# Pump 11 Elite OEM Module Series

# USER'S MANUAL



# Harvard Apparatus Pump 11 Elite OEM Module Series

Publication 5420-007 Rev 1.0



phone 800.272.2775 email bioscience@harvardapparatus.com

# Table of Contents

SUBJECT PAGE N	0.
General Information	4
Safety Information	4
Warranty and Repair Information	5
Manual Description	5
Warranty	5
Repair Facilities and Parts	5
Serial Numbers	5
Calibrations	5
Specifications	6
Product Overview	8
Pump Models	8
Operating Instructions	9
Power Connections	9
Syringe Loading	10
External Pump Control	11
Setting up HyperTerminal	11
Pump Chain Commands	12
Using the Pump 11 Elite Series Pump Chain Commands	12
Error Messages	13
Command Errors	13
Argument Errors	13
System Commands	13
Run Commands	15
Rate Commands	15
Volume Commands	16
Time Commands	17
Digital I/O Commands	18
Internal Commands	18
Serial Command Notes	18



# Table of Contents

3

SUBJECT	PAGE NO.
Appendices	
Appendix A: Syringe Volume/Diameter Reference Table	19
Appendix B: Min/Max Flow Rates	20
Appendix C: External Connections	22
User I/O Connector Specifications	22
Utilizing USB Interface	23
RS-485	25
Legacy RJ-11 Option	26
Appendix D: Maintenance	27
Maintenance	27
Upgrading Pump 11 Elite Series Software	28
Troubleshooting	29
Appendix E: Ordering Information	30

**General Information** 

# SAFETY INFORMATION

Please read the following safety precautions to ensure proper use of your syringe pump. If the equipment is used in a manner not specified, the protection provided by the equipment may be impaired.

# To Prevent Hazard or Injury:

# USE PROPER POWER SUPPLY

The pump is supplied with an approved power supply and line cord. To maintain the safety integrity of the device, use only the following power supplies:

#### Cui Inc.

 Model:
 3A – 242DB24

 Output:
 24V – 1.0A

 Input:
 100–240V\_50–60 Hz 0.8A

 Globtek
 Inc.

 Model:
 GT-41062-T3

 Output:
 24V - 0.75A

 Input:
 100-240V\_50-60 Hz 0.6A

#### USE PROPER LINE CORD

Use only the specified line cord for this product and make sure line cord is certified for country of use. The operating voltage range for the Pump 11 Elite Series is 12-30 VDC. The universal power supply operating voltage range is 100-240 VAC, 50-60 Hz.

# GROUND THE PRODUCT

This product is grounded through the grounding conductor of the power cord. To avoid electric shock, the grounding conductor must be connected to earth ground. Before making any connections to the input or output terminals of the product, ensure that the product is properly grounded.

# MAKE PROPER CONNECTIONS

Make sure all connections are made properly and securely. Any signal wire connections to the unit must be no longer than 3 meters.

# **OBSERVE ALL TERMINAL RATINGS**

Review the operating manual to learn the ratings on all connections.

# AVOID EXPOSED CIRCUITRY

Do not touch any electronic circuitry inside of the product.

#### AVOID PINCH HAZARD

A pinch hazard may exist between the pusher block and end blocks. Avoid placing fingers between these points while the pump is running.

## DO NOT OPERATE WITH SUSPECTED FAILURES

If damage is suspected on or to the product do not operate the product. Contact qualified service personnel to perform inspection.

#### ORIENT THE EQUIPMENT PROPERLY

Do not orient the equipment so that it is difficult to operate the disconnection device.

# PLACE PRODUCT IN PROPER ENVIRONMENT

Review the operating manual for guidelines for proper operating environments.

# OBSERVE ALL WARNING LABELS ON PRODUCT

Read all labels on product to ensure proper usage.





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# WARRANTY AND REPAIR INFORMATION



**CAUTION:** REFER TO SAFETY INFORMATION AND SETTING UP THE HARVARD APPARATUS PUMP 11 ELITE SERIES BEFORE PLUGGING IN THE PUMP.

# **Manual Description**

This manual is designed to provide all operational and Method information required to operate and maintain the Pump 11 Elite Syringe Pumps. The functions and features are described in the Technical Specifications section.

# Warranty

Harvard Apparatus warranties this instrument for a period of two years from date of purchase. At its option, Harvard Apparatus will repair or replace the unit if it is found to be defective as to workmanship or materials. This warranty does not extend to damage resulting from misuse, neglect or abuse, normal wear and tear, or accident. This warranty extends only to the original consumer purchaser.

IN NO EVENT SHALL HARVARD APPARATUS BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES. Some states do not allow the exclusion or limitation of incidental or consequential damages so the above limitation or exclusion may not apply to you. THERE ARE NO IMPLIED WARRANTIES OF MERCHANTABILITY, OR FITNESS FOR A PARTICULAR USE, OR OF ANY OTHER NATURE. Some states do not allow this limitation on an implied warranty, so the above limitation may not apply to you.

If a defect arises within the warranty period, promptly contact **Harvard Apparatus, 84 October Hill Road, Holliston, Massachusetts 01746** using out toll free number 1-800-272-2775 or outside the US call 1–508-893-8999. Email address is bioscience@harvardapparatus.com. Goods will not be accepted for return unless an RMA (returned materials authorization) number has been issued by our customer service department. The customer is responsible for shipping charges for non-warranty repairs. Please allow a reasonable period of time for completion of repairs or replacement. If the unit is replaced, the replacement unit is covered only for the remainder of the original warranty period dating from the purchase of the original device.

This warranty gives you specific rights, and you may also have other rights which vary from state to state.

# **Repair Facilities and Parts**

Harvard Apparatus stocks replacement and repair parts. When ordering, please describe parts as completely as possible, preferably using a part number obtained from our Technical Support department. If practical, enclose a sample part or sketch. We offer a complete reconditioning service.

# **Serial Numbers**

All inquiries concerning our product should refer to the serial number of the unit, located on the rear panel.

# Calibrations

All electrical apparatus are calibrated at rated voltage and frequency. While the flow and volume will stay calibrated, the peak pressure may vary. Harvard Apparatus recommends an annual calibration of the pump.



**CAUTION:** FOR RESEARCH USE ONLY. NOT FOR CLINICAL USE ON PATIENTS.



Specifications	Pump 11 Elite OEM	Pico Plus Elite OEM
Accuracy	± 0.5%	± 0.35%
Reproducibility	± 0.05%	± 0.05%
Syringes (Min./Max.)	0.5 μl / 60 ml (10 ml dual)	0.5 μl / 10 ml
Flow Rate:		
Minimum (0.5 µl syringe)	1.26 pl/min	0.54 pl/min
Maximum (10 ml syringe)	26.02 ml/min	11.70 ml/min
Maximum (60 ml syringe)	88.40 ml/min	N/A
Display	None	None
Non-Volatile Memory	Stores all settings	Stores all settings
Connectors:		
RS-485	IEEE-1394, 6 pos	IEEE-1394, 6 pos
USB	Туре В	Туре В
I/O & TTL	15 pin D-Sub Connector	15 pin D-Sub Connector
Footswitch	Mini phono jack	Mini phono jack
RS-232 (option)	RJ-11	RJ-11
Linear Force (Max)	16 kg (35 lbs) @ 100% Force Selection	16 kg (35 lbs) @ 100% Force Selection
Drive Motor	0.9° Stepper Motor	0.9° Stepper Motor
Motor Drive Control	Microprocessor with 1/16 microstepping	Microprocessor with 1/16 microstepping
Number of Microsteps per one rev. of Lead Screw	15,360	20,480
Step Resolution	0.069 µm/µstep	0.031 µm/µstep
Step Rate:		
Minimum	27.5 sec/µstep	27.5 sec/µstep
Maximum	26 µsec/µstep	26 µsec/µstep
Pusher Travel Rate:		
Minimum	0.15 μm/min	0.068 μm/min
Maximum	159.00 mm/min	71.55 mm/min
Input Power	12-30 VDC (24V recommended)	12-30 VDC (24V recommended)
Input Power Connection	2.5mm ID x 5.5mm OD male plug	2.5mm ID x 5.5mm OD male plug
Power Supply	100-240 VAC, 50-60 Hz, 8 Watts Universal Power Supply, Use Only a Harvard Apparatus Approved Power Supply and Line Cord	100-240 VAC, 50-60 Hz, 8 Watts Universal Power Supply, Use Only a Harvard Apparatus Approved Power Supply and Line Cord
Dimensions	24.13 x 17.15 x 10.67 cm (9.5 x 6.75 x 4.2 in)	24.13 x 17.15 x 10.67 cm (9.5 x 6.75 x 4.2 in)
Weight	2.3 kg (5.08 lbs)	2.3 kg (5.08 lbs)



Specifications	Pump 11 Elite OEM	Pico Plus Elite OEM
Atmospheric Specifications:		
Operating Temperature	4°C to 40°C (40°F to 104°F)	4°C to 40°C (40°F to 104°F)
Storage Temperature	-10°C to 70°C (14°F to 158°F)	-10°C to 70°C (14°F to 158°F)
Operating Humidity	See Chart Below	See Chart Below
Storage Humidity	20% to 80% RH, non condensing	20% to 80% RH, non condensing
Method of Operation	Continuous	Continuous
Classification	Class I	Class I
Pollution Degree	1	1
Installation Category	Ш	Ш
Supplier Name	Harvard Apparatus	Harvard Apparatus
Supplier Address	84 October Hill Rd., Holliston, MA 01746	84 October Hill Rd., Holliston, MA 01746
Supplier Phone Number	(508) 893-8999	(508) 893-8999
Regulatory Certifications	CE, ETL (UL, CSA), WEEE, EU RoHS & CB Scheme	CE, ETL (UL, CSA), WEEE, EU RoHS & CB Scheme
Safety Declarations	ANSI/UL 61010-1 ED. 3 ; CAN/CSA C22.2 No. 61010-1Ed 3 ; IEC 61010-1 Ed 3 ; CENELEC EN 61010-1 ; CB Scheme	ANSI/UL 61010-1 ED. 3 ; CAN/CSA C22.2 No. 61010-1Ed 3 ; IEC 61010-1 Ed 3 ; CENELEC EN 61010-1 ; CB Scheme
EMC Declaration	FCC 47CFR 15B Class A; EN61326-1	FCC 47CFR 15B Class A; EN61326-1





# **Product Overview**



# The Harvard Apparatus Pump 11 Elite Series is the next generation of syringe pumps.

A green led light on the front panel makes it easy to see if the pump is running.

The pumps are versatile and can be interconnected through the RS-485 interface. Pump 11 Elite Series models can be mixed and matched in the daisy chain offering maximum flexibility. Up to 99 pumps can be linked together through the RS-485 interface provided each pump is assigned its own unique pump address.

Flow performance is optimized with a small step angle stepping motor that drives a precision lead screw and pusher block. The syringe mechanism is easy to use and securely holds the syringes for smooth flow performance.

Advanced microstepping techniques are employed to further reduce the step angle to eliminate flow pulsation. The accuracy is 0.5% (0.35% for Pico Plus Elite). A wide dynamic flow range from 1.26 pl/min to 88.40 ml/min (0.54 pl/min to 11.70 ml/min for the Pico Plus Elite) can be programmed into the pump. Flow rates are selectable with user selected engineering units from ml,  $\mu$ l, nl, pl, and hours, minutes and seconds.

Up to 16 kg (35 lbs) of linear force is available. This force is user adjustable to ensure the right force is applied for the various syringe sizes.

Easy external connections to a computer or other control devices are made through USB interface. Simple ASCII commands make communication with the pump easy. For direct control of the pump, the user can use the I/O interface (15pin Dsub). One trigger output and a trigger input in for external events such as a process parameter are available. The footswitch input will allow the control of the pump through an external device. The unit also has an output for run indication allowing connection to a remote LED.

The 11 Elite OEM Pumps are available with single and dual syringe options. Complete flexibility is offered with the ability to use most manufacturers syringes ranging from 0.5  $\mu$ l to 60 ml single syringe and 5  $\mu$ l to 10 ml dual syringe.

# **Pump Models**

Single Syringe Infuse/Withdraw Programmable

Dual Syringe Infuse/Withdraw Programmable

Pico Plus (dual) Infuse/Withdraw Programmable



# **OPERATING INSTRUCTIONS**



# POWER CONNECTIONS

- 1. Plug the power cord in. The Pump 11 Elite Series has a DC power input connector on the rear of the unit. The operating range for the Pump 11 Elite Series series is 12-30 Vdc.
- 2. Turn on the main power switch.



**CAUTION:** DO NOT CONNECT TO FIREWIRE PORTS ON A COMPUTER. DAMAGE MAY OCCUR TO THE PUMP OR COMPUTER.





The Pump 11 Elite Series can accommodate up to two syringes. Depending on the mechanism, any type of syringe, glass, plastic or stainless steel can be used. The Pump 11 Elite OEM Module can accommodate from 0.5  $\mu$ l to 60 ml single syringe and 0.5  $\mu$ l to 10 ml dual syringe. The syringe barrel clamp should be flipped for syringes larger than 30 ml.

- 1. Press the release button (1) and move the pusher block (2) to the approximate length of the syringe.
- Unscrew the bracket clamping knobs (7,8) to loosen the retaining brackets (4,5) on the pusher block (2) and the Syringe holder block (3).
- 3. Unscrew the syringe barrel clamp by unscrewing the syringe barrel clamp knob (6).
- Place the syringe on the syringe holder block (3). Ensure the barrel flange is with in the syringe holder's block's retaining bracket (5) and the plunger flange is in the pusher block's retaining bracket.

\*The Pico Plus Elite can accomodate from 0.5  $\mu l$  to 10 ml.

5. Screw down the syringe clamp knob (6)

until the syringe barrel clamp (10) is tight against the syringe barrel. Do not overtighten, especially when using glass syringes.

- 6. Secure the syringe flanges by pushing the retaining brackets (4,5) tightly against the syringe flanges using the bracket clamping knobs (7,8). The syringe plunger should be secured by the pusher block retaining bracket and the flange of the syringe should be secured by the syringe holder block retaining bracket.
- 7. Tighten the mechanical stop collars (9) using allen wrench (12) to prevent excess travel of the pusher block.

The syringe barrel clamp (10) may need to be flipped depending on your syringe size. To do so, completely unscrew and remove the syringe barrel clamp knob from the syringe block. Then remove lock nut (11). Flip the bracket and reassemble.







CAUTION: BE SURE MECHANICAL STOP COLLARS ARE POSITIONED PROPERLY TO PREVENT THE PLUNGER FROM BOTTOMING OUT ON GLASS SYRINGES.



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# EXTERNAL PUMP CONTROL

This section of the Pump 11 Elite Series manual describes the control of the pump using an external computer device. If communicating via the USB Port, see Appendix C for one time installation instructions of USB Driver.

# Setting Up HyperTerminal

HyperTerminal is a Windows application designed to support the external control of devices such as the Pump 11 Elite Series pump through a USB connection. The following instructions describe the configuration of the HyperTerminal application.

- Select "Start All Programs Accessories Communications – HyperTerminal".
- 2. Enter a name for a New Connection (i.e Pump\_11\_Elite), then click OK.

Connection Description
New Connection
Enter a name and choose an icon for the connection:
Name:
Pump_11_Elite
lcon:
OK Cancel

 Select the Virtual Comm Port from the "Connect using" drop-down list. Click OK. (If the Virtual Comm Port is not known, use Device Manager to find it. Instructions on setting up the Virtual CommPort Driver are supplied in Appendix E.)

Connect To	? 🛛
Rump_1	1_Elite
Enter details for	the phone number that you want to dial:
Country/region:	United States (1)
Area code:	508
Phone number:	
Connect using:	COM1 🗸
	OK Cancel

To determine the proper comport, in your PCs "Systems Properties" screen, under the "Hardware" tab, select "Device Manger". Expand the "ports (COM & LPT)" section and you should see "Elite". The comport is listed next to this in parenthesis. 4. Set up the Port Settings as shown below and click OK.

11

OM	8 Properties	? ×
Po	rt Settings	
	'	
	Bits per second: 115200	
	Data bits: 8	
	Parity: None	
	Stop bits: 1	
	Elow control: None	
	<u>R</u> estore Defaults	
	OK Cancel App	oly

5. Verify the Settings are as shown below.

HD_Ultra_Comm Properties	? ×
Connect To Settings	
Function, arrow, and ctrl keys act as	
Backspace key sends	
Emulation:	
Auto detect Terminal Setup	
Tel <u>n</u> et terminal ID: ANSI	
Backscroll buffer lines: 500	
Elay sound when connecting or disconnecting	
Input Translation	
OK Car	ncel

 Choose ASCII Setup and select "Echo typed characters locally" then click OK to complete the setup.



OTE	NOTE: To determine if your pump is
	connected correctly, in Hyperterminal's
-	main window press 'Enter'; a ':' should
	appear. If not connected properly, close
	Hyperterminal, turn off the pump, unplug
	then re-plug the USB cable, turn on the pump
	and re-open Hyperterminal.



# PUMP CHAIN COMMANDS

The Pump Chain commands allow all pump control information to be managed from an external computer source. These commands can also be used to control a series of pumps (up to 100) from a single computer interface.

Pump 11 Elite Series commands are communicated to the pump via a USB port interface through a terminal Method such as Harvard Apparatus' Method Manager or HyperTerminal. In using the Pump Chain commands, you will need to assign each pump in the pump chain a unique address, using the Set Pump Address command in the Settings menu. The address range is from 00 to 99. This address value is used to identify which pump is to receive a command and which pump is responding. The first pump in the chain, the one connected to the computer, must use address 0 (zero). Configure each pump with its assigned address and baud rate as described in the Pump Settings section of this guide.

> NOTE: When daisy-chaining using the optional RJ-11 connectors, all pumps must use the same baud rate. Values above 38400 are recommended.

NOTE: If you are using the optional RJ-11 connections for daisy-chaining, the connection from the computer must come through either the RJ-11

or RS-232 connectors.

NOTE: Once communication is established, if you manipulate the touch screen, you must reestablish communications to the PC (<CR> will do this)

NOTE: System commands and start/stop commands can be executed from Method or Method configuration screens. However, for parameter commands (rate, dia, vol, etc) it is necessary to execute from the Quick Start configuration screen.

NOTE: To maximize communication speed [as fast as 50 ms rate changes]: (a) prefix commands with the @ symbol to turn off GUI updates (ex: @irate 100 u/m) (b) use the 'NVRAM off' command to turn off writes of rate to memory.

# Using the Pump 11 Elite Series Pump Chain Commands

The following instructions will help you to utilize the Pump Chain commands feature on the Pump 11 Elite Series pump.

Commands may be abbreviated to the first four letters, i.e. address would be abbreviated addr. A space must follow the command if arguments are included.

If the pump address is nonzero, the one or two-digit pump address precedes the command. For example, to set the infuse rate for pump 12, the command would look like "12irat 3.2 u/m". 12



Every line of the response from a pump with a nonzero address is prefixed by the two digit pump address (prefixed with a 0 if necessary) followed by a colon. No colon is used to seperate the pump address from the prompt however.

In the command list below, the following convention is used:

{ }	Required parameter
[]	Optional parameter
l choices	Separator between parameter
# zeros	Numeric value without preceding
###	Numeric value with preceding zeros
#-#	A range of values
<cr></cr>	Carriage return
<lf></lf>	Line feed
<sp></sp>	Space
[prefix]	Pump address prefix in the format #: if the pump address is not zero
<prompt></prompt>	Prompt (see below)
The following pro executed:	ompts are returned after a command is

:	The pump is idle
>	The pump is infusing
<	The pump is withdrawing
*	The pump stalled
T*	The target was reached

If the pump is in poll REMOTE mode, there will be no prompts or carraige returns.

If the pump is in poll ON mode, a XON character is added after the prompt.

If the pump address is nonzero, the pump address is prefixed to the prompt without a colon.

In the following list of commands:

- The pump address is prefixed to every response line followed by a colon.
- <lf>[##]<prompt> is the response unless otherwise noted.



13

#### **Error Messages**

Error messages are displayed if the entered command cannot be executed for some reason. The error message will take up two lines with the first line being the message type and the second line describing the error itself. The second line may be up to 80 characters long.

## **Command Errors**

Command errors are displayed when the command is unrecognized, entered in the wrong mode, or the state of the pump keeps the command from executing (i.e. using the IRUN command if a limit switch is active).

The command error has the following format:

<lf>[##:]Command error:<cr>

<lf>[##:]<sp><sp><sp>{error message}<cr> <lf>[##]<prompt>

#### Argument Errors

Argument errors are displayed when a command argument is unrecognized or out of range. The argument in question will be displayed except in the case of missing arguments.

The argument error has the following format:

<lf>[##:]Argument error: [bad argument]<cr>

<lf>[##:]<sp><sp><sp>{error message}<cr><lf>[##]<prompt>

#### System commands

#### ADDRESS

Sets or displays the pump address. Valid range is 0 to 99.

#### **Command format:**

address [0-99]

#### Query response:

<lf>[##:]Pump address is #<cr>

<lf>[##]<prompt>

Notes: Pumps with an address of 0 are masters, and pumps with an address between 1 and 99 are slaves.

#### BAUD

Sets or displays the baud rate. Valid baud rates are 9600, 19200, 38400, 57600, 115200, 128000, 230400, 256000, 460800, and 921600. Note that some computers may not be able to handle baud rates above 115200.

#### **Command format:**

baud [9600 | 19200 | 38400 | 57600 | 115200 | 128000 | 230400 | 256000 | 460800 | 921600]

#### Query response:

<lf>[##:]# baud<cr>

<lf>[##]<prompt>

#### BOOT

Enter the bootloader.

#### **Command format:**

boot

#### CATALOG

Displays a catalog of Methods stored in the pump.

#### **Command format:**

cat

#### Query response:

<lf>[##:]Method name Size<cr>

<|f>[##:]-----<Cr>

<lf>{##:]{Method name} #<cr> This line is repeated for each file on the disk

<lf><lf>[##:]# file(s) using # steps<cr>

<lf>[##]<prompt>

Notes: The file size is the number of steps in the Method plus one for the file information header.

The last line shows the number of files and the total number of steps being used on the disk.

#### DELMETHOD

Deletes a Method stored in the pump.

#### **Command format:**

delMethod {Method}

#### ECHO

Sets or displays the USB echo state. Valid states are on or off.

#### **Command format:**

echo [onloff]

#### Query response:

<lf>[##:] OFF<cr>

<lf>[##]<prompt>

or:

<lf>[##:] ON<cr>

<lf>[##]<prompt>

#### FORCE

Sets or displays the infusion force level in percent. Valid range is 1 to 100.

#### **Command format:**

force [1-100]

#### Query response:

<lf>[##:]#%<cr><lf>[##]<prompt>



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#### FTSWITCH

Sets or displays the footswitch setting. The footswitch may be used in a toggle on or off mode (momentary), a press to run mode (falling), or a release to run mode (rising).

#### **Command format:**

ftswitch [mom | risel fall]

#### Query response:

<lf>[##:]Momentary<cr>

<lf>[##]<prompt>

or:

<lf>[##:]Active high<cr>

<lf>[##]<prompt>

or:

<lf>[##:]Active low<cr>

<lf>[##]<prompt>

#### LOAD

Loads a method. Command format:

load

load {method name}

load qs {ilwliwlwi}

Query response:

<lf>[##:]Quick Start - Infuse Only (qs i)<cr>

<lf>[##]<prompt>

#### or:

<lf>[##:]Quick Start - Withdraw Only (qs w)<cr><lf>[##]<prompt>

#### or:

<lf>[##:]Quick Start - Infuse/Withdraw (qs iw)<cr> <lf>[##]<prompt>

#### or:

<lf>[##:]Quick Start - Withdraw/Infuse (qs wi)<cr><lf>[##]<prompt>

#### or:

<lf>[##:]{method name}<cr>

<lf>[##]<prompt>

#### **METRICS**

Displays the pump metrics. The operation of this command is covered in the 11 Elite Configuration document.

#### Command format:

metrics

#### POLL

Sets or displays the polling mode state.

When polling mode is off, prompts are displayed when an event happens, such as a target being reached. 14

When polling mode is on, prompts are not displayed when an event happens, and a XON character is output when the pump is ready for another command

When polling mode is in remote mode, the following occurs

- Prompts are not displayed
- Carraige returns are not displayed
- The pump address is displayed even if 0
- Echo is forced off and the echo command is illegal
- Command format:

poll [on | off | remote]

#### Query response:

<lf>[##:] OFF<cr>

<lf>[##]<prompt>

or:

<lf>[##:] ON<cr>

<lf>[##]<prompt><xon>

or:

[##:] REMOTE<If>

#### TIME

Sets or displays the date and time.

#### **Command format:**

time [mm/dd/yy] [hh:mm:ss]\*

#### Query response:

<lf>[##:]##/##/## ##:##:## #M<cr>

<lf>[##]<prompt>

\* 24 hour time format



#### SYRMANU

Sets or displays the syringe manufacturer. Quick Start mode only. Valide 3-character manufacturer codes are shown in the table below:

air	Air-Tite, HSW Norm-Ject
bdg	Becton Dickinson, Glass (all types)
bdp	Becton Dickinson, Plasti-pak
cad	Cadence Science, Micro-Mate Glass
has	Harvard Stainless Steel
hm1	Hamilton 700, Glass
hm2	Hamilton 1000, Glass
hm3	Hamilton 1700, Glass
hm4	Hamilton 7000, Glass
hos	Hoshi
ils	ILS, Glass
nip	Nipro
sge	SGE (Scientific Glass Engineering)
smp	Sherwood-Monoject, Plastic
tej	Terumo Japan, Plastic
top	Тор

Typing 'syrm' with no arguements displays the current syringe setting.

Typing 'syrm ?' displays a list of manufacturers with their associated 3-letter code.

Typing 'syrm {code} ?' shows a list of syringe sizes associated with their specified manufacturer.

#### Command format:

syrm [? | {3 char code} ? | {volume} ul | ml]

#### Query response:

<lf>[##:] {manufacturer}, {diameter} mm<cr>

<lf>[##]<prompt>

or:

<lf>[##:] Custom, {diameter} mm<cr>

<lf>[##]<prompt>

or:

<lf>[##]<prompt>

or:

<lf>[##:] {volume}, {unit}<cr> (this line is repeated for each syringe size)

<lf>[##]<prompt>

#### VER

Displays the short version string.

#### Command format:

ver

#### Query response:

<lf>[##:] 11 Elite #.#.#.#<cr><lf>[##]<prompt>

#### VERSION

Displays the full version string.

#### **Command format:**

version

#### Query response:

<lf>[##:]Firmware: v#.#.#.#<cr>

<lf>[##:]Pump address: #<cr>

<lf>[##:]Serial number: C######<cr>

<lf>[##:]Device ID: ########

<lf>[##]<prompt>

#### Run commands

#### IRUN

Runs the pump in the infuse direction. Quick Start mode only.

#### **Command format:**

irun

#### RRUN

Runs the pump in the opposite direction. Quick Start mode only.

#### **Command format:**

rrun

#### RUN

Simulates a key press of the run button located in the lower right corner of the screen.

#### **Command format:**

run

#### STOP / STP

Stops the pump.

#### **Command format:**

stop stp



#### WRUN

Runs the pump in the withdraw direction. Quick Start mode only.

#### **Command format:**

wrun

# **Rate commands**

#### CRATE

Displays the current rate that the motor is running at. A valid response is returned only in dynamic situations (while the pump is running). Quick Start mode only.

#### **Command format:**

crate

#### Query response:

<lf>[##:]Infusing at # xl/xxx<cr>

<lf>[##]<prompt>

#### or:

Pump 11 Elite OEM Module

<lf>[##:]Withdrawing at # xl/xxx<cr>

<lf>[##]<prompt>

#### DIAMETER

Sets or displays the syringe diameter in mm. Quick Start mode only.

#### **Command format:**

diameter [{syringe diameter}]

#### Query response:

<lf>[##:]#.#### mm<cr>

<lf>[##]<prompt>

#### IRAMP

Sets or displays the infusion rates while ramping. Quick Start mode only.

#### **Command format:**

iramp [{start rate} {start units} {end rate} {end units} {ramp time in seconds}]

#### Query response:

<lf>[##:]Ramp not set up.<cr>

<lf>[##]<prompt>

#### or:

<lf>[##:]# xl/xxx to # xl/xxx in # seconds<cr> <lf>[##]<prompt>

#### IRATE

Sets or displays the infusion rate. Quick Start mode only. The rate argument may be replaced by "max" or "min" to set the maximum or minimum rate, respectively. "lim" may be used to display the range limits. 16

#### **Command format:**

irate [max | min | lim | {rate} {rate units}]

#### Query response:

<lf>[##:]# xl/xxx<cr>

<lf>[##]<prompt>

or:

- <lf>[##:]# xl/xxx to # xl/xxx<cr>
- <lf>[##]<prompt>

#### WRAMP

Sets or displays the withdraw rates while ramping. Quick Start mode only.

#### **Command format:**

wramp [{start rate} {start units} {end rate} {end units} {ramp time in seconds}]

#### Query response:

<lf>[##:]Ramp not set up.<cr>

<lf>[##]<prompt>

or:

<lf>[##:]# xl/xxx to # xl/xxx in # seconds<cr>

<lf>[##]<prompt>



#### WRATE

Sets or displays the withdraw rate. Quick Start mode only. The rate argument may be replaced by "max" or "min" to set the maximum or minimum rate, respectively. "lim" may be used to display the range limits.

#### **Command format:**

wrate [max | min | lim | {rate} {rate units}]

#### Query response:

- <lf>[##:]# xl/xxx<cr>
- <lf>[##]<prompt>
- or:
- <lf>[##:]# xl/xxx to # xl/xxx<cr>

<lf>[##]<prompt>



For commands requiring rate units, use the following format: m, u, n, p/h, m, s. ex: m/m = milliliter/minutes ex: n/s = nanoliter/second



USER'S MANUA

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## Volume commands

#### CIVOLUME

Clears the infused volume. Quick Start mode only.

#### **Command format:**

civolume

#### **CTVOLUME**

Clears the target volume. Quick Start mode only.

#### **Command format:**

ctvolume

#### **CVOLUME**

Clears both the infused and withdrawn volumes. Quick Start mode only.

#### Command format:

cvolume

#### CWVOLUME

Clears the withdrawn volume. Quick Start mode only.

# Command format:

cwvolume

#### **IVOLUME**

Displays the infused volume. Quick Start mode only.

#### **Command format:**

ivolume

#### Query response:

<lf>[##:]# xl<cr><lf>[##]<prompt>

#### **SVOLUME**

Sets or displays syringe volume. Quick Start mode only.

#### **Command format:**

svolume

#### Query response:

<lf>[##:]#.#### ul<cr>

<lf>[##]<prompt>

or:

<lf>[##:]#.#### ml<cr>

<lf>[##]<prompt>

#### TVOLUME

Harvard Apparatus Sets or displays the target volume. Quick Start mode only.

#### **Command format:**

tvolume [{target volume} {volume units}]

#### Query response:

<lf>[##:]Target volume not set<cr>

<lf>[##]<prompt>

<lf>[##:] # xl<cr>

or:

<lf>[##]<prompt>

#### **WVOLUME**

Displays the withdrawn volume. Quick Start mode only.

#### **Command format:**

wvolume

#### Query response:

<lf>[##:]# xl<cr>

<lf>[##]<prompt>

#### Time commands

#### CITIME

Clears the infused time. Quick Start mode only.

#### **Command format:**

citime

#### CTIME

Clears both the infused and withdrawn times. Quick Start mode only.

#### **Command format:**

ctime

#### **CTTIME** Clears the target time. Quick Start mode only.

**Command format:** 

cttime

#### CWTIME

Clears the withdrawn time. Quick Start mode only.

#### **Command format:**

cwtime

# ITIME

Displays the infused time. Quick Start mode only.

#### **Command format:**

itime

#### Query response:

<lf>[##:]# seconds<cr><lf>[##]<prompt>

or:

<lf>[##:]##:##:##<cr>

<lf>[##]<prompt>

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17

#### TTIME

Sets or displays the target time. Quick Start mode only.

#### **Command format:**

ttime [{target time}]

#### Query response:

<lf>[##:]Target time not set<cr><lf>[##]<prompt>

or:

Pump 11 Elite OEM Module

<lf>[##:]# seconds<cr><lf>[##]<prompt>

or:

<lf>[##:]##:##:##<cr>

<lf>[##]<prompt>

#### WTIME

Displays the withdrawn time. Quick Start mode only.

**Command format:** 

#### wtime

#### Query response:

<lf>[##:]# seconds<cr>

<lf>[##]<prompt>

#### or:

<lf>[##:]##:##:##<cr><lf>[##]<prompt>

# Digital I/O commands

#### INPUT

Reads and displays the trigger input port status.

#### Command format:

input

#### Query response:

<lf>[##:] Low.<cr>

<lf>[##]<prompt>

or:

<lf>[##:] High.<cr><lf>[##]<prompt>

#### OUTPUT

Sets the level on the output port.

#### **Command format:**

output {1} {high | low}

## Internal commands

#### **STATUS**

Displays the raw status for use with a controlling computer.

#### **Command format:**

status

# Serial Command Notes

The output is in three integer fields and one flag field, all separated by spaces and terminated by a carriage return/linefeed pair. The first integer is the current rate in femtoliters per second. The second integer is the infuse time in milliseconds. The time has a granularity of 1 millisecond. The third integer is the infused volume in femtoliters. All three values are for the current direction.

The flag field consists of six flags.

Flag one is the motor direction and will be "i or I" if the pump is infusing and "w or W" if the pump is withdrawing. If the letter is lower case, the pump motor is idle. If upper case, the pump motor is running.

Flag two is the limit switch status. If the infuse limit switch was hit, "i or I" is displayed. If the withdraw limit switch was hit, "w or W" is displayed. If no limit switch was hit or the pump does not have limit switches, "." is displayed.



The Pump 11 Elite OEM Module does not contain limit switches, so "." will be displayed.

Flag three is the stall status and will be "S" if the pump has stalled. Otherwise it will be ".".

Flag four is the trigger input state and will be "T" if high and "." if low.

Flag five is the direction port state and will be "i or I" for infuse and "w or W" for withdraw.

Flag six is the target reached status. It will be "T" if the target time or volume was reached and "." if not.



USER'S MANUA

# Pump 11 Elite OEM Module USER'S MANUAL

# Appendices

# APPENDIX A: SYRINGE VOLUME/DIAMETER REFERENCE TABLE

Harva Stai	rd Apparatus nless Steel	SGE Scie Engi	entific Glass	Cadenc Formerly	e Science, Inc. y Popper & Sons	ŀ	loshi
2.5 ml 8 20 50 <b>A</b> HSW Size 1 ml 2.5 5	<u>Size</u> <u>Diameter</u> 4.851 mm 9.525 19.130 28.600 <b>Air-Tite</b> <b>Norm-Ject</b> <u>Diameter</u> 4.69 mm 9.65 12.45	Size 5 µl 10 25 50 100 250 500 1 ml 2.5 5 10 25 10 2.5 5 10 2.5 5 10 2.5 5 10 2.5 5 2.5 5 5 5 5 5 5 5 5 5 5 5 5 5	Diameter 0.343 mm 0.485 0.728 1.03 1.457 2.303 3.257 4.606 mm 7.284 10.301 14.567 23	MICRC <u>Size</u> 0.25 m 0.5 1 2 3 5 10 20 30 50	D-MATE Glass <u>Diameter</u> 3.47 mm 3.62 4.82 8.91 8.91 11.71 14.65 19.56 22.7 28.02	Size 1 ml 2 3 5 10 20 30 50	Diameter 6.50 mm 9.10 12.60 15.10 20.45 22.50 25.60 Top
5 10 20 30 50	12.45 15.9 20.05 22.9 29.2	50 Ha Glass	27.5 amilton - All Types	Bector Glass	n Dickinson -All Types Diameter	<u>Size</u> 1 ml 2.5 5	<u>Diameter</u> 6.40 mm 9.30 13.10 15.3
Bector 'Pla	n Dickinson asti-pak' Diameter	<u>Size</u> 0.5 µl 1	Diameter 0.103 mm 0.146	0.5 ml 1 2.5 5	4.64 mm 4.64 8.66 11.86	20 30 50	21.0 23.0 29.0
1 ml 3 5 10 20 30 50 60	4.699 mm 8.585 11.989 14.427 19.05 21.59 26.594 26.594	2 5 10 25 50 100 250 500	0.206 0.343 0.485 0.729 1.03 1.457 2.304 3.256	10 20 30 50 Sherwo	14.34 19.13 22.7 28.6 <b>ood-Monoject</b>	NIP <u>Size</u> 1 ml si 1 ml lo 2.5 ml 5	RO <u>Diameter</u> hort 6.6 mm ng 4.7 9.0 13.0
T	<b>erumo</b> Diameter	1 mi 1.25 2.5 5	4.608 mm 5.151 7.285 10.3	<u>Size</u> 1 ml	Diameter 4.674 mm	20 30 50	20.1 23.2 29.1
1 ml vc 1 ml tb 2.5 5 10 20 30 60	6.50 mm 4.70 mm 9 13 15.8 20.15 23.2 29.2	10 25 50	14.567 23.033 32.573	3 6 12 20 35 60	8.865 12.600 15.621 20.142 23.571 26.568	ILS Size 250 ul 500 ul 1 ml 2.5 ml 5 ml 10 ml	<b>Glass</b> Diameter 2.303 mm 3.26 mm 4.606 mm 7.28 mm 10.3 mm 14.567 mm

# Suggested Force Level Settings for Common Syringes

Syringe Type/Material	Capacity	Force Setting	Common Manufacturer(s)
Plastic Syringes	≤5ml	50%	BD plastic, Sherwood, Airtite, Terumo
	>5ml	100%	
Stainless Steel	All	100%	Harvard Apparatus
Glass/Glass	≤20ml	30%	Cadence (Popper)
	>20ml	50%	
Glass/Plastic	≤250µl	30%	Hamilton, SGE
	≤5ml	50%	
	>5ml	100%	

The Pump 11 Elite OEM Module can accommodate syringes ranging from 0.5 μl to 60 ml single syringe and 0.5 μl to 10 ml dual syringe.

NOTE: The Pico Plus Elite OEM Module can accommodate syringes ranging from 0.5 µl to 10 ml.



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# APPENDIX B: PUMP 11 ELITE OEM MODULE (SINGLE & DUAL) MIN/MAX FLOW RATES

Nominal Minimum/Maximum Flow Rates for Various Syringes. (Actual Limits will vary depending on syringe manufacturer)							
Syringe Size	Syringe ID	Minimum Rate	Units	Maximum Rate	Units		
0.5 <i>µ</i> l	0.103 mm	1.26	pl/min	1.326	µl/min		
1 <i>µ</i> I	0.146 mm	2.52	pl/min	2.654	µl/min		
2 <i>µ</i> I	0.206 mm	5.10	pl/min	5.304	µl/min		
5 <i>µ</i> I	0.343 mm	14.160	pl/min	14.710	µl/min		
10 <i>µ</i> I	0.485 mm	28.260	pl/min	29.400	µl/min		
25 <i>µ</i> I	0.729 mm	63.960	pl/min	66.430	µl/min		
50 <i>µ</i> I	1.030 mm	127.700	pl/min	132.600	µl/min		
100 <i>µ</i> I	1.457 mm	255.500	pl/min	265.400	µl/min		
250 <i>µ</i> I	2.304 mm	638.900	pl/min	663.500	µl/min		
500 <i>µ</i> I	3.256 mm	1.276	nl/min	1.325	ml/min		
1000 <i>µ</i> l	4.608 mm	2.556	nl/min	2.654	ml/min		
1 ml	4.699 mm	2.658	nl/min	2.760	ml/min		
3 ml	8.585 mm	8.871	nl/min	9.213	ml/min		
5 ml	11.99 mm	17.300	nl/min	17.970	ml/min		
10 ml	14.43 mm	25.050	nl/min	26.020	ml/min		
20 ml	19.05 mm	43.680	nl/min	45.360	ml/min		
30 ml	21.59 mm	56.110	nl/min	58.270	ml/min		
50 ml	26.59 mm	85.130	nl/min	88.400	ml/min		
60 ml	26.59 mm	85.130	nl/min	88.400	ml/min		



# PICO PLUS ELITE OEM MODULE MIN/MAX FLOW RATES

Nominal Minimum/Maximum Flow Rates for Various Syringes. (Actual Limits will vary depending on syringe manufacturer)							
Syringe Size	Syringe ID	Minimum Rate	Units	Maximum Rate	Units		
0.5 <i>µ</i> I	0.103 mm	0.54	pl/min	596.5	nl/min		
1 <i>µ</i> I	0.1457 mm	1.14	pl/min	1.194	µl/min		
2 <i>µ</i> I	0.206 mm	2.28	pl/min	2.386	µl/min		
5 <i>µ</i> I	0.343 mm	6.36	pl/min	6.615	µl/min		
10 <i>µ</i> I	0.485 mm	12.72	pl/min	13.230	µl/min		
25 <i>µ</i> I	0.729 mm	28.74	pl/min	29.880	µl/min		
50 <i>µ</i> I	1.030 mm	57.42	pl/min	59.650	µl/min		
100 <i>µ</i> I	1.457 mm	114.9	pl/min	119.4	µl/min		
250 <i>µ</i> I	2.304 mm	287.4	pl/min	298.5	µl/min		
500 <i>µ</i> I	3.256 mm	574.0	pl/min	596.1	µl/min		
1000 <i>µ</i> I	4.608 mm	1.150	nl/min	1.194	ml/min		
1 ml	4.699 mm	1.196	nl/min	1.241	ml/min		
3 ml	8.585 mm	3.990	nl/min	4.144	ml/min		
5 ml	11.989 mm	7.782	nl/min	8.082	ml/min		
10 ml	14.430 mm	11.270	nl/min	11.700	ml/min		



# **APPENDIX C: EXTERNAL CONNECTIONS**

# **User I/O Connector Specifications**

#### Pin Assignments

- 1. Direction control input Rising edge sets pump to infuse Falling edge sets pump to refill
- 2. Trigger Input Event trigger - falling edge triggers a Method event
- 3. Footswitch Input (or Timer) Settable to work as:

-Momentary switch closure to ground or TTL Logic Low; falling edge toggles between states (run/stop)

- -Starts on rising edge, stops on falling edge
- -Starts on falling edge, stops on rising edge
- 4. Trigger 1 Output TTL Logic Output-Default = Low Control thru Method or serial comm
- 9-13. Signal Return / Ground
- 14. Run Indicator Voltage

+5V through a 470 ohm resistor (connect to LED Anode)

15. Run Indicator Output TTL Logic Output, active low (low = run) (connect to LED Cathode)

#### **Electrical Specifications**

Inputs:	VIH ≥ 2V	lih ≤ 20µA
	$VIL \leq 0.4V$	IIL $\leq$ 0.5mA
Outputs:	VOH ≥ 3.8V	IOH ≤ 6mA

VOL  $\leq$  0.4V IOL  $\leq$  6mA

All Inputs are pulled high to +5 Vdc through a 10k resistor All Outputs are at TTL Logic Levels. Pulse duration should be 0.1s minimum.



**User I/O Connector Specifications** 



22

# Pump 11 Elite OEM Module USER'S MANUAL

# Utilizing the USB Interface



#### **USB VIRTUAL COMMPORT DRIVER INSTALLATION**

When you connect the Pump 11 Elite Series pump to a computer via USB for the first time, Windows will seek to install a driver for communication. The following section details the installation of the Virtual CommPort Driver supplied with the Pump 11 Elite Series Pump.



File Action View Help		
	R 3 R 15	
a 🚔 jturcotte-07		
D-I Computer		
Disk drives		
Display adapters		
DVD/CD-ROM drive	8	
P - Wig Human Interface D	evices	
p - M Jungo		
Keyboards	2	
D-1 Mice and other poir	nting devices	
p Monitors		
Network adapters		
. Other devices		
Ports (COM & LL	Undate Driver Software	
TT Communica	Pinkle	
TP Intel(R) Activ	Disable	
Processors	Uninstall	
Sound video an	Scan for hardware changes	
G- Storage controlls	Search in the online changes	
System devices	Properties	L
a - Universal Serial Bus	controllers	
- 🗑 Generic USB Hu	b	
- 🖗 Generic US8 Hu	b	
- 🖗 Generic USB Hu	b	
- 🖉 Generic USB Hu	b	
1 m		

 Connect the pump to the computer via USB. Open the control panel and select System and Security and then System. Click Device
 Manager on the left hand menu.

2. Two Flash Update Applications will be displayed in the device manager, under Other Devices. Right click on either of the flash update applications and select Update Driver Software.





USB	VIRTUAL	COMMPORT	DRIVER	INSTALLATION	(CONTINUED)
					(0011111020)

Hov	v do you want to search for driver software?	
•	Search automatically for updated driver software Windows will search your computer and the Internet for the latest driver software for your device, unless you've disabled this feature in your device installation settings.	
•	Browse my computer for driver software Locate and install driver software manually.	



Windows can't verify the publisher of this driver software

You should check your manufacturer's website for updated driver software

Only install driver software obtained from your manufacturer's website or disc. Unsigned software from other sources may harm your computer or stea

Don't install this driver software

Install this driver software anyway

Dupdate Driver Software - USB serial port for 11 Elite Syringe Pump (COM4)

Windows has successfully updated your driver software Windows has finished installing the driver software for this device: USB serial port for 11 Elite Syringe Pump

for your device.

information.

Windows Security

See details

3. Select Browse my computer for driver software.

4. Click Browse and navigate to the pump drivers folder located on the CD supplied with the pump. Select the file Harvard Apparatus USB-CDC.inf. Make sure the Include Subfolders box is checked and then click Next.

 If a warning message regarding the driver publisher is displayed, choose Install this driver software anyway.

6. Click Close after the software has been successfully installed.

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Close

X

24

# RS-485



Mating Face				
	Pin #	RS-485 In Signal	RS-485 Out Signal	Notes
	1	PWR IN	PWR OUT (+30V) <sup>-</sup>	* Protected by
	2	GND	GND	resettable fuse
3 4	3	RS-485 A	TIED TO PIN 4"	<sup>**</sup> 100 Ω, ½ w to
5 2 1	4	RS-485 B	TIED TO PIN 3"	GIND termination
5 [6]	5	TIED TO PIN 6"	RS-485 A	
	6	TIED TO PIN 5"	RS-485 B	

#### RS-485 In/Out - IEEE-1394 Sockets



#### Daisy-Chaining via RS-485



#### **Gradient Connections via RS-485**

#### **RS-485 Dasiy Chain Connection Options:**

from it.

- If all pumps have software versions 2.0.0 or higher, 99 pumps in chain.
- If all pumps have software versions 1.0.6 or lower, 99 pumps in chain.
- If mix of pumps with software version 1.0.6 or lower and 2.0.0 or higher, maximum of 5 pumps in chain and  $\underline{1}$  RS-485 adapter (catalog # 70-4025) required.



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update.

# Pump 11 Elite OEM Module USER'S MANUAL

# Legacy RJ-11 Option



Pumps with Legacy RJ-11 Option



**Daisy-Chaining with Legacy RJ-11 Option** 





# Maintenance

Pump 11 Elite Series pumps require no special maintenance other than keeping them clean by avoiding accidental spills of pumped material.

The two guide rods and the lead screw should be sparingly lubricated every 100 hrs. The guide rods and the lead screw should be lubricated with Super Lube Synthetic Grease provided with the pump.

To clean the exterior surfaces, use a lint-free cloth to remove loose dust. For more efficient cleaning, use a soft cloth dampened [not soaked] with water, an aqueous solution of 75% isopropyl alcohol, or a mild detergent.



# Upgrading Pump 11 Elite Series Software

NOTE Prior to upgrading, users will need to install the Pump 11 Elite Series USB driver as well as the bootloader driver file (Pump 11 Elite Series-Bootloader.inf). Reference "USB Virtual Comport Driver Installation".

- 1. Upload the latest software version to your desktop (format is filename.srec).
- 2. Disconnect all I/O devices and then connect the pump to PC using a USB cable.
- 3. Using Method Manger, send the 'Boot' command to enter "Boot Loader Mode".



4. From the CD provided with the pump, open the Pump 11 Elite Series Pump Updater Application.

🚯 Pump Updater		
	Pump is connected in 'Update Software' mode	
Open Update File	G:\Pump Update Files\11 Elite v2.0.0.srec	
	S0100000313120456C6974652E737265639F	÷
Start Update		
File Read Successfully	- press Start Update	COM3:

- 5. Click Open Update File and browse to the file previously saved on your desktop and click Open.
- 6. Click Start Update.

🚯 Pump Updater 🔍		• <b>*</b>	
	Pump is connected in 'Update Software' mode		
Open Update File	G:\Pump Update Files\11 Elite v2.0.0.srec		
Reboot	S0100000313120456C6974652E737265639F	÷	
Complete	Downloaded file: 1319006 bytes		
T		1	
Update complete		COM3	.::

7. After the update is complete, press Reboot to power cycle the pump.



# TROUBLESHOOTING

#### **1. Infusion Accuracy**

To ensure infusion accuracy always use new syringe(s) and measure syringe bore diameter and enter actual dimensions in millimeters (mm) using the Custom Syringe entry option. Additionally, make sure that the guide rods and lead screw are properly lubricated.

# Pump 11 Elite Series Error Messages

#### 2. Motor Stalled

This indicates that the pusher block travel has been impeded. This may be caused by the syringe plunger hitting bottom, a kink in the tubing (occlusion), syringe plunger binding, incorrect positioning of mechanical stop collars or any situation requiring more force to the head of the syringe than the pump is capable of delivering. To restart the pump, remove the cause of stalling and/or increase the force setting, then press RUN. The pump will continue the interrupted procedure where it stopped.

#### 3. Out of Range

A value was entered or encountered in a pump Method that was beyond the pump's limits.

#### 4. Overload Protection

The Pump 11 Elite OEM Module Series incorporates resettable fuses for overload protection. In the event of an overload, power to the pump may be disconnected. Try to determine and remove the source of the overload, wait a few minutes, and then re-apply power to the pump.



# APPENDIX E: ORDERING INFORMATION

# **Standard Version**

Description	Single Syringe Dual Syringe		
Pump 11 Elite OEM ModuleInfusion/Withdrawal	70-4800	70-4801	
Pump 11 Pico Plus Elite Infusion/Withdrawal	_	70-4802	

# **Options**

Description	Catalog Number
RS-232 RJ-11 Connectors Option	70-3030

\*If needed, must be ordered at the same time as the Elite pump

# Accessories

Description	Catalog Number 70-4000	
RS-485 Cable for Pump-to-Pump Communication, 0.5 m (2 ft)		
RS-485 Cable for Pump-to-Pump Communication, 1 m (3 ft)	70-4021	
RS-485 Cable for Pump-to-Pump Communication, 2 m (7 ft)	70-4001	
RS-485 Cable for Pump-to-Pump Communication, 9 m (30 ft)	70-4020	
USB Cable for PC-to-Pump Communication, 2 m (7 ft)	70-4002	
USB Cable for PC-to-Pump Communication, 5 m (16 ft)	70-4003	
Cable Assy, Daisy-chain, Legacy RS-232 RJ-11, 0.5 m (2 ft)	55-7760	
Cable Assy, Daisy-chain, Legacy RS-232 RJ-11, 2 m (7 ft)	72-2478	
Line Cord, US (115 v)	5113-001	
Adapter, D-sub 15 to Term. Blk	70-4006	
Footswitch (w/ Phono Plug)	70-2215	
Adapter for 25ml, 50ml Hamilton GasTight™ syringes	55-8000	
Hex Key, 3/32	5012-005	
Lubricant, SuperLube, 1cc	70-4013	
RS-485 Adapter (See Appendix C: External Connections)	70-4025	

For additional items such as Syringes, Tubing, Syringe Heaters, Spill Sensors, Temperature Controllers, Nano-Fluidic Accessories, and much more please visit our website www.harvardapparatus.com or call (800) 272-2775.



	Declaratio	on of Conformity		
Manufacturer:	Harvard Apparatus, Inc. 84 October Hill Road Holliston, Massachusetts 01746-1388, U.S.A. Phone: (508) 893-8999			
We herewith declare that the <b>Product Name:</b>	e following product <b>Pump 11 Elite OE</b>	: M Module Syringe Pump Series		
Model No.:	Pump 11 Elite OEM Module Series- Catalog # 70-4xxx			
To which this declaration re standards, and other normat	lates, is in conformitive requirements:	ty with the applicable EC Directives, harmonized		
Application of Council Directive(s):	2006/95/EC 2004/108/EC 2011/65/EU	Low Voltage Directive Electromagnetic Compatibility Directive RoHS Directive		
Standard(s) to which conformity is declared:				
Safety: Emissions/Immunity:	EN 61010-1:2012 (3rd Edition) EN 61326:2006/05/01 EN 61000-4-2:1995 + A1:1998+A2:2001 EN 61000-4-3:2002 EN 61000-4-4:2004 EN 61000-4-5:1995+A1:2001 EN 61000-4-6:2007 EN 61000-4-8:1993+A1:2001 EN 61000-4-11:2004 EN 61000-3-2:2000 EN 61000-3-3:1995+A1:2001 CISPR11:2003+A1:2004, Group 1, Class A			
EMC and Safety compliance were evaluated by Intertek/ETL Semko         Reference test report         file numbers:       100071222 BOX-002, -004a, -007         I, the undersigned, hereby declare that the equipment specified above conforms to the above Directive(s) and Standard(s).				
Place: Date:	United States of A April 02, 2012	America		
CE Harvar Apparat	r <b>d</b> Us	Beth Bauman (Signature) Beth Bauman (Full Name) VP Engineering / Operations (Position)		