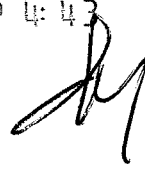


OFFICE OF DEFECTS &  
RECALLS

2014 NOV 24 P 4:43

November 21, 2014



Mr. Scott Yon  
Chief, Vehicle Integrity Division  
Office of Defects Investigation  
National Highway Traffic Safety Administration  
1200 New Jersey Avenue, SE  
Washington, D.C. 20590

RE: Additional NHTSA Questions: NVS-212eer, PE14-023

Dear Mr. Yon:

On November 6, 2014, NHTSA requested additional information regarding Hyundai's responses to the above referenced Information Request ("IR"). The questions and Hyundai's responses are provided below.

Question 1

Explain the differences between the single and dual pretensioners. This includes a description of the buckle pretensioner and the retractor pretensioners (how they are separate, what triggers them, etc.) and how the vehicle performs with and without the buckle pretensioner.

**Response to Question 1:**

- The 2006 through 2008 model year Hyundai Sonata incorporates pretensioners in the driver and front passenger seat belt retractor assemblies. Additionally, pretensioners are incorporated in the driver and front passenger seat belt buckle assemblies. The seat belt pretensioners in the 2006-2008 Hyundai Sonata are pyrotechnic devices designed to help manage occupant energy in a collision. The pretensioners are activated by the force generated from gas emission; the force of the gas causes the seat belt webbing to rapidly retract during a collision.
  - The "single pretensioner" terminology in the Hyundai responses refers to a vehicle incorporating pretensioners only in the driver and front passenger seat belt retractor assemblies. The retractor pretensioner winds seat belt webbing back into the retractor

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## Hyundai Motor America

housing during a collision, helping to remove seat belt slack.

- The “dual pretensioner” terminology in the Hyundai responses refers to a vehicle incorporating pretensioners in both driver and front passenger seat belt retractor and seat belt buckle assemblies.

The pretensioners in the seat belt retractor and seat belt buckle assemblies are both controlled by the SRS Control Module but utilize separate wiring and connectors. The seat belt retractor pretensioner circuitry and operation is not affected by the seat belt buckle pretensioner connector or circuitry. Simulation testing by Hyundai indicates the vehicle maintains a “5 Star” NCAP rating with a single pretensioner configuration.

- Attachment A provides a brief description of the pretension assemblies from the 2008 Sonata shop manual and the related wiring diagram and circuit schematics.
- Attachment B provides additional technical information regarding the seat belt buckle pretensioner.

Attachment B has been provided to the Office of Chief Counsel with a request for treatment as Confidential Business Information.

- Attachment C provides information related to NCAP simulation testing comparing single and dual pretensioner-equipped vehicles. As previously stated, the simulation demonstrates the performance of a vehicle with a single retractor pretensioner maintains a NCAP “5 star” rating

### Question 2

Why did Hyundai choose to use the dual pretensioners?

### **Response to Question 2:**

During the development of the 2006 “NF” Sonata, Hyundai engineers reviewed crash test reports and simulations and chose to utilize pretensioners in the seat belt buckle assemblies in addition to retractor assemblies. This provided an additional margin when it ran a New Car Assessment Program (NCAP) 5 star rating simulation. That simulation documentation was previously provided.

**Hyundai Motor America**

Question 3

Did Hyundai continue to use this design for MY2009 and beyond?

**Response to Question3:**

In regard to the NF platform Hyundai Sonata, the 2009 through 2010 model year “facelift” (F/L) Hyundai Sonata did not utilize pretensioners in the seat belt buckles. 2010 was the last year for the NF Sonata platform, and the Sonata was redesigned for MY 2011.

Sincerely,

A handwritten signature in cursive script that reads "Steve Johnson".

Steve Johnson  
Director, Engineering and Design Analysis

Attachments:

Attachment A  
Attachment B  
Attachment C

PE14-023

ATTACHMENT A

2008 SONATA SHOP MANUAL

## SEAT BELT PRETENSIONER

### SEAT BELT PRETENSIONER

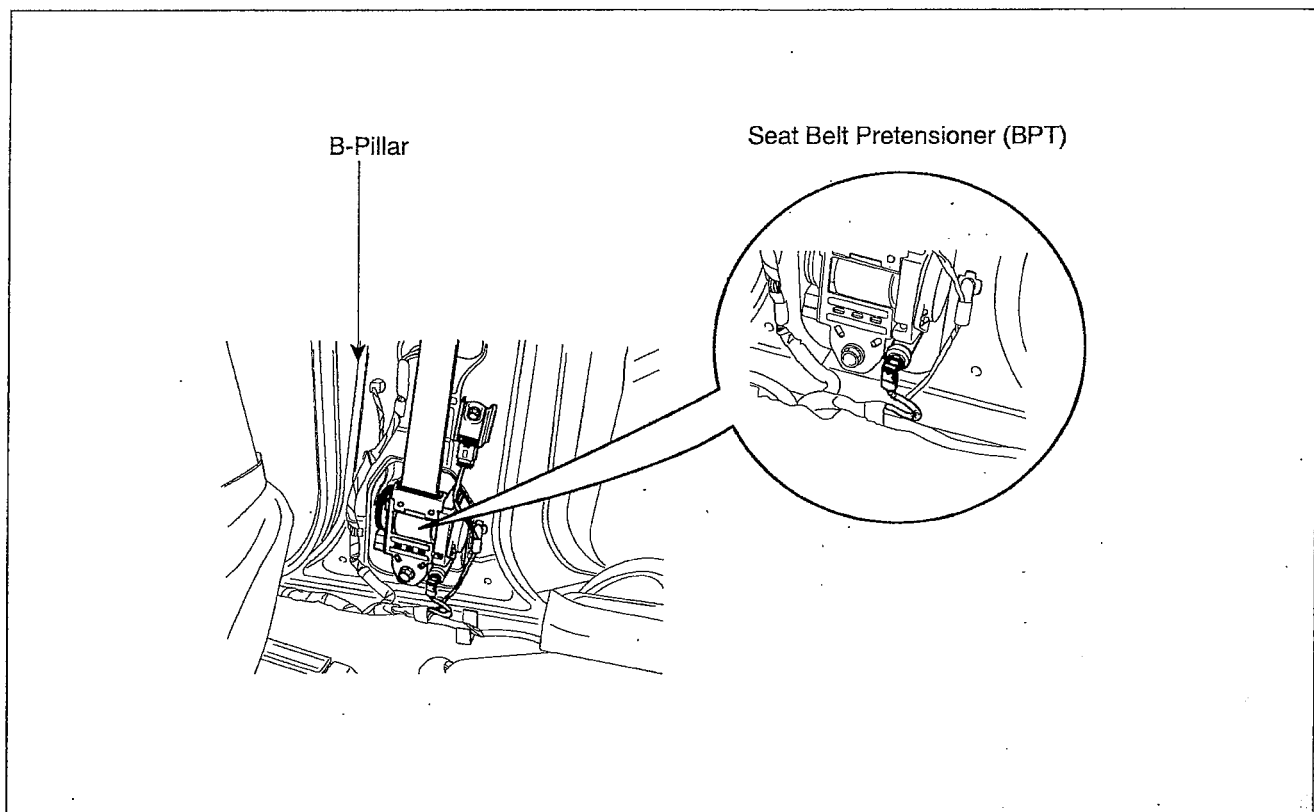
#### DESCRIPTION E526F07B

The Seat Belt Pretensioners (BPT) are installed inside B-Pillar (LH & RH). When a vehicle crashes with a certain degree of frontal impact, the pretensioner seat belt helps to reduce the severity of injury to the front seat occupants by retraction the seat belt webbing. This prevents the front occupants from thrusting forward and hitting the steering wheel or the instrument panel when the vehicle crashes.

#### CAUTION

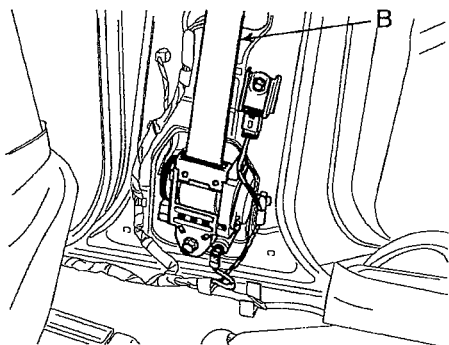
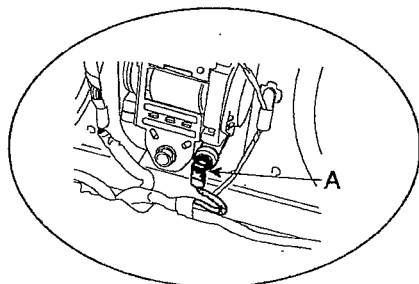
- *Never attempt to measure the circuit resistance of the Seat Belt Pretensioner (BPT) even if you are using the specified tester. If the circuit resistance is measured with a tester, the pretensioner will be ignited accidentally. This will result in serious personal injury.*
- *Both the seat belt and the seat belt buckle must be replaced if they worn during an accident, even if the pretensioners did not deploy.*

#### COMPONENTS EC262A4B



**REMOVAL** E2B51176**SEAT BELT PRETENSIONER**

1. Disconnect the battery negative cable, and wait at least three minutes before beginning work.
2. Remove the front seat assembly (Refer to BD group - seat)
3. Remove the front door scuff trim (Refer to BD group - interior)
4. Remove the center pillar trim (Refer to BD group - interior)
5. Remove the lower anchor bolt (Refer to BD group - belt)
6. Remove the upper anchor bolt (Refer to BD group - belt)
7. Disconnect the connector (A).
8. Loosen the mounting bolt.  
Remove the pretensioner (B).



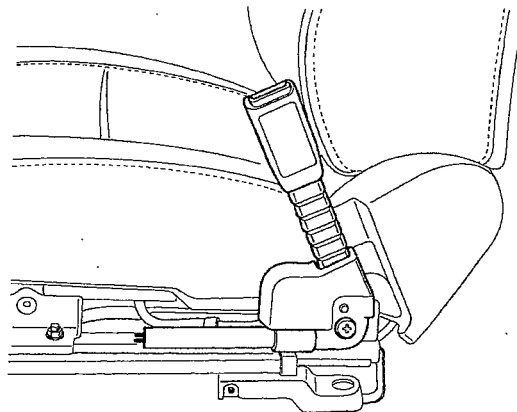
9. Installation is the reverse of removal.

**NOTE**

After installing the belt pretensioner, confirm proper system operation: Turn the ignition switch ON: the SRS indicator light should turn on about six seconds and then go off.

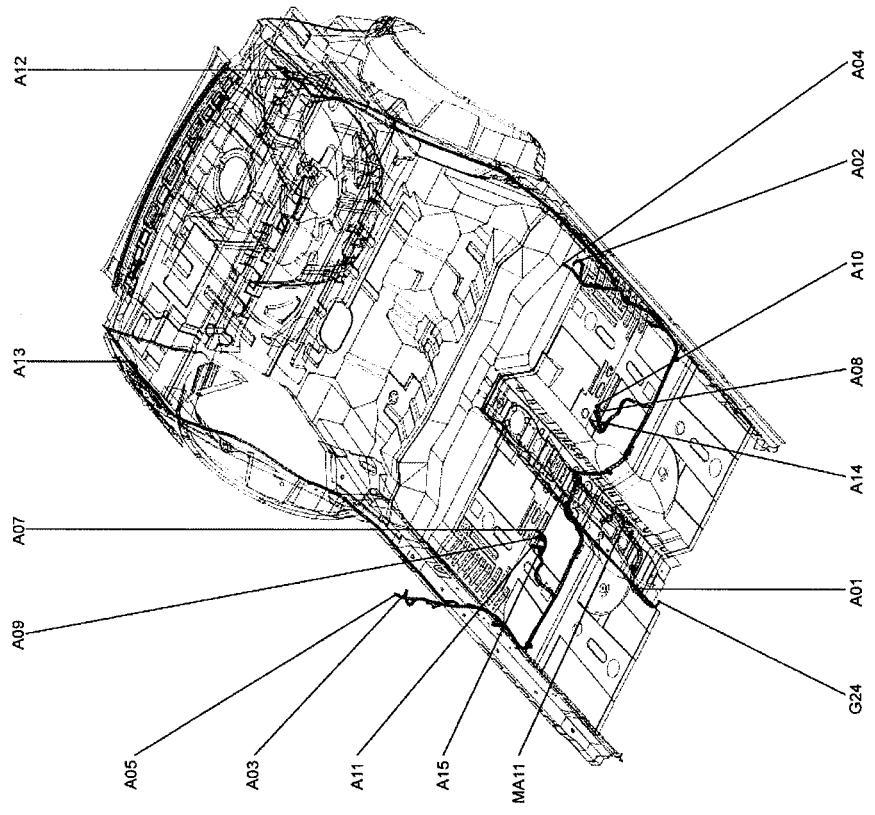
**SEAT BELT BUCKLE PRETENSIONER**

1. Disconnect the (-) battery cable and wait at least three minutes before beginning work.
2. Remove the front seat assembly (Refer to BD group - seat)
3. Remove the buckle pretensioner bolt.



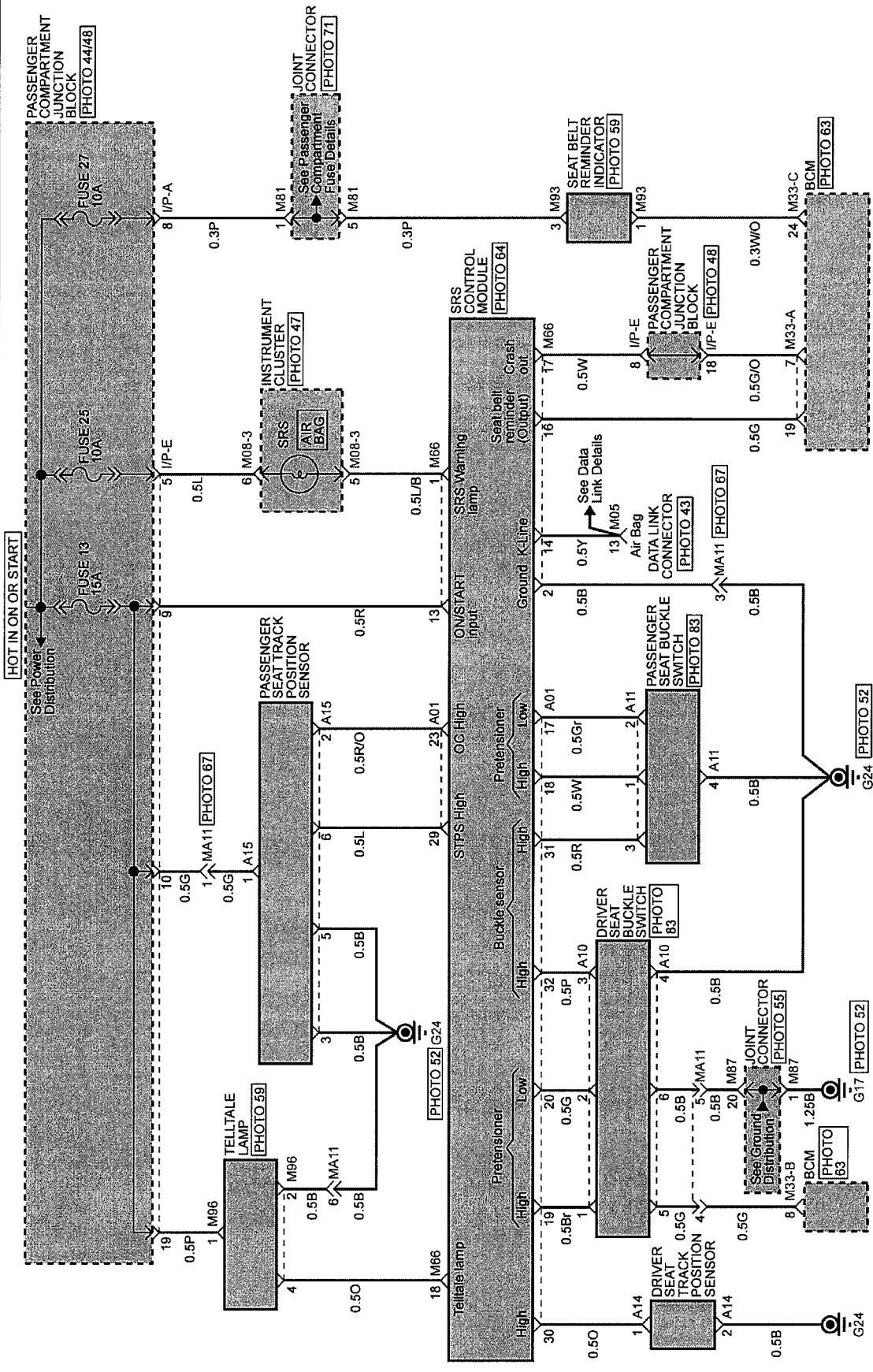
KRB110B

4. Remove the seat belt buckle pretensioner.
5. Installation is the reverse of removal.

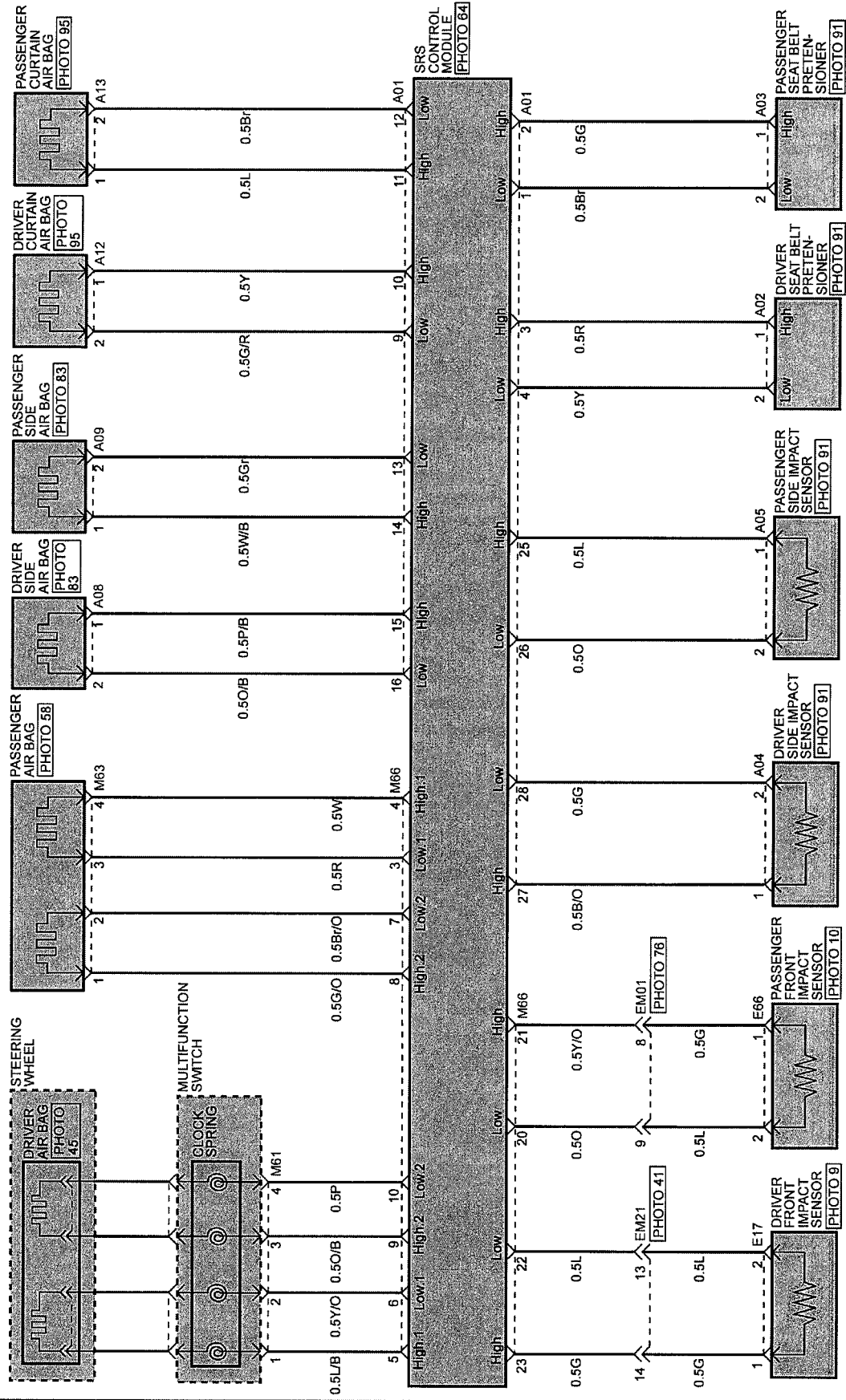


# AIR BAG SYSTEM (SRS) (1)

SD569-1







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Attachment B  
Hyundai Response to  
Additional Questions

PE14-023

November, 2014

# Differences and Characteristics

## Belt Retractor Pretensioner and Buckle Pretensioner

- Generally, the retractor pretensioner effect is dominant over the protection by the buckle pretensioner
- Addition of a buckle pretensioner can supplement the effectiveness provided by the seat belt

	Retractor Pretensioner	Buckle Pretensioner
Pretension	<p>Load</p> <p>Time</p> <p>Tension</p>	<p>Limited by buckle travel ( [REDACTED] mm)</p> <p>Pretension is complete in [REDACTED] ms.</p> <p>Lap belt is tensioner primarily</p>
Restraint effects	<p>Pretensions up to the maximum pretensioner capacity ([REDACTED] of webbing)</p> <p>Webbing starts moving in [REDACTED] ms after deployment signal. Pretension is complete in [REDACTED] ms.</p> <p>Shoulder belt is tensioner primarily</p> <p>Restrains upper torso and hips; primarily affects upper torso.</p>	<p>Supplements hip restraint</p>
Comparison of effect on occupant protection	<ul style="list-style-type: none"> <li>• For vehicles with limited space for head and chest areas to move, a retractor pretensioner is preferable</li> <li>• Addition of a buckle pretensioner supplements lower limb protection.</li> <li>• Pretension stroke is limited with buckle pretensioners, limiting their effectiveness</li> </ul>	

Page 3

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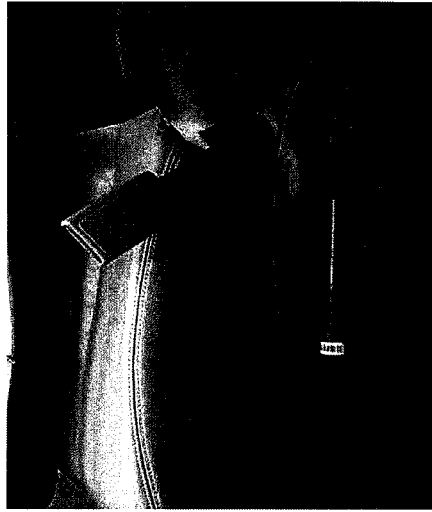
Page 4

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# NF / NF FL

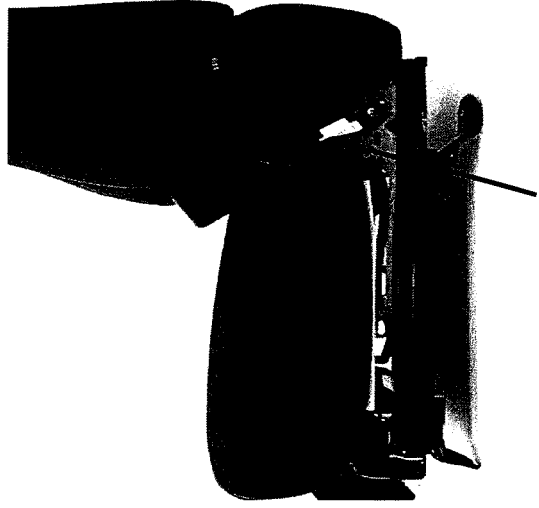
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2006-2008 Hyundai Sonata



Buckle Pretensioner

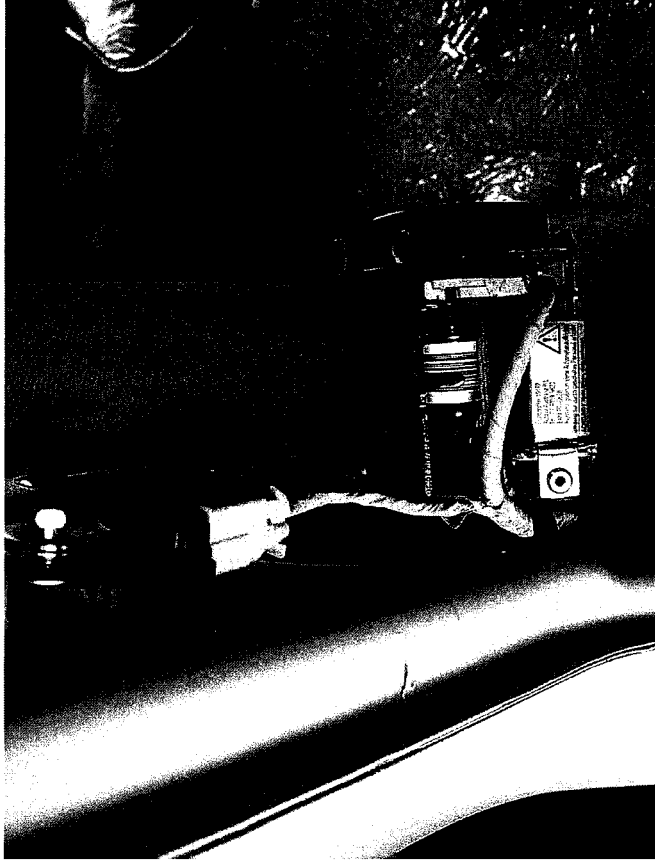
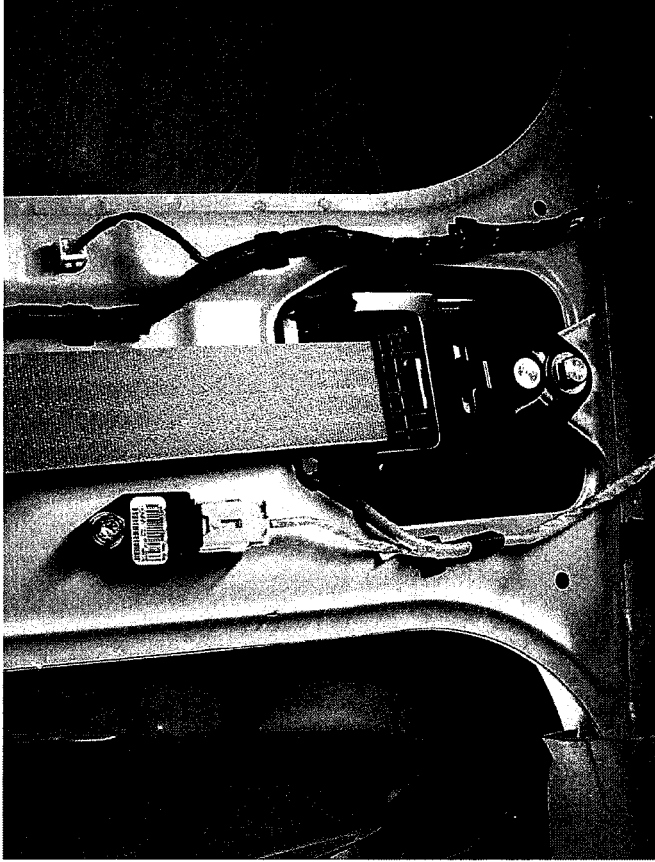
2009-2010 Hyundai Sonata



No Buckle Pretensioner

# Seatbelt Retractor Pretensioner

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Attachment C  
Hyundai Response to  
Additional Questions

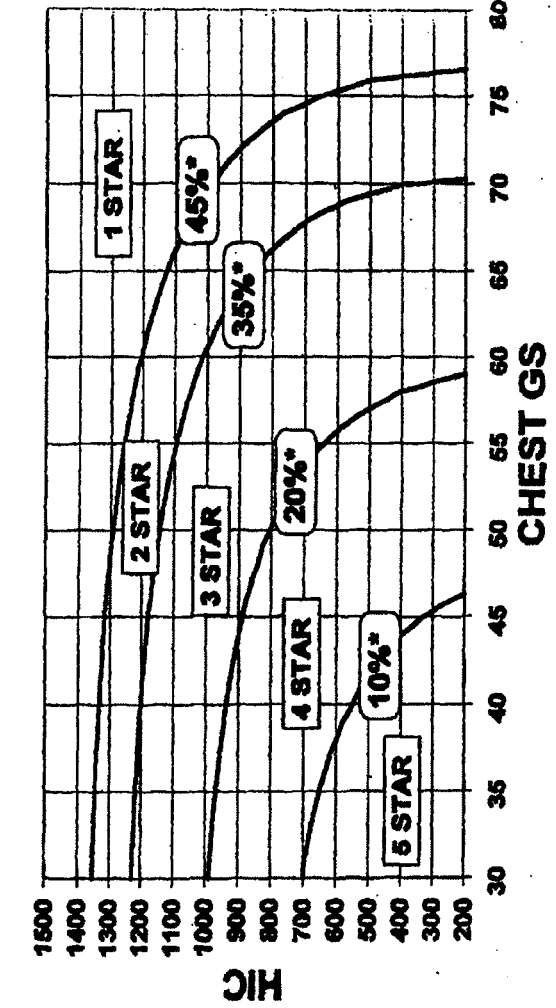
PE14-023

November, 2014



# NF F/L 56kph NCAP Test Result Review

Test Condition		Specification		Injury Value		RATING	Remarks
				HIC	CHEST G		
Driver Side	Engine	Driver Airbag	S/BELT	HIC	CHEST G		
NF	⊕2.4	Φ40,T10"	DUAL PT	268	43	8.5%(★5)	Compliant Test Pass
NF FL	↑	↑	SINGLE PT	311	44	9.3%(★5)	Compliant Test Pass



\* DUAL PT : Retractor PT + Buckle PT  
 \* SINGLE PT : Retractor PT  
 •HIC : Head Injury Criteria  
 •Φ40,T10 = 40mm vent hole, 10 inch teather