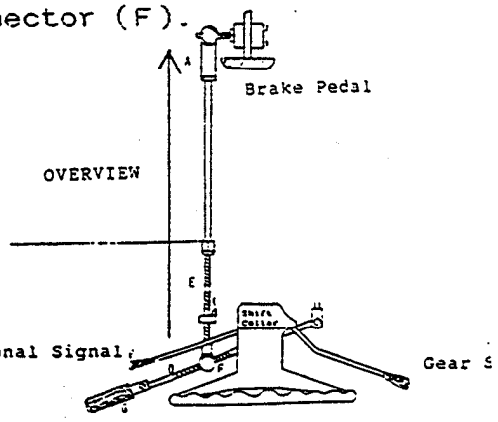
When handle is pulled toward the driver - as if to work the gas - there should be absolutely NO chance that the handle can come up INSIDE the steering wheel. If the car has a tile wheel, check all positions. Close the door and check to see that the handle clears arm rest, window crank, mirror adjustment, parking brake handle and the door itself. Put the turn signal lever in the left turn position and make certain the handle will clear this as well. MAKE SURE THE HANDLE CLEARS EVERYTHING IN ALL POSITIONS.

Step 6 - Items D , F , and E Adjustments for Brake Action: Adjust the handle position (D with G attached) using the threaded adjustment (E1) by repositioning the connector (F) on the handle (D). When adjusting threaded rod (E1) at least 2" of threaded rod must remain inside the brake tubing (E4). For your convenience, the black threaded adjustment has been marked with silver to indicate the maximum extension. If the threaded rod shows silver threads you have gone beyond the maximum extension. Shorten the length of the threaded adjustment (E1) until no silver threads are visible.

Set the length of push rod (E) so the end of the handle extension is 5" to 7" from the rim of the wheel. Whenever possible, it should be set for the span of the driver's hand when the control is at rest. Thumb should rest on the rim of the wheel and the little finger should just touch the end of the handle extension (G). This will give a comfortable position when driving.

Connector (F) adjusts the leverage applied to the brake. Usual position is about the middle of the handle (D). Moving it closer to the support rod (C) head increases the leverage and makes it easier to work the brake BUT it also increases the distance the handle will have to travel to apply the brakes. Moving the connector (F) closer to the handle extension reverses both results; harder to work but shorter to push. To adjust the position of connector (F), remove the handle (D1) from the support rod (C) and rotate the handle to move connector (F) to the desired position. Reattach the handle to the support rod head but do not tighten or pin at this point. See diagram below for proper positioning of connector (F).

Proper position of connector (F) to give a direct push to the brake:



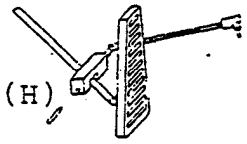
As you adjust the connector (F) you will notice you are also changing the position of the handle as it relates to the steering wheel. Therefore, all of these adjustments must be made in one operation. When you get the braking action working the way you want, make sure the handle also moves freely toward the wheel - as if you were applying the gas. Try the brakes without moving the car - use both foot pressure and the hand control. IF YOU FEEL EVERYTHING IS PERFECT, GO BACK OVER EACH NUT, SCREW AND BOLT FOR FINAL TIGHTENING. FINAL ADJUSTMENT FOR STOP NUT D2 - TIGHTEN 9/16 NYLON LOCKNUT UNTIL HANDLE BINDS, THEN BACK OFF 1/6 OF A TURN OR UNTIL HANDLE IS JUST "FREE" IN SUPPORT ROD HEAD. INSERT THE SMALL COTTER PIN (D3) INTO THE HANDLE AT THE SUPPORT ROD HEAD (C) AND SAFETY SPREAD THE ENDS.

Step 7 - Item H Gas Pedal Clamp: Diagram A shows a typical installation on a car with suspended or hinged gas pedal. Attach clamp (H) to the factory gas linkage rod about an inch above the pivot point of the linkage rod and gas pedal, with the milled side facing the floor. This location will not interfere with the hinging action.

On most cars, the clamp is mounted with the ball joint (I2) to the right of the linkage rod. All Chrysler products (including Dodge and Plymouth) are exceptions. On these cars the ball joint (J2) is mounted to the left of the linkage rod as shown in diagram B. Gas rod to the right (standard mounting) of the gas pedal - Chrysler vehicles cut right side gas pedal in 1/4" and down 1 1/2" to make room for ball joint and gas rod. Be sure to get customer approval BEFORE cutting OEM gas pedal.

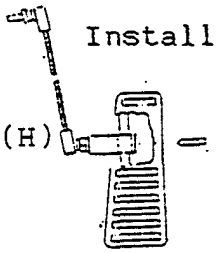
Typical installation:

A.



Installation on Chrysler:

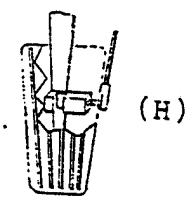
B.



Ford uses a U-shaped channel rather than a rod to suspend the gas pedal. On these cars install the gas clamp with the milled slot facing up. Put the clamp on the smallest part of the channel - under the pedal pad - and slide it toward the firewall until it is snug. Tighten the clamp until the cone point set screw digs into the channel BUT DO NOT OVERTIGHTEN SO AS TO CRUSH THE CHANNEL. If the channel is crushed, the clamp will not stay in place. On most Fords you will be able to mount the clamp as shown in diagram C - with the ball joint (J2) to the right of the gas linkage. On some vehicles the gas pedal clamp will not work due to unusually wide gas pedal bar. Remove gas clamp (H) and ball joint (I2). Use a straight ball joint and bolt through gas pedal bar. Sometimes this can also be done by bolting 90 degree ball joint to side of gas pedal bar. The configuration of the existing gas pedal and the transmission hump or engine cover will determine how the clamp will be installed.

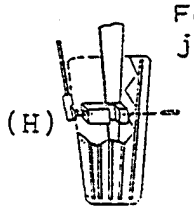
Typical installation on Ford:

C.



Installation on a Ford with ball joint to the left

D.

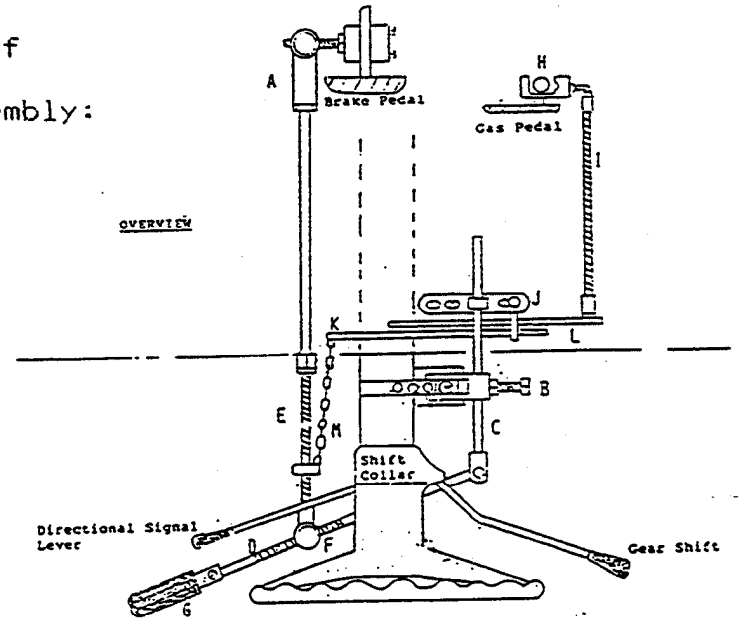


IN ALL CASES MAKE SURE NEITHER THE BALL JOINT (I2) NOR ANY PART OF THE CLAMP CAN TANGLE IN THE RUG OR MAT WHEN GAS PEDAL IS DEPRESSED. It may be necessary to slice the carpet to allow proper gas action. Use the Allen wrench supplied in the parts kit to tighten the clamp on the linkage rod.

Step 8 - Item I Gas Push Rod: Due to design modifications in many new cars, we have lengthened our gas push rod (I1) to 12". If you need a shorter piece, cut the rod to the needed length and file the end for proper size and fit. Using the gas pushrod (I1) as a guide, you should now see where to install the pivot bolt hanger assembly (J) on support rod (C). CAUTION: BALL JOINTS MUST BE SCREWED ON ALL THE WAY TO WITHIN 1/2 TURN OF TIGHT. IF THE THREADED ROD IS NOT GOING TO BE USED IN THIS FASHION, ADD A 1/4-20 NUT TO LOCK BALL JOINT TO THREADED ROD. THIS WILL PREVENT THREADED ROD FROM VIBRATING (UNSCREWING) OUT OF EITHER BALL JOINT CAUSING GAS FAILURE.

Step 9 - Items J, K, and L Pivot Bolt Hanger Assembly, Cross Arm to Chain and Cross Arm for Ball Joint: The pivot bolt hanger assembly (J) rod (C). Rods (K and L) should be parallel to the floor of the vehicle and at right angles to support rod (C). The diagram below shows proper positioning of the pivot bolt hanger assembly.

Placement of
Pivot Bolt
Hanger Assembly:

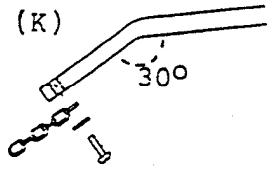


With suspended/hinged pedals, the length setting of the rods (K and L) will approximate that shown above. At this point, you can also determine if you have installed the gas pedal clamp (H) in a good place to prevent binding of the ball joints (I2) and to get proper alignment.

Ball joints (I2) MUST have free movement. Sometimes it may be necessary to unscrew one of the ball joints a half turn to correct binding.

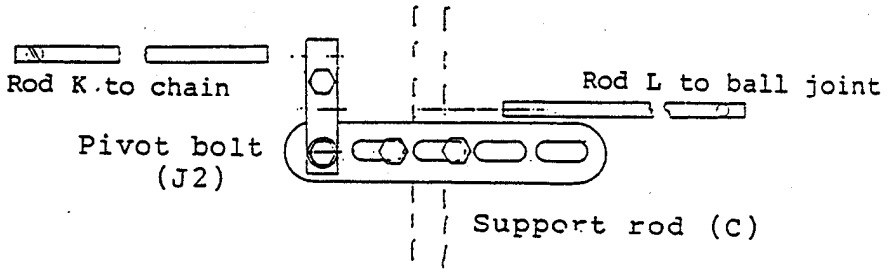
On some cars it will be necessary to move the hanger assembly (J) using the adjustable mounting slots on the hanger bar (J1). To further aid in alignment, it is sometimes helpful to shift the position of the pivot bolt (J2) to the left side of the support rod (C). If a low dash panel prevents proper action of rod (K) to the chain, you may have to bend rod (K) toward the floor as illustrated below.

Rod (K) bent approximately 30 degrees toward floor:

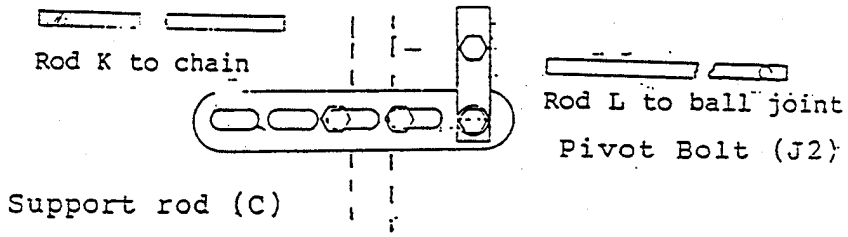


The diagrams below illustrate how the pivot bolt hanger assembly (J) may be assembled with the pivot (J2) to either the left or right of support rod (C).

Pivot bolt (J2) to the left of support rod (C):



Pivot bolt (J2) to the right of support rod (C):

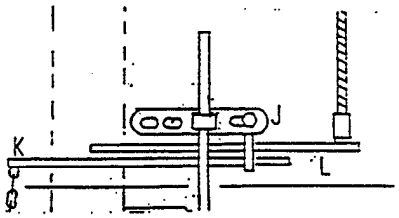


In some cases to will be necessary to remove a portion of the OEM heater and/or air conditioning duct system in order to avoid interference with the operation of the hanger assembly (J)) If necessary, angle the assembly with rods (K and L) pointed downward. Remove the underside dash panel completely, along with any metal mounting brackets. Any panels which are removed should be returned to the customer for reinstallation after the hand control is removed.

CAUTION: IN ALL CASES, MAKE SURE NOTHING HITS OR INTERFERES WITH THE OPERATION OF ANY COMPONENT (I., J., K., OR L.) OF THE COMPLETED GAS ASSEMBLY WHEN THE GAS PEDAL IS FULLY DEPRESSED, EITHER BY HAND OR FOOT OPERATION. MAKE CERTAIN NOTHING WILL IMPEDE ANY DRIVER'S FOOT AS IT MOVES FROM THE GAS PEDAL TO THE BRAKE PEDAL.

Step 10 - Item M Gas Chain: Upper end of the chain will be attached to threaded section of brake push rod (E) with attaching collar (E3). Cars with suspended/hinged pedals should have rods (K and L) set as shown in the diagram below; very short on the right side and approximately three times as long on the left side.

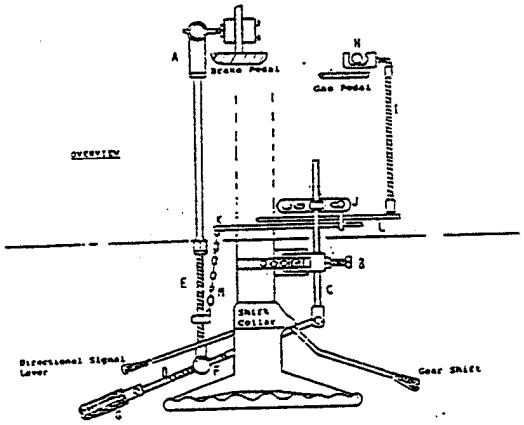
Typical setting for rods (K and L):



It is the relationship of these rods (K and L) to each other and their relative positions to the pivot bolt which affect the leverage and allow you to get the proper gas action.

Set the rods (K and L) so they push and pull in the most direct line possible. Rod (L) with the ball joint should be lined up so it pushes straight toward the gas pedal. The point where the chain (M) attaches to rod (K) should be lined up as nearly as possible to the point where the chain attaches to the threaded brake push rod (E). See diagram below for proper alignment.

Proper alignment of rod (L) with gas pedal clamp (H) and rod (K) with gas attaching collar on brake push rod (E):



Sliding rod (K) to the left makes the pulling action for gas easier but increases the distance the handle must move. Sliding rod (L) to the right decreases the distance the handle must move, but increases the force required. You may have to make several adjustments before proper, easy action is achieved.

CAUTION: THE CHAIN MUST NOT RUB OR CATCH ON ANY PART OF THE CAR, WHETHER OPERATED BY HAND CONTROL OR FOOT PEDAL. CUT EXCESS CHAIN.

WARNING: WITH THE GAS PEDAL PUSHED FIRMLY TO THE FLOOR, EITHER BY HAND OR FOOT, THE PIVOT ASSEMBLY (J) AND RODS (K AND L) SHOULD NOT ROTATE MORE THAN 45 DEGREES, OR IT MAY SWING PAST CENTER, LOCKING THE GAS TO THE FLOOR. CHECK THIS CAREFULLY BY FORCING THE ASSEMBLY TO ROTATE AS FAR AS YOU CAN. IF ASSEMBLY CAN BE FORCED OVER CENTER, YOU MUST RE-ADJUST YOUR ROD (K AND L) POSITIONS.

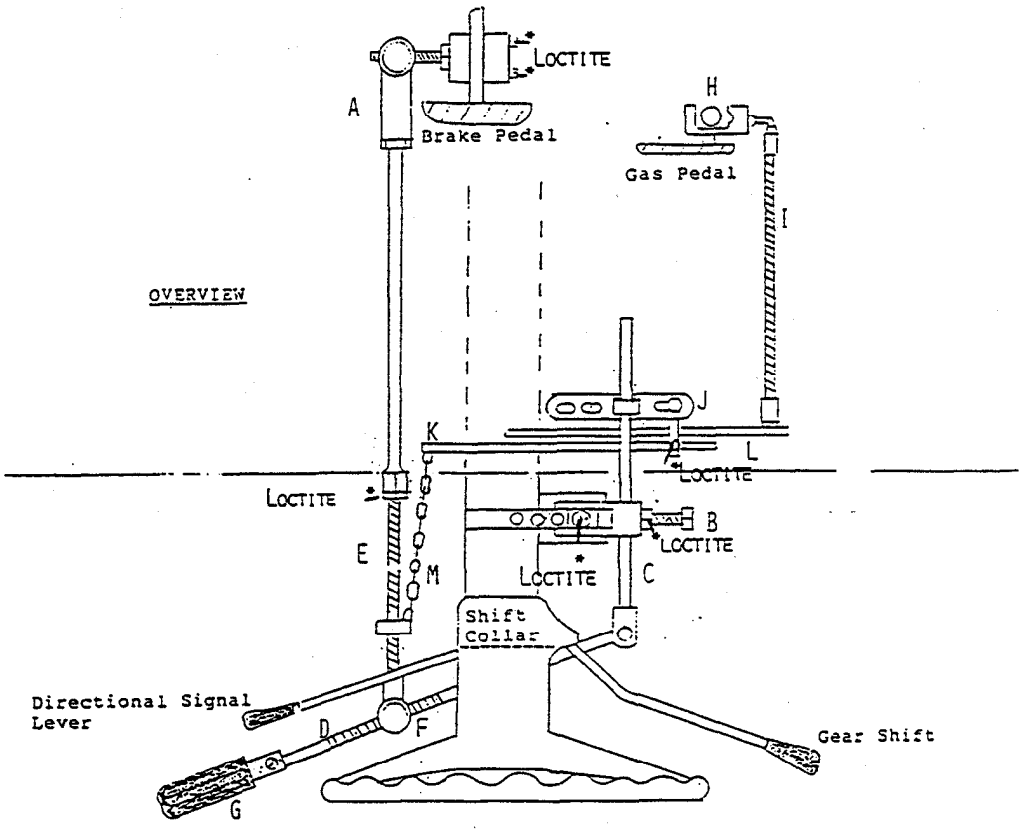
DRIVE-MASTER ULTRA-LITE XL HAND CONTROL INSTALLATION INSTRUCTIONS cont'd:

Step 11 - Quality Control: Using the check list provided, go over all nuts, bolts, screws, and fasteners for proper tightness. CUT OFF ANY EXCESS CHAIN. CHECK ALL FASTENERS AND MAKE SURE THE COTTER PIN (D3) HAS BEEN MADE SAFE (SPREAD OPEN) BEFORE YOU GO ON TO STEP 12.

Step 12 - Test Drive: Now test drive the vehicle, first checking that it stops properly. Put the vehicle through a series of starts and stops, do a HARD PANIC stop, see that the car can achieve passing gear, and check for proper action on both straight-always and around corners. REPEAT SEVERAL TIMES USING HAND CONTROLS FOR GAS AND BRAKE, THEN USING FOOT CONTROLS.

After you are completely satisfied that your installation is correct and safe, apply the Loctite provided in the parts kit to the threaded fasteners which are asterisked in the diagram below. DO NOT APPLY LOCTITE TO THE PIVOT BOLT (J2) OR TO THE HANDLE ASSEMBLY (D).

Apply Loctite ONLY to those areas indicated:



PLEASE PASS THIS INSTRUCTION BOOKLET ALONG TO THE CONSUMER FOR THEIR FILES.

XL PARTS KIT - CONTENTS and APPLICATION:

(1) 1/8" allen key for gas pedal clamp (H).

(2) 1/16" dia. x 1/2" long cotter pin. One to be used to secure handle (D) in support rod (C) - one as a spare.

(1) tube Loctite to be used ONLY according to the instructions for Step 12.

Tools helpful for Ultra-Lite XL hand control installation:

(1) 3/8" open wrench

(1) 7/16" open end wrench

(1) 1/2" open end wrench

(1) 9/16" open end wrench

(1) 5/8" open end wrench

(1) 6" adjustable wrench

(1) common screwdriver

(1) pair of pliers to cut chain

PRO TIPS:

Long V is usually used in conjunction with universal support rod to help prevent cutting dash.

When gas clamp won't fit pedal, try or request a straight ball joint through pedal or bolt 90 degree ball joint through side of pedal arm.

Install hand control with tilt wheel all the way down - when possible.

Do not tighten threaded gas rod ball joint back off 1/2 turn for full ball joint action.

When test driving vehicle and applying brakes, make sure your hand does not hit dash. If it does, readjust brake rod.

BULLETIN

WHEN INSTALLING HAND CONTROLS (SPECIFICALLY WHEN MOUNTING CLAMPS ON THE STEERING COLUMN) BE ESPECIALLY CAREFUL ON VEHICLES WITH AIR BAGS. DO NOT CUT, CRIMP, OR SHORT OUT WIRES THAT ARE INVOLVED WITH THE AIR BAG TRIGGERING SYSTEM. IT WILL DEPLOY!

We strongly urge that you call or refer to the vehicle's motor manual (or similar technical reference) to be sure you have the correct wires for horn, dimmer, or electronic directionals.

QUALITY CONTROL CHECK LIST AND TORQUE VALUES

DO NOT ASSUME ANYTHING IS TIGHT. GO OVER EACH NUT, BOLT, SCREW AND FASTENER ACCORDING TO THIS CHECKLIST. OBSERVE ALL RECOMMENDED TORQUE VALUES.

		CHECKED
XL-A	BRAKE ASSEMBLY, TWO (2) BOLTS (A3) 275 INCH POUNDS EACH	_____
XL-B	STEERING COLUMN CLAMP ASSEMBLY:	
	MAIN BOLT (B3) 125 INCH POUNDS	_____
	LOCK NUT (B3A) 250 INCH POUNDS	_____
	SADDLE BOLTS (B4) 200 INCH POUNDS EACH	_____
XL-D	HANDLE ASSEMBLY:	
	STOP NUT (D2) 200 INCH POUNDS	_____
	COTTER PIN (D3) PROPERLY SAFE (SPREAD OPEN)	_____
XL-E	BRAKE PUSH ROD ASSEMBLY:	
	LOCKING NUT (E2) 150 INCH POUNDS	_____
	GAS CHAIN ATTACHING COLLAR (E3) 30 INCH POUNDS	_____
XL-G	HANDLE EXTENSION, TWO (2) SCREWS, 25 INCH POUNDS EACH	_____
XL-H	GAS PEDAL CLAMP SET SCREW, 50 INCH POUNDS	_____
XL-I	GAS PUSH ROD BALL JOINTS (I2) 100 INCH POUNDS EACH	_____
XL-J	PIVOT BOLT HANGER ASSEMBLY:	
	TWO (2) BOLTS (J3) 175 INCH POUNDS EACH	_____
	CROSS ARM LOCKING BOLT (J4) 150 INCH POUNDS	_____
XL-K	GAS CROSS ARM TO CHAIN, SCREW AND WASHER, 30 INCH POUNDS	_____
	WARNING LABEL - ENCLOSED IN PLASTIC ENVELOPE AND READS AS FOLLOWS:	
	WARNING: THIS VEHICLE EQUIPPED FOR USE BY HANDICAPPED AND NOT TO BE USED BY THOSE UNTRAINED IN IT'S USE.	
	AFFIXED TO DASH OR A PLACE WHERE REFLECTIONS ARE NOT A HAZARD.	_____

ULTRA-LITE XL SERIAL #_____

QUALITY CONTROL CHECKLIST COMPLETED BY _____
SIGNATURE

HAND CONTROL INSTALLED BY _____
SIGNATURE

DATE _____

INSTALLER: PLEASE PASS THIS INSTRUCTION BOOKLET, WARRANTY AND OPERATING INSTRUCTIONS ON TO THE ULTIMATE CONSUMER.

DRIVE-MASTER ULTRA-LITE HAND CONTROL OPERATING INSTRUCTIONS

THE OPERATION OF THE ULTRA-LITE XL HAND CONTROL IS VERY BASIC:

1. USING ONE HAND IN A GRIPPING MOTION, PULL THE LEVER OF THE HAND CONTROL TOWARD THE VEHICLE STEERING WHEEL TO ACCELERATE.

2. GRIPPING THE HAND CONTROL IN THE SAME MANNER, PUSH THE LEVER OF THE HAND CONTROL TOWARD THE DASHBOARD OF THE CAR TO APPLY THE BRAKE.

A MESSAGE TO THE USER -

YOUR DRIVE-MASTER ULTRA-LITE XL SHOULD HAVE BEEN INSTALLED SO THAT:

1. THERE ARE NO OBSTRUCTIONS TO EITHER THE ACCELERATION OR BRAKING OPERATIONS OF THE HAND CONTROL.

2. THERE ARE NO OBSTRUCTIONS TO YOU WHEN YOU ENTER OR LEAVE THE VEHICLE.

3. THE ACCELERATION/BRAKING LEVER IS IN A COMFORTABLE POSITION FOR YOU TO ACCOMPLISH BOTH THOSE OPERATIONS COMPLETELY AND REPEATEDLY.

DO NOT LEAVE YOUR DEALER UNTIL THESE THREE THINGS ARE DONE TO YOUR SATISFACTION!

Make:_____

Model:_____

Drive-Master
HCDM01
Hand Control Application Guide

Year	Strap Clamp -- Long V	Strap Clamp -- Short V	L Bracket Clamp	FWD Clamp	11" Tube Brake Assembly	14" Tube Brake Assembly	Universal Support Rod	15" Support Rod	18" Support Rod	13" Handle	Handle Extension	Gas Assembly	Angled 15" Support Rod	Angled 18" Support Rod	Bent Threaded Adjustment
1985															
1986															
1987															
1988															
1989															
1990															
1991															
1992															
1993															
1994															
1995															
1996															
1997															
1998															
1999															
2000															

Special Instructions:

_____

_____

_____

_____

_____

_____

DRIVE-MASTER CO. INC.

ULTRA-LITE XL HAND CONTROL INSTALLATION INSTRUCTIONS

WINDSTAR - ADDENDUM

Remove Plastic Panel (Knee Bolster) under steering column.

Remove metal plate behind plastic panel to expose under side of steering column.

Under the column, find large shiny black plate.

Mounting of Main Clamp - Mounting clamp is assembled as needed for Windstar installation. - Position 1/2" main rod mounting hole so main rod will be parallel with steering column. Using the mounting plate as a template, drill two (2) 5/16" holes - approximately 2" in from the right side of the large shiny black plate. Mount clamp to plate and tighten the two 5/16-18 grade 8 mounting bolts, lockwashers, and stop nuts supplied, dead tight torque to 30 foot pounds.

Start vehicle and rotate steering wheel so large opening is to your right. Slide main support rod into mounting block's 1/2" hole. Follow standard instructions to complete installation.

NOTES:

The lower dash panel support stays on the vehicle. Relocate Ford computer test port. Suggestion after removing, relocate port and wire harness to behind right side kick panel by gas pedal.

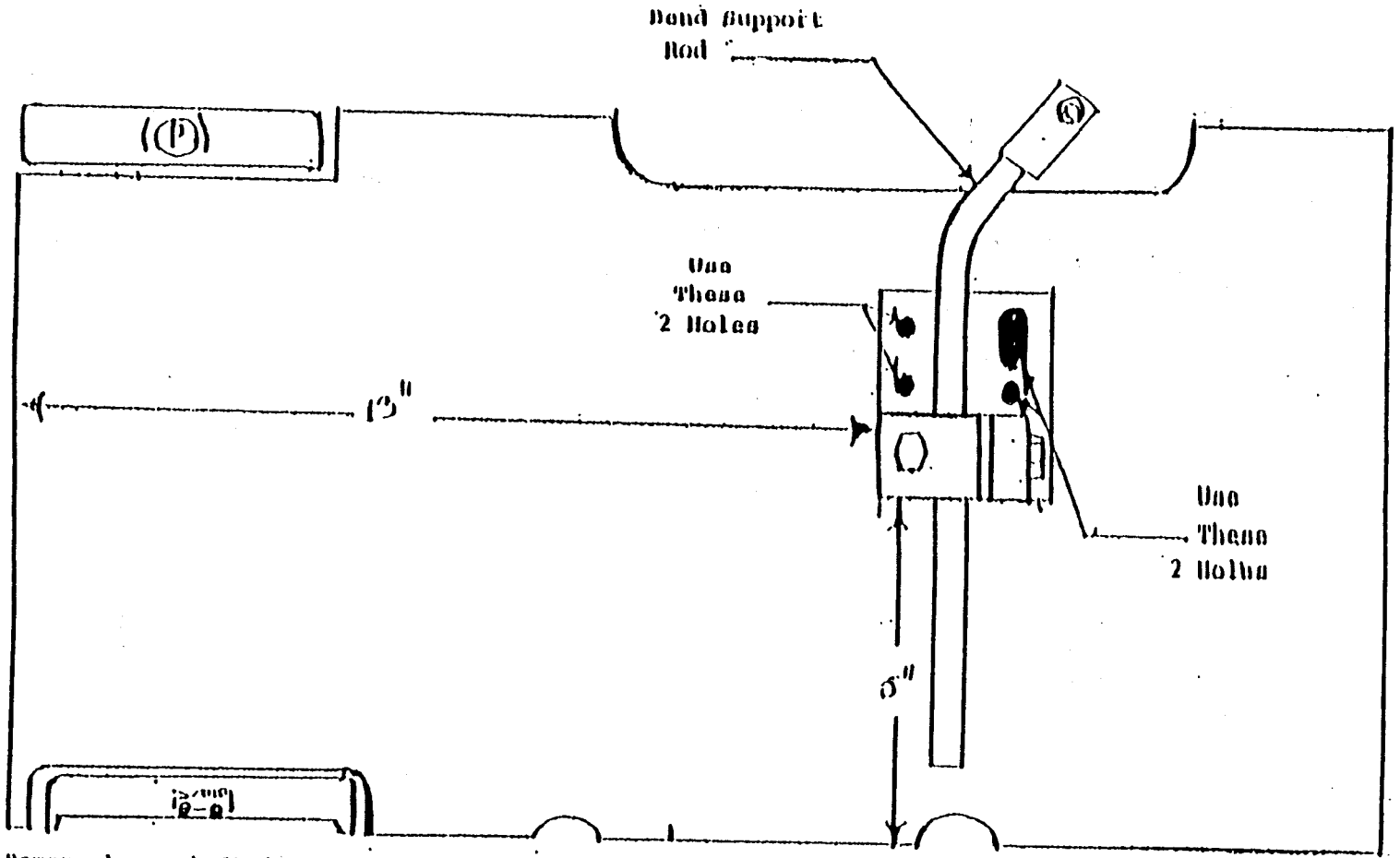
Using copper colored wire supplied, after cutting chain to length, tie off to last link and cut piece of tubing supplied - pull over chain. This will prevent chain links catching on lower panel support.

Once hand control is mounted, adjusted, and checked per check list, cut original dash panel to fit around hand control. Remount panel making sure brake rod does not rub when push or pulling on handle of hand control. This is important as the possibility exists to limit the travel needed for gas and brake.

PARTS:

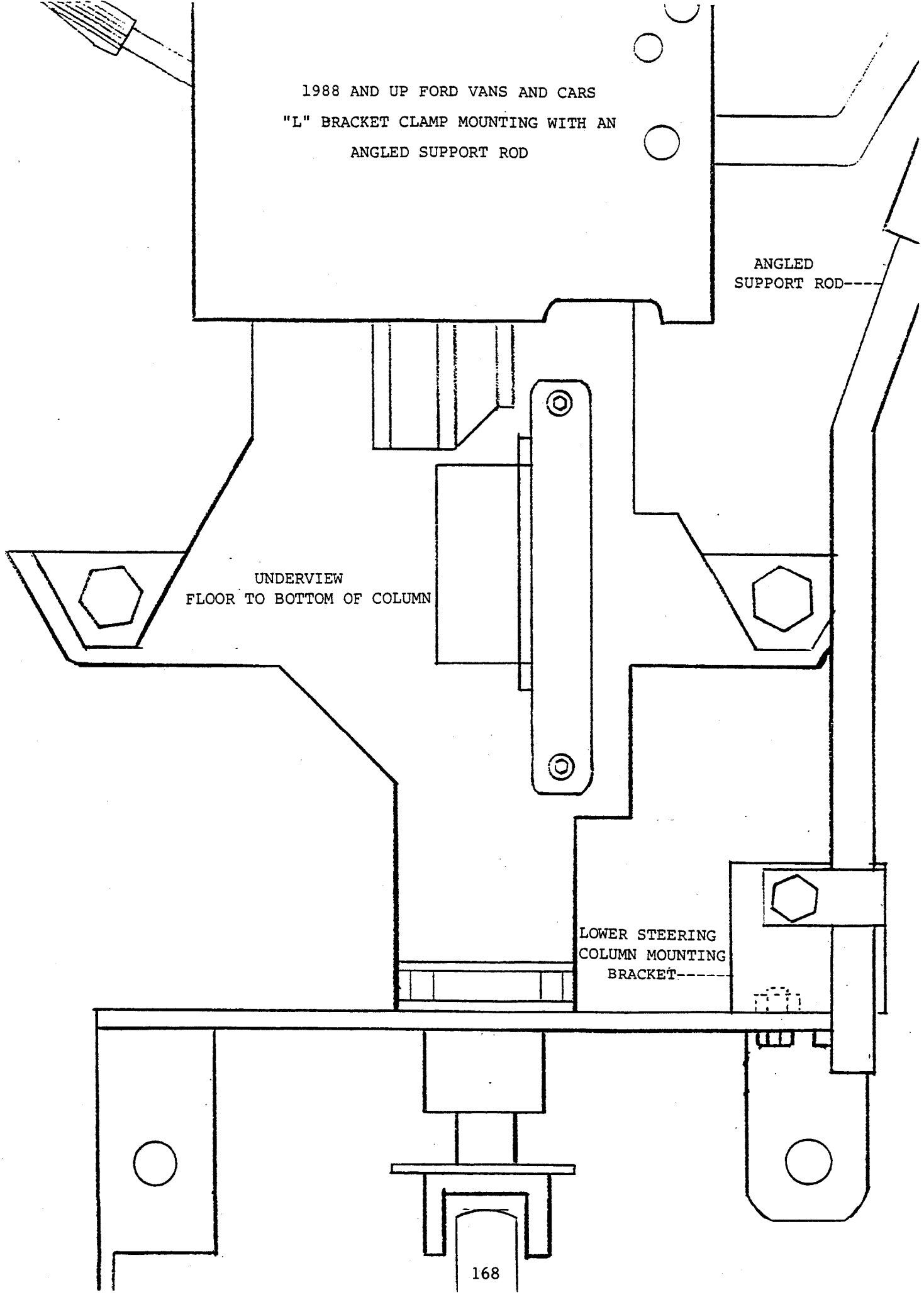
1 - FWD Bracket and Regular Clamp bolted together, clamp laying down.
1 - Straight Support Rod
1 - 11" Brake Tube
1 - 18" Weld Wire
1 - 10" Shrink Tube to fit over chain

And Clamp Location



Remove lower left (black) wire cover box to access nuts. Bolt on clamp to knee bolster, using the following hardware: 4 - 5/16-18x1¼
4 - 5/16 stop nuts
8 - 5/16 flat washers

1988 AND UP FORD VANS AND CARS
"L" BRACKET CLAMP MOUNTING WITH AN
ANGLED SUPPORT ROD



Hand Control #3

Manufacturing and Production Services Corp.

Monarch Mark I-A

MONARCH MARK 1A

INSTALLATION INSTRUCTIONS

AND PARTS LIST

BEGINNING WITH SERIAL No. 10,500

–READ CAREFULLY–

MANUFACTURING AND PRODUCTION SERVICES CORP.
7948 Ronson Road • San Diego, CA 92111
(619) 292-1423
(800) 243-4051
FAX (619) 292-7034

Contents

Supplement

VEHICLE	ADAPTER				BENT BRAKE ROD	NOTES
	YEAR	A	EARS	B		
Nissan	All					
Quest	92-95	✔	7"			
Quest	96-98			✔	✔	
Saab	All			✔	✔	
Toyota	All			✔	✔	94-98 Cut B Mount - Bent Handle
Saturn	92-95			✔		Long Side B Mount
Saturn	96-98			✔	✔	Long Side B Mount
Kia	All			✔	✔	
Lexus 400	92-94	✔	Special			Lexus Mount
Lexus 400	95-98			✔	✔	Cut B Mount

Supplement

VEHICLE	ADAPTER				BENT BRAKE ROD	NOTES
	YEAR	A	EARS	B		
Acura						
Legend	91-93	✔	Special		✔	
Legend	94-98			✔	✔	Call MPS
Integra	90-98			✔	✔	
Chrysler Plymouth						
Chrysler Full Size Van	85-95			✔		95 BB Rod
Chrysler Full Size Van	96-98	✔			✔	Spec Dodge Ear
Voyager/ Caravan	All			✔		96-98 Cut Down B Mount
Intrepid	All			✔	✔	
Cirrus	97-98			✔	✔	Wide Acc. Clamp
Breeze	97-98			✔	✔	Wide Acc. Clamp
Sebring	97-98			✔	✔	Wide Acc. Clamp
Stratus	97-98			✔	✔	Wide Acc. Clamp
Stealth	All			✔	✔	
Spirit	All			✔		
Shadow	All			✔		
Colt	All			✔		
La Baron	All			✔		
La Baron	90-97			✔	✔	
Full Size Truck	98			✔	✔	GM 29
Dakota	98			✔	✔	
Durango	98			✔	✔	
Volkswagon	-					
Euro Van	92-97	✔	Special			
Honda						
Accord	90-93			✔		
Accord	94-98			Long Side	✔	Bent Handle
Civic	93-98			Long Side	✔	Long Side B - Bent Handle
Mazda	All			✔		
Volvo						Call MPS
740		✔	Special			
960 & 850				✔	✔	
Subaru	All			✔		
GL Wagon	87-91	✔	Special			
GL Wagon	92-98	✔	Special			
Mitsubishi	All			✔	✔	
Hyundai	All			✔	✔	
Renault	All			✔		
Isuzu	All			✔		
BMW	All			✔	✔	
Mercedes	All			✔	✔	

Introduction

The MPS MONARCH MARK IA must be used on vehicles equipped with an automatic type transmission only.

The MPS MONARCH MARK IA automotive hand control was developed specifically to enable physically handicapped persons to drive their own vehicles. Most persons who can steer a car safely and confidently can become excellent drivers with this unit. The vehicle on which this device is to be installed should be in good working condition. If it is expected the brakes need repair, this should be accomplished before this control is installed. Although power steering and power brakes are not necessary for persons with adequate arm, hand, and wrist strength they are highly recommended.

Before you can begin installing the hand control, the lower dash must be removed on most vehicles to expose the Steering Column. Now determine which mount is to be used, A or B Adapter. Find the proper place to mount Adapter to Steering Column. Follow directions on Adapter Installation, Figs. 1 thru 5. Air Conditioning Vents and other obstructions may have to be removed or remounted.

Once Hand control is installed the dash panel will have to be modified to be replaced. Make sure nothing interferes with Accelerator or brake functions.

Before attempting to install this device read all instructions carefully and study the parts drawing. Note how the unit is assembled and the relationship between parts. Throughout the text and illustrations part numbers are referenced to using the actual index numbers. This manual contains the main mounting adapters and a comprehensive list of the vehicle for which the mount is intended. Be certain your exact vehicle is listed on this list or elsewhere on or in the Container. Do not attempt to install this unit on a vehicle if you are not certain it is intended to be used on it. Any questions call MPS Corp.

To perform the installation you will need hex wrenches: 1/8", 5/32" and 3/16". Also required are two 7/16" open end wrenches, one 3/8" open end wrench, two 1/2" wrenches, and a 9/16" wrench. Installation of the dimmer switch will require a screw driver, good plastic tape, and a 5/16" socket wrench or nut driver for removal of the foot switch. A 3/8" drive socket set is very useful and any modification of the dash board or air conditioning ducting will require a hack saw or key hole metal cutting saw.

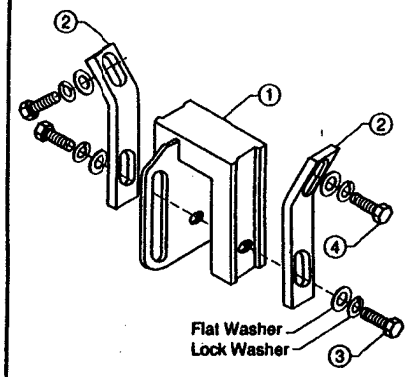
The performance of this device depends completely on the quality of the installation. Take your time and do an excellent job. This unit is adjustable to solve almost any installation problem.

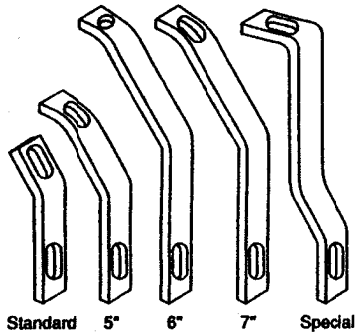
After installation has been completed be certain driver understands and is comfortable with the proper operation and position of hand control. (If driver is not, MPS highly recommends professional driver training.)

Driver must be familiar and completely comfortable with the operation and position of the hand control before operating vehicle.

"A" Mount Installation

Figure 1





Ears

All Ears will bolt to "A" Mount body.

Parts List

Part No.	Description
100 SM-1	Mounting Block
100 SM-2	Ears (2 reqd)
100 SM-3	3/4" H.T. Bolt (2 reqd)
100 SM-4	1" H.T. Bolt (2 reqd)

1. The "A" Mount body will adapt to a number of different size Ears. the proper Ears should have come with Hand Control when ordered.

A. REMOVE NEGATIVE SIDE OF BATTERY FOR AIR BAG BEFORE INSTALLATION. BE SURE TO RECONNECT AFTER INSTALLATION.

B. The "A" Mount fixture is secured to the same support which holds the steering column. Some model vehicles have studs to mount to. Other models may need longer bolts. See Fig. 3 & 4.

C. If necessary remove any decorative cover which may prevent access to the steering column support.

D. It must be determined which pair of mounting holes is best suited for a given installation. Hold the unit in mounted position (Fig. 2) in the upper pair of holes or studs and check for alignment. Now hold the unit in the lower pair of holes and check for the same alignment. (On the majority of installations the lower holes or studs are used.)

E. When determined which pair of holes or studs will provide the most satisfactory installation, remove the hex head bolts or nuts from the steering column support.

F. Loosen all bolts in the mounting fixture. Secure the fixture to the steering column using original nuts or the 1" or 2" bolts and the 5/16" flat and lock washers provided. The new mounting fixture bolts should not protrude into the steering column any further than the original bolts.

G. Push the fixture against the column support as indicated on page 7 and tighten all bolts securely.

Note: Save original steering support bolts for replacement when Hand Control is removed.

Supplement

VEHICLE	YEAR	ADAPTER A	ADAPTER EARS	ADAPTER B	BENT BRAKE ROD	NOTES
Oldsmobile						
98 Regency	88-97	✔	6"		✔	8mm Bolts
Achieva	92-97			✔	✔	GM Acc Clamp
Bravada	92-95	✔	6"			8mm Bolts
Toronado	85-91	✔	Std.			
Toronado	92-97			✔	✔	
Silhouette	92-95	✔	5"			10mm Bolts
Silhouette	96-98			✔	✔	Short Grip
Pontiac						
Firebird	85-90	✔	Std.			
Firebird	91-98	✔	6"		✔	
Grand Am	85-91	✔	5"			10mm Bolts
Grand Am	92-98			✔	✔	96-98 Long Side B Mount GM Acc Clamp
Grand Prix	92-98			✔	✔	
Bonneville	92-98			✔	✔	
Sunfire	92-98			✔	✔	GM Acc Clamp
Trans Sport	92-95	✔	5"			10mm Bolts
Trans Sport	96-98			✔	✔	Short Grip
G.M.C.						
Safari	85-91	✔	Std.			
Safari	92-97	✔	6"			
Safari	98			✔	✔	
Yucon	96-98			✔	✔	19 1/2" Main
Full Size Trucks	85-94	✔	Std.			
Full Size Trucks	95-98			✔	✔	19 1/2" Main Shaft
Full Size Vans	74-82			✔		Lg Van Brake Bracket
Full Size Vans	83-91	✔	Std.			
Full Size Vans	92-96	✔	6"			
Full Size Vans	96 1/2-98			Long Side	✔	19 1/2" Main Shaft Bent Handle Short Grip
Jeep						
CJ-5	85-95	✔	Std.			96-98 Call MPS
Wrangler	85-95	✔	Std.			96-98 Call MPS
Cherokee	85-95	✔	Std.			
Cherokee	96-98			✔	✔	Cherokee B
Cherokee Grand	91-98			✔	96-98 ✔	
Geo						
Storm	92-98			✔	✔	
Prism	92-98			✔	✔	

Supplement

VEHICLE	YEAR	ADAPTER A	ADAPTER EARS	ADAPTER B	BENT BRAKE ROD	NOTES
Ford						
Full Size Bronco	85-91	✔	Std.			
Full Size Bronco	92-97	✔	7"			
Expedition	97-98	✔	7"		✔	
Windstar	94-98	✔	7"		✔	Short Grip
Full Size Van	75-82			✔		
Full Size Van	83-91	✔	Std.			
Full Size Van	92-96	✔	7"		✔	
Full Size Van	97-98	Special Mount			Spec ✔	Short Bent Handle-19 1/2" Main Shaft
Full Size Trucks	85-92	✔	Std.			
Full Size Trucks	93-98	✔	7"		✔	
Ranger	85-94	✔	Std.			
Ranger	95-98	✔	EXP		✔	98 Wide Acc. Clamp
Lincoln						
Continental	84-87			✔		A mount 5" ears will work
Continental	88-89	Taurus Mount			✔	
Continental	90-98	✔	7"		✔	
Town Car	85-89			✔	✔	A mount 5" ears will work
Town Car	90-98	✔	7"		✔	95-98 Modified 7" ear
Mark VII	85-89			✔	✔	A mount 5" ears will work
Mark VII	90-92	✔	7"		✔	
Mark VIII	93-96	✔	7"		✔	
Mark VIII	97-98	✔			✔	Special Lincoln Ears
Mercury						
Grand Marquis	85-89			✔		
Grand Marquis	90-98	✔	7"		✔	95-98 Modified 7" ear
Topaz	85-94			✔	✔	
Sable	86-89	Taurus Mount				
Sable	90-98	✔	7"		✔	
Cougar	85-93			✔	✔	
Cougar	94-97	✔	7"		✔	
Tracer				✔		
Villager	93-95	✔	7"		✔	
Villager	96-98			✔	✔	
Oldsmobile						
Cutlass Supreme	85-87	✔	Std.			
Cutlass Supreme	88-94			✔		
Cutlass Supreme	95-98			✔	✔	
Cutlass Ciera	85-97	✔	5"			10mm Bolts
88 Royale	85-87	✔	Std.			
88 Royale	88-95	✔	6"		✔	8mm Bolts
98 Regency	85-87	✔	Std.			

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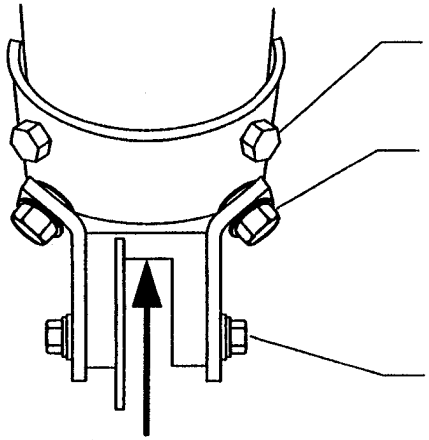
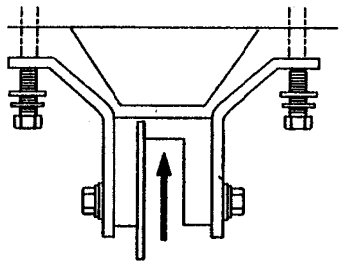
"A" Mount Installation

Figure 2



When bolts are semi-tight drive Mount in direction of vertical arrow and tighten securely.

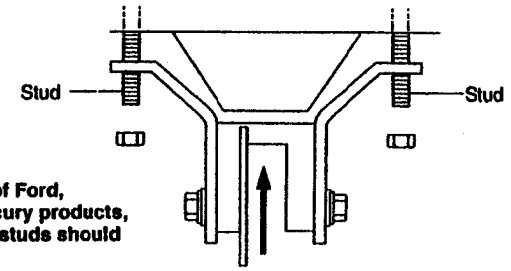
Figure 3



Some 1985 & later GM vehicles will require 2" long 8mm Or 10mm bolts.

5", 6", 7" & Special Ear Mounting

Figure 4

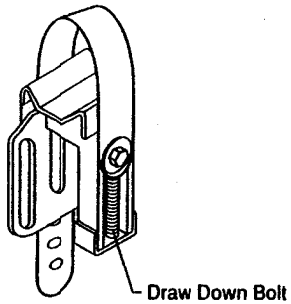


On majority of Ford, Lincoln, Mercury products, lower pair of studs should be used.

Some vehicles will require removing tension washer from nut. **(Note: Use Locktite when replacing nut on stud.)**

"B " Mount Installation

Figure 5



Adapter B

REMOVE NEGATIVE SIDE OF BATTERY FOR AIR BAG BEFORE INSTALLATION. BE SURE TO RECONNECT AFTER INSTALLATION.

This mount consists of a Vee-support and strap which is tightened around the vehicles steering column.

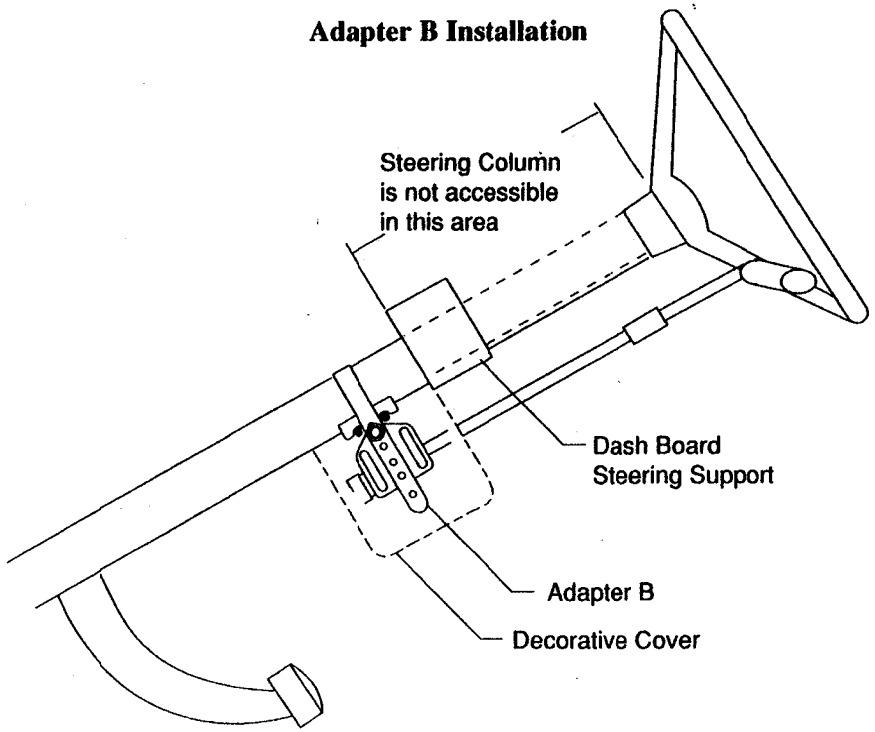
To begin mounting, remove bolt that secures adjustable side of strap.

With the mounting plate of "B" Adapter on left side of steering column, place strap around steering column being careful not to have any wiring under the strap. Pull strap as tight as possible and secure in whichever hole provides the tightest position. Place mount as close as possible to steering column support. See Fig. 6.

Secure mount by tightening draw down bolt and cone point set screws. **(Do not overtighten.)**

Figure 6

Adapter B Installation



See Supplement for various vehicles which require Adapter B Mount.

Supplement

VEHICLE	YEAR	ADAPTER A	ADAPTER EARS	ADAPTER B	BENT BRAKE ROD	NOTES
Chevrolet						
Corvette	85-97	✔	Special			
Corvette	98			✔	✔	19 1/2 " Shaft - GM Acc. Clamp
Lumina Auto	89-94			✔		
Lumina Auto	95-98			✔	✔	
Lumina Van	90-95	✔	5"			10mm Bolts
Lumina Van	96			✔	✔	
Venture Van	97-98			✔	✔	Short Grip
Malibu	98			✔	✔	
Monte Carlo	95-98			✔	✔	
Astro Van	85-91	✔	Std.			
Astro Van	92-97	✔	6"			
Astro Van	98			✔	✔	
Suburban	85-94	✔	Std.			
Suburban	95-98			✔	✔	19 1/2" Main Shaft
Full Size Blazer	85-94	✔	Std.			
Tahoe	95-98			✔	✔	19 1/2" Main Shaft
S10 Blazer	85-94	✔	Std.			
S10 Blazer	95-98			✔	✔	
Full Size Trucks	85-94	✔	Std.			
Full Size Trucks	95-98			✔	✔	19 1/2" Main Shaft
S10 Trucks	85-94	✔	Std.			
S10 Trucks	95-98			✔	✔	
Full Size Vans	74-82			✔		Lg Van Bracket
Full Size Vans	83-91	✔	Std.			
Full Size Vans	92-96	✔	6"		✔	
Full Size Vans	96 1/2-98			Long Side	✔	19 1/2" Main Shaft & Bent Handle Short Grip
FORD						
Escort	85-98			✔	✔	Bent Handle
Tempo	91-94			✔	✔	A mount 5" ears w/ 10 1/2" main shaft
Probe	88-93			✔		
Probe	94-97	✔	7"		✔	
Mustang	85-93			✔	✔	
Mustang	94-98	✔	7"		✔	Short Grip
Taurus	86-89	Taurus Mount				
Taurus	90-98	✔	7"		✔	
T-Bird	85-93			✔	✔	
T-Bird	94-97	✔	7"		✔	
Crown Victoria	85-89			✔		A mount 5" ears will work
Crown Victoria	90-98	✔	7"		✔	95-98 Modified 7" Ear
Contour	95-98	✔	Spec.		✔	Wide Acc. Clamp
Explorer	91-94	✔	Std.		✔	
Explorer	95-98	✔	EXP		✔	Wide Acc. Clamp - Short Grip
Aerostar	85-91			✔		
Aerostar	92-97	✔	7"		✔	

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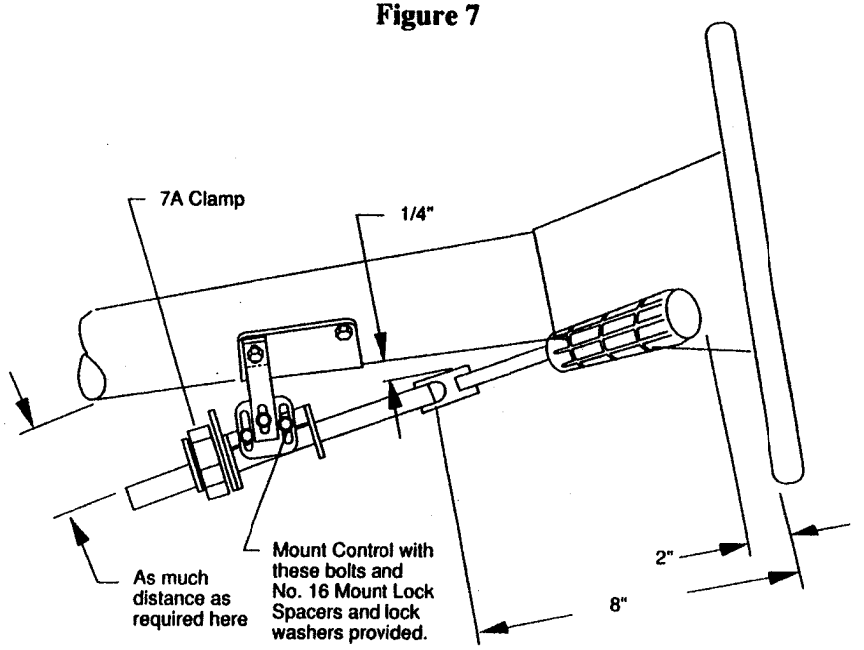
NOTE: Supplement pages do not contain all the years and makes of vehicles in which the MONARCH MARK IA can be installed.

Supplement

VEHICLE	ADAPTER				BENT BRAKE ROD	NOTES
	YEAR	A	EARS	B		
AMC	–	✔	Std.			
Buick						
Century	85-97	✔	5°			10mm Bolts
Century	98			✔	✔	
La Sabre	85-86	✔	Std.			
La Sabre	87-89	✔	6°		✔	8mm Bolts
La Sabre	90-98			✔	✔	
Park Avenue & Ultra	85-87	✔	Std.			
Park Avenue & Ultra	88-98			✔	✔	
Regal	85-87	✔	Std.			
Regal	88-98			✔	✔	
Skylark	85-87	✔	Std.			
Skylark	88-97			✔	✔	GM Acc Clamp
Riviera	85	✔	Std.			
Riviera	86-98			✔	✔	92-98 19 1/2" Main Shaft Short Grip
Roadmaster	85-92	✔	6°		✔	8mm Bolts
Roadmaster	93-97			✔	✔	
Reatta	88-89	✔	Std.			
Reatta	90-92			✔	✔	
Cadillac						
Catera	98			✔	✔	
Concours	93-97	✔	6°		✔	8mm Bolts; GM Acc Clamp
Deville	85-90	✔	6°		✔	Bent Handle
Deville	91-98			✔	✔	GM Acc Clamp 19 1/2" Main Shaft - Bent Handle
El Dorado	85-87	✔	Std.			Bent Handle
El Dorado	88-91	✔	6°		✔	8mm Bolts - Bent Handle
El Dorado	92-98			✔	✔	GM Acc Clamp 19 1/2" Main Shaft - Bent Handle
Seville	85-90	✔	Std.		✔	Bent Handle
Seville	91-98			✔	✔	GM Acc Clamp 19 1/2" Main Shaft - Bent Handle
Fleetwood Brougham	92-96	✔	6°		✔	
Chevrolet						
Citation	85-91	✔	5°			10mm Bolts
Citation	92-93			✔	✔	
Cavalier	85-91	✔	5°			10mm Bolts
Cavalier	92-98			✔	✔	GM Acc Clamp
Corsica	90-92	✔	5°		✔	
Corsica	93-96			✔	✔	GM Acc Clamp
Celebrity	85-97	✔	5°		✔	10mm Bolts
Beretta	85-96	✔	Std.			93-96 GM Acc Clamp
Caprice	85-91	✔	Std.			
Caprice	92-96	✔	6°		✔	8mm Bolts
Camaro	80-90	✔	Std.			
Camaro	91-98	✔	6°		✔	

Main Body of Hand Control

Figure 7



Control may be tilted as shown to clear air conditioning or other obstacles.

To secure the hand Control to the Adapter remove the 2 (two) bolts No. 16 on Hand Control body, slide the control in the mount and replace bolts. Loosely tighten bolts so position of Hand control can be changed if needed.

The Control should be positioned as high as possible on Adapter. This will allow for more leg room for the driver.

The proper shaft length is 8" from top of Main Shaft No. 2 to steering wheel rim. To lengthen or shorten main shaft loosen No. 7A Clamp and slide shaft to desired position and retighten.

Occasionally the bottom of the main shaft will need to shorten to allow able bodied drivers adequate foot clearance on brake pedal. Allow 1/4" of clearance between top of main shaft and steering column. If vehicle has tilt steering, adjust steering wheel to lowest position and allow proper clearance.

Check for any obstruction of Hand Control movement and securely tighten bolts No. 16.

It may be necessary to raise or lower Accelerator Arm No. 12 for proper alignment and dashboard clearance. See Fig. 8.

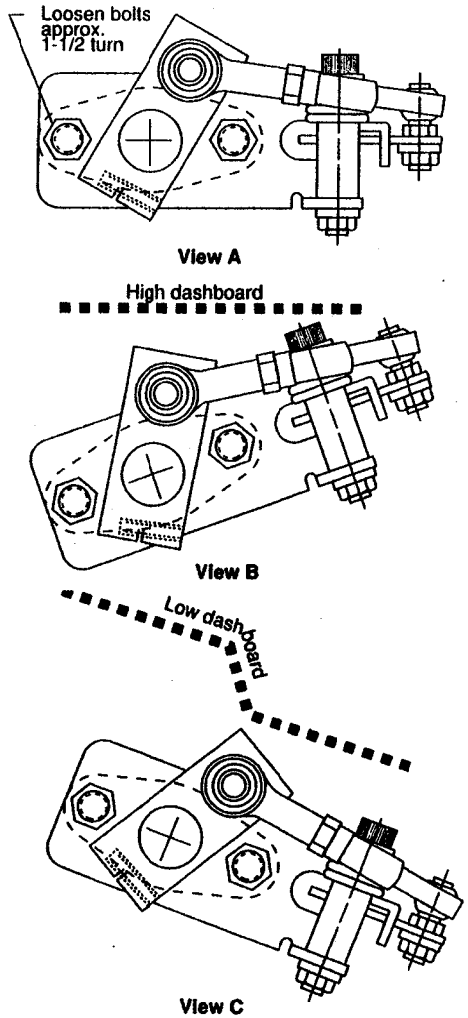
Note: Some vehicles may require less than 8" pending dash formation and hand control position.

Accelerator Arm No. 12 Adjustment

Figure 8

Loosen the 2 (two) bolts on the base of Hand Control about 1 1/2 turns each.
Adjust Accelerator Arm No. 12 up or down for proper dashboard clearance and accelerator alignment. Re-tighten bolts. (Tight.)

Note. Check Hand Control for accelerator binding after adjustment is made. If binding occurs repeat above steps and realign main shaft through main body.



1. Determine if the accelerator activating arm clears alignment with the top accelerator pedal. See Fig. 9.
2. After alignment is achieved tighten all bolts securely. Be certain mounting block is resting against column support.
3. Proceed with rest of the installation.
4. After installation is complete the decorative cover may be cut away as required and replaced.

Parts List For Tubular Operating Handle

Part Number	Description
MMIA	Standard Operating Handle
MMI-2	Main Shaft
MMI-2A	Clevis Assembly
MMI-3A	Rear Bearing Plate
MMI-4	Tie Rod End
MMI-5	Tie Rod End
MMI-6	Bearing Plate Spacers (2)
MMI-7A	Tie Rod Activating Clamp
MMI-8	Thrust Washer
MMI-9	Accelerator Mount and Pivot Plate
MMI-10	Accelerator Arm Pivot Bolt
MMI-11	Accelerator Arm Spacer
MMI-12	Accelerator Activating Arm
MMI-14	Bearing Block Assembly
MMI-15	Slide Nut Assembly Plate
MMI-16	Mount Lock Spacers (2)
MMI-17	Return Spring
MMI-21	Accelerator Slide Nut-Threaded
MMI-22	Accelerator Slide Nut- Not threaded
MMI-23	Accelerator Ball Joint Assembly (Upper)
MMI-24	1" Accelerator Extension
MMI-25	2" Accelerator Extension
MMI-26	4" Accelerator Extension
MMI-27	Accelerator Slip Tube
MMI-28	Accelerator Ball Joint Assembly (Lower)
MMI-29	Accelerator Clamp
MMI-30	Brake Rod
MMI-30A	Upper Brake Clamp Assembly
MMI-30B	Bent Brake Rod
MMI-31	Brake Ball Joint Assembly
MMI-32	Brake Ball Joint Assembly Clamp
MMI-33	Brake Clamp
MMI-34	Brake Clamp Bracket
MMI-36	Brake Return Spring

Parts List For Standard Operating Handle

Part Number	Description
MMIA	Standard Operating Handle
MMI-BL	Operating Handle Left Side Bend
MMI-BR	Operating Handle Right Side Bend
MMI-2	Main Shaft
MMI-3A	Rear Bearing Plate
MMI-4	Tie Rod End
MMI-5	Tie Rod End
MMI-6	Bearing Plate Spacers (2)
MMI-7A	Tie Rod Activating Clamp
MMI-8	Thrust Washer
MMI-9	Accelerator Mount and Pivot Plate
MMI-10	Accelerator Arm Pivot Bolt
MMI-11	Accelerator Arm Spacer
MMI-12	Accelerator Activating Arm
MMI-14	Bearing Block Assembly
MMI-15	Slide Nut Assembly Plate
MMI-16	Mount Lock Spacers (2)
MMI-17	Return Spring
MMI-21	Accelerator Slide Nut-Threaded
MMI-22	Accelerator Slide Nut- Not threaded
MMI-23	Accelerator Ball Joint Assembly (Upper)
MMI-24	1"Accelerator Extension
MMI-25	2"Accelerator Extension
MMI-26	4" Accelerator Extension
MMI-27	Accelerator Slip Tube
MMI-28	Accelerator Ball Joint Assembly (Lower)
MMI-29	Accelerator Clamp
MMI-30	Brake Rod
MMI-31	Brake Ball Joint Assembly
MMI-32	Brake Ball Joint Assembly Clamp
MMI-33	Brake Clamp
MMI-34	Brake Clamp Bracket
MMI-35	Switch Cover
MMI-36	Brake Return Spring
MMI-37	Horn Button Bracket Standard

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Accelerator Linkage and Leverage Adjustment

Attach the Accelerator Clamp No. 29 on the Accelerator suspended arm without interfering with the Accelerator Pedal. (See Fig. 9.)

The higher the Accelerator Clamp #29 is on the suspended arm the less handle movement is needed for full accelerator, but will require additional effort. The lower the Accelerator Clamp No. 29, the opposite will apply.

The alignment of the Accelerator Rod is now required so the Upper Ball Joint No. 23 will align in a straight line with Lower Ball Joint No. 28 on Accelerator Clamp No. 29.

The complete assembly of parts No.'s 9 thru 12 may need to be readjusted for ball Joint alignment. See Fig 8. Check to make sure there is no Ball Joint binding under full acceleration.

The Upper Accelerator Ball Joint Assembly No.'s 21, 22 & 23 may be placed on top or bottom of Accelerator Arm No. 12 to achieve proper or straight alignment with Lower Accelerator Ball Joint No. 28.

Use No. 27 Accelerator Slip Tube and any combination of No.'s 24, 24 or 26 Accelerator Extension to assemble Accelerator Rod so that approximately 1" (one inch) or less of threaded rod is visible on Lower Ball Joint Assembly No. 28.

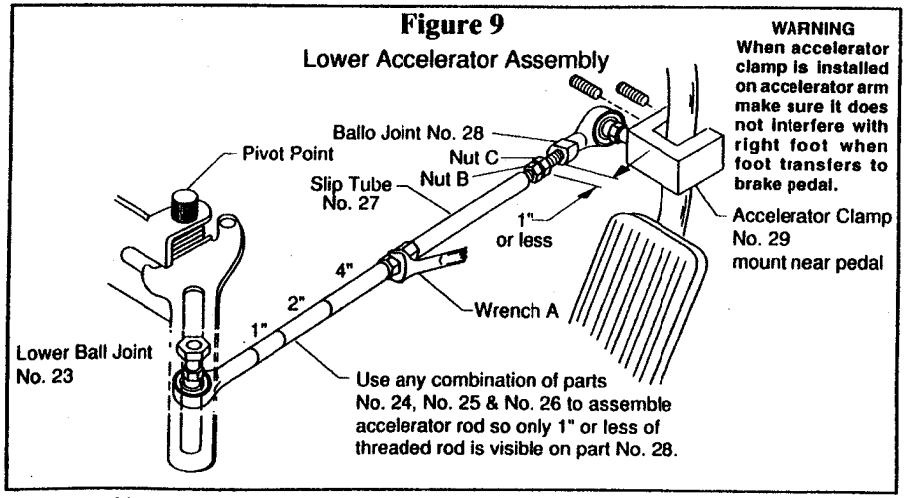
Final Accelerator adjustment is performed after vehicle has been started and warmed up. Tighten No. 27, Slip Tube, against Upper Ball Joint, No. 23, or any Accelerator Extension, No.'s 24, 25 or 26 to secure No. 27 Slip Tube from loosening.

Thread 2 (two) 7/16" Hex Nuts up against No. 27 Slip Tube until proper Accelerator response is achieved. Tighten Nut C against Nut B to secure accelerator adjustment. See Fig. 9.

Note. Check to make sure car is not fast idling. If so, readjust the 2 (two) 7/16" Hex Nuts against Slip Tube No. 27.

Figure 9

Lower Accelerator Assembly



WARNING
When accelerator clamp is installed on accelerator arm make sure it does not interfere with right foot when foot transfers to brake pedal.

On some vehicles, No. 27 Slip Tube and No. 28 Accelerator Threaded Rod may need to be shortened for proper installation. Assemble Slip Tube onto No. 23 Upper Ball Joint. (No.'s 28 & 29 Lower Accelerator Clamp Assembly should already be attached to Accelerator Suspended Arm.)

Thread the two 1/4" nuts on No. 28 Accelerator Rod down closet to Ball Joint, No. 28. Hold No.'s 27 and 28 close together, mark on No. 27 where Accelerator Adjuster Nuts are positioned, now mark No. 28, where top of Accelerator Rod No. 28, come to bottom of Hex Fitting on No. 27. See Fig. 9. Cut both pieces and assemble. This allows minimum loss of length to Accelerator Rods.

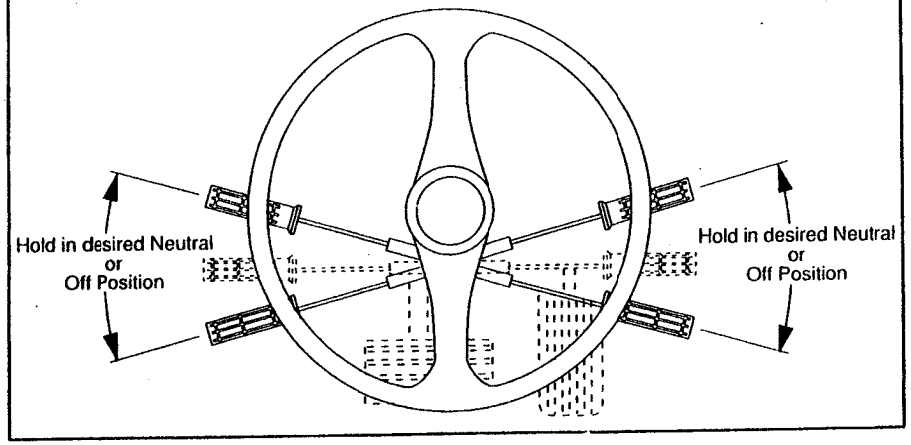
Warning

With Lower Accelerator Rod Assembled and adjustments made, depress vehicle Accelerator Pedal by hand to the floor to make sure No. 28 Accelerator Rod does not fall out of No. 27 or bind and cause the Accelerator Pedal to stick or hang up. If this problem occurs call MPS Corporation.

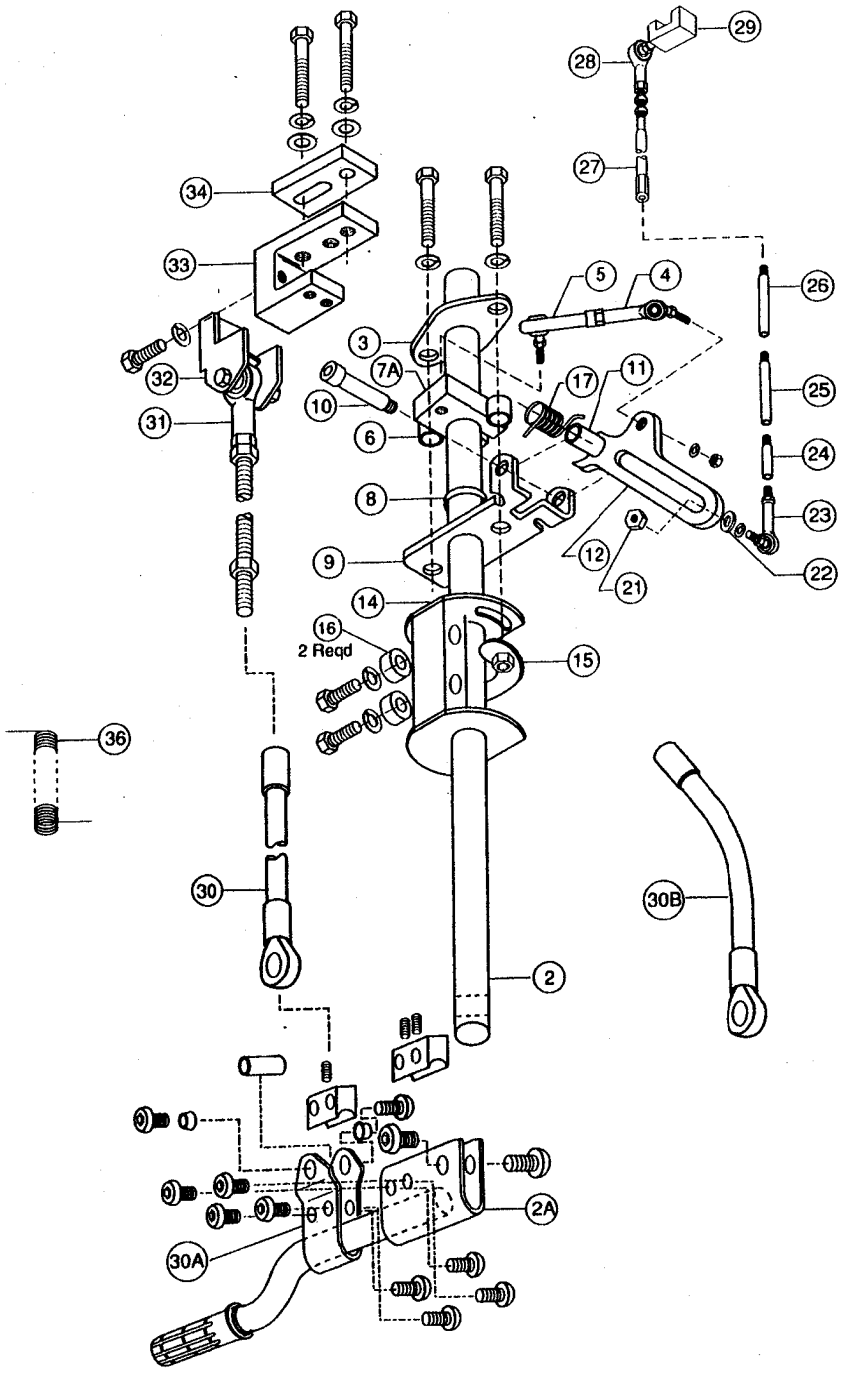
Aligning and Positioning Main Shaft & Handle

To properly position the Operating Handle and Main Shaft Loosen 7A Clamp 1/2 Turn. Raise or lower handle to desired position. Hold handle in the desired Neutral of Off position (fig. 10). This would be the position when both the brake and Accelerator are off. Retighten 7A Clamp.

Figure 10

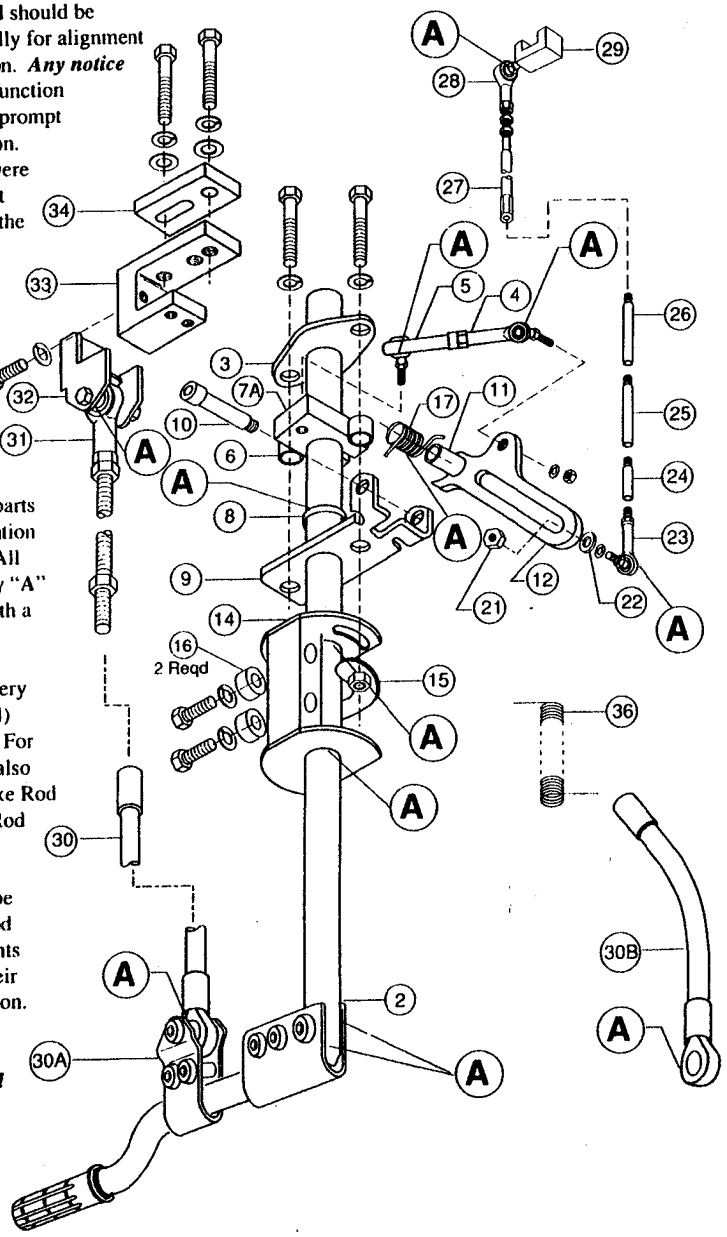


Assembly Illustration For Tubular Operating Handle



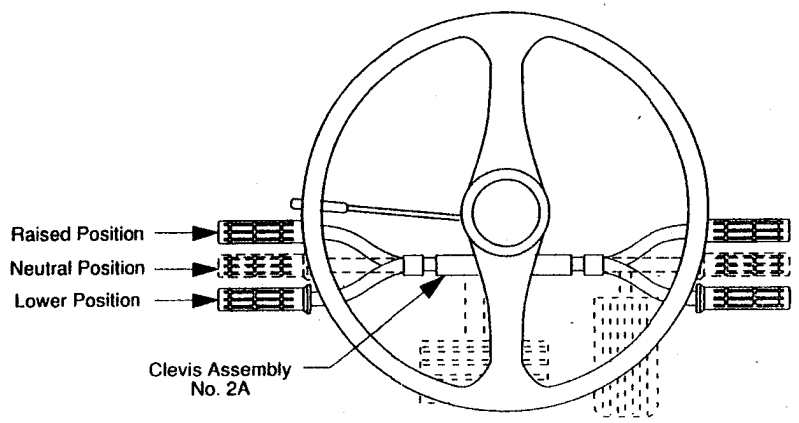
Maintenance For Tubular Operating Handle

This driving device has now become part of the vehicles control system and should be checked periodically for alignment and proper function. ***Any notice of change in the*** function of the unit should prompt immediate attention. Fasteners which were necessary to adjust the installation of the control should be periodically checked for tightness. This unit has been prelubricated during assembly but because of adjustment and movement of the parts we suggest lubrication after installation. All points indicated by "A" should be oiled with a light machine oil immediately after installation and every three (3) or four (4) months thereafter. For extended life it is also suggested the Brake Rod and Accelerator Rod be disconnected periodically and light machine oil be deposited in the rod ends and these joints moved through their total possible motion. ***Keep the control clean. Avoid excessive dust and dirt on all moving parts.***



Installation of Tubular Operating Handle

Figure 10A



The Operating Handle (No. 1-A) is attached to the Main Shaft No 2 and Clevis Assembly No. 2A with 4 (four) 1/4"-20 x 1/2" button head cap screws and 2 (two) 1/4"-20 x 1/2 cone point set screws. The Upper Brake Rod Assembly is attached to the handle with 4 (four) 1/4"-20 x 1/2" button head cap screws and 1 (one) 1/4"-20 x 1/2" cone point set screw.

Installation

Clevis Assembly No. 2A should be adjusted in a horizontal position for most installations. Loosen Clamp No. 7A on Hand Control 1/2 turn and rotate Clevis Assembly No. 2A to proper position. See Fig. 10.

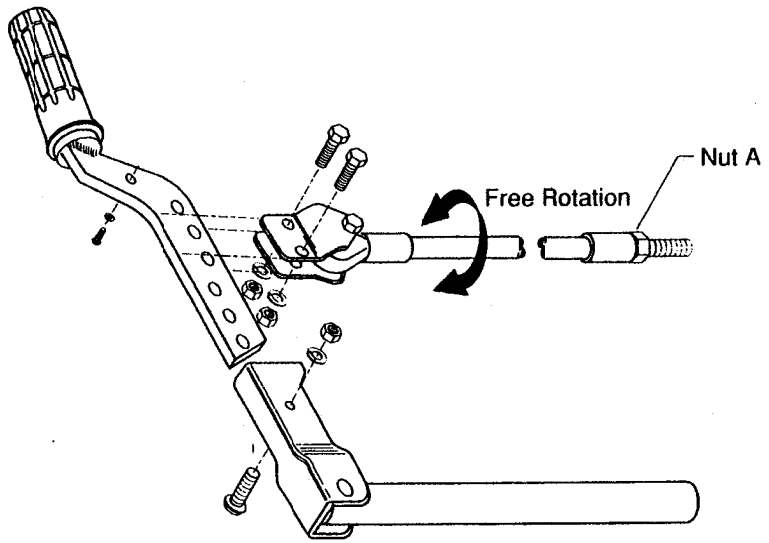
Slide Operating handle MM1A through No. 30A Upper Brake Rod Flange and into Clevis Assembly. Handle will bottom out against stop in Clevis. Handle should be made as long as possible with adequate clearance while simulating brake and accelerator motions from any object or obstruction on the door (with left hand installation) this includes any window cranks, power window switches or arm rests in any position. If obstruction occurs remove handle from Clevis Assembly and cut excess length off bare end of handle. Re-install Handle through No. 30A Upper Brake Rod Flange and into Clevis Assembly. Check clearance again. If proper clearance is achieved, loosely tighten the 4 (four) 1/4"-20 x 1/2" button head cap screws on Clevis Assembly-2 on top and 2 on bottom-**Do Not Tighten Cone Point Set Screws**. Rotate Handle up or down to achieve proper height of Handle. See Fig. 10. If vehicle has tilt steering, adjust steering wheel to lowest position and place turn signal arm in Left Turn position. Move Handle to simulate brake motion to assure Handle will have no obstruction in the brake motion. If obstruction occurs, loosen the 4 (four) button head cap screws slightly and rotate Handle so no obstruction is possible. Retighten 4 (four) button head screws on Clevis Assembly securely and **tighten cone point set screws** on back of Clevis Assembly to secure Handle in position.

Upper Brake Rod Assembly For Standard Operating Handle

The Operating Handle (No. 1-A) is attached to the Main Shaft and Clevis Assembly with the 5/16-18 x 7/8" Button Head Screw, lock washer and nut as shown (with the head of the screw under the handle). The Handle should be made as long as possible with adequate clearance from any object or obstruction on the door (with left hand installations) this includes any window cranks in any position. The Brake Rod (No. 30) is assembled with the Brake Ball-Joint Assembly (No. 31) adjust for proper length, and attach to the Operating Handle with the 1/4-28 x 3/4" bolts, lock washers and nuts provided in the manner shown. Attach in the holes indicated for maximum brake leverage.

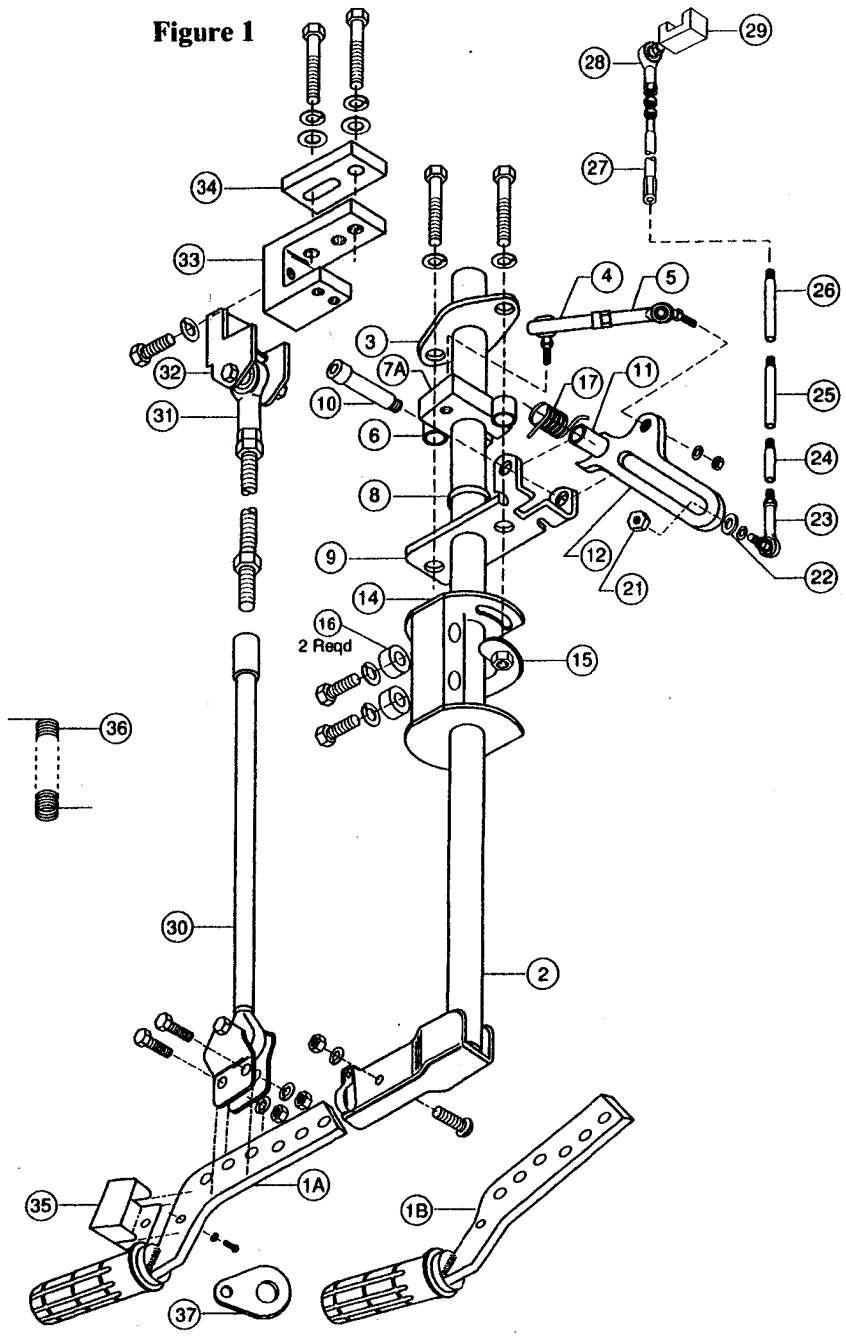
After Handle and Brake Rod are assembled as shown Lock Nut (A) against Brake Rod. Be certain, after nut is locked, that Brake Rod rotates freely as indicated by arrow in both the off and full-on accelerator positions. If Brake Rod is not free to rotate loosen and retighten nut (A).

Figure 11



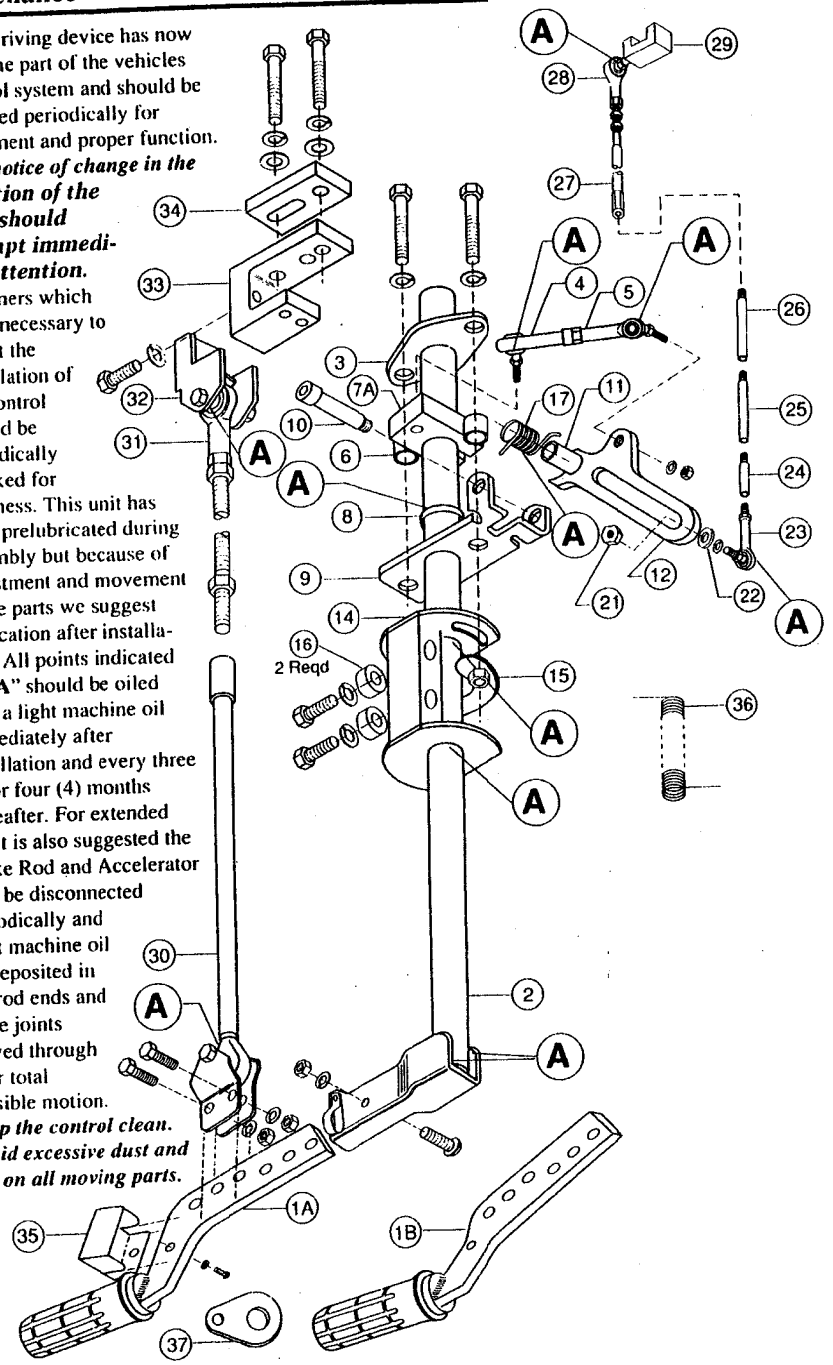
Assembly Illustration For Standard Operating Handle

Figure 1



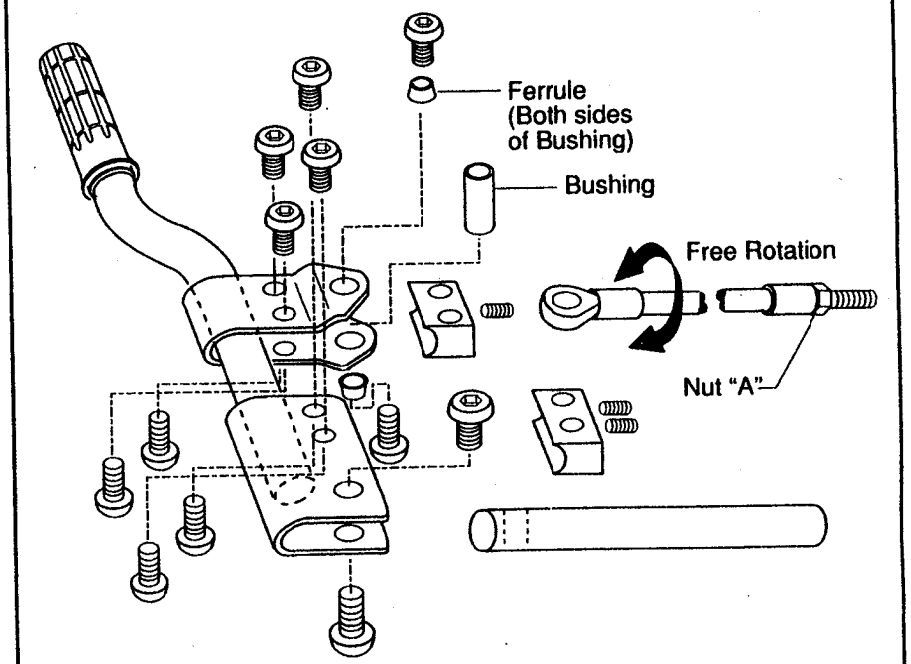
Maintenance For Standard Operating Handle

This driving device has now become part of the vehicles control system and should be checked periodically for alignment and proper function. ***Any notice of change in the function of the unit should prompt immediate attention.*** Fasteners which were necessary to adjust the installation of the control should be periodically checked for tightness. This unit has been prelubricated during assembly but because of adjustment and movement of the parts we suggest lubrication after installation. All points indicated by "A" should be oiled with a light machine oil immediately after installation and every three (3) or four (4) months thereafter. For extended life it is also suggested the Brake Rod and Accelerator Rod be disconnected periodically and light machine oil be deposited in the rod ends and these joints moved through their total possible motion. ***Keep the control clean. Avoid excessive dust and dirt on all moving parts.***



Upper Brake Rod Assembly For Tubular Operating Handle

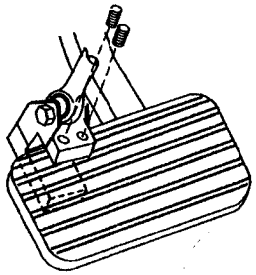
Figure 11A



The Brake Rod No. 30 is assembled with the Lower Brake Rod Assembly No.'s 31,32 and 33. Thread No. 30 onto No. 31 and adjust for proper length and attach to No. 30A Upper Brake Rod Flange using Ball Joint ferrules (one on either side of ball Joint, 5/16" bushing slides through ferrules and Ball Joint) with 2 (two) 1/4" -20 x 1/2" button head cap screws threaded through top and bottom of Flange and into bushing. Rotate Flange on Handle so there is no Ball Joint binding. Tighten the 4 (four) button head cap screws slightly (two on top and two on bottom). With vehicle started, depress Handle hard in braking motion, if Handle is traveling into dash or going way over center, slide Upper Brake Rod Flange away from Clevis Assembly toward rubber grip. (It may be necessary to go past first bend on Handle.) This will allow for minimum travel, but will require additional effort to apply the brake. Allow room for hand on grip with ABS Brake system (Handle will travel further under hard brake with this system.) If satisfied with clearances and no Ball Joint binding occurs, securely tighten 4 (four) button head screws on flange and 1 (one) cone point set screw to secure Flange from rotating on handle. After Handle and Brake Rod are assembled as shown Lock Nut (A) against Brake Rod. Be certain, after nut is locked, that Brake Rod rotates freely as indicated by arrow in both the off and full-on accelerator positions. If Brake Rod is not free to rotate in both the off and full-on accelerator positions, loosen and retighten nut (A).

Brake Clamp Installation (At Pedal)

Figure 12

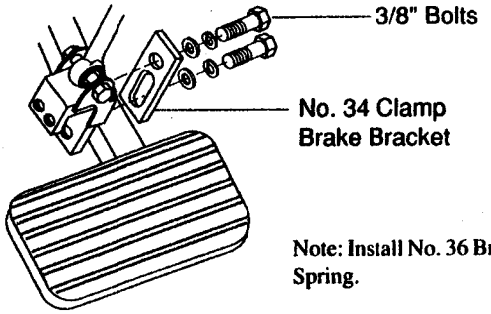


Note: Install No. 36 Brake Return Spring to assist brake pedal to return to off position.

The Brake Rod Assembly is attached to the Operating Handle on one end and the Brake Pedal or suspension arm on the other end. The most desirable attaching area is on the Brake Suspension Bar. The Brake Clamp (No. 33) must be secured along the top left of the brake pedal. Use 3/8-16 x 1-1/4" and the 1/4-20 x 3/4" socket head screws provided. This part must rest against the edge of the pedal to provide secure installation. First tighten the 1/4" set screws evenly on Brake Clamp leaving approximately 1/4" of set screw showing on top. Now tighten 3/8" set screws on bottom with 3/16" long Allen wrench provided. Further tighten 1/4" set screws. Insure set screws are buried through the rubber into the steel pedal. Tighten all set screws evenly with long arm Allen wrenches. *(Note. Do not remove rubber pad from brake pedal. This will give able bodied driver adequate grip on Brake Pedal.)* See Fig 12.

Brake Clamp Installation (On Suspension Bar)

Figure 13



Note: Install No. 36 Brake Return Spring.

The most desirable attaching area is on the Brake Suspension Bar. For Left Hand installation this Bar must be located in the center or left of center on the Brake Pedal. When attaching use 3/8"-16 x 1 1/4" bolts and washers with No. 34 Brake Clamp Bracket. Be certain Brake Clamp No. 33 is held in a straight alignment with the Brake Rod so the Ball-Joint will not bind when either the Brakes or Accelerator is applied. Tighten bolts equally. See Fig 13.

Converting the Control for Right Hand Use

1. Lay Hand Control on flat working area and loosen No. 7A Clamp Screw so shaft will slide freely. See Fig. 14
2. Remove Ball Joint No. 4 from No. 7A Clamp.
3. Remove Ball Joint No. 5 from Accelerator Arm No. 12 and replace on opposite side of No. 12. Replace nut & lock washer & tighten.
4. Slide Main Shaft past No. 7A Clamp.
5. Lift No. 7A Clamp straight up and out of Hand Control body. Turn No. 7A Clamp upside down so No. 7A Clamp is now headed downward in Hand Control body. See Fig. 15. (Note. Thrust Washer No. 8 must be replaced between No. 9 and No. 7A.)
6. Slide Main Shaft back through thrust washer and No. 7A Clamp leaving approx. 1" (one inch) of shaft extended through Hand Control body. (Note. The head of the cap screw on No. 7A Clamp should be facing Accelerator Arm No. 12.)
7. Replace No. 4 Ball Joint to No. 7A Clamp and tighten.
8. Slide main shaft to desired length and tighten No. 7A Clamp Screw.

Note: Generally for Right-Hand use, Gear Shift Lever must be bent for proper clearance.

Figure Figure 14

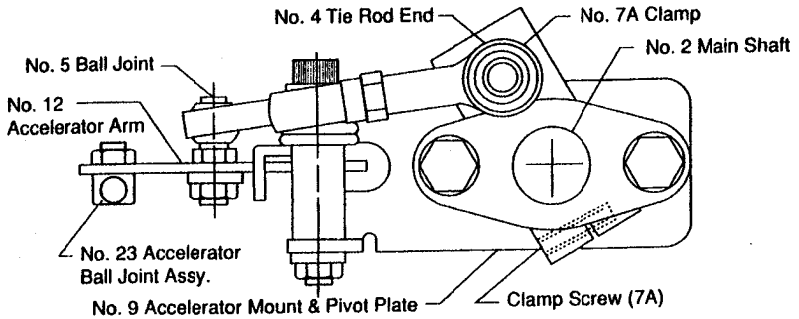
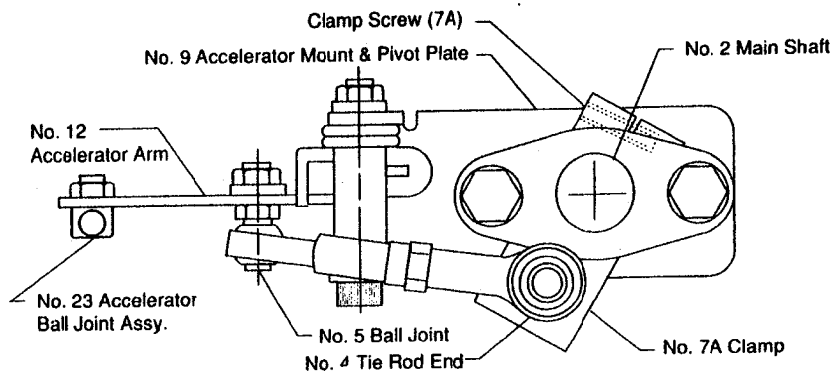


Figure 15



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Hand Control #4

Wells-Engberg

CT-100 Rotary Hand Operated Driving Control

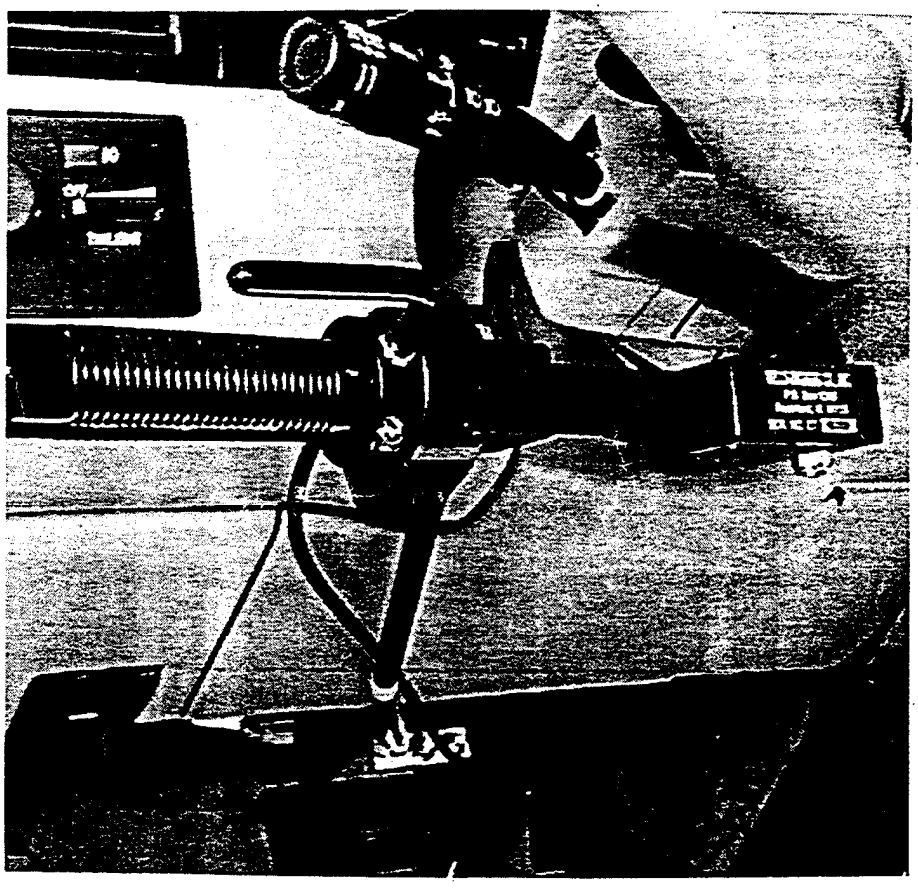
WELLS-ENGBERG

7354

Installation and
Operating Instructions

CT-100 Rotary Hand Operated Driving Control

Please call 1-800-642-3628 with Installation Questions



This Manual Must Be Left with the Customer

Introduction

When properly installed, the Wells-Engberg CT-100 Rotary Hand Operated Driving Control with cable throttle hook-up will provide easier and more convenient safe driving opportunities for the disabled driver and less encumbered driving for the able-bodied. By combining a twist style throttle with a thrust style braking mechanism, the control gives the driver independent simultaneous one-hand control of both the throttle and brake to readily adapt to most driving situations. By replacing traditional mechanical accelerator foot pedal linkages with a cable hook-up directly to the upper portion of the pedal mechanism, the control provides more clearance for operation and ease of entry and exit. **The control is intended for use on vehicles with automatic transmissions, power steering and power brakes**, and is available in both left-hand and right-hand operated models.

To operate control:

- Twist black hand grip clockwise to accelerate.
- Release to decelerate or idle.
- Push black hand grip forward (toward firewall) to brake.
- Release to coast.

Caution: Carefully follow each step of the instructions in this manual when installing, adjusting and maintaining the Wells-Engberg Rotary Hand Operated Driving Control. While the instructions are written showing the installation of a left-hand control, they are also applicable to right-hand controls by installing the pivot arm to the left of the steering column and flipping the main arm. To switch the control from one hand to the other, the twist grip mechanism will have to be reversed, as well as the stop pin relocated. (See Step 7, Fig. 8.)

DRIVE SAFELY !

Licensing Information Organizations

Listed below are organizations to help you obtain the necessary information for a motor vehicle license which requires the use of hand controls.

Veteran's Administration Central Office
810 Vermont Ave. N.W.
Washington, D.C. 20420
1-202-233-2373

Chrysler Motors
Physically Challenged Resource Center
P.O. Box 159
Detroit, MI 48288-0159
1-800-255-9877

American Automobile Association
Traffic Safety Department
Handicapped Driver Research
8111 Gatehouse Road
Falls Church, VA 22047
1-800-336-4357

Association of Driver Educator's for the Disabled
33736 La Crosse
Westland, MI 48185
1-313-425-8911

Louisiana Tech University
Center for Rehabilitation Science & Biomedical Eng.
P.O. Box 10426
Ruston, LA 71272
1-318-257-0211

Table of Contents

Warranty

Hand controls from Wells-Engberg are warranted for a period of one year from date of original purchase and installation–when properly installed under normal use and service–against defective materials or workmanship.

Defective controls will be repaired or replaced at no charge when the entire control is returned prepaid to Wells-Engberg Company. Call 1-800-642-3628 for authorization and shipping instructions.

This warranty is void if the control has been damaged by accident, misuse or improper installation. It is also void if the serial number is altered or removed.

This warranty contains the entire obligation of Wells-Engberg and no other warranties expressed, implied, or statutory are given.

This warranty is void unless the attached Warranty Registration Card has been properly completed and mailed to Wells-Engberg within ten days of purchase and installation.

Serial number for your records _____

Warnings and Precautions

THESE INSTRUCTIONS ARE INTENDED FOR DEALER USE ONLY!

AIR BAG INSTRUCTIONS

Before attempting to install any adaptive aids in the vehicle equipped with an air bag system, the negative (ground) battery cable must be disconnected and isolated. Failure to do so could result in accidental deployment and possible personal injury.

ALL WARRANTIES MAY BE VOIDED IF NOT PROPERLY INSTALLED BY AN AUTHORIZED WELLS-ENGBERG DEALER

The vehicle must be equipped with automatic transmission, power steering, and power brakes.

WARNING FOR MODIFIED OR "CUSTOMIZED" VEHICLE

Installation of hand controls or other Wells-Engberg Co., Inc. driving aids on modified vehicles is **NOT AUTHORIZED.**

Modified means changes not made or authorized by the vehicle's manufacturer. These are as follows:

- Oversized, undersized or untreaded tires,
- Modified suspension systems,
- Additional or modified carburetors or linkages,
- Small steering wheels not supplied by the vehicle's manufacturer,
- Or changes that tend to make the vehicle difficult or dangerous to drive.

VEHICLE MUST MEET ALL MOTOR VEHICLE SAFETY STANDARDS

The physically impaired driver needs good equipment for safe driving. Modified or "customized" vehicles not authorized by the vehicle's manufacturer are not authorized by Wells-Engberg Co., Inc., and tend to put in danger the driver as well as the installer of driving aids on such vehicles.

Wells-Engberg Co., Inc., reserves the right to discontinue sales to dealers that ignore this warning.

WARNING FOR DRIVING FROM WHEELCHAIR

WELLS-ENGBERG CO., INC., IS NOT LIABLE FOR ANY DAMAGES INCURRED WHILE OPERATOR IS DRIVING FROM A WHEELCHAIR THAT IS NOT SECURED BY A STATE OR FEDERALLY APPROVED TIE DOWN.

WELLS-ENGBERG CO., INC., IS NOT RESPONSIBLE FOR ALTERATIONS, MODIFICATIONS, OR REPAIRS.

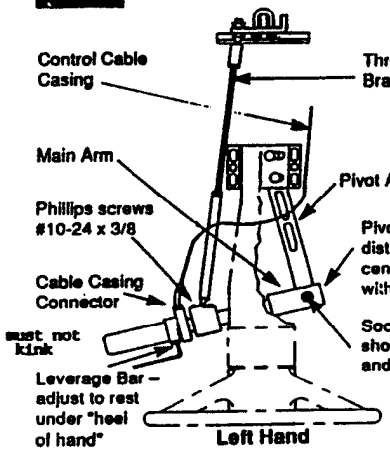
WARNING ! ! !

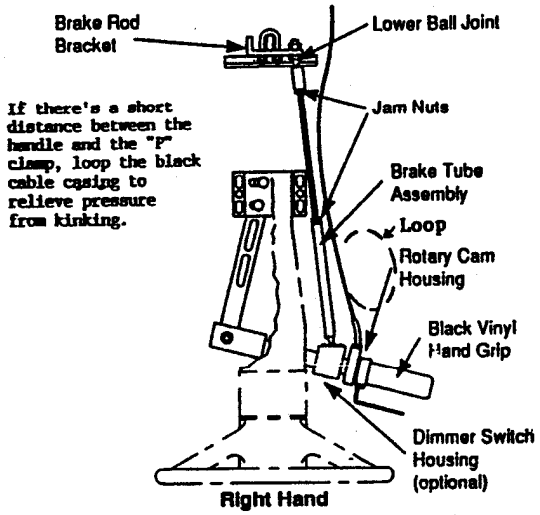
If your vehicle has an electro mechanical device that processes control of the acceleration between the accelerator pedal and the fuel-injection unit, the hand control cable connection **must** be made at the pedal mechanism. The electro mechanical processor must **NOT** be bypassed with the hand control cable connection at the fuel injection unit.

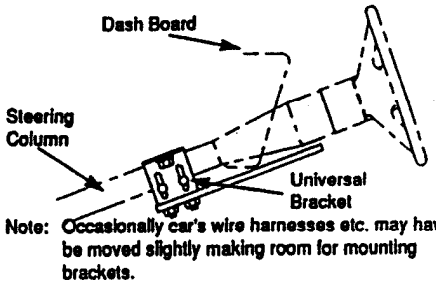
3

Parts Identification

Fig. 1







Note: Occasionally car's wire harnesses etc. may have to be moved slightly making room for mounting brackets.

Accelerator Parts Packet Contents

Part No.	Description	Quantity
H02	Eyelet connector	2
H05	Ball chain w/coupling	1
H06	Double ended coupling	1
H07	#10x3/8 screw w/nut	1
H08	1/4 dia. plastic tubing	1
H11	"P" clamp	3
H12	"L" bracket	1
H14	Nylon wire tie	4
H18	Tech screws	6
H19	1/4 washer	1
H20	Swage fitting	2
H21	4-hole plate	1

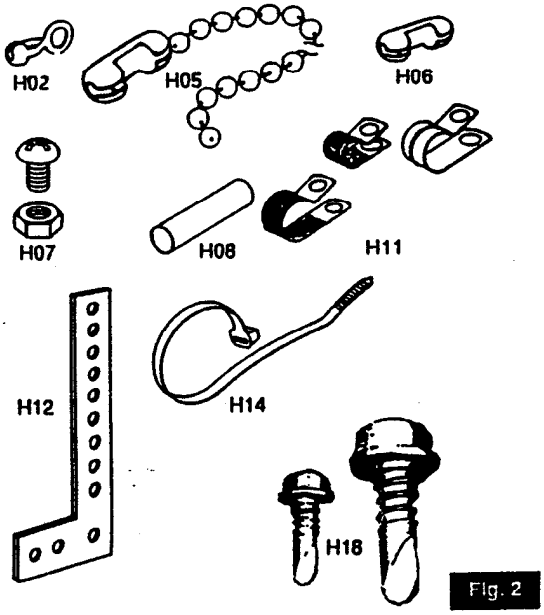
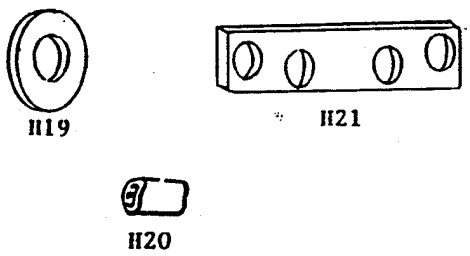


Fig. 2



4

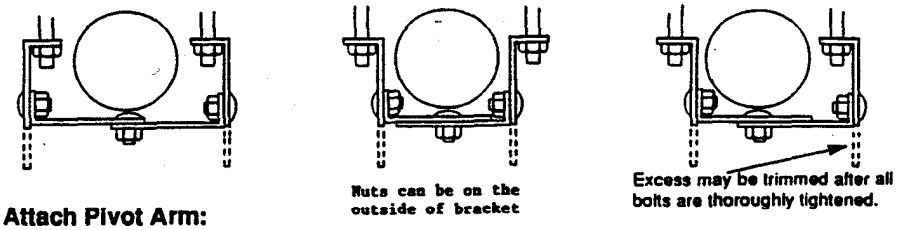
Mount Control & Brake Hook-up

Step 1 – Install Universal Bracket:

a) Remove decorative panel enclosing bottom side of steering column (screws and snap-out clips).
b) Determine how **Universal Bracket** will best fit on studs of steering column support bracket. (See options shown in Fig. 3).
c) Remove nut and washer from stud on one side of steering column bracket. Mount bracket leg to stud. Repeat for other leg. Complete assembly of **Universal Bracket**, keeping horizontal brackets as close to steering column as possible.

Note: If desired, after bracket height is determined to be correct (see Installation Adjustments Pg. 7), side legs of bracket may be trimmed to eliminate extension.

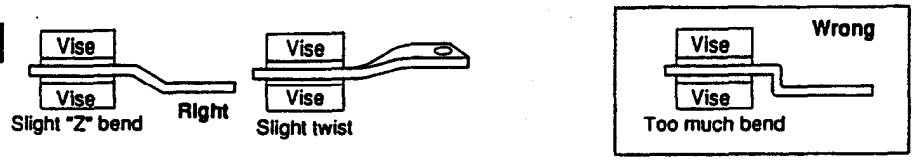
Fig. 3



Step 2 – Attach Pivot Arm:

a) Attach **Pivot Arm**, keeping in mind the best position for the pivot point of the main arm as shown in Fig. 1. (Main arm should be as close to the underside of steering column as possible and as far up as possible, but not so close as to interfere with spokes of steering wheel or tilting wheel).
b) **Main Arm** must not interfere with steering wheel (check in all positions if steering column is adjustable and with the drive selector lever). Adjustments may be made by lowering or pivoting the **Pivot Arm** on the **Universal Bracket**, or putting a "Z" bend (Fig. 4) in the **Pivot Arm** (remove to bend).

Fig. 4



If you can't use the universal mounting brackets on the underside of the vehicle's steering column, the pivot arm may be mounted as follows (Fig. 5).

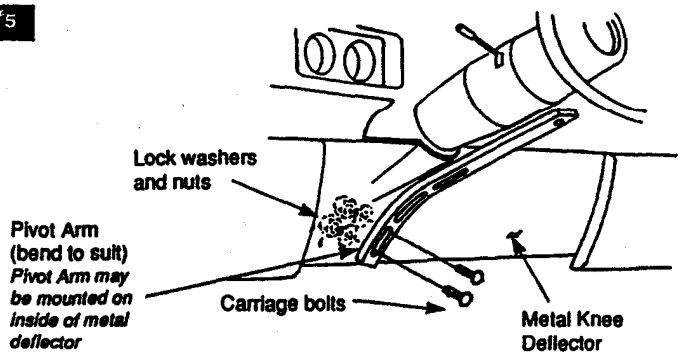
Alternate Pivot Arm Mounting

a) The plastic panel in some vehicles is very rigid and an integral part of the dash structure. If that's the case, the pivot arm can be mounted directly to this plastic dash structure. Fender washer should be used against the plastic to distribute strengt

NOTE: Federal Motor Vehicle Safety Standard #208 states that the knee deflector panel **CAN NOT** be removed or have substantial modifications made to it. If the knee deflector panel must be removed to gain access to the steering column yoke, it **MUST** be replaced.

b) Determine the best location for attaching the **Pivot Arm** to the **Knee Deflector Panel.**
NOTE: **Pivot Arm** may need to be bent to obtain proper clearances.
c) Drill (2) 13/32 diameter holes through **Knee Deflector Panel** and attach **Pivot Arm** using (2) carriage bolts, (2) washers, and (2) KEP nuts supplied with **Universal Mounting Bracket** parts pack.
NOTE: In some instances, pre-drilled or existing holes will be present and could be used to mount **Pivot Arm** to **Knee Deflector Panel.**
d) Check stability of **Pivot Arm** mounting. If **Pivot Arm** flexes too much or is unstable, relocate **Pivot Arm** near a reinforced area on **Knee Deflector Panel**, or make a back-up plate.
e) If mounting location is suitable, continue on to Step 3.
f) Re-install decorative panel cutting necessary slots for the **Pivot Arm**.

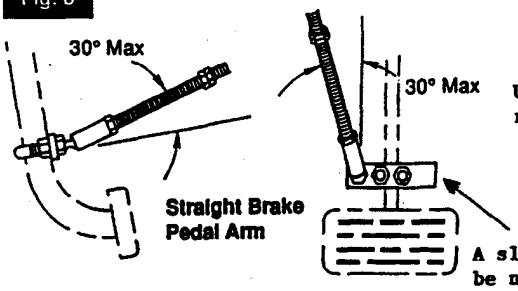
Fig. 5



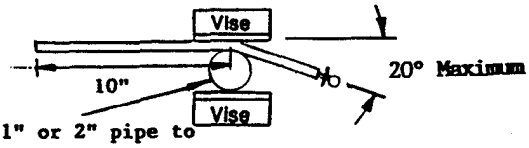
Step 3 – Mount Brake Bracket and Threaded Rod:

a) Determine best orientation of **Brake Rod Bracket** from choices shown in Fig. 6.
b) Attach **Threaded Brake Rod** and ball joint to bracket with lock nut provided. Wrench tighten.
c) Assemble **Brake Rod Bracket** to brake pedal, as shown, with **Threaded Brake Rod** as close to brake pedal as possible without interfering with foot operation of brake. The ball joint can be placed to the right or left of the brake pedal; however, the left side is more often used.

Fig. 6



A slight twist in the brake bracket may be necessary to maintain 30° or less angle



Use 1" or 2" pipe to roll tube around

Fig. 6A

Brake Tube Bending

Tube must not kink

Step 4 – Attach Brake Tube Assembly:

Insert ball into housing on **Main Arm**, and attach plate using two round head Phillips screws. (See Fig. 1).
NOTE: **Brake Tube Assembly** is furnished extra long and may have to be cut off to properly locate the main arm. Threaded rod must extend at least 6" into **Brake Tube Assembly**. *Deburr inside of tube* before re-assembling. **Brake Tube** can be bent up to 20°, see Fig. 6A. Be sure tube is bent in a spot that will allow the threaded rod to slip inside the straight, lower portion (10" straight). **Brake Tube Assembly** can be fine adjusted using jam nuts on threaded rod.

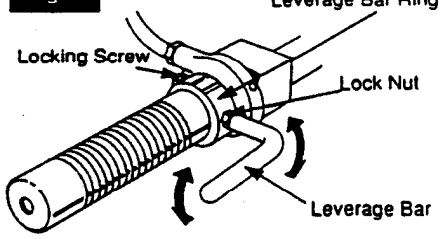
Step 5 – Attach Main Arm:

a) Slip **Brake Tube Assembly** over **Brake Rod**.
b) Align hole in **Main Arm** to **Pivot Arm**. (See Fig. 1).
c) Insert socket head shoulder screw from top of unit and thread lock nut from bottom. Wrench tighten.
d) Check to be sure **Main Arm** pivots freely on **Pivot Arm**.
e) **Brake Rod** must not touch underside of dash. *Note:* **Brake Rod** rises when pushed down. *Check with motor running* to permit full depression of pedal. To correct interference, adjust position of **Brake Rod Bracket** on pedal and/or position of **Pivot Arm** (as described above).
f) **Brake Rod** angle must not exceed 30° from straight alignment (causing ball joint to bend on edge of bracket). To correct, loosen and move **Pivot Arm** on **Universal Bracket**. (See Figs. 6 and 1).
g) Brake rod attachment must not interfere with foot operation of brake pedal by an able-bodied driver.

Step 6 – Check Position:

Installation Adjustments

Fig. 7



a) "Standard" installation puts the hand control as close to the underside of the steering column as possible, with the **Main Arm** parallel to the steering wheel. However, driver preference may be easily accommodated with minor adjustments. (See Fig. 1).
b) Will **Control Handle** clear turn signal arm on left hand installation?
c) Will **Control Handle** clear gear shift lever on right hand installation?
d) Will steering wheel rotate freely without hitting **Main Arm**?
e) Position and angle of **Black Vinyl Hand Grip** on **Main Arm** is adjusted by shortening or lengthening **Brake Tube Assembly**, or lowering or by pivoting **Pivot Arm** on **Universal Bracket.**
f) Position of **Leverage Bar Assembly** is adjusted by loosening locking screw at back of **Leverage Bar Ring**. Rotate sleeve to desired position and tighten locking screw. (See Fig. 7).
g) Angle of **Leverage Bar** is adjusted by loosening lock nut at base of **Leverage Bar Arm**. Retighten lock nut after adjusting. ***NOTE*: Leverage Bar** must not be threaded through **Leverage Bar Ring** to tighten into **Twist Grip Sleeve**. This will dimple **Sleeve** and cause **Handle** to bind. **Twist Assembly** must always rotate freely.

> ***NOTE:* When adjustments are complete, wrench tighten all nuts on control assembly. Torque down all screws. Be certain that jam nuts on brake threaded rod are tight.**

Step 7 – Change Control From Left-Hand to Right-Hand:

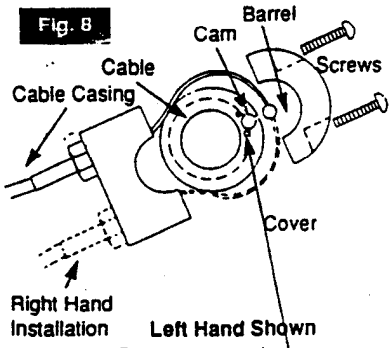
Before original installation if you need to change your control from a left hand installation to a right hand installation, follow the steps listed below. (See Fig. 8)

a) Remove the two screws holding the **Covers** to the **Main Arm Assembly**.
b) Pull **Cable** out of **Cable Casing**.
c) Pull stop pin out of **Cam** and insert into hole noted in Figure 8.
d) Unscrew the **Cable Casing Connector** at the **Main Arm Assembly** and re-thread into the hole directly below the one it was removed from.
e) Insert **Cable** into **Cable Casing** and route **Cable** around the **Cam** so that **Cable Casing** and **Cable** are on the same side of **Cam**. Insert **Barrel** into **Cam**.
f) Re-assemble **Covers** to the **Main Arm Assembly**. The covers should be up against the brake rod block and the screws facing the driver.

For re-installing control or replacing damaged **Cable**, a new **Cable must** be used. Follow the steps listed below.

a) Loosen and remove the **Swage Fitting** at the cable hook-up end.
b) Remove the two screws holding the **Covers** to the **Main Arm Assembly**.
c) Lift the **Cable** so that the cable **Barrel** may be slipped sideways out of the **Cam**.
d) Pull **Cable** out of **Cable Casing**.
e) Push new **Cable** into **Cable Casing**, insert **Barrel** and **Cable** into **Cam**.
f) Re-assemble **Covers** to the **Main Arm Assembly**. The covers should be up against the brake rod block and the screws facing the driver.
g) Re-assemble the **Swage Fitting** (See Step 11, Fig. 15).

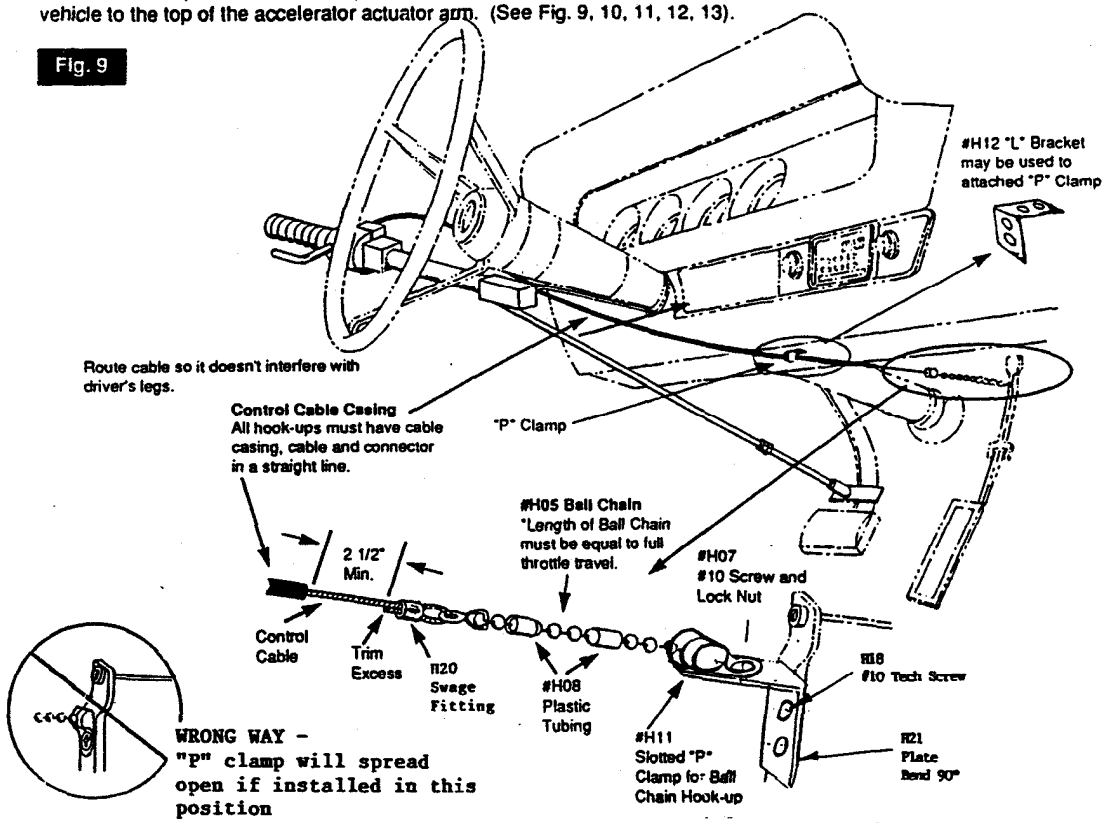
Fig. 8



Step 8 – Route Cable:

Most vehicle accelerator pedal assemblies work on a fulcrum principal. Push down on the pedal, the actuator rod pivots just above the pedal and the top of the rod pulls an existing cable to actuate the carburetor or fuel injection. We have developed an installation procedure for connecting our CT-100 and CP-200II cable controls inside the vehicle to the top of the accelerator actuator arm. (See Fig. 9, 10, 11, 12, 13).

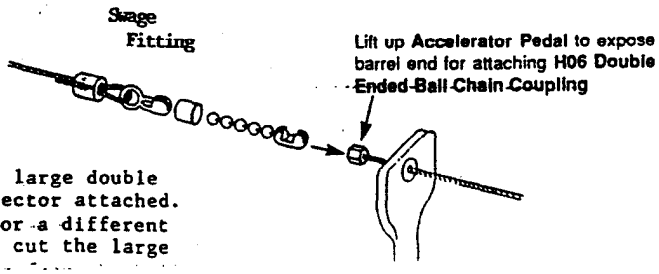
Fig. 9



Alternate Mounting Showing Double Ended Ball Chain Connector

Connected to existing ball end

Fig. 10



Ball chain comes with large double ended ball chain connector attached. If smaller connector or a different mounting is required, cut the large

Control Installation

( ) Universal bracket bolts tight
( ) Pivot arm attachment nuts tight
( ) Pivot arm/main arm connection bolt tight
Don't Assume That Anything Is Tight
( ) Main arm movement free
The handle of the control can be moved to the left or to the right by loosening the bolts on the pivot arm. Make sure the handle clears the arm rest and window crank on the door. Re-tighten the bolts on the pivot arm.
( ) Main arm position
( ) Main arm clearance
( ) Steering wheel, all positions
( ) Drive selector lever
( ) Brake tube position
( ) Angle 30° max. on upper & lower ball joints
( ) Clearance of dash structure
( ) Clearance for foot operation
( ) Tube lock nut tight
( ) Top plate screws tight
( ) Bracket "U" bolt nuts tight
( ) Bottom ball joint nut tight
( ) Brake tube operation (motor running)
( ) Clearance of dash structure
( ) Free return
Check that brake light switch is not actuated by control (except when brakes are applied).
( ) Twist control operation
( ) Free movement, (both directions)
( ) Automatic return to idle position
Is control handle close enough to steering wheel so the driver can grasp handle and still loop thumb over steering wheel, if necessary? Will spokes of steering wheel clear dimmer switch when steering wheel is turned? Will control handle clear all door handles on left hand installation?
( ) Leverage bar position
( ) Lock nut tight
( ) Ring screw tight (back side)
( ) Decorative panel
( ) Reinstall panel. Some trimming with saw or hot knife may be required.

Cable Installation:

( ) Clearance (no interference)
( ) Loops adequate (no less than 4" radius)
( ) Cable pulling straight
( ) Ball chain connections secure (plastic tubing covers)
( ) Cable clamps tight

Operation:

( ) Static, motor running, (vehicle in "park", emergency brake ON)
( ) Free and easy operation of gas pedal
( ) Brake rod clears dash when brake is applied (hard)
( ) Engine return to normal idle

Road Test:

IMPORTANT ! **COMPLETELY ROAD TEST VEHICLE AND HAND CONTROLS USING AN ABLE-BODIED DRIVER BEFORE ALLOWING CUSTOMER TO OPERATE.**

( ) Will car shift to passing gear
( ) Brakes work without excessive reach
( ) Customer has been given complete instructions on how to operate hand controls.

Do not turn a hand controlled car over to a driver who does not have a [illegible]

	W1000-A	Mounting Brackets (2)
	W1000-B	3/8 - 16 x 1" carriage bolts (6)
	W1000-C	3/8" SAEflat washers (6)
	W1000-D	3/8 - 16" Kep nuts (6)
W1014	Pivot Arm	
W1015	Main Arm Assembly	
	W1015-A	Main arm tube
	W1015-B	Pivot block
	W1015-C	Brake ball joint block
	W1015-D	1/8 x 1 - 1/8 spring pins (2)
	W1015-E	3/8 x 5/8 SHSS
	W1015-F	5/16 - 18 greer nut-hex
	W1015-G	10 - 24 x 3/8 PHrdHD M/S (2)
W1003	Leverage Bar Ring w/8-32 x 1/2 SHCS (Locking screw)	
W1004	Leverage Bar w/1/4-20 jam nut (Lock nut)	
W1005	Leverage Bar Rubber Sleeve	
W1006	Vinyl Hand Grip (Black)	
W1016	Cam Block Assembly	
	W1016-A	Upper cam block
	W1016-B	Lower cam block
	W1016-C	1/4 - 20 x 3/4 PHrdHD M/S (2)
	W1016-D	5-1/2' black nylon conduit w/connector
	W1016-E	6' braided cable w/barrel fitting
W1017	Twist Grip Assembly	
	W1017-A	Cam Assembly
	W1017-B	3/32 x 7/16" spring pin
W1018	Completed Main Arm	
W1019	Brake Tube Assembly	
	W1010-A	Brake tube
	W1019-A	Brake ball plate
	W1019-B	Upper brake ball joint
W1011	Brake Rod Assembly	
	W1011-A	5/16 - 18 threaded rod
	W1011-B	5/16 - 18 jam nuts (3)
	W1011-C	Lower ball joint
	W1011-D	3/8 - 24 ESNA nut
	W1011-E	"L" Brake rod bracket
	W1011-F	"U" Bolt w/(2) 3/8 - 16 KEPS nuts
W1020	Accelerator Parts Packet Complete	
	H02	Eyelet connectors (2)
	H05	Ball chain w/coupling
	H06	Double ended coupling
	H07	#10x3/8 screw w/nut
	H08	1/4 dia. plastic tubing
	H11	"P" clamp (3)
	H12	"L" Bracket
	H14	Nylon wire tie (4)
	H18	Tech screws (6)
	H19	1/4 washer
	H20	Swage fitting (2)
	H21	4-hole plate
W1021	Dimmer Switch Assembly	
W1022	Instruction Manual	

WELLS-

Hand Control #5

Mobility Products & Design

3500 Series Hand Control

TABLE OF CONTENTS

RECOMMENDED TOOL LIST

ELECTRIC DRILL-3/8" CAPACITY

DRILL BITS

OPEN-END WRENCHES

SOCKET SET

SIDE CUTTERS

SCREW DRIVERS

ALLEN WRENCHES

TEST LIGHT

PLIERS

TORQUE WRENCH

ELECTRIC TAPE

CALL 1-800-488-7688 FOR ASSISTANCE OR PARTS

THESE INSTRUCTIONS ARE INTENDED FOR DEALER USE ONLY!

Late model cars contain decorations such as panels and trim around the dashboard area and the accessories such as air conditioning. Therefore it is often necessary to remove and or trim those panels and ducts to obtain the necessary clearances.
The installation and adjustment of hand controls has become more complicated. For this reason an experienced, specially trained mechanic must perform the installation.

WARNING: All M.P.D. Inc. products must be installed by an authorized M.P.D. Inc. dealer, and are not intended to be sold "over the counter". All warranties will be voided, and all liabilities will be assumed by any person, company, or organization knowingly violating this strict M.P.D. Inc. policy.

The vehicle must be equipped with automatic transmission, power steering, and power brakes.

WARNING FOR "CUSTOMIZED" VEHICLE

Installation of hand controls or other M.P.D. Inc. driving aids on "customized" vehicles is NOT AUTHORIZED.

"Customized" means changes made for the purpose of high performance, or for use on areas other than normal highways or byways used by the general public; these changes are as follows:

-Oversized, undersized or untreaded tires,

-Modified suspension systems,

-Additional or modified carburetors or linkages,

-Small steering wheels not supplied by the vehicle's manufacturer,

-Or changes that tend to make the vehicle difficult or dangerous to drive-VEHICLE MUST MEET ALL MOTOR VEHICLE SAFETY STANDARDS.

The physically impaired driver needs good equipment for safe driving, and "customized" vehicles not authorized by the vehicle's manufacturer or not authorized by M.P.D. Inc., tend to defeat this purpose, and puts the driver, as well as others, in danger.

M.P.D. Inc. reserves the right to discontinue sales to dealers that ignore this warning.

WARNING FOR DRIVING FROM A WHEELCHAIR

ANY PERSON DRIVING FROM A WHEELCHAIR MUST HAVE A 30 MPH/20G IMPACT TESTED TIE DOWN SYSTEM, USED IN CONJUNCTION WITH SHOULDER AND LAP RESTRAINTS WHICH MEET F.M.V.S.S. GUIDELINES. M.P.D. INC. IS NOT LIABLE FOR PERSONAL INJURY OR PROPERTY DAMAGE THAT RESULT FROM IMPROPER USE OR APPLICATIONS OF RESTRAINT SYSTEM.

M.P.D. INC. IS NOT RESPONSIBLE FOR ALTERATIONS, MODIFICATIONS, OR REPAIRS.

STEP 1: MOUNT GAS CLAMP

WITH GEAR SHIFT IN PARK AND PARKING BRAKE ON, mount Gas Clamp first, see below. It is difficult to gain access to gas pedal area after main control assembly has been installed. Keep Gas Clamp as clear as possible of pedal so that the non-handicapped driver will have unobstructed access to the gas pedal.

DO NOT attach Gas Rod to L-Bar at this time (see Step 8).

figure 1.

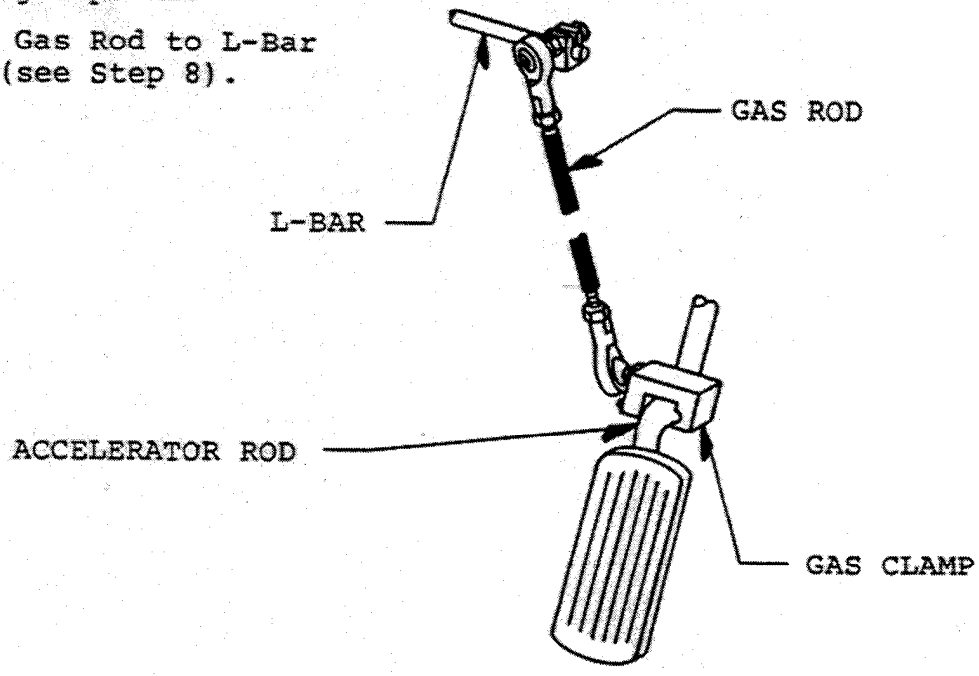
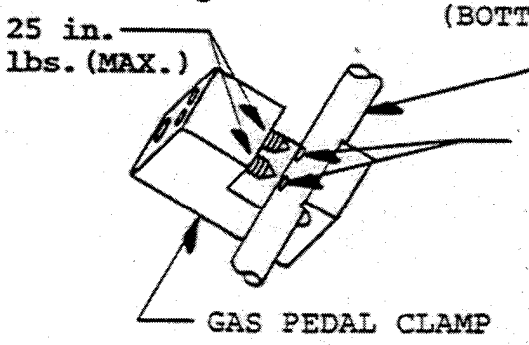


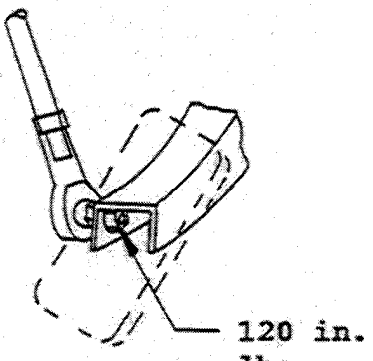
figure 2.



After determining correct position of gas pedal clamp, remove clamp and using dents made by set screw points, drill (2) 1/8" diameter x 1/8" deep holes. Replace clamp making sure set screw points enter holes.

figure 3.

On "U" shaped pedal arms, drill a 5/16" diameter hole in arm, and attach gas pedal ball joint using a lockwasher and a 5/16"-24 hex nut. Make sure the linkage will not interfere with the gas pedal operation.



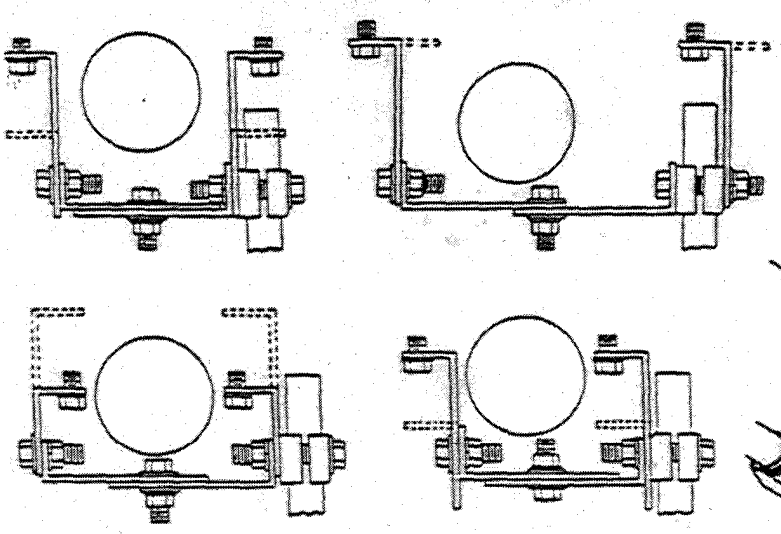
STEP 2: INSTALL MOUNTING BRACKET

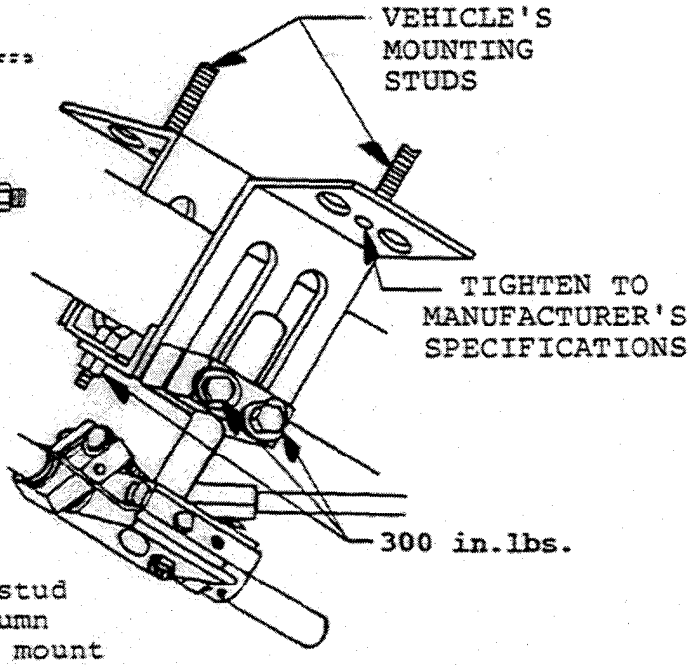
Remove the dash panel and any air conditioning ducts below the steering column. Air conditioning ducts can be moved to different positions, sometimes requiring longer duct hoses. The vehicle's wiring harness and connector may have to be moved.

#68657 BOLT-ON UNIVERSAL BRACKET

WARNING: THIS MOUNTING BRACKET MUST BE ASSEMBLED AS ILLUSTRATED. ANY USE OF A SINGLE COMPONENT PIECE AS A MOUNTING BRACKET IS NOT AUTHORIZED BY M.P.D.

POSSIBLE MOUNTING COMBINATIONS

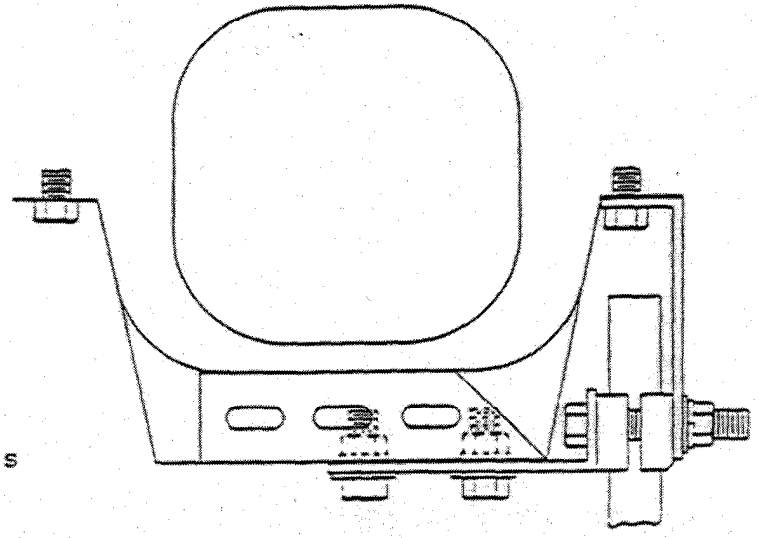




Remove nut and washer from vehicle stud or bolt on one side of steering column bracket. Using lockwasher provided mount bracket leg to steering column bracket with existing fasteners. Repeat for other leg. After bracket height is determined, short bracket legs may be used. Tighten to torque specifications shown.

1991 TAURUS AND SABLE MOUNTING
(SOME LATE MODEL 1990 ALSO)

Remove nut from vehicle stud on the right side of steering column. Mount bracket leg as shown in diagram and fasten using existing nut. Fasten other bracket leg and vertical clamp as shown in the diagram. After position of brackets has been determined, drill two 3/8" holes in existing shield below column and fasten bracket using 3/8" bolts, washers and nuts. Tighten to torque specifications shown in above illustration.



OPTIONAL HAND CONTROL MOUNTINGS

BOLT ON "Y" BRACKET (MODEL 3507)

1. Remove any dash panels or shields that may prevent access to the steering column supports.

2. Assemble (2) mounting brackets to the mounting block using (2) 3/8"-16 x 3/4" hex head bolts, flatwashers and lockwashers as shown in illustration (Do not tighten at this time).

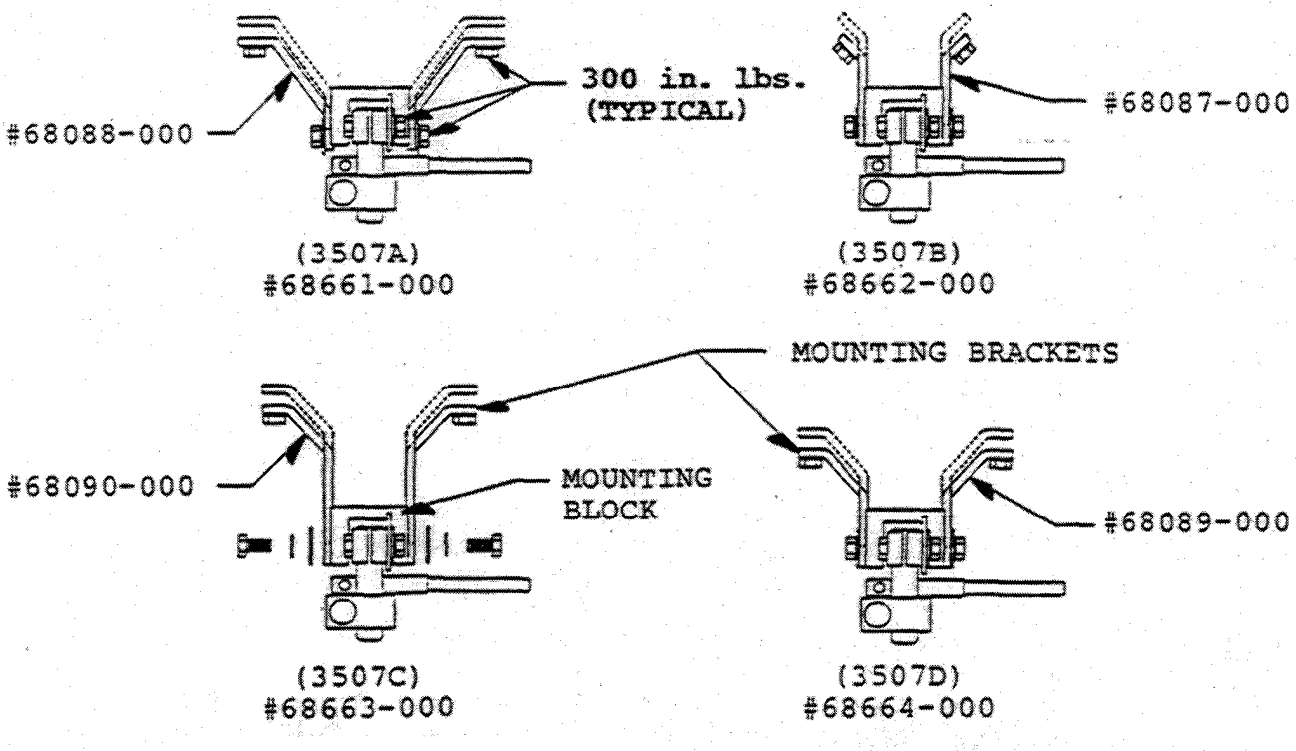
3. The column is usually supported by (2) pair of mounting bolts. Hold the mounting block assembly up to each pair of mounting bolts and check for alignment. When it has been determined which pair of mounting bolts will work best for your installation, remove those fasteners supporting the steering column.

4. Secure the mounting block assembly to the steering column using the original fasteners.

5. Slide the mounting block towards the steering column and tighten all bolts.

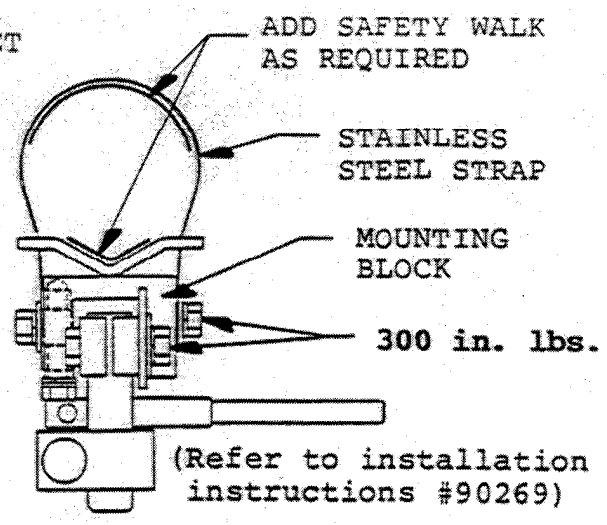
6. Slide the vertical clamp over the vertical shaft on the hand control and fasten to the mounting block plate using (2) 3/8"-16 x 1 3/4" hex head bolts, flatwashers, lockwashers and hex nuts (tighten lightly). Vertical shaft may be trimmed to adjust the control up tight.

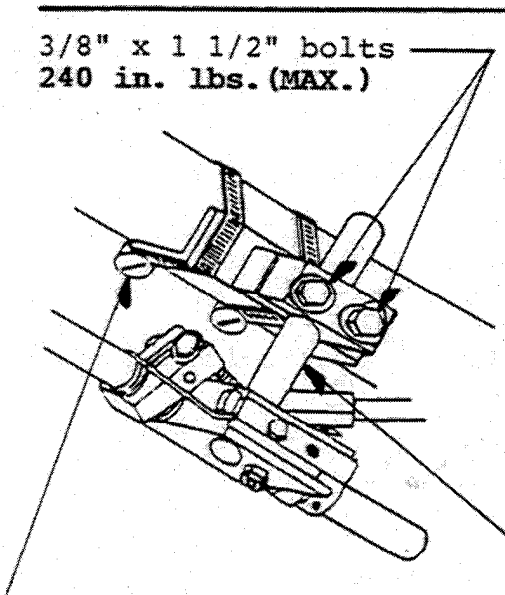
7. At this point, the hand control can be adjusted horizontally or vertically to the desired position and all bolts must be tightened to the specified torque specifications.



#68665 (3506) STRAP-ON UNIVERSAL BRACKET

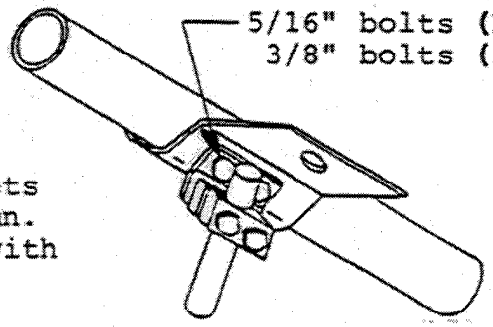
Mount the Strap-On Universal Bracket as shown using the stainless steel strap provided. Lightly tighten until final position is determined, then final tighten to 300 in. lbs. DO NOT EXCEED





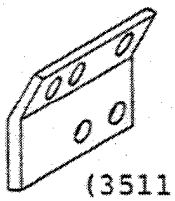
#68640 (3509) CLAMP-ON UNIVERSAL BRACKET

Mount Clamp-On Universal Bracket as shown using stainless steel clamps provided. Lightly tighten until final position has been determined, then final tighten to 50-100 in. lbs. DO NOT EXCEED



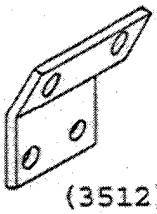
AUXILIARY MOUNTING BRACKETS

Mount Auxiliary Mounting Brackets on right side of steering column. Remove (2) bolts, and replace with bolts and lockwashers provided.



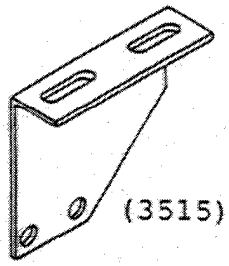
(3511)

#68621-Will fit most pre-1984 General Motors, Chrysler Corp. and American motors cars. Also will fit Chevy vans.



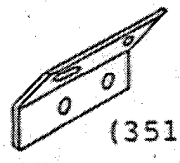
(3512)

#68622-Will fit most pre-1982 Ford Galaxy, LTD, Mercury Marquis, and Lincoln Continental. Also will fit in pre-1992 Ford vans.



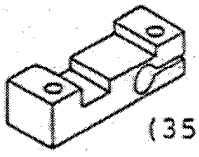
(3515)

#68625-Will fit Omni and Horizon.



(3517)

#68627-Will fit many pre-1984 GM cars.



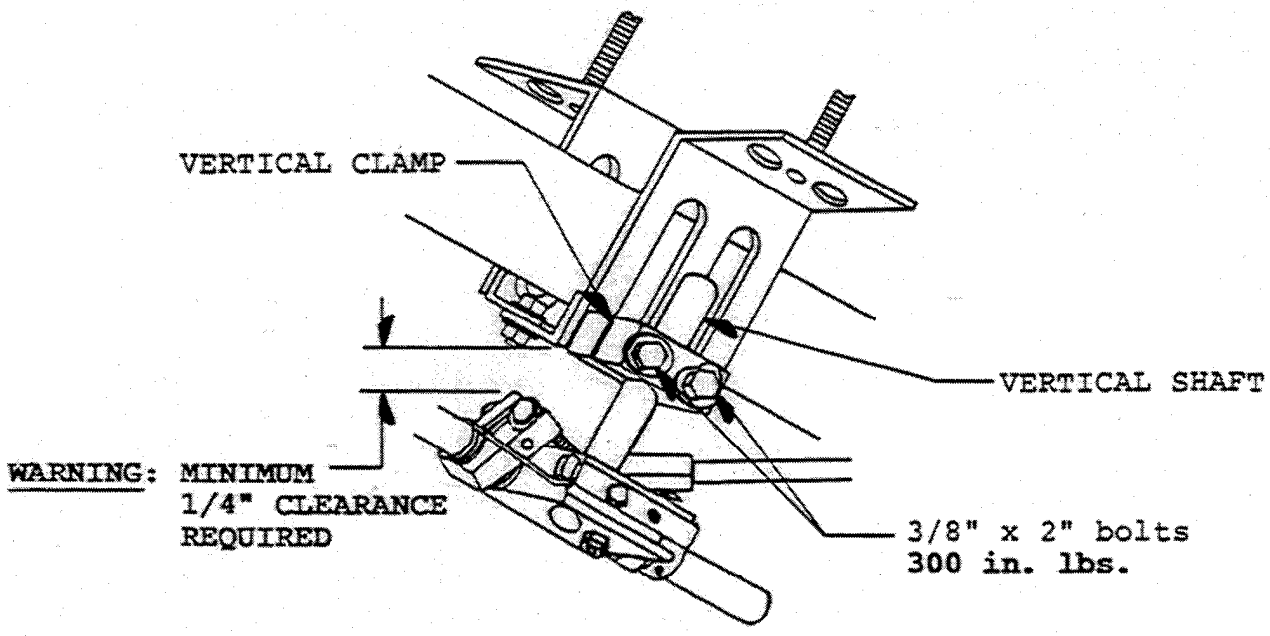
(3518)

#68628-Will fit Taurus and Sable. (Pre-1991)

If the control is to be converted for right hand use, follow the instructions on pages 19 & 20 of this manual.

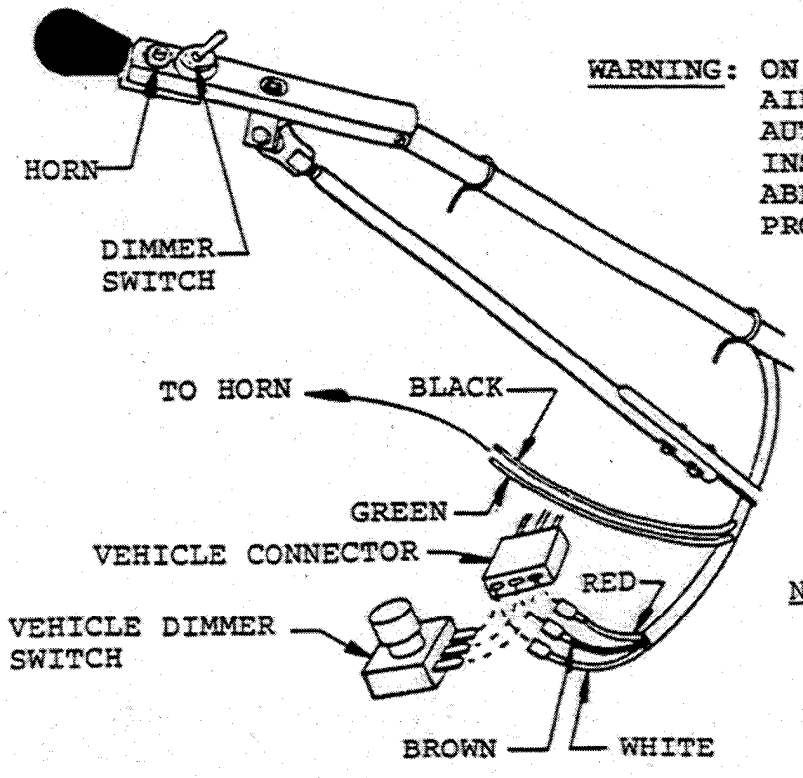
STEP 3: MOUNT MAIN CONTROL ASSEMBLY & VERTICAL CLAMP

Loosely install Main Control Assembly by sliding the Vertical shaft into the Vertical Clamp, see figure below. Lightly tighten bolts in the Vertical Clamp. This will keep the control up out of the way while the horn & dimmer wiring is completed.



STEP 4: HORN WIRING

Locate the steering column connector, usually at the bottom of the dashboard. A test light can be used to probe the terminal that honks the horn. Usually one terminal and a chassis ground are used, but sometimes two terminals are used. See illustration below.



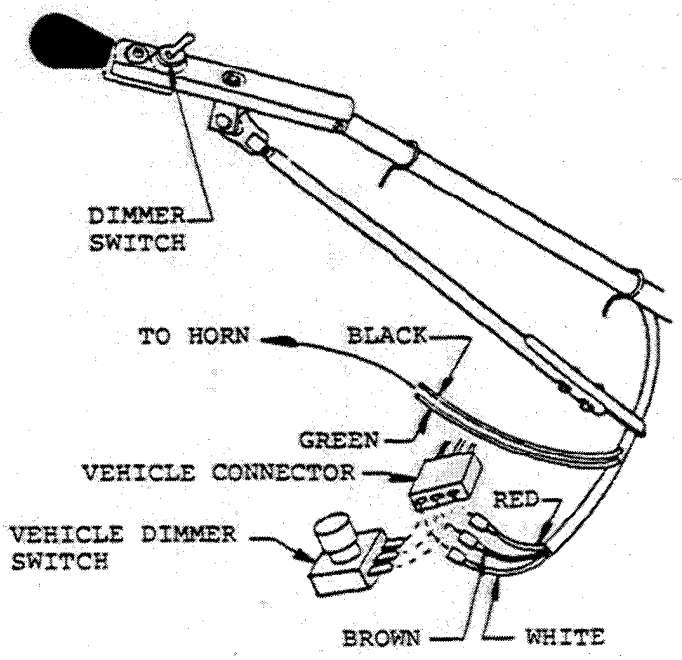
WARNING: ON VEHICLES WITH SUPPLEMENTAL AIR BAG RESTRAINTS, CONTACT AUTOMOBILE MANUFACTURER FOR INSTRUCTIONS ON HOW TO DISABLE THE AIR BAG PRIOR TO PROBING FOR HORN WIRES.

NOTE: Refer to additional information on page 21.

STEP 5: DIMMER WIRING

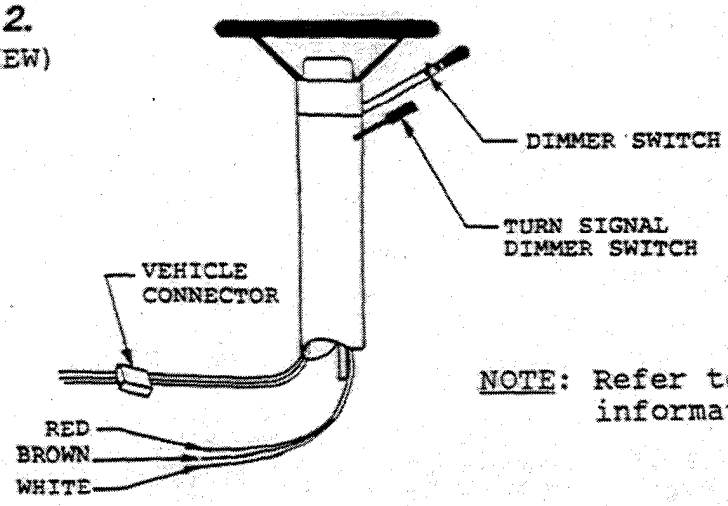
If vehicle has a floor mounted dimmer switch, unplug switch and connect control wires as shown in Figure 1. Brown wire must go to center terminal on connector. It is not important which of the outer terminals the red and white wires go to, since they will just reverse the position of the switch. Make sure to securely tape control switch cable to the connector using vinyl electrical tape, this will keep the cable from vibrating loose. Leave the vehicle dimmer switch in place (It is no longer operative).

figure 1.



If vehicle has dimmer on turn signal lever, locate wires coming from column. Some vehicles have a connector where these wires plug in, and probing can be done there. With test light, probe and locate hot, low beam and high beam wires for headlights. Cut and connect these wires using same color wires as noted above. It will be necessary in most cases to use the 2S Conversion Kit #68505, if the turn signal lever dimmer switch is to be operative also.

figure 2.
(TOP VIEW)



NOTE: Refer to additional information on page 21.

Assy. No.	Ref. No.	Part No.	Qty	Description
68518-000			*1*	*Safety Collar Assembly*
	25	68022-000	1	Safety Collar
	26	84001-000	1	1/4"-20 x 3/16" C.P. Set Screw
68519-000			*1*	*Cam Assembly*
	14	82042-000	1	5/16" Serrated Washer
	27	68013-000	1	Cam
	28	86010-000	1	3/8" x 1" Dowel Pin
	29	80018-000	1	5/16"-18 x 1" HHCS
68520-000			*1*	*Up-Stop Assembly*
	37	68010-000	1	Up-Stop
	38	80019-000	1	1/4"-20 x 1" HHCS
	39	80004-000	1	1/4"-20 x 1 1/4" HHCS
	40	82002-000	1	1/4" Lockwasher
	41	82001-000	1	1/4" Flat Washer
	42	83037-000	1	1/4" - 20 Jam Nut
68522-000			*1*	*Main Block Assembly*
	31	99137-000	2	Main Shaft Bushing
	32	99136-000	2	L-Bar Flange Bushing
	36	68011-000	1	Main Block
68524-000			*1*	*L-Bar Assembly*
	26	84001-000	1	1/4"-20 x 3/16" C.P. Set Screw
	49	68006-000	1	L-Bar
	50	84017-000	1	1/4"-20 x 1/4" C.P. Set Screw
	51	68005-000	1	Cam Follower
	52	68004-000	1	L-Bar Pivot
	53	99110-000	1	5/16" Snap Ring
	54	83036-000	1	5/16"-24 Jam Nut
	55	83054-000	1	5/16"-24 Hex Nut
68537-000			*1*	*Handle Assembly (Knob)*
	1	68021-001	1	Handle
		68050-001	1	Handle - Black
	2	68020-001	1	Switch Guard-Standard Handle
	3	91076-000	1	Control Knob
	67	91005-000	1	1/2" Plastic Hole Plug
	69	91077-000	2	7/16" Plastic Hole Plug
68575-000			*1*	*Gas Rod Assembly*
	54	83036-000	2	5/16"-24 Jam Nut
	58	89038-000	1	Gas Rod
	59	68002-000	1	Gas Rod Tube
68599-000			*1*	*3500 Wiring Harness Kit*
	4	83045-000	2	U-580 Shoulder Nut
	6	93014-000	1	Dimmer Switch
	7	93013-000	1	Horn Button Switch
		68598-000	1	Assembly Kit
68702-001			*1*	*Clevis Pin Assembly*
	9	81043-000	1	1/4"-28 x 1 1/4" Button Head Screw
	10	68019-001	1	Handle Pivot Bearing
	11	82039-000	1	1/4" Fiber Flat Washer
	12	83046-000	1	1/4"-28 Uni-Tork Nut
	24	82018-000	2	3/8" Brass Washer
	73	82013-000	1	1/4" SAE Washer

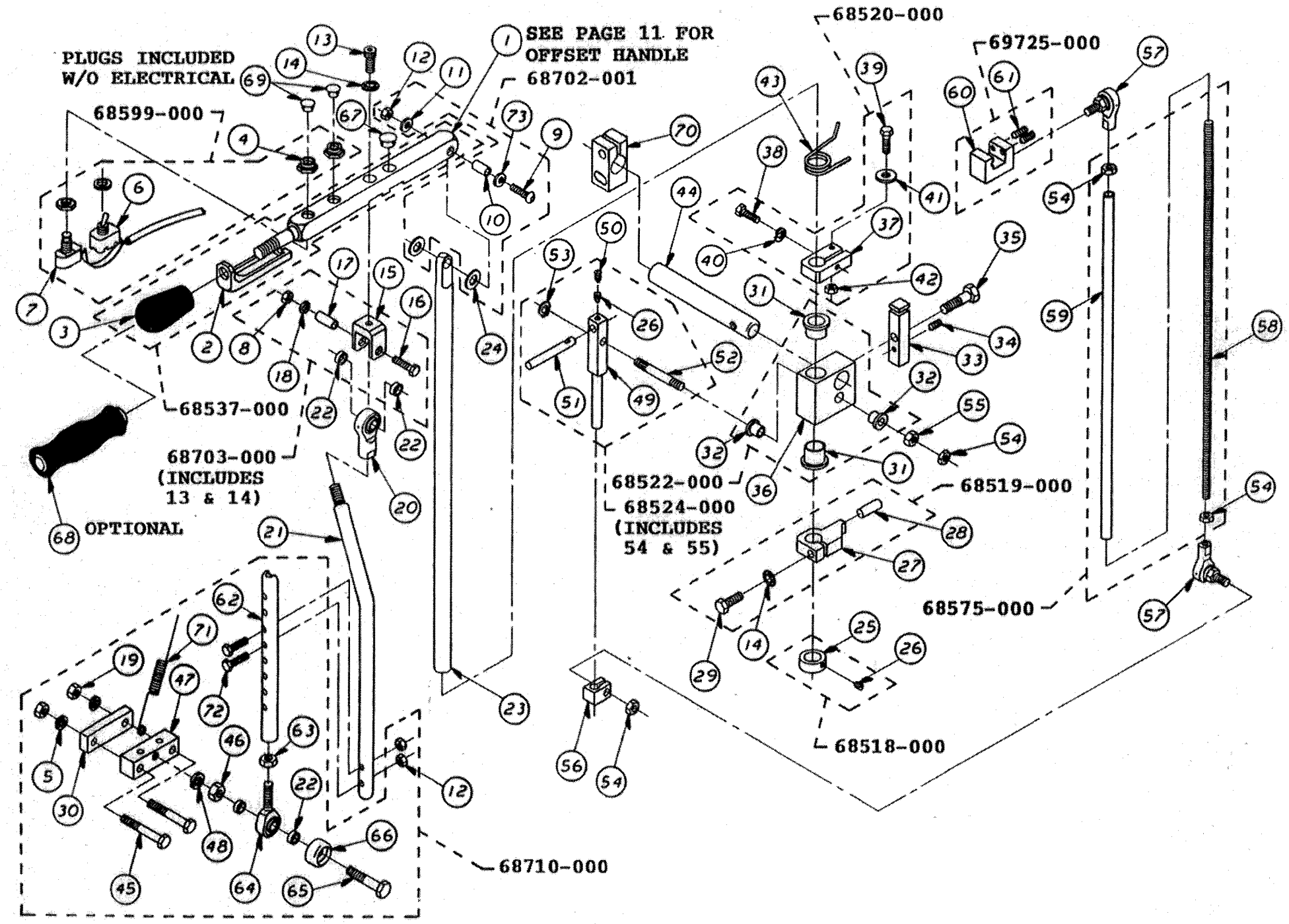
Assy. No.	Ref. No.	Part No.	Qty	Description
68703-000			***1***	***Clevis Bracket Assembly***
	8	83028-000	1	1/4"-20 Centerlock Nut
	13	81009-000	1	5/16"-18 x 3/4" SHCS
	14	82042-000	1	5/16" Serrated Washer
	15	68018-000	1	Clevis
		68049-000	1	Clevis - Black
	16	80004-000	1	1/4"-20 x 1 1/4" HHCS
	17	68017-000	1	Clevis Sleeve
	18	82034-000	1	1/4" Star Washer (External)
	22	69537-000	2	Rod End Spacer
68710-000			***1***	***Lower Brake Rod & Clamp Assembly***
	5	82007-000	2	5/16" Lockwasher
	12	83046-000	2	1/4"-28 Uni-Tork Nut
	19	83021-000	2	5/16" Toplock Nut
	22	69537-000	2	Rod End Spacer
	30	69535-000	1	Brake Arm Clamp
	45	80023-000	2	5/16"-18 x 2 1/4" HHCS
	46	83002-000	1	3/8"-16 Hex Nut
	47	69536-000	1	Control Brake Clamp
	48	82006-000	1	3/8" Lockwasher
	62	68047-000	1	Lower Brake Rod - Black
	63	83035-000	1	3/8"-24 Jam Nut
	64	89043-000	1	Brake Rod End
	65	80014-000	1	3/8"-16 x 2" HHCS
	66	69538-000	1	Rod End Safety Ring
	71	98055-000	1	Brake Return Spring
	72	80065-000	2	1/4"-28 x 1" HHCS
	60	69539-000	1	Gas Clamp #2
	61	84029-000	2	1/4"-20 x 3/4" C.P. Set Screw
69725-000			***1***	***Gas Pedal Clamp #2 Assembly***
	60	69539-000	1	Gas Clamp #2
	61	84029-000	2	1/4"-20 x 3/4" C.P. Set Screw

INDIVIDUAL PART NUMBERS

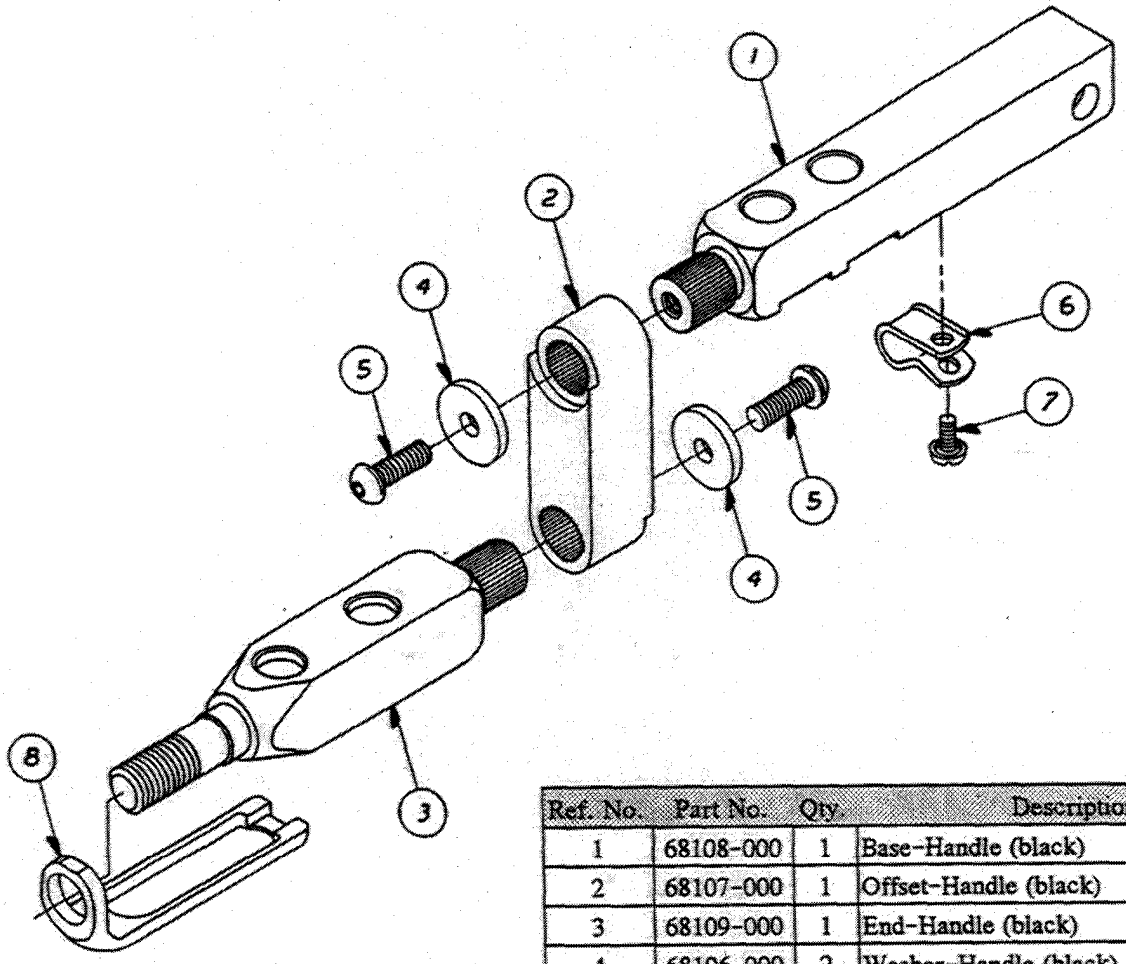
Ref. No.	Part No.	Qty.	Description
20	89029-000	1	Brake Rod End
21	68039-000	1	Upper Brake Rod-Bent-Black
23	68015-000	1	Main Shaft
33	68012-000	1	Spring Stop
34	84019-000	1	1/4"-20 x 1/2" C.P. Set Screw
35	80011-000	1	3/8"-16 x 1 1/2" HHCS
43	98023-000	1	Return Spring (Left)
	98034-000	1	Return Spring (Right)
44	68009-000	1	Vertical Shaft
54	83036-000	1	5/16"-24 Jam Nut
56	68003-000	1	Sliding Gas Clamp
57	89033-000	2	Gas Rod End
68	68700-000	1	Foam Grip Assembly
70	68008-000	1	Vertical Clamp
	68086-000	1	Vertical Clamp (3506 & 3507)
	92064-000	1	Oiler Kit

SPECIAL APPLICATION PARTS

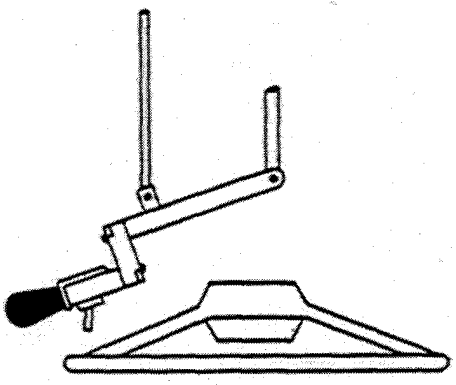
Part No.	Description
68032-000	Upper Brake Rod Extension Black (2")
68048-000	Upper Brake Rod-Black
68077-000	Upper Brake Rod (20")Black
68034-000	Main Shaft (13 1/2")
68014-000	Main Shaft (27")
68035-000	Vertical Shaft (3 3/4")
68044-000	Vertical Shaft (8")
99127-000	1 5/16" - 2 1/4" Stainless Clamp
99128-000	2"-4" Stainless Clamp
68080-000	Handle (Extended Length)
68698-000	3500 Offset Handle (Black)


PLUGS INCLUDED
W/O ELECTRICAL
68599-000
SEE PAGE 11 FOR
OFFSET HANDLE
68702-001
68520-000
69725-000
68537-000
68703-000
(INCLUDES
13 & 14)
OPTIONAL
68522-000
68524-000
(INCLUDES
54 & 55)
68519-000
68575-000
68518-000
68710-000

3500 OFFSET HANDLE (BLACK)
(68698-000)



Ref. No.	Part No.	Qty.	Description
1	68108-000	1	Base-Handle (black)
2	68107-000	1	Offset-Handle (black)
3	68109-000	1	End-Handle (black)
4	68106-000	2	Washer-Handle (black)
5	81045-000	2	1/4"-28 x 3/4" button hd. screw
6	91013-000	1	Cable clamp
7	85032-000	1	#10-24 x 3/8" pan hd. mach. screw
8	68111-000	1	Switch Guard



THE OFFSET HANDLE CAN BE ASSEMBLED TO THE USER'S PREFERENCE, BY REMOVING THE SCREWS (REF. NO.5). REMOVE THE HANDLE END (REF. NO.3), OR HANDLE BASE (REF. NO.1) OR BOTH, AND ROTATE TO DESIRED LOCATION. RE-ASSEMBLE HANDLE USING WASHERS (REF. NO.4), AND SCREWS (REF. NO.5).

NOTE: APPLY LOCTITE ® 242, OR EQUIVALENT, TO SCREW THREADS AND TORQUE TO 130 IN./LBS.

STEP 6: MOUNT BRAKE CLAMP

Mount Brake Clamp as shown in Figure 1 below. DO NOT use on Vehicles that have the brake pedal arm coming through the floor. Mount Brake Clamp as close to pedal as possible without causing interference with foot operation. Tighten to torque specifications shown.

figure 1.

#68710-LOWER BRAKE ROD ASM.

1. Using (2) 5/16" bolts, insert into Pedal Clamp #69536.
2. Position on brake arm as close to the brake pedal as possible.
3. Using 5/16" lockwashers and nuts fasten and torque to 260 in. lbs.

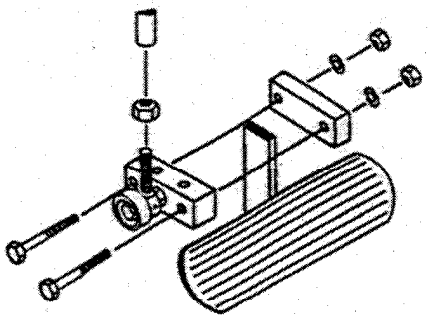


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figure 2. ADDITIONAL BRAKE CLAMP MOUNTING OPTIONS

#68710-LOWER BRAKE ROD ASM.

1. Remove pedal pad and drill (2) 9/32" diameter holes in brake pedal as shown.
2. Attach brake pedal mount under the brake pedal using (2) 1/4" bolts, lockwashers and hex nuts. Torque to 60 in. lbs.
3. Replace pedal pad trim if desired.

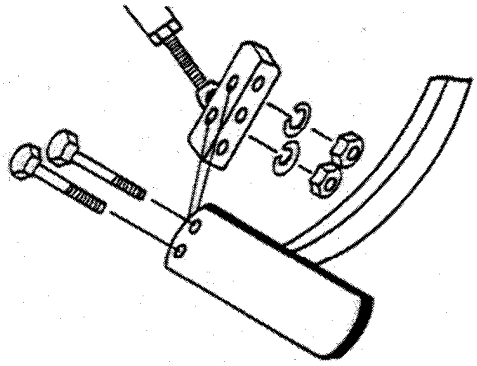

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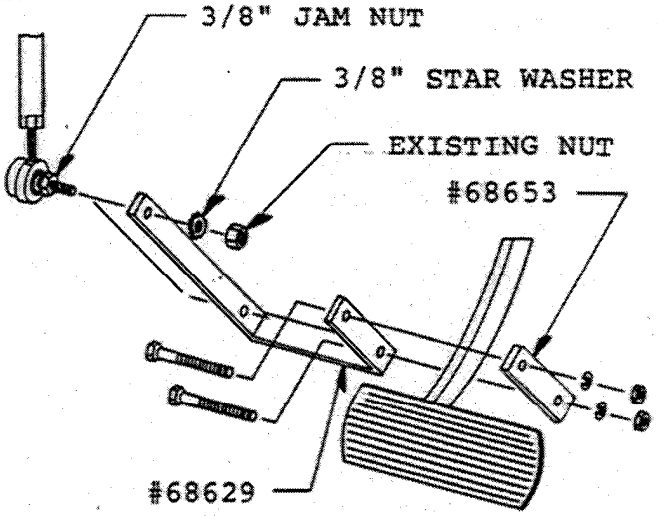
figure 3.

#68620-AUXILIARY OFFSET BRAKE BRACKET

1. Using (2) 5/16" bolts, insert into Brake Bracket #68629.
2. Position on brake arm as shown and insert bolts into Clamp Bar #68653.
3. Using 5/16" lockwashers and nuts fasten and torque to 260 in. lbs.
4. Remove existing nut and lock-washer on brake rod end. This nut will be used to fasten the brake rod end to Brake Bracket #68629. Replace existing nut with a 3/8" jam nut. Insert brake rod end and fasten with star washer and existing nut. Torque 3/8" nut to 400 in. lbs.

NOTE: The Auxiliary Offset Brake Bracket can be used when the brake arm is on the right side of the pedal or the column and causes a severe angle of the brake rod from the handle.

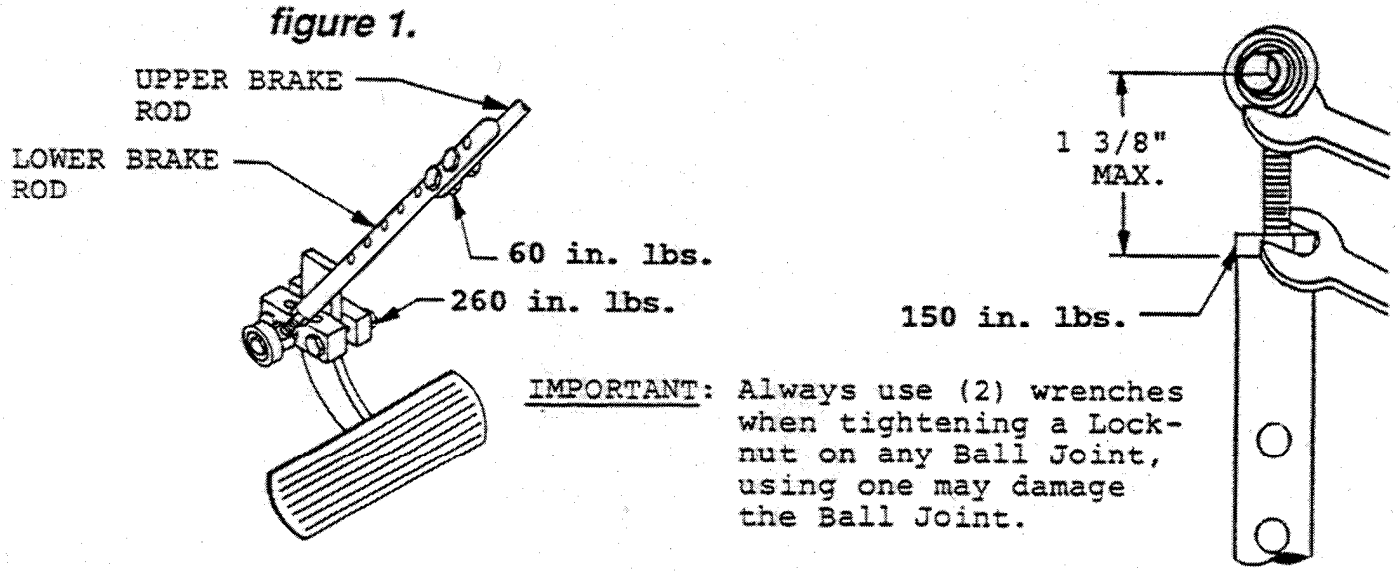


WARNING: MAKE SURE THAT NO PART OF AUXILIARY OFFSET BRAKE BRACKET WILL PREVENT THE BRAKE PEDAL FROM BEING FULLY DEPRESSED.

STEP 7: INSTALL BRAKE ROD

By using the various holes in the Lower Brake Rod (Figure 1), incremental adjustments of one inch can be made. Fine adjustment is accomplished by the threads at each end of the brake rods. Always maintain ½" thread engagement of rod to brake rod end. This will give a total of one inch fine adjustment. Tighten lock nut at bottom of Lower Brake Rod. DO NOT put another nut at top of Upper Brake Rod.

figure 1.



IMPORTANT: Always use (2) wrenches when tightening a Locknut on any Ball Joint, using one may damage the Ball Joint.

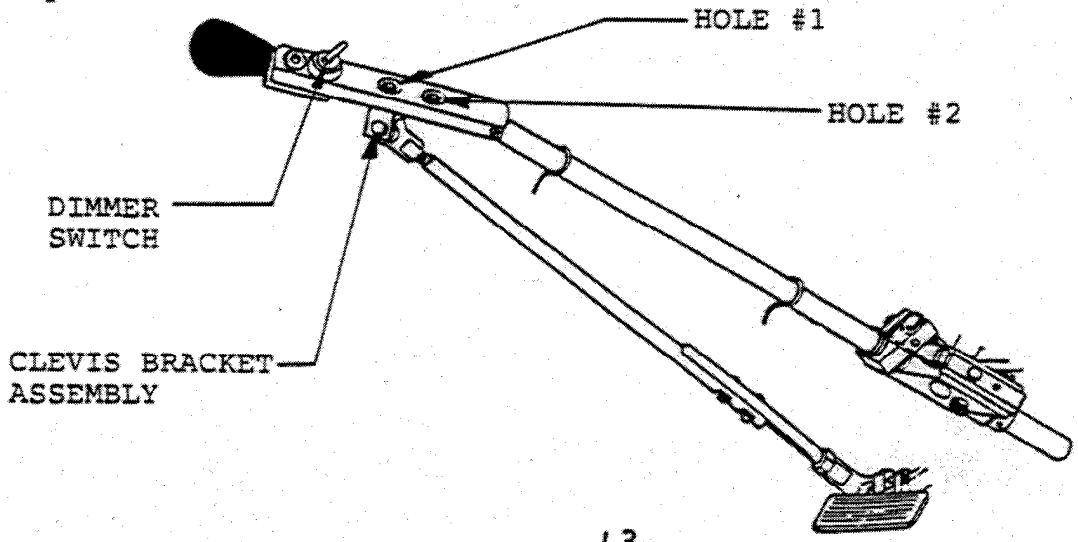
WARNING: STANDARD BRAKE CLAMP ASSEMBLY MUST BE PLACED AS CLOSE TO THE BRAKE PEDAL AS POSSIBLE!

NOTE: From centerline of Rod End to edge of Lower Brake Rod should not exceed 1 3/8".

---

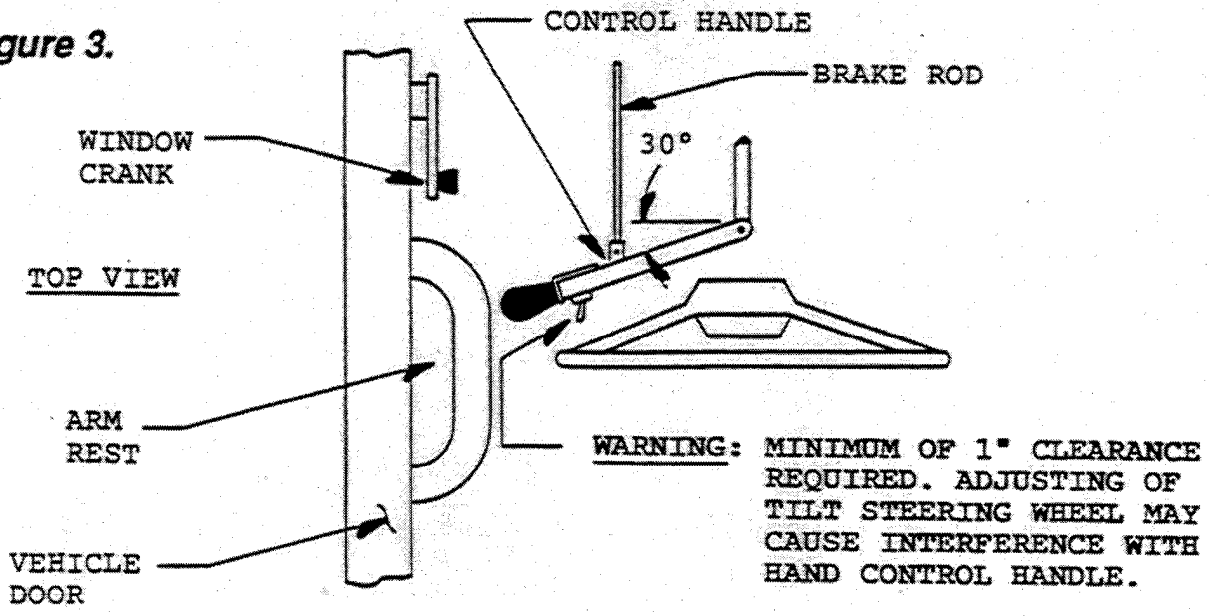
figure 2.

The handle of the control is drilled in two places for the Clevis Bracket Assembly, see below. The standard installation, which is factory assembled, has it in hole #1 closest to the dimmer switch. Moving the Clevis Bracket Assembly to hole #2 requires less effort to brake but more travel of the Handle. It is important to check for full braking function with the motor running. Torque 5/16-18 by 3/4" SHCS to 235 in. lbs.



With assembly of brake rod complete make sure that the dimmer switch clears steering wheel while maintaining approximately 30° angle of handle to Main Shaft (Figure 3).

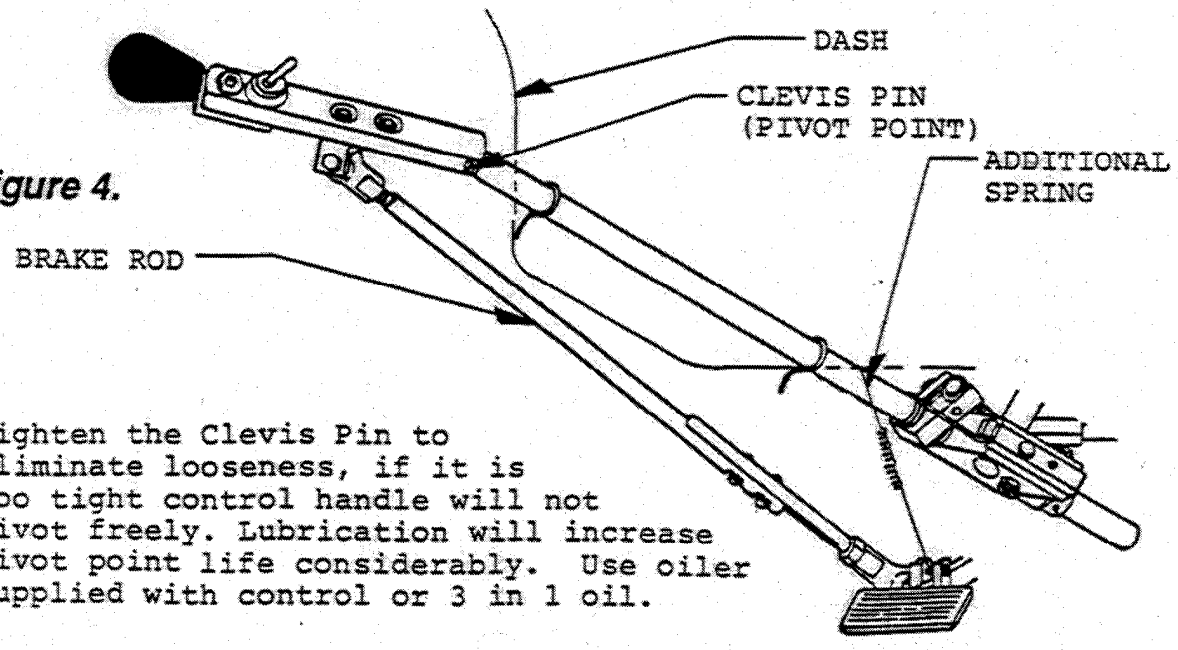
figure 3.



With engine running, gear shift in park and parking brake on; push control handle forward firmly to apply brakes hard. The control handle must clear arm rest, window crank and dash panel (see Figure 2, page 16). MAKE SURE BRAKE ROD DOES NOT RUB DASH BOTTOM, BECAUSE ACCELERATION OR HIGH IDLE COULD OCCUR.

WARNING: NEVER BEND BRAKE ROD, USE THE BENT BRAKE ROD #68039.

figure 4.



Tighten the Clevis Pin to eliminate looseness, if it is too tight control handle will not pivot freely. Lubrication will increase pivot point life considerably. Use oiler supplied with control or 3 in 1 oil.

If brake lights stay on when Control Handle is released, it may be necessary to install Brake Return Spring #98055 (supplied) to Brake Clamp Bolt at one end, and the dash at the other end (Figure 4).

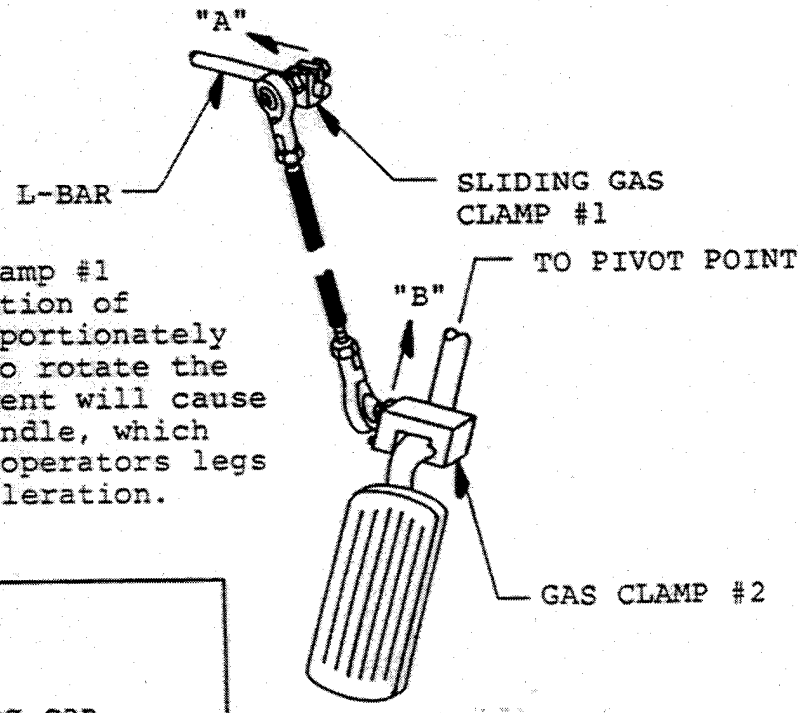
STEP 8: COMPLETE GAS ROD INSTALLATION

With L-Bar at approximately a **right angle** (90°) to the Gas Rod Asm #68575, install Sliding Gas Clamp #1, and cut Gas Rod to length, then cut Gas Rod Tube 1 1/2" shorter than Gas Rod. Attach Gas Rod to Gas Clamp #2.

ADJUSTMENTS FOR GAS ROD LINKAGE

1. Moving the Sliding Gas Clamp #1 in the direction of the arrow "A" will increase the stroke of handle but will decrease the effort required to rotate the handle (Less responsive acceleration).
2. Moving the Gas Clamp #2 in the direction of the arrow "B" (Closer to the pivot point) will decrease travel of handle, and will increase the pressure required to rotate the handle (More responsive acceleration). Moving Gas Clamp #2 in the opposite direction of arrow "B" will increase travel of handle and decrease the pressure required to rotate the handle (Less responsive acceleration).

figure 1.

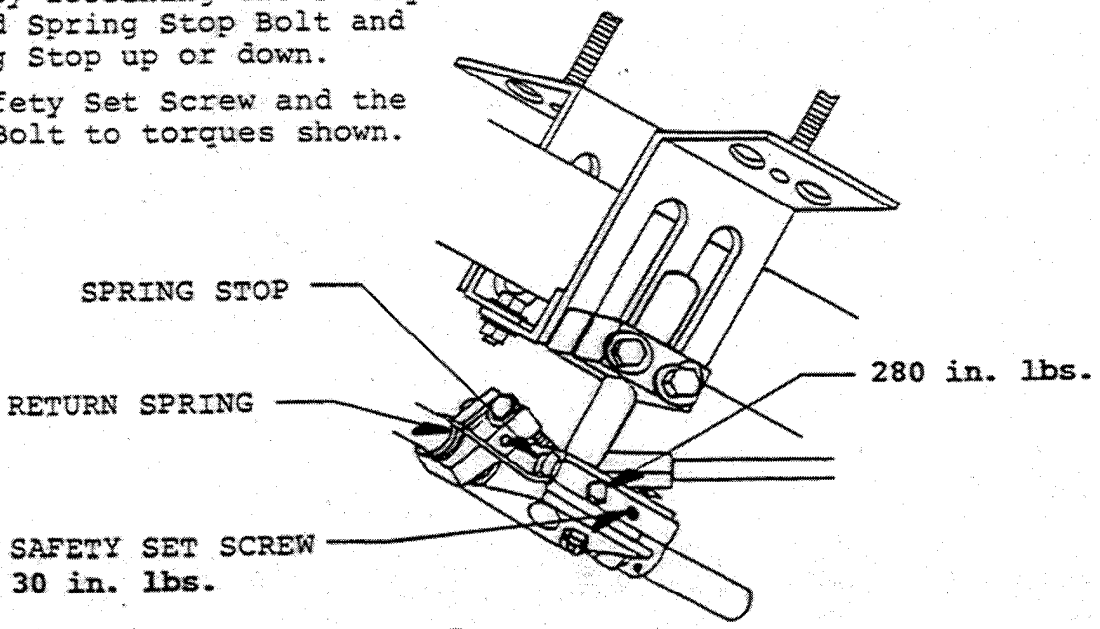


NOTE: As the Sliding Gas Clamp #1 is moved in the direction of arrow "A" it will proportionately require less effort to rotate the handle. This adjustment will cause more stroke of the handle, which could interfere with operators legs and prevent full acceleration.

figure 2.

Tension on the Return Spring can be adjusted by loosening the Safety Set Screw and Spring Stop Bolt and moving Spring Stop up or down.

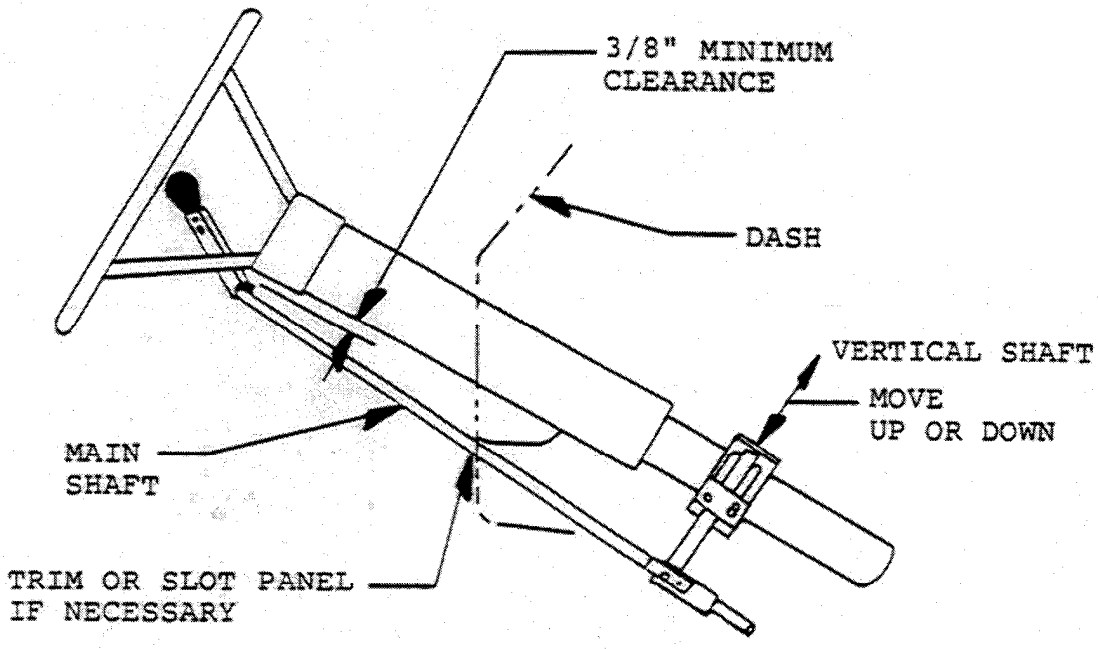
Retighten Safety Set Screw and the Spring Stop Bolt to torques shown.



STEP 9: **OBTAIN FINAL CLEARANCES AND ADJUSTMENTS**

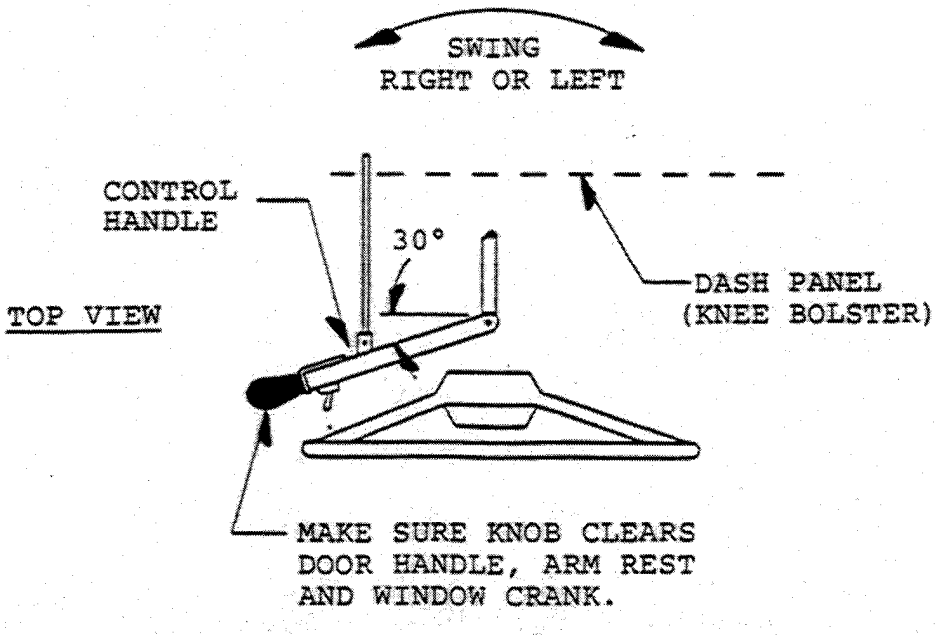
Position Main Control Assembly as shown in Figure 1. The Vertical Shaft can be moved up or down to obtain proper clearance between the Main Shaft and the steering column.

figure 1.



The handle of the control can be moved to the left or to the right by loosening the bolts in the Vertical Clamp. Make sure the handle clears the arm rest and window crank on the door. Re-tighten the Vertical Clamp bolts to torque specifications.

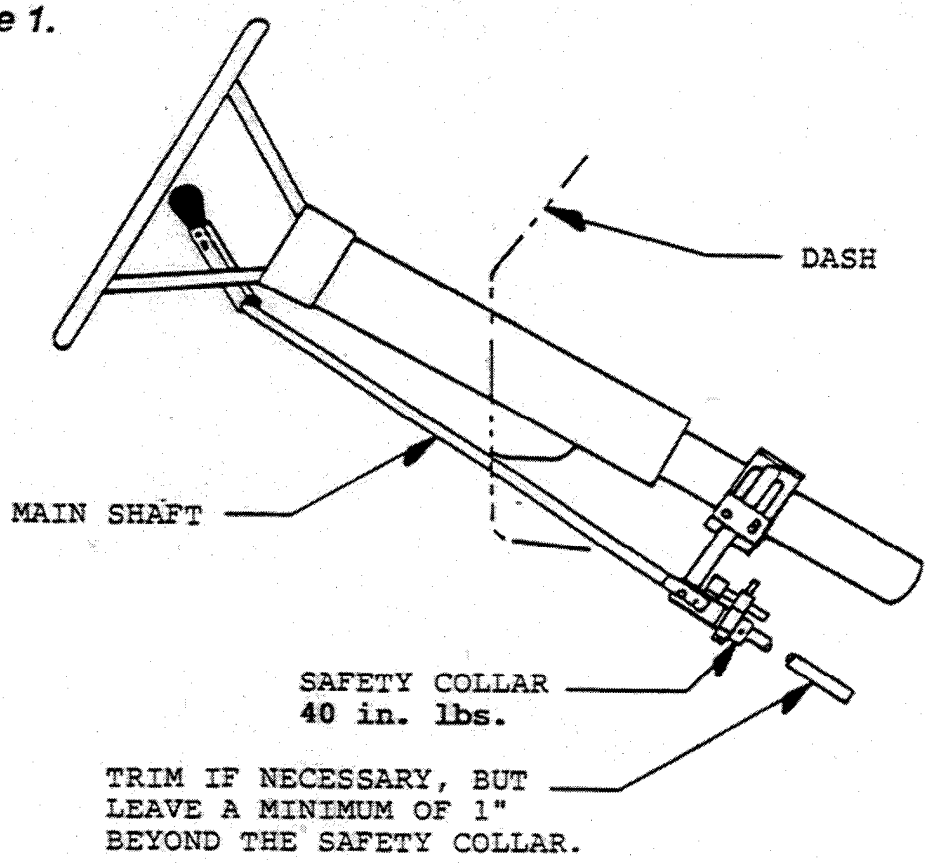
figure 2.



STEP 9: (CONTINUED)

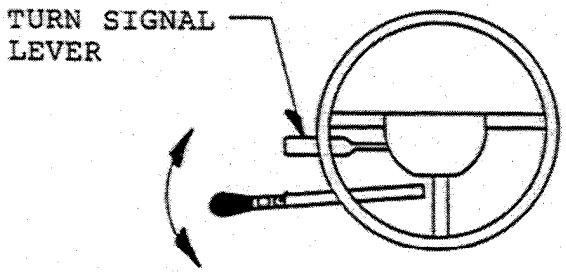
If the bottom end of the Main Shaft is too close to the vehicle brake, any excess can be trimmed off (Figure 1). Allow enough Main Shaft so that the Safety Collar #68518 can be installed as the final step of installation.

figure 1.



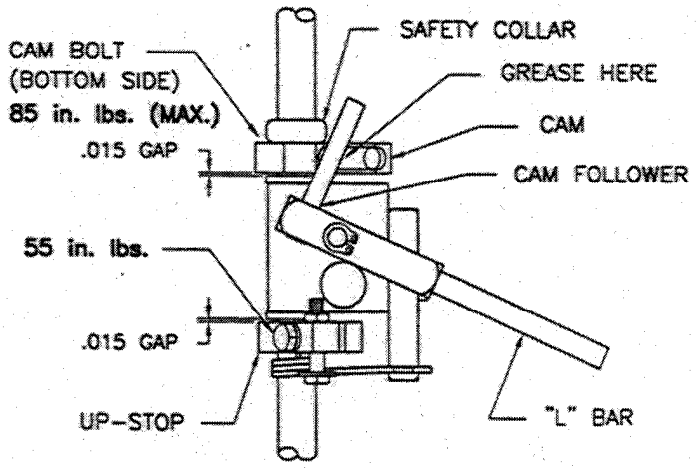
Control handle may be moved up or down (Figure 2) to accommodate user's needs by loosening the Up-Stop bolt (Figure 3) and rotating handle and Main Shaft. Cam assembly will need re-adjustment also.

figure 2.



Make sure handle clears when applying the brakes with turn signal lever in left turn position.

figure 3.



NOTE: Apply small amount of grease where cam contacts cam follower.

STEP 10: FINAL CHECK-OUT

1. Physically check adequate tightness of all bolts and nuts. Observe all torque specifications. DO NOT ASSUME THAT ANYTHING IS TIGHT.
2. Does return spring return control handle so no pressure is applied to gas pedal and car idles fast? Tension can be adjusted by loosening spring stop bolt and rotating spring stop (See page 15, Fig. 2).
3. Check that brake light switch is not actuated by control (except when brakes are applied). (See page 14, Fig. 4)
4. Is control handle close enough to steering wheel so the driver can grasp handle and still loop thumb over steering wheel, if necessary? Will spokes of steering wheel clear dimmer switch when steering wheel is turned? Will control handle clear all door handles on left hand installation? (See page 14, Fig. 3 and page 16, Fig. 2)
5. Will control handle clear turn signal arm on left hand installation? (See page 17, Fig. 2)
6. Will control handle clear gear shift lever on right hand installation?
7. Verify proper operation of horn. If proper wires were not used, turn signals, etc., could interfere with horn operation. (See page 6)
8. Verify proper operation of dimmer switch. Is dimmer cable securely out of the way? (See page 7)
9. With engine running, gear shift in park, and parking brake on; push control handle forward firmly and apply brakes hard.
   NOTE: This must be done with engine running since power brakes tend to depress the farthest then. Make sure brake rod doesn't rub dash or anything else. (See page 14, Figure 4).
10. With engine off, check for free easy operation of gas pedal; by rotating control handle toward lap. With engine running, recheck to see if engine will return to normal idle.
11. Will control fully operate gas pedal without hitting driver's lap? If not reset up-stop and cam and/or reposition sliding gas clamp. (See page 15, Fig. 1 and page 17, Fig. 3)
12. Apply small amount of grease to cam. (See page 17, Fig. 3)
13. Is safety collar positioned behind cam on main shaft. (See page 17, Fig. 1)
14. TEST DRIVE CAR YOURSELF. BE CAREFUL!! Check if the car will go into passing gear. Be sure controls do not interfere with any foot pedal operation of the car by a non-handicapped driver.
15. Customer has been given complete instructions on how to operate hand controls.
16. Do not turn a hand controlled car over to a driver who does not have a motor vehicle license for hand controls. The handicapped driver must always be licensed for driving prior to accepting a hand controlled car.
17. Customer has been made aware of returning within one week of installation for an installation check-out.
18. Fill out and return warranty registration card.

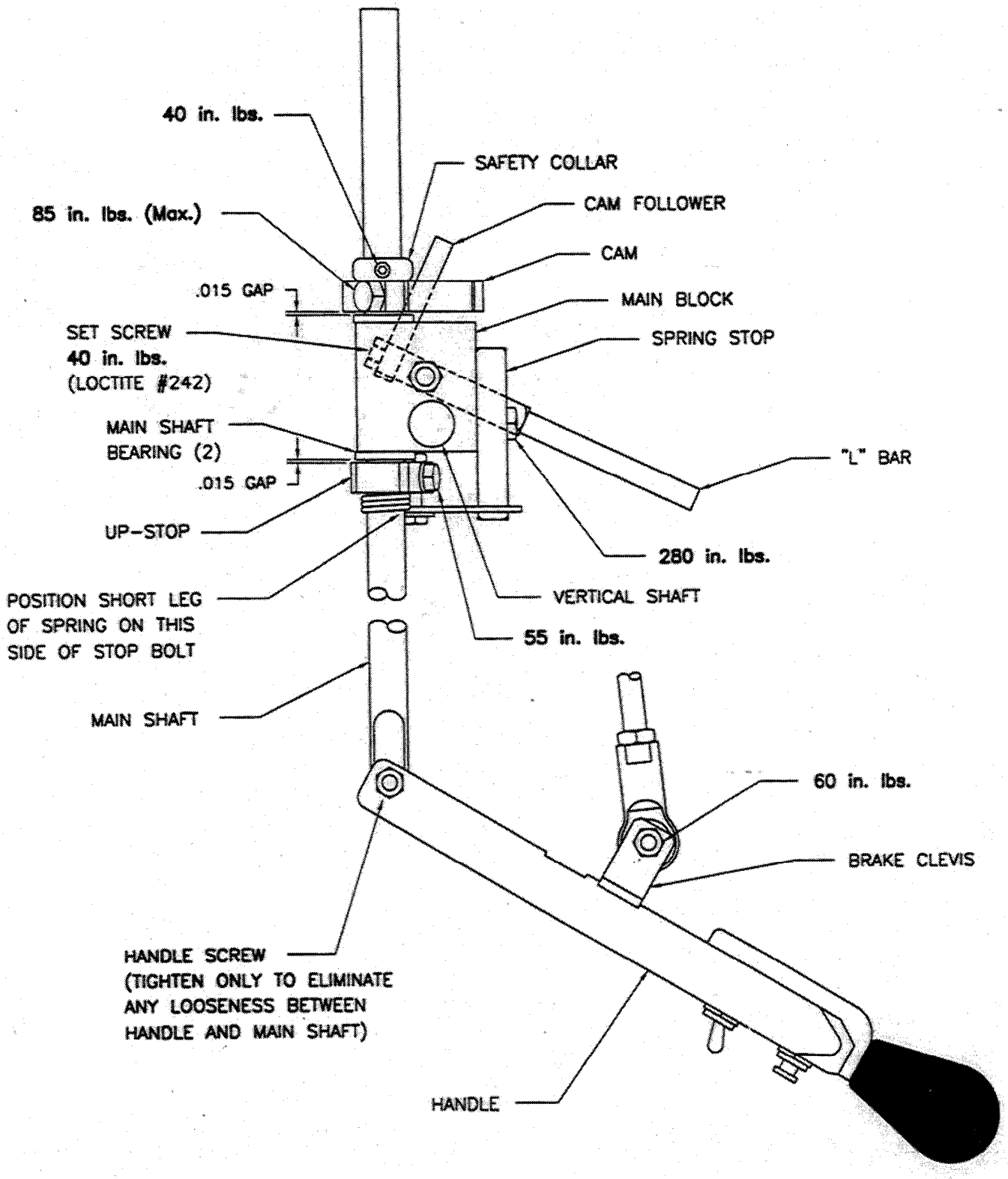
RIGHT HAND CONVERSION

Most installations are for left hand, therefore controls will be shipped for left hand, unless right hand is requested.

TO CONVERT TO RIGHT HAND, REFER TO PAGE 20, THEN:

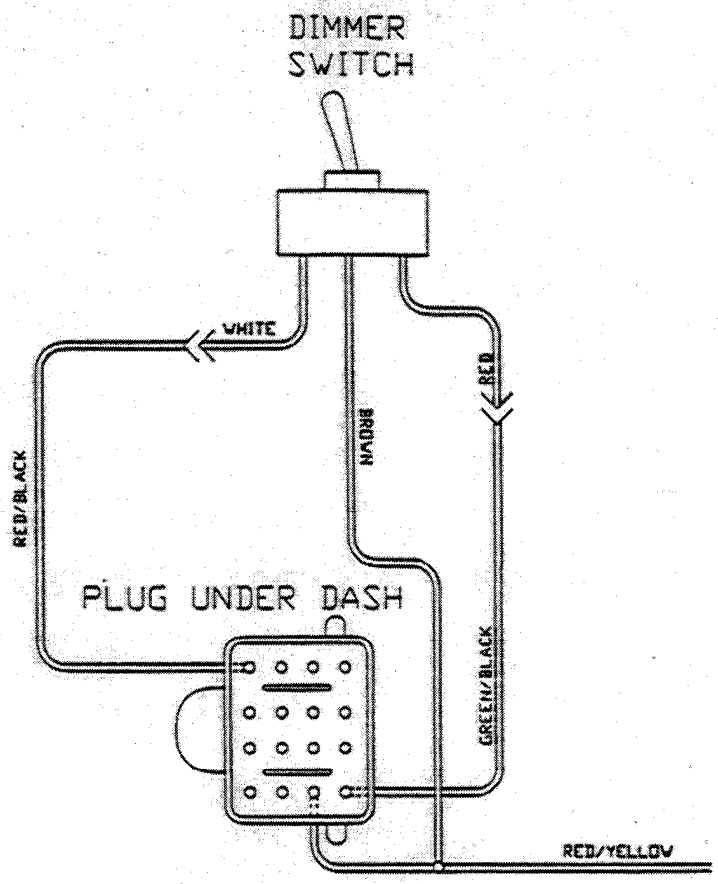
1. Remove Safety Collar and Cam (note position). Loosen Up-Stop.
2. Pull Main Shaft out of Main Block.
3. Remove Up-Stop (note position) and Spring from Main Shaft.
4. Reverse Spring, or use Right Hand Spring #98034-000. Replace on Main Shaft. **Replace Up-Stop on Main Shaft exactly as removed.**
5. Re-install shaft assembly into Main Block, and re-install Cam in reversed position (temporarily secure).
6. Position Up-Stop so that Stop Bolt is striking Vertical Shaft on bottom, and with Handle positioned to the right. Leave a .015 gap between Up-Stop and Main Shaft Bearing as shown. Re-tighten Up-Stop.
   NOTE: Up-Stop cannot be re-tightened unless Cam is tightened or Safety Collar is installed.
7. L-Bar must be removed, and re-installed from the bottom of Main Block. Cam Follower must be removed, and re-installed on the opposite side of L-Bar.
   NOTE: Cam Follower does not come out easy. Use Loctite #242 on Set Screws.
8. Position L-Bar toward Handle, and position Cam to Cam Follower. Leave a .015 gap between Cam and Main Shaft Bearing as shown. Re-tighten Cam.
9. If using Left Hand Spring, position long leg of Spring on top of Spring Stop, then position short leg of Spring behind Up-Stop Bolt.
10. Remove Handle Screw, and reverse, so that the head is on the bottom of Handle.
11. Remove the 1/4" hex head bolt from the Brake Clevis on the Handle. Turn the bolt 180 °, and re-install into the Brake Clevis.
    NOTE: Make sure that the Rod End Spacers are in place.
12. Route the horn and dimmer switch wiring over the top of the Brake Clevis.
13. Position the Safety Collar tightly behind the Cam, and **tighten securely as the final step of installation.**

ILLUSTRATION FOR RIGHT HAND CONVERSION

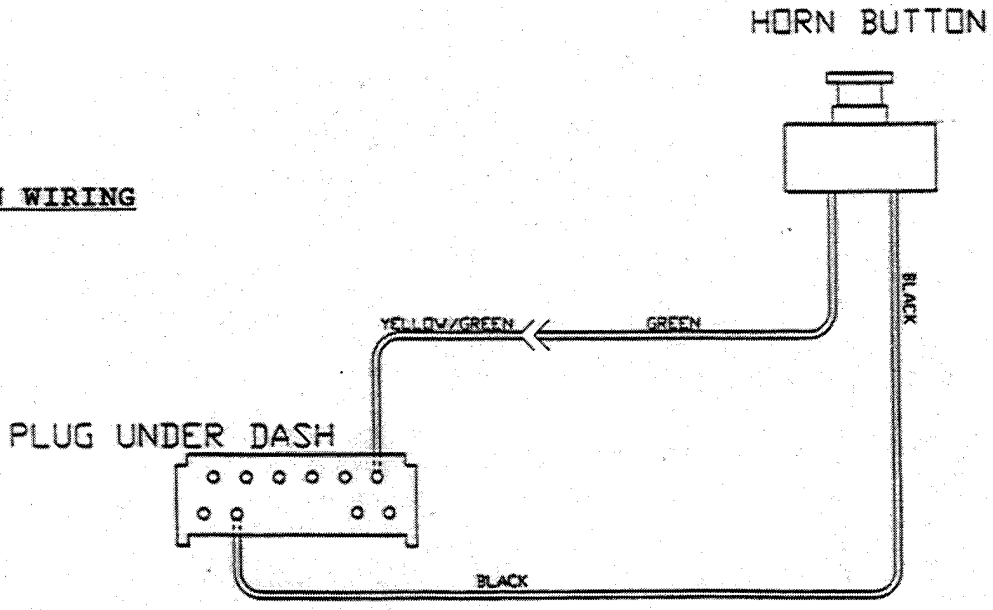


WIRING DIAGRAM - HORN & DIMMER
(POST "1992" FORD)

DIMMER WIRING



HORN WIRING



3500 HORN AND DIMMER
(POST 1994 FULL SIZE DODGE)

DIMMER WIRING

1. Remove plastic enclosures over column using T20 Torx Driver.

2. Remove large wiring harness plug connected to turn signal lever using 9/32" socket.

3. Locate solid green 14 ga. wire, and red wire with orange stripe. T-tap into these wires and connect to red and brown wires from dimmer switch on hand control (refer to figure 1).

NOTE: White wire is not used.

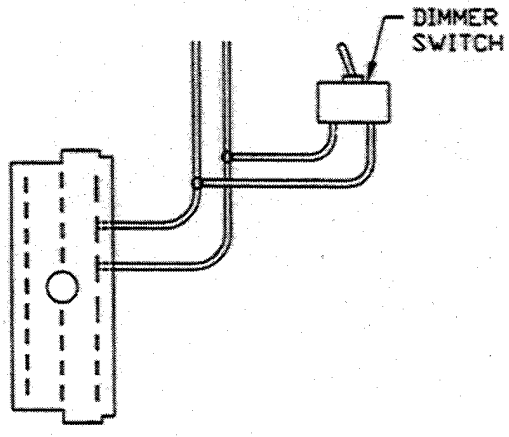
HORN WIRING

1. Locate 5 wire plug directly below steering column.

2. Tap into brown wire with red stripe on the side of the plug with 3 sockets. Connect to black wire from the horn switch (refer to figure 2).

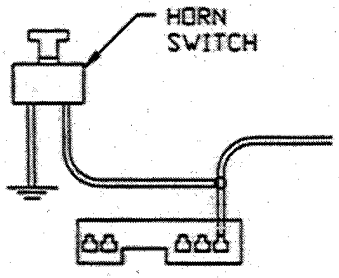
3. Connect the green wire from the horn switch to chassis ground.

FIGURE 1.



END VIEW OF PLUG

FIGURE 2.



END VIEW OF PLUG

MOBILITY PRODUCTS AND DESIGN
1-800-488-7688

OPTIONAL HAND CONTROL MOUNTINGS
(BOLT ON "Y" BRACKET - MODEL 3507)

INSTALLATION INSTRUCTIONS:

STEP 1: Remove any dash panels or shields that may prevent access to the steering column supports.

STEP 2: Assemble (2) mounting brackets to the mounting block using (2) 3/8"-16 x 3/4" HHCS, 3/8" flat washers and 3/8" lock washers as shown on illustrations (do not tighten yet).

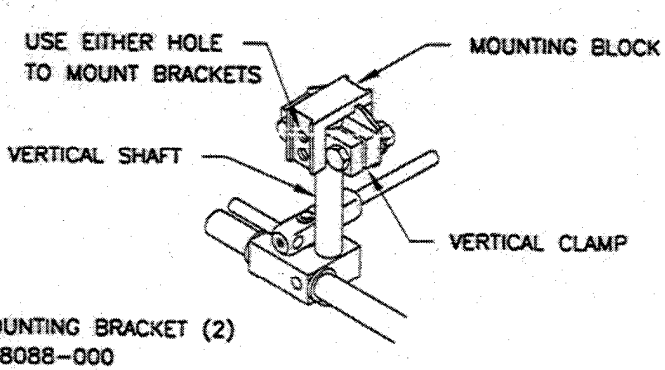
STEP 3: The steering column is usually supported by (2) sets of mounting bolts. Hold the mounting block assembly up to each set of mounting bolts, and check for alignment. When it has been determined which set of mounting bolts will work best for your installation, remove them.

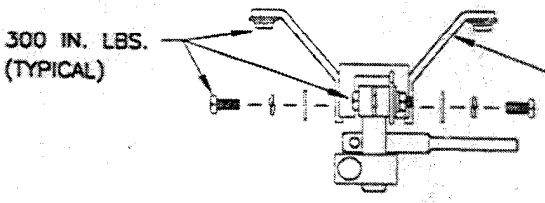
STEP 4: Secure the mounting block assembly to the steering column using the O.E.M. fasteners.

STEP 5: Slide the mounting block assembly towards the steering column, and tighten all fasteners.

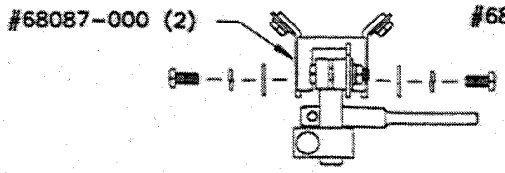
STEP 6: Slide the vertical clamp onto the vertical shaft on the hand control, and fasten to the mounting block plate using (2) 3/8"-16 x 1 3/4" HHCS, 3/8" flat washers, 3/8" lock washers and 3/8"-16 hex nuts (do not tighten yet). The vertical shaft may be trimmed to adjust the control up tight.

STEP 7: At this point, the hand control can be adjusted horizontally or vertically to the desired position, and all fasteners must be tightened to the torque specifications shown.





(3507A) #68661-000



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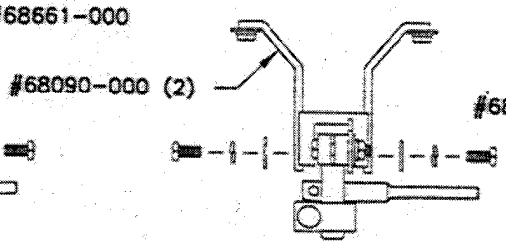

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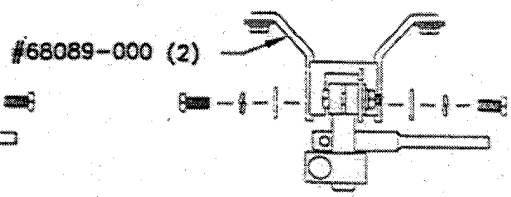
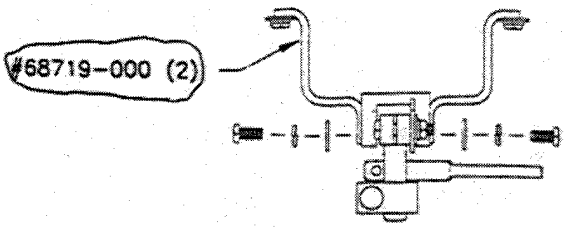
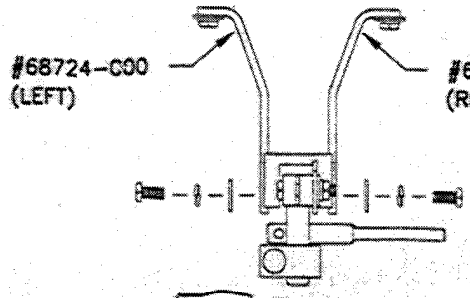


(3507D) #68664-000



(3507E) #68727-000



(3507F) #68728-000

PART NUMBER	REV
90253-000	C

OBILITY PRODUCTS & DESIGN

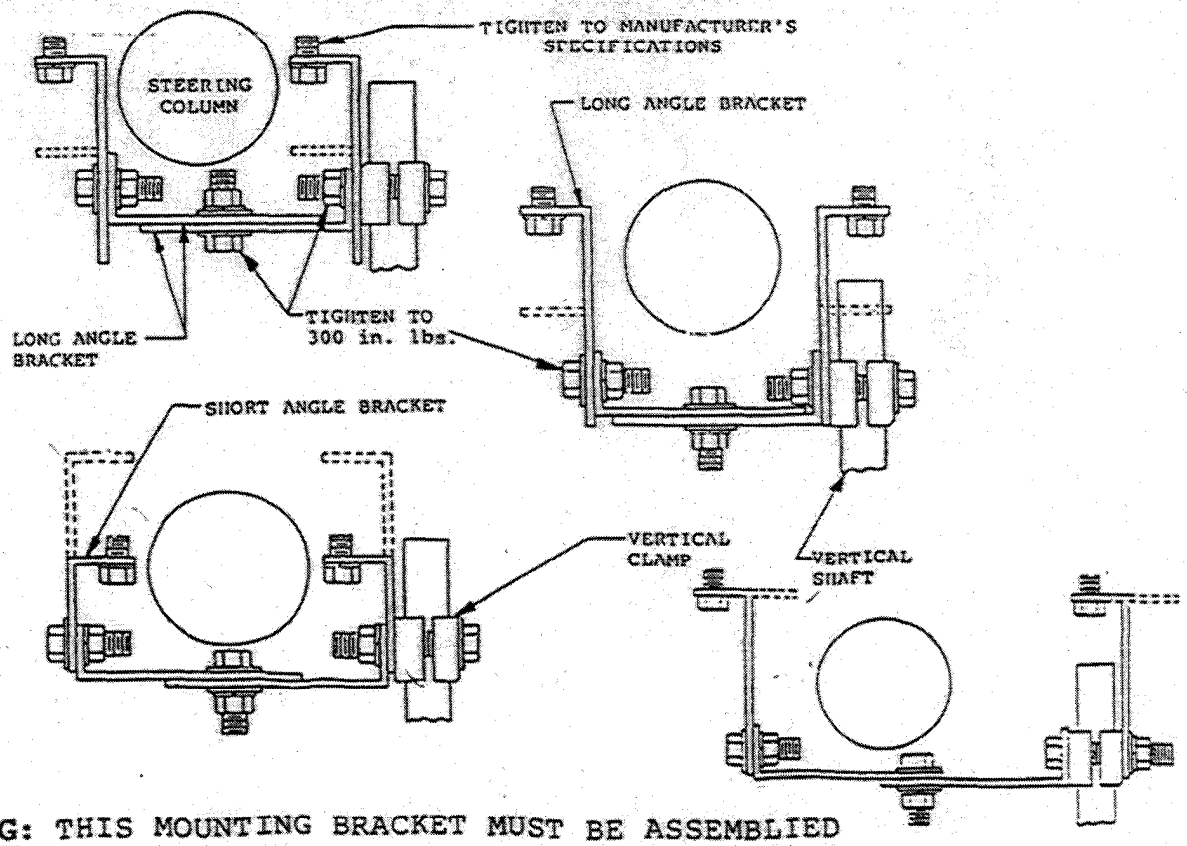
1-800-488-7688

INSTALLATION INSTRUCTIONS FOR BOLT-ON UNIVERSAL BRACKET

(#68657)

1. Remove dash panel to obtain access to steering column.
2. To attach mount bracket to steering column it may be necessary to move car's wiring harness and connectors slightly.
3. Remove nut and washer from stud or bolt from one side of steering column bracket.
4. Using lockwashers provided mount bracket legs to steering column bracket with existing fasteners.
5. Repeat for other leg.
6. After bracket height is determined short bracket legs may be used to avoid trimming of long bracket legs.
7. Complete assembly of Universal Bracket, keeping horizontal brackets as close as possible to steering column and securely tighten all fasteners to torque specifications shown.
8. Mount Vertical Clamp with the (2) 3/8" x 2" bolts provided.

MOUNTING CONFIGURATIONS



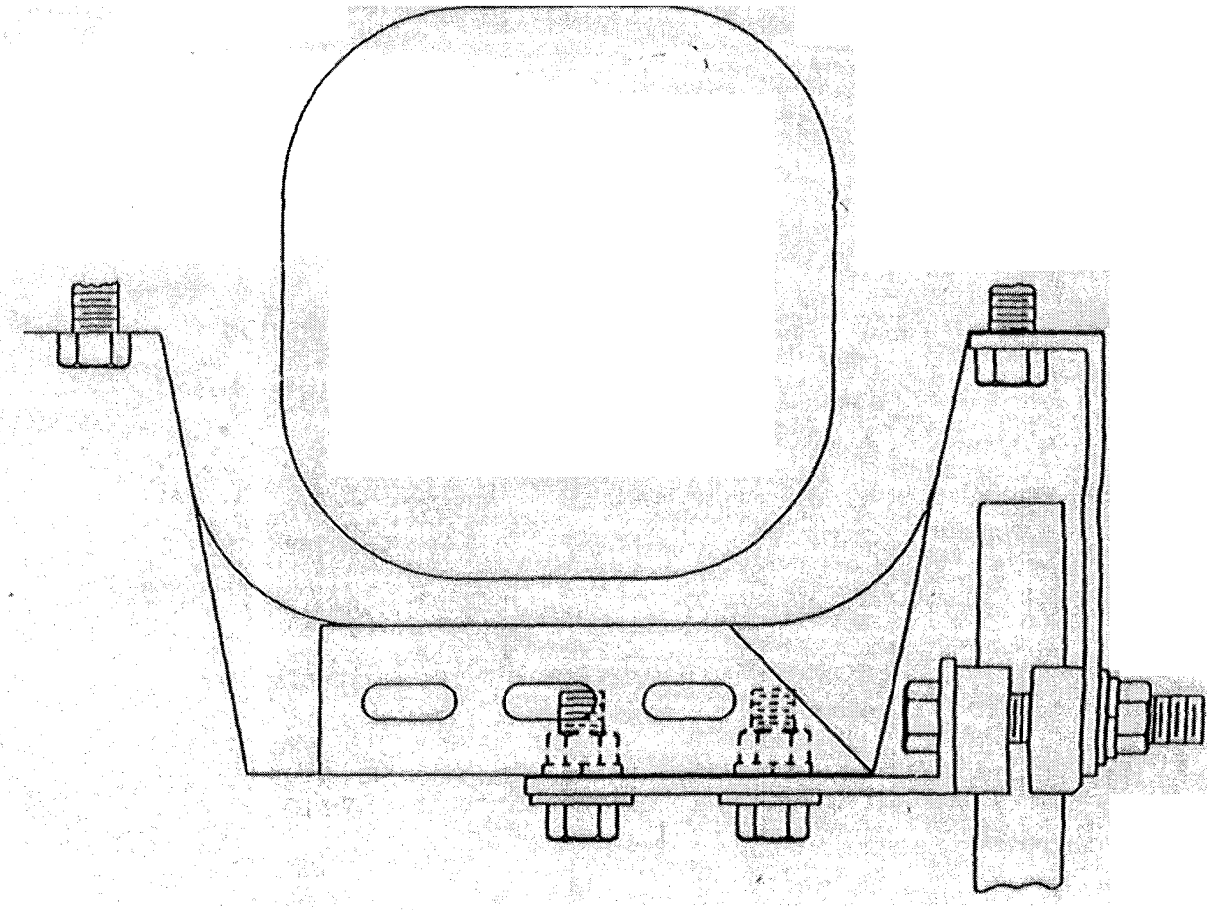
WARNING: THIS MOUNTING BRACKET MUST BE ASSEMBLIED AS ILLUSTRATED ABOVE. ANY USE OF A SINGLE COMPONENT PIECE AS A MOUNTING BRACKET IS NOT AUTHORIZED BY M.P.D.

PART NUMBER	REV.
90097	B

1991 TAURUS AND SABLE MOUNTING

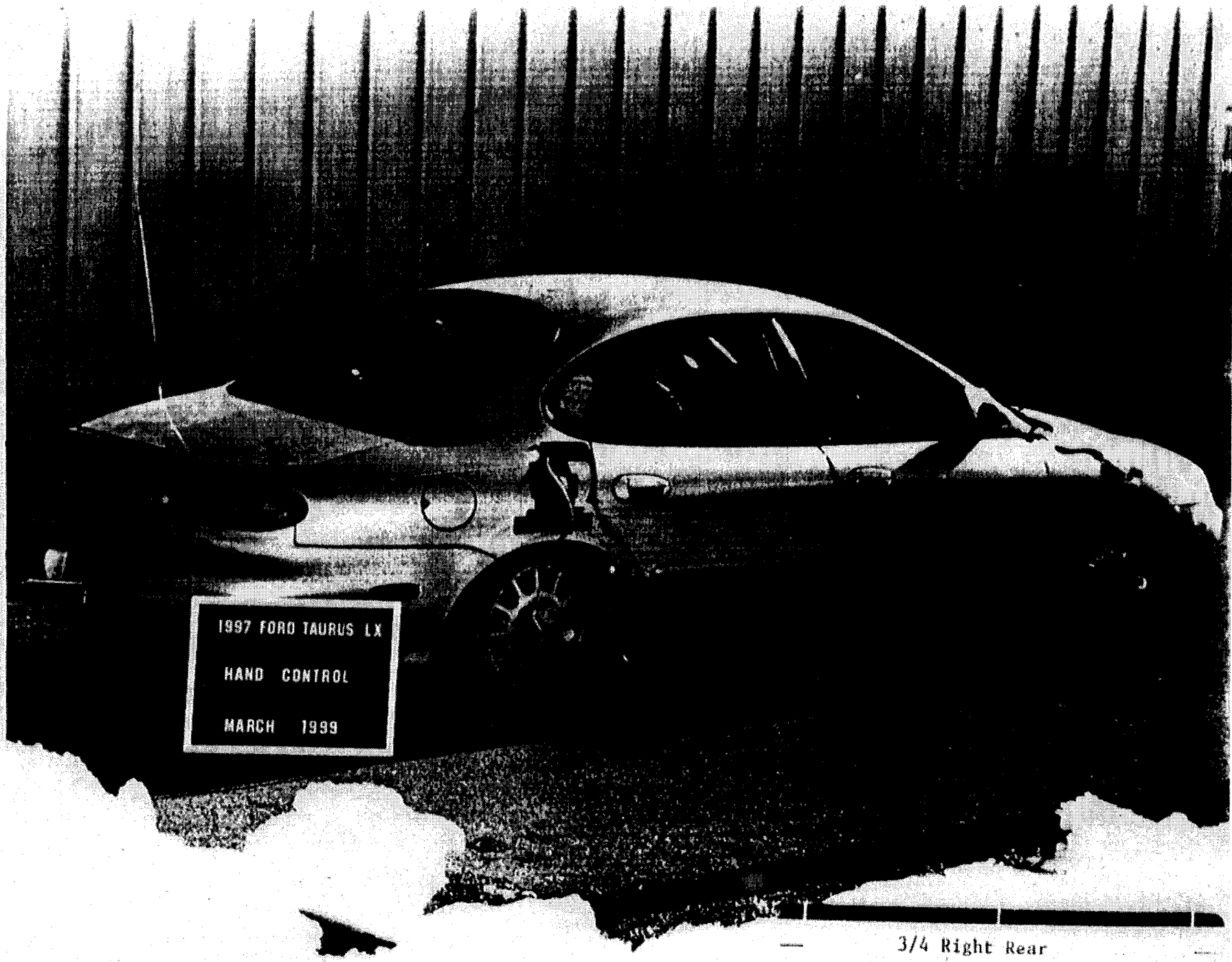
(SOME LATE MODEL 1990 ALSO)

Remove nut from vehicle stud on the right side of steering column. Mount bracket leg as shown in diagram and fasten using existing nut. Fasten other bracket leg and vertical clamp as shown in the diagram. After position of brackets has been determined, drill two 3/8" holes in existing shield below column and fasten bracket using 3/8" bolts, washers and nuts. Tighten to torque specifications shown in illustration on the other side of the page.



APPENDIX P

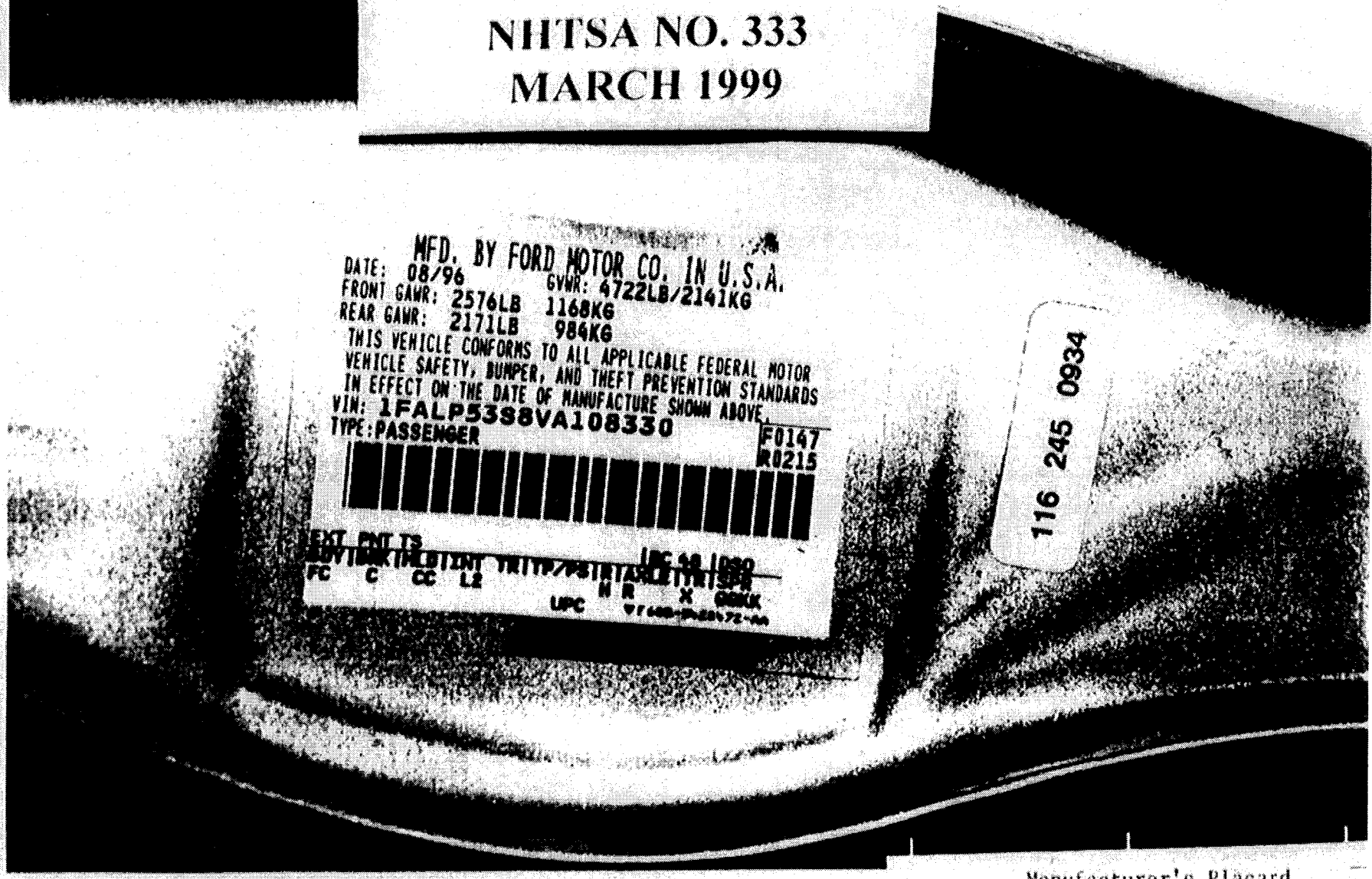
Test Vehicle Photographs



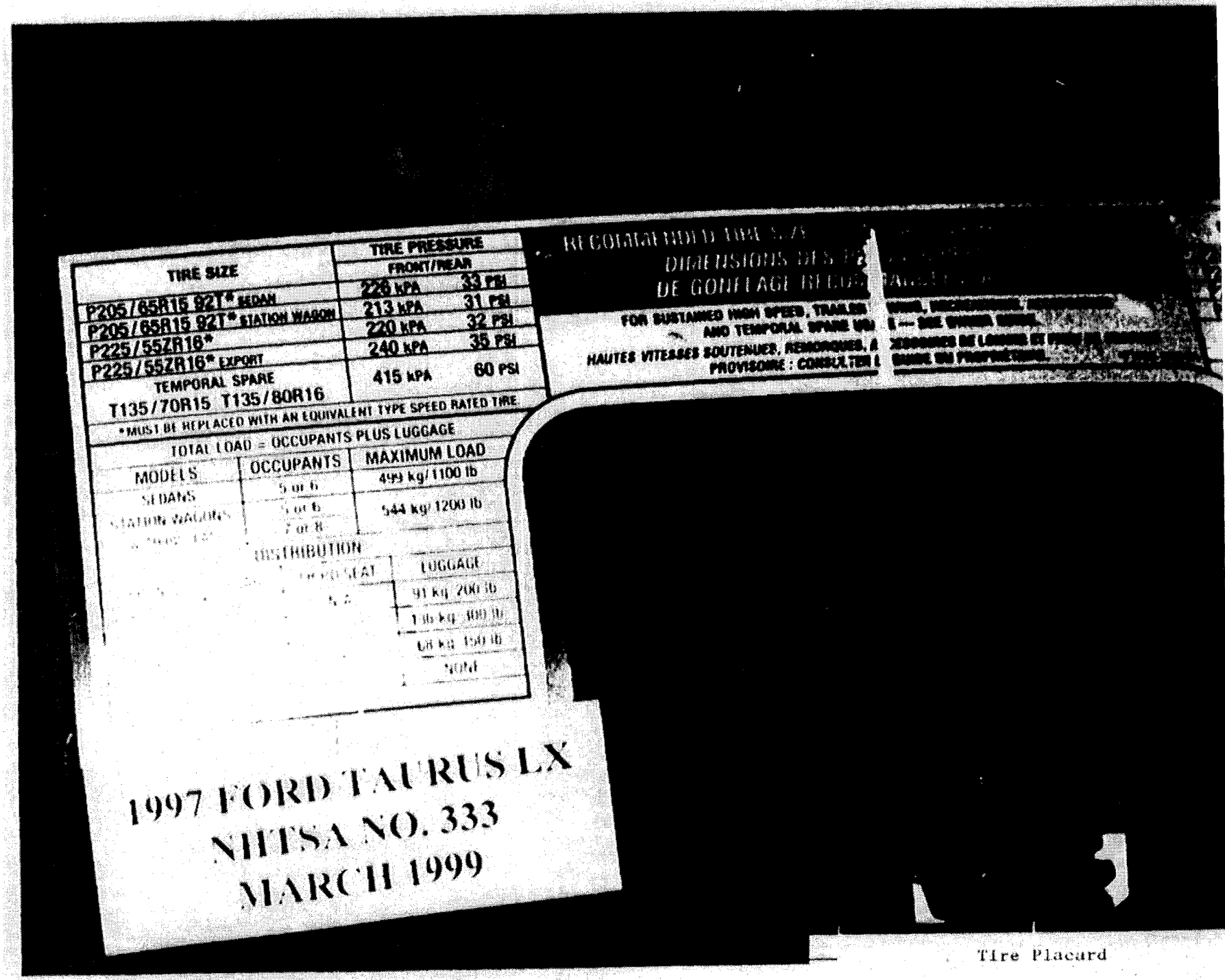
3/4 Right Rear

3/4 Right Front

1997 FORD TAURUS LX
NHTSA NO. 333
MARCH 1999



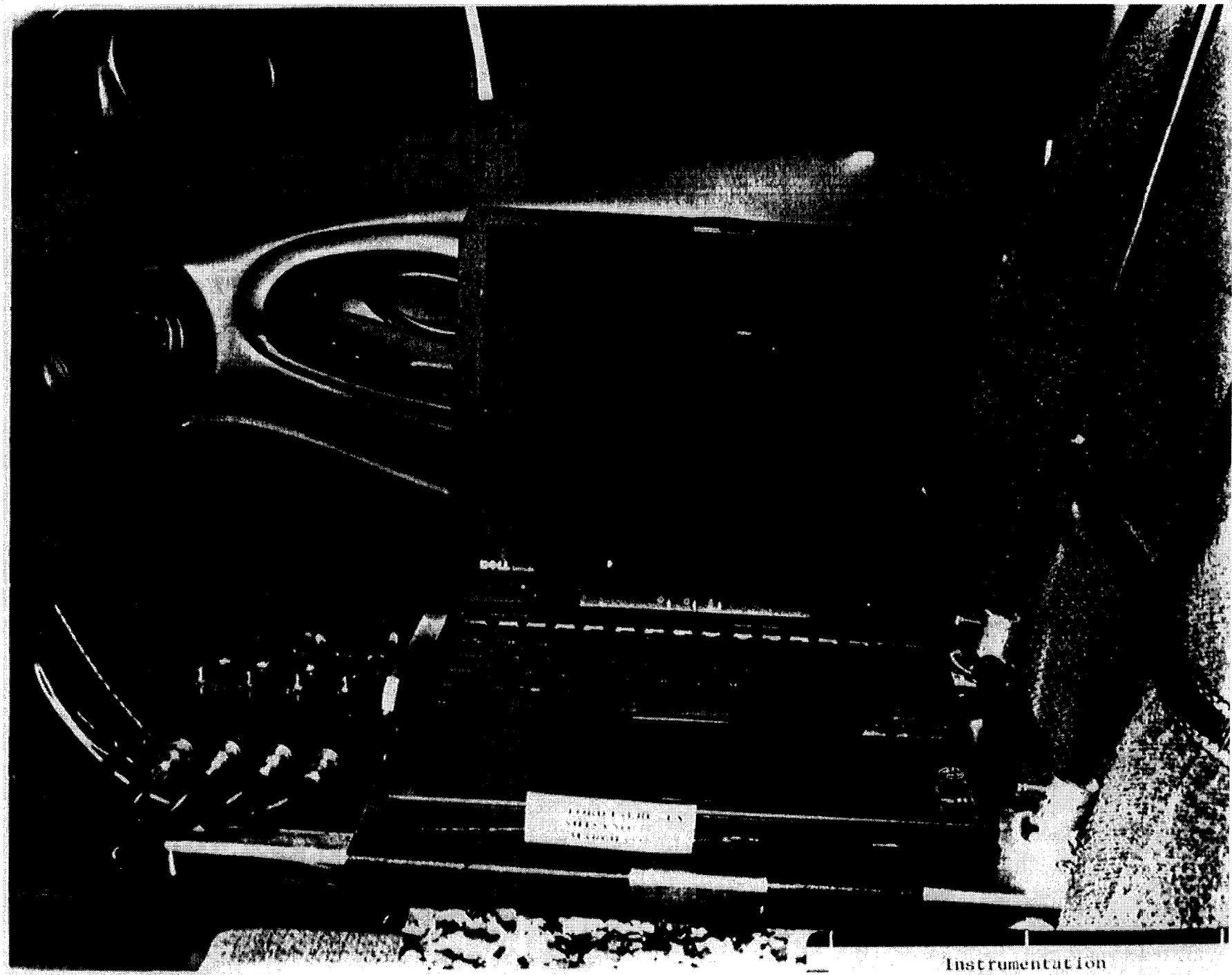
Manufacturer's Placard



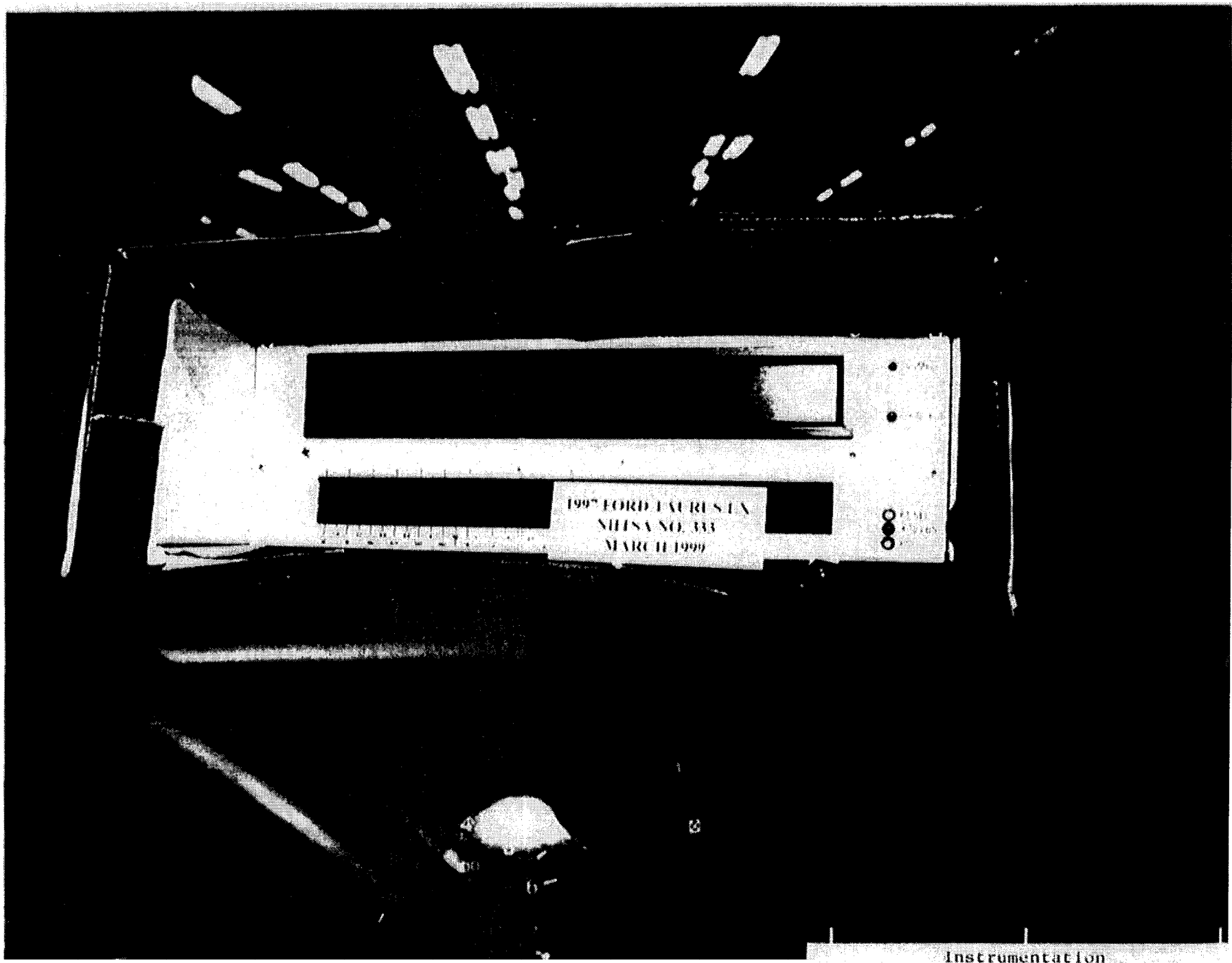
Tire Placard

APPENDIX Q

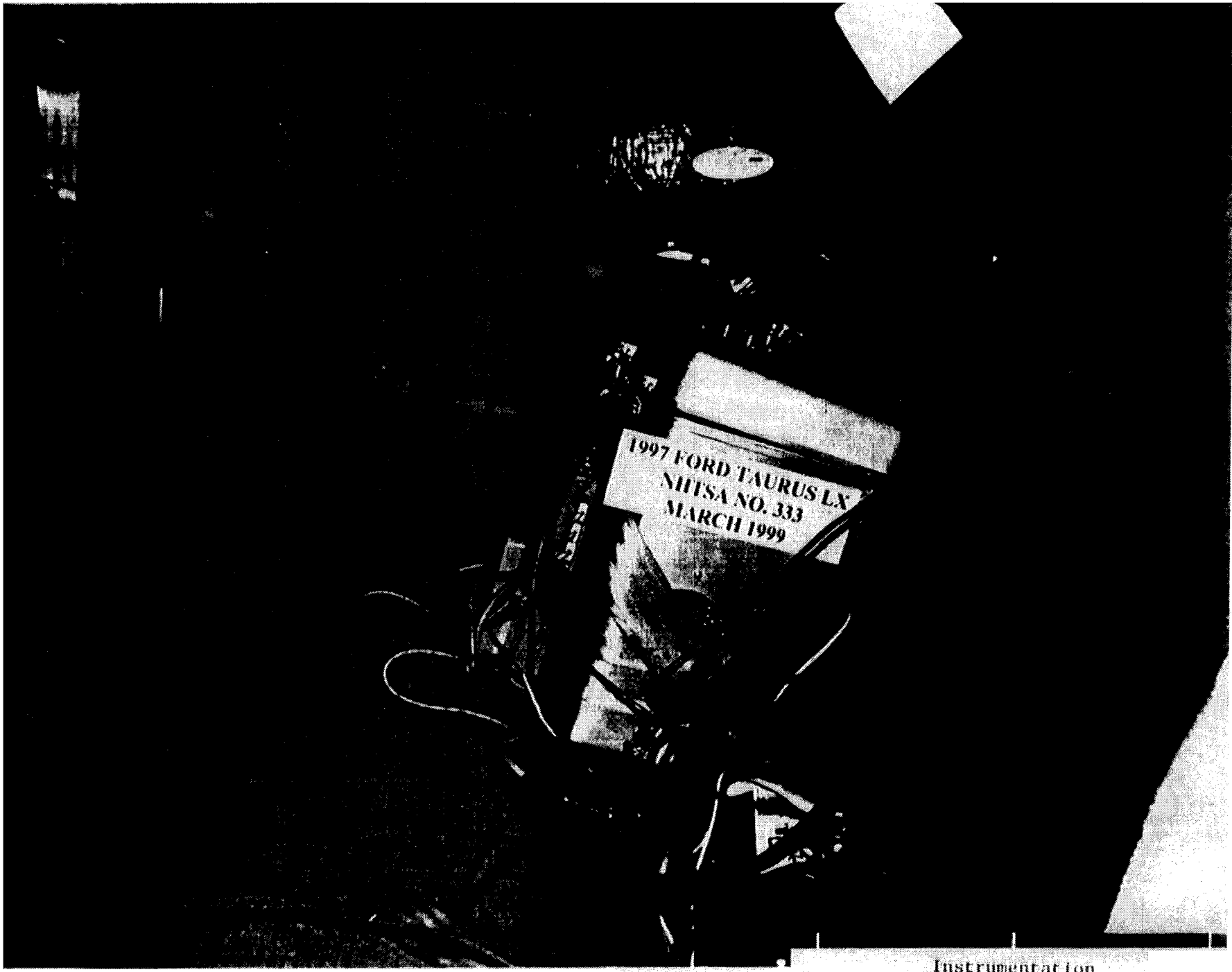
Instrumentation Installed in Test Vehicle Photographs



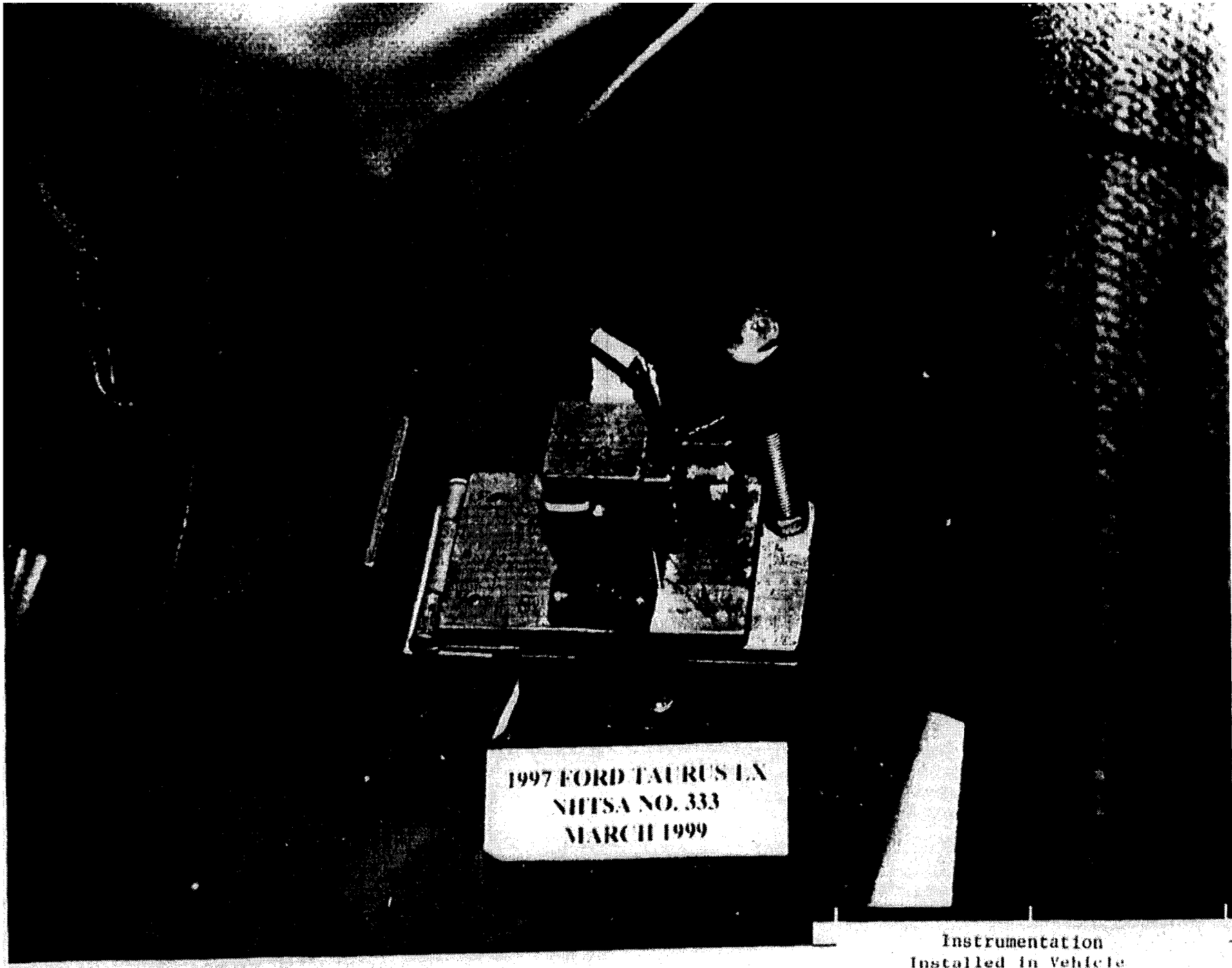
Instrumentation
Installed in Vehicle



Instrumentation
Installed in Vehicle



Instrumentation
Installed in Vehicle



Instrumentation
Installed in Vehicle

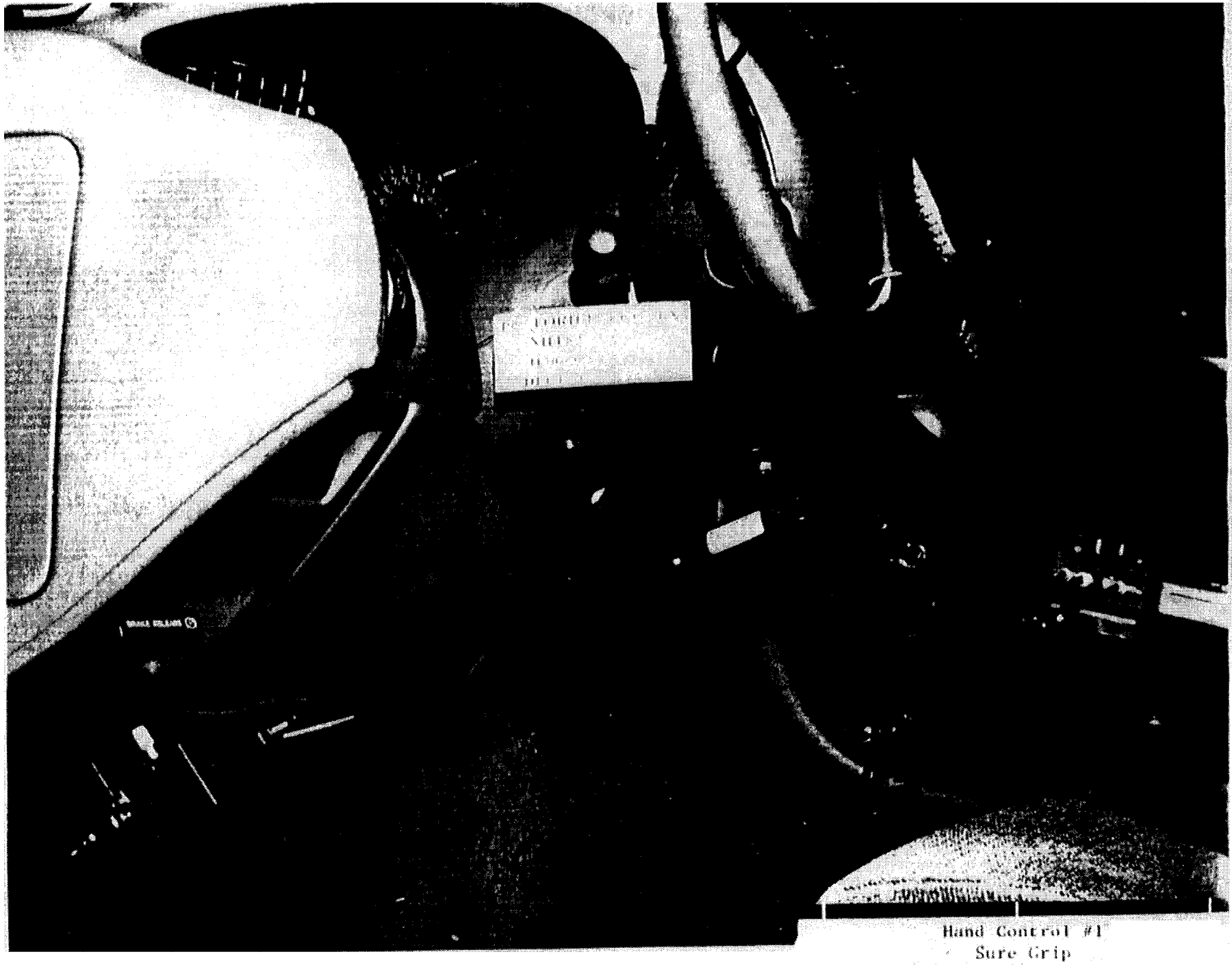
APPENDIX R

Hand Controls Installed in Vehicle
and with Driver Seated

Hand Control #1

Howell Ventures Limited

Sure Grip



Hand Control #1
Sure Grip

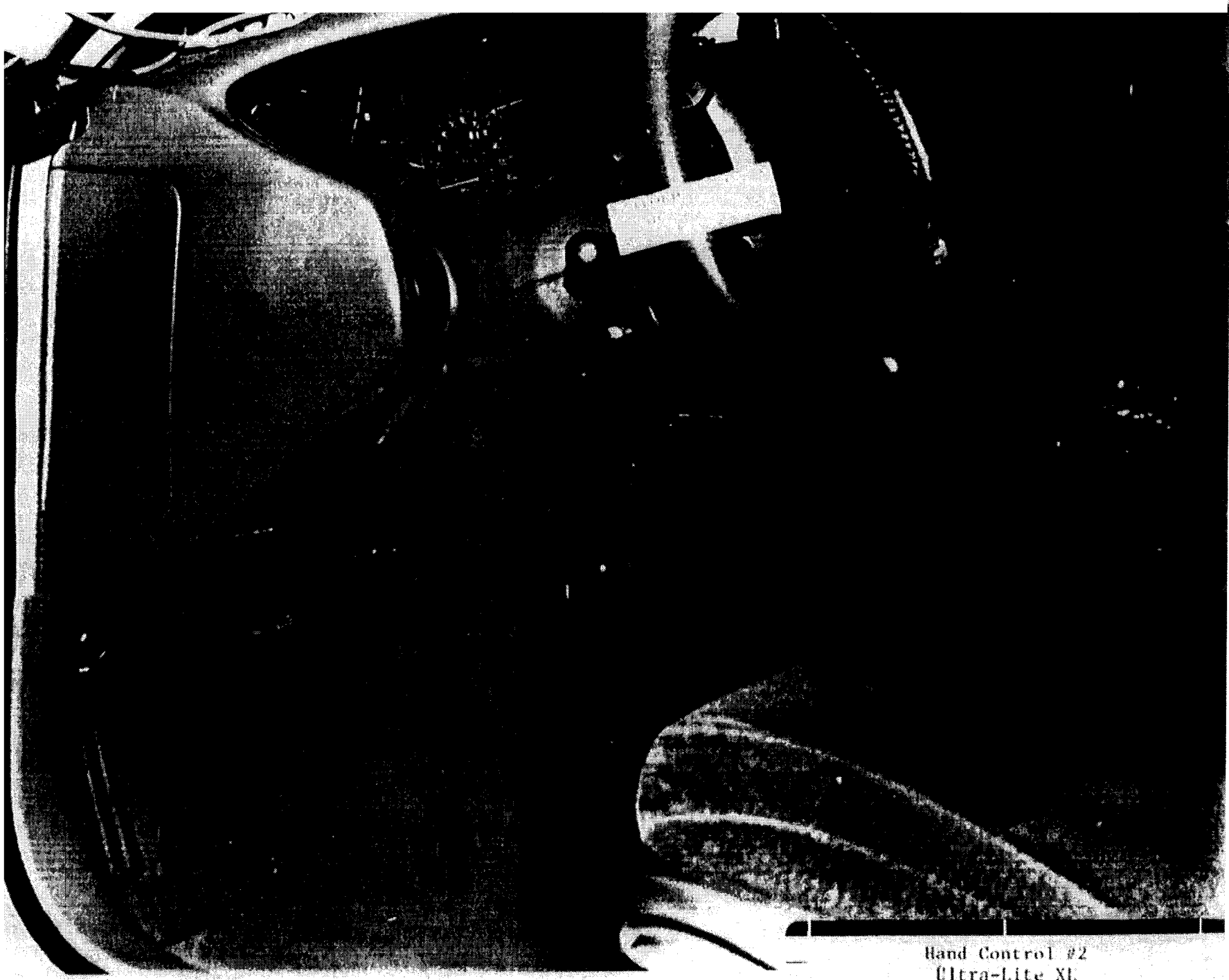
Hand Control #1
Sure Grip

Hand Control #1
Sure Grip

Hand Control #2

Drive-Master Co., Inc.

Ultra-Lite XL



Hand Control #2
Ultra-Lite XL

Hand Control #2
Ultra-Lite XL

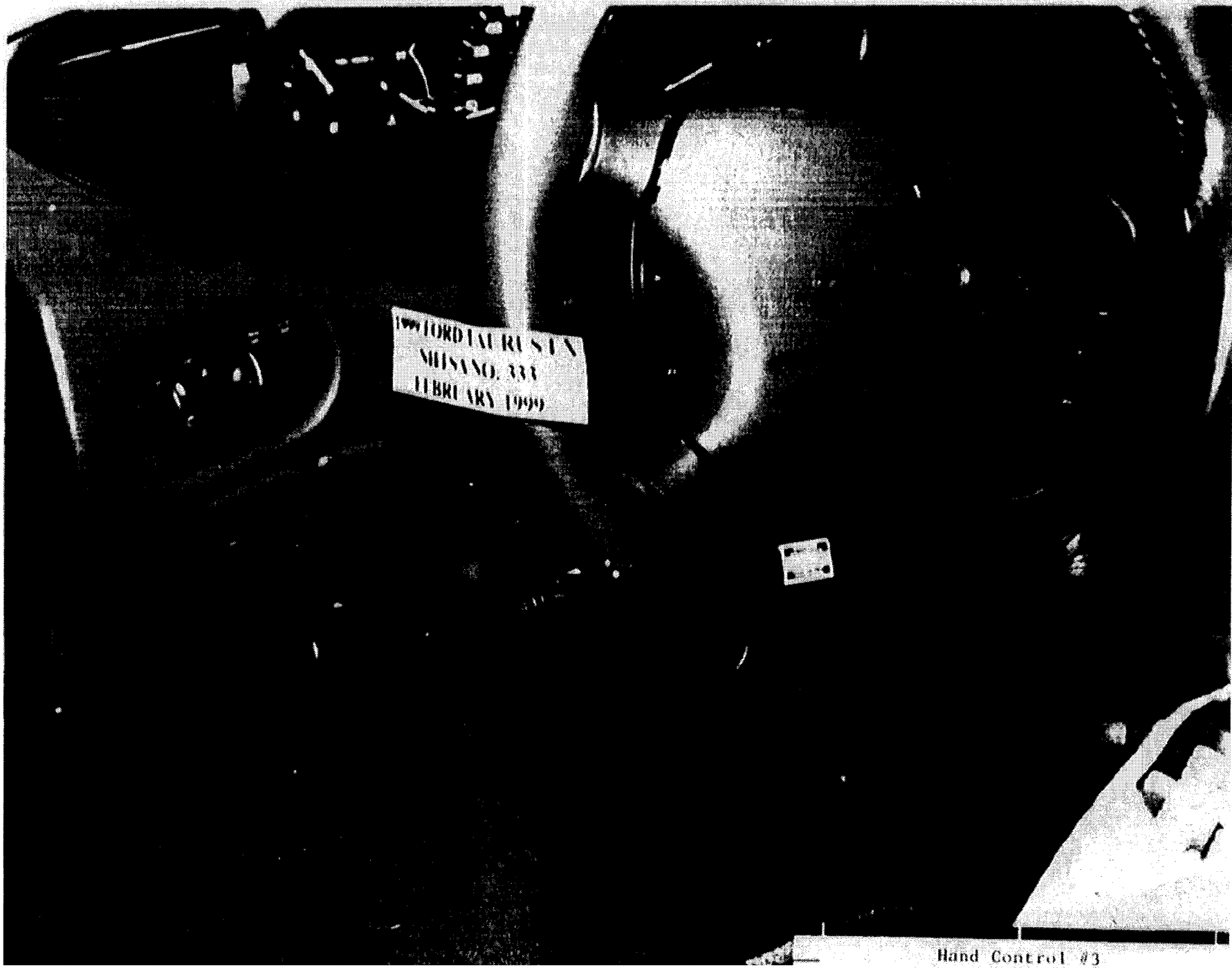
Hand Control #3

Manufacturing and Production Services Corp.

Monarch Mark I-A

Hand Control #3
Monarch Mark I-A

Hand Control #3
Monarch Mark I-A

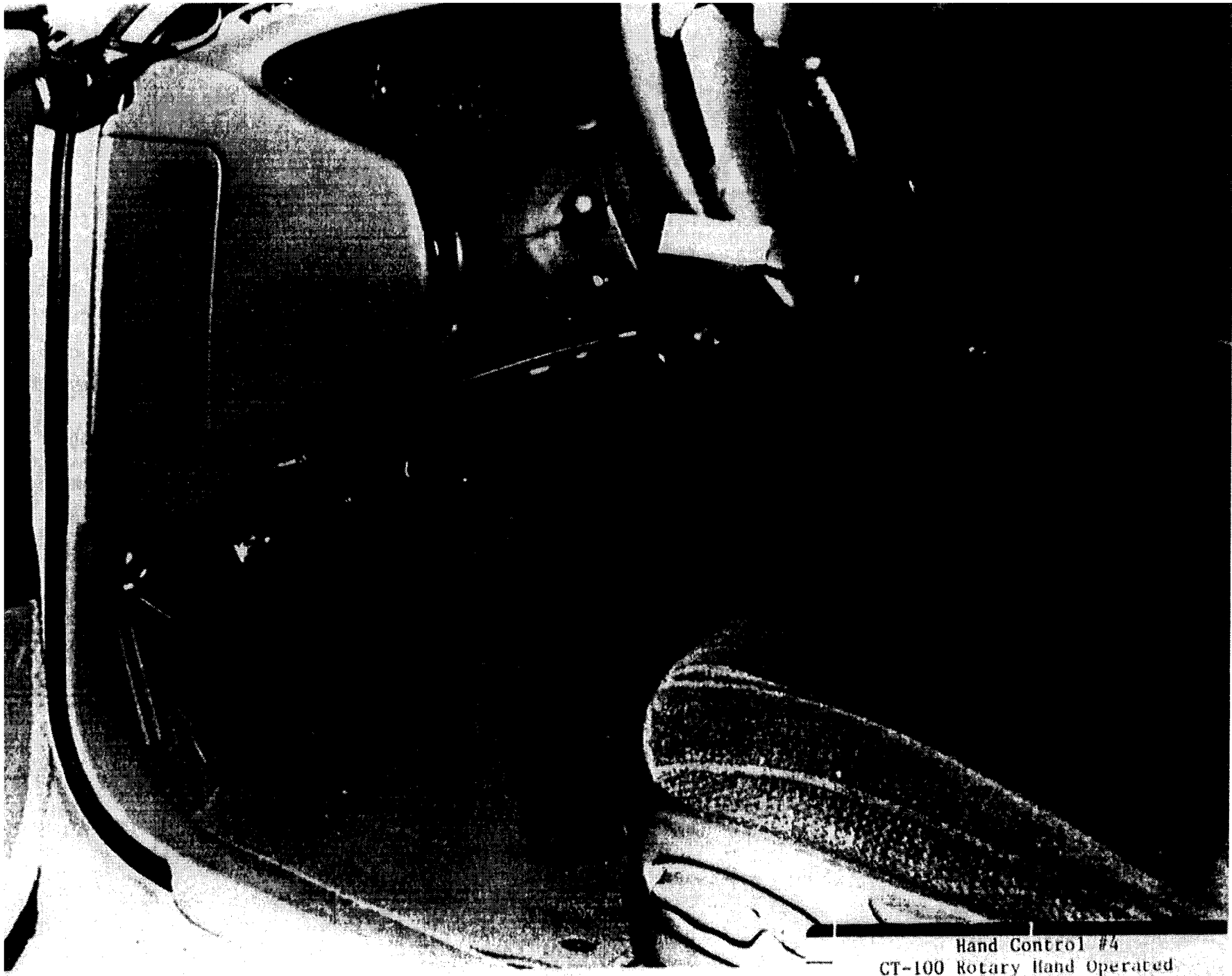


Hand Control #3
Monarch Mark 1-A

Hand Control #4

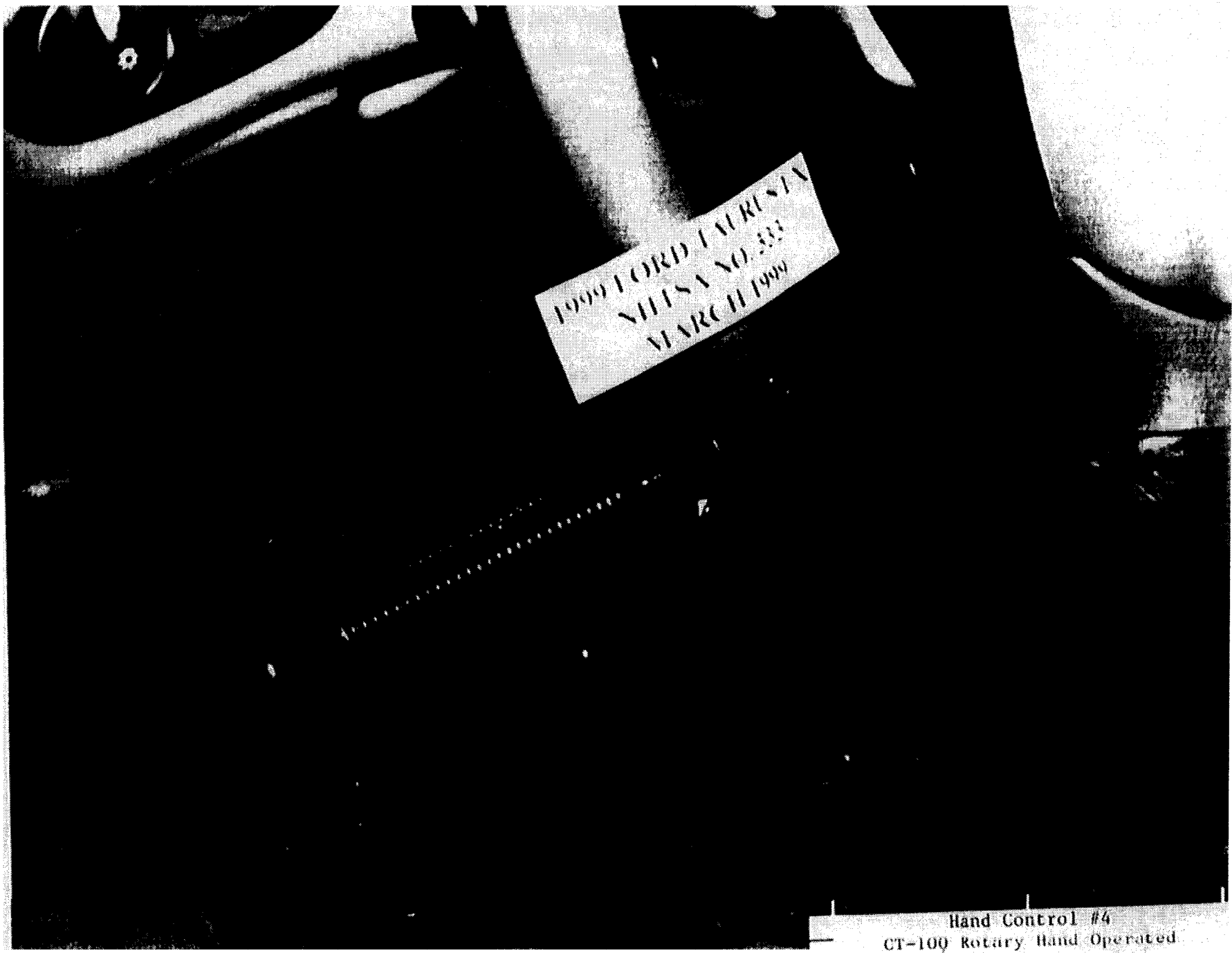
Wells-Engberg

CT-100 Rotary Hand Operated Driving Control



Hand Control #4
CT-100 Rotary Hand Operated
Driving Control

Hand Control #4
CT-100 Rotary Hand Operated
Driving Control



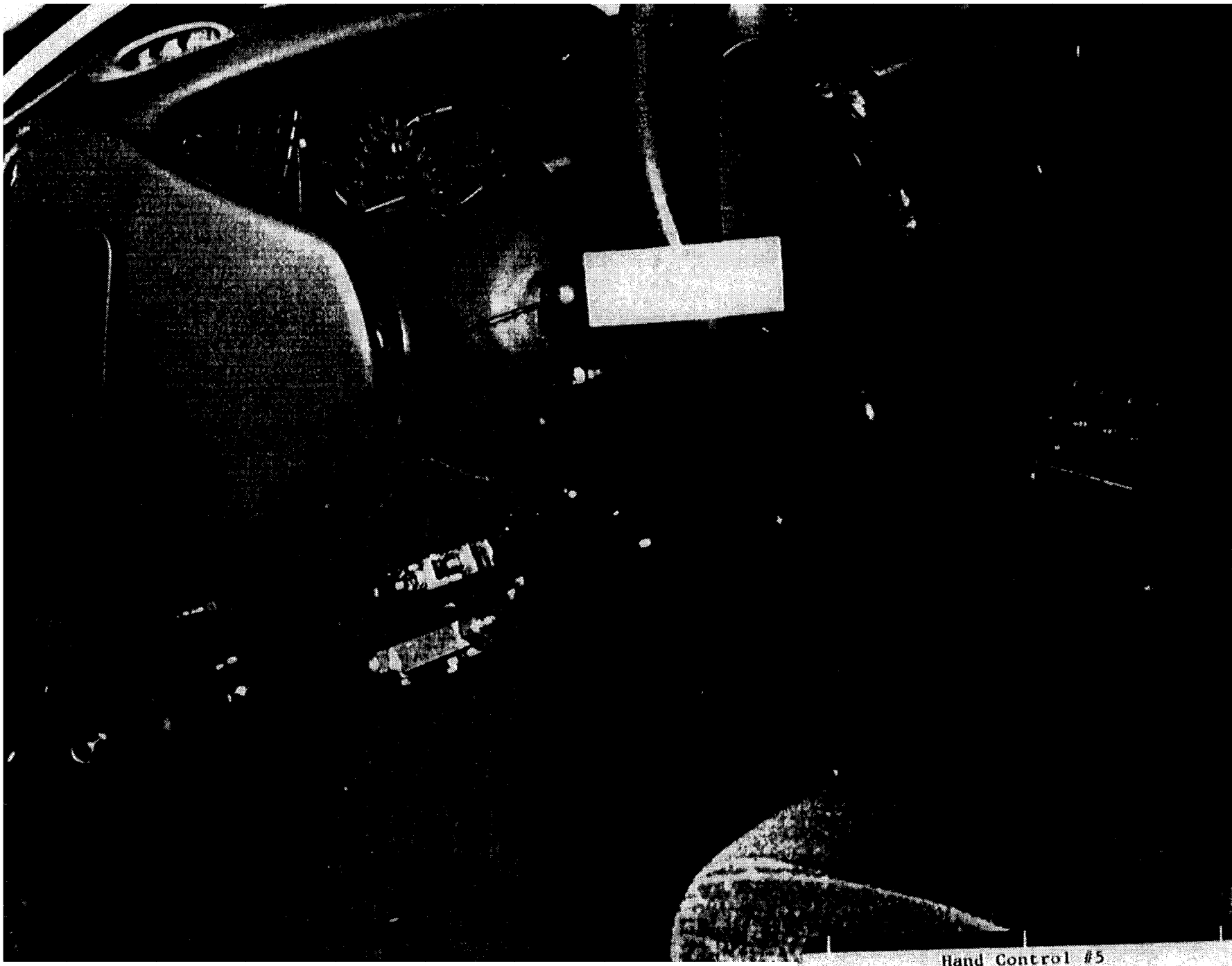
Hand Control #4
CT-100 Rotary Hand Operated
Driving Control

Hand Control #5

Mobility Products & Design

3500 Series Hand Control

Hand Control #5
Mobility Products and Design



Hand Control #5
Mobility Products and Design

Hand Control #5
Mobility Products and Design