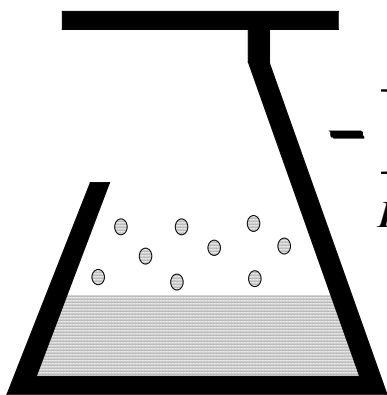


Custom Products for Research

Programmable Syringe Pump



- KEM Scientific, Inc.

Instruments for Science from Scientists

Warranty

J-KEM Scientific, Inc. warrants this unit to be free of defects in materials and workmanship and to give satisfactory service for a period of 12 months from date of purchase. If the unit should malfunction, it must be returned to the factory for evaluation. If the unit is found to be defective upon examination by J-KEM, it will be repaired or replaced at no charge. However, this WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of being damaged as a result of excessive current, heat, moisture, vibration, corrosive materials, or misuse. Components which wear or are damaged by misuse are not warranted. This includes syringes and valves

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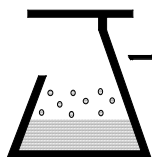
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Service

J-KEM Scientific maintains its own service facility and technical staff to service all parts of the controller, usually in 24 hours. For service, contact:

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Here's an offer you can't refuse

J-KEM's Syringe Pump is not a static instrument.

J-KEM's goal is to make the finest products available to the research community, period. We understand that research continuously changes, as a result this instrument is designed to allow customized upgrades to its software simply and in your own lab. Your controller is designed to take advantage of a new memory technology that allows new software (containing new or modified program features) to be uploaded directly to the controller's memory via e-mail. Upgradeable programming allows the controller to change as the requirements of your research change.

If you want the program to work a different way, or if you need a new feature added to the program, call us!! We're ready to work with you.

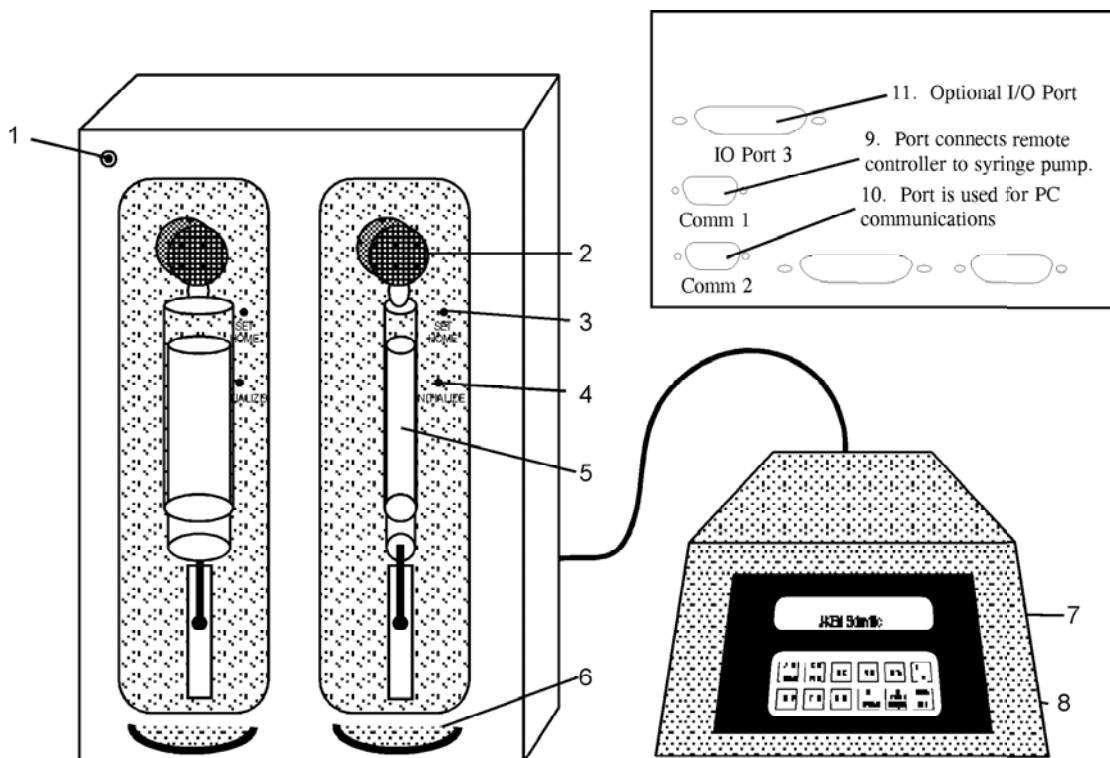
President

Pump Overview

The syringe pump is programmed with 2 standard programs plus one user-defined program. The two standard programs are:

1. **Timed Delivery.** This program delivers a user specified amount of liquid over a user specified amount of time. This program is useful for the controlled delivery of a reagent to a reaction. Allows the user to construct a program of 1 to 16 discrete steps.
2. **PC Remote Control.** This program allows the syringe pump to be controlled directly from a remote PC.
3. **Program Recorder.** This program allows the user to load a program script, written on the PC, to the controllers memory and run it automatically. Five scripts can be stored and recalled for use at any time.

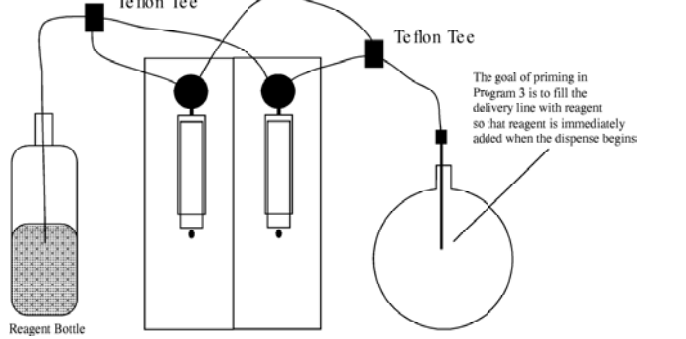
Hardware



1. Hand Held Probe Electrical Connection. Hand held probes with probe mounted triggers are useful for Programs 1&2. For various probe designs, see the Appendix.
2. Multi-Port Distribution Valve. Valves connect multiple solvent reservoirs or distribution points. Any port can be used for withdrawal or distribution.
3. Set Home Button. Used when changing syringes (see Changing Syringes). Don't press this button during normal use.
4. Initialize Button. Used when changing syringes (see Changing Syringes). Don't press this button during normal use.
5. Syringe. Syringes from 10 μ l to 50 ml are available (see Changing Syringes).
6. Manual Syringe Adjustment. Used when changing syringes (see Changing Syringes). Don't press this button during normal use.
7. Controller LCD Display. The display shows user relevant information for the program being run.
8. Controller Keypad. The keys have multiple context sensitive meanings with the most common meanings printed on the keys.
9. For syringe pumps equipped with remote controllers, this port connects the syringe pump to the controller via a 9-pin cable.
10. PC communications port connects to a standard PC comm port. Used for PC control of the syringe pump (see Program 4) or flash memory reprogramming.
11. Optional I/O port connections. For units equipped with I/O port connections, see section titled I/O Ports for connection diagram.

Program One Description.

This program adds a user specified volume of reagent over a specified period of time. Both syringe positions are used in this program to provide continuous, uninterrupted, deliver or fluid. The user can enter up to 16 program segments where for each segment the user can specify a port to fill from, a port to dispense to, the volume to dispense and the duration of the dispense.

<p>Program Setup: Program 1 requires that each pump have the same size syringe and the same number of ports on the distribution valve.</p> <ol style="list-style-type: none"> 1. Connect the same port on each pump's distribution valve to the common reagent or solvent being added. For multi-step programs, for example, a program adding 3 different reagents: Reagent A must be connected to the same port letter on pumps 1 & 2 (for example Port A). Reagent B must be connected to the same port letter on pumps 1 & 2 (for example Port C). Reagent C must be connected to the same port letter on pumps 1 & 2 (for example Port E). 2. The reactor must be connected to the same port letter on pumps 1 & 2. 	
<p>Select Program one by answering '1' to the question:</p>	<p>Select Program [1-2] Program:</p>
<p>The controller displays the name of the program and allows you to select it or start again. Press '1'.</p>	<p>Run Timed Delivery? Yes No</p>
<p>The program presents the option of delivering a single reagent in a single step program</p>	<p>Run 1=Single Ramp 2=Multi-ramp Program</p>
<p>The infinity controller retains the last program in memory, even with power to the controller is turned off. The last program can be re-run by answering this question Yes, or a new program entered by answering No.</p>	<p>Use Last Program? Yes No</p>
<p>The option of priming the pump(s) manually is presented. Priming the pump allows the user to flush air from the inlet and dispense lines.</p>	<p>Prime Pump Manually Yes No</p>
<p>The program presents the option of filling the syringe manually. This is useful when adding an unknown amount of reagent, for example the product mixture from a previous reaction, and you simply want to add "all of it". Filling the syringe manually provides the option of directing the actions of the pump to withdraw the entire content of a sample into the syringe(s). Only the first reagent of a multi-step program can be fill manually.</p>	<p>Fill SYR Manually? Yes No</p>

Press the ENTER key to initiate filling the syringe. See the section titled “Using the Controller’s Manual Prime Function”. When finished filling the syringe, the program continues with the next step below.	[Displayed if manual fill is entered] Fill Syringe 1 Now [ENT]= Start
If syringe 1 is completely filled, the program presents the option of adding additional reagent to syringe 2.	[Displayed if manual fill is entered] Add more to SYR 2? Yes No
1. Enter the delivery time for the reagent. Note: only the blinking digit can be changed on the clock. The format of the clock is: Hr:Min:Sec To enter 35 minutes, press ‘0’ ‘0’ ‘3’ ‘5’ ‘Enter’ (trailing zeros don’t need to be filled in). For more information, see the section titled “Entering Numeric Data into the Controller”. For multi-step programs, entering a time of “0” terminates program entry short of the full 16 steps allowable.	[S1] Enter Dispense Time = 00:00:00
2. Enter the volume to dispense in milliliters (if the syringe was filled manually, this question is skipped).	[S1] Enter Dispense Volume[ml]:
3. Enter the port to fill from (i.e., the port the reagent bottle is attached to). This port can be different for each step. If the syringe was filled manually, this question is skipped.	[S1] Enter Fill Port=
4. Enter the port to dispense to (i.e., the port the reaction is attached to). This port can be different for each step. For multi-step programs, the controller repeatedly cycles through questions 1-4. This continues until either 16 steps of data are entered, or a time of “0” is entered for a program step.	[S1] Enter Dispense Port=
The program is ready at this point. Pressing ENTER starts the program, pressing RESET will abort the program	Program READY [ENTER]->Continue
This is the normal run time screen. The top line shows the current step and the amount of time remaining in the step. The bottom line shows the volume delivered in the current step.	Step 1 00:45:13 Volume[ml]: 2.341

Keys active during program execution.

1. Pressing the Pause key, stops the addition until being manually restarted by the user. The program resumes as the point that the pause key was pressed.
2. Pressing the ‘Reset’ key aborts the program.

Program Two Description.

Program two allows the actions of the syringe pump to be controlled by a remote PC.

- Program Setup:**
1. Set up the reaction with all necessary liquid connections.
 2. Connect the syringe pump to a PC's comm port via a 9-pin cable.

Select Program four by answering '2' to the question	Select Program [1-2] Program:
The controller displays the name of the program and allows you to select it or start again. Press the key under the word "Yes" [2] to run this program or the key under the word "No" [5] to select again.	PC Remote Control Yes No
The default display screen of this program is shown at the right	REMOTE PC CONTROL RESET = Exit Program

The command structure of this program is very exacting in the syntax of an issued command, a command with the wrong syntax will most likely hang the program. All commands are case sensitive.

Sending Commands

The Infinity controller communicates via a standard 9-pin connector using an RS232 protocol. This allows communication with the controller using a standard PC comm port. Commands are case sensitive. The terminating character is '\r' or 0x0D (i.e., carriage return). The controller responds to a valid serial command by returning the appropriate value listed in the table below. The response occurs AFTER the command is executed, so monitoring for the regulator's response is an excellent way of knowing when the regulator is ready to receive another command. The reply to an improperly formatted or invalid command is "ERROR\r".

Implemented Serial Commands

PC Command	Example	Infinity Response	Comments
Individual and Global Pump Addresses			
When issuing a pump command you must supply the address of the pump to perform the action, for example, if you want pump 1 to withdraw 100 microliters, the command is: WITHDRAW(1,100.0), or pump 2 to home the command is: HOME(2). By supplying the global address of '0', both pumps simultaneously respond to the issued command. For example, issuing the command HOME(0) causes both pumps to simultaneously home. A consequence of using global addressing with the WITHDRAW and DISPENSE commands is that both pumps end up at the volume of pump position 1, no matter what volume they start at. For example if pump 1 has 1 ml in its syringe and pump 2 has 3 ml, a command of DISPENSE (0,500.0) [i.e., dispense 500 µl] causes pump 1 to dispense 500 µl and pump 2 to dispense 2500 µl, since pump 2 must end at the same syringe position as pump 1. Now that both syringes are at the same position, a second command of DISPENSE (0,200.0) causes both pump to dispense 200 µl.			
PORT(address,port) address is the pump address. port is the port number you want the distribution valve to advance to.	PORT(1,4)\r PORT(2,1)\r PORT(0,1)\r Global address causes both pumps to go to port 1 simultaneously	PORT(1,4)OK\r PORT(2,1)OK\r PORT(0,1)OK\r	This command sends the specified pump to the specified port. The controller replies with the command sent, followed by the characters 'OK', followed by carriage return.

<p>WITHDRAW(address, volume)</p> <p>Address is the pump address. Volume is the volume to withdraw into the syringe. Volume is a floating point number and is in microliters.</p>	<p>WITHDRAW(1,2500.0)\r</p>	<p>WITHDRAW(1,2500.0)OK\r</p>	<p>This command instructs the specified pump to withdraw the specified volume. Volume is in microliters and is a floating point number. If the volume exceeds the capacity of the syringe to withdraw, the syringe fills to its maximum capacity.</p>
<p>DISPENSE(address, volume)</p> <p>Address is the pump address. Volume is the volume to dispense and is in microliters.</p>	<p>DISPENSE(2,125.6)\r</p>	<p>DISPENSE(2,125.6)OK\r</p>	<p>This command instructs the specified pump to dispense the specified volume. Volume is in microliters and is a floating point number. If the volume is specified is larger than the volume in the syringe, the entire syringe content is dispensed.</p>
<p>HOME(address)</p>	<p>HOME(2)\r HOME(0)\r Global address causes both pumps to home simultaneously</p>	<p>HOME(2)OK\r HOME(0)OK\r</p>	<p>Causes the pump to dispense the entire content of the syringe. Periodically using the HOME() command is a good programming technique since it sets certain program counters to 0.</p>
<p>FILL(address)</p>	<p>FILL(1)\r</p>	<p>FILL(1)OK\r</p>	<p>Causes the syringe to fill to its maximum setting. It is advantageous to use the FILL command when you intend to fill the syringe rather than the WITHDRAW command, since this sets certain software counters to 0.</p>
<p>RATE(address, rate)</p> <p>Address is the pump address. Rate is the rate of fluid delivery. Units are in ml/minute</p>	<p>RATE(2,1.75)\r RATE(1,DEFAULT)\r</p>	<p>1.75\r DEFAULT\r</p>	<p>Sets the syringe speed to the specified rate. Rate commands apply to both dispenses and withdrawals. Specifying the rate as “DEFAULT” sends the syringe rate to its default value. The table below shows the default, minimum and maximum syringe speeds for the various syringe sizes.</p>
<p>LITERAL(Address, Command)</p> <p>Address is the pump address. Command is the native pump command</p>	<p>LITERAL(1,“/1L4R”)\r NOTE: Do not include the ‘\r’ character in the native command.</p>	<p>LITERAL(1,“/1L4R”)OK\r</p>	<p>Allows the user to pass any native pump command to the pump. There are about 160 native pump commands available. Contact J-KEM for a list of commands. Do not include the ‘\r’ character in the native command.</p>
<p>DELAY_MS(value)</p> <p>Value is the number of milliseconds to pause.</p>	<p>DELAY_MS(120)\r</p>	<p>DELAY_MS(120)OK\r</p>	<p>Causes the program to delay for the number of milliseconds specified. The number of milliseconds must be a whole number in the range of 1 to 65000.</p>
<p>DELAY_SEC(value)</p> <p>Delay for the number of seconds specified.</p>	<p>DELAY_SEC(5)\r</p>	<p>DELAY_SEC(5)OK\r</p>	<p>Causes the program to pause for the number of seconds specified. Seconds must be a whole number in the range of 1 to 1x10⁸.</p>
<p>BEEP(value)</p> <p>Causes the controller to ‘beep’ for the number of milliseconds specified.</p>	<p>BEEP(350)\r</p>	<p>BEEP(350)OK\r</p>	<p>Causes the controller to emit a ‘beep’ sound for the number of milliseconds specified.</p>

WARNING()	WARNING()\r	WARNING()OK\r	Causes the controller to emit a 3-beep tone useful as a attention getting warning signal.
PAUSE()	PAUSE()\r	PAUSE()OK\r	Causes the program to pause until the RESET key is pressed on the controllers keypad.
withdraw(2,30.0)\r		ERROR\r	Commands are case sensitive. Commands must be issued in capital letters.
DISPENSE(3,200.0)\r		ERROR\r	There is no pump address 3.
MASTER(1)\r		ERROR\r	There is no command: 'MASTER()'

Communications parameters can be changed in the Infinity controller's programming mode. Default communication parameters are:

Baud - 9600, Parity - none, Data bits - 8, Stop bits - 1.

Table of Default, Minimum, and Maximum Syringe Speeds.

Syringe Size	25µl	50µl	100µl	250µl	500µl	1ml	1.25ml	2.5ml	5ml	10ml	25ml	50ml
Default Speed (vol/min)	156µl	312µl	624µl	1.56ml	3.12ml	6.24ml	7.8ml	15.6ml	31.25ml	62.5ml	118.8ml	125ml
Minimum Speed (vol/min)	1.25µl	2.5µl	5µl	12.5µl	25µl	50µl	62.5µl	125µl	250µl	500µl	1.25ml	2.5ml
Maximum Speed** (vol/min)	312.5µl	625µl	1.25ml	3.125ml	6.25ml	12.5ml	15.625ml	31.25ml	62.5ml	125ml	312.5ml	625ml

** The maximum speed that a syringe will obtain is dependent on the viscosity of the material delivered.

Program Three Description.

Program three allows a group of syringe pump commands to be uploaded from a PC into the controller's memory and then run at any future date. A total of three programs can be stored and each stored program can have of up to 300-400 program steps.

Program 3 allows you to write syringe pump scripts using a text editor on your PC, and then upload the commands into the syringe pumps memory. Once stored in memory, the syringe pump runs the script without being attached to the PC. Any of the syringe pump commands listed in program 2 can be used.

In addition to the commands available for program 2, this program includes two unique commands LOOP_START and LOOP_END that allow iterative program loops to be run.

The LOOP_START and LOOP_STOP commands mark the starting and stopping point of a program loop, respectively. All the commands contained between LOOP_START and LOOP_END are run for the number of times specified in the LOOP_START(passes) command. Loops can be nested 1 deep, that is, a loop can appear inside a loop one time. See examples that follow.

1	Select Program three by answering '3' to the question	Select Program [1-3] Program:
2	The controller displays the name of the program and allows you to select it or start again. Select YES by pressing the '2' key, or NO by pressing the '5'	Run Program Recorder Yes No
3	The controller presents the option of recalling a previously stored program or loading a new program to memory. Select '1' or '2'.	1= Run Program 2= Upload Program
4	If you selected to Run an existing program, the following questions are asked. If you selected to Load a new program, go to Question 9.	
5	The syringe pump stores 3 user defined programs of 300 steps each. Enter the program you want to recall.	Load program[1-3]:
6	You are given the option of sending the recalled program to an application like HyperTerminal, where it can be printed. To download and print the program see the section titled "Program Printer Using HyperTerminal".	Print Program? Yes No
7	The controller provides the option of priming the pump. Priming the pump flushes and fills the liquid lines with the desired solvent. Usually, priming the pump is necessary. See the section titled "Using the Controller's Manual Prime Function" for additional information.	Prime Pump? Yes No
8	The program is ready to start. Press the Enter key to begin.	Program Ready... Continue -> Enter
9	A running program can be paused by pressing the PAUSE key. The currently running step must finish running and then the program will pause. The program is resumed by pressing the Enter key.	Program PAUSED.. Continue -> Enter

10	The controller asks the following questions if you selected to Load a new program. See examples of loading a new program below.	
11	Enter an address to store the new program at	Store as Program Number[1-3]:
12	The controller is ready for the PC to begin uploading the program.	Ready for upload
13	When the program begins to upload, the screen changes to show the number of commands received.	Commands Received ###
14	When the program is done uploading, the total number of commands read is displayed.	### Commands Read Continue -> ENTER
15	You are given the option of sending the uploaded program to an application like HyperTerminal, where it can be printed. To download and print the program see the section titled "Program Printer Using HyperTerminal".	Print Program? Yes No
16	When a program finishes uploading, the controller checks each command for correct syntax. If an error is found, the following screens are displayed. The offending command is displayed. If the offending command is listed as "VOID", that means that the uploaded program exceeded the 300 command limit.	Error at Line ### Continue -> ENTER WITHDRA(500.0)r Continue -> ENTER
17	The program upload is aborted. You must correct the offending command and re-upload the program.	Program Aborted Continue -> ENTER

Any program that sends text out the PC's serial port can be used to upload programs to the controller. A convenient program is HyperTerminal since it's included with all installations of MS Windows. To use HyperTerminal to upload siring pump programs, see the section titled "Uploading a Program Using HyperTerminal".

Keys active during program execution.

1. Pressing the Pause key, stops the program until being manually restarted by the user. The program resumes at the point that the pause key was pressed.
2. Pressing the 'Reset' key aborts the program.

Program 1 Example Simple command script

Command	Effect
PORT(1,1)	Go to port 1 on pump 1
FILL(1)	Fill the syringe on pump 1 from port 1. Filling, then homing the syringe has the effect of flushing air from the syringe and feed lines.
HOME(1)	
WITHDRAW(1,3000.0)	Withdraw 3ml of reagent from port 1 on pump 1.
PORT(1,4)	Go to port 4, the reaction port on pump 1.
RATE(1,2.50)	Set the delivery rate of the syringe to 2.5ml/min on pump 1.
HOME(1)	Deliver the entire content of the syringe
DELAY_SEC(3600)	Delay for 1 hour before proceeding to the next step
PORT(1,2)	Go to port 2 on pump 1.
RATE(1,DEFAULT)	Set the rate of the syringe to its normal speed on pump 1.
WITHDRAW(1,4000.0)	Withdraw 4ml of reagent from port 2 on pump 1.
PORT(1,4)	Go back to the reaction port on pump 1.
RATE(1,1.00)	Set the syringe rate to 1ml/min on pump 1.
HOME(1)	Deliver the entire content of the syringe on pump 1.
RATE(1,DEFAULT)	Set the syringe rate to its normal speed on pump 1.
END	End of program. NOTE: The “END” command is
END	End of program required to appear twice

Program 2 Example Example of a single program loop.

Command	Effect
PORT(1,1)	Go to port 1 on pump 1
FILL(1)	Fill the syringe from port 1. Filling, then homing the syringe has the effect of flushing air from the syringe and feed lines.
HOME(1)	
FILL(1)	Fill the syringe from port 1 on pump 1
PORT(1,2)	Go to port 2 on pump 1
RATE(1,2.50)	Set the syringe delivery rate to 2.5ml/min on pump 1
PORT(2,1)	Go to port 1 on pump 2
FILL(2)	Fill the syringe from port 1. Filling, then homing the syringe has the effect of flushing air from the syringe and feed lines.
HOME(2)	Home pump 2
FILL(2)	Fill the syringe from port 1 on pump 2
PORT(2,2)	Go to port 2 on pump 2
RATE(2,5.0)	Set the syringe delivery rate to 5ml/min on pump 2
LOOP_START(50)	Mark the beginning of a loop. The statements in italic will be repeated 50 times before the loop exits.
<i>DISPENSE(1,1000.0)</i>	Dispense 1.0 ml from pump 1
<i>DISPENSE(2,1000.0)</i>	Dispense 1.0 ml from pump 2
<i>DELAY_MS(500)</i>	Delay 500 milliseconds
LOOP_END()	Make the end of the loop
HOME(1)	Home the syringe
HOME(2)	Home the syringe
END	End of program. NOTE: The “END” command is
END	End of program required to appear twice

Program 3 Example. Example of a nested program loop. This program instructs a pump with a 10ml syringe to repeatedly make ninety six 100 μ l dispense to 10 different titer plates (It would add 100 μ l to each cell of 10 microtiter plates). By using the loop command you can construct very sophisticated programs will very few commands.

Command	Effect
PORT(2,1)	Go to the reagent port, port 1 on pump 2
FILL(2)	Fill the syringe from port 1. Filling, then homing the syringe has the effect of flushing air from the syringe and feed lines.
HOME(2)	
LOOP START(10)	Mark the starting point of the outer loop and run it 10 times
PORT(2,1)	Go to the reagent port on pump 2
FILL(2)	Fill the syringe with reagent on pump 2
PORT(2,2)	Go to the delivery port on pump 2
<i>LOOP START(96)</i>	Mark the start of the inner loop and run it 96 times
<i>DISPENSE(2,100.0)</i>	Dispense 100 μ l from pump 2
<i>DELAY MS(250)</i>	Delay 250ms to move the dispensing tip to the next cell
<i>LOOP END()</i>	Mark the end of the inner loop
WARNING()	Audio cue that plate is done
PAUSE()	Pause the program until a new plate is in place. Resume the program by pressing the Enter key.
LOOP END()	Mark the end of the outer loop.
PORT(2,1)	Program over. Go to reagent port on pump 2
HOME(2)	Empty syringe.
END	End of program. NOTE: The “END” command is
END	End of program required to appear twice

Preparing a File for Upload using NotePad

Syringe pump programs must be simple ASCII text files. The best way to assure you're writing a text file is to use Notepad and save files with the default extension of '.txt'. You can use text editors like Microsoft Word, but you **MUST** save the file as a "Text only (.txt)" file. Excel is a poor choice of a text editor since it adds special characters to the end of each command even when the file is saved as a '.txt' file. A properly prepared file will appear as a list of commands with no formatting, extra spaces, tabs, or comments following the commands. The last two lines of the program should be END followed by a carriage return.

Remember, all commands are case sensitive. Below is a short sample:

```
PORT(1,1)
HOME(1)
LOOP_START(5)
PORT(1,2)
FILL(1)
LOOP_START(3)
DISPENSE(1,200.0)
DELAY_MS(800)
LOOP_END()
LOOP_END()
END
END
```

Uploading a Program Using HyperTerminal

The easiest way to upload programs from a remote PC is to use HyperTerminal since it's included with all versions of Windows.

To Initially Configure HyperTerminal

HyperTerminal must be configured to communicate with the Infinity Controller.

1. Connect a serial cable (9-pin) between the PC's COMM port and the female 9-pin connector on the back of the Infinity controller.
2. Start HyperTerminal (under 'Programs', 'Accessories', 'Communications'). Enter a name for the uploader like 'Infinity Uploader', then click OK twice.
3. Select 'Properties' from the File menu.. On the Connect To tab, choose the current PC comm port on the 'Connect Using' drop down menu. Typically, this is 'Direct on Com1', sometimes 'Direct on Com2'.
4. Click the 'Configure' button.
Set port settings to: Bits per second: 9600
Data bits: 8
Parity: None
Stop Bits: 1
Flow control: None.
Click the OK button
5. Click the Settings tab, then click the ASCII setup button.
Uncheck 'Send line ends with line feeds'
Check, 'Append line feeds on incoming line ends'
Click OK (twice).
6. From the File menu, select 'Save'.
7. Exit HyperTerminal (this is required to properly store parameters).

To Upload Data Using HyperTerminal










1. Start Program 3 in the syringe pump controller. Answer all the questions until the controller displays the message "Ready for upload".
2. Start HyperTerminal by double clicking on the HyperTerminal program "Infinity Uploader".
3. From the Transfer menu, select 'Send Text File'.
4. Locate the text data file created in Notepad, then click Open.

Program Printer Using HyperTerminal

Program printer downloads the current script program to your PC where it can be printed or archived.. The easiest way to capture and then print a stored program is by using HyperTerminal since HyperTerminal is included with all versions of Windows. Before HyperTerminal can capture the file, it must be configured with the correct communications parameters. Set up the HyperTerminal application as described earlier in the section titled “To Initially Configure HyperTerminal”.

1. Start HyperTerminal by double clicking on the application icon “Infinity Uploaded” created when HyperTerminal was configured.
2. When the message ‘Start File Capture’ appears on the screen of the Infinity Controller, select the option “Capture Text...” from HyperTerminal’s Transfer menu.
3. Enter a file name, then click OK.
4. Press the ENTER key of the Infinity controller to begin file transfer. During the file transfer, the commands appear on HyperTerminal’s screen and are saved to disk in under the file name entered.
5. When transfer is complete, exit HyperTerminal. The file created can be printed from any text editor like MS Word or Notepad.

Entering Numeric Data into the Controller

	Controller Display	Solution
1	<p>Answering Yes/No questions</p>	<p>Many questions are answered with Yes/No answers. The standard format of these questions is for the controller to ask its question on the first line of the display and then list Yes and No on the second line of the display. To answer the question 'Yes', press the key that's directly below 'Yes' (that would be the #2 key). To answer the question 'No', press the key that is directly below 'No' (that would be the #5 key).</p>
2	<p>Floating Point Numbers</p> <p>Many questions require that you enter a floating point number, for example 20.13</p>	<p>An answer of 20.13 is entered with the following key presses.</p> <p>Press  on the J-KEM controller [Note: the  key is both the decimal point and Enter key. The first time you press  you get a decimal point, the second time the number is entered].</p> <p>If you make a mistake during data entry, the incorrect value can be deleted one digit at a time by pressing the  key. You must correct your mistake BEFORE pressing the  key the second time to enter the number</p> <p>Negative numbers are entered by pressing the  first to create the "-" sign.</p>
3	<p>Integer Numbers</p>	<p>Whole numbers are entered by pressing the correct number keys then the 'Enter' key to store the number. For example, to enter the number 18, press '1' '8' 'Enter'. To delete an incorrectly entered number, press the  key.</p> <p>Negative numbers are entered by pressing the  first to create the "-" sign.</p>
4	<p>Entering a Time</p> <p>Questions requiring a time to be entered will look something like this: Enter Time 00:00:00</p>	<p>When entering a time, only the flashing digit can be changed. To enter 45 minutes, press: '0' '0' '4' '5' 'Enter'. It is not necessary to fill in trailing zeros. To delete or backup 1 space in the timer display, press the 'Delete' button.</p> <p>Negative numbers are entered by pressing the  first to create the "-" sign.</p>

Using the Controller's Manual Prime Function

Example of Manual Prime Screens.

<p>The purpose of priming the pump is to flush air from the lines and fill all the various pieces of tubing connecting solvents, reagents, and the reaction vessel with the proper fluid prior to starting the procedure. This is done by operating the pump, via the front panel keypad. In manual mode you are able to select the pumps port position and cause the pump to dispense and withdraw solvent on command. You will be prompted to select the pump (either 1 or 2) that you want to manipulate.</p>	
<p>When the prime routine is running, the entire keypad is active.</p> <ul style="list-style-type: none"> • Change ports by pressing the 'A - H' keys. <p>The top line of this display shows the active keys, which are: The PORT keys (A-H), the Withdraw key, the Dispense key, and RESET</p> <p>Select port C by pressing the C key.</p> <ul style="list-style-type: none"> • Pull reagent into the syringe by pressing the 'Withdr' key. 	<p>Sel PORT, W, D [Rst] Port: A Vol: 0.0µl</p> <p>Sel PORT, W, D [Rst] Port: C Vol: 0.0µl</p> <p>WITHDRAW Slo Fas Ent Port: C Vol: 0.0 µl</p>
<p>When the withdraw key is pressed you're given the option of filling the syringe slowly (by pressing the 'Slow' key) or more rapidly (by pressing the 'Fast' key). To stop the pump after a manual withdraw is started, press any key on the controller.</p>	<p>WITHDRAW Slo Fas Ent Port: C Vol: 125.8 µl</p>
<p>To exit withdrawal mode, press the 'Enter' key.</p>	<p>Sel PORT, W, D [Rst] Port: C Vol: 125.8 µl</p>
<p>When the dispense key is pressed you're given the option of dispensing the contents of the syringe slowly (by pressing the 'Slow' key) or more rapidly (by pressing the 'Fast' key). To stop the pump after a manual dispense is started, press any key on the controller.</p>	<p>DISPENSE Slo Fas Ent Port: C Vol: 125.8 µl</p>
<p>To exit dispense mode, press the 'Enter' key.</p>	<p>Sel PORT, W, D [Rst] Port: C Vol: 45.1 µl</p>
<p>The process of selecting a port, withdrawing and dispensing reagents can continue until all solvent and reagent lines are primed. Press the 'Reset' key to exit the prime routine.</p>	

Changing Syringes and Distribution Valves

Changing a syringe or distribution valve is a two step process. First the syringe or valve is physically replaced and, second, the computer controller is placed in programming mode where the changes are logged to the computers memory.

Changing Syringe or Distribution Valve

1	Turn power to the syringe pump off.								
2	Use the syringe adjustment knob (#6) to move the syringe plunger down about 1/2"								
3	Completely remove the screw at the base of the syringe (i.e., the screw that moves the plunger up and down								
4	Unscrew the syringe from the distribution valve								
5	If you're replacing the valve, remove the two screws holding the valve to the pump, then pull the valve off. Install the new valve by sliding the valve over the alignment posts and replacing the two screws. Tighten the screws finger tight.								
6	Screw the new syringe into the distribution valve. Make sure a white Teflon washer is in the distribution valve screw port when the new syringe valve is installed. If not put a washer in before proceeding. Tighten the syringe securely with your fingers, never use pliers. Install the screw holding the plunger of the syringe to the drive bar.								
7	When power to the pump is on, press the 'INITIALIZE' button (# 4) on the front panel of the pump. The syringe will go to a 'soft stop' position.								
8	Using the 'Manual Syringe Adjustment' (# 6) wheel at the bottom of the front panel, move the syringe up until it stops moving freely, then pull it back until most of the tension is relieved.								
9	Press the 'SET HOME' button (#3). The syringe initializes to its new 'home' position.								
10	The computer controller must be programmed for the new syringe size. Turn power to the controller on and immediately after hearing 3 quick 'beeps' press the 'Enter' button on the controller keypad. The controller displays a short message indicating that programming mode has been entered. When asked if you want to "Edit Pump Data" answer this question 'Yes', then follow the directions as they appear on the screen. This section of the program is very <u>unforgiving</u> , make sure you answer each question accurately or the syringe pump will not perform correctly.								
11	In response to the question "How many pumps are in the system?" enter "2".								
12	The controller asks if you want to edit data for pump #1. If changes were made to pump 1, answer Yes, otherwise answer No. The controller then asks if you want to edit data for pump 2. Answer Yes if pump 2 was changed, otherwise answer No. If you edit data for a pump, the following questions are asked. After entering the edit mode, the controller asks the question "Syringe= #####µl 1=[OK] 2=[Change]". The display is showing the last stored syringe size. If this size is correct, press the '1' for OK and then continue at Step 10. If it's not correct, press '2' to enter the correct size (in microliters).								
13	Enter the correct syringe size using the numbers on the keypad. When the display shows the correct size, press the 'Enter' key.								
14	The next screen shows the number of positions on the distribution valve. If the display shows the correct number of ports on the valve, press '1', otherwise press '2' and enter the correct number followed by the 'Enter' key.								
15	PAW Flag stands for 'Pause After Withdrawal Flag'. For 25 and 50ml syringes it's often necessary to pause the program after the syringe makes a withdrawal to allow solvent to settle in the syringe. If the pump is using a 25 or 50ml syringe, this flag should equal '1', for all other syringe sizes the flag is set to '0' in most cases. If the PAW Flag is correct, press '1', otherwise press '2' to change it.								
16	PAW Delay stands for 'Pause After Withdrawal Delay'. If the 'PAW Flag' is '0', this question can be ignored by pressing the '1' key. Otherwise, enter the number of milliseconds the program should pause after making a withdrawal followed by the 'Enter' key. This is an empirically determined number and will vary depending on the viscosity of the solvent being drawn into the syringe. The correct value allows enough time for vacuum bubbles to disappear after making a large withdrawal. As a rule of thumb, 2000 ms is adequate for a 25 ml syringe and 4000 ms is adequate for a 50ml syringe.								
17	Max Pump Speed:*****. This shows the maximum allowable speed for the pump to withdraw and dispense with the syringe. A value of '0' instructs the pump to use pre-defined default pump speeds. If the displayed value is the desired value, press 1=[OK] to accept it or press 2=[Change] to change it. If you pressed 2 to change pump speed, the program asks you to enter a speed between 0 - 10,000. Enter the desired number followed by the 'Enter' key. As a guide to selecting a pump speed, consider the table below. <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Syringe Size</th> <th>Default Speed</th> </tr> </thead> <tbody> <tr> <td>10ul - 10 ml</td> <td>10000</td> </tr> <tr> <td>25 ml</td> <td>4000</td> </tr> <tr> <td>50 ml</td> <td>2000</td> </tr> </tbody> </table>	Syringe Size	Default Speed	10ul - 10 ml	10000	25 ml	4000	50 ml	2000
Syringe Size	Default Speed								
10ul - 10 ml	10000								
25 ml	4000								
50 ml	2000								

Programming Mode

Programming mode allows configuration of syringe pump and communication parameters. To enter programming mode, turn power to the controller off for 5 seconds then turn power back on. When power is restored, three quick ‘beeps’ sound and the message “Recall Data” appears, press and release the ENTER key while this message is in the display. Upon entering programming mode a program number appears. This is a unique program number useful to J-KEM when debugging errors. When in programming mode, the dialog boxes below appear.

1	Edit Pump Data? 1= Yes 2= No	This section is entered when a new syringe size or valve is installed on the syringe pump. See the section titled “Changing Syringes and Distribution Valves” for an explanation of the options in this section. Options allow setting syringe size, valve port positions, default syringe speeds, and certain delay times.
2	Edit PC COMMS? 1= Yes 2= No	This section allows setting communication parameters between the PC and the syringe pump controller.
		Baud = 9600 1= OK 2= Change If this is the desired baud rate, press OK to accept this value, otherwise press CHANGE and you’ll be queried to enter a new value.
		Data Bits= 8 1= OK 2= Change If this is the desired number of data bits, press OK to accept this value, otherwise press CHANGE and you’ll be queried to enter a new value.
		Parity is NONE 1= OK 2= Change If this is the desired value, press OK to accept this value, otherwise press CHANGE and you’ll be queried to enter a new value.
		Stop Bits= 1 1= OK 2= Change If this is the desired number of stop bits, press OK to accept this value, otherwise press CHANGE and you’ll be queried to enter a new value.
3	Edit Pump COMMS? 1= Yes 2= No	These values should not be changed from the factory default. The defaults are: Baud = 9600 Data Bits= 8 Parity is NONE Stop Bits= 1

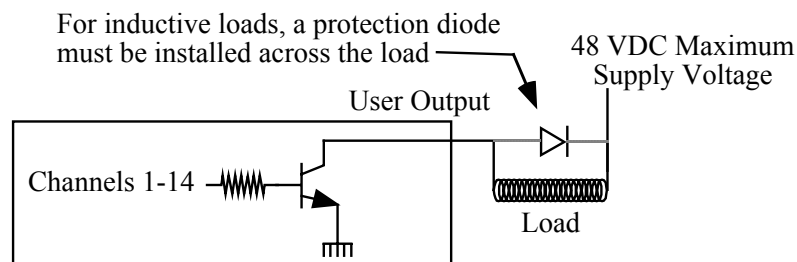
I/O Port Connections (optional syringe pump feature)

An optional feature is customized digital input/output registers. Not all models of syringe pumps have digital inputs and outputs implemented. Digital inputs and outputs are useful to coordinate the solvent dispensing functions of the syringe pump with other pieces of equipment. To implement this option, contact J-KEM.

PC Command	Example	Infinity Response	Comments
INPUT(line) Line is the input line number.	LINE(4)\r	LINE(4)1OK\r LINE(4)0OK\r	This command queries the state of input line #4. If the state is low, the command returns '0', if the state is high the command returns '1'.
OUTPUT(line,state) Line is desired output line. State is the desired state of the line.	OUTPUT(3,1)\r OUTPUT(5,0)\r	OUTPUT(3,1)OK\r OUTPUT(5,0)OK\r	Sets the specified output line to the specified state. A state of 1 sets the output line to its high state, and a state of 0 sets it to its low state.

Input and Output port connections support optional features on J-KEM's syringe pumps. Except for digital input 1 which supports the use of external hand held probes (see next section), the function of each of the input and output lines requires custom programming by J-KEM. The pin out of the 15-pin I/O port is listed below.

Inputs		
Digital input #	Pin Number on 15-pin Connector	Function
1	1	Supports the use of hand held or foot peddle operated dispensing probes.
2	2	Not defined
3	3	Not defined
4	4	Not defined
Outputs Maximum TOTAL supply current from all inputs summed together is 500ma		
Digital output #	Pin Number on 15-pin Connector	Function
		Open collector outputs Maximum input voltage: 48 VDC Maximum supply current per outlet 170ma
1	9	Not defined
2	10	Not defined
3	11	Not defined
4	12	Not defined
Grounds		
Pin Number on 15-pin Connector	Function	
Pins 5, 6, 7, 8	All 4 pins are ground connections and are used for both the digital inputs and outputs	



All digital outputs have open collector outputs as shown in the drawing. When the output is turned ON the load is pulled to ground. When turned off the load is allowed to float. Care must be taken when driving inductive loads, the user must provide a reverse biasing diode directly across the load or damage to the output will occur. **The maximum current on any one output is 170ma and the total current for all outputs can not total more than 500ma. The maximum input voltage is 48 VDC.**

