# II. INSTALLATION



## What You Will Need

Everything you need to operate your MicroPro Pump has been supplied, including plumbing connections, solvent reservoir and the µPro pump.

For routine maintenance you will need 1/4", 5/16", and 1/2" wrenches, a 5/32" and 9/64" hex keys, as well as a small flathead screwdriver. Depending on your configuration, other tools may be required. Tools needed for routine and specialized maintenance of your µPro pump are included in Eldex Part No. 1432.

## Unpacking & Location

Unpack your µPro pump carefully. You should not discard any packing material, as you will want to re-use it for storage and shipping. If any damage is evident from improper handling during shipment, you should contact the freight company that delivered the unit and file a claim.

**CAUTION:** We have tested this pump with 2 propanol. Residual amounts of 2 propanol may be in the syringe and connecting tubing. You may wish to flush with an appropriate, miscible solvent.

You may be using a variety of fluids which require special handling procedures and safety precautions. Consult the appropriate MSDS (Material Safety Data Sheet) supplied with the materials you will be using. Be certain to follow all handling, safety, and disposal procedures appropriate for the materials you use.

Use your µPro pump in a clean, well ventilated and dust free environment, free of corrosive or explosive vapors. The µPro Pump is designed for table top use; do not install your pump on the floor. The µPro Pump must be operated in an upright position. Safety may be impaired if use of your µPro pump is not as instructed.

# Setup Summary

Following is a brief summary of the setup procedures. Detailed explanations and procedures follow.

## Electrical

1. Check the voltage setting on the Power Entry Module; correct if necessary.
2. Connect the power cord.
3. Make the I/O (Input/Output) connections (if installed and desired).

## Plumbing

1. Fill the solvent bottle(s).
2. Degas the fluid.
3. Attach the fitting for the tubing from the solvent reservoir to the inlet port.

## Software Setup

1. Set the syringe temperature (if installed).
2. Set the default refill and purge rates.

## Prime Pump

1. Prime the syringe.
2. Purge to the outlet.

## Outlet Connection

1. Connect from the outlet of the µPro pump to the downstream device.

## Equilibrate and Characterize

If your µPro pump is fitted with a pressure transducer and you wish to use pre-pressurization, equilibrate and characterize the system. Characterizing the system will measure the resistance of the downstream devices and allow the µPro to pre-pressurize quickly.

1. Run the µPro using `REAL TIME` until the system pressure is equilibrated.
2. Characterize the µPro using `SETUP/CONFIGURATION`.

# Setup and Connections

## Electrical

### Power Entry Module

Before connecting the power cord, check that the voltage input is properly set for the conditions you will be using. Figure 2.1 shows the power entry module. The voltage is indicated in the Fuse Drawer window (1).

If the voltage is not correctly set:

1. Remove the Fuse Drawer (1) (use a small screwdriver to pry up the spring on the underneath side of the drawer).
2. Remove the Voltage Selection Insert (2) and re-position it so the correct voltage will show through the fuse drawer window.
3. Replace the fuses (3) with ones appropriate for the desired voltage (see p. 1.16).

**NOTE:** You can damage the instrument by connecting it to an improper voltage!

The correct voltage should now appear in the window and you may plug the modular power cord into the Power Inlet receptacle (4).

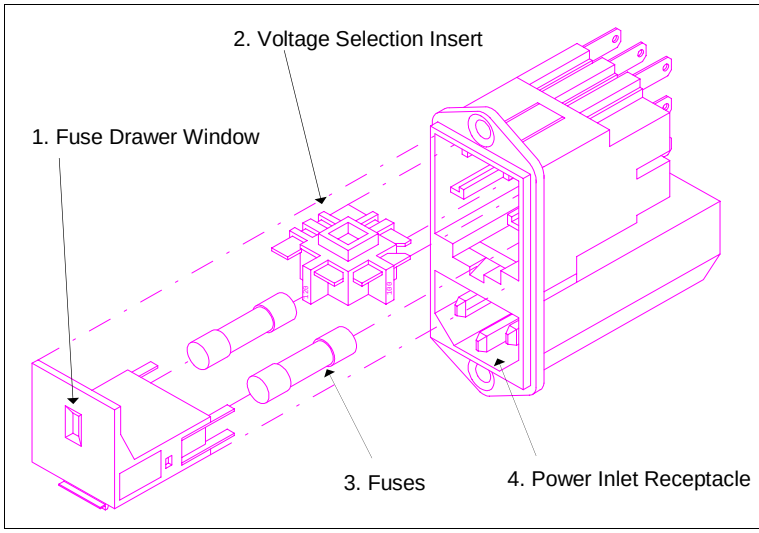


**Figure 2.1: Power Entry Module**

### Inputs/Outputs

I/O functions are on two optional printed circuit boards (PCB). The I/O board provides access for all contact closure or TTL inputs and outputs (inputs and outputs are set for contact closure; to change to TTL, consult the factory). The Analog I/O board provides access for analog inputs and outputs.

## I/O Board

Figure 2.2 shows the I/O board. Table 2.1 indicates the function of the positions on the I/O board.

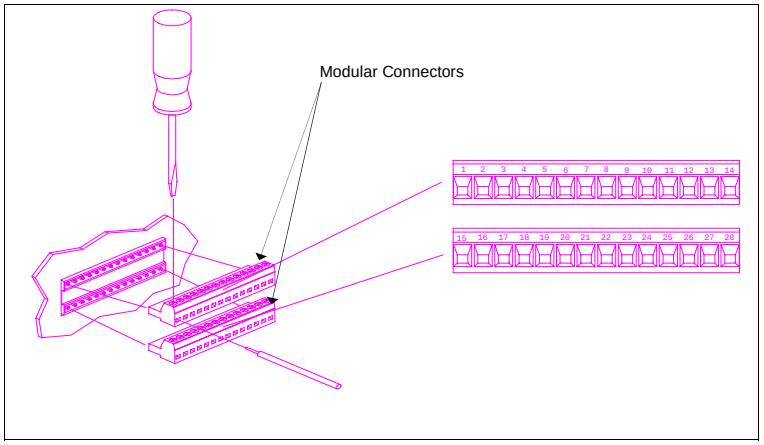


**Figure 2.2: Input/Output Board**

To wire the I/O board for remote inputs or outputs, use your fingers or a small screwdriver and pry away the modular connectors. Using a small screwdriver, loosen the screw on top of the position you wish to wire, insert the wire and tighten the screw.

**Table 2.1: I/O Functions**

| I/O position | Function | I/O position | Function |
|---|---|---|---|
| 1 & 2 | Output 1 | 15 & 16 | Run |
| 3 & 4 | Output 2 | 17 & 18 | Run After Equilib.* |
| 5 & 6 | Output 3 | 19 & 20 | Hold |
| 7 & 8 | Output 4 | 21 & 22 | Stop |
| 9 & 10 | Output 5 | 23 & 24 | Reserved* |
| 11 & 12 | Output 6 | 25 & 26 | % Syringe |
| 13 | Ground | 27 & 28 | Pump Ready* |
| 14 | +24 Volts | | |

*The function of these inputs and outputs differs when using the pump in remote analog mode. See p.3.42 for details.

## *Inputs*

The µPro Pump can be remotely controlled from devices which send contact closures. Four remote inputs are available on the I/O board as defined in Table 2.2:

**Table 2.2: I/O Board Inputs**

| I/O Position | Function | Description |
|---|---|---|
| 15 & 16 | Run Start | Starts a file/cycle or file/sequence, or real time parameters, including pre-pressurization & equilibration.<br>If contact 17 & 18 is closed, pump runs programmed file after completing equilibration.<br>If contact 17 & 18 is not closed, pump runs under a hold condition at the end of equilibration until contact 17 & 18 is closed, when it proceeds with running the file. |
| 17 & 18 | Run After Equilibration Start* | Runs programmed file at end of equilibration (factory default setting is closed). |
| 19 & 20 | Run Hold | Freezes the clock; but, allows the pump to continue running under existing conditions. |
| 21 & 22 | Run Stop | Closing contact stops the pump and aborts the program. |
| 23 & 24 | Reserved* | |

*The function of these inputs and outputs differs when using the pump in remote analog mode. See p.3.42 for details.

## *Outputs*

The µPro Pump can send contact closures to remote devices. Eight remote outputs are available on the I/O board which are defined in Table 2.3.

**Table 2.3: I/O Board Outputs**

| I/O Position | Function | Description |
|---|---|---|
| 1 & 2 | Output for control of external device. | Corresponds to first I/O entry on the local interface. |
| 3 & 4 | Output for control of external device. | Corresponds to second I/O entry on the local interface. |
| 5 & 6 | Output for control of external device. | Corresponds to third I/O entry on the local interface. |
| 7 & 8 | Output for control of external device. | Corresponds to fourth I/O entry on the local interface. |
| 9 & 10 | Output for control of external device. | Corresponds to fifth I/O entry on the local interface. |
| 11 & 12 | Output for control of external device. | Corresponds to sixth I/O entry on the local interface. |
| 25 & 26 | % Syringe Dispensed | Closes contact when pump has dispensed 95% of syringe volume. |
| 27 & 28 | Pump Ready* | Closes contact when pump has completed the equilibration part of the file being run (when 17 & 18 are already closed, 27 & 28 do not close). |

*The function of these inputs and outputs differs when using the pump in remote analog mode. See p.3.42 for details.

## Analog I/O Board

Figure 2.3 shows the Analog I/O board. Table 2.4 indicates the function of the positions on the Analog I/O board.

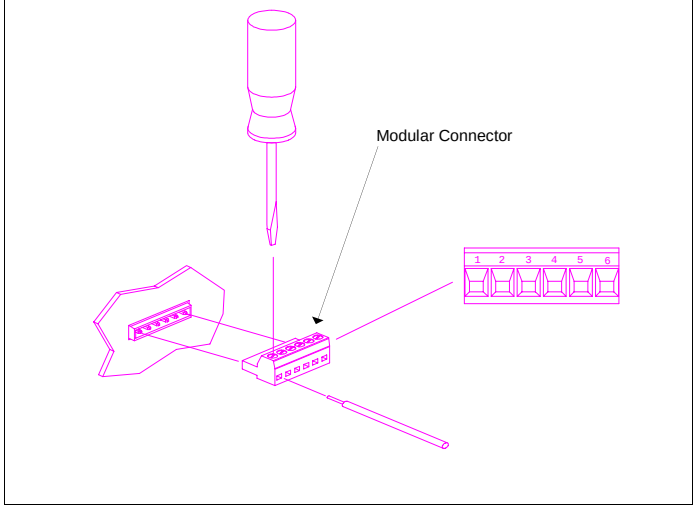


**Figure 2.3: Analog I/O Board**

To wire the Analog I/O board for remote inputs or outputs, use your fingers or a small screwdriver and pry away the modular connectors. Using a small screwdriver, loosen the screw on top of the position you wish to wire, insert the wire and tighten the screw.

**Table 2.4: Analog I/O Board Functions**

| Analog Position | Function | Analog Position | Function |
|---|---|---|---|
| 1 | Ground | 4 | 5V |
| 2 | 0-1V Pressure Output | 5 | Reserved** |
| 3 | 0-1V %B* | 6 | Reserved** |

*Output is 0-1V for flow rate in single syringe or reciprocating syringes modes. Output is 0-1V Pressure Output for 2nd syringe in multi-independent syringe mode.
**Used only in remote analog control mode. See p. 3.42.

## Address and Configuration Ports

Two ports are on the rear panel are for system configuration (Figure 2.4). The upper port sets the address of each pump in the system, while the lower port sets the hardware configuration of the syringe (syringe size and pressure transducer type).

Do not change the settings of the address or configuration ports without consulting a factory authorized technician. The various positions functions are indicated in Table 2.5.

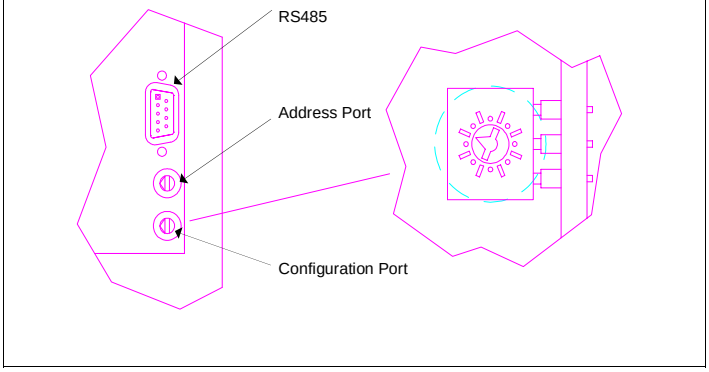


**Figure 2.4: Address/Configuration Ports**

**Table 2.5: Address/Configuration Port Functions**

| Address Port Position | Function | Configuration Port Position | Function |
|---|---|---|---|
| 0 | Single Mode Master. | 0 | 2mL syringe, no xducr. |
| 1 | Reciprocating Mode Master. | 1 | 2mL syringe, 1k psi xducr. |
| 2 | Gradient Mode Master. | 2 | 2mL syringe, 5k psi xducr. |
| 3 | Multi-Syringe Mode Master. | 3 | 2mL syringe, 10k psi xducr. |
| 4 | Slave B or 2. | 4 | 10mL syringe, no xducr. |
| 5 | Slave C or 3 or TLD in Binary Gradient. | 5 | 10mL syringe, 1k psi xducr. |
| 6 | Slave D or 4 or TLD in Ternary Gradient. | 6 | 10mL syringe, 5k psi xducr. |
| 7 | Gradient Master for TLD | 7 | 10mL syringe, 10k psi xducr. |
| 8 | Reserved. | 8 | Reserved. |
| 9 | Reserved. | 9 | Reserved. |
| A | Reserved. | A | Reserved. |
| B | Reserved. | B | Reserved. |
| C | Reserved. | C | Reserved. |
| D | Reserved. | D | Reserved. |
| E | Reserved. | E | Reserved. |
| F | Reserved. | F | Reserved. |

## Serial Connections

One serial type port is provided on the rear panel for system control providing control of additional µPro pump systems. The port is a female RS485. Contact a factory authorized technician for appropriate cabling. Connecting the cabling is similar to typical computer serial connections.

On “Master” µPro pump systems (systems with a local display and keypad), an additional serial type port is provided on the rear panel for remote computer control (with appropriate software). The port is a female RS232. Contact a factory authorized technician for appropriate cabling and software. Connecting the cabling is similar to typical computer serial connections.

# Plumbing

## Solvent Bottle

The µPro pump includes solvent bottles. 2mL syringe systems include a 200mL bottle; 10mL syringe systems include a 400mL bottle.

Bottles come with standard GL-45 bottle caps and tubing assembly. The tubing assembly includes plastic lines for fluid and helium with a fluid and helium filter. The helium line is approximately 2 feet long and has a 1/4-28 fitting on the end. You may connect to this line using a union to plumb helium.

## Bottle Tray

In addition to the solvent bottles, a white plastic bottle tray is provided. The bottle tray is intended to contain any fluid leaks. Place the bottle tray inside the unit, underneath the syringe, with the wider part of the bottle tray oriented toward the rear. Place the bottle assembly in the bottle tray.

## Degassing

It is strongly recommended that you degas the fluid prior to using it. There are many means of degassing the fluid, including ultrasonication and vacuum systems. Many users find helium sparging convenient and effective. The µPro bottle assemblies are provided with the necessary connections, as described above, to use helium degassing.

## Inlet Connection

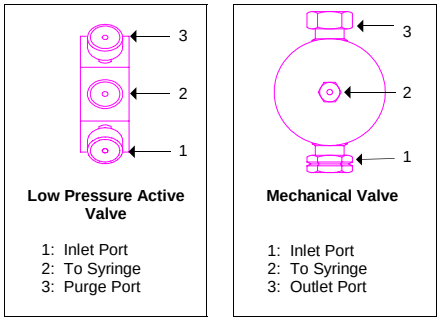


**Figure 2.5: Inlet Connections**

Attach the 1/4-28 tube nut to the inlet port of your µPro system. The specific location of your inlet port depends on the configuration of your µPro system. Inlet ports will be on either a low pressure active valve (if your system uses two low pressure active valves per syringe, the inlet valve is to the left of the syringe) or a mechanical valve (see Figure 2.5). When using a dual syringe system, the first syringe (syringe A when operating in binary gradient mode) is the syringe under the display (to the right hand side of the system).

**NOTE!** Do not strip the threads of the valve or fitting when making the inlet connection.

## Purge Connection

Two functions are provided by the low pressure active valve (where present); providing an inlet, and purging the syringe. A purge line may be provided with the µPro pump (a few feet of Teflon® tubing with a 1/4-28 plastic tube nut attached). The purge line is connected to the upper port of the low pressure active valve (see Figure 2.5). Do not strip the threads of the valve or fitting.

Systems may use low pressure active valves for both system inlet (to left of syringe) and outlet.

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**TIP:** Thread the purge line through the grommet on the left side of the instrument and channel to a waste vessel.

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## Ternary and Quaternary Connection

A ternary or quaternary pump is supplied with a connection kit including both plumbing and electronic connections needed. As additional ternary or quaternary syringes are added to a binary gradient system, they are positioned adjacent to the left of the binary gradient system. The pre-formed tubing and fittings are connected to port six of the slave pump and the mixer in the binary gradient pump (see Figure 2.6). The cable is connected to the RS485. The power to the slave pumps should be turned on before the binary gradient system power is turned on.

## Transitional Liquid Delivery Connection

A transitional liquid delivery (TLD) pump is supplied with a connection kit including both plumbing and electronic connections needed. The TLD pump is positioned adjacent to the right of the binary gradient system. The output of the gradient pump is plumbed to position 5 of the upper high pressure active valve. The pumping system's output is plumbed to position 6 of the upper high pressure active valve. The cable is connected to the RS485. The power to the TLD pump should be turned on before the gradient system power is turned on.

# Software Setup

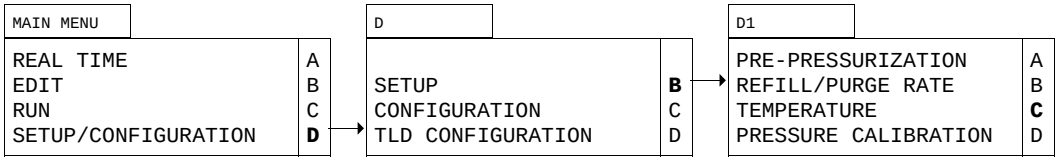
Before setting the parameters of temperature and refill/purge rates, you may find it useful to read the local interface overview on pages 3.5-3.6.

**TIP:** If you are several layers deep in the software, pressing DISPLAY and then ΔMENU will return you directly to the Main Menu.

When navigating the menu driven software, you can return to the Main Menu by pressing ΔMENU until the Main Menu appears.

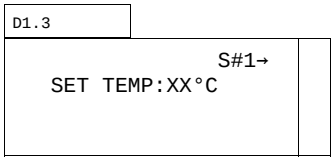
## Temperature

To set the temperature (if fitted to your configuration of the µPro) of the syringe, select softkey D (SETUP/CONFIGURATION) from the Main Menu. Select softkey B (SETUP) from screen D and softkey C (TEMPERATURE) from screen D1.




**Select softkey D** **Select softkey B** **Select softkey C**

The display will change to D1.3. Enter an appropriate temperature. Valid entries are from 0 to 50°C. In order to control temperature, the setting must be at least 5°C above ambient temperature (at least 7°C above ambient temperature is preferred).




**Enter desired temperature**
**Press ENTER**

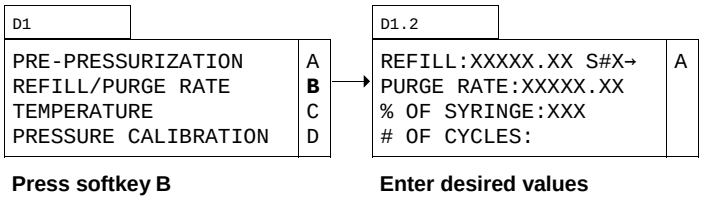
Since temperature control is fully integrated into the µPro, it may not be immediately apparent whether your µPro is fitted with temperature control. You can determine whether your system has temperature control by observing whether a fan is blowing air over the syringe when the power to the instrument is turned on.

**TIP:** Temperature control is critically important, especially at flow rates in the lower range of the capacity of the syringe. Temperature control significantly enhances flow precision and the reproducibility of your results.

## Default Refill and Purge Rates

When you press ENTER from screen D1.3 (above) after entering a temperature setting, you are returned to screen D1 (below). To set the default refill and purge rates, press softkey B (REFILL/PURGE RATE) and screen D1.2 will be displayed.

The values entered in screen D1.2 apply to the syringe indicated in the upper right corner of the display. Pressing softkey A toggles to other syringes or which may be present on the system or ALL (single syringe systems do not have S#X on the display).




### Refill Rate

The refill rate determines the flow rate into the syringe. The best rate to enter depends on your application.

At the maximum refill rate, the syringe refills from empty in approximately 30 seconds (since the µPro system has a default operating mode of refilling at the end of each run, it will be unusual for the syringes to have to be completely refilled).

**TIP:** The slower the refill rate, the less likely the possibility of the introduction of air into the system as a consequence of cavitation; but, it will take longer to refill the syringes. Usually, accepting the default refill rate provides an acceptable compromise for purposes of purging the syringes. You may wish to slow the refill rate down when the system is running files (see p. 3.19).

Press ENTER to accept the default rate or enter a valid number and press ENTER.

### Purge Rate

The PURGE RATE determines the flow rate out of the syringe during purge. The best rate to enter depends on your application.

Usually, accepting the default purge rate will be the best choice. Highly viscous fluids may require a lower purge rate to avoid an overpressure error.

Press ENTER to accept the default rate or enter the desired purge rate and press ENTER.

### % of Syringe

The % OF SYRINGE field determines the approximate percentage of the syringe expelled with each cycle of the purge routine.

Enter a valid whole number (1-100) and press ENTER or press ENTER to accept the default.

**TIP:** It will rarely be necessary to purge the entire syringe repeatedly. Most often a value of 50% will be sufficient to accomplish the purposes of purge, and save solvent and time.

## # of Cycles

The # OF CYCLES field determines the number of times the syringe is purged and refilled.

**TIP:** You likely need to enter a higher value than the default in the # OF CYCLES field to be certain that all the air has been expelled from the system. Usually 4 cycles of the purge program will be adequate.

Enter a valid whole number (0-99) and press ENTER or press ENTER to accept the default.

Pressing RUN when the cursor is in either the PURGE RATE, % OF SYRINGE or the # OF CYCLES fields will cause the syringe to purge and then refill. The µPro repeats this the number of times entered; however, it executes these repeats purging the percentage of the syringe volume entered.

## Other Syringes in System

To program the same refill and purge rates for all syringes and run the cycle for all syringes simultaneously, toggle softkey A to ALL.

Toggle softkey A to program and run the additional syringes independently.

**NOTE:** At the end of a Refill/Purge routine, the syringe(s) will be in the fully forward, or purged, state.

# Priming and Purging

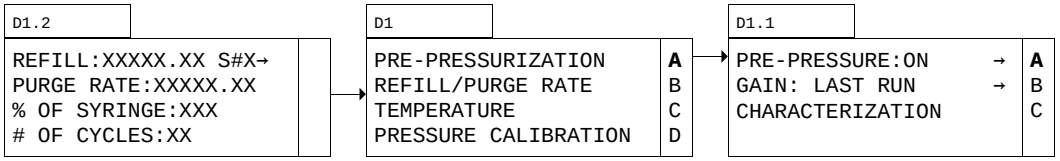
## Inlet

To prime the syringe, first press softkey A while in screen D1.2 to check the refill and purge rates for the syringes installed. Position the cursor on the PURGE RATE, % OF SYRINGE or # OF CYCLES field and press RUN (when the S# field reads ALL, all syringes are run). The system will automatically purge and refill the syringes the % of the syringe and number of times entered.

**NOTE!** During the priming and purging process be sure to check for inadequate degassing or leaks at the various connections and correct as necessary.

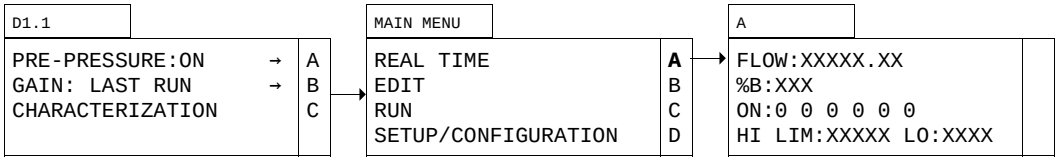
## Outlet

Before purging the µPro to the outlet of the pump, you should turn PRE-PRESSURIZATION OFF. To do this press ΔMENU from the D1.2 screen and select softkey A (PRE-PRESSURIZ-ATION) to display screen D1.1. Toggle softkey A to show PRE-PRESSURIZATION OFF.




Prime the output side of the µPro system using REAL TIME operation of the instrument. To program REAL TIME operation, press DISPLAY and ΔMENU (or ΔMENU 3 times).

Press softkey A from the Main Menu. The cursor will appear in the FLOW field of screen A. Enter a positive number to deliver flow to the output of the µPro pump (thereby purging the outlet side of the µPro of any air or other solvents in the system) and press ENTER. 200µL/min or so will usually be adequate to purge the outlet side of the µPro quickly.




Program the additional fields as desired (if you are using a gradient system, program the additional percentages in equal amounts to prime all lines).

**TIP:** If multiple syringes are plumbed to a common outlet, as in gradient mode, program each syringe to run at approximately equal flow rates (e.g., in gradient mode, after entering a value in the flow field, enter 50% in the %B field (if a binary gradient system is being used). Then press ENTER and RUN.

Press RUN to run the system at the programmed values. Once all the air or other solvent has been expelled from the outlet side of the µPro, press STOP.

**NOTE!** During the priming and purging process be sure to check for inadequate degassing or leaks at the various connections and correct as necessary.

**TIP:** Air may become trapped in the mixer in gradient systems. This may be corrected by plugging the output of the mixer and running the system until an elevated pressure is attained (approximately 80% of system capability). Turning the flow to zero and allowing the system to remain under pressure for 10-15 minutes will cause any air to become re-absorbed.

# Outlet Connection

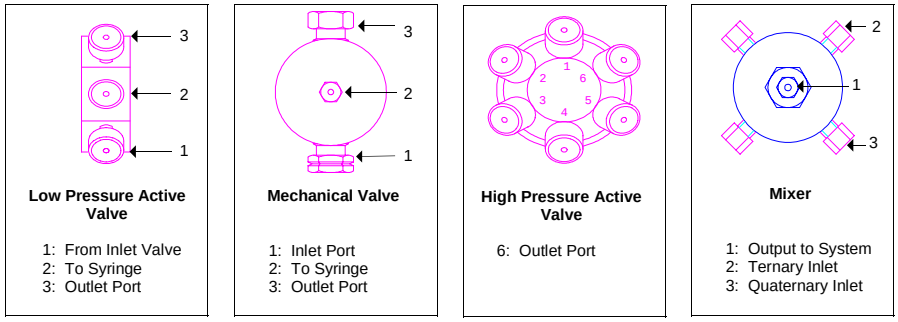



**Figure 2.6: Outlet Connections**

## Gradient Systems

The outlet of the µPro is at the outlet port of the mixer (see Figure 2.6). Connection to your system is by a 10-32 tube nut and ferrule for 1/16" tubing. Slip the tube nut over the end of the tubing and then slip the ferrule over the end of the tubing. Using a 1/4" wrench, remove the fitting from the syringe input/output (see Figures 1.2 and 1.3). Insert the tubing end into the syringe input/output.

**NOTE!** Do not seat the ferrule in the mixer output, since doing so may damage the internal components of the mixer.

Make sure that the end of the tubing "bottoms" firmly. Hold the tubing in place with one hand while you use a 1/4" wrench to tighten the fitting 1/4 turn past "finger-tight". Remove the tubing from the syringe output and re-attach original tubing connection at syringe input/output. Attach the seated outlet connection to the mixer output.

In ternary and quaternary applications, single syringe µPro pumps are connected to the mixer.

In a continuous flow gradient system with a TLD pump, the gradient pump is connected to port 5 of the upper high pressure active valve. The pumping system's output is connected to port 6 of the upper high pressure active valve. Detailed plumbing schematics are located in the Appendix.

## Isocratic & Gradient Slave (High Pressure Active Valve) Systems

The outlet of the pump is port 6 of the high pressure active valve (see Figure 2.6). Connection to your system is by a 10-32 tube nut and ferrule for 1/16" tubing. Follow the procedure described for Gradient Systems concerning attaching the tube nut and ferrule to the 1/16" tubing.

## Mechanical Valve Systems

The outlet of the pump is from the upper valve on the cylinder (see Figure 2.6). Connection to your system is by a 10-32 tube nut and ferrule for 1/16" tubing.

You can seat the tube nut and ferrule in the port to the syringe.

## Low Pressure Active Valve Systems

The outlet of the system is from the upper port on the outlet valve (to right of syringe). Connection to your system is by a 1/4-28 plastic tube nut and ferrule for 1/16" tubing.

Do not strip the threads of the valve or fitting.

## Mixer Configuration

Gradient versions of the µPro pump are fitted with a mixer. The mixer uses a cartridge system to accommodate mixers with different volumes. The different volumes allow you to exchange mixer sizes easily to optimally configure the µPro to your flow rate. Table 2.6 indicates the various mixers presently available.

When shipped from the factory, a 2mL µPro system is fitted with the 15µL mixer, a 10mL µPro system is fitted with the 50µL mixer. 2mL µPro systems are also provided with a 5µL mixer as an accessory (to install the 5µL mixer, be sure the remove the stir bar), 10mL systems are provided with a 170µL mixer as an accessory.

**Table 2.6: Mixer Sizes**

| Mixer Size | Mixer Type | Syringe Size | Flow Rate Range | Mark to Distinguish |
|---|---|---|---|---|
| 5µL | 3 stage static | 2mL | 1-10µL/min | PEEK with nipple |
| 15µL | 1 stage dynamic | 2mL | 10-40µL/min | All PEEK material |
| 50µL | 3 stage dynamic | 2mL and 10mL | 20-100µL/min | 2 steel bands |
| 170µL | 3 stage dynamic | 10mL | 100µL/min+ | Grooves on steel bands |

To determine the mixer size in your unit, see page 5.5 for the procedure on replacing mixer cartridges.

**TIP:** Thread your outline line through the grommet on the right side of the instrument.

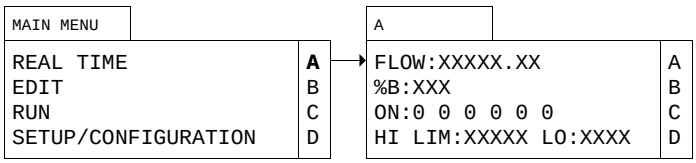
# Equilibrate and Characterize

If your µPro pump is fitted with a pressure transducer and you wish to use pre-pressurization, equilibrate and characterize your system once the pump has been primed.

## Equilibration

The equilibration conditions you choose will depend on your application. Generally, you will want to equilibrate under conditions identical to those at the beginning of the file you will be running. You will want to run equilibration with the system connected to the downstream devices you will be using during the running of the file. An aim of equilibration is to determine the operating pressure of the system so that system characterization accuracy is enhanced.

To equilibrate the system select REAL TIME operation (if you have not changed the menu from the last point of these procedures, you are already in REAL TIME operation) from the Main Menu by pressing softkey A.




The cursor will appear on the first line of the display. The flow rate you enter depends on your application. Since the goal of equilibration is to determine the operating pressure of the system at the desired flow, the final flow rate run to equilibrate should be the flow you will run in your application. However, because syringes will need to compress a volume due to the compressibility of fluids, you may want (for a relatively short period of time) to enter a higher flow rate to accomplish this compression quickly. You can quickly and easily change the entered flow rate by positioning the cursor in the FLOW field, enter a new flow rate and press ENTER.

**TIP:** If multiple syringes are plumbed to a common outlet, as in gradient mode, you will want to program the additional syringes (or % B, etc.) at the rates they will operate at during the beginning of your file. For example, if the program you intend to run begins at 5% B, program 5%B during this "REAL TIME" equilibration.

When you have entered the appropriate flow rate and press ENTER, the cursor will appear on the second line, where you will enter the appropriate %B (if multiple syringes are present and gradient mode is chosen) and press ENTER.

If you wish to activate one of the six external events you may do so (0 is OFF, 1 is ON). Press enter through these fields so the cursor is positioned in the HI LIM (high pressure limit) field. Enter a high pressure limit and press ENTER. The cursor will move to the LO (low pressure limit) field. Enter an appropriate low pressure limit and press ENTER.

Replace the front cover if you have not done so already. Pressing RUN will cause the µPro system to run the syringes under the specified conditions.

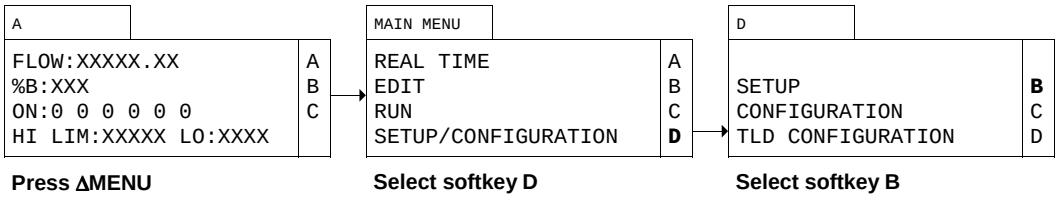
You will want to allow the system to pump for a period of time sufficient for the pressure to stabilize at the final flow rate. Once the pressure has stabilized, you may characterize the system.

## Chacterization

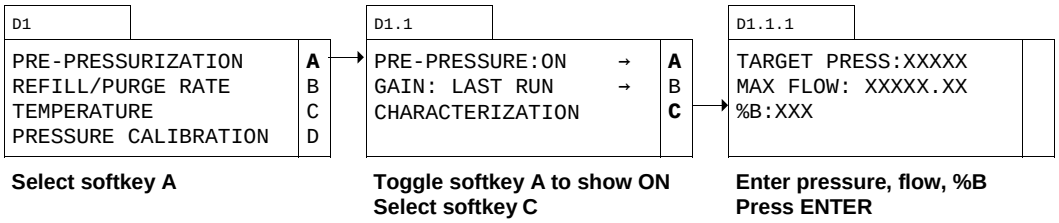
The purpose of characterizing the system is to determine the resistance of the system so the fluid in the syringes will be compressed and the syringes will quickly begin to deliver fluid to the downsteam system.

Before beginning characterization, press STOP to stop running the equilibration step described above and make a note of the operating pressure as shown on the Display screen. You should allow the system pressure to fall below your target pressure before characterizing.

To characterize the system, press ΔMENU to return to the Main Menu. Press softkey D to select SETUP/CONFIGURATION. From screen D, press softkey B to select SETUP and screen D1 will appear.



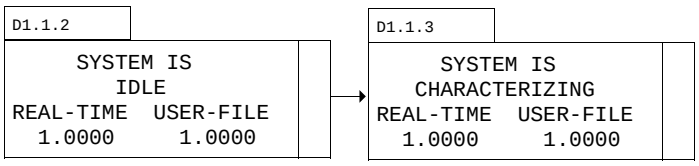

From screen D1 select softkey A (PRE-PRESSURIZATION) to display screen D1.1. Press softkey A to toggle the PRE-PRESSURIZATION field to ON. Select softkey C (CHARACTER-IZATION) to display screen D1.1.1.




Enter the pressure value you arrived at after stabilization during equilibration plus 10% in the TARGET PRESSURE field. With the cursor in the MAX FLOW field, enter the maximum flow rate you want the system to run at during pre-pressurization.

**TIP:** Usually a minimum value of 100µL/min., or 5 to 10 times the actual flow rate (whichever is greater) is a good value to enter in the MAX FLOW field. Too high a value will cause the system to overshoot the pressure, too low a value will cause the system to take an excessive amount of time in characterizing and pre-pressurizing.

If you have a gradient µPro, the %B field will be displayed on line three (%C will appear on ternary systems and %D will appear on quaternary systems). Enter the value for %B which you will use as your starting conditions. Press ENTER and screen D1.1.2 will be displayed.




Press RUN and the display will change to screen D1.1.3. The pump will begin running and calculating the resistance of the system. When it has finished characterizing, a value will be displayed in the GAIN VALUE field and the pump will stop running. You may press DISPLAY during the characterization process to monitor the progress if you wish (the FLOW field in the Display screen will display 0.00 when characterization is complete).

**TIP:** You will want to re-run the equilibration and characterization routines described above when you change the system in a way which alters the systems resistance (e.g., use a different column). Since characterization defines the system resistance, changes in the flow rate alone do not require re-running the characterization routine.

Now the system has been characterized and you are ready to run programmed files.