Output	ID (MSB LSB)	Description
ALWAYS OUTPUT	**7F 7Fh**	**HEADER** (6 BYTES + [2 x No. OF DATA TYPES])
	00 00h	**FIXED LEADER DATA** (58 BYTES)
	00 80h	**VARIABLE LEADER DATA** (77 BYTES)
WATER PROFILING DATA WD command WP command	**01 00h**	**VELOCITY** (2 BYTES + 8 BYTES PER DEPTH CELL)
	02 00h	**CORRELATION MAGNITUDE** (2 BYTES + 4 BYTES PER DEPTH CELL)
	03 00h	**ECHO INTENSITY** (2 BYTES + 4 BYTES PER DEPTH CELL)
	04 00h	**PERCENT GOOD** (2 BYTES + 4 BYTES PER DEPTH CELL)
BP command #BJ command	**06 00h**	**BOTTOM TRACK DATA** (81 BYTES)
	58 00h	**BOTTOM TRACK COMMAND OUTPUT** (43 BYTES)
	58 03h	**BOTTOM TRACK HIGH RESOLUTION VELOCITY** (70 BYTES)
	58 04h	**BOTTOM TRACK RANGE** (41 BYTES)
	20 13h	**NAVIGATION PARAMETERS DATA** (85 BYTES)
#EE command	**30 00h**	**ENVIRONMENT COMMAND PARAMETERS OUTPUT** (47 BYTES)
	30 01h	**SENSOR SOURCE FOR DOPPLER PROCESSING** (62 BYTES)
ALWAYS OUTPUT		**CHECKSUM** (2 BYTES)

Figure 29. PD0 Standard Output Data Buffer Format

The Pathfinder always sends the Least Significant Byte (LSB) first.

Some data outputs are in bytes per depth cell. For example, if the WN-command = 30 (default), WD command = WD 111 110 000 (default), WP command > 0, BP command > 0, the required data buffer storage space is 951 bytes per ensemble. There are seven data types output for this example: Fixed Leader, Variable Leader, Velocity, Correlation Magnitude, Echo Intensity, Percent Good, and Bottom Track.

```
  20   BYTES OF HEADER DATA (6 + [2 x 7 Data Types])
  58   BYTES OF FIXED LEADER DATA (FIXED)
  77   BYTES OF VARIABLE LEADER DATA (FIXED)
 242   BYTES OF VELOCITY DATA (2 + 8 x 30)
 122   BYTES OF CORRELATION MAGNITUDE DATA (2 + 4 x 30)
 122   BYTES OF ECHO INTENSITY (2 + 4 x 30)
 122   BYTES OF PERCENT-GOOD DATA (2 + 4 x 30)
 122   BYTES OF PROFILE STATUS DATA (2 + 4 x 30)
  81   BYTES OF BOTTOM TRACK DATA (FIXED)
   2   BYTES OF CHECKSUM DATA (FIXED)
 968   BYTES OF DATA PER ENSEMBLE
```

Header Data Format

BYTE	BIT POSITIONS 7	6	5	4	3	2	1	0	
1	HEADER ID (7Fh)								
2	DATA SOURCE ID (7Fh)								
3	NUMBER OF BYTES IN ENSEMBLE								LSB
4									MSB
5	SPARE								
6	NUMBER OF DATA TYPES								
7	OFFSET FOR DATA TYPE #1								LSB
8									MSB
9	OFFSET FOR DATA TYPE #2								LSB
10									MSB
11	OFFSET FOR DATA TYPE #3								LSB
12									MSB
↓	(SEQUENCE CONTINUES FOR UP TO N DATA TYPES)								↓
2N+5	OFFSET FOR DATA TYPE #N								LSB
2N+6									MSB

See Table 32 for a description of the fields.

Figure 30. Binary Header Data Format

Fixed Leader Data Format

BYTE	BIT POSITIONS 7	6	5	4	3	2	1	0	
1	FIXED LEADER ID								LSB 00h
2									MSB 00h
3	CPU F/W VER.								
4	CPU F/W REV.								
5	SYSTEM CONFIGURATION								LSB
6									MSB
7	REAL/SIM FLAG								
8	LAG LENGTH								
9	NUMBER OF BEAMS								
10	NUMBER OF CELLS								
11	PINGS PER ENSEMBLE								LSB
12									MSB
13	DEPTH CELL LENGTH								LSB
14									MSB
15	BLANK AFTER TRANSMIT								LSB
16									MSB
17	PROFILING MODE								
18	LOW CORR THRESH								
19	NO. CODE REPS								
20									
21	ERROR VELOCITY MAXIMUM								LSB
22									MSB
23	TPP MINUTES								
24	TPP SECONDS								
25	TPP HUNDREDTHS								
26	COORDINATE TRANSFORM								
27	HEADING ALIGNMENT								LSB
28									MSB

BYTE	BIT POSITIONS 7	6	5	4	3	2	1	0	
29	HEADING BIAS								LSB
30									MSB
31	SENSOR SOURCE								
32	SENSORS AVAILABLE								
33	BIN 1 DISTANCE								
34									
35	XMIT PULSE LENGTH								LSB
36									MSB
37	SPARE								LSB
38									MSB
39	FALSE TARGET THRESH								
40	SPARE								
41	TRANSMIT LAG DISTANCE								LSB
42									MSB
43	SPARE								LSB
↓									↓
50									MSB
51	SYSTEM BANDWIDTH								LSB
52									MSB
53	SPARE								
54	SPARE								
55	System Serial Number								LSB
↓									↓
58									MSB

See Table 33 for a description of the fields

Figure 31. Fixed Leader Data Format

Variable Leader Data Format

BYTE	BIT POSITIONS 7	6	5	4	3	2	1	0	
1	VARIABLE LEADER ID								LSB 80h
2									MSB 00h
3	ENSEMBLE NUMBER								LSB
4									MSB
5	RTC YEAR								
6	RTC MONTH								
7	RTC DAY								
8	RTC HOUR								
9	RTC MINUTE								
10	RTC SECOND								
11	RTC HUNDREDTHS								
12	ENSEMBLE # MSB								
13	BIT RESULT								LSB
14									MSB
15	SPEED OF SOUND								LSB
16									MSB
17	DEPTH OF TRANSDUCER								LSB
18									MSB
19	HEADING								LSB
20									MSB
21	PITCH (TILT 1)								LSB
22									MSB
23	ROLL (TILT 2)								LSB
24									MSB
25	SALINITY								LSB
26									MSB
27	TEMPERATURE								LSB
28									MSB
29	MPT MINUTES								
30	MPT SECONDS								
31	MPT HUNDREDTHS								

BYTE	BIT POSITIONS 7	6	5	4	3	2	1	0	
32	HDG STD DEV								
33	PITCH STD DEV								
34	ROLL STD DEV								
35	ADC CHANNEL 0								
36	ADC CHANNEL 1								
37	ADC CHANNEL 2								
38	ADC CHANNEL 3								
39	ADC CHANNEL 4								
40	ADC CHANNEL 5								
41	ADC CHANNEL 6								
42	ADC CHANNEL 7								
43	ERROR STATUS WORD (ESW)								LSB
44									
45									
46									MSB
47	SPARE								
48									
49	PRESSURE								LSB
50									
51									
52									MSB
53	PRESSURE SENSOR VARIANCE								LSB
54									
55									
56									MSB
57	SPARE								
↓									↓
↓									↓
66									

BYTE	BIT POSITIONS 7	6	5	4	3	2	1	0	
67	HEALTH STATUS								
68	LEAK A COUNT								LSB
69									MSB
70	LEAK B COUNT								LSB
71									MSB
72	TX VOLTAGE								LSB
73									MSB
74	TX CURRENT								LSB
75									MSB
76	TRANSDUCER IMPEDANCE								LSB
77									MSB

Figure 32. Variable Leader Data Format

Variable Leader data refers to the dynamic Pathfinder data (from clocks/sensors) that change with each ping. The Pathfinder always sends Variable Leader data as output data (LSBs first).

Table 34: Variable Leader Data Format

Hex Digit	Binary Byte	Field	Description
1-4	1,2	VID / Variable Leader ID	Stores the Variable Leader identification word (MSB=00h LSB=80h).

5-8	3,4	Ens / Ensemble Number	This field contains the sequential number of the ensemble to which the data in the output buffer apply.
			Scaling: LSD = 1 ensemble; Range = 1 to 65,535 ensembles
			NOTE: The first ensemble collected is #1. At "rollover," we have the following sequence:
			`1 = ENSEMBLE NUMBER 1`
			`↓`
			`65535 = ENSEMBLE NUMBER 65,535 | ENSEMBLE`
			`0 = ENSEMBLE NUMBER 65,536 | #MSB FIELD`
			`1 = ENSEMBLE NUMBER 65,537 | (BYTE 12) INCR.`

9,10 11,12 13,14 15,16 17,18 19,22 21,22	5 6 7 8 9 10 11	RTC Year RTC Month RTC Day RTC Hour RTC Minute RTC Second RTC Hundredths	These fields contain the time from the Pathfinder's real-time clock (RTC) that the current data ensemble began. The TS- command (TS – Set Real-Time Clock) initially sets the clock. The Pathfinder does account for leap years.
23-24	12	Ensemble # MSB	This field increments each time the Ensemble Number field (bytes 3, 4) "rolls over." This allows ensembles up to 16,777,215. See Ensemble Number field above.

Velocity Data Format

BYTE	BIT POSITIONS 7/S	6	5	4	3	2	1	0	
1	VELOCITY ID								LSB 00h
2									MSB 01h
3	DEPTH CELL #1, VELOCITY 1								LSB
4									MSB
5	DEPTH CELL #1, VELOCITY 2								LSB
6									MSB
7	DEPTH CELL #1, VELOCITY 3								LSB
8									MSB
9	DEPTH CELL #1, VELOCITY 4								LSB
10									MSB
11	DEPTH CELL #2, VELOCITY 1								LSB
12									MSB
13	DEPTH CELL #2, VELOCITY 2								LSB
14									MSB
15	DEPTH CELL #2, VELOCITY 3								LSB
16									MSB
17	DEPTH CELL #2, VELOCITY 4								LSB
18									MSB
↓	(SEQUENCE CONTINUES FOR UP TO 128 CELLS)								↓
1019	DEPTH CELL #128, VELOCITY 1								LSB
1020									MSB
1021	DEPTH CELL #128, VELOCITY 2								LSB
1022									MSB
1023	DEPTH CELL #128, VELOCITY 3								LSB
1024									MSB
1025	DEPTH CELL #128, VELOCITY 4								LSB
1026									MSB

See Table 35 for description of fields

Figure 33. Velocity Data Format

The number of depth cells is set by the WN-command (WN – Number of Depth Cells).

Correlation Magnitude, Echo Intensity, Percent-Good, and Status Data Format

BYTE	BIT POSITIONS 7/S	6	5	4	3	2	1	0	
1	ID CODE								LSB
2									MSB
3	DEPTH CELL #1, FIELD #1								
4	DEPTH CELL #1, FIELD #2								
5	DEPTH CELL #1, FIELD #3								
6	DEPTH CELL #1, FIELD #4								
7	DEPTH CELL #2, FIELD #1								
8	DEPTH CELL #2, FIELD #2								
9	DEPTH CELL #2, FIELD #3								
10	DEPTH CELL #2, FIELD #4								
↓	(SEQUENCE CONTINUES FOR UP TO 128 BINS)								↓
511	DEPTH CELL #128, FIELD #1								
512	DEPTH CELL #128, FIELD #2								
513	DEPTH CELL #128, FIELD #3								
514	DEPTH CELL #128, FIELD #4								

See Table 36 through Table 39 for a description of the fields.

Figure 34. Correlation Magnitude, Echo Intensity, Percent-Good, and Status Data Format

The number of depth cells is set by the WN-command (WN – Number of Depth Cells).

Binary Bottom-Track Data Format

BYTE	BIT POSITIONS 7/S	6	5	4	3	2	1	0	
1	BOTTOM-TRACK ID								LSB 00h
2									MSB 06h
3	BT PINGS PER ENSEMBLE								LSB
4									MSB
5	RESERVED								LSB
6									MSB
7	BT CORR MAG MIN								
8	BT EVAL AMP MIN								
9	RESERVED								
10	BT MODE								
11	BT ERR VEL MAX								LSB
12									MSB
13	RESERVED								
14									
15									
16									
17	BEAM#1 BT RANGE								LSB
18									MSB
19	BEAM#2 BT RANGE								LSB
20									MSB
21	BEAM#3 BT RANGE								LSB
22									MSB
23	BEAM#4 BT RANGE								LSB
24									MSB
25	BEAM#1 BT VEL								LSB
26									MSB
27	BEAM#2 BT VEL								LSB
28									MSB
29	BEAM#3 BT VEL								LSB
30									MSB
31	BEAM#4 BT VEL								LSB
32									MSB
33	BEAM#1 BT CORR.								
34	BEAM#2 BT CORR.								
35	BEAM#3 BT CORR.								
36	BEAM#4 BT CORR.								

BYTE	BIT POSITIONS 7/S	6	5	4	3	2	1	0	
37	BEAM#1 EVAL AMP								
38	BEAM#2 EVAL AMP								
39	BEAM#3 EVAL AMP								
40	BEAM#4 EVAL AMP								
41	BEAM#1 BT %GOOD								
42	BEAM#2 BT %GOOD								
43	BEAM#3 BT %GOOD								
44	BEAM#4 BT %GOOD								
45	REF LAYER MIN								LSB
46									MSB
47	REF LAYER NEAR								LSB
48									MSB
49	REF LAYER FAR								LSB
50									MSB
51	BEAM#1 REF LAYER VEL								LSB
52									MSB
53	BEAM #2 REF LAYER VEL								LSB
54									MSB
55	BEAM #3 REF LAYER VEL								LSB
56									MSB
57	BEAM #4 REF LAYER VEL								LSB
58									MSB
59	BM#1 REF CORR								
60	BM#2 REF CORR								
61	BM#3 REF CORR								
62	BM#4 REF CORR								
63	BM#1 REF INT								
64	BM#2 REF INT								
65	BM#3 REF INT								
66	BM#4 REF INT								
67	BM#1 REF %GOOD								
68	BM#2 REF %GOOD								
69	BM#3 REF %GOOD								
70	BM#4 REF %GOOD								
71	BT MAX. DEPTH								LSB
72									MSB

BYTE	BIT POSITIONS 7/S	6	5	4	3	2	1	0
73	BM#1 RSSI AMP							
74	BM#2 RSSI AMP							
75	BM#3 RSSI AMP							
76	BM#4 RSSI AMP							
77	GAIN							
78	(*SEE BYTE 17)							
79	(*SEE BYTE 19)							
80	(*SEE BYTE 21)							
81	(*SEE BYTE 23)							

Figure 35. Binary Bottom-Track Data Format

This data is output only if the BP-command is > 0 and PD0 is selected. See Table 40 for a description of the fields.

The PD0 output data format assumes that the instrument is stationary and the bottom is moving. Pathfinder (Speed Log) output data formats (see Special Output Data Formats) assume that the bottom is stationary and that the Pathfinder or vessel is moving.

This data is output only if the BP-command is greater than zero and PD0 is selected. The LSB is always sent first.

Table 40: Bottom-Track Data Format

Hex Digit	Binary Byte	Field	Description
1-4	1,2	ID Code	Stores the bottom-track data identification word (MSB=06h LSB=00h).
5-8	3,4	BP/BT Pings per ensemble	Stores the number of bottom-track pings to average together in each ensemble (BP – Bottom-Track Pings per Ensemble). If BP = 0, the Pathfinder does not collect bottom-track data. The Pathfinder automatically extends the ensemble interval (TE – Time Per Ensemble) if BP x TP > TE. Scaling: LSD = 1 ping; Range = 1 to 999 pings
9-12	5,6	Reserved	Reserved
13,14	7	BC/BT Corr Mag Min	Stores the minimum correlation magnitude value (BC - Correlation Magnitude Minimum). Scaling: LSD = 1 count; Range = 0 to 255 counts
15,16	8	BA/BT Eval Amp Min	Stores the minimum evaluation amplitude value (BA - Evaluation Amplitude Minimum). Scaling: LSD = 1 count; Range = 1 to 255 counts
17,18	9	Reserved	Reserved
19,20	10	BM/BT Mode	Stores the bottom-tracking mode.

Environmental Command Parameters Output Format

BIT POSITIONS									
BYTE	7	6	5	4	3	2	1	0	
1	FIXED ATTITUDE ID								LSB 00h
2									MSB 30h
3	ATTITUDE OUTPUT COORDINATES and PROCESSING CONTROL USING INTERPOLATED ATTITUDE (#EE)								
4									
5									
6									
7									
8									
9									
10									
11	RESERVED								
12	FIXED HEADING SCALING (#EH)								
13									
14	FIXED HEADING COORDINATE FRAME (#EH)								
15	ROLL MISALIGNMENT (#EI)								
16									
17	PITCH MISALIGNMENT (#EJ)								
18									
19	USER INPUT FOR PITCH, ROLL, and COORDINATE FRAME (#EP)								
20									
21									
22									
23									
24	USER INPUT FOR UP/DOWN ORIENTATION (#EU)								
25	USER INPUT FOR HEADING BIAS/VARIATION/SYNCHRO OFFSET (#EV)								
26									
27	SENSOR SOURCE (EZ)								
↓									↓
34									
35	TRANSDUCER DEPTH (ED)								
36									
37									
38									

BYTE	BIT POSITIONS 7	6	5	4	3	2	1	0
39	SALINITY (ES)							
40 41	WATER TEMPERATURE (ET)							
42 43	SPEED OF SOUND (EC)							
44	COORDINATE TRANSFORMATION (EX)							
45	3 BEAM SOLUTION (EX)							
46	BIN MAP (EX)							
47	MSB COORDINATE TRANSFORMATION (EX)							

Figure 36. Environmental Command Parameters Output Format

Environmental Command Parameters correspond to the most useful "E" menu command parameters. The Pathfinder will output Fixed Attitude data as output data (LSBs first). See Command Descriptions for detailed descriptions of commands used to set these values.

Table 41: Environmental Command Parameters Output Format

Hex Digit	Binary Byte	Field	Description
1-4	1,2	FAID / Fixed Attitude ID	Environmental Command Parameters Output word (MSB=30h, LSB=00h).
5-20	3-10	Attitude Output Coordinates	Stores the setting of the #EE command; a user input for the Variable Attitude data to be output (EE - Environmental Data Output).
21,22	11	Reserved	
23-27	12-13	Fixed Heading Scaling	Stores the setting of the #EH command; a user input for heading (EH - Heading).
28	14	Fixed Heading Coordinate Frame	Stores the setting of the #EH command coordinate frame: 1 is ship, 0 is instrument (EH - Heading).
29-32	15,16	Roll Misalignment	Stores the setting of the #EI command; a user input for the roll misalignment (EI - Roll Misalignment Angle).
33-36	17,18	Pitch Misalignment	Stores the setting of the #EJ command; a user input for the pitch misalignment (EJ - Pitch Misalignment Angle).
37-46	19-23	Pitch, Roll and Coordinate Frame	Stores the setting of the #EP command; a user input for the pitch, roll, and coordinate (instrument or ship) frame (EP - Pitch and Roll Angles).
47,48	24	Orientation	Stores the setting of the #EU command; a user input for the up/down orientation (EU - Up/Down Orientation).
49-52	25,26	Heading Offset	Stores the setting of the #EV command; a user input for the heading offset due to heading bias, variation, or synchro initialization (EV - Heading Bias).

Table 41: Environmental Command Parameters Output Format

Hex Digit	Binary Byte	Field	Description
53-68	27-34	Sensor Source	Stores the setting of the EZ command; a user input defining the use of internal, external, or fixed sensors (EZ - Sensor Source).
69-76	35-38	Transducer Depth	Stores the setting of the ED command; a user input defining depth of the transducer (see ED - Depth of Transducer).
77-78	39	Salinity	Stores the setting of the ES command; a user input defining the salinity of the water (see ES – Salinity).
79-82	40,41	Water Temp	Stores the setting of the ET command; a user input defining the temperature of the water (see ET - Temperature).
83-86	42,43	SoS	Stores the setting of the EC command; a user input defining the speed of sound (see EC - Speed of Sound).
87-88	44	Transform	Stores the setting of the right two digits of the EX command that describe the coordinate transformations (see EX – Coordinate Transformation).
89-90	45	3 Beam Solution	Stores the setting of the fourth bit of the EX command that allows 3 beams good (instead of 4) transformations.
91-92	46	Bin Map	Stores the setting of the fifth bit of the EX command that controls bin mapping.
93-94	47	MSB of EX transformation	Stores the setting of the left digit of the EX command that describes the coordinate transformations.

Bottom Track Command Output Format

BIT POSITIONS									
BYTE	7	6	5	4	3	2	1	0	
1.	BOTTOM TRACK COMMAND ID								LSB 00h
2.									MSB 58h
3.	AMPLITUDE THRESHOLD								
4.	CORRELATION MAGNITUDE								
5.	RESERVED								
6.									
7.	ERROR VELOCITY MAXIMUM								
8.									
9.	DEPTH GUESS								
10.									
11.	RESERVED								
12.	GAIN SWITCH THRESHOLD LOW								
13.	GAIN SWITCH THRESHOLD HIGH								

BYTE	BIT POSITIONS 7	6	5	4	3	2	1	0
14. 15.	GAIN SWITCH ALTITUDE							
16.	WATER MASS LAYER MODE							
17. 18.	WATER MASS LAYER MIN SIZE							
19. 20.	WATER MASS LAYER NEAR BOUNDARY							
21. 22.	WATER MASS LAYER FAR BOUNDARY							
23.	BOTTOM TRACK MODE							
24.	SPEED LOG HOLD TRACK							
25. 26.	SPEED LOG TIME-OUT							
27.	SPEED LOG FILTER TIME CONSTANT							
28. 29.	PINGS PER ENSEMBLE							
30. 31. 32. 33. 34. 35. 36.	RESERVED							
37. 38.	BT MAXIMUM TRACKING DEPTH							
39. 40.	RESERVED							
41.	TRANSMIT LENGTH							
42. 43.	RESERVED							

Figure 37. Bottom Track Command Output Data Format

Table 42. Bottom Track Command Output Data Format

Binary Byte	Field	Description
37-38	Maximum Tracking Depth	Stores the setting of the BX command; Setting are 10 to 65535 dm (see BX – Maximum Tracking Depth)
39 - 40	Reserved	Reserved
41	Transmit Length	Stores the setting of the #BY command; Setting are 0 to 100% (see #BY – Transmit Length)
42-43	Reserved	Reserved

Bottom Track High Resolution Velocity Format

	BIT POSITIONS								
BYTE	7	6	5	4	3	2	1	0	
1.	BOTTOM TRACK HIGH RESOLUTION VELOCITY ID								LSB 03h
2.									MSB 58h
3.	BT VELOCITY 1								
4.									
5.									
6.									
7.	BT VELOCITY 2								
8.									
9.									
10.									
11.	BT VELOCITY 3								
12.									
13.									
14.									
15.	BT VELOCITY 4								
16.									
17.									
18.									
19.	BT DISTANCE MADE GOOD 1								
20.									
21.									
22.									

BYTE	BIT POSITIONS 7	6	5	4	3	2	1	0
23. 24. 25. 26.	BT DISTANCE MADE GOOD 2							
27. 28. 29. 30.	BT DISTANCE MADE GOOD 3							
31. 32. 33. 34.	BT DISTANCE MADE GOOD 4							
35. 36. 37. 38.	WATER MASS VELOCITY 1							
39. 40. 41. 42.	WATER MASS VELOCITY 2							
43. 44. 45. 46.	WATER MASS VELOCITY 3							
47. 48. 49. 50.	WATER MASS VELOCITY 4							
51. 52. 53. 54.	WATER MASS DISTANCE MADE GOOD 1							

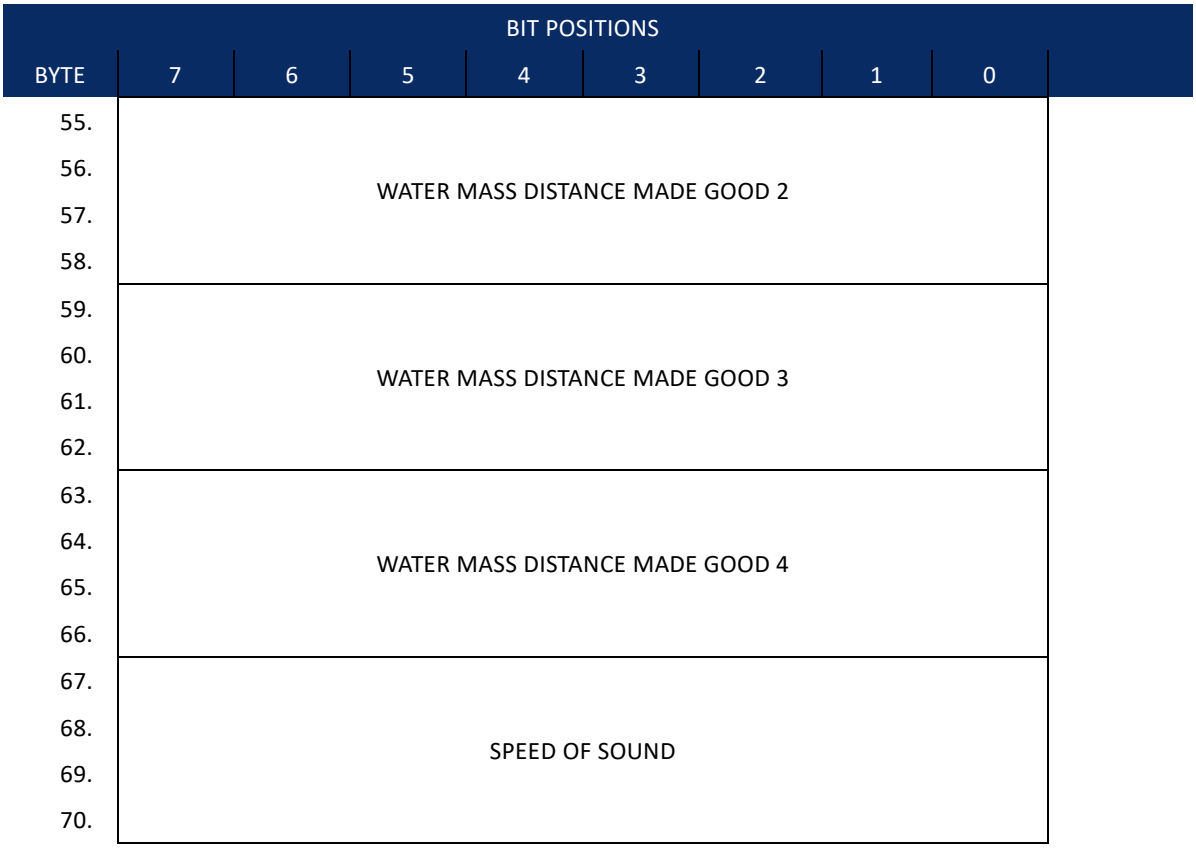

Figure 38. Bottom Track High Resolution Velocity Output Format

The sign of the bottom track and water mass layer velocities in the Bottom Track High Resolution Velocity Format indicate the direction the DVL or vessel is moving with respect to a stationary bottom and is the opposite sign of the velocities in the Binary Bottom Track Data Format.

This format is selected via the #BJ command (see BJ – Data Type Output Control).

Table 43: Bottom Track High Resolution Velocity Output Format

Binary Byte	Field	Description
1-2	ID	PD0 ID (MSB=58h LSB=03h)
3-6	BT Velocity 1	Bottom Track Axis 1 Velocity in 0.01mm/s. Reference frame dependent on EX – Coordinate Transformation.
7-10	BT Velocity 2	Bottom Track Axis 2 Velocity in 0.01mm/s. Reference frame dependent on EX command.
11-14	BT Velocity 3	Bottom Track Axis 3 Velocity in 0.01mm/s. Reference frame dependent on EX command.
15-18	BT Velocity 4	Bottom Track Axis 4 Velocity in 0.01mm/s. Reference frame dependent on EX command.

Bottom Track Range Format

BYTE	BIT POSITIONS 7	6	5	4	3	2	1	0	
1.	BOTTOM TRACK RANGE ID								LSB 04h
2.									MSB 58h
3.	Slant Range								
4.									
5.									
6.									
7.	Axis Delta Range								
8.									
9.									
10.									
11.	Vertical Range								
12.									
13.									
14.									
15.	% Good 4 Bm								
16.	% Good Bm 1&2								
17.	% Good Bm 3 & 4								
18.	BEAM 1 Raw Range								
19.									
20.									
21.									
22.	BEAM 2 Raw Range								
23.									
24.									
25.									
26.	BEAM 3 Raw Range								
27.									
28.									
29.									

BYTE	BIT POSITIONS 7	6	5	4	3	2	1	0
30. 31. 32. 33.	BEAM 4 Raw Range							
34.	BEAM 1 Raw Max BT Filter							
35.	BEAM 2 Raw Max BT Filter							
36.	BEAM 3 Raw Max BT Filter							
37.	BEAM 4 Raw Max BT Filter							
38.	BEAM 1 RAW MAX BT AMPLITUDE							
39.	BEAM 2 RAW MAX BT AMPLITUDE							
40.	BEAM 3 RAW MAX BT AMPLITUDE							
41.	BEAM 4 RAW MAX BT AMPLITUDE							

Figure 39. Bottom Track Range Output Data Format

This data type is output when selecting PD0 and the High Accuracy Bottom Track feature is installed (see OL – Display Feature List) and then selected via the #BJ command (see BJ – Data Type Output Control).

Table 44: Bottom Track Range Output Data Format

Binary Bytes	Field	Description
1-2	ID	PD0 ID (MSB=58h LSB=04h)
3-6	Slant Range	Average range to bottom along the Z axis of the instrument frame, averaged over the ensemble. Valid only for at least 2 beams good on axis; zero is output for invalid data. Units are 0.1mm.
7-10	Axis Delta Range	Difference in slant range between beam 1 & 2 estimate and beam 3 & 4 estimate averaged over the ensemble. Valid only for 4 beam good pings. Units are 0.1mm.
11-14	Vertical Range	Average vertical range (altitude) of bottom depth (accounting for instrument tilt) over the ensemble. Zero is output if vertical range cannot be calculated because less than three beams are good, etc. Units are 0.1mm.
15	% Good 4 Bm	Percent Good 2 axis (4 Bm) slant range solutions.
16	% Good Bm 1&2	Percent Good axis Bm 1 & 2 slant range solutions.
17	% Good Bm 3 & 4	Percent Good axis Bm 3 & 4 slant range solutions.
18-21	BM 1 Raw Range	Slant range to the bottom along beam 1 multiplied by cos(Janus), averaged over the ensemble, even if fewer than 3 beams detect the bottom. Units 0.1mm

Navigation Parameters Data Format

BYTE	BIT POSITIONS 7	6	5	4	3	2	1	0	
1	ID_NAV_PARAMS								LSB 13h
2									MSB 20h
3	TIME-TO-BOTTOM BEAM 1								LSB
4									
5									
6									MSB
7	TIME-TO-BOTTOM BEAM 2								LSB
8									
9									
10									MSB
11	TIME-TO-BOTTOM BEAM 3								LSB
12									
13									
14									MSB
15	TIME-TO-BOTTOM BEAM 4								LSB
16									
17									
18									MSB
19	BOTTOM TRACK STANDARD DEVIATION BEAM 1								LSB
20									MSB
21	BOTTOM TRACK STANDARD DEVIATION BEAM 2								LSB
22									MSB
23	BOTTOM TRACK STANDARD DEVIATION BEAM 3								LSB
24									MSB
25	BOTTOM TRACK STANDARD DEVIATION BEAM 4								LSB
26									MSB
27	SHALLOW OPERATION FLAG								
28	TIME-TO-WATER MASS LAYER BEAM 1								LSB
29									
30									
31									MSB

BYTE	BIT POSITIONS 7	6	5	4	3	2	1	0	
32	TIME-TO-WATER MASS LAYER BEAM 2								LSB
33									
34									
35									MSB
36	TIME-TO-WATER MASS LAYER BEAM 3								LSB
37									
38									
39									MSB
40	TIME-TO-WATER MASS LAYER BEAM 4								LSB
41									
42									
43									MSB
44	RANGE TO WATER MASS CELL								LSB
45									MSB
46	WATER TRACK STANDARD DEVIATION BEAM 1								LSB
47									MSB
48	WATER TRACK STANDARD DEVIATION BEAM 2								LSB
49									MSB
50	WATER TRACK STANDARD DEVIATION BEAM 3								LSB
51									MSB
52	WATER TRACK STANDARD DEVIATION BEAM 4								LSB
53									MSB
54	BOTTOM TRACK TIME-OF-VALIDITY BEAM 1								LSB
55									
56									
57									MSB
58	BOTTOM TRACK TIME-OF-VALIDITY BEAM 2								LSB
59									
60									
61									MSB

BYTE	BIT POSITIONS 7	6	5	4	3	2	1	0	
62	BOTTOM TRACK TIME-OF-VALIDITY BEAM 3								LSB
63									
64									
65									MSB
66	BOTTOM TRACK TIME-OF-VALIDITY BEAM 4								LSB
67									
68									
69									MSB
70	WATER TRACK TIME-OF-VALIDITY BEAM 1								LSB
71									
72									
73									MSB
74	WATER TRACK TIME-OF-VALIDITY BEAM 2								LSB
75									
76									
77									MSB
78	WATER TRACK TIME-OF-VALIDITY BEAM 3								LSB
79									
80									
81									MSB
82	WATER TRACK TIME-OF-VALIDITY BEAM 4								LSB
83									
84									
85									MSB

Figure 40. Navigation Parameters Data Format

Sensor Source for Doppler Processing Format

BYTE	BIT POSITIONS 7	6	5	4	3	2	1	0	
1.	SENSOR SOURCE FOR DOPPLER PROCESSING FORMAT ID								01h LSB
2.									30h MSB
3.	HEADING								
4.									
5.									
6.									
7.	HEADING STATUS								
8.	HEADING SOURCE								
9.									
10.	PITCH								
11.									
12.									
13.									
14.	PITCH STATUS								
15.	PITCH SOURCE								
16.									
17.	ROLL								
18.									
19.									
20.									
21.	ROLL STATUS								
22.	ROLL SOURCE								
23.									
24.	SOS								
25.									
26.									
27.									
28.	SOS STATUS								
29.	SOS SOURCE								
30.									
31.	TEMPERATURE								

BYTE	BIT POSITIONS 7	6	5	4	3	2	1	0
32. 33. 34.								
35.	TEMPERATURE STATUS							
36. 37.	TEMPERATURE SOURCE							
38. 39. 40. 41.	SALINITY							
42.	SALINITY STATUS							
43. 44.	SALINITY SOURCE							
45. 46. 47. 48.	DEPTH							
49.	DEPTH STATUS							
50. 51.	DEPTH SOURCE							
52. 53. 54. 55.	PRESSURE							
56.	PRESSURE STATUS							
57. 58.	PRESSURE SOURCE							
59. 60. 61. 62.	ENSEMBLE TIMER TICKS							

Figure 43. Sensor Source for Doppler Processing Output Format