CHEMYX

Fusion Touch User Manual

Chemyx Inc.
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www.chemyx.com

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WEEE and RoHS Compliance

EU Directives WEEE and RoHS:

Chemyx is currently compliant with WEEE (Waste Electrical and Electronic Equipment) and RoHS (Restriction on the use of Hazardous Substances) directives. Our products fall under Category 8, medical equipment and/or Category 9, monitoring and control instruments.

During the next few years, Chemyx will transition ahead of time to meet the expected WEEE and RoHS changes and will continue to monitor the RoHS directives to our products.

• Do Not Dispose Product with Municipal Waste
• Special Collection/Disposal Required

Declaration of Conformity

We

Chemyx, Inc.
3727 Greenbriar, Bldg 301
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USA

declare under our sole responsibility that the product,

Chemyx Syringe Pumps

to which this declaration relates is in conformity with the following standard(s) or other normative documents.

73/023/EEC, Low Voltage Directive

89/336/EEC, Electromagnetic Compatibility Directive

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What's in the box
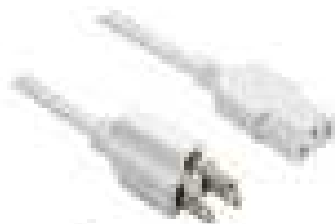
1. Fusion Touch Syringe Pump
2. Power Cable
3. System Manual
4. PC Pump Controller Software

Technical Specifications

Note: The step resolution sated is the minimum step resolution achieved by a pump.

Fusion Touch 100

Syringe size	0.5 microliter to 60 milliliter
Voltage operating range	115 V~240V, 0.25 A, 55-60 Hz
Drive mechanism	Stepper motor
Step resolution (advance per microstep)	0.198 microns
Flow rate range	0.001 µl/hr (10µl) to 90 ml/min
Nominal linear force	29 lbs
Dimensions	9.5x 6.5 x 4 inch
Weight	7.0 lbs
Temperature range	10°C ~ 50°C
Humidity	20% - 80% RH
RS232 Connector	D9 Sub-connector
TTL Connector	USB-B Receptacle

Fusion Touch 200

Syringe size	0.5 microliter to 60 milliliter
Voltage operating range	115 V~240V, 0.25 A, 55-60 Hz
Drive mechanism	Stepper motor
Step resolution (advance per microstep)	0.098 microns
Flow rate range	0.001 µl/hr (10µl) to 45 ml/min
Nominal linear force	50 lbs
Dimensions	9.5x 6.5 x 4.5 inch
Weight	7.0 lbs
Temperature range	10°C ~ 50°C
Humidity	20% - 80% RH
RS232 Connector	D9 Sub-connector
TTL Connector	USB-B Receptacle

Fusion Touch 400

Syringe size	0.5 microliter to 60 milliliter
Voltage operating range	115 V~240V, 0.25 A, 55-60 Hz
Drive mechanism	Stepper motor
Step resolution (advance per microstep)	0.098 microns
Flow rate range	0.001 µl/hr (10µl) to 45 ml/min
Nominal linear force	50 lbs
Dimensions	9.5x 6.5 x 4.5 inch
Weight	7.0 lbs
Temperature range	10°C ~ 50°C
Humidity	20% - 80% RH
RS232 Connector	D9 Sub-connector
TTL Connector	USB-B Receptacle

Limited Warranty

Chemyx warrants its products against defects in materials and workmanship for a period of one year from the shipment date. Chemyx will repair any product that proves defective during its stated warranty period.

The foregoing warranty will not apply to effects resulting from:

- Improper or inadequate maintenance or operation
- Unauthorized modification or misuse of the product
- Operation outside the electrical specifications for the product
- Operation outside the temperature specifications for the product
- User-induced internal and external contaminations of the instrument
- Failure to use proper surge protection
- Improper product return, packaging, and shipping
- Removing serial number from syringe pump.

You must contact either by e-mail or phone Chemyx Inc. before returning a product. Chemyx will issue a Return Authorization (RA) number to you.

Return products to:

Chemyx Inc.
4003 Greenbriar suite D
Stafford, TX 77477

Repairs

Chemyx can repair any syringe pump without major damage. You must contact either by e-mail or phone Chemyx Inc. before returning a product. Chemyx will issue a Return Authorization (RA) number to you.

Return products to:

Chemyx Returns
4003 Greenbriar suite D
Stafford, TX 77477

Dead Pixel Policy

During the LCD Monitor manufacturing process, it is not uncommon for one or more pixels to become fixed in an unchanging state. The visible result is a fixed pixel that appears as an extremely tiny dark or bright dot. In almost every case, these fixed pixels are hard to see and do not detract from display quality or usability. A display with multiple bright or dark dots is considered normal and within industry standards.

Serial Number

The serial number is located on the back top right corner of the pump under a small barcode. Removal of the serial number label voids your warranty.

Calibration

Chemyx Pumps are pre-calibrated upon arrival to your site. All calibrated parameters are within stated accuracy and precision specifications of the pump. Although the pump might be highly accurate different syringes have much greater error ranging from Glass at 1% to Plastic at 5% error. Chemyx is not responsible for errors generated from syringes. Please consider your syringe type before …….

Operational Safety

Please read the following safety precautions to ensure personal safety and operational longevity of the Chemyx syringe pump. Chemyx, Inc. is not responsible for the equipment if used in a manner not specified by the manufacturer; warranty coverage provided by the equipment may be dropped as a result.

CHEMYX PRODUCTS ARE NOT FOR USE ON HUMANS

USE PROPER POWER SUPPLY
    Chemyx Inc is not responsible for the use of power supplies outside the stated electrical specifications or failure to switch the power converter from 240V to 120V while in the 240V environment or vice versa.

GROUND PRODUCT
    Proper grounding is required.

DO NOT OPEN THE PUMP
    Warranty coverage will be dropped if the pump is opened without authorization from Chemyx. Do not touch any electric connectors on the product.

DO NOT OPERATE WITH SUSPECTED FAILURES
    Even though the pump can operate at extremely fast speeds, the user must determine the proper flow rate for any given application. For instance, pumping at 90ml/min using a 20 gauge needle will cause stalls and/or potential bursting of the syringe. Chemyx is not responsible for any damage that might result from examples similar to above.

PINCH HAZARD
    Do not place fingers between the pusher block and end block while the pump is running.

OBSERVE ALL WARNING LABELS ON PRODUCT
    Read all labels on product to ensure proper usage.

CHEMYX IS NOT RESPONSIBLE FOR SYRINGE DAMAGE
    It is the user's responsibility to wet ground glass syringes and set / tighten the safety nut appropriately for microsyringes.
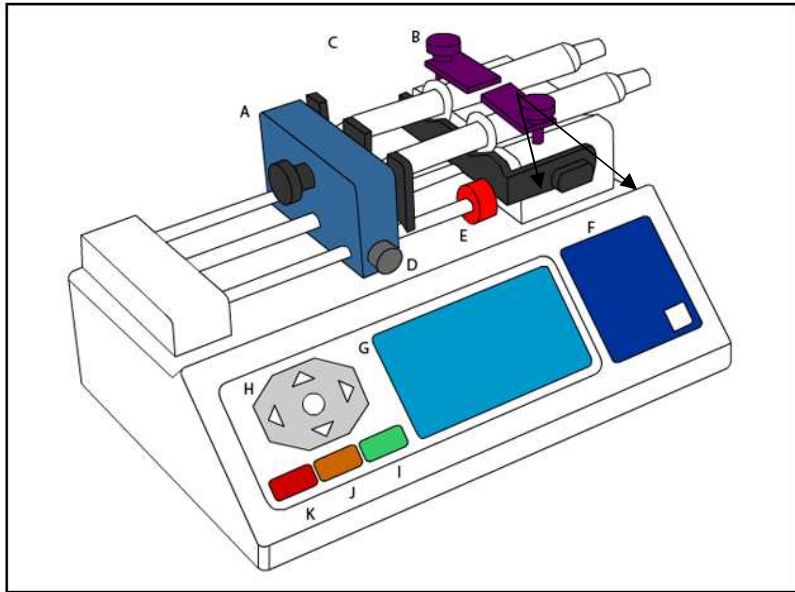
Principle of Operation

All Chemyx Fusion series syringe pumps are driven via a stepping motor that drives a lead screw and Pusher Block. The resulting action ejects fluid from the barrel of a syringe.
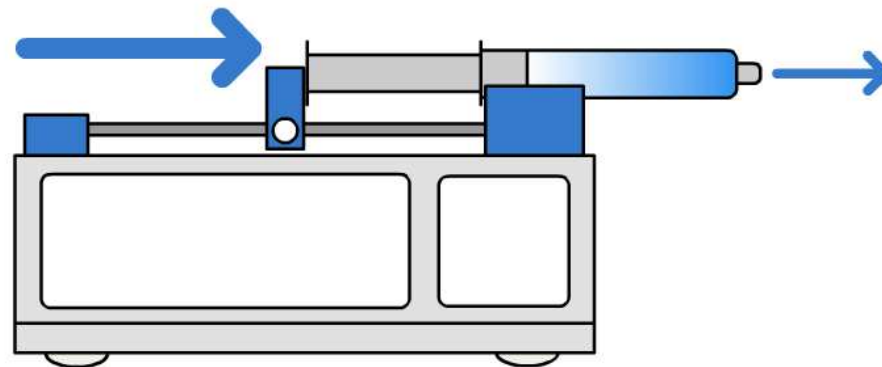

When withdrawing the operation is the same with only the motor reversing direction.

Pump Features

A: Pusher block – locking mechanism varies
B: Spring loaded syringe holder
C: Withdraw holder (Fusion 200 only)
D: Locking nut
E: Safety nut
F: Numeric keypad
G: LCD screen
H: Directional keypad
I: Start button
J: Pause button
K: Stop button

Note: Fusion 400 systems have 4 channel screw clamp holders.
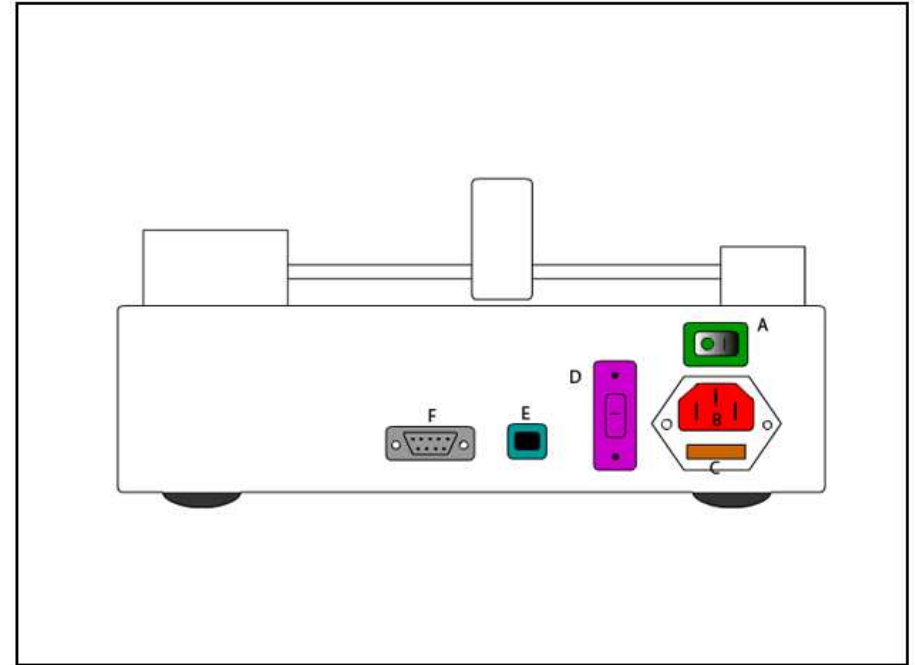
A: Power switch
B: Power plug
C: 2 Amp fuse
D: Voltage Converter
E: TTL port USB – B Receptacle
F: D9 RS232 serial port

Alarms

Audible Alarms will sound in case of a stall and on power on.

Stall Detection

Stall detection occurs when an optical detector used in verifying expected movement of the motor detects jamming or excessive pressure.

In the case of severe stalls from corroded guide rods, the mechanical locking nut will decouple and unlock the pusher block

Keypad Interface
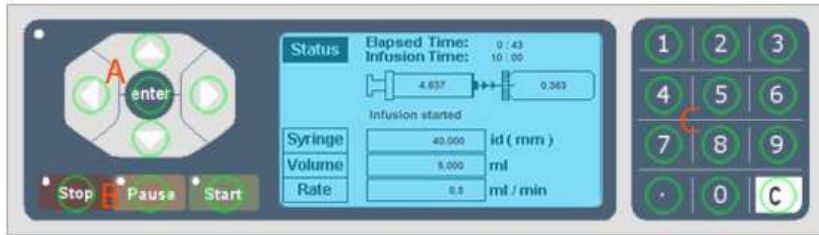
The green circles represent depressible buttons on the membrane surface.

A) Navigation controls

The navigation key pad is for tabbing between inputs on the interface. Once you select an input the enter button is used to confirm the input to memory.
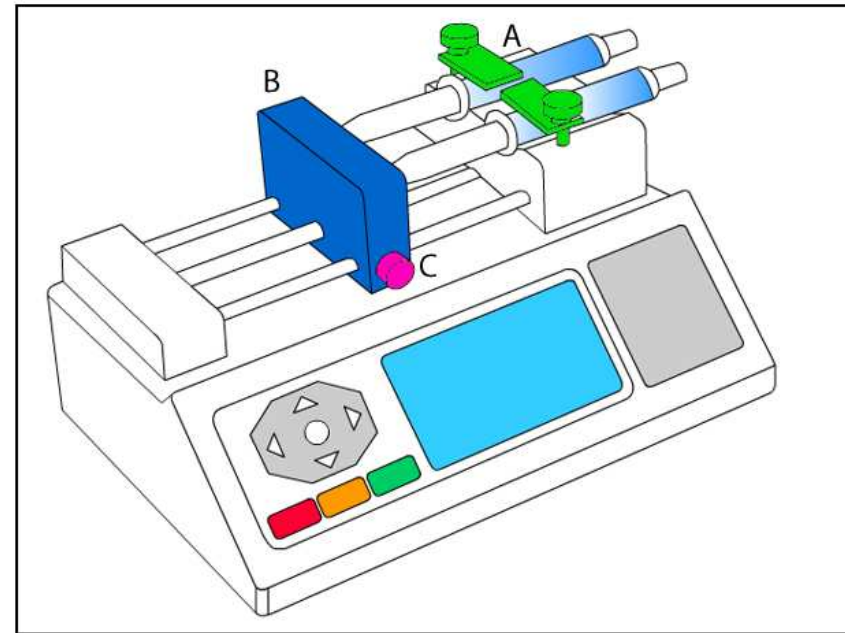
B) Pump controls

The pump controls are used for starting pausing and stopping the pump. If any input is out of the pump's range, the pump will not start.

C) Numeric Keypad Controls

The numeric keypad is for entering inputs into the available data entry boxes. The C in the bottom right corner clears an input box if an error has been made in entry.

Operating Instructions

Syringe Loading

Place the syringe into one of the V shaped slots by lifting the spring clamp (part **A**).
Depress the locking nut (Part **C**) to release the pusher block (Part **B**). The pusher block should be pressed firm against the plunger of the syringe before initiating pumping.

Running the Pump Interface – Basic

When powering on the system user will see a startup screen. User can decide between using the pump via pump keypad (manually) or via touch-screen. A mix of both manual and touch-screen entry is necessary.

Start run profile/ set required run specifications by first selecting syringe size through 'Find Syringe' toggle button. User will select appropriate syringe from Chemyx syringe library screen. Selecting the 'Accept/Enter' toggle button will confirm syringe used in flow profile. Upon confirming syringe selection, user will be returned to the flow profile data entry screen.
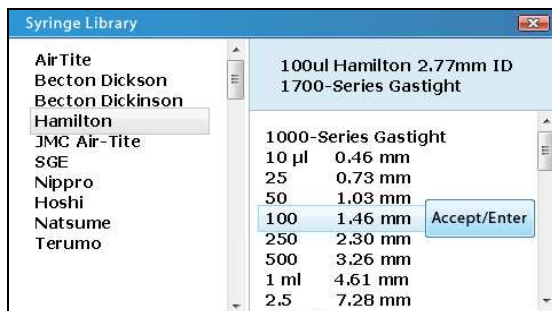
Please note: the following data entry screens (VOLUME, RATE, and DELAY) require hybrid data entry- user may select 'volume,' 'Rate,' 'Delay,' toggle button(s) via touch-screen; but numerical entry for volume must be done via keypad

Enter desired volume for delivery (User may select between infuse/withdraw)

Enter desired delivery rate

Enter desired delay (mm:ss) (Minutes: Seconds)

OPTIONS:
Options screen includes four components:
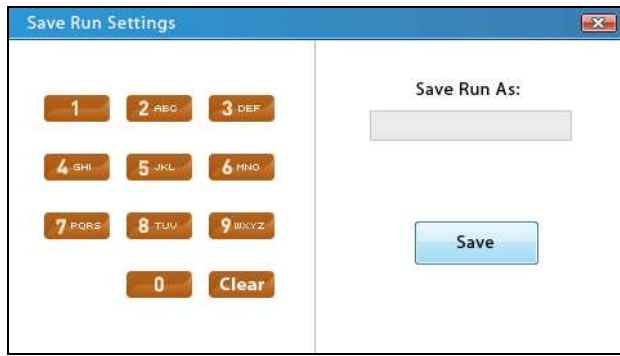

1. Current Units
    Select units for volume delivery (ml/min, ml/hr, ul/min, ul/hr)

2. Save Run to File
    Use touch-screen numeric keypad or membrane numeric keypad to label flow profiles (runs) in the 'Save As' entry screen. Saving run settings will send user back to main data entry screen

3. Prime/Bolus Rate
   Enter Priming/Bolus Rate via keypad

4. Disable/Enable Volume Lock
   User may decide between enabling/disabling a flow volume lock. Disabling volume lock will allow user to pump infinitely

From Options screen-Return back to Main Data Entry screen to begin programmed run by selecting **STOP** on the membrane keypad or exiting out of screen via touch screen-top right corner.

START, **STOP**, **PAUSE**, membrane keypad options can be selected as needed during run

Running Flow Profiling Overview(multi-step):

When powering on the system user will see a startup screen. User scrolls/arrows over to multi-step folder to elect to work with multiple flow profiles.
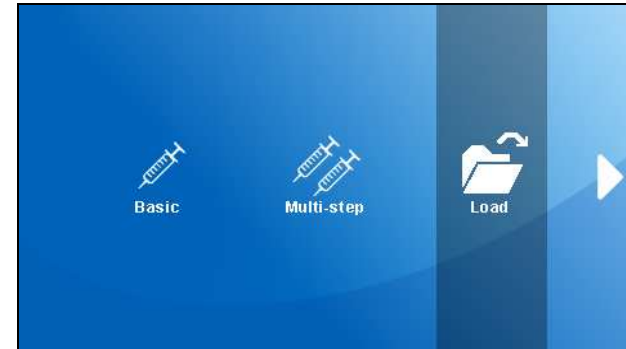
In Multi-Step mode begin setting run parameters through the setup screen

User selects syringe size through syringe library; as well as distinguishes the total number of steps in the multiple flow profile sequence and the intended amount of loops for that sequence.

- Loop All function- This function allows users to determine the total number of times the total sequence of programmed steps is to repeat itself

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Flow profiling or multistep programmable is an automated operation mode where the syringe pump runs a series of user inputs without the need for intervention.

Using this this feature, the pump can:
1) create infuse/withdraw cycles
2) ramp flows up evenly over time
3) run a variety of custom stepped flows under an automated microprocessor controlled process.
4) create intermittent doses
5) run a prep-step prior to main infusion

Flow Profile Setup: Screen capture from the pump interface:

Flow profile setup each individual step in the profile has it's own set of parameters.

One the desired number of steps are complete, the pump will perform the steps in sequential order.

Users define a set number of operational steps that the pump can run through.

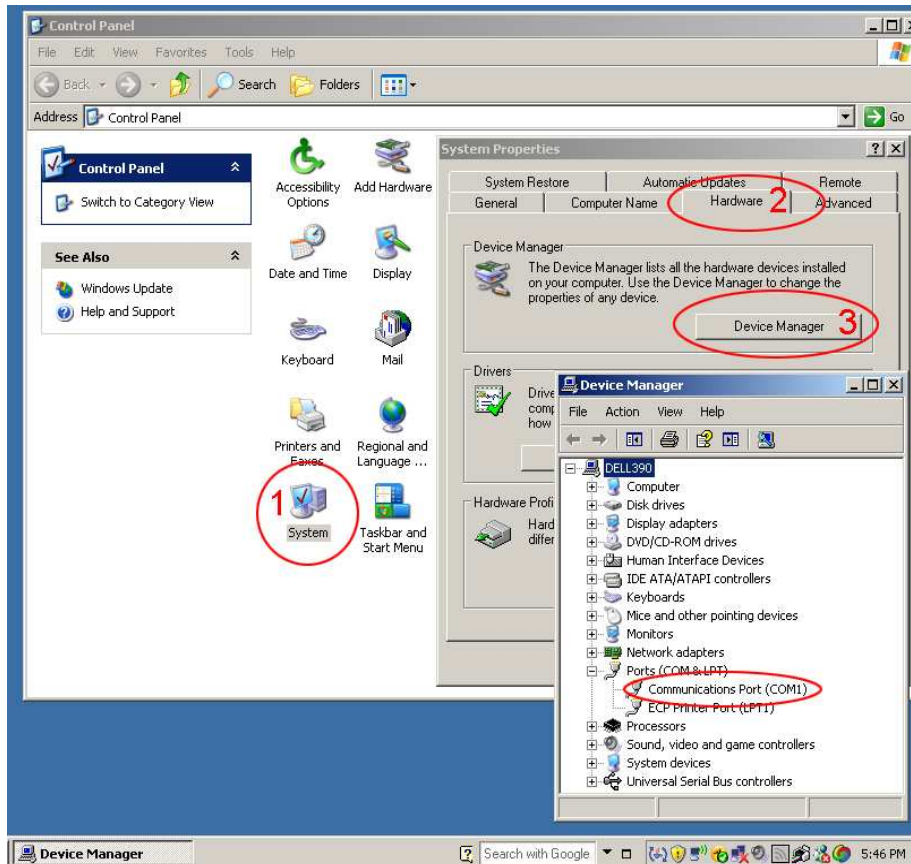# Computer Control (RS232 Operation)

Cable Requirements
In order to interface to a PC you need the following hardware cable

pictured below:
DB9 Serial Cable Male to Female – Strait though configuration. Do not purchase a "Null Modem," "crossover," or "crossed over" cables.

RS232 Port Settings

Before interfacing with a PC, make sure a RS232 port exists on your PC. RS232 ports will be in parentheses and named "COM1-100" like the one above named COM1

RS232 Port Settings (continued)

Baud Rate - 9600, Data Bits - 8, Parity - none, Stop bits - 1, Flow control – none.

Most programming packages like LabView, LabWindows and Visual Studio will allow you to program comport settings dynamically in program.
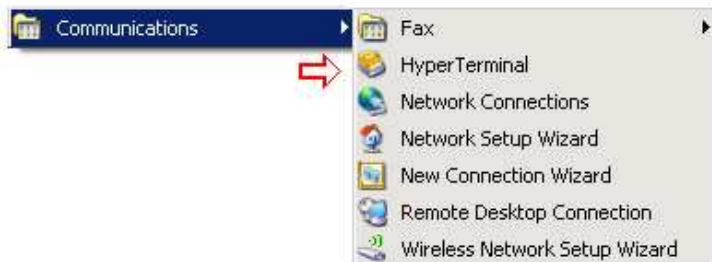
RS232 Communication Protocols

| Protocols:	Resulting Action by Pump
help	- Show help information
stop	- Pump Stop
pause	- Pump Pause
start	- Pump Run
status	- Pump Return Status
set units [xxx]	- Pump Set units
set diameter [x.x]	- Pump Set diameter
set rate [x.x]	- Pump Set rate
set time [xxx]	- Pump Set time@volume
set volume [x.x]	- Pump Set volume
set delay [xxx]	- Pump Set delay@start
save setting	- Pump parameter saved
read limit parameter Parameter	- Pump Returns Limit
view parameter	- Pump parameter settings
restart	- Pump restart

Example: "set volume 1.35" send the command to set the volume to 1.35.

Testing Communication in HyperTerminal

HyperTerminal is a Microsoft utility where users can manually enter in protocols one by one to get the pump to communicate. All Windows based PCs have the HyperTerminal utility. Located in START > Programs > Accessories > Communications > HyperTerminal

Click HyperTerminal to start the program. Configure the COM port with the following settings.
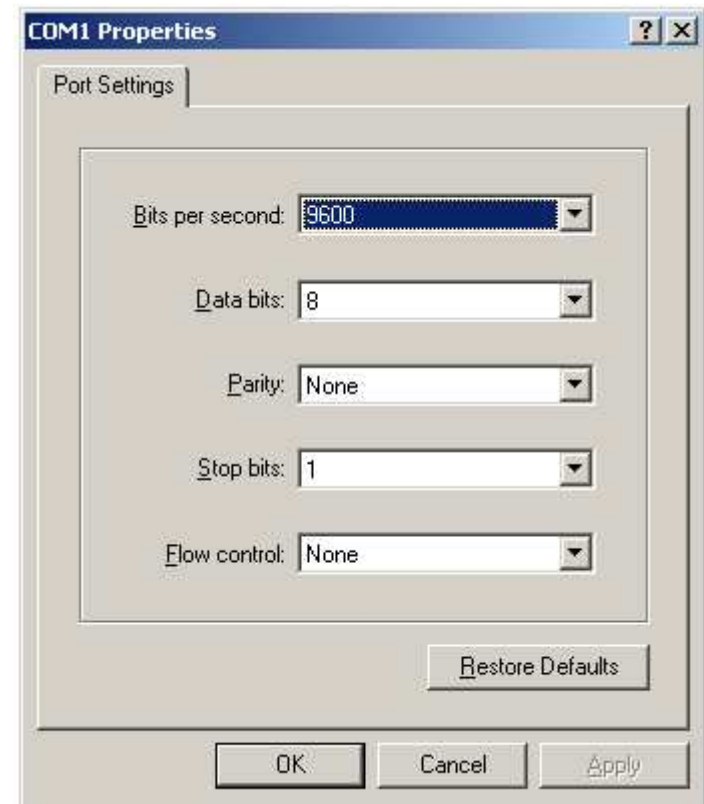
After you press OK you will come to a blank window with a blinking cursor. You can type in protocols here to test communication or to run the pump from a remote computer. Connect the pump to the PC. Type in "help" and then press enter to get a complete list of protocols available to the pump.

USB to RS232 Dongle Converters

Due to the large numbers of computers made without RS232 ports, USB to RS232 dongles have been popular to "emulate" a RS232 port. Most but not all USB to RS232 dongles work with chemyx pumps due to driver conflict issues.

TTL

TTL is a hold over from classical syringe pumps built in the 1970s before RS232 ports existed. However Chemyx does have a TTL port grandfathered in for triggering starts and stops. The TTL port has a USB-B receiver configuration.

TTL works with Chemyx's foot switch, hand switch or parallel switches.

Other

Multi pump control "Daisy Chaining"

Pumps can be daisy chained via a RS232 Y connector or parallel switches. Please contact chemyx for more details on daisy chaining pumps.

Chemyx Pump Controller Program (Freeware not supported)

Chemyx does not provide technical support for the free pump controller program attached to the manual CD.

This program is freeware to control Chemyx syringe pumps.

Pump Maintenance

Chemyx pumps require limited maintenance that can be performed with minimal downtime and effort. Proper maintenance of your pump will ensure the system's operating life to over 5 years. On a routine basis, the following procedures should be followed:

Oil your system:
1. Apply motor oil or machine oil to the lead screw and guide rod. This should be performed once **every 4 months** to maintain optimal lubrication.
2. Clean contact surfaces and debris. Take care to remove any debris on the lead screw and guide rods.

Consistent oiling of your pump will protect the pump from oxidizing fumes in fume hoods and extend the pumps performance and operating life many years.

Approved Lubricants:

Engine oil or Motor oil – any type
Silicone oil
Machine oil
Tooling oil or "WD-40"

Contact Chemyx if you wish to use other lubricants.

Signs that your system is not adequately lubricated:

1) Grinding sounds coming from the lead screw.
2) Locking nut is decoupling under load before stall
3) Slow decrease of max pushing force.

Appendices -A

Replacing The Fuse.

In the event of a power surge resulting from a lightning strike, plugging the pump into an incorrect voltage or other surge event, the fuse in the syringe pump will break. If the fuse breaks, no power will be supplied to the pump.

Chemyx syringe pumps come with a complimentary backup fuse inside the pump. Please follow the instructions below on how to access the fuse holder and replace a broken fuse.

Step 1: Locate the power plug on the back of the pump. The Fuse holder is located underneath the 3 prongs of the power plug.
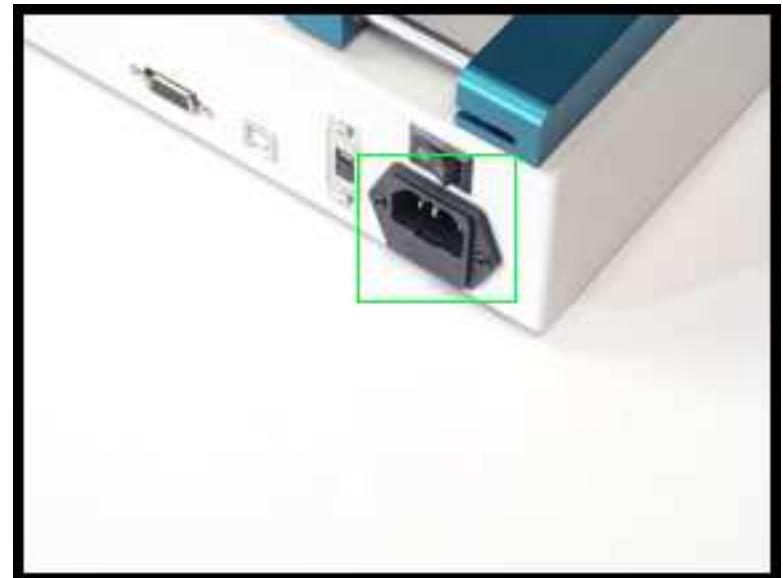
Step 2: Remove the fuse holder from the power plug. There is a small indentation on the bottom edge of the power plug. A small coin or screw driver may be needed to remove the fuse holder from the pump.
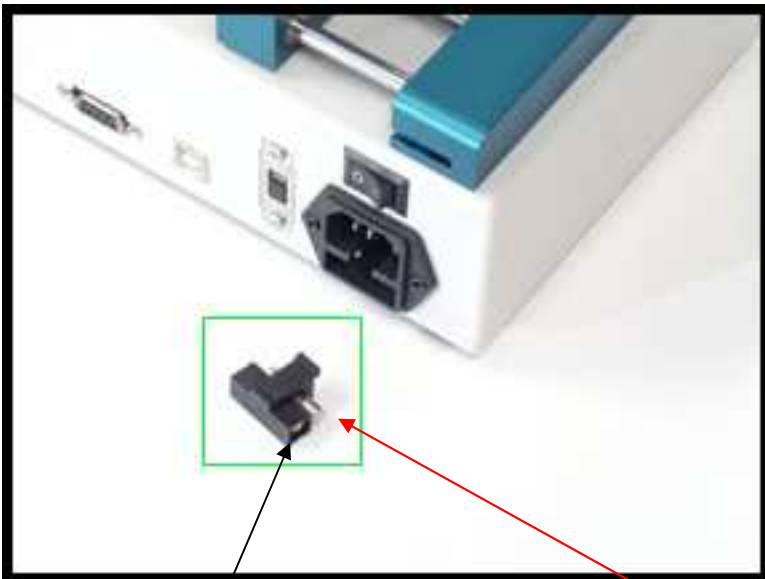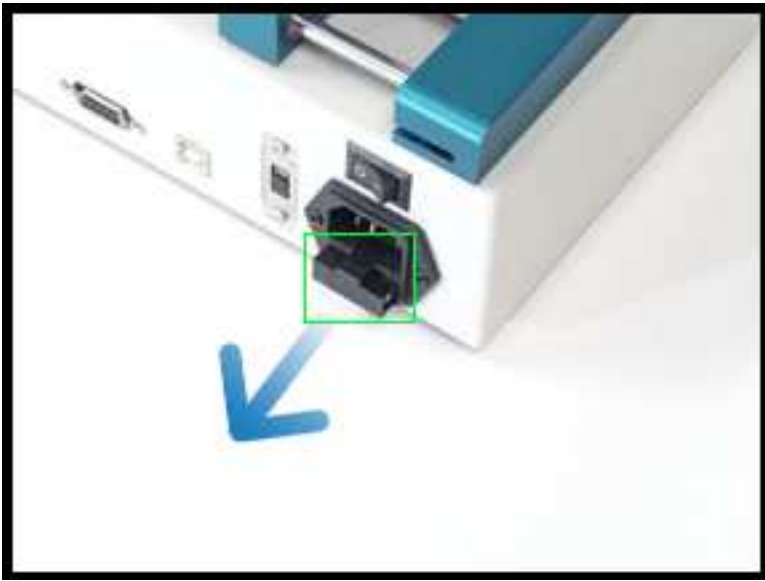
There are 2 fuses in the fuse holder. The exposed fuse in the back is the fuse that is being currently used. In the event of a power surge this fuse will be the broken fuse. Step 4: Remove the broken fuse from the active slot in the holder. Most of the time and broken fuse will be visible to the naked eye.

Remove the back-up fuse from the plastic casing represented below by the check mark. Place the back-up fuse in the active slot. Insert the fuse holder back into the pump's power plug to reactivate the pump.