

#### Innovating Together.

# **MULTI-FLO**

Infusion Device Analyser

Copyright © 2012 SEAWARD GROUP Last Update: 5th July 2012 Instruction Manual 385A550 Revision 1.0

#### Rigel Medical 24 Month Warranty Statement

Rigel Medical provides a standard 12-month manufacturer's warranty against breakdown during normal use. This warranty can be upgraded to a 24-month warranty (terms and conditions apply\*). Problems caused through misuse, damage, fair wear & tear, consumables and accessories are excluded from standard warranty. Such components found to be being used in excess of their manufacturer's operating recommendations are also excluded. Shipping to an authorised service center is the responsibility of the sender.

#### \*Terms and Conditions of 24 Month Warranty

The Rigel product must be registered with Rigel Medical within 30 days of purchase to be eligible for the extended 24-month warranty. Instruments must be returned to an authorised service center complete with proof of purchase within 13 months of purchase for calibration at the current rate. Any items returned for calibration outside of the 13 month period stated above may not be eligible for the second 12 month section of warranty. The second 12 month section of the warranty begins at the expiry of the initial 12 month period, not when the unit is calibrated.

Details correct at time of going to print. The manufacturer retains the right to make amendments to the above terms and conditions without prior notice.

#### **Calibration Statement**

The Rigel Multi-Flo Infusion Device Analyser is fully calibrated and found to be within the specified performance and accuracy at the time of production. The Seaward Group provides its products through a variety of channels; therefore it may be possible that the calibration date on the provided certificate may not represent the actual date of first use.

Experience has indicated that the calibration of this instrument in not effected by storage prior to receipt by the user. We therefore recommend that the recalibration period be based on a 12 month interval from the first date the unit is placed in to service.

Date received into service; / / .

#### © Copyright 2012

All rights reserved. Nothing from this edition may be multiplied, or made public in any form or manner, either electronically, mechanically, by photocopying, recording, or in any manner, without prior written consent from the SEAWARD GROUP. This also applies to accompanying drawings and diagrams.

Due to a policy of continuous development the SEAWARD GROUP reserves the right to alter the equipment specification and description outlined in this publication without prior notice and no part of this publication shall be deemed to be part of any contract for the equipment unless specifically referred to as an inclusion within such contract.

Disposal of old product



The Rigel Multi-Flo has been designed and manufactured with high quality materials and components, which can be recycled and reused.

When this symbol is attached to a product it means the product is covered by the European Directive 2002/96/EC.

Please familiarise yourself with the appropriate local separate collection system for electrical and electronic products or contact your local supplier for further information.

Please dispose of this product according to local regulations. Do not dispose of this product along with normal waste material. By offering your old products for recycling, you will help prevent potential negative consequences for the environment and human health.

#### **Certificate of Conformity**

Manufactured by:

Seaward Electronic Ltd, Bracken Hill, South West Industrial Estate Peterlee, County Durham, SR8 2SW, England

As the manufacturer of the apparatus listed, declare under our sole responsibility that the product:

#### **Rigel Multi-Flo Infusion Device Analyser**

To which the declaration relates are in conformity with the relevant clauses of the following standard:

BS EN 61010-1:2010 Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements.

BS EN 61326:2006 Electrical equipment for measurement, control, and laboratory use -EMC requirements.

Performance: The instrument operates within specification when used under the conditions in the above standards EMC and Safety Standards.

The product identified above conforms to the requirements of Council Directive 2004/108/EC and 2006/95/EC.

This Conformity is indicated by the symbol *C*, i.e. "Conformité Européenne"

Seaward Electronic Ltd. is registered under BS EN ISO9001:2000 Certificate No.: Q05356.

# Index

Introduct	tion	2
Design	Philosophy	. 2
Unpack	king the Multi-Flo	. 3
Warning	s and Cautions	4
User N	otes	.4
Safety	Notes	.4
Multi-Flo	Overview	6
1 Gett	ing Started	7
1.1	Before you Switch On!	.7
1.2	Turning the Multi-Flo On and Off	. 7
1.3	Accessing the Multi-Flo Tests	. 7
1.4	Setting the Time/Date	. 8
1.5	Displaying the Multi-Flo Information	. 9
2 Anal	ysing an Infusion Device1	0
2.1	Connecting an Infusion Device to the Multi-Flo	10
2.2	Priming the Channels	10
2.3	Patient Controlled Analgesia (PCA) test	11
2.4	Occlusion test	12
2.5	Flow Rate/Volume test	14
2.6	Draining the Channels	15
3 Mair	ntaining the Rigel Multi-Flo1	17
3.1	Cleaning	17
3.2	User Maintenance	17
3.3	Return Instructions	18
4 Acce	essories1	9
4.1	Optional Accessories	19
4.2	Replacement Spare Parts	19
5 Spec	cifications2	20
5.1	Technical Specifications	20
5.2	General Specifications	21
5.3	Environmental Conditions	21
6 Sup	port	22
6.1	Contact Us	22

## Introduction

### **Design Philosophy**

The Rigel Multi-Flo Infusion Device Analyser provides accurate and fast analysis of the performance of all common infusion devices. The Multi-Flo's instant flow measurement allows for high resolution flow and pressure analyses and provides a highly accurate calibration method for proving the correct function of all infusion devices.

Infusion devices can be tested under positive and negative pressure settings whilst bolus and PCA tests are conducted with the highest possible resolution.

Measuring flow rates, volume and pressure, the Multi-Flo is available in 1, 2 and 4 channel configuration which can be upgraded in the future to include additional channels up to a maximum of 4 channels. The Multi-Flo will ensure it meets your current and future requirements.

Note; This version of the manual (V1.0) describes the manual function of the Multi-Flo only. Software upgrades available by the end of 2012 will activate the automatic testing sequences, remote PC control, data storage and download. Register your product asap to receive notification of the free firmware upgrade. To register your product, please visit:

www.rigelmedical.com/register-product

# **Unpacking the Multi-Flo**

Carefully unpack all items from the box and ensure the following items are included:

Rigel Multi-Flo Infusion Device Analyser Mains Power Lead Multi-Flo Quick Start Guide Utilities Disc USB Bluetooth Adaptor

# Warnings and Cautions

### **User Notes**

Ensure that the Multi-Flo is operated with the **distilled or de-ionised water** only.

The following symbols are used throughout this Instruction Manual;



Warning of electrical danger! Indicates instructions must be followed to avoid danger to persons.



Important, follow the documentation! This symbol indicates that the operating instructions must be adhered to in order to avoid danger.

#### Safety Notes



**Users** - The Rigel Multi-Flo Infusion Device Analyser is designed for use by adequately trained technical personnel only.



**Operation** - The Rigel Multi-Flo Infusion Device Analyser is designed for use within the published specifications. Any application outside of these specifications or any unauthorised user modifications may result in hazardous conditions or improper operation.



**Operation** - Refer to the Device Under Test (DUT) manufacturer operating instructions to ensure safe operation whilst analysing the DUT.



**Safety** - Ensure that only accessories supplied by the manufacturer or accessories that meet the manufacturer's specification are used.



**Safety** - Where safe operation of the Multi-Flo is no longer possible it should be immediately shut down and secured to prevent accidental operation.

It must be assumed that safe operation is no longer possible:

- if the instrument or leads show any sign of damage or
- the instrument does not function or
- after long periods of storage under adverse environmental conditions.

### **Multi-Flo Overview**



#### KEY

- 1 Large colour graphic display.
- 2 ON/OFF button
- 3 Function keys F1 F4
- 4 Start button
- 5 Rotary encoder
- 6 Stop/End button.
- 7 Channel inlet connectors.
- 8 Channel drain connectors.
- 9 Folding legs
- 10 Type A USB connection
- 11 Type B USB connection
- 12 IEC mains power lead connection
- 13 Auxiliary output connection

13



### 1 Getting Started

#### 1.1 Before you Switch On!

Ensure that the Multi-Flo is operated with the **distilled or de-ionised water** only.

The Rigel Multi-Flo has two legs on the front base of the unit. These are designed to raise the front of the unit to improve the viewing angle of the colour graphic display.

#### 1.2 Turning the Multi-Flo On and Off



To turn the Multi-Flo ON, press the orange I/O key so it is in the in position.

To turn the Multi-Flo OFF, press the orange I/O key so it is in the out position.

#### 1.3 Accessing the Multi-Flo Tests

From the main menu, use the rotary encoder to highlight Manual mode. Press the rotary encoder to enter manual mode.

	Main	menu				S	umma	iry	
Manual	mode			сн	Туре	Volume	Press	ure Flow	Duration
Automa	tic mode			1	Flow	0.00	3	0.000	Ready
Select of	lata			2	Flow	0.00	0	0.000	Ready
About				3	N/A				
	12:11:14 pn	n 30.07.2012		4	N/A				
AUTO	PRIME	DRAIN	ABOUT		-	STOP A	.L ]	1	SETUP

Here you can access the test menu for each individual channel.

Flow Te	est Setup	PCA	Setup	Occiu	ision Setup
Selected Channel: Test type:	1 Flow / Volume test	Selected Channel:	1	Selected Channel:	1
Flow Rate:	100.00 ml/h	Test type:	PCA test 🔹	Test type:	Occlusion test
Back pressure:	0 mmHg	Basal Flow Rate 10.00	▲ Bolus ▼ Volume: 0.00 ◆	Infusion pump type:	Manual
Sampling window:	30 sec	Total Volume ml: 0.00	1.		( and the second s
Duration: 0hr	15min 🚖 Osec 🚖	Duration: 1hr	Omin 🖨 Osec 🖨		
-		-			

Highlight the required channel and press **SET UP** or push the rotary encoder. Highlight the Test type menu and push the rotary encoder. This will allow you to toggle between PCA test, Occlusion test and Flow Rate.

Press  $\checkmark$  to save or  $\checkmark$  to exit without saving.

#### 1.4 Setting the Time/Date

From the main menu, use the rotary encoder to highlight Setup. Press the rotary encoder to enter the setup menu.

Main menu	Time and Date
Manual mode Automatic mode Select data	Time  12:30:45 pm
Setup About	Date 30.07.2012
AUTO PRIME DRAIN ABOUT	🛑 12 / 24 Format 🔽

Highlight the part of the time/date you wish to change using the rotary encoder and push to enter. Use the rotary encoder to increase or decrease the value then push again to confirm. Alternatively, use a USB keyboard to enter data.

Press **12/24** to toggle between 12 and 24 hour clock mode.

Press Format to toggle between DDMMYYYY and MMDDYYYY date format.

Press  $\mathbf{V}$  to save the changes, then  $\mathbf{H}$  to exit.

#### 1.5 Displaying the Multi-Flo Information

	Main	menu			Ab	out	
Manual	mode					GEL	
Automa Select o Setup	tic mode lata				+44 (0) 191	587 8701	
About				@	info@RigelM	Aedical.com	
	12:15:02 pn	n 30.07.2012	ŝ	www			
AUTO	PRIME	DRAIN	ABOUT	-	Details	Calibration	$\square$

From the main menu, press the **About** function key. The main About screen displays telephone, email and website information for the equipment manufacturer.

	De	etails			Calibrat	ion Details	
1	Version 0.15.	2		Channel	Cal Date	Verified	
Channel	Firmware Ver.	Hardware Ver.	Serial no.	1			
1	5.07	3 0.42A	V00-0000	2			
2	5.07	3 0.41A	V00-0000	3	N/A	N/A	
3	-	<u>ще</u>	<u></u>	4	N/A	N/A	
4	-	-	-				
-		Calibration		-	Details	ĺ	
			Co	ntact	<u> </u>		
		This prod Seaward requires ( us to find centre. Seaward Elect Service Depart 11 Bracken Hill South West Inc.	uct is manufac Electronic Ltd calibration or s out your near out your near ronic Ltd, ment kettal Estate, zaw,	tured and in: In case the jervice, pleas est authorise set authorise set -44(0)191 507 fmc+44(0)191 516 service@cestward www.setward.co.	spected by product e contact d service		
		engand	Details	Calibration			

Press **Details** to view the firmware version, hardware version and serial no. for the Multi-Flo unit and each individual installed channel.

Press **Calibration** to view the calibration data of the installed channels.

Press ito view the Service and Calibration contact information.

#### 2 Analysing an Infusion Device



#### 2.1 Connecting an Infusion Device to the Multi-Flo

Ensure the flow direction is as per diagram above. The flow inlet is the top connection whilst the flow outlet is positioned below the inlet for each channel.

#### 2.2 Priming the Channels

Upon power-up the Multi-Flo is in automatic priming mode however, should priming be required at any other stage, select the PRIME from the main menu;

	Main	menu		Priming
Manual Automa Select o Setup About	mode tic mode data 12:11:14 pn	n 30.07.2012		Prime system: connect infusion pump and prime the system until air in the drain disappears.
AUTO	PRIME	DRAIN	ABOUT	

Prime the system until the drain is clear of air bubbles. Press **to** return to the main menu.

#### 2.3 Patient Controlled Analgesia (PCA) test

The PCA test determines the additional volume delivered on top of the basal flow rate set by the user. The additional volume or sometime referred to as BOLUS, is an indication of the correct safety settings of an infusion device.

From the main menu, select Manual mode. This will take you to the channel summary screen.

	Main	menu				S	umma	ary	
Manual	mode			сн	Туре	Volume	Press	sure Flow	Duration
Automa	tic mode			1	Flow	0.00	3	0.000	Ready
Select of	lata			2	Flow	0.00	0	0.000	Ready
About				3	N/A				
	12:11:14 pn	n 30.07.2012		4	N/A				
AUTO	PRIME	DRAIN	ABOUT		-	STOP A	.L ]	Ĩ	SETUP

Highlight the required channel and press **SET UP**. Use the rotary encoder to highlight Test type, press the encoder to access the sub-menu. The Test type box will now be highlighted in white.

Use the rotary encoder to select PCA test and press the rotary encoder to confirm. The PCA Setup screen will now be displayed.

Use the rotary encoder to edit the basal flow rate, bolus volume, total volume and test duration.

F	PCA Setup	
Selected Channel:	1	
Test type:	PCA test	-
Basal Flow Rate I	D.00 - Bolus Volume: 0.00	-
Total Volume ml: 0.	00 🗘	
Duration: 1hr	🚖 Omin 🌲 Osec	-
-		1

NOTE: The basal flow rate setting is used to determine the additional volume being delivered ie the BOLUS. Therefore an incorrect setting of the basal flow rate will lead to an inaccurate BOLUS detection.

Press for save and advance to the PCA test summary screen, or for to exit without saving.

A		. ÷	
2 PC/	Ą	Basal flow ml/h	0.000
Elapsed:	Ready	Total volume mi	0.00
Remaining	00:15:00	rous volunio mi	0.00
Bolus			Mean
Volume ml			0.00
Flow ml/h			0.000
Duration Se	c		0
-	Graph	Setting	СН

Press the green START button to begin the test.

**Safety** - Press the red STOP button at any time to stop the test.

#### 2.4 Occlusion test

The Occlusion test simulates an obstruction in the infusion process. Most infusion devices have the ability to detect this obstruction and provide an occlusion alarm. The occlusion test is able to test this alarm feature in infusion devices.

From the main menu, select Manual mode. This will take you to the channel summary screen. Highlight the required channel and press **SET UP**. This will take you to the Occlusion Setup screen.

	Main	menu				S	umma	ary	
Manual	mode			сн	Туре	Volume	Press	sure Flow	Duration
Automa	tic mode			1	Flow	0.00	3	0.000	Ready
Select of	lata			2	Flow	0.00	0	0.000	Ready
About				3	N/A				
	12:11:14 pn	n 30.07.2012		4	N/A				
AUTO	PRIME	DRAIN	ABOUT		-	STOP A	L	1	SET UP

sion Setup	-
1	
Occlusion test	•
Manual	-
	1 Occlusion test Manual

Use the rotary encoder to select Occlusion test and press the rotary encoder to confirm. The Occlusion Setup screen will now be displayed.

#### Infusion Pump Type

The manual pump setting refers to an infusion device that does not provide for an automatic back-off of pressure. As such, the green button available during the test, must be pressed as soon as the occlusion alarm sound.

The automatic pump setting refers to infusion devices that do provide an automatic pressure back-off function. The Multi-Flo will detect the occlusion alarm when the line pressure decreases after alarm.

2 Oc	clusion	Pum	p type:	
Time :	00:00:00	Ma	nual	
	Ready			
Pump type	9:	Manual		
Current m	mHg:	0.0		
Peak mmHg:		0.0		
Back-off n	ımHg:			
Bolus Volume ml:		0.0	)	
-	Graph	Setup	СН	

Press **V** to save and advance to the Occlusion test summary screen, or **to** exit without saving.

Press the green START button to begin the test.

Use the rotary encoder during the test, to change the highlighted (blue) field holding the main measurement parameter.



Safety - Press the red STOP button at any time to stop the test.

#### 2.5 Flow Rate/Volume test

The Rigel Multi-Flo is capable of measuring the instantaneous flow at a resolution of  $10\mu$ l/hr. In addition, the flow rate can be viewed based over an average period (user selectable) as well as detecting peak and minimal flow rates.

From the main menu, select Manual mode. This will take you to the channel summary screen.

Main menu					S	umma	ary		
Manual Automa Select o Setup About	mode tic mode data			СН [1 2 3	Type Flow Flow N/A	Volume 0.00 0.00	Press 3 0 	sure Flow 0.000 0.000 	Duration Ready Ready 
	12:11:14 pn	n 30.07.2012	ABOUT	4	N/A		-	1	

Use the rotary encoder to select Flow Rate and press the rotary encoder to confirm.

Flow Te Selected Channel:	est Setup 1	1 Flow F Elapsed:	Ready	Mea O.	n ml/h:
Test type: Flow Rate: Back pressure:	Flow / Volume test 100.00 ml/h 0 mmHg	Remaining:     Mean ml/h:     Peak ml/h:	0.000	Error %:	100.0
Sampling window: Duration: 0hr 🔷	30 sec	<ul> <li>Inst. Flow ml/h</li> <li>Min ml/h:</li> </ul>	: 0.000 	Volume ml: P mmHg:	0.00 0
-			Graph	Setup	СН

The Flow Test Setup screen will now be displayed.

Press **I** to save and advance to the Flow Rate test summary screen, or **I** to exit without saving.

Press the green START button to begin the test.

Use the rotary encoder during the test, to change the highlighted (blue) field holding the main measurement parameter.



#### Viewing the flow graph

<b>1</b> Flow Rate Elapsed: 00:01:49 Remaining: 00:13:11	меа 200	in mi/h: <b>).972</b>	250 (1) (200 (1) (1) (1) (1) (1) (1) (1) (1) (1) (1)			annel 1 ~ ~~
Mean ml/h: 200.972						
Peak ml/h: 210.000	Error %:	-1.9	NO 50			
Inst. Flow ml/h: 203.864	Volume ml:	6.09				
Min ml/h: 191.992	P mmHg:	-1	 ۳	20 40	60 80	100 120
draph Graph	Setup	СН	-		Туре	СН

From the summary screen select Graph to view the graph of instantaneous flow rate against time.

The graph can switch between instantaneous flow and volume by pressing the TYPE button.

#### 2.6 Draining the Channels

From the main menu, select DRAIN. This will take you to the Drain function screen.

	Main	menu		Drain
Manual Automa Select o Setup About	mode tic mode lata			Channel 1 Channel 2 Channel 3 Channel 4 Drain All
-	12:11:14 pn	n 30.07.2012	\$ 	
AUTO	PRIME	DRAIN	ABOUT	

Either select the individual channel to drain or select Drain All.

Draining	Ĩ
Draining All Channels	

Once the fluid has been drained, press to stop the draining process.



Warning; Once the fluid is drained, do not leave the drain pump facility running longer than necessary.

# 3 Maintaining the Rigel Multi-Flo

#### 3.1 Cleaning

Ensure that the Multi-Flo is operated with the **distilled or de-ionised water** only.

Always ensure you drain the Multi-Flo after use to avoid build-up of contamination of the internal flow channels.

Clean the external case of the Rigel Multi-Flo with a clean dry cloth.

Avoid using solvents and abrasive scouring agents to clean the external case of the Rigel Multi-Flo.

If the Multi-Flo is subject to liquid ingress in a manner other than intended, the unit should be returned for repair, stating clearly the cause for repair.

#### 3.2 User Maintenance

The Rigel Multi-Flo is a rugged quality instrument. However, care should always be taken when using, transporting and storing this type of equipment. Failure to treat the product with care will reduce both the life of the instrument and its reliability.

Always check the Multi-Flo and all accessories for damage and signs of wear before use.

Do not attempt to open the Multi-Flo. Maintenance should only be carried out by authorised personnel.

The Multi-Flo contains no user serviceable parts.

Keep the Multi-Flo and accessories clean and dry.

The recommended calibration period for this unit is 12 months.

#### 3.3 Return Instructions

For repair or calibration of the Multi-Flo, please contact Calibration House.

Calibration House 11 Bracken Hill Southwest Industrial Estate Peterlee County Durham SR8 2LS United Kingdom

Tel: +44 (0) 191 587 8739 Fax: +44 (0) 191 518 4666

Email: info@calibrationhouse.com

Prior to returning your unit, please contact Calibration House to obtain a RMA.

By obtaining a RMA your service request can be booked in advance, allowing for a quicker turnaround time of your equipment.

Please have your instrument make, model and serial number available.

#### 4 Accessories

#### 4.1 **Optional Accessories**

The 1 and 2 channel Multi-Flo configurations are field upgradeable to a maximum of 4 channels.

- USB keyboard
- USB download lead
- <u>Med-eBase</u> PC download and remote control software

#### 4.2 Replacement Spare Parts

- 44B122 IEC mains lead
- 27B044 Mains fuse, 20 x 5mm T3.15A 250V

#### 5 Specifications

#### 5.1 Technical Specifications

#### **Flow Measurement**

Test Duration: Programmable up to 24 hours for memory storage.

Display range	0.010 ml/h to 1500 ml/h
Max. display resolution	10 μl/h
Measured range	0.500 ml/h to 1450 ml/h
Accuracy	± 1% of the reading after 100µl volume at 0 mmHg backpressure applied.
Volume	0.001 ml to 9999 ml
Flow update rate	1 Hz

#### **Occlusion / back pressure measurement**

Pressure measurement range	-500 to 2500 mmHg
Back pressure setting range	-200 to 600 mmHg
Unit selection	Bar, PSI, mmHg, mmH2O
Accuracy	± 1% of the reading up to 1500 mmHg
Max. resolution	1 mmHg

#### PCA / Bolus measurements (Volume)

Display Range	0.1 ml to 100 ml
Measuring Range	0.5 ml to 100 ml
Accuracy	± 1% of the reading
Max. resolution	0.01 ml
Basal flow rate	1 ml to 30 ml/h
Pressure	Max. 2500 mmHg

#### 5.2 General Specifications

Dimensions	300mm x 204mm x 150mm
Weight	5kg (1 channel)
	6kg (2 channel)
	8kg (4 channel)
Mains supply	90 - 264 VAC, 50/60 Hz, 60W
Mains cable	Standard IEC 10A connector
Storage environment	0°C to +50°C
Operating conditions	+15°C to +40°C
Environmental protection	IP40
PC Communication	USB B
Keyboard Communication	USB A
Display	LCD colour graphic display ¼" VGA

#### 5.3 Environmental Conditions

The Rigel Multi-Flo has been designed to perform tests and measurements in a dry environment.

Maximum barometric elevation for making measurements is 2000m.

Protective system IP40 according to IEC 60529.

Electromagnetic compatibility (EMC). Interference immunity and emitted interference conforming to IEC 61326-1.

Operating temperature range of 15°C to 40°C, without moisture condensation.

The Multi-Flo can be stored at any temperature in the range 0°C to +50°C.

#### 6 Support

#### 6.1 Contact Us

#### **Rigel Medical Contact details**

#### **Rigel Medical Address details**

Sales and Delivery enquiries Tel: +44 (0) 191 587 8730 Fax: +44 (0) 191 586 0227 Email: <u>sales@rigeImedical.com</u>

**Technical enquiries** 

Tel: +44 (0) 191 587 8701

Email: <a href="mailto:support@rigelmedical.com">support@rigelmedical.com</a>

Rigel Medical 15 - 18 Bracken Hill South West Industrial Estate Peterlee, County Durham SR8 2SW, United Kingdom

**CalibrationHouse Address details** 

# CalibrationHouse Contact details

Service, Calibration and Repair	CalibrationHouse
Tel: +44 (0) 191 587 8739	11 Bracken Hill
Fax: +44 (0) 191 518 4666	South West Industrial Estate
Email: info@calibrationhouse.com	Peterlee, County Durham
	SR8 2SW, United Kingdom

Part of

