

Ultimus V High Precision Fluid Dispenser

Operating Manual



Fluid dispensing system Precise dispensing
ystems Consistent silicone dispensing
systems Consistent paste dispensing
systems Consistent liquid dispensing
systems Consistent powder dispensing
systems Consistent gaseous dispensing
systems Consistent vacuum dispensing
systems Consistent adhesive dispensing
systems Consistent sealant dispensing
systems Consistent paint dispensing
systems Consistent ink dispensing
systems Consistent dye dispensing
systems Consistent resin dispensing
systems Consistent gel dispensing
systems Consistent liquid dispensing
systems Consistent膏状物 dispensing
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You have selected a reliable, high-quality dispensing system from Nordson EFD, the world leader in fluid dispensing. The Ultimus™ V high precision dispenser was designed specifically for industrial dispensing and will provide you with years of trouble-free, productive service.

This manual will help you maximize the usefulness of your Ultimus V high precision dispenser.

Please spend a few minutes to become familiar with the controls and features. Follow our recommended testing procedures. Review the helpful information we have included, which is based on more than 50 years of industrial dispensing experience.

Most questions you will have are answered in this manual. However, if you need assistance, please do not hesitate to contact EFD or your authorized EFD distributor. Detailed contact information is provided on the last page of this document.

The Nordson EFD Pledge

Thank You!

You have just purchased the world's finest precision dispensing equipment.

I want you to know that all of us at Nordson EFD value your business and will do everything in our power to make you a satisfied customer.

If at any time you are not fully satisfied with our equipment or the support provided by your Nordson EFD Product Application Specialist, please contact me personally at 800.556.3484 (US), 401.431.7000 (outside US), or Jamie.Clark@nordsonfd.com.

I guarantee that we will resolve any problems to your satisfaction.

Thanks again for choosing Nordson EFD.



Jamie
Jamie Clark, Vice President

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Nordson EFD Product Safety Statement

WARNING

The safety message that follows has a WARNING level hazard.

Failure to comply could result in death or serious injury.



ELECTRIC SHOCK

Risk of electric shock. Disconnect power before removing covers and / or disconnect, lock out, and tag switches before servicing electrical equipment. If you receive even a slight electrical shock, shut down all equipment immediately. Do not restart the equipment until the problem has been identified and corrected.

CAUTION

The safety messages that follow have a CAUTION level hazard.

Failure to comply may result in minor or moderate injury.



READ MANUAL

Read manual for proper use of this equipment. Follow all safety instructions. Task- and equipment-specific warnings, cautions, and instructions are included in equipment documentation where appropriate. Make sure these instructions and all other equipment documents are accessible to persons operating or servicing equipment.



MAXIMUM AIR PRESSURE

Unless otherwise noted in the product manual, the maximum air input pressure is 7.0 bar (100 psi). Excessive air input pressure may damage the equipment. Air input pressure is intended to be applied through an external air pressure regulator rated for 0 to 7.0 bar (0 to 100 psi).



RELEASE PRESSURE

Release hydraulic and pneumatic pressure before opening, adjusting, or servicing pressurized systems or components.



BURNS

Hot surfaces! Avoid contact with the hot metal surfaces of heated components. If contact can not be avoided, wear heat-protective gloves and clothing when working around heated equipment. Failure to avoid contact with hot metal surfaces can result in personal injury.

Nordson EFD Product Safety Statement (continued)

Halogenated Hydrocarbon Solvent Hazards

Do not use halogenated hydrocarbon solvents in a pressurized system that contains aluminum components. Under pressure, these solvents can react with aluminum and explode, causing injury, death, or property damage. Halogenated hydrocarbon solvents contain one or more of the following elements.

Element	Symbol	Prefix
Fluorine	F	"Fluoro-"
Chlorine	Cl	"Chloro-"
Bromine	Br	"Bromo-"
Iodine	I	"Iodo-"

Check the Safety Data Sheet (SDS) or contact your material supplier for more information. If you must use halogenated hydrocarbon solvents, contact your EFD representative for compatible EFD components.

High Pressure Fluids

High pressure fluids, unless they are safely contained, are extremely hazardous. Always release fluid pressure before adjusting or servicing high pressure equipment. A jet of high pressure fluid can cut like a knife and cause serious bodily injury, amputation, or death. Fluids penetrating the skin can also cause toxic poisoning.

WARNING

Any injury caused by high pressure liquid can be serious. If you are injured or even suspect an injury:

- Go to an emergency room immediately.
- Tell the doctor that you suspect an injection injury.
- Show the doctor the following note.
- Tell the doctor what kind of material you were dispensing.

Medical Alert — Airless Spray Wounds: Note to Physician

Injection in the skin is a serious traumatic injury. It is important to treat the injury surgically as soon as possible. Do not delay treatment to research toxicity. Toxicity is a concern with some exotic coatings injected directly into the bloodstream.

Qualified Personnel

Equipment owners are responsible for making sure that EFD equipment is installed, operated, and serviced by qualified personnel. Qualified personnel are those employees or contractors who are trained to safely perform their assigned tasks. They are familiar with all relevant safety rules and regulations and are physically capable of performing their assigned tasks.

Nordson EFD Product Safety Statement (continued)

Intended Use

Use of EFD equipment in ways other than those described in the documentation supplied with the equipment may result in injury to persons or damage to property. Some examples of unintended use of equipment include:

- Using incompatible materials.
- Making unauthorized modifications.
- Removing or bypassing safety guards or interlocks.
- Using incompatible or damaged parts.
- Using unapproved auxiliary equipment.
- Operating equipment in excess of maximum ratings.
- Operating equipment in an explosive atmosphere.

Regulations and Approvals

Make sure all equipment is rated and approved for the environment in which it is used. Any approvals obtained for Nordson EFD equipment will be voided if instructions for installation, operation, and service are not followed. If the equipment is used in a manner not specified by Nordson EFD, the protection provided by the equipment may be impaired.

Personal Safety

To prevent injury, follow these instructions:

- Do not operate or service equipment unless you are qualified.
- Do not operate equipment unless safety guards, doors, and covers are intact and automatic interlocks are operating properly. Do not bypass or disarm any safety devices.
- Keep clear of moving equipment. Before adjusting or servicing moving equipment, shut off the power supply and wait until the equipment comes to a complete stop. Lock out power and secure the equipment to prevent unexpected movement.
- Make sure spray areas and other work areas are adequately ventilated.
- When using a syringe barrel, always keep the dispensing end of the tip pointing towards the work and away from the body or face. Store syringe barrels with the tip pointing down when they are not in use.
- Obtain and read the Safety Data Sheet (SDS) for all materials used. Follow the manufacturer's instructions for safe handling and use of materials and use recommended personal protection devices.
- Be aware of less-obvious dangers in the workplace that often cannot be completely eliminated, such as hot surfaces, sharp edges, energized electrical circuits, and moving parts that cannot be enclosed or otherwise guarded for practical reasons.
- Know where emergency stop buttons, shutoff valves, and fire extinguishers are located.
- Wear hearing protection to protect against hearing loss that can be caused by exposure to vacuum exhaust port noise over long periods of time.

Nordson EFD Product Safety Statement (continued)

Fire Safety

To prevent a fire or explosion, follow these instructions:

- Shut down all equipment immediately if you notice static sparking or arcing. Do not restart the equipment until the cause has been identified and corrected.
- Do not smoke, weld, grind, or use open flames where flammable materials are being used or stored.
- Do not heat materials to temperatures above those recommended by the manufacturer. Make sure heat monitoring and limiting devices are working properly.
- Provide adequate ventilation to prevent dangerous concentrations of volatile particles or vapors. Refer to local codes or the SDS for guidance.
- Do not disconnect live electrical circuits when working with flammable materials. Shut off power at a disconnect switch first to prevent sparking.
- Know where emergency stop buttons, shutoff valves, and fire extinguishers are located.

Preventive Maintenance

As part of maintaining continuous trouble-free use of this product, Nordson EFD recommends the following simple preventive maintenance checks:

- Periodically inspect tube-to-fitting connections for proper fit. Secure as necessary.
- Check tubing for cracks and contamination. Replace tubing as necessary.
- Check all wiring connections for looseness. Tighten as necessary.
- Clean: If a front panel requires cleaning, use a clean, soft, damp rag with a mild detergent cleaner. DO NOT USE strong solvents (MEK, acetone, THF, etc.) as they will damage the front panel material.
- Maintain: Use only a clean, dry air supply to the unit. The equipment does not require any other regular maintenance.
- Test: Verify the operation of features and the performance of equipment using the appropriate sections of this manual. Return faulty or defective units to Nordson EFD for replacement.
- Use only replacement parts that are designed for use with the original equipment. Contact your Nordson EFD representative for information and advice.

Nordson EFD Product Safety Statement (continued)

Important Disposable Component Safety Information

All Nordson EFD disposable components, including syringe barrels, cartridges, pistons, tip caps, end caps, and dispense tips, are precision engineered for one-time use. Attempting to clean and re-use components will compromise dispensing accuracy and may increase the risk of personal injury.

Always wear appropriate protective equipment and clothing suitable for your dispensing application and adhere to the following guidelines:

- Do not heat syringe barrels or cartridges to a temperature greater than 38° C (100° F).
- Dispose of components according to local regulations after one-time use.
- Do not clean components with strong solvents (MEK, acetone, THF, etc.).
- Clean cartridge retainer systems and barrel loaders with mild detergents only.
- To prevent fluid waste, use Nordson EFD SmoothFlow™ pistons.

Action in the Event of a Malfunction

If a system or any equipment in a system malfunctions, shut off the system immediately and perform the following steps:

1. Disconnect and lock out system electrical power. If using hydraulic and pneumatic shutoff valves, close and relieve pressure.
2. For Nordson EFD air-powered dispensers, remove the syringe barrel from the adapter assembly. For Nordson EFD electro-mechanical dispensers, slowly unscrew the barrel retainer and remove the barrel from the actuator.
3. Identify the reason for the malfunction and correct it before restarting the system.

Disposal

Dispose of equipment and materials used in operation and servicing according to local codes.

Specifications

NOTE: Specifications and technical details are subject to change without prior notification.

Item	Specification
Cabinet size	22.5W x 9.50H x 19.9D cm (8.86W x 3.74H x 7.85D")
Weight	3.4 kg (7.7 lb)
Internal AC-DC power supply	AC input: 100–240 VAC ($\pm 10\%$), ~50/60Hz, 0.5 A DC output (internal): 24 VDC @ 1.7 A
Cycle rate	Exceeds 600 cycles per minute
Time range	0.0000–9.9999 s
Foot pedal	Voltage: 24 VDC Current: 20 mA
End-of-cycle feedback circuits	5–24 VDC, 100 mA maximum
Cycle initiate	Foot pedal, finger switch, or 5–24 VDC signal
Input air pressure	7.0 bar (100 psi) maximum
Air output	0–7.0 bar (0–100 psi)
Ambient operating conditions	Temperature: 5–50° C (41–122° F) Humidity: 85% RH at 30° C non-condensing Height above sea level: 2,000 m max (6,562 ft)
Product classification	Installation: Category II Pollution: Degree 2
Approvals	CE, UKCA, TÜV, RoHS, WEEE, China RoHS

RoHS标准相关声明 (China RoHS Hazardous Material Declaration)

产品名称 Part Name	有害物质及元素 Toxic or Hazardous Substances and Elements					
	铅 Lead (Pb)	汞 Mercury (Hg)	镉 Cadmium (Cd)	六价铬 Hexavalent Chromium (Cr6)	多溴联苯 Polybrominated Biphenyls (PBB)	多溴联苯醚 Polybrominated Diphenyl Ethers (PBDE)
外部接口 External Electrical Connectors	X	0	0	0	0	0
0: 表示该产品所含有的危险成分或有害物质含量依照EIP-A, EIP-B, EIP-C 的标准低于SJ/T11363-2006 限定要求。 Indicates that this toxic or hazardous substance contained in all the homogeneous materials for this part, according to EIP-A, EIP-B, EIP-C is below the limit requirement in SJ/T11363-2006.						
X: 表示该产品所含有的危险成分或有害物质含量依照EIP-A, EIP-B, EIP-C 的标准高于SJ/T11363-2006 限定要求。 Indicates that this toxic or hazardous substance contained in all the homogeneous materials for this part, according to EIP-A, EIP-B, EIP-C is above the limit requirement in SJ/T11363-2006.						

WEEE Directive

 This equipment is regulated by the European Union under WEEE Directive (2012/19/EU). Refer to www.nordsonfd.com/WEEE for information about how to properly dispose of this equipment.

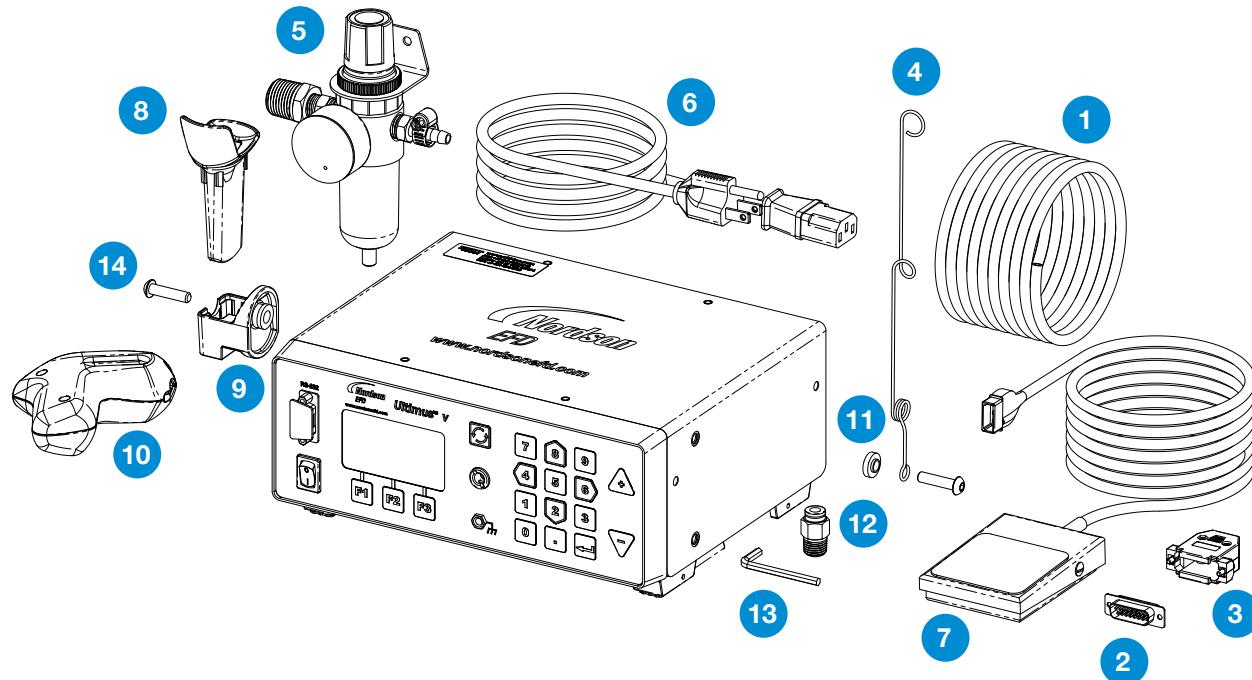
Ultimus V Features

- Electronically change / adjust dispensing Time, Pressure, and Vacuum
- Simultaneously display dispensing Time, Pressure, and Vacuum
- Auto Increment mode to adjust dispensing parameters after a certain number of shots or a specific lapsed time
- Auto Sequence mode that allows deposit patterns to be repeated automatically
- 400 individual memory storage cells
- Scroll or select cells via front panel keypad or external PC / PLC control
- Switching between Steady, Timed, and Teach modes
- Front panel Manual Cycle key
- Teach function
- Multi-level operator lockout
- Alarm indicators
- End of Cycle Feedback loop
- Soft button data input 0–9 keypad
- Operator control of LCD display brightness
- Easy UP / DOWN arrow key navigation
- External PC interface for data input
- Display cycle counter
- RS-232 interface compatible with standard RS-232 protocol
- ESD-safe via connection with external ESD grounding plug
- 0–7.0 bar (0–100 psi) air regulation range; 0–18 H₂O vacuum regulation range
- Internal universal power supply
- D-sub I/O (15-pin) and communication (9-pin) connections
- Alarm input / output I/O signals



Unpacking the Dispenser

Unpack the contents of the package and lay them out on a clean workbench.



The following items should be included with your Ultimus V dispenser:

- 1 Tubing — 6 mm OD blue urethane
- 2 Connector, 15 pos plug, D-sub solder
- 3 Backshell, 15 pos D-sub
- 4 Hose support adapter
- 5 Filter regulator
- 6 Power cord (ordered separately)
- 7 Foot pedal
- 8 Barrel holder sleeve
- 9 Barrel holder
- 10 Ergonomic barrel holder
- 11 Hose support locating washer
- 12 Fitting — 1/4 NPT X 6 mm OD
- 13 Wrench —hex key, 4 mm
- 14 Screw — M6 X 25 mm, Bh, Blk

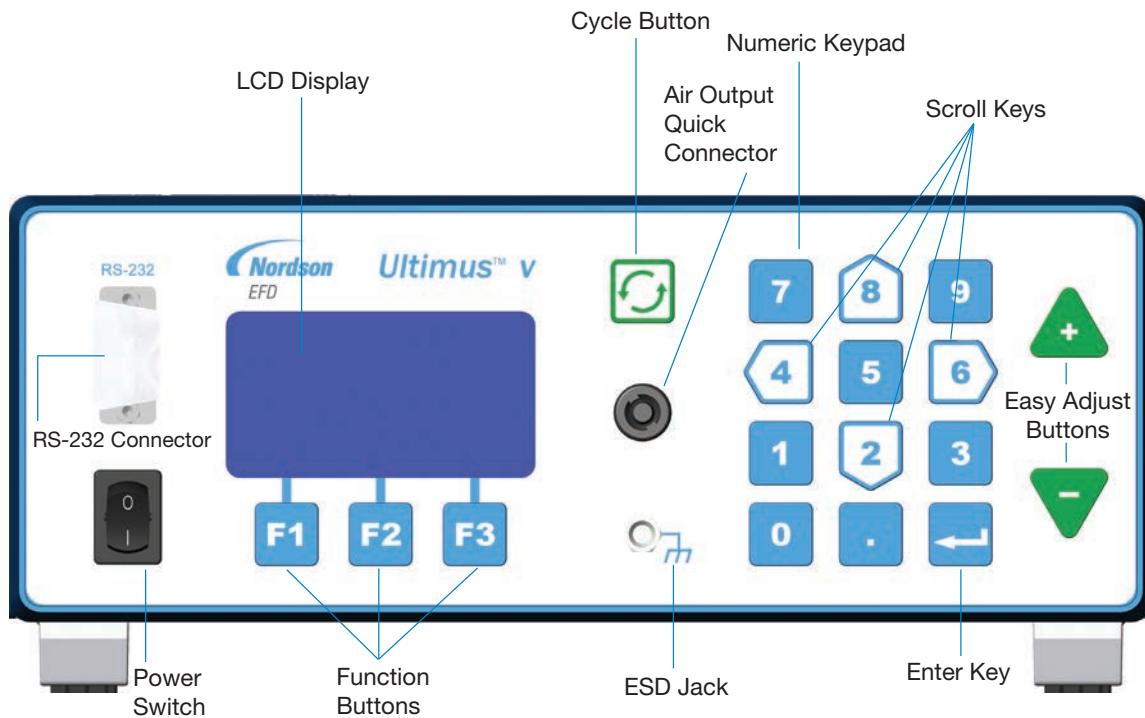
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Literature — Optimum Component Poster

Dot Test Kit Sheet

Box of 50 tip caps

Features and Controls



Front Panel

Power Switch: Turns the Ultimus V dispenser on and off.

RS-232 Connector: Allows all dispensing parameters to be modified from a remote PC or PLC.

LCD Display: Shows data and system status as well the current function selected.

Function Buttons: Used to select items shown on the bottom of the LCD display above the individual function buttons. The function of each key depends on the current screen display and / or mode.

Cycle Button: Initiates a dispense cycle.

Air Output Quick Connector: Syringe barrel adapter / Optimeter™ connection.

ESD Jack: Standard 0.166" banana jack allows the user to connect grounding for ESD-sensitive equipment.

Numeric Keypad: Used to enter settings.

Scroll Keys: The arrow-shaped 2,4, 6, and 8 keys on the numeric keypad can be used for cursor scrolling as well as data entry.

Easy Adjust Buttons: Adjusts dispense time or memory cell location.

Enter Key: Confirms highlighted selection or data entered.

Features and Controls (continued)

Back Panel

Air In: Main filtered air supply input.

6 mm push-in fitting, used to connect main air supply. Minimum 1.0 bar (15 psi) above desired dispensing pressure; maximum 0–7.0 bar (0–100 psi).

Exhaust: Syringe barrel and vacuum air exit port.

6 mm push-in fitting. Output air from the syringe barrel exits from this port at the end of every dispensing cycle. The air consumed by the vacuum generator exhausts through this port as well. The push-in fitting allows tubing to be connected for remote discharge.

Foot Pedal / Finger Switch Connector: Connection for dispenser actuating device.

Connection is for a momentary contact closure switching device. EFD strongly suggests the use of EFD foot pedals and finger switches, which are specifically designed for this application.

RS-232 Connector: (DB-9 Male Style)

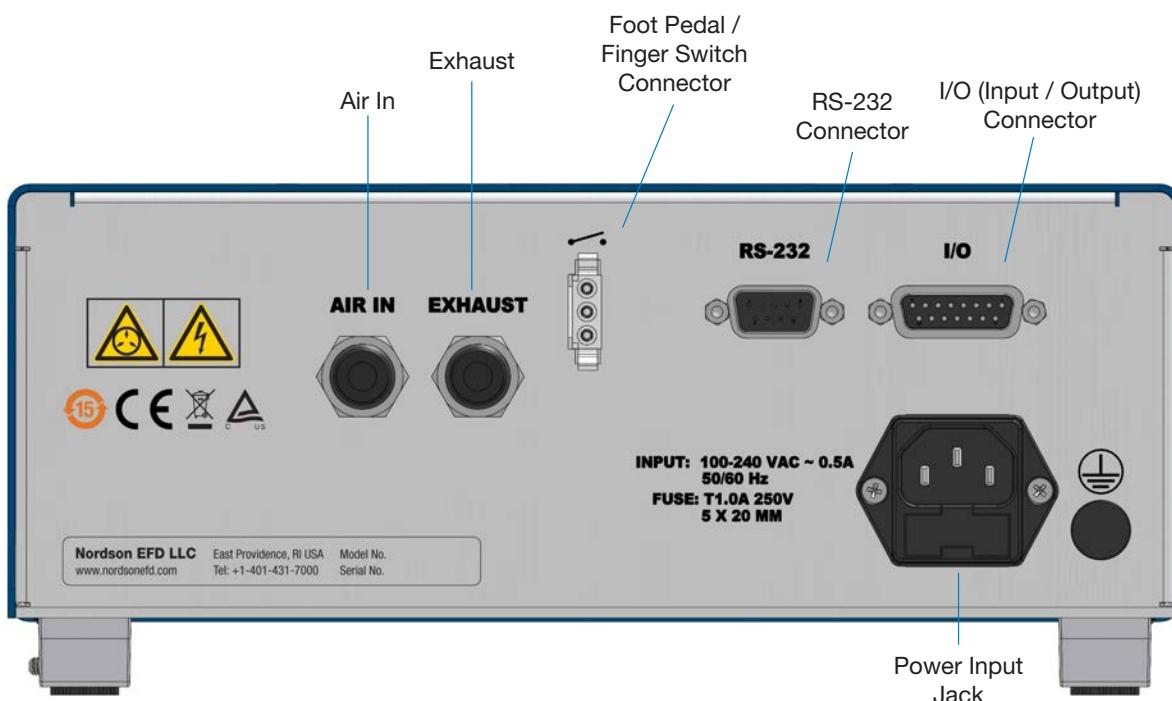
Either the front or rear RS-232 port can be enabled at one time. The RS-232 port is selected in the Communication LCD screen.

Any communications to the disabled RS-232 port will be ignored by the dispenser. The RS-232 protocol is covered in Appendix B.

I/O (Input / Output) Connector: (DB-15 Female Style) Used to connect to any input or output.

For detailed pin information, refer to Appendix A.

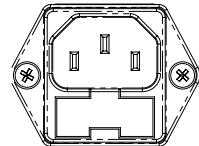
AC Power Input: Connects dispenser to local power source.



Initial Setup for Testing

Connect Power

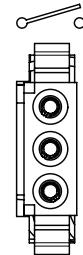
1. Connect the power cord to the back of the dispenser.
2. Plug the power cord into your local power source.
3. Turn the power switch on the front panel to the on position.



Connect Foot Pedal

The Ultimus V can be operated using the foot pedal provided, or by an external device via a DB-15 connector.

1. Plug the foot pedal into the connector on the back of the dispenser.
2. You can also operate the Ultimus V with an optional finger switch or a 5 to 24 VDC pulse.



Connect Air Input

NOTE: Clean, dry, filtered factory air is required to meet warranty. To ensure air quality, install the five-micron filter regulator provided with the Ultimus V.

1. Push one end of the air input hose into the Air In fitting on the back of the dispenser.
2. Connect the other end of the air input hose to the filter regulator supplied with the Ultimus V dispenser.

NOTE: Input air should be set at least 1.0 bar (15 psi) — or more — higher than dispensing pressure, up to a maximum of 0–7.0 bar (0–100 psi).

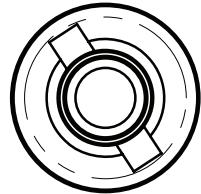


Connect Air Output

Push the connector on the adapter / Optimeter into the connector on the front of the Ultimus V and twist clockwise to lock.

Attach Syringe Barrel and Tip

1. Secure an EFD syringe barrel filled with your fluid to the adapter / Optimeter.
2. Replace the tip cap with an appropriate EFD precision dispense tip.



Dispensing System Setup

Deposit size is controlled by time, pressure and tip size.

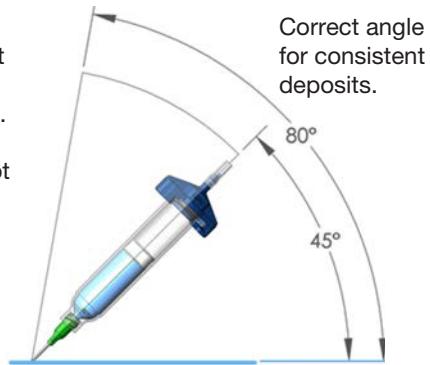
Please follow these instructions to test each function. Use the convenient Dot Standards sheet included in your dispensing kit.

Using Steady Mode to Dispense a Dot or Stripe or Fill a Cavity

- 1.** Start with pressure set to zero.
- 2.** Place the syringe barrel over a piece of paper or test surface.
- 3.** Place the unit in “Steady” mode.
- 4.** Unsnap the safety clip. Depress and hold the foot pedal for the remainder of setup.
- 5.** While resting the tip on the paper (test surface), increase the air pressure by 0.069–0.138 bar (1–2 psi) using the keypad until you have reached the desired fluid dispensing flow rate.
NOTE: Always use the lowest possible pressure and the largest possible tip size. The combination of the lowest possible output pressure + largest possible tip size + longest possible dispense duration = most consistent and accurate deposits.
- 6.** Release the foot pedal.
- 7.** Retest the dispensing rate a few more times. Fine tune as required by making small changes in pressure.



Remember — always bring the tip in contact with the work surface at the illustrated angle. After the tip is in position, press the foot pedal. Release pedal and remove tip by lifting straight up.



Using Timed Mode to Make Repeatable Deposits

1. Refer to the previous section to purge your dispense tip of air and fill it with fluid.
2. Place the unit into “Timed” mode.
3. Set the dispense time. The dispense time or duration may be set in one of two ways:
 - Using the Up / down Arrows to set time. Refer to the “Features and Controls” section.
 - Using the Program / Teach button to set time. Refer to the “Features and Controls” section.
4. Press the foot pedal / finger switch to activate the dispense cycle. The dispenser will now continuously dispense for the pre-set duration of time. Once the time has expired, the dispenser will stop dispensing and await another triggering signal from the foot pedal / finger switch or signal from the host controller.

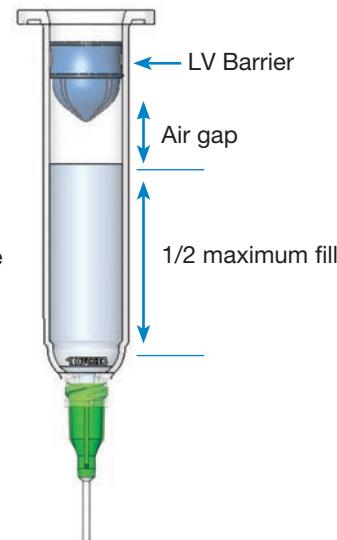
NOTE: The foot pedal / finger switch only needs to be pressed for a moment.

If the foot pedal / finger switch or contact closure I/O signal is initiated at any time during the dispense cycle, the dispenser will immediately abort and stop dispensing. This is a unique safety feature to prevent accidental dispensing.

Using the Vacuum Control Feature for Low Viscosity Fluids

The Vacuum Control feature allows you to dispense low viscosity fluids consistently without dripping between cycles. The vacuum overcomes head pressure on the fluid within the barrel, which prevents dripping.

1. Make sure that you have attached an EFD syringe barrel filled with the fluid intended for dispensing, and that the air pressure is set all the way to zero. EFD recommends the use of a Blue LV Barrier piston for watery, low viscosity materials.
 2. Make sure the barrel adapter safety clip is closed.
 3. Remove the tip cap and replace it with an appropriate EFD dispense tip.
 4. Set the air pressure at 0.1 bar (2 psi).
 5. While pointing the tip over a container or resting it on a test surface, release the safety clip on the adapter / Optimeter hose assembly.
 6. Place the dispenser in “Steady” mode. Depress and hold the foot pedal until a drip begins to form at the end of the tip.
 7. Release the foot pedal. At this point, fluid will continue to exit the tip.
 8. Increase the vacuum using the keypad by 0.5 to 1.0 inches of water until the fluid deposit size stabilizes without growing.
- NOTE:** Do not increase the vacuum to the point where the deposit is actually drawn back into the tip or to where bubbles form in the barrel. Excessive vacuum causes inconsistent dispensing.
9. Lift the tip off the test surface, wipe the tip end and retest by pressing the foot pedal momentarily. The deposit should stay at the intended size and not increase or decrease in size. If it does, repeat steps 4–8 to fine-tune the vacuum control.
 10. Once the vacuum is properly set, increase air pressure to the desired production setting before beginning your dispensing process.



Filling the Syringe Barrel

Caution: Do not completely fill syringe barrels. The optimum fill is a maximum 2/3 of the barrel capacity and 1/2 of the barrel capacity when using the EFD blue LV Barrier™ piston.

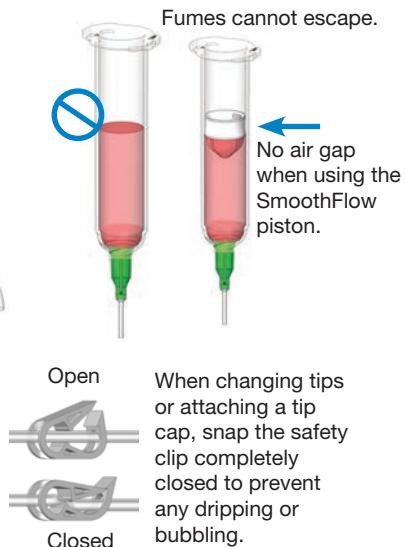
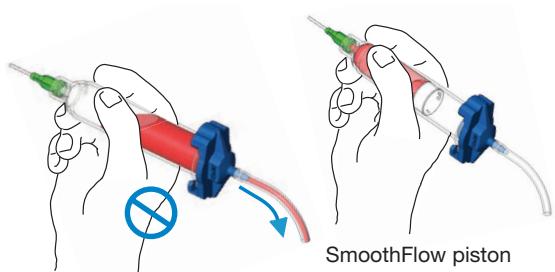
For best results, we strongly recommend that you use a piston as part of your dispensing system. The white EFD SmoothFlow piston is appropriate for most fluids and has several advantages.

- First, vacuum adjustment is less sensitive.
- Second, the piston prevents fumes from the fluid being exhausted into the work environment.
- Third, the piston prevents fluid backflow into the dispenser if the syringe barrel is inadvertently turned upside down.
- Fourth, the piston makes it easy and safe to change tips without dripping.

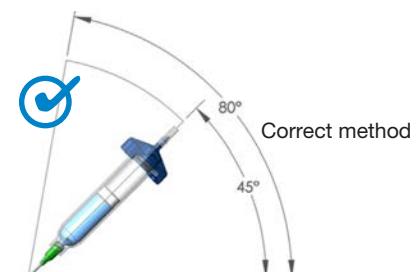
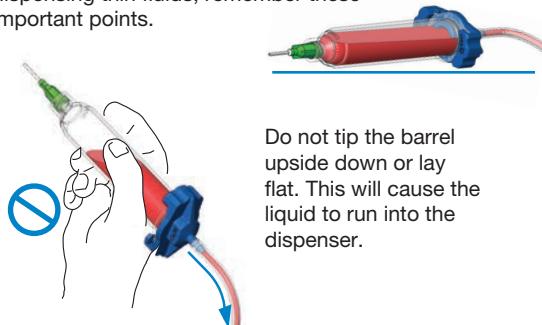
For watery solvents and cyanoacrylates, request the blue EFD LV Barrier piston, available in 3cc, 10cc, and 30 / 55 / 70cc sizes. If you are dispensing an RTV silicone and find that the piston bounces and causes stringing, request EFD's assistance in selecting a suitable piston.

Remember

For best results, EFD strongly recommends the use of a piston as part of your dispensing system.



If you choose to not use a piston when dispensing thin fluids, remember these important points.



Initial Settings

Dispenser settings and dispensing parameters can be entered manually using the keypad and buttons on the front of the Ultimus V dispenser or, alternatively, by using the RS-232 remote communication capability of the dispenser. Refer to “Appendix B — RS-232 Protocol” on page 39 for details.

NOTE: To facilitate setup, begin by setting the language in which data will be displayed. Refer to “Setting Language” on page 22.

The following examples show data being entered manually.

- Press the power switch to turn on the dispenser. The Main screen will be displayed and show all the dispensing parameters. The first time the dispenser is powered up, all settings will be preset to zero.

AI	Auto Increment Function
MEM	Current Memory Address
TIME	Dispensing Time
PRES	Dispensing Pressure
VAC	Vacuum
SHOT	Dispense Counter
Dispensing Status (shown as icons)	



Basic Menu Operation

- From the Main screen, press the F3 (Menu) key to display the first Main Menu screen.
- Use the Up / Down (8 / 2) keys to move through the individual menu items.
- Press the Enter key to display the screen for the highlighted item.
- Use the Up / Down (8 / 2) keys to scroll through and select individual items.
- Press the F2 (Save) key to confirm your selection.
- Use the F1 (Previous) and F2 (Next) keys to display the previous / next menu screen.
- Press the F2 (Home) function key to return to the Main screen.
- If a menu item is locked out via the Operator Lockout screen, that menu item will be blanked out and cannot be selected.

Setting the Real Time Clock

Highlight SET CLOCK on the Main Menu screen, then press the Enter key.

- Press the F3 function key to select 12 hour or 24 hour format, then enter the time.

NOTE: A leading zero must be used as required. For example:

Time	12 hour format	24 hour format
5:30 am	05:30 am	05:30
1:30 pm	01:30 pm	13:30

- If 12 hour format is used, Press 1 for am or 2 for pm after entering the time.
- Press the F2 (Save) key to save this setting.



Setting the Date

- Highlight SET DATE on the Main Menu screen, then press the Enter key.
- Enter the date in MM / DD / YY format.
- Press the F2 (Save) key to save this setting.



Setting Units of Pressure

- Highlight UNITS OF PRESSURE on the Main Menu screen, then press the Enter key.
- Use the Up / Down (8 / 2) keys to select the unit type.
- Press the F2 (Save) key to save this setting.



Setting Units of Vacuum

- Highlight UNITS OF VACUUM on the Main Menu screen, then press the Enter key.
- Use the Up / Down (8 / 2) keys to select the unit type.
- Press the F2 (Save) function key to save this setting.



Setting Language

- From the Main screen, press the F3 (Menu) key to display the Main Menu.
- Press the 2 (Down Arrow) button on the keypad until the desired Language is highlighted, then press the F2 (Save) key to confirm your selection.
- Press the F2 key to return to the Main screen, where data will be displayed in the language you just selected.

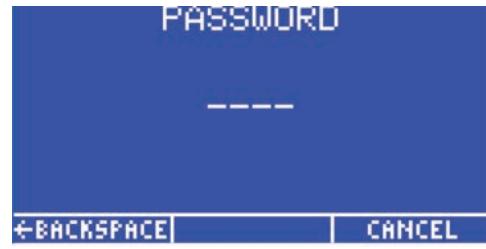


Setting Operator Lockout Parameters

- From the Main screen, Press the F3 (Menu) key to display the Main Menu Screen.
- Use the Up / Down (8 / 2) keys to highlight OPERATOR LOCKOUT, then press the Enter key.
- The Password screen will be displayed.

NOTE: The Ultimus V dispenser is shipped with the password preset to 0000.

Enter the 4-digit security code, then press the Enter key. An incorrect password will clear the digits and redisplay the dashes.



General Operator Lockout Procedures

The following items can be locked out to prevent unauthorized adjustment:

- | | | |
|--------------------|------------------------|-----------------------|
| • Time Setting | • Dispense Mode | • Pressure Units Menu |
| • Pressure Setting | • Auto Increment Mode | • Vacuum Units Menu |
| • Vacuum Setting | • Auto Increment Reset | • Language Menu |
| • Memory Setting | • Alarm Reset | • Set Comm Menu |
| • Deposit Counter | • Main Menu | • Alarms Menu |

NOTES:

- If a square is checked, it means that item has been locked out and the user cannot change or select that item.
- To lock out an item, press the Up / Down (8 / 2) keys to highlight the desired item. Press the Enter key to toggle the lockout setting on and off.
- Press the F3 (Next) key to load the next Operator Lockout screen. Press the F1 (Previous) key to load the previous Operator Lockout screen. When finished, press the F2 (Save) key to save the settings and return to the Main Menu screen.
- It is also possible to lock out the entire Main Menu so that when the user presses the Menu Function key on the Main screen, the Password screen appears first. When the correct password is entered, the Main Menu screen will load.
- When the Time Setting parameter is locked out, the deposit time duration cannot be adjusted and the Teach dispense mode will also be locked out.
- When the F1 (Dispense Mode) key is locked out, the Ultimus will remain in the current Dispense Mode (Timed or Steady) and cannot be changed.
- Locking out the Set Clock item will also lock out the Set Date item.
- The user can be locked out from resetting the dispensing parameters back to the starting address before the Ultimus V reaches the ending address and the final trigger value by checking the Auto Increment Reset option.
- Resetting the Alarms can be locked out. The user will be asked for the password when a latched alarm is being reset.

Setting a New Password

- Highlight Set Password and press the Enter key.
- When the Password screen appears, enter the new password and press the Enter key.
- When the Please Confirm Operation screen appears, press F1 (Yes) to save the new password or F3 (No) to keep the original password.



Clearing a Password

- Pressing and holding the Enter and 1 keys while the Ultimus V is powering up will reset the security password.
- The Please Confirm Operation screen will appear. Pressing the YES function key will reset the password to "0000" (all zeros). Pressing the NO function key will allow the Ultimus V to continue to power up without resetting the password.

Alarm Options Screen

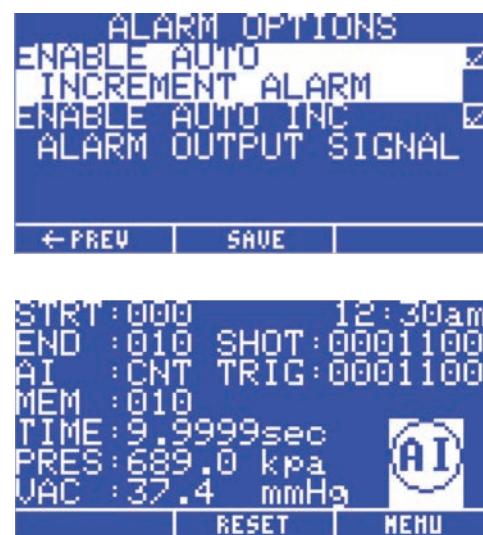
- The Alarm Input Signal is the signal that is sensed on the Alarm Input pins of the digital I/O connector. The dispenser will not allow any dispense cycles to occur when this signal is active. The Alarm Input Signal is enabled when a check mark is shown in the box next to Enable Input Alarm Signal.
- The Alarm Input Signal can trigger the Alarm Output Signal on the Digital I/O connector. A check mark in the box next to Enable Input Alarm Output Signal indicates the Alarm Output Signal is enabled for Input Alarm Signals.
- The Alarm Input Signal can be latched. When an Alarm Input occurs and it is latched, the user must reset the Input Alarm before the dispense cycle can resume.

To reset the Input Alarm, view the main screen and use the Up / Down (8 / 2) and Left / Right (4 / 6) keys to select the Input Alarm. Pressing the F2 (Reset) key will reset the Input Alarm. A check mark in the box next to Enable Input Alarm Latching indicates that the Alarm Input Latch is enabled.



Alarm Options Screen (continued)

- The Pressure Alarm can activate the Alarm Output Signal on the digital I/O connector. A check mark in the box next to Enable Pressure Alarm Output Signal indicates that the Alarm Output signal is enabled for Pressure Alarm signals.
- The Pressure Alarm Signal can be latched. When a Pressure Alarm occurs and it is latched, the user must reset the Alarm before dispense cycles can be resumed. To reset the Pressure Alarm, view the main screen and use the Up / Down (8 / 2) keys and the Left / Right (4 / 6) keys to select the Pressure Alarm. Pressing the F2 (Reset) function key will reset the Pressure Alarm. A check mark in the box next to Enable Pressure Alarm Latching indicates the Pressure Alarm Latch is enabled.
- The Auto Increment Alarm will activate when Auto Increment is active, the memory address is set at the End Address and the dispense count / timer has passed the Trigger value. The Auto Increment Alarm is enabled when a check mark is shown in the box next to Enable Auto Increment Alarm.
- The Auto Increment Alarm can activate the Alarm Output Signal on the digital I/O connector. A check mark in the box next to Enable Auto Inc Alarm Output Signal indicates that the Alarm Output Signal is enabled for Auto Increment Alarms.
- The Auto Increment Alarm is always latched. To reset the Auto Increment Alarm, view the main screen and use the Up / Down (8 / 2) keys and the Left / Right (4 / 6) keys to select the Auto Increment Alarm. The F2 function key will now be labeled "RESET". Pressing the F2 function key will reset the Auto Increment Alarm.



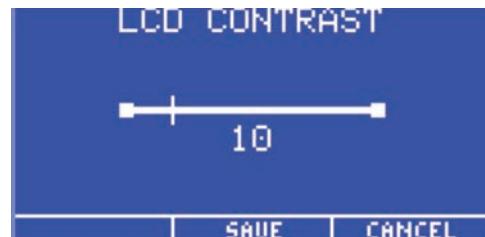
Communications Port Options Screen

- The Comm Port Settings screen allows the user to select which RS-232 port is active. The firmware will not allow both ports to be enabled at the same time.
- Pressing the Enter key when Baud Rate is selected will display the Baud Rate selection screen.
- Pressing the F2 (Save) key will store the communications port settings.



Contrast Control

- The LCD contrast can be adjusted from 0 to 63 levels. As the contrast ratio is adjusted up or down, the LCD will automatically adjust to the new ratio.
- The Easy Adjust buttons {Plus (+) / Minus (-) arrow keys} will increase or decrease the LCD contrast ratio. The F2 (Save) key will store the LCD Contrast settings.



Information Screen

- The information screen displays the SAP part number for the dispenser and the name Ultimus V. The Technical Support phone number and web address are also displayed.
- VER: is the version number of the Main board firmware.



Setting Dispense Time, Pressure, And Vacuum

Shot size is determined by a combination of dispense time, air pressure, vacuum (to prevent dripping when dispensing thin fluids) and tip size.

Selecting a Memory Cell

Memory cells can be selected on the Main screen as follows:

- Use the Up / Down (8 / 2) or Left / Right (4 / 6) keys to highlight the MEM field.
- Press the Enter key, enter the 3-digit cell number (000–399), and press the Enter key again.

OR

- Use the Easy Adjust buttons to increase or decrease the cell number.

NOTE: Changing to a different memory cell will display the dispense time, pressure, vacuum and trigger settings stored in that cell and set the regulator to those pressure and vacuum settings. Any changes to time, pressure or vacuum while in a specific cell will automatically replace the current settings.

Dispense Modes

Timed Mode

This mode is used when the desired dispense time is known.

- Use the Up / Down (8 / 2) or Left / Right (4 / 6) keys to highlight the MEM, TIME, PRES or VAC field.
- Press the F1 key to cycle through the dispensing modes (TIMED -> STEADY -> TEACH -> TIMED) until TIMED is displayed and the TIME field is highlighted.
- Press the Enter key to display the Time entry screen. Enter the dispense time, then press the Enter key to save.

OR

- Use the Easy Adjust buttons to increase or decrease dispense time.

Teach Mode

Teach Mode allows you to set the desired deposit size based on physical observation.

- Press the F1 key until TEACH is displayed, then press the F2 (Reset) key to set dispense time to all zeros.
- Press the foot pedal or the Cycle button until the desired deposit size is achieved, then release the pedal or button. The elapsed dispense time will be displayed in the TIME field.
- Pressing the foot pedal or button again will add to the elapsed dispense time. To reset dispense time and start over, press the F2 (Reset) button.
- Press the F3 key to Save the time setting.

Dispense Modes (continued)

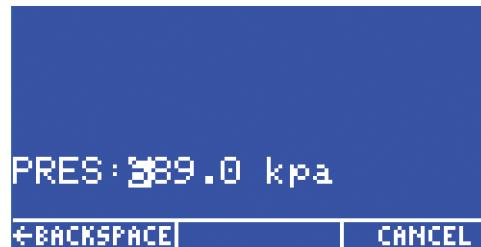
Steady Mode

In Steady mode, the timer is not used. Instead, the unit continues to dispense as long as the foot pedal or Cycle button is pressed.

Setting Pressure

Pressure must be entered using the numeric keypad.

- Use the Up / Down (8 / 2) and Left / Right (4 / 6) keys to highlight the PRES field.
- Press the Enter key, enter the desired pressure, and press the Enter key again to save the setting.



Setting Vacuum

Vacuum must be entered using the numeric keypad.

- Use the Up / Down (8 / 2) and Left / Right (4 / 6) keys to highlight the VAC field.
- Press the Enter key, enter the desired vacuum, and press the Enter key again to save the setting.



Using Auto Increment Mode

The Ultimus V dispenser features an Auto Increment mode that can be set up to automatically adjust dispense time, pressure and vacuum settings when dispensing fluids that change viscosity over time. There are 400 unique memory locations in which different combinations of dispense time, pressure, and vacuum settings can be stored.

Four Auto Increment modes are available:

- **Off.** Auto Increment is not enabled.
- **Dispense Count Mode.** Automatically adjusts settings to compensate for viscosity changes by moving to the next memory cell, based on the number of dispensing cycles.
- **Time Mode.** Automatically adjusts settings to compensate for viscosity changes by moving to the next memory cell, based on the number of seconds that have elapsed.
- **Auto Sequence mode.** Similar to Dispense Count mode except that the memory cell address automatically resets and continues from the start once the end is reached.

To choose an Auto Increment mode:

- Use the Up / Down (8 / 2) and Left / Right (4 / 6) keys to highlight the AI field.
- Pressing the F1 key will cycle through the AI modes. OFF -> COUNT -> TIMED -> SEQUENCE -> OFF.

When Auto Increment mode is enabled in Dispense Count Mode, Time Mode or Auto Sequence Mode, three variables become available on the main LCD screen: Start Address, End Address and Trigger. Each of these variables can be selected and updated either directly with the key pad, or by using the Easy Adjust Increase / Decrease keys. When Auto Increment mode is disabled, the Start Address, End Address and Trigger are not displayed on the LCD.

- **Start Address.** The memory cell address at which Auto Increment mode begins.
- **End Address.** The last memory cell address that will be set before Auto Increment ends.
- **Trigger.** The number of dispensing cycles or the time that elapses before the memory cell address is increased to the next address. Each memory cell has its own trigger value. Therefore, as the memory cell address increases, a new trigger value is loaded for that memory cell. **Any changes to the trigger value while in a specific memory cell will automatically save the trigger value to that memory cell.**

Using Auto Increment Mode (continued)

Dispense Count Mode

Enabling Auto Increment in Dispense Count mode allows the Ultimus V to increase the memory cell address from the Start Address to the End address based on the number of dispense cycles that occur.

The Shot variable on the main screen tracks the number of dispense cycles for the current memory address and resets to zero when the memory cell address advances to the next address.

In Count mode, the Trigger value represents the number of dispense cycles that need to occur before the current memory cell is advanced to the next location. The valid range is 00001 to 99999 dispense cycles. The total dispense cycle count for the unit is saved and will continue to increment while in Auto Increment mode.

Time Mode

Enabling Auto Increment in Time Mode will allow the Ultimus V to increment the memory cell address from the Start Address to the End Address, based on the number of seconds that have elapsed.

When Time mode is selected, the real time clock becomes a counter that counts, in seconds, from 00000 to 99999. The counter resets to all zeros when the memory cell address increments.

In Time mode, the Trigger value represents the amount of time that needs to elapse before the current memory cell is advanced to the next location. The valid range is 00001 to 99999 seconds.

Auto Sequence Mode

Enabling Auto Increment in Auto Sequence mode allows the Ultimus V to increase the memory cell address from the Start Address to the End address based on the number of dispense cycles that occur.

The Shot variable on the main screen tracks the number of dispense cycles for the current memory address and resets to zero when the memory cell address advances to the next address.

As in Count mode, the Trigger value represents the number of dispense cycles that need to occur before the current memory cell is advanced to the next location. The valid range is 00001 to 99999 dispense cycles. The total dispense cycle count for the unit is saved and will continue to increment while in Auto sequence mode.

Once the trigger value is reached for the End address, the Ultimus V will automatically reset the memory cell address back to the Start address and continue increasing the memory cell address as before. The auto increment alarm will not be set in this mode.

Using Auto Increment Mode (continued)

Sample Memory Cell Settings

NOTES:

- When dispensing fluids that change viscosity, it is generally better to set Auto Increment to Time instead of Count.
- Within the individual memory cells, it is preferable to leave the dispense time the same, and only change the pressure from cell to cell in order to maintain the same cycle rate.
- It is recommended to use small pressure adjustments or allow some settling time to ensure consistent deposit amounts.

Cell 0 — Set initial parameters to produce the desired dot size. For example: 20 psi pressure, 0.150 seconds dispense time, 0 vacuum. Set the trigger value to 900 (15 minutes).

Cell 1 — Increase pressure to 23 psi, keep 0.150 seconds dispense time, 0 vacuum. Set the trigger value to 900 (15 minutes).

Cell 2 — Increase pressure to 27 psi, keep 0.150 seconds dispense time, 0 vacuum. Set the trigger value to 900 (15 minutes).

Cell 3 — Increase pressure to 32 psi, keep 0.150 seconds dispense time, 0 vacuum. Decrease the trigger value to 540 (9 minutes).

Cell 4 — Increase pressure to 37 psi, keep 0.150 seconds dispense time, 0 vacuum. Set the trigger value to 540 (9 minutes).

Cell 5 — Increase pressure to 45 psi, keep 0.150 seconds dispense time, 0 vacuum. Set the trigger value to 540 (9 minutes).

Cell 6 — Increase pressure to 55 psi, keep 0.150 seconds dispense time, 0 vacuum. Decrease the trigger value to 360 (6 minutes).

Cell 7 — Increase pressure to 65 psi, keep 0.150 seconds dispense time, 0 vacuum. Decrease the trigger value to 180 (3 minutes).

Cell 8 — (last cell) — Increase pressure to 80 psi, keep 0.150 dispense time, 0 vacuum. Decrease the trigger value to 120 (2 minutes).

If the Auto Increment Alarm is enabled in the Alarm Options screen, the Auto Increment alarm will engage and further dispensing cycles will be stopped. If the Auto Increment Alarm is disabled, the timer will continue to increment and dispense cycles will still be allowed — however, the memory cell address will no longer advance, and will remain at the End Address settings.

NOTES:

- Setting the parameters in the cells needs to be done only one time. When the material reaches the end of its working life, simply replace it with a full syringe and use the same preset parameters.
- To start over, highlight AI, then press F2 (Reset). If the AI Alarm is used, resetting the alarm will also reset the AI mode.

Part Numbers

NOTE: Power cords are purchased separately.

Part #	Description
7012590	Ultimus V dispenser, 0-100 psi (0-7 bar)
7012589	Ultimus V dispenser, calibrated*, 0-100 psi (0-7 bar) *Calibrated to EFD specifications based on NIST standards.
7014871	Kit, power cord, American plug
7014872	Kit, power cord, European plug

Accessories

See the Dispenser Accessories data sheet for a complete list of optional accessories that will maximize the performance of your dispenser. Visit www.nordsonfd.com/DispenserAccessories for details.

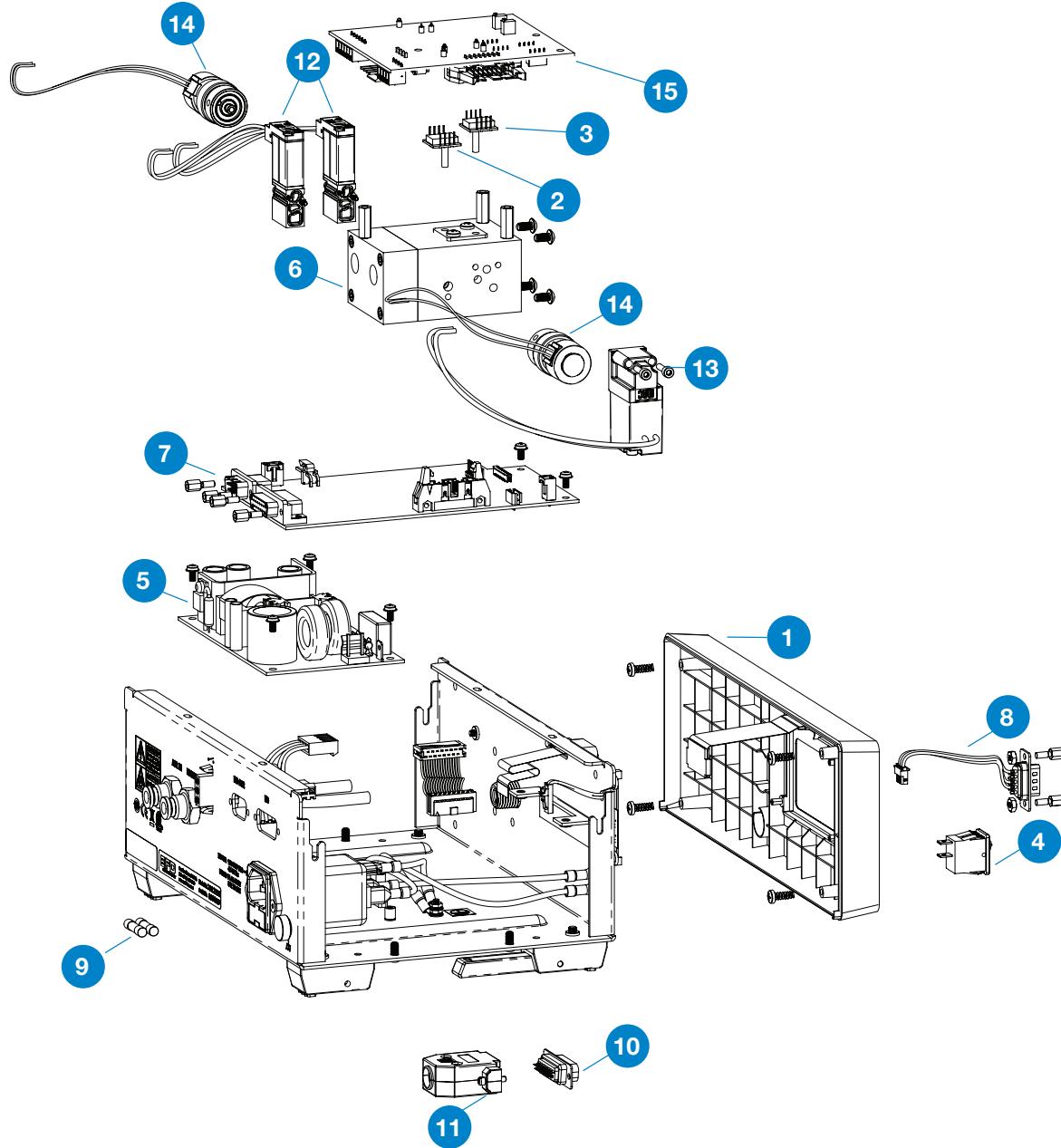
Replacement Parts

Ultimus V

1	Bezel and Overlay Ultimus V	—
2	High Pressure Transducer Ultimus V	7014545
3	Low Pressure Transducer Ultimus V	7014546
4	Power Switch Ultimus V	7014547
5	Power Supply Ultimus V	—
6	Base Manifold Ultimus V	—
7	Main PC Board Ultimus V	—
8	Cable Front RS-232 Ultimus V	—
9	Ultra 2800 Replacement Fuses	7017255
10	Connector Ultimus V I/O 15pos D-Sub	7014553
11	Backshell Ultimus V I/O 15 Pos D-Sub	—
12	Fill Valve Ultimus V	7014555
13	Dispense Valve Ultimus V	—
14	Proportional Valve Ultimus V	—
15	PCB control Ultimus V	—

Replacement Parts (continued)

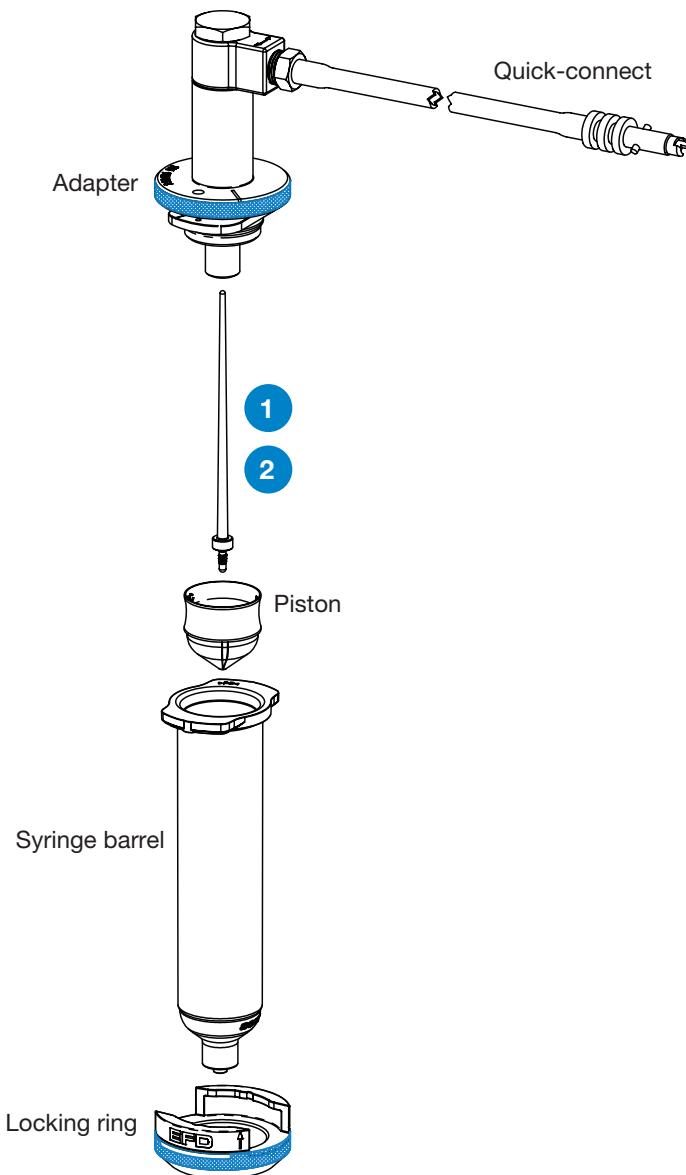
Ultimus V (continued)



Replacement Parts (continued)

Optimeter

1	Pin Optimeter 10cc Std 5 Pack	7014561
2	Pin Optimeter 30cc Std 5 Pack	7014562



Appendix A – I/O Connector Pin Descriptions

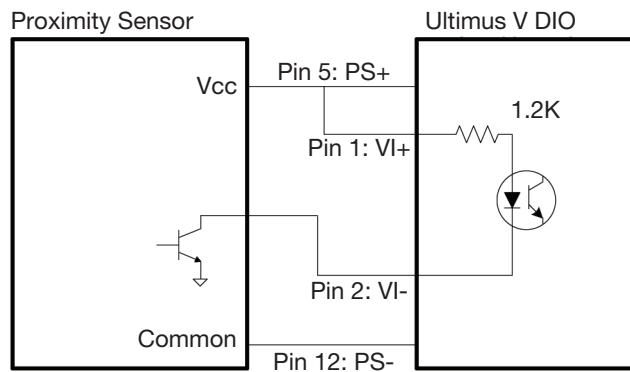
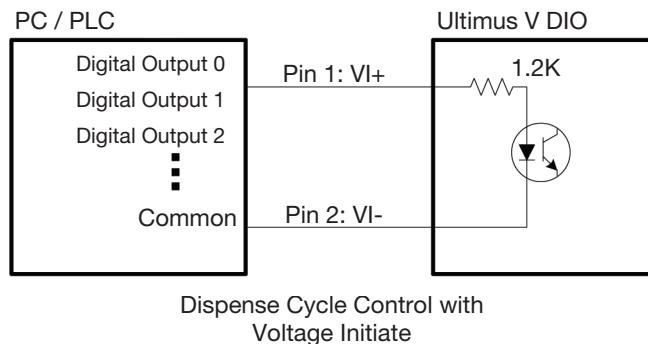
Pin 1: VI+

Voltage Initiate+: This pin is the positive side of a Voltage Initiate signal.

Pin 2: VI-

Voltage Initiate-: This pin is the return of the Voltage Initiate signal.

The Voltage Initiate signal will trigger a dispense cycle when a 5 to 24 VDC signal appears across these pins. An internal 1.2K resistor will limit the Voltage Initiate signal current to 20 mA or less. The signal can be momentary (no less than 10ms) or maintained. A new dispense cycle will begin once the 5 to 24 VDC signal is removed and then applied again.



Pin 3: EOCF+

End of Cycle Feedback+: This is the positive input signal for the End of Cycle Feedback solid state switch.

Appendix A – I/O Connector Pin Descriptions (continued)

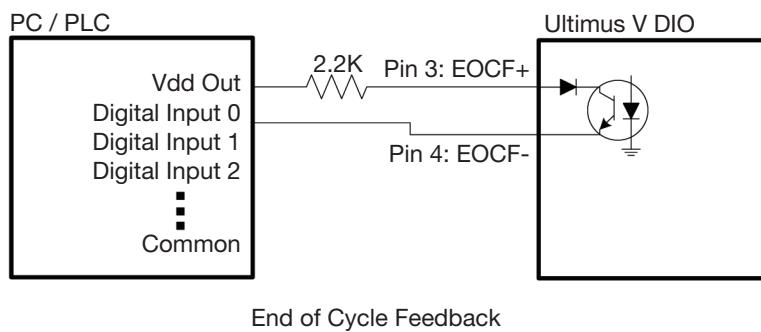
Pin 4: EOCF-

End of Cycle Feedback–: This signal is the output of a solid state switch.

Upon completion of a dispense cycle, a solid state switch closes and remains closed until the next dispense cycle. The End Of Cycle Feedback circuit can be used to signal back to a host computer, start another device in sequence or initiate other operations that need to be tied into the completion of the dispense cycle.

The circuit is designed to operate between 5 to 24 VDC with a 100 mA maximum current.

NOTE: A resistor should be placed between the external power source and the EOCF+ pin to limit the current through the EOCF circuit to less than 100 mA.

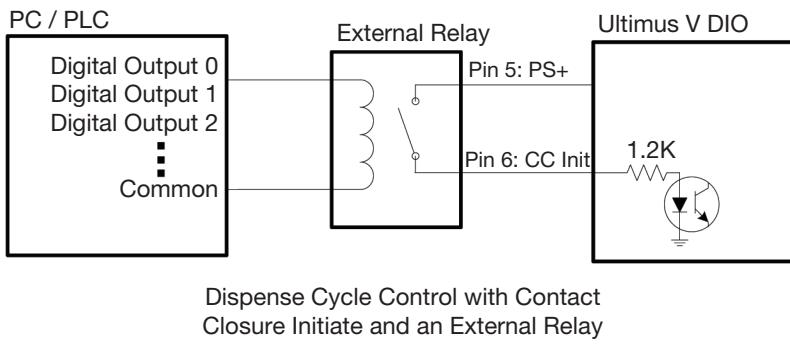


Pin 5: PS+

24 VDC Power Supply+: This pin will provide 24 VDC, 100 mA power to an external load.

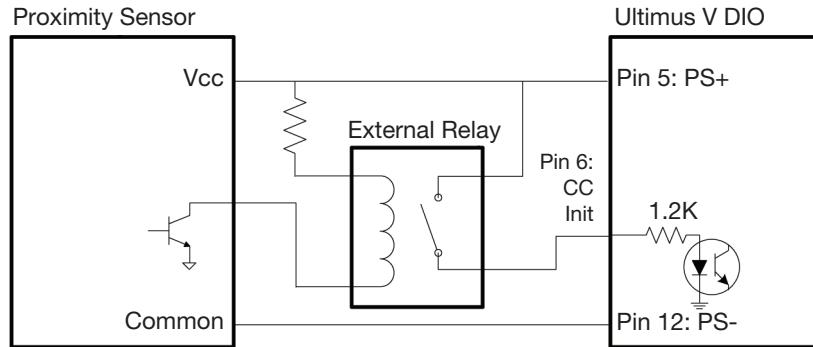
Pin 6: CC Init

Contact Closure Initialization: This pin senses a relay or switch closure. Once a closure is sensed, the dispenser initiates a dispense cycle depending on the operating mode. An internal 1.2K resistor will limit the Contact Closure Initiate signal current to 20 mA or less. The contact closure can be momentary or maintained in a steady mode. A new cycle can be initiated by opening and then closing the contact again.



Appendix A – I/O Connector Pin Descriptions (continued)

Pin 6: CC Init (continued)



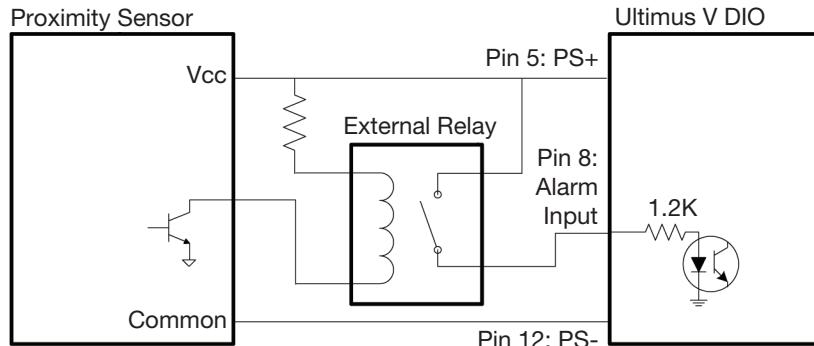
Dispense Cycle Control with Contact Closure Initiate,
NPN Proximity Sensor, and an External Relay

Pin 7: PS+

24 VDC Power Supply+: This pin will provide 24 VDC, 100 mA power to an external load.

Pin 8: Alarm In

Alarm Input: This pin senses a relay or switch closure. Once a closure is sensed, the dispenser will display the Input Alarm Indicator and prevent any further dispense cycles from initializing. An internal 1.2K resistor will limit the Alarm Input signal current to 20 mA or less. This signal can be disabled in the Alarm Options LCD screen.



Alarm Input, NPN Proximity Sensor,
and an External Relay

Pin 9: Alarm Out+

Alarm Output+: This is the positive input signal for the Alarm Output solid state switch.

Appendix A – I/O Connector Pin Descriptions (continued)

Pin 10: Alarm Out–

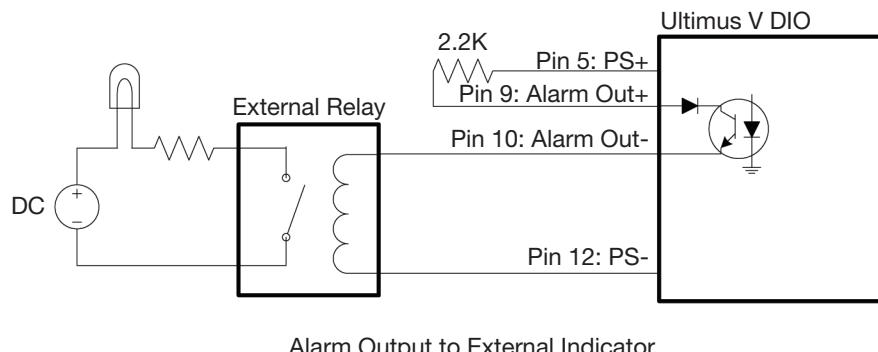
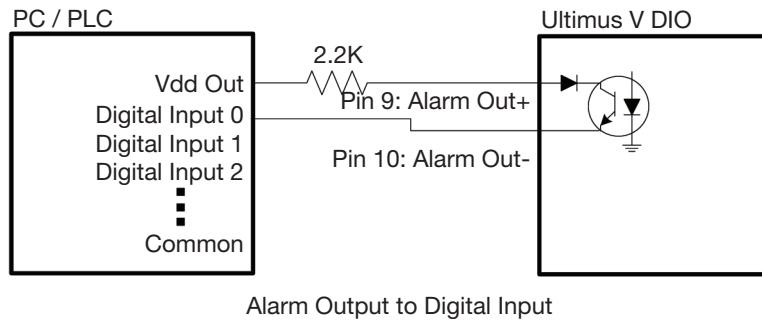
Alarm Output–: This signal is the output of a solid state switch.

The Alarm Out signal is connected by a solid state switch. When an alarm condition occurs, the dispenser closes the solid state switch, shorting out the Alarm Out pins.

The Alarm Out signal can be activated by the Input Alarm, Pressure Alarm or Auto Increment Alarm. The Alarm Options LCD screen is used to allow or disallow any of the alarm conditions from activating the Alarm Out signal.

The circuit is designed to operate between 5 to 24 VDC with a 100 mA maximum current.

NOTE: A resistor should be placed between the external power source and the Alarm Out+ pin to limit the current through the Alarm Output circuit to less than 100 mA.



Pin 11: PS+

24 VDC Power Supply+: This pin will provide 24 VDC, 100 mA power to an external load.

Pin 12 to Pin 15: PS-

24 VDC Power Supply–: These pins are the 24 VDC power supply reference and return pins.

Appendix B – RS-232 Protocol

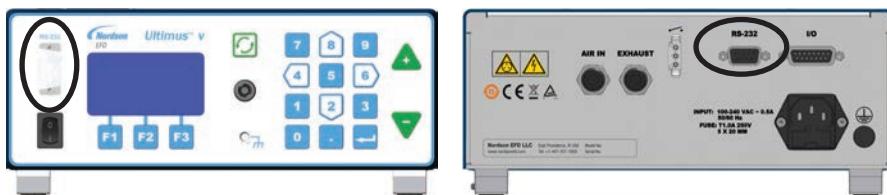
NOTE: This appendix is provided only in English.

You can control the dispenser remotely through a programmable logic controller (PLC) or personal computer (PC) by connecting to the RS-232 port located on the front or back of the dispenser.

You can also use the Ultimus V Interactive software or the National Instruments LabVIEW™ software to view or change the Ultimus V dispenser settings. Information for using the Ultimus V Interactive software and a LabVIEW driver and sample program are included in this appendix.

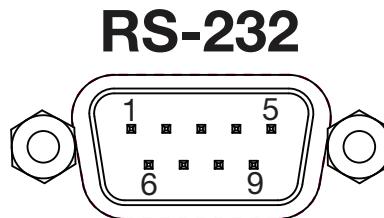
1. Physical Connection

Use the RS-232 port located on the front or back of the dispenser to connect the dispenser to a PLC or PC. Ensure that the port you use is also enabled in the dispenser settings. Refer to “Communications Port Options Screen” on page 26 for details.



1.1 RS-232 Pin Assignments

Pin	Description
Pin 2: RS-232_TX	The RS-232 TX pin transmits data from the dispenser to an external communication device. The external communication device should connect this pin to its RS-232 RX pin.
Pin 3: RS-232_RX	The RS-232 RX pin receives data from the external communication device into the dispenser. The external communication device should connect this pin to its RS-232 TX pin.
Pin 5	Common Ground



Appendix B – RS-232 Protocol (continued)

1.2 Connection Examples

The following examples show how to connect using a PC / laptop without a built-in RS-232 COM port.

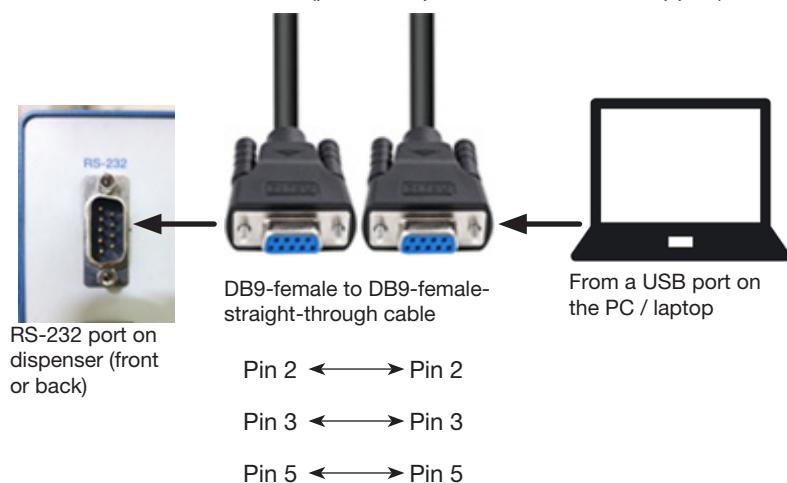
1.2.1 Using a USB-to-RS-232 Converter

Most standard USB-to-RS-232 converters come with a DB-9 male-type connector. Because the connector on the dispenser is also a DB-9 male-type connector, you can use a DB-9 female-to-female adapter (gender changer) to make the RS-232 connection.



1.2.2 Using a DB9-Female to DB9-Female-Straight-Through Cable

NOTE: A null modem cable (pin 2 and pin 3 connections swapped) will NOT work with the Ultimus V dispenser.



Appendix B – RS-232 Protocol (continued)

2. RS-232 Protocol

The RS-232 protocol for the Ultimus V dispenser is RS-232C standard. The dispenser acts as a terminal to the remote PC / PLC, referred to as the Client.

2.1 Communication Specifications

The Ultimus V dispenser communicates using the following settings:

- Synchronous Mode: Half Duplex
- Baud Rates: 9600, 19200, 38400, 115200 (default)

NOTE: Baud Rate is selectable through the Comm Port Settings menu. Refer to “Communications Port Options Screen” on page 26 for more information.

- Start Bit: 1
- Data Length: 8 bit (ASCII)
- Parity Bit: None
- Stop Bit: 1

Appendix B – RS-232 Protocol (continued)

2.2 Data Encoding

RS-232 communication is accomplished by using text packets that include one or more elements. All text packets passed between the Ultimus V dispenser and the client (PC / PLC) are encoded in ASCII.

The ASCII control characters shown below are used to synchronize communication between the dispenser and the client. These ASCII control characters must be sent as a single byte (their hexadecimal value) — not as the their text abbreviations.

CORRECT: ENQ is sent from the client as a control character using its hexadecimal (hex) value of 0x05 [Dec (Decimal) 5], **not** as the text characters “E,” “N,” and “Q.”

INCORRECT: The client sends “E,” “N,” and “Q” as text characters, which means the dispenser will **not** respond.

The following ASCII control characters are used as part of the communication protocol:

Name	Abbreviation	Binary	Dec	Hex	Caret Notation (see NOTE)
Start of Text	STX	0000 0010	2	0x02	^B
End of Text	ETX	0000 0011	3	0x03	^C
End of Transmission	EOT	0000 0100	4	0x04	^D
Enquiry	ENQ	0000 0101	5	0x05	^E
Acknowledgment	ACK	0000 0110	6	0x06	^F
Negative Acknowledgment	NAK	0001 0101	21	0x15	^U
Space	–	0010 0000	32	0x20	[space bar]
Zero	0	0011 0000	48	0x30	0
...
Nine	9	0011 1001	57	0x39	9
A	A	0100 0001	65	0x41	A
...
Z	Z	0101 1010	90	0x5A	Z

NOTE: The caret notation is sometimes used to display the control characters, which are normally not visible. Additionally, many terminals allow typing of control characters by holding down the Ctrl key and pressing the corresponding caret notation key.

EXAMPLE: To send the ENQ control character, press Ctrl+E.

Appendix B – RS-232 Protocol (continued)

2.3 Text Packet Format

Each text packet contains the following information and is structured as shown below:

[STX] [No. Bytes] [Command] [Data] [Checksum] [ETX]

NOTE: EOT (0x04), ENQ (0x05), ACK (0x06), and NAK (0x15), and are single-byte control characters, with nothing else added to them.

2.3.1 STX

Every text packet begins with this Start of Text control character (hexadecimal 0x02 or CTRL+B), except as noted below.

NOTE: The Start of Text control character (STX / 0x02) is **not** added when sending ENQ (0x05), ACK (0x06), EOT (0x04), or NAK (0x15) because these are single-byte control characters, not text.

2.3.2 No. Bytes

The No. Bytes (Number of Bytes) part of the text packet is the number of characters in the Command and Data parts of the packet. This value is expressed as a 2-digit hexadecimal with its characters encoded as ASCII.

EXAMPLES:

- If Command is four characters and Data is six characters, the No. Bytes decimal value is 10. In the text packet, No. Bytes will be 0x0A in hexadecimal, so the ASCII character value for No. Bytes will be 0A. This is encoded in ASCII as 0x30, 0x41.
- If the number of Command plus Data characters is 16, No. Bytes will be 0x10 in hexadecimal, so the ASCII character value for No. Bytes will be 10, which is encoded as 0x31, 0x30.

2.3.3 Command

The Command part of the text packet is next. The list of available Commands is contained in “RS-232 Commands” on page 50. A Command is up to four characters long. If a Command does not contain four characters, the remaining characters must be the ASCII space character (0x20). The Command is transmitted as ASCII characters.

2.3.4 Data

The Data part of the text packet is after the Command. The Data part can be from 0 to 251 characters long, depending on the Command. The Data part is transmitted as ASCII characters, typically a decimal representation of a number.

Appendix B – RS-232 Protocol (continued)

2.3.5 Checksum

The Checksum is the next part of the text packet. The Checksum is a form of error checking for the text packet. The Checksum is calculated by subtracting the actual value of each ASCII byte (e.g., “2” in ASCII is 0x32 in hex, 48 in decimal) from Zero (0x00). The resulting negative value’s least significant byte is the Checksum value.

Each byte (ASCII character) starting with No. Bytes (2.3.2) through Data (2.3.4) is used to calculate the Checksum. Converting the least significant byte (2 digits in hex) to ASCII characters and appending them to the rest of the text packet provides the Checksum value. If the Checksum is incorrectly calculated / transmitted with the text packet, the dispenser responds with a Failure Command (A2) text packet.

The Checksum can also be understood as:

$$\text{Checksum} = 0 - (\text{Byte 1 of No. Bytes} + \text{Byte 2 of No. Bytes} + \text{Command/Data byte[1]} + \text{Command/Data byte[2]} + \text{Command/Data byte[3]} + \dots + \text{Command/Data byte[n]})$$

Where “n” = the number of bytes

An example of the Checksum calculation is shown in 2.3.7.

2.3.6 ETX

The final part of the text packet is the End of Text control character (hexadecimal 0x03 or CTRL+C), except as noted below.

NOTE: The End of Text control character (ETX / 0x03) is **not** added when sending ENQ (0x05), ACK (0x06), NAK (0x15), or EOT (0x04), because these are single-byte control characters, not text.

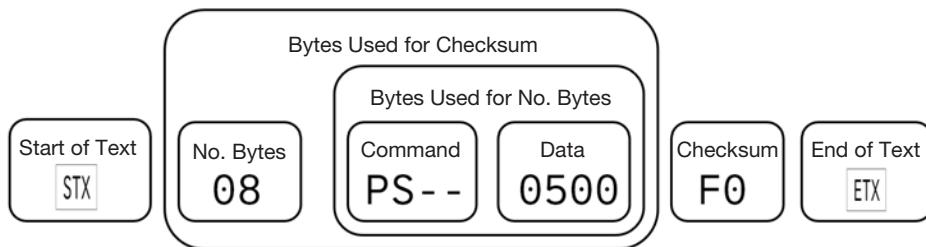
Appendix B – RS-232 Protocol (continued)

2.3.7 Text Packet Example

The following is a visual example of a text packet. This example uses the Pressure Set Command (PS--0500) to send a 50.0 psi value to the dispenser.

NOTE: The two hyphens (--) in the Pressure Set Command are used to denote two spaces (hex 0x20).

The text packet:



The text packet in hexadecimal format:

Bytes used to calculate the Checksum												Checksum appended		
STX	0	8	P	S	space	space	0	5	0	0	F	0	ETX	
0x02	0x30	0x38	0x50	0x53	0x20	0x20	0x30	0x35	0x30	0x30	0x46	0x30	0x03	

Checksum calculation example based on the above text packet:

$$\begin{aligned}
 0 &- 0x30 - 0x38 - 0x50 - 0x53 - 0x20 - 0x20 - 0x30 - 0x35 - 0x30 - 0x30 \\
 &= 0xFDF0
 \end{aligned}$$

The least significant byte of the above value is F0, so this value is appended to the text packet after the Data bytes. The End of Text control character (ETX / 0x03) is appended.

Appendix B – RS-232 Protocol (continued)

2.4 Communication Sequence

The dispenser uses two communication sequences: Write (2.4.1) and Read (2.4.2).

2.4.1 Write Text Packets

Write text packets are used when the client (PLC / PC) sets a parameter on the dispenser, but does not require feedback data.

NOTE: Refer to “Diagram of Write Text Packet Communication between the Client and Dispenser” on page 47 for a visual representation of the Write sequence.

The Write text packet sequence is as follows:

1. The client transmits an Enquiry (ENQ / 0x05) to the dispenser.
2. When the dispenser receives the Enquiry (ENQ / 0x05), the dispenser transmits an acknowledgment (ACK / 0x06) back to the client.
3. When the client receives the acknowledgment (ACK / 0x06), the client must send the Write text packet within 2 seconds to avoid a communication timeout.

EXAMPLE: (STX) + 08 + PS-- + 0500 + F0 + (ETX)

[In this example, the hyphens (--) represent ASCII space values (hexadecimal 0x20).]

In the above text packet, the Checksum is F0. The Checksum calculation method is explained in 2.3.5.

NOTE: The plus signs (+) are present only to show how each character is appended to form the example text packet; they are not part of the transmitted data. The parentheses are present only to indicate a single-byte control character, and are also not part of the transmitted data.

The above text packet in hexadecimal format is shown below:

STX	0	8	P	S	space	space	0	5	0	0	F	0	ETX
0x02	0x30	0x38	0x50	0x53	0x20	0x20	0x30	0x35	0x30	0x30	0x46	0x30	0x03

4. When the dispenser receives the text packet and successfully executes it, the dispenser transmits a Success Command (A0) text packet to the client.

EXAMPLE: (STX) + 02 + A0 + 2D + (ETX)

In the above text packet, the Checksum is 2D. The Checksum calculation method is explained in 2.3.5.

NOTE: The plus signs (+) are present only to show how each character is appended to form the example text packet; they are not part of the transmitted data. The parentheses are present only to indicate a single-byte control character, and are also not part of the transmitted data.

The above text packet in hexadecimal format is shown below:

STX	0	2	A	0	2	D	ETX
0x02	0x30	0x32	0x41	0x30	0x32	0x44	0x03

Appendix B – RS-232 Protocol (continued)

2.4.1 Write Text Packets (continued)

If there is an error in the text packet, if it cannot be executed, or if the transmission was interrupted and timed out (if the client takes more than 2 seconds to send a text packet), the dispenser transmits a Failure Command (A2) text packet. Refer to “2.5 Communication Timeout” on page 50 for details.

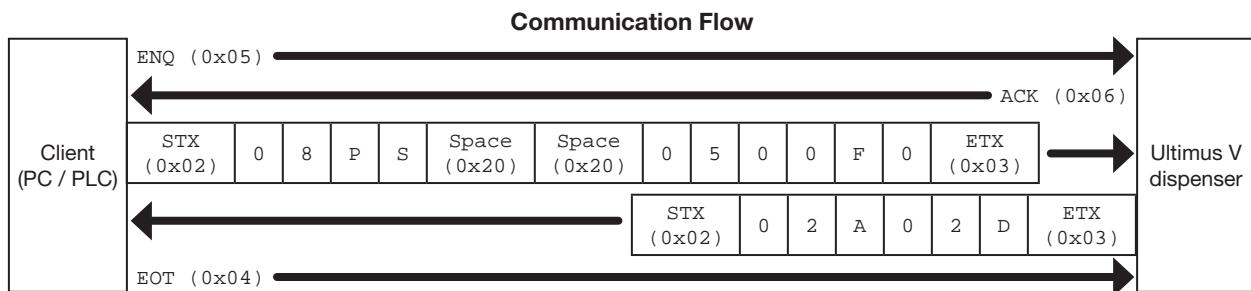
EXAMPLE: (STX) + 02 + A2 + 2B + (ETX)

The above text packet in hexadecimal format is shown below:

STX	0	2	A	2	2	B	ETX
0x02	0x30	0x32	0x41	0x32	0x32	0x42	0x03

If the client receives an Failure Command (A2) text packet, the client can either transmit another text packet or the client can transmit an End of Text (EOT / 0x04) command to end the sequence.

Diagram of Write Text Packet Communication between the Client and Dispenser



NOTES:

- The STX (0x02) and ETX (0x03) control characters are **not** added when sending ENQ (0x05), ACK (0x06), NAK (0x15), or EOT (0x04). These are stand-alone / single-byte control characters.
- Communication Timeout:** The client sends an Enquiry (ENQ / 0x05) to the dispenser and receives an acknowledgment (ACK / 0x06) in response. The next text packet (such as the PS--0500 text packet shown previously) must be sent by the client within 2 seconds, otherwise the dispenser enters a Communication Timeout state and responds with an Failure Command (A2) text packet.

Appendix B – RS-232 Protocol (continued)

2.4.2 Read Text Packets

When a Read text packet is sent, the dispenser sends the requested data back to the client.

NOTE: Refer to “Diagram of Read Text Packet Communication between the Client and Dispenser” on page 49 for a visual representation of the Write command sequence.

The Read text packet sequence is as follows:

5. The client transmits an Enquiry (ENQ / 0x05) to the dispenser.
6. When the dispenser receives the Enquiry (ENQ / 0x05), the dispenser transmits an acknowledgment (ACK / 0x06) back to the client.
7. When the client receives the acknowledgment (ACK / 0x06), the client must send the Read text packet within 2 seconds to avoid a communication timeout.

EXAMPLE: (STX) + 04 + UA-- + C6 + (ETX)

[In this example, the hyphen (-) represents an ASCII space value (Hex 0x20).]

NOTE: The plus signs (+) are present only to show how each character is appended to form the example text packet; they are not part of the transmitted data. The parentheses are present only to indicate a single-byte control character, and are also not part of the transmitted data.

The above text packet in hexadecimal format is shown below:

STX	0	4	U	A	space	space	C	6	ETX
0x02	0x30	0x34	0x55	0x41	0x20	0x20	0x43	0x36	0x03

8. When the dispenser receives the text packet, the dispenser transmits a Success Command (A0) text packet to the client.

EXAMPLE: (STX) + 02 + A0 + 2D + (ETX)

In the above text packet, the Checksum is 2D. The Checksum calculation method is explained in 2.3.5.

NOTE: The plus signs (+) are present only to show how each character is appended to form the example text packet; they are not part of the transmitted data. The parentheses are present only to indicate a single-byte control character, and are also not part of the transmitted data.

The above text packet in hexadecimal format is shown below:

STX	0	2	A	0	2	D	ETX
0x02	0x30	0x32	0x41	0x30	0x32	0x44	0x03

If there is an error in the text packet, if it cannot be executed, or if the transmission was interrupted and timed out (if the client takes more than 2 seconds to send a text packet), the dispenser transmits a Failure Command (A2) text packet. Refer to “2.5 Communication Timeout” on page 50 for details.

EXAMPLE: (STX) + 02 + A2 + 2B + (ETX)

The above text packet in hexadecimal format is shown below:

STX	0	2	A	2	2	B	ETX
0x02	0x30	0x32	0x41	0x32	0x32	0x42	0x03

Appendix B – RS-232 Protocol (continued)

2.4.2 Read Text Packets (continued)

9. If the client receives a Success Command (A0) text packet, the client returns an acknowledgment (ACK / 0x06) to indicate that it is ready to receive data. If the client receives a Failure Command (A2) text packet, the client must restart the communication process by sending an Enquiry (ENQ / 0x05) to the dispenser.
10. When the acknowledgment (ACK / 0x06) from the client is received, the dispenser sends a text packet that contains the data requested by the client.

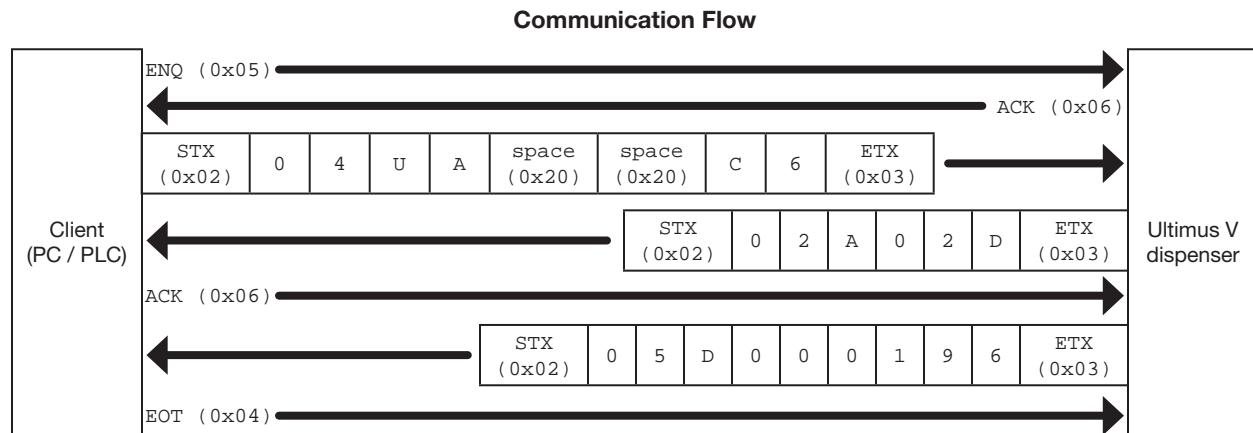
EXAMPLE: (STX) + 05 + D0 + 001 + 96 + (ETX)

The above text packet in hexadecimal format is shown below:

STX	0	5	D	0	0	0	1	9	6	ETX
0x02	0x30	0x35	0x44	0x30	0x30	0x30	0x31	0x39	0x36	0x03

11. When the client receives the text packet, the client can either transmit another text packet or the client can transmit End of Text (EOT / 0x04) to end the sequence.

Diagram of Read Text Packet Communication between the Client and Dispenser



NOTES:

- The STX (0x02) and ETX (0x03) control characters are **not** added when sending ENQ (0x05), ACK (0x06), NAK (0x15), or EOT (0x04). These are stand-alone / single-byte control characters.
- **Communication Timeout:** The client sends an Enquiry (ENQ / 0x05) to the dispenser and receives an acknowledgment (ACK / 0x06) in response. The next text packet (such as the UA-- text packet shown previously) must be sent by the client within 2 seconds, otherwise the dispenser enters a Communication Timeout state and responds with a Failure Command (A2) text packet.

Appendix B – RS-232 Protocol (continued)

2.5 Communication Timeout

To ensure that RS-232 packets do not compromise the operation of the LCD display, the Ultimus V dispenser has a Communication Timeout safeguard. As soon as the dispenser receives an Enquiry (ENQ / 0x05) from the client, it responds with an acknowledgment (ACK / 0x06). The dispenser enters a communication-hold state and awaits the next text packet(s). If no text packet is received within 2 seconds, the dispenser sends a Failure Command (A2) text packet to the client and removes the communication hold. Any characters received by the dispenser will reset the timeout. When a failure occurs, the client must restart the communication sequence by (1) sending an End of Text (EOT / 0x04) and then (2) starting a new Write or Read sequence by sending an Enquiry (ENQ / 0x05).

2.6 RS-232 Commands

This section contains the RS-232 commands for the Ultimus V dispenser. Each sub-section includes a brief description of the command, the command format with the text packet data attached to the command, and, if necessary, the format of the return command along with its attached data.

These commands are contained in the Command part of the text packet, shown below:

[STX] [No. Bytes] [Command] [Data] [Checksum] [ETX]

NOTE: A hyphen (-) represents an ASCII space value (hex 0x20).

2.6.1 Response Commands

These commands are used to communicate command success or failure between the client and the dispenser.

2.6.1.1 Success Command (A0)

This command is sent when a command is successfully executed.

Text packet structure: (STX) + 02 + A0 + 2D + (ETX)

The above text packet in hexadecimal format:

STX	0	2	A	0	2	D	ETX
0x02	0x30	0x32	0x41	0x30	0x32	0x44	0x03

2.6.1.2 Failure Command (A2)

This command is sent if a command fails to execute. This can be caused by an error in the text packet or if the transmission was interrupted and timed out (if the client takes more than 2 seconds to send a text packet),

Text packet structure: (STX) + 02 + A2 + 2B + (ETX)

The above text packet in hexadecimal format:

STX	0	2	A	2	2	B	ETX
0x02	0x30	0x32	0x41	0x32	0x32	0x42	0x03

Appendix B – RS-232 Protocol (continued)

2.6.2 Write Commands

These commands are sent by the client (PC / PLC) to the dispenser to change specific parameters or settings on the dispenser. Write commands are sent using the sequence explained in “2.4.1 Write Text Packets” on page 46.

NOTE: The two hyphens (--) shown in the commands represent ASCII space values (hex 0x20).

2.6.2.1 Memory Change Command

This command changes the selected memory location of the dispenser. The LCD screen will update to the new memory location, including updating the dispense time, pressure, and vacuum parameters.

Client command and data: CH--ccc

ccc: The 3-digit memory location from 0–399. The dispenser will automatically limit the value to prevent any errors.

EXAMPLE: To change the Memory Location to 001, the text packet is:

(STX) + 07 + CH-- + 001 + 3D + (ETX)

The above text packet in hexadecimal format:

STX	0	7	C	H	Space	Space	0	0	1	3	D	ETX
0x02	0x30	0x37	0x43	0x48	0x20	0x20	0x30	0x30	0x31	0x33	0x44	0x03

2.6.2.2 Timed Mode Command

This command switches the dispenser to the Timed mode.

Client command and data: (STX) + 04 + TT-- + B4 + (ETX)

The above text packet in hexadecimal format:

STX	0	4	T	T	Space	Space	B	4	ETX
0x02	0x30	0x34	0x54	0x54	0x20	0x20	0x42	0x34	0x03

2.6.2.3 Steady Mode Command

This command switches the dispenser to the Steady mode.

Client command and data: (STX) + 04 + MT-- + BB + (ETX)

The above text packet in hexadecimal format:

STX	0	4	M	T	Space	Space	B	B	ETX
0x02	0x30	0x34	0x4D	0x54	0x20	0x20	0x42	0x42	0x03

2.6.2.4 Time / Steady Toggle Command

This command toggles the dispenser between Timed mode and Steady mode.

Client command and data: (STX) + 04 + TM-- + BB + (ETX)

The above text packet in hexadecimal format:

STX	0	4	T	M	Space	Space	B	B	ETX
0x02	0x30	0x34	0x54	0x4D	0x20	0x20	0x42	0x42	0x03

Appendix B – RS-232 Protocol (continued)

2.6.2.5 Pressure Set Command

This command updates the pressure value in the current memory location

Client command and data: PS--pppp

pppp: The 4-digit pressure setting excluding the decimal point. This is a unitless value. The valid pressure ranges and decimal point are determined by the pressure units currently selected in the dispenser.

Values to use in the command:

Pressure Unit	Pressure Setting Required	Value to Send in the Command (pppp)
psi	0.0–100.0 psi	0000–1000
kPa	0.0–689.5 kPa	0000–6895
Bar	0.000–6.895 bar	0000–6895

EXAMPLE: If the units of pressure are set to psi and you want to change the pressure setpoint to 50.0 psi, the text packet is: (STX) + 08 + PS-- + 0500 + F0 + (ETX)

The above text packet in hexadecimal format:

STX	0	8	P	S	space	space	0	5	0	0	F	0	ETX
0x02	0x30	0x38	0x50	0x53	0x20	0x20	0x30	0x35	0x30	0x30	0x66	0x30	0x03

2.6.2.6 Memory-Pressure Set Command

This command updates the pressure value in the memory location specified in the command. This command also updates the LCD screen to the specified memory location.

Client command and data: PH--CHcccPpppp

ccc: The 3-digit memory location from 0–399. The dispenser will automatically limit the value to prevent any errors.

pppp: The 4-digit pressure setting, excluding the decimal point. This is a unitless value. The valid pressure ranges and decimal point are determined by the pressure units currently selected in the dispenser.

Values to use in the command:

Pressure Unit	Pressure Setting Required	Value to Send in the Command (pppp)
psi	0.0–100.0 psi	0000–1000
kPa	0.0–689.5 kPa	0000–6895
Bar	0.000–6.895 bar	0000–6895

EXAMPLE: If the units of pressure are set to psi, the required memory location is 2, and the required pressure setpoint is 30.0 psi, the text packet is: (STX) + 0E + PH-- + CH002P0300 + 83 + (ETX)

Length of this text packet: Decimal 14 or hexadecimal 0x0E

The above text packet in hexadecimal format:

STX	0	E	P	H	space	space	C	H	0	0	2
0x02	0x30	0x45	0x50	0x48	0x20	0x20	0x43	0x48	0x30	0x30	0x32
P											
0x50	0x30	0x33	0x30	0x30	0x38	0x33	0x03				

Appendix B – RS-232 Protocol (continued)

2.6.2.7 Vacuum Set Command

This command updates the vacuum value in the current memory location.

Client command and data: VS--vvvv

vvvv: The 4-digit vacuum, setting excluding the decimal point. This is a unitless value. The valid vacuum ranges and decimal point are determined by the vacuum units currently selected in the dispenser.

Values to use in the command:

Vacuum Unit	Vacuum Setting Required	Value to Send in the Command (vvvv)
H ₂ O	0.0–18.0 H ₂ O	0000–0180
kPa	0.00–4.48 kPa	0000–0448
Hg	0.00–1.32 Hg	0000–0132
mmHg or Torr	0.0–33.6 mmHg	0000–0336

EXAMPLE: If the units of vacuum are set to H₂O and if the required vacuum setpoint is 10.5 H₂O, the text packet is: (STX) + 08 + VS-- + 0105 + E9 + (ETX)

The above text packet in hexadecimal format:

STX	0	8	V	S	space	space	0	1	0	5	E	9	ETX
0x02	0x30	0x38	0x56	0x53	0x20	0x20	0x30	0x31	0x30	0x35	0x45	0x39	0x03

2.6.2.8 Memory-Vacuum Set Command

This command updates the vacuum value in the memory location specified in the command. This command also updates the LCD screen to the specified memory location.

Client command and data: VH--CHcccVvvv

ccc: The 3-digit memory location from 0–399. The dispenser will automatically limit value to prevent any errors.

vvv: The 4-digit vacuum setting, excluding the decimal point. This is a unitless value. The valid vacuum ranges and decimal point are determined by the vacuum units currently selected in the dispenser.

Values to use in the command:

Vacuum Unit	Vacuum Setting Required	Value to Send in the Command (vvvv)
H ₂ O	0.0–18.0 H ₂ O	0000–0180
kPa	0.00–4.48 kPa	0000–0448
Hg	0.00–1.32 Hg	0000–0132
mmHg or Torr	0.0–33.6 mmHg	0000–0336

EXAMPLE: If the units of vacuum are set to H₂O, the required memory location is 2, and the required vacuum setpoint is 10.0 H₂O, the command is: (STX) + 0E + VH-- + CH002V0100 + 79 + (ETX)

Length of this text packet: Decimal 14 or hexadecimal 0x0E

The above text packet in hexadecimal format:

STX	0	E	V	H	space	space	C	H	0	0	2
0x02	0x30	0x45	0x56	0x48	0x20	0x20	0x43	0x48	0x30	0x30	0x32
V											
0x56	0x30	0x31	0x30	0x30	0x37	0x39	0x03				

Appendix B – RS-232 Protocol (continued)

2.6.2.9 Time Set Command

This command updates the dispense time value in the current memory location.

Client command and data: DS--Ttttt

tttt: The 4- or 5-digit dispense time value, excluding the decimal point. The valid range is 0.0000 to 9.9999. This command accepts either 3 or 4 decimal places.

- If a value between 0000 to 9999 is entered, the dispenser will set the dispense time as 0.000 s to 9.999 s.
- If a value between 10001 to 99999 is entered, the dispenser will set the dispense time as 1.0001 s to 9.9999 s.

EXAMPLE: (1) If the required dispense time is 0.125 s, the text packet is: (STX) + 09 + DS-- + T0125 + A4 + (ETX)

Length of this text packet: Decimal 9 or hexadecimal 0x09

The above text packet in hexadecimal format:

STX	0	9	D	S	space	space	T	0	1	2	5	A	4	ETX
0x02	0x30	0x39	0x44	0x53	0x20	0x20	0x54	0x30	0x31	0x32	0x35	0x41	0x34	0x03

EXAMPLE: (2) If the required dispense time is 1.0125 s, the command is: (STX) + 0A + DS-- + T10125 + 6B + (ETX)

Length of text packet: Decimal 10 or hexadecimal 0x0A

The above text packet in hexadecimal format:

STX	0	A	D	S	space	space	T	1	0	1	2	5	6	
0x02	0x30	0x41	0x44	0x53	0x20	0x20	0x54	0x31	0x30	0x31	0x32	0x35	0x36	
B	ETX													
0x42	0x03													

2.6.2.10 Memory-Time Set Command

This command updates the dispense time value in the memory location specified in the command. This command also updates the LCD screen to the specified memory location.

Client command and data: DH--CHcccTtttt

ccc: The 3-digit memory location from 0–399. The dispenser will automatically limit value to prevent any errors.

tttt: The 4- or 5-digit dispense time value, excluding the decimal point. The valid range is 0.0000 to 9.9999. This command accepts either 3 or 4 decimal places.

- If a value between 0000 to 9999 is entered, the dispenser will set the dispense time as 0.000 s to 9.999 s.
- If a value between 10001 to 99999 is entered, the dispenser will set the dispense time as 1.0001 s to 9.9999 s.

EXAMPLE: (1) If the required memory location is 001 and the required dispense time 0.125 s, the text packet is: (STX) + 0E + DH-- + CH001T0125 + 87 + (ETX)

Length of this text packet: Decimal 14 or hexadecimal 0x0E

The above text packet in hexadecimal format:

STX	0	E	D	H	space	space	C	H	0	0	1	T	0
0x02	0x30	0x45	0x44	0x48	0x20	0x20	0x43	0x48	0x30	0x30	0x31	0x54	0x30
1	2	5	8	7	ETX								
0x31	0x32	0x35	0x38	0x37	0x03								

Appendix B – RS-232 Protocol (continued)

2.6.2.10 Memory-Time Set Command (continued)

EXAMPLE: (2) If the required memory location is 001 and the required dispense time 1.0125 s, the text packet is:
 (STX) + 0F + DH-- + CH001T10125 + 55 + (ETX)

Length of this text packet: Decimal 15 or hexadecimal 0x0F

The above text packet in hexadecimal format:

STX	0	F	D	H	space	space	C	H	0	0	1	T	1	
0x02	0x30	0x46	0x44	0x48	0x20	0x20	0x43	0x48	0x30	0x30	0x31	0x54	0x31	
0		1	2	5	5	5	ETX							
0x30	0x31	0x32	0x35	0x35	0x35	0x03								

2.6.2.11 Memory-Time-Pressure-Vacuum Set Command

This command updates the dispense time, dispense pressure and vacuum values in the memory location specified in the command. This command also updates the LCD screen to the specified memory location.

Client command and data: EM--CHcccTttttPppppVvvv

ccc: The 3-digit memory location from 0–399. The dispenser will automatically limit value to prevent any errors.

tttt: The 5-digit dispense time value excluding the decimal point. The valid range is 0.0000 to 9.9999.

pppp: The 4-digit dispense pressure value excluding the decimal point. The valid pressure ranges and decimal point are determined by the pressure units currently selected in the dispenser.

vvvv: The 4-digit vacuum value excluding the decimal point. The valid vacuum ranges and decimal point are determined by the vacuum units currently selected in the dispenser.

Values to use in the command:

Pressure Unit	Pressure Setting Required	Value to Send in the Command (pppp)
psi	0.0–100.0 psi	0000–1000
kPa	0.0–689.5 kPa	0000–6895
Bar	0.000–6.895 bar	0000–6895
Vacuum Unit	Vacuum Setting Required	Value to Send in the Command (vvvv)
H ₂ O	0.0–18.0 H ₂ O	0000–0180
kPa	0.00–4.48 kPa	0000–0448
Hg	0.00–1.32 Hg	0000–0132
mmHg or Torr	0.0–33.6 mmHg	0000–0336

EXAMPLE: If the required memory location is 001, the required dispense time is 1.0125 s, the required pressure setting is 30.0 psi, and the required vacuum setting is 10.0 H₂O, the text packet is:
 (STX) + 19 + EM-- + CH001T10125P0300V0100 + 31 + (ETX)

Length of this text packet: Decimal 25 or hexadecimal 0x19

Appendix B – RS-232 Protocol (continued)

2.6.2.11 Memory-Time-Pressure-Vacuum Set Command (continued)

The above text packet in hexadecimal format:

STX	1	9	E	M	space	space	C	H	0	0	1
0x02	0x31	0x39	0x45	0x4D	0x20	0x20	0x43	0x48	0x30	0x30	0x31
T	1	0	1	2	5	P	0	3	0	0	V
0x54	0x31	0x30	0x31	0x32	0x35	0x50	0x30	0x33	0x30	0x30	0x56
0	1	0	0	3	1	ETX					
0x30	0x31	0x30	0x30	0x33	0x31	0x03					

2.6.2.12 Pressure Units Set Command

This command sets the unit of measure for pressure display.

Client command and data: E6--uu

uu: The pressure units. 00 = PSI, 01 = BAR, 02 = KPA

EXAMPLE: To display pressure in kPA, the text packet is: (STX) + E6-- + 02 + 7D + (ETX)

The above text packet in hexadecimal format:

STX	0	6	E	6	space	space	0	2	7	D	ETX
0x02	0x30	0x36	0x45	0x36	0x20	0x20	0x30	0x32	0x37	0x44	0x03

2.6.2.13 Vacuum Units Set Command

This command sets the unit of measure for vacuum display.

Client command and data: E7--uu

uu: The vacuum units. 00 = KPA, 01 = Inches H₂O, 02 = Inches Hg, 03 = mmHg, 04 = TORR

EXAMPLE: To display vacuum in H₂O, the text packet is: (STX) + 06 + E7-- + 01 + 7D + (ETX)

The above text packet in hexadecimal format:

STX	0	6	E	7	space	space	0	1	7	D	ETX
0x02	0x30	0x36	0x45	0x37	0x20	0x20	0x30	0x31	0x37	0x44	0x03

2.6.2.14 Dispense Parameter Memory Clear

This command re-initializes the dispensing parameter memory locations by setting them all to 0.

Client command and data: (STX) + 04 + CL-- + CD + (ETX)

The above text packet in hexadecimal format:

STX	0	4	C	L	space	space	C	D	ETX
0x02	0x30	0x34	0x43	0x4C	0x20	0x20	0x43	0x44	0x03

Appendix B – RS-232 Protocol (continued)

2.6.2.15 Deposit Count Clear Command

This command resets the deposit counter on the dispenser to all zeros.

Client command and data: (STX) + 04 + EA-- + D6 + (ETX)

The above text packet in hexadecimal format:

STX	0	4	E	A	space	space	D	6	ETX
0x02	0x30	0x34	0x45	0x41	0x20	0x20	0x44	0x36	0x03

2.6.2.16 Reset Auto Increment Command

This command resets the Auto Increment functions. The dispenser will set the Memory Address to the Start Address Value, reset the counters, and clear the auto increment alarm. If the dispenser is not in counter or timer mode, the dispenser returns a Failure Command (A2) text packet.

Client command and data: (STX) + 04 + SE-- + C4 + (ETX)

The above text packet in hexadecimal format:

STX	0	4	S	E	space	space	C	4	ETX
0x02	0x30	0x34	0x53	0x45	0x20	0x20	0x43	0x34	0x03

2.6.2.17 Auto Increment Mode On / Off Command

This command enables or disables the Auto Increment Mode. When enabling the Auto Increment Mode, the dispenser will enable to Count Mode.

NOTE: This command is not necessary to enable Auto Increment Mode. The Auto Increment Mode command (2.6.2.18) can be used instead.

Client command and data: AI--i

i: Enable Command. 0=OFF, 1 = ON

EXAMPLE: To enable the Auto Increment Mode, the text packet is: (STX) + 05 + AI-- + 1 + A0 + (ETX)

The above text packet in hexadecimal format:

STX	0	5	A	I	space	space	1	A	0	ETX
0x02	0x30	0x35	0x41	0x49	0x20	0x20	0x31	0x41	0x30	0x03

Appendix B – RS-232 Protocol (continued)

2.6.2.18 Auto Increment Mode Command

This command changes the Auto Increment Mode to either Timer, Counter, or Auto Sequence mode. This command also updates the lower four digits of the trigger value.

Client command and data: AC--SsDddd

s: Mode Command. 1 = Timer Mode, 2 = Counter Mode, 4 = Auto Sequence Mode.

dddः: Trigger Value. 0001–9999

EXAMPLE: To set the mode to Timer Mode and the Trigger value to 100, the text packet is:
(STX) + 0B + AC-- + S1D0100 + 41 + (ETX)

Length of this text packet: Decimal 11 or hexadecimal 0B

The above text packet in hexadecimal format:

STX	0	B	A	C	space	space	S	1	D	0	1	0	0
0x02	0x30	0x42	0x41	0x43	0x20	0x20	0x53	0x31	0x44	0x30	0x31	0x30	0x30
4 1 ETX													
0x34 0x31 0x03													

2.6.2.19 Set Start & End Address Command

This command downloads the auto increment start and end addresses.

Client command and data: SS--SsssEeee

sss: Start Address 000–399

eee: End Address 000–399

EXAMPLE: To set the Auto Increment Start Address as 1 and the End Address as 50, the text packet is:
(STX) + 0C + SS-- + S001E050 + E9 + (ETX)

Length of this text packet: Decimal 12 or hexadecimal 0C

The above text packet in hexadecimal format:

STX	0	C	S	S	space	space	S	0	0	1	E	0	5
0x02	0x30	0x43	0x53	0x53	0x20	0x20	0x53	0x30	0x30	0x31	0x45	0x30	0x35
0 E 9 ETX													
0x30 0x45 0x39 0x03													

Appendix B – RS-232 Protocol (continued)

2.6.2.20 Set Trigger Value Command

This command downloads the 5-digit trigger value into the current memory location.

Client command and data: EQ--Ttttt

tttt: Trigger Value. 00001–99999

EXAMPLE: If the trigger value is 1000, the text packet is: (STX) + 0A + EQ-- + T01000 + 74 + (ETX)

Length of this text packet: Decimal 10 or hexadecimal 0A

The above text packet in hexadecimal format:

STX	0	A	E	Q	space	space	T	0	1	0	0	0	7
0x02	0x30	0x41	0x45	0x51	0x20	0x20	0x54	0x30	0x31	0x30	0x30	0x30	0x37
4													ETX
0x34													0x03

2.6.2.21 Set the Real Time Clock Command

This command sets the time for the real time clock on the dispenser.

Client command and data: EB--HhhMmmAMa

hh: Hours. 0–23 for 24 hour format, 1–12 for 12 hour format

mm: Minutes. 0–59

a: Hour format. 0 = AM, 1 = PM, 2 = 24 hour format

EXAMPLE: To set the time as 14:05 and the hour format to 24-Hour, the text packet is:
(STX) + 0D + EB-- + H14M05AM2 + A6 + (ETX)

Length of this text packet: Decimal 13 or hexadecimal 0D

The above text packet in hexadecimal format:

STX	0	D	E	B	space	space	H	1	4	M	0	5	A
0x02	0x30	0x44	0x45	0x42	0x20	0x20	0x48	0x31	0x34	0x4D	0x30	0x35	0x41
M													ETX
0x4D													0x03

Appendix B – RS-232 Protocol (continued)

2.6.2.22 Set the Real Time Date Command

This command sets the date for the real time clock on the dispenser.

Client command and data: EC--MmmDddYyy

mm: Months. 1–12

dd: Days. 1–31

yy: Years. 00–99

EXAMPLE: To set the date as 1st January 2022, the text packet is: (STX) + 0D + EC-- + M01D01Y22 + B4 + (ETX)

Length of this text packet: Decimal 13 or hexadecimal 0D

The above text packet in hexadecimal format:

STX	0	D	E	C	space	space	M	0	1	D	0	1	Y
0x02	0x30	0x44	0x45	0x43	0x20	0x20	0x4D	0x30	0x31	0x44	0x30	0x31	0x59
2			B			4			ETX				
0x32			0x42			0x34			0x03				

2.6.2.23 Operator Lockout Set Command

This command updates the operator lockout settings. A “1” indicates that a feature is locked out. A “0” indicates that the feature is not locked out.

Client command and data: EG--PAaaaaDTtDPpDVvMmDCcDMdAlaARuALbMMePUfVUgLAhCLjCOKAMn

aaaa: 4-digit password. This needs to match the password set on the dispenser. The dispenser returns an error if incorrect.

- t:** Lockout dispense time: “1”=lockout, “0”=enabled (DT)
- p:** Lockout dispense pressure (DP)
- v:** Lockout dispense vacuum (DV)
- m:** Lockout memory cell selection (M)
- c:** Lockout deposit counter selection (DC)
- d:** Lockout dispense mode change (DM)
- a:** Lockout Auto Increment Mode selection (AI)
- u:** Lockout Auto Increment Reset (AR)
- b:** Lockout Alarms Reset (AL)
- e:** Lockout Main Menu selection (MM)
- f:** Lockout Pressure Unit Menu selection (PU)
- g:** Lockout Vacuum Unit Menu selection (VU)
- h:** Lockout Language Menu selection (LA)
- j:** Lockout Set Clock / Date Menu selection (CL)
- k:** Lockout Set Communications Menu selection (CO)
- n:** Lockout Alarm Options Menu selection (AM)

Appendix B – RS-232 Protocol (continued)

2.6.2.23 Operator Lockout Set Command (continued)

EXAMPLE: If the supervisor password is 0000 and if Dispense Time, Dispense Pressure, and Dispense Vacuum need to be locked out, the text packet is:

(STX) + 39 + EG-- + PA0000DT1DP1DV1M0DC0DM0AI0AR0AL0MM0PU0VU0LA0CL0CO0AM0 + 79 + (ETX)

Length of this text packet: Decimal 57 or hexadecimal 39

The above text packet in hexadecimal format:

STX	3	9	E	G	space	space	P	A	0	0	0	0
0x02	0x33	0x39	0x45	0x47	0x20	0x20	0x50	0x41	0x30	0x30	0x30	0x30
D	T	1	D	P	1	D	V	1	M	0	D	C
0x44	0x54	0x31	0x44	0x50	0x31	0x44	0x56	0x31	0x4D	0x30	0x44	0x43
0	D	M	0	A	I	0	A	R	0	A	L	0
0x30	0x44	0x4D	0x30	0x41	0x49	0x30	0x41	0x52	0x30	0x41	0x4C	0x30
M	M	0	P	U	0	V	U	0	L	A	0	C
0x4D	0x4D	0x30	0x50	0x55	0x30	0x56	0x55	0x30	0x4C	0x41	0x30	0x43
L	0	C	O	0	A	M	0	7	9	ETX		
0x4C	0x30	0x43	0x4F	0x30	0x41	0x4D	0x30	0x37	0x39	0x03		

2.6.2.24 Set Language Command

This command sets the language for the dispenser.

Client command and data: ED--LI: Language Index

0 = English

1 = French

2 = German

3 = Spanish

4 = Italian

5 = Chinese

6 = Japanese

7 = Korean

EXAMPLE: To set the language as Spanish, the text packet is: (STX) + 05 + ED-- + 3 + 9F + (ETX)

The above text packet in hexadecimal format:

STX	0	5	E	D	space	space	3	9	F	ETX	
0x02	0x30	0x35	0x45	0x44	0x20	0x20	0x33	0x39	0x46	0x03	

Appendix B – RS-232 Protocol (continued)

2.6.2.25 Alarm Options Set Command

This command sets the options for all dispenser alarms. A “1” indicates the alarm feature is enabled. A “0” indicates the alarm feature is disabled.

Client command and data: EI--INiOoILIPOpPLbAEeAOa

- i: Enable Input Alarm (IN)
- o: Enable Output of Input Alarm (IO)
- l: Latch the Input Alarm (IL)
- p: Enable Output of the Pressure Alarm (PO)
- b: Latch the Pressure Alarm (PL)
- e: Enable Auto Increment Alarm (AE)
- a: Enable Output of the Auto Increment Alarm (AO)

EXAMPLE: To enable the alarms for “Enable Output of the Pressure Alarm (PO)” and “Latch the Pressure Alarm (PL)”, the text packet is: (STX) + 19 + EI-- + IN0IO0IL0PO1PL1AE0AO0 + 61 + (ETX)

Length of this text packet: Decimal 25 or hexadecimal 19

The above text packet in hexadecimal format:

STX	1	9	E	I	space	space	I	N	0	I	O	0
0x02	0x31	0x39	0x45	0x49	0x20	0x20	0x49	0x4E	0x30	0x49	0x4F	0x30
I	L	0	P	O	1	P	L	1	A	E	0	A
0x49	0x4C	0x30	0x50	0x4F	0x31	0x50	0x4C	0x31	0x41	0x45	0x30	0x41
O	0	6	1	ETX								
0x4F	0x30	0x36	0x31	0x03								

2.6.2.26 Reset Alarms Command

This command clears any latched alarms.

Client command and data: (STX) + 04 + EK-- + CC + (ETX)

The above text packet in hexadecimal format:

STX	0	4	E	K	space	space	C	C	ETX
0x02	0x30	0x34	0x45	0x4B	0x20	0x20	0x43	0x43	0x03

2.6.2.27 Dispense Command

This command initiates a dispense cycle. If the dispenser is in Timed Mode, it will dispense for the duration currently set for the Dispense Time parameter. If the dispenser is in Steady Mode, it will begin dispensing. Another dispense command is then needed to end the dispense cycle.

Client command and data: (STX) + 04 + DI-- + CF + (ETX)

The above text packet in hexadecimal format:

STX	0	4	D	I	space	space	C	F	ETX
0x02	0x30	0x34	0x44	0x49	0x20	0x20	0x43	0x46	0x03

Appendix B – RS-232 Protocol (continued)

2.6.3 Read Commands

For these commands, the client requests a set of data from the dispenser, which the dispenser will return before ending the transmission. Read commands are sent using the sequence explained in “2.4.2 Read Text Packets” on page 48.

NOTE: The two hyphens “--” shown in the commands represent ASCII space values (Hex 0x20).

2.6.3.1 Pressure Time Read Command

This command returns the Dispense Pressure and Dispense Time for the specified address. It also updates the LCD screen to the specified memory location.

Client command and data: UCccc

ccc: The 3-digit memory location from 0–399. The dispenser will automatically limit value to prevent any errors.

EXAMPLE: To read the Dispense Pressure and Dispense Time values in memory location #1, the text packet is: (STX) + 05 + UC001 + 72 + (ETX)

NOTE: This command changes the current memory location in the dispenser as set in the command (e.g., 001 in above example command), in addition to returning the values for Dispense Pressure and Dispense Time.

The above text packet in hexadecimal format:

STX	0	5	U	C	0	0	1	7	2	ETX
0x02	0x30	0x35	0x55	0x43	0x30	0x30	0x31	0x37	0x32	0x03

NOTE: “D0” is the letter “D” followed by the digit “0.”

Return Format: D0PDppppDTtttt

pppp: The 4-digit pressure setting excluding the decimal point. This is a unitless value. The valid pressure ranges and decimal point are determined by the pressure units currently selected in the dispenser.

tttt: The 4-digit dispense time value excluding the decimal point. The valid range is 0.000 to 9.999. This command truncates the last decimal place of the dispense time. This was done to make this command compatible with the Musashi FX808 protocol.

Interpreting the pressure setting from the return feedback value:

Pressure Unit	Value Received from the Dispenser (pppp)	Pressure Setting
psi	0000–1000	0.0–100.0 psi
kPa	0000–6895	0.0–689.5 kPa
Bar	0000–6895	0.000–6.895 bar

EXAMPLE: If the pressure setting at the requested memory location is 50.0 psi and the time setting is 1.005 s, the text packet received from the dispenser is: (STX) + 0E + D0PD0500DT1005 + 60 + (ETX)

Length of the response text packet: Decimal 14 or hexadecimal 0x0E

The above text packet in hexadecimal format:

STX	0	E	D	0	P	D	0	5	0	0	D	T	1
0x02	0x30	0x45	0x44	0x30	0x50	0x44	0x30	0x35	0x30	0x30	0x44	0x54	0x31
<hr/>													
0	0	5	6	0	ETX								
0x30	0x30	0x35	0x36	0x30	0x03								

Appendix B – RS-232 Protocol (continued)

2.6.3.2 Memory Channel, Dispense Pressure, and Dispense Time Read Command

This command returns the dispenser's current memory channel, Dispense Pressure value, and Dispense Time value to the client.

Client command and data: (STX) + 04 + UD-- + C3 + (ETX)

The above text packet in hexadecimal format:

STX	0	4	U	D	space	space	C	3	ETX
0x02	0x30	0x34	0x55	0x44	0x20	0x20	0x43	0x33	0x03

NOTE: "D0" is the letter "D" followed by the digit "0."

Return Format: D0ChcccPDppppDTttt

ccc: The 3-digit memory location from 0–399. The dispenser will automatically limit value to prevent any errors.

pppp: The 4-digit pressure setting excluding the decimal point. This is a unitless value. The valid pressure ranges and decimal point are determined by the pressure units currently selected in the dispenser.

tttt: The 4-digit dispense time value excluding the decimal point. The valid range is 0.000 to 9.999. This command truncates the last decimal place of the dispense time. This was done to make this command compatible with the Musashi FX808 protocol.

Interpreting the pressure setting from the return feedback value:

Pressure Unit	Value Received from the Dispenser (pppp)	Pressure Setting
psi	0000–1000	0.0–100.0 psi
kPa	0000–6895	0.0–689.5 kPa
Bar	0000–6895	0.000–6.895 bar

EXAMPLE: If the current memory location is 1, the pressure setting at the memory location is 50.0 psi, and the time setting is 1.005 s, the text packet received from the dispenser is:

(STX) + 13 + D0CH001PD0500DT1005 + 55 + (ETX)

Length of the response text packet: Decimal 19 or hexadecimal 0x13

The above text packet in hexadecimal format:

STX	1	3	D	0	C	H	0	0	1	P	D	0	5
0x02	0x31	0x33	0x44	0x30	0x43	0x48	0x30	0x30	0x31	0x50	0x44	0x30	0x35
0	0	D	T	1	0	0	5	5	5	ETX			
0x30	0x30	0x44	0x54	0x31	0x30	0x30	0x35	0x35	0x35	0x03			

Appendix B – RS-232 Protocol (continued)

2.6.3.3 Pressure Time Vacuum Read Command

This command returns the Dispense Pressure, Dispense Time, and Vacuum values of the specified address. This command also update the LCD screen to the specified memory location.

Client command and data: E8ccc

ccc: The 3-digit memory location from 0–399. The dispenser will automatically limit value to prevent any errors.

EXAMPLE: To read the pressure, time, and vacuum values in memory location #1, the text packet is:
(STX) + 05 + E8001 + 8D + (ETX)

NOTE: This command changes the current memory location in the dispenser as set in the command (e.g., 001 in above example command), in addition to returning the values for pressure, time, and vacuum.

The above text packet in hexadecimal format:

STX	0	5	E	8	0	0	1	8	D	ETX
0x02	0x30	0x35	0x45	0x38	0x30	0x30	0x31	0x38	0x44	0x03

NOTE: “D0” is the letter “D” followed by the digit “0.”

Return Format: D0PDffffDTttttVCvvv

ffff: The 4-digit pressure setting excluding the decimal point. This is a unitless value. The valid pressure ranges and decimal point are determined by the pressure units currently selected in the dispens

tttt: The 5-digit dispense time value excluding the decimal point. The valid range is 0.0000 to 9.9999 seconds.

vvv: The 4-digit vacuum setting excluding the decimal point. This is a unitless value. The valid vacuum ranges and decimal point are determined by the vacuum units currently selected in the dispenser.

Interpreting the pressure setting from the return feedback value:

Pressure Unit	Value Received from the Dispenser (ffff)	Pressure Setting
psi	0000–1000	0.0–100.0 psi
kPa	0000–6895	0.0–689.5 kPa
Bar	0000–6895	0.000–6.895 bar

Interpreting the vacuum setting from the return feedback value:

Vacuum Unit	Value received from Ultimus V (vvv)	Vacuum Setting
H ₂ O	0000–0180	0.0–18.0 H ₂ O
kPa	0000–0448	0.00–4.48 kPa
Hg	0000–0132	0.00–1.32 Hg
mmHg or Torr	0000–0336	0.0–33.6 mmHg

EXAMPLE: If the requested memory location is 1, the pressure setting at the memory location is 50.0 psi, the time setting is 1.0055 s, and the vacuum setting is 10.0 H₂O, the text packet received from the dispenser is:
(STX) + 15 + D0PD0500DT10055VC0100 + E0 + (ETX)

Length of the response text packet: Decimal 21 or hexadecimal 0x15

Appendix B – RS-232 Protocol (continued)

2.6.3.3 Pressure Time Vacuum Read Command (continued)

The above text packet in hexadecimal format:

STX	1	5	D	0	P	D	0	5	0	0	D	T	1
0x02	0x31	0x35	0x44	0x30	0x50	0x44	0x30	0x35	0x30	0x30	0x44	0x54	0x31
0	0	5	5	V	C	0	1	0	0	E	0	ETX	
0x30	0x30	0x35	0x35	0x56	0x43	0x30	0x31	0x30	0x30	0x45	0x30	0x03	

2.6.3.4 Memory Location Read Command

This command returns the current memory location at which the dispenser is set. “D0” is the letter “D” followed by the digit “0.”

Client command and data: (STX) + 04 + UA-- + C6 + (ETX)

The above text packet in hexadecimal format:

STX	0	4	U	A	space	space	C	6	ETX
0x02	0x30	0x34	0x55	0x41	0x20	0x20	0x43	0x36	0x03

Return Format: D0ccc

ccc: The 3-digit memory location from 0–399.

EXAMPLE: If the current memory location is 001, the text packet received from the dispenser is:
(STX) + 05 + D0001 + 96 + (ETX)

The above text packet in hexadecimal format:

STX	0	5	D	0	0	0	1	9	6	ETX
0x02	0x30	0x35	0x44	0x30	0x30	0x30	0x31	0x39	0x36	0x03

Appendix B – RS-232 Protocol (continued)

2.6.3.5 Pressure Units Read Command

This command returns the units the dispenser is using to display pressure.

Client command and data: (STX) + 04 + E4-- + E3 + (ETX)

The above text packet in hexadecimal format:

STX	0	4	E	4	space	space	E	3	ETX
0x02	0x30	0x34	0x45	0x34	0x20	0x20	0x45	0x33	0x03

NOTE: “D0” is the letter “D” followed by the digit “0.”

Return Format: D0PUuu

uu: The pressure units. 00 = PSI, 01 = BAR, 02 = KPA

EXAMPLE: If the dispenser is set to display units of pressure in KPA, the text packet received from the dispenser is: (STX) + 06 + D0PU02 + 1F + (ETX)

The above text packet in hexadecimal format:

STX	0	6	D	0	P	U	0	2	1	F	ETX
0x02	0x30	0x36	0x44	0x30	0x50	0x55	0x30	0x32	0x31	0x46	0x03

2.6.3.6 Vacuum Units Read Command

This command returns the units the dispenser is using to display vacuum.

Client command and data: (STX) + 04 + E5-- + E2 + (ETX)

The above text packet in hexadecimal format:

STX	0	4	E	5	space	space	E	2	ETX
0x02	0x30	0x34	0x45	0x35	0x20	0x20	0x45	0x32	0x03

NOTE: “D0” is the letter “D” followed by the digit “0.”

Return Format: D0VUuu

uu: The vacuum units. 00 = KPA, 01 = Inches H₂O, 02 = Inches Hg, 03 = mmHg, 04 = TORR.

EXAMPLE: If the dispenser is set to display units of vacuum in H₂O, the text packet received from the dispenser is: (STX) + 06 + D0VU01 + 1A + (ETX)

The above text packet in hexadecimal format:

STX	0	6	D	0	V	U	0	1	1	A	ETX
0x02	0x30	0x36	0x44	0x30	0x56	0x55	0x30	0x31	0x31	0x41	0x03

Appendix B – RS-232 Protocol (continued)

2.6.3.7 Total Status Read Command

This command returns the status and values of the Auto Increment Mode and the dispense mode (Timed, Steady, or Teach).

NOTE: This is the same command as the Musashi 808FX Total Status command, so the Vacuum Interval Mode status is included in the text packet. However, the Ultimus V dispenser does not support this mode, so this data defaults to safe values.

Client command and data: (STX) + 04 + AU-- + C6 + (ETX)

The above text packet in hexadecimal format:

STX	0	4	A	U	space	space	C	6	ETX
0x02	0x30	0x34	0x41	0x55	0x20	0x20	0x43	0x36	0x03

NOTE: “D0” is the letter “D” followed by the digit “0.”

Return Format: D0AI1MmSssssDddddddVlqVvvvltttTMxSAaaaEAeee

i: Auto Increment mode status. 0 = Off, 1 = Enabled

m: Auto Increment mode function. 1 = Timer, 2 = Count, 4=Auto Sequence Mode

ssss: Trigger Value. The upper digit is truncated to make this function compatible with the Musashi command

ddddddd: Current Timer / Counter value

q: Defaulted to 0

vvv: Defaulted to 0001

ttt: Defaulted to 0001

x: Dispense mode. 0 = Timed, 1 = Steady, 2 = Teach

aaa: Auto Increment Start Address. 000–399

eee: Auto Increment End Address. 000–399

EXAMPLE: If Auto Increment mode is On, the Auto Increment Mode function is Count, the Trigger value is 100, the current Timer / Counter value is 10500, the dispense mode is Timed, the Auto Increment Start Address is 001, and the Auto increment End Address is 050, the text packet received from the dispenser is:

(STX) + 2E + D0AI1M2S0100D0010500VI0V0001I0001TM0SA001EA050 + 2C + (ETX)

Length of the response text packet: Decimal 46 or hexadecimal 0x2E

The above text packet in hexadecimal format:

STX	2	E	D	0	A	I	1	M	2	S	0	1	0
0x02	0x32	0x45	0x44	0x30	0x41	0x49	0x31	0x4D	0x32	0x53	0x30	0x31	0x30
0	D	0	0	1	0	5	0	0	V	I	0	V	0
0x30	0x44	0x30	0x30	0x31	0x30	0x35	0x30	0x30	0x56	0x49	0x30	0x56	0x30
0	0	1	I	0	0	0	1	T	M	0	S	A	0
0x30	0x30	0x31	0x49	0x30	0x30	0x30	0x31	0x54	0x4D	0x30	0x53	0x41	0x30
0	1	E	A	0	5	0	2	C	ETX				
0x30	0x31	0x45	0x41	0x30	0x35	0x30	0x32	0x43	0x03				

Appendix B – RS-232 Protocol (continued)

2.6.3.8 Trigger Value Read Command

This command returns the 5-digit trigger value of the current memory location.

Client command and data: (STX) + 04 + ER-- + C5 + (ETX)

The above text packet in hexadecimal format:

STX	0	4	E	R	space	space	C	5	ETX
0x02	0x30	0x34	0x45	0x52	0x20	0x20	0x43	0x35	0x03

NOTE: “D0” is the letter “D” followed by the digit “0.”

Return Format: D0TVtttt

tttt: 5-digit trigger value. Range is 00000–99999.

EXAMPLE: If the trigger value is 100, the text packet received from the dispenser is:
(STX) + 09 + D0TV00100 + 88 + (ETX)

Length of the response text packet: Decimal 9 or hexadecimal 0x09

The above text packet in hexadecimal format:

STX	0	9	D	0	T	V	0	0	1	0	0	8
0x02	0x30	0x39	0x44	0x30	0x54	0x56	0x30	0x30	0x31	0x30	0x30	0x38
8	ETX											
0x38	0x03											

2.6.3.9 Deposit Count Read Command

This command returns the current 7-digit deposit count that is stored in the dispenser.

Client command and data: (STX) + 04 + E9-- + DE + (ETX)

The above text packet in hexadecimal format:

STX	0	4	E	9	space	space	D	E	ETX
0x02	0x30	0x34	0x45	0x39	0x20	0x20	0x44	0x45	0x03

NOTE: “D0” is the letter “D” followed by the digit “0.”

Return Format: D0SCcccccc

ccccccc: 7-digit deposit counter. Range is 0000000 to 9999999.

EXAMPLE: If the deposit counter value is 1050250, the text packet received from the dispenser is:
(STX) + 0B + D0SC1050250 + 27 + (ETX)

The above text packet in hexadecimal format:

STX	0	B	D	0	S	C	1	0	5	0	2	5	0
0x02	0x30	0x42	0x44	0x30	0x53	0x43	0x31	0x30	0x35	0x30	0x32	0x35	0x30
2	ETX												
0x32	0x03												

Appendix B – RS-232 Protocol (continued)

2.6.3.10 Real Time Clock Read Command

This command returns the current time of the real time clock on the dispenser.

Client command and data: (STX) + 04 + EE-- + D2 + (ETX)

The above text packet in hexadecimal format:

STX	0	4	E	E	space	space	D	2	ETX
0x02	0x30	0x34	0x45	0x45	0x20	0x20	0x44	0x32	0x03

NOTE: “D0” is the letter “D” followed by the digit “0.”

Return Format: D0HhhMmmAMa

hh: Hours. 0–23 for 24 hour format, 1–12 for 12 hour format

mm: Minutes. 0–59

a: Hour format. 0 = AM, 1 = PM, 2 = 24 hour format

EXAMPLE: If the current time on the dispenser is 14:25, the text packet received from the dispenser is:
(STX) + 0B + D0H14M25AM2 + F9 + (ETX)

The above text packet in hexadecimal format:

STX	0	B	D	0	H	1	4	M	2	5	A	M	2
0x02	0x30	0x42	0x44	0x30	0x48	0x31	0x34	0x4D	0x32	0x35	0x41	0x4D	0x32
F												ETX	
0x46												0x03	

Appendix B – RS-232 Protocol (continued)

2.6.3.11 Real Time Date Read Command

This command returns the current date of the real time clock on the dispenser.

Client command and data: (STX) + 04 + EF-- + D1 + (ETX)

The above text packet in hexadecimal format:

STX	0	4	E	F	space	space	D	1	ETX
0x02	0x30	0x34	0x45	0x46	0x20	0x20	0x44	0x31	0x03

NOTE: “D0” is the letter “D” followed by the digit “0.”

Return Format: D0MmmDddYyy

mm: Months. 1–12

dd: Days. 1–31

yy: Years. 00–99

EXAMPLE: if the date is 25th December 21, the text packet received from the dispenser is:

(STX) + 0B + D0M12D25Y21 + 03 + (ETX)

The above text packet in hexadecimal format:

STX	0	B	D	0	M	1	2	D	2	5	Y	2	1
0x02	0x30	0x42	0x44	0x30	0x4D	0x31	0x32	0x44	0x32	0x35	0x59	0x32	0x31
0			ETX										
0x30			0x33			0x03							

2.6.3.12 Operator Lockout Read Command

This command returns the current operator lockout settings.

Client command and data: EH--PAxxxx

xxxx: 4-digit password. This needs to match the password set on the dispenser. The dispenser returns an error if incorrect.

EXAMPLE: If the supervisor password is 0000, the text packet received from the dispenser is:

(STX) + 0A + EH--PA0000 + 71 + (ETX)

The above text packet in hexadecimal format:

STX	0	A	E	H	space	space	P	A	0	0	0	0	
0x02	0x30	0x41	0x45	0x48	0x20	0x20	0x50	0x41	0x30	0x30	0x30	0x30	
7			ETX										
0x37			0x31			0x03							

Appendix B – RS-232 Protocol (continued)

2.6.3.12 Operator Lockout Read Command (continued)

NOTE: “D0” is the letter “D” followed by the digit “0.”

Return Format: D0DTtDPpDVvMmDCcDMdAlaARuALbMMePUfVUgLAhCLjCOkAMn

- t:** Lockout dispense time: “1”=lockout, “0”=enabled (DT)
- p:** Lockout dispense pressure (DP)
- v:** Lockout dispense vacuum (DV)
- m:** Lockout memory cell selection (M)
- c:** Lockout deposit counter selection (DC)
- d:** Lockout dispense mode change (DM)
- a:** Lockout Auto Increment Mode selection (AI)
- u:** Lockout Auto Increment Reset (AR)
- b:** Lockout Alarms Reset (AL)
- e:** Lockout Main Menu selection (MM)
- f:** Lockout Pressure Unit Menu selection (PU)
- g:** Lockout Vacuum Unit Menu selection (VU)
- h:** Lockout Language Menu selection (LA)
- j:** Lockout Set Clock / Date Menu selection (CL)
- k:** Lockout Set Communications Menu selection (CO)
- n:** Lockout Alarm Options Menu selection (AM)

EXAMPLE: If the Dispense Time (DT), Dispense Pressure (DP), and Dispense Vacuum (DV) are locked out, the text packet received from the dispenser is:

(STX) + 31 + D0DT1DP1DV1M0DC0DM0AI0AR0AL0MM0PU0VU0LA0CL0CO0AM0 + 2A + (ETX)

Length of the response text packet: Decimal 49 or hexadecimal 31

The above text packet in hexadecimal format:

STX	3	1	D	0	D	T	1	D	P	1	D	V	1
0x02	0x33	0x31	0x44	0x30	0x44	0x54	0x31	0x44	0x50	0x31	0x44	0x56	0x31
M	0	D	C	0	D	M	0	A	I	0	A	R	0
0x4D	0x30	0x44	0x43	0x30	0x44	0x4D	0x30	0x41	0x49	0x30	0x41	0x52	0x30
A	L	0	M	M	0	P	U	0	V	U	0	L	A
0x41	0x4C	0x30	0x4D	0x4D	0x30	0x50	0x55	0x30	0x56	0x55	0x30	0x4C	0x41
0	C	L	0	C	0	0	A	M	0	2	A	ETX	
0x30	0x43	0x4C	0x30	0x43	0x4F	0x30	0x41	0x4D	0x30	0x32	0x41	0x03	

Appendix B – RS-232 Protocol (continued)

2.6.3.13 Alarm Options Read Command

This command returns the current settings of the dispenser alarm options.

Client command and data: (STX) + 04 + EJ-- + CD + (ETX)

The above text packet in hexadecimal format:

STX	0	4	E	J	space	space	C	D	ETX
0x02	0x30	0x34	0x45	0x4A	0x20	0x20	0x43	0x44	0x03

NOTE: “D0” is the letter “D” followed by the digit “0.”

Return Format: D0INilOoILIPOpPLbAEeAOa

A “1” indicates the alarm feature is enabled. A “0” indicates the alarm feature is disabled.

- i: Enable Input Alarm (IN)
- o: Enable Output Of Input Alarm (IO)
- l: Latch the Input Alarm (IL)
- p: Enable Output of the Pressure Alarm (PO)
- b: Latch the Pressure Alarm (PL)
- e: Enable Auto Increment Alarm (AE)
- a: Enable Output of the Auto Increment Alarm (AO)

EXAMPLE: If Enable Output of the Pressure Alarm (PO) and Latch the Pressure Alarm (PL) are enabled, the text packet received from the dispenser is: (STX) + 17 + D0IN0IO0IL0PO1PL1AE0AO0 + BD + (ETX)

Length of the response text packet: Decimal 23 or hexadecimal 17

The above text packet in hexadecimal format:

STX	1	7	D	0	I	N	0	I	O	0	I	L
0x02	0x31	0x37	0x44	0x30	0x49	0x4E	0x30	0x49	0x4F	0x30	0x49	0x4C
0	P	O	1	P	L	1	A	E	0	A	O	0
0x30	0x50	0x4F	0x31	0x50	0x4C	0x31	0x41	0x45	0x30	0x41	0x4F	0x30
B	D	ETX										
0x42	0x44	0x03										

Appendix B – RS-232 Protocol (continued)

2.6.3.14 Alarm Status Read Command

This command returns the status of each of the dispenser alarms.

Client command and data: (STX) + 04 + EL-- + CB + (ETX)

The above text packet in hexadecimal format:

STX	0	4	E	L	space	space	C	B	ETX
0x02	0x30	0x34	0x45	0x4C	0x20	0x20	0x43	0x42	0x03

NOTE: “D0” is the letter “D” followed by the digit “0.”

Return Format: D0INiPApAla

i: input Alarm Status: 1= Alarm is set, 2= No alarm

p: Pressure Alarm Status

a: Auto Increment Alarm Status

EXAMPLE: If the Pressure Alarm Status is “Alarm is set,” the text packet received from the dispenser is:
(STX) + 0B + D0IN2PA1A12 + D3 + (ETX)

Length of the response text packet: Decimal 11 or hexadecimal 0B

The above text packet in hexadecimal format:

STX	0	B	D	0	I	N	2	P	A	1	A	I	2
0x02	0x30	0x42	0x44	0x30	0x49	0x4E	0x32	0x50	0x41	0x31	0x41	0x49	0x32
D			ETX										
0x44			0x03										

Appendix B – RS-232 Protocol (continued)

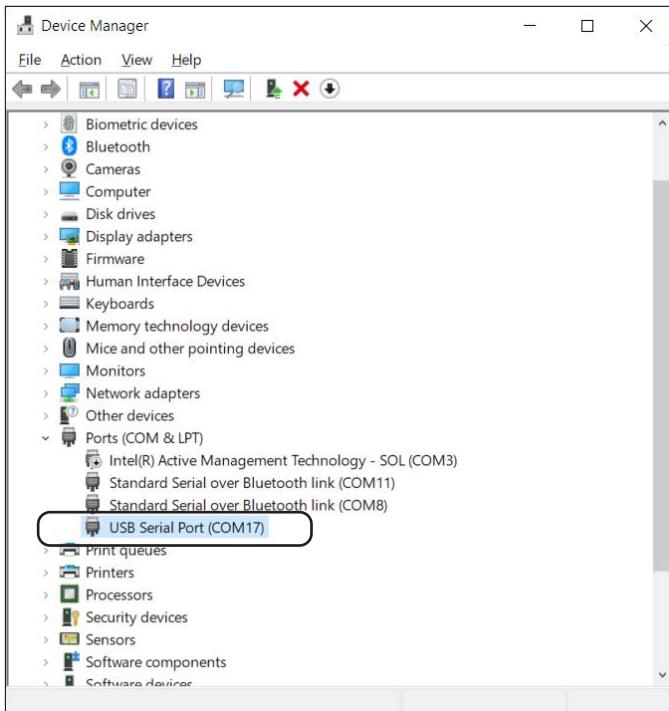
3. Troubleshooting Remote Communication

3.1 No Response from the Dispenser

1. Check that the dispenser is powered ON.



2. Check that the cable connections between the client and the dispenser are firmly and properly secured.
3. Check that the dispenser Comm Port Settings match the COM port you are trying to use: Front Port Enabled / Rear Port Enabled checkbox and Baud Rate. Refer to “Communications Port Options Screen” on page 26 for details.
4. Ensure that the cable used for communication is not a null-modem / cross cable. Use only a DB9-female-to-DB9-female straight-through cable.
5. Check that the COM port is present in the Device Manager and that you are using the correct COM port. In the example below, the correct port is COM17. If multiple COM ports appear, unplug and replug the adapter to see which COM ports disappear and reappear.



Appendix B – RS-232 Protocol (continued)

Troubleshooting Remote Communication (continued)

3.1 No Response from the Dispenser (continued)

6. Check that you are using the correct command format, as explained under “2.6.2 Write Commands” on page 51 and “2.6.3 Read Commands” on page 63.
7. Check that you are sending the Enquiry (ENQ / 0x05) control character from the client to the dispenser as a single-byte text packet (hexadecimal 0x05), not as separate “E,” “N,” and “Q” characters.

NOTE: This also applies to the ACK (0x06), NAK (0x21), EOT (0x04) control characters. Control characters do not need STX (0x02) or ETX (0x03) added to them.

3.2 Dispenser Returns a Failure Command (A2)

1. Check that the length of the data and the checksum calculation is correct in the sent text packet. If the checksum is incorrectly calculated, the dispenser discards the text packet and returns a Failure Command (A2) response.
2. If the client sends an Enquiry (ENQ / 0x05) text packet, the dispenser responds with an Acknowledgment (ACK / 0x06) text packet. However, if the client does not transmit the next text packet within 2 seconds, the dispenser enters a Communication Timeout and responds with a Failure Command (A2).

To recover the communication, ensure that the length of the data and checksum calculation are correct, then restart the communication by sending the Enquiry (ENQ /0x05) control character to the dispenser and following the correct write / read communication sequence as explained under “2.4.1 Write Text Packets” on page 46 and “2.4.2 Read Text Packets” on page 48.

Appendix B – RS-232 Protocol (continued)

4. Ultimus V Interactive Software

The Ultimus V Interactive Software facilitates RS-232 communication. It is especially useful for bulk editing of the Dispense Time, Dispense Pressure, Vacuum, and Trigger Value settings.

NOTE: For physical connection instructions, refer to “1. Physical Connection” on page 39.

4.1 Installation

1. Download the Ultimus V Interactive software from the following address:

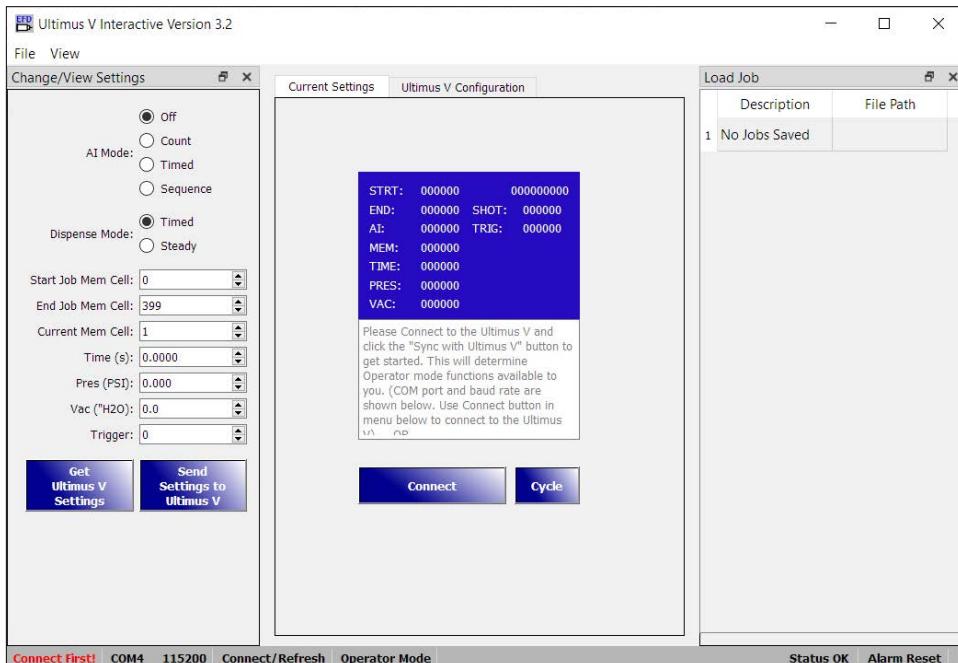
<https://www.nordson.com/en/divisions/efd/contact-us/ultimus-interactive-software>

NOTE: The name of the file will be “UltimusVInteractive_3_0_Installer.zip,” or a higher version.

2. Unzip the file in the folder where you want to store the program.

4.2 Opening the Software

Open the “UltimusV_Interactive_Remastered.exe” file from inside the extracted folder.



You should see the following elements (as shown from the bottom left corner of the software screen):

- Connection status messages from the Ultimus V Interactive software to the Ultimus V dispenser:
 - Not Connected to Ultimus V
 - Connect First!
 - Connected to Ultimus V
- COM port number (COM1, COM2, COM3, etc.)
- Baud Rate selected: 115200, 38400, 19200, 9600
- Operator Mode / Supervisor Mode

Appendix B – RS-232 Protocol (continued)

Ultimus V Interactive Software (continued)

4.3 Connecting to the Dispenser

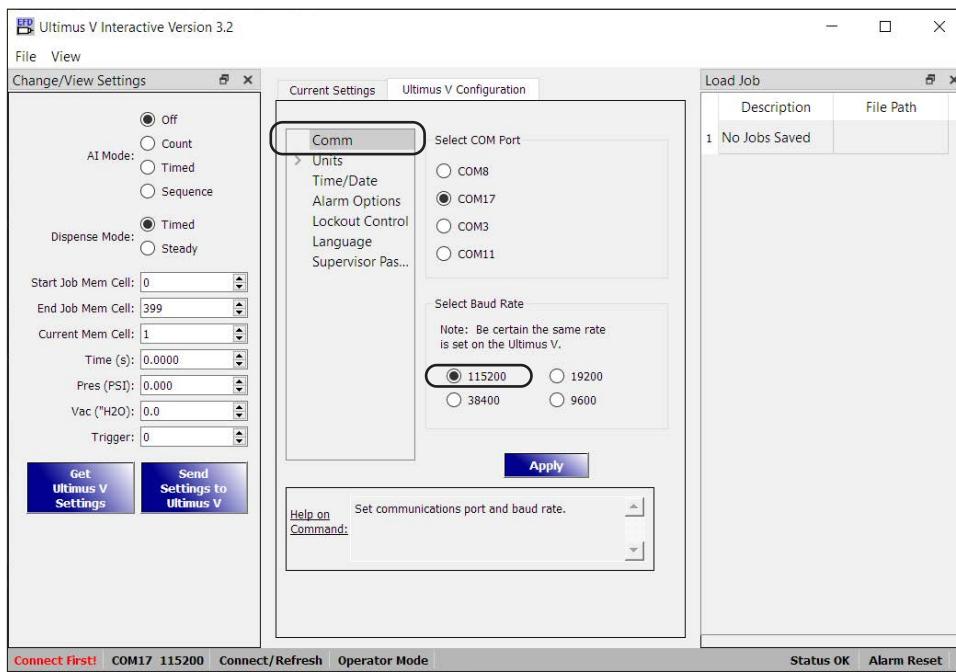
4.3.1 Check the Communication Settings

1. Click the Ultimus V Configuration tab and select COMM from the list on the left side.

The installed COM port number (COM17 in this example) is shown on the right side. This list refreshes every time you navigate to this setting. If you do not see your COM port, ensure that the COM port cable is properly connected, change to the Current Settings tab, then return to the Comm tab. If the COM port still does not appear, check that the COM port appears in the device manager and that it is not in use by another program.

Below the Select COM Port area is the Select Baud Rate (Data Rate) setting. Ensure that this settings matches the baud rate setting of the Ultimus V dispenser. When you check the baud rate setting for the dispenser, EFD recommends also ensuring that the expected front/rear connection is selected. Refer to “Communications Port Options Screen” on page 26 for more details.

2. If you changed the baud rate to any setting other than the default setting (115200), click APPLY.



Appendix B – RS-232 Protocol (continued)

Ultimus V Interactive Software (continued)

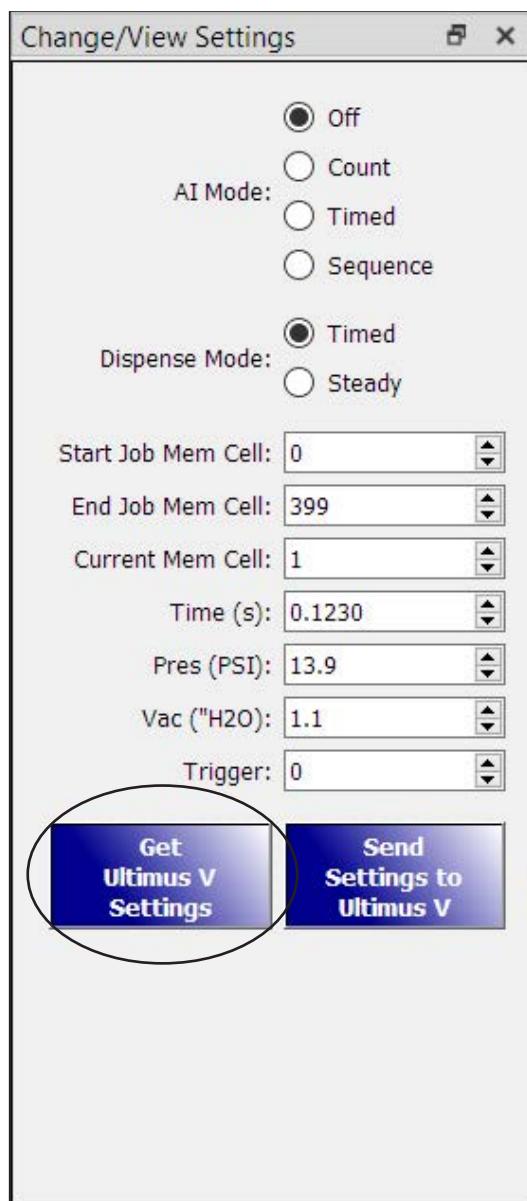
4.3.2 Connect

1. Return to the Current Settings tab and click CONNECT.

At this point, the status shown on the bottom left of the screen should say “Connected.” Note however, that this status references only that the software is now connected to the COM port; it has not necessarily established communication with the dispenser.

2. To check the connection, click GET ULTIMUS V SETTINGS.

If the values in the window update to the current dispenser settings, the connection is successful.



Appendix B – RS-232 Protocol (continued)

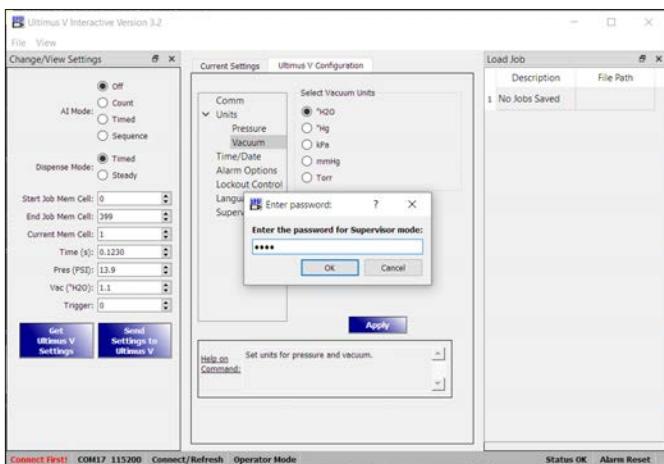
Ultimus V Interactive Software (continued)

4.4 Bulk Editing

To send multiple values to the dispenser at once, you must use the Supervisor Mode.

1. Click FILE > SUPERVISOR MODE, or press CTRL + S at the main screen of the Ultimus V Interactive software.
2. Enter the password for Supervisor mode (Default: 0000).

The Supervisor password can be changed at the Ultimus V dispenser front panel keypad. The Ultimus V dispenser and Ultimus V Interactive software must use the same password for correct operation.



3. After correct entry of the Supervisor password, a new tab called "Dispense Profile" appears. Use this tab to send multiple values to the dispenser at once.

Dispense Profile **Current Settings** **Ultimus V Configuration**

Mem Cell	Dispense Time (s)	Dispense Pressure (PSI)	Vacuum ("H2O)	Trigger
0	0.15	5	0.0	100
1	0.16	5	0.0	100
2	0.17	5	0.0	100
3	0.18	5	0.0	100
4	0.19	5	0.0	100
...

Enter the settings you want to send to the dispenser, from Memory cell 0 up to 399. You can enter settings for the following parameters:

- Dispense Time
- Dispense Pressure
- Vacuum
- Trigger Value

Click TRANSMIT PROFILE to send all the settings to the dispenser.

See the Dispense Profile Graph for Dispense Time, Dispense Pressure, or Vacuum with respect to Cumulative Trigger.

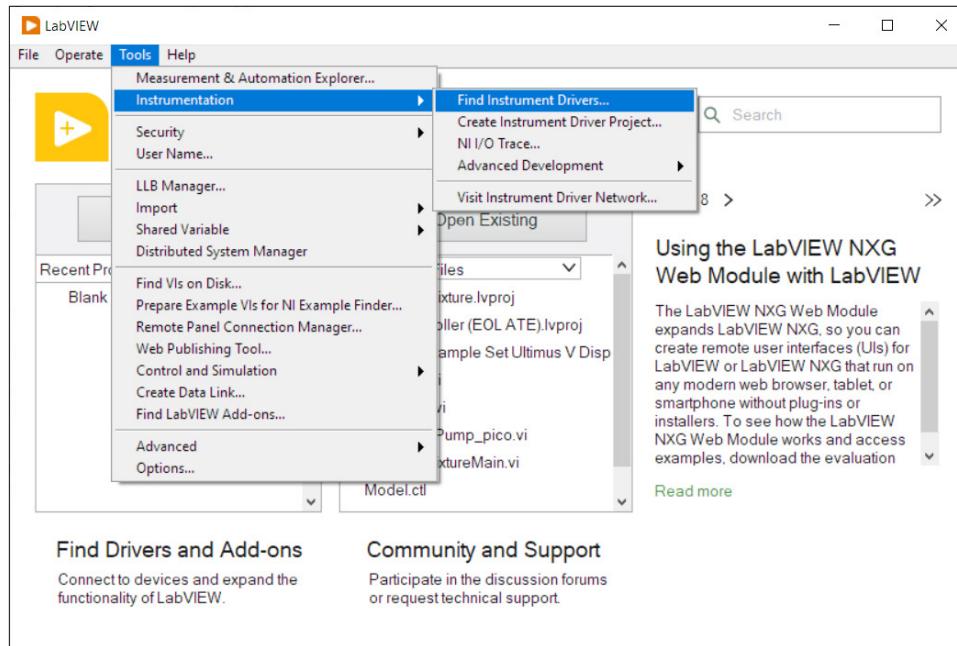
Appendix B – RS-232 Protocol (continued)

5. LabVIEW Driver and Example Program

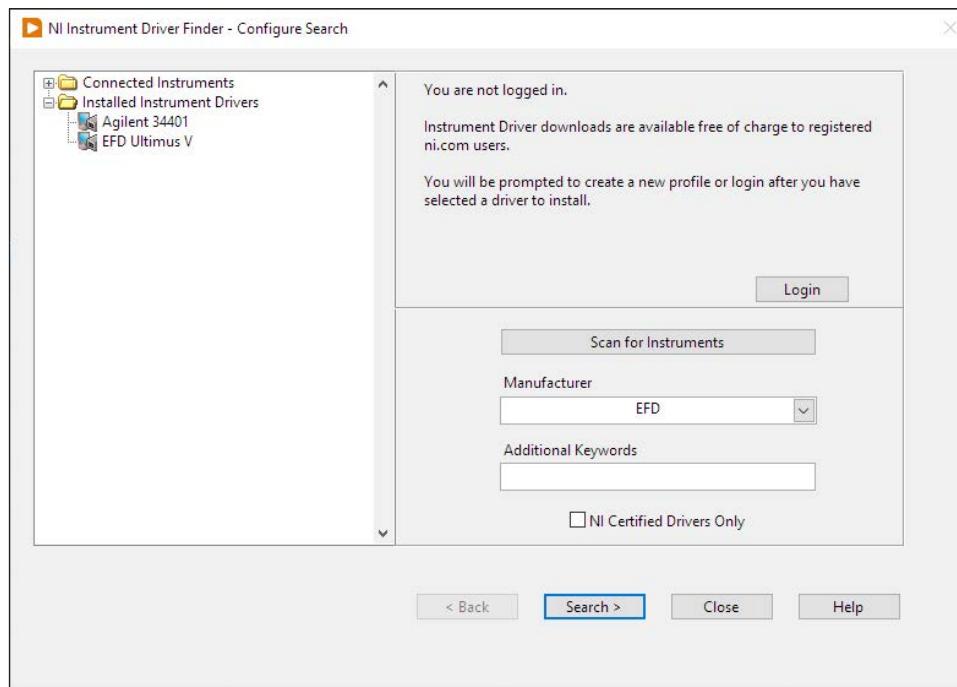
National Instruments LabVIEW software facilitates RS-232 communication with the dispenser. An EFD driver and sample program are available.

NOTE: For physical connection instructions, refer to “1. Physical Connection” on page 39.

1. Open the NI Instrument Driver Finder.



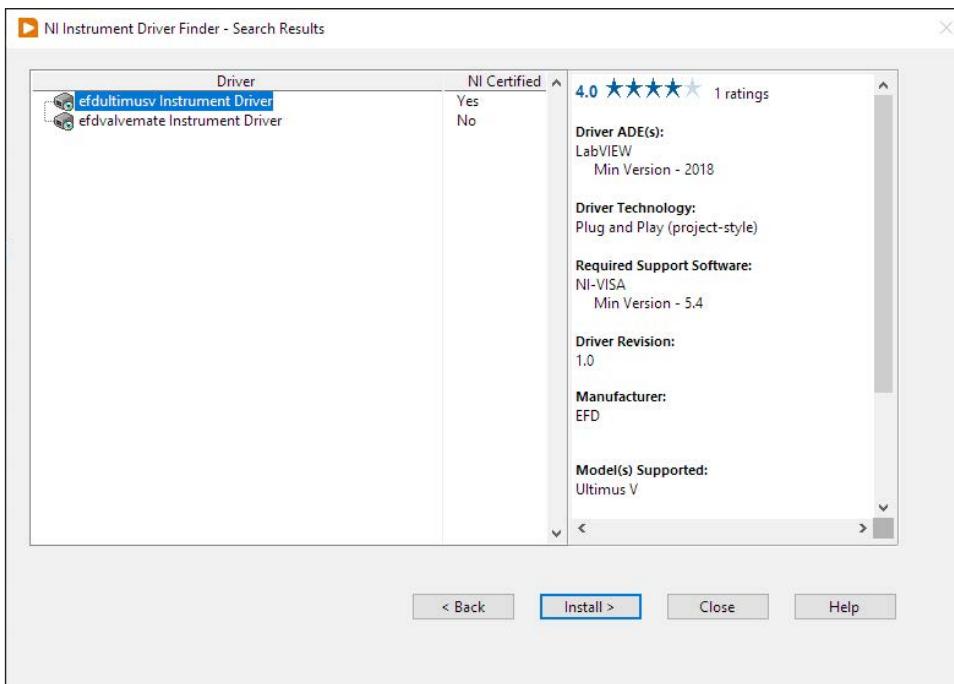
2. Search by manufacturer for “EFD.”



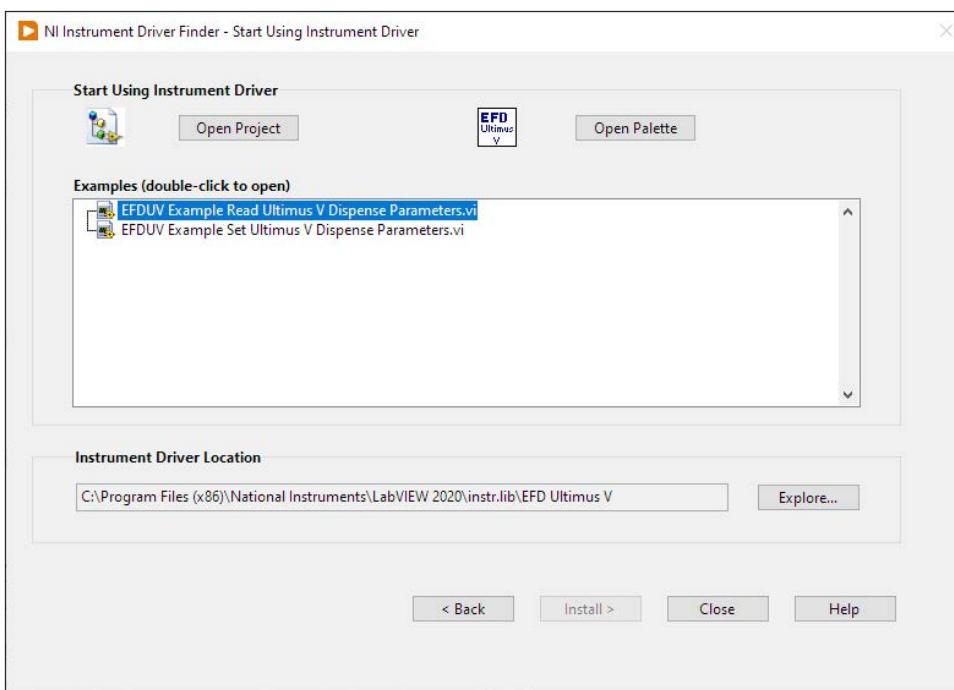
Appendix B – RS-232 Protocol (continued)

LabVIEW Driver and Example Program (continued)

3. Select and install the “efdultimus Instrument Driver.”



4. Once installed, select the “EFDUV Example Read Ultimus V Dispense Parameters” file.

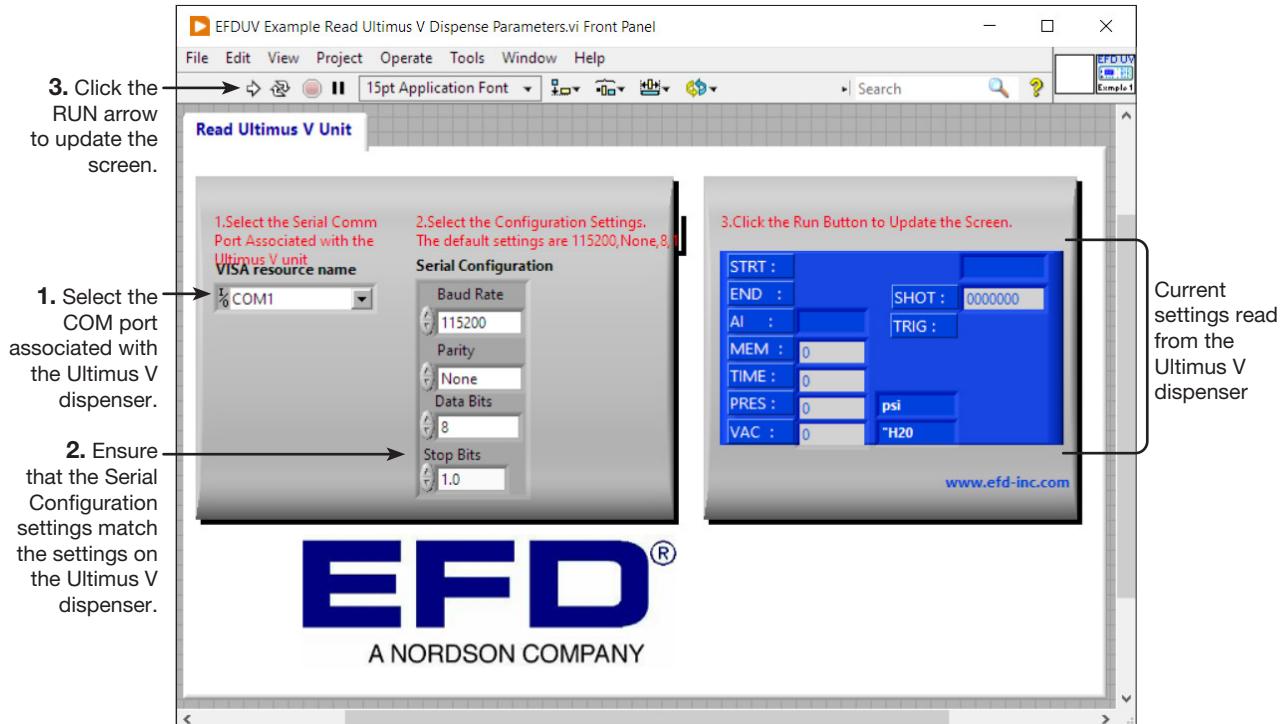


Appendix B – RS-232 Protocol (continued)

LabVIEW Driver and Example Program (continued)

The “EFDUV Example Read Ultimus V Dispense Parameters” GUI opens. Follow the steps shown below to read the current settings of the Ultimus V dispenser.

In this example, the software opens with the COM port configuration settings as shown. Clicking the RUN arrow runs a set of commands that will read the settings from the dispenser and display them in the box on the right side.



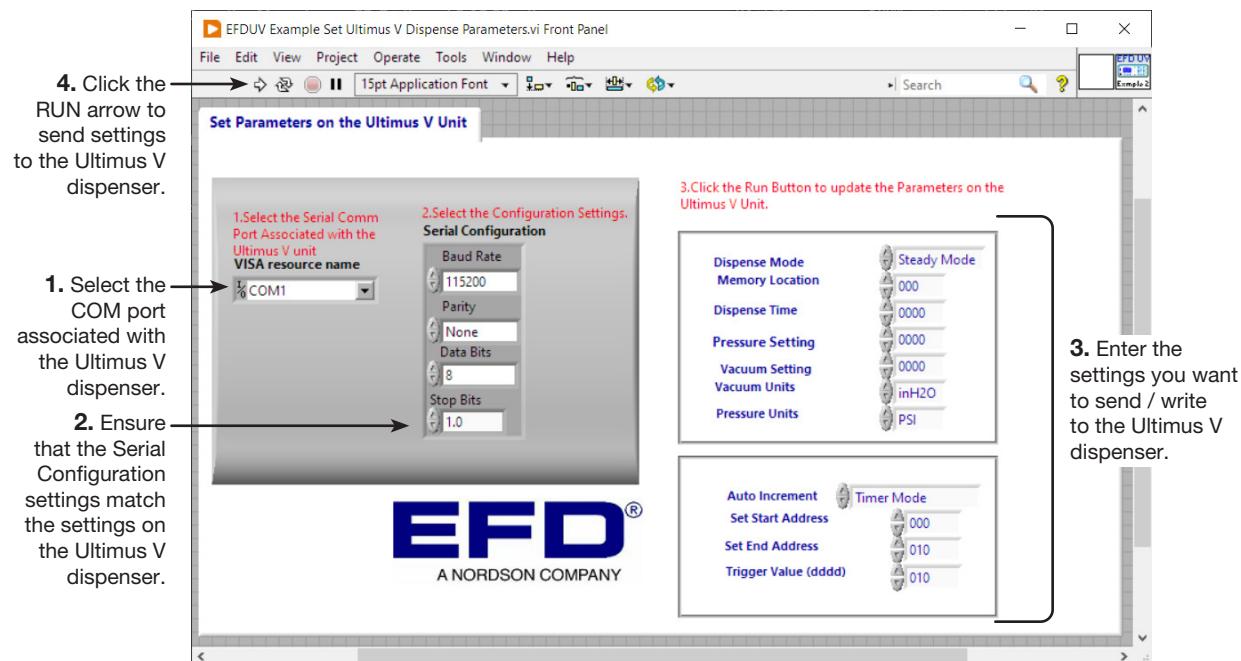
Appendix B – RS-232 Protocol (continued)

LabVIEW Driver and Example Program (continued)

5. Open the “EFDUV Example Set Ultimus V Dispense Parameters” file.

The “EFDUV Example Set Ultimus V Dispense Parameters” GUI opens. Follow the steps shown below to write the settings to the Ultimus V dispenser.

In this example, the software opens with the COM port configuration settings as shown. Clicking the RUN arrow runs a set of commands that will write (send) the settings entered in the box on the right side to the Ultimus V dispenser.



Dispense Time:

- The Dispense Time setting is either a 4-digit or 5-digit value.
- If a value between 0000 to 9999 is entered, the dispenser sets the Dispense Time as 0.000 s to 9.999 s.
- If a value between 10001 to 99999 is entered, the dispenser sets the Dispense Time as 1.0001 s to 9.9999 s.

Pressure Setting:

- For psi pressure units, if the required pressure is 100.0 psi, enter a value of 1000. For 99.8 psi, enter 998, and so on.
- For kPa pressure units, if the required pressure is 689.5 kPa, enter a value of 6895.
- For bar pressure units, if the required pressure is 6.895 bar, enter a value of 6895.

Vacuum Setting:

- For H₂O vacuum units, if the required vacuum is 18.0 H₂O, enter a value of 180.
- For kPa vacuum units, if the required vacuum is 4.48 kPa, enter a value of 448.
- For Hg vacuum units, if the required vacuum is 1.32 Hg, enter a value of 132.
- For mmHg or Torr vacuum units, if the required vacuum is 33.6 mmHg or Torr, enter a value of 336.

Notes

NORDSON EFD ONE YEAR LIMITED WARRANTY

This Nordson EFD product is warranted for one year from the date of purchase to be free from defects in material and workmanship (but not against damage caused by misuse, abrasion, corrosion, negligence, accident, faulty installation, or by dispensing material incompatible with equipment) when the equipment is installed and operated in accordance with factory recommendations and instructions.

Nordson EFD will repair or replace free of charge any defective part upon authorized return of the part prepaid to our factory during the warranty period. The only exceptions are those parts which normally wear and must be replaced routinely, such as, but not limited to, valve diaphragms, seals, valve heads, needles, and nozzles.

In no event shall any liability or obligation of Nordson EFD arising from this warranty exceed the purchase price of the equipment.

Before operation, the user shall determine the suitability of this product for its intended use, and the user assumes all risk and liability whatsoever in connection therewith. Nordson EFD makes no warranty of merchantability or fitness for a particular purpose. In no event shall Nordson EFD be liable for incidental or consequential damages.

This warranty is valid only when oil-free, clean, dry, filtered air is used, where applicable.



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