SPECTRALOG
Data Logger
Operation Manual

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Biwater Spectrascan

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WARNING

SPECTRALOG

THESE EQUIPMENTS CONTAIN A LITHIUM BATTERY. THE FOLLOWING RULES MUST BE STRICTLY OBSERVED.

1. UNDER NO CIRCUMSTANCES SHOULD THE EQUIPMENT BE OPENED. THE LITHIUM BATTERY MUST NOT BE TAKEN OUT OR TAMPERED WITH. ALTHOUGH ANY ACCIDENTAL ATTEMPT TO RECHARGE FROM OUTSIDE THE CASE IS PROTECTED AGAINST AND IS THEREFORE PERFECTLY SAFE, ANY APPLICATION OF VOLTAGE TO THE CELL DIRECTLY IS EXTREMELY DANGEROUS (IF THESE RULES ARE NOT FOLLOWED BEWARE THAT MISTREATMENT OF LITHIUM CELLS MAY CAUSE SEVERE BURNS, FIRE OR EXPLOSION).

2. DO NOT INCINERATE OR HEAT THIS EQUIPMENT ABOVE 75°C.

3. IN THE EVENT OF SEVERE DAMAGE TO THE CASE, WHERE THERE IS A RISK OF INGRESS OF MOISTURE, REMOVE THE EQUIPMENT FROM USE, PLACE IN A LOCATION WHERE 'DRYING' WILL OCCURE AND CONTACT THE MANUFACTURERS FOR FURTHER ADVICE ON REPAIR OR DISPOSAL.

4. LITHIUM BATTERIES ARE SUBJECT TO VERY SPECIAL AND EXTREMELY ONEROUS CONDITIONS WHEN SHIPPED BY AIR. THE MANUFACTURER CERTIFIES THAT THE LITHIUM BATTERY CONTAINED CONFORMS TO THE UN RECOMMENDATION ON TRANSPORT OF DANGEROUS GOODS (ST/SG/AC 10/11 SECOND REVISED EDITION 1996) MANUAL OF TREAT CRITERIA. THIS ENTITLES THE EQUIPMENT TO BE SHIPPED BY AIR UNDER THE NON DANGEROUS GOODS CATEGORY.

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Preface

This manual describes the installation and use of SPECTRALOG manual read and SPECTRALOG-T telemetry data loggers.

It does not however provide information on the use of the SPECTRALOG WISDOM module, this is provided as a separate addition to the WISDOM User Manual.

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Contents

1. Use of SPECTRALOG Data Loggers

1.1 System Overview

SPECTRALOG is a range of data loggers which enables the secure logging of flow and pressure data as required for district or zonal metering schemes and confirmation of minimum levels of service.

SPECTRALOG loggers can be used in the harshest of environments, being IP68 rated and self-sufficient for operating power for periods of 5 years and above, depending on the application.

The SPECTRALOG range is extremely flexible and has many variants including telemetry communications and multi-channel types covering a range of application requirements. This Operation Manual covers four variants:

- 1F - Single Channel Flow
- 1Pi - Single Channel Pressure (internal transducer)
- 1FPi   - Dual Channel Flow and Pressure (internal transducer)
- 1FPiT - Dual Channel Flow and Pressure (internal transducer) PSTN

Local manual communications are by means of a high-speed asynchronous serial data connection using Spectrascan's proprietary *SPECTRALINK* protocol, which can interface to a wide range of standard equipment.

Remote telemetry communications are facility by an integral modem connected to a PSTN land line via an approved telecommunication junction box.

SPECTRALOG data loggers are designed to interface to a PSION Workabout handheld data terminal which allows logged data to be viewed on site and/or transferred to the Workabout's memory for collection and transfer to a host system. Spectrascan supply interfacing software for the Workabout, allowing quick transfer of stored data and viewing of current and derived data.

Communication functions do not interrupt or affect SPECTRALOG's logging of data.

The SPECTRALOG 1F (Single Channel Flow) variant is supplied with a socket allowing connection of a wide variety of pulse units. The socket is compatible with Spectrascan's other data logging products.

The SPECTRALOG 1Pi (Single Channel Pressure) variant is supplied with an internal pressure transducer having a standard measurement range of 0-10 bar. A 0-20 bar transducer is also optionally available if specified at the time of ordering.

A male quick-release connector is fitted for connection to the water distribution system. A flexible hose purpose-designed for making connection is available as an optional accessory.

The SPECTRALOG 1FPi combines the functionality and specification of 1F and 1Pi models.

The SPECTRALOG 1FPiT combines the functionality and specification of 1FPi with a self-powered modem capable of communication at V22bis (2400 Baud) or V23HD (1200 Baud) or V21 (300 Baud).

All SPECTRALOG data loggers are housed in an extremely robust IP68 aluminium case and are guaranteed to survive submersion to 1 metre depth.

This manual describes the use of the SPECTRALOG for making flow and pressure measurements individually. Dual channel variants combines the two functions, the instructions applying equally.

1.2   Product Description

1.2.1   General

The SPECTRALOG aluminium case protects the internal components against hostile environments. The case is compact and includes a carrying handle. Note that the handle is reversible and, depending upon requirements, may be mounted at the reverse end of the SPECTRALOG case or removed altogether. Finished in bright orange, the unit is easily discernible in dimly lit and dirty environments.

Slots at the side of the case allow easy mounting to a flat surface using the Holster accessory.

The user interface to all SPECTRALOG loggers is via a high-speed digital communications link ('LOCAL COMMS' connector). When connected to a PSION Workabout handheld computer a comprehensive range of set-up and data transfer functions are available to the user.

Different variants in the SPECTRALOG range are identified by the facilities provided from the table below:

Variant	Analogue Input	Digital Input	PSTN Telemetry
1F	No	Yes	No
1Pi	Internal Pressure	No	No
1FPi	Internal Pressure	Yes	No
1FP	Yes & External Pressure	Yes	No
1FPi-T	Internal Pressure	Yes	Yes
1FP-T	Yes & External Pressure	Yes	Yes

1.2.2   Connections

1.2.2 (i)   Local Communications

The 'LOCAL COMMS' 5 pin connector is located on the top face of the unit, next to the handle.

Easy connection can be made using the appropriate communications lead. Normally connection can be made without moving the SPECTRALOG data logger from its installed position.

The 'LOCAL COMMS' connector is also used to connect the Sensor Power Pack. When this connection is made 'LOCAL COMMS' is conducted through the connector on the Sensor Power Pack.

The 'PSTN' 3 pin connector is located next to the 'LOCAL COMMS' connector on telemetry models. Connection is made to the PSTN junction box enclosure via the flying lead fixed to the junction box. An authorised telecom engineer will be required to connect the junction box to the Public Switched Telephone Network (PSTN).

Ingress of dust and moisture to the connectors is prevented by the screw-on cap attached by a secure lanyard.

1.2.2 (ii)   Flow

The 'FLOW' connector is located on the bottom face of the unit, allowing easy connection of pulse unit cables.

The FLOW input connector can normally remain permanently connected. The connector type and pin-out is compatible with existing Spectrascan products.

SPECTRALOG data loggers support a wide range of pulse units if you are unsure as to the suitability of a pulse unit please contact Spectrascan for confirmation.

Ingress of dust and moisture to the connector is prevented by the screw-on cap attached by a secure lanyard.

1.2.2 (iii)   Pressure

The 'PRESSURE' quick-fit coupling connector is located on the bottom face of the unit, allowing easy connection of a flexible hose.

The PRESSURE hose can normally remain permanently connected.

Ingress of dust and other contaminants to the pressure inlet is protected by a press-on cap when the transducer is not connected to the main.

1.2.2 (iv)   Connection to Sensors

In common situations the logger provides the electrical power required by its sensors. All that is needed is to plug the sensor into the sensor socket. Note that some flow sensors require an external power supply; see Appendix A.

Although mechanically the same, the pressure and flow input sockets are not identical and care must be taken to connect the sensor to the appropriate socket. Incorrect connection will not cause damage.

The logger is fully protected against long periods of submersion to depths of a metre or so, as are its connections providing they have been fitted to the sensor by Spectrascan and are correctly installed. The water protection of the connectors, however, is essentially dependent on how clean they have been kept. If any dirt has lodged on the rubber sealing rings then water may possibly penetrate and damage is likely to occur. To clean the connectors use of methylated spirits and a toothbrush should be adequate.

All sensor connectors supplied by Spectrascan are fitted with blanking caps, which are themselves watertight. To protect connectors from water and dirt all blanking caps should be in place except when connections are made.

It is also strongly recommended that when connections are made the loose blanking caps should be mated to each other. This prevents dirt or water entering the caps (and, ultimately, being transferred to the connectors).

Note that sensor connectors and caps mate with a twist-and-click action and that correct mating can be checked by observing the ends of the gold pins through the observation holes.

Do not worry if the sensors are connected after logging has begun (or even if there is a need to disconnect and reconnect during a run) – no harm will result. Zeros will be logged during the disconnection period, the unit may also record an event depending on its configuration.

1.2.3   Communications

SPECTRALOG supports communications to the PSION Workabout and Series 3 handheld computer products as standard via the *SPECTRALINK* protocol.

Current logged values and derived parameters can be read quickly and displayed continuously on the graphical display of the PSION unit. Spectrascan supply a Solid State Disk (SSD), ready installed with the SPECTRALOG software, allowing the user to access the full facilities of the logger.

The user may transfer logged data to the PSION unit and store it to files within the PSION unit's memory. The stored data can be uploaded into Spectrascan's WISDOM platform for central archiving, manipulation and graphical display. If preferred a PC or notebook may be connected directly to the SPECTRALOG logger and the data transferred directly into the WISDOM database.

SPECTRALOG-T variants enable WISDOM to access the logger directly over the telephone network using a modem capable of supporting V22bis, V23HD or V21 protocol. V22bis is preferred.

1.2.4   Memory Capacity/Modes

The SPECTRALOG has a memory size of 36518 readings. On the dual channel loggers, if both pressure and flow channels are enabled, this is split to 18259 readings per channel. Logging duration might, therefore, be limited depending on the measurement interval and length of logging run required. To assess this the amount of memory that will be used for a logging run is displayed during Channel Configuration in the SPECTRALOG WISDOM module.

If statistics/events are enabled then the number of data readings is reduced to 34596 for a single channel and 17298 for the dual channel variant.

Three different memory modes are available to be used with the SPECTRALOG:

•   Cyclic Memory Mode

When configured to use Cyclic Memory Mode, the SPECTRALOG will log data continuously. When the logger has used up all of its memory with stored data, it will continue to log, overwriting the oldest data stored in the logger.

Warning: When using this memory mode, data will be lost if stored data is not read back from the logger at regular intervals which are shorter than the maximum amount of data that the SPECTRALOG can store.

•   Block Memory Mode

When configured to use Block Memory Mode the SPECTRALOG will log data for a specific amount of time. It will use the Block Time Settings to determine at which date and time to start logging and at which date and time to stop logging.

•   Stop When Full Memory Mode

When configured to use Stop When Full Memory Mode, the SPECTRALOG will begin logging immediately and will continue until the memory is full. At this point the logger will stop logging.

1.2.5 Pulse Unit Calibration

Pulse units are used on fixed meter installations and provide a pulse output where frequency is proportional to the rate of flow. All that is required for calibration is to enter the calibration factor, FCAL, pulses per litre into WISDOM/PSION. No individual calibration is necessary.

If it is required to determine FCAL the pulse unit manufacturers details must be examined. For example a Kent LRP pulse unit produces 10 pulses per revolution of the meter's centre sweep. If used on a meter giving 1000 litres per revolution then:

$$FCAL = \frac{10}{1000} = 0.01 \text{ pulses/litre}$$

Calibration factors for common types of pulse units and meters are given in Appendix A.

The information is accurate as far as is known, at time of issue. Spectrascan cannot be held responsible if errors exist.

The Calibration factors (FCAL) given in these tables assume the flow measurement is required in Litres/sec. Apart from the Kent PSM range where the results will be in Litres/min. If different measurement units are required then the appropriate correction factor should be applied to the FCAL; e.g. if a meter where FCAL from the tables will give Litres/sec requires conversion to Litres/min. FCAL divided by 60 will give the correct answer.

1.2.6   Internal Pressure Calibration

The pressure variant has an internal, 0-10 bar, pressure transducer as standard. This is accurately calibrated by Spectrascan at manufacture using equipment which is traceable to National Standards (N.P.L.). The calibration consists of two components, sensitivity and offset. The sensitivity is termed PCAL and permanently stored in the logger's memory, allowing the SPECTRALOG to be used without the need of entering a calibration figure.

The offset may be subject to drift mainly due to temperature variation. Any drift in offset is measured and corrected by using the AUTOCAL facility. When AUTOCAL is used it corrects all of the existing, collected data.

1.2.7   Auto Calibration

This corrects the SPECTRALOG's internal transducer 'offset' drift by measuring it at atmospheric pressure and should be carried out before a new logging run is commenced or routinely depending on accuracy requirements. For the best results the SPECTRALOG should be at the distribution main being monitored.

The following procedure is recommended:

• Connect the SPECTRALOG to the distribution main for at least one minute.

• Disconnect so that the SPECTRALOG is now measuring atmospheric pressure.

• Perform the AUTOCAL function using a PSION Workabout or PC running the WISDOM SPECTRALOG module

NOTE: During a logging run AUTOCAL may be carried out whilst the SPECTRALOG is logging data by disconnection from the distribution main; but beware, there is a possibility that in doing so the event threshold is passed and an event recorded.

1.2.8   Sensor Power Pack

The Sensor Power Pack is used to provide power for high current sensors that cannot be energised directly by the SPECTRALOG.

To use the Sensor Power Pack the output lead is connected to the SPECTRALOG 'LOCAL COMMS' connector. Local communications is then performed by attaching the comms lead to the Sensor Power Pack socket.

The Sensor Power Pack contains eight Alkaline Manganese high performance 'C' cells, when these cells have become discharged replacements can be purchased from various retailers. Although a replacement kit can be purchased from Spectrascan containing cells, end plate gasket and screws.

Cell replacement involves removing the nine screws securing the end plate, this operation requires the handle to also be removed by removing its two screws. The board containing the cells can now be withdrawn whilst remaining attached to the endplate.

When fitting new cells, ensure polarities are observed and do not mix cells of different conditions. To maintain protection against water ingress the gasket should be replaced with the new item supplied in the replacement kit. The end plate screws should be tightened evenly until the final torque setting of 2.25Nm is reached. The handle can now be reattached.

Flow sensors requiring external power are identified in Appendix A. Power is provided for these from the Sensor Power Pack and the logging duration time might be limited by the amount of power the sensor requires.

The capacity of the Sensor Power Pack is 7.75Ah (depending on make and condition of cells fitted). Therefore, logging duration is determined as follows:

$$\text{Duration (hours)} = \frac{7750}{\text{Sensor current (mA)}}$$

The logging duration can be extended by using an additional Sensor Power Pack, this will double the duration from the above calculation.

2. Installation

2.1 Overview

The SPECTRALOG is designed to operate in a boundary box, kiosk, flowmeter pit, hydrant chamber, etc. which may be liable to flooding. When connections supplied by Spectrascan are correctly installed the equipment is waterproof to the IP68 protection classification.

2.2 Wall mounting

At temporary installations, the SPECTRALOG may be hung from a wall-mounted hook by its handle.

In permanent installations the Holster accessory can be fixed to flat vertical surface and the SPECTRALOG attached by sliding the unit into the holster by use of the side slots in the SPECTRALOG enclosure. This allows for easy removal and replacement of the unit if required.

The SPECTRALOG does not necessarily have to be wall mounted but should be positioned such that the unit and connectors are readily accessible for use.

2.3 Installation Procedure

The following sections describe the procedure for the installation of a SPECTRALOG at a remote site.

2.3.1   Safety First

Many sites, particularly boundary boxes, are on the verges of main roads, some within inches of the carriageway. The installation Engineer should be aware of and conform to all of the practices and precautions so ensure the safety of her/himself and of other road users and pedestrians.

2.3.2   Care of Equipment

The ancillary equipment, particularly the pressure transducers, are very delicate and should be treated with care. Always protect from knocks (a knock will cause the pressure transducer offset to change) and keep the protective wrapping on the unit whilst in transit and when not attached to the water main. When disconnecting the sensor, say for removal to another site, replace its protective covering to prevent any accidental damage.

Sensors can also be damaged due to cable strain. When installing the sensor, ensure that the sensor cable is not wound around the unit or other equipment, but is coiled *loosely*. Take care not to place anything on the sensor.

2.3.3 Equipment Required

When installing a SPECTRALOG or visiting an existing site, it is advisable to go well prepared. The following items represent a minimum toolkit.

- Entry tool to boundary box/kiosk, etc. (e.g. Atplas lid removal tool);
- Portable water pump;
- Sponge;
- Cleaning cloth;
- PTFE/silicone lubricant;
- PSION Workabout with SPECTRALOG SSD (Note a portable PC running the SPECTRALOG host software module may alternatively be used);
- Local communications lead for PSION or PC.

2.3.4 Installation Procedure

It is best practice to pre-configure the SPECTRALOG unit using the PSION Workabout or SPECTRALOG host software module prior to visiting the site. This generally avoids wasted time on site where weather conditions may be adverse.

The same basic procedure should be followed when installing any variant at a site:

- Remove any loose dirt from the entrance of the boundary box/kiosk.
- Open boundary box/kiosk using the special tool (e.g. Atplas lid removal tool).
- Remove any dirt and water from the top rim of the boundary box/kiosk.
- Remove any water that may have collected in the bottom by means of a portable pump and/or sponge. If there is a large quantity of water in the box, try to determine if it is surface water or water from the main itself.

For flow variants:

- Connect the flow meter head/cable to the flow meter and then connect the other end of the flow meter to the Flow/Digital input socket of the SPECTRALOG. The operation should be performed in this sequence to

ensure that the first logger readings are valid, otherwise spurious readings may be recorded.

For internal pressure variants:

- Plug the flexible pressure hose into the water main (if not already fitted).
- Remove the internal pressure transducer dust cap.
- Connect the flexible pressure hose to the internal pressure transducer. Due to the pressure of water in the main, it may be necessary to ease the collar of the quick fit coupling upwards, while pushing the transducer down, to effect a coupling.
- Connecting the transducer at this time will enable its temperature to stabilise to that of the water, for subsequent correction of the offset value.

- The pressure offset must now be calibrated. Disconnect the transducer from the water main and perform the Autocal function.

- Re-connect the transducer to the water main, the instantaneous pressure can be viewed on the Psion display.

- Put the SPECTRALOG into the boundary box/kiosk, ensuring that none of the leads are under any strain. Particular care should be taken with the transducer, which is very delicate.

- Clean the entrance to the boundary box/kiosk. If at a boundary box, clean the lid and spray the rubber seal with PTFE lubricant. Close the boundary box/kiosk and tighten with the special tool.

Appendix A Full-Bore Flowmeter Calibration

This appendix provides the calibration information necessary to program SPECTRALOG data loggers with a range of full-bore flowmeters.

The information contained in the following tables is taken from the flowmeter manufacturer's literature.

The Flowmeter Calibration Factors used in the tables will give logged results in Litres/Second, Cubic Metres and Litres/Property, dependant on the parameter measured.

Due to the continuous addition of new pulse units to the range covered by SPECTRALOG the tables may not be fully comprehensive. If in doubt as to whether a particular pulse unit is supported and what calibration factors should be used, contact Biwater Spectrascan.

To assist in the quick configuration of SPECTRALOG default Flowmeter Calibration Factors can be used. A table of default values follows this page.

Connection to all pulse units, switches and flowmeter cables must be undertaken by Spectrascan to ensure correct operation and absolute hermeticity.

SPECTRALOG is compatible with all listed flowmeters. In some cases, however, the flowmeter may not be capable of being powered directly from the SPECTRALOG. In such instances, it is usually possible to power the meter from the Sensor Power Pack; this is shown in the tables.

Table A-1   Default Flowmeter Calibration Values

Flowmeter	Manufacturer	Default FCAL	Default Units
LRP	Kent	0.1	L/s
HRP	Kent	1	L/s
PSM	Kent	0.033	L/m
MSM	Kent	0.033	L/m
PG100	Kent	0.1	L/s
BPG10	Kent	1	L/s
BPG20	Kent	1	L/s
K01	Socam (Meinecke)	0.01	L/s
R01	Socam (Meinecke)	0.01	L/s
R01.1	Socam (Meinecke)	0.01	L/s
R02.2	Socam (Meinecke)	0.01	L/s
RD01	Socam (Meinecke)	0.01	L/s
OPTO 06	Socam (Meinecke)	1	L/s
K505R	Socam (Meinecke)	0.1	L/s
K510	Socam (Meinecke)	0.1	L/s
Model DS	Schlumberger	0.1	L/s
Model D	Schlumberger	0.1	L/s
Model E	Schlumberger	0.1	L/s
Model S	Schlumberger	0.1	L/s
Model TLO	Schlumberger	1	L/s
Model TLOS	Schlumberger	1	L/s
Cyble (3 wire)	Schlumberger	1	L/s
Cyble (5 wire) LF	Schlumberger	1	L/s
Cyble (5 wire) HF	Schlumberger	1	L/s
Aquamag	ABB Kent Taylor	0.01	L/s
Magmaster	ABB Kent Taylor	0.01	L/s
Aquaprobe	ABB Kent Taylor	0.01	L/s
VBC	ABB Kent Taylor	0.01	L/s

Table A-2   Kent Helix and Kent Master Meters

Flowmeter Calibration Factors (FCAL) for Kent Pulse Unit types LRP, HRP, DRP & DLRP			
		Pulse Unit Types	
		LRP (pulses/Litre)	HRP (pulses/Litre)
Logger will power sensor directly?		YES	YES
Type	Meter size (mm)	FCAL	
Helix 2000	40	0.1	1
	50	0.1	1
	65	0.1	1
	80	0.1	1
	100	0.01	0.1
	150	0.01	0.1
	200	0.01	0.1
	250	0.01	0.1
	300	0.01	0.1
Helix 3000	40	0.1	1
	50	0.1	1
	65	0.1	1
	80	0.1	1
	*100	0.1	1
	150	0.01	0.1
Master 2000	40	1	10
	50	1	10
	80	0.1	1
	100	0.1	1
Warning: Some earlier 100mm meters require: FCAL = 0.01 (LRP) or 0.1 (HRP). These meters can be distinguished by the centre pointer dial registration = 1000 litres/rev.			

Table A-3   Kent Domestic Meters

Flowmeter Calibration Factors (FCAL) for Kent Domestic Meters types PSM, PSM-LT & MSM					
		8-Digit Counter Style (Pulses/Litre)		7-Digit Counter Style (Pulses/Litre)		MSM-T Probe
Logger will power sensor directly?		YES		YES		YES
		FCAL				
Type	Meter size (mm)	Rates in L/sec	Rates in L/min	Rates in L/sec	Rates in L/min	Rates in L/sec
PSM-PS15	15	2.0	0.0333	2.0	0.0033	
PSM-PS20	20	2.0	0.0333	2.0	0.0033	
PSM-PS25	25	0.2	0.0033	-	-	
PSM-PS30	30	0.2	0.0033	0.02	0.0003	
PSM-PS40	40	0.2	0.0333	0.2	0.0033	
PSM-LT	15	2.0	0.0333	-	-	
MS 1.0						1
MS 1.5						1
MS 2.5						1

Notes:

(i)   With SPECTRALOG data loggers the measurement interval should be 15 minutes or longer, due to very low pulse rates from PSM and MSM meters.

(ii)   An easy way to determine the FCAL is to observe the number of red digits on the meter:

2 red digits = FCAL 0.02 (or 0.00033 for results in L/min)
3 red digits = FCAL 0.2 (or 0.0033 for results in L/min)
4 red digits = FCAL 2.0 (or 0.0333 for results in L/min)

Table A-4 Kent Helix 4000 Meters

Flowmeter Calibration Factors (FCAL) for Kent Pulse Unit types PG100, BPG10 & BPG20					
Logger will power sensor directly?		PG100	BPG10		BPG20
		YES	NO		NO
		FCAL			
		Position on register			
Type	Meter size (mm)	1 pulse/ 1 Litre (0.001)	1 pulse/ 10 Litres (0.01)	1 pulse/ 100 Litres (0.1)	1 pulse/ 1000 Litres (1)
PG100	125	-	0.1	0.01	0.001
BPG10	125	1	-	-	-
BPG20	125	1	-	-	-
PG100	> 150	-	0.01	0.001	0.0001
BPG10	> 150	0.1	-	-	-
BPG20	> 150	0.1	-	-	-
Use Sensor Power Pack					

Table A-5   Socam, Meinecke & Spanner Polux Flowmeters

Flowmeter Calibration Factors for Socam (Meinecke) Pulse Unit types RO1.1 & OPTO 06				
		Pulse Unit Types		
		RO1.1		OPTO 06
		K = 1 position (pulses/ Litre)	K = 10 position (pulses/ Litre)	K = 1000 position (pulses/ Litre)
Logger will power sensor directly?		YES	YES	NO
Type	Meter size (mm)	FCAL		
COSMOS II	50-125	0.001	0.01	1.0
	150-300	0.0001	0.001	0.1
	400-500	*	0.0001	0.01

Notes:

(i)   The K number is used to define the number of pulses per central pointer revolution.

K = 1 is 1 pulse per revolution
K = 10 is 10 pulse per revolution
K = 1000 is 1000 pulse per revolution

(ii)   If using the RO1.1 pulse unit, it is recommended that K = 10 is used at all times

(iii)   "*" indicates that the FCAL value is too low to be used for data logging

Use Sensor Power Pack

Table A-6   Socam Domestic Meters 510 & 501

Flowmeter Calibration Factors (FCAL) for Socam Pulse Unit types K510 & K505R		
	Pulse Unit Types	
	K510	K505R
Will logger power sensor directly?	YES	YES
Meter Type	FCAL	
510 PR Qn 1.5-2.5 501 L Qn 1-1.5-2.5 501 LM Qn 1-1.5-2.5	2 1 0.1 0.01 0.001	2
510 PR Qn 3.5-6-10 501 JM Qn 1.5-2.5-3.5-6-10	0.2 0.1 0.01 0.001	0.2

Notes:

(i)   The K510 is a factory fitted reed switch that cannot be removed. The FCAL is determined at the time of fitting. The above table shows the available range of values. Check individual meters for full calibration details.

(ii)   The K505R is a removable reed switch for temporary installation. Only two FCAL values are available.

(iii)   Using the Model K510 and K505R reed switches with certain values of FCAL may result in pulse rates greater than 8 Hz being generated. If this is expected, then the SPECTRALOG should be programmed using the HRP option.

Table A-7   Schlumberger Domestic Meter

Flowmeter Calibration Factors (FCAL) for Schlumberger Pulse Unit Model D, DS, E, S, TLO & TLO S				
		Pulse Unit Types		
		Opto Switch TLO/TLO S (Pulses/Litre)	Reed Switch Model D/DS (Pulses/Litre)	Reed Switch Model E/S (Pulses/Litre)
Logger will power sensor directly?		NO	YES	YES
Type	Meter Size (mm)	FCAL		
Aquadis	15	100	10	These can be factory fitted in four different positions, check individual meter and literature for full calibration details
	20	100	10	
	25	33	1	
	30	33	1	
	40	10	1	
Use Sensor Power Pack				

Table A-8   Schlumberger Woltex and Woltmag V Flowmeters

Flowmeter Calibration Factors (FCAL) for Schlumberger Pulse Unit Model D, DS, E, S, TLO & TLO S				
		Pulse Unit Types		
		Opto Switch TLO/TLO S (Pulses/Litre)	Reed Switch Model D/DS (Pulses/Litre)	Reed Switch Model E/S (Pulses/Litre)
Logger will power sensor directly?		NO	YES	YES
Type	Meter size (mm)	FCAL		
Woltex	50	1	0.1	These can be factory fitted in four different positions, check individual meter and literature for full calibration details
	65	1	0.1	
	80	1	0.1	
	100	1	0.1	
	150	0.1	0.01	
	200	0.1	0.01	
	250	0.1	0.01	
	300	0.1	0.01	
	400	0.01	0.001	
	500	0.01	0.001	
Woltmag V	50	0.5	0.05	As above
	65	0.5	0.05	
	80	0.5	0.05	
	100	0.5	0.05	
Notes: (i) Using the Model DS reed switch with meter sizes of 15 or 20mm may result in pulse rates greater than 8 Hz being generated. If this is expected, then the SPECTRALOG should be programmed using the HRP option.				
Use Sensor Power Pack				

Table A-9   Kent Aquamag (formerly VBC) and Magmaster   Meters

Flowmeter Calibration Factors (FCAL) for the Kent Industrial Measurements Aquamag (VBC) and Magmaster full-bore electromagnetic flowmeters.	
Logger will power sensor directly?	YES
Meter size (mm)	FCAL Cable wired to x1 output (Pulses/Litre)
50	1.0
65	1.0
80	0.1
100	0.1
150	0.1
200	0.1
250	0.01
300	0.01

Notes:

(i)   Special cables are required to connect SPECTRALOG to this flowmeter. Cables must be supplied by Spectrascan to ensure that the correct power is taken from the logger and hence its battery life is not degraded.

(ii)   Different cables are required for connection to Aquamag/Magmaster and to the older VBC flowmeters.

Appendix B Warranty and Maintenance

Warranties may be considered void if it can be shown that faults have developed due to misuse, lightening, faulty installation or unauthorised tampering.

The SPECTRALOG contains no user serviceable parts. In the case of malfunction contact Biwater Spectrascan or your local distributor for assistance.