

Table of Contents

| | |
|---|----|
| Section 1. TM1200 Controls | 3 |
| Section 2. TM1200 Procedures | 6 |
| Considerations | 6 |
| Checking the Battery Status | 6 |
| Setting the Day and Time | 6 |
| Clearing Programs | 7 |
| Programming | 7 |
| Activating the TM1200 Programs | 8 |
| Changing the TM1200 Valve Position for Testing | 9 |
| Section 3. TM1200 Field Use | 10 |
| After Field Use | 11 |
| Do's and Do Not's | 11 |
| Section 4. TM1200 Troubleshooting | 12 |
| TM1200 Valve Opens as Soon as the TM1200 is Activated | 12 |
| Sample Canister does not Fill | 12 |
| Leak Checks | 13 |
| Leak Checks Considerations | 14 |
| Section 5. TM1200 Maintenance | 15 |
| Battery Replacement | 15 |
| Section 6. Warranty and Parts | 18 |
| Warranty | 17 |
| Service Parts list for the TM1200 | 18 |
| Ordering Parts | 18 |
| Technical Support | 18 |
| Section 7. Appendices | |
| CS1200E Flow Controller Operation & Care Guide | 19 |
| Nickel Ferrule Instructions | 25 |

Section 1. TM1200 Controls

| | |
|-----|-------------|
| P | Program |
| D | Day |
| H | Hour |
| M | Minute |
| ⚙️ | Manual |
| 🕒 | Time |
| C/R | Clear/Reset |
| ⚡ | Test |
| 🌙 | Sleep Mode |

Figure 1.1 - TM1200 Control Diagram





Figure 1.2 - TM1200 Settings and Controls. The ON/OFF settings are start and stop times in 24 hour military time.

P - Program. Switches from the main (time) screen to the program screen. Once on the program screen press P to move through the sampling event ON and Off times.

D - Day. Sets the day of the week.

H - Hour. Sets the hour in 24 hour time.

M - Minute. Sets the minutes.

MANUAL - (Gear Symbol). Toggles the TM1200 State. The TM1200 State can be Flashlight, AUTO, or Flashlight with an X (on it). The TM1200 State will be shown at the bottom of the TM1200 screen. Press TEST to check the Valve Status Light in the different TM1200 States.

| TM1200 STATE | Valve Status Light | TM1200 Valve Position |
|-------------------------|--------------------|-----------------------|
| Flashlight | On | Open |
| Flashlight with an X | Off | Closed |
| AUTO (All programs OFF) | Off | Closed |
| AUTO (A program is ON) | On | Open |

TIME - (Clock Symbol). Accesses the main (time) screen and changes the day and time. Press to switch from the program screen to the main screen. Hold down while pressing D, H, and M to change the actual day of the week and time (hours and minutes only).



Figure 1.3 - TM1200 Lights, Controls, and Statuses.

C/R - Clear (Clear/Reset). If the screen shows a program, pressing C/R will delete (or reset) the day(s) and time of the event shown on the program screen. Be aware this only affects the part of the program that is shown. The program ON day/time and the program OFF day/time must be cleared separately.

TEST - (Lightning symbol). This is only active if Sleep Mode is Off. Press to check the Battery Status and the TM1200 Valve position if Sleep Mode is Off. The Valve Status Light will turn On if the TM1200 Valve is open. If the TM1200 Valve is closed the Valve Status Light will remain Off when TEST is pressed.

SLEEP MODE - (Quarter moon symbol). Set the switch to the left (<-->) to turn on TM1200 Sleep (inactive) Mode. Set the switch to the right (-->) to turn Off Sleep Mode. With Sleep Mode Off programs will run, the TM1200 Valve can be manually activated, and TEST can be used to check the Battery and Valve Status Lights. With Sleep Mode On the programs do not run, MANUAL is deactivated, and TEST is deactivated. In Sleep Mode (On) less power is used which extends battery life.

After the TM1200 Sleep Mode is switched Off but before field use or testing the TM1200, one must toggle through the TM1200 Valve positions.

Press and hold TEST while pressing MANUAL. Slowly (about 3 seconds between presses) change the the TM1200 State to Flashlight. The Valve Status Light should be lit. From Flashlight press MANUAL to change the TM1200 State to AUTO. Just after moving to AUTO you should hear the TM1200 Valve click closed and the Valve Status Light should turn Off. If the Valve Status light stays On once the TM1200 State changes to AUTO it means the TM1200 is programmed to be open at that time. It may be necessary to clear a program.

Be aware that if the valve is not stepped open and then closed the TM1200 Valve may be open when it is expected to be closed.

R - TM1200 Reset. This is recessed to prevent accidental resets. Use the tip of a pen to press R when necessary. TM1200 Reset clears the day and time as well as all programs.

Section 2. TM1200 Procedures

Refer to figures 1-1, 1-2, and 1-3 as needed.

Considerations

Any TM1200 programs that the user does not want must be cleared before entering a new program. If a program is not cleared the timer will do any programmed ON and OFF events that occur before the user's planned event.

For example, if the user is setting up on Monday for a 24 hour sampling event on Friday. They program the TM1200 to start sampling on Friday at 1 am and finish on Saturday at 1 am. If there is a second program for a 12 hour sampling event on Tuesday already set up on the TM1200, the event on Tuesday will start and stop as programmed before the Friday sampling event. For this reason, any extra sampling programs must be cleared.

Always verify the TM1200 is set to the correct day of the week and time. Conceivably a TM1200 could be used in more than one time zone and the timers do not automatically adjust to Daylight Saving (Summer) Time. Also if the battery dies or is replaced the correct day of the week and time (as well as any programs) may be lost.

The TM1200 will not work with Sleep Mode On. Sleep Mode must be Off for sampling to occur.

After sliding Sleep Mode Off the user must step the TM1200 Valve On (TM1200 State to Flashlight) then Off (TM1200 State to AUTO with no programmed events) using MANUAL before leak checking or setting up for sampling. This is because the TM1200 valve may be in the open or closed position when the sleep mode is turned off. Stepping the valve opens and closes the valve so the position is known. Step the TM1200 State to AUTO by pressing and holding TEST while pressing MANUAL until the Valve Status Light turns On (The TM1200 State should be Flashlight.) and then press MANUAL until the Valve Status Light turns Off and the TM1200 State at the bottom of the TM1200 screen shows AUTO. When switching from Flashlight to AUTO there should be a click. The click is the sound of the TM1200 valve closing.

Checking the Battery Status

Turn Off Sleep Mode by sliding SLEEP MODE to the right.

Press TEST. If three or four Battery Status Lights (red, yellow, and two greens) are lit the Battery Status is good. If no green lights are lit the battery must be replaced immediately.

Instructions for battery replacement are later in this manual.

Setting the Day and Time

Sleep Mode can be On or Off when setting the Day and Time.

To set the current Day of the Week hold down the TIME Button. While holding down the TIME Button push D repeatedly until the correct Day of the Week is shown.

Day of the Week abbreviations:

SU - Sunday

MO - Monday

TU - Tuesday

WE - Wednesday

TH - Thursday

FR - Friday

SA - Saturday

The time on the TM1200 screen is in 24 HOUR MILITARY TIME. Times range from 00:00:00 (HH:M-M:SS) to 23:59:59.

To set the current Hour hold down TIME and push H until reaching the correct time in hours (in 24 hour military time).

To set the current Minutes hold down TIME and push M the until reaching the correct time in minutes.

Setting the seconds directly is not possible.

Clearing Programs

Sleep Mode can be On or Off when clearing programs.

Up to 17 programs can be programmed on a TM1200. If an event is programmed it will show a time between 00:00 and 23:59 on the TM1200 screen and there will be at least one day of the week abbreviated at the top of the TM1200 screen. The screen will also show the number of the event and if it is the ON time for the event (TM1200 valve open) or the OFF time for the event (TM1200 valve closed).

To view the programs that are set up press P on the front of the TM1200 until the program step is reached.

To clear an ON or OFF event press P until the ON/OFF event is reached and then press C/R on the front of the TM1200. Once cleared the time should read "--:--" and there will be no days of the week on the TM1200 screen.

Repeat for all other ON/OFF events. Each event consists of a start day and time as well as an end day and time. The user will need to press P a total of 34 times to view and clear all sampling programs completely.

Press P again repeatedly to go through all the programs to verify all sampling events have been cleared.

Press TIME to show the current time on the screen.

To Program

Sleep Mode can be On or Off when programming the TM1200.

When inputting a sampling program (event) the ON day and time are entered before the OFF day and time by default.

Before programming the TM1200 clear any old programs as explained in the previous topic. The TM1200 Valve will open and close at any programmed times so any unneeded programs must be cleared.

Start by pushing TIME once. Verify the day and time are set correctly and set if necessary.

Push P once, on the left of the TM1200 screen there should be a "1" and in the bottom left of the screen there should be an "ON". The screen shows the day(s) and time for program 1 to start (TM1200 Valve open).

Press D until the desired Day(s) is at the top of the TM1200 screen. The options are:

| | |
|----|----------------------------|
| MO | TH, FR, SA |
| TU | MO, TU, WE, TH, FR, SA, SU |
| WE | MO, TU, WE, TH, FR |
| TH | SA, SU |
| FR | MO, WE, FR |
| SA | TU, TH, SA |
| SU | MO, TU, WE |
| | TH, FR, SA |

Once the Day(s) has been set use H and M to set the program ON time in 24 hour military time.

Military Time 12 Hour Time

| | |
|-------|---------|
| 00:00 | 12 a.m. |
| 13:00 | 1 p.m. |
| 14:00 | 2 p.m. |
| 15:00 | 3 p.m. |
| 16:00 | 4 p.m. |
| 17:00 | 5 p.m. |
| 18:00 | 6 p.m. |
| 19:00 | 7 p.m. |
| 20:00 | 8 p.m. |
| 21:00 | 9 p.m. |
| 22:00 | 10 p.m. |
| 23:00 | 11 p.m. |

After entering the program 1 ON day and time but before touching any other buttons you will need to program the program 1 OFF Day and Time. To do so push P again and OFF will appear in the lower left corner of the TM1200 screen with the number 1 still on the left. Then use D, H, and M button to set the desired program 1 OFF Day and Time.

To add additional sampling events press P and enter the ON and OFF Days and Times for them. Up to 17 sampling events (On/Off cycles) can be programmed. It is important that none of the sampling events will overlap.

When done press P to go through all programmed events and verify they were programmed correctly.

When done press TIME to return to the main screen.

Activating the TM1200 Programs

After the TM1200 is programmed the TM1200 and its programs are activated by sliding the Sleep Mode switch to the right to turn sleep mode Off. The TM1200 valve will not change valve positions unless the TM1200 is out of the sleep mode. (Note that the TM1200 can accept programming at any time as long as its battery has power. It does not need to be either sleep mode On or Off when programming.)

After Sleep Mode is slid Off slowly step through the TM1200 States in order to change and verify the TM1200 Valve position by pressing MANUAL while holding down TEST.

Press MANUAL until the valve status light is brightly lit and the TM1200 State changes to a flashlight on the bottom of the TM1200 screen. At this point the TM1200 valve is open.

Press MANUAL one more time. The valve status light should go out and the TM1200 State should change to AUTO on the bottom of the TM1200 screen. You should also hear the TM1200 valve click. The click is the TM1200 valve closing.

At this point the TM1200 is waiting for a sampling event to start.

The fastest way to deactivate programs is to turn Sleep Mode On by sliding the sleep switch to the left.

Another way to deactivate sampling is to press MANUAL until the TM1200 State changes from AUTO to a Flashlight with an X which closes the TM1200 valve.

Changing the TM1200 Valve Position for Testing

Before starting press P repeatedly to go through the programs. Make sure no programs are scheduled ON or OFF during the testing of the valve positions. If necessary clear any programs that could interfere with valve testing. (If this is not done it will be possible for the valve to change positions unexpectedly when the TM1200 State is AUTO. If a program is present and the valve is programmed to be open at the time the valve status is changed to AUTO the valve will open. If the instructions in this topic are followed, the TM1200 valve should be closed at that point.)

The TM1200 must be Sleep Mode Off to change the TM1200 positions manually.

Slide Sleep Mode Off (to the right).

Immediately after the TM1200 Sleep Mode is slid Off slowly step through the TM1200 States and Valve positions by pressing MANUAL while holding down TEST.

Step the TM1200 State to Flashlight. The TM1200 Valve should open and the Valve Status Light should turn On.

Step the TM1200 State to AUTO on the bottom of the TM1200 screen. The Valve Status Light should turn Off and a click should be heard from the TM1200 Valve indicating the valve is closing.

Then push MANUAL to toggle the valve as desired. To view the Valve Status Light press TEST.

| TM1200 State | Valve Status Light | TM1200 Valve Position |
|----------------------|--------------------|-----------------------|
| Flashlight | On | Open |
| Flashlight with an X | Off | Closed |
| AUTO | Off | Closed |

AUTO - Be aware the table refers to the procedure as written. The Valve Status Light can be On or Off and the TM1200 Valve Position can be open or closed depending on the sampling programs. If the valve is programmed to be open at a time during this test the Valve Status Light will be on and the Valve Position will be open.

Section 3. TM1200 Field Use

Check the Battery Status and replace the battery if the status is the single red light only or the red light and yellow light only. If the status shows the red and yellow lights plus a single green the battery should consider replacing the battery immediately or after the sample is taken.

Verify the TM1200 day and time are correct and change if necessary.

Clear all old programs on the TM1200.

Program the TM1200 for the next sampling event.

Slide Sleep Mode Off (right).

Press MANUAL while holding down TEST until the Valve Status Light is brightly lit and the TM1200 State becomes Flashlight on the bottom of the TM1200 screen. At this point the TM1200 Valve is open.

Press MANUAL one more time. The Valve Status Light should go out and the TM1200 State should change to AUTO on the bottom of the TM1200 screen. You should also hear the TM1200 Valve click. The click is the TM1200 Valve closing. At this point the TM1200 is waiting for a sampling event to start. Press MANUAL one more time. This will change the TM1200 State to Flashlight with an X. In this state the TM1200 Valve is closed and programs will be ignored.

Connect the TM1200 to the evacuated canister which will receive the sample. (The user must verify the canister is at an acceptable vacuum/pressure according to their SOP before connecting the canister to the sampling equipment.)

Connect a CS1200 Flow Controller (or other sampling equipment) to the top of the TM1200.

(Before doing a leak check read the instructions for your sampling equipment. This procedure may not be appropriate for your equipment as it was written with Entech's CS1200 Flow Controller in mind. The sampler should also have an SOP that they follow in the field which details the exact leak check criteria for passing and failing.)

Plug the inlet of the sampling equipment. Open the canister valve. Press MANUAL twice until the TM1200 State changes to Flashlight. This opens the TM1200 Valve and applies vacuum from the canister through the TM1200 Valve to the plugged sample inlet. Wait 1 minute. Note the pressure on the CS1200 (or other sampling equipment). Close the canister valve. Wait one minute and note the pressure on the CS1200 (or other sampling equipment). If the difference between the first pressure and second pressure is acceptable by your SOP continue. Otherwise troubleshoot and fix the leak before continuing. Leaks are usually at the fittings.

Remove the plug from the sample inlet.

Press MANUAL until the TM1200 State changes to AUTO.

Open the canister valve.

Record any initial sampling data required.

Return after sampling is complete.

Close the canister valve. Remove the TM1200 and sampling equipment from the canister.

Put a 1/4" plug snugly on the canister.

Record any final data required.

If another sampling event will take place just start again at the beginning of this topic.

If sampling is done slide Sleep Mode On (to the left).

After Field Use

If cleaning is desired activate the valve and flush with clean gas.

Before putting a TM1200 into storage or if it will not be used again for more than a week remove its battery. This will prolong the battery's life and prevent corrosion inside the TM1200.

Do's and Do Not's

DO check the battery status before sampling.

DO check the correct time is set before sampling.

DO NOT use new canisters that have not been cleaned and certified for sampling. New canisters must be cleaned and certified (blank and inertness tested) before use for real world samples.

DO step the TM1200 Valve open and then closed anytime Sleep Mode is turned Off.

Section 4. TM1200 Troubleshooting

TM1200 Valve Opens as Soon as the TM1200 is Activated.

Follow the instructions for field use exactly as they appear in the proceeding section. There are a few possibilities if those instruction are followed.

The day and time are not set correctly.

An unneeded program has not been cleared.

The TM1200 is not programmed correctly.

A program is set to be running at the present time. Change the program or turn it off temporarily.

The user did not follow instructions and connected the TM1200 to the canister and opened the canister valve before using MANUAL to step the TM1200 Valve open and then closed.

The TM1200 is actually leaking through the valve. Clear all TM1200 programs. Connect the TM1200 to an evacuated canister. Use MANUAL to step the TM1200 State to Flashlight on TM1200 screen and then step the TM1200 State to AUTO. You should hear the TM1200 Valve click closed. Put a vacuum/pressure gauge on the TM1200 inlet. Open the canister valve and monitor the pressure/vacuum on the gauge. If the pressure drops the TM1200 has a leak through the valve and the TM1200 valve must be repaired or replaced.

Sample Canister Does Not Fill

If this occurs the user may find the canister still under full vacuum when they arrive to pick up the sample.

Verify the canister valve was open for sampling.

Verify the sample inlet was not left plugged after the leak check.

Be aware that in rare cases a canister valve may not open as expected even though the handle turns. If this is suspected try a different evacuated canister.

Verify Sleep Mode was Off (slid to the right). Programmed events do not occur when Sleep Mode is On.

Verify the TM1200 State was AUTO. If the TM1200 State was not AUTO, sampling will not occur.

Check the battery status and replace the battery if needed.

Make sure the day and time are set correctly.

Make sure the TM1200 was programmed correctly.

There may be an issue with the sampling equipment. Inspect it.

Connect an evacuated canister to the TM1200. Put a pressure/vacuum gauge on the TM1200. Use MANUAL to step the TM1200 State to Flashlight. Open the canister valve. If the pressure drops the TM1200 Valve is opening. If not the TM1200 Valve is not opening and it must be troubleshoot.

It is also possible that the gauge used to measure the pressure/vacuum in the canister is not working (reading the pressure or vacuum) correctly.

Leak Checks

Preliminary steps.

Check the Battery Status and replace the battery if the status is a single red light.

Verify the TM1200 day and time are correct and change if necessary.

Clear all programs on the TM1200.

Slide Sleep Mode Off (to the right).

Press MANUAL while holding down TEST until the Valve Status Light is brightly lit and the TM1200 State becomes Flashlight (without an X on it) on the bottom of the TM1200 screen. At this point the TM1200 Valve is open.

Press MANUAL one more time. The Valve Status Light should go out and the TM1200 State should change to AUTO on the bottom of the TM1200 screen. You should also hear the TM1200 Valve click. The click is the TM1200 Valve closing. At this point the TM1200 is waiting for a sampling event to start. Press MANUAL one more time. This will change the TM1200 State to Flashlight with an X. In this state the TM1200 Valve is closed and programs will be ignored.

Main steps.

Before doing a leak check read the instructions for your sampling equipment. This procedure may not be appropriate for your application and equipment. The sampler should also have an SOP which details the exact leak check criteria for passing and failing.

Connect the TM1200 to an evacuated canister.

Connect a CS1200 Flow Controller (or other sampling equipment) to the top of the TM1200. Plug the inlet of the CS1200.

Open the canister valve. Press MANUAL twice until the TM1200 State changes to Flashlight. This opens the TM1200 Valve and applies vacuum from the canister through the TM1200 Valve to the plugged sample inlet. Wait 1 minute. Note the pressure on the CS1200 (or other sampling equipment). Close the valve on the canister. Wait one minute and note the pressure on the CS1200 (or other sampling equipment). If the difference between the first pressure and second pressure is acceptable by your SOP continue. Otherwise close the canister valve then troubleshoot and fix the leak before continuing. Leaks are usually at the fittings.

If a leak is found at this point open the canister valve. After one minute note the pressure. Then press MANUAL until the TM1200 State changes to Flashlight with an X. At this point the TM1200 Valve is closed. If the pressure drops again the leak is between the TM1200 Valve and the plugged sample inlet. If the pressure does not drop again the leak is at the connection of the TM1200 to the canister. Tighten this fitting until snug, and if needed replace the nut, ferrule, or canister valve.

If a leak is found between the plugged sampling equipment inlet and the TM1200, press MANUAL until the TM1200 State is Flashlight (no X). This opens the TM1200 Valve. Close the canister valve.

Replace one component of the sampling equipment. Open the canister valve. After one minute note the pressure. Close the canister valve. Wait one minute and note the pressure. If the difference between the two pressures is acceptable now the leak was in the component that was replaced. Repeat until the component with the leak is replaced.

After the leak checks are complete.

Slide Sleep Mode to ON (to the left) when done.

Leak Check Considerations.

How much of a leak is acceptable? This depends on a location of the leak and the size of the leak relative to the target flow rate.

If a leak is located at the connection to the canister that be more important than a leak on the sampler side of the TM1200. If this case the leak would be present whenever the canister valve was open. If the leak were on the sampler side of the TM1200 the leak would only be present during sampling when the TM1200 Valve was open. This makes leaks on the canister side of the TM1200 more significant than those on the sampler side.

If a leak were present at the rain guard (The rain guard is a protective cover for the CS1200 filter.) of a CS1200 and nothing was going to be connected to the rain guard (no sample lines) during sampling this leak would not affect sampling at all as the same air would be sampled and filtered regardless of the size of the leak. If a sample line were connected to the rain guard then the leak would have to be evaluated for its size and significance.

What is the target flow rate into the canister? If a certain percentage leak is acceptable larger absolute leak rates in cc/min are acceptable at high flow rates than at low flow rates. For example if sampling at 120 cc/min into a canister if one found a leak at 0.1 cc/min into the canister the leak would not be as significant as a leak of 0.1 cc/min when the target flow rate is 0.3 cc/min.

Also, be aware that if using a CS1200 with a very low flow rate, leaks before the restrictor in the flow path may not be as obvious if a short time is used for the leak check. Longer leak checks and equilibration times may be required.

Section 5. TM1200 Maintenance

Battery Replacement

Parts and Tools Needed:

Phillips Screwdriver

9 Volt Battery (9 Volt Format 522, 9VF522, 6LR61, 6AM6)

Procedure:

Remove the two screws securing the white cover to the TM1200 and then remove the cover. Refer to figure 5-1.



Figure 5.1 - White Cover Screws.

Remove the two screws on the rear of the TM1200. Refer to figure 5-2. Figure 5-2.

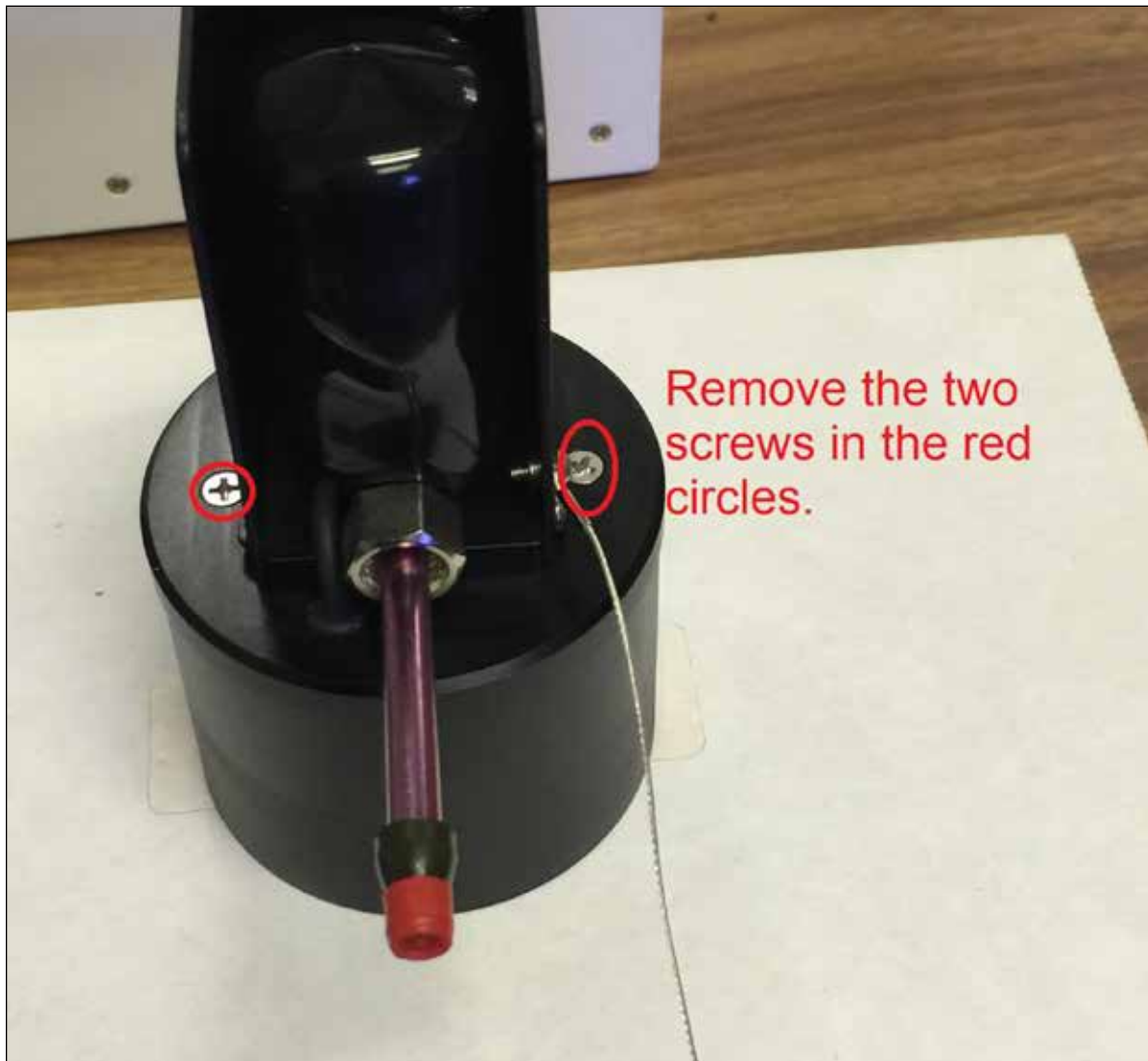


Figure 5.2 - TM1200 Rear Cover Screws.

At this point only an O-Ring is holding the front and of the TM1200 together. Carefully pull off the front of the TM1200 by pulling, rocking, and twisting the front portion of the timer.

Refer to figure 5-3.

Remove the old battery and put in a new one.

Reassemble the unit and verify the new battery works.



Figure 5.3 - TM1200 Open for Battery Replacement.

After replacing the battery all sampling events as well as the day of the week and time may need to be entered again. The TM1200 has an internal capacitor on its board that allows the TM1200 to maintain the day and time as well as programmed sampling events as long as the original battery was not completely dead and as long as the 9 volt battery is changed within a short time. If necessary set the time and program the TM1200.

Section 6. Warranty and Parts

Warranty

Please refer to <https://www.entechinst.com/warranties/> for warranty information.

Service Parts List for the TM1200

9 V Battery

01-30-40400 - ¼" Nickel Ferrule, 10 pack

01-30-40900 - ¼" Nickel Ferrule Puller

Ordering Parts

For the United States, Canada, or any other country which does not have a distributor for Entech Instruments,

To place an order please contact orders@entechinst.com.

For help determining which parts are needed please contact support@entechinst.com.

For quotes please contact your local Entech representative or sales@entechinst.com.

Quotes can also be requested or orders placed through the Entech Store at www.entechinst.com if an account is created.

For countries with a distributor please contact your local distributor directly for quotes, help determining parts, and to place orders.

If you are in a country other than the United States or Canada and do not know if your country has a distributor or do not know how to contact your distributor please email info@entechinst.com and request the contact information for your local distributor.

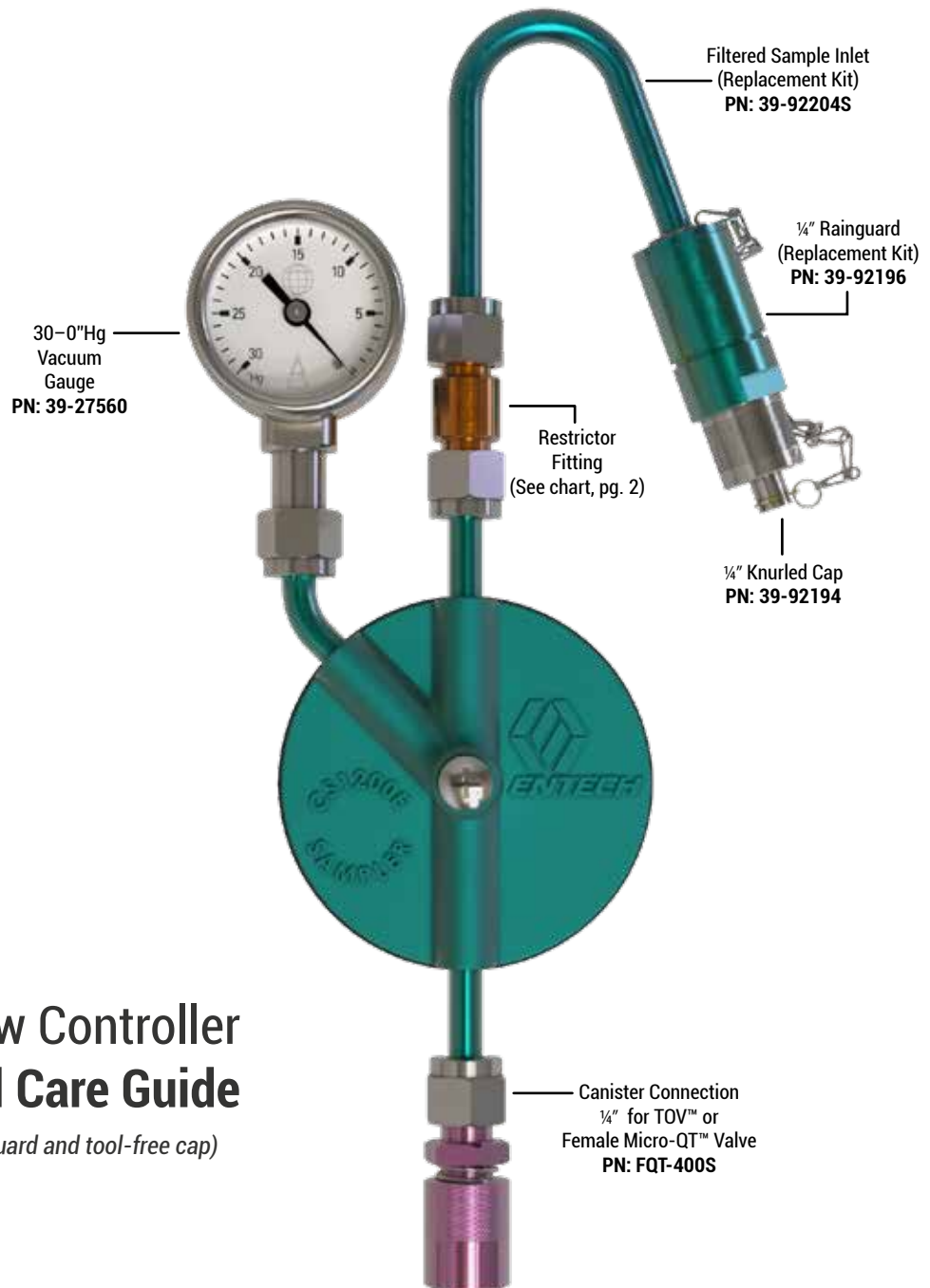
Technical Support

Get in Touch

Contact your local Entech solutions provider today!

Tel.: (805) 527 5939 • Fax: (805) 527-7913 • support@entechinst.com • www.entechinst.com

Section 7. Appendices

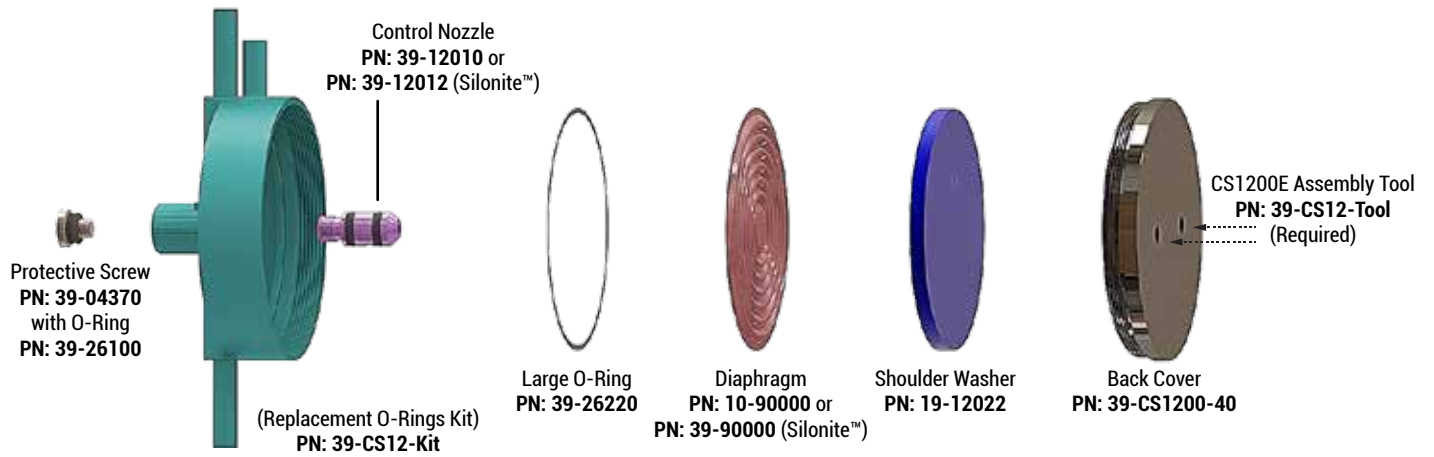


CS1200E Flow Controller Operation and Care Guide

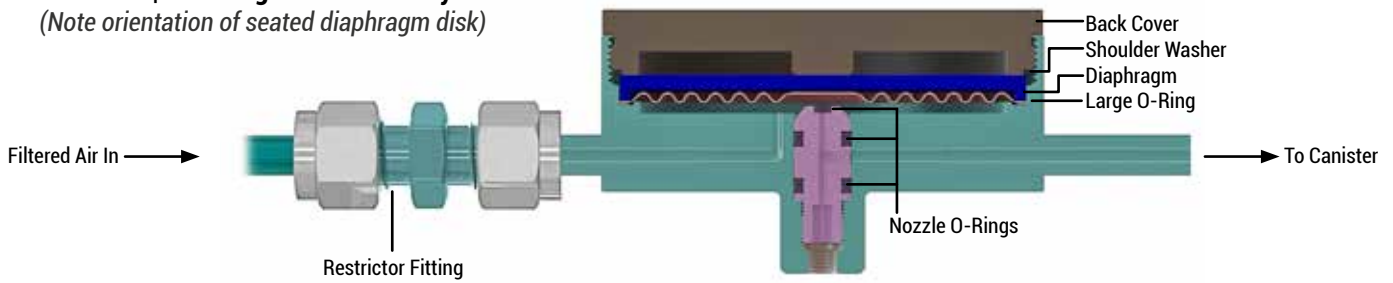
(For CS1200E with new rainguard and tool-free cap)

• CS1200E | About

The CS1200E is a high purity flow regulation system used to fill canisters at a constant rate from vacuum to within 1psi of atmospheric pressure without requiring power. The CS1200E fully meets the requirements of US EPA Method TO15 and other canister based VOC air sampling methods. The CS1200E consists of three main parts – the vacuum regulator, the flow restrictor, and the inlet. The vacuum regulator houses a diaphragm and a control nozzle that allows the pressure to be maintained just below atmospheric pressure even as the pressure in the attached canister increases. By choosing the appropriate restrictor (Code = 0 - 7) based on the canister size and sampling duration required, the flow rate will remain constant. With any given restrictor, the flow rate can be adjusted by a factor of 3x by adjusting the position of the control nozzle.



● **CS1200E | Flow Regulator Assembly**
(Note orientation of seated diaphragm disk)



● **CS1200E | Restrictors and Flow Range**

CS1200E Restrictors – The CS1200E features easily changed restrictor fittings with a stamped code to designate the general flow range. Further calibration using the control nozzle is required to fine tune the actual flow rate to achieve the desired canister fill duration.

Table 1 – CS1200E | Restrictors and Canister Fill Duration Range

CS1200E with stamped flow range code – PN: 39-CS1200E(S)x. Add “S” to order Silonite™ Coated version and replace “x” with desired flow code.



| CS1200E Restrictors | | | | | | Recommended Restrictor for Volumes and Fill Times | | | | | | | | | |
|-----------------------|--------------|-------------------|------|-------------------------------|----------|---|-------|-------|----|------|----|------|------|----|-----|
| Part # | | Flow Range | Code | Replacement Restrictor Part # | | Fill Duration | 450mL | 600mL | 1L | 1.4L | 2L | 2.7L | 3.2L | 6L | 15L |
| Silonite™ Coated | Uncoated | | | Silonite™ Coated | Uncoated | | | | | | | | | | |
| 39-CS1200ES0 | 39-CS1200E0 | 150 – 450 cc/min. | 0 | 39-23000S | 39-23000 | 15 min. | 2+ | 2 | 1 | 1 | 1 | 0 | 0 | 0 | — |
| 39-CS1200ES1 | 39-CS1200E1 | 50 – 150 cc/min. | 1 | 39-23010S | 39-23010 | 1 hr. | 3+ | 3+ | 3 | 2+ | 2+ | 2 | 2 | 1 | 0 |
| 39-CS1200ES2 | 39-CS1200E2 | 20 – 60 cc/min. | 2 | 39-23030S | 39-23030 | 3 hrs. | 4+ | 4 | 4 | 3+ | 3 | 3 | 3 | 2+ | 1 |
| 39-CS1200ES2+ | 39-CS1200E2+ | 12 – 36 cc/min | 2+ | 39-23160S | 39-23160 | 8 hrs. | 5 | 5 | 4+ | 4+ | 4 | 4 | 3+ | 3 | 2+ |
| 39-CS1200ES3 | 39-CS1200E3 | 7 – 21 cc/min. | 3 | 39-23080S | 39-23080 | 12 hrs. | 6 | 5 | 5 | 4+ | 4+ | 4 | 4 | 3+ | 2+ |
| 39-CS1200ES3+ | 39-CS1200E3+ | 4 – 12 cc/min. | 3+ | 39-23160S | 39-23160 | 1 day | 6 | 6 | 5 | 5 | 5 | 4+ | 4+ | 4 | 3+ |
| 39-CS1200ES4 | 39-CS1200E4 | 2 – 6 cc/min. | 4 | 39-23240S | n/a | 2 days | 7 | 7 | 6 | 6 | 5 | 5 | 5 | 4+ | 4 |
| 39-CS1200ES4+ | 39-CS1200E4+ | 1 – 3 cc/min. | 4+ | 39-23480S | n/a | 7 days | — | — | — | 7 | 7 | 7 | 7 | 6 | 5 |
| 39-CS1200ES5 | 39-CS1200E5 | 0.5 – 1.5 cc/min. | 5 | 39-24010S | n/a | 14 days | — | — | — | — | — | 7 | 7 | 7 | 5 |
| 39-CS1200ES6 | n/a | 0.2 – 0.6 cc/min. | 6 | 39-24020S | n/a | 30 days | — | — | — | — | — | — | — | 7 | 6 |
| 39-CS1200ES7 | n/a | 0.1 – 0.3 cc/min. | 7 | 39-24040S | n/a | | | | | | | | | | |

Assuming canisters are filled to 4" Hg below atmosphere

● CS1200E | Target Flow Rates for Filling Silonite™ Canisters

CS1200E Calibration – In order to maintain sample integrity, the CS1200E flow rates should always be verified and/or calibrated immediately prior to delivery to customer for field sampling.

Table 2 – CS1200E | Canister Target Flow Rate and Fill Duration¹

Target Flow Rates shown in cc/min. for canisters with Micro-QT™ Valves and the TrueSeal™ Valve only.

| Fill Duration | 450mL cc/min. | 600mL ² cc/min. | 1L cc/min. | 1.4L cc/min. | 2L cc/min. | 2.7L cc/min. | 3.2L cc/min. | 6L cc/min. | 15L cc/min. |
|---------------|------------------|-------------------------------|---------------|-----------------|---------------|-----------------|-----------------|---------------|----------------|
| 1 Hour | 6.5 | 8.7 | 14.5 | 20.3 | 29 | 39.2 | 46.4 | 87 | – |
| 2 Hours | 3.3 | 4.4 | 7.3 | 10 | 14.6 | 20 | 23.2 | 43.5 | 109 |
| 3 Hours | 2.2 | 2.9 | 4.8 | 6.8 | 9.6 | 13.1 | 15.5 | 29 | 72.5 |
| 4 Hours | 1.63 | 2.2 | 3.6 | 5.1 | 7.2 | 9.8 | 11.6 | 21.8 | 54.4 |
| 8 Hours | 0.82 | 1.1 | 1.8 | 2.5 | 3.6 | 4.9 | 5.8 | 10.9 | 27.2 |
| 12 Hours | 0.54 | 0.73 | 1.2 | 1.7 | 2.4 | 3.3 | 3.9 | 7.3 | 18.2 |
| 24 Hours | – | – | 0.60 | 0.85 | 1.2 | 1.6 | 1.9 | 3.6 | 9.06 |
| 2 Days | – | – | – | – | – | 0.82 | 0.97 | 1.8 | 4.5 |
| 1 Week | – | – | – | – | – | – | – | 0.52 | 1.3 |

Tables are calculated for an 87% final fill volume.

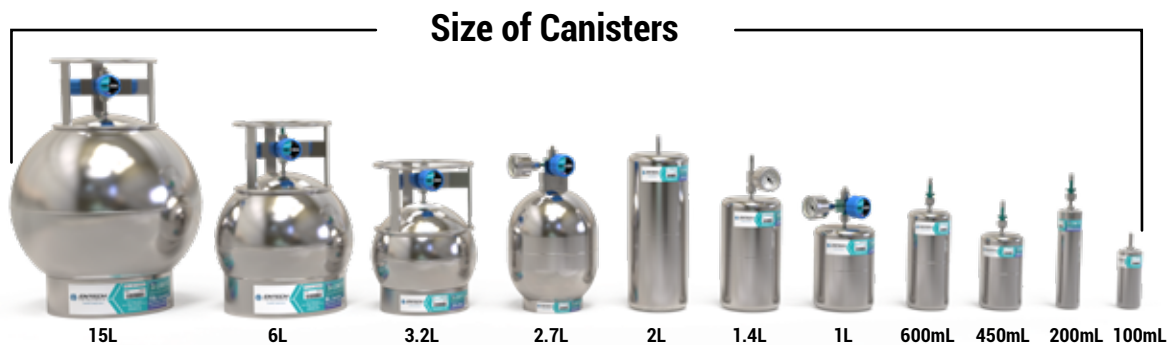
.87 x Volume (cc) = 87% Volume.

87% Volume ÷ Minutes = Target Flow Rate (cc / min.).



¹ For sampling events above 3000 feet, reduce flow rate by 15%. MicroValves™ are recommended for use on Silonite™ Canisters and MiniCans™ up to 3.2L. Larger canisters with MicroValves™ may require longer cleaning times due to the added restriction of the valve. The TrueSeal™ Valve can be used with all canister sizes with the exception of the 600mL.

² The 600mL Minican™ with an integrated Micro-QT2™ Valve is designed only for MicroValve™ connections.



Leak Check Procedure for CS1200E

1. Attach and securely tighten the CS1200E's ¼" tool-free cap with chain onto the filtered inlet.
2. Connect the CS1200E to an evacuated canister. (*evacuated to below 20"Hg*)
3. If the CS1200E is connected to a canister using a TrueSeal Valve, turn knob to open valve momentarily and then close. If the CS1200E includes a MicroValve™, simply connect and disconnect the CS1200E to and from a Micro-QT™ Valve canister.
4. Verify no vacuum loss. If leaks occur, tighten fittings as needed to ensure vacuum integrity and repeat process above.

Manual Calibration Procedure for CS1200E – Time measurement, manual adjustments.

(Use the Flow Professor™ for flow rates >10cc/min)

1. Perform leak check as shown above. Connect CS1200E to evacuated canister. *(evacuated to below 20"Hg)*
2. If the CS1200E is connected to a TrueSeal™ Valve, open valve momentarily and then close. If the CS1200E is connected using a MicroValve™, simply connect and then disconnect canister. *(additionally, decrease the time by 7%)*
3. Measure the time it takes for pressure to rise from 20"Hg to 10"Hg. Use tables below to calculate the flow rate.
4. Turn the control nozzle to increase or decrease flow rate and retest using pressure rise time measurement.

The following tables shows the target flow rates for various canister sizes and sampling durations.

(Target pressure is 0.87 atmospheres)

450mL MiniCan™ – Time from 20"Hg to 10"Hg

| Gauge Seconds | Code | Target Flow Rate cc/min. | Duration |
|---------------|------|-----------------------------|----------|
| 15.5 | 4 | 2.12 | 3 Hours |
| 31 | 5 | 1.09 | 6 Hours |
| 41.5 | 5 | 0.82 | 8 Hours |

1L MiniCan™ – Time from 20"Hg to 10"Hg

| Gauge Seconds | Code | Target Flow Rate cc/min. | Duration |
|---------------|------|-----------------------------|----------|
| 7 | 4 | 4.8 | 3 Hours |
| 18.5 | 4 | 1.80 | 8 Hours |
| 56 | 5 | 0.60 | 24 Hours |

3.2L Silonite™ Canister – Time from 20"Hg to 10"Hg

| Gauge Seconds | Code | Target Flow Rate cc/min. | Duration |
|---------------|------|-----------------------------|----------|
| 6 | 4 | 5.8 | 8 Hours |
| 17.5 | 4 | 1.93 | 24 Hours |
| 35 | 5 | 0.96 | 2 Days |

6L Silonite™ Canister – Time from 20"Hg to 10"Hg

| Gauge Seconds | Code | Target Flow Rate cc/min. | Duration |
|---------------|------|-----------------------------|----------|
| 5 | 3 | 7.3 | 12 Hours |
| 9.5 | 4 | 3.6 | 24 Hours |
| 65.5 | 5 | 0.52 | 1 Week |



Flow Professor™ CS1200E Calibration – (For the most accurate CS1200E calibrations, use the Flow Professor™)

The Flow Professor™ automates the calibration process for sampling into canisters as small as 450mL and as large as 15L.

1. Set canister size in the Flow Professor WIN7/10 Software.
2. Select sampling duration and vacuum to leave inside the canister after sampling (typically 2-4" Hg).
3. Attach Flow Professor to the CS1200E.
4. Select START CALIBRATION.

See Flow Professor operations guide for more details.

The Flow Professor™ automatically adjusts the the CS1200E to the correct flow rate. The software also adjusts for estimated field temperatures and sampling site elevation to optimize sampling rates under any environmental condition. The Flow Professor also identifies when a wrong or fouled restrictor has been installed, and when a diaphragm has become damaged. Flow vs pressure charts are created that validate sampling accuracy prior to field deployment.



The Flow Professor™ shown with CS1200ES

• CS1200E | Maintenance and Troubleshooting

CS1200E Cleaning – CAUTION! - The CS1200E should not be placed under vacuum for long periods of time with the inlet cap on. The diaphragm is meant to control to within approximately 1 psi of atmospheric pressure, and with the cap off, there is no way for a larger vacuum to develop. With the inlet cap installed, the inside of the flow controller can eventually reach negative 14 psig with continued application of a strong outlet vacuum. This can warp the diaphragm as it is forced downward into the control nozzle.

When to Clean

The internal volume of the CS1200E is so low that cleaning isn't necessary when it has been utilized exclusively for ambient air analysis. The remaining gas volume is small enough that it will not contaminate the next sample.

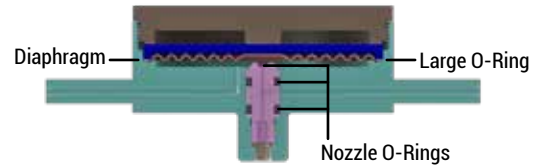
When performing higher concentration sampling, use one of the 3 choices below when purging the CS1200E using your Entech canister cleaning system:

1. Cap off the CS1200E inlet, and cycle between roughly 15 psia and 1 psia, without engaging the high vacuum pump. 5 cycles should be sufficient.
2. Or, remove the cap and just pressurize the cleaning system to 20 psia (not much higher) to allow reverse flow through the sampler.
3. Alternatively, remove the cap and pull a vacuum on the CS1200E, allowing lab air to be slowly pulled in. If the CS1200s are used for soil gas or other high concentration samples, lab air will be well below your detection limits. There is a big dilution factor when considering the 2cc internal volume of the sampler and the 1-6L volume of the canister. After slowly pulling room air through the unit, the CS1200E can be backflushed with N2 at a maximum of 20 psia for another 5 minutes before removal and capping to eliminate the room air.

Damaged Diaphragm –Over-tightening the flow adjust screw and can lead to reduced precision or inability to adjust the flow rate.

Tools Needed: 1/8" Hex Key, 5/64" Hex Key, Forceps, Cover Removal Tool (PN: 39-CS12-TOOL), Safety Glasses.

1. Remove the front protective screw and turn the adjustment screw counter-clockwise until it stops.
2. With the flow controller body face down on a table, remove the back cover using the cover removal tool.
3. Flip the flow controller body over to dump the back cover plate and metal disc to the table surface.
4. Examine diaphragm for damage (*diaphragm is a thin ribbed, metallic disk*). A damaged diaphragm surface will appear deformed, creased, or wrinkled. If diaphragm is undamaged and correctly seated, reassemble and proceed to **step 9**.
5. Gently pry the edges of the diaphragm up with forceps and invert the controller body to remove the diaphragm.
6. Inspect to make certain that the large O-Ring is seated snugly in the groove inside the flow controller body. Also, ensure that the small O-Rings are present in the center and sides of the adjustment nozzle.
7. Insert diaphragm into the flow controller as shown in this diagram. (*The raised edge will be seated flat against the O-ring*)
8. Place the metal disc on top of the diaphragm with the flat side facing up and screw the back plate on by hand, then gently tighten with the same tool used to remove the cover. Only gentle tightening is required for leak-tight CS1200E operation.
9. Recalibrate the flow controller.



Filter Replacement –The Silonite™ coated filter may need to be replaced if it becomes contaminated / clogged.

Tools Needed: Cotton or Latex® gloves

1. Unscrew filter cover and remove from the end of the threaded inlet tube.
2. Unscrew filter and remove from end of the threaded inlet tube.
3. Remove and replace small O-ring with the new O-ring provided with replacement filter.
4. Install new filter and replace filter cover.



Replacement Silonite™
Filter with O-Ring
PN: 39-92150

Restrictor Replacement –Restrictor union may be replaced if it becomes contaminated, clogged or to provide different flow range.

Tools Needed: 3/16" Wrench, and 1/2" Wrench

1. Remove inlet tube assembly by loosening 1/4" compression nut at top of restrictor union.
2. Loosen 1/4" compression nut connecting bottom of restrictor union fitting to CS1200E body.
3. Remove and replace union with desired flow range restrictor union.
4. Reconnect inlet tube.

Replacement Restrictor
Fittings.
Add "S" for Silonite™ Version



| Restrictor Code | Part Number |
|-----------------|-------------|
| 0 | 39-23000(S) |
| 1 | 39-23010(S) |
| 2 | 39-23030(S) |
| 2+ | 39-23160(S) |
| 3 | 39-23080(S) |
| 3+ | 39-23160(S) |
| 4 | 39-23240S |
| 4+ | 39-23480S |
| 5 | 39-24010S |
| 6 | 39-24020S |
| 7 | 39-24040S |

PLEASE NOTE!

Flow controllers shipped after October 2016 now use pure Nickel ferrules. They are extremely leak tight, but can be removed using a Nickel Ferrule Puller extraction tool from Entech.



NiFITY – Nickel Ferrules (10 Pack)
PN: 30-40400

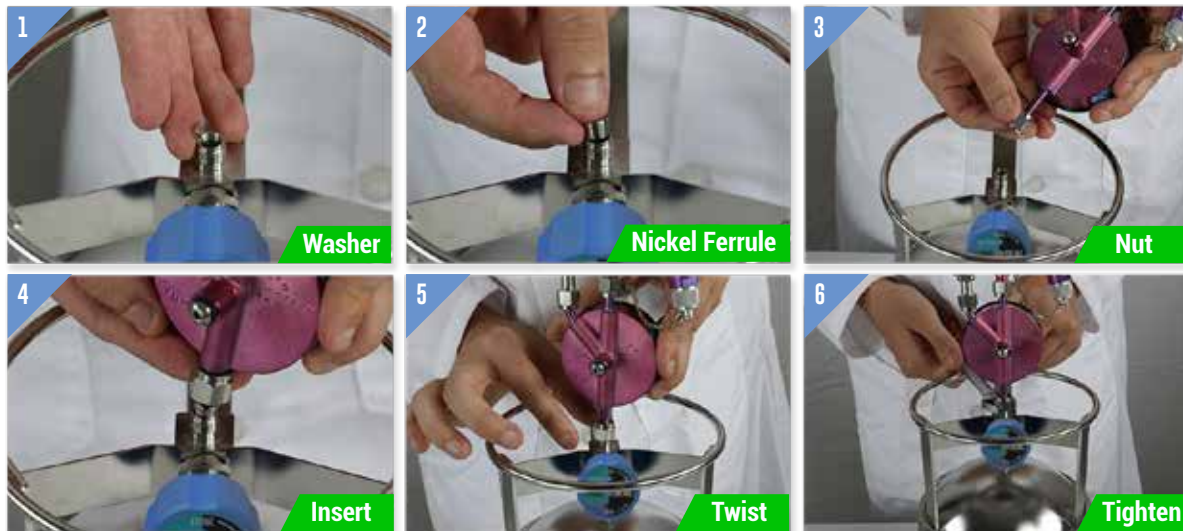
NiFITY – Nickel Ferrule Remover
PN: 30-40900

• About Entech NiFITY Nickel Ferrules

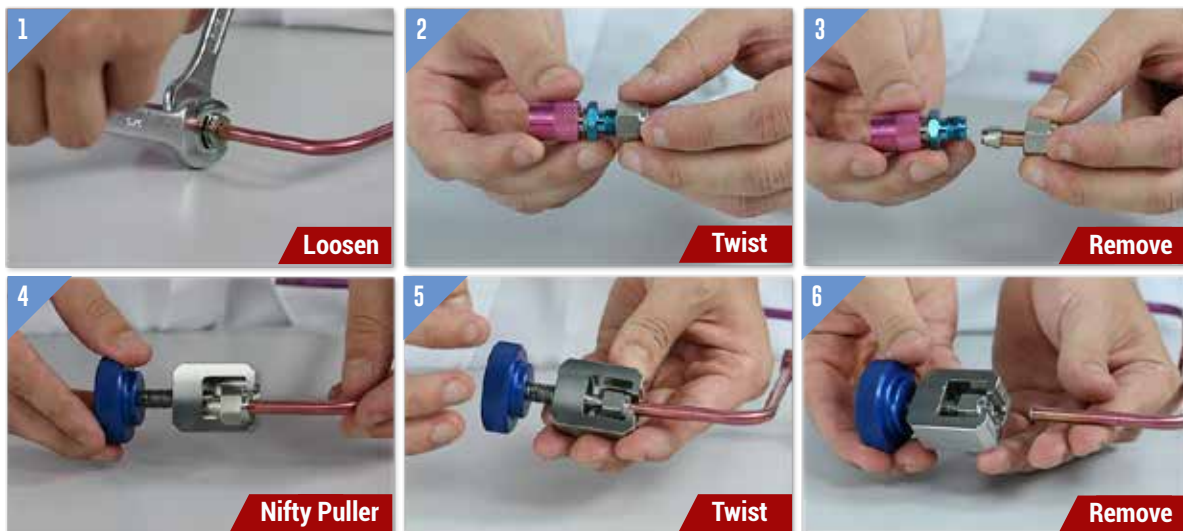


The ferrule, a small but critical component to leak tight sampling, has evolved. Your order is now using the latest ferrule technology from Entech. Through years of development, Entech has created a pure Nickel Ferrule that improves overall performance when compared to any other ferrule currently used for whole air sampling and analysis. The unique properties of Nickel create the best combination of inertness, low carryover, and replaceability, so you never have to throw away a fitting, flow controller, a 6L canister because your ferrule or ¼" Swagelok™ style nut failed you. Nickel ferrules seal and are easily replaceable just like Graphite-Vespel™ Ferrules, yet just like stainless steel ferrules, they are also non-contaminating and cannot be removed by hand. See instructions below for installation or removal.

Installing Nickel Ferrules



Removing Nickel Ferrules





Learn more about us:



entechinst.com



facebook.com/entechinst



twitter.com/entechinst



linkedin.com/company/entech-instruments-inc

Entech Instruments
2207 Agate Court
Simi Valley, CA 93065
Phone: 805-527-5939

TM1200 manual –201106-2.0

© 2020 Entech Instruments. Silonite™, MiniCan™, MicroValves™, Micro-QT™, and The Flow Professor™ are trademarks of Entech Instruments. All Rights Reserved.