



CRITICAL ITEMS LIST (CIL)

No. 10-03-04-14R/01

SYSTEM:	Space Shuttle RSRM 10	CRITICALITY CATEGORY:	1R
SUBSYSTEM:	Ignition Subsystem 10-03	PART NAME:	Redesigned Igniter Adapter-To-Igniter Chamber Joint, Thermal Barrier, Motor Seal, Packing with Retainer (2)
ASSEMBLY:	Igniter Assembly 10-03-04	PART NO.:	(See Table A-3)
FMEA ITEM NO.:	10-03-04-14R Rev N	PHASE(S):	Boost (BT)
CIL REV NO.:	N (DCN-562R1)	QUANTITY:	(See Table A-3)
DATE:	05 Oct 2001	EFFECTIVITY:	(See Table 101-6)
SUPERSEDES PAGE:	440-1ff.	HAZARD REF.:	BI-02
DATED:	31 Jul 2000	DATE:	
CIL ANALYST:	D. J. McGough		
APPROVED BY:			

RELIABILITY ENGINEERING: K. G. Sanofsky 05 Oct 2001

ENGINEERING: K. J. Speas 05 Oct 2001

1.0 FAILURE CONDITIONS: Failure during operation (D)

2.0 FAILURE MODE: 1.0 Leakage of the Motor Seal of the Inner Gasket and packing with retainer

3.0 FAILURE EFFECT: Seal failure would result in hot gas flow through the joint to the atmosphere causing burn-through, thrust imbalance and loss of RSRM, SRB, crew, and vehicle

4.0 FAILURE CAUSES (FC):

FC NO.	DESCRIPTION	FAILURE CAUSE KEY
1.1	Nonconforming finish of sealing surfaces or contamination on sealing surfaces	A
1.2	Nonconforming nonmetallic material properties	B
1.3	Performance degradation due to aging	C
1.4	Damage to elastomers, threads, or sealing surfaces	D
1.5	Nonconforming dimensions	E
1.6	Improper installation of components	F
1.7	Nonconforming surface or subsurface defects in elastomers	G
1.8	Cracks, corrosion, or other material defects	H
1.9	Moisture and/or fungus degradation of elastomer	I
1.10	Performance degradation due to temperature effects	J

CRITICAL ITEMS LIST (CIL)

No. 10-03-04-14R/01

DATE: 05 Oct 2001
 SUPERSEDES PAGE: 440-1ff.
 DATED: 31 Jul 2000

5.0 REDUNDANCY SCREENS:

SCREEN A: Pass--The leak test procedure verifies the Motor Seal and packing with retainer
 SCREEN B: Fail--No provision is made for failure detection by the crew
 SCREEN C: Pass--The Motor Seal and packing with retainer cannot be lost due to a single credible cause

- Motor Seal and packing with retainer form part of a redundant seal system with the igniter seal. Packing with retainer will not be pressurized because it is a stand by redundant to the Motor Seal. If the Motor Seal fails the packing with retainer will maintain a seal. If the Motor Seal and packing with retainer fail, a leak path will exist and could result in loss of crew and vehicle.

6.0 ITEM DESCRIPTION:

- Igniter Adapter-to-Igniter Chamber Joint Motor Seal of Inner Gasket and Packing with Retainer. Materials are listed in Table 1.

TABLE 1. MATERIALS

Drawing No.	Name	Material	Specification	Quantity
1U77610	Segment, Rocket Motor, Forward	Composite of Various Components		1/motor
1U77499	Igniter Assembly	Composite of Various Components		1/motor
1U77450	Adapter, Igniter Chamber, Igniter	D6AC Steel	STW4-2706	1/motor
1U77538	Chamber, Igniter	D6AC Steel	STW4-2706	1/motor
1U77462	Gasket - Inner	Seal-Fluorocarbon Rubber	MIL-R-83248	1/motor
1U75374	Retainer-4130 Steel Packing with Retainer	Seal-Fluorocarbon Rubber	Type I, Class 1 MIL-S-18729 MIL-R-83248	36/igniter
1U77358	Bolt Inner, Igniter	Retainer - 4130 Steel	Type I, Class 1 MIL-S-18729	32/motor
1U77356	Bolt, Special	Cadmium Plated	QQ-P-416 Ty I, Cl 2	4/motor
1U77824	Washer, Special, Countersunk	MP159 High-strength Alloy	AMS-5842	36/inner joint
1U51916	Cartridge Assembly Sealant/Adhesive	MP159 High-strength Alloy	MIL-S-18729 or MIL-S-6758 MIL-H-6875	A/R
		Heat Treat	QQ-P-416 Cl 3, Ty II	
		Cadmium Plated	STW5-2942	
		Lubricating Oil and Gelling Agent		

6.1 CHARACTERISTICS:

- The Motor Seal (Figures 1 and 2) is an integral part of the Inner Gasket. The Inner Gasket crown and void areas are shown in Figure 3. The Inner Gasket is located between the Igniter Chamber and the Igniter Adapter, and is held in place by 36 bolts. The Motor Seal contains high pressure during ignition and boost phase that prevents hot gases from escaping into the atmosphere.
- The packing with retainer (Figures 1 and 4) is installed on the Inner Bolt and the Special Bolt below the Special Washer (Figures 5, 6, 7 and 8) and is located on the Igniter Adapter flange. Packing with retainer contains high pressure during ignition and boost if the Motor Seal fails.

7.0 FAILURE HISTORY/RELATED EXPERIENCE:

- Current data on test failures, flight failures, unexplained failures, and other failures during RSRM ground processing activity can be found in the PRACA Database.



CRITICAL ITEMS LIST (CIL)

No. 10-03-04-14R/01

DATE: 05 Oct 2001
SUPERSEDES PAGE: 440-1ff.
DATED: 31 Jul 2000

8.0 OPERATIONAL USE: N/A

CRITICAL ITEMS LIST (CIL)

No. 10-03-04-14R/01

DATE: 05 Oct 2001
SUPERSEDES PAGE: 440-1ff.
DATED: 31 Jul 2000

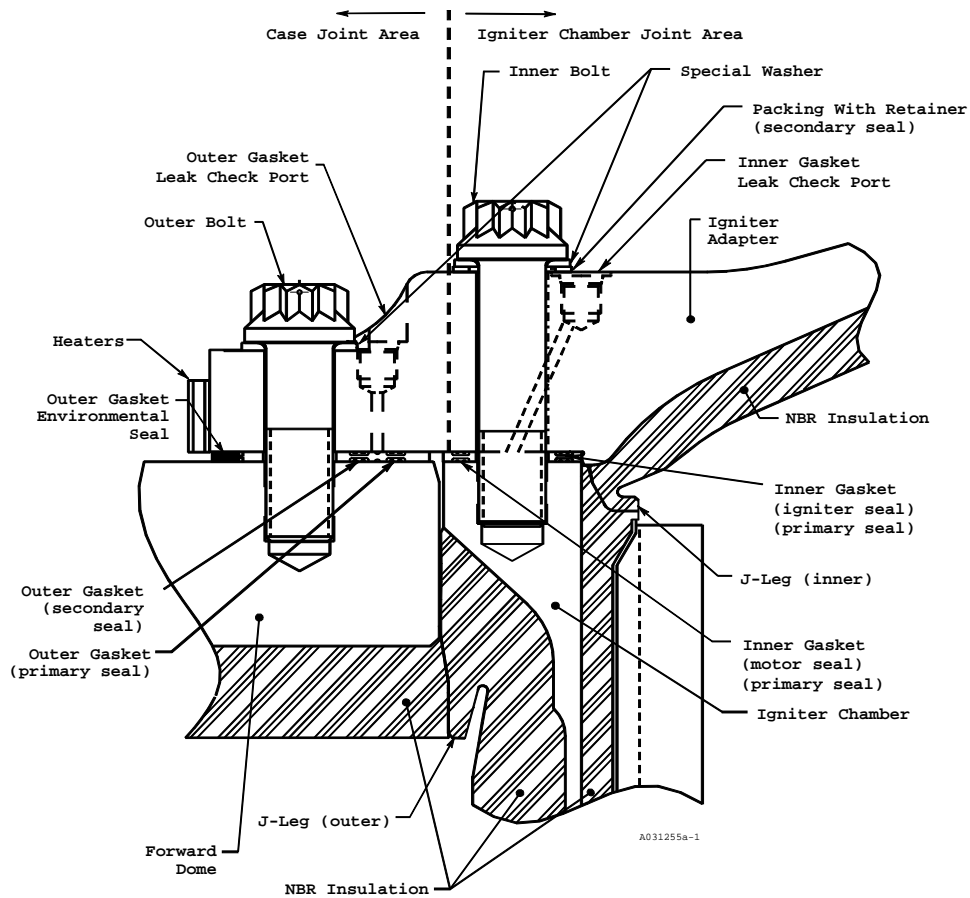


Figure 1. Igniter Adapter-to-Chamber Joint and Igniter Adapter-to-Case Joint

CRITICAL ITEMS LIST (CIL)

No. 10-03-04-14R/01

DATE: 05 Oct 2001
SUPERSEDES PAGE: 440-1ff.
DATED: 31 Jul 2000

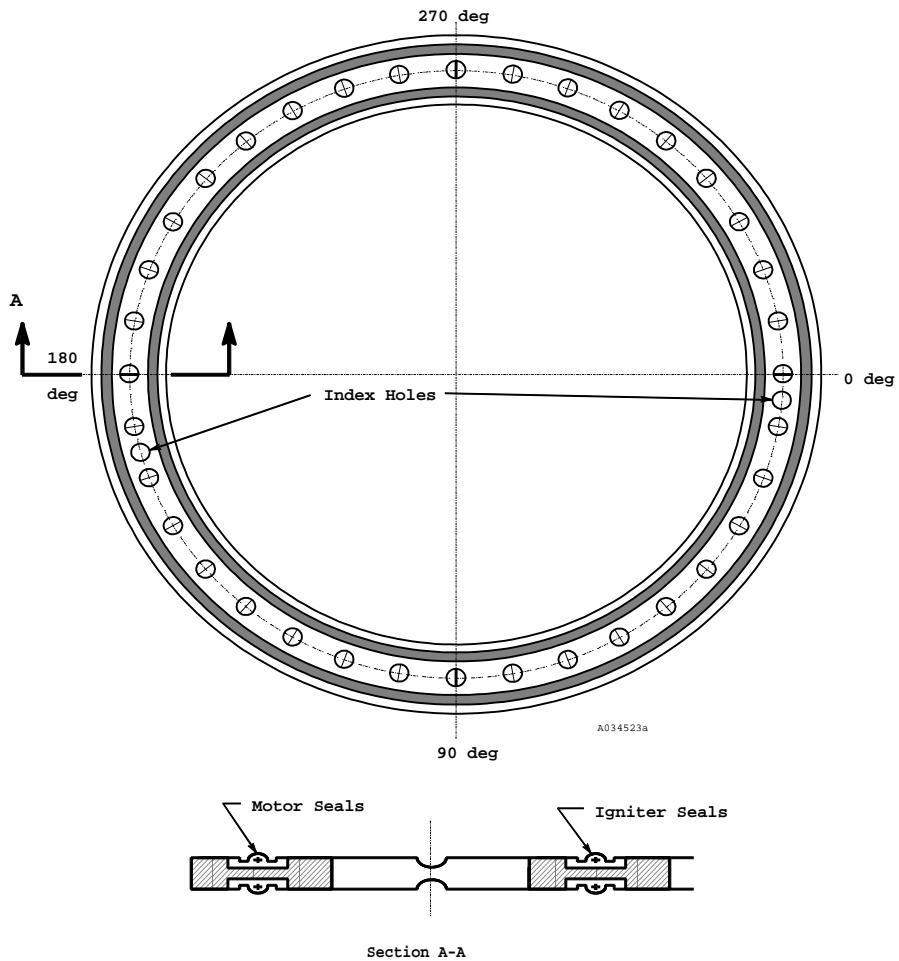
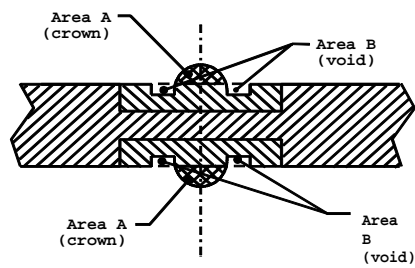


Figure 2. Inner Gasket

CRITICAL ITEMS LIST (CIL)

No. 10-03-04-14R/01

DATE: 05 Oct 2001
SUPERSEDES PAGE: 440-1ff.
DATED: 31 Jul 2000



Area A of each seal is between 45 and 95 percent of area B of each seal

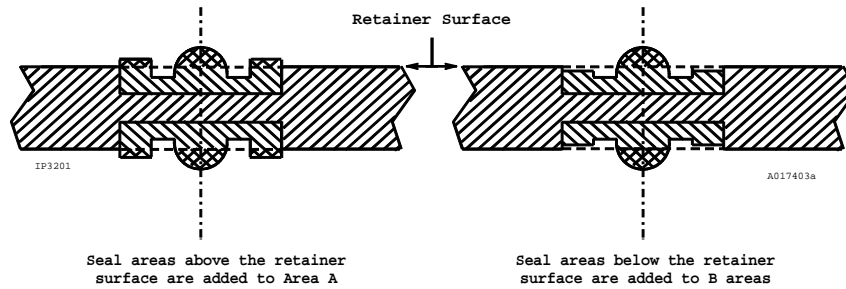


Figure 3. Gasket Crown and Void Areas

CRITICAL ITEMS LIST (CIL)

No. 10-03-04-14R/01

DATE: 05 Oct 2001
SUPERSEDES PAGE: 440-1ff.
DATED: 31 Jul 2000

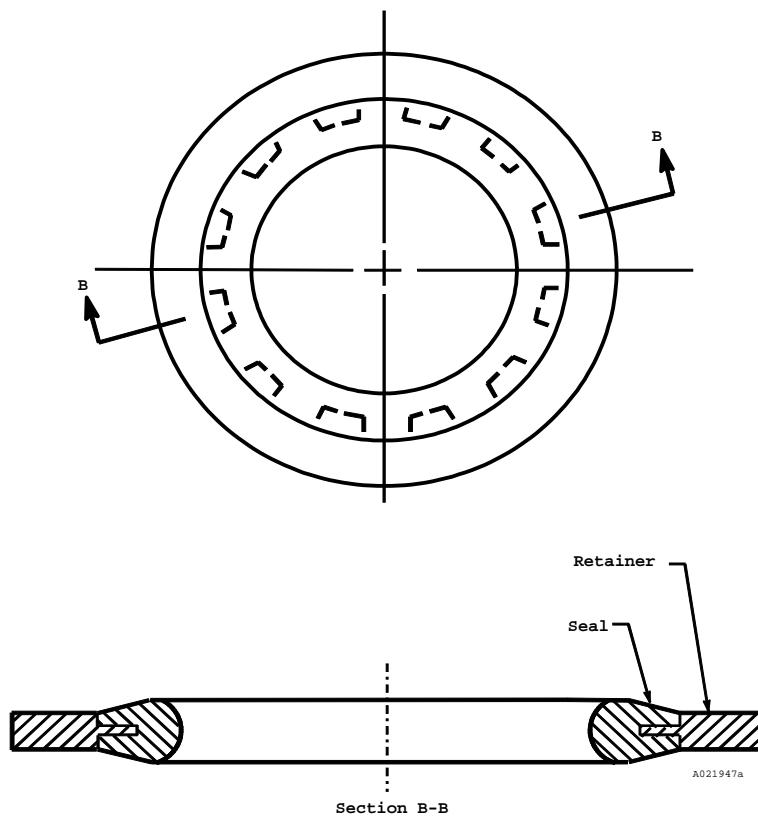


Figure 4. Packing with Retainer

CRITICAL ITEMS LIST (CIL)

No. 10-03-04-14R/01

DATE: 05 Oct 2001
SUPERSEDES PAGE: 440-1ff.
DATED: 31 Jul 2000

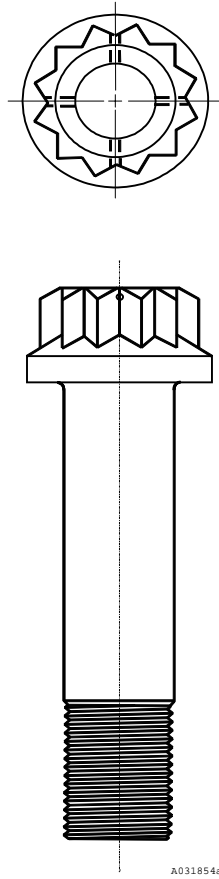


Figure 5. Inner Bolt

CRITICAL ITEMS LIST (CIL)

No. 10-03-04-14R/01

DATE: 05 Oct 2001
SUPERSEDES PAGE: 440-1ff.
DATED: 31 Jul 2000

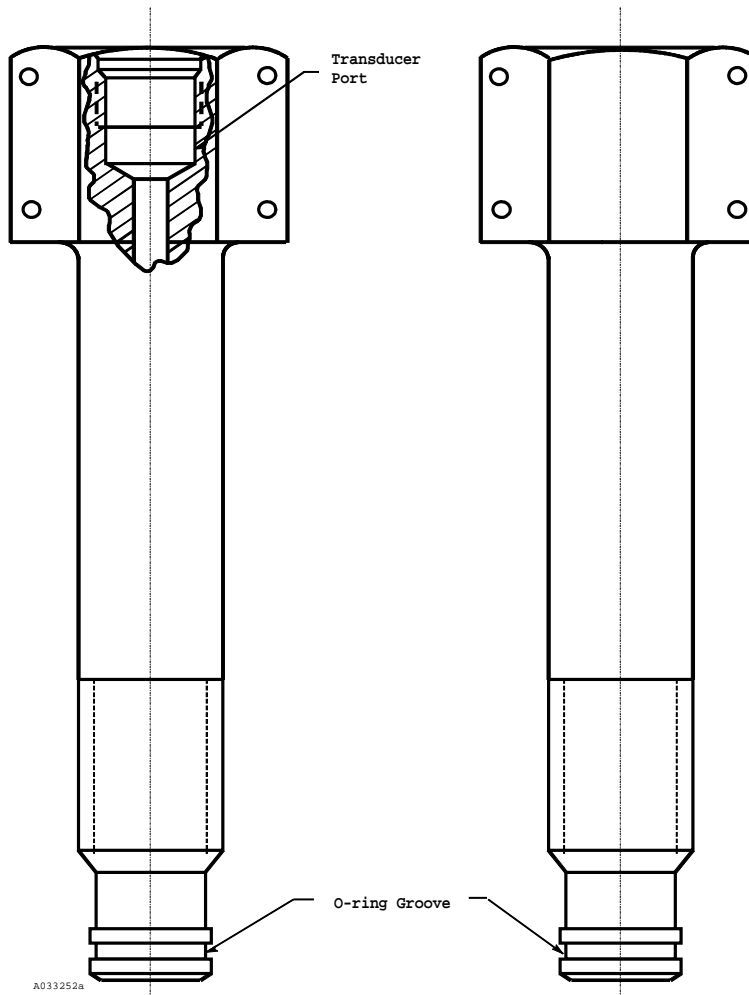


Figure 6. Special Bolt With Transducer Port and Solid Special Bolt

CRITICAL ITEMS LIST (CIL)

No. 10-03-04-14R/01

DATE: 05 Oct 2001
SUPERSEDES PAGE: 440-1ff.
DATED: 31 Jul 2000

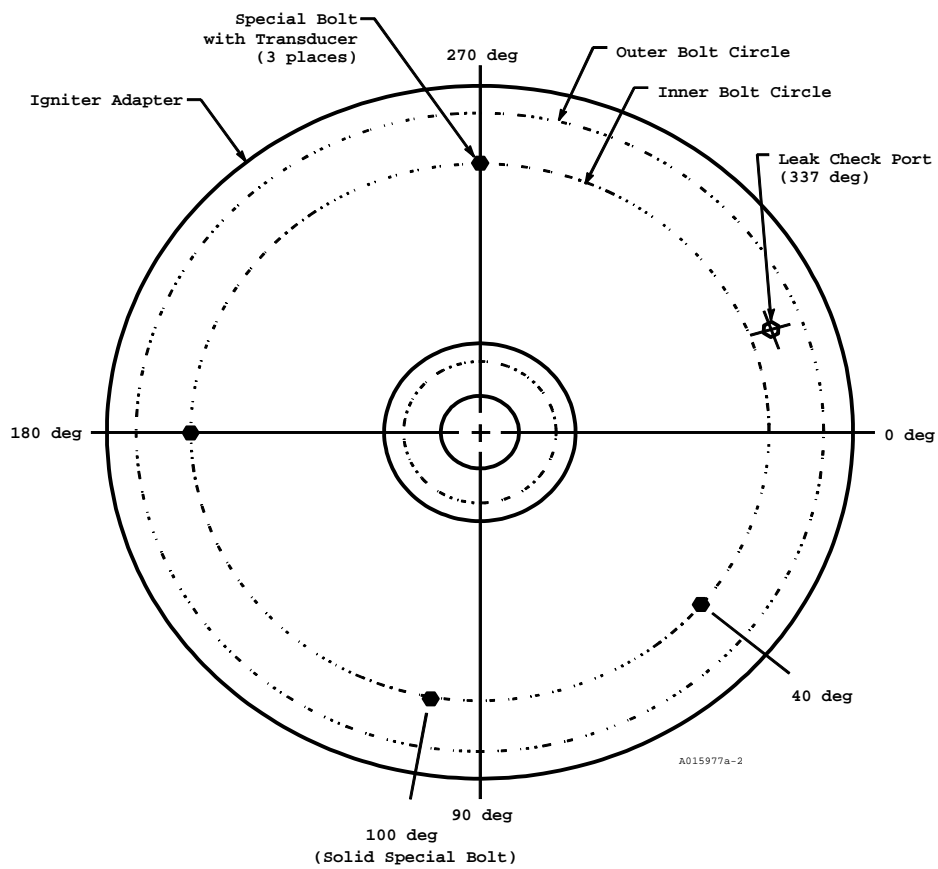


Figure 7. Special Bolt and Leak Check Port Locations

CRITICAL ITEMS LIST (CIL)

No. 10-03-04-14R/01

DATE: 05 Oct 2001
SUPERSEDES PAGE: 440-1ff.
DATED: 31 Jul 2000

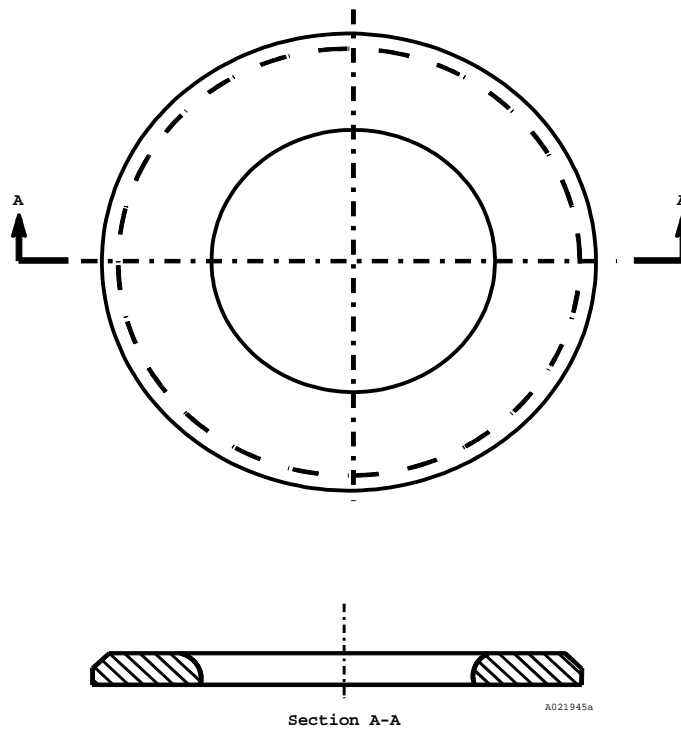


Figure 8. Special Washer

CRITICAL ITEMS LIST (CIL)

No. 10-03-04-14R/01

DATE: 05 Oct 2001
 SUPERSEDES PAGE: 440-1ff.
 DATED: 31 Jul 2000

9.0 RATIONALE FOR RETENTION:

9.1 DESIGN:

DCN FAILURE CAUSES

- | | | |
|-----------------|-----|--|
| A | 1. | Igniter Adapter sealing surface finish requirements are per engineering drawings.
a. Refurbishment of the Igniter Adapter is performed per engineering. |
| A | 2. | Igniter Chamber surface finish requirements are per engineering drawings.
a. Refurbishment of the Igniter Chamber is performed per engineering. |
| A,G | 3. | Inner gasket rubber seal surface quality requirements are per engineering. |
| A,E,G | 4. | Packing with retainer's surface quality conforms to engineering that establishes geometric dimensions and fabrication details. Packing with retainer is a one-time-use item. |
| A | 5. | Inner Bolt surface finish requirements are per engineering drawings. |
| A | 6. | Special Bolt surface finish requirements are per engineering drawings. |
| A | 7. | Special Washer surface finish requirements are per engineering drawings. The Special Washer is a one-time-use item. |
| A | 8. | Surface finish is controlled per engineering drawings and specifications. Surface finish testing was performed on O-ring sealing surfaces for the case and nozzle. Sealing surface finish requirements in the igniter metal components are the same as the case and nozzle metal components. Results show considerable sealing margin in the current design, and more dependence on temperature than surface finish per TWR-17991. |
| A,B,D,E,F,G,H,I | 9. | Leak test requirements and procedures are determined per TWR-17922 and TWR-19510. |
| A,D,F,G,H,I | 10. | Cleanliness of sealing surfaces to prevent contamination is controlled per shop planning, engineering, and TWR-16564. |
| A | 11. | Prior to assembly per shop planning, all grease is removed from sealing surfaces and bolt holes using clean, dampened lint-free cloth for sealing surfaces and a soft bristled brush for bolt holes. A piece of mylar film is used to remove excessive grease from the grooves of the igniter gasket. |
| A,D,F | 12. | All sealing surfaces of the Igniter Assembly components must conform to engineering drawings and specifications. |
| B | 13. | The igniter inner gasket seal is fabricated from fluorocarbon rubber. |
| B | 14. | Packing with retainer sealing material is high temperature, low compression set, fluid resistant, fluorocarbon rubber. |
| B | 15. | Grease material requirements are per engineering. |
| B | 16. | Criteria for nonmetallic properties were determined by TWR-17367. |
| B,C | 17. | Tests for sealing the igniter gaskets with joint deflection were performed as outlined |

CRITICAL ITEMS LIST (CIL)

No. 10-03-04-14R/01

DATE: 05 Oct 2001
 SUPERSEDES PAGE: 440-1ff.
 DATED: 31 Jul 2000

and reported in TWR-61388 and TWR-61400. The tests show that sealing function is maintained for worst case compression set under maximum extremes of temperature and maximum deflections.

- B 18. Packing with retainer rubber is mechanically and adhesively bonded to the retainer. The mechanical bond is built into the design of the retainer.
- C 19. Cured fluorocarbon elastomer rubber age-resistant properties are very good with a maximum storage life of up to 20 years when packaged per MIL-HDBK-695.
- C 20. Aging studies of O-rings after 5 years installation life were performed. Test results are applicable to all RSRM fluorocarbon seals. Fluorocarbon maintained its tracking ability and resiliency and was certified to maintain its sealing capability over 5 years per TWR-65546.
- C 21. Grease is stored at warehouse-ambient condition that is any condition of temperature and relative humidity experienced by the material when stored in an enclosed warehouse, in unopened containers, or containers that were resealed after each use. Storage life under these conditions is per engineering.
- C 22. Aging studies to demonstrate characteristics of grease after 5 years installation life were performed on TEM-9. Results showed that grease provided adequate corrosion protection for D6AC steel, and that all chemical properties of the grease remained intact per TWR-61408 and TWR-64397.
- D,F 23. Thiokol IHM 29 procedures describe the requirements for handling, packaging and transportation systems for the control of internal loads, stresses, or deflections preventing damage to the elastomers or sealing surfaces.
- D,F 24. Igniter installation requirements are per engineering as follows:
 - a. Igniter adapter, igniter chamber, inner gasket, inner bolts, special bolts, packing with retainer, special washers and igniter assembly mating surfaces are cleaned.
 - b. Filtered grease is applied to the underside of inner bolt and special bolt heads, packing with retainers, igniter chamber and igniter adapter sealing surfaces prior to assembly.
 - c. Special washers and packing with retainer are installed on the inner and special bolts.
- E 25. Igniter inner gasket dimensions are per engineering.
- E 26. Inner Bolt dimensions are per engineering drawings.
- E 27. Special Bolt dimensions are per engineering drawings.
- E 28. Special Washer dimensions are per engineering drawings. The Special Washer is a one-time-use item.
- E 29. Igniter Chamber dimensions are per engineering drawings.
 - a. Refurbishment of the Igniter Chamber is performed per engineering.
- E 30. Igniter Adapter dimensions are per engineering drawings.
 - a. Refurbishment of the Igniter Adapter is performed per engineering.
- E 31. A special tool (inspection aid) was developed to visually inspect the seal footprint

CRITICAL ITEMS LIST (CIL)

No. 10-03-04-14R/01

DATE: 05 Oct 2001
 SUPERSEDES PAGE: 440-1ff.
 DATED: 31 Jul 2000

around the entire circumference of each new inner gasket.

- G 32. Testing and analysis of elastomers that established criteria for acceptable abrasions, grind marks, scratches, cuts, inhomogeneities, splices, repairs, substandard material, surface voids and inclusions, and internal voids and inclusions are documented in TWR-17991.
- H 33. The Igniter Chamber and the Igniter Adapter are made of high-strength D6AC steel and heat-treated.
- H 34. Refurbished Igniter Chambers and Igniter Adapters are per engineering requirements.
- H 35. Analyses and testing to qualify the Igniter Chamber and Igniter Adapter are reported in TWR-10735, TWR-11559, TWR-61222, and TWR-16104.
- H 36. A lot acceptance test is required for each igniter lot. The igniter is fired and must meet requirements per engineering.
- H 37. Igniter Chambers and Igniter Adapters are hydroproof tested and then magnetic-particle inspected before every use.
- H 38. The Igniter Chamber and Igniter Adapter are included in TWR-16872. Fracture control analysis of the modified igniter presented in TWR-16104 shows that the Igniter Chamber and Igniter Adapter may be used eight times for the conservative assumptions used. Planned number of uses is four.
- H 39. A Material Use Agreement is provided per MSFC requirements for D6AC steel.
- H 40. Inherent resistance to corrosion and stress-corrosion cracking of metal parts is augmented by the use of filtered grease. Filtered grease is applied to the underside of bolt heads when the bolts and igniter special washers are pre-assembled, and to bolts, special washers, adapter flange, and igniter chamber interfaces after the bolts are installed and torqued.
- J 41. Igniter gasket fluorocarbon elastomer resiliency and dynamic tests were performed per TWR-61388 and TWR-61400. Tests show that the sealing function is maintained for worst-case compression-set under maximum extremes of temperature and maximum deflections.
- J 42. Inner Gasket fluorocarbon elastomer material high temperature response for compression set and volume swell (in fluids) is covered in TWR-17367.
- J 43. The igniter inner gasket seal is fabricated from fluorocarbon rubber.
- J 44. TWR-15832 currently limits igniter joint temperature to no lower than specified in TWR-61388 and TWR-61400.
- A,B,E,H 45. Igniter special bolts are acceptable for reuse if engineering requirements are met. The special bolts are considered a fracture control item per TWR-16874. The bolts are made from a high strength multiphase alloy with high fracture toughness and resistance to stress corrosion per TWR-66014. After refurbishment, the special bolts must meet the eddy current inspection criteria.

CRITICAL ITEMS LIST (CIL)

No. 10-03-04-14R/01

DATE: 05 Oct 2001
 SUPERSEDES PAGE: 440-1ff.
 DATED: 31 Jul 2000

9.2 TEST AND INSPECTION:

FAILURE CAUSES and
 DCN TESTS (T)

CIL CODE

1. For New Segment, Rocket Motor, Forward, verify:

A,D,H,I	a.	Special bolts are clean and free of visible contamination prior to installation	AEG166
A,D,H,I	b.	Special bolt hole threads and sealing surface in the igniter chamber are clean and free of contamination and defects prior to special bolt installation	AEG092
A,D,H	c.	Filtered grease is applied to the underside of the special bolt head before installation	AEG018
A,B,D,E, F,G,I (T)	d.	Installed transducer bolt assemblies have been leak tested at low and high pressures	AEG196,AEG195
C	e.	Packing with retainer shelf life, and package container seal prior to installation	AEG161
C	f.	Shelf life of filtered grease prior to application	AEG371
D,F	g.	Special bolts are tightened with a snug torque and angle-of-twist in the proper sequence	AEG428
D,F	h.	Filtered grease is applied to the packing with retainer	AEG244
D,F	i.	Igniter special washer is installed correctly with radius towards special bolt head	AEG192
D,F	j.	Special bolts are installed and turned in until finger tight	AEG105
562 D,F	k.	Special bolts are lock/safety wired correctly using double-twist method	AEG106
H	l.	Filtered grease is applied to all exposed bare metal surfaces of the igniter after installation	AEG028

2. For New Igniter Assembly verify:

A,B,D,E, F,G,H,I (T)	a.	Inner Gasket and Inner Bolt redundant seals are leak tested with an acceptable leak rate per the leak check specification	AEF108, AEF120
A,D,F	b.	Inner Bolts are clean and free of visible contamination prior to installation per the installation specification	AEF048
A,D,F	c.	Packing with retainer is clean and free of visible contamination prior to installation per the installation specification	CCC005
A,D,F	d.	Special Washers are clean prior to installation per the installation specification	CCC006
A,D,F,H,I	e.	Igniter Chamber sealing and mating surfaces and threaded holes are clean and free of contamination and surface defects prior to installation per the igniter process finalization and installation preparation specifications	AEF224
A,D,F,H,I	f.	Igniter Adapter sealing and mating surfaces and threaded holes are clean and free of contamination and surface defects prior to installation per the igniter process finalization and installation preparation specifications	AEF218
A,D,F,H	g.	Filtered grease is applied to the underside of the Inner Bolt head before installation per the installation specification	AEF026
A,D,F	h.	Filtered grease is applied to the packing with retainer (both sides and through hole of rubber element only) per the installation specification	CCC014
A,D,F,H	i.	Filtered grease is applied to the Chamber sealing surface per the installation preparation specification	CCC016
A,D,F,H	j.	Filtered grease is applied to the Adapter sealing surfaces and bolt through holes per the installation preparation specification	CCC017

CRITICAL ITEMS LIST (CIL)

No. 10-03-04-14R/01

DATE: 05 Oct 2001
 SUPERSEDES PAGE: 440-1ff.
 DATED: 31 Jul 2000

A,D,F		k.	Inner Bolts are installed correctly per the installation specification	CCC033
A,D,F		l.	Packing with retainer is installed correctly per the installation specification	CCC020
A,D,F		m.	Special Washer is installed correctly with radius towards inner bolt head	AEF138
A,B,D,E, F,G,H,I	(T)	n.	Packing with retainer seals are bubble tested after bolt loading per the leak test specification	AEF120A
C		o.	Inner Gasket shelf life has not expired and package container seal was not violated prior to installation	ACS064
C		p.	Packing with retainer shelf life has not expired and package container seal was not violated prior to installation	ACS064A
C		q.	Shelf life of filtered grease has not expired prior to application	ACP075
D,F		r.	Inner Gasket is free of contamination, corrosion and excess grease prior to installation per the installation preparation specification	AEF071
D,F		s.	Inner bolts are tightened with a snug torque and angle-of-twist in the proper sequence	AEF281
562 D,F		t.	Inner Bolts are lock/safety wired correctly using double-twist method per the applicable specification	AEF063

3. For New Igniter Chamber, verify:

A,E		a.	Flatness and parallelism of sealing surface	AEC087,AEC092
A,H	(T)	b.	Magnetic-particle inspection	AEC139,AEC156
A,H	(T)	c.	Proof test	AEC206,AEC207
A		d.	Surface finish for top sealing surface (Datum-A-)	AEC230
A,E,H		e.	Supplier records are complete and acceptable	AEC280
D,E,F		f.	Threaded holes for inner bolts	AEC261
D,E,F		g.	Threaded holes for Special Bolts	AEC262
E		h.	8.550 dimension of view "B"	AEC001
E		i.	11.100 dimension of view "B"	AEC001A
E		j.	9.250 dimension of view "B"	AEC001B
E		k.	Circular runout in view "B"	AEC001C
E		l.	1.20 dimension of view "B"	AEC001D
E		m.	.510 dimension of view "B"	AEC001E
E		n.	Bolt hole through diameter	AEC004
E		o.	Tap drill depth of threaded holes	AEC049,AEC049A
E		p.	Outside diameter of sealing surface	AEC191
E		q.	True position threaded holes	AEC264
E		r.	Wall thickness--membrane area stamp VIP item number	AEC288
E		s.	Inside diameter in flange area	RAA117
H		t.	D6AC steel	AEC041
H	(T)	u.	Ultrasonic testing	AEC265,AEC274

4. For Refurbished Igniter Chamber, verify:

A,H	(T)	a.	Hydroproof successful	AEC117
A,H	(T)	b.	Magnetic-particle after hydroproof test and all indications are recorded	AEC143
A,D,F		c.	No unacceptable scratches, gouges, or pitting in sealing surfaces	AEC173
A		d.	Surface finish for top sealing surface	AEC291
D,E,F		e.	Threaded holes conform to gauging requirements	AEC035
D,F		f.	Threaded holes are free from contamination, damage, and surface defects	AEC098
E		g.	Flatness and parallelism of mating surfaces	AEC086
E		h.	Wall thickness membrane area after hydroproof test	AEC287

5. For New Igniter Adapter, verify:

CRITICAL ITEMS LIST (CIL)

No. 10-03-04-14R/01

DATE: 05 Oct 2001
 SUPERSEDES PAGE: 440-1ff.
 DATED: 31 Jul 2000

A,H	(T)	a.	Proof test	AAS198A
A,H	(T)	b.	Magnetic-particle inspection after proof test is complete and acceptable	AAS313A
A,D,F		c.	Surface finish of bottom surface (Datum -C-)	AAS458,AAS466
A,E,H		d.	Supplier records are complete and acceptable	AAS550
A		e.	Surface finish on Inner Bolt circle for packing with retainer per engineering	RAA108
E		f.	Flange thickness at inner bolt circle	AAS006,RAA105
E		g.	Inner leak check port spot face depth	AAS075
E		h.	Diameter of inner bolt through holes	AAS076,AAS077
E		i.	Outside diameter	AAS366
E		j.	True position of inner bolt through holes	RAA096,RAA101
E		k.	Flatness and parallelism of bottom surface (Datum -C-)	RAA109,AAS138
E		l.	Outside diameter of alignment lip	RAA115
E		m.	Height of alignment lip	RAA116
H	(T)	n.	Chemical analysis	AAS029,AAS323
H	(T)	o.	Mechanical properties	AAS404,RAA044
H	(T)	p.	Metallurgical characteristics	AAS404C,RAA045
H		q.	Heat treatment	AAS175,AAS177
H		r.	Material is D6AC steel	AAS029A
H		s.	No obvious shipping or handling damage	AAS343
H	(T)	t.	Ultrasonic testing complete and acceptable	AAS541,RAA001

6. For Refurbished Igniter Adapter, verify:

A,H	(T)	a.	Hydroproof successful	AAN008
A,D,F,H		b.	Sealing and mating surfaces for surface defects and surface finish	AAS107
A,H	(T)	c.	Magnetic-particle after hydroproof test	AAS301
E		d.	Flatness and parallelism of sealing and mating surfaces	AAS136
		e.	Diameter of inner bolt through holes	AAS505
E		f.	Flange thickness	AAS061A
H		g.	Threaded holes for surface contamination, damage, surface irregularities, raised metal and scratches after hydroproof testing	AAS123

7. For New Igniter Inner Gasket, verify:

A,E,G,H		a.	Primary and secondary seals for unbonds	CCC050,CCC064
A,E,G,H		b.	Primary and secondary seals for flash	CCC051,CCC065
A,E,G,H		c.	Primary and secondary seals for unacceptable flat spots on the crown	ACS096,CCC069
A,E,G,H		d.	Primary and secondary seals for abrasions	CCC054,CCC071
A,E,G,H		e.	Primary and secondary seals for flow marks	CCC057,CCC072
A,E,G,H		f.	Primary and secondary seals had the foot-print inspection performed	CCC058,CCC073
A,E,G,H		g.	Primary and secondary seals had the compression inspection performed	CCC059,CCC074
A,E,G,H		h.	Primary and secondary seals had the finger inspection performed	CCC060,CCC075
A,E,G,H		i.	Primary and secondary seals for inclusions, cuts, voids, foreign material or other irregularities	ACS139,ACS002
A,E,G,H		j.	Primary and secondary seals for undispersed materials	CCC056,CCC116
A,H	(T)	k.	Magnetic particle testing	ACS118,ACS110
A,B,C,E,G,H		l.	Supplier records are complete and acceptable	ACS034
B,C,J		m.	Seal material is fluorocarbon rubber	ACS127
C		n.	Time between cure date and supplier shipping date	ACS178
C		o.	Each gasket is packaged and sealed in an individual bag	ACS106
E		p.	Primary and secondary seals for crown height	ACS054

CRITICAL ITEMS LIST (CIL)

No. 10-03-04-14R/01

DATE: 05 Oct 2001
 SUPERSEDES PAGE: 440-1ff.
 DATED: 31 Jul 2000

E	q.	Total variation in retainer thickness	ACS206
E	r.	Groove depth	ACS102
E	s.	Groove full radius	ACS103
E	t.	Diameter of index pin through hole	ACS079B
E	u.	Diameter of bolt through holes	ACS079
E	v.	True position of bolt through holes	ACS079A
E	w.	Outside diameter of gasket	ACS078
E	x.	Metal retainer thickness	ACS109
H	y.	VOIDS, circumferential scratches and radial scratches in metal retainer do not exceed acceptable conditions	CCC096,ACS074
H	z.	Absence of corrosion on the metal retainer	CCC099,CCC049
H	aa.	No shipping/handling damage	RAA120

8. For Refurbished Inner Gasket, verify:

A,E,G,H	a.	Primary and secondary seals for unbonds	CCC050A,CCC064A
A,E,G,H	b.	Primary and secondary seals for flash	CCC051A,CCC065A
A,E,G,H	c.	Primary and secondary seals for unacceptable flat spots on the crown	ACS096A,CCC069A
A,E,G,H	d.	Primary and secondary seals for abrasions	CCC054A,CCC071A
A,E,G,H	e.	Primary and secondary seals for flow marks	CCC057A,CCC072A
A,E,G,H	f.	Primary and secondary seals had the foot-print inspection performed	CCC058A,CCC073A
A,E,G,H	g.	Primary and secondary seals had the compression inspection performed	CCC059A,CCC074A
A,E,G,H	h.	Primary and secondary seals had the finger inspection performed	CCC060A,CCC075A
A,E,G,H	i.	Primary and secondary seals for inclusions, cuts, voids, foreign material or other irregularities	ACS139A,ACS002A
A,E,G,H	j.	Primary and secondary seals for undispersed materials	CCC056A,CCC116A
A,B,C,E,G,H	k.	Supplier records are complete and acceptable	ACS034A
B,C,J	l.	Seal material is fluorocarbon rubber	ACS127A
C	m.	Time between cure date and supplier shipping date	ACS178A
C	n.	Each gasket is packaged and sealed in an individual bag	ACS106A
E	o.	Primary and secondary seals for crown height	ACS054A
H	p.	VOIDS, circumferential scratches and radial scratches in metal retainer do not exceed acceptable conditions	CCC096A,ACS074A
H	q.	Absence of corrosion on the metal retainer	CCC099A,CCC049A
H	r.	No shipping/handling damage	RAA120A

9. For New Bolt, Igniter, Inner verify:

A,H	(T)	a.	No surface discontinuities detected by dye penetrant inspection	AHD019
A,H		b.	Certificate of Conformance is complete and acceptable	AHD006
A		c.	Surface finish on washer face	AHD057
A		d.	Surface finish on grip diameter	AHD034
E		e.	Bolt length	AHD035
E		f.	Grip length	AHD029
E		g.	Grip diameter	AHD025
E		h.	Fillet radius	AHD022
E		i.	Threads per engineering	AHD061
E		j.	Perpendicularity of bolt axis-to-bolt shoulder	AHD051
E		k.	Head diameter	RAA077
E		l.	Dimension "F"	RAA078
H	(T)	m.	Material - tensile ultimate strength, tensile yield strength, and alloy	RAA074
H	(T)	n.	Ultrasonic inspection is acceptable	RAA075
H		o.	No shipping or handling damage	RAA094

CRITICAL ITEMS LIST (CIL)

No. 10-03-04-14R/01

DATE: 05 Oct 2001
 SUPERSEDES PAGE: 440-1ff.
 DATED: 31 Jul 2000

10. For Refurbished Bolt, Igniter, Inner verify:
- | | | | | |
|-------|--|----|-----------------------------------|--------|
| A,E,H | | a. | Surface finish on sealing surface | LHA004 |
|-------|--|----|-----------------------------------|--------|
11. For New Bolt, Special verify:
- | | | | | |
|-------|-----|----|---|--------|
| A,H | (T) | a. | No surface discontinuities detected by dye penetrant inspection | ACC107 |
| A,H | | b. | Certificate of Conformance is complete and acceptable | ACC009 |
| A | | c. | Surface finish of shank and bolt head bottom surface | ACC114 |
| D,F,H | (T) | d. | Eddy-current inspection is acceptable | CCC055 |
| E | | e. | Bolt length | ACC004 |
| E | | f. | Length, shoulder-to-thread end | ACC062 |
| E | | g. | Grip length | ACC000 |
| E | | h. | Shank diameter | ACC102 |
| E | | i. | Shank fillet radius | ACC104 |
| E | | j. | External threads are per engineering | ACC130 |
| E | | k. | Perpendicularity of bolt axis-to-bolt shoulder | ACC093 |
| E | | l. | Head length | ACC002 |
| E | | m. | Head width | ACC003 |
| H | (T) | n. | Material - tensile ultimate strength, tensile yield strength, and alloy | RAA086 |
| H | (T) | o. | Ultrasonic inspection is acceptable | RAA087 |
| H | | p. | No shipping or handling damage | ACC076 |
12. For New Washer, Special, verify:
- | | | | | |
|---------|--|----|---|--------|
| A,D,E,F | | a. | Thickness | RAA138 |
| E | | b. | Certificate of Conformance is complete and acceptable | RAA131 |
| E | | c. | Outside diameter | RAA137 |
| E | | d. | Inside diameter | RAA134 |
13. For New Packing With Retainer verify:
- | | | | | |
|-----------|-----|----|--|-----------------------------|
| A,B,C,E,H | | a. | Certificate of Conformance complete and acceptable | AFC004 |
| A,C,D,F,G | | b. | Surface quality | AFC068 |
| B,H,J | | c. | Seal material is fluorocarbon rubber | AFC028 |
| B,D,F | | d. | Rubber is adhesively bonded to each retainer | LAA042 |
| B | (T) | e. | Shore A hardness of rubber | AJF013,LAA021,AJF012,LAA025 |
| B | (T) | f. | Tensile strength of rubber | AJF015,LAA022,AJF014,LAA026 |
| B | (T) | g. | Percent elongation of rubber | AJF017,LAA023,AJF016,LAA027 |
| B | (T) | h. | Compression-set of rubber | AJF002,LAA024,AJF001,LAA028 |
| C | | i. | Each packing with retainer is packaged in the correct material | AFC046 |
| C | | j. | Packages are sealed prior to shipment | AFC045 |
| C | | k. | Storage conditions acceptable | AFC064 |
| C | | l. | Age limit at time of shipment was not exceeded | AFC048 |
| C | | m. | Parts are repackaged and resealed | AFC047 |
| E | | n. | Diameter "A" | AFC014 |
| E | | o. | Diameter "C" | AFC015 |
| E | | p. | Seal thickness dimension "D" | AFC063 |
| E | | q. | Retainer thickness dimension "E" | AFC052 |
14. For New Grease verify:
- | | | | | |
|---|-----|----|--------------------|--------|
| B | (T) | a. | Penetration | LAA037 |
| B | (T) | b. | Dropping point | ANO042 |
| B | (T) | c. | Zinc concentration | LAA038 |
15. For New Filtered Grease verify:



CRITICAL ITEMS LIST (CIL)

No. 10-03-04-14R/01

DATE: 05 Oct 2001
 SUPERSEDES PAGE: 440-1ff.
 DATED: 31 Jul 2000

B,D,F (T) a. Contamination ANO064

16. For Refurbished Special Bolt verify:

- | | | | |
|---------|----|--|--------|
| A,D,E,H | a. | Surface finish of O-ring groove | LHA901 |
| A,D,E,H | b. | Surface finish of shank and bolt head bottom surface | LHA902 |
| A,D,E,H | c. | External threads | LHA903 |
| A,D,E,H | d. | Port threads | LHA904 |
| A,D,E,H | e. | Surface finish of sealing surfaces in port area | LHA905 |
| A,D,E,H | f. | Eddy current inspection is acceptable | LHA906 |

17. KSC verifies:

- | | | | | |
|-----|-----|----|--|--------|
| 562 | D,F | a. | Lock/safety wire on the igniter adapter inner and outer bolt circles, the OPTs, and the RSRM Port Plugs (leak check port plug for lock/safety wire) to be unbroken prior to forward skirt closeout per OMRSD File V, Vol. I, B47IG0.040. | OMD045 |
| | J | b. | Igniter heaters are activated and that temperatures are in compliance with NASA Launch Commit Criteria (NSTS-16007) per OMRSD File II, Vol. I, S00FA0.620 | OMD012 |