Seanet Remote Communications

Software Manual

0706-SOM-00004, Issue: 02

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Help & Support

First please read this manual thoroughly (particularly the Troubleshooting section, if present). If a warranty is applicable, further details can be found in a Warranty Statement at the end of the manual.

Tritech International Ltd can be contacted as follows:

Mail	*Tritech International Ltd* Peregrine Road Westhill Business Park Westhill, Aberdeenshire AB32 6JL, UK
Telephone	+44 (0)1224 744111
Email	support@tritech.co.uk
Website	www.tritech.co.uk

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1. The Serial Numbers of the product and any *Tritech International Ltd* equipment connected directly or indirectly to it.
2. Software or firmware revision numbers.
3. A clear fault description.
4. Details of any remedial action implemented.

Contamination

If the product has been used in a contaminated or hazardous environment you *must* de-contaminate the product and report any hazards *prior* to returning the unit for repair. *Under no circumstances should a product be returned that is contaminated with radioactive material.*

The name of the organisation which purchased the system is held on record at *Tritech International Ltd* and details of new software or hardware packages will be announced at regular intervals. This manual may not detail every aspect of operation and for the latest revision of the manual please refer to www.tritech.co.uk

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Warning Symbols

Throughout this manual the following symbols may be used where applicable to denote any particular hazards or areas which should be given special attention:

Note

This symbol highlights anything which would be of particular interest to the reader or provides extra information outside of the current topic.

Important

When this is shown there is potential to cause harm to the device due to static discharge. The components should not be handled without appropriate protection to prevent such a discharge occurring.

Caution

This highlights areas where extra care is needed to ensure that certain delicate components are not damaged.

Warning

DANGER OF INJURY TO SELF OR OTHERS

Where this symbol is present there is a serious risk of injury or loss of life. Care should be taken to follow the instructions correctly and also conduct a separate Risk Assessment prior to commencing work.

1. Introduction

The SeaKing SKV4 remote communication protocol is largely based around the V4 Protocol that was first introduced to Tritech Series-2 heads as part of the WINSON Sonar Software.

There have been a few changes to the WINSON V4 Protocol release which have been necessary due to functional differences between the Series-2 and SeaKing heads. For instance, SeaKing heads are dual frequency devices and therefore the facility for a remote real-time switching of operating frequency was required.

WINSON V4 users should note that where the SeaKing features have been introduced, they have taken the place of Series-2 WINSON features which have been removed. This has enabled string layouts and lengths to remain very similar and will enable existing Series-2 Survey software to be adapted quite easily for SeaKing use.

The SeaKing SKV4 protocol has the following main features:

- Remote interrogation of Seanet SCU to determine device availability, configuration and communication modes/ports.
- Remote setting of device configuration and communications modes and ports.
- Direct any device output to any available communications port.
- Capable of multiple continuous device data streams.

2. Setup

2.1. Flow of Data

The Seanet SCU system allows a number of subsea devices/sensors to be connected as a network and run on a single twisted pair (or RS232 modem) link controlled by the Tritech communications controller card (AIF). Each device is allocated a unique network address called a `node` number that is downloaded and embedded into the flash memory of the device.

Changing the application that is running in Seanet Pro by choosing a new application from the `Applications` menu will call out a different set of devices. Depending on the chosen application (e.g., Single Profiler), each SKV4 compatible device will be allocated a software data channel in the Seanet RemV4 program called `slots`. The working application is preset under the `Application` menu and if necessary can be modified using the `Application Wizard`. When a new application is selected and the slot positions for each application change the RemV4 program will retain all previous settings for each slot.

When using the SKV4 protocol, the slot number is important because SKV4 commands use the slot number and receive the data which is present on that slot. The Seanet RemV4 program can be viewed by double-clicking on its icon in the Windows System Tray or through the Windows Start Menu.

2.2. Using the SeaKing SKV4 Protocol

Data from various devices on the SCU network can be controlled and sent to and from a remote survey or logging computer (or computers) using up to four RS232 ports.

Note

The Seanet SCUV4 has two serial ports and the SCUV5 has four fitted as standard which can be used for remote survey. More ports can be added if the SCU is fitted with an additional PCI card.

The serial ports can be configured using the RemV4 program `Remote Channel Setup` (accessible by selecting `Channels` from the `Settings` menu).

This allows the user to select Baud rates and handshaking to match their equipment and also set transfer parameters such as parity checking.

The Seanet SKV4 system is very flexible and allows the user to choose which channel to direct data from individual devices, the form of that data and whether it should be continuous or triggered on demand.

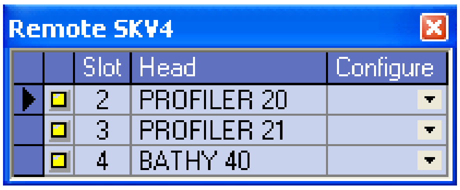
In order to use SKV4 successfully, the user must understand the *slot number* system, since data is always extracted by addressing the correct slot number for the device.

The slot numbers for a particular system can be obtained in 2 ways:

1. View the list of available devices in the Remote SKV4 menu (on the computer local to the sonar devices). To do this choose the `Remote SKV4` option from the `Applications` menu from within the RemV4 program.

2. Using the remote link and issuing a "Global Enquire" command (`:GE`) that returns information on the allocation of all slots.

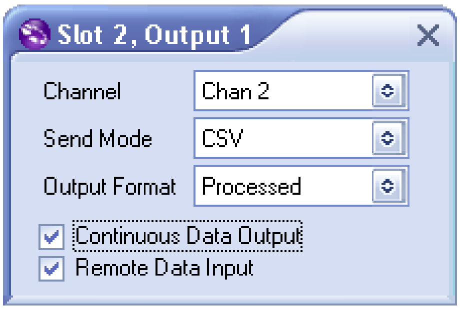
2.2.1. Remote SKV4



Status Indicator	Yellow means that Seanet Pro is in control of the head and green indicates that the remote PC is in control.
Slot/Head	List of available devices (application dependent) and their associated slot numbers.
Configure	Configure data outputs. Click on an output in the list to configure the settings.

2.2.2. Slot Mode Configuration

Each slot can receive SKV4 commands sent to it and can be configured to supply a maximum of two simultaneous data outputs from the slot device. Output 1 should always be used to configure the main format for data output. Output 1 will also accept any SKV4 commands sent by a remote computer. Output 2 is used only as a method of transmitting the same data from a slot device in two different output formats out two different serial ports. Output 2 is used for output only and does not accept any SKV4 commands sent to it.



Channel Selection	Select a remote channel for the slot to send/receive SKV4 data. Channels can be configured in the Remote Channel Setup.
Send Mode	Available options are ASCII, hexadecimal, binary and CSV.
Output Format	List of output formats (head dependent). Profiler = RAW or PROCESSED, SeaKing 700 = WINSON RAW, WINSON PROCESSED, SEAKING LONG or SEAKING SHORT.
Continuous Data Output	When this box is checked the output will be continuous.
Remote Data Input	Enable to accept messages from a a remote channel (i.e., via a serial port). This option is not available for Output 2.

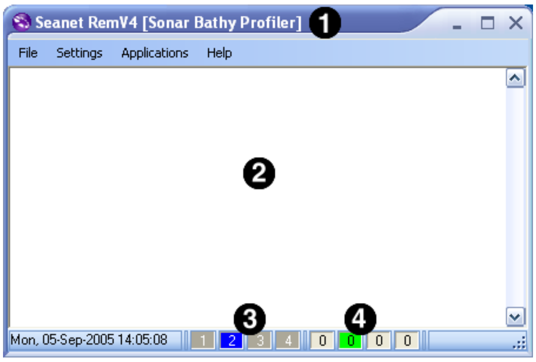
2.3. Installing RemV4

The RemV4 program is designed to be installed and run alongside the Seanet Pro application and allows the export of data through a serial link from the computer connected to the subsea equipment.

RemV4 should have been installed alongside Seanet Pro automatically, however, if it is not available on the computer after installing Seanet Pro please contact *Tritech International Ltd* Technical Support.

3. Seanet RemV4

Seanet RemV4 is a program that runs alongside the main Seanet Pro program which handles serial port communications between Seanet Pro and a remote computer. It can be viewed by double clicking on its icon in the Windows system tray. Alternatively, it can be opened through the Windows Start Menu (`Start` → `Programs` → `Seanet Pro` → `RemV4`).

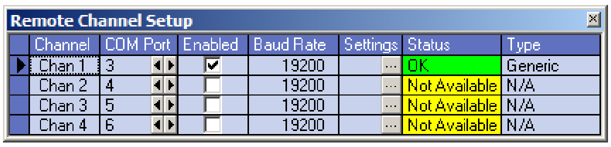


- ❶ Current Seanet Pro Application. If the main Seanet Pro program is running, the current application will be shown in the titlebar.
- ❷ Terminal Display Window. Any RemV4 input/output will be shown in this window.
- ❸ Channel Status Panels. Show the status of each remote channel (connected, not connected or error connecting).
- ❹ Channel Message Queue Panels. Show the output message queue for each remote channel. If message queue is greater than 10 then the channel baud rate will need to be increased.

Figure 3.1. RemV4 Main Display

3.1. Settings

The RemV4 program has four available channels and these are configured using the `Settings` menu. To configure the channels launch the `Remote Channel Setup` dialog (click on `Channels` in the `Settings` menu).


Remote Channel Setup

Channel	COM Port	Enabled	Baud Rate	Settings	Status	Type
Chan 1	3	☑	19200	...	OK	Generic
Chan 2	4	☐	19200	...	Not Available	N/A
Chan 3	5	☐	19200	...	Not Available	N/A
Chan 4	6	☐	19200	...	Not Available	N/A

Figure 3.2. RemV4 Program Settings

Using the `Remote Channels Setup` dialog it is possible to choose the COM port that will be used by the channel and also the COM port settings

(Baud rate, parity, etc.). The COM port settings are accessed by clicking on the ellipsis button under the `Settings` column.

To change the program settings for RemV4 launch the `RemV4 Options` dialog by clicking on `Options` under the `Settings` menu.

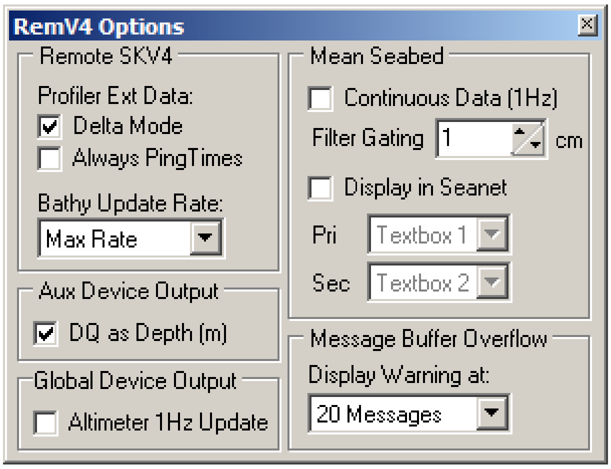


Figure 3.3. RemV4 Program Settings

3.2. Applications

There are four available applications to configure in RemV4 and these will determine the type and content of the output strings sent over the serial link.

RemV4 Applications Menu

1. **Remote SKV4**

   Configure SKV4 compatible devices for remote communication. See Chapter 10, *Additional Remote SKV4 Options*.

2. **Aux Device Output**

   Send data received from a Sonar, Profiler or Junction Box auxiliary port. See Section 11.2, “Serial Output of Auxiliary Port Data”.

3. **Mean Seabed Output**

   Send a Mean Seabed value. See Section 11.1, “Profiler Serial Output of Mean Seabed”.

4. **Global Device Output**

   Send data from a device which has been designated for global use in Seanet Pro. See Section 11.3, “Serial Output of Global Device Data”.

4. Data Constants and Structures

Table 4.1. General Data Descriptions

Description	DataCodes	Data Types
Slot number (range 01 to 12)	SlotN	SLOTN
Device source code (range 00 to 99)	SourceN	SOURCEN
Reply terminator (ASCII character 13 and 10)	<CR><LF>	2*CHAR
Command terminator (ASCII 10)	<LF>	1*CHAR
Space character		1*CHAR
Total number of bytes in message in Hex (including header and terminators)	NB	CARDINAL
Seanet application identifier	WAP	10*CHAR

Table 4.2. System Data Constants

SourceType Data Constants	DataType = SOURCEN
Device Description	**ASCII Text Data Code**
Null device (nothing in a slot) (sNUL)	32 or Hex:20 (or 00 in :GE reply)
Reserved	33 or Hex:21
SeaKing/Gemini Imaging Sonar (hSON)	34 or Hex:22
Reserved	35 or Hex:23
Reserved	36 or Hex:24
SeaKing Profiler Head (hPRF)	37 or Hex:25
Reserved	38 or Hex:26
SeaKing 700 Series (Bathy)	39 or Hex:27
Reserved	40 to 52
SeaKing Attitude Sensor	53 or Hex:35

Table 4.3. SlotReplyHdr Data Structure

Description	DataCodes	Data Types
Total number of bytes in message in Hex (including header and terminators)	NB	CARDINAL
Slot number (range 01 to 0C)	SlotN	SLOTN
Generic device type	SourceTypes	SOURCEN
Reply mode (0 = ASCII, 1 = Hex, 2 = binary, 3 = CSV)	0, 1, 2 or 3	DIGIT
Send SeaKing long = 3*, send SeaKing short = 2*, send raw data = 1, send processed data = 0 (* only applicable to Bathy)	0, 1, 2 or 3 (always `0` in `:GV` reply)	DIGIT
Example: `002B022501` which is as follows: Byte count = Hex 002B (43) Slot = 02 = Profiler system Sourcetype = 37(Hex 25) = Profiler system Data replay mode is ASCII text Send rawdata = true		

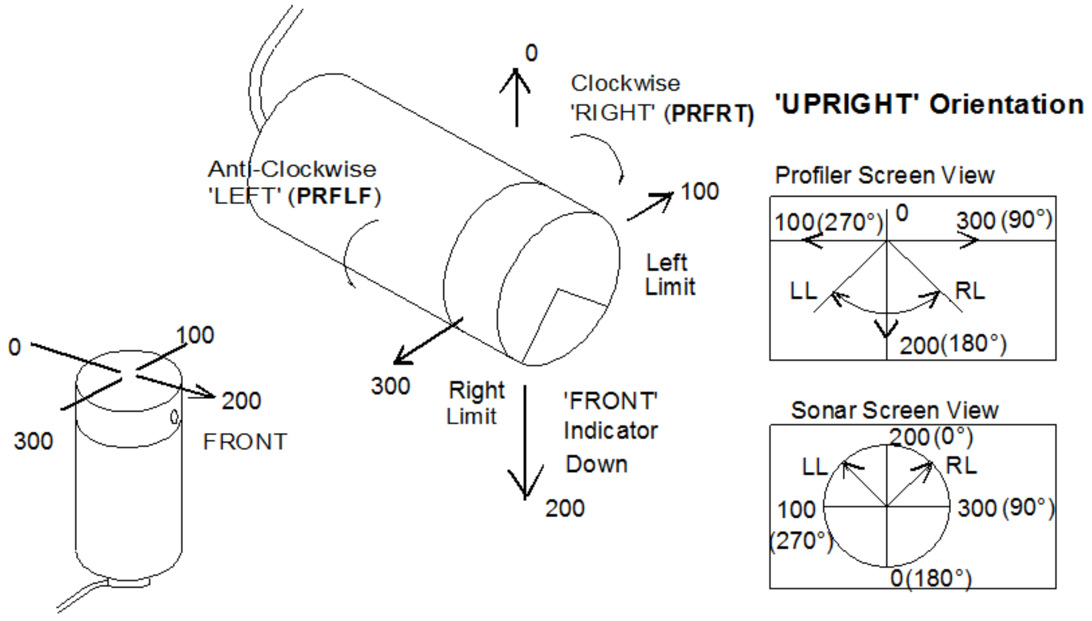
Table 4.4. SlotModeHdr Data Structure

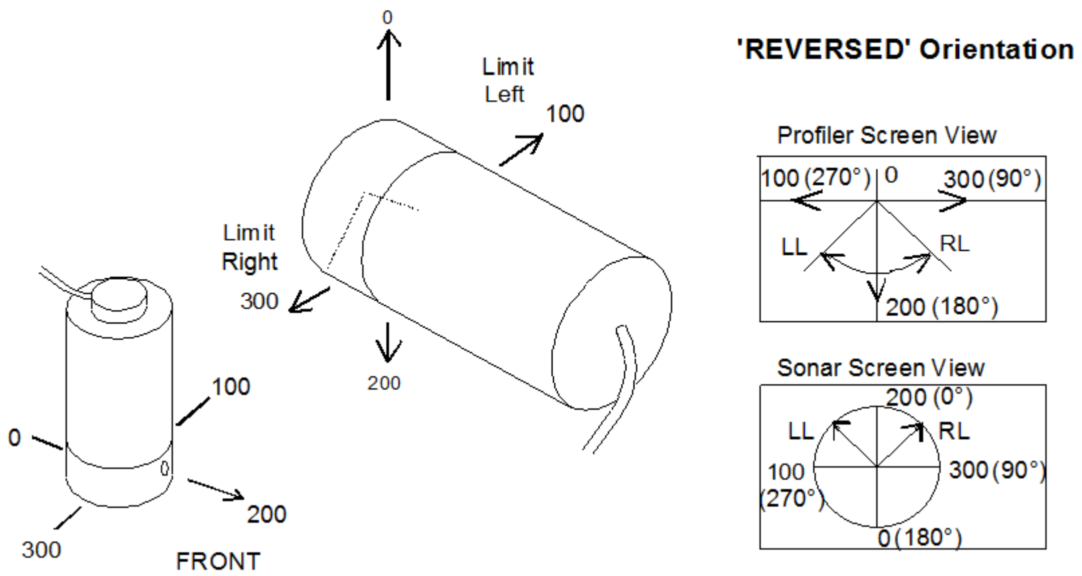
Description	DataCodes	Data Types
Slot number (range 01 to 0C)	SlotN	SLOTN
Generic device type	SourceTypes	SOURCEN
Unused, always 00	00	
Node number	1 to 63H	NODEN
Example: `03250015` which is as follows: Slot 3 Slave Profiler Node number 21 (Hex 15)		

Table 4.5. SlotMode Data Structure

Description	DataCodes	Data Types
Profiler data reply mode (unused in Bathy) send raw data = 1, send processed data = 0	0 or 1	DIGIT
Continuously send data = 1, data on demand = 0	0 or 1	DIGIT
Report cursor position (on = 1, off = 0)	0 or 1	DIGIT
Reply mode (0 = ASCII, 1 = Hex, 2 = binary, 3 = CSV)	0, 1, 2 or 3	DIGIT
Profiler data reply mode (unused in Bathy) send raw data = 1, send processed data = 0	0 or 1	DIGIT
Communications channel for reply data	1, 2 or 3	DIGIT
Unused	Always 0	
Example: `001230` which is as follows: Send processed data on demand with cursor reporting in binary on communications channel 3		

5. Profiler and Sonar Scan Directions





Note

Directions 0, 100, 200 and 300 are in head data units (Gradian) where 0 to 400 Gradian is equal to 0° to 360°.

Directions (0°), (90°), (180°) and (270°) are the displayed sector.

Scan Right, scans collecting data from LEFT limit to RIGHT limit followed by a "fly-back" to the LEFT (**Scan Left** is the opposite).

Alternate Scan, collect data in both scan directions with no "fly-back".

6. Command Summary

Command messages sent to the SCU are made up of a command code followed by the required data codes. Reply messages from the SCU are made up of the reply code followed by data code.

Table 6.1. SKV4 Commands

Description	Command Code	Reply Code
Global enquire slot mode	:GE + <LF>	%E + NB + WAP + 12*(SlotModeHdr+SlotMode) + <CR><LF>
Specific enquire slot mode	:GM + SlotN + <LF>	%M + NB + SlotModeHdr + SlotMode + <CR><LF>
Specific send slot mode	:SM + SlotN + SlotMode + <LF>	no reply
Specific enquire device configuration	:GC + SlotN + <LF>	%G + SlotReplyHdr + device configuration data + <CR><LF>
Specific send device configuration	:SC + SlotN + SourceN + device configuration data + <CR><LF>	No reply
Specific enquire slot position	:GP + SlotN + <LF>	%P + SlotReplyHdr + Position data + <CR><LF>
Specific send slot position	:SP + SlotN + position data + <LF>	no reply
Specific trigger slot and request next data	:ST + SlotN + <LF>	%D + SlotReplyHdr + device system reply data + <CR><LF>
Specific request current data	:SR + SlotN + <LF>	%D + SlotReplyHdr + device system reply data + <CR><LF>
Specific request continuous data output ON	:S + SlotN + <LF>	(%D + SlotReplyHdr + device system reply data + <CR><LF>) repeatedly until :S is received
Specific request continuous data output OFF	:S + SlotN + <LF>	no reply
Specific request current mean VOS (valid with SeaKing SK704 Bathy and surface software V1.5+)	:GV + SlotN + <LF>	%V + SlotReplyHdr + mean velocity reply data + <CR><LF>
Specific remote control OFF (send to any slot where :SC was issued to release controls from remote back to local. Will reset Profilers to continuous scan)	:RO + SlotN + <LF>	no reply
Get button bar data	:GB + <LF>	%B + NB + Title Bar Text + 8*(User Text) + time + date + icon library + icon1 + icon 2 + <CR><LF>
Set button bar data	:SB + Title Bar Text + 8*(User Text) + time + date + icon library + icon1 + icon 2 + <LF>	no reply

6.1. Examples of Use

- SlotN = 04 for SeaKing 700 Series systems (Bathy)
- SlotN = 02 for Profiler system (02 = Master, 03 = Slave)
- WAP = BP for Bathy/Profiler system (left blank in Seanet Pro)

Table 6.2. Global Enquire Slot Mode - `:GE`

Message formats	
Command	`:GE` + <LF>
Reply	`%E` + NB + WAP + 12*(SlotModeHdr + SlotMode) + <CR><LF>
Message strings	
Command	`:GE<LF>`

Reply	`%E00BABP01000000000000022500141010100325`
	`0015101010042700281000100500000000000006`
	`0000000000000700000000000008000000000000`
	`090000000000000A0000000000000B0000000000`
	`000C000000000000<CR><LF>`

Table 6.3. Specific Enquire Slot Mode - `:GM`

Message formats	
Command	`:GM` + SlotN + <LF>
Reply	`%M` + NB + SlotModeHdr + SlotMode + <CR><LF>
Message strings	
Command	`:GM02<LF>`
Reply	`%M00160225001400010<CR><LF>`

Table 6.4. Specific Send Slot Mode - `:SM`

Message formats	
Command	`:SM` + SlotN + SlotMode + <LF>
Reply	no reply
Message strings	
Command	`:SM02100010<LF>`
Reply	no reply

7. Profiler System Data

7.1. Configuration Data Structure

Data Description	Data Range	Data Type
Range scale in decimetres	10 to 300	CARDINAL
ScanWidth in 1/16 Gradian steps	0 to 6392	CARDINAL
Scan centre direction in 1/16 Gradian steps	0 to 6392	CARDINAL
Profiler head gain setting (as percentage)	0 to 100	CARDINAL
Resolution control (0 = Lo, 1 = Med, 2 = Hi, 3 = Ult)	0 to 3	DIGIT
Manual triggered scan = 1, continuous scan = 0	0 or 1	BOOLEAN
Profiler head enabled. Bit0 = Master Profiler, Bit1 = Slave Profiler	0 to 3	DIGIT
Unused	Always 0	BOOLEAN
Operating frequency (0 = Low, 1 = High)	0 or 1	BOOLEAN
Mirror sector (1 if enabled)	0 or 1	BOOLEAN
Unused	Always 0	BOOLEAN
Unused	Always 0	BOOLEAN
Ping Sync (1 if enabled)	0 or 1	BOOLEAN
Scan Mode (0 = right, 1 = left, 2 = alternate)	0, 1 or 2	DIGIT
Orientation (0 = upright, 1 = reversed)	0 or 1	DIGIT
Gain slop in 1/255 units	0 to 255	CARDINAL
Unused	Always 000	SHORTCARD
Speed of sound in metres per second * 10 (typically 14750dm·s^{-1})	14000 to 15500	CARDINAL

Table 7.1. Example Profiler Configuration Data Structure

RangeScale 10 metres
ScanWidth 180 degrees (200 Gradians)
ScanCentre Direction Front (Red LED on) (200 Gradians)
Gain Setting 15% (Normal)
Resolution Control High
Continuous Scan
Master and Slave Profiler Heads Enabled
Unused (always 0)
Operating Frequency = Low
Mirror Sector Enabled
Unused (always 0)
Unused (always 0)
Ping Sync Enabled
Scan Mode Alternate
Orientation Upright
Gain Slope = 30
Unused (always 000)
Speed of Sound = 14750
Always ASCII Text when sent to RemV4, RemV4 replies in data reply mode of slot.
ASCII Text = `0010003200032000001520300010012000077000014750`

7.2. Position Data Structure

Data Description	Data Range	Data Type
Horizontal X position in millimetres	-5000 to 5000	INTEGER
Vertical Y position in millimetres	-5000 to 5000	INTEGER
Longitudinal Z position in millimetres	-5000 to 5000	INTEGER
Rotational R position in Gradians *10	-2000 to 2000	INTEGER
EchoRanging time correction in microseconds	-100 to 100	INTEGER
Example: Head 0.5 metre horizontally from vehicle datum and 1 metre above datum Head at X=500, Y=1000, Z=0, R=0, no time correction Always ASCII text when sent to RemV4, RemV4 replies in data reply mode of slot ASCII Text: `+00500-01000+00000+00000+00000` Hex: `01F403E8000000000000`		

7.3. Reply Data Structure

Data Description	Data Range	Data Type
Horizontal X position in millimetres	-5000 to 5000	INTEGER
Vertical Y position in millimetres	-5000 to 5000	INTEGER
Longitudinal Z position in millimetres	-5000 to 5000	INTEGER
Rotational R position in Gradians *10	-2000 to 2000	INTEGER
EchoRanging time correction in microseconds	-100 to 100	INTEGER
Number of Profiler Samples (NPS)	00001 to 00799	CARDINAL
Scan Start Angle in 1/16 Gradians	00000 to 06392	CARDINAL
Step size and direction during scan in 1/16 Gradians (008 = Ult, 016 = Hi, 024 = Med, 032 = Lo)	-032 (scan left) to 032 (scan right)	CARDINAL
Velocity of sound in decimetres per second	14000 to 15500 (in 1 metre steps)	CARDINAL
Time at start of scan	00000000 to 23595959	TIME
Duration of scan in units of 1 millisecond	0 to 65535	CARDINAL
Profiler head operating mode Bit0: Orientation (0 = upright, 1 = reversed) Bit1: 0 = Raw data in μs clock units / processed data in mm (applied when ≤30m range scale is set) 1 = raw data in 10μs clock units / processed data in cm (applied when 50 or 80m range scale set) Bit4: 0 = Profiler data to surface excludes ping times, 1 = data includes ping times Bit2,3,5,6,7 are reserved and always 0 Example: Upright = 000, reversed = 001, upright profiler data sent to SCU includes ping times = 016.	0 to 7	BYTE
NPS * Profile data points (Raw or Processed)	0 to 65535	NPS*CARDINAL

Note

Raw data is the return acoustic path length in microseconds (x10 when using 50m or 80m range scale). The slant range is therefore calculated by multiplying by the velocity of sound divided by 2.

Processed data gives actual slant range in millimetres (or centimetres when using 50m or 80m range scale) using the system velocity of sound.

Reply Data Example 1
Head at XYZR=0, no time correction, 3*5metre ranges in microseconds, start at 199, ultimate, PRFRT, Vprop = 1500m·s^{-1}, scan at 15:27:33:02, duration 33µs, orientation reversed with no ping times: 30 metre range scale selected.

ASCII Text:
`+00000+00000+00000+00000+000000000303184+00815000152733`
`020000300106667066670666 7`

Reply Data Example 2
Head at XYZR=0, no time correction, 3*5metre ranges in microseconds, start at 199, ultimate, PRFRT, Vprop=1500m·s^{-1}, scan at 15:27:33:02, duration 33µs, orientation reversed with no ping times: As Example 1 but with 50m range scale selected.

ASCII Text:
`+00000+00000+00000+00000+000000000303184+00815000152733`
`020000300300667006670066 7`

7.4. Examples of Use

These examples use slot 2 (i.e., SlotN = 02).

Table 7.2. Get Configuration - `:GC`

Message formats	
Command	`:GC` + SlotN + <LF>
Reply	`%G` + SlotReplyHdr + Profiler configuration data + <CR><LF>
Message strings	
Command	`:GC02<LF>`
Reply	`%G003A022501000100320003200000152030010` `01200007700014750<CR><LF>`

Table 7.3. Get Position - :GP

Message formats	
Command	:GP + SlotN + <LF>
Reply	%P + SlotReplyHdr + Profiler position data + <CR><LF>
Message strings	
Command	GP02<LF>
Reply	%P002C022501+00500-01000+00000+00000+00000<CR><LF>

Table 7.4. Set Slot Position - :SP

Message formats	
Command	:SP + SlotN + Profiler position data + <LF>
Reply	no reply
Message strings	
Command	:SP02+00500-01000+00000+00000+00000<LF>
Reply	no reply

Table 7.5. Trigger New Data - :ST

Use when manual triggered scan is enabled in the Profiler configuration data structure. This control will trigger the heads and acquire scan data fro one complete scan. If a dual head system is in operation the signal should be sent to the Master head to trigger both heads.	
Message formats	
Command	:ST + SlotN + <LF>
Reply	%D + SlotReplyHdr + Profiler data + <CR><LF>
Message strings	
Command	:ST02<LF>
Reply	%D005E022501+00000+00000+00000+00000+000000000303184+008150001527330200003001066670666706667<CR><LF>

Table 7.6. Get Single Data Record - :SR

Message formats	
Command	:SR + SlotN + <LF>
Reply	%D + SlotReplyHdr + Profiler data + <CR><LF>
Message strings	
Command	:SR02<LF>
Reply	%D005E022501+00000+00000+00000+00000+000000000303184+008150001527330200003001066670666706667<CR><LF>

Table 7.7. Set Configuration - `:SC`

When sent to the Master head the configuration information is copied to the Slave	
Message formats	
Command	`:SC` + SlotN + SOURCEN + Profiler configuration data + <CR><LF>
Reply	no reply
Message strings	
Command	:SC022500010032000320000015203001001200007700014750<CR><LF>
Reply	no reply

Table 7.8. Set Continuous Mode - `:S+`

Message formats	
Command	:S+ + SlotN + <LF>
Reply	(%D + SlotReplyHdr + Profiler data + <CR><LF>) repeatedly until :S- + SlotN is received.
Message strings	
Command	:S+02<LF>
Reply	%D005E022501+00000+00000+00000+00000+000000000303184+008150001527330200003001066670666706667<CR><LF>

Table 7.9. Turn Off Continuous Mode - `:S-`

Message formats	
Command	:S- + SlotN + <LF>
Reply	no reply
Message strings	
Command	:S-02<LF>
Reply	no reply

8. SeaKing 700 Series (Bathy) System Data

8.1. Local Latitude and Gravity

All *Tritech International Ltd* supplied pressure sensors fitted to the SeaKing 700 series are calibrated using a deadweight tester in a location where the gravity value is $9.80665 m \cdot s^{-2}$

Depth calculations take into account the gravity of the operating location, which is specified as a latitude, and are calculated as follows:

$$g = 9.7803184(1 + 0.0053024 \sin^2 \theta - 0.0000059 \sin^4 \theta)$$

$Given:$
$\theta = \text{local latitude in degrees}$

(International Association of Geodesy, Sp.Pub.Bull Geodesy 1970)

Figure 8.1. Local Gravity Formula

Note

If operating in a locality where the local gravity is known, choose an appropriate latitude value to give the desired local gravity value.

The gravity does not have to be calculated manually and can be done using Seanet Pro. Simply enter a latitude in the main program `Environment` settings (from the `Settings` menu) and the local gravity will be shown.

8.2. Configuration Data Structure

Data Description	Data Range	Data Type
Barometric pressure in millibars	900.0 to 1100.0	REAL
Specific gravity	0.900 to 1.100	REAL
Speed of sound in decimetres per second	14000 to 15500	CARDINAL
Message format selector 0 = WINSON Processed 1 = WINSON Raw 2 = SeaKing Short 3 = SeaKing Long	0 to 3	DIGIT
Measured/supplied parameter selector 0 = use supplied parameters (manual) 1 = Select measured speed of sound (AUTO_VOS) 2 = Select measured mean specific gravity (AUTO_SG) 4 = Select measured barometric pressure (AUTO_BAR)	0 or any combination of: 1 + 2 + 4	DIGIT
Message update rate 0 = maximum rate (approximately 4Hz) 1 = 2Hz update rate 2 = 1Hz update rate 3 = update every 2 seconds 4 = update every 5 seconds 5 = update every 10 seconds	0 to 5	DIGIT
Local latitude (for local gravity calculation)	0.0 to 90.0	REAL

Example

Barometric pressure = 1100 millibars

Specific gravity = 1.027

Speed of sound = 14750dm·s^{-1}

Message format = SeaKing short (only applicable to SeaKing example)

Measured parameters = AUTO_VOS, AUTO_SG (only applicable to SeaKing example)

Update rate = 1Hz (only applicable to SeaKing example)

WINSON ASCII: `+1.10000E+03+1.02700E+0014750`

WINSON Hex: `448980003F8374BC399E`

SeaKing Short ASCII: `+1.10000E+03+1.02700E+0014750232+5.80000E+01`

SeaKing Short Hex: `448980003F8374BC399E232LLLL`

Note

In the Configuration Data Structure table the first three rows are compatible with the WINSON format. If the last 4 fields are not sent the system will always reply in the WINSON (raw) compatible format and if the system is in the WINSON compatible mode the last 4 fields are not sent in response to a `:GC` request (this is to preserve backwards compatibility with older software).

The `:GC` command will always return current manual system settings for VOS, Mean Density and Barometric Pressure.

8.3. Position Data Structure

Data Description	Data Range	Data Type
Vertical position in millimetres (SeaKing 700 head)	-5000 to 5000	INTEGER
Vertical position in millimetres (Altimeter)	-5000 to 5000	INTEGER
Reserved	-5000 to 5000	INTEGER
Zero offset in millimetres	-5000 to 5000	INTEGER
Reserved	-100 to 100	INTEGER

Example

SeaKing 700 0.5m below datum and Altimeter 1m below datum

SeaKing 700 Y=500, Altimeter Y=1000, no zero offset

Always ASCII text when sent to RemV4, RemV4 replies in data reply mode of slot

ASCII: `+00500+01000+00000+00000+00000`

Hex: `01F403E8000000000000`

8.4. Mean Velocity Reply Data Structure

Data Description	Data Range	Data Type
Vehicle datum depth in millimetres (sensor pressure - atmospheric pressure) * Mean Density * calibration gravity/local gravity - vertical position + vertical zero offset	0000000000 to 100000000	LONGINT
Velocity of sound in decimetres per second (calculated from local column measurements at 1psi intervals)	14000 to 15500	CARDINAL
Example SeaKing 700 at 58.418m depth Mean VOS = 14720dm·s^{-1} ASCII: `+000005841814720` Hex: `0000E4323980`		

8.5. WINSON Raw Reply Data Structure

Data Description	Data Range	Data Type
Internal temperature in tents of a degree centigrade	-200 to 500	INTEGER
Pressure in 100,000ths of a PSIa	0000000000 to 100000000	LONGCARD
Pressure sensor temperature in 1/100ths of a degree	-5400 to 10700	INTEGER
Raw pressure reading	0000000 to 10000000	LONGCARD
Raw temperature reading	0000000 to 10000000	LONGCARD
Local oscillator calibration coefficient in Hz	-500 to 500	INTEGER
Conductivity in micro Siemens per centimetre	00000 to 65000	CARDINAL
Conductivity probe temperature in 1/100ths of a degree	-1000 to 5000	INTEGER
Salinity in parts per million calculated from conductivity	00000 to 100000	CARDINAL
Velocity of sound in decimetres per second	14000 to 15500	CARDINAL
Altimeter return path (does not include altimeter position offset)	0 to 203390	LONGINT
SeaKing 700 system devices (1 = valid) Bit0 = pressure sensor Bit1 = conductivity sensor Bit2 = altimeter Bit3 = internal temperature (SK701 units only) Bit4 = velocity of sound calculation Bit5 = salinity calculation	000 to 063	SHORTCARD
Depth in millimetres (this does not include offsets)	1000000 to 700000	
Time at start of scan	00000000 to 23595999	TIME

Example

Internal temperature	= 5°C	= 50
Pressure sensor	= 200PSIa	= 20000000
Pressure sensor temperature	= 5°C	= 500
Raw pressure reading	= 2135648	= 2135648
Raw temperature reading	= 1986497	= 1986497
Local oscillator calibration	= -10Hz	= -10
Conductivity	= 40µS·cm^{-1}	= 40000
Conductivity temperature	= 5°C	= 500
Conductivity Salinity	= 3.4 parts per 1000	= 3400
Velocity of Sound	= 14750dm·s^{-1}	= 14750
Altimeter reading	= 24m	= 162710 (return path)
SeaKing 700 system devices	= SK704 (CTDA)	= 055
Depth in millimetres	= 136.921m	= 136921
Time in HHMMSSCC	= 09:45:33:74	= 09453374

ASCII:
```
+000500020000000+005000002135648000198649 7-0001040000+005000340014750+0000
162710055+000013692109453374
```

Hex:
```
003201312D0001F400209660001E4FC1FFF69C4001F40D48399E00027B9637000216D90090
3F3E
```


8.6. WINSON Processed Reply Data Structure

Data Description	Data Range	Data Type
Internal temperature in tents of a degree centigrade	-200 to 500	INTEGER
Pressure in 100,000ths of a PSIa	0000000000 to 100000000	LONGCARD
Pressure sensor temperature in 1/100ths of a degree	-5400 to 10700	INTEGER
Raw pressure reading	0000000 to 10000000	LONGCARD
Raw temperature reading	0000000 to 10000000	LONGCARD
Local oscillator calibration coefficient in Hz	-500 to 500	INTEGER
Conductivity in micro Siemens per centimetre	00000 to 65000	CARDINAL
Conductivity probe temperature in 1/100ths of a degree	-1000 to 5000	INTEGER
Salinity in parts per million calculated from conductivity	00000 to 100000	CARDINAL
Velocity of sound in decimetres per second	14000 to 15500	CARDINAL
Altimeter return path (including altimeter position offset)	0 to 30000	LONGINT
SeaKing 700 system devices (1 = valid) Bit0 = pressure sensor Bit1 = conductivity sensor Bit2 = altimeter Bit3 = internal temperature (SK701 units only) Bit4 = velocity of sound calculation Bit5 = salinity calculation	000 to 063	SHORTCARD
Depth in millimetres (including offsets)	1000000 to 700000	
Time at start of scan	00000000 to 23595999	TIME

Example

Internal temperature	= 5°C	= 50
Pressure sensor	= 200PSIa	= 20000000
Pressure sensor temperature	= 5°C	= 500
Raw pressure reading	= 2135648	= 2135648
Raw temperature reading	= 1986497	= 1986497
Local oscillator calibration	= -10Hz	= -10
Conductivity	= 40μS·cm^{-1}	= 40000
Conductivity temperature	= 5°C	= 500
Conductivity Salinity	= 3.4 parts per 1000	= 3400
Velocity of Sound	= 14750dm·s^{-1}	= 14750
Altimeter reading	= 24m	= 24000
SeaKing 700 system devices	= SK704 (CTDA)	= 055
Depth in millimetres	= 136.921m	= 136921
Time in HHMMSSCC	= 09:45:33:74	= 09453374

ASCII:
```
+000500020000000+0050000021356480001986497-0001040000+005000340014750+0000
024000055+000013692109453374
```

Hex:
```
003201312D0001F400209660001E4FC1FFF69C4001F40D48399E00005DC037000216D90090
3F3E
```


8.7. SeaKing Long Reply Data Structure

Data Description	Data Range	Data Type
Time at start of scan	00000000 to 23595999	TIME
Vehicle datum depth in millimeters (sensor pressure - atmospheric pressure) * mean density * calibration gravity/local gravity - vertical position + vertical zero offset	0000000000 to 100000000	LONGINT
Vehicle datum altitude in millimetres (altimeter time * speed of sound) + vertical altimeter position	0000000000 to 0000100000	LONGINT
Velocity of sound in decimetres per second	14000 to 15500	CARDINAL
Mean density used for depth calculation (in units of 100g·l^{-1})	0000090000 to 0000110000	LONGCARD
Barometric pressure used for depth calculation in millibars	00900 to 01100	CARDINAL
Measured pressure in 100,000ths of a PSIa	0000000000 to 100000000	LONGCARD
Altimeter reading	0 to 200000 (0 to 30m)	LONGINT
System temperature in 1/100ths of a degree	-1000 to 5000	INTEGER
Conductivity in micro Siemens per centimetre	00000 65000	CARDINAL
Local density calculated from conductivity (in units of 100g·l^{-1})	0000090000 to 0000110000	LONGCARD
SeaKing 700 system devices (1 = valid) Bit0 = pressure sensor Bit1 = conductivity sensor Bit2 = altimeter Bit3 = internal temperature (SK701 units only) Bit4 = velocity of sound calculation Bit5 = salinity calculation	000 to 063	SHORTCARD
Measured or supplied parameters used in depth and altitude calculations: 0 = user supplied parameters (MANUAL) 1 = Using measured VOS (AUTO_VOS) 2 = Using measured specific gravity (AUTO_SG) 4 = Using measured pressure (AUTO_BAR)	0 or any combination of: 1 + 2 + 4	SHORTCARD

8.8. SeaKing Short Reply Data Structure

Data Description	Data Range	Data Type
Time at start of scan	00000000 to 23595999	TIME
Vehicle datum depth in millimeters (sensor pressure - atmospheric pressure) * mean density * calibration gravity/local gravity - vertical position + vertical zero offset	0000000000 to 100000000	LONGINT
Vehicle datum altitude in millimetres (altimeter time * speed of sound) + vertical altimeter position	0000000000 to 0000100000	LONGINT
Velocity of sound in decimetres per second	14000 to 15500	CARDINAL
Mean density used for depth calculation (in units of 100g·l^{-1})	0000090000 to 0000110000	LONGCARD
Barometric pressure used for depth calculation in millibars	00900 to 01100	CARDINAL
SeaKing 700 system devices (1 = valid) Bit0 = pressure sensor Bit1 = conductivity sensor Bit2 = altimeter Bit3 = internal temperature (SK701 units only) Bit4 = velocity of sound calculation Bit5 = salinity calculation	000 to 063	SHORTCARD
Measured or supplied parameters used in depth and altitude calculations: 0 = user supplied parameters (MANUAL) 1 = Using measured VOS (AUTO_VOS) 2 = Using measured specific gravity (AUTO_SG) 4 = Using measured pressure (AUTO_BAR)	0 or any combination of: 1 + 2 + 4	SHORTCARD

8.9. Examples of Use

These examples use slot 4 (i.e., SlotN = 04).

Table 8.1. Get Configuration - :GC

Message formats	
Command	:GC + SlotN + <LF>
Reply	%G + SlotReplyHdr + SeaKing 700 Configuration data + <CR><LF>
Message strings in WINSON raw data mode	
Command	:GC04<LF>
Reply	%G002B042701+1.10000E+03+1.02700E +0014750<CR><LF>
Message strings in SeaKing long data mode	
Command	:GC04<LF>
Reply	%G003A042703+1.10000E+03+1.02700E +0014750132+5.80000E+01<CR><LF>

Table 8.2. Get Slot Position - :GP

Message formats	
Command	:GP + SlotN + <LF>
Reply	%P + SlotReplyHdr + SeaKing 700 position data + <CR><LF>
Message strings	
Command	:GP04<LF>
Reply	%P002C042701+00500+01000+00000 +00000+00000<CR><LF>

Table 8.3. Set Slot Position - :SP

Message formats	
Command	:SP + SeaKing 700 position data + <LF>
Reply	no reply
Message strings	
Command	:SP04+00500+01000+00000+00000+00000<LF>
Reply	no reply

Table 8.4. Trigger New Data - `:ST`

Message formats	
Command	`:ST` + SlotN + `<LF>`
Reply	`%D` + SlotReplyHdr + SeaKing 700 data + `<CR><LF>`
Message strings	
Command	`:ST04<LF>`
Reply	`%D0074042701+000000000020000+0050000021356480001986497-0001040000+005000340014750+0000160000031+000013692109453374<CR><LF>`

Table 8.5. Get Single Data Record - `:SR`

Message formats	
Command	`:SR` + SlotN + `<LF>`
Reply	`%D` + SlotReplyHdr + SeaKing 700 data + `<CR><LF>`
Message strings	
Command	`:SR04<LF>`
Reply	`%D0074042701+000000000020000+0050000021356480001986497-0001040000+005000340014750+0000160000031+000013692109453374<CR><LF>`

Table 8.6. Set Configuration - `:SC`

Message formats	
Command	`:SC` + SlotN + SOURCEN + SeaKing 700 configuration data + `<CR><LF>`
Reply	no reply
Message string in WINSON raw/processed format	
Command	`:SC0427+1.10000E+03+1.02700E+0014750<CR><LF>`
Reply	no reply
Message string in SeaKing long/short format	
Command	`:SC0427+1.10000E+03+1.02700E+0014750232+5.80000E+01<CR><LF>`
Reply	no reply

Table 8.7. Set Continuous Mode - `:S+`

Message formats	
Command	`:S+` + SlotN + <LF>
Reply	(%D + SlotReplyHdr + SeaKing 700 data + <CR><LF>) repeatedly until `:S-` is received
Message strings	
Command	:S+04<LF>
Reply	%D0074042701+000500000020000+0050000021356480001986497-0001040000+005000340014750+0000160000031+000013692109453374<CR><LF>

Table 8.8. Turn Off Continuous Mode - `:S-`

Message formats	
Command	`:S-` + SlotN + <LF>
Reply	no reply
Message strings	
Command	:S-04<LF>
Reply	no reply

Table 8.9. Get Current Mean Velocity of Sound - `:GV`

Message formats	
Command	`:GV` + SlotN + <LF>
Reply	%V + SlotReplyHdr + mean velocity data + <CR><LF>
Message strings	
Command	:GV04<LF>
Reply	%V001E042700+000005841814720<CR><LF>

9. Button Bar Data

Notes

String message limit is 128 characters.

The remote icon setting is not implemented in Seanet Pro. This was designed to operate with icon libraries on the older SONV3 and WINSON software programs.

When setting the button bar data the tilde symbol (~) is a place holder for the string being sent. The string can be terminated prematurely with the line feed command (<LF>) and the remaining data will be unchanged.

To blank out a button bar string a space must be sent to separate the ~ place holder.

To leave a string unchanged the ~ place holder follows the previous ~ immediately with no space.

Time is in UTC format.

Table 9.1. Button Bar Layout

<table>
<tr><td colspan="8">Title Bar Text</td></tr>
<tr><td colspan="5" rowspan="12">sensor display area</td><td colspan="3"></td></tr>
<tr><td>Icon 3</td><td>Icon 10</td><td></td></tr>
<tr><td colspan="3"></td></tr>
<tr><td colspan="3">User1</td></tr>
<tr><td colspan="3">User2</td></tr>
<tr><td colspan="3">User3</td></tr>
<tr><td colspan="3">User4</td></tr>
<tr><td colspan="3">User5</td></tr>
<tr><td colspan="3">User6</td></tr>
<tr><td colspan="3">User7</td></tr>
<tr><td colspan="3">User8</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td></td><td></td><td></td><td></td><td>12-APR-13
10:25:35</td><td></td><td colspan="2"></td></tr>
</table>

Table 9.2. Get Button Bar Data

Message format	
Command	:GB + <LF>
Reply	%B + NB + Title Bar Text + 8*(User Text) + TIME + DATE + Icon Library + Icon 1 + Icon 2 + <CR><LF>
Message strings	
Command	:GB<LF>
Reply	%B006DTitle Bar Text~User1~User2~User3~User4~User5~User6~User7 ~User8~10253548~12042013~iconlib.exe~0003000A<CR><LF>

Table 9.3. Set Button Bar Data

Message format	
Command	:SB Title Bar Text + 8*(User Text) + TIME + DATE + Icon Library + Icon 1 + Icon 2 + <LF>
Reply	no reply
Message strings (see Table 9.4, “Updated Button Bar Example”)	
Command	:SBTitle Bar Text~User One~ ~~User Four~User5~User6~User7 ~User8~10253548~12042013~iconlib.exe~0003000A<LF>
Alternative	:SBTitle Bar Text~User One~ ~~User Four<Lf>
Reply	no reply

Table 9.4. Updated Button Bar Example

<table>
<tr><td colspan="9">Title Bar Text</td></tr>
<tr><td colspan="5" rowspan="12">sensor display area</td><td colspan="4"></td></tr>
<tr><td colspan="2">Icon 3</td><td>Icon 10</td><td></td></tr>
<tr><td colspan="4"></td></tr>
<tr><td colspan="4">User One</td></tr>
<tr><td colspan="4"></td></tr>
<tr><td colspan="4">User3</td></tr>
<tr><td colspan="4">User Four</td></tr>
<tr><td colspan="4">User5</td></tr>
<tr><td colspan="4">User6</td></tr>
<tr><td colspan="4">User7</td></tr>
<tr><td colspan="4">User8</td></tr>
<tr><td colspan="4"></td></tr>
<tr><td></td><td></td><td></td><td></td><td>12-APR-13
10:25:35</td><td></td><td colspan="3"></td></tr>
</table>

10. Additional Remote SKV4 Options

10.1. Profiler Serial Message Extended Outputs

When a Profiler application is run in Seanet Pro which has the roll correction option selected, there will be appended data attached to the end of the standard Profiler (RemV4) data message transmitted via the serial port. This appended data will be one of two forms dependent on whether or not the roll sensor is active and producing valid data. The appended data will start with `#` or `*` to signify the type of the data.

The Profile data points at the end of the standard Profiler message are always uncorrected for roll. When the roll sensor is active, the appended data that will follow will include all the roll angle corrections that should be applied to correct each of the Profile data points. By appending the roll data separately it is possible to choose whether or not to apply them. If the roll sensor is not activated, the appended data will be of the form that states the ping times for each of the Profile data points. The option is therefore available to integrate and synchronise the time-stamped data with another third party roll sensor.

10.1.1. Profiler Data Extended with Roll Correction Data

The following table only shows the extended data, for the normal part of the Profiler data refer to Section 7.3, "Reply Data Structure"

The extended data is sent in one of two modes which is controlled by selecting `Delta Mode` in the `RemV4 Options` dialog (navigate to `Options` in the `Settings` menu):

- *Normal Angle Mode* - absolute roll angle in 1/16 Gradians for every ping.
- *Delta Angle Mode* - absolute roll angle in 1/16 Gradians associated with 1st Profile data point (ping). All other Roll angles thereafter are delta values showing angle variance relative to the preceding angle.

<table>
<tr><th>Data Description</th><th>Data Range</th><th>Data Type</th></tr>
<tr><td>Start character</td><td>#</td><td>1*CHAR</td></tr>
<tr><td>Data Mode
Normal Angle Mode = 000
Delta Angle Mode = 002 (default)</td><td>000 or 002</td><td>SHORTCARD</td></tr>
<tr><td rowspan="3">NPS * roll correction angles</td><td>Normal Mode:
-01067 to 01067</td><td>INTEGER</td></tr>
<tr><td>Delta Mode 1st angle: -01067 to 01067</td><td>INTEGER</td></tr>
<tr><td>Delta Mode:
-999 to 999</td><td>SHORTINT</td></tr>
<tr><td colspan="3">Example:
Head at XYZR=0, no time correction, 5*5m ranges in microseconds, start at 199, ultimate, PRFRT, Vprop = 1500, scan at 15:27:33:02, duration 33µs, orientation upright, 1st ping roll angle at 3/16 Gradians, 2nd at 0 Gradians (absolute), 3rd/4th at -2/16 Gradians (absolute), 5th at 1/16 Gradians (absolute).

Normal Mode:
<code>+00000+00000+00000+00000+000000000303184+00815000152733
020003301606667066670666706667066667#000+00003+00000
-00002-00002+00001</code>
Delta Mode:
<code>+00000+00000+00000+00000+000000000303184+00815000152733
02000330160666706667066670666706667#002+00003-003-002
+000+003</code></td></tr>
</table>

10.1.2. Profiler Data Extended with Ping Time Data

The following table only shows the extended data, for the normal part of the Profiler data refer to Section 7.3, “Reply Data Structure”

The extended data is sent in one of two modes which is controlled by selecting `Delta Mode` in the `RemV4 Options` dialog (navigate to `Options` in the `Settings` menu):

- *Normal Time Mode* - 1st time = 1st ping Tx Time (time of day in µs) - time at start of scan, 2nd Time = 2nd Ping Tx Time (time of day in µs) - time at start of scan, etc.,

- *Delta Time Mode* - 1st time = 1st ping Tx Time (time of day in µs) - time at start of scan, all other ping times thereafter are delta values (µs) showing time variance relative to the preceding ping time.

<table>
<tr><th>Data Description</th><th>Data Range</th><th>Data Type</th></tr>
<tr><td>Start character</td><td>*</td><td>1*CHAR</td></tr>
<tr><td>Data Mode
Normal Time Mode = 016
Delta Time Mode = 018</td><td>016 or 018</td><td>SHORTCARD</td></tr>
<tr><td rowspan="3">NPS * Ping Time Data (transmit time of ping)</td><td>Normal Mode:
00000 to 65535</td><td>CARDINAL</td></tr>
<tr><td>Delta Mode 1st Ping:
00000 to 65535</td><td>CARDINAL</td></tr>
<tr><td>Delta Mode:
-127 to 126</td><td>SHORTINT</td></tr>
<tr><td colspan="3">Example:
Head at XYZR=0, no time correction, 5*5m ranges in microseconds, start at 199, ultimate, PRFRT, Vprop = 1500, scan at 15:27:33:02, duration 33µs, orientation upright, 1st Ping Time at 15:27:34:62, 2nd at 15:27:34:627, 3rd at 15:27:34:634, 4th at 15:27:34:64, 5th at 15:27:34:646

Normal Time Mode:
<code>+00000+00000+00000+00000+000000000303184+00815000152733 020003301606667066670666706667*01601600+01607 +01614+01620+01626</code>
Delta Time Mode:
<code>+00000+00000+00000+00000+000000000303184+00815000152733 020003301606667066670666706667*01801600+007+007 +006+006</code></td></tr>
</table>

10.2. Roll Sensor Serial Output

The *Tritech International Ltd* roll sensor data can be transmitted out of the surface serial port. The string that is transmitted contains fields for both roll and pitch angle data. There are 2 models of attitude sensor (one just has the roll sensor and the other has both pitch and roll). If only using a roll sensor then the transmitted data string will contain a null valued pitch field.

To configure the roll sensor surface output:

1. Enable a remote channel (serial port) for the roll sensor output. The roll sensor data can be transmitted on a separate channel that is selected for the profiler slots. Or it can be transmitted out of the same channel as

the Profilers with the higher baud rate of 19200 configured. Select the `Channel` option from the `Settings` menu from the RemV4 menu and then click on the `Setup` button opposite the selected channel to configure serial port parameters. Once serial port parameters are set check the `Enable Channel` box to open the serial port.

2. Select `Remote SKV4` from the `Applications` menu.
3. Find 'Attitude 60' in the list of heads and click on `Output 1` in the drop down `Configure` list.
4. Select the `Channel` that was configured in step 1 to output the roll data from and check the `Continuous Data Output` option to start sending the data.

The roll sensor data message that is transmitted out of the serial port will be of the following format:

`%D` + SlotReplyHdr + Attitude Reply Data Structure

Note

For the `SlotReplyHdr` data structure please refer to Table 4.3, “SlotReplyHdr Data Structure”

<table>
<tr><th>Description</th><th>Data Range</th><th>Data Types</th></tr>
<tr><td>Time of sample (milliseconds passed since start of the day)</td><td>0 to 86399000</td><td>LONGCARD</td></tr>
<tr><td>Roll angle in 1/1000ths of a degree</td><td>-32768 to 32767</td><td>INTEGER</td></tr>
<tr><td>Pitch Angle in 1/1000ths of a degree</td><td>-32768 to 32767</td><td>INTEGER</td></tr>
<tr><td colspan="3">Example: Sample taken at 11:05:15, roll angle of -7.8°, pitch angle of -5.8°

ASCII: <code>0039915531-07761-05831</code></td></tr>
</table>

10.3. Additional SeaKing 700 Message Outputs

The SeaKing 700 includes 5 additional serial output message types in the Seanet Pro surface software. These messages are the same formats that are supported on a UK94 Bathy System (circa. June 2000).

The additional 5 messages are enabled as default and it is possible to select the additional message types along with the *Tritech International Ltd* standard message types.

SeaKing 700 Output Types

1. WINSON Raw (*Tritech International Ltd* type)

2. WINSON Processed (*Tritech International Ltd* type)
3. SeaKing Long (*Tritech International Ltd* type)
4. SeaKing Short (*Tritech International Ltd* type)
5. Standard UK90
6. Alternate UK90
7. MB1000/HB200
8. Alternate 1
9. Alternate 2

10.3.1. Standard UK90 String Format

This output provides a string format that is identical to the original UK90 string format.

It is possible to configure the following serial data formats on the UK94 surface unit:

- 4800Bd, 8 data bits, 2 stop bits, no parity
- 9600Bd, 8 data bits, 2 stop bits, no parity

Note

The output format my need to be configured on the SCU to replicate a UK94 output if the receiving terminal expects this data format.

Description	Data Range	Field Range
Depth in metres (including offsets)	0 to 4000.0	Dxxx.xx
space character	n/a	#
Altitude in metres (including vertical offset)	0 to 99.99	Axx.xx
space character	n/a	#
Altitude in metres (including vertical offset)	0 to 99.99	Axx.xx
space character	n/a	#
Temperature in °C	0 to 35	Txx
7 space characters	n/a	#######
Atmospheric pressure in mbar (either manually entered value or obtained from a surface barometric sensor)	900 to 1100	Pxxxx
space character	n/a	#
Velocity of sound in decimetres per second	14000 to 15500	Vxxxxx
space character	n/a	#
Mean density of seawater * 10000 (or manually entered value)	9000 to 11000	dxxxxx
space character	n/a	#
Height in metres of barometric sensor above sea level	0 to 99	Hxx
terminator	n/a	<CR><LF>

Example

Depth	136.92m	D0136.92
Altimeter reading	24.75m	A24.75
Temperature reading	5°C	T05
Atmospheric pressure	1004mbar	P1004
VOS	14750$\text{dm}\cdot\text{s}^{-1}$	V14750
Relative seawater density	1.019	d10190
Height above sea-level	15m	H15

ASCII:
D0136.92#A24.75#A24.75#T05#######P1004#V14750#d10190#H15<CR><LF>

is a space character (ASCII code 32)
<CR> is the carriage return character (ASCII code 13)
<LF> is the line feed character (ASCII code 10)

10.3.2. Alternate UK90 String Format

This output provides a string format that is the same as the Standard UK90 format except the second altitude reading removed.

It is possible to configure the following serial data formats on the UK94 surface unit:

- 4800Bd, 8 data bits, 2 stop bits, no parity
- 9600Bd, 8 data bits, 2 stop bits, no parity

Note

The output format my need to be configured on the SCU to replicate a UK94 output if the receiving terminal expects this data format.

Description	Data Range	Field Range
Depth in metres (including offsets)	0 to 4000.0	Dxxx.xx
space character	n/a	#
Altitude in metres (including vertical offset)	0 to 99.99	Axx.xx
space character	n/a	#
Temperature in °C	0 to 35	Txx
7 space characters	n/a	#######
Atmospheric pressure in mbar (either manually entered value or obtained from a surface barometric sensor)	900 to 1100	Pxxxx
space character	n/a	#
Velocity of sound in decimetres per second	14000 to 15500	Vxxxxx
space character	n/a	#
Mean density of seawater * 10000 (or manually entered value)	9000 to 11000	dxxxxx
space character	n/a	#
Height in metres of barometric sensor above sea level	0 to 99	Hxx
terminator	n/a	<CR><LF>

Example

Depth	136.92m	D0136.92
Altimeter reading	24.75m	A24.75
Temperature reading	5°C	T05
Atmospheric pressure	1004mbar	P1004
VOS	14750$dm \cdot s^{-1}$	V14750
Relative seawater density	1.019	d10190
Height above sea-level	15m	H15

ASCII: D0136.92#A24.75#T05#######P1004#V14750#d10190#H15<CR><LF>

is a space character (ASCII code 32)
<CR> is the carriage return character (ASCII code 13)
<LF> is the line feed character (ASCII code 10)

10.3.3. MB1000/HB200 String Format

It is possible to configure the following serial data formats on the UK94 surface unit:

- 4800Bd, 8 data bits, 2 stop bits, no parity

- 9600Bd, 8 data bits, 2 stop bits, no parity

Note

The output format my need to be configured on the SCU to replicate a UK94 output if the receiving terminal expects this data format.

Description	Data Range	Field Range
Depth in metres (including offsets)	0 to 999.99	Dxxx.xx
space character	n/a	#
Altitude in metres (including vertical offset)	0 to 99.99	Axx.xx
space character	n/a	#
Temperature in °C	0 to 35	Txx
space character	n/a	#
Atmospheric pressure in mbar (either manually entered value or obtained from a surface barometric sensor)	900 to 1100	Pxxxx
space character	n/a	#
Velocity of sound in decimetres per second	14000 to 15500	Vxxxxx
space character	n/a	#
Mean density of seawater * 10000 (or manually entered value)	9000 to 11000	dxxxxx
terminator	n/a	<CR><LF>

Example

Depth	136.92m	D0136.92
Altimeter reading	24.75m	A24.75
Temperature reading	5°C	T05
Atmospheric pressure	1004mbar	P1004
VOS	14750dm·s^{-1}	V14750
Relative seawater density	1.019	d10190

ASCII: D0136.92#A24.75#T05#P1004#V14750#d10190<CR><LF>

is a space character (ASCII code 32)
<CR> is the carriage return character (ASCII code 13)
<LF> is the line feed character (ASCII code 10)

Note

If a depth of greater than 999.99m is produced the depth field is extended to *Dxxxx.xx*. This is different from the UK94 system which at depths greater than 999.99m outputs "Dxxx.xx" to indicate over range.

10.3.4. Alternate 1 String Format

This output provides a string format that is compatible with the Ulvertech data format.

It is possible to configure the following serial data formats on the UK94 surface unit:

- 9600Bd, 8 data bits, 2 stop bits, no parity

Note

The output format my need to be configured on the SCU to replicate a UK94 output if the receiving terminal expects this data format.

Description	Data Range	Field Range
Depth in centimetres (including offsets)	0 to 99999	ddddd
Comma character	n/a	,
Altitude in centimetres (including vertical offset)	0 to 9999	aaaa
terminator	n/a	<CR><LF>
Example Depth 87.92m 08792 Altimeter reading 24.75m 2475 ASCII: `08792,2475<CR><LF>`		
, is a comma character (ASCII code 44) **<CR>** is the carriage return character (ASCII code 13) **<LF>** is the line feed character (ASCII code 10)		

Note

If a depth of greater than 999.99m is found the depth field is shown as "xxxxx" to indicate over range. Alternate 2 string format should be used for systems rated over 999.99m

10.3.5. Alternate 2 String Format

This output provides a string format that is compatible with the Ulvertech data format but with an extra depth digit to allow readings greater than 999.99m.

It is possible to configure the following serial data formats on the UK94 surface unit:

- 9600Bd, 8 data bits, 2 stop bits, no parity

Note

The output format my need to be configured on the SCU to replicate a UK94 output if the receiving terminal expects this data format.

Description	Data Range	Field Range
Depth in centimetres (including offsets)	0 to 400000	dddddd
Comma character	n/a	,
Altitude in centimetres (including vertical offset)	0 to 9999	aaaa
terminator	n/a	<CR><LF>

Example

Depth	87.92m	008792
Altimeter reading	24.75m	2475

ASCII: 008792,2475<CR><LF>

, is a comma character (ASCII code 44)
<CR> is the carriage return character (ASCII code 13)
<LF> is the line feed character (ASCII code 10)

11. Additional Serial Output Options

11.1. Profiler Serial Output of Mean Seabed

The RemV4 program has the facility to calculate and output a Mean Seabed value equated from the scan data of a single or dual head Profiler system. The Mean Seabed value will be output in a string, which is of a format that is compatible with a TSS Altitude message.

The RemV4 program is used to select the Profiler head(s) to include in the Mean Seabed calculation and also to configure a serial port through which the calculated data can be sent. While a Mean Seabed output is active it is also possible to transmit the full Profiler data message out the the same or a different port using the *Tritech International Ltd* SKV4 protocol. A quad head Profiler system is operated as 2 pairs - it is not possible to combine data from 4 heads into a single Mean Seabed calculation.

The Mean Seabed calculation will include only seabed coverage and not trench coverage. Several rules have been set to distinguish seabed from trench coverage. There is also a filter that will remove spurious Profiler points from the calculation.

11.1.1. Software Setup for Mean Seabed Output

1. Open the RemV4 program by double-clicking the RemV4 icon in the Windows system tray (alternatively launch from `Start` → `Programs` → `Seanet` → `RemV4`).

2. Enable a remote channel (serial-port) for Mean Seabed output. Select `Channel` from the `Settings` menu and click the `Setup` button opposite the selected channel to configure serial port parameters. Once serial port parameters are set, check the `Enable Channel` box to open the serial port.

3. Enable the Mean Seabed output. Select `Mean Seabed Output` from the `Applications` menu. This will display the `Mean Seabed Output` dialog. This dialog will display a list of the Profiler pairs available for Mean Seabed output. If no Profiler are available (i.e., Seanet Pro is not running or is running a non-Profiler application) then the list will be empty. Find the correct profiler pair, select which heads to use, an output format for the data, an active remote channel and then check the `Send` box to start sending the Mean Seabed data.

4. The RemV4 terminal display window should now show any mean seabed data it is sending to the selected channel.

11.1.2. Operating the Mean Seabed

The Mean Seabed output will function with a single, dual or quad head Profiler system. If a quad head system is used the first pair will normally be used for the Mean Seabed calculations and the second pair for the full trench/seabed survey.

All valid data points within the scan packet will be passed into the Mean Seabed calculation. A set of rules will remove data points that fall within trench coverage so that only seabed returns are used in the calculation. Non-valid data points will not be included and these include zero values and points outside a boundary determined by the value of the gating parameter.

Mean Seabed Rules

- Any null (zero) data points within the scan packet will not be included in the calculation.
- If the current data point exceeds a calculated mean altitude by the gating value, this current data point will not be included in the final calculation. This will eliminate any spurious points and spikes from the final Mean Seabed value.
- In a dual-head operation, if at any time one of the Profilers is disabled or is not producing data then a Mean Seabed calculation will still be produced using the data from the functional head.
- If there are no valid data points then a zero output will be produced.

To change any Mean Seabed options and calculation parameters (e.g., gating) in the RemV4 program, select `Options` from the `Settings` menu.

The scan packet size and position can be adjusted using the `Direction` and `Width` controls on the RAT controller (or using the RAT mimic in Seanet Pro):

Note

The `Mirror Slave` control is enabled in order to achieve the above direction and scan packet orientation. This control will counter the scan direction of the slave with respect to the master Profiler.

In the derivation of the Mean Seabed figure, each data point is first measured by the profiler and returned as the return path time. The system VOS (set from `Environment` in the `Settings` menu of Seanet Pro) is then applied to this to convert the time into a slant range (the distance to the seabed at the current angle of incidence). With this polar data a height off seabed range is then calculated and if valid is applied in the final Mean Seabed calculation. To be valid the range must be non-zero and within the gating restrictions.

11.1.3. Mean Seabed Output String Formats

The following ASCII string formats are supported for Mean Seabed output by RemV4 software:

1. **TSS Altimeter String Format 1**

   Rxx.xx<CR><LF>

   Where, R is the string header character and xx.xx is Mean Seabed Range in metres ("00.00" is output if there are no valid data points).

2. **TSS Altimeter String Format 2**

   T00.00 Rxx.xx<CR><LF>

   Where, T00.00 is the temperature field character and temperature (always zero), R is the string header character and xx.xx is Mean Seabed Range in metres ("00.00" is output if there are no valid data points).

3. **Ulvertech Bathy String Format**

   00000,xxxx<CR><LF>

   Where, 00000 is the depth value (always zero) and xxxx is Mean Seabed range in centimetres ("0000" is output if there are no valid Profiler data points).

4. **Innovatum Compatible String Format**

   Rxx.xx000000000000000000000000000000000000000000000000
   0000000000000000000<CR><LF>

   Where, R is the string character header, xx.xx is the Mean Seabed range in metres ("00.00" is output if there are no valid Profiler data points) and the 0 x 67 are blank fields.

11.1.4. Mean Seabed Operating Notes

Offsets

These are applied in the Seanet Profiler application by selecting Position from the pop-up tools menu. There are separate offsets for Master and Slave Profiler heads. For the purposes of Mean Seabed calculations only the R and Y offsets are relevant.

The Profiler(s) should be mounted with the oil fill screw on the housing facing directly downwards. If there is any angular imperfection with this mounting then this should be corrected using the R offset. These corrections will be accounted for in the calculation of the Mean Seabed.

It will be necessary to produce a Mean Seabed calculation that is relative to a particular point on the vehicle (i.e., the skid). If the Profiler(s) are mounted above this point then this height difference should be calculated and entered as the Y offset. This should be performed for both Profilers are these themselves may be mounted at different heights. The Y offset will be included in the calculation of the Mean Seabed.

Using Dual Profilers for Mean Seabed Calculation

If a dual-head Profiler system, consisting of Master and Slave heads, is used to calculate Mean Seabed then it is very important that the Profiler heads are time synchronised. If the heads are not synchronised, they will both send a separate Mean Seabed calculation. In the Seanet Pro Profiler application, select `Setup` from the pop-up tools menu. There is a drop-down list called `Sync Mode` that is used to configure the synchronisation, Ping Sync and Scan Sync.

Note

Scan Sync should be enabled as a minimum if running a dual head system for Mean Seabed.

The Scan Sync control will ensure that both Master and Slave Profilers start their sweep at the same time. This is important for ensuring they are always scanning at the same point along the trench. This will ensure accurate Mean Seabed readings being derived from the averaging of both Profiler scans.

The Ping Sync control is a second level of synchronisation that, in addition to Scan Sync, will force both Profilers to ping at interleaved intervals. This control is normally enabled in cross-profiling applications (i.e., where the scans overlap in the middle where there may be acoustic interference). When Ping Sync in enabled the Master will ping first followed by the Slave, continuing until the scan of each head is completed. In applications where there is enough separating distance between the mounting position of Master and Slave heads and where the scans do not overlap this control can be disabled to speed up the profiling.

11.2. Serial Output of Auxiliary Port Data

It is possible to configure the auxiliary port on a SeaKing Sonar or Multicomm Intelligent Junction Box for input of RS232 and RS485 serial message packets. These serial messages may be from devices such as a gyro compass or altimeter. ASCII messages received through the auxiliary port do not require a header or identifier but must be terminated with a line feed character (ASCII code 10). These messages are restricted to a maximum length of 100 bytes (including the line feed character).

Messages through the auxiliary port of a SeaKing are contained in sonar data packets for transmission to the surface control unit. The message is then stripped from the sonar data and displayed in Seanet Pro.

Auxiliary device data can also be serially transmitted out of the SCU COM port using the Seanet RemV4 program. An optional message header can be added to the message before it is transmitted. If selected, the message will also terminate with both carriage return and line feed characters (ASCII codes 13 and 10).

Table 11.1. Head Auxiliary Data Output with Message Header (%A)

Data Description	Data Range	Data Type
Total message length in hexadecimal	NB	CARDINAL
Device node number in hexadecimal	1 to 63H	NODEN
Head type identifier in hexadecimal	SourceTypes	SOURCEN
unassigned	always 0	DIGIT
unassigned	always 0	DIGIT
Message data	STRING<CR><LF>	STRING

Example

Sonar Head (Type 22 Hex), Node 2, Tcm2 Compass Message: $C70.1P-4.2R-3.5T21.5*15<LF>

%A0026022200$C70.1P-4.2R-3.5T21.5*15<CR><LF>

11.2.1. RemV4 Software Setup for Auxiliary Device Data Output

1. Open the RemV4 program by double-clicking the RemV4 icon in the Windows system tray (alternatively launch from `Start` → `Programs` → `Seanet` → `RemV4`).

2. Enable a remote channel (serial-port) for Mean Seabed output. Select `Channel` from the `Settings` menu and click the `Setup` button opposite the selected channel to configure serial port parameters. Once serial port parameters are set, check the `Enable Channel` box to open the serial port.

3. Enable auxiliary device output. Select `Aux Device Output` from the `Applications` menu. This will display the `Aux Device Output` dialog which will display a list of heads currently available for auxiliary data output. If no compatible heads are available for auxiliary device output then the list will be empty. find the correct head in the list, select an active channel and then click on the `Send` check-box to start sending data (the Multicomm Junction Box will be shown in the head list as `GLOBALS 244`).

4. The RemV4 program terminal display window should now show any auxiliary data it is sending to the selected channel.

11.2.2. Additional Notes for an Auxiliary Digiquartz Sensor

When a Digiquartz depth sensor is connected through an auxiliary port it sends raw pressure data in BAR or PSI. Seanet Pro converts this pressure reading into a depth value for display. RemV4 has the ability to send either the exact raw pressure data string from the Digiquartz sensor or a processed depth data string.

To send Digiquartz data as a depth value instead of the raw pressure value open the `RemV4 Options` dialog by selecting `Options` from the `Settings` menu and make sure `DQ as Depth (m)` is selected under the section `Aux Device Output`

The data from the Digiquartz sensor will now be sent as a depth value in the format `sxxxx.xxxm<CR><LF>`.

11.3. Serial Output of Global Device Data

A 'Global' device is regarded in Seanet Pro as any device which can share its data across multiple applications. Any Seanet Pro application therefore has access to global data provided by the device.

For example, the SeaKing Parametric Sub-Bottom Profiler produces an altitude value. This value can be set within the Seanet Sub Bottom application as the global altimeter value. Once set as the global altimeter, the altitude value from the Sub-Bottom Profiler can be used in the Seanet Bathy application when an altimeter is not available. Likewise, an altimeter used in a Seanet Bathy application can be set as global and its altitude value can be accessed by other Seanet applications if required.

11.3.1. RemV4 Software Setup for Global Device Data Output

1. Open the RemV4 program by double-clicking the RemV4 icon in the Windows system tray (alternatively launch from `Start` → `Programs` → `Seanet` → `RemV4`).

2. Enable a remote channel (serial-port) for Mean Seabed output. Select `Channel` from the `Settings` menu and click the `Setup` button opposite the selected channel to configure serial port parameters. Once serial port parameters are set, check the `Enable Channel` box to open the serial port.

3. Enable global device output. Select `Global Device Output` from the `Applications` menu. This will display the `Global Device Output` dialog which will display a list of global devices currently available for data output. Find the correct device in the list, select an active remote channel,

the required data output format and then click on the Send check-box to start sending data.

4. The RemV4 terminal display window should now show any global device data it is sending to the selected channel.

11.3.2. Global Altimeter Output String Formats

The following ASCII string formats are supported for global altimeter output by Seanet RemV4.

1. **Tritech PA Altimeter**

   `xxx.xxxm<CR><LF>`

   Where, xxx.xxx is the altitude in metres and m is the metres character.

2. **TSS Altimeter Format 1**

   `Rxx.xx<CR><LF>`

   Where, R is the string header character and xx.xx is the altitude in metres.

3. **TSS Altimeter Format 2**

   `T00.0 Rxx.xx<CR><LF>`

   Where, T00.0 is the temperature field character and temperature (always zero), R is the string header character and xx.xx is the altitude in metres.

4. **Ulvertech Bathy String Format**

   `00000,xxxx<CR><LF>`

   Where, 00000 is the depth value (always zero) and xxxx is the altitude in centimetres.

11.3.3. Global Barometer Output String Formats

The following ASCII string formats are supported for global barometer output by Seanet RemV4.

1. **Airflow Instruments DB2**

   `Xxxx#mbar<CR><LF>`

   Where, Xxxx is the barometric pressure in mbar. If a value of less than 1000mbar then the leading X will be replaced with a space. # is a single space characters (ASCII code 32) and mbar is the units identifier.

2. **Vaisala PTB220**

   `xxxx.xx#hPa<LF>`

   Where, `xxxx.xx` is the barometric pressure in hPa, # is a space character (ASCII code 32) and `hPa` is the units identifier.

3. **Paroscientific (mbar)**

   `*0001xxxx.xxx<CR><LF>`

   Where, * is an asterisk character (ASCII code 42), `00` is the DID (PC), `01` is the SID (transmitter 01-98) and `xxxx.xxx` is the barometric pressure in mbar.

11.3.4. Global Attitude Output String Formats

The following ASCII string formats are supported for global attitude output by Seanet RemV4.

1. **CDL**

   `P±xx.xxR±yy.yy<CR><LF>`

   Where, `P` is the pitch field header character, `±xx.xx` is the pitch in degrees, `R` is the roll field header character and `±yy.yy` is the roll in degrees.

2. **NMEA 0183 "TRO"**

   `$PHTRO,x.xx,a,y.yy,b*kk<CR><LF>`

   Where, $ is the dollar character, `PHTRO` is the message header, `x.xx` is the pitch in degrees, a is "M" for bow up (+ve) or "P" for bow down (-ve), `y.yy` is the roll in degrees, b is "T" for port up (+ve) or "B" for port down (-ve), `*` is the asterisk character and `kk` is an XOR checksum of all characters between $ and `*` exclusive.

3. **NMEA 0183 "TRH"**

   `$PHTRH,x.xx,a,y.yy,b,z.zz,c*kk<CR><LF>`

   Where, $ is the dollar character, `PHTRO` is the message header, `x.xx` is the pitch in degrees, a is "M" for bow up (+ve) or "P" for bow down (-ve), `y.yy` is the roll in degrees, b is "T" for port up (+ve) or "B" for port down (-ve), `z.zz` is the heave acceleration in $m \cdot s^{-1}$ (always zero), c is "U" for going up or "O" for going down, `*` is the asterisk character and `kk` is an XOR checksum of all characters between $ and `*` exclusive.

11.3.5. Global Compass Output String Formats

The following ASCII string formats are supported for global compass output by Seanet RemV4.

1. **Digilog/OceanTools**

```
HxxxxP±yyyyR±zzzzF<CR><LF>
```

Where, H is the heading field character, xxxx is the heading in degrees (multiplied by 10), P is the pitch field header character, ±yyyy is the pitch in degrees (multiplied by 10), R is the roll field character, ±zzzz is the roll in degrees (multiplied by 10) and F is the status ("E" for OK, "N" for invalid, "S" for setting or "W" for water ingress).

2. **MDL**

```
HxxxxP±yyyyR±zzzz<CR><LF>
```

Where, H is the heading field character, xxxx is the heading in degrees (multiplied by 10), P is the pitch field header character, ±yyyy is the pitch in degrees (multiplied by 10), R is the roll field character and ±zzzz is the roll in degrees (multiplied by 10)

3. **CDL Format 1**

```
Hhhh.hP±ppp.ppR
±rrr.rrTtt.tDdddd.dBbb.bAaaWwwLlllFf<CR><LF>
```

Where, H is the heading field header character, hhh.h is the heading in degrees, P is the pitch field header character, ±ppp.pp is the pitch in degrees, R is the roll field header character, ±rrr.rr is the roll field in degrees, T is the temperature field header character, tt.t is the temperature in °C, D is the depth field header character, ddddd.d is the depth (always zero), B is the battery field header character, bb.b is the battery voltage (always zero), A is the alignment field header character, aa is the alignment timer (always zero), W is the preheat field character, ww is the preheat timer (always zero), L is the latitude field header character, lll is the latitude (always zero), F is the fault field header character and f is the fault indicator ("0" is OK, "1" is non-fatal fault, "2" is fatal fault, "3" is preheat).

4. **CDL Format 2**

```
HhhhhP±pppppR±rr.rrTtttDddddddBbbbAaaWwwLlllFf<CR><LF>
```

Where, H is the heading field header character, hhhh is the heading in degrees (multiplied by 10), P is the pitch field header character, ±ppppp is the pitch in degrees (multiplied by 10), R is the roll field header character, ±rr.rr is the roll field in degrees (multiplied by 10), T is the temperature field header character, ttt is the temperature in °C (multiplied by 10), D is the depth field header character, dddddd is the depth (always zero), B is the battery field header character, bbb is the battery voltage (always zero), A is the alignment field header character, aa is the alignment timer (always zero), W is the preheat field character, ww is the preheat timer (always zero), L is the latitude field header character, lll is the latitude (always zero), F is the fault field header character and f is the fault indicator ("0" is OK, "1" is non-fatal fault, "2" is fatal fault, "3" is preheat).

5. **TCM2**

```
$Cccc.cPpp.pRrr.rTtt.tXxxx.xYyyy.yZzzz.zEeee*kk<CR><LF>
```

Where, $ is the dollar character, C is the compass field header character, ccc.c is the compass field heading in degrees, P is the pitch field header character, pp.p is the pitch in degrees, R is the roll field header character, rr.r is the roll in degrees, T is the temperature field header character, tt.t is the temperature in °C, X is the x-component field header character, xxx.x is the x-component of the magnetic field in micro Tesla, Y is the y-component field header character, yyy.y is the y-component of the magnetic field in micro Tesla, Z is the z-component field header character, zzz.z is the z-component of the magnetic field in micro Tesla, E is the error field header character, eee is the error code ("0" is OK), * is the asterisk character and kk is an XOR checksum of all characters between $ and * exclusive.

6. **NMEA 0183 "HDT"**

```
$HEHDT,x.x,T*kk<CR><LF>
```

Where, $ is the dollar character, HEHDT is the NMEA header string, x.x is the heading in degrees, T is true North, * is the asterisk character and kk is an XOR checksum of all characters between $ and * exclusive.

7. **NMEA 0183 "HDM"**

```
$HCHDM,x.x,M*kk<CR><LF>
```

Where, $ is the dollar character, HEHDM is the NMEA header string, x.x is the heading in degrees, M is magnetic North, * is the asterisk character and kk is an XOR checksum of all characters between $ and * exclusive.

Glossary

AIF	Originally "Acoustic Interface" but also used to refer to "ARCNET Interface" in which case it can refer to either the interface port on a SeaHub or SCU or to the expansion card available for installation into a computer.
ASCII	American Standard Code for Information Interchange - a character encoding scheme originally based on the English alphabet.
CSV	Comma Separated Value - a text file in tabular format with table cells separated by commas, usually given the filename extension `.csv` but this can vary depending on the application.
PCI	Peripheral Component Interconnect - used to refer to both the transfer bus and the socket for expansion cards within a computer.
RAT	Remote Access Terminal - the detachable front part of the Tritech Surface Control Unit (SCU) computer. Provides an alternative to using a keyboard and mouse.
RS232	Traditional name for a series of standards for serial binary data control signals.
RS485	A standard for defining the electrical characteristics of drivers and receivers for use in a balanced digital multipoint system (also known as EIA-485).
SCU	Surface Control Unit - a specially manufactured computer which is rack mountable and capable of processing the data from the sonar equipment running either Windows XP Embedded or Windows 7 and Seanet Pro or Gemini software.
SeaKing	A specific sonar produced by *Tritech International Ltd* but also refers to the family of sonar equipment manufactured by *Tritech International Ltd* comprising of the SeaKing, SeaKing DST scanning and profiling sonars and the Hammerhead survey sonar.
Seanet Pro	The software supplied by *Tritech International Ltd* which is capable of running all the sonar devices.
SKV4	SeaKing V4 Protocol, the communications protocol used with the SeaKing family of devices.
VOS	Velocity of Sound

WINSON	Sonar control software produced by Tritech that predates Seanet Pro and was used to control the Series-2 family of devices.

