

RESTEK



WASSON•ECE
INSTRUMENTATION

TO-Clean Manual



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Note to the end user.

This manual should be read in its entirety, prior to use of the applicated instrument. Once read, please follow the instructions in the “getting started” section of the manual in setting gas pressures and supplying appropriate power to the gas chromatograph.

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Instrument Description

TO-Clean is a revolutionary canister cleaning system developed by Wasson-ECE Instrumentation. The TO-Clean canister cleaner allows for fully automated canister cleaning. The TO-14/15 compliant TO-Clean system was designed to take the guess work out of canister cleaning. The twelve 6-liter canister capacity will increase your lab's efficiency. The system is fully automated, allowing the user to start a cleaning cycle and walk away. Using the touch screen controller, up to ten custom methods can be defined and loaded as needed. The system also comes with an automated leak check method to ensure system performance. This provides a high performance system that is easy to use as well as consistent.

An on-board touch screen embedded controller makes system operation as easy as pressing start. The controller allows the user to save up to ten different methods. The user can define each method including: number of cycles, pressure, and soak times. Once the method has been defined, it is saved and is accessible for later use.

Product Features

- EPA Method TO-14/15 compliant
- 12 canister capacity, expandable to 24 one liter canisters
- Embedded touch screen controller
- 30 mTorr vacuum for 12, 6-liter canisters
- Automated system leak test
- Electronic valve control
- Custom-built trays for different canister sizes
- User defined methods
- Save up to ten methods
- Isothermal oven, controllable to 110°C
- Edwards RV-8 vacuum pump



Initial Setup

Gas Supply

Connect all gas lines to the proper fittings, as described in the Hardware section. Gas bottle regulators should be high quality two stage regulators. Set the gas bottle pressures leading to the TO-Clean to the following gas pressures:

Gas	Minimum Quality	Maximum Set Pressure
Nitrogen	Ultra High Purity	60 psig

Valve actuation requires approximately 55 psig dry instrument air or nitrogen. Industrial compressed “house air” is usually inadequate for valve actuation without additional treatment. Water and particulates can damage the actuators. Connect gases as described in the Hardware Description section.

Pack List

Unpack and inspect the system for any damage that may have been incurred during shipment. Ensure that all of the items found in the pack list are present. Table 1 lists the items that should be present with your order. This list may vary depending on your order. Check the shipping pack list which is shipped with the instrument for a more accurate description of what was shipped with your order. If there is a variance between your shipped pack list and your order please contact our shipping department at 970-221-9179 to reconcile these differences.

Table 1: Pack List

Quantity	Item	Restek PN	Wasson- ECE PN	Check
1	TO-Clean Canister Cleaner (120V, 60Hz)	22916	A3000-120	
0	TO-Clean Canister Cleaner (220/230V, 50/60Hz)	22917	A3000-220	
1	Power Cord for Pump		1225	
1	Bag - ¼" nuts with caps, qty 12		12910-001	
1	Bag - ¼" vespel ferrules, qty 12		1499	
1	Oven Cart	22919	25568-030	(Optional)
1	Humidifier	24282	25568-021	(Optional)
1	Wasson-ECE manual		XXXXX	
1	Edwards RV-8 Vacuum pump		70218	
1	Dewar, Pyrex Brand Glass, 4300 mL	22918	25568-022	(Optional)
1	½" Stainless Steel U-tube, TO Clean, vacuum trap		A2552-004	
1	1/8" Stainless Steel U-tube, TO Clean pressure trap		A2552-002	
1	TO-Clean Power cord		1225	
1	1/8" Stainless Steel Tubing – 12 ft		S0122	
1	PVC Vacuum Tubing – 6 ft		25574-003	
1	PVC Vacuum Tubing – 3 ft		25574-003	
1	Edwards Oil, 1 quart		70487	
1	Edwards Oil Mist Filter		70219	
1	1L Option, tubing, fittings, and inserts for 24-1L canisters	22920	A3000-001	(Optional)
1	Watlow User Manual CD			

Power Requirements

The TO-Clean system and vacuum pump are configured for 120VAC/60 hertz. The TO-Clean requires one dedicated 20-amp circuit and the vacuum pump requires a 15-amp circuit.



Hardware Description and Assembly

Place the TO-Clean on a bench top or on the optional system cart.

Vacuum Pump

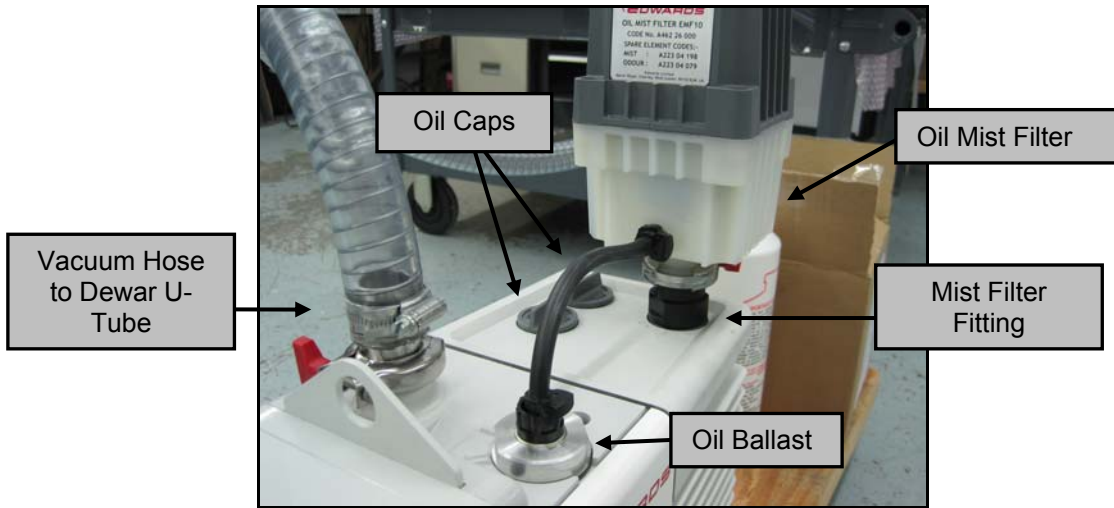
The TO-Clean comes with an Edwards BOC RV-8 vacuum pump. Unpack the pump and place it on the floor next to the canister cleaner. Attach the vacuum hose to the top of the pump, using the metal clamp, as shown in Figure 1.

The oil mist filter and oil ballast have been pre-assembled at the factory and are connected by a short piece of tubing. Unscrew the gray oil ballast cap and screw the oil ballast into the threaded hole until tight. Remove the clear cap from the black mist filter fitting on the pump. Place the oil mist filter on top of the black fitting and secure using the metal clamp.

Unscrew the two gray oil caps on the pump and pour the oil that came with the vacuum in either of the inlets. There is an oil level window on the back of the vacuum. The oil reservoir should be $1/3 - 1/2$ full. You should not need the entire bottle for the first fill. Screw the oil caps back on before turning the pump on.

For further information on the Edwards pump see the manual and CD included in the shipment.

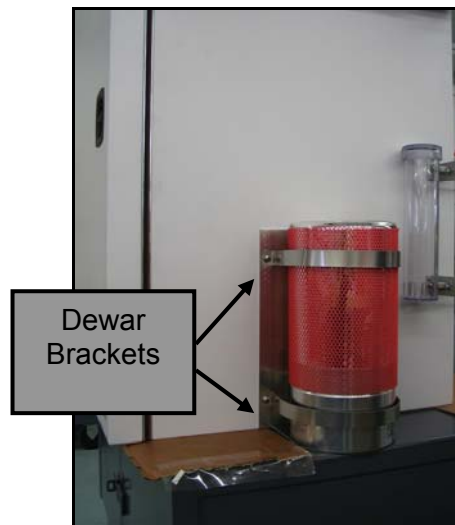
Figure 1 – Vacuum Pump



Dewar

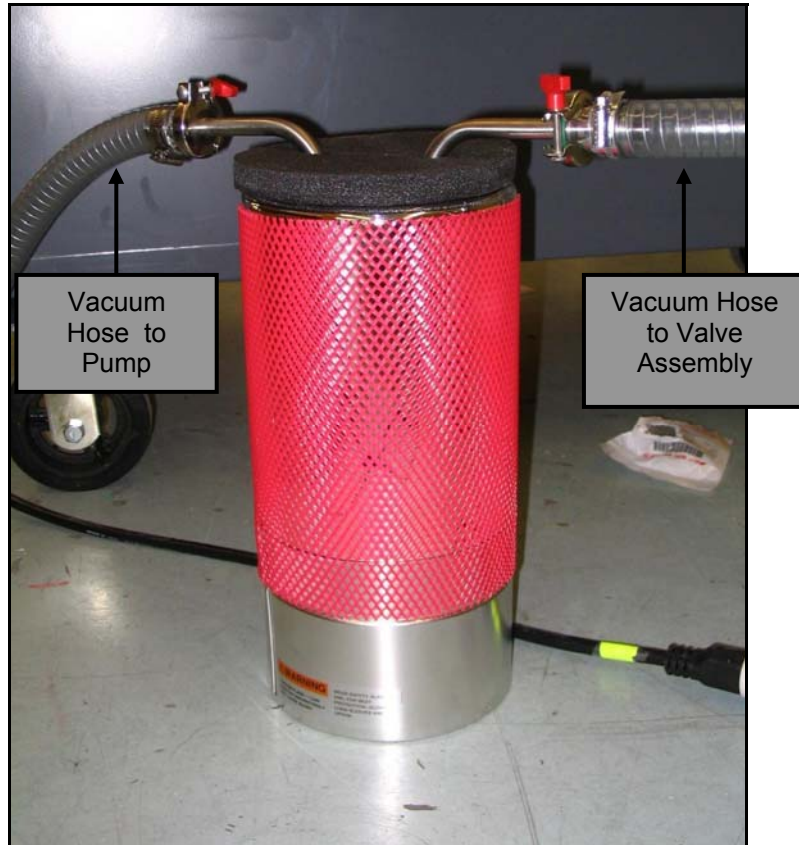
The optional Dewar houses the U-Tube where contaminants are trapped. This cleans the nitrogen entering the system and protects the pump from contaminants in the canisters. Connect the Dewar brackets to the right side of the TO-Clean as shown in Figure 2. Slide the Dewar into the brackets and place both the vacuum and nitrogen U-tubes into the Dewar along with the provided insulating cap.

Figure 2 - Dewar Bracket



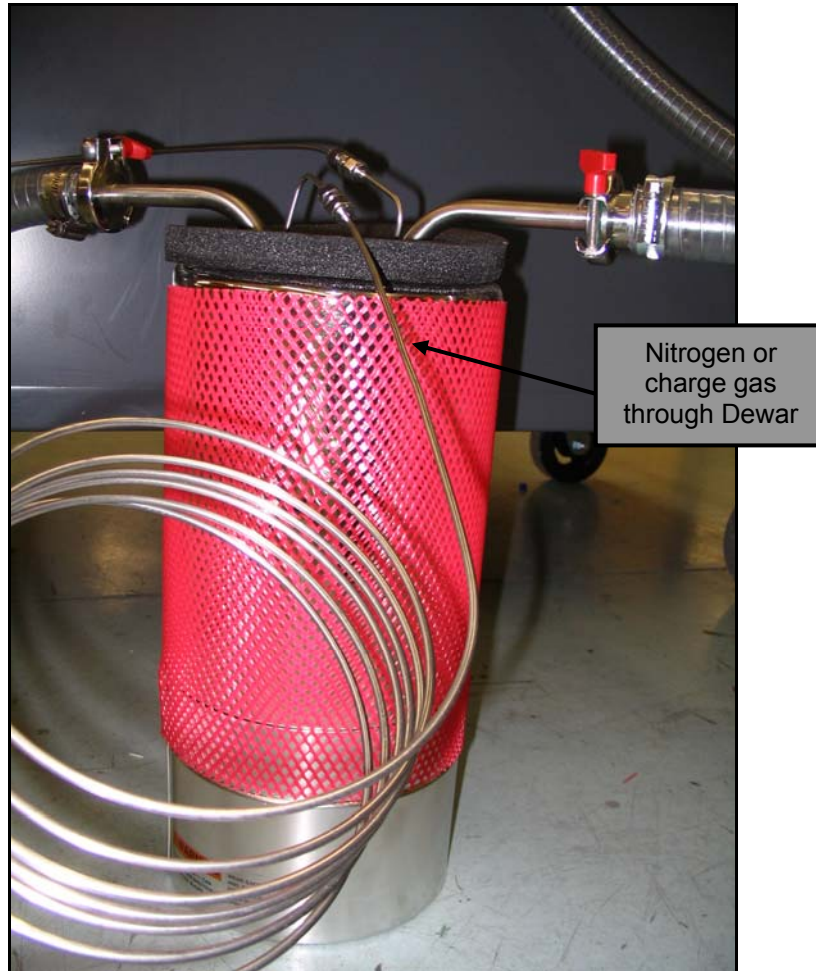
Attach the vacuum hose from the pump to the Dewar U-Tube using the metal clamp, as shown in Figure 3. Attach the vacuum hose which goes to the valve assembly to the other side of the Dewar U-Tube using the metal clamp.

Figure 3 - Dewar Vacuum Hose Connections



Connect the 1/8" line from the compressed nitrogen regulator to the 1/8" Dewar U-tube fitting as shown in Figure 4. Connect the other side of the 1/8" Dewar U-Tube line to the bottom of the humidification chamber, described in the next section. Once the system has been assembled, leak checked, and is ready to run, the Dewar can be filled with liquid nitrogen or liquid argon. The user should be able to lift the insulating lid with all the Dewar connections intact.

Figure 4 - Dewar with Nitrogen Charge Gas Connection



Humidification Chamber

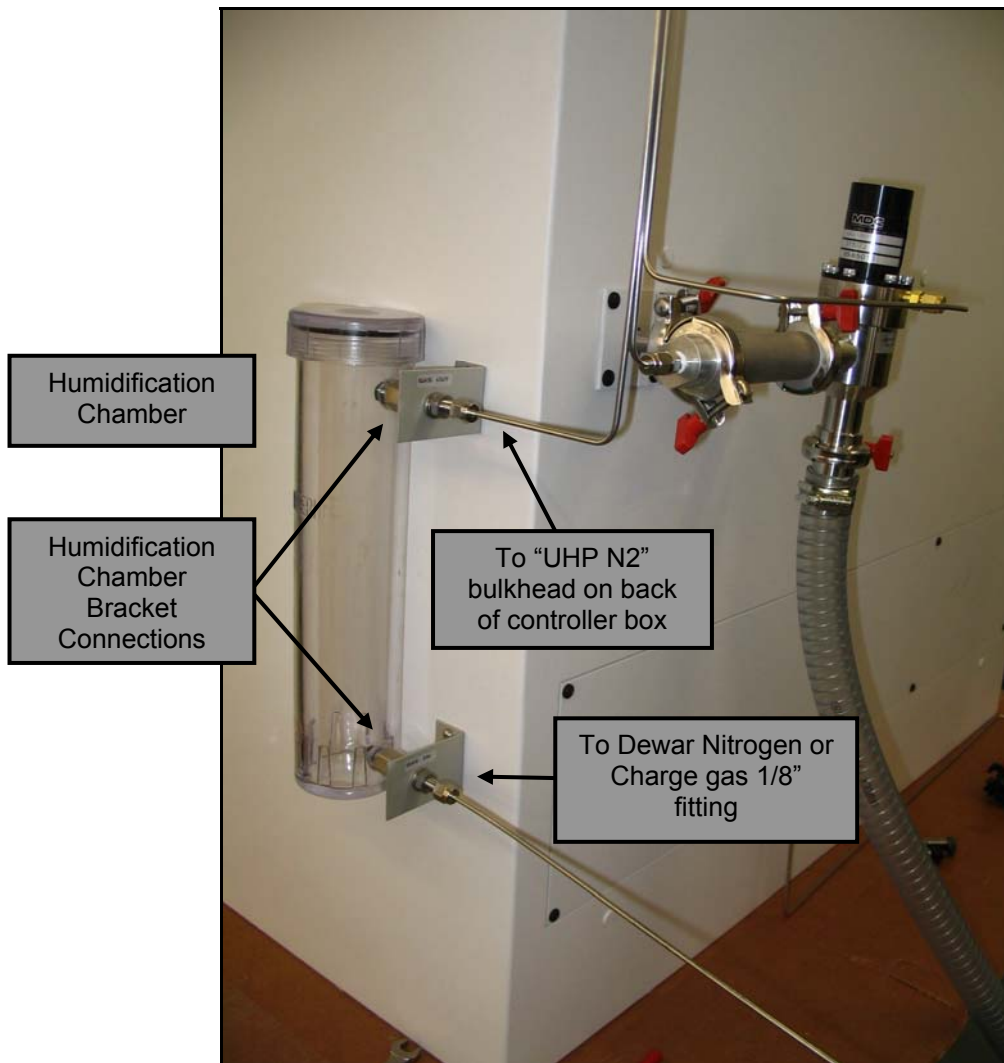
The optional humidification chamber is filled with water and humidifies the nitrogen entering the canisters. This aids in removing volatile organic compounds from the canisters. If the humidification chamber was shipped separately, it will need to be attached to the 1/4" fittings on the humidifier bracket, shown in Figure 5. If not already connected, attach the 1/8" nitrogen charge gas tubing from the Dewar to the bottom bracket. Attach the 1/8" tubing on the top bracket to the 1/8"

bulkhead labeled “UHP Nitrogen” on the back of the controller box, shown in Figure 7.

Note:

The maximum pressure of the humidification chamber is 90 psig.

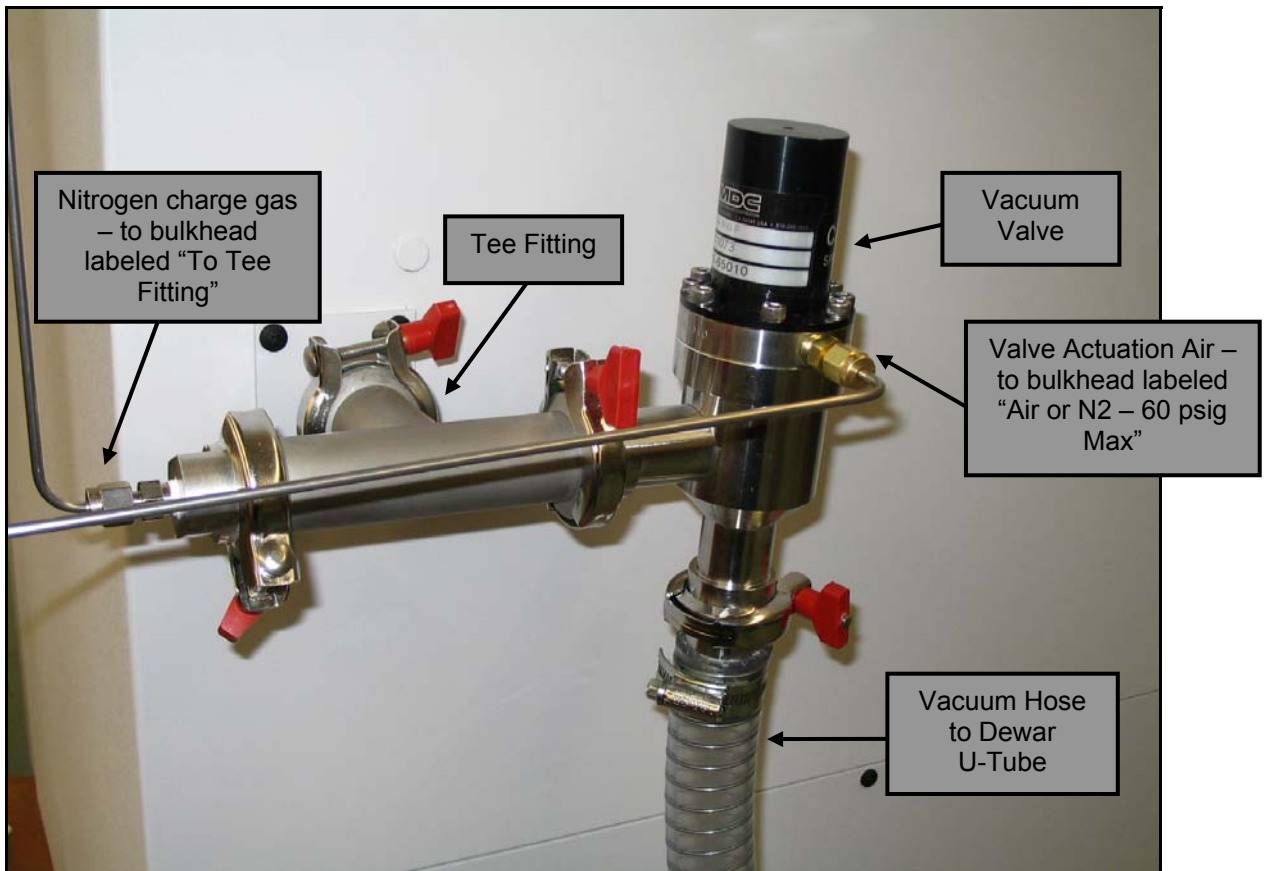
Figure 5 - Humidification Chamber



Vacuum Valve Assembly

The vacuum valve assembly is located at the back of the TO-Clean and consists of the vacuum valve and tee fitting, shown in Figure 6. Attach the vacuum valve hose assembly from the Dewar U-Tube to the bottom of the vacuum valve. If not already connected, attach the 1/8" vacuum valve actuation air line to the 1/8" fitting on the vacuum valve. Attach the 1/8" nitrogen charge line from the bulkhead labeled "To Tee Fitting", located on the back of the controller box, to the tee on the vacuum valve assembly.

Figure 6 - Vacuum Valve Assembly



Controller Box

The controller box, located at the upper right side of the TO-Clean, houses the electrical components, including the Watlow heater controller and the touch screen controller. Operation of these components is described in the Operation section of this manual.

There are five 1/8" bulkheads located on the back of the controller box, shown in Figure 8. If not already connected, attached the tubing show in Figure 6 "Valve Actuation Air" and "Nitrogen Charge Gas" to the bulkheads labeled "Vacuum Valve" and "To Tee Fitting", respectively and connect tubing from the humidifier shown in Figure 5 to the bulkhead labeled "UHP Nitrogen".

You will need to connect actuator gas to the bulkhead labeled "Air or Nitrogen - 60 PSIG Max" and the bulkhead labeled "Purge Vent" to a proper vent location.

Troubleshooting note:

Note: If actuator gas is not attached to the bulkhead labeled "Air or Nitrogen – 60 PSI Max" at a minimum pressure of 55 psig, the vacuum valve will not actuate.

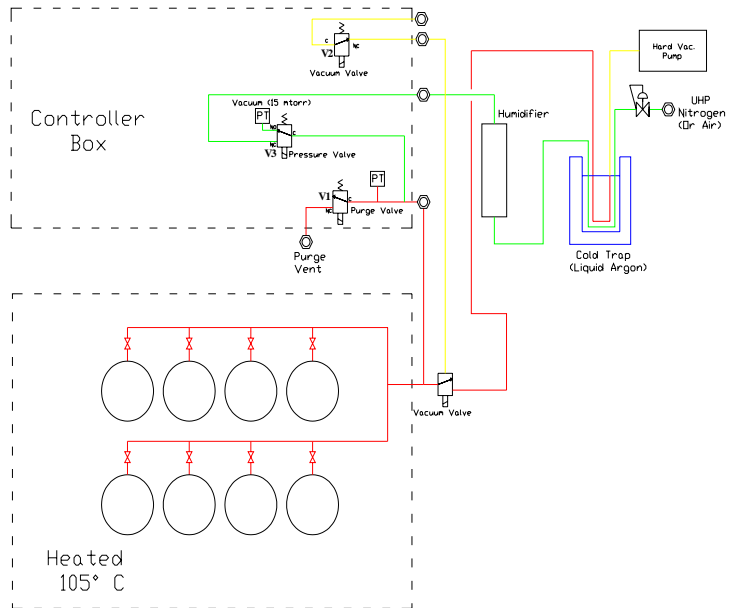
Figure 7 - Controller Box – Back



Plug the power cable to the back of the control box. The power switch is located on the back of the control box. Set the power switch to the “on” position. The fan on the back of the controller box should start running and the heater and control screen on the front of the controller box will turn on.



Plumbing Diagram



Operation

Setting the Oven Temperature – Watlow 988 Series Control

The oven temperature is controlled by the Watlow controller located on the front of the control panel. Set the controller temperature to the temperature at which you wish to clean the canisters. To change the operating temperature, press the [▼] or [▲] arrow keys on the Watlow controller. The lower display will show the set temperature; the upper display will show the actual temperature. The oven's maximum temperature is 110°C.

Note:

If you are using Restek canisters, the blue Parker valves can withstand heating to 250°C, but the gauges on the 3-way valves can only be heated to 80°C. Please verify what type of valve/gauge is on the canister before setting oven temperature.

The instructions for setting your Watlow parameters are described below. The set points are also listed in Table 2. Complete information about the Watlow controller and all default values can be found in the Watlow Series 988 Controller User's Manual on the CD included with the shipment.

Setting your Watlow Parameters

1. Reach the setup page by pressing both the arrow [▼] and [▲] keys at the same time for three seconds. The lower display should read [set]. The upper display should give you four options. Use the arrow keys [▼] or [▲] to select between menu options: [InPt], [OtPt], and [COM].
2. Scroll to [GLbL], and hit the [Mode] key. [C_F] should show up in the lower display, the upper display should be [°C]. Use the [▼] or [▲] keys to scroll through the options for the upper display.
3. Hit the [Mode] key until [rP] is shown in the lower display. Arrow through the options for the upper display until it reads [Strt].

Operation

4. Hit the [Mode] key until “rate” is in the lower display. The upper display should read [100].
5. Hit the [Display] key to return to the main display.
6. Use the arrow keys to enter the Setup Menus again (step #1). Scroll to [InPt] and hit the [Mode] key.
7. Keep pressing the [Mode] key until [In 1] is in the lower display. The upper display should show [H] (use the arrow keys to scroll through if it is not set to [H]).
8. Press the [Mode] key until [rL1] is in the lower display. The upper display should show [0] (use the arrow keys to scroll through if it is not set to [0]).
9. Press the [Mode] key until [rH1] is in the lower display. The upper display should show [110] (use the arrow keys to scroll through if it is not set to [110]).
10. Press the [Mode] key until [In 2] is in the lower display. The upper display should be set to [rtd].
11. Press the [Display] key to return to the main display.
12. Use the arrow keys to enter the Setup Menus again (step #1). Scroll to [OtPt] and hit the [Mode] key.
13. Keep pressing the [Mode] key until [Ot 1] is in the lower display. The upper display should show [Ht].
14. Press the [Mode] key until [Ot 2] is in the lower display. The upper display should be set to [Ht].
15. Hit the [Display] key to return to the main display.
16. Press the [Mode] key until [OPer] is shown in the lower display. The upper display should read [PidA].
17. Press the [Mode] key until [Pb2A] is shown in the lower display. The upper display should read [0].
18. From the main display hit the Display key until [Pr 2] is shown in the lower display. Then hit the [Mode] key until [SP 2] is shown in the lower display. The upper display should read [300].



19. Hit the [Display] key to return to the main display.

Table 2: Watlow Setpoints

Setup Menu Options (selected with [▼] or [▲] keys from Main Display)	Lower Display (selected with [Mode] key)	Upper Display (selected with [▼] or [▲] keys)
GlbL	C_F	°C
	rP	Strt
	Rate	100
InPt	Ln 1	H
	rL1	0
	rH1	110
	Ln 2	rtd
OtPt	Ot 1	Ht
	Ot 2	Ht
Main Display	Lower Display (selected with [Mode] key)	Upper Display (selected with [▼] or [▲] keys)
	Oper	PidA
	Pb2A	0
Main Display (select with [Display] key)	Lower Display (selected with [Mode] key)	Upper Display (selected with [▼] or [▲] keys)
Pr 2	SP2	300



Connecting the Canisters

Place the 6 liter canisters upside down in the slots in the oven shelves and connect them to the ¼" Swagelok fittings provided with the steel flex tubing. If there are any positions that are unused ensure that position is plugged with the provided ¼" Swagelok plug.

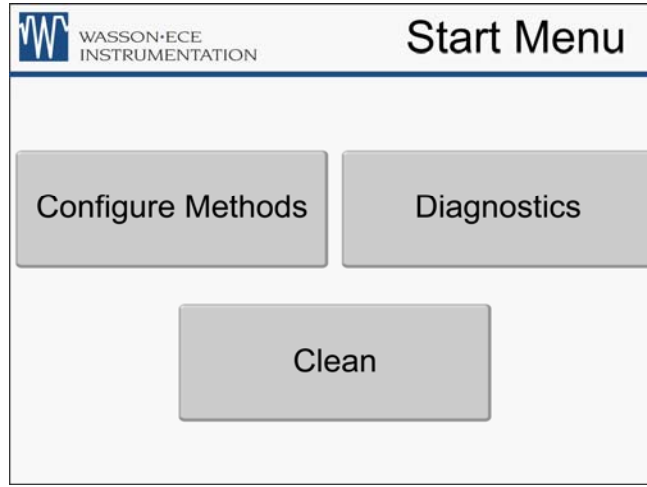
Connecting 1 Liter Canisters

If you purchased the optional upgrade to 24 - 1 Liter Canister capacity, your system will include 12 sheet metal inserts. These are removable and are fastened to the standard rack with four screws each. The 1 liter canisters are placed upside down over the opening in the insert. The steel flex tubing will have a removable tee with two connections to handle double the canisters. To convert back to 6 liter canisters, remove the metal inserts by unscrewing the 4 screws, and remove the tees from the flex tubing lines.

Software Control

When the controller is powered on using the power switch located on the back of the controller the user is presented with the *Start Menu* (Figure 8) which allows the user to select one of three options: *Configure Methods*, *Diagnostics*, or *Clean*.

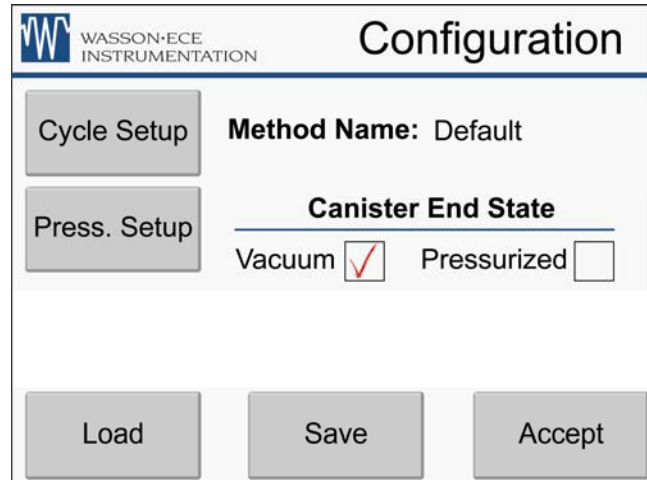
Figure 8 - Start Menu



Method Configuration

From the *Start Menu* select *Configure Methods*. In the *Configuration* screen (Figure 9) the user is able to configure the method including *Cycle Setup*, *Pressure Setup*, and *Canister End State*.

Figure 9 - Configuration Screen



Operation

To configure a method, start by selecting *Cycle Setup*. In the *Cycle Setup* screen (Figure 10), the user can select the number of cycles desired by touching the up and down arrows. Notice that for each cycle, both the *Low* and *High Pressure Cycle Times* can be adjusted. Each cycle can have different low and high pressure cycle times. Once the desired settings have been achieved select *Accept* to return to the *Configuration* screen.

Figure 10 - Cycle Setup

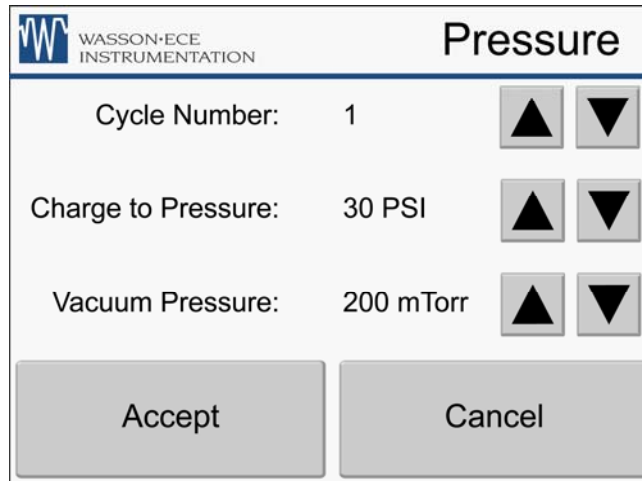
The screenshot shows a software interface titled "Cycle/Times" with the "WASSON•ECE INSTRUMENTATION" logo in the top left. The interface contains four rows of settings, each with a text label and a numerical value, followed by two arrow buttons (up and down) for adjustment:

- Number of Cycles: 3
- Cycle Number: 1
- Low Pressure Cycle Time: 1:00 min
- High Pressure Cycle Time: 1:00 min

At the bottom of the screen are two large buttons labeled "Accept" and "Cancel".

From the *Configuration* screen (Figure 9) select *Pressure Setup*. In the *Pressure Setup* screen (Figure 11) cycle set the charge pressure and the vacuum pressure for each cycle.

Figure 11- Pressure Setup



The screenshot shows a software interface titled "Pressure" with the "WASSON·ECE INSTRUMENTATION" logo in the top left. The interface contains three rows of settings, each with a label, a value, and two arrow buttons (up and down). The first row is "Cycle Number: 1", the second is "Charge to Pressure: 30 PSI", and the third is "Vacuum Pressure: 200 mTorr". At the bottom of the screen are two large buttons labeled "Accept" and "Cancel".

Select *Accept* to return to the *Configuration* screen (Figure 9). Before the method is saved choose a *Canister End State*. The canister end state allows the user to select if the canisters will be under vacuum or under pressure at the end of the cycle. If the canisters will need to be tested for certification after cleaning, select *Pressure*. The pressure of the canister will be left at the *Charge Pressure* of the last cycle. If the canisters will need to be readied for sampling then select *Vacuum*. The canisters will be left at the *Vacuum Pressure* of the last cycle. This pressure is set in the *Pressure Setup* screen (Figure 11).

After the method has been configured the user can save and name the method using the keyboard provided in the *Save Method* screen (Figure 12) by choosing *Save* from the *Configuration* (Figure 9) screen. Type the name of the new method and choose *Save*. After saving the method the software returns to the *Configuration* screen. From the *Configuration* screen choose *Accept*. This will return the user to the *Start Menu* (Figure 8).

Figure 12 - Save Method Screen

WASSON·ECE INSTRUMENTATION Save Method

Method_Name

1	2	3	4	5	6	7	8	9	0
Q	W	E	R	T	Y	U	I	O	P
A	S	D	F	G	H	J	K	L	
Z	X	C	V	B	N	M			del

Save Cancel

Canister Cleaning

In the *Start Menu* (Figure 8) select *Clean*. The *Clean Menu* (Figure 13) displays the Method that is currently loaded. To start cleaning using the loaded method parameters, select *Clean*. If no method is listed as loaded or a different method is desired, select *Load Method*.

Figure 13 - Clean Menu

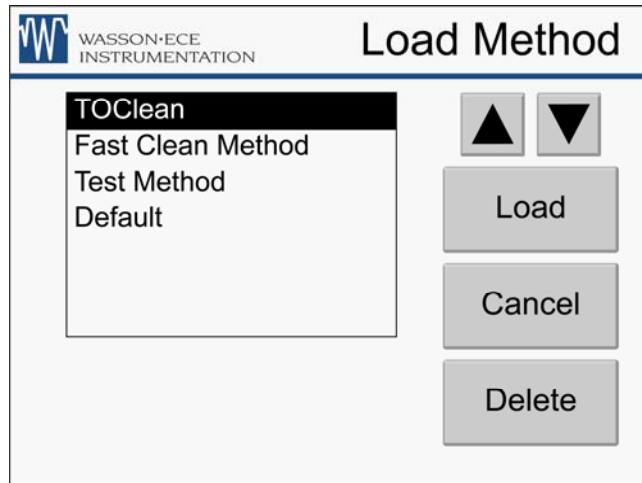
WASSON·ECE INSTRUMENTATION Clean Menu

Method: Default Load Method

Clean Cancel

In the *Load Method* screen (Figure 14) scroll to the desired method using the arrows on the side of the screen and choose *Load*.

Figure 14 - Load Method Screen



Once the method has been loaded the user is returned to the *Clean Menu* and the loaded method is displayed on the screen. The method has now been loaded and is ready to clean. Select *Clean*. The system will start to run the method and the *Cleaning* status screen (Figure 15) will be displayed. Cleaning status will display the status of the system including number of cycles remaining, cycle status, pressure and time remaining for the current cycle. Using the *Cancel* button the cleaning can be cancelled at any time.

Figure 15 - Cleaning Status

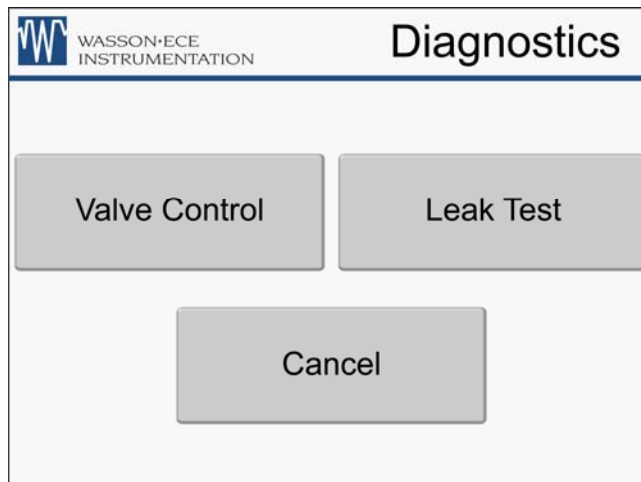


Diagnostics

The control software allows the user to diagnose the system for potential problems. By selecting *Diagnostics* from the *Start Menu* the user can leak check the system and actuate valves in the system to diagnose valve problems.

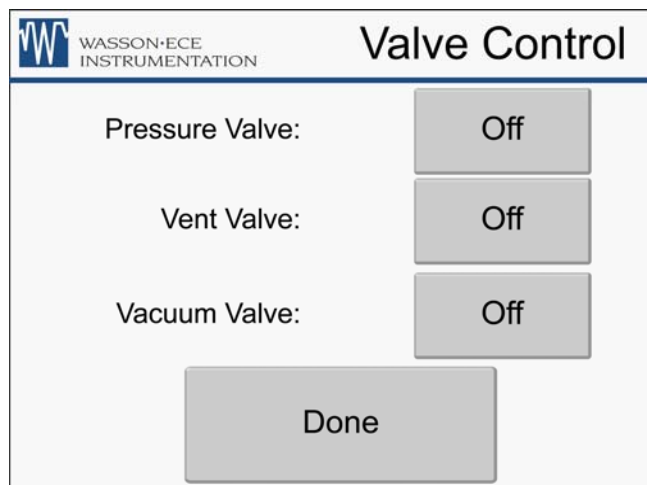
The *Diagnostics* screen (Figure 16) allows the user to select *Valve Control* or *Leak Test* the system.

Figure 16 - Diagnostics



All system valves can be tested using the *Valve Control* menu (Figure 17). This menu allows the user to actuate the *Pressure Valve*, *Vent Valve*, and *Vacuum Valve*. When the valve is actuated the user will hear the valve switch. If the valve switch is not audible then contact the Wasson-ECE service department for support at (970) 221-9179.

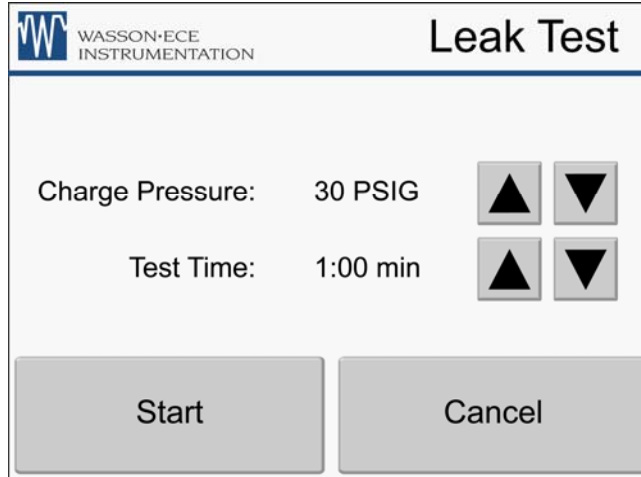
Figure 17 - Valve Control



The *Leak Test* menu (Figure 18) allows the user to check that the system is leak tight. If the system is not leak tight achieving lower vacuum will be difficult if not impossible. From the *Diagnostics* menu select *Leak Test*. Using the arrows choose a desired charge pressure and a soak time. If the system holds pressure to +/- 0.4 psi the system is considered leak tight and will pass the test. If the system fails the leak test secure all fittings and run the leak test again. The status of the leak test is displayed in the *Leak Test* menu.

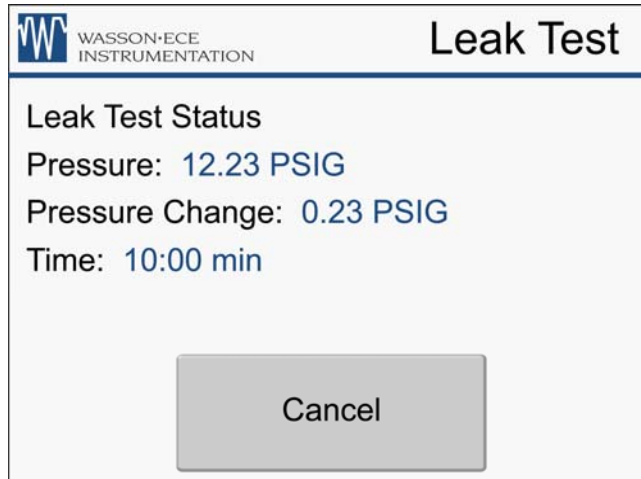
The leak test feature can also be used to ensure the canisters have been attached properly and that none of the canister fittings are loose before cleaning.

Figure 18 - Leak Test Menu



As the leak test is performed, the Leak Test Status screen (Figure 19) is displayed. The leak test can be stopped at any time by pressing "Cancel".

Figure 19 - Leak Test Status



Maintenance

This section can help you solve operating problems that may arise while operating the gas chromatograph.

If you cannot solve the problem, call the Wasson-ECE Instrumentation Service Department at (970) 221-9179.

Vacuum Pump

A periodic maintenance and inspection schedule of the vacuum pump can lead to increased uptime, reliable results, and longer instrument lifetime. Refer to Table 3 for the recommended maintenance schedule for the vacuum pump.

Maintenance instructions are described below. For further information refer to the Edwards Instruction Manual CD which is included with the system.

Table 3 – Recommended Maintenance Schedule for Vacuum Pump

Maintenance	Frequency
Check oil level	Monthly
Replace the oil	Every 3000 hours of operation
Inspect and clean inlet filter	Yearly
Inspect and clean gas-ballast control	Yearly
Clean oil level window	Yearly
Clean motor fan-cover and enclosure	Yearly

Check Oil Level

The user must ensure that there is sufficient oil in the vacuum pump. This can be quickly monitored using the oil level window on the back of the pump. If you need to add more oil, follow the steps in the Hardware Description and Assembly section of this manual on page 4.



Replace the Oil

1. Operate the pump for ten minutes to warm the oil.
2. Turn the pump OFF.
3. Place a block under the front of the pump to tilt it toward the drain in the back.
4. Unscrew one of the oil caps on the top of the pump.
5. Place a vessel under the drain and remove the drain plug.
6. Replace drain plug and fill the pump with oil as described in the Hardware Description and Assembly section of the manual on page 4.
7. Replace oil caps and remove block before operating the pump.

Inspect and Clean the Inlet Filter

1. Disconnect the Vacuum Hose to Dewar U-Tube from the pump inlet port (Figure 1).
2. Remove the filter and O-ring and inspect for cleanliness.
3. If needed, remove the O-ring from the filter and wash the filter with a proper cleaning solution and allow it to dry. Do not let the O-ring come into contact with the cleaning solution.
4. Re-assemble the filter, O-ring, and Vacuum Hose to Dewar U-Tube.

Inspect and Clean the Gas Ballast Control

1. Remove the oil ballast (Figure 1) from the top of the pump.
2. Wipe with a clean dry cloth and check that the air hole is not blocked.
3. Screw the oil ballast back into place.

Clean Oil Level Sight Glass

1. Drain the oil as described above.

Maintenance

2. Undo the two screws at the top and bottom of the oil level window and remove the bezel, window, and O-ring.
3. Clean the screws, bezel and window with a proper cleaning solution.
4. Wipe the O-ring with a dry cloth.
5. Re-assemble the oil level window.
6. Fill the pump with oil and check for any leaks through the window.

Clean the Motor Fan-Cover and Enclosure

1. Turn the pump OFF and disconnect from the electrical supply.
2. Use a dry cloth and soft brush to remove dirt and deposits from the fan-cover and enclosure.

Dewar U-Tube Traps

The Vacuum U-Tube and Pressure U-Tube housed in the Dewar will periodically need cleaning. To do this:

1. Remove the 1/8" tube fittings on either side of the Pressure U-Tube.
2. Remove the vacuum hoses on either side of the Vacuum U-Tube by unscrewing metal clamps.
3. Carefully remove U-Tubes from Dewar cap.
4. Allow the traps to come to room temperature in a properly vented location.
5. Pour out any moisture in the U-Tubes.
6. Allow to dry completely. They may also be placed in a heater to facilitate removal of organic components.
7. Replace Dewar cap and attach U-Tubes to respective fittings.

This should be done on a weekly basis (or more frequently, if needed).



Replacement Parts

Refer to the plumbing diagram on page 12 for the valve that needs to be replaced.

Valve	Wasson-ECE Part Number
1	56156
2	56154
3	56154
Vacuum Valve	25564

Item	Wasson-ECE Part Number
O-Ring Seals for Vacuum Hose and Tee Fitting	25566
1/4" Nuts with caps	12910-001
1/4" Vespel ferrules	1499
Tee Fitting, NW25	25572
Metal Clamps for Vacuum and Tee	25570
Pressure Transducer, 0-30 PSI	25560
Pressure Transducer, 15 mTorr	25562
PVC Vacuum Tubing – 6 ft, 3 ft	25574-003
Humidifier	25568-021
Dewar, Pyrex Brand Glass, 4300 mL	25568-022
1/2" Stainless Steel U-tube, vacuum trap	A2552-004
1/8" Stainless Steel U-Tube, pressure trap	A2552-002
Edwards RV-8 Vacuum pump	70218
Edwards Oil, 1 quart	70487
Edwards Oil Mist Filter	70219



Warranty Statement

Wasson-ECE provides quality analytical systems that are designed, tested and warranted to perform in a reasonable manner consistent with the performance criteria as detailed in the Quotation from which the system was purchased. The warranty includes all materials provided as part of the system such materials originating with Wasson-ECE, Agilent Technologies, or any other “third-party” components incorporated into the solution and identified on the Quotation.

Wasson-ECE analytical systems are warranted to perform to design specifications for a period of one year after shipment from the factory in Colorado. Both materials and labor are included in the warranty in North America where the sale is directly from Wasson-ECE to the customer who is the end user. Outside of North America, only materials are warranted; labor is the responsibility of local distributors or other resale agents.

This warranty excludes the end user’s operation of the systems in a manner outside of their design specifications. Examples of this misuse include, but are not limited to:

- The application of inappropriate samples
- Over temperature of ovens, columns, or valves
- Low quality carrier gas, or out of carrier gas
- Particles, precipitates, or heavy liquids introduced
- Power fluctuations such as over voltage or off frequency
- Method loss, corruption, or modifications not authorized
- Fire or mechanical damage from the environment
- Damage from transportation outside of contracted scope

Revised August 1, 2007

CE Certification – Declaration of Conformity

