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**National Highway  
Traffic Safety  
Administration**



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DOT HS 808 587

April 1997

Summary Report

# **Cost, Weight and Lead Time Impacts of a Mercedes-Benz "Sensormat" Type Occupant Detection System**

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<p>16. Abstract</p> <p>This summary report is based, in part, on the findings contained in Contract No. DTNH22-96-C-02063 entitled "Cost Analysis of the Mercedes-Benz Occupant Detection System for Air Bag Shut-Off" prepared by Ludtke &amp; Associates of Washington, Michigan. The purpose of the contract was to develop absolute and incremental estimates of the variable manufacturing costs, weights, lead time, and capital investments associated with adopting the Mercedes-Benz "Sensormat" type front passenger seat occupant detection system for air bag shut-off. Using the contractor's estimates of variable manufacturing costs as the starting point, NHTSA applied mark-up factors developed from analysis of auto manufacturer and supplier income statements to arrive at the incremental retail price estimates shown below:</p> <p><i>Occupant Detection Switch and System Support</i></p> <table border="0"> <tr> <td>-- With Mercedes-Benz Air Bag Control Module</td> <td style="text-align: right;">\$12</td> </tr> <tr> <td>-- With Domestic Air Bag Control Module</td> <td style="text-align: right;">\$19</td> </tr> <tr> <td>-- Incremental Weight</td> <td style="text-align: right;">3.7 oz.</td> </tr> <tr> <td>-- Required Lead Time - One Model Line</td> <td style="text-align: right;">22 Mo.</td> </tr> </table> <p><i>In addition, the contractor developed cost and weight estimates for the Mercedes air bag control module from which retail price equivalents have been projected:</i></p> <table border="0"> <tr> <td>-- Air Bag Control Module</td> <td style="text-align: right;">\$145</td> </tr> <tr> <td>-- Air Bag Control Module with "Sensormat" System</td> <td style="text-align: right;">\$153</td> </tr> <tr> <td>-- Absolute Weight</td> <td style="text-align: right;">4.5 oz.</td> </tr> </table> <p><i>All cost estimates are based on U.S. labor rates, materials costs and economies of scale.</i></p>				-- With Mercedes-Benz Air Bag Control Module	\$12	-- With Domestic Air Bag Control Module	\$19	-- Incremental Weight	3.7 oz.	-- Required Lead Time - One Model Line	22 Mo.	-- Air Bag Control Module	\$145	-- Air Bag Control Module with "Sensormat" System	\$153	-- Absolute Weight	4.5 oz.
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# ABSTRACT

This summary report is based, in part, on the findings contained in Contract # DTNH22-96-C-02063 entitled "COST ANALYSIS OF THE MERCEDES-BENZ OCCUPANT DETECTION SYSTEM FOR AIR BAG SHUT-OFF" prepared by Ludtke & Associates of Washington, Michigan. The purpose of the contract was to develop absolute and incremental estimates of the variable manufacturing costs, weights, lead time, and capital investments associated with adopting the Mercedes-Benz "Sensormat" type front passenger seat occupant detection system for air bag shut-off. Using the contractor's estimates of variable manufacturing costs as the starting point, NHTSA applied mark-up factors developed from analysis of auto manufacturer and supplier income statements to arrive at the incremental retail price estimates shown below :

## Occupant Detection Switch and System Support

- **With Mercedes-Benz Air Bag Control Module**                      **\$ 12**
- **With Domestic Air Bag Control Module**                              **\$ 19**
- **Incremental Weight**    **3.7 oz.**
- **Required Lead Time - One Model Line**                                      **22 Mo.**
- **Required Lead Time - Fleet Wide**    **5 Yrs**

In addition, the contractor developed cost and weight estimates for the Mercedes air bag control module from which retail price equivalents have been projected:

- **Air Bag Control Module**    **\$ 145**
- **Air Bag Control Module with "Sensormat" System**                      **\$ 153**
- **Absolute Weight**    **4.5 oz.**

All cost estimates are based on U.S. labor rates, materials costs and economies of scale.

## I. Summary

The cost and pricing estimates presented below represent the incremental variable and total manufacturing cost, wholesale cost, and retail price associated with an occupant detection system based, in part, on the Mercedes - Benz "Sensormat" design. The complete Mercedes system consists of the "Sensormat" switch pad, antennae, and a specially designed child restraint equipped with dual transponders for redundancy. The manufacturer's target price is in the range of \$60 - \$70 for the entire system.

This study is confined to an analysis of the incremental costs, weight, and lead time impacts associated with equipping light duty vehicles with the "Sensormat" type occupant detection switch pad and associated support systems.

**Estimated retail price increases for the control module, switch pad and wiring harness range from \$12 - \$ 19 ; depending solely on the required changes to the control module.** Figure -1 illustrates the "Sensormat" system.

## II. Results

Two different occupant detection switches and supporting system configurations were analyzed in detail:

- The Mercedes - Benz "Sensormat" and supporting systems and,
- The Mercedes - Benz "Sensormat" and supporting systems modified for adaptation to U.S. makes and models.

**Table II-1** provides the derivation of NHTSA'S retail price estimate for the Mercedes - Benz "Sensormat" detection system and supporting hardware as currently offered by the manufacturer. **The \$ 11.93 unit price estimate is based on U.S. material and component costs, Michigan labor rates (union shop), U.S. production technology and U.S. volume economies of scale at an annual production of 250,000 units for each make and model so equipped.** It is also assumed that the entire system and supporting hardware are supplied to the vehicle manufacturer by a vendor specializing in automotive occupant restraint electronics. **All cost estimates are rounded to two decimal places in this report.**

VARIABLE-MANUFACTURING COST  
WORST CASE INDUSTRIAL AVERAGE  
OCCUPANT DETECTION SYSTEM FOR AIRBAG SHUTOFF

VAR. MFG. COST=\$3.63 (PRORATED)  
WEIGHT=0.5 OZ (PRORATED)

VAR. MFG. COST=\$2.50  
WEIGHT=1.6 OZ

VAR. INSTALLATION COST=\$2.83  
WEIGHT=0.005 OZ

VAR. MFG. COST=\$0.52  
WEIGHT=1.6 OZ

TOTAL SYSTEM  
VAR. MFG. COST=\$9.48  
WEIGHT=3.7 OZ

See Table II - 2 For Retail Price Development

Figure - 1

**TABLE II - 1 OCCUPANT DETECTION SWITCH AND SYSTEM SUPPORT  
MERCEDES - BENZ DESIGN**

<b>COST ELEMENTS INCREMENTAL (DECREMRNTAL)</b>	<b>DIRECT MATERIAL</b>	<b>DIRECT LABOR</b>	<b>VARIABLE BURDEN</b>	<b>SCRAP ALLOWANCE</b>	<b>VARIABLE MFG. COSTS</b>	<b>FIXED,OTH + PROFIT</b>	<b>COST TO VEHICLE MFR</b>	<b>OTHER COST + PROFIT</b>	<b>WHOLESALE (DEALER COST)</b>
<b>CONTROL MODULE</b>									
PC BOARD (1)	\$0.23	\$0.05	\$0.12		\$0.40	\$0.20	\$0.60	\$0.20	\$0.80
CASE-MODULE (1)	\$0.01	\$0.01	\$0.01		\$0.03	\$0.02	\$0.05	\$0.01	\$0.06
COVER PLATE (1)	\$0.02				\$0.02	\$0.01	\$0.03	\$0.01	\$0.04
SCREWS & LABELS	\$0.01				\$0.01	\$0.01	\$0.02	\$0.00	\$0.02
ASSEMBLY LABOR		\$0.01	\$0.01		\$0.02	\$0.01	\$0.03	\$0.01	\$0.04
<b>TOTAL CONTROL MODULE</b>	<b>\$0.27</b>	<b>\$0.07</b>	<b>\$0.14</b>		<b>\$0.48</b>	<b>\$0.24</b>	<b>\$0.72</b>	<b>\$0.24</b>	<b>\$0.96</b>
<b>SWITCH PAD</b>									
PIGTAIL - PRESSURE PAD (1)									
WIRE (2)	\$0.03				\$0.03	\$0.02	\$0.05	\$0.01	\$0.06
TERMINAL-STAPLE (2)	\$0.09				\$0.09	\$0.05	\$0.14	\$0.04	\$0.18
TERMINAL PIN - SOLDER (2)	\$0.19				\$0.19	\$0.10	\$0.29	\$0.09	\$0.38
CONNECTOR (1)	\$0.14				\$0.14	\$0.07	\$0.21	\$0.07	\$0.28
ASSEMBLY	\$0.01	\$0.10	\$0.09		\$0.20	\$0.10	\$0.30	\$0.10	\$0.40
RESISTOR (1)	\$0.01				\$0.01	\$0.01	\$0.02	\$0.00	\$0.02
TERMINAL-STAPLE (2)	\$0.09				\$0.09	\$0.05	\$0.14	\$0.04	\$0.18
ASSEMBLY COST	\$0.49	\$0.26	\$0.92	\$0.08	\$1.75	\$0.88	\$2.63	\$0.87	\$3.49
<b>TOTAL SWITCH PAD</b>	<b>\$1.05</b>	<b>\$0.36</b>	<b>\$1.01</b>	<b>\$0.08</b>	<b>\$2.50</b>	<b>\$1.25</b>	<b>\$3.75</b>	<b>\$1.24</b>	<b>\$4.99</b>
<b>INSTALLATION</b>		<b>\$0.47</b>	<b>\$2.33</b>	<b>\$0.03</b>	<b>\$2.83</b>		<b>\$2.83</b>	<b>\$0.93</b>	<b>\$3.76</b>
<b>WIRING ADDITIONS</b>									
WIRE (2)	\$0.11				\$0.11	\$0.06	\$0.17	\$0.05	\$0.22
TERMINAL SOCKET - SOLDER (2)	\$0.23				\$0.23	\$0.12	\$0.35	\$0.11	\$0.46
CONNECTOR (1)	\$0.14				\$0.14	\$0.07	\$0.21	\$0.07	\$0.28
ASSEMBLY LABOR		\$0.01	\$0.03		\$0.04	\$0.02	\$0.06	\$0.02	\$0.08
<b>TOTAL WIRING ADDITIONS</b>	<b>\$0.48</b>	<b>\$0.01</b>	<b>\$0.03</b>		<b>\$0.52</b>	<b>\$0.26</b>	<b>\$0.78</b>	<b>\$0.26</b>	<b>\$1.04</b>
<b>TOTAL VARIABLE MFG. COST</b>	<b>\$1.80</b>	<b>\$0.91</b>	<b>\$3.51</b>	<b>\$0.11</b>	<b>\$6.33</b>				
<b>TOTAL MANUFACTURING COSTS</b>					<b>\$6.33</b>	<b>\$1.75</b>	<b>\$8.08</b>		
<b>WHOLESALE PRICE (DEALER COST)</b>							<b>\$8.08</b>	<b>\$2.67</b>	<b>\$10.75</b>
<b>DEALER MARKUP</b>									<b>\$1.18</b>
<b>RETAIL PRICE</b>									<b>\$11.93</b>

3.

Finally, it should be noted that the use of German material costs, labor costs, and production economies of scale would nearly double the retail price impact to approximately \$20.

**Table II - 2** presents the derivation of NHTSA'S estimate of \$ **18.89** as the incremental retail price associated with adding a Mercedes - Benz "Sensormat" type detection switch and supporting systems to a typical U.S. light duty vehicle. **The increase of \$ 6.96 over the configuration shown in Table - 1 is accounted for exclusively by upgrades required of U.S. type air bag control modules to accommodate the "Sensormat" and associated supporting hardware.** In addition, allowance had to be made for the variety of front seating configurations available in domestic light vehicles (e.g. bucket, split bench, and bench). Thus, more than one switch pad size would have to be provided for.

The retail price impacts shown in Table II -1 and Table II - 2 are calculated according to the following formulae :

**Supplier variable costs X 1.5 = Cost to the vehicle manufacturer**

**Cost to vehicle manufacturer X 1.33 = Wholesale (Dealer) cost.**

**Dealer cost X 1.11 = Retail price equivalent**

These mark-up rates have been developed by financial analysis of vehicle manufacturer and Tier - 1 supplier income statements as well as contractor inputs over a period of 22 years.

**Table II - 3** presents the derivation of the retail price estimate of **\$10.87** for the switch pad, installation labor and wiring changes exclusive of the air bag control module. The same mark-up factors used above apply.

**Table II - 4** provides a detailed bill-of-material for a Mercedes - Benz air bag control module. The estimated \$ **145.07** is based on the same analytical assumptions as above.

**TABLE II-2 OCCUPANT DETECTION SWITCH AND SYSTEM SUPPORT  
MERCEDES - BENZ TYPE DESIGN MODIFICATIONS FOR DOMESTIC PRODUCTION**

<b>COST ELEMENTS INCREMENTAL (DECREMRNTAL)</b>	<b>DIRECT MATERIAL</b>	<b>DIRECT LABOR</b>	<b>VARIABLE BURDEN</b>	<b>SCRAP ALLOWANCE</b>	<b>VARIABLE MFG. COSTS</b>	<b>FIXED , OTH. + PROFIT</b>	<b>COST TO VEHICLE MFR</b>	<b>OTHER COST + PROFIT</b>	<b>WHOLESALE (DEALER COST)</b>
<b>CONTROL MODULE</b>									
PC BOARD (1)	\$3.29	\$0.07	\$0.19		\$3.55	\$1.78	\$5.33	\$1.76	\$7.08
CASE-MODULE (1)	\$0.01	\$0.01	\$0.01		\$0.03	\$0.02	\$0.05	\$0.01	\$0.06
COVER PLATE (1)	\$0.02				\$0.02	\$0.01	\$0.03	\$0.01	\$0.04
SCREWS & LABELS	\$0.01				\$0.01	\$0.01	\$0.02	\$0.00	\$0.02
ASSEMBLY LABOR		\$0.01	\$0.01		\$0.02	\$0.01	\$0.03	\$0.01	\$0.04
<b>TOTAL CONTROL MODULE</b>	<b>\$3.33</b>	<b>\$0.09</b>	<b>\$0.21</b>		<b>\$3.63</b>	<b>\$1.82</b>	<b>\$5.45</b>	<b>\$1.80</b>	<b>\$7.24</b>
<b>SWITCH PAD</b>									
PIGTAIL - PRESSURE PAD (1)									
WIRE (2)	\$0.03				\$0.03	\$0.02	\$0.05	\$0.01	\$0.06
TERMINAL-STAPLE (2)	\$0.09				\$0.09	\$0.05	\$0.14	\$0.04	\$0.18
TERMINAL PIN - SOLDER (2)	\$0.19				\$0.19	\$0.10	\$0.29	\$0.09	\$0.38
CONNECTOR (1)	\$0.14				\$0.14	\$0.07	\$0.21	\$0.07	\$0.28
ASSEMBLY	\$0.01	\$0.10	\$0.09		\$0.20	\$0.10	\$0.30	\$0.10	\$0.40
RESISTOR (1)	\$0.01				\$0.01	\$0.01	\$0.02	\$0.00	\$0.02
TERMINAL-STAPLE (2)	\$0.09				\$0.09	\$0.05	\$0.14	\$0.04	\$0.18
ASSEMBLY COST	\$0.49	\$0.26	\$0.92	\$0.08	\$1.75	\$0.88	\$2.63	\$0.87	\$3.49
<b>TOTAL SWITCH PAD</b>	<b>\$1.05</b>	<b>\$0.36</b>	<b>\$1.01</b>	<b>\$0.08</b>	<b>\$2.50</b>	<b>\$1.25</b>	<b>\$3.75</b>	<b>\$1.24</b>	<b>\$4.99</b>
<b>INSTALLATION</b>		<b>\$0.47</b>	<b>\$2.33</b>	<b>\$0.03</b>	<b>\$2.83</b>		<b>\$2.83</b>	<b>\$0.93</b>	<b>\$3.76</b>
<b>WIRING ADDITIONS</b>									
WIRE (2)	\$0.11				\$0.11	\$0.06	\$0.17	\$0.05	\$0.22
TERMINAL SOCKET - SOLDER (2)	\$0.23				\$0.23	\$0.12	\$0.35	\$0.11	\$0.46
CONNECTOR (1)	\$0.14				\$0.14	\$0.07	\$0.21	\$0.07	\$0.28
ASSEMBLY LABOR		\$0.01	\$0.03		\$0.04	\$0.02	\$0.06	\$0.02	\$0.08
<b>TOTAL WIRING ADDITIONS</b>	<b>\$0.48</b>	<b>\$0.01</b>	<b>\$0.03</b>		<b>\$0.52</b>	<b>\$0.26</b>	<b>\$0.78</b>	<b>\$0.26</b>	<b>\$1.04</b>
<b>TOTAL VARIABLE MFG. COST</b>	<b>\$4.86</b>	<b>\$0.93</b>	<b>\$3.58</b>	<b>\$0.11</b>	<b>\$9.48</b>				
<b>TOTAL MANUFACTURING COSTS</b>					<b>\$9.48</b>	<b>\$3.33</b>	<b>\$12.81</b>		
<b>WHOLESALE PRICE (DEALER COST)</b>							<b>\$12.81</b>	<b>\$4.23</b>	<b>\$17.02</b>
<b>DEALER MARKUP</b>									<b>\$1.87</b>
<b>RETAIL PRICE</b>									<b>\$18.89</b>

5.

**TABLE II - 3 OCCUPANT DETECTION SWITCH PAD, INSTALLATION LABOR, & WIRING HARNESS  
MERCEDES - BENZ DESIGN**

<b>COST ELEMENTS INCREMENTAL (DECREMRNTAL)</b>	<b>DIRECT MATERIAL</b>	<b>DIRECT LABOR</b>	<b>VARIABLE BURDEN</b>	<b>SCRAP ALLOWANCE</b>	<b>VARIABLE MFG. COSTS</b>	<b>FIXED , OTHER + PROFIT</b>	<b>COST TO VEHICLE MFR</b>	<b>OTHER COST + PROFIT</b>	<b>WHOLESALE (DEALER COST)</b>
<b>ADDITIONS : (QTY)</b>									
<b>SWITCH PAD</b>									
PIGTAIL - PRESSURE PAD (1)									
WIRE (2)	\$0.03				\$0.03	\$0.02	\$0.05	\$0.01	\$0.06
TERMINAL-STAPLE (2)	\$0.09				\$0.09	\$0.05	\$0.14	\$0.04	\$0.18
TERMINAL PIN - SOLDER (2)	\$0.19				\$0.19	\$0.10	\$0.29	\$0.09	\$0.38
CONNECTOR (1)	\$0.14				\$0.14	\$0.07	\$0.21	\$0.07	\$0.28
ASSEMBLY	\$0.01	\$0.10	\$0.09		\$0.20	\$0.10	\$0.30	\$0.10	\$0.40
RESISTOR (1)	\$0.01				\$0.01	\$0.01	\$0.02	\$0.00	\$0.02
TERMINAL-STAPLE (2)	\$0.09				\$0.09	\$0.05	\$0.14	\$0.04	\$0.18
ASSEMBLY COST	\$0.49	\$0.26	\$0.92	\$0.08	\$1.75	\$0.88	\$2.63	\$0.87	\$3.49
<b>TOTAL SWITCH PAD</b>	<b>\$1.05</b>	<b>\$0.36</b>	<b>\$1.01</b>	<b>\$0.08</b>	<b>\$2.50</b>	<b>\$1.25</b>	<b>\$3.75</b>	<b>\$1.24</b>	<b>\$4.99</b>
<b>INSTALLATION</b>		<b>\$0.47</b>	<b>\$2.33</b>	<b>\$0.03</b>	<b>\$2.83</b>		<b>\$2.83</b>	<b>\$0.93</b>	<b>\$3.76</b>
<b>WIRING ADDITIONS</b>									
WIRE (2)	\$0.11				\$0.11	\$0.06	\$0.17	\$0.05	\$0.22
TERMINAL SOCKET - SOLDER (2)	\$0.23				\$0.23	\$0.12	\$0.35	\$0.11	\$0.46
CONNECTOR (1)	\$0.14				\$0.14	\$0.07	\$0.21	\$0.07	\$0.28
ASSEMBLY LABOR		\$0.01	\$0.03		\$0.04	\$0.02	\$0.06	\$0.02	\$0.08
<b>TOTAL WIRING ADDITIONS</b>	<b>\$0.48</b>	<b>\$0.01</b>	<b>\$0.03</b>		<b>\$0.52</b>	<b>\$0.26</b>	<b>\$0.78</b>	<b>\$0.26</b>	<b>\$1.04</b>
<b>TOTAL VARIABLE MFG. COST</b>	<b>\$1.53</b>	<b>\$0.84</b>	<b>\$3.37</b>	<b>\$0.11</b>	<b>\$5.85</b>				
<b>TOTAL MANUFACTURING COSTS</b>					<b>\$5.85</b>	<b>\$1.51</b>	<b>\$7.36</b>		
<b>WHOLESALE PRICE (DEALER COST)</b>							<b>\$7.36</b>	<b>\$2.43</b>	<b>\$9.79</b>
<b>DEALER MARKUP</b>									<b>\$1.08</b>
<b>RETAIL PRICE</b>									<b>\$10.87</b>

6.

TABLE II-4 MERCEDES-BENZ AIR BAG CONTROL MODULE

COST ELEMENTS INCREMENTAL (DECREMRNTAL)		DIRECT MATERIAL	DIRECT LABOR	VARIABLE BURDEN	SCRAP ALLOWANCE	VARIABLE MFG. COSTS	FIXED, OTHER + PROFIT	COST TO VEHICLE MFR	OTHER COST + PROFIT	WHOLESALE (DEALER COST)
ADDITIONS :	(QTY)									
MODULE										
BOARD	(1)	\$1.06				\$1.06	\$0.53	\$1.59	\$0.52	\$2.11
CAPACITOR	(7)	\$1.13				\$1.13	\$0.57	\$1.70	\$0.56	\$2.25
CAPACITOR	(1)	\$0.07				\$0.07	\$0.04	\$0.11	\$0.03	\$0.14
CAPACITOR SM	(4)	\$0.06				\$0.06	\$0.03	\$0.09	\$0.03	\$0.12
RESISTOR	(40)	\$0.24				\$0.24	\$0.12	\$0.36	\$0.12	\$0.48
RESISTOR	(47)	\$0.19				\$0.19	\$0.10	\$0.29	\$0.09	\$0.38
DIODE	(2)	\$0.24				\$0.24	\$0.12	\$0.36	\$0.12	\$0.48
DIODE	(6)	\$0.70				\$0.70	\$0.35	\$1.05	\$0.35	\$1.40
DIODE	(2)	\$0.24				\$0.24	\$0.12	\$0.36	\$0.12	\$0.48
ZENER	(1)	\$0.03				\$0.03	\$0.02	\$0.05	\$0.01	\$0.06
POWER L	(2)	\$3.28				\$3.28	\$1.64	\$4.92	\$1.62	\$6.54
IC	(1)	\$10.90				\$10.90	\$5.45	\$16.35	\$5.40	\$21.75
IC	(1)	\$13.82				\$13.82	\$6.91	\$20.73	\$6.84	\$27.57
IC	(1)	\$17.28				\$17.28	\$8.64	\$25.92	\$8.55	\$34.47
RELAY	(1)	\$3.76				\$3.76	\$1.88	\$5.64	\$1.86	\$7.50
RELAY	(1)	\$5.16				\$5.16	\$2.58	\$7.74	\$2.55	\$10.29
CONNECTOR	(1)	\$1.57				\$1.57	\$0.79	\$2.36	\$0.78	\$3.13
ASSEMBLY COST		\$0.01	\$1.41	\$3.14	\$0.05	\$4.61	\$2.31	\$6.92	\$2.28	\$9.20
CASE-MODULE	(1)	\$0.21	\$0.33	\$0.50	\$0.03	\$1.07	\$0.54	\$1.61	\$0.53	\$2.13
COVER PLATE	(1)	\$0.03	\$0.01	\$0.01		\$0.05	\$0.03	\$0.08	\$0.02	\$0.10
SCREW	(5)	\$0.03				\$0.03	\$0.02	\$0.05	\$0.01	\$0.06
LABEL	(1)	\$0.01				\$0.01	\$0.01	\$0.02	\$0.00	\$0.02
LABEL	(1)	\$0.01				\$0.01	\$0.01	\$0.02	\$0.00	\$0.02
<b>TOTAL VARIABLE MFG. COSTS</b>		<b>\$60.03</b>	<b>\$1.75</b>	<b>\$3.65</b>	<b>\$0.08</b>	<b>\$65.51</b>				
<b>TOTAL MANUFACTURING COSTS</b>						<b>\$65.51</b>	<b>\$32.76</b>	<b>\$98.27</b>		
<b>WHOLESALE PRICE (DEALER COST)</b>								<b>\$98.27</b>	<b>\$32.43</b>	<b>\$130.69</b>
<b>DEALER MARKUP</b>										<b>\$14.38</b>
<b>RETAIL PRICE</b>										<b>\$145.07</b>

7.

**Table II - 5** presents the bill of material with the changes required to accommodate more pins, wiring, and multiple switch pad sizes. These changes add an estimated \$ 8.04 to the price of this particular module using Detroit labor rates, U.S. supplier prices, and domestic economies of scale.

**Estimated tooling investment is \$ 134,912 for both of the system configurations analyzed in this study. If amortized over three years and 250,000 units per year, the per unit impact is \$ 0.18 . Machinery and equipment investment is estimated to be \$ 1,514,256 which if depreciated over seven years at 250,000 units per year amounts to \$ 1.16 per unit. All of these estimates are based on U.S. capital equipment costs.**

**Incremental weight is estimated to be 3.7 oz.**

**Required lead time per vehicle model line is estimated to be 22 months industry-wide. Full implementation could require as much as five (5) years to equip the entire light duty vehicle fleet.**