CTC Sampler Implementation in the GC/MSD ChemStation

Technical Overview

Introduction

Diversifying application requirements among laboratories has lead to the need for flexible and expanded sample introduction tools. The systems of the CTC Analytics, specifically the GC PAL and Combi PAL, are representative examples. These samplers provide many possibilities, such as:

- A wide range of possible liquid injection volumes from many vials (>100), with many vial types and many injection styles ("sandwiched," in-syringe internal standard addition, etc.)
- Automated solid-phase micro-extraction (SPME) sampling and injection
- Heated headspace sampling and introduction
- Continuous flow sampling
- And many other approaches

Another powerful aspect of these devices is their high degree of flexibility and readily customizable processes. This allows customers to design the sampling process according to their specific situation. For example, rapid GC/MS analyses will permit higher sample throughput and the higher vial capacity of the CTC GC PAL will be attractive. As many as three tray holders could be configured, each supporting a 98-vial tray, so that almost 300 2-ml vials could be processed. Another approach would be to switch from the 2-ml vial to a 1-ml vial and use the 200-vial trays, allowing 600 samples to be loaded.

Other working scenarios involve the injection itself. Customers making large-volume injections will appreciate the extended sample waste and wash stations available. Typically, to make different injection volumes for samples requires making different GC/MSD acquisition methods. The new ChemStation SW allows overriding the injection volume which can be sent down to the injector without constructing a new method.

For laboratories that wish to have the occasional capability of SPME or headspace and do not want to invest in dedicating hardware or instruments, the Combi PAL allows rapid switching between such arrangements.

Essentially, the CTC PAL samplers provide many choices that can be tailored to fit the customer's work practices.

The intention of this technical overview is to describe the integration of the control of the CTC PAL systems into the GC/MSD ChemStation G1701DA (D.03 SP1) software. This is not meant to be an exhaustive description of all the functionality in the CTC or GC/MSD ChemStation SW but to provide an overview of the basics in the integration.

CTC Control in GC/MSD ChemStation

After hardware and software installation and setup with the trays, washes, wastes, etc., configured, the CTC can now be selected as the injection source through Instrument\Inlet\Injection Parameters. The GC/MSD ChemStation will reflect this in the CTC injector icon appearing in the instrument display (Figure 1). A window will also appear giving the CTC hardware status.

CTC parameters can be accessed by clicking on the CTC icon or they are listed under **Instrument** (Figure 2). The CTC functions they control or enable are described in the following sections.

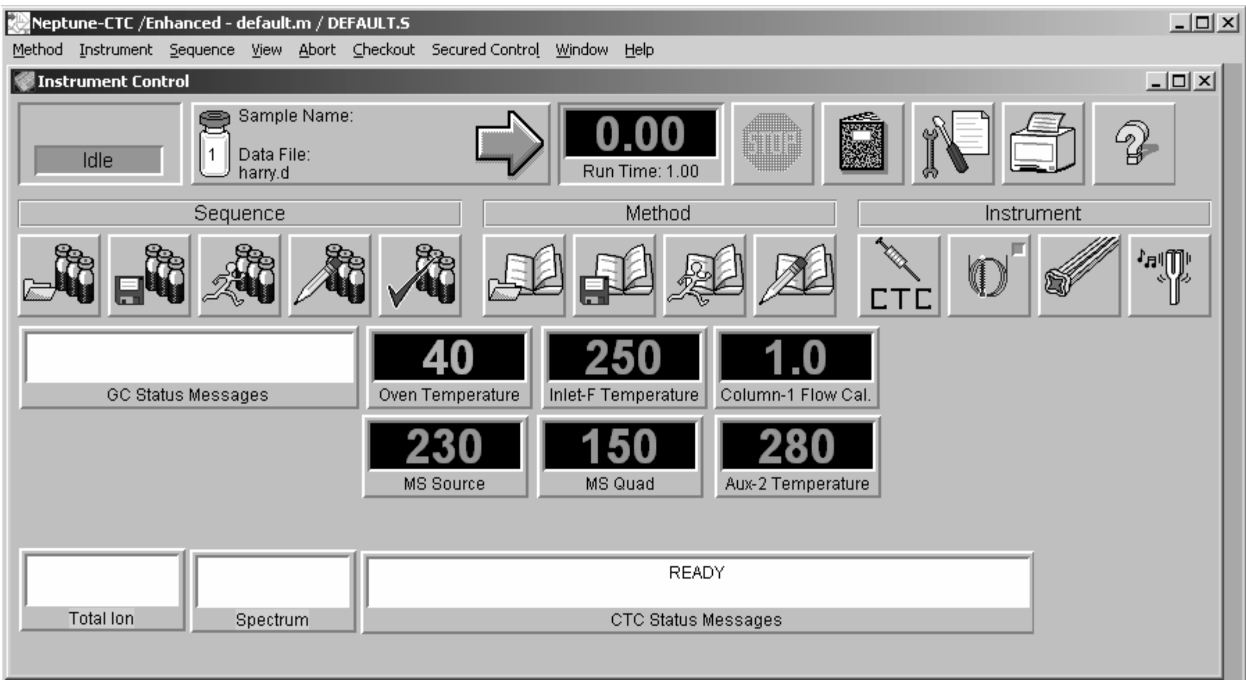

Figure 1. CTC injector icon.

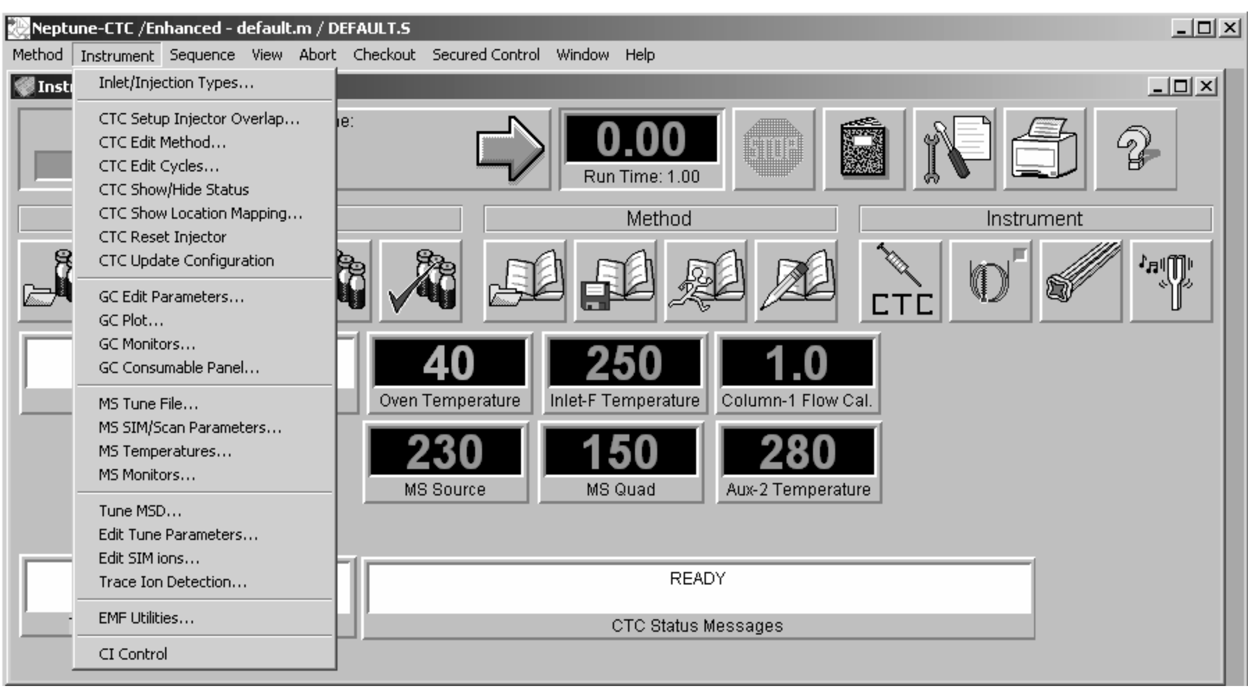

Figure 2. CTC injector menus.

CTC Setup Injector Overlap (Figure 3)

Although the CTC moves very rapidly to avoid losing time due to sampler or data analysis functions, this feature can enable the CTC to start processing the next sequential sample for injection prior to the end of the previous sample's acquisition and analysis.

Selecting the **Enable Overlapped Injection** for this method check box allows for two options for pre-injection sample processing **Starting at**:

Full completion of CTC cycle will enable pre-injection sample processing immediately after completing the previous sample.

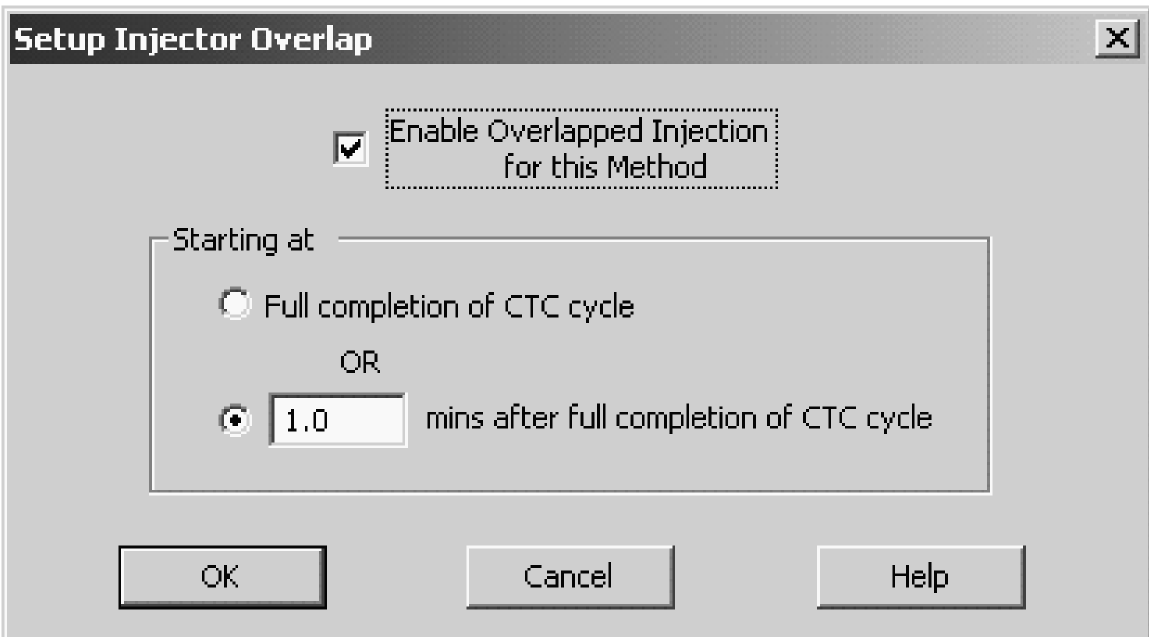

Figure 3. Enabling overlapped injections.

x mins after full completion of CTC cycle will delay preprocessing by a user-selected period.

Injection is made after acquisition and any data analysis actions are completed.

These overlap settings must be saved to the method to be enabled. Other methods executed in a sequence that have different or no overlap settings will override these settings and transition samples will not have either overlap settings applied.

CTC Edit Method (Figure 4)

This allows parameters within the CTC injection method to be altered.

The syringe size installed is displayed next to **Injection Volume**. The CTC supports a wide range in syringe volumes (1.2-µl to 500-µl for liquids) and styles (headspace, etc.). Syringes and their injection volume ranges are described in the CTC manual.

Available Cycles allows the user to select from among the CTC cycles composed and present in the sampler. **Description** gives an overview of the CTC cycle information.

For the loaded CTC cycle, the available cycle parameters are displayed. Most importantly, note the **Inject to** parameter allows any of the selected objects, such as GCInj2 (a second port) and Waste# (allowing inject to waste for a blank run perhaps).

Edit Cycles

This menu item requires the CTC Cycle Editor to edit the details or construct more complicated operations.

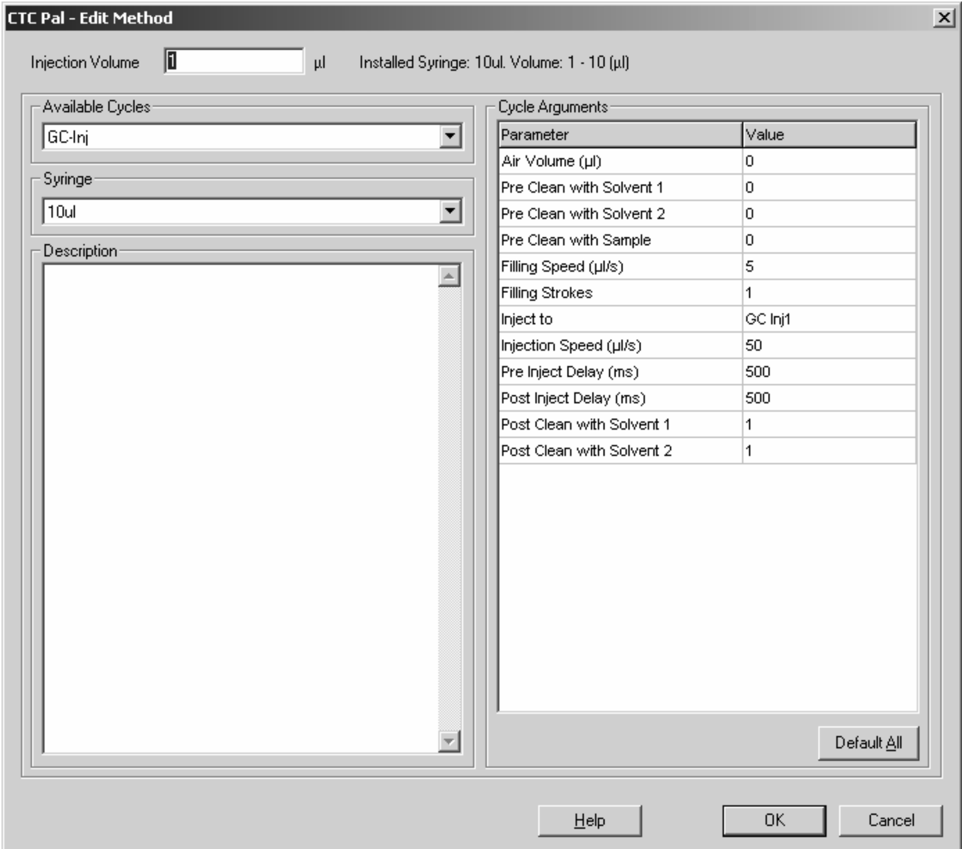

Figure 4. Edit CTC method.

CTC Show/Hide Status Sampler Status Panel

This menu item displays or hides the CTC status panel in the Instrument Control view.

CTC Location Mapping (Figure 5)

To discern the defined arrangement of names and trays, simply invoke the location mapping. **Plate Number** indicates a stack, tray, and plate

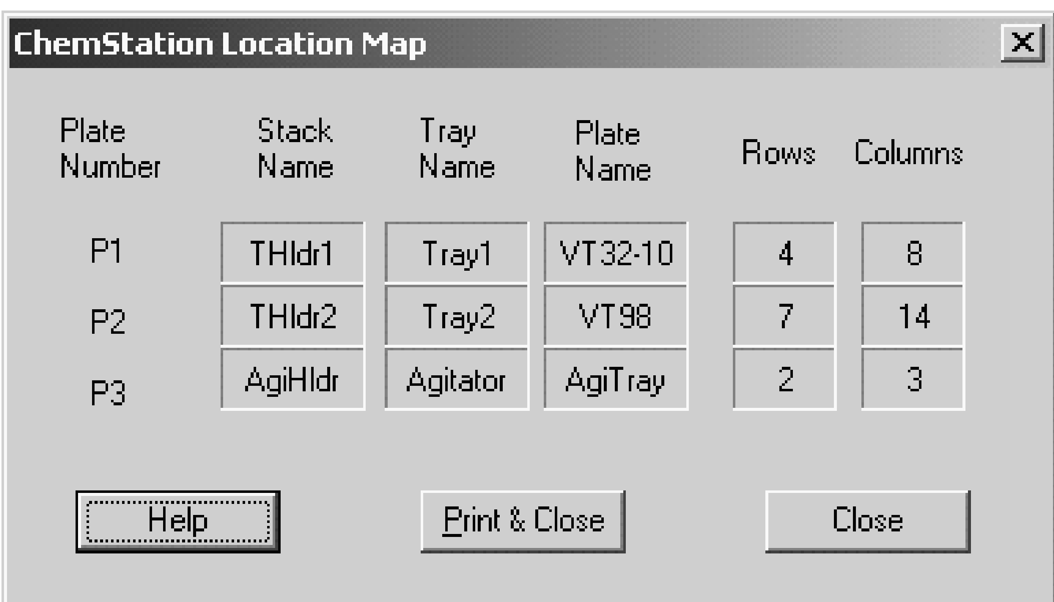

Figure 5. Tray and plate configurations.

combination. The **Stack Name** is the tray holder name as defined in the CTC setup. Most important is the **Plate Name,** which indicates the vial size and number. Vial positions in the plates are ordered by row and then by column, with the first row (closest to CTC) and first column (left-most) hole being the position of vial #1. The rows and columns for each plate are given in the CTC location mapping.

Table 1. Supported Trays and Their Plates in the GC/MSD ChemStation (Vials) are:

Tray Type	Vials	Vial Rows	Vial Column	Vial Size mL
VT200	200	16	20	1.0
VT98	98	7	14	2.0
VT78	78	6	13	7.0
VT32-10	32	4	8	10.0
VT32-20	32	4	8	20.0

The CTC will allow other tray types to be configured in the PAL controller and a variety of custom trays can be created.

For example, a company uses a particular vial design and wishes to make injections from these particular vials rather than from standard 2-ml vials. A custom tray can be arranged and a custom syringe size created to enable such injections (Figure 6)

CTC Reset Injector

This menu item sends the CTC injector to the "home" position and resets the CTC sampler to the initial power-on state.

CTC Update Configuration

This menu item retrieves the latest hardware configuration from the CTC. If new objects are added or moved or a new syringe size is in place, this menu item updates the configuration for the GC/MSD ChemStation.

Figure 6. Example of a custom tray developed for custom vials.

Making Single Injections

In testing injection methods or in GC/MSD method development, running a single standard or sample is convenient. With the CTC, more information needs to be supplied than just the vial number (Figure 7). The user can now select from the loaded trays and override the method's configured injection volume. If the user selects "Overide using" with another volume than the configured method, that volume is recorded with the data file. The volume increment must be compatible with the syringe volumes.

Sequences with the CTC PAL

Similar to the situation with single injections, sequences of injections require more information. To prevent the sequence sample table from becoming too cumbersome, users can configure the sequence to suit their needs (Figure 8). A simple custom sample sequence table is shown in Figure 9. Entering information into the sequence table requires selecting the vial, as is usual, and also the tray, which is indicated by **Tray Name**. The user can also decide to override the method volumes and set other injection volumes in the sample sequence table. If the user never performs this action, this option can be removed from the sequence table by using this configuration tool.

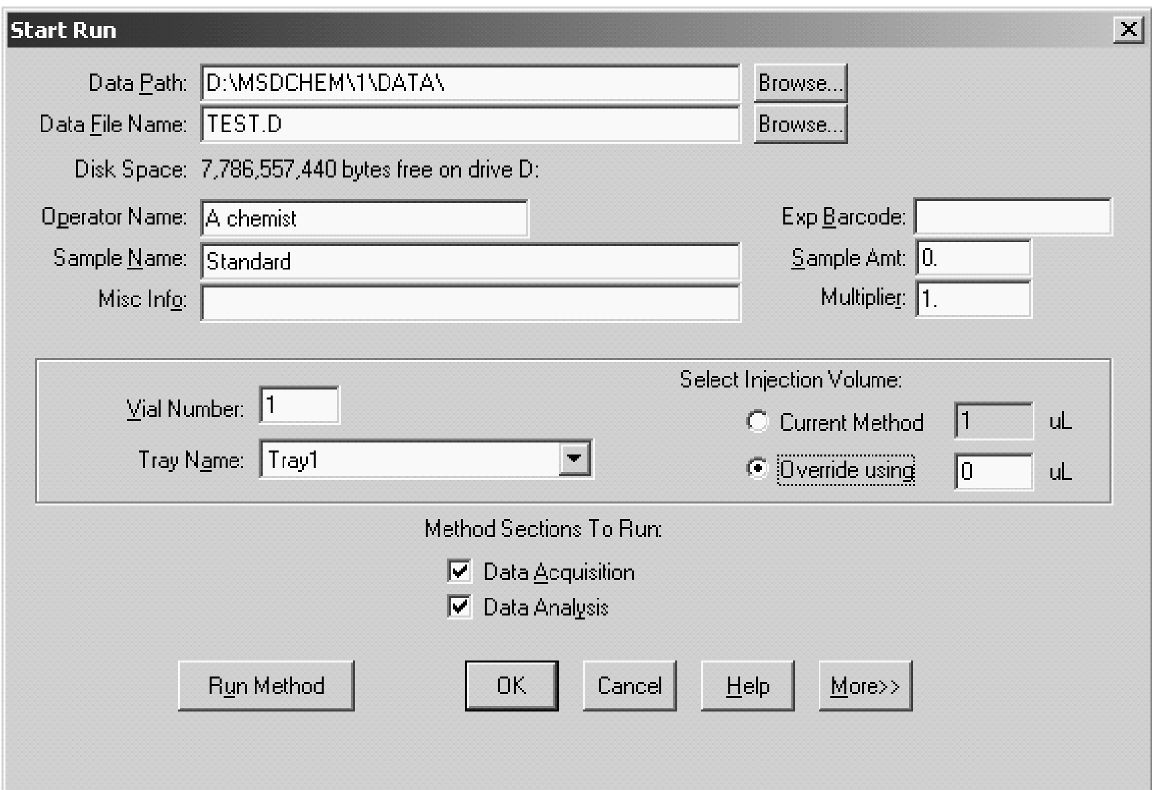

Figure 7. Making single injections.

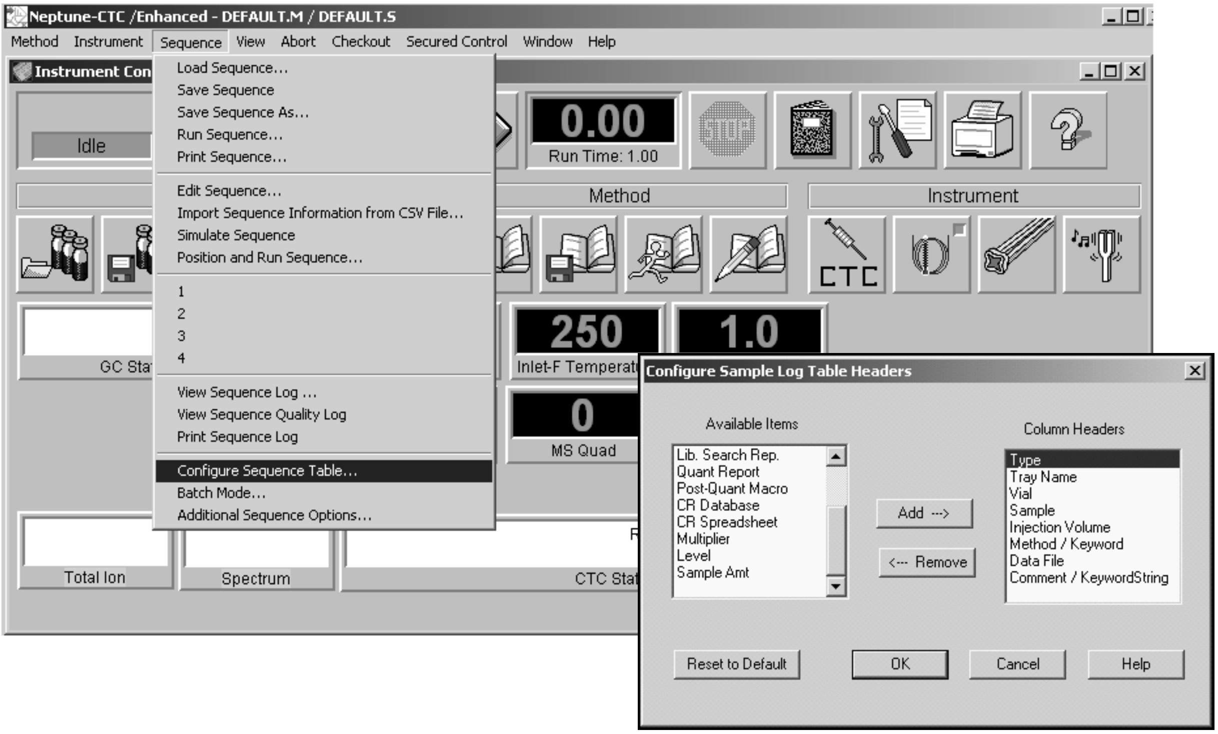

Figure 8. Configuring sample sequence tables.

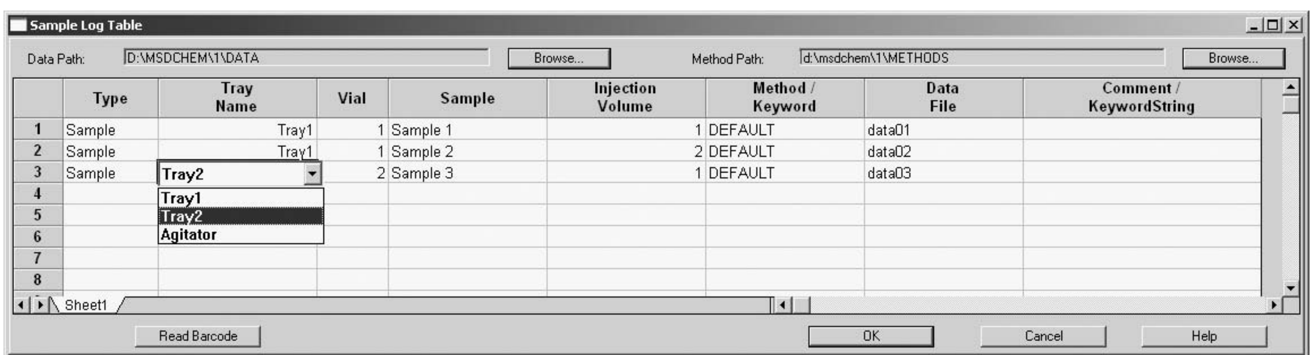

Figure 9. A custom sample sequence table.

Additional CTC information

A variety of information is available on the Agilent Technologies Web site (www.agilent.com/chem/ctc). Some key references by title and reference number are:

CTC automated sample injectors for GC, distributed by Agilent (5989-5127EN)
Describes the many configurations and their functions, such as SPME, etc.

CTC Analytics Autosampler Consumables Selection Guide for GC and Combi PAL Supplies (5989-5120EN)
Gives part numbers and descriptions for the CTC syringes, trays, vials, etc.

For More Information

For more information on our products and services, visit our Web site at www.agilent.com/chem.

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