

HOME

**FINNIGAN**  
**Valve Oven**  
*Trace&C ultra*

# Valve Oven Operating Manual



**Thermo**  
ELECTRON CORPORATION

## Valve Oven Operating Manual

May 2003 Edition

Part Number 317 093 63

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Printed in Italy

Published by ThermoFinnigan Italia S.p.A., Strada Rivoltana, 20090 Rodano - Milan - Italy

Tel: +39 02 95059355 Fax: +39 02 95059388

Printing History: First Edition, released May 1999.

Second Edition, released July 2002

Third Edition, released May 2003

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# About This Manual

## Overview

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This *Valve Oven Operating Manual* contains information for operating the Valve Oven, including Troubleshooting and ordering spare parts.

This manual is organized as follows:

Chapter 1, *Valve Oven Overview*, provides an overview to TRACE GC Ultra Valve Oven features and components.

Chapter 2, *Valve Installation*, provides instructions for installing valves in the TRACE GC Ultra Valve Oven.

Chapter 3, *Operation*, presents operating instructions for the TRACE GC Ultra Valve Oven.

Chapter 4, *Troubleshooting*, has information to help you find and correct potential problems when using the TRACE GC Ultra Valve Oven.

Appendix A, *Customer Communication*, has contact information for ThermoFinnigan offices worldwide. This appendix also contains a one-page *Reader Survey*. Use this survey to give us feedback on this manual and help us improve the quality of our documentation.

The *Glossary* is an alphabetical descriptive list of terms common to this industry. This also includes abbreviations, acronyms, metric prefixes, and symbols.

The *Index* presents an alphabetical list of key terms and topics in this guide, including cross references and the corresponding page numbers.

# Conventions Used in This Manual

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The following symbols and typographical conventions are used throughout this manual.

<b>Bold</b>	Bold text indicates names of windows, menus, dialog boxes, buttons, and fields.
<i>Italic</i>	Italic indicates cross references, first references to important terms defined in the glossary, and special emphasis.
Monospace	Monospace, or Courier, indicates filenames and file paths, or text the user should enter with the keyboard.
Monospace Bold	Monospace Bold indicates messages or prompts displayed on the computer screen or on a digital display.
»	This symbol illustrates menu paths to select, such as <b>File»Open....</b>
<b>KEY NAME</b>	Bold, uppercase sans serif font indicates the name of a key on a keyboard or keypad, such as <b>ENTER</b> .



This symbol alerts you to an action or procedure that, if performed improperly, could damage the instrument.













This symbol alerts you to important information related to the text in the previous paragraph.










This symbol alerts you to an action or procedure that, if performed improperly, could result in damage to the instrument or possible physical harm to the user. This symbol may be followed by icons indicating special precautions that should be taken to avoid injury.

# Instrument Markings and Symbols

The following table explains the symbols used on Thermo Finnigan instruments. Not all of them are used on the TRACE GC Ultra gas chromatograph and Valve Oven.

Symbol	Description
	Direct Current
	Alternating Current
	Both direct and alternating current
	Three-phase alternating current
	Earth (ground) terminal
	Protective conductor terminal
	Frame or chassis terminal
	Equipotentiality
	On (Supply)
	Off (Supply)

Symbol	Description
	Equipment protected throughout by DOUBLE INSULATION or REINFORCED INSULATION (Equivalent to Class II of IEC 536)
	Instruction manual symbol affixed to product. Indicates that the user must refer to the manual for specific Warning or Caution information to avoid personal injury or damage to the product.
	Caution, risk of electric shock
	Caution, hot surface
	Caution (refer to accompanying documents)
	In-position of a bistable push control
	Out-position of a bistable push control



# Using the TRACE GC Ultra Document Set

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The TRACE GC Ultra Document Set (CD-Rom PN 317 095 00) includes all manuals in electronic format, and serves as your library for information about the TRACE hardware and software.

The TRACE GC Ultra Document Set (PN 317 093 00) as paper copy is also available. Furthermore, ThermoFinnigan part numbers (PN) for the paper copy manuals are provided for each book title.

## *Site Preparation and Installation Manual* (PN 317 091 90)

This manual and diskette describes how to set up a workspace for the TRACE GC and how to connect the TRACE GC Ultra to the gas supplies and peripheral devices.

## *Acceptance Package* (PN 317 092 20)

This folder contains required shipping documents and quality report forms.

## *Getting Started* (PN 317 092 30)

This guide contains sequences for checking configuration, installing detectors, and making a first analysis with the TRACE GC Ultra.

## *Operating Manual* (PN 317 091 70)

This manual provides descriptions of the TRACE GC Ultra hardware and software and instructions for their use.

## *UFM Ultra Fast Module Device* (PN 317 093 98)

This manual provides descriptions of the TRACE GC Ultra equipped with the UFM device. and instructions for it use.

## *Quick Reference Card* (PN 317092 40)

This reference card contains guidelines for carrier gas use and injection sequences.

## *K-Factor Quick Reference* (P/N 317 092 41)

This reference card contains information to interpretate results from a Column Evaluation.

*Preventive Maintenance Schedule* (PN 317 092 80)

This document provides a list of recommended scheduled maintenance and a year-long log book to record maintenance, observations, supply lists, and service records.

*Maintenance and Troubleshooting Guide* (PN 317 091 80)

This manual contains instructions for diagnosing and resolving operational problems.

*Standard Operating Procedures* (PN 317 092 00)

This manual contains instructions, operating sequences, and test criteria for final testing of the TRACE GC Ultra.

*Spare Parts Catalog* (PN 317 092 10)

This catalog contains a list of spare parts for the TRACE GC Ultra.



# Valve Oven Overview

This chapter provides an overview to TRACE GC Ultra Valve Oven features and components.

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# Introduction

The TRACE GC Ultra Valve Oven, shown in Figure 1-1, is a temperature controlled enclosure for mounting up to six (four heated + two unheated) sampling and/or switching valves, 1/8" OD packed columns and up to eight needle valves and four pressure regulators.

A large number of applications require this additional space for a correct analysis setup.

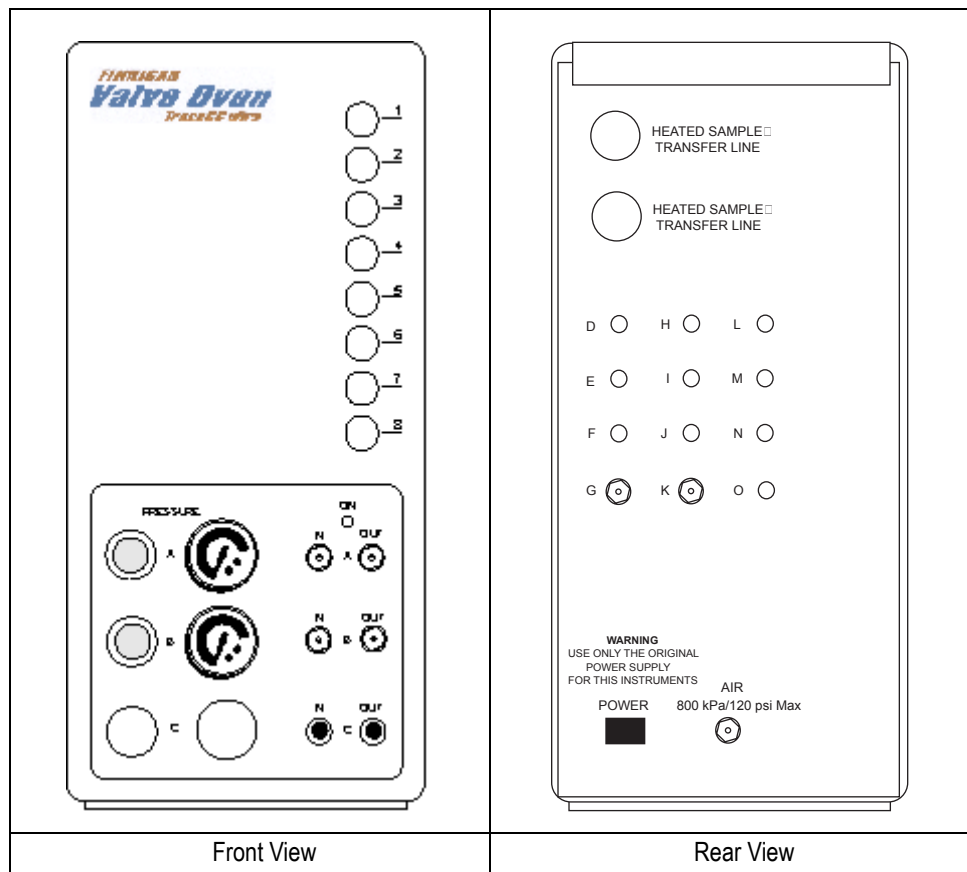


Figure 1-1. The Valve Oven

## Options

The type of valve enclosure can be selected among three different options depending on the analytical requirements.

### 1. TRACE GC Ultra Valve Oven

It provides an additional isothermal heated zone to accommodate valves and columns. It consists of an inner heated enclosure and an external unheated area. The former is designed to house up to four heated valves, restrictors and 1/8" OD packed columns. The latter houses up to two valves and pressure regulators. This option is therefore particularly suitable for applications such as natural gas or refinery gas analyses where, together with the GC column oven, an additional isothermally heated area is required for gas sampling, column switching, storing or sample cutting valves. It can accommodate up to four constant pressure regulators, up to eight needle valves, plus front and rear sample and carrier gas inlets/outlets.

### 2. TRACE GC Ultra Valve Box for Up to Six Valves

This version is the same as previous option (*TRACE GC Ultra Valve Oven*) but without heating elements. It provides an additional cold zone to accommodate up to four gas sampling/switching valves, up to two valves for liquid sampling, restrictors and 1/8" OD packed columns.

It is therefore particularly suitable for engineered applications that can be exploited at ambient temperature, for which multi-column and/or multi-valve configurations (sampling, switching, storing or heart-cutting) are required. It can also accommodate up to four constant pressure regulators, up to eight needle valves, plus front and rear sample and carrier gas inlets/outlets

### 3. TRACE GC Ultra Valve Box for Up to Two Valves

This version is the same as previous option (*TRACE GC Ultra Valve Box for Up to Six Valves*) but can accommodate ONLY up to two valves, thus providing a customized solution for not highly demanding engineered applications. This version does not include any electronics; the drivers for the two three-way-valves controlling the pneumatic actuators are installed on the TRACE GC Ultra.

It is able to accept restrictors and 1/8" OD packed columns; it can also accommodate up to four constant pressure regulators, up to eight needle valves, plus front and rear sample and carrier gas inlets/outlets.

When up to two Valco Purged valves are required (e.g. applications with Pulsed Discharge Detector), this option has to be selected for their housing.

For more informations, refer to *Valve Oven Components*.



**NOTE**

When any Valve box (heated or unheated) is configured with valves, these are factory tested to verify actuation but are NOT plumbed. Plumbing can be performed upon availability of plumbing diagrams.

**Materials needed:**

- Shop air or bottled air at a pressure of 60–80 psi
- Helium, Nitrogen, or other gas depending on your applications

## Installation and Power Requirements

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The Valve Oven is attached to TRACE GC Ultra and it is factory installed and configured. On-site installation is related to the gas plumbing defined by the customer's application or accompanying diagram.



**Figure 1-2.** The Valve Oven and the TRACE GC Ultra

## Power Requirements and Voltage Selection

Valve ovens installed by the factory will contain the line voltage selected as noted by the sales order, 115 V ac or 230 V ac. The line voltage selection can be changed by relocating a jumper located behind the valve driver electronics (Figure 1-3).



**CAUTION** AC line voltage is applied to the valve oven when the main GC is turned on. Turn the main GC power off before removing the valve oven heaters.

Valve oven power for the 24 V dc solenoid is supplied by an external power module that plugs into the rear of the valve oven. This power module will accept input voltage from 106 V ac to 240 V ac. A green light on the front of the valve oven (*Power On Indicator*) indicates when the power module is plugged in (Figure 1-2).

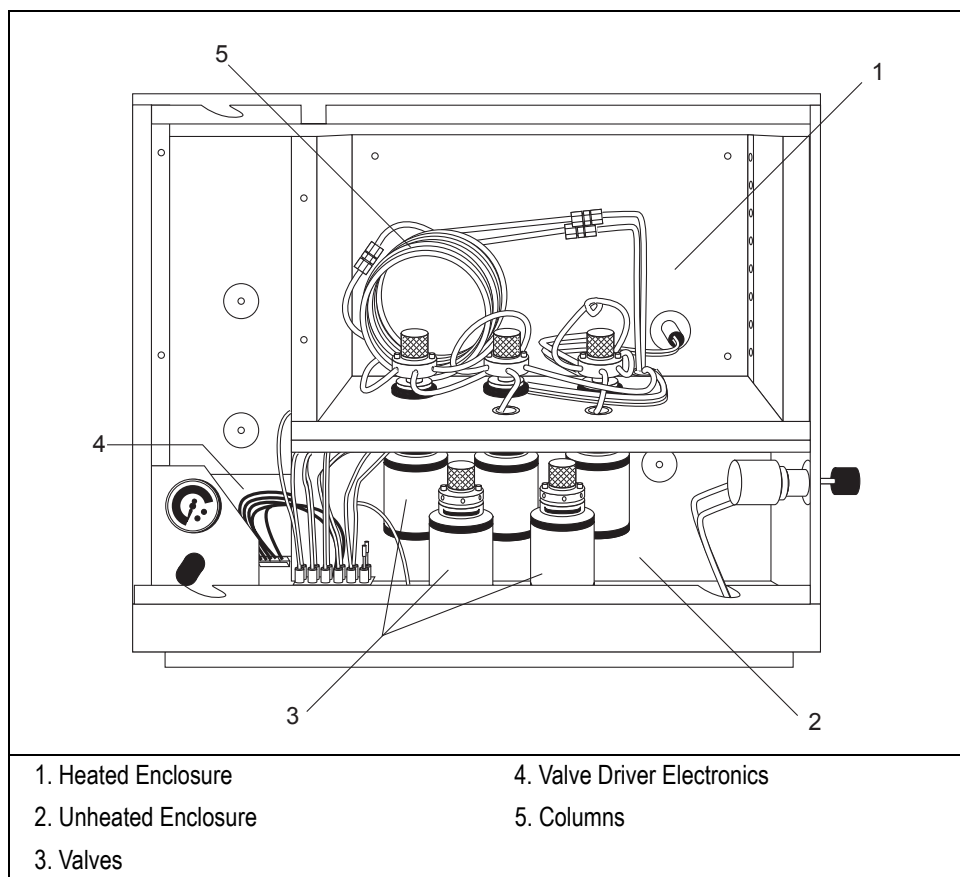


**NOTE** In case of using the TRACE GC Ultra Valve Box for up two valves, any power supply is necessary since the solenoid valves are activated directly by the TRACE GC Ultra.

# Valve Oven Components

The TRACE GC Ultra Valve Oven consists of four major components as shown in Figure 1-3.

- Heated Enclosure
- Unheated Enclosure
- Valve
- Column



**Figure 1-3.** TRACE GC Ultra Valve Oven Components



## Heated Section

The heated enclosure is a temperature controlled (40 to 175 °C) isothermally heated zone, able to contain the following:

- up to four (4) valves with associated sample loops
- up to fifty feet of 1/8" OD stainless steel column with associated clamp and fixed unions
- up to eight (8) heated needle valves (restrictors) accessible from the front
- provisions for sample transfer directly into the heated zone from the front or rear of the unit

## Unheated Section

Unheated enclosures can contain the following:

- two unheated pneumatic Valco liquid or gas sample injection valves
- up to four pressure regulators installed on the front of the unit, and one mounted internally
- up to six in and out connections for sample loading/vent/flow measurement

## Valves

Your TRACE GC Ultra Valve Oven has the following available valves:

- standard pneumatic Valco rotary valves
- standard pneumatic Valco rotary valves with purged housing

## Column

Although the type of column you use will vary depending on your application, the TRACE GC Ultra Valve Oven typically uses packed columns. The column mounting area can accommodate 1/8" OD columns.



# Valve Installation

This chapter provides instructions for installing and configuring valves in the TRACE GC Ultra Valve Oven.

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# Introduction

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**NOTE**

Before starting, cool the Valve Oven to 50°C or cooler. Do not turn the GC off.

The heated section of the Valve Oven accepts standard Valco gas actuated valves with 3-inch standoff. The unheated section will accommodate Valco gas actuated valves without standoff.



**CAUTION**

**Be careful not to mix actuators with valves that have different numbers of ports, as the actuator travel for each valve can be different.**

## Opening the Valve Oven

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**WARNING!** The Valve Oven cover can be very hot. Use caution when removing the heated Valve Oven cover.

1. Remove the top cover by releasing a single screw on the Valve Oven compartment rear panel.
2. Slide the panel toward the rear about ½ inch and lift away. This exposes the heated Valve Oven cover and valve pneumatics.
3. To remove the heated Valve Oven cover, locate the two thumb screws on the lower edge of the heated Valve Oven cover.
4. Turn these screws counter clockwise (ccw) to release the cover. The cover can be removed by lifting up and pulling out.

# Installing Valves in the Heated Oven

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Installing valves consists of the following steps:

- Step 1. Installing the solenoid
- Step 2. Disassembling the valve and actuator
- Step 3. Installing the valve and standoff
- Step 4. Connecting gas lines from the solenoid to the actuator
- Step 5. Installing the actuator to the valve standoff
- Step 6. Testing the valve



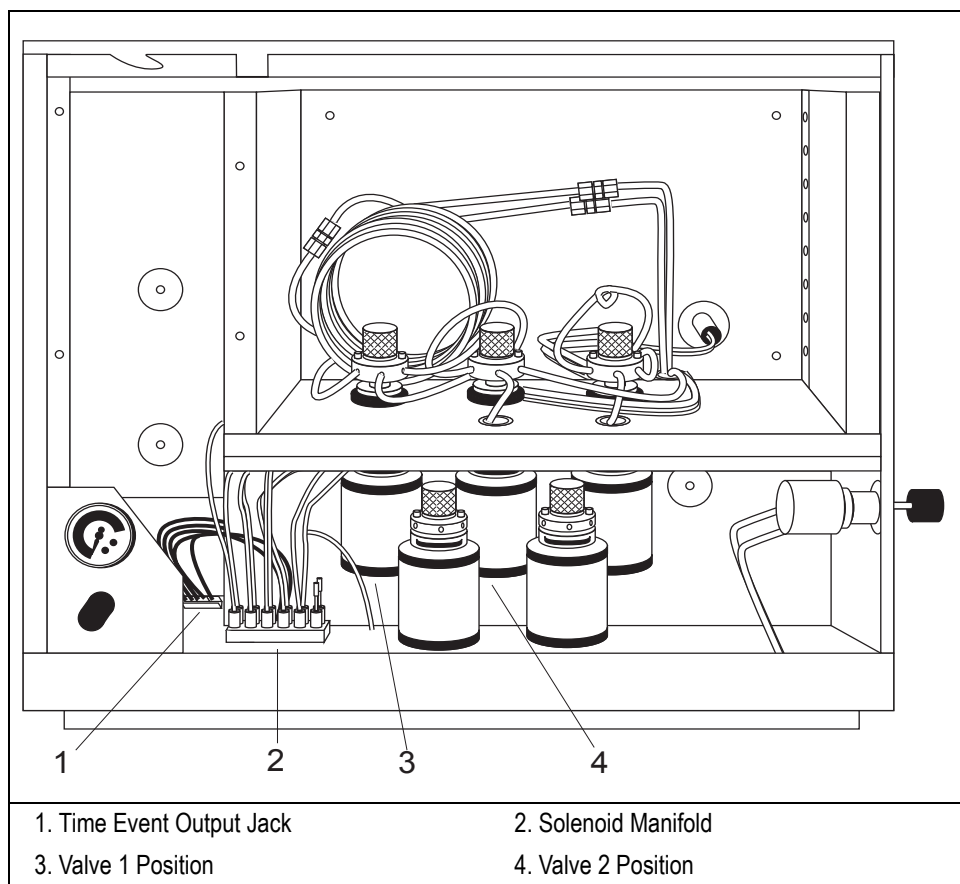
**CAUTION** Turn the actuator gas off before you start these procedures.

## Step 1. Installing the Solenoid Valves

1. Locate the solenoid manifold in the rear floor of the valve compartment (Figure 2-1). The space closest to the rear of the GC is reserved for pneumatic valve 1, next is valve two, and so on. A total of 6 pneumatic valves can be installed (up to 4 in the upper compartment and up to 2 in the lower).
2. Remove the rectangular shaped cap from the manifold using the #0 phillips screwdriver.
3. Secure the solenoid valve to the underplate using the two screws supplied with the valve.

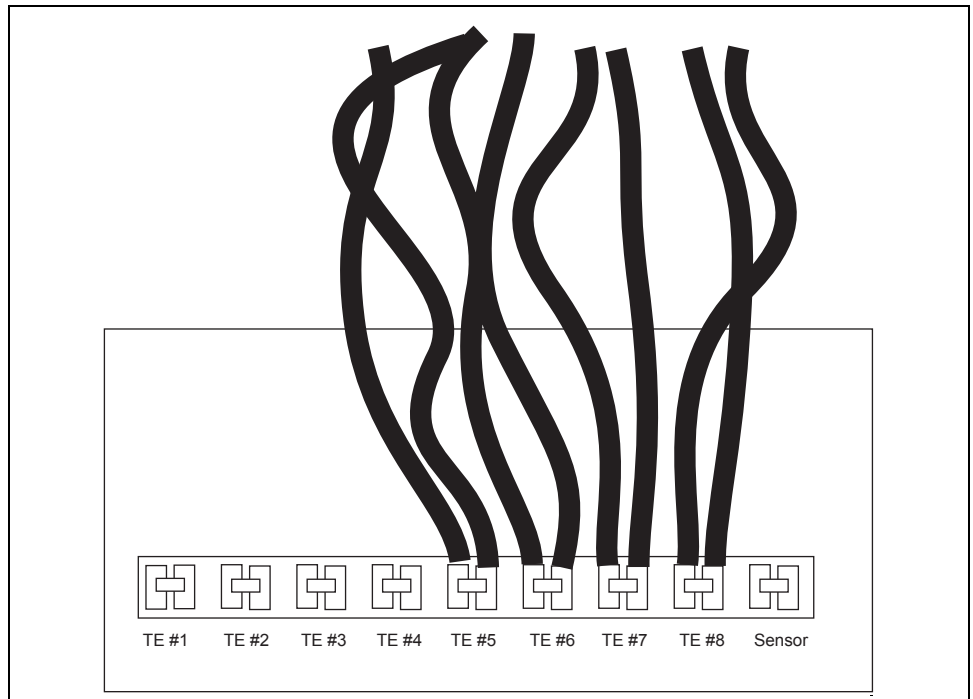


**CAUTION** Tighten screws evenly, taking care that the solenoid gasket rests on all surfaces to prevent leaks



**Figure 2-1.** Timed Event Output Jacks, Solenoid Manifold, and Valve Positions

4. Connect the cable from the solenoid valve (Figure 2-4) to the proper timed event output jack (Figure 2-2) located in the lower rear inside corner of the valve compartment.  
Valve 1 is attached to timed event #8 (TE8), Valve 2 is attached to timed event #7 (TE7), and so forth (Figure 2-2).



**Figure 2-2.** Timed Event (TE) Output Jacks

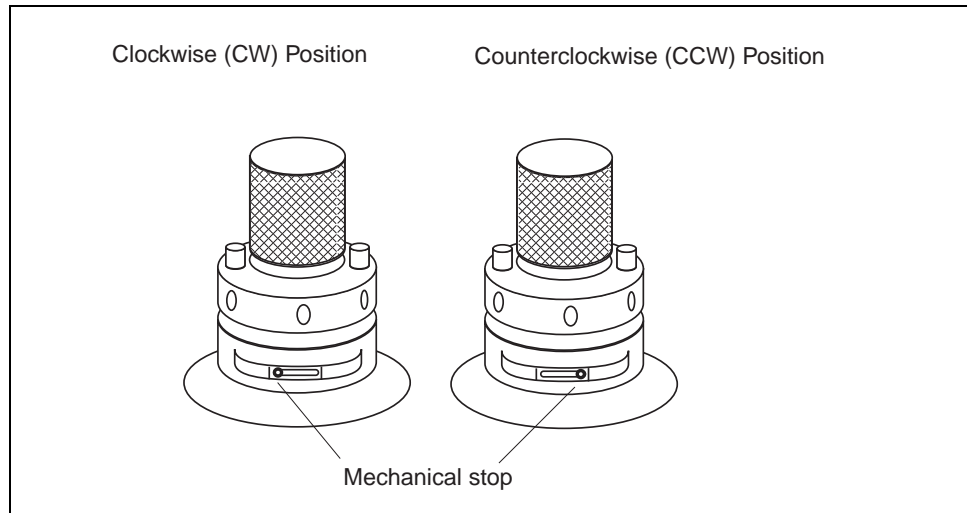
## Step 2. Disassembling the Valve and Actuator



### NOTE

Valves are usually installed starting from the mounting hole closest to the rear of the Valve Oven.

1. Remove any insulation found in the valve mounting hole. The valve mounting hole is located in the lower Valve Oven heater block.
2. Inspect the valve and actuator being sure the valve is in the counter clock wise (ccw) position. The ccw position is when the mechanical stop is in the position noted in Figure 2-3. If the valve is not in the ccw position, locate the square nut on the opposite end of the actuator (Figure 2-5).



**Figure 2-3.** Mechanical Stop Positions for both CW and CCW

3. Using a 5/16" or 8mm wrench, rotate the nut to the ccw position (Figure 2-5).
4. Once the valve is in the ccw position, separate the actuator from the valve and standoff by loosening the allen screw in collar B (Figure 2-5).



**CAUTION**

**Be careful to pull the actuator away from the valve standoff by gripping the standoff but without rotating the actuator or the valve.**



**NOTE**

Handle the valve and standoff with care so the two pieces do not separate.

5. Remove the collar attached to the valve standoff (collar A, Figure 2-5) by loosening the screw that secures the collar to the valve standoff. This collar mounts to the Valve Oven heater block.

### Step 3. Installing the Valve and Standoff

1. Locate the desired valve position in the heater block and place the collar over the hole in the heater block.
2. Secure the collar using two M 4 x10 mm screws. Be sure the 7/64" set screw in the collar is accessible from the outer edge of the Valve Oven.



3. Grip the valve standoff by the standoff only, and slide it through the collar allowing it to extend into the lower valve compartment.

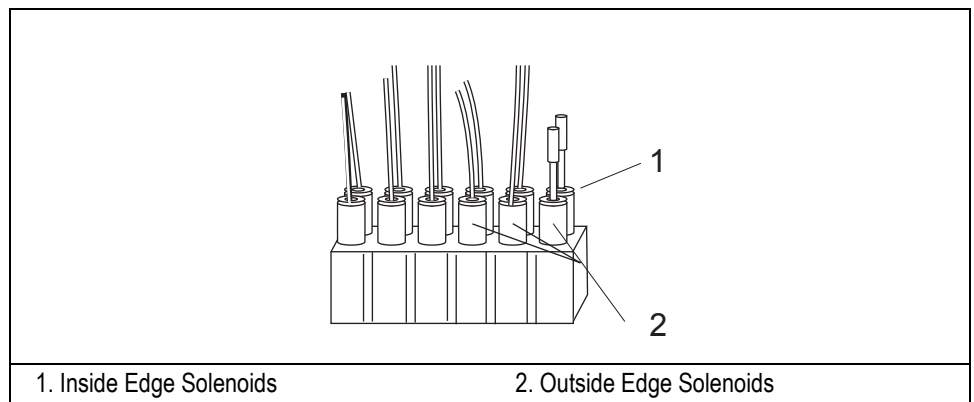
#### Step 4. Connecting Gas Lines from the Solenoid Valve to the Actuator



#### NOTE

Gas lines are much easier to connect to the actuator if the connection is made before the actuator is assembled to the valve.

1. Locate the 1/8 in. nylon tubing supplied in the Valve Oven kit and cut it into two equal 12" pieces.
2. Push one of the tube pieces into the lower fitting on the actuator assembly, making sure it passes through the ferrule in the actuator fitting. Tighten the nut and ferrule using a 3/8" open end wrench. Use a backup 3/8" open end wrench on the mating piece that is screwed into the actuator.
3. Place the other end of the tubing into the valve solenoid fitting located on the outside edge (Figure 2-4) of the solenoid by pushing the tubing firmly into the fitting. It should automatically seal in place.



**Figure 2-4.** Solenoid Manifold Edges

4. Turn the actuator gas supply on. This line should now be pressurized.

5. Verify there are no major leaks in the fittings.



Applying pressure to this side of the actuator will ensure that the actuator stays in the ccw position.

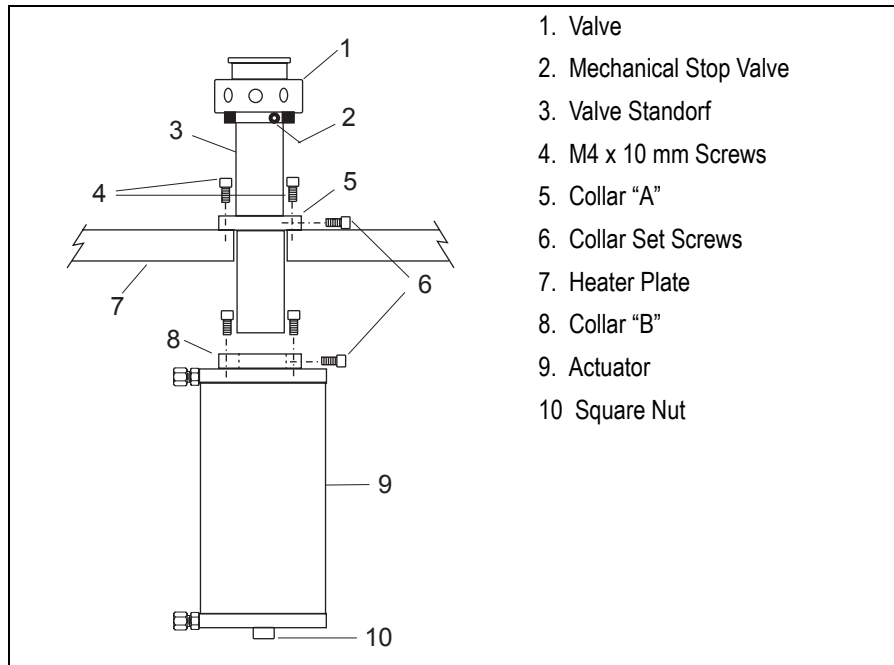
6. Take the other 1/8" piece of nylon tubing and place it in the upper fitting on the actuator. Be sure the tube passes through the ferrule in the fitting. Tighten the fitting using the 3/8" open end backup wrench.
7. Connect the opposite end to the solenoid fitting.



The tubing can be released from the solenoid by pushing down on the solenoid fitting and pulling out on the tubing at the same time.

### **Step 5. Installing the Actuator to the Valve Standoff**

1. Carefully fit the actuator into the valve standoff being sure not to rotate the valve.
2. Once the two square fittings on the actuator and valve are coupled, tighten the collar on the valve. Be sure this fitting is very tight so the actuator will not rotate on the valve standoff.
3. Slide the valve and actuator assembly up or down to the desired location and tighten the upper collar to hold the valve and actuator in place.



**Figure 2-5.** Installing the actuator to the valve standoff

### Step 6. Testing the Valve

1. Configure the valve and rotate it clockwise and counter-clockwise. Refer to Chapter 3, *Operation* for more information.
2. Ensure that the valve moves freely in both directions.
3. Refer to Figure 2-3 and inspect the valve stop when the valve is in both positions to ensure that the stop is at the travel limit on each side.

# Installing Valves in the Unheated Compartment

---

Unheated valves are installed in the area below the Valve Oven. Unheated valves do not use a standoff. Valves and actuator assemblies are installed without removing the actuator from the valve.

Installing valves in the unheated compartment consists of the following steps:

Step 1. Installing the Mounting Bracket

Step 2. Connecting gas lines from the solenoid to the actuator

Step 3. Installing the valve and bracket



## CAUTION

**Turn the actuator gas off before you start these procedures.**

### Step 1. Installing the Mounting Bracket

Each unheated valve assembly will require a mounting bracket, included as part of the liquid valve assembly.

1. Install the bracket to the lower portion of the actuator using two M4 x 10 screws (Figure 2-6).
2. Choose two mounting holes in the bracket that will allow the actuator and the valve to be oriented in a favorable direction.

### Step 2. Connecting Gas Lines from the Solenoid to the Actuator



## NOTE

Gas lines are much easier to connect to the actuator if the connection is made before the valve/actuator and bracket are secured to the floor of the valve enclosure.

1. Locate the 1/8" nylon tubing supplied in the Valve Oven kit and cut it into two equal 12" pieces.
2. Push one of the tube pieces into the lower fitting on the actuator assembly, making sure it passes through the ferrule in the actuator fitting. Tighten the nut and ferrule using a 3/8" open end wrench. Use a backup 3/8" open end wrench on the mating piece that is screwed into the actuator.

3. Place the other end of the tubing into the valve solenoid fitting located on the outside edge of the solenoid by pushing the tubing firmly into the fitting. It should automatically seal in place.
4. Turn the actuator gas supply on. This line should now be pressurized.
5. Verify there are no noticeable leaks in the fittings.

**NOTE**

Applying pressure to this side of the actuator will ensure that the valve and actuator rotates to the ccw position.

6. Take the other 1/8 in piece of nylon tubing and place it in the upper fitting on the actuator. Be sure the tube passes through the ferrule in the fitting. Tighten using the 3/8" open end wrench with backup.
7. Connect the opposite end to the inside fitting on the solenoid.

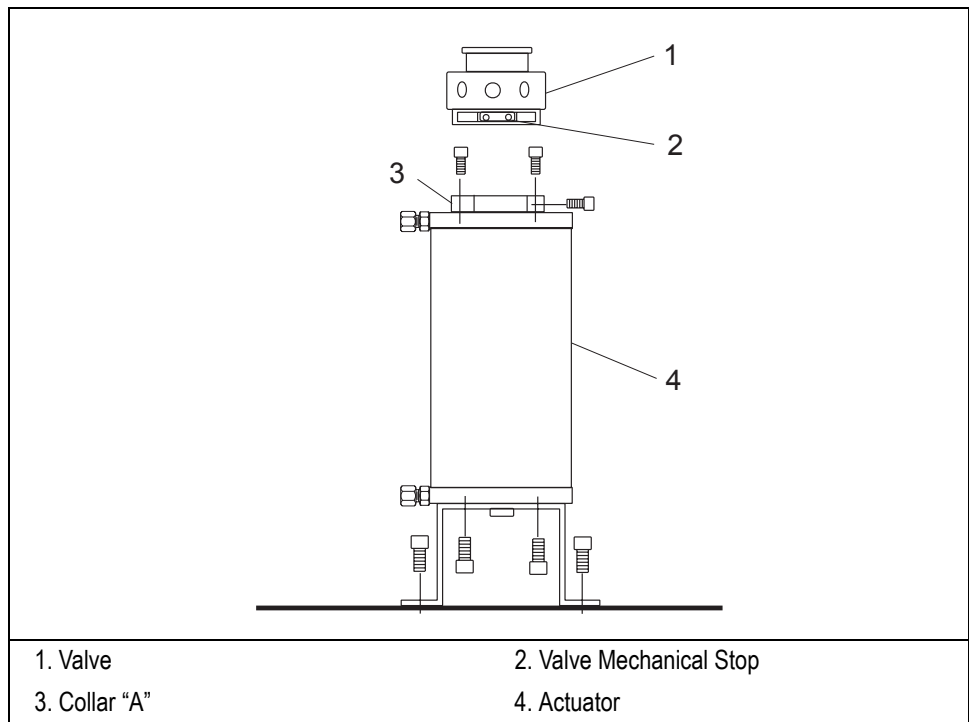
**Step 3. Installing the Valve Bracket**

Once the gas lines are attached to the actuator and the valves, the actuator and bracket are ready to be mounted inside the valve compartment.

1. Locate the three sets of mounting holes in the Valve Oven compartment floor.
2. Select the desired set of holes and secure the valve bracket to the holes using M 4 x 10 screws (Figure 2-6).

**NOTE**

Liquid sample valves should be mounted such that the C and P ports are next to the feed-throughs in the Valve Oven.



**Figure 2-6.** Installing an Unheated Compartment Valve

# Installing Valves in the Valve Box

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This version of Valve Oven is used when any valves heating is required.

## Valve Box for up to Six Valves

This option is analogous to the Valve Oven but without heating elements. Hence, for the valves installation procedure, follows all the steps described previously for the heated oven and unheated compartment.

Refer to:

- *Installing Valves in the Heated Oven*
- *Installing Valves in the Unheated Compartment*

## Valve Box for up to Two Valves

This option does not contain any heating elements. Besides, it is designed to accommodate only up to two valves. It does not include any electronics and the solenoid valves controlling the valves actuators are driven by the TRACE GC Ultra.

The solenoid valves are connected to the timed event output located on the Mother Board of the TRACE GC Ultra.

- Sampling Valve 1 must be connected to J51
- Sampling Valve 2 must be connected to J52

Then, the valves installation follows the same procedure described previously for the heated oven and unheated compartment.

Refer to:

- *Installing Valves in the Heated Oven*
- *Installing Valves in the Unheated Compartment*

## Configuring Valves

The valves in the Valve Oven are gas-actuated. The valves are controlled by solenoid valves that are turned on and off by timed events. Each solenoid valve uses one timed event. Valve 1 will use timed event # 8, Valve 2 will use timed event # 7, and so on. Once a valve occupies a timed event, this timed event is removed from the list of external events that can be added to a run table.

You can configure a valve to be a gas sampling valve or a switching valve.

### Gas Sampling Valves

Gas sampling valves have two positions—Load and Inject. These correspond to the **OFF** and **ON** positions, respectively. Gas sampling valves are plumbed so that counter-clockwise position is Load and the clockwise position is Inject

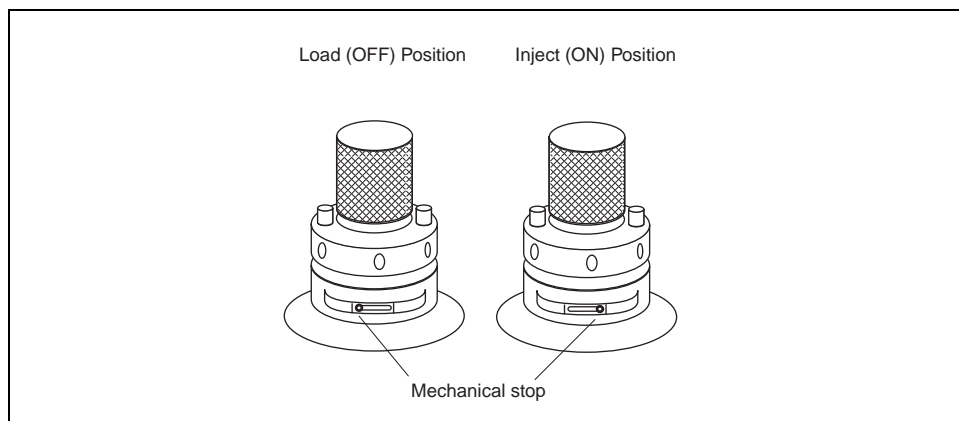


Figure 2-7. Mechanical Stop Positions for Gas Valves

### Switching Valves

Switching valves have two positions—On and Off. Switching valves are plumbed so that the counter-clockwise position is Off and the clockwise position is On.

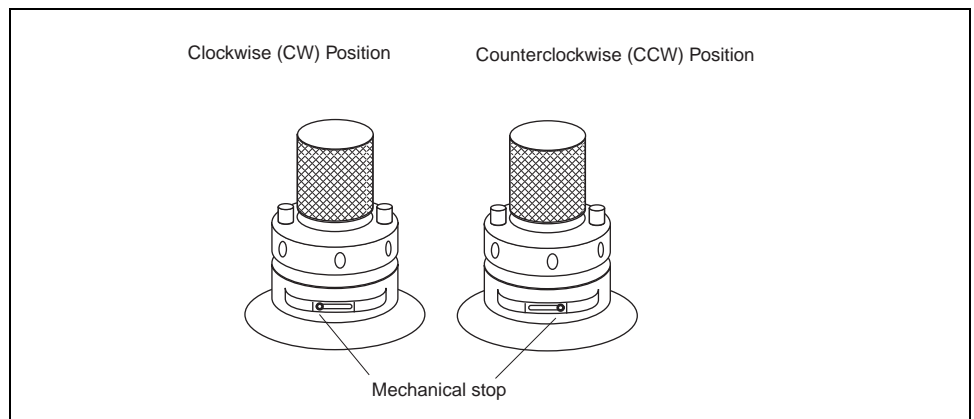


Typically, the valve nearest to the rear of the Valve Oven will be configured as valve 1.

1. Press **CONFIG** on the TRACE GC Ultra keypad.



2. Scroll to `Valves` and press **ENTER**.
3. Select `Valve #1` and press **ENTER**.
  - If you want valve #1 to be a gas sampling valve, select `Gas sampling`.
  - If you want valve #1 to be a switching valve, select `Switching`.
4. Press **ENTER**.
5. Press **CLEAR** to return to the `Configure Valves` menu.
6. Repeat as necessary for the remaining valves in the Valve Oven or valve compartment.



**Figure 2-8.** Mechanical Stop Positions for Switching Valves





# Operation

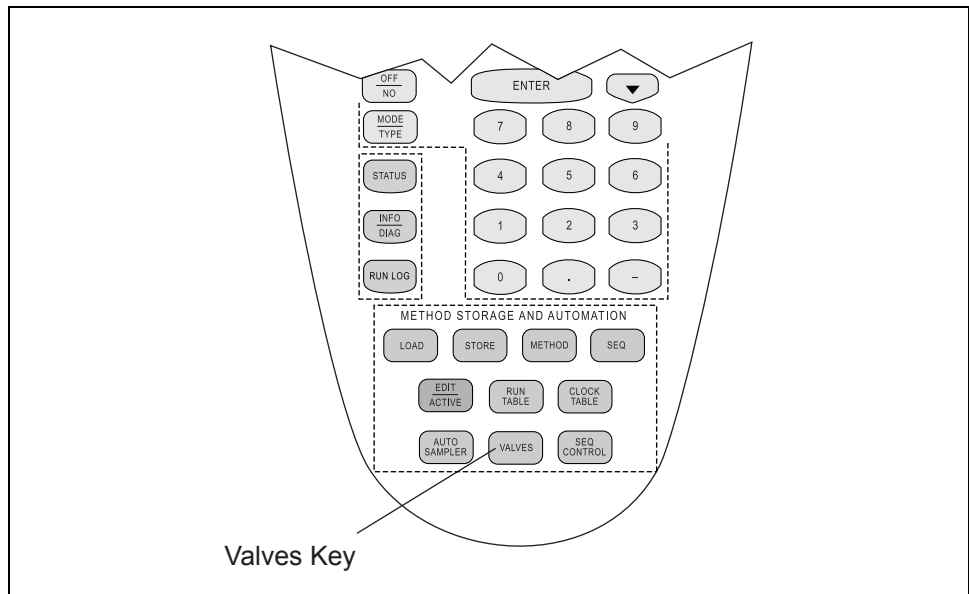
This chapter presents operating instructions for the TRACE GC Ultra Valve Oven. The valves can be operated manually using the keypad on the TRACE GC Ultra, or automatically using the run table accessed on the TRACE GC Ultra keypad.

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# Operating Valves Manually

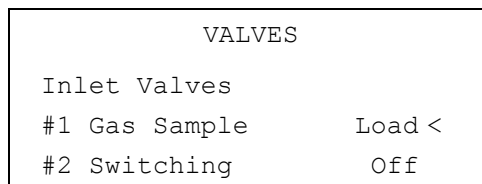
1. Press **VALVES** on the TRACE GC Ultra keypad.



**Figure 3-1.** The TRACE GC Ultra Keypad, Showing the Valves Key

2. Scroll to the valve you want to operate.

The display may look like this:



- If the valve is a gas sampling valve, press **On** to place the valve in the **Inject** position or **Off** to place the valve in the **Load** position.

- If the valve is a switching valve, press `On` to place the valve in the clockwise (`CW`) position or `Off` to place the valve in counterclockwise (`CCW`) position.

The display changes to reflect the current valve state.

- The default conditions of a switching valve determines which position (`ON` or `OFF`) the valve is in after GC initialization and after a run is completed. The default conditions can be changed by selecting `Switch vlv defaults` from the `VALVES` menu.

VALVES	
#2 Switching	Off
#3 Gas Sample	Load
Switch vlv defaults	Off<

- Scroll to the switching valve you wish to change and press `On` or `Off` to enter its new default condition.

# Operating Valves Automatically

Press the RUN TABLE key to access the TRACE GC Ultra Run Table display. You can automatically switch valves by adding the desired valve event to the run table.

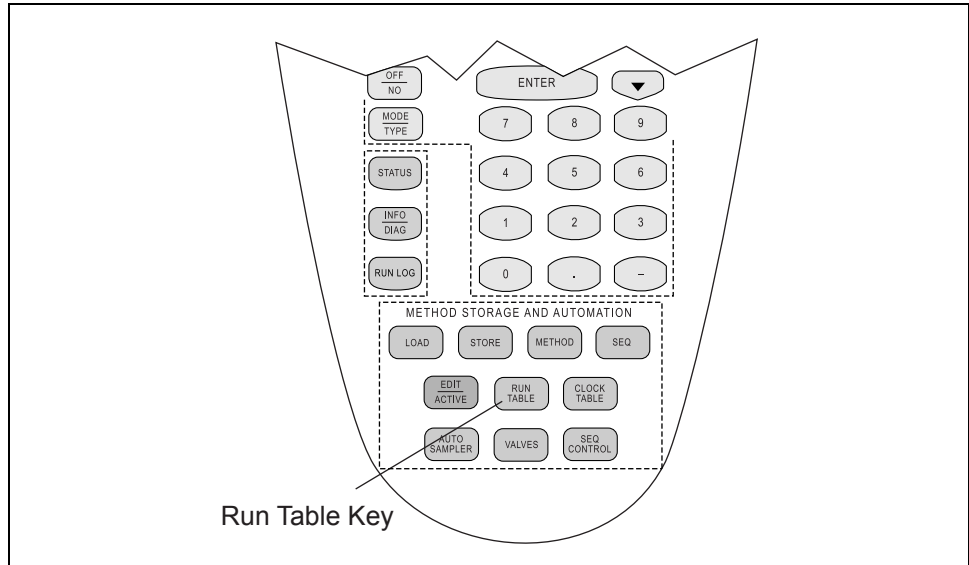
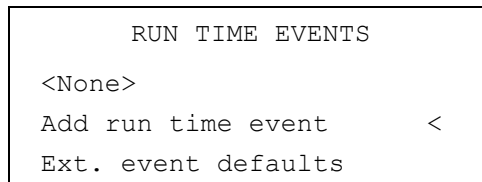


Figure 3-2. The TRACE GC Ultra Keypad, Showing the Run Table Key

## Adding a Gas Sampling Valve Event to the Run Table

1. On the TRACE GC Ultra keypad, press **RUN TABLE**.



2. Scroll to Add Run Time Event and press **ENTER**.

```

SELECT EVENT to add
Signal
Valve <
External Event
    
```

3. Select Valve and press **ENTER**.
4. Scroll to the sampling valve that you want to add and press **ENTER**.

```

SELECT PARAM to Add
Valve #1 Sampling <
Valve #2 Switching
Valve #3 Sampling
    
```

The following screen appears:

```

RUN TIME EVENT
Valve #1 Sampling
Inject at 0.00
Inject for 0.00
    
```

The *Inject at* parameter is the time into the run that the sample is to be injected. The *Inject for* parameter is the time that the valve remains into the inject position. After that time, the valve returns to the Load position. If the *Inject for* time exceeds the GC run time, the GC will automatically reset the valve to the Load position at the end of the run.

5. Repeat as necessary for any remaining sampling valves. If you need to edit a run table entry, select the entry to be edited and press **ENTER**.



To delete a run table entry, select it and press **CLEAR**. The TRACE GC Ultra will ask you if you really want to delete the entry. Press **YES**.

6. Press **CLEAR** three times to exit to the Run Event table.



**NOTE**

Pressing **CLEAR** within a run table entry will delete that entry. To use **CLEAR** to back out of the menu, you must first be out of the run table entries themselves.

## Adding a Gas Switching Valve Event to the Run Table

For switching valves, two run time entries are required—one to switch the valves on and one to switch the valves off.

1. On the TRACE GC Ultra keypad, press **RUN TABLE**.
2. Scroll to Add run time event and press **ENTER**.
3. Select Valve and press **ENTER**.

```
SELECT PARAM to Add
Valve #1  Sampling
Valve #2  Switching  <
Valve #3  Sampling
```

4. Scroll to the Switching valve that you want to add and press **ENTER**.

```
RUN TIME EVENT
Valve #2  Switching
Run time           0.00
Setpoint           On (Off)
```

The Run time parameter is the time into the run when the valve switches to the new position. The Setpoint parameter is the position that the valve will go to at the selected time. The On value usually designates a clockwise switch and the Off value designates a counterclockwise switch.

If you want the valve to switch back to its original position at the end of run, then do not need enter a second run table entry.







# Troubleshooting

This chapter has information to help you to find and correct potential problems when using the TRACE GC Ultra Valve Oven.

## **Chapter at a Glance...**

Leak Testing .....	43
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Valve Plumbing .....	45

The most common problem associated with valves and plumbing are leaks, valves not switching properly, and valves not plumbed correctly.

## Leak testing

Leak testing requires studying plumbing diagrams and system configurations.

1. Identify all gas sources leading into the flow path to be leak tested. Determine if the gas sources are either a common source or if they are at the same bottle pressure.
2. Be sure all components in the sample path will withstand the pressure being applied to the system.
3. Be sure all possible gas outlets are blocked. This will require knowing how to identify the various flow paths throughout the valving system to be sure vents are blocked or bypassed.



Leak should be detected using an electronic leak detector.

Refer to the TRACE operations manual, *Chapter 4, Gases and Controls*, for leak test suggestions and the necessary hardware required to pressure check a plumbing system.

**Table 4-1. Leak Testing for Valves**

Symptom	Cause	Remedy
Valve leaking between ports	Defective rotor	Replace rotor or valve
Valve leaking around rotor	Valve rotor not seating properly	Tighten rotor
	Rotor Defective	Replace Rotor in valve
Leaking out valve ports	Ferrule not seating	Replace ferrule

## Valve Switching

Valco valves contain a rotor that is turned by the actuator. This rotor channels the gas between the various ports of the valve. If the rotor is not being switched properly, a flow path may be partially or fully blocked, or leaks may occur between valve ports.

Each valve contains a mechanical stop that should reach an extreme when the valve is rotated in the clockwise or counterclockwise direction. Close inspection of the valve will indicate if the valve is being switched to its limits, Figure 2-4. Actuator pressure should be 420 Kpa (60psig) to 630 Kpa (90 psig).

**Table 4-2. Causes and Remedies for Improper Valve Switching**

Cause	Remedy
Low actuator line pressure	Increase line pressure
Solenoid not actuating	Verify timed event is set correctly
	Check voltage at solenoid
	Replace defective solenoid

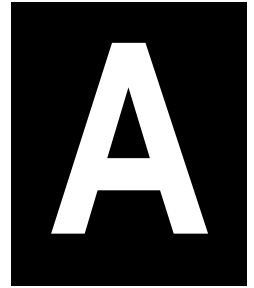
**Table 4-2.** Causes and Remedies for Improper Valve Switching

Cause	Remedy
Actuator leaking	Replace actuator
Valve event not set correctly	Check valve event configuration and event in the run table

## Valve Plumbing

Verify the valve and system plumbing conforms to the appropriate plumbing diagram for your system setup (See *Chapter 3*). Trace the plumbing from port to port to insure all connections are made properly





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This appendix has contact information for Thermo Finnigan offices worldwide. This appendix also contains a one-page *Reader Survey*. Use this survey to give us feedback on this manual and help us improve the quality of our documentation.

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**Manual:** Valve Oven Operating Manual

**Part No.:** 317 093 63

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This section is an alphabetical descriptive list of terms common to this industry. This also includes abbreviations, acronyms, metric prefixes, and symbols.

## A

A	ampere
ac	alternating current
ADC	analog-to-digital converter

## B

b	bit
B	byte (8 b)
baud rate	data transmission speed in events per second

## C

°C	Celsius
CIP	Carriage and Insurance Paid To
cm	centimeter
CPU	central processing unit (of a computer)
CSE	Customer Service Engineer

## D

d	depth
DAC	digital-to-analog converter
dc	direct current
DS	data system

## E

ECD	Electron Capture Detector
EMC	electromagnetic compatibility
ESD	electrostatic discharge

## F

°F	Fahrenheit
FID	Flame Ionization Detector
FOB	Free on Board
FPD	Flame Photometric Detector
ft	foot

## G

g	gram
gain	A measure of the ability of an electronic circuit or device to increase the magnitude of an electronic input parameter.
GC	gas chromatograph
GND	electrical ground

## H

<i>h</i>	height
h	hour
harmonic distortion	A high-frequency disturbance that appears as distortion of the fundamental sine wave.
HOT OC	High Oven Temperature Cold On-Column Injector
HV	high voltage

Hz	hertz (cycles per second)
<b>I</b>	
ID	inside diameter
IEC	International Electrotechnical Commission
impulse	See <i>transient</i>
in	inch
I/O	input/output
<b>K</b>	
k	kilo ( $10^3$ or 1024)
K	Kelvin
kg	kilogram
kPa	kilopascal
<b>L</b>	
<i>l</i>	length
l	liter
LAN	Local Area Network
lb	pound
LED	light-emitting diode
LVOCI	Large Volume On-Column Injector
LVSL	Large Volume Injector
<b>M</b>	
m	meter (or milli [ $10^{-3}$ ])
M	mega ( $10^6$ )

## Glossary

$\mu$	micro ( $10^{-6}$ )
MBq	megabecquerel
mCi	millicurie
meniscus	The curved upper surface of a column of liquid.
min	minute
mL	milliliter
mm	millimeter
m/z	mass-to-charge ratio
<b>N</b>	
n	nano ( $10^{-9}$ )
negative polarity	The inverse of a detector signal polarity.
nm	nanometer
NPD	Nitrogen Phosphorous Detector
<b>O</b>	
OCI	On-Column Injector
OD	outside diameter
$\Omega$	ohm
<b>P</b>	
p	pico ( $10^{-12}$ )
Pa	pascal
PCB	printed circuit board
PDD	Pulsed Discharge Detector
PID	Photoionization Detector



PKD	Packed Column Injector
PN	part number
PPKD	Purged Packed Column Injector
psi	pounds per square inch
PTV	Programmable Temperature Vaporizing Injector
<b>R</b>	
RAM	random access memory
RF	radio frequency
ROM	read-only memory
RS-232	industry standard for serial communications
<b>S</b>	
s	second
S/SL	Split/Splitless Injector
sag	See <i>surge</i>
slow average	A gradual, long-term change in average RMS voltage level, with typical durations greater than 2 s.
SOP	Standard Operating Procedures
source current	The current needed to ignite a source, such as a detector lamp.
surge	A sudden change in average RMS voltage level, with typical duration between 50 $\mu$ s and 2 s.
<b>T</b>	
TCD	Thermal Conductivity Detector

transient                      A brief voltage surge of up to several thousand volts, with a duration of less than 50  $\mu$ s.

## **U**

UFM                              Ultra Fast Module

## **V**

V                                  volt

V ac                              volts, alternating current

V dc                                volts, direct current

VGA                                Video Graphics Array

## **W**

w                                  Width

W                                  Watt

The symbol for a compound unit that is a quotient (for example, degrees Celsius per minute or grams per liter) is written with a negative exponent with the denominator.

For example:

$^{\circ}\text{C min}^{-1}$  instead of  $^{\circ}\text{C}/\text{min}$

$\text{g L}^{-1}$  instead of  $\text{g}/\text{L}$

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