

TABLE OF CONTENTS

Overview	3	System Tab	17
Liability Ownership	3	Priming Tab	18
General Manual Notes	3	Status Tab	21
Changes to the Manual	3	Alarms Tab	23
Intended Audience	3	Recipe Tab	24
Intended Use/Scope	3	Recharge Tab	25
Safety	4	Utility Tab	25
Supplier Registration for Safety Updates	4	Info Tab	25
Contacting the Supplier with Emergency Health Issues	4	Self Test Tab	25
Handling	5	Profiling Tab	25
Chemical Leaks	5	Confirmation Tab	27
Specifications	7	Maintenance	32
Compatibility	8	Changing the Filter	32
System Overview	9	Flushing the System	33
Appearance	9	Updating the Firmware	34
Two-Stage Technology Operating Principle	10	Troubleshooting	35
Quick Filter Changeout	10	Appendix: Priming Recipe Information	38
Installation	12	Guidelines for Priming a New Filter	38
Handling	12	Priming Settings	38
Facility Requirements	12	Manufacturing Information	39
Tools and Materials	12	System Relocation Notice	39
Install the Pump	12	Spare Parts	39
Storage	14	Technical Support	39
MMI Software	15	For More Information	39
Installing Software	15	Terms and Conditions of Sale	39
Connect Tab	16	Product Warranties	39
		Repair Service	39

OVERVIEW

Entegris, Inc. provides the enclosed product manual for your information.

Prior to using this manual, the user should verify with the product manufacturer that the user has the most recent copy of the product manual.

This manual is owned by Entegris, Inc., an affiliated company or its suppliers and title shall not pass to you as a result of your use of the manual.

LIABILITY OWNERSHIP

Read the following carefully before continuing:

In no event shall Entegris or its suppliers be liable for any damages whatsoever (including, without limitation, damages for loss of business profits, business interruption, loss of business information or any pecuniary loss) arising out of the use of or inability to use this manual, even if Entegris has been advised of the possibility of such damages.

GENERAL MANUAL NOTES

CHANGES TO THE MANUAL

The manufacturer reserves the right to make changes to the product covered in this manual to improve performance, reliability or manufacturability.


Although every effort has been made to ensure accuracy of the information contained in this manual, the manufacturer assumes no responsibility for inadvertent errors. Contents of the manual are subject to change without notice.

INTENDED AUDIENCE

This manual is intended for technicians involved in semiconductor manufacturing, and assumes that each individual is familiar with the proper handling of photochemicals and other potentially hazardous materials. Users must also be familiar with installing and using software on a computer running the Windows® operating system.

INTENDED USE/SCOPE

This manual is intended to be used by experienced technicians for the planning, installation, and operation of the described pump system. This manual contains basic safety information and contains basic safety information for the installation and use of the pump system. This manual covers the pump system only.

 **WARNING: Mishandling products exposed to a hazardous substance may result in death or serious injury. Always follow the recommendations and guidelines provided by the chemical suppliers and manufacturers. Always wear appropriate personal protection equipment as required for the chemicals in use. Refer to the Material Safety Data Sheets (MSDS) for each chemical.**

SAFETY

⚠ DANGER: Failure to follow these safety instructions may lead to fire, electric shock, chemical exposure, or other injuries, or damage to property. Read all safety information before usage.

SUPPLIER REGISTRATION FOR SAFETY UPDATES

The manufacturer requests that you notify us of your equipment installation, usage and status and provide appropriate contact information so that we may advise you with any safety alerts and information regarding your system. Please register your usage with your local service center.

CONTACTING THE SUPPLIER WITH EMERGENCY HEALTH ISSUES

Please contact the manufacturer with any emergency safety and health concerns.

⚠ WARNING: Safety is designed into every product. When followed, these minimum guidelines provide an acceptable level of safety for operating and maintaining the system, but are not a substitute for determining internal safety procedures.

Failure to comply with the safety precautions or warnings indicated in this manual violates the safety standards that form a part of the intended use of this equipment. The manufacturer assumes no liability for the user's failure to comply with these requirements.

⚠ WARNING: Use of controls, adjustments or procedures other than those specified in this manual without consulting a competent safety professional may result in exposure to potential hazards. Always follow established industrial safety practices when operating the equipment.

⚠ CAUTION: End of life statement. De-commissioning of the system, or any part of the system shall be in a manner that is consistent with appropriate regulations and guidelines.

⚠ WARNING: Chemicals are not supplied with this equipment. Refer to the chemical suppliers' MSDS for specific health and safety information.

⚠ WARNING: POTENTIAL CHEMICAL LEAK! Use one set of O-rings only. Check that the filter has O-rings or the manifold has O-rings. NEVER use O-rings on both the filter and the manifold or the system may leak chemical.

⚠ WARNING: PINCH HAZARD! Keep fingers clear of jaw mechanism to prevent personal injury.



⚠ WARNING: PINCH HAZARD! Pump weight in excess of 5 kg (17 lb). Use care in lifting and carrying the pump to prevent personal injury.



⚠ WARNING: Wear chemical-resistant garments and eye protection while changing the filter and during start-up. Use additional personal protective equipment (PPE) as directed by facility safety personnel, the MSDS or chemical safety guidelines.

⚠ CAUTION: Only technically qualified personnel should install the equipment.

⚠ CAUTION: DO NOT use this equipment in any manner not specified by the manufacturer. If the equipment is used in a manner other than as specified in this document, the safety protections may be impaired.

⚠ CAUTION: Fittings and components damage easily: handle all components with extreme care. DO NOT scratch or overtighten any component.

⚠ CAUTION: EQUIPMENT DAMAGE HAZARD! Turn off power before connecting or disconnecting any cable to the device, or damage may occur.

HANDLING

Each dispense system is manufactured with strict assembly, test, and inspection processes to ensure high-quality assembly and protection from unintended chemical release. As with all chemical handling systems, the dispense system has chemical connection points which must be handled with care, including:

- Fluid ports on the top surface
- Filter fittings

The pump mechanism has additional connecting points:

- Pressure sensor ports on the back (under the top cover)
- Between valve plate (front) and pump block
- Pump diaphragm mechanism in the pump block

A potential for chemical leak can occur at the above cited points. Use care to ensure that O-rings are either on the filter or on the manifold, never on both, or the system will leak. Refer to filter installation instructions in this manual.

Do not loosen any screws on the mechanism unless specifically directed to do so by an Entegris service engineer. Handle the dispense system with care to prevent damage to any fluid handling point.

Additional points of critical assembly and performance include pneumatic tubings, pressure and vacuum connecting points, and solenoid manifold tubes (inside bottom cover or backplane). Use care to prevent any damage to the unit which could result in chemical leakage.

CHEMICAL LEAKS

In the event of a suspected or confirmed chemical leak from the pump or in the vicinity of the pump, please follow the instructions below:

1. Determine chemical currently in use with pump.
2. Obtain Material Safety Data Sheet:
 - a. Determine if any incompatible materials may come in contact with the leaking material.
 - b. Isolate incompatibles with barriers including spill containment, closing valves, and removing the chemical supply if it is safe to do so.
 - c. Identify appropriate chemical protection equipment requirements including gloves, face and eye protection and chemical protective clothing to prevent exposure to or contact with chemicals.
 - d. Determine if the chemical has permissible exposure limits or short term exposure limits:
 - Identify limits requiring respiratory protection.
 - Ensure that appropriate monitoring devices are available to measure air levels.
3. Only employees properly trained to clean up spills of hazardous materials should conduct clean up activities. Consult local authorities or identified hazardous materials emergency response agencies or contractors for assistance if the facility does not have trained employees for spill cleanup or containment.
4. Ensure adequate monitoring and protective equipment is available for cleanup of hazardous materials.
5. Obtain supplies for cleanup and containment compatible with the chemical.

6. Obtain compatible containers to collect spilled material and cleanup materials.
7. Ensure adequate ventilation is provided before opening cabinet or equipment where a buildup of vapors could occur. If flammable material is in use:
 - a. Monitor area for flammable levels with appropriate monitoring devices.
 - b. Isolate all power sources or potential sources of sparks.
 - c. Use intrinsically safe tools and monitoring equipment.
8. Isolate pump from power sources to prevent fluids from flowing through unit during cleanup of leak or spill:
 - a. Use appropriate lockout/tagout out procedures to de-energize unit.
 - b. De-energize all areas of unit that may be in contact with spilled or leaking material.
 - c. When disconnecting nitrogen and/or any pressurized gas, wear appropriate Personal Protective Equipment (PPE) including gloves, then close the facility gas supply to prevent gas release when disconnecting lines.
9. If spilled material is within equipment, wipe all surfaces carefully with wipes appropriate for the chemical.
10. If material is contained in the tubing or the pump, provide collection container under the lines or pump during removal to collect chemical and prevent additional spills.
11. Decontaminate surfaces with appropriate decontamination materials per recommendation of chemical manufacturer.
12. Contain cleanup materials and contaminated debris and equipment.
13. Dispose of materials in accordance with local, state and national regulatory requirements.
14. Provide any required service to the equipment and verify all spilled material is collected or cleaned from surfaces.
15. Replace any equipment and secure lines in accordance with normal maintenance and service requirements.
16. Confirm air levels are safe.
17. Return equipment to service per standard procedures.

SPECIFICATIONS

Dispense performance	Volume	0.1 – 10.0 mL in 0.001 mL increments		
	Rate	0.1 – 3.0 mL/sec in 0.001 mL/sec increments		
	Repeatability	<0.02 mL 3 sigma		
	Viscosity range*	100 – 300 cP		
	Maximum dispense pressure**	0.40 MPa (60 psi)		
Recharge performance	Fill rate, filtration rate, vent rate, purge rate	0.1 – 3.0 mL/sec in 0.01 mL/sec increments		
	Vent frequency	Auto-venting or 1 – 10,000 dispense cycles		
Mechanical	Wetted surfaces	Modified PTFE, PTFE, Kalrez®		
	Connection type	Insert style, Super Pillar®, Super 300 Type Pillar or Flowell™ 60 series		
	Filter	Impact® 2 V2 (OF style)		
	Inlet, outlet and vent tubing	OD	6.35 mm (0.25") or 6.0 mm (0.24")	
		ID	3.97 mm (0.15628") or 4.0 mm (0.16")	
	Gas	Inlet gas type	Regulated N ₂ or CDA	
		Inlet gas pressure	448 kPa – 469 kPa (65 psi – 68 psi)	
	Vacuum	-68 kPa (20 in -Hg minimum)		
Dimensions	Height	242.6 mm (9.55")		
	Width	60.7 mm (2.39")		
	Depth	235.0 mm (9.25")		
Weight	~5 kg (11 lb)			
Electrical	Current rating	1.25A		
	Input voltage (system)	24 VDC ±10%		
	Serial communication	Specifications are dependent on interface module use		
	Parallel communication	Triggers and acknowledgments		
Certifications	See provided documentation			
Environment	Indoor use only			
	Altitude below 2000 m (2187.22 yd)			
	Ambient temperature 5° – 40°C (41° – 104°F)			
	Maximum relative humidity 80% for temperatures up to 31°C (88°F) decreasing linearly to 50% relative humidity at 40°C (104°F)			
	Mains supply fluctuations from 22 – 26 VDC			
	Transient overvoltages of overvoltage category II			
	Pollution degree 2			

*Depends on tool configuration. Contact applications support for detailed window of operation.

**Maximum pressure is a limit on the Window of Operation. Actual volumes and rates may be restricted to comply with the pressure limits for a given viscosity, tubing diameter, tubing length and tubing height.

COMPATIBILITY

The IntelliGen® dispense system has been optimized for the dispense of photoresists and other photochemicals. The system is uniquely designed to deliver highly accurate dispenses even at very low volumes with high repeatability.

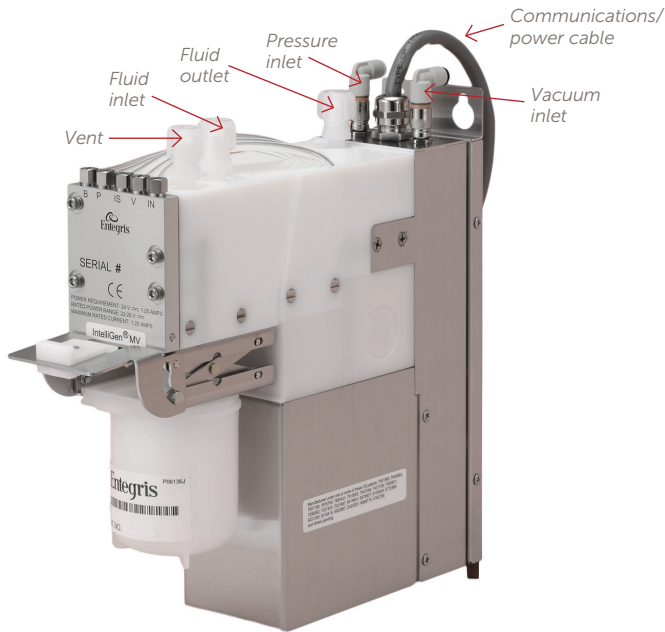
The internal wettable surfaces of the dispense system are PTFE, modified PTFE, and Kalrez.

The following is a partial list of compatible solvents. Please contact technical support for compatibility of a specific solvent that is not included in the list.

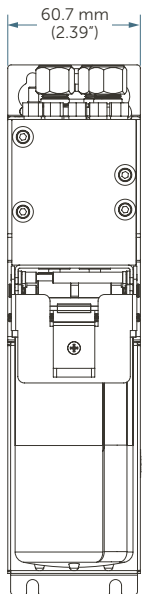
Acetone	Ethyl acetate	MIBK (methyl isobutyl ketone, 4-methyl-2-pentanone)
Adamantane (tricyclodecane)	Ethyl acetyl acetate (ethyl acetoacetate)	Mineral oil
n-Amyl acetate	Ethyl alcohol	Mineral spirits
Anisole (methyl phenyl ether, Methoxybenzene)	Ethyl benzene	MMP (methyl 3-methoxypropionate)
2-Butoxyethanol (ethylene glycol monobutyl ether, butyl cellosolve)	Ethyl cyclohexane	Morpholine
n-Butyl acetate	Ethyl lactate	NMP (N-methyl pyrrolidinone)
Butyl alcohol	Ethyl malonate (diethyl malonate, malonic ester)	Octamethyltrisiloxane
Butyl cyclohexane	Ethyl pyruvate	Orthodichlorobenzene (1,2-dichlorobenzene)
Butyl ether (dibutyl ether)	Gamma butyrolactone	2- Pentanone (methyl propyl ketone)
Cyclopentanone	2- Heptone (methyl amyl ketone)	Petroleum spirits (petroleum ether)
Cyclohexanone	Hexane	PGE (propylene glycol monoethyl ether, 1-ethoxy-2propanol)
Developer (positive, 0.26N TMAH)	2-Hexanone (methyl butyl ketone, propylacetone)	PGME (propylene glycol monomethyl ether, 1 methoxy-2-propanol)
Diacetone alcohol	HMDS (hexamethyldisilazane)	PGMEA (propylene glycol monomethyl ether acetate, 1-Methoxy-2-propyl acetate)
DI water	Hexamethyldisiloxane	PGPE (propylene glycol propyl ether, 1-propoxy-2-propanol)
Dichloromethane (methylene chloride)	1,6-hexanediol diacrylate	2-Propenamide (N,N-dimethylacrylamide)
Diethyl maleate	2-hydroxy-2-methylpropiophenone	2-Propenoic acid
DIGLYME (diethylene glycol dimethyl ether)	IPA (isopropyl alcohol, 2-propanol)	Propyl alcohol
Dimethyl acetamide	Isoamyl acetate	Tetrahydrofuran
Dimethyl cyclohexane	Isobutyl ketone (2,6-dimethyl-4-heptanone, diisopropylacetone)	Trichloroethylene
Dimethyl maleate	MCA (methyl cellosolve acetate, 2-Methoxyethyl acetate)	2.5% TMAH (tetramethyl ammonium hydroxide) in DI water
Dimethyl sulfoxide	Mesitylene (1,3,5 trimethylbenzene)	Toluene
1,3-Dioxolane (glycol methylene ether)	Methyl acetate (methyl acetic ester)	Xylene
EEP (Ethyl 3-ethoxypropionate)	Methyl alcohol	
ECA, EEA, EGMEA (cellosolve acetate)	Methyl ethyl ketone (2-butanone)	
Ethanone (2,2-dimethoxy-1,2-diphenyl, dimethoxy phenylacetophenone)	2-Methoxy-1-propanol (monopropylene glycol methyl ether)	

SYSTEM OVERVIEW

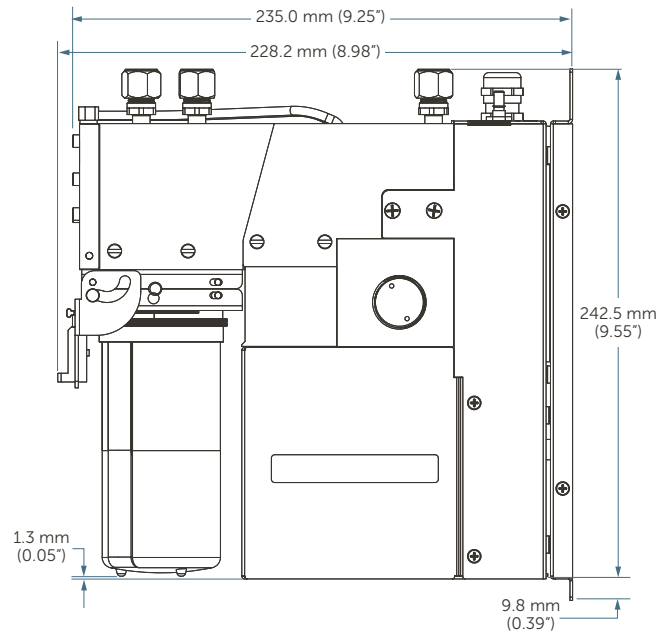
APPEARANCE



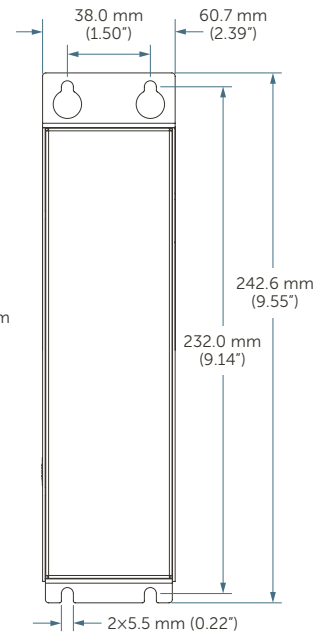
Front View



Side View



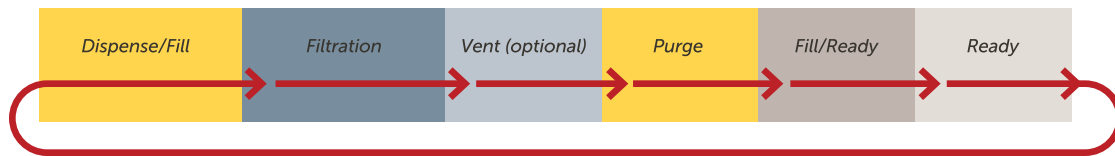
Rear View



TWO-STAGE TECHNOLOGY OPERATING PRINCIPLE

The IntelliGen dispense system uses a proven, unique two-stage design to operate dispense and filtration functions independently. Filtration occurs at a reduced rate, which prevents microbubble formation and maximizes filter performance.

The system uses two motors (one for fill, one for dispense), and advanced fluid paths to deliver extreme repeatability at dispense rates down to 0.1 mL/sec. During normal operation, the dispense system cycles through the dispense/fill, filtration, vent, purge, fill/ready and ready states.



1. READY State

- The inlet, external outlet, vent and purge valves are closed.
- The isolate and barrier valves remain open for a time to allow the system to reach ambient pressure, then the valves close.
- The dispense chamber is full of fluid and is ready to dispense.

2. DISPENSE and FILL State

- The external valve opens as the dispense motor pushes fluid through the outlet and onto the wafer.
- The dispense rate and volume are motor-controlled and independent of the fill and filtration rate.
- Simultaneously during dispense, the inlet valve can open and begin filling the inlet chamber.

3. FILTRATION State

- The isolation and barrier valves open and the fill motor pushes fluid through the filter and into the dispense chamber, as the dispense motor retracts.
- At the programmed filtration rate, the dispense chamber fills with filtered fluid.

4. VENT State

- The barrier valve closes and the vent valve opens.
- The fill motor pushes fluid and bubbles upstream of the filter membrane through the vent port.

5. PURGE State

- The barrier valve closes as the purge valve opens and the dispense motor pushes fluid out of the dispense chamber to the inlet source. This step ensures that the dispense fluid contains no bubbles.

6. READY/FILL State

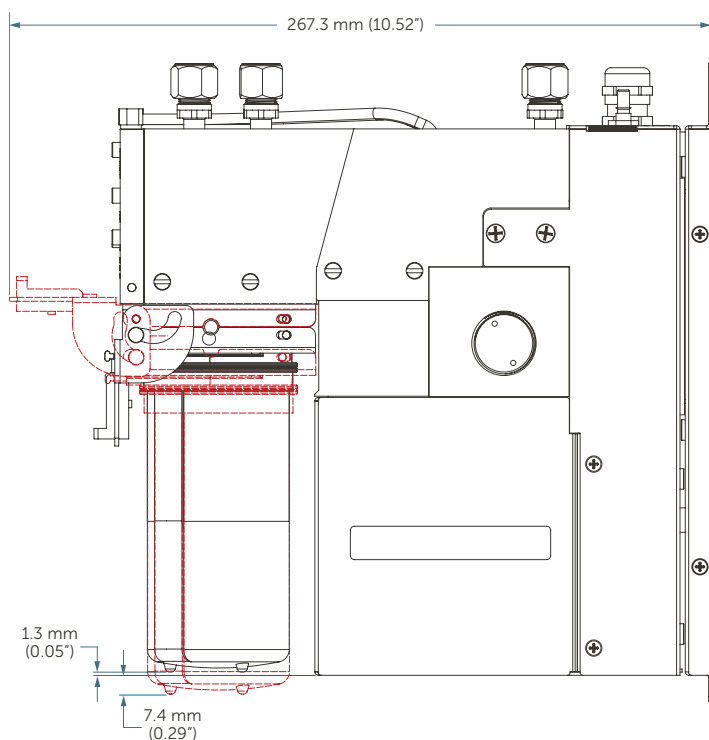
- The dispense chamber is full of fluid and ready to dispense.

QUICK FILTER CHANGEOUT

Patented Connectology® allows start-to-finish filter change in under a minute. No tools are required, no photochemicals to clean up and there is minimal personnel exposure to potentially hazardous volatile organic compounds (VOCs). Additionally, the dispense systems use a patented two-stage technology which provides rapid priming of the filter, resulting in significant chemical savings.

The following diagram shows the absolute minimum required clearances for filter replacement. The filter can be placed into the service area, then slid into the manifold. This feature allows easy installation into tight areas with drip trays, etc. below the equipment.

⚠ CAUTION: DRIP HAZARD! If the pump has been installed with minimum changeout space, use appropriate wipes, caps, and/or other materials to prevent spillage of fluid from the filter during changeout.



INSTALLATION

This section covers the site requirements, tools and equipment to install the system. Technical support is available for all installation types.

NOTE: All components are shipped in protective packaging to prevent damage during transport. If damage is found, please file a damage claim with the transportation carrier and contact customer support immediately.

CAUTION: Avoid particulate contamination. Do not unwrap any cleanroom-packaged item until immediately before installation.

WARNING: Only technically qualified personnel should install the system. Wear chemical-resistant garments and eye protection. Chemicals are not supplied with this equipment. Obtain a chemical MSDS for each chemical used with the system and follow all safety requirements.

CAUTION: Fittings and components damage easily; handle them with extreme care. Do not scratch or overtighten any part.

HANDLING

Use care when lifting and carrying the pump. The pump weighs in excess of 5 kg (11 lb), has blunt edges, and can cause pinch or other personal injury.

WARNING: PINCH HAZARD! Pump weight in excess of 5 kg (11 lb). Use care in lifting and carrying the pump to prevent personal injury.



FACILITY REQUIREMENTS

- Filtered N₂ or CDA, 551 kPa (80 psig)
- Vacuum >20 in Hg
- 24 VAC input power

WARNING: Installation location must provide adequate exhaust ventilation and monitoring.

The installation location should incorporate secondary containment and spill detection. Facility must have appropriate alarm and shutdown procedures for the chemicals in use.

TOOLS AND MATERIALS

Verify all system facility hookups including liquid and power supplies. The following tools and materials are required:

- Inlet/outlet tubing appropriately sized for the system and compatible with the fluid in use
- Tube cutter
- Adjustable wrench
- Electrical power cable
- Tie wraps
- Cleanroom wipes
- Pillar insertion tool/fixture
- Flaring tools
- Mounting hardware
- Impact 2 V2 (OF style) (sold separately)
- External stop/suckback valve

INSTALL THE PUMP

Step 1: Preparation

1. Use the dimensional drawings as a reference for dimensions and locations.
2. Leave appropriate space around the system to perform any connections, maintenance or troubleshooting. Clearance space can be shared space with other equipment.
3. Verify all system facility hookups including liquid and power supplies. Refer to system specifications.

Step 2: Unpack and Position the System

Allow space to make fluid fitting connections and power and other cable connections. Please consult customer support with any installation questions.

1. Remove the outer protective bags in your change room. Wipe the inner bags according to your cleanroom procedures.
2. Bring the system components to the installation location. Remove the inner bags.
3. Leave enough clearance around the system to allow service access. Refer to system dimensional drawings on previous pages.

Step 3: Connect Electrical Supply Cable

1. Connect power/communications cable. Contact Entegris for any pinout or connection details.

Step 4: Connect N₂ and Vacuum Supplies

1. Connect filtered and regulated N₂ or CDA supply to the inlet connection. Do not turn on the supply at this time.
2. Connect vacuum supply to the vacuum connector. Rating is >20 in Hg.

Step 5: Install the Filter

The dispense system cannot operate without a filter or a flushing shell installed.

⚠ WARNING: POTENTIAL CHEMICAL HAZARD! Obtain the chemical supplier's MSDS sheets for specific health and safety information.

⚠ WARNING: Wear chemical-resistant garments and eye protection at all times when working on or near the fluid system. Obtain the chemical supplier's MSDS for each chemical in use for specific health and safety information.

NOTE: UPE filter membrane does not require pre-wetting for use with most photochemicals. Consult a technical support representative for additional information on filter selection and compatibility.

1. Wear protective personal protection equipment.
2. Pull down the tab on the lever until it clears the catch (shown with filter installed for reference).



3. Raise the lever to open the filter manifold.



4. Verify that only ONE set of O-rings is used.

⚠ WARNING: POTENTIAL CHEMICAL LEAK! Use one set of O-rings only. Check that the filter has O-rings. NEVER use O-rings on both the filter and the manifold or the system may leak.

5. Slide in a new filter.



⚠ WARNING: PINCH HAZARD! Keep fingers clear of jaw mechanism to prevent personal injury.



6. Keep your fingers CLEAR of the jaws, then lower the lever until the tab clicks into place on the filter.



Step 6: Connect Fluid Lines

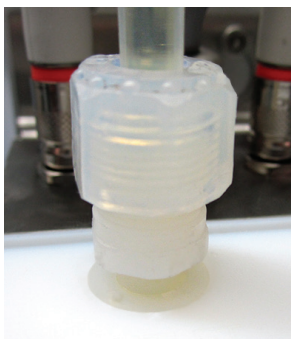
Minimize tubing lengths whenever possible and maximize fluid tubing size wherever practical to further reduce pressure drop through the tubing.

Use the shortest tube length practical, while providing adequate service loops.

As a general rule, minimize the distance between the source liquid and the system and between the system and the point-of-dispense.

⚠ CAUTION: DRIP HAZARD! Do not overtighten fittings. Excessive force will damage the internal seals. Tighten the fittings by hand; then use a small adjustable wrench to tighten for the final ¼ turn.

1. Insert Pillar sleeve and tube assembly into the fluid fitting adapter.
2. Hand tighten Pillar nut.



3. Use a 13 mm wrench to hold the fluid fitting adapter from turning when tightening the Pillar nut, sleeve and tube assembly. This is only to hold, not to turn.



4. While holding the fluid fitting adapter with the 13 mm wrench tighten the Pillar nut using a 16 mm wrench to the specified Pillar recommended specifications.



⚠ CAUTION: Tightening the union nut: Refer to Super Type Pillar Fitting Instruction Manual No. 048L-1.

Refer to the standard Super 300 Type Pillar or Flowell manufacturer's installation instructions for the making of other fitting connections.

STORAGE

Short-Term "Wet" Storage

A wet pump should be left in auto-recirculation mode to recirculate fluid and avoid problems related to stagnant chemical.

Long-Term "Dry" Storage

For long-term storage, the pump should be flushed and cleaned prior to performing a shut-down. See the *Flushing the System* section of this manual, page 33.

MMI SOFTWARE

The new and improved user-friendly MMI (Man-Machine Interface) Software provides more information at the point of dispense for better control of the dispense.

New features include:

- A pressure sensor on the fill side of the dispense pump to better understand what is occurring during the fill stage. This allows better recharge control and also provides an indication of when filter replacement is necessary.
- An improved dispense confirmation page with additional tests to determine the changes that occur between dispenses with the ability to compare dispenses and the referenced dispense assigned to the recipe number.
- An improved profiling page that allows side-by-side comparisons between last dispense profile, any saved dispense profile, or any referenced dispense profile (accessed from the Confirmation page) for four traces: dispense pressure, dispense motor position, fill pressure, and fill motor position.
- A self-test page with tests designed to evaluate the status of the dispense pump.
- An improved alarms page that allows the user to search and sort alarms history to determine changes to the system. Every header column can be sorted.
- An information page that allows the user to assign names for fab, tool, coater, resist, or fluid. This page also is a quick reference pump information page.
- A mouse-over feature that provides a brief description, the minimum and maximum limits, and the default value.
- The ability to record pump information in real time and save to csv file.

INSTALLING SOFTWARE

To program the pump, you must establish communications with a host computer, laptop or similar system, using the supplied software.

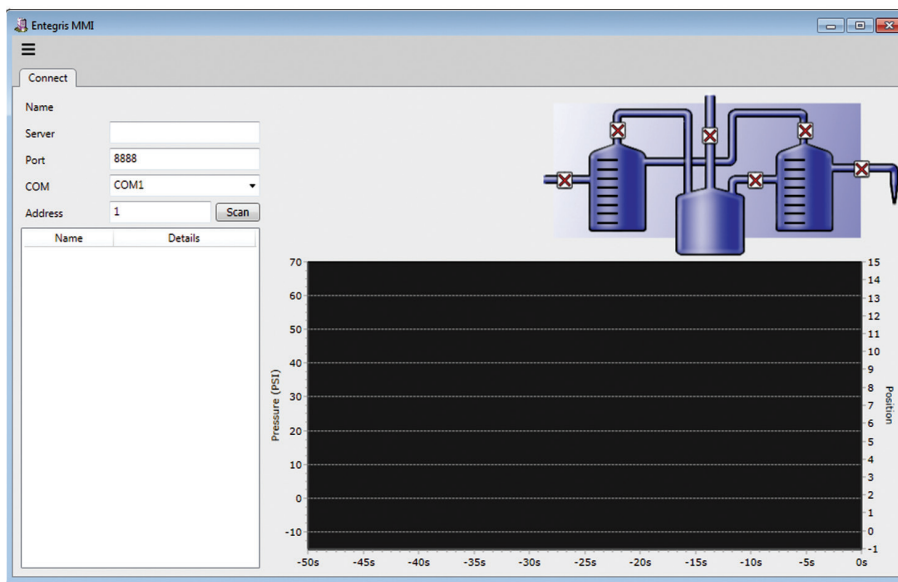
To install the software and establish communications with the dispense system:

1. Verify that a filter has been installed in the pump.
2. Connect the cables as appropriate for your configuration, as covered in the *Installation* section of this manual, page 12.
3. Verify that power is being supplied to the dispense system.
4. Install the MMI software into a separate directory on your computer, then double-click on the *.exe file to start the program.

CONNECT TAB

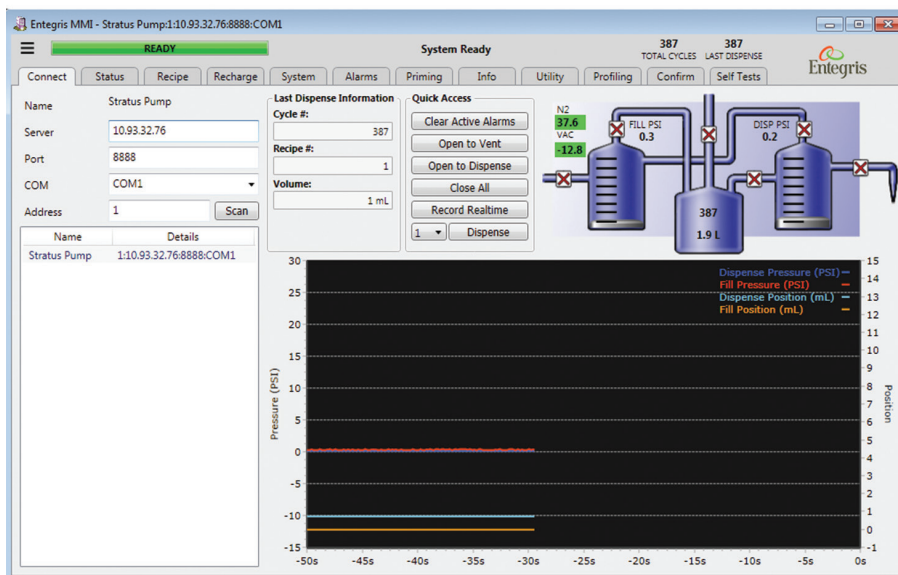
The Connect tab establishes the connection between the dispense pump and the MMI software.

1. Enter the Server, Port, and Comm information.
 - The exact COM port will depend on the specific computer connection and system setup.
2. Enter the Address, or click "Scan" to search for pump connections.
 - Each IntelliGen MV system can be assigned a unique address from 1 to 63.
3. Click "Connect" to connect to the pump.
 - The Connect tab will record all previous connections with the latest connection at the top.



4. A Time Synchronization screen may appear. Read the instructions displayed to synchronize the time stamps between the computer and the dispense system.

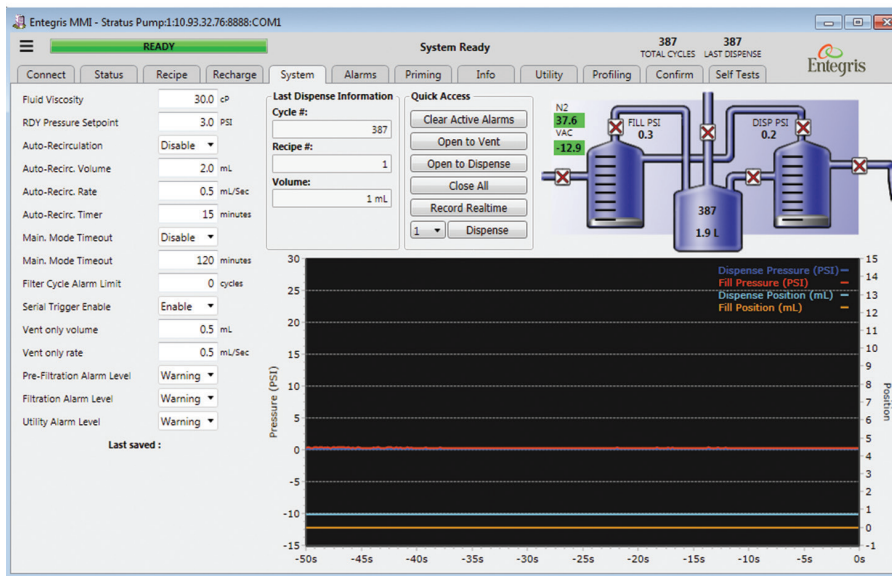
When communications have been established, the MMI display will come alive with realtime dispense.



SYSTEM TAB

The System tab provides variables relating to the system management of the pump. Variables can be changed from the default values to optimize the dispense system.

Use the mouse-over feature to obtain more information on displayed variables.



PRIMING TAB

The Priming tab provides the ability to purge the dispense pump and system of air using a “priming sequence” of steps.

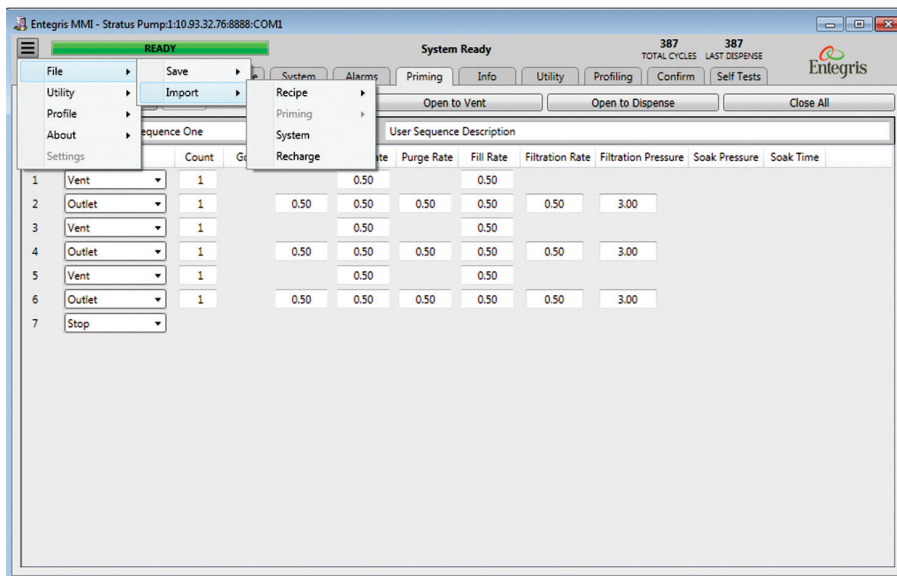
- Use “Loading a Sequence from a Saved File” to load an existing priming sequence.
- Use “Creating a Sequence” to create a new priming sequence.

Samples of priming sequences are provided in the Appendix, page 38.

Loading a Sequence from a Saved File

A priming sequence can be loaded from a previously created sequence:

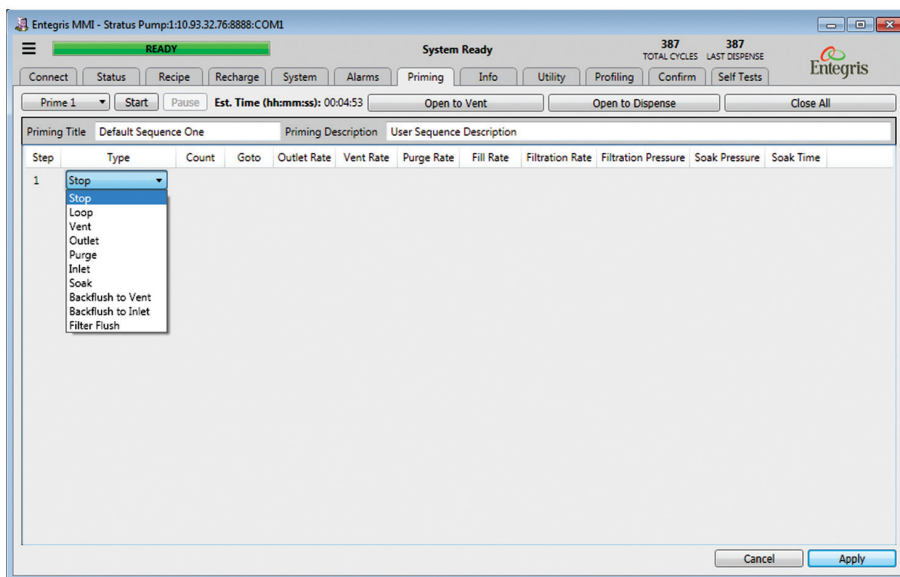
1. Click the menu logo.
2. Select “File”.
3. Select “Import”.
4. Select “Priming”.
5. Select number to be assigned.
6. Select priming file to be downloaded.
7. Press “Open”.
8. Press “Start” to begin priming.



Creating a Sequence

A priming sequence can be created with multiple steps to provide the most efficient sequence for a specific fluid type and viscosity:

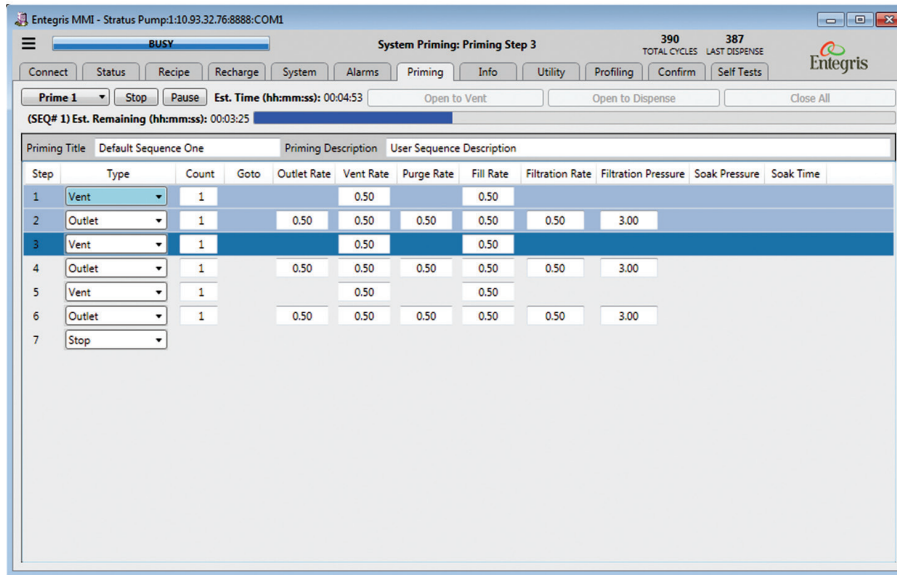
1. Under "Type" select a type of priming.
2. Under "Count" enter how many times the type of priming is to be performed.
3. For each step type, rates can be changed based on application needs.
4. Continue adding types and counts that will purge the system of air.
5. Press "Apply".
6. Press "Start" to begin priming.
7. Priming sequence can be saved by clicking the menu logo. Select "File", select "Save", select "Number", assign name of the priming sequence, press "Save".



Priming

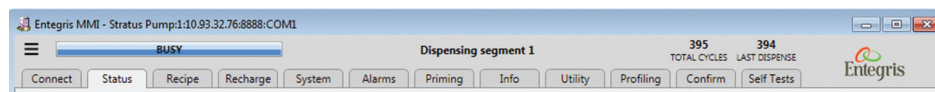
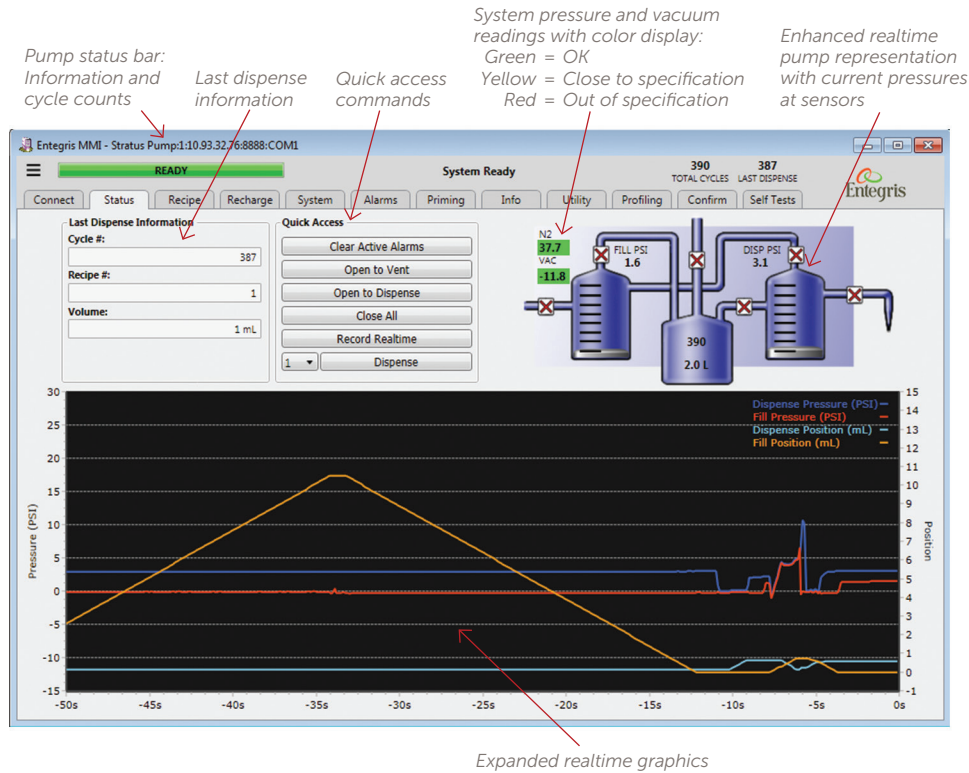
When in use, the Priming tab is divided into three sections:

- In the top section, pump status and priming step is displayed.
- In the middle section, an estimated time of completion and countdown is displayed.
- In the priming field, finished steps are highlighted in light blue, the current step is highlighted in dark blue and unfinished steps remain in gray.

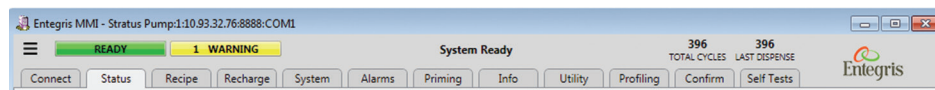


STATUS TAB

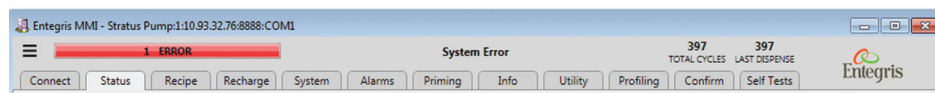
The Status tab displays realtime data of the dispense system.



When the dispense pump is dispensing or recharging, the status will show "Busy".



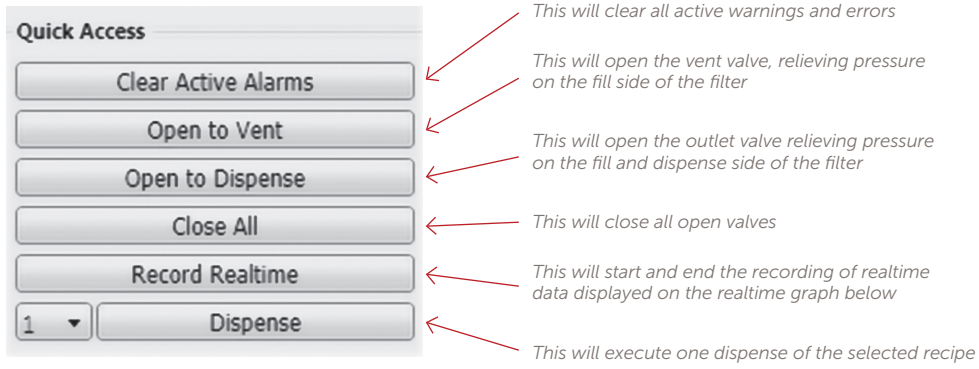
When a warning has been triggered, the status will display "Warning".
The dispense pump will still function.



When an error has been triggered, the status will display "Error".
The dispense pump will stop dispensing.

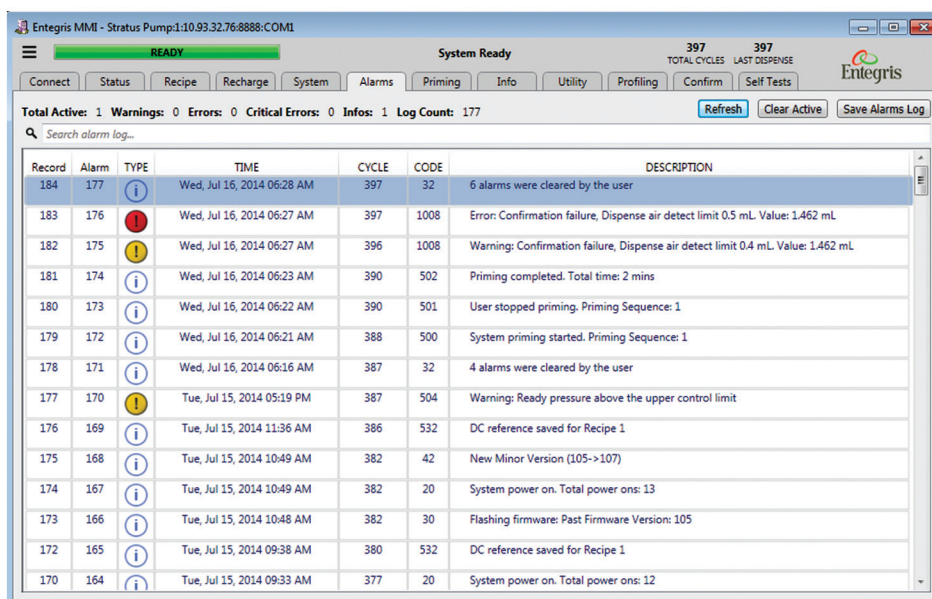
Quick Access Menu

The Quick Access Menu allows the user to quickly perform certain functions without switching pages.







ALARMS TAB

The Alarms tab displays information on the pump system’s current state and history.



Types of Alarms

ERROR TYPE	ACTION	SOLUTION
 Critical error	Pump shuts down immediately. Motors are disabled.	Clear error. If problem persists, call Entegris support.
 System error	Pump stops dispensing after completing the cycle. Motors are not disabled.	Clear error. Something changed in system; check system setup.
 System warning	An event occurred that did not affect the system. Pump continues to operate normally.	Investigate cause of warning.
 Information	An event occurred that did not affect the system. Pump continues to operate normally.	No effect. Alarm log only.

Each header description on the Alarms page can be sorted by double clicking on it (type, time, code, etc.).

Use the “Save Alarms Log” to save the log history to a csv file.

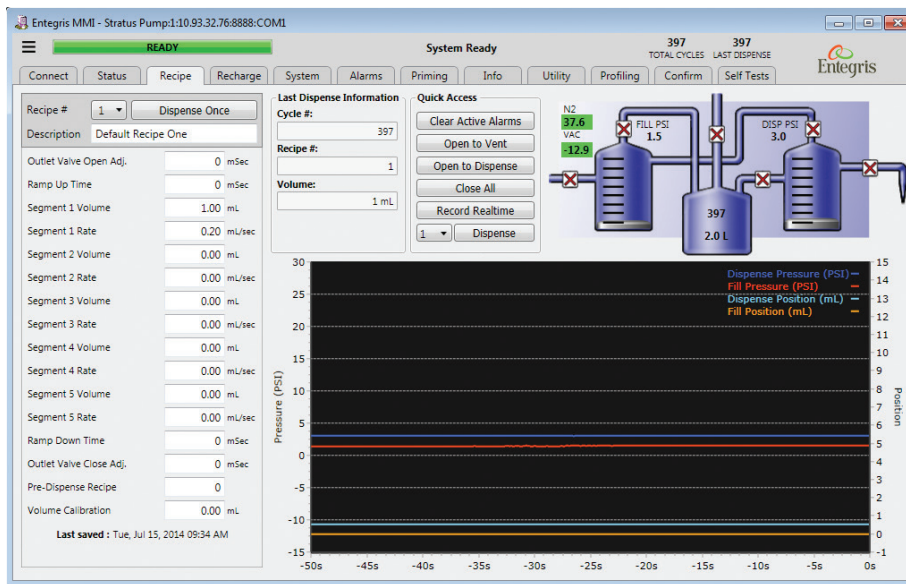
RECIPE TAB

The Recipe tab allows access to the variables that control dispense.

To import or save all recipes or individual recipes:

1. Click the menu logo.
2. Select "File".
3. Select "Import" or "Save".
 - To Import: Assign a number to the file then press "Open".
 - To Save: Select recipe to save, assign a name to the file, then press "Save".

Use the mouse-over feature to obtain more information on displayed variables.



RECHARGE TAB

The Recharge tab allows access to the variables that control the “Recharge” portion of the dispense cycle, including vent, purge, fill and filtration, and maximum dispense volume.

Use the mouse-over feature to obtain more information on displayed variables.

UTILITY TAB

The Utility tab includes “Continuous Dispense” and “Reset Cycle Counters” functions.

INFO TAB

The Information tab contains “read-only” items that pertain to individual pump tracking records and dispense statistical history. The screen also allows entry of information of system specifications, including location, type and fluid being used.

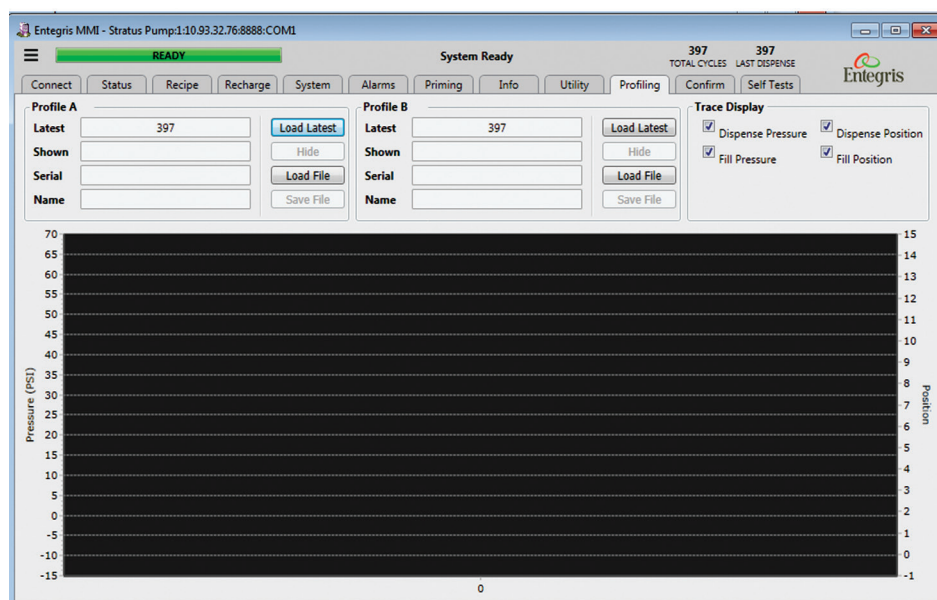
SELF TEST TAB

The Self Test tab includes tests that evaluate motor backlash, the performance of the fill and dispense motors, and the accuracy of the pressure sensors.

NOTE: Execution of these tests is setup dependent. Refer to test description to obtain setup.

PROFILING TAB

The Profiling tab allows dispense profiles to be plotted, saved, and imported individually or for comparison. The traces are dispense pressure, motor dispense position, fill pressure, and motor position which can be turned on or off.



Profile Command

There are two profile commands: Profile A and Profile B:

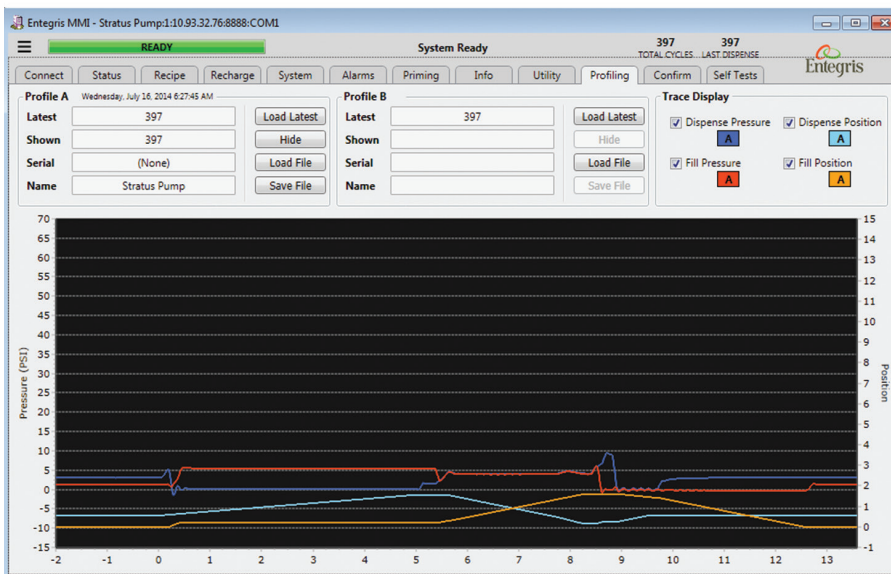
This will load the latest dispense to the graph below

This shows or hides the profile from the graph below

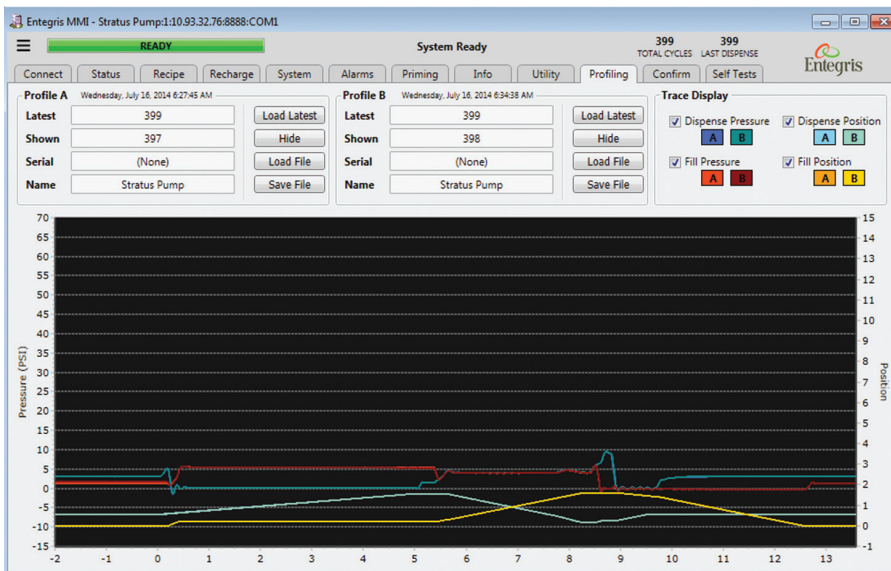
This will load a saved csv file to the graph below

This will save the cycle number displayed in the "Latest" text field to a csv file

Example plots are shown below:



Single profile display

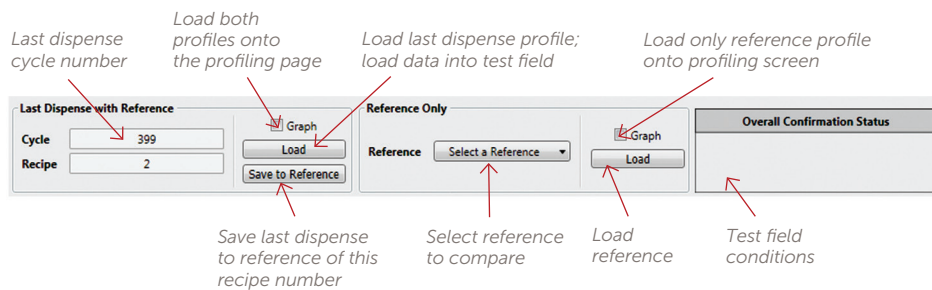
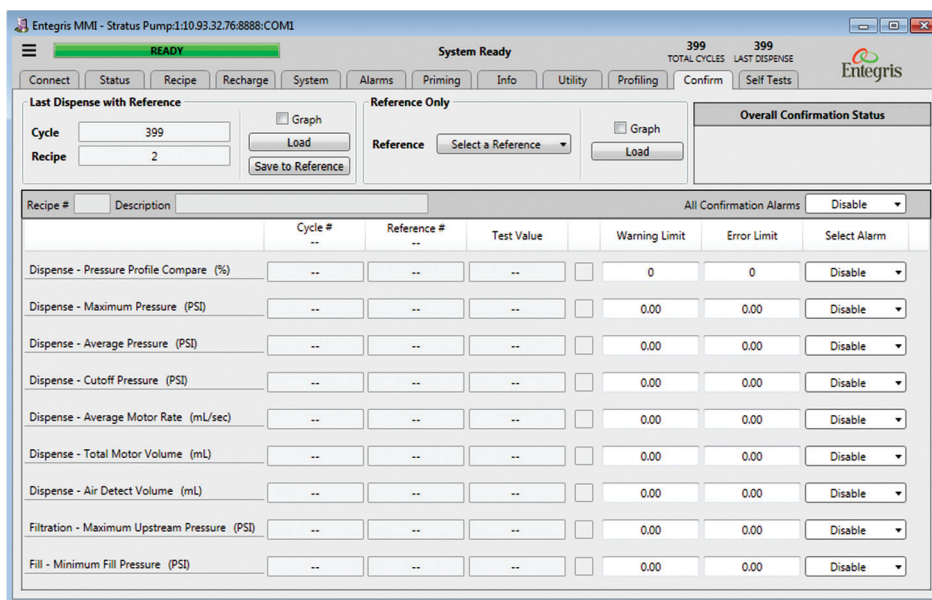


Comparison profiles displayed

CONFIRMATION TAB

The Confirmation tab compares a dispense profile to a referenced profile by means of a criteria of “settable” confirmation tests.

- Alarms can be set to warning or error.
- Alarm limits, upper and lower, can be set by the user.
- A referenced dispense profile can be saved and viewed for each recipe.



Control panel

Enable/disable all confirmation alarms

Recipe #	Description	Cycle #	Reference #	Test Value		Warning Limit	Error Limit	Select Alarm
		--	--	--	<input type="checkbox"/>	0	0	Disable
	Dispense - Pressure Profile Compare (%)	--	--	--	<input type="checkbox"/>	0.00	0.00	Disable
	Dispense - Maximum Pressure (PSI)	--	--	--	<input type="checkbox"/>	0.00	0.00	Disable
	Dispense - Average Pressure (PSI)	--	--	--	<input type="checkbox"/>	0.00	0.00	Disable
	Dispense - Cutoff Pressure (PSI)	--	--	--	<input type="checkbox"/>	0.00	0.00	Disable
	Dispense - Average Motor Rate (mL/sec)	--	--	--	<input type="checkbox"/>	0.00	0.00	Disable
	Dispense - Total Motor Volume (mL)	--	--	--	<input type="checkbox"/>	0.00	0.00	Disable
	Dispense - Air Detect Volume (mL)	--	--	--	<input type="checkbox"/>	0.00	0.00	Disable
	Filtration - Maximum Upstream Pressure (PSI)	--	--	--	<input type="checkbox"/>	0.00	0.00	Disable
	Fill - Minimum Fill Pressure (PSI)	--	--	--	<input type="checkbox"/>	0.00	0.00	Disable

Reference and last dispense data and results
 Test operation criteria
 Settable warning and error limits
 Enable warning or error

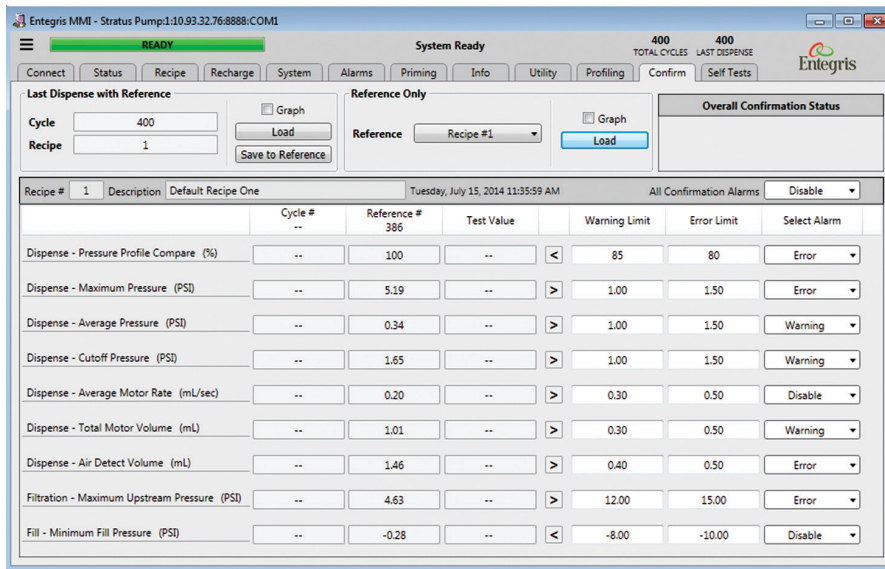
Using Dispense Confirmation

1. When the user is satisfied with the condition of dispense, press "Save to Reference". Please be patient; this may take time.
2. In the "Reference Only" section, select the recipe, then press "Load". Data should load for reference.
3. Enter values for the Error Limit and Warning Limits:
 - Error Limit: Pump will generate an error if the dispense confirmation value for the current dispense is below the user-settable limit. The error must be cleared before operation can continue.
 - Warning Limit: Pump will generate a warning if the dispense confirmation value for the current dispense is below the user-settable limit. Pump will continue to operate.

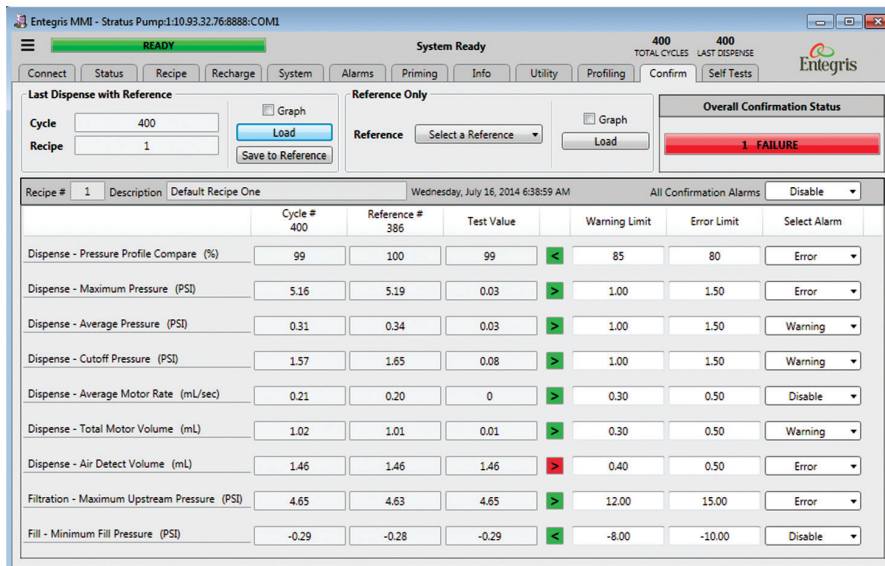
Test results should be monitored using warning limits before using error limits for fine tuning.

- Values can be set for "tight" control or "loose" control of the dispenses.
 - Enable individual tests: set to warning or error.
4. Execute one dispense.

- After cycle completes, in the "Last Dispense with Reference", press Load. The Data field should fill in with confirmation test results.



Confirmation Example



- Since "All Confirmation Alarms" was disabled, the data field shows what the results would have been if the confirmations test was enabled.
- The results show one test condition would have triggered an error.
- Pump shows "Ready" because alarms are disabled.

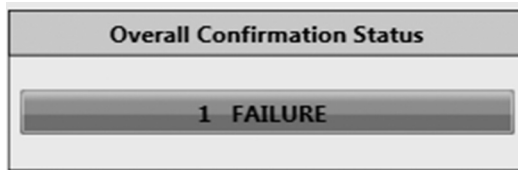
Reading the Results

Read the results as a sentence.

Recipe #	Description	Cycle #	Reference #	Test Value	Warning Limit	Error Limit	Select Alarm
1	Default Recipe One	400	386				
	Dispense - Pressure Profile Compare (%)	99	100	99	85	80	Error
	Dispense - Maximum Pressure (PSI)	5.16	5.19	0.03	1.00	1.50	Error
	Dispense - Average Pressure (PSI)	0.31	0.34	0.03	1.00	1.50	Warning
	Dispense - Cutoff Pressure (PSI)	1.57	1.65	0.08	1.00	1.50	Warning
	Dispense - Average Motor Rate (mL/sec)	0.21	0.20	0	0.30	0.50	Disable
	Dispense - Total Motor Volume (mL)	1.02	1.01	0.01	0.30	0.50	Warning
	Dispense - Air Detect Volume (mL)	1.46	1.46	1.46	0.40	0.50	Error
	Filtration - Maximum Upstream Pressure (PSI)	4.65	4.63	4.65	12.00	15.00	Error
	Fill - Minimum Fill Pressure (PSI)	-0.29	-0.28	-0.29	-8.00	-10.00	Disable



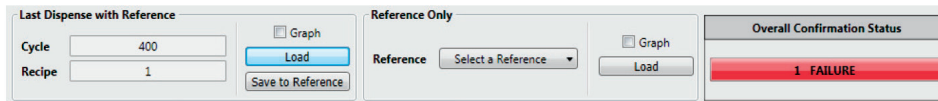
In this example, "Air Detect Volume" would have triggered an alarm, if enabled. Result shown in data field and "Overall Confirmation Status".



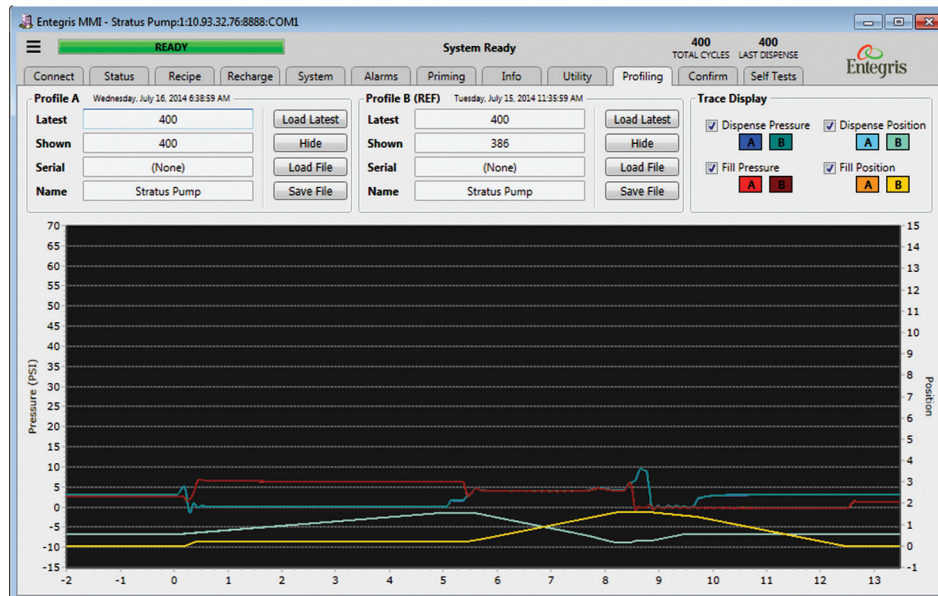
To enable tests, enable "All Confirmation Alarms".

Using the Profiling Page for Confirmation

- In the Control Panel, check the graph boxes.
 - It is possible to graph reference profile separately by first selecting a reference and then pressing "Load" in the "Reference Only" section.
 - When pressing "Load" in "Last Dispense with Reference" section, the reference profile will load automatically.
 - Standard profiling commands and features apply to the confirmation profiles.



- The reference profile is always "Profile B".



- Press "Load Latest" to compare each subsequent dispense as "Profile A".
- Use the "Trace Display" function to compare specific traces.

MAINTENANCE

The system needs no special maintenance beyond periodically changing the filter and flushing the system when necessary.

CHANGING THE FILTER

Filter replacement can be set on the MMI by using the "Filter Cycle Alarm Limit" feature on the Systems tab.

⚠ WARNING: POTENTIAL CHEMICAL HAZARD! Obtain the chemical supplier's MSDS sheets for specific health and safety information. Wear chemical-resistant garments and eye protection while draining the system, changing the filter and during start-up. Dispose of the used filter in a manner that is consistent with approved regulations and the guidance of the chemical supplier.

NOTE: UPE filter membrane does not require pre-wetting for use with most photochemicals. Consult a technical support representative for additional information on filter selection and compatibility.

1. Verify that the pump is offline (no dispense signals will be received during the filter changeout process).
2. Pull down the tab on the lever until it clears the catch.



3. Raise the lever to open the filter manifold and remove the old filter.



4. Verify that only ONE set of O-rings is used.

⚠ WARNING: POTENTIAL CHEMICAL LEAK! Use one set of O-rings only. Check that the filter has O-rings. NEVER use O-rings on both the filter and the manifold or the system may leak.

5. Slide in a new filter.



⚠ WARNING: PINCH HAZARD! Keep fingers clear of jaw mechanism to prevent personal injury.



6. Lower the lever until the tab clicks into place on the filter.



7. Dispose of the used filter in accordance with all appropriate safety and disposal laws, regulations, and safety requirements.
8. To prime a new filter, see *Guidelines for Priming a New Filter*, page 38.

FLUSHING THE SYSTEM

Clean and flush the dispense system when the chemical is changed, when the system is removed from service for an extended period of time, or when the dispense system and lines require flushing to remove particulates.

⚠ WARNING: Wear chemical-resistant garments and eye protection when working with all chemicals.

The following procedure covers most photochemical applications, but chemicals used for flushing and cleaning must be compatible with the fluid in the pump. Contact the photochemical fluid manufacturer to verify that the flushing and cleaning chemicals used will not adversely react with their product and will be effective in flushing the pump.

Isopropyl alcohol (IPA) may react with the photochemicals in the pump, so make sure that the pumps and filters flushed with IPA are first flushed with the photochemical base solvent before using photoresist in the pump.

The amount of solvent, acetone and IPA used for flushing are not fixed, but 500 – 750 mL is typical.

Depending upon the pump setup, the first 200 mL of cleaning fluid can be recycled through the pump to dissolve any residue. Remove and discard this fluid, then pass fresh flushing chemical through the pump and discard.

When changing photochemicals, the chemical manufacturer may recommend a full tubing change to avoid cross contamination. If the photochemical solvent bases are the same, the acetone and IPA flushes may not be necessary. Contact the photochemical manufacturer for their recommended procedure.

When flushing the pump to remove photoactive compound (PAC) precipitates, contact the photochemical manufacturer to determine the proper solvent for dissolving the PAC crystals. In general, the PAC crystals may not dissolve in a solvent base and a stronger solvent such as N-methyl pyrrolidinone (NMP) may be required. PAC crystals remaining in the pump may act as nucleation sites and cause particulates. Flushing of the pump is accomplished using the Priming functions described in the Priming section of this manual. In general, the rates entered when flushing the pump can be higher than when priming the system with chemical.

These settings will need to be adjusted for tubing diameter, length, and the viscosity of the chemicals in use.

Flushing a Working Pump

1. Remove the filter and replace it with a flushing shell.
2. Connect the inlet line to a photoresist solvent or a manufacturer recommended stripper or thinner.
3. Follow the priming operation sequence to flush out the pump, then continue to dispense until the bulk of the original chemical is removed from the pump.
4. Connect the inlet line to a container of a manufacturer-recommended cleaning solvent.
5. Follow the priming operation sequence to flush out the pump, then continue to dispense until the bulk of the first cleaning agent is removed from the pump.
6. Connect the inlet line to a container of isopropyl alcohol (IPA) and flush the pump with this solution to remove previous cleaning agents from the pump.
7. Through the MMI, manually open all of the pump valves. Also open the outlet valve.
8. Blow dry the pump using compressed and filtered dry nitrogen. (A blow-down valve is available on the prewet system. Turn the valve clockwise to blowdown a pump.)
9. After 10 minutes, close the vent valve and continue to blow-dry the pump for 10 minutes.

10. After 10 minutes, close the purge valve and open the vent valve and continue to blow-dry the pump for 10 minutes.
11. After 10 minutes reopen the purge valve and let the dry nitrogen flow through the pump for 10 minutes.
12. Turn off the nitrogen blow-dry valve. Close all pump valves.

Flushing a Nonworking Pump


Use this procedure to flush and dry a pump that is not properly functioning and needs to be returned to the factory for rebuild. Contact Entegris prior to returning any device for service and to obtain appropriate forms to certify proper decontamination and handling of the dispense system by all personnel.

1. Remove all tubing connections and drain and flush them separately.
2. Remove the filter and replace it with a flushing shell.
3. Remove the pressure source from the pump to float the valves.
4. Reattach tubing to the pump to avoid splattering the photochemicals.
5. Empty the lines as follows:
 - Pressurize the inlet line with N₂ or CDA to push the photochemical through the filter inlet.
 - Pressurize the purge line to push the photochemical through the dispense line.
 - Pressurize the vent line to push the photochemical through the filter vent port.
6. Discharge solvent, followed by IPA, through the pump using the inlet, purge and vent lines. Attach a pressurized source of the fluid to each of the lines or use a gravity feed to each of the lines.
7. Blow dry the pump by applying compressed N₂ or CDA through the inlet, purge and vent lines.

UPDATING THE FIRMWARE

Pump and MMI Firmware Matching

If a pump is changed out, or software has been upgraded on the controller, the system may display an MMI firmware warning. To update firmware from the controller to a pump, follow the screen prompts.

1. On the Connections tab, select and open the pump to be updated.
2. The MMI will detect that the pump has a different firmware version and ask if you want to update.
3. To update, select "Download". The download screen will display.
 -  **CAUTION: Do not interrupt the download process. If the pump is powered down during the flash process, it may cease to operate. If this occurs, please contact Entegris for assistance.**
4. When the download is complete, the download windows will close.

NOTE: In some instances, the "Download Firmware" screen may freeze. In this case, moving the mouse will cause it to update. In all cases, the entire firmware download and flash process should be complete in less than five minutes.

TROUBLESHOOTING

This section covers some of the common problems and solutions for the dispense system. Refer to the “Serial Communications Protocol” for details on event codes, error codes, and other details, if required.

After making any adjustments, test the result with two to three dispenses. If the solutions in this section do not help, please contact technical support.

Pump Does Not Dispense

PROBLEM	SOLUTION
Pump is not responding	Check the electrical connections between the pump, the interface module, and the track. Check that the N ₂ or CDA supply is on.
External stop valve not operating	Verify pneumatic connections to the external valve.
Pump is in error state	Clear alarm code using the MMI then clear errors. Refer to error code listing.
Improper N ₂ /CDA pressure or vacuum applied	Verify N ₂ or CDA and vacuum supply pressure (check connections and facility supplies).
No chemical in pump	Replace source bottle and prime the pump. Replace filter if chemical has dried out.
Bubbles in tubing	Check for leaks. Check fitting connections and tubing.

Poor Quality Dispense

If the dispense quality is poor (whether at the start, stop or middle of dispense), check the following:

PROBLEM	SOLUTION
Air trapped in lines	Perform multiple dispenses using high volume and high rate.
Nozzle too high or nozzle ID too large	Adjust nozzle height and size for dispense rate and viscosity.

Poor Start of Dispense

If the problem is related to the start of the dispense, check the following:

SYMPTOM	PROBLEM	SOLUTION
Fluid pulls up in nozzle before dispense starts	External stop valve opening too soon	Slow down the valve through the external stop valve setup.
Double dispense: dispense starts, stops, then proceeds with main dispense	External stop valve opening too late	Open valve more quickly through the external stop valve setup.

Poor End of Dispense

If the problem is related to the end of the dispense, check the following:

SYMPTOM	PROBLEM	SOLUTION
Droplet hangs down/drips	External stop valve closing too late or parameters require adjusting	Close the valve earlier by adjusting the close time on the Recipe tab (Outlet Valve Control), or adjust suckback settings.
Fluid cuts off too high in the nozzle	External stop valve closing too quickly	Close the valve later by adjusting the close time on the Recipe tab (Outlet Valve Control), or adjust suckback settings.
No suckback	Bubbles in the dispense line	Ensure no bubbles are in the dispense line.
	Inappropriate suckback parameters on Recipe tab	Ensure there is enough time for the chemical to flow back. Higher viscosity chemicals will require longer time. For new system start-up, start with the low suckback rate and high suckback volume. For example: 0.05 cc/s and 0.5 cc respectively. This gives the chemical 10s to flow back. Optimize the parameters accordingly.

High Particle Counts on Wafer

If there are high particle counts, check the following:

PROBLEM	SOLUTION
Filter media is too open	Use smaller pore size filter.
Filter not being fully wetted during installation or priming	Perform multiple purge cycles using higher than normal filtration to completely wet the filter.
Filter lifetime exceeded	Replace filter.
Contaminated or old resist	Drain, flush and clean the entire system and fluid path. Use new photochemical. See <i>Flushing the System</i> , page 33.

Resist Thickness

Typically, resist thickness problems are not related to the pump, but the coater system and nozzle settings.

Check the following items if there is a problem with resist thickness:

SYMPTOM	PROBLEM	SOLUTION
Resist thickness non-uniform	Delay between end of dispense and the final wafer spin	Correct wafer spin timing.
	Nozzle not centered above wafer	Center nozzle.
	Dried chemical on nozzle	Clean nozzle.
	Nozzle too high or too low above wafer	Adjust nozzle height. Typically 6 to 9 mm above wafer. Position and dispense rate will vary with fluid viscosity.

APPENDIX: PRIMING RECIPE INFORMATION

GUIDELINES FOR PRIMING A NEW FILTER

A filter consists of three areas that need to have air replaced with fluid: upstream of the membrane, downstream of the membrane, and in the porous area of the membrane itself. This air needs to be removed from the filter and vented out of the pump.

Begin the priming sequence with:

- Vent cycles to fill the upstream part of the filter with fluid, until a solid stream of fluid is seen in the vent line.
- Purge cycles until solid fluid is again seen in the vent line. This begins to wet the membrane and removes the bulk of the air from the filter downstream of the membrane.
- Inlet cycles will recirculate the fluid through the filter and back to the inlet, with a small amount of vent. This completes the wetting of the membrane without excessive use of chemical.

PRIMING SETTINGS

SETTING	DESCRIPTION	RANGE
Cycle type	Type of priming for that step	Stop
		Loop
		Vent
		Outlet
		Purge
		Inlet
		Soak
		Backflush to vent
		Backflush to Inlet
		Filter flush
Count	Number of cycles	1 – 999
Outlet rate	Priming dispense rate	0.1 – 3.0 mL/sec
Vent rate	Priming vent rate	0.1 – 3.0 mL/sec
Purge rate	Priming purge rate	0.1 – 3.0 mL/sec
Fill rate	Priming fill rate	0.1 – 3.0 mL/sec
Filtration rate	Priming filtration rate	0.1 – 3.0 mL/sec
Filtration pressure	Priming filtration maximum pressure	
Soak pressure		
Soak time		

Contact your local Entegris sales representative to create a customized filter priming recipe.

MANUFACTURING INFORMATION

SYSTEM RELOCATION NOTICE

If a CE marked system that corresponds to this technical manual is moved from the original designated country of installation to another country, please contact Entegris, Inc.

SPARE PARTS

Please contact Entegris support for replacement filters, flushing shells, and spare parts.

TECHNICAL SUPPORT

For technical support, contact the factory at +1 800 394 4084. Please have the complete model number, chemical and application information ready when calling.

FOR MORE INFORMATION

Please call your Regional Customer Service Center today to learn what Entegris can do for you. Visit www.entegris.com and select the Customer Service link for the center nearest you.

TERMS AND CONDITIONS OF SALE

All purchases are subject to Entegris' Terms and Conditions of Sale. To view and print this information, visit www.entegris.com and select the Legal Notices link from the footer.

PRODUCT WARRANTIES

For product warranties, visit www.entegris.com and select the Legal Notices link from the footer.

REPAIR SERVICE

Rebuild and warranty service is available through Entegris, call +1 800 394 4084 or contact your Regional Customer Service Center for more information. Entegris will expedite processing by providing a Return Materials Authorization (RMA) number, MSDS requirements, and important cleaning and packaging details.

If the unit being returned was exposed to a hazardous substance, it must be flushed and cleaned in accordance with the provided flushing requirements. A copy of the Material Safety Data Sheet (MSDS) for each hazardous substance, including cleaning fluids, must be included with the returned product. See the *Flushing the System* section of this manual, page 33.

LIMITED WARRANTY

Entegris' products are subject to the Entegris, Inc. General Limited Warranty. To view and print this information, visit entegris.com and select the [Legal & Trademark Notices](#) link in the footer. Entegris does not warrant any failure in the case of customers using unapproved foreign components.

FOR MORE INFORMATION

Please call your Regional Customer Service Center today to learn what Entegris can do for you. Visit entegris.com and select the [Contact Us](#) link to find the customer service center nearest you.

TERMS AND CONDITIONS OF SALE

All purchases are subject to Entegris' Terms and Conditions of Sale. To view and print this information, visit entegris.com and select the [Terms & Conditions](#) link in the footer.



Corporate Headquarters

129 Concord Road
Billerica, MA 01821
USA

Customer Service

Tel +1 952 556 4181
Fax +1 952 556 8022
Toll Free 800 394 4083

Entegris®, the Entegris Rings Design®, and other product names are trademarks of Entegris, Inc. as listed on entegris.com/trademarks. All third-party product names, logos, and company names are trademarks or registered trademarks of their respective owners. Use of them does not imply any affiliation, sponsorship, or endorsement by the trademark owner.

©2014-2023 Entegris, Inc. | All rights reserved. | Printed in the USA | 3811-7730ENT-0123