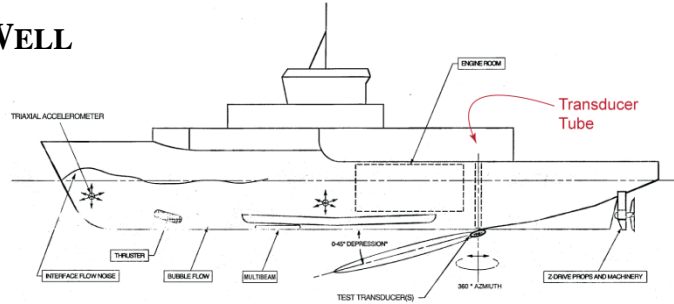


R/V ROGER REVELLE TRANSDUCER WELL

Eric T. Slater

*Ocean Physics Group, Marine Physical Lab.
Scripps Institution of Oceanography
University of California, San Diego
16 June, 2000*



DEPLOYMENT FIXTURE

Prior to use of this equipment verify with the ship's master that it acceptable to deploy this structure and at what depth. It is also obviously important to verify that the lower well cover plate has been removed. This cover is not watertight so there may be water in the well even if the lower plate is still attached.

This deployment fixture was built to support the development of the R/V Roger Revelle's Hydrographic Doppler Sonar system (HDSS). The Ocean Physics Group (OPG) of the Marine Physical Lab. designed this system to provide a stable sensor mount which was de-coupled acoustically from the structure-borne hull "noise" of the ship. Modal damping of the structure was also considered in the design of the pipe string and mounts. A servo motor driven pod was developed to provide both optical and acoustic real time images of the ship's underwater bubble flow and acoustic signal at speeds of up to 14 knots. The pod is 014" and extends approx. 48" outside the lower end of the 23" I.D. well located at frame 92.

The main structure consists of three 10 ft. pipe sections. Two pneumatic clutches are attached to this assembly. When inflated they clamp the pipe string to the inner wall of the ship's well. The vertical static load should be limited to 1,000 lbs. (water) total. The radial load can be quite high if desired but should be reviewed by OPG engineers if exceeding 200 lb.-ft. The system was able to provide very stable real-time video at 14 knots while another deployment supported a 160 kHz, four-beam Doppler sonar at similar speeds.

The pipe string sections are numbered 1-3 with arrows down. Each pipe end has a forged 150 psi type pipe flange welded to the 6" Sch. 40 pipe. All materials are 6061 aluminum alloy. The welded assemblies have been stress-relieved and tempered to T-6 condition. Post heat treat the pipe flanges were machined parallel and the entire assembly was hard anodized and painted. Currently pipe #1 has both pneumatic clutch assemblies attached. This arrangement can be changed to meet possible variability in the modal response of the pipe string. Each pipe has two clutch mount flanges and internal CRES tubing air lines. The air line is attached near the inner pipe wall to allow for a free internal cable run. This cable-run method gives good mechanical and flow protection when the ship is underway.

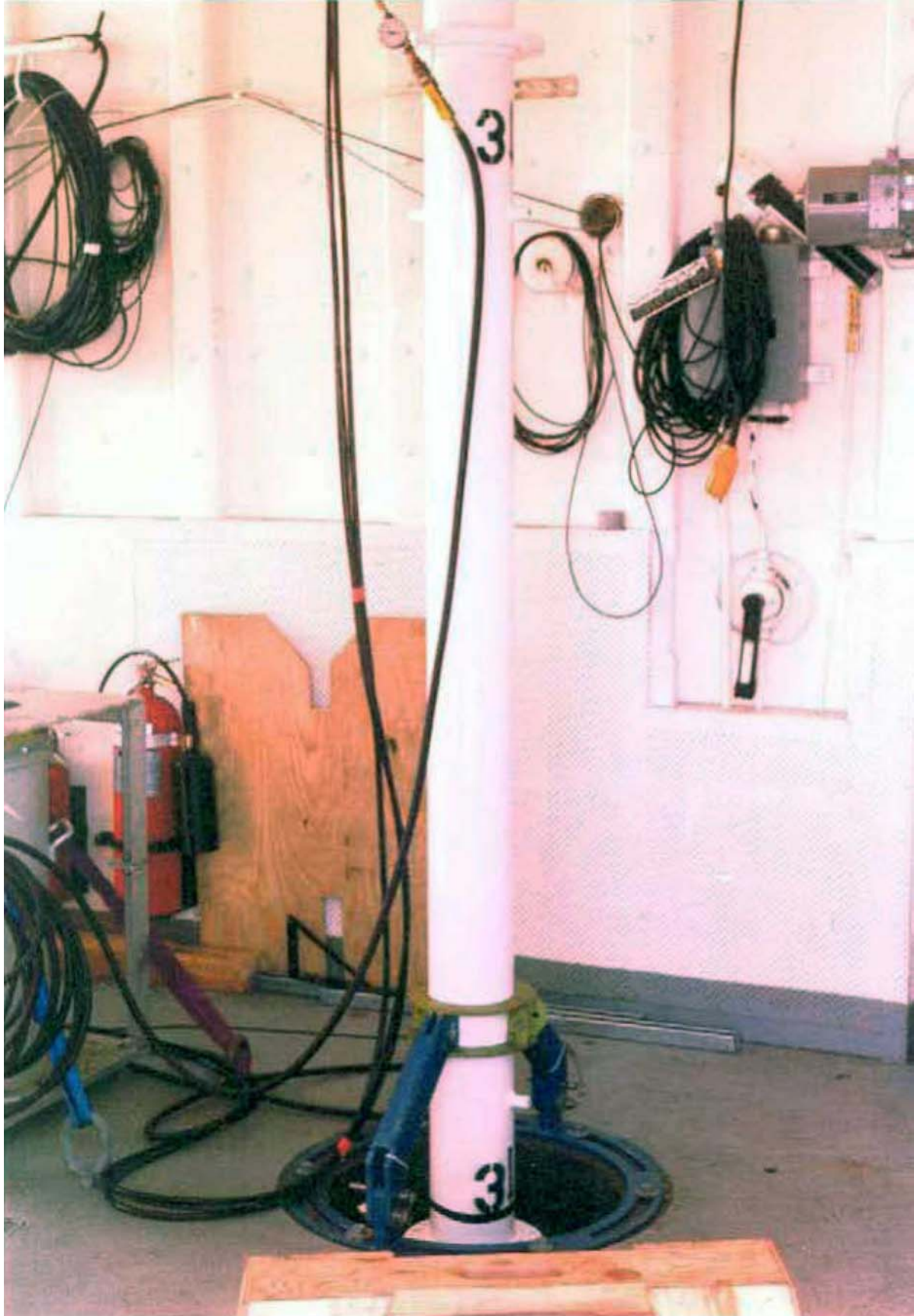
Prior to assembly of the pipe string the pipe support clamp must be bolted to the deck over the well (see drawing 424-108, sheets 1 and 2). This clamp will support and guide the pipe string as it is lowered into the well. It will also be the support for the pipe as each subsequent pipe is attached via the hoist. The upper clamp collar has been bored to allow the 6" pipe to slip until the pipe stop lugs are resting on the upper clamp face.

To deploy a sensor on the pipe string an adapter must be fabricated to join the pipe flange to the sensor. This adapter should be approx. the desired depth the sensor is to project outboard of the

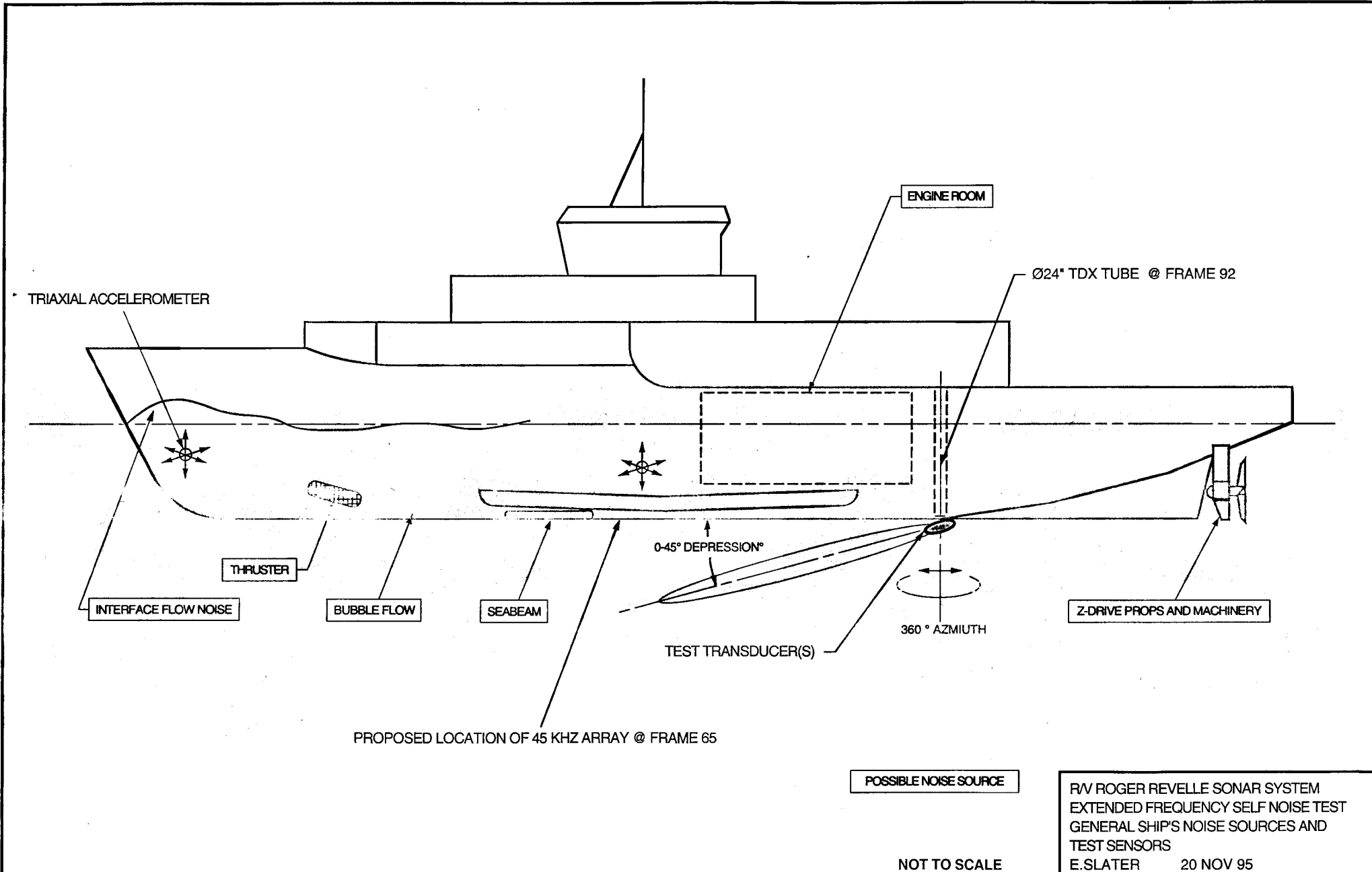
hull since this allows a 13" margin of error before the lower clutch would extend outboard of the tube. The #1 pipe must not be lowered outside the hull. If this occurs it is quite likely the clutch will jam outboard of the well tube. This situation would require that the whole string be jettisoned unless divers were available to guide the clutch back into the well tube. Care must also be taken that the adapter is not so long (48 inches maximum) that the # 1 pipe and adapter cause the chain hoist to "two-block" prior to being vertical.

PIPE STRING ASSEMBLY

1. Open the deck mounted pipe clamp. Thread the sensor cable through the pipe as the adapter is assembled to the "down" end of the pipe. It was found that a piece of 112" PVC x 12' pipe made a good wire pull when the pipe was horizontal.
2. A pipe lifting-flange is bolted to the upper flange ("up") end of the pipe. This flange has a cutout for cable clearance. The pipe is then lifted by the electric hoist and lowered into the well. Once the lower clutch is in the well tube the pipe should be lowered approx. 12" until the deck clamp collar will clear the lower stop lugs (see 424-100-4). The collar is then bolted together and the 0112 quick release pins are engaged in the clamp bar pivot plate. The pipe is then lowered to rest on the upper stop lugs. The pipe clamp will then take the weight of the pipe.
3. The #2 pipe is assembled in a similar manner with the cable threaded from the "down" end first. The lifting flange is attached again and the pipe is lifted over the #1 upper flange. The clutch air line is then joined via a flexible rubber hose joint to the fixed tube air line in pipe # 1. The #2 pipe is lowered slowly so as not to pinch the hose. The pipe flange is then bolted together while the chain hoist is kept attached. Once the bolts are secure the load is taken by the hoist and the deck clamp collar is unbolted and opened. The string is then lowered until the lower pipe lugs are clear of the deck clamp then the clamp is reinstalled
4. The third and final pipe is assembled as per #2 but should be measured and marked so that it will not be lowered deep enough to allow the clutch outside the well tube. The "top" end #3 pipe's air line should be attached to the ship's air via a three-way valve, a pressure regulator and a short (15-20 ft.) hose. The three way valve can also be attached to a small vacuum pump such that the pump will pull the clutch tube down to its minimum diameter. This contraction helps when removing the string if there is any bio-fouling or set taken by the clutch shoes on the corroded well tube.
5. Once the desired depth is reached the clutches are inflated with 75 psi regulated air pressure. It is advised that the deck clamp collar remains clamped and that the chain hoist remains attached to the pipe string. Removal is essentially the reverse order as installation. A plywood cover over the open well is suggested if a further deployment is required. If not then the steel cover should be attached. While the majority of the materials used in the fabrication of this fixture are suitable for sea water use the Eaton clutches are not. Their shells are carbon steel and will corrode. With this in mind please do not leave them in the well unless in use. A good freshwater wash-down is always appreciated.



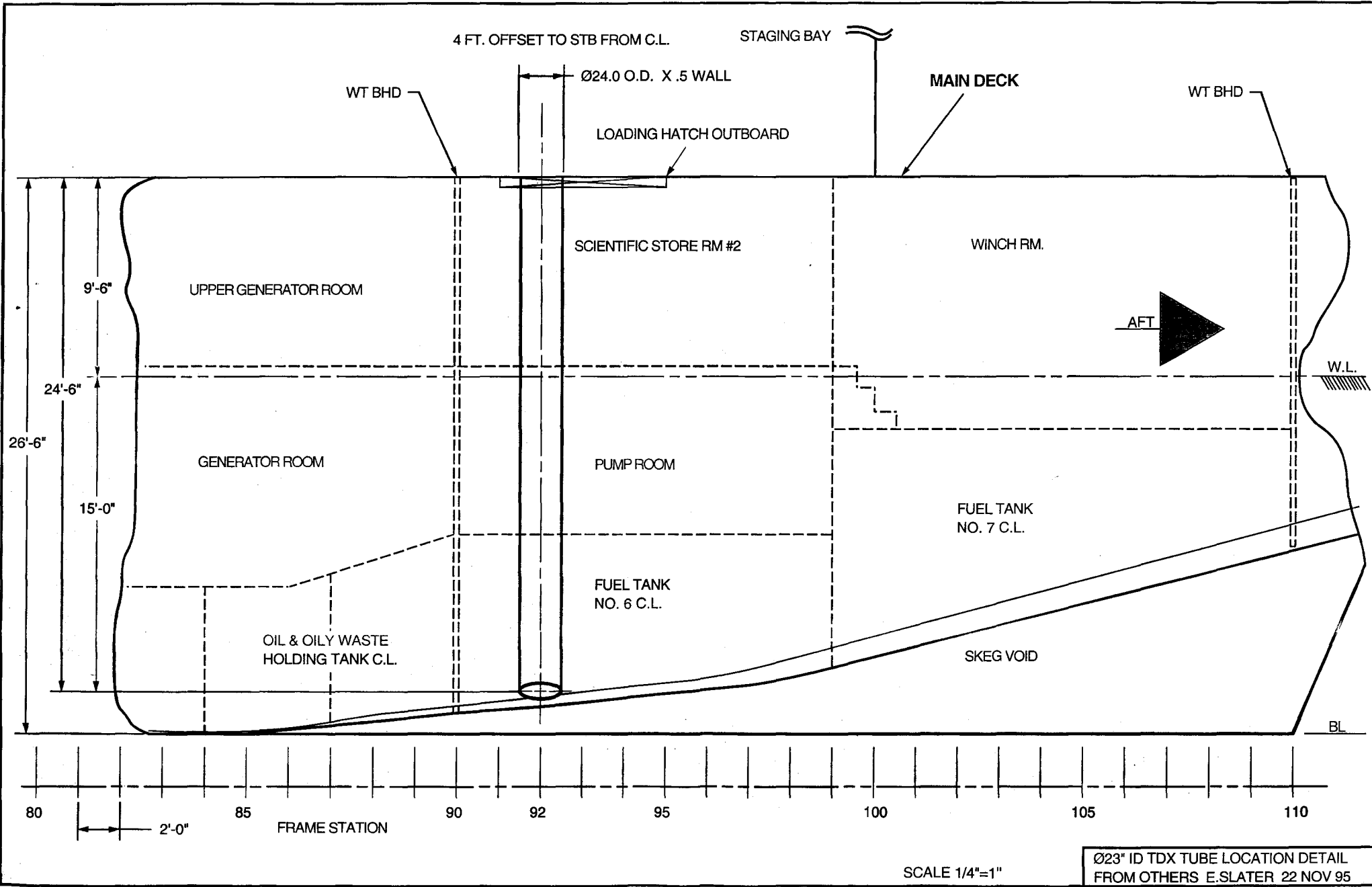




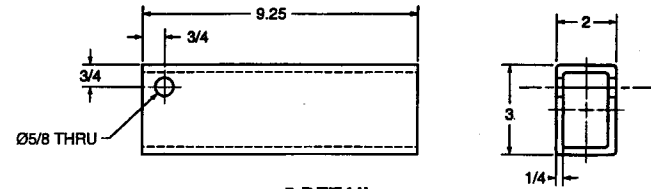
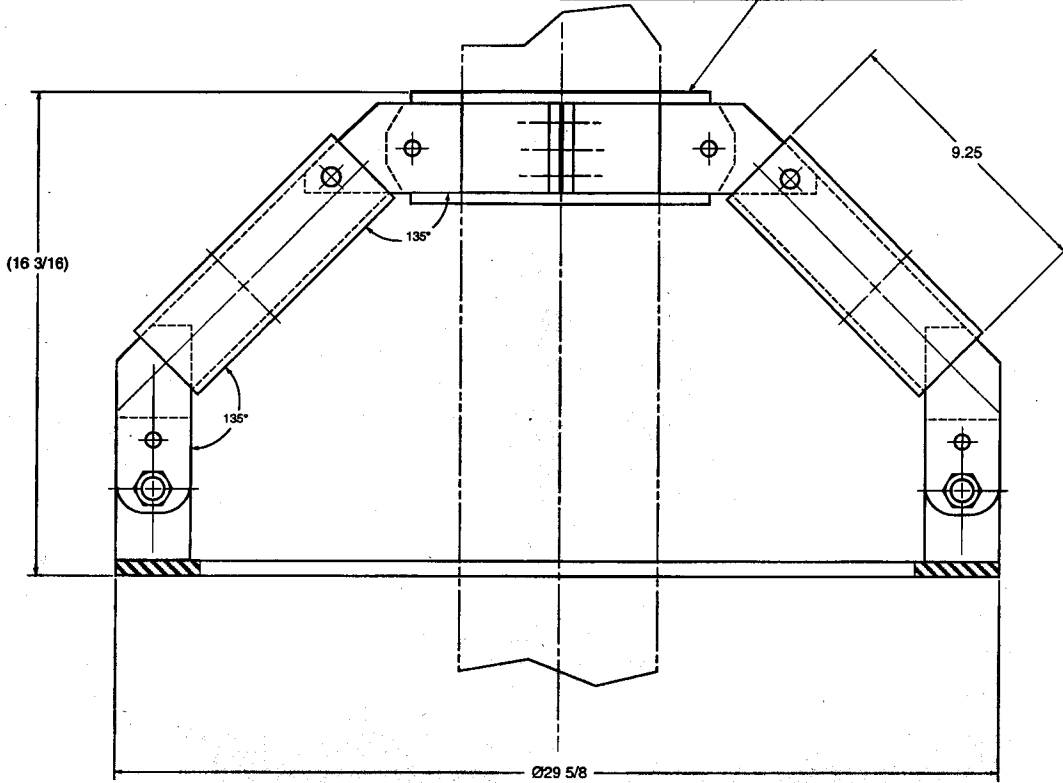
POSSIBLE NOISE SOURCE

R/V ROGER REVELLE SONAR SYSTEM
 EXTENDED FREQUENCY SELF NOISE TEST
 GENERAL SHIP'S NOISE SOURCES AND
 TEST SENSORS
 E.SLATER 20 NOV 95

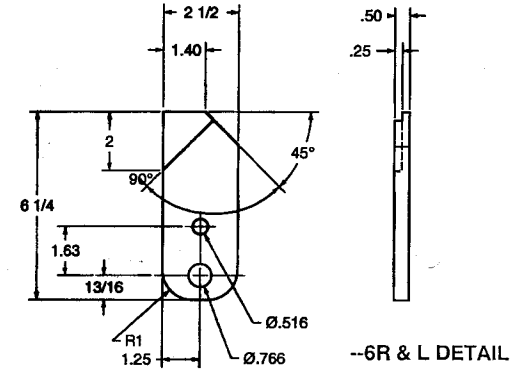
NOT TO SCALE



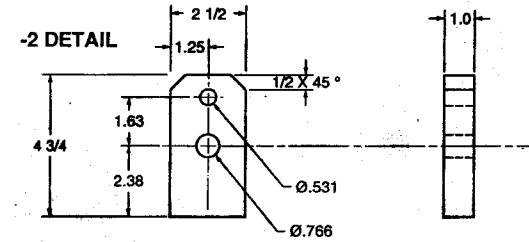
EXISTING PIPE CLAMP PER 284-113 SHT 1-2 17 JAN 89



-5 DETAIL

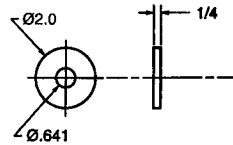


-6R & L DETAIL

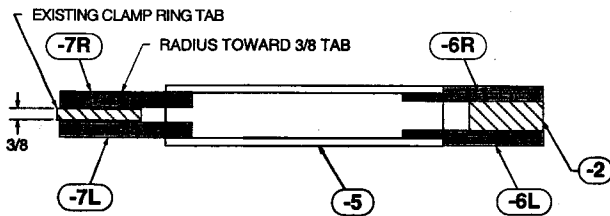
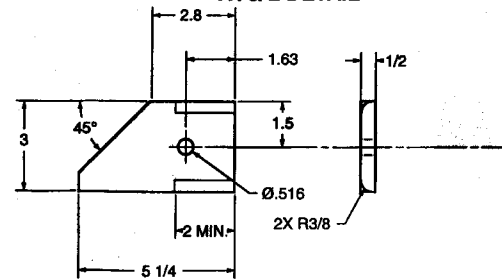


-2 DETAIL

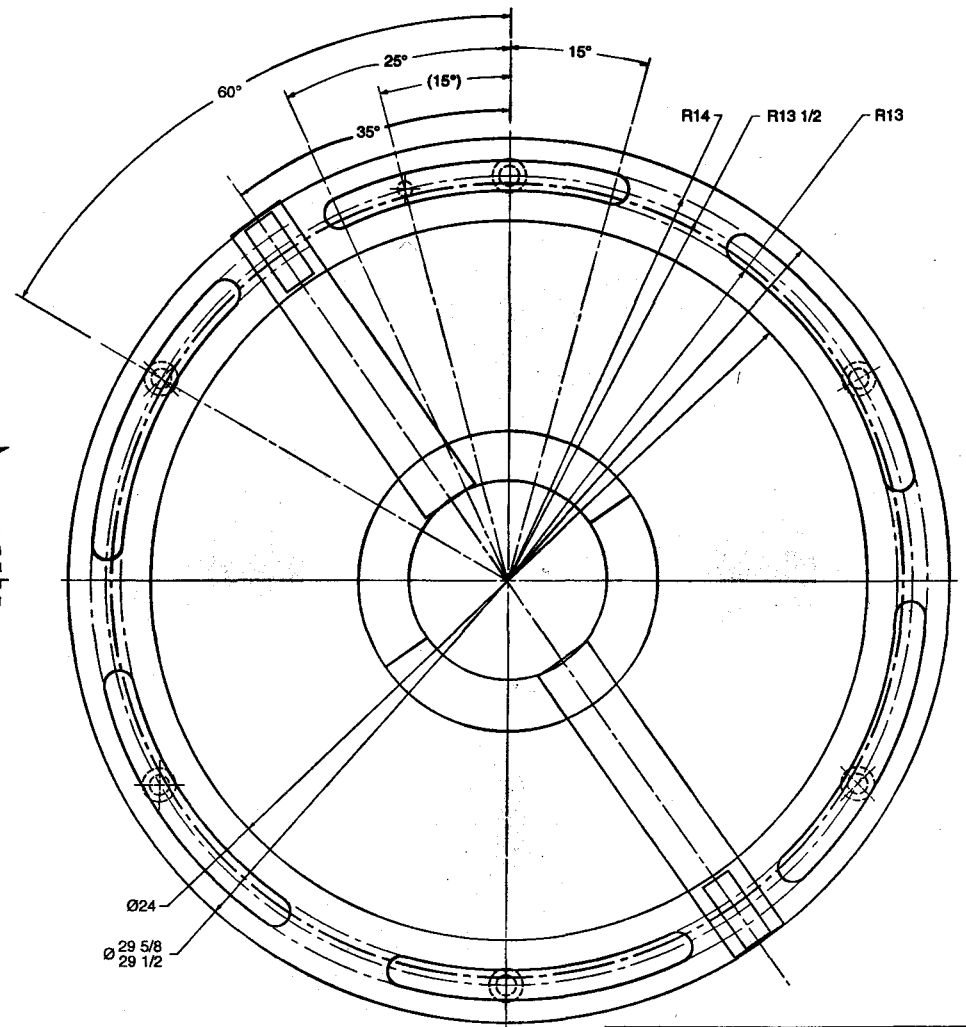
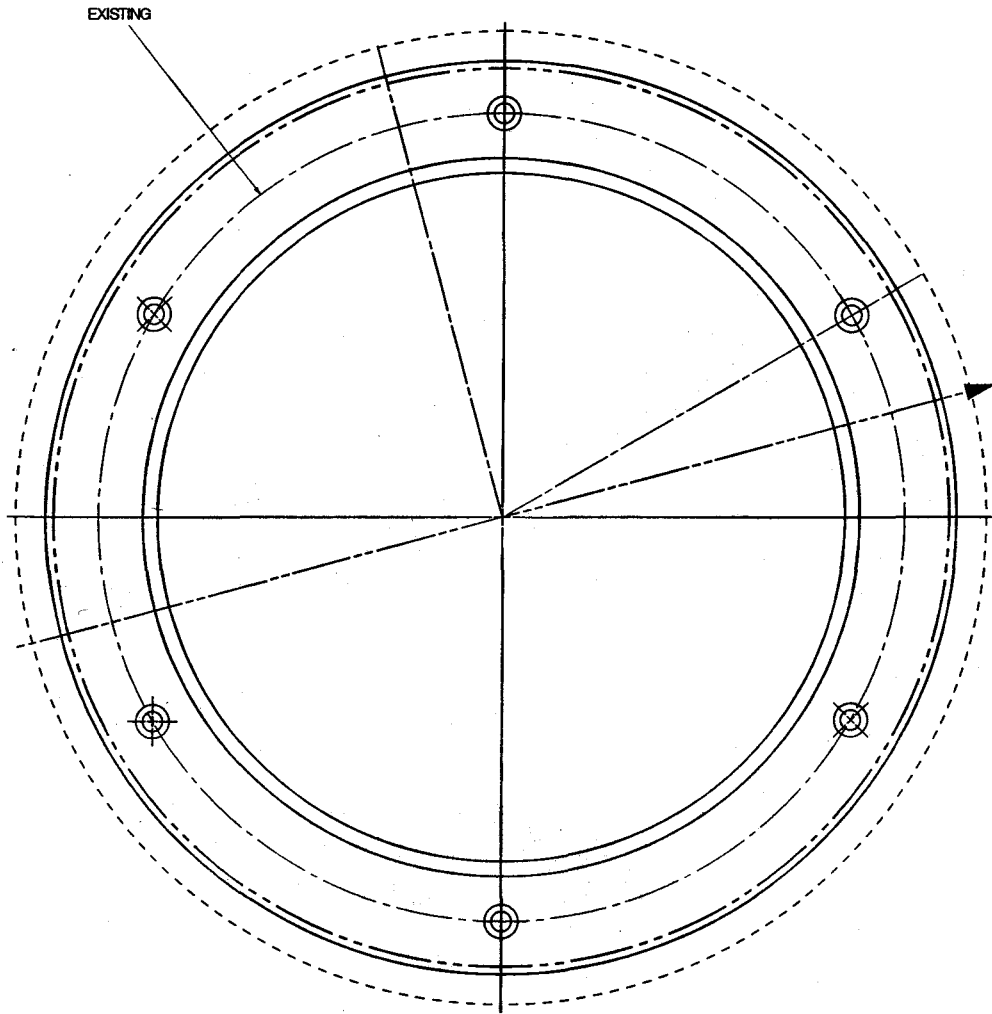
-3 DETAIL



-7R & L DETAIL

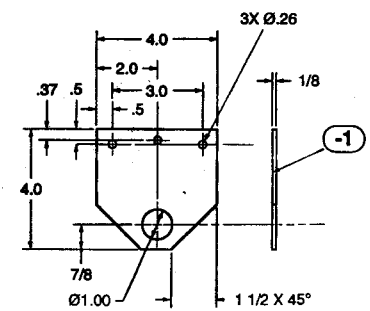
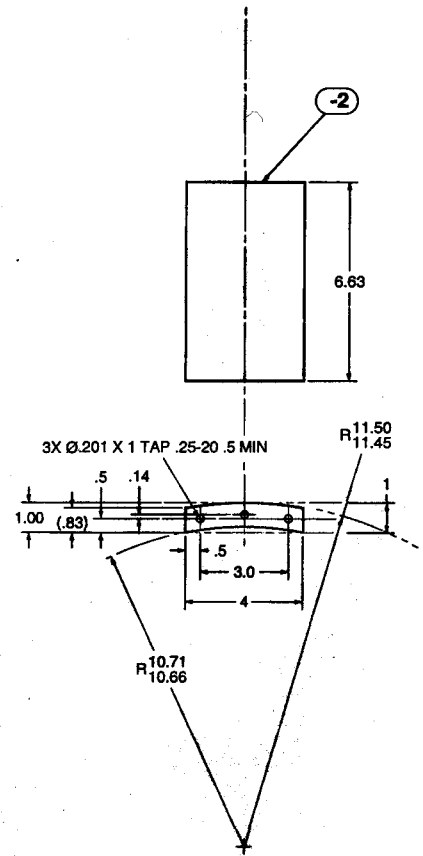
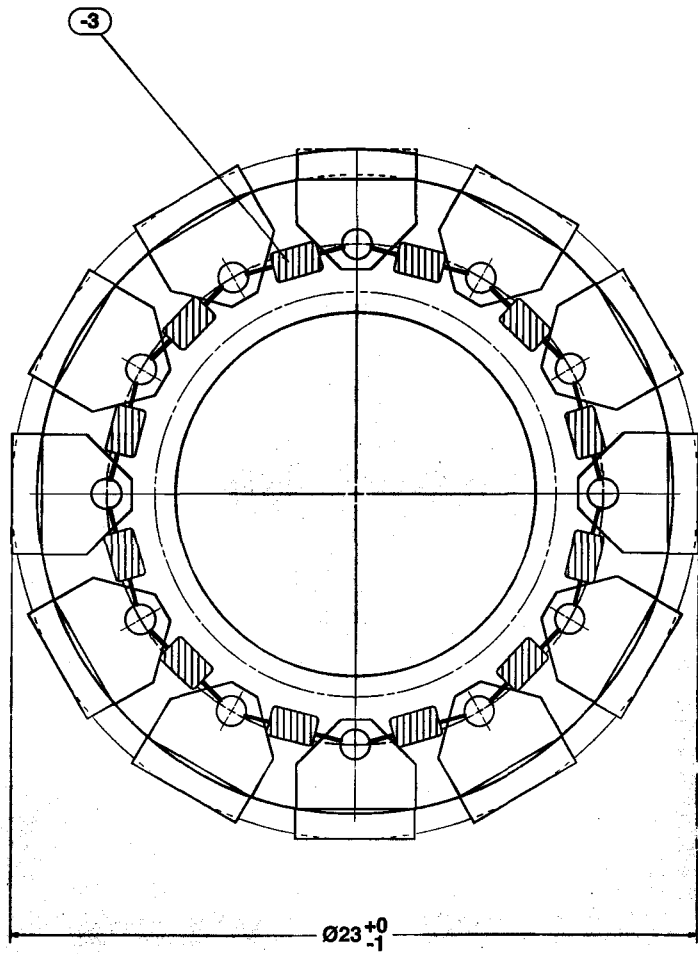


7	2	UPPER TABS: LEFT & RIGHT		
6	2	LOWER TABS: LEFT & RIGHT		
5	2	STRUT TUBE 2 X 3 X .25		FORGED
4	2	LIFT EYE CROSSBY OR EQUIV.		
3	6	CLAMP BOLT WASHERS		ORCRES
2	2	PIVOT PAD		
1	1	CLAMP PLATE		STEEL
NO	DIFF	PART OR RECD. & NO.	FOR SIGNATURE OR OBSERVATION	MATERIAL SPECIFICATION
GENERAL NOTES		DRAWN Eric	DATE 8 JUNE 1996	MARINE PHYSICAL LAB OCEAN PHYSICS GROUP INC 0213 Scripps Institution of Oceanography
A UNLESS SPECIFIED BREAK ALL SHARP EDGES		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES		R.V. REVELLE TEST CRUISE PIPE CLAMP MOUNT PLATE AND DETAILS
DIM. REFERENCE TO HELL COIL PIN CLAMP PATTERN OPENING MANUAL FOR OPENING SEAL GLAND FINISH DETAILS		TOLERANCES ARE: FRACTIONS DECIMALS #1/32 .0015 .015 JXX .001 .005 ANGLES #1"		REV D 424-108 SCALE 1/2"=1" SHEET 2 OF 2



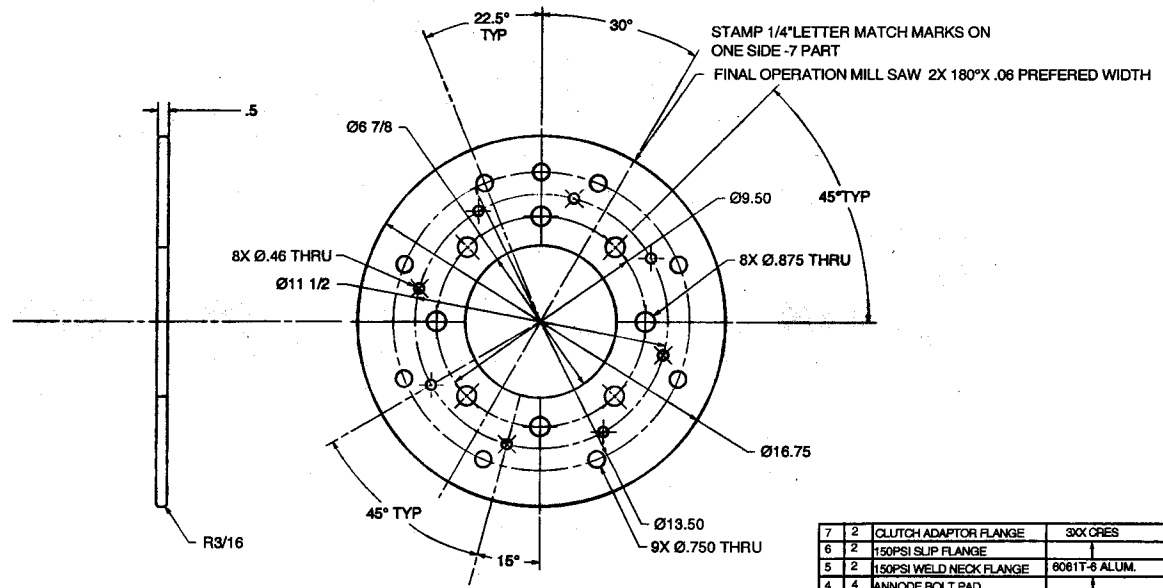
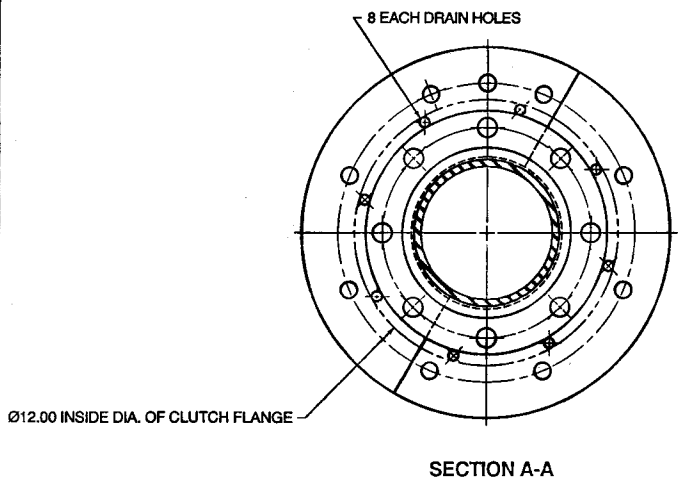
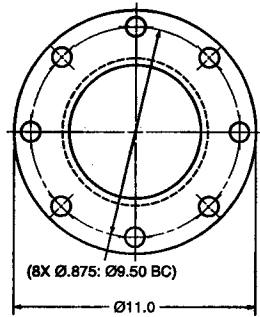
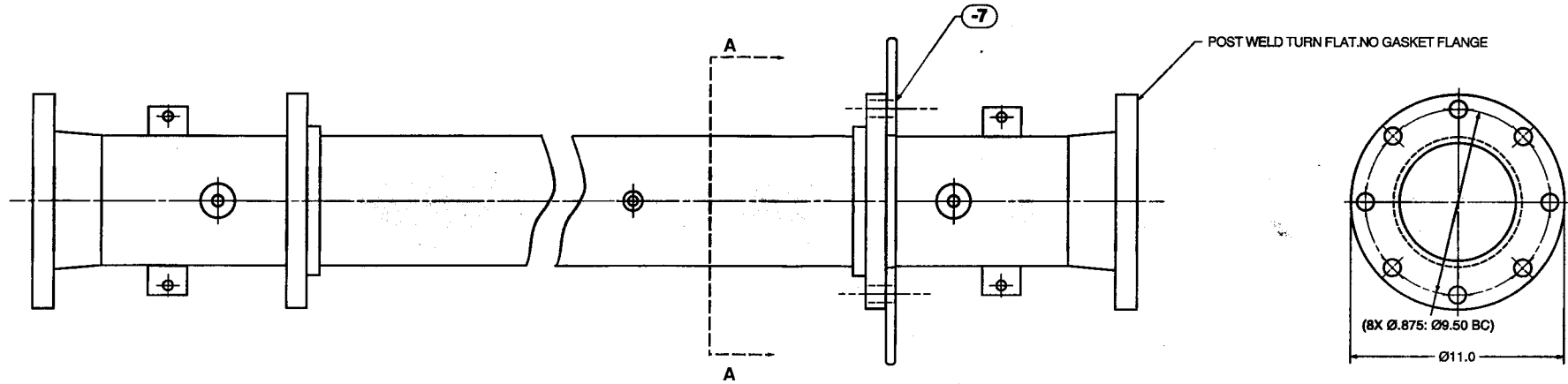
QTY	PART OR DESCR	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION
4	2	LIFT EYE PAD	
3	6	CLAMP BOLT WASHERS	
2	1	PIVOT PAD	
1	1	CLAMP PLATE	STEEL

GENERAL NOTES	DRAWN ETC SLATER 1999	DATE 17 JUNE 1999	MARINE PHYSICAL LAB OCEAN PHYSICS GROUP - MC 0213 SCIENCE DIVISION OF OCEANOGRAPHY
A UNLESS SPECIFIED BREAK ALL SHARP EDGES			
B "ALL" REFERENCE TO HULL COIL PIN CLIP PARTS OPENING MANUAL FOR FINISH DETAILS	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS DECIMALS #1/32 .001 #.015 #1/16 .002 #.005 #1/8 .003 #.010 #1/4 .005 #.015 #1/2 .007 #.020 #3/4 .009 #.025 #1 .011 #.030 #1 1/4 .013 #.035 #1 1/2 .015 #.040 #2 .017 #.045 #2 1/2 .019 #.050 #3 .021 #.055 #3 1/2 .023 #.060 #4 .025 #.065 #4 1/2 .027 #.070 #5 .029 #.075 #5 1/2 .031 #.080 #6 .033 #.085 #6 1/2 .035 #.090 #7 .037 #.095 #7 1/2 .039 #.100 #8 .041 #.105 #8 1/2 .043 #.110 #9 .045 #.115 #9 1/2 .047 #.120 #10 .049 #.125 #10 1/2 .051 #.130 #11 .053 #.135 #11 1/2 .055 #.140 #12 .057 #.145 #12 1/2 .059 #.150 #13 .061 #.155 #13 1/2 .063 #.160 #14 .065 #.165 #14 1/2 .067 #.170 #15 .069 #.175 #15 1/2 .071 #.180 #16 .073 #.185 #16 1/2 .075 #.190 #17 .077 #.195 #17 1/2 .079 #.200 #18 .081 #.205 #18 1/2 .083 #.210 #19 .085 #.215 #19 1/2 .087 #.220 #20 .089 #.225 #20 1/2 .091 #.230 #21 .093 #.235 #21 1/2 .095 #.240 #22 .097 #.245 #22 1/2 .099 #.250 #23 .101 #.255 #23 1/2 .103 #.260 #24 .105 #.265 #24 1/2 .107 #.270 #25 .109 #.275 #25 1/2 .111 #.280 #26 .113 #.285 #26 1/2 .115 #.290 #27 .117 #.295 #27 1/2 .119 #.300 #28 .121 #.305 #28 1/2 .123 #.310 #29 .125 #.315 #29 1/2 .127 #.320 #30 .129 #.325 #30 1/2 .131 #.330 #31 .133 #.335 #31 1/2 .135 #.340 #32 .137 #.345 #32 1/2 .139 #.350 #33 .141 #.355 #33 1/2 .143 #.360 #34 .145 #.365 #34 1/2 .147 #.370 #35 .149 #.375 #35 1/2 .151 #.380 #36 .153 #.385 #36 1/2 .155 #.390 #37 .157 #.395 #37 1/2 .159 #.400 #38 .161 #.405 #38 1/2 .163 #.410 #39 .165 #.415 #39 1/2 .167 #.420 #40 .169 #.425 #40 1/2 .171 #.430 #41 .173 #.435 #41 1/2 .175 #.440 #42 .177 #.445 #42 1/2 .179 #.450 #43 .181 #.455 #43 1/2 .183 #.460 #44 .185 #.465 #44 1/2 .187 #.470 #45 .189 #.475 #45 1/2 .191 #.480 #46 .193 #.485 #46 1/2 .195 #.490 #47 .197 #.495 #47 1/2 .199 #.500	R.V. REVELLE TEST CRUISE PIPE CLAMP MOUNT PLATE AND DETAILS	
	SIZE	DRAWING NO.	REV.
		D 424-108	
	SCALE	1/2" = 1"	SHEET 1 OF 1

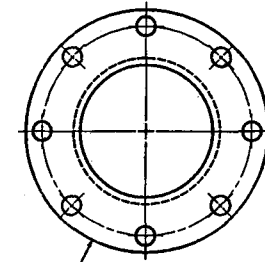
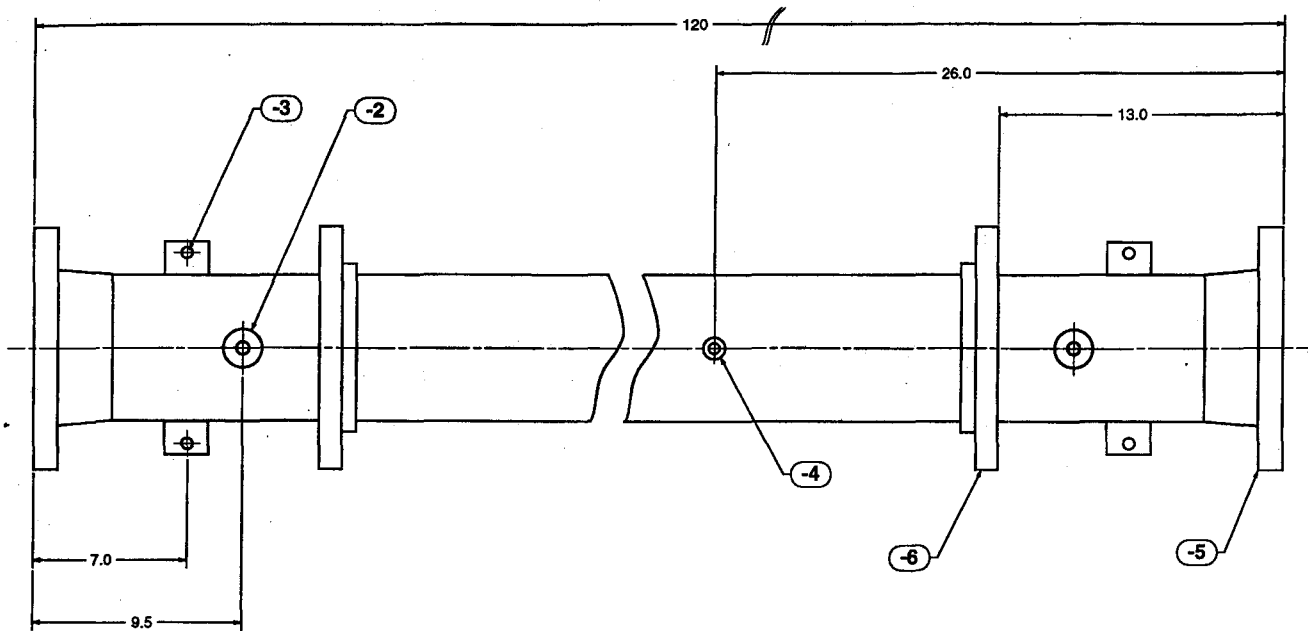


NO	QTY	PART OR REGD. Q. NO.	DESCRIPTION OR IDENTIFICATION	MATERIAL OR IDENTIFICATION
3	24		SPRING, EXTENSION W/ HOOKS	CPES
2	12		CLUTCH PAD	ALUM.
1	24		SPRING PLATE	30X CPES

GENERAL NOTES	DRAWN E/T/C	DATE 13 JUNE 1956	MARINE PHYSICAL LAB OCEAN PHYSICS GROUP MC 0113 SCIPPS INSTITUTION OF OCEANOGRAPHY
A UNLESS SPECIFIED BREAK ALL SHARP EDGES	SLATER		
B UNLESS REFERENCED TO HELL COIL PIN C REF PAPER OR IN MANUAL FOR D RING SEAL GLAND FINISH DETAILS	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS DECIMALS ±1/32 .001 ±.005 HOLEES ±.1"		R.V. REVELLE TEST CRUISE CLUTCH EXPANSION PLATE ASSY. DETAIL
	SEE	DRAWING NO. D 424-107	REV.
		SCALE 1/2"=1"	SHEET 1 OF 1

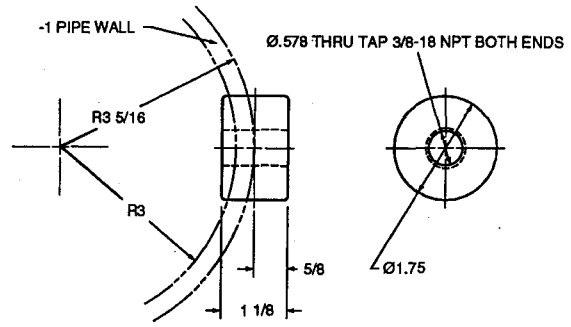


7	2	CLUTCH ADAPTOR FLANGE	30X CRES
6	2	150PSI SLIP FLANGE	
5	2	150PSI WELD NECK FLANGE	6061T-6 ALUM.
4	4	ANODE BOLT PAD	
3	4	LIFT TABS	
2	2	AIR FITTING BUSHING	60XX T-6 ALUM.
1	1	BIPS SCH 40 PIPE Ø6.625 OD	6061T-6 ALUM.
QTY		PART OR	MATERIAL
NO.		OR DESCRIPTION	SPECIFICATION
GENERAL NOTES		DRAWN	DATE
A. UNLESS SPECIFIED		ERIC	16 FEB
BREAK ALL SHARP		SLATER	1998
B. UNLESS OTHERWISE		MARINE PHYSICAL LAB	
SPECIFIED DIMENSIONS		OCEAN PHYSICS GROUP - MP 028	
C. UNLESS OTHERWISE		SCIENTIFIC INSTITUTION OF OCEANOGRAPHY	
SPECIFIED DIMENSIONS		R.V. REVELLE TEST CRUISE	
ARE IN INCHES		40 KHZ PROTOTYPE	
TOLERANCES ARE:		-7 FLANGE DETAIL	
FINISH	FINISH	DECIMALS	XX ± 0.15
DRYING MANUAL FOR	DRYING MANUAL FOR	±.125	XX ± .05
FINISH DETAILS	FINISH DETAILS	ANGLES	± 1°
SCALE		DRAWING NO.	
3/8" = 1"		D 424-100	
		REV.	
		SCALE 3/8" = 1" 1 SHEET 2 OF 2	

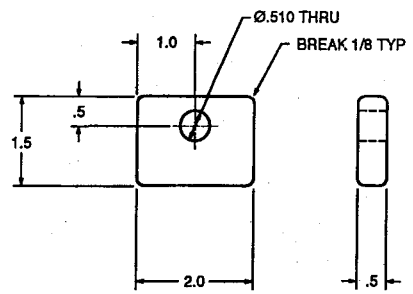


BOLT PATTERN MUST ALIGN BETWEEN END FLANGES ±2°

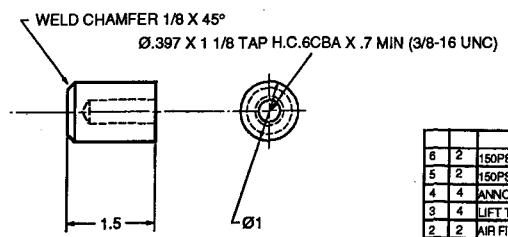
-2 DETAIL



-3 DETAIL



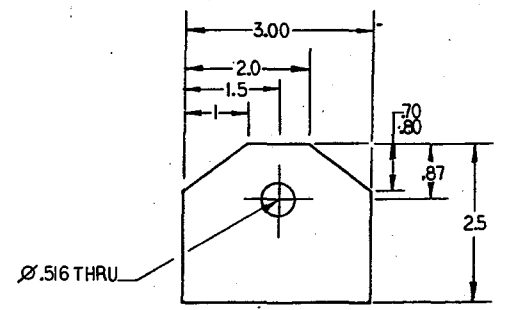
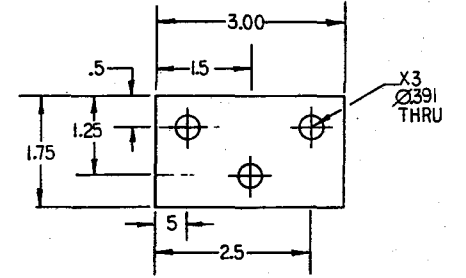
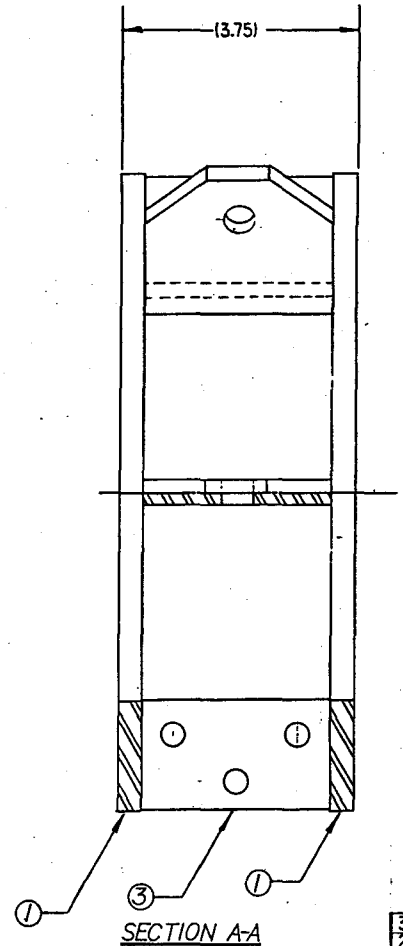
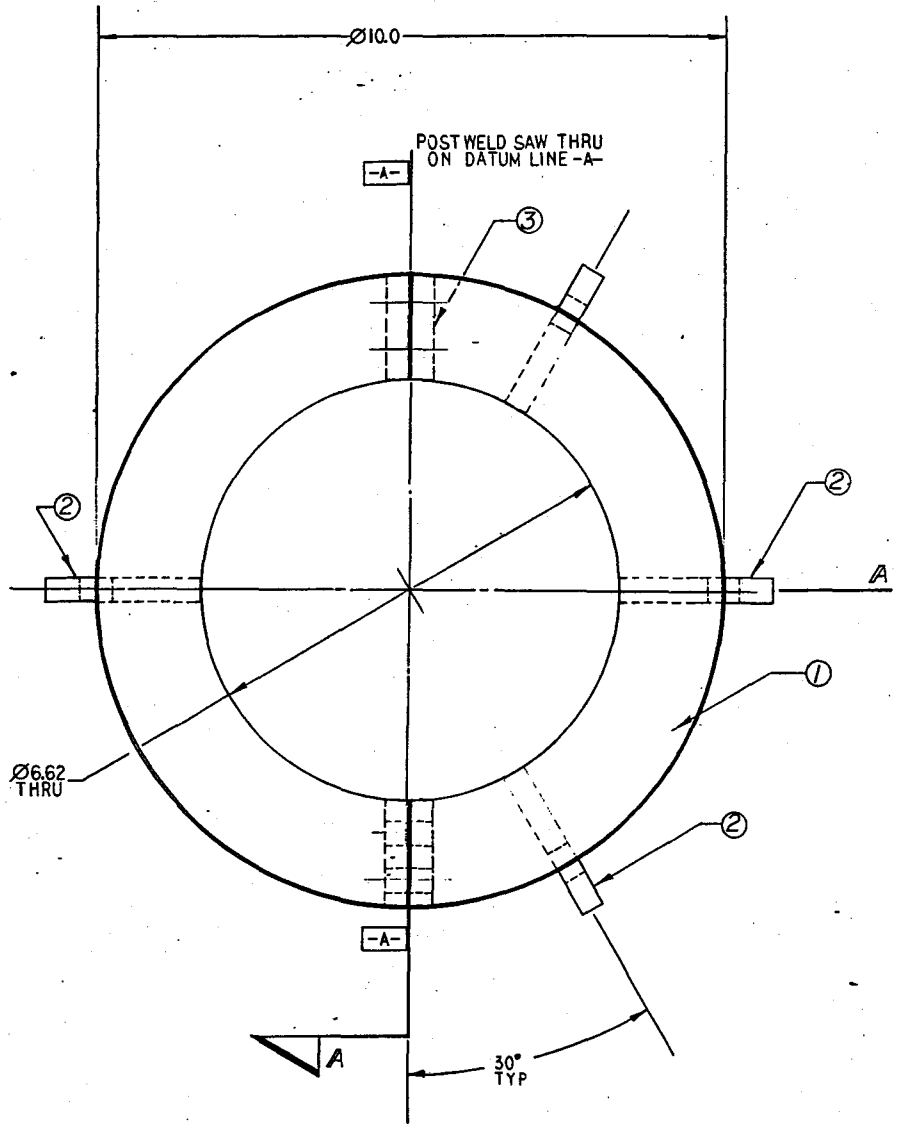
-4 DETAIL



NO.	QTY	PART OR IDENTIFICATION	DESCRIPTION	MATERIAL	SPECIFICATION
6	2	150PSI SLIP FLANGE			
5	2	150PSI WELD NECK FLANGE		6061T-6 ALUM.	
4	4	ANODE BOLT PAD			
3	4	LIFT TABS			
2	2	AIR FITTING BUSHING		60XX T-6 ALUM.	
1	1	BIPS SCH 40 PIPE Ø6.625 OD		6061T-6 ALUM.	

GENERAL NOTES	DRAWN	DATE	BY
ALL UNLESS SPECIFIED BREAKALL SHARP EDGES	ERIC	12 FEB 1996	
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES ARE FRACTIONS DECIMALS ANGLES	SI ALTER		
REFER TO HELI COIL PIN 2. REF. PAPER 04983 MANUAL FOR OCEAN REEL BLAND PARTS DETAILS			

PROJECT	DESCRIPTION	MATERIAL	SPECIFICATION
BIARINE	PHYSICAL LAB		
OCEAN PHYSICS GROUP	MC 813		
32000	INSTITUTION OF OCEANOGRAPHY		
R.V. REVELLE TEST CRUISE			
40 KHZ PROTOTYPE			
PIPE STRING DETAIL			
SIZE	DRAWING NO.	REV.	
SCALE 3/8"=1"	D 424-100	1	1997 10P 7



3	4	CLAMP PLATE	1.75 X 3.00		
2	4	TAB	2.5 X 3.00		
1	2	DISC	3.75 PLT Ø100		ALUM. 6061-T6
QTY	PRICE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION		MATERIAL SPECIFICATION
			PARTS LIST		
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS DECIMALS ANGLES			CONTRACT NO.		
+ 1/32 - 0.05 + 1/16			APPROVALS		
- 1/32 - 0.05 - 1/16			DATE		
- 1/32 - 0.05 - 1/16			DRAWN SLATER		
			DATE 17 JAN		
			CHECKED		
			DATE 17 JAN		
MATERIAL NOTED			ISSUED		
FINISH NONE			SCALE/FULL		
NEXT ASST	USED ON	APPLICATION	DO NOT SCALE DRAWING	SIZE (FRCH NO.)	DWG. NO.
				D	284-113
				SCALE/FULL	SHEET 1-1

CEAREX SONAR SYSTEM
UPPER PIPE CLAMP