



**ENTECH**  
INSTRUMENTS

*See What's Really There™*



# 7200CTS

## CRYOGEN-FREE

### Preconcentrator

***The most accurate Cryogen-Free  
Preconcentrator on the Market***

**— NEW —**  
**LN<sub>2</sub> FREE**  
**7200CTS**



**NEW LN<sub>2</sub> FREE 7200CTS**

**“One of The Biggest  
Technological Leaps the  
TO15 Market Has Ever Seen.”**

**“A Game Changer For All  
Environmental Labs.”**

## Introducing The Cryogen-Free 7200CTS

### The Only Capillary Column Based TO15 Preconcentrator

Entech is proud to release the world's first multi-capillary column trapping system (MCCTS) *patent pending*, for the precise concentration of vapor phased volatile chemicals in the boiling point range of -50°C to >230°C without the need for liquid nitrogen or complicated electronic cooling. With over 28 years of continued improvements and industry feedback, the 7200CTS is as established and reliable as it is new and improved. Many of the important advancements that have led to its unparalleled reproducibility, such as quantitative volumetric measurements utilizing “Accu-Sample Technology,” and digital valve isolation, are left unchanged from the 7200. The core trapping system, however, has been completely reengineered, giving way to a technology that will likely replace the utilization of packed traps for most, if not all methods requiring the preconcentration of vapor phase volatile organic compounds.

### 7200CTS Features

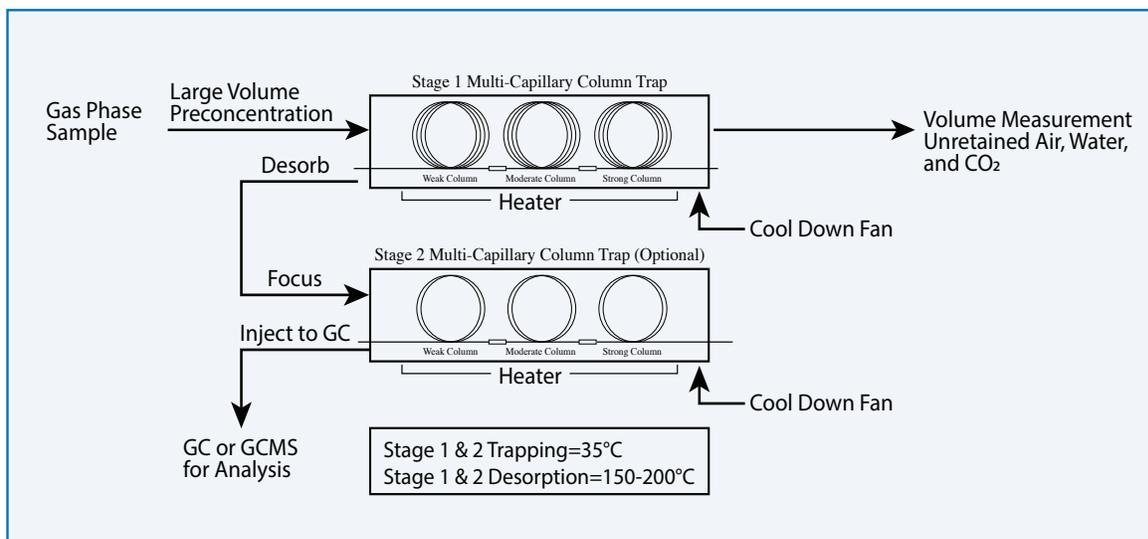
- **Elimination of cryogen.**  
*Save on annual LN<sub>2</sub> costs with easier and more reliable maintenance.*
- **Faster Injection Rates Than Packed Traps.**  
*Enjoy 3.5-4.5 second wide light end volatiles peak widths with zero conventional splitting.*
- **Improved precision and sensitivity.**  
*Full TO15 validation with single-digit %RSDs for most compounds in 0.1- 30PPBv standard curve.*
- **Wide dynamic range (low Part-Per-Trillion to PPM).**
- **Far longer trap life than packed trap counterparts.**
- **Near complete elimination of water!**  
*Water is virtually unretained without the need for cryogen or complex electronic cooling.*
- **Less GCMS maintenance.**  
*Less water means less column bleed, longer GC column lifetimes, and fewer MS Source cleanings, all of which improves productivity while lowering costs.*



# Multi-Capillary Column Trapping

## The Future of Vapor Phase Volatiles Analysis

The MCCTS in the 7200CTS concentrates all TO15 compounds at 35°C, which is conveniently achieved by using simple cooling fans. Two stages of traps are used: the first pre-concentrates the sample, calibration standards, and internal standard; and the second further focuses the concentrate prior to GCMS injection. The new solution uses multiple capillary columns in series with increasing strength to trap compounds boiling from -50°C to >230°C, using volumes of 10-500cc. The design shows considerably less susceptibility to contamination when exposed to high concentration soil gas samples, reducing the downtime laboratories experience when accidentally analyzing these samples prior to dilution. With the 7200CTS, full TO15 validation is easily achieved, including blank levels immediately following higher concentration samples containing BTEX, PCE, and TCE, which are compounds often found in soil gas at high concentrations.



## Understanding The Limitations of Packed Traps

Packed column traps have been used for many decades to preconcentrate samples for GC or GCMS analysis, but they suffer from two major impediments: 1. a phenomenon known as “**channeling**”, and 2. equally as problematic, the physical size of the adsorbent particles that the traps are packed with. These two concepts are further explained here.

The ‘Channeling Effect’ can be described as the continuous formation and collapse of channels throughout the length of an adsorbent bed, coinciding with the normal heating and cooling cycles of the trapping system. Since all materials including adsorbents have a Coefficient of Thermal Expansion, the contraction of the adsorbent upon cooling prior to the next trapping event is inevitable, causing the creation of channels or “gaps” within the adsorbent or along the walls of the tubing containing the adsorbent. Channeling poses a major challenge to quantitative

***Packed traps work well if you understand their limitations and take steps to prevent contamination, but now there’s a better solution that not only eliminates contamination worries, but also makes much better financial sense.***

sample recovery, as the creation of low impedance flow paths throughout an adsorbent bed promotes both deeper penetration of target analytes into the bed, and a higher analyte saturation into the adsorbent particles contiguous with the channels. This leads to an uneven distribution of chemicals throughout the trap. As packed traps heat up, these channels collapse as the adsorbent expands, making it more difficult for many heavier or thermally labile compounds to be recovered. The result is not only reduced recovery, but

increased carryover, increased thermal degradation due to longer residence times on the hot, active adsorbent, and reduced adsorbent bed lifetime. Channeling can be especially prevalent along the walls of the adsorbent bed.

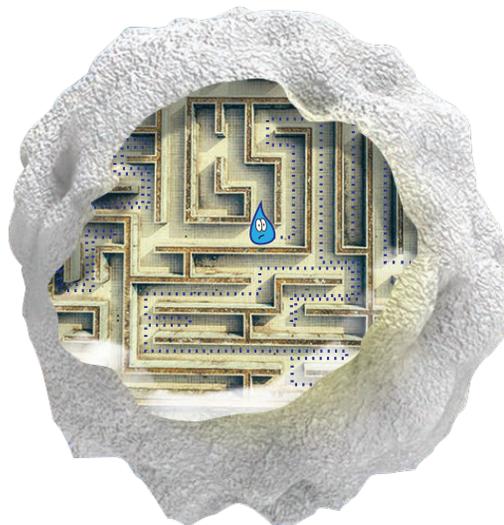
### Open Tubular Columns Solve Channeling

MCCTS uses multiple open tubular capillary columns with increasing strength to trap complex air samples containing compounds over a wide range of volatilities. The lightest compounds are trapped by the strongest phase placed at the back of the trap, while weaker columns are placed closer to the front of the trap to collect the heavier compounds. Only the walls of the capillary columns are coated, so there is no chance for channeling to occur. During heating and cooling, the difference in the size of the opening through the traps is negligible, preventing any possibility of excessive penetration during trapping, and therefore any inconsistencies in recovery during desorption. By utilizing 2 or 3 columns connected in series with increasing adsorbent strength and then backflushing the trapped compounds, the 7200CTS effectively recovers a much wider range of compounds than with packed traps, while minimizing memory effects (carryover).

### Larger Particles in Packed Traps Pose Another Problem - Sample & Water Retention

The particles in packed traps must be relatively large to avoid excessive pressure drop across the bed, but these larger particles retain adsorbed chemicals longer during

thermal desorption, causing poor run to run reproducibility and difficulty cleaning up the traps when exposed to higher concentrations or heavier molecular weight compounds. Even hydrophobic adsorbents, such as Tenax™, can accumulate water due to the complex inner surfaces of these larger particles and the statistical challenge for molecules to escape their inner 'maze'.



Water vapor has a statistically greater challenge escaping from packed trap particles than capillary column particles, even with hydrophobic adsorbents!

## A Deeper Look At The Limitations Of Packed Traps & Advantages of MCCTS

### 1. The Channeling Effect

The 'Channeling Effect' can be described as the continuous formation and collapse of channels throughout the adsorbent material coinciding with normal heating and cooling cycles.

As these channels shrink due to heat of desorption, targeted analytes are trapped, reducing recoveries and increasing carry-over in subsequent analyses.

Packed trap particles must be relatively large to avoid excessive pressure drop. These larger particles retain adsorbed chemicals longer during desorption, resulting in broad chromatographic peaks while making traps more difficult to clean.

Both contamination and water molecules take a lot longer to diffuse out of something with 1000x the internal volume.

**Packed Trap**

# VS

### 2. Particle Size

Capillary columns have a small inner diameter which allows diffusion to occur quickly across the ID of the column, ensuring complete interaction of the chemicals with the adsorbent on the walls. The geometry stays substantially the same while either cold or hot, eliminating any variations from run to run.

In contrast to packed traps, capillary columns have very small particles or a thin film polymer coating the internal walls, allowing chemicals to exchange much faster between the particles and the gas phase for faster injection rates and more complete water/CO2 elimination.

**Capillary Trap**

## Superior Water Management

Water management improves dramatically with the Multi-Capillary Column trap design. Water is almost unretained by the traps, resulting from both the hydrophobic nature of the adsorbent, and the much smaller particle sizes than those used in packed traps. Even though they are hydrophobic, any particles with pores will have water molecules diffusing through them. The larger the particle, the longer it will take for the diffusion to release enough water to reduce the effect on the GCMS. The extremely small particles in the new capillary traps require almost no dry purging to remove the water because water can more quickly diffuse in and out of these particles.

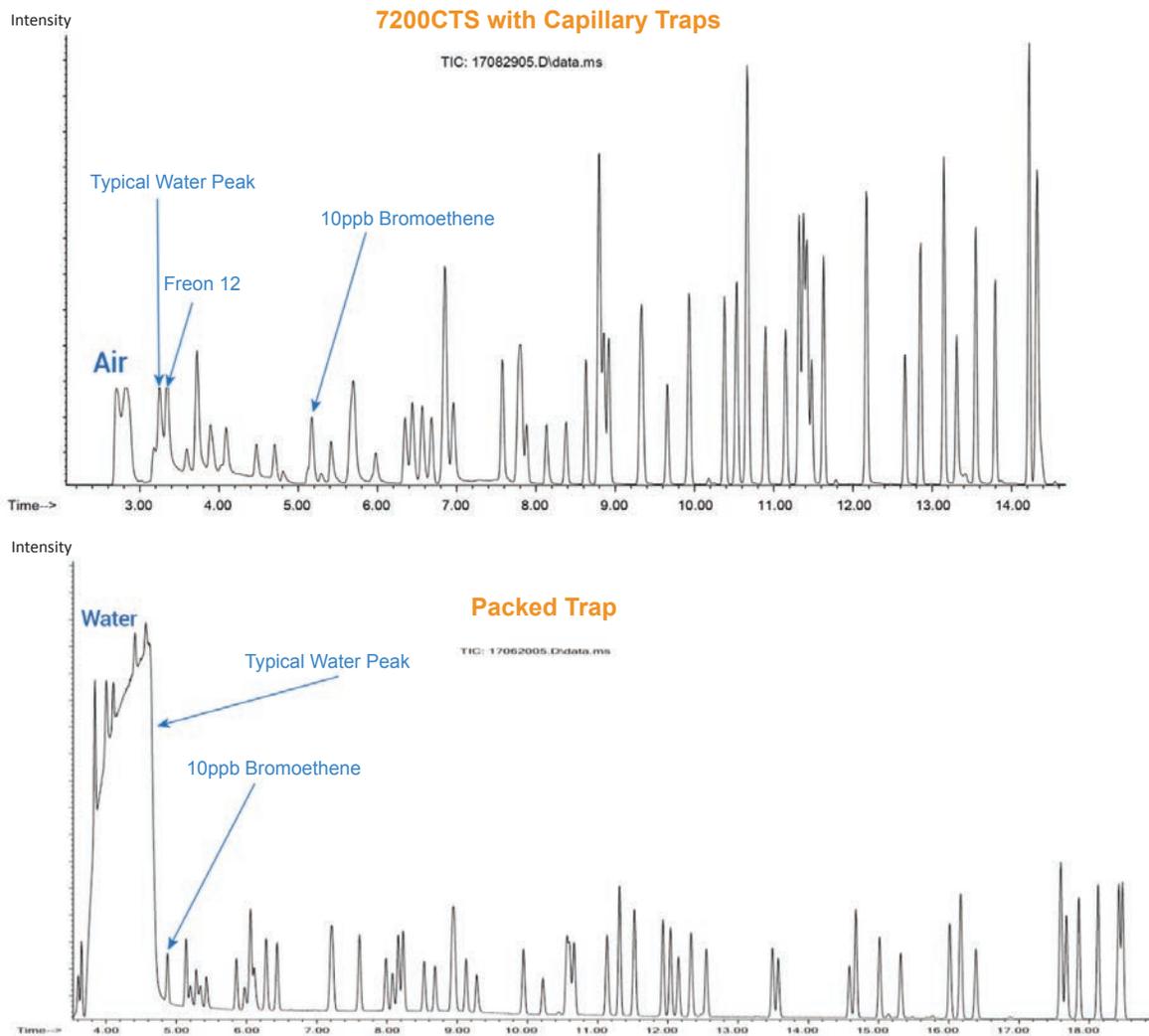
Typical water peaks when scanning m/z 18 are up to 10,000 times smaller than when using packed traps or cold trap

dehydration, meaning that the GCMS will have almost no water to bake out, resulting in vastly improved sensitivity stability even when running many samples in any given day with shorter intervals between injections.

***“...the GCMS will have almost no water to pump out, resulting in vastly improved sensitivity stability...”***

Finally, systems which eliminate water via cold trapping at -10 to -40° C show losses of more highly polar compounds such as light fatty acids and mono-glycol esters. These compounds are recovered perfectly using the new Multi-Capillary Column Trapping System, offering a more complete solution for measuring a wider range of compounds.

## Full Scan GCMS While Including the Air and Water Peaks - Packed vs Capillary Trapping (7200CTS)



**Figure 1, 2** - Although the two chromatograms above are not on the same Y and X axis scale, as they were run using two different instruments, both chromatograms show a 10ppb TO15 standard at 50% RH. TO15 standard compound Bromoethene, shown at 10ppb for both runs, can be used to visually compare the relative amount of water found when scanning down to mass 18 for water using a packed trap vs a capillary column trap. At 25° C, 50% RH is equivalent to 15 million PPBv of water. A typical water peak using packed traps or cold trap water management is 0.5-1 minutes wide.

## Peak Shape Comparison to Peltier Cooled Packed Traps

After trapping TO15 compounds on a primary, multi-stage trap, the sample is back-flushed during heating to a second trap with smaller column lengths to allow even faster injection into the GCMS to yield optimal peak shape of the lightest through the heaviest compounds. Both the first and second stages operate at 35° C during trapping, so only fan cooling is needed. This avoids complicated and maintenance intensive Peltier cooled traps.

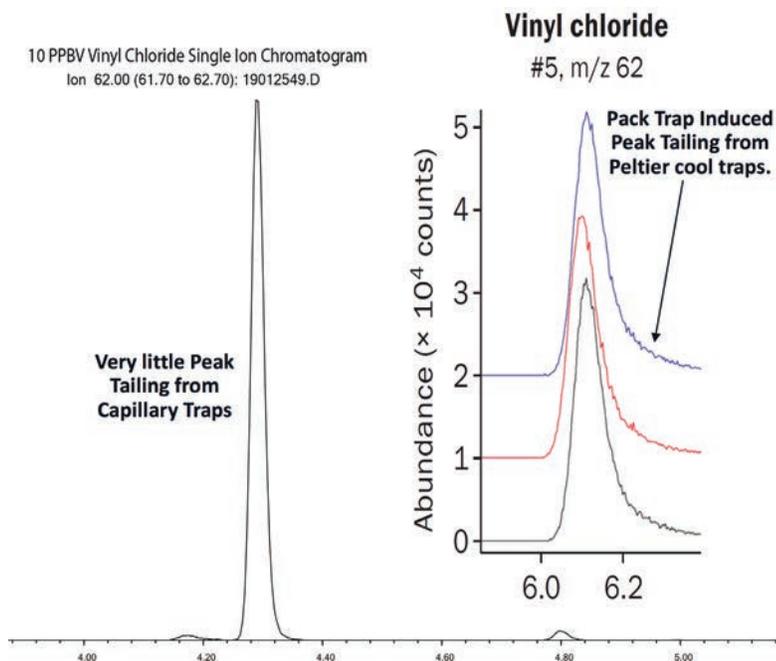


Figure 3 - Peak shape comparison

## Cryogen-Free Fast Injection

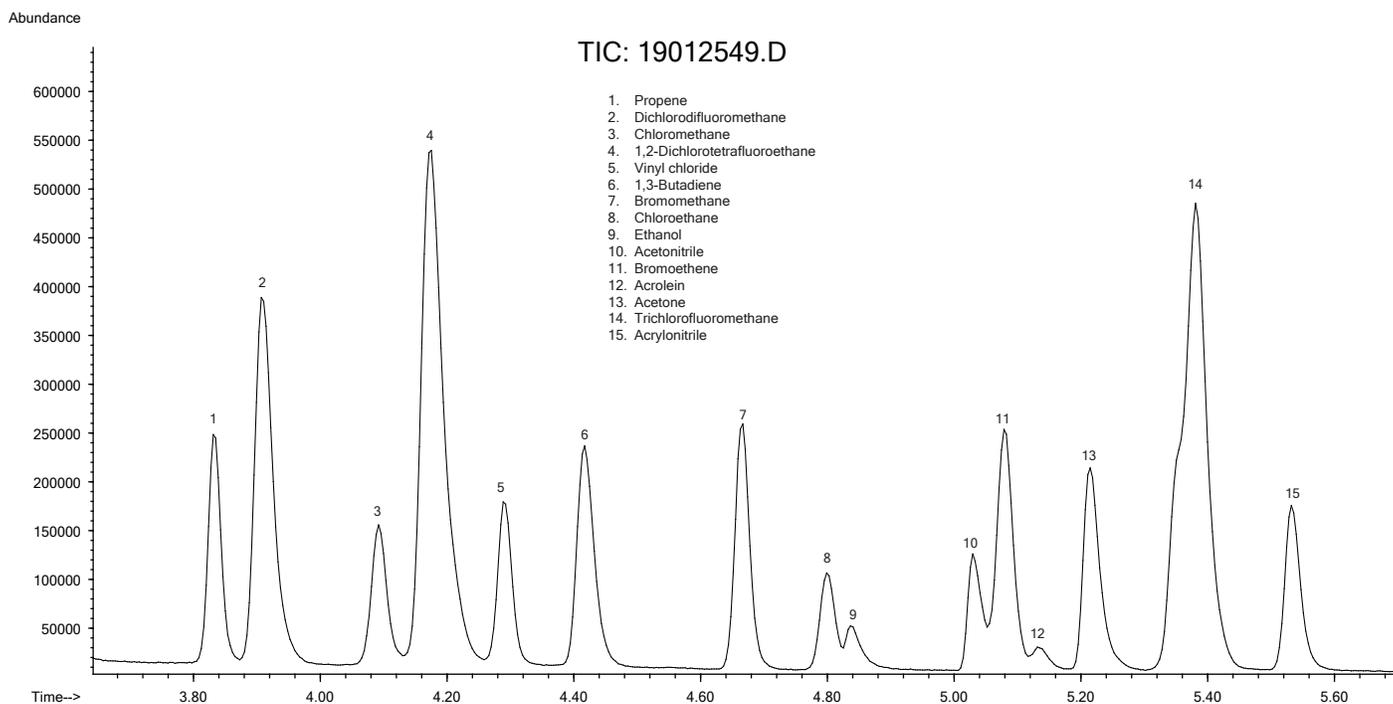


Figure 4 - TO15, 84 Compound Standard, 250cc, 10PPBV - The total ion chromatogram above demonstrates the cryogen-free fast injection of the light end with excellent separation and little or no peak tailing.

## 250cc at 10PPBv, 84 Component TO15 Std

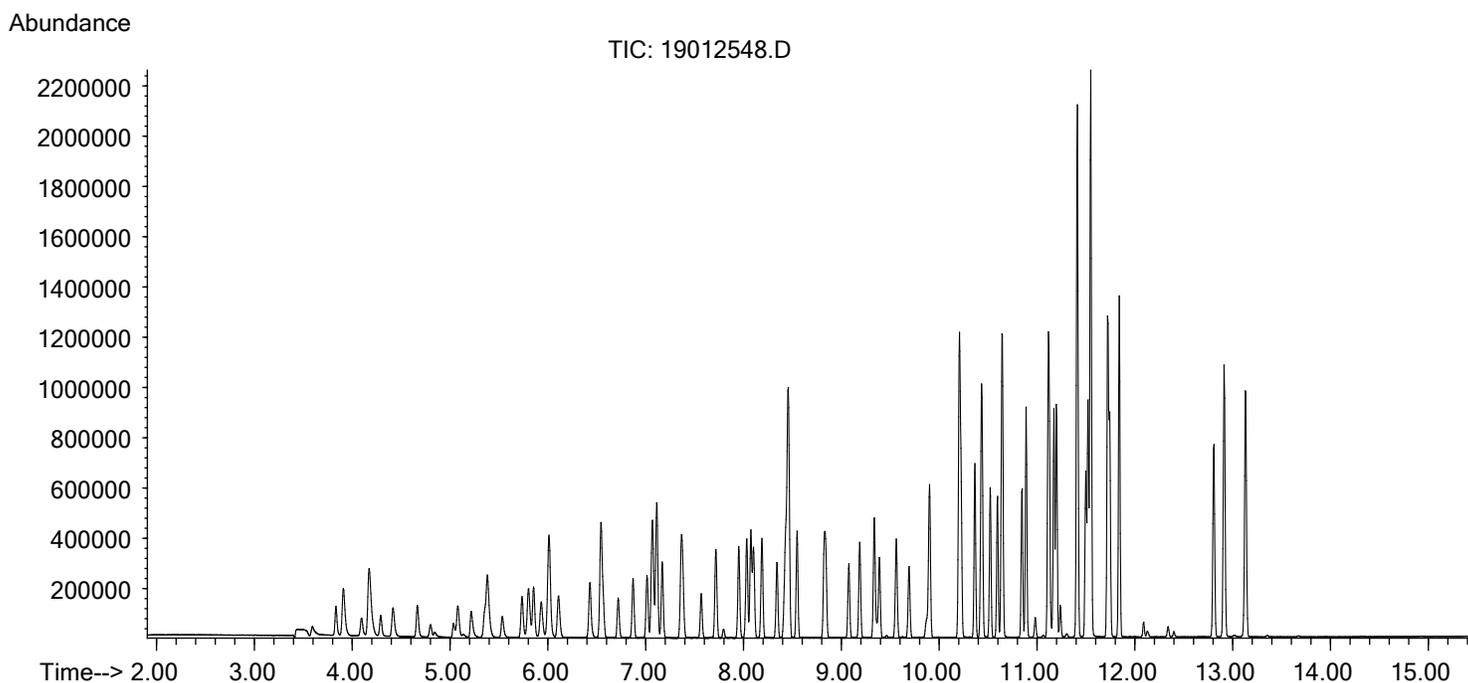


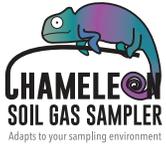
Figure 5 - Complete recovery through High Boilers.

## 7200CTS/7650-M, MillionAir™ Analysis System

Description	Unit	Part #
<b>System Includes:</b>		
7200CTS Cryogen-Free VOC Preconcentrator (Includes 1cc Loop Valve and diaphragm pump), 120VAC/60Hz	EA	7200CTS-01
7200CTS Cryogen-Free VOC Preconcentrator (Includes 1cc Loop Valve and diaphragm pump), 240VAC/50Hz	EA	7200CTS-01-HV
7200CTS-01 Bundle - All Rotary Valves & Fittings (Silonite Coating Option), 120VAC/60Hz	EA	7200CTS-01S
7200CTS-01 Bundle - All Rotary Valves & Fittings (Silonite Coating Option), 240VAC/50Hz	EA	7200CTS-01S-HV
7200CTS M1 Multi-Capillary Column Trap & Mandrel (For TO15 Analysis)	EA	7200CTS-M1-01
7200CTS M2 Multi-Capillary Column Focusing Trap & Mandrel (For TO15 Analysis)	EA	7200CTS-M2-01

## Inlet & Autosampler Systems

Description	Unit	Part #
<b>System Includes:</b>		
7016D 16 Position Autosampler, 120VAC/60Hz	EA	7016D
7016D 16 Position Autosampler, 240VAC/50Hz	EA	7016D-HV
7650 w/ Loop Injection, 120VAC/60Hz	EA	7650-M
7650 w/ Loop Injection, 240VAC/50Hz	EA	7650-M-HV
SkyCan Automated SPR75 Rail, 90-250VAC, 60/50Hz	EA	SK75-01



**CHAMELEON**  
Soil Gas Sampling



**MICRO-QT™**  
Valves



**SILONITE™**  
Coating Advantages



**MCCTS TRAPS**  
Multi-Capillary Column Trap

**FLOW PROFESSOR**  
Calibration System

*The Only Capillary Column Based Whole Air VOC Preconcentrator*

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

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