

EA02-025

FORD 10/27/03

APPENDIX N

BOOK 38

PART 1 OF 3

Trip Report

Supplier Name: Texas Instruments
Supplier Codes: A9H2E, K9L1A, K9L1E
Date of Trip: June 24 & 25, 1999

Purpose of Trip:

1. QOS Review of facility.
2. Business Unit Review for T097 Business Unit.

Outcome and Verification:

- The current QOS for the facility was reviewed. Both Internal and External Measurables are tracked for the three facilities.
- A Business Unit Review for T097 was held. Business Unit T097 consists of the three facilities listed above.
- Plant process operations were reviewed for all three facilities.
- TI needs to better share "Best Practices" across their facilities. What they do very well at location K9L1E, they do not necessarily do well at A9H2E and K9L1A.
- Sites A9H2E and K9L1E need to study and implement Lean Manufacturing. The Kan-Bar system is already being implemented in these two facilities.

Observations of A9H2E:

- Lack of a Visual Factory environment - There were few operator instructions and visuals in the employees' immediate work area.
- There was not a Training Matrix visible in the area.
- QOS information is collected and reviewed by the management, but not delivered to employees in their immediate work area.
- The training and proficiency level of each operator is not obvious to visitors.
- Parts at the test station have a potential to be mixed and recorded. Parts to be tested are not kept binned nor kept separate from parts that have already been tested. The operator takes the parts to the station, then proceeds to test them. However, there is no fail-safe method to stop the same part from being re-tested in the place of another.

Observations of K9L1A:

- One Hundred Percent inspection is performed for production parts, due to lack of machine capability.
- Neither part nor process of manufacturing has changed since the 1980's.
- Lack of a Visual Factory environment - There were few operator instructions and visuals in the employees' immediate work area.
- There was not a Training Matrix visible in the area.

- QOS information is collected and reviewed by the management, but not delivered to employees in their immediate work area.
- The training and proficiency level of each operator is not obvious to visitors.

Observations of K9L1E:

- Visual Factory environment used - There were operator instructions and visuals in the employees' immediate work area.
- Soldering Training Certification is recorded on the badges of the employees.
- QOS information is collected and reviewed by the management, but not delivered to employees in their immediate work area.
- 5-S Efforts are displayed in the employees work area.
- Parts are separated around test stations. Parts at test station go into containers until tested. After the test, they parts are moved to a post-test container.

Next Steps and Responsibility:

TI is evaluating a move of assembly line(s) to a non-Q1 site in Mexico. TI expressed a concern of having their suppliers ODL compliant, therefore TI needs to evaluate their supply base for ODL compliance prior to choosing to move.

A Business Unit Review for T097 will be held next quarter - responsibility of John Rentis.

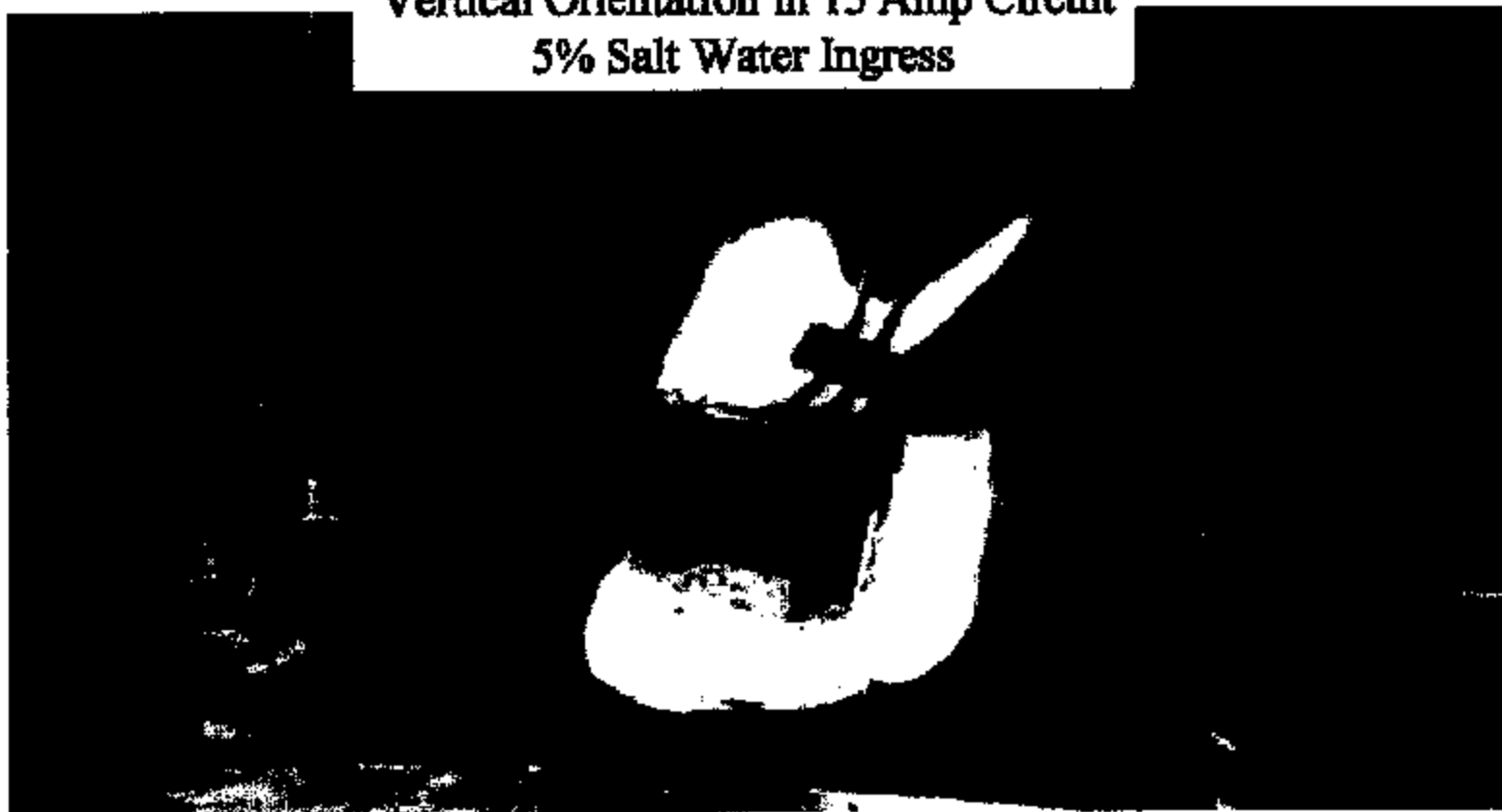
Ford Participants:

John Rentis - Commodity Engineer

BUY / OFF	REPAIR	MANDATORY COMPLIANCE INSPECTION REPORT	REJECTS
		Engine/Trans Usage to Manifold - wrong Check Accel. Bracket to Engine - (see) - wrong - incomplete. Check Engine/Trans Serial # to Manifold Verify Cat Converter to Manifold QV1200	
		Tires - Wheels - Wheel Lugs - Spare - (see) (wrong) (miss) (L) (R) Front Rear Trans Linkage - (see) Intermediate Shaft to Steer Gear (see) (distorted) Fuel Tank - Lines - Hoses - Shields - Clips - Fuel Filter & Hose - Fuel Sender Wire & Hose - Fuel Tank Roll Over Valve (wrong) Vacuum Lines & Hoses (see) (clips). QC600 QC602 QC603 QV1200	
		Brake Pressure Leak Test - Mtyl. Fluid Level - Intermediate Shaft to Column - (see) Stop light switch pin miss - Inter Shaft Mark on (pedal) QC700 QC710 QC602	
		Vin Plate (wrong) (raw) (dam) (misa) QV200	
		Check Emission Light - Park Brake Function & Light - (inop) - Theft Lamp - Accel Return Start in Gear - Shift Link Adjust. - Park - Neutral - Wheel Lock - Trans Funct. - Clutch Funct. - Up Shift / Down (inop) (binds) - Knob - Key Warning (inop) (belltone) Key Start Lamps - 4wd / 4wd low / abs / check eng / brake / oil / dr ajnt air bag / gauge - (inop) Check Eng Light - Key On Seat Belt Light (inop) (stays on) (tone) Elec - Canadian Running Lights - Cluster Lights - (inop) (usage) Int Lights - Blum Ent Exterior Lights H/Lights (H)(L) - T/Lamps - Turn Sig. - Emerg. Flashers - Cargo License Light - Backup Light - Park Light - Brake Light (inop) (L) (R) - HI Mount Heater / Defroster - Blower Speeds 1-2-3-4 Air Flow (inop) - A/C No Cool. Check (PRND21) Position. Start Light - Check Strg Col Cyl Lock Retention - (see) (inop) Perform EEC Test - Dynamic Brake Test - Spike Test Seat Belts (L) (R) (inop) Anti-Lock Brakes Function. Anti-Lock Brake Light inop - Power Seats (inop) (noise) Over drive lamp (inop) - Passenger Air Bag Deactivation Switch (inop) Wiper/Washer Function (no fluid) (inop) (dam) (aim) (reset blades) (speeds) QC720 QC800 QC804 QC807 QC490 QC310 QC300 QC308 QC810 QC809 QC700 QV210 QV125 QV130 QV201 QC405 QC700 QV200 QV250 QV100	
		Secondary M/Latch (holds) QC490	
		Check P/Seat - (security)(function)(see)(inop) (L) (R) Front Seat Travel (binds) Seat Belts - (ht)-(rear)-(cent) (see)(dam)(twisted)(wrong)(miss) (L) (R) Labels - Car - Calif - Maple Leaf - 4x4 (miss) (wrg) Seat Belt Light (inop) (stays on) (belltone) (buzzer) Owners Manual - Warr. Facts - Tire - 4x4 Booklets - Canadian Mark - Car Air Bag Label - Door Ajar - Viscor Labels QC400 QV100 QV810 QV205 QV215 QV250 QV254 QV180 QV103 QV200 QV203 QV205 QV102 QV212 QV300 QV301 QV270 QV400	
		Verify Unleaded Gas Label - (missing) (wrong) QV225	
		Check Vacuum & Electrical Connections (routing) (clips) (see). Air Cleaner Duct/Valve (see) (incomp) Exhaust Emiss Decal - (see)(wrong)(dam) Accel linkage (binds)(see) Labels - Jack / A/C / Air Bag / Coolant QV100 QV254 QC350 QC360	
		Check Front Susp. Stab. Bar - Corner Keys (tie rod)(strg gear) Tie Rod Clamp Nut Cool Lines - Exhaust Comp. - Fuel Sys - Fuel Vapor Lines - Floorpan Plugs - Hoses Brake Lines - Speedo Cable - Eng. Trans. - Drain Plugs - Cover Plates - Shields Elec. Wiring & Con. - Seat Belt Cable Routing (dam) (miss) (see) (clearance) (locks) (kinked) (clip) (seat) (position) (twisted). QC300 QV203	
		MCIR COMPLETE	QC800 QV250
		CAI BUY / OFF	QC800 QV250



77PS Cellanex 4300 Base
Vertical Orientation in 15 Amp Circuit
5% Salt Water Ingress



Not Enough Printer Memory -- See User's Guide

ENC2-025-R 1894B



**77PS
45° Orientation in 15 Amp Circuit
5% Salt Water Ingress**

Cellanex 4300 Base



Cellanex 3316 Base



'Intermittent ignition created thru T1 fluid ingress lab test PS/99/13'

Cellanex 4300 presentation

COMPETITIVE SPEED CONTROL STUDY
1991-1992 - SUMMARY

SATURN (VDO/YAZAKI) SPEED CONTROL

VARIABLE COST ESTIMATE SUMMARY

AUGUST 7, 1981

ACTUATOR:

	\$	
. MATERIAL & FREIGHT		10.88
. DIRECT LABOR		2.29
. INDIRECT LABOR & OVERHEAD		1.81

. ACTUATOR VARIABLE COST	\$	14.98

AMPLIFIER:

. MATERIAL & FREIGHT		8.55
. DIRECT LABOR		3.82
. INDIRECT LABOR & OVERHEAD		1.30

. AMPLIFIER VARIABLE COST	\$	13.77
TOTAL VARIABLE COST	\$	28.75

ANALYSIS DATA:

- . LOW VOLUME, 50,000 UNITS ANNUAL.
- . ACTUATOR BUILD IS A NON AUTOMATED, BENCH BUILD, THREE OPERATORS AT 25 UNITS PER HOUR.
- . THE ACTUATOR DESIGN IS NOT COMPATIBLE WITH AUTOMATION. THE MOTOR, CAST FRAME AND LEADSCREW AND CLUTCH MUST BE PREASSEMBLED BEFORE PLACING IN THE HOUSING CAVITY.
- . THE CABLE ASSEMBLY IS EXCLUDED FROM THE COST. ONLY THE BRASS PULLER STEM IS INCLUDED.
- . DRIVE MOTOR IS PURCHASED COMPLETE. ASSUMED THE MOTOR IS AN "OFF THE SHELF" SPECIES.
- . THE LABOR RATE OF \$18.05 PER HOUR (FRINGED) IS INDICATIVE OF A JAPAN RATE AS WELL AS A USA SUPPLIER OF ELECTRONIC MODULES.
- . THE ESTIMATED MATERIAL COST FOR THE ELDO/DANA WARNER DESIGN SERVO ACTUATOR IS \$8.40 THEREFORE THE SATURN IS AN ESTIMATED \$2.29 MORE THAN THE ELD DESIGN.
- . A COST COMPARISON TO THE ELD DESIGN IS NOT FEASIBLE BECAUSE OF THE DIFFERENT BUILD PROCESS EMPLOYED FOR THE SATURN VS. THE AUTOMATED LINE USED FOR THE ELD DESIGN.

ELD VEHICLE CONTROLS
COST ESTIMATING

x

SATURN SPEED CONTROL ACTUATOR

VARIABLE COST

MATERIAL:	UNIT COST	QU.	EXT. COST
OUTER COVER-PLASTIC	0.43	1	0.43
INNER COVER-PLASTIC	0.32	1	0.32
RUBBER OUTER SHELL	0.90	1	0.90
HOUSING-PLASTIC	0.52	1	0.52
CABLE PROTECTOR-PLASTIC	0.22	1	0.22
MOUNTING LUG SCREWS	0.07	3	0.21
LIMIT SWITCH ARMS W/ 2 CONTACT POINTS	0.16	2	0.32
LIMIT SWITCH BAR W/ 2 CONTACT POINTS	0.16	1	0.16
MOTOR FRAME ASSY			
SCREWS-COVER MOUNTING	0.01	2	0.02
COVER-ZINC	0.41	1	0.41
DRIVE BELT	0.17	1	0.17
DRIVE GEAR-PLASTIC	0.12	1	0.12
LEADSCREW	0.21	1	0.21
BEARING/RETAINER ASSY	0.16	1	0.16
FRAME-MOTOR & LEAD SCREW			
CAST & TRIM	0.40	1	0.40
MACHINED	0.28	1	0.28
SCREWS/WASHERS	0.02	2	0.04
DRIVE PULLEY-ZINC	0.07	1	0.07
SCREW	0.01	1	0.01
MOTOR (HONG KONG)	3.50	1	3.50
BLACK/WHITE WIRES	0.005	2	0.01
WIRE TERMINALS	0.015	2	0.03
CLUTCH ASSEMBLY			
PLASTIC COIL HOUSING	0.15	1	0.15
CLUTCH POLE	0.45	1	0.45
PLASTIC BOBBIN	0.12	1	0.12
MAGNET WIRE	0.20	1	0.20
LEAD WIRE	0.01	1	0.01
COIL TERMINALS	0.015	2	0.03
LEADSCREW NUT	0.04	1	0.04
FELT WIPER	0.01	1	0.01
RETAINER	0.025	1	0.03
TERMINALS	0.015	2	0.03
BRASS CABLE ACTUATOR	0.42	1	0.42
ASSEMBLY LABOR	0.48	1	0.48
MISC. AIR MATERIAL			0.10
TOTAL MATERIAL			10.57
FREIGHT 1.0 %			0.11
MATERIAL AND FREIGHT			10.68

SPEED CONTROL ACTUATOR- DIRECT LABOR

PROCESS FLOW 50,000 UNITS ANNUAL
200 PER DAY
1 SHIFT OPERATION
BENCH BUILD 25 PER HOUR.
2,400 MIN. PER PC.

ONE OPERATOR= 2.4 MIN. +10% ALLOWANCE=2.64 M

		QPM/MIN	MINUTES PER QPN.	PARTIAL OPERATORS
10	PLACE PLASTIC HOUSING IN FIXTURE. PLACE LIMIT SWITCH BAR OVER PLASTIC PROTRUSIONS. CLAMP TO HOLD. CYCLE PRESS TO HOT STAKE PROTRUSIONS. UNLOAD FIXTURE. VISUAL CHECK AND ASIDE	0.06 0.066 0.06 0.078	0.28	0.10
20	APPLY GLUE TO RUBBER COVER. PLACE COVER OVER HOUSING AND SET ASIDE TO CURE.	0.80	0.80	0.28
30	ASSEMBLE (3) MOUNTING SCREWS.	0.40	0.40	0.15
40	ASSEMBLE (PRESS) (2) TERMINALS TO HOUSING.	0.14	0.14	0.05
50	PLACE MOTOR FRAME IN FIXTURE. PLACE BUSHING/RETAINER IN FRAME. PRESS BUSHING INTO FRAME. ASIDE.	0.04 0.06 0.06	0.16	0.06
60	MANUAL CUT AND STRIP (2) WIRES.	0.33	0.33	0.13
70	PLACE MOTOR IN FIXTURE. ALIGN (2) WIRES. SOLDER WIRES TO MOTOR TERMINALS.	0.15 0.20	0.35	0.13
75	SOLDER (2) TERMINALS ONTO MOTOR LEAD WIRES.	0.40	0.40	0.15
77	PRESS PULLEY ONTO MOTOR SHAFT	0.17	0.17	0.06
90	PRESSEMBLE PLASTIC GEAR TO LEADSCREW PRESS LEADSCREW AND GEAR THRU BUSHING/RETAINER. ASIDE.	0.08 0.08 0.04	0.21	0.08
90	ASSEMBLE AND SOLDER (2) WIRE ENDS TO CLUTCH TERMINALS.	0.48	0.48	0.18
100	THREAD CLUTCH ONTO LEADSCREW.	0.25	0.25	0.09
110	PLACE CABLE TUBE THRU HOLE IN HOUSING. PLACE MOTOR INTO MOTOR FRAME. ASSEMBLE MOTOR WITH (2) SCREWS.	0.07 0.07 0.20	0.34	0.13
120	ASSEMBLE BELT TO PULLEY AND GEAR. ASSEM. COVER. DRIVE (2) SCREWS.	0.13 0.26	0.39	0.14
130	MANUALLY PLACE ENTIRE MOTOR, CLUTCH AND FRAME ASSEMBLY INTO HOUSING CAVITY. RUN DOWN SCREW	0.26 0.06	0.33	0.13
140	INSERT (4) TERMINAL BLADES INTO PLASTIC RECEPTICALS	0.33	0.33	0.13
150	SNAP IN CABLE SNOUT AND CABLE ASSEMBLY.	0.17	0.17	0.06
160	SET UP IN TEST FIXTURE. TEST ELECTRICAL AND CABLE FUNCTION.	0.75	0.75	0.28

170	ASSEMBLE INNER COVER. RUN DOWN (2) SCREWS.	0.10 0.16	0.26	0.10
180	ASSEMBLE OUTER COVER. RUN DOWN (4) SCREWS.	0.07 0.24	0.31	0.12
30	INSPECT AND PACK	0.40	0.4	0.15

 INHERENT DELAY 2.89
 0.31

LABOR OPERATORS PER SHIFT 3.00

3 HEADS X 8 HOURS=24 HOURS
 24 HOURS X \$18.08 PER HOUR= \$457 PER SHIFT
 \$457 / 200 END ITEMS= \$2.29 LABOR COST PER END ITEM.

INDIRECT LABOR- 1.8 HEADS.
 1.8 X 8 HOURS X \$12.75 PER HOUR= \$253
 \$253 / 200 END ITEMS= \$1.27 PER END ITEM.

VARIABLE OVERHEAD- 15% OF D.L. OR \$3.34

SATURN (VDO/ YAZAKI) SPEED CONTROL AMPLIFIER

VARIABLE COST

MATERIAL:	UNIT COST	QU.	EXT. COST		
RESISTORS					
1/8w. 5% CC	0.0058	48	0.28	FREIGHT: 1%	0.09
1/2w 5% CC	0.0100	1	0.01		
CAPACITORS					
50v. MONO. CERAM.	0.0250	17	0.43	DIRECT LABOR:	
4.7uf. 20v. TANTALUM AXIAL	0.1200	1	0.12	BWS = .19 HOURS	
33uf. 50v. ELECT.	0.0320	3	0.10	RATE = \$19.05/HR.	
220uf. 25v. ELECT.	0.0650	1	0.07		\$
INDUCTOR				DIRECT LABOR COS	3.82
AXIAL LEAD-WHITE	0.0200	1	0.02	INDIRECT & VON =	
				18% LL.	
				20% VON	
DIODES					
1N4148	0.0125	8	0.10		
1N4004	0.0450	8	0.36	VARIABLE COST	13.77
MR751	0.1200	1	0.12		
1N5961B ZENER	0.08	1	0.08		
33V. 1W. ZENER	0.08	1	0.08		
TRANSISTORS					
MPS 8099	0.058	6	0.35		
MPS 651	0.055	1	0.05		
MPS 751	0.055	1	0.05		
SD437/438	0.15	4	0.60		
INTEGRATED CIRCUITS					
NEC D80C48HC418 40 PIN	2.90	1	2.90		
LM2901 14 PIN	0.52	1	0.52		
SP					
TOSHIBA TA7900B 9 PIN	0.11	1	0.11		
CRYSTAL					
	0.4000	1	0.40		
MECHANICAL					
	SQ. IN.				
CIRCUIT BOARD FR4 DSPTH	13.88	0.12	1.67		
CONNECTOR- 8 PIN	0.12	1	0.12		
PIN SOCKETS	0.017	7	0.12		
HEAT SINKS	0.036	2	0.07		
RYBETS	0.01	2	0.02		
SOLDER			0.03		
MATERIAL COST			\$	8.78	

PURCHASED ELO DESIGN

NEXT GEN. SPEED CONTROL SERVO ACTUATOR

AUGUST 7, 1991

VARIABLE COST ESTIMATE

MACRO ASSESSMENT

1994 PPV- 1524K

VARIABLE COST SUMMARY:

MATERIAL	\$	8.25
FREIGHT 2%		0.15
DIRECT LABOR		0.21
INDIRECT LABOR		0.09
OVERHEAD		0.47
VARIABLE COST	\$	<u>8.14</u>

COMPONENT MATERIAL COST:

HOUSING-CAST AND MACHINED	\$	1.75	MOTOR ASSEMBLY	\$	
MOTOR HOUSING-STAMPED		0.40	SHAFT-ARMATURE		0.40
MOTOR HOUSING END CAP		0.10	BEARING ASSEMBLY		0.30
BEARINGS-CLUTCH SHAFT	2	0.18	LAMINATIONS		0.36
CLUTCH SHAFT RETAINERS	2	0.08	COPPER WIRE		0.80
SHAFT-CLUTCH		0.12	INSULATOR-PLASTIC		0.25
BOBBIN-PLASTIC		0.20	CONNECTOR		0.25
TERMINAL BLADES-BOBBIN	2	0.04	ARMATURE LAMINATIONS		0.49
POLE PIECE-POWDERED METAL		0.45			
CLUTCH GEAR ASSEMBLY		0.40	SUB TOTAL		<u>2.80</u>
COPPER WIRE-BOBBIN COIL		0.30			
PINNION GEAR		0.25	COMPONENTS		7.84
ANTI BACKLASH GEAR		0.20	AS PURCHASED MATERIAL		0.15
SPRINGS-ANTI B/L GEAR	2	0.08	PACKAGING MATERIAL		0.10
SHAFT-PINNION GEAR		0.10			
PULLEY-CABLE		0.30	BASE MATERIAL		7.89
SPRING-PULLEY		0.08	5% ALLOWANCE		0.39
SPRING-RECCEL		0.05			
SUB TOTAL	\$	<u>5.04</u>	TOTAL MATERIAL	\$	<u>8.25</u>

ASSEMBLY OPERATION PROCESS

	OPERATORS
LOAD HOUSING TO FIXTURE BORE (MACHINE) ID OF MOTOR CUP RECESS AND MILL THE FACE OF RECESS. -FREE EFFORT JOB. NOT TIED TO LINE-	1
STATOR ASSEMBLY	
ASSEMBLE LAMINATION STACK AND WELD.	1
ASSEM.(2) PLASTIC INSULATORS & (12) PAPER INSULATORS (SLOT CELL INSERTS).	1
WIND STATOR W/ 54 TURNS.	1
PULL (3) WIRE LEADS OUT AND CLIP SPLICE INTO ONE.	1
GLUE CONNECTOR SHELL INTO PLACE. ATTACH SPLICED LEAD TO CONNECTOR SLOT. ATTACH (3) ADDITIONAL LEADS TO CONNECTOR. CRIMP IN FIXTURE	2
TEST STATOR (10 SEC. CYCLE)	2
AUTO PLACE (4) TERMINALS IN CONNECTOR. SINGLE STATION INDEX. REEL FEED.	2
PRE-HEAT STATOR. DIP IN VARNISH. BAKE OVEN. CHAIN CONVEYER. MANUAL LOAD/AUTO OPN.	1
ROTOR ASSEMBLY	
ASSEMBLE ROTOR STACK. TIG WELD (3) PLACES.	1
PRESS IN SHAFT.	1
DIP IN VARNISH AND BAKE. CHAIN CONVEYER	1
AUTO GRIND AND GAGE THE BEARING JOURNAL.	1
AUTO DIP IN RUST PREVENTATIVE SOLUTION. LOADER/UNLOADER	2
ASSEM. (2) SPACERS AND PRESS (2) BEARINGS ONTO SHAFT.	1

NEXT GEN SPEED CONTROL

ASSUME (2) SHIFT OPERATION.
2341 PARTS/ (8) HOURS.
RUN RATE, 308 PER HOUR.
.183 MIN./PC (9.8 SEC.)

STACKERS, SLOT LINERS AND WINDERS
ARE SET UP IN MULTIPLES AND USED
AS RUN RATES DEMAND. LABOR IS
NOT BASED ON MULTIPLE MACHINE
TEND.
FOR THIS ESTIMATE IT IS ASSUMED
THAT EACH MACHINE IS TENDED TO
BY A WHOLE OPERATOR AND NOT A SPLIT

MOTOR ASSEMBLY

APPLY GLUE TO OUTSIDE OF STATOR STACK. 1
PLACE STATOR IN HOUSING.
APPLY GLUE TO OD OF MOTOR CUP. 1
PLACE CUP OVER STATOR AND MACHINE PRESS INTO 1
HOUSING. (HOUSING IN CARRIER PALLET.)
BAKE OVEN. MANUAL LOAD 1
(3) STAGE HONE INSERT, ROUGH, SEMI & FINISH. 1
STATOR ID AND CUP END ID.
(3 SPN. MACHINE)
WASH TO REMOVE HONE OIL. MANUAL LOAD/UNLOAD 2
APPLY RUST INHIBITOR SPRAY TO HONED SURFACES. 1
MANUAL REMOVE EXCESS RUST SPRAY AND TOWEL DRY. 1

POLE PIECE SUB ASSEMBLY (2 PCT. PER PALLET)

STEP DRILL ID OF POLE PIECE 1
MANUAL OPN.
MACHINE ID OF RIM 1
MANUAL OPN.
SAND SURFACE OF OUTER RIM AND INNER FACE. 1
CLEAN AND GAGE EACH PART. PLACE IN BASKET. 2
DIP BASKET IN RUST PREVENTATIVE. 1
PLACE (2) POLE PIECES IN PALLET FIXTURES. 2
PLACE (2) SHAFTS IN SHAFT HOLE.
AUTO PRESS SHAFT THRU POLE PIECE.

BOBBIN ASSEMBLY

WIND (2) BOBBINS PER CYCLE. 1300 TURNS. 2
MANUAL PLACE (2) WIRE ENDS IN TERMINAL SLOTS.
ATTACH TAPE TO BOBBIN WINDOWS.
INSERT (2) TERMINALS AND ELECTRICAL TEST. 1

CLUTCH ASSEMBLY

MANUALLY PLACE BOBBIN IN POLE PIECE. 2
ASSEMBLE SPRING TO POLE PIECE.
ASSEM. GEAR AND RETAINER OVER SHAFT. PRESS
ONTO SHAFT.

AUTO TEST FOR RESISTANCE AND SHORTS. AUTO
(TEST 2 PER CYCLE. R & L STATIONS)
REMOVE (2) ASSEMBLIES FROM PALLET. 1

FINAL ASSEMBLY

LOAD (2) HOUSING AND MOTOR ASSEMBLIES TO 2
FIXTURES. (2) PER PALLET.

MANUAL ASSEM. LARGE SNAP RING. 1

MANUAL ASSEM. ROTOR ASSEMBLY INTO STATOR. 1

ASSEM. SPRING INTO CUP HEAD OVER BEARING. 1
ASSEM. END CAP OVER CUP END AND SECURE
IN MAGNA FLUX MACHINE.

MANUAL ASSEM. BUMPER SPRING. TURN PALLET. 1

TEST MOTOR. 2 STATION SEQUENCE. AUTO

PICK UP CLUTCH ASSEM. (2) BEARINGS ON 2
SHAFT. PLACE IN HOLDING FIXTURE.
USING A VACUUM TOOL, REMOVE CLUTCH
FROM FIXTURE AND PLACE IN ACTUATOR.(BEARINGS
HELD IN POSITION BY TOOL)
[TWO OPERATORS]

AUTO ASSEM. BEARING RETAINER. TWO STATION. 2
REPEAT FOR SECOND POCKET.

OFF LINE OPERATION

ROTARY DIAL-MAN LOAD (2) GEAR 3
HALVES. ASSEM. TWO SPRINGS INTO POCKETS.
AUTO WIND GEAR. PLACE FIN TO HOLD TENSION.
MANUAL REMOVE FROM DIAL ROTARY.

FINAL ASSEMBLY (CONTINUED)

ASSEM. SHAFT THRU GEAR. SET IN ACTUATOR. SET TO FIXTURE. MANUALLY PULL DOWN RAM TO STAKE INTO ACTUATOR. REPEAT FOR SECOND MOUNTING LOCATION. REMOVE PIN FROM GEAR.	1
MANUAL CHECK FOR PROPER CLUTCH MOVEMENT.	1
ASSEM. AND WIND RETURN SPRING TO PULLEY. INSERT PIN IN PULLEY TO KEEP SPRING WOUND. POSITION AND PRESS ON TO CLUTCH SHAFT. REMOVE RETAINER PIN.	2
TEST.	2
MANUAL INSPECT.	1
STAMP DATE CODE.	1
PACK-12 PER LAYER. 3 TO 4 LAYERS. 6 HIGH. SHRINK WRAP.	2

PRODUCTION OPERATORS	66
REPAIR	2
STOCK HANDLE	2
UTILITY	2
MISC.	1
LABOR HEADS PER SHIFT.	72

FULL CAPACITY= 3M / YR.
RUN 80 HRS/WK OR 2 SHIFTS. 62500 / WK.
RUN AT 780 / HOUR 6240 PCS/8 HRS.
.0789 MIN/PC.
4.6 SECONDS

1994: RUN 1.6 M PER YEAR.
RUN 80 HRS/WK OR 2 SHIFTS. 28,412 / WK.
RUN AT 980 / HOUR = 2841 PCS/8 HRS.
.1632 MIN/PC.
8.6 SECONDS PER PC.
72 HEADS X 8 HRS. = 576 HOURS/ SHIFT
576/2841 = .1998 HRS/ PC.
HOURLY RATE= \$1.05
\$1.05 X .1998 = \$.2098 PER PC.

DIRECT LABOR COST= \$1.21 PER PIECE.

INDIRECT LABOR

	HEADS (DAY)	VAR. %	VAR. INDIRECT
QUALITY CONTROL INSPECTO	4	100	4.0
QUALITY CONTROL LAB.	2	100	2.0
SWEEPER/CLEANER	2	100	2.0
TOOL ROOM	1.5	100	1.5
MAINTENANCE	5	100	5.0
STOCK HANDLE/WAREHOUSE	2	100	2.0
LIFT TRUCK/TUG	1	100	1.0
RECEIVING/ SHIPPING	2	100	2.0
SPC.ADM.	2	100	2.0
CUTTER GRIND	0.5	100	0.5
CRIB	2	100	2.0
TOTAL VARIABLE INDIRECT LABOR			24.0

24.0 HEADS X 5 HOURS = 120 HOURS FOR (2) SHIFTS.
120 HOURS / 5588 PCS/DAY = .0214 HRS/ PC.
.0214 X \$1.75/HRS = \$0.37 / PC.

VARIABLE OVERHEAD

ASSUME SAME AS FORD ALTEC ALLOCATION OF 3.47

ACURA SPEED CONTROL

VARIABLE COST SUMMARY

SEPTEMBER 15, 1991

1991 ECONOMICS
VOLUME: 50,000 UNITS ANNUAL

SERVO ACTUATOR	\$	
SERVO ACTUATOR MATERIAL		13.73
IN BOUND FREIGHT 2%		0.27
DIRECT LABOR-FINAL ASSEMBLY		3.21
INDIRECT & OVERHEAD		1.62
SUB-ASSEMBLY LABOR & OVERHEAD		1.97
TOTAL SERVO COST	\$	21.00
SPEED CONTROL AMPLIFIER		
AMPLIFIER MATERIAL	\$	14.83
IN BOUND FREIGHT 2%		0.29
DIRECT LABOR		3.45
INDIRECT AND OVERHEAD		1.56
TOTAL AMPLIFIER COST	\$	19.93
COMBINED VARIABLE COST	\$	40.94

JAPAN IS THE ASSUMED COUNTRY OF MANUFACTURE.

MATERIAL AND LABOR COST REFLECT LOW VOLUME BUILD.

DIRECT LABOR RATE USED, \$19.08 PER HOUR.

VEHICLE CONTROLS
COST ESTIMATING
SEPT. 15, 1991

ACURA SPEED CONTROL ACTUATOR

MAY 23, 1981

VARIABLE COST ESTIMATE

MATERIAL ESTIMATE

SERVO ACTUATOR MODULE

OUTPUT PULLEY ASSEMBLY	0.51
RETURN SPRING KEEPER	0.13
OUTPUT LIMIT CAM	0.12
WIRE CLIP-PLASTIC	0.10
STAMPED DUST SHIELD	0.08
BOTTOM COVER-ALUM.DIE CASTING	0.43
OUTPUT RETURN SPRING	0.08
ALUM. SCREWS (2)	0.05
LOCK WASHERS (3)	0.04
COVER-OUTPUT GEAR	0.48
RUBBER BEARING/SEAL	0.03
SEAL RETAINING SPRING	0.06
SHOCK ABSORBER HOUSING	0.36
SHOCK ABSORBER PLUNGER	0.12
SPRING RETAINER	0.08
BUSHING	0.08
SPRING	0.06
SCREWS (2)	0.04
OUTPUT SHAFT & GEAR ASSY	0.38
WASHERS-OUTPUT SHAFT (2)	0.02
E RING	0.03
NUT-OUTPUT SHAFT	0.01
LOCK WASHER-OUTPUT SHAFT	0.01
RING RETAINER-OUTPUT SHAFT	0.02
SCREWS & WASHERS-PCB TO HOUSING	0.06
SCREWS, WASHER & NUT SWITCH TO PC	0.12
CIRCUIT BOARD-SINGLE SIDED	0.40
CONNECTOR ASSEMBLY	0.73
SWITCHES (2)	0.70
DIODES (2)	0.09
DIODES (2)	0.11
WORM GEAR SHAFT & GEAR ASSY	0.62
SINTERED BRONZE BEARINGS (2)	0.20
SINTERED BRONZE BEARING-MOTOR SH	0.09
SINTERED BRONZE BUSHING-SMALL	0.07
RUBBER HOUSING SEAL (2)	0.20
RUBBER HOUSING SEAL-MOTOR MOUNT	0.08
HOUSING-ALUM.DIE CAST	1.37
GROMMET-4 WIRE	0.07
PINS- STEEL (2)	0.04
SUB TOTAL	\$ 8.39

MOTOR ASSEMBLY

MOTOR HOUSING	0.23
MAGNETS	0.18
BRONZE BUSHING	0.08
WASHER	0.01
BRUSH HOLDER ASSY-PLASTI	0.20
RIVET	0.01
SHAFT STOP	0.01
ARMATURE SHAFT	0.07
GEAR-ARM. SHAFT	0.06
E CLIP	0.01
WASHER-GRAB	0.01
LAMINATIONS 34	0.51
EPOXY	0.02
COPPER WIRE	0.20
INSULATOR	0.01
COMMUTATOR	0.18
BRUSH & WIRE ASSY (2)	0.10
BRUSH SPRINGS (2)	0.04
BRUSH RET. & WIRE CONT.	0.08
LEAD WIRES (2)	0.02
SUB TOTAL	\$ 1.97

CLUTCH ASSEMBLY

ENGAGE PLATE-CAST STEEL	0.25
GEAR/PLATE	0.15
BRONZE BEARING (2)	0.10
RIVETS-LARGE (3)	0.18
RIVETS-SMALL (3)	0.12
SPRING ARMS (3)	0.09
SPACER WASHERS (3)	0.02
E RING	0.02
SHAFT	0.08
CONTACT POINT & ARM ASSY	0.14
CONTACT CARRIER-PLASTIC	0.10
COLLAR BUSHING	0.01
RIVETS (2)	0.01
COLLAR-PRESS FIT	0.08
MOLDED GEAR & CON. ASSY	2.00
SUB TOTAL	3.37

ESTIMATED
MATERIAL COST \$ 13.73

ACCURA SPEED CONTROL SERVO

DIRECT LABOR LINE BALANCE
.832 MIN. PER PIECE

LINE BALANCE- 24 PCS PER HOUR.
750 PCS. PER (6) HOURS. 480 MIN.

OPN. NUMBER	DESCRIPTION	OPN. MIN.	MIN. REQ'D (HRS.)	OPN. HEADS REQ'D	INHERENT DELAY HEADS	CUM. OPN. MIN.	ASSIGN HEADS	REMAINING MIN.
10	UNLOAD HOUSING FROM RACK. LOAD HOUSING TO FIXTURE. PRESS IN (2) OUTPUT SHAFT BUSHINGS.	0.18	137	0.29	0.72	137	1	
15	LOAD FDT. PRESS IN WORM GEAR BUSHING.	0.13	89	0.21	0.79	236		
20	LOAD FDT. PRESS IN (2) GUIDE PINS.	0.28	167	0.58	0.68	403		77
25	ASSEM. CLUTCH SHAFT TO HOUS. SECURE WITH E CLIP	0.18	137	0.29	0.72	137	1	
30	ASSEM. CONTACT ARM ASSY. DRIVE RETAINING SCREW.	0.15	114	0.24	0.78	251		
40	ASSEM. WORM GEAR SHAFT & DROP IN COIL GEAR OVER SHAFT.	0.10	75	0.18	0.84	327		
50	ASSEM. PRE-BUILT CLUTCH ASSY TO COIL GEAR. ASSEM. E CLIP	0.13	89	0.21	0.79	426		54
55	ASSEM. & ENGAGE SHAFT & GEAR ASSY	0.10	75	0.18	0.84	75		
60	PU COVER. PRESS IN RUBBER SEAL.	0.08	61	0.13	0.87	137	1	
65	PU RUBBER GASKET. ASSEM. TO HOUS.	0.15	114	0.24	0.78	251		
70	PLACE COVER ON HOUSING. DRIVE (2) SCREWS ASSIST W/ OPN. 60 A/R	0.05 0.23	38 176	0.08 0.38	0.92 0.64	289 464		16
80	DRIVE (2) COVER SCREWS.	0.21	160	0.33	0.67	160	1	
85	PLACE SHOCK ABSORBER ASSY. DRIVE (2) SCREWS.	0.35	266	0.55	0.45	426		54
90	ASSEM. MOTOR AND DRIVE (4) SCREWS. ASSEM. RUBBER SEAL	0.65	494	1.03	-0.08	494	1	-0.14
100	ASSEM. CONNECTOR & GROMMET ASSY TO HOUSING. ASSIST W/ OPN 90	0.25	190 0.14	0.40	0.80	190 204	1	85
105	ASSEM. PLASTIC PART OVER SHAFT	0.07	53	0.11	0.59	243		
110	ASSEM. PLASTIC CAM OVER SHAFT	0.08	61	0.13	0.57	304		
120	FLUX & SOLDER (2) WIRES TO CONTACT ARM ASSY	0.25	190	0.40	0.80	190	1	9
125	PU PCB ASSY. FEED (4) WIRES THRU BOARD HOLES. ORIENT PCB TO HOUSING.	0.37	281	0.59	0.41	471		
130	STRIP (4) WIRES, FLUX & SOLDER TO PCB. [ASSIST W/ OPN. 125]	0.60	456	0.85	0.08	466	1	24
140	ASSEM. COVER & DRIVE (4) SCREWS.	0.50	380	0.79	0.21	380	1	100
150	ASSEM. RETURN SPRING & PLACE DUST COVER.	0.17	129	0.27	0.73	129	1	199
155	PLACE PULLEY, WASHER & DRIVE NUT.	0.20	152	0.32	0.68	281		
160	TEST & APPLY LABEL	0.632	480	1.00	-0.00	480	1	
170	FINAL INSPECT & PACK	0.632	480	1.00	-0.00	480	1	
OPERATION LABOR HEADS			5065	10.58			12	619
% OF WORK MIN. & DELAY MIN.			59%					11%

RELIEF HEADS. 12 * 1-13 X 24-312MIN

312 1

STOCK HANDLER
UTILITY & REPAIR

1
2

TOTAL LABOR HEADS

16 HEADS

CMS- 16 X 480/780- 10.105 MIN/PC.
.1684 HOURS PER PC.

.1684 HOURS X \$19.05/HR- \$3.21

DIRECT LABOR COST

\$ 3.21

INDIRECT LABOR

	INDIRECT LABOR HEADS	VARIABLE %	VARIABLE INDIRECT
QUALITY CONTROL INSPECTOR	1.0	100	1.0
QUALITY CONTROL LAB.	0.2	100	0.2
SWEEPER/CLEANER	0.3	100	0.3
SWEEPER/CLEANER- OFF SHIFT	0.2	50	0.1
TOOL ROOM	0.8	70	0.6
MAINTENANCE	2.0	65	1.3
STOCK HANDLER/WAREHOUSING	1.0	100	1.0
LIFT TRUCK/ TUG	0.4	80	0.4
RECEIVING/SHIPPING DOCK	0.6	80	0.5
SPC/ ADM.	0.5	60	0.3
CUTTER/GRIND	0.1		
CRIB	0.2	50	0.1
TOTAL VARIABLE INDIRECT			6.8 HEADS

INDIRECT LABOR COST-

6.8 HEADS X 9 HOURS X \$19.05/ HR / 780 PCS- \$1.18

OVERHEAD 21% (\$3.21 X .21)-\$0.67

SUMMARY:		\$
DIRECT LABOR		3.21
INDIRECT LABOR		1.18
OVERHEAD		0.67
TOTAL		5.03

ACTUATOR
SUB ASSEMBLY OPERATIONS

DIRECT LABOR

	OPN. MIN.
CLUTCH PLATE ASSEMBLY	
LOAD ARBOR PRESS FIXT. WITH FLANGE GEAR. PLACE BUSHING. CYCLE PRESS TO SECURE BUSHING. REMOVE & ASIDE.	0.16
PU & PLACE GEAR FLANGE IN FIXT. PLACE (1) SPRING ARM & RIVET IN GEAR FLANGE	0.05 0.09
REPEAT FOR (2) ADDITIONAL SPRING ARMS & RIVETS.	0.18
CYCLE MACHINE TO SECURE RIVET	0.05
REMOVE AND ASIDE ASSY.	0.05
	<hr/> 0.40
PU & LOAD STEEL PLATE TO FIXTURE	0.05
PU & PLACE FLANGE GEAR, SPRING ARM AND RIVET ASSY. OVER PLATE.	0.05
INSERT (3) RIVET STUDS THRU ARM.	0.13
CYCLE MACHINE TO STAKE STUD RIVETS	0.05
REMOVE & ASIDE PART	0.05
	<hr/> 0.31
TOTAL OPERATION MIN.	0.57
OPERATOR ALLOWANCES 10%	0.09
	<hr/> 0.96
TOTAL MINUTES	0.96
FULLY BURDENED COST PER MIN.	0.48
	<hr/> 0.44
ASSEMBLY COST	0.44

DIRECT \$18.05/HR.
INDIRECT 30%
OVERHEAD 15%
TOTAL \$27.62/HR.

MOTOR ASSEMBLY ARMATURE ASSEMBLY

AUTO LOAD SHAFT. ASSEM. INSULATOR OVER
SHAFT. AUTO BUILD LAMINATION STACK
OVER SHAFT. AUTO ASSEM. COMMUTATOR
TO SHAFT. AUTO CONVEY TO WINDER.

AUTO WIND ARMATURE. CONVEY TO STAKE STATION.
STAKE COMMUTATOR TANGS.
AUTO CONVEY TO COMMUTATOR LATHE. TURN
COMMUTATOR. AUTO CONVEY TO STORAGE RACK.

CYCLE TIME-.45 MIN.(WIND)

FULLY BURDENED COST PER MINUTE, \$.48 .45 MIN. X \$.48=\$.21

MOTOR FINAL ASSY.	OPN. MIN.
LOAD PLASTIC BRUSH HOLDER TO FIXTURE. ORIENT STAMPED CONTACT ARM TO BRUSH HOLDER. PLACE RIVET. INDEX FIXT. & STAKE.	0.14
PLACE (2) BRUSHES IN HOLDER. PLACE (2) SPRINGS OVER POSTS. COCK SPRINGS.	0.36
ASSEM. (2) BRUSH RETAINERS AND STAKE DOWN.	0.25
LOAD BRUSH HOLDER ASSY TO FIXTURE ORIENTING BRUSH LEADS TO BRASS RING BR/CONTACT. CYCLE FIXTURE TO WELD LEADS TO CONTACT.	0.20
ASSEM. & SOLDER (2) WIRES.	0.18
PRESS BUSHING INTO BRUSH HOLDER (SHAFT)	0.12
ASSEM. ARMATURE TO HOLDER. SLIDE SMALL GEAR OVER SHAFT. ASSEM. C CLIP.	0.17
ASSEM. ARMATURE & BRUSH HOLDER TO CUP ASSY. DRIVE (2) SCREWS.	0.30
INSPECT & TEST	0.50
PACK	0.15

LABOR MINUTES	2.38
OPERATOR ALLOWANCES 10%	0.24
INHERENT DELAY 10%	0.26

TOTAL MINUTES	2.88
FULLY BURDENED COST PER MINUTE	\$.48

DIRECT LABOR COST	\$ 1.38

ACURA SPEED CONTROL AMPLIFIER

VARIABLE COST ESTIMATE

MATERIAL:	QU.	UNIT COST	EXT. COST
RESISTORS			
1/8W. 5% CARBON COMP.	32	0.0055	0.176
1/4W. 5% CARBON COMP.	8	0.0057	0.051
1/2W. 2% CARBON COMP.	1	0.609	0.009
1W. 2% CARBON COMP.	2	0.08	0.128
CAPACITORS			
.01 UF DISC.	9	0.022	0.198
30 PF DISC.	2	0.02	0.040
.022 UF DISC.	1	0.023	0.023
.1UF DISC.	3	0.018	0.054
.33UF 35V. ELECT.	1	0.09	0.090
33UF 16V.	2	0.034	0.068
10UF 50V.	1	0.04	0.040
1UF 50V.	1	0.28	0.280
33UF TANT.	1	0.12	0.120
.22UF MONO.	2	0.07	0.140
.047 UF FILM	1	0.035	0.035
.033 FILM	1	0.048	0.048
CRYSTAL 60 MHZ	1	0.35	0.350
DIODES			
1N4004	16	0.042	0.672
27V. ZENER	1	0.18	0.180
K350 ZENER	3	0.06	0.180
6.5V ZENER	3	0.15	0.450
5.1 ZENER	4	0.06	0.240
TRANSISTORS			
C4085 NPN 150W.	2	0.25	0.500
A1555 PNP 150W.	2	0.25	0.500
NEC B1217 TO128	1	0.2	0.200
NPN TO92	9	0.055	0.495
IC'S			
mitsuba 7808001 12 PIN SIP	1	0.75	0.750
mitsuba 7808001 9 PIN SIP	1	0.75	0.750
mitsuba 80C50-321 40 PIN DIP	1	2.75	2.750
mitsuba M5238 5 PIN SIP	1	0.3	0.300
mitsuba 7807002 13 PIN SIP	1	0.75	0.750
78N05 5V. REG.	1	0.45	0.450
MECHANICAL			
CIRCUIT BOARD	1	2.45	2.450
CONNECTOR 14 PIN	1	0.2	0.200
HEAT SINK	1	0.19	0.190
SCREWS	4	0.02	0.080
HOUSING/COVER	1	0.27	0.270
MOUNTING BRACKET	1	0.5	0.500
TOTAL MATERIAL			14.63

IN BOUND FREIGHT 2%	\$	0.29
AMPLIFIER ASSEMBLY		
DIRECT LABOR:		
.18 HOURS X \$19.05 PER HOUR-	\$	3.45
INDIRECT LABOR: 30%		1.04
OVERHEAD: 15%		0.52
TOTAL LABOR AND OVERHEAD	\$	<u>5.00</u>
TOTAL VARIABLE COST- AMPLIFIER	\$	<u>19.99</u>

MAXIMUM SPEED CONTROL COMPETITIVE ANALYSIS

SPEED CONTROL SYSTEM CHARACTERISTIC	MC-6 / 626 *	NPV	SCV	EX-7
On / Off Switch	Yes - On lower left of dash	Yes - On upper right of dash	Yes - On lower left of dash	Yes - On stalk, right of dash
Controls	Stalk - Resume / Accel - Set / Coast	Stalk - Resume - Set - Coast	Steering wheel buttons - Accel / Resume - Coast / Set	Stalk - Resume - Set - Coast
Indicator Lamps	"Cruise Main" - On cluster Indicates system On / Off	"Cruise Main" - Above switch Indicates system On / Off	Indicator lamp incorporated with On / Off switch	"Main" for system On / Off "Cruise" for system activation
Servo Type / Location	Vacuum - three solenoids Mounted on right check tower No vacuum assistance	Vacuum - three solenoids At dash panel, far right No vacuum assistance	Vacuum - three solenoids Mounted on right check tower No vacuum assistance	Electric Motor - Iso mounted At dash panel, far right
Cable / Throttle Attachment Method	Bowden cable w/ dual nut adjust at servo Attaches to accelerator pedal	Same as MC-6 / 626	Same as MC-6 / 626	Bowden cable w/ dual nut adjust at servo. Dedicated attachment @ throttle
Brake Redundancies	• Stop Lamp Sw. on brake pedal • Dedicated Brake Sw. on brake pedal, w/ parallel clutch sw. for HTX vehicles • Neutral shutoff for ATX cars	• Stop Lamp Sw. on brake pedal • Dedicated Brake Sw. on brake pedal • Neutral shutoff	Same as NPV	• Stop Lamp Sw. on brake pedal • Dedicated Brake Sw. on brake pedal, w/ parallel clutch sw. for HTX vehicles • Neutral shutoff for ATX cars
Amplifier Type / Location	uP Based, 6 IC's, Top side and Mounted under dash	Same as MC-6 / 626	Same as MC-6 / 626	
PERFORMANCE				
Set Accuracy / Droop	Droops 1/2 to 2 MPH, returns to maintain speed within 1/2 MPH	Droops 1/2 to 2 MPH, typically returns to set speed.	Droops 1 MPH max. when set, typically returns to set speed	Droops 1 MPH max. when set, typically returns to set speed
Acceleration Rates	1.5 MPH/s below 50 MPH, 1.0 MPH/s above 50 for conscious accel. Won't downshift if above 50 MPH, force rate less than 0.6 MPH/s	1.2 - 1.0 MPH/s at all speeds; transmission interface forces a downshift during any accel or resume	1.5 - 1.2 MPH/s at all speeds; transmission interface forces a downshift during any accel or resume	With manual transmission, and turbo engine, accel rates were 1.4 - 2.0 MPH/s
OTHER				
Favorable (+) or Objectionable (-) Features	+ Smooth level road maintenance - Twist action to activate stalk controls is clumsy - Accel rates too slow - Resume lost if speed drops below 25 MPH	+ Smooth level road maintenance + No transmission interface - Twist action to activate stalk controls is clumsy - Does not hold speed tightly	+ Has steering wheel switches - Transmission interface forced downshift w/ Accel or Resume - Does not hold speed tightly - Resume lost if speed drops below 25 MPH	+ No detectable surging for high performance vehicle + Holds speed tightly - Stalk visibility poor - Resume lost if speed drops below 25 MPH

* Same System / Powertrain

at/comp/comp

July 23, 1991

REDA HE-4 / 626 SPEED CONTROL COMPETITIVE ANALYSIS

SPEED CONTROL CHARACTERISTIC			
SPEED CONTROL FEATURE	YES	NO	COMMENTS
On	X		Momentary toggle on lower right of dash panel. Turns off w/ ignition. Poor visibility.
Off	X		
Set	X		• Twist stalk toward driver
Accel	X		• Twist stalk away from driver (AFTER Set)
Coast	X		• Twist stalk toward driver (AFTER SET)
Resume	X		• Twist stalk away from driver (AFTER Brake)
Cancel		X	
On / off Light	X		"CRUISE PALP" light on dash when "OFF" button is pushed
Cruise light		X	

FORD COMPANION: TEMPO / TOPAZ		
YES	NO	COMMENTS
X		Momentary toggle on steering wheel.
X		
X		• Tap Set / Accel button
X		• Solid Set / Accel button
X		• Solid Coast button
X		• Tap Resume button
	X	
	X	
	X	

COMPONENT	
Servo	Vacuum with 1 vac, 2 vent solenoids. 3 inch diam. diaphragm. No position feedback.
Cable	Studen type, attaches to accelerator pedal; lost motion at pedal. Adjusted at SEA by dual nuts at servo.
Amplifier	uP based, 6 IC's, Top side SMD, mounts under dash. Mounting bracket is staked onto metal lid. Weight: 0.50 lbs.
Redundant Brake Mechanism	(1) Stop lamp switch input. (2) Dedicated stop switch on brake pedal fed thru vac solenoid. Also, clutch switch for NTR, Neutral lockout for ATX.

Vacuum servo with one vac, one vent valve. 3 1/2 inch diam. diaphragm. Includes feedback potentiometer.
Studen type, adjustable piggyback attachment to accel cable at throttle body. Comes to SEA pre-adjusted.
1 custom IC. Analog design. Board edge connector. Requires custom bracket for IP installation.
(1) Stop lamp switch input. (2) Dedicated vacuum dump switch on brake pedal. (3) 10 MPH redundant brake. Also, clutch switch for NTR.

PERFORMANCE	
Set Accuracy / Drop	ATX typically droops 2 MPH, NTX droops 1 MPH during initial set. Resurves to and maintains speed within 1/2 MPH on level road.
Level Road Performance	Excellent. Throttle swings of 1" Hg. at speeds below 50 MPH; 2" Hg. above 50 MPH, 8/9 ratings at all speeds.
Acceleration	1.5 MPH/s when below 50 MPH, 1.0 MPH/s above 50 MPH. ATX will not downshift if speed is above 50, causing accel rates slower than .7 MPH/s.

• PLUS •	HIGHLIGHTS	- MINUS -
• Smooth level road speed maintenance		• Stalk twist action is clunky • Accel rates slow at high speeds • Resume lost if speed drops below 25

MAZDA RX-6 / 626 SPEED CONTROL COMPETITIVE ANALYSIS

SPEED CONTROL CHARACTERISTIC			
SPEED CONTROL FEATURE	YES	NO	COMMENTS
On	X		Momentary toggle on lower right of dash panel. Turns off w/ ignition. Poor visibility.
Off	X		
Set	X		- Twist stalk toward driver - Twist stalk away from driver (AFTER set) - Twist stalk toward driver (AFTER set) - Twist stalk away from driver (AFTER brake)
Accel	X		
Coast	X		
Resume	X		
Cancel		X	
On / Off Light Cruise Light	X	X	"CRUISE MAIN" Light on dash when "On" button is pushed.

COMPONENT	
Servo	Vacuum with 1 vac, 2 vent solenoids. 3 inch diam. diaphragm. No position feedback.
Cable	Bowden type, attaches to accelerator pedal; lost motion at pedal. Adjusted at B&A by dual nuts at servo.
Amplifier	UP Based, 6 IC's, Top side SMD, mounts under dash. Mounting bracket is staked onto metal lid. Weight: 0.50 lbs.
Redundant Brake Mechanism	(1) Stop lamp switch input. (2) Dedicated stop switch on brake pedal fed thru vac solenoid. Also, clutch switch for MIX, Neutral lockout for AEX.

PERFORMANCE	
Set Accuracy / Droop	AEX typically droops 2 MPH, MIX droops 1 MPH during initial set. Returns to and maintains speed within 1/2 MPH on level road.
Level Road Performance	Excellent. Throttle swings of 1" Hg. at speeds below 50 MPH, 2" Hg. above 50 MPH, 8/9 ratings at all speeds.
Acceleration	1.5 MPH/s when below 50 MPH, 1.0 MPH/s above 50 MPH. AEX will not downshift if speed is above 50, causing accel rates slower than .7 MPH/s.

+ PLUS +	HIGHLIGHTS	- MINUS -
+ Smooth level road speed maintenance		- Stalk twist action is clumsy - Accel rates slow at high speeds - Resume lost if speed drops below 25

UNLOADED FUEL ONLY

E FL

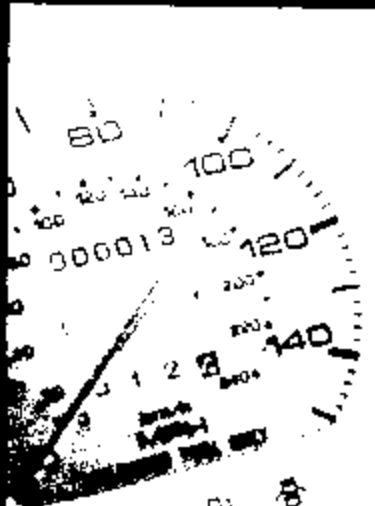
(A.L.)



0.14
0.0125
0.0125

MAZDA MX3 / 626

EMZ-025-A 19873

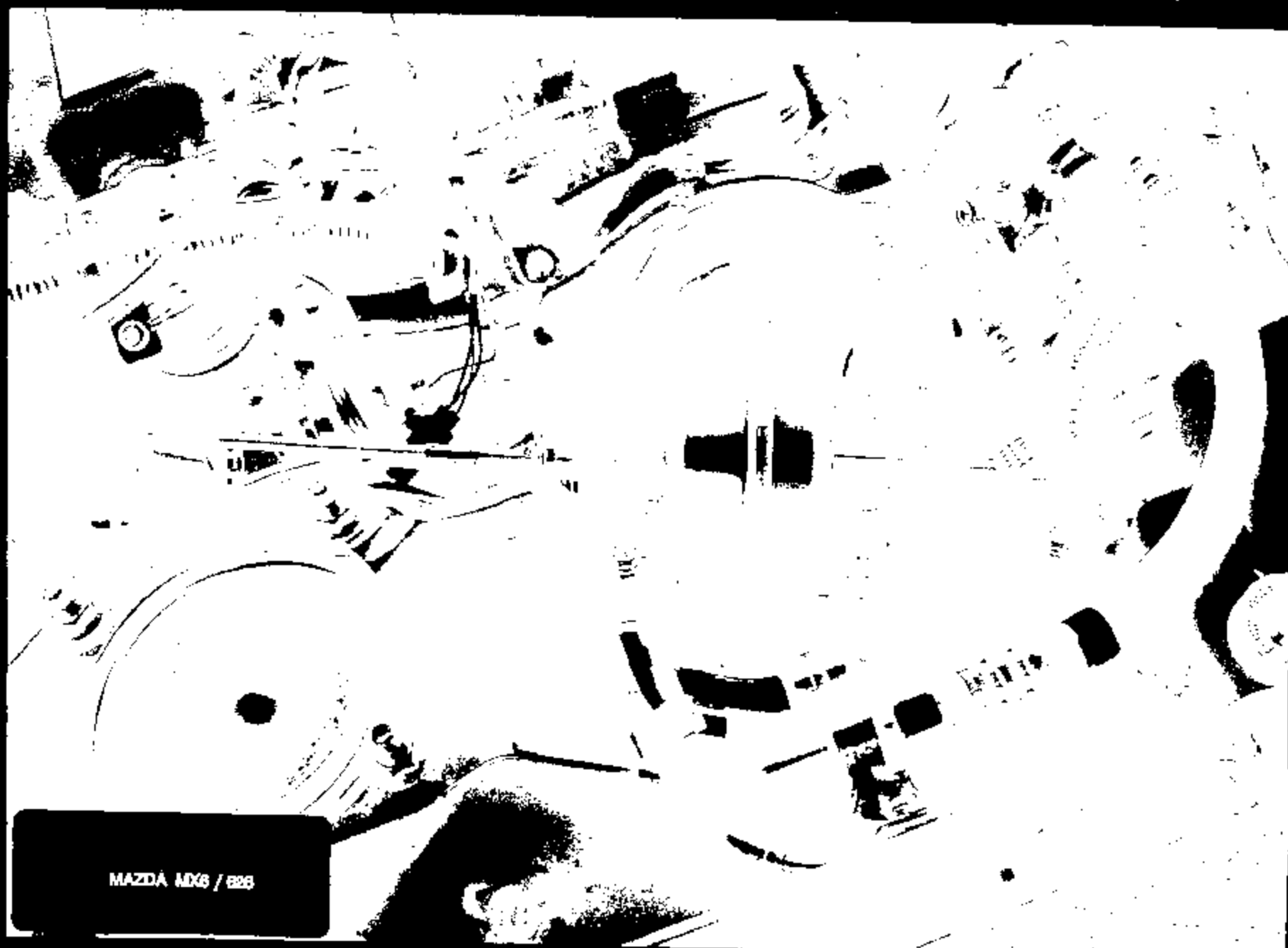


000013

RESUME &
ADULT
OFF
COAST

8002-029-0 13074

MAZDA M068 / 000



MAZDA MX6 / 826

RAZOR 800 SPEED CONTROL COMPETITIVE ANALYSIS

SPEED CONTROL CHARACTERISTIC			
SPEED CONTROL FEATURE	YES	NO	COMMENTS
On / Off	X		Push On / Push Off toggle on upper right of dash. Will not turn off with ignition.
Set	X		- Momentarily push button on end of stalk.
Accel	X		- Hold in button on end of stalk (AFTER Set)
Coast	X		- Twist stalk toward driver (AFTER Set)
Resume	X		- Twist stalk away from driver (AFTER Brake)
Cancel		X	
On / Off Light	X		"CRUISE MAIN" above on / off switch
Cruise Light		X	when "ON" button is pushed

RIVAL COMPANATOR: AEROSTAR			
YES	NO	COMMENTS	
X		Momentary toggle on steering wheel.	
X		- Top Set / Accel button	
X		- Hold Set / Accel button	
X		- Hold Coast button	
X		- Top Resume button	
	X		
	X		
	X		

COMPONENT	
Servo	Vacuum with 1 vac, 2 vent solenoids. 3 inch diam. diaphragm. No position feedback.
Cable	Bowden type, attaches to accelerator pedal; lost motion at pedal. Adjusted at SEA by dual nuts at servo.
Amplifier	IP Based, 6 IC's, Top side PCB, mounts under dash. Mounting bracket is staked onto metal lid. Weight: 0.50 lbs.
Redundant Brake Mechanism	(1) Stop lamp switch input. (2) Dedicated stop switch on brake pedal fed thru vac solenoid. (3) 9 mph redundant brake. (4) Disengages when transmission is shifted to neutral.

Vacuum servo with one vac, one vent valve. 5 1/2 inch diam. diaphragm. Includes feedback potentiometer.
Bowden type, adjustable piggyback attachment to accel cable at throttle body. Comes to SEA pre-adjusted.
1 Custom IC. Analog design. Board edge connector. Requires custom bracket for IP installation.
(1) Stop lamp switch input. (2) Dedicated vacuum clamp switch on brake pedal. (3) 10 MPH redundant brake. Also, clutch switch for ATX.

PERFORMANCE	
Set Accuracy / Droop	Droops 1/2 MPH at low speeds, as much as 2 MPH at 60 and above. Returns to and maintains speed within 1 MPH on level road.
Level Road Performance	1st - 1.5 MPH variance on flat road, as much as 3 MPH variance on slight hills. 2nd Hg. throttle swings at 30 and 40 MPH, 1st swings above 50. Ratings from 7 to 9.
Acceleration	1.5 MPH/s when below 30 MPH, 1.0 MPH/s above 30 MPH. ATX will automatically downshift from fourth to third during accel or resume, resulting in consistent accel rates.

+ PLUS +	HIGHLIGHTS	- MINUS -
<ul style="list-style-type: none"> Smooth level road speed maintenance Does not lose resume if speed drops below 25 MPH (like other Razors) Transmission interface for downshifts 	<ul style="list-style-type: none"> Stalk twist action is clumsy Wide variance of speed for all ht grades. 	

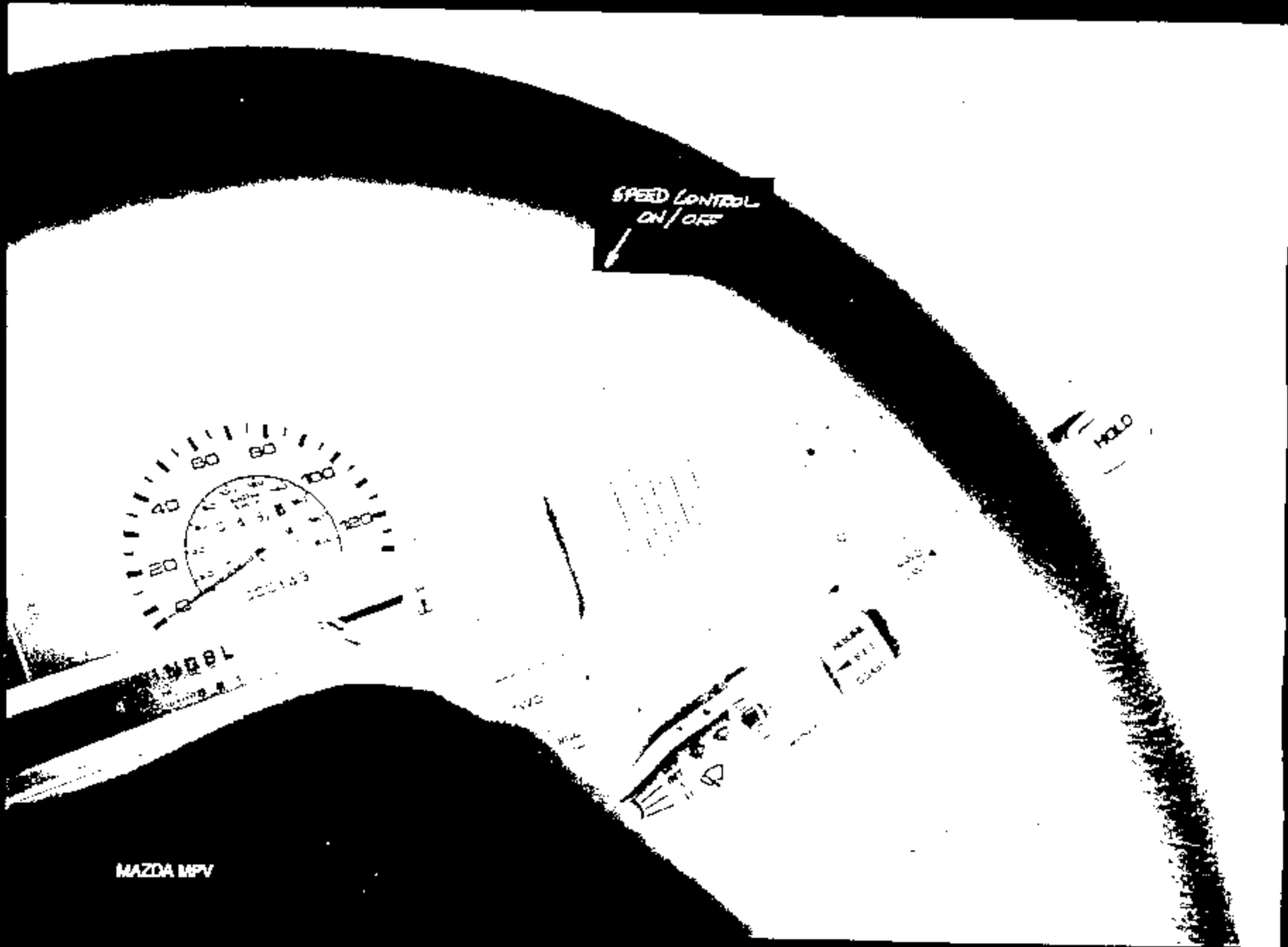
MAZDA NEW SPEED CONTROL COMPETITIVE ANALYSIS

SPEED CONTROL CHARACTERISTIC			
SPEED CONTROL FEATURE	YES	NO	COMMENTS
On Off	X X		Push On / Push Off toggle on upper right of dash. Will not turn off with ignition.
Set Accel Coast Resume	X X X X		- Momentarily push button on end of stalk - Hold in button on end of stalk (AFTER set) - Twist stalk toward driver (AFTER set) - Twist stalk away from driver (AFTER brake)
Cancel		X	
On / Off Light Cruise Light	X	X	"CRUISE MAIN" above On / Off switch when "On" button is pushed.

COMPONENT	
Servo	Vacuum with 1 vac, 2 vent solenoids. 3 inch diam. diaphragm. No position feedback.
Cable	Bowden type, attaches to accelerator pedal; lost motion at pedal. Adjusted at SEA by dual nuts at servo.
Amplifier	uP Based, 6 IC's, Top side SMD, mounts under dash. Mounting bracket is staked onto metal lid. Weight: 0.50 lbs.
Redundant Brake Mechanism	(1) Stop lamp switch input. (2) Dedicated stop switch on brake pedal fed thru vac solenoid. (3) 9 MPH redundant brake (4) Disengages when transmission is shifted to neutral.

PERFORMANCE	
Set Accuracy / Droop	Droops 1/2 MPH at low speeds, as much as 2 MPH at 60 and above. Returns to and maintains speed within 1 MPH on level road.
Level Road Performance	Fair. 1 - 1.5 MPH variance on flat road, as much as 3 MPH variance on slight hills. 2" Hg. throttle swings at 30 and 40 MPH, 1" swings above 50. Ratings from 7 to 9.
Acceleration	1.5 MPH/s when below 50 MPH, 1.0 MPH/s above 50 MPH. ATX will automatically downshift from fourth to third during accel or resume, resulting in consistent accel rates.

+ PLUS +	HIGHLIGHTS	- MINUS -
+ Smooth level road speed maintenance + Does not lose resume if speed drops below 25 MPH (like other Mazdas) + Transmission interface for downshifts		- Stalk twist action is clumsy - Wide variance of speed for slight grades.

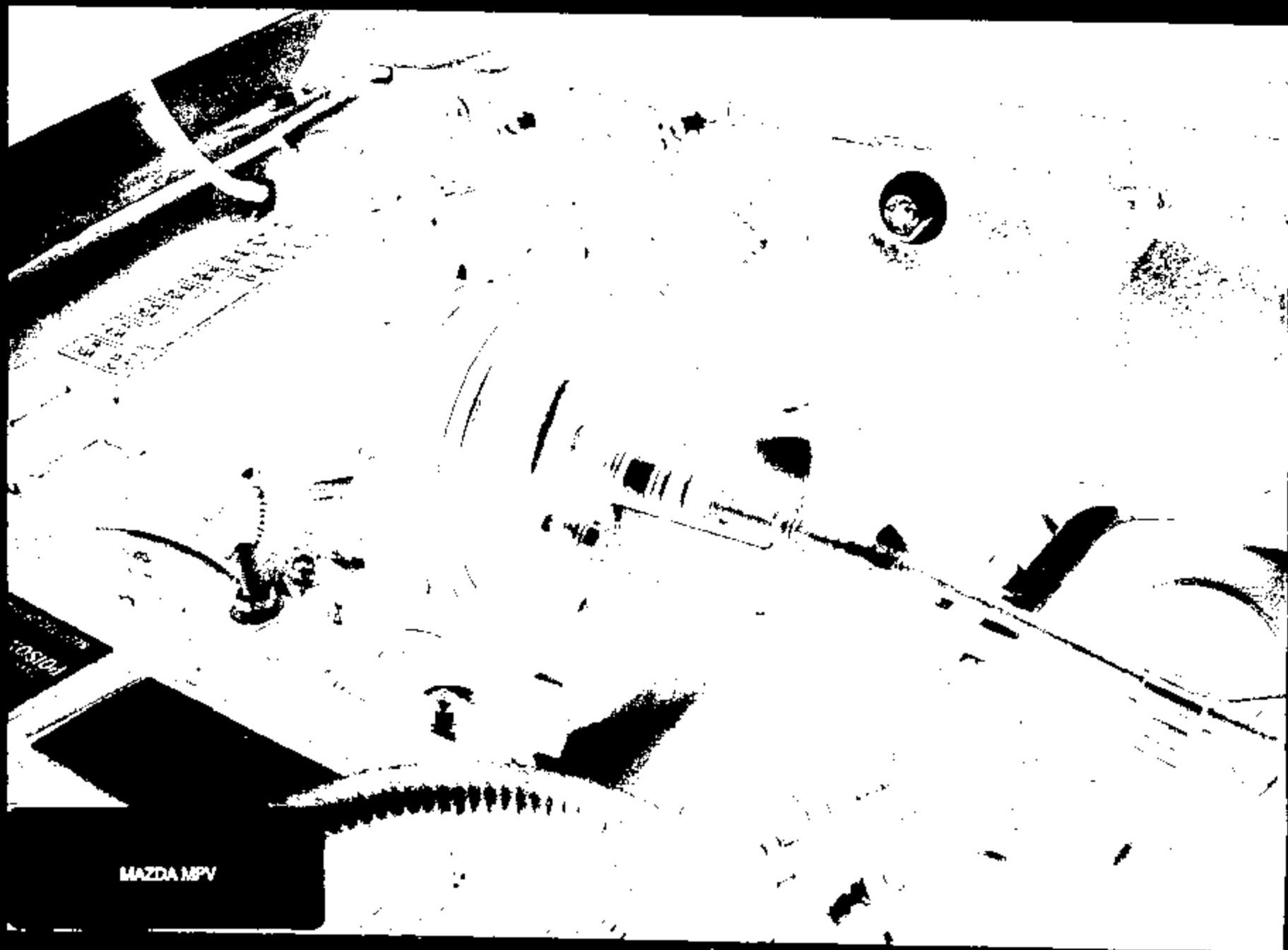


SPEED CONTROL
ON/OFF

HELD

MAZDA MPV

EM2-025-R 10078



MAZDA MPV

MAZDA 929 SPEED CONTROL COMPETITIVE ANALYSIS

SPEED CONTROL CHARACTERISTIC			
SPEED CONTROL FEATURE	YES	NO	COMMENTS
On	X		Momentary toggle on lower left of dash panel. Turns off with ignition. Hidden by steering wheel.
Off	X		
Set	X		<ul style="list-style-type: none"> • Momentarily push "Set Coast" on steering wheel. • Hold in "Accel Resume" on wheel (AFTER Set) • Hold in "Set Coast" on wheel (AFTER Set) • Momentarily push "Accel Resume" (AFTER Brake)
Accel	X		
Coast	X		
RESUME	X		
Cancel		X	
On / Off Light	X		Green light incorporated into ON / OFF switch. Light is difficult to see during daylight ambient.
Cruise Light		X	

FORD COMPARATOR: OLDSMOBILE / GRAND MARQUIS		
YES	NO	COMMENTS
X		Momentary toggle on steering wheel.
X		
X		• Tap Set / Accel button
X		• Hold Set / Accel button
X		• Hold Coast button
X		• Tap Resume button
	X	
	X	
	X	

COMPONENT	
Servo	Vacuum with 1 vac, 2 vent solenoids. 3 inch diameter diaphragm. No position feedback.
Cable	Bowden type, attaches to accelerator pedal; least motion at pedal. Adjusted at SEA by dual nuts at servo.
Amplifier	4 th Gen, 6 IC's, Top side MD, mounts under dash. Mounting bracket is staked onto metal lid. Weight: 0.30 lbs.
Redundant Brake Mechanism	(1) Stop lamp switch input. (2) Dedicated stop switch on brake pedal fed thru vac solenoid. (3) 9 MPH redundant brake (4) Disengages when transmission is shifted to neutral.

Vacuum servo with one vac, one vent valve. 5 1/2 inch diam. diaphragm. Includes feedback potentiometer.
Bowden type, adjustable piggyback attachment to accel cable at throttle body. Comes to SEA pre-adjusted.
1 custom IC. Analog design. Board edge connector. Requires custom bracket for IP installation.
(1) Stop lamp switch input. (2) Dedicated vacuum dump switch on brake pedal. (3) 10 MPH redundant brake. Also, clutch switch for NTK.

PERFORMANCE	
Set Accuracy / Droop	Droops 1 MPH when set below 60, returns to speed. Droops 2 MPH when set at 70, but returns to speed. Maintains within 1 MPH on level road, but speedometer movement is noticeable.
Level Road Performance	Fair. 1 MPH variance on flat road, as much as 2 MPH variance on slight hills. 5 th Hg. throttle surges at 30 thru 50 MPH, slight surging is felt at all speeds, ratings from 6.5 to 8.
Acceleration	1.5 MPH/s at all speeds. Transmission automatically downshifts with any accel or resume, resulting in consistent accel rates, but in most cases was considered objectionable.

+ PLUS +	HIGHLIGHTS	- MINUS -
+ Steering wheel switches.	<ul style="list-style-type: none"> - Instant downshift with accel or res. - Slight surge detected at all speeds. - Resume lost if speed droops below 25 	

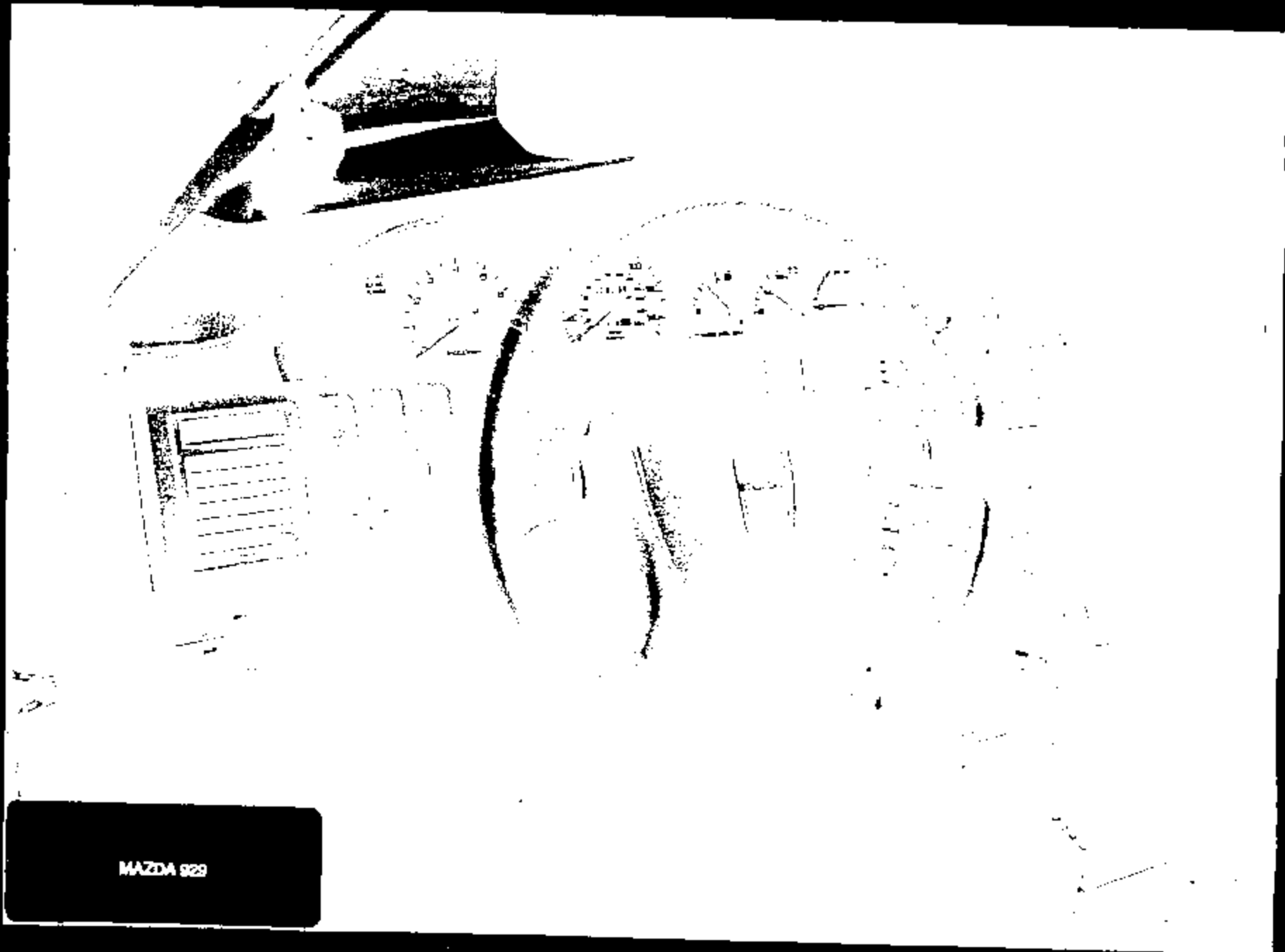
MAZDA 929 SPEED CONTROL COMPETITIVE ANALYSIS

SPEED CONTROL CHARACTERISTIC			
SPEED CONTROL FEATURE	YES	NO	COMMENTS
On Off	X X		Momentary toggle on lower left of dash panel. Turns off with ignition. Hidden by steering wheel.
Set Accel Coast Resume	X X X X		- Momentarily push "Set Coast" on steering wheel - Hold in "Accel Resume" on wheel (AFTER set) - Hold in "Set Coast" on wheel (AFTER set) - Momentarily push "Accel Resume" (AFTER brake)
Cancel		X	
On / Off Light Cruise Light	X	X	Green light incorporated into On / Off switch. Light is difficult to see during daylight ambient.

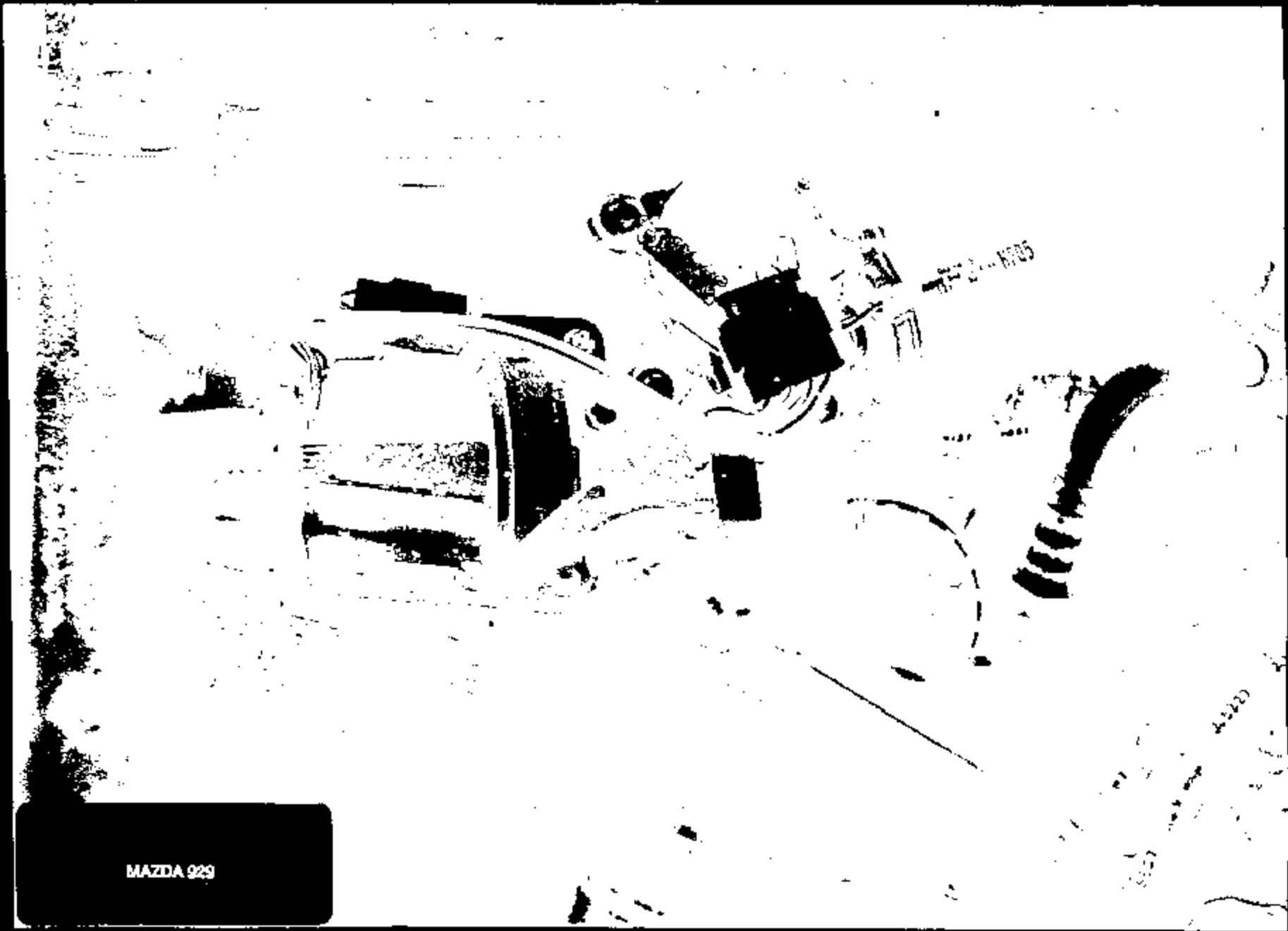
COMPONENT	
Servo	Vacuum with 1 vac, 2 vent solenoids. 3 inch diam. diaphragm. No position feedback.
Cable	Bowden type, attaches to accelerator pedal; lost motion at pedal. Adjusted at BSA by dual nuts at servo.
Amplifier	UP Based, 6 IC's, Top side SMD, mounts under dash. Mounting bracket is staked onto metal lid. Weight: 0.50 lbs.
Redundant Brake Mechanism	(1) Stop lamp switch input. (2) Dedicated stop switch on brake pedal fed thru vac solenoid. (3) 9 MPH redundant brake (4) Disengages when transmission is shifted to neutral.

PERFORMANCE	
Set Accuracy / Droop	Droops 1 MPH when set below 60, returns to speed. Droops 2 when set at 70, but returns to speed. Maintains within 1 MPH on level road, but speedometer movement is noticeable.
Level Road Performance	Fair. 1 MPH variance on flat road, as much as 2 MPH variance on slight hills. 5" Hg. throttle swings at 30 thru 50 MPH, slight surging is felt at all speeds, ratings from 6.5 to 8.
Acceleration	1.5 MPH/s at all speeds. Transmission subconsciously downshifts with any accel or resume, resulting in consistent accel rates, but in most cases was considered objectionable.

+ PLUS +	HIGHLIGHTS	- MINUS -
+ Steering wheel switches.		- Instant downshift with accel or res. - Slight surge detected at all speeds. - Resume lost if speed droops below 25



MAZDA 929



MAZDA 929

67422-621-0 1983

NADA RX-7 SPEED CONTROL COMPETITIVE ANALYSIS

SPEED CONTROL CHARACTERISTIC			
SPEED CONTROL FEATURE	YES	NO	COMMENTS
On	X		Momentary On / Off toggle on speed control stalk. Turns off w/ ignition. Hidden by wheel.
Off	X		
Set	X		<ul style="list-style-type: none"> - Momentarily push "Set" button on end of stalk. - Hold in "Set" button on stalk (AFTER Set) - Push control stalk down (AFTER Set) - Push control stalk up (AFTER Brake)
Accel	X		
Coast	X		
Resume	X		
Cancel		X	
On / Off Light	X		"MAIN" light next to stalk when "ON" is pushed.
Cruise Light	X		"CRUISE" light next to stalk when speed control is engaged.

FORD COMPARATOR: NEXT GEN.		
YES	NO	COMMENTS
X		Momentary toggle on steering wheel.
X		
X		<ul style="list-style-type: none"> - Tap Set / Accel button - Hold Set / Accel button - Hold Coast button - Tap Resume button
X		
X		
X		
X		Potentially
	X	
X		Potentially

COMPONENT	
Servo	Electric motor driven with 3 iso-mounts. No position feedback. Output is metal cam.
Cable	Bowden type, attaches to concentric cam with lost motion at throttle body. Adjusted at BSA by dual nuts at servo.
Amplifier	1/4 Speed, 6 IC's, Top side SPD, mounts under dash. Mounting bracket is staked onto metal lid. Weight: 0.50 lbs. Manf. Mitsubishi
Redundant Brake Mechanism	(1) Stop lamp switch input. (2) Dedicated stop switch on brake pedal fed thru servo clutch. Also, clutch switch for NTX, Neutral lockout for ATX

	Bowden type, adjustable piggyback attachment to accel cable at throttle body. Comes to BSA pre-adjusted.
	(1) Stop lamp switch input. (2) Dedicated brake system deactivator switch. (3) 10 MPH redundant brake. Also, clutch switch for NTX.

PERFORMANCE	
Set Accuracy / Droop	Droops 0.5 MPH max. at speeds below 50, 1 MPH max. during initial set. Returns to and maintains speed within 1/2 MPH on level road.
Level Road Performance	Excellent. Throttle swings of 1" Rg. at all speeds on level road, 8/9 ratings at all speeds.
Acceleration	1.5 MPH/s at all speeds for ACCEL, 1.0 MPH/s for Resume. Engine performance allowed roughly equivalent times whether NTX was in a lower or higher gear for any given speed.

+ PLUS +	HIGHLIGHTS	- MINUS -
<ul style="list-style-type: none"> + Smooth level road speed maintenance + Both ON / OFF and engage lights 		<ul style="list-style-type: none"> - ON / OFF button hard to see / reach - Lights dim / hidden by wheel - Resume test if speed drops below 25

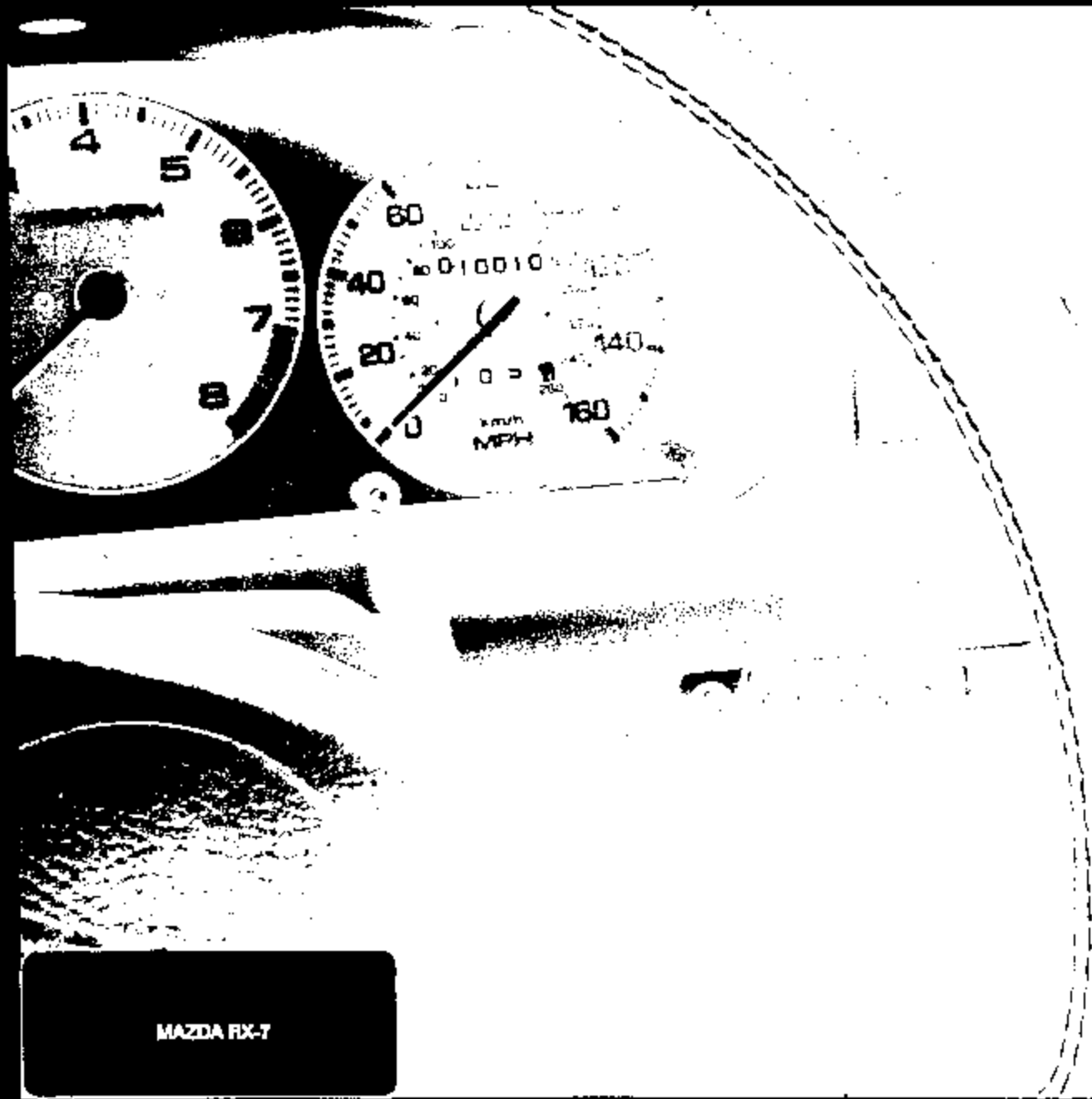
MAZDA RX-7 SPEED CONTROL COMPREHENSIVE ANALYSIS

SPEED CONTROL CHARACTERISTIC			
SPEED CONTROL FEATURE	YES	NO	COMMENTS
On Off	X X		Momentary On / Off toggle on speed control stalk. Turns off w/ ignition. Hidden by wheel.
Set Accel Coast Resume	X X X X		- Momentarily push "Set" button on end of stalk. - Hold in "Set" button on stalk (AFTER set) - Push control stalk down (AFTER set) - Push control stalk up (AFTER brake)
Cancel		X	
On / Off Light Cruise Light	X X		"MAIN" light next to stalk when "On" is pushed. "CRUISE" light next to stalk when s/c is engaged.

COMPONENT	
Servo	Electric motor driven with 3 iso-mounts. No position feedback. Output is metal can.
Cable	Bowden type, attaches to concentric cam with lost motion at throttle body. Adjusted at SEA by dial nuts at servo.
Amplifier	uP Based, 6 IC's, Top side SMD, mounts under dash. Mounting bracket is staked onto metal lid. Weight: 0.50 lbs. Manf: Mitsubishi
Redundant Brake Mechanism	(1) Stop lamp switch input. (2) Dedicated stop switch on brake pedal fed thru servo clutch. Also, clutch switch for MTX, Neutral lockout for MTX.

PERFORMANCE	
Set Accuracy / Droop	Droops 0.5 MPH max. at speeds below 50, 1 MPH max. during initial set. Returns to and maintains speed within 1/2 MPH on level road.
Level Road Performance	Excellent. Throttle swings of 1" Hg. at all speeds on level road, 8/9 ratings at all speeds.
Acceleration	1.5 MPH/s at all speeds for ACCEL, 1.0 MPH/s for RESUME. Engine performance allowed roughly equivalent times whether MTX was in a lower or higher gear for any given speed.

+ PLUS +	HIGHLIGHTS	- MINUS -
+ Smooth level road speed maintenance + Both ON / OFF and engage lights		- ON / OFF button hard to see / reach - Lights dim / hidden by wheel - Resume lost if speed drops below 25



MAZDA RX-7



MAZDA RX-7

COMPETITIVE SPEED CONTROL SYSTEM
1984 PATENTED SYSTEM

Pat. 4,229,000
Int. Class. G01C 1/00

1992 BENCHMARK SPEED CONTROL SYSTEM

FUNCTION	1992 HONDA CBR	1992 HONDA CBR	NEXT GENERATION SPEED CONTROL
On / Off Switch		Yes - on end of speed control stalk.	Yes - On steering wheel.
Controls		Short stalk on center-right of steering wheel - Turns w/ wheel. Up = Resume/Accel Down = Set/Coast Towards driver = Cancel	On steering wheel - Set / Accel Coast Resume (/ Coast)
Indicator Lamps		Green "CRUISE" indicator when on button pushed. (Not a "SET" indicator)	Indicates when system is controlling speed. May be a logic level signal, or a current sink for a lamp.
Servo Type / Location		DC motor w/ reduction gears, internal clutch, position feedback, 40 mm. of lin. travel. Make: Nippon Denso or Aisin Belki 2.15 lbs.	Stepper motor with clutch and geartrain Electronics integral to servo assembly. Typically mounted under hood, or under front fender.
Cable / Throttle Attachment Method		Arm with dual-rat adjust provides direct attachment to concentric cable at servo. Independent cam provides last action. Cable from cam to throttle body.	Solder cable that comes to ECU pre-adjusted. Piggy back attachment wraps onto throttle lever "railhead".
Brake Interferences		Dual contact single plunger stop lamp switch, 2nd set of normally closed contacts feeds clutch. Neutral shutoff, parking brake shutoff.	- Stop lamp SW. on brake pedal. - Pressure switch on brake prop valve, powers servo clutch.
Amplifier Type / Location		26 pin conn. (21 used). Mounted behind rt hand kick panel. wP based, 3 IC's, discrete & back-side WIP's. Make: Fujitsu Tui	Thick film technology, includes Motorola LP, 5 high power drivers. Make: BLD - North Penn
PERFORMANCE			
Set Accuracy / Droop		No perceptible drop or set high on level road at any speed.	
Acceleration Rates		1.0 MPH/s at all speeds, requires a 4/3 downshift for 30 to 50 mph Torque conv. unlock for 50 to 60 mph; stays in 4th at higher speeds.	
OTHER			
Favorable (+) or Objectable (-) Features		<ul style="list-style-type: none"> + "CRUISE" ind. on dashboard + Excellent switch feel + No droop w/ set, accel, decel + New CANCEL feature - Resume speed lost if MPH < 25 - Amp has 21 input/output circuits, costly wiring 	

2002-025-A 10000

1992 TOYOTA CAMRY



LEVEL ROAD SPEED CONTROL DATA SHEET

Vehicle No.: 526T000	Model: CARD	Y.Y.: 1992	Eng.: 3.0L V6	Trans.: 4HD AUTO	AXLE:
Vehicle Mt.:	Calib.:	Servo: ELEC.	Amp.:	Vac assist: N/A	Cable Slack 1/:
Location/Altitude: EPG	Temp: 60°F	Date: 9/23/92	Driver: MIF	Recorder: MIF	
T.P. reading at idles: _____ E.U.	_____ Deg.	_____ E.U.	_____ Deg.	Max T.P. at servo full stroke: _____ E.U.	_____ Deg.

KEY SPEED ACCURACY - Record actual vs. set speed and drop in RPM 2/

Gear	Set Spd	30		40		50		60		70	
		DR	ACT	DR	ACT	DR	ACT	DR	ACT	DR	ACT
3rd / Drive											
4th / D.D.	30	30		40	40	50	50	60	60	70	70
5th / --											

Comments:

ROAD LOAD PERFORMANCE - Record Max & Min readings for: Manifold Vacuum & T.P. in E.U. and/or degrees, & subjective rating (1 - 10)

Gear	Veh Spd	30				40				50				60				70				
		Vacuum	TP	Surge	Rating	Vacuum	TP	Surge	Rating	Vacuum	TP	Surge	Rating	Vacuum	TP	Surge	Rating	Vacuum	TP	Surge	Rating	
3rd / Drive																						
4th / D.D.	18-19			220	9	17-18				220	9	15-16										
5th / --																						

Comments:

ACCELERATION RATES - Record Accel. rate in sec. (Resume mode) and Max T.P. reading in E.U. and/or deg.

MPH	Run #1	Run #2	30 - 40				40 - 50				50 - 60				60 - 70			
			Time	Max T.P.	Gear	Rating	Time	Max T.P.	Gear	Rating	Time	Max T.P.	Gear	Rating	Time	Max T.P.	Gear	Rating
10 MPH Split Accels (Begin at speed shown, simultaneously depress accel and release pedal.)	Run #1		2.47		4.0	2.56		4.50	8.93		4.53		4					
	Run #2		1.46		2.1	9.03		4.2	10.09		10.28		4					
30 - 70 Accels (Run in high gear, begin accel at 27, begin timing at 30)	Run #1		2.62		3	8.00		2	7.24		3	7.75		3				
	Run #2																	

Comments:

1/ Record no. of grooves/bytes and inches or millimeters from test cable position.
 2/ Record with engine running.
 3/ For more accurate set speed data, depress Set Button x times and divide final reading by x (let speed stabilize before each "Set").
 scp40 07/17/90

E902-420-9 10091

COMPETITIVE SPEED CONTROL PERFORMANCE EVALUATION

Vehicle Make: 1992 TOYOTA
 Vehicle Model: CAMRY
 Powertrain: 3.0L V6 w/ 4WD AUTO

Tag Number: 5GT 066
 Evaluated By: A. FORDRICH
 Evaluation Date: SEPT. 23 1992

JURY EVALUATION

VEHICLE EVALUATION RATING SYSTEM

	UNACCEPTABLE				BORDER LINE	ACCEPTABLE				
RATING INDEX	1	2	3	4	5	6	7	8	9	10
EVALUATION OF VEHICLE/COMPONENT PERFORMANCE	PREDICTION REJECT		CUSTOMER COMPLAINT		BORDER LINE	BARELY ACCEPT- ABLE	FAIR	GOOD	VERY GOOD	EXCELLEN

FEATURE/COMPONENT	RATING	COMMENT
1. Interior control placement	8	Location? TURNS WITH STEERING WHEEL STALK - PULL TO CANCEL, PUSH DOWN TO SET/CONST PUSH UP TO RESUME/ACCEL MAIN: MOUNTAIN SWITCH ON STALK END
2. Visibility of controls	8	ALWAYS WITHIN SIGHT, EXCELLENT FOR 1 FINGER OPERATION. NO NEED TO REMOVE HAND FROM WHEEL LIGHT SHADDED BY STEERING WHEEL.
3. Ease of controlling control operation	3	SIMILAR 3-STEP MANUAL CASTLE WORDS EXCEPT "MAN" TYPICAL JAPANESE SYSTEM OPERATION
4. General control appearance	9	



COMPETITIVE SPEED CONTROL PERFORMANCE EVALUATION

FEATURE/COMPONENT	RATING	COMMENT
5. Tactile feel upon setting	7	HAS A TACTILE FEEL DURING SWEEP MOTION, BUT BUTTON ACTIVATION OCCURS WELL AFTER THE TACTILE FEEL. ONLY "MAN" ACTIVATES AT POINT OF TACTILE FEEL.
6. Accel pedal compensation after setting speed	8	RESPONDS IMMEDIATELY, NO DROOP
7. On/Off switch (Yes/No)	No Rating	"MAN" SWITCH - PART OF STALK CONTROL
8. Set speed accuracy	10	Amt of droop: 0 Hi or Lo? — Min set speed: 25 MPH Max: ?
9. "Cruise" light (Yes/No)	YES	"CRUISE" IN GREEN LETTERS ON FAR RIGHT OF CLUSTER, NEXT TO FUEL GAGE. "CRUISE" IS ON/OFF SWITCH, NOT A SET INDICATOR.
10. "Neutral" switch (Yes/No)	No Rating	YES
11. Damp valve (Yes/No)	No Rating	N/R STOP LAMP SWITCH HAS DUAL PLUNGERS.

COMPENSATIVE SPEED CONTROL PERFORMANCE EVALUATION

FEATURE/COMPONENT	RATING	COMMENT
12. Electric or vacuum servo	No Rating	ELECTRO-MECHANICAL, ELECTRONICS UNDER DASH
13. Vacuum reservoir (Yes/No)	No Rating	n/k
14. "Coast" feature (Yes/No)	No Rating	YES - "SET/COAST" FEATURE
15. "Coast" feature performance	9	SETS ACCURATELY WITH NO LAG IN SPEEDOMETER.
16. Resume feature (Yes/No)	No Rating	YES - IMMEDIATE RESPONSE ON ACTIVATION. LOSS IN ACCURACY & QUICKLY. ACCELERATION TAKES OUT BEFORE SET SPEED IS REACHED
17. Resume performance	9	"
18. Accel switch (Yes/No)	No Rating	"RES/ACC" WORKS AS IN ACCEL ONLY AFTER A SPEED IS INITIALLY SET WITH "SET/COAST". n/k

COMPENSATIVE SPEED CONTROL PERFORMANCE EVALUATION

FEATURE/COMPONENT	RATING	COMMENT
19. Accel switch performance	8	FAST & ACCURATE WITH NO SPEEDOMETER LAG.
20. Overall system performance	9	FUNCTIONS WELL & CONSISTANT

21. Unusual features

- STALK INCORPORATED w/ STEERING WHEEL
- SHUTOFF WHEN TRANS SHIFTED TO NEUTRAL
- SHUTOFF IF PARKING BRAKE ENGAGED.

22. Deficiencies

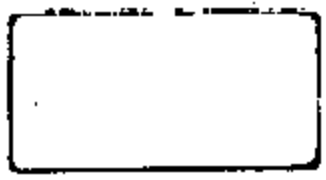
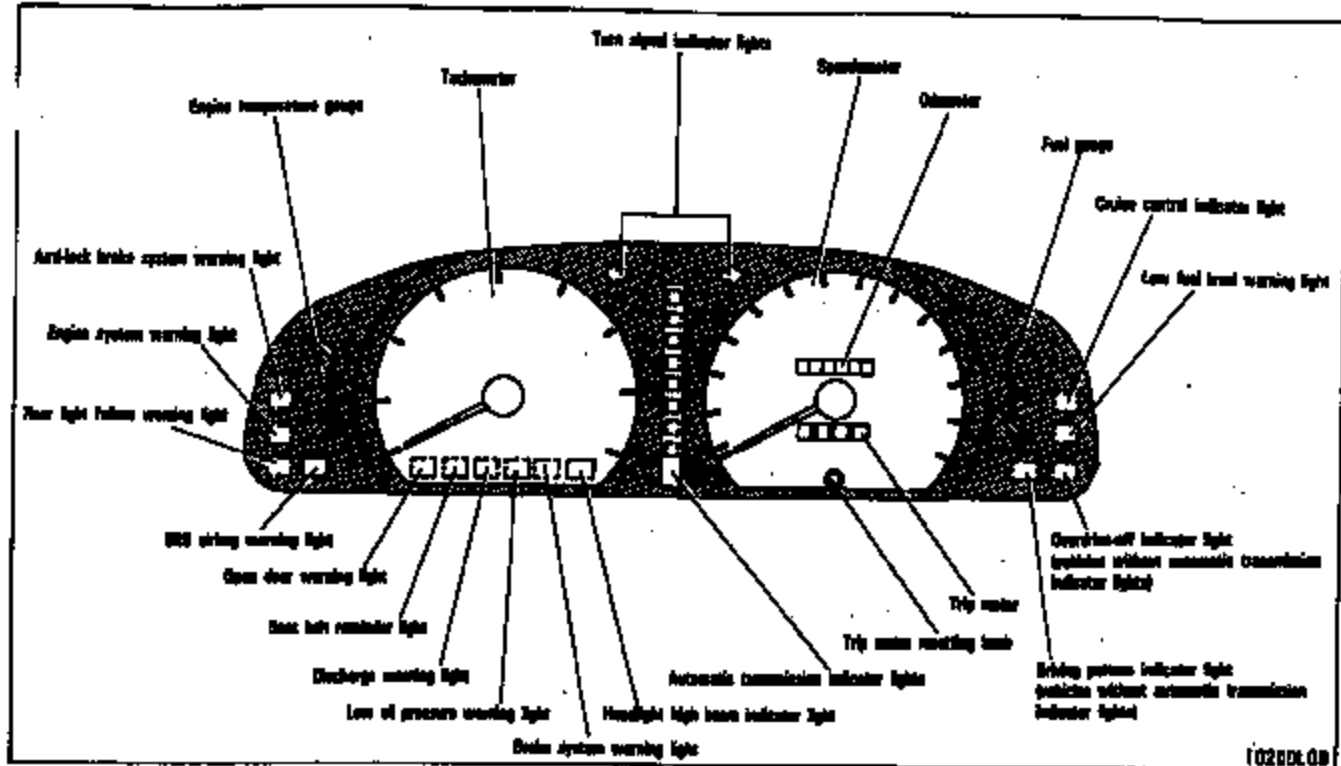
- LOTS RESUME FUNCTION IF SPEED DROOPS BELOW 25 MPH.
- COMPLICATED CAM/LEVER LINKAGE AT ~~THE~~ SERVO, w/ ONE CABLE GOING TO THROTTLE.

23. Other Comments

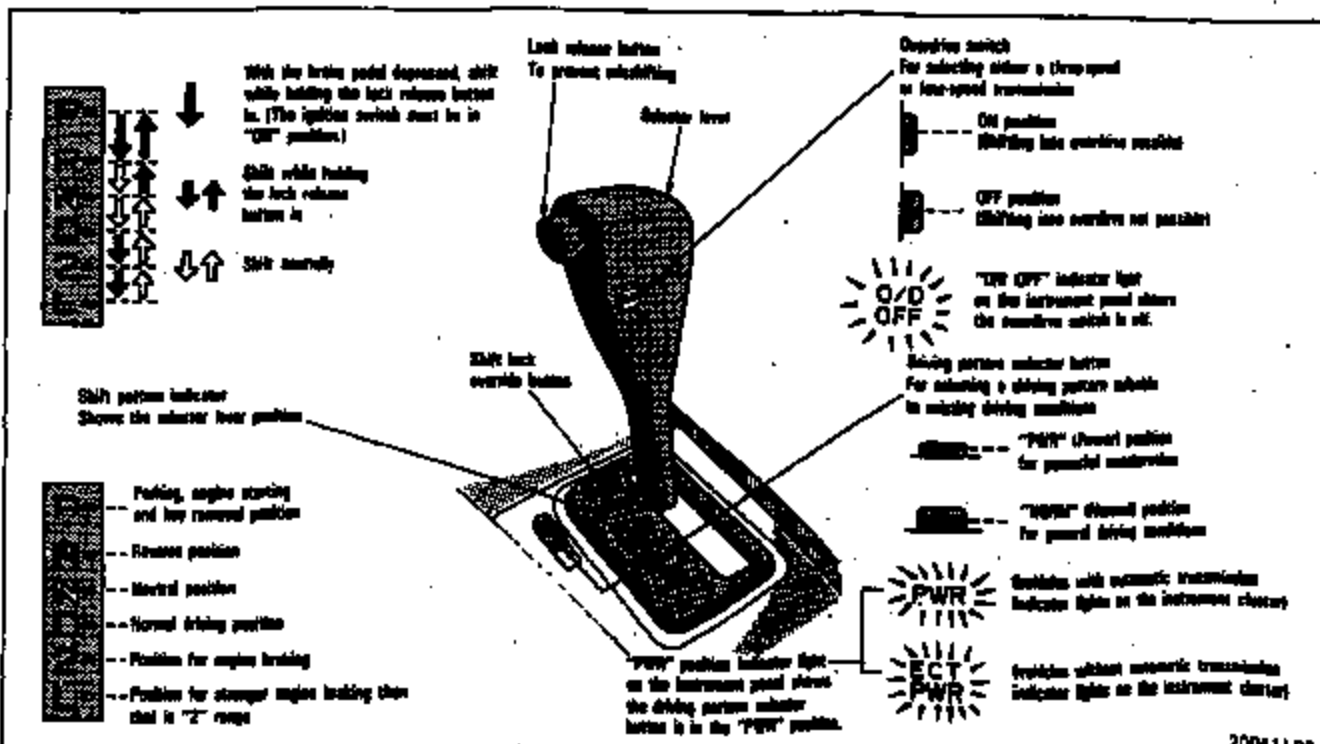
- UNLIKE LEXUS (w/ HIRTZL'S SAME SYSTEM) COULD NOT HEAR SERVO OPERATION.

f:\friedric\part2

Instrument cluster overview



Automatic transmission



270011100

(a) Normal driving

1. Start the engine as instructed in "How to start the engine" in Part 3.

The transmission must be in "P" or "N". The engine will not start in "R", "2", "L" or "D" range even if the key is turned.

2. Set the driving pattern selector button to the "NORM" position.

Your transmission is fitted with a driving pattern selector button which allows you to select either "NORM" or "PWR" to suit your driving condition. For ordinary driving, Toyota recommends that you use the "NORM" position to improve fuel economy. For powerful acceleration, use the "PWR" position. In the "PWR" position, the "PWR" position indicator light is on and the transmission is shifted up and down at a higher vehicle speed than in the "NORM" position.

3. Push the overdrive switch to set it on.

Always turn the overdrive switch on for better fuel economy and quieter driving. (See "[b] Using engine braking" and "[f] Good driving practice" for exceptions.)

4. With your foot holding down the brake pedal, shift the selector lever to "D".

CAUTION: Never put your foot on the accelerator pedal while shifting.

5. Release the parking brake and brake pedal. Depress the accelerator pedal slowly for smooth starting.

The vehicle will start in the first gear and automatically shift to the second, third and overdrive gears according to the vehicle speed. However, while the engine coolant temperature is low and the vehicle is travelling at low speed, the transmission will not be shifted into the overdrive gear even with the overdrive switch on.

In "D" range, the automatic transmission system will select the most suitable gear for the running conditions such as hill climbing, hard towing, etc.

If you need to accelerate rapidly while driving, push the accelerator pedal all the way to the floor. The transmission will automatically downshift to the third, second or first gear, according to the vehicle speed.

If engine braking is needed, such as in descending a long hill, see "[b] Using engine braking."

(b) Using engine braking

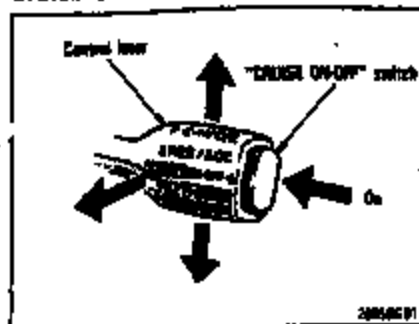
To use the braking power of the engine, downshift the transmission in the way described below:

- Turn off the overdrive switch. (This is effective only when you are driving in the "D" range.) The "O/D OFF" indicator light will come on and the transmission will downshift to the third gear.
- Shift into the "2" range. The transmission will downshift to the second gear when the vehicle speed is or becomes lower than the speed listed below and more powerful engine braking will be obtained.
- Shift into the "L" range. The transmission will downshift to the first gear when the vehicle speed is or becomes lower than the speed listed below and maximum engine braking will be applied.

	km/h (mph)	
	"2"	"L"
5S-FE engine	111 (69)	55 (35)
3V2-FE engine	125 (77)	55 (35)

CAUTION: Be careful when downshifting on a slippery surface. Abrupt shifting could cause the vehicle to spin or skid.

Cruise control



The cruise control allows you to cruise the vehicle at a desired speed over 40 km/h (25 mph) even with your foot off the accelerator pedal.

Your cruising speed can be maintained up or down grades within the limits of engine performance, although a slight speed change may occur when driving up or down the grades. On steeper hills, a greater speed change will occur so it is better to drive without the cruise control.

If the vehicle speed falls below 40 km/h (25 mph), the preset speed will automatically cancel out.

If the vehicle speed drops 16 km/h (10 mph) below the preset speed, the preset speed will also automatically cancel out.

If the preset speed automatically cancels out other than for the above cases or, if the indicator light flashes several times, the cruise control may be malfunctioning. In such cases, have your vehicle checked by your Toyota dealer at the earliest opportunity.

RESETTING AT A FASTER SPEED

Press the control lever upward in the "RES/ACC" direction and hold it. Release the lever when the desired speed is attained. While the lever is held upward, the vehicle will gradually gain speed.

However, a faster way to reset is to accelerate the vehicle and then press the control lever downward in the "SET/COAST" direction.

RESETTING AT A SLOWER SPEED

Push the control lever downward in the "SET/COAST" direction and hold it. Release the lever when the desired speed is attained. While the lever is held downward, the vehicle speed will gradually decrease.

CAUTION

To help maintain maximum control of your vehicle, do not use the cruise control when driving in heavy or varying traffic, or on slippery (rainy, icy or snow-covered) or winding roads.

TURNING ON THE SYSTEM

To operate the cruise control, push the "CRUISE ON-OFF" switch. This turns the system on. The indicator light in the instrument panel shows that you can now set the vehicle at a desired cruising speed. Another push will turn the system completely off.

CAUTION

To avoid accidental cruise control engagement, keep the "CRUISE ON-OFF" switch off when not using the cruise control.

SETTING AT A DESIRED SPEED

Bring the vehicle to a desired speed, press the "SET/COAST" direction and release it. This sets the vehicle at that speed. Now you may take your foot off the accelerator pedal. If you need acceleration—for example, when passing—depress the accelerator pedal enough for the vehicle to exceed the set speed. When you release it, the vehicle will return to the speed set prior to the acceleration.

CAUTION (for manual transmission)

While driving with the cruise control on, do not shift to neutral without depressing the clutch pedal, as this may cause engine racing or overrevving.

CANCELLING THE PRESET SPEED

You can cancel the preset speed by:

- pulling the control lever in the "CANCEL" direction and releasing it.
- depressing the brake pedal.
- depressing the clutch pedal (manual transmission).
- placing the selector lever in "N" (automatic transmission).

However, a faster way to reset is to depress the brake pedal and then press the control lever downward in the "SET/COAST" direction.

RESUMING THE PRESET SPEED

Push the control lever upward in the "RES/ACC" direction. The vehicle will resume the speed set prior to cancellation unless the vehicle slows down to less than 40 km/h (25 mph) or to a speed 16 km/h (10 mph) below the preset speed.

Part B SPECIFICATIONS

- Dimensions and weight
- Engine
- Fuel
- Service specifications
- Tires
- Fuses

Dimensions and weight

Overall length	mm	4770
	in.	187.8
Overall width	mm	1770
	in.	69.7
Overall height	mm	1400
	in.	55.1
Wheelbase	mm	2820
	in.	103.1
Front track	mm	1560
	in.	61.0
Rear track	mm	1500
	in.	59.1
Vehicle capacity weight (occupants + luggage)		
	kg	410
	lb.	904

Engine

Model: 5S-FE and 3VZ-FE

Type:

- 5S-FE engine
4 cylinder in line, 4 cycle, gasoline
- 3VZ-FE engine
6 cylinder V type, 4 cycle, gasoline

Bore and stroke, mm (in.):

- 5S-FE engine
87.0 x 81.0 (3.43 x 3.19)
- 3VZ-FE engine
87.6 x 82.0 (3.44 x 3.23)

Displacement, cm³ (cu. in.):

- 5S-FE engine 2164 (132.0)
- 3VZ-FE engine 2859 (180.9)

Fuel

Fuel type:

Use only UNLEADED fuel, Research Octane Number 91 (Octane Rating 87) or higher. For 3VZ-FE engine, to improve vehicle performance, the use of Premium unleaded gasoline with a Research Octane Number 96 (Octane Rating 91) or higher is recommended.

Fuel tank capacity, L (gal., Imp. gal.):
70 (18.5, 15.4)

Service specifications

ENGINE

Valve clearance (engine cold, mm (in.):

5S-FE engine	
Intake	0.18-0.28 (0.007-0.011)
Exhaust	0.28-0.36 (0.011-0.016)
3VZ-FE engine	
Intake	0.13-0.23 (0.005-0.009)
Exhaust	0.27-0.37 (0.011-0.015)

Spark plug type:

5S-FE engine	
NIPPONDENSO	PK20R11
NGK	BKR6EP-11
3VZ-FE engine	
NIPPONDENSO	PO20R
NGK	BCPR6EP-11

Spark plug gap, mm (in.): 1.1 (0.043)

Drive belt tension measured with Barsugh's drive belt tension gauge No. 6T-33-73F
least belt, lb.:

5S-FE engine	
with air conditioner	
Alternator belt	130 ± 10
Power steering pump belt	80 ± 20
without air conditioner	
Alternator belt	95 ± 20
Power steering pump belt	60 ± 20

3VZ-FE engine

with air conditioner	
Alternator belt	125 ± 10
Power steering pump belt	115 ± 20
without air conditioner	
Alternator belt	115 ± 20
Power steering pump belt	115 ± 20

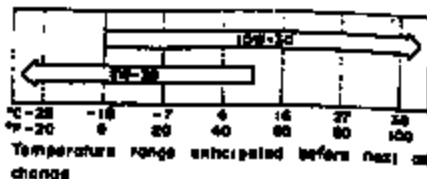
ENGINE LUBRICATION

Oil capacity, L (qt., Imp. qt.):

5S-FE engine	
Dry fill	4.5 (4.8, 4.0)
Drain and refill	
with filter	4.1 (4.3, 3.8)
without filter	3.7 (3.9, 3.3)
3VZ-FE engine	
Dry fill	5.0 (5.3, 4.4)
Drain and refill	
with filter	4.3 (4.5, 4.0)
without filter	4.1 (4.3, 3.6)

Oil grade (API):
 88-FE engine
 SG Multigrade and fuel-efficient oil is recommended.)
 3VZ-FE engine
 SG (Energy-Conserving II multigrade engine oil is recommended.)

Recommended oil viscosity (SAE):



COOLING SYSTEM

Total capacity, L (qt., Imp. qt.):

88-FE engine 6.3 (6.7, 5.5)
 3VZ-FE engine 8.5 (9.0, 7.5)

Coolant type:

With ethylene-glycol antifreeze
 (Do not use alcohol type.)

BRAKES

Minimum pedal clearance when depressed, mm (in.): 70 (2.8)

Pedal freplay, mm (in.):
 7-8 (0.04-0.24)

Pad wear limit, mm (in.): 1.0 (0.04)

Lining wear limit, mm (in.): 1.0 (0.04)

Parking brake adjustment:

Lever type 5-8 clicks
 Pedal type 3-8 clicks

Fluid type:

SAE J1703 or FMVSS No. 118 DOT 3

STEERING

Wheel freplay:

Less than 30 mm (1.2 in.)

Power steering fluid type:

Automatic transmission fluid DEXRON®-II

BATTERY

Specific gravity reading at 20°C (68°F):

1.260 Fully charged
 1.180 Half charged
 1.080 Discharged

Charging rates:

Quick charge 15 A max.
 Slow charge 5 A max.

CLUTCH

Pedal freplay, mm (in.):

5-16 (0.2-0.6)

Fluid type:

SAE J1703 or FMVSS No. 118 DOT 3

MANUAL TRANSDAXLE

88-FE engine

Oil capacity, L (qt., Imp. qt.):
 2.8 (2.7, 2.3)

Oil type:

Multipurpose gear oil API GL-5
 If it is impossible to get multipurpose gear oil API GL-5, you may use multipurpose gear oil API GL-4 or GL-3

Recommended oil viscosity:
 SAE 75W-90

3VZ-FE engine

Oil capacity, L (qt., Imp. qt.):
 4.2 (4.4, 3.7)

Oil type:

Multipurpose gear oil API GL-4 or GL-5

Recommended oil viscosity:
 SAE 75W-90 or 80W-90

AUTOMATIC TRANSMISSION

Fluid capacity, L (qt., Imp. qt.):

88-FE engine
 Dry fill 6.8 (6.9, 5.7)
 Drain and refill Up to 2.6 (2.8, 2.2)

3VZ-FE engine

Dry fill 5.9 (6.2, 5.1)
 Drain and refill Up to 2.8 (2.8, 2.2)

Fluid type:

Automatic transmission fluid DEXRON®-II

DIFFERENTIAL

Fluid capacity L (qt., Imp. qt.):

88-FE engine
 1.8 (1.7, 1.4)
 3VZ-FE engine
 0.6 (0.6, 0.7)

Fluid type:

Automatic transmission fluid DEXRON®-II

Tires

Tire size:

Conventional tire

88-FE engine vehicles
 P195/70R14 80H
 3VZ-FE engine vehicles
 P205/65R15 92H

Snow tire

Same as original tire

Tire pressure, kPa (kg/cm² or bar, psi):

Normal driving

Conventional tire

P195/70R14 80H (88-FE engine vehicles)
 For all loads including full rated loads

200 (2.0, 29)

For reduced loads (1 to 4 passengers)

180 (1.8, 26)

P205/65R15 92H (3VZ-FE engine vehicles)

For all loads including full rated loads

220 (2.2, 32)

For reduced loads (1 to 4 passengers)

180 (1.8, 26)

Snow tire

Same as original tire

Trailer towing

88-FE engine vehicles

200 (2.0, 29)

3VZ-FE engine vehicles

220 (2.2, 32)

When driving under the above vehicle load conditions at sustained high speeds above 180 km/h (100 mph), in countries where such speeds are permitted by law, inflate the front and rear tires to 240 kPa (2.4 kg/cm², 35 psi) provided that it does not exceed the maximum cold tire pressure marked on the tire sidewall.

Wheel size:

P195/70R14 80H tire

14 x 5.5 JJ (steel wheels)

14 x 5.5 JJ (aluminum wheels)

P205/65R15 92H tire

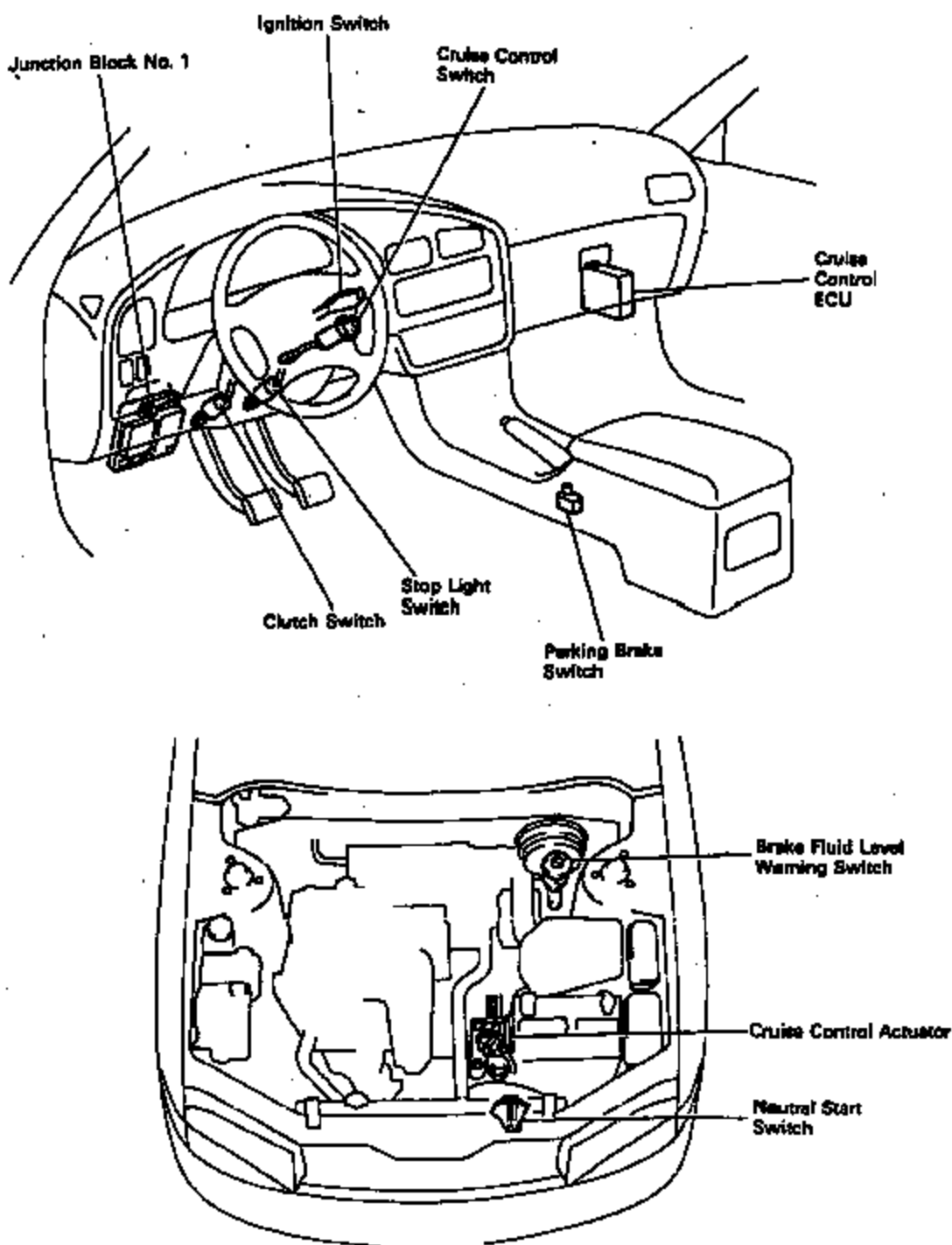
15 x 6 JJ (steel wheels)

15 x 6 JJ (aluminum wheels)

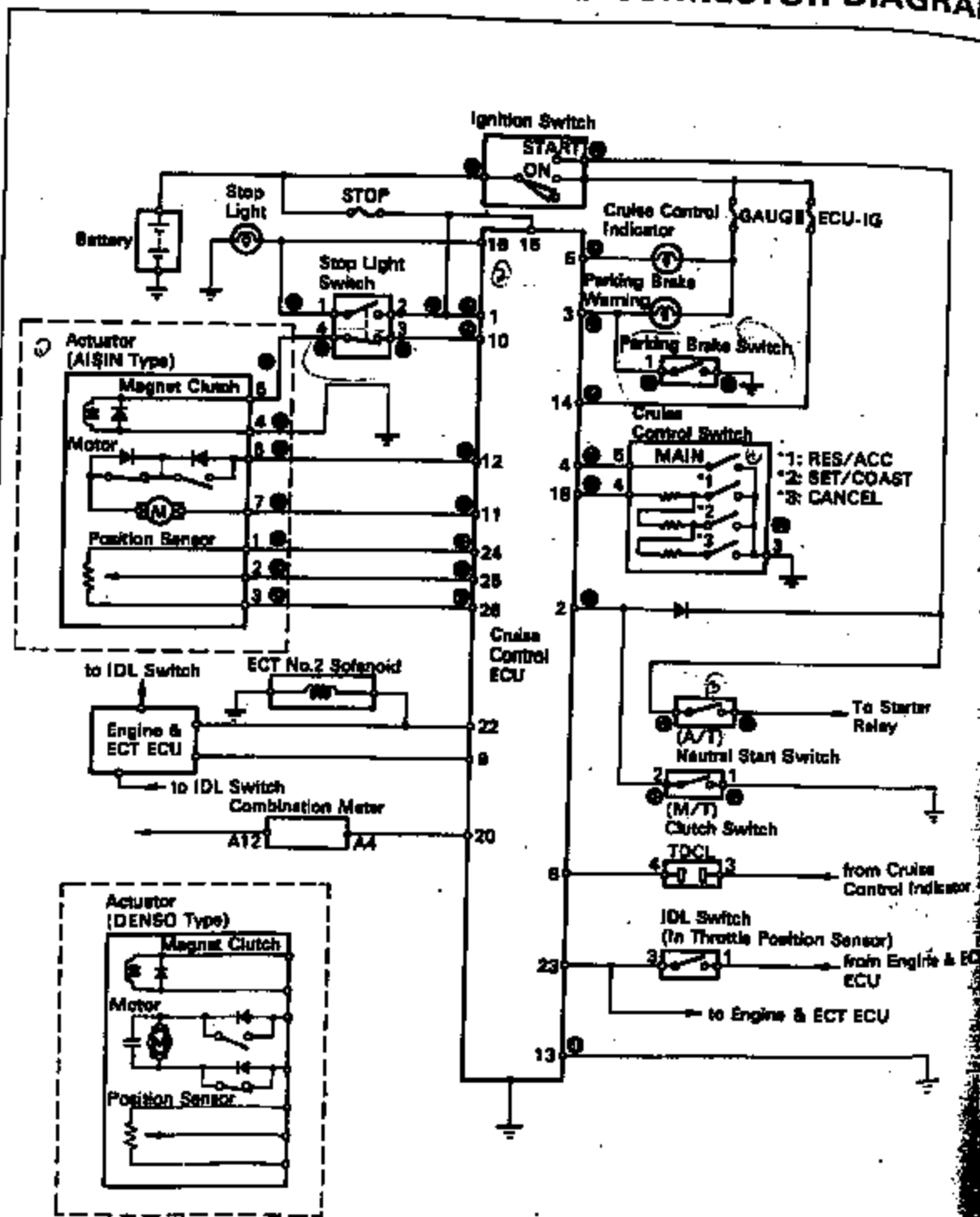
Wheel nut torque, N·m (kgf·m, ft·lb.):

103 (10.5, 76)

CRUISE CONTROL SYSTEM PARTS LOCATION

101 884
101 701

WIRING AND CONNECTOR DIAGRAMS



The POWER SOURCE CIRCUIT has been simplified. For full details, see page BE-11.

Teardown Analysis S/C System for 92 Toyota Camry

Electric actuator with P/M Motor with E/M clutch.

Worm/spur gear train with 203/1 ratio & clutch

resistance @ 39.0 Ω . Output arm pushes arm on junction box

Actuator (less bracket) :

Weight = 1141 gm

Volume = 664 cc

No. Parts = 127 (Does not include 27pc connector harness)

Amplifier (with Mtg Bracket) :

Weight = 283 grams

Volume = 428 cc

No. Parts = 5 (PC board has heat sink & 26 pin connector)

Dave Porter 10-5-92

For Reference, NGSC (actuator & amplifier) has

Weight = 1258 grams (No bracket)

Volume = 589 cc

No. Parts = 44

1995 1/2 DMI01 Program

1992 TAURUS/1992 TOYOTA CAMRY TEARDOWN

Subsystem 10.03 - Speed Control

	1992 DM3	1992 CAMRY	1995 1/2 DMI01*
<u>CUSTOMER VALUE COMPARISON</u>			
<u>Features</u>			
-SET, ACCEL, COAST, RESUME	X	X	X
-CANCEL/RESUME		X	X
-TAP UP/TAP DOWN			X
-Control Location	SW	Stalk	SW
-Cruise Light		X	?
-Lighted Switches			?
<u>Performance</u>			
-Vacuum Servo	X		
-Electric Servo		X	X
<u>COST COMPARISON</u>			
-Design Cost (0)/U Base	Base	(\$37.52)	(\$4.50)
<u>WEIGHT COMPARISON</u>			
-Weight in Pounds (0)/U Base	Base	(2.0)	1.7
<u>COMPLEXITY</u>			
-AFL (0)/U Base	Base	(\$.08)	\$2.15
<u>OPPORTUNITIES</u>			
-None identified in Teardown Study.			
-Common bracketry; cables, and calibrations.			
<u>RECOMMENDATIONS</u>			
-Implement NGSC.			

*DMI01 data from separate studies of NGSC, not Teardown analysis.

ngactear.wp
3/6/92

Design Cost Comparison

1992 Ford Taurus GL 3.0L V6 12V AXOD-E/1992 Toyota Camry LE 3.0L V6 24V A540E 4-Door Sedan
(Per Affected Unit @ 1-1-91 Economics)

Group	CPSC	Component	Fuel System		Explanation of Major Cost Variance
			Taurus (O)/N Camry		
6	10.01.06	Electric Fuel Pump		\$ (3.32)	Taurus added pulse damper \$(1.25), added fuel pump relay \$(1.02), gear driven vs. turbine fuel pump \$(.70), added bracket \$(.25), larger inlet filter \$(.05), and 2 larger vs. 4 miscellaneous components \$(.04)
7	10.01.07	Fuel <u>Published Fuel Capacity</u> Taurus Camry 16.0 gallons 18.5 gallons		.48	Camry 17.1 vs. 16.4 gallons
8	03.13.02	Fuel Evaporation		.94	Camry 5 rubber hoses vs. 1 convoluted tube \$1.30, 3 steel vs. 3 nylon vapor lines \$.79, 16 vs. 8 miscellaneous components \$.53, and more AFL \$.34 partly offset by Taurus' separate fuel vapor valve [Camry's 3 fuel vapor valves are inside the fuel tank shown in Group 1] \$(1.87) and separate fuel vapor valve seal \$(.15)
9	10.02.01	Foot Operated Throttle Control		(1.47)	Taurus more AFL \$(1.04), added shield \$(.56), larger accelerator pedal pad \$(.09), and added spring, spring guide, and tube on shorter accelerator cable \$(.05) partly offset by Camry's steel rod weldment vs. stamped steel accelerator pedal arm \$.25 and 8 larger vs. 15 miscellaneous components \$.02
10	10.03.01	Speed Control Speed Sensors		(3.44)	Taurus only: separate vehicle speed sensor [Camry's speed sensor shown with speedometer on Board 40 Group 5 - Ref. \$4.11] \$(3.29) and AFL \$(.15)

EM82-628-4 28895

Design Cr Comparison

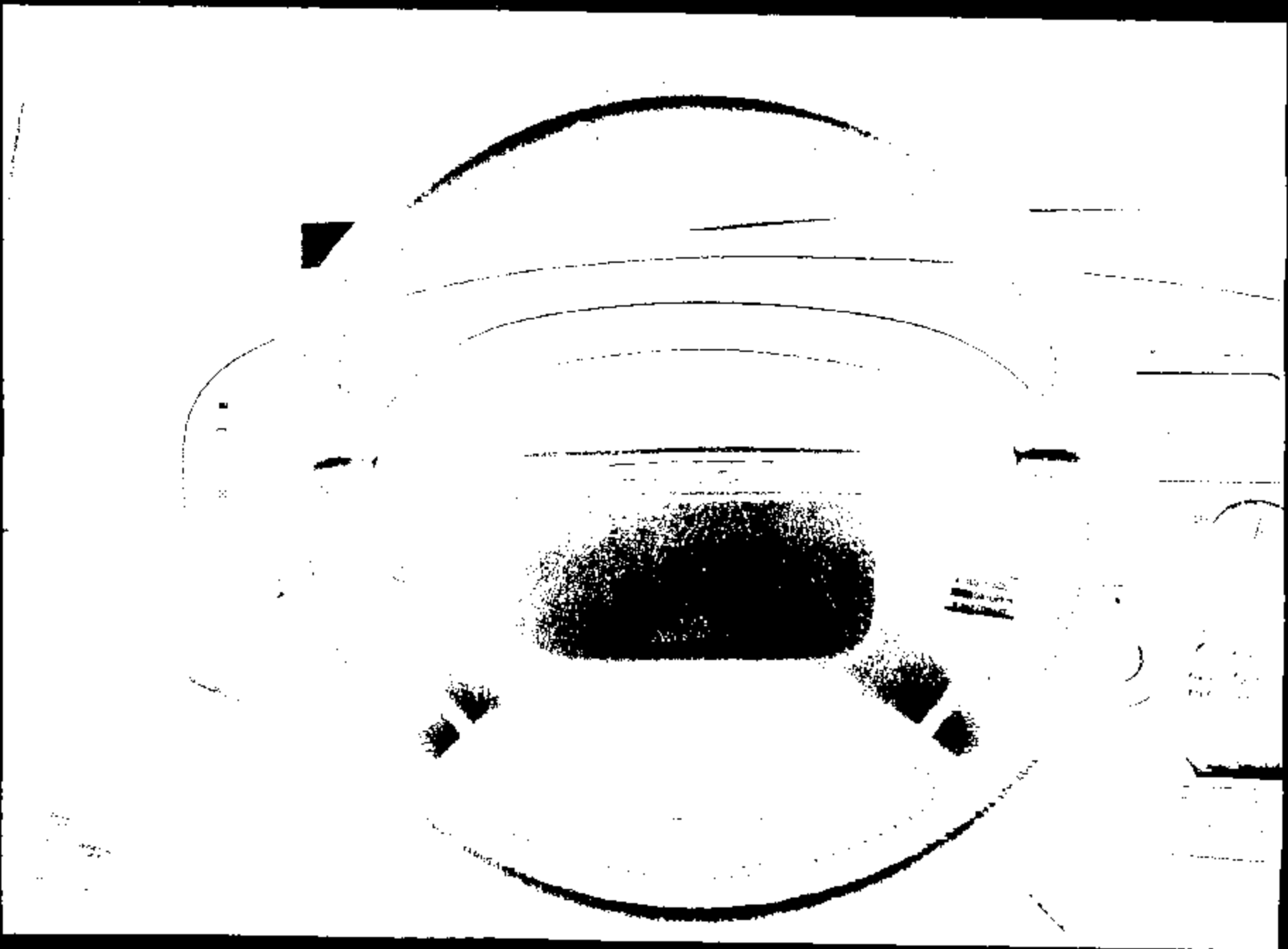
1992 Ford Taurus GL 3.0L V6 12V AXOD-E/1992 Toyota Camry LE 3.0L V6 24V A560K 4-Door Sedans
 (Per Affected Unit @ 1-1-91 Economics)

Fuel System

<u>Group</u>	<u>GPSC</u>	<u>Component</u>	<u>Taurus (0)/U Camry</u>	<u>Explanation of Major Cost Variance</u>
⑪	10.03.02	Speed Control Servo Actuators	\$ 16.92	Camry 2.0 lbs. heavier electro-mechanical with added electric motor vs. electric/vacuum speed control servo and bracket assembly \$16.20, added bracket \$3.07, added housing \$1.09, more APL \$.28, and longer speed control actuator cable \$.20 partly offset by Taurus' added vacuum canister \$(2.60), 2 added vacuum hoses \$(1.20), and 7 larger vs. 9 attachments \$(.12)
⑫	10.03.03	Speed Control Module/Amplifier	24.93	Camry double-sided with 120 added surface mounted devices vs. single-sided printed circuit board on speed control module \$24.59, larger mounting bracket \$.29, and more APL \$.05
⑬	10.03.04	Speed Control Switches	(.89)	Taurus only: added vacuum dump valve [Camry's speed control system is electro-mechanical shown in Group 11] \$(.67), added plastic mounting bracket \$(.12), and APL \$(.10)
16	10.04.03	Fuel Shut OFF Control	(2.40)	Taurus only: added inertia switch \$(2.19), APL \$(.15), and 5 attachments \$(.06)
		Total	<u>852.33</u>	

SUMMARY OF GROUPS 10-13 }
 - SPEED CONTROL } \$37.52

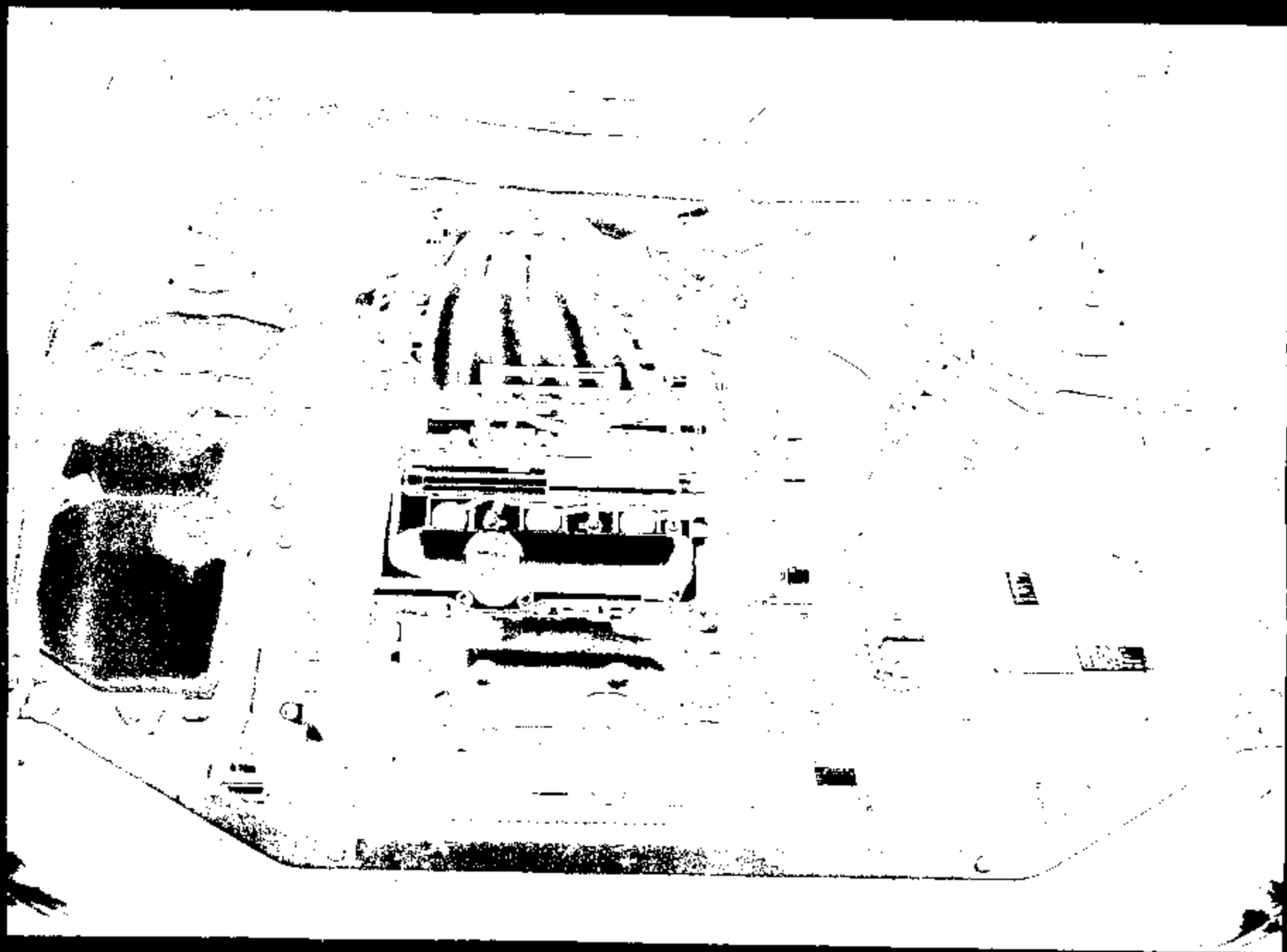
1992-025-A 20005



FORM 875-A 2007

Handwritten text, possibly a name or date, is visible on the left side of the document.

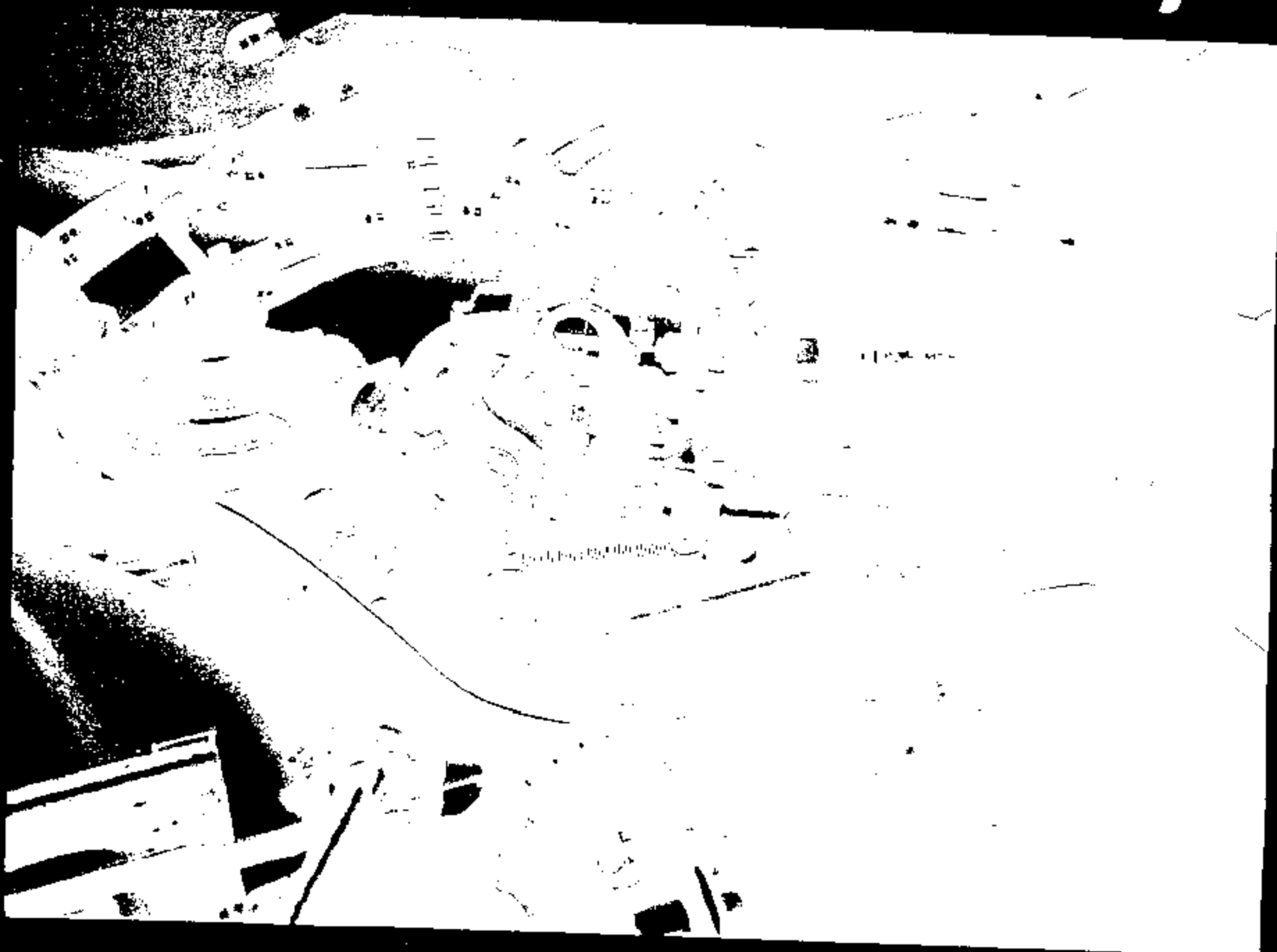
A RES / ACC
ON-OFF
SET / CONTR.



EMR2-020-A 20000



EM92-023-A 28D10



EPAC-028-A 20011

FORM 625-A 20012

1992 MADA 929



LEVEL ROAD SPEED CONTROL DATA SHEET

Vehicle No.:		Model:		W.T.:		Eng.:		Trans.:		Axles:			
Vehicle Mt.:		Calib.:		Servo:		Amp.:		Vac Assist:		Cable Slack 1/:			
Location/Altitude:				Temp:		Date:		Driver:		Recorder:			
T.P. reading at idle: _____ E.U.		WOT: _____ E.U.		Deg. 2/		Max T.P. at servo full stroke: _____ E.U.		Deg.					
KEY SPEED ACCURACY - Record actual vs. set speed and drop in RPM 3/													
Gear Set Spd		30		40		50		60		70			
Ran. Auto		Dro	Act	Dro	Act	Dro	Act	Dro	Act	Dro	Act		
3rd / Drive													
4th / D.D.													
5th / ..													
Comments:													
ROAD LOAD PERFORMANCE - Record Max & Min readings for: Manifold Vacuum & T.P. in E.U. and/or degree, & subjective rating (1 - 10)													
Gear Veh Spd		30		40		50		60		70			
Man. Auto		Vacuum	TP	Surge	Vacuum	TP	Surge	Vacuum	TP	Surge	Vacuum	TP	Surge
		Min/Max	Min/Max	Per/Rat	Min/Max	Min/Max	Per/Rat	Min/Max	Min/Max	Per/Rat	Min/Max	Min/Max	Per/Rat
3rd / Drive													
4th / D.D.													
5th / ..													
Auto Trans. O/S													
From High Gear													
Comments:													
Full Stroke Shift Speed													
ACCELERATION RATES - Record Accel. rate in sec. (Rush mode) and max T.P. reading in E.U. and/or deg.													
		RPM		30 - 40		40 - 50		50 - 60		60 - 70			
		Time	Max T.P.	Gear	Time	Max T.P.	Gear	Time	Max T.P.	Gear	Time	Max T.P.	Gear
10 MPH Split Axels		Run #1											
(Begin at speed shown, simultaneously depress accel and release pedal.		Run #2											
30 - 70 Axels		Run #1											
(Run in high gear, begin accel at 27, begin timing at 30)		Run #2											
Comments:													

E902-025-A 20013

1/ Record no. of grooves/beads and inches or millimeters from taut cable position.
 2/ Record with engine running.
 3/ For more accurate set speed data, depress Set Button x times and divide final reading by x (set speed stabilize before each "Set").
 scp4a 07/17/90

**SPEED
CONTROL**

**Competitive
Evaluation**

BIC

Shop Manual Exchange Program

In late 1989 Ford Parts and Service Division formalized a program with eleven major automobile manufacturers in regards to exchanging service literature. Under this program, FPSD sends shop manuals and owner guides to these eleven manufacturers. In turn, these companies send their literature to us.

When received, this material is stored at Truck Operations, Simultaneous Engineering Technical Center located at 15050 Commerce Drive North. As an agreement with Mr. John Stawasz (X06378), Supervisor of the garage area, other Ford activities are allowed to check these books out for a limited duration. Ford of Europe is a part of this program but, their material is on a "per request" basis.

The participating manufacturers in this program are:

- American Honda
- Chevrolet
- Ford of Europe
- GMC Truck
- Hyundai
- Lexus Trucks of America
- Mazda
- Mitsubishi
- Nissan
- Oldsmobile
- Subaru of America
- Toyota

*Lexus ASE for
has manuals
by look...*

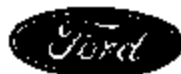
U061\shopman.42

COMPETITIVE DESIGN COMPARISON

	FORD CURRENT MODEL	FORD MGSC	FORD A.C. SPARK PLUG	HONDA ACURA	MERCEDES	SCORPIO	TOYOTA CAMRY	TOYOTA EFI PICKUP	TOYOTA VAN
SUPPLIER	GM	GM	A.C. SPARK PLUG	DAIHATSU	DAIHATSU	HELLA	DAIHATSU	DAIHATSU	DAIHATSU
TYPE OF SERVO	VACUUM	POTORIZED GEARDRUM	POTORIZED CENTRALIN	VACUUM	POTORIZED GEARTRAIN	VACUUM	VACUUM M/FLAP	VACUUM	MECHANICAL
TYPE OF AMPLIFIER	PI BOARD	PI BOARD WICKFILM		PI BOARD	PI BOARD	PI BOARD	PI BOARD	PI BOARD	PI BOARD
IS AMPLIFIER MOUNTED SEPARATE OF SERVO?	YES	NO	NO	YES	YES	YES	YES	YES	YES
IS AMPLIFIER MICRO CONTROLLED?									
RECOMPENT BRAKE TYPE (MECH., ELECT)	MECHANICAL	ELECTRICAL	ELECTRICAL	ELECTRICAL	ELECTRICAL	ELECTRICAL MECHANICAL	ELECTRICAL	ELECTRICAL	ELECTRICAL
FUNCTIONS:									
ON SWITCH	YES	YES	YES	YES	NO	YES	YES	YES	YES
OFF SWITCH	YES	YES	YES	YES	YES	YES	YES	YES	YES
CONST FEATURE	YES	YES	YES	YES	YES	YES	YES	YES	YES
ACCEL FEATURE	YES	YES	YES	YES	YES	YES	YES	YES	YES
RESUME FEATURE	YES	YES	YES	YES	YES	YES	YES	YES	YES
CANCEL FEATURE	NO	NO	NO	YES	NO	NO	NO	NO	NO
TAP UP/TAP DOWN	NO	NO	YES	NO	NO	NO	NO	NO	NO
LOCATION:									
ON SWITCH	STEERING W/L	STEERING W/L	TURN STALK	ON/OFF BOARD	N.A.	STEERING W/L	ON/OFF BOARD	ON/OFF BOARD	ON/OFF BOARD
OFF SWITCH	STEERING W/L	STEERING W/L	TURN STALK	TURN STALK	STEERING W/L	STEERING W/L	UPPER STALK	UPPER STALK	UPPER STALK
CONST FEATURE	STEERING W/L	STEERING W/L	TURN STALK	TURN STALK	STEERING W/L	STEERING W/L	UPPER STALK	UPPER STALK	UPPER STALK
ACCEL FEATURE	STEERING W/L	STEERING W/L	TURN STALK	TURN STALK	STEERING W/L	STEERING W/L	UPPER STALK	UPPER STALK	UPPER STALK
RESUME FEATURE	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
CANCEL FEATURE	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
ARE VACUUM RESERVOIRS USED?	YES	NO	NO	YES	NO	NO	YES & VAC PUMP	NO	NO
WEIGHT:									
SERVO	21lb 0.25oz	11lb 14.56oz	21lb 9.3oz	11lb 9.34oz	21lb 3oz	15.01oz	11lb 14.06oz	11lb 13.5oz	21lb 0.7oz
AMPLIFIER	3.875oz	PART OF SERVO	PART OF SERVO	0.8oz	10.25oz	0.75oz	7.31oz	6.38oz	10.57oz
VERSION COST:									
SERVO	\$8.72	\$75.44	\$13.80	\$11.32	\$17.50	\$7.71	100	100	\$15.06
AMPLIFIER	\$4.40	\$14.35	\$33.84	\$9.62	\$16.64	\$12.84	100	100	\$24.23
RELIABILITY R/100:									
SERVO	1.27	0.41	INDUFF. DATA	INDUFF. DATA	INDUFF. DATA	INDUFF. DATA	0.30	0.30	0.30
AMPLIFIER	0.62	0.50	INDUFF. DATA	INDUFF. DATA	INDUFF. DATA	INDUFF. DATA	0.50	0.50	0.50
OTHER		0.34	INDUFF. DATA	INDUFF. DATA	INDUFF. DATA	INDUFF. DATA	100	100	100
TOTAL		0.95	INDUFF. DATA	INDUFF. DATA	INDUFF. DATA	INDUFF. DATA	100	100	100

* MGSC PROVIDES LABOR SAVINGS OVER CURRENT MODEL

Total System Cost



CONFIDENTIAL
 ADVANCED CAR AND TRUCK RESEARCH
 PROJECT 92/ACTR-92082

Inter Office

Ford North American
 Automotive Operations
 Sales Operations
 P.O. Box 1590
 September 22, 1992

Mr. G. H. Forrest

- | | |
|---------------------|--------------|
| cc: D. A. Davis | S. G. Rahaim |
| R. Glenn | F. Shorr |
| R. F. Haase | J. B. Sieg |
| E. A. Koehler-Gaunt | S. J. Vince |
| J. A. Perkins | M. C. Webb |

Subject: Next Generation Speed Control Telephone Survey

Attached is the report on the Next Generation Speed Control Telephone Survey conducted during the month of July 1992. The purpose of this research was to acquire customer feedback regarding Next Generation Speed Control and competitive speed control systems.

Additionally, focus group research is under consideration to expand on the Speed Control findings revealed in the quantitative research. We will advise you of the specific plans for these groups at a later date.

If further information is required, please contact me or a member of the research team listed in the report.

Jerry Metala

G. A. Metala
 92-24820

Attachment

NEXT GENERATION SPEED CONTROL TELEPHONE SURVEY

Research Team:

G. A. Mateja	32-24550
J. B. Garrison	38-04833
L. A. Dinnwath	84-58455

NEXT GENERATION SPEED CONTROL TELEPHONE SURVEY
(92/ACTR-92052)

PURPOSE: To acquire customer feedback regarding Next Generation Speed Control and competitive speed control systems including owner usage patterns, system performance, and interest in specific future controls and features.

METHOD: A national telephone survey was conducted during July among 600 retail owners of 1992 model year personal vehicles with a speed control system. The following vehicles are included: Lincoln Town Car, Econoline, Taurus/Sable, Tempo/Topaz, F-Series Full-Size Pickup, GM C/K Series Full-Size Pickup, Toyota Camry, and Honda Accord. All owners were given a verbal explanation of potential future features and switches.

FINDINGS: Overall, most owners are completely or very satisfied with their speed control system. (p. 3)

- Satisfaction ranges between 87%-90% completely or very satisfied for all vehicle groups, except GM C/K Series which has only 81% completely or very satisfied.
- Virtually all owners intend to purchase speed control again.

On average, less than half of all owners are frequent users of their speed control. (p. 3)

- F-Series, followed by Econoline, exhibits the highest percentage of owners who use their speed control everyday or a few times a week at 58% and 52%, respectively. Taurus/Sable and Honda Accord owners use their speed control the least at 31%.
- When using speed control, respondents indicate that the majority of usage (approximately 74%) occurs at speeds of 55 mph or over. Very little usage (3%) is reported under 40 mph.

Most speed control users find their system to be simple to operate. (p. 3)

- Econoline exhibits the highest percentage of owners who find their speed control very simple or somewhat simple to operate at 88%.
- Toyota Camry owners indicate least often that their speed control is very simple to operate (59%).

When asked about usage of specific switches, more owners indicate regular usage of the "Resume" switch than any other feature. (p. 3)

- On average, almost 60% of the owners use their "Resume" switch.
- Usage of the "Coast", "Cancel", and "Tap Up/Tap Down" functions is relatively low (about 20% use frequently or very often).
- Customers with an "On Light" and/or a "Set Light" on their speed control system rate the lights quite favorably.
- All speed control switches are perceived as reacting just about right by most (over 90%) of the owners. Nearly all (94%) users state that their speed control has just about the right number of functions.

When customizing speed control functions, over half of the owners elect to include all features. (p. 4)

- Both "Tap Up" and "Tap Down" experience the lowest percentages of inclusion with 8-car Averages of 55% and 51%, respectively. GM C/K Series owners, however, indicate a significantly higher level of acceptance of both features (89% and 88%, respectively). This may be explained by the existence of "Tap Up/Tap Down" on the current GM C/K Series speed control system.
- Those customers whose speed control systems currently have "Cancel", an "On Light", or a "Set Light" include these features significantly more frequently than those who do not have them.
- Overall, more features are chosen for inclusion on the speed control system by more Honda Accord owners than by the owners of the other vehicles.
- Owners under 50 choose to include more features more often than the owners over 50.

Lighted switches exhibit the highest level of interest both with and without price revealed. (p. 4)

- With price provided, lighted switch interest is highest among Honda Accord owners and lowest among Toyota Camry owners.
- Although interest in most features decreases once price is revealed, the "On Light" experiences the most significant drop.
- Interest in "Cancel" and "Tap Up/Tap Down" is moderate even before price is revealed.

Nearly one-fourth of all owners almost never or never use their speed control system. (p. 5)

- The most prevalent reason given by owners for not using speed control is that they do not drive on the highway, but only in town. Owners also commonly mention that they do not feel comfortable using the system.
- Fewer Tempo/Topaz owners (38%) use their speed control than do owners of any other vehicles studied. Also, more males (82%) than females (63%) use their speed control.

IMPLICATIONS: Illuminated switches should be included on future Company speed control systems.

- Those owners who currently have an "On Light" and/or a "Set Light" express high interest in including these features on their speed control. They also assign favorable ratings with regard to the performance of these lights on their current systems.
- Interest in lighted switches is high amongst all ownership groups when customizing speed control. Also, lighted switches generate the highest interest ratings of all other features both with and without price provided.
- Illuminating these switches may improve the ratings of the evaluation "is easy to use at night"

Potential for "Cancel" and "Tap Up/Tap Down" is limited to specific vehicles.

- Econoline, F-Series, and, to a lesser extent, Tempo/Topaz owners express greater interest in "Cancel" than the other Ford respondent groups, both with and without price revealed.
- Interest in "Tap Up/Tap Down" is moderate; only those respondents who currently have it on their speed control express interest in including it when asked to customize functions.

-3-
SPEED CONTROL OVERALL RATINGS

Percentage Points	BY VEHICLE OWNERSHIP									
	Overall	NEXT GENERATION			OTHER SPEED CONTROL			SELECTED COMPETITORS		
		7000 Car	28000 -line	70000 Series	70000 /Serie	Tempo/ Tops	Honda Accord	Toyota Camry	Oldsmobile Cutlass	
Overall Satisfaction Completely/Very satisfied	88	90	87	89	89	87	88	90	81	
Will Purchase Speed Control Again	99	100	99	100	99	99	100	97	99	
Frequency of Usage A few times a week	41	34	52	58	31	38	31	43	48	
Average percent within speed ranges										
25-30 mph	23.7	21.1	3.3	2.3	1.9	3.7	2.3	3.1	1.7	
40-55 mph	23.3	21.9	28.8	26.3	23.0	23.7	18.6	19.9	27.3	
Over 55 mph	53.0	57.0	67.9	71.2	75.1	72.6	79.3	76.9	70.9	
Significance of Operation Very simple/Somewhat simple	93	93	98	96	96	94	92	93	96	
Switch Usage Very often/frequently										
Set manual	33	23	39	28	28	42	44	60	33	
Coast	17	13	20	19	9	21	27	17	13	
Resume	17	6	44	44	58	56	58	49	41	
Cancel	17	n/a	n/a	n/a	n/a	n/a	n/a	17	n/a	
Tap up/tap down	20	23	18	n/a	n/a	n/a	n/a	n/a	21	
Speed of Acceleration Set speed										
Too fast	3	0	4	4	0	6	n/a	n/a	0	
Too slow	2	0	1	1	0	0	n/a	n/a	0	
Just about right	95	100	95	95	100	94	100	95	100	
Speed of Acceleration Cruise										
Too fast	3	1	6	0	0	0	n/a	n/a	0	
Too slow	2	0	0	0	0	0	n/a	n/a	0	
Just about right	95	100	94	100	100	100	100	100	100	
Speed of Acceleration Cruise										
Too slow	6	0	5	0	12	6	2	4	6	
Too fast	0	0	0	0	0	0	0	0	0	
Just about right	94	100	95	100	88	94	98	96	94	
Speed of Response Tap up/tap down										
Too fast	0	0	0	n/a	n/a	n/a	n/a	n/a	0	
Too slow	0	0	0	n/a	n/a	n/a	n/a	n/a	0	
Just about right	100	100	100	100	100	100	100	100	100	
Number of Functions Too many	3	3	6	7	5	3	1	11	1	
Too few	0	0	0	0	0	0	0	0	0	
Just about right	97	97	94	93	95	97	99	89	99	

Sample size (600) (75) (75) (75) (75) (75) (75) (75) (75)

n/a indicates those vehicles for which a question was not applicable.

Source: Next Generation Speed Control Telephone Survey (92/ACTR-92052)

Marketing Research
MAAD Marketing

July, 1992

ERG2-825-R 20821

-4-
SPEED CONTROL OVERALL RATINGS

Average 1-10 ratings	BY VEHICLE OWNERSHIP									
	Average	NEXT GENERATION			OTHER SPEED CONTROL			SELECTED COMPETITORS		
		7- Car	7- Sedan	7- Truck	7- Sedan	7- Truck	7- Truck	Honda Accord	Toyota Camry	GM C/K Series
Speed Control Evaluations										
Convenience of speed control	9.1	9.1	9.1	9.0	9.1	9.3	8.9	8.9	9.2	
Highway driving comfortable	9.3	9.4	9.4	9.4	9.3	9.3	9.3	9.3	9.3	
Easy to operate	9.1	9.2	9.1	9.1	9.1	9.2	9.0	8.8	9.3	
Controls well located	9.0	9.1	9.1	9.1	9.1	9.3	8.7	8.4	9.0	
Speed control reliable	9.2	9.2	9.2	9.1	9.2	9.3	9.2	9.3	9.1	
All switches provided	9.1	9.2	9.3	8.9	9.1	9.2	9.1	9.0	8.9	
Maintains accurate speed	9.0	9.2	9.0	8.9	8.9	9.2	8.8	9.3	8.9	
Provides better gas mileage	8.3	8.4	8.1	7.8	8.0	8.0	7.7	7.9	8.0	
Discourages speeding	7.7	8.2	7.4	7.1	7.4	8.0	7.3	7.3	7.3	
Easy to use at night	7.9	7.8	7.9	7.8	7.8	7.9	8.1	8.4	7.8	
Switches are understandable	9.1	9.2	9.2	9.2	9.3	9.2	8.8	8.3	9.1	
Speed Control Switch Evaluations										
Location of switches	8.9	9.3	9.1	9.2	9.1	9.1	8.6	8.3	8.7	
Feel of switches	8.9	9.1	9.0	9.0	8.8	9.1	9.0	9.0	8.7	
Visibility of switches	8.4	8.7	8.7	8.7	8.3	9.1	8.0	8.0	8.1	
Ease of switch use	9.0	9.1	9.1	8.9	8.9	9.2	8.9	8.9	9.0	
Sound of switches	9.0	9.1	8.8	9.0	8.9	9.0	8.8	9.1	9.0	
Performance of Lights										
On light	8.1	n/a	n/a	n/a	n/a	n/a	7.8	8.4	n/a	
Set light	8.7	8.8	n/a	n/a	n/a	n/a	8.7	n/a	n/a	

Average 1-10 ratings	BY VEHICLE OWNERSHIP															
	Average	NEXT GENERATION			OTHER SPEED CONTROL			SELECTED COMPETITORS			BY SEX		BY AGE		BY INCOME	
		7- Car	7- Sedan	7- Truck	7- Sedan	7- Truck	7- Truck	Honda Accord	Toyota Camry	GM C/K Series	Male	Female	20-29 Yrs	30-49 Yrs	50k Over	50k Over
Interest in Other Features (without price)																
Cancel	6.8	6.8	6.8	6.1	6.4	6.9	n/a	6.7	6.5	6.4	6.7	6.4	6.5	6.5	6.5	
Tap up/tap down	5.7	n/a	n/a	5.6	5.7	5.6	5.8	n/a	5.7	5.4	6.0	5.7	5.7	5.7	5.7	
On light	6.9	7.1	6.4	7.1	6.8	6.7	6.8	6.8	6.8	6.9	7.0	6.7	7.0	6.8	6.8	
Set light	6.8	5.6	5.7	6.0	5.7	5.8	6.0	6.0	6.0	6.1	6.2	5.9	6.4	5.6	5.6	
Lighted switches	7.1	7.3	7.4	7.3	7.1	7.3	7.1	7.1	7.1	7.1	7.6	6.9	7.4	7.3	7.3	
Interest in Other Features (with price)																
Cancel	6.4	6.1	6.1	5.4	5.4	6.4	n/a	5.9	5.7	5.4	6.1	5.4	5.4	5.4	5.4	
Tap up/tap down	4.9	n/a	n/a	4.1	4.6	4.9	5.3	n/a	5.0	5.4	5.1	4.6	4.6	4.6	4.6	
On light	6.9	7.1	6.4	7.1	6.8	6.7	6.8	6.8	6.8	6.9	7.0	6.7	7.0	6.8	6.8	
Set light	6.8	5.6	5.7	6.0	5.7	5.8	6.0	6.0	6.0	6.1	6.2	5.9	6.4	5.6	5.6	
On light and set light	9.3	9.1	9.0	9.3	9.1	9.3	9.1	9.1	9.1	9.1	9.6	9.1	9.9	9.0	9.1	
Lighted switches	6.7	7.1	6.8	6.7	6.5	7.1	6.8	6.7	6.5	7.1	7.0	6.3	6.8	6.7	6.7	

Percentage Points																
Customized Speed Control (2 include)																
Reset	73	63	63	71	65	74	73	68	72	73	80	74	73	74	73	
Coast/decel/set	61	55	55	66	59	68	68	65	68	68	70	68	68	68	67	
Resume	61	55	55	66	59	68	68	65	68	68	70	68	68	68	67	
Tap Up	61	55	55	66	59	68	68	65	68	68	70	68	68	68	67	
Tap down	61	55	55	66	59	68	68	65	68	68	70	68	68	68	67	
Cancel	61	55	55	66	59	68	68	65	68	68	70	68	68	68	67	
On light	73	76	41	67	68	61	73	73	74	74	74	74	74	74	74	
Set light	62	72	13	55	61	53	54	54	62	62	62	61	61	61	61	
Lighted switches	78	72	76	73	73	81	73	69	71	71	88	72	78	78	78	

Sample Size (600) (75) (75) (75) (75) (75) (75) (75) (75) (369) (231) (343) (246) (250) (370)

n/a: indicates those vehicles for which a question was not applicable.

Source: Next Generation Speed Control Telephone Survey (92/ACTR-92052)

Marketing Research
R&D Marketing

July, 1992

ERR2-825-A 28822

REASONS FOR NOT USING SPEED CONTROL

	BY VEHICLE OWNERSHIP															
	8-car Average	FORD						SELECTED COMPETITORS			BY SEX		BY AGE		BY INCOME	
		NEXT GENERATION		OTHER SPEED CONTROL				Honda Accord	Toyota Camry	GM C/K Series	Male	Fe-male	Under 50 yrs	50 yrs & Over	Under 50k	50k Over
		Town Econo Car	-line	F-Series	Taurus/Sable	Tempo/Topaz										
<u>Respondents not Using Speed Control</u>	27	23	22	17	30	38	35	26	22	16	37	22	32	24	28	
<u>Reasons for not Using</u>																
<u>Do not drive on highway /Town driving only</u>	45	35	45	25	35	44	53	58	41	40	46	44	43	41	45	
<u>Speed control broken</u>	1	0	5	0	0	0	0	0	5	1	1	1	1	0	1	
<u>Congested traffic /Heavy traffic</u>	7	4	6	13	6	11	8	0	5	7	7	9	5	11	9	
<u>Do not drive long distances/Use mostly for work</u>	16	9	10	19	16	18	19	12	18	14	16	18	14	17	15	
<u>Not sure how to use</u>	1	0	0	0	0	2	3	0	0	3	1	1	1	0	1	
<u>Too much trouble to use</u>	2	4	0	0	0	2	0	4	5	2	1	3	1	3	1	
<u>Pull trailer</u>	0	0	5	0	0	0	0	0	0	1	0	0	1	0	1	
<u>Do not feel comfortable using/Don't like</u>	21	26	19	19	26	20	11	23	29	13	25	21	18	20	21	
<u>Do not feel in control</u>	5	13	9	0	3	7	3	4	5	2	6	3	6	1	6	
<u>Prefer driving my self</u>	2	9	0	0	5	0	0	0	0	2	2	1	3	3	2	
<u>Use on vacation only</u>	10	13	10	19	3	13	6	15	0	15	7	8	14	9	10	
<u>Causes bad gas mileage</u>	1	0	0	0	0	4	0	0	0	0	1	1	1	3	0	
<u>Does not work well with a manual transmission</u>	0	0	0	0	0	0	0	0	5	0	1	1	0	0	1	
<u>Vehicle too new to evaluate</u>	5	13	10	6	3	2	6	4	5	8	4	4	7	7	5	
<u>Modified for handicapped</u>	0	0	5	0	0	0	0	0	0	1	0	0	1	0	1	
<u>Other</u>	4	0	5	13	10	2	0	0	5	7	1	4	3	4	3	
Sample Size	(219)	(23)	(20)	(16)	(31)	(45)	(36)	(26)	(22)	(65)	(134)	(100)	(115)	(76)	(143)	

Question: How often do you yourself use your speed control? Why don't you use your speed control?

Source: Next Generation Speed Control Telephone Survey (92/ACTR-92058)

Marketing Research
NAG Marketing

July, 1992

8902-028-A 20023

SAMPLE CHARACTERISTICS

BY VEHICLE OWNERSHIP

	FORD						SELECTED COMPETITORS		
	NEXT GENERATION		OTHER SPEED CONTROL				Honda Accord	Toyota Camry	GM C/K Series
	Town Car	Econo-line	F-Series	Taurus/Sable	Tempo/Tapaz				
B-car Average	X	X	X	X	X	X	X	X	
Number of Respondents	(600)	(75)	(75)	(75)	(75)	(75)	(75)	(75)	(75)
Sex									
Male	61	73	72	75	49	44	47	51	75
Female	39	28	28	25	51	51	53	49	25
	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>
Age									
Under 20 years	1	0	0	0	0	2	1	0	3
20-29	9	0	11	7	3	24	15	5	9
30-39	21	1	28	17	14	29	31	25	26
40-49	26	16	29	33	23	23	28	31	29
50-59	21	19	19	27	21	20	21	19	24
60-64	9	24	9	7	8	4	4	12	4
65 years and over	11	38	3	9	28	7	0	8	0
Refused	2	4	1	0	3	0	0	4	3
	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>
Median Age (years):	46.3	62.6	43.5	47.2	53.9	41.6	41.3	45.3	42.9
Marital Status									
Married	62	68	97	79	66	72	73	81	63
Single/not married	18	12	3	21	14	28	27	19	17
	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>
Highest Level of Education									
Some grade school	0	1	0	0	0	0	0	0	0
Grade school graduate, no high school	1	0	0	4	0	8	0	0	1
Some high school	4	4	3	3	6	5	1	0	9
High school graduate, no college	27	25	28	37	27	29	17	11	37
Some college	27	23	32	31	29	40	19	24	21
College graduate, no post graduate	25	35	20	19	20	15	41	33	19
Postgraduate	14	7	14	5	16	11	22	31	7
Other (trade school, etc.)	1	1	3	1	1	0	0	0	3
Refused	1	3	0	0	1	0	0	1	3
	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>
Median Household Income(\$100's)	51.4	60.0	55.6	56.8	50.9	34.1	57.9	68.0	45.4
Residential Environment									
Urban	22	23	29	15	23	23	34	23	16
Suburban	46	52	50	25	43	48	57	60	31
Rural	31	23	27	60	33	31	8	16	50
Refused	1	2	0	0	1	0	1	1	3
	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>

Source: Next Generation Speed Control Telephone Survey (92/ACTR-92052)

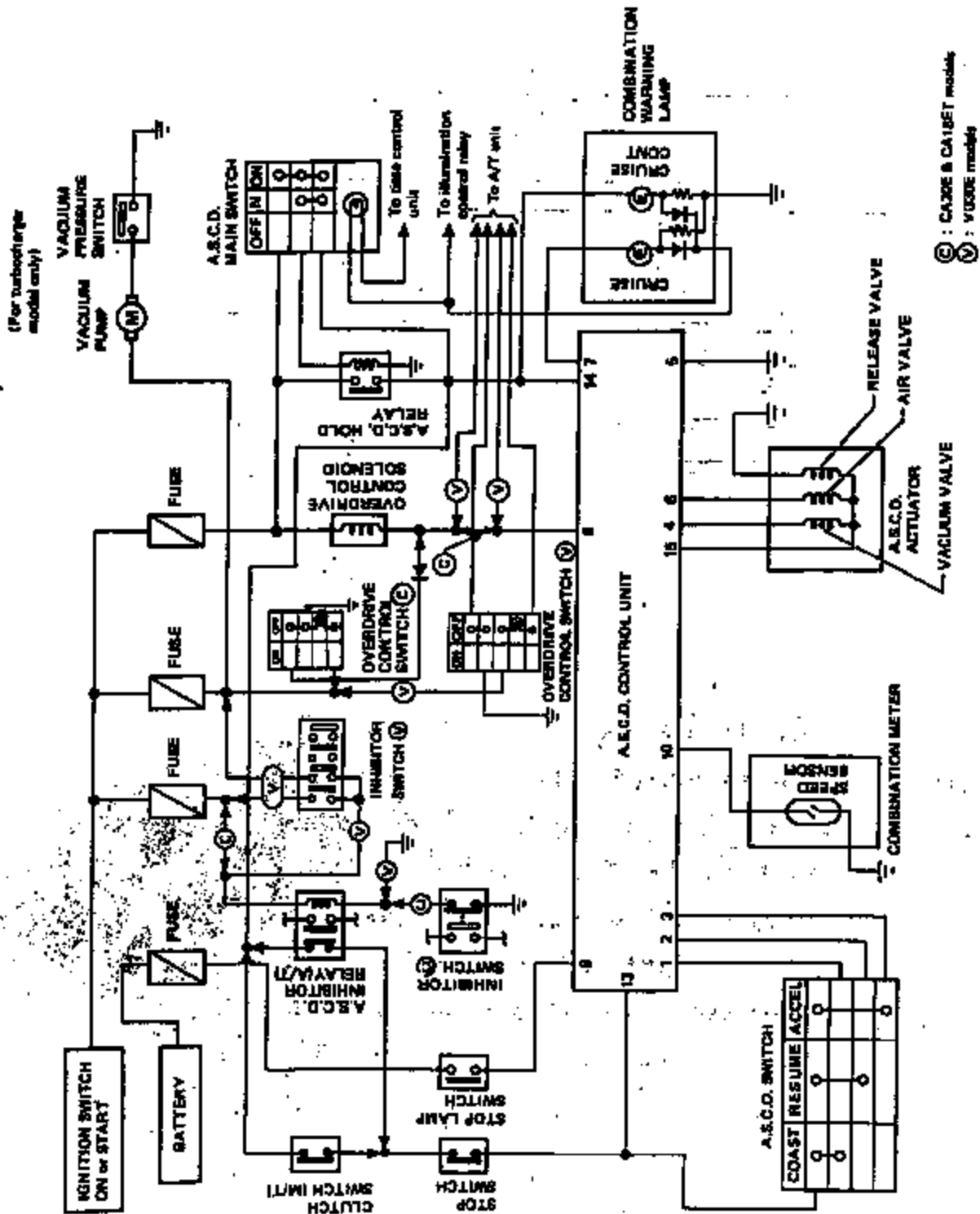
SAMPLE CHARACTERISTICS OF RESPONDENTS WHO "ALMOST NEVER" OR "NEVER" USE SPEED CONTROL

	BY VEHICLE OWNERSHIP									
	3-car Average X	FORD			SELECTED COMPETITORS			Honda Accord X	Toyota Camry X	GM C/K Series X
		NEXT GENERATION		OTHER SPEED CONTROL	F-Series X	Mustang/Sable X	Tempo/Topaz X			
	Yours Car X	Econo-line X								
<u>Number of Respondents</u>	(219)	(23)	(20)	(10)	(31)	(45)	(38)	(26)	(22)	
<u>Sex</u>										
Male	39	43	70	81	19	16	28	46	59	
Female	61	57	30	19	81	84	72	54	41	
	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	
<u>Age</u>										
Under 20 years	0	0	0	0	0	0	0	0	0	
20-29	8	0	0	4	3	7	14	4	18	
30-39	15	4	13	19	18	22	14	15	14	
40-49	24	13	43	60	14	20	14	31	32	
50-59	16	13	28	19	4	20	19	15	9	
60-64	9	18	10	0	10	4	11	12	4	
65 years and over	20	48	18	12	52	29	28	19	23	
Refused	2	4	8	0	3	2	6	4	0	
	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	
<u>Median Age (years):</u>	52.1	65.5	47.5	46.2	66.4	49.5	54.5	49.0	43.6	
<u>Marital Status</u>										
Married	76	83	108	94	69	67	72	75	82	
Single/not married	24	17	8	6	41	33	28	25	18	
	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	
<u>Highest Level of Education</u>										
Some grade school	0	0	0	0	0	0	0	0	0	
Grade school graduate, no high school	1	4	6	8	3	0	1	0	6	
Some high school	4	0	0	18	3	4	0	4	9	
High school graduate, no college	30	17	15	50	28	38	30	11	58	
Some college	28	39	45	12	26	27	25	31	18	
College graduate, no post graduate	21	22	15	19	19	18	17	38	27	
Postgraduate	11	9	15	0	10	9	28	8	0	
Other (trade school, etc.)	1	0	5	8	3	0	0	0	0	
Refused	4	9	0	4	10	4	0	8	0	
	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	
<u>Median Household Income(\$100's)</u>	47.8	70.0	60.0	68.0	39.9	38.0	62.5	50.0	50.0	
<u>Residential Environment</u>										
Urban	22	26	5	18	13	22	25	27	41	
Suburban	54	48	79	31	56	53	72	54	32	
Rural	21	17	20	50	22	27	3	13	27	
Refused	3	9	0	0	10	0	0	6	0	
	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	

Source: Next Generation Speed Control Telephone Survey (92/ACTR-92052)

NISSAN 200 SX - 1989 - VACUUM SERVO AUTOMATIC SPEED CONTROL DEVICE (A.S.C.D.)

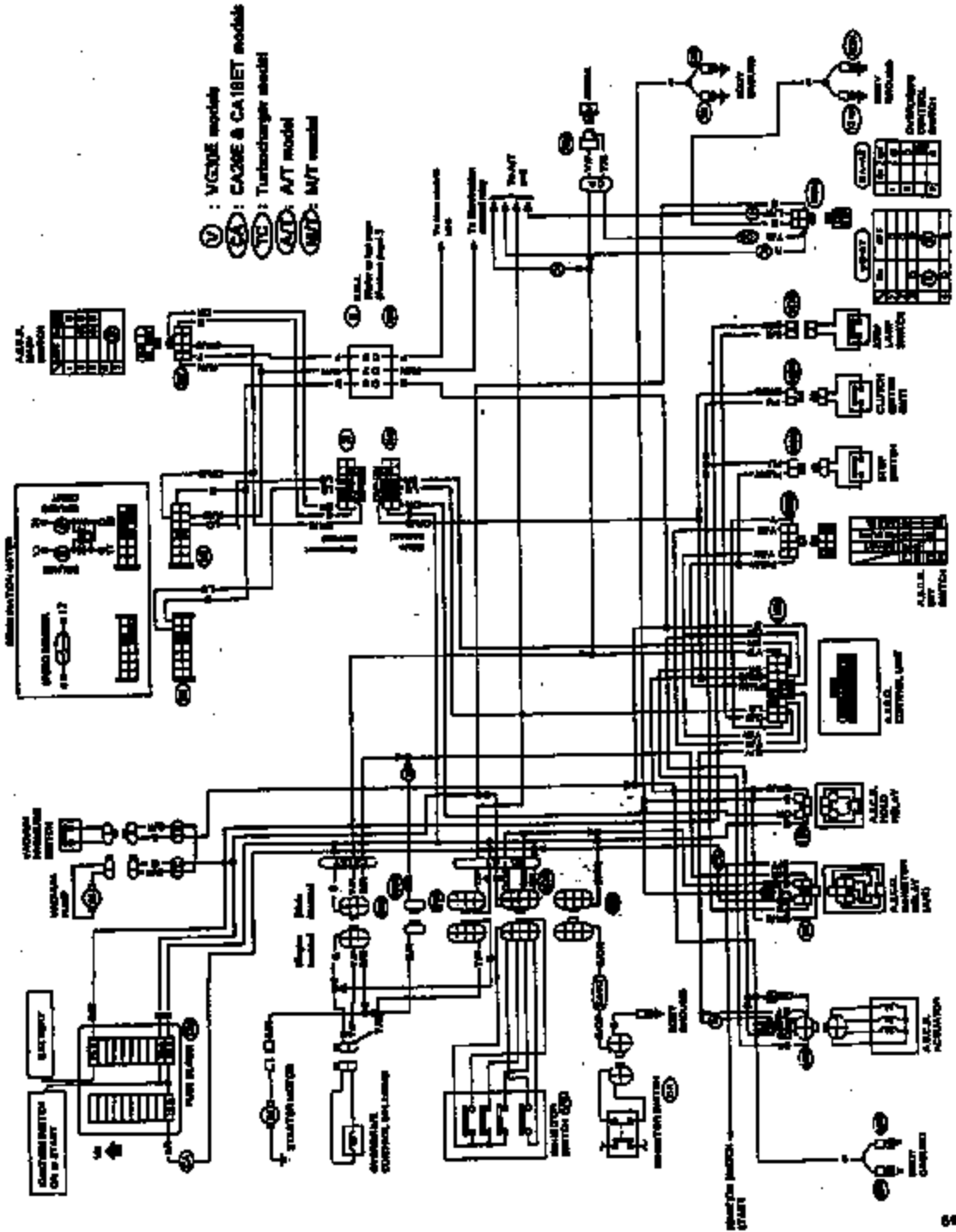
Schematic



EL-86

AUTOMATIC SPEED CONTROL DEVICE (A.S.C.D.)

Wiring Diagram



EL-87

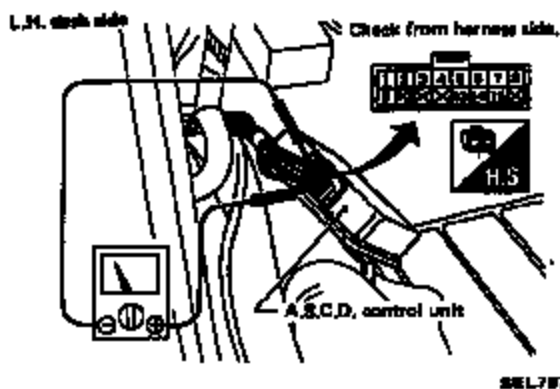
AUTOMATIC SPEED CONTROL DEVICE (A.S.C.D.)

Trouble-shooting

Trouble		Refer to TROUBLE-SHOOTING PROCEDURE.
A.S.C.D. control unit cannot be set properly.		1
Resume switch will not operate.		2
Accelerate switch will not operate.		3
Engine hunts.		4
Large difference between set vehicle speed and actual speed.		5
A/T model only	<ul style="list-style-type: none"> • When A.S.C.D. is set while vehicle is operating in "O.D." range, O.D. will be cancelled and shifting to O.D. cannot be made thereafter. • O.D. will not be cancelled even if actual vehicle speed is 8 km/h (4 MPH) lower than set speed. (Set speed cannot be maintained.) • O.D. will not be cancelled even if accelerator switch is turned "ON". 	6

PREPARATION FOR TROUBLE-SHOOTING

1. Remove driver's side dash cover.
2. Remove A.S.C.D. control unit with harness connected.
3. Perform check from harness side using circuit tester, with harness connector connected.



POWER SUPPLY CIRCUIT CHECK

1. Turn ignition switch to "ON".
 2. Turn A.S.C.D. main switch to "ON".
 3. Connect voltmeter from harness side.
 4. Measure voltage across ③ and ④
- Approx. 12 [V] O.K.

AUTOMATIC SPEED CONTROL DEVICE (A.S.C.D.)

Trouble-shooting (Cont'd)

1 A.S.C.D. control unit cannot be set properly.

Turn A.S.C.D. main switch "OFF" and then "ON" to make sure indicator illuminates.

Yes

No

Check for loose vacuum hose.

Check A.S.C.D. main switch and A.S.C.D. main relay.

O.K.

Check power supply circuit for A.S.C.D. control unit.

O.K.

N.G.

Check stop switch, clutch switch (M/T model), inhibitor relay and inhibitor switch (A/T model).

O.K.

Check harness between A.S.C.D. power supply circuit.

Check A.S.C.D. set switch circuit for A.S.C.D. control unit.

O.K.

N.G.

Check A.S.C.D. set switch, and harness between control unit and set switch.

Go to "A.S.C.D. Actuator Check".

O.K.

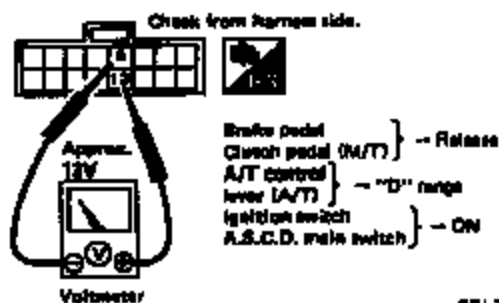
N.G.

Replace actuator.

(Next page)

POWER SUPPLY CIRCUIT CHECK

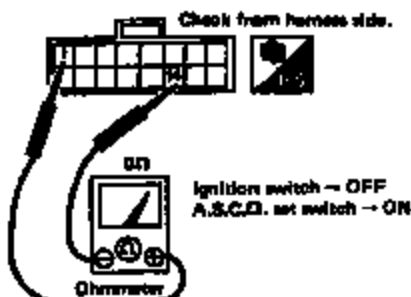
1. Release brake and clutch pedals.
2. Turn ignition switch to "ON".
3. Connect voltmeter from harness side.
4. Turn A.S.C.D. main switch to "ON".
5. Check voltage between ① and ②.



SEL798P

SET SWITCH CIRCUIT CHECK

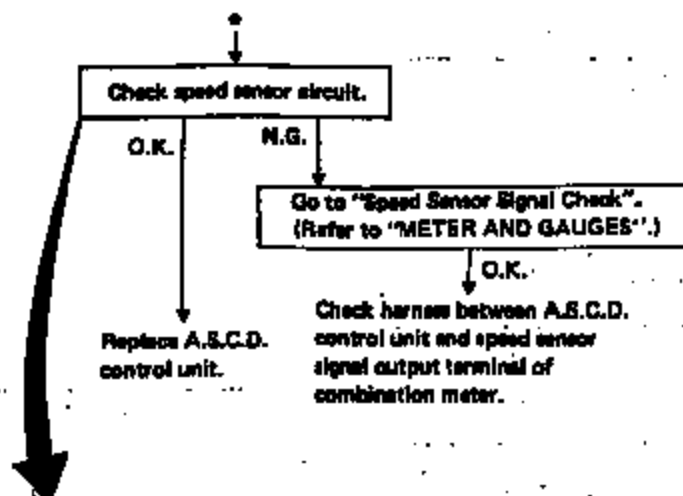
1. Turn ignition switch to "OFF".
2. Connect ohmmeter from harness side.
3. Push A.S.C.D. set switch.
4. Check continuity between ① and ②.



SEL798P

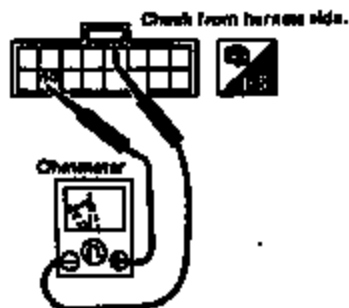
AUTOMATIC SPEED CONTROL DEVICE (A.S.C.D.)

Trouble-shooting (Cont'd)



SPEED SENSOR CIRCUIT CHECK

1. Turn ignition switch to "OFF".
 2. Disconnect speedometer cable from transmission.
 3. Connect an ohmmeter between ③ and ④ from harness side.
 4. Turn ignition switch to "ON".
 5. Slowly turn speedometer cable pinion by hand to make sure ohmmeter pointer deflects.
- Ohmmeter pointer deflects twice per rotation of pinion.

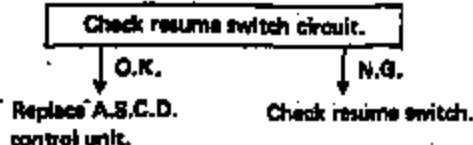


SELB00F

AUTOMATIC SPEED CONTROL DEVICE (A.S.C.D.)

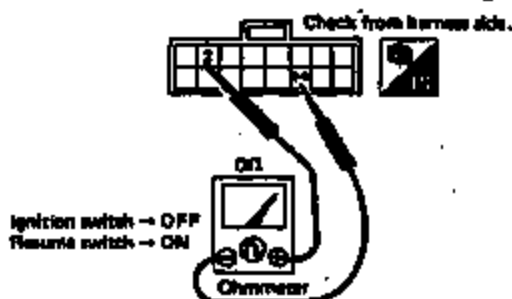
Trouble-shooting (Cont'd)

2 Resume switch will not operate.



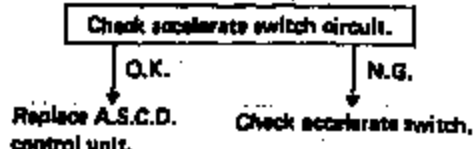
RESUME SWITCH CIRCUIT CHECK

1. Turn ignition switch to "OFF".
2. Connect ohmmeter from harness side.
3. Turn resume switch to "ON".
4. Check continuity between ② and ④.



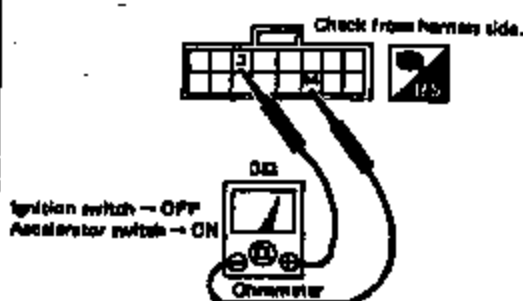
SKL801F

3 Accelerate switch will not operate.



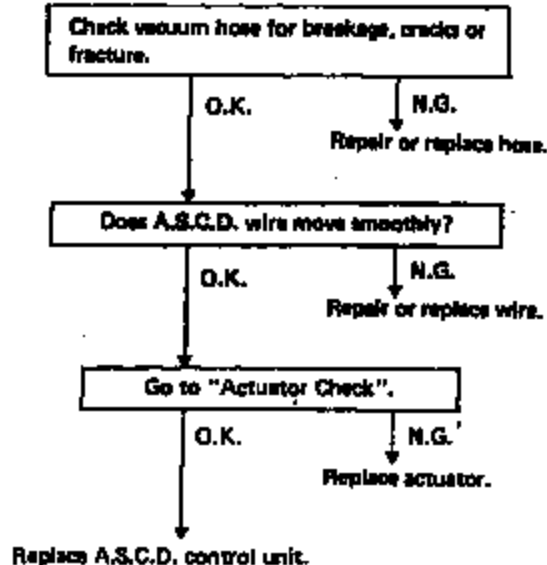
ACCELERATE SWITCH CIRCUIT CHECK

1. Turn ignition switch to "OFF".
2. Connect ohmmeter from harness side.
3. Turn accelerate switch to "ON".
4. Check continuity between ③ and ④.



SKL802F

4 Engine hunts.



5 Large difference between set vehicle speed and actual speed.

