

**Basic  
Oceanography  
and Acoustic  
Training**

# Basic Oceanography and Acoustic Training

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## Concepts:

- **Module 1:**

- **Temperature, Salinity, and Pressure**

- **T, S, and P Effects on Sound Speed**

- **Module 2:**

- **Bathythermograph Introduction**

- **JJXX Encoding/Decoding**

- **SVPD Decoding**

# Basic Oceanography and Acoustic Training

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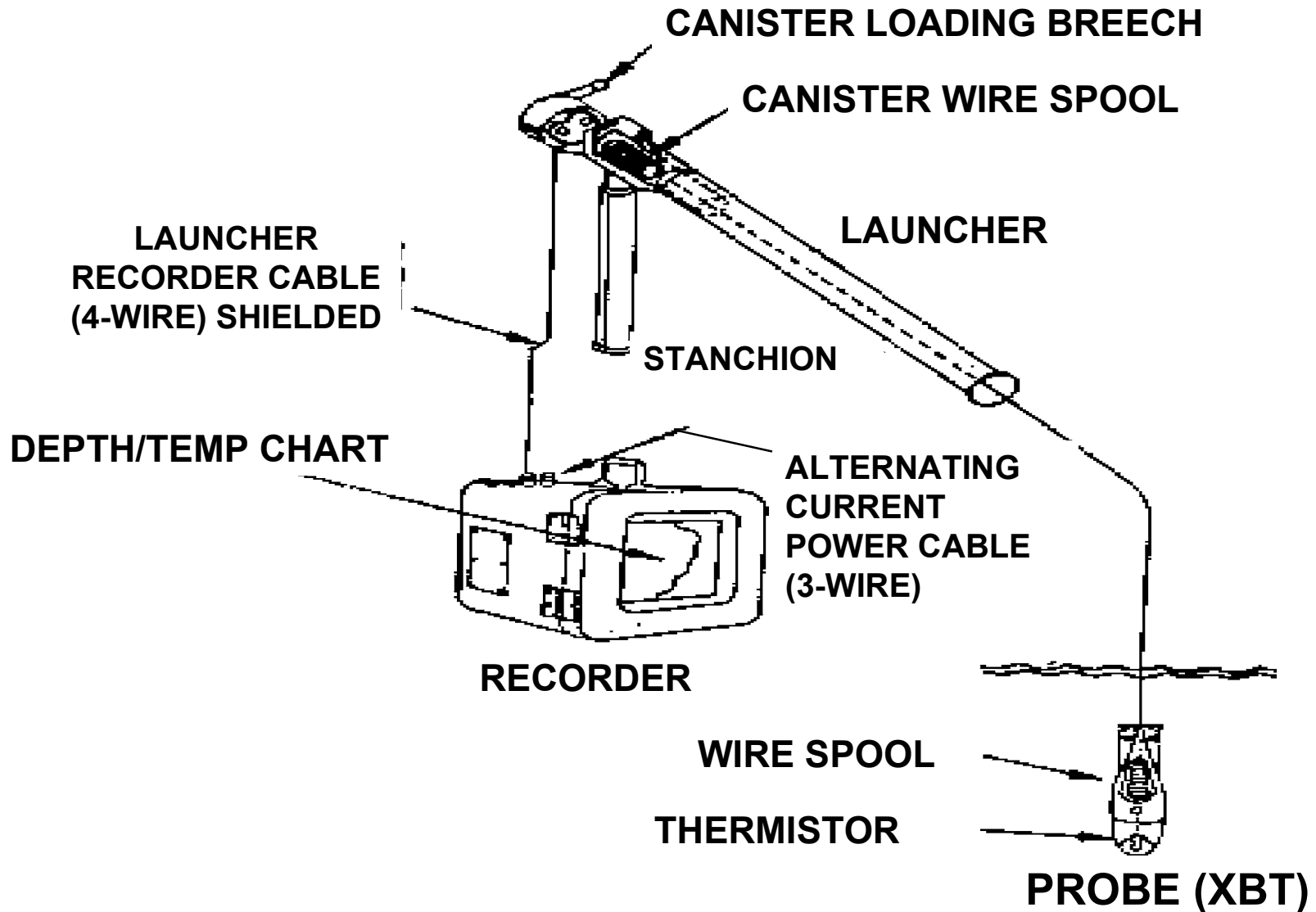
## **Bathythermograph Systems**

# Function

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**To measure and record subsurface water temperature at various depths. Then use the temperature profile to determine a sound speed profile.**

# XBT COMPONENTS



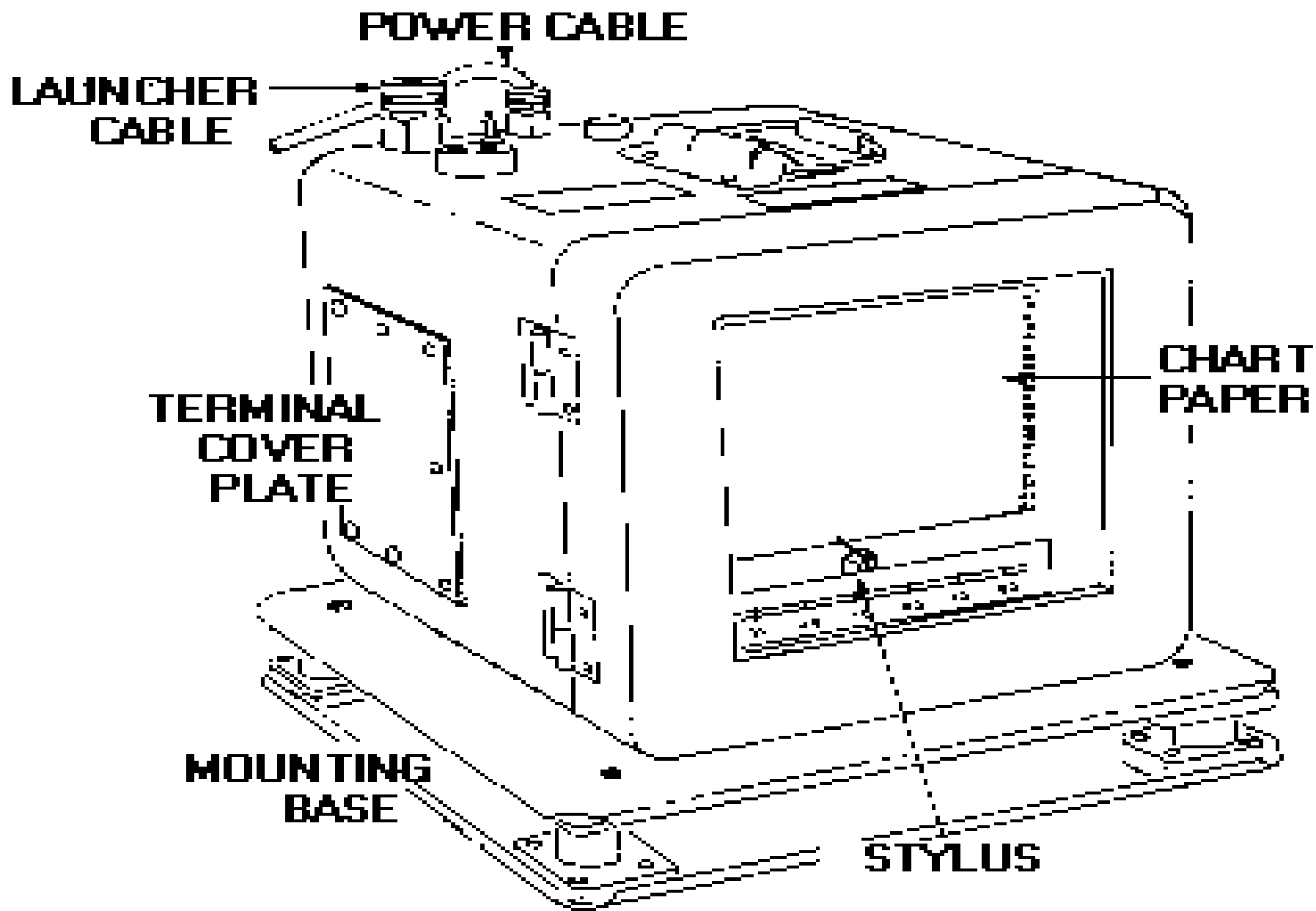


Figure 5-1.—RO-326A/NNQ-56 battery thermograph data recorder.

# BT Launcher Types

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- **Through Hull - AN/SSQ-61**
- **Deck Mounted - AN/SSQ-56A**

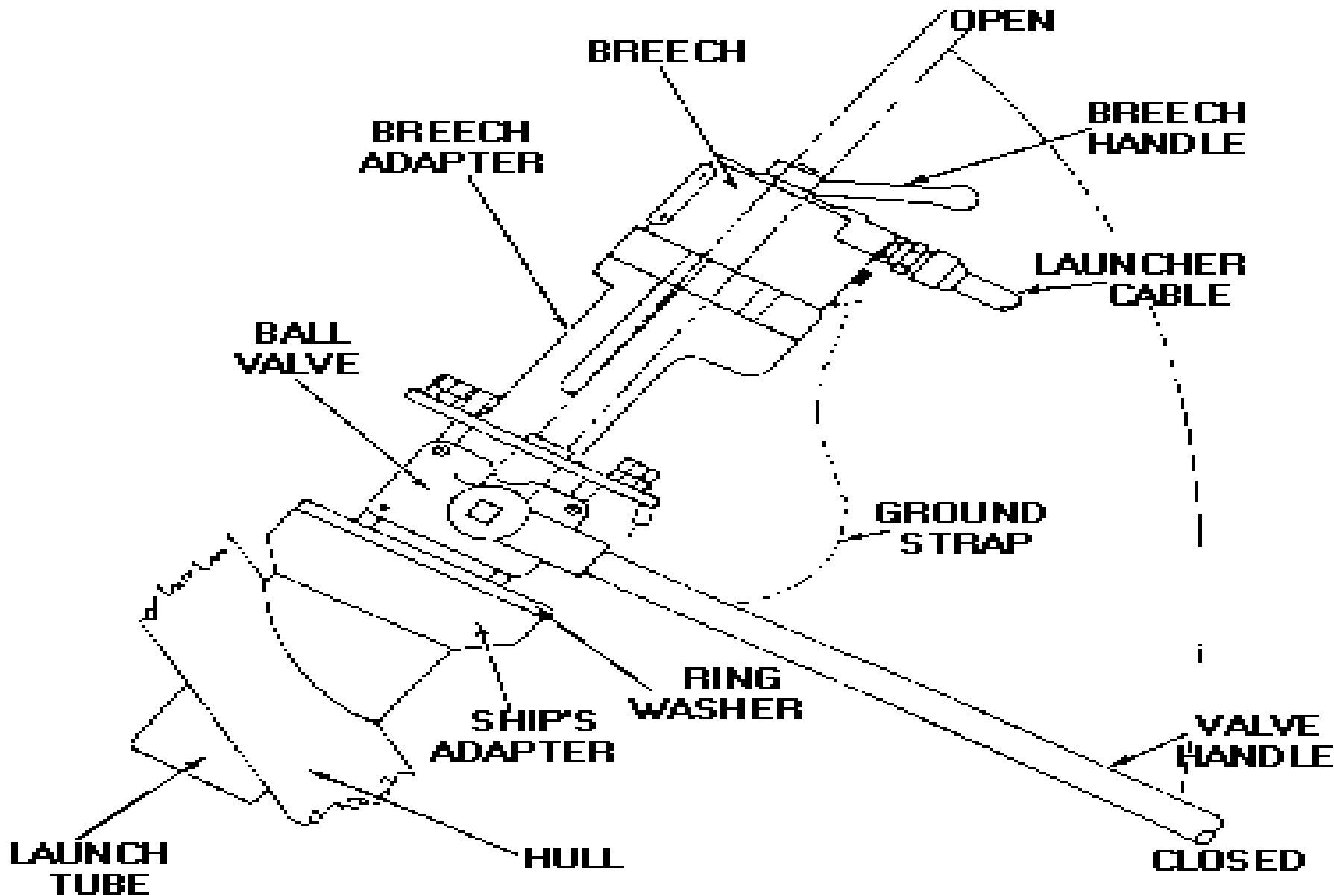


Figure 5-2. Mkc-8577/NSQ-61 bathythermograph through-the-hull launcher.



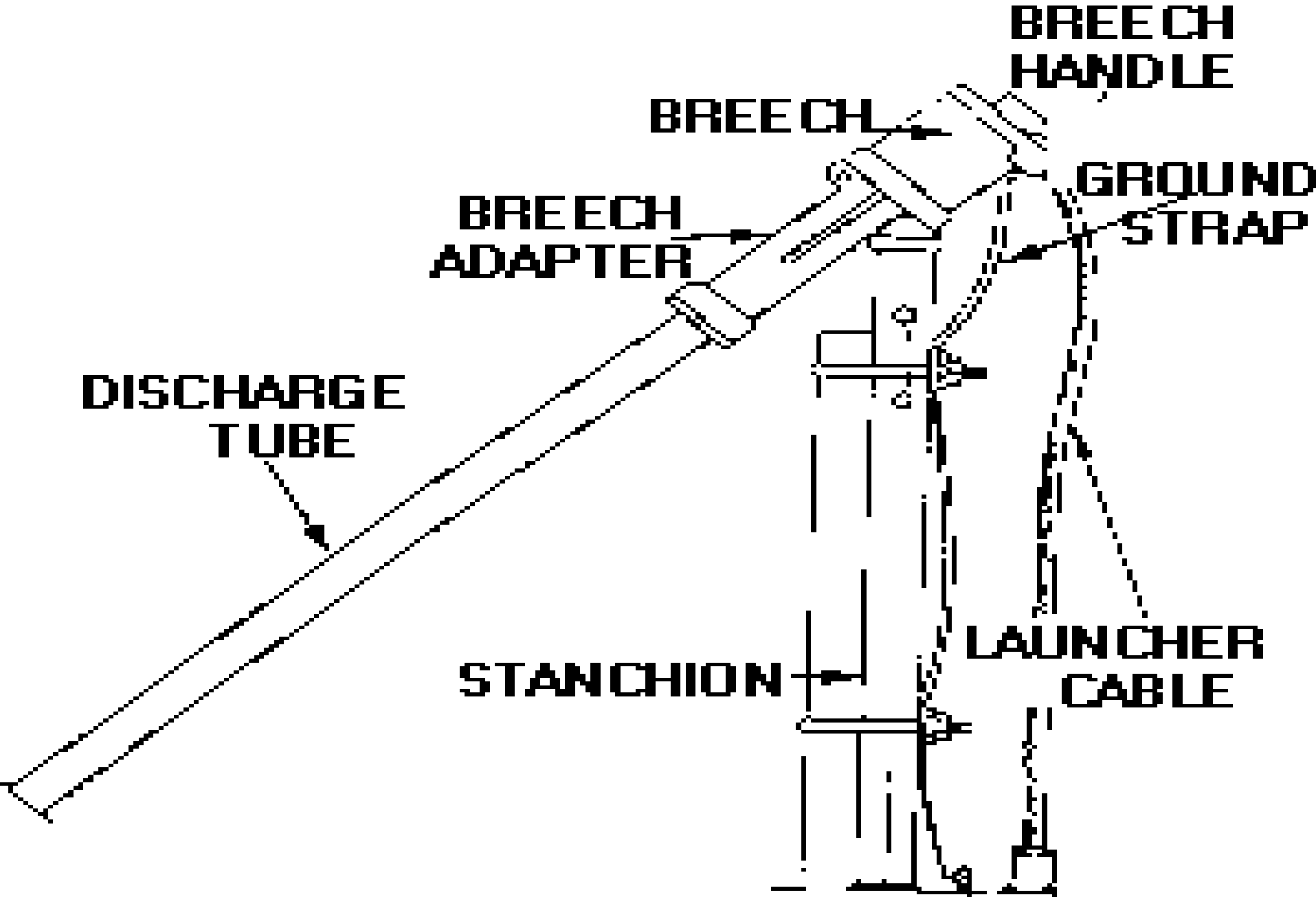
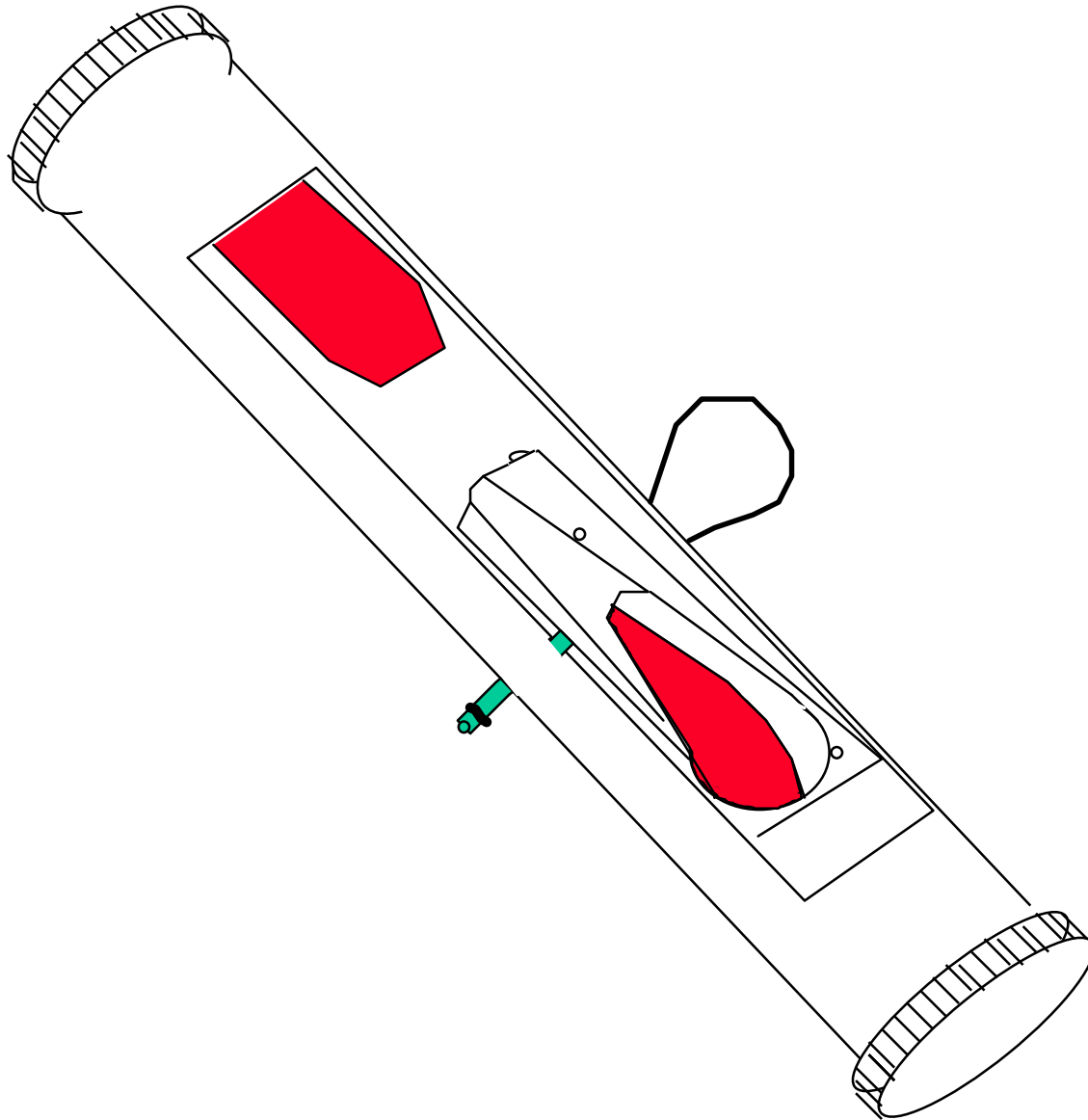


Figure 5-3. MK-7594/NSQ-56 deck-mounted launcher.

# XBT PACKAGE



# Probe Types and Max Depths

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**T4 - 1500FT (460M)**

**T7 - 2500FT (760M)**

**AN/SQQ-36 - 1000FT**

**SSXBT - 2500FT (760M)**

# BT Launch Operation

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**“X” Turn on power at recorder**

**“Y” Opens ball valve**

**“Y” Loads BT and locks breech**

**“X” Verifies automatic start sequence of recorder**

**“Y” Pulls pin and releases BT**

**“X” Verifies proper recording**

**“Y” Removes canister, closes ball valve and breech**

**“X” Evaluates trace**

# Basic Oceanography and Acoustic Training

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## **Bathythermograph Encoding/Decoding**

**ENCODED  
BT  
MESSAGE**

PRIORITY

P 020200Z JAN 96 PSN 352468S28

FM USS UNDERWAY

TO FLENUMMETOCEN DATA MONTEREY CA  
OCEANO WEST

C O N F I D E N T I A L //N03140//

JJXX

...

		SQDN TYPE	SQDN NMBR	SORTIE NUMBER	YR	MON		
B	A						Z	T

### III. RADIO MESSAGE INFORMATION

1			
MESSAGE PREFIX			
M1	M1	M1	M1
J	J	X	X

2		
DATE (GMT)		
DAY	MONTH	YR
Y Y	M M	J

3		
TIME (GMT)		
HOU	MIN	
G G	g g	

QU AD	4				
	LATITUDE				
	DEG		MIN		
QC	La	La	La	La	

5				
LONGITUDE				
DEG		MIN		

6				
INDICATOR GROUP				
8	8	8	8	8

### BATHYTHERMOGRAPHIC TRACE READINGS

DEPTH		TEMP		
Zo	Zo	To	To	To
O	O			
Z	Z	Tz	Tz	Tz
Z	Z	Tz	Tz	Tz

DEPTH		TEMP		
Z	Z	Tz	Tz	Tz
Z	Z	Tz	Tz	Tz
Z	Z	Tz	Tz	Tz

DEPTH		TEMP		
Z	Z	Tz	Tz	Tz
Z	Z	Tz	Tz	Tz
Z	Z	Tz	Tz	Tz

DEPTH		TEMP		
Z	Z	Tz	Tz	Tz
Z	Z	Tz	Tz	Tz
Z	Z	Tz	Tz	Tz

DEPTH		TEMP		
Z	Z	Tz	Tz	Tz
Z	Z	Tz	Tz	Tz
Z	Z	Tz	Tz	Tz

DEPTH		TEMP		
Z	Z	Tz	Tz	Tz
Z	Z	Tz	Tz	Tz
Z	Z	Tz	Tz	Tz

**RADIO MESSAGE INFORMATION**

**“JJXX”**

1				
Message				
Prefix				
M <sub>i</sub>	M <sub>i</sub>	M <sub>j</sub>	M <sub>j</sub>	
<b>J</b>	<b>J</b>	<b>Y</b>	<b>Y</b>	

2				
DATE (UTC)				
DAY		MONTH		YR
Y	Y	M	M	Y

3				
TIME (UTC)				
HOUR		MIN		
G	G	g	g	

Q u a d	4				
	LATITUDE				
	DEG		MIN		
	L <sub>a</sub>	L <sub>a</sub>	L <sub>a</sub>	L <sub>a</sub>	L <sub>a</sub>
Q <sub>c</sub>					

5				
LONGITUDE				
DEG		MIN		
L <sub>o</sub>	L <sub>o</sub>	L <sub>o</sub>	L <sub>o</sub>	L <sub>o</sub>

6				
INDICATOR GROUP				
<b>8</b>	<b>8</b>	<b>8</b>	<b>8</b>	<b>8</b>

7				
INSTRUMENTS				
BT TYPE			RECORDER	
I <sub>x</sub>	I <sub>x</sub>	I <sub>x</sub>	X <sub>r</sub>	X <sub>r</sub>

DEPTH		TEMP		
Z <sub>0</sub>	Z <sub>0</sub>	T <sub>0</sub>	T <sub>0</sub>	T <sub>0</sub>
<b>0</b>	<b>0</b>			

DEPTH		TEMP		
Z	Z	T <sub>z</sub>	T <sub>z</sub>	T <sub>z</sub>

DEPTH		TEMP		
Z	Z	T <sub>z</sub>	T <sub>z</sub>	T <sub>z</sub>

DEPTH		TEMP		
Z	Z	T <sub>z</sub>	T <sub>z</sub>	T <sub>z</sub>

DEPTH		TEMP		
Z	Z	T <sub>z</sub>	T <sub>z</sub>	T <sub>z</sub>

DEPTH		TEMP		
Z	Z	T <sub>z</sub>	T <sub>z</sub>	T <sub>z</sub>

DEPTH		TEMP		
Z	Z	T <sub>z</sub>	T <sub>z</sub>	T <sub>z</sub>

Z	Z	T <sub>z</sub>	T <sub>z</sub>	T <sub>z</sub>

Z	Z	T <sub>z</sub>	T <sub>z</sub>	T <sub>z</sub>

Z	Z	T <sub>z</sub>	T <sub>z</sub>	T <sub>z</sub>

Z	Z	T <sub>z</sub>	T <sub>z</sub>	T <sub>z</sub>

Z	Z	T <sub>z</sub>	T <sub>z</sub>	T <sub>z</sub>

Z	Z	T <sub>z</sub>	T <sub>z</sub>	T <sub>z</sub>

Z	Z	T <sub>z</sub>	T <sub>z</sub>	T <sub>z</sub>

Z	Z	T <sub>z</sub>	T <sub>z</sub>	T <sub>z</sub>

Z	Z	T <sub>z</sub>	T <sub>z</sub>	T <sub>z</sub>

Z	Z	T <sub>z</sub>	T <sub>z</sub>	T <sub>z</sub>

Z	Z	T <sub>z</sub>	T <sub>z</sub>	T <sub>z</sub>

Z	Z	T <sub>z</sub>	T <sub>z</sub>	T <sub>z</sub>

RADIO CALL				

# RADIO MESSAGE INFORMATION

## “JJYY”



# Sample BT Messages

---

JJYY 17028 00009 72910 13621 88888 42102  
00646 09645 15639 36636 45620 49600 52570  
55566 59549 68534 76518 90503 99901 03469  
18463 30448 50430 XXXX

---

JJYY 06028 00009 73200 12100 88888 99999 00614  
01614 02614 04614 06614 08615 11615 13613  
16606 21592 25581 33552 41517 49506 66486  
98461 99901 31443 64431 97420 99902 30411  
62404 95398 99903 28392 61387 94383 99904  
27379 59375 92372 99905 74364 99906 56359  
99908 20353 99909 84350 99911 72350 C001

---

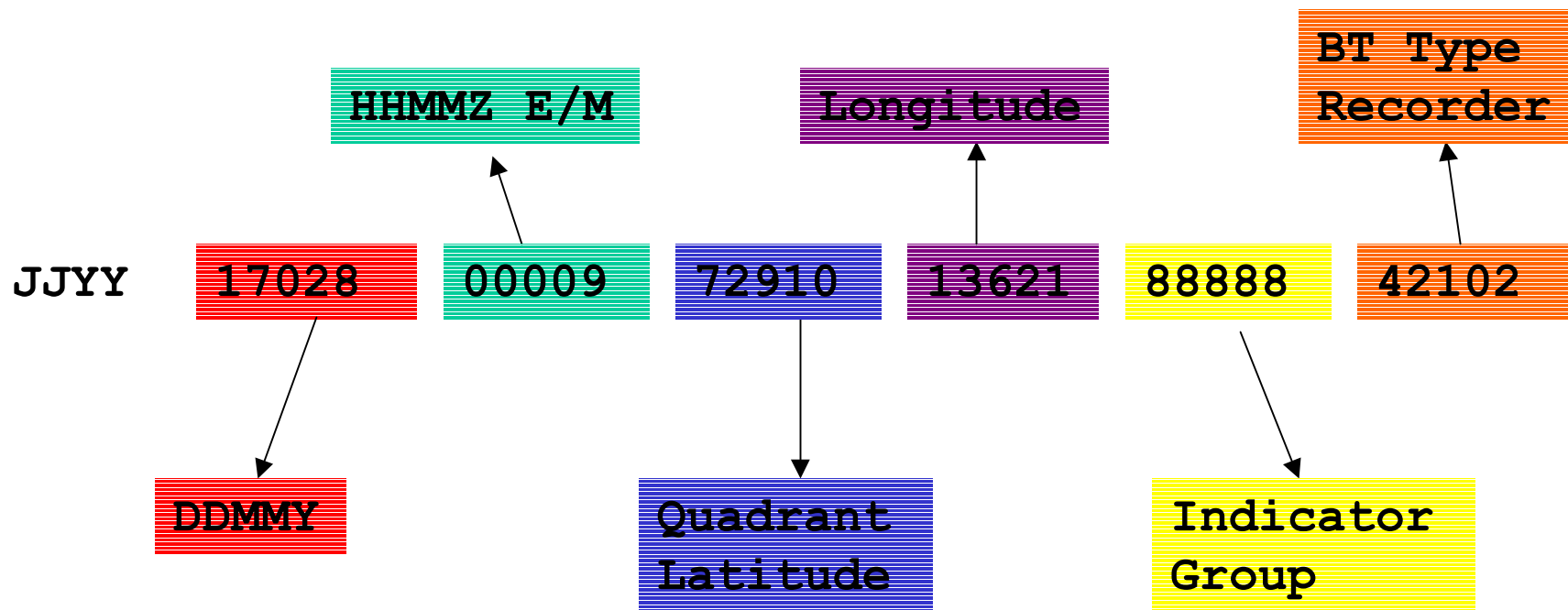
JJYY 26028 0000/ 73246 11834 88888 42102  
00167 52167 75165 90150 99901 20140 50125  
99902 00115 50105 99903 10095 99904 00091  
30090 57085

# Mandatory Reporting Points

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- **Surface Temperature**
- **Mixed Layer Depth**
- **Depth of termination for the observation**

# Sample BT Message



```
JJYY 17028 00009 72910 13621 88888 42102
00646 09645 15639 36636 45620 49600 52570
55566 59549 68534 76518 90503 99901 03469
18463 30448 50430 XXXX
```

# Table 5

## *Quadrants of the Globe*

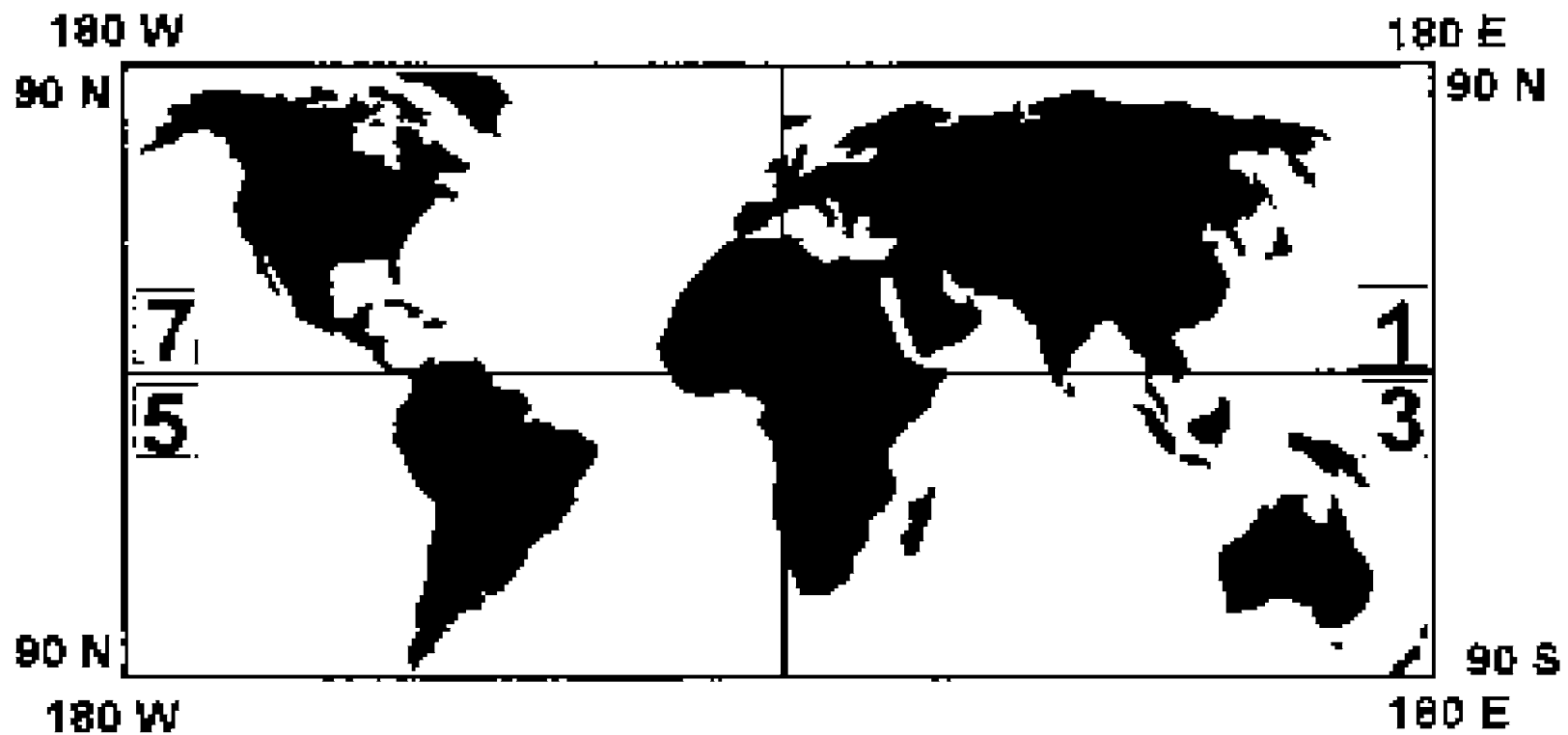
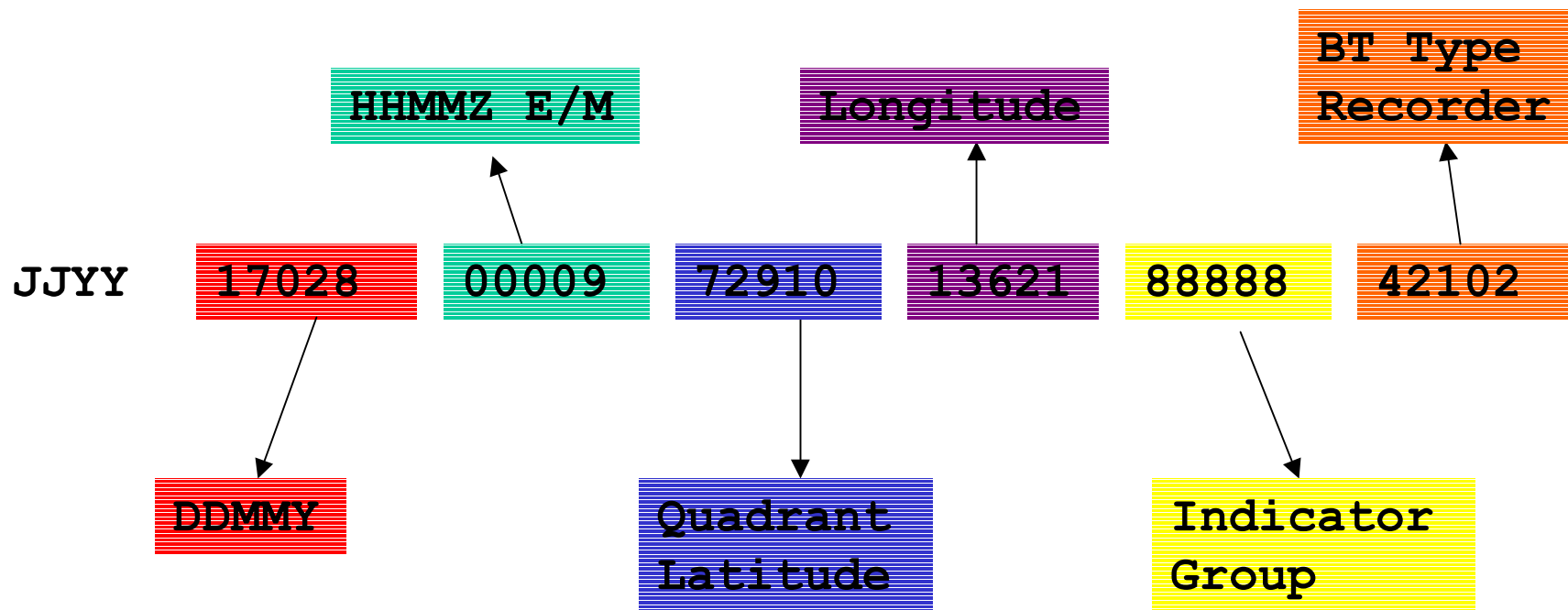


Figure F.1. Quadrants of the Globe - Table 5

# Sample BT Message



```
JJYY 17028 00009 72910 13621 88888 42102
00646 09645 15639 36636 45620 49600 52570
55566 59549 68534 76518 90503 99901 03469
18463 30448 50430 XXXX
```

# BT Types

---

<u>Code</u>	<u>Instrument</u>	<u>A</u>	<u>B</u>	<u>Max Depth</u>
001	Sippican T-4	6.472	-2.16	1500FT
002	Sippican T-4	6.691	-2.25	1500FT
041	Sippican T-7	6.472	-2.16	2500FT
061	Sippican T-10	6.031	-2.16	660FT
421	Spartan XBT-4	6.472	-2.16	
431	Spartan XBT-5	6.828	-1.82	
999	Unknown			

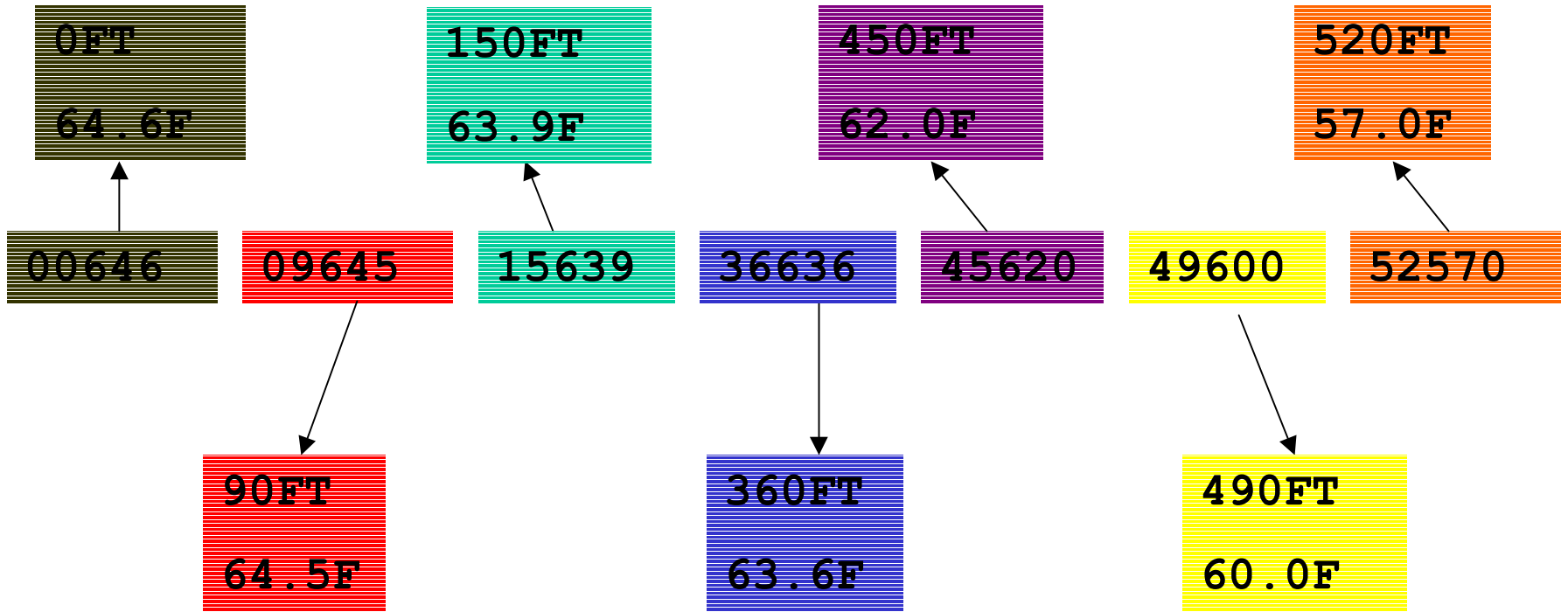
Equation:  $z = At + 10^{-3} Bt^2$

# Recorder Types

---

<u>Code</u>	<u>Recorder</u>
02	Sippican MK2A/SSQ-61
04	Sippican An/BQH-7/MK8
05	Sippican MK-12
99	Unknown

# Sample BT Message



```
JJYY 17028 00009 72910 13621 88888 42102
00646 09645 15639 36636 45620 49600 52570
55566 59549 68534 76518 90503 99901 03469
18463 30448 50430 XXXX
```



# 999NN Group

---

## Depth (meters)

## 999NN group encoded

00-99

None

100-199

99901

200-299

99902

300-399

99903

etc.

---

## Depth (feet)

## 999NN group encoded

00-999

None

1000-1999

99901

2000-2999

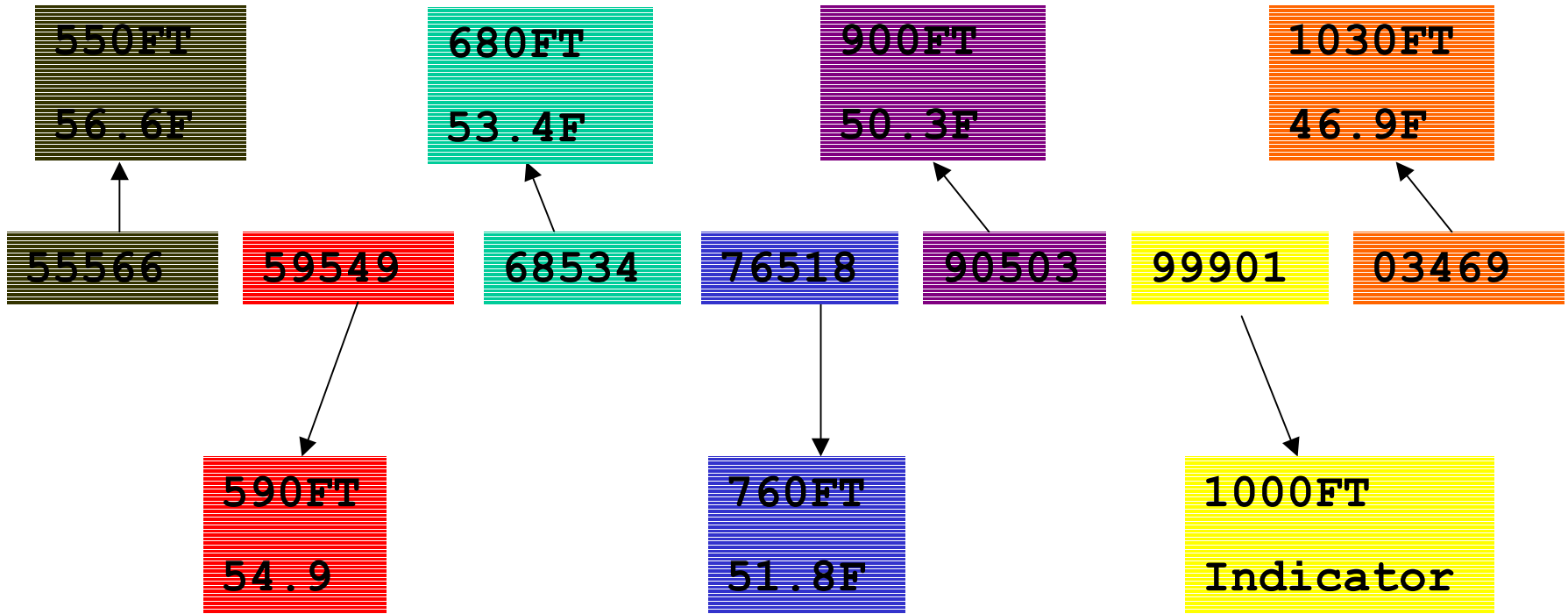
99902

3000-3999

99903

etc.

# Sample BT Message



```
JJYY 17028 00009 72910 13621 88888 42102  
00646 09645 15639 36636 45620 49600 52570  
55566 59549 68534 76518 90503 99901 03469  
18463 30448 50430 XXXX
```

0.0	64.6
90.0	64.5
150.0	63.9
360.0	63.6
450.0	62.0
490.0	60.0
520.0	57.0
550.0	56.6
590.0	54.9
680.0	53.4
760.0	51.8
900.0	50.3
1030.0	46.9
1180.0	46.3
1300.0	44.8
1500.0	43.0

Delete Selected Point(s)

Add a Point

Cursor Position  
Depth

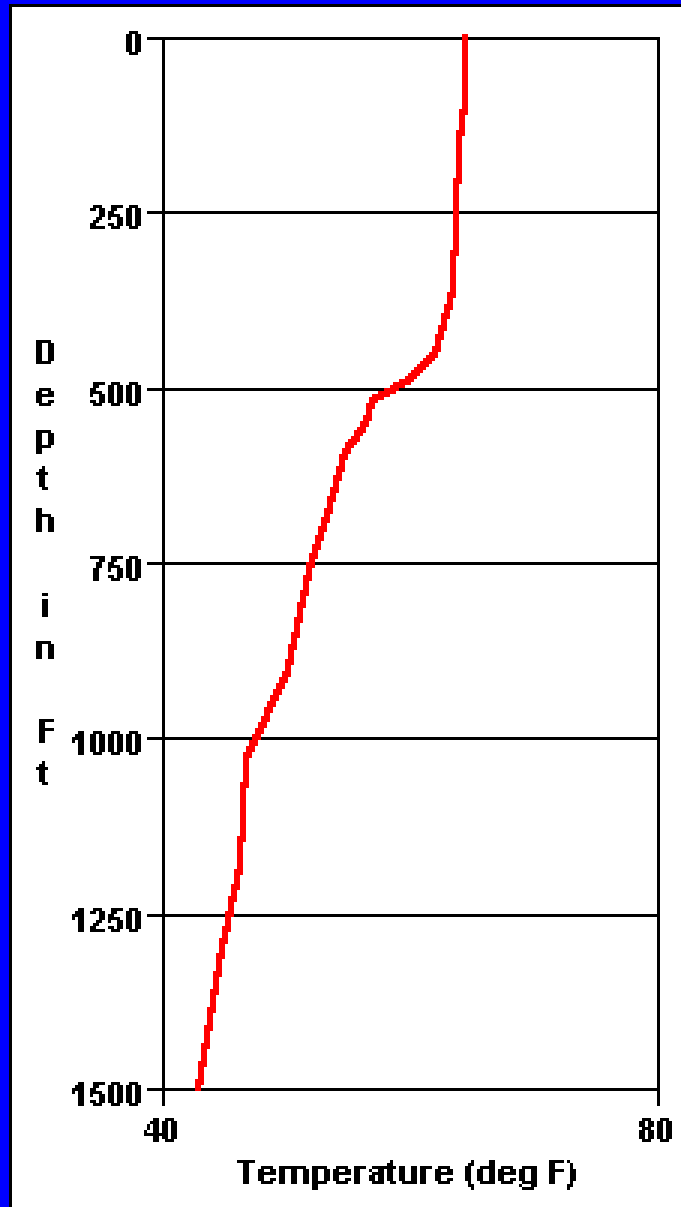
214.3

Temperature

34.2

Merge with Historical

wenzel.txt  
29 10 N / 136 21 W



# Sample BT Message

---

```
JJYY 26028 0000/ 73246 11834 88888 42102  
00167 52167 75165 90150 99901 20140 50125  
99902 00115 50105 99903 10095 99904 00091  
30090 57085
```

# Sample BT Message

---

```
JJYY 26028 0000/ 73246 11834 88888 42102
00167 52167 75165 90150 99901 20140 50125
99902 00115 50105 99903 10095 99904 00091
30090 57085
```

---

M	°C	M	°C	M	°C
0	16.7	120	14.0	310	9.5
52	16.7	150	12.5	400	9.1
75	16.5	200	11.5	430	9.0
90	15.0	250	10.5	457	8.5

# Miscellaneous BT Codes

---

- Negative Temperatures (< 0°C)?

# Miscellaneous BT Codes

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- Negative Temperatures ( $< 0^{\circ}\text{C}$ )?
  - $5T_zT_z$  - 5 takes the place of the minus sign

# Miscellaneous BT Codes

---

- Negative Temperatures ( $< 0^{\circ}\text{C}$ )?
  - $5T_zT_z$  - 5 takes the place of the minus sign
- BT Hit the Bottom?



# Miscellaneous BT Codes

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- **Negative Temperatures (< 0°C)?**
  - $5T_zT_z$  - 5 takes the place of the minus sign
  
- **0000 Code group - Reported after the last depth/temperature group if last Z/T group is the ocean bottom reading.**

# SVPD Message Format

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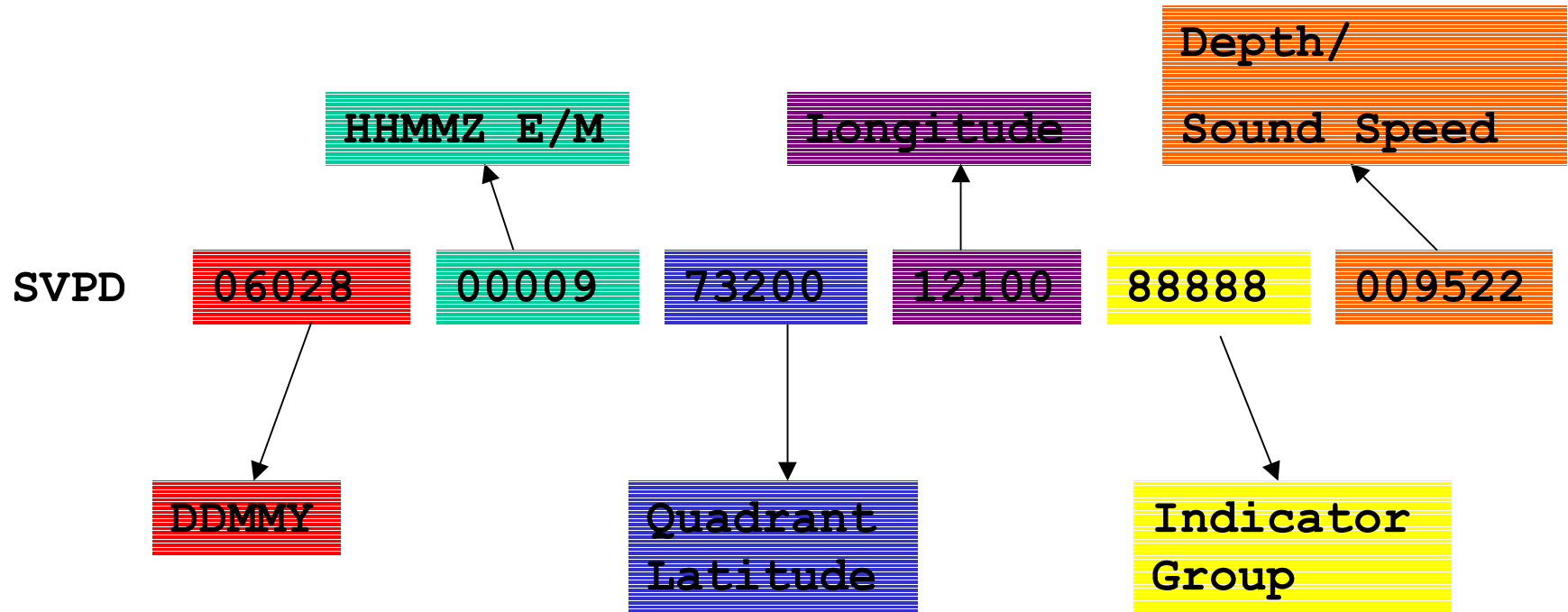
- **Same general format as JJXX**
- **If English, add 4000 or 5000 to sound speed value**
- **If Metric, add 1000 to sound speed value**

# Sample SVPG Message

---

```
SVPD 06028 00009 73200 12100 88888 009522 019524
029526 049529 069533 089544 119548 139539 169507
219434 259380 339222 419020 498963 668865 988752
999901 318682 648653 978633 999902 308623 628623
958633 999903 288647 618665 948686 999904 278710
598736 928765 999905 748845 999906 568943 999908
209178 999909 849442 999911 729442 C001
```

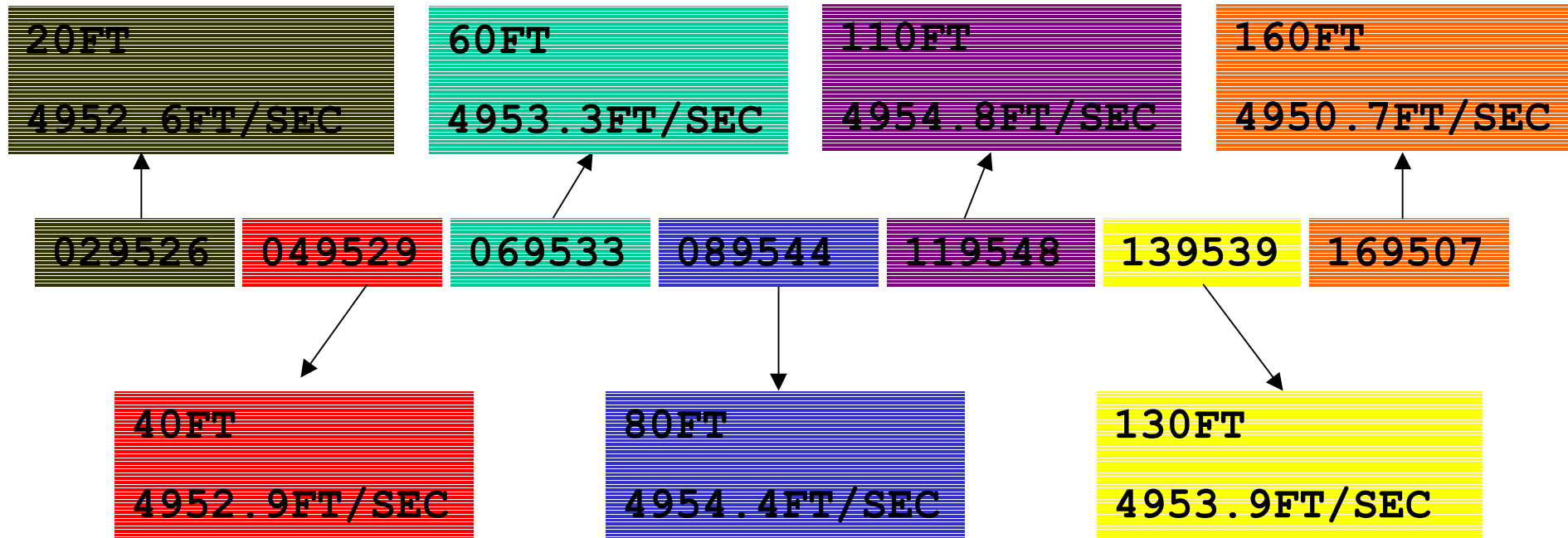
# Sample SVPD Message



```

SVPD 06028 00009 73200 12100 88888 009522 019524
029526 049529 069533 089544 119548 139539 169507
219434 259380 339222 419020 498963 668865 988752
999901 318682 648653 978633 999902 308623 628623
958633 999903 288647 618665 948686 999904 278710
598736 928765 999905 748845 999906 568943 999908
209178 999909 849442 999911 729442 C001
  
```

# Sample SVPD Message



```
SVPD 06028 00009 73200 12100 88888 009522 019524
029526 049529 069533 089544 119548 139539 169507
219434 259380 339222 419020 498963 668865 988752
999901 318682 648653 978633 999902 308623 628623
958633 999903 288647 618665 948686 999904 278710
598736 928765 999905 748845 999906 568943 999908
209178 999909 849442 999911 729442 C001
```

# Sample SVPG Message

---

```
SVPD 06028 00009 73200 12100 88888 009522 019524
029526 049529 069533 089544 119548 139539 169507
219434 259380 339222 419020 498963 668865 988752
999901 318682 648653 978633 999902 308623 628623
958633 999903 288647 618665 948686 999904 278710
598736 928765 999905 748845 999906 568943 999908
209178 999909 849442 999911 729442 C001
```

---

	FT	FT/SEC		FT	FT/SEC		FT	FT/SEC
	0	4952.2		330	4922.2		3280	4864.7
	10	4952.4		410	4902.0		3610	4866.5
	20	4952.6		490	4896.3		3940	4868.6
	40	4952.9		660	4886.5		4270	4871.0
	60	4953.3		980	4875.2		4590	4873.6
	80	4954.4		1310	4868.2		4920	4876.5
<b>SLD</b> →	110	4954.8		1640	4865.3		5740	4884.5
	130	4953.9	<b>DSCA</b> →	1970	4863.3		6560	4894.3
	160	4950.7		2300	4862.3		8200	4917.8
	210	4943.4		2620	4862.3		9840	4944.2
	250	4938.0		2950	4863.3		11720	4922.4