

Melton v GM

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Summary

- Obtained ignition switches from third-parties as well as from salvage yard steering columns
- Conducted ignition switch torque analysis both in-vehicle and on lab bench
- Torque analysis conducted using two methods:
 - Torque gauge to measure maximum torque for given position bounds (e.g., run/acc)
 - Torque transducer and linear potentiometer to measure torque vs angle
- Ignition switch torque analysis revealed certain ignition switches did not meet specifications
- X-Ray and ignition switch inspections revealed a design change in ignition switch part #10392423 between 2006 and 2007 MY Cobalts
- Analyzed warranty repair data for BCM and ignition switch/steering column repairs

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Cobalt and ION Ignition Switch Torque Analysis

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Torque Analysis Summary

- Obtained ignition switches from third-parties as well as from steering columns found in salvage yards
- Conducted ignition switch torque analysis using two methods:
 1. Used torque gauge to measure maximum torque for given position bounds (e.g., run/acc)
 - Testing was performed both in-vehicle and on lab bench. Did not observe significant differences in torque measurements.
 2. Used torque transducer and linear potentiometer to measure torque vs angle for entire ignition switch range of rotation
 - Testing was performed on lab bench only.
- Torque analysis revealed certain ignition switches from 05-06 Cobalts and 03 ION did not meet specifications

Steering Columns/Ignition Switches Obtained from Salvage Yards

Model	Year	# Steering Columns Obtained
Cobalt	2005	5
	2006	4
	2007	4
	2008	3
	2009	2
ION	2003	2
	2004	2
	2005	2
	2006	3
	2007	1
HHR	2006	2
	2007	2
Solstice	2006	1
	2007	2
G5	2007	2
Total	-	37



Torque Gauge Measurements (Steering Columns from Salvage Yards)

Model Year	Model & VIN	P/N	Cap Size	Off to Acc (N-cm)	Acc to Run (N-cm)	Run to Start (N-cm)	Run to Acc (N-cm)	Acc to Off (N-cm)
2005	Cobalt VIN 1306	10392423	Short	2.8	7.4	50.9	-6.0	-6.7
2005	Cobalt VIN 2380	10392423	Short	3.2	7.8	48.0	-7.8	-8.1
2006	Cobalt VIN 7326	10392423	Short	2.1	7.8	50.9	-7.1	-8.1
2006	Cobalt VIN 6342	10392423	Short	2.1	8.5	50.9	-7.8	-8.5
2007	Cobalt VIN 9561	10392423	Long	3.5	19.8	50.9	-16.2	-16.2
2008	Cobalt VIN 4195	15886190	Long	5.3	19.8	48.0	-22.6	-22.6
2008	Cobalt VIN 0386	15886190	Long	4.9	17.0	48.0	-19.8	-22.6
2009	Cobalt VIN 3438	15886190	Long	3.2	19.8	53.7	-15.5	-15.9

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Torque Gauge Measurements (Cobalt Switches from Third Parties)

Model Year(s)	Manufacturer	P/N	Off to Acc (N-cm)	Acc to Run (N-cm)	Run to Start (N-cm)	Run to Acc (N-cm)	Acc to Off (N-cm)
2008-2010	AC Delco	15886190	6.0	22.6	45.2	-22.6	-22.6
2008-2010	AC Delco	15886190	6.2	22.6	45.2	-22.6	-22.6
2008-2010	Auto Parts	15886190	2.3	16.4	39.6	-14.8	-16.6
2007	AC Delco	10392423	10.6	19.8	45.2	-22.6	-20.9
2009	AC Delco	10392423	5.7	19.8	53.7	-22.0	-22.0
2005-2010	Napa Auto Parts	KS7138	6.7	19.8	50.9	-16.4	-22.6
2010	AC Delco	10392423	5.7	19.8	50.9	-22.6	-22.6
2005	Duralast	L1328	8.8	17.0	45.2	-22.0	-28.3
2008	Duralast	LS1497	6.4	17.0	42.4	-17.0	-17.0
2005	CarQuest	53-27479	6.0	28.3	56.5	-17.0	-22.6
2005, 2008	BWD	CS1138	6.4	17.0	53.7	-17.0	-28.3
2009	AC Delco	15886190	6.4	19.8	50.9	-19.8	-22.6
2010	AC Delco	1566190	5.7	19.8	53.7	-22.6	-22.6
2005	AC Delco	10392423	7.1	19.8	48.0	-22.6	-25.4
2011	AC Delco	20939745	2.1	19.8	56.5	-33.9	-22.6
2005	??	10392423	3.2	7.8	48.0	-7.8	-8.1
2008	??	15886190	4.9	17.0	48.0	-19.8	-22.6

Cobalt Switches from Salvage Yard
Steering Columns for Comparison

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Measurement Method Comparison

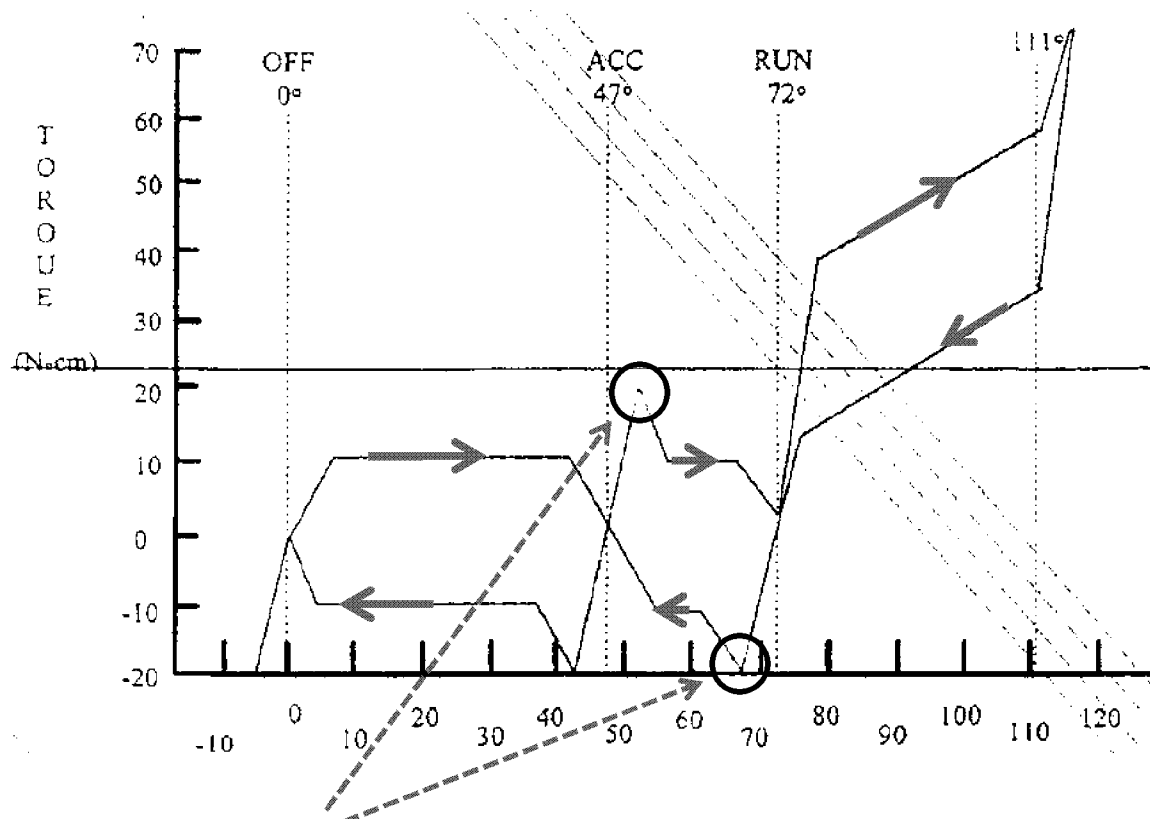
Vehicle	Acc to Run		Run to Acc	
	Torque Gauge (N-cm)	Torque + Angle DAQ (N-cm)	Torque Gauge (N-cm)	Torque + Angle DAQ (N-cm)
2006 Cobalt VIN 6342	8.5	7.7	-7.8	-6.9
2006 Cobalt VIN 7326	7.8	6.8	-7.1	-7.3
2007 Cobalt VIN 9561	19.8*	15.7	-16.2*	-15.0
2008 Cobalt VIN 4195	19.8*	18.9	-22.6*	-17.5
2009 Cobalt VIN 3438	19.8*	18.8	-15.5*	-15.3
2003 ION VIN 3016	-	10.5	-	-8.7
2005 ION VIN 7696	-	18.1	-	-16.2

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*Torque gauge used for this range of torques has lower resolution.

Specification

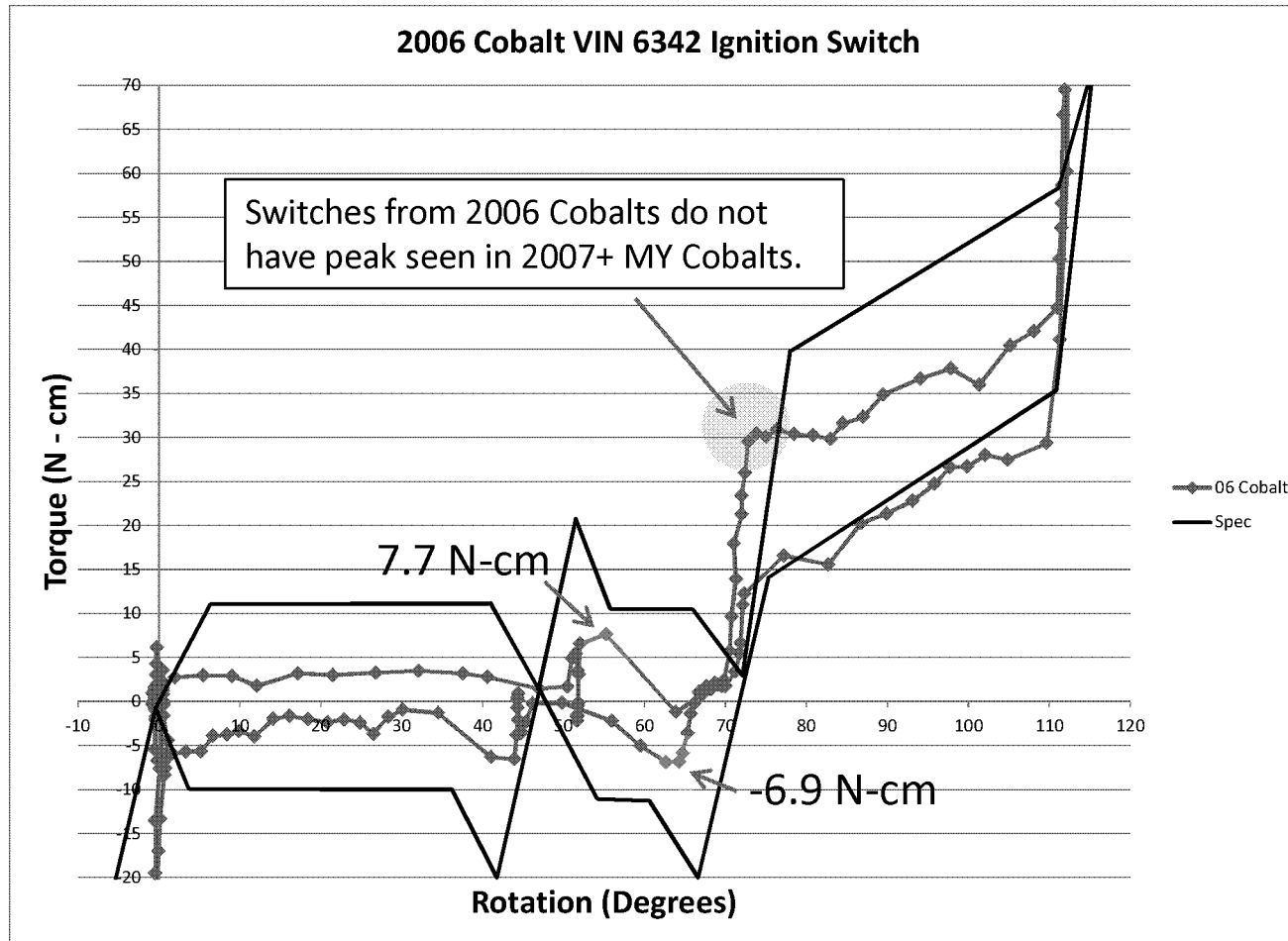


20 +/- 5 N-cm specification for

- Acc → Run
- Run → Acc

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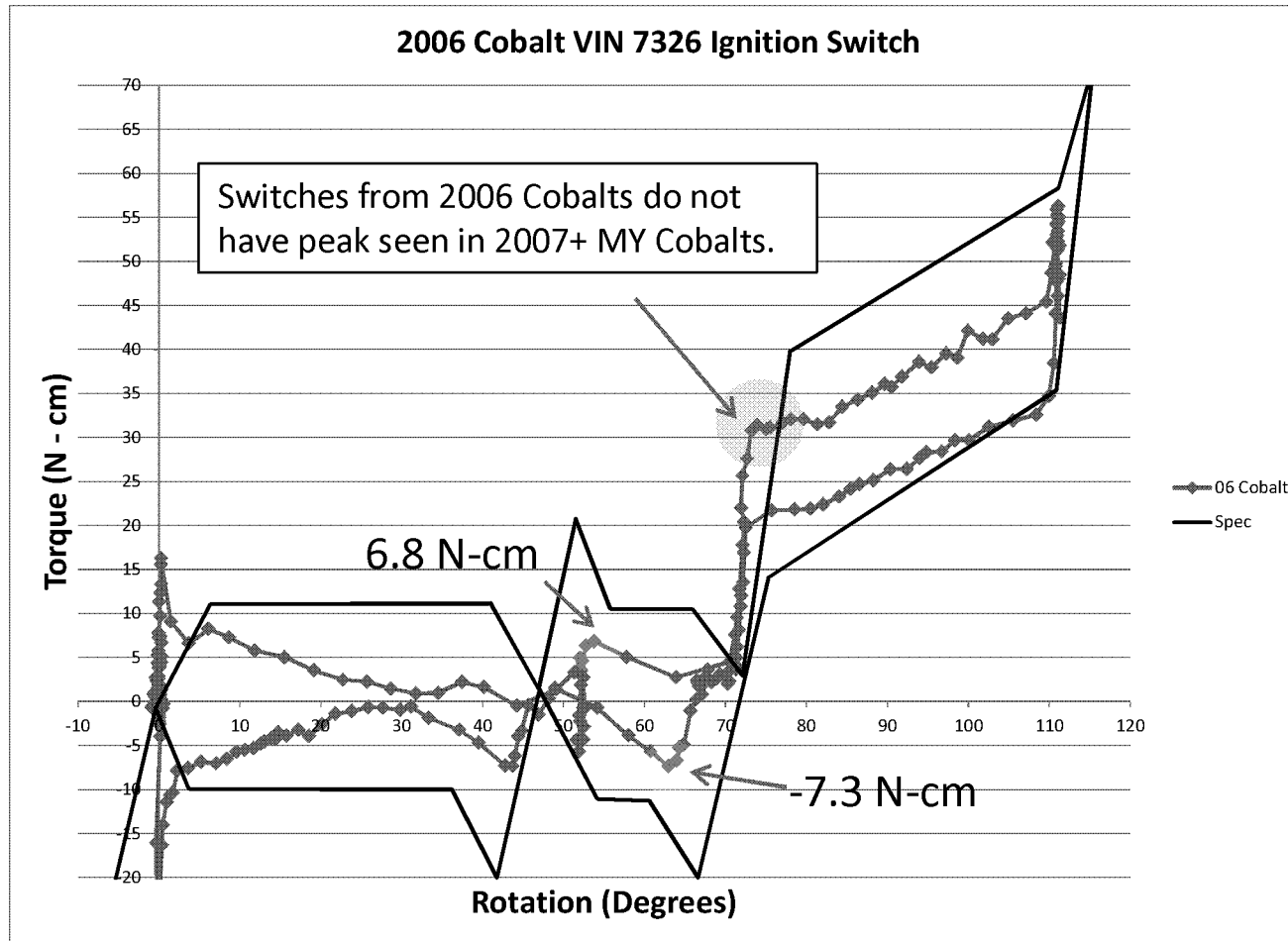
Torque vs Angle Measurements



Does not meet Run/Acc spec.

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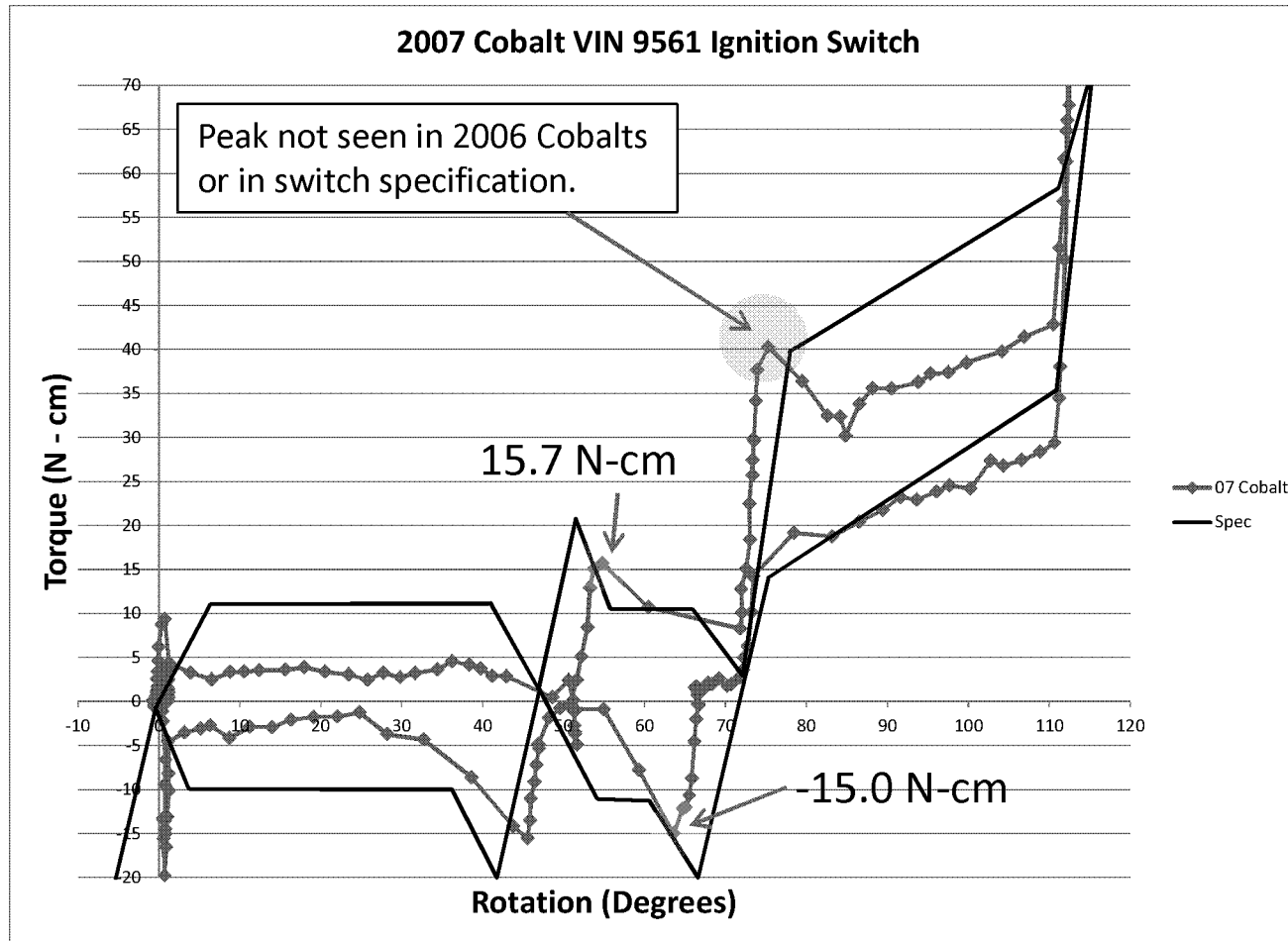
Torque vs Angle Measurements



Does not meet Run/Acc spec.

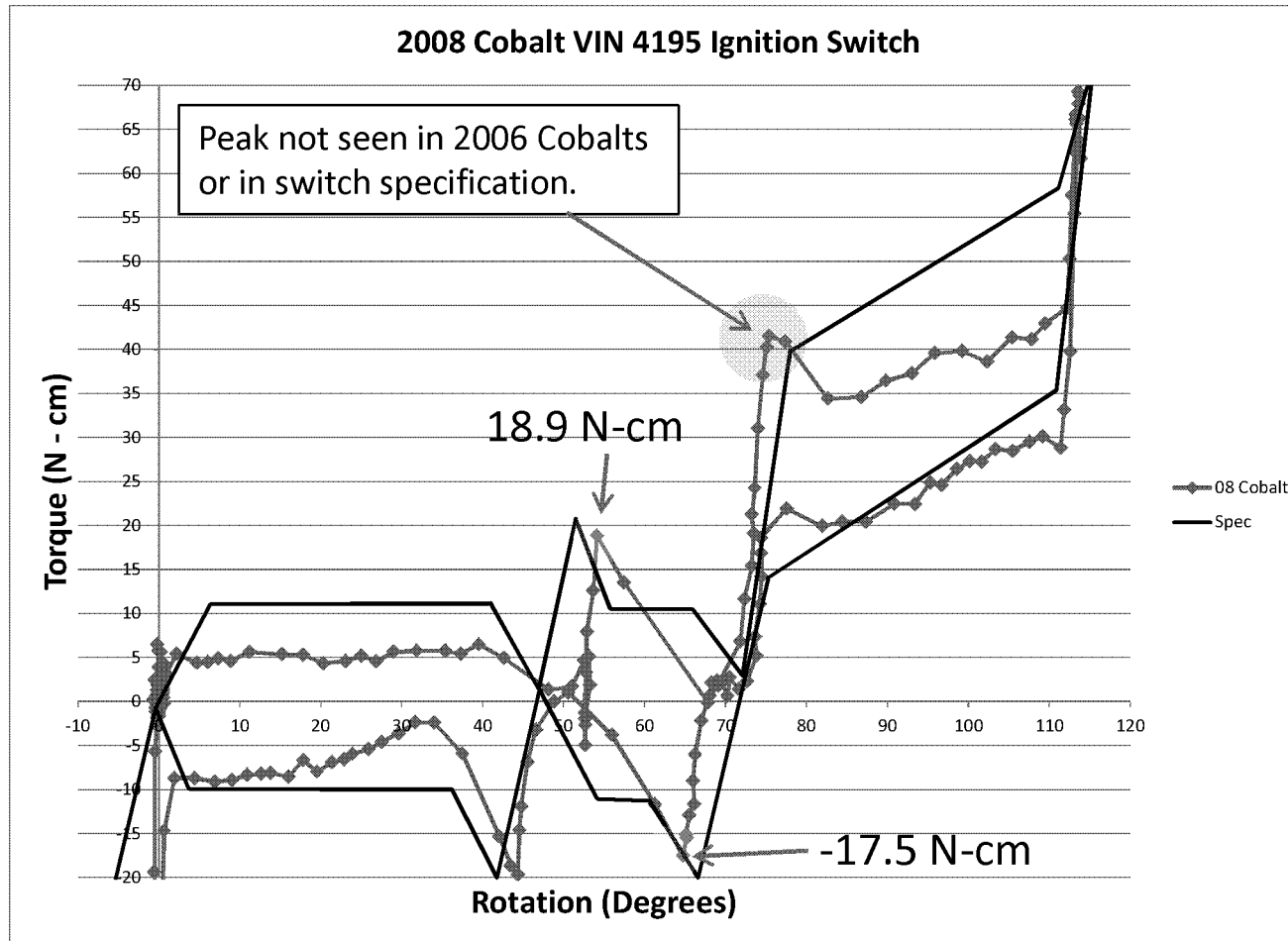
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Torque vs Angle Measurements



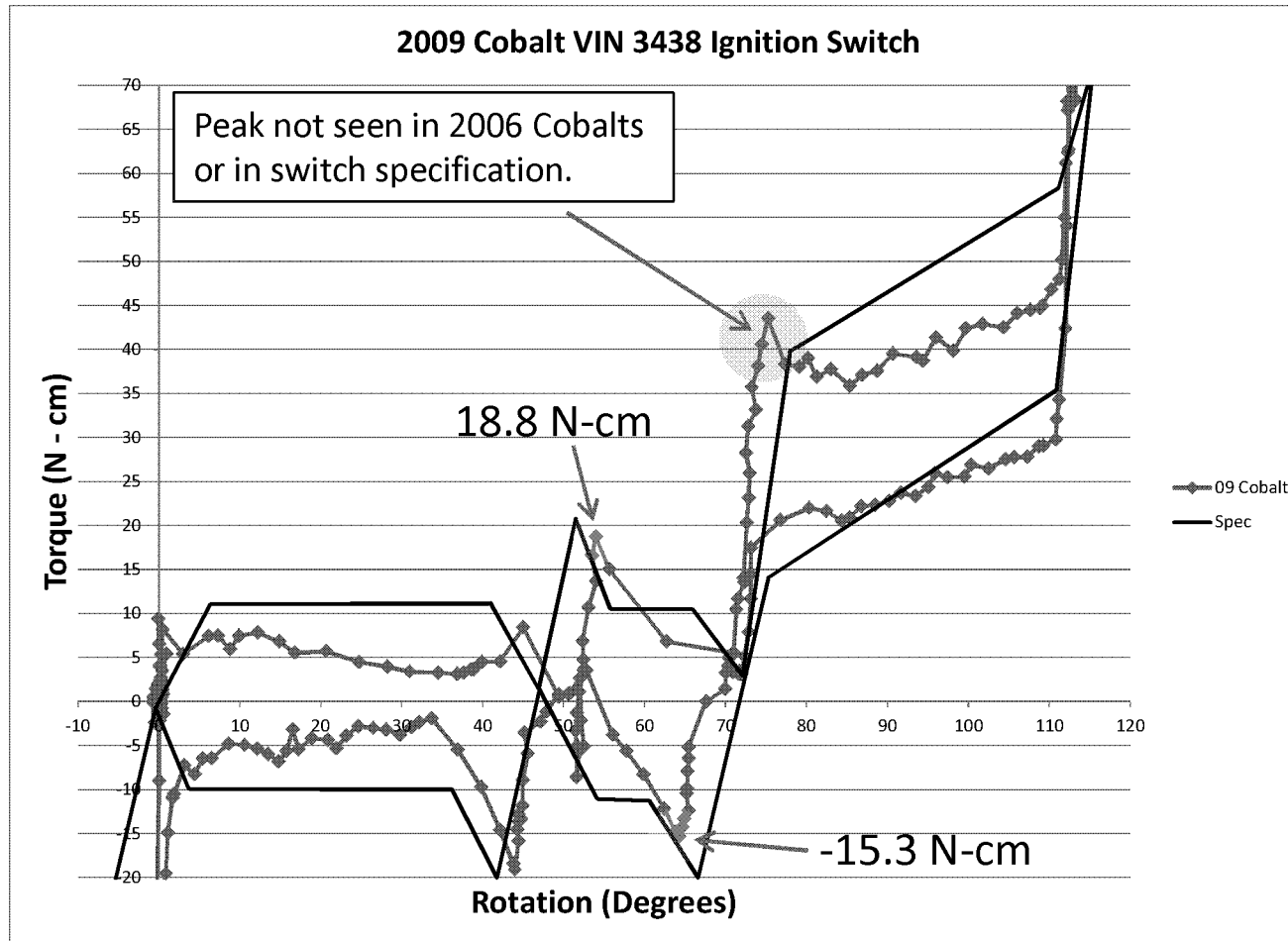
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Torque vs Angle Measurements



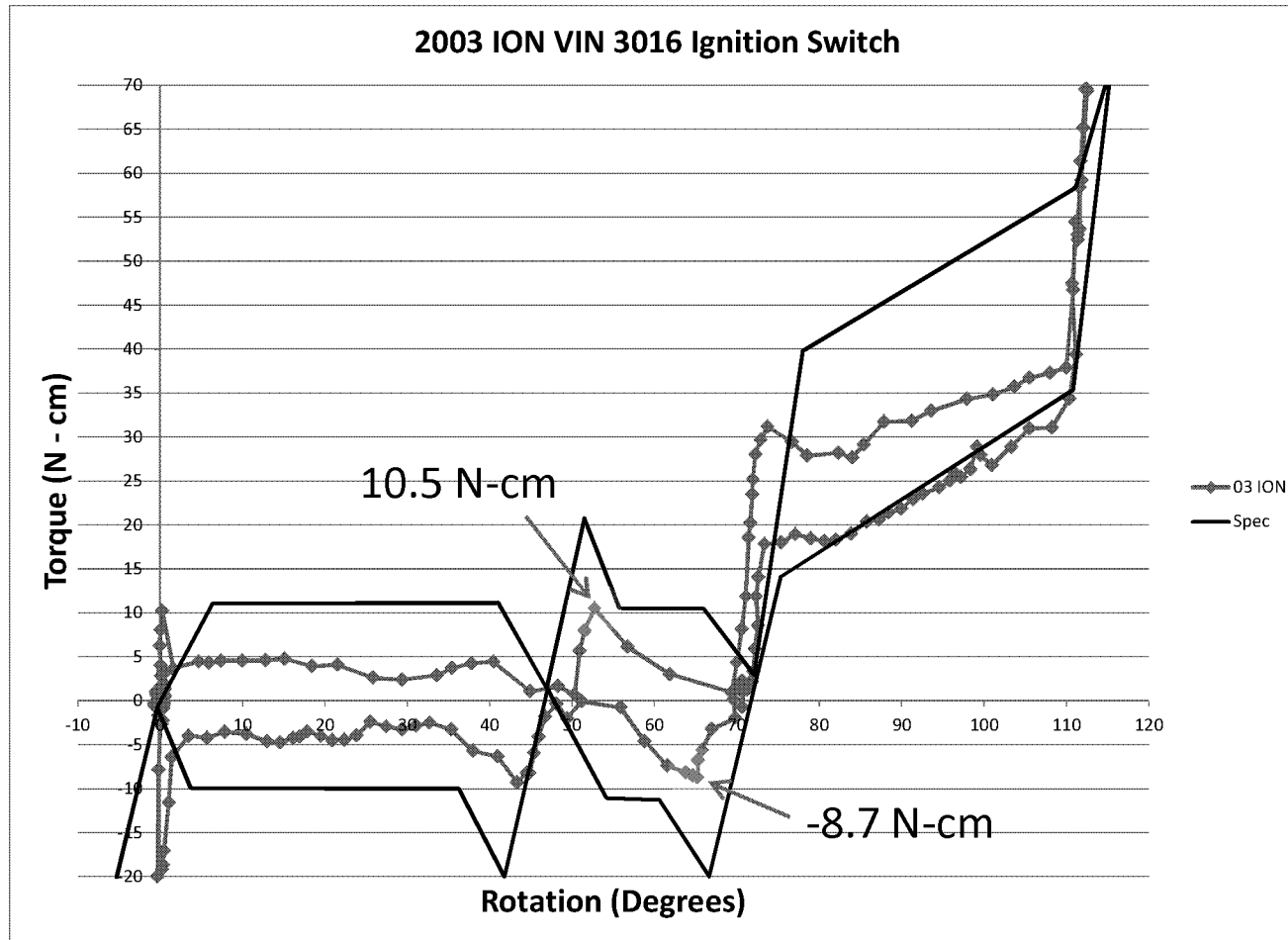
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Torque vs Angle Measurements



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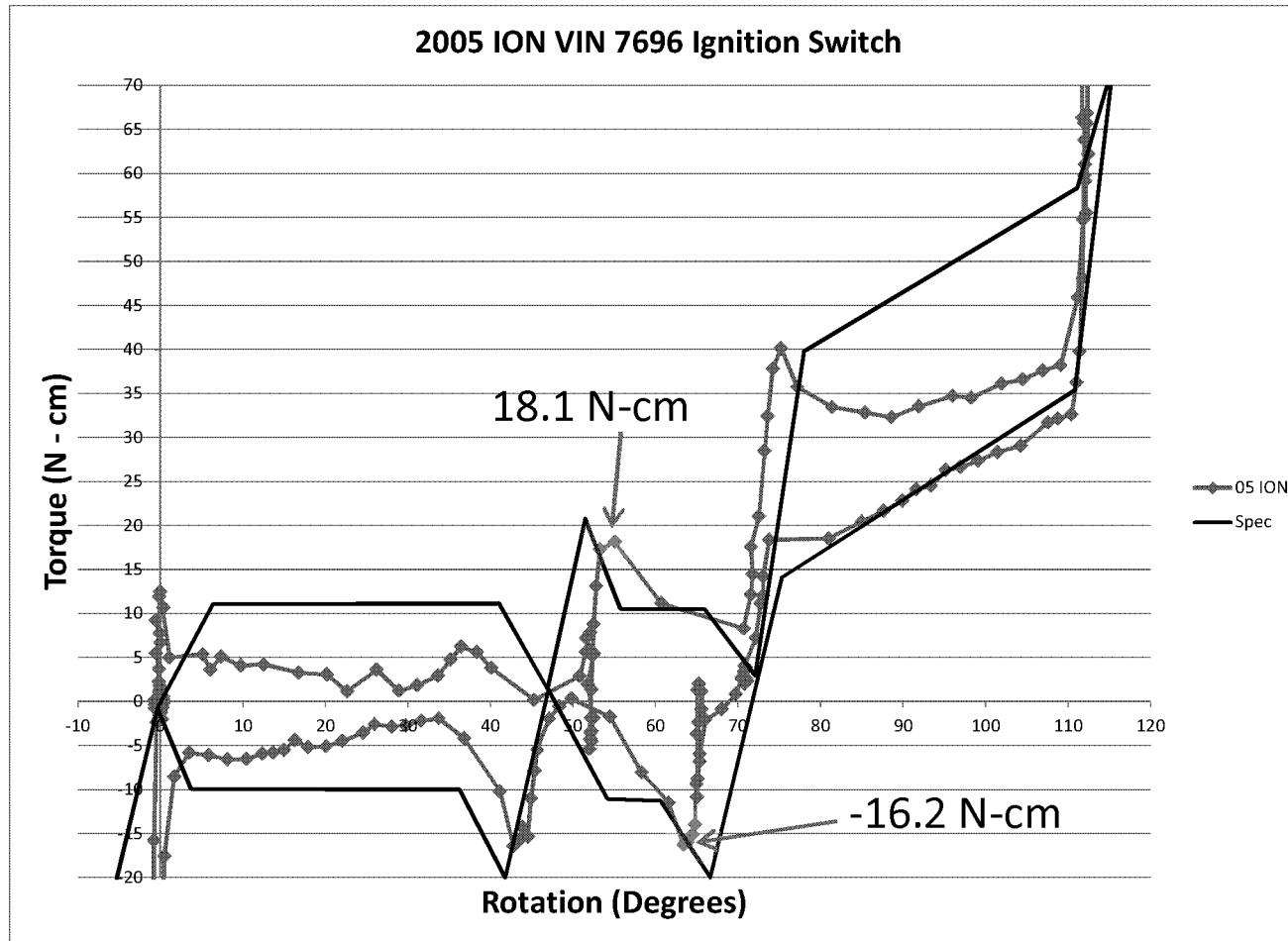
Torque vs Angle Measurements



Does not meet Run/Acc spec.

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Torque vs Angle Measurements



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X-Ray Comparison of Ignition Switches

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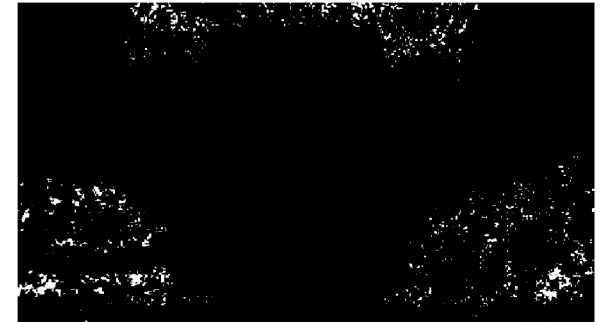
2005 Salvage Yard Cobalt



2008 Salvage Yard Cobalt



2005-2007 AC Delco



- 12 spring coils
- Run to Acc: -7.7 N-cm
- Cap is shorter than observed in MY 07+ and aftermarket switches

- 15 spring coils
- Run to Acc: -22.6 N-cm

- 14 spring coils
- Run to Acc: -22.6 N-cm

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*images are to scale relative to each other

Torque Measurements

Switch (All from salvage yards)	P/N (#)	PCB Production Date*	Cap Size	Model Year	Off to Acc (N-cm)	Acc to Run (N-cm)	Run to Start (N-cm)	Run to Acc (N-cm)	Acc to Off (N-cm)
05 Cobalt -2380	10392423	NS 04 34	Short	2005	3.2	7.8	48.0	-7.8	-8.1
05 Cobalt - 1306	10392423	NS 04 48	Short	2005	2.8	7.4	50.9	-6.0	-6.7
06 Cobalt - 7326	10392423	NS 05 43	Short	2006	2.1	7.8	50.9	-7.1	-8.1
06 Cobalt - 6342	10392423	NS 05 12	Short	2006	2.1	8.5	50.9	-7.8	-8.5
07 Cobalt - 9561	10392423	??	Long	2007	3.5	19.8	50.9	-16.2	-16.2
09 Cobalt -3438	15886190	??	Long	2009	3.2	19.8	53.7	-15.5	-15.9
08 Cobalt - 0386	15886190	??	Long	2008	4.9	17.0	48.0	-19.8	-22.6

*Date observed on PCB silkscreen

- Format NS XX YY: XX is year and YY is week

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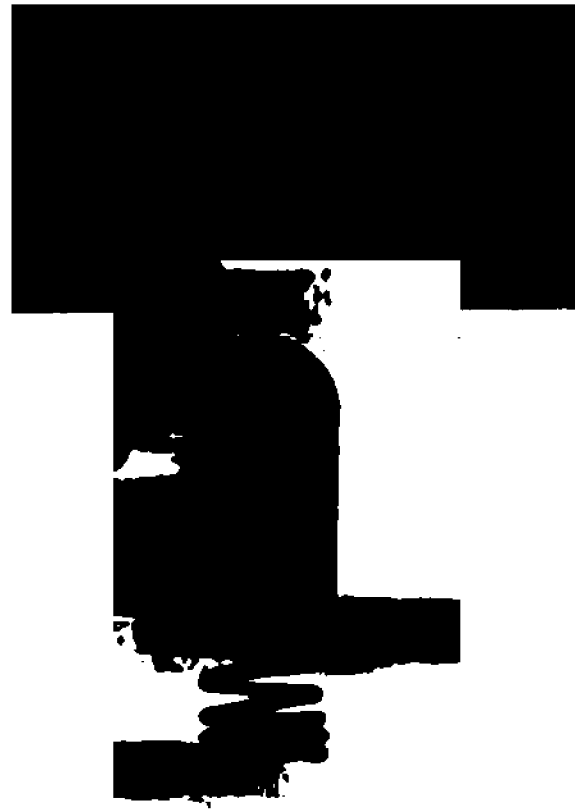
Detent Spring X-Rays

2005 Cobalt VIN 1306



- 13 Coils
- Run to Acc: -6.0 N-cm
- NS 04 48 (PCB prod. date)

2006 Cobalt VIN 6342



- 12 Coils
- Run to Acc: -7.8 N-cm
- NS 05 12 (PCB prod. date)

2006 Cobalt VIN 7326

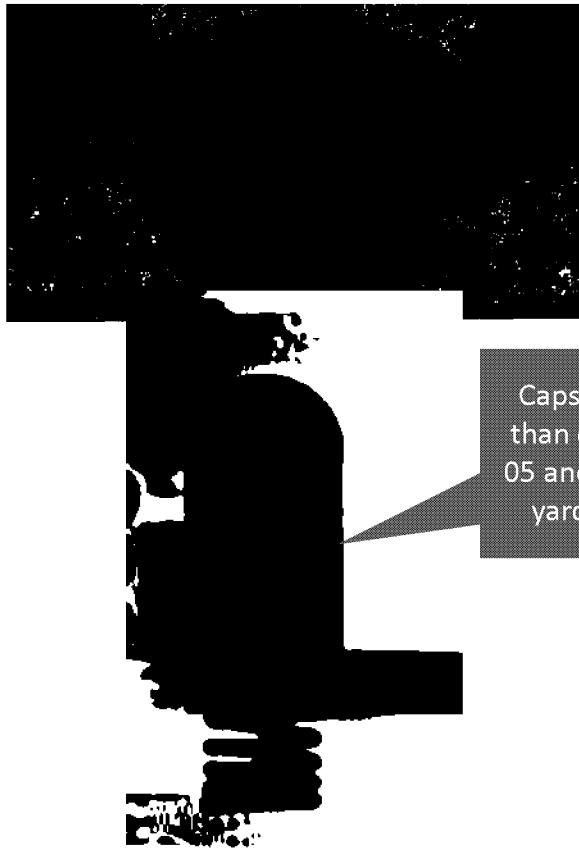


- 13 Coils
- Run to Acc: -7.1 N-cm
- NS 05 43 (PCB prod. date)

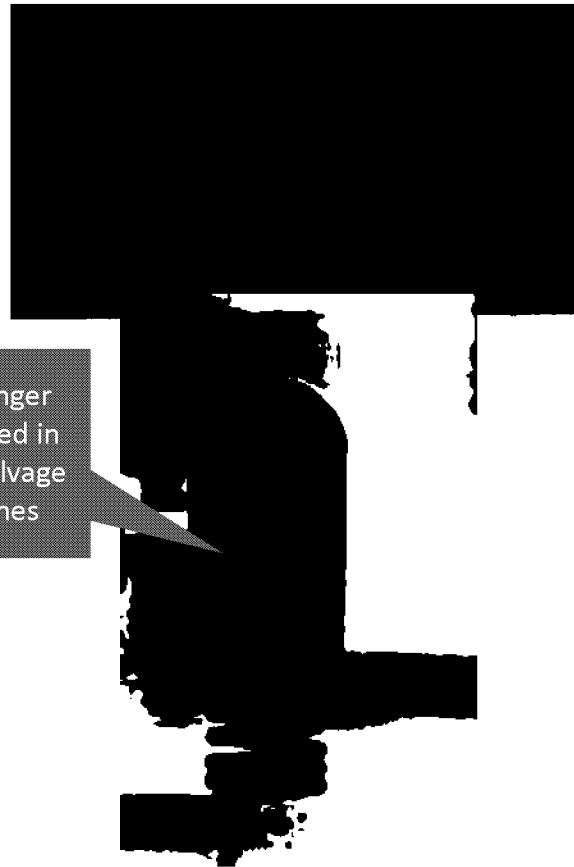
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Detent Spring X-Rays

2007 Cobalt VIN 9561



2009 Cobalt VIN 3438



2005 Cobalt VIN 2380



Caps are longer than observed in 05 and 06 salvage yard switches

- 16 Coils
- Run to Acc: -16.2 N-cm

- 17 Coils
- Run to Acc: -15.5 N-cm

- 12 Coils
- Run to Acc: -7.8 N-cm
- NS 04 34 (PCB prod. date)

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Detent Spring X-Rays

2008 Cobalt VIN 0386

AC Delco Aftermarket Switch
for 2005 -2007 Cobalt (for
comparison)



- 15 Coils
- Run to Acc: -22.6 N-cm

- 14 Coils
- Run to Acc: -22.6 N-cm

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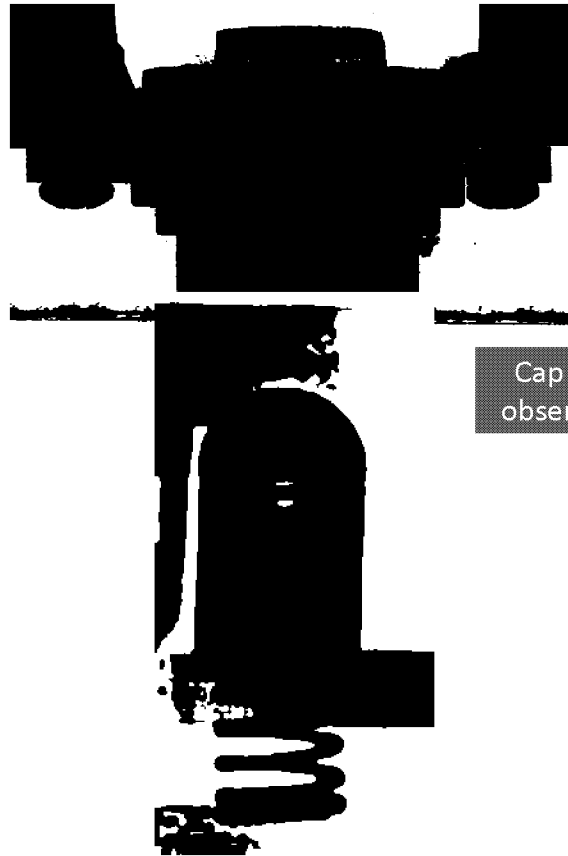
Detent Spring X-Rays

2003 ION VIN 9476



- 12 Coils

2003 ION VIN 3016



- 12 Coils
- Run to Acc: -8.7 N-cm

2005 ION VIN 7696



- 16 Coils
- Run to Acc: -16.2 N-cm

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Detent Spring X-Rays

PCB Silkscreen

2003 Ion VIN 9476



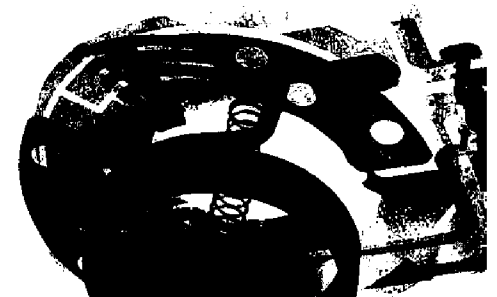
- NS 04 38 (PCB prod. date)
- Other markings:
 - 741 - 79244
 - REV G
 - 1 - 20

2003 Ion VIN 3016



- No PCB prod. date
- Other markings:
 - 741 - 79244
 - REV G

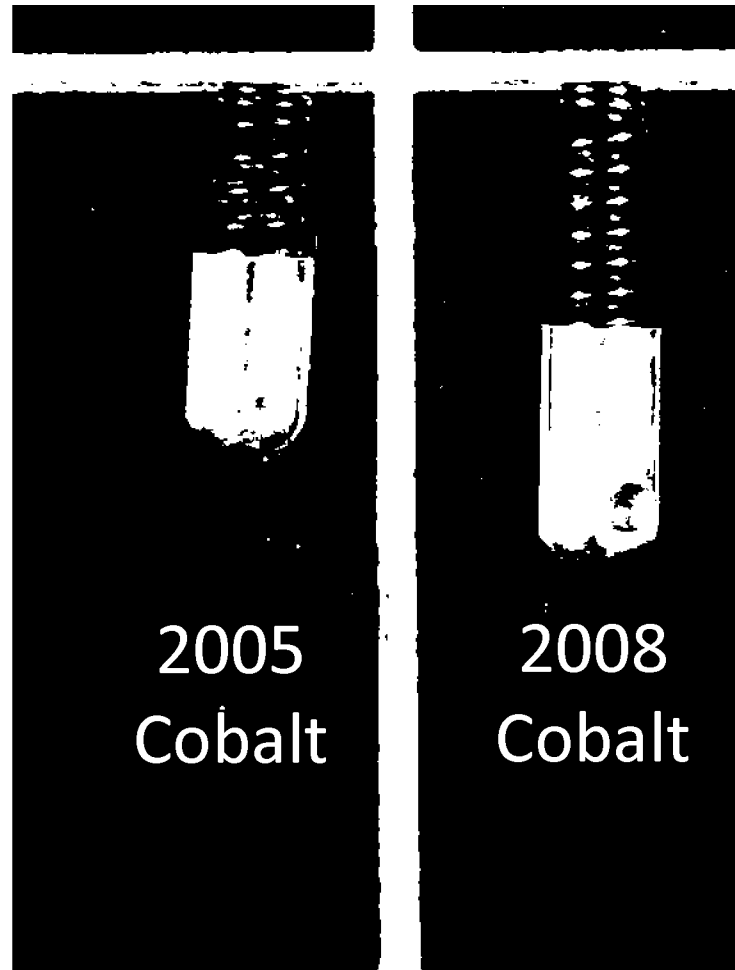
2005 Ion VIN 7696



- No PCB prod. date
- Other markings:
 - 12861211
 - REV 05
- Records do not indicate ignition switch replaced

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Spring and Cap Comparison



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