INTERNATIONAL PHASE OF OCEAN DRILLING (IPOD)
DEEP SEA DRILLING PROJECT
DEVELOPMENT ENGINEERING
TECHNICAL NOTE NO. 5

CORE BARREL INSTRUMENTATION, PRESSURE (CBIP)

SCRIPPS INSTITUTION OF OCEANOGRAPHY
UNIVERSITY OF CALIFORNIA AT SAN DIEGO
CONTRACT NSF C-482
PRIME CONTRACTOR: THE REGENTS, UNIVERSITY OF CALIFORNIA

DISCLAIMER

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TECHNICAL NOTE NO. 5

CORE BARREL INSTRUMENTATION, PRESSURE (CBIP)

Prepared for the
NATIONAL SCIENCE FOUNDATION
National Ocean Sediment Coring Program
Under Contract C-482

by the

UNIVERSITY OF CALIFORNIA
Scripps Institution of Oceanography
Prime Contractor for the Project

June 1984

W. A. Nierenberg, Director
Scripps Institution of Oceanography

M. N. A. Peterson
Principal Investigator and
Project Manager
Deep Sea Drilling Project
Scripps Institution of Oceanography

INTRODUCTION

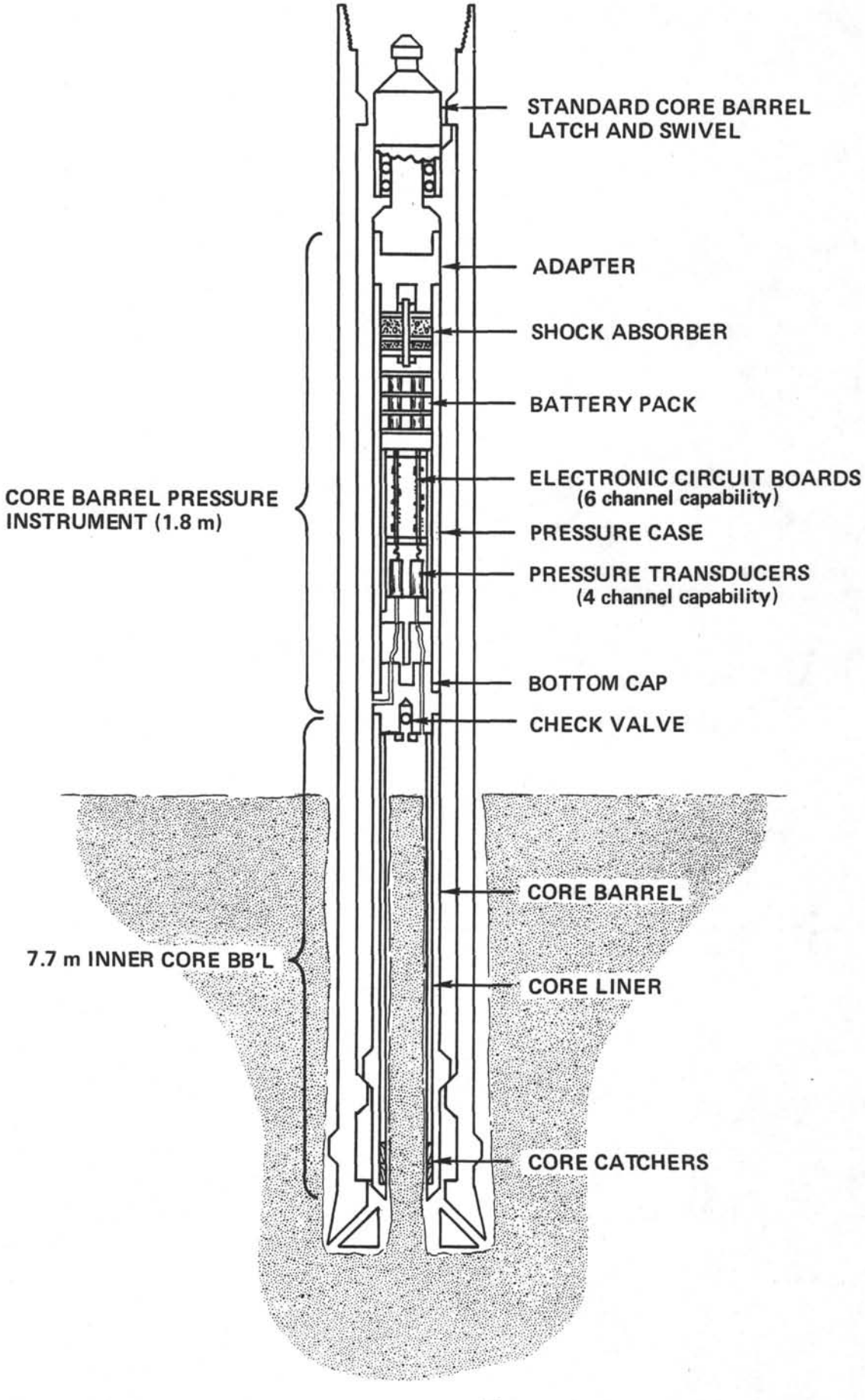
CORE BARREL INSTRUMENTATION, PRESSURE (CBIP)

DSDP has been using core barrels of various types for 15 years to retrieve samples of the deep ocean bottom. However, the hydraulic environment in and around the core barrel is still not understood too well. The CBIP was designed and built to measure pressures at some chosen locations in the core barrel during the coring process. Once the pressure regime has been determined it may be possible to develop more efficient coring systems.

The CBIP is presently set up to make three separate pressure measurements--at the top of the core barrel, above the ball vent valve, and in the annulus between the core barrel and the drill pipe. The tool is rated to 10,000 psi (22,500 feet). The electronics contains three channels and is expandable to six channels. The data sampling rate can be set from one sample every 5.12 seconds to one sample every .32 second. At the slowest sampling rate the memory unit will provide for approximately 8 hours of recording time using the three channels.

DEEP SEA DRILLING PROJECT

CORE BARREL INSTRUMENTATION, PRESSURE (CBIP)



INDEX

DEPLOYMENT OF CORE BARREL INSTRUMENTATION, PRESSURE (CBIP)

The CBIP has been deployed on two legs of the DSDP--Leg 94 and Leg 96. On Leg 96, the calibration was improper, and no meaningful data was obtained from the one run. On Leg 94, the CBIP was run four times, all with the Extended Core Barrel (XCB) system. The data from the first two runs, when plotted, showed lags in the response of the transducers caused by grease blockages in the small pressure tubing leading from the ports to the transducers. This data, also, was considered not meaningful. The grease was cleared out of the tubing and provision was made to prevent any more grease from entering the tubing.

The last two runs of the CBIP, after the grease blockages were removed, yielded very good data. The plots of this data, labeled No. 3 and No. 4, are included in this package. Plot No. 3 shows the increasing pressure as the instrument descended to the bottom of the drill string. After landing, but before coring, P2=P3 and both were greater than P1 by about 270 psi. When coring started, the ball vent valve lifted against the 270 psi back pressure and P1=P2=P3 at about 4600 psi. After coring was complete, the ball valve closed again and P2=P3>P1. When coring and circulation were stopped to make a connection, the pressures equalized at ambient pressure (about 4350 psi). A similar situation occurred each time a connection was made. Finally, the plot shows decreasing pressure as the instrument was hauled back up to the surface.

Plot No. 4 shows events similar to those of Plot No. 3. However, one event occurred in run No. 4 that did not occur in run No. 3. That is the pressure spike just before the instrument was returned to the surface. It is believed that this spike was due to the impact of the overshot landing on top of the core barrel.

The data from these deployments of the CBIP have shown:

1) The drop rate of the core barrel is around 10 to 15 feet per second.

2) Because of the circulation a back pressure of 250 to 300 psi is imposed upon the ball vent before coring is started. This pressure must be overcome, and the ball lifted, before water can vent off and core can be taken into the core barrel. Actually, at the start of coring, the water may be able to vent down around the outside of the core, but as the core becomes longer, this vent path becomes more restrictive.

3) The pressures P2 and P3 are essentially equal throughout the entire operation except for the trip back to the surface where P2 exceeds P3 by about 100 psi. The reason for this is not clear. The two pressure regions P2 and P3 are interconnected and should be equal. As the core barrel is being retrieved, the downward relative flow of water in the annulus may tend to produce a venturi effect in the region of P3, but it seems that this would produce, if anything, a lower pressure for P2. The dynamic pressure that would result from the velocity of retrieval is about 0.5 psi--nowhere near the 100 psi difference between P2 and P3.

The following recommendations are put forth for future work involving the CBIP:

1) The instrument has only been run with the XCB system. The attempt to run it with the standard rotary coring system on Leg 94 did not produce meaningful data. More attempts should be made with the rotary system.

2) It would be useful to make a few runs of the CBIP without the ball in the venting system. It needs to be determined if the ball valve is really necessary, and if so, during what part of the operation it is needed. Perhaps some other arrangement could be set up whereby the top of the core barrel is freely vented (with no back pressure) during coring and then is closed off during retrieval to prevent washing of the core.

Don Bellows

Don Bellows

INSTRUCTIONS FOR ASSEMBLY OF CORE BARREL INSTRUMENTATION, PRESSURE (CBIP)

Refer to Assembly Drawing R-OP3330. The CBIP can be used with the Standard Rotary Coring System or with the Extended Core Barrel (XCB).

1. Install O-Ring, Backup Ring and Rubber Shock Pad (OP3350) in Bottom Cap (OP3349). Install O-Ring and Backup Ring in Adapter (OP3331).

2. Install desired number of Pressure Transducers (1 to 4) on Transducer Block (OP3345). Plug unused ports on Transducer Block with Swagelok Plugs. CBIP is designed to allow any one or all of three pressure measurements at top of core barrel, above ball valve, and in annulus between core barrel and drill pipe.

3. Assemble Bottom Cap to Torque Rod (OP3346) by means of Torque Rod Plate (OP3347) and Torque Rod Cap (OP3348).

4. Install 1/16 O.D. Pressure Tubing (OP3353) as required. Plug unused ports on top face of Bottom Cap with Swagelok Plugs. Plug unused pipe threaded ports with pipe plugs. From this point on, be careful that Pressure Tubing is not damaged by subsequent handling.

5. Attach half of Holding Tray (OP3342) to Transducer Block at one end and to Hang Plate (OP3338) at other end. Transducer Block goes at end nearest small holes (for mounting Electronics Package). Install Shock Rod (OP3333).

6. Install Electronics Pack and Battery Pack into Holding Tray and attach at bulkheads with screws as shown. Shock Indicator is optional--it may or may not be installed. Make appropriate electrical connections between Battery Pack, Electronics Pack, and Pressure Transducers. Set timer (if tool is to be deployed soon) and install other half of Holding Tray.

7. Slide Rebound Pad (OP3337) on to Shock Rod. Apply coating of silicone grease to I.D. of Pressure Case (OP3340) where Bottom Cap O-rings will contact. Also, apply Moly-D grease to threads on Bottom Cap and Adapter.

8. Install inner assembly into Pressure Case by sliding in from end opposite previously installed Stop Plate (OP3336). Shock Rod will pass thru hole in center of Stop Plate and appear near end of Pressure Case. Screw Bottom Cap into Pressure Case and tighten securely with strap wrenches. If Shock Indicator has been installed, be careful when handling and wrenching that large shocks are not applied which might cause the Shock Indicator to trip prematurely.

9. Pull end of Shock Rod until instrument package is fully extended on Torque Rod. Install Shock Sleeve (OP-3352), Foam Shock Pad (OP-3335), and Moving Plate (OP-3334). Then install locknut on Shock Rod.

10. Apply coating of silicone grease to I.D. of Pressure Case where Adapter O-Rings will contact. Install Adapter and wrench down securely with strap wrenches. Shock Indicator is optional.

11. To use CBIP in Rotary Core Barrel, remove Thread Protector (OP-3351). Bottom end of CBIP attaches into top of core barrel; top end attaches into swivel. Length of CBIP, shoulder to shoulder, is six feet. To use in Extended Core Barrel (XCB) a double box sub (OP-3236) must be used at bottom of CBIP to mate with Vent Sub. A double pin sub (OP-4401) must be used at top of CBIP to mate with Quick Release Assembly.

    There is no need for roughnecks to apply wrench to Pressure Case (OP-3340) and it should not be done. Wrench should be applied only to Adapter (OP-3331) or Bottom Cap (OP-3349) when connecting CBIP to core barrel.

The CBIP will be shipped completely assembled. To remove instrument package from pressure housing, first take off Adapter. This will expose locknut on end of Shock Rod. Remove locknut. Entire instrument package may then be removed by unscrewing Bottom Cap and pulling from bottom end.

April 20, 1983
DB

PARTS LIST - CORE BARREL INSTRUMENTATION, PRESSURE (OP3330)

ITEM NO.	DESCRIPTION	PART NO.	REQ'D	SUPPLIER
1	Adapter	OP-3331	1	
2	Mount, Shock Indicator (Optional)	OP-3332	2	
3	Shock Rod	OP-3333	1	
4	Moving Plate	OP-3334	1	
5	Shock Pad, Foam	OP-3335	1	
6	Stop Plate	OP-3336	1	
7	Rebound Pad	OP-3337	1	
8	Hang Plate	OP-3338	1	
9	Plate, Battery	OP-3339	2	
10	Pressure Case	OP-3340	1	
11	Plate, Insulator	OP-3341	4	
12	Holding Tray	OP-3342	1	
14	Electronics Plate	OP-3344	2	
15	Transducer Block	OP-3345	1	
16	Torque Rod	OP-3346	1	
17	Plate, Torque Rod	OP-3347	1	
18	Cap, Torque Rod	OP-3348	1	
19	Bottom Cap	OP-3349	1	
20	Shock Pad, Rubber	OP-3350	1	
21	Thread Projector	OP-3351	1	
22	Shock Sleeve (optional)	OP-3352	1	
23	Pressure Tubing	OP-3353	1-4	
24	P.C. Board Assembly	OP-3354	1	
25	ADC-RAM Board	OP-3355	1	Tex Engrg (S.D.)
26	Logic Board	OP-3356	1	Tex Engrg (S.D.)
27	Torque Rod Assembly	OP-3357	1	
28	Tie Rod	OP-3358	2	
29	Valve Seat Retainer	OP-3359	1	
30	Pressure Transducer	CEC-1200	1-4	Bell & Howell, CEC Div (L.A.)
31	Connector	CEC 166267-0006	1-4	Bell & Howell, CEC Div (L.A.)
32	Battery, Gates 2 Volt, 2.5 AH D Cell	0810-0004	8	Tauber Electronics (S.D.)

PARTS LIST - CORE BARREL INSTRUMENTATION, PRESSURE (OP3330)

ITEM NO.	DESCRIPTION	PART NO.	REQ'D	SUPPLIER
33	Valve Seat & Ball	2E3	1	Harbison-Fischer (Tex)
34	Swagelok Connector	SS-100-1-OR	2-8	San Diego Valve (S.D.)
35	Swagelok Plug	SS-100-P	0-6	San Diego Valve (S.D.)
36	Shock Indicator (optional)	SR-355	0-2	Inertia Switch (N.Y.)
37	Retaining Ring	N5000-300	2	King Bearing (S.D.)
38	Pipe Plug	1/8 HHP-SS	0-8	Aero Space Supply (S.D.)
39	O-Ring, Parker (spare for Item 30)	MS28775-012	1-4	Aero Space Supply (S.D.)
40	O-Ring, Parker (space for Item 34)	2-011N674-70	---	Aero Space Supply (S.D.)
42	O-Ring, Parker	2-151N674-70	2	Aero Space Supply (S.D.)
44	Backup Ring, Parker	8-151	2	Aero Space Supply (S.D.)
45	SS Flat HD Screw, 100°, ¼-28 x ½	---	16	Pell Mell Supply (S.D.)
46	SS Soc HD Cap Screw, 10-32 x ½ (optional, shock indicator)	---	4	Pell Mell Supply (S.D.)
47	SS Flat HD Screw, 100°, 10-32 x 5/8.	---	12	Pell Mell Supply (S.D.)
48	SS Soc HD Cap Screw, 6-32 x 2	---	4	Pell Mell Supply (S.D.)
49	SS RD HD Screw, 6-32 x ½ (optional-shock indicator)	---	6	Pell Mell Supply (S.D.)
50	SS Lock Nut, 6-32 (optional-shock indicator)	---	6	Pell Mell Supply (S.D.)
51	SS Hex Locknut, ½-13	---	1	Pell Mell Supply (S.D.)
52	SS Hex Nut, ½-13	---	1	Pell Mell Supply (S.D.)
53	SS Cotter Pin, 1/8 x 1	---	1	Pell Mell Supply (S.D.)
54	Loctite Threadlocker	222	A/R	Yale Enterprises (S.D.)
55	Loctite Threadlocker	271	A/R	Yale Enterprises (S.D.)
56	Loctite Threadlocker	277	A/R	Yale Enterprises (S.D.)
57	Loctite Superbonder 495	7520A11	A/R	McMaster-Carr (L.A.)
58	Cyanoacrylate Prep	7502A11	A/R	McMaster-Carr (L.A.)
59	Silicone Grease	1286K11	A/R	McMaster-Carr (L.A.)
60	Molylube	1279K2	A/R	McMaster-Carr (L.A.)
61	Teflon Tape	4591K11	A/R	McMaster-Carr (L.A.)
62	Connector, Trailer Lite, 2-Pole		1	Kragen (S.D.)
63	SS Hex Nut, 1/4-20		2	Aero Space Supply (S.D.)
64	Board Stiffener	OP-3360	8	

PARTS LIST - CORE BARREL INSTRUMENTATION, PRESSURE (OP3330)
ELECTRONICS

ITEM NO.	DESCRIPTION		REQ'D	SUPPLIER
1	RAM	MB8167-70C	12	R.V. WEatherford (S.D.)
2	A-D	ADC HC-12BMM	6	Datel-Intersil (Santa Ana)
3	IC	CD 4051 BE	12	Newark Electronics (S.D.)
4	IC	CD 4050 BE	7	Newark Electronics (S.D.)
5	IC	CD 4518 BE	3	Newark Electronics (S.D.)
6	IC	CD 4520 BE	3	Newark Electronics (S.D.)
7	IC	CD 4059 AE	1	Newark Electronics (S.D.)
8	IC	CD 4017 BE	4	Newark Electronics (S.D.)
9	IC	CD 4045 BE	1	Newark Electronics (S.D.)
10	IC	CD 4069 BE	2	Newark Electronics (S.D.)
11	IC	CD 4053 BE	1	Newark Electronics (S.D.)
12	IC	CD 4070 BE	2	Newark Electronics (S.D.)
13	IC	CD 4081 BE	2	Newark Electronics (S.D.)
14	IC	CD 4022 BE	2	Newark Electronics (S.D.)
15	IC	CD 4078 BE	3	Newark Electronics (S.D.)
16	IC	CD 4013 BE	4	Newark Electronics (S.D.)
17	VR	UA 7805 CKC	1	Newark Electronics (S.D.)
18	VR	UA 7810 CKC	1	Newark Electronics (S.D.)
19	VR	UA 7812 CKC	1	Newark Electronics (S.D.)
20	Diode	1N914	10	Newark Electronics (S.D.)
21	Crystal	76F829	1	Newark Electronics (S.D.)
22	Dip Switch	DYS8	1	Newark Electronics (S.D.)
23	Pot (Bournes)	13F3419	12	Newark Electronics (S.D.)
24	CAP	CK05BX104	13	Newark Electronics (S.D.)
25	CAP (Sprague)	17F2053	6	Newark Electronics (S.D.)
26	CAP, Trim (Johanson)	9614	1	Newark Electronics (S.D.)
27	Header (Alpha)	FCC 151-26	1	Newark Electronics (S.D.)
28	Push Button	13F3647	1	Newark Electronics (S.D.)
29	CAP	14F1270	1	Newark Electronics (S.D.)
30	CAP	14F1274	1	Newark Electronics (S.D.)
31	CAP	14F1281	1	Newark Electronics (S.D.)
32	CAP	13F5054	1	Newark Electronics (S.D.)
33	Socket	38F1560	1	Newark Electronics (S.D.)


INNER BARREL LATCH ASSY OP3010
INNER BARREL SWIVEL ASS'Y OP3100
ADAPTER OP3331
MOVING PLATE OP3334
SHOCK SLEEVE OP3352 (OPTION)
SHOCK ROD OP3333
SHOCK PAD OP3335
STOP PLATE OP3336
RETAINING RING (2)
REBOUND PAD OP3337
HANG PLATE OP3338
½-13 HEX NUT
½-13 HEX LOCKNUT
MOUNT, SHOCK INDICATOR OP3332
SHOCK INDICATOR 10-32 × ½ SOC HD SC (2), 6-32 × ½ RD HD SC (3), 6-32 LOCKNUT (3)
OPTIONAL (2 PLCS)
⅛ × 1 COTTER PIN
72
TIE ROD OP3358 (2 REQ'D)
2⅜ (TYP 4 PLC)
BATTERY PACK
PLATE, BATTERY OP3339
BATTERY (GATES 0810-0004) STRIPPED OF OUTER CASE 8 CELLS IN SERIES.
INSULATOR PLATE OP3341 (4)
PLATE, BATTERY OP3339
¼-28 × ½ FL HD SC (8 REQ'D)
PRESSURE CASE OP3340
P.C. BOARDS: ADC OP3355, RAM OP3355, LOGIC OP3356
ELECTRONICS PACKAGE
BOARD STIFFENER (SPACERS) OP3360 8 REQ'D
ELECTRONICS PLATE OP3344 (2 REQ'D) + 6-32 × ½ SOC HD SC (4 REQ'D)
SPACER OP3343, LOCTITE SUPERBONDER 495
10-32 × ⅝ FLT. HD. SC. (12 REQD)
CONNECTOR CEC 166267-0006
HOLDING TRAY OP3342
PRESSURE TRANSDUCER CEC-1200, O-RING (MS28775-012) (1 TO 4 OPTION). LOCTITE 271 (THDS), DC4 (O-RING)
¼-28 × ½ FLT HD SC (8 REQD)
TRANSDUCER BLOCK OP3345
PLUG UNUSED PORTS SWAGELOK SS-100-P (2 TO 6 OPTION) LOCTITE 271 (THD) DC-4 (O-RING)
PRESSURE TUBING OP3353
TORQUE ROD ASSEMBLY OP3357 (LOCTITE 271)
SWAGELOK CONN. SS-100-1-OR (2 TO 8 OPTION) LOCTITE 271 (THDS) DC-4 (O-RING)
CAP, TORQUE ROD OP3348 LOCTITE 271
PLATE, TORQUE ROD OP3347 + #10-32 × ½ SOC HD. SC. (4) LOCTITE 222
O-RING #2-151 PARBAK #8-151 (DC4 SILICONE GREASE)
⅛ SOC PIPE PLUG (AS REQ'D) TEFLON TAPE
BOTTOM CAP OP3349
RUBBER SHOCK PAD OP3350
VALVE SEAT RETAINER OP3359, VALVE SEAT + ⅝ BALL (HARBISON-FISCHER #2E3) LOCTITE 271
RATING: PRESSURE: 10,000 PSI DEPTH: 22,500 FT
REVISIONS
NO. DESCRIPTION DATE BY CH APR
1 UPDATED PER DETAIL REVISIONS 1-24-84 R.K.
DO NOT SCALE
CONCENTRICITY ALL DIAMETERS TIR .001
TOLERANCES UNLESS NOTED
FRACTIONS ± 1/64
DECIMALS ± .005
ANGLES ± 1/2°
CORNERS 1/64 × 45° or 1/64 R
FINISH
DEEP SEA DRILLING PROJECT
SCRIPPS INSTITUTION OF OCEANOGRAPHY
UNIVERSITY OF CALIFORNIA, SAN DIEGO
LA JOLLA, CALIFORNIA 92093
TITLE
CORE BARREL INSTRUMENTATON (PRESSURE) ASSEMBLY
SURFACE TREATMENT
MATERIAL
DATE 11-7-82
BY R.K.
CHECKED
APPROVED
HEAT TREATMENT
SCALE 1:1
REQ'D/ASSY
PART NO. OP3330-1
DWG. NO. R-OP3330-1
REV.

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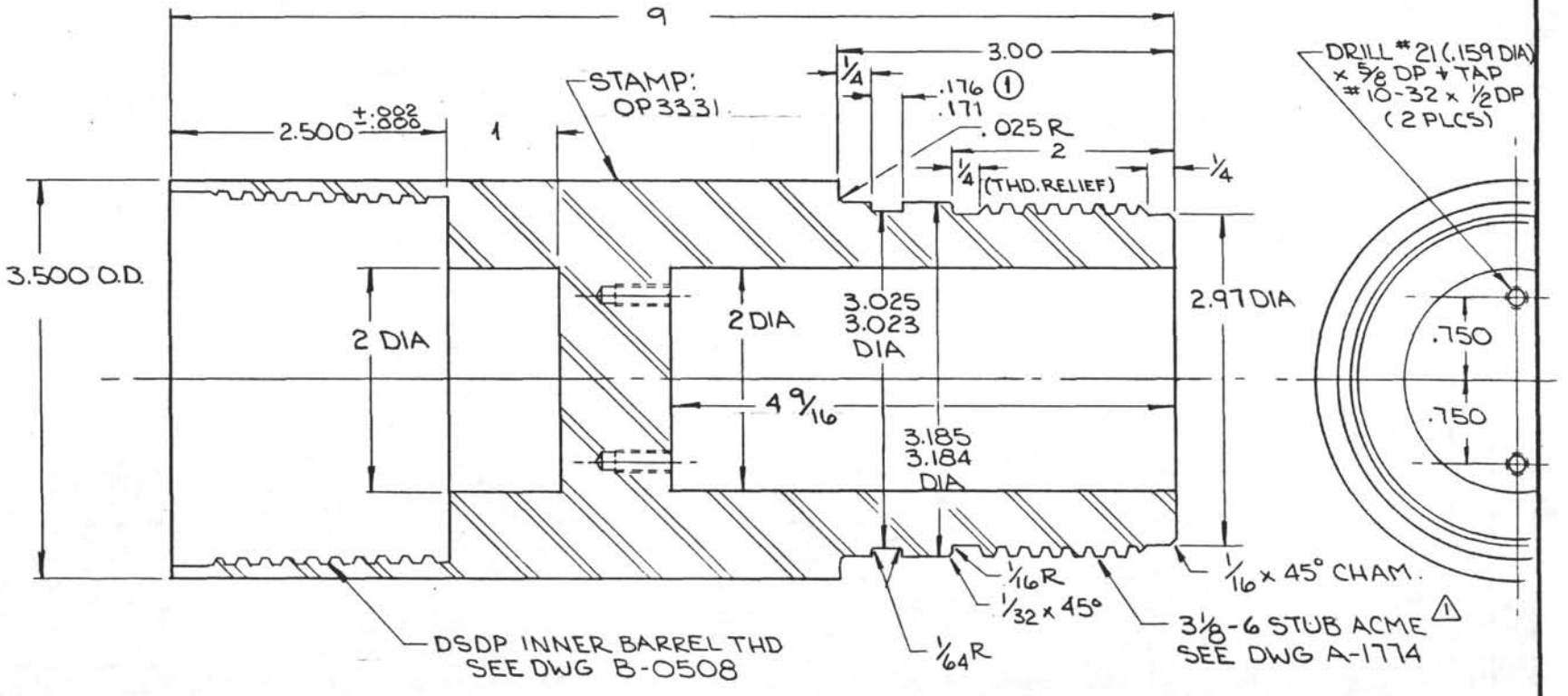

① FOR O-RING #2-151
AND PARBACK #8-151

DO NOT SCALE

CONCENTRICITY ALL DIAMETERS: TIR .003

TOLERANCES UNLESS NOTED FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES ± 1/2° CORNERS 1/64 x 45° or 1/64 R FINISH 125	DEEP SEA DRILLING PROJECT SCRIPPS INSTITUTION OF OCEANOGRAPHY UNIVERSITY OF CALIFORNIA, SAN DIEGO LA JOLLA, CALIFORNIA 92093					
	TITLE: ADAPTER ~ CB1P ~					
SURFACE TREATMENT	MATERIAL: NITRONIC60	DATE: 11-24-82	BY: RK	CHECKED: 12-7-82	APPROVED	
HEAT TREATMENT	SCALE: 1:1	REQ'D/ASS'Y: 1	PART NO.: OP3331-1	DWG. NO.: B-OP 3331-1	(REV.)	

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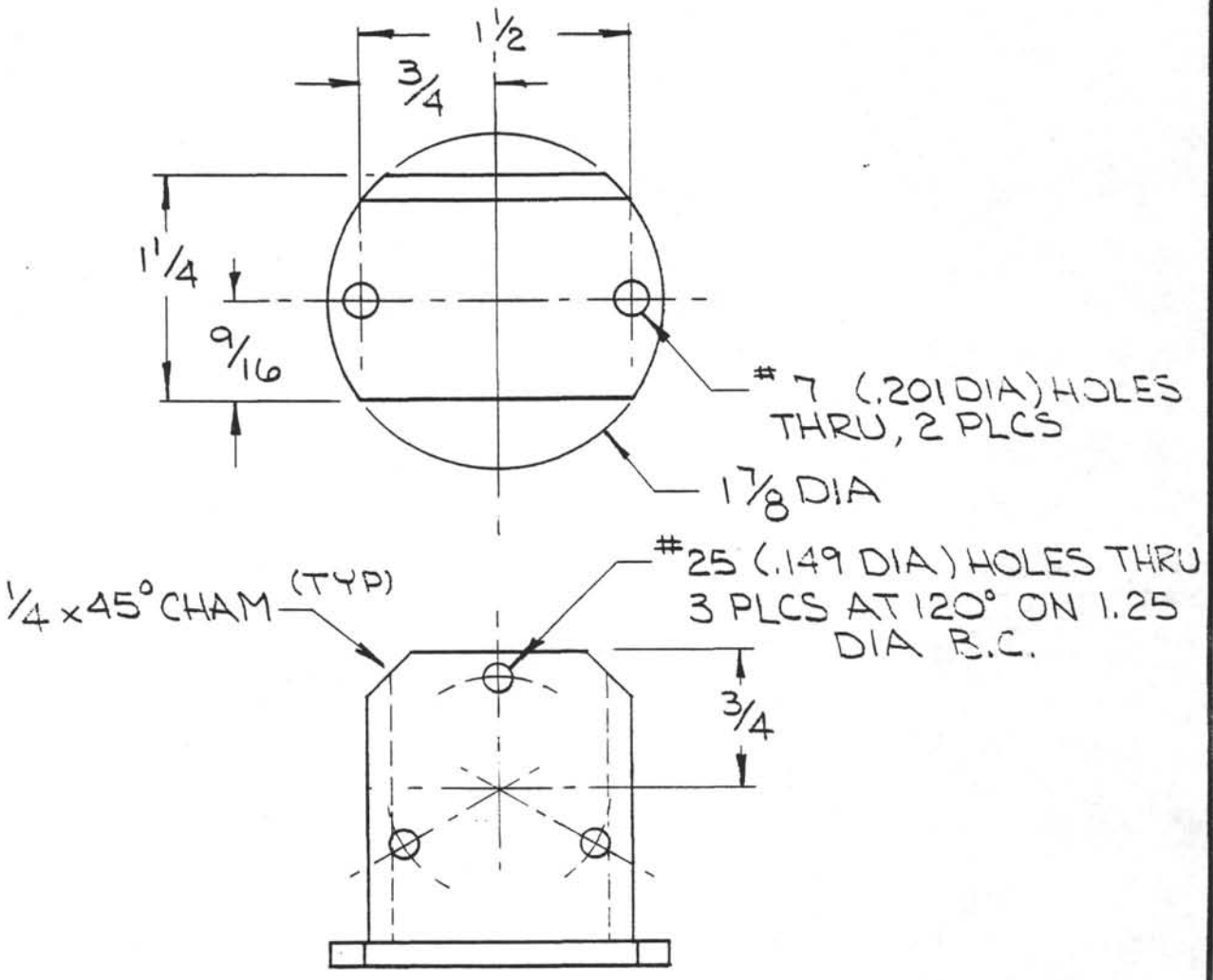

MAT'L: 1 3/4 x 1 1/4 x 1/8 STEEL ANGLE

DO NOT SCALE

CONCENTRICITY ALL DIAMETERS: TIR .003

TOLERANCES UNLESS NOTED FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES ± 1/2° CORNERS 1/64 x 45° or 1/64 R FINISH 125	DEEP SEA DRILLING PROJECT SCRIPPS INSTITUTION OF OCEANOGRAPHY UNIVERSITY OF CALIFORNIA, SAN DIEGO LA JOLLA, CALIFORNIA 92093				
	TITLE: MOUNT, SHOCK INDICATOR ~CB-1-P~				
SURFACE TREATMENT: PAINT	MATERIAL: SEE ABOVE	DATE: 12-1-82	BY: RK	CHECKED: BS 12-7-82	APPROVED
HEAT TREATMENT	SCALE: 1:1 / REQ'D/ASS'Y: 2	PART NO.: OP3332		DWG. NO.: A-OP3332-	(REV.)

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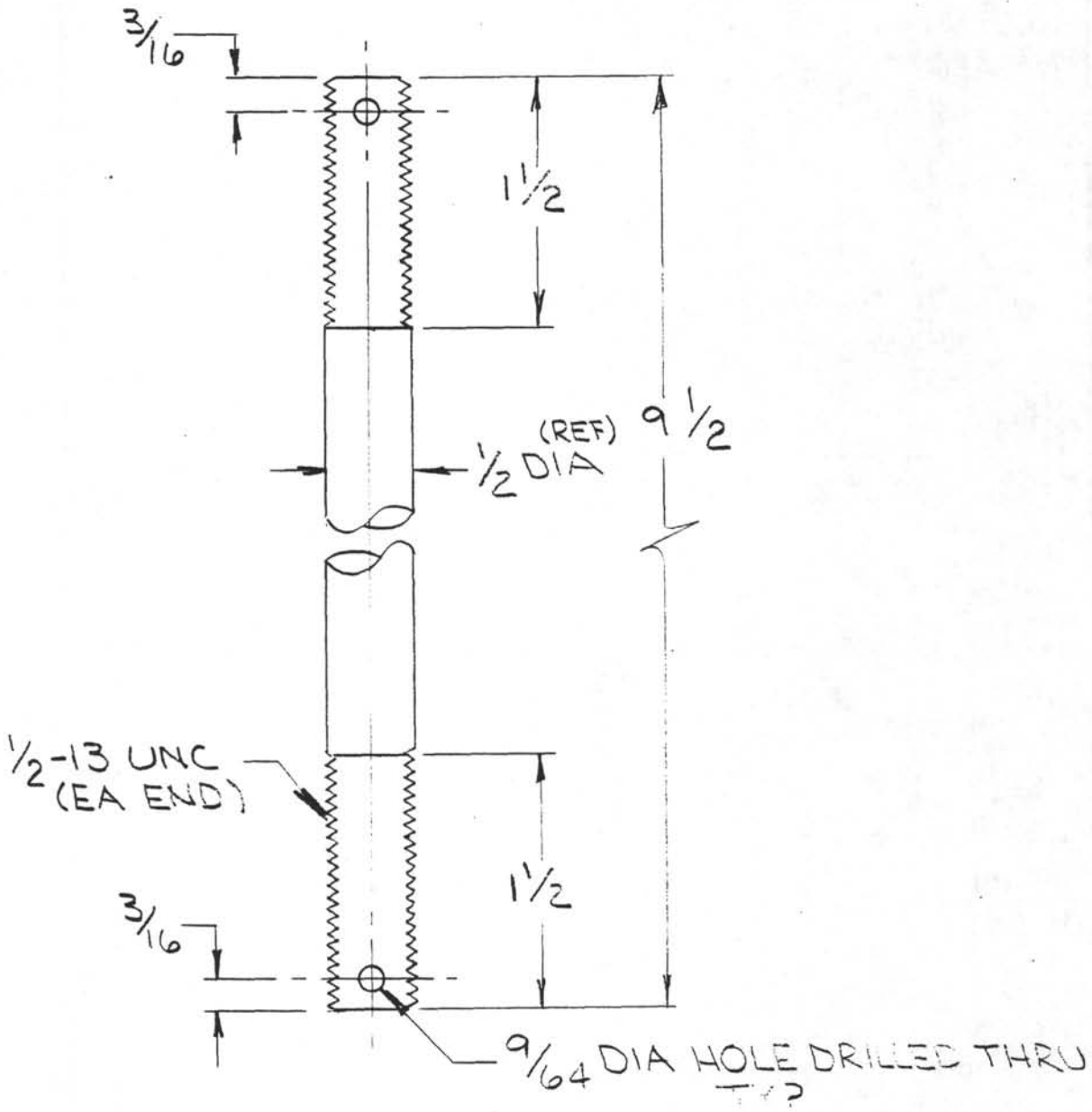

DO NOT SCALE

CONCENTRICITY ALL DIAMETERS: TIR .003

TOLERANCES UNLESS NOTED FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES ± 1/2° CORNERS 1/64 x 45° or 1/64 R FINISH 125	DEEP SEA DRILLING PROJECT SCRIPPS INSTITUTION OF OCEANOGRAPHY UNIVERSITY OF CALIFORNIA, SAN DIEGO LA JOLLA, CALIFORNIA 92093				
	TITLE: SHOCK ROD ~CBIP~				
SURFACE TREATMENT: PASSIVATE	MATERIAL: 316 SS ROD	DATE: 11.16.82	BY: RH	CHECKED: SD 12-7-82	APPROVED
HEAT TREATMENT	SCALE: 1:1	REQ'D/ASS'Y: 1	PART NO.: OP3233	DWG. NO.: A-OP3233	(REV.)

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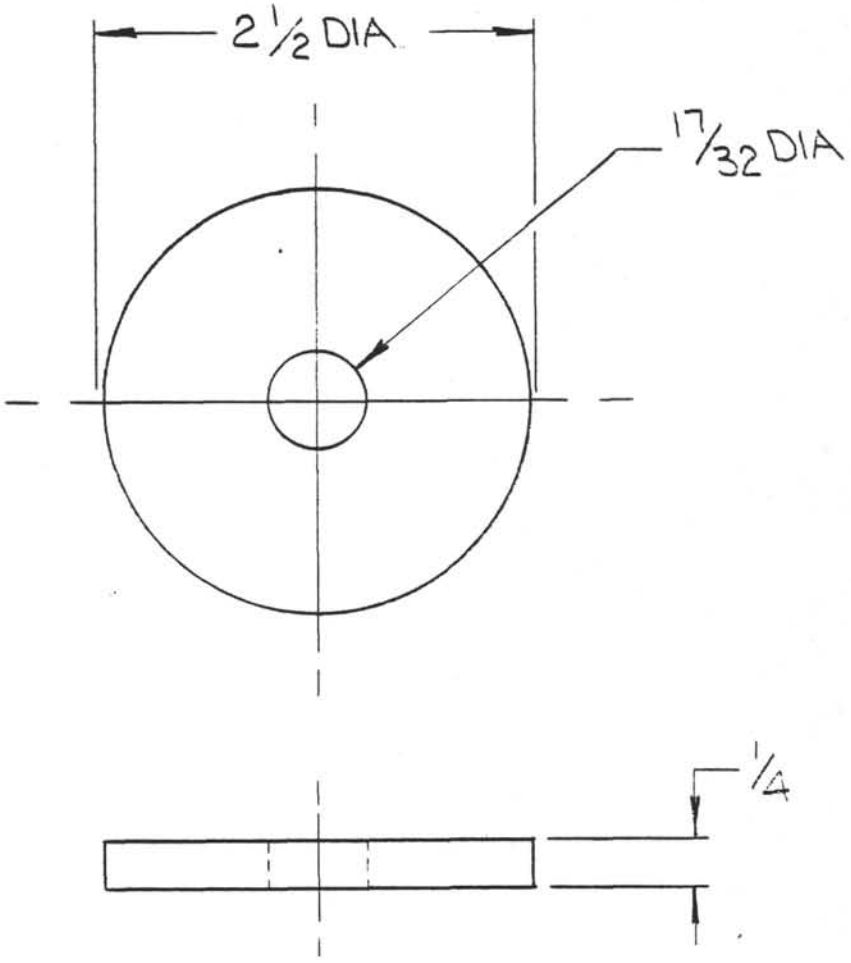

DO NOT SCALE

CONCENTRICITY ALL DIAMETERS: TIR .003

TOLERANCES UNLESS NOTED FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES ± 1/2° CORNERS 1/64 x 45° or 1/64 R FINISH 125	DEEP SEA DRILLING PROJECT SCRIPPS INSTITUTION OF OCEANOGRAPHY UNIVERSITY OF CALIFORNIA, SAN DIEGO LA JOLLA, CALIFORNIA 92093				
	TITLE: MOVING PLATE ~CB1P~				
SURFACE TREATMENT: PASSIVATE	MATERIAL: 316 S.S.	DATE: 11-30-92	BY: RK	CHECKED: [illegible]	APPROVED
HEAT TREATMENT	SCALE: 1:1	REQ'D/ASS'Y: 1	PART NO.: OP3334-1	DWG. NO.: A-OP3334-1	(REV.)

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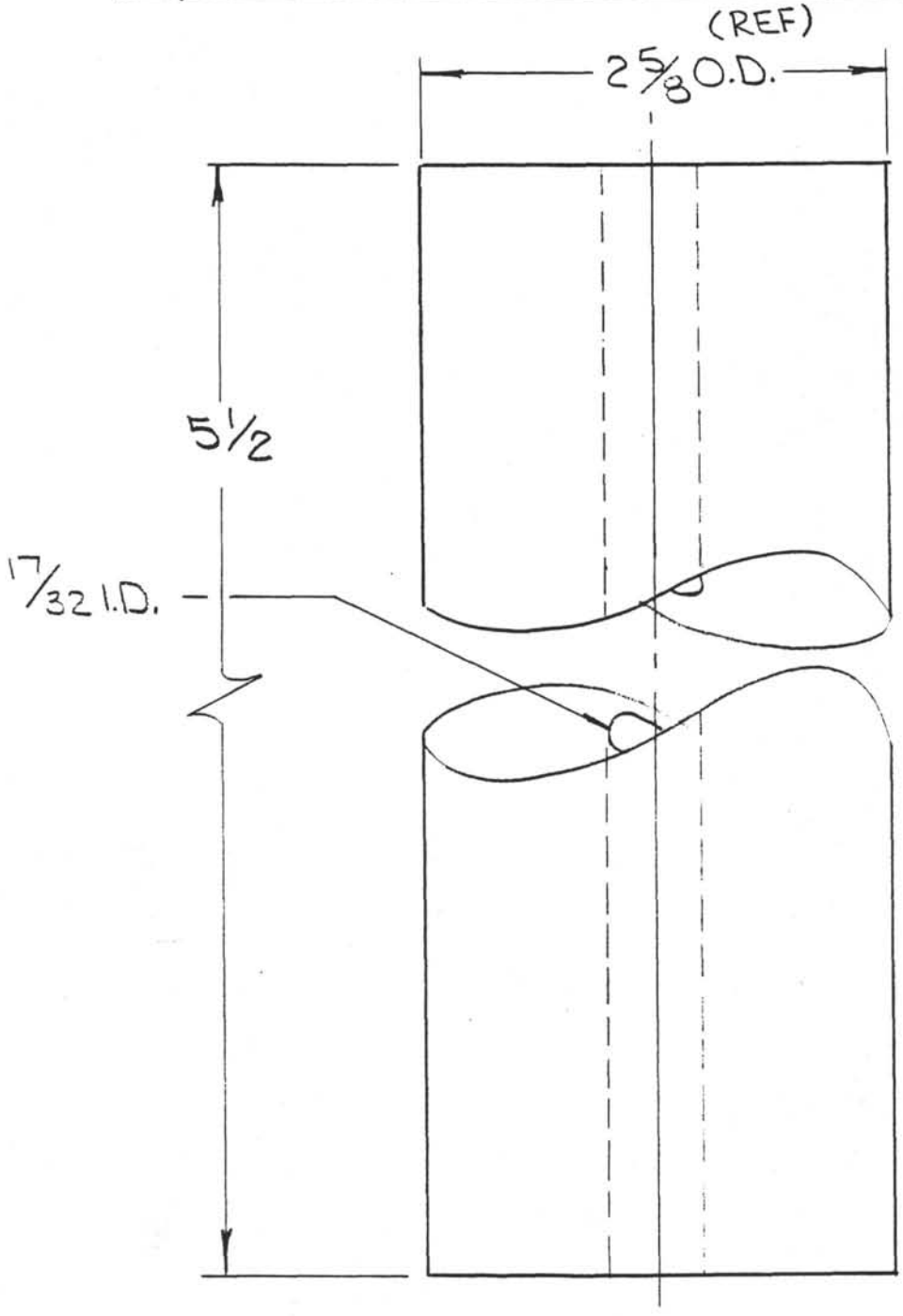


DO NOT SCALE

CONCENTRICITY ALL DIAMETERS: TIR .003

TOLERANCES
UNLESS NOTED
FRACTIONS ± 1/64
DECIMALS ± .005
ANGLES ± 1/2°
CORNERS 1/64 x 45°
or 1/64 R
FINISH 125

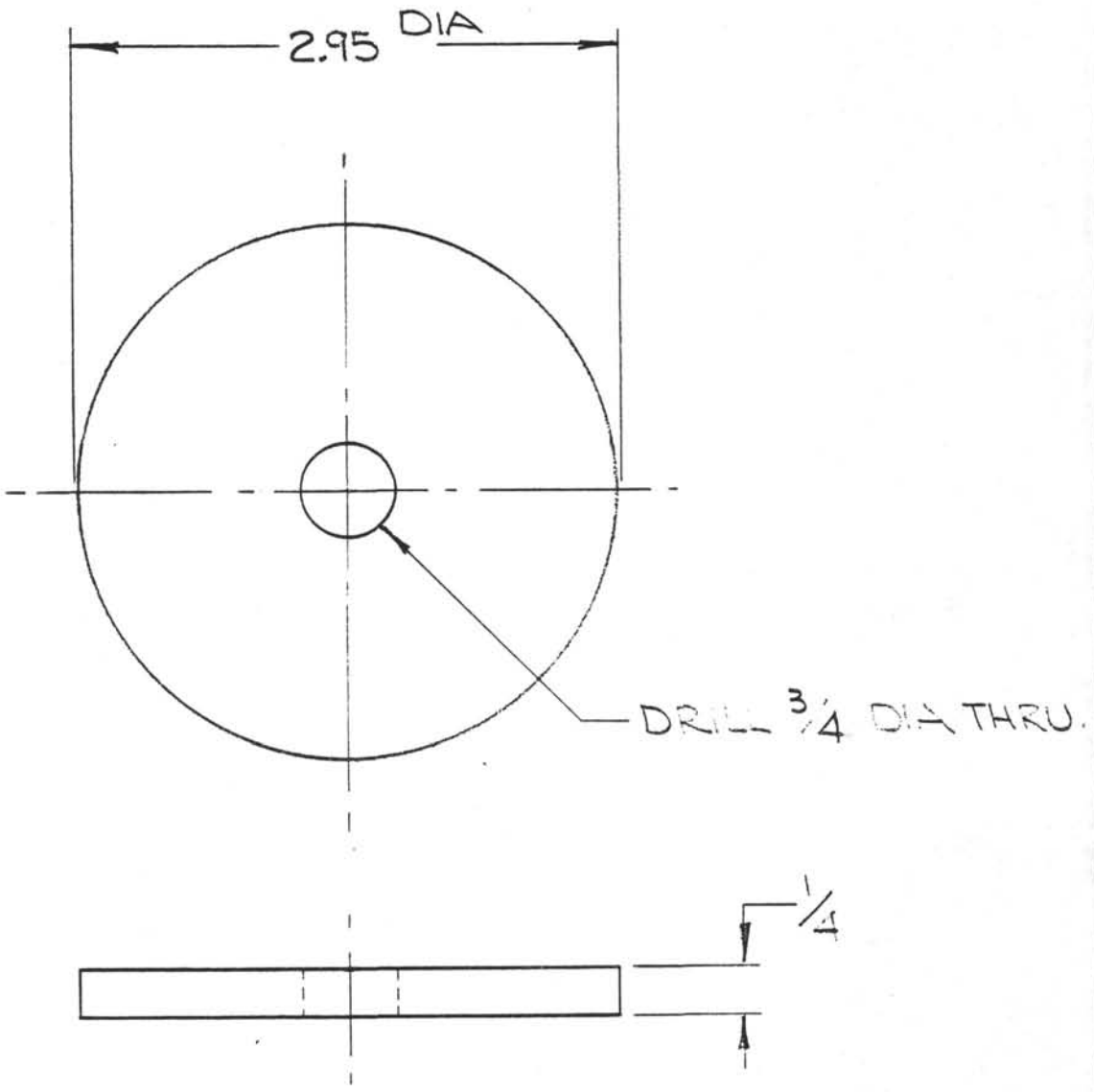
DEEP SEA DRILLING PROJECT
SCRIPPS INSTITUTION OF OCEANOGRAPHY
UNIVERSITY OF CALIFORNIA, SAN DIEGO
LA JOLLA, CALIFORNIA 92093

TITLE: SHOCK PAD, FOAM.
~ C.B.I.P ~

SURFACE TREATMENT	MATERIAL	DATE	BY	CHECKED	APPROVED
	ETHAFOAM	11-23-82	RK	EB 12-1-82	

HEAT TREATMENT	SCALE	REQ'D/ASS'Y	PART NO.	DWG. NO. (REV.)
	1:1	1	OP 3335	A-OP3335

REVISIONS					
NO.	DESCRIPTION	DATE	BY	CH.	APR.

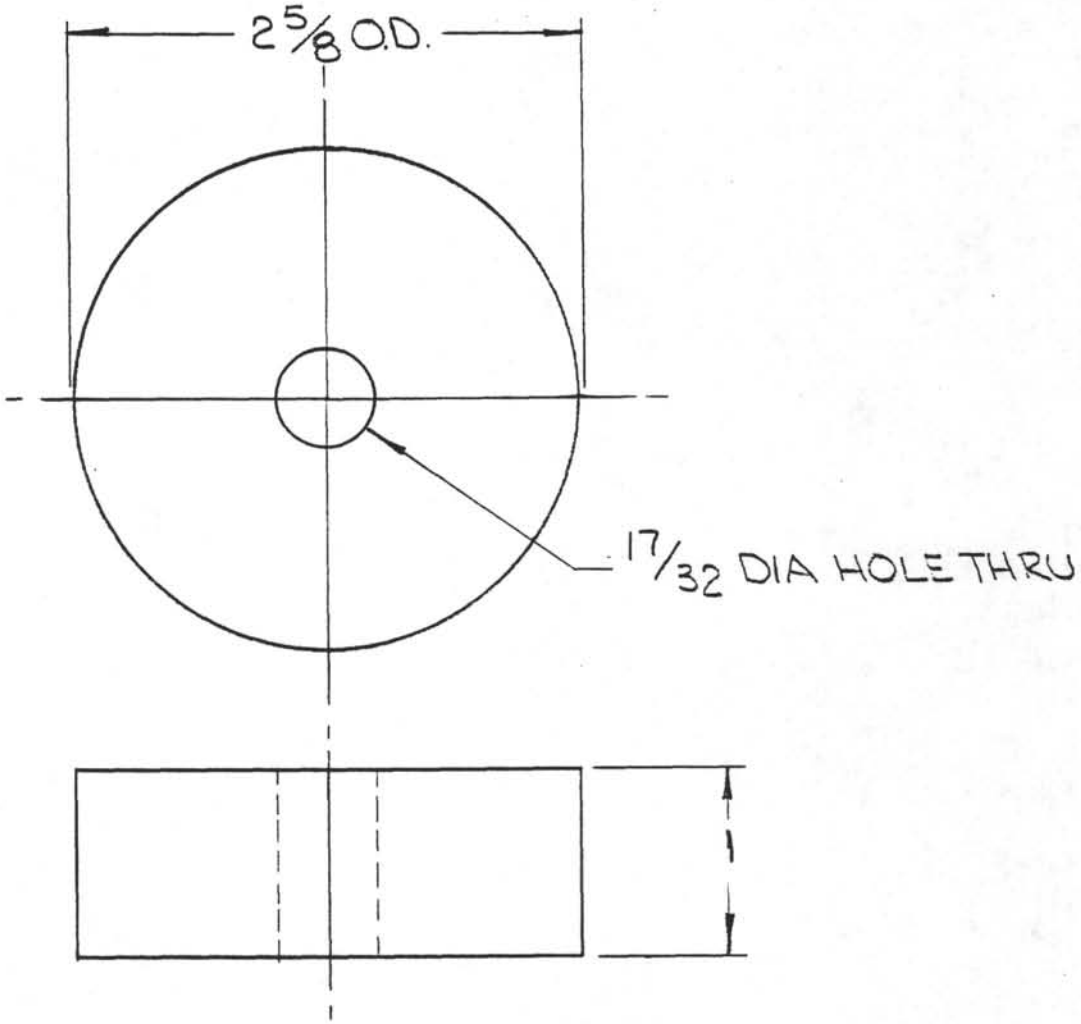


DO NOT SCALE

CONCENTRICITY ALL DIAMETERS: TIR .003

TOLERANCES UNLESS NOTED FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES ± 1/2° CORNERS 1/64 x 45° or 1/64 R FINISH 125	DEEP SEA DRILLING PROJECT SCRIPPS INSTITUTION OF OCEANOGRAPHY UNIVERSITY OF CALIFORNIA, SAN DIEGO LA JOLLA, CALIFORNIA 92093				
	TITLE: STOP PLATE ~C·B·I·P~				
SURFACE TREATMENT: PASSIVATE	MATERIAL: 316 S.S.	DATE: 11·22·82	BY: RK	CHECKED: 12-7-82	APPROVED
HEAT TREATMENT: —o—	SCALE: 1:1	REQ'D/ASS'Y: 1	PART NO.: OP3336	DWG. NO.: A-OP3336	(REV.)

REVISIONS					
NO.	DESCRIPTION	DATE	BY	CH.	APR.

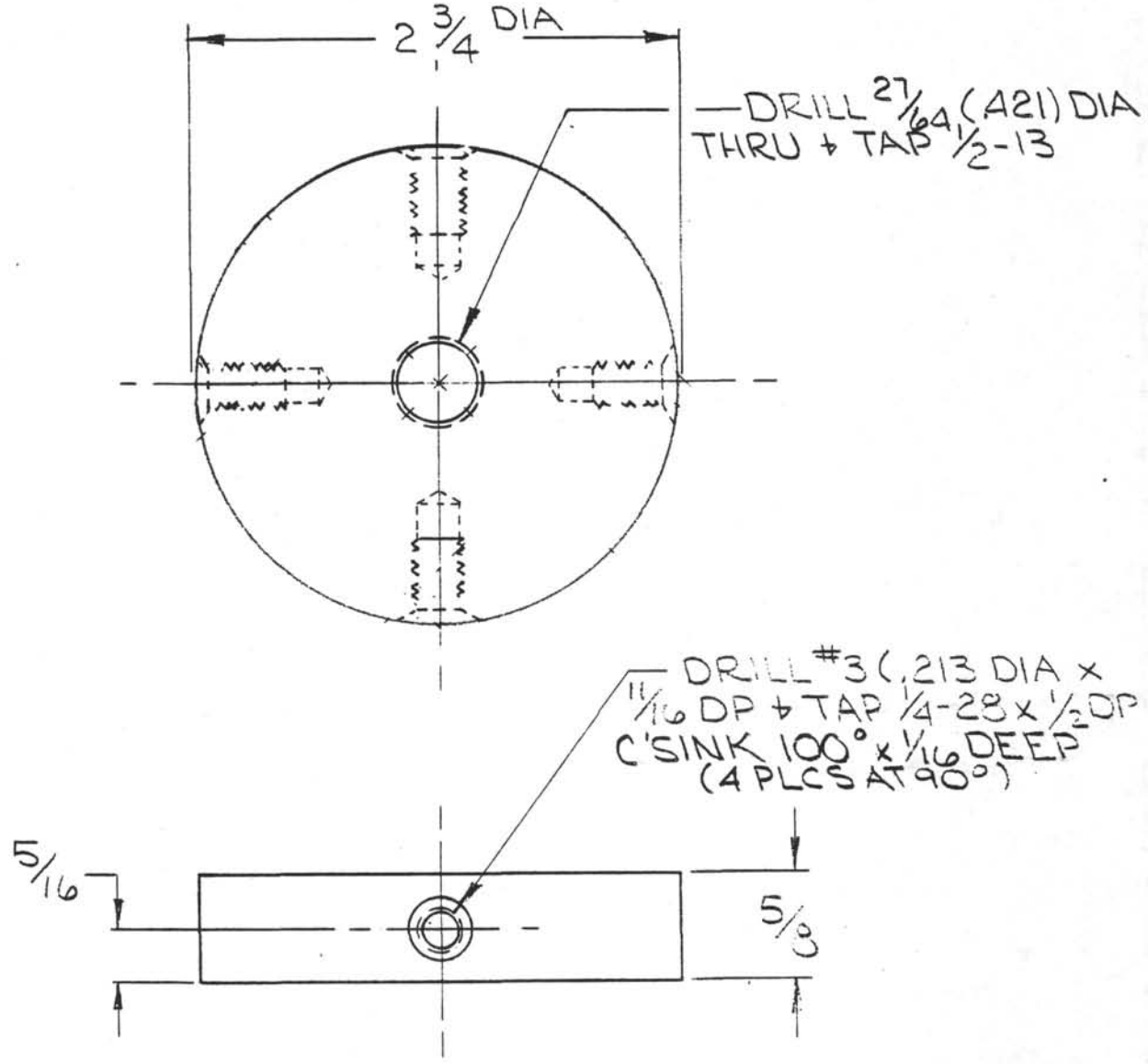


DO NOT SCALE

CONCENTRICITY ALL DIAMETERS: TIR .003

TOLERANCES UNLESS NOTED FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES ± 1/2° CORNERS 1/64 x 45° or 1/64 R FINISH 125	DEEP SEA DRILLING PROJECT SCRIPPS INSTITUTION OF OCEANOGRAPHY UNIVERSITY OF CALIFORNIA, SAN DIEGO LA JOLLA, CALIFORNIA 92093					
	TITLE: REBOUND PAD ~ CB1P~					
SURFACE TREATMENT	MATERIAL: ETHAFOAM	DATE: 11·30·82	BY: RK	CHECKED: DB 12-7-82	APPROVED	
HEAT TREATMENT	SCALE: 1:1	REQ'D/ASS'Y: 1	PART NO.: OP 3337	DWG. NO.: A-OP3337	(REV.)	

REVISIONS					
NO.	DESCRIPTION	DATE	BY	CH.	APR.

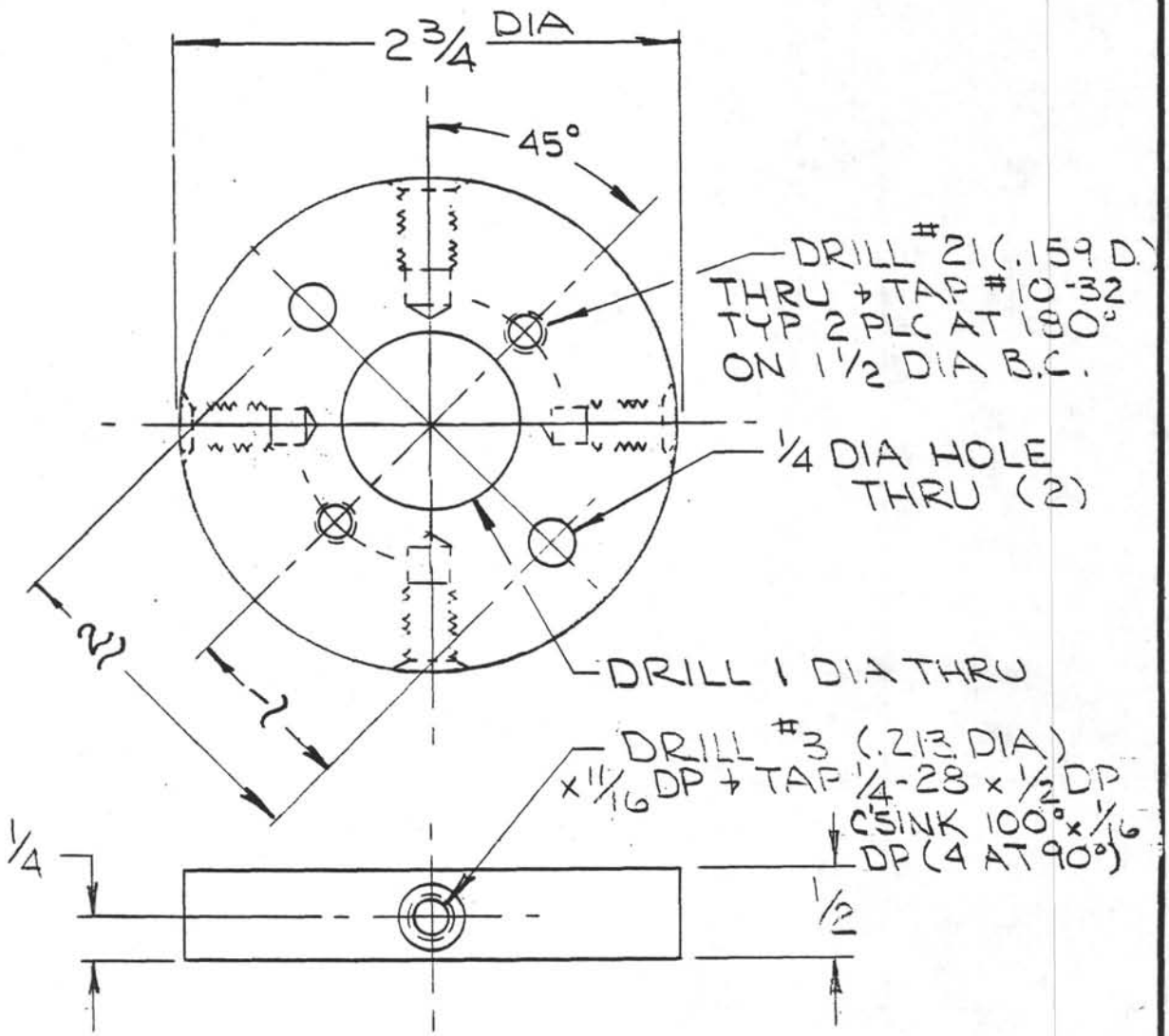


DO NOT SCALE

CONCENTRICITY ALL DIAMETERS: TIR .003

TOLERANCES UNLESS NOTED FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES ± 1/2° CORNERS 1/64 x 45° or 1/64 R FINISH 125	**DEEP SEA DRILLING PROJECT** SCRIPPS INSTITUTION OF OCEANOGRAPHY UNIVERSITY OF CALIFORNIA, SAN DIEGO LA JOLLA, CALIFORNIA 92093				
	TITLE: HANG PLATE ~CBIF~				
SURFACE TREATMENT: IRIDITE	MATERIAL: 6061-T6 ALU.	DATE: 11-22-82	BY: RK	CHECKED: LB 12-7-82	APPROVED
HEAT TREATMENT: —○—	SCALE: 1:1	REQ'D/ASS'Y: 2	PART NO.: OP3338	DWG. NO. (REV.): A-OP3338	

REVISIONS					
NO.	DESCRIPTION	DATE	BY	CH.	APR.
1	RE DESIGNED	1-28-83	RK	DB	

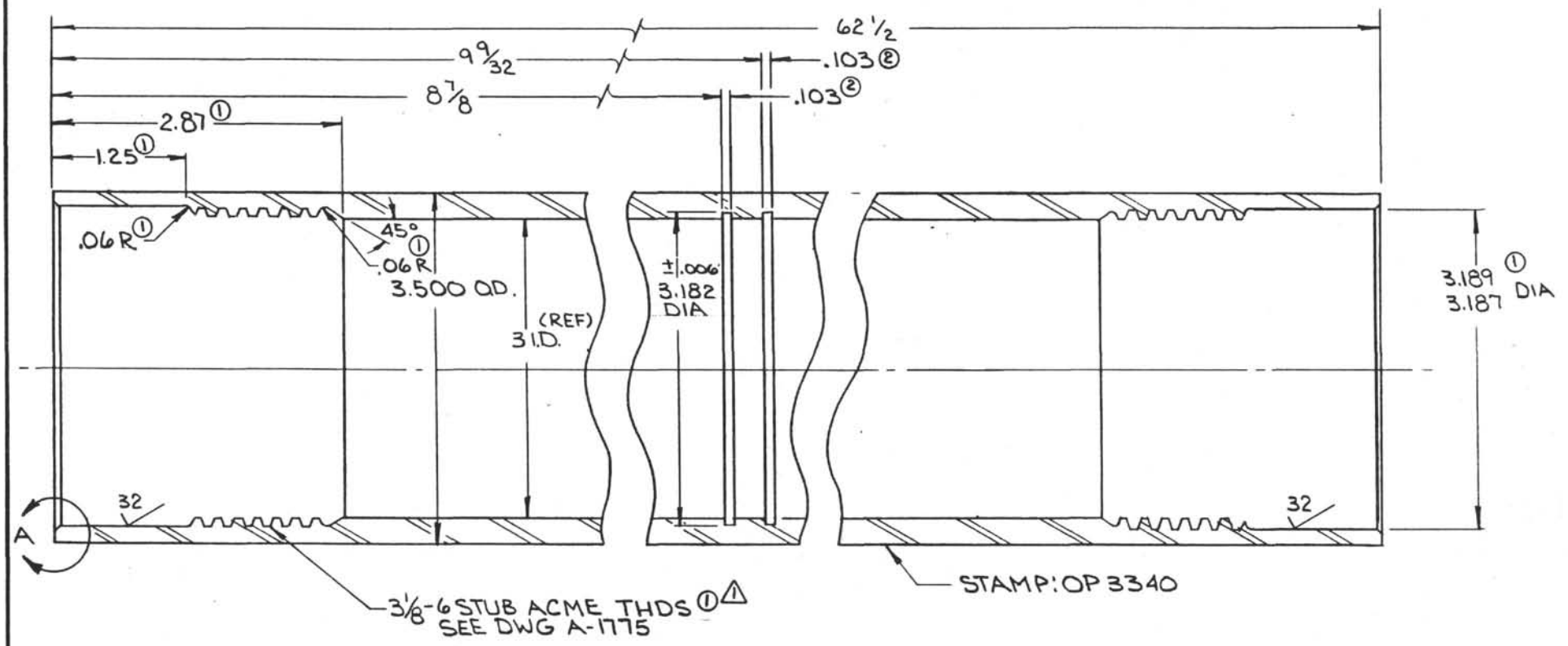


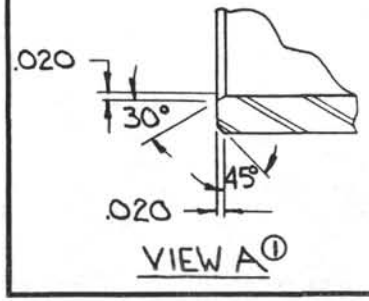
DO NOT SCALE

CONCENTRICITY ALL DIAMETERS: TIR .003

TOLERANCES UNLESS NOTED FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES ± 1/2° CORNERS 1/64 x 45° or 1/64 R FINISH 125	DEEP SEA DRILLING PROJECT SCRIPPS INSTITUTION OF OCEANOGRAPHY UNIVERSITY OF CALIFORNIA, SAN DIEGO LA JOLLA, CALIFORNIA 92093				
	TITLE: PLATE, BATTERY ~CB1P~				
SURFACE TREATMENT: IRIDITE	MATERIAL: 6061-T6 ALU.	DATE: 11-23-82	BY: RK	CHECKED: RB 12-7-82	APPROVED
HEAT TREATMENT	SCALE: 1:1	REQ'D/ASS'Y: 3	PART NO.: OP3339-1	DWG. NO.: A-OP3339-1	(REV.)

REVISIONS					
NO.	DESCRIPTION	DATE	BY	CH.	APR.
1	3 1/8-6 THD WAS 3 1/8-8	1-3-83	RK		
2	DELETED .32 FINISH x 12" FROM R. END	1-25-84	RK		





① TYPICAL BOTH ENDS ①

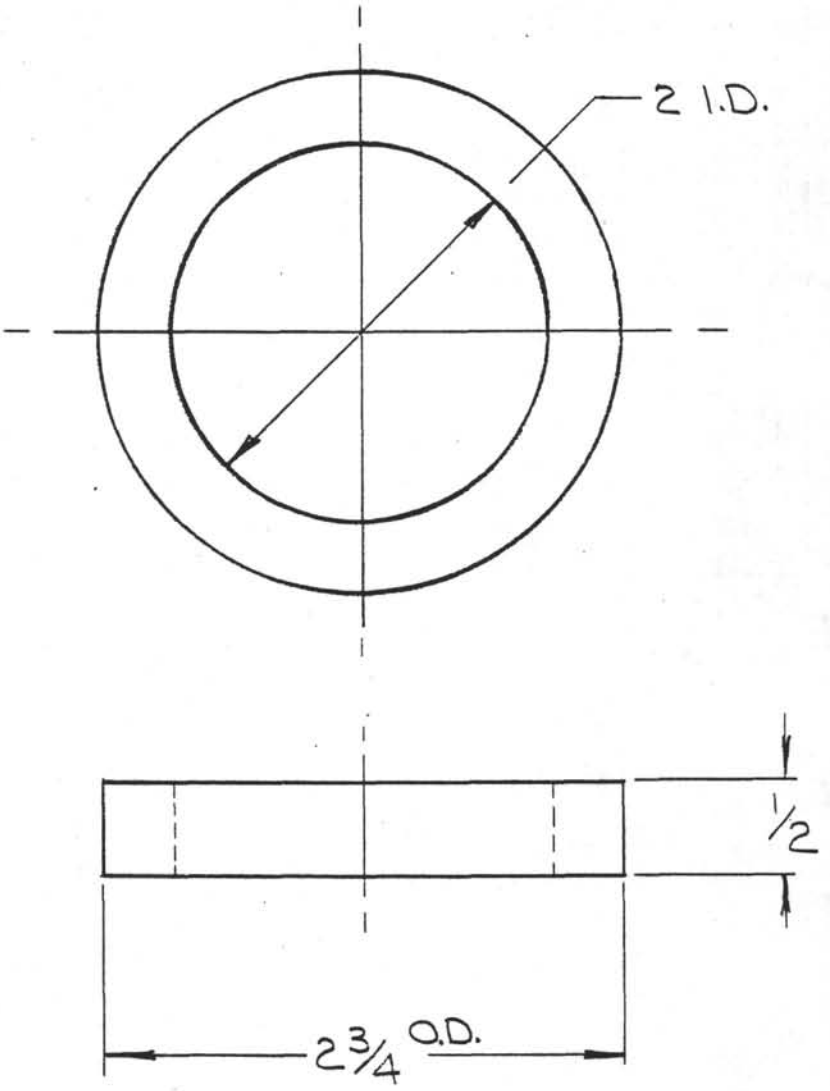
② FOR RETAINING RING "TRUARC" #N500-300

DO NOT SCALE

CONCENTRICITY ALL DIAMETERS: TIR .003

TOLERANCES UNLESS NOTED FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES ± 1/2° CORNERS 1/64 x 45° or 1/64 R FINISH 125	DEEP SEA DRILLING PROJECT SCRIPPS INSTITUTION OF OCEANOGRAPHY UNIVERSITY OF CALIFORNIA, SAN DIEGO LA JOLLA, CALIFORNIA 92093					
	TITLE: PRESSURE CASE ~ C.B.I.P ~					
SURFACE TREATMENT: PARKOLUBE	MATERIAL: 4130 C.D.		DATE: 11-15-82	BY: RK	CHECKED: AB 12-7-82	APPROVED
HEAT TREATMENT: Rc 36	SCALE: 1:1	REQ'D/ASS'Y: 1	PART NO.: OP3340-2		DWG. NO.: B-OP 3340-2	(REV.)

REVISIONS					
NO.	DESCRIPTION	DATE	BY	CH.	APR.

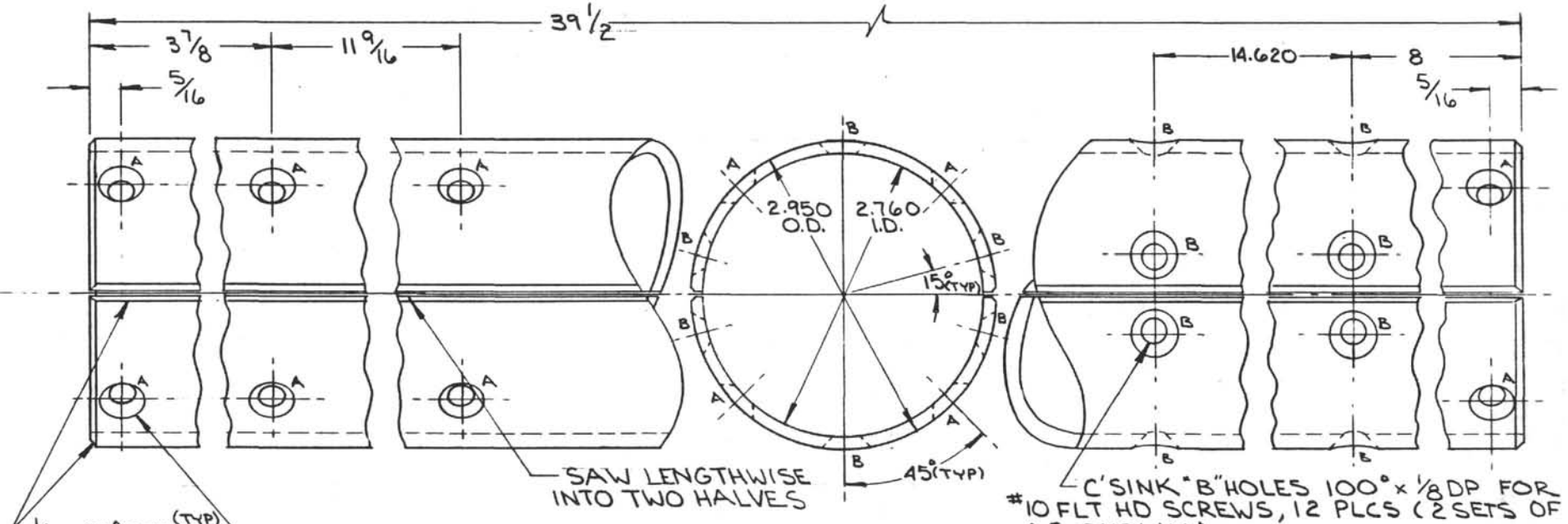


DO NOT SCALE

CONCENTRICITY ALL DIAMETERS: TIR .003

TOLERANCES UNLESS NOTED FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES ± 1/2° CORNERS 1/64 x 45° or 1/64 R FINISH 125	DEEP SEA DRILLING PROJECT SCRIPPS INSTITUTION OF OCEANOGRAPHY UNIVERSITY OF CALIFORNIA, SAN DIEGO LA JOLLA, CALIFORNIA 92093				
	TITLE: PLATE, INSULATOR ~C.B.I.P.~				
SURFACE TREATMENT	MATERIAL: PVC	DATE: 1.25.83	BY: RK	CHECKED	APPROVED
HEAT TREATMENT	SCALE: 1:1	REQ'D/ASS'Y: 4	PART NO.: OP3341	DWG. NO.: A-OP3341-O	(REV.)

REVISIONS					
NO.	DESCRIPTION	DATE	BY	CH.	APR.
1	ADDED A + B HOLES	3.18.82	RK		
2	MAT'L WAS 4130 CD STEEL				



MAT'L: ② 6061-T6 AL. TUBE 3" O.D x .120 WALL

NOTE: TURN OD TO 2.950 BEFORE SAWING IN TWO HALVES.

DO NOT SCALE — CONCENTRICITY ALL DIAMETERS: TIR .003

TOLERANCES UNLESS NOTED
FRACTIONS ± 1/64
DECIMALS ± .005
ANGLES ± 1/2°
CORNERS 1/64 x 45° or 1/64 R
FINISH 125

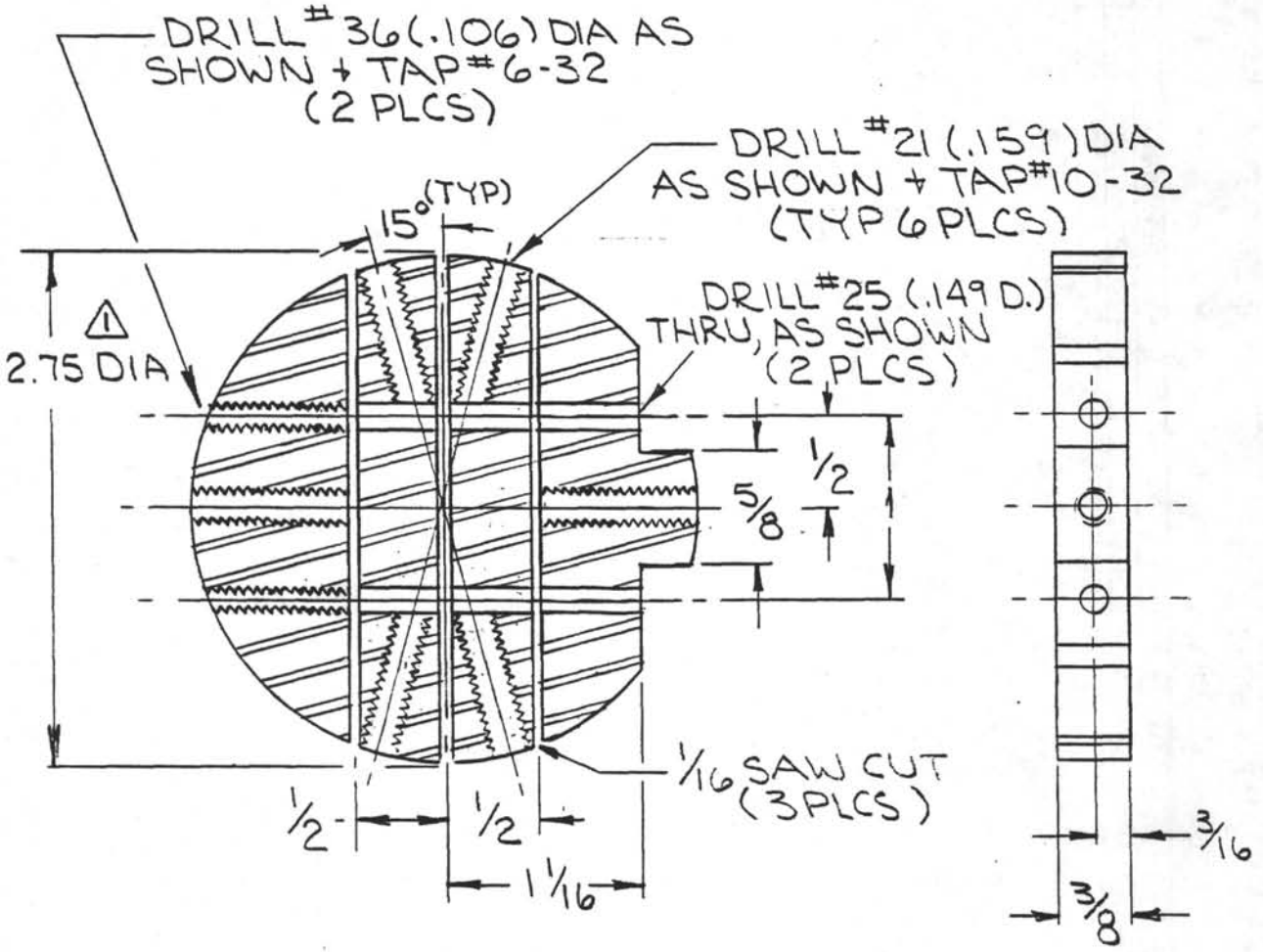
DEEP SEA DRILLING PROJECT
SCRIPPS INSTITUTION OF OCEANOGRAPHY
UNIVERSITY OF CALIFORNIA, SAN DIEGO
LA JOLLA, CALIFORNIA 92093

TITLE: HOLDING TRAY ~C.B.I.P.~

SURFACE TREATMENT	MATERIAL	DATE	BY	CHECKED	APPROVED
IRIDITE	SEE DWG	11.23.82	RK	DE 12-6-82	

HEAT TREATMENT	SCALE	REQ'D/ASS'Y	PART NO.	DWG. NO. (REV.)
—	1:1	1	OP3342-2	B-OP3342-2

REVISIONS					
NO.	DESCRIPTION	DATE	BY	CH.	APR.
1	2.75 WAS 2 DIA.				

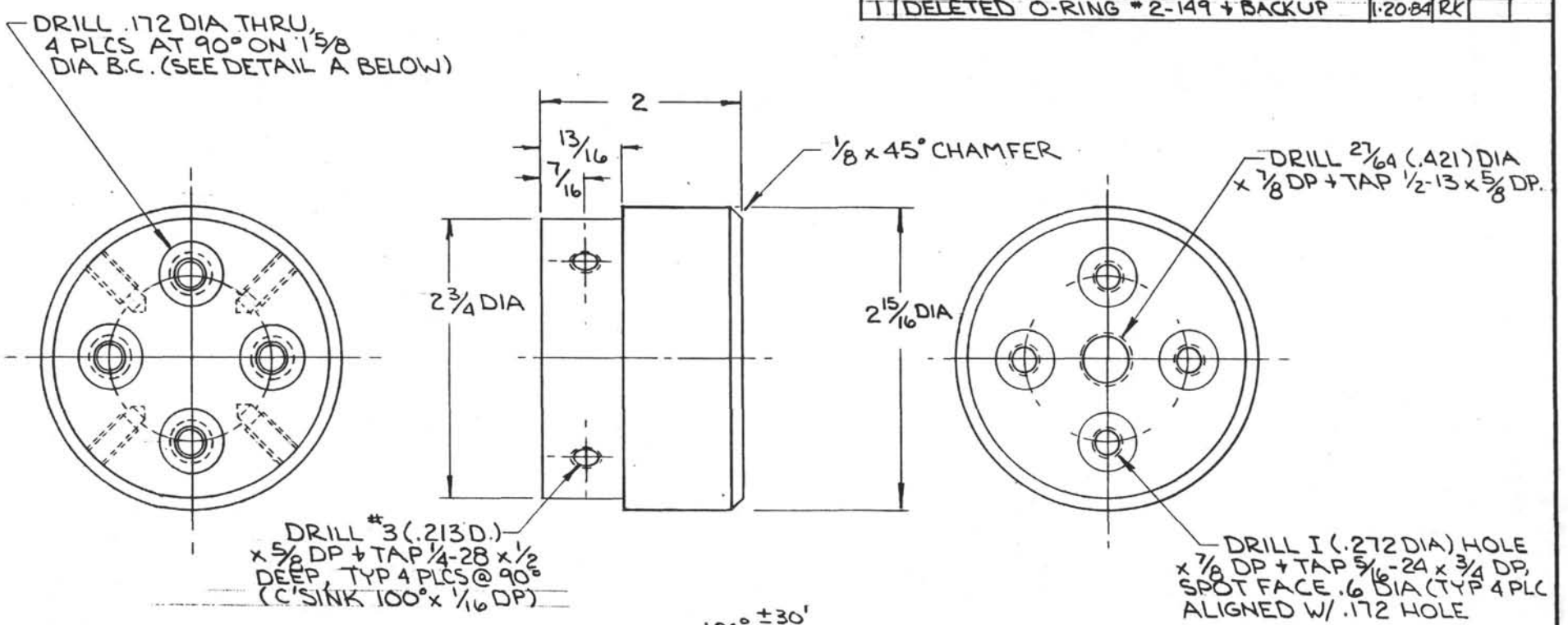


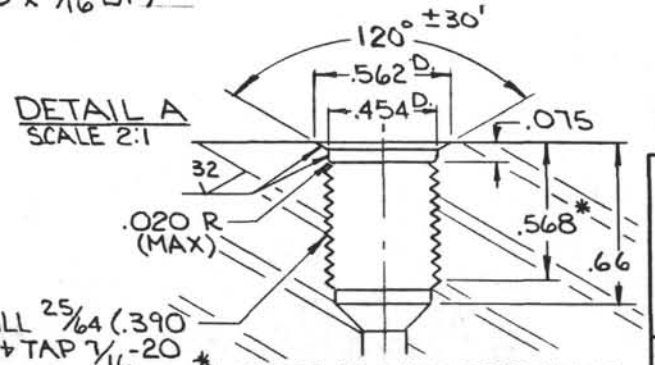
DO NOT SCALE

CONCENTRICITY ALL DIAMETERS: TIR .003

TOLERANCES UNLESS NOTED FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES ± 1/2° CORNERS 1/64 x 45° or 1/64 R FINISH 125	DEEP SEA DRILLING PROJECT SCRIPPS INSTITUTION OF OCEANOGRAPHY UNIVERSITY OF CALIFORNIA, SAN DIEGO LA JOLLA, CALIFORNIA 92093				
	TITLE: ELECTRONICS PLATE ~C·B·I·P~				
SURFACE TREATMENT: IRIDITE	MATERIAL: 6061-T6 AL	DATE: 11·16·82	BY: RK	CHECKED: BB 12-7-82	APPROVED
HEAT TREATMENT: —o—	SCALE: 1:1	REQ'D/ASS'Y: 2	PART NO.: OP3344-1	DWG. NO.: A-OP3344-1	(REV.)

REVISIONS					
NO.	DESCRIPTION	DATE	BY	CH.	APR.
1	DELETED O-RING # 2-149 + BACKUP	1·20·84	RK		





DETAIL A
SCALE 2:1

DO NOT SCALE

CONCENTRICITY ALL DIAMETERS: TIR .003

TOLERANCES UNLESS NOTED
FRACTIONS ± 1/64
DECIMALS ± .005
ANGLES ± 1/2°
CORNERS 1/64 x 45° or 1/64 R
FINISH 125

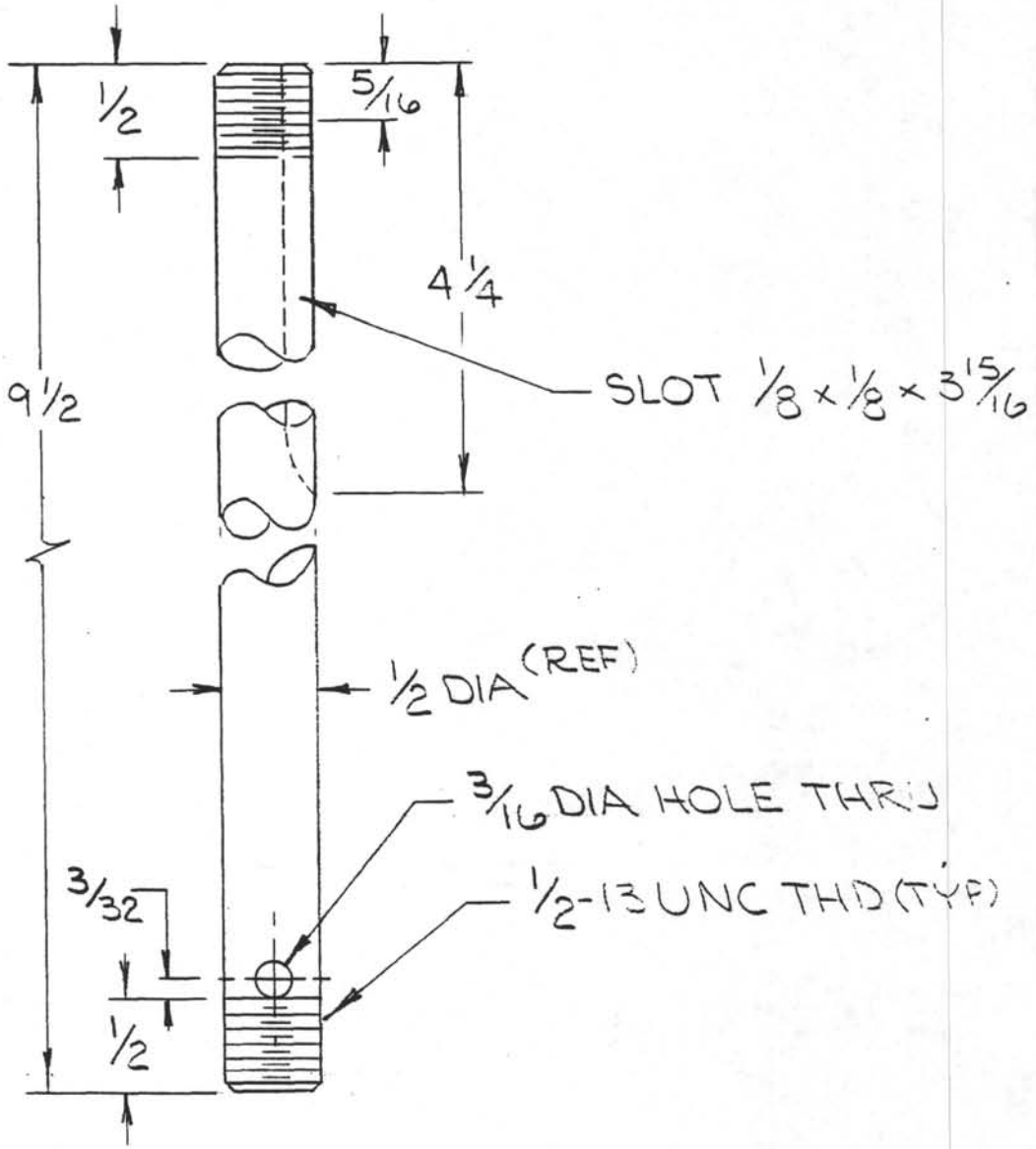
DEEP SEA DRILLING PROJECT
SCRIPPS INSTITUTION OF OCEANOGRAPHY
UNIVERSITY OF CALIFORNIA, SAN DIEGO
LA JOLLA, CALIFORNIA 92093

TITLE: TRANSDUCER BLOCK ~ C.B.1.P ~

SURFACE TREATMENT	MATERIAL	DATE	BY	CHECKED	APPROVED
PASSIVATE	316 S.S.	11·16·82	RK	RB 12-6-82	

HEAT TREATMENT	SCALE	REQ'D/ASS'Y	PART NO.	DWG. NO. (REV.)
	1:1	1	OP3345-1	B-OP3345-1

REVISIONS					
NO.	DESCRIPTION	DATE	BY	CH.	APR.

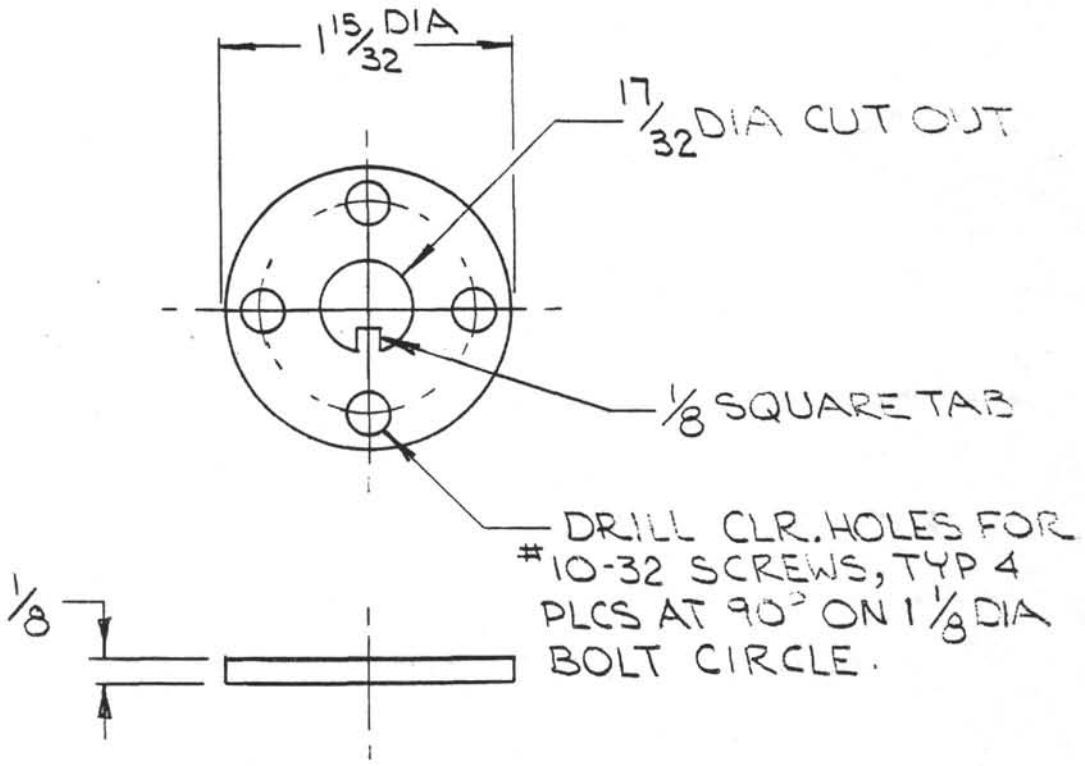


DO NOT SCALE

CONCENTRICITY ALL DIAMETERS: TIR .003

TOLERANCES UNLESS NOTED FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES ± 1/2° CORNERS 1/64 x 45° or 1/64 R FINISH 125	DEEP SEA DRILLING PROJECT SCRIPPS INSTITUTION OF OCEANOGRAPHY UNIVERSITY OF CALIFORNIA, SAN DIEGO LA JOLLA, CALIFORNIA 92093					
	TITLE: TORQUE ROD ~C.B.I.P~					
SURFACE TREATMENT: PASSIVATE	MATERIAL: 316 S.S.		DATE: 11-23-82	BY: RK	CHECKED: [illegible] 12-7-82	APPROVED
HEAT TREATMENT	SCALE: 1:1	REQ'D/ASS'Y: 1	PART NO.: OP3346		DWG. NO.: A-OP3346	(REV.)

REVISIONS					
NO.	DESCRIPTION	DATE	BY	CH.	APR.

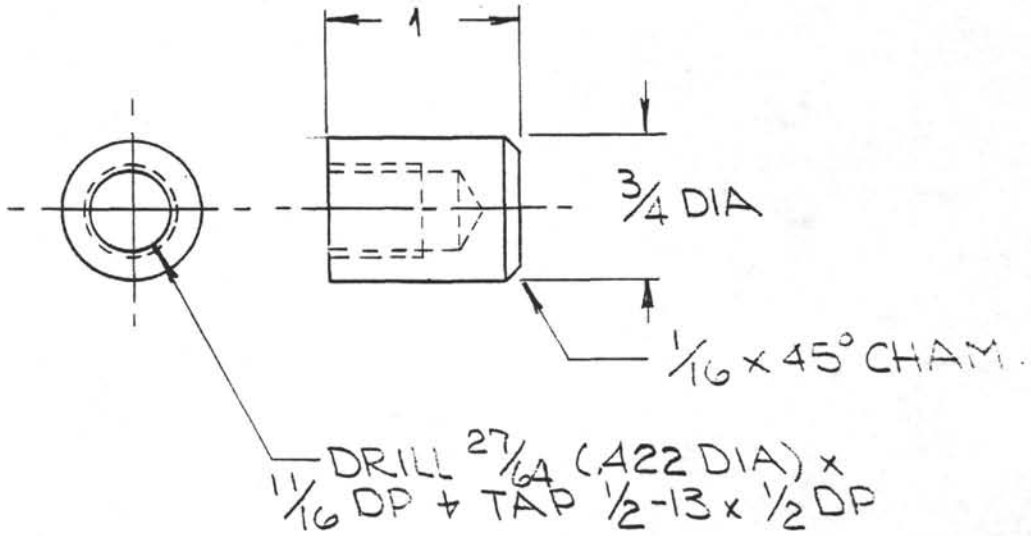


DO NOT SCALE

CONCENTRICITY ALL DIAMETERS: TIR .003

TOLERANCES UNLESS NOTED FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES ± 1/2° CORNERS 1/64 x 45° or 1/64 R FINISH 125	DEEP SEA DRILLING PROJECT SCRIPPS INSTITUTION OF OCEANOGRAPHY UNIVERSITY OF CALIFORNIA, SAN DIEGO LA JOLLA, CALIFORNIA 92093				
	TITLE: PLATE, TORQUE ROD ~C.B.I.P.~				
SURFACE TREATMENT: PASSIVATE	MATERIAL: 316 S.S.	DATE: 11.23.82	BY: RK	CHECKED: DB 12-7-82	APPROVED
HEAT TREATMENT	SCALE: 1:1	REQ'D/ASS'Y: 1	PART NO.: OP3347	DWG. NO.: A-OP3347	(REV.)

REVISIONS					
NO.	DESCRIPTION	DATE	BY	CH.	APR.

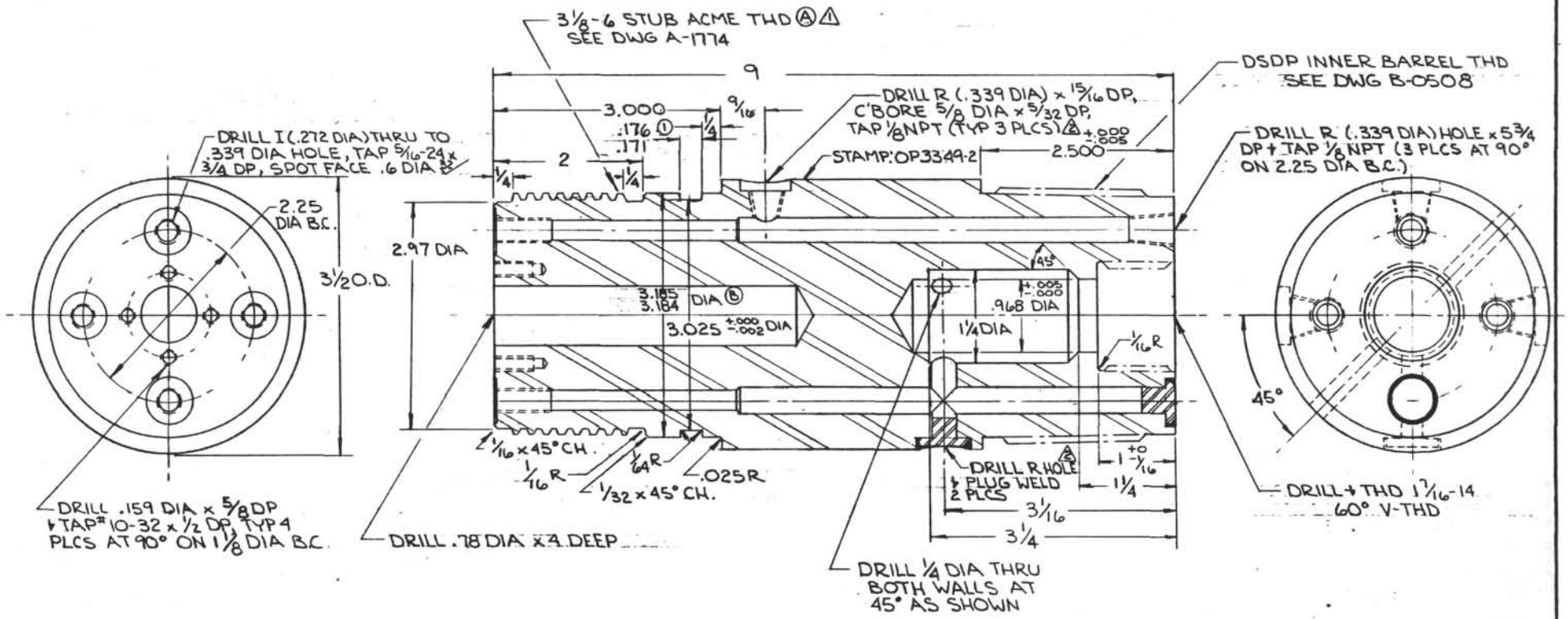


DO NOT SCALE

CONCENTRICITY ALL DIAMETERS: TIR .003

TOLERANCES UNLESS NOTED FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES ± 1/2° CORNERS 1/64 x 45° or 1/64 R FINISH 125	DEEP SEA DRILLING PROJECT SCRIPPS INSTITUTION OF OCEANOGRAPHY UNIVERSITY OF CALIFORNIA, SAN DIEGO LA JOLLA, CALIFORNIA 92093				
	TITLE: CAP, TORQUE ROD ~CB-1-P~				
SURFACE TREATMENT: PASSIVATE	MATERIAL: 316 S.S.		DATE: 11-22-82	BY: RK	CHECKED: CB 12-7-82 / APPROVED
HEAT TREATMENT	SCALE: 1:1	REQ'D/ASS'Y: 1	PART NO.: OP 3348		DWG. NO.: A-OP 3348 (REV.)

REVISIONS					
NO.	DESCRIPTION	DATE	BY	CH.	APR.
1	3⅛-6 THD WAS 3⅛-8	1-383	RK		
2	⅛NPT WAS 5 PLC, PLUG & WELD WAS ⅛NPT	1-20-84	RK		



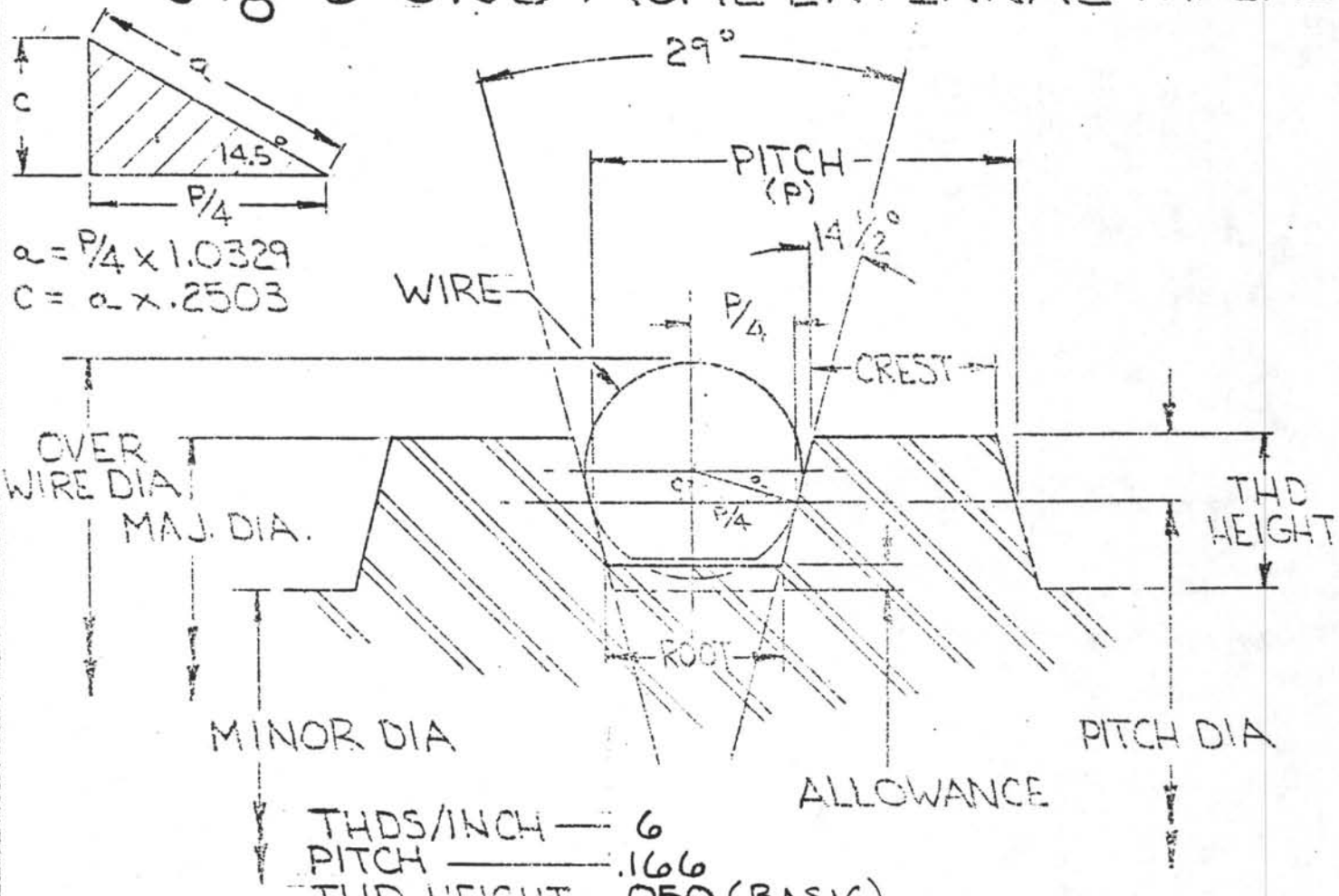
NOTE:
DIA Ⓐ & Ⓑ TO BE CONCENTRIC WITHIN .0005 FULL INDICATOR READING.

① FOR O-RING #2-151 AND PARBAK #8-151

TOLERANCES UNLESS NOTED	DEEP SEA DRILLING PROJECT				
FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES ± 1/2° CORNERS 1/64 x 45° or 1/64 R FINISH 125	SCRIPPS INSTITUTION OF OCEANOGRAPHY UNIVERSITY OF CALIFORNIA, SAN DIEGO LA JOLLA, CALIFORNIA 92093				
	TITLE: BOTTOM CAP ~C.B.I.P.~				
SURFACE TREATMENT	MATERIAL: NITRONIC 60	DRAWN BY: RK	DATE: 11-15-83	CHECKED: 12-7-83	APPROVED
HEAT TREATMENT	PART NO.: OP 3349-2	SIZE: C	DWG NO.: C-OP 3349-	REV.: 2	

REVISIONS					
NO.	DESCRIPTION	DATE	BY	CH.	APR.

3 1/8-6 STUB ACME EXTERNAL THREAD



$a = P/4 \times 1.0329$

$C = a \times .2503$

THDS/INCH — 6
PITCH — .166
THD HEIGHT — .050 (BASIC)
MAJ. DIA. — { 3.125 / 3.116
MINOR DIA — { 3.005 / 2.982
PITCH DIA — 3.075
ROOT — .0652
WIRE DIA — .086

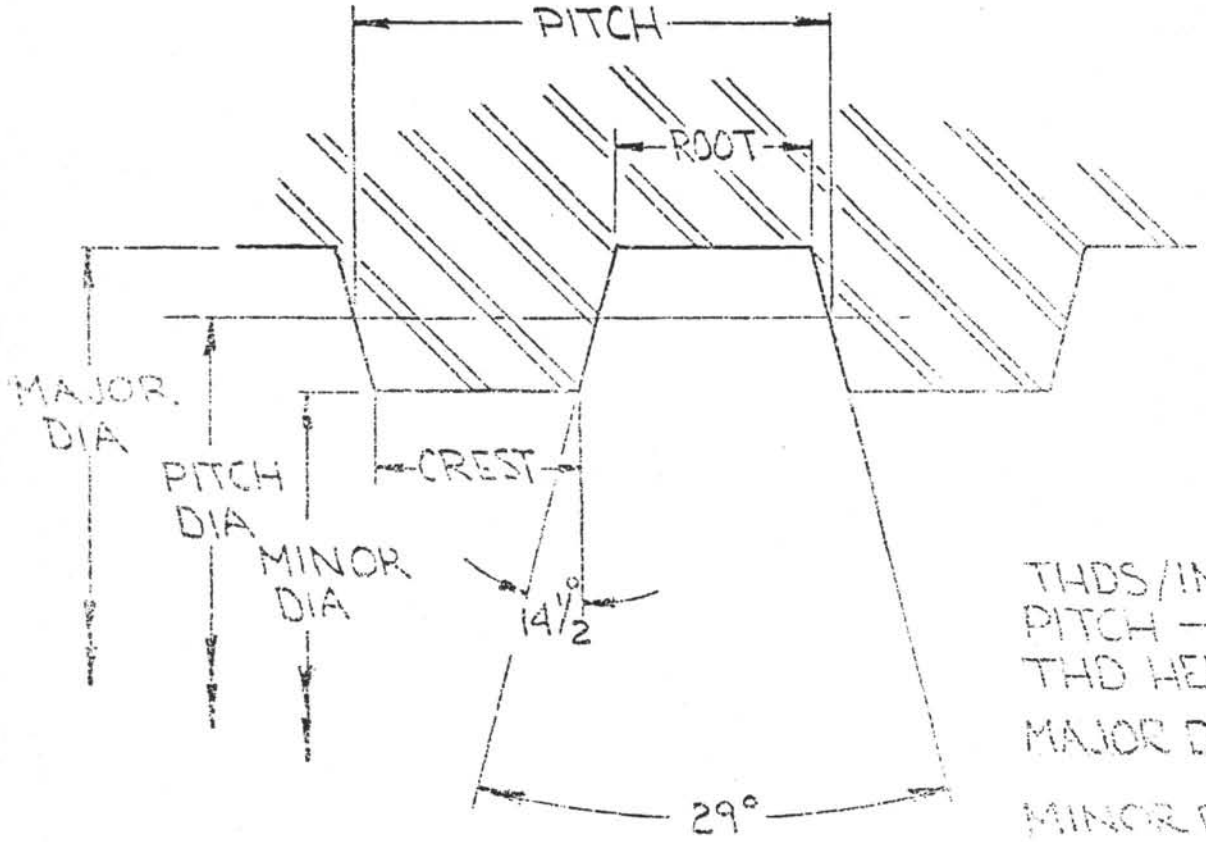
OVER WIRE DIA — 3.182

CONCENTRICITY:
ALL DIAMETERS
TIR .003

TOLERANCES UNLESS NOTED FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES ± 1/2° CORNERS 1/64 x 45° or 1/64 R FINISH 125	DEEP SEA DRILLING PROJECT SCRIPPS INSTITUTION OF OCEANOGRAPHY UNIVERSITY OF CALIFORNIA, SAN DIEGO LA JOLLA, CALIFORNIA 92093				
	TITLE STUB ACME THREAD SPECS. 3 1/8-6 EXTERNAL				
SURFACE TREATMENT	MATERIAL	DRAWN BY	DATE	CHECKED	APPROVED
HEAT TREATMENT	PART NO.	SIZE	DWG. NO.		REV
			A-1774		

REVISIONS					
NO.	DESCRIPTION	DATE	BY	CH.	APR.

$3\frac{1}{8}$"-6 STUB ACME INTERNAL THREAD

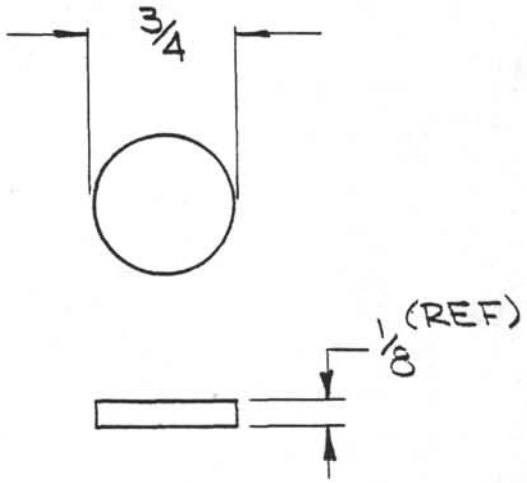


THDS/IN	6
PITCH	.166
THD HEIGHT	.050*
MAJOR DIA	3.167 / 3.145
MINOR DIA	3.033 / 3.025
ROOT	.0652
CREST	.0704

* BASIC

TOLERANCES UNLESS NOTED FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES ± 1/2° CORNERS 1/64 x 45° or 1/64 R FINISH 125	DEEP SEA DRILLING PROJECT SCRIPPS INSTITUTION OF OCEANOGRAPHY UNIVERSITY OF CALIFORNIA, SAN DIEGO LA JOLLA, CALIFORNIA				92038
	TITLE STUB ACME INTERNAL THREAD 3 1/8-6				
SURFACE TREATMENT	MATERIAL	DRAWN BY	DATE	CHECKED	APPROVED
HEAT TREATMENT	PART NO	SIZE	DWG. NO.		REV.
			A-1775		

REVISIONS					
NO.	DESCRIPTION	DATE	BY	CH.	APR.



DO NOT SCALE

CONCENTRICITY ALL DIAMETERS: TIR .003

TOLERANCES UNLESS NOTED
FRACTIONS ± 1/64
DECIMALS ± .005
ANGLES ± 1/2°
CORNERS 1/64 x 45° or 1/64 R
FINISH 125

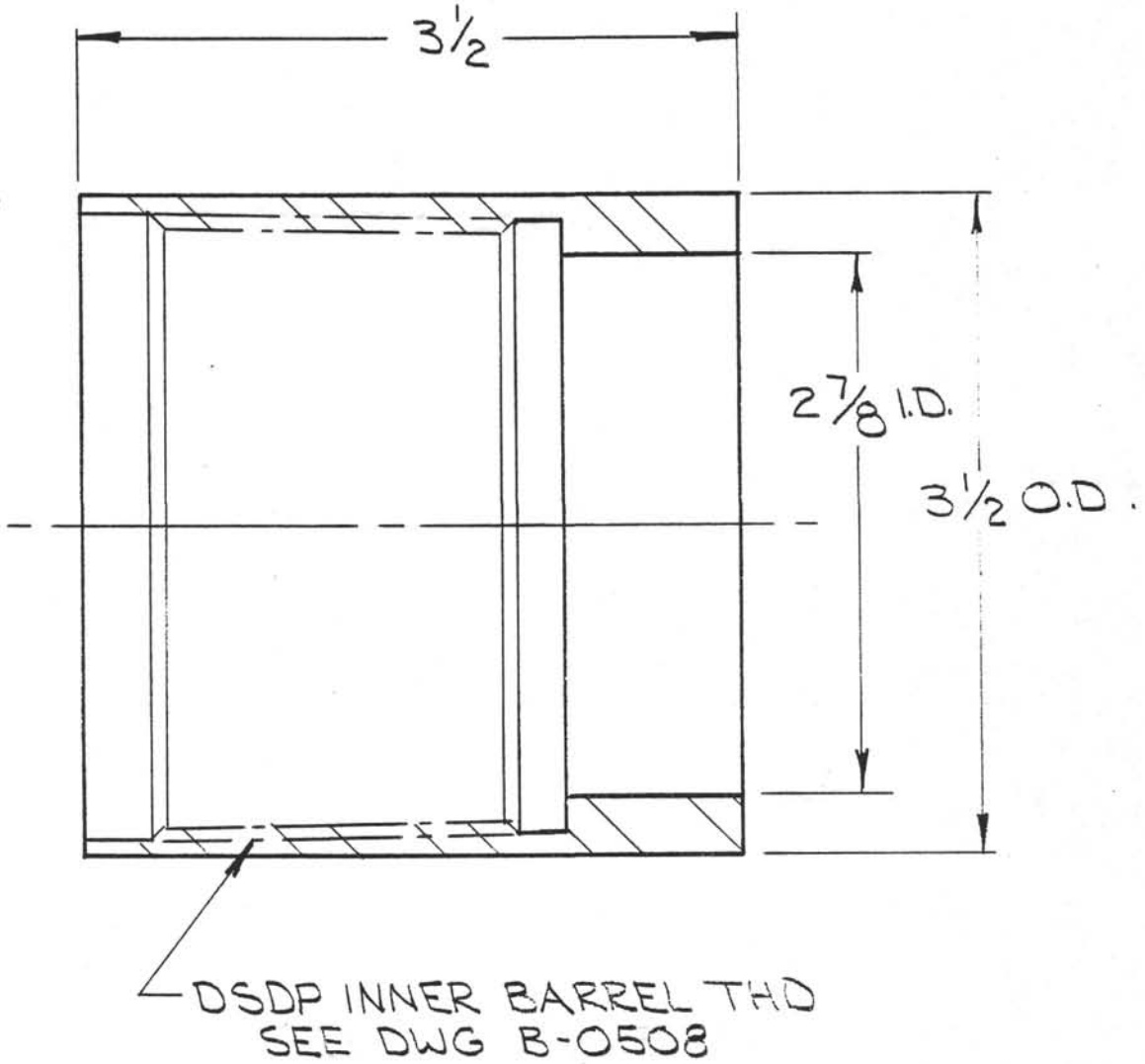
DEEP SEA DRILLING PROJECT
SCRIPPS INSTITUTION OF OCEANOGRAPHY
UNIVERSITY OF CALIFORNIA, SAN DIEGO
LA JOLLA, CALIFORNIA 92093

TITLE: SHOCK PAD, RUBBER
~C·B·I·P~

SURFACE TREATMENT	MATERIAL	DATE	BY	CHECKED	APPROVED
	1/8 SHEET RUBBER	1·13·83	RK		

HEAT TREATMENT	SCALE	REQ'D/ASS'Y	PART NO.	DWG. NO. (REV.)
	1:1	1	OP3350	A-OP3350

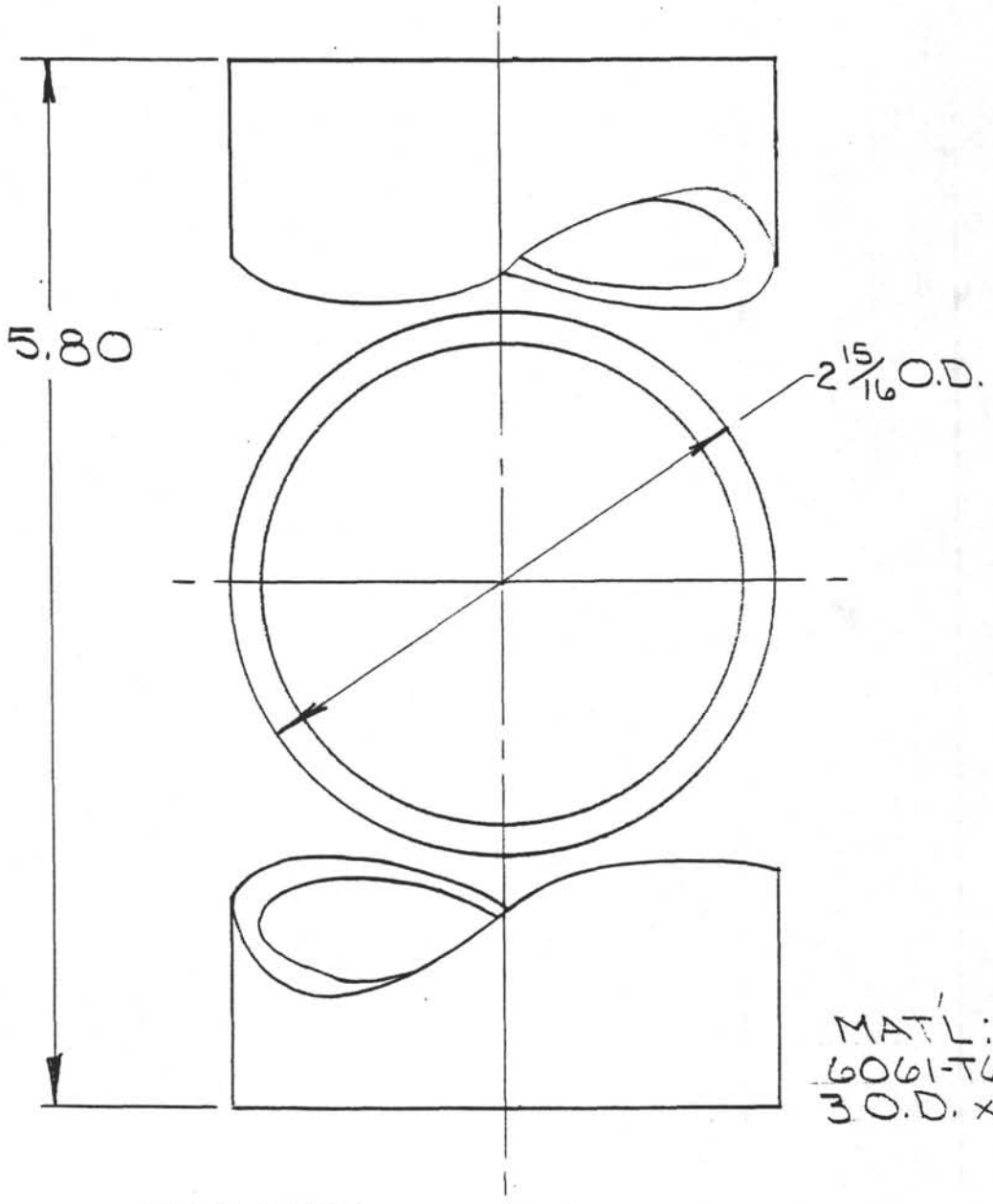
REVISIONS					
NO.	DESCRIPTION	DATE	BY	CH.	APR.



DO NOT SCALE CONCENTRICITY ALL DIAMETERS: TIR .003

TOLERANCES UNLESS NOTED FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES ± 1/2° CORNERS 1/64 x 45° or 1/64 R FINISH 125	DEEP SEA DRILLING PROJECT SCRIPPS INSTITUTION OF OCEANOGRAPHY UNIVERSITY OF CALIFORNIA, SAN DIEGO LA JOLLA, CALIFORNIA 92093					
	TITLE: THREAD PROTECTOR ~ CBIP ~					
SURFACE TREATMENT: PARKOLUBE	MATERIAL: 4130 C.D.		DATE: 1·24·83	BY: R.K.	CHECKED: [illegible]	APPROVED
HEAT TREATMENT	SCALE: 1:1	REQ'D/ASS'Y: 2	PART NO.: OP 3351		DWG. NO. (REV.): A-OP3351-0	

REVISIONS					
NO.	DESCRIPTION	DATE	BY	CH.	APR.



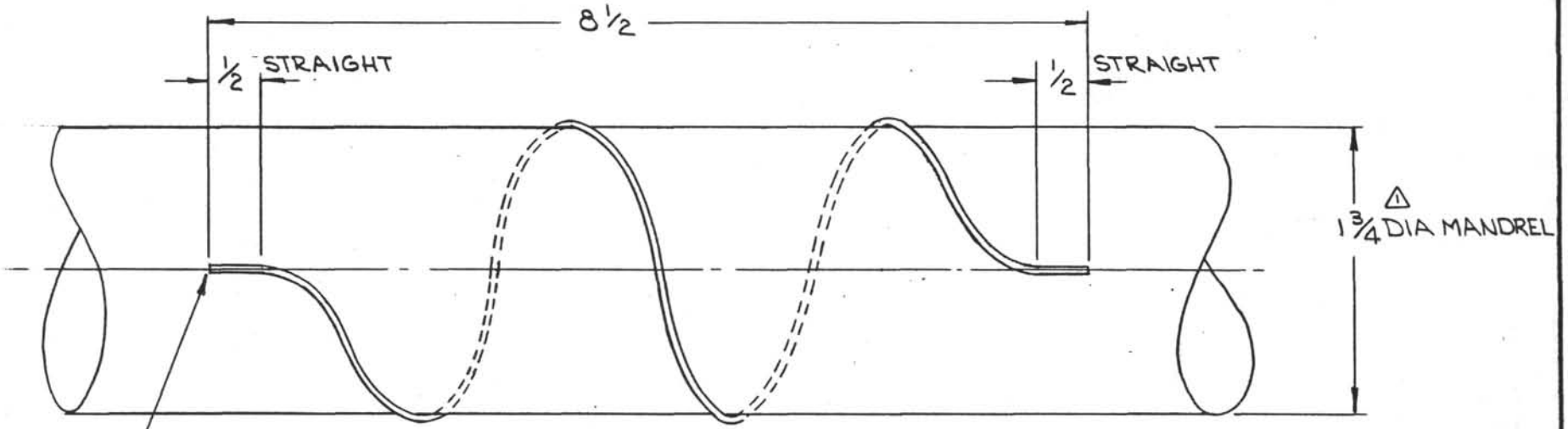
MAT'L:
6061-T6 AL. TUBE
3 O.D. x .188 WALL

DO NOT SCALE

CONCENTRICITY ALL DIAMETERS: TIR .003

TOLERANCES ·UNLESS NOTED FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES ± 1/2° CORNERS 1/64 x 45° or 1/64 R FINISH 125	DEEP SEA DRILLING PROJECT SCRIPPS INSTITUTION OF OCEANOGRAPHY UNIVERSITY OF CALIFORNIA, SAN DIEGO LA JOLLA, CALIFORNIA 92093				
	TITLE: SHOCK SLEEVE ~C·B·I·P~				
SURFACE TREATMENT: IRIDITE	MATERIAL: SEE ABOVE	DATE: 1·25·83	BY: RK	CHECKED: [illegible]	APPROVED
HEAT TREATMENT	SCALE: 1:1	REQ'D/ASS'Y: 1	PART NO.: OP3352	DWG. NO.: A-OP3352-0	(REV.)

REVISIONS					
NO.	DESCRIPTION	DATE	BY	CH.	APR.
1	1¾ WAS 2¾ , 23½ WAS 20	1·20·84	RK		



MAT'L: 1/16 O.D. x .030 I.D. x 23½ LONG S.S. TUBING

DO NOT SCALE

CONCENTRICITY ALL DIAMETERS: TIR .003

TOLERANCES UNLESS NOTED
FRACTIONS ± 1/64
DECIMALS ± .005
ANGLES ± 1/2°
CORNERS 1/64 x 45° or 1/64 R
FINISH 125

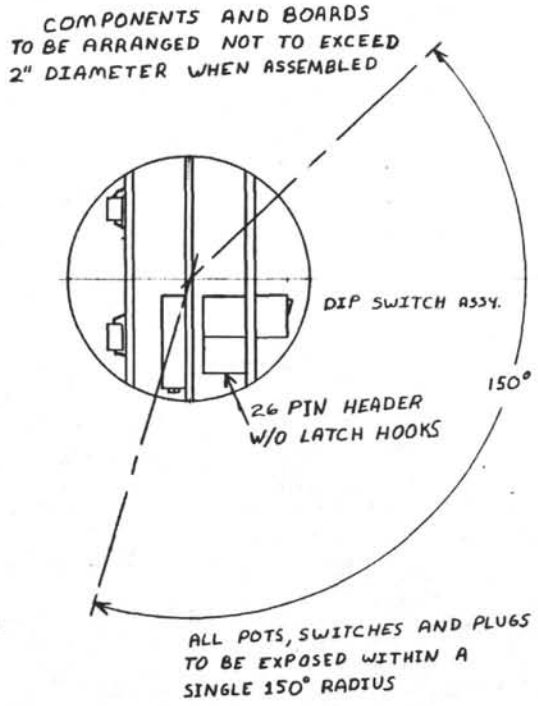
DEEP SEA DRILLING PROJECT
SCRIPPS INSTITUTION OF OCEANOGRAPHY
UNIVERSITY OF CALIFORNIA, SAN DIEGO
LA JOLLA, CALIFORNIA 92093

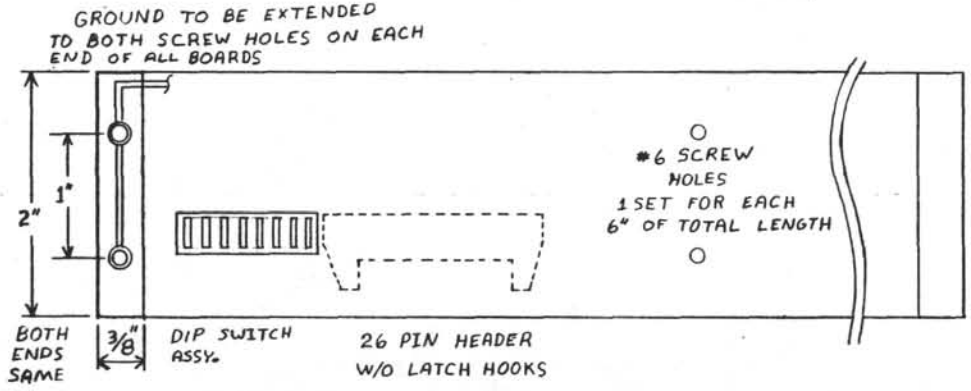
TITLE: PRESSURE TUBING ~C.B.I.P.~

SURFACE TREATMENT	MATERIAL	DATE	BY	CHECKED	APPROVED
	SEE NOTE	1·28·83	RK	DB	

HEAT TREATMENT	SCALE	REQ'D/ASS'Y	PART NO.	DWG. NO. (REV.)
	NO	1	OP 3353-1	B-OP3353-1

REVISIONS					
NO.	DESCRIPTION	DATE	BY	CH.	APR.





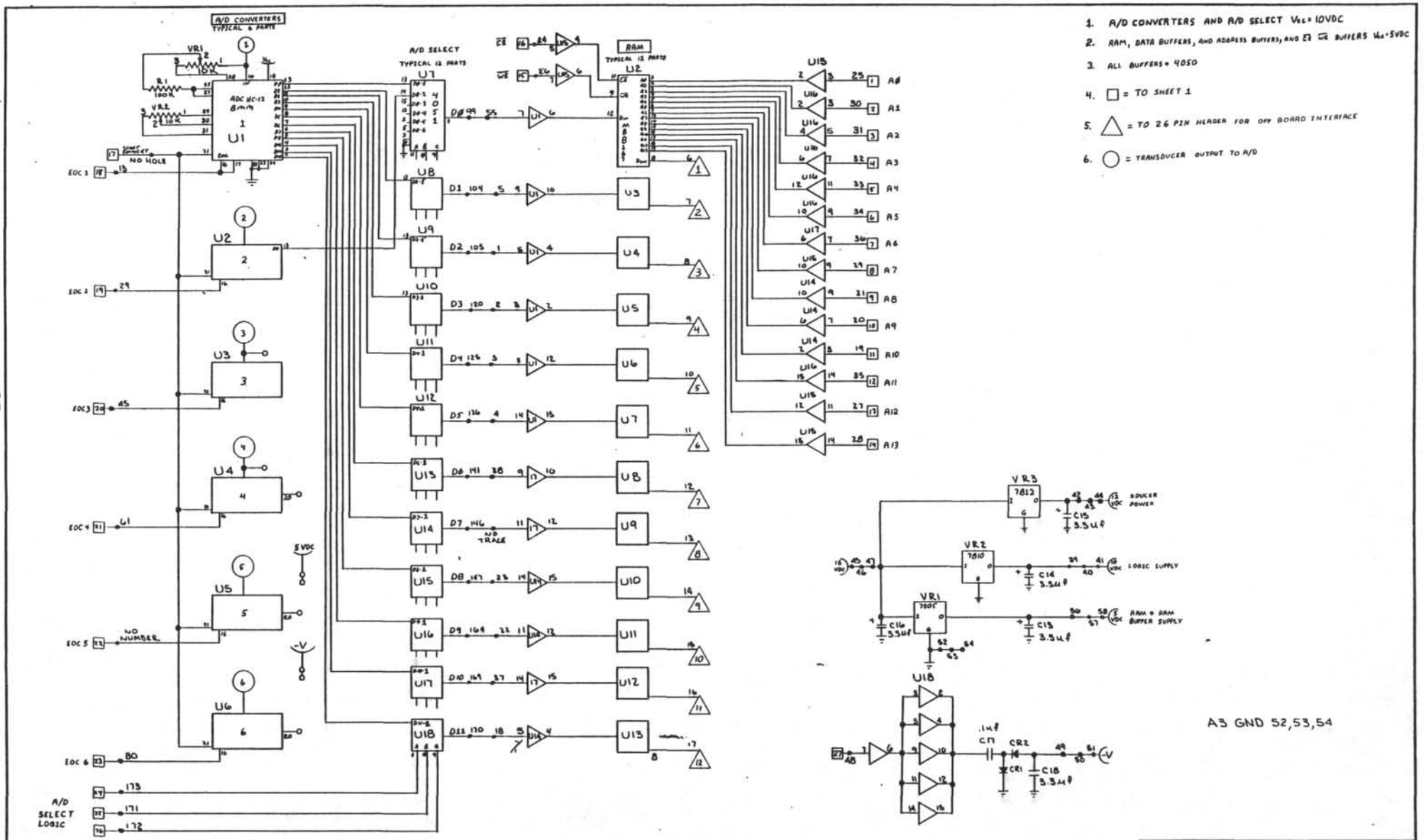
PLACEMENT OF COMPONENTS
NOT CRITICAL EXCEPT AS NOTED

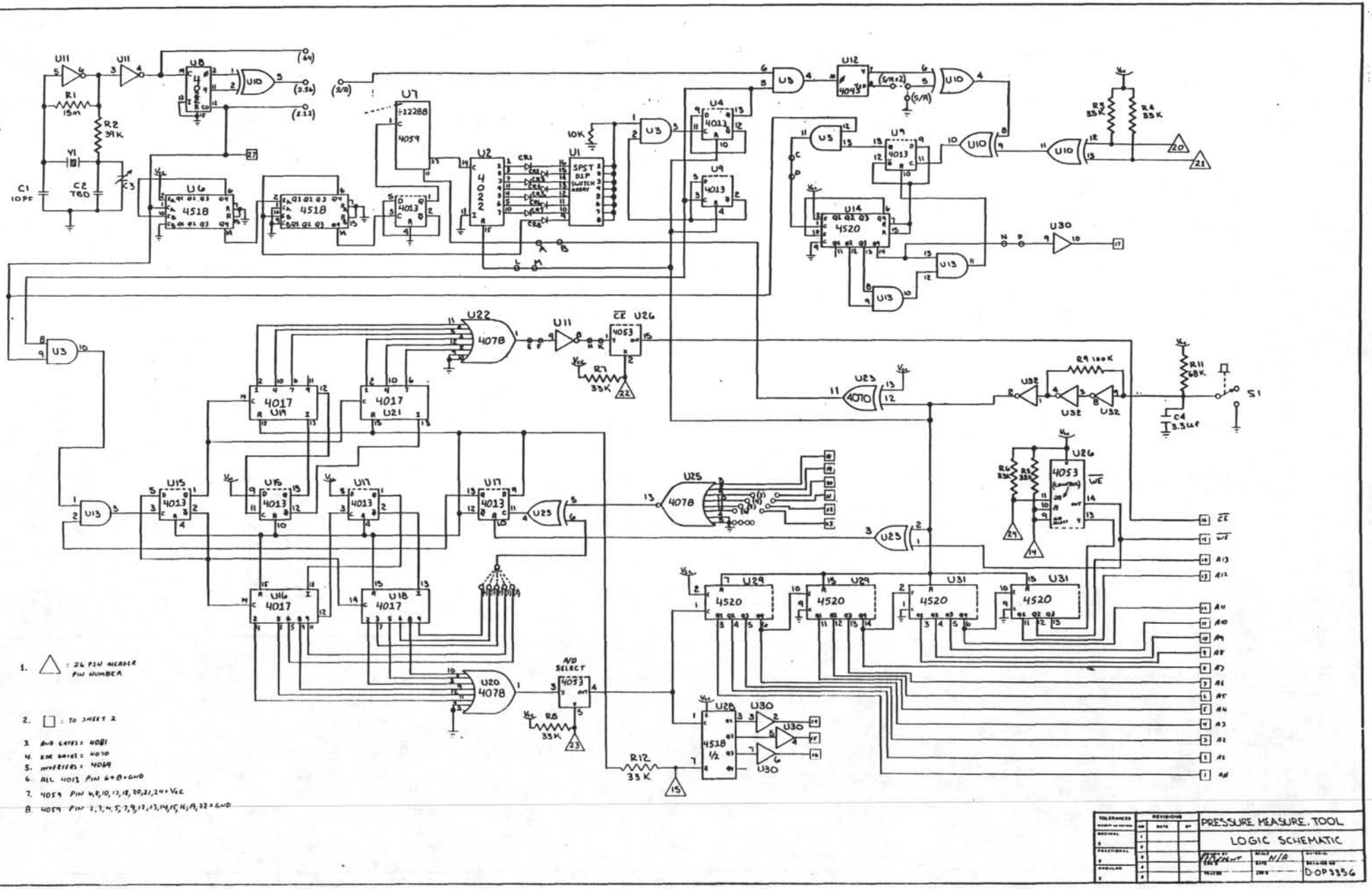
NUMBER OF BOARDS NOT FIXED AT 3

DO NOT SCALE

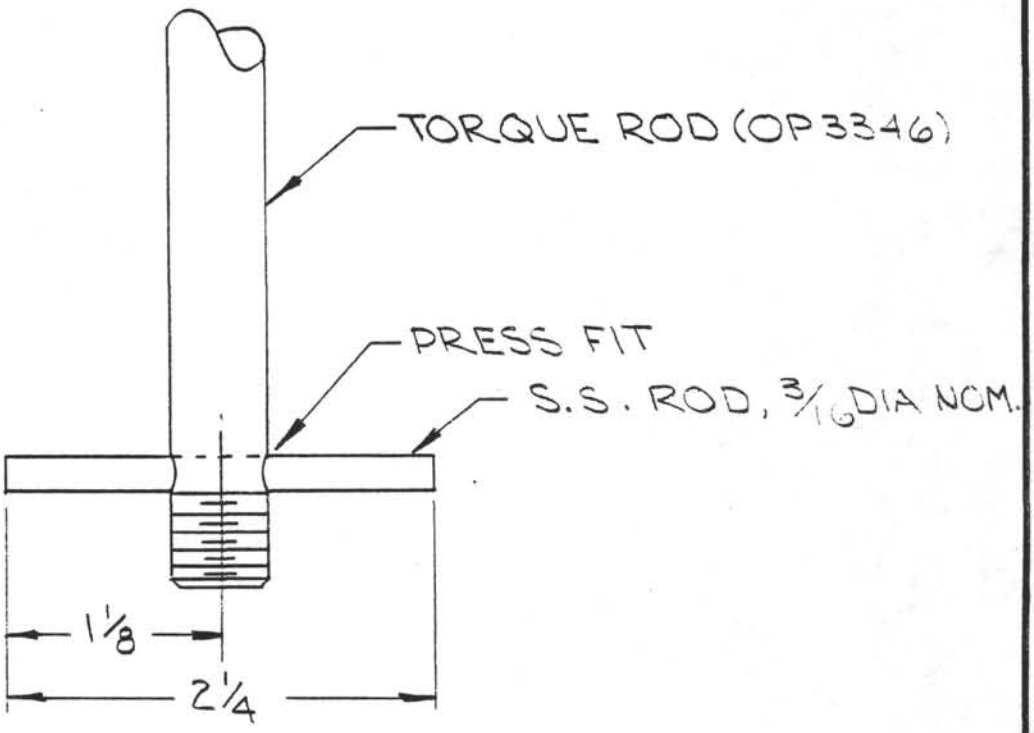
CONCENTRICITY ALL DIAMETERS: TIR .003

TOLERANCES UNLESS NOTED FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES ± 1/2° CORNERS 1/64 x 45° or 1/64 R FINISH 125	DEEP SEA DRILLING PROJECT SCRIPPS INSTITUTION OF OCEANOGRAPHY UNIVERSITY OF CALIFORNIA, SAN DIEGO LA JOLLA, CALIFORNIA 92093				
	TITLE P.C.BOARD ASS'Y ~C.B.I.P.~				
SURFACE TREATMENT	MATERIAL		DATE	BY RL	CHECKED / APPROVED
HEAT TREATMENT	SCALE	REQ'D/ASS'Y	PART NO. OP3354		DWG. NO. B-OP3354 (REV.)


A/D CONVERTERS
TYPICAL 6 PARTS
A/D SELECT
TYPICAL 12 PARTS
RAM
TYPICAL 12 PARTS
1. A/D CONVERTERS AND A/D SELECT VCC = 10VDC
2. RAM, DATA BUFFERS, AND ADDRESS BUFFERS; AND E1 WE BUFFERS VCC = 5VDC
3. ALL BUFFERS = 4050
4. □ = TO SHEET 1
5. △ = TO 26 PIN HEADER FOR OFF BOARD INTERFACE
6. ○ = TRANSDUCER OUTPUT TO A/D
A/D SELECT LOGIC
5 VDC
-V
NO HOLE
NO NUMBER
NO TRACE
A3 GND 52,53,54
PRESSURE MEASUREMENT TOOL
ADC & RAM SCHEMATIC
D-OP3355


PRESSURE MEASURE. TOOL
LOGIC SCHEMATIC
D-OP3356
1. △ : 24 PIN HEADER PIN NUMBER
2. □ : TO SHEET 2
3. AND GATES = 4081
4. XOR GATES = 4070
5. INVERTERS = 4069
6. ALL 4013 PIN 6=B=GND
7. 4059 PIN 4,8,10,17,18,20,21,24=VCC
8. 4059 PIN 1,2,3,4,5,7,9,12,13,14,15,16,19,22=GND

REVISIONS					
NO.	DESCRIPTION	DATE	BY	CH.	APR.

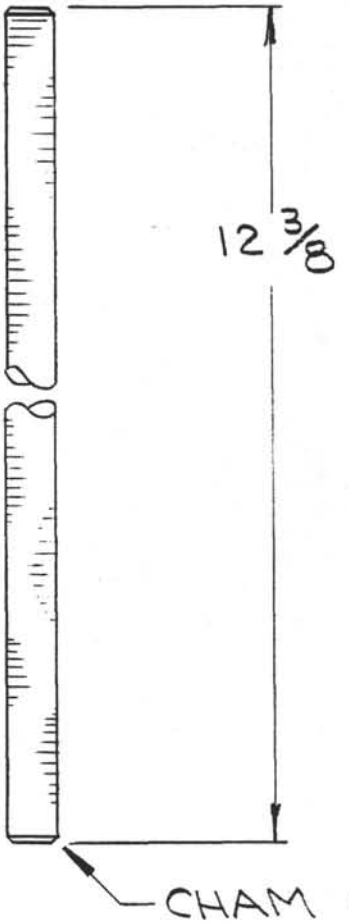


DO NOT SCALE

CONCENTRICITY ALL DIAMETERS: TIR .003

TOLERANCES UNLESS NOTED FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES ± 1/2° CORNERS 1/64 x 45° or 1/64 R FINISH 125	DEEP SEA DRILLING PROJECT SCRIPPS INSTITUTION OF OCEANOGRAPHY UNIVERSITY OF CALIFORNIA, SAN DIEGO LA JOLLA, CALIFORNIA 92093				
	TITLE: TORQUE ROD ASS'Y ~CBIP~				
SURFACE TREATMENT	MATERIAL: SEE ABOVE	DATE: 4·18·83	BY: RK	CHECKED	APPROVED
HEAT TREATMENT	SCALE	REQ'D/ASS'Y	PART NO.: OP 3357	DWG. NO.: A-OP3357	(REV.)

REVISIONS					
NO.	DESCRIPTION	DATE	BY	CH.	APR.



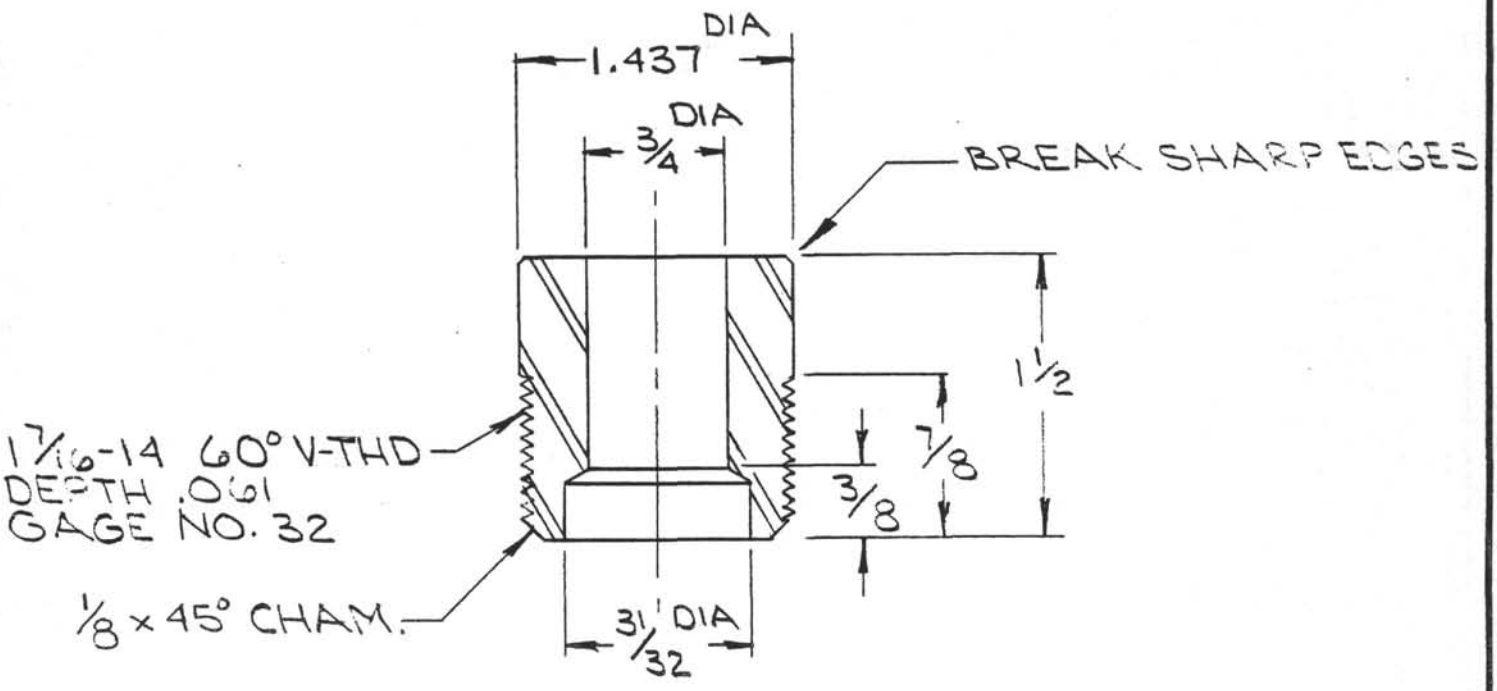
MAT'L: 1/4-20 THREADED STAINLESS ROD

DO NOT SCALE

CONCENTRICITY ALL DIAMETERS: TIR .003

TOLERANCES UNLESS NOTED FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES ± 1/2° CORNERS 1/64 x 45° or 1/64 R FINISH 125	DEEP SEA DRILLING PROJECT SCRIPPS INSTITUTION OF OCEANOGRAPHY UNIVERSITY OF CALIFORNIA, SAN DIEGO LA JOLLA, CALIFORNIA 92093				
	TITLE: TIE ROD ~C.B.I.P.~				
SURFACE TREATMENT	MATERIAL: SEE ABOVE	DATE: 2-18-83	BY: RK	CHECKED	APPROVED
HEAT TREATMENT	SCALE: 1:1	REQ'D/ASS'Y: 3	PART NO.: OP3358	DWG. NO.: A-OP3358-0	(REV.)

REVISIONS					
NO.	DESCRIPTION	DATE	BY	CH.	APR.

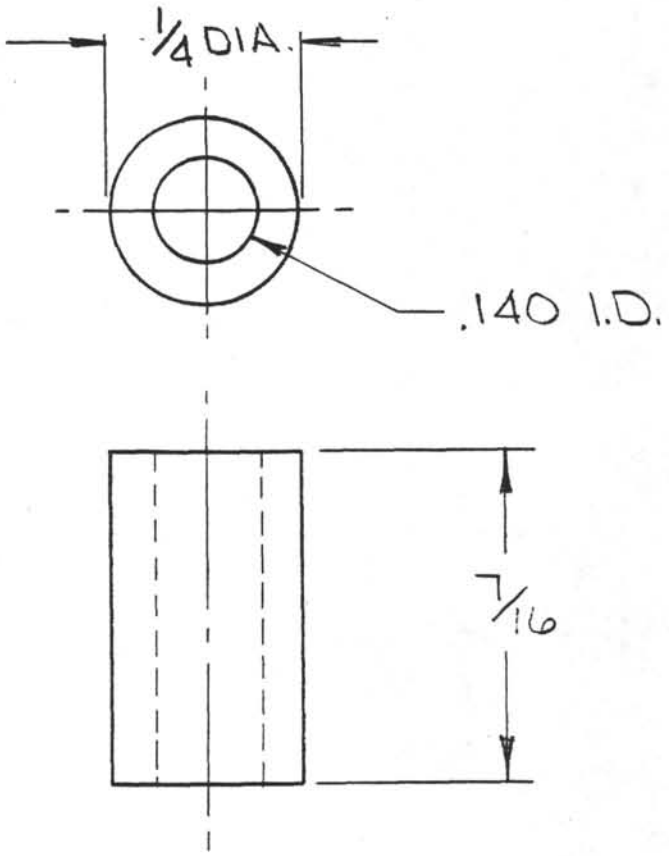


DO NOT SCALE

CONCENTRICITY ALL DIAMETERS: TIR .003

TOLERANCES UNLESS NOTED FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES ± 1/2° CORNERS 1/64 x 45° or 1/64 R FINISH 125	DEEP SEA DRILLING PROJECT SCRIPPS INSTITUTION OF OCEANOGRAPHY UNIVERSITY OF CALIFORNIA, SAN DIEGO LA JOLLA, CALIFORNIA 92093				
	TITLE: VALVE SEAT RETAINER ~ C·B·I·P ~				
SURFACE TREATMENT	MATERIAL: S.S.		DATE: 4·18·83	BY: RK	CHECKED: JB / APPROVED
HEAT TREATMENT	SCALE: 1:1	REQ'D/ASS'Y: 1	PART NO.: OP 3359		DWG. NO.: A-OP 3359 (REV.)

REVISIONS					
NO.	DESCRIPTION	DATE	BY	CH.	APR.



MAT'L:
METAL OR PLASTIC

DO NOT SCALE

CONCENTRICITY ALL DIAMETERS: TIR .003

TOLERANCES UNLESS NOTED FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES ± 1/2° CORNERS 1/64 x 45° or 1/64 R FINISH 125	DEEP SEA DRILLING PROJECT SCRIPPS INSTITUTION OF OCEANOGRAPHY UNIVERSITY OF CALIFORNIA, SAN DIEGO LA JOLLA, CALIFORNIA 92093				
	TITLE: BOARD STIFFENER C.B.I.P				
SURFACE TREATMENT	MATERIAL: SEE DWG	DATE: 8·10·82	BY: RK	CHECKED: [illegible]	APPROVED
HEAT TREATMENT	SCALE: 4:1	REQ'D/ASS'Y: 3	PART NO.: OP3360	DWG. NO.: A-CP3360	(REV.)

APPENDIX A

Pressure Measurement Tool
Recorder Package Specifications

Pressure Measurement Tool
Recorder Package

Specifications

Power Requirements	16 VDC, 5 Watts
Memory	16384 data points total. The number of samples is determined by the total number of inputs.(4 inputs = 4096 samples)
Sample Rates	1 sample every 5.12, 2.56, 1.28, .64, or .32 sec. jumper selectable
Data Output	12 bit binary (signed magnitude) TTL comp.
Environmental	0 to 85 C, 25g shock, 10,000 psi
Transducers	Bell and Howell CEC-1200 0 to 5 VDC output, 10,000 lbs max working pressure. 12 to 40 VDC unregulated excitation, common to tool side of input plug.
Number of Inputs	2 to 6. Each transducer requires 1 wire. All signal low and exciter ground pins common to tool side of plug

Pressure Measurement Tool
Deck Interface

Specifications

Power requirements	120 VAC
Inputs	
from host computer	.5 uSec negative pulse to to initiate each byte of data transfer. Also data accepted. This is a pos. transition on completion of each byte transfeRred.
from tool	12 bit byte of data, TTL or CMOS compatible.
Outputs	
to host computer	12 bit signed magnitude byte. Also Data Available (logic high when data is latched into interface).
to tool (read data only)	Chip Enable -. This is a .5 uSec negative pulse from the host computer. Address Step. This is the positive transition of data accepted.
to tool (calibrate)	Chip Enable -. 3 uSec neg pulse. Write Enable -. 20 Hz Start Convert. 20 Hz signal opposite Write enable. Address Step. Push button with channel select.
visual	12 bit status indicators. (on = +)

Pressure Measurement Tool

The recorder package is constructed of low power consumption C-MOS integrated circuits and a crystal controlled oscillator, for low battery drain and stability over long periods of time. The battery pack consists of eight 2 VDC lead acid cells hooked in series for a total of 16 VDC. Total deployment times in excess of 16 hours should be easily attained, with data retention times running into days. Sample rates are jumper selectable at 5.12, 2.56, and .64 sec. per sample. These rates can also be doubled by moving a jumper to provide rates of 2.56, 1.24, and .32 sec. per sample. The number of analog inputs is variable from two to six, and the logic must be configured to reflect the number in use by means of jumpers. Recorder delayed start is controlled by eight switches numbered 1 to 8, corresponding to 10 to 70 minutes of delay, with number 8 being zero delay. The package has no power ON/OFF switch, so a power-on reset circuit has been built in to insure the tool logic always starts in the proper state. In addition, a reset button is installed so that delayed start times can be accurately predicted, and readouts to the computer can be re-started. The analog to digital converters require a 0 to 5 VDC input voltage, however, provisions have been made for one or two amplifiers to replace A/D's for low level input signals. Since each low level input requires two A/D slots, the total number of input channels will be reduced. The recorder package has 16384

bytes of memory on-board, which must be divided by the total number of input channels to determine the number of samples taken. Four input channels will result in 4096 samples being recorded, six = 2730 complete samples, with 2731 containing data from only the first four channels.

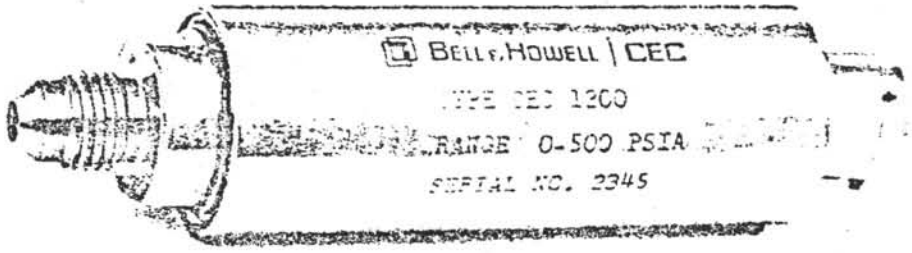
The deck interface unit is presently configured to output to a TEKTRONIX 4051 display terminal via the general purpose interface module plugged into the backplane. On receipt of a .5 uSec negative pulse from the computer, one byte of data is transferred from the tool to the deck interface, then to the computer. This process is repeated until one complete sample has been loaded into the computer, then it is manipulated and displayed in engineering units. The cycle repeats until all data has been transferred from the tool, displayed, and hard copied. Data may be read from the tool as many times as desired without "wiping out" its memory. The deck interface is also used to calibrate the recorder package, and use of the computer is not necessary as the interface provides all logic signals needed for calibration. The recorder may be calibrated dynamically, with compressed gas or water, or statically with an external power supply. During calibration the selected input channel transducer voltage is converted to a digital byte and written to memory. It is then read out to the interface and displayed on the 12 bit status indicators. The reading can be converted to dynamic pressure or static voltage and the channel adjusted accordingly. Selection of the next channel is accomplished by pressing the STEP push button on the interface.

The outside diameter of the electronics section is 2", and length is not determined at this time, but should not excede 18". This will allow use in many other applications. The electronics package, battery, pressure transducers, and shock absorber will be mounted on a split shell type chassis 3.0" in diameter and about 4' in length, to fit inside a ~~standard~~ 6' innerbarrel pressure case.

APPENDIX B

Transducer Specifications

CEC 1200 Sputtered Thin Film High Output Pressure Transducer



- Proven Sensor Design
- 5 Volt Output
- Rugged Dual Case Isolation
- High Performance
- Highly Reliable
- Long-Term Stability

Providing long-term stability and reliability, the CEC 1200 Sputtered Gage High Output Pressure Transducer is a highly accurate thin film transducer. The thermal sensitivity error band performance is typically better than 0.25% within any 50°F temperature band.

The use of sputtered film deposition and advanced design, combined with solid state signal conditioning for 5 volt output, create transducers with a maximum combined error for nonlinearity, hysteresis, and nonrepeatability of ±0.25% for the full range output.

Available in many standard ranges from 15 to 10,000 psi, the CEC 1200 also features an innovative double-case isolation. The basic sputtered sensor is electron beam welded to the pressure chamber/adapter, which also provides a high degree of mechanical isolation from mounting torque effects.

The CEC 1200, with integral amplifier, features a common negative input/output to provide three-wire operation. The unique amplifier design achieves a true zero output with reference to the common line.

The CEC 1200 Sputtered Gage High Output Pressure Transducers are manufactured in accordance with the program quality requirements of MIL-Q-9858A.

CEC DIVISION

BELL & HOWELL

SPECIFICATIONS

CEC 1200 Sputtered Thin Film High Output Pressure Transducer

Pressure Rating

Standard Ranges:	0-15, 25, 50, 100, 250, 500, 1000, 1500, 2000, 2500, 5000 and 10,000 psi, absolute or gage. Sealed gage available in ranges of 100 psi and above.
Proof Pressure:	200% of rated pressure, not to exceed 15,000 psi.
Burst Pressure:	300% of rated pressure, not to exceed 20,000 psi.

Electrical Characteristics

Excitation:	12 to 30 Vdc unregulated.
Input Current:	20 mA maximum.
Full Range Ouptut:	5.0 Vdc ±0.1 Vdc.
Residual Unbalance:	≤ ±2% FRO.
Output Impedance:	100 ohms nominal.
Combined Nonlinearity, Hysteresis, and Nonrepeatability:	±0.25% FRO.
Insulation Resistance:	≥ 100 megohms at 45 Vdc.
Electrical Connector:	See drawing.

Mechanical Characteristics

Pressure Chamber Material:	17-4 PH stainless steel.
Pressure Fitting:	7/16-20 male, flared.
Mounting Isolation:	Double case isolation provides assurance that the sensing element will be unaffected by external stress.
Sensing Element:	4 active-arm bridge.
Weight:	7 ounces maximum.

Environmental Performance

Temperature:	
Operating Range:	−40°F to +185°F.
Compensated Range:	−20°F to +150°F.
Thermal Zero Shift:	±0.005% FRO/°F nominal over the compensated temp. range.
Thermal Sensitivity Shift:	±0.005% FRO/°F nominal over the compensated temp. range.
Combined Thermal Zero and Sensitivity Shift:	0.3% over the compensated temperature range.
Vibration Sensitivity:	At 35g peak from 10 to 2000 Hz (¼" D.A. max.) the output shall not exceed 0.04% FRO g for 15 psi units, decreasing logarithmically to less than 0.002% − FRO g for 10,000 psi units.
Natural Frequency:	50 kHz at 5000 psi, decreasing logarithmically to 5 kHz at 15 psi.
Shock:	Withstands 100g, 11 msec duration, half sine wave without damage.
Humidity:	Per MIL-E-5272C, Procedure 1.

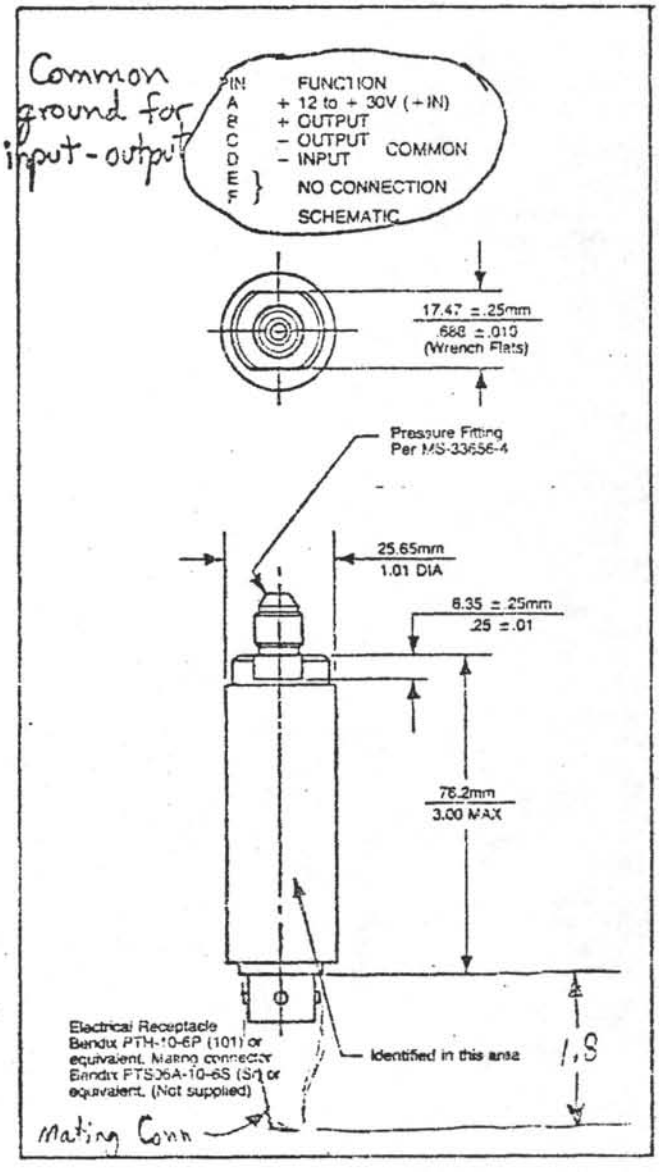
Accessories

Included:	Calibration record and dust caps.
Optional:	Mating electrical connector. (Specify CEC part number 166267-0005.)

Ordering Information:

When ordering, specify the instrument's complete type number, pressure range desired and whether absolute, gage, or sealed gage unit is required. (Example: CEC 1200 pressure transducer, 0-100 psia.)

In keeping with Bell & Howell's policy of continuing product improvement, specifications may be changed without notice. If the performance and configuration provided herein for our standard product does not fit your exact needs, please check with us regarding customized transducers. Contact us directly at the factory or through your nearest CEC Sales Office.



CEC DIVISION

360 Sierra Madre Villa, Pasadena, California 91109 (213) 796-9361

BELL & HOWELL

APPENDIX C

Transducer Calibrations

METROX

METROX INC.
7165 CONSTRUCTION COURT
SAN DIEGO, CA 92121
(714) 271-1731

CALIBRATION DATA

Instrument: CEC 1200 **S/N** 1062

Certified by: _____ **Date:** 4-28-83

Equipment: _____

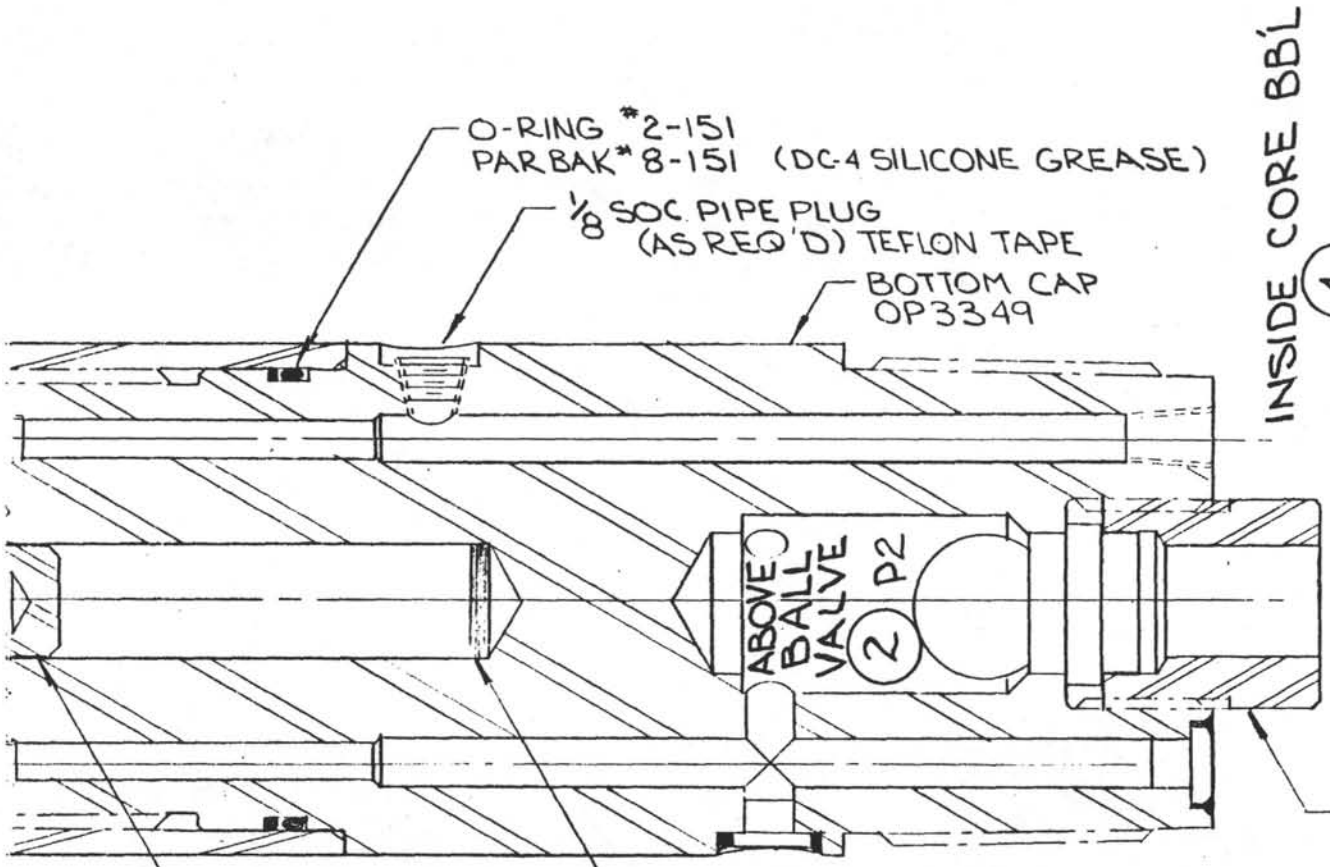
S.N. 1062		1049		S.N. 1050		
P (psi)	V (volts)	P	V	P	V	
0	.0094	0	.0042	0	−.0099	
1000	.517	1000	.510	1000	+.492	
2000	1.022	2000	1.014	2000	.994	
3000	1.526	3000	1.516	3000	1.494	
4000	2.030	4000	2.020	4000	1.993	
5000	2.530	5000	2.520	5000	2.490	
6000	3.030	6000	3.020	6000	2.990	
5000	2.530	5000	2.520	5000	2.490	
4000	2.030	4000	2.020	4000	1.994	.001
3000	1.526	3000	1.520	3000	1.496	.002
2000	1.022	2000	1.020	2000	.996	.002
1000	.517	1000	.512	1000	.495	.003
S.N. 1051		0	.0059	0	−.0088	.0011
0	.0256					
1000	.530					
2000	1.029					
3000	1.530					
4000	2.030					
5000	2.530					
6000	3.030					
5000	2.530					
4000	2.030					
3000	1.530					
2000	1.030					
1000	.530					

Full scale sensitivity: _____

Shunt calib. data: _____

APPENDIX D

MEASURED DATA



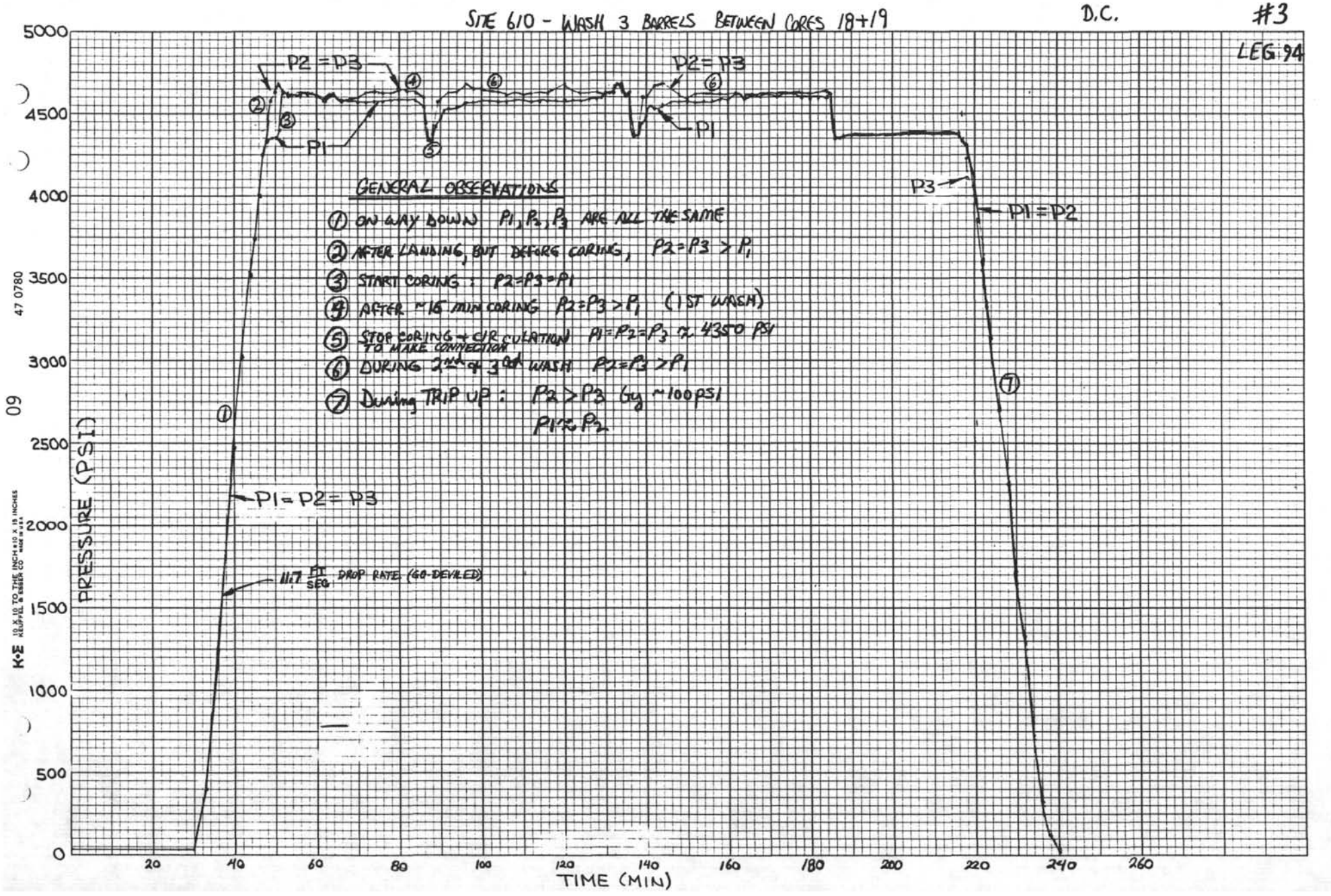
RATING:
PRESSURE: 10,000 PSI
DEPTH: 22,500 FT

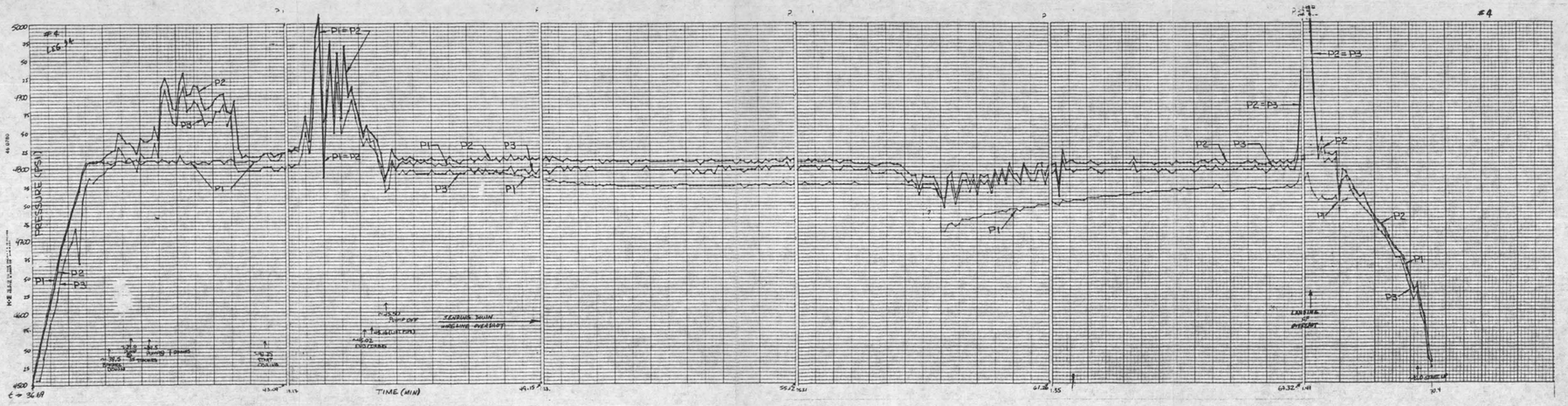
VALVE SEAT RETAINER OP3359,
VALVE SEAT 1 15/16 BALL (HARRISON-
FISCHER # 2E3) LOCTITE 277

DO NOT SCALE

CONCENTRICITY ALL DIAMETERS: TIR .003

TOLERANCES UNLESS NOTED FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES ± 1/2° CORNERS 1/64 x 45° or 1/64 R FINISH 125	DEEP SEA DRILLING PROJECT SCRIPPS INSTITUTION OF OCEANOGRAPHY UNIVERSITY OF CALIFORNIA, SAN DIEGO LA JOLLA, CALIFORNIA 92093					
	TITLE: CORE BARREL INSTRUMENTATON (PRESSURE) ASSEMBLY					
SURFACE TREATMENT	MATERIAL		DATE 11·7·82	BY RK	CHECKED	APPROVED
HEAT TREATMENT	SCALE 1:1	REQ'D/ASS'Y	PART NO. OP3330-1		DWG. NO. R-OP3330-1	(REV.)


SITE 610 - WASH 3 BARRELS BETWEEN CORES 18+19
D.C.
#3
LEG 94
P2 = P3
P1
P2 = P3
P1
P3
P1 = P2
P1 = P2 = P3
11.7 FT/SEC DROP RATE (GO-DEVILED)
GENERAL OBSERVATIONS
① ON WAY DOWN P1, P2, P3 ARE ALL THE SAME
② AFTER LANDING, BUT BEFORE CORING, P2 = P3 > P1
③ START CORING: P2 = P3 = P1
④ AFTER ~16 MIN CORING P2 = P3 > P1 (1ST WASH)
⑤ STOP CORING → CIRCULATION TO MAKE CONNECTION P1 = P2 = P3 ≈ 4350 PSI
⑥ DURING 2ND & 3RD WASH P2 = P3 > P1
⑦ During TRIP UP: P2 > P3 by ~100 PSI
P1 ≈ P2
PRESSURE (PSI)
TIME (MIN)
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
20
40
60
80
100
120
140
160
180
200
220
240
260
47 0780
K&E 10 X 10 TO THE INCH • 10 X 15 INCHES KEUFFEL & ESSER CO MADE IN U.S.A.


#4
P1
P2
P3
P1=P2
P2=P3
PRESSURE (PSIA)
TIME (MIN)
#4

PRESSURE MEASURING TOOL