
PRECISION

EXTRACTION SOLUTIONS

Model ASE 100 Automated Solvent Evaporator Operational Manual



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Congratulations on the purchase of your new Precision® Extraction Solutions Model ASE 100 Automated Solvent Evaporator! You are well on your way to a better experience in professional extraction.

Please read and understand this operational manual thoroughly prior to using your new solvent recovery skid. Also visit our YouTube channel for a video overview of the ASE 100 system and other Precision® Extraction Solutions products. Remember, safety first!

If you need further assistance or for warranty information, please contact Precision® Extraction Solutions Technical Support directly at (855) 420-0020 ext. 2 or visit our client portal at support.precisionextraction.com.



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SAFETY FIRST!



SAVE THESE INSTRUCTIONS!

It is the owners' and operators' responsibility to read and understand the following safety information. This equipment is to be installed, operated, maintained, cleaned, and transported only by qualified personnel. Operators must follow the following safety precautions to ensure the safety of persons and property. Failure to read and heed these instructions places all operators, facility, and equipment at risk. Print this section and display it where it can readily be seen by equipment operator(s).



FIRE AND EXPLOSION HAZARD: MISUSE OF THIS EQUIPMENT CAN RESULT IN PROPERTY DAMAGE, SEVERE INJURY, OR DEATH.

WARNING!

- Do NOT use this system to recover solvents other than ethanol. System is designed to evaporate ethanol from oil. Use of the evaporator with solvents other than ethanol could result in exceeding the autoignition temperature and triggering an explosion. NEVER override the overtemperature limits on the heating elements, as these are set to avoid exceeding the autoignition temperature of ethanol.
- Wear appropriate personal protective equipment (PPE) including safety glasses and gloves during use. Avoid contacting solvent or inhaling solvent vapors. Read and understand the ethanol manufacturer's Safety Data Sheet (SDS) for further safety information. Retain SDS on site and ensure it is readily available to operator(s).
- The evaporator components are classified for use in a Class 1 Division II area. Flammable vapors should not be present in the area during normal operation. Ethanol is a flammable liquid. Take precautions to minimize release of ethanol vapors into the atmosphere and store all ethanol in closed containers. In the event of release of flammable vapors in the area, use the emergency stop.
- Do NOT make any unauthorized modifications to the equipment. Altering the design or using unapproved replacement parts voids the warranty and may cause property damage and/or injury.
- Only allow trained personnel to work on the evaporator. This applies to all assembly and servicing work. Follow lock out tag out procedures when working around electrical components.
- Ensure vacuum exhaust and pressure relief valve drain lines are routed into an appropriate vessel. Allowing these lines to discharge in an uncontrolled way may cause injury.

CAUTION!

- Ensure that suction valves are open and adequate liquid level is present before starting pumps. Pumps are not designed to run without liquid in them. Running the pumps dry for more than 30 seconds can result in damage to internal parts.



NOTE: USE OF THIS EQUIPMENT CONSTITUTES USER AGREEMENT TO UTILIZE EQUIPMENT FOR LAWFUL PURPOSES ONLY. USER ASSUMES SOLE RESPONSIBILITY FOR SAFE USE, TRANSPORT AND STORAGE OF EQUIPMENT. USER ASSUMES ALL RISK ASSOCIATED WITH EQUIPMENT USE.

Section 1—Product Overview

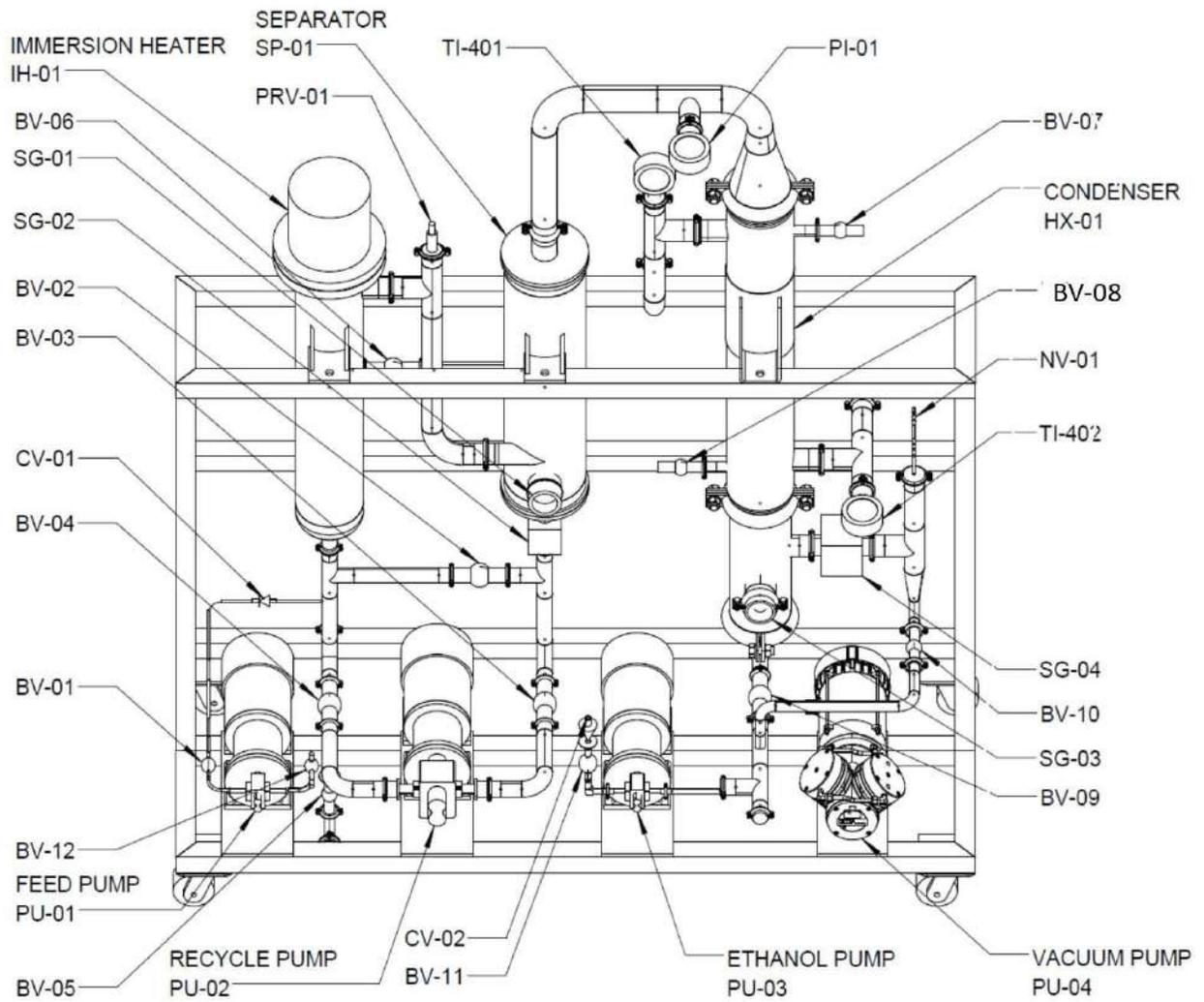


Figure 1: ASE 100 Component Overview

- 1.1. Vessels
 - 1.1.1. Immersion Heater (IH-01)
 - 1.1.2. Separator (SP-01)
 - 1.1.3. Condenser (HX-01)
- 1.2. Pumps
 - 1.2.1. Feed Pump (PU-01)
 - 1.2.2. Recycle Pump (PU-02)
 - 1.2.3. Ethanol Pump (PU-03)
 - 1.2.4. Vacuum Pump (PU-04)
- 1.3. Check Valves
 - 1.3.1. Feed Inlet Check Valve (CV-01)
 - 1.3.2. Ethanol Output Check Valve (CV-02)
- 1.4. Valves
 - 1.4.1. Input Regulation Valve (BV-01)
 - 1.4.2. Low Recycle Loop Valve (BV-02)
 - 1.4.3. Separator/Recycle Loop Valve (BV-03)
 - 1.4.4. Recycle Loop Valve (BV-04)
 - 1.4.5. Crude Output Valve (BV-05)
 - 1.4.6. Mid Recycle Loop Valve (BV-06)
 - 1.4.7. High Water Loop Valve (BV-07)
 - 1.4.8. Low Water Loop Valve (BV-08)
 - 1.4.9. Condenser Output Valve (BV-09)
 - 1.4.10. Vacuum Drain Line Valve (BV-10)
 - 1.4.11. Ethanol Output Valve (BV-11)
 - 1.4.12. Feed Ball Valve (BV-12)
 - 1.4.13. Vacuum Inlet Needle Valve (NV-01)
- 1.5. Gauges
 - 1.5.1. Vacuum Gauge (PI-01)
 - 1.5.2. Water Loop Outlet Temperature Gauge (TI-401)
 - 1.5.3. Water Loop Inlet Temperature Gauge (TI-402)
- 1.6. Sight Glasses
 - 1.6.1. Separator Sight Glass (SG-01)
 - 1.6.2. Recycle Loop Sight Glass (SG-02)
 - 1.6.3. Condenser Vessel Sight Glass (SG-03)
 - 1.6.4. Vacuum Drain Line Sight Glass (SG-04)
- 1.7. Pressure Relief Valves
 - 1.7.1. Heater/Separator Pressure Relief Valve (PRV-01)

Section 2—Getting Started

2.1. Offloading

- 2.1.1. Equipment transport must be done using a suitable lifting device such as a forklift.
- 2.1.2. Crates are only to be lifted at the designated locations.
- 2.1.3. Ensure equipment is placed gently to avoid jarring the contents of the crate.

CAUTION: Avoid damaging contents during offloading. Damaged parts or equipment may not function as intended and should be replaced immediately.

2.2. System Placement

- 2.2.1. Place ASE 100 in a dry, clean, C1D1 equivalent environment on a suitably flat surface.
- 2.2.2. Route the control panel and, as necessary, the ancillary chiller outside the hazardous (classified) area.

2.3. Setup

- 2.3.1. Connect the feed input line to the Feed pump inlet.
- 2.3.2. Connect feed line to quick connect.
- 2.3.3. Connect the chilled water inlet and outlet to HX-103 (Condenser).
- 2.3.4. Connect the ethanol collection line to the ethanol pump output.
- 2.3.5. Verify that all drain valves are closed.

2.4. Testing

- 2.4.1. Ensure all electrical utilities are properly connected.
- 2.4.2. Turn on main power to the PLC panel.
- 2.4.3. Turn on the vacuum pump and watch the vacuum gauge to ensure pressure decreases to -21inHg or lower, as see on the vacuum gauge (PI-01)
- 2.4.4. Turn on the Feed Pump (PU-01) and ensure pump rotates. This is done by an auditory and visual check that the pump internals are spinning.
- 2.4.5. Turn on the Recycle Pump (PU-02) and ensure the pump rotates. This is done by an auditory and visual check that the pump internals are spinning.
- 2.4.6. Turn on the Ethanol Pump (PU-03) and ensure the pump rotates. This is done by an auditory and visual check that the pump internals are spinning.

Section 3—Operating the ASE 100

- 3.1. Turn on the PLC and the Chiller. Chiller comes preset to 45°F.
- 3.2. Close Vacuum Inlet Needle Valve (NV-01).
- 3.3. Close Vacuum Drain Line Valve (BV-10).
- 3.4. Close the Crude Drain Valve (BV-05).
- 3.5. Close Feed Ball Valve (BV-12).
- 3.6. Close Mid Recycle Loop Valve (BV-06).
- 3.7. Close Low Recycle Loop Valve (BV-02).
- 3.8. Close Recycle Loop Valve (BV-04).
- 3.9. Attach feed hose to Miscella container.
 - 3.9.1. Connects to Feed Pump (PU-01) via compression fitting at BV-12.
- 3.10. Place vacuum exhaust and PRV lines into the vessel. This vessel should rarely acquire any material but should be vented and safe for the solvent being recovered.
- 3.11. Turn on Vacuum Pump via PLC.

CAUTION: Pumps are not designed to run without liquid in them. Running the pumps dry for more than 30 seconds can result in damage to internal parts. Ensure that suction valves are open and adequate liquid level is present before starting pumps.

- 3.12. Allow plant to achieve vacuum level of -21inHG or lower. This can be confirmed by the vacuum gauge (PI-01).
- 3.13. Open Feed Ball Valve (BV-12).
- 3.14. Allow pump to prime for about 30 seconds.
- 3.15. Turn on the Feed Pump (PU-01) via the PLC at 45Hz.
- 3.16. Watch separator sight glass (SG-01) for fill level.
- 3.17. Fill until recycle loop vertical sight glass (SG-02) is full, and level is approximately halfway up separator sight glass (SG-01).
- 3.18. Turn off the Feed Pump (PU-01) via PLC.
- 3.19. Open Recycle Loop Valve (BV-04).
- 3.20. Turn on Recycler Pump (PU-02) via PLC at 45Hz.
- 3.21. Watch fill level via Separator Sight Glass (SG-01)—if level drops turn on the Feed Pump (PU-01) to maintain fill level at 1/2 of Separator Sight Glass (SG-01).

NOTE: Always keep the fill level in view of the sight glass. If the feed rate is too high, causing the fill level to go above the sight glass, this can cause an overflow to the condenser section and dirty the recovered solvent.

- 3.22. Close Feed Ball Valve (BV-12).
- 3.23. Open PID Controls on PLC.
- 3.24. Adjust SP to 90.
- 3.25. Set CV Max to 30. CV controls the amount of power the heater can output to reach its desired goal. Keeping this at 30 or below will result in longer heating times but avoids overheating.
- 3.26. Work temperature up in 10°F increments to match the Present Value (PV). This will usually be higher than the set point when adjusted.

- 3.26.1. The heater will overshoot the set point. When SP is set to 90 the PV/Process Temp will hit ~100. At this point adjust SP to 100. After the PV/Process Temp, and high temp start to fall back in line with SP make the next temp adjustment to 110, this will most likely cause the PV/Process temp to jump to ~120.
 - 3.26.2. Raising the heater temperature in this fashion will help avoid any major temperature overshoots.
 - 3.27. Set SP to 115.
 - 3.28. Set CV max to 45.
 - 3.29. Turn Recycle Pump (PU-02) via PLC to 60Hz.
 - 3.30. When recovered solvent reaches the sight glass in collection (SG-03) start EtOH pump at 60Hz via PLC.
 - 3.30.1. Keep Ethanol Output Valve (BV-11) closed for ~30 seconds after starting the pump. This allows the pump to prime and build proper pressure to output.
 - 3.30.2. After ~30 seconds open the Ethanol Output Valve (BV-11). Ensure liquid is outputting into vessel. When liquid is being output adjust output speed as necessary to match recovery rate.
- NOTE:** It is critical to keep the liquid level in the condenser below the Vacuum Drain Line Sight Glass (SG-04) leading to the vacuum connections.
- 3.31. Once the system is recovering clean solvent the separator must be kept at a full level.

CAUTION: Allowing the separator to run at a low level will cause damage to the Recycle Pump (PU-02) and can cause the heater to spike in temperature setting, off the high limit alarm and shutting the system down.
 - 3.32. Opening the Feed Ball Valve (BV-12) on feed pump will allow a slow trickle of miscella to feed into the system due to the vacuum.
 - 3.33. When all set points are at optimal ranges begin to work the system in a continuous manner.
 - 3.34. Turn on and adjust feed pump to maintain proper fill level that matches evaporation rates.
 - 3.35. Adjust output pump to maintain proper level in condenser.

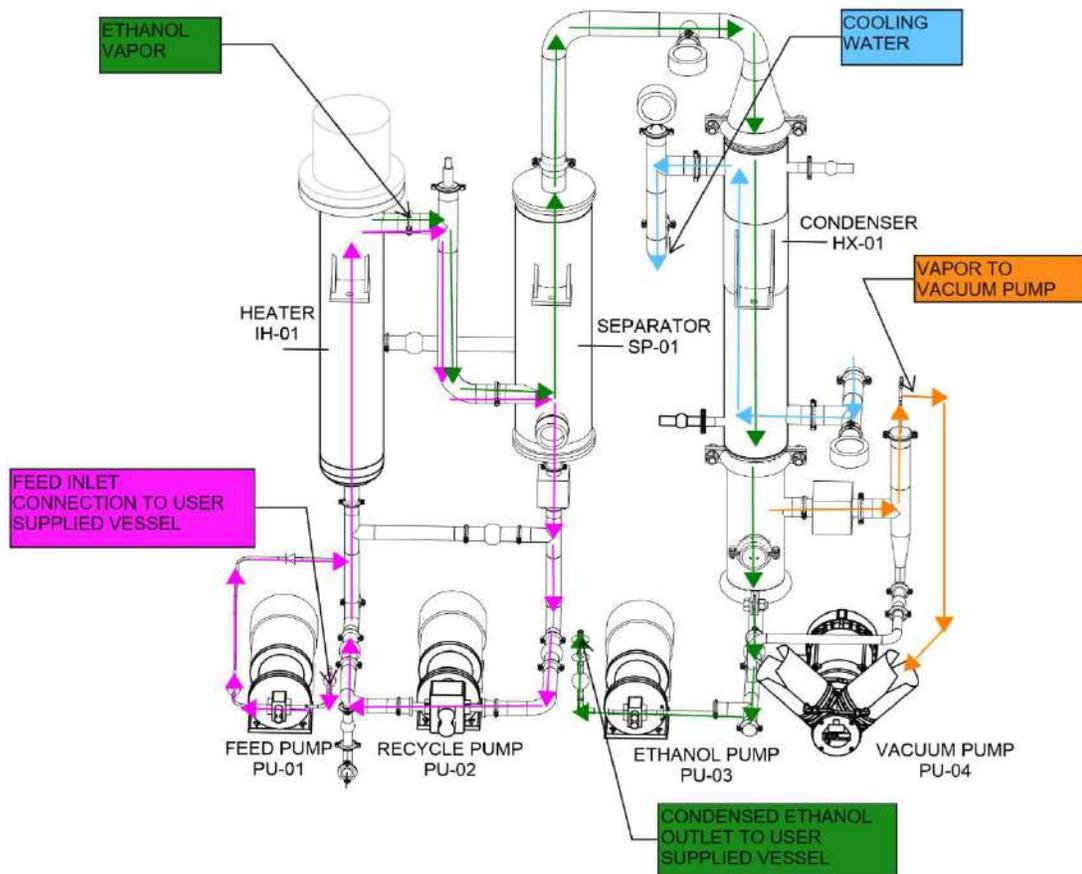


Figure 2: ASE 100 Process Flow

Section 4—Dispensing Crude

- 4.1. Turn off the heater via PLC.
- 4.2. Turn off vacuum pump via PLC.
- 4.3. Open Vacuum Inlet Needle Valve (NV-01).
- 4.4. Allow system pressure to naturalize. This can be confirmed with vacuum gauge PI-01.
- 4.5. Attach crude output line to vessel via the compression fitting below the Crude Output Valve (BV-05).
- 4.6. Open Mid Recycle Loop Valve (BV-06).
- 4.7. Open Low Recycle Loop Valve (BV-02).
- 4.8. Adjust recycling pump speed to 45Hz via PLC.
- 4.9. Open Crude Output Valve (BV-05).
- 4.10. Throttle Recycle Loop Valve (BV-04).
- 4.11. Allow crude to be fully evacuated.
- 4.12. Turn off Recycle Pump (PU-02) via PLC.
- 4.13. Close Crude Output Valve (BV-05).

Section 5—Cleaning

- 5.1. Turn on the PLC and Chiller. Chiller comes preset to 45°F.
- 5.2. Open Vacuum Inlet Needle Valve (NV-01).
- 5.3. Close Vacuum Drain Line Valve (BV-10).
- 5.4. Close Crude Output Valve (BV-05).
- 5.5. Close Feed Ball Valve (BV-12).
- 5.6. Close Mid Recycle Loop Valve (BV-06).
- 5.7. Close Low Recycle Loop Valve (BV-02).
- 5.8. Close Recycle Loop Valve (BV-04).
- 5.9. Attach feed hose to Clean Solvent container. This connects to the feed pump via compression fitting at BV-12.
- 5.10. Attach Ethanol output line to the Ethanol Pump (PU-03) via a compression fitting at CV-02.
- 5.11. Place vacuum exhaust and PRV lines into vessel.

NOTE: This vessel should rarely acquire any material but should be vented and safe for the solvent being recovered.

- 5.12. on Vacuum Pump via PLC.
- 5.13. Allow plant to achieve vacuum level of -10inHG or lower. This can be confirmed by Vacuum Gauge (PI-01).
- 5.14. Open Feed Ball Valve (BV-12).
- 5.15. Allow pump to prime (30 seconds).
- 5.16. Turn on feed pump via the PLC at 45Hz.
- 5.17. Watch Separator Sight Glass (SG-01) for fill level.
- 5.18. Fill until Recycle Loop Sight Glass (SG-02) is full, and level is approximately halfway up Separator Sight Glass (SG-01).
- 5.19. Turn off Feed Pump (PU-01) via PLC.
- 5.20. Open Recycle Loop Valve (BV-04).
- 5.21. Turn on Recycle Pump (PU-02) via PLC at 45Hz.
- 5.22. Watch fill level via Separator Sight Glass (SG-01). If level drops, turn on Feed Pump (PU-01) to maintain fill level at 1/2 of Separator Sight Glass (SG-01).
- 5.23. Close Feed Ball Valve (BV-12).
- 5.24. Turn Recycle Pump (PU-02) via PLC to 60Hz.
- 5.25. Allow system to recycle this solvent for 20 minutes. During this time, no solvent should be evaporating and condensing.
- 5.26. Follow the procedure detailed in **Section 4—Dispensing Crude** to remove the cleaning solvent from system.
- 5.27. Depending on how dirty the system is this may need to be repeated to ensure a proper clean of the system.

NOTE: Only use cleaning solvent appropriate for the operator's process.

Section 6—Periodic Maintenance

NOTE: All additional parts for the ASE 100 MUST be ordered through Precision® Extraction Solutions.

ACTIONS TAKEN	FREQUENCY
Check for leaks	Every Operation
Check tightness of all clamps	Weekly
Inspect hoses	Weekly
Ensure proper operation of emergency stop switches	Quarterly
Have pressure gauge recalibrated	Annually
Pump repair/rebuild*	As Necessary
Sight Glass Removal/Cleaning	As Necessary

Section 7—Troubleshooting

Common failure signs that indicate the need for repairs/replacement are decreased flow rate or pressure; fluid leakage; unusual noises and vibrations; and increased power consumption

PROBLEMS	SOLUTIONS
Ethanol pump stops flowing when running.	Slowly open the vacuum needle valve. This will reduce vacuum in the system slightly and allow the pump to start outputting again. When flow resumes close the needle valve to return to and maintain proper vacuum.
Feed pump (PU-01) is running but nothing is flowing into the machine.	Ensure the feed input regulation valve (BV-01) is not clogged. If line continuously clogs increase efficiency of pre-recovery filtration methods.
	Ensure the feed line check valve (CV-01) is not clogged. If line continuously clogs increase efficiency of pre-filtration methods.
Plant does not achieve proper vacuum depth.	Ensure all externally opening valves (BV-12, BV-05, BV-11) are closed and vacuum adjustment valve is closed tightly.
Panel and Skid do not turn on.	Ensure power to the PLC panel is properly wired and energized.
	Ensure Emergency Stop switches are disengaged.
Heater disengages during operation.	Check alarms section of the PLC panel. Heater will automatically disengage at 160°C and display a “High Temp alarm”. Allow the heater to cool down before reengaging the system. This is generally caused by running the Recycle loop while low on fluid.
Pump stops.	Refer to alarm screen on HMI. Check power source and breakers for potential power interruption.
Heating element shuts off.	Refer to alarm screen on HMI. Check power source and breakers for potential power interruption.
	High temperature shutoff may have been reached. Ensure that heater is full of liquid.
Pump is not moving liquid.	Ensure inlet and discharge valves are open.
	Pump may be airlocked. Bleed the air out of the line if possible or stop pump and restart.
Ethanol is no longer evaporating and temperature in the heater is rising.	Ethanol has been fully evaporated from oil in the unit. Pump out the clean oil and start another batch of ethanol/oil (miscella).

Warranty Information

For any further assistance or for warranty information, please contact Precision® Extraction Solutions Technical Support directly at (855) 420-0020 ext. 2 or visit our client portal at support.precisionextraction.com.