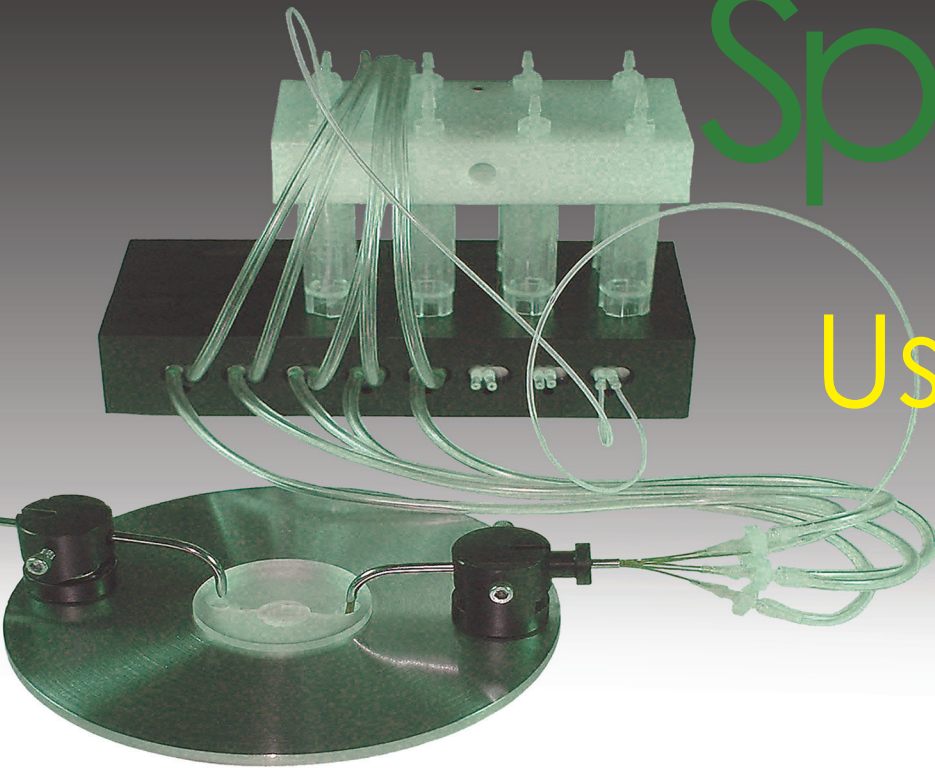# Pressure Spritzer

User's Guide

Programmable Systems for Solutions Application & Switching

- **Up to 8-Channels**
- **Programmable timing and sequencing up to 32 steps**
- **Compatible with Imaging & Data Acquisition systems**
- **No electrical noise during switching**
- **Automatic switch to WASH solutions for easy manual operation**
- **Single cell & Local Application**
- **Works with Temperature Controlled Systems**

Bioscience Tools

Ph: 877-853-9755
www.biosciencetools.com

Contents

Specifications

Input

    connector for 4mm O.D. tubing (10-32 threaded)

    includes adapters for different size tubing

    300PSI max

    (not required for internal pressure generator)

Output

    x4 connectors for 1/8in O.D. tubing (10-32 threaded)

    100PSI max

Remote Control

    wireless control for easy manual operation

TTL Signals

    +5 Volts activates valves, individual BNC connector

    for each valve

Analog Voltage Input Decoder

    Input analog voltage at rear panel BNC is decoded at

    0.5V intervals per channel

Pressure Controller (optional)

    0-15PSI (up to 25PSI upon request)

Programmable Timers

    1 ms accuracy, stored in controller memory

AUTO memory mode

    automatically switches channels, and activates "wash"

    solution between channels in sequence

Software control

    through RS232 port (or USB adapter)

Size (Controller) : 12Wx6Hx9D in.

Power Supply

   100 to 240 VAC, 50/60 Hz 75W

$C\epsilon$

Introduction

The controller comes with power cable, tubing, and all necessary fitting. A source of pressurized gas is required to operate the system, unless an internal pressure generator is used. The pressure sources needs to be regulated, since the maximum input pressure should not exceed 300 PSI. The controller ships adjusted for input pressure 40 PSI. The individual pressure outputs are regulated by the controller. During operation, the controller is continuously monitoring output pressure.

Installation Guide

1 Using provided fitting and clamps, connect pressure source (cylinder or wall outlet) to the controller. Some tubing and additional fitting might be required to connect to your source as designs vary. Usually some luer-lock fitting or other easy-connect adapters are used to splice different diameter tubing connecting your source to 4mm O.D. translucent tubing, which fits inside INPUT ports on the back of the controller. After splicing provided 4mm tubing to the pressure source, simply push the tubing inside INPUT ports all way, and slightly pull back to clamp. In order to disconnect the source, push YELLOW rim inside the connector, and pull the tubing out. Make sure the regulator on the source does not show more than 300 PSI of output pressure. Pressures around 40 PSI should be sufficient to operate the system. The controller ships tuned to work with 40 PSI input pressure

Similarly, insert a piece of 1/8in. O.D. BLACK tubing inside OUTPUT port on the back of the controller, and connect the other end of tubing to your setup to provide pressure. Usually luer connectors are used for this purpose.

Connect power cable.
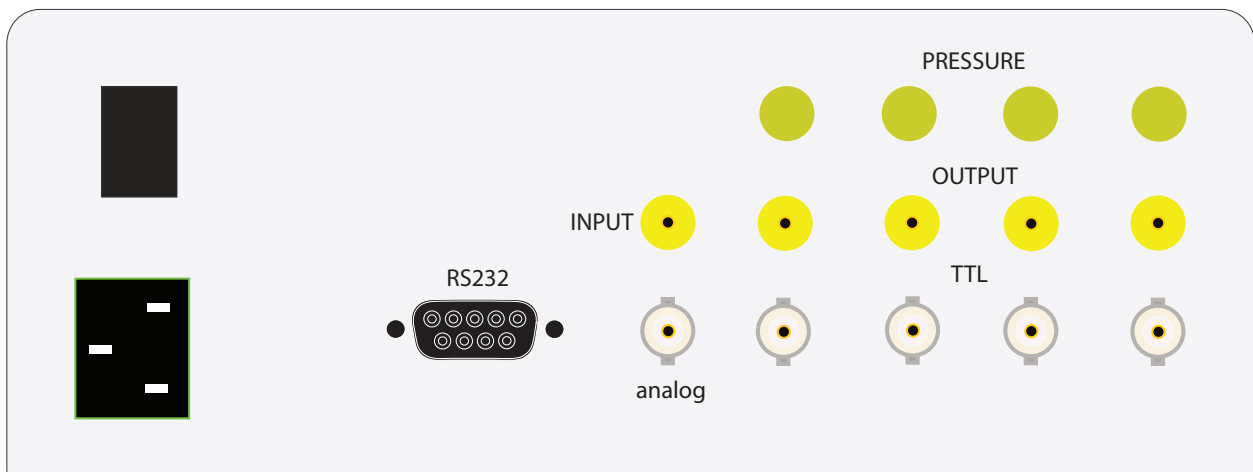
2 Turn the controller ON using ON/OFF switch on the BACK panel. The pressure readings will show pressure available for channels. If pressure source is connected, rotate the appropriate pressure regulator on the back clockwise slowly to increase the pressure to required output (or rotate other way to decrease the output pressure).

3 Initially the controller will keep valves closed, which is shown by OPEN button. Touching the button OPEN, or clicking on any channel on provided remote control, will open the valves - the button will show CLOSE word.

Valve Control

Each output channel can be activated by one of four ways:

Manual Switch by touching the front display, or using remote control; manual control can be used to OVERRIDE external input;

External Input TTL signal activates an individual channel. Rear panel BNC connectors provide access to all 4 channels;

Analog Signal Decoder allows you to activate each output channel by applying a voltage signal in the range 0 - 10V to Analog Discriminator input BNC, located on the rear panel; using this input, one analog output channel from a data acquisition system can control 16 output channels;

Software Commands sent through RS232/USB interface allow you to program solution application and exchange protocols, which make the system extremely flexible.

Using Wireless Remote Control PC-16-RC

1. The remote control unit requires three AAA type batteries (included).

2. Eight push-buttons will activate/de-activate the first eight channels of PC-16 controller directly: push once to activate, push again to de-activate.

3. The grey unlabeled, CONTROL, button will activate/de-activate channels from 9 to 16, when used in conjunction with buttons 1 to 8. Pushing the control button will make the remote unit's LED turn red. Pushing the numerical button, while LED is red, will activate/de-activate the corresponding channel of PC-16 controller.
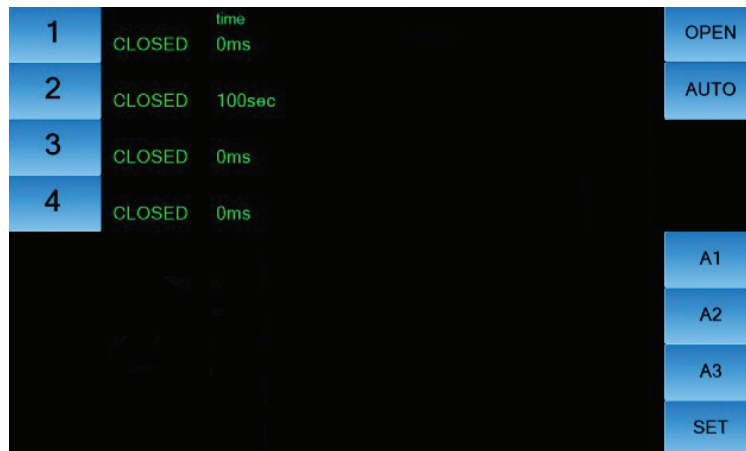
The remote control is programmed to activate only PC-16 controller with certain address (and will not work with other controllers). To put the remote into the correct mode, press GREY (CONTROL) button until the remote starts flashing (blinking) and then press button "1" - to program to the address 1 (or 2 for address 2; and 3 for address 3). To program the controller for the correct address, touch button A1 for address 1, or A2 for address 2, A3 for address 3.

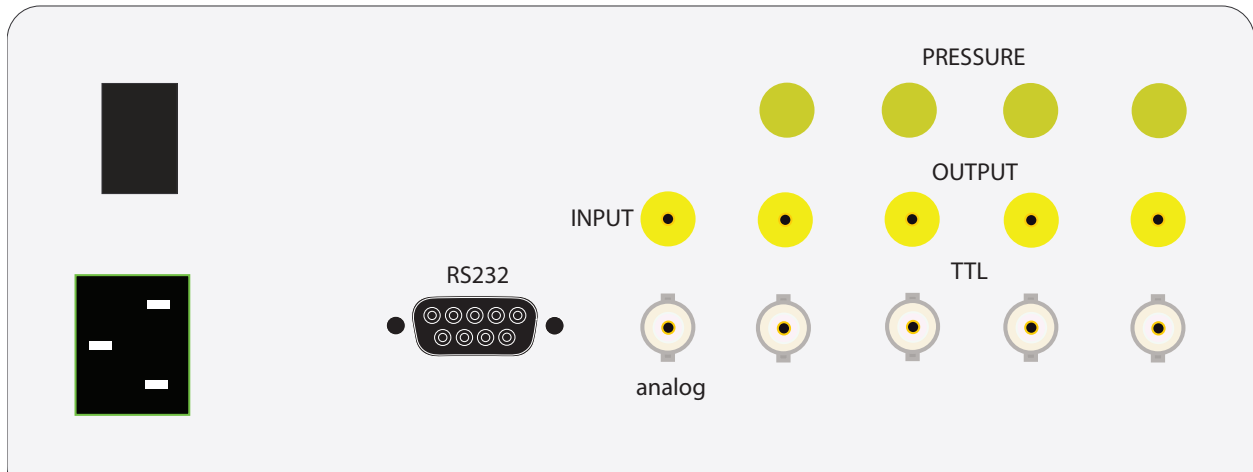| BUTTON	PC-16 CHANNEL	PC-16 CHANNEL CONTROL
1	1	9
2	2	10
3	3	11
4	4	12
5	5	13
6	6	14
7	7	15
8	8	16

Troubleshooting

If the remote unit stops activating some channels, press the control button until the unit's LED starts blinking and push button 1 to restore the settings.

Front Panel Controls

Front Panel Controls	
1,2, ... 4 Switches	Touching the channel NUMBER button manually switches valves ON/OFF. This will override external software, TTL and ANALOG signals.
AUTO	Switches the controller into Automatic Memory Mode. Activating any channel manually (or using remote control) while in AUTO memory mode - will initiate previously set timer for this channel, and starts switching next channels in sequence if programmed. Pressing AUTO button while a channel is OPEN - will designate this channel as a "WASH" solution, This channel will turn ON automatically when no channels are open. This can be used to activate "WASH" between channels in AUTO sequence.
CLOSE	Pressing CLOSE turns INHIBIT mode ON. In INHIBIT mode, there is no signal or power supplied to the valves - valves are CLOSED . This is used if turning all the valves OFF at once is required during the experiment, or during the initial setup and filling the lines.
A1, 2, 3	Switches the address for the controller, this should correspond to the address set on the remote control;
SET	Displays SET screen to adjust timers and sequence parameter;

Output and Back Panel

PRESSURE

OUTPUT

INPUT

RS232

TTL

analog

| Back Panel	
Input & Output connectors	For 4mm & 1/8in. O.D. tubing.
BNC 1 ... 4	BNC connectors for TTL input signal (+5V). Applying the TTL signal will activate an individual channel. Multiple parallel connections are possible.
Analog IN	IN: BNC connector to apply an analog signal to switch individual channels using Analog Discriminator.
RS232 IN	DB-9 connector for the provided null-modem cable to link to your computer and use software control (during imaging applications, for example). Can be used with optional USB adapter.

Using Analog Input Controls

The table below shows recommended values for analog input to activate the channels. The analog discriminator uses windows 0.5V wide.

Input Voltage	Channel Activated
0 - 0.5 V	None
0.5 - 1 V	Channel 1
1 - 1.5 V	Channel 2
1.5 - 2 V	Channel 3
2 - 2.5 V	Channel 4
2.5 - 3 V	Channel 5
3 - 3.5 V	Channel 6
3.5 - 4 V	Channel 7
4 - 4.5 V	Channel 8
4.5 - 5 V	Channel 9
5 - 5.5 V	Channel 10
5.5 - 6 V	Channel 11
6 - 6.5 V	Channel 12
6.5 - 7 V	Channel 13
7 - 7.5 V	Channel 14
7.5 - 8 V	Channel 15
8 - 8.5 V	Channel 16

Programming timers and channel sequences

If you touch button SET on the front panel, the display will show SET screen, which will allow you to program timers for individual channels, and delays between channels in sequence.
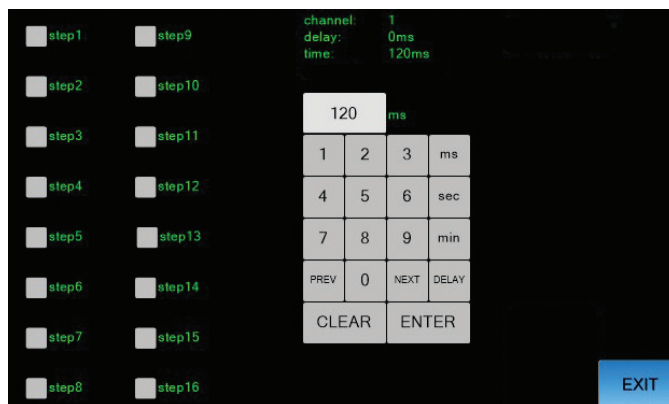
The touch pad on the right is used to enter time values in ms, sec or min. To switch between time and delay, touch "Delay"/"Time" button. To edit the values, use "Clear" button. Touch button "Enter" to put the new value into the controller memory. In order to mover between different channels values, touch buttons NEXT/PREV.

In order to make all 16 channels available for use, select box "16 channels". After finishing programming, touch EXIT button.

ONCE PROGRAMMED THE TIMERS SETTINGS ARE STORED in THE CONTROLLER MEMORY and WILL BE AVAILABLE EVERY TIME THE CONTROLLER IS USED. IN ORDER TO CHANGE TIMING or ERASE SETTINGS - THE CONTROLLER NEEDS TO BE RE-PROGRAMMED USING SET SCREEN

Each channel can be programmed for TIME to be active, and DELAY time before it becomes active after the previous STEP in the sequence. If the channel has TIME programmed more than 0ms, it will make STEP (with the same number as the channel number) in the sequence.

Sequence will go from lower STEP number to the higher number STEP, if activated. For sequence to continue to the next STEP, DELAY for this STEP (channel) should be more than 0ms. DELAY of 1ms makes sequence go "without" a delay (with almost no delay). If either TIME or DELAY for a STEP are equal 0ms – sequence will stop before this "not activated" STEP. If DELAY for channel 1 is more than 0ms – sequence will continue as a "loop", starting again with STEP 1. Up to 16 STEPs can be activated, even if only 8-channels are physically present in the system. If automatic WASH is used between steps while in delay, the maximum number of "steps" will be 32.

To initiate sequence, the controller should be put into AUTOmatic mode, by touching AUTO button on the screen, and then pressing (on the screen or remote) any button (STEP) in the sequence. Removing AUTOmatic mode by pressing the button again, will stop the sequence.

After STEPs in the sequence are activated using SET screen, multiple channels can be added to the STEP, by going

through the channels (touching NEXT/PREV buttons) and selecting STEPs where the channel should be active. This can be used to overlap multiple channels at the same time, combine different channels in the same volume/sample, or activate multiple channels to apply solutions in parallel to different samples/volumes.

For more flexibility, the channel can be excluded from the same number STEP by un-selecting the same number STEP on the screen (for the same number channel). This means that although the channel was used to activate the STEP in the sequence, it does not have to be actually OPEN during this step. This can be used to make sequences of channels in random order.

Software control using RS232 port.
After connecting the controller to your computer through provided RS232 null-modem cable (or an optional USB adapter **CFPS-USB**), you can switch valves by sending ASCII codes from your application software. This is used to program automatic perfusion control during your experiment.
RS232 port (COM1, for example) should be set at 115,200 baud, 8 bits, Parity none, 1 Stop bit. The following is the list of commands:

Command	
!Sn	Set channel n ON (where n is 0 for channel 1, F for channel 15)
!Cn	Set channel n OFF
!A0	Set first 8 channels (1 ... 8) OFF
!B0	Set second 8 channels (9 ... 16) OFF
!A1	Set first 8 channels ON
!B1	Set second 8 channels ON
!SG	Set all channels ON
!CG	Set all channels OFF
!Rn	Read status of channel n, returns 0 if OFF, and 1 if ON
!RG	Read status of all channels, returns 16 bits nnnnnnnnnnnnnnnn, the first bit is channel 16, the last is for channel 1

Custom Modifications

Bioscience Tools can modify and add custom features on request. An example of possible modification is changing TTL control so that high level (+5V) closes and low (0V) opens the valve, or modifying the internal software to work with N.O. valves instead of N.C. ones.

Warranty

This product is warranted to be free from defects in material and workmanship for the duration of one year. Normal wear, or damage resulting from abuse, accident, alteration, misuse, service by an unauthorized party or shipping damage, are excluded from this warranty and are not covered. Bioscience Tools will repair or replace the defective product covered by this warranty free of charge if it is returned, postage prepaid, to Bioscience Tools, ph: 1-877-853-9755.

Pressure Controller (optional)

The complete pressure control system comes with a built-in pressure controller, and tubing to connect to custom set-ups. No pressurized source of gas is required to operate the system. During operation, the controller is continuously monitoring the output pressure level to provide consistent and defined flow of solution.

Turn the controller ON. Initially, the pressure output is open to the air. Touch SET button and then, PRESSURE button. Set/adjust required pressure using the key-pad and CLEAR button, and touch ENTER key to save the new value. Touch button START to start the pressure controller.
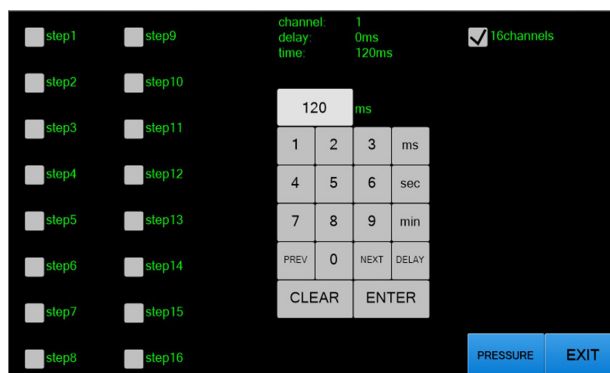
The output pressure will regulate solution flow rates in your liquid delivery setup.
IMPORTANT: in case of open (not-sealed) systems, it is normal pressure reading being low. This, however, should be avoided since the controller is designed to provide pressure to closed systems in order to regulate flow rates in small volume delivery setups.

Specifications

Output Range
  0 to 15 PSI (other ranges available upon request)

Sensors
  built-in pressure sensors;

Feedback
  from output pressure sensor;

Power Supply
  94 to 234 V AC, 50/60 Hz