❾ `Pings` is the number of samples (data points) in profile.
❿ `<DATA*pings>` is the profile data points (ping echoes) in microsecond units. These time values are for the echo return path, this is the time to the seabed/ reflector and back. Apply a velocity of sound equation to calculate the range.

7.4.2. Sonars

This applies to the SeaKing Sonar, SeaPrince Sonar, Micron Sonar and SeaKing Survey Sonar (Hammerhead).

Example 7.2. Imaging Sonar CSV

```
SOf,DateTime,Node,Status,Hdctrl,Rangescale,Gain,Slope,AdLow,AdSpan,LeftLim,RightLim,
    Steps,Bearing,Dbytes,Dbytes of DATA
SON,13:26:49.178,2,16,5863,60,21,90,29,66,0,6368,32,4928,260,0,1,28,82,80,...,0,0,0
SON,13:26:49.210,2,16,5863,60,21,90,29,66,0,6368,32,4896,260,0,2,21,79,72,...,0,0,0
❶       ❷      ❸ ❹  ❺   ❻ ❼  ❽ ❾  ❿ ⓫  ⓬   ⓭  ⓮   ⓯  ⓰
```

Note

To fit within the margins a line break has been added to the header line in the example; in the actual CSV file each line will be continuous.

❶ `SOf` is the line header.
❷ `DateTime` the date and time of the line.
❸ `Node` is usually 2 for imaging sonars.
❹ `Status` is the data validation byte in hexadecimal (see Section 7.4.8, "`Status` and `Hdctrl` Byte Values").
❺ `Hdctrl` is a 2 byte bitset in hexadecimal (see Section 7.4.8, "`Status` and `Hdctrl` Byte Values").
❻ `Rangescale` is the range value in decimetres.
❼ `Gain` is the receiver gain that was applied for the current scanline of data and helps to show the control state during replay.
❽ `Slope` is the receiver slope or Time Variable Gain (TVG) that was applied at the receiver for the current scanline and helps to show control state during replay.
❾❿ `AdLow`/`AdSpan` control the mapping of the received sonar echo amplitude. The sonar receiver has an 80dB dynamic range and signal levels are processed internally such that 0 to 80dB = 0 to 255 (full 80dB (8 bit)
⓫⓬ `LeftLim`/`RightLim` are the limit angles in 1/16 Gradians. Values of 0 to 6400 equate to 0 to 360° (so multiply by 360/6400 to convert to degrees).
⓭ `Steps` is the angular step size in 1/16 Gradians.
⓮ `Bearing` is the transducer bearing in 1/16 Gradians.
⓯ `Dbytes` the number of data bytes in the scanline.
⓰ `Dbytes of DATA` the sample data points, the total number should match the value of `Dbytes`.

RMC Position Data (latitude/longitude) and Course Data

GGA Position Data (latitude/longitude

Note

The CSV output will comprise data from *one* of the NMEA data strings that include Position (latitude/longitude) data.

7.4.7. Auxiliary Device Data

The auxiliary device data is received through a serial port and logged in `.v4log` file. The data can be up to 100 bytes long and must be terminated with a line feed character (<LF>). The data is logged in the original format that it was received through the serial port.

When converted to a CSV file the output will contain 2 comma separated fields. The first field is the message time stamp and the second field is the device data. If the auxiliary device data contains the line feed or carriage return terminators (<LF> and <CR>) they will be removed.

Example 7.8. Tritech PA Altimeter as an Auxiliary Device

```
Msg Time,Aux Data
12:19:06.811,001,150m
12:10:06.874,001.030m
```

7.4.8. `Status` and `Hdctrl` Byte Values

`Status` Byte	
Bit	**Function**
0	HdPwrLoss
1	MotErr
2	PrfSyncErr
3	PrfPingErr
4	AdUnMapped
5	hdsp5
6	hdsp6
7	ExtraBytes

Example 7.9. Status Byte

For a status value of 16:
16 (hexadecimal) = 00010110 (binary)
Note: this value is big-endian so the order is Bit7...Bit0
Bit0 = 0 (the scan is OK and can be used)
Bit1 = 1 (this can be ignored)
Bit2 = 1 (this can be ignored)
Bit3 = 0 (this can be ignored)
Bit4 = 1 (indicating the data is in 8-bit ADC mode)
Bit5 = 0 (this is always 0 and not used)
Bit6 = 0 (this is always 0 and not used)
Bit7 = 0 (if this is 1 a message is appended after the data record)

Hdctrl Bitset				
Bit	**Function**	**If 0**	**If 1**	**Notes**
0	adc8on	4bit mode	8bit mode	
1	cont	sector scan	continuous	
2	scanright	scan left	scan right	
3	invert	upright	inverted	
4	motoff	motor on	motor off	
5	txoff	TX on	TX off (for test)	
6	toggleadcmux	off	on	for Sub-Bottom Profiler
7	chan2	use channel 1	use channel 2	
8	raw	cookedADC	raw ADC mode	
9	hasmot	no motor	has motor	
10	applyoffset	no offset	heading offset	
11	pingpong	fire together	pingpong mode	applicable to Sidescan
12	stareLLim	normal	point at left limit	
13	ReplayASL	normal	analogue scanline	
14	ReplyThr	reserved and should always be 0		
15	IgnoreSens	normal	no error checking	diagnostic use only

Example 7.10. Hdctrl Bitset

For a status value of 8923:
8923 (hexadecimal) = 1000100100100011(binary)
Note: this value is big-endian so the order is Bit15...Bit0
Checking against the table shown, the bitset indicates that the sonar is in a diagnostic mode (Bit15 is 1) so the scanline cannot be relied on for data. Additionaly pingpong mode has been enabled (Bit11), the data is in RawADC mode (Bit8), TX is off (Bit5), the device is operating in continuous mode (Bit1) and the data is being transmitted in 8bit form (Bit0).

