

# Sievers\* InnovOx ES Laboratory TOC Analyzer

## Operation and Maintenance Manual

3.11 firmware or later



**Sievers InnovOx ES**  
Laboratory TOC Analyzer



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An electronic version of the Analyzer's *Operation and Maintenance Manual*  
is accessible from the Sievers website: [Customer Support > Sievers Analyzers & Instruments].

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# Identification Records

**Analyzer serial number:**

(This is located on the side of the Analyzer.)

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**Sievers Autosampler serial number:**

(This is located on the side of the Sievers Autosampler.)

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**Date of receipt and installation of the Analyzer:**

(This is the warranty start date.)

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## Revision History

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# Warnings

Warning	
	This symbol on the instrument indicates that the user should refer to the manual for operating instructions.
	The vial port contains sharp needles designed to pierce the septa of sample vials. Do not put fingers or inappropriate materials into the vial port.
	<p>To protect against inhalation of toxic fumes, make sure the Analyzer is installed in a well-ventilated area. To treat the gas waste stream, a halogen trap is provided and will shut down the instrument when the trap has expired.</p> <p>Depending on the composition of the sample, halogens such as chlorine or bromine, or toxic fumes from fluoride, cyanide, or other toxic salts, can be emitted into the Analyzer's liquid waste stream. To protect against inhalation of hazardous fumes, add sodium hydroxide (lye) to the waste container to neutralize acid in the waste. Avoid stratification of the waste within the container by occasionally agitating the container.</p>
	This symbol indicates that to comply with European Union Directive 2002/96/EC for waste electrical and electronic equipment (WEEE), the Analyzer should be disposed of separately from standard waste.
	For continued protection against fire hazard, replace the fuse with a fuse of the same type and rating.
	Hazardous reagents (sodium persulfate, hydrochloric acid, and phosphoric acid) are used in the Analyzer. The waste stream from the instrument is acidic and must be disposed of properly. Consult your federal, state, and local government regulations.
	This is a Safety Class I product. It must be must be attached to a grounded power source. To avoid damage to the Analyzer and the chance of injury, make sure the Analyzer is connected to a power line of the proper voltage.
	To ensure proper operation and protect against injury, do not operate the Analyzer when its covers are off.

Warning
Any operation requiring access to the inside of the Analyzer, including installation of maintenance items, could result in injury. To avoid potentially dangerous electric shock or burning, turn off power and disconnect from the power supply before opening the Analyzer. Use caution when touching any electronic components.
When handling components that contain sample, standards, waste solution, or reagents, wear eye protection and gloves.
Always stop analysis before turning off the Analyzer.
This is a Class A product. In a domestic environment, this product may cause electromagnetic interference in which case the user may be required to take adequate measures to correct the interference.
If this instrument is used in a manner not specified by Veolia, the protection provided by the instrument may be impaired.
Consult the SDS that accompanies each standards set and the reagents to identify proper disposal techniques.
Keep foreign objects away from the Analyzer's fan to avoid introducing hazards into the Analyzer. The cooling air inlet for the reactor is at the bottom of the Analyzer; do not allow paper or other objects to block or enter that inlet.
If the Analyzer is used with compressed gases, the pressure of the gas at the gas inlet must not exceed 689 kPa (100 psig). Use only nitrogen or CO <sub>2</sub> -free air.
Before analyzing a new sample, refer to Chapter 3, Interferences, for information on potential interferences and their effect on the Analyzer.
If you experience an issue with the printed circuit assembly (PCA) that contains a lithium battery, please contact Veolia or your local service provider for return instructions. Whenever changing the lithium battery, observe the correct polarity. Dispose of used batteries according to the manufacturer's instructions and local disposal requirements.

## Warning



This symbol on the instrument indicates that the product does contain restricted substances included in China RoHS II. Please refer to the following table.

### InnovOx TOC Analyzers

产品中有毒物质的名称及含量

Table of Hazardous Substances' Name and Concentration

部件名称 Component Name	有毒物质Hazardous Substances' Name					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
展示 Display	X	O	O	O	O	O

本表格按照SJ/T 11364的规定编制。

This table is prepared according to SJ/T 11364

O: 表示该有害物质在该部件所有均质材料中的含量均在 GB/T 26572规定的限量要求以下

X: 表示该有害物质至少在该部件的某一均质材料中的含量超出 GB/T 26572规定的限量要求






• 此表所列数据为发布时所能获得的最佳信息

O: Indicates that hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement in GB/T 26572.

X: Indicates that 1 hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement in GB/T 26572.

• Data listed in the table represents best information available at the time of publication.

## 警告

警告	
	仪器上的此符号表示用户应参阅操作说明手册。
	瓶口含有锐利的针，设计用于刺穿样本瓶的隔片。请勿将手指或不当物体放入瓶口中。
	<p>为了防止吸入有毒烟雾，请确保将分析仪安装在通风良好的地方。在处理气体废物时，使用卤素捕集器，当捕集器过期时，会关闭仪器。</p> <p>样品由多种成分组成，氯或溴等卤素，或氟化物、氰化物、或其它毒性盐发出的有毒烟雾，可能会进入分析仪的废液之中。为了防止吸入有害气体，请向废液容器中加入氢氧化钠（碱液）或碳酸钠（纯碱），以中和废液中的酸。应偶尔搅动容器中的废液，以避免废液分层。</p>
	此符号表示符合有关废弃电气和电子设备（WEEE）的欧盟指令 2002/96/EC，分析仪应与标准废物隔离单独处置。
	为持续防止火灾，请使用同一型号和额定值的保险丝更换保险丝。
在分析仪中使用有害试剂（过硫酸钠、盐酸以及磷酸）。仪器中排出的废物流属酸性，必须妥善处理。请查询联邦、州和当地政府的法规。	
这是安全等级 I 级产品。它必须连接到接地的电源上。为避免对分析仪造成损坏，并避免受伤，要确保分析仪连接到电压正确的电源线上。	
为确保正常工作并防止受伤，在分析仪护盖拆掉时不得操作分析仪。	
需要进入分析仪内部的任何操作，包括安装维护物品，都可能会导致伤害。为避免潜在的电气危险或灼伤，在打开分析仪之前请关闭电源并拔下电源线。在接触任何电子器件时务必小心。	
在搬运含有样本、标准、废物溶液或试剂的部件时，请佩戴眼睛保护和手套。	
一定要在关闭分析仪之前先停止分析。	
这是 A 级产品。在室内环境中，该产品可能会造成电磁干扰，此时用户需要采取适当措施消除干扰。	

## 警告

如果以 Veolia 公司未规定的方式使用分析仪，分析仪所提供的保护功能可能会不起作用。

查阅随每个标准组和试剂配备的物质安全数据表（MSDS），以确定正确的处置技术。

分析仪风扇附近避免置放异物，以避免将有害物吹入分析仪。用于反应器的冷却空气进口在分析仪的底部，严禁纸张或其它物体堵塞或进入该入口。

如果分析仪与压缩气体配套使用，气体入口处的气体压力不得超过 689 kPa（100 psig）。只可使用氮气或不含二氧化碳的空气。

在分析新样品之前，应参阅“第 3 章：干扰因素”，了解可能的干扰因素及其对分析仪的影响。

如果带有锂电池的印刷电路组件（PCA）出现故障，请联系 Veolia 查询退货事宜。每当更换锂电池时，请注意不要颠倒电池的正负极方面。请按照厂家的说明和当地的废物处理要求弃置废旧电池。



仪器上此符号表示该产品含有列入中国 RoHS II 限用物质。请参照下表。

### InnovOx TOC Analyzers

产品中有毒物质的名称及含量

Table of Hazardous Substances' Name and Concentration

部件名称 Component Name	有毒物质Hazardous Substances' Name					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
展示 Display	X	0	0	0	0	0

本表格依据SJ/T 11364的规定编制。

This table is prepared according to SJ/T 11364

0: 表示该有害物质在该部件所有均质材料中的含量均在 GB/T 26572规定的限量要求以下

X: 表示该有害物质至少在该部件的某一均质材料中的含量超出 GB/T 26572规定的限量要求






• 此表所列数据为发布时所能获得的最佳信息

0: Indicates that hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement in GB/T 26572.

X: Indicates that 1 hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement in GB/T 26572.

• Data listed in the table represents best information available at the time of publication.






# Warnhinweise

Warnhinweise	
	Dieses Symbol auf dem Instrument weist darauf hin, dass der Benutzer im Bedienungshandbuch nachlesen soll.
	Die Ampullenöffnung enthält scharfe Nadeln, die dazu dienen, die Septa der Probeampullen zu durchstechen. Stecken Sie weder Ihre Finger noch ungeeignetes Material in die Ampullenöffnung.
	<p>Um sich davor zu schützen, giftige Dämpfe einzuatmen, achten Sie darauf, dass der Analysator in einem gut belüfteten Bereich installiert wird. Zur Behandlung der Abgasströme ist eine Halogenfalle vorgesehen, die das Gerät herunterfährt, wenn sie abgelaufen ist.</p> <p>Je nach Zusammensetzung der Probe können Halogene wie Chlor oder Brom oder giftige Dämpfe aus Fluorid, Cyanid oder anderen toxischen Salzen in den Abfall des Analysators abgegeben werden. Um sich davor zu schützen, gefährliche Dämpfe einzuatmen, geben Sie Natriumkarbonat (Soda) in den Abfallbehälter, um Säure im Abfall zu neutralisieren. Durch gelegentliches Schütteln des Behälters vermeiden Sie Schichtbildung der Abfälle.</p>
	Dieses Symbol weist darauf hin, dass der Analysator in Übereinstimmung mit der Richtlinie der Europäischen Union 2002/96/EC über Elektro- und Elektronik- Altgeräte (WEEE) nicht mit dem Hausmüll entsorgt werden darf.
	Zum kontinuierlichen Schutz vor Brandgefahr ersetzen Sie eine defekte Sicherung durch eine Sicherung desselben Typs und derselben Stärke.
Im Analysator werden gefährliche Reagenzien (Natriumpersulfat, Salzsäure und Phosphorsäure) verwendet. Der Abfallstrom aus dem Instrument ist säurehaltig und muss richtig entsorgt werden. Richten Sie sich dabei bitte nach Ihren staatlichen und lokalen Vorschriften.	
Dies ist ein Produkt der Schutzklasse I. Es muss an eine geerdete Steckdose angeschlossen werden. Um Schäden am Analysator und die Gefahr einer Verletzung zu verhindern, achten Sie darauf, dass der Analysator an eine Steckdose mit der richtigen Spannung angeschlossen wird.	

Warnhinweise
Um für einen einwandfreien Betrieb zu sorgen und sich vor Verletzungen zu schützen, betreiben Sie den Analysator nicht, wenn die Abdeckungen offen sind.
Alle Arbeiten im Inneren des Analysators, einschließlich der Anbringung von Verschleißteilen, können zu Verletzungen führen. Um elektrische Schläge oder Verbrennungen zu vermeiden, schalten Sie den Analysator aus und ziehen Sie den Netzstecker, bevor Sie ihn öffnen. Seien Sie vorsichtig, wenn Sie elektrische Komponenten berühren.
Wenn Sie mit Komponenten hantieren, die Proben, Standardlösungen, Abfall oder Reagenzien enthalten, tragen Sie einen Augenschutz und Handschuhe.
Stoppen Sie die Analyse immer bevor Sie den Analysator ausschalten.
Dies ist ein Produkt der Klasse A. Im häuslichen Umfeld kann dieses Produkt eine elektromagnetische Beeinflussung verursachen. In diesem Fall kann es sein, dass der Benutzer entsprechende Maßnahmen treffen muss, um diese Störung zu beheben.
Wenn dieses Instrument auf eine nicht von Veolia festgelegte Weise verwendet wird, kann der durch das Instrument gewährleistete Schutz beeinträchtigt werden.
Lesen Sie bitte die Anweisung zur richtigen Entsorgung in den Sicherheitsdatenblättern, die jedem Standardset und den Reagenzien beiliegen, nach.
Halten Sie Gegenstände vom Ventilator des Analysators fern, damit nichts in den Analysator gelangen kann. Der Lufteinlass zur Kühlung des Reaktors befindet sich auf der Unterseite des Analysators. Achten Sie darauf, dass dieser Einlass nicht durch Papier oder andere Objekte blockiert wird oder Gegenstände in diesen Einlass eindringen.
Wenn Druckgas für den Analysator verwendet wird, darf der Druck des Gases beim Gaseinlass 689 kPa (100 psig) nicht überschreiten. Verwenden Sie nur Stickstoff oder kohlenstofffreie Luft.
Vor der Analyse einer neuen Probe Kapitel 3 zu Interferenzen lesen, um Informationen zu möglichen Interferenzen und ihre Auswirkung auf den Analysator zu erhalten.
Wenn sich Probleme mit der bestückten Leiterplatte (PCA) ergeben, die eine Lithiumbatterie enthält, wenden Sie sich bitte wegen der Rücksendeanweisungen an Veolia. Beachten Sie bei jedem Wechsel der Lithiumbatterie die richtige Polung. Entsorgen Sie die gebrauchten Batterien gemäß den Herstelleranweisungen und den örtlichen Entsorgungsbestimmungen.








# Advertencias

Advertencias	
	Este símbolo, presente en el instrumento, indica que el usuario debe consultar las instrucciones de uso en el manual.
	El puerto de ingreso de la ampolla contiene agujas filosas diseñadas para perforar las membranas de las ampollas de muestra. No coloque los dedos ni materiales inapropiados en dicho puerto.
	<p>Con el fin de protegerse contra la inhalación de humo tóxico, asegúrese de instalar el Analizador en un lugar con buena ventilación. Para tratar el drenaje de gases, se proporciona una trampa para gases halógenos. El instrumento parará cuando la trampa química alcance su vencimiento.</p> <p>Según la composición de la muestra, los halógenos tales como el cloro o el bromo, o los humos tóxicos del flúor, cianuro y otras sales tóxicas, pueden emitirse con los residuos del Analizador. Para protegerse contra la emanación de humos peligrosos, añada hidróxido de sodio (agua alcalina) o carbonato de sodio (sosa comercial) al recipiente de residuos a fin de neutralizar el ácido en los residuos. Agite el recipiente de cuando en cuando para evitar que los residuos se estratifiquen dentro del mismo.</p>
	Este símbolo indica que para cumplir con la Ley 2002/96/EC de Desecho de Equipamientos Eléctricos y Electrónicos (WEEE, por su sigla en inglés) de la Unión Europea, el Analyzer debe desecharse en forma independiente de los residuos estándar.
	Para obtener una protección permanente contra el peligro de incendio, reemplace el fusible por otro fusible del mismo tipo y capacidad.
En el Analyzer se utilizan reactivos peligrosos (persulfato de sodio, ácido clorhídrico y ácido fosfórico). La corriente de desechos proveniente del instrumento es ácida y debe desecharse de manera correcta. Consulte las leyes locales, estatales y federales de su país.	
Éste es un producto de Seguridad Clase I. Debe contar con una conexión con cable a tierra. Para evitar daños en el Analyzer y la probabilidad de lesiones, asegúrese de que el equipo esté conectado al voltaje correcto.	
Para garantizar el funcionamiento correcto y evitar lesiones, no utilice el Analyzer sin la cubierta.	






Advertencias
<p>Toda manipulación que requiera acceso al interior del Analyzer, incluso la instalación de elementos para mantenimiento, puede ocasionar lesiones. Para evitar el riesgo potencial de descargas eléctricas o quemaduras, apague y desconecte el suministro de energía antes de abrir el Analyzer. Proceda con cuidado al tocar cualquier componente eléctrico.</p>
<p>Durante la manipulación de componentes que contengan muestras, estándares, soluciones de desecho o reactivos, utilice anteojos y guantes de protección.</p>
<p>Siempre detenga el análisis antes de apagar el Analyzer.</p>
<p>Éste es un producto Clase A. En un ámbito doméstico, este producto puede provocar interferencias electromagnéticas, en cuyo caso el usuario deberá tomar las medidas necesarias para corregir estas interferencias.</p>
<p>La utilización de este instrumento de un modo no especificado por Veolia puede afectar la protección que brinda el instrumento.</p>
<p>Para conocer las técnicas apropiadas de desecho, consulte la hoja de datos de seguridad del material (MSDS, por su sigla en inglés) que se encuentra junto a cada familia de estándares y reactivos.</p>
<p>Mantenga los objetos extraños alejados del ventilador del Analyzer para evitar su ingreso en el dispositivo. La entrada del aire de refrigeración del reactor se encuentra en la parte inferior del Analyzer; evite que se obstruya con papel u otros objetos.</p>
<p>Si utiliza el Analyzer con gases comprimidos, la presión del gas en la entrada correspondiente no debe superar los 689 kPa (100 psig). Use sólo nitrógeno o una corriente de aire con CO<sub>2</sub>.</p>
<p>Antes de analizar una nueva muestra, consulte el Capítulo 3, Interferencias, para obtener información sobre las posibles interferencias y sus efectos sobre el Analyzer.</p>
<p>Si se presenta un problema con el conjunto de circuito impreso (PCA) que contiene una batería de litio, sírvase comunicarse con Veolia para recibir instrucciones sobre la devolución del producto. Siempre que cambie la batería de litio, observe que la polaridad sea la correcta. Deseche las baterías usadas conforme a las instrucciones del fabricante y los requisitos locales sobre el desecho.</p>

# Avertissements

Avertissements	
	Ce symbole présent sur l'instrument indique que l'utilisateur doit consulter le manuel pour le mode d'emploi.
	L'orifice à flacons contient des aiguilles acérées conçues pour percer le septum des flacons d'échantillon. Ne pas introduire les doigts ni aucun matériel inapproprié dans l'orifice à flacons.
	<p>Pour protéger les personnes contre les fumées toxiques, assurez-vous de bien installer l'analyseur dans une salle bien ventilée. Un piège à halogène est prévu pour traiter le flux d'élimination de gaz, une fois que le piège a joué son rôle.</p> <p>Selon la composition de l'échantillon, des émissions de composés halogènes tels que le chlore ou le brome ainsi que des émissions de fluorure, de cyanure ou d'autres sels toxiques peuvent avoir lieu. Pour protéger les utilisateurs contre l'inhalation de fumées toxiques ajoutez de l'hydroxyde de sodium (soude caustique) ou du carbonate de sodium (soude) au conteneur de déchets pour neutraliser les déchets acides. Pour éviter la stratification des déchets dans le récipient, agitez-le périodiquement.</p>
	Ce symbole indique qu'aux fins de conformité avec la directive 2002/96/CE de l'Union Européenne concernant les matériels électroniques et électriques mis au rebut, l'analyseur doit être jeté séparément des déchets standard.
	Pour une protection continue contre le risque d'incendie, remplacer le fusible par un fusible de mêmes type et calibre.
	Des réactifs dangereux (persulfate de sodium, acide chlorhydrique et acide phosphorique) sont utilisés dans l'analyseur. L'écoulement de déchets provenant de l'instrument est acide et doit être mis au rebut comme il convient. Consulter les réglementations gouvernementales fédérales, nationales et locales en vigueur.
	Ceci est un produit de catégorie de sécurité I. Il doit être branché sur une source d'alimentation mise à la terre. Pour ne pas risquer d'endommager l'analyseur et éviter tout risque de blessure, s'assurer que l'analyseur est connecté à une ligne d'alimentation à la tension adéquate.






Avertissements
Pour garantir un bon fonctionnement et se prémunir contre tout risque de blessure, ne pas faire fonctionner l'analyseur après avoir ôté les capots.
Toute intervention nécessitant d'accéder à l'intérieur de l'analyseur, y compris l'installation d'éléments de maintenance, pourrait occasionner des blessures. Pour éviter tout risque de choc électrique ou de brûlure dangereuse, couper l'alimentation et déconnecter la source d'alimentation avant d'ouvrir l'analyseur. Faire preuve de prudence en touchant un composant électronique.
Pour manipuler des éléments qui contiennent un échantillon, des standards, une solution de déchets ou des réactifs, porter une protection oculaire et des gants.
Toujours arrêter l'analyse avant d'éteindre l'analyseur.
Ceci est un produit de classe A. Dans un environnement domestique, ce produit peut causer des interférences électromagnétiques, auquel cas l'utilisateur peut être contraint de prendre les mesures adéquates pour y remédier.
Si cet instrument est utilisé d'une manière non spécifiée par Veolia, la protection offerte par l'instrument peut s'en trouver affaiblie.
Consulter les fiches techniques des substances dangereuses fournies avec chaque jeu de standards et avec les réactifs afin d'identifier les bonnes techniques de mise au rebut.
Maintenir les corps étrangers à l'écart du ventilateur de l'analyseur pour écarter tout risque d'introduction dans l'analyseur. L'admission d'air de refroidissement pour le réacteur se situe au bas de l'analyseur; ne pas laisser de papier ou d'autres objets entraver cette admission ou pénétrer par celle-ci.
Si l'analyseur est utilisé avec des gaz comprimés, la pression du gaz au niveau de l'admission du gaz ne doit pas excéder 689 kPa (100 psig). Utiliser exclusivement de l'azote ou de l'air sans CO <sub>2</sub> .
Avant d'analyser un nouvel échantillon, se reporter au chapitre 3, Interférences, pour de plus amples informations sur les interférences potentielles et leurs effets sur l'analyseur.
Si un problème se présente avec l'ensemble du circuit imprimé (PCA) qui contient une batterie de lithium, contactez Veolia pour les instructions de renvoi. Lors du changement de batterie de lithium, observez la polarité correcte. Jetez les batteries usées selon les instructions du fabricant et les exigences locales de mise au rebut.

# Avvertenze

Avvertenze	
	Questo simbolo sullo strumento indica che l'utente deve far riferimento al manuale delle istruzioni per l'uso.
	La porta della fiala contiene aghi acuminati destinati a forare il diaframma delle fiale campione. Non mettere le dita o materiali inappropriati nella porta della fiala.
	<p>Per evitare l'inalazione di fumi tossici, accertarsi che l'analizzatore venga installato in un'area ben ventilata. Per trattare il flusso dei rifiuti, viene fornita una trappola alogena e lo strumento si spegne allo scadere della trappola.</p> <p>In base alla composizione del campione, lo scarico dell'analizzatore può emettere alogeni come il cloro o il bromo o i fumi tossici derivanti dal fluoruro, cianuro o altri sali tossici. Per evitare l'inalazione di fumi pericolosi, aggiungere idrossido di sodio o carbonato di sodio (soda) al contenitore dei rifiuti per neutralizzare gli acidi al suo interno. Evitare la stratificazione dei rifiuti all'interno del contenitore agitandolo di tanto in tanto.</p>
	Questo simbolo indica che per conformarsi alla Direttiva europea 2002/96/CE sui rifiuti provenienti da apparecchiature elettriche ed elettroniche (WEEE), l'analizzatore deve essere smaltito separatamente dai normali rifiuti.
	Per una protezione costante contro i pericoli di incendio, sostituire il fusibile con un altro dello stesso tipo e della stessa potenza.
Nell'analizzatore vengono utilizzati reagenti pericolosi (persolfato di sodio, acido idroclorico e acido fosforico). Il flusso di scarico dello strumento è acido e deve essere smaltito correttamente. Fare riferimento alle proprie norme nazionali, regionali e locali.	
Questo è un prodotto di Classe di sicurezza I. Deve essere collegato ad una sorgente di alimentazione prov di messa a terra. Per evitare danni materiali e la possibilità di lesioni, accertarsi che l'analizzatore sia collegato ad una linea di alimentazione dalla tensione corretta.	
Per garantire il corretto funzionamento e la protezione dagli infortuni, non utilizzare l'analizzatore se i rivestimenti non sono installati.	

Avvertenze
Ogni intervento che richiede accesso alla parte interna dell'analizzatore, compresa l'installazione di componenti di manutenzione, potrebbe causare lesioni. Per evitare scosse elettriche potenzialmente pericolose o ustioni, spegnere l'analizzatore e scollegarlo dall'alimentazione prima di aprirlo. Prestare attenzione quando si toccano componenti elettronici.
Manipolando componenti che contengono campioni, standard, soluzioni di scarico o reagenti, indossare protezioni oculari e guanti.
Arrestare sempre l'analisi prima di spegnere l'analizzatore.
Questo è un prodotto di Classe A. In ambiente domestico il prodotto può essere causa di interferenza elettromagnetica, nel qual caso l'utente può essere tenuto a prendere misure adeguate per correggerla.
Se lo strumento viene utilizzato in modo diverso da quello specificato dalla Veolia, potrebbe essere compromessa la protezione pre per l'apparecchiatura.
Per individuare le tecniche appropriate di smaltimento, fare riferimento alla scheda tecnica di sicurezza (SDS) di accompagnamento a ciascun gruppo di standard e ai reagenti.
Per evitare pericoli, tenere gli oggetti estranei lontani dalla ventola dell'analizzatore. L'aspirazione dell'aria di raffreddamento per il reattore si trova nella parte inferiore dell'analizzatore; evitare che carta o altri oggetti blocchino l'apertura o vi entrino.
Se l'analizzatore viene utilizzato con gas compressi, la pressione del gas all'ingresso non deve superare i 689 kPa (100 psig). Usare solo azoto o aria esente da CO <sub>2</sub> .
Prima di procedere all'analisi di un nuovo campione, vi invitiamo a consultare il Capitolo 3, intitolato "Interferenze" per avere maggiori informazioni sulle potenziali interferenze e il loro effetto sull'analizzatore.
Se si riscontrano problemi con l'assemblaggio del circuito stampato (PCA) contenente una batteria al litio, si prega di contattare Veolia per la restituzione. Durante la sostituzione della batteria al litio, controllare la polarità. Disfarsi delle batterie usate secondo le indicazioni del produttore e le disposizioni locali.

## 警告

警告	
	機器についているこの記号は、ユーザーが操作指示書を参照する必要があることを示します。
	バイアルポートには、サンプルバイアルの隔壁を貫通するために設計された鋭い針が含まれています。バイアルポートには指や不適切な素材を入れないようにしてください。
	<p>有毒ガスから身を守るため、必ず分析装置を換気の良い場所に設置してください。ガス廃棄物の流れを処理するためにハロゲントラップを設けています。トラップの使用期限が切れた場合、機器をシャットダウンします。</p> <p>サンプルの組成によっては、塩素や臭素などのハロゲン、またはフッ化物、シアン化合物、その他の有毒な塩から出る有毒ガスが分析装置の廃液に放出される可能性があります。有害ガスを吸入しないようにするため、水酸化ナトリウム（苛性アルカリ溶液）または炭酸ナトリウム（ソーダ灰）を廃液容器に加え、廃液中の酸を中和します。時々、容器をかき混ぜて、容器内で廃液が層を形成しないようにします。</p>
	この記号は、EUの廃電気電子機器指令（WEEE）に準拠しており、分析機器を標準の廃棄物とは別に廃棄すべきであることを示します。
	危険を継続的に回避するため、必ずヒューズは同種の定格のものと交換してください。
有害な試薬（過硫酸ナトリウム、塩化水素酸、燐酸）が分析機器で使用されます。機器から出る排水は酸性であり正しい方法で廃棄する必要があります。国、州、および地方自治体の政府規制に従ってください。	
これは、安全等級Ⅰ製品です。接地電源に接続する必要があります。分析機器の破損と人体傷害を回避するため、分析機器を正しい電圧の電力線に接続するようにしてください。	
正しく機能させ、人体傷害を防ぐため、カバーが外れているときには分析機器を操作しないでください。	

## 警告

保守管理用の品目の取り付けを含む、分析機器内部に接近する操作は、人身傷害につながる可能性があります。感電や火傷の危険性を回避するため、分析機器を開く前に電源を切り、コンセントから抜いてください。電気部品に触れる場合は細心の注意を払ってください。

サンプル、標準、廃液または試薬が含まれる部品を取り扱う際は、目の保護具と手袋を着用してください。

分析は、必ず分析機器の電源を切る前に停止してください。

これは、等級 A 製品です。屋内環境においては、この製品は電磁干渉を発生することがあり、その場合はユーザーが適切な是正措置を取る必要があります。

この機器が Veolia によって指定された方法で使用されなかった場合、機器に組み込まれた保護機能は損なわれます。

適切な廃棄方法については、各標準セットや試薬についている製品安全データシートをご覧ください。

分析機器が破損しないよう、分析機器のファンに異物を近づけないようにしてください。反応装置の冷却空気入り口は分析機器の下にあります。紙などの異物が入り口を塞いだり入り込んだりしないようにしてください。






分析機器を圧縮気体と使用する場合、ガス注入口の圧力は 689 kPa (100 psig) を超過しないようにしてください。窒素または二酸化炭素が含まれない空気を使用します。

新しいサンプルを分析する前に、第三章『障害』をご参照下さい。発生する可能性の高い障害と、それらが分析器に及ぼす影響について記載されています。

リチウム電池を含むプリント回路アセンブリ (PCA) に問題を抱えている場合、返送方法について Veolia にお問い合わせください。リチウム電池を交換するときはいつでも、正しい極性になるようによく見てください。使用済み電池は、製造者の指示および地方自治体の廃棄要件に従って廃棄してください。








## 경고

경고	
	기기에 이 기호가 있으면 사용자가 작동 지침을 위해 설명서를 참조해야 함을 의미합니다 .
	바이알 포트에는 샘플 바이알뚜껑의 가운데 고무 부분 (Septa) 을 을 뚫도록 설계된 날카로운 바늘이 포함되어 있습니다 . 바이알 포트에 손가락 또는 부적절한 물질을 집어넣지 마십시오 .
	<p>유독 가스 흡입을 방지하기 위해 분석기를 환기가 잘 되는 구역에 설치하십시오 . 기체 폐기물 흐름을 처리하기 위해 할로겐 트랩이 제공되며 트랩이 만료된 경우 기기를 종료합니다 .</p> <p>샘플의 구성에 따라 , 염소 또는 브롬과 같은 할로겐이나 불화물 , 시안화물 또는 기타 유독성 염분에서 나온 유독 가스가 분석기의 액체 폐기물 흐름으로 방출될 수 있습니다 . 유해 가스의 흡입을 방지하기 위해 폐기물 용기에 수산화나트륨 ( 가성소다 ) 을 추가하여 폐기물 내의 산을 중화시키십시오 . 가끔 용기를 흔들어 용기 내의 폐기물 성층을 방지하십시오 .</p>
	이 기호는 유럽연합 전기전자장비 폐기물 (WEEE) 지침 2002/96/EC를 준수하기 위해 분석기를 일반 폐기물과 분리하여 폐기해야 함을 나타냅니다 .
	지속적인 화재 위험 예방을 위해 퓨즈를 동일한 형식 및 정격의 퓨즈로 교체하십시오 .
분석기에는 유해한 시약 ( 과황산나트륨 , 염산 및 인산 ) 이 사용됩니다 . 기기에서 나오는 폐기물 흐름은 산성이며 주의하여 폐기해야 합니다 . 연방 , 주 , 지방 정부 규정을 참조하십시오 .	
이 기기는 안전 클래스 I 제품입니다 . 이 기기는 접지된 전원에 연결되어야 합니다 . 분석기 손상 및 부상 위험을 피하기 위해 분석기가 적절한 전압의 전원선에 연결되어 있는지 확인하십시오 .	
적절한 작동을 보장하고 부상을 방지하기 위해 커버를 벗긴 상태나 도어를 연 상태로 분석기를 작동하지 마십시오 .	
유지보수 품목 설치와 같이 분석기 내부에 접근해야 하는 작업은 부상을 초래할 수 있습니다 . 위험한 감전 또는 화상을 피하기 위해 분석기를 열기 전에 전원을 끄고 전원 공급 장치에서 분리하십시오 . 전자 부품을 만질 때 주의하십시오 .	

경고
샘플, 표준 용액, 폐기물 용액 또는 시약이 포함된 구성품을 취급할 경우는 보호 장비 및 장갑을 착용하십시오.
항상 분석기를 끄기 전에 분석을 멈추십시오.
이 기기는 클래스 A 제품입니다. 가정 환경에서 이 제품은 전자파 장애를 초래할 수 있으며 이 경우 사용자가 장애를 교정하기 위해 적절한 조치를 취해야 할 수 있습니다.
이 기기를 Veolia 에서 규정하지 않은 방식으로 사용할 경우 기기가 제공하는 보호 장치가 손상될 수 있습니다.
적절한 폐기 방법을 확인하기 위해 각 표준 용액 세트 및 시약에 동반되는 MSDS 를 참조하십시오.
분석기에 위험을 유입시키지 않기 위해 분석기에서 이물질은 멀리하십시오. 반응기의 냉각 공기 입구는 분석기 바닥에 있습니다. 종이 또는 기타 물체가 이 입구를 막거나 입구에 들어가지 않도록 하십시오.
분석기를 압축 가스와 함께 사용할 경우 가스 입구에서의 가스 압력이 689 kPa(100 psig) 를 초과해서는 안 됩니다. 질소 또는 CO <sub>2</sub> 가 없는 공기만 사용하십시오.
새 샘플샘플을 분석하기 전에 잠재적 간섭 및 그것이 분석기에 미치는 영향에 관한 정보를 확인하기 위해 3 장, 간섭을 참조하십시오.
리튬 배터리가 포함된 인쇄 회로 어셈블리 (PCA) 에 문제가 있을 경우 Veolia 또는 지역 서비스 제공업체에 반환 지침을 문의하십시오. 리튬 배터리를 교체할 때 올바른 극성을 준수하십시오. 제조업체의 지침 및 지역 폐기 요구 사항에 따라 사용된 배터리를 폐기하십시오.

# Advertências

Advertências	
	Este símbolo no instrumento indica que o usuário deve consultar o manual e obter instruções de operação.
	A abertura do frasco contém agulhas afiadas projetadas para perfurar a membrana dos frascos de amostras. Não coloque os dedos ou materiais inapropriados na abertura do frasco.
	<p>Para obter proteção contra a inalação de gases tóxicos, certifique-se de que o analisador está instalado em uma área bem ventilada. Para tratar do fluxo de resíduos gasosos, uma armadilha de halogênio é fornecida e desligará o instrumento quando houver excesso na armadilha.</p> <p>Dependendo da composição da amostra, halogênios como cloro ou bromo, ou gases tóxicos de fluoreto, cianureto ou outros sais tóxicos, podem ser emitidos nos resíduos do analisador. Para obter proteção contra a inalação de gases perigosos, adicione hidróxido de sódio (água sanitária) ou carbonato de sódio (cinza de soda) ao recipiente de resíduos para neutralizar o ácido contido nos resíduos. Para evitar a estratificação dos resíduos, agite recipiente ocasionalmente.</p>
	Este símbolo indica que, para estar de acordo com a European Union Directive 2002/96/EC para resíduos de equipamentos elétricos e eletrônicos (REEE), o Analisador deve ser descartado separadamente do lixo padrão.
	Para proteção contínua contra risco de incêndio, substitua o fusível queimado por um fusível do mesmo tipo e categoria.
Reagentes perigosos, como persulfato de sódio, ácido clorídrico e ácido fosfórico, são usados no Analisador. O fluxo de resíduos do instrumento é acidífero e deve ser descartado de forma adequada. Consulte as regulamentações federais, estaduais e municipais.	
Este produto é um produto de Segurança Classe I. Ele deve ser ligado a uma fonte de energia com fio terra. Para evitar danos no Analisador e a possibilidade de avarias, certifique-se de que o mesmo esteja conectado a uma linha de energia com voltagem apropriada.	

Advertências
Para garantir a operação adequada e a proteção contra danos, não opere o Analisador sem as tampas ou com a porta aberta.
Qualquer operação que exija acesso ao interior do Analisador, inclusive a instalação de itens de manutenção, podem causar ferimentos. Para evitar possíveis choques elétricos ou queimaduras perigosas, desligue e desconecte o Analisador da tomada antes de abri-lo. Tenha cuidado quando tocar qualquer componente eletrônico.
Quando manipular componentes que contenham amostras, modelos, resíduos de soluções ou reagentes, use óculos de proteção e luvas
Sempre interrompa a análise antes de desligar o Analisador.
Este produto é um produto Classe A. Em ambientes domésticos, este produto pode causar interferência eletromagnética. Nesse caso, pode ser necessário que o usuário tenha que tomar medidas para corrigir a interferência.
Se o instrumento for usado de forma não especificada pela Veolia, a proteção fornecida pelo instrumento poderá ser prejudicada.
Consulte as Especificações de segurança do material que acompanha cada conjunto de modelos e reagentes para identificar as técnicas de descarte apropriadas.
Mantenha objetos estranhos afastados do ventilador do Analisador para evitar danificá-lo. A entrada de ar refrigerante do reator se localiza na superfície inferior do Analisador; não deixe que papéis ou outros objetos bloqueiem ou entrem por essa entrada.
Se o analisador for usado com gases comprimidos, a pressão do gás na entrada de gás não deverá exceder 689 kPa (100 psig). Use apenas ar sem CO <sub>2</sub> ou nitrogênio.
Antes de analisar uma nova amostra, consulte o Capítulo 3, Interferências, para obter informações sobre possíveis interferências e seus efeitos no Analisador.
Se você se deparar com um problema com as placas de circuitos impressos que contenha bateria de lítio, entre em contato com a Veolia para obter instruções para a devolução. Sempre que trocar a bateria de lítio, observe a polaridade correta. Jogue fora as baterias usadas de acordo com as instruções do fabricante e com os requisitos de descarte locais.

# Chapter 1. Introduction

The Sievers InnovOx ES Laboratory TOC Analyzer is a high-sensitivity Analyzer used to measure the concentration of total organic carbon (TOC), Non-purgeable Organic Carbon (NPOC), Total Carbon (TC), and Inorganic Carbon (IC) in water samples.

The Analyzer uses Supercritical Water Oxidation (SCWO) to measure a wide range of carbon concentrations in complex sample matrices, including those containing high concentrations of total dissolved solids (TDS) and particulates.

In the Analyzer's innovative SCWO approach, organic compounds are oxidized to  $\text{CO}_2$  at high temperatures in a sealed reactor, using an oxidizing agent. The concentration of TOC in the sample can be calculated from the difference between the TC and IC concentrations (i.e.,  $\text{TOC} = \text{TC} - \text{IC}$ ). The sample also may be acidified then sparged with a gas to remove IC (as  $\text{CO}_2$ ); when that is done, the measurement is referred to as NPOC. Non-purgeable Organic Carbon measurements are appropriate when the sample is known to contain little Purgeable Organic Carbon (POC).

The Analyzer can be used to monitor water samples ranging from high-purity water containing 0.05 ppm or 50 ppb TOC to water samples containing up to 50,000 ppm TOC.

## Warning

Do not attempt to analyze samples containing hydrofluoric acid or fluoride ions in the Analyzer. Serious damage can occur to the instrument and toxic gases can be emitted.

## Chapter 2. System Description

### *System Specifications*

System specifications for the Sievers InnovOx ES Laboratory TOC Analyzer and other options are listed on following pages.

### Operating specifications<sup>1</sup>

Analysis Modes	NPOC, TOC (TC-IC), TC, IC
Range	50 ppb to 50,000 ppm TOC
Precision	RSD ≤3% of reading at >5 ppm NPOC or TOC
Accuracy	Greater of ± 3% of reading or ± 0.25 ppm, 1 to 100 ppm, NPOC or TOC
Linearity	R <sup>2</sup> ≥ 0.995, measured as NPOC
LOD <sup>2</sup>	≤50 ppb
TOC Calibration Stability	Up to 6 months
Analysis Time	2.6 to 8.3 minutes
Smallest Inner Diameter (ID)	1.42 mm or 1420 µm
Sample Temperature	5-60 °C (41-140 °F)
Ambient Temperature Range	10-40 °C (50-104 °F)
Sampling	Ambient pressure, 0.08 to 2.82 mL sample volume per analysis

### Analyzer specifications

Sample Capacity	Up to 120 with optional Autosampler <sup>3</sup> (or single standard vial port)
Outputs	Ethernet Port (1); USB Ports (3)
Display	Color LCD w/touch-screen
Power	100 – 240 ± 10% VAC, 50 – 60 Hz, 400 VA
Installation/Overvoltage Category	II
Dimensions	H: 52.05 cm (20.5 in.); W: 32.26 cm (12.7 in.); D: 58.42 cm (23.0 in.)
Dimensions (Autosampler)	H: 52.2 cm (20.5 in.); W: 31.1 cm (12.25 in.); D: 53.3 cm (21.0 in.)
Weight	22.41 kg (49.4 lb); 14.1 kg (31.1 lb) for optional Autosampler
Safety Certifications	CE, UKCA, ETL listed. Conforms to UL Std. 61010-1. Certified to CSA C22.2 NO. 61010-1

### Environment

Maximum Relative Humidity	Up to 95%, non-condensing
Normal Operating	Indoor use only. Keep instrument and reagents out of direct sunlight.
Maximum Altitude	3,000 m (9,800 ft)
Pollution Degree	2

<sup>1</sup> Stated analytical performance is achievable under controlled laboratory conditions that minimize operator and standards errors.

<sup>2</sup> NPOC mode, bottled N<sub>2</sub> as carrier gas. This performance is achieved under controlled conditions where variables that influence low-level performance have been minimized or eliminated. This performance may not be achievable on instruments delivered before August 2016.

<sup>3</sup> Up to 63 sample tubes for 40 mL and 60 mL vials. Up to 120 sample tubes for 35 mL vials.

**Figure 1: System Specifications**

## Additional Specifications

<b>Carrier Gas</b>	If the optional <i>Carrier Gas CO<sub>2</sub> Scrubber</i> option is not used, then CO <sub>2</sub> free ( $\leq 1$ ppm CO <sub>2</sub> ) compressed Nitrogen is necessary. If using a cylinder of purified Nitrogen, the delivery pressure must be regulated to 207 - 689 kPa (30-100 psig). Unit will consume up to 200 mL/min in NPOC mode.		
<b>Sample Time (min)</b> (Time to reported value)		NPOC (Lab)	TOC & TC (Lab)
	Rep 1	8.3	9.7
	Rep 2+	5.8	8.3
	Sample 1 Flush	+ 1.4 per rep	+ 1.4 per rep
	Sample 2 Flush	+ 5.2 per rep	+ 5.2 per rep
	Dilution Flush	+ 0.7 per rep	+ 0.7 per rep
<b>Computer Interface</b>	Web browser interface via direct Ethernet connection or LAN. Google Chrome® with IE Tab® Extension enabled.		

## Reagent Consumption<sup>1</sup>

<b>Monthly Acid (all ranges)</b>	1.1 L (.29 US gal) — Empty 2 L bottle provided
<b>Monthly Oxidizer (all ranges)</b>	2.8 L (.74 US gal) — Empty 2 L bottle provided
<b>Dilution Water (all ranges)</b>	4.2 L (1.11 US gal) — Empty 2 L bottle provided

## SCWO Method Compliance

<b>Supercritical Water Oxidation (SCWO)</b>	SCWO complies with general TOC methods: USEPA 415.1, USEPA 415.3, USEPA SW 9060, DIN-EN1484, ISO 8245, ASTM D5173, M5310E Standard Methods
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## Sievers Autosampler

<b>Size</b>	52.2 cm height x 29.2 cm width x 53.3 cm depth (20.5 in. x 11.5 in. x 21.0 in.)
<i>with Wash Station:</i>	52.2 cm height x 31.1 cm width x 53.3 cm depth (20.5 in. x 12.25 in. x 21.0 in.)

<sup>1</sup> All reagent usage estimates are based on default settings of 5% acid and 15% oxidizer with Analyzer running continuously in NPOC mode eight hours a day for 30 days (No additional flushes enabled).



<b>Net Weight</b>	14.1 kg (31.1 lbs.)
<i>with Wash Station:</i>	14.5 kg (32 lbs.)
<b>Power Supply</b>	60 Watt (Base Model), 100 Watt (Base Model with Stirring Station), 100-240 VAC, 50-60Hz No manual voltage adjustments are required. The power supply unit has the following approvals: CE, UKCA, and recognized cRU component for Canada and U.S.
<b>Certification</b>	Designed and certified to C Tick, CE, and UKCA standards
<b>Fuse Rating</b>	1.6 A
<b>Temperature Range</b>	<b>Non-Operating</b> 5 °C - 45 °C, 20 - 95% RH 41 °F - 113 °F, 20 - 95% RH  <b>Operating</b> 10 °C - 40 °C, 8 - 95% RH 50 °F - 104 °F, 8 - 95% RH
<b>Safety Certification</b>	CE, UKCA, ETL listed. Conforms to UL Std. 61010-1 Certified to CSA C22.2 No. 61010-1
<b>Maximum Number of Sample Racks</b>	3
<b>Maximum Number of Standards Racks</b>	1
<b>Maximum Number of Stirring Plates</b>	3

Sample Analysis Volume	Range	Sample Volume
	Up to 100 ppm	2.82 mL
	Up to 1,000 ppm	2.00 mL
	Up to 5,000 ppm	0.80 mL
	Up to 20,000 ppm	0.20 mL
	Up to 50,000 ppm	0.08 mL

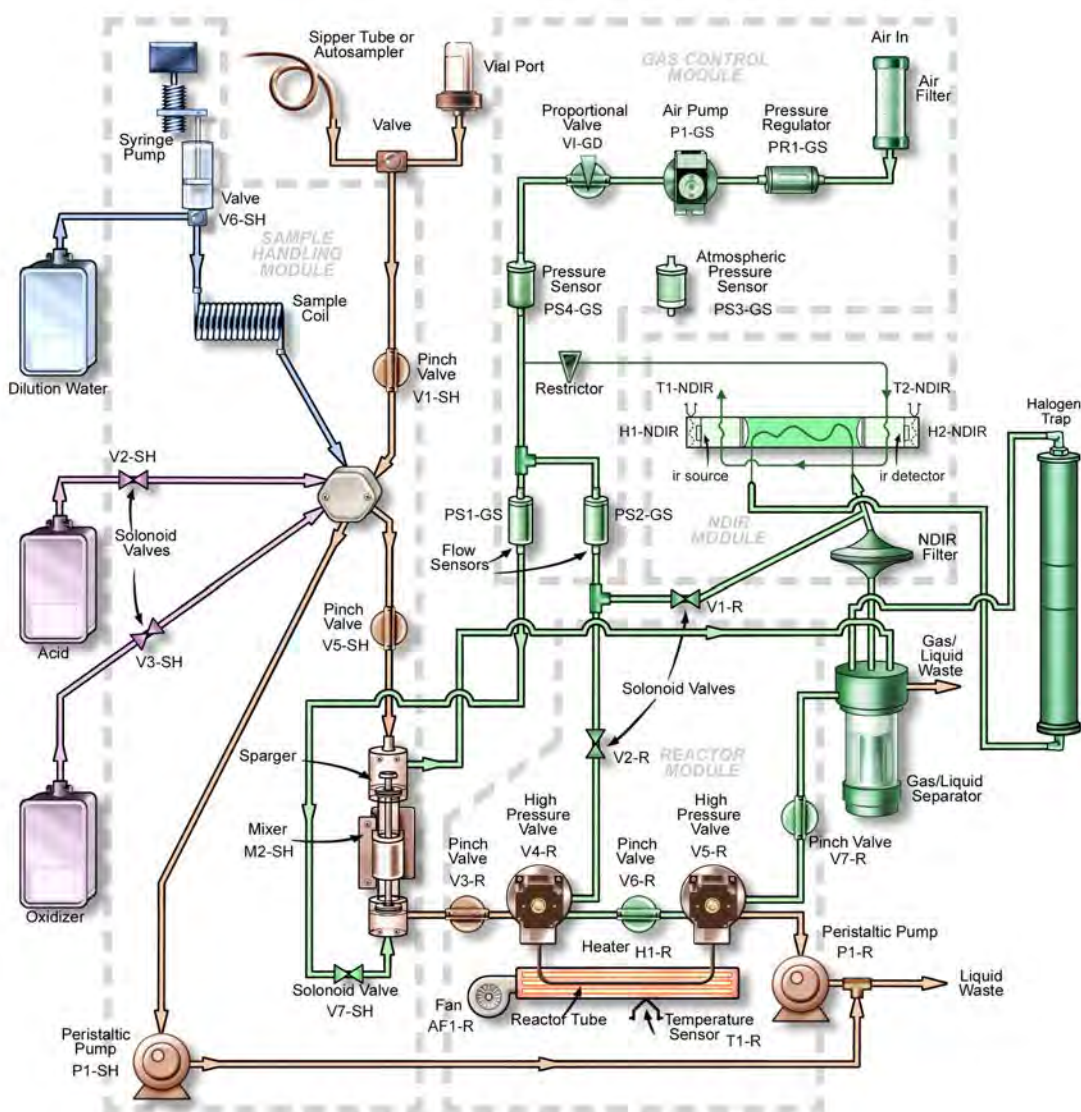
## System Overview

The Sievers InnovOx ES Laboratory TOC Analyzer consists of seven major modules:

1. Sample Inlet Module, which includes the *Vial Sampler*
2. Sample Handling Module, which draws sample into the Analyzer and mixes the sample with acid, oxidizer, and dilution water. When NPOC is measured, the sample is sparged in this module.
3. Gas Control Module, which controls the flow rates of *Carrier Gas* and *Sparge Gas*.
4. Reactor Module where organics are oxidized to CO<sub>2</sub>. The reactor module consists of the:
  - Reactor tube

- Heater and cooling fan
  - Peristaltic pump
  - Valves
5. Gas-Liquid Separator, where carrier gas, containing CO<sub>2</sub> from the reactor, is separated from liquid before entering the nondispersive infrared (NDIR) detector.
  6. NDIR Module, containing:
    - Aerosol filter
    - NDIR detector
  7. System/controller board, containing:
    - Microprocessors and circuitry
    - Ethernet and USB data outputs
    - Color video graphics array (VGA) display with touchscreen

[Figure 2](#) is a schematic of the Analyzer's fluidics, followed by a brief description of how carbon measurements are made in the InnovOx TOC Analyzer.



**Figure 2: Analyzer Schematic**

**NOTE:** This schematic is a flattened image of the Analyzer's components. For a spatial representation of the fluidics layout inside the instrument, refer to [Figure 80 on page 195](#).

## Sample Flow Path

Discrete samples can be measured by the Sievers InnovOx ES Laboratory TOC Analyzer by inserting a filled 60-mL or 40-mL vial into the vial port on the front of the Analyzer. Opening the door over the vial port automatically positions a valve so that sample from the vial enters the Analyzer.

Samples also can be measured through a sipper tube connected to the sample inlet port on the left side of the Analyzer. To use the sample inlet port, the door over the vial port must be completely closed to ensure that the valve is in the correct position.

A third way of measuring samples is with the optional Sievers Autosampler. The Sievers Autosampler has the capacity for 63 60-mL vials, 63 40-mL vials, or 120 35-mL tubes — plus 6 40-mL vials in its standards rack. The samples are drawn into the Analyzer through the sample inlet port.

The Analyzer makes measurements in five concentration ranges: *Up to 100 ppm*, *Up to 1,000 ppm*, *Up to 5,000 ppm*, *Up to 20,000 ppm*, and *Up to 50,000 ppm*. The Analyzer automatically prepares and dispenses the measurement recipe according to the range selected. In the *Up to 100 ppm* range, the sample is diluted by a factor of 0.7:1. In the *Up to 1,000 ppm* range, the Analyzer measures concentrations up to 1,000-ppm organic carbon (NPOC or TOC) or 100 ppm IC. The sample is diluted with an equal volume of low-TOC dilution water and reagents. In the *Up to 5,000 ppm* range, the sample is diluted by a factor of 5:1. The sample is diluted by a factor of 20:1 in the *20,000 ppm* range, and the sample is diluted by a factor of 50:1 in the *50,000 ppm* range.

A measurement of a new sample begins with a “fast flush” which involves pumping sample into the Sample Handling Module by its peristaltic pump. Reagents are then drawn into the sample coil in the Sample Handling Module by the syringe pump. Normally the syringe is empty and the sample coil contains dilution water. When the reagents are drawn into the sample coil, the syringe fills with a volume of the dilution water that equals the volume of reagents to be used in the measurement. 6M phosphoric acid ( $\text{H}_3\text{PO}_4$ ) or 3N hydrochloric acid (HCl) (referred to as Acid in the user interface) is drawn into the sample coil first, followed by the sodium persulfate ( $\text{Na}_2\text{S}_2\text{O}_8$ ) reagent (referred to as Oxid or Oxidizer in the user interface).

The purpose of the acid is to reduce the pH to 2 or less; this converts any carbonate or bicarbonate salts to  $\text{CO}_2$ . The volume of the acid reagent that will be used in the analysis is determined by the Acid % setting. A value of 1% means that the volume of acid reagent will be 1% (V/V) of the total solution volume that later will be contained in the sparging chamber.

The oxidizer has a concentration of 30% (W/V). The volume of the oxidizer reagent to be mixed with the other solutions in the sparging chamber is determined by the Oxid % setting. A value of

15% means that the volume of oxidizer reagent will be 15% (V/V) of the total solution volume that later will be contained by the sparging chamber.

The syringe then empties, depositing the reagents into the sparging chamber. Next, the syringe fills with the necessary volume of dilution water. The sample is then drawn into the sample coil. Because the sample only enters the sample coil, the syringe and its three-way valve are protected against contamination by salts and particulates in the samples. This greatly extends the life of the syringe and valve.

In the next step, the syringe pump empties the sample coil into the sparging chamber. The mixing bar in the sparging chamber mixes the solution, and any particulates that were in the sample are suspended in the homogeneous solution. Any IC in the sample is converted to CO<sub>2</sub> by the acid. If NPOC is to be measured, the solution is sparged with CO<sub>2</sub>-free gas to remove the CO<sub>2</sub> before the solution is transferred to the reactor.

The solution is not sparged when TC, IC, or TOC (TC-IC) is measured. However, some IC is lost from the solution while it is in the sparging chamber because the solution is acidic, and the IC is converted into volatile CO<sub>2</sub>. The instrument calibration procedures include a method of calibrating the IC, TOC (TC - IC) and TC measurements, which should be used whenever the samples are expected to contain significant concentrations of IC, and NPOC will not be measured.

Next, solution is pumped from the sparger by the peristaltic pump in the Reactor Module into the reactor tube, which is at room temperature. The high-pressure valves at each end of the reactor tube seal it. When NPOC or TC is to be measured, the reactor is rapidly heated to 375 °C (707 °F)<sup>2</sup> and supercritical water oxidation (SCWO) of the organics is completed within 3 min.

When water is heated to 375 °C<sup>2</sup> in a sealed reactor, the pressure rises to more than 3,200 psi (22.1 MPa), which is above the critical point of water. Supercritical water is a fluid that has special properties that are very beneficial for TOC measurement:

- Supercritical water is non polar, so organics that are not highly soluble in water become very soluble. Oxygen, produced by the decomposition of the persulfate anion, becomes very soluble. However, salts that normally dissolve in water are not soluble in supercritical water.

---

<sup>2</sup>The reactor temperature of 375° C should not be confused with the heater testing criteria temperature used in diagnostics (355° ±5° temperature), as the testing criteria temperature in the diagnostics process is an indirect measurement of a controlled reactor temperature. The control point (used in diagnostics) has been demonstrated to achieve a reactor temperature of 375° C necessary to create supercritical water in the Analyzer's sample flow path. For additional information on the heater testing criteria see ["Heater Testing Criteria" on page 231](#).

- Supercritical water has a very low viscosity and a high diffusibility. Therefore, the oxidation is fast because of the rapid transport of reactants.

The benefits of SCWO are perhaps most pronounced when the sample contains high concentrations of chloride. Traditional TOC measurement techniques, involving oxidation with sodium persulfate, are inefficient with those samples because much of the oxidizing power of the sodium persulfate is consumed by the oxidation of the chloride. However, the Sievers InnovOx ES Laboratory TOC Analyzer can oxidize chloride-containing samples without excessive formation of chlorine because the salt is not soluble during the oxidation process.

Additionally, hard-to-oxidize organics that would not be oxidized by sodium persulfate at normal temperatures, even when the oxidation is initiated by UV radiation, are virtually completely oxidized in the Sievers InnovOx ES Laboratory TOC Analyzer. This is partly because organics, which normally are not soluble (such as cellulose), are soluble in supercritical water.

The Reactor Module is designed to have a low thermal mass, allowing the reactor tube to be heated rapidly, and then cooled rapidly. When the oxidation period is completed, the reactor is cooled by turning off the heater and blowing ambient air over the reactor tube. Within about 90 seconds, the reactor is cooled to room temperature. The high-pressure valves are opened, and the CO<sub>2</sub> in the reactor is flushed out by the carrier gas. Salts dissolve again in the water as it cools, and are flushed out of the reactor, along with any particulates remaining in the solution.

The ability of the reactor to rapidly cool down to room temperature allows the Sievers InnovOx ES Laboratory TOC Analyzer to be operated on very contaminated samples without building up salts and particulates in the reactor that would require extensive maintenance in conventional TOC analyzers. When maintenance is required on the Analyzer, it is not necessary to wait for the reactor to cool down before maintenance can be performed, or heat back up before measurements can be made again. The Sievers InnovOx ES Laboratory TOC Analyzer is always at room temperature, except when organics are being oxidized.

When IC is to be measured, organics do not have to be oxidized. Therefore, the reactor is filled with the acidified sample as described above, but the reactor is not heated and no oxidizer is added.

The CO<sub>2</sub> produced in the sparger by the acidification of the IC, and in the reactor by the oxidation of organics, is separated from liquid in the Gas-Liquid Separator. Then the CO<sub>2</sub> is measured in the advanced NDIR detector. This NDIR has been specially designed for use in the Sievers InnovOx ES Laboratory TOC Analyzer. It has no moving parts for long-term reliability, and it is constructed with durable materials that do not require the use of consumable absorbers to prevent attack by corrosive gases. Furthermore, the response of the NDIR is stabilized against temperature changes by controlling the temperatures of the IR source and detector. The NDIR response also is compensated for changes in barometric pressure, so that the Sievers InnovOx ES Laboratory TOC Analyzer requires only infrequent recalibration.

**Table 1: InnovOx Wetted Materials List**

<b>Material</b>	<b>Components</b>
PFA	Clear tubing
316 SS	Sample needle(s) and inlet tube fitting
ETFE	Barb fittings
Isoprene	Pinch-valve tubing
Tantalum	Reactor tube
Titanium	Reactor valves
Polypropylene	Mixer bar
Norprene <sup>®</sup> Chemical with PVC lining	Pump tubing and Waste Tubing
UHMW polyethylene	Reactor seals
Polypropylene, PTFE	NDIR filter
AFLAS <sup>®</sup>	O-rings on seals
PEEK <sup>®</sup>	Sample manifold, reagent inlet fittings
PVC	Gas liquid separator, NDIR P-detector, sparger
PCTFE, PTFE	Vial port valve
Neoflon PCTFE <sup>®</sup> and PEEK	Reagent valves

## ***Additional System Components***

### **System/Controller and Electronics**

Operation of the Analyzer is controlled by an advanced X86 microprocessor on the System/Controller Board, which communicates with the other Analyzer modules over a Multipoint-Low Voltage Differential Signaling (M-LVDS) bus. Other electronic assemblies provide the interface, monitor and control functions for the Analyzer:

- **Color LCD VGA display** with touch panel



- **Sample handling module board** for microprocessor-controlled preparation of the sample, reagents, and dilution water
- **Gas control module board** for microprocessor-controlled control of the carrier and sparge gases
- **Reactor module board** for microprocessor-controlled oxidation of the samples
- **NDIR module board** for microprocessor-controlled measurement of the CO<sub>2</sub> produced in the Sample Handling and Reactor Modules
- **Terminator board**, which terminates the M-LVDS bus and provides Ethernet and USB interfaces
- **Power Entry/Supply**

## Data Outputs

The Analyzer has one Ethernet (TCP/IP) and three<sup>3</sup> USB ports. Data is output in text, PDF and CSV formats, allowing flexibility for exporting and printing data. Historical data can be transferred from the Analyzer via the USB ports to a USB memory device (provided) and then transferred to any computer that supports USB. The Analyzer can also support several USB HP printers for direct report printing.

Real-time and historical data also can be transferred from the Analyzer via the Ethernet port to a computer using communication software such as PuTTY<sup>®</sup>, HyperTerminal<sup>®</sup>, and Tera Term<sup>®</sup>. For details, see ["Appendix C: Importing Analyzer Data into a Spreadsheet."](#)

*NOTE: The Analyzer MUST be connected to a Direct Connection (Peer to Peer) computer using an Ethernet cross-over cable or to a Network computer using an Ethernet straight-through cable. The Analyzer cannot be directly connected to a computer via the USB port.*

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<sup>3</sup>Three (3) USB ports are provided for your convenience. However, you can only export data from one (1) port at any time. The Analyzer will export to the first inserted USB memory device. While this USB memory device is inserted, the Analyzer will not recognize any additional USB memory devices inserted in other USB ports.



## Major Accessories and Configurations

### Carrier Gas CO<sub>2</sub> Scrubber Option

The Sievers InnovOx ES Laboratory TOC Analyzer uses CO<sub>2</sub>-free gas to sparger samples and carry CO<sub>2</sub> from the sparger and reactor to the NDIR detector. The *Carrier Gas CO<sub>2</sub> Scrubber* Option can be used to purify normal ambient air. The *Carrier Gas CO<sub>2</sub> Scrubber* Option consists of:

- An internal air pump
- A *Carrier Gas CO<sub>2</sub> Scrubber* housing mounted on a bracket and attached to the exterior rear side of the Analyzer
- A replaceable cartridge that contains the materials required to filter volatile organic compounds and CO<sub>2</sub> from the air

The *Carrier Gas CO<sub>2</sub> Scrubber* Option allows the Analyzer to be operated in locations where the use of compressed gas cylinders is undesirable or not feasible. The consumable *Scrubber Cartridge* must be replaced yearly per the maintenance schedules found in [Chapter 9, "Maintenance"](#) on page 177.

### Sievers Autosampler System

The optional Sievers Autosampler System requires the following:

- Sievers Autosampler
- *InnovOx User Interface*, via Web browser
- Sievers InnovOx ES Laboratory TOC Analyzer
- User-supplied Windows® computer, running *Google Chrome*® Web Browser with the “IE Tab” Extension by *Blackfish Software* enabled

You control the Sievers Autosampler using the *InnovOx User Interface* via your computer's web browser. Using this interface, you can create and run protocols that instruct the Sievers Autosampler how to sample from vials positioned in the sample racks. All Sievers Autosampler operations are performed via a protocol. A protocol is comprised of groups of one or more vials that have the same sampling properties.

The a has the capacity for 63 60-mL vials, 63 40-mL vials, or 120 35-mL tubes — plus 6 40-mL vials in its standards rack. Screw-capped vials with Teflon®-lined septa are available from Veolia.

A stainless steel needle with PFA tubing is used to transfer samples from the sample vials into the Analyzer. Results are stored on the Analyzer.

### ***Stirring Station Option***

The Sievers Autosampler with Stirring Station option uses a magnetic system to stir and mix the sample during the sampling process to create a homogeneous mixture for analysis. During the operation of the Stirring Station, the action of the magnetic stir bars keeps particles (that would otherwise settle in the bottom of vial) suspended during the sampling process. Using three Stirring Stations, the Sievers Autosampler has a capacity of 63 40-mL vials (29 x 81 mm).

### ***Wash Station Option***

The Sievers Autosampler is also available with an optional Wash Station that can clean the interior and exterior of the Sievers Autosampler needle between sample runs.

## Chapter 3. Interferences

Certain substances affect the safety and reliability of the Sievers InnovOx ES Laboratory TOC Analyzer if they are present in the water sample.

### Safety

Some water samples may contain species that form toxic products when they are acidified or oxidized. Species such as cyanide ( $\text{CN}^-$ ), sulfide ( $\text{S}^{2-}$ ), and fluoride ( $\text{F}^-$ ) produce toxic gases when acidified. Samples that contain those species should not be analyzed in the InnovOx TOC Analyzer.

Other interferences, including chloride ( $\text{Cl}^-$ ) and bromide ( $\text{Br}^-$ ) are oxidized in the Analyzer, forming toxic gases that are discharged from the Analyzer in its waste stream. The waste must either be kept basic or immediately discharged into an appropriate drain to avoid formation of toxic concentrations of those species in the air. If the waste solution is collected, excess sodium hydroxide prills should be added to its container before the analysis starts, and the waste container should be actively mixed or periodically agitated, to ensure the solution remains basic. In either case, the Analyzer should only be used in well-ventilated areas.

Other compounds may react violently when they come in contact with the acid, oxidizer, or while being oxidized in the reactor. Compounds such as hydrazine and hydrogen peroxide may generate excessive volumes of gas during the oxidation. However, the Analyzer can handle the additional pressure in the reactor associated with gas-producing samples.

## Reliability

The reliability of the Analyzer can be affected by other interferences.

### Interferences to avoid

Some interferences corrode the tantalum reactor tube, reactor valves, or other analyzer components. Samples containing the following should be avoided:

- Hydrofluoric acid
- Fluoride

### Special considerations

If the sample contains any of the following, contact Technical Support for special consideration recommendations.

- Concentrated reducing acids, including HCl, HBr, HI, H<sub>2</sub>SO<sub>4</sub>, or H<sub>3</sub>PO<sub>4</sub>

*NOTE: The Analyzer should be used in a well-ventilated workspace. Corrosive gases or vapors that are allowed to come in contact with the Analyzer will promote corrosion of certain components.*

When the Analyzer runs highly acidic or caustic samples via the vial port, side sample port or Sievers Autosampler it is highly recommended to run a vial of blank water at the end of the protocol. This helps rinse the sample flow path and extends the life of the Analyzer.

For information on Method Development, see [“Method Development” on page 270](#).

# Chapter 4. Installation

## Overview

This chapter provides installation instructions for the Sievers InnovOx ES Laboratory TOC Analyzer and will help familiarize you with their design and function. An interior overview diagram is available in [Chapter 9, "Maintenance."](#)

If you need additional assistance, contact Technical Support or your local service provider. You can also visit our website.

## Step 1: Unpack and Inspect the Analyzer

Open the shipping box and remove the Analyzer from the packaging. Verify that all items are present:

### Caution

SAVE THE ORIGINAL PACKING MATERIALS. If for any reason you need to return the Analyzer, you MUST pack the instrument in the original carton to ensure that no damage occurs during shipment. There will be a charge assessed for replacement packing materials required for return shipments to and from the factory. Insure all instruments for the return shipment.

1. Sievers InnovOx ES Laboratory TOC Analyzer
2. *Operation and Maintenance Manual* (downloaded from our website).
3. Accessories included:
  - Sample inlet tube and fittings (1)
  - Reagent and Dilution Water tubes and fittings (three with a single 1/4-28 fitting, and one with two 1/4-28 fittings)
  - Waste tubes
  - 7/16 in. + 3/8 in. wrench (for sample fitting and reactor seal)
  - 5/32 in. Allen® wrench (hex key) for reactor valve
  - Squeeze bottle
  - Spare fuses
  - Metal posts (for NDIR leak testing)
  - Ethernet cable for direct connection to PC (crossover cable)
  - Ethernet cable for network connection (straight-through cable)
  - Spare reactor seals (2)
  - 2 L bottles (4) for Acid, Oxidizer, Dilution Water, and Waste
  - Nut and ferrules for gas inlet port
  - USB memory device
  - Packing straps (for return shipment)
  - Syringe Lubrication Kit
  - Extra tubing
  - Extra fittings
4. Certificate of Performance

## Step 2: Select a Location for the Analyzer

Place the Analyzer on a clean, unobstructed surface that can accommodate the instrument's dimensions and weight. For details, refer to [“System Specifications”](#) in [Chapter 4, “Installation”](#) and [“Appendix A: Analyzer Dimension Diagrams.”](#) For proper heat dissipation, ensure that 16 cm (6.3 in.) is available at the rear and on both sides of the Analyzer. If you will be using the Analyzer with a Sievers Autosampler, ensure that there is adequate space to the left of the Analyzer for the Sievers Autosampler. The Analyzer is designed to be operated right-side up, resting on the rubber feet.

Locate the Analyzer in a well-ventilated area to avoid inhaling any toxic gases that may be emitted from the waste. Avoid direct sunlight and extreme temperatures; operating at elevated temperatures (greater than 40 °C, 104 °F) or low temperatures (below 10 °C, 50 °F) can cause errors in the measurements.

*NOTE: Do not start the Analyzer until the Gas/Liquid Waste and Liquid Waste lines are connected.*

## Step 3: Connect the Waste Lines

Locate the waste line connections labeled “Gas/Liquid Waste” and “Liquid Waste” on the rear of the Analyzer. Locate the Waste tubing from the Accessories Kit.

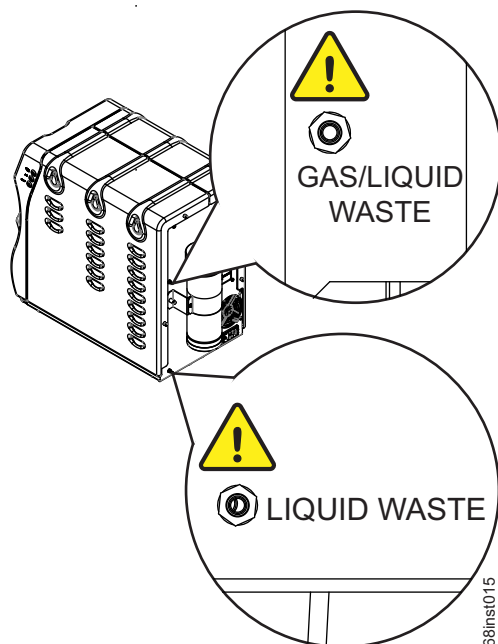


Figure 3: Waste lines locations

## Connect the “Gas/Liquid Waste” tube

1. Connect one end of the waste tubing to the barb labeled “Gas/Liquid Waste.” See [Figure 3 on page 64](#).
2. Place the other end of the tube into the Waste Container.
  - **Important! Do not** allow the end of the “Gas/Liquid Waste” tube to extend below the level of any liquid waste within the Waste Container.
  - **Important! Do not** allow the “Gas/Liquid Waste” tubing to rise above the level of the “Gas/Liquid Waste” barb.
  - Avoid low spots in the “Gas/Liquid Waste” tube or the Gas-Liquid Separator will not drain correctly.

## Connect the “Liquid Waste” tube

1. Connect one end of the waste tubing to the barb labeled “Liquid Waste.” See [Figure 3 on page 64](#).
2. Place the other end of the tube into the Waste Container.



## Set up the “Waste” Container

1. Designate a proper location for the Waste Container (2 L) provided based on the following requirements:
  - **Avoid** low spots in the tubes so that water traps do not form in the tube.
  - **Do not** position the Waste Container behind the Analyzer. Any fumes will be drawn into the Analyzer and will corrode Analyzer internal components.
  - **Do not** place the Waste Container higher than the surface that the Analyzer is sitting on because the Gas-Liquid Separator will not drain properly. The Waste Container must be located *on* or *below* the surface on which the Analyzer is sitting.
  - **Important!** The Waste Container *Cap* must be vented to avoid pressurizing the Waste Container.
2. Neutralize waste during operation. **If neutralization is not an option**, locate the Waste Container as far away from the Analyzer as physically possible and place under a chemical fume hood.

### Warning



To protect against inhalation of toxic fumes, make sure the Analyzer is installed in a well-ventilated area. To treat the gas waste stream, a halogen trap is provided and will shut down the instrument when the trap has expired.

Depending on the composition of the sample, halogens such as chlorine or bromine, or toxic fumes from fluoride, cyanide, or other toxic salts, can be emitted into the Analyzer's liquid waste stream. To protect against inhalation of hazardous fumes, add sodium hydroxide (lye) to the waste container to neutralize acid in the waste. Avoid stratification of the waste within the container by occasionally agitating the container.

## Step 4: Fill the Gas-Liquid Separator (GLS)

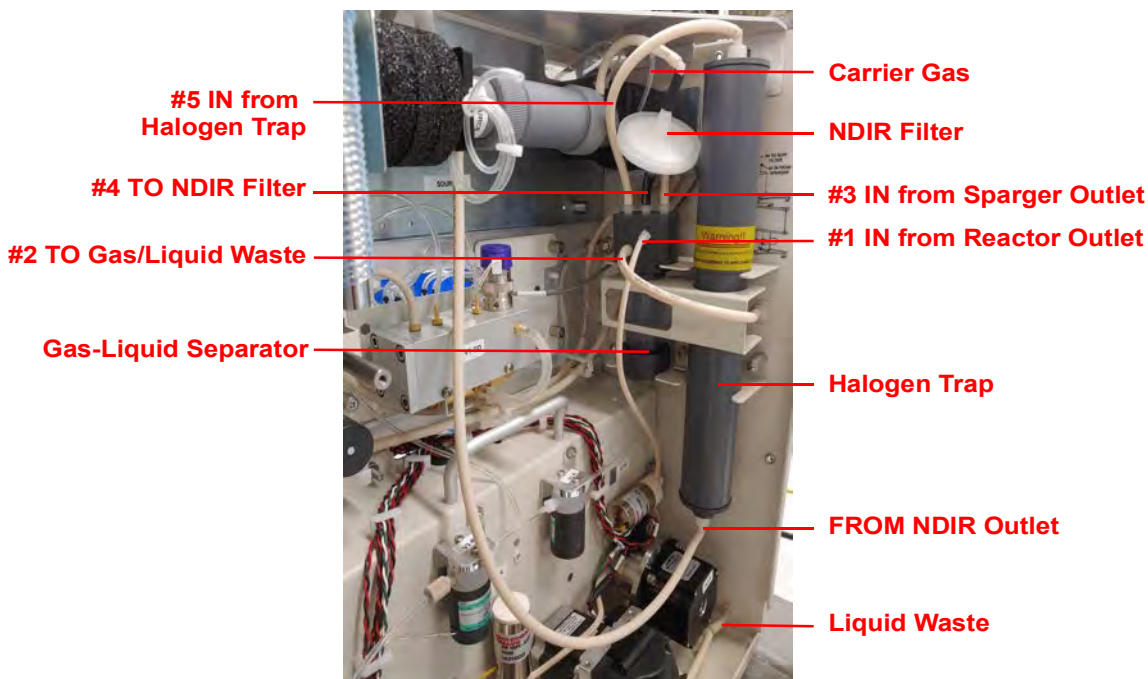
Follow this procedure for the *initial installation* of the Analyzer only. The Gas-Liquid Separator (GLS) is cleaned as part of regular maintenance following a different procedure. For more information on maintaining the GLS, see [“Cleaning the GLS. \(Gas-Liquid Separator\)” on page 184](#).

1. Remove the fluidics cover on the right side of the Analyzer. Use a screwdriver, if necessary, to loosen the two thumb screws.

2. Locate the Gas-Liquid Separator. See [Figure 4 on page 66](#).
3. Disconnect the tubing that connects to the barbs on the Gas-Liquid Separator.
4. Loosen the screw that secures the Gas-Liquid Separator bracket, and pull the Gas-Liquid Separator away from the Analyzer.
5. Gently pull the components of the Gas-Liquid Separator apart.
6. Carefully pour DI Water into the clear reservoir of the Gas-Liquid Separator until the water level reaches the pressure ring.
7. Carefully reassemble the Gas-Liquid Separator. Some DI Water will come out of the barbs when reassembling the Gas-Liquid Separator. This is normal and expected. Clean up any DI Water with a paper towel.

*NOTE: If no DI Water comes out, the barb may be clogged. Clean any clogged barbs.*

8. Secure the Gas-Liquid Separator to the bracket by tightening the screw. Do not over-tighten.
9. Reconnect the tubing to the correct barbs. See [Figure 4 on page 66](#) and [Figure 5 on page 67](#).



**Figure 4: The Gas-Liquid Separator (GLS)**

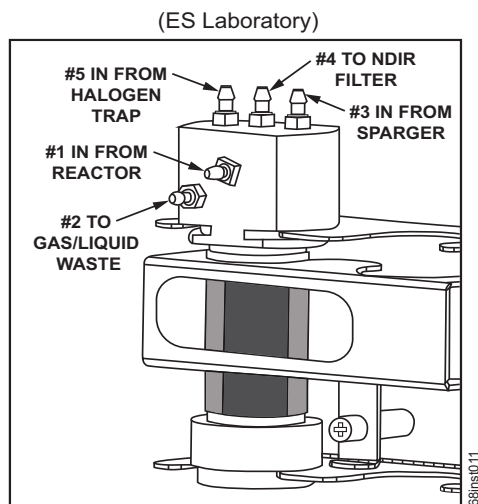


Figure 5: Gas-Liquid Separator (GLS), Lab Label

## Step 5: Connect the Sample Inlet System

**NOTE:** If you are using the Analyzer with a Sievers Autosampler, do not complete the steps in this section at this time. Instead, complete the steps in [Chapter 5, "Sievers Autosampler Installation,"](#) and then proceed to ["Step 6: Connect the Reagent and Dilution Water Lines."](#)

If you are using the Analyzer *without* a Sievers Autosampler, continue with this section to connect the Sample Inlet. Connecting the sample tubing directly to the Analyzer sample inlet port allows you to use the Continuous mode to measure a flowing sample stream or to use the Grab mode to take measurements from individual vials or flasks.

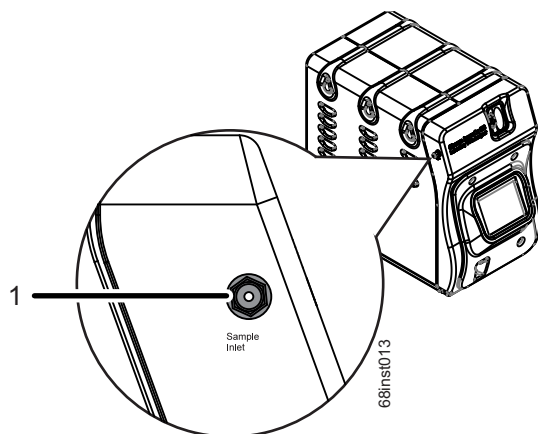


Figure 6: Sample Inlet port

## Connect the sample inlet tubing

1. Using a 7/16 in. wrench, connect the sample inlet tubing to the “**Sample Inlet**” port located on the left side of the Analyzer (1). See [Figure 6 on page 67](#). Tighten the fitting one-quarter turn past finger-tight. Do not over-tighten.
2. Place the other end of the tubing in the sample container, or connect to a flowing sample stream.

## Step 6: Connect the Reagent and Dilution Water Lines

Locate the pre-cut tubing and the three bottles in the Accessories Kit. For each tube, attach one end of the tubing to the appropriate port on the Analyzer and place the other end inside the appropriate container. See [Figure 7 on page 68](#).

- Connect the **Dilution Water (1)**
- Connect the **Acid (2)** — (6M  $\text{H}_3\text{PO}_4$  or 3N HCl)
- Connect the **Oxidizer (3)** — (sodium persulfate oxidizing solution [30% (w/v) sodium persulfate ( $\text{Na}_2\text{S}_2\text{O}_8$ )])

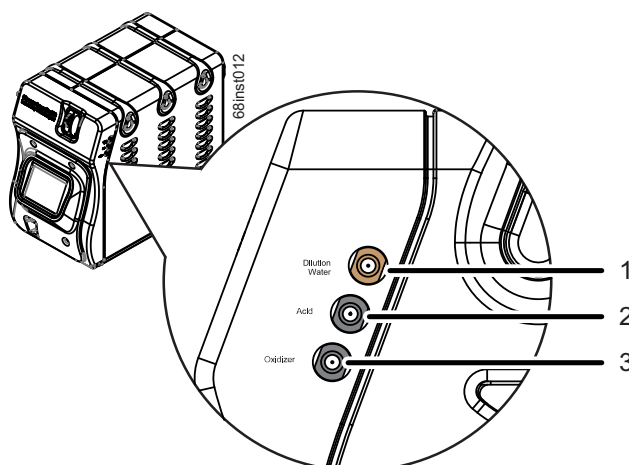


Figure 7: Reagent and Dilution Water lines

## Connect the Dilution Water

1. Fill the “Dilution Water” bottle with deionized water or the best-quality water available to you.

2. Attach one end of the tubing to the top (tan) port **(1)**, labeled “**Dilution Water**” on the right side of the Analyzer, and tighten the PEEK nut finger-tight. See [Figure 7 on page 68](#).
3. Insert the other end of the tubing into the “Dilution Water” bottle.

## Connect the Acid

### Warning

When handling components that contain sample, standards, waste solution, or reagents, wear eye protection and gloves.

Prior to performing this procedure, you must determine which acid is needed for the sample. For more information, see [“Acid considerations” on page 267](#).

1. Determine which acid you will be using for analysis. For more information, see [“Acid considerations” on page 267](#).
2. Carefully transfer the appropriate acid into the “Acid” 2 L bottle.
3. Locate the pre-cut tubing section that contains a fitting on *only one end* from the Accessories Kit.
4. Attach the fitting end of the pre-cut tubing to the middle (black) port **(2)** labeled “**Acid**” on the right side of the Analyzer, and tighten the PEEK nut finger-tight. See [Figure 7 on page 68](#).
5. Carefully insert the end of the pre-cut tubing *without a fitting* into the bottle.

## Connect the Oxidizer (sodium persulfate oxidizing solution)

### Warning

When handling components that contain sample, standards, waste solution, or reagents, wear eye protection and gloves.

Before performing this procedure, it is critical to understand the storage and environmental impacts on the sodium persulfate oxidizing solution. For more information, see [“Oxidizer considerations” on page 268](#).

In addition, prior to performing this procedure, the sodium persulfate oxidizing solution must be mixed together in the “Oxidizer” container. For more information on this procedure, see [“To prepare the Oxidizer \(sodium persulfate oxidizing solution\)” on page 269](#).

1. Prepare the sodium persulfate oxidizing solution in the “Oxidizer” bottle, if not already prepared. For more information, see [“To prepare the Oxidizer \(sodium persulfate oxidizing solution\)” on page 269](#).
  - **IMPORTANT!** Ensure **all oxidizer powder is dissolved** before connecting to the Analyzer.
2. Remove the cover from the prepared “Oxidizer” bottle and replace it with the cover that has a hole (from the Accessories Kit).
3. Attach one end of the pre-cut tubing to the bottom (black) port **(3)** labeled “**Oxidizer**” on the right side of the Analyzer, and tighten the PEEK nut finger-tight. See [Figure 7 on page 68](#).
4. Insert the other end of the pre-cut tubing into the bottle through the hole in the cover.

## Step 7: Install the Carrier Gas CO<sub>2</sub> Scrubber (Optional)

The Sievers InnovOx ES Laboratory TOC Analyzer can be equipped with the optional *Carrier Gas CO<sub>2</sub> Scrubber*. If you will be using compressed gas rather than this option, skip this step and proceed to [“Step 8: Connect the Compressed Gas Source \(Optional\)” on page 72](#).

If your Analyzer has the optional *Carrier Gas CO<sub>2</sub> Scrubber*, the Analyzer will be configured with an Air Pump. The *Carrier Gas CO<sub>2</sub> Scrubber* is delivered in a separate shipping container and must be attached to the Analyzer as follows:

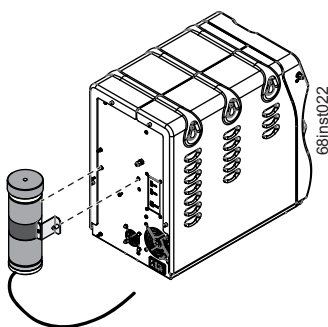
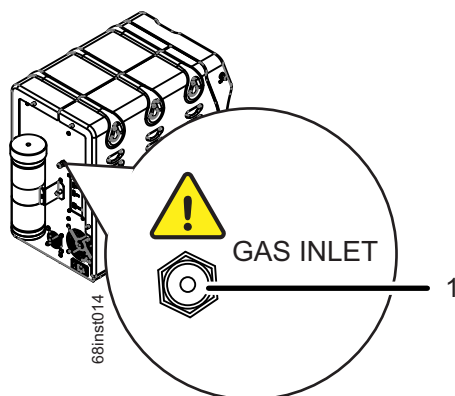


Figure 8: Install the *Carrier Gas CO<sub>2</sub> Scrubber*



**Figure 9: Gas Inlet port (*Carrier Gas CO<sub>2</sub> Scrubber* option shown)**

1. Locate and remove the *Carrier Gas CO<sub>2</sub> Scrubber* from the packaging.
2. Secure the *Carrier Gas CO<sub>2</sub> Scrubber* to the rear of the Analyzer by tightening the two *captive screws*. See [Figure 8 on page 70](#).
3. Remove the nut and ferrule from the inlet port labeled **GAS INLET** on the rear of the Analyzer (**1**), see [Figure 9 on page 71](#).
4. Connect the attached tubing from the bottom of the *Scrubber Housing* to the **GAS INLET** port on the rear of the Analyzer.
5. Tighten the fitting with a 7/16 in. wrench. Tighten the fitting one-quarter turn past finger-tight. Do not over-tighten.
6. Open the top *Scrubber Housing* by loosening the knurled cap. Remove the *Filter Cartridge*.
7. Remove the *Filter Cartridge* from the packaging. Two labels indicate the top and bottom of the cartridge. Take note of which end of the cartridge should be oriented toward the top, and then remove the two labels.
8. Install the *Filter Cartridge* into the *Scrubber Housing*, by inserting the cartridge so that the top end is up.
9. Close the top of the *Scrubber Housing* by tightening the knurled cap.
10. After you turn on the Analyzer's power, be sure to activate the Air Pump via the on-screen menu. (See ["Turn on the Air Pump" on page 75](#).)


## Step 8: Connect the Compressed Gas Source (Optional)

If you are not using the optional *Carrier Gas CO<sub>2</sub> Scrubber*, then the *Carrier Gas* and *Sparge Gas* may be provided by one of the following:

- Cylinder of compressed air or nitrogen
- Laboratory generator of zero air or nitrogen

For best performance, especially when measuring low concentrations, the compressed gas should contain no more than 1 ppm of CO<sub>2</sub> or hydrocarbons.

The pressure of the gas supplied to the Analyzer must be regulated to 207 - 689 kPa (30-100 psig) and must not exceed 689 kPa (100 psig).

Warning	
	Secure all gas cylinders to an immovable structure or permanent wall. Wear eye protection when using compressed gases to avoid possible eye injury. Only use regulators designed for use with the selected gas. Store compressed gases in accordance with all safety codes.
If the Analyzer is used with compressed gases, the pressure of the gas at the gas inlet must not exceed 689 kPa (100 psig). Use only nitrogen or CO <sub>2</sub> -free air.	

If you are using the Analyzer with a compressed gas canister:

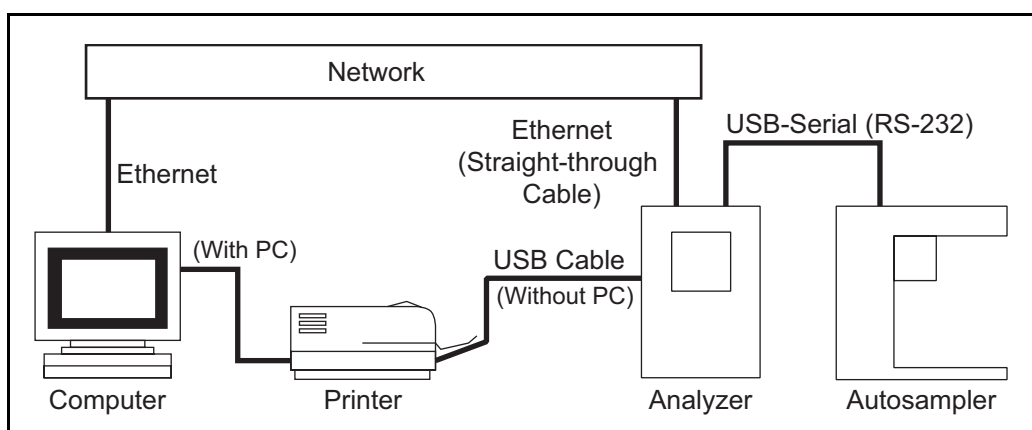
1. Remove the nut and ferrule from the inlet port labeled **GAS INLET** port on the rear of the Analyzer (1). See [Figure 9 on page 71](#).
2. Attach the ferrule and nut to the tubing from your canister.
3. Connect the tubing from the compressed gas canister to the inlet port labeled **GAS INLET** port on the rear of the Analyzer (1). See [Figure 9 on page 71](#).
4. Tighten the fitting with a 7/16 in. wrench. Tighten the fitting one-quarter turn past finger-tight. Do not over-tighten.



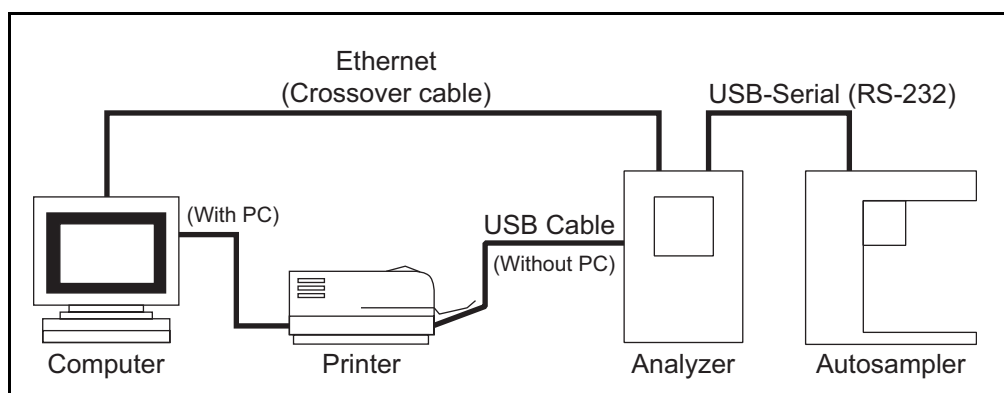
## Step 9: Connect to a Network or Direct Connection Computer (Optional)

In addition to exporting data to an external USB memory device (using any ONE of the USB ports on the instrument), the Sievers InnovOx ES Laboratory TOC Analyzer can be connected to a *Network* or a *Direct Connection (Peer to Peer)* computer.

If you are using the Sievers Autosampler with the Analyzer, you must connect the Sievers Autosampler to a *Network* computer or *Direct Connection* computer to view the *InnovOx User Interface* through the Web Browser. The following diagrams, [Figure 10](#) and [Figure 11](#), depict the cable configurations for connecting the Analyzer, the Sievers Autosampler, a *Network* or *Direct Connection* computer, and a printer.



**Figure 10: Connecting to a *Network* computer**



**Figure 11: Connecting to a *Direct Connection* computer**

You can complete these network or computer connections before or after you connect the Sievers Autosampler communication cables.

The Sievers InnovOx ES Laboratory TOC Analyzer is shipped with two different types of Ethernet cables for use in connecting the Analyzer to a *Network* or *Direct Connection* computer. Select the appropriate Ethernet cable for your connection setup:

- To connect to the Analyzer via a *Network*, use the standard Ethernet cable (a straight-through cable).
- To connect to the Analyzer via a *Direct Connection* computer, use the crossover Ethernet cable.

You will also need to enable and setup the IP Address for the Analyzer. **Veolia recommends you consult with your Information Technology Group to determine the best configuration for your working environment.** For more information on Ethernet setup options, see [“Connecting to the Analyzer via Ethernet” on page 145.](#)

For additional information regarding the connection of serial cables for the Sievers Autosampler, see [“Step 4: Connecting Communication and Power Cables” on page 88.](#)

## Step 10: Turn on Power and Configure Basic Settings

Enable power to the Analyzer. Before using the Analyzer, you may need to configure various basic settings.

1. Install the power cord on the back of the Analyzer. Plug the other end of the cord into a grounded AC power source.
2. Turn on the power switch on the back of the Analyzer. The green LED power indicator on the front of the Analyzer will light up immediately, followed by the display. (It could take up to two minutes for the *System Info* screen to display.) If either of these results do not occur, refer to [Chapter 10, “Troubleshooting.”](#) The green LED stays illuminated when AC power is connected.
3. The *System Info* screen will be displayed, with a reminder to attach the waste lines. If the *Waste Lines* were not attached already, do that now. (See Installation, [“Step 3: Connect the Waste Lines” on page 63.](#)) When ready, press the **Main** button on the display.

## Setting the Clock

Set the Analyzer clock to ensure that all TOC measurements reflect the correct date and time, as follows.

1. Select the **Maintenance** tab.
2. Press the **Advanced** button
3. Press the **Clock** button.
4. Specify the correct date and time via each of the buttons.
5. Press the **Save** button.

## Turn on the Air Pump

If you are using the optional *Carrier Gas CO<sub>2</sub> Scrubber*, you also must activate the air pump, as follows:

1. Select the **Maintenance** tab.
2. Press the **Advanced** button.
3. Press the **Air Pump** button. Set the pump to **On**.
4. Press the **Back** button twice.

## Step 11: Perform a Test Analysis

To confirm that the Analyzer is in proper working condition, perform a test analysis on a sample for which you know the approximate TOC or NPOC value and which has a concentration of less than 1,000 ppm.

1. On the *Main* Screen, press the **Menu** button.
2. Select the **Maintenance** tab.
3. Press the **Prime Reagents** button, then press the **Prime All** button. The reagent and dilution water lines will be primed within about 3 minutes. All bubbles, except for very small ones, should be pushed out of the reagent and dilution water lines when the Prime is complete. If not, press **Prime All** again. (If one or more of the reagent or dilution water lines are not primed, see [“Step 6: Connect the Reagent and Dilution Water Lines” on page 68](#) and, if needed, [Chapter 10, "Troubleshooting."](#))
4. When the Prime Reagents is completed, press the **Back** button to return to the *Menu* screen.
5. Press the **Setup** tab, and then press the **Grab** button. Press the **Analysis Protocol** button to display the list of stored protocols.
6. Highlight, the “Default GRAB” protocol.

7. Press the **Modify** button to display the *Protocol Setup* screen. Ensure the **Range** (ppm) button is set to **Up to 1,000**. If it is not, press the **Range** button to display the **Range** choices on the right side of the screen. Press the **Up to 1,000** button.
8. Press the **Calibration** button on the *Protocol Setup* screen, and the list of stored calibrations will be displayed. Highlight the most recent 0-1000 ppm calibration. Then press the **Select** button to select the calibration to be used in the analysis. The Factory Default calibration may be used if no others are available.
9. The *Protocol Setup* screen will be displayed. Press the **Reps** button to set the number of replicate measurements to be performed. A keypad will be displayed on the right side of the screen. Press **3**, then press **Enter** to set the Analyzer to 3 replicate measurements.
10. Ensure that the other settings in the *Protocol Setup* screen are:
  - Measure: NPOC
  - Acid: 5%
  - Oxidizer: 15% (Dependent upon COD of the sample<sup>4</sup>)
  - Rej 0
  - Flush: Off
  - Repeat Criteria: Off
11. Ensure that the other settings in the *Protocol Setup/Advanced Setup* screen are:
  - Sparge (for NPOC mode only): 0.8 min.
  - Blank Correction: Off
  - Manual Dilution: 1:1.0

If any of the settings need to be changed, press the button that is to be changed, and the choices will show up on the right side of the screen, as described above.
12. Press the **Save As** button and then use the on-screen keypad to enter a name for this new protocol. After you enter the name, press **Save**.
13. The list of protocols appears. Make sure the name of the new protocol is highlighted and then press **Back**.

---

<sup>4</sup> The Oxidizer setting is dependent upon the chemical oxygen demand (COD) of the sample. The presence of chloride, nitrogen, sulfides, phosphorus, and so on can influence how much oxidizer is required. Higher levels of these species in the sample will require more oxidizer. For example, a brine sample with 25% sodium chloride (NaCl) requires a 30% Oxidizer setting. Wastewater discharge will require as little as 5% Oxidizer. For more information, see ["Oxidizer" on page 125](#).

14. When ready, press the **Start Analysis** button. Press **Main** to return to the *Main* screen. A graph of the CO<sub>2</sub> peaks will be displayed. Each peak is displayed after its peak height is measured, and the measured NPOC concentration is displayed at the top of the screen.
15. When the analysis is complete, the CO<sub>2</sub> peaks will be displayed on the screen. If there are no peaks and the Mass Response axis is only 1.0 µg full scale, then refer to the Troubleshooting section of this Manual. Otherwise, proceed to the next step.

## **Step 12: Calibrate the Analyzer**

Before placing the Analyzer into normal operation, calibrate the Analyzer in a manner suited to your application. Consult [Chapter 6, "Calibration and Verification"](#) for details on calibration options.

# Chapter 5. Sievers Autosampler Installation

## Overview

This chapter provides installation instructions for the Sievers Autosampler for use with the Sievers InnovOx ES Laboratory TOC Analyzer.

If you need additional assistance, contact Technical Support or your local service provider. You can also visit our website.

## Before you begin

Confirm that you have completed Steps 1 - 5 of the installation instructions for the Sievers InnovOx ES Laboratory TOC Analyzer starting on [page 61](#). Then, after you have installed the Sievers Autosampler according to the instructions provided in this chapter, return to the installation instructions for the Analyzer on [page 68](#) and complete Steps 6 - 12.

**NOTE:** *If your Sievers Autosampler was supplied with plastic vial racks, you do not have the option of switching to 35 mL or 60 mL vials. Veolia has released an upgraded version of the Sievers Autosampler that adds this functionality if you need it. Please contact Technical Support or your local service provider for more information. You can also visit our website.*

## Step 1: Unpack and Inspect the Sievers Autosampler

### Caution

SAVE THE ORIGINAL PACKING MATERIALS. If for any reason you need to return the Sievers Autosampler, you MUST pack the instrument in the original carton to ensure that no damage occurs during shipment. There will be a charge assessed for replacement packing materials required for return shipments to and from the factory. Insure all instruments for the return shipment.

Open the Sievers Autosampler shipping box and verify that it contains the following components:

- Sievers Autosampler
- Sievers Autosampler power cord
- Sievers Autosampler *Operations and Maintenance manual* (download from our website)
- 1 - 40 mL sample rack (included with each Sievers Autosampler purchase)
- Additional 40 mL, 35 mL, and 60 mL sample racks (as ordered)
  - USB cable
  - USB-to-Serial (RS-232) cable


**NOTE:** *This USB-to-Serial cable may be supplied in two separate pieces that you should connect together.*

- Needle Assembly Kit — InnovOx needle assembly, including Norprene® tubing with attached Valco® fitting and ferrule.
- Stirring Station Kit (included with optional purchase of the Stirring Station):
  - Stirring plate(s), (quantity up to 3, as ordered)
  - 40 mL sample rack, sized for the stirring station (quantity up to 3, as ordered)
  - Stir bars (One package of 21 quantity), plus additional quantities as ordered

## Step 2: Select a Location for the Sievers Autosampler

The Sievers Autosampler is designed to be placed to the immediate left of the Analyzer. To ensure the proper functioning of both instruments, minimize the space between the Sievers Autosampler and Analyzer as much as possible. Line up the front edge of the Sievers Autosampler parallel to the front edge of the Analyzer.

## Step 3: Install the Sievers Autosampler Hardware

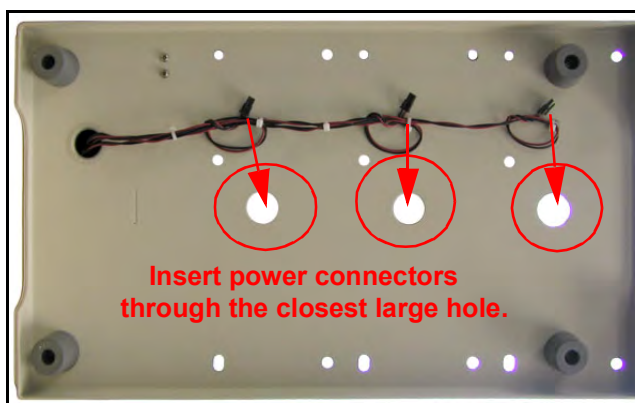
Warning	
	Do NOT apply power to the Sievers Autosampler until you have installed all of the Sievers Autosampler hardware, as described in this section. Instructions for connecting the power cable is included in <a href="#">“Step 4: Connecting Communication and Power Cables” on page 88</a> .

### Install the Stirring Plates (Optional)

If you purchased the optional Stirring Station with the Sievers Autosampler, install the stirring plate(s) now. Otherwise, proceed to [“Step 4: Connecting Communication and Power Cables” on page 88](#).

1. Remove the stirring plate(s) and sample rack(s) from the packaging.
2. Locate the power connector underneath the Sievers Autosampler base for each stirring plate to install ([Figure 12](#)).

**NOTE:** *Three power connectors have been wired underneath the base of the Sievers Autosampler. Each connector inserts from underneath through one of three center holes located on the base of the Sievers Autosampler.*



**Figure 12: Under the Sievers Autosampler - Stirring Plate Wiring**

3. Insert the connector through the closest large hole (located down the center of the Sievers Autosampler base).
4. Place the stirring plate on the base of the Sievers Autosampler and connect the wiring to the stirring plate ([Figure 13](#)).

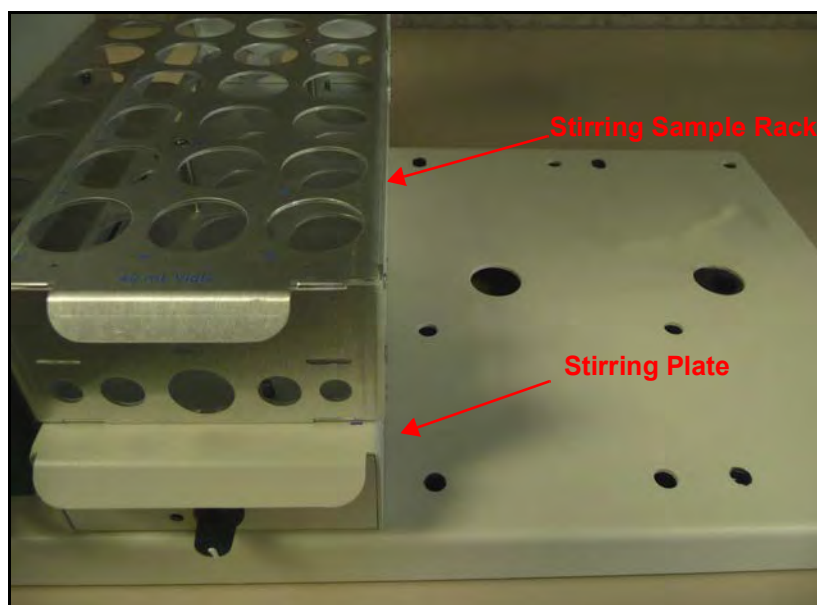




**Figure 13: Connecting the Stirring Plate Wiring**

5. Install the sample rack on top of the stirring plate, inserting the rods on the top of the stirring plate into the corresponding holes on the bottom of the sample rack.

**NOTE:** You **MUST** use the stirring sample rack to ensure proper operation, as its height is sized for the stirring station and Sievers Autosampler arm movement. This also ensures a parallel height with the general sample racks to allow operation with any combination of stirring racks and general racks.



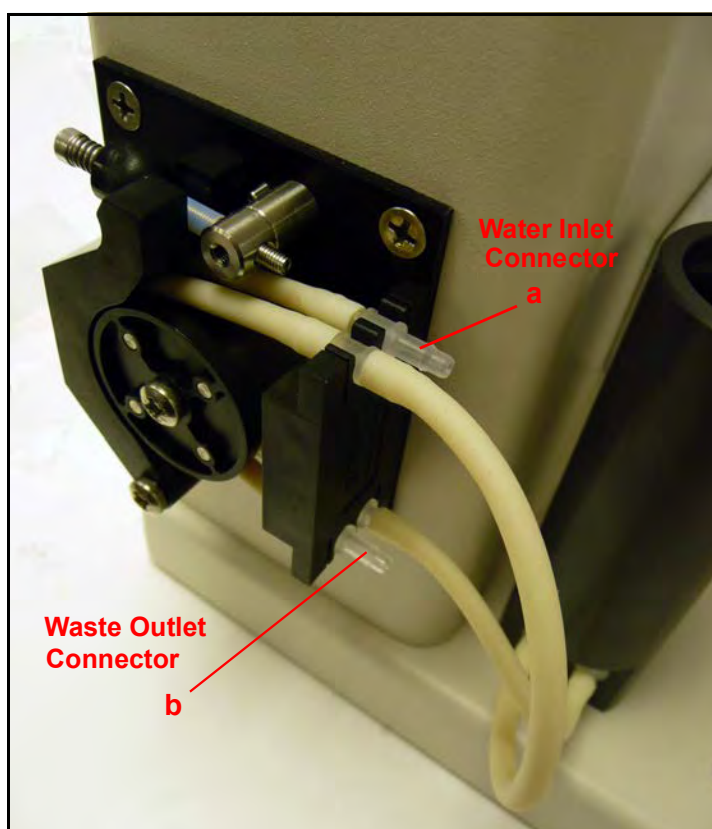
**Figure 14: Stirring Plates Installation**

6. Tuck any remaining stirring station power wires back through the large holes and underneath the Sievers Autosampler before operation.

## Install the Wash Station Tubing (Optional)

If you purchased the optional Wash Station with the Sievers Autosampler, install the tubing for the water source and waste now. Refer to [Figure 15](#) and [Figure 16](#) as needed. Otherwise, proceed to [“Step 4: Connecting Communication and Power Cables” on page 88](#).

1. Remove the tubing from the package, and cut one length of tubing to use for the water source and one for the waste facility or drain.
2. Remove any tape from the Sievers Autosampler arm, and move the Sievers Autosampler arm to the front of the unit while you install the tubing.
3. Take one end of a tubing section created in step [1](#) and connect it to an inlet water source of DI water. Connect the other end to the upper connector outside the pump, and closest to the instrument (a).



**Figure 15: Tubing Connectors**

4. Locate the other section of tubing created in step [1](#) and connect one end to the lower connector (furthest from the instrument) located on the outside of the pump (b). Place the other end of the tubing in a suitable waste facility or drain.

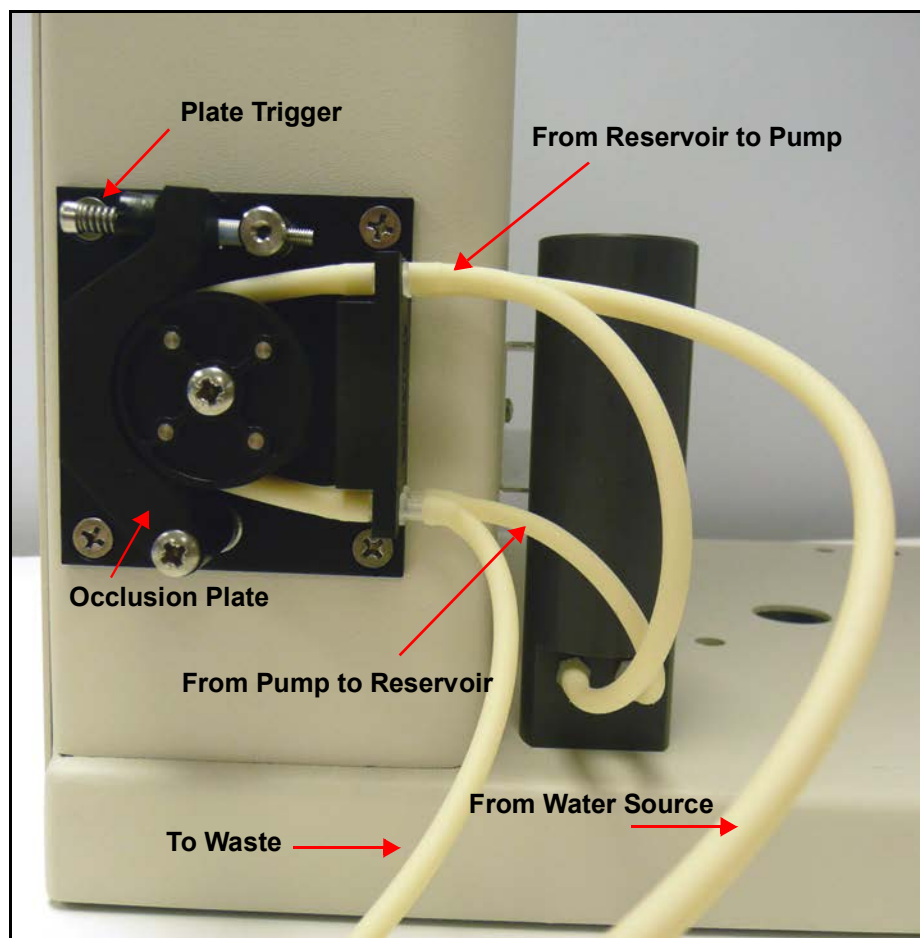


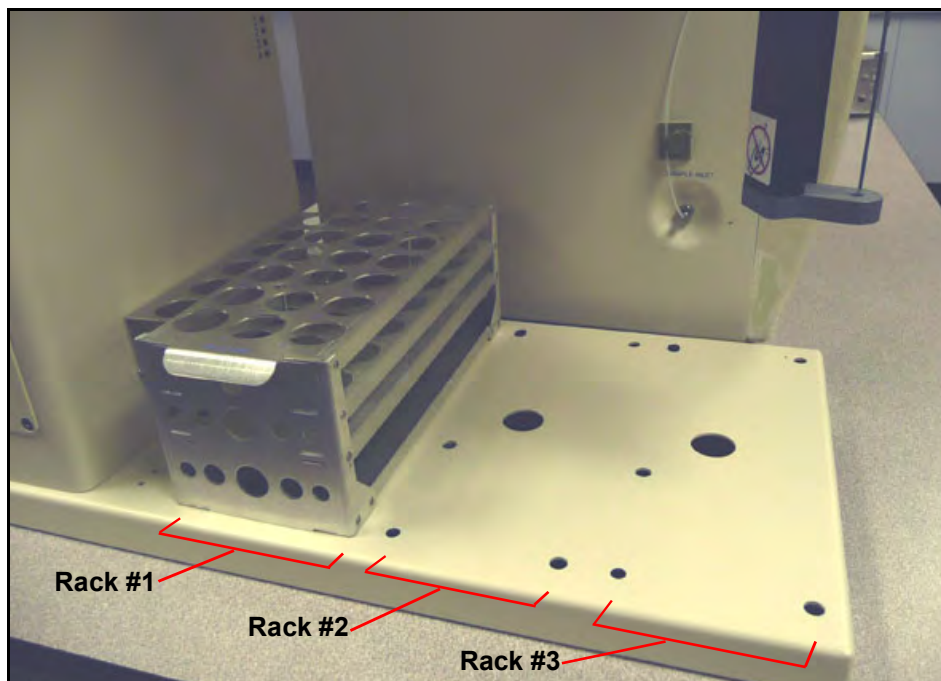
Figure 16: Routing the Wash Station Tubing

## Install the Sample Racks

The Sievers Autosampler can be operated with the Sievers InnovOx ES Laboratory TOC Analyzer using one, two, or three sample racks. All racks in a single protocol must be either 35 mL, 40 mL, or 60 mL.

1. Remove the racks from the packaging.
2. Insert each rack onto the base of the Sievers Autosampler, fitting the feet (located on the bottom of the vial rack) into the corresponding slots on the rack location base.

**NOTE:** Any 35 mL, 40 mL, or 60 mL general sample rack can be inserted in either the Rack #1, #2, or #3 position of the Sievers Autosampler base. Position #1 is located closest to the back wall of the Sievers Autosampler. Do NOT try to install a stirring sample rack directly on the base of the Sievers Autosampler, as its height and bottom feet are sized for insertion into the stirring plate.



**Figure 17: Installing the Vial Racks**

## Install the Needle Assembly

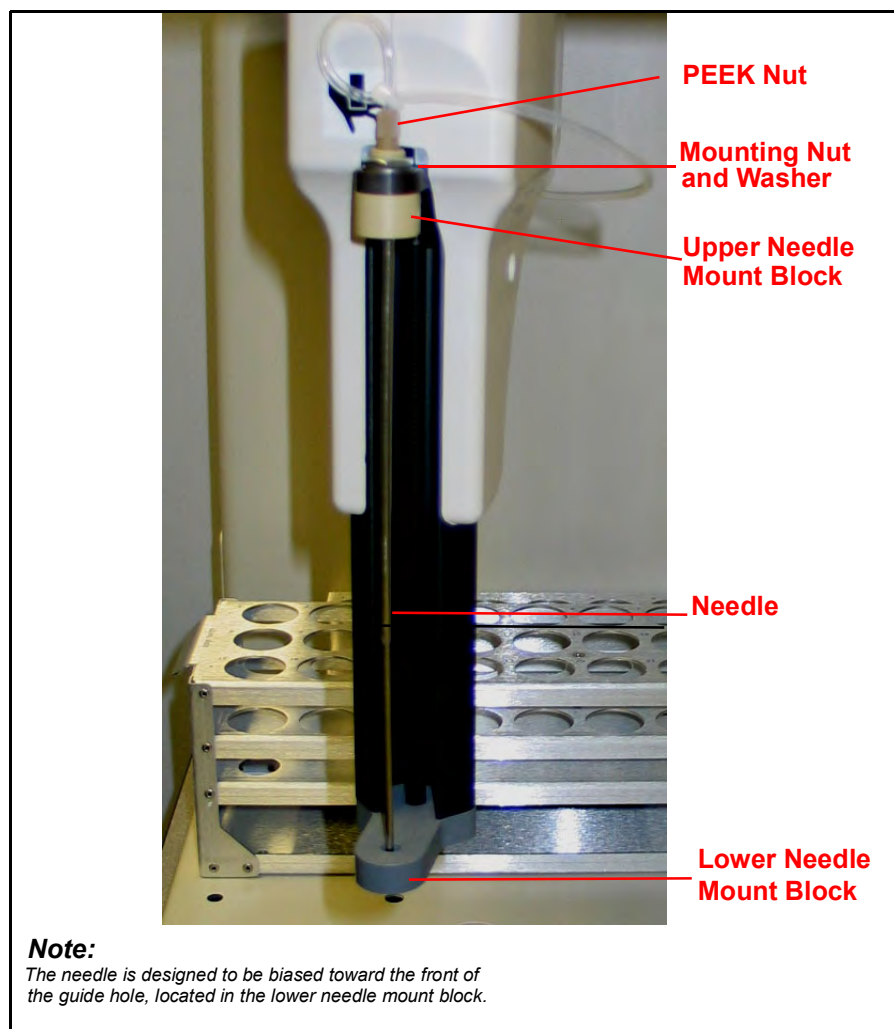
Refer to [Figure 18](#) and [Figure 19](#) as needed.

1. If the Sievers Autosampler arm is secured with tape, remove the tape.
2. Swing the arm around so that it is extended out in front of the instrument.
3. Using a standard screwdriver on the screw located at the top of the Sievers Autosampler arm ([Figure 18](#)), slightly lower the needle mount block. This will allow room to use a wrench on the mounting nut when performing step [9](#).



**Figure 18: Lowering the Sievers Autosampler Arm**

4. Remove the needle assembly from the packaging.
5. Unscrew the PEEK nut (with the sample tubing attached) from the needle assembly and set it aside.
6. Carefully twist off the protective cap from the tip of the needle.
7. Lower the tip of the needle through the lower mount block, and then push the top of the threaded assembly upward and into the upper mount block.
8. Place the locking washer over the top threaded portion of the needle assembly so that it sits on the top of the upper mount block.
9. Place the 1/2" nut over the washer and tighten the nut with a 1/2" open-end wrench. Be careful NOT to over-tighten the nut.
10. Screw the PEEK nut (with the sample tubing attached) back into the threaded mount of the needle assembly until it is finger-tight. Do NOT over-tighten the nut.
11. Raise the Sievers Autosampler arm back up using a standard screwdriver on the screw located on the top of the Sievers Autosampler arm ([see Figure 18](#)).



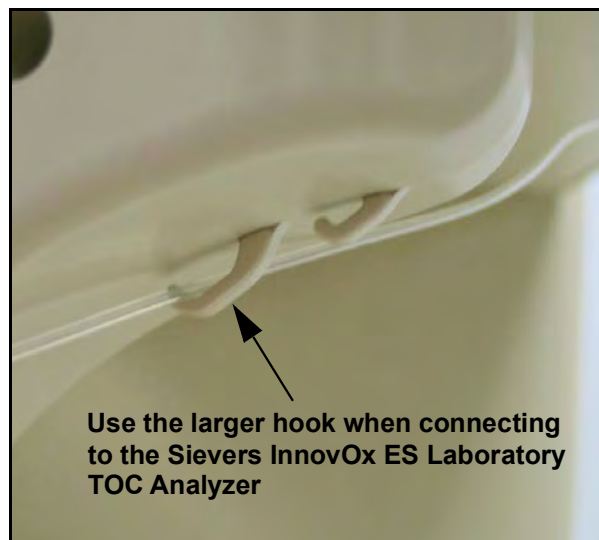
**Figure 19: Sievers Autosampler Arm with Needle Assembly**

## Route the Sample Tubing

The length of the sample tubing (116.8 cm, 46 in) is specifically designed to provide for maximum Sievers Autosampler mobility without requiring excessive flushing between samples. If the tubing becomes too taut, leaks can result. Thus, routing tubing carefully is extremely important for proper Sievers Autosampler functionality.

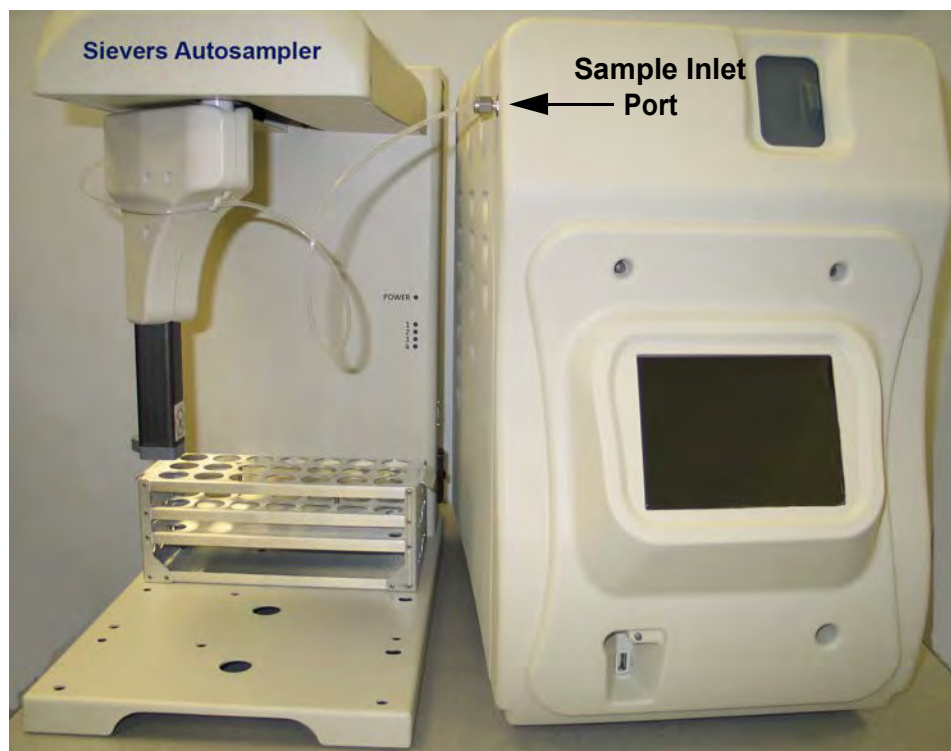
1. Make sure that the arm of the Sievers Autosampler is still extended out in front of the instrument.
2. Take the end of the tubing that extends from the PEEK nut at the top of the needle assembly and point the tubing RIGHT, and then around the arm to the larger hook (located at the back of the Sievers Autosampler arm).





**Figure 20: Sievers Autosampler Arm — Sample Tubing Hook**

3. Slip the tubing on the larger hook and then route the tubing over to the Sievers InnovOx ES Laboratory TOC Analyzer.
4. Insert the Swagelok® fitting (attached to the end of the needle assembly tubing), into the **Sample Inlet** port. The **Sample Inlet** port is located toward the front of the Analyzer on the top-left side.

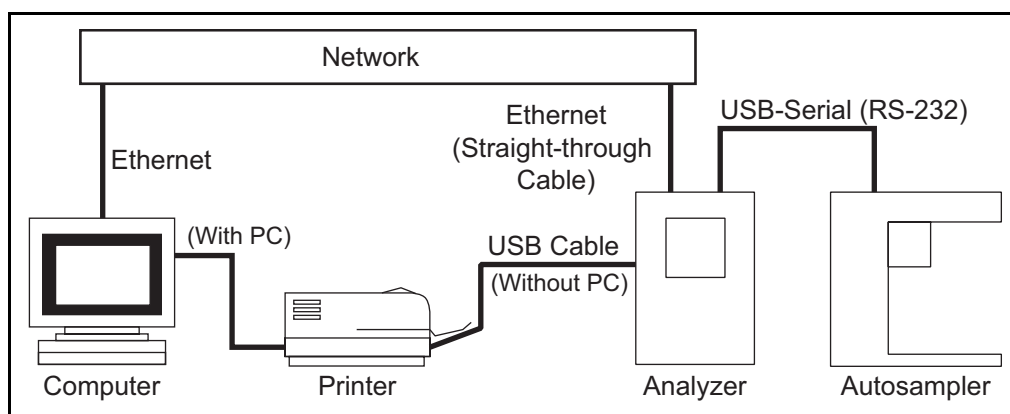


**Figure 21: Connecting to the Sample Inlet Port**

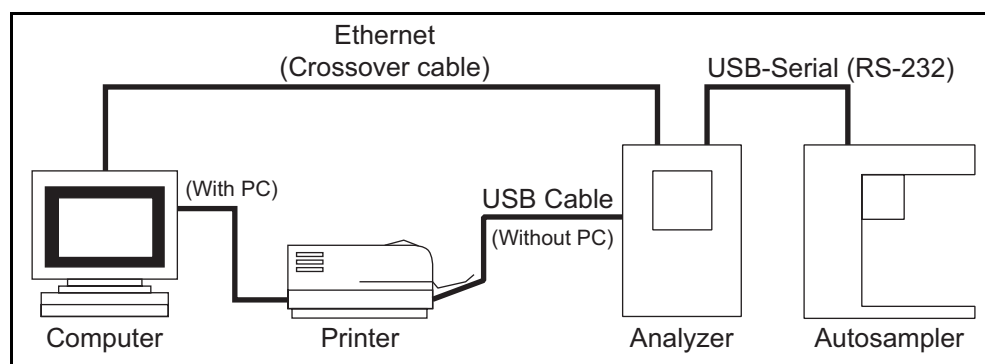
## Step 4: Connecting Communication and Power Cables

This section contains instructions for connecting the serial communications between the Sievers Autosampler and the Sievers InnovOx ES Laboratory TOC Analyzer.

The Analyzer can also communicate via a *Network* or a *Direct Connection* computer, as outlined in [Figure 22](#) and [Figure 23](#). You can complete these *Network* or *Direct Connection* computer connections before or after you connect the Sievers Autosampler communication cables. Refer to the Analyzer installation instructions, [“Step 9: Connect to a Network or Direct Connection Computer \(Optional\)” on page 73](#).



**Figure 22: Connecting to a *Network* Computer**



**Figure 23: Connecting to a *Direct Connection* Computer**

### To connect the USB-to-serial cable

The following instructions enable the Sievers Autosampler to communicate to the Sievers InnovOx ES Laboratory TOC Analyzer.



1. Locate the USB-to-serial (RS-232) cable.

*NOTE     If this cable was supplied in two separate pieces, connect them together now.*

2. Connect the USB connector end to one of the USB ports on the Analyzer.
3. Attach the serial connector end of the cable to the Sievers Autosampler serial port. Tighten the captive screws.

### ***To connect the power cable***

1. Locate the power cord. Connect the socket (female connector) into the Sievers Autosampler, and then connect the plug to a grounded power supply.
2. Turn on power to the Analyzer instrument, and then turn on the power to the Sievers Autosampler using the power switch (located toward the back and lower-right side of the instrument).

## ***Step 5: Continue the Analyzer Installation***

After you have installed the Sievers Autosampler according to the previous steps 1 - 5, return to the installation instructions for the Analyzer on [page 68](#) and complete steps 6 - 12.

## Chapter 6. Calibration and Verification

### Overview

Calibration of the Sievers InnovOx ES Laboratory TOC Analyzer for NPOC, IC, and TC and TOC (TC - IC) measurements is accomplished using standards that contain known concentrations of the form of carbon of interest. It is required that the Analyzer be calibrated for the specific mode that you will be running samples.

Each measurement range (e.g., *Up to 1,000 ppm*) in the Analyzer is calibrated separately. The Sievers InnovOx ES Laboratory TOC Analyzer can store multiple calibrations for each of its five ranges (up to a total of 20 calibrations). NPOC and IC calibration can be made with one-to-six points. TC/TOC calibration can be made with one-to-six TC points and zero-to-six IC points. (For best results, make sure to rinse with one Reagent Water vial in between the IC and TOC vials.) These points can be individual calibration standards of different concentrations, or the Auto Dilution feature can be used. When Auto Dilution is selected, the Analyzer automatically dilutes a standard solution to a lower concentration selected by the operator. When an application involves measurement of samples containing less than about 10 ppm TOC, you may want to correct the calibration for the blank associated with the reagents and dilution water. Blank Corrected calibrations and verifications are described on [“Blank Correction” on page 99](#).

When you analyze a sample, the Analyzer allows you to specify which calibration will be used for that analysis; thus, you can specify the use of different calibrations with particular sample matrices. Or, you may use calibrations that focus on particular concentration ranges that may be appropriate to your different applications.

To use the Auto Range feature (as described on [“Auto Range” on page 125](#)), all five of the Analyzer's measurement ranges should be calibrated<sup>5</sup>. The four calibrations that you select for use in the Auto Range measurement are stored as a Calibration Group.

Because verification options are similar to calibration options, the information presented below applies to calibration and verification procedures.

## Handling Standards

Veolia recommends special handling of all standards to ensure proper preparation and analysis. Most standards are provided in 250 mL bottles. Additionally, observe the following practices:

- Keep all standards containers refrigerated at all times to help ensure stability; store at approximately 5 °C ( $\pm 4$  °), away from light, in a box or solid-door refrigerator. Warm standards to ambient temperature prior to starting analysis.
- Certified reference materials should be stored separate from other chemicals, such as IPA, acetone, and acetic acid.
- Avoid storage of standards in uncapped containers.
- Shake the 250 mL bottle containing reference materials prior to pouring into vials.
- Remove vial caps only when prepared to pour standards and replace caps immediately after pouring.
- Avoid handling of vial septa. Also avoid touching the top of the vial to protect against introducing foreign particles, TOC, and IC.
- Wear gloves when preparing standards.
- Pour standards in a clean area to avoid introducing contaminants.

## Calibration and Verification Options

When calibrating the Analyzer using either the Single-Point Calibration or Two-Point Calibration, the algorithm used to calculate the slope of the calibration curve uses the following variables:

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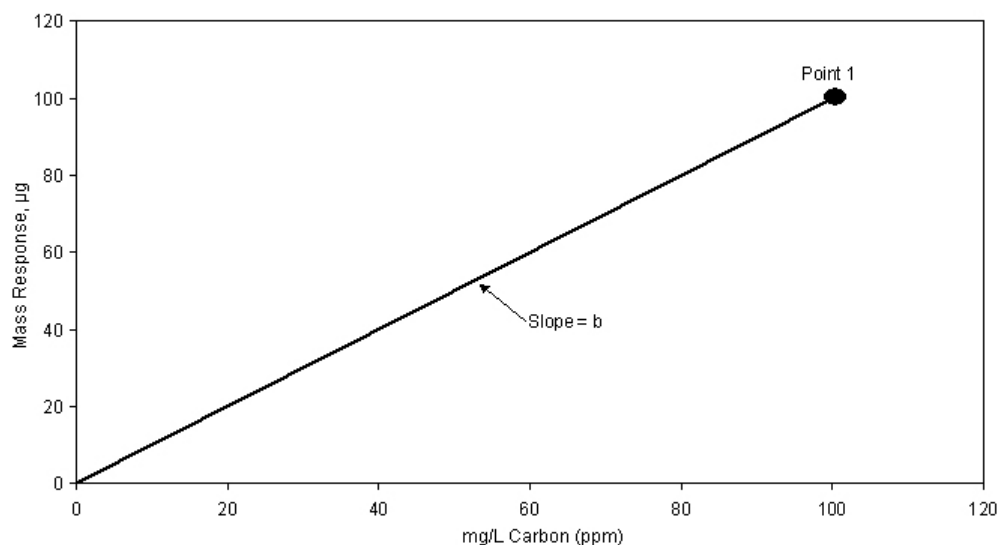
<sup>5</sup>The Auto Range feature can be used without calibrating all five ranges; however, it will not be as accurate as when the ranges are calibrated. When any of the ranges are not calibrated, the default calibration constants for that range are used. This method is useful for a quick, approximate measurement of an unknown sample.

- The mass response
- The ratio of sample volume to total volume (where total volume includes sample, dilution water, reagents, and so on.)
- The concentration of the standard (e.g., 1,000 ppm)

$$\text{Slope}^6 = [(\text{standard concentration}) * (V_s/V_t)]/(\text{mass response})$$

## Single-Point Calibration

When a single-point calibration is performed, only one standard is used, as shown in [Figure 24](#). For that reason, single-point calibrations are convenient and rapid; however, the analysis of samples may be less accurate than when other calibration methods are used.



**Figure 24: Calibration Curve for Single-Point Calibration**

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$^6V_s$  = Volume of sample in sparger needed for dilution range, mL

$V_t$  = Total solution volume in sparger, mL

The concentration of samples is calculated from a calibration equation of the form:

$$C = b \cdot R$$

where,

R = Mass Response,  $\mu\text{g}$

b = Calibration constant (slope)

C = mg/L Carbon, ppm

In a single-point calibration, the calibration constant is the slope of the curve shown in [Figure 24](#), and the response of the Analyzer is assumed to pass through the origin.

Certain recommendations can be made about the use of single-point calibrations:

- Reagent water (TOC or IC concentration of zero) may not be used as the single point.
- If the highest accuracy is sought, calibrate using at least two points.
- The concentration of the calibration point in a single-point calibration should be greater than the expected concentration of the samples, but not exceed them by too much.
- Because Auto Dilution contributes some uncertainty to the calibration, single-point calibrations using Auto Dilution normally are not recommended.
- If you plan to use the Auto Range feature, calibration of the 50,000 ppm range is important because the preliminary measurement is performed in this range. For best performance of the Auto Range feature, it is recommended that the 50,000 ppm range be calibrated using a six-point, point-to-point calibration ([page 97](#)). The recommended points are: Reagent Water, 100 ppm, 1,000 ppm, 5,000 ppm, 20,000 ppm and 50,000 ppm.

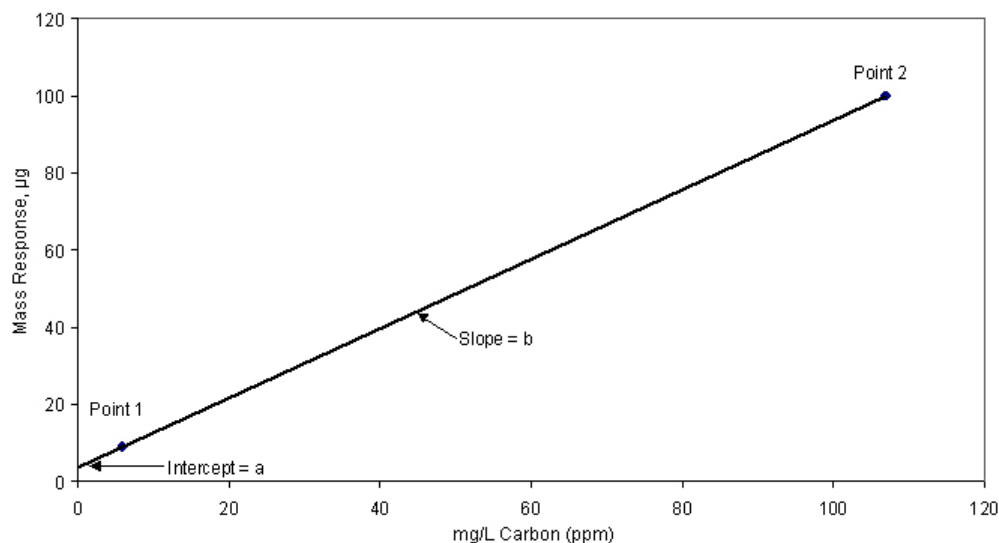
## Two-Point Calibration

The Analyzer can be calibrated with up to 6 points. The concentrations of the two points should be selected to bracket the range of concentrations expected in the samples that will be subsequently analyzed.

As in all calibrations involving more than a single point, the point having the lowest concentration is measured first. In most cases the Analyzer will be used to analyze samples containing substantial TOC concentrations. However, if the Analyzer will be used to measure samples having very low TOC concentrations, then Point 1 may have to be reagent water ( $\text{TOC} \leq 0.1$  ppm) in order to bracket the concentrations of the samples.

When you plan on measuring TOC(TC-IC) in your samples, it is recommended that the first calibration point for the TC and IC portions be reagent water. This will ensure that the best linear response will be achieved for both TC and IC regardless of the variability of the individual concentrations.

[Figure 25](#) depicts a two-point calibration in which point 1 is not reagent water, but a standard of known TOC concentration. The concentrations of both points are entered into the calibration protocol.



**Figure 25: Two-Point Calibration (Point 1 is Standard)**

The response of the Analyzer is defined by the equation:

$$C = a + b \cdot R$$

where,

R = Mass Response, µg

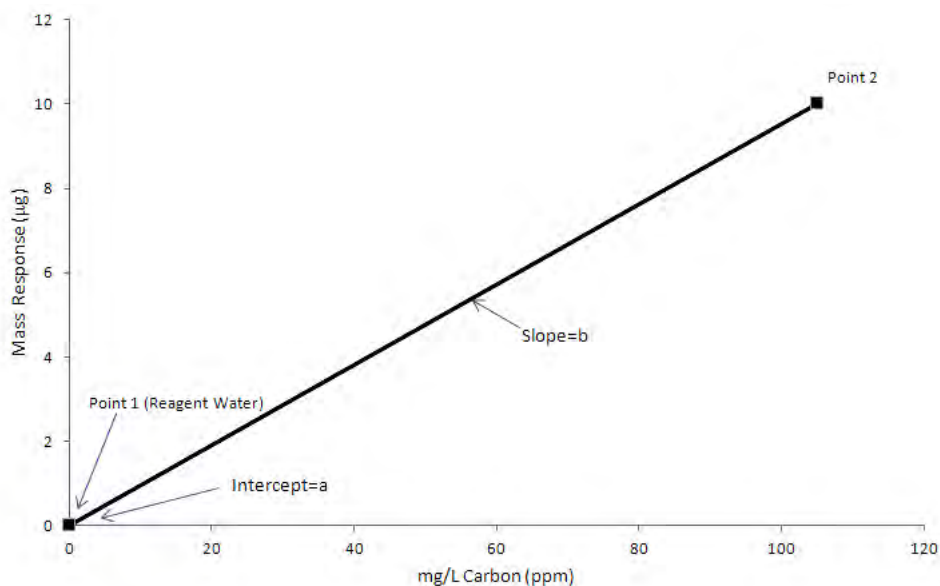
a = Calibration intercept

b = Calibration constant (slope)

C = mg/L Carbon, ppm

The calibration of the Analyzer is defined by the intercept, a, and the slope, b.

For the case in which point 1 is reagent water, the calibration of the Analyzer is depicted graphically in [Figure 26](#). The operator designates point 1 as reagent water in the protocol by setting its concentration to 0 ppm. The Analyzer interprets “0 ppm” as “reagent water.”



**Figure 26: Two-Point Calibration (Point 1 is Reagent Water)**

When the Analyzer measures the reagent water, it also measures the TOC in the reagents and dilution water used in the measurement. Because the TOC concentration in the reagent water is very low, this measurement approximates the TOC concentration in the reagents and dilution water for the particular volumes of reagents and dilution water used in the calibration. The Analyzer corrects the calibration for the TOC in the reagents and dilution water by setting the measured response (i.e., Mass Response) to equal 0 ppm.

The operator enters the concentration of point 2 into the calibration protocol. The concentration of the standard used for point 2 is referred to as  $C_2$ . In the example in [Figure 26](#), the operator set the concentration of point 2 to 100 ppm, so  $C_2 = 100$  ppm.  $C_1$  (or  $C_{RW}$ ) for reagent water is zero.

The calibration constant,  $b$ , is calculated from the difference in the response to the two points:

where,

$R_2$  = Response of Analyzer to point 2

$R_{RW}$  = Response of Analyzer to reagent water

$C_1$  = TOC concentration of point 1 (= 0 for RW)

$C_2$  = TOC concentration of point 2 (mg/L)

Certain recommendations can be made about the use of two-point calibrations:

- The concentrations of the points should bracket the expected range of concentrations of the samples. When unknown samples will be measured, the first calibration point should be reagent water.

- The accuracy of the calibration will be maximized when the concentrations of the points are close to the concentrations of the samples.
- Because Auto Dilution contributes some uncertainty to the calibration, the calibration will be most accurate if the calibration at point 2 is not done using Auto Dilution.
- It is recommended that the 5,000 ppm range and higher ranges be calibrated using at least two points.
- If you plan to use the Auto Range feature, calibration of the 50,000 ppm range is important because the preliminary measurement used to determine the appropriate analysis range is performed in this range. For best performance of the Auto Range feature, it is recommended that the 50,000 ppm range be calibrated using a six-point, point-to-point calibration ([page 97](#)). The recommended points are: Reagent Water, 100 ppm, 1,000 ppm, 5,000 ppm, 20,000 ppm and 50,000 ppm.

## Calibration with More than Two Points

When the calibration is performed with more than two points (multi-point calibration), the user has the choice of having the Analyzer calculate the calibration constants from a linear fit of the points, or from a point-to-point fit.

### *Linear Fit Multi-Point Calibration*

The advantage of selecting the linear fit is that the calibration is affected less by uncertainties in the measurement, or errors in the concentration, of any one point.

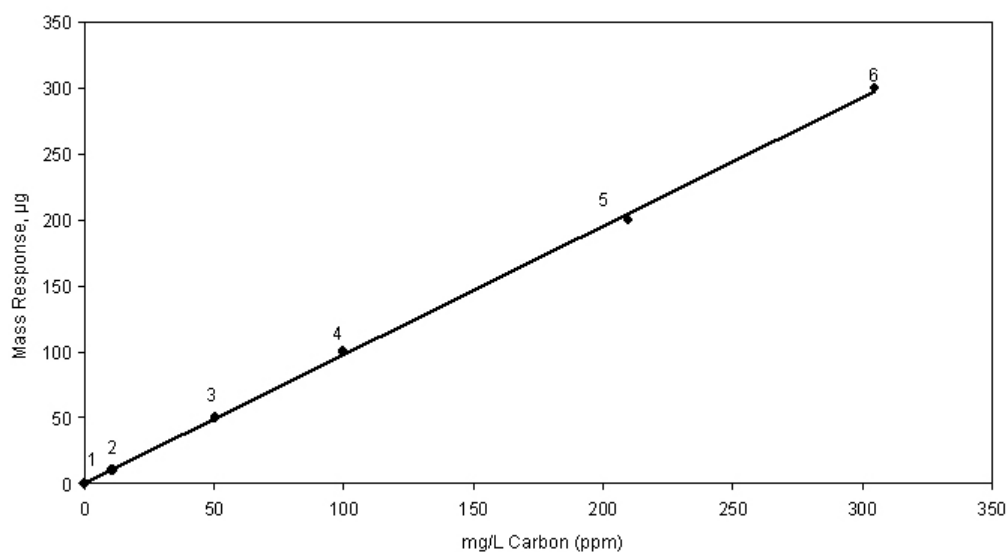
[Figure 27](#) depicts a linear fit calibration with 6 points. The point having the lowest concentration is measured first, and the points must increase in concentration at each step. Point 1 can either be reagent water or a higher, known concentration.

In either case, the Analyzer performs a linear regression to calculate the intercept,  $a$ , and slope,  $b$ , of the calibration:

$$C = a + b \cdot R$$

A correlation coefficient,  $R^2$ , is also calculated. The correlation coefficient is a statistical measure of agreement between the measured values ( $R$ ) and standard concentration ( $C$ ).





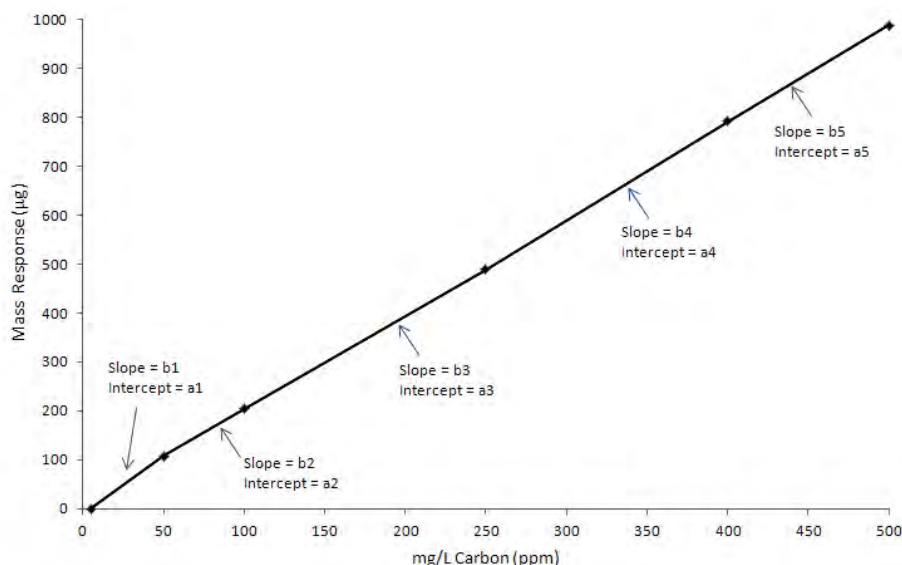
**Figure 27: Linear Fit Six-Point Calibration**

### ***Point-to-Point Multi-Point Calibration***

The advantage of selecting the point-to-point calibration is that any nonlinearity of response is compensated for during the calibration.

[Figure 28](#) depicts a point-to-point calibration with 6 points. Like the linear fit, the point having the lowest concentration is measured first, and the points must increase in concentration at each step. Point 1 can either be reagent water or a higher, known concentration.

The Analyzer calculates an intercept and slope for the line connecting each pair of points, as shown in [Figure 28](#). When this calibration is later applied to a sample, the Analyzer applies the appropriate intercept and slope, based on the mass response for that sample.



**Figure 28: Point-to-Point Calibration with Six Points**

Certain recommendations can be made about the use of multi-point calibrations:

- The concentrations of the points should extend beyond both ends of the expected concentration range of the samples. When TOC in samples will be measured, the first calibration point should be reagent water.
- The accuracy of the calibration will be maximized when the concentrations of the points are close to the concentrations of the samples.
- It is recommended that the 5,000 ppm range and higher ranges be calibrated using at least two points.
- If you plan to use the Auto Range feature, calibration of the 50,000 ppm range is important because the preliminary measurement is performed in this range. For best performance of the Auto Range feature, it is recommended that the 50,000 ppm range be calibrated using a six-point, point-to-point calibration. The recommended points are: Reagent Water, 100 ppm, 1,000 ppm, 5,000 ppm, 20,000 ppm and 50,000 ppm.

## Auto Dilution

If you are calibrating with multiple points within a range, you can use one standard and the Analyzer will dilute it for additional calibration points. For example, if you are calibrating in the *Up to 1,000 ppm* range and want to calibrate at 6 points, you could use a stock standard solution of 1,000 ppm TOC. You can use the Auto Dilution feature to dilute the standard to five additional points (such as 100, 250, 500, 625, and 750 ppm). Diluting beyond 100 ppm would exceed a

dilution ratio. of 10:1, which is not permitted. So, if you wanted to calibrate at a point below 100 ppm via Auto Dilution, you must start with a standard less than 1,000 ppm TOC.

The dilution ratio available for use in Auto Dilution is shown by range in [Table 2](#).

**Table 2: Maximum Dilution Allowed Using Auto Dilution Feature**

Range	Maximum Dilution
Up to 100 ppm	14:1
Up to 1,000 ppm	10:1
Up to 5,000 ppm	4:1
Up to 20,000 ppm	Not available
Up to 50,000 ppm	Not available

## Blank Correction

Use the Blank Correction feature if you want the Analyzer to automatically calculate the TOC contribution from the acid, oxidizer, and dilution water used with the Analyzer and exclude TOC contributions from these sources when calculating calibration values. For additional information, see [“About Blank Correction” on page 132](#).

Only calibrate the Analyzer with blank correction turned on if your samples contain less than 10 ppm TOC, IC, TC or NPOC, and you also plan to measure your unknown samples with the blank correction feature turned on. If you run a 'zero' or blank as your first point in a calibration curve, it is not recommended to use the Blank Correction feature.

In order to perform a calibration with Blank Correction on, first calibrate the Analyzer in TOC mode in the *Up to 1,000 ppm* range with Blank Correction off. Then perform the blank measurement using that calibration. See [“Measuring the Blank” on page 133](#) for the procedure.

## Calibration Groups

If you are using the Analyzer's Auto Range function, you will need to specify at least one calibration group. The calibration group tells the Analyzer which calibration to use in each range. The Analyzer can store up to 20 calibration groups.

*NOTE: All Auto Dilution ranges are available to include in a calibration group, with the exception of the Up to 100 ppm range.*

### To set up a calibration group

1. From the *Menu* screen, select **Cal/Ver**.
2. Select **Calibration Groups**.
3. Select the **New** button.
4. Specify the calibration type and calibration to use in each range.

*NOTE: The factory default values may be used; however, these values are not as accurate as the actual calibrations.*

*If you want to use a factory default calibration for one of the ranges, do NOT press the default button and try to select the calibration for that range. The Analyzer will automatically include the factory default.*

5. Press the **Save As** button.
6. Enter a name for the calibration group and then press the **Save** button.

## Preparing for Calibration

### Save System Settings

Prior to performing any calibration procedure or system protocol, save the current system settings, in the event they need to be re-loaded.

### To save the system settings

1. Select the **Maintenance** tab.
2. Press the **Advanced** button.

3. Press the **System Properties** button.
4. Make sure that the USB memory device is attached to the USB port<sup>7</sup>.
5. Press the **USB Backup** button.
  - **IMPORTANT:** The **USB Backup** function will backup the entire systems properties information; including Verification settings, Calibration settings, and System Password settings. After creating the backup, place the USB memory device in a safe, secure location.

*NOTE: If “No USB Key Recognized” message appears, select **OK** and retry before using a different USB memory device.*

## Perform Maintenance Tasks

Before calibrating the Analyzer, perform any necessary maintenance tasks. Ensure that the oxidizer reagent is fresh. If the reagent has been stored at room temperature, it is recommended that the oxidizer be less than two weeks old.

### *To perform a blank-corrected calibration*

1. Install fresh dilution water.
2. Perform a prime of the reagents and dilution water (**Maintenance** → **Prime Reagents** → **Prime All**).
3. Rinse down the Analyzer by analyzing low-TOC water until the response of the Analyzer has stabilized to 0.45 µg of C or less.
4. Perform the Blank Measurement to ensure that the blank concentrations in the Analyzer's memory accurately reflect the status of the reagents and dilution water that will be used in the calibration. See [“Measuring the Blank” on page 133](#) for additional information.

The Analyzer is now ready for calibration. Set up the calibration as described in the following section.

### *To perform a calibration that is not blank-corrected*

1. Consider installing fresh dilution water if it is more than a few days old.

---

<sup>7</sup>One external and two internal USB ports are provided for your convenience. However, you can only export data from one port at any time. The Analyzer will export to the first inserted USB memory device. While this USB memory device is inserted, the Analyzer will not recognize any additional USB memory devices inserted in other USB ports. The Analyzer can take up to 15 seconds to recognize the USB memory device.

2. Perform a prime of the reagents and dilution water (**Maintenance** → **Prime Reagents** → **Prime All**).
3. Rinse down the analyzer if it has been analyzing samples more concentrated than the first (lowest concentration) calibration point. Rinse down the Analyzer by analyzing low-TOC water until the response of the Analyzer has stabilized to 0.45 µg of C or less. Rinse down can be expedited when necessary by repeating a Prime Reagents (as described in step 2).

## Setting Up NPOC, IC, TC/TOC Calibration

You can set up multiple calibration protocols for each of the Analyzer's five dilution ranges.

### To set up a new calibration

1. Select the **Cal/Ver** tab.
2. Press the **Calibrate** button.
3. To create a new calibration, select an existing calibration type and press the **Modify** button. To help simplify the set-up process, you will see three default calibration protocols to choose from: NPOC, IC, and TC/TOC (so called because both TC and TOC are calibrated simultaneously). Select the appropriate default to modify. Certain protocol variables will be enabled or disabled depending on the type of calibration you are creating.
4. Specify the settings for the new calibration.
  - Press **Num. Points** to set the number of calibration points (1 to 6). In TC/TOC calibration mode, you will be asked to enter the number of IC points and the number of TOC points. To create a TC/TOC calibration curve, you are able to run a multi point IC curve and multi point TOC curve in one protocol. The IC number should be the number of IC points you will analyze.

*NOTE: In TC/TOC calibration mode, the user will independently set up the number of TOC points and IC points. Also, there should be a rinse vial measuring NPOC between the IC and the TOC vials; but if there are no IC vials, the rinse vial is not needed.*

- Press **Range** to specify the range for this calibration.
- Press the **Acid** and/or **Oxidizer** buttons to change the percentage of each reagent that will be added.
- Press **Auto Dilut.** to specify whether the Auto Dilution feature should be set to **On** or **Off**.
- Press **Spurge**, if applicable, to change the sparging time.

- Press **Blank Correction** to specify whether the blank correction feature should be set to **On** or **Off**. Blank correction is unavailable if reagent water is selected as the first point in a multi-point calibration.
  - Press **Cal. Type** if the number of calibration points is 3 or larger. This button allows the user to select either a **Linear** best-fit calibration curve or a point-to-point (**Pt-Pt**) calibration curve.
5. Press the **Next** button to specify the settings for the first calibration point (Point 1). The first point has to have the lowest concentration, and the concentration of each subsequent point has to be greater than the preceding points.
- If Auto Dilution is on, enter the **Standard** concentration. Enter a value with up to two decimal places, such as 1000.50.
  - Press the **Point** button to set the NPOC, TOC or IC standard concentration for the calibration point. Enter a value with up to two decimal places, such as 1.25. The type of standard is shown in gray at the bottom of the screen (e.g., NPOC Standard, IC Standard, Rinse or TOC Standard).
  - Press the **Reps** button to change the number of measurements (repetitions) the Analyzer will make for this calibration point ([Table 3](#)).
  - Press the **Rejects** button to change the number of measurements the Analyzer should exclude from its calculations. The number of rejects must be less than the number of repetitions.
  - Press the **Sample Flush** button to select from 0 to 5 sample flushes. These sample flushes will be performed before this calibration point is measured. The use of more than 2 sample flushes is not recommended with vials. The optimum number of flushes depends upon the difference between the concentration of the prior calibration point and the current point.
  - Press **Repeat Criteria** to turn this feature **On** or **Off**. Explanation of this feature can be found on [page 126](#).
6. Press the **Next** button if you specified more than one calibration point. Specify the settings indicated in step [5](#). If you have entered the settings for the last calibration point, press the **Save** button to continue (pressing the **Save As** button will allow you to define the name for the new calibration protocol).

*NOTE: In TC/TOC calibration mode, you will first enter the IC standards, a rinse vial will automatically be inserted into the protocol to mitigate concentration step changes, and then you will enter the TOC standards. The box in the lower-left corner of the screen will tell you what type of sample is expected (e.g., NPOC Standard, IC Standard, Rinse or TOC Standard).*

7. Enter a name for the new calibration protocol, and then press the **Save** button.

**Table 3: Approximate Number of Calibration Repetitions Possible.**

Mode	Range				
	100 ppm	1,000 ppm	5,000 ppm	20,000 ppm	50,000 ppm
NPOC	6	7	14	20	20
TOC	3	3	12	20	20
IC	6	7	14	20	20
TC	3	3	12	20	20

These ranges are based on a completely filled 40-mL Vial and no sample flushes. The maximum number of repetitions that can be selected is 20. Divide the number of reps shown above by 2 for TOC and TC modes.

## Calibrating the Analyzer

### To calibrate the Analyzer

1. From the *Menu*, select the **Cal/Ver** tab.
2. Press the **Calibrate** button.
3. Select a calibration protocol from the list by touching the screen. If you want to create a new calibration, follow the previous steps in [“To set up a new calibration” on page 102.](#)
4. Press the **Start Cal** button and follow the on-screen prompts. The prompts will vary depending on the settings you have specified in the selected calibration.
5. After the Analyzer has completed measurements on all standards vials, the *Calibration Summary* screen displays the following values. (Refer to [Figure 29 on page 106.](#))

- **Expected:** Indicates the expected concentration of the calibration point.

When Auto Dilution is *Off*, the expected concentration is the Certified Concentration of the standard. For reagent water, there is no expected concentration, so the entry is “N/A.”

When Auto Dilution is *On*, the Expected concentration is the concentration of the standard after dilution. For example, if a 1,000 ppm TOC standard is used in the calibration, and is diluted to calibrate the Analyzer at 100 ppm, the Expected concentration will be 100 ppm.

- **Measured:** Indicates the average measured concentration of the standard, using default calibration constants.



- **RSD:** Indicates the percent relative standard deviation of the non-rejected measurements of the standard.
  - **Adjusted:** Indicates the calculated concentration of the standard, using the new calibration constants from the calibration just completed.
  - **R2:** Indicates the correlation coefficient for the linear regression of the Measured vs. the Expected values (for a 3-6 point linear calibration only).
  - **Slope:** One or more values of calibration slope will be displayed, depending upon the type of calibration. The slope is one of the key calibration constants. See the [“Calibration and Verification Options” on page 91](#) section for a definition. The typical slope values are:
    - **NPOC mode** and **TC/TOC mode:**  $700 \pm 200$  indicates a proper response
    - **IC mode:**  $1200 \pm 350$  indicates a proper response
    - **Heated IC mode:** 900 (only applicable in IC Calibration) indicates a proper response
  - **Intercept:** The intercept is another calibration constant, and an intercept value is listed for each slope value. See [“Calibration and Verification Options”](#) section for a definition.
  - **Cancel:** Closes the results screen without saving the new calibration constants.
  - **Measurements:** Displays a screen that allows the user to edit the calibration. (See [“Editing a Calibration” on page 106.](#))
  - **Export PDF:** Permits user to export calibration results in PDF form to a USB memory device.
  - **Apply:** Saves the new calibration constants.
6. Depending on the calibration results, either press the **Apply** button to save the calibration results, press the **Measurements** button to edit the calibration (as described in the [“Editing a Calibration”](#) section), or press the **Cancel** button to discard the calibration results.
7. After the calibration is applied, the results will be saved to memory. It is strongly recommended that the calibration summary be exported and saved to a PC for future reference whenever the Analyzer is calibrated.

**NOTE:** The *Export PDF* function has been moved to the *Calibration History* screen. For information on this feature, refer to [“To review and export Calibration History” on page 112](#)

Calibrate Summary			06:57 AM Apr 14, 2020	
	Expected	Measured	RSD	Adjusted
800 ppm	800ppm	1605ppm	0.13%	800ppm
Slope		Intercept		
0.0 ppm - 800 ppm	299	0.00		

Cancel

Measurements

Apply

### Figure 29: Calibration Summary Screen

**NOTE:** The **Export PDF** button, previously located on this screen, has been moved to the Calibration History screen (Cal/Ver tab > Calibration History). For information on this feature, refer to [“Reviewing Calibration and Verification History”](#) on page 112.

## Editing a Calibration

If a calibration measurement is inaccurate (e.g., due to a bubble in the sample or oxidizer lines), it can be rejected from calibrations. Any measurement can be rejected if there are at least two 'good' calibration measurements at that calibration point following the rejection. After the inaccurate measurement is deleted, the Analyzer will calculate a new slope, intercept, measured and % RSD values for the calibration.

When the **Apply** button then is pressed, the new slope and intercept are placed in the Analyzer's memory, and are used whenever this calibration is selected. No editing can be performed after the **Apply** button has been pressed.

To *edit a calibration*, press the **Measurements**<sup>8</sup> button when the calibration is complete (see [Figure 29](#)). The column on the left of the new display shows the concentration of the standard at each calibration point. The next column displays the repetition number. The measured value for each repetition is displayed in the third column, and the fourth column displays the % Difference between the measured value and the concentration of the standard. The fifth column identifies whether or not that measurement is a reject. The **Reject/Accept** button toggles the status (Y or

<sup>8</sup>If the Calibration was a *TC/TOC Calibration*, first select the individual *Summary* to locate the **Measurements** button.

**N)** of the highlighted measurement. A calibration point must have at least two non-rejected measurements before another measurement can be rejected.

To view a plot of the calibration curve, press the **Cal. Curve** button (see [Figure 30](#)). A plot of mg/L of Carbon (ppm) vs. Mass Response ( $\mu\text{g}$ ) will be displayed on the screen. The points used are the average from each concentration. Press the **Back** button to return to *Measurements*.

To *edit the Standard* that was used for the calibration, select the **Edit Standard** button (see [Figure 30](#)). The next screen will allow you to change the value of the Standard (see [Figure 31](#)). This will allow you to adjust the Calibration results without having to redo the calibration process.

When the **Back** button is pressed from the *Measurements* screen, the *Calibration Summary* screen is shown again, with the *new* slope, *new* intercept, measured and % RSD. Remember to press the **Apply** button to save the edited calibration.

Measurements			07:53 AM Mar 9, 2020	
Standard	Rep #	Measured	% Diff	Reject
500	1	496	-0.79	N
500	2	492	-1.51	N
1000	1	993	-0.67	N
1000	2	1008	0.76	N

Edit Standard

Reject

Page Up

Page Down

Back

Cal. Curve

### Before Editing Standard

Measurements			07:55 AM Mar 9, 2020	
Standard	Rep #	Measured	% Diff	Reject
250	1	496	98.4	N
250	2	492	97.0	N
500	1	993	98.7	N
500	2	1008	102	N

Edit Standard

Reject

Page Up

Page Down

Back

Cal. Curve

### After Editing Standard

### Figure 30: Editing a Calibration

Edit Standard	07:54 AM Mar 9, 2020
Standard 500.0	
Back	

**Figure 31: Edit Standard screen**

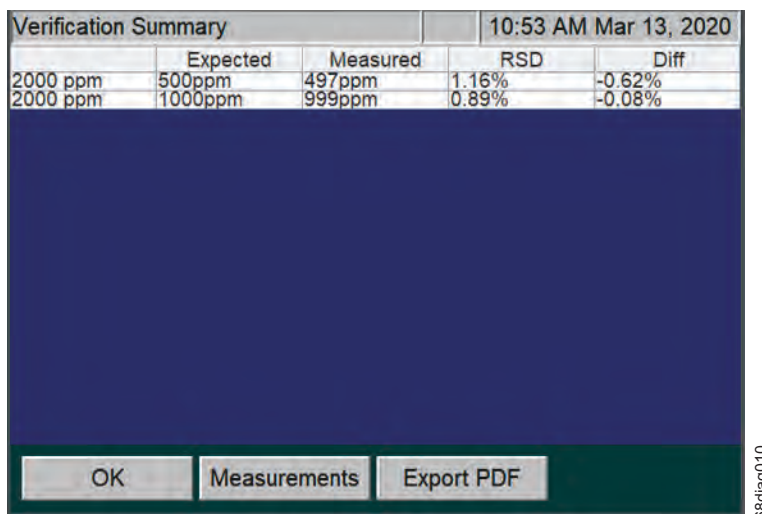
## Performing a Calibration Verification

Verification parallels the options available under calibration menu choices. Verifications may be performed in TOC, NPOC, TC, or IC analysis modes. As with calibration, you can save multiple verification protocols in each of the Analyzer's five ranges, and you can save up to 20 verification protocols in total.

For more detailed information regarding options available under verification menus, consult the relevant sections describing calibration, keeping in mind that you must press the **Verification** button rather than the **Calibrate** button in the **Cal/Ver** tab, and for each verification protocol you must specify a calibration protocol for the measurements.

*NOTE: A Warning dialog will appear if the selected Verification protocol does not have a valid calibration curve selected. If the **Continue** button is pushed, the results will be processed against a default slope and intercept. Push the **Cancel** button to stop the protocol.*

After the Verification is completed, the *Verification Summary* screen will display. To view or edit a Verification, press the **Measurements** button when the Verification is complete (see [Figure 32](#)).



Verification Summary				10:53 AM Mar 13, 2020	
	Expected	Measured	RSD	Diff	
2000 ppm	500ppm	497ppm	1.16%	-0.62%	
2000 ppm	1000ppm	999ppm	0.89%	-0.08%	

Buttons: OK, Measurements, Export PDF

**Figure 32: Verification Summary screen, before editing**

From the *Measurements* screen, the column on the left of the display shows the concentration of the standard at each calibration point. The next column displays the repetition number. The measured value for each repetition appears in the third column, and the fourth column displays the % Difference between the measured value and the concentration of the standard. The fifth column identifies whether or not that measurement is a reject. The **Reject/Accept** button toggles the status (**Y** or **N**) of the highlighted measurement.

- **Y** indicates the measurement will be *Rejected*
- **N** indicates the measurement will be *Accepted*

A verification point must have at least two non-rejected measurements before another measurement can be rejected. (see [Figure 33](#)).

Measurements				10:53 AM Mar 13, 2020
Standard	Rep #	Measured	% Diff	Reject
500	1	497	-0.55	Y
500	2	491	-1.75	N
500	3	503	0.55	N
500	4	497	-0.67	N
1000	1	997	-0.27	Y
1000	2	1009	0.90	N
1000	3	992	-0.84	N

Accept Page Up Page Down

Back

Measurements screen, before **Accept**

Measurements				10:55 AM Mar 13, 2020
Standard	Rep #	Measured	% Diff	Reject
500	1	497	-0.55	Y
500	2	491	-1.75	N
500	3	503	0.55	N
500	4	497	-0.67	N
1000	1	997	-0.27	N
1000	2	1009	0.90	N
1000	3	992	-0.84	N

Reject Page Up Page Down

Back

Measurements screen, after **Accept**

**Figure 33: Measurements screen; Accepting a measurement**

Press the **Back** button to apply the updated measurement. After the measurement is applied, the results will be saved to memory. It is strongly recommended that the *Verification Summary* be exported and saved on a PC for future reference after each verification is completed. To export verification summary data to a USB memory device, make sure a USB memory device is connected to the Analyzer's USB port. (Only one USB memory device should be inserted at a time in one of the three available USB ports). Then press **Export PDF**.

Press the **OK** button to accept the final state of the Verification results. To review the Verification history, see [“To review and export Verification History” on page 113](#).

If needed, after the Verification has been accepted, it is possible to change the Calibration that was used within the Verification process. See [“To apply a new Calibration to a Verification Summary” on page 110](#).

Verification Summary			10:57 AM Mar 13, 2020	
	Expected	Measured	RSD	Diff
2000 ppm	500ppm	499ppm	0.67%	-0.22%
2000 ppm	1000ppm	999ppm	0.73%	-0.13%

OK Measurements Export PDF

Figure 34: Verification Summary screen, after editing

Table 4 lists the approximate number of repetitions that are possible from a 40-mL vial, completely filled with the standard solution. If Auto Dilution is employed, more repetitions are possible than are shown in this table, but the maximum number of repetitions that can be selected is 20.

Table 4: Approximate Number of Verification Repetitions Possible

Mode	Range				
	100 ppm	1,000 ppm	5,000 ppm	20,000 ppm	50,000 ppm
NPOC	6	7	14	20	20
TOC	3	3	12	20	20
IC	6	7	14	20	20
TC	3	3	12	20	20

**NOTE:** This estimation is based on a completely filled 40-mL vial and no sample flushes.

### To apply a new Calibration to a Verification Summary

After the Verification has been accepted, it is possible to change the Calibration that was used within the Verification process and apply it to the Verification results.

1. From the *Menu*, select the **Cal/Ver** tab.
2. Press the **Verification History** button.
3. Select a **Verification** from the list.
4. Press the **View** button to view the *Verification Summary* screen ([Figure 35 on page 111](#)).



5. Press the **Calibration** button to see a list of available *Calibrations* ([Figure 35 on page 111](#)).

Verification Summary				05:42 PM Jul 26, 2021
	Expected	Measured	RSD	Diff
1000 ppm	1000ppm	1161ppm	0.76%	16.1%
OK				Calibration
PDF to USB				CSV to USB

68diag013

**Figure 35: Verification Summary screen; from the Verification History menu**

6. From the *Select Calibration* screen, select an available calibration from the list and press the **Select** button to apply ([see Figure 36](#)). To cancel the process, select the **Back** button.

Select Calibration		10:51 AM Apr 2, 2020
Name	Date	
IC 2pt cal autodilution	Mar 12, 2020 10:16:14	
2 PT IC CAL	Mar 09, 2020 07:48:08	
Default IC Calibration	Mar 04, 2020 08:36:36	

68diag012

**Figure 36: Select Calibration screen**

7. The Verification is then recomputed and the screen automatically changes back to the *Verification Summary* screen.

8. It is strongly recommended that the edited Verification Summary results be exported and saved on a PC for future reference. Do the following:
  - Insert a USB memory device into the USB port.
  - From the *Verification Summary* screen, select either **Export PDF** or **CSV to USB**, depending on the desired data format ([Figure 35 on page 111](#))

**NOTE:** For more information on this task, see [“To review and export Verification History” on page 113](#).

## Reviewing Calibration and Verification History

The Analyzer stores a history of calibrations (up to 40 calibrations) and a history of verifications data (up to 41 verifications). It is recommended to export the Calibration and Verification history after performing these tasks.

### To review and export Calibration History

1. From the *Menu*, select the **Cal/Ver** tab.
2. To display a list of calibrations stored on the Analyzer, press the **Calibration History** button.
3. To export **all** of the calibrations on the list, press the **Export All** button. Then press the button that corresponds to the desired data format (CSV or PDF). To export verification summary data to an USB memory device, make sure a USB memory device is connected to the Analyzer's USB port. (Only one USB memory device should be inserted at a time in one of the three available USB ports). Then press the desired export format button.

**NOTE:** To export calibration summary data to Ethernet, first set up a PC to collect data using a data acquisition program such as PuTTY, HyperTerminal, and Tera Term from the Ethernet port on the Analyzer. Set the port number to 10802 to access the exported file, and capture the file under file name you select. Then, press the **Cal. CSV to Ethernet** button.

---

**NOTE:** If the printer is set up, printing of the **Cal/Ver** history is also available.

4. To review or export an individual *Calibration Summary* (which is recommended after performing a Calibration of the Analyzer), select a calibration to view by scrolling up or



down the list to highlight a selection, and then press the **View** button. A summary of the selected calibration appears.

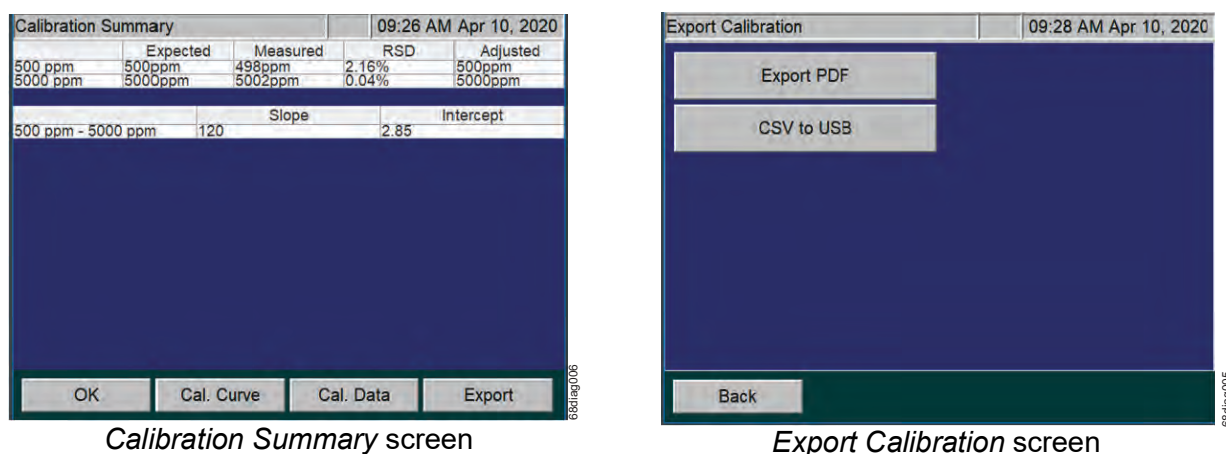
**NOTE:** If the selected Calibration is a TC/TOC Calibration, the next screen will allow you to **Export PDF** or export to **CSV to USB**. Selecting the individual summary button will allow you to review the **Cal. Curve** and **Cal. Data**.

5. Use the **Cal. Curve** button and the **Cal. Data** button to review the *Calibration Summary* data ([see Figure 37](#)).
6. To export the calibration summary, select the **Export** button to open the *Export Calibration* screen ([see Figure 37](#)).
7. Select either **Export PDF** or **CSV to USB**, depending on the desired data format ([see Figure 37](#)).

**NOTE:** If you select the **CSV to USB** button a progress screen will appear and close after the export operation has completed.

**NOTE:** If the printer is set up, printing of the **Cal/Ver** history is also available.

*NOTE:* To import the data into a spreadsheet, see ["Appendix C: Importing Analyzer Data into a Spreadsheet."](#)



**Figure 37: Export Calibration screens**

### To review and export Verification History

1. From the *Menu*, select the **Cal/Ver** tab.
2. To display a list of verifications stored on the Analyzer, press the **Verification History** button.

3. To export **all** of the verifications on the list, press the **Export All** button. Then press the button that corresponds to the desired data format (CSV or PDF). To export verification summary data to an USB memory device, make sure a USB memory device is connected to the Analyzer's USB port. (Only one USB memory device should be inserted at a time in one of the three available USB ports). Then press the desired export format button.

**NOTE:** To export verification summary data to Ethernet, first set up a PC to collect data using a data acquisition program such as PuTTY, HyperTerminal, and Tera Term from the Ethernet port on the Analyzer. Set the port number to 10802 to access the exported file, and capture the file under file name you select. Then, press the **Cal. CSV to Ethernet** button.

**NOTE:** If the printer is set up, printing of the **Cal/Ver** history is also available.

4. To export an individual *Verification Summary* (which is recommended after performing a Verification of the Analyzer), select a verification to view by scrolling up or down the list to highlight a selection, and then press the **View** button. A summary of the selected verification appears.
5. To export the calibration summary, select either the PDF to USB button or the CSV to USB button, depending on the desired data format..

**NOTE:** If you select the **CSV to USB** button a progress screen will appear and close after the export operation has completed.

**NOTE:** If the printer is set up, printing of the **CalVer** history is also available.

**NOTE:** To import the data into a spreadsheet, see ["Appendix C: Importing Analyzer Data into a Spreadsheet."](#)

Verification Summary		05:42 PM Jul 26, 2021	
	Expected	Measured	RSD
1000 ppm	1000ppm	1161ppm	0.76%
			16.1%

OK

Calibration

PDF to USB

CSV to USB

**Figure 38: Verification Summary screen; export options**

## Chapter 7. Basic Analyzer Operation

### Overview

The Sievers InnovOx ES Laboratory TOC Analyzer utilize a touch-sensitive color LCD for all menu selection activities. Not all menu options may be relevant or available on your Analyzer.

### The Main Screen

When the Analyzer is first powered on, the Analyzer begins initialization to prepare for making measurements. A startup screen appears with basic Veolia contact information and the firmware version number. Press the **Main** button to display the *Main* screen.

The *Main* screen provides the most important status and activity information for the Analyzer and offers you two primary options:

- Press the **Menu** button to display the *Menu* screen and change the Analyzer's settings.
- Press the **Start Analysis** button to initiate measurements with the most current Analyzer settings. Once analysis begins, the button changes to **Stop Analysis**.
- In **Grab** mode, press the **Peaks** or **Data** button to toggle the display between a graphical view of the CO<sub>2</sub> peaks and a tabular view of measurement results.

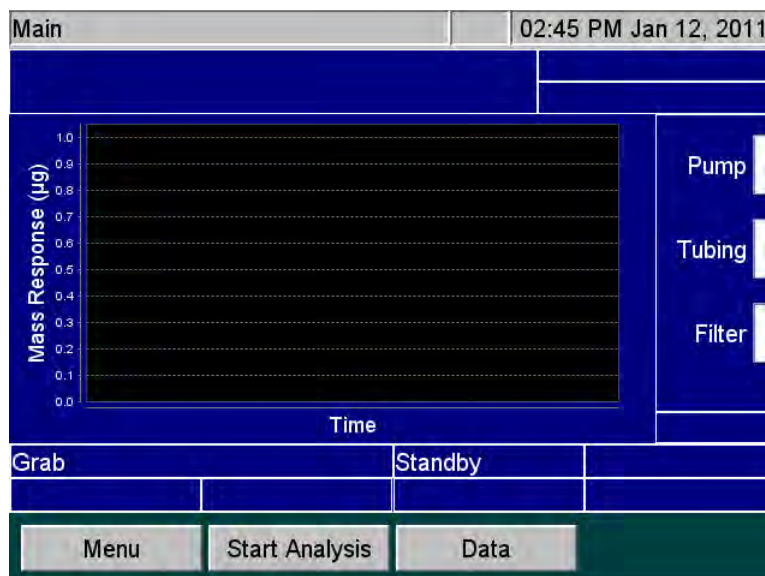


Figure 39: The Main Screen (in Grab mode)

## The Menu Screen

The *Menu* screen ([Figure 40](#)) provides you with access to all Analyzer settings and configuration options. The *Menu* screen displays five tabs that provide access to the main configuration areas.

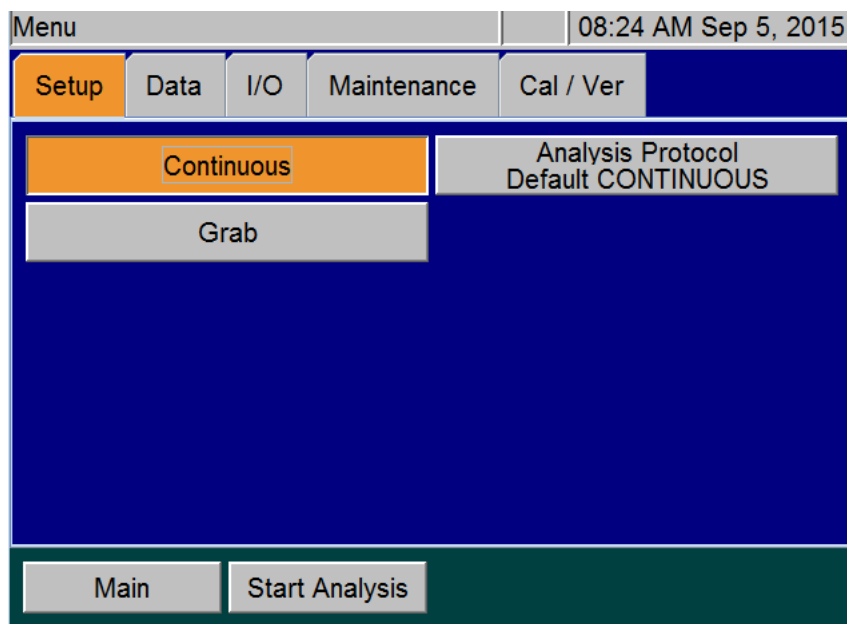


Figure 40: The Menu Screen

Select an appropriate tab to display its available options:

- **Setup** — Set the Analyzer mode and specify analysis parameters. (The buttons for the basic modes of operation (Continuous and Grab) are described in more detail in the following [“The Setup tab”](#) section.)
- **Data** — Display, print and export historical data stored in RAM. (Information for using this tab is described in [“The Data tab” on page 134.](#))
- **I/O** — Configure the Analyzer’s input and output interfaces. (Information for using this tab is described in [“The I/O tab” on page 139.](#))
- **Maintenance** — Configure the Analyzer Advanced settings, run diagnostics, get system information, shut down the Analyzer, implement Conversion Factors, retrieve error messages, and perform other maintenance tasks (Information for using this tab is described in [“The Maintenance tab” on page 148.](#))
  - For more information related to Maintenance tasks, see [Chapter 9, “Maintenance”](#).
- **Cal / Ver**— Calibrate the Analyzer and perform calibration verification. Also, view past calibration and verification data. (Refer to [Chapter 6, “Calibration and Verification”](#) for more information.)

You can also press the **Start Analysis** button, located on the lower portion of the screen, to initiate measurements. This button is also visible from any other tab.

## *The Setup tab*

### Setting Up Analysis Protocols

The Analyzer can store up to 100 analysis protocols.

#### *To set up a new protocol*

1. Select the **Setup** tab.
2. Press either the **Continuous** or **Grab** button.
3. Select **Continuous** if you wish to measure a sample, such as a process stream, that will change its concentration over time. The Analyzer will make measurements on that sample until you press Stop Analysis.

Select **Grab** when you wish to measure a specific sample in a vial, flask, or other container. If you select **Grab**, the Analyzer will make as many measurements you select (up to 20 measurements)

on that sample, and it will then calculate the average of those measurements. The precision (Relative Standard Deviation) of the measurements also will be reported.

Most measurements using the Sievers InnovOx ES Laboratory TOC Analyzer will be made in the **Grab** mode, so it is described first. Refer to ["Appendix B: Acronyms and Definitions"](#) for definitions of the terms used in the following section.

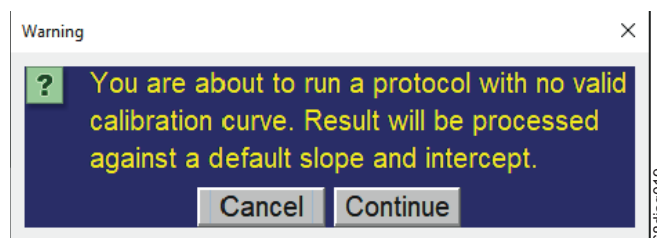
## Specifying Grab Mode Settings

To specify settings for Grab Mode analysis, follow these steps:

1. Press the **Grab** button if it is not already highlighted.
2. Press the **Analysis Protocol** button.
3. To create a analysis protocol, select an existing protocol by touching the protocol name with your finger. When the desired protocol is highlighted, press the **Modify** button.
4. Press the **Measure** button to specify which value to measure: IC, NPOC, TC, or TOC.
5. Press the **Range** button to specify which of the five ranges encompasses the sample, or select **Auto** to have the Analyzer use the Auto Range function (as described in step [13](#)).
6. Press the **Acid** and **Oxidizer** buttons to specify the percent of each reagent to use in the protocol.
7. Press the **Reps** button to change the default setting for the number of measurements (repetitions) the Analyzer will make for this sample. (See [Table 5 on page 121](#).) If **Repeat Criteria** is ON, then this field will be grayed out and uneditable.
8. Press the **Rejects** button to change the default setting for the number of measurements the Analyzer should exclude from its calculations. The number of rejects must be less than the number of repetitions. If **Repeat Criteria** is ON, then this field will be grayed out and uneditable.
9. For **Grab Sample Analysis**, press **Repeat Criteria** to allow the Analyzer to follow configurable logic to determine the number of repetitions to run. If **ON** is selected, you will be able set the maximum number and minimum number of repetitions for the vial. The number of reps will be determined by the Analyzer depending on what you enter for the RSD criteria. If you enter 7 Max Reps and 2 Min Reps, the Analyzer will run at least two repetitions and compare the calculated RSD to the RSD criteria entered. If the calculated RSD is less than the RSD criteria, the Analyzer will stop analysis on the vial and move to the next step in the protocol. If the calculated RSD is higher than the RSD criteria, the Analyzer will run one more repetition and recalculate the RSD. The number of reps used to calculate the RSD will be the Min Reps value in consecutive order. If the Analyzer continues to not satisfy the RSD criteria, it will move to the next step in the protocol after the Max Reps number is realized and list the final value in the report.

10. Press the **Flush** button if you want to include 1 to 5 sample flushes and/or a dilution water flush in the protocol. This flush occurs prior to the first measurement.
11. Press the **Conversion Factor** button to apply a configurable factor to the final result. You can configure up to five unit factors with unique alphanumeric units in the **Maintenance** tab → **Conversion Factors** ([See “Configuring Conversion Factors” on page 127](#)).
12. Press **Advanced Setup** to access **Blank Correction**, **Manual Dilution**, and **Spurge** settings. **Blank Correction** can be set for **On** or **Off**. **Manual Dilution** is used to specify if you have diluted the sample. The default setting of 1.0 means that the sample was not diluted manually. The final result will be reported as full strength. The **Spurge** default setting of 0.8 Min has been determined to be a sufficient spurge time for most sample matrices (with the exception of the Up to 100 ppm range, which has a default setting of 2 min.) and is only available in NPOC mode.
13. Press the **Calibration** button to specify which calibration should be used in this protocol. You can only select calibrations for the appropriate range and analysis mode, as specified in the **Measure** and **Range** buttons.

**NOTE:** A **Warning** will be displayed when initiating Analysis if the Calibration setting is using a “Factory Default” calibration.



**Figure 41: Warning; No valid calibration curve**

If you specified the Auto Range function via the **Range** button, then this option will allow you to specify the **Calibration Group** to use with the protocol. For more information, see [“Calibration Groups” on page 100](#).

14. Press the **Save** button to overwrite the modified protocol or press the **Save As** button to save as a unique name.
15. If the **Save As** button is selected, you will be prompted to enter a new name.
16. The new protocol appears in the list. Select the protocol. You can confirm the correct protocol is selected by confirming the protocol is listed on the **Analysis Protocol** button. ([See Figure 40 on page 116](#).)

Default GRAB		02:44 PM Mar 20, 2022
Measure NPOC	Range (ppm) Up To 1,000	
Acid 5.0 %	Oxidizer 15.0 %	
Reps 4	Rejects 1	
Repeat Criteria Off	Flush Off	
Conversion Factor None	Advanced Setup	
Calibration Factory Default		
Back	Save	Save As

68diag029

**Figure 42: Specifying Settings for Measurements in Grab Mode**

The following [Table 5](#) lists the approximate number of repetitions that can be performed with the Analyzer when the vial port is used to analyze samples in 40-mL vials. It is recommended that you completely fill the vial to maximize the number of repetitions.

The number of repetitions shown for Auto Range refers to when the sample is less than 1,000 ppm, and the instrument selects the 1,000-ppm range. If a higher range is selected, more repetitions can be made. The maximum number of repetitions that can be selected is 20.

**NOTE:** *As an example, the following table lists the approximate number of repetitions possible using the Sievers Autosampler when using 40-mL vials. The possible number of repetitions varies according to the size of the vials used in the protocol.*



**Table 5: Vial Port - Repetitions Possible**

<b>Vial Port: Approximate Number of Repetitions Possible using Completely Filled 40-mL Vials<sup>a</sup></b>					
<b>Mode</b>	<b>Flushes</b>				
	<b>None</b>	<b>1 Sample</b>	<b>2 Sample</b>	<b>3 Sample</b>	<b>Dilution Water</b>
<b>Auto Range</b>					
NPOC	7	6	5	3	7
TOC	3	2	1	0	3
IC	7	6	3	1	7
TC	3	2	1	0	3
<b>100 ppm Range</b>					
NPOC	6	5	4	2	6
TOC	3	2	1	0	3
IC	6	5	3	1	6
TC	3	2	1	0	3
<b>1,000 ppm Range</b>					
NPOC	7	6	5	3	7
TOC	3	2	1	0	3
IC	7	6	4	2	7
TC	3	2	1	0	3
<b>5,000 ppm Range</b>					
NPOC	14	13	12	10	14
TOC	12	11	10	5	12
IC	14	13	11	9	14
TC	12	11	10	9	12
<b>20,000 ppm Range</b>					
NPOC	20	20	20	20	20
TOC	20	20	20	20	20
IC	20	20	20	20	20
TC	20	20	20	20	20
<b>50,000 ppm Range</b>					
NPOC	20	20	20	20	20
TOC	20	20	20	20	20
IC	20	20	20	20	20
TC	20	20	20	20	20

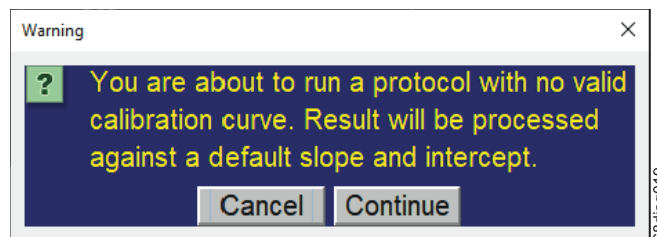
- a. For 35 mL tubes, use one (1) less repetition than listed. For 60 mL vials, use two (2) more repetitions than listed. The maximum number of repetitions that can be selected is 20.

## Specifying Continuous Mode Settings

To specify settings for Continuous Mode analysis, follow these steps:

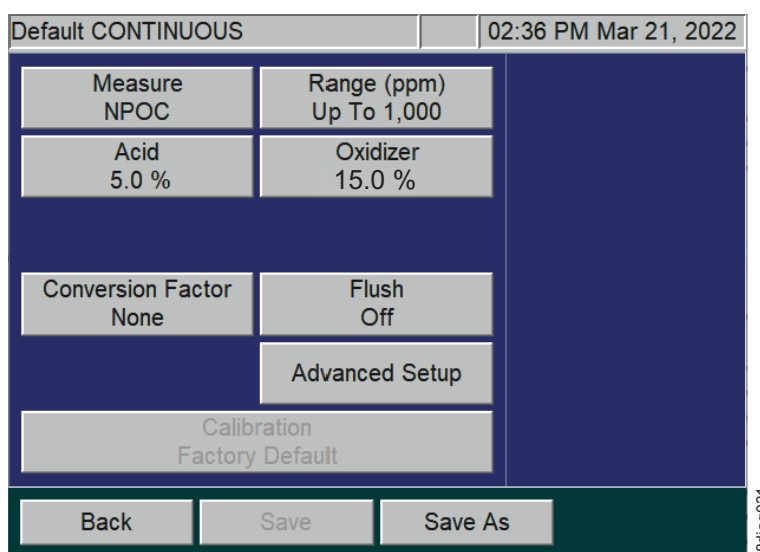
1. Press the **Continuous** button under the **Setup** tab if not already highlighted.
2. Press the **Analysis Protocol** button.
3. To create a analysis protocol, select an existing profile and press the **Modify** button.
4. Press the **Measure** button to specify which value to measure: IC, NPOC, TC, or TOC.
5. Press the **Range** button to specify which of the five ranges encompasses the sample, or select **Auto** to have the Analyzer use the Auto Range function (as described in [“Auto Range” on page 125](#)).
6. Press the **Acid** and **Oxidizer** buttons to specify the percent of each reagent to use in the protocol.
7. Press the **Flush** button if you want to include 1 to 5 sample flushes and/or a dilution water flush in the protocol. This flush occurs prior to the first measurement and then after every 20 measurements during analysis.
8. Press the **Conversion Factor** button to apply a configurable factor to the final result. You can configure up to five unit factors with unique alphanumeric units in the **Maintenance** tab → **Conversion Factors**. (See [“Configuring Conversion Factors” on page 127](#).)
9. Press **Advanced Setup** to access **Blank Correction**, **Manual Dilution**, and **Sparge** settings. **Blank Correction** can be set for **On** or **Off**. **Manual Dilution** is used to specify if you have diluted the sample. The default setting of 1.0 means that the sample was not diluted manually. The final result will be reported as full strength. The **Sparge** default setting of 0.8 Min has been determined to be a sufficient sparge time for most sample matrices (with the exception of the *Up to 100 ppm range*, which has a default setting of 2 min.) and is only available for NPOC mode.
10. Press the **Calibration** button to specify which calibration profile should be used in this protocol. You can only select calibrations for the appropriate range and analysis mode, as specified in the **Measure** and the **Range** button.

**NOTE:** A **Warning** will be displayed when initiating Analysis if the Calibration setting is using a “Factory Default” calibration.



**Figure 43: Warning; No valid calibration curve**

If you specified the Auto Range function via the **Range** button, then this option will allow you to specify the **Calibration Group** to use with the protocol. For more information, see [“Calibration Groups” on page 100](#).



**Figure 44: Specifying Settings for Measurements in Continuous Mode**

## Measure

The Analyzer allows you to make NPOC, TOC, TC, and IC measurements. NPOC is measured by adding sample, Acid, Oxidizer, and Dilution Water (if required) to the sparger. The solution is mixed, and any IC in the solution is converted to CO<sub>2</sub> by the acid. Then, CO<sub>2</sub>-free gas is bubbled through it to remove that CO<sub>2</sub>. A portion of the sparged solution is then introduced into the Reactor, where the organics in the solution are oxidized to CO<sub>2</sub> and are subsequently measured in the NDIR.

When TC or IC is measured, acid is added to the sample for each of these measurements, but oxidizer is not added when IC is measured. The sample, reagents, and dilution water are mixed, but the solution is not sparged so that it retains as much IC as possible. However, some IC is lost from the solution because it has been acidified. The amount of IC lost is dependent upon the amount of acid added and the nature of the sample.

TOC measurements are made by measuring both TC and IC on the sample, and calculating the TOC by difference ( $\text{TOC} = \text{TC} - \text{IC}$ ). In order for the TOC measurement to be as accurate as possible, the solution is introduced into the sparger prior to loading the Reactor.

It is recommended that TOC be measured whenever the sample may contain significant concentrations of volatile organic compounds that would be lost from the solution if NPOC were measured.

## Range

The Analyzer has five ranges (as shown in Table 6). Select the range that best matches the most likely TOC levels in the current sample. A range can be used for a sample that has a concentration less than the range listed in the table. For example, the 5,000 ppm range could be selected for a sample that is expected to contain 85 ppm of TOC.

However, it is important not to exceed the upper limit in each range. (In this example, a sample thought to contain more than 5,000 ppm must not be analyzed in the 5,000 ppm range. One of the two higher ranges must be selected.) If a sample having too high a concentration is analyzed, the organics may not be completely oxidized, and the reactor may become fouled with partially oxidized organic material. At best, the Analyzer will require a significant time to rinse that material out of the reactor and high-pressure valves. At worst, the reactor may require disassembly and cleaning.

If you do not know the approximate TOC level in your sample, then you can use the Auto Range function, described below.

**Table 6: Analyzer Ranges with Default Reagent Settings**

Range	Sample Volume (mL)	Acid Volume (mL)	Oxidizer Volume (mL)	Dilution Water Volume (mL)
<i>The following ranges for the Sievers InnovOx ES Laboratory TOC Analyzer are based the default reagent settings of 5% acid and 15% oxidizer, with the exception of the Up to 100 ppm range, which is based on 5% acid and 5% oxidizer.</i>				
Up to 100 ppm	2.82	0.20	0.20	0.78
Up to 1,000 ppm	2.00	0.20	0.60	1.20
Up to 5,000 ppm	0.80	0.20	0.60	2.40
Up to 20,000 ppm	0.20	0.20	0.60	3.00

**Table 6: Analyzer Ranges with Default Reagent Settings (Continued)**

Range	Sample Volume (mL)	Acid Volume (mL)	Oxidizer Volume (mL)	Dilution Water Volume (mL)
Up to 50,000 ppm	0.08	0.20	0.60	3.12

## Auto Range

Use the Auto Range setting to let the Analyzer determine the best range for the current sample. The Analyzer makes a preliminary measurement to determine the best range match, then enters normal analysis mode.

If you are using the Analyzer's Auto Range function, you will need to specify a calibration group to use with the protocol. For more information, see ["Calibration Groups" on page 100](#).

## Acid

The solution must be acidified to a  $\text{pH} \leq 2$  to convert IC to  $\text{CO}_2$  and to ensure that  $\text{CO}_2$  produced in the Reactor is properly expelled from the Gas-Liquid Separator. Since the concentration of the acid reagent is 3 to 6 M, a setting of 5% is adequate for most samples. However, if the sample is highly basic or contains a large concentration of pH buffers, increase the acid percentage appropriately. To determine the correct setting for those kinds of samples, increase the acid percentage until further increases do not result in higher measured values.

## Oxidizer

For most samples, an oxidizer percentage of 15% results in accurate measurements regardless of the range. However, there are samples that benefit from lower or higher settings. If the sample is known to contain less than about 1 ppm of NPOC or TOC, then the oxidizer can be set to a lower percentage. It can be set to 0% if the sample is saturated with dissolved oxygen from exposure to the air. The dissolved oxygen usually is sufficient as an oxidizer, and the precision of the measurements may be better than when the oxidizer setting is left at 15%.

Samples that contain large concentrations of oxidizable inorganic species require the oxidizer setting to be greater than 15%. For example, high concentrations of organics in saturated sodium chloride brines have been found to require oxidizer percentages as high as 30% or more. For best shelf life, the oxidizer should be kept out of sunlight and maintained at 15 - 25 °C. For more information, see ["Oxidizer considerations" on page 268](#). Reference the following as needed: ["Step 11: Perform a Test Analysis" on page 75](#).

## Repetitions

Set the number of repetitions to the number of measurements you desire to make on a Grab sample. The maximum number of repetitions is 20.

## Rejects

You may opt to have the first few measurements on a Grab sample to be omitted from calculation of the average concentration and RSD. This is the number of rejects, and it must be set to at least one measurement less than the selected number of repetitions.

## Repeat Criteria

Use **Repeat Criteria** to allow the analyzer to follow configurable logic to determine the number of repetitions to run. If selected to **ON**, you will be able set the maximum number and minimum number of repetitions for the vial. The number of reps will be determined by the Analyzer depending on what you enter for the RSD criteria. If you enter 7 Max Reps and 2 Min Reps, the analyzer will run at least two repetitions and compare the calculated RSD to the RSD criteria entered. If the calculated RSD is less than the RSD criteria, the analyzer will stop analysis on the vial and move to the next step in the protocol. If the calculated RSD is higher than the RSD criteria, the analyzer will run one more repetition and recalculate the RSD. The number of reps used to calculate the RSD will be the Min Reps value in consecutive order. If the analyzer continues to not satisfy the RSD criteria, it will move to the next step in the protocol after the Max Reps number is realized and report the final value in the report.

## Spurge

The duration of the sparging during the NPOC measurements is set. Because of the high efficiency of the Sparging Chamber, a spurge time as short as 0.8 min. often is sufficient for all ranges, except the *Up to 100 ppm* range, which has a spurge time of 2 min. The minimum spurge time for all ranges is 0 min. in NPOC mode. However, the composition of the sample can affect this. The Sparging Chamber may also become contaminated during use, requiring longer spurge times. Therefore, the spurge can be set up to a maximum of 30 min.

## Flush

The Analyzer can be set to perform two different types of flushes prior to a measurement of a Grab sample. If the sample contains large concentrations of particulates or salts, it is advisable to select a **Dilution Water Flush**. If you select **Dilution Water Flush**, the Analyzer flushes out the Reactor and the high-pressure valves with dilution water before the sample is measured. This flush removes any salt or particulates from previous measurements.

The second type of flush is the **Sample Flush**. Select one to five Sample Flushes if the sample to be measured is thought to be a much different concentration than the previous sample. During a Sample Flush, the Analyzer prepares the sample, acid, oxidizer, and dilution water, in the same proportions that will be used in the subsequent sample measurement. This mixture is then used to rinse out the sparger and down-stream tubing. The Dilution Water and Sample Flush(es) may both be run with the Dilution Water Flush first, followed by the Sample Flush(es).

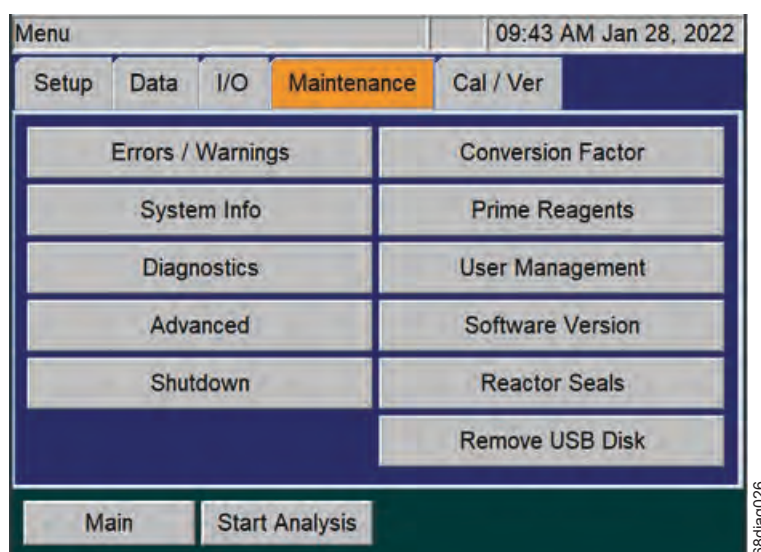
## Manual Dilution

Some users prefer to dilute the sample manually before it is introduced into the Analyzer. If that has been done, enter the dilution ratio used (as Dilution Water Volume/Sample Volume) for the manual dilution, and the Analyzer will report the undiluted concentration of the sample.

## Configuring Conversion Factors

Configure up to five conversion factors that can be applied to the Analyzer's results by using the Conversion Factor feature (**Maintenance** tab → **Conversion Factor**) shown in [Figure 45](#).

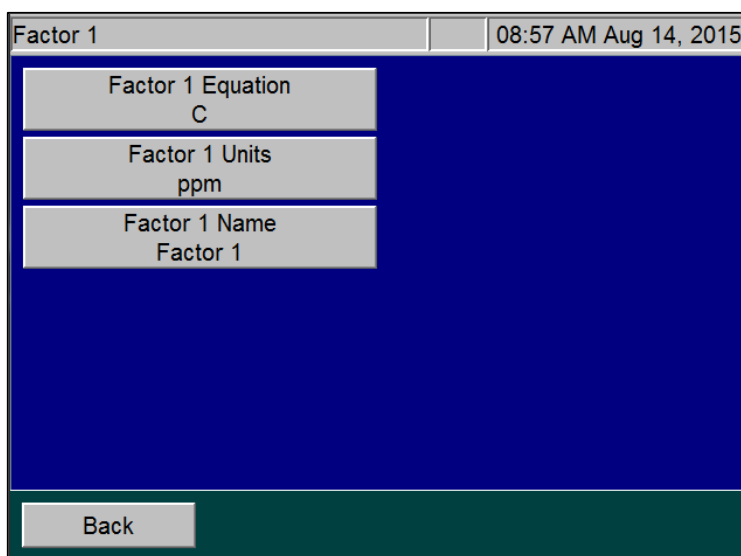
**NOTE:** When the *User Management* feature is enabled, this configuration setup requires the login of an Administrator-level user. For additional information, refer to [“User Management” on page 131](#).



**Figure 45: The Maintenance Tab**

1. When the *User Management* feature is enabled, first log in to the Analyzer with the Administrator ID and password. Otherwise, if the User Management feature is disabled, continue to the next step.

2. Select the **Maintenance** tab and press the **Conversion Factor** button ([Figure 45](#)) to access the five available conversion factors (**Factor 1**, **Factor 2**, **Factor 3**, **Factor 4**, and **Factor 5**).
3. Press the **Factor 1** button (or other **Factor** button to configure that factor). The Factor screen appears with configurable **Factor Equation**, **Factor Units** and **Factor Name** buttons ([Figure 46](#)).



**Figure 46: Configuring a Conversion Factor**

4. To set up a Conversion Factor equation, press the **Factor Equation** button and use the keypad to enter the equation. Use the letter “C” in the equation to represent the raw value produced by the Analyzer. (It can be *TOC*, *TC*, *IC*, or *NPOC* depending on what mode the analyzer is set up to run when the conversion factor is used.)



Equation 10:27 AM Aug 14, 2015

23.7+(1.68\*C) <<<

7 8 9 + - \* /

4 5 6 C ( )

1 2 3

0 .

COD Example:  
49.2 + (3.0 \* C)  
Where C = TOC, TC, IC, or NPOC

Back Save

Figure 47: Configuring the Factor Equation

5. Press the **Save** button to save the equation and return to the *Factor* screen.
6. Press the **Factor Units** button and use the alpha/numeric keypad to type the units identifier (up to 10 alpha/numeric characters), such as *MG PER L* ([Figure 48](#)).

Factor Units 10:30 AM Aug 14, 2015

MG PER L <<<

1 2 3 4 5 6 7 8 9 0

Q W E R T Y U I O P

A S D F G H J K L -

Z X C V B N M \_ .

Back Save

Figure 48: Configuring the Factor Units

7. Press the **Save** button to save the units and return to the *Factor* screen.

8. Press the **Factor Name** button and use the alpha/numeric keypad to type a name for the conversion factor ([Figure 49](#)).



**Figure 49: Configuring the Factor Name**

9. Press the **Save** button to save the conversion factor name and return to the *Factor* screen.
10. Press the **Back** button to access the other available conversion factors.
11. Repeat steps [3](#) through [10](#) for each conversion factor to configure when setting up Continuous or Grab measurements.

Each configured conversion factor now appears when setting up Stream measurements or Grab measurements ([Figure 50](#)), as described earlier in this chapter. To apply a conversation factor, press its button from this screen.

Default GRAB		02:56 PM Mar 20, 2022	
Measure NPOC	Range (ppm) Up To 1,000	None	
Acid 5.0 %	Oxidizer 15.0 %	Factor 1	
Reps 4	Rejects 1	Factor 2	
Repeat Criteria Off	Flush Off	Factor 3	
Conversion Factor None	Advanced Setup	Factor 4	
Calibration Factory Default		Factor 5	
Back	Save	Save As	

Figure 50: Using a Conversion Factor

**NOTE:** If a conversion factor equation is changed, the new equation does not change any previously converted values in historical reports. However, the new **Factor Units** and **Factor Name** will display next to each legacy value. Therefore, we recommend using a different conversion factor slot (Factor 1, Factor 2, Factor 3, Factor 4, and Factor 5) when configuring different equations.

## User Management

You can enable or disable a User Management feature on the Analyzer. This feature allows you to configure one Administrative User (Admin) and up to three unique Users. The Admin will have access to all features throughout the firmware. The User will only have access to start, stop, obtain result reports, view protocols, and certain **Maintenance** tab options, such as **Prime Reagents** and **Diagnostics**.

1. Select the **Maintenance** tab.
2. Press the **User Management** button.
3. Press the **User Management Enabled/Disabled** button and select desired setting.
4. If **Enabled**, you will be able to press the **Admin** button.
5. Select **User Name** to enter a unique user ID and then select **Enter**.
6. Select **Password** to enter a unique user password and then select **Enter**.
7. Repeat steps 5 and 6 to customize Users 1 through 3.

8. Write down your passwords and store them in a safe place for future reference.

**NOTE:** *If you have forgotten your password, you will need to contact Technical Support or your local service provider to help unlock your Analyzer with the key code that is displayed on the Login screen.*

## About Blank Correction

The reagents and dilution water contain organic contaminants that are included in the TOC and NPOC measurements. Those contaminants make a significant contribution to the TOC and NPOC measurements when the samples contain less than about 10 ppm of TOC or NPOC. For the greatest accuracy, the TOC or NPOC measurements should be corrected for those contaminants (the “blank”).

There are two ways of making this correction. If all of the samples are to be measured using the same Acid and Oxidizer settings, and the same Range, then the simplest way is to calibrate the Analyzer using Reagent Water as the first calibration point. The water must be low-TOC (less than 0.1 ppm), reagent-grade water. Selecting Reagent Water as the first point in a calibration automatically adjusts the calibration to correct subsequent measurements for the TOC in the reagents and dilution water. For that reason, the automated Blank Correction feature (described below) is inactivated.

If the samples will be analyzed with different Acid and Oxidizer settings, or with different ranges, then you may want to use the automated Blank Correction feature. Its advantage is that it measures the individual organic carbon concentrations in the acid, oxidizer, and dilution water. Therefore, the Analyzer can calculate the carbon contributions made by the Acid, Oxidizer, and Dilution Water even when the analysis settings change.

The Analyzer must be rinsed down before starting either procedure. To rinse down the Analyzer, analyze low-TOC water until the response of the Analyzer has been stabilized to 0.45 µg of C or less.

Blank Correction is intended to be used only with samples that are <10 ppm TOC.

The automated Blank Correction feature can only be used after the Analyzer has been calibrated in TOC mode. If you want to use the automated Blank Correction at initial installation, perform a TOC mode calibration with Blank Correction set to Off. Measure the Blank using that calibration. (See the following section for details). After the blank is measured, you can then perform analyses with Blank Correction set to On. Consult [Chapter 6, "Calibration and Verification"](#) for additional information.

## Measuring the Blank

The Analyzer can measure the carbon concentrations in the acid, oxidizer, and dilution water, and subsequently blank-correct results. During a blank measurement, the Analyzer flushes the reagents and dilution water, and then measures the TC and IC in the acid, oxidizer, and dilution water. From those measurements, the Analyzer calculates the TOC concentrations in the Acid, Oxidizer, and Dilution Water.

### *To measure the blank*

1. Ensure that the Analyzer is rinsed down.
2. Select the **Cal/Ver** tab.
3. Press the **Blank** button.
4. Press the **Calibration** button to select the TOC mode calibration to use when measuring the blank. If you do not specify a calibration, the Analyzer will use the default TOC calibration for the 1,000 ppm range. Use the **Next** and **Prev** buttons to highlight a calibration and then press the **Select** button.
5. Press the **Start Blank** button to begin measuring the blank.
6. When the analysis is complete, the Analyzer displays a results screen that lists the measured TC, IC and TOC concentrations of dilution water, acid, and oxidizer.
7. To save the measured blank values, press the **Apply** button.

## The Data tab

### Viewing and Exporting Data

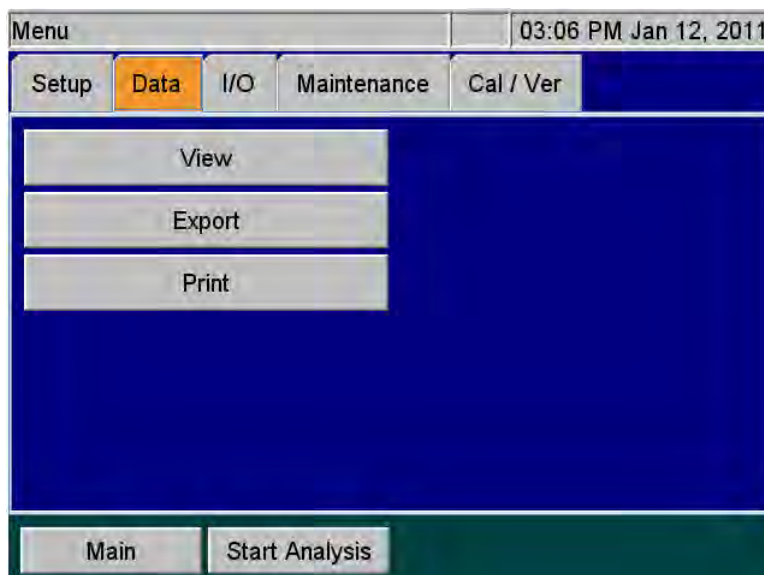


Figure 51: The Data Screen

You can review the data history on the Analyzer screen, export the data to a USB memory device, and/or print the data.

### Viewing Data On Screen

#### *To view data history on the Analyzer screen*

1. Select the **Data** tab.
2. Press the **View** button.

View		03:28 PM Jan 12, 2011	
Jan 12, 2011	Sample Name	Measurement	Units/Mode
14:57:24	Continuous	891	ppm NPOC
14:56:48	Continuous	897	ppm NPOC
14:56:12	Continuous	898	ppm NPOC
14:55:35	Continuous	908	ppm NPOC
14:54:59	Continuous	906	ppm NPOC
14:54:23	Continuous	894	ppm NPOC
14:53:47	Continuous	895	ppm NPOC
14:51:51	Sample	902	ppm NPOC
14:51:14	Sample	905	ppm NPOC

Back Result Details Page Up Page Down Go To

Figure 52: Data View Screen

- Touch the screen or use the **Page Up/Page Down** buttons to move through the list of sampling data that appears. To view data starting at a specific date, press the **Go To** button and use the date buttons to specify the starting date.
- Select the **Result Details** button for more information about the selected measurement.
  - If the selected measurement is from a *Grab Sample*, the *Result Details* screen will also display a **Calibration** button. Select the **Calibration** button to change the *Calibration* for this measurement. (see Figure 53). Press the **Select** button to apply the new *Calibration*. The measurement will be recomputed with the new applied calibration and return to the *Result Details* screen.

Result Details		01:32 PM Nov 9, 2021	
Sample Name	SAMPLE		
Time	Oct 01, 2020 15:51:29		
Range	Up To 1,000		
Mode	NPOC		
Measured Value (ppm)	1804		
TC (ppm)	N/A		
IC (ppm)	N/A		
Average (ppm)	1804		
SD (ppm)	0.00		
RSD (ppm, %)	0.00		
Mass Response (µg)	1504		
Calibration			
Calibration Blank (ppm)	N/A		

Back Calibration

Results Details screen with Calibration

Select Calibration		01:34 PM Nov 9, 2021	
Name	Date		
NPOC Calibration	Jun 30, 2021 10:58:43		

Select Page Up Page Down

Back

Select Calibration screen

Figure 53: Result Details and Select a new Calibration

## Exporting Historical Data

Export historical data from the Analyzer directly to a computer or to a computer network using an Ethernet connection and a data acquisition program. Then, import the data file into a spreadsheet program as shown in ["Appendix C: Importing Analyzer Data into a Spreadsheet."](#)

### To export data history

1. To export data using the Ethernet port, you must first configure the Analyzer's IP address. (See ["Connecting to the Analyzer via Ethernet" on page 145](#)).
2. Select the **Data** tab, and then press the **Export** button to display the *Export* screen.



Export		03:33 PM Jan 12, 2011
Range 1 Week		
From Date 15:32 Jan 05, 2011		
To Date 15:32 Jan 12, 2011		
Back Export		

3. Press the **Range** button to select the time frame for the data to export. The following buttons appear on the right:
  - **1 Day**
  - **1 Week**
  - **All**
  - **Custom** (Enter a specific date and time range.)
4. Press the **Export** button. The *Export Data* screen appears.



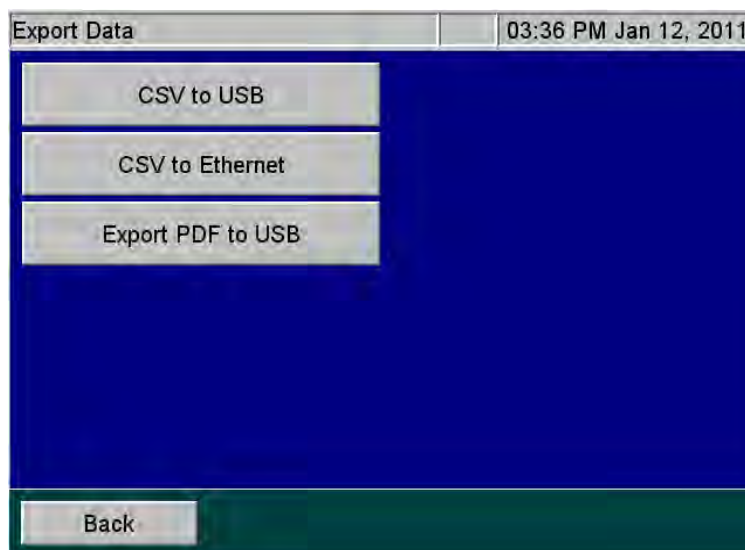


Figure 54: Export Data Screen

5. Press one of the following buttons to select and execute a format for the data export:
  - **CSV to USB** — Exports a comma-separated text file to a USB memory device.
  - **CSV to Ethernet** — Exports a comma-separated text file via the Ethernet port.
  - **Export PDF to USB** — Exports a PDF file to a USB memory device.
6. Press the **Back** button to return to the **Data** tab.

## Reviewing Exported Data

When the Analyzer exports data via the USB or Ethernet ports, the export data includes the following:

Table 7: Data Fields Output

Field	Value	Output Options (if Available)
1	Date	MM/DD/YYYY HH:MM
2	Sample Name	Stream 1-5, Check Standard, User-Entered Sample Name (Up to 30 characters)
3	Analysis Mode	NPOC, TOC, IC, TC
4	Stream Number	Blank, 1, 2, 3, 4, or 5
5	NPOC (ppm)	
6	TOC (ppm)	
7	IC (ppm)	

**Table 7: Data Fields Output (Continued)**

Field	Value	Output Options (if Available)
8	TC (ppm)	
9	Converted Result	
10	Unit	
11	Reject	Y or N
12	Acid (%)	
13	Oxid (%)	
14	Range Mode	Manual or Auto
15	Range	Up to 100, Up to 1,000, Up to 5,000, Up to 20,000, Up to 50,000
16	Spurge (min.)	
17	Flush	Off, DI, 1S, 2S, 3S, 4S, or 5S
18	Blank Correction	On or Off
19	Resuspend	Off
20	Pressure (psi)	Ambient pressure, psia
21	Man Dilution	Manual Dilution Numeric Value
22	Calibration Name	Alphanumeric characters
23	Calibration Date	MM/DD/YYYY HH:MM
24	Error/Warning	Error/Warning Number
25	CO <sub>2</sub> (mg)	Mass of CO <sub>2</sub> measured (mg). Rejects are not reported.
26	Mass Response (µg)	
27	Equation	Conversion factor equation
28	Method ID	Conversion factor name
29	Leak Check Ratio	Diagnostic should be <1.008

## Printing Data

You can print data from the Analyzer directly to a USB-connected printer. You will first need to configure the Analyzer's IP Address, as described in [“Configuring the Analyzer's IP Address” on page 139](#). Next, refer to [“Setting Up and Configuring a Printer” on page 141](#) for information on compatible printers and configuring a printer to work with the Analyzer.

## The I/O tab

### Setting Up Input and Output

Use the I/O tab to configure the Analyzer's IP address, set up a printer, and enable a liquid sensor (when a liquid sensor is installed inside the Analyzer).

### Configuring the Analyzer's IP Address

You must configure the Analyzer's Internet Protocol (IP) settings for use in connecting the Analyzer to a *Network* or *Direct Connection* (Peer to Peer) computer. Before beginning this procedure, determine the best method for connecting to your Analyzer and, if needed, determine the correct IP Address to input to the Analyzer. See [“Connecting to the Analyzer via Ethernet” on page 145](#).

#### To configure the Analyzer's IP Address

1. Select the **I/O** tab, and then press the **IP Configuration** button to display the *IP Configuration* screen.

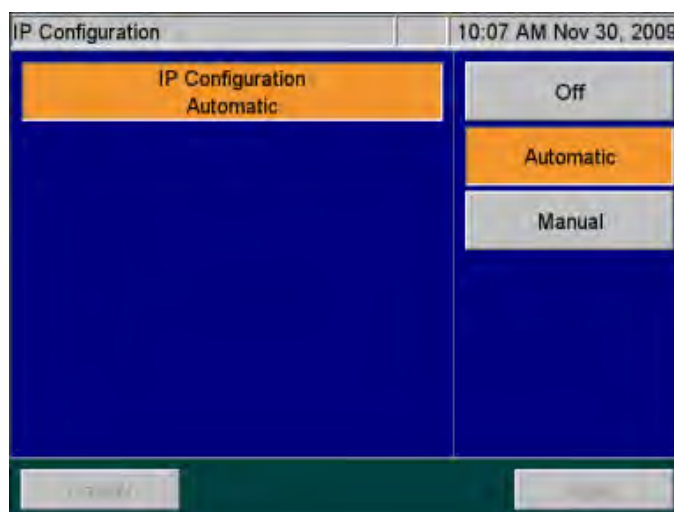


Figure 55: IP Configuration Screen

2. Press one of the following buttons to configure the Analyzer's IP address.
  - **Off** (default) — Indicates that the Analyzer is not communicating with a *Network* or *Direct Connection* computer.
  - **Automatic** — The Analyzer is connected to your *Network* with a standard Ethernet cable, and your network uses a DHCP server to *dynamically* assign IP addresses.

- **Manual** — The Analyzer is connected in one of the following manual configurations:
3. If you selected **Manual** in the previous step, you must enter an *IP address*. Press the **IP Address** button. Using the numeric pad appears to the right, enter the IP address as follows:
    - **Network connection** — If you are connecting to the *Network* and your network assigns a static IP address to all network devices, enter the IP address provided by your Information Technology Group.
    - **Direct Connection** — If you are connecting to the Analyzer using a *Direct Connection* (Peer to Peer) computer with an Ethernet Crossover cable, you must specify an IP Address that closely matches the Computer's *IPv4 Address* and matches the Computer's *Subnet Mask*. The first three octets<sup>9</sup> of the Analyzer IP Address **MUST** be the same as those of the *Direct Connection* (Peer to Peer) computer. Veolia recommends setting the last octet of the Analyzer IP Address to be one digit difference from the *Direct Connection* computer's *IPv4 Address*. For more information on locating the *Direct Connection* computer's *IPv4 Address*, see [“Configuring a Direct Connection computer” on page 146](#).
  4. If you selected **Manual** in step 2, you must enter a *Subnet Mask*. Press the **Net Mask** button. Using the numeric pad appears to the right, enter the *Subnet Mask* as follows:
    - **Network connection** — If you are connecting to the *Network* via a standard Ethernet cable, enter the *Subnet Mask* address provided by your Information Technology Group.
    - **Direct Connection** — If you are connecting the Analyzer via a *Direct Connection* (Peer to Peer) computer with an Ethernet Crossover cable, the Analyzer *Net Mask* address **MUST** match the *Subnet Mask* address of the computer. For more information on locating the *Direct Connection* computer's *Subnet Mask*, see [“Configuring a Direct Connection computer” on page 146](#).
  5. Press the **Apply** button.

**NOTE:** The Analyzer will require a reboot after editing the *IP Configuration* settings.

---

<sup>9</sup>IP Addresses are typically written as four 8-bit fields, separated by periods. These fields are known as *octets*.

## Setting Up and Configuring a Printer

Consult the HP® website for USB printers supported by the driver associated with the system controller board installed in your Analyzer. Perform a visual inspection of system controller board installed in your Analyzer to determine the associated HP printer drive package, as follows:

- **Type A** System Controller Board shown in [Figure 55: Controller Board Types](#) — This system controller board communicates with HP printer drive package 1.6.10.
- **Type B** System Controller Board shown in [Figure 55: Controller Board Types](#) — This system controller board communicates with HP printer driver package 3.16.11.



**Type A — System Controller**



**Type B — System Controller Board**

**Figure 56: Controller Board Types**

To install the printer, it must first be disconnected from the Analyzer when power cycling or rebooting the Analyzer. Once the Analyzer is on, connect a USB communication cable (not supplied with Analyzer). Select the I/O menu and select “Printer Setup” option. Select the Printer Disabled button to change it to Printer Enabled. Select the Search button to have the Analyzer search for a connected approved HP Printer.

The printer must first be configured to work with the Analyzer (Refer to [“Setting Up and Configuring a Printer” on page 141.](#))

### *To print data*

1. Select the **Data** tab.
2. Click the **Print** button.
3. Select the desired result file and then click the **Print** option.

Print Result		03:51 PM Jan 12, 2011
Name	Date	
Default CONTINUOUS	Jan 12, 2011 14:53:04	
Default GRAB	Jan 12, 2011 14:49:18	
Default GRAB	Jan 12, 2011 13:57:55	

Print

Page Up

Page Down

Back

### Figure 57: Print Data Screen

## To configure a printer

1. Ensure that all printers are disconnected from the Analyzer before turning *On* the Analyzer. (If the Analyzer is currently running with a printer connected, disconnect the printer, shut down and power off the Analyzer, and then restart the Analyzer.)
2. Select the **I/O** tab, and then press the **Printer Setup** button to display the *Printer Setup* screen.
3. Press the **Printer** button to display the **Enabled** and **Disabled** buttons.
4. Press the **Enabled** button. The Printer button appears with an “Enabled” indicator.
5. Using a USB communication cable (provided by the customer), connect one of the approved printers (listed previously) to the Analyzer. Connect the USB host connector-end of the printer cable into one of the USB host ports (labeled “USB HOST”) on the Analyzer. Connect the other (USB device port) end of the cable into the printer.

**NOTE:** Consult the instructions that come with the printer for additional help, as needed.

6. Press the **Search** button to identify the printer. The printer name appears on the screen.
7. Press the **Apply** button to save the changes and return to the **I/O** tab screen.

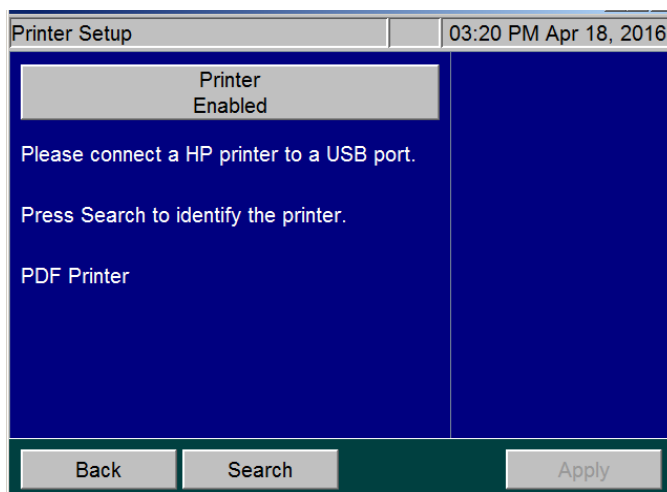


Figure 58: IP Configuration Screen

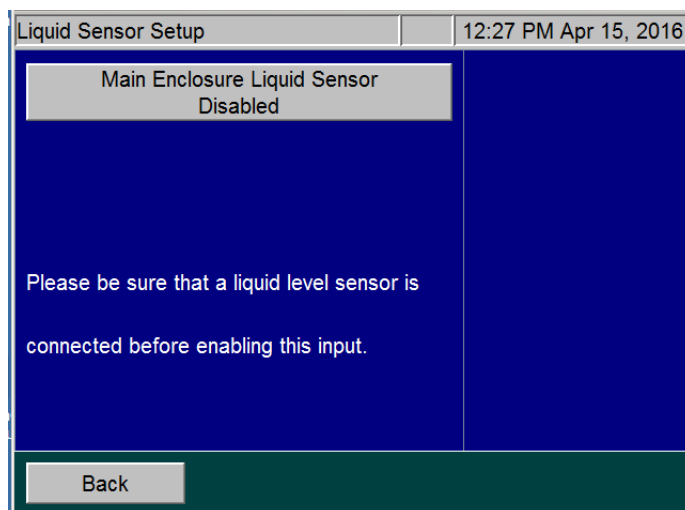
## Enabling the Liquid Sensor

The liquid sensor is a corrosion-resistant and optically-based sensor intended for detecting large leaks inside the Analyzer. The sensor is mounted on the inside floor of the Analyzer and triggers when the face of the sensor contacts fluid. (Due to variations in installation conditions, fluid from leaks may not immediately contact the sensor.) When a leak is detected, the Analyzer reports this error, displays a pop-up message, and stops analysis.

The *I/O* tab contains a **Liquid Sensor Setup** button for factory-technician use to enable the liquid sensor before a new Analyzer is shipped.

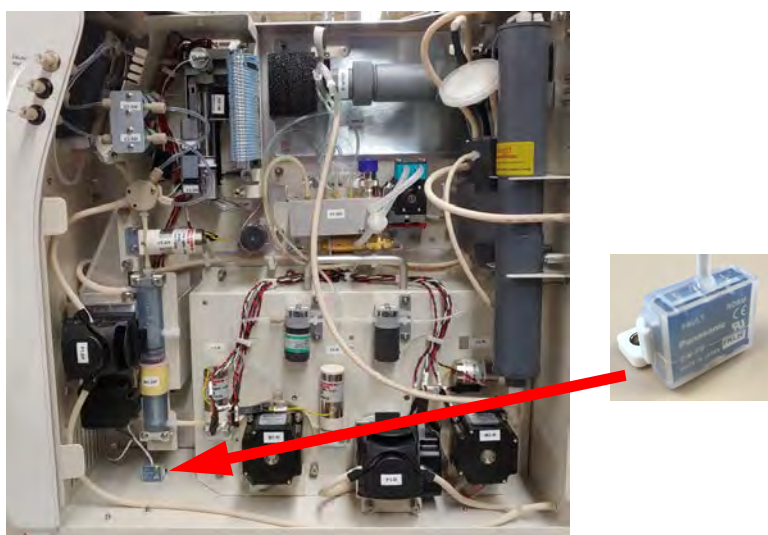
### *To enable a liquid sensor*

1. Verify that the Analyzer has a liquid sensor installed on the inside floor of the Analyzer ([Figure 60](#)). (If you are unsure of the presence of a liquid sensor, do NOT enable this feature.)
2. Select the *I/O* tab.
3. Press the **Liquid Sensor Setup** button. The *Liquid Sensor Setup* screen appears with the **Main Enclosure Liquid Sensor** button.



**Figure 59: Liquid Sensor Setup Screen**

4. Press the **Main Enclosure Liquid Sensor** button and press the **Enabled** button.
  5. Verify that the **Main Enclosure Liquid Sensor** button now shows an *Enabled* state.
- The leak sensor for the Analyzer's main enclosure is now activated.



**Figure 60: Liquid Sensor Location — Analyzer Enclosure**



## Connecting to the Analyzer via Ethernet

The Analyzer can be connected to a *Network* or *Direct Connection* (Peer to Peer) computer via an Ethernet cable. For more information on the cable configurations, see [“Step 9: Connect to a Network or Direct Connection Computer \(Optional\)” on page 73](#).

- If you connect to the Analyzer via your *Network*, use the standard Ethernet cable.
- If you connect to the Analyzer via a *Direct Connection* computer, use the Ethernet Crossover cable.

**To ensure that you connect to the Analyzer properly, consult with your Information Technology Group to determine the best configuration for your networking environment.**

### Configuring a Network Connection

If you are connecting the Analyzer to the *Network*, you will need to use the standard, straight through Ethernet cable. Consult with your Information Technology Group for help in assigning the correct *IP Address* and *Subnet Mask* for the Analyzer.

**IMPORTANT!** The guidelines here are intended to help you connect the Analyzer to the computer, but Veolia cannot anticipate all network configurations. **To ensure that you connect to the Analyzer properly, Veolia strongly recommends you consult with your Information Technology Group.**

There are certain situations that can arise that may require additional configuration. Most modern network interfaces (including the Analyzer) use “autonegotiation,” which should result in “plug and play” operation. However, there are instances in which autonegotiation may fail or be disabled. In such cases, the Ethernet interface will need to be configured manually to the “10BASE-T half duplex” setting on the remote device. Contact your IT professional for help with this configuration.

### To Connect to the Analyzer via Network Connection

Prior to performing this procedure, consult with your Information Technology Group for help in assigning a unique *IP Address* and *Subnet Mask* for the Analyzer.

1. Connect the standard Ethernet Cable between the Analyzer and the network router or hub (both ends of the cable must be connected), if not already installed.
2. Continue to [“Configuring the Analyzer’s IP Address” on page 139](#) and follow the directions for setting a **Manual IP Address** for a *Network* connection. Input the Analyzer *IP Address* and *Subnet Mask* that were provided to you. After completing this task, return to this procedure.

3. From the *Network* computer, navigate to the computer's Internet Web Browser and type in the *Analyzer IP Address* (from step 2) and press **Enter**.

**NOTE:** For best results, Veolia recommends using *Google Chrome* Web Browser with the "IE Tab" Extension by *Blackfish Software* enabled.

4. Add this web page to the browser *Favorites*. Use this web page to communicate with the Analyzer and the Sievers Autosampler, if applicable.



**NOTE:** If your environment supports more than one Analyzer, it is possible for multiple Analyzers to be controlled by a single *Network* computer. Ensure each Analyzer uses a unique IP Address within the same network as the *Network* computer.

## Configuring a Direct Connection computer

If you are connecting the Analyzer via a *Direct Connection* (Peer to Peer), connect the Ethernet Crossover cable to the Analyzer and then plug the other end directly into your computer. You will need to manually configure the Analyzer with a new *IP Address* and *Net Mask* based on the *IPv4 Address* of your computer.

**IMPORTANT!** The guidelines here are intended to help you connect the Analyzer to the computer. **To ensure that you connect to the Analyzer properly, Veolia strongly recommends you consult with your Information Technology Group.**

### To Connect to the Analyzer via Direct Connection Computer

1. Connect the Ethernet Crossover Cable between your computer and the Analyzer (both ends of the cable must be connected), if not already installed.
2. From the *Direct Connection* computer, open the *Command Prompt* window.
  - For **Windows 10®** Computers:
    - Press the **Start** button . Select the **Command Prompt** icon .
    - Alternately, from the *Windows Task Bar*, type "CMD" the *Search Box* and press **Enter**.
  - For **Windows 7®** Computers:
    - Press the **Start** button. Type "CMD" in the *Search Box* and press **Enter**.
3. From the *Command Prompt*, type in "ipconfig" exactly and press **Enter**. This will display the *Windows IP Configuration* information.

4. Locate the *active* “Ethernet adapter Ethernet” settings. This is the information for the Ethernet port on the computer.

**NOTE:** There could be more than one “*Ethernet adapter Ethernet*” in the list. Ensure to locate the *Active port*, not a *Wireless LAN* or *Local Area Connection*.

5. Locate the active *IPv4 Address* and *Subnet Mask*. Write these addresses down for reference later.

**NOTE:** The *IPv4 Address* and *Subnet Mask* are written as four, 8-bit fields separated by periods. These fields are known as *octets*.

- Example *IP Address*: 192.168.1.10
- Example *Subnet Mask*: 255.255.255.0

6. Next, you must customize the *Analyzer IP Address* to be *almost identical* to the *Computer IPv4 Address* you just wrote down. Ensure the *Analyzer Net Mask* matches the *Computer Subnet Mask* exactly. See below for an example (for demonstration only).

- *Computer IPv4 Address*: 169.254.1.10  
*Computer Subnet Mask*: 255.255.255.0
- *Analyzer IP Address*: 169.254.1.11 (**Last octet is different** from the *Computer IPv4 Address*)  
*Analyzer Net Mask*: 255.255.255.0 (**Matches** the *Computer Subnet Mask*)

**NOTE:** In this example, note the *difference* between the *Computer IPv4 Address* and the *Analyzer IP Address* in the last *octet* of the *Analyzer IP Address*.

Ensure the last octet of the *Analyzer IP Address* is set between 1 and 254 but is not the same value as the *Computer IPv4 Address*. The *Analyzer IP Address* must be unique.

Continue to [“Configuring the Analyzer’s IP Address” on page 139](#) and follow the directions for setting up a **Manual IP Configuration** for a *Direct Connection* (Peer to Peer) computer. After completing this task, return to this procedure.

7. From the *Direct Connection* computer, navigate to the computer’s Internet Web Browser and type in the newly configured *Analyzer IP Address* (for this example: 169.254.1.11) and press **Enter**.

**NOTE:** For best results, Veolia recommends using *Google Chrome* Web Browser with the “IE Tab” Extension by *Blackfish Software* enabled.

8. Add this web page address to the browser *Favorites*. Use this web page to communicate with the Analyzer and the Sievers Autosampler, if applicable.

**NOTE:** When using the *Direct Connection* computer to control the Analyzer and/or Sievers Autosampler, if the computer shuts down or crashes after a protocol has been initiated, the Analyzer will complete the protocol run. The computer's *Power Saver Settings* will not affect the Analyzer.

## Collecting Real-Time Data

Collect real-time measurement data from the Analyzer using Ethernet and a data acquisition program. For additional information, see ["Connecting to the Analyzer via Ethernet" on page 145](#). Next, import the .csv data file collected into a computer per the instructions in "Appendix C: Importing Analyzer Data into a Spreadsheet." When the real-time data is collected, it includes the information shown in [Table 7 on page 137](#).

["Appendix C: Importing Analyzer Data into a Spreadsheet"](#) provides instructions on how to collect this information using a data acquisition program. When the real-time data is collected, it includes the information shown in [Table 7 on page 137](#).

### **To collect real-time data (with Ethernet connection)**

Configure the Ethernet connection and then use a data acquisition program to capture a TCP/IP transmitted .csv text file in real time. Examples include PuTTY, HyperTerminal, and Tera Term.

1. For direct connection of the Analyzer to a PC, select the crossover Ethernet cable from the Accessories Kit. Attach one end to the Ethernet port in the electronics area of the Analyzer, and the other end to an Ethernet port on the PC.
2. For connection of the Analyzer to a network, select the straight-through Ethernet cable from the Accessories Kit. Attach one end of the cable to the Ethernet port on the Analyzer, and plug the other end into a convenient network port.
3. Open a data acquisition program that can capture a TCP/IP transmitted .csv text file in real time. Examples include PuTTY, HyperTerminal, and Tera Term.

## **The Maintenance tab**

## Configuring Analyzer Advanced Settings

Analyzer settings are considered to be advanced if they will not be regularly changed in the course of normal Analyzer operations.

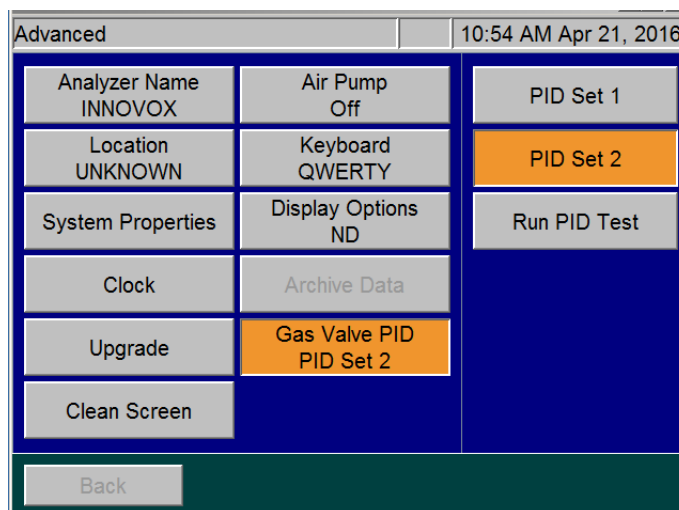


Figure 61: The Advanced Screen

## Setting the Analyzer Name and Location

Specify the Analyzer name and location so that data history and printed output reflect the source of your measurements.

1. Select the **Maintenance** tab.
2. Press the **Advanced** button.
3. Press the **Analyzer Name** button, use the keyboard to specify a name, and then press **Set**.
4. Press the **Location** button, use the keyboard to specify a location name, and then press **Set Location**.

## Saving and Restoring System Properties

Calibration constants and other key parameters are stored in the Analyzer's memory. You should export the factory settings for future reference.

### *To save system settings*

1. Select the **Maintenance** tab.
2. Press the **Advanced** button.
3. Press the **System Properties** button.

4. Press the button that corresponds to the desired export format and method.

## Setting the Clock

Set the Analyzer clock to ensure that all TOC measurements reflect the correct date and time.

### *To set the clock*

1. Select the **Maintenance** tab.
2. Press the **Advanced** button
3. Press the **Clock** button.
4. Specify the correct date and time via each of the buttons.
5. Press the **Save** button.

## Upgrade Option

When installing firmware upgrades, the Upgrade button will be displayed in the *Advanced* screen. For complete instructions, please refer to the instruction sheet shipped with the firmware USB memory device.

If you downloaded the upgrade files from the Veolia website, make sure that the files are saved in the proper folders on your USB memory device (:\\InnovOx\\Upgrade). After you install your USB memory device in the USB port, wait 15 seconds and then select the **Upgrade** button. This process may take several minutes.

## Cleaning the Analyzer Screen

To clean the Analyzer's touchscreen, complete the following steps.

1. Select the **Maintenance** tab.
2. Press the **Advanced** button.
3. Press the **Clean Screen** button. The Analyzer temporarily disables the screen allowing 30 seconds to clean the screen.

## Turning on the Air Pump

If you are using the optional Carrier Gas CO<sub>2</sub> Scrubber, you also must activate the air pump, as follows:

1. Select the **Maintenance** tab.
2. Press the **Advanced** button.
3. Press the **Air Pump** button. Set the pump to **On**.
4. Press the **Back** button.

## Setting the Keyboard Options

Specify the manner in which the Keyboard will be displayed: standard **QWERTY** mode or **Alphabetical** mode.

1. Select the **Maintenance** tab.
2. Press the **Advanced** button.
3. The **Keyboard** button will either be set to **Keyboard QWERTY** or **Keyboard Alphabetical**. Press the button to toggle between the two options.

## Setting the Display Options

When the Analyzer values fall into the negative range, the user has the option to display these values as **Negative** or as **Non-Detect (ND)**.

1. Select the **Maintenance** tab.
2. Press the **Advanced** button.
3. The **Display** button will either be set to **Display Negative** or **Display ND**. Press the button to toggle between the two options.

## Archiving the Data History

This feature allows you to export the data history in CSV format and delete the data store. Make sure to insert a USB memory device in the USB port at least 15 seconds before selecting this feature. After downloading the data, the unit will automatically shut down, power off, and restart. This button will be grayed out if there is no data in the history file or if the analysis is running.

### *To archive the data history*

1. Insert a USB memory device into the USB port, and wait 15 seconds.
2. Select the **Maintenance** tab.
3. Press the **Advanced** button. The *Advanced* Screen appears.

4. Press the **Archive Data** button.

*NOTE: Archiving data will remove/erase all measurement data from the Analyzer.*

## Gas Valve PID Parameters

The Analyzer contains Gas Valve parameters that have been previously set at the factory using the default setting of PID Set 2. In the case where an instrument is upgraded in the field from firmware versions  $\leq 3.06$  to versions  $\geq 3.07$ , the Gas Valve PID parameter may need to be changed. The determining factor is the style of gas manifold installed in the instrument. Using [Figure 62](#), compare the gas manifold in your Analyzer and set the corresponding Gas Valve PID setting using the following instructions.

### *To configure gas flow PID option settings*

1. Using [Figure 62](#), identify the type of gas manifold installed in the Analyzer.
2. Select the **Maintenance** tab.
3. Press the **Advanced** button. The *Advanced* screen appears.
4. Locate and verify which PID option is currently active by identifying whether “PID Set 1” or “PID Set 2” appears on the **Gas Valve PID** button.
5. To change the PID setting, press the **Gas Valve PID** button. The **PID Set 1** and **PID Set 2** buttons appear.

*NOTE: The **Run PID Test** button also appears and is typically used by the Factory or On-Site Service. The test activates an automatic diagnosis and setting by the Analyzer for the type of gas manifold currently installed. The Run PID Test can take several minutes, after which the Analyzer displays one of the following test results and automatic settings: **PID Test Passed - Using Set 1**, **PID Passed - Using Set 2**, or **PID Test Failed**.*

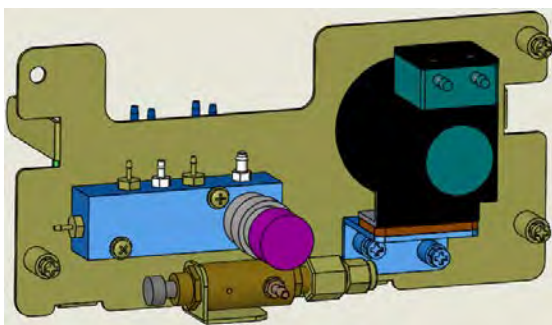
*Press the **Back** button. If the test passed, the Advanced Screen appears with the confirmed PID setting showing on the **Gas Valve PID** button. If the test failed, a failure message appears referencing Gas Flow Regulation Error 151. This requires conducting a visual inspection of the gas manifold and manually configuring the corresponding PID setting on the Advanced screen. After which, Gas Flow diagnostics should be run to verify proper operation.*

6. To manually configure the PID setting, press the appropriate PID button for the installed gas manifold (as identified in [Figure 62](#)):
  - For a *Legacy Model* gas manifold — Press the **PID Set 1** button.



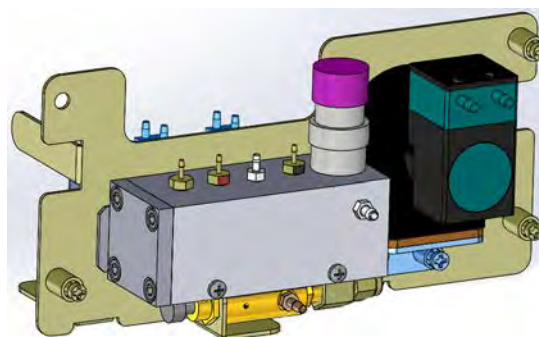
- For a *Current Factory-Install and Replacement Model* gas manifold — Press the **PID Set 2** button.

The Analyzer is now configured to regulate the gas flow pressure according to the selected set of PID parameters.



**Gas Manifold — Legacy Model**

*(Requires PID Set 1 Setting)*



**Gas Manifold — Current Factory-Install and Replacement Model**

*(Requires PID Set 2 Setting)*

**Figure 62: Comparing Gas Manifold Types / PID Settings**

## Warning and Error Output

You can export the summary warning/error history for the Analyzer.

### *To output the list*

1. Select the **Maintenance** tab.
2. Press the **Errors/Warnings** button.
3. Press the **Export Errors** button.
4. Press the button that corresponds to the desired output method.

## Shutting Down the Analyzer

To ensure that you do not lose any data, always shut down the Analyzer using the on-screen menu before using the power switch.

### *To shut down the Analyzer*

1. Make sure analysis is stopped.

2. Select the **Maintenance** tab.
3. Press the **Shutdown** button. The **Confirm Shutdown** dialog box appears.
4. Press **Yes** and allow approximately 30 seconds for the firmware to close. The screen will shut down and the instrument will go into standby mode. You may leave the Analyzer in this state to save power and touch the screen to restore the Analyzer. Or, turn the power switch to *Off* to shut down the Analyzer.

*NOTE: The Analyzer is not shutdown until the power switch is turned to the Off position.*

*NOTE: If you are planning to perform maintenance inside the Analyzer, make sure to first shut down and power Off the Analyzer.*

## Resuming Analyzer Operation After Shutdown

When you are ready to resume operation after shutting down the Analyzer, follow these steps:

1. Ensure the green light is illuminated on the front of the Analyzer, showing that AC power is on as intended. If the light is not on, verify that AC power is connected and the power switch is in the On position.
2. Press the touchscreen to start the Analyzer.

## Cal / Ver tab

For information on using the functions within this tab, see [“Calibration and Verification” on page 90](#).

## Chapter 8. Sievers Autosampler User Interface

### Overview

You control the Sievers Autosampler using the *InnovOx User Interface* via a web connection<sup>10</sup>. Using the interface, you can easily create and run protocols that instruct the Sievers Autosampler how to sample from vials in the sample racks.

All Sievers Autosampler operations are performed via a protocol. A protocol is comprised of groups of one or more vials that have the same sampling properties.

The *InnovOx User Interface* is designed for use with an Internet Web Browser on a Windows operating system<sup>11</sup>. The Sievers Autosampler and Sievers InnovOx ES Laboratory TOC Analyzer must first be connected to a *Network* or *Direct Connection* computer. After connecting, the user interface software uses the Analyzer's IP address to communicate with the Analyzer. For details on connecting the Analyzer to your *Network* or *Direct Connection* computer, see [“Connecting to the Analyzer via Ethernet” on page 145](#).

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<sup>10</sup>The web-based *InnovOx User Interface* is the sole user interface used to control the Sievers Autosampler. Although you can use the touchscreen on the Sievers InnovOx ES Laboratory TOC Analyzer to control the Analyzer, you cannot access or control the Sievers Autosampler from the Analyzer touchscreen.

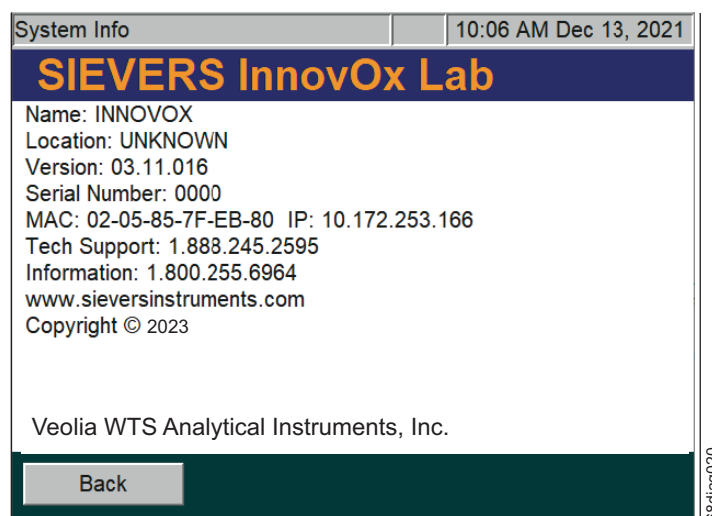
<sup>11</sup>For best results, Sievers recommends using *Google Chrome* Web Browser with the “IE Tab” Extension by *Blackfish Software* enabled.

Verify that the Sievers Autosampler is connected to the Analyzer and that the Analyzer is connected to a *Network* or *Direct Connection* computer. For instructions to create this setup, see [“Step 9: Connect to a Network or Direct Connection Computer \(Optional\)” on page 73](#).

## To set up the web-based user interface

Prior to beginning this procedure, the Analyzer IP Address must first be enabled and configured within the firmware. For more information, see [“Configuring the Analyzer’s IP Address” on page 139](#) and [“Connecting to the Analyzer via Ethernet” on page 145](#). **To ensure that you connect to the Analyzer properly, consult with your Information Technology Group to determine the best configuration for your environment.**

1. On the Sievers InnovOx ES Laboratory TOC Analyzer, use the touchscreen to locate the IP Address for the Analyzer. It is located on the **System Info** screen (**Maintenance** → **System Info**). Write down the IP Address to use in step [3](#).



**Figure 63: System Info Screen with IP Address**

2. On your computer, launch the web browser.

**NOTE:** For best results, Sievers recommends using *Google Chrome* Web Browser with the “IE Tab” Extension by Blackfish Software enabled.

3. In the address field, enter the IP Address of the Analyzer that you obtained in step [1](#).
4. Click **Go**, or press the **Enter** key. The Sievers InnovOx ES Laboratory TOC Analyzer *Splash Screen* appears.

5. Bookmark this Web page for quick future access. This will enable you to directly access the Sievers InnovOx ES Laboratory TOC Analyzer without having to re-enter the IP address.
6. Click the **Click Here to Enter** link to display the *InnovOx Protocol* screen. You control the Sievers Autosampler from this screen. The *Protocol* screen allows you to run, create, or modify protocols.

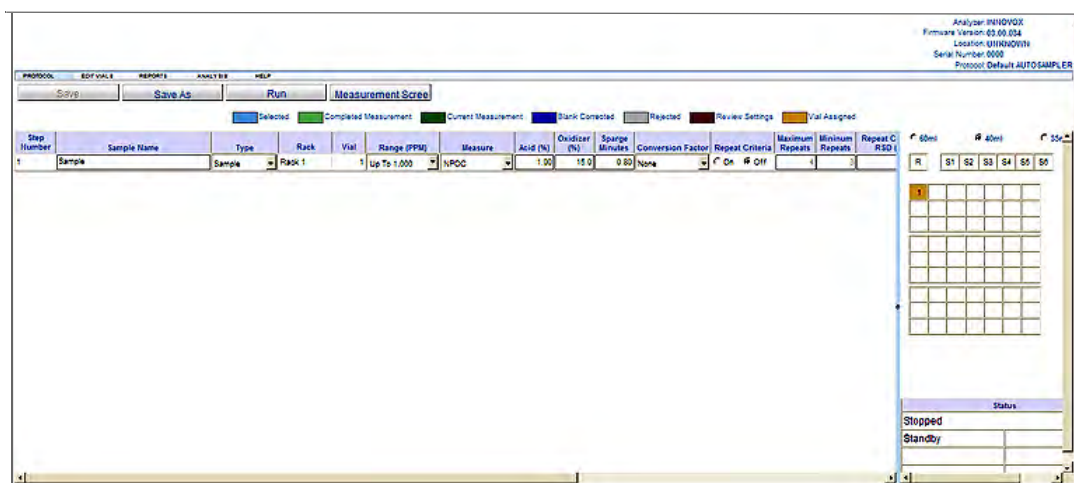


Figure 64: InnovOx Protocol Screen

## Working with Protocols

The *InnovOx User Interface* for the Sievers Autosampler allows you to create and modify protocols that automate the sampling from vials.

The *InnovOx User Interface* has two main screens; the *Measurement Screen* and the *Protocol Screen*. These screens allow you to view sampling analysis results and create and modify protocols.

- To display the *Measurement Screen*, select **Analysis** → **Measurement Screen** or select the **Measurement Screen** button on the *secondary menu bar*.
- To display the *Protocol Screen*, select **Analysis** → **Protocol Screen** or select the **Protocol Screen** button on the *secondary menu bar*.

## The Measurement Screen



Figure 65: InnovOx Measurement Screen with Areas Identified

Use the *Measurement Screen* to view sampling analysis results. The *Measurement Screen* consists of the following areas. Refer to [Figure 65](#).

- **Color Key**<sup>12</sup> — Just below the InnovOx Menus, there is a color key with various color blocks followed by a description for the status of analysis. Each row in the Protocol Detail area will change to one of these colors according to the status of analysis. Status values include **Selected**, **Completed Measurement**, **Current Measurement**, **Vial Assigned**, **Blank Corrected**, **Rejected**, and **Review Settings**.
- **Sample Details** — This area displays the sample results, including average result, standard deviation, and relative standard deviation for each step in the protocol.
- **Sample Peak Graph** — During sampling analysis, a graph depicting the sample peaks of CO<sub>2</sub> (µg) and Time appears below the **Protocol Details** area.
- **Vial Information** — This area displays specific results for each repetition for the vial (or protocol step) currently running or selected from the Sample Details list. The specific analytical conditions are also displayed for the selected vial.
- **Vial Rack Configuration** — This area represents the sample rack in your Sievers Autosampler. The color codes give you a visual indication of the status of each vial.

<sup>12</sup>For best results, Sievers recommends using *Google Chrome* Web Browser with the “IE Tab” Extension by Blackfish Software enabled.

- **Status** — The various fields in this area reflect the current phase of the sampling you are running, along with related details for the protocol (such as the vial and repetition number of the current sample).

## The Protocol Screen

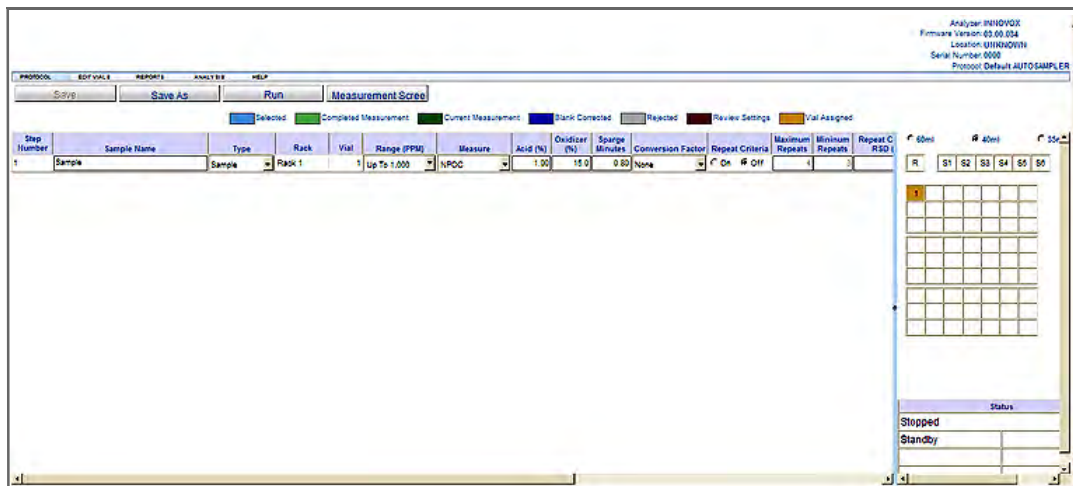


Figure 66: InnovOx Protocol Screen

Use the *Protocol* screen to create and modify protocols. For more information about editing protocols, see [“Editing Protocols” on page 167](#).

## InnovOx Menus

The *InnovOx User Interface* for the Sievers Autosampler contains five menus: **Protocol**, **Edit Vials**, **Reports**, **Analysis** and **Help**. In addition, there is also a *secondary menu bar* that changes depending on the screen and current selections.

### Main Menus

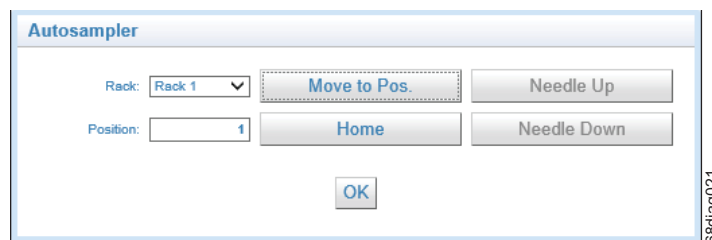
**NOTE:** All references to menus in these instructions refer to the InnovOx User Interface (drop-down) menus and should not be confused with the web browser menus.



- Use the **Protocol** menu to open, review, and edit protocols relating to samples, calibration and verifications. Once edits have been made to the protocol, you will be able to save the changes with this menu. Importing and exporting is also available through this menu. The **Save** and **Save As** selections are replicated in the secondary menu bar for convenience.
- Use the **Edit Vials** menu to make changes to the protocol opened through the **Protocol** menu. You will be able to edit the protocol using the selections **Cut**, **Copy** and **Paste**. Several lines can be edited at once by using the selection **Select All** followed by the **Edit** selection, or by holding the Ctrl + Shift keys while highlighting protocol lines with the left mouse buttons. Selections are also available to insert vials or protocols. Depending on what protocol type was selected from the **Protocol** menu, the appropriate fields will be available for edit.
- Use the **Reports** menu to generate reports of protocols and reports for Samples, Calibrations and Verifications. To help summarizing long sample reports, you will have the option to print a summary or full sample report. The reports are .pdf files that can be saved to your computer.
- Use the **Analysis** menu to begin the selected protocol. Once a protocol is initiated and running, you can use the *Protocol* Screen selection to begin creating or editing another protocol. To return to the live measurement screen, use the *Measurement Screen* selection. For convenience, you can toggle back and forth between the *Protocol* Screen and the *Measurement Screen* using the secondary menu bar. Once the analysis has been initiated, you can edit the current protocol or add an emergency vial to a user-definable location on the Sievers Autosampler.
- Use **Help** to access the **Command Autosampler** and **About** menu (System Information).

**NOTE:** The **Command Autosampler** menu is only available when the Analyzer is in *Standby mode*.

- Use the **Command Autosampler** menu to open the *Autosampler* dialog and initialize the Sievers Autosampler. Use the *Autosampler* dialog to do the following:



**Figure 67: Autosampler dialog (Command Autosampler functions)**



- Select the **Rack** or **Position**.
- Select the **Move to Pos.** button to move the Sievers Autosampler to the vial designated by the *Rack* and *Position* settings. This button is not available if the needle is lowered.
- Select the **Home** button to raise the needle, if required, and position the Sievers Autosampler to the *Home Position*.
- Move the **Needle Up** or **Needle Down** buttons to change the position of the needle.
- The maximum position available is determined by the vial size selected when the *Autosampler* dialog was opened. For 60 mL and 40 mL vials, the maximum amount of rack positions is 21 vials. For 35 mL vials, the maximum amount of rack positions is 40 vials.
- Once you've completed your task, ensure you select the **Home** button to return the Sievers Autosampler to *re-home* the needle.
- Select the **OK** button to stop communications with the Sievers Autosampler and close the *Autosampler* dialog. The needle will remain in the current position after the **OK** button is selected.
- After completing all tasks with this diagnostic tool, power cycle the Sievers Autosampler.

## Secondary Menu Bar

The *Secondary Menu Bar* is located below the *Main Menu Bar*. The buttons on this bar will change depending on your current activity, current screen, and current selection.

## About Protocols

### Repetitions

The following table ([Table . “Importing Vial Names,” on page 163](#)) lists the approximate number of repetitions that can be performed with the Sievers Autosampler using 40-mL vials. It is recommended that you completely fill the vial to maximize the number of repetitions.

The number of repetitions shown for Auto Range refers to when the sample is less than 1,000 ppm, and the instrument selects the 1,000-ppm range. If a higher range is selected, more repetitions can be made. The maximum number of repetitions that can be selected is 20.

*NOTE: As an example, the following table lists the approximate number of repetitions possible using the Sievers Autosampler when using 40-mL vials. The possible number of repetitions varies according to the size of the vials used in the protocol.*

**Table 8: Repetitions Possible — Sievers Autosampler**

<b>Sievers Autosampler: Approximate Number of Repetitions Possible using Completely Filled 40<sup>a</sup>-mL Vials</b>					
<b>Mode</b>	<b>Flushes</b>				
	<b>None</b>	<b>1 Sample</b>	<b>2 Sample</b>	<b>3 Sample</b>	<b>Dilution Water</b>
<b>Auto Range</b>					
NPOC	7	6	5	3	7
TOC	3	2	1	0	3
IC	7	6	3	1	7
TC	3	2	1	0	3
<b>100 ppm Range</b>					
NPOC	6	5	4	2	6
TOC	3	2	1	0	3
IC	6	5	3	1	6
TC	3	2	1	0	3
<b>1,000 ppm Range</b>					
NPOC	7	6	5	3	7
TOC	3	2	1	0	3
IC	7	6	4	2	7
TC	3	2	1	0	3
<b>5,000 ppm Range</b>					
NPOC	14	13	12	10	14
TOC	12	11	10	5	12

**Table 8: Repetitions Possible — Sievers Autosampler (Continued)**

<b>Sievers Autosampler: Approximate Number of Repetitions Possible using Completely Filled 40<sup>a</sup>-mL Vials</b>					
<b>Mode</b>	<b>Flushes</b>				
	<b>None</b>	<b>1 Sample</b>	<b>2 Sample</b>	<b>3 Sample</b>	<b>Dilution Water</b>
IC	14	13	11	9	14
TC	12	11	10	9	12
<b>20,000 ppm Range</b>					
NPOC	20	20	20	20	20
TOC	20	20	20	20	20
IC	20	20	20	20	20
TC	20	20	20	20	20
<b>50,000 ppm Range</b>					
NPOC	20	20	20	20	20
TOC	20	20	20	20	20
IC	20	20	20	20	20
TC	20	20	20	20	20

- a. For 35 mL tubes, use one (1) less repetition than listed. For 60 mL vials, use two (2) more repetitions than listed. The maximum number of repetitions that can be selected is 20.

## Importing Vial Names

The *InnovOx User Interface* lets you import vial names into your existing protocols. This feature allows you to save time by preparing vial names on your personal computer (e.g., using Microsoft Excel® spreadsheet program or Microsoft® Word software). The file containing the vial names must be in text format (.txt). Each vial name must be followed by a hard return. For example, the text file could contain the following:

```
Lab Sample 10/5/2008
Lab Sample 10/6/2008
Loop 2 Sample 10/5/2008
Loop 2 Sample 10/6/2008
```

The list of sample names can be created in an Excel spreadsheet, and then saved as a tab-delimited text file.

After you have saved the text file, open the protocol. A screen will pop up for browsing the personal computer to select the name file to be imported. Click **Protocol** → **Samples** → **Import Names**. Once the name file has been selected, press **Submit** to import the protocol or **Cancel** to

cancel the action. The new vial names will populate the protocol sample name fields starting at step Number 1.

## Importing Protocols

You can create and edit protocols on your personal computer and import them into the *InnovOx User Interface*. Files must be in text format. If the files are created in an Excel spreadsheet program, they must be saved in Text (MS-DOS) or tab delimited (.txt) format.

## Import Format

Refer to [Table 9](#), in this section, for the required fields in an imported protocol. The second line of the file must contain the words “Vial Size” and the second entry in that line must be one of the following:

- For 35 mL tubes — **35**
- For 40 mL vials — **40**
- For 60 mL vials — **60**

Any comments can be inserted in the protocol if they follow two forward slashes, (“//”). Any entry that follows “//” in a line will be ignored by the *InnovOx User Interface*. It is convenient for the column headings to be inserted as a comment in the second line, as shown in the table.

In subsequent lines, the parameters shown in [Table 9](#) must be listed in the order shown. The Calibration file name can be left blank, or the name of the desired calibration can be entered; however, the name of the calibration must be entered exactly as it is saved on the Analyzer.

To import the protocol, click **Protocol** → **Samples** → **Import Protocol**. You will be prompted to browse the personal computer to select the protocol file you want to import. After you select the protocol file, click **Submit** to import the protocol or click **Cancel** to cancel the action.

If you have difficulty importing a protocol, try starting then immediately stopping the currently displayed protocol. When the current protocol is stopped, import the new protocol. If this does not help, try power cycling the Analyzer.

**Table 9: Required Fields in an Imported Protocol**

//Version 3.0 or higher														
Vial Size	40													
//Step Number	Sample Name	Type	Measure	Range	Rep	Rej	Acid	Oxid	Spurge	Flush	Resuspend	Blank	Calibration	Man Dilution
1	Check std 1	Standard	NPOC	Up To 1,000	4	1	1	15	0.8	Off	Off	Off		1
2	Sample 1	Sample	NPOC	Up To 1,000	4	1	1	15	0.8	Off	Off	Off		1
3	Sample 2	Sample	NPOC	Up To 1,000	4	1	1	15	0.8	Off	Off	Off		1
4	Sample 3	Sample	NPOC	Up To 1,000	4	1	1	15	0.8	Off	Off	Off		1
5	Check std 2	Standard	NPOC	Up To 1,000	4	1	1	15	0.8	Off	Off	Off		1
6	Sample 4	Sample	NPOC	Up To 1,000	4	1	1	15	0.8	Off	Off	Off		1
7	Sample 5	Sample	NPOC	Up To 1,000	4	1	1	15	0.8	Off	Off	Off		1
8	Sample 6	Sample	NPOC	Up To 1,000	4	1	1	15	0.8	Off	Off	Off		1
9	Sample 7	Sample	NPOC	Up To 1,000	4	1	1	15	0.8	Off	Off	Off		1
10	Check std 3	Standard	NPOC	Up To 1,000	4	1	1	15	0.8	Off	Off	Off		1

**NOTE:** All fields for a protocol (such as Rep Criteria) are NOT shown in [Table 9](#). You must edit these fields on the Protocol screen.

## Creating and Modifying New Protocols

For details on the configuration options, refer to [“The Setup tab” on page 117](#). In addition to those listed features, there is one additional features **Type**, that needs to be set when the Analyzer is operated with the Sievers Autosampler:

- **Type** — The vials are identified as being one of three types:
- **Sample** — Designates the vial rack and position of the sample vial.
- **Rinse** — Instructs the Sievers Autosampler to perform a needle rinse using the optional Wash Station.
- **Standard** — Indicates the vial in the first open position in the standards rack.

**NOTE:** For optimal particle suspension, utilize the Sievers Autosampler Stirring Station option. For more information on this option, see [“Stirring Station Option” on page 58](#).

### To create a new sample protocol

1. Click **Protocol** → **Samples** → **New**.
2. Select one of the following vial size options (located just above the Vial Rack Configuration area):
  - 35 mL
  - 40 mL
  - 60 mL

- To edit step Number 1, highlight the line by clicking on it, then simply click or tab to move fields. Some fields can be modified with the or up/down arrow keys. A vial can also be edited by going to **Edit Vials** → **Edit...** The following window is then displayed:

- For more information on editing protocols, refer to [Table 10, “Editing Protocols,” on page 167.](#)
- Click **Save** to save the protocol with a new name. The **Save Protocol** dialog box appears.

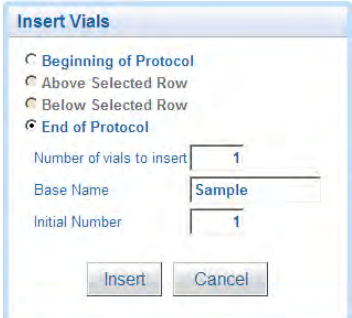
- Type a name for the new protocol in the name field, and click **Save**.

### *To modify an existing protocol*

- To modify an existing protocol, click **Protocol** → **Samples** → **Open**. The **Open Protocol** dialog box appears.

2. Make changes to the current values, as needed. Refer to [Table 10, “Editing Protocols,” on page 167.](#)
3. Click the **Save or Save As** selection in the **Protocol Menu** in the secondary menu near the top of the screen. A dialog box will display that the protocol is being saved, or you will prompted to save the protocol with a brand-new name.

**Table 10: Editing Protocols**

To	Do This
<b>To add new vials</b>	<ol style="list-style-type: none"> <li>1. Click <b>Edit Vials</b> → <b>Insert</b>. The Insert Vials dialog box appears  </li> <li>2. Select an option for the location of the vial.</li> <li>3. Type a number for the quantity of new vials.</li> <li>4. If you want to use a common Base Name for all the vials being added, enter that next.</li> <li>5. Type the initial number that will be added to the base name and go up in increments of 1 for the total vials added.</li> <li>6. Click <b>Insert</b>.</li> </ol> <p>NOTE: Inserting one or more vials from a protocol will place the vials in the next empty position(s) starting with Rack 1, Position 1.</p>
<b>To make changes to a vial</b>	Edit the individual fields of the sample parameters.

**Table 10: Editing Protocols (Continued)**

To	Do This
<b>To make simultaneous changes to multiple vials (contiguous rows)</b>	<ol style="list-style-type: none"> <li>1. Click on the step number of the first sample that you want to be part of the multiple vial samples. The line will be highlighted blue.</li> <li>2. <b>Shift-Click</b> on the last sample that you want to be part of the contiguous list of vials. The first, last, and all the vials in between should be highlighted blue.</li> <li>3. Click <b>Edit Vials</b> → <b>Edit</b>. The <b>Group Edit Vial</b> dialog box appears. You will have the option to apply all variable edits or only the variables you select with a check box.</li> <li>4. Click <b>Save</b> to apply changes.</li> </ol>
<b>To make simultaneous changes to multiple vials (non-contiguous rows)</b>	<ol style="list-style-type: none"> <li>1. Click on the step number of the first sample that you want to be part of the multiple vial samples. The line will be highlighted blue.</li> <li>2. <b>Ctrl-Click</b> on each sample that you want to be part of the non-contiguous list of vials. All the vials selected should be highlighted blue.</li> <li>3. Click <b>Edit Vials</b> → <b>Edit</b>. The <b>Group Edit Vial</b> dialog box appears. You will have the option to apply all variable edits or only the variables you select with a check box.</li> <li>4. Click <b>Save</b> to apply changes.</li> </ol>
<b>To ensure that a row is no longer selected</b>	Click <b>Edit Vials</b> → <b>Clear Highlight</b> .
<b>To incorporate another protocol</b>	<ol style="list-style-type: none"> <li>1. Click <b>Edit Vials</b> → <b>Insert Protocol</b></li> <li>2. First select where you want to insert the new protocol within the existing protocol being edited.</li> <li>3. Select from the drop-down menu the name of the protocol you would like to insert. Click <b>Insert</b>.</li> </ol>



**Table 10: Editing Protocols (Continued)**

<b>To</b>	<b>Do This</b>
<b>To duplicate one or more rows</b>	<ol style="list-style-type: none"><li>1. Select the row(s), and then click <b>Edit Vials</b> → <b>Copy</b>.</li><li>2. Click <b>Edit Vials</b> → <b>Paste</b>. The selected row(s) are appended to the end of the protocol.</li></ol>
<b>To delete one or more rows</b>	Select the row(s) to delete, and then click <b>Edit Vials</b> → <b>Delete</b> .

Table 10: Editing Protocols (Continued)

To	Do This
<p><b>To edit the Rack(s) and/or Vial Position(s) for a Sievers Autosampler Sample protocol</b></p> <p><b>NOTE:</b> This is not allowed for Calibration or Verification protocols.</p>	<ol style="list-style-type: none"> <li>1. Open a Sample protocol. Click <b>Protocol</b> → <b>Samples</b> → <b>Open</b>.</li> <li>2. From the <i>Protocol</i> screen, use the drop down arrows on the <b>Rack</b> and <b>Vial</b> to edit the vial settings.</li> <li>3. Click <b>Save</b> to apply changes.</li> </ol> <p><b>Editing the Rack:</b></p> <ul style="list-style-type: none"> <li>• The <b>Rack</b> selection will allow the User to select from any Sievers Autosampler <i>Rack</i>.</li> <li>• Changing the <b>Rack</b> to <i>Rinse</i> or <i>Standards</i> shall update the <i>Type</i> and the vial shall not be displayed in the <i>Vial Grid</i>.</li> <li>• The <b>Rack</b> cannot be edited if the <b>Type</b> is <i>Rinse</i> or <i>Standard</i>.</li> <li>• Changing the Rack to a different Sample Rack will be reflected in the <i>Vial Grid</i>.</li> <li>• Changing the <i>Rack size</i> will reposition all vials in a sequential manner.</li> </ul> <p><b>Editing the Vial:</b></p> <ul style="list-style-type: none"> <li>• The <b>Vial</b> position may be set to any valid position in the Rack unless the Rack is set to <i>Rinse</i> or <i>Standards</i>.</li> <li>• The <b>Vial</b> cannot be edited if the <b>Type</b> is <i>Rinse</i> or <i>Standard</i>.</li> <li>• NOTE: If two or more Vials are set to the same <b>Rack</b> or <b>Vial</b> position, an error will occur upon saving. The error message will identify the first two “Step Numbers” that are in conflict. However, there may be additional conflicts.</li> <li>• Inserting one or more vials or vials from a protocol shall place the vials in the next empty position starting with Rack 1, Vial Position 1.</li> <li>• <b>Copy</b> and <b>Paste</b> will position vials in the next available empty positions.</li> <li>• The vial sequence identified in the protocol will be the needle sequence when the protocol is run.</li> </ul>

## Running a protocol

### To run a protocol

1. Click **Protocol** → **Samples** → **Open**.
2. In the **Protocol** field, select the protocol to run. Select **Open**.
3. Click **Analysis** → **Run** or use **Run** in the secondary menu bar.

**NOTE:** A **Warning** will be displayed when initiating Analysis if the Calibration setting is using a "Default" calibration.

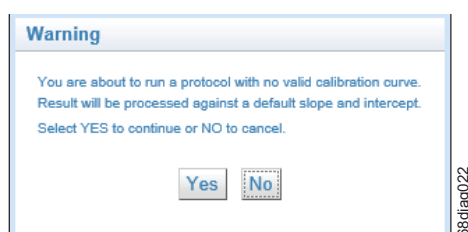


Figure 68: Default slope and intercept Warning

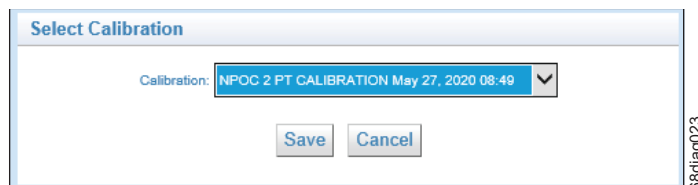
4. The **Result Name** dialog box appears.



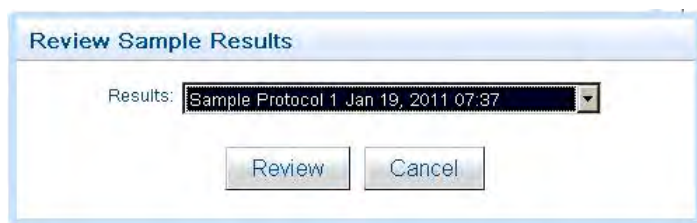
5. Complete the following to save the results file:
  - **Result Name** — Type a name for the results file.
  - **Analysis will start at Step Number** — Type the number for the beginning step of the protocol process.
6. Click **OK**. The Sievers Autosampler automatically begins the sampling analysis according to the protocol instructions, and the results of the sampling analysis display on the screen.

**NOTE:** The *InnovOx User Interface* will automatically change to view the *Measurement Screen* when a protocol is initiated.

7. The protocol field colors change according to the status of analysis.
8. After analysis completes, it is possible to *edit* the Calibration used for each measurement, if necessary. If needed, do the following.
  - a. From the *Results* screen, select a vial and then click **Analysis** → **Change Calibration**.
  - b. Select a new calibration from the *Select Calibration* menu.



- c. Press the **Save** button. The new results will be computed and the screen shall update with the new results. The new calibration name will be displayed in the *Vial Information*.
9. To save and/or print a PDF file containing these results, click **Reports** → **Sample Result** → **Summary or Detail**. The Summary report is a condensed version of the Detail report. The **Review Sample Results** box appears.



10. Click **Review** to display the PDF file. You can save and/or print this file, as needed.

## Reviewing Protocols and Results

You can review protocols, results, or calibration data in a PDF file.

### To review protocols and results

1. To Review Protocols, click **Reports** and one of the following choices:
  - **Sample Protocol**: review protocol details
  - **Sample Results**: completed results in summary or detail format
  - **Calibration Protocol**: review calibration details
  - **Calibration Result**: completed results with calibration curve and data

- **Verification Protocol:** review verification details
  - **Verification Result:** completed verification results with performance evaluation
2. The **Review** dialog box appears.
  3. Select from the drop-down menu and click **Review**.
  4. A PDF report is generated for review or printing.

## Reviewing Current Analysis Data

When a protocol is running, you can display the summary of the current analysis by selecting **Analysis** → **Measurement Screen**, OR by selecting the **Measurement Screen** button in the *secondary menu bar*.

## Running System Protocols

You can run two kinds of system protocols with the *InnovOx User Interface*: calibrations and verifications.

## Creating Calibration and Verification Protocols

The Sievers InnovOx ES Laboratory TOC Analyzer must be calibrated for the mode in which you will be operating. The Analyzer allows calibration for NPOC, IC, and TC/TOC modes. The web connection for the Analyzer lets you access the calibration protocols that have been created both via the Web and on the Analyzer. If you want to create a new calibration protocol via the Web, follow these steps:

1. Click **Protocols** → **Calibrations** or **Verifications** → **Open....**
2. The appropriate *Open* screen appears. Select the calibration or verification you want to modify.
3. To edit the *Number of Points*, *Range (PPM)*, *Acid* or *Oxidizer %*, *Spurge Minutes*, *Blank Correction*, *Auto Dilution*, and *Calibration Type*, click **Protocols** → **Calibrations** or **Verifications** → **Setup**. The appropriate *Setup* screen appears. Change the number of points to be used.

Consult [Chapter 6, "Calibration and Verification"](#) for more information on specific calibration and verification settings.

Calibration Setup

Calibration Mode: NPOC

Number of Points: 1

Range (PPM): Up To 1,000

Acid %: 5.00

Oxidizer %: 15.0

Sparge Minutes: 0.80

Blank Correction: ☒ On ☐ Off

Auto Dilution: ☒ On ☐ Off

Calibration Type: Point to Point

Accept Cancel

Figure 69: The Calibration Setup Screen

4. Click **Accept**.
5. When you are finished, click the **Save** or **Save as** button in the secondary menu bar.
6. You will be prompted to assign a name to the protocol. Enter the name and press **Save**.

Table 11: Approximate Number of Repetitions — Completely Filled 40-mL Vial

Range*				
100 ppm	1,000 ppm	5,000 ppm	20,000 ppm	50,000 ppm
8	8	15	20	20

\* These Ranges are based on a completely filled 40-mL Vial and no sample flushes for NPOC, IC, and TC Modes. Divide the number of reps shown above by 2 for TOC mode.

### To run a Calibration or Verification protocol

1. Click **Protocol** → **Calibrations** or **Verifications** → **Open....**
2. The appropriate *Open* screen appears. Select the Calibration or Verification you want to run.
3. Click **Analysis** → **Run** or select the **Run** button in the secondary menu bar.
4. A *24-Hour Flush* dialog will appear. Perform a reagent flush if a flush has not been performed within the last 24 hours. Press **Flush** to start the reagent flush. Press **Skip** to skip the reagent flush.
5. The protocol will run and an *Apply Calibration or Verification Measurements* dialog will appear upon completion.

- The *Apply Calibration* dialog displays the Calibration Summary and all of the measurements. Select the check-boxes in the *Rejected* column to edit measurement rejected states, as needed.
  - The *Verification Measurements* dialog displays the Verification Summary and all the measurements. Select the check-boxes in the *Rejected* column to edit measurement rejected states, as needed. The Verification Summary is automatically updated after a measurement reject state is changed.
6. If necessary, it is possible to *apply a new Standard* to a Calibration result or *apply a new Calibration to a Verification Summary* after the measurements have been performed.
- To apply a new Standard to a Calibration result, see [“To apply a new Standard to a Calibration result” on page 175](#).
  - To apply a new Calibration to a Verification Summary, see [“To apply a new Calibration to a Verification Summary” on page 176](#).

### ***To apply a new Standard to a Calibration result***

After running a *Calibration protocol*, it is possible to change the *Standard* that was used within the Calibration protocol and apply it to the Calibration results. This procedure is applicable to IC, TC, NPOC, and TOC Calibrations.

1. Run a *Calibration protocol*. For more information see [“To run a Calibration or Verification protocol” on page 174](#).
2. At the conclusion, an *Apply Calibration* dialog will be displayed.
3. Select the *Standard* text box. It will become active.
4. Type in the new **Standard value** in the *Calibration Summary* and select away from the text box. The *new* Standard will be automatically applied to the Measurements and reflected in the summary.
5. Select the check-boxes in the *Rejected* column to edit measurement rejected states, as needed. If no edits are needed, continue to the next step.
6. Select the **Apply** button to apply and close the *Apply Calibration* dialog.

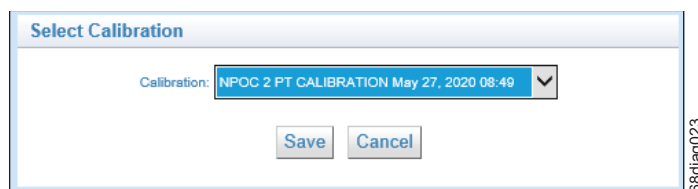
## To apply a new Calibration to a Verification Summary

After running a *Verification protocol*, it is possible to change the *Calibration* that was used within the Verification protocol and apply it to the Verification results. This procedure is applicable to IC, TC, NPOC, and TOC Verifications.

1. Run a *Verification protocol*. For more information see [“To run a Calibration or Verification protocol” on page 174](#).
2. At the conclusion, a *Verification Measurements* dialog will be displayed.
3. Select the check-boxes in the *Rejected* column to edit the measurement rejected states, as needed. If no edits are needed, continue to the next step.
4. Select the **OK** button to close the *Verification Measurements* screen. **Do not navigate away from the Results screen.**
5. Select a vial **Point** and navigate to **Analysis → Change Calibration** to open the *Select Calibration* dialog.

**NOTE:** An error will occur if a vial **Point** is not selected first. If this occurs, close the *Error* dialog, select a vial **Point**, and repeat Step [5](#).

6. From the *Select Calibration* dialog, select a new **Calibration**.



**Figure 70: Select Calibration dialog**

7. Select the **Save** button. This will apply the *new* calibration to the Verification results and the update the *Results* screen.

**NOTE:** This procedure can be repeated while the *Results* screen is active. Navigating away from the *Results* screen will lock in the selected Calibration within the *Verification Results*.



## Chapter 9. Maintenance

To ensure optimum performance of the Sievers InnovOx ES Laboratory TOC Analyzer, routinely perform the maintenance described in this chapter. Maintenance items **MUST** be purchased from Veolia.

If you need additional assistance when performing this preventative maintenance, contact Technical Support or your local service provider. You can also visit our website.

Suggested maintenance varies with three types of applications: **Normal**, **Harsh**, and **Extreme**. A flowchart to help determine which maintenance schedule to use is included in [Table 12, “Maintenance Schedule Type \(by Industry Application\),” on page 178](#).

*NOTE: If you are still unable to determine a maintenance schedule for your specific application, or you need additional assistance when performing this preventative maintenance, please contact Technical Support or your local service provider.*

After determining which schedule to use, refer to one of the following:

- **Normal Applications** — [Table 13, “Recommended Maintenance Schedule — Normal Applications,” on page 179](#).
- **Harsh Applications** — [Table 14, “Recommended Maintenance Schedule — Harsh Applications,” on page 180](#).
- **Extreme Applications** — [Table 15, “Recommended Maintenance Schedule — Extreme Applications,” on page 181](#).

**Table 12: Maintenance Schedule Type (by Industry Application)**

### Sievers\* InnovOx Lab recommended maintenance schedule flow chart

Industry	Application	Recommended Maintenance Schedule†
Environmental	Discharges	Normal
	Seawater	Harsh
	Leachates	Harsh
Wastewater	WWTP Influent / Effluent	Normal
	WWTP Treatment Process	Normal
Specialty Chemicals	Brine (All Types)	Harsh
	Urea, AN & UAN Fertilizers	Normal
	Acids (<1%)	Harsh
	NaOH (< 5M)	Harsh
Universities & Research Centers	Chemical, Environmental, Agricultural Engineering	Normal
Cleaning Verification & Method Development	Cleaning Verification	Normal
Industrial Effluent & Processes	Petroleum Refinery Desalter & Brine Effluent	Harsh
	Mine Ore	Harsh
	Metal Plating Solutions	Harsh
	Food & Beverage	Harsh

† - Based on running < 15 samples a day. If running > 15 samples per day it is recommended you choose the next highest level of maintenance that listed above.

[www.sieversinstruments.com](http://www.sieversinstruments.com)

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## Sievers\* InnovOx Laboratory TOC Analyzer recommended maintenance schedule normal applications

**Table 13: Recommended Maintenance Schedule — Normal Applications**

Service	Daily	Weekly	Monthly	3 Month	6 Month	9 Month	Yearly	Replacement Parts and Notes
Check Dilution Water Level	✓	✓	✓	✓	✓	✓	✓	-
Check Acid Level	✓	✓	✓	✓	✓	✓	✓	-
Check Oxidizer Level	✓	✓	✓	✓	✓	✓	✓	APK 68050-XX
Check For Leaks	✓	✓	✓	✓	✓	✓	✓	-
Empty Waste Container	✓	✓	✓	✓	✓	✓	✓	-
Inspect Buffer Coil for Large Bubbles	✓	✓	✓	✓	✓	✓	✓	-
Inspect Syringe and Reagent Valves For Leaks	✓	✓	✓	✓	✓	✓	✓	-
Inspect Pinch Tubing	✓	✓	✓	✓	✓	✓	✓	Check for Softening/Swelling/Cracking
Inspect Pump Tubing or Pump Heads	✓	✓	✓	✓	✓	✓	✓	Check for Softening/Swelling/Cracking
Inspect V2-R Gas Tubing	✓	✓	✓	✓	✓	✓	✓	Check for Salt Build Up and Clogging
Inspect GLS for Clogging	✓	✓	✓	✓	✓	✓	✓	-
Inspect Drain Line For Flow	✓	✓	✓	✓	✓	✓	✓	-
Inspect Sample Feed Lines for Leaks	✓	✓	✓	✓	✓	✓	✓	-
Replace Liquid in GLS		✓	✓	✓	✓	✓	✓	-
Wipe Down Outside of Analyzer		✓	✓	✓	✓	✓	✓	-
Clean Vial Port and Needles (if Used)		✓	✓	✓	✓	✓	✓	-
Replace Oxidizer			✓	✓	✓	✓	✓	APK 68050-XX
Check & Tighten All Barbed Fittings and Thumb Screws				✓	✓	✓	✓	-
Replace High-Pressure Valve Seals †				✓	✓	✓	✓	APK 68110-XX
Inspect and Clean Valve Bodies				✓	✓	✓	✓	-
Clean the Sparger				✓	✓	✓	✓	-
Lubricate Syringe				✓	✓	✓	✓	APK 68306-XX
Replace Pump Tubing †					✓	✓	✓	APK 68615-XX
Perform Diagnostics					✓		✓	-
Replace Pinch Tubing †					✓		✓	APK 68100-XX
Replace NDIR Filter					✓		✓	HFL 68100-XX
Replace Waste Tubing					✓		✓	APK 68130-XX
Replace All Gas Tubing							✓	APK 68140-XX
Replace Scrubber Filter Cartridge (if Equipped)							✓	APK 68555-XX
Replace Air Pump Diaphragm and Disc Filter (if Equipped)							✓	ARK 34110 & HTF 34000
Replace Halogen Trap (if Equipped)							✓	APK 68705-XX
<b>Estimated Time to Complete Service (Minutes)</b>	<b>5</b>	<b>10</b>	<b>15</b>	<b>30</b>	<b>120</b>	<b>30</b>	<b>150</b>	
<b>Service Kits available—contact your local Sievers Sales Representative or Field Service Technician for more information.</b>								

† - The replacement/service interval of these items are subject to instrument application and may vary drastically from the suggested replacement interval. In most cases, replacement of these items are more frequent than stated in the above table. A Check Standard should be run after maintenance activities have been completed to verify instrument operation and performance. Please contact Sievers Technical Support or your local service provider for questions regarding InnovOx maintenance.



## Sievers\* InnovOx Laboratory TOC Analyzer recommended maintenance schedule harsh applications

**Table 14: Recommended Maintenance Schedule — Harsh Applications**

Service	Daily	Weekly	Monthly	3 Month	6 Month	9 Month	Yearly	Replacement Parts and Notes
Check Dilution Water Level	✓	✓	✓	✓	✓	✓	✓	-
Check Acid Level	✓	✓	✓	✓	✓	✓	✓	-
Check Oxidizer Level	✓	✓	✓	✓	✓	✓	✓	APK 68050-XX
Check Humidifier Water Level (If Equipped)	✓	✓	✓	✓	✓	✓	✓	-
Check For Leaks	✓	✓	✓	✓	✓	✓	✓	-
Empty Waste Container	✓	✓	✓	✓	✓	✓	✓	-
Inspect Buffer Coil for Large Bubbles	✓	✓	✓	✓	✓	✓	✓	-
Inspect Syringe and Reagent Valves For Leaks	✓	✓	✓	✓	✓	✓	✓	-
Inspect Pinch Tubing	✓	✓	✓	✓	✓	✓	✓	Check for Softening/Swelling/Cracking
Inspect Pump Tubing	✓	✓	✓	✓	✓	✓	✓	Check for Softening/Swelling/Cracking
Inspect V2-R Gas Tubing	✓	✓	✓	✓	✓	✓	✓	Check for Salt Build Up and Clogging
Inspect GLS for Clogging	✓	✓	✓	✓	✓	✓	✓	-
Inspect Drain Line For Flow	✓	✓	✓	✓	✓	✓	✓	-
Inspect Sample Feed Lines for Leaks	✓	✓	✓	✓	✓	✓	✓	-
Replace Liquid in GLS	✓	✓	✓	✓	✓	✓	✓	-
Wipe Down Outside of Analyzer	✓	✓	✓	✓	✓	✓	✓	-
Clean Vial Port and Needles (If Used)	✓	✓	✓	✓	✓	✓	✓	-
Replace Oxidizer	✓	✓	✓	✓	✓	✓	✓	APK 68050-XX
Check & Tighten All Barbed Fittings and Thumb Screws	✓	✓	✓	✓	✓	✓	✓	-
Replace High-Pressure Valve Seals †	✓	✓	✓	✓	✓	✓	✓	APK 68110-XX
Inspect and Clean Valve Bodies	✓	✓	✓	✓	✓	✓	✓	-
Perform Diagnostics	✓	✓	✓	✓	✓	✓	✓	-
Replace Pump Tubing †	✓	✓	✓	✓	✓	✓	✓	APK 68615-XX
Replace Pinch Tubing †	✓	✓	✓	✓	✓	✓	✓	APK 68100-XX
Clean the Sparger	✓	✓	✓	✓	✓	✓	✓	-
Lubricate Syringe	✓	✓	✓	✓	✓	✓	✓	APK 68306-XX
Replace NDIR Filter	✓	✓	✓	✓	✓	✓	✓	HFL 68100-XX
Replace Waste Tubing	✓	✓	✓	✓	✓	✓	✓	APK 68130-XX
Replace All Gas Tubing	✓	✓	✓	✓	✓	✓	✓	APK 68140-XX
Replace Scrubber Filter Cartridge (If Equipped)	✓	✓	✓	✓	✓	✓	✓	APK 68555-XX
Replace Air Pump Diaphragm & Disk Filter (If Equipped)	✓	✓	✓	✓	✓	✓	✓	ARK 34110 & HTF 340001
Replace Halogen Trap (If Equipped)	✓	✓	✓	✓	✓	✓	✓	APK 68705-XX
<b>Estimated Time to Complete Service (Minutes)</b>	<b>5</b>	<b>10</b>	<b>30</b>	<b>120</b>	<b>130</b>	<b>120</b>	<b>150</b>	
<b>Service Kits available—contact your local Sievers Sales Representative or Field Service Technician for more information.</b>								

† - The replacement/service interval of these items are subject to instrument application and may vary drastically from the suggested replacement interval. In most cases, replacement of these items are more frequent than stated in the above table. A Check Standard should be run after maintenance activities have been completed to verify instrument operation and performance. Please contact Sievers Technical Support or your local service provider for questions regarding InnovOx maintenance.



## Sievers\* InnovOx Laboratory TOC Analyzer recommended maintenance schedule extreme applications

**Table 15: Recommended Maintenance Schedule — *Extreme Applications***

Service	Daily	Weekly	Monthly	3 Month	6 Month	9 Month	Yearly	Replacement Parts and Notes
Check Dilution Water Level	✓	✓	✓	✓	✓	✓	✓	-
Check Acid Level	✓	✓	✓	✓	✓	✓	✓	-
Check Oxidizer Level	✓	✓	✓	✓	✓	✓	✓	APK 68050-XX
Check For Leaks	✓	✓	✓	✓	✓	✓	✓	-
Empty Waste Container	✓	✓	✓	✓	✓	✓	✓	-
Inspect Buffer Coil for Large Bubbles	✓	✓	✓	✓	✓	✓	✓	-
Inspect Syringe and Reagent Valves For Leaks	✓	✓	✓	✓	✓	✓	✓	-
Inspect Pinch Tubing	✓	✓	✓	✓	✓	✓	✓	Check for Softening/Swelling/Cracking
Inspect Pump Tubing	✓	✓	✓	✓	✓	✓	✓	Check for Softening/Swelling/Cracking
Inspect V2-R Gas Tubing	✓	✓	✓	✓	✓	✓	✓	Check for Salt Build Up and Clogging
Inspect GLS for Clogging	✓	✓	✓	✓	✓	✓	✓	-
Inspect Drain Line For Flow	✓	✓	✓	✓	✓	✓	✓	-
Inspect Sample Feed Lines for Leaks	✓	✓	✓	✓	✓	✓	✓	-
Replace Liquid in GLS		✓	✓	✓	✓	✓	✓	-
Wipe Down Outside of Analyzer		✓	✓	✓	✓	✓	✓	-
Clean Vial Port and Needles (If Used)		✓	✓	✓	✓	✓	✓	-
Replace Oxidizer		✓	✓	✓	✓	✓	✓	APK 68050-XX
Check & Tighten All Barbed Fittings and Thumb Screws		✓	✓	✓	✓	✓	✓	-
Replace High-Pressure Valve Seals †		✓	✓	✓	✓	✓	✓	APK 68110-XX
Inspect and Clean Valve Bodies		✓	✓	✓	✓	✓	✓	-
Replace Pump Tubing †		✓	✓	✓	✓	✓	✓	APK 68615-XX
Perform Diagnostics		✓	✓	✓	✓	✓	✓	-
Replace Pinch Tubing †		✓	✓	✓	✓	✓	✓	APK 68100-XX
Clean the Sparger		✓	✓	✓	✓	✓	✓	-
Lubricate Syringe		✓	✓	✓	✓	✓	✓	APK 68306-XX
Replace NDIR Filter		✓	✓	✓	✓	✓	✓	HFL 68100-XX
Replace Waste Tubing		✓	✓	✓	✓	✓	✓	APK 68130-XX
Replace All Gas Tubing		✓	✓	✓	✓	✓	✓	APK 68140-XX
Replace Air Filter Cartridge (If Equipped)		✓	✓	✓	✓	✓	✓	APK 68555-XX
Replace Air Pump Diaphragm & Disc Filter (If Equipped)		✓	✓	✓	✓	✓	✓	APK 34110 & HTF 34000
Replace Halogen Trap (If Equipped)		✓	✓	✓	✓	✓	✓	APK 68705-XX
<b>Estimated Time to Complete Service (Minutes)</b>	<b>5</b>	<b>10</b>	<b>30</b>	<b>120</b>	<b>130</b>	<b>120</b>	<b>150</b>	
<b>Service Kits available—contact your local Sievers Sales Representative or Field Service Technician for more information.</b>								

† - The replacement/service interval of these items are subject to instrument application and may vary drastically from the suggested replacement interval. In most cases, replacement of these items are more frequent than stated in the above table. A Check Standard should be run after maintenance activities have been completed to verify instrument operation and performance. Please contact Sievers Technical Support or your local service provider for questions regarding InnovOx maintenance.

## Recommended Spare Parts

Veolia recommends that you obtain the following maintenance items to ensure spare parts are readily available, dictated by your maintenance schedule (Yearly maintenance kits, that include all necessary items, are also available.):

- Reactor Seal Kit
- NDIR Filter
- Gas Tubing Kit
- Waste Tubing Kit
- Boxer Sample Pump Tubing Kit

To order spare parts, contact Customer Care or your local service provider. Installation and training by a qualified service technician can also be provided.

## Periodic Maintenance Tasks

For help with periodic maintenance tasks, contact Technical Support or your local service provider. You can also visit our website.

## Daily Inspections

To ensure optimum performance of the Analyzer, inspect the following items daily before operating the Analyzer.

1. **Check reagent levels.** Inspect the reagent and dilution water containers to ensure that there is adequate Acid, Oxidizer, and Dilution Water to perform the analyses. Prepare the reagents, if necessary, according to the directions in [“Reagents” on page 266](#).
2. **Check Oxidizer age.** The oxidizer reagent loses strength as it ages, depending upon its temperature. (See [Figure 121 on page 268](#) in [“Oxidizer considerations” on page 268](#).) Prepare fresh 30% (W/V) sodium persulfate oxidizing solution, if necessary. See [“To prepare the Oxidizer \(sodium persulfate oxidizing solution\)” on page 269](#).
3. **Check waste container.** Ensure that the waste container is not full. (Dispose of excess waste liquid according to pertinent regulations.) Also, add base to waste container (such as 50 g soda ash or sodium hydroxide per liter of waste) to neutralize the waste that will be collected. This prevents discharge of potentially toxic gases from the waste solution. Also, if chloride-containing samples are run, add 10 g/L of activated carbon to the waste container.

4. **Check waste tubes.** Ensure the waste tubes are in the Waste Container, but make sure that the Gas/Liquid Waste tube **does not** extend into the liquid. Ensure the Gas/Liquid Waste tube **does not** rise above the level of the “Gas/Liquid Waste” barb.
5. **Check reagent and dilution water tubes.** Ensure that the ends of the reagent and dilution water tubes extend into their respective liquids. Do not push the tubes into the containers so far that they bend up and extend out of the liquid.
6. **Prime Reagents, if necessary.** Ensure that the tubing from the reagent and dilution water containers is full of liquid, and that there are no large bubbles in those tubes. If any of the tubes contain large bubbles, perform a **Prime Reagent**. See [“Performing a Prime Reagents” on page 184](#).
7. **Check calibration.** Analyze one or more check standards to confirm that the Analyzer is operating properly and that its calibration is accurate.
8. **Check GLS (Gas-Liquid Separator) for clogs.** Verify that the clear PVC cylinder appears to be full of water. If large bubbles are emerging from the center of the GLS and traveling up towards the top of the assembly, there is a clog. Remove the clog to allow the PVC cylinder to fill. See [“Cleaning the GLS, \(Gas-Liquid Separator\)” on page 184](#).
9. **Inspect pinch tubing.** Verify that all pinch tubing remains pliable, elastic, and does not become discolored. If tubing response becomes slow or the tubing becomes discolored, replace immediately. See [“Replacing the Pinch Valve Tubing” on page 193](#).
10. **Inspect peristaltic pump tubing.** Visually inspect the peristaltic pump tubing for excessive softening, discoloration, or lack of fluid movement. If any of these symptoms are observed, replace the pump tubing immediately. Peristaltic pump tubing becomes flat and worn over time. If not addressed, the tubing can rupture causing damage throughout the instrument. See [“Replacing the Peristaltic Pump Head Tubing” on page 195](#).
11. **Inspect V2R tubing.** Inspect the clear gas line extending from the outlet of V2-R to the top of the Reactor Inlet valve. This tubing can become blocked with crystalline deposits over time. This is especially true when analyzing high TDS samples, i.e., Concentrated Brine. If crystalline deposits are observed in this gas line, replace immediately.

## Adding the Dilution Water

1. Fill the “Dilution Water” bottle (from the Accessories Kit) with deionized water or the best-quality water available to you.
2. Attach one end of the tubing to the top (tan) port, and tighten the PEEK nut finger-tight.
3. Insert the other end of the tubing into the bottle.

## Performing a Prime Reagents

When installing new reagents, perform a *Prime Reagents* to clear the tubing of bubbles and old solution. You can perform Prime Reagents by following these steps:

1. Select the **Maintenance** tab.
2. Press the **Prime Reagents** button.
3. Select the Prime you want to perform:
  - **Prime Acid**: Primes the Acid.
  - **Prime Oxidizer**: Primes the Oxidizer.
  - **Prime Dilution**: Primes the Dilution Water.
  - **Prime All**: Primes the Acid, Oxidizer and Dilution Water.

## Cleaning the Analyzer

You can clean the external housing of the Analyzer with a damp cloth using water or non-abrasive cleaners. Prior to cleaning, shut down the Analyzer (**Maintenance** → **Shutdown**), turn the Analyzer power switch to *Off*, and disconnect the power cord from main power. Do not spray liquids directly on the Analyzer. Wipe dry with a clean, soft cloth.

The touchscreen may be cleaned with a soft cloth or cotton pad lightly applied with a spray cleaner. Isopropyl Alcohol may be used, but ensure that all solvent residue is removed. Water may cause damage or discoloration of the polarizer. Clean any condensation or moisture from any source immediately. Before cleaning the screen, you can temporarily deactivate touchscreen sensitivity for 30 seconds by selecting the following option:

1. Press the **Menu** button and select the **Maintenance** tab.
2. Press the **Advanced** button.
3. Press the **Clean Screen** button.

## Cleaning the GLS, (Gas-Liquid Separator)

The Gas-Liquid Separator requires periodic cleaning, when residue builds up inside. Water in the Gas-Liquid Separator is acidic. Wear safety goggles and gloves during this procedure.



## To clean the Gas-Liquid Separator

### Warning

When handling components that contain sample, standards, waste solution, or reagents, wear eye protection and gloves.

1. Stop any analysis.
2. Shut down the Analyzer via the on-screen menu (**Maintenance** → **Shutdown**).
3. Wait for the display to turn off, and then turn the power switch (located on the back of the Analyzer) to the *Off* position.
4. Disconnect the power cable.
5. Remove the Fluidics Cover from the right side of the Analyzer.
6. Disconnect the tubing that connects to the barbs on the Gas-Liquid Separator.
7. Loosen the screw that secures the Gas-Liquid Separator bracket, and pull the Gas-Liquid Separator away from the Analyzer.
8. Gently pull the components of the Gas-Liquid Separator apart over an appropriate waste receptacle and dispose of the water.

*NOTE: There are two gray PVC pressure rings inside the Gas-Liquid Separator. Ensure these pressure rings remain installed and are not dislodged or lost when emptying the Gas-Liquid Separator waste.*

9. Rinse the Gas-Liquid Separator with water to remove any residue inside it. (A baby bottle brush or similar brush can aid in the process.)
10. Carefully fill the Gas-Liquid Separator with DI water until the clear tube on the Gas-Liquid Separator is completely full.

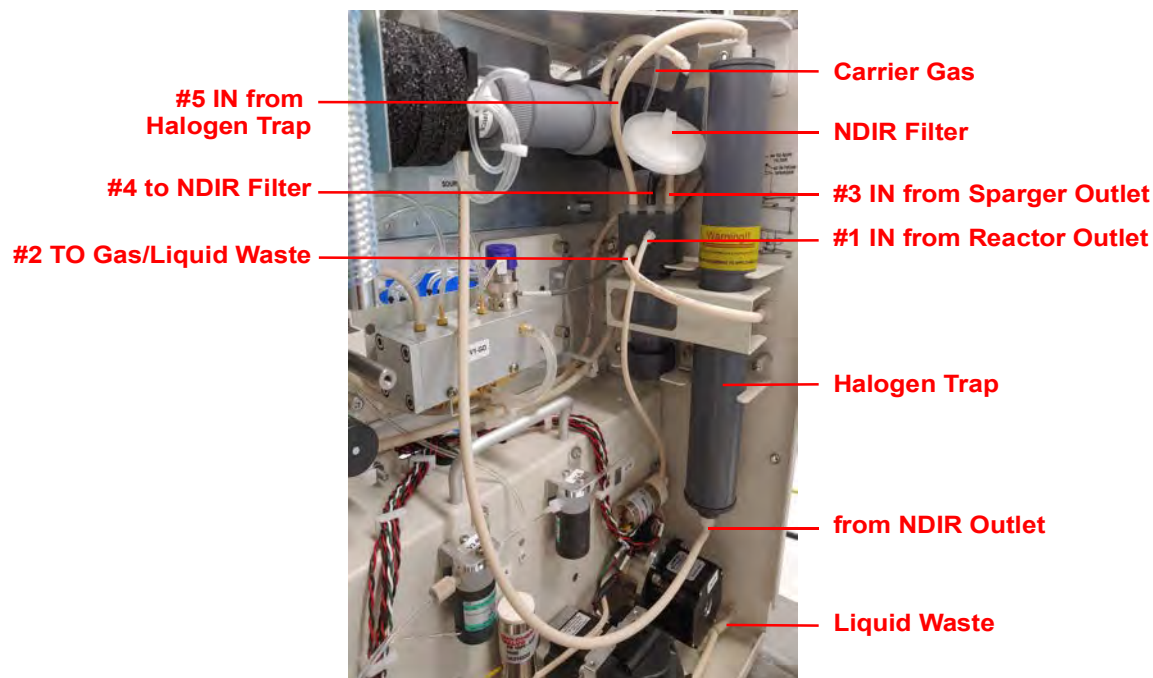
*NOTE: Ensure the pressure rings are installed correctly.*

11. Reassemble the Gas-Liquid Separator. Some DI Water will come out of the barbs when reassembling the Gas-Liquid Separator. This is normal and expected. Clean up any DI Water with a paper towel.

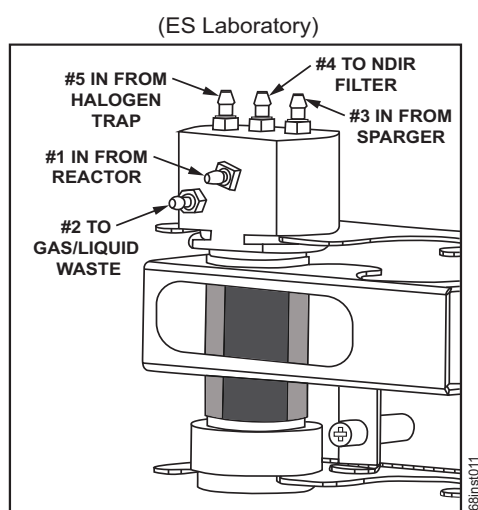
*NOTE: If no DI Water comes out, the barb may be clogged. Clean any clogged barbs and ensure flow can resume.*

12. Secure the Gas-Liquid Separator to the bracket by tightening the screw. Do not over-tighten.

13. Reconnect the tubing to the correct barbs (see [Figure 71](#) and [Figure 72](#)).
14. Perform other maintenance tasks, or reinstall the fluidics cover and return the Analyzer to normal operation.



**Figure 71: The Gas-Liquid Separator (GLS)**



**Figure 72: Gas-Liquid Separator (GLS), Lab Label**

## Cleaning the Sparger

The Sparger requires periodic cleaning, when residue builds up inside.

### *To clean the Sparger*

1. Stop any analysis.
2. Shut down the Analyzer via the on-screen menu (**Maintenance** → **Shutdown**).
3. Wait for the display to turn off, and then turn the power switch (located on the back of the Analyzer) to the *Off* position.
4. Disconnect the power cable. Remove the fluidics cover from the right side of the Analyzer.
5. Locate the Sparger and disconnect the tubing from the four barbs. See [Figure 73 on page 188](#).
6. Loosen the four screws that connect the Sparger to the bracket.
7. Remove the Sparger and carefully unplug the electrical connector attached to the mixer on the Sparger (M2-SH).

*NOTE: Use caution! The wires are fragile where they attach to the electromagnet.*

8. Gently pull the Sparger apart. Be sure to open the Sparger over an appropriate waste receptacle. Remove the mixing bar.
9. Rinse the thru-ports of the Sparger and the mixing bar with water.
10. Reassemble the Sparger with the mixing bar.
11. Reconnect the electrical connector.
12. Secure the Sparger to the bracket by tightening the four screws.
13. Reattach the tubing to the four barbs.
14. Perform other maintenance tasks, or reinstall the fluidics cover and return the Analyzer to normal operation.

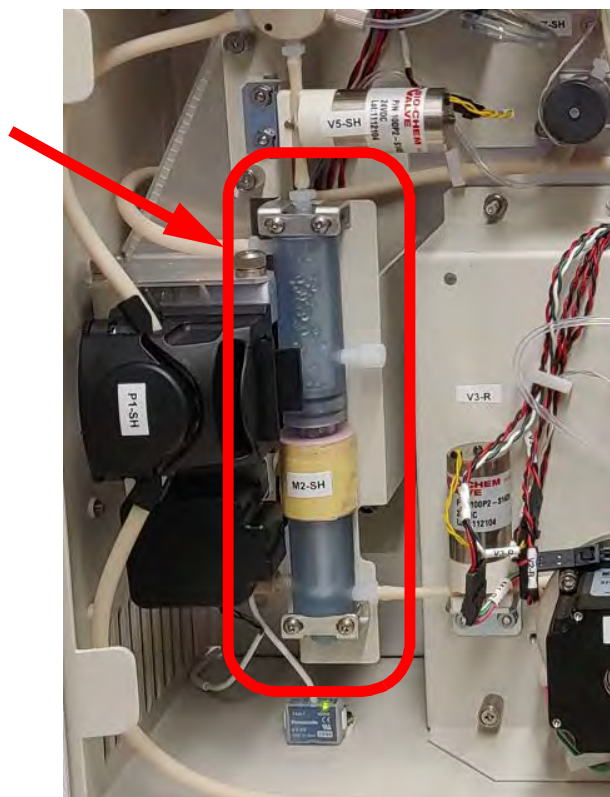


Figure 73: The Sparger

## Cleaning the Vial Port

The Vial Port requires periodic cleaning.

### *To clean the Vial Port*

1. Insert a Vial filled with Low TOC water into the Vial Port.
2. On the Touch Screen, navigate to the following: **Maintenance** → **Diagnostics** → **Valves** → **Flow Control Valves** → **Sample Handling Valves** → **V1-SH** → **P1-SH**.
3. Run this P1-SH pump until the vial is  $\frac{3}{4}$  empty.
4. Stop the pump first, then close V1-SH.
5. Exit the **Diagnostics** and **Maintenance** menus.
6. Remove the emptied vials.

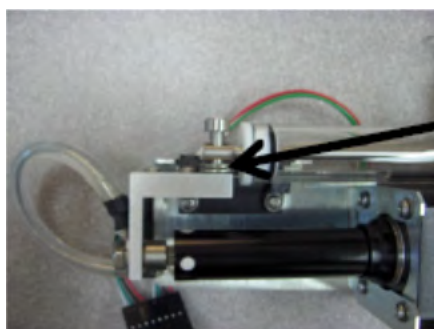
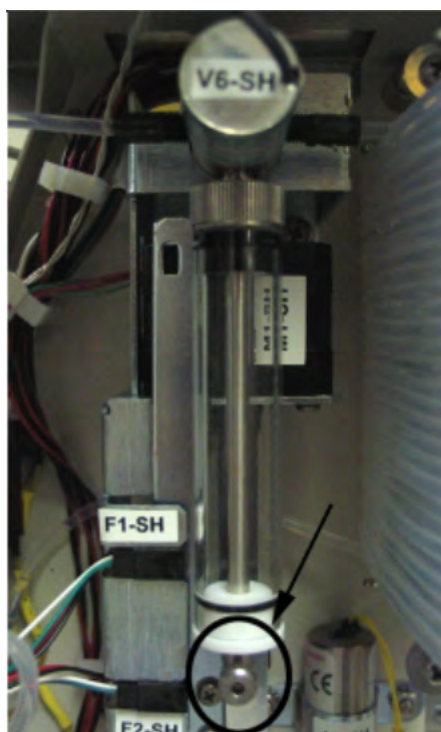
## Lubricating the Syringe

Perform this instruction after every three months of operation to ensure that the Analyzer is operating with adequately lubricated syringes.

### *To lubricate the syringe*

Before you begin, locate the Syringe Lubrication Kit that came with the Analyzer's Accessory Kit. You will also need to provide a 3/32 in. Allen (hex key) wrench.

1. Stop any analysis.
2. Shut down the Analyzer via the on-screen menu (**Maintenance** → **Shutdown**).
3. Wait for the display to turn off, and then turn the power switch (located on the back of the Analyzer) to the *Off* position.
4. Disconnect the power cable.
5. Remove the fluidics cover from the right side of the Analyzer.
6. Using a 3/32 in. Allen wrench, loosen and remove the screw that secures the syringe. Remove *any* washers under the block, and retain them for re-installation.

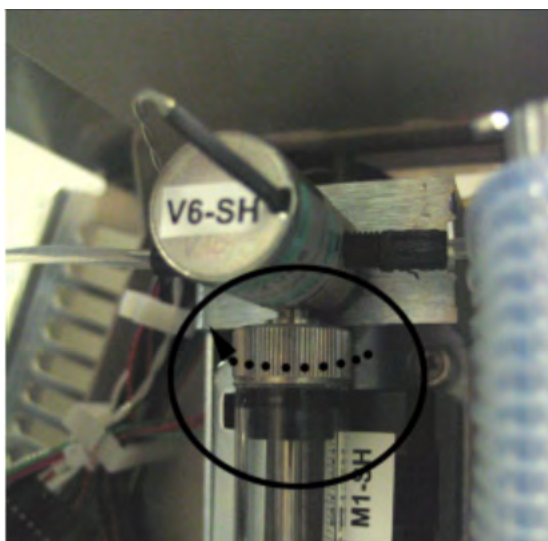


#### **Washers\***

*\*If these washers are NOT installed with your Analyzer. ignore this portion of the instruction.*

**Figure 74: Locating the Syringe Screw and Washers**

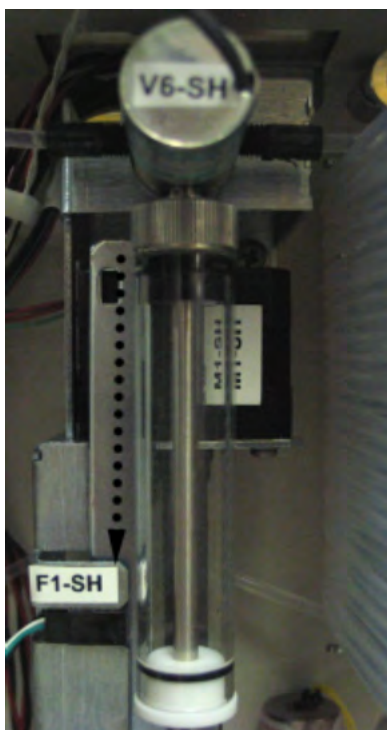
7. Unscrew the syringe base by turning the base to the left.



**Figure 75: Unscrewing the Syringe Base**

8. Remove the syringe from the Analyzer by pulling it down and away from the valve.

The washer should remain in the valve. If the washer comes free of the valve when you remove the syringe, be sure to capture the washer for re-installation. You must place the washer back on the plunger tip when reinstalling.



**Figure 76: Removing the Syringe**



9. Pull the plunger all the way out of the syringe barrel.



**Figure 77: Pulling out the Plunger**

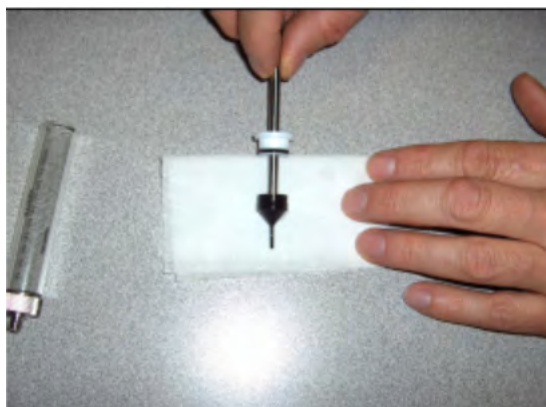
10. Fold a disposable lint free paper wipe in quarters. Remove the stopper from the lubricant container and place the folded wipe over the opening of the container.



**Figure 78: Removing the Stopper**

11. Turn the container over and allow an air bubble to rise to the base of the container. Turn the container right side up, wipe the opening and replace the stopper. Store the lubricant in an upright position.

12. Swirl the syringe tip once in the slightly moistened wipe and reinstall it into the syringe barrel. Cycle two or three strokes to ensure adequate distribution of the lubricant.



**Figure 79: Distributing the Lubricant**

13. Position the lubricated syringe under the valve.

*NOTE: If the washer became free upon removal, before reinstalling the syringe into the valve, ensure that the washer is in place at the top of the syringe.*

14. Screw the syringe base into the threading in the valve by turning the base to the right.
15. Using a 3/32 in. Allen wrench, tighten the screw that secures the syringe. The top of the syringe moves independently of the syringe plunger, so it can be aligned with the screw hole.
16. Attach the power cord and plug it into the A/C source. Restore power to the Analyzer.
17. Before returning the Analyzer to normal operation, run the liquid reactor flow diagnostic to confirm movement of the newly lubricated syringe.  
  
Also confirm that no leaks are present.
18. Reinstall the fluidics cover and return the Analyzer to normal operation.

## **Consumables Replacement**

To purchase consumables, contact Customer Care or your local service provider.

For help replacing consumables, contact Technical Support or your local service provider. You can also visit our website.



## Replacing the Pinch Valve Tubing

Pinch valve tubing in the Analyzer's pinch valves must be replaced periodically to ensure proper operation of these valves. Replace the tubing in accordance with your maintenance schedule.

### To replace the tubing

#### Warning

When handling components that contain sample, standards, waste solution, or reagents, wear eye protection and gloves.

Refer to [Figure 80](#) on page 195, as needed.

1. Stop any analysis.
2. Disconnect the reagents and dilution water from the Analyzer.
3. Remove the fluidics cover from the right side of the Analyzer.

#### Warning

Ensure that the cover on the left side of the Analyzer remains closed.

4. Locate the replacement tubing from the *Pinch Tubing Replacement Kit*. Cut the tubing for the following valves to the same lengths as the tubing you are replacing:

#### Valve Names

V1-SH	V2-SH	V3-SH	V5-SH
V3-R	V6-R	V7-R	

**NOTE:** Depending on the Analyzer configuration, some of these valves may not use pinch tubing.

5. To facilitate removal of the tubing from the valves, navigate to the *Flow Control Valves* screen (**Menu** → **Maintenance** → **Diagnostics** → **Valves** → **Flow Control Valves**).
6. Press the button for the appropriate flow control valves module you are changing [**Sample Handler Valves** or **Reactor Valves**] to display the available valves for that module.

**NOTE:** [Figure 80](#) on page 195 identifies the valves and their locations.

7. Press the specific valve button (such as *V1-SH* on the *Sample Handler Valves* detail screen) to open the valve.

**NOTE:** All valves, except **V6-R**, have a default state of *normally closed* so the first press on the button opens the valve and the next press closes the valve again. **V6-R** is *normally open* so the first press will close the valve.

8. Pull the sample tubing out of the valve and then disconnect the existing tubing from the barb at both ends.
9. Connect each new piece of tubing to the barbs, and then into the valve. Be sure to seat the tubing fully under the pin and all the way to the back of the valve opening.
10. After connecting each piece of tubing, return to the Analyzer screen to toggle the valve closed again.
11. After replacing the last piece of tubing, reconnect the reagents and dilution water to the Analyzer.
12. On the *Sample Handler Valves* screen, press the **Back** button to navigate through the previous screens (*Flow Control Valves*, *Valves*, and *Diagnostics* screens) to display the *Maintenance* tab.
13. Do one of the following:
  - Perform other maintenance tasks, as needed.
  - Reinstall the fluidics cover and return the Analyzer to normal operation.

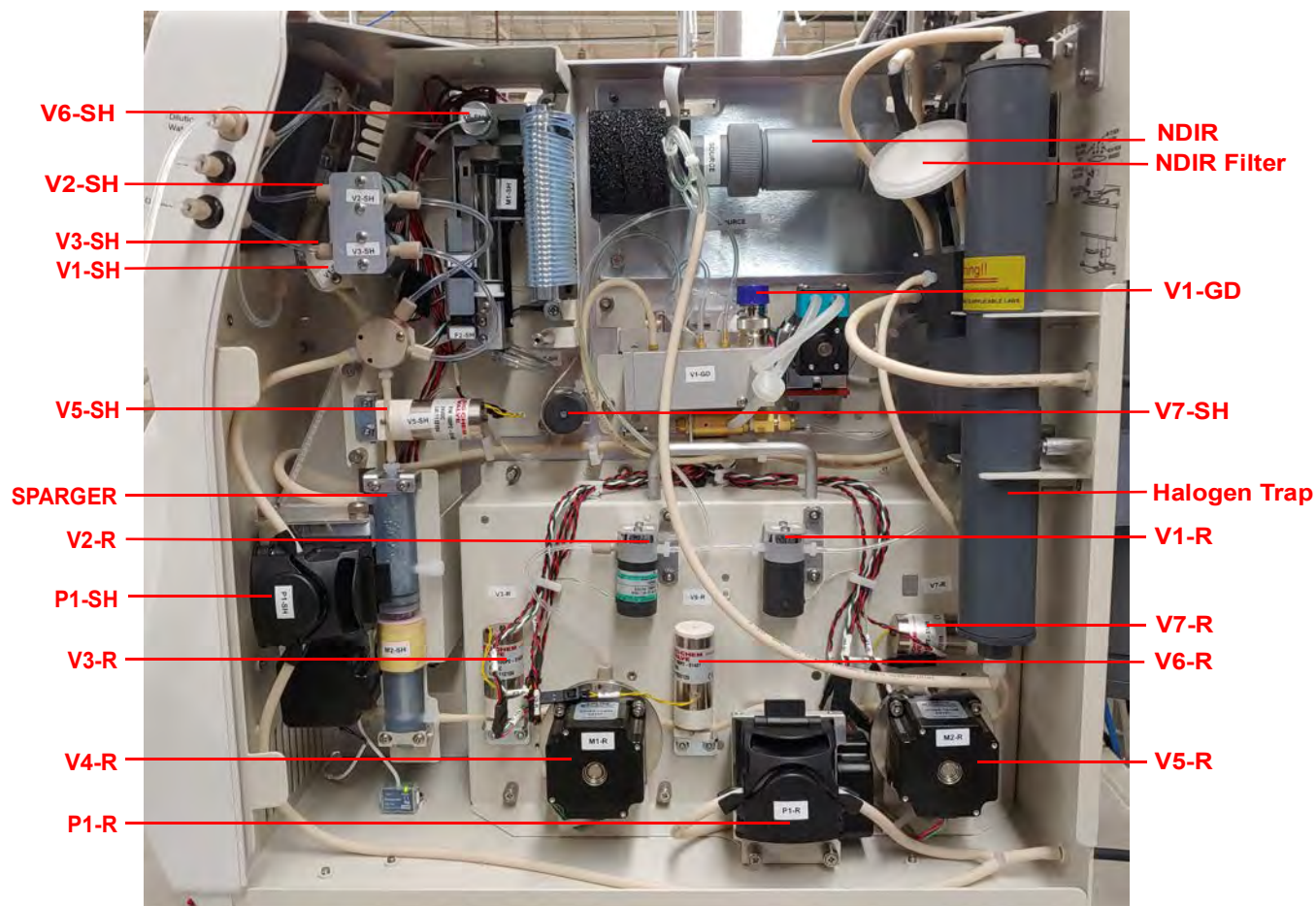


Figure 80: Valve Locations — Sievers InnovOx ES Laboratory TOC Analyzer

## Replacing the Peristaltic Pump Head Tubing

The Analyzer has two peristaltic pump heads: one in the Sample Handling module and one in the Reactor module. Replace the pump tubing in accordance with your maintenance schedule.

**NOTE:** This information pertains strictly to the peristaltic pumps (P1-R and P1-SH), and should not be confused with the maintenance schedule for the multi-stream, exterior sample pump located on the outside of the instrument.

## To replace the P1-SH or P1-R peristaltic pump-head tubing

### Warning

When handling components that contain sample, standards, waste solution, or reagents, wear eye protection and gloves.

1. Shut down the Analyzer via the on-screen menu (**Maintenance** → **Shutdown**).
2. Wait for the display to turn off, and then off power to the Analyzer using the main power switch on the side of the Analyzer.
3. Remove the fluidics cover from the right side of the Analyzer.
4. Disconnect the ends of the old pump-head tubing from the waste line and the sample inlet. (If additional room is needed for maneuvering, first remove the pump head by taking out its two screws.)
5. Pull open the lever located on the edge of the pump head to release the old tubing.
6. Install the new tubing through the pump head, as shown.



**P1-SH Pump Head**



**P1-R Pump Head**

7. Close the pump-head lever to secure the tubing.
8. Connect the ends of the new tubing, as follows:
  - **P1-SH Pump Head** — The tubing on top connects to the waste line and the tubing on the bottom connects to the sample inlet line.
  - **P1-R Pump Head** — The tubing on the left connects to the waste line and the right connects to the sample inlet line.
9. If you removed the pump head to install the tubing, reinstall the pump head now and secure it with the two screws.
10. Perform other maintenance tasks, or reinstall the fluidics cover and return the Analyzer to normal operation.

## Replacing the Carrier Gas CO<sub>2</sub> Scrubber Filter Cartridge

If you are using the optional *Carrier Gas CO<sub>2</sub> Scrubber* option, the *Filter Cartridge* should be replaced yearly.

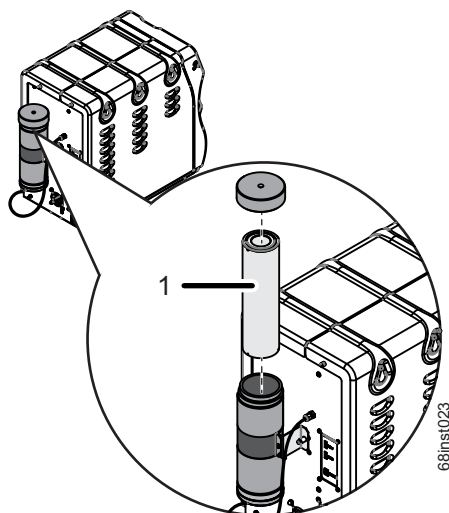


Figure 81: Replace the Carrier Gas CO<sub>2</sub> Scrubber Filter Cartridge

### To replace the Carrier Gas CO<sub>2</sub> Scrubber Filter Cartridge

1. Stop any Analysis.
2. Shut down the Analyzer via the on-screen menu (**Maintenance** → **Shutdown**).
3. Wait for the display to turn off, and then turn the power switch (located on the rear of the Analyzer) to the *Off* position.
4. Disconnect the power cable.
5. Unscrew the knurled cap on the top of the *Carrier Gas CO<sub>2</sub> Scrubber* housing.
6. Remove the old Filter Cartridge (**1**) and dispose of it in accordance with local and federal regulations. See [Figure 81 on page 197](#) and [Figure 82 on page 198](#).
7. Remove the new *Filter Cartridge* from the packaging. Two labels indicate the top and bottom of the cartridge. Take note of which end of the cartridge should be oriented toward the top, and then remove the two labels.
8. Install the new *Filter Cartridge* (**1**) into the *Scrubber Housing*, by inserting the cartridge so that the top end is up. See [Figure 81 on page 197](#).

9. Close the top of the *Scrubber Housing* by tightening the knurled cap.

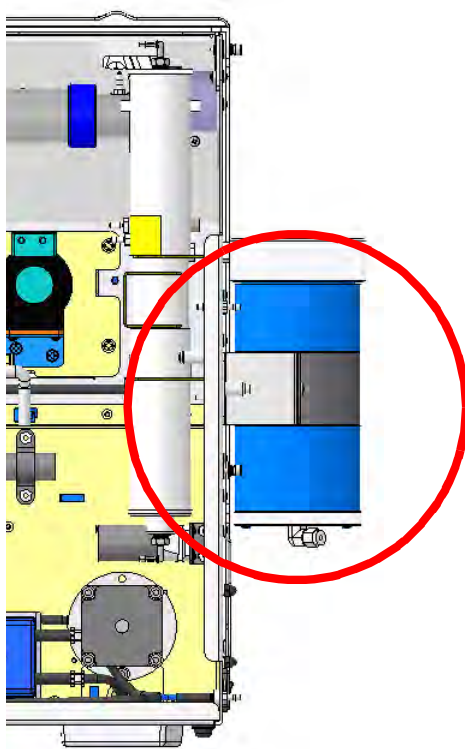


Figure 82: Carrier Gas CO<sub>2</sub> Scrubber

## Replacing the NDIR Filter

The NDIR filter (see [Figure 83](#)) should be replaced if the filter has become plugged with aerosols, or if liquid has gotten into the NDIR from the Gas-Liquid Separator, or after three months. Replacement of the NDIR filter is indicated when the carrier gas flow rate is too slow and the CO<sub>2</sub> peaks are occurring later in the measurement process than is normal. If liquid is found in the NDIR sample chamber, then the NDIR filter should be replaced.

### *To replace the NDIR Filter*

1. Stop any Analysis.
2. Shut down the Analyzer via the on-screen menu (**Maintenance** → **Shutdown**).
3. Wait for the display to turn off, and then turn the power switch (located on the back of the Analyzer) to the *Off* position.
4. Disconnect the power cable.



5. Disconnect the reagents and dilution water from the Analyzer.
6. Remove the fluidics cover from the right side of the Analyzer.
7. Disconnect the tubing from each end of the filter, and remove the filter from the Analyzer.
8. Dispose of the Filter.
9. Attach the new Filter to the tubing. Ensure the “INLET” side is correctly oriented.
10. Perform other maintenance tasks, or reinstall the fluidics cover and return the Analyzer to normal operation.

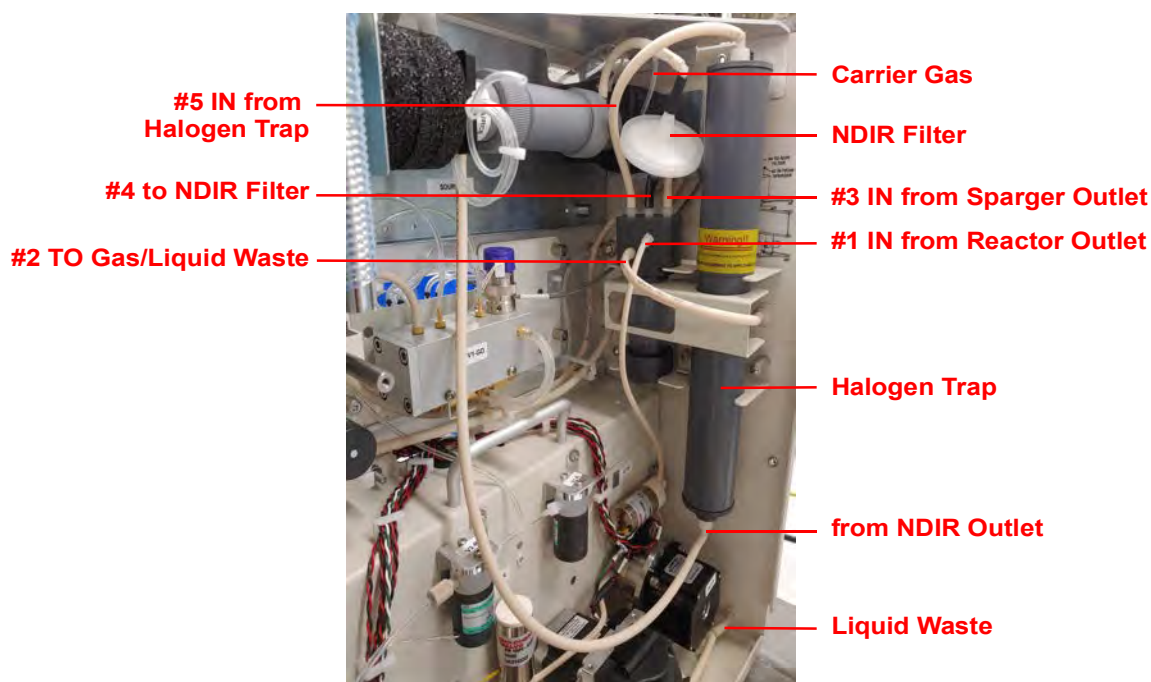


Figure 83: Replacing the NDIR Filter

## Replacing the Disc Filter

The disc filter is used when the Analyzer has been configured with the optional air pump. Replace the disc filter, which protects the gas supply pump, after 12 months of operation (see [Figure 84](#)), as follows:

1. Stop any Analysis.
2. Shut down the Analyzer via the on-screen menu (**Maintenance** → **Shutdown**).
3. Wait for the display to turn off, and then turn the power switch (located on the back of the Analyzer) to the *Off* position.
4. Disconnect the power cable.

5. Disconnect the reagents and dilution water from the Analyzer.
6. Remove the fluidics cover from the right side of the Analyzer.
7. Disconnect the tubing from each end of the filter, and remove the filter from the Analyzer.
8. Dispose of the filter.
9. Remove the new filter from the packaging and connect the tubing to each end of the filter.
10. Perform other maintenance tasks, or reinstall the fluidics cover and return the Analyzer to normal operation.



**Figure 84: Replacing the Disc Filter**



## Other Maintenance Tasks

Other maintenance tasks are performed only when required, as indicated in the following sections.

### Replacing the High Pressure Valve Seals

The Sievers InnovOx ES Laboratory TOC Analyzer has two high pressure valves. Each valve contains a seal that wears over time. The seals should be replaced after three months of operation, however, the replacement frequency for the valve depends on sample composition; samples that are abrasive will wear down the seals more frequently. The Analyzer issues a warning when the seals are starting to leak. Replace the seals using the following procedure.

#### *To replace the High Pressure Valve Seals*

1. Stop any Analysis.
2. Shut down the Analyzer via the on-screen menu (**Maintenance** → **Shutdown**).
3. Wait for the display to turn off, and then turn the power switch (located on the back of the Analyzer) to the *Off* position.
4. Disconnect the power cable.
5. Disconnect the reagents and dilution water from the Analyzer.
6. Remove the fluidics cover from the right side of the Analyzer.
7. Remove the four screws that secure the valve motor to the Analyzer, using a 5/32 in. Allen wrench (hex key).
8. Pull the motor away from the Analyzer ([Figure 85](#)). The seal is threaded on the motor shaft.
9. Remove the seal from the end of the shaft, using a 3/8 in. wrench ([Figure 86](#)).
10. Secure the new seal to the end of the valve shaft and tighten the seal 1/4 turn past finger-tight, using a 3/8 in. wrench. Do not over-tighten the seal.
11. Replace the motor and secure it with the four screws.
12. Repeat [step 7](#) through [step 11](#) for the other motor. Always replace both seals.
13. Reattach the reagents and dilution water containers.
14. Perform other maintenance tasks, or reinstall the fluidics cover and return the Analyzer to normal operation.

15. The seals must be used before they conform to the shape of the sealing surface in the valves. They will have to operate for at least 20 measurements before the Analyzer will achieve its maximum precision.



**Figure 85: The High Pressure Valve Seal — Before Removal**

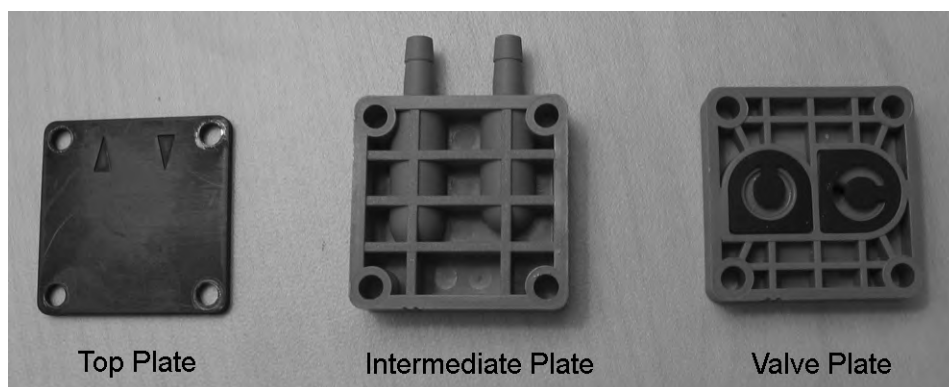


**Figure 86: The High Pressure Valve Seal — After Removal**

## Replacing the Pump Diaphragm

Replace the diaphragm in the optional air pump after one year of operation. This is the same schedule that every fourth Carrier Gas CO<sub>2</sub> Scrubber cartridge is installed.

1. Stop any analysis.
2. Shut down the Analyzer via the on-screen menu (**Maintenance** → **Shutdown**).
3. Wait for the display to turn off, and then turn the power switch (located on the back of the Analyzer) to the *Off* position.
4. Disconnect the power cable.
5. Disconnect the reagents and dilution water from the Analyzer.
6. Remove the fluidics cover from the right side of the Analyzer.
7. Locate the pump diaphragm housing.
8. Using a small Phillips screwdriver, loosen the four screws on the pump head and lift the black head plate from the intermediate plate ([Figure 86](#)).



**Figure 87: Pump Plates**

9. Remove the intermediate plate, and then remove the valve plate. If necessary, carefully clean the head and intermediate plates of any residue. Be careful not to scratch the parts.
10. Unscrew the old diaphragm by turning it counterclockwise using both hands. If possible, avoid using tools for this step. If the diaphragm is too tight to unscrew without the aid of a tool, carefully use a pair of needle-nose pliers to loosen the diaphragm.
11. Remove the spacers from the thread of the old diaphragm and place them on the new diaphragm.
12. Remove the new pump diaphragm from the packaging and set it in place. Tighten the new diaphragm firmly by hand by turning it clockwise. Avoid using tools for this step.
13. Push the edge of the diaphragm down into place.

14. Place the intermediate plate on top of the valve plate, and then place the top plate on top of the intermediate plate. Be careful to align the score marks, and make sure the flow arrows point toward the connection barbs ([Figure 88](#)).



**Figure 88: Aligning the Pump Head Plates**

15. Insert the Phillips screws and spring washers into the four holes in the pump head.
16. Place the pump head on the pump and tighten the four Phillips screws. Do not over-tighten the screws. Make sure the connection barbs are facing away from the pump motor. (Refer to [Figure 88](#) for the correct orientation.)
17. Reattach the reagents and dilution water containers.
18. Perform other maintenance tasks, or reinstall the fluidics cover and return the Analyzer to normal operation.

## ***Sievers Autosampler Maintenance***

The Sievers Autosampler has been designed for low maintenance, and therefore no user adjustments are necessary under normal operating conditions.

Periodically clean the Sievers Autosampler and the optional Stirring Station (stirring plate and sample rack) with a soft cloth, dampened with a mild and diluted detergent. Do NOT spray

detergent directly on the Analyzer. This will help preserve the plastic components and painted surfaces.

**NOTE:** Spillage that occurs during normal usage of the Sievers Autosampler should be cleaned immediately to preserve the life of the instrument.

If your Sievers Autosampler is equipped with the optional Wash Station, the Wash Station tubing should be replaced annually.

If contamination builds up on the outside of the needle over time, you can wipe the needle clean with a lint-free towelette soaked in DI water. Or, flush the needle using the wash bottle in the Accessory Kit. For more information, refer to [“Cleaning the Needle Assembly” on page 245](#).

## Replacing Sievers Autosampler Fuses

Replace the blown fuse with a fuse of the same type and rating:

1.6 A, 250 V, 5 mm x 20 mm

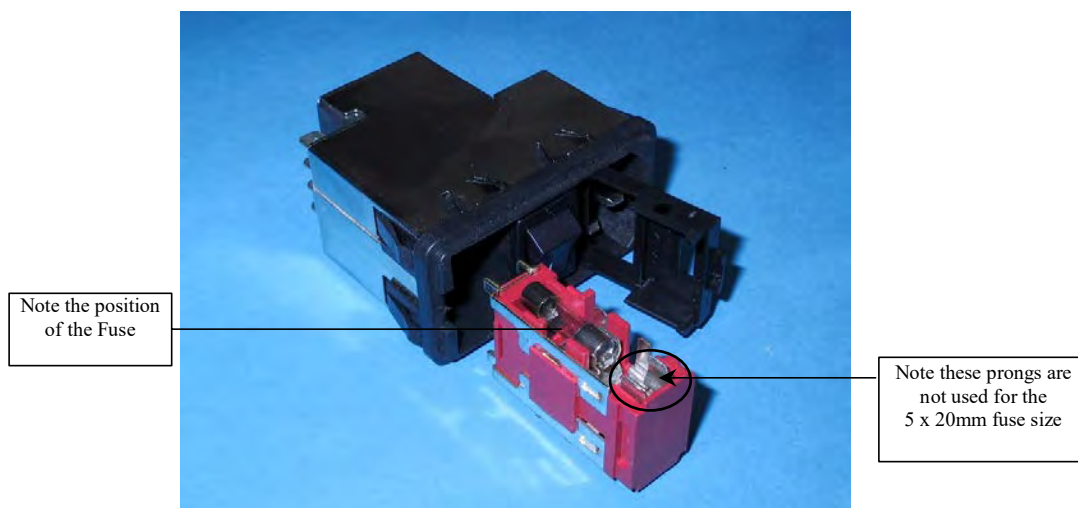
or

1.6 A, 250 V, 1/4" x 1-1/4"

### *To replace a Sievers Autosampler fuse*

1. Stop any analysis.
2. Turn the Sievers Autosampler power switch to the *Off* position and disconnect the Sievers Autosampler power cord from the main power source.
3. Shut down the Analyzer via the on-screen menu (**Maintenance** → **Shutdown**).
4. Wait for the Analyzer display to turn off, and then turn the power switch (located on the back of the Analyzer) to the *Off* position.
5. Disconnect the Sievers Autosampler from the Analyzer.
6. On the Sievers Autosampler, use a small flat head screwdriver to un-clip the cover and slide out the fuse compartment (located directly above the main power switch).
7. Replace the blown fuse with a fuse of the same type and rating.
8. Slide the fuse compartment back into the Sievers Autosampler and clip the cover back into place.
9. Reconnect the Sievers Autosampler to the Analyzer.

10. Insert the Sievers Autosampler power cord into the main power source. power supply cable and restore power to the instrument.



**Figure 89: The Sievers Autosampler Fuse Housing**

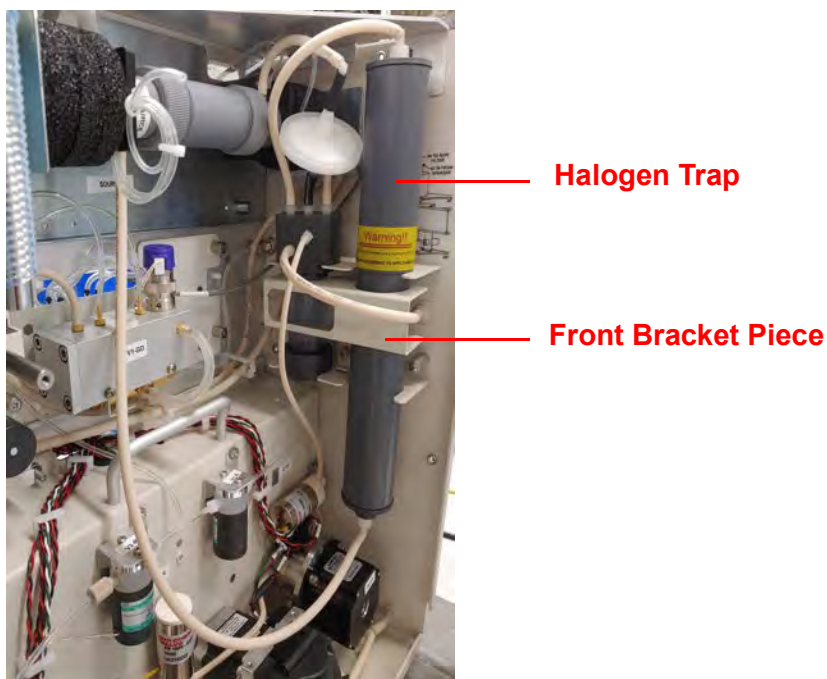
## Replacing the Halogen Trap

The halogen trap replacement depends on the customer's sample water. The halogen trap life will be reduced with the use of HCl reagent or the presence salt in the sample water. Keep a spare halogen trap on hand if these conditions exist in your application. **Error Code 6441** will display when the trap expires.

Without these factors, the halogen trap should last for the life of the instrument.

1. Stop any Analysis.
2. Shut down the Analyzer via the on-screen menu (**Maintenance** → **Shutdown**).
3. Wait for the display to turn off, and then turn the power switch (located on the back of the Analyzer) to the *Off* position.
4. Disconnect the power cable.
5. Remove the fluidics cover from the right side of the Analyzer.
6. Disconnect the tubing from both ends of the halogen trap.
7. Remove the front bracket piece.
8. Remove the halogen trap and dispose of it.
9. Insert the new halogen trap into the right bracket opening so the shoulder rests on top of the backside bracket.

10. Reinstall the front bracket piece.
11. Connect the tube from the NDIR detector to the lower end of the halogen trap.
12. Connect the tube from the top of the gas/liquid separator to the upper end of the halogen trap.
13. Reinstall the fluidics cover and return the Analyzer to normal operation.
14. Plug in the power cord, and then power on the Analyzer.



**Figure 90: Halogen Trap**

# Chapter 10. Troubleshooting

## Overview

This chapter provides the starting point for troubleshooting basic issues with your Analyzer.

If you need additional assistance, contact Technical Support or your local service provider. You can also visit our website.

## Reviewing Warnings and Errors

To review the warnings and errors list, follow these steps:

1. Select the **Maintenance** tab.
2. Press the **Errors/Warnings** button.
3. Review the error or warning instructions on the screen, and perform the appropriate action or actions.
4. Press the **Reset** button to clear the Error (E) or Warning (W) message from the header.
5. To export the error list in .csv format, press the **Export Errors** button then select either **USB** or **Ethernet**.



## ***Analyzer Warnings and Error Messages***

These warnings and error messages may appear on the screen of the Analyzer if the condition occurs. If you are using the Analyzer with the Sievers Autosampler, warnings and error messages are reported in the web-based user interface. The warnings and error messages display in the Status area located at the bottom of the screen.

### ***50 - Power Supply Error***

Message: “Please power cycle the Analyzer. If the problem persists, export errors and contact Technical Support or your local service provider for further instructions and analysis.”

Explanation: Contact Technical Support or your local service provider for further guidance.

### ***150 - Software Control Error***

Message: “Software control error. Please power cycle the Analyzer. If the problem persists, export errors and contact Technical Support or your local service provider for further instructions and analysis.”

Explanation: There are a variety of causes for this error. This error should be very rare. Analysis of the exported errors will give the specific line of code that triggered the error in order to suggest the resolution.

### ***250 - Syringe Position Error***

Message: “Syringe position error. Please power cycle the Analyzer. If the problem persists, export errors and contact Technical Support or your local service provider for further instructions and analysis.”

Explanation: There is a potential problem in the operation of the syringe pump. Refer to [“Liquid Flow Check” on page 232](#).

### ***151- Gas Flow Regulation Error***

Message: “Gas flow regulation error. See O&M manual error description for details.”

Explanation: The PID Test has either failed to stabilize in the allotted time or is out of the acceptable range. Therefore, the test was not able to determine which PID settings to use. First, determine which Gas Valve PID settings should be selected by identifying which Gas Manifold is installed in your particular instrument, as described in [Figure 62](#) on page [153](#). Next, verify the appropriate PID option is activated in the Analyzer (**Maintenance > Advanced**). Refer to [“To](#)

[configure gas flow PID option settings” on page 152](#) for additional configuration details. After confirming the configuration, perform the *Gas Leak Check* diagnostics ([“Gas Leak Checks” on page 233](#)) to identify any other possible problems. If the error continues, contact Technical Support or your local service provider for further guidance.

### **350 - Heater Error**

Message: “Heater has been on too long. Please power cycle the Analyzer. If the problem persists, export errors and contact Technical Support or your local service provider for further instructions and analysis.”

Explanation: There are a variety of causes for this error. This error should be very rare. Analysis of the exported errors will give the specific line of code that triggered the error in order to suggest the resolution.

### **351 - Software Invalid State Error**

Message: “Software invalid state error. Please power cycle the Analyzer. If the problem persists, export errors and contact Technical Support or your local service provider for further instructions and analysis.”

Explanation: There are a variety of causes for this error. This error should be very rare. Analysis of the exported errors will give the specific line of code that triggered the error in order to suggest the resolution.

### **6401 - Error**

Message: “This error is usually associated with another error. Check the Errors/Warnings button for a complete list of all recent errors. Please shutdown the Analyzer. and power cycle. If the problem persists, export errors and contact Technical Support for further instructions.”

Explanation: This is a “catch all” for any errors not specifically defined elsewhere. These should be very rare and would relate to threads or potential communication issues. There could be a large number of causes that would be difficult to address in this section. Analysis of the exported errors will give the specific line of code that triggered the error in order to suggest the resolution.

### **6408 - iButton Read Error**

Message: “Unable to read system information from iButton. Please power cycle the Analyzer. If the problem persists, consult the Operation and Maintenance Manual for further instructions.”

**Explanation:** This is a failure to read information from the iButton®. This information includes the serial number, family, and model. Possible reasons for failure include corrosion on iButton contacts, a gap between the iButton and system board contacts, or a component failure. Consult with Technical Support or your local service provider for further instructions on determining the root cause.

### **6409 - Internal Communications Error**

**Message:** “Internal communications problem. Please power cycle the Analyzer. If the problem persists, consult the Operation and Maintenance Manual for further instructions.”

**Explanation:** A module in the Analyzer is not communicating over the bus. First, evaluate the LEDs on the individual boards. You can sometimes view the reflection of the LEDs looking through the hole on the back cover of the instrument. Or, for a better view, remove the back cover. All boards should have a green LED to indicate power. Any yellow LEDs blinking faster than once per second, other than on the NDIR board ([Figure 92](#)), may indicate a problem with the board. If this is the case, shut down the Analyzer and turn off power. Check that all connections on the gray ribbon cable are secured to their respective boards. If the problem persists, export the errors and contact Technical Support or your local service provider for further instructions.

*NOTE: It is not abnormal for the yellow LED on the NDIR board to blink faster. However, on Analyzer start-up the rate should be consistent with the other boards' LEDs.*

### **6410 - Autosampler Error**

**Message:** “Autosampler error. Be sure the Autosampler is turned on and connected. Cycle power on the Autosampler to clear the error.”

**Explanation:** This error will be triggered if the Analyzer fails to communicate with the Sievers Autosampler at all (i.e., disconnected USB-to-Serial RS-232 cable) or if the Sievers Autosampler receives a command that it does not recognize. Also, check the blue LEDs on the Sievers Autosampler to see if there is a mechanical error with the Sievers Autosampler itself that is preventing on-going communication. Refer to [Table 18, “Sievers Autosampler LED Error Codes,” on page 248](#).

### **6411 - Unstable NDIR Baseline Detected Warning**

**Message:** “An unstable NDIR baseline is caused by a reactor seal leak, a gas leak, or contamination. Perform the gas leak tests in diagnostics and ensure system is not leaking. If the warning persists, clean the GLS, replace reactor seals and pinch tubing.”

Explanation: CO<sub>2</sub> was detected by the NDIR when no CO<sub>2</sub> should have been present. Follow the troubleshooting instructions detailed in the warning message. For details on performing the tests, refer to [“Gas Leak Checks.” on page 233](#). Rinsing the NDIR's center tube with warm tap water can also fix this problem.

### **6421 – Over Range Error**

Message: “The measured value was too high for the current range.”

Explanation: Select an appropriate higher range and restart the analysis.

### **6422 – Gas Inlet Pressure Error**

Message: “Gas inlet pressure is low.”

Explanation: Check source gas. Be sure that your lines are connected and that there is sufficient pressure. If using the air purifier, check to be sure it is powered and functioning. If the problem persists, please export the errors and contact Technical Support or your local service provider for further instructions.

### **6423 – Reactor Heating Error**

Message: “There was a problem encountered with the heater reaching the target temperature during the analysis cycle. Go to the *Diagnostics* screen and run the Heater Test. If the test does not pass, please export the errors and contact Technical Support or your local service provider for further instructions.”

Explanation: The heater failed to reach the temperature needed for oxidation of the sample. Or, the heater has become too hot. The Heater test aids in determining the cause.

### **6424 – Reactor Cooling Error**

Message: “If the IP56 option is installed, wash the air filter if it is dirty. Otherwise, check for obstructions at the reactor cooling air inlet and outlet (bottom and right side of case). Go to *Diagnostics* screen and run the Heater test, and check for air flow out of the reactor cooling air outlet after 190 sec. Export the errors and contact Technical Support or your local service provider for further instructions.”

Explanation: The reactor did not cool down in the allotted time.

**6426 – PDF Document Error**

Message: “Shutdown the Analyzer and then power cycle the Analyzer. If the problem persists, please export the errors and contact Technical Support or your local service provider for further instructions.”

Explanation: This error is associated with the creation of a .pdf file. If you are creating a .pdf from the Analyzer, shut down the Analyzer, power cycle and repeat. If the problem persists, contact Technical Support or your local service provider for further instructions.

**6427 – Bus Error Fatal Error**

Message: “An error was detected during communication over the bus in the Analyzer. First, evaluate the LEDs on the individual boards. All boards, except the NDIR's, should have a green LED to indicate power. Any yellow LEDs blinking faster than once per second, other than the NDIR board, may indicate a problem with the board. Then shut down the Analyzer and turn off power. Check that all connections on the gray ribbon cable are secured to their respective boards. If the problem persists, please export the errors and contact Technical Support or your local service provider for further instructions.”

It is not abnormal for the yellow LED on the NDIR board to blink faster. However, on Analyzer start-up the rate should be consistent with the other boards' LEDs.

Explanation: The bus referred to in this discussion is the communications bus internal to the Analyzer. This error will also occur if an AutoRange protocol is started and one or more calibrations in the Calibration group have been deleted.

**6428 – Flash Card Error**

Message: “An error has been detected within the flash card. Shut down the Analyzer and power cycle. To avoid re-occurrence, always shut down the Analyzer prior to turning off the power. If the problem persists, please export the errors and contact Technical Support or your local service provider for further instructions.”

Explanation: An error has been detected in the flash memory card on the Analyzer's System Controller Board.

**6429 – Network Error**

Message: “This is an error that occurs when the InnovOx is trying to communicate with a network. Shut down the Analyzer, turn off the power and reconnect the network cable. You may need to contact your IT department for more information. If the problem persists, please export the errors and contact Technical Support or your local service provider for further instructions.”

Explanation: An error inside the Analyzer has been detected that prevents communications with a network.

### **6430 – Touchscreen Error**

Message: “Please shut down the Analyzer and power cycle. If the problem persists, shut down the Analyzer and power down. Then, check the cable connections. You may be able to regain control of the unit by plugging a mouse into any of the USB port. If the problem persists please export the errors and contact Technical Support or your local service provider for further instructions.”

Explanation: This error can be troubleshot by shutting down the Analyzer and turning off the power. Access the display assembly, and inspect the connections and the gasket that surrounds the touchscreen. Re-seat the connections and realign the gasket. If the problem persists, contact Technical Support or your local service provider.

### **6431 – Firmware Update Error**

Message: “Please shut down the Analyzer and power cycle. Retry the upgrade. If the problem persists, please export the errors and contact Technical Support or your local service provider for further instructions.”

Explanation: This error would occur only when a new version of firmware is being installed in the Analyzer.

### **6432 – Datastore Error**

Message: “Please shut down the Analyzer and power cycle. If the problem persists, please export the errors and contact Technical Support or your local service provider for further instructions.”

Explanation: An error has been found during writing to the data history portion of the flash memory card on the Analyzer’s System Controller Board. Archiving the *Datastore* manually may alleviate the issue. [See “Archiving the Data History” on page 151](#) for instructions. If this error persists, please contact Technical Support or your local service provider.

### **6433 – Sparger Gas Flow Error**

Message: “Go to the Diagnostics screen and run the Gas Valves test (V7-SH). If the gas flow rate fails to maintain 200 cc/min, please export the errors and contact Technical Support or your local service provider for further instructions.”

Explanation: The flow rate of gas through the sparger was found to be too low. There may be a problem with valve V7-SH or with the gas tubing. Check that the correct gas flow is exiting the Gas Supply Module.

#### **6434 – Carrier Bypass Gas Flow Error**

Message: “Go to the Diagnostics screen and run the Gas Valves test (V1-R). If the gas flow rate fails to maintain 165 cc/min, please export the errors and contact Technical Support or your local service provider for further instructions.”

Explanation: The flow rate of carrier gas through valve V1-R was found to be too low. There may be a problem with valve V1-R or with the gas tubing. The NDIR filter also may be plugged. Check that the correct gas flow is exiting the Gas Supply Module. Valves V4-R or V5-R not opening could also cause this error to appear.

#### **6435 – Reactor Gas Flow Error**

Message: “Go to the Diagnostics screen and run the Gas Valves test (V2-R). If the gas flow rate fails to maintain 165 cc/min, please export the errors and contact Technical Support or your local service provider for further instructions.”

Explanation: The flow rate of carrier gas through valve V2-R was found to be too low. The Reactor may be plugged. There also may be a problem with valve V2-R, V7-R, or with the gas tubing. The NDIR filter may be plugged. Check that the correct gas flow is exiting the Gas Supply Module.

#### **6436 – Gas Flow Irregularity Error**

Message: “Check all tubing for pinches or crimps. Check that the end of the coil of tubing coming out of the NDIR is not plugged. Go to the Diagnostics screen and run the Gas Flow Zero Test (see the manual) Run the Liquid Reactor Flow Check and the Gas Leak Check. If any of the tests fail, please export the USB Diagnostics and contact Technical Support or your local service provider for further instructions.”

Explanation: A leak in the Reactor has been detected. The fittings on the ends of the Reactor tube may be leaking, or there may be a leak in the Reactor tube itself. See [“Gas Valves” on page 227](#).

#### **6437 – Invalid Conversion Equation Error**

Message: “Conversion factor resulted in a mathematical error while applying the equation.”

Explanation: When the equation assessment with your TOC measurement is invalid, this message will appear. Please review your equation.

### **6438 – Printer Error**

Message: “System either failed to detect an HP printer, or the printer is not currently supported. Please export the errors and diagnostics, and contact Technical Support or your local service provider for further instructions.”

Explanation: Please refer to [“Setting Up and Configuring a Printer” on page 141](#) for a list of supported printers.

### **6440 – Datastore Manually Archived**

Message: “Datastore manually archived by user. Historical marker only, no follow-up necessary.”

Explanation: This warning is meant as an historical marker for when a user manually archives the datastore.

### **6441 – Halogen Gas Detected Error**

Message: “Halogen gas detected.”

Explanation: The Halogen trap is spent and needs to be replaced. Refer to [“Replacing the Halogen Trap,” on page 206](#). This error will also display in firmware versions >3.04 if the Analyzer has not been upgraded with a Halogen Trap. Contact Customer Care or your local service provider immediately to obtain a Halogen Trap Upgrade Kit.

### **6442 - Fluid Leak in Main Enclosure Error**

Message: “Fluid leak detected in main instrument enclosure. Resolve the source of the leak. Clean and dry the sensor.”

Explanation: The liquid sensor is a corrosion-resistant and optically-based sensor intended for detecting large leaks inside the Analyzer. The sensor is mounted on the inside floor of the Analyzer and triggers when the face of the sensor contacts fluid. (Due to variations in installation conditions, fluid from leaks may not immediately contact the sensor.) When a leak is detected, the Analyzer reports this error, displays a pop-up message, and stops analysis. Do the following: 1) Identify and repair the source of the leak. 2) Wipe up the fluid inside the Analyzer. 3) Remove the sensor from its mount, making sure to pull it straight up to release and protect it from damage. 4) Thoroughly dry the sensor, the mount, and surrounding surfaces. 5) Reinsert the



sensor into its mount. 6) Using the Analyzer's touch panel, reset the error (*Maintenance* tab > **Errors/Warnings** button).

## Other Software Errors

Other software errors are listed in the following [Table 16. "Other Software Errors."](#) These errors are grouped according to the module in which the error is found.

**Table 16: Other Software Errors**

Error Number							Description	Message	Explanation
S/C Board Bridge	Gas Control	Sample Handling	Reactor	NDIR	Multi-stream	I/O Board			
1	101	201	301	401	501	601	RTOS Error	Please power cycle the Analyzer. If the problem persists, export errors and contact Technical Support or your local service provider for further instructions and analysis.	There are a variety of causes for this error. These include timing and software threading issues. This error should be very rare. Analysis of the exported errors will give the specific line of code that triggered the error in order to suggest the resolution.
2	102	202	302	402	502	602	Software Function Error		There are a variety of causes for this error. This error should be very rare. Analysis of the exported errors will give the specific line of code that triggered the error in order to suggest the resolution.
3	103	203	303	403	503	603	Software ADC Channel Error		
4	104	204	304	404	504	604	Software Return Error		

## Visual Inspection

After confirming that there are no warning or error messages indicating a specific problem, proceed to a visual inspection of the Analyzer to identify any obvious physical problems or symptoms. Begin with an external visual inspection, and proceed to an internal visual inspection. If possible, perform the inspection with the Analyzer in analysis mode so you can verify that relevant modules are performing as usual (described below).

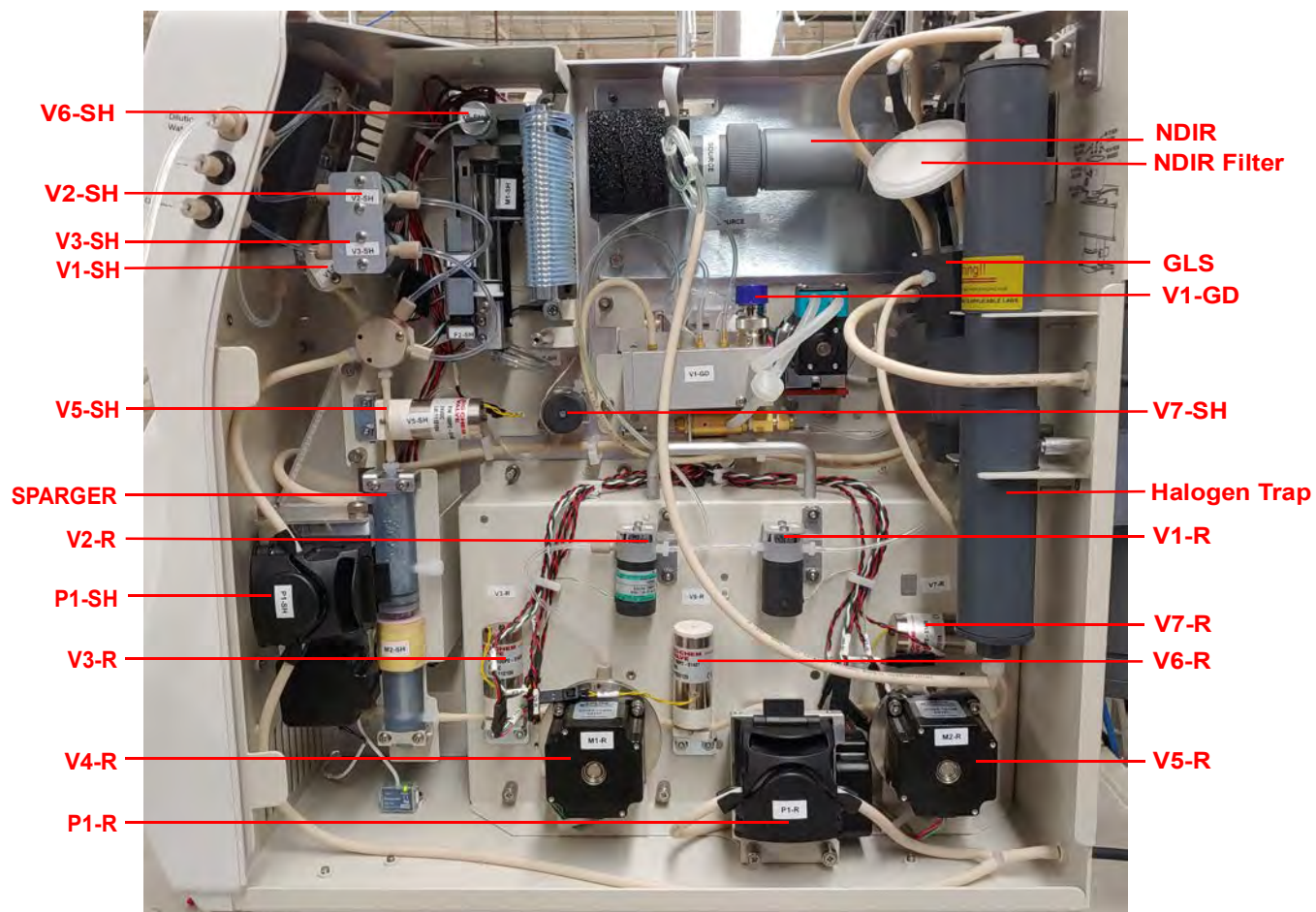
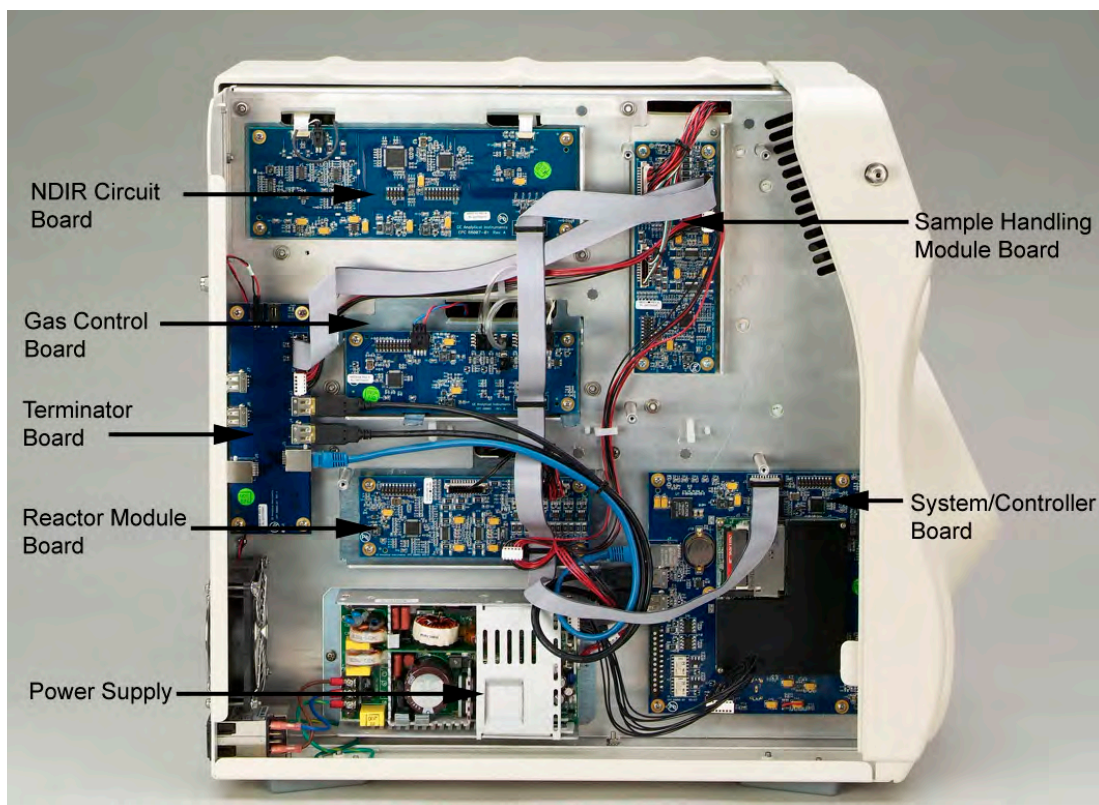
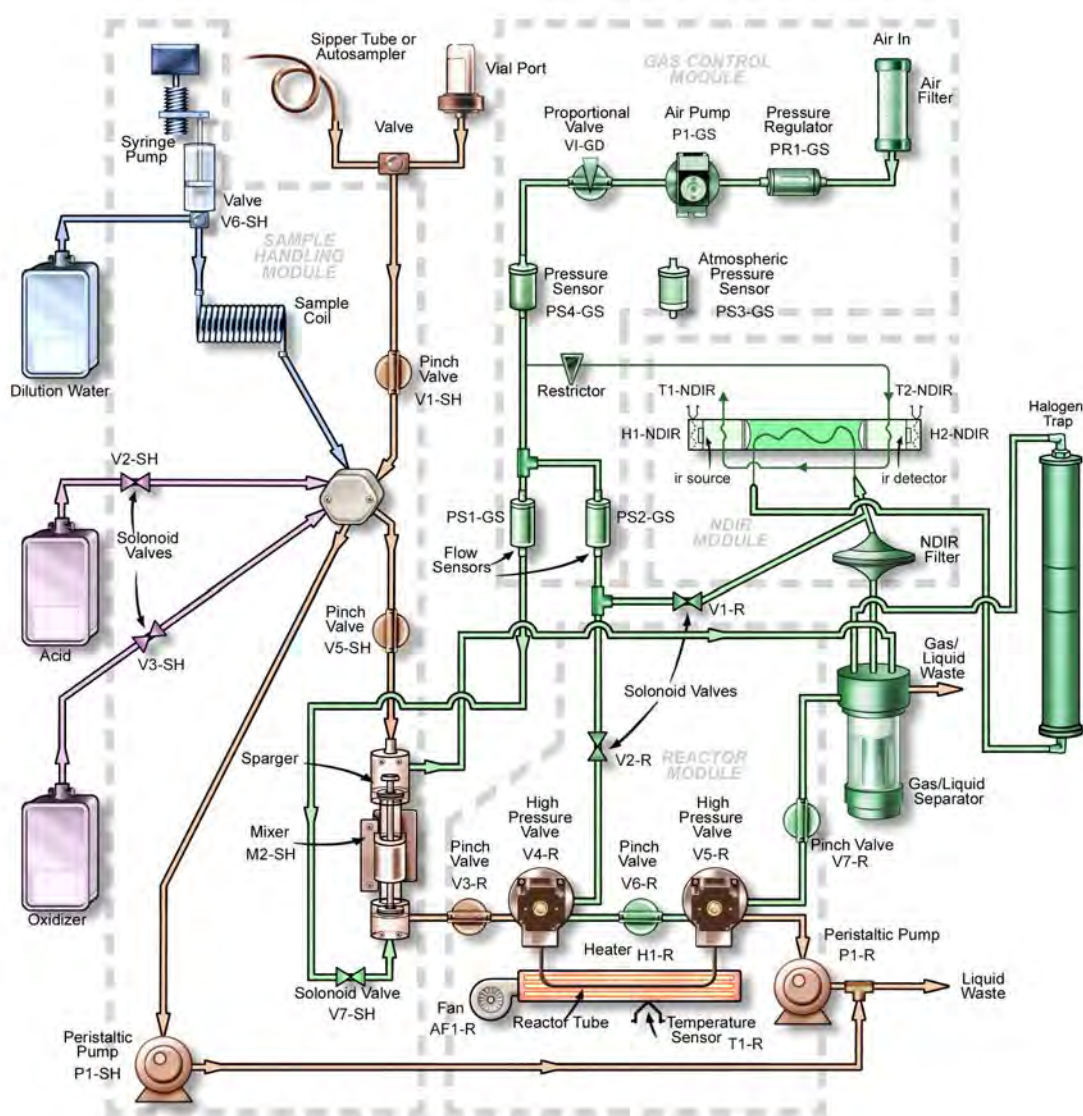


Figure 91: The Fluidics Side of the Analyzer



**Figure 92: The Electronics Side of the Analyzer**



**Figure 93: Analyzer Flow Path with Valves Indicated**

## External Inspection

- Confirm that the Vial Sampler door is completely closed if you are using the sample inlet on the left side of the Analyzer.
- Confirm that there are no leaks present at the sample inlet, reagent inlets, dilution water inlet, or the waste connections.
- Ensure that the sample inlet tube, if it is being used, does not contain air or a large volume of bubbles.

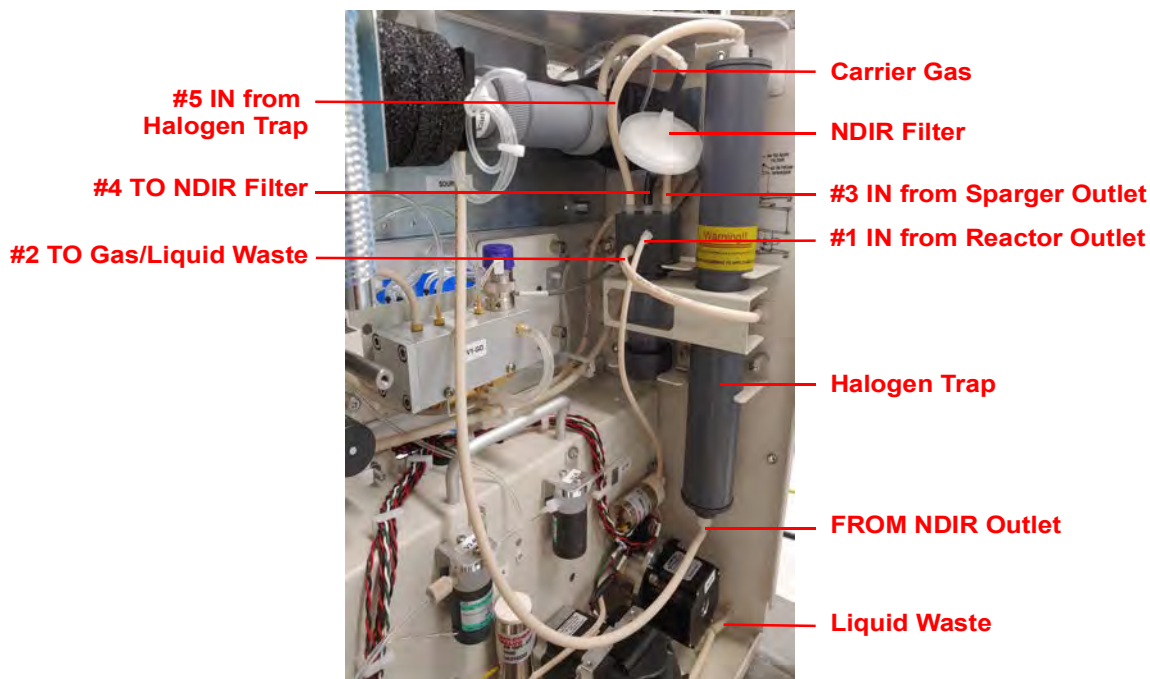


- Ensure that the reagent and dilution water tubes do not contain air or large volume of bubbles.
- Confirm that all cables are securely attached to the Analyzer.
- There should be no liquid leaks under the Analyzer.
- Tip the Analyzer slightly, and ensure that there is no paper or other material blocking the Reactor cooling air inlet on the bottom of the case.
- If you are experiencing erratic carbon readings, confirm that the pH of the waste stream is not too high. The pH should equal 2 or less.
- If you are using the filter cartridge, confirm that the filter cartridge is positioned correctly (black filter contents should be pointing up).
- If the Analyzer is making measurements:
  - If you are using a vial in the Vial Sampler, confirm that air enters the vial through the vent needle when the Analyzer draws sample out of the vial.
  - Confirm that gas is flowing from Gas/Liquid Waste outlet.
  - Sample, acid, and oxidizer should be drawn into the Analyzer periodically, unless either the acid or oxidizer is set to 0%.
  - Liquid waste should flow periodically from the Gas/Liquid and the Liquid Waste outlets.
  - Ensure the large cooling fan on the back of the Analyzer is operating.
  - Confirm that the Reactor cooling air blows out Reactor Exhaust on the back of the Analyzer prior to each NPOC measurement. The exhaust should be noticeably warm when the cooling air starts flowing.

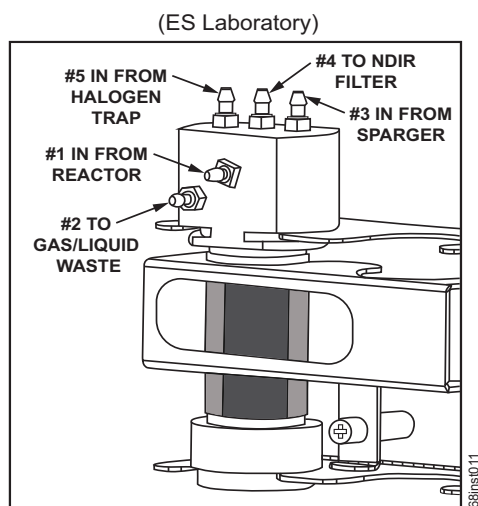
## Internal Inspection

- Check for leaks throughout the Analyzer; there should not be moisture on the inside of the Analyzer case.
- Confirm that the reagent and dilution water tubes inside the analyzer are full of liquid, or contain only a few bubbles. If excessive bubbles are present, a reagent flush should be performed.
- Check that the sample coil is full of liquid. If excessive bubbles are present, a dilution water flush should be performed.
- Inspect the syringe pump for leaks, and to confirm that the plunger moves during analysis.
- Confirm that the peristaltic pumps in the Sample Handling Module and Reactor Module operate during an analysis.

- Confirm that the Gas-Liquid Separator contains liquid to the proper level ([Figure 94](#) and [Figure 95](#)) and that all tubes are properly connected.
- If maintenance work has recently been performed on the Analyzer, confirm that electronics cables are securely attached.



**Figure 94: Connections to the Gas-Liquid Separator**



**Figure 95: Gas-Liquid Separator (GLS), Lab Label**

## ***Reviewing Solutions for Basic Problems***

If a visual inspection of the Analyzer does not help you identify the source of the problem you are experiencing, consult the specific problems discussed in this section.

### **The Analyzer Will Not Power On**

If the green power indicator on the front panel is illuminated, but the display is not illuminated, touch the display. The Analyzer may be in Standby to save power.

If the Analyzer will not power on, confirm that the power switch is on, and that the power cord is firmly seated at both ends. Also, make sure that there is power to the outlet at the wall, surge protector, or circuit breaker.

If the power cord is seated correctly and power is available to the Analyzer, but the green power light on the front of the Analyzer is not illuminated, then the fuse in the power entry module on the back of the Analyzer may have blown.

To replace the fuse in the power entry module, follow these steps:

1. Unplug the power cord from the back of the Analyzer.
2. Use a small flat-head screwdriver to pry open the fuse cover on the power entry module on the back of the Analyzer.
3. Remove the old fuse from the holder and replace with a new fuse. Replacement fuses should be of the following type:  
T5A, 250 VAC (SloBlo), size 5 x 20 mm
4. If the Analyzer still does not power on after replacing the fuse, contact Technical Support or your local service provider.

## Diagnostics Menu

The *Diagnostics* menu options are designed to help you troubleshoot Analyzer issues with Technical Support or your local service provider.

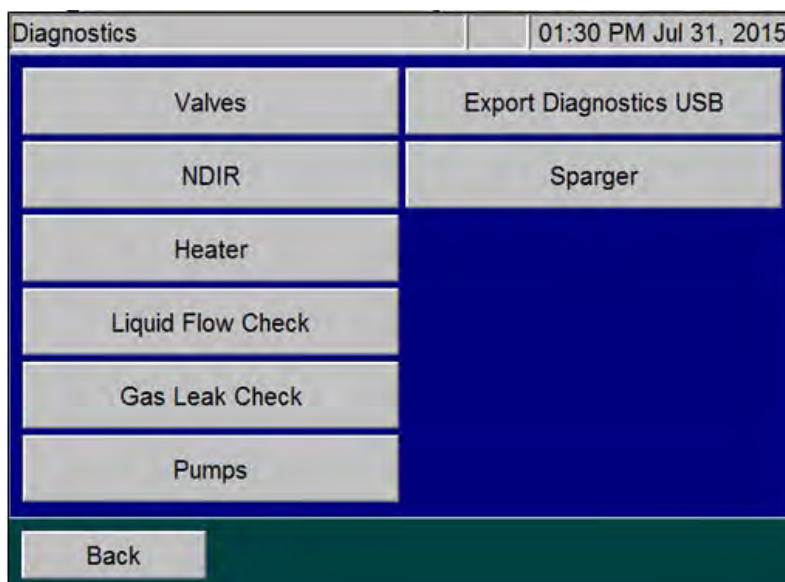


Figure 96: The Diagnostics Screen

When the *Diagnostics* screen appears (**Maintenance** → **Diagnostics**), all of the Analyzer components are in their safe condition (valves, heaters, fans, pumps, etc. are unpowered). When you start any one of the following diagnostic tests, only the specific components that are defined below are activated. When you press the **Cancel** or **Back** button and navigate to the main *Diagnostics* screen, the activated components are immediately turned off again. Note that multiple buttons on a screen may be pressed to activate multiple components.

When you are finished performing the appropriate diagnostic tests, components return to their safe (unpowered) conditions.



## Valves

On the *Valves* screen, valves are categorized by valve type (**Flow Control Valves** and **Gas Valves**), as shown in [Figure 97](#).

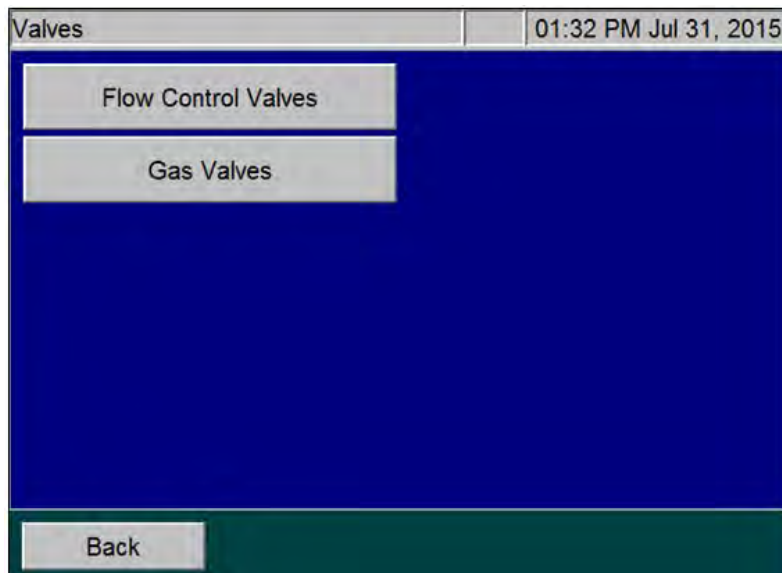
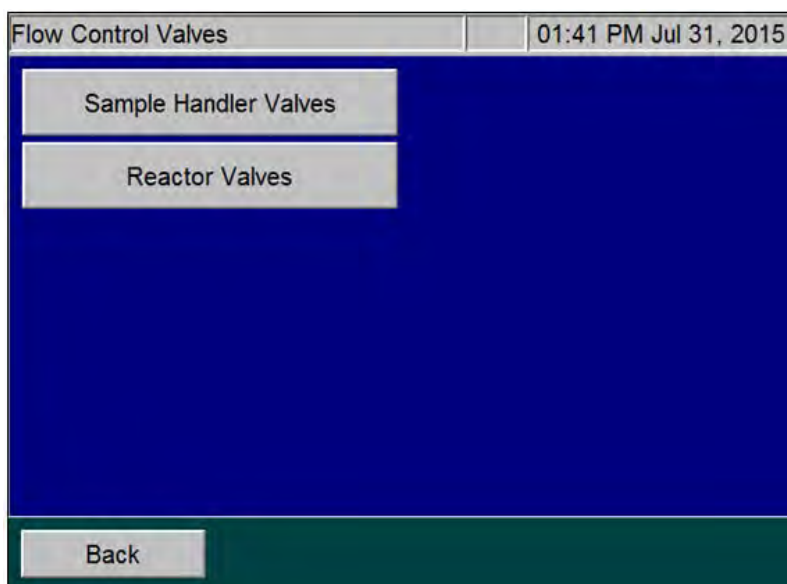
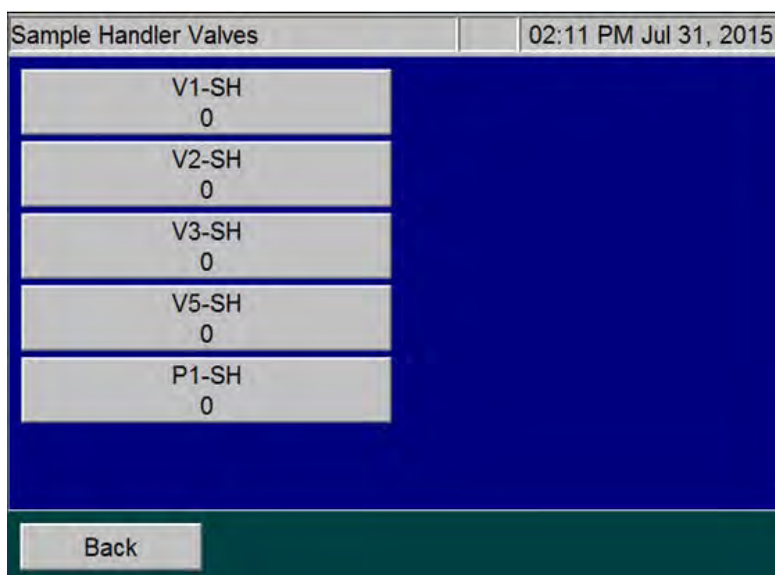


Figure 97: The Valves Screen

### *Flow Control Valves*

The Flow Control Valves are categorized by Analyzer module, consisting of Sample Handler (SH) Valves and Reactor (R) Valves, as shown in [Figure 98](#). Select the appropriate Flow Control Valves module to show its respective valves. [Figure 99](#) shows the Sample Handler Valves.

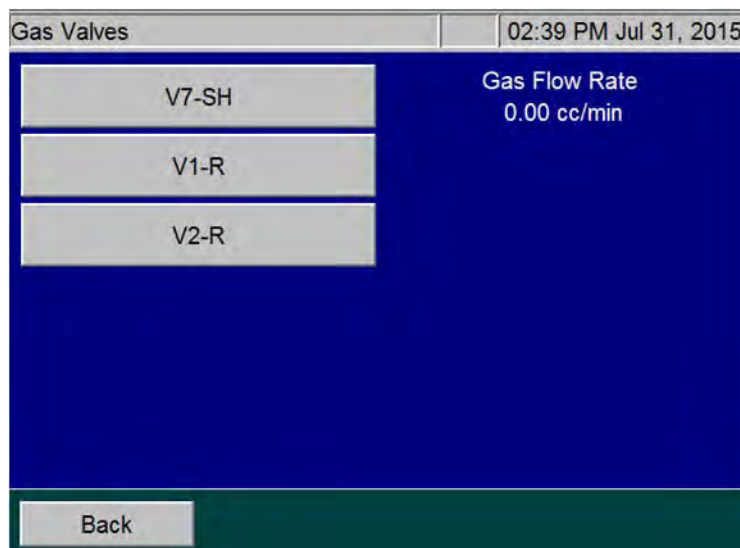
**Figure 98: The Flow Control Valves Screen****Figure 99: The Sample Handler Valves Screen**

Refer to [Figure 91 on page 218](#) for the names of all the valves and their locations in the Analyzer. Pressing one of the valve buttons causes the valve to toggle open or closed. The state of the valve is shown on the button below its name (“0” being inactivated and “1” being activated). Typically, a valve is closed when inactivated (a “0” state) with the exception of V6-R, which is open when inactivated.

When a valve is working properly, a click can be heard when the valve is activated and when inactivated. Alternatively, the click can be felt when touching the valve body during activation/inactivation

## Gas Valves

When you press the **Gas Valves** button, the following screen appears.



**Figure 100: The Gas Valves Screen**

When you press one of the three valve buttons, a Gas Valve Test begins. The valve being tested is highlighted and the gas flow rate is shown. After a 20-second flow test, the results are displayed as in [Figure 101](#). To stop the Gas Valve test, press the valve button again or press the **Back** button.

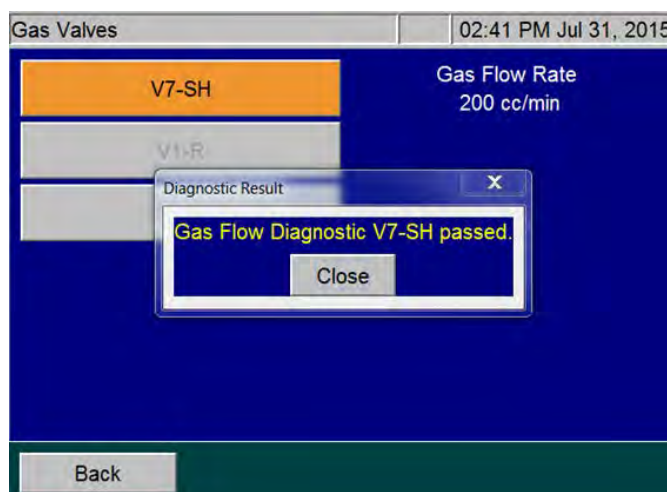


Figure 101: The Gas Valves Screen — Diagnostic Test Results

## Gas Valve Testing Criteria

### Sparge Gas Valve (V7-SH)

When the Sparge Gas Valve (V7-SH) is tested, the gas flow rate should be approximately 200 cc/min. Initially, the flow rate will fluctuate from this value as the gas flow control system adjusts to having the valve opened, but will stabilize within 20 seconds. If the flow rate stabilizes to less than 200 cc/min, investigate possible plugging in the sparge gas lines. If the flow rate does not stabilize to 200 cc/min after 20 seconds, V1-GD may need to be replaced.

During this test, the gas valves are set as follows:

- Proportional Valve (V1-GD) is set to its nominal set point for the sparge gas flow.
- Sparge Gas Valve (V7-SH) is opened.
- Carrier Gas Valve, (V1-R) is closed.
- Reactor Purge Valve (V2-R) is closed.

### Carrier Valve (V1-R)

When Carrier Valve V1-R is tested, the gas flow rate should be approximately 165 cc/min. Initially, the flow rate will fluctuate from this value as the gas flow control system adjusts to having the valve opened, but will stabilize within a few seconds. If the flow rate stabilizes to less than 165 cc/min, investigate possible plugging in the carrier gas lines. If the flow rate does not stabilize to 165 cc/min after 20 seconds, V1-GD may need to be replaced.

During this test, the gas valves are set as follows:

- Reactor Purge Valve (V2-R) is closed.
- Proportional Valve (V1-GD) is set to its nominal set point for the carrier gas flow.
- Carrier Gas Valve (V1-R) is opened.
- Sparge Gas Valve (V7-SH) is closed.

### **Gas Flow Zero Test**

If a “6436 error” occurs, the Analyzer issues a “Gas Flow Irregularity Error”. This indicates that the instrument detected an irregularity in gas flow between the Gas Distribution Module and the Reactor Module. This can be caused by a broken part or plug in the gas distribution module. If any of the tests fail, please export the errors and contact Technical Support or your local service provider for further instructions.

Perform the *Gas Flow Zero Test*:

1. In the instrument menu, go to *Maintenance - Diagnostics - Valves - Gas Valves*.
2. When you enter the *Gas Valve Diagnostic*, the gas flow should read 0.00 cc/min.
3. Press **V7-SH** button. The button will turn orange and the flow should read 200 cc/min.
4. Press the **V7-SH** button again and count how many seconds it takes for the gas flow to return to 0.00 cc/min.
5. If this flow takes 10 seconds or longer to return to 0.00 cc/min, there is a problem with the gas manifold and the instrument has failed the test. A fail on this test indicates that the Gas Distribution Manifold is causing the 6436 error.
6. Run this test on the remaining two gas valves (*V1-R* and *V2-R*). *V1-R* and *V2-R* should both read 165 cc/min when the flow is turned on.

### **Reactor Valve (V2-R)**

When Reactor Purge Valve (V2-R) is tested, the gas flow rate should be approximately 165 cc/min. Initially, the flow rate will fluctuate from this value as the gas flow control system adjusts to having the valve opened, but will stabilize within a few seconds. If the flow rate stabilizes to less than 165 cc/min., investigate possible plugging in the reactor purge gas lines. If the flow rate does not stabilize to 165 cc/min after 20 seconds, the proportional valve V1-GD may need to be replaced.

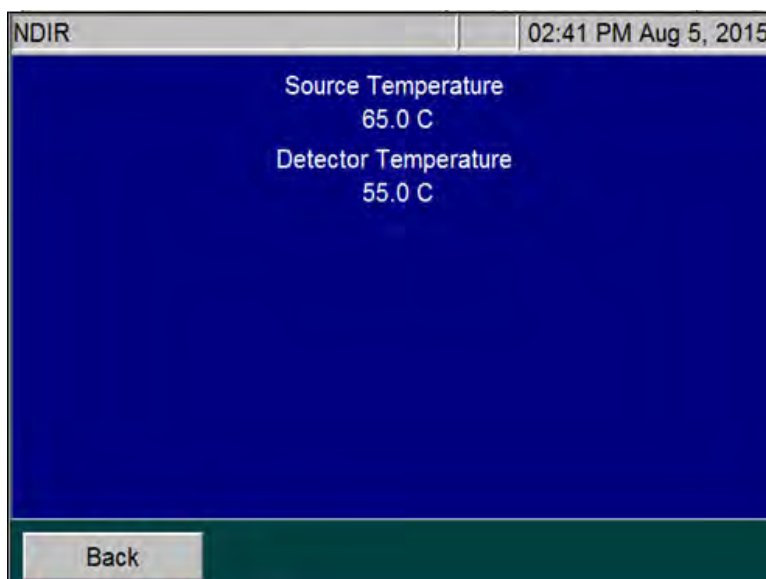
During this test, valves are set as following:

- Carrier Gas Valve (V1-R) is closed.

- Spurge Gas Valve (V7-SH) is closed.
- Reactor Purge Valve (V2-R) is opened.
- Reactor Seal Valves (V4-R) and (V5-R) are opened.
- Reactor Flow Control Valves (V6-R) and (V3-R) are closed.
- Reactor Valve (V7-R) is opened.
- Proportional valve (V1-GD) is set to its normal set point for the carrier gas flow.

## NDIR

When you press the **NDIR** button, the following screen appears.



**Figure 102: The Temperatures Display on the NDIR Screen**

This screen provides temperature information to facilitate troubleshooting.

- The Source Temperature should be  $65\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ .
- The Detector Temperature should be  $55\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ .

## Heater

The heater test is a test of the overall reactor heater thermal control system.

## To test the heater temperatures

1. On the *Diagnostics* screen, press the **Heater** button to display the Heater screen. The **Heater** button is automatically set to **Off** (gray color) to indicate that the heater is off. The reactor fan is on.
2. To start the test, press the **Heater** button ([Figure 103](#)). The button turns orange, the heater powers on, and the system begins going through its programmed heating and cooling profile.

The test time is 4 minutes and 30 seconds. At the end of this time frame, the measured temperature value appears.

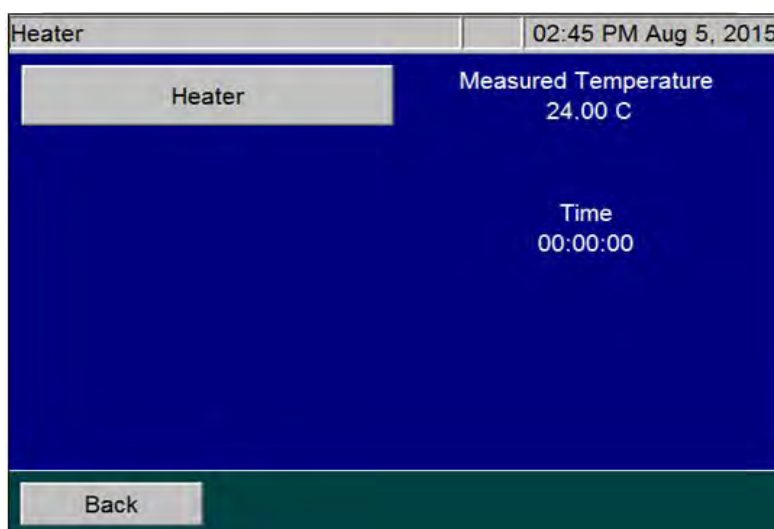


Figure 103: The Heater Screen

*NOTE: After the test is started, the **Heater** button becomes inactive to allow the thermal control system to complete its heating and cooling cycle. If the **Back** button is pressed while the heater is heating, the fan will not cool it down and the heater will be slow to cool. To quickly cool the heater, access the Diagnostics menu and press the **Heater** button again to activate the fan.*

## Heater Testing Criteria

- Heating Phase — The heating phase lasts 130 seconds, after which the heater reaches its target temperature of  $355^{\circ} \pm 5^{\circ} \text{C}$ . A message indicating the actual heater temperature and results of the test is shown on the screen.

**NOTE:** The  $355^{\circ} \pm 5^{\circ}$  temperature is an indirect measurement of a controlled reactor temperature. This control point has been demonstrated to achieve a reactor temperature of  $375^{\circ} \text{C}$  necessary to create supercritical water in the Analyzer's sample flow path. For additional information on the Analyzer's sample flow path, see ["Sample Flow Path" on page 52](#).

- **Holding Phase** — The heater maintains the set temperature for an additional 50 seconds.
- **Cooling Phase** — At 180 seconds, the cooling fan comes on and remains on for 110 seconds. After which, a message indicating the heater temperature and test results appears, the timer resets to zero, and the **Heater** button becomes active again.

## Liquid Flow Check

The Liquid Flow test is a visual test that allows you to check for possible obstructions in the flow of liquid through two paths: the sparger through reactor bypass and the sparger through the reactor. When you press the **Liquid Flow Check** button, the following screen appears:

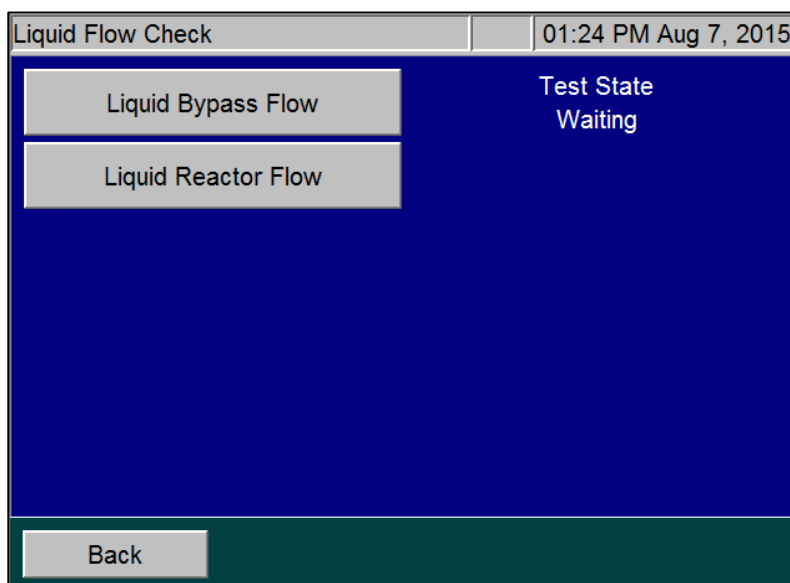


Figure 104: The Liquid Flow Check Screen

### To perform the Liquid Bypass Flow test

1. Press the **Liquid Bypass Flow** button. The button appears orange and the Analyzer displays the various Test states.



- *Draining* — Pump P1-R empties any liquid that may be in the sparger through the reactor bypass in preparation for the test.
- *Loading* — The syringe fills with dilution water.
- *Dispensing* — The water dispenses into the sparger. Valves V4-R, V5-R, and V7-R are closed.
- *Bypass Flow* — Valves V3-R and V6-R open and Pump P1-R empties the sparger through the reactor bypass and out to the waste. It will take a few seconds for the water to exit the Liquid Waste tube located at the back of the Analyzer.

If you do not see water exiting the waste tube while P1-R is operating, or if the liquid level in the sparger does not go down, the reactor bypass tube may be plugged.

- *Waiting* — The test is complete.

### **To perform the Liquid Reactor Flow test**

Press the **Liquid Reactor Flow** button. The button appears orange and the Analyzer displays the various Test states.

- *Draining* — Pump P1-R empties any liquid that may be in the sparger through the reactor bypass in preparation for the test.
- *Loading* — The syringe fills with dilution water, which is then dispensed into the sparger. Valve V6-R is closed and valves V3-R, V4-R, and V5-R are open.
- *Dispensing* — Pump P1-R empties the sparger through the reactor tube.
- *Reactor Flow* — It will take a few seconds for the water to exit the Liquid Waste tube located in the back of the Analyzer.
- If you do not see water exiting the waste tube while P1-R is operating, or if the liquid level in the sparger does not go down, the reactor tube may be plugged.
- *Waiting* — The test is complete.

## **Gas Leak Checks**

There are six tests to help locate leaks in the gas delivery system that may exist in the Analyzer. Step-by-step instructions for each leak test are provided in the following pages. Perform the procedures in the following sequential order.

Check 1 — Gas Manifold Leak Check (using the **Gas Manifold** button)

Check 2 — Reactor Inlet Valve Leak Check (using the **Reactor Inlet Valve** button)

Check 3 — Reactor Bypass Leak Check (using the **Reactor Bypass** button)

Check 4 — Reactor Leak Check (using the **Reactor** button)

Check 5 — Reactor Outlet Valve Leak Check (using the **Reactor Outlet Valve** button)

Check 6 — Gas Liquid Separator, NDIR Filter, NDIR Sample Path and Sparger Leak Check (using the **Reactor Bypass** button)

### ***Before You Begin***

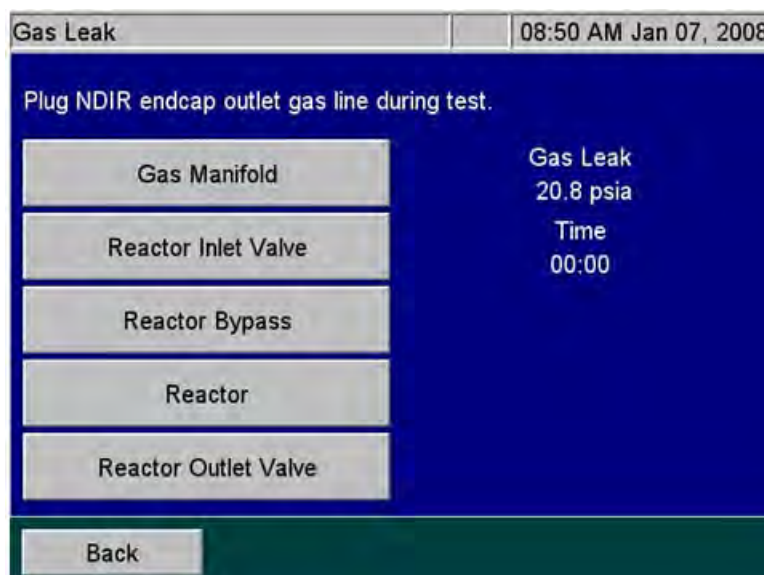
Before starting the Gas Leak Checks, ensure that either the *Carrier Gas CO<sub>2</sub> Scrubber* option is installed or the gas inlet to the Analyzer is connected to a source of compressed gas. The pressure of the gas supplied to the Analyzer should be regulated to 207 - 689 kPa (30-100 psig). Refer to [“Step 8: Connect the Compressed Gas Source \(Optional\)” on page 72](#) for more information.

Also, make sure to insert the small plug (included in the Accessories Kit) into the end of the coiled tube coming from the left side of the NDIR. This prevents leakage of vent gas out of the NDIR during testing.

### ***To perform the (Check 1) Gas Manifold Leak Check***

This test checks for leaks in the gas lines between valve V1-GD and V7-SH, V1-R, and V2-R. It also checks for leaks in the NDIR end caps and vent gas line. This flow path is highlighted in [Figure 106](#).

1. Verify that the Analyzer is set with the correct PID setting, as described in [“Gas Valve PID Parameters” on page 152](#).
2. Ensure that the NDIR is plugged, as described in the *Before You Begin* section.
3. On the *Diagnostics* screen (**Maintenance** → **Diagnostics**), press the **Gas Leak** button to display the *Gas Leak Check* screen ([Figure 105](#)). The pressure reading at the Pressure Sensor PS4-GS and a timer [initially is set to 00:00 (min:sec)] appear.



**Figure 105: The Gas Leak Check Screen**

4. Press the **Gas Manifold** button to start the test. The Analyzer closes the following valves: V1-R, V2-R, V4-R, V5-R, and V7-SH. The Analyzer opens valves V7-R, V6-R, and V3-R. The Gas Control Module pressurizes the lines for 24 sec., and then valve V1-GD closes to trap that pressure in the area being tested and the system holds for an additional 15 sec. If a major leak is detected at this time, an “Analyzer failed to pressurize” warning will appear and the test will end. During this 39-sec. pressurization period, the timer remains at 00:00 and “Pressurizing . . .” appears under the timer.
5. When the system passes pressurization, the leak check begins, the timer starts, and “Testing . . .” appears under the timer. The test passes if the drop in pressure is  $\leq 0.5$  psi.
6. With a new instrument or an instrument with new gas tubing, you may need to repeat this procedure multiple times to relax all the compliance in the system that can look like a false leak.
7. If you perform the test several times and the test still fails, check for leaks in the tubing or valves between V1-GD and V1-R, V2-R, and V7-SH. Ensure the brass fittings on the gas manifold in the Gas Control Manifold are not leaking. Check gas connections leading to the NDIR end caps. If all of those items are correct, then contact Technical Support or your local service provider for further information.
8. To continue the series of gas leak checks, leave the plug on the NDIR end cap outlet gas line and proceed to the next section, [“To perform the \(Check 2\) Reactor Inlet Valve Leak Check.”](#) Otherwise, remove the plug for normal operation.

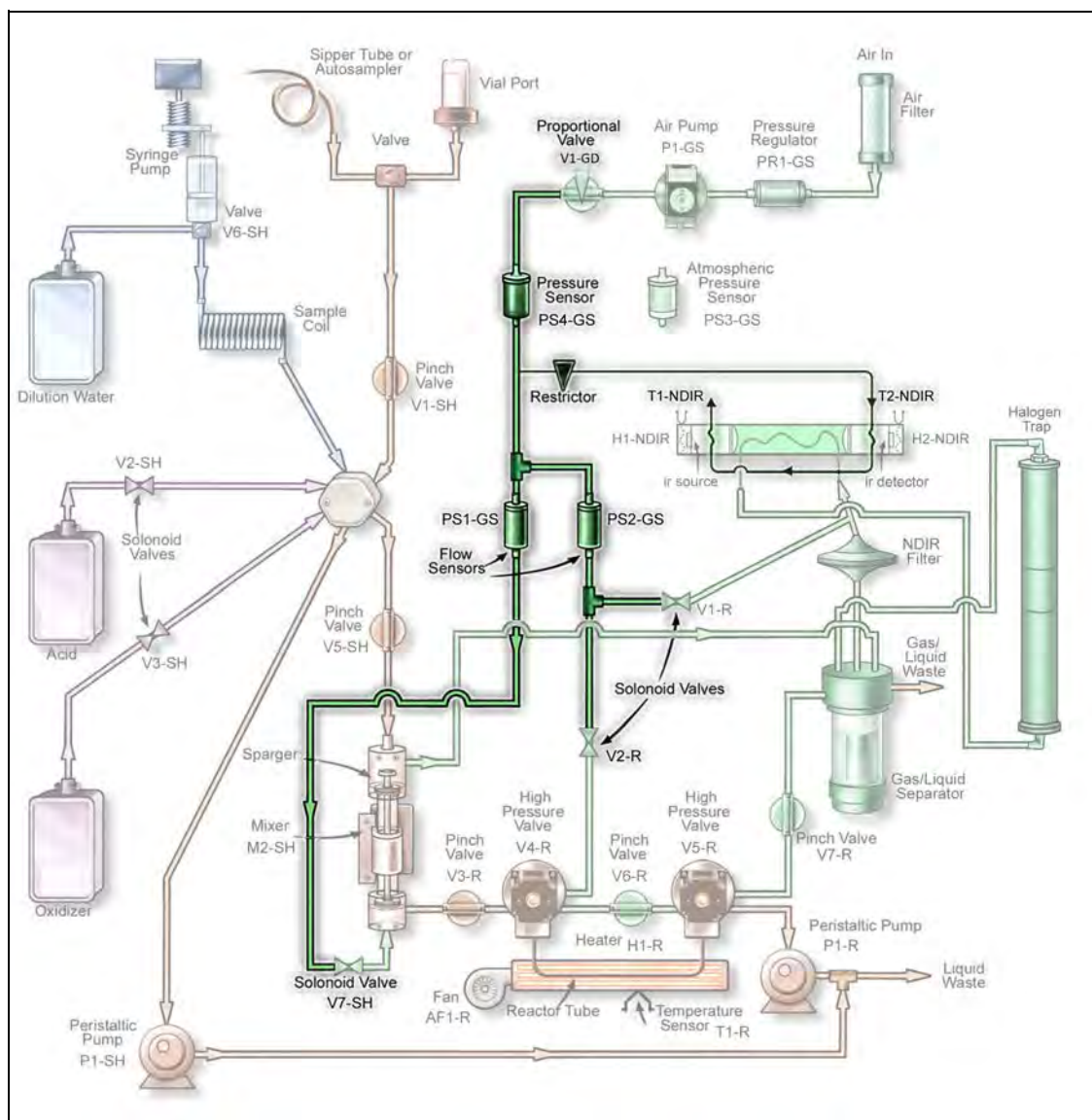


Figure 106: Gas Manifold Leak Check

### To perform the (Check 2) Reactor Inlet Valve Leak Check

This test checks for leaks in the same area as the Gas Manifold Leak Check and it also checks for leaks in the fittings on valve V4-R. This flow path is highlighted in [Figure 107](#).

1. Ensure that the NDIR is plugged, as described in the *Before You Begin* section.
2. Press the **Reactor Inlet Valve** button to start the test. The Analyzer closes the following valves: V1-R, V3-R, V4-R, V6-R, and V7-SH. The Analyzer opens Valve V2-R, V5-R, and V7-R.

The Gas Control Module pressurizes the lines for 24 sec., and then valve V1-GD closes to trap the pressure in the area being tested. The system holds for an additional 15 sec. If a major leak is detected at this time, an “Analyzer failed to pressurize” warning appears and the test will end. During this 39-sec. pressurization period, the timer remains at 00:00 and “Pressurizing . . .” appears under the timer.

3. When the system passes pressurization, the leak check begins, the timer starts, and “Testing . . .” appears under the timer. The test lasts for 60 sec. The test passes if the drop in pressure is  $\leq 0.5$  psi.
4. If the test fails, but the Analyzer passed the Gas Manifold Leak Check, then check the connections on V4-R and the connections between V4-R and V2-R, V3-R and V6-R. If all of those connections are correct, the seal in V4-R may need to be replaced due to leaking O-rings.
5. To continue the series of gas leak checks, leave the plug on the NDIR end cap outlet gas line and proceed to the next section, [“To perform the \(Check 3\) Reactor Bypass Leak Check.”](#) Otherwise, remove the plug for normal operation.

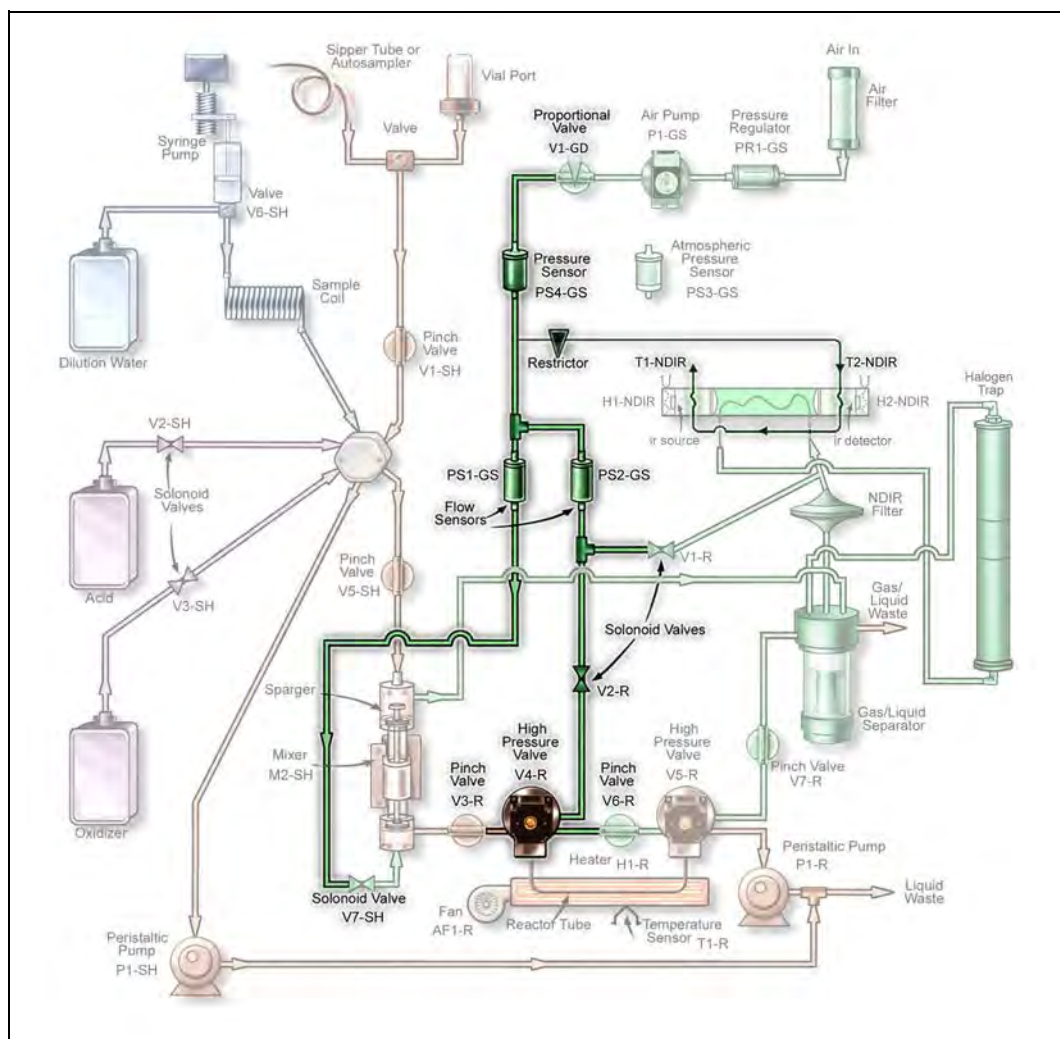


Figure 107: Reactor Inlet Valve Leak Check

### To perform the (Check 3) Reactor Bypass Leak Check

This test checks for leaks in the same area as the Reactor Inlet Valve Leak Check and also checks for leaks in valve V5-R, V7-R and pump P1-R. This flow path is highlighted in [Figure 108](#).

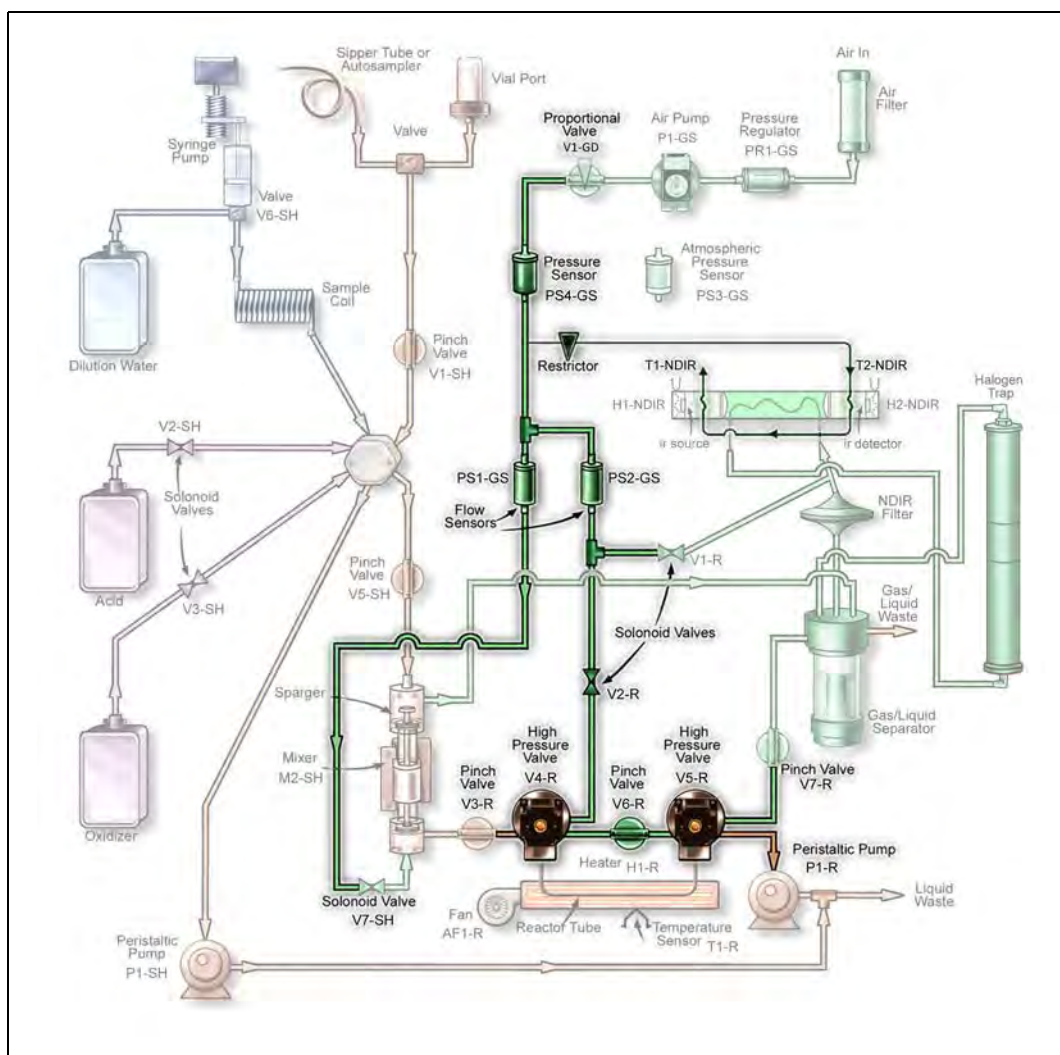
1. Ensure that the NDIR is plugged, as described in the *Before You Begin* section.
2. Press the **Reactor Bypass** button to start the test. The Analyzer closes the following valves: V1-R, V3-R, V4-R, V5-R, V7-R and V7-SH. The Analyzer opens valves V2-R and V6-R.

The Gas Control Module pressurizes the lines for 24 sec., and then valve V1-GD closes to trap the pressure in the area being tested. The system holds for an additional 15 sec. If a major leak is detected at this time, an “Analyzer failed to pressurize” warning appears



and the test will end. During this 39-sec. pressurization period, the timer remains at 00:00 and the analyzer displays "Pressurizing . . ." under the timer.

3. When the system passes pressurization, the leak check begins, the timer starts, and "Testing . . ." appears under the timer. The test lasts for 60 sec. The test passes if the drop in pressure is  $\leq 0.5$  psi.
4. If the test fails, but the Analyzer passed the Gas Manifold and Reactor Inlet Leak Checks, then check the gas connections on V5-R and the connections between V5-R and V6-R, V7-R and pump P1-R. If all of those connections are correct, the seal in V5-R may need to be replaced due to leaking O-rings.
5. To continue the series of gas leak checks, leave the plug on the NDIR end cap outlet gas line and proceed to the next section, ["To perform the \(Check 4\) Reactor Leak Check."](#) Otherwise, remove the plug for normal operation.



**Figure 108: Reactor Bypass Leak Check**

### ***To perform the (Check 4) Reactor Leak Check***

This test checks for leaks in the same area as the Reactor Bypass Leak Check and checks for leaks at the reactor tube. This flow path is highlighted in [Figure 109](#).

1. Ensure that the NDIR is plugged, as described in the *Before You Begin* section.
2. Press the **Reactor** button to start the test. The Analyzer closes the following valves: V1-R, V3-R, V7-R and V7-SH. The Analyzer opens valves V2-R, V4-R, V5-R, and V6-R.

The Gas Control Module pressurizes the lines for 24 sec., and then valve V1-GD closes to trap the pressure in the area being tested. The system holds for an additional 15 sec. If a major leak is detected at this time, an “Analyzer failed to pressurize” warning appears and the test will end. During this 39-sec. pressurization period, the timer remains at 00:00 and the analyzer displays “Pressurizing . . .” under the timer.

3. When the system passes pressurization, the leak check begins, the timer starts, and “Testing . . .” appears under the timer. The test lasts for 60 sec. The test passes if the drop in pressure is  $\leq 0.5$  psi.
4. If the test fails, but the Analyzer passed the Gas Manifold, Reactor Inlet, and Reactor Bypass Leak Checks, then check the O-rings on the seals in V4-R and V5-R. Replace the seals, if necessary. If the seals are good, then check the reactor tube fittings on the V4-R and V5-R. A hole in the reactor will also cause a leak.
5. To continue the series of gas leak checks, leave the plug on the NDIR end cap outlet gas line and proceed to the next section, [“To perform the \(Check 5\) Reactor Outlet Valve Leak Check.”](#) Otherwise, remove the plug for normal operation.



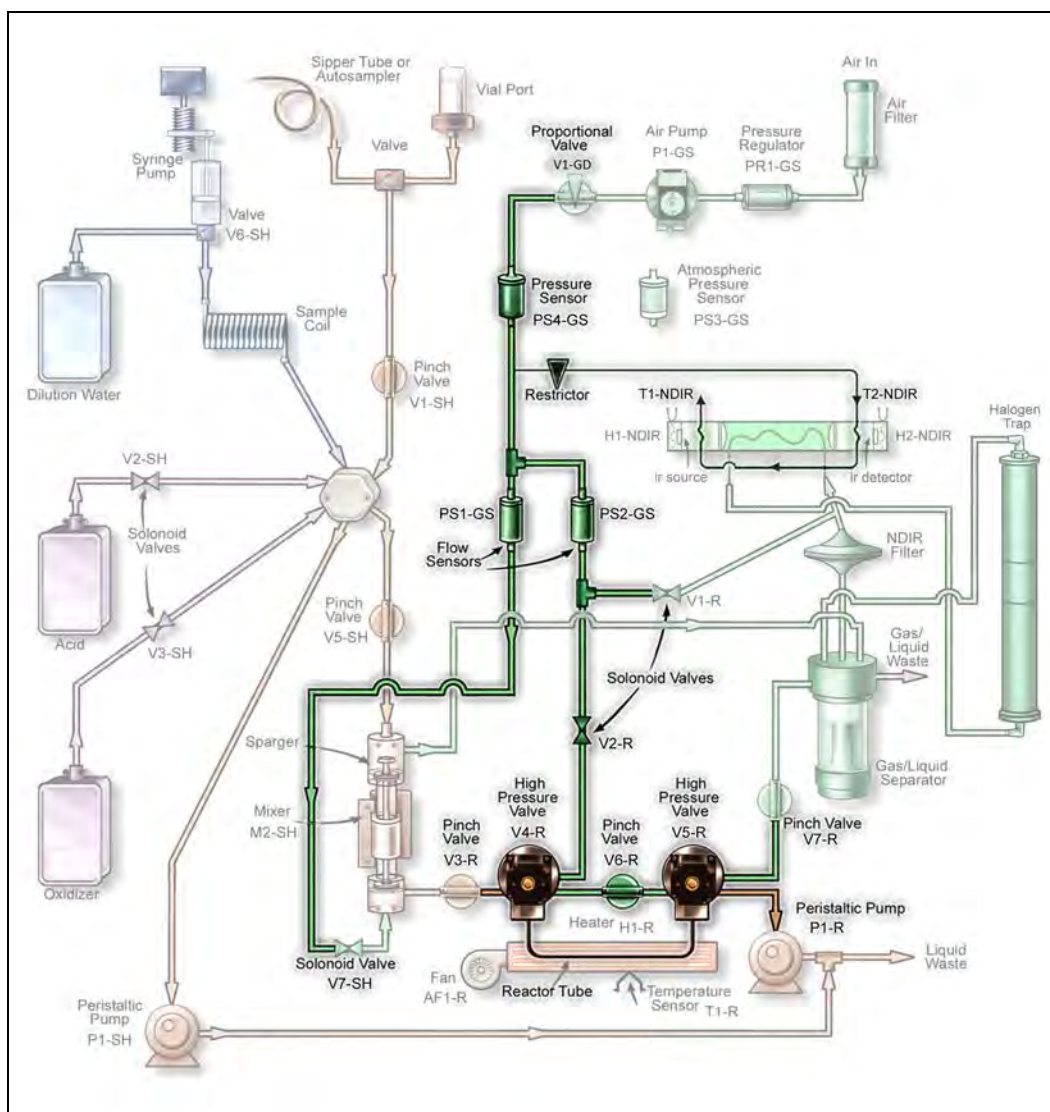


Figure 109: Reactor Leak Check

### To perform the (Check 5) Reactor Outlet Valve Leak Check

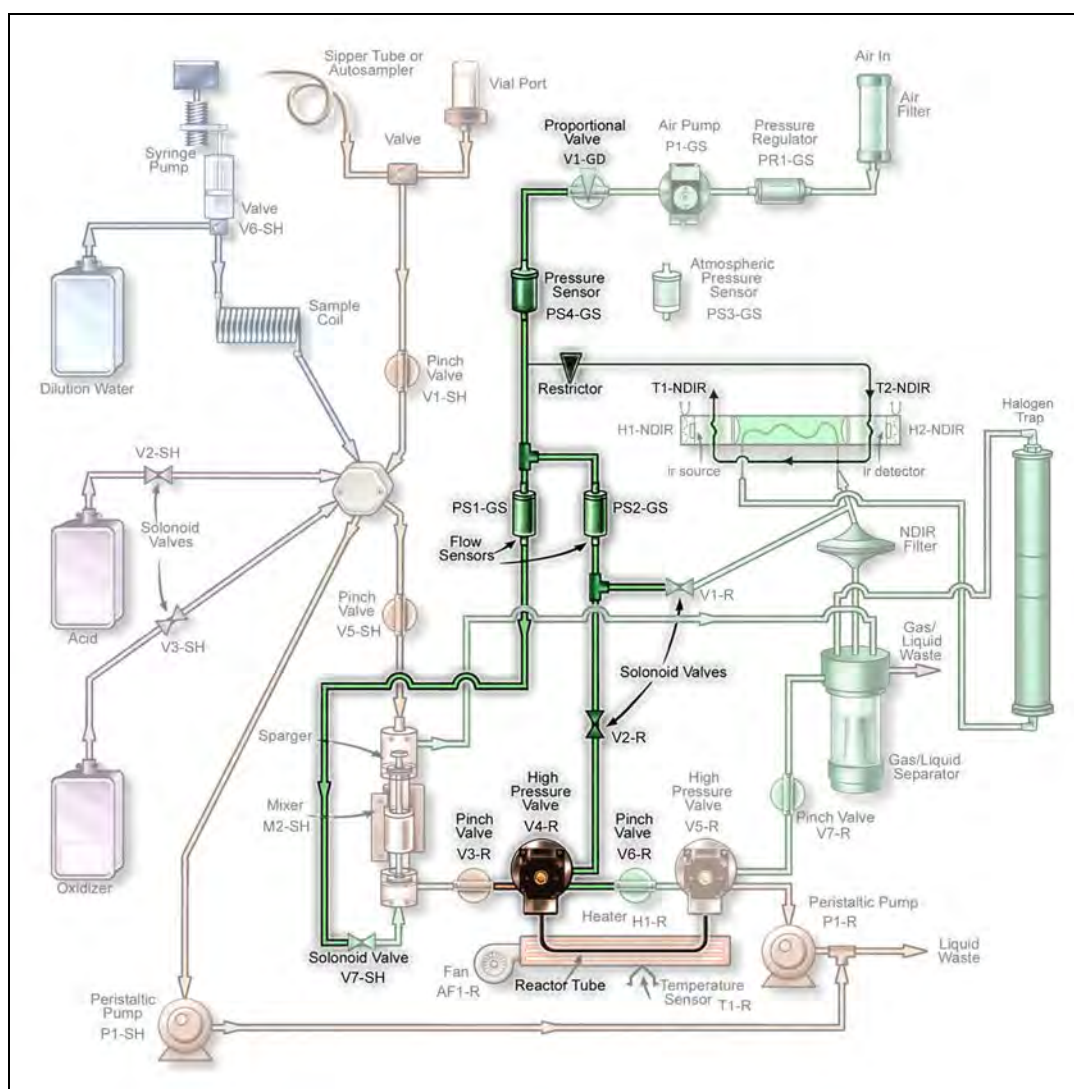
This test checks for leaks at valve V5-R. The flow path is highlighted in [Figure 110](#).

1. Ensure that the NDIR is plugged, as described in the *Before You Begin* section.
2. Press the **Reactor Outlet Valve** button to start the test. The Analyzer closes the following valves: V1-R, V3-R, V5-R, V6-R and V7-SH. The Analyzer opens valves V2-R, V4-R and V7-R.

The Gas Control Module pressurizes the lines for 24 sec., and then valve V1-GD closes to trap the pressure in the area being tested. The system holds for an additional 15 sec. If a major leak is detected at this time, an “Analyzer failed to pressurize” warning appears

and the test will end. During this 39-sec. pressurization period, the timer remains at 00:00 and “Pressurizing . . .” appears under the timer.

- When the system passes pressurization, the leak check begins, the timer starts, and “Testing . . .” appears under the timer. The test lasts for 60 sec. The test passes if the drop in pressure is  $\leq 0.5$  psi.
- If the test fails, but all previous Leak Tests passed, the seals in V5-R may need to be replaced.
- To continue the series of gas leak checks, leave the plug on the NDIR end cap outlet gas line and proceed to the next section, [“To perform the \(Check 6\) Gas-Liquid Separator \(GLS\), NDIR Filter, NDIR Sample Path and Sparger Leak Check.”](#) Otherwise, remove the plug for normal operation.



**Figure 110: Reactor Valve Outlet Check**

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## **To perform the (Check 6) Gas-Liquid Separator (GLS), NDIR Filter, NDIR Sample Path and Sparger Leak Check**

1. Ensure that the NDIR is plugged, as described in the *Before You Begin* section.
2. Pull the pinch valve tubing out of V7-R. Refer to [“Valves” on page 225](#) for instructions on how to open the valve to facilitate removal of the tubing.
3. Place a clamp on the Gas-Liquid Separator “#2 Gas/Liquid Waste” tube (the tube that extends from the Gas-Liquid Separator and out of the Analyzer). The Gas-Liquid Separator will pressurize slightly during this test; ensure that it is installed correctly and its bracket screw is fastened securely. See [Figure 94 on page 222](#).
4. On the *Gas Leak Check* screen, press the **Reactor Bypass** button to start the test. The Analyzer closes the following valves: V1-R, V3-R, V4-R, V5-R, V7-R, and V7-SH. The Analyzer opens valves V2-R and V6-R.
5. The Gas Control Module pressurizes the lines for 24 sec., and then valve V1-GD closes to trap the pressure in the area being tested and the system holds for an additional 15 sec. If a major leak is detected at this time, an “Analyzer failed to pressurize” warning appears and the test will end. During this 39-sec. pressurization period, the timer remains at 00:00 and “Pressurizing . . .” appears under the timer.
6. When the system passes pressurization, the leak check begins, the timer starts, and “Testing . . .” appears under the timer. The test lasts for 60 sec. The test passes if the drop in pressure is  $\leq 0.5$  psi.
7. If the test fails, but all previous Leak Tests passed, check the fittings and tubing at the Gas-Liquid Separator, NDIR filter, and sparger.
8. Reinstall the pinch tubing into V7-SH.
9. Remove the clamp from the Gas/Liquid Waste tube.
10. Remove the plug on the NDIR end cap outlet gas line.

## Pumps

The Analyzer's pumps can be tested by pressing the **Pumps** button from the *Diagnostics* screen. The screen in [Figure 111](#) shows pumps available to test.

P1-SH and P1-R are the sample pumps located in the interior of the Analyzer. Press the button which corresponds with the pump you would like to test. Press the button again to stop the pump.

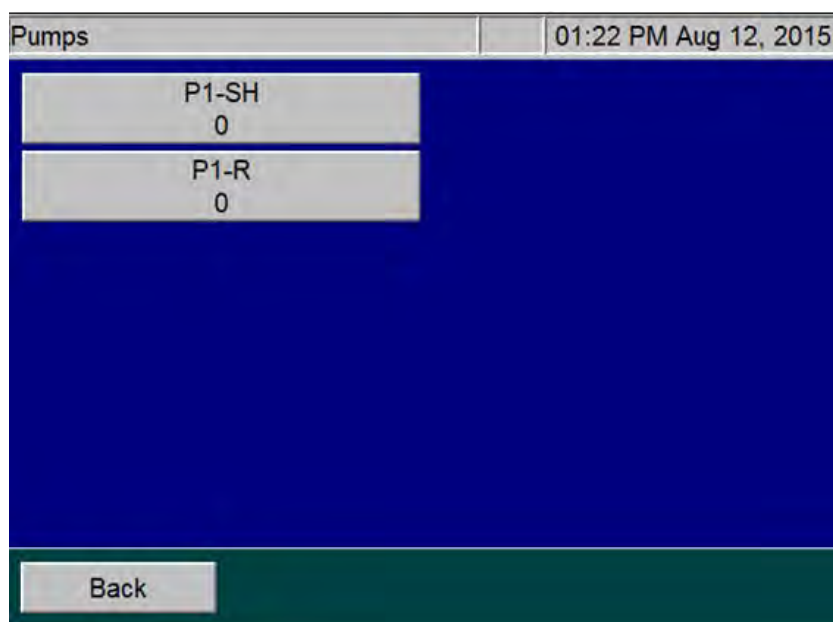


Figure 111: The Pumps Diagnostics Screen

## Export Diagnostic Data

When you press the **Export Diagnostics USB** button, you can export diagnostic data to a USB memory device. The Analyzer exports the data in a file that includes a log of diagnostics information.

## Testing the Sparger

Test the mixing bar located inside the sparger as follows:

1. On the *Diagnostics* screen, press the **Sparger** button ([Figure 112](#)).
2. Press the **Mixing bar** button to activate the mixing bar in the sparger.
3. Press the **Mixing bar** button again to stop the mixing bar.
4. Press the **Back** button to return the mixing bar to its inactive state.

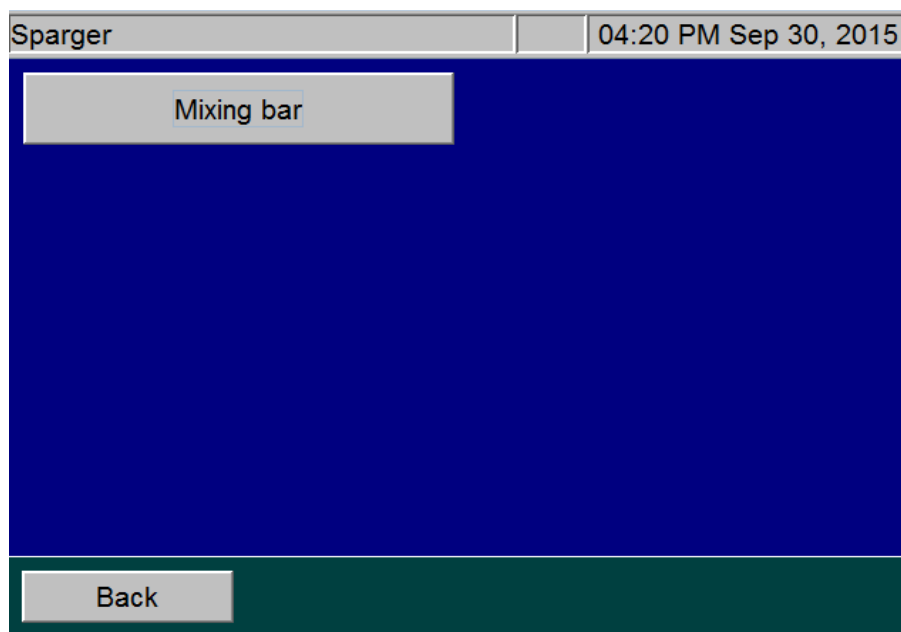


Figure 112: Sparger Diagnostics Screen

## *Troubleshooting the Sievers Autosampler*

### **Cleaning the Needle Assembly**

Over time it is possible for the needle to become clogged. To clean the needle assembly, flush water through the needle by following these steps:

1. Turn off power to the Sievers Autosampler.
2. Loosen the fitting that secures the sample tube to the Analyzer, using a 7/16 in. open-end wrench.
3. Fill the Analyzer's water bottle with DI water (the water bottle is supplied in the Analyzer's Accessories Kit).
4. Attach the water bottle nozzle to the Sievers Autosampler sample tubing using a short connector tube, such as Norprene tubing.
5. Manually place the needle assembly into a large flask, to collect water that will be flushed through the needle assembly.
6. Force water into the sample tubing from the water bottle. If water does not stream out but instead drips or leaks out slowly, there is an obstruction in the tubing. Apply more pressure to the squirt bottle to see if you can remove the clog. Be careful to squirt water, and not air, into the tubing.
7. Check for a plug in the needle vent by unscrewing the sample tubing where it connects to the top of the needle assembly and screwing it in to the needle vent port. Then, use a

water bottle to gently force water into the vent port. Water should flow out from the needle.

If water does not come out of the needle, try to clear the clog with fine wire, etc. If that is not successful, you may need to replace the needle.

## Misalignment of Needle

You may need to re-align the Sievers Autosampler needle if you experience any of the following:

- The needle is not correctly piercing the center of the septa.
- The needle is hitting the edge of the septa or vial.
- The needle is otherwise failing to properly enter the sample vial.

### *To troubleshoot the realignment*

1. Visually inspect the needle assembly to confirm that the needle is not bent. Also confirm that the needle assembly is properly mounted on the upper mount block and that the mounting nut is not loose. (Refer to [page 84](#) for needle assembly installation instructions.)
2. Confirm that the sample rack is securely seated in the correct mounting holes on the rack location base. If the rack is misaligned, the needle will not properly pierce the septa.
3. If the visual inspection of the Sievers Autosampler does not lead to corrective action, contact Technical Support or your local service provider.

## *Sievers Autosampler Operating State Check*

There are four external indicators used to identify the functioning state of the Sievers Autosampler.

**Table 17: Sievers Autosampler Indicator Lights**

Indicator	Meaning/Action
The green indicator on the front of the Sievers Autosampler	<p>If it is illuminated then the main power supply is operational.</p> <p>If it is not lit, toggle the Power Switch on the side of the Sievers Autosampler. Wait 10 seconds before turning the unit back on. If the unit initializes but the light does not come on then the indicator is faulty. If the unit does not initialize and indicator does not light then it is possible that either the power supply fuse has blown or the internal power supply is faulty.</p>
The CPU Activity LEDs on the side of the Sievers Autosampler	<p>If the LED flashes at 10 second intervals then the internal computer is operating and the power supply is operational. If the indicator does not light then it is possible that:</p> <p>The internal power supply is faulty.</p> <p>The main electronics board is faulty.</p> <p>The indicator is faulty.</p> <p>Further confirmation of a failure can be obtained by observing the status of the other LED indicators, the communications, and by resetting the Sievers Autosampler by powering off, then on. If it does not perform the initialization sequence by driving the arm then there is a fault. Contact Technical Support or your local service provider.</p>
The Host communications LEDs	<p>This LED flashes when serial communications from the Host computer is received.</p> <p>Use the Host or other computer to send serial commands to the Sievers Autosampler. If the LED flashes, then the internal computer is operating, it is receiving characters from the Host computer, and its power supply is operational.</p> <p><i>NOTE: The flashing only indicates that a character has been received. It does not indicate that the character is correct.</i></p>
The Error Status Indicator LEDs	<p>These LEDs show the status of the Sievers Autosampler and the error state. Refer to the error codes in the following <a href="#">Table 18</a>.</p>

Four indicator lights, marked 1 through 4, are used to identify the functioning state of the Sievers Autosampler:

**Table 18: Sievers Autosampler LED Error Codes**

Light 1	Light 2	Light 3	Light 4	Error Number	Error Description
Off	Off	Off	Off	0	No Error.
Off	Off	On	Off	2	Program memory check-sum error. Contact Technical Support or your local service provider.
Off	Off	On	On	3	Configuration memory check-sum error. Contact Technical Support or your local service provider.
Off	On	Off	Off	4	RAM Test error. Contact Technical Support or your local service provider.
Off	On	On	Off	6	X-axis position error. The X-axis motor was commanded to move, but did not reach the desired position.
Off	On	On	On	7	Theta-axis position error. The Theta-axis motor was commanded to move, but did not reach the desired position.
On	Off	Off	Off	8	Z-axis position error. The Z-axis motor was commanded to move, but did not reach the desired position.
On	Off	On	On	11	X-axis movement detected without the motor being commanded to move.
On	On	Off	Off	12	Theta-Axis movement detected without the motor being commanded to move.
On	On	Off	On	13	Z-axis movement detected without the motor being commanded to move.



## Known Software Issues

### Problems Connecting PC Directly to Analyzer

The procedure described in [“Collecting Real-Time Data” on page 148](#) in most cases will result in successful connection of a PC directly to the Analyzer. However, some organizations configure their PC's in unique ways that cannot be anticipated in this manual. If you cannot use the web browser to operate the Analyzer with the PC directly connected to the Analyzer, first ensure that you are using a crossover cable. If problems continue, contact your IT professional for help configuring the PC to the 10BASE-T half duplex setting.

### Problems Navigating Web Browser Menus

If you click on buttons on the web browser, but the web browser does not respond, it may be because of two problems that cannot be controlled by the InnovOx user interface. First, make sure to click on the text in the buttons, rather than just on the blank space on the buttons.

If the web browser responds, but is slow to do so, that probably is due to traffic on the network the Analyzer is connected to. In that case, faster response may be achieved by connecting the PC directly to the Analyzer.

## Contacting Technical Support

If you need further help troubleshooting any of these or other issues, contact Technical Support or your local service provider. You can also visit our website.

Before contacting Technical Support or your local service provider, please perform system diagnostics ([“Diagnostics Menu” on page 224](#)). When calling, provide the date of the last preventative maintenance for all consumables and basic Analyzer information from the *System Info* screen (*Maintenance* tab → **System Info**). Additionally, export and send the following data prior to contacting the team:

- **Diagnostics File** — (Menu → *Maintenance* tab → **Diagnostics** → **Export Diagnostics USB**)
- **Cal/Ver History** — (Menu → *Cal/Ver* tab → either **Calibration History** or **Verification History** → **Export All**)
- **Regular Run Data** — (Menu → *Data* tab → **Export** → **Range 1 Week** → **1 Week**)

- **System Properties Back Up** — (Menu → *Maintenance* tab → **Advanced** → **System Properties** → **USB Backup**)

## Returning the Analyzer to Sievers

In some instances, after consulting with Technical Support or your local service provider, it may be necessary to return the Analyzer to the factory for repairs. **The provided Return Authorization (RA) number must be sent with the Analyzer.**

Several precautions must be followed to ensure that the Analyzer is not damaged during shipment. If the original shipping container has not been retained, contact Technical Support or your local service provider to order shipping supplies. You can also visit our website.

Installation and training by a qualified service technician can also be provided. **Under no circumstances should the Analyzer be packed in anything other than the original shipping container.**

### Warning

If the Analyzer is returned in anything other than a Sievers shipping container, you will be charged for any damage that occurs during shipping.

Before repackaging the Analyzer, prepare it for shipping as follows:

1. If the Analyzer is taking measurements, press the **Stop Analysis** button. Then press **Yes** to confirm you want to stop the analysis.
2. Use a 7/16 in. wrench to remove the sample inlet line from the left side of the Analyzer.
3. Prime all lines with DI Water. Place all three tubes on the right side of the Analyzer (acid, oxidizer, and dilution water) into a container of DI water. Select **Menu** → **Maintenance** → **Prime Reagents** → **Prime All**.
4. Remove the three tubes from the DI water and then select **Prime All** again to drain water from the Analyzer's lines.
5. Remove the reagent tubes and the tube to the dilution water from the right side of the Analyzer.
6. If the Analyzer is fitted with an optional *Carrier Gas CO<sub>2</sub> Scrubber*, remove it from the back of the Analyzer. Use a 7/16-in. wrench to remove the Swagelok fitting from the Gas Inlet. Then use a Phillips screwdriver to remove the *Carrier Gas CO<sub>2</sub> Scrubber* bracket

from the back of the Analyzer. Do not return the *Carrier Gas CO<sub>2</sub> Scrubber* or its bracket with the Analyzer.

7. If the Analyzer uses compressed gas instead of the *Carrier Gas CO<sub>2</sub> Scrubber*, turn off the gas at the source. Use a 7/16-in. wrench to remove the gas tube from the Gas Inlet on the back of the Analyzer.
8. Remove the cover to the right side of the Analyzer.
9. Press the **Setup** tab, then press the **Grab** button.
10. Press the **Analysis Protocol** button. Select any protocol, then press **Modify**.
11. On the protocol setup screen, press the **Measure** button to select **TOC**.
12. Press the **Rejects** button and set it to zero.
13. Save protocol as "Drain."
14. Press **Back**.
15. Name the result "Drain."
16. Press the **Rep** button, and set it to 1 repetition.
17. Then press **Start Analysis**.
18. Wait until the mixing bar in the sparger has come on and then stopped. Then press **Stop Analysis**. Press **Yes** to confirm you want to stop the analysis.
19. Wait until the analysis has been terminated, then return to the *Menu* screen. Select the **Maintenance** tab, and press **Shutdown**.
20. When the display is dark, turn off the power switch and unplug the power cord.
21. Wearing eye protection and rubber gloves, remove the tubes from the Gas-Liquid Separator. Unscrew the bracket, and remove the Gas-Liquid Separator from the Analyzer.
22. Drain the Gas-Liquid Separator by turning it over. It is acceptable for the Gas-Liquid Separator to contain a few drops of liquid.
23. Reinstall the Gas-Liquid Separator.
24. Reattach the cover on the Analyzer.

You can now repackage the Analyzer and ship it to the factory.

For international shipments, coordinate with a representative to ensure quick passage through customs.

## Appendix A: Analyzer Dimension Diagrams

Diagrams show Analyzer dimensions and required clearances as follows: inches [millimeters].

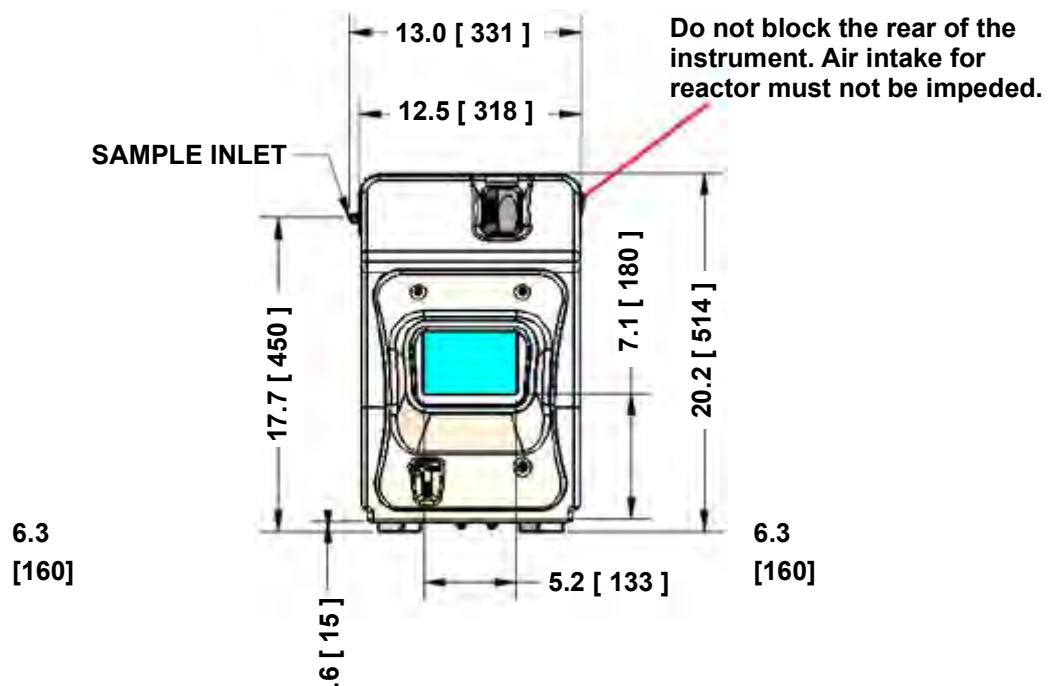
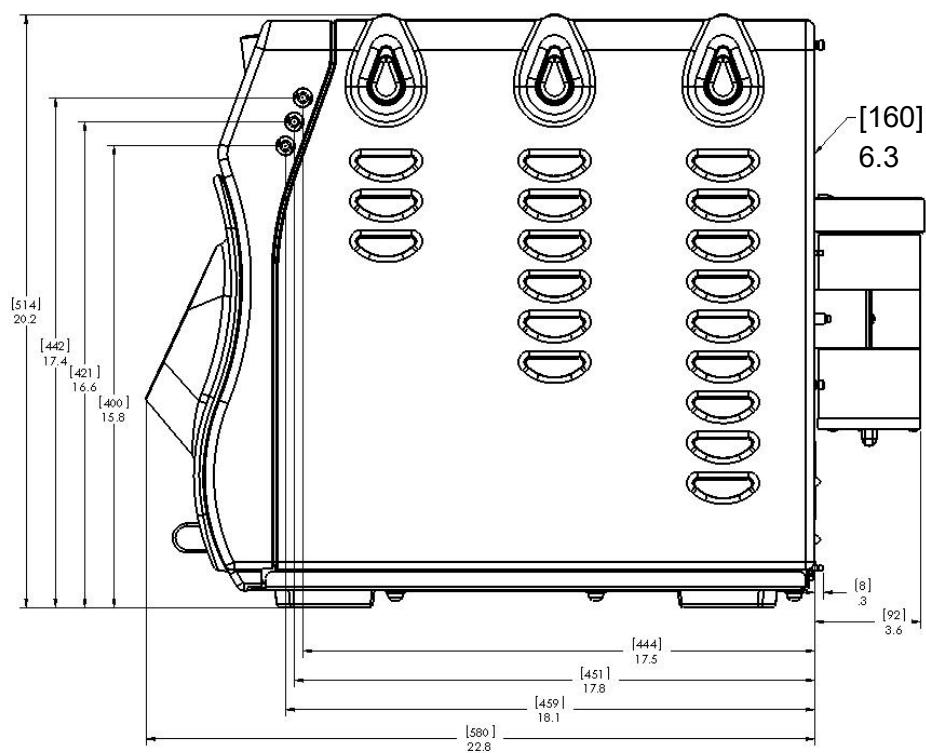
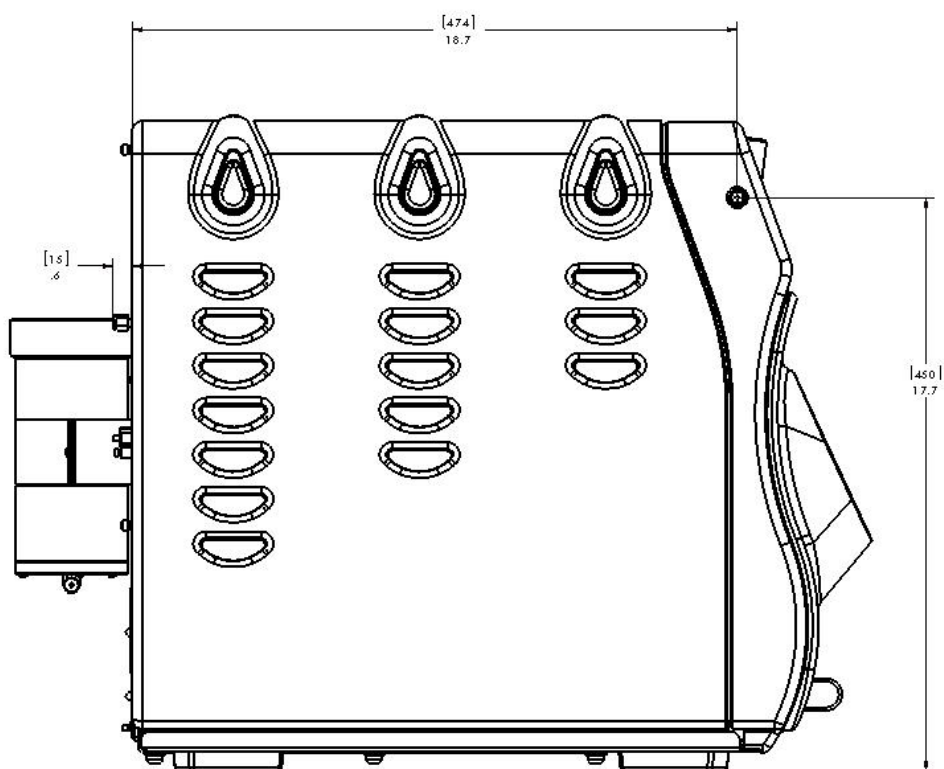


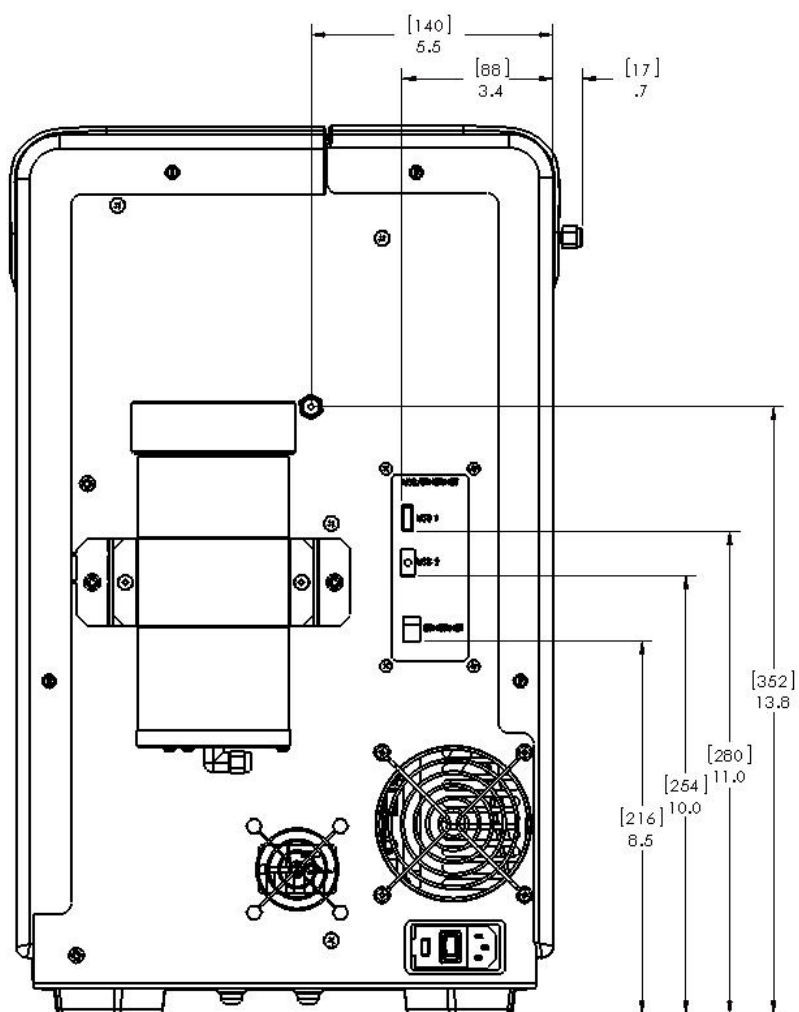
Figure 113: Analyzer Dimensions (Front View)



**Figure 114: Analyzer Dimensions (Right Side View)**



**Figure 115: Analyzer Dimensions (Left Side View)**



**Figure 116: Analyzer Dimensions (Rear View)**

## Appendix B: Acronyms and Definitions

**Acid %:** The amount of acid added to the sample, oxidizer, and dilution water (if any). A setting of 1% Acid means that 1% (V/V) of the total solution will be acid. The default value for Acid % in new protocols is 5%.

**Auto Dilution:** The **Auto Dilution** feature is used only during calibrations and verifications. The Sievers InnovOx ES Laboratory TOC Analyzer automatically dilutes a standard, having a higher concentration, so that the Analyzer can be calibrated or verified at a lower concentration.

The standard can be diluted by any factor, up to a limit that differs according to which measurement Range is to be used:

Range	Maximum Dilution Ratio
Up to 100 ppm	14:1
Up to 1,000 ppm	10:1
Up to 5,000 ppm	4:1
Up to 20,000 ppm	None
Up to 50,000 ppm	None

For example, a standard having a concentration of 1,000 ppm TOC can be diluted down to ~7 ppm in the 100 ppm range or 100 ppm in the 1,000 ppm range. It can be diluted to 1250 ppm in the 5,000 ppm range. In the 20,000 ppm range or 50,000 ppm Range, **Auto Dilution** is not active.

**Auto Range:** The **Auto Range** feature allows samples to be measured when the correct measurement Range is not known. The Sievers InnovOx ES Laboratory TOC Analyzer first makes a preliminary measurement of the sample using the 50,000 ppm Range. Based on the results of that measurement, the Analyzer selects the correct Range to use and performs the analysis of the sample using the protocol settings selected by the user. For **Auto Range** to be applied, all five Ranges must



	be calibrated, and a calibration for each Range must be assigned to a Calibration Group.
<b>Blank:</b>	<p><b>Blank</b> refers to the measurement of the carbon concentrations in the acid, oxidizer, and dilution water. The Analyzer performs this measurement automatically when the <b>Blank</b> button is pressed. The <b>Blank</b> button is found in the <i>Maintenance</i> Screen.</p> <p>It refers to the calculated contribution that the carbon in the acid, oxidizer, and dilution water make to a measurement performed by the Analyzer. When <b>Blank Correction</b> is On during the analysis of a sample or standard, this blank contribution by the reagents and dilution water is subtracted from the carbon measurement.</p> <p>The advantage of using the Blank Correction feature is that the correction is calculated, regardless of any changes in the measurement Range, or changes in Acid or Oxidizer percentages.</p>
<b>Blank Corrected:</b>	Carbon concentration measurements that have had the contribution of carbon in the reagents and dilution water subtracted.
<b>Calibration:</b>	Adjustment of the Analyzer's response, following measurement of one or more standards, having accurately known concentrations. Calibrations performed in the Sievers InnovOx ES Laboratory TOC Analyzer can be performed in the NPOC, IC, and TC/TOC mode, using standards containing known concentrations of the form of carbon of interest. It is required that the Analyzer be calibrated for the specific mode that you will be running samples.
<b>Calibration Group:</b>	To apply <b>Auto Range</b> , all four Ranges in the Sievers InnovOx ES Laboratory TOC Analyzer must be calibrated. The four calibrations that the user selects for use with <b>Auto Range</b> are assigned to a Calibration Group. Calibration Groups are named and saved in the same way that individual Calibrations are saved.
<b>Check Standard:</b>	In this manual, the term "check standard" refers to a standard, having a known carbon concentration that is used to confirm that the Analyzer is performing properly and that its calibration is within acceptable limits. A check standard is not used for calibration or verification.
<b>Concentration:</b>	In the Sievers InnovOx ES Laboratory TOC Analyzer, concentrations of samples and standards are reported in the units of ppm (mg C/L).
<b>Flush:</b>	The Sievers InnovOx ES Laboratory TOC Analyzer can perform two types of flushes: Sample Flushes and Dilution Water Flushes. These are defined below.
<i>Sample Flush</i>	Sample Flushes should be performed only when there is a very large concentration difference between one sample and the next. One, two, or three Sample Flushes can be performed before the new sample is analyzed, depending upon how difficult rinsing out the first sample is expected to be. During a Sample Flush, the Analyzer draws in the new sample and mixes it with the same amounts of reagents and dilution that will be used in the subsequent analysis. This solution is drawn through the Sparging Chamber and Reactor Module to rinse out traces of the previous sample. Note: The reactor dose and heater come to temperature

	ONLY when selecting two or three sample flushes. This is recommended for the highest concentration differences between samples.
<b>Dilution/Sample Flush</b>	This option is available as part of the <b>Flush</b> menu in the Sievers Autosampler <i>InnovOx User Interface</i> . This selection allows a combination of the dilution water flush and the sample and the sample flush, as described previously.
<b>Dilution Water Flush</b>	A Dilution Water Flush should be performed only when a sample contains a high concentration of salts or particulates. Dilution water is drawn through the Sparging Chamber and the Reactor to dissolve any residual salts and to flush out particulates that may otherwise remain behind. Dilution Water Flushes reduce maintenance by cleaning the Reactor and its valve seals.
<b>IC:</b>	Inorganic Carbon
<b>IR:</b>	Infrared
<b>Manual Dilution:</b>	Some users prefer to manually dilute samples before analysis. The <b>Manual Dilution</b> button allows those users to enter the dilution ratio that was used. The concentration reported by the Sievers InnovOx ES Laboratory TOC Analyzer is then multiplied by that factor. When no manual dilution was performed, <b>Manual Dilution</b> should be set to “1.0.”
<b>NDIR:</b>	Nondispersive Infrared
<b>Needle Rinse:</b>	After a highly contaminated sample has been analyzed using the Sievers Autosampler, it may be beneficial to rinse interior and exterior of the needle before moving to the next sample. That is accomplished by selecting <b>Rinse</b> prior to the next sample. The Sievers Autosampler must be fitted with the optional Wash Station.
<b>NPOC:</b>	Nonpurgeable Organic Carbon
<b>Oxidizer %:</b>	The amount of oxidizer added to the sample, acid, and dilution water (if any). A setting of 15% Oxidizer means that 15% (V/V) of the total solution will be oxidizer.
<b>Prime Reagents:</b>	Perform a <i>Prime Reagents</i> to clear the tubing of bubbles and old solution.
<b>Protocol:</b>	“Protocol” refers to the settings used to make a measurement with the Sievers InnovOx ES Laboratory TOC Analyzer, including the calibration that is used. Protocols can be named and saved in the Analyzer’s memory for later use.
<b>Protocol Date:</b>	Date that the protocol was created and saved on the Analyzer.
<b>Protocol Name:</b>	Name used to identify a saved protocol.
<b>Range:</b>	The concentration ranges that Sievers InnovOx ES Laboratory TOC Analyzer measures. These ranges are designated as:  Up to 100 ppm Up to 1,000 ppm Up to 5,000 ppm

	Up to 20,000 ppm Up to 50,000 ppm  Do not exceed the upper concentration specified for each range. For example, if the 5,000 ppm range is selected, accurate results will not be achieved if a sample with a concentration greater than 5,000 ppm is analyzed.
<b>Reagent Water:</b>	Reagent-grade water, having a TOC concentration less than 0.1 ppm. Containers of Sievers Reagent Water are available from Veolia that have a TOC concentration less than 0.05 ppm.
<b>Rejects:</b>	The number of initial measurements of a sample in the Grab mode or in the Sievers Autosampler that will be omitted from the Analyzer's calculations. If <b>Reject</b> is set to 2, the first two measurements will be omitted.
<b>Repetition:</b>	The number of measurements to be made on a sample in the Grab mode, or on a vial in the Sievers Autosampler.
<b>Resuspend:</b>	When samples are analyzed using the Sievers Autosampler, <b>Resuspend</b> can be turned On to cause the Sievers InnovOx ES Laboratory TOC Analyzer to draw sample from a vial into the Analyzer, and quickly dispense that sample back into the vial to agitate the sample and make it homogeneous. Particles that may have settled to the bottom of the vial are suspended in solution.
<b>Rinse Down:</b>	Before performing specific tasks or after measuring very high concentrations, it is recommended to <i>Rinse Down the Analyzer</i> . To "Rinse Down the Analyzer", analyze low-TOC water until the response of the Analyzer has been stabilized to 0.45 µg of C or less.
<b>Sample Name:</b>	Name assigned to a vial when it is analyzed using the Sievers Autosampler.
<b>Sparge:</b>	Passing CO <sub>2</sub> -free gas through the acidified sample removes IC from the solution. The subsequent measurement of the organic carbon in the sample is a NPOC measurement.
<b>TC</b>	Total Carbon (i.e., TC = TOC + IC)
<b>TDS:</b>	Total Dissolved Solids
<b>TIC:</b>	Total Inorganic Carbon (TIC = IC)
<b>TOC:</b>	Total Organic Carbon
<b>TSS:</b>	Total Suspended Solids
<b>Type of Vial:</b>	Vials in the Sievers Autosampler are designated as Sample or Standard.
<b>Verification:</b>	Following calibration of the Sievers InnovOx ES Laboratory TOC Analyzer, it is recommended that the accuracy of the calibration be confirmed by performing Calibration Verification. Verification protocols allow a calibration to be confirmed using up to six verification standards, each having a known carbon concentration.
<b>Vial Number:</b>	Number assigned to a vial in the Sievers Autosampler to show the order that it will be measured.

<b>VOC:</b>	Volatile Organic Carbon
<b>V/V:</b>	Volume of the solute divided by the total volume of the solution. Used when a concentration is expressed as a percentage.
<b>W/V:</b>	Weight of the solute divided by the total volume of the solution. Used when a concentration is expressed as a percentage.

## Appendix C: Importing Analyzer Data into a Spreadsheet

This appendix describes how to import Analyzer data files into a spreadsheet program.

### *Importing Data into a Spreadsheet Program*

The Analyzer exports data in comma-delimited text format to create a .csv file that can be imported into many spreadsheet or database programs. A common application involves exporting data from the Analyzer and importing the data into an Excel spreadsheet program.

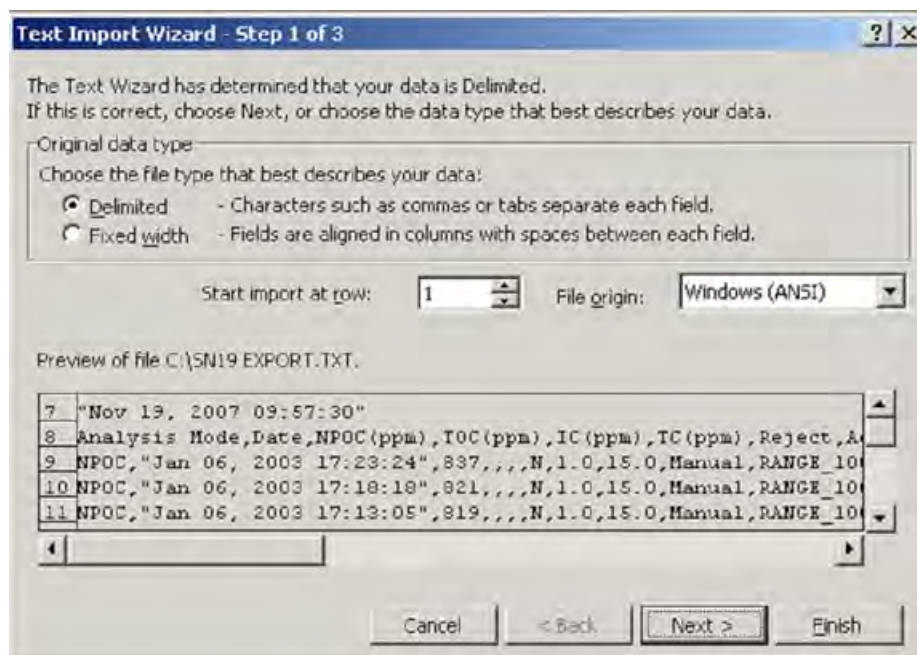
#### *To import data into a spreadsheet program*

1. Export data from the Analyzer via one of two methods.
  - Export to one of the Analyzer's USB ports<sup>13</sup> and capture the data on a USB memory device. After exporting the data, remove the USB memory device from the Analyzer and attach it to your computer's USB port. It should appear in your available drive list as a "removable media drive."

---

<sup>13</sup>Three (3) USB ports are provided for your convenience. However, you can only export data from one (1) port at any time. The Analyzer will export to the first inserted USB memory device. While this USB memory device is inserted, the Analyzer will not recognize any additional USB memory devices inserted in other USB ports.

- Export to the Analyzer's Ethernet port and capture the data using a data acquisition program, such as PuTTY, HyperTerminal, or Tera Term. See [“Collecting Real-Time Data” on page 148](#).
2. On your computer, launch the Excel spreadsheet program.
  3. Select **File** → **Open**.
  4. Set the **Files of type** drop-down menu to **All Files (\*.\*)**. Browse to the file containing the data exported from the Analyzer, and click **Open**. The USB memory device appears as a “Removable Disk” in the list of available drives.
  5. If the Excel spreadsheet program opens the data in a spreadsheet, you do not need to continue with the next steps. You can work with the file as you would any other Excel spreadsheet program file.
  6. Depending on the version of Excel spreadsheet program you have, the program may automatically start the “Text Import Wizard” to help you create a spreadsheet from the data in the file. If the “Text Import Wizard” dialog box appears (Figure 117), make sure **Delimited** is selected and click the **Next** button.



**Figure 117: Excel Spreadsheet Program Screen — Text Import Wizard - Step 1**

7. Make sure the **Comma** check box is selected, to identify the file as being comma-delimited (Figure 118).

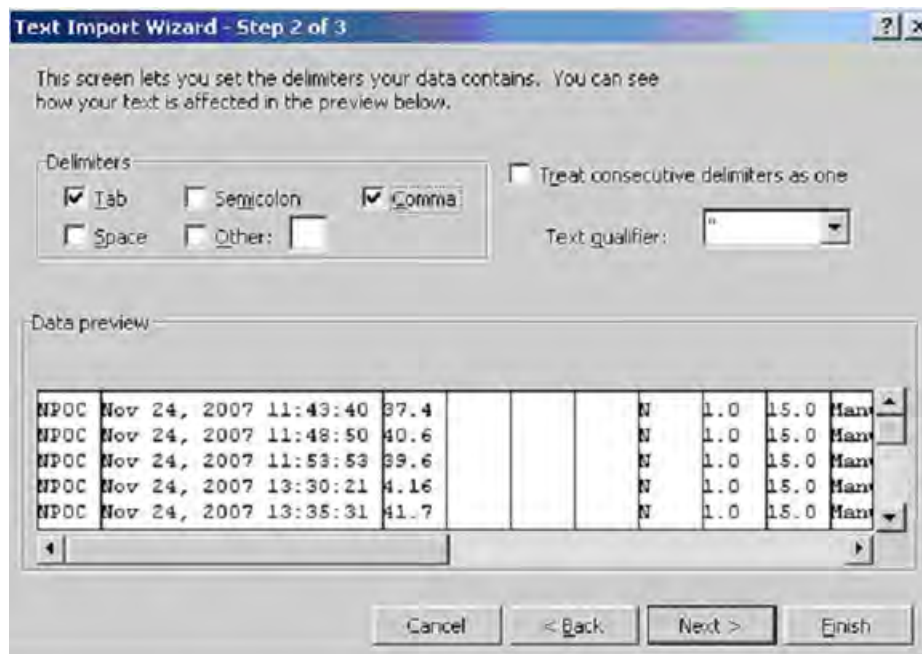
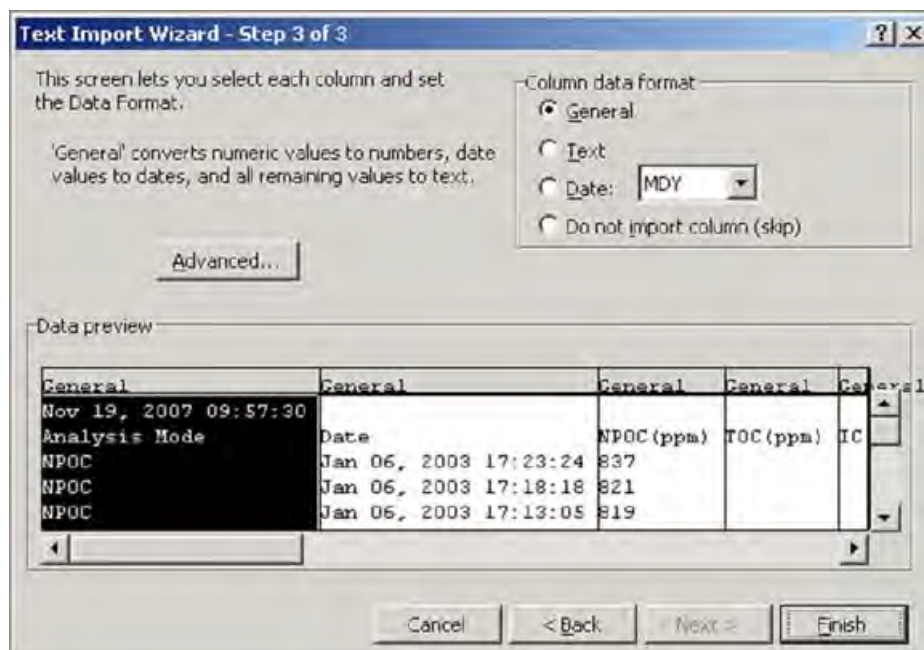


Figure 118: Excel Spreadsheet Program — Text Import Wizard - Step 2

8. The screen displays a preview of the data that will be imported. If desired, you can select a column and assign a **Column data format** (Figure 119). Click **Finish** to continue.



**Figure 119: Excel Spreadsheet Program — Text Import Wizard - Step 3**

9. A new spreadsheet containing your exported data opens. You can now modify the document as you would modify any other Excel spreadsheet program file.



## Appendix D: Sample Considerations, Reagents, and Method Development

This appendix describes Sample Considerations and Method Development. Contact Technical Support or your local service provider for questions about specific applications. You can also visit our website.

### *Sample Considerations*

Warning
Do not attempt to analyze samples containing hydrofluoric acid or fluoride ions in the Analyzer. Serious damage can occur to the instrument and toxic gases can be emitted.
Before analyzing a new sample, refer to Chapter 3, Interferences, for information on potential interferences and their effect on the Analyzer.

If the sample contains inorganic reducing compounds, those compounds often consume some of the oxidizer, causing incomplete oxidation of organic compounds. The result is low NPOC, TC, and TOC measurements.

Species that are known to produce this effect are:

- Halides (Cl<sup>-</sup>, Br<sup>-</sup>, and I<sup>-</sup>)

- Nitrite ( $\text{NO}_2^-$ )

This is much less of a problem in the Sievers InnovOx ES Laboratory TOC Analyzer than in other wet chemical analyzers because the Sievers InnovOx ES Laboratory TOC Analyzer uses supercritical water oxidation (SCWO). Salts tend to precipitate in the Reactor when supercritical conditions are reached. This makes those species less reactive during the oxidation, while the organic compounds are more soluble and, therefore, more reactive.

To overcome the effect of reducing agents in the sample, increase the oxidizer percentage until further increases do not produce significantly greater NPOC, TC, or TOC readings.

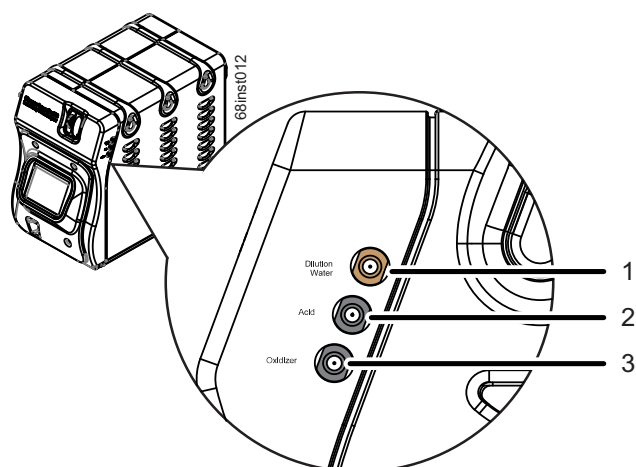
Contact Technical Support or your local service provider for questions about specific applications. You can also visit our website.

## Reagents

Use this section to learn more about the Oxidizer and Acid reagents of the Analyzer.

- [“Acid considerations” on page 267](#)
- [“Oxidizer considerations” on page 268](#)

Warning
When handling components that contain sample, standards, waste solution, or reagents, wear eye protection and gloves.
Hazardous reagents (sodium persulfate, hydrochloric acid, and phosphoric acid) are used in the Analyzer. The waste stream from the instrument is acidic and must be disposed of properly. Consult your federal, state, and local government regulations.
Consult the SDS that accompanies each standards set and the reagents to identify proper disposal techniques.



**Figure 120: Reagent and Dilution Water lines**

## Acid considerations

### Select the correct Acid for your sample

The Sievers InnovOx ES Laboratory TOC Analyzer is designed to operate with either of two different acids: 6M phosphoric acid ( $\text{H}_3\text{PO}_4$ ) and 3N hydrochloric acid ( $\text{HCl}$ ). Select the best choice for your sample based on the following:

- 6M Phosphoric acid is preferred where salts in the sample will not form precipitates in the acid due to the presence of the phosphate anions.
- If precipitate formation is problem, use 3N hydrochloric acid.

Warning
When handling components that contain sample, standards, waste solution, or reagents, wear eye protection and gloves.
Hazardous reagents (sodium persulfate, hydrochloric acid, and phosphoric acid) are used in the Analyzer. The waste stream from the instrument is acidic and must be disposed of properly. Consult your federal, state, and local government regulations.
Consult the SDS that accompanies each standards set and the reagents to identify proper disposal techniques.

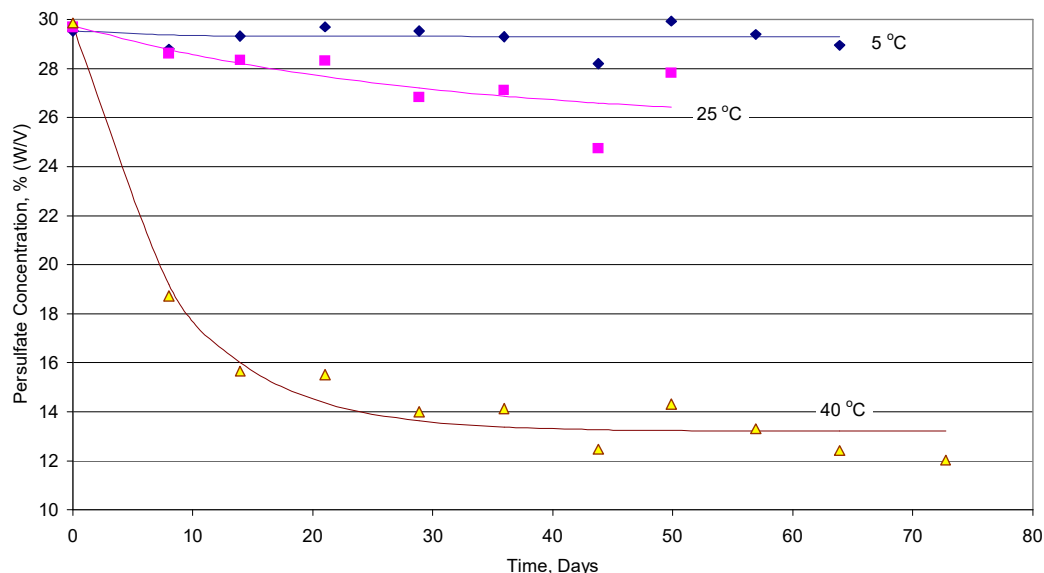
## To prepare the Acid

1. Determine which acid you will be using for your sample. For more information, see [“Acid considerations” on page 267](#).
2. Carefully transfer the appropriate acid into the “Acid” (2 L) bottle.
3. Locate the tubing section (from the Accessories Kit) containing a fitting on *only one end*. Insert the end of the tubing *without a fitting* into the “Acid” bottle.
4. Attach the fitting on the other end of the tubing to the middle (black) port **(2)** labeled “Acid” on the right side of the Analyzer **(2)**, and tighten the PEEK nut finger-tight. See [Figure 120 on page 267](#).

## Oxidizer considerations

### Storage and Environment

The following figure shows how the strength of 30% (W/V) sodium persulfate solution decreases with time at 5 °C (41 °F), 25 °C (77 °F), and 40 °C (104 °F). These data were obtained with reagent grade sodium persulfate in low-TOC reagent water, while the solution was stored in high-density polyethylene (HDPE) bottles of the type used with the Sievers InnovOx ES Laboratory TOC Analyzer.



**Figure 121: Aging of 30% (W/V) Na<sub>2</sub>S<sub>2</sub>O<sub>8</sub> in HDPE Bottles**

About 90% of the initial strength of the oxidizer reagent is retained for 30 days at 25 °C (77 °F), but less than 1.5 days at 40 °C (>104 °F). Therefore, the oxidizer reagent should be replaced more often when it is stored at temperatures over 25 °C (>77 °F).

## Disposal

Veolia recommends disposing of any aged Oxidizer (sodium persulfate oxidizing solution) appropriately before preparing a new solution. It is a good laboratory habit to avoid mixing new sodium persulfate solution with aged sodium persulfate solution to eliminate the possibility of diluting the solution or premature degradation of the Oxidizer.

Disposal of solid oxidizer should be performed as specified in the appropriate SDS. You can find copies of these documents on our website or contact Technical Support or your local service provider for more information.

## To prepare the Oxidizer (sodium persulfate oxidizing solution)

The sodium persulfate oxidizing powder solution is available in a 600 g pouches. Contact Technical Support or your local service provider for more information on ordering consumables.

Warning
When handling components that contain sample, standards, waste solution, or reagents, wear eye protection and gloves.
Hazardous reagents (sodium persulfate, hydrochloric acid, and phosphoric acid) are used in the Analyzer. The waste stream from the instrument is acidic and must be disposed of properly. Consult your federal, state, and local government regulations.
Consult the SDS that accompanies each standards set and the reagents to identify proper disposal techniques.

1. Open the oxidizer pouch and pour the entire contents (600 g) into the “Oxidizer” bottle.
2. Fill the bottle with deionized (or comparable) water until it reaches the fill mark on the bottle. This makes 2 L of oxidizer reagent.
3. Seal the container with the bottle cover *without a hole* and agitate the “Oxidizer” bottle to mix the oxidizer powder with the water until the powder is completely dissolved.
  - **IMPORTANT!** Wait a few minutes and agitate the bottle *again* to ensure **all oxidizer powder is dissolved** before connecting to the Analyzer.

4. Remove the bottle cover from the “Oxidizer” bottle and replace it with the bottle cover *that has a hole*.
5. Attach one end of the pre-cut tubing to the bottom (black) port labeled “Oxidizer” on the right side of the Analyzer **(3)**, and tighten the PEEK nut finger-tight. See [Figure 120 on page 267](#).
6. Insert the other end of the tubing into the bottle through the hole in the cover.

## Method Development

Some interferences form precipitates when acidified or oxidized. Thiosulfate precipitates sulfur when acidified. The precipitate may plug the Sparger, tubing in various places in the Analyzer, and reactor.

Some precipitates may be avoided by proper selection of the acid. To determine if the sample is likely to form precipitates, take a volume of the sample and add about 5% (by volume) acid to it. If a precipitate forms when 6M H<sub>3</sub>PO<sub>4</sub> is used, try 3N HCl. Next, add about 15% (by volume) of the oxidizer solution to the sample. This will indicate if precipitate would form when the sample is mixed with the oxidizer.

Samples that contain excessively high levels of volatile organic compounds (VOCs) may require accelerated preventative maintenance of the sample tubing.

The Oxidizer setting is dependent upon the chemical oxygen demand (COD) of the sample. The presence of chloride, nitrogen, sulfides, phosphorus, and so on can influence how much oxidizer is required. Higher levels of these species in the sample will require more oxidizer. For example, a brine sample with 25% sodium chloride (NaCl) requires a 30% Oxidizer setting. Wastewater discharge will require as little as 5% Oxidizer.

For more information on other sample type examples and method developments, locate the Application Notes from our website. Visit the *Document Library* and apply the Document Filter to view the available *Application Notes* documents.

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