PROCESS SYSTEMS INTERNATIONAL DOCUMENT REVIEW CHECKLIST
PROJECT NAME: LTCD
PSI DOD. NO. 1049-8-205
CHK BY / DATE
IS PROJECTENG THS 3-9-96 34 MECHANICAL Jus 3/0/96
SM MECHANICAL In 3/0/91
STRESS
ELECTRICAL
RT_PROCESS R. 3/7/96
MFG. ENG.
MANUF
AB OA COBB 3-5-96
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### **PROCESS SYSTEMS INTERNATIONAL** DOCUMENT APPROVAL CHECKLIST PROJECT NAME:\_\_\_\_\_ PSI DOC. NO. NOTE: THIS REVIEW DOES NOT RELIEVE THE SELLER OR CONTRACTOR OF ANY OBLIGATIONS UNDER THE P.O. OR CONTRACT. FA = FINAL APPROVAL AS = APP'D AS NOTED - REVISE & RESUBMIT \_\_\_\_ AF = APPROVED FOR FABRICATION ------ RP=RELEASED FOR PROCUREMENT OF MATERIALS ONLY BY\_\_\_\_\_ DATE\_\_\_\_

Spec - Marshacturing Process, Gody Klange

VENDOR NAME: GNB
REVISION NO:
SLEWATTAL NO: 157
STOTUS: Keners & Apporal

MAR 0 5 1996

NUMBER:	IGO PAGE:	N049-8-205		0 5 1996 MANUFACTU			
BF-001		GNB	•	ROUTING			
ISSUED:	REV:	CORPORA	TION				
TITLE: M	ANUFACTURING PI	ROCESS, BODY FLANGE, LIGO			•		
				•			
· <b>1.</b>	Order Certified M	faterial.		• •			
	1.1 Purchase Rev 2.	approved material as described in s	section 6.0 PSI	Specification V04	9-2-03		
	= = =	ourchase shall be in accordance wit	h UHV-001 1.0				
2.	Raw Material Re	ceiving Inspection					
	2.1 Raw mate	rial to be inspected to purchase or	ler specificatior	lS.			
		l inspection data and material certi- area. (LIGO Rolling File Chart)	fication in mate	rial records file lo	cated		
3.	Tag and Identify	All Inspected Material					
	3.1 Identify all material per print specifications and in accordance with PSI Specifications V049-2-033 Rev. 2 Section 6.5.						
4.	3.2 Store all identified material in segregated area. GNB specification UHV-001 shall apply to all process steps within this document.						
5.	Approved cutting between operatio	fluids shall not be allowed to dry ns.	on part surface.	Clean per GNB-H	IS-00		
BOD	Y FLANGE						
А.	Record material of	control number.			•		
B.	Face mill materia	l to size per print.					
C.	Inspect per print	specifications.					
• D.	Stamp material c	ontrol number on part edge.					
E.	Approved outside	e supplier to grind material per prin	nt and clean.				
<b>F</b> .	Inspect received	material per print.					
PREPARED BY:		ENGINEERING	SPE	CIFICATION			
QA	DATE:	DATE:	NUMBER:		REV:		
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NUMBER: BF-001	PAGE:OF2_	- GN	B	MANUFACTUR ROUTING
ISSUED:	REV:	CORPOR		
TITLE: MA	NUFACTURING PROCE	SS, BODY FLANGE, LIGO		1
G.	Finish machine. Ref. s	tep 5.		-
H.	Finish turn per print -	Ref. step 5.		· · · · · · · · ·
<b>I.</b>	Finish machine per pri	nt - Ref. step 5.		
J.	Inspect finished machi	ined part per print.		
K.	Electropolish material	per NTA Ultra Polish. (Ou	utside vendor)	•
<b>.</b> L.	Inspect surface finish on nicks, dings and burrs.	of received material for sur	face roughness, h	andling marks such
М.	Clean per SP-001.			
N.	Store cleaned part per	UHV-001 Sec. 2.0		
PREPARED BY:	ENG	INEERING	SPE	CIFICATION
	DATE:	DATE:		
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NUMBER: BF-001	PAGE:OF_	_2	GNB		MANUFACTUI ROUTING				
ISSUED: REV:			CORPORA	TION	•	-			
TITLE: MANUFACTURING PROCESS, BONNET FRAME, LIGO									
1.	1. Order Certified Material.								
	1.1 Purchase approved material as described in section 6.0 PSI Specification V049-2-033 Rev 2.								
	1.2 Material p	urchase shal	l be in accordance wit	h UHV-001 1.0.					
2.	Raw Material Rec	ceiving Inspe	ction						
	2.2 Record all	l inspection d	pected to purchase ord lata and material certif Rolling File Chart)	-		cated in			
3.	Tag and Identify	All Inspected	l Material						
	3.1 Identify all material per print specifications and in accordance with PSI Specifications V049-2-033 Rev. 2 Section 6.5.								
1 -			terial in a segregated a			-			
4.	GNB specification	on UHV-001	shall apply to all proc	ess steps within	this document.				
5.	Approved cutting fluids shall not be allowed to dry on part surface. Clean per GNB-HS-001, between operations.								
BON	NET FRAME								
А.	Face mill materia	l to size per	print. (Dry)						
В.	Inspect per print	specification							
C.	Stamp material control number on part edge.								
D.	#4 Grain material 2 sides, per Stainless Steel Polishing UHV process.								
E.	E. Inspect surface finish for pits, uniform finish, handling marks such as nicks, dings, and burrs.								
PREPARED BY:		ENGINEERING		SPEC	CIFICATION				
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### TITLE:

E: MANUFACTURING PROCESS, BONNET FRAME, LIGO

- F. Finish machine per print Ref. step 5.
- G. Inspect per print specifications.
- H. Electropolish material per NTA Ultra Polish.
- I. Inspect, finish for surface roughness, handling marks such as nicks, dings and burrs.
- J. Clean material per SP-001.
- K. Store material per UHV-001 Sec. 2.0

PREPARED BY:	ENGINEERING	SPECIFIC	ATION
DATE:	DATE:		
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DATE:	DATE:		

NUMBER: BP-001	PAGE:OF	_2	GNB		MANUFACTU				
ISSUED:	REV:		CORPORA	<b>FION</b>					
TITLE: MA	I INUFACTURING PI	ROCESS,	BODY PLATES, LIGO		l ·				
		<u></u>			•	-			
1.	1. Order Certified Material.								
	1.1 Purchase approved material as described in section 6.0 PSI Specification V049-2-033 Rev 2.								
	1.2 Material p	ourchase	shall be in accordance with	h UHV-001 1.0					
2.	Raw Material Re	ceiving I	nspection		•				
	2.2 Record al	l inspect	e inspected to purchase ord ion data and material certif OGO Rolling File Chart)			cated in			
3.	Tag and Identify	All Insp	ected Material						
·	Specificat	tions V04	al per print specifications a 49-2-033 Rev. 2 Section 6. I material in a segregated a	5.	ce with PSI				
4.			-001 shall apply to all proc		this document.				
5.	Approved cutting between operatio		hall not be allowed to dry o	on part surface.	Clean per GNB-H	(S-001,			
BODY	Y PLATES								
А.	Face mill materia	ıl to size	per print (Dry)						
B.	Inspect per print	specifica	tions.			C			
C.	Stamp identifying	g part nu	mber on part edge.		Proc	ess? ?			
D.	#4 Grain materia	l 2 side p	per Stainless Steel Polishin	g UHV process	. E				
E.	Inspect finish for	surface	roughness, handling marks	s such as nicks,	dings and burrs.				
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# **GNB** CORPORATION

MANUFACTURING ROUTING

### TITLE: MANUFA

MANUFACTURING PROCESS, BODY PLATES, LIGO

- F. Electropolish material per NTA Ultra Polish.
- G. Repeat step E.
- H. Clean material per SP-001.
- I. Store material per UHV-001 Sec. 2.0

PREPARED BY:	ENGINEERING	SPECIFICATION		
DATE:	DATE:			
QA	OPERATIONS	NUMBER:	REV:	
DATE:	DATE:			

NUMBER: BW-001	PAGE:		GNB		MANUFACTU ROUTING			
ISSUED:	REV:		CORPORA					
TITLE: MAN	UFACTURING P	ROCESS, BODY	WELDMENT, LIGO	, <u> </u>				
1. Order Certified Material.								
	1.1 Purchase approved material as described in section 6.0 PSI Specification V049-2- Rev 2.							
	1.2 Material	purchase shall b	e in accordance wit	h UHV-001 1.0				
2.	Raw Material Re	ceiving Inspect	ion			·		
	2.2 Record al	l inspection dat	cted to purchase ord a and material certif olling File Chart)	-		ated in		
3.	Tag and Identify	All Inspected N	Aaterial					
3.1 Identify all material per print specifications and in accordance with PSI Specifications V049-2-033 Rev. 2 Section 6.5.								
			ial in a segregated a					
4.	GNB specificati	on UHV-001 sł	nall apply to all proc	ess steps within	this document.			
5.	Approved cutting between operation	-	t be allowed to dry	on part surface.	Clean per GNB-H	<b>S-001</b> ,		
BODY	WELDMENT							
<b>A.</b>	Initiate individua	d inspection file	e of each weldment.					
В.	Transfer all parts	to welding clea	anroom.					
C.	Fit weldment per	r print specifica	tions.					
D.	Inspect weldmen	it per print spec	ifications.					
E.	E. Vacuum and structural weld per print in accordance to Wp-001.							
PREPARED BY:		ENGINEERING		SPE	CIFICATION			
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QA	DATE:	OPERATIONS	DATE:	NUMBER:		REV:		

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TITLE: MA	NUFACTURING PRO	CESS, BODY WELDMENT, LI	GO		
				•	
F.	Repeat step C - sta	mp per WP-001 # 10	۲		
G.	Hand electropolish	all weld zones to remove wel	ld discoloration a	nd oxidation.	
H.	Clean per GNB-HS	5-001.			
<b>I.</b>		GNB Standard Diffusion Pun epeat steps D through H as re-		e. If weld repair is re	quire
<b>J.</b> -	Clean per SP-001				
K.	Store per UHV-00	1 2.5			
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ISSUED:	REV:		CORPORA	ΓΙΟΝ		•		
TITLE: MA	NUFACTURING PR	ROCESS,	BONNET PLATES, LIGO		·			
				· · · · · ·	• •			
1.	Order Certified M	laterial.			· ·			
	1.1 Purchase approved material as described in section 6.0 PSI Specification V049-2-033 Rev 2.							
	1.2 Material purchase shall be in accordance with UHV-001 1.0.							
2.	Raw Material Red	ceiving ]	Inspection					
	<ul> <li>2.1 Raw material to be inspected to purchase order specifications.</li> <li>2.2 Record all inspection data and material certification in material records file located in receiving area. (LIGO Rolling File Chart)</li> </ul>							
3.	Tag and Identify	All Insp	ected Material					
	<ul> <li>3.1 Identify all material, per print specification and in accordance with PSI Specifications V049-2-033 Rev. 2 Section 6.5.</li> <li>3.2 Store all identified material in a segregated area.</li> </ul>							
4.	GNB specification	on UHV	-001 shall apply to all proc	ess steps within	this document.			
5.	Approved cutting between operation		shall not be allowed to dry	on part surface.	Clean per GNB-H	(S-001,		
BON	NET PLATES							
А.	Face mill materia	l to size	per print. (Dry)					
B.	Inspect per print	specifica	ations.					
C.	Stamp identifying	g part ni	umber on part edge.					
D.	# 4 Grain material 2 sides per Stainless Steel Polishing UHV process.							
E.	Inspect surface finish for pits, uniform finish, handling marks such as nicks, dings and burrs.							
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ISSUED:	REV:	CORPORA	TION		
TITLE: MA	NUFACTURING PRO	CESS, BONNET PLATES, LIGO	)		
<b>F.</b>	Finish machine per	print - Ref. step 5.			
G.	Inspect per print spe	cifications.			•
H.	Weld lifting eyes pe	r print in accordance with WP	S GT-5-P8.	•	
I.	Electropolish materi	al per NTA Ultra Polish.			
J.	Inspect recieved mar burrs.	terial for surface roughness, ha	andling marks suc	h as nicks, dings a	and
K.	Clean material per U	JHV-001 Sec. 2.0			
					•
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NUMBER: CR-001	PAGE:OF	_2	GNB		MANUFACTU ROUTING			
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TITLE: MAI	UFACTURING P	ROCESS, CARF	LIAGE, LIGO		· · · · · · · · · · · · · · · · · · ·			
				·	•			
- 1.	Order Certified N	Aaterial.						
	1.1 Purchase approved material as described in section 6.0 PSI Specification V049-2-033 Rev 2.							
· · · · ·	1.2 Material	purchase shall	be in accordance with	h UHV-001 1.0.				
2.	Raw Material Re	ceiving Inspec	tion					
	<ul> <li>2.1 Raw material to be inspected to purchase order specifications.</li> <li>2.2 Record all inspection data and material certification in material records file located in receiving area. (LIGO Rolling File Chart)</li> </ul>							
3.	Tag and Identify	All Inspected	Material					
	3.1 Identify all material per print specifications and in accordance with PSI Specifications V049-2-033 Rev. 2 Section 6.5.							
	-		rial in a segregated a					
4.	GNB specificati	on UHV-001 s	shall apply to all proc	ess steps within	this document.			
- 5.	Approved cutting between operation	-	ot be allowed to dry o	on part surface.	Clean per GNB-H	IS-00,		
CARR	IAGE							
NOTE	All surface	ces machined a	and/or polished for re	duced surface a	rea and ease of cle	aning.		
А.	Saw cut material	per B.O.M. R	ef. preclean.					
В.	Identify material	per print note						
C.	Inspect material per print specification.							
D.	D. Pre-machine all surfaces of material per print - Ref. step 5.							
PREPARED BY:		ENGINEERING		SPE	CIFICATION			
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QA	DATE:	OPERATIONS	DATE:	NUMBER:	·····	REV:		

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ISSUED:	REV:	CORPOR	ATION	
TITLE: MA	NUFACTURING PR	OCESS, CARRIAGE, LIGO		
			· · · · · · ·	•
E.	Stamp all material	with identifying number stam	p location as noted	l on drawing.
<b>F.</b>	Repeat step C.			
G.	Fit and weld per pasurfaces.	rint in accordance with WP-00	1. Insure venting	of all joints or lapped
H.	Repeat step C.			
I.	Finish machine pri	int - Ref. step 5.		
J.	Inspect per print.			
К.	Electropolish mate	erial per NTA Ultra Polish.		
L.	Inspect finish for s	surface roughness, handling m	arks such as nicks,	dings and burrs.
· M.	Clean per SP-001.			
N.	Store material per	UHV-001 2.4		
PREPARED BY:	T	ENGINEERING	(ID)	
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QA		OPERATIONS	NUMBER:	REV:
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TITLE: M	ANUFACTURING	PROCESS, GAT	re frame, ligo				
			· · · · · ·		•		
1.	Order Certified	l Material.					
•	1.1 Purcha Rev 2.	se approved ma	aterial as described in sec	ction 6.0 PSI	Specification V049-	2-0	
	1.2 Materia	al purchase shal	ll be in accordance with	UHV-001 1.0	).		
2.	Raw Material	Receiving Inspe	ection				
	2.2 Record	all inspection of	pected to purchase orde data and material certific Rolling File Chart)			ted	
3.	Tag and Identify All Inspected Material						
			er print specifications an		ce with PSI		
	•		-033 Rev. 2 Section 6.5 terial in a segregated are				
4.	GNB specific	ation UHV-001	shall apply to all proces	ss steps withi	n this document.		
5.	Approved cutt between opera		not be allowed to dry or	ı part surface.	. Clean per GNB-HS	-00	
GAT	<u>E FRAME</u>						
NOT	E: All sur	faces machined	l and/or polished. For re	duced surface	area and ease of cle	ani	
А.	Approved supp	plier to grind pe	er print.				
В.	Inspect per purchase order specifications.						
C.	Stamp identify	ving part numbe	er on part edge. Machine	to net shape.	. Ref. step 5		
D.	Inspect per pri	nt specification	15.				
D.							
D. PREPARED BY:		ENGINEERING	ł	SPE	CIFICATION		

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<ul> <li>E. Fit and weld all sub-components per print in accordance with WP-001. Insure venting joints or lapped surfaces.</li> <li>F. Repeat step D.</li> <li>G. Finish machine per print - Ref. step 5.</li> <li>H. Inspect per print specifications.</li> <li>I. Electropolish material per NTA Ultra Polish.</li> <li>J. Inspect finish for surface roughness, handling marks such as nicks, dings, and burrs.</li> <li>K. Clean per SP-001.</li> <li>L. Store per UHV-001 2.4</li> </ul>	ISSUED:			
joints or lapped surfaces.         F.       Repeat step D.         G.       Finish machine per print - Ref. step 5.         H.       Inspect per print specifications.         I.       Electropolish material per NTA Ultra Polish.         J.       Inspect finish for surface roughness, handling marks such as nicks, dings, and burrs.         K.       Clean per SP-001.         L.       Store per UHV-001 2.4         PREPARED BY:       ENGINEERING         DATE:       DATE:	TITLE: MA	NUFACTURING PROCESS,	, GATE FRAME, LIGO	
joints or lapped surfaces.         F.       Repeat step D.         G.       Finish machine per print - Ref. step 5.         H.       Inspect per print specifications.         I.       Electropolish material per NTA Ultra Polish.         J.       Inspect finish for surface roughness, handling marks such as nicks, dings, and burrs.         K.       Clean per SP-001.         L.       Store per UHV-001 2.4         PREPARED BY:       ENGINEERING         DATE:       DATE:				
G.       Finish machine per print - Ref. step 5.         H.       Inspect per print specifications.         I.       Electropolish material per NTA Ultra Polish.         J.       Inspect finish for surface roughness, handling marks such as nicks, dings, and burrs.         K.       Clean per SP-001.         L.       Store per UHV-001 2.4         PREPARED BY:       ENGINEERING         DATE:       DATE:	· E.			vith WP-001. Insure ventin
H.       Inspect per print specifications.         I.       Electropolish material per NTA Ultra Polish.         J.       Inspect finish for surface roughness, handling marks such as nicks, dings, and burrs.         K.       Clean per SP-001.         L.       Store per UHV-001 2.4         PREPARED BY:       ENGINEERING         DATE:       DATE:	F.	Repeat step D.	· · ·	
I.       Electropolish material per NTA Ultra Polish.         J.       Inspect finish for surface roughness, handling marks such as nicks, dings, and burrs.         K.       Clean per SP-001.         L.       Store per UHV-001 2.4         PREPARED BY:       ENGINEERING         DATE:       DATE:	G.	Finish machine per print	- Ref. step 5.	
J.       Inspect finish for surface roughness, handling marks such as nicks, dings, and burrs.         K.       Clean per SP-001.         L.       Store per UHV-001 2.4         PREPARED BY:       ENGINEERING         DATE:       DATE:	H.	Inspect per print specific	ations.	
K.       Clean per SP-001.         L.       Store per UHV-001 2.4	I.	Electropolish material pe	r NTA Ultra Polish.	
L. Store per UHV-001 2.4           PREPARED BY:         ENGINEERING         SPECIFICATION           DATE:         DATE:         DATE:	J.	Inspect finish for surface	roughness, handling marks such	as nicks, dings, and burrs.
PREPARED BY: DATE: ENGINEERING DATE: ENGINEERING DATE: ENGINEERING	К.	Clean per SP-001.		
DATE: DATE: DATE:	L.	Store per UHV-001 2.4		
DATE: DATE: DATE:				
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TITLE: MA	NUFACTURING PR	ROCESS, GA	TE PLATE, LIGO				
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1.	Order Certified M	Aaterial.					
	1.1 Purchase Rev 2.	approved n	naterial as described in s	ection 6.0 PSI	Specification V049	)-2-033	
	1.2 Material p	purchase sh	all be in accordance wit	h UHV-001.			
2.	Raw Material Re	ceiving Ins <sub>]</sub>	pection				
	2.2 Record al	l inspection	nspected to purchase ord a data and material certif O Rolling File Chart)	-		ated in	
3.	Tag and Identify	All Inspect	ed Material				
	Specificat	-	per print specifications a 2-033 Rev. 2 Section 6.		ce with PSI		
	3.2 Store all i	identified m	aterial in a segregated a	rea.		-	
4.	GNB specification	on UHV-00	1 shall apply to all proc	ess steps within	this document.		
5.	Approved cutting between operatio	-	ll not be allowed to dry	on part surface.	. Clean per GNB-H	IS-001,	
GATI	E PLATES						
A.	Turn per print - F	Ref. step 5.			· .		
B.	Inspect per print	-	inc				
С.		-					
	Finish machine a	ui uctaris pe	er print.				
D.	Repeat step B.						
E.	Electropolish per	r NTA Ultra	a Polish.				
PREPARED BY:		ENGINEERIN	G	SPE	CIFICATION		
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NUMBER:         PAGE:           GP-001        2_OF2		2	GN	B	MANUFACTU ROUTIN	
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TTLE: MA	NUFACTURING PI	ROCESS, GATE PI	LATES, LIGO		· ·	
					•	
F.	Inspect finish for	surface roughnes	s, handling ma	rks such as nicks	, dings and burrs.	
G.	Clean per SP-00	1.	•			
H.	Store material pe	r UHV-001 2.4.				
	-					
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	· . · ·					
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NUMBER: LK-001	PAGE:	DF_2	GNB	MANUFACTU	
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TITLE: M	ANUFACTURING I	PROCESS, LINK PLATE, LI	GO	<u> </u>	
				•	
1.	Order Certified	Material.		•	
	1.1 Purchase	e approved material as desc	cribed in section 6.0 PSI	Specification V04	9-2-033
	Rev 2.	purchase shall be in accor			
2.	Raw Material R	eceiving Inspection		•	
	2.2 Record a	terial to be inspected to put Il inspection data and mate g area. (LIGO Rolling File	erial certification in mate		cated in
3.	Tag and Identify	All Inspected Material			
	Specifica	all material per print speci ations V049-2-033 Rev. 2	Section 6.5.	ce with PSI	
	3.2 Store all	identified material in a seg	gregated area.		
4.	GNB specificat	ion UHV-001 shall apply t	o all process steps within	this document.	
5.	Approved cuttin between operation	g fluids shall not be allowe	ed to dry on part surface.	Clean per GNB-H	IS-001,
LINK	PLATE				
А.	Saw cut materia	l per B.O.M. Ref. preclean	•		
B.	Identify material	per print note.			
C.	Inspect material	per print specification.			
D.	Machine comple	ete per print. (All surfaces)	Polish for easy clean.		
E.	Repeat step C.				
PREPARED BY:		ENGINEERING	SPEC	CIFICATION	••••
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NUMBER: LK-001	PAGE:OF		NB	MANUFACTURING ROUTING
ISSUED:	REV:	CORPO	RATION	
TITLE: MA	NUFACTURING PROCE	ESS, LINK PLATE, LIGO		
				•
F.	Electropolish per NTA			
G.	Inspect finish for surfa	ace roughness, handling	marks such as nick, o	lings and burrs.
H.	Clean per SP-001.			
I.	Store per UHV-001 2.	4		
•				
				· ·
PREPARED BY:		NEERING	SPE	CIFICATION
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ISSUED:       REV:       CORPORATION         TITLE:       MANUFACTURING PROCESS, PINS/AXLES, LIGO         1.       Order Certified Material.         1.1       Purchase approved material as described in section 6.0 PSI Specification V049-24, Rev 2.         1.2       Material purchase shall be in accordance with UHV-001 1.0.         2.       Raw Material Receiving Inspection         2.1       Raw material to be inspected to purchase order specifications.         2.2       Record all inspection data and material certification in material records file locate receiving area. (LIGO Rolling File Chart)         3.       Tag and Identify All Inspected Material         3.1       Identify all material per print specifications and in accordance with PSI Specifications V049-2-03 Rev 2. Section 6.5.         3.2       Store all identified material in segregated area.         4.       GNB specification UHV-001 shall apply to all process steps within this document.         5.       Approved cutting fluids shall not be allowed to dry on part surface. Clean per GNB-HS-04 between operations.         PINS/AXLES         A.       Saw cut material per print note.         C.       Inspect material per print specification.         D.       Machine complete per print.         E.       Repeat step C.         F.       Heat treat per print note/specification. <th>NUMBER: PA-001</th> <th>PAGE:</th> <th>)F_2</th> <th>GNI</th> <th>B</th> <th>MANUFACTU ROUTING</th> <th></th>	NUMBER: PA-001	PAGE:	)F_2	GNI	B	MANUFACTU ROUTING	
1.       Order Certified Material.         1.1       Purchase approved material as described in section 6.0 PSI Specification V049-24 Rev 2.         1.2       Material purchase shall be in accordance with UHV-001 1.0.         2.       Raw Material Receiving Inspection         2.1       Raw material to be inspected to purchase order specifications.         2.2       Record all inspection data and material certification in material records file locate receiving area. (LIGO Rolling File Chart)         3.       Tag and Identify All Inspected Material         3.1       Identify all material per print specifications and in accordance with PSI Specifications V049-2-033 Rev. 2 Section 6.5.         3.2       Store all identified material in segregated area.         4.       GNB specification UHV-001 shall apply to all process steps within this document.         5.       Approved cutting fluids shall not be allowed to dry on part surface. Clean per GNB-HS-0 between operations.         PINS/AXLES         A.       Saw cut material per print note.         C.       Inspect material per print specification.         D.       Machine complete per print.         E.       Repeat step C.         F.       Heat treat per print note/specification.         PATE:       DATE:	ISSUED:	REV:		CORPORA	TION		
1.1       Purchase approved material as described in section 6.0 PSI Specification V049-2-4 Rev 2.         1.2       Material purchase shall be in accordance with UHV-001 1.0.         2.       Raw Material Receiving Inspection         2.1       Raw material to be inspected to purchase order specifications.         2.2       Record all inspection data and material certification in material records file locate receiving area. (LIGO Rolling File Chart)         3.       Tag and Identify All Inspected Material         3.1       Identify all material per print specifications and in accordance with PSI Specifications V049-2-033 Rev. 2 Section 6.5.         3.2       Store all identified material in segregated area.         4.       GNB specification UHV-001 shall apply to all process steps within this document.         5.       Approved cutting fluids shall not be allowed to dry on part surface. Clean per GNB-HS-0 between operations.         PINS/AXLES       A.         A.       Saw cut material per print note.         C.       Inspect material per print specification.         D.       Machine complete per print.         E.       Repeat step C.         F.       Heat treat per print note/specification.         PATE:       DATE:	TITLE: M	ANUFACTURING	PROCESS, I	PINS/AXLES, LIGO			
Rev 2.         1.2       Material purchase shall be in accordance with UHV-001 1.0.         2.       Raw Material Receiving Inspection         2.1       Raw material to be inspected to purchase order specifications.         2.2       Record all inspection data and material certification in material records file locate receiving area. (LIGO Rolling File Chart)         3.       Tag and Identify All Inspected Material         3.1       Identify all material per print specifications and in accordance with PSI Specifications V049-2-033 Rev. 2 Section 6.5.         3.2       Store all identified material in segregated area.         4.       GNB specification UHV-001 shall apply to all process steps within this document.         5.       Approved cutting fluids shall not be allowed to dry on part surface. Clean per GNB-HS-0 between operations.         PINS/AXLES         A.       Saw cut material per print note.         C.       Inspect material per print specification.         D.       Machine complete per print.         E.       Repeat step C.         F.       Heat treat per print note/specification.         PREPARED BY:       ENGINEERING         DATE:	. 1.	Order Certified	Material.			•	
2.       Raw Material Receiving Inspection         2.1       Raw material to be inspected to purchase order specifications.         2.2       Record all inspection data and material certification in material records file locate receiving area. (LIGO Rolling File Chart)         3.       Tag and Identify All Inspected Material         3.1       Identify all material per print specifications and in accordance with PSI Specifications V049-2-033 Rev. 2 Section 6.5.         3.2       Store all identified material in segregated area.         4.       GNB specification UHV-001 shall apply to all process steps within this document.         5.       Approved cutting fluids shall not be allowed to dry on part surface. Clean per GNB-HS-0 between operations.         PINS/AXLES         A.       Saw cut material per B.O.M Ref preclean.         B.       Identify material per print note.         C.       Inspect material per print specification.         D.       Machine complete per print.         E.       Repeat step C.         F.       Heat treat per print note/specification.         PATE:         DATE:			e approved	material as described in	n section 6.0 PSI	Specification V049	9-2-(
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3.1       Identify all material per print specifications and in accordance with PSI Specifications V049-2-033 Rev. 2 Section 6.5.         3.2       Store all identified material in segregated area.         4.       GNB specification UHV-001 shall apply to all process steps within this document.         5.       Approved cutting fluids shall not be allowed to dry on part surface. Clean per GNB-HS-0 between operations. <b>PINS/AXLES</b> A.       Saw cut material per B.O.M Ref preclean.         B.       Identify material per print note.         C.       Inspect material per print specification.         D.       Machine complete per print.         E.       Repeat step C.         F.       Heat treat per print note/specification.         PREPARED BY:         DATE:		2.2 Record	all inspection	on data and material cer	-		cate
Specifications V049-2-033 Rev. 2 Section 6.5.         3.2       Store all identified material in segregated area.         4.       GNB specification UHV-001 shall apply to all process steps within this document.         5.       Approved cutting fluids shall not be allowed to dry on part surface. Clean per GNB-HS-0 between operations.         PINS/AXLES         A.       Saw cut material per B.O.M Ref preclean.         B.       Identify material per print note.         C.       Inspect material per print note.         D.       Machine complete per print.         E.       Repeat step C.         F.       Heat treat per print note/specification.         PREPARED BY:         DATE:         DATE:	3.	Tag and Identif	d Identify All Inspected Material				
<ul> <li>GNB specification UHV-001 shall apply to all process steps within this document.</li> <li>Approved cutting fluids shall not be allowed to dry on part surface. Clean per GNB-HS-0 between operations.</li> <li>PINS/AXLES</li> <li>A. Saw cut material per B.O.M Ref preclean.</li> <li>B. Identify material per print note.</li> <li>C. Inspect material per print specification.</li> <li>D. Machine complete per print.</li> <li>E. Repeat step C.</li> <li>F. Heat treat per print note/specification.</li> <li>PREPARED BY: ENGINEERING SPECIFICATION DATE:</li> </ul>		Specific	ations V04	9-2-033 Rev. 2 Section	6.5.	ce with PSI	
between operations.         PINS/AXLES         A.       Saw cut material per B.O.M Ref preclean.         B.       Identify material per print note.         C.       Inspect material per print specification.         D.       Machine complete per print.         E.       Repeat step C.         F.       Heat treat per print note/specification.         PREPARED BY:       ENGINEERING         DATE:       DATE:	4.					this document.	-
A.       Saw cut material per B.O.M Ref preclean.         B.       Identify material per print note.         C.       Inspect material per print specification.         D.       Machine complete per print.         E.       Repeat step C.         F.       Heat treat per print note/specification.         PREPARED BY:         DATE:       DATE:	5.		-	all not be allowed to dr	y on part surface.	Clean per GNB-H	IS-0
B.       Identify material per print note.         C.       Inspect material per print specification.         D.       Machine complete per print.         E.       Repeat step C.         F.       Heat treat per print note/specification.         PREPARED BY:         DATE:       DATE:	PINS	/AXLES					
C. Inspect material per print specification. D. Machine complete per print. E. Repeat step C. F. Heat treat per print note/specification. PREPARED BY: ENGINEERING SPECIFICATION DATE: DATE:	А.	Saw cut materia	l per B.O.I	M Ref preclean.			
D. Machine complete per print. E. Repeat step C. F. Heat treat per print note/specification. PREPARED BY: ENGINEERING SPECIFICATION DATE: DATE:	B.	Identify materia	l per print	note.			
E. Repeat step C. F. Heat treat per print note/specification. PREPARED BY: ENGINEERING SPECIFICATION DATE: DATE:	C.	Inspect materia	l per print s	pecification.			
F. Heat treat per print note/specification.  PREPARED BY: DATE: DATE: DATE:	D.	Machine compl	ete per prir	nt.			
PREPARED BY: ENGINEERING SPECIFICATION DATE: DATE:	E.	Repeat step C.					
DATE: DATE:	F.	Heat treat per p	rint note/sp	ecification.			
	PREPARED BY:		ENGINEER	ING	SPE	CIFICATION	
		DATE:					<u> </u>

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ISSUED:	REV:	CORPO		Rouinte
TITLE: MA	NUFACTURING PRO	CESS, PINS/AXLES, LIGO	· ·	
G.	Hand polish to unifo	orm surface finish		
			· · · · ·	
H.	Clean per SP-001.			
. <b>I.</b>	Store per UHV-001	2.4.		
. ••			• .	
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NUMBER: DC-001	PAGE:OF	GNB		MANUFACTU	
ISSUED:	REV:	CORPORA	<b>FION</b>		· ·
TITLE: MA	ANUFACTURING PROCE	S, DRIVE COMPONENTS, LIC	GO		
			······································	-	
1.	Order Certified Materia	<b>1.</b>		•	
	1.1 Purchase appro Rev 2.	ved material as described in s	ection 6.0 PSI S	pecification V049	<del>}</del> -2-033
	1.2 Material purcha	se shall be in accordance wit	h UHV-001 1.0.		-
2.	Raw Material Receivin	g Inspection			
	2.2 Record all insp	be inspected to purchase or ection data and material certi- (Ligo rolling file cart)	-		cated in
3.	Tag and Identify All In	spected Material			
	V049-2-033 Re	erial, per print specification a v. 2 Section 6.5. ied material in a segregated a		e with PSI Specif	ications
4.	GNB specification UF	V-001 shall apply to all proc	ess steps within	this document.	
5.	Approved cutting fluid between operations.	s shall not be alllowed to dry	on part surface.	Clean per GNB-I	HS-001
MOD	IFICATION OF BALI	SCREW AND COMPON	<u>ENTS</u>		
А.	Modify each drive con	ponent per print.			- - - -
В.	Inspect per print specif	ications.			
C.	Clean components with to items outside the va	a 409 and alcohol to remove a cuum environment.	all contaminants	, SP-001 does not	apply:
D.	Store per UHV-001 2.4	h.			
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1	DATE:	DATE:			1

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NUMBER: GGF-001	PAGE:	2	GNB		MANUFACTU	
ISSUED:	REV:		CORPORAT		ROUILIG	-
TITLE: AS		CADDI			•	
IIILE: AS	SEMBLY PROCESS		AGE/ GATE/ GATE FRAME A	ASSEMIBLI		
					•	
1.	Order Certified M	faterial.				
	Rev 2.		d material as described in s		- 	9-2-033
	1.2 Material p	ourchase	shall be in accordance wit	h UHV-001 1.0	•	
2.	Raw Material Re	ceiving	Inspection			
	2.2 Record al	l inspect	e inspected to purchase ord tion data and material certif Ligo rolling file cart)	•		cated in
3.	Tag and Identify	All Insp	ected Material			
	-		ial, per print specification a 2 Section 6.5.	nd in accordance	e with PSI Specifi	ications
	3.2 Store all i	dentifie	d material in a segregated a	rea.		•
4.	GNB specification	on UHV	-001 shall apply to all proc	ess steps withir	this document.	
5.	Approved cutting between operation		shall not be allowed to dry	on part surface.	Clean per GNB-H	(S-001,
	RIAGE/ GATE/ G 3 ASSY-001 APPI		RAME ASSEMBLY PECIFICALLY)			
А.	Consolidate inspe	ection fi	les for components of each	assembly.		
B.	Assemble link, n	on-lubri	cated bearings and pin asse	mbly per print.		
C.	Assemble wheel,	non-lut	pricated bearings and axle a	ssembly per pri	nt.	
D.	Inspect all sub-as	semblie	s for bearing fit and freedo	m of rotation.		
E.	Join all compone	nts per 1	top level assembly.			
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## **GNB** CORPORATION

### TITLE:

: ASSEMBLY PROCESS CARRIAGE/ GATE/ GATE FRAME, LIGO (CONT.)

- F. Inspect assembly for correct actuation and lock over position for wheel to wheel distances per print.
  - G. Inspect all fasteners for proper fit and print specified torque.

H. Wipe all accessible surface with chem wipes and alcohol to remove any contaminants.

I. Transfer assembly to cleanroom, let set minimum of two (2) hours prior to final assembly.

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SSUED:	REV:		CORPOR			· .
ITLE: AS	SEMBLY PROCE	SS, VALVE, I	 LIGO	·	· · · · ·	
			<u> </u>		• •	
				·		
1.	Order Certified	Material.			· ·	
	1.1 Purchas Rev 2.	e approved	material as described	l in section 6.0 PSI	Specification V04	9-2-033
	1.2 Materia	l purchase s	hall be in accordance	e with UHV-001 1.	0.	
2.	Tag and Identif	y All Inspe	cted Material		· ·	
			l, per print specificat Section 6.5.	ion and in accorda	nce with PSI Specif	fications
			material in a segrega	ted area.		
3.	GNB specifica	tion UHV-(	001 shall apply to all	process steps with	in this document.	
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VAL	VE ASSEMBLY	-				
А.	Clean all surface assembly and h		ohol and chem wipes ts.	. Transfer to Class	100 Cleanroom	Jo Tro
В.	Attach drive as drawing.	sembly to c	arriage, gate and gate	e frame mechanism	per top level as	No gra
C.	Install clean an	d baked O-1	rings to gate and bon	net plate O-ring gro	ooves.	How hel
D.	Using handling	cart insert	drive and carriage, g	ate and gate frame	assembly into valve	e body.
E.	Inspect/clean se	eal surface.	Attach Bonnet plate	to valve body with	n specified fastener	s.
F.	Adjust gate sea print specificat	-	Standard adjustment	procedure, torque	fasteners and set sc	rews per
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NUMBER: VAP-001	PAGE:	_OF2	GNB		MANUFACTU ROUTING	
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TITLE: AS	SEMBLY PROCI	ESS, VALVE, LIGO		·····		
					•	
<sup>.</sup> G.	Cycle valve to	inspect mechanism	actuation.	· ·	• • •	·
H.	Inspect gate se	eal adjustment, repea	at step F as required.			
I.	Repeat step A	•	·		•	
J.	Valve to be fit	ted immediately wit	h testing blanks.			
·.		е		· · · ·		. <b>.</b>
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NUMBER: VT1-001	PAGE:	_OF1	GNB	MANUFACTURING
ISSUED: REV:			RPORATION	ROUTING
TITLE: T	ESTING, 1ST ART	ICLE, LIGO		
1.	GNB specifica	ation UHV-001 shall ap	oply to all process steps with	in this document.
2.			with the exception of 1st artic	II
VAL	VE TESTING 1			of bill gui Test criter
А.	Actuate valve i V049-2-005 Re	n vertical position, actu ev. 3 per attached proce	ator up 20 times in accorda dure.	
B.	Shock test.			nce with PSI Spe E Bekeo K No
C.	Actuate valve u actuate 100 time	nder vacuum and leak t es.	test per GNB Standard Diffi	usion Pump Procedure
D.	Disassemble an to review all con	d inspect all componen mponents for adherence	ts. Engineering Manager an e to original specifications.	" d Manufacturing
E.		shall be cleaned per SI		
F.	All worn compo	ments shall be replaced	as specified by engineering	E Informer which perh E VAP.
G.	Assemble valve	per valve assembly pro	ocedure. Assy-001.	which pert
	NOTE: L ai	igo project manager sh bove testing.	all determine hold and with	ess points during the
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······		OPERATIONS	NUMBER:	
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## **GNB** CORPORATION

### TITLE: VALVE SHOCK TESTING PROCEDURES (LIGO ELECTRIC VALVE)

### 1. <u>Mounting</u>

A. The valve must be mounted in the vertical position resting on a pad which deflects at least 0.1 inches when the valve is placed on it in accordance with PSI Specification V049-2-005 Rev. 3 6.3.

### 2. <u>Conditions</u>

The valve will be tested in two conditions.

- A. Under normal atmospheric pressure.
- B. Under vacuum.
- 3. <u>Test Specification</u>
  - A. Test will be performed on all the valve housings (or near the edge of one of the flange covers) near the connecting flanges (or weld stubs) in three axes (horizontal, vertical, and axial) to determine shock levels in each of the three axes. This test will be conducted under normal atmospheric pressure and under vacuum. The levels of shock will be measured in g's peak-to-peak. The final data will list values for each of the three axes.

#### Note:

- 1. Acceleration levels can be collected from additional points on the value in all three axes at the request of the Buyer or end user.
- Shock test to be performed and analyzed by Balance Engineering. 718 Derby Ave Oakland, CA 94601 (510) 533-5612 Contact Person: Kevin Chin

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