

Deeter

Liquid Volume Dispenser



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Introduction

The Liquid Volume Dispenser (LVD) is designed to deliver a measured volume of liquid at the press of a button. In normal use, the operator selects a volume, presses a button and the LVD delivers the required volume without further operator intervention.

The volume is easy to select and is retained in non-volatile memory for repeat operation. Volumes between 0.10 litres and 100.00 litres can be selected in increments of 0.01 litres.

The Dispenser can be connected to a PC for remote control and monitoring.

A simple calibration method enables the LVD to accurately measure volumes over a flow rate range of between 0.5 and 5 litres/minute.

Wetted surfaces are nylon, PTFE, Buna and acetal, making the LVD suitable for a wide range of fluids.

1. Installation

The Dispenser has two John Guest Speedfit[®] push-fit connectors on the bottom side of the case for fluid in and out. The fittings take a tube outside diameter of 8mm.

The Dispenser is provided with a 12VDC mains adapter that plugs into a socket on the left side of the case. Low voltage operation means the dispenser is safe to use if liquid is spilled.

A USB type B connector is provided on the right side of the case for connection to a PC. Installation of the PC software supplied with the Dispenser is described in section 5.

2. Volume Accuracy

A calibration method allows fine adjustment of the delivered volume and can considerably reduce the size of any error. One or two measured dispenses (into a measuring vessel or weighed) should be performed to enable calculation of a percentage error. The result is then entered in the Calibration Menu (see section 4.5).

The Dispenser will deliver an accurate volume of liquid if properly calibrated and conditions are kept constant. The two most important conditions for accurate delivery are the liquid temperature and flow rate. The LVD calculates the flow rate and has a thermistor to sense the liquid temperature, and uses these inputs to compensation for drifts in flow rate and temperature. However, accuracy will suffer over large changes in flow rate or temperature and recalibration may be required.

3. Operator Controls

A liquid crystal display shows the selected volume and progress during dispensing.


Operator controls consist of three push-button switches, inscribed with the following symbols:


SYMBOL			
DESCRIPTION	UP	DOWN	ENTER

4. Operating States

4.1 Ready


After power-up and between dispensing states, the display shows **READY** on the top line and the selected volume on the bottom line.

Press  to increase the volume. Hold the button to rapidly increase the volume. The maximum setting is 100.00 litres.

Press  to decrease the volume. Hold the button to rapidly decrease the volume. The minimum volume setting is 0.10 litres.


Any change to the volume setting is saved to non-volatile memory when dispensing commences, thus powering off and back on will recover the previous setting.

Press  to start dispensing.

Hold the  button for 3 seconds to select user options (see *Option Setting and Calibration*).

Hold the  button and then  to manually deliver a dose (see *Manual Dispensing*).

4.2 Dispensing

Dispensing can be started by pressing  from the Ready state or by computer command.

The display will show the flow rate, the delivered volume and the target volume.

Pressing  will stop delivery with **PAUSED** shown on the display. Pressing  again will resume delivery.



Holding the  button for 3 seconds will cancel delivery and return to Ready state.


If the flow rate falls below 0.5 litres/minute, the word **UNDER** will flash, alternating with the flow rate. At very low flow rates the word **UNDER** will remain constant. A short beep will sound every 5 seconds if the Warning Beep option is enabled.


If the flow rate rises above 5.1 litres/minute, the word **OVER** will flash, alternating with the flow rate. At very high flow rates the word **OVER** will remain constant. A short beep will sound every 5 seconds if the Warning Beep option is enabled.


When the target volume is reached, the LVD will automatically return to Ready state. The buzzer will sound for 1.5 seconds (long beep) if the Finish Beep option is enabled.





4.3 Manual Dispensing

Press and hold the  button and then press  to gain manual control of the dispense valve. This state may be used for adding a 'top-up' after normal dispensing, limited to a maximum of 10.00 litres.


(The press of the  button will temporarily change the volume setting, but the previous setting will be restored immediately Manual Dispensing state is entered.)

Whenever  is pressed the dispense valve will open. The flow rate will be shown on the top line of the display and the additional volume of liquid will be shown on the bottom line.


When  is released, the top line of the display shows the target volume while the bottom line continues to show the added volume.


The LVD will remain in Manual state while  is pressed. If  is released, the LVD will remain in Manual state while  is pressed, and for 4 seconds after  is released.

4.4 Option Setting

The Option menu is entered from Ready state by pressing and holding  for 3 seconds.

There are two audio options: **FINISH BEEP** and **WARNING BEEP**.


Pressing  will toggle the **FINISH BEEP** option between **ON** and **OFF**. When **ON** is selected, a long beep will be sounded to indicate the target volume has been reached at the end of Dispense state.


Pressing  will toggle **WARNING BEEP** between **ON** and **OFF**. When **ON** is selected, short beeps will be heard if the flow rate is outside the limits for accurate dispensing.


Both options are saved to non-volatile memory, so are restored to the operator's preference on power-up.


Exit Option Setting by pressing . This will lead to the Calibration Menu.

4.5 Calibration Menu

The Calibration Menu is entered from the Option menu by pressing . The display will show the current calibration value between -12.0% and +12.0%. Negative values will reduce the volume delivered and positive numbers will increase the volume.

Pressing  will increment the calibration percentage by 0.1%. Holding the button will rapidly increase the percentage.

Pressing  will decrement the calibration percentage by 0.1%. Holding the button will rapidly decrease the percentage.

Pressing  saves the calibration value to non-volatile memory, exits the Calibration menu and returns to Ready state.

5. Serial Communications Control

The Dispenser has a serial communication option to enable automated control and monitoring by computer. Communication is via USB and requires a cable (not supplied) with a 'type B' connector.

The PC software supplied with the Dispenser replicates the operator controls and makes it easier to access options settings and view progress during dispensing. For those who wish to develop their own PC control and monitoring software details of serial port settings and the command structure are given in [Appendix A](#).

6. Software Installation

Once inserted into your CD/DVD drive the CD should Auto Boot, if not simply double click upon the CD Drive within Explorer to start the CD, or double click upon the autorun.exe file.

The CD Contains;

Liquid Dispenser Help.chm – Html Help File.

Deeter_Liquid_Dispenser.pdf – The Liquid Dispenser Manual

AdbRdr940_en_US.exe – Adobe Acrobat Reader Installer is required for the Manual.

Install\Setup.exe – This folder contains the Liquid Dispenser Setup and installer.

Once running you will be presented with the following:



Each item when hovered over will display a message explaining what will happen when clicked.

The Liquid Dispenser application software uses Microsoft NET Framework v3.5 the Installer will attempt to download and install you must be connected to the internet when the application is first installed. You must also agree to Microsoft's terms and conditions to use NET Framework. The application has an "unknown publisher" (i.e. Deeter).

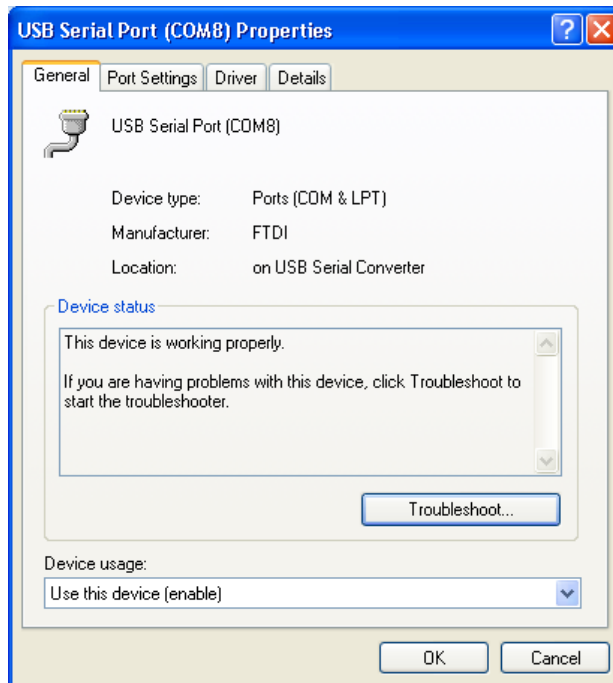
The application can be run from the Start button:

Start|All Programs| Deeter Electronics Ltd| LiquidVolumeDispenser| Liquid Volume Dispenser

Connect the USB cable and ensure the Dispenser is powered up. The first time this connection is made, the Windows driver for this device must be installed using plug-and-play (if available) or by downloading the driver.

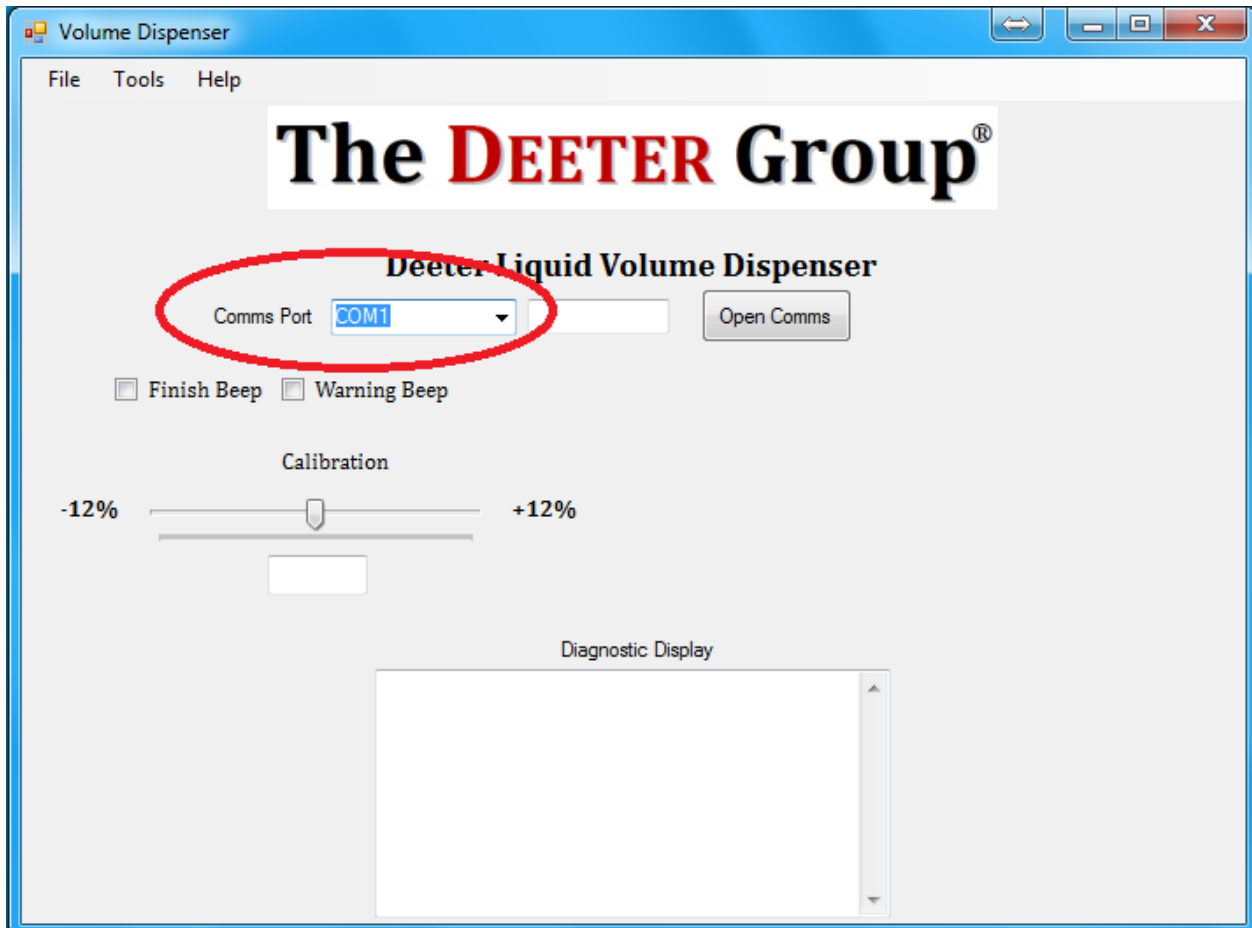
6.1 Software Drivers

Drivers for a wide range of operating systems can be downloaded free of charge from www.ftdichip.com. The Virtual COM Port (VCP) driver is required for use with the PC software supplied with the Dispenser and makes the Dispenser appear as a standard RS232 device.

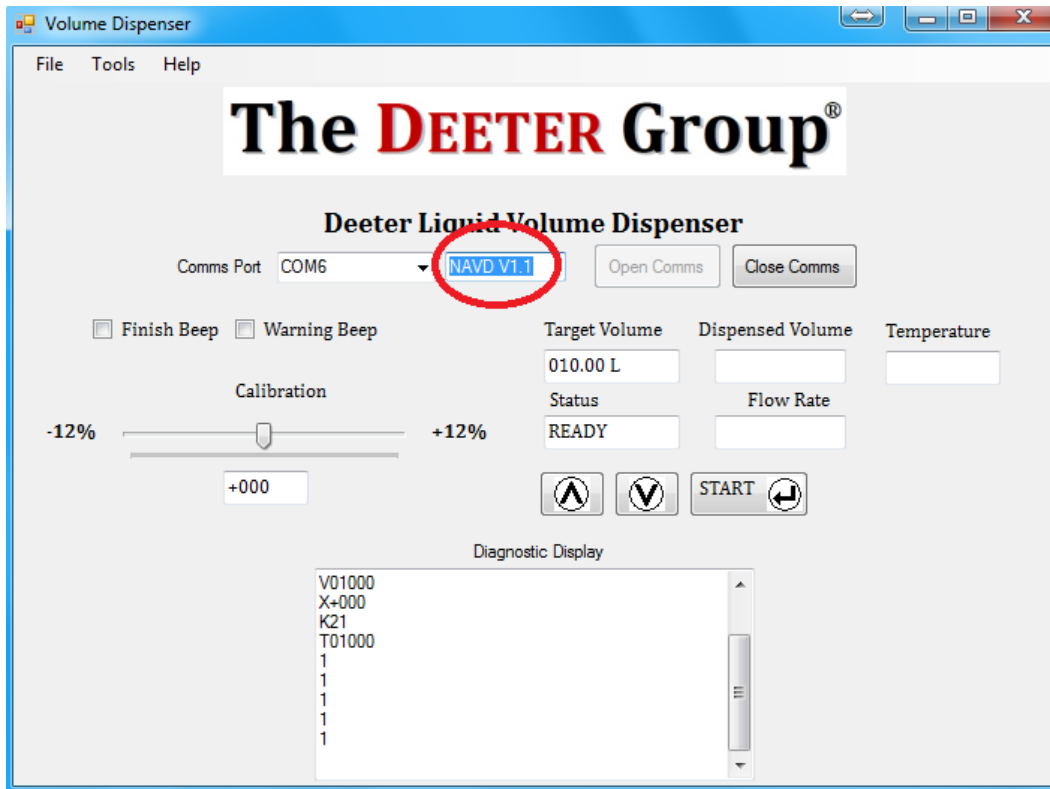


6.2 Software Application

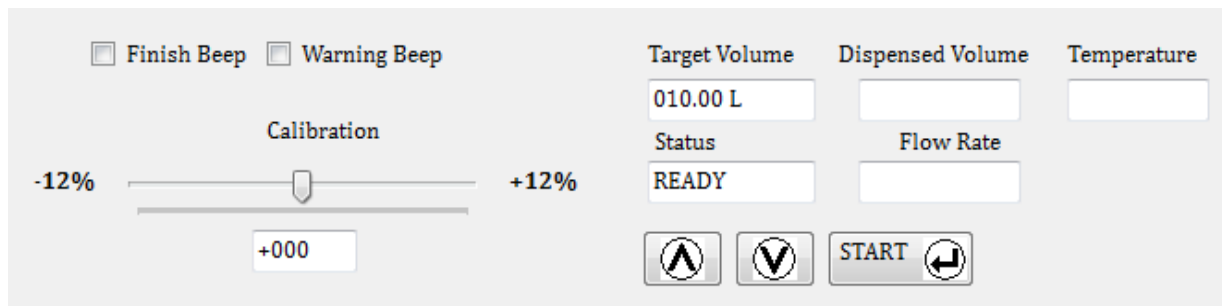
When started the software will display a drop down list, from this list you will need to select the comms port for the USB device.



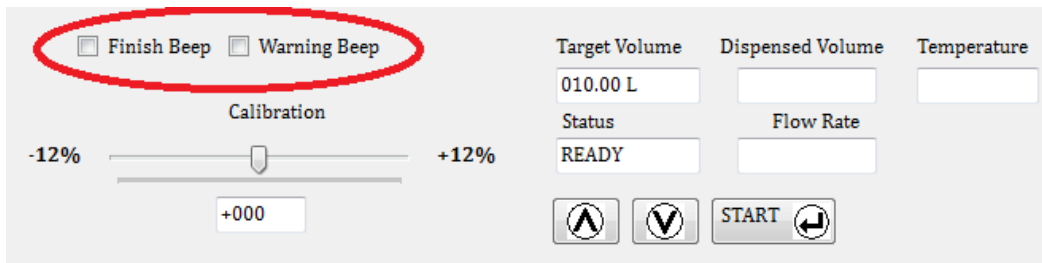
When the Deeter Liquid Volume Dispenser is connected it will fill in the current firmware version and automatically display the currency settings for Target Volume etc. You will also see a Start Button.



The Status will change to Ready after displaying the current Firmware version.



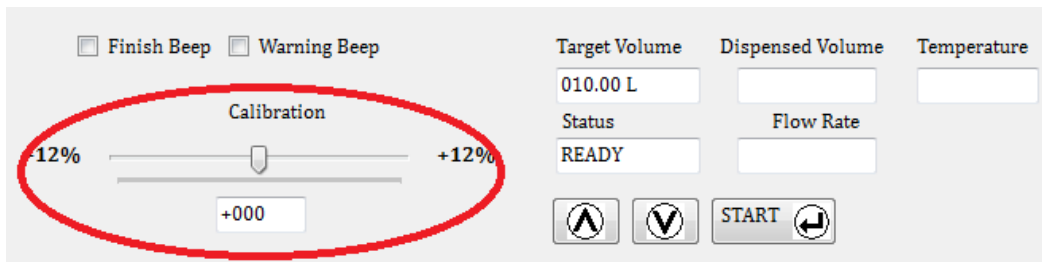
The following options are adjustable.



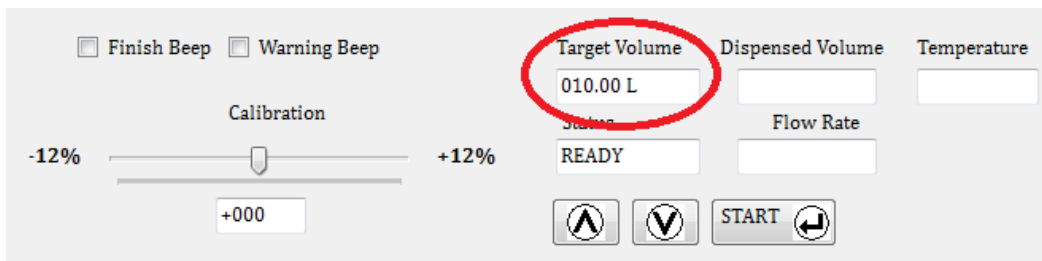
The two check boxes allow you to Enable and Disable the Finish Beep and Warning Beep from the Liquid Dispenser.

Finish Beep - A simple Beep upon completion of the dispensing of liquid.

Warning Beep - This Beep is only heard when the pressure for the liquid goes above or below the required rate for accurate dispensing.




Set calibration percentage from -12% to +12%, the calibration adjustment is made in units of 0.1%, you can use the arrow keys to make fine adjustments if required.



Target Volume is the display of the current Target Volume.

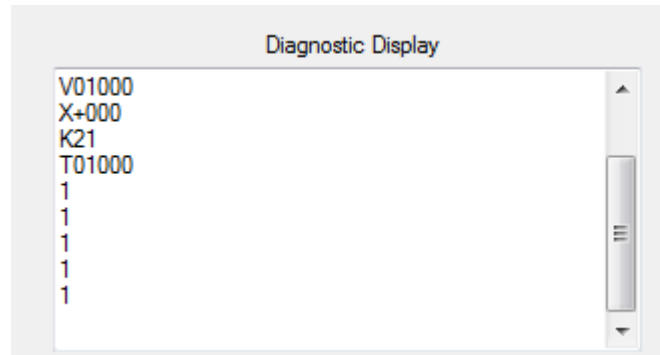
Press  to increase the volume. The maximum setting is 100.00 litres.

Press  to decrease the volume. The minimum volume setting is 0.10 litres.

It is possible to enter the Target Volume you wish directly into the box (i.e. 025.25) then click Up or Down and the Target Volume will be set. Please note the maximum and minimum volumes, 100.00 and 000.10.

Press  to start dispensing.

7 Diagnostic Display



This display shows the commands flowing between the Liquid Dispenser and the Software via the serial connection. If any problems occur then a copy of what was happening at the time will be required to assist Deeter in providing you support. The contents of this box can be copied and pasted into Notepad or any other text editor and then sent via email.

8 Specifications

Dimensions:	175mm x 125mm x 78mm
Power supply:	10 – 15VDC at 500mA 12VDC mains socket adapter supplied
Power supply fuse:	500mA anti-surge, 5x20mm cartridge
Flow rate range:	0.5 to 5.0 litres per minute

Appendix A – Serial Port Settings and Command Structure

The serial port settings are: 19200 baud, 8 data bits, no parity bit, 1 stop bit.

Commands have the following structure (ignore spaces, inserted for clarity):

S C P1 P2 ... Pn CS

where

S is the sequence start character, 'S'
C is the command character 'A' - 'Z' (case sensitive)
P1 to Pn are parameters in the range '0' - '9', '+', '-', and '?'
CS is a two-byte checksum

The checksum is the 8-bit sum of the command character and the parameter characters. It is the sum of the ASCII characters, not the numbers they represent, and is sent as a hexadecimal number represented by two ASCII characters in the range '0' – '9' and 'A' – 'F'

All valid commands are acknowledged by echoing back the command character followed by the carriage return character, 0Dh. Reports start with the command character and are terminated with carriage return.

Invalid commands, sequences with parameters outside the permitted range, or incorrect checksums will return 'B' and carriage return.

The 'S' character will clear any previous partial command sequence to start a new one.

Command List

Commands (with parameters ranges shown in brackets) are:

A Auto report off/on (0/1), minutes (0-9), seconds (0-59)

If auto-report is enabled, a report of the dispensed volume, flow-rate, temperature, and mode will be sent at regular intervals while dispensing. Reports will stop after the target volume has been reported. Reports are of the form:

Axxxxx,yyyyy,zzz,m<CR>

where A is the command character 'A', xxxxx is the dispensed volume in centilitres, yyyyy is the flow-rate in centiliters per minute, zzz is the temperature, m is the Mode (see the Report Mode command) and <CR> is the carriage return character 0Dh.

The temperature is in units of 0.5C with a zero at around -21C (see K command). For example, the number 415 would represent 20.5C (41.5 – 21 = 20.5)

C report dispense Completion off/on (0/1)

If enabled, a report will be sent when the target dispense volume has been reached. The report is of the form:

Cx<CR>

where x is '0' if the flow rate has been outside limits for accurate dispensing, and '1' if the flow rate has kept within limits.

D report Dispense volume

This will return the present dispensed volume in the form:

Dxxxxx<CR>

where xxxxx is the dispensed volume in centilitres.

E set **E**nd beep off/on (0/1/?)

A '?' after the command character (E) will return the current status of the End Beep.

F report **F**low rate

This will return the present flow rate in the form:

Fxxxxx<CR>

where xxxxxx is the flow rate in centilitres per minute. Note: the maximum flow rate should be less than 5 litres per minute so the first two digits should always be '0'.

G **G**o

This command will start a dispense

H **H**alt

This command will terminate a dispense

J **T**emperature

This will report the temperature in degrees C to the nearest 0.5C. The temperature is preceded by a '+' or '-' sign and includes a decimal point before the final digit ('0' or '5')

K set thermistor zero offset temperature (00-99/?)

The default zero offset for the thermistor is -21C. The absolute temperature is not required for error compensation, which uses temperature changes, but absolute temperatures can be displayed by the PC software and this command enables calibration of the displayed temperature.

A '?' after the command character (K) will return the current zero offset in the form:

Kxx<CR>

where xx is the offset temperature in C

M report **M**ode

This will return:

Mn<CR>

where M is the command character 'M' and n is a number from 1 to 4 to indicate the current status of the dispenser.

- 1 Ready
- 2 Dispensing
- 3 Paused
- 4 The LVD is under operator control from the keypad (e.g. manual dispensing, option setting, etc)

N report version **N**umber

This will return the firmware version number e.g. 'LVD V1.1'

P **P**ause

This command will pause the current dispense, allowing it to continue later.

R **R**estart

This command will restart a paused dispense

T report **T**arget volume

This command will return the target volume in the form:

Txxxxx<CR>

where xxxxxx is the volume in centilitres.

V set **V**olume (00010-10000/?)

Sets the target volume in centiliters

A '?' after the command character (V) will report the target volume (same as the T command but with 'V' prefix)

W set **W**arning beep off/on (0/1/?)

A '?' after the command character (W) will return the current status of the Warning Beep.

X set calibration percentage (-120 to +120/?)

Sets the percentage calibration adjustment in units of 0.1%. The first parameter must be '-' or '+'.

A '?' after the command character (X) will report the calibration (same as the Y command but with 'X' prefix)

Y report calibration

This command will return the present calibration in the form:

Ysxxx<CR>

where s is the sign character '-' or '+', and xxx is the adjustment in 0.1% units.

Appendix B – Serial Port Settings and Command Structure

Connect the USB cable and ensure the Dispenser is powered up. The first time this connection is made, the Windows driver for this device must be installed using plug-and-play (if available) or by downloading the driver.

Drivers for a wide range of operating systems can be downloaded free of charge from www.ftdichip.com. The Virtual COM Port (VCP) driver is required for use with the PC software supplied with the Dispenser and makes the Dispenser appear as a standard RS232 device.

