Memo:
User Interface Definition of Explorer DVL Setup Commands, Coordinate Transform and Attitude Output Firmware

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1. Introduction

This memo is intended to summarize the proposed changes customers would encounter in the Explorer DVL coordinate transform and attitude data output as compared to earlier RDI products. The reason for the changes from previous firmware is two-fold:

- Corrections to earlier RDI coordinate transformation and data output schemes are implemented,
- The small Autonomous Underwater Vehicle (AUV) application has special attitude sampling, recording and coordinate transformation requirements because of the length of ping, vessel motion, interface to the ship and its sensors and physical orientation on the ship.

In general, every attempt has been made to leave the meaning of old commands and ensemble data types the same or at least backward compatible. That is, the new command functionality "fits around" the old commands. Where a command has more significant changes, a new command has been added to replace an old command in the Explorer DVL command set.

2. Commands Differences

This table presents all the ExplorerDVL commands available and compare with the WorkHorse DVL commands. (Expert # commands are highlighted in yellow).

NEW. New Feature: Unlike the WHDVL, the ExplorerDVL accepts command changes during operation w/o the need to stop the ping cycle(by sending a <BREAK>). This allows for dynamic setup configuration w/o stopping the operation of the ExplorerDVL. These dynamic setup commands are defined in the column "Dynamic Commands" in the table below.

Command	Default	Similar to WHDVL Format?	Similar to WHDVL function?	Dynamic Comma-nds	Description
?	N/A	Yes	Yes		Shows command menu
<BREAK> End	N/A	Yes	Yes		Interrupts or wakes up Explorer and loads last settings used
#BA*nnn*	024	No, add '#'	Yes	Yes	Evaluation amplitude minimum (1 to 255 counts)
#BB*nnnn*	0005	New Command	New Command	**Yes**	**Bottom Blanking Interval (0 to 9999 cm)**
#BC*nnn*	220	No, add '#'	Yes	**Yes**	**Bottom** Correlation Magnitude minimum (0 to 255 counts)
#BE*nnnn*	1000	No, add '#'	Yes	**Yes**	**Bottom** Error velocity maximum (0 to 9999 mm/s)
#BF*nnnnn*	00000	No, add '#'	Yes	**Yes**	**Bottom** Depth guess (1 to 65535 dm, 0 = automatic)
#BI*nnn*	003	No, add '#'	Yes	**Yes**	**Bottom** Gain switch depth (0 to 999 meters)
#BJnnnnnnnn n	110000000	New Command	New Command	**No**	**Bottom** Data Out {t;c;*;h;r;*;*;*;*}
#BK*n*	0	No, add '#'	Yes	**Yes**	WMass Mode [0=off 1=WB 2=LostB 3=W]
#BL*mmm,nnn n,ffff*	20, 80,160	No, add '#'	Yes	**Yes**	Water mass layer parameters: Min Size (dm), Near (dm), Far (dm)
BP*nnn*	1	Yes	Yes	Yes	Bottom Track Pings per Ensemble
#BS	N/A	No, add '#'	Yes	**Yes**	Clear distance traveled
BX*nnnn*	01000	Yes	Yes	Yes	Maximum Tracking Depth (0 to 65535 dm)
CB*nnn*	411	Yes	Yes	No	Serial port control (baud rate/parity/stop bits)
CF*nnnn*	11110	Yes –except last bit=0 No Recorder	Yes	No	Flow control
CK	N/A	Yes	Yes	No	Keep parameters as user defaults
CR*n*	N/A	Yes	Yes	No	Retrieve parameters (0 = User, 1 = Factory)
CS or **Tab**	N/A	Yes	Yes	No	Start pinging
#CTn	1	No, add '#'	Yes	No	Turnkey operation (0 = Off, 1 = On)
#CO n p	0 1	New Command	New Command	Yes	Set Out Trig ([0-3]=[off r/x x r], pol)
CX*n*	0 0 65535	New Command	New Command	Yes	Set Input Trigger [mode, dly, timeout]

Command	Default	Similar to WHDVL Format?	Similar to WHDVL function?	Dynamic Commands	Description
EA±*nnnn*	+00000	Yes	Yes	**Yes**	Heading Alignment [.01 deg cw]
#EC*nnnn*	1500	No, add '#'	Yes	**Yes**	Speed of Sound (1400 to 1600 m/s)
ED*nnnn*	00000	Yes	Yes	**Yes**	Transducer Depth (0 to 65535 dm)
#EE	0000101	New Command	New Command	No	Output Coordinate Frame (Att[2]; Intrp[2]; Cmd[1]; Rw/Nm[1]; Snsr Out[1])
#EH*nnnn,n*	00000,1	New Command	New Command	**Yes**	Heading {heading; frame}
#EI*nnnnn*	+00000	New Command	New Command	**Yes**	Roll Misalignment Angle [.01 deg cw]
#EJ	+00000	New Command	New Command	**Yes**	Pitch Misalignment Angle [.01 deg cw]
#EP±*nnnn*	+00000, +00000,1	New Command	New Command	**Yes**	Tilts {pitch; roll; frame}
#ER±*nnnn*	+00000	No, add '#'	Yes	**Yes**	Roll [.01 deg cw]
ES*nn*	35	Yes	Yes	**Yes**	Salinity (0 to 40 parts per thousand)
#ET±*nnnn*	2100	No, add '#'	Yes	**Yes**	Temperature (-5.00 to +40.00 degrees C) [.01 deg cw]
#EU	0	New Command	New Command	**Yes**	Orientation [0=Switch,1=Up,2=Down]
#EV	+00000	New Command	New Command	**Yes**	Heading Variation [.01 deg cw]
EX*nnnn*	11111	Yes	Yes	**Yes**	Coordinate Transformation (Xform:Type; Tilts; 3Bm; Map)
#EY	0 0 0 0 0 0 0 0	New Command	New Command	No	Doppler Param Source {c;d;h;p;r;s;t;u}
EZ*nnnnnn*	22222220	New Command	New Command	**Yes**	Sensor Source (C;D;H;P;R;S;T; U)
PA	N/A	Yes	Yes	No	Pre-deployment tests
PC2	N/A	Yes	Yes	No	Display Pressure, Temperature, Heading, Pitch, Roll Built-in test
#PD*n*	PD0	No, add '#'	Yes	No	Data stream select (0, 3, 4)
PS0	N/A	Yes	Yes	No	Display System Configuration
PS1	N/A	Yes	Yes	No	Display fixed leader (binary).
PT0	N/A	Yes	Yes	No	Built-In test – Help
PT3	N/A	New Command	New Command	No	Built-In test - Receive Path
PT5	N/A	New Command	New Command	No	Built-In test - Transmit/Receive Continuity
SC	N/A	New Command	New Command	No	Sensor Commands [ID Event "Command"]
SD	N/A	New Command	New Command	No	Sensor Data Out [ID abcd..., a-d=1/0]
SM	N/A	New Command	New Command	No	Aux Snsr Aux Menu [sid]
#SO	101.325	New Command	New Command	Yes	Absolute Press Sensor Offset [kPa]
SPn	0 99;0 99;0 99;0 99	New Command	New Command	No	Sensor-port Assignment [sid0 to0 ...]
SR	N/A	New Command	New Command	No	Sensor Reset [sid]
TEhh:mm:ss.ff	00:00:00.00	Yes	Yes	No	Time per ensemble (hours:minutes:seconds.100th of seconds)
TPmm:ss.ff	00:00.05	Yes	Yes	No	Time between pings (minutes:seconds.100th of seconds)
TSyy/mm/dd, hh:mm:ss	N/A	Yes	Yes	No	Set real-time clock (year/month/day, hours:minutes:seconds)
TTccyy/mm/dd, hh:mm:ss	N/A	Yes	Yes	No	Set real-time clock (Y2k compatible) (century year /month/day, hours:minutes:seconds)

Command	Default	Similar to WHDVL Format?	Similar to WHDVL function?	Dynamic Comma-nds	Description
#WA*nnn*	050	No, add '#'	Yes	Yes	False target threshold maximum (0 to 255 counts)
WB*n*	0	Yes	Yes	Yes	Mode 1 Bandwidth Control (0 = Wide, 1 = Narrow)
#WC*nnn*	064	No, add '#'	Yes	Yes	Correlation threshold (0 to 255 counts)
WD*nnn nnn nnn*	111110000	Yes	Yes	No	Data Out {v;c;a;p;s;*;*;*;*}
#WE*nnnn*	2000	No, add '#'	Yes	Yes	Error velocity threshold (0 to 5000 mm/s)
WF*nnnn*	0088	Yes	Yes	Yes	Blanking Distance [0 to 999 cm]
#WJn	1	No, add '#'	Yes	Yes	BroadBand Receiver gain (0 = Low, 1 = High)
W*Nnnn*	030	Yes	Yes	Yes	Number of Bins (1 to 255)
WP*nnnn*	000	Yes	Yes	Yes	Pings per ensemble (0 to 16384)
WS*nnnn*	0200	Yes	Yes	Yes	Bin size 10 to 800 cm
#WT*nnnn*	0000	No, add '#'	Yes	Yes	Transmit length (0 to 3200 cm)
WV*nnn*	0175	Yes	Yes	Yes	Ambiguity velocity (020 to 700 cm/s radial)

3. Brief Summary of Differences from Other RDI Products

3.1. Add EI and EJ Commands to Align Instrument Pitch and Roll with Ship Coordinates

The EI and EJ commands complement the existing EA but are associated with pitch-like and roll-like misalignment of the ADCP on a ship, respectively. The introduction of these commands allows for external pitch and roll data to now be used properly in the instrument to ship coordinate transformation.

Depending on whether internal or external sensors are used, the parameters may be calibrated by either 1.) correcting the instrument heading, pitch and roll when the ship is aligned with geographic coordinates or 2). calculating these parameters from the recorded velocities from actual ship runs.

3.2. Eliminate EB and Replace it with EV

The EB command is used primarily for correcting magnetic variation. It also has a confusing application in WH to allow the user to output ship heading in the variable leader data instead of instrument heading when EA is used with instrument sensors. The description of EB in all the Broadband and early Workhorse technical manuals has a sign error.

EB is eliminated and replaced by EV. EV is used for correcting constant offsets only.

For the confusing case where a user wants ship's heading, is using instrument sensors

and has a misaligned ADCP relative to the ship frame, the user will be able to output ship heading (and more, see below) by switching on a new data type in the ensemble output. Since this is an unlikely case for a small vehicle, this feature will enabled be in a future release.

3.3. Modify EP to Accept Pitch, Roll and Coordinate Frame Inputs and Allow Real-time Changes

In current RDI ADCP firmware, EP and ER specify user input pitch and roll in the instrument coordinate frame. A DVL user would typically like these to be ship based values.

This is handled by two new parameters of the EP command. The first parameter of the EP command specifies pitch, the second roll and the third the coordinate frame of both pitch and roll. The EP command also accepts only pitch inputs and the ER command still accepts roll for backward compatibility. The coordinate frame specified in the EP command defines the coordinate frame of the data received by pitch and roll sensor input.

The pitch and roll output in the ensemble data is referenced to the coordinate frame specified in the EP command.

Entering pitch and roll information in one command has the added benefit for the DVL user of increasing the command through-put when the pitch and roll information is being sent via the master command serial port.

3.4. Modify EH to Accept Heading Coordinate Frame Inputs and Allow Real-time Changes

This is a similar change to the previous one regarding pitch and roll. The command has a new second parameter that specifies the coordinate frame for all heading input, including sensors. The command also accepts single parameter inputs (heading) for backward compatibility. The heading output in the ensemble data is referenced to the coordinate frame specified in the EP command.

3.5. Add EE Command: Attitude Command Parameters Switch, Selection of Raw or Nominal Beam Coordinates

This command has three functions. The first is to control whether attitude commands are output in a new ensemble data type.

The second is to allow velocity data in beam coordinates to be mapped to nominal beam coordinates. For phased array systems, setting nominal coordinate beam data applies a speed of sound correction on the vertical velocity component and enables an algorithm

that corrects all velocity output for an error caused by the vertical component. These corrections are applied to the phased array velocity for other coordinate transformations when this bit is set.

The last function of the EE command is to control whether detailed sensor data is output in an ensemble data type.

3.6. Change the EZ Command to Prohibit Different Pitch and Roll Sensor Sources; Add the Up/Down Sensor Source bit

Mixed sensor sources (e.g., roll internal and pitch external) can create ambiguous conditions that should not be allowed. The pitch bit in the EZ command is used to define both the pitch and the roll sources.

The unused eighth bit of the EZ command is now be used to allow the user to input an orientation rather than use the sensor orientation.

3.7. Add EU Command to Specify Up/Down Orientation

This command parallels other commands that allow the user to input a value that replaces the sensor data.

3.8. Bin Mapping Applied for Leveled Ship Coordinates

In other RDI products bin mapping is only applied for leveled Earth coordinates (i.e., with tilts used). This is believed to be a bug in those firmware versions; Explorer DVL bin maps for leveled Ship and Leveled Earth coordinates.

4. Differences in the Binary Output

In Green are the ExplorerDVL fields with similar output then WHDVL but different definition.
In Yellow identical fields between WHDVL and EXplorerDVL.
In Red are the ExplorerDVL fields radically different or missing with respect to the WHDVL output data format.

PD0:

Fixed Leader Data Format

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

BYTE	ExplorerDVL	DVL
29	HEADING BIAS	HEADING BIAS
30		
31	SENSOR SOURCE	SENSOR SOURCE
32	SENSORS AVAILABLE	SENSORS AVAILABLE
33	BIN 1 DISTANCE	BIN 1 DISTANCE
34		
35	XMIT PULSE LENGTH	XMIT PULSE LENGTH
36		
37	(starting cell) WP REF LAYER AVERAGE (ending cell)	(starting cell) WP REF LAYER AVERAGE (ending cell)
38		
39	FALSE TARGET THRESH	FALSE TARGET THRESH
40	SPARE	SPARE
41	TRANSMIT LAG DISTANCE	TRANSMIT LAG DISTANCE
42		
43		
↓	SPARE	CPU BOARD SERIAL NBR
50		
51	SYSTEM BANDWIDTH	SYSTEM BANDWIDTH
52		
53	SPARE	SPARE
54	SPARE	BASE FREQUENCY INDEX
55		
↓	System Serial Number	SPARE
58		
59		SPARE

New Definition (Green Fields)

61,62	31	EZ / Sensor Source	Contains the selected source of environmental sensor data. These firmware switches indicate the following. FIELD DESCRIPTION 1xxxxxxx = CALCULATES EC (SPEED OF SOUND) FROM ED, ES, AND ET x1xxxxxx = USES ED FROM DEPTH SENSOR xx1xxxxx = USES EH FROM TRANSDUCER HEADING SENSOR xxx1xxxx = USES EP FROM TRANSDUCER PITCH SENSOR xxxx1xxx = USES ER FROM TRANSDUCER ROLL SENSOR xxxxx1xx = USES ES (SALINITY) FROM CONDUCTIVITY SENSOR xxxxxx1x = USES ET FROM TRANSDUCER TEMPERATURE SENSOR xxxxxxx1 = USES EU FROM TRANSDUCER TEMPERATURE SENSOR NOTE: If the field = 0, or if the sensor is not available, the ExplorerDVL uses the manual command setting. If the field = 1, the ExplorerDVL uses the reading from the internal sensor or an external synchro sensor (only applicable to heading, roll, and pitch). Although you can enter a “2” in the EZ-command string, the ExplorerDVL only displays a 0 (manual) or 1 (int/ext sensor).
110-119	55-58	System Serial Number	System Serial Number

Variable Leader Data Format

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

BYTE	ExplorerDVL	DVL
38	ADC CHANNEL 3	ADC CHANNEL 3
39	ADC CHANNEL 4	ADC CHANNEL 4
40	ADC CHANNEL 5	ADC CHANNEL 5
41	ADC CHANNEL 6	ADC CHANNEL 6
42	ADC CHANNEL 7	ADC CHANNEL 7
43 ↓ 46	ERROR STATUS WORD (ESW)	ERROR STATUS WORD (ESW)
47	SPARE	SPARE
48		
49 ↓ 52	PRESSURE	PRESSURE
53 ↓ 56	PRESSURE SENSOR VARIANCE	PRESSURE SENSOR VARIANCE
57	SPARE	SPARE
58	SPARE	RTC CENTURY
59	SPARE	RTC YEAR
60	SPARE	RTC MONTH
61		RTC DAY
62		RTC HOUR
63		RTC MINUTE
64		RTC SECOND
65		RTC HUNDREDTHS

New Definition (Green Fields)

25-28	13,14	BIT / BIT Result	This field contains the results of the ExplorerDVL's Built-in Test function. A zero code indicates a successful BIT result. **BIT byte13 Error Code** — **Description** 0x01 Transmitter Shutdown 0x02 Transmitter Overcurrent 0x03 Transmitter Undercurrent 0x04 Transmitter Undervoltage 0x10 FIFO interrupt missed 0x11 FIFO ISR re-entry 0x21 Sensor start failure 0x22 temperature sensor failure 0x23 pressure sensor failure 0x24 tilt sensor failure 0x27 Bad Comms with sensor 0x28 Bad Comms with sensor 0x60 Sensor Cal Data checksum failure 0x30 Stuck UART 0x31 QUART Transmit timeout 0x32 QUART IRQ Stuck 0x33 QUART Buffer stuck 0x34 QUART IRQ Active 0x35 QUART cannot clear interrupt 0x50 RTC low battery 0x51 RTC time not set 0xFF Power failure **BIT Number of Errors byte 14** Number of BIT errors
37-40	19,20	EH / Heading	Contains the ExplorerDVL heading angle. This value may be a manual setting or a reading from a heading sensor. The variation angle from the EV command is added to heading before output. The coordinate frame this data is referenced to is specified by the EH command. Scaling: LSD = 0.01 degree; Range = 000.00 to 359.99 degrees
41-44	21,22	EP / Pitch (Tilt 1)	Contains the ExplorerDVL pitch angle. This value may be a manual setting or a reading from a tilt sensor. Positive values mean that Beam #3 is spatially higher than Beam #4. The coordinate frame this data is referenced to is specified by the EP command. Scaling: LSD = 0.01 degree; Range = -20.00 to +20.00 degrees

45-48	23, 24	ER / Roll (Tilt 2)	Contains the ExplorerDVL roll angle. This value may be a manual setting or a reading from a tilt sensor. For up-facing ExplorerDVLs, positive values mean that Beam #2 is above the earth's horizontal while than Beam #1is below the earth's horizontal. For down-facing ExplorerDVLs, positive values mean that Beam #1 is above the earth's horizontal and than Beam #2 is below the earth's horizontal. The coordinate frame this data is referenced to is specified by the EP command. Scaling: LSD = 0.01 degree; Range = -20.00 to +20.00 degrees
			These fields contain the outputs of the Analog-to-Digital Converter (ADC).. Here is the description for each channel: CHANNEL DESCRIPTION 0 Not Used 1 XMIT VOLTAGE 2 Not Used 3 Not Used 4 Not Used 5 Not Used 6 Not Used 7 Not Used Note that the ADC values may be "noisy" from sample-to-sample, but are useful for detecting long-term trends.
69-70	35	ADC Channel 0	
71-72	36	ADC Channel 1	
73-74	37	ADC Channel 2	
75-76	38	ADC Channel 3	
77-78	39	ADC Channel 4	
79-80	40	ADC Channel 5	
81-82	41	ADC Channel 6	
83-84	42	ADC Channel 7	
85-86	43	Error Status Word	Reserved for TRDI use.
87-88	44		Reserved for TRDI use.
89-90	45		Reserved for TRDI use.
91-92	46		Reserved for TRDI use.

Binary Bottom-Track Data Format

BYTE	ExplorerDVL	DVL	
1 2	BOTTOM-TRACK ID	BOTTOM-TRACK ID	LSB 00h MSB 06h
3 4	BT PINGS PER ENSEMBLE	BT PINGS PER ENSEMBLE	
5 6	BT DELAY BEFORE RE-ACQUIRE	BT DELAY BEFORE RE-ACQUIRE	
7	BT CORR MAG MIN	BT CORR MAG MIN	
8	BT EVAL AMP MIN	BT EVAL AMP MIN	
9	BT PERCENT GOOD MIN	BT PERCENT GOOD MIN	
10	BT MODE	BT MODE	
11 12	BT ERR VEL MAX	BT ERR VEL MAX	
13 ↓ 16	RESERVED	RESERVED	
17 18	BEAM#1 BT RANGE	BEAM#1 BT RANGE	
19 20	BEAM#2 BT RANGE	BEAM#2 BT RANGE	
21 22	BEAM#3 BT RANGE	BEAM#3 BT RANGE	
23 24	BEAM#4 BT RANGE	BEAM#4 BT RANGE	
25 26	BEAM#1 BT VEL	BEAM#1 BT VEL	
27 28	BEAM#2 BT VEL	BEAM#2 BT VEL	
29 30	BEAM#3 BT VEL	BEAM#3 BT VEL	
31 32	BEAM#4 BT VEL	BEAM#4 BT VEL	
33	BEAM#1 BT CORR.	BEAM#1 BT CORR.	
34	BEAM#2 BT CORR.	BEAM#2 BT CORR.	
35	BEAM#3 BT CORR.	BEAM#3 BT CORR.	
36	BEAM#4 BT CORR.	BEAM#4 BT CORR.	
37	BEAM#1 EVAL AMP	BEAM#1 EVAL AMP	
38	BEAM#2 EVAL AMP	BEAM#2 EVAL AMP	

BYTE	ExplorerDVL	DVL
39	BEAM#3 EVAL AMP	BEAM#3 EVAL AMP
40	BEAM#4 EVAL AMP	BEAM#4 EVAL AMP
41	BEAM#1 BT %GOOD	BEAM#1 BT %GOOD
42	BEAM#2 BT %GOOD	BEAM#2 BT %GOOD
43	BEAM#3 BT %GOOD	BEAM#3 BT %GOOD
44	BEAM#4 BT %GOOD	BEAM#4 BT %GOOD
45	REF LAYER MIN	REF LAYER MIN
46		
47	REF LAYER NEAR	REF LAYER NEAR
48		
49	REF LAYER FAR	REF LAYER FAR
50		
51	BEAM#1 REF LAYER VEL	BEAM#1 REF LAYER VEL
52		
53	BEAM #2 REF LAYER VEL	BEAM #2 REF LAYER VEL
54		
55	BEAM #3 REF LAYER VEL	BEAM #3 REF LAYER VEL
56		
57	BEAM #4 REF LAYER VEL	BEAM #4 REF LAYER VEL
58		
59	BM#1 REF CORR	BM#1 REF CORR
60	BM#2 REF CORR	BM#2 REF CORR
61	BM#3 REF CORR	BM#3 REF CORR
62	BM#4 REF CORR	BM#4 REF CORR
63	BM#1 REF INT	BM#1 REF INT
64	BM#2 REF INT	BM#2 REF INT
65	BM#3 REF INT	BM#3 REF INT
66	BM#4 REF INT	BM#4 REF INT
67	BM#1 REF %GOOD	BM#1 REF %GOOD
68	BM#2 REF %GOOD	BM#2 REF %GOOD
69	BM#3 REF %GOOD	BM#3 REF %GOOD
70	BM#4 REF %GOOD	BM#4 REF %GOOD
71	BT MAX. DEPTH	BT MAX. DEPTH
72		
73	BM#1 RSSI AMP	BM#1 RSSI AMP
74	BM#2 RSSI AMP	BM#2 RSSI AMP
75	BM#3 RSSI AMP	BM#3 RSSI AMP

BYTE	ExplorerDVL	DVL
76	BM#4 RSSI AMP	BM#4 RSSI AMP
77	GAIN	GAIN
78	(*SEE BYTE 17)MSB	(*SEE BYTE 17)MSB
79	(*SEE BYTE 19)MSB	(*SEE BYTE 19)MSB
80	(*SEE BYTE 21)MSB	(*SEE BYTE 21)MSB
81	(*SEE BYTE 23)MSB	(*SEE BYTE 23)MSB
82 ↓ 85		RESERVED

PD4/5:

PD4/5 ExplorerDVL and DVL are identical.

PD6:

PD6 ExplorerDVL and DVL are identical.