

Waters 2777 Sample Manager

Installation and Maintenance Guide

Waters

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Milford, MA 01757

71500277704, Revision C

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Note: When you use the instrument, follow generally accepted procedures for quality control and methods development.

If you observe a change in the retention of a particular compound, in the resolution between two compounds, or in peak shape, immediately determine the reason for the changes. Until you determine the cause of a change, do not rely on the separation results.

Note: The Installation Category (Overvoltage Category) for this instrument is Level II. The Level II Category pertains to equipment that receives its electrical power from a local level, such as an electrical wall outlet.



Attention: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Important : Toute modification sur cette unité n'ayant pas été expressément approuvée par l'autorité responsable de la conformité à la réglementation peut annuler le droit de l'utilisateur à exploiter l'équipement.

Achtung: Jedwede Änderungen oder Modifikationen an dem Gerät ohne die ausdrückliche Genehmigung der für die ordnungsgemäße Funktionstüchtigkeit verantwortlichen Personen kann zum Entzug der Bedienungsbefugnis des Systems führen.

Avvertenza: eventuali modifiche o alterazioni apportate a questa unità e non espressamente approvate da un ente responsabile per la conformità annulleranno l'autorità dell'utente ad operare l'apparecchiatura.

Atención: cualquier cambio o modificación efectuado en esta unidad que no haya sido expresamente aprobado por la parte responsable del cumplimiento puede anular la autorización del usuario para utilizar el equipo.

注意：未經有關法規認證部門允許對本設備進行的改變或修改，可能會使使用者喪失操作該設備的權利。

注意：未經有關法規認證部門明確允許對本設備進行的改變或改裝，可能會使使用者喪失操作該設備的合法性。

주의 : 기기 검교정 담당자의 승인 없이 무단으로 기기를 변경 또는 수정하는 경우에는, 그 기기 운영에 대한 허가가 취소될 수 있습니다.

注意：規制機関から明確な承認を受けずに本装置の変更や改造を行うと、本装置のユーザとしての承認が無効になる可能性があります。



Caution: Use caution when working with any polymer tubing under pressure:

- Always wear eye protection when near pressurized polymer tubing.
- Extinguish all nearby flames.
- Do not use Tefzel tubing that has been severely stressed or kinked.
- Do not use Tefzel tubing with tetrahydrofuran (THF) or concentrated nitric or sulfuric acids.
- Be aware that methylene chloride and dimethyl sulfoxide cause Tefzel tubing to swell, which greatly reduces the rupture pressure of the tubing.

Attention : Soyez très prudent en travaillant avec des tuyaux de polymères sous pression :

- Portez toujours des lunettes de protection quand vous vous trouvez à proximité de tuyaux de polymères.
- Eteignez toutes les flammes se trouvant à proximité.
- N'utilisez pas de tuyau de Tefzel fortement abîmé ou déformé.
- N'utilisez pas de tuyau de Tefzel avec de l'acide sulfurique ou nitrique, ou du tétrahydrofurane (THF).
- Sachez que le chlorure de méthylène et le sulfoxyde de diméthyle peuvent provoquer le gonflement des tuyaux de Tefzel, diminuant ainsi fortement leur pression de rupture.

Vorsicht: Bei der Arbeit mit Polymerschläuchen unter Druck ist besondere Vorsicht angebracht:

- In der Nähe von unter Druck stehenden Polymerschläuchen stets Schutzbrille tragen.
- Alle offenen Flammen in der Nähe löschen.
- Keine Tefzel-Schläuche verwenden, die stark geknickt oder überbeansprucht sind.
- Tefzel-Schläuche nicht für Tetrahydrofuran (THF) oder konzentrierte Salpeter- oder Schwefelsäure verwenden.
- Durch Methylenchlorid und Dimethylsulfoxid können Tefzel-Schläuche quellen; dadurch wird der Berstdruck des Schlauches erheblich reduziert.



Precauzione: prestare attenzione durante le operazioni con i tubi di polimero sotto pressione:

- Indossare sempre occhiali da lavoro protettivi nei pressi di tubi di polimero pressurizzati.
- Estinguere ogni fonte di ignizione circostante.
- Non utilizzare tubi Tefzel soggetti a sollecitazioni eccessive o incurvati.
- Non utilizzare tubi Tefzel contenenti tetraidrofurano (THF) o acido solforico o nitrico concentrato.
- Tenere presente che il cloruro di metilene e il dimetilsolfossido provocano rigonfiamento nei tubi Tefzel, che riducono notevolmente il limite di pressione di rottura dei tubi stessi.

Advertencia: manipular con precaución los tubos de polímero bajo presión:

- Protegerse siempre los ojos en las proximidades de tubos de polímero bajo presión.
- Apagar todas las llamas que estén a proximidad.
- No utilizar tubos Tefzel que hayan sufrido tensiones extremas o hayan sido doblados.
- No utilizar tubos Tefzel con tetrahidrofurano (THF) o ácidos nítrico o sulfúrico concentrados.
- No olvidar que el cloruro de metileno y el óxido de azufre dimetilo dilatan los tubos Tefzel, lo que reduce en gran medida la presión de ruptura de los tubos.

警告：當在有壓力的情況下使用聚合物管線時，小心注意以下幾點：

- 當接近有壓力的聚合物管線時一定要戴防護眼鏡。
- 熄滅附近所有的火焰。
- 不要使用已經被壓扁或嚴重彎曲的特氟隆 (Tefzel) 管線。
- 不要在特氟隆 (Tefzel) 管線中使用四氫呋喃 (THF) 或濃硝酸或濃硫酸。
- 要了解使用二氯甲烷及二甲基亞楓會導致特氟隆 (Tefzel) 管線膨脹，大大降低管線的耐壓能力。



警告: 当在有压力的情况下使用聚合物管线时, 小心注意以下几点

- 当接近有压力的聚合物管线时一定要戴防护眼镜
- 熄灭附近所有的火焰。
- 不要使用已经被压瘪或严重弯曲的特氟隆(Tefzel)管线。
- 不要在特氟隆(Tefzel)管线中使用四氢呋喃(THF)或浓硝酸或浓硫酸。
- 要了解使用二氯甲烷及二甲基亚砷会导致 特氟隆(Tefzel)管线膨胀, 大大降低管线的耐压能力。

경고 : 폴리머재질의 튜빙을 압력하에서 사용할 때는 다음 사항에 유의하십시오.

- 압력을 받은 폴리머 튜빙 부근에서는 반드시 보호안경을 착용할 것
- 모든 화기의 접근을 금함
- 눌리거나 뒤틀린 Tefzel 튜빙은 사용하지 말 것
- Tefzel 튜빙을 테트라히드로퓨란 (THF)이나 염산 및 황산과 함께 사용하지 말 것
- 디클로로메탄(methylene chloride)와 디메틸설폭사이드(dimethyl sulfoxide)는 Tefzel 튜빙을 팽창시켜 쉽게 파열되므로 주의할 것

警告: ポリマーチューブに圧力をかけて取り扱う場合は、次のように注意してください。

- 加圧したポリマーチューブの付近では、常に保護めがねを着用してください。
- 付近の火はすべて消してください。
- 激しい応力やねじれを受けたTefzelチューブは使用しないでください。
- テトラヒドロフラン (THF)、濃硝酸、あるいは濃硫酸には、Tefzelチューブを使用しないでください。
- メチレン-クロライドやジメチルスルホキシドはTefzelチューブを膨張させ、チューブの破断圧力を大幅に低下させますので、注意してください。



Caution: *The user shall be made aware that if the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.*

Attention : *L'utilisateur doit être informé que si le matériel est utilisé d'une façon non spécifiée par le fabricant, la protection assurée par le matériel risque d'être défectueuses.*

Vorsicht: *Der Benutzer wird darauf aufmerksam gemacht, dass bei unsachgemäßer Verwendung des Gerätes unter Umständen nicht ordnungsgemäß funktionieren.*

Precauzione: *l'utente deve essere al corrente del fatto che, se l'apparecchiatura viene usata in un modo specificato dal produttore, la protezione fornita dall'apparecchiatura potrà essere invalidata.*

Advertencia: *el usuario deberá saber que si el equipo se utiliza de forma distinta a la especificada por el fabricante, las medidas de protección del equipo podrían ser insuficientes.*

警告： 使用者必須非常清楚如果設備不是按照製造廠商指定的方式使用，那麼該設備所提供的保護將被消弱。

警告： 使用者必須非常清楚如果設備不是按照製造廠商指定的方式使用，那麼該設備所提供的保護將被消弱

경고： 제조사가 지정한 것 이외의 방법으로 기기를 사용하는 경우에는, 사용자가 위험으로부터 보호될 수 없는 경우가 발생할 수 있음에 유념하십시오.

警告： ユーザは製造業者が指定していない方法で装置を使用した場合は装置が提供する保護が損なわれることがあるということを承知しているものとします。



Caution: To protect against fire hazard, replace fuses with those of the same type and rating.

Attention : Remplacez toujours les fusibles par d'autres du même type et de la même puissance afin d'éviter tout risque d'incendie.

Vorsicht: Zum Schutz gegen Feuergefahr die Sicherungen nur mit Sicherungen des gleichen Typs und Nennwertes ersetzen.

Precauzione: per una buona protezione contro i rischi di incendio, sostituire i fusibili con altri dello stesso tipo e amperaggio.

Advertencia: sustituya los fusibles por otros del mismo tipo y características para evitar el riesgo de incendio.

警告：為了避免火災的危險，應更換同種類型及規格的保險絲。

警告：为了避免火灾的危险，应更换同种类型及规格的保险丝。

경고： 화재를 방지하기 위해서는 퓨즈 교체 시 같은 종류, 같은 등급의 것을 사용하십시오.

警告：火災の危険防止のために、ヒューズの交換は同一タイプおよび定格のもので行なってください。



Caution: To avoid possible electrical shock, disconnect the power cord before servicing the instrument.

Attention : Afin d'éviter toute possibilité de commotion électrique, débranchez le cordon d'alimentation de la prise avant d'effectuer la maintenance de l'instrument.

Vorsicht: Zur Vermeidung von Stromschlägen sollte das Gerät vor der Wartung vom Netz getrennt werden.

Precauzione: per evitare il rischio di scossa elettrica, scollegare il cavo di alimentazione prima di svolgere la manutenzione dello strumento.

Precaución: para evitar descargas eléctricas, desenchufe el cable de alimentación del instrumento antes de realizar cualquier reparación.

警告：要避免觸電，請在修理或保養器材前把電源線拔出。

警告：为避免可能引起得触电危险，在修理前请切断电源连接。

경고: 전기 충격의 가능성을 피하기 위해서는, 기기를 수리하기 이전에 전원 코드를 차단하십시오.

警告：感電の危険性を避けるために、装置の保守を行う前には装置の電源コードを引き抜いてください。

Commonly Used Symbols

	Direct current Courant continu Gleichstrom Corrente continua Corriente continua 直流電 直流电 직류 直流
	Alternating current Courant alternatif Wechselstrom Corrente alternata Corriente alterna 交流電 交流电 교류 交流
	Protective conductor terminal Borne du conducteur de protection Schutzleiteranschluss Terminale di conduttore con protezione Borne del conductor de tierra 保護的導線端子 保护性的接地端 보호 도체 단자 接地

Commonly Used Symbols (Continued)

	Frame or chassis terminal Borne du cadre ou du châssis Rahmen- oder Chassisanschluss Terminale di struttura o telaio Borne de la estructura o del chasis 結構或底盤端子 机架或底盤接地端 프레임 또는 틀 단자 フレームまたはシャーシアース
	Caution or refer to manual Attention ou reportez-vous au guide Vorsicht, oder lesen Sie das Handbuch Prestare attenzione o fare riferimento alla guida Actúe con precaución o consulte la guía 小心或查閱手冊 小心或查閱手冊 경고 또는 사용설명서 참조 警告またはマニュアルを参照
	Caution, hot surface or high temperature Attention, surface chaude ou température élevée Vorsicht, heiße Oberfläche oder hohe Temperatur Precauzione, superficie calda o elevata temperatura Precaución, superficie caliente o temperatura elevada 警告，熱表面或高溫 警告,热表面或高温 경고, 뜨거운 표면 또는 고온 警告、熱くなっている面、あるいは高温

Commonly Used Symbols (Continued)

	Caution, risk of electric shock (high voltage) Attention, risque de commotion électrique (haute tension) Vorsicht, Elektroschockgefahr (Hochspannung) Precauzione, rischio di scossa elettrica (alta tensione) Precaución, peligro de descarga eléctrica (alta tensión) 警告, 小心触電 (高壓電) 警告, 小心触电 (高压电) 경고, 전기충격의 위험 (고압) 警告、電気ショックの危険性 (高電圧)
	Caution, risk of needle-stick puncture Attention, risques de perforation de la taille d'une aiguille Vorsicht, Gefahr einer Spritzenpunktion Precauzione, rischio di puntura con ago Precaución, riesgo de punción con aguja 警告, 小心尖狀物刺傷 警告, 小心尖狀物刺伤 경고, 뾰족한 것으로부터의 상해 위험 警告、ニードルで穴をあける危険性
	Caution, ultraviolet light Attention, rayonnement ultraviolet Vorsicht, Ultraviolette Licht Precauzione, luce ultravioletta Precaución, emisiones de luz ultravioleta 警告, 紫外光 警告, 紫外光 경고, 자외선 警告、紫外線

Commonly Used Symbols (Continued)

	Fuse Fusible Sicherung Fusibile Fusible 保險絲 保险丝 퓨즈 ヒューズ
1	Electrical power on Sous tension Netzschalter ein Alimentazione elettrica attivata Alimentación eléctrica conectada 開啓電源 接通电源 전원 켜기 電源オン
0	Electrical power off Hors tension Netzschalter aus Alimentazione elettrica disattivata Alimentación eléctrica desconectada 關閉電源 切断电源 전원 끄기 電源オフ

United States – FCC Emissions Notes

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Note: *This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:*

- *Reorient or relocate the receiving antenna.*
- *Increase the separation between the equipment and receiver.*
- *Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.*
- *Consult the dealer or an experienced radio TV technician for help.*

Shielded cables must be used with this unit to ensure compliance with the Class B FCC limits.

Canada – Spectrum Management Emissions Notes

Cet appareil numérique de la classe B est conforme à la norme NMB-003.

This Class B digital apparatus complies with Canadian ICES-003.

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Preface

This guide describes the procedures for unpacking, installing, setting up, maintaining, and troubleshooting the Waters® 2777 and 2777C (Compact) Sample Manager. Also included is information about specifications, spare parts, software maps, and a glossary.

This guide is intended for a wide variety of users whose familiarity with computers and software ranges from novice to expert. Users should know how to set up and operate general laboratory instruments and computer-controlled devices, and how to handle solvents.

Organization

This guide contains the following:

[Chapter 1](#) introduces the 2777 Sample Manager.

[Chapter 2](#) describes installation procedures.

[Chapter 3](#) describes setting up, configuring, and operating the 2777 Sample Manager.

[Chapter 4](#) describes maintenance procedures.

[Chapter 5](#) describes troubleshooting procedures.

[Appendix A](#) provides specifications for the 2777 Sample Manager.

[Appendix B](#) provides spare parts for the 2777 Sample Manager.

[Appendix C](#) contains several software maps (for use with the 2777 Sample Manager as a stand-alone device) and the signals for pins in the external connectors.

[Appendix D](#) contains a glossary of terms that are specific to the 2777 Sample Manager.

Related Documentation

Printed Documentation

CTC Analytics AG Cycle Composer Control Software User Guide

Waters 2488 Multichannel Absorbance Detector with MassLynx Control Operator's Guide

Waters AutoPurification Systems Operator's Guide

Waters Licenses, Warranties, and Support

Waters ZQ Detector Operator's Guide

Printed Documentation for the Base Product

FractionLynx Software User's Guide

MassLynx BioLynx & ProteinLynx Guide

MassLynx Guide to Data Acquisition

MassLynx Inlet Control Guide

MassLynx Interfacing Guide

MassLynx MetaboLynx User's Guide

MassLynx Security User's Guide

MassLynx Software Release Notes

MassLynx Software User's Guide

OpenLynx Software User's Guide

QuanLynx Software User's Guide

Online Documentation

MassLynx Help: Describes all MassLynx™ windows, menus, menu selections, and dialog boxes for the base software and software options. Also includes reference information and procedures for performing all tasks required to use MassLynx software.

Documentation on the Web

Related product information and documentation can be found on the World Wide Web. Our address is <http://www.waters.com>.

Documentation Conventions

The following conventions can be used in this guide:

Convention	Usage
<i>Italic</i>	Italic indicates information that you supply such as variables. It also indicates emphasis and document titles. For example, “Replace <i>file_name</i> with the actual name of your file.”
Courier	Courier indicates examples of source code and system output. For example, “The SVRMGR> prompt appears.”
Courier Bold	Courier bold indicates characters that you type or keys you press in examples of source code. For example, “At the LSNRCTL> prompt, enter set password oracle to access Oracle.”
Keys	The word <i>key</i> refers to a computer key on the keypad or keyboard. <i>Screen keys</i> refer to the keys on the instrument located immediately below the screen. For example, “The A/B screen key on the 2414 Detector displays the selected channel.”
...	Three periods indicate that more of the same type of item can optionally follow. For example, “You can store <i>filename1</i> , <i>filename2</i> , ... in each folder.”
>	A right arrow between menu options indicates you should choose each option in sequence. For example, “Select File > Exit” means you should select File from the menu bar, then select Exit from the File menu.

Notes

Notes call out information that is helpful to the operator. For example:

Note: *Record your result before you proceed to the next step.*

Attentions

Attentions provide information about preventing damage to the system or equipment. For example:



Attention: *To avoid damaging the detector flow cell, do not touch the flow cell window.*

Cautions

Cautions provide information essential to the safety of the operator. For example:



Caution: To avoid burns, turn off the lamp at least 30 minutes before removing it for replacement or adjustment.



Caution: To avoid electrical shock and injury, unplug the power cord before performing maintenance procedures.



Caution: To avoid chemical or electrical hazards, observe safe laboratory practices when operating the system.

Chapter 1

Introduction

The Waters® 2777 and 2777C (Compact) Sample Manager is an XYZ robotic autosampler that enables you to perform automated sample handling with high-throughput screening for LC/MS (Figure 1-1 and Table 1-1). It can operate as a stand-alone instrument or as a part of a Waters MassLynx™ ZQ™ system. You can configure it as a single-valve unit or as a 4-valve module for parallel injections. It features chromatography front-end automation and a sample injection system especially designed for high-throughput applications in screening labs.

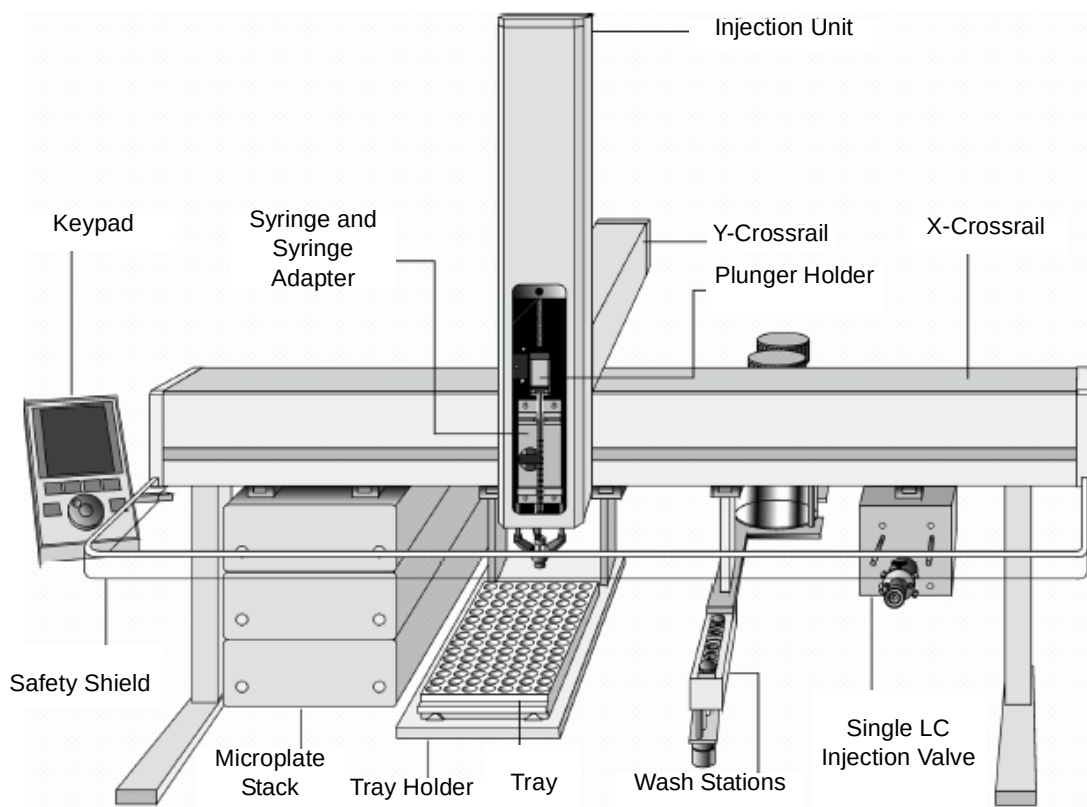


Figure 1-1 Standard 2777 Sample Manager

Table 1-1 Hardware Components of the 2777 Sample Manager

Component	Description
X-crossrail and Y-crossrail	Provide support for the injection unit, wash station, injection valve(s), keypad, and stacks.
Injection unit	Contains the syringe, syringe adapter, and plunger holder and moves the syringe along the Z-axis.
Syringe, syringe adapter, and plunger holder	Aspirate sample from vials or microplates and dispense it in the injection valve.
Wash stations	Wash the syringe and valve(s) with one or two solvents.
Injection valve(s)	Receives sample from the syringe and passes it to the column(s).
Keypad	Enables stand-alone functionality and local control.
Microplate stack, tray holder, and heater cooler stack	Hold vials, microplates, or deep-well plates containing the samples.
Safety shield	Protects the operator during operation.
Dilutor (optional; not shown)	Serially dilutes samples, adds a volume of reagent and solvent to vials or wells, or injects samples and immediately flushes the valve (up to 10 mL).

1.1 Features

The 2777 Sample Manager has the following features:

- Handles microplates, deep-well plates, and standard vials
- Comes in two widths: standard 2777 for greater sample handling, or compact 2777C for smaller footprint and bench space
- Provides a minimum recovery time between injections of 30 to 60 seconds
- Can wash the syringe and the valves with two different solvents
- With the optional heater cooler stack, can cool samples to 39 °F (4 °C) or heat samples to 104 °F (40 °C)
- Aspirates samples from the plate into the syringe, then injects them directly into an LC valve without exposure to tubing

- Supports Open Access and allows new samples to be added for later processing
- Includes the Cycle Composer software (license for MassLynx required) already installed on the 2777 Sample Manager
- Contains a side-slitted injection unit to accommodate an optional dilutor

1.1.1 Configurations

The standard 2777 Sample Manager is wider for greater sample handling. The compact 2777C Sample Manager is narrower and requires less bench space. Both 2777 Sample Managers are available in two configurations:

- Single-valve 2777 Sample Manager for analytical operations ([Figure 1-1](#)):
 - Keypad
 - Injection unit consisting of a Syringe Kit with a 100- μ L syringe and syringe adapter
 - Wash station for two solvents
 - One 6-port single LC injection valve
 - One microplate stack (either three or six drawers)
- 4-valve 2777 Sample Manager for preparative operations:
 - Keypad
 - Injection unit consisting of a Sideport Syringe Kit with an 80- μ L syringe and syringe adapter
 - Wash station for two solvents
 - One 4-valve module with four, 6-port LC injection valves
 - One microplate stack (either three or six drawers)
 - 2777 dilutor

1.1.2 Sample Capacity

The capacity of the standard 2777 Sample Manager with a single injection valve is up to three microplate stacks or tray holders.

- Each stack can contain up to 12 standard microplates (96 or 384 wells) or 6 deep-well plates.
- Each tray holder can contain 1 sample tray, and each sample tray can contain 32 standard 20-mL vials.

- The capacity of a fully loaded single-valve unit is one of the following:
 - Up to 32 standard 20-mL vials (two plates in two tray holders, one tray per holder)
 - Up to 24 standard microplates (in two 6-drawer stacks, two plates per drawer)
 - Up to 12 deep-well microplates (in two 3-drawer stacks, two plates per drawer)
- The capacity of the standard 2777 Sample Manager with a 4-valve module is up to two microplate stacks. Each stack can hold one of the following:
 - Two deep-well stacks (12 plates with 96 or 384 wells)
 - Two standard microplate stacks (24 plates with 96 or 384 wells)
 - Two tray holders (196 2-mL vials)

The capacity of the compact 2777C Sample Manager with a single injection valve is two stacks or one heater cooler stack. The capacity of the compact 2777C Sample Manager with a 4-valve module is one stack.

1.1.3 How Sample Flows

The 2777 Sample Manager is an XYZ robotic autosampler with a syringe-only concept, where samples flow through the syringe needle and not through tubing. The 2777 Sample Manager operates as shown in [Figure 1-2](#).

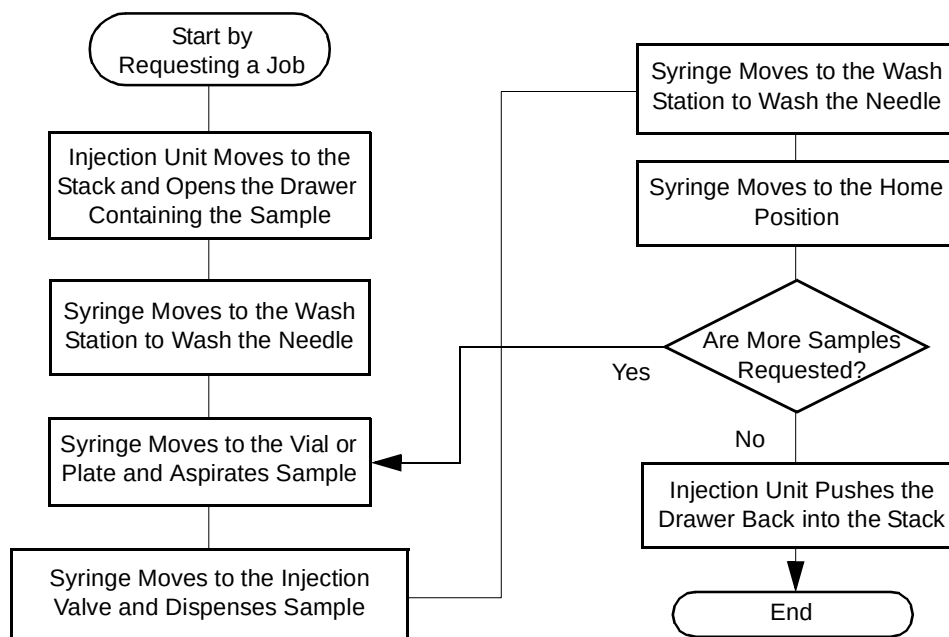


Figure 1-2 Typical Sample Flow

1.2 Software

You can control the 2777 Sample Manager in two ways:

- Remotely on a PC using MassLynx software
- Locally on the 2777 keypad using Cycle Composer software ([Figure 1-3](#))

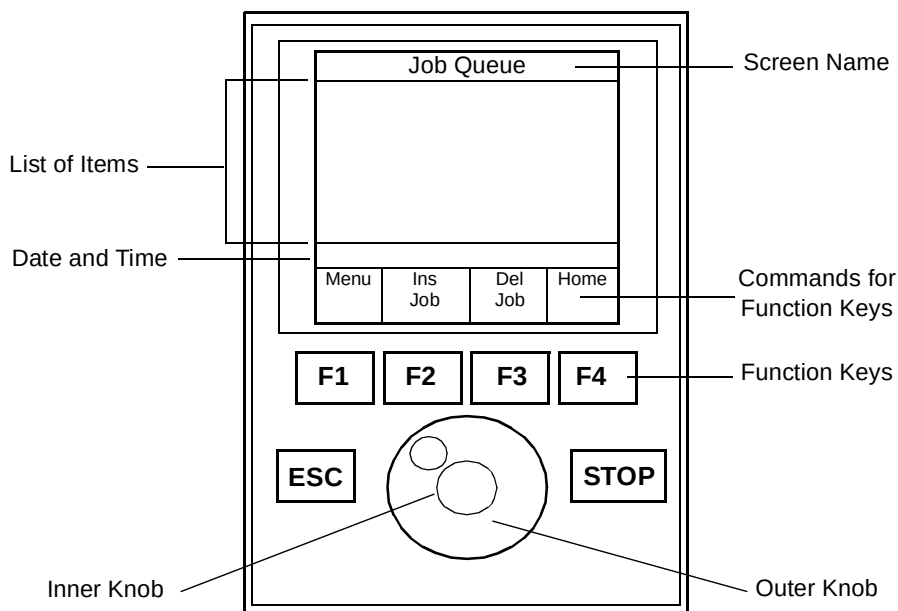


Figure 1-3 2777 Keypad

Each screen on the keypad has the same format:

- The screen name appears at the top of the screen.
- A list of items appears below the title. You can scroll through the list and select an item.
- The date and time, status, or allowed values for a parameter appear in the highlighted area above the function key labels on the bottom of the screen.
- The function keys have commands that change according to the current screen.

Cycle Composer software and PAL Loader software (from the *Waters 2777 Sample Manager Version 1.0 CD*) are required.

1.3 Spare Parts and Options

Both the standard 2777 and the compact 2777C Sample Managers can accommodate all options. See [Appendix B](#) for a complete list of spare parts and their descriptions.

1.3.1 Syringes and Syringe Adapters

Many syringes are available. Each syringe must be installed in its designated syringe adapter ([Figure 1-4](#)). You can select the following types of syringes:

- 10- to 5000- μ L syringes
- Either standard or Gastight[®] syringes
- Standard or 22-gauge syringes

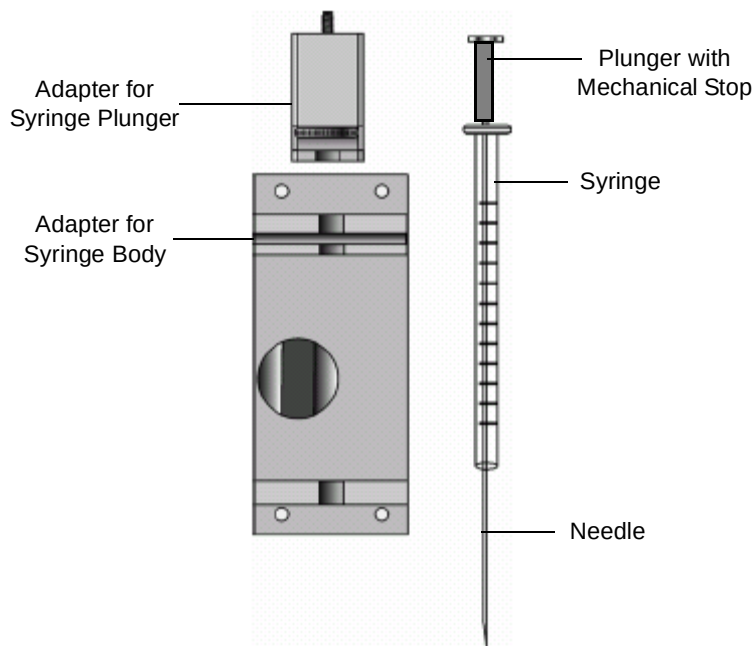


Figure 1-4 Syringe Adapter and Syringe

1.3.2 Microplate Stacks

Three types of microplate stacks are available.

- **6-Drawer Stack** – Holds up to 12 microplates, two per drawer in six drawers (Figure 1-5).

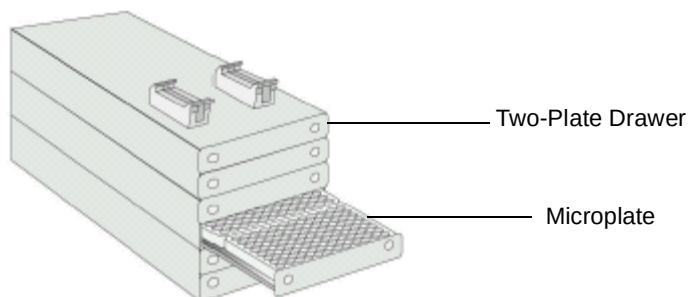


Figure 1-5 6-Drawer Stack

- **3-Drawer Stack** – Holds up to six deep-well plates or microplates, two per drawer in three drawers.
- **Heater Cooler Stack** – Maintains temperatures of sealed microplates or deep-well plates from 39 °F (4 °C) to 104 °F (40 °C). A heater cooler stack protects thermolabile samples and stabilizes sample temperatures. It has an LED display and power supply. Temperature is regulated within ± 1 °C.

The 3-drawer heater cooler stack accommodates up to six standard microplates, six deep-well plates, or 6 × 54 2-mL vials (Figure 1-6).

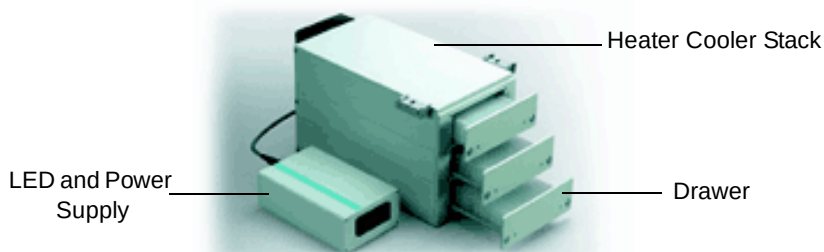


Figure 1-6 Heater Cooler Stack

1.3.3 Tray Holders

Several types of sample containers fit into the tray holders ([Figure 1-7](#) and [Table 1-2](#)).

Table 1-2 Tray Holders

Type	Number of Positions	Array of Wells
Standard (MT) microplate	96	8 × 12
Deep-well (DW) plate	96	8 × 12
High-density (HD) microplate	384	12 × 32
Sample tray for 7-mm microvials, 1.0 mL	200	10 × 20
Sample tray for 12-mm vials, 2.0 mL	98	7 × 14
Sample tray for 7-mm microvials, 1.0 mL	78	6 × 13
Sample tray for 12-mm vials, 2.0 mL	54	6 × 9

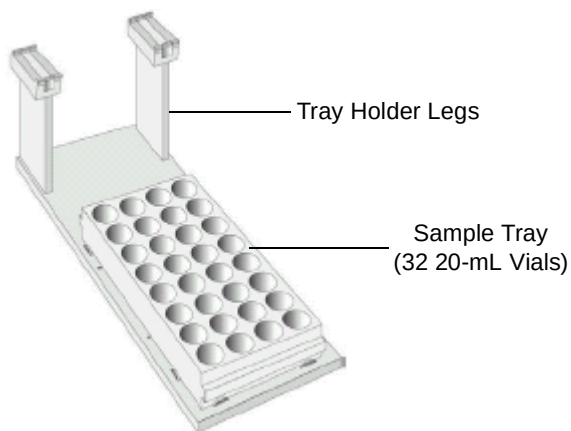


Figure 1-7 Tray Holder and Sample Tray

The tray holder is available in two widths:

- 3.0 in (7.6 cm)
- 4.5 in (11.4 cm)

1.3.4 4-Valve Module

The 4-valve module can be used with any 2777 Sample Manager ([Figure 1-8](#)). Valve drive control requires the SER2 port.

The 4-valve module operates with PAL firmware version 2.4.0 or later and Cycle Composer software version 1.4 or later. Stand-alone operation requires Cycle Composer software.

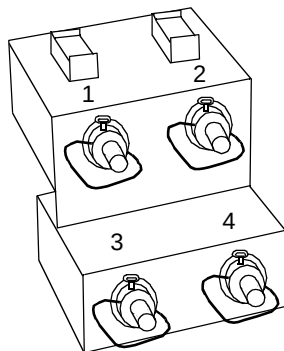


Figure 1-8 4-Valve Module

1.3.5 Dilutor

The 2777 dilutor operates with any 2777 Sample Manager equipped with a side-slitted injection unit ([Figure 1-9](#)). One auxiliary (AUX) port must be available for dilutor control.

The 2777 dilutor operates with PAL firmware version 2.4.0 or later and Cycle Composer software version 1.4 or later. Stand-alone operations require Cycle Composer software.



Figure 1-9 2777 Dilutor

Chapter 2

Installing the 2777 Sample Manager

2.1 Overview

This chapter describes how to install the 2777 Sample Manager and its options (Figure 2-1).

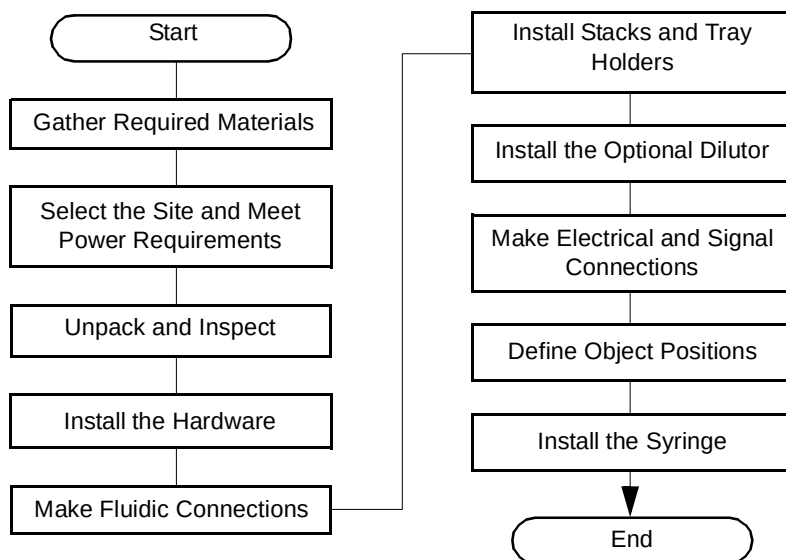


Figure 2-1 Installing the 2777 Sample Manager

The 2777 Sample Manager includes the following components:

- Microplate stack(s) or tray holder(s) for sample handling
- Single injection valve or 4-valve module for sample injection
- Wash station module for solvent handling

Options include a second valve drive, a dilutor, stacks or tray holders, or a heater cooler stack.

After installing the hardware, you need to define the positions of the components, including the two wash stations, waste station, stack(s), tray holder(s), and injector port(s) on the injector valve(s).

2.2 Required Materials

You need to provide the following supplies and materials:

- Wash 1 and Wash 2 solvents
- Waste reservoir
- Sample containers
 - Standard 96-position microplates (8 × 12)
 - Deep-well 96-position microplates (8 × 12)
 - High-density 384-position microplates (12 × 32)
 - Sample tray, 200 positions (10 × 20) for 7-mm microvials, 1.0 mL
 - Sample tray, 98 positions (7 × 14) for 12-mm vials, 2.0 mL
 - Sample tray, 78 positions (6 × 13) for 7-mm microvials, 1.0 mL
 - Sample tray, 54 positions (6 × 9) for 12-mm vials, 2.0 mL

2.3 Site Selection and Power Requirements



Caution: To avoid electric shock, turn off the instrument(s) and unplug the power cord(s) before installing components or performing maintenance procedures.

2.3.1 Selecting the Site

Select a site for the 2777 Sample Manager that meets the requirements in [Table 2-1](#).

Table 2-1 Installation Site Requirements

Factor	Requirement
Operating temperature range	39 to 104 °F (4 to 40 °C)
Maximum relative humidity	75%, noncondensing
Height	25.5 in. (64.8 cm)
Depth	14.1 in. (38.5 cm)
Width	Standard 2777: 32.6 in. (82.8 cm) Compact 2777C: 21.0 in. (53.4 cm)
Weight	Standard 2777: 22 lbs. (10 kg) without accessories Compact 2777C: 18 lbs. (8 kg) without accessories
Bench	Level to within $\pm 2^\circ$
Vibration	Negligible
Clearance	At least 6 in. (15.25 cm) at the rear; space for fluid waste container below the instrument and solvent containers next to the instrument; access to power switch(es) and power cord(s); clean, level, smooth surface.
Static electricity	Negligible
Electromagnetic fields	Negligible; no nearby source of electromagnetic noise, such as arcing relays or electric motors.

2.3.2 Meeting Power Requirements

The 2777 Sample Manager requires the following:

- Grounded alternating current (AC) power source
- Minimal power transients and fluctuations
- Autoselecting, 100 to 240 VAC, 50/60 Hz



Caution: To avoid electric shock, turn off the instrument(s) and unplug the power cord(s) before performing installation or maintenance procedures.

2.4 Unpacking and Inspecting

The 2777 Sample Manager is shipped in two or more boxes. The largest box contains the following items (see also [Table B-6](#)):

- Documentation
 - *Declaration of Conformity*
 - *Certificate of Functional Performance*
 - *Waters 2777 Sample Manager Version 1.0 CD*
 - *2777 Sample Manager Installation and Maintenance Guide*
- Keypad
- Stand-alone supports (legs)
- Safety shield with two thumbscrews and washers
- Cables to connect the PC, keypad, wash station module, and power supply
- Power supply and power cord
- Wash station module (two parts) with tubing and two bottles
- X/Y-crossrail assembly
- Injection unit
- Miscellaneous parts such as waste tubing

The second box typically contains the injection valve (see [Table B-7](#) for the single injection valve or [Table B-8](#) for the 4-valve module).

Additional options and accessories, such as dilutors, syringe kits, stacks, tray holders, and sample trays, are shipped separately.

To unpack the 2777 Sample Manager and its components:

1. Open the largest box. Remove the top tray and documentation.
2. Remove all boxes and the injection unit from the largest box before attempting to remove the X/Y-crossrail.

Note: *Leave the foam block inside the injection unit to assist in mounting the injection arm to the Y-crossrail.*

3. Remove any loose foam packing around the X/Y-crossrail. Carefully lift the X/Y-crossrail and remove it from the box. Hold the Y-crossrail in place as you

remove the assembly from the box. Set the X/Y-crossrail assembly on a bench and remove the foam pieces from each end.

4. Unpack the remaining containers.
5. Verify that all components are present.

Note: Save all packing materials for future use in moving or shipping the unit.

6. If you see damage to any component, see *Waters Licenses, Warranties, and Support*.
7. If you see any discrepancy in the contents of the order, contact Waters Technical Service at 800 252-4752, *U.S. and Canadian customers only*. Other customers, call your local Waters subsidiary or your local Waters Technical Service Representative, or call Waters corporate headquarters in Milford, Massachusetts (U.S.A.) for assistance.

2.5 Installing the Hardware

If you are installing the 2777 Sample Manager as part of a mass spectrometry system, you can leave power on to the other components during this installation ([Figure 2-2](#)). A mass spectrometry system might contain a pump, mass detector, fraction collector, columns, and a computer (with a mouse and a monitor) running Windows NT[®] with Service Pack 6a for MassLynx version 3.5, or Windows 2000 or Windows XP for MassLynx version 4.0. See the manufacturer's instructions for each software and hardware component.

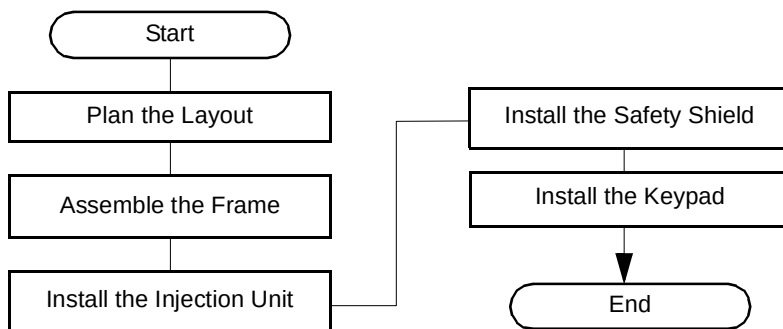


Figure 2-2 Installing the Hardware

2.5.1 Planning the Layout

The goal in planning the layout of the hardware components (injection unit, wash station module, stacks, and tray holders) is to minimize the length of tubing from the 2777 Sample Manager to the detector. For example:

- Place the wash station as closely as possible to the injection valve to minimize the time required to move between the two positions during routine operation.
- Place the injection valve as closely as possible to the detector to minimize dead volume between the sample injection point and detection.
- Mount the keypad on either side of the X-crossrail, usually on the side away from the detector.

Determine approximately where you want to locate the 2777 Sample Manager and its components: LC injection valve(s) (either single injection valve or 4-valve module), wash station module, stacks and/or tray holder(s), and keypad ([Figure 2-3](#)).

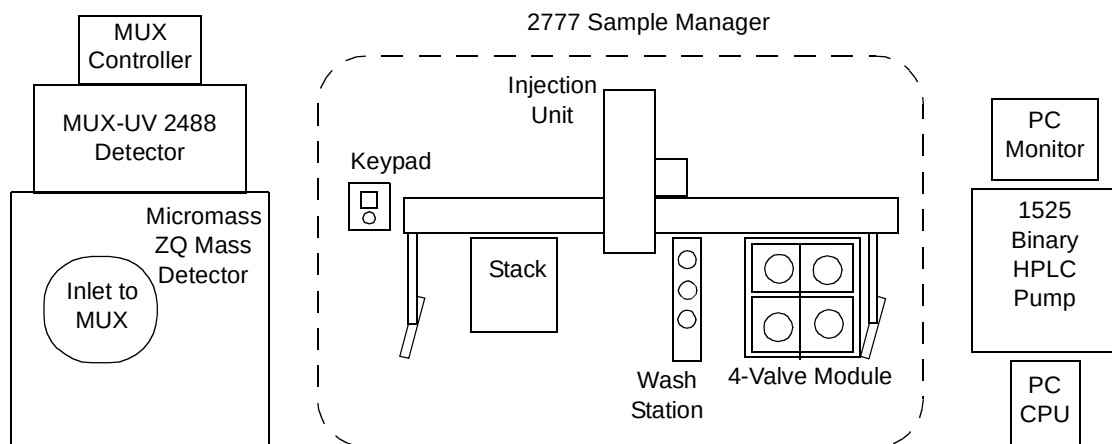


Figure 2-3 Planning the Layout

2.5.2 Assembling the Frame



Attention: To prevent damage, do not install the 2777 Sample Manager on top of another instrument.

1. Place the X/Y-crossrail assembly onto a level, clean, stable surface. Make sure that no objects will interfere with either the Y-crossrail or injection unit throughout the entire range of potential movements.

2. If you are installing a heater cooler stack or a stack (with three or six drawers):
 - a. Loosen the TORX[®] screws on the two mounting clamps located on top of the stack.
 - b. Move the Y-crossrail to the center of the X-crossrail and temporarily place the X-crossrail assembly on top of the stack with the mounting clamp teeth fitting into the grooves on the bottom of the X-crossrail. The stack should be near the center of the crossrail so that the crossrails are balanced.

Note: If your unit does not have a stack, support the crossrail in a suitable manner (you can use a sturdy cardboard box) before attempting to install the legs.

3. Install each leg approximately 1 in. (2.5 cm) from the end of the X-crossrail.

Note: You can install the heater cooler stack at one end instead of a leg.

- a. Loosen the TORX screws at the rear of the mounting clamps.
 - b. Fit one leg into the grooves in the X-crossrail.
 - c. Be sure that both clamps fit completely into the grooves.
 - d. Tighten the TORX screws until the leg is firmly in place.
 - e. Repeat steps a through d for the other leg.
4. Carefully inspect the legs and claws to make sure they are correctly attached to the X-crossrail (Figure 2-4). Push each component completely to the rear of the crossrail so that the claws are tight in the front and back grooves.

Note: The mounting clamps and installation process are common to all objects that you will install on the X-crossrail.

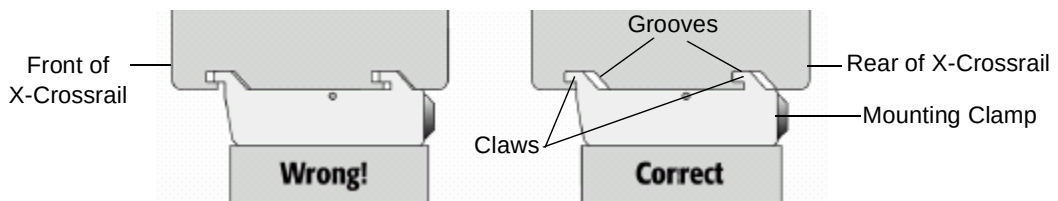


Figure 2-4 Attaching the Mounting Claws (Left Side View)

2.5.3 Installing the Injection Unit



Attention: To avoid damaging the injection unit, install it carefully, and have someone hold it in place while you insert the mounting screws.

1. Remove the three TORX mounting screws A, B, and C from the Y-crossrail (Figure 2-5). These screws will attach the injection unit to the Y-crossrail.

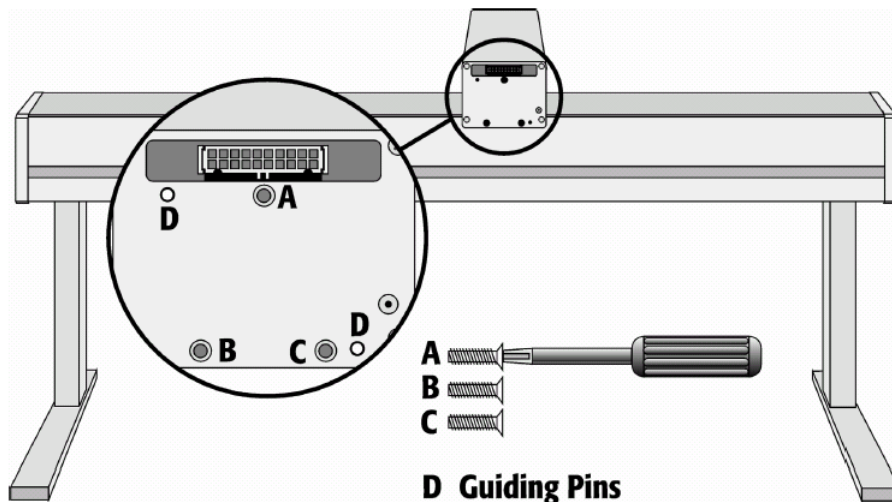


Figure 2-5 Removing Screws from the Injection Unit

2. Place one of the screws onto the end of the TORX T20 driver.
3. Slide the clear plastic cover on the front of the injection unit all the way to the top.
4. Push the flat ribbon cable (from under the rear part of the Y-crossrail) until it protrudes 1 in. (2.5 cm) from the front end of the Y-crossrail, then connect the cable to the corresponding connector on the injection unit (Figure 2-6).

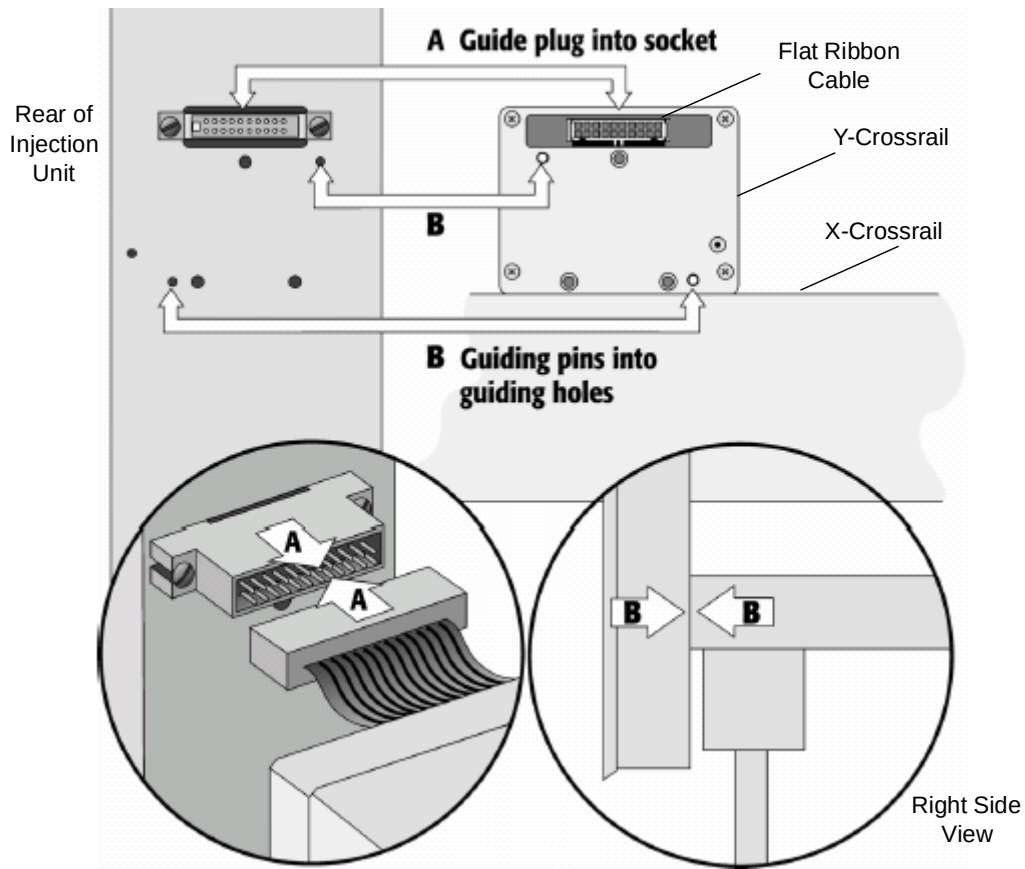


Figure 2-6 Connecting the Flat Ribbon Cable

5. Hold the injection unit in place against the Y-crossrail, pushing it fully to the rear. Make sure the two locating pins on the Y-crossrail fit into the two guiding pin holes on the injection unit.
6. Locate the three large holes in the black anodized frame attached to the Z-crossrail inside the injection unit (Figure 2-7, left). Slide the frame upward until the top hole is centered on the top threaded hole in the end of the Y-crossrail. You can use the small foam block (shipped with the unit) to keep the frame in place. Insert and securely tighten TORX screw A.

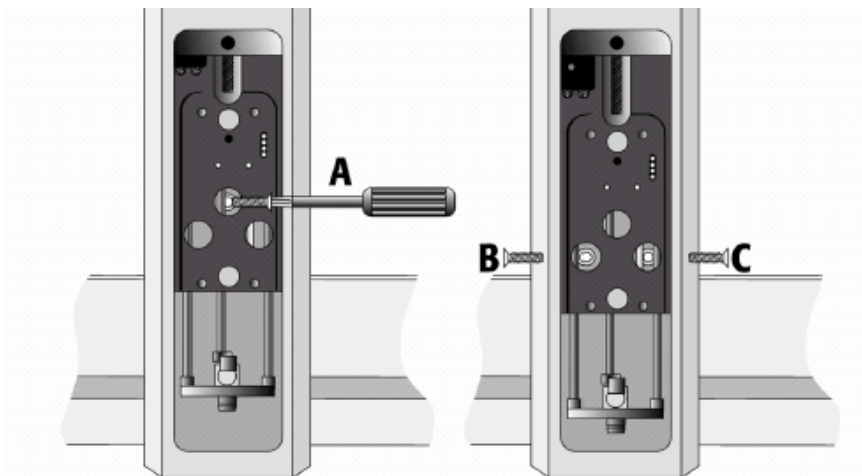


Figure 2-7 Attaching the Injection Unit with TORX Screws

7. Install the two remaining TORX screws B and C in the left and right mounting holes, respectively ([Figure 2-7](#), right). You can use the smallest TORX driver to hold the elastic cord to the left side, while inserting screw C into the right hole. Remove the small foam block. The assembly now looks like [Figure 2-8](#).

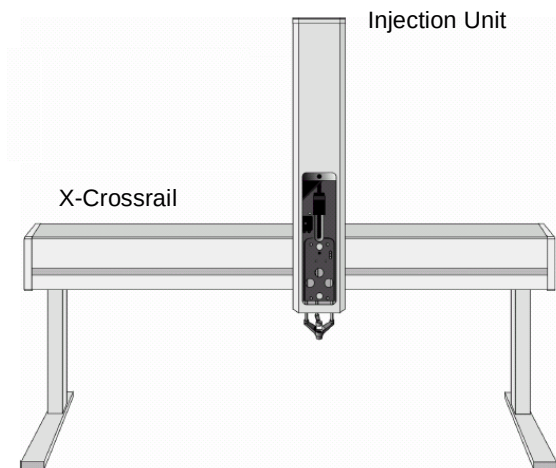


Figure 2-8 2777 Sample Manager with the Injection Unit

2.5.4 Installing the Safety Shield and Keypad

The 2777 Sample Manager has a safety shield to protect you from injury during operation.



Caution: To ensure safe operation of the 2777 Sample Manager, install the safety shield.

You can install the keypad on either the right or left side of the X-crossrail ([Figure 2-9](#)).

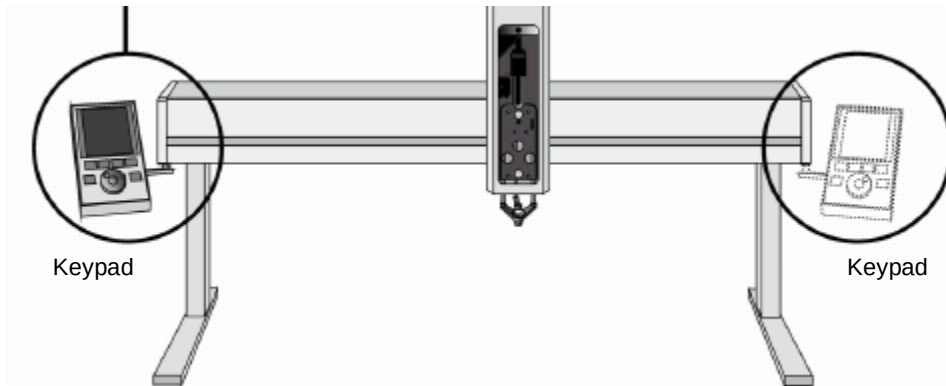


Figure 2-9 Placing the Keypad

To install the safety shield and the keypad:

1. Attach the shield on the left and right sides to the outside of the X-crossrail, just underneath the end, as follows:
 - a. Use the longer screw on the side where you plan to install the keypad.
 - b. Use the shorter screw on the other side.
 - c. Install the arm of the keypad bracket on either the right or left side of the X-crossrail using the longer thumbscrew and one washer ([Figure 2-10](#)).

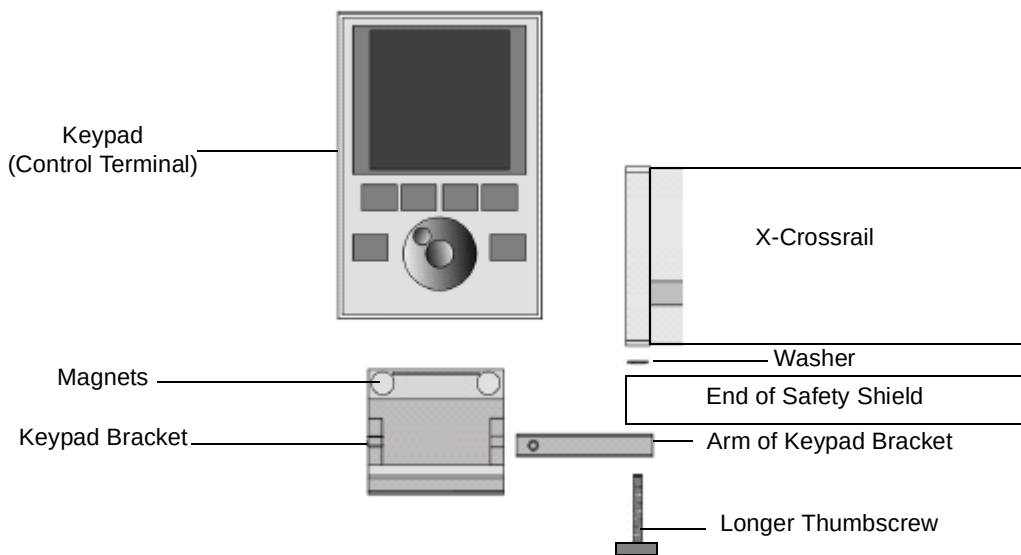


Figure 2-10 Installing the Keypad on the Left Side

2. Connect one end of the white coiled cable to the keypad and the other end to the SER3 interface jack on the rear of the X-crossrail.
3. Place the keypad on the bracket. The lip in the rear of the keypad fits in the groove of the bracket, and magnets hold the keypad on the bracket.

2.6 Making Fluidic Connections

Fluidic connections include the wash station module with solvents, the waste reservoir, and the single injection valve and/or 4-valve module.

2.6.1 Installing the Wash Station Module



Caution: Observe safe laboratory practices when you handle solvents. See the Material Safety Data Sheets published by the manufacturer for the solvents you use.

1. Turn the solvent bottle holder upside down, and remove the two screws from the end.
2. Attach the wash station module (upside down) to the solvent bottle holder using the two screws, then turn the module so that the right side is up (as in [Figure 2-11](#)).

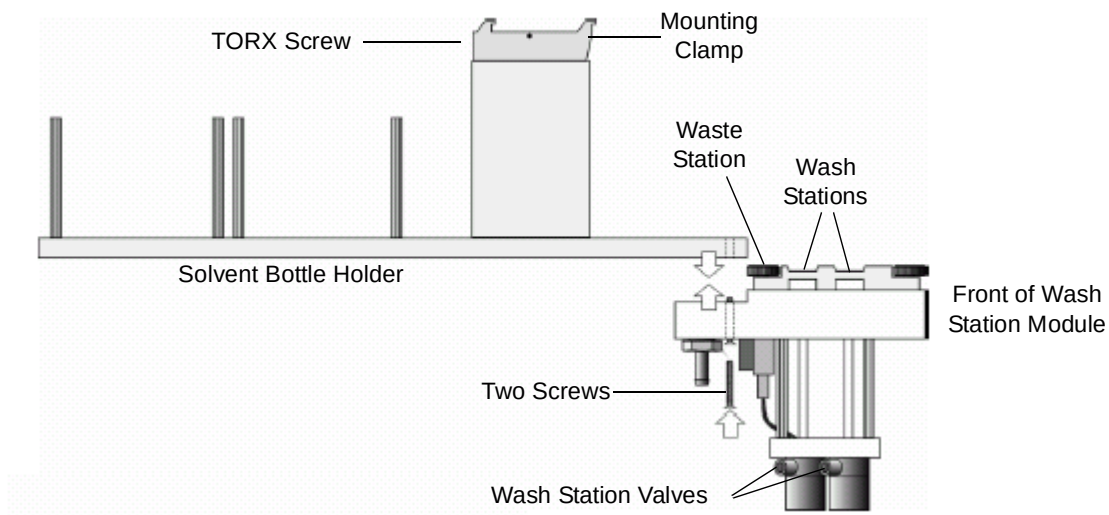


Figure 2-11 Assembling the Wash Station Module (Left Side View)

3. Loosen the screw at the rear of the mounting clamp.
4. Attach the clamp on the wash station module to the grooves underneath the X-crossrail, as closely as possible to the injection valve ([Figure 2-12](#)).

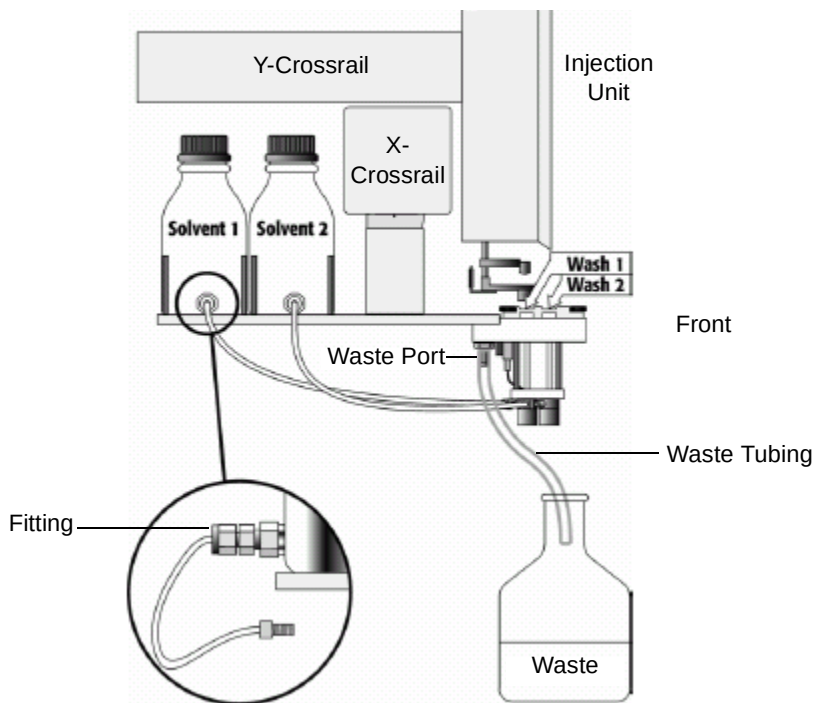


Figure 2-12 Installing the Solvent Bottles (Left Side View)

5. Push the assembly completely to the rear of the crossrail so that the claws in the clamp are tight in the front and back grooves. Tighten the mounting screw.
6. Locate the white Teflon[®] fittings and two lengths of Teflon tubing that connect the wash station valves to the wash solvent bottles.
7. Place the solvent bottles onto their holders and attach the tubing and fittings. If needed, you can loosen the adjustable pin and move it in or out to hold each bottle firmly (Figure 2-13).

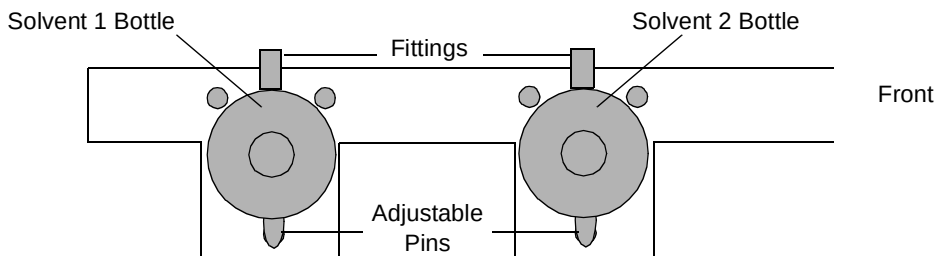


Figure 2-13 Adjusting the Solvent Bottle Pins (Top View)

Note: Close the fittings and fill the solvent bottles with standard HPLC solvents.

8. Attach one end of the supplied transparent Tygon® tubing to the wash station waste port.
9. Place the other end of the tubing in a waste reservoir (not supplied) that is positioned lower than the wash stations. Stretch the tubing to make sure that no waste fluid is trapped before it reaches the waste reservoir.



Attention: To allow waste fluid to drain properly and prevent it from backing up, you must place the waste reservoir in a lower position than the wash station assembly. Ensure that the:

- End of the waste tubing in the waste container always remains above the level of the waste fluid.
- Waste tubing does not get crimped or bent. A crimp or bend in the line may prevent adequate flow to the waste reservoir.
- Waste tubing has a minimum downward slope of 0.5 in. per foot (4.2%) to provide adequate drainage.

10. Connect the control cable between Interface 2 (on the rear of the X-crossrail) and the four-pronged connector on the wash station module (Figure 2-14).

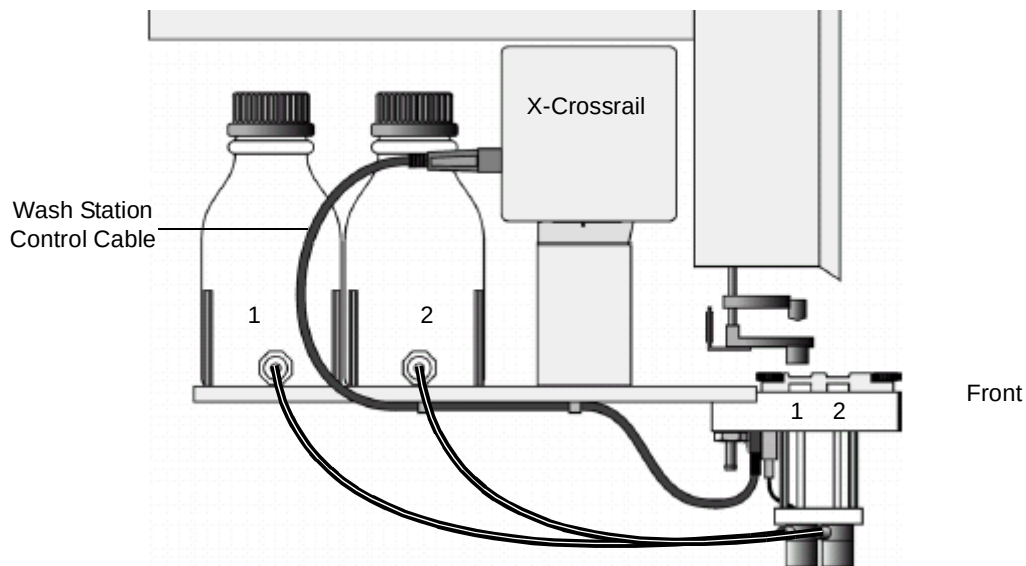


Figure 2-14 Connecting the Control Cable for the Wash Station Module

2.6.2 Installing the Single Injection Valve

The 2777 Sample Manager can be equipped with either the single LC injection valve or 4-valve modules (see [Section 2.6.3](#)). The standard LC injection valve is a 6-port VICI® valve. The injection valve and rotor are already installed on the valve drive.

Note: To minimize dead volume between sample injection point and detection, place the injection valve near the detector.

To install the single injection valve:

1. Place the blue injection valve drive under the X-crossrail ([Figure 2-15](#)).

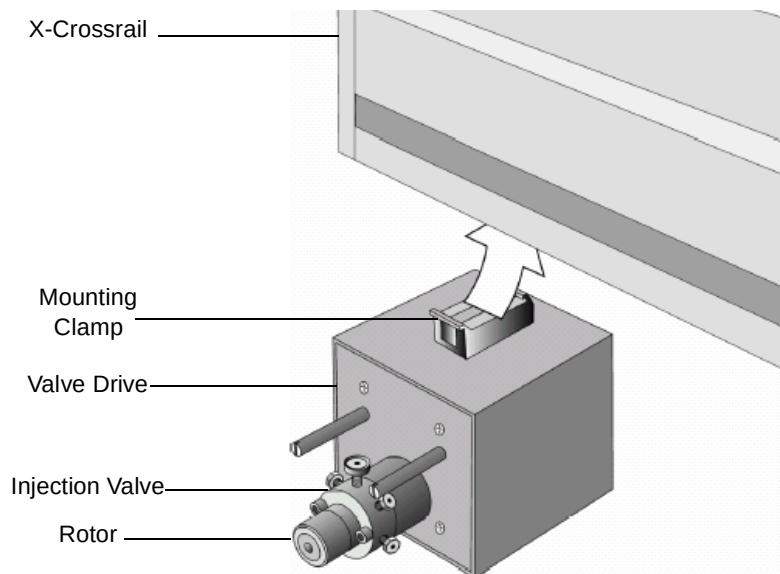


Figure 2-15 Installing the Single Injection Valve

2. Loosen the TORX screw at the rear of the mounting clamp.
3. Attach the valve drive to the X-crossrail and tighten the TORX screw. Inspect the clamp to make sure it is installed correctly.
4. Connect the control cable from the valve drive to AUX1 (auxiliary port 1, on the right side of the rear of the X-crossrail). If you install the injection valve(s) near AUX1, you can use the short control cable. If you install the injection valve on the left side, use the long control cable.

2.6.3 Installing the 4-Valve Module

The 4-valve module offers automated parallel LC/MS analysis, which is required for multiplexed LC/MS interfaces such as the Waters Micromass[®] MUX-technology[™] systems. The 4-valve module consists of four 6-port injection valves. The valves can be loaded serially, and then switched to inject simultaneously. This works in parallel with four LC columns to enhance throughput. The single syringe design allows parallel analysis in random access sampling mode.

Note: *To minimize dead volume between sample injection point and detection, place the injection valve module near the detector.*

To install the 4-valve module:

1. Unpack the components ([Figure 2-16](#)). You also receive the following components:
 - PEEK Tubing Kit
 - Disk or CD with firmware, object list, and Cycle Composer macros

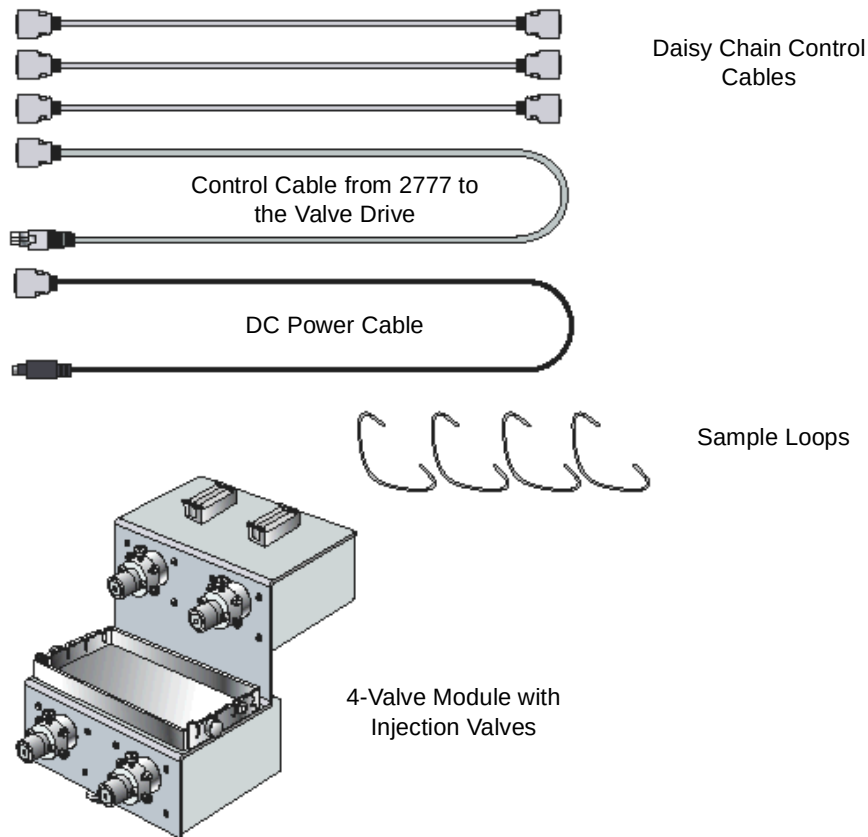


Figure 2-16 Components of the 4-Valve Module

2. Install the 4-valve module on the X-crossrail:
 - a. Position the 4-valve module along the X-crossrail near the detector.
 - b. Loosen each TORX screw at the rear of the mounting clamps on the top of the 4-valve module.
 - c. Attach the two mounting clamps to the grooves underneath the X-crossrail, and tighten the TORX screws. Inspect the clamps to make sure they are installed correctly.
3. Turn the support screw under the middle of the module so that it touches the benchtop and supports the module.



Caution: To avoid electric shock, turn off the instrument and unplug the power cord(s) before performing installation or maintenance procedures.



Attention: To avoid damaging the instrument electronics, turn off the power supply(ies) before connecting or disconnecting any cable to the 2777 Sample Manager.

4. Connect the control cables as follows (Figure 2-17):
 - a. Connect the long cable from SER2 (on the rear of the 2777 X-crossrail) to A (on the rear of valve 1).
 - b. Connect a short cable from B on valve 1 to A on valve 3.
 - c. Connect a short cable from B on valve 3 to A on valve 4.
 - d. Connect a short cable from B on valve 4 to A on valve 2.

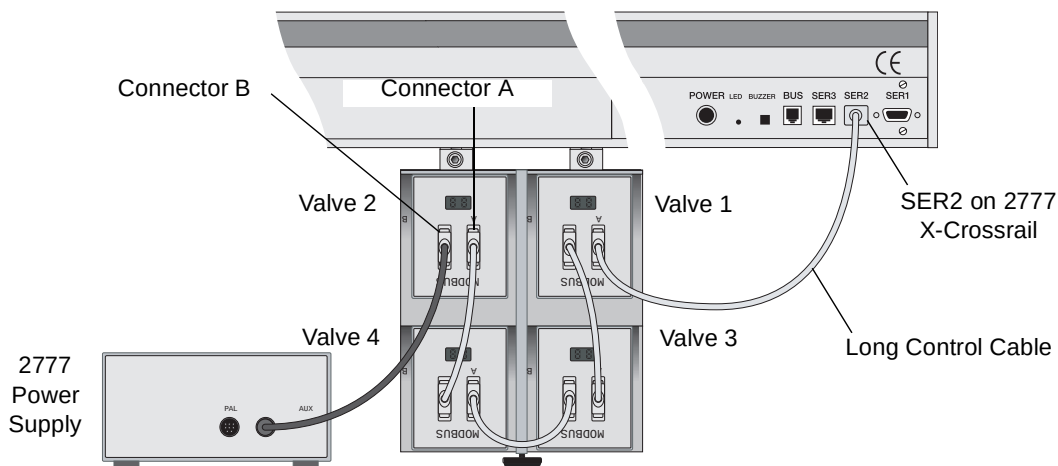


Figure 2-17 Connecting Control Cables to the 4-Valve Module (Rear View)

5. Connect the DC power cable from B on valve 2 to the Aux connector on the 2777 power supply.
6. Install four analytical columns in the column bracket as follows (Figure 2-18):

Note: The location of the column bracket between the upper and lower injection valves minimizes the tube length between valves and columns. The bracket also

contains any solvent leaks. Columns can have a maximum diameter of 15 mm and a maximum length including fittings of 160 mm.

- a. Connect the appropriate type of PEEK tubing to both ends of the columns.

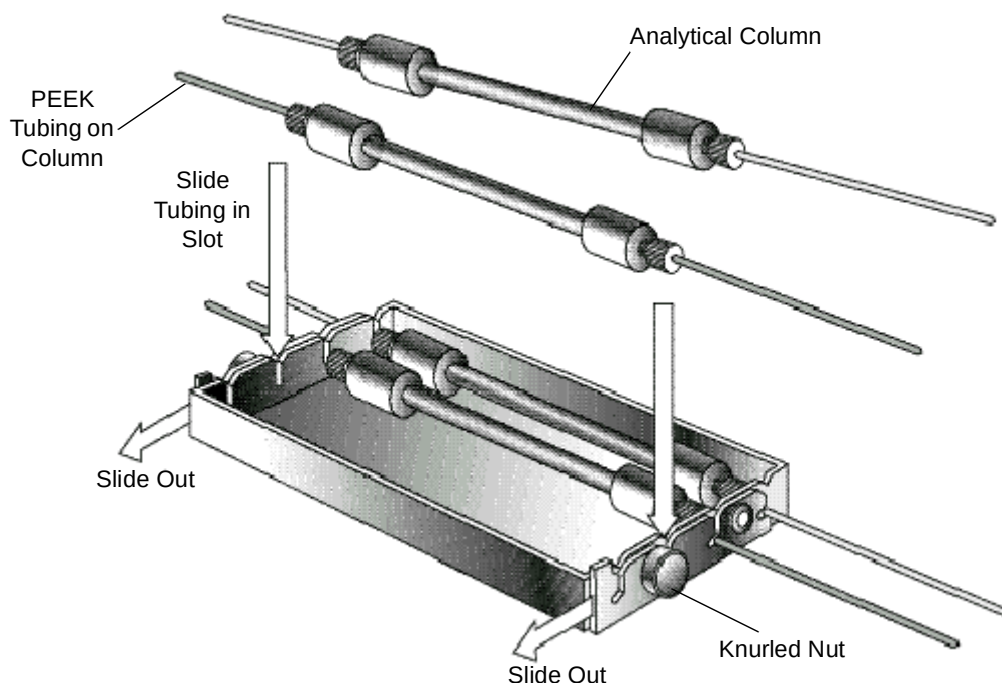


Figure 2-18 Installing Columns in the Column Bracket

- b. Loosen the two knurled nuts at both sides of the bracket and shift the two slides to the front.
- c. Insert the PEEK tubing on both sides of column 1 into the corresponding slots of the bracket.
- d. Repeat step c for columns 2 to 4.
- e. Shift the slides on both sides of the bracket to the rear and fasten the two knurled nuts ([Figure 2-19](#)).

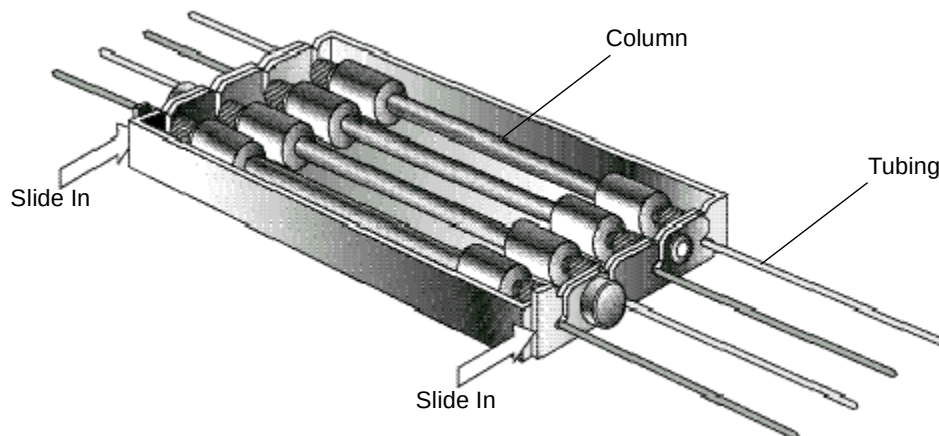


Figure 2-19 Finishing Column Installation

7. Finish installing the HPLC tubing for your application, such as in the following example (Figure 2-20):

- From the pump to a five-way splitter
- From the splitter to injection valves 1 through 4
- From injection valves 1 through 4 to columns 1 through 4, respectively
- From the columns to the Waters Micromass MUX-UV 2488 Detector

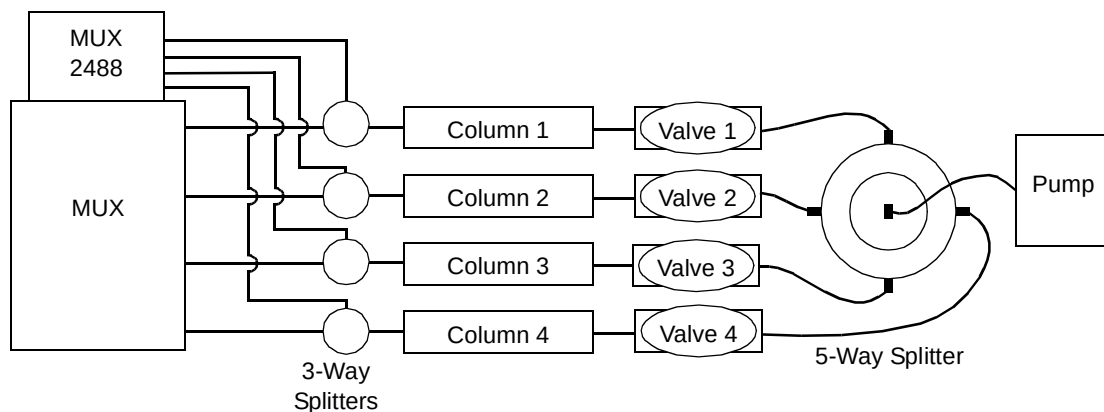


Figure 2-20 Connecting Tubing for the 4-Valve Module

Note: The injection valves and rotors are already installed on each valve.

8. Install a sample loop on each valve (ports 3 and 6; Figure 2-21).

9. To prevent waste from backing up, install a check valve at the waste port (port 2) of each valve (from the MUX interface kit).

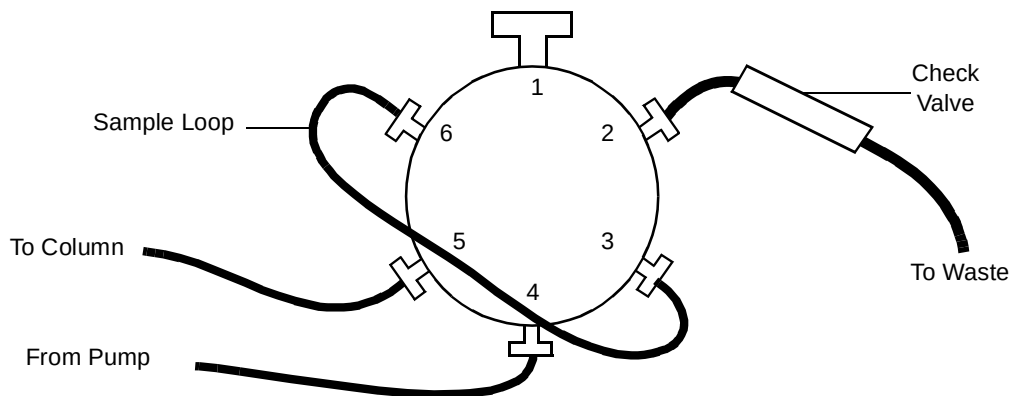


Figure 2-21 Installing Check Valves

2.7 Installing Stacks and Tray Holders

You can install microplate stacks, tray holders, or a heater cooler stack on the 2777 Sample Manager.

Note: You can install the heater cooler stack at one end instead of a supporting leg.

2.7.1 Installing a Microplate Stack

A microplate stack is a tray holder with three or six drawers.

1. Loosen the two TORX screws at the rear of the two mounting clamps on top of the stack ([Figure 2-22](#)).

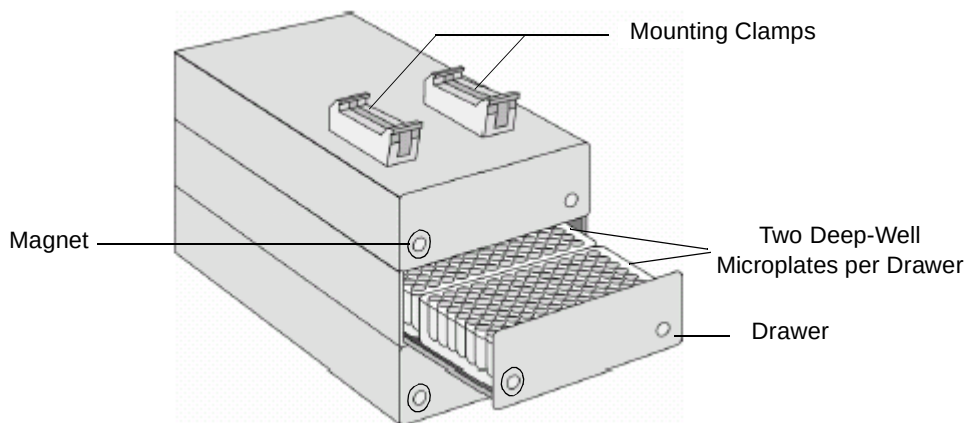


Figure 2-22 Installing a 3-Drawer Microplate Stack

2. Carefully lift the X-crossrail assembly on top of the stack with the mounting clamp teeth fitting into the grooves on the bottom of the X-crossrail.
3. Be sure that the clamps fit completely into the grooves by pushing the stack toward the rear of the X-crossrail. Alternately tighten the two TORX screws (at the rear of each clamp) until the two mounting clamps are firmly in place.
4. Inspect the stack clamps to ensure that they are correctly attached to the X-crossrail (see [Figure 2-4](#)).

Note: To open the drawers, pull the right edge toward you.



Attention: To avoid system damage, make sure the drawers are closed before powering on the instrument.

2.7.2 Installing a Tray Holder

1. Loosen the two TORX screws at the rear of the mounting clamps, which are located on top of the tray holder legs ([Figure 2-23](#)).

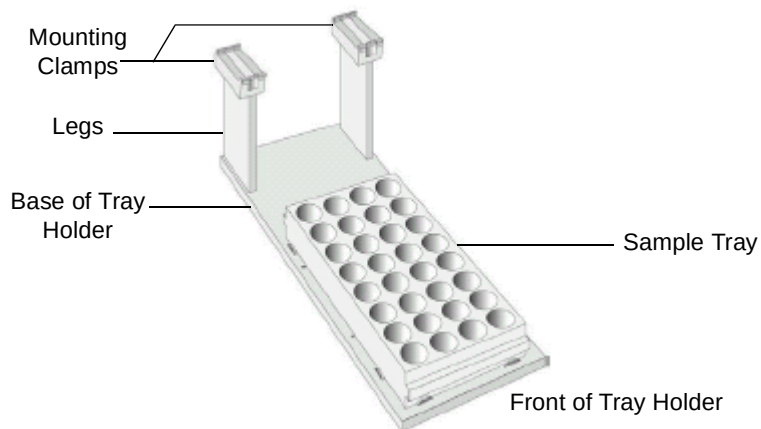


Figure 2-23 Installing a Tray Holder

2. Install the tray holder with the mounting clamp teeth fitting into the grooves underneath the X-crossrail. Place the tray holder near the center of the X-crossrail.
3. Push the tray holder completely to the rear of the crossrail so that the claws of the clamp are tight in the front and rear grooves. Alternately tighten the two TORX screws until the clamps are firmly in place.
4. Carefully inspect the clamps to make sure that they are correctly attached to the X-crossrail (see [Figure 2-4](#)).

2.8 Installing the 2777 Dilutor

Use the 2777 dilutor to dispense liquid before sample injection without user intervention or syringe change. This option combines two separate steps: adding liquid, and then injecting sample. Typical applications are dilutions, derivatizations, sample spiking, or standard additions. Syringes up to 5 mL allow you to use large dilution ratios.

The dilutor can be used with any 2777 Sample Manager that has a side-slitted injection unit. One AUX port must be available.

The Cycle Composer software controls the dilutor. The dilutor operates with PAL firmware version 2.4.0 or later and Cycle Composer software version 1.4 or later. The 2777 Sample Manager is shipped with Cycle Composer software already installed. For specifications, see [Table A-5](#).

Figure 2-24 shows the installation procedure for the dilutor.

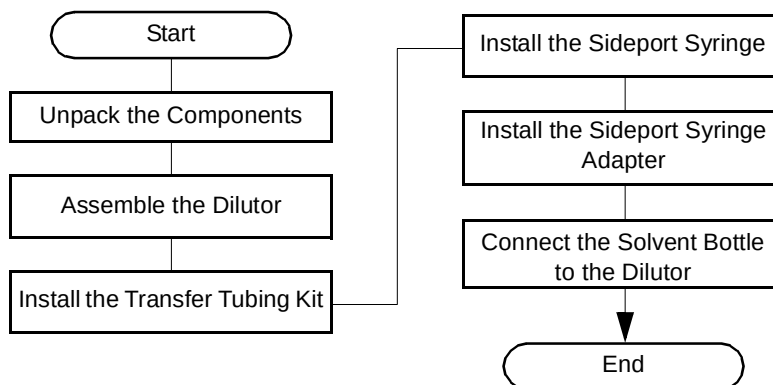


Figure 2-24 Installing the Dilutor

2.8.1 Unpacking Components

The components of the dilutor option are shipped in one box. Unpack the contents and compare them to [Figure 2-25](#) for completeness.

A dilutor syringe must be installed on the dilutor module. The dilutor can use the following dilutor syringe sizes:

- 1.0 mL
- 2.5 mL (standard)
- 5.0 mL
- 10 mL

A sideport syringe in its adapter must be installed in the injection unit. The dilutor can use the following sideport syringe sizes:

- 20- μ L sideport syringe
- 80- μ L sideport syringe (standard)

Note: You can use either sideport syringe with all dilutor syringes.

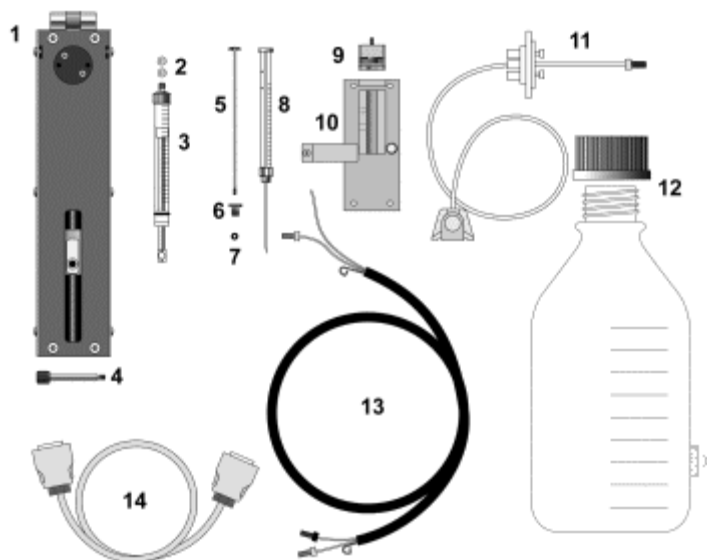


Figure 2-25 Dilutor Components

1. Dilutor module
2. PTFE dilutor syringe washer (two pieces)
3. Dilutor syringe
4. Dilutor syringe screw
5. Sideport syringe plunger
6. Plunger sealing screw
7. Perfluor O-ring
8. Sideport syringe with removable needle
9. Sideport syringe plunger holder
10. Sideport syringe adapter
11. Solvent bottle transfer line including PEEK solvent filter, 10 mm
12. Solvent bottle with cap
13. Transfer tubing kit
14. Dilutor module connection cable

2.8.2 Assembling the Dilutor

Install the dilutor near the left end of the X-crossrail.

1. Turn the dilutor module upside down and insert one washer into the lower dilutor solenoid valve port.
2. Carefully screw the dilutor syringe into the lower solenoid valve port and tighten it firmly ([Figure 2-26](#)).

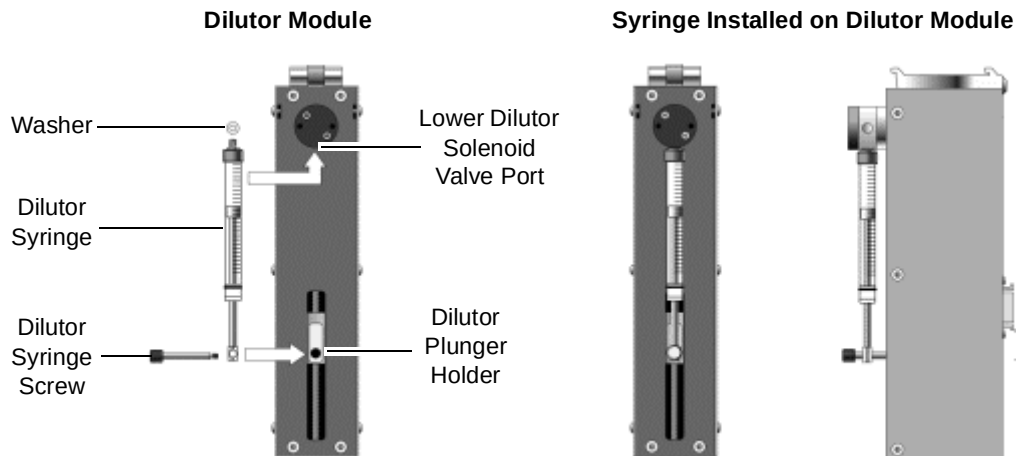


Figure 2-26 Installing the Dilutor Syringe on the Dilutor Module

3. Insert the dilutor syringe screw into the syringe barrel hole, and screw it into the dilutor plunger holder.
4. Install the dilutor module with the mounting clamp teeth fitting into the grooves on the bottom of the X-crossrail ([Figure 2-27](#)). Mount the dilutor at the left end of the X-crossrail. Be sure that the clamp fits completely into the grooves. Tighten the TORX screw until the mounting clamp is firmly in place.

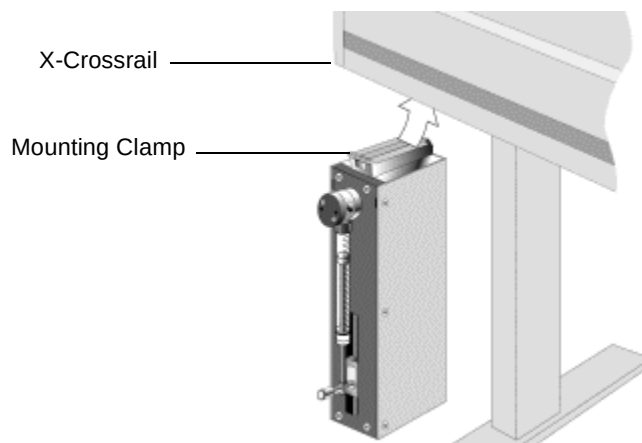


Figure 2-27 Attaching the Dilutor to the X-Crossrail

5. Make sure the mounting clamp is correctly attached to the X-crossrail (see [Figure 2-4](#)).

2.8.3 Installing the Transfer Tubing Kit

1. Unscrew the left-top TORX screw from the dilutor cover ([Figure 2-28](#)).
2. Locate the end with one connection fitting of the transfer tubing kit.

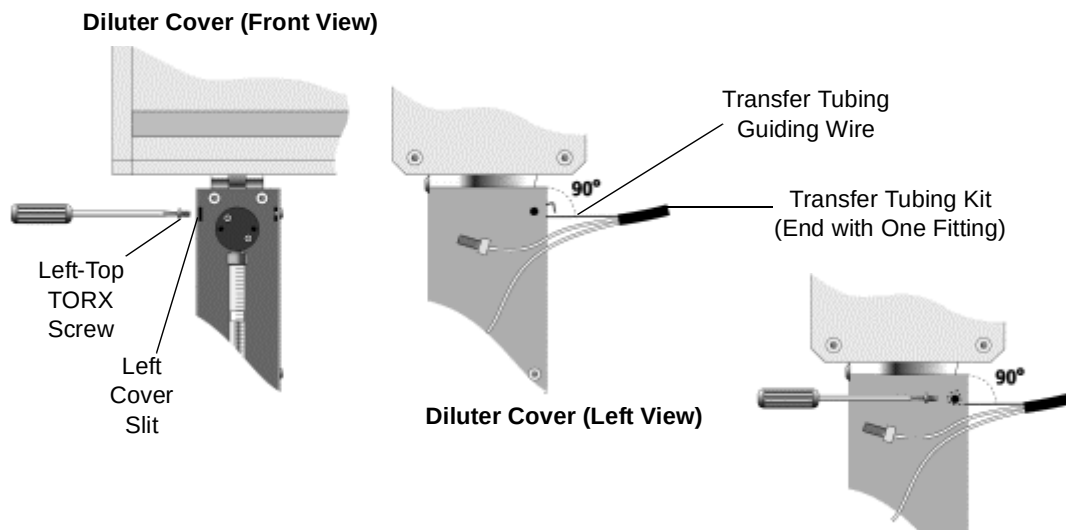


Figure 2-28 Attaching the Transfer Tubing Kit to the Dilutor Module

3. Insert the transfer tubing guiding wire into the left cover slit.
4. Adjust the guiding wire in a 90° angle to the dilutor cover and tighten the cover TORX screw again firmly.
5. Connect the white connection fitting to the left port of the dilutor solenoid valve.
6. Open the TORX screw at the guiding bracket of the sideport syringe adapter (Figure 2-29).

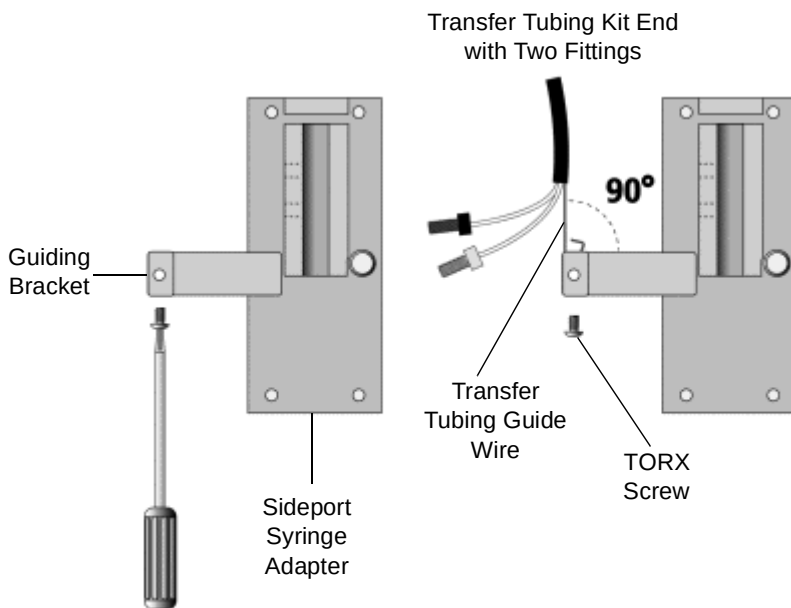


Figure 2-29 Attaching the Transfer Tubing Kit to the Sideport Syringe Adapter

7. Locate the transfer tubing kit end with two connection fittings.
8. Insert the transfer tubing guiding wire into the guiding bracket slit.
9. Adjust the guiding wire in a 90° angle to the bracket and tighten the TORX screw firmly (Figure 2-29).

2.8.4 Installing the Sideport Syringe

1. Insert the sideport syringe without a plunger into the syringe adapter (Figure 2-30). Make sure the syringe side holes open to the left side.

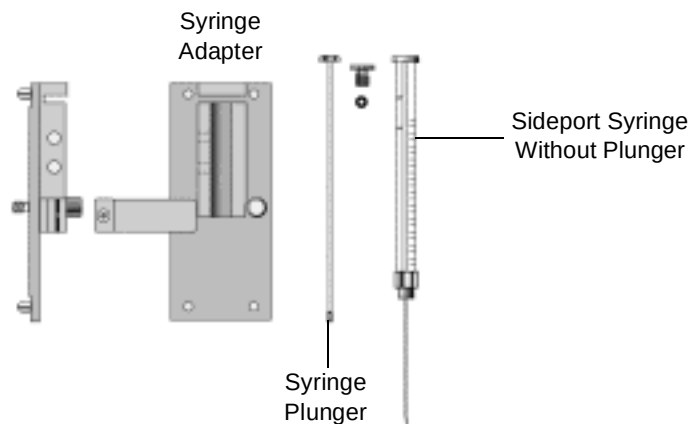


Figure 2-30 Installing the Sideport Syringe in the Adapter

2. Locate the black connection fitting and screw it into the upper connection thread (Figure 2-31).

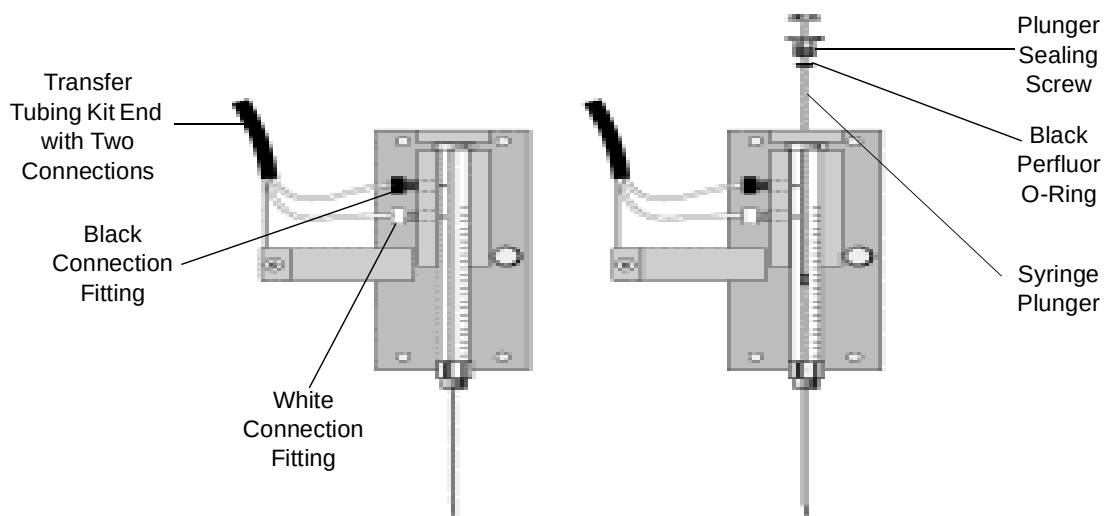


Figure 2-31 Installing the Sideport Syringe

3. Locate the white connection fitting and screw it into the lower connection thread.
4. Place the plunger sealing screw over the syringe plunger.
5. Place the black Perfluor O-ring over the syringe plunger.

6. Insert the plunger into the sideport syringe and carefully screw the plunger sealing screw into the syringe adapter bracket.

Note: Do not overtighten the plunger sealing screw. Check the plunger friction by manually moving the plunger up and down. Loosen the plunger sealing screw if too much friction is applied.

2.8.5 Installing the Sideport Syringe Adapter

1. Make sure the tubing kit connection fittings and the guiding wire are attached properly to the sideport syringe adapter, and the syringe plunger is inserted in the sideport syringe.



Caution: To avoid electric shock, turn off the instrument and unplug the power cord(s) before performing installation or maintenance procedures.



Attention: To avoid damaging the instrument electronics, turn off the power supply(ies) before connecting or disconnecting any cable to the 2777 Sample Manager.

2. Turn off the power supplies.
3. Screw the sideport syringe plunger holder into the injection unit slider (Figure 2-32).

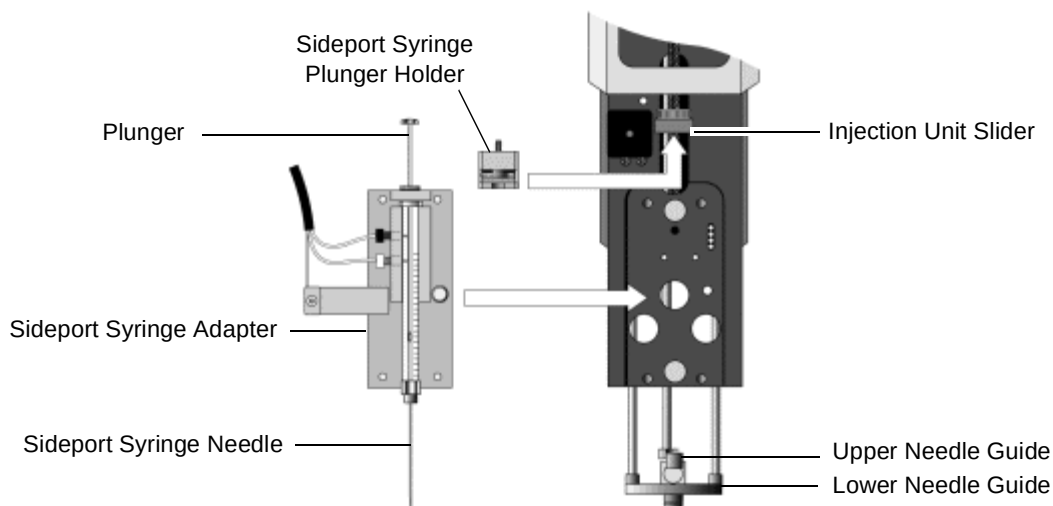


Figure 2-32 Installing the Sideport Syringe Plunger Holder

4. Ensure that the syringe is in the appropriate syringe adapter (see [Section 2.8.4](#)). Pull out the plunger to approximately 20% of its length.
5. If necessary, loosen the plunger retaining screw in the plunger holder.
6. Move the syringe, installed in the syringe adapter, partially into the injection unit. Guide the needle first into the upper needle guide and then into the lower needle guide ([Figure 2-33](#)).

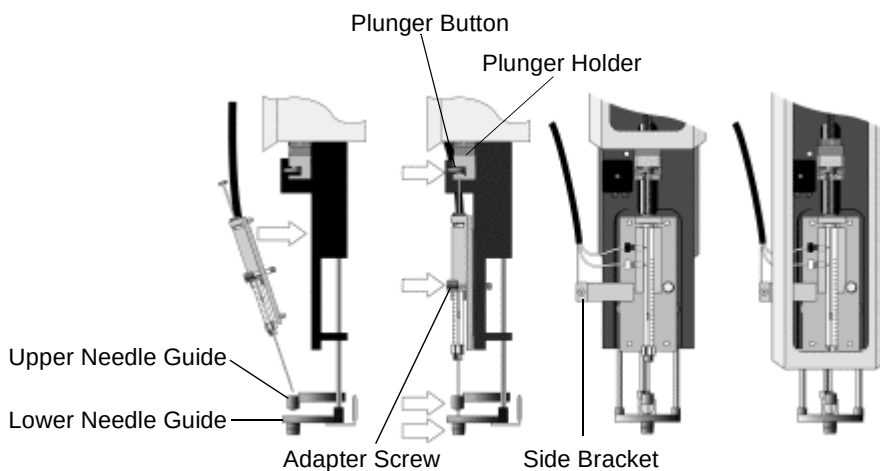


Figure 2-33 Installing the Sideport Syringe Adapter

7. Guide the side bracket of the sideport syringe adapter through the left injection unit slit.
8. Place the plunger button in the plunger holder. Allow the syringe adapter to click into place by magnetic force against the syringe carrier.
9. Tighten the plunger retaining screw against the plunger button.
10. Tighten the sideport syringe adapter screw against the black injection unit slider.
11. When all other components are ready, turn on the power supply. During initialization, the plunger moves down until it hits the mechanical stop. This position is stored as the syringe's zero volume position.



Attention: To avoid damaging the instrument, check the needle penetration in the LC valve after replacing a sideport syringe (see [Section 2.12.3](#)).

2.8.6 Connecting the Solvent Bottle to the Dilutor

1. Attach the PEEK solvent filter to the solvent transfer line and insert the filter into the solvent bottle (Figure 2-34).

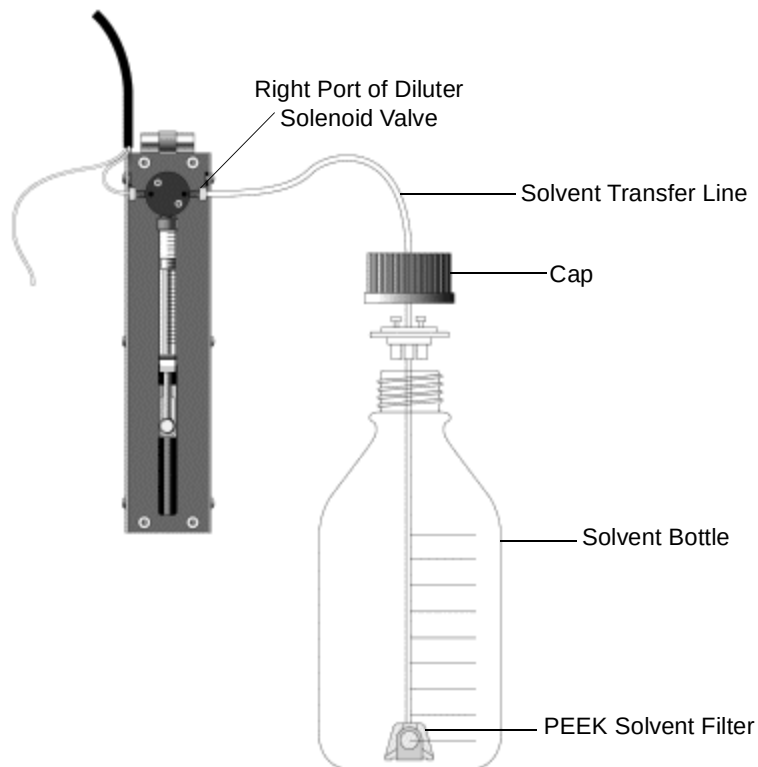


Figure 2-34 Connecting the Solvent Bottle

2. Connect the other end of the solvent line to the right port of the dilutor solenoid valve.
3. Fill the solvent bottle with solvent (not supplied).
4. Close the solvent bottle with the blue cap.
5. Adjust the solvent filter close to the solvent bottle bottom.

2.8.7 Connecting the Dilutor to the X-Crossrail



Attention: To avoid damaging the instrument electronics, turn off the power supply(ies) before connecting any cable to the 2777 Sample Manager.

1. Connect one end of the dilutor module connection cable to the AUX2 or AUX connector at the rear of the X-crossrail ([Figure 2-35](#)).
2. Connect the other end to the connector at the rear of the dilutor module.

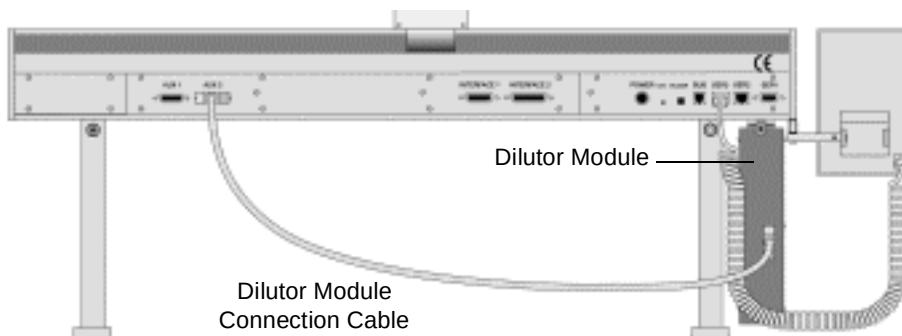


Figure 2-35 Connecting the Dilutor Module Connection Cable

The dilutor utility functions provide quick access to dilutor parameters that you may need to change (such as prime function or syringe plunger speeds).

- For setup and operation, see [Section 3.4](#).
- To access the dilutor utility functions, see [Section 3.3.6](#).

Note: The dilutor must be installed and set up properly before you can use the utility functions.

2.9 Making Electrical and Signal Connections



Caution: To avoid electric shock, turn off the instrument and unplug the power cord(s) before performing installation or maintenance procedures.



Attention: To avoid damaging the instrument electronics, turn off the power supply(ies) before connecting or disconnecting any cable to the 2777 Sample Manager.

2.9.1 Checking Cable Connections

Before powering on the 2777 Sample Manager, make sure the cables for the LC injection valve, wash station module, keypad, and options are correctly connected to the rear of the X-crossrail (Figure 2-36).

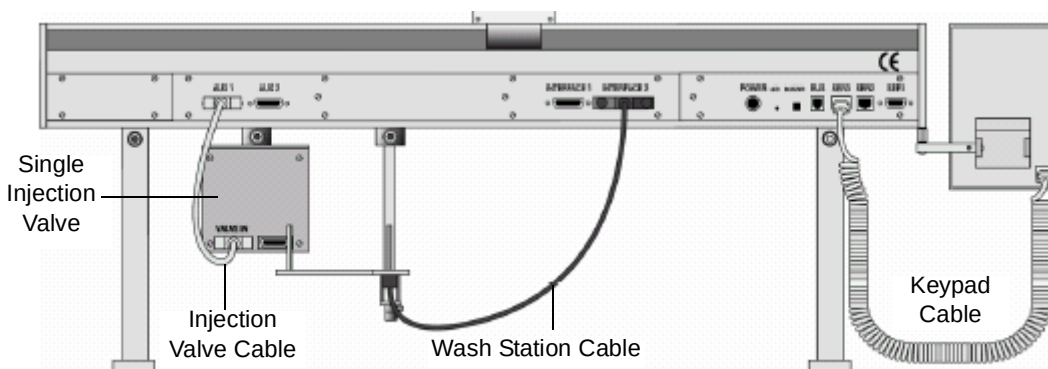


Figure 2-36 Checking Standard 2777 Sample Manager Connections

Table 2-2 Summary of Cable Connections

Component	Standard 2777 Connector	Compact 2777C Connector
LC injection valve (single valve)	AUX1	AUX
Dilutor module (optional)	AUX2	Not available
Open	INTERFACE 1	INTERFACE
Wash station	INTERFACE 2 ^a	WASH STATION
Power supply (has cable to local outlet)	POWER	POWER
Keypad	SER3	SER3
4-valve module (optional)	SER2	SER2
PC	SER1	SER1

a. If your instrument has a WASH STATION connection, connect the wash station cable to it.

2.9.2 Connecting the Power Supply

The 2777 Sample Manager and the optional heater cooler stack have separate power supplies.



Attention: To avoid damaging the instrument, turn off all power supplies when you install or maintain the instrument.

1. Place the 2777 power supply in a location where the power switch is accessible and easy to operate, and where it is possible to unplug the AC power cord from the power supply in case of an emergency.
2. Set the power supply switch to the OFF position (O).
3. Connect one end of the DC power cable to the PAL connector on the 2777 power supply and the other end to the power connector at the rear of the X-crossrail.
4. Connect the female end of the AC power cable to the 2777 power supply, then connect the male end to an AC power outlet.
5. If you have a heater cooler stack, connect its cable from the heater cooler stack to the LED and power supply module for the heater cooler stack.



Attention: To prevent crashes, make sure the drawers are closed before powering on the instrument.

6. Set the power supply switches for the 2777 and heater cooler stack (if installed) to the ON position. You can turn on the power supplies in any order. The model name, 2777 Sample Manager, and the software or firmware version number appear on the keypad, followed by the Job Queue screen.

To control the 2777 Sample Manager locally using the keypad, see [Section 2.10](#). To control the 2777 Sample Manager as part of the MassLynx system, see the *MassLynx Help*.

2.10 Using the Keypad

Use the keypad to control the 2777 Sample Manager locally.

2.10.1 Screens

Depending on the 2777 operating state and the particular function being accessed, different screens appear on the keypad (control terminal). All screens have the same basic format ([Figure 2-37](#)).

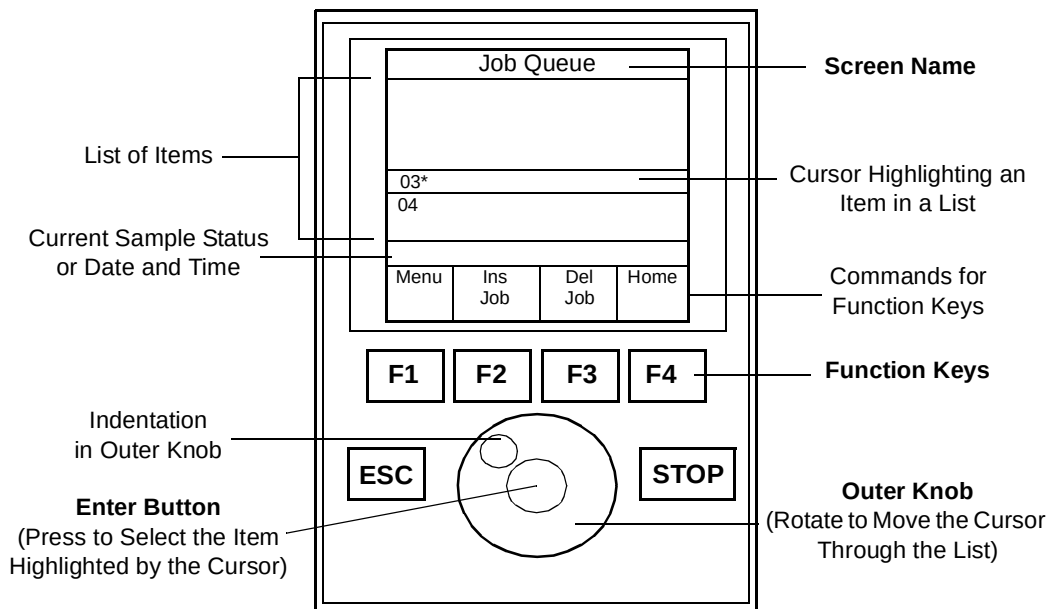


Figure 2-37 2777 Keypad

2.10.2 Function Keys

Functions or commands for a particular screen are assigned to the corresponding function keys (F1, F2, F3, and F4) directly below each function key label. Selecting the function key defined as home (F4) displays the Job Queue screen.

2.10.3 ESC and STOP Keys

Press the ESC (escape) key to return to the previous menu without saving your changes (unless you already pressed the Enter button).

Press the STOP key to abort the current cycle, job, or job queue.

2.10.4 Scroll Knob and Enter Button

To scroll through items in a list, rotate the outer knob. To select a highlighted item, press the central knob (Enter button), then use the outer knob to scroll through available options for that item or to change a numeric value. Press the Enter button again to select the selected option or value. The Enter button is also used for other operations that require an Enter operation to continue or complete an operation.

To select the commands and parameters, this guide uses the following convention:

Select F1 Menu > Setup > Objects > Tray Holders.

This indicates the following sequence:

1. Select the Menu function key by pressing F1.
2. Turn the outer knob clockwise to scroll to Setup and press the Enter button.
3. Turn the outer knob clockwise to scroll to Objects and press the Enter button.
4. Turn the outer knob clockwise to scroll to Tray Holders and press the Enter button.

2.11 Defining Reference Positions of Objects

All objects must be defined before you use the 2777 Sample Manager. Objects are the components you installed on the X-crossrail. You must also define other devices connected to 2777 Sample Manager using the signal connectors (see [Section 2.11.7](#)).

You must accurately define the reference position for each object installed on the X-crossrail, so that the syringe will move to the correct physical location without crashes. Make sure the stack(s), tray holder(s), valve(s), wash station module, and dilutor (if installed) are properly mounted to the X-crossrail before defining the reference positions, and that all cables and tubing are pushed away from the paths of the injection unit.

You must define the reference positions for the following 2777 objects:

- **Tray holder(s), stack(s), and heater cooler stack** – Each installed component

- **Injection valve(s)** – One valve in the single injection valve, and four valves in the 4-valve module
- **Wash ports** – Two in the wash station module
- **Waste port** – One in the wash station module

[Appendix C, Software Maps and Connections](#), shows you how to access the parameters for the objects you need to define. [Table C-1](#) through [Table C-5](#) contain specific pin and signal information for each external connector.

2.11.1 Naming Trays, Types, and Holders

Use the following standard naming conventions for 2777 trays, tray types, and tray holders. These conventions allow the 2777 Sample Manager to be preconfigured for certain applications, simplify software backups and application development, and improve technical support and training.

- **MT96** – Standard 96-position microplates
- **DW96** – Deep-well 96-position microplates
- **MT384** – High-density 384-position microplates
- **VT200** – Sample tray, 200 positions (10 × 20) for 7-mm microvials, 1.0 mL
- **VT98** – Sample tray, 98 positions (7 × 14) for 12-mm vials, 2.0 mL
- **VT78** – Sample tray, 78 positions (6 × 13) for 7-mm microvials, 1.0 mL (opposite side of 98-position tray)
- **VT54** – Sample tray, 54 positions (6 × 9) for 12-mm vials, 2.0 mL



Caution: To avoid damaging the 2777 Sample Manager or injuring yourself, perform the following procedures carefully. Keep your hands away from the injection unit during setup and operation. Do not remove the safety shield.

2.11.2 Defining a Tray Holder

1. From the Job Queue screen, select F1 Menu > Setup > Objects > Tray Holders.
2. Scroll to a predefined *Named_Tray_Holder* (for example, THldr1), then press Enter. The Tray Holder: THldr1 screen appears with current values for the X/Y/Z position ([Figure 2-38](#)).

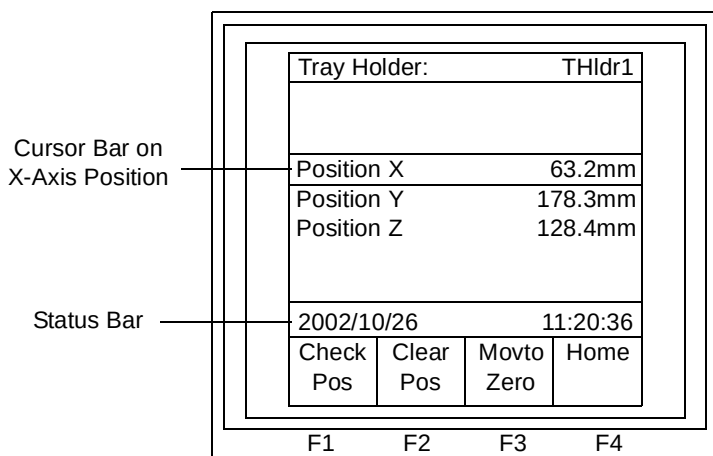


Figure 2-38 Tray Holder: THldr1 Screen

3. Press Enter to select Position X. The Position X value is highlighted, the syringe moves to the predefined position on the X-crossrail, and the allowed values for the parameter appear in the status bar (Figure 2-39).

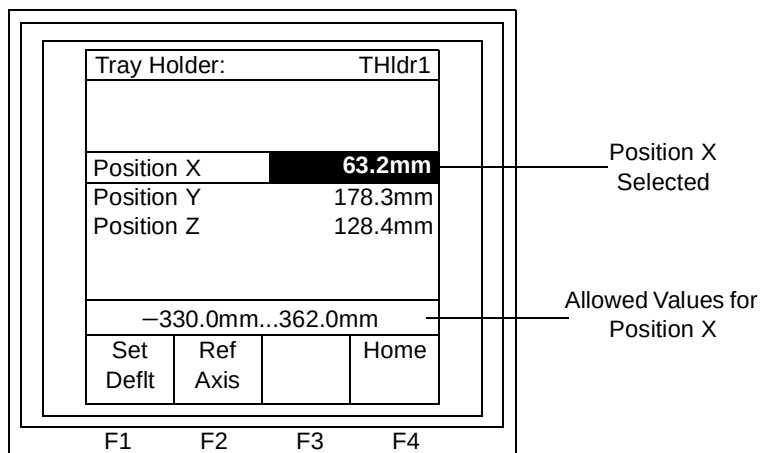


Figure 2-39 Tray Holder: THldr1 Screen After Selecting Position X

4. Center the lower needle guide in the reference position (the hole in the base plate of the holder, Figure 2-40) as follows:
 - a. Rotate the outer knob to move the lower needle guide to the reference position. Observe the movement carefully as you center the lower needle guide over the hole.

- b. When the lower needle guide looks centered, press Enter to save the Position X value.

Note: If you press ESC instead of Enter, the value is not saved.

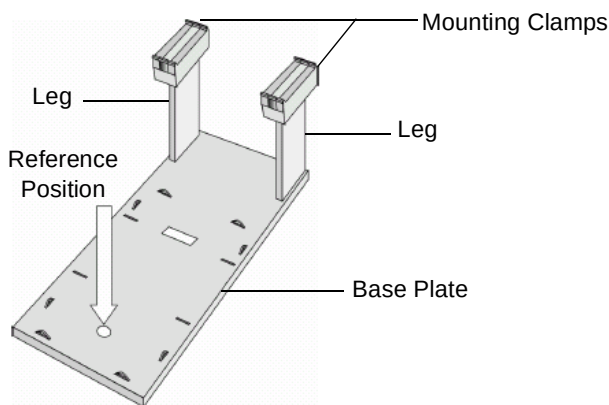


Figure 2-40 Tray Holder Reference Position

5. Repeat steps 3 and 4 for Position Y and Position Z.

The reference position for the tray holder is a hole slightly larger than the lower needle guide in the base plate of the tray holder. Center the lower needle guide in the hole (X and Y directions) with the bottom of the needle guide flush with the bottom of the base plate (Z direction).

6. Select F3 Movto Zero. The injection unit moves to the home position (0, 0, 0 at the center of the X-crossrail).
7. Select F1 Check Pos. The syringe moves to the defined X/Y/Z position.
8. If the syringe moves to the incorrect position, repeat steps 3 through 7.
9. Repeat steps 3 through 8 for all tray holders.
10. If you are installing the instrument for the first time, continue with the next section. If not, select F4 Home. The syringe moves to the home position and the Job Queue screen reappears.

2.11.3 Defining a Stack with Six or Three Drawers

The reference position for a 6-drawer stack is a hole located in the second drawer from the top (Figure 2-41, left). For a 3-drawer stack, the reference position is in the top drawer (Figure 2-41, right). The reference position for a 3-drawer heater cooler stack is the same as that for a 3-drawer stack. In all stacks, center the lower needle guide in the reference hole (in the X and Y directions), with the bottom of the needle guide flush with the bottom of the drawer (in the Z direction).

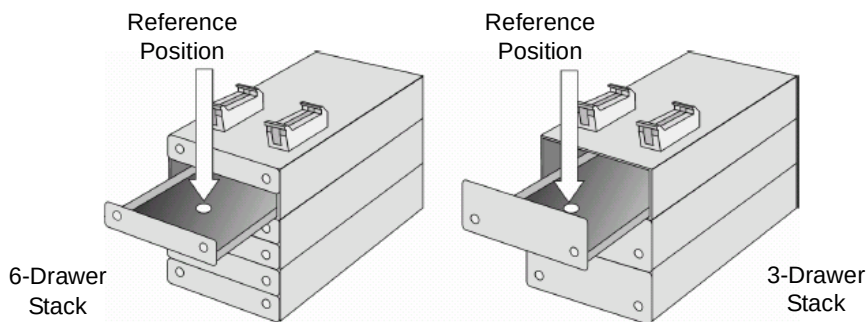


Figure 2-41 Stack Reference Positions

To define a stack or heater cooler stack:

1. From the Job Queue screen, select F1 Menu > Setup > Objects > Tray Holders. The installed stack(s) appear (for example, Stack1).
 2. If more than one stack appears, scroll to a stack, then press Enter. The Tray Holder: Stack1 screen displays the X/Y/Z position for the selected stack.
 3. Select Position X, then press Enter. The syringe moves to the predefined X-axis position and the allowed values for the parameter appear in the status bar. Center the lower needle guide in the reference hole (Figure 2-41) as follows:
 - a. Rotate the outer knob to move the lower needle guide to the reference position. Observe the movement carefully as you center the lower needle guide over the hole.
 - b. When the lower needle guide looks centered, press Enter to save the Position X value.
- Note:** If you press ESC instead of Enter, the value is not saved.
4. Repeat steps 3 and 4 for Position Y and Position Z.
 5. Select F3 Movto Zero. The injection unit moves to the home position.

6. Select F1 Check Pos. The syringe moves to the defined X/Y/Z position.
7. If the syringe moves to the incorrect position, repeat steps 3 through 7.
8. Repeat steps 3 through 8 for all stacks and heater cooler stacks.
9. If you are installing for the first time, continue with the next section. If not, select F4 Home. The syringe moves to the home position and the Job Queue screen reappears.

2.11.4 Defining Wash Stations

The reference positions for the two wash stations are the holes above the wash station glass liners (see Wash 1 and Wash 2 in [Figure 2-42](#)). Center the lower needle guide in each hole (in the X and Y directions), with the bottom of the lower needle guide lightly touching the surface of the wash station module (in the Z direction).

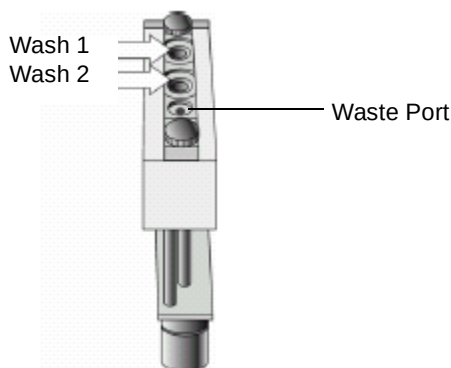


Figure 2-42 Wash Station Reference Positions

1. From the Job Queue screen, select F1 Menu > Setup > Objects > Wash Stations. The Wash Stations screen appears.
2. Select Wash1, then press Enter. The Wash Stat: Wash1 screen displays the X/Y/Z position and the needle penetration value for the Wash 1 port.
3. Select Position X, then press Enter. The syringe moves to the predefined X-axis position, and the allowed values for the parameter appear in the status bar.
4. Center the lower needle guide in the reference hole as follows:
 - a. Rotate the outer knob to move the lower needle guide to the reference position. Observe the movement carefully as you center the lower needle guide over the hole.
 - b. When the lower needle guide looks centered, press Enter to save the Position X value.

Note: If you press *ESC* instead of *Enter*, the value is not saved.

5. Repeat steps 3 and 4 for Position Y and Position Z.
6. Select F3 Movto Zero. The injection unit moves to the home position.
7. Select F1 Check Pos. The syringe moves to the defined X/Y/Z position.
8. If the syringe moves to the incorrect position, repeat steps 3 through 7.
9. Repeat steps 3 through 8 for the Wash 2 port.
10. If you are installing the instrument for the first time, continue with the next section. If not, select F4 Home. The syringe moves to the home position and the Job Queue screen reappears.

2.11.5 Defining the Waste Port

The reference position for the waste port is a hole slightly larger than the needle guide in front of Wash 2 (see Waste Port in [Figure 2-42](#)). Center the lower needle guide in the reference hole (in the X and Y directions), with the bottom of the lower needle guide lightly touching the surface of the wash station module (in the Z direction).

Note: The Waste Port position represents an injector within the 2777 software (see [Section 2.12](#) to install and prime the syringe and [Appendix C](#) for software maps and connections) and is defined in the Injectors object class.

1. From the Job Queue screen, select F1 Menu > Setup > Objects > Injectors.
2. Scroll to Waste, then press Enter. The Injector: Waste screen appears with the X/Y/Z positions and the needle penetration value.
3. Select Position X, then press Enter. The syringe moves to the predefined X-axis position, and the allowed values appear in the status bar.
4. Center the lower needle guide in the reference hole (see [Figure 2-42](#)) as follows:
 - a. Rotate the outer knob to move the lower needle guide to the reference position. Observe the movement carefully as you center the lower needle guide over the hole.
 - b. When the lower needle guide looks centered, press Enter to save the Position X value.

Note: If you press *ESC* instead of *Enter*, the value is not saved.

5. Repeat steps 3 and 4 for Position Y and Position Z.
6. Select F3 Movto Zero. The injection unit moves to the home position.
7. Select F1 Check Pos. The syringe moves to the defined X/Y/Z position.

8. If the syringe moves to the incorrect position, repeat steps 3 through 7.
9. If you are installing for the first time, continue with the next section. If not, select F4 Home. The syringe moves to the home position and the Job Queue screen reappears.

2.11.6 Defining the Injection Valves

The reference position for an LC injection valve is the fitting of the valve needle guide mounted on the top valve port ([Figure 2-43](#)). You must define all four injection valves for the 4-valve module.

1. From the Job Queue screen, select F1 Menu > Setup > Objects > Injectors.
2. Select an injector (LC Vlv1 for the single-valve instrument, or LC Vlv1 through LC Vlv4 for the 4-valve module), then press Enter. The X/Y/Z position for the selected injector appears.
3. Select Position X, then press Enter. The syringe moves to the predefined X-axis position and the allowed values for the parameter appear in the status bar.
4. Center the lower needle guide in the reference position (the hole in the valve needle guide fitting of Port 1, [Figure 2-40](#)) as follows:
 - a. Rotate the outer knob to move the lower needle guide to the reference position. Observe the movement carefully as you center the lower needle guide over the hole.
 - b. When the lower needle guide looks centered, press Enter to save the Position X value.

Note: *If you press ESC instead of Enter, the value is not saved.*

5. Repeat steps 3 and 4 for Position Y and Position Z.

Note: *Adjust Position Z so that the bottom of the lower needle guide is just touching the surface of the valve needle guide fitting, then reduce the value by 0.5 mm.*

6. Select F3 Movto Zero. The injection unit moves to the home position.
7. Select F1 Check Pos. The syringe moves to the defined X/Y/Z position.
8. If the syringe moves to the incorrect position, repeat steps 3 through 7.

Port 1 of the Injection Port LC Valve

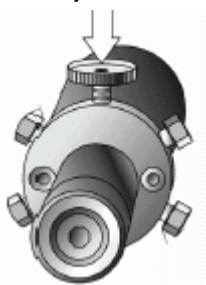


Figure 2-43 Reference Position for the Single Injection Valve

9. For a 4-valve module, repeat steps 3 through 8 to define all four injection valves ([Figure 2-44](#)).

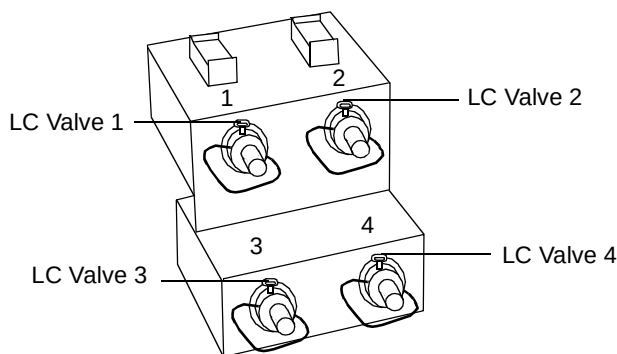


Figure 2-44 Reference Positions for the 4-Valve Module

10. If you are installing the instrument for the first time, continue with the next section. If not, select F4 Home. The syringe moves to the home position and the Job Queue screen reappears.

2.11.7 Interfacing to Other Devices

The 2777 Sample Manager can interface with instruments or devices such as the Waters Micromass ZQ Mass Detector and Waters 1525 Binary Pump. The devices require definition before operation with the 2777 Sample Manager.

Synchronization and Output Signals

Synchronization Signals (Sync Signals) are inputs that tell the 2777 Sample Manager when to wait or proceed with a sample processing step. *Output Signals* (Out Signals) are

sent from the 2777 Sample Manager to external devices to indicate status or completion of particular processing steps. These signals are classified as *objects*.

Physical Events (for example, TTL-In1) are also objects and can be assigned to named signals. 2777 Cycles require that certain signals such as Start, Inject, and Injected be defined. [Table 2-3](#) explains the 2777 Events and signal assignments associated with the standard 2777 LC-Inj Cycle.

Table 2-3 Signals and Objects in the Injection Cycle

Standard Assignment for Injection Cycles	Description	Default Events	Interface1 Pin Number
Start (Sync Signal)	Start a cycle (Input from LC or data system)	TTL-In1	7 8(GND)
Inject (Sync Signal)	Inject READY to INJECT	Immediate (Ignore)	
Injected (Out Signal)	Is activated at the moment of sample injection	SW-Out1	3 4
Running (Out Signal)	Active as long as the Job Queue is being processed and the 2777 Sample Manager is not in an error state	Off	

Example of Assigning a Physical Event

Note: This example defines SW-Out 1, but the process applies to each device installed on the 2777 Sample Manager.

To assign a physical event (such as SW-Out1) to an existing signal object (Injected):

1. From the Job Queue screen, select F1 Menu > Setup > Objects > Out Signals > Injected > Destination.
2. Select an event from the allowed events, Off through OutExp16 (see [Section C.4](#)). The selected screen appears.
3. Review the default settings for each event and object. The 2777 Sample Manager is shipped with all cycle events predefined as shown in [Table 2-3](#).
 - a. If a different physical signal is required, assign a new event to the signal object.
 - b. Scroll to Pulse Time, press Enter, and select a value from 0 ms to 9.9 s.
 - c. If a signal is to be ignored, set its corresponding event to Immediate.

4. Press Enter to save the settings. The Job Queue screen reappears.
5. Repeat steps 2 through 4 for each device.

2.12 Installing and Priming the Syringe



Caution: To avoid injury, power off the instrument when putting your hands near the injector unit. Do not remove the safety shield.

Note: The syringe must be equal to or larger than the largest sample loop in use.

The 2777 Sample Manager is shipped with one syringe kit, consisting of a:

- Syringe adapter
- Plunger holder for a 100- μ L syringe
- 100- μ L LC syringe

The Gastight 100- μ L syringe, equipped with a 22-gauge needle, is appropriate for injection into the standard injection valve. However, certain applications may require different syringe sizes (see [Appendix B](#)).

2.12.1 Installing the Syringe

1. Select F1 Menu > F1 Chang Syr. The injection unit moves to a location for easier installation of the syringe. A Replace Syringe message appears on the Menu screen.



Caution: To avoid injury, keep your hands away from the syringe and needle during operation. Do not remove the safety shield.

2. Place the syringe in the appropriate syringe adapter ([Figure 2-45](#)). Pull the plunger out to approximately 20% of its length. If necessary, loosen the plunger retaining screw in the plunger holder.

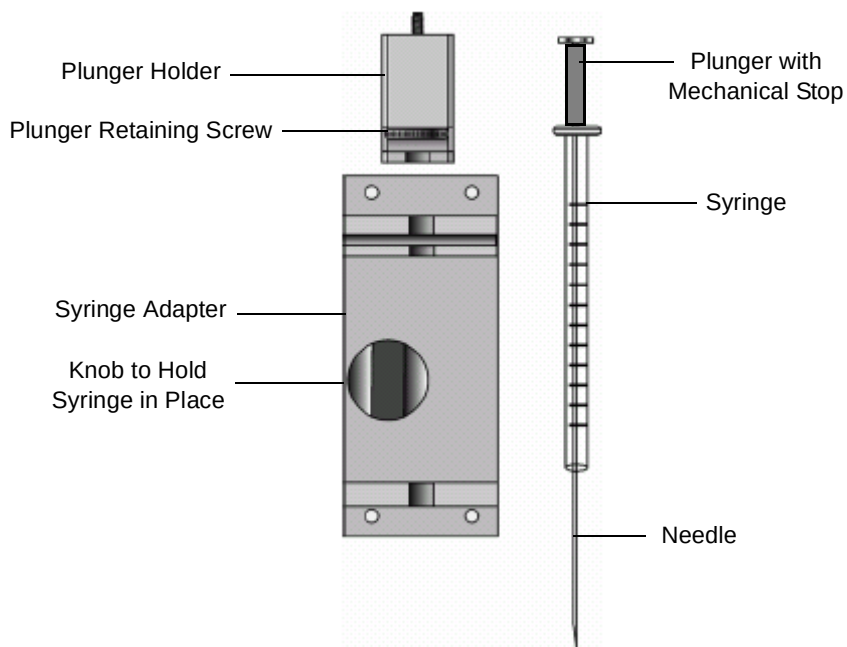


Figure 2-45 Placing the Syringe in the Adapter

3. Move the syringe and adapter partially into the injection unit. Guide the needle first into the upper needle guide and then into the lower needle guide.
4. Place the plunger button into the plunger holder. Allow the syringe adapter to click into place by magnetic force against the syringe carrier.
5. Tighten the plunger retaining screw against the plunger button.
6. Select Continue by pressing Enter. The syringe moves to 0, 0, 0.
7. Select F4 Home. The plunger moves down until it hits the mechanical stop. This position is stored as the syringe's zero volume position. The injection unit then returns to the home position.



Caution: Observe safe laboratory practices when you handle solvents. See the Material Safety Data Sheets from the manufacturer for the solvents you use.

2.12.2 Priming the Syringe



Attention: After installing or replacing a syringe:

- Prime the syringe.
 - Check the needle penetration in the LC valve (see [Section 2.12.3](#)).
1. Select F1 Menu > F2 Clean Syr. A Select Wash Station message appears.
 2. Select either Wash1 or Wash2, then press Enter. A Wash1 or Wash2 Clean Count message appears.
 3. Select the number of priming strokes for the syringe (1 through 9 or Abort), then press Enter. The priming is performed.

You can prime a fixed needle syringe by using an adequate number of filling strokes in a 2777 method.

Prime a Gastight syringe manually by removing the plunger, filling the syringe with solvent from the top of the barrel until solvent either overflows or forms a bead at the top of the syringe, inserting the plunger, and pressing completely down.

2.12.3 Defining the Valve Needle Penetration Depth



Attention: Before performing the following procedure, define the object positions X/Y/Z for LC Vlv1 (LC Vlv2) properly and insert a syringe adapter including a syringe in the injection unit.

1. From the Job Queue screen, select F1 Menu > Setup > Objects > Injectors > Object > LC Vlv1. The Injector: LC Vlv1 screen appears ([Figure 2-46](#)).

Injector: LC Vlv1			
Position X		246.9mm	
Position Y		2.6mm	
Position Z		86.0mm	
Needle Penetr		20.0mm	
Valve		DC6-1-C	
2002/10/26		11:15:36	
Check Pos	Clear Pos	Movto Zero	Home
F1	F2	F3	F4

Figure 2-46 Injector: LC Vlv1 Screen

2. Select F1 Check Pos. The syringe moves to the previously defined LC Vlv1 position.
3. Select Needle Penetr, then press Enter.
4. Slowly rotate the outer knob to adjust the needle penetration depth (Z direction). The syringe moves down stepwise into the injection port.
5. When the syringe needle tip enters the valve needle guide, slow down the Z movement again.



Attention: To avoid damaging the syringe needle tip, observe the syringe needle carefully while moving it. Do not remove the safety shield.

6. Move the needle down one step at a time until you hear a click inside the injection unit. Stop the Z down movement immediately.
7. Rotate the outer knob two steps in the opposite direction, then press Enter to save the needle penetration depth value.
8. Select F3 Movto Zero. The syringe moves to the home position.
9. Verify the needle penetration depth by repeating step 2.

10. Select F4 Home. The syringe moves to the home position and the Job Queue screen reappears.



Attention: To allow you to restore your settings, back up the 2777 Control system after installing a new 2777 Sample Manager (see [Section 4.6](#)).

- After defining all positions and adjusting the valve needle penetration, back up the existing configuration.
- Periodically backing up the system ensures that an updated 2777 configuration is always available.

Chapter 3

Preparing for Operation

This chapter contains procedures for methods, job and job queue, utility functions, and information on injection cycles, along with common procedures and dilutor options. They represent the key steps required to set up and process multiple groups of samples when using the 2777 Sample Manager as a stand-alone instrument (not under MassLynx control). It provides an overview for new users and a reminder for infrequent users.

Before operating the 2777 Sample Manager, keep the following prerequisites in mind:

- All accessories should be installed (see [Chapter 2](#)).
- All objects should be defined correctly (see [Section 2.11](#)).
- The appropriate size syringe and matching adapter should be installed (see [Section 2.12](#)).



Caution: To avoid injury, keep your hands away from the 2777 Sample Manager syringe and injection unit during operation. Do not remove the safety shield.



Caution: To avoid injury, the safety shield must be installed for safe operation of the 2777 Sample Manager. Do not remove the safety shield.



Caution: To avoid injury, observe safe laboratory practices when you handle solvents, change tubing, or operate the 2777 Sample Manager. Know the physical and chemical properties of the solvents you use. See the Material Safety Data Sheets from the manufacturer for the solvents in use.

3.1 Working with Methods

Methods for the 2777 Sample Manager consist of elements that define how the samples are processed. The elements of a method are a cycle, a syringe, and a parameter list. Methods have names with up to eight characters and can be changed, copied, and deleted.

You can define up to 18 methods and assign names up to 8 characters. Names can contain the letters a through z, the numbers 0 through 9, spaces, and many special characters. The first letter of a name is automatically capitalized.

You can create, copy, change, and delete 2777 methods from the Method menu. You can view and select 2777 methods from the Job menu, but you cannot create, copy, change, or delete them.

3.1.1 Creating a Method

1. From the Job Queue screen, select F1 Menu > Methods. The Methods screen appears ([Figure 3-1](#)).

The screenshot shows a window titled 'Methods' with a list of methods: Method1, Method2, and Method3. Below the list is a status bar showing the date '2002/10/22' and time '10:11:47'. At the bottom is a menu bar with four options: F1, F2, F3, and F4. The F3 option is labeled 'Print Meth'.

Methods			
Method1			
Method2			
Method3			
2002/10/22		10:11:47	
F1	F2	F3 Print Meth	F4

Figure 3-1 Methods Screen

2. If you want to place the new method in a certain place in the list, scroll to the item after which you want to place the new method.
3. Select F2 Insrt Meth. The Enter Name message appears.

4. Create a method name as follows:
 - a. For the first character, rotate the outer knob to scroll through the list of available characters. When the correct character appears, press Enter.
 - b. Repeat step 4a for each character of the name you want to create. The name can contain up to eight characters.
 - c. When the name is complete, press F4 Enter (not the Enter button). The Select Cycle message appears.
5. Press Enter to select LC-Inj.
6. If Autodetect is off, the Select Syringe message appears. Select the correct size of the installed syringe (such as 100 μ L), then press Enter. The Method: *New_Name* screen appears (Figure 3-2).

Note: After you create a method, you cannot change the syringe. If you need to use a different syringe, create a new method.

Method: <i>New_Name</i>			
CYCLE		LC-Inj	
SYRINGE		100ul	
Sample Volume		80ul	
Air Volume		0nl	
2002/10/22		10:11:47	
		Print Meth	Home

F1
F2
F3
F4

Figure 3-2 Method: *New_Name* Screen

7. Review the method parameters as follows:
 - **CYCLE** – LC-Inj Cycle (only one cycle).
 - **SYRINGE** – Selected syringe (no changes allowed).
 - **Sample Volume** – Selected sample volume. Default: 80 μ L. Values: 0 nL to 80 μ L.
 - **Air Volume** – Volume of air aspirated after the syringe needle lifts out of the sample liquid. Default: 0. Values: 0 to 80 μ L.

- **Pre Cln Slv1** – Pre-injection syringe wash strokes with solvent from Wash1. Default: 0. Values: 0 to 99.
 - **Pre Cln Slv2** – Pre-injection syringe wash strokes with solvent from Wash2. Default: 0. Values: 0 to 99.
 - **Pre Cln Spl** – Pre-injection syringe rinse cycles with sample. Default: 0. Values: 0 to 99.
 - **Fill Speed** – Speed of plunger movement to aspirate sample. Default: 50 $\mu\text{L/s}$. Values: 1.0 to 200 $\mu\text{L/s}$.
 - **Fill Strokes** – Number of filling strokes to aspirate sample. Default: 0. Values: 0 to 99.
 - **Pullup Del** – Delay time between sample aspiration and injection. Default: 500 ms. Values: 0 ms to 99 s.
 - **Inject to** – Name of injector used for injection. Default: None. Values: None or Waste.
 - **Inject Speed** – Speed of plunger movement during sample injection. Default: 100 $\mu\text{L/s}$. Values: 1.0 to 200 $\mu\text{L/s}$.
 - **Pre Inj Del** – Delay time before sample injection. Default: 0 ms. Values: 0 ms to 999 s.
 - **Pst Inj Del** – Delay time after sample injection. Default: 0 ms. Values: 0 ms to 999 s.
 - **Pst Cln Slv1** – Post-injection syringe wash strokes with solvent 1. Default: 1. Values: 0 to 99.
 - **Pst Cln Slv2** – Post-injection syringe wash strokes with solvent 2. Default: 0. Values: 0 to 99.
 - **Vlv Cln Slv1** – Valve rinse cycles with solvent 1. Default: 1. Values: 0 to 99.
 - **Vlv Cln Slv2** – Valve rinse cycles with solvent 2. Default: 0. Values: 0 to 9.
8. Assign or change the parameter values according to your application requirements (Table 3-1). To change a value, scroll to the parameter and press Enter. The allowed values appear in the status bar. Scroll through the values, then press Enter to select a value.
- If you want to restore the default (factory setting), select F1 Set Deflt.
 - If you want to return to the value before you made changes, press ESC.
9. Press ESC. The Methods screen reappears. You can review, copy, insert, or delete methods.

If an error message appears, such as Syringe Overfilled, select the method and the erroneous parameter, and make the suggested change.

10. Select F4 Home. The Job Queue screen reappears.

Table 3-1 LC-Inj Cycle Process and Parameters

Number	Processing Step	Method Parameter	Object (Class)	Used Object Value
1	Reference X, Y, Z axis and syringe plunger	—	— (System)	Start Ref = ON
2	Wait for Start signal	—	Start (Sync Signals)	—
3	Read Barcode if enabled	—	TRAY (Tray type)	Barcode is not None
4	Syringe wash strokes with solvent from Wash1	Pre Cln Slv1	SYRINGE (Syringes) Wash1 (Wash Stations)	Fill Speed Eject Speed Needle Penetr Clean Volume Max Fill Speed Max Eject Speed
5	Syringe wash strokes with solvent from Wash2	Pre Cln Slv2	SYRINGE (Syringes) Wash2 (Wash Stations)	Fill Speed Eject Speed Needle Penetr Clean Volume Max Fill Speed Max Eject Speed
6	Rinse syringe with sample selected number of times	Pre Cln Spl Sample Volume Fill Speed Pullup Del	SYRINGE (Syringes) TRAY (Tray Type) Waste (Injectors)	Eject Speed Fill Volume Needle Penetr

Table 3-1 LC-Inj Cycle Process and Parameters (Continued)

Number	Processing Step	Method Parameter	Object (Class)	Used Object Value
7	Fill syringe with sample using several filling strokes; aspirate air outside of vial if Air Volume is not 0	Sample Volume Air Volume Fill Speed Fill Strokes Pullup Del	SYRINGE (Syringes) TRAY (Tray Type)	Eject Speed Overfill Fill Volume Needle Penetr
8	Move to injection valve	Inject to	—	—
9	Wait for Inject signal	—	Inject (Sync Signals)	—
10	Drive needle to penetration depth	Inject to	— (Injectors)	Needle Penetr
11	Delay	Pre Inj Del	—	—
12	Switch valve to Active Position	—	—	—
13	Activate Injected	—	Injected (Out)	Pulse Time
14	Dispense syringe contents into sample loop	Inject Speed	—	—
15	Delay	Pst Inj Del	—	—
16	Switch valve to Standby position	—	—	—
17	Retract needle from injector	—	—	—
18	Clean syringe and needle with solvent from Wash1	Pst Cln Slv1	SYRINGE (Syringes) Wash1 (Wash Stations)	Fill Speed Eject Speed Needle Penetr Clean Volume Max Fill Speed Max Eject Speed

Table 3-1 LC-Inj Cycle Process and Parameters (Continued)

Number	Processing Step	Method Parameter	Object (Class)	Used Object Value
19	Clean syringe and needle with solvent from Wash2	Pst Cln Slv2	SYRINGE (Syringes) Wash2 (Wash Stations)	Fill Speed Eject Speed Needle Penetr Clean Volume Max Fill Speed Max Eject Speed
20	Rinse valve inlet with solvent from Wash1	Vlv Cln Slv1	SYRINGE (Syringes) Wash1 (Wash Stations)	Fill Speed Inject Speed Needle Penetr Clean Volume Max Fill Speed Max Eject Speed
21	Rinse valve inlet with solvent from Wash2	Vlv Cln Slv2	SYRINGE (Syringes) Wash2 (Wash Stations)	Fill Speed Inject Speed Needle Penetr Clean Volume Max Fill Speed Max Eject Speed
22	Move to home position	—	Home (Positions)	—

3.1.2 Copying a Method

1. From the Job Queue screen, select F1 Menu > Methods. The Methods screen appears.
2. Select a method from the list, then select F1 Copy Meth.
3. At the prompt, enter a name for the new method (up to eight characters).
4. Press F4 Enter to save the name. The Method: *New_Name* screen displays the parameters.
5. Change the parameters as needed, and verify that all parameters are appropriate for the installed hardware.

6. Press ESC. The changes are saved, the Methods screen reappears, and the list of methods includes the new method.
7. Select F4 Home. The Job Queue screen reappears.

3.1.3 Changing a Method

Note: *You cannot change the syringe.*

1. From the Job Queue screen, select F1 Menu > Methods. The Methods screen appears.
2. Select a method, then press Enter. The Method: *Method_Name* screen appears.
3. Scroll to the parameter you want to change, then press Enter.
4. Scroll through the list of allowed values and select one, then press Enter to save the new value.
5. Press ESC to return to the Methods screen, where you can view or change other methods.
6. Select F4 Home. The Job Queue screen reappears.

3.1.4 Deleting a Method

Methods can be deleted from the Methods screen if they are not in use. A method in use by an active job cannot be deleted.



Attention: *Do not delete methods that you may need. When you select F3 Del Meth, the method is permanently deleted.*

1. From the Job Queue screen, select F1 Menu > Methods. The Methods screen appears.
2. Select a method, then press Enter. The Method: *Method_Name* screen appears.
3. Select F3 Del Meth.
4. At the Delete Method? message, select Yes to delete the method, then press Enter.
If you want to keep the method, select No, then press Enter.
5. Press ESC to return to the Methods screen, where you can view or change other methods.
6. Select F4 Home. The Job Queue screen reappears.

3.2 Using a Job and Job Queue

A job is an entry that contains the information needed by the 2777 Sample Manager to process multiple samples by the same processing steps. The elements of a job are a method and a tray that defines the location of the samples to be processed.

A job queue is a list of one or more sample processing jobs. The Job Queue screen contains the list of current jobs. Jobs are executed in the order displayed on the Job Queue screen. You can add new jobs to the queue while samples are being processed.



Caution: Observe safe laboratory practices when you handle solvents. See the Material Safety Data Sheets from the manufacturer for the solvents you use.

3.2.1 Building a Job Queue

1. Load your sample trays onto an available location in a tray holder or stack. Note the corresponding tray name (such as Stk1-01).



Attention: To ensure that the syringe can reach all samples, do not load a standard (short) microplate in front and a deep-well (tall) tray in back in the same drawer, because the syringe will not be able to reach the shorter microplate.

Note: When loading two trays or plates in a drawer, Waters recommends that you load the same size tray or plate.

2. From the Job Queue screen, select F2 Add Job. The Select Insert Mode message appears.
3. Select an option:
 - **Append** – To add a job to the end of the job queue.
 - **Insert** – To add the job after the job where the cursor is now located.
 - **Abort** – To stop the addition of a new job.
4. Press Enter. The Job: ## screen appears ([Figure 3-3](#)).

Job: ##			
TRAY		2	
– First		1	
– Last		1	
– Increment		1	
– Count		4	
METHOD		MethodXYZ	
2002/10/22		10:11:47	
View Meth	Prev Job	Next Job	Home

F1 F2 F3 F4

Sequential Numbers
from 01 to 99

Figure 3-3 Job: ## Screen

5. Select the parameters for this job as follows:
 - a. Select TRAY (by pressing Enter), select the tray name that corresponds to the location of the tray that you just loaded (such as 2 or Stk1-01), then press Enter.
 - b. Select First, select the first sample number, then press Enter.
 - c. Select Last, select the last sample number, then press Enter.
 - d. Select Increment, select a number, then press Enter.
 - e. Select Count, select the count, then press Enter.
 - f. Select METHOD, select the method, then press Enter.
6. Select F4 Home to save the new job. The Job Queue screen reappears.
7. To add more jobs, repeat steps 2 through 6.

Note: Load all samples before the run begins.

8. Ensure that all stack drawers are completely closed.

3.2.2 Reviewing a Job and Changing the Job Method

1. From the Job Queue screen, select a job, then press Enter. The Job: ## screen appears (Figure 3-3). You can review the parameters for the job.
2. To view the methods that are available, scroll to METHOD, then press Enter.

3. To view the parameters of the selected method, scroll to METHOD, then select F1 View Method. The Method: *Method_Name* screen appears (Figure 3-4). You cannot change the method parameters at this screen.

Method: <i>Method_Name</i>			
CYCLE		LC-Inj	
SYRINGE		100ul	
Sample Volume		80ul	
Air Volume		0nl	
2002/10/22		10:11:47	
			Home

F1 F2 F3 F4

Figure 3-4 Method: *Method_Name* Screen

4. If you want to select a different method for the job:
 - a. Press ESC.
 - b. Scroll to Method, then press Enter.
 - c. Scroll through the list of available methods, select a method, and press Enter.
5. To view the method parameters, press F1 View Meth. You cannot change the parameters at this screen.
6. Press ESC. The Job Queue screen reappears, and the method is changed.

3.2.3 Starting a Job Queue

Note: If you want to process a specific job, select the job from the Job Queue screen, then select F4 Start. The Select Job(s) to Process screen appears.

1. Select F4 Start. The Select Job(s) to Process screen appears.
2. Select an option:
 - **All** – To process the entire job queue starting from the job at the top.
 - **Selected** – To process the selected job.
 - **Abort** – To suppress the start of a job queue.
 - **Resume** – To continue with the next job after the aborted one.

3.2.4 Stopping a Job Queue

1. Press Stop.
2. Select an option:
 - **Continue** – To resume processing with the current sample.
 - **Sample** – To stop processing the current sample. When you select Continue, processing resumes with the next sample.
 - **Job** – To stop processing all samples in the current job. When you select Continue, processing resumes with the next job. The aborted job is marked with an X.
 - **Job Queue** – To stop processing all jobs in the job queue. The Job Queue screen appears. The aborted job is marked with an X.

3.2.5 Removing and Adding a Tray

If you want to remove or add a tray when a job is in process:

1. Press Stop to stop the job or job queue.
2. Open the drawer.
3. Remove or add the tray.
4. Close the door.
5. Select F4 Resume.

3.2.6 Preparing Samples

Vials may have crimp caps, screw caps, or none.

You can use covers on microplates or deep-well plates or leave them open.

Use a heater cooler stack if you have heat-labile samples or if you need controlled temperature stability across a large set of samples.

3.2.7 Using Solvents



Caution: Observe safe laboratory practices when you handle solvents. See the Material Safety Data Sheets from the manufacturer for the solvents you use.



Attention: To avoid precipitating salts, use an intermediate solvent such as distilled and deionized water when you change from buffers to high-organic-content solvents. See Appendix C, *Solvent Considerations*, in the Waters AutoPurification Systems Operator's Guide for information on solvent miscibility. This guide is available on the Waters Web site (www.waters.com).

Common HPLC solvents are acceptable.

3.3 Using Utility Functions

Utility functions provide access to checking operations and parameters that you may need to change (see [Figure C-2](#)). These functions are available for the syringe, trays, injectors, wash stations, and dilutor. They access key functions without setting up and executing a method and job.

To access utility functions:

1. From the Job Queue screen, select F1 Menu > Utilities. The Utilities screen appears.
2. Select one of the following:
 - **Syringe** – see [Section 3.3.1](#)
 - **Tray** – see [Section 3.3.2](#)
 - **Injector** – see [Section 3.3.3](#)
 - **Wash Station** – see [Section 3.3.4](#)
 - **Vial** – see [Section 3.3.5](#)
 - **Dilutor** – see [Section 3.3.6](#)

3.3.1 Syringes

To replace a syringe, see [Section 4.3 on page 86](#).

1. From the Job Queue screen, select F1 Menu > Utilities > Syringe.
2. You can check or change the following parameters:
 - **Actual Id** – Identification number (ID) of the currently inserted syringe. If the syringe detection system is set to manual, the extension .man appears. This value cannot be changed. The syringe must be installed in its correct holder.
 - **Fill Volume** – Filling of the syringe (nL or μ L). Air bubbles may remain below the plunger after the first pull up. If the plunger is moved up and down several

times (see Fill Strokes), these air bubbles are worked out. This operation may completely fill the syringe even when using very small sample volumes.

- **Fill Strokes** – Number of fill strokes. All fill strokes except the last one use the selected fill volume. If the selected sample volume is higher than the fill volume, the sample volume is used for all fill strokes. If zero is selected, the plunger is pulled up only once using the sample volume value.
- **Pullup Del** – Delay time (ms or s) between sample pullup and ejection while filling the syringe. The same delay time is used after the last plunger pullup until the syringe needle is moved out of the sample vial/well. It is only used if more than one fill stroke is selected. This feature is especially useful for handling viscous fluids or syringe sizes greater than 100 μL .
- **Fill Speed** – Speed of plunger movement ($\mu\text{L/s}$) used in all syringe filling operations.
- **Eject Speed** – Speed of plunger movement ($\mu\text{L/s}$) used in all syringe eject operations except sample injections.
- **Inject Speed** – Speed of plunger movement ($\mu\text{L/s}$) for sample injection.
- **Plg Chnge Pos** – Plunger position during the Chang Syringe operation (μm or mm). The syringe plunger is moved to a position where the syringe can be removed and replaced. The value may be changed for different types of syringes.

3. Select one of the following functions:

- **F1 Chang Syr** – Moves the syringe to a position where the syringe assembly can be completely lowered to facilitate removal of the syringe adapter. The syringe can then be removed and replaced. A prompt to specify the new syringe appears. After installing the syringe, press Enter (see [Section 2.12](#)).
- **F2 Clean Syr** – Cleans or primes the syringe before use. You can clean the syringe any time a job is not running. After selecting F2, either Wash1 or Wash2 can be selected.
- **F3 Set Pos** – Defines the Chang Syringe position.
- **F4 Home** – Moves the injection unit to its home position and the Job Queue screen reappears.

3.3.2 Tray

To change, remove, or add a tray or plate, see [Section 3.2.5](#).

1. From the Job Queue screen, select F1 Menu > Utilities > Tray.
2. At the Select Tray message, select a tray.

3. You can check or change two parameters:
 - **Needle Penetr** – Needle penetration depth into the sample vial (μm or mm). The stored Defaults for each tray type are approximately 2 mm above the sample vial bottom and/or microplate bottom. The needle penetration depth for the selected tray may be changed by selecting a value (see [Chapter 5](#)).
 - **Tray Type** – Shows the tray type that is selected for the tray and allows alternate use of microplates or deep-well plates in a stack. If different tray types are allowed, they can be changed here (see Section C.2, Utilities Software Map).
4. Select one of the following functions:
 - **F3 Movto nnn** – Serves as a quick check to verify that the XYZ coordinates are defined correctly for the selected tray. To use this function, the selected tray including the sample vials or microplate must be present. After selecting F3 Movto 001, the injection unit moves to sample position 1. Repeat for the last sample position in the first row and the last sample position in the last row.
 - **F4 Home** – The injection unit moves to its home position and the Job Queue screen reappears.

3.3.3 Injector

1. From the Job Queue screen, select F1 Menu > Utilities > Injector.
2. At the Select Injector message, select LC Vlv1, LC Vlv2, LC Vlv3, LC Vlv4, or Waste, then press Enter.
3. You can check or change one parameter:
 - **Needle Penetr** – Injection valve needle penetration value (μm or mm). To ensure reproducible sample injection and minimize carryover, the needle penetration depth in the injection valve must be set accurately (see [Section 2.11.6](#)).
4. Select one of the following functions:
 - **F1 Rinse Inj** – Rinses injector valve using either Wash1 or Wash2 to clean the LC injection valve port.
 - **F2 Act Valve** – Switches the LC injection valve between the load and inject positions. It may be used to test the valve drive function or to perform manual injections.
 - **F3 Movto Inj** – The injection unit moves to the injection valve position. You can select Needle Penetr to check or change the injection valve needle penetration value (see [Section 2.11.6](#)).
 - **F4 Home** – The injection unit moves to its home position and the Job Queue screen reappears.

3.3.4 Wash Station

1. From the Job Queue screen, select F1 Menu > Utilities > Wash Station.
2. At the Select Wash Station message, select Wash1 or Wash2, then press Enter.
3. You can check or change two parameters:
 - **Needle Penetr** – Wash station needle penetration value (μm or mm). To ensure reproducible sample injection and minimize carryover, the needle penetration depth must be set accurately.
 - **Rinse Time** – Increases the solvent flow time (ms or s) through the wash station glass liners after the last wash stroke is performed and the needle is retracted. If Rinse Time is set to 0 s, the wash station valve is closed immediately after the last wash stroke.
4. Select one of the following functions:
 - **F2 Act Valve** – Switches the selected wash station valve between the Open and Close positions. You can use it to check the valve function or to prime the wash solvent lines.
 - **F3 Movto Wash** – The injection unit moves to the selected wash station. You can select Needle Penetr to check or change the needle penetration value for the wash station.
 - **F4 Home** – The injection unit moves to its home position and the Job Queue screen reappears.

3.3.5 Vial

1. From the Job Queue screen, select F1 Menu > Utilities > Vial.
2. At the Select Vial message, select a vial, then press Enter.
3. You can check or change one parameter:
 - **Needle Penetr** – Needle penetration value (μm or mm) in the vial.
4. Select one of the following functions:
 - **F3 Movto Vial** – The injection unit moves to the selected vial.
 - **F4 Home** – The injection unit moves to its home position and the Job Queue screen reappears.

3.3.6 Dilutor

Note: The dilutor must be installed and set up properly before the utility functions can be used (see [Section 2.8](#)).

At a minimum, you need to select the following:

- Correct sizes for the sideport syringe and the dilutor syringe
- Appropriate priming volume (increase as needed)
- Correct waste position to dispense solvent during priming and rinsing

To set up the dilutor:

1. From the Job Queue screen, select F1 Menu > Utilities > Dilutor. The Dilutor screen appears.
2. You can change the following parameters:
 - **Syringe** – Indicates the size of the sideport syringe (typically 80 μ L) currently installed in the injection unit.
 - **Syr Dilut Pos** – Defines the dilute position of the plunger in the sideport syringe (mm), which allows solvent to flow continuously into the syringe through the bottom port and out to the defined port (such as the waste port). The plunger should be positioned exactly above the lower hole of the sideport syringe. Verify the Syr Dilut Pos after every sideport syringe change.
 - **Dilutor Syr** – Indicates the volume of the dilutor syringe (1.0, 2.5, 5.0, or 10 mL) currently installed in the dilutor module.
 - **Prime Volume** – Indicates the volume (1.0 to 10 mL) for priming the solvent lines between the solvent bottle and the dilutor syringe and for priming the transfer line between the dilutor syringe and the sideport syringe.
 - **Pullup Del** – Selects a delay time (ms or s) between solvent pullup and ejection while filling the dilutor syringe. This feature is especially useful for handling viscous solvents.
 - **Fill Speed** – Selects speed (μ L/s) of plunger movement during all dilutor syringe filling operations.
 - **Eject Speed** – Selects speed (μ L/s) of plunger movement during all dilutor syringe ejection operations.
 - **Eject Delay** – Selects a delay time (ms or s) between solvent ejection and next solvent aspiration of the dilutor syringe. This feature is especially useful for handling viscous solvents.

3. Select one of the following functions:
 - **F1 Prime** – Primes the solvent lines between the solvent bottle and the dilutor syringe and primes the transfer line between the dilutor syringe and the sideport syringe. The dilutor syringe aspirates the volume defined in Prime Volume and ejects the solvent to the waste port (or as defined). Several plunger strokes may be needed, depending on dilutor syringe size and prime volume. Prime before first time use and after every solvent or syringe change.
 - **F2 Chang DSyr** – Moves the plunger of the dilutor syringe to a position where the dilutor syringe assembly can be completely lowered, and facilitates removal of the dilutor syringe from the dilutor (see [Section 2.8](#)). After removing and replacing the dilutor syringe or plunger, the Insert and Select Dilutor Syringe prompt appears. Select the dilutor syringe size (1, 2.5, 5.0, or 10 mL), then press Enter.
 - **F4 Home** – The dilutor syringe moves to its Zero position and the Job Queue screen reappears.
4. Select F1 Menu > Setup > Objects > Dilutors > Dilutor to specify the destination of the solvent during priming and rinsing (Waste to parameter), and other dilutor syringe parameters. The Dilutor: Dilutor screen appears.
5. You can change the following parameters:
 - **Syringe** – Indicates the size of the sideport syringe (typically 80 μ L) currently installed in the injection unit and used with the dilutor module.
 - **Dilutor Syr** – Indicates the volume of the dilutor syringe (1.0 to 10 mL) currently installed in the dilutor module.
 - **Scale Length** – Indicates the distance from the sideport syringe plunger to the lower sideport (mm).
 - **Min Speed** – Sets the minimum speed (μ L/s) for plunger movement.
 - **Max Fill Spd** – Sets the maximum speed (μ L/s) for plunger movement during all dilutor syringe filling operations. These limits control the fill speed in step 2 (Dilutor screen from Utilities).
 - **Max Eject Spd** – Sets the maximum speed (μ L/s) for plunger movement during all dilutor syringe ejection operations. These limits control the eject speed in step 2 (Dilutor screen from Utilities).
 - **Pullup Del** – Selects a delay time (ms or s) between solvent pullup and ejection while filling the dilutor syringe. This feature is especially useful for handling viscous solvents.

- **Fill Speed** – Selects speed ($\mu\text{L/s}$) of plunger movement during all dilutor syringe filling operations.
 - **Eject Speed** – Selects speed ($\mu\text{L/s}$) of plunger movement during all dilutor syringe ejection operations.
 - **Eject Delay** – Selects a delay time (ms or s) between solvent ejection and next solvent aspiration of the dilutor syringe. This feature is especially useful for handling viscous solvents.
 - **Tube Volume** – Selects the volume of solvent (mL) in the transfer tubing between the dilutor syringe and the sideport syringe.
 - **Prime Volume** – Specifies the volume (1.0 to 10 mL) for priming the solvent lines between the solvent bottle and the dilutor syringe and for priming the transfer line between the dilutor syringe and the sideport syringe. A setting of 10 mL is recommended for a 2.5-mL (or larger) dilutor syringe.
 - **Waste to** – Specifies location where the solvent from the dilutor syringe is dispensed. Allows you to wash the injection ports. Values: injection valves (LC Vlv1, LC Vlv2, LC Vlv3, or LC Vlv 4, if 4-valve module is installed), or Waste (port).
6. You can select one of the following functions:
- **F1 Prime** – Primes the solvent lines between the solvent bottle and the dilutor syringe and primes the transfer line between the dilutor syringe and the sideport syringe. The dilutor syringe aspirates the volume defined in Prime Volume and ejects the solvent to the waste port (or as defined). Several plunger strokes may be needed, depending on dilutor syringe size and prime volume. Prime before first time use and after every solvent or syringe change.
 - **F4 Home** – The dilutor syringe moves to its Zero position and the Job Queue screen reappears.

3.4 Using the Dilutor

Use this section if a dilutor is installed in the 2777 Sample Manager.

Note: You must use Cycle Composer software to operate the dilutor. You should be familiar with Cycle Composer control software (see the CTC Analytics AG Cycle Composer Control Software User Guide).

The dilutor can only be used with Cycle Composer software. The 2777 Sample Manager is shipped with Cycle Composer already installed. Make sure that your installation meets the hardware and software requirements before operating the dilutor (see [Table A-5](#)).

The dilutor is shipped with a diskette or CD containing three different dilutor application examples ([Table 3-2](#)). You can use these examples to learn about the dilutor and as a starting point to develop your own applications. Copy the examples to your Cycle Composer method folder using the File Import option of Cycle Composer.

Table 3-2 Cycle Composer Methods

Method	Method Description	Macro Used	Macro Description
Serial dilute 200 μ L to 96 wells	Dilute 200 μ L to a range of samples starting with index set in sample list.	Serial dilute to tray	Dilute a selectable volume to a sequence of samples in a microplate. The first sample is specified in the sample list.
Add 50 μ L reagent, dilute with 200 μ L and inject	Add reagent to sample and immediately dilute with solvent. Aspirate sample with mixing strokes and inject into valve. Clean syringe and valve inlet by flushing with dilutor.	Add reagent and dilute	Put reagent to the vial selected in sample list and add solvent with the dilutor.
Inject and flush valve with dilutor	Load sample into syringe, inject to valve and immediately flush syringe and valve with dilutor.	Flush injector	Flush an injection valve with the dilutor using a selectable volume up to 10 mL.

Chapter 4

Maintaining the 2777 Sample Manager

This chapter describes routine maintenance procedures that you can perform to ensure that the Waters 2777 Sample Manager consistently provides accurate and precise results. You also perform these procedures when you determine that a specific component in the 2777 Sample Manager has a problem. For information about isolating problems in the instrument, see [Chapter 5](#).

Note: The power supply(ies) have no operator-serviceable or replaceable parts inside. If a power supply is not functioning, see [Section 5.3](#).

Note: To clean the outside of the instrument, use only a soft lint-free paper or cloth dampened with mild soap and water.

4.1 Suggested Maintenance Intervals

Regularly performing maintenance helps ensure accuracy and precision of the 2777 Sample Manager. [Table 4-1](#) suggests intervals for the maintenance procedures to ensure uninterrupted operation. If you use the system heavily (for example, nights and weekends), or if you use aggressive solvents, you may need to perform the maintenance procedures more frequently.

Table 4-1 Suggested Maintenance Intervals

Procedure	Interval	Method or Reference
Clean instrument, syringe, and surfaces	Weekly or as needed	Use only a soft lint-free paper or cloth dampened with mild soap and water.
Replace the valve needle seal	Every 1500 to 2000 penetrations	See Section 4.4 on page 87 . Check the tightness of the needle in the needle seal.

Table 4-1 Suggested Maintenance Intervals (Continued)

Procedure	Interval	Method or Reference
Replace the valve rotor	Annually, or more often if running high throughput volumes	See Section 4.5.2 on page 88 . Depends also on the quality of samples and solvents
Replace the syringe plunger	Annually, or twice a year if running high throughput volumes	See Section 4.3 on page 86 . Depends heavily on the application throughput, quality of sample solution (particles), and wash solvent. Check the tightness of the plunger regularly.
Maintain the dilutor	As needed	See Section 4.8 on page 92 .

4.2 Safety Information

4.2.1 Declaration of Conformity

See the *Declaration of Conformity* sheet enclosed with the instrument.

4.2.2 Electrical Hazards

Every analytical instrument has specific hazards, so be sure to read and comply with the following precautions. They will help ensure the safe, long-term use of your 2777 Sample Manager.



Caution: The supplied power cord(s) must be inserted into a power outlet with a protective earth contact (ground). When using an extension cord, make sure that the cord also has an earth contact.

Do not change the external or internal grounding connections. Tampering with or disconnecting these connections could endanger you and/or damage the 2777 Sample Manager.

The instrument is properly grounded in accordance with these regulations when shipped. You do not need to make any changes to the electrical connections or the instrument's chassis to ensure safe operation.



Caution: Do not turn the instrument on if you suspect that it has incurred any kind of electrical damage. Instead, disconnect the power cord(s) and contact a Waters Technical Service representative for a product evaluation. Do not attempt to use the instrument until it has been evaluated. Electrical damage may have occurred if the 2777 Sample Manager shows visible signs of damage, or was transported under severe stress.

Damage can also result if the instrument is stored for prolonged periods under unfavorable conditions (e.g., subjected to heat, water, etc.).

Disconnect the power cord(s) before attempting any type of maintenance.

Capacitors inside the instrument may still be charged even if the instrument is turned off.



Caution: To avoid electric shock, turn off the instrument(s) and unplug the power cord(s) before performing the maintenance procedures in this chapter.



Attention: To avoid damaging electrical parts, do not disconnect an electrical assembly while power is applied to the 2777 Sample Manager. Once power is turned off, wait approximately 10 seconds before you disconnect an assembly.

To avoid damage due to electrostatic discharge, do not touch integrated circuit chips or other components.



Attention: The instrument includes many integrated circuits. These circuits may be damaged if exposed to excessive line voltage fluctuations and/or power surges.

Note: Never try to repair or replace any component of the instrument that is not described in this manual without the assistance of a Waters Technical Service Representative. Parts not included in [Appendix B](#) are not recommended for replacement by the customer.

4.2.3 Other Hazards



Caution: To avoid injury during 2777 Sample Manager operation, keep your hands away from the syringe. Do not remove the safety shield.



Caution: To avoid injury, observe safe laboratory practices when you handle solvents, change tubing, or operate the 2777 Sample Manager. Know the physical and chemical properties of the solvents you use. See the Material Safety Data Sheets from the manufacturer for the solvents in use.



Caution: Do not operate without the safety shield. The safety shield must be installed for safe operation.

4.2.4 Lithium Battery

An onboard lithium battery (Panasonic VL2330) buffers the electronic memories when the instrument is turned off. It should be replaced only with the same or equivalent type recommended by the equipment manufacturer.



Attention: Dispose of discharged lithium batteries locally according to national waste disposal regulations for batteries.

Note: The power supply(ies) have no operator-serviceable or replaceable parts inside. If a power supply is not functioning, see [Section 5.3](#).

4.3 Replacing the Syringe



Caution: To avoid injury, use caution when maintaining, cleaning, changing, or otherwise handling the syringe. Do not remove the safety shield.

To replace the syringe:

1. From the Job Queue screen, select F1 Menu > F1 Chang Syr. The injection unit moves to a location that facilitates removal of the syringe.
2. Loosen the plunger retaining screw, and then move the plunger slightly out of the plunger holder.
3. Pull the syringe adapter out, and then carefully up to remove the syringe adapter with the syringe from the injection unit.
4. After replacing a syringe, check the needle penetration in the LC valve (see [Section 2.12.3](#)).
5. Prime the syringe (see [Section 2.12](#)).
 - Select F1 Menu to see the available options for changing (F1 Change Syringe) and cleaning (F2 Clean Syringe).
 - To completely remove air bubbles, prime the syringe manually.

4.4 Replacing the Valve Needle Seal

Replace the valve needle seal every 1500 to 2000 penetrations.

All valves are equipped with a special valve needle guide fitting in port 1 (the top port). This fitting has a wide diameter to mate with the syringe needle guide on the injection unit. The valve needle guide also has a countersunk hole to facilitate insertion of the syringe needle into the injection port ([Figure 4-1](#)).

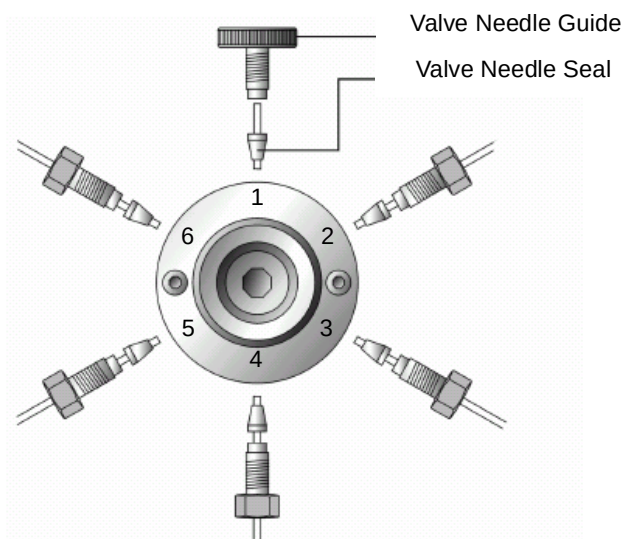


Figure 4-1 Valve Needle Guide and Valve Needle Seal



Attention: To ensure reproducible sample injection and minimize carryover:

- The valve needle guide and the valve needle seal must be installed properly.
- The valve needle seal must be changed every 1500 to 2000 penetrations (see [Section 4.4](#)).
- The needle penetration depth must be set accurately (see [Section 2.11.6](#)).

The valve needle guide holds the needle seal. The needle seal, which is a short length of Teflon tubing, forms the seal around the syringe needle. A stainless steel ferrule is tightened around the Teflon sleeve to ensure a leak-proof fit.

To replace the valve needle seal:

1. Unscrew the valve needle guide from port 1 on the valve.

2. Remove the valve needle seal.
3. Install a new valve needle seal.
4. Screw the valve needle guide into port 1.

4.5 Replacing the Injection Valve and Rotor

4.5.1 Replacing and/or Cleaning the Injection Valve

1. Remove the sample loop, needle guide fitting, and tubing from the valve body ([Figure 4-2](#)).

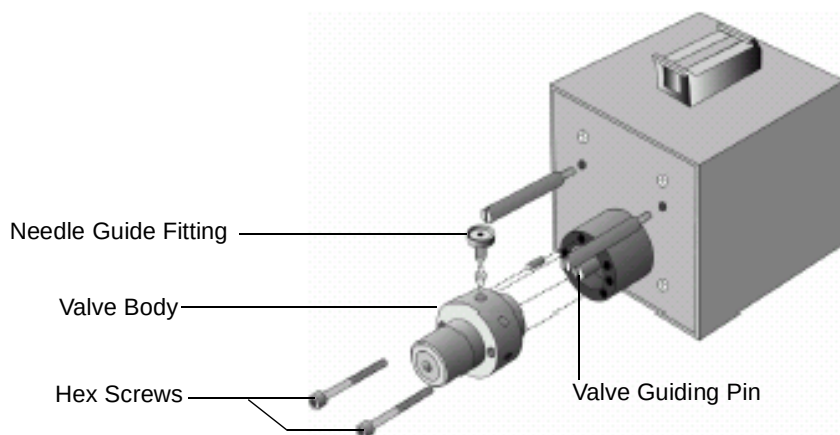


Figure 4-2 Replacing the Injection Valve

2. Unscrew the two hex screws that hold the valve to the valve drive.
3. Check that the valve guiding pin remains at its position.
4. Install the replacement valve (repeat steps 1 through 3 in reverse order).

4.5.2 Replacing the Valve Rotor

Replace the valve rotor during preventative maintenance or when you observe injection problems, inaccuracy, contamination, or carryover.

1. Follow the arrows in [Figure 4-3](#). Do not remove the valve from the valve drive. Do not remove any tubing or the loop.

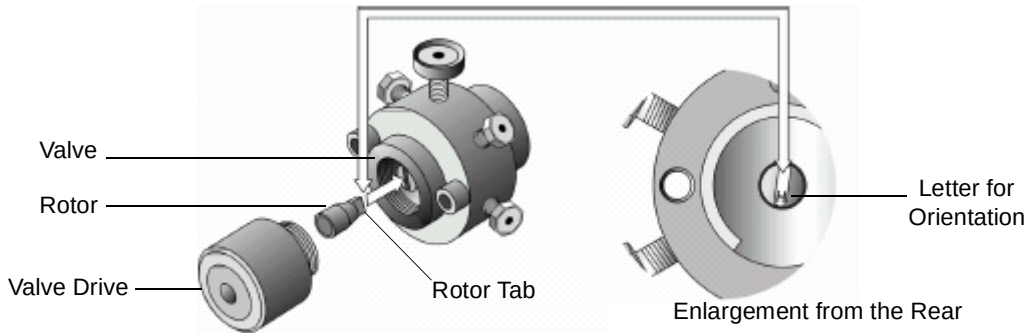


Figure 4-3 Replacing the Valve Rotor

2. Unscrew the knurled preload assembly. Do not tamper with the preset socket adjustment screw.
3. Engage the end of the rotor with a magnet or a pair of tweezers.
4. Locate the letter (e.g., H) stamped on the new or cleaned rotor and orient the letter to the lower half of the valve.
5. Insert the new rotor. Make sure the rotor tab fits into the slot in the valve drive.
6. Replace the knurled preload assembly.
7. Tighten the preload assembly. It must end up fully bottomed out.

4.6 Backing Up the 2777 Control Program

The following procedures require a computer with the Windows 2000 or Windows XP operating system, the 2777 PAL Loader program (version 1.1 or later), the RS-232 cable, a diskette, and the correct version of the 2777 firmware to be loaded.



Attention: Back up the 2777 Control program after installation and periodically to ensure that an updated configuration of the 2777 Sample Manager is always available.

Create the following directory structure to store 2777 firmware updates and backups:

- **C:\ProgramFiles\2777\Loader\Backup** – Contains full backup files of current and previous 2777 configurations; includes firmware and parameter settings; maintained for archival purposes.

- **C:\ProgramFiles\2777\Loader\Update** – Contains extracted Update files in Loader format (*.sss); may include firmware only, or firmware with parameter settings.

To back up the 2777 control program:

1. Power off the 2777 Sample Manager (and dilutor if installed) and the computer.
2. Connect the RS-232 cable between the SER1 connector on the 2777 Sample Manager and a serial port on the computer. The serial port must be configured using the following settings:
 - **Baud** – 9600
 - **Data Bits** – 8
 - **Parity** – None
 - **Stop Bits** – 1
 - **Flow Control** – None
3. Power on the 2777 Sample Manager.
4. When the Job Queue screen appears, power on the computer.
5. Double-click the PAL Loader icon on the computer desktop. The PAL Loader dialog box appears ([Figure 4-4](#)).

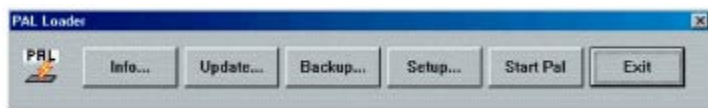


Figure 4-4 PAL Loader Dialog Box

6. Click Backup. The Backup Target Memory dialog box shows the path (storage location) and filename to be assigned to the new backup ([Figure 4-5](#)). You can enter a customized path and/or filename.

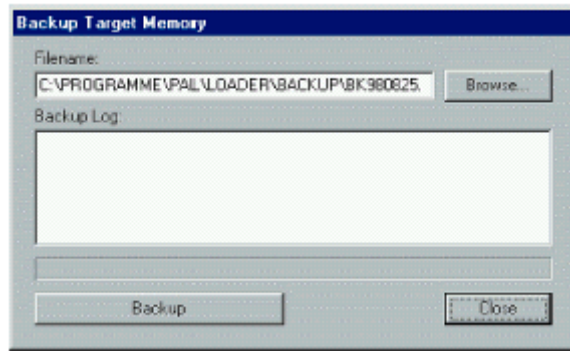


Figure 4-5 Backup Target Memory Dialog Box

7. Click Backup. The backup proceeds and information on the backed-up components appears in the Backup Log window. The process takes several minutes.
8. When the backup finishes, the Backup of Target Memory succeeded message appears. Click Close.
9. Click Start Pal in the PAL Loader dialog box to terminate control by the Loader program.
10. Click Exit.

4.7 Restoring a Backup



Attention: This operation may overwrite existing parameter settings. Ensure that your backups are current before starting this procedure.

The backup file to be restored must reside on the computer's hard drive. The file cannot be loaded from a disk drive because a full update (including parameter settings) does not fit on a single diskette in the 2777 Loader format. It must be transferred to the computer hard drive in compressed (*.zip) format and extracted into the *.sss file, which is the 2777 Loader format.

To restore a 2777 backup:

1. Power off the 2777 Sample Manager and the computer.

2. Connect the gray RS-232 cable between the SER1 connector on the 2777 Sample Manager and a PC serial port.
3. Ensure the serial port is configured using the following settings:
 - **Baud** – 9600
 - **Data Bits** – 8
 - **Parity** – None
 - **Stop Bits** – 1
 - **Flow Control** – None
4. Power on the 2777 Sample Manager.
5. When the Job Queue screen appears, power on the computer.
6. Double-click the PAL Loader icon on the computer desktop. The PAL Loader dialog box appears ([Figure 4-4](#)).
7. Click Update. The Update Flash Memory dialog box appears.
8. Click Browse and select the appropriate .sss backup file.
9. Click Open. The Update Flash Memory dialog box appears. The path and filename for the update file appear in the Filename entry box.
10. Click Update to load the new firmware. The process takes several minutes.
11. When the update finishes, the Update of target memory succeeded message box appears. Click Close.
12. Click Start Pal in the PAL Loader dialog box to terminate control by the Loader program. The Job Queue screen reappears on the keypad.

4.8 Maintaining the Dilutor Syringe

Maintenance of the dilutor syringe includes:

- Inspecting the syringe plunger seal
- Maintaining the sideport syringe
- Replacing the transfer tubing kit

The dilutor syringe plunger requires periodic replacement. The frequency depends on the duty cycles, the type of solvents, and the size of the syringe. Replace the syringe plunger if it is leaking or damaged.

4.8.1 Inspecting the Syringe Plunger Seal

1. From the Job Queue screen, select F1 Menu > Utilities > F2 Change DSyr. The dilutor syringe plunger moves to a position in the middle of the plunger drive for easier access.
2. Remove the dilutor syringe screw.
3. Unscrew the dilutor syringe from the dilutor solenoid valve.
4. Inspect the syringe. If needed, replace the syringe.
5. Carefully screw the dilutor syringe into the lower solenoid valve port and tighten it firmly.

Note: Make sure you insert only one dilutor syringe washer. Do not insert a second washer.

6. Rotate the syringe barrel and insert the dilutor syringe screw into the syringe button hole, and screw it into the dilutor drive pin.

4.8.2 Maintaining the Sideport Syringe

Maintenance of the sideport syringe includes:

- Inspecting the syringe plunger seal
- Replacing the syringe plunger
- Replacing the removable syringe needle
- Replacing the syringe

The sideport syringe plunger requires periodic replacement. The frequency depends on the duty cycles, the type of solvents, and the size of the syringe. Replace the syringe plunger if it is leaking or damaged.



Caution: To avoid electric shock, turn off the instrument and unplug the power cord(s) before performing installation or maintenance procedures.



Attention: To avoid damaging the instrument electronics, turn off the power supply(ies) before connecting or disconnecting any cable to the 2777 Sample Manager.

To inspect or replace the sideport syringe plunger, the syringe, or the syringe needle:

1. Turn off the power supply.

2. Move the injection unit to a clear position within the working space.
3. Loosen the plunger holder retaining screw (#1 in [Figure 4-6](#)).
4. Unscrew the sideport syringe adapter screw (#5) and remove the sideport syringe assembly from the injection unit.
5. Loosen the two transfer tubing connection fittings (#2) but do not remove them completely.
6. Loosen the plunger sealing screw (#3) and lift it up (#4). Make sure the Perfluor O-ring remains in the plunger sealing screw.

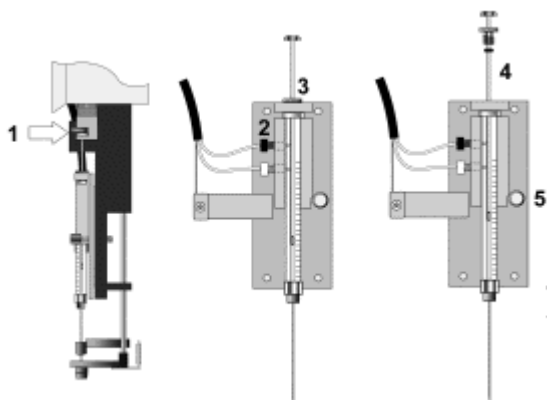


Figure 4-6 Exchanging the Sideport Syringe

7. Inspect the sideport syringe plunger and/or the removable needle and replace them if necessary.
8. To reinstall the sideport syringe, repeat steps 1 through 7 (in reverse order).

4.8.3 Replacing the Transfer Tubing Kit

1. Unscrew the white connection fitting from the left port of the dilutor solenoid valve.
2. Unscrew the left top dilutor cover TORX screw and remove the guiding wire ([Figure 4-7](#)).

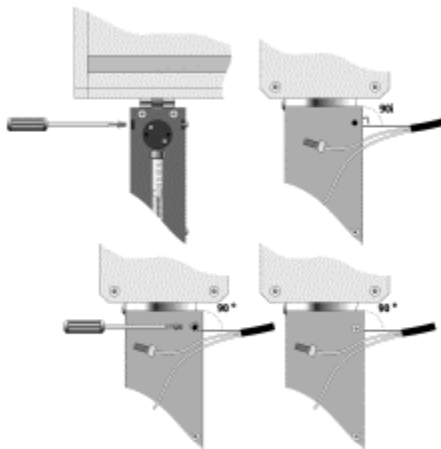


Figure 4-7 Removing the Transfer Tubing Kit at the Dilutor Side

3. Unscrew the two connection fittings from the guiding bracket of the sideport syringe adapter.
4. Loosen the TORX screw at the guiding bracket of the sideport syringe adapter.
5. Remove the transfer tubing kit ([Figure 4-8](#)).

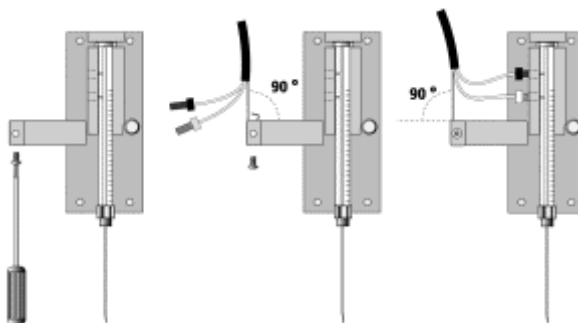


Figure 4-8 Removing the Transfer Tubing Kit at the Sideport Syringe Side

6. To reinstall the transfer tubing kit, repeat steps 1 through 5 in reverse order (see [Section 2.8](#)).

Chapter 5

Troubleshooting the 2777 Sample Manager

This chapter describes how to find the source of and fix problems you may encounter with the 2777 Sample Manager.

To troubleshoot MassLynx software problems, see the following documents:

- *FractionLynx Software User's Guide*
- *MassLynx Guide to Data Acquisition*
- *MassLynx Inlet Control Guide*
- *MassLynx Interfacing Guide*
- *MassLynx Software Release Notes*
- *MassLynx Software User's Guide*

Note: The power supply(ies) have no operator-serviceable or replaceable parts inside. If a power supply is not functioning, see [Section 5.3](#).

5.1 Proper Operating Procedures

To keep your 2777 Sample Manager running optimally, follow the operating procedures and guidelines in [Chapter 3](#) and perform the maintenance procedures in [Chapter 4](#).

Check the 2777 Sample Manager periodically to determine that it is operating within acceptable parameters. Run control samples daily when running assays.

To troubleshoot problems with the instrument, see [Table 5-1](#).

5.2 Spare Parts

See [Appendix B](#) for spare parts information. Parts not included in [Appendix B](#) are not recommended for replacement by the customer.

5.3 Contacting Waters Technical Service

If you encounter any problems replacing parts in the 2777 Sample Manager, contact Waters Technical Service at 800 252-4752, *U.S. and Canadian customers only*. Other customers, call your local Waters subsidiary or your local Waters Technical Service Representative, or call Waters corporate headquarters in Milford, Massachusetts (U.S.A.) for assistance.

5.4 Safety and Handling

When you troubleshoot the 2777 Sample Manager, keep the following safety considerations in mind.



Caution: To avoid injury during 2777 Sample Manager operation, keep your hands clear of the syringe. Do not remove the safety shield.



Caution: To avoid injury, observe safe laboratory practices when you handle solvents, change tubing, or operate the 2777 Sample Manager. Know the physical and chemical properties of the solvents you use. See the Material Safety Data Sheets from the manufacturer for the solvents in use.



Attention: To avoid damaging electrical parts, never disconnect an electrical assembly while power is applied to the 2777 Sample Manager. Once power is turned off, wait approximately 10 seconds before you disconnect an assembly.



Attention: To avoid damage due to electrostatic discharge, do not touch integrated circuit chips or other components.

5.5 Symptoms and Solutions

The 2777 Sample Manager represents only one of several components in a chromatography system. [Table 5-1](#) is limited to the 2777 Sample Manager only.

Table 5-1 Troubleshooting the 2777 Sample Manager

Symptom or Error Message	Possible Cause	Recommended Action
No or very low detector signal is observed.	The valve needle guide and/or needle seal are not properly installed.	Check the valve needle guide and seal (see Section 4.4).
	The valve ports are not plumbed correctly to the pump and/or detector.	Check fluidic connections (see Section 2.6).
	Syringe is clogged.	1. Remove the syringe, then aspirate and dispense liquid manually. 2. Clean the syringe. 3. If still clogged, replace the syringe.
	Needle is bent.	Inspect and/or change the syringe (see Section 4.3).
	No sample liquid is injected.	Check to see if sample well is empty. Make sure the correct sample is requested. Check and/or adjust needle penetration into the sample vial.
	Sample volume is missing or too low.	Increase the sample volume. Make sure the correct sample is requested.
Mobile phase and/or sample flows out of the wrong ports on the LC injection valve.	The valve rotor is reversed (180° out of alignment).	Remove the rotor and reinstall it in the correct position (see Section 4.5.2). Look for a letter (such as H) stamped on the rotor. The letter must be located on the lower half of the rotor.

Table 5-1 Troubleshooting the 2777 Sample Manager (Continued)

Symptom or Error Message	Possible Cause	Recommended Action
Sample is backing up on the valve needle guide.	Syringe needle outer diameter (OD) is too small.	Make sure the syringe needle is 22-gauge.
	Valve needle seal is leaking.	Change the valve needle seal (see Section 4.4).
	The needle penetration depth for the injection valve is not set correctly.	Adjust the injection valve needle penetration (see Section 2.12.3).
	The syringe plunger speed is too high, resulting in excessive inlet pressure.	Reduce the inject speed in the method.
Poor reproducibility	Syringe pressure differences when filling the syringe, possibly due to high viscosity sample.	Increase the pullup delay value.
	Vacuum is created in sample vial.	Reduce the sample volume in the sample vial.
	Solvent is highly volatile.	Use a Gastight syringe and sample tray cooling. Increase the pullup delay value. Reduce the filling speed in method.
	Particulates are clogging the syringe or injection valve.	Remove particulates and clean the syringe needle and injection valve.
	Vials are not properly crimped.	Check vial cap by attempting to rotate by hand. Loose caps may cause selective loss of lighter components from sample. Adjust the crimping tool correctly.

Table 5-1 Troubleshooting the 2777 Sample Manager (Continued)

Symptom or Error Message	Possible Cause	Recommended Action
Excessive carryover between samples	Syringe and/or valve injection port are dirty.	Increase Pst Inj Slv1 and/or Vlv Cln Slv1 values in the method. Use PreClnSlv1 and PreClnSpl.
	Waste tubing inner diameter (ID) at the injection valve is too small, causing waste liquid to be pulled back by capillary action into the rotor groove.	Replace the waste tubing with larger ID tubing.
	Valve rotor is damaged or grooved.	Replace the valve rotor (see Section 4.5.2).
	Valve needle seal is leaking.	Change the valve needle seal (see Section 4.4).
	Wash solvent is inappropriate.	Use the appropriate wash solvent.
Unexplained chromatographic peaks	Air is being introduced into the injection loop. Needle penetration depths may be inadequate, causing air to be pulled into the syringe.	Check and/or adjust the needle penetration depth into the sample vial. Make sure the Air Volume Method parameter is set to zero.
Unexplained collisions of the injection unit	Object is not defined correctly.	Define the object correctly (see Section 2.11). Ensure that the needle is straight.
Error Message: <i>Object Not Detected</i>	Z value for the object is incorrect.	Define the Z value for the object (see Section 2.11).
	Sample vial, deep-well plate, or microplate is missing.	Insert sample vial, deep-well plate, or microplate.
Error Message: <i>Object Collision before Z Tolerance</i>	Z value for the object is incorrect.	Define the Z value for the object (see Section 2.11).

Table 5-1 Troubleshooting the 2777 Sample Manager (Continued)

Symptom or Error Message	Possible Cause	Recommended Action
Error Message: Motor AUX1 (or AUX2) failed	Injection valve drive is not connected.	Turn off the instrument, then check connections between 2777 rear panel and LC Vlv1 (see Section 2.9).
	LC Vlv1 Connection cable is defective.	Check the connections. Change the connection cable.
	MOTIO board is defective.	Call Waters Technical Service.

Appendix A

Specifications

This appendix provides specifications for the Waters® 2777 Sample Manager.

Table A-1 General Specifications

Condition	Specification
Injection volume range	10 to 100 µL with standard 100-µL syringe Down to 0.5 µL with optional 4-port internal loop configuration Up to 2500 µL with optional larger sample loop and syringe
Replicate injections	1 to 99 from one vial
Precision ^a	< 0.2% RSD, 20-µL sample loop, overfilling < 0.5% RSD, 20-µL sample loop, partial filling
Carryover	< 0.05%
Injection cycle time	20 to 60 sec., depending on plunger speeds, injection volume, and wash cycles

a. **Conditions:** Mobile phase = methanol:water (60:40) degassed, online degasser, flow = 1.0 mL/min.
Column = Symmetry C₁₈ 4.6 × 75 mm. Sample = uracil and propylparaben (10 mg/mL). Injection volume = 80 µL (full loop) or 10 µL (partial loop).

Table A-2 Electrical Specifications

Parameter	Requirement
Protection class ^a	Class I
Overvoltage category ^b	II
Pollution degree ^c	2
Moisture protection ^d	Normal (IPXO)

Table A-2 Electrical Specifications (Continued)

Parameter	Requirement	
2777 Sample Manager		
	Voltage	24 VDC
	Current	3.2 A
	Fuse	T 6.3 A/250 V
2777 Power Supply		
Input	 Line voltage	Grounded AC, 100 to 240 V
	Line frequency	50/60 Hz
	Current	4 A
	Fuse (5 × 20 mm)	T 5 A/250 V
Output	Voltage	36 VDC
	Current	4.16 A
Single-Valve Injector		
Input	Voltage	24 VDC
	Current	2.5 A
4-Valve Injection Module		
Input	Voltage	24 VDC
	Current	4.5 A
Heater Cooler		
Input	Voltage	24 VDC
	Current	2.7 A
Heater Cooler Power Supply		
Input	 Line voltage	Grounded AC, 100 to 240 V
	Line frequency	50/60 Hz
	Current	2 A

Table A-2 Electrical Specifications (Continued)

Parameter	Requirement	
Output	Voltage	24 VDC
	Current	4.5 A
	Fuse	T 3.15 A/250 V
Trademark	2777 is not a registered trademark.	

- a. **Protection Class I** — Protection class describes the insulating scheme used in the instrument to protect the user from electrical shock. Class I identifies a single level of insulation between live parts (wires) and exposed conductive parts (metal panels), in which the exposed conductive parts are connected to a grounding system. In turn this grounding system is connected to the third pin (ground pin) on the electrical power cord plug.
- b. **Over Voltage Category II** — Overvoltage category II pertains to instruments that receive their electrical power from a local level such as an electrical wall outlet.
- c. **Pollution Degree 2** — This is a measure of pollution on electrical circuits that may produce a reduction of dielectric strength or surface resistivity. Degree 2 refers to normally only non-conductive pollution. Occasionally, however, a temporary conductivity caused by condensation must be expected.
- d. **Moisture Protection** — Normal (IPXO) — IPXO means that there is NO Ingress Protection against any type of dripping or sprayed water. The X is a place holder to identify protection against dust if applicable.

Table A-3 Physical Specifications

Parameter	Specification
Height	25.5 in. (64.8 cm)
Depth	14.1 in. (38.5 cm)
Width	Standard 2777: 32.6 in. (82.8 cm) Compact 2777C: 21.0 in. (53.4 cm)
Weight	22 lbs. (10 kg) without accessories

Table A-4 Operating and Environmental Requirements

Parameter	Requirement
Operating temperature range	39 to 104 °F (4 to 40 °C)
Storage temperature range	−104 to 158 °F (−40 to 70 °C)
Maximum relative humidity	75%, noncondensing
Storage humidity range	0 to 90%, noncondensing

Table A-4 Operating and Environmental Requirements (Continued)

Parameter	Requirement
Bench space	6 in. (15.25 cm) clearance at rear; access to power switch and power cord; clean, level, smooth surface
Vibration	Negligible
Static electricity	Negligible

Table A-5 Dilutor Specifications

Part	Specification
Dilutor syringe	2.5 mL (optional 1 mL, 5 mL, and 10 mL)
Volume range	0.25 mL to 2.5 mL
Flow rate range	10 μ L/min to 300 μ L/min
Sideport syringe	80 μ L with removable needle (optional 20 μ L)
Flow rate range	1 μ L/min to 200 μ L/min
Transfer tubing kit	2 pieces PTFE tubing, ID 0.787 mm, OD 1.58 mm, 620 μ L including connection fittings and guiding wire
Solvent reservoir	1000-mL borosilicate glass including 10- μ m PEEK solvent filter
Control	Cycle Composer software version 1.4 or later
PAL firmware	Version 2.4.0 or later
Piston/valve drive	Stepper motor with independently operated solenoid valve
Wetted parts	All liquids compatible with borosilicate glass, PTFE, Kel-F, FEP
Width	1.9 in. (47 mm)
Depth	2.6 in. (67 mm)
Length	8.5 in. (217 mm)
Weight	2.16 lb. (980 g)

Appendix B

Spare Parts

This appendix provides information on the following spare parts:

- Cables – [Table B-1](#)
- LC valves and parts – [Table B-2](#)
- Syringe kits and syringes – [Table B-3](#)
- Dilutors – [Table B-4](#)
- Miscellaneous parts – [Table B-5](#)

Note: *Never try to repair or replace any component of the instrument that is not described in this guide without the assistance of a Waters Technical Service Representative.*

For the contents of the startup kit and accessory kits, see [Tables B-6 to B-9](#).

Table B-1 Cables

Part Description	Waters Part Number
Contact closure cable (Interface 1)	700002193
Control terminal to serial 3	700002195
LC valve to auxiliary (AUX) port 1 (7.9 in. or 20 cm)	700002189
LC valve to auxiliary port 1 (30 in. or 76 cm)	700002190
Power cable (PS to power), either domestic/110 V or ex-US/240 V	700002191
Printer cable (serial interface)	700002196
RS-232 cable (SER1 to PC)	700002194
Wash station cable (to Interface 2 connector) for standard 2777	700002192
Wash station cable (to Wash Station connector) for compact 2777C	700002487

Table B-2 LC Valves and Parts

Part Description	Waters Part Number
20- μ L Sample loop	430000849
100- μ L Sample loop	430000847
200- μ L Sample loop	430000846
250- μ L Sample loop	430000845
1000- μ L Sample loop	430000843
4-Valve module	725000181
50- μ L Sample loop	430000848
500- μ L Sample loop	430000844
6-Port VICI Valco valve	417000145
Needle guide fitting	700002211
Needle seal, 22-gauge (10/pack)	700002208
Rotor	700002210
Single valve assembly	725000182

Table B-3 Syringe Kits and Syringes

Part Description	Waters Part Number
10- μ L Plunger (10/pack)	700002212
10- μ L Syringe kit	205000181
10- μ L Syringe, 22-gauge	430000859
25- μ L Plunger (10/pack)	700002213
25- μ L Syringe kit	205000182
25- μ L Syringe, 22-gauge	430000861
100- μ L Plunger (10/pack)	700002214
100- μ L Syringe kit	205000183
100- μ L Syringe, 22-gauge	430000863
100- μ L Syringe, 22-gauge, low dead volume	430000864
250- μ L Plunger (10/pack)	700002215

Table B-3 Syringe Kits and Syringes (Continued)

Part Description	Waters Part Number
250-μL Syringe kit	205000184
250-μL Syringe, 22-gauge	430000865
500-μL Plunger (10/pack)	700002216
500-μL Syringe kit	205000185
500-μL Syringe, 22-gauge	430000866
1000-μL Plunger	700002217
1000-μL Syringe kit	205000186
1000-μL Syringe, 22-gauge	430000867
2500-μL Plunger	700002218
2500-μL Syringe kit	205000187
2500-μL Syringe, 22-gauge	430000868
5000-μL Plunger	700002219
5000-μL Syringe kit	205000188
5000-μL Syringe, 22-gauge	430000869

Table B-4 Dilutors

Part Description	Waters Part Number
1.0-mL Dilutor syringe	430000855
1.0-mL Dilutor syringe plunger	700002232
2.5-mL Dilutor syringe	430000856
2.5-mL Dilutor syringe plunger	700002233
5.0-mL Dilutor syringe	430000857
5.0-mL Dilutor syringe plunger	700002234
10.0-mL Dilutor syringe	430000858
10.0-mL Dilutor syringe plunger	700002235
20-μL Dilutor kit	205000191
20-μL Sideport syringe needle (3/pack)	700002239
20-μL Sideport syringe plunger (10/pack)	700002237

Table B-4 Dilutors (Continued)

Part Description	Waters Part Number
20- μ L Sideport syringe without needle	700002231
80- μ L Sideport syringe needle (3/pack)	700002238
80- μ L Sideport syringe plunger (10/pack)	700002236
80- μ L Sideport syringe without needle	700002230
Dilutor assembly without syringe or holder	205000190

Table B-5 Other Spare Parts

Part Description	Waters Part Number
PCBs	
2777 power supply	700002188
CPU printed circuit board (PCB)	700002186
Motor driver PCB	700002187
Body	
Injection unit	700002201
Transparent cover (for injection unit)	700002202
Transparent safety shield for standard 2777	700002203
Transparent safety shield for compact 2777C	700002488
X/Y crossrail with electronics	700002200
Wash Station	
500-mL Wash solvent bottle	700002229
Glass tube, 22-gauge	700002222
O-Ring, Perfluor white (4/pack)	700002224
Shutoff valve	700002227
Swagelok fitting	700002226
Teflon tubing (including fittings)	700002228
Viewing glass	700002223
Wash station assembly, no holder or cable	700002220
Wash station tube (including fittings)	700002225

Table B-5 Other Spare Parts (Continued)

Part Description	Waters Part Number
Wash station valve assembly	700002221
Trays and Stacks	
2.0-mL Sample tray (6/pack)	415000408
3-Drawer stack (for 6 deep-well plates)	415000411
6-Drawer stack (for 12 microplates)	415000410
Peltier cooled 3-drawer stack ^a	725000177
Sample tray	415000409
Tray holder, 3.0 in. (7.6 cm) wide, holds 2 microtiter plates	205000245
Tray holder, 4.5 in. (11.4 cm) wide, holds 4 microtiter plates	205000247
Miscellaneous	
Control terminal (keypad) [MB 01-00]	Not available
Control terminal holder [MB 20-00]	Not available
Cycle Composer CD with version 1.5 [PAL CycCompCD]	Not available
<i>Installation and Maintenance Guide</i>	71500277704
MUX Kit (4 check valves)	205000189
Stack drawer magnet	700002241

a. Peltier cooled 3-drawer stack (4 to 40 °C) holds 6 microtiter plates (96/384 wells), 6 deep-well plates (96/384 wells), or 6 sample trays (2-mL vials); includes power supply 110 V/220 V, LED display, temperature regulation $\pm 1^{\circ}\text{C}$.

Table B-6 2777 Startup Kit

Part Description	Quantity
Legs	2
Safety shield	1
Injection unit (Z axis)	1
X/Y axis	1
Power supply	1

Table B-6 2777 Startup Kit (Continued)

Part Description	Quantity
Hand-held controller:	
• Keypad	1
• Hand-held controller holder	1
• Hand-held controller screws	2
Installation Manual	1
<i>Waters 2777 Sample Manager Installation and Maintenance Guide</i>	1
Wash station solvent bottles	2
Wash station holder assembly	1
Wash station valve assembly	1
100- μ L syringe kit with 2 100- μ L syringes	1
Wash station tubing	1
Waste tubing	1
RS-232 cable (SER1 to CPU)	1
Hand-held controller cable (SER3 to keypad)	1
Wash station cable (Interface 2 to wash station)	1
Signal cable (Interface 1)	1
TORX drivers	3
Mini-flatblade screwdriver	1
Spare injection unit screws	3

Table B-7 Single Valve Injector Kit

Part Description	Quantity
LC valve	1
LC valve cables (AUX1 to valve)	2

Table B-7 Single Valve Injector Kit (Continued)

Part Description	Quantity
LC Valve Kit:	
• Stainless steel (S)S compression screws	6
• SS ferrules	6
• Wrench	1
• Needle seals	3
• Tubing	1
20- μ L sample loop	1

Table B-8 4-Valve Module Kit

Part Description	Quantity
4-way injection valve assembly	1
Check valves for MUX	4
Fingertight adapters (blue, yellow, green, red, white)	10 pieces each
PEEK tubing, orange (0.020 in. ID)	5 m
PEEK tubing, blue (0.010 in. ID)	5 m
PEEK tubing, red (0.005 in. ID)	5 m
PEEK fittings	20
5-way PEEK splitter	1
Needle seals	10
20- μ L sample loops	4
SS compression screws	5
SS ferrules	5
Valve communication cables:	
• Main cable from SER2 to Valve 1	1
• Serial cables	3
Tubing cutter	1
Valve positioner	1
Hex key, 3/32 in.	1
Wrench	4

Table B-9 Dilutor Kit

Part Description	Quantity
Dilutor assembly	1
Kloehn 2.5-mL syringe	1
80- μ L sideport syringe kit with 80- μ L sideport syringe	1
Cap and tubing for solvent bottle	1
Shielded tubing with white and black connectors	1
Solvent bottle	1
Communication cable	1

Appendix C

Software Maps and Connections

Use this appendix to program external events when connecting devices to the 2777 Sample Manager. The available options in the software maps vary, depending on the hardware configuration of your system.

When you power on the 2777 Sample Manager, the Job Queue screen appears. In stand-alone mode, the selections you can make from the function keys are as follows:

- **F1 Menu** – To view the Menu software (see [Section C.1](#)).
- **F2 Add Job** – To display the default job, then modify it to create a new job.
- **F3 Del Job** – To delete a job.
- **F4 Start** – To select and start a job or job queue.

C.1 Menu Software Map

Figure C-1 shows the Menu software map for the 2777 Sample Manager. From the Job Queue screen, select F1 Menu, then use this map to navigate through the Menu software on the keypad.

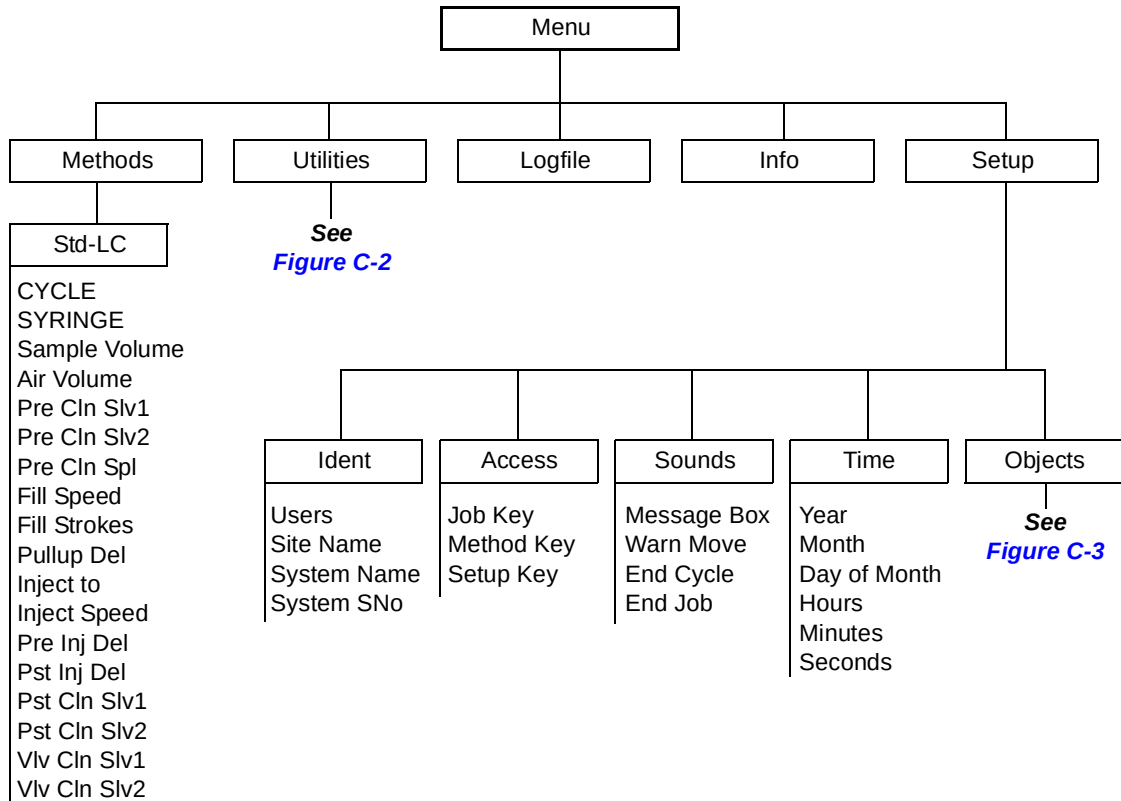


Figure C-1 Menu Software Map

C.2 Utilities Software Map

To access utilities from the Job Queue screen, select F1 Menu > Utilities. [Figure C-2](#) shows the Utilities software map.

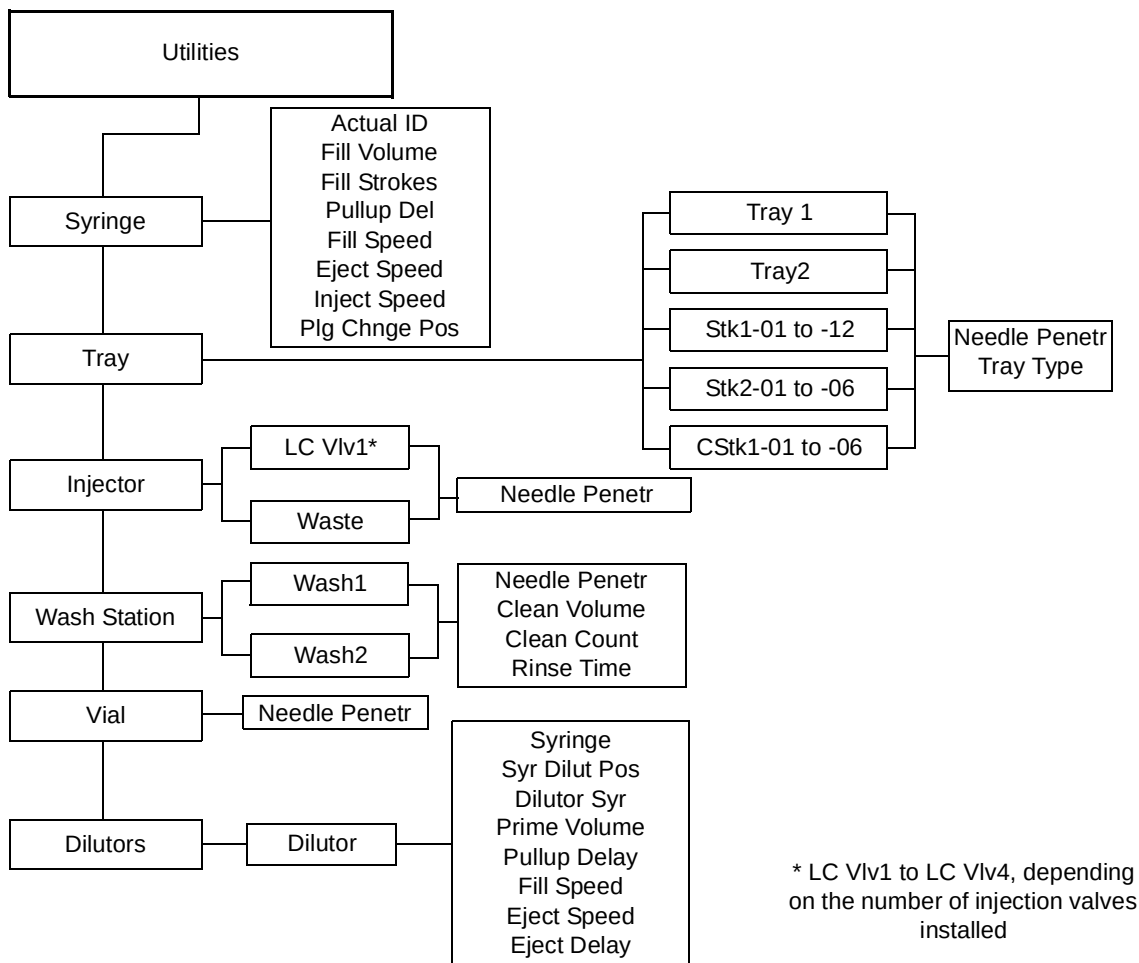


Figure C-2 Utilities Software Map

C.3 Objects Software Map

To access and set up objects, from the Job Queue screen, select F1 Menu > Setup > Objects. [Figure C-3](#) shows the Objects software map.

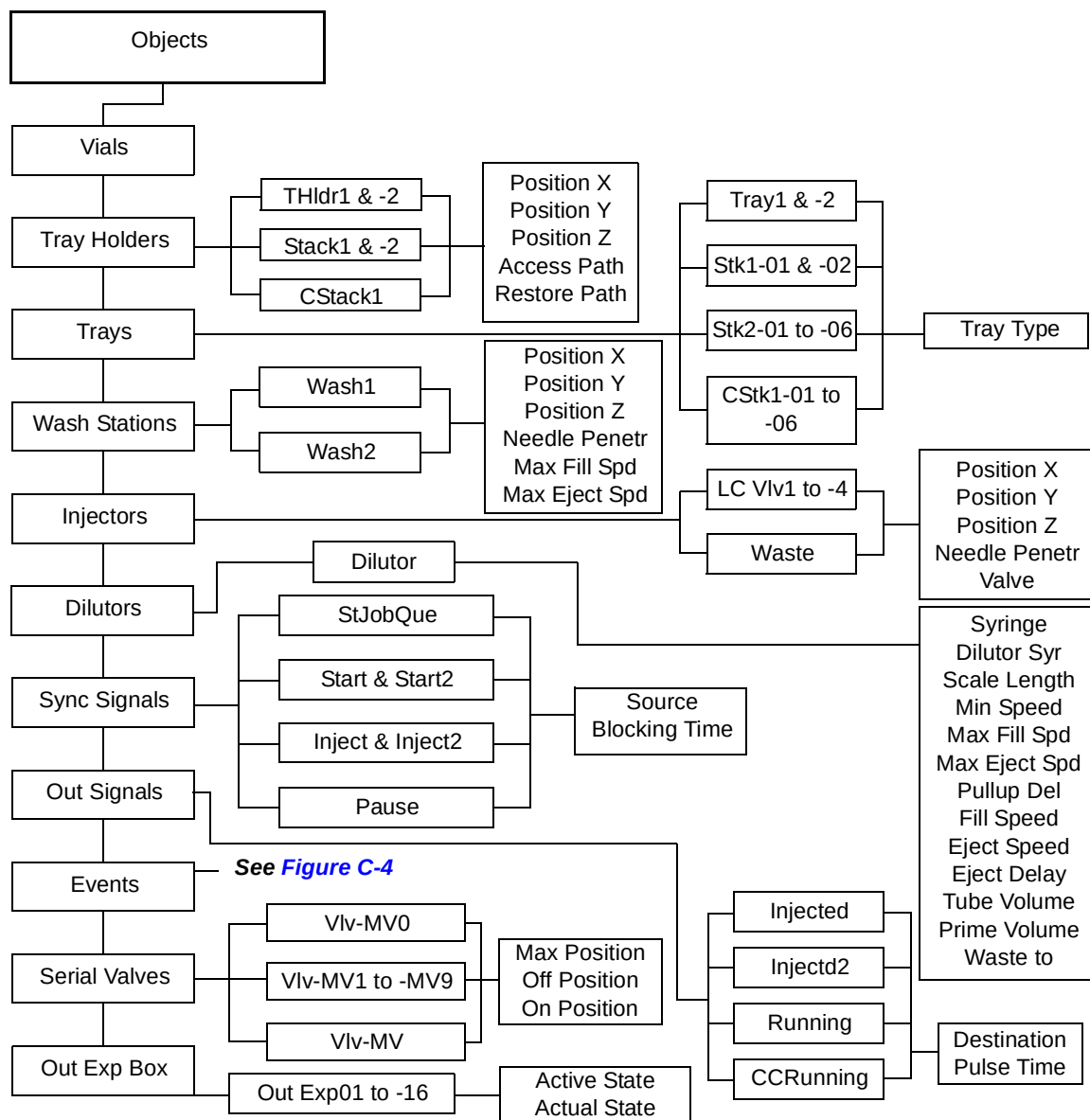


Figure C-3 Objects Software Map

C.4 Events Software Map

To program events, select F1 Menu > Setup > Objects > Events. [Figure C-4](#) shows the Events software map. See [Section 2.11.7](#) for procedures on interfacing with other devices. See [Section C.5](#) for specific pin connections for the external connectors.

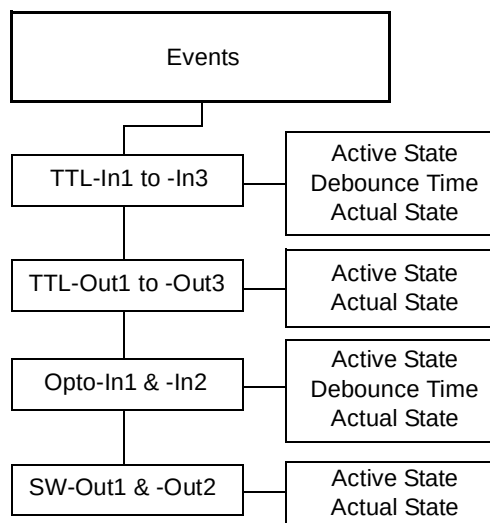


Figure C-4 Events Software Map

C.5 External Connectors

The X-crossrail of the standard 2777 Sample Manager contains the following connectors (from left to right): AUX1, AUX2, INTERFACE 1, INTERFACE 2, POWER, BUS, SER3, SER2, and SER1.

The X-crossrail of the compact 2777C Sample Manager contains the following connectors (from left to right): AUX, INTERFACE, WASH STATION, POWER, SER3, SER2, and SER1.

[Tables C-1 to C-5](#) describe the pins and signals for external connectors. See [Section C.4](#) to program the events for devices you connect to the 2777 Sample Manager.

Table C-1 SER1 Connector

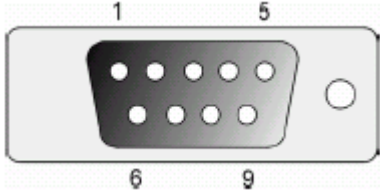
Connector	Pin	Signal Name
	1	DCD
	2	RXD
	3	TXD
	4	DTR
	5	GND
	6	DSR
	7	RTS
	8	CTS
	9	RI

Table C-2 SER2 and SER3 Connectors

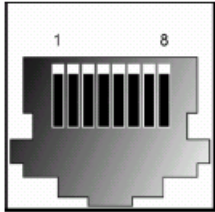
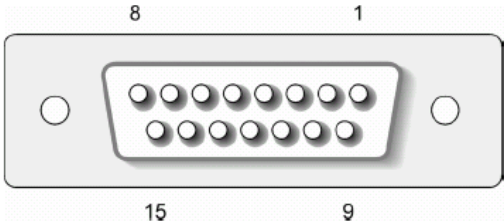
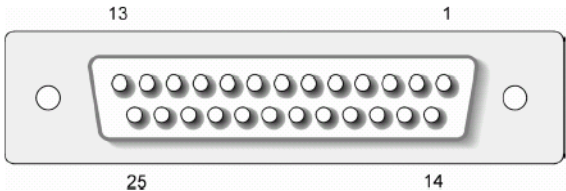
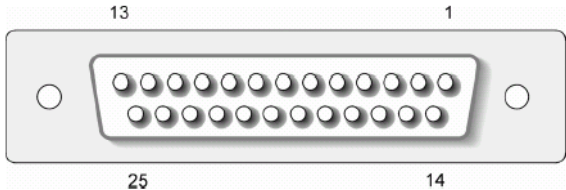
Connector	Pin	Signal Name
	1	GND
	2	RXD
	3	TXD
	4	RTS
	5	CTS
	6	+5V
	7	Reserved
	8	Reserved

Table C-3 INTERFACE 1 Connector^a

Connector	Pin	Signal Name
	1	Pwr-Out1 +
	2	Pwr-Out2 +
	3	SW-Out NO
	4	SW-Out1 COM
	5	SW-Out2 NO
	6	Opto-In1 +
	7	TTL-In1 +
	8	GND
	9	Pwr-Out1 –
	10	Pwr-Out2 –
	11	TTL-In2
	12	SW-Out2 COM
	13	TTL-In3
	14	Opto-In1 –
	15	+5V

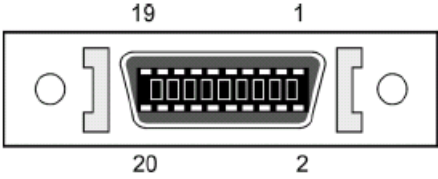
a. This connector on the compact 2777C Sample Manager has no number.

Table C-4 INTERFACE 2 Connector^a

Connector	Pin	Signal Name
	1	TTL-In1
	2	TTL-In2
	3	TTL-In3
	4	TTL-Out1
	5	TTL-Out2
	6	TTL-Out3
	7	Opto-In1 +
	8	Opto-In2 +
	9	SW-Out1 NO
	10	SW-Out2 NO
	11	Pwr-Out1 +
	12	Pwr-Out2 +
	13	+5V
	14 to 19	GND
	20	Opto-In1 –
	21	Opto-In2 –
	22	SW-Out1 COM
	23	SW-Out2 COM
	24	Pwr-Out1 –
	25	Pwr-Out2 –

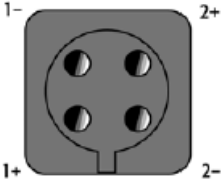
a. For Standard 2777 Sample Manager only

Table C-5 AUX1 and AUX2 Connectors^a

Connector	Pin	Signal Name
	1, 3	Motor A1
	2, 4	Motor A2
	5, 7	Motor B1
	6, 8	Motor B2
	10, 16, 18	GND
	11	Temp +
	12	Temp –
	13	Sens
	14	+5V
	15, 17	Heater
	19, 20	+36V

a. The compact 2777C has one AUX connector.

Table C-6 WASH STATION Connector

Connector	Pin	Signal Name
	1+	Pwr-Out1+
	1–	Pwr-Out1–
	2+	Pwr-Out2+
	2–	Pwr-Out2–

Appendix D

Glossary

cycle	Specific operations necessary to process one sample. The cycle operations are repeated for each sample within a job. Cycles are designed for specific applications. The Standard 2777 cycle is named LC-Inj.
DW	Deep Well (microplate). Holds more sample than standard microplate.
HTC	High Throughput Compact model.
HTS	High Throughput Screening model.
job	Information needed by the 2777 Sample Manager to process multiple samples using the same processing steps. The elements of a job are a <i>method</i> and a <i>tray</i> that defines the location of the samples to be processed. For identification, jobs are automatically numbered from 01 to 99, then restart at 01 when they are added to the job queue.
job queue	List of sample processing jobs. Jobs are executed in the order displayed on the Job Queue screen. You can add new jobs to the queue while samples are being processed.
method	Elements that define how the samples are processed. The elements of a method are a cycle, a syringe, and a parameter list. Methods have names with up to eight characters and can be changed, copied, and deleted.
method parameters	Parameters associated with the cycle operations. User-assigned parameter values define how a processing operation is performed. A zero parameter value disables a cycle operation. Cycle parameters are application-specific.
object	Data structures describing the properties of physical modules. Certain modules (such as stacks) require several objects to fully describe the properties.
Output Signals (Out Signals)	Signals sent from the 2777 Sample Manager to external devices to indicate status or completion of particular processing steps.
PAL	Prep And Load (Loader software).

stack	A particular type of tray holder with drawers that are designed to hold microplates. A 6-drawer stack holds 12 standard microplates, two in each drawer. A 3-drawer stack holds 6 deep-well microplates, two in each drawer. Each stack has a reference position (X, Y, Z coordinates) that defines its location.
<i>Synchronization Signals (Sync Signals)</i>	Input signals from external devices that tell the 2777 Sample Manager when to wait or proceed with a sample processing step.
tray	Container that holds multiple samples. Trays are defined by designating the tray type and the tray holder. Tray names are used to identify the sample source within a job.
tray holder	Container that holds one or two trays. Each tray holder has a reference position (X, Y, Z coordinates) that defines its location.
tray type	Category that defines the pattern and sampling sequence of sample locations within a tray. Standard tray types include shallow and deep-well 96-position microplates and trays that hold 1-, 2-, 10-, and 20-mL vials.

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