

ALWAYS OUTPUT	<b>HEADER</b> (6 BYTES + [2 x No. OF DATA TYPES])
	<b>FIXED LEADER DATA</b> (53 BYTES)
	<b>VARIABLE LEADER DATA</b> (65 BYTES)
WD-command WP-command	<b>VELOCITY</b> (2 BYTES + 8 BYTES PER DEPTH CELL)
	<b>CORRELATION MAGNITUDE</b> (2 BYTES + 4 BYTES PER DEPTH CELL)
	<b>ECHO INTENSITY</b> (2 BYTES + 4 BYTES PER DEPTH CELL)
	<b>PERCENT GOOD</b> (2 BYTES + 4 BYTES PER DEPTH CELL)
BP-command	<b>BOTTOM TRACK DATA</b> (85 BYTES)
ALWAYS OUTPUT	<b>RESERVED</b> (2 BYTES)
	<b>CHECKSUM</b> (2 BYTES)

**Figure 7. PD0 Standard Output Data Buffer Format**

**NOTE.** Some data outputs are in bytes per depth cell. For example, if the WN-command (number of depth cells) = 30 (default), and the following data are selected for output, the required data buffer storage space is 835 bytes per ensemble.

```
WD-COMMAND = WD 111 100 000 (default), WP-COMMAND > 0, BP-COMMAND > 0
20  BYTES OF HEADER DATA (6 + [2x Number Of Data Types])
53  BYTES OF FIXED LEADER DATA (FIXED)
65  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)
85  BYTES OF BOTTOM TRACK DATA (FIXED)
2   BYTES OF RESERVED FOR RDI USE (FIXED)
2   BYTES OF CHECKSUM DATA (FIXED)
835 BYTES OF DATA PER ENSEMBLE
```

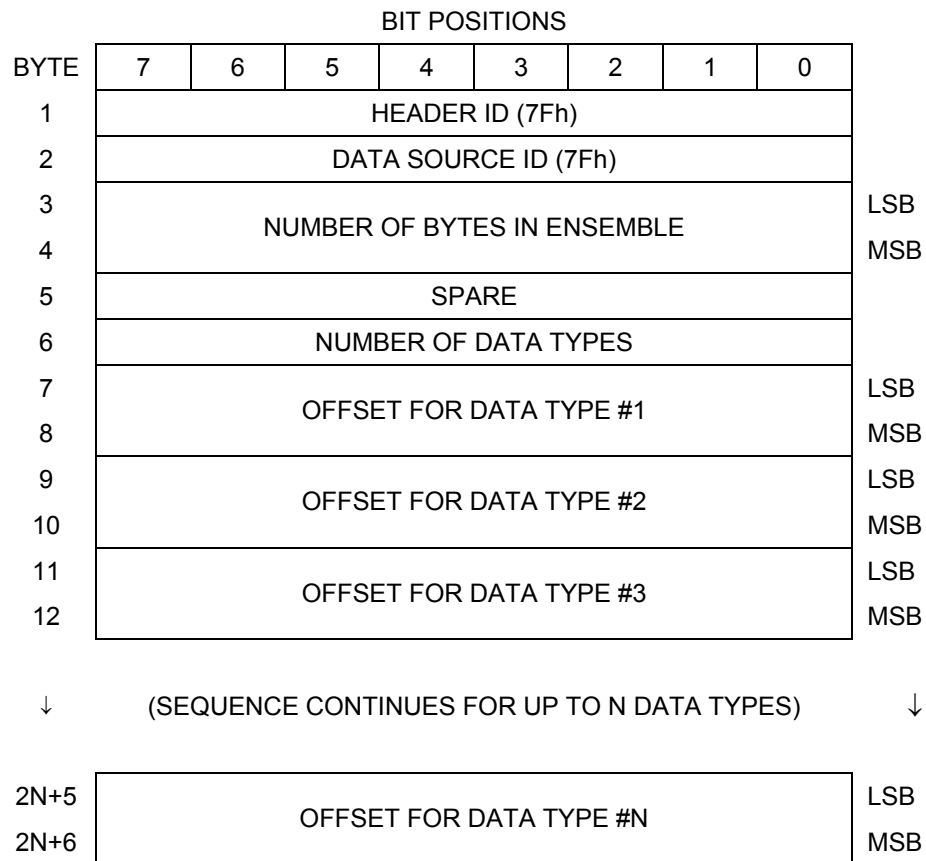


**NOTE.** *WinRiver* and *VmDas* may add additional bytes.

For example, *WinRiver* does not add any bytes to the Bottom Track data, but does insert data in place of other bytes. The Navigation NMEA strings (up to 275 bytes) are stored in the \*r.000 raw data between the Bottom Track data and the Reserved/Checksum data. *WinRiver* output data format is described in the *WinRiver User's Guide*.

*VmDas* adds 78 bytes of Navigation data between the Bottom Track data and the Reserved/Checksum data. The ENR file (raw data from the ADCP) does not have these bytes, only the ENS, ENX, STA and LTA files. *VmDas* output data format is described in the *VmDas User's Guide*.

## 5.1 Header Data Format



See [Table 28, page 117](#) for a description of the fields.

**Figure 8. Binary Header Data Format**



**NOTE.** This data is always output in this format.

## 5.2 Fixed Leader Data Format

BIT POSITIONS									
BYTE	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	SPARE								
9	NUMBER OF BEAMS								
10	NUMBER OF CELLS {WN}								
11	PINGS PER ENSEMBLE {WP}								LSB
12									MSB
13	DEPTH CELL LENGTH {WS}								LSB
14									MSB
15	BLANK AFTER TRANSMIT {WF}								LSB
16									MSB
17	PROFILING MODE {WM}								
18	LOW CORR THRESH {WC}								
19	NO. CODE REPS								
20	%GD MINIMUM {WG}								
21	ERROR VELOCITY MAXIMUM {WE}								LSB
22									MSB
23	TPP MINUTES								
24	TPP SECONDS								
25	TPP HUNDREDTHS {TP}								
26	COORDINATE TRANSFORM {EX}								
27	HEADING ALIGNMENT {EA}								LSB
28									MSB

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29	HEADING BIAS {EB}	LSB
30		MSB
31	SENSOR SOURCE {EZ}	
32	SENSORS AVAILABLE	
33	BIN 1 DISTANCE	
34		
35	XMIT PULSE LENGTH BASED ON {WT}	LSB
36		MSB
37	(starting cell) WP REF LAYER AVERAGE {WL} (ending cell)	LSB
38		MSB
39	FALSE TARGET THRESH {WA}	
40	SPARE	
41	TRANSMIT LAG DISTANCE	LSB
42		MSB
43	CPU BOARD SERIAL NUMBER	LSB
↓		↓
50		MSB
51	SYSTEM BANDWIDTH {WB}	LSB
52		MSB
53	SYSTEM POWER {CQ} / SPARE (for Navigator)	
54	SPARE (Navigator only)	
55	RESERVED (Navigator only)	
↓		
59		

See [Table 29, page 120](#) for a description of the fields**Figure 9. Fixed Leader Data Format****NOTE.** This data is always output in this format.**NOTE.** The Fixed Leader is 52 bytes long for the Rio Grande and 53 bytes for WorkHorse Monitor/Sentinel/Long Ranger ADCPs. Bytes 54 through 59 are included in the Navigator ADCP/DVL Output Data Format only.

## 5.3 Variable Leader Data Format

BIT POSITIONS									
BYTE	7	6	5	4	3	2	1	0	
1	VARIABLE LEADER ID								80h
2									00h
3	ENSEMBLE NUMBER								LSB
4									MSB
5	RTC YEAR {TS} RTC MONTH {TS} RTC DAY {TS} RTC HOUR {TS} RTC MINUTE {TS} RTC SECOND {TS} RTC HUNDREDTHS {TS}								
6									
7									
8									
9									
10									
11									
12	ENSEMBLE # MSB								
13	BIT RESULT								LSB
14									MSB
15	SPEED OF SOUND {EC}								LSB
16									MSB
17	DEPTH OF TRANSDUCER {ED}								LSB
18									MSB
19	HEADING {EH}								LSB
20									MSB
21	PITCH (TILT 1) {EP}								LSB
22									MSB
23	ROLL (TILT 2) {ER}								LSB
24									MSB
25	SALINITY {ES}								LSB
26									MSB
27	TEMPERATURE {ET}								LSB
28									MSB
29	MPT MINUTES MPT SECONDS MPT HUNDREDTHS								
30									
31									
32	HDG STD DEV PITCH STD DEV ROLL STD DEV								
33									
34									

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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) {CY?}	LSB
44		
45		
46	SPARE	MSB
47		
48	PRESSURE	LSB
49		
50		
51	PRESSURE SENSOR VARIANCE	MSB
52		
53		
54	PRESSURE SENSOR VARIANCE	LSB
55		
56		
57	SPARE	MSB
58	RTC CENTURY	
59	RTC YEAR	
60	RTC MONTH	
61	RTC DAY	
62	RTC HOUR	
63	RTC MINUTE	
64	RTC SECOND	
65	RTC HUNDREDTH	

See [Table 30, page 126](#) for a description of the fields.**Figure 10. Variable Leader Data Format****NOTE.** This data is always output in this format.

## 5.4 Velocity Data Format

		BIT POSITIONS									
BYTE		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 31, page 131](#) for description of fields

**Figure 11. Velocity Data Format**



**NOTE.** The number of depth cells is set by the WN-command.

## 5.5 Correlation Magnitude, Echo Intensity, and Percent-Good 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 32, page 133](#) through [Table 34, page 135](#) for a description of the fields.

**Figure 12. Binary Correlation Magnitude, Echo Intensity, and Percent-Good Data Format**



**NOTE.** The number of depth cells is set by the WN-command.



## 5.6 Binary Bottom-Track Data Format

BIT POSITIONS									
BYTE	7/S	6	5	4	3	2	1	0	
1	BOTTOM-TRACK ID								LSB 00h
2									MSB 06h
3	BT PINGS PER ENSEMBLE {BP}								LSB
4									MSB
5	BT DELAY BEFORE RE-ACQUIRE {BD}								LSB
6									MSB
7	BT CORR MAG MIN {BC}								
8	BT EVAL AMP MIN {BA}								
9	BT PERCENT GOOD MIN {BG}								
10	BT MODE {BM}								
11	BT ERR VEL MAX {BE}								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

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33	BEAM#1 BT CORR.	
34	BEAM#2 BT CORR.	
35	BEAM#3 BT CORR.	
36	BEAM#4 BT CORR.	
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 {BL}	LSB
46		MSB
47	REF LAYER NEAR {BL}	LSB
48		MSB
49	REF LAYER FAR {BL}	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	

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67	BM#1 REF %GOOD	
68	BM#2 REF %GOOD	
69	BM#3 REF %GOOD	
70	BM#4 REF %GOOD	
71	BT MAX. DEPTH {BX}	LSB
72		MSB
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)	MSB
79	(*SEE BYTE 19)	MSB
80	(*SEE BYTE 21)	MSB
81	(*SEE BYTE 23)	MSB
82	RESERVED	
83		
84		
85		

Figure 13. Binary Bottom-Track Data Format



**NOTE.** This data is output only if the BP-command is > 0 and PD0 is selected. See [Table 35, page 139](#) for a description of the fields.



**NOTE.** The PD0 output data format assumes that the **instrument** is stationary and the **bottom** is moving. DVL (Speed Log) output data formats (see [“Special Output Data Formats,” page 142](#)) assume that the bottom is stationary and that the ADCP or vessel is moving.



**NOTE.** Bytes 82 through 85 have been added in firmware version 8.17 (WorkHorse Monitor/Sentinel/Long Ranger) and firmware version 9.12 for WorkHorse Navigator ADCP/DVLs.

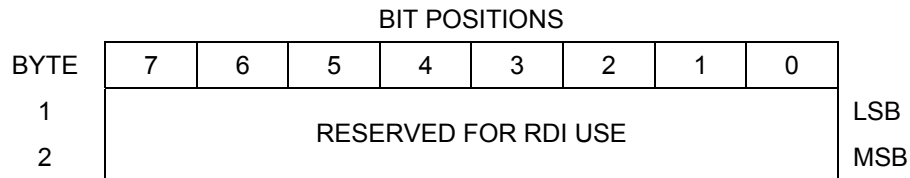


**NOTE.** Bottom Track is a feature upgrade for WorkHorse Monitor and Sentinel ADCPs (see [“Feature Upgrades,” page 4](#)).



**NOTE.** Bottom Track is not available for Long Ranger ADCPs.

## 5.7 Binary Reserved BIT Data Format



**Figure 14. Binary Reserved BIT Data Format**

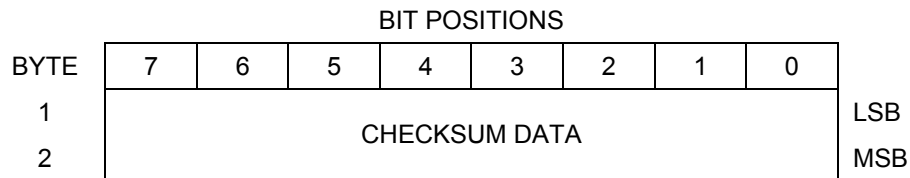


**NOTE.** The data is always output in this format. See [Table 36](#) for a description of the fields.

**Table 36: Reserved for RDI Format**

Hex Digit	Binary Byte	Field	Description
1-4	1,2	Reserved for RDI's use	This field is for RDI (internal use only).

## 5.8 Binary Checksum Data Format



**Figure 15. Binary Checksum Data Format**



**NOTE.** The data is always output in this format. See [Table 37](#) for a description of the fields..

**Table 37: Checksum Data Format**

Hex Digit	Binary Byte	Field	Description
1-4	1,2	Checksum Data	This field contains a modulo 65535 checksum. The Work-horse computes the checksum by summing all the bytes in the output buffer excluding the checksum.