USERS MANUAL FOR PREVCO SUBSEA HOUSINGS

Model Number (Part Number Suffix):

A/A/P2_9.201(TD)-24-2-0-1-DP-1 (A1)

Manual Revision 12
01/27/17

PREVCO SUBSEA LLC
10,000 N. Technology Drive
Fountain Hills AZ, 85268
480 837 0100
480 718 7723 fax

Table of Contents

To: University of Tasmania

From: John Head

CC: Project # PS2528

Subject: Welcome to New Users and Repeat Customers

Date: August 1, 2017

I'd like to take this opportunity to express my appreciation to you for choosing to purchase a PREVCO SUBSEA housing. We at PREVCO SUBSEA recognize that by choosing us you have entrusted us with the responsibility for helping to insure the success of your program and we take that responsibility very seriously. While we provide a full range of ocean engineering services, subsea housings are our specialty and we take pride in producing the highest quality, most reliable housings available.

I trust that this manual will provide you with the necessary data and background information to help your personnel utilize this unit efficiently and effectively for the life of your program. If you or your staff have any questions or need any further assistance whatsoever I encourage you to contact me directly so that I can personally see that these are promptly addressed. I also encourage you to use the customer feedback form in Appendix B. Your comments and criticism are the core of our ongoing quality improvement program. We are committed to constantly improving both our products and our services and your feedback is crucial to that effort.

Thank you again,

John Head

John Head
President
PREVCO SUBSEA LLC

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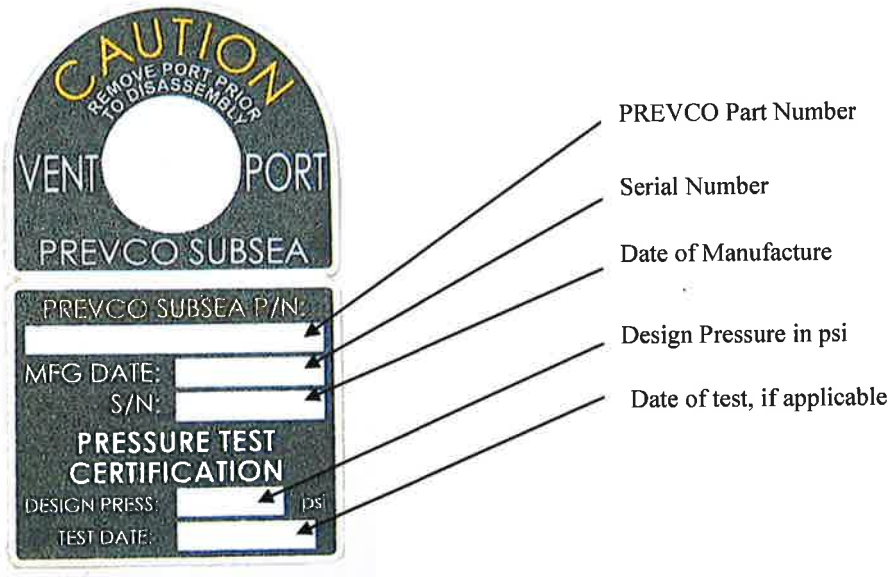
SUBSEA HOUSING SPECIFICATIONS

PREVCO MODEL NUMBER	A/A/P2_9.201(TD)-24-2-0-1-DP-1	(See PREVCO model Number guide)
PREVCO PART NUMBER	PS2528 - 060717 - A1	
SERIAL NUMBER (S)	-001	
END CAP CLOSURE METHOD	Threaded Tube	
BASE MATERIAL	Aluminum - 6061-T6	
MAX. OPERATIONAL DEPTH	Threaded Tube	
NOMINAL OVERALL LENGTH	26.3	(inches)
NOMINAL OVERALL DIAMETER	10.8	(inches)
MAX. INSIDE PACKAGING LENGTH	24.0	(inches)
MAX. INSIDE PACKAGING DIAMETER	9.3	(inches)
NUMBER OF PISTON SEALS PER END CAP	2	(See BOM for seal size)
NUMBER OF FACE SEAL PER END CAP	0	(See BOM for seal size)
APPROXIMATE WEIGHT		
IN-AIR	91.3	(lbs)
IN-SEA WATER	-22.5	(lbs)

Identification Information

PREVCO SUBSEA housings are identified with the following sticker:



I. GENERAL HANDLING CONSIDERATIONS

All PREVCO SUBSEA housings are designed to withstand the rigors of the harsh ocean environment. Like all oceanographic equipment, subsea housings must be handled and maintained correctly to maximize their service life. Dents and scratches, which may appear only superficial, can lead to slow leaks or catastrophic failure under high stress. Listed below are several suggestions to keep in mind while using your subsea housing.

1. **WASHDOWN**
To avoid salt build-up and crevice corrosion around connectors, fasteners and seals always thoroughly wash down the housing and adjacent equipment with fresh water as soon as is practicable after recovery.

2. **ALWAYS USE VENT PORT**
For safety reasons the vent port, if supplied, should always be removed prior to disassembly. This will relieve any possible internal pressure and prevent the end cap from "popping-off" unexpectedly. It is always a good idea to keep the vent port out during end cap assembly as well. This eliminates internal pressure build-up and eases assembly.

3. **PROTECT SURFACE FINISH**
Care should be taken to avoid dents and scratches to the surface of any subsea housing as these may lead to failure under high stress. Anodized aluminum and plastic housings are particularly sensitive to damage.

3.1 **Anodized Aluminum** – PREVCO's hard anodized coating on aluminum housings is very durable and robust, however if damaged, accelerated corrosion at the point of damage may result. The unit should be inspected for damage prior to and immediately after each deployment. Damage to the coating on the flanges is not considered critical and does not necessarily require repair, however all coating damage should be monitored for signs of accelerated corrosion. Damage to the body of the housing should be addressed as soon as practical. It is normally not recommended to repair damaged areas by re-anodizing. Corrosion damage may be effectively retarded by removing all corrosion products from the area, properly preparing the surface and coating the damaged area with good epoxy base paint system. This repair technique is not applicable to seal areas where the coating build-up may violate the flatness or surface finish requirements of the seal design.

3.2 **Plastic** – Plastic housings are not subject to corrosion damage, but can be damaged by harsh cleaning fluids or prolonged exposure to ultraviolet radiation. Do not store your plastic subsea housing in direct sunlight and use only mild soap and water to clean the unit.

4. FASTENERS

Subsea fasteners are subject to both corrosion and galling damage. Always lubricate fasteners and do not over torque fasteners during assembly. See bill of materials in Appendix A for recommended fastener lubricant. During assembly/disassembly, inspect all fasteners for damage. Discard any fasteners showing signs of corrosion or ones that require unusually high torque to engage or disengage.

5. PROTECT CRITICAL SEAL SURFACES

Critical seal surfaces include both the o-ring grooves and their mating seal surface. Typical critical seal surfaces are depicted in figure 1. On designs utilizing face seals PREVCO provides a built in protective ridge to help protect this otherwise exposed seal surface from damage. Always protect critical seal surfaces from contact with hard objects that may mare, scratch or dent them. Never rest components on these surfaces without providing a protective pad made of some compliant material. Do not scrape or clean these surfaces with metal tools.

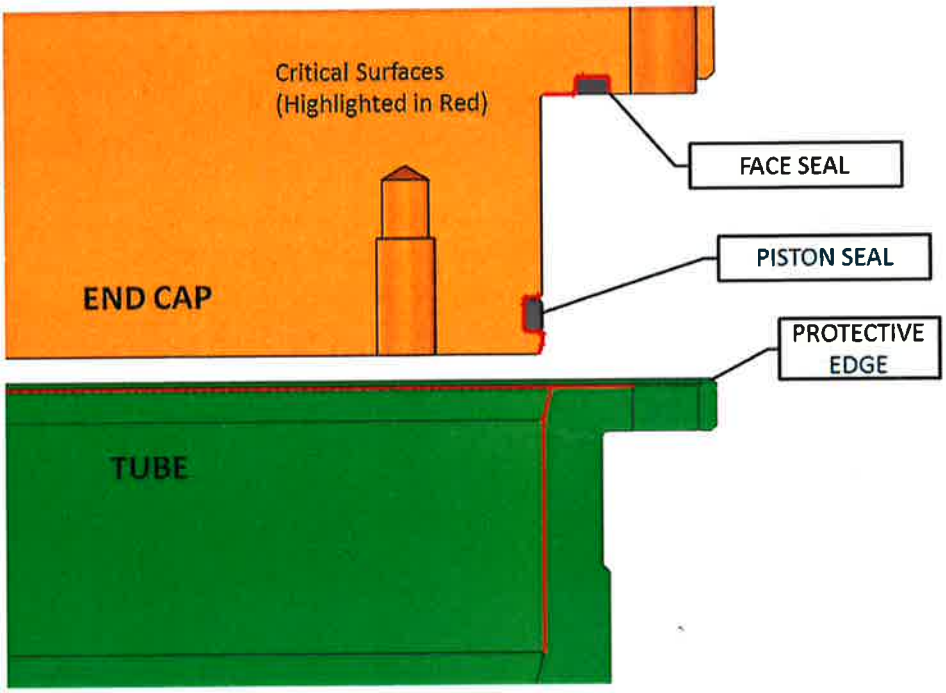


FIGURE 1: SEAL GEOMETRY (Dotted red lines represent critical surfaces. ***Note that not all designs utilize a face seal.*****)**

6. AVOID UNFAVORABLE GALVANIC COUPLES

Galvanic corrosion is responsible for many avoidable corrosion related failures in the marine environment. Electrical currents generated by combinations of dissimilar metals in seawater cause this accelerated corrosion. PREVCO's subsea housing must be protected from this form of accelerated corrosion. This type of corrosion can be prevented by avoiding the use of dissimilar metals, however this may not be practicable. If your system must utilize dissimilar metals, the following general design guidelines should be considered.

6.1 **Electrical Isolation** - Galvanic corrosion can be largely avoided by electrically isolating dissimilar metals. This can be accomplished by avoiding direct metal-to-metal contact through the use of insulating mounting pads, plastic shoulder washers or plastic fasteners.

6.2 **Use Galvanically Similar Materials**-If electrical isolation is not practical, refer to a galvanic series chart (these are available on line or in any corrosion textbook. Try to select materials that are close together on this chart as the further they are separated on the chart, the higher the potential corrosion rate and subsequent damage.

6.3 **Use Favorable Area Ratios-** Again referring to the galvanic series chart; when two dissimilar metals are electrically coupled together in sea water, the one with the lower potential (anode) will corrode away and the one with the higher potential (cathode) will be protected. The current density and reaction rate will be inversely proportional to the exposed area ratios. Therefore, it is highly advantageous to maintain a large anode-to-cathode area ratio. This will minimize the current density in the parts that are corroding and thus slow down the damaging end of the reaction. This is why stainless steel fasteners are commonly used to hold together large, bare aluminum structures. The aluminum corrodes sacrificially to the stainless fasteners, but because the area ratio is so favorable, the reaction rate is very slow that the damage is often negligible.

6.4 **Coatings and Cathodic Protection-** Favorable area ratios can sometimes be achieved artificially by coating the anodic member with a high quality, non-conducting paint system. In the event that the subsea housing or other critical component is or may become an anode for a larger structure it may be advisable to provide cathodic protection for the larger structure in the form of commercially available anodes or an active cathodic protection system.

7. **HANDLE WITH CARE** – The very nature of subsea housings; being large, heavy and sensitive to surface damage, make them awkward and difficult to handle. For parts or assemblies over 40 pounds always use lift points, if provided, for lifting and handling. Never set a housing or end plate down on a hard, rough surface. Never slide a housing or end plate on any surface. If no lift points are provided, always lift with synthetic lifting straps routed under and secured to the housing. *Note the threaded holes in the end caps are for jacking screws to aid in the removal of the end caps. They are not lift points and should not be used for this purpose.*

II. ASSEMBLY AND DISASSEMBLY PROCEDURES

ASSEMBLY

The following general steps describe the recommended assembly procedure for PREVCO SUBSEA housing assemblies with through bolted style end cap closures.

1. **Unpack and Inspection-** Carefully unpack the subsea housing. Remove end caps in accordance with instructions below. Check all parts against the bill of materials (see appendix A) to verify completeness. Inspect all parts and critical seal areas for shipping damage. Report any missing hardware or shipping damage to PREVCO immediately.
2. **Install connectors and internal hardware-** Install connectors in accordance with manufacturer's instructions. Refer to the seal installation instructions section III for additional guidance. Install interior hardware. *Note if an interior equipment rack or chassis is to be installed to one or both end plates these should be fit checked to the housing before proceeding. Complete wiring and checkout of internal hardware and connectors.*
3. **Install end cap seals-** See Section III on handling and installation of seals.
4. **Install end caps-** It is recommended that end cap installation be performed vertically from above with the tube standing upright on end (see figure 2). If this is not practicable, the end caps may be assembled in the horizontal axis taking care to evenly support the weight of the end cap (see figure 3) and avoid misalignment during assembly. The following steps apply to both methods.
   a. Carefully insert the end cap into tube to the point where the piston seal is partially engaged. Avoid any scraping or impact between the critical tube seal surface and internal hardware or endplate.

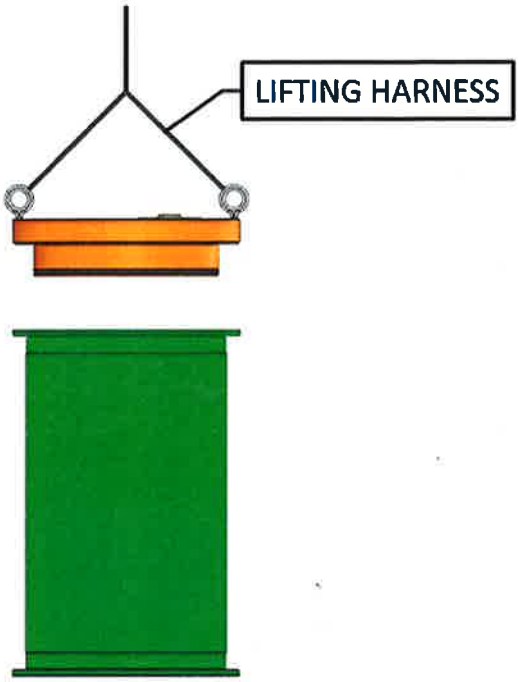


Figure 2: Vertical End Cap Installation

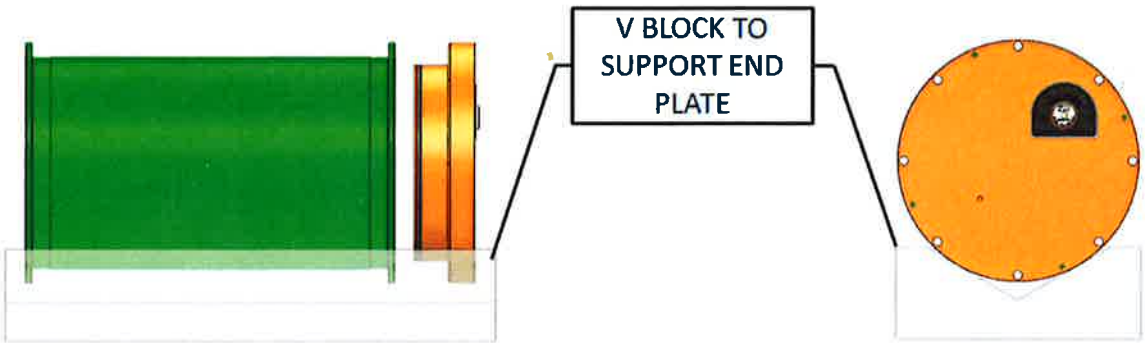


Figure 3: Horizontal End Cap Installation

b. Inspect all seals to insure that they are correctly seated and that all sealing surfaces are clean and free of contamination. Extra O-ring lubricant may be applied to face seals to help retain them in their grooves during assembly if required.
c. Install three or more assembly rods evenly spaced around the perimeter of the end cap as shown in figure 4. If assembly rods (jacking screws) were not provided, threaded rod or extra-long machine screws may be used. See item 25 in the bill of materials (appendix A) for thread definition and minimum length requirements. Be sure to protect the housing surface from damage where the threaded jacking screw/nut bears on it by using flat (preferably nylon) washers. Tighten all assembly

rod nuts thumb tight and then continue to tighten them incrementally in a star pattern, ½ turn at a time until the end cap is uniformly seated. *Note that if long machine screws are used, they will have to be replaced with shorter screws before they bottom out on the far side of the flange groove. This procedure is intended to smoothly assemble the end cap while keeping the end cap aligned with the tube to prevent jamming. During assembly, observe the piston seal(s) as they enter the tube to insure that they enter the tube smoothly and are not pinched or damaged.* **In no case are impacts, hammering or significant rotation to be used to aid assembly.**

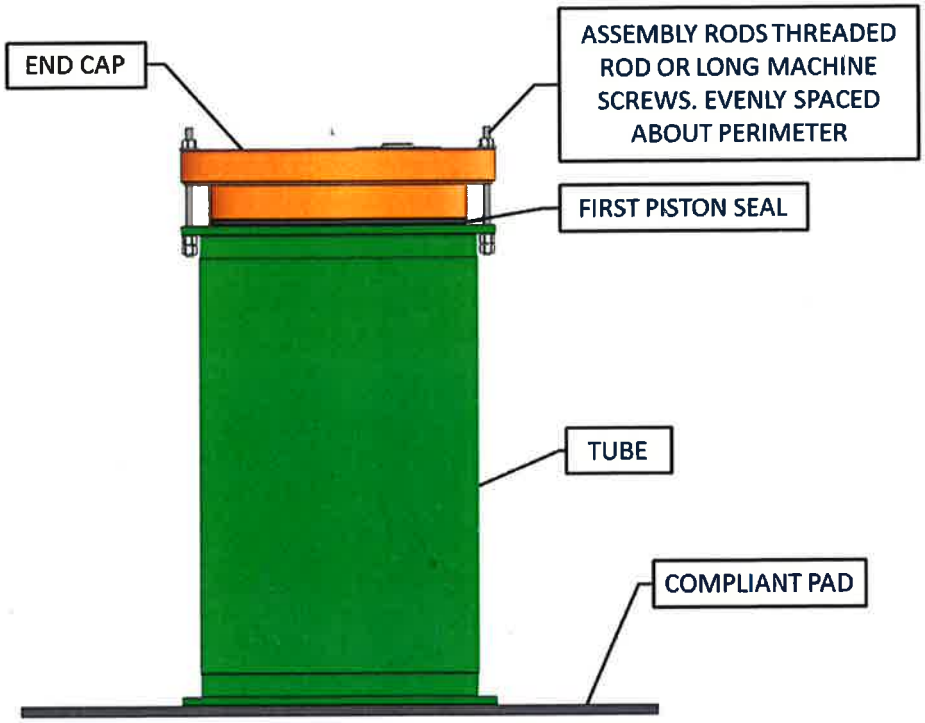


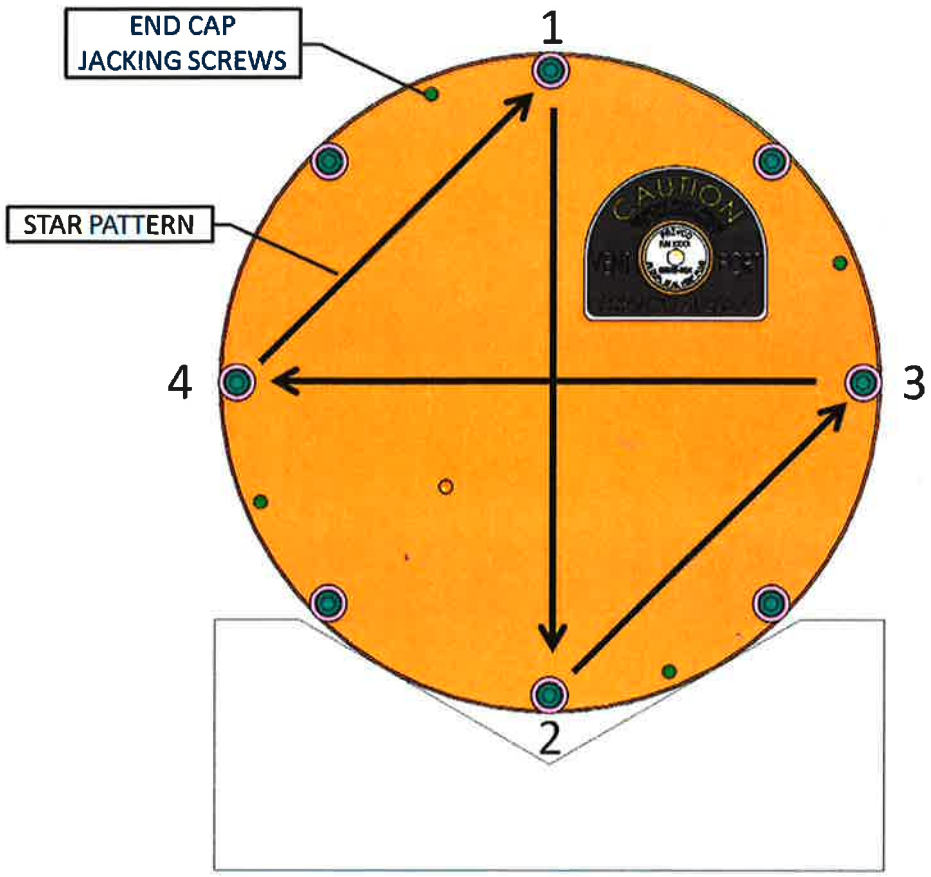
Figure 4: End Cap Installation Using Assembly Rods

d. Remove assembly rods. Install and torque assembly hardware in accordance with instructions on assembly drawing (see appendix A). *Note do not leave any hardware installed in the threaded holes in the end cap during deployment.*
e. Repeat end plate installation on reverse end if applicable.
f. Vacuum leak test as described in Section IV and back fill if required.
g. Install vent port.

DISASSEMBLY

Disassembly is essentially the reverse procedure of assembly except the assembly rods are used as jacking screws to remove the end plates.

a. Stand the unit on end or rest it horizontally in a V block.
b. Remove vent port.
c. Remove all end plate fastening hardware.
d. Insert three or more assembly rods (jacking screws) into the threaded holes in the end cap flange evenly spaced about the perimeter. Hand tighten the jacking screws until they just contact the tube flange. A saw kerf may be added to one end of each assembly rod to be used as a screw driver slot or the ends may be double nutted using the assembly hardware. To minimize damage to the finish of the flange, make sure that the end of the jacking screws are flat and free of burrs and sharp edges.
   Note if mounted in the horizontal position; attach lifting hardware or blocking to support the weight of the end cap as it is removed. The weight of the end cap must be supported from, as close as possible, it's center of gravity to prevent cocking or jamming which might result in damage to the critical seal surfaces.
e. Incrementally tighten each jacking screw in ½ turn increments using a star pattern until the inner most piston seal is free.
   Note that over time the surface finish of the housing under the jacking screws may become damaged. Damage may be minimized by inserting a thin metal plate between the jacking screw and the housing flange, once the flanges have been separated. Minor damage within the counter bores is considered normal wear and as it is not in a critical area need not be repaired. Accelerated corrosion, if it occurs, in these areas may be a sign of an external galvanic couple and the cause should be investigated and eliminated as soon as possible.



f. Carefully remove end cap taking care to protect the critical tube seal surface from contact with end cap and internal hardware.

III. HANDLING AND INSTALLATION OF SEALS

The predominant failure mode of subsea housings is seal failure. PREVCO SUBSEA housings employ O-ring seals for vent ports, relief valves, connectors and end cap closures. Analysis of O-ring seals in certain underwater connectors that have been in use for decades show that roughly 8 out of 13 leaks past the O-rings result from improper installation and assembly or from improper quality control and inspection procedures at the time of assembly.[1] Therefore, the care and maintenance of O-ring seals may be the most important component of the assembly process to insure a long and successful operating life. The following abbreviated steps should be followed as a general guide for the handling and installation of O-ring seals. *Note that these steps should be repeated at every assembly; that is remove, inspect and reinstall all O-ring seals prior to each assembly. Dirt and air borne debris (particularly human hair) can often lead to seal failure. Always clean and lubricate seals and components immediately prior to assembly.*

[1] Sandwith, C. J., O-ring Installation for Underwater Components and Applications, NRL Memorandum Report 4809, April 15, 1982

1. **Storage-** NITRILE (BUNA-N) is the PREVCO standard subsea housing seal material. Alternate materials that may be supplied for special applications may have different storage and handling requirements – see manufacturers recommendations. NITRILE is subject to aging damage when exposed to ultraviolet radiation, ozone or elevated temperature. Always store spare seals in a clean environment protected from direct sunlight, ozone and elevated temperatures. Discard any seal with damaged packaging or a cure date that is over 5 years old. *Note: O-ring seals discarded for any reason should be cut completely through with a pair of scissors to prevent accidental re-use.*
2. **Seal Surface Inspection-** Prior to installing O-ring seal, inspect all seal surfaces for cleanliness, proper finish and absence of defects. Surfaces and edges must be free of all contaminants, dirt, nicks, scratches, gouges, marks and burrs. Minor burrs can be removed by "touching" them with 400 grit emery paper, provided that the surface coating is not compromised. Do not install O-rings on components that are not free of burrs or other imperfections.
3. **Clean Seal Surfaces-** Clean sealing surfaces and all surfaces that the O-ring may come in contact with during installation. Use Isopropyl Alcohol for all surfaces other than polyacrylate and polyurethane.
4. **Prepare Seal Surfaces-** Mask any sharp edges over which the O-ring must pass during installation (threads, holes,..etc). Do not mask the seal groove edge. Apply seal lubricant (see bill of materials in appendix A) as a uniform thin film over entire seal groove and mating seal surface. For long life applications or for added anti-corrosion protection put sufficient lubricant in the groove that the groove will be full after the O-ring is installed.
5. **Seal Inspection-** Verify that packaged seal is the correct part number listed in the bill of materials and remove seal from package. During handling, carefully protect the seal from damage by fingernails, tools, dirt, contamination or chips. Thoroughly inspect seal for cracks, nicks, dents or flat spots that might inhibit sealing. MIL-STD-171 and MIL-STD-413 can be used as guidance. No defects are allowable. Again, any O-ring seals discarded for any reason should be cut completely through with a pair of scissors to prevent accidental re-use.
6. **Seal Preparation-** Clean seal using Isopropyl Alcohol for all materials other than polyacrylate and polyurethane. Apply a thin continuous film of seal lubricant (see bill of materials in appendix A) over the entire O-ring seal surface. While applying the lubricant, pass the entire seal through your fingers several times to insure complete coverage and simultaneously inspect by feeling for defects and debris which might have become trapped in the lubricant.
7. **Installation-** Do not use metal tools to install or remove O-rings from their grooves. Install the O-ring seal in its groove without excessive twisting or stretching. Preferably, O-rings should not be stretched more than 50% of their initial ID. Push the seal down to the bottom of its groove and all the way to the back, if it is a piston seal. Back is defined as the side that the O-ring will be pushed against during assembly. Inspect that the seal is evenly distributed and the same height around the groove. Run

a finger completely around the exposed O-ring, feeling for any debris that may have attached to the lubricated surface. Remove excess lubricant or add lubricant, if desired, to fill the groove.

After the above installation steps are completed and prior to the next assembly it is recommended that an independent inspection operation be performed. The goal of this inspection is to provide a redundant check that all O-rings are installed and fitted up in their grooves correctly prior to closing the seal.

8. **O-Ring Removal** – To remove an O-ring from it's groove follow the process outlined below. Do not use any metal tools to aid in the removal of O-rings seals as they may damage the sealing surface or the O-ring itself..

Place the index fingers approximately at the 10 and 2 o'clock positions as shown. *Note that some assemblies may require working the O-ring from near the 6 o'clock position to get develop a practical buckle in the 0-ring.*

Stretch the o-ring by simultaneously applying inward radial pressure and circumferential translation until the seal buckles as shown.

Grasp the buckled portion of the seal and remove the entire seal from the groove.

IV. VACUUM LEAK TEST PROCEDURE

To verify the installation and correct seating of housing seals a vacuum leak check may be performed after completing the assembly of the housing. A recommended procedure is as follows:

1. Connect the assembled housing to a suitable vacuum pump through the vent port using a standard SAE #3 or #4 fitting as appropriate. A shut off valve should be installed in the vacuum line as close to the port as possible to exclude the vacuum system from the test. A suitable vacuum gage should be installed between the shut off valve and the housing.
2. Open the valve and start the vacuum pump. Evacuate the housing to a minimum of 25 in Hg. Continue to evacuate for a minimum of three minutes after reaching the desired test level.
3. Close the valve, turn off the pump and record the reading on the vacuum gage.
4. Hold vacuum for 30 minutes and record gage reading at that time.
5. The difference between the initial and final readings should not exceed .5 in Hg.

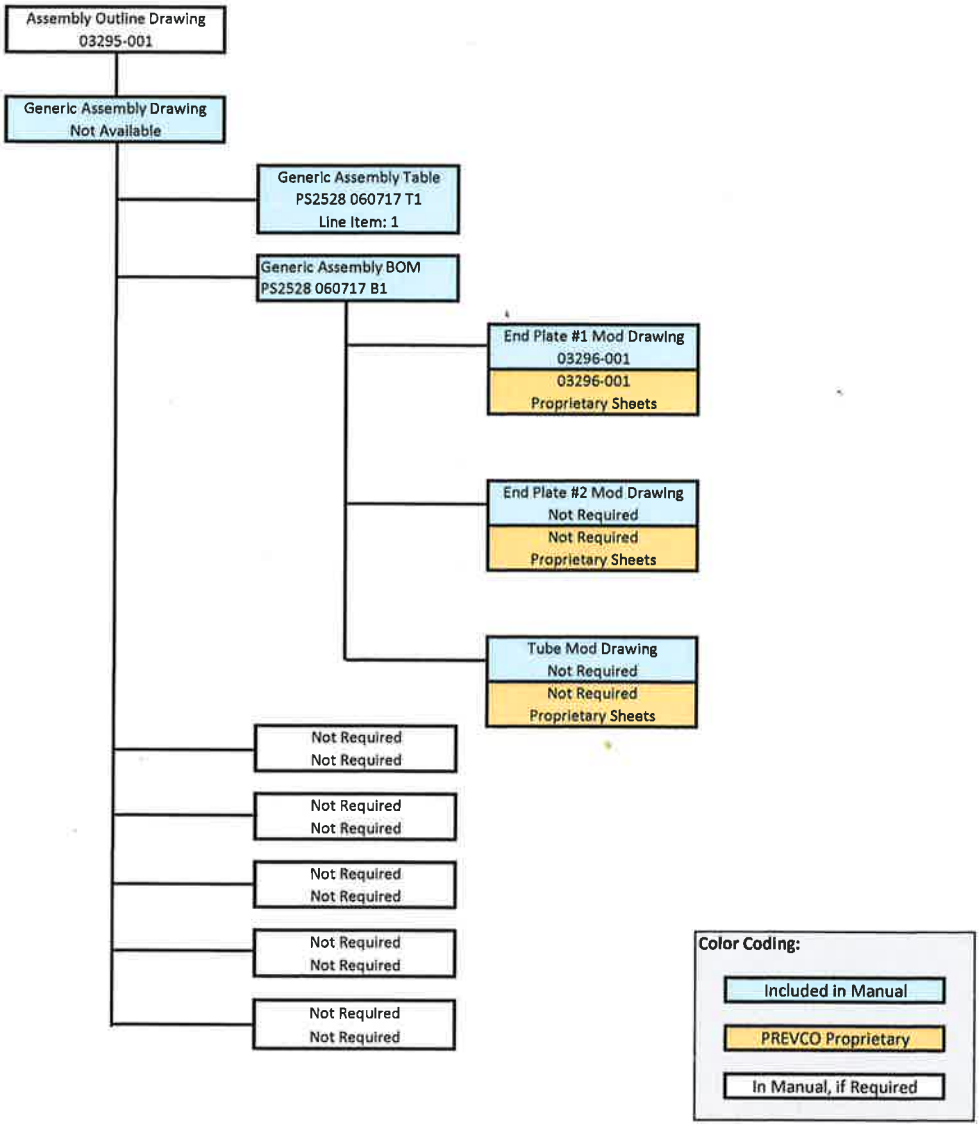
Note that the most common cause of a **vacuum leak test failure** *is a failure of the fittings or vacuum hose seals. In the event of a failure always start by verifying the integrity of the test system. This can be simply accomplished by repeating the test without the housing. Plug the end of the vacuum hose where it would normally be attached to the housing with an appropriate fitting.*

APPENDIX A:

DRAWINGS, TABLES AND BILL OF MATERIALS

DRAWING TREE FOR PREVCO PROJECT: PS2528

PREVCO Model No: A/A/P2_9.201(TD)-24-2-0-1-DP-1
PREVCO Part No. PS2528-060717-A1



PREVCO LLC BILL OF MATERIALS FOR STANDARD SUBSEA HOUSING ASSEMBLY

PREVCO SUBSEA HOUSING ASSEMBLY MODEL NO.:	A/A/P2_9.201(TD)-24-2-0-1-DP-1 Qty: 1
PREVCO SUBSEA HOUSING ASSEMBLY PART NO.:	PS2528 - 060717 - A1
BOM TABLE NUMBER:	PS2528 - 060717 BOM - B1
END PLATE #1 MODIFICATION DRAWING NUMBER:	03296-001
END PLATE #2 MODIFICATION DRAWING NUMBER:	Not Required
TUBE MODIFICATION DRAWING NUMBER:	Not Required
HOUSING ASSEMBLY OUTLINE DRAWING NUMBER:	03295-001 Generic Assy NO: Not Available

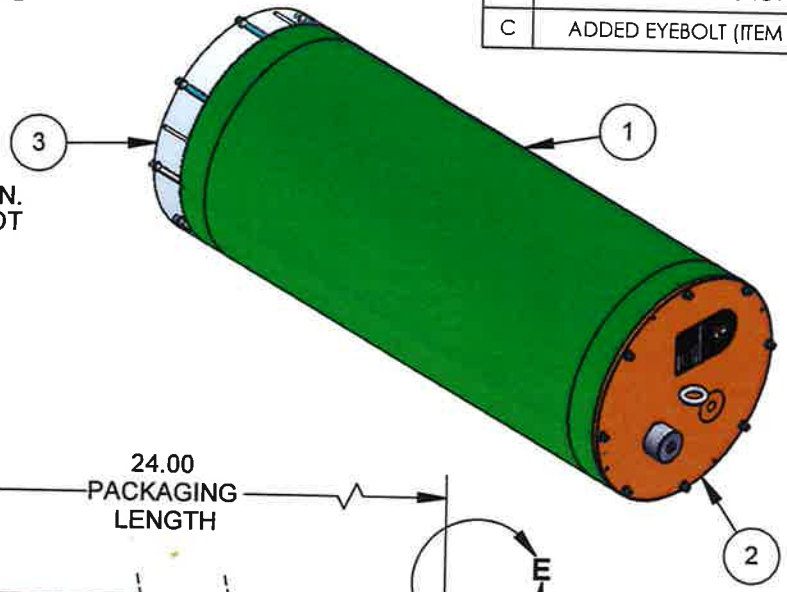
Quantities for ONE Assembly	Item Number	Part or Drawing Number	Component Description	Comments
1	1	Not Required	Tube Material: Aluminum Table No.:	PREVCO
1	2	03296-001	End Plate #1 Material: Aluminum Table No.: PS2528 - 060717 CP1	PREVCO
1	3	Not Required	End Plate #2 Material: Plastic Table No.:	PREVCO
0	4		Table No.:	
	5			PREVCO
	6			PREVCO
	7			PREVCO
	8			PREVCO
4	9	2-272	Seal, Piston Material: Nitrile 70 Durometer	PARKER or Equiv.
0	10		Material:	or Equiv.
0	11		Material:	or Equiv.
1	12	00669-001	Port, PREVCO Dual Seal, #4 Material: 316 Stainless	PREVCO Torque to 40 inch lbs
Ref	13	3-904	Seal, Port Material: Nitrile 90 Durometer	PARKER or Equiv.
Ref	14	2-015	Seal, Port Material: Nitrile 90 Durometer	PARKER or Equiv.
	15		Material:	
	16		Material:	
	17		Material:	
	18		Material:	
8	19	Commercial Grade	Screw, Ext Hex (EP1) 10-32UNF-2A Material: CRES 316 Appr. Len.: 0.88	Torque to 23 inch-lbs nom.
8	20	Commercial Grade	Screw, Ext Hex (EP2) 10-32UNF-2A Material: CRES 316 Appr. Len.: 2.25	Torque to 23 inch-lbs nom.
0	21			
0	22			
0	23			
16	24	Commercial Grade	Washer, Flat No. 10 Material: CRES 316	or Equiv.
16	25	Commercial Grade	Washer, Split Lock No. 10 Material: CRES 316	or Equiv.
0	26		Material: CRES 316	or Equiv.
0	27		Material:	
16	28	91145A156	Washer, Shoulder No. 10 Material: Nylon Long Barrel	McMaster Carr or Equiv.
Ref	29	Commercial Grade	Jacking Screws 10-32UNF-2A Material: Optional Min. Len.: 2.75	Not Supplied Full threads required
A/R	30	DC-4	Lubricant, Seal (Alt: Parker O-Ring Lubricant)	DOW Corning
A/R	31	Ultra Tef Gel	Thread Lubricant	Ultra Safety Systems
1	32	00378-001	Sticker, Identification	PREVCO
1	33	00379-001	Sticker, PREVCO Logo	PREVCO
1	34	01397-001	PREVCO Zincoid Material: Zinc	PREVCO
16	35	91731A049	INSERT, THREADED 10-32UNF-2B Material: 18-8 STAINLESS	McMaster Carr or Equiv.
0	36			
0	37	CFE	Connectors-Customer furnished Material:	See Outline Drawing
0	38			
0	39			
0	40			
0	41			
0	42			
0	43			
0	44			
0	45			
0	46			
0	47			
0	48			
0	49			
0	50		SEE OUTLINE DRAWING FOR CONNECTOR DEFINITION AND LOCATIONS	

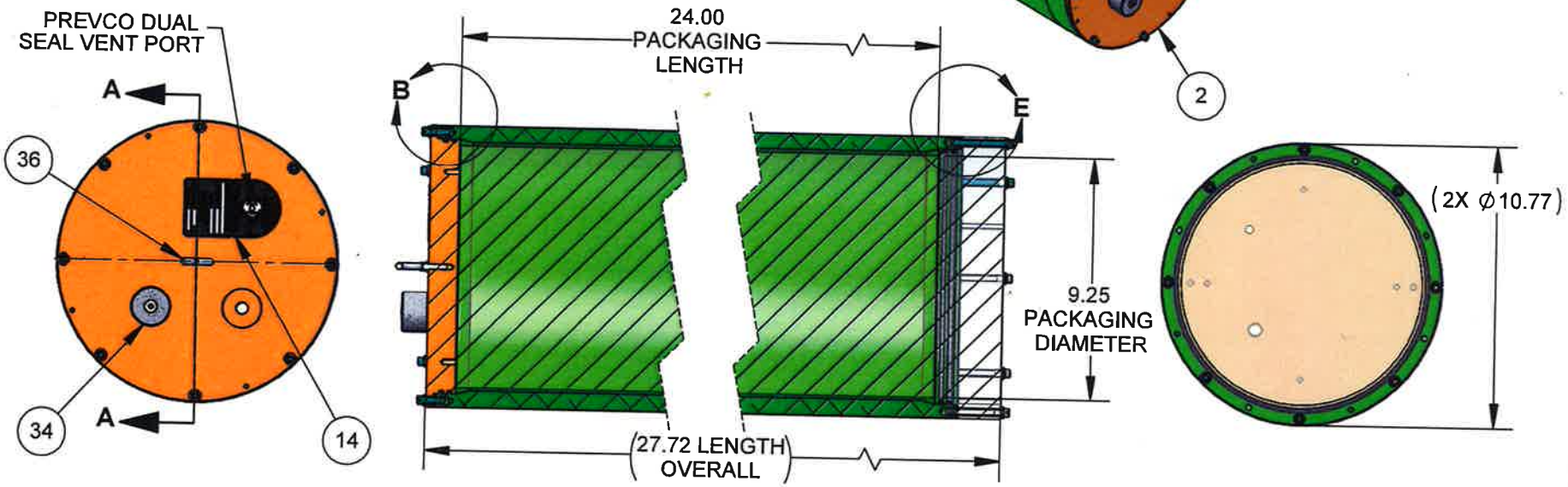
NOTES, UNLESS OTHERWISE SPECIFIED:

1. ALL DIMENSIONS ARE PRELIMINARY AND SHOWN FOR REFERENCE ONLY.
2. "PACKAGING" DIMENSIONS DEFINE THE MAXIMUM PERMISSIBLE SIZE OF THE CUSTOMERS INTERNAL HARDWARE ASSEMBLY. THEY ARE NOT THE PHYSICAL DIMENSIONS OF THE HOUSING. PACKAGING DIMENSIONS INCLUDE CONSIDERATION FOR ASSEMBLY CLEARANCE, FABRICATION TOLERANCES AND HOUSING DEFLECTION AT MAXIMUM RATED DEPTH.
3. SEE PROJECT BOM FOR ASSEMBLY DETAILS.
4. CUSTOMER SUPPLIED CONNECTORS NOT SHOWN.
5. CUSTOMER INTERNAL ASSEMBLY HARDWARE NOT SHOWN.

ITEMS NOT SHOWN:
13 14 29 30

REVISIONS			
REV.	DESCRIPTION	DATE	APP.
A	PRE-RELEASE FOR REVIEW	07/14/17	BD
B	UPDATED VIEWS TO SHOW M6X1.0 THREAD HOLES	7/27/2017	BD
C	ADDED EYEBOLT (ITEM 36) TO END PLATE #1	08/09/17	BD





SECTION A-A
SCALE 1 : 6

TOLERANCES UNLESS NOTED			
.X	.XX	.XXX	ANGLES
±.050	±.010	±.003	±.5°
CONCENTRICITY .004 TIR			
PRIMARY UNITS ARE INCHES			

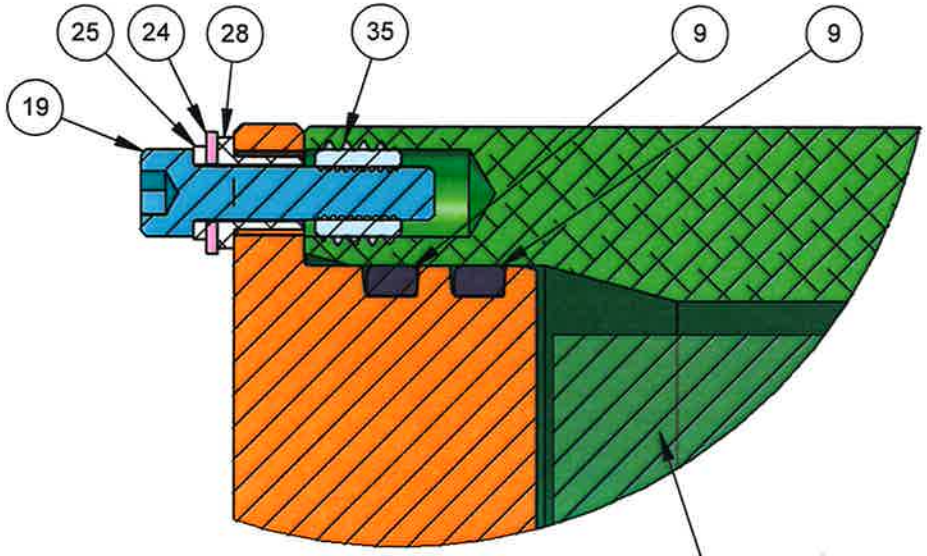
PREVCO SUBSEA LLC

PROJECT	PS2528	MODEL NO. PREFIX	A/A/P2_9.201(TD)-12-2-0-1-DP
CAGE CODE:	1PV08	In-Air Weight Est. (lbs):	79.02
DRAWN BY:	MAD	APPR. BY:	BD

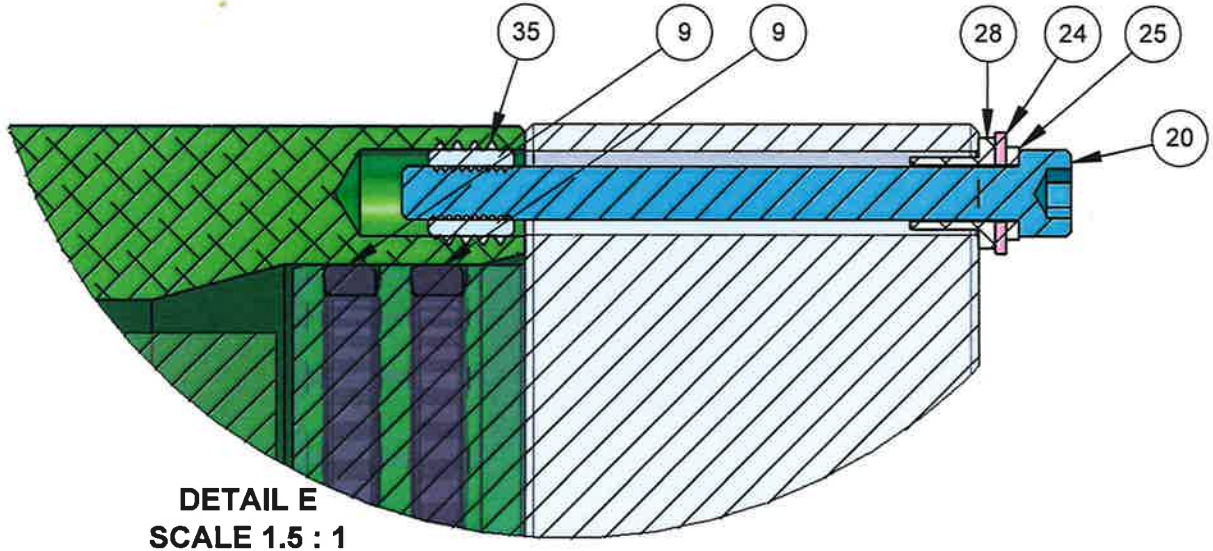
DRAWING TITLE: HOUSING ASSY - OUTLINE DRAWING

DRAWING NO. 03295-001

DRAWN DATE: 07/14/17 | SHEET 1 of 3 | REV. C



DETAIL B
SCALE 1.5 : 1



DETAIL E
SCALE 1.5 : 1

TOLERANCES UNLESS NOTED			
.X	.XX	.XXX	ANGLES
±.050	±.010	±.003	±.5°
CONCENTRICITY .004 TIR			
PRIMARY UNITS ARE INCHES			

PREVCO SUBSEA LLC

PROJECT	MODEL NO. PREFIX
PS2528	A/A/P2_9.201(TD)-12-2-0-1-DP

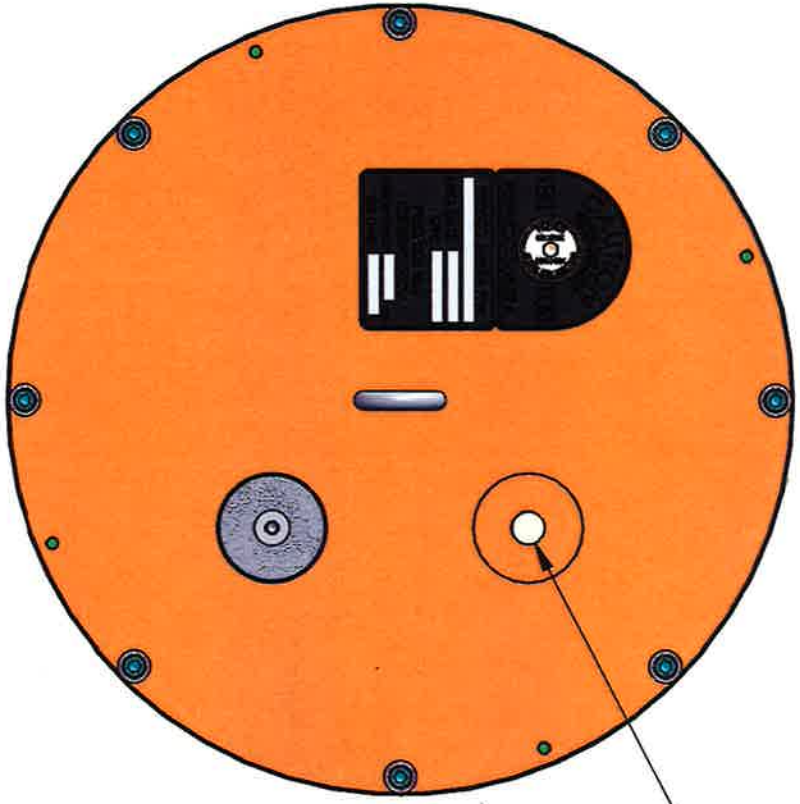
CAGE CODE: 1PV08

DRAWN BY: MAD APPR. BY: BD

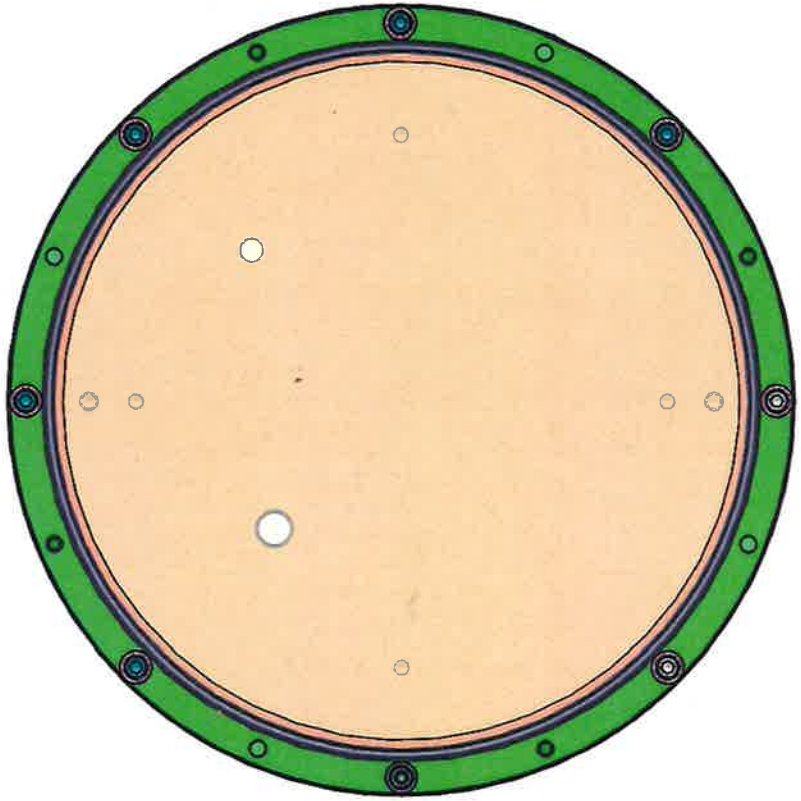
DRAWING TITLE: HOUSING ASSY - OUTLINE DRAWING

DRAWING NO. 03295-001

DRAWN DATE: 07/14/17 | SHEET 2 of 3 | REV. C



END PLATE #1



END PLATE #2

CONNECTOR(S) LOCATED AS SHOWN ABOVE

TOLERANCES UNLESS NOTED			
.X	.XX	.XXX	ANGLES
±.050	±.010	±.003	±.5°
CONCENTRICITY .004 TIR			
PRIMARY UNITS ARE INCHES			

PREVCO SUBSEA LLC

PROJECT	MODEL NO. PREFIX
PS2528	A/A/P2_9.201(TD)-12-2-0-1-DP

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DRAWING NO. 03295-001

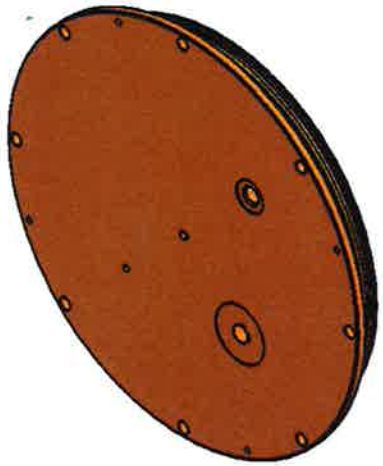
DRAWN DATE: 07/14/17 | SHEET 3 of 3 | REV. C

NOTES, UNLESS OTHERWISE SPECIFIED

1. MAKE FROM DRAWING **# 02189-111 BARE BLANK**
2. FINISH: **IF ALUMINUM** ALL SURFACES TO BE HARD ANODIZED IAW MIL-A-8625, TYPE III, CLASS 2, COLOR BLACK WITH NICKLE ACETATE SEAL. COATING THICKNESS .002 +/- 10%. ANODIZE ELECTRODE ATTACHMENT ON INTERIOR SURFACE INDICATED ONLY. NO MARKS, SCRATCHES, PITS, ETC ALLOWED. MASK FEATURE(S) INDICATED ON FIELD OF DRAWING. ALL DIMENSIONS APPLY AFTER ANODIZING (INCLUDING NOTE 6) ANODIZE REPAIR WORK IS NOT ALLOWED WITHOUT WRITTEN APPROVAL BY PREVCO SUBSEA LLC.
   FINISH: **IF PVC** NONE.
   FINISH: **IF ACRYLIC** CRITICAL SURFACES INDICATED SHAL BE OPTICALLY CLEAR AND FREE OF NICKS AND SCRATCHES . PACKAGING SHALL PROTECT CRITICAL SURFACES FROM DAMAGE DURING SHIPMENT.
3. DIMENSIONS AND FEATURES INDICATED ARE DEFINED AS 'CRITICAL' FOR INSPECTION AND QUALITY CONTROL PURPOSES. SEE PURCHASE ORDER FOR SPECIFIC INSPECTION REQUIREMENTS.
4. SPOTFACES INDICATED TO HAVE A 32 MICROINCH FINISH WITH NO SWIRL MARKS.
5. INSIDE RADII .010 MAX.
6. BREAK ALL SHARP EDGES .005/.015.
7. MACHINED SURFACE FINISH 63 MICROINCHES MAX.
8. REPAIR WORK PERFORMED BY WELDING OR ANY OTHER METHOD IS NOT ALLOWED WITHOUT WRITTEN APPROVAL BY PREVCO SUBSEA LLC.

REVISIONS

REV.	DESCRIPTION	DATE	APP.
A	PRE-RELEASE FOR REVIEW	07/17/17	BD
B	SHT 4: ADDED M6X1.0 - 6H	7/27/2017	BD
C	ADDED TAPPED HOLE - SHT 3	08/09/17	BD



TOLERANCES UNLESS NOTED

X	XX	XXX	ANGLES
±.050	±.010	±.003	±.5°

CONCENTRICITY .004 TIR

PRIMARY UNITS ARE INCHES

PREVCO SUBSEA LLC

PROJECT: PS2528

MODEL NO. PREFIX: A/A/P2_9.201(TD)-24-2-0-1-DP

CAGE CODE: 1PV08

DRAWN BY: MAD

APPR. BY: BD

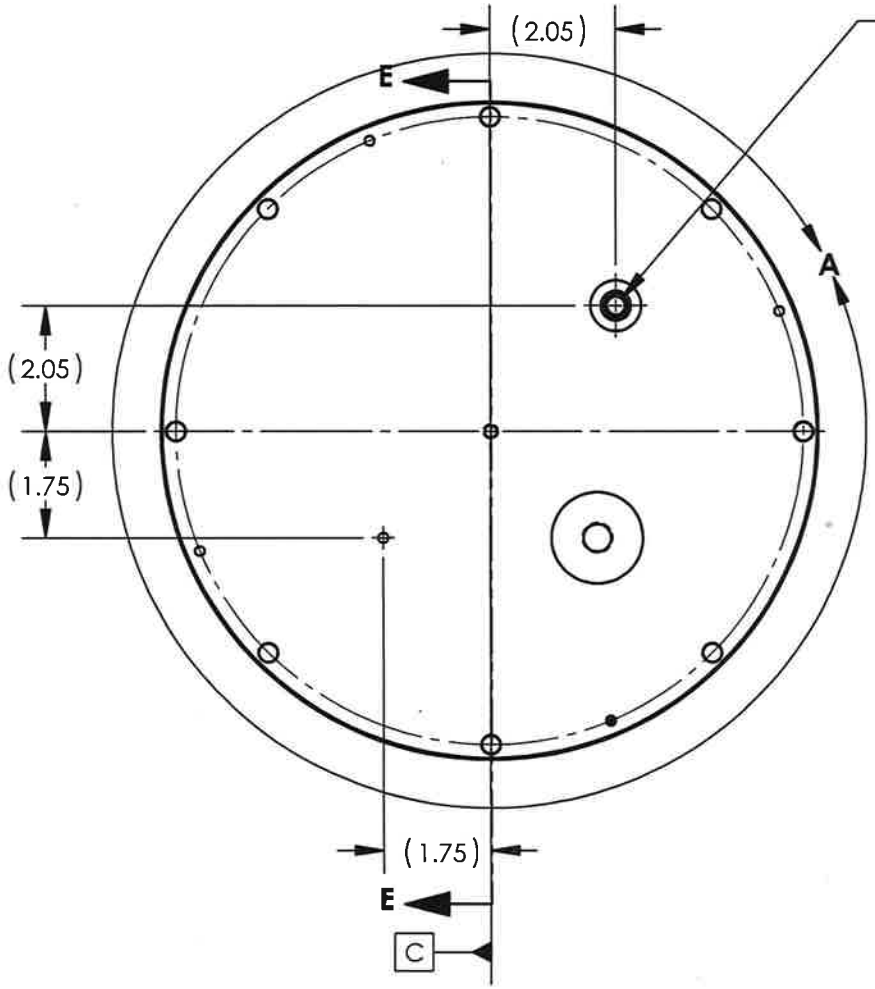
DRAWING TITLE: END CAP # 1 MODIFICATION DRAWING

DRAWING NO. 03296-001

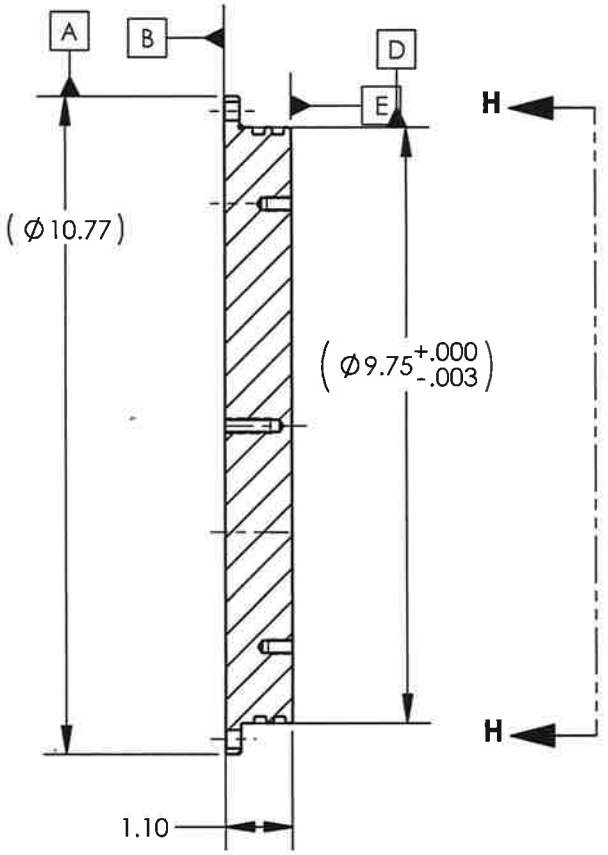
DRAWN DATE: 07/14/17

SHEET 1 of 4

REV. C



(OUTSIDE)



SECTION E-E
SCALE 1 : 3

TOLERANCES UNLESS NOTED			
.X	.XX	.XXX	ANGLES
±.050	±.010	±.003	±.5°
CONCENTRICITY .004 TIR			
PRIMARY UNITS ARE INCHES			

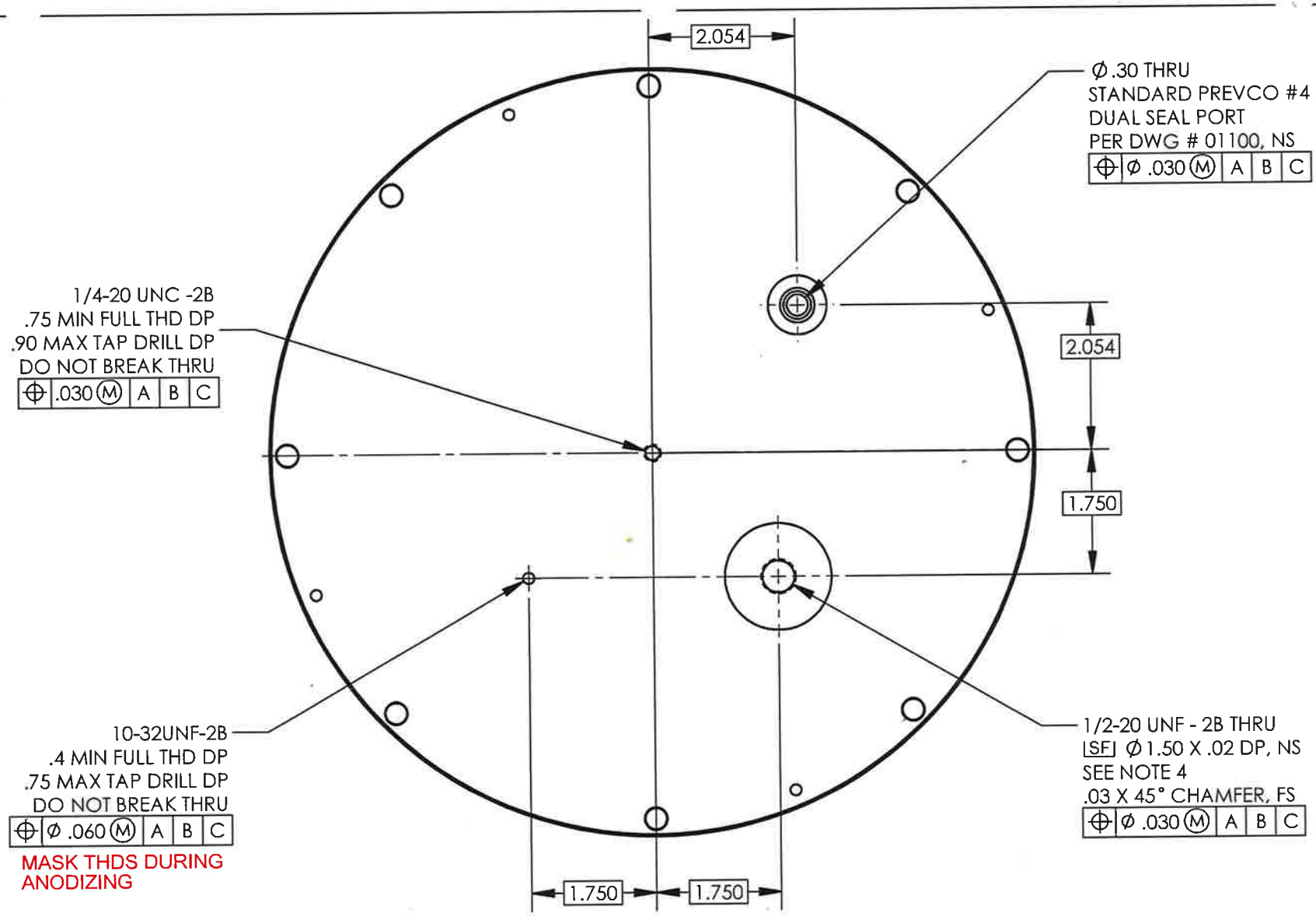
PREVCO SUBSEA LLC

PROJECT	MODEL NO. PREFIX
PS2528	A/A/P2_9.201(TD)-24-2-0-1-DP
CAGE CODE: 1PV08	
DRAWN BY: MAD	APPR. BY: BD

DRAWING TITLE
END CAP # 1 MODIFICATION DRAWING

DRAWING NO. 03296-001

DRAWN DATE: 07/14/17 | SHEET 2 of 4 | REV. C



DETAIL A
SCALE 1 : 2

TOLERANCES UNLESS NOTED			
.X	.XX	.XXX	ANGLES
±.050	±.010	±.003	±.5°
CONCENTRICITY .004 TIR			
PRIMARY UNITS ARE INCHES			

PREVCO SUBSEA LLC

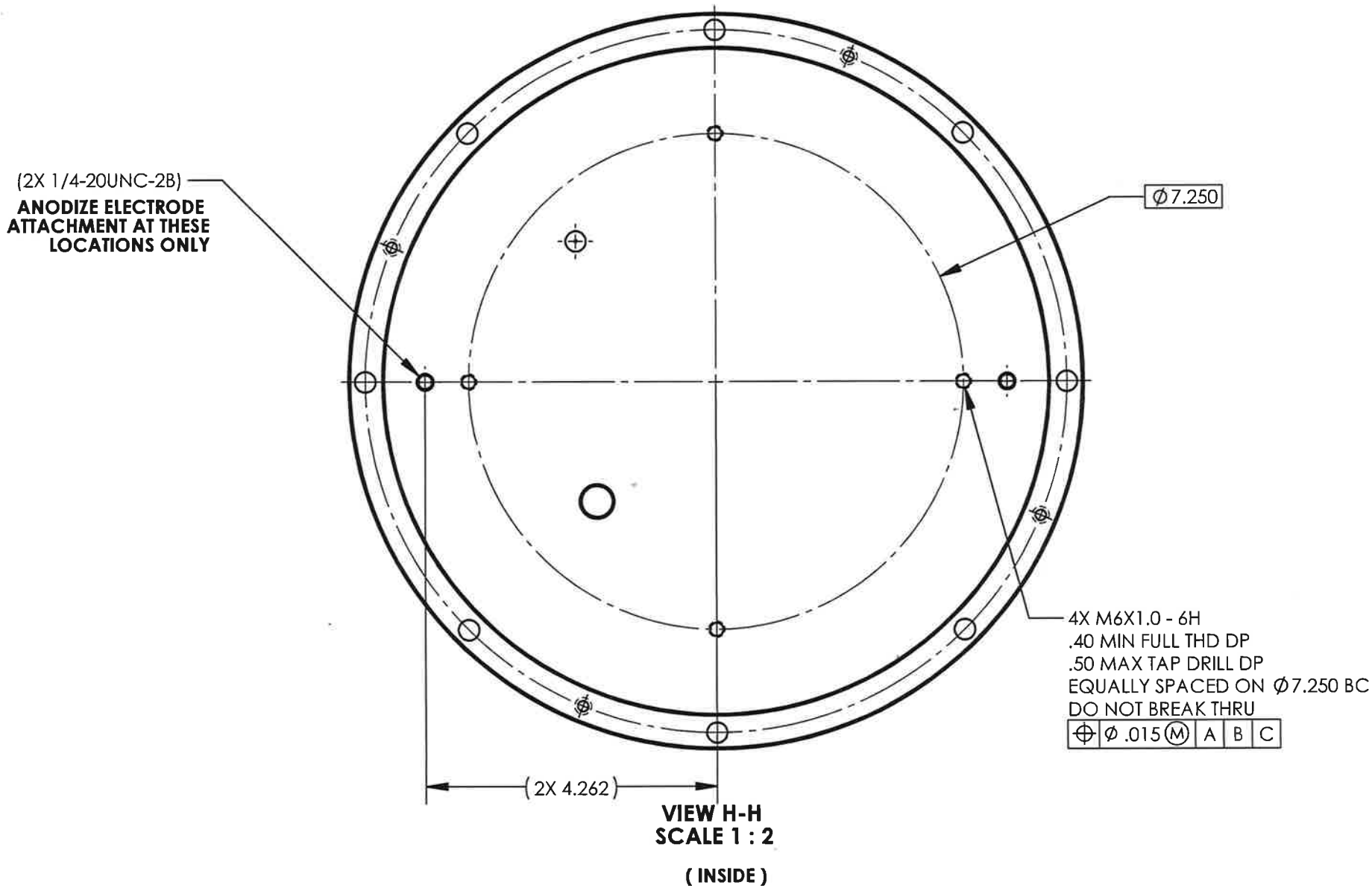
PROJECT	MODEL NO. PREFIX
PS2528	A/A/P2_9.201(TD)-24-2-0-1-DP

CAGE CODE: 1PV08	In-Air Weight Est. (lbs):
DRAWN BY: MAD	APPR. BY: BD

DRAWING TITLE
END CAP # 1 MODIFICATION DRAWING

DRAWING NO. 03296-001

DRAWN DATE: 07/14/17 | SHEET 3 of 4 | REV. C



TOLERANCES UNLESS NOTED			
.X	.XX	.XXX	ANGLES
±.050	±.010	±.003	±.5°
CONCENTRICITY .004 TIR			
PRIMARY UNITS ARE INCHES			

PREVCO SUBSEA LLC

PROJECT	MODEL NO. PREFIX
PS2528	A/A/P2_9.201(TD)-24-2-0-1-DP

CAGE CODE: 1PV08

DRAWN BY: MAD APPR. BY: BD

DRAWING TITLE: END CAP # 1 MODIFICATION DRAWING

DRAWING NO. 03296-001

DRAWN DATE: 07/14/17 | SHEET 4 of 4 | REV. C

Prevco Drawing Table Number:	PS2528	060717	A1	

Project Number: PS2528
Quote Number: Q4275 Rev A

ASSEMBLY DIMENSIONS AND FEATURES; See table below for appropriate modification and generic drawing numbers

PREVCO Generic Assembly Table: PS2528 - 060717 - B2

PREVCO SUBSEA LLC		Depth Rating	Flange Diameter (2X)	Overall Length (End Plate-to-End Plate)	Nominal Outside Diameter of Tube	Maximum Inside Packaging Diameter	Maximum inside Packaging Length	End Plate Fasteners				Internal Hardware Mounting Features		End Plate #1 Modification Drawing Number	End Plate #2 Modification Drawing Number	Tube Modification Drawing Number	Applicable Generic Assembly Drawing Number
Model Number	Housing Part No.							Fastener Size	Fastener Bolt Circle Diameter	Fastener Assembly Torque	Number of Fasteners per End Plate	Threaded Hole Size	Threaded Hole Bolt Circle Diameter				
		meters	Dim "B"	Dim "LOV"	Dia "B1"	Dia "PD"	Dim "PL"	"THD1"	Dia "G"	"TO" Inch*lbs	"N"	"THD2"	Dia "J"				
A/A/P2_9.201(TD)-24-2-0-1-DP-1	PS2528-060717-A1	100	10.768	26.321	10.750	9.250	24.000	10-32UNF-2A	10.270	23	8	See Layout Dwg		03296-001	Not Required	Not Required	Not Available