



HIGH TECH, INC.

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Prepared For

Hydroid, Inc.
19210 33rd Avenue West
Suite B
Lynnwood, Wa 98036

Hydrophone Calibration Report

Model# HTI-94-WB

Quantity: 2

January 2021

Purchase Order Number – PO00063706



HIGH TECH, INC.

21120 Johnson Road
Long Beach, MS 39560

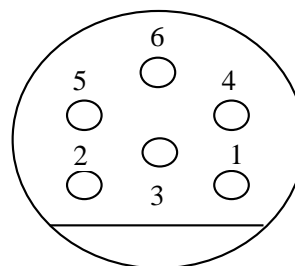
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1211/1/1 Hydrophone Information
Model# HTI-92-WB / Differential
Connector: Impulse IE55-1206-CCP
Cable Length: 66 inches

01/14/21

Connector Pinout

Pin 1	12VDC Return/Shield
Pin 2	+12VDC
Pin 3	+ Positive Signal Output
Pin 4	- Negative Signal Output
Pin 5	N/C
Pin 6	N/C



Caution: DO NOT apply voltage to signal output.
This will permanently damage hydrophone.

Hydrophones listed on this page:

- Leaked less than 0.1uA @ 27VDC after 1hr @ 100PSI hydrostatic pressure
- Passed shield integrity test
- Has the same Polarity Response



DEPARTMENT OF THE NAVY

NAVAL UNDERSEA WARFARE CENTER DIVISION
1176 HOWELL STREET
NEWPORT RI 02841-1708

USRD Calibration Memorandum No. 6143

MEASUREMENTS ON
HIGH TECH, INC. MODEL HTI-92-WB HYDROPHONES
SERIAL 1211001 AND 1211002

Please contact Dr. V. Évora at (401) 832-8475 or DSN 432-8475, or email at Victor.M.Evora@navy.mil, Naval Undersea Warfare Center, Division Newport, Code 1531 with any questions.

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USRD CALIBRATION MEMORANDUM NO. 6143
JANUARY 2021

Calibration Memorandum Summary

1. Measurements on the subject hydrophones were made in the Low Frequency Facility (LOFAC) and the Acoustic Open Tank Facility (OTF) during the period 11 through 13 January 2021. Preliminary data was provided to Mr. Calvin Kirsch of High Tech, Inc. upon completion of the measurements. Funds for this service were provided by High Tech, Inc. Check Number 43919.
2. Electroacoustic Characteristics (EC) were measured in the LOFAC in the frequency range of 2 to 2000 Hz, at the temperature to 22.4° C and at the hydrostatic pressure to 345 kPa (35.2 m). Free-Field Voltage Sensitivity (FFVS) was measured in the OTF in the frequency range of 1.0 to 60 kHz, at the water temperature of 18.6° C and at the depth of 2.28 m (22.4 kPa). Conditions and results of the measurements are presented in enclosure (1).
3. The orientation of the hydrophones was described for a cylinder as shown in enclosure (2). The cable exited in the +Z direction with no regard to the +X axis.

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USRD CALIBRATION MEMORANDUM NO. 6143
JANUARY 2021

TABLE 1
DATA DIRECTORY
MODEL HTI-92-WB HYDROPHONE

	CHART	TABLE
FFVS		
Serial 1211001		
LOFAC		2
OTF	1	
Serial 1211002		
LOFAC		3
OTF	2	

Table 2

ELECTROACOUSTIC CHARACTERISTICS

High Tech Inc. Model HTI-92-WB Hydrophone Serial 1211001

Open-circuit voltage measured at end of cable; Balanced

Temperature: 21.8° C

theta = 180°

Freq (Hz)	345 kPa (35.2 m)	
	FFVS (dB re 1V/uPa)	PHASE (degrees)
2.0	-169.2	-129.6
2.1	-169.0	-130.5
2.1	-168.9	-131.4
2.2	-168.7	-132.3
2.2	-168.6	-133.2
2.3	-168.5	-134.0
2.4	-168.4	-134.8
2.4	-168.3	-135.7
2.5	-168.1	-136.5
2.6	-168.0	-137.5
2.7	-167.9	-138.3
2.7	-167.8	-139.1
2.8	-167.7	-140.0
2.9	-167.6	-141.0
3.0	-167.5	-141.9
3.1	-167.4	-142.6
3.2	-167.4	-143.3
3.3	-167.3	-144.2
3.4	-167.2	-145.0
3.5	-167.1	-145.9
3.6	-167.0	-146.6
3.7	-166.9	-147.3
3.8	-166.9	-148.0
3.9	-166.8	-148.8
4.0	-166.7	-149.7
4.1	-166.7	-150.2
4.3	-166.6	-151.1
4.4	-166.5	-151.8
4.5	-166.5	-152.5
4.6	-166.4	-153.1
4.8	-166.4	-153.7
4.9	-166.3	-154.2
5.0	-166.3	-154.8
5.2	-166.3	-155.4
5.3	-166.2	-156.0
5.5	-166.2	-156.5
5.6	-166.1	-157.1
5.8	-166.1	-157.9
6.0	-166.1	-158.7
6.2	-166.0	-159.0
6.3	-166.0	-159.4
6.5	-166.0	-160.0
6.7	-165.9	-160.6

Table 2

ELECTROACOUSTIC CHARACTERISTICS

High Tech Inc. Model HTI-92-WB Hydrophone Serial 1211001

Open-circuit voltage measured at end of cable; Balanced

Temperature: 21.8° C

theta = 180°

Freq (Hz)	345 kPa (35.2 m)	
	FFVS (dB re 1V/uPa)	PHASE (degrees)
6.9	-165.9	-161.0
7.1	-165.9	-161.5
7.3	-165.8	-161.9
7.5	-165.8	-162.3
7.8	-165.8	-162.8
8.0	-165.8	-163.3
8.3	-165.7	-163.7
8.5	-165.7	-164.2
8.8	-165.7	-164.6
9.0	-165.7	-164.9
9.3	-165.7	-165.3
9.5	-165.7	-165.6
9.8	-165.6	-166.0
10.0	-165.6	-166.3
10.3	-165.6	-166.6
10.6	-165.6	-167.0
10.9	-165.6	-167.3
11.2	-165.6	-167.6
11.5	-165.6	-167.9
11.8	-165.5	-168.2
12.2	-165.5	-168.5
12.5	-165.5	-168.8
12.8	-165.5	-169.0
13.2	-165.5	-169.3
13.6	-165.5	-169.6
14.0	-165.5	-169.8
14.5	-165.5	-170.2
15.0	-165.4	-170.4
15.5	-165.4	-170.7
16.0	-165.4	-171.0
16.5	-165.4	-171.2
17.0	-165.4	-171.4
17.5	-165.4	-171.7
18.0	-165.4	-171.9
18.5	-165.4	-172.1
19.0	-165.4	-172.3
19.5	-165.4	-172.5
20.0	-165.3	-172.6
20.6	-165.3	-172.8
21.2	-165.3	-173.0
21.8	-165.3	-173.2

Table 2

ELECTROACOUSTIC CHARACTERISTICS

High Tech Inc. Model HTI-92-WB Hydrophone Serial 1211001

Open-circuit voltage measured at end of cable; Balanced

Temperature: 21.8° C

theta = 180°

Freq (Hz)	345 kPa (35.2 m)	
	FFVS (dB re 1V/uPa)	PHASE (degrees)
22.4	-165.3	-173.4
23.0	-165.3	-173.5
23.6	-165.3	-173.7
24.3	-165.3	-173.8
25.0	-165.3	-174.0
25.8	-165.3	-174.2
26.5	-165.3	-174.3
27.2	-165.3	-174.5
28.0	-165.3	-174.7
29.0	-165.3	-174.8
30.0	-165.3	-175.0
30.7	-165.3	-175.1
31.5	-165.3	-175.2
32.5	-165.3	-175.4
33.5	-165.3	-175.5
34.5	-165.2	-175.6
35.5	-165.2	-175.8
36.5	-165.2	-175.9
37.5	-165.2	-176.0
38.7	-165.2	-176.1
40.0	-165.2	-176.2
41.2	-165.2	-176.4
42.5	-165.2	-176.5
43.7	-165.2	-176.5
45.0	-165.2	-176.6
46.2	-165.2	-176.7
47.5	-165.2	-176.8
48.7	-165.2	-176.9
50.0	-165.2	-177.0
51.5	-165.2	-177.1
53.0	-165.2	-177.2
54.5	-165.2	-177.3
56.0	-165.2	-177.4
58.0	-165.2	-177.5
60.0	-165.2	-177.6
61.5	-165.2	-177.6
63.0	-165.2	-177.7
65.0	-165.2	-177.8
67.0	-165.2	-177.8
69.0	-165.2	-177.9
71.0	-165.2	-178.0

Table 2

ELECTROACOUSTIC CHARACTERISTICS

High Tech Inc. Model HTI-92-WB Hydrophone Serial 1211001

Open-circuit voltage measured at end of cable; Balanced

Temperature: 21.8° C

theta = 180°

Freq (Hz)	345 kPa (35.2 m)	
	FFVS (dB re 1V/uPa)	PHASE (degrees)
73.0	-165.2	-178.0
75.0	-165.2	-178.1
77.5	-165.2	-178.2
80.0	-165.2	-178.2
82.5	-165.2	-178.3
85.0	-165.2	-178.4
87.5	-165.2	-178.4
90.0	-165.2	-178.5
92.5	-165.2	-178.5
95.0	-165.2	-178.6
97.5	-165.2	-178.6
100.0	-165.2	-178.6
103.0	-165.2	-178.7
106.0	-165.2	-178.8
109.0	-165.2	-178.9
112.0	-165.2	-178.9
115.0	-165.2	-178.9
118.0	-165.2	-178.9
122.0	-165.2	-179.0
125.0	-165.2	-179.0
128.0	-165.2	-179.1
132.0	-165.2	-179.3
136.0	-165.2	-179.8
140.0	-165.3	-178.9
145.0	-165.2	-178.9
150.0	-165.2	-178.9
155.0	-165.2	-179.0
160.0	-165.2	-178.9
165.0	-165.2	-178.9
170.0	-165.1	-178.9
175.0	-165.1	-179.2
180.0	-165.1	-179.4
185.0	-165.2	-179.5
190.0	-165.2	-179.4
195.0	-165.2	-179.4
200.0	-165.2	-179.4
206.0	-165.2	-179.5
212.0	-165.2	-179.5
218.0	-165.2	-179.5
224.0	-165.2	-179.5
230.0	-165.2	-179.6

Table 2

ELECTROACOUSTIC CHARACTERISTICS

High Tech Inc. Model HTI-92-WB Hydrophone Serial 1211001

Open-circuit voltage measured at end of cable; Balanced

Temperature: 21.8° C

theta = 180°

Freq (Hz)	345 kPa (35.2 m)	
	FFVS (dB re 1V/uPa)	PHASE (degrees)
236.0	-165.2	-179.7
243.0	-165.2	-179.4
250.0	-165.2	-179.4
258.0	-165.2	-179.5
265.0	-165.2	-179.6
272.0	-165.2	-179.6
280.0	-165.2	-179.6
290.0	-165.1	-179.6
300.0	-165.1	-179.9
307.0	-165.2	-180.0
315.0	-165.2	-179.9
325.0	-165.2	-179.8
335.0	-165.2	-179.7
345.0	-165.2	-179.7
355.0	-165.2	-179.8
365.0	-165.2	-179.8
375.0	-165.2	-179.8
387.0	-165.2	-179.8
400.0	-165.2	-179.8
412.0	-165.1	-179.9
425.0	-165.1	-179.9
437.0	-165.2	179.9
450.0	-165.2	-180.0
462.0	-165.2	-179.8
475.0	-165.2	-179.6
487.0	-165.1	-179.6
500.0	-165.2	-179.4
515.0	-165.1	-178.3
530.0	-165.0	-179.1
545.0	-165.0	179.9
560.0	-165.0	179.7
580.0	-165.1	179.7
600.0	-165.1	179.5
615.0	-165.1	179.8
630.0	-165.1	179.8
650.0	-165.1	179.7
670.0	-165.1	179.7
690.0	-165.1	179.8
710.0	-165.1	179.7
730.0	-165.1	179.7
750.0	-165.1	179.9

Table 2

ELECTROACOUSTIC CHARACTERISTICS

High Tech Inc. Model HTI-92-WB Hydrophone Serial 1211001

Open-circuit voltage measured at end of cable; Balanced

Temperature: 21.8° C

theta = 180°

Freq (Hz)	345 kPa (35.2 m)	
	FFVS (dB re 1V/uPa)	PHASE (degrees)
775.0	-165.1	-179.9
800.0	-165.1	-179.6
825.0	-165.1	-179.5
850.0	-165.0	-179.3
875.0	-165.0	-177.3
900.0	-164.9	-179.4
925.0	-164.6	179.4
950.0	-164.6	178.6
975.0	-164.9	178.4
1000.0	-164.9	179.4
1030.0	-164.7	179.0
1060.0	-164.8	178.5
1090.0	-164.8	177.7
1120.0	-164.7	177.3
1150.0	-164.8	178.5
1180.0	-164.9	177.4
1220.0	-165.0	178.3
1250.0	-165.0	178.1
1280.0	-164.9	177.1
1320.0	-165.2	-179.8
1360.0	-165.0	179.9
1400.0	-164.6	-176.8
1450.0	-164.7	-178.7
1500.0	-164.9	-179.2
1550.0	-164.6	-179.4
1600.0	-164.4	179.5
1650.0	-164.5	179.6
1700.0	-164.4	-179.2
1750.0	-163.8	-179.1
1800.0	-164.4	176.4
1850.0	-164.4	179.6
1900.0	-164.1	177.4
1950.0	-164.2	174.7
2000.0	-165.0	176.1

FREE-FIELD VOLTAGE SENSITIVITY

High Tech, Inc. Model HTI-92-WB Hydrophone Serial 1211001
Open-circuit voltage measured at end of cable; Unbalanced
18.6 °C; 2.28 m depth (22.4 kPa)

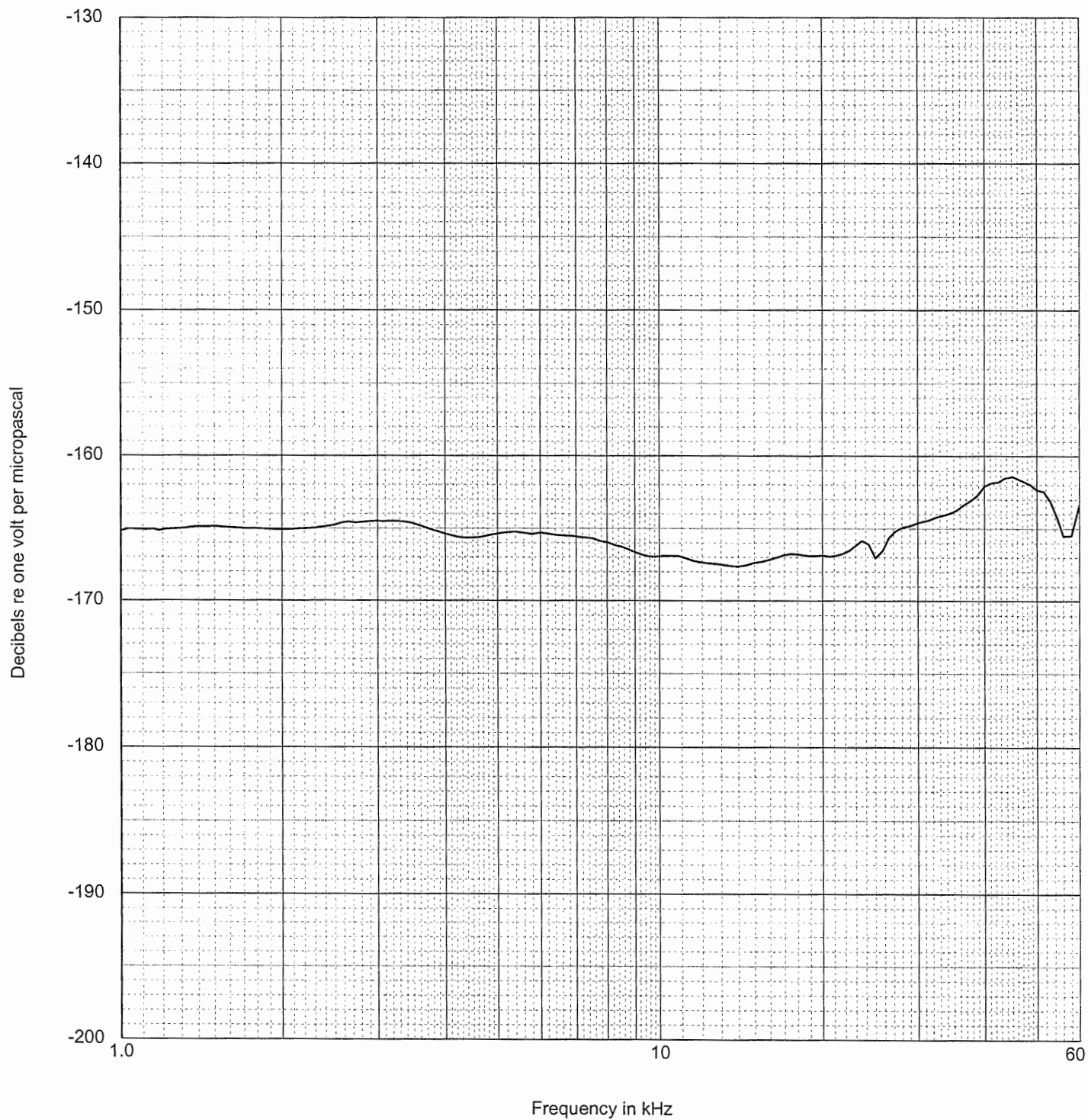


Table 3

ELECTROACOUSTIC CHARACTERISTICS

High Tech Inc. Model HTI-92-WB Hydrophone Serial 1211002

Open-circuit voltage measured at end of cable; Balanced

Temperature: 22.4° C

theta = 180°

Freq (Hz)	345 kPa (35.2 m)	
	FFVS (dB re 1V/uPa)	PHASE (degrees)
2.0	-167.6	-129.5
2.1	-167.4	-131.1
2.1	-167.3	-132.1
2.2	-167.2	-133.0
2.2	-167.0	-133.9
2.3	-166.9	-134.7
2.4	-166.8	-135.4
2.4	-166.7	-136.4
2.5	-166.6	-137.4
2.6	-166.5	-138.4
2.7	-166.4	-139.2
2.7	-166.3	-140.0
2.8	-166.2	-140.9
2.9	-166.1	-142.0
3.0	-165.9	-143.1
3.1	-165.9	-143.7
3.2	-165.8	-144.4
3.3	-165.7	-145.3
3.4	-165.6	-146.2
3.5	-165.6	-147.0
3.6	-165.5	-147.8
3.7	-165.4	-148.6
3.8	-165.4	-149.3
3.9	-165.3	-150.2
4.0	-165.2	-151.0
4.1	-165.2	-151.8
4.3	-165.1	-152.6
4.4	-165.0	-153.2
4.5	-165.0	-154.0
4.6	-165.0	-154.6
4.8	-164.9	-155.2
4.9	-164.9	-155.8
5.0	-164.8	-156.4
5.2	-164.8	-157.1
5.3	-164.8	-157.7
5.5	-164.7	-158.2
5.6	-164.7	-158.8
5.8	-164.6	-159.4
6.0	-164.6	-160.1
6.2	-164.6	-160.6
6.3	-164.6	-161.1
6.5	-164.5	-161.7
6.7	-164.5	-162.2

Table 3

ELECTROACOUSTIC CHARACTERISTICS

High Tech Inc. Model HTI-92-WB Hydrophone Serial 1211002

Open-circuit voltage measured at end of cable; Balanced

Temperature: 22.4° C

theta = 180°

Freq (Hz)	345 kPa (35.2 m)	
	FFVS (dB re 1V/uPa)	PHASE (degrees)
6.9	-164.5	-162.8
7.1	-164.5	-163.2
7.3	-164.5	-163.7
7.5	-164.4	-164.1
7.8	-164.4	-164.6
8.0	-164.4	-165.1
8.3	-164.4	-165.5
8.5	-164.4	-166.0
8.8	-164.4	-166.4
9.0	-164.3	-166.8
9.3	-164.3	-167.1
9.5	-164.3	-167.5
9.8	-164.3	-167.8
10.0	-164.3	-168.1
10.3	-164.3	-168.4
10.6	-164.3	-168.8
10.9	-164.3	-169.1
11.2	-164.3	-169.4
11.5	-164.3	-169.7
11.8	-164.2	-169.9
12.2	-164.2	-170.3
12.5	-164.2	-170.5
12.8	-164.2	-170.8
13.2	-164.2	-171.0
13.6	-164.2	-171.3
14.0	-164.2	-171.6
14.5	-164.2	-171.9
15.0	-164.2	-172.1
15.5	-164.2	-172.4
16.0	-164.2	-172.7
16.5	-164.2	-172.9
17.0	-164.2	-173.1
17.5	-164.2	-173.3
18.0	-164.2	-173.5
18.5	-164.2	-173.7
19.0	-164.2	-173.8
19.5	-164.2	-174.0
20.0	-164.2	-174.2
20.6	-164.2	-174.3
21.2	-164.2	-174.5
21.8	-164.2	-174.7

Table 3

ELECTROACOUSTIC CHARACTERISTICS

High Tech Inc. Model HTI-92-WB Hydrophone Serial 1211002

Open-circuit voltage measured at end of cable; Balanced

Temperature: 22.4° C

theta = 180°

Freq (Hz)	345 kPa (35.2 m)	
	FFVS (dB re 1V/uPa)	PHASE (degrees)
22.4	-164.2	-174.8
23.0	-164.2	-174.9
23.6	-164.1	-175.1
24.3	-164.1	-175.2
25.0	-164.1	-175.4
25.8	-164.1	-175.5
26.5	-164.1	-175.6
27.2	-164.1	-175.8
28.0	-164.1	-175.9
29.0	-164.1	-176.1
30.0	-164.1	-176.2
30.7	-164.1	-176.3
31.5	-164.1	-176.4
32.5	-164.1	-176.5
33.5	-164.1	-176.6
34.5	-164.1	-176.7
35.5	-164.1	-176.8
36.5	-164.1	-176.9
37.5	-164.1	-177.0
38.7	-164.1	-177.1
40.0	-164.1	-177.2
41.2	-164.1	-177.2
42.5	-164.1	-177.3
43.7	-164.1	-177.3
45.0	-164.1	-177.4
46.2	-164.1	-177.5
47.5	-164.1	-177.6
48.7	-164.1	-177.6
50.0	-164.1	-177.7
51.5	-164.1	-177.8
53.0	-164.1	-177.8
54.5	-164.1	-177.9
56.0	-164.1	-178.0
58.0	-164.1	-178.0
60.0	-164.1	-178.1
61.5	-164.1	-178.2
63.0	-164.1	-178.2
65.0	-164.1	-178.3
67.0	-164.1	-178.3
69.0	-164.1	-178.4
71.0	-164.1	-178.4

Table 3

ELECTROACOUSTIC CHARACTERISTICS

High Tech Inc. Model HTI-92-WB Hydrophone Serial 1211002

Open-circuit voltage measured at end of cable; Balanced

Temperature: 22.4° C

theta = 180°

Freq (Hz)	345 kPa (35.2 m)	
	FFVS (dB re 1V/uPa)	PHASE (degrees)
73.0	-164.1	-178.4
75.0	-164.1	-178.5
77.5	-164.1	-178.5
80.0	-164.1	-178.6
82.5	-164.1	-178.6
85.0	-164.1	-178.7
87.5	-164.1	-178.7
90.0	-164.1	-178.7
92.5	-164.1	-178.8
95.0	-164.1	-178.8
97.5	-164.1	-178.8
100.0	-164.1	-178.9
103.0	-164.1	-178.9
106.0	-164.1	-178.9
109.0	-164.1	-179.0
112.0	-164.1	-179.1
115.0	-164.1	-179.1
118.0	-164.1	-179.0
122.0	-164.1	-179.0
125.0	-164.1	-179.1
128.0	-164.1	-179.1
132.0	-164.1	-179.2
136.0	-164.1	-179.4
140.0	-164.1	-179.4
145.0	-164.1	-179.2
150.0	-164.1	-179.1
155.0	-164.1	-179.1
160.0	-164.1	-179.1
165.0	-164.1	-179.0
170.0	-164.1	-179.0
175.0	-164.1	-179.1
180.0	-164.1	-179.3
185.0	-164.1	-179.3
190.0	-164.1	-179.4
195.0	-164.1	-179.4
200.0	-164.1	-179.4
206.0	-164.1	-179.4
212.0	-164.2	-179.4
218.0	-164.1	-179.4
224.0	-164.1	-179.4
230.0	-164.1	-179.6

Table 3

ELECTROACOUSTIC CHARACTERISTICS

High Tech Inc. Model HTI-92-WB Hydrophone Serial 1211002

Open-circuit voltage measured at end of cable; Balanced

Temperature: 22.4° C

theta = 180°

Freq (Hz)	345 kPa (35.2 m)	
	FFVS (dB re 1V/uPa)	PHASE (degrees)
236.0	-164.1	-179.7
243.0	-164.1	-179.5
250.0	-164.1	-179.5
258.0	-164.1	-179.6
265.0	-164.1	-179.6
272.0	-164.1	-179.6
280.0	-164.1	-179.5
290.0	-164.1	-179.6
300.0	-164.1	-179.6
307.0	-164.1	-179.7
315.0	-164.1	-179.7
325.0	-164.1	-179.7
335.0	-164.1	-179.7
345.0	-164.1	-179.8
355.0	-164.1	-179.8
365.0	-164.1	-179.8
375.0	-164.1	-179.8
387.0	-164.1	-179.8
400.0	-164.0	-179.8
412.0	-164.0	-179.8
425.0	-164.0	-179.8
437.0	-164.0	180.0
450.0	-164.0	179.8
462.0	-164.1	179.7
475.0	-164.1	179.9
487.0	-164.1	-179.9
500.0	-164.1	-179.7
515.0	-164.2	-179.7
530.0	-164.2	-179.4
545.0	-164.0	-179.2
560.0	-164.0	-179.5
580.0	-164.0	179.8
600.0	-164.0	-179.6
615.0	-164.0	-179.4
630.0	-163.9	-179.5
650.0	-163.9	-179.8
670.0	-163.9	179.8
690.0	-163.9	179.7
710.0	-163.9	179.5
730.0	-164.0	179.6
750.0	-164.0	179.4

Table 3

ELECTROACOUSTIC CHARACTERISTICS

High Tech Inc. Model HTI-92-WB Hydrophone Serial 1211002

Open-circuit voltage measured at end of cable; Balanced

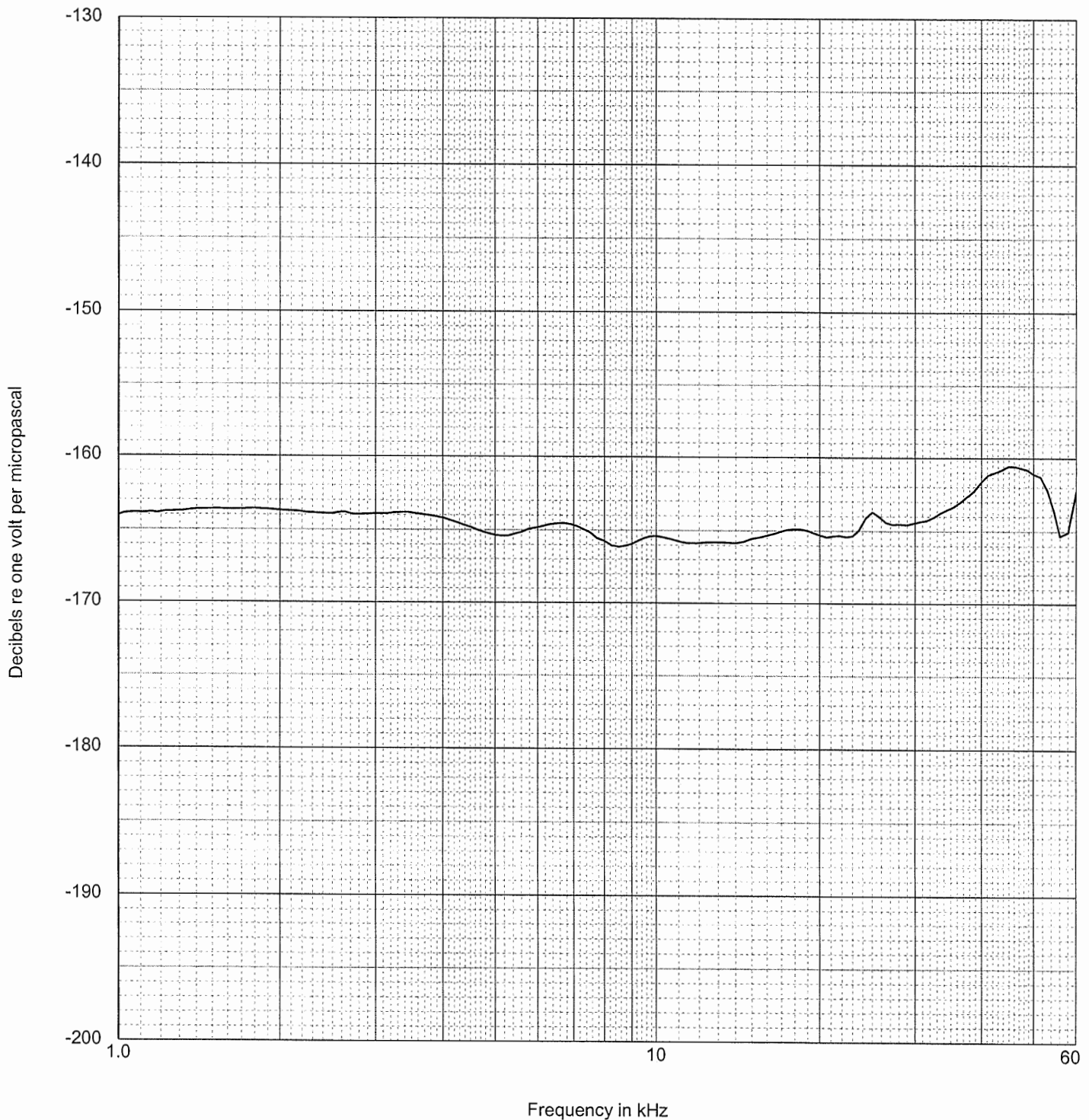
Temperature: 22.4° C

theta = 180°

Freq (Hz)	345 kPa (35.2 m)	
	FFVS (dB re 1V/uPa)	PHASE (degrees)
775.0	-164.0	179.9
800.0	-164.1	-179.9
825.0	-164.1	-179.8
850.0	-164.0	-179.1
875.0	-164.0	-178.9
900.0	-163.8	-179.6
925.0	-163.6	-179.5
950.0	-163.6	-179.8
975.0	-163.7	179.7
1000.0	-163.6	179.8
1030.0	-163.6	178.7
1060.0	-163.8	178.5
1090.0	-163.6	178.4
1120.0	-163.4	178.4
1150.0	-163.7	178.9
1180.0	-163.6	178.0
1220.0	-163.7	177.9
1250.0	-163.8	176.6
1280.0	-164.0	174.7
1320.0	-164.4	179.1
1360.0	-163.1	-179.8
1400.0	-163.3	-178.3
1450.0	-163.9	-179.1
1500.0	-164.0	-178.4
1550.0	-163.7	-178.6
1600.0	-163.4	-179.6
1650.0	-163.4	179.8
1700.0	-163.3	179.8
1750.0	-163.1	-179.8
1800.0	-163.5	179.2
1850.0	-163.1	-179.0
1900.0	-163.0	178.9
1950.0	-163.1	175.4
2000.0	-163.4	172.7

FREE-FIELD VOLTAGE SENSITIVITY

High Tech, Inc. Model HTI-92-WB Hydrophone Serial 1211002
Open-circuit voltage measured at end of cable; Unbalanced
18.6 ° C; 2.28 m depth (22.4 kPa)



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NAVAL UNDERSEA WARFARE CENTER DIVISION
UNDERWATER SOUND REFERENCE DETACHMENT
1176 HOWELL STREET, NEWPORT, RI 02841-1708

USRD DRAWING 62785
(REVISED 1 AUGUST 1995)

COORDINATE SYSTEM FOR TRANSDUCER OR PANEL ORIENTATION

The left-handed coordinate system in the sketch below is affixed to the transducer or panel and moves with it, regardless of its physical position. The angle (θ, ϕ) denotes the direction of sound propagation. Measurements are made with sound propagated parallel to the positive X axis ($\theta=90^\circ$, $\phi=0^\circ$) unless otherwise specified.

For some measurements, the position of an auxiliary transducer may be specified in terms of cartesian coordinates X, Y, and Z.

Transducers and panels are oriented as follows:

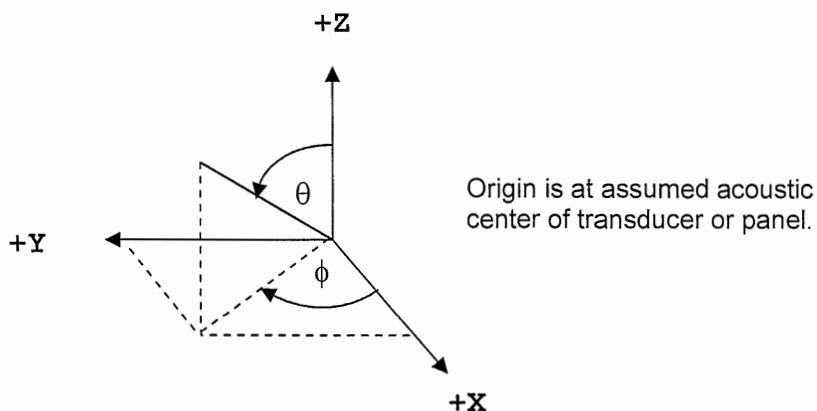
ACOUSTIC SURFACE

ORIENTATION

Cylinder	The cylindrical axis is the Z axis; a reference mark for the +Z direction and for another axis is specified.
Plane	The plane or piston face is the YZ plane, with the X axis normal to the face at the geometric center. A reference mark in the YZ plane is specified.
Sphere	Points on the surface for any two of the three axes are specified.
Other	A sketch of non-conforming configurations is provided.

Directional Response Patterns: Unless otherwise specified, the following apply:

SPECIFIED PLANE	AXIS OF ROTATION	POSITION OF AXES OR DIRECTIONS ON POLAR PLOTS				
		+X AXIS	+Y AXIS	+Z AXIS	$\theta=45^\circ$ $\phi=90^\circ$	$\theta=45^\circ$ $\phi=270^\circ$
XY	Z	0°	90° CW	Upward	-----	-----
XZ	Y	0°	Downward	90° CW	-----	-----
YZ	X	Upward	0°	90° CW	-----	-----
ROLL	$\theta=45^\circ$ $\phi=270^\circ$	0°	-----	-----	90° CW	Upward



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