

Sievers* InnovOx Online TOC Analyzer

Operation and Maintenance Manual

3.11 firmware or later



Sievers InnovOx
Online TOC Analyzer



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An electronic version of the Analyzer's *Operation and Maintenance Manual*
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Identification Records

Analyzer serial number:

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

Date of receipt and installation of the Analyzer:

(This is the warranty start date.)

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Revision History

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DLM 68100-06 EN Rev. A	Firmware 3.02 (Consumables Replacement Schedule Update)	May 2013
DLM 68100-07 EN Rev. A	Firmware 3.04 and Wastewater Sampler	August 2014
DLM 68100-08 EN Rev. A	Firmware 3.05	October 2015
DLM 68100-09 EN Rev. A	Firmware 3.06 and 3.07	June 2016
DLM 68100-10 EN Rev. A	Firmware 3.07 with update of LOD operating specification for NPOC mode	January 2017
DLM 68100-11 EN Rev. A	Firmware 3.08; updated maintenance schedule and related instructions	June 2017
DLM 68100-12 EN Rev. A	Firmware 3.09; Rebranding	December 2018
DLM 68100-13 EN Rev. A	Firmware 3.11; firmware updates, various updates, updated maintenance schedules	August 2022
DLM 68100-14 EN Rev. A	Rebranding, Veolia, updated maintenance schedules	August 2023

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Limites de correction et de fiabilité

La garantie susdite ne s'applique pas aux défauts résultants d'une installation, d'une maintenance, d'un réglage, d'un calibrage ou d'un fonctionnement inapproprié, opéré par l'utilisateur. L'installation, la maintenance, le réglage, le calibrage ou le fonctionnement doit être réalisé conformément aux instructions du manuel de l'utilisateur et de maintenance. La mise en œuvre de procédures de maintenance non recommandées peut annuler toute disposition de garantie.

Les procédures de correction indiquées dans le présent document sont les seuls remèdes du client. Le groupe Veolia ne saurait en aucun cas être tenu pour responsable de tout préjudice direct, indirect ou spécial de quelque nature que ce soit (y compris, les pertes de bénéfices), qu'il soit fondé sur un contrat, sur un acte dommageable ou sur une autre théorie légale. Le manuel de l'opérateur et de maintenance est aussi précis que possible au moment de la publication et la responsabilité du groupe ne saurait être engagée pour les éventuelles erreurs qu'il pourrait contenir. Le groupe Veolia ne saurait en aucun cas être tenu pour responsable des préjudices accidentels ou de quelque nature que ce soit, dus à l'utilisation du manuel ou de la documentation connexe. La garantie ne s'applique qu'à l'acquéreur d'origine. La garantie limitée ne peut être transférée par l'acquéreur d'origine à une autre partie sans l'autorisation expresse écrite du groupe Veolia. Veolia exclut tout particulièrement les garanties implicites de commercialisation et d'adaptabilité dans un but spécifique.

Beschränkte Ansprüche und Haftung

Die vorangehende Garantie gilt nicht für Schäden, die aus unsachgemäßer oder unzureichender Installation, Wartung, Anpassung, Kalibrierung oder Betrieb durch den Kunden resultieren. Installation, Wartung, Anpassung, Kalibrierung oder Betrieb müssen gemäß den Anweisungen in der Bedienungsanleitung durchgeführt werden. Durch die Verwendung von nicht empfohlenen Wartungsmaterialien kann der Garantieanspruch erlöschen.

Die hier erwähnten Ansprüche beziehen sich auf die einzigen und ausschließlichen Ansprüche des Kunden. Veolia ist unter keinen Umständen verantwortlich für direkte, indirekte, besondere, zufällig entstandene oder Folgeschäden (einschließlich Verlust von Einkünften), die auf Vertrag, unerlaubten Handlungen oder andere Rechtstheorien basieren. Die Bedienungsanleitung ist zur Zeit der Veröffentlichung nach bestem Wissen korrekt, und es wird keine Verantwortung für mögliche vorhandene Fehler übernommen. Veolia ist unter keinen Umständen haftbar für zufällige oder Folgeschäden, die in Verbindung mit oder durch die Verwendung der Bedienungsanleitung und begleitender Materialien entstehen. Die Garantie gilt nur für den ursprünglichen Käufer. Die beschränkte Garantie lässt sich nicht ohne ausdrückliche schriftliche Genehmigung von Veolia vom ursprünglichen Käufer auf eine andere Person übertragen. Veolia schließt besonders die konkludente Garantie der Handelsüblichkeit und Eignung für einen bestimmten Zweck aus.

Limitazione di rimedi e responsabilità

La precedente garanzia non è valida per difetti risultanti da installazione, manutenzione, regolazione, taratura o utilizzo improprio o inadeguato da parte dell'utente. L'installazione, la manutenzione, la regolazione, la taratura o l'utilizzo deve essere conforme alle istruzioni indicate nel manuale d'uso e manutenzione. L'utilizzo di materiali di manutenzione diversi da quelli consigliati rende nullo un reclamo in garanzia.

Gli unici rimedi spettanti all'utente sono quelli qui inclusi. In nessun caso Veolia sarà responsabile per danni diretti, indiretti, speciali, accidentali o consequenziali (inclusa la perdita di profitti) risultanti dall'applicazione del contratto, atto illecito o altra teoria legale. Il manuale d'uso e manutenzione è

accurato al momento della pubblicazione e l'azienda non si assume alcuna responsabilità per la presenza di eventuali errori. In nessun caso Veolia sarà responsabile per danni accidentali o consequenziali correlati o derivanti dall'utilizzo del manuale e di altro materiale di supporto correlato. La garanzia è valida solo per l'acquirente originale. La presente garanzia limitata non è trasferibile dall'acquirente originale a terzi senza l'espresso consenso scritto da parte di Veolia. Veolia declina espressamente le garanzie implicite di commerciabilità e idoneità a un particolare scopo.

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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.
	To protect against inhalation of toxic fumes, make sure the Analyzer is installed in a well-ventilated area. 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 waste. To protect against inhalation of hazardous fumes, the waste line should be vented to an outdoor environment.
	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.
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 with the covers off or the door open.	
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.	
If a mounting stand accessory is used with the Analyzer, the mounting stand must be bolted either to a wall or the floor prior to installation of the Analyzer.	
The pressure of the compressed gas at the Analyzer's gas inlet must not exceed 689 kPa (100 psig). The pressure of compressed gas at the blowback gas inlet on the Filter Panel accessory must not exceed 276 kPa (40 psig). Use only dry, oil-free air or nitrogen.	

Warning
If the IP56 accessory is used with the Analyzer, do not operate the Analyzer without the filter installed on the reactor cooling air inlet.
Before analyzing a new sample, refer to Chapter 3, Interferences, for information on potential interferences and their effect on the Analyzer.
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 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.
This equipment must be electrically grounded in accordance with local codes and ordinances or, in the absence of local codes, in accordance with the NATIONAL ELECTRICAL CODE, ANSI/NFPA NO. 70.

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

本表格依据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。
	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。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。为防止人员吸入有害烟雾，请将废液管的出口通到室外。
	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。
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。	
如果分析仪带有安装架附件，在安装分析仪之前，必须先将安装架用螺栓固定在墙壁或地板上。	
分析仪进气口的压缩气体的气压不可超过 689 kPa（100 psig）。过滤器面板附件上反吹气口的压缩气体的气压不可超过 276 kPa（40 psig）。只可使用干燥、无油的空气或氮气。	
如果分析仪带有 IP54 附件，不可操作没在反应器冷却器进气口安装过滤器的分析仪。	
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。	
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。	

警告

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。

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。

此设备必须按照地方法规和条例接地。在没有地方法规的情况下，必须按照美国电工法 ANSI/NFPA 第 70 号的规定接地。



仪器上此符号表示该产品确实含有列入中国 RoHS II 限用物质。请参照下表。

InnovOx TOC Analyzers

产品中有害物质的名称及含量

Table of Hazardous Substances' Name and Concentration

部件名称 Component Name	有害物质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	○	○	○	○	○	○

本表格依据SJ/T 11364的规定编制。

This table is prepared according to SJ/T 11364

○: 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

×: 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

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

×: 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.
	Stellen Sie zum Schutz gegen das Einatmen giftiger Dämpfe sicher, dass der Analysator an einem gut belüfteten Ort installiert ist. Abhängig von der Zusammensetzung der Probe können Halogene, wie Chlor oder Brom, oder giftige Dämpfe von Fluorid, Cyanid oder anderen giftigen Salzen in den Abfall des Analysators abgegeben werden. Zum Schutz vor dem Einatmen gefährlicher Dämpfe sollte die Abfallleitung ins Freie geführt werden.
	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.
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.	
Um eine sichere Funktionsweise und einen Schutz vor Verletzungen zu gewährleisten, den Analysator nicht ohne Abdeckungen oder bei offener Tür betreiben.	
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.	
Falls der Analysator mit einer Zubehör-Standvorrichtung verwendet wird, ist diese Standvorrichtung vor der Montage des Analysators entweder an die Wand oder an den Boden zu schrauben.	





Warnhinweise
Der Druck des verdichteten Gases am Gaseinlass des Analysators darf 689 kPa (100 psig) nicht überschreiten. Der Druck des verdichteten Gases an der Rückstoß-Einlassöffnung für das Gas darf 276 kPa (40 psig) nicht überschreiten. Ausschließlich trockene, ölfreie Luft oder Stickstoff verwenden.
Falls mit dem Zubehörteil IP56 verwendet, den Analysator nicht ohne den montierten Filter am Kühlluftreinlass betreiben.
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 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 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.
Dieses Gerät muss gemäß den lokalen Bestimmungen, bzw. falls keine solchen Bestimmungen vorliegen, gemäß dem National Electrical Code, ANSI/ NFPA, Nr. 70 elektrisch geerdet werden.

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.
	Con el fin de protegerse contra la inhalación de humo tóxico, asegúrese de instalar el Analizador en un lugar con buena ventilación. 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. Con el fin de protegerse contra la inhalación de vapores nocivos, los conductos de drenaje deben ventilar hacia un entorno exterior.
	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.
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 adecuado y protegerlo contra lesiones, no haga funcionar el Analyzer sin las cubiertas colocadas o con la puerta abierta.	
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.	
Si junto con el Analyzer se utiliza un accesorio de soporte de montaje, el mismo debe ir atornillado ya sea a la pared o al piso antes de la instalación del Analyzer.	





Advertencias
La presión del gas comprimido en la entrada de gases del Analyzer no debe exceder de 689 kPa (100 psig). La presión del gas comprimido en la entrada de resoplado de gases del panel de filtrado no debe exceder de 276 kPa (40 psig). Utilice solamente nitrógeno o aire seco libre de aceite.
Si el accesorio IP56 se utiliza junto con el Analyzer, no haga funcionar el analizador sin el filtro instalado en la entrada de aire de refrigeración del reactor.
Antes de analizar una nueva muestra, consulte el Capítulo 3, Interferencias, para obtener información sobre las posibles interferencias y sus efectos sobre el Analyzer.
Durante la manipulación de componentes que contengan muestras, estándares, soluciones de desecho o reactivos, utilice anteojos y guantes de protección.
Siempre detenga el análisis antes de apagar el Analyzer.
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.
La utilización de este instrumento de un modo no especificado por Veolia puede afectar la protección que brinda el instrumento.
Para conocer las técnicas apropiadas de desecho, consulte la hoja de datos de seguridad del material (SDS, por su sigla en inglés) que se encuentra junto a cada familia de estándares y reactivos.
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.
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.
El equipo debe tener una conexión eléctrica a tierra de conformidad con los códigos y ordenanzas locales o, en ausencia de dichas regulaciones, de conformidad con el Código Eléctrico Nacional, ANSI/NFPA, no 70.

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.
	Pour protéger les personnes contre les fumées toxiques, assurez-vous de bien installer l'analyseur dans une salle bien ventilée. 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 se protéger contre l'inhalation de fumées dangereuses, le conduit de déchets doit être évacuée vers un environnement extérieur.
	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.
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.	
Pour assurer un bon fonctionnement et une protection contre toute blessure, ne pas opérer l'analyseur avec les capots retirés ou la porte ouverte.	
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.	
Si un accessoire support de montage est utilisé avec l'analyseur, le support de montage doit être boulonné au mur ou au sol avant l'installation de l'analyseur.	





Avertissements
La pression du gaz comprimé à l'admission de gaz de l'analyseur ne doit pas dépasser 689 kPa (100 psig). La pression du gaz comprimé à l'admission du gaz de retour sur le panneau filtrant ne doit pas dépasser 276 kPa (40 psig). Utiliser uniquement de l'air sans huile, sec ou de l'azote.
Si l'accessoire IP56 est utilisé avec l'analyseur, ne pas opérer l'analyseur sans le filtre monté sur l'admission de l'air de refroidissement du réacteur.
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.
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 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.
Cet appareil doit être électriquement relié à la terre en accord avec les codes et ordonnances locaux ou, en absence de ces derniers, en accord avec le code national électrique, ANSI/ NFPA, n° 70.

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.
	Per evitare l'inalazione di fumi tossici, accertarsi che l'analizzatore venga installato in un'area ben ventilata. 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 proteggere dall'inalazione di fumi pericolosi, la linea dei rifiuti dovrebbe essere fatta sfiatare all'aperto.
	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.
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 provvista 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.	
Al fine di garantire che tutte le operazioni vengano svolte correttamente ed evitare infortuni, vi consigliamo di azionare l'analizzatore utilizzando le adeguate protezioni e chiudendo la porta.	
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.	
Qualora insieme all'analizzatore venisse utilizzato un supporto per il montaggio, è necessario che quest'ultimo venga fissato al muro o sul pavimento prima di procedere all'installazione del dispositivo.	





Avvertenze
<p>La pressione del gas compresso nella bocchetta del gas dell'analizzatore non deve superare 100 psig (libbre per pollice quadrato), corrispondenti a 689 kPa (kilopascal). La pressione del gas compresso nella bocchetta del gas per il controsoffio sul pannello del filtro non deve superare 40 psig, corrispondenti a 276 kPa. Utilizzare solo aria secca e disoleata o azoto.</p>
<p>Qualora il dispositivo IP56 venisse utilizzato insieme all'analizzatore, quest'ultimo non deve essere azionato prima di aver installato il filtro sulla bocchetta dell'aria di raffreddamento del reattore.</p>
<p>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.</p>
<p>Manipolando componenti che contengono campioni, standard, soluzioni di scarico o reagenti, indossare protezioni oculari e guanti.</p>
<p>Arrestare sempre l'analisi prima di spegnere l'analizzatore.</p>
<p>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.</p>
<p>Se lo strumento viene utilizzato in modo diverso da quello specificato dalla Veolia, potrebbe essere compromessa la protezione prevista per l'apparecchiatura.</p>
<p>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.</p>
<p>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.</p>
<p>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.</p>
<p>Quest'attrezzatura deve essere collegata elettricamente a terra in conformità ai decreti e alle leggi locali o, in assenza, in conformità al Codice elettrico nazionale, ANSI/NFPA, Numero 70.</p>

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。
	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。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。有害ガスから保護するために、廃液ラインを屋外環境に放出する必要があります。
	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。
有害な試薬（過硫酸ナトリウム、塩化水素酸、リン酸）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。	
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。	
分析器に取付スタンドアクセサリを使用する場合は、分析器を取り付ける前に取付スタンドを壁または床にボルトで固定しておく必要があります。	
分析器のガス注入口の圧縮ガスの圧力は 689 kPa (100 psig) 以下でなければなりません。フィルターパネルアクセサリのガスブローバック口の圧縮ガスの圧力は 276 kPa (40 psig) 以下でなければなりません。乾燥した油分を含まない空気または窒素のみご使用ください。	





警告
分析器に IP56 アクセサリーを使用する場合は、必ずリアクターエア冷却口にフィルターを取り付けて分析器をご使用下さい。
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。
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。
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。
この機器は、その地域の規定や条例に従って、また地域の規定がない場合には、米国電気規則、ANSI/NFPA、規格番号 70 に従って、電氣的に接地する必要があります。

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 .
	유독 가스 흡입을 방지하기 위해 분석기를 환기가 잘 되는 구역에 설치하십시오 . 샘플의 구성에 따라 , 염소 또는 브롬과 같은 할로겐이나 불화물 , 시안화물 또는 기타 유독성 염분에서 나온 유독 가스가 분석기의 폐기물로 방출될 수 있습니다 . 유해 가스의 흡입을 방지하기 위해 폐기물 라인을 실외 환경으로 환기시켜야 합니다 .
	이 기호는 유럽연합 전기전자장비 폐기물 (WEEE) 지침 2002/96/EC를 준수하기 위해 분석기를 일반 폐기물과 분리하여 폐기해야 함을 나타냅니다 .
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 .	
분석기와 함께 마운팅 스탠드 액세서리를 사용할 경우 분석기를 설치하기 전에 마운팅 스탠드를 벽 또는 바닥에 볼트로 체결해야 합니다 .	
분석기 가스 입구 측의 압축 가스 압력은 689 kPa(100 psig) 를 초과해서는 안 됩니다 . 필터 패널 액세서리에 있는 역류 가스 입구 측의 압축 가스 압력은 276 kPa(40 psig) 를 초과해서는 안 됩니다 . 건조하고 유분이 없는 공기 또는 질소만 사용하십시오 .	

경고
분석기와 함께 IP56 액세서리를 사용할 경우 반응기 냉각 공기 입구에 필터를 설치하지 않은 상태로 분석기를 작동하지 마십시오 .
새 샘플샘플을 분석하기 전에 잠재적 간섭 및 그것이 분석기에 미치는 영향에 관한 정보를 확인하기 위해 3 장 , 간섭을 참조하십시오 .
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 이물질들을 멀리하십시오 . 반응기의 냉각 공기 입구는 분석기 바닥에 있습니다 . 종이 또는 기타 물체가 이 입구를 막거나 입구에 들어가지 않도록 하십시오 .
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 .
이 장비는 지역 규정 및 법령 (또는 지역 규정이 없을 경우 국가 전기 규정 , ANSI/NFPA NO. 70) 에 따라 전기적으로 접지되어야 합니다 .

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.
	Para obter proteção contra a inalação de gases tóxicos, certifique-se de que o analisador está instalado em uma área bem ventilada. 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 haver proteção contra a inalação de gases perigosos, a tubulação de resíduos deve ter exaustão para ambiente externo.
	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.
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.	
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.	
Se uma plataforma de montagem acessória for usada com o Analisador, essa deve ser aparafusada na parede ou no chão antes da instalação do Analisador.	

Advertências
A pressão do gás comprimido na entrada de gás do Analisador não deve exceder 689 kPa (100 psig). A pressão do gás comprimido na entrada de gás de sopro de retorno (blowback) no acessório PAINEL de filtro não deve exceder 276 kPa (40 psig). Use apenas ar seco e sem óleos ou nitrogênio.
Se o acessório IP56 for usado com o Analisador, não o opere sem o filtro instalado na saída de ar refrigerante do reator.
Antes de analisar uma nova amostra, consulte o Capítulo 3, Interferências, para obter informações sobre possíveis interferências e seus efeitos no Analisador.
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 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.
O equipamento deve ser aterrado eletricamente, de acordo com os códigos e normas locais. Se não existir códigos locais, use o National Electrical Code, ANSI/NFPA, número 70.

Chapter 1. Introduction

The Sievers InnovOx On-Line TOC Analyzer from Veolia 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 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 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 InnovOx 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 On-Line TOC Analyzer follow starting on the next page. For detailed utilities requirements for installing the Analyzer, see [Table 4, “Utilities Requirements,” on page 66](#).

Table 1: System Specifications

Operating specifications¹	
Analysis Modes	NPOC, TOC (TC-IC), TC, IC
Range	50 ppb to 50,000 ppm TOC
Precision	RSD \leq 3% of reading at >5 ppm NPOC or TOC
Accuracy	Greater of $\pm 3\%$ of reading or ± 0.25 ppm, 1 to 100 ppm, NPOC or TOC
Linearity	$R^2 \geq 0.995$, measured as NPOC
LOD ²	≤ 50 ppb
TOC Calibration Stability	Up to 6 months
Analysis Time	2.6 to 8.3 minutes in Online mode
Particle size	$\leq 200 \mu\text{m}$ and up to 100 ppm TSS with clean water sampler or $> 200 \mu\text{m}$ and up to 1,000 ppm TSS with optional wastewater sampler
Smallest Inner Diameter (ID)	1.57 mm or 1570 μm
Sample Temperature	5-60 °C (41-140 °F), or 5-85 °C (41-185 °F) with high-temperature options
Ambient Temperature	10-40 °C (50-104 °F)
Source Sample Pressure	Maximum back pressure at the Analyzer must be < 7 kPa (1 psi). Achieve this with a combination of gravity drain and recommended flow of the equipped sampler.
Minimum Sample Flow Rate	50 mL/min without filtration; 3 - 5 US GPM with filtration
Drain	Gravity Drain
Analyzer specifications	
Outputs	External USB Port (1); Internal USB Ports (2); Ethernet (1); Binary End-of-Analysis Output (1); Isolated 4-20 mA Analog Outputs (5 analytical; 1 for stream ID)
Inputs	Binary Input (1) for Remote Analysis Start/Stop
Display	Color LCD w/touch-screen
Power	100 - 240 $\pm 10\%$ VAC, 50 - 60 Hz, 400 VA
Alarm Relays	System Fault Alarm (1); User-Configurable Alarms, High and Low Limit (4)
Communications Protocols	Modbus®; TCP/IP over Ethernet
Installation/Overvoltage Category	II
Sample Streams	2 Streams (standard), 5 Streams (optional)
Dimensions	H: 92.7 cm (36.5 in.); W: 64.6 cm (25.4 in.); D: 38.7 cm (15.3 in)
Weight	36.3 kg (80 lb)
Safety Certifications	CE, UKCA, ETL listed. Conforms to UL Std. 61010-1. Certified to CSA C22.2 NO. 61010-1
Environment	
Enclosure Options	IP56
Maximum Relative Humidity	Up to 95%, non-condensing
Maximum Altitude	3,000 m (9,800 ft)
Pollution Degree	2

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

² NPOC mode, bottled N₂ 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.

Additional System Specifications

Carrier Gas

Instrument Air:

ANSI / ISA - 7.0.01

CO₂ Free ≤ 1 ppm CO₂

Oil and Water free Pressurized Air

Delivery pressure should be regulated to between 551 - 689 kPa (80 - 100 psig) when using the IP56 and between 551 - 689 kPa (80 - 100 psig) when using the Regenerative Air Supply option(s). If using a cylinder of purified gas, the delivery pressure must be regulated to 207 - 689 kPa (30 - 100 psig).

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

Operating Specifications

Sample Time (min)

(Time to reported value)

	NPOC (OL)	TOC & TC (OL)
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

Note: The time for the analytical cycle is the same whether or not the Sample Back-flush feature is utilized.

Sample Consumption

Clean Water Sampler:

Sample flow should be set to provide a flow between 50 mL/min and 400 mL/min.

Wastewater Sampler; Velocity Mode

Sample flow should be set to provide a flow between 11 LPM (3 US GPM) and 19 LPM (5 US GPM).

Wastewater Sampler; Overflow Mode

Sample flow should be set to provide a flow between 50 mL/min and 400 mL/min

A gravity drain is required for all Sampler options with no back pressure (< 7 kPa, 1 psig) within the Analyzer.

(See aliquot in respective range)

Filter Panel

>1.0 LPM w/o exterior sample pump
≥400 mL/min with exterior sample pump

	Temperature	Low Temp Option: $\leq 60\text{ }^{\circ}\text{C}$ ($\leq 140\text{ }^{\circ}\text{F}$) High Temp Option: $\leq 85\text{ }^{\circ}\text{C}$ ($\leq 185\text{ }^{\circ}\text{F}$)
	Fast Flush	10 mL
	Sample Flush	Refer to aliquot volumes in respective range.
Monthly Carrier Gas	<i>Analyzer:</i>	
	Supply Pressure	207 - 689 kPa (30 to 100 psig)
	Flow/Consumption	0.2 LPM (0.007 SCFM)
	Analyzer Connection	Push-to-connect, 6.35 mm OD (1/4") Polyethylene tubing
	<i>IP56 Accessory:</i>	
	Supply Pressure	551 - 689 kPa (80 -100 psig)
	Flow/Consumption	56.6 - 70.8 LPM (2.0 - 2.5 SCFM)
	Analyzer Connection	Push-to-connect, 6.35 mm OD (1/4") Polyethylene tubing
	<i>Regenerative Air Purifier (optional accessory):</i>	
	Supply Pressure	551 - 689 kPa (80 - 100 psig)
	Flow/Consumption	3.3 - 5.7 LPM (0.1 - 0.2 SCFM)
	Analyzer Connection	Push-to-connect, 6.35 mm OD (1/4") Polyethylene tubing
Electrical	<i>Or, when using all three (Analyzer, IP56, and Regenerative Air Purifier option):</i>	
	Supply Pressure	551 - 689 kPa (80 - 100 psig)
	Flow/Consumption	60.1 - 76.7 LPM (2.1 - 2.7 SCFM)
	Analyzer Connection	Push-to-connect, 6.35 mm OD (1/4") Polyethylene tubing
	Power	100 - 240 VAC +/- 10% 50/60 Hz, 400 VA
	Alarm Relays	30 VDC @ 1A max or 125 VAC @ 0.5A max
	Binary Input	12-24 V (remote start)
	Binary Output	Relay rated max 125 VAC or 110 VDC @ 1A (analysis complete)
	Analog Output	4-20 mA, max load @ 600 ohms, powered
	Ethernet	Modbus port 502

Reagent Consumption¹

Monthly Acid (all ranges)	3.3 L (0.87 US gal) — Empty 3.5 US gallon carboy provided
Monthly Oxidizer (all ranges)	8.4 L (2.22 US gal) — Empty 3.5 US gallon carboy provided
Dilution Water (all ranges)	12.6 L (3.33 US gal) — Empty 5 US gallon carboy provided

- ¹. All reagent usage estimates are based on default settings of 5% acid and 15% oxidizer with Analyzer running continuously in NPOC mode for 30 days (No additional flushes enabled).

Monthly Check Standard (all ranges) Frequency dependent — Empty 1.0 US gallon carboy provided

SCWO Method Compliance

Supercritical Water Oxidation (SCWO) SCWO complies with general TOC methods: USEPA 415.1, USEPA 415.3, USEPA SW 9060, DIN-EN1484, ISO 8245, ASTM 5173, M5310E Standard Methods

System Overview

IP56

The Sievers InnovOx On-Line TOC Analyzer utilizes compressed air to meet the IP56 ingress protection requirement. This feature protects the Analyzer from water vapor and the ingress of dust and chemical vapors that would interfere with operation of the Analyzer.

Modules

The Sievers InnovOx On-Line TOC Analyzer consists of eleven major modules:

1. Multistream module, which accommodates two or five sample streams, depending on the Analyzer configuration. It also includes a vial port, which is used to calibrate the Analyzer. The multistream module also includes a port through which a check standard can be measured.
2. The Sample Pump accessory can be used to draw sample water to the multistream module from sources that are not pressurized.
3. 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.
4. Gas Control module, which controls the flow rates of carrier and sparge gas.
5. The Regenerative Air Purifier (optional) removes CO₂ from compressed air without maintenance.
6. Reactor module where organics are oxidized to CO₂. The reactor module consists of the:
 - Reactor tube

- Heater and cooling fan
 - Peristaltic pump
 - Valves
7. Gas-Liquid Separator, where carrier gas, containing CO₂ from the reactor, is separated from liquid before entering the non-dispersive infrared (NDIR) detector.
 8. NDIR module, containing an aerosol filter and the NDIR detector.
 9. System/controller board, which contains:
 - Microprocessors and circuitry
 - Ethernet and USB data outputs
 - Color video graphics array (VGA) display with touchscreen
 - Flash memory card
 10. Input/Output (I/O) board, which contains 4-20 mA analog outputs and digital inputs and outputs.
 11. Power Supply/Power Entry (universal).

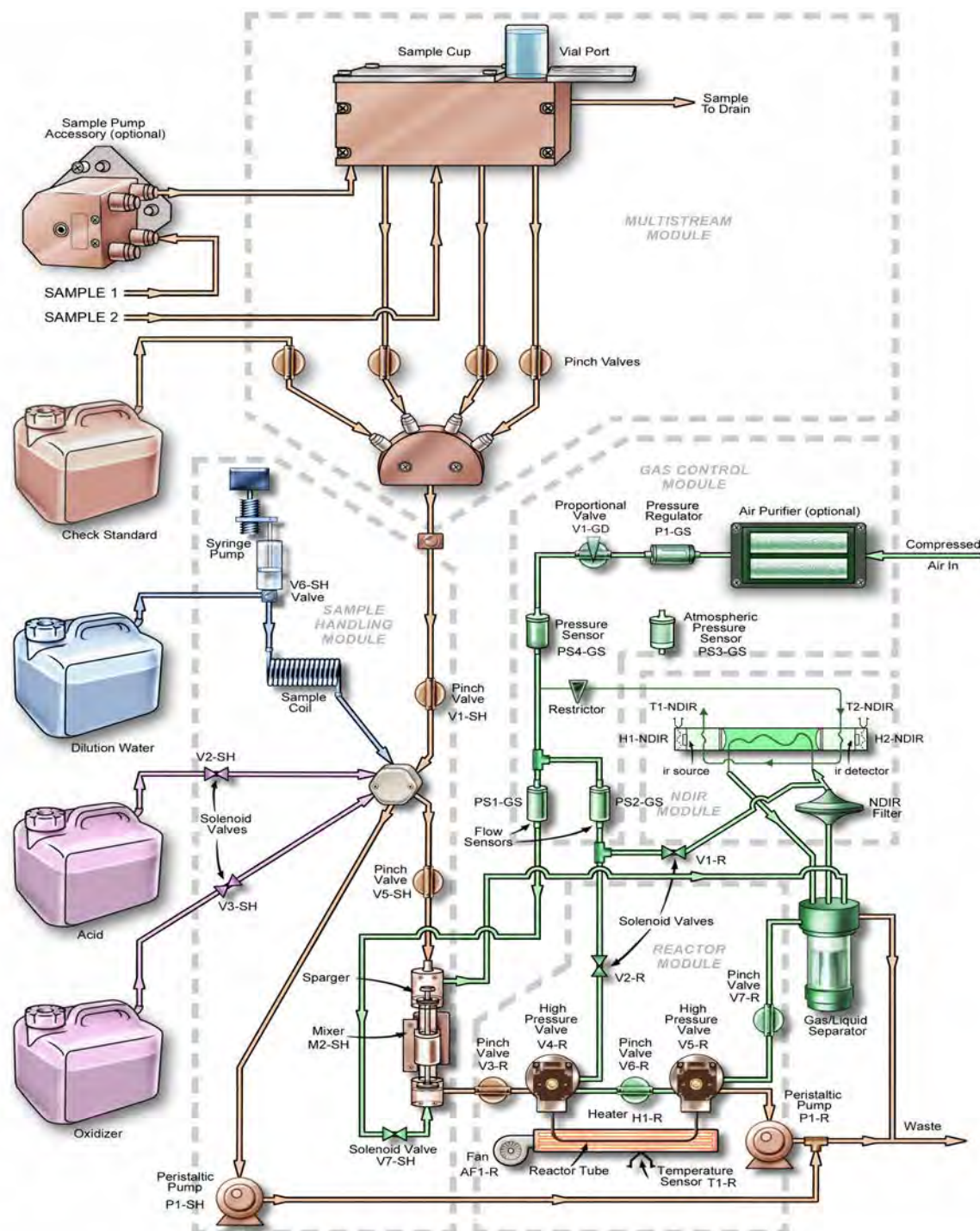


Figure 1: Analyzer Schematic

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 101 on page 232](#).

Sample Flow Path

In the Online mode, the Sievers InnovOx On-Line TOC Analyzer can monitor up to two sample streams, or in the optional 5-Stream configuration, it can monitor up to five sample streams.

Additionally, a 60-mL or 40-mL vial filled with sample can be inserted into the vial port for analysis in the Grab mode.

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. Next, reagents are 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 dilution water that equals the volume of reagents to be used in the measurement. 6 M phosphoric acid (H_3PO_4) or 3 N 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 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 CO₂ by the acid. If NPOC is to be measured, the solution is sparged with CO₂-free gas to remove the CO₂ before the solution is transferred to the reactor.

The solution is not sparged when TC, IC, or TOC (TC-IC) is measured. However, 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 CO₂. The instrument calibration procedures include a method of calibrating the IC measurement, 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)² and supercritical water oxidation (SCWO) of the organics is completed within 3 min.

When water is heated to 375 °C (707 °F)² in a sealed reactor, the pressure rises to more than 3,200 psig (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.
- 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 On-Line TOC Analyzer can oxidize chloride-containing samples without excessive formation of chlorine because the salt is not soluble during the oxidation process.

2. 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 247](#).

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 On-Line 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 110 seconds, the reactor is cooled to room temperature. The high-pressure valves are opened, and the CO₂ 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 On-Line 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 On-Line 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 CO₂ 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 CO₂ is measured in the advanced NDIR detector. This NDIR has been specially designed for use in the Sievers InnovOx On-Line 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 On-Line TOC Analyzer requires only infrequent recalibration.

Table 2: InnovOx Wetted Materials List

Material	Components
PFA	Clear tubing
316 SS	Sample needle(s) and inlet tube fitting
ETFE	Barb fittings

Table 2: InnovOx Wetted Materials List

Material	Components
Isoprene	Pinch-valve tubing
Tantalum	Reactor tube
Titanium	Reactor valves
Polypropylene	Mixer bar
Norprene® Chemical with PVC lining	Pump tubing and Waste tubing
Santoprene™	External pump tubing
UHMW polyethylene	Reactor seals
Polypropylene, PTFE	NDIR filter
AFLAS®	O-rings on seals
PEEK®	Sample manifold, reagent inlet fittings
PVC	Gas-liquid separator, NDIR detector, sparger, multistream manifold, sample cups, external tubing
PCTFE, PTFE	Vial port valve
Neoflon PCTFE® 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 Multi-point 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
- **Multistream module board** for microprocessor-controlled selection of the sample to be measured (This board also controls operation of the optional sample pump accessory.)
- **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 CO₂ produced in the Sample Handling and Reactor Modules
- **Input/Output board** for processing digital input signals and analog and digital outputs
- **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 Modbus[®]) and three³ USB ports. Data are output through the USB ports in text, PDF, and CSV formats, allowing flexibility for exporting and printing data. Historical and diagnostic 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.

Real-time data can be transferred from the Analyzer via the Ethernet port to a computer using communication software such as PuTTY[®], HyperTerminal[®], and Tera Term[®]. For details, see ["Appendix C: Importing Analyzer Data into a Spreadsheet."](#) Data also can be transferred through the Ethernet port using Modbus. Details on using Modbus are also provided in ["Appendix D: Modbus Map."](#) Stream-specific data may be output via 4-20 mA outputs.

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.

-
3. One USB port is provided for your convenience on the left side of the Analyzer. There are two additional USB ports on the System/Controller board internal to the Analyzer. 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.

Options and Accessories

The Sievers InnovOx On-Line TOC Analyzer has several options and accessories.

Options

Sample Preparation (Sampler) Devices

The Analyzer may be configured at the time of purchase to maximize performance by selecting a sample preparation device (sampler) most appropriate for the sample to be processed. The following table lists available sampler configurations.

Table 3: Sample Preparation (Sampler) Options

SAMPLER TYPE	2-Stream	5-Stream
CLEAN WATER SAMPLER		
Standard Configuration	Standard	Standard
High Temperature (Hot Water) Configuration	Optional	<i>Not Available</i>
WASTEWATER SAMPLER* *Substitute for Clean Water Samplers		
High Temperature (Hot Water) Configuration	Optional	Optional
Low Temperature Configuration	Optional	Optional

Clean Water Sampler Options

The Clean Water Sampler options include the 2-Stream Standard (standard or high-temperature) configuration and the 5-Stream (standard) configuration. The standard configurations accommodate sample streams that have low levels of solids [$< 200 \mu\text{m}$ particle size and $< 100 \text{ mg/L TSS}$ (0.01% or 100 ppm)] at a temperature up to 60°C (140°F). The 2-Stream high-temperature option accommodates low levels of solids at a temperature up to 85°C (185°F).

Clean Water Sampler — Standard Configuration (2-Stream or 5-Stream)

This base Analyzer configuration is capable of monitoring up to two sample streams or five sample streams in the *Online* mode. A vial port is provided for calibration and verification using standards in 40-mL vials. Samples can also be analyzed if they are in 40-mL vials using the vial port and Grab mode. An additional port is provided for the automated measurement of a check standard to ensure the Analyzer is calibrated and operating properly.

Clean Water Sampler Specifications (2-Stream and 5-Stream Standard Configurations)

The *Clean Water Sampler* is the default option and is intended for:

- Cooling water

The *Clean Water Sampler* specifications are not to exceed:

Pressure	Drains at ambient pressure to gravity drain (no back pressure < 7 kPa (1 psig))
Temperature	60 °C (140 °F)
Flow	50 - 400 mL/min
Total Suspended Solids (TSS)	Maximum 0.01% (100 ppm), Solids maximum 200 µm soft particle size

Clean Water Sampler — High Temperature Configuration (2-Stream Only)

With this high temperature configuration, the 2-Stream Standard configuration can be upgraded to accept samples with temperature up to 85 °C (185 °F). A vial port is provided for calibration and verification using 40-mL vial standards and Grab mode. An additional port is provided for the automated measurement of a check standard to ensure the Analyzer is calibrated and operating properly.

Clean Water Sampler Specifications (2-Stream High Temperature Configuration)

The *High Temperature Sampler* is intended for:

- Condensate
- Cooling water

The *High Temperature Clean Water Sampler* specifications are not to exceed:

Pressure	Drains at ambient pressure to gravity drain (no back pressure < 7 kPa (1 psig))
Temperature	85 °C (185 °F)
Flow	50 - 400 mL/min

Total Suspended Solids (TSS)	Maximum 0.01% (100 ppm), Solids maximum 200 µm soft particle size
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Wastewater Sampler Options

The Wastewater Sampler option is recommended for use with water samples that contain high levels of solids and can be implemented in one of two ways: *Velocity Sampling* and *Overflow Sampling*. The preferred *Velocity Sampling* mode is designed for use with fast flow and samples containing total suspended solids (TSS) maximum of 0.1% (1,000 ppm) and/or samples containing settleable solids of hard particulates (and/or grit). The *Overflow Sampling* mode is for low flow streams. It also allows for use of an external pump (such as the Sievers Exterior Peristaltic Sample Pump) when there is no sample flow. The Wastewater Sampler, therefore, meets TSS requirements by creating clean water streams and samples free of particulates. The Wastewater Sampler is substituted for the Clean Water Sampler and is available in a 2-Stream (*High Temperature or Low Temperature configuration*) or 5-Stream (*High Temperature or Low Temperature configuration*).

The Wastewater Sampler includes sample flow monitors with its own *Fail Safe* option. For additional information, see [“Installing the Wastewater Sampler System \(Optional\)” on page 91](#).

Velocity Wastewater Sampling — High Temperature Configuration

With this high temperature configuration, the 2-Stream and 5-Stream Standard *Velocity Wastewater Sampler* configurations can be upgraded to accept samples with temperature up to 85 °C (185 °F). A vial port is provided for calibration and verification using 40-mL vial standards and Grab mode. An additional port is provided for the automated measurement of a check standard to ensure the Analyzer is calibrated and operating properly.

Velocity Wastewater Sampler Specifications (2-Stream and 5-Stream High Temperature Configuration)

The High Temperature Velocity Wastewater Sampler is intended for:

- Condensate
- Cooling water

The *High Temperature Velocity Wastewater Sampler* specifications are not to exceed:

Pressure	Drains at ambient pressure to gravity drain (no back pressure < 7 kPa (1 psig))
Temperature	85 °C (185 °F)
Flow	11-19 LPM (3-5 US GPM)
Total Suspended Solids (TSS)	Maximum 0.10% (1,000 ppm), Filters to 200 µm. Rejects hard particulates (sand or grit).

Velocity Wastewater Sampling — Low Temperature Configuration (2-Stream or 5-Stream)

With this low temperature configuration, the 2-Stream Standard configuration or 5-Stream Standard can be upgraded to accept samples with temperature up to 60 °C (140 °F). A vial port is provided for calibration and verification using 40-mL vial standards and Grab mode. An additional port is provided for the automated measurement of a check standard to ensure the Analyzer is calibrated and operating properly.

Velocity Wastewater Sampler Specifications (2-Stream or 5-stream Low Temperature Configuration)

The Low Temperature Velocity Wastewater Sampler is intended for:

- Typical industrial wastewater

The *Low Temperature Velocity Wastewater Sampler* specifications are not to exceed:

Pressure	Drains at ambient pressure to gravity drain (no back pressure < 7 kPa (1 psig))
Temperature	60 °C (140 °F)
Flow	11-19 LPM (3-5 US GPM)
Total Suspended Solids (TSS) hard	Maximum 0.10% (1,000 ppm), Filters to 200 µm. Rejects particulates (sand or grit).

Overflow Wastewater Sampling (Low-Temperature and High-Temperature)

(Clean water streams free of particulates and meeting TSS requirements.)

Pressure	Drains at ambient pressure to gravity drain (< 7 kPa (1 psig) under recommended operating conditions)
Temperature	Low temperature option: 60 °C (140 °F) High temperature option: 85 °C (185 °F) ^a
Flow	50 - 400 mL/min
Total Suspended Solids (TSS)	Maximum 0.10% (1,000 ppm), Solids maximum 200 µm soft particle size. Flow must be sufficient to remove solids to meet the Analyzer specification for TSS sampling.

^a *In applications with sample temperatures above 85° C (185° F), the 1-in. flexible sample tubing should not be used. The samples should be plumbed with rigid piping suitable for the sample temperatures and any corrosive properties the sample might exhibit.*

Sample Peristaltic Pump (External Sample Pump)

Some sample streams are not pressurized, or are not sufficiently pressurized to provide the necessary flow to the Analyzer. For that reason, the sample peristaltic pump accessory is available for those applications that require a pump to get the sample to the Analyzer.

NOTE: Maximum pump suction: 3 MPS, 400 mL/min

Regenerative Air Purifier

The Regenerative Air Purifier option makes it possible for the Analyzer to operate using instrument air (ANSI/ISA - 7.0.01) as the compressed gas source. The Regenerative Air Purifier removes carbon dioxide and moisture from the air so that it can be used as carrier and sparge gas. When used as specified, the Regenerative Air Purifier reduces carbon dioxide to <1 ppm and 99.9+ % of the water vapor. No consumables are required for its operation, but the instrument air must be dry and oil-free.

To ensure proper operation of the Regenerative Air Purifier, the compressed air pressure must have a supply pressure of 551 - 689 kPa (80 - 100 psig). The required volume is dependent on actual sustained pressure.

NOTE: As the drains are manual and are not connected out of the Analyzer, the filter cups must be inspected on a regular basis.

Accessories

Mounting Stand

A Mounting Stand is available, which accommodates an Analyzer; its reagents, dilution water, and check standard carboys; and one sample filter panel. The mounting stand allows the Analyzer to be mounted at various heights for convenience. For safety, the mounting stand must be bolted to the floor or a wall.

Fail Safe

If the *Fail Safe* accessory is selected, sensors are installed in the Analyzer to detect when the flow of each sample stream stops. The Analyzer will not attempt to analyze a stream when its flow has stopped, but will resume analysis of it when the flow starts again. Sensors also are

installed that detect when any of the reagents, dilution water, or check standard needs to be replenished.

Enclosures

Sample Filter Panel

An optional filter panel is available that filters one sample stream, and it is automatically cleaned by back flushing with compressed air. The sample filter panel is operated pneumatically, so no electrical power is required. The Analyzer controls the back flushing and the Filter Panel is adjustable for a wide range of particulate levels in the sample stream.

Chapter 3. Interferences

Certain substances affect the safety and reliability of the Sievers InnovOx On-Line 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 (CN^-), sulfide (S^{2-}), and fluoride (F^-) produce toxic gases when acidified. Samples that contain those species should not be analyzed in the Sievers InnovOx On-Line TOC Analyzer.

Other interferences, including chloride (Cl^-) and bromide (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 Sievers InnovOx On-Line

TOC 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, H₂SO₄, or H₃PO₄

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 or side sample port, 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 291](#).

Chapter 4. Installation

Overview

This chapter provides installation instructions for the Sievers InnovOx On-Line TOC Analyzer and also includes information on the Analyzer design and function. An interior overview diagram is available in [Chapter 8, "Maintenance."](#)

Utilities requirements are provided for reference when installing the Analyzer. See [Table 4, "Utilities Requirements," on page 66.](#)

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



Sievers* InnovOx On-Line Utilities Requirements

Sievers* InnovOx On-Line Utilities Requirements

Gas Requirements					Analyzer Connection Type & Dimension	Tubing Supplied By
Components Requiring Gas Supply	Gas Type & Quality	Pressure	Flow/Consumption			
IP56	Oil and Water Free Pressurized Air (Instrument Air ANSI/ISA - 7.0.01)	551 - 689 kPa (80 - 100 PSIG)	56.6 - 70.8 LPM (2.0 - 2.5 SCFM)		Connection: Push-to-Connect Tubing: 6.35 mm OD (1/4") Polyethylene	Customer Supplied
Regenerative Air Purifier (Optional Accessory)	Oil and Water Free Pressurized Air (Instrument Air ANSI/ISA - 7.0.01)	551 - 689 kPa (80 - 100 PSIG)	3.3 - 5.7 LPM (0.1 - 0.2 SCFM)			Customer Supplied
Analyzer	CO ₂ Free Instrument Air or Bottled Nitrogen (CO ₂ Content must be < 1 ppm)	207 - 689 kPa (30 - 100 PSIG)	0.2 LPM (0.007 SCFM)			Customer Supplied
All Above Options Used (Typical Installation)					Connection: Push-to-Connect Tubing: 6.35 mm OD (1/4") Polyethylene	Customer Supplied

Table 4: Utilities Requirements

Sampler Requirements					Analyzer Connection Type & Dimension	Fittings and Tubing Supplied By
Sampler Type	Flow	Max Back-Pressure ¹	Maximum TSS and Particle Type			
Clean Water Sampler	50 - 400 mL/min	< 7 kPa (< 1 PSIG)	100 mg/L TSS or 0.01% TSS Colloidal Solids Only (≤ 200 µm)		Connection: Quick-Connect Or Barb Tubing: 6 mm ID (1/4") Flexible PVC	Sievers Supplies Fittings & 7.5 m (25') Tubing - 2 or 5 Stream
Wastewater Sampler (Velocity Mode)	11 - 19 LPM (3 - 5 US GPM)	< 7 kPa (< 1 PSIG)	0.1% (1,000 ppm) Particulate Solids (≥ 200 µm)		Connection: 3/4" NPT to 1" Barb Tubing: 25 mm ID (1") Flexible PVC	Sievers Supplies Fittings & 7.5 m (25') Tubing - 2 Stream 15 m (50') Tubing - 5 Stream
Wastewater Sampler (Overflow Mode)	50 - 400 mL/min	< 7 kPa (< 1 PSIG)	0.1% (1,000 ppm) Colloidal Solids Only (≤ 200 µm)		Connection: 3/4" NPT to 1/4" Barb Tubing: 6 mm ID (1/4" ID) Flexible PVC	Sievers Supplies Fittings & 7.5 m (25') Tubing - 2 Stream 15 m (50') Tubing - 5 Stream
Sample Peristaltic Pump	400 mL/min	Max Lift: 3 m (10')	0.1% (1,000 ppm) Colloidal Solids Only (≤ 200 µm)		Connection: Barbed Luer-Lok Tubing: 6 mm ID (1/4") Flexible PVC	Sievers Supplies Fittings & 7.5 m (25') Tubing - 2 or 5 Stream
¹ All Samplers must have access to a gravity drain to ensure no back pressure is put on the Sampler/Analyzer. Not following this requirement may cause catastrophic damage to the analyzer and void any warranty.						
² Sievers will supply the connections at the Analyzer. The customer is responsible for providing the correct fittings from their system to the tubing that feeds the Analyzer.						

Waste Requirements				
Waste Type	Waste Line Requirements		Analyzer Connection Type & Dimension	Fittings and Tubing Supplied By
Liquid Waste	All Analyzer Liquid Waste and Sampler Waste Must Have A Gravity Drain Ensuring No Backpressure On The System.		Connection: 3/4" Barb Tubing: 19 mm ID (3/4") Flexible PVC	Sievers Supplies Fittings & 7.5 M (25") Tubing - 2 or 5 Stream
Gas Waste	Gas Waste Line Must Be Vented Vertically. If The Analyzer Is Installed In A Building Or Shelter, The Gas Waste Must Be Vented Outside.			
Sievers will supply the connections at the Analyzer. No other fittings are needed for the waste lines.				

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Sievers* InnovOx On-Line Utilities Requirements

Table 5: Utilities Requirements (Cont'd.)

Analyzer Installation Requirements		
Property	Specifications	Notes
Analyzer Dimensions (HxWxD)	92.7 cm x 64.6 cm x 38.7 cm (36.5" x 25.4" x 15.3")	Customer Should Insure Adequate Space For Analyzer Installation: 1.8 m x 1.2 m x 0.9 m (6' x 4' x 3')
Analyzer Weight	36.3 kg (80 lbs)	Customer Should Insure Proper Support For Mounting The Analyzer
Electrical Connection	100 to 240 VAC, 1 Phase, 5.5-2.5A, 50/60hz	Installation shall ONLY be performed by a qualified electrician. Ensure electrical connection and wire size are adequate and in conformance all local codes and ordinances.
Alarm Relays	Max Load: 30 VDC @ 1A Max Load: 125 VAC @ 0.5A - Double Insulated Wire	Wires Supplied By Customer 22-18 AWG, rated to 300 V Strip lengths: 9.5 mm (3/8")
Binary Input	12 - 24 V (Remote Start/Stop)	
Binary Output	Relay Rated Maximum: 125 VAC Or 110 VDC @ 1A	
Analog Output	4-20 mA, Maximum Load: 600 ohms	
Ambient Temperature	10 - 40 °C (50 - 104 °F)	
Sample Temperature	5 - 60 °C (41 - 140 °F)	If Ambient Temperature Exceeds The Required Specification, An Additional Shelter Is Required
Maximum Relative Humidity	Up to 95%, Non-Condensing	If Ambient Humidity Exceeds The Required Specification, An Additional Shelter Is Required
Maximum Altitude	3,000 m (9,800')	-

Analyzer Reagent Requirements		
Reagent	Specification	Concentration
Dilution Water	Milli-Q, Deionized, Distilled	-
Acid	Phosphoric Acid or Hydrochloric Acid	6M H ₃ PO ₄ or 3N HCl
Oxidizer	Sodium Persulfate Solution	30% w/v
		Estimated Monthly Reagent Consumption
		12.6 L (3.33 gal)
		3.3 L (0.87 gal)
		8.4 L (2.22 gal)

Suggested Compressor and Pumps ²				
Component	Manufacturer	Model	Where to Buy	Notes
Compressor	Atlas Copco	LFx 1.0 or LFX MED 1.0 with (50 - 90L) Air Receiver	Visit https://www.atlascopco.com/en-uk/cc/in-your-country to find your local supplier	Oil Free Compressors Of Similar Specification May Be Used
Sample Pump	Please contact your local pump supplier for help with selecting an appropriate pump for you application. Visit http://www.pump-manufacturers.com/submit-enquiry.html to find your local supplier.			
Recommendations for customer with limited access to house air and/or sample flow. Other compressors & pumps may be used with similar specifications to those stated above.				

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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.

- Sievers InnovOx On-Line TOC Analyzer
- *Operation and Maintenance Manual (available for download from our website)*
- Accessories included:
 - Reagent, Dilution Water, Check Standard tubes (tubing assemblies and fittings)
 - Vial port tube and fittings
 - Waste tube (1/2-in. ID)
 - 5/32 in. Allen® wrench (hex key), for reactor valve
 - Squeeze bottle
 - Metal dowel (for NDIR leak testing)
 - Spare reactor seals (2)
 - 13.2 L (3.5 US gal) carboys for Acid and Oxidizer
 - 3.7 L (1.0 US gal) carboy for Check Standard
 - 19 L (5.0 US gal) carboy for Dilution Water
 - Tubing for sample inlet, 3 m (10 ft.)
 - PVC sample control valves (2 or 5, depending on the Analyzer configuration)
 - USB memory device
 - Two (2) PVC conduit connectors ("strain relief" hubs) for conduit wiring
 - Sealing washers for PVC conduit connectors
 - Terminal ring for AC conduit ground wire
 - Ferrites for I/O cable
 - Ethernet cables (one cross-over and one straight-through)
 - Grounding wrist strap

- Level sensors for Reagents, Dilution Water, and Check Standard (if Fail Safe Accessory was ordered)
- Mounting Stand mounting hardware for Analyzer and Filter Panel (if Mounting Stand Accessory was ordered)
- Extra tubing
- Extra fittings
- Certificate of Performance

Additional Installation Equipment

To install the Sievers InnovOx On-Line TOC Analyzer, you will also need to provide the following equipment:

- Mounting hardware to support the Analyzer (See [“Step 2: Select a Location for the Analyzer” on page 70.](#))
 - Mounting hardware to bolt Mounting Stand to wall or floor (if you ordered a Mounting Stand accessory)
 - Insulated wire (22-18 American Wire Gauge - AWG, rated to 300 Volts) for analog and alarm outputs (optional; see [“Step 5: Install Input/Output, Cables, and Accessories” on page 77.](#))
 - Analog (4-20 mA) recorder (optional)
 - Insulated wire for AC power conduit (adequate electrical connection and wire size in conformance with all local codes and ordinances, as determined and performed by a qualified electrician)
- (See [“Step 10: Turn on Power and Configure Basic Settings” on page 110.](#))

NOTE: The AC power connection should *ONLY* be performed by a qualified electrician.

- An external circuit breaker or switch that disconnects both poles of the supply voltage, rated appropriately

Step 2: Select a Location for the Analyzer

Select a location in a well-ventilated area to avoid inhaling any toxic gases that may be emitted from the Analyzer's waste. Place the Analyzer in a location away from direct sunlight and exposure to extreme temperatures.

WARNING

Operating at elevated temperatures (greater than 40 °C, 104 °F) prevents proper operation, and operating at low temperatures (below 10 °C, 50 °F) can cause errors in the measurements or damage to the Analyzer.

Wall Mount Installation

To mount the Analyzer on a wall, consult the required clearances for the Analyzer as shown in ["Appendix A: Analyzer Dimension Diagrams."](#)

Allow a minimum of 5 cm (2 in.) clearance between the back of the Analyzer and the wall for heat dissipation; allow 30.5 cm (12 in.) of clearance on the sides, top and bottom of the Analyzer for the plumbing and electrical connections. Additionally, this clearance provides for the proper circulation for temperature and humidity control. When selecting the location, mount the Analyzer so that the display screen is approximately at eye-level.

Hardware for mounting the Analyzer on a wall or instrument rack is not included in the accessories kit. Hardware should be selected based on site-specific circumstances. Mounting hardware must be able to support four times the weight of the unit; thus, you should install mounting bolts capable of supporting 145 kg (320 lb.).

Mounting Stand Installation, (Optional)

The Sievers InnovOx On-Line TOC Analyzer is designed to be mounted on a Mounting Stand or on a wall. For an illustration of the required clearances for the Mounting Stand accessory, [see Figure 2](#).

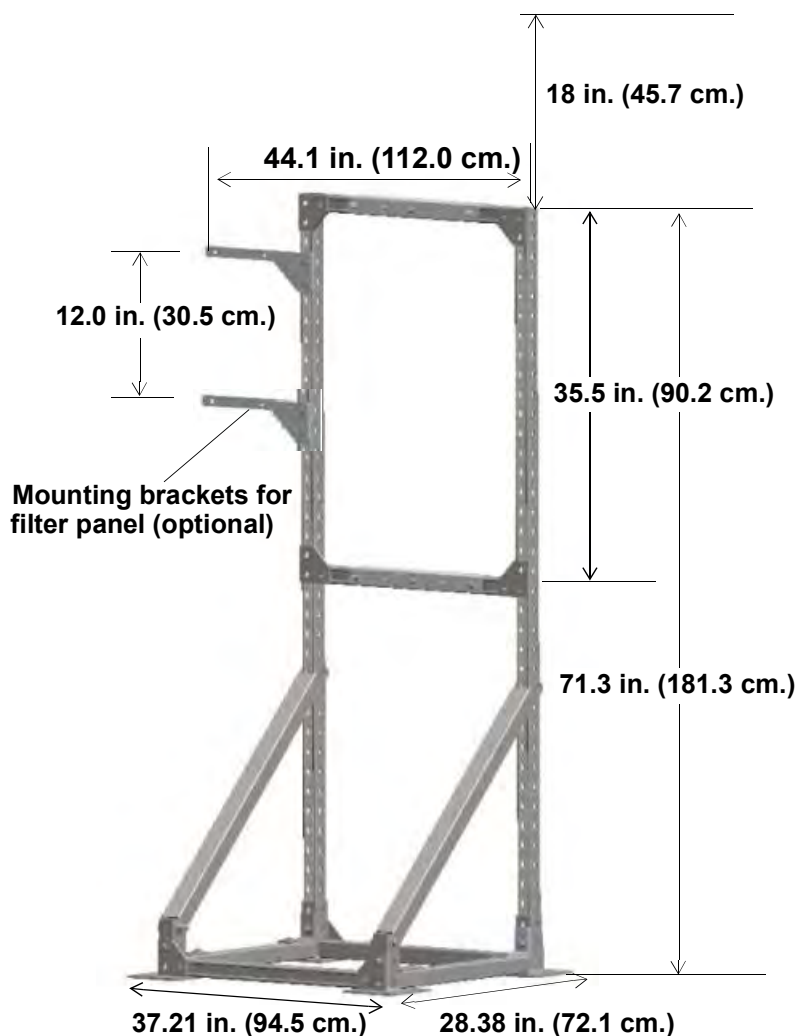


Figure 2: Mounting Stand - Clearances

At least two people are required to move the Mounting Stand to the selected location. Bolt the Mounting Stand to a wall or the floor before placing the Analyzer on it. The horizontal braces shown in [Figure 2](#) can be adjusted so that the display of the Analyzer is approximately eye-level, but the spacing between the two horizontal braces must be 94.5 cm.

To mount a Filter Panel on the Mounting Stand, attach the two Filter Panel brackets 30.5 cm apart, as shown in [Figure 2](#). Further instructions for installation of the Filter Panel are provided in the *Sievers InnovOx Filter Panel Operation and Maintenance Manual*.

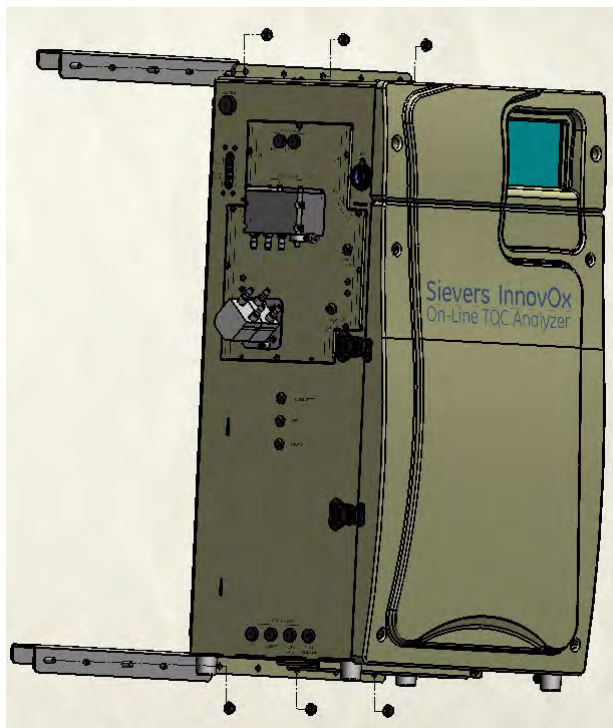


Figure 3: Attaching Mounting Brackets on the Analyzer

To mount the Analyzer on the Mounting Stand, attach the two mounting brackets to the top and bottom of the Analyzer as shown in [Figure 3](#). The brackets are held on by six 5/16-18 flange nuts. Insert the bracket with the studs through the flange that is welded onto the instrument case. Tighten the six flange nuts.

Next, lift the Analyzer onto the Mounting Stand. Secure the Analyzer on the Mounting Stand (refer to [Figure 4](#)). Lock the Analyzer onto the Mounting Stand, using four 2 in. 10-32 screws on both the top and bottom mounting brackets you attached to the Analyzer. Tighten the screws down against the inside surface of the cross members of the Mounting Stand. By friction, these screws keep the instrument from moving around.

NOTE: We recommend when lifting the instrument that you use a two-person lift. OSHA standards require protecting employees from injury. This instrument weighs over 40 lbs. It is the policy of Veolia to require a two-person lift for items weighing over 40 lbs.



Figure 4: Mounting the Analyzer to the Stand

Step 3: Connect the Waste Lines

Locate the 1/2-in. ID Waste tubing from the Accessories Kit.

Important! A gravity drain is required with no back pressure (less than 7 kPa, 1 psig).

Connect the waste lines, as follows:

1. Locate the *Waste Block* on the right side of the Analyzer. Connect one end of the Waste tube to the elbow barb labeled “**WASTE TO DRAIN**”, as shown in [Figure 5](#).



Figure 5: Connecting the Waste Lines on the Waste Block

2. Place the other end of the tube into a free-flowing gravity drain. Avoid low spots in the tube so that water cannot be trapped in the tube.
3. The *Waste Block* also requires a Vent tube to be attached to ensure that corrosive and noxious gases are routed away from the instrument. Route the Vent tube to prevent the liquid build up from condensation. The Vent tube should be connected to the upper straight barb fitting and routed at least 2 meters away, preferably vented to an outdoor environment. See [Figure 5](#).

Warning



To protect against inhalation of toxic fumes, make sure the Analyzer is installed in a well-ventilated area. 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 waste. To protect against inhalation of hazardous fumes, the waste line should be vented to an outdoor environment.

Step 4: Fill the Gas-Liquid Separator

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 Gas-Liquid Separator” on page 203](#).

1. Open the door of the Analyzer.
2. Locate the Gas-Liquid Separator. See [Figure 6: The Gas-Liquid Separator on page 76](#).
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 tube of the Gas-Liquid Separator until the water level reaches the pressure ring.

NOTE: There are two gray PVC pressure rings inside the Gas-Liquid Separator. Ensure these pressure rings remain installed.

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 of the barb, 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 6 on page 76](#) and [Figure 7 on page 77](#).

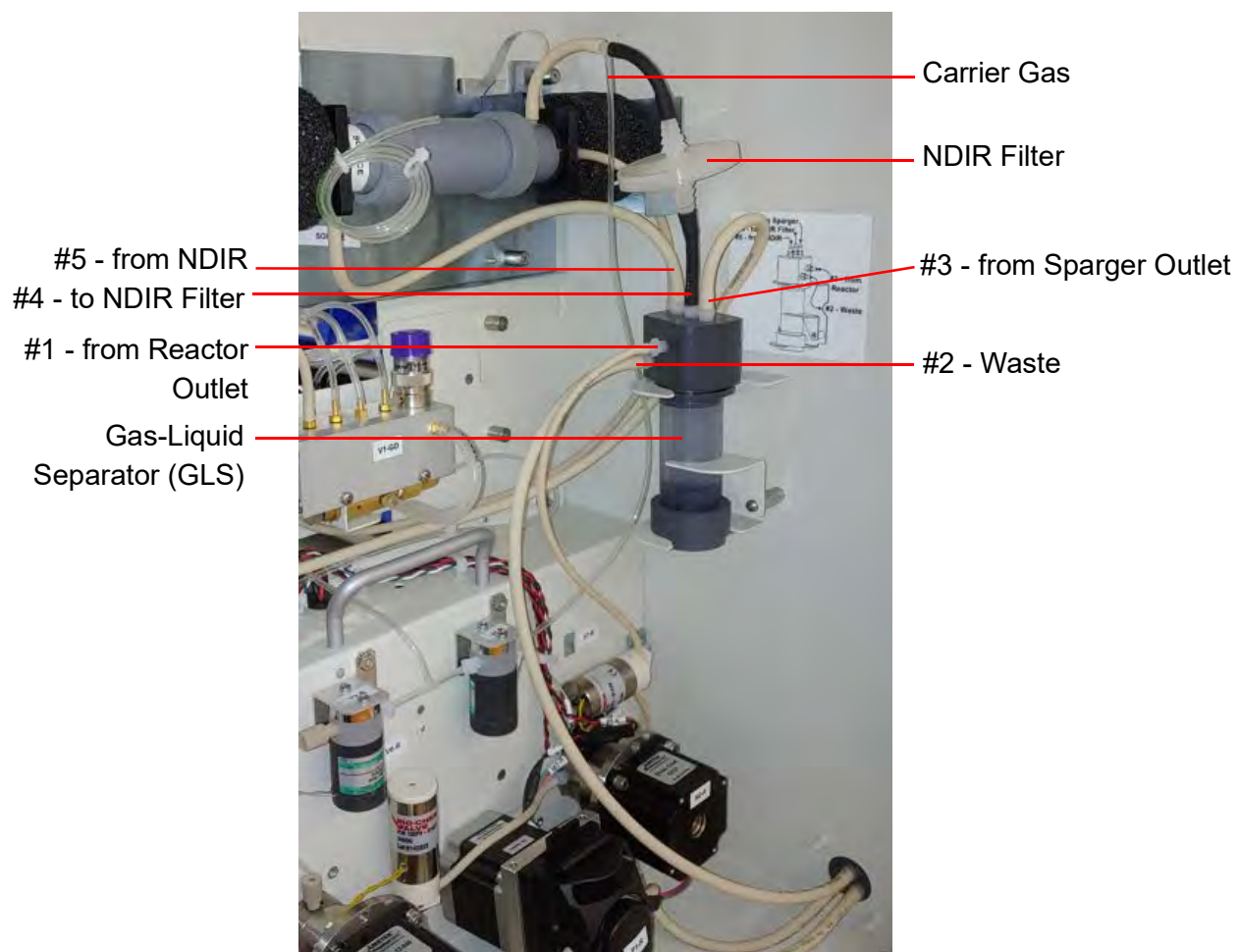


Figure 6: The Gas-Liquid Separator

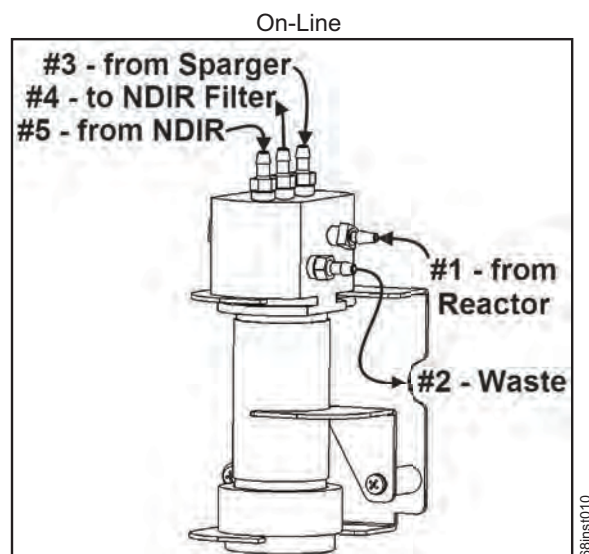


Figure 7: Gas-Liquid Separator (GLS), Label

Step 5: Install Input/Output, Cables, and Accessories

NOTE: Before installing any wiring inside the Analyzer, put on a grounding strap for ESD protection.

The Analyzer's Input/Output (I/O) board is located in the top of the Analyzer under the access cover. Remove the cover. There are four terminal blocks on the I/O board, with TB1 located closest to the front of the Analyzer. From front to rear the other terminal blocks are TB2, TB3, and TB4. Consult the tables in this section for a list of functions on each terminal block. The output and alarm connections should be installed by a qualified electrician.

Route the cables to the terminal blocks through the pass-through port, labeled **Control**, on the left side of the Analyzer. Remove the pass-through cap. Secure the PVC conduit connector ("strain relief" hub) and washer to the conduit and the Analyzer in the normal manner. Wire should be 22-18 AWG, rated to 300 Volts. Strip lengths should be 9.5 mm (3/8 in.). Install the ferrite (from the Accessories Kit) on the I/O cable, as shown in [Figure 13 on page 85](#). To attach the output connections, first remove the terminal block from the I/O board by firmly grasping the terminal block and pulling it straight out from the board. Make a note of the orientation of the terminal block before removing. Completely loosen the screw for each pin you are connecting, insert the wire, tighten the screw, and then gently pull on each connection to make sure the connection is secure. Gently reinsert the terminal block into the board socket.

Starting from the front of the Analyzer, the terminal blocks are as follows

- **TB1 Analog Outputs** — The maximum 4-20 mA load is 600 ohms. Analog outputs 1-5 are allocated for transferring data for streams 1-5. Analog 6 indicates which stream is currently active during the analyses of multi-streams (or if applicable, a single-stream).
- **TB2 Binary Input (Analysis Start/Stop)**
- **TB3 Alarm Outputs (Alarms 3 and 4, System Fault Alarm, and the Binary Analysis Complete Signal)** — The maximum load for these ports is 30 VDC at 1.0 A or if using double-insulated wiring the maximum load is 125 VAC at 0.5 A.
- **TB4 Alarm Outputs (Alarms 1 and 2)** — The maximum load for these ports is 30 VDC at 1.0 A or if using double-insulated wiring the maximum load is 125 VAC at 0.5 A.

Table 6: Analog Outputs (TB1)

Pin	Signal	Function
1	Analog 1 (+)	4-20 mA Stream #1
2	GND_ISO (-)	
3	ANALOG 2 (+)	4-20 mA Stream #2
4	GND_ISO (-)	
5	ANALOG 3 (+)	4-20 mA Stream #3
6	GND_ISO (-)	
7	ANALOG 4 (+)	4-20 mA Stream #4
8	GND_ISO (-)	
9	ANALOG 5 (+)	4-20 mA Stream #5
10	GND_ISO (-)	
11	ANALOG 6 (+)	Stream ID (11 mA, 12 mA, 13 mA, 14 mA, or 15 mA, as designated in Table 7: Stream ID)
12	GND_ISO (-)	

NOTE: 4-20 mA outputs are isolated from system ground.
 4-20 mA outputs are not individually isolated from each other and, therefore, are not intended to be connected to multiple systems with differences in ground potential.
 4-20 mA outputs may be configured by the user to output NPOC, IC, TC, or TOC ppm levels.

Table 7: Stream ID

Active Stream	Stream ID
Standby	Output matches the <i>standby</i> level set for the first sequentially-ordered active stream, starting with Stream 1
1	11 mA
2	12 mA

Table 7: Stream ID (Continued)

Active Stream	Stream ID
3	13 mA
4	14 mA
5	15 mA
Error	Output matches the <i>error</i> level set for the first sequentially-ordered active stream, starting with Stream 1
Warning	n/a (Does not change current value.)

Table 8: Binary Input (TB2)

Pi n	Signal	Function
1	BININ1+	Start/ Stop
2	BININ1-	
3	BININ2+	RESERVED
4	BININ2-	
5	BININ3+	RESERVED
6	BININ3-	
7	BININ4+	RESERVED
8	BININ4-	
9	BININ5+	RESERVED
10	BININ5-	
11	BININ6+	RESERVED
12	BININ6-	

NOTE: *Binary inputs are isolated from system ground and from each other.
The + input should be supplied with a voltage from +12 volts to +24 volts and the -
input should be controlled by a relay or an open collector transistor.*

Table 9: Alarm Outputs (TB3)

Pi n	Signal	Function
1	BINOUT3_NO	User Assigned Alarm #3
2	BINOUT3_COM	
3	BINOUT3_NC	
4	BINOUT4_NO	User Assigned Alarm #4
5	BINOUT4_COM	
6	BINOUT4_NC	
7	BINOUT5_NO	Analysis Complete Output
8	BINOUT5_COM	
9	BINOUT5_NC	
10	BINOUT6_NO	System Fault Alarm
11	BINOUT6_COM	
12	BINOUT6_NC	

NOTE: Binary outputs are isolated from system ground and from each other.

Binary outputs are implemented by relays which are rated for a maximum voltage of 125 VAC or 110 VDC @ 1 AMP. The maximum switching power (resistive load) is 62.5 VA, 30 Watts.

The System Fault Alarm logic is set up so an un-powered instrument indicates an error status. The System Fault Alarm relay is energized when the Analyzer power is on. Errors cause this relay to de-energize until the error is cleared.

The Analysis Complete Output relay will energize momentarily (pulse) when the analysis is complete for every measurement.

Table 10: Alarm Outputs (TB4)

Pin	Signal	Function
1	+24V	+24 Volts
2	+24V	
3	+24V	
4	GND	System Ground
5	GND	
6	GND	
7	BINOUT1_NO	User Assigned Alarm #1
8	BINOUT1_COM	
9	BINOUT1_NC	
10	BINOUT2_NO	User Assigned Alarm #2
11	BINOUT2_COM	
12	BINOUT2_NC	

NOTE: *Binary outputs are isolated from system ground and from each other.*

Binary outputs are implemented by relays which are rated for a maximum voltage of 125 VAC or 110 VDC @ 1 AMP. The maximum switching power (resistive load) is 62.5 VA, 30 Watts.

+24 volts and system ground are provided for local use only and are not intended for connections more than 15 feet away from the Analyzer.

Installing the 4-20 mA Connection

The data from the Analyzer may be recorded using the 4-20 mA outputs located on TB1. Each analog output is assigned to a particular sample stream. 4-20 mA output #1 provides an analog signal proportional to the concentration measured in sample stream #1. Output #2 provides a signal proportional to the concentration measured in sample stream #2, and so forth. The analog output is calibrated at the factory prior to shipping. An example wiring connection for one of the 4-20 mA outputs is shown in [Figure 8](#).

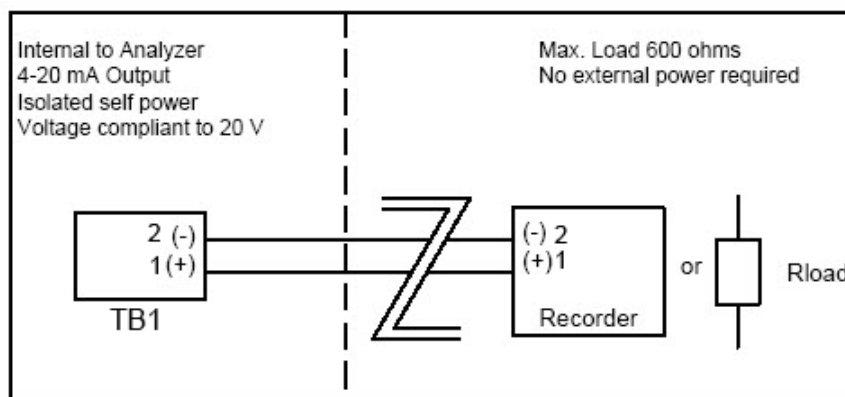


Figure 8: Wiring Diagram for the 4-20 mA Connection

NOTE: For additional information on setting up 4-20 mA outputs in the Analyzer firmware, see [“To set up stream measurements” on page 147, step 11](#).

Installing the Remote Start (Binary Input) Connection

The Analyzer remote start (binary input) connection, located on TB2, can be wired in a variety of ways and is intended to execute a start/stop command to the Analyzer from a remote location, such as a Process Logic Control (PLC) System or Center. Wiring examples are shown in [Figure 9](#) and [Figure 10](#). [Figure 9: Wiring Option — Binary Input using Analyzer’s Internal Supply](#) shows how the internal 24 VDC of the Analyzer (on TB4) may be used to power the binary input.

No menu configuration is necessary. For more information on diagnostics testing of the binary input, see [“Binary Input” on page 263](#).

Remote start/stop using binary input works in tandem with the display **Start** and **Stop Analysis** button. Changing the state of the *Remote Input* will change the *Analysis Run* state if not already in that mode. The **Display Start/Stop Analysis** button remains functional while the remote start/stop is in use. This allows for manual override of the analysis mode.

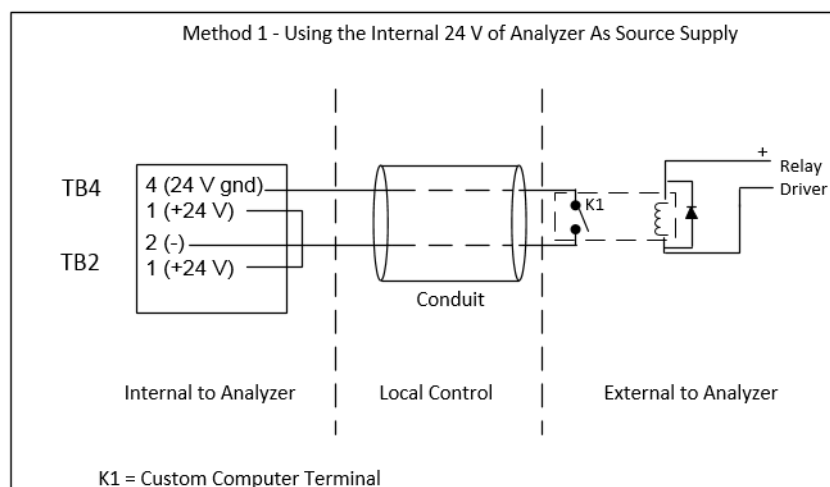


Figure 9: Wiring Option — Binary Input using Analyzer's Internal Supply

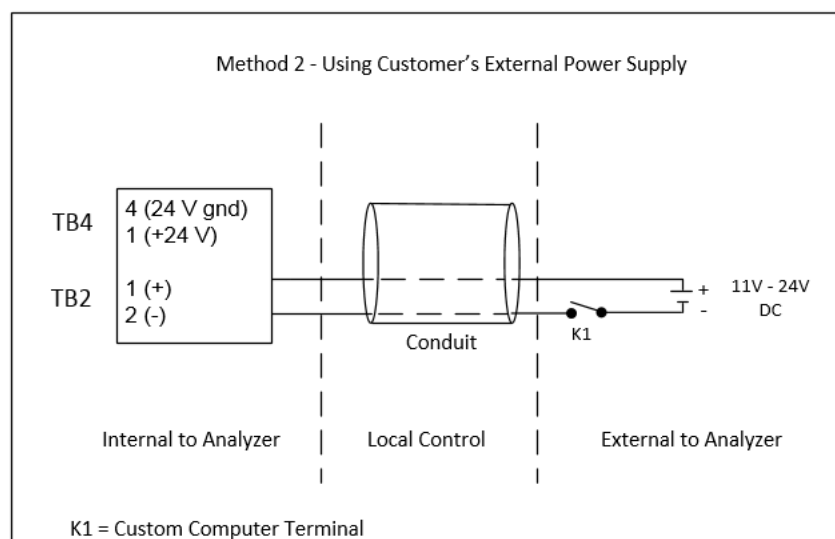


Figure 10: Wiring Option — Binary Input using Analyzer's External Supply

Installing the Analysis Complete Output Connection

The analysis complete (binary output) on TB3 may be used as a control signal to a sample sequencer device. Once the binary output is wired properly, the Analyzer will automatically provide a one-second contact closure at the end of every sample analysis.

No menu configuration is necessary. The binary output is active in the Online, Check Standard, and Grab modes.

Installing the Alarms and System Fault Output Connection

Four user-configured alarms are provided on TB3 and TB4. They may be assigned to any of the sample streams. The concentration at which the alarm is triggered is set as described in [“Configuring Alarm Outputs” on page 181](#).

The fifth alarm (the “System Fault Alarm”) is configured to transmit an alarm whenever an Error is detected in the Analyzer.

All of the alarms can be wired in both Normally Open (NO) and Normally Closed (NC) configurations.

Installing the Ethernet Connection

The Ethernet connection provides an additional means of capturing data from the Analyzer. Using Modbus, commands may be issued to the Analyzer as well as collecting data. Refer to [“Using the Ethernet Connection and Modbus” on page 181](#) for details on the use of Modbus.

The Ethernet cable may use a *Direct Connection* to a computer if a crossover cable is used ([Figure 11](#)). Or, as shown in [Figure 12](#), a straight-through Ethernet cable is used to connect to a *Network*. Cables are provided with the Analyzer.

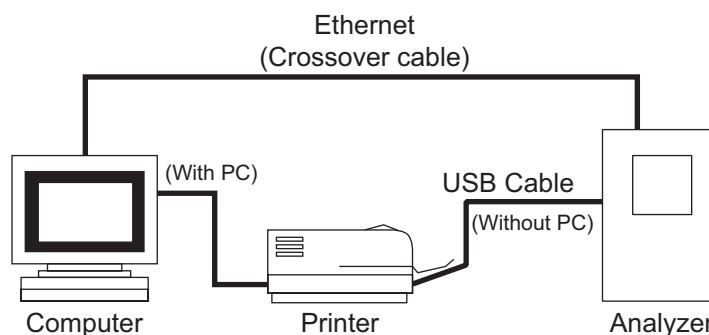


Figure 11: Connecting the Analyzer to a *Direct Connection* Computer

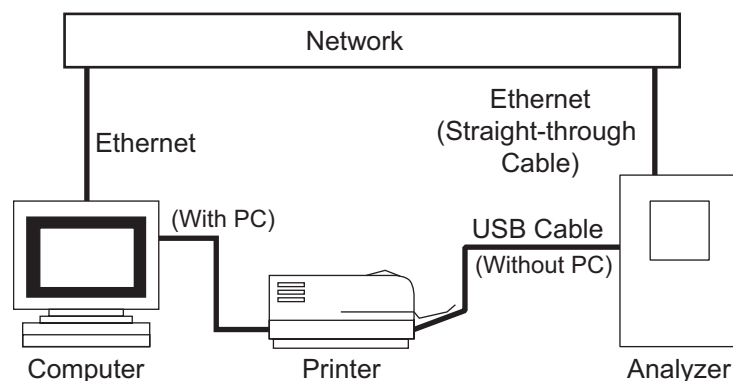


Figure 12: Connecting the Analyzer to a Network

To install the Ethernet connection, route the Ethernet cable through the **Control** port on the left side of the Analyzer's enclosure. Pass the Ethernet cable twice through the ferrite (supplied in the Accessories Kit), as shown in [Figure 13](#). Then, insert the Ethernet cable into the Ethernet port on the System Controller Board.



Figure 13: Ethernet Cable Passing through Ferrite

You also will need to set up the IP Address for the Analyzer. For more information on network setup options, see [“Configuring the Analyzer’s IP Address” on page 175](#) or [“Connecting to the Analyzer via Ethernet” on page 177](#).

Installing the USB Connection

The USB port is intended to provide data transfer to a USB memory device or to a printer. The USB memory device can then be used with your computer’s USB port to transfer exported data

for import into a spreadsheet or database program. The Analyzer cannot be directly connected to a computer via the USB port.

Due to a significant variance among USB memory devices, not all USB memory devices are compatible with the Analyzer. For a list of known compatible USB memory devices, access the FAQs for Sievers TOC Analyzers on our website.

To attach the USB memory device, unscrew the cover from the USB port on the left side of the Analyzer. Then slide the USB memory device into the port. The drive must be oriented properly to slide in. Allow several seconds for the Analyzer to recognize the device. Reattach the cover when the export is complete and the USB memory device is removed.

Step 6: Connecting to a Power Supply

If you are hardwiring the Analyzer to a panel, the Sievers InnovOx On-Line TOC Analyzer requires an external source of AC power connected to the enclosure using a watertight conduit connector. A **qualified electrician** should make the electrical connections according to local Electrical Code. An external switch or circuit breaker is required to facilitate maintenance and servicing of the Analyzer. It should be installed near the Analyzer and be clearly marked as the disconnecting device for the Analyzer.

NOTE: The AC power connection should ONLY be performed by a qualified electrician.

NOTE: Before installing any wiring inside the Analyzer, put on a grounding strap for ESD protection.

Remove the pass-through cap from the port labeled **AC INLET** on the right side of Analyzer. Secure the conduit connector and washer to the Analyzer panel in the normal manner. Attach the AC power conduit through the pass-through port. Secure the conduit pass-through to the Analyzer panel. Route the AC power conduit through the pass-through port. AC connections inside the Analyzer are made to the top of the terminal block ([Figure 14 on page 87.](#)), with the line (brown/black wire) connected to the terminal block, and neutral (blue/white wire) connected to the position marked **NEUTRAL**. Connect the grounding conductor (green and yellow wire) to the ground stud.

When connecting the wire to the terminal block, use a small flathead screwdriver to tighten the wire into the terminal. After connecting the wire, pull on each connection gently to make sure the connection is secure.

Metallic conduit is required for the Analyzer to meet CE Mark / UKCA Mark electrical requirements.

When the power wiring is complete, reattach the top access cover on the Analyzer.

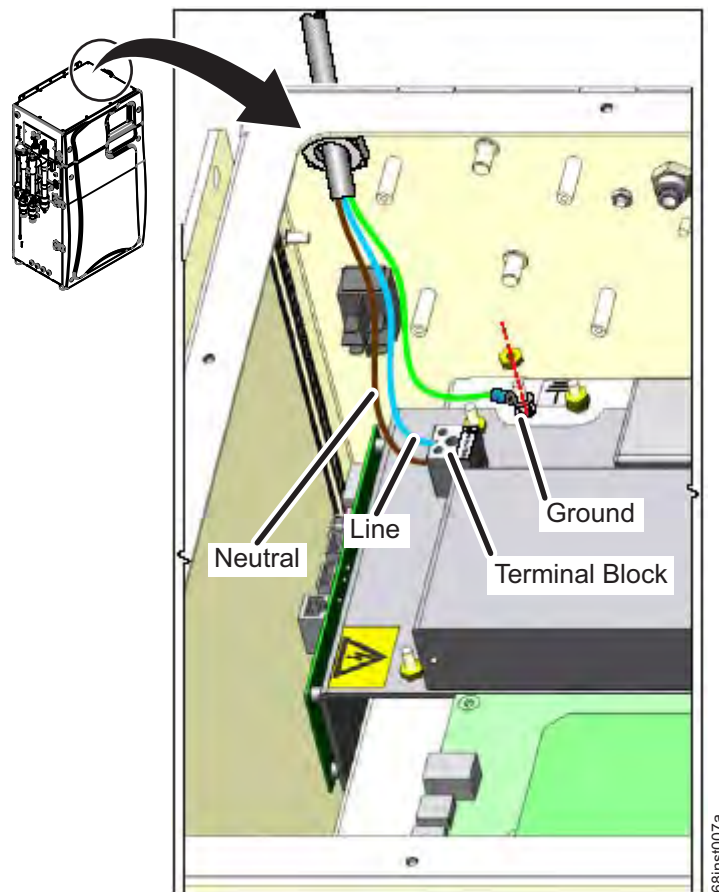


Figure 14: Wiring AC Power Conduit

Step 7: Connect the Sample Inlet System

The flow from the water source should be disabled until the Sample Inlet System is completely installed and the Analyzer is ready to begin analysis. Determine the Sample Inlet System that will be installed. For more information, see the following procedures:

- **Clean Water Sampler System** — The *Clean Water Sampler System* comes pre-installed on the Analyzer. You must connect sample to it. Continue to [“Installing the Clean Water Sampler System” on page 88](#).
- **Wastewater Sampler System** — The *Wastewater Sampler System* is a purchasable option with two different *Modes* available (*Velocity Mode* and *Overflow Mode*). If using,

this system must be installed. Continue to [“Installing the Wastewater Sampler System \(Optional\)” on page 91](#) for more information.

Installing the Clean Water Sampler System

The Analyzer normally operates in Online mode to measure one or more flowing sample streams.

If the sample stream has sufficient flow (50 - 400 mL/min) to flow through the Sample Cup, connect one end of the flexible 6 mm (1/4-in.) ID tubing provided with the Analyzer to the sample source. Connect the other end to the barbed fitting nearest the Analyzer on the Sample Cup inlet fitting. The one-quarter turn PVC ball valves provided in the accessories kit may be used to control sample flow if the sample flow is high. The barbed fitting farthest from the Analyzer should be connected to a gravity drain. This will insure that no back pressure (< 7 kPa, 1 psig) is created within the Analyzer. See [Figure 15 on page 89](#) and [Figure 16 on page 90](#).

If the sample stream does not have sufficient flow to the Sample Cup, the optional External Sample Peristaltic Pump(s) must be used. This hardware will come pre-installed from manufacturing, including the tubing to the Sample Cup Inlet. For more information, see [“Connecting Sample to the optional External Sample Peristaltic Pump\(s\)” on page 89](#). Attach one end of the flexible 6 mm (1/4-in.) ID tubing (provided with the Analyzer) to the sample source. Connect the other end to the barbed Luer-Lok adapter fitting (provided with the *Sample Peristaltic Pump*). Attach the fitting to the “Pump Inlet” on the pump head. See [Figure 15 on page 89](#) and [Figure 16 on page 90](#).

NOTE: Ensure the pump inlet tubing is connected to the correct fittings for the Analyzer configuration. The External Sample Peristaltic Pump hardware is oriented differently for 2-Stream and 5-Stream configurations. For more information, see [“Connecting Sample to the optional External Sample Peristaltic Pump\(s\)” on page 89](#).

When using the Clean Water Sampler System, the External Sample Peristaltic Pump Outlet tubing comes pre-installed from manufacturing. A short piece of flexible 6 mm (1/4-in.) ID tubing has been connected to the Luer-Lok adapter fitting on the pump outlet on the pump head. The other end of the tube has been attached to the selected Sample Cup inlet. See [Figure 15 on page 89](#) and [Figure 16 on page 90](#).

After connecting the Sample to the Analyzer, connect a length of the same flexible 6 mm (1/4-in.) ID tubing (provided with the Analyzer) to the barb farthest from the Analyzer on the Sample Cup and route to a gravity drain. This will insure that no back pressure (< 7 kPa, 1 psig) is created within the Analyzer. See [Figure 15 on page 89](#) and [Figure 16 on page 90](#).

NOTE: In 5-stream Analyzers, Pump #1 may be used to pump Stream #1 and #2. Pump #2 may be used to pump Stream #3 and #4. Do not mix the Streams and Pumps.

Connecting Sample to the optional External Sample Peristaltic Pump(s)

If the sample stream does not have sufficient flow to the Sampler System, the optional External Sample Peristaltic Pump(s) will be installed during manufacturing. The External Sample Peristaltic Pump(s) will be installed and oriented differently between the **2-Stream** and **5-Stream** configurations. See the images below for the different Analyzer configuration *External Sample Peristaltic Pump(s)* connections.

NOTE: When using the *Clean Water Sampler System*, the *Pump Outlet tubing* comes pre-installed from manufacturing. See [Figure 15 on page 89](#) and [Figure 16 on page 90](#).

NOTE: When using the *Wastewater Sampler System (in Overflow Mode)*, the *Pump Outlet tubing must be connected during installation*. See [Figure 17 on page 90](#) and [Figure 18 on page 91](#).

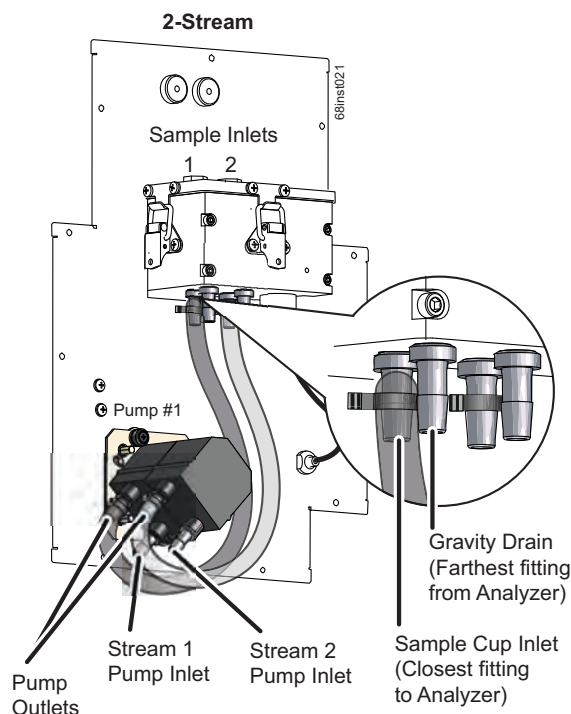


Figure 15: 2-Stream Clean Water Sampler, Sample Peristaltic Pump connections

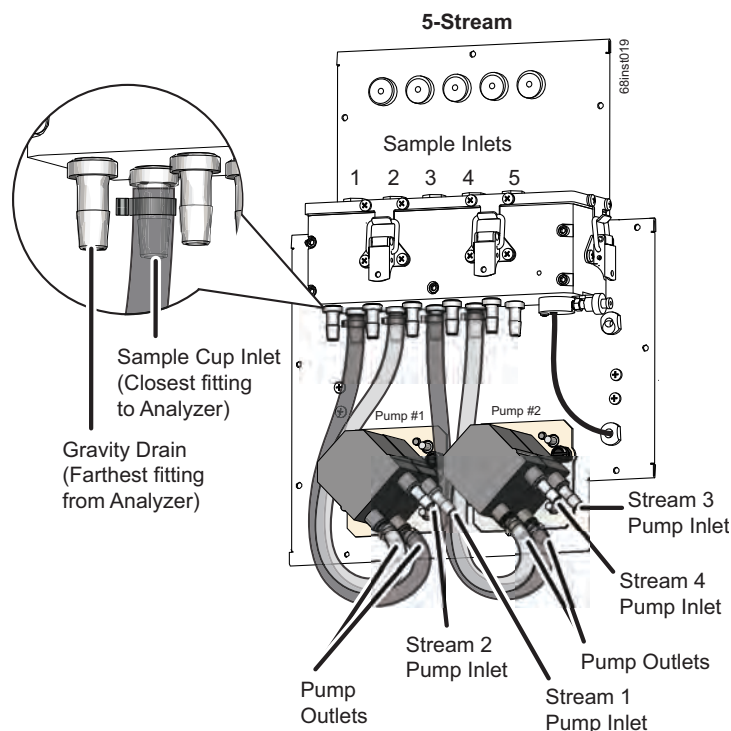


Figure 16: 5-Stream Clean Water Sampler, Sample Peristaltic Pump connections

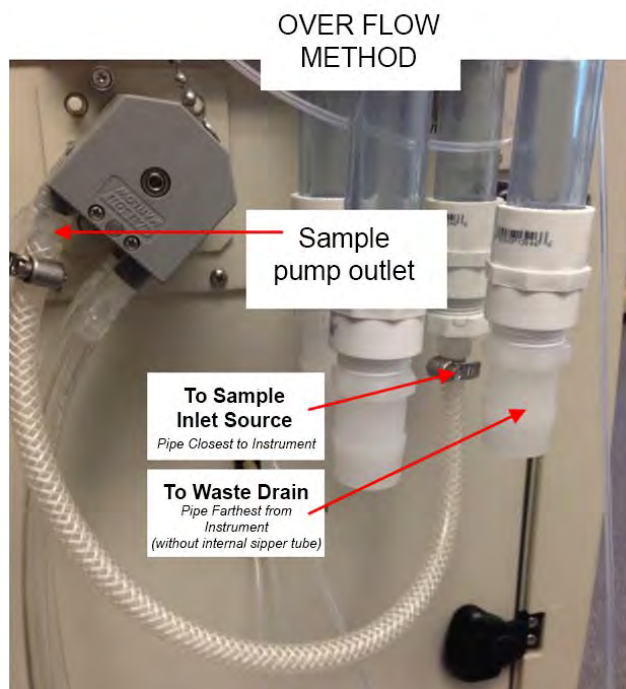


Figure 17: 2-Stream Wastewater Sampler, Sample Peristaltic Pump Connections: Overflow Mode

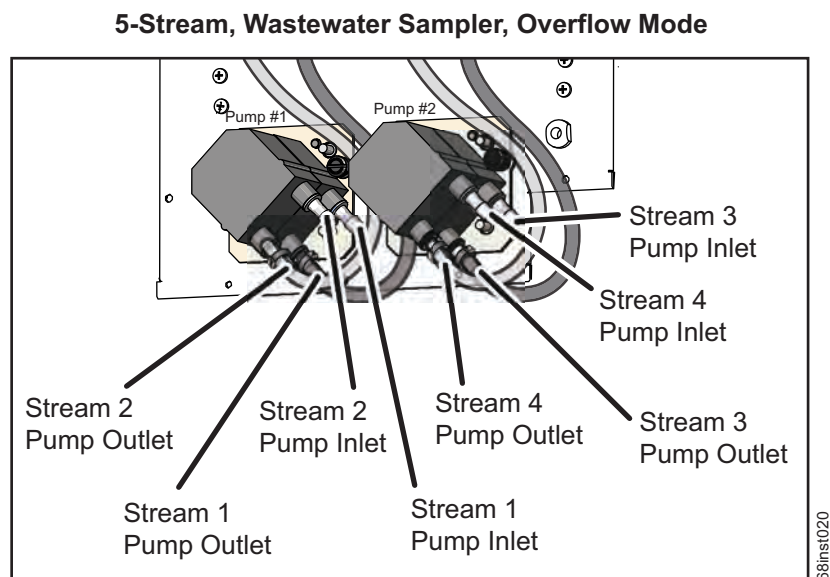
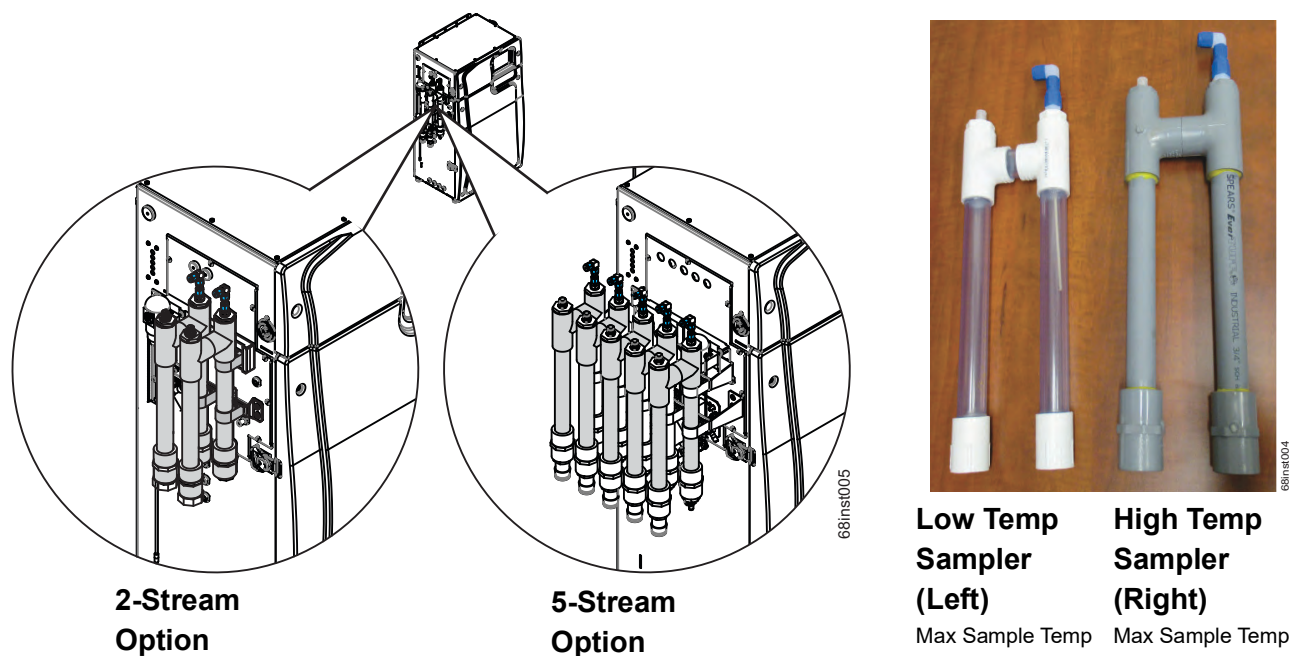


Figure 18: 5-Stream Wastewater Sampler, Sample Peristaltic Pump Connections: Overflow Mode

Installing the Wastewater Sampler System (Optional)



Note: In applications with sample temperatures above 85 °C (185 °F), the 1-in. flexible sample tubing should not be used. The samples should be plumbed with rigid piping suitable for the sample temperatures and any corrosive properties the sample might exhibit.

Figure 19: Wastewater Sampler

The *Wastewater Sampler* pipe assembly, inlet tubing, and two brackets for the *Wastewater Sampler* are packed separately and placed within the Analyzer's main shipping container. You will need to attach the brackets to the side of the Analyzer and install the sampler pipe assembly using one of two configurations (*Velocity Mode* or the *Overflow Mode*), as described in the following procedures.

First, proceed to the following procedure [“Installing the Wastewater Sampler brackets” on page 92](#).

After installing the *Wastewater Sampler* brackets, continue to the correct procedure for your Analyzer configuration.

- [“To install the Wastewater Sampler \(Velocity Mode\)” on page 93](#)
- [“To install the Wastewater Sampler \(Overflow Mode\)” on page 98](#)

Installing the Wastewater Sampler brackets

Attach and secure the *Wastewater Sampler* brackets to the left side of the Analyzer, as follows. (The screws are taped to the side of each bracket.) See [Figure 20](#) and [Figure 21](#).

- **Top bracket** — Slide the following bracket over the plate adapter and secure it by tightening a screw on each end of the plate adapter.

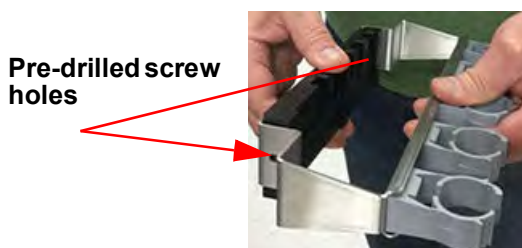


Figure 20: Top Wastewater Sampler Bracket w/Plate Adapter

- **Lower bracket** — Hold the following bracket so that the screw holes are aligned with the available screw openings on the Analyzer, and secure with the provided screws. [Depending which openings were used to install the multi-stream valve bracket to the inside of the Analyzer, the available openings may vary between (A) and (A) or (B) and (B)].

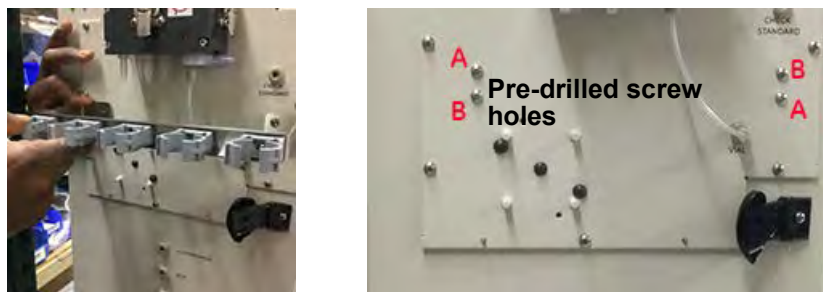


Figure 21: Lower Wastewater Sampler Bracket

To install the Wastewater Sampler (Velocity Mode)

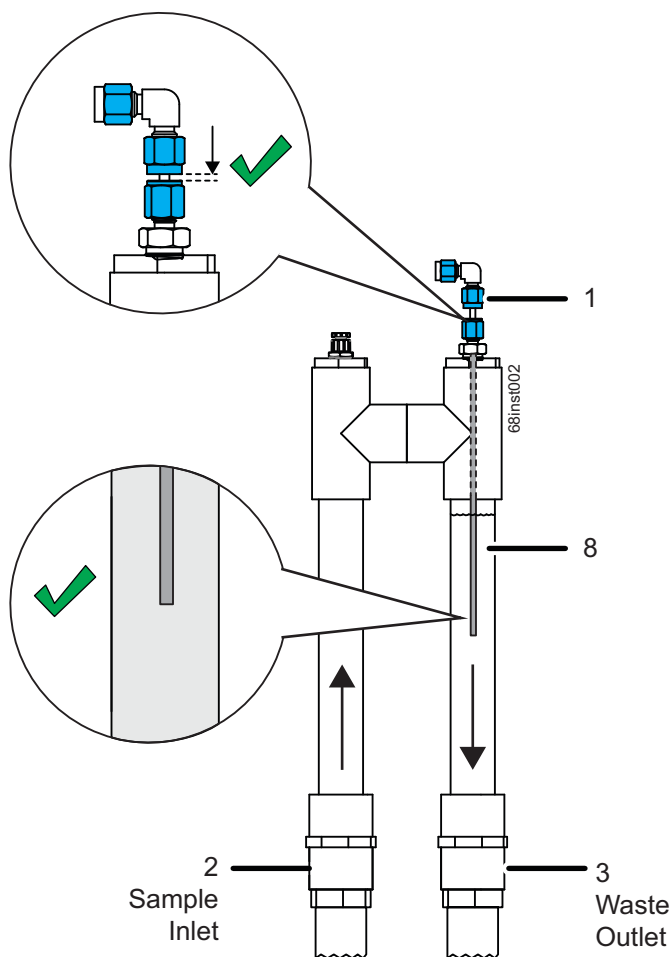


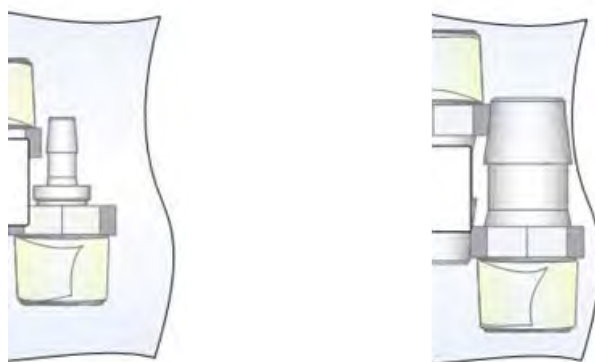
Figure 22: Velocity Mode

Use *Velocity Mode* when the sample flow-through rate is in the range of 11 to 19 LPM (3 to 5 US GPM) with minimal back pressure to ensure a high velocity, but with relative laminar flow.

The sample stream to the *Wastewater Sampler* is installed at the pipe farthest from the Analyzer **(2)**. The water quickly flows over the weir and sample is drawn from the stream in the opposite direction of the sample flow, allowing solids to flow by the sample tube and preventing them from being drawn into the instrument. See [Figure 22: Velocity Mode](#).

Flexible 1" tubing is included with the Kit for the supply and drain side of the *Wastewater Sampler* **(3)** pipe assembly. When configuring for *Velocity Mode* operation, use the 3/4" NPT to 1" barb fittings for the outlet pipe of the sampler.

1. Locate a *Wastewater Sampler* pipe assembly and a large-size barbed fitting for each of the streams you are installing.



Small-size Barb Fitting

Large-size Barb Fitting

Figure 23: Velocity Mode — Barb Fittings Identification

2. For this *Velocity Mode*, install a large-size barb into the open end of the Waste Outlet pipe [the pipe *with* the internal sipper tube (needle)].

NOTE: *Leave the pre-installed barb inside the other pipe (the pipe without the internal sipper tube). Also, leave the plug at the top of the sample inlet pipe intact, if one exists.*

3. Insert a Wastewater Sampler pipe assembly into the two bracket clamps located on the outside of the Analyzer. For *Velocity Mode*, ensure that the pipe (*with* internal sipper tube) *is installed nearest to the instrument*. Also, ensure that the sample inlet pipe is installed farthest from the instrument.

To Waste Outlet

Pipe Nearest to Instrument (with internal sipper tube)

To Sample Inlet Source

Pipe Farthest from Instrument



Figure 24: Velocity Mode — Installation

4. Close the two clamps over the pipe and use pliers or channel locks to secure.
5. Connect a section of inlet tubing (supplied in Kit) from the bulkhead to the fitting on the top of the sipper tube.
6. Repeat steps [2](#) through [5](#) for each stream.
7. If you are also installing the *Fail Safe* option, cut and remove the tie wrap used to secure the sensor to the Analyzer during shipping.
8. Remove the U-bolt (4) from the sensor (5) and position the U-bolt (4) over and near the end of the pipe with the sipper tube (8). See [Figure 25: Velocity Mode — Fail Safe Installation on page 96](#).

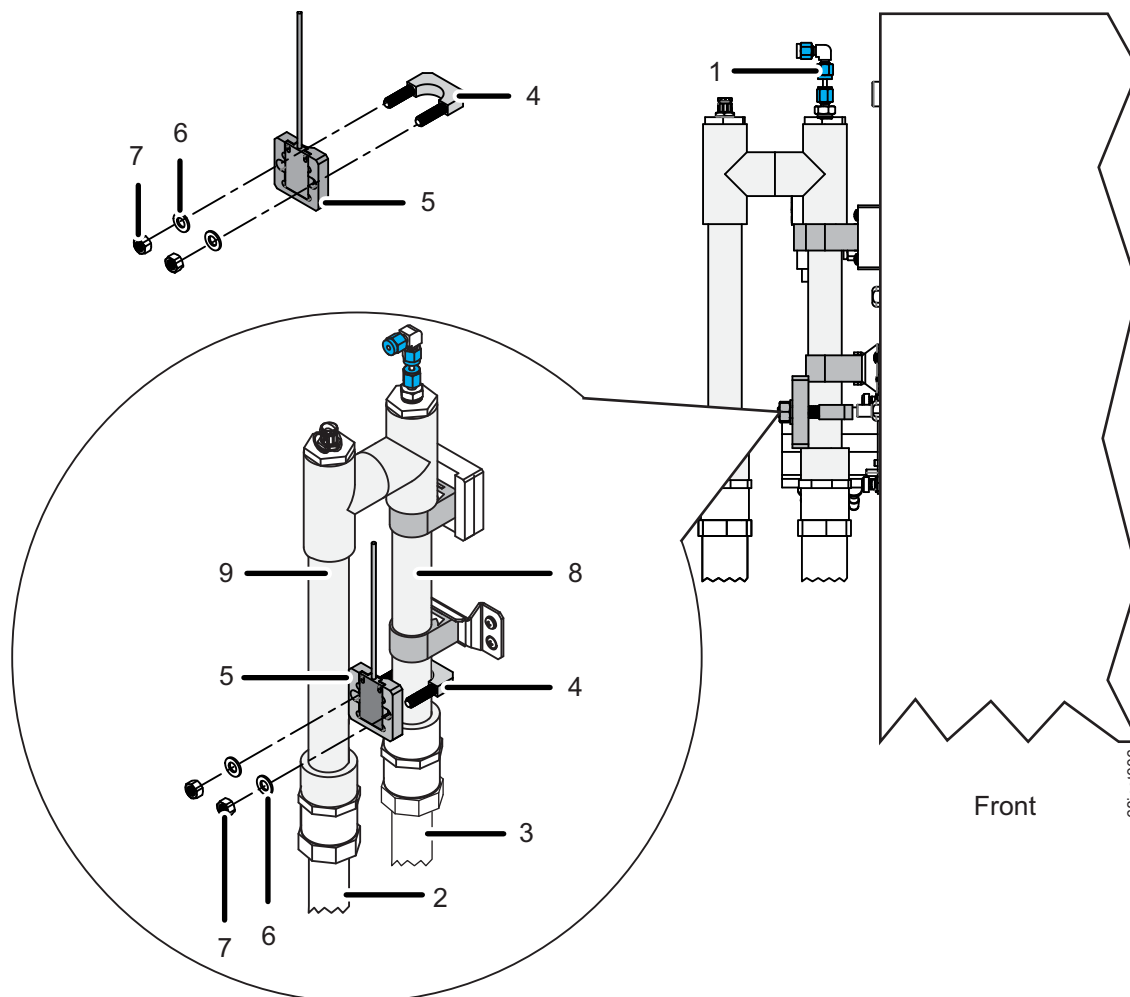


Figure 25: Velocity Mode — Fail Safe Installation

9. Insert the ends of the U-bolt (4) through the holes on the sensor (5), and then attach and secure a washer (6) and nut (7) finger-tight. (Do NOT use an additional tool to tighten, as this may break the sensor.)

NOTE: Ensure the Fail Safe Sensor (5) is installed correctly. The inductive side of the sensor must contact the tubing. The inductive side of the sensor has a series of concentric rings.

10. If you have the *Fail Safe* option, repeat steps 7 through 9 for each stream.
11. Connect the pipe farthest from the instrument (the pipe *without* the internal sipper tube) to the sample source (2). (See [Figure 24: Velocity Mode — Installation on page 95.](#))
12. Connect the pipe nearest the instrument (the tube *with* the internal sipper tube (8)) to the waste outlet (3). The barbed fitting nearest the Analyzer should be connected to a gravity

drain (3). This will insure that no back pressure (< 7 kPa, 1 psig) is created within the Analyzer. (See [Figure 24: Velocity Mode — Installation on page 95.](#))

13. Adjust the sample flow to 11 - 19 LPM (3-5 US GPM).

14. The needle (1) height comes preset for *Velocity Mode* (see [Figure 26](#)).

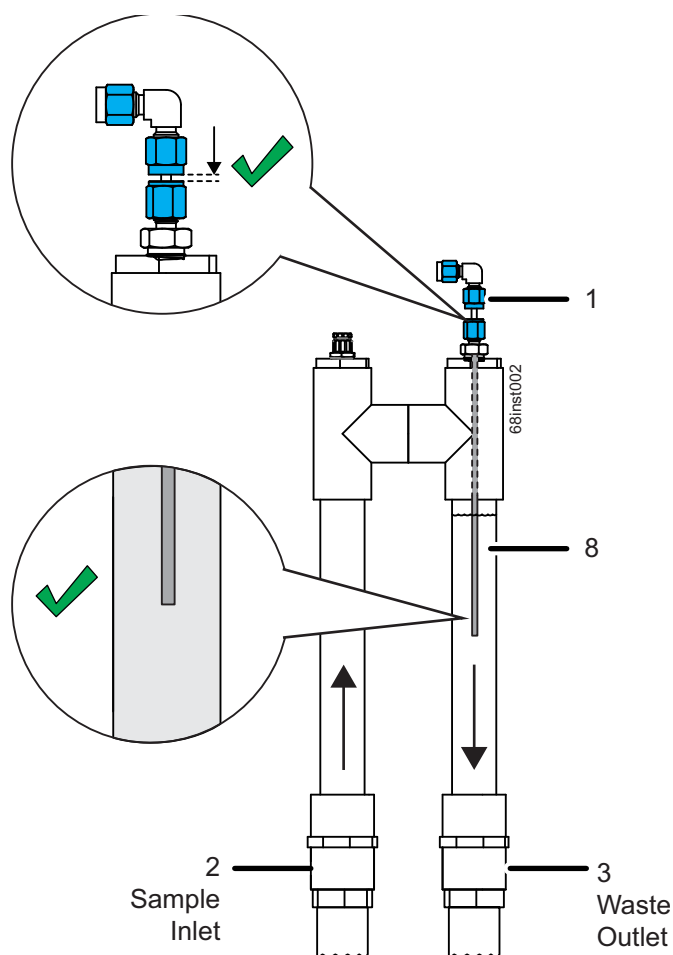


Figure 26: Velocity Mode — Installing Sipper Tube

To install the Wastewater Sampler (Overflow Mode)

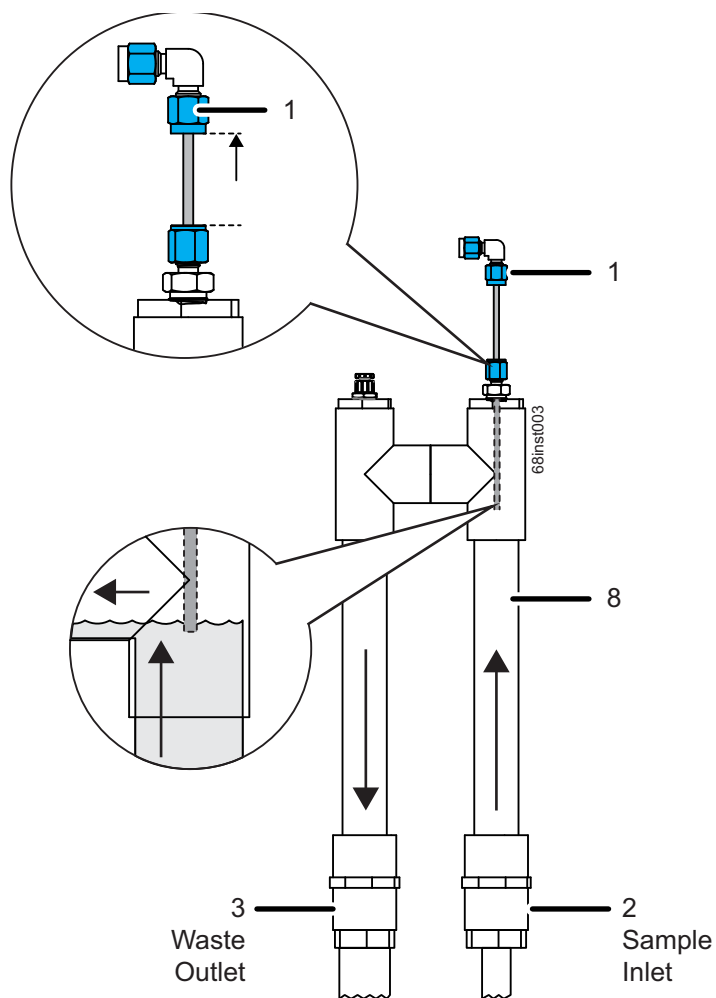


Figure 27: Overflow Mode

Use *Overflow Mode* when the sample flow-through rate is in the range of 50 - 400 mL/min with minimal back pressure. In slow-flowing wastewater streams, *Overflow Mode* sampling retains a volume of sample until the Analyzer has a sample demand. On demand, the Analyzer pulls in sample from the reservoir as excess overflows to a gravity drain. See [Figure 27](#).

An exterior sample peristaltic pump accessory may also be used with this mode when there is no sample flow. Up to four [4] Wastewater Samplers can be operated in parallel using this mode when the 5-stream option is selected.

1. If using the *External Sample Peristaltic Pump*, ensure the pump orientation matches the Analyzer configuration. See [Figure 28 on page 99](#) and [Figure 29 on page 99](#).

NOTE: The *External Sample Peristaltic Pump(s)* will be oriented differently between the **2-Stream** and **5-Stream** configurations. Ensure to connect sample for the correct Analyzer configuration.



Figure 28: Overflow Mode — 2-Stream, External Sample Peristaltic Pump Position

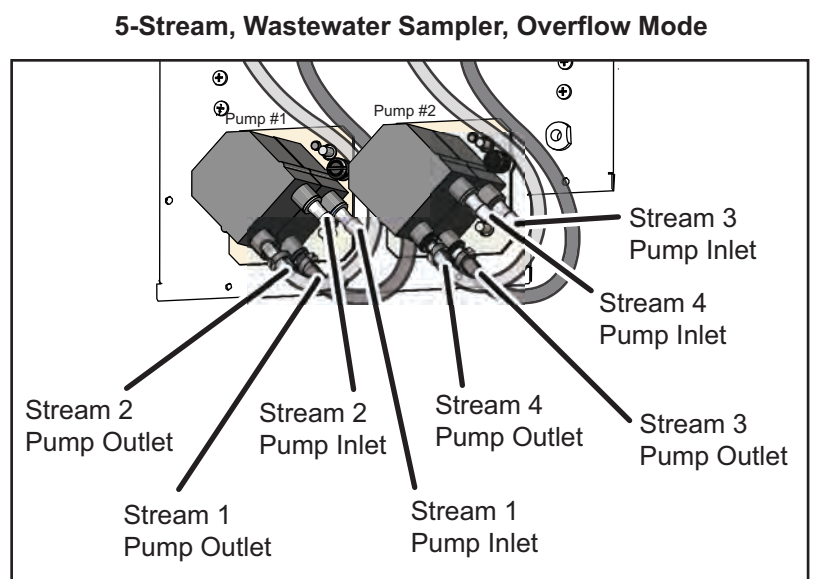


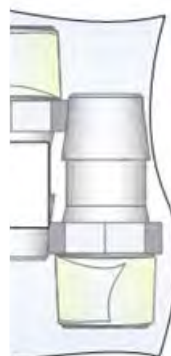
Figure 29: 5-Stream Wastewater Sampler, Sample Peristaltic Pump Connections: Overflow Mode

2. Connect the sample to the peristaltic pump(s). Refer, as needed, to [“Connecting Sample to the optional External Sample Peristaltic Pump\(s\)” on page 89](#).

3. Locate a *Wastewater Sampler* pipe assembly and a small-size barbed fitting for each of the streams you are installing.



Small-size Barb Fitting



Large-size Barb Fitting

Figure 30: Overflow Mode — Barb Fittings Identification

4. For *Overflow Mode*, install a small-size barb into the open end of the sample inlet pipe. This is the pipe *with* the internal sipper tube (needle).

NOTE: Leave the pre-installed barb inside the other pipe (the pipe without the internal sipper tube).

To Sample Inlet Source

Pipe Nearest the Instrument (pipe with internal sipper tube)

To Waste Outlet

Pipe Farthest from Instrument



Figure 31: Overflow Mode — Installation

5. Locate the filter vents located in the *Wastewater Sampler Kit*.
6. Remove the plug located at the top of the waste drain outlet pipe (the pipe *without* the internal sipper tube) and install a filter vent in its place for each stream you are installing.
7. Insert a *Wastewater Sampler* pipe assembly into the clamp located on the outside of the Analyzer. For this *Overflow Mode*, ensure that the waste drain pipe (*without* internal needle) is installed farthest from the instrument. Also, ensure that the sample inlet pipe is installed nearest to the instrument.

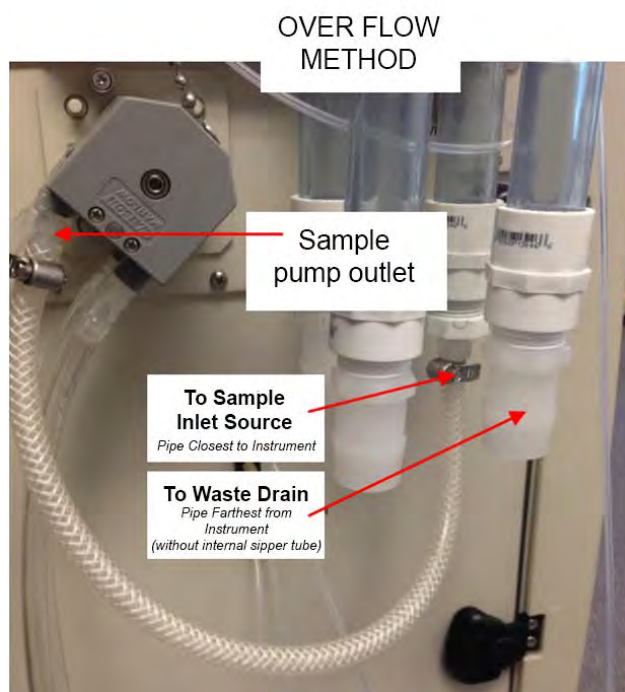


Figure 32: 2-Stream, Overflow Mode — Installation

8. Close the two clamps over the pipe and use pliers or channel locks to secure.
9. Connect an inlet tubing section (provided in Kit) from the bulkhead to the fitting on the top of the sipper tube.
10. Repeat steps [4](#) through [9](#) for each stream.
11. If you are also installing the *Fail Safe* option, cut and remove the tie wrap used to secure the sensor to the Analyzer during shipping.
12. Remove the U-bolt **(4)** from the sensor **(5)** and position the U-bolt **(4)** over and near the end of the pipe with the sipper tube **(8)**. See [Figure 33: Overflow Mode — Fail Safe Installation on page 103](#).

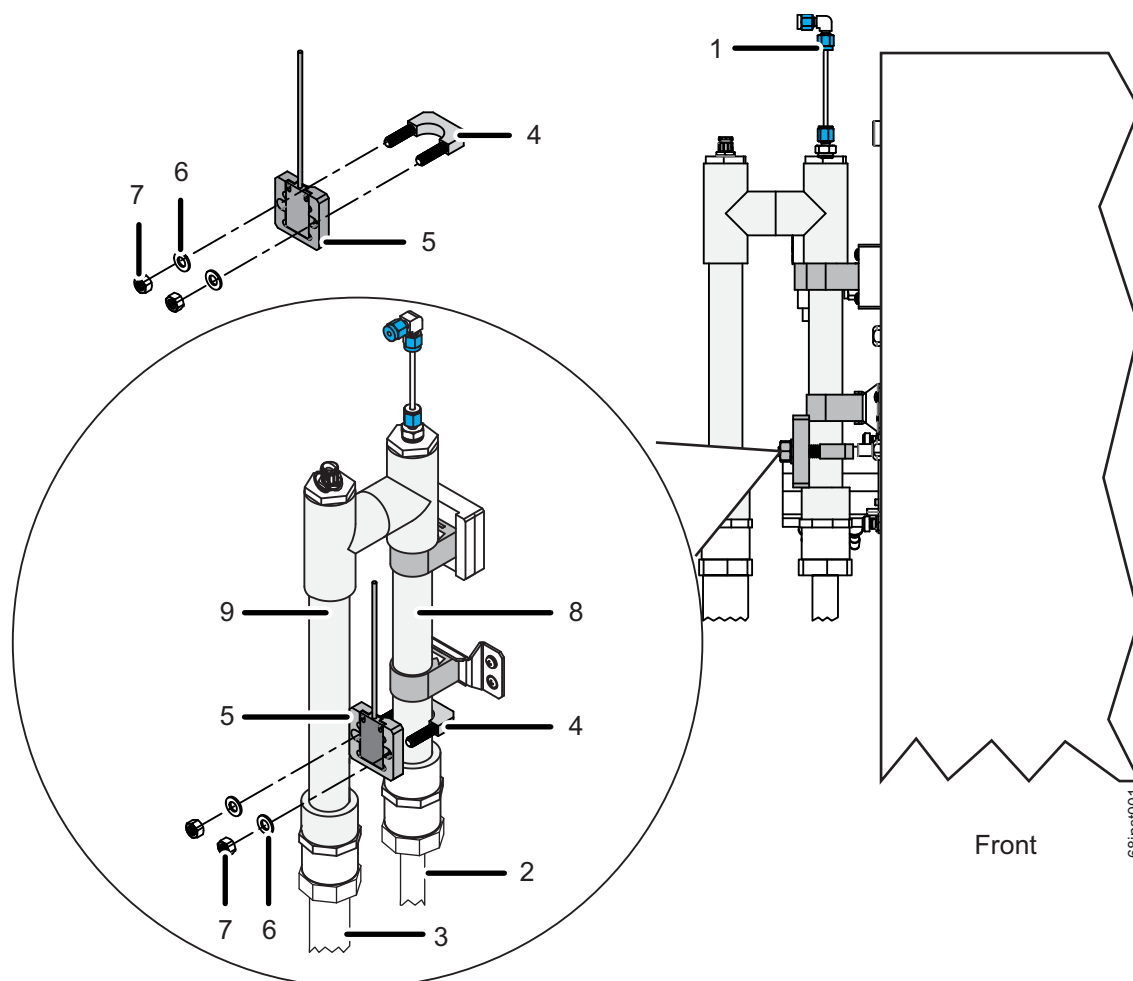


Figure 33: Overflow Mode — Fail Safe Installation

13. Insert the ends of the U-bolt (4) through the holes on the sensor (5), and then attach and secure a washer (6) and nut finger-tight (7). (Do NOT use an additional tool to tighten, as this may break the sensor.)

NOTE: Ensure the Fail Safe Sensor (5) is installed correctly. The inductive side of the sensor must contact the tubing. The inductive side of the sensor has a series of concentric rings.

14. If you have the *Fail Safe* option, repeat the steps 11 through 13 for each stream.
15. Connect the pipe nearest the instrument (the pipe with the internal sipper tube (8)) to the sample source (2). (See [Figure 33: Overflow Mode — Fail Safe Installation on page 103](#) and [Figure 32: 2-Stream, Overflow Mode — Installation on page 102](#).)
16. Connect the pipe farthest from the instrument (the pipe *without* the internal sipper tube (3)) to the waste outlet, connected to a gravity drain. This will insure that no back pressure

(< 7 kPa, 1 psig) is created within the Analyzer. (See [Figure 32: 2-Stream, Overflow Mode — Installation on page 102.](#))

17. Adjust the sample flow to 50 - 400 mL/min.
18. Set the needle height (1) of the internal sipper tube (needle). Test the proper adjustment of the sipper tube by performing a sample flush and verifying that no bubbles are pulled through the inlet tubing. Ensure it is installed at the highest point possible before drawing air bubbles. See [Figure 34.](#)

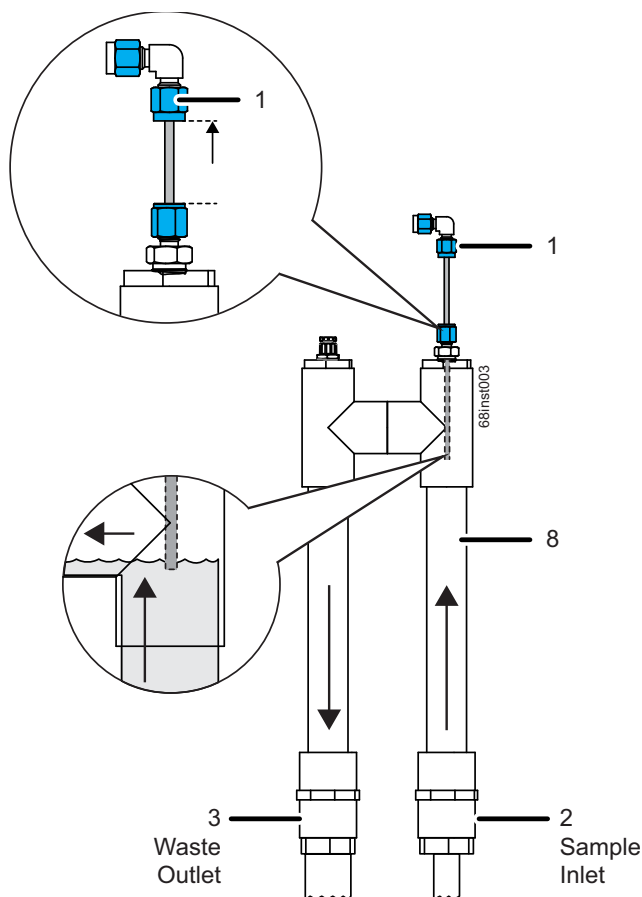


Figure 34: Overflow Mode — Adjusting the Sipper Tube Height

Installing the Check Standard System

The Analyzer can automatically measure a check standard periodically when it is operating in the Online mode. Check Standard measurements also can be manually initiated when desired.

Access one of the 1/8-in. OD tubes in the Analyzer's accessories. Attach the 1/4-28 PEEK fitting in the Check Standard port on the left side of the Analyzer. The fitting should be finger-tight. See [Figure 35: Connections \(2-Stream, Clean Water Sampler shown\) on page 106.](#)

Fill the carboy to the desired level with check standard solution. The concentration of the check standard solution should approximate the sample's concentration.

Place the other end of the tube into the opening of the Check Standard carboy.

Installing the Grab Sample System

Warning



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.

To sample from a vial, no special hardware setup is required. Place a 40-mL vial (septum-down) in the Vial Port and operate the Analyzer in Grab mode (for details, see [“Grab Measurements” on page 157](#)).

Step 8: Connect the Reagent and Dilution Water Lines

Locate the pre-cut tubing and the three carboys in the Accessories Kit, and then connect the tubing from these containers to the appropriate port on the left side of the Analyzer according to the instructions in this section:

- Connect the **Dilution Water**.
- Connect the **Acid** — (6M H_3PO_4 or 3N HCl).
- Connect the **Oxidizer** — sodium persulfate oxidizing solution [30% (w/v) sodium persulfate ($\text{Na}_2\text{S}_2\text{O}_8$)].

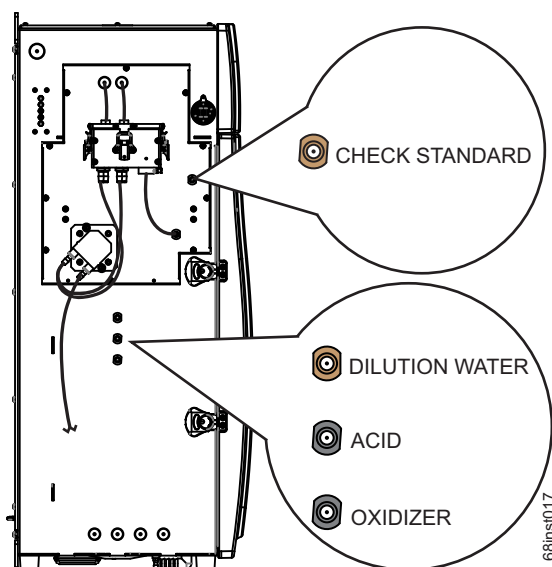


Figure 35: Connections (2-Stream, *Clean Water Sampler* shown)

To connect the Dilution Water

1. Attach one end of the tubing to the top tan port labeled “**DILUTION WATER**” on the left side of the Analyzer, and tighten the PEEK nut finger-tight. See [Figure 35 on page 106](#).
2. Fill the “Dilution Water” carboy with deionized water or the best-quality water available to you.
3. Insert the other end of the tubing assembly into the opening of the “Dilution Water” 19 L (5 US gal) carboy.

To 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 288](#).

1. Determine which acid you will be using for analysis. For more information, see [“Select the correct Acid for your sample” on page 288](#).
2. Carefully transfer the 3N hydrochloric acid or 6M phosphoric acid into the “Acid” 13.2 L (3.5 US gal) carboy.

3. Attach one end of the tubing to the middle (black) port labeled “**ACID**”, and tighten the PEEK nut finger-tight. See [Figure 35 on page 106](#).
4. Insert the other end of the tube assembly into the opening of the “Acid” carboy.

To connect the Oxidizer (sodium persulfate oxidizing solution)


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

Prior to 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 289](#).

Prior to performing this procedure, the sodium persulfate oxidizing solution must be mixed together in the “Oxidizer” carboy container. For more information on this procedure, see [“To prepare the Oxidizer \(sodium persulfate oxidizing solution\)” on page 290](#).

1. Prepare the sodium persulfate oxidizing solution in the “Oxidizer” carboy, if not already prepared. For more information, see [“To prepare the Oxidizer \(sodium persulfate oxidizing solution\)” on page 290](#).
 - **IMPORTANT!** Ensure **all oxidizer powder is dissolved** before connecting to the Analyzer.
2. Attach one end of the tubing to the bottom (black) port labeled “**OXIDIZER**” on the left side of the Analyzer and tighten the PEEK nut finger-tight. See [Figure 35 on page 106](#).
3. Insert the other end of the tube assembly into the opening of the prepared “Oxidizer” carboy.

Step 9: Connect the Compressed Gas Source

Warning	
	<p>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.</p>
<p>The pressure of the compressed gas at the Analyzer's gas inlet must not exceed 689 kPa (100 psig). The pressure of compressed gas at the blowback gas inlet on the Filter Panel accessory must not exceed 276 kPa (40 psig). Use only dry, oil-free air or nitrogen.</p>	

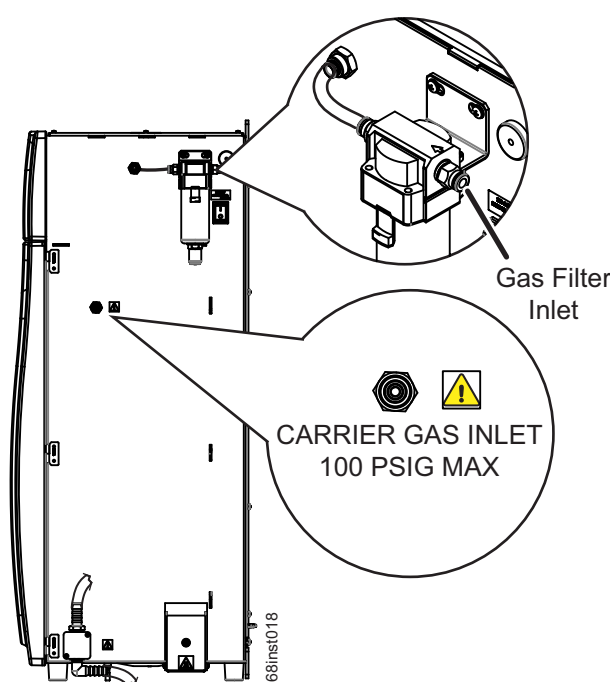


Figure 36: Gas Inlets

The Analyzer requires low-CO₂ gas as *Carrier Gas* and *Sparge Gas*. In addition, the Analyzer also employs dry, oil-free gas to purge the electronics area to prevent dust accumulation on sensitive components. Depending on the Analyzer configuration, the compressed gas system will be installed differently at manufacturing. Follow the directions below for your Analyzer configuration.

NOTE: If you are installing the *Regenerative Air Purifier* option *after* initial installation of the Analyzer, contact Technical Support or your local service provider.

Option 1: [If the optional *Regenerative Air Purifier* is installed.] See [Figure 36: Gas Inlets on page 108.](#)

Using compressed air with the optional *Regenerative Air Purifier* can provide low-CO₂ gas as *Carrier Gas* and as *Spurge Gas*. The *Regenerative Air Purifier* removes CO₂ and moisture from compressed air that is pressurized from 551 - 689 kPa (80 to 100 psig) and must not exceed 689 kPa (100 psig).

Make one gas connection: (This delivers compressed gas to the entire Analyzer - both *Gas Filter Inlet* and *Carrier Gas Inlet* at the same time. The Analyzer compressed gas system tubing has already been teed at manufacturing to supply both inputs with one gas connection.)

- **Gas Filter Inlet:** Press a 6.38 mm (1/4-in.) OD flexible tube (such as polyethylene tubing) into the *Gas Filter Inlet* mounted on the right side of the Analyzer. Ensure the pressure is regulated to 551-689 kPa (80-100 psig) and must not exceed 689 kPa (100 psig). This supplies compressed gas to the *IP56 Accessory* as well as *Carrier Gas* and *Spurge Gas* in the *Gas Control Module*.

Option 2: [If the optional *Regenerative Air Purifier* is **not** installed.] See [Figure 36: Gas Inlets on page 108.](#)

Make two gas connections: (This delivers two separate compressed gas sources for the *Carrier Gas Inlet* and the *Gas Filter Inlet*. Ensure the correct gas pressure is regulated for each compressed gas source and the appropriate gas type is used for each compressed gas connection.) See [Figure 36: Gas Inlets on page 108.](#)

- **Carrier Gas Inlet:** Press a 1/4-in. OD flexible tube (such as polyethylene tubing) into the **CARRIER GAS INLET** port on the right side of the Analyzer. The other end of the tube should be connected to the gas source. Ensure the pressure is regulated to 207-689 kPa (30-100 psig) and must not exceed 689 kPa (100 psig). **Use only nitrogen or CO₂-free air.** Purified air or nitrogen are suitable gases. This supplies the *Carrier Gas* and *Spurge Gas* to the *Gas Control Module*.
- **Gas Filter Inlet:** Press a 6.38 mm (1/4-in) OD flexible tube (such as polyethylene tubing) into the *Gas Filter Inlet* mounted on the right side of the Analyzer. Ensure the pressure is regulated to 551-689 kPa (80-100 psig) and must not exceed 689 kPa (100 psig). Can use dry, Instrument air or better. This supplies compressed gas to the *IP56 Accessory*.

Specifications — IP56 Accessory

Pressure	551 - 689 kPa (80-100 psig)
Demand (Flow)	2 - 2.5 SCFM (56.6 - 70.8 LPM)
Maximum Pressure	689 kPa (100 psig)

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. Turn on the power switch located on the side of the Analyzer. The display will light up. (It can take up to two minutes for the *System Info* screen to appear.) If this does not occur, refer to [Chapter 9, "Troubleshooting."](#)
2. The *System Info* screen appears with a reminder to attach the waste lines. If the waste lines were not attached already, do that now (see ["Step 3: Connect the Waste Lines" on page 74](#)). 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.

To set the current date and time

1. Press the **Menu** button.
2. Select the **Maintenance** tab.
3. Press the **Advanced** button
4. Press the **Clock** button.
5. Specify the correct date and time via each of the buttons.
6. Press the **Save** button, and then 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. Insert the check standard tube into the sample.
2. Press the **Setup** tab, and then press the **Check Standard** button. Press the **Check Standard Setup** button.

3. Ensure that Check Standard is **Enabled**. If it is not enabled, press the **Check Standard** button. Then, press the **Enabled** button that appears on the right side of the screen.
4. Ensure the **Range** (ppm) button is set to **Up to 1,000**. If it is not, press the **Range** button to display the **Range** options on the right side of the screen. Press the **Up to 1,000** button.
5. The **Calibration** button will appear as "Factory Default." This is acceptable for the test.
6. Press the **Rep** 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.
7. Press the **Back** button to return to the **Setup** tab.
8. Press the **Grab** button, and then press the **Analysis Protocol Default GRAB** button. The **Protocol** screen appears.
9. Press the **Modify** button and ensure the settings on the **Default GRAB** screen are configured as follows:
 - Measure: NPOC
 - Acid: 5%
 - Oxidizer: 15% (Dependant upon COD of the sample⁴)
 - Rej: 0
 - Flush: Off
10. Press the **Advanced Setup** and ensure the settings on the **Advanced Setup** screen are configured as follows:
 - Sparge: 0.8 min.
 - Blank Correction: Off
11. Press **Back** button to return to the Default GRAB screen.
12. Press the **Back** button to return to the Protocol screen.
13. Press the **Back** button to return to the Main screen and select the **Maintenance** tab.
14. Press the **Prime Reagents** button, then press the **Prime All** button. The reagent, dilution water, and check standard lines will be primed. All bubbles, except for very small ones, should be pushed out of the lines when the Prime is complete. If not, press **Prime All**

4. 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 163](#),

again. (If one or more of the reagent, dilution water, or check standard lines are not primed, see [Chapter 9, "Troubleshooting."](#))

15. When the Prime Reagents is completed, press the **Back** button to return to the *Menu* screen.
16. When ready, press the **Start Analysis** button. Press **Main** to return to the *Main* screen. A graph of the CO₂ peaks will be displayed. Each peak appears after its peak height is measured, and the measured NPOC concentration appears at the top of the screen.
17. When the analysis is complete, the CO₂ 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 5, "Calibration and Verification"](#) for details on calibration options.

Chapter 5. Calibration and Verification

Overview

Calibration of the Sievers InnovOx On-Line TOC Analyzer for NPOC, IC, TC and TOC (TC- IC) measurements is accomplished using standards that contain known concentrations 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 On-Line TOC Analyzer can store multiple calibrations for any 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. (To ensure best results, The Analyzer automatically rinses from the 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 122.](#)

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 (see [“Auto Range” on page 162](#)) all five of the Analyzer’s measurement ranges should be calibrated. The five calibrations, one for each range that you select for use in the Auto Range measurement, are stored as a Calibration Group.

Handling Standards

Veolia recommends special handling of all standards to ensure proper preparation and analysis, as follows: (Most standards are provided in 250 mL bottles.)

- Keep all standards containers refrigerated at all times to help ensure stability; store at approximately 5 °C (± 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 Sievers InnovOx On-Line TOC 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:

- 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)

$$\text{Slope}^5 = [(\text{standard concentration}) * (V_s/V_t)]/(\text{mass response})$$

Single-Point Calibration

When a single-point calibration is performed, only one standard is used, as shown in [Figure 37](#). 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.

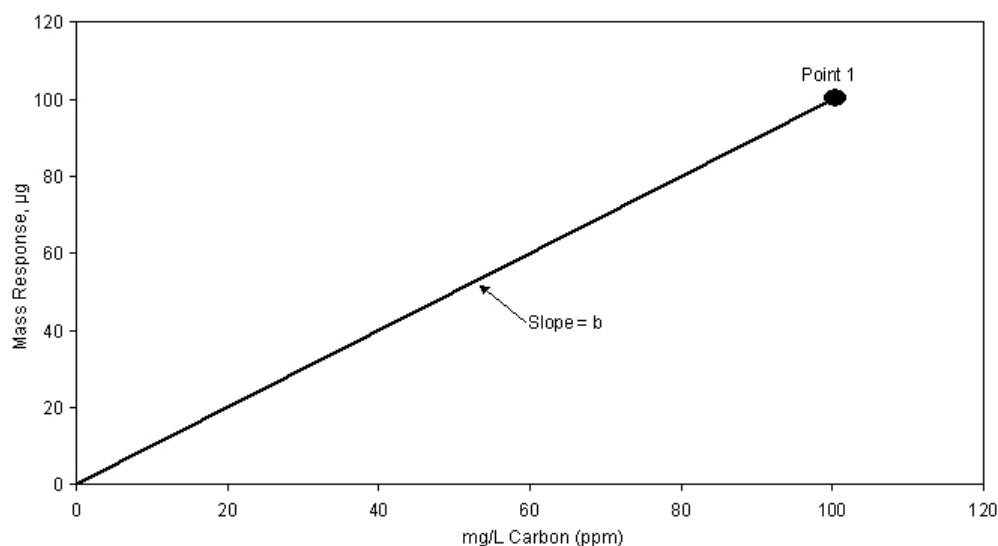


Figure 37: Calibration Curve for Single-Point Calibration

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

$$C = b \cdot R$$

where,

R = Mass Response, µg

b = Calibration constant (slope)

C = mg/L Carbon, ppm

In a single-point calibration, the calibration constant is the slope of the line shown in [Figure 37](#), and the response of the Analyzer is assumed to pass through the origin.

5. V_s = Volume of sample in sparger needed for dilution range, mL
 V_T = Total solution volume in sparger, mL

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 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 (see [page 120](#)). 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 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 38](#) depicts a two-point calibration in which point 1 is not reagent water, but rather a standard of the known TOC concentration. The concentrations of both points are entered into the calibration protocol.

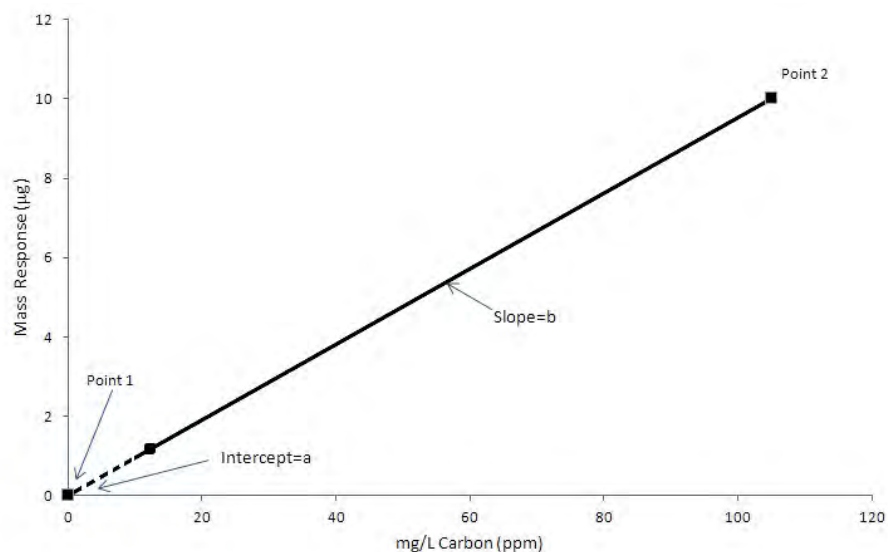


Figure 38: Two-Point Calibration (Point 1 is Standard)

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 39](#). 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.”

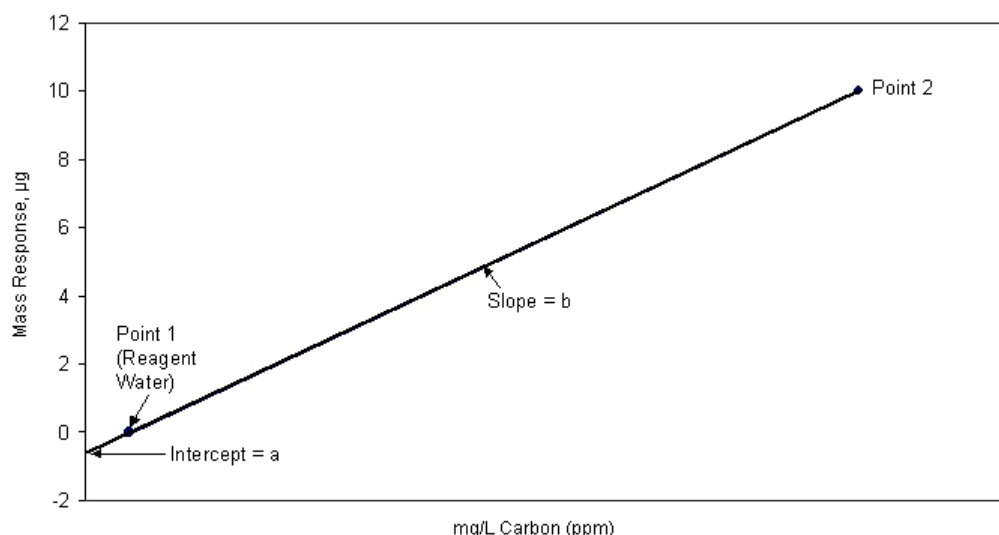


Figure 39: Two-Point Calibration (Point 1 is Reagent Water)

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 measurement 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 16, 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:

$$b = \frac{C_2 - C_{RW}}{R_2 - R_{RW}}$$

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. 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 (see [page 120](#)). 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 three to six 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 40](#) 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).

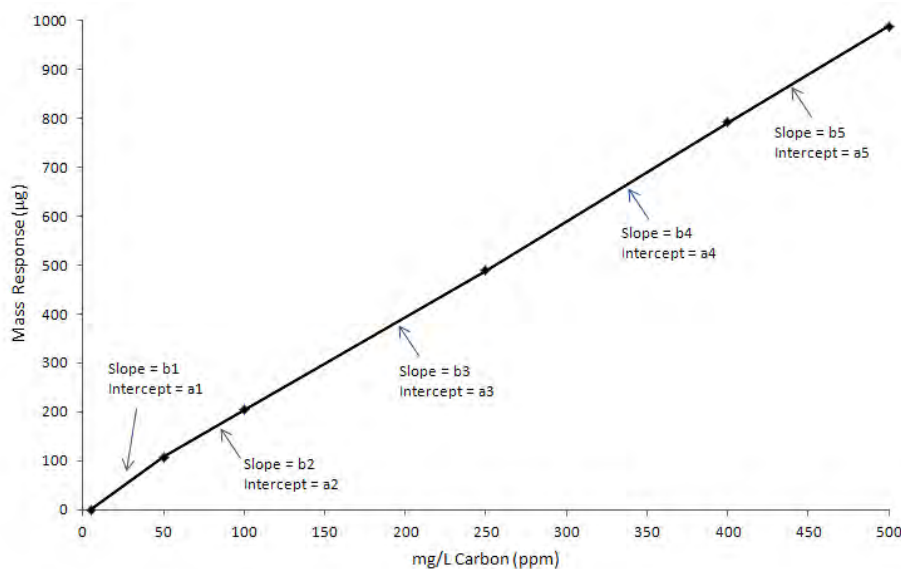


Figure 40: Linear Fit Six-Point Calibration

Point-to-Point Multi-Point Calibration

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

[Figure 41](#) 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 41](#). When this calibration is later applied to a sample, the Analyzer applies the appropriate intercept and slope, based on the magnitude of its mass response for that sample.

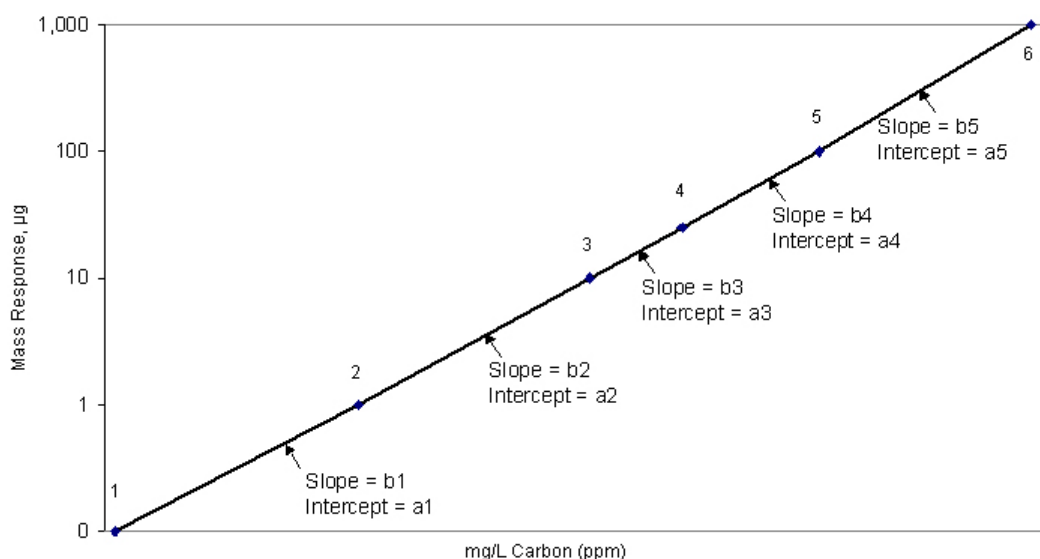


Figure 41: Point-to-Point Calibration with Six Points

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.
- 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 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. 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 ratios available for use in Auto Dilution are shown by range in [Table 11](#).

Table 11: 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 [“Blank Correction” on page 169](#).

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 170](#) 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. Press the **New** button.
4. Specify the Calibration Type and calibration to use in each range. For each range, press the range button and then select the calibration from the list. Only those calibrations specified by the **Calibration Type** button will appear.

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 then select a 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. From the Analyzer **Menu**, 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 port⁶.

⁶. One USB port is provided for your convenience on the left side of the Analyzer. There are two additional USB ports on the System/Controller board internal to the Analyzer. 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.

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 the “No USB Key” 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 170](#) 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.
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.

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 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 set up the number of TOC points and IC points independently. 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, or TOC Standard).
 - Press the **Reps** button to change the number of measurements (repetitions) the Analyzer will make for this calibration point (see [Table 12](#)).
 - 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 change the number of sample flushes to be performed before measurement of the standard.
 - Press **Repeat Criteria** to turn this feature **ON** or **OFF**. Explanation of this feature can be found in Chapter 6 of this manual.
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. 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, or TOC Standard).
7. Enter a name for the new calibration protocol, and then press the **Save** button.

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.

Table 12: 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

Calibrating the Analyzer

To calibrate the Analyzer

1. 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 125](#).
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 42 on page 128](#).)
 - **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 appear, depending upon the type of calibration. The slope is one of the key calibration constants. See the “Calibration and Verification Options” section ([page 114](#)) for a definition. The typical slope values are:
 - **NPOC mode** and **TC/TOC mode**: 700 ± 200 indicates proper response
 - **IC mode**: 1200 ± 350 indicates 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 the “Calibration and Verification Options” section ([page 114](#)) 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 Section [“Editing a Calibration” on page 128.](#))
 - **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 (See the [“Editing a Calibration” on page 128.](#)) 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.

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 42: 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 [“To review and export Calibration History” on page 134](#).

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**⁷ button when the calibration is complete ([see Figure 42](#)). 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 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. 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 43](#)). A plot of mg/L of Carbon (ppm) vs. Mass Response (μg) appears 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 43](#)). The next screen will allow you to change the value of the Standard ([see Figure 44](#)). 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 43: Editing a Calibration

7. If the Calibration was a *TC/TOC Calibration*, first select the individual *Summary* to locate the **Measurements** button.

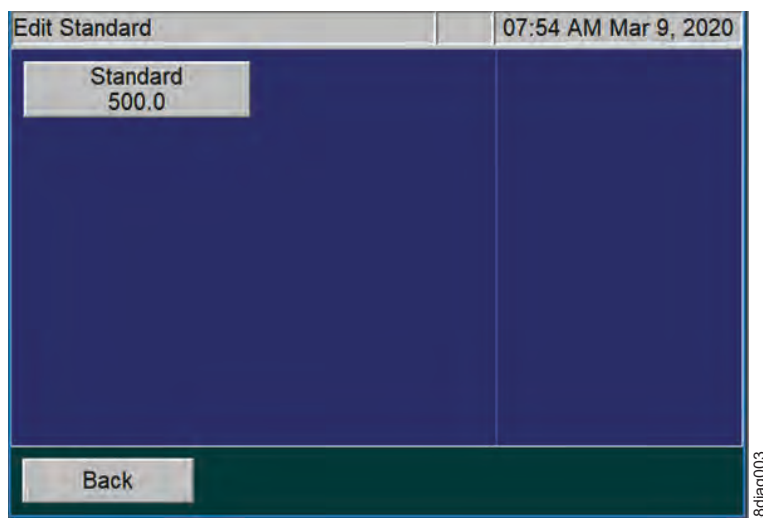


Figure 44: Edit Standard screen

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 ([Figure 45 on page 131](#)).

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%

OK Measurements Export PDF

Figure 45: Verification Summary screen, before editing

*NOTE: A **Measurements** button has been added to the Verification Summary screen.*

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 46 on page 131](#).

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

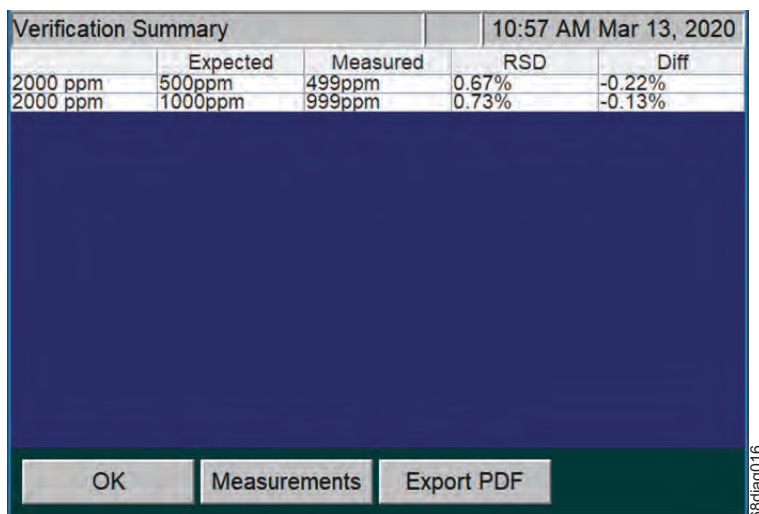
Measurements screen, after **Accept**

Figure 46: 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 136](#).

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 132](#).



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%

Buttons: OK, Measurements, Export PDF

Figure 47: Verification Summary screen, updated

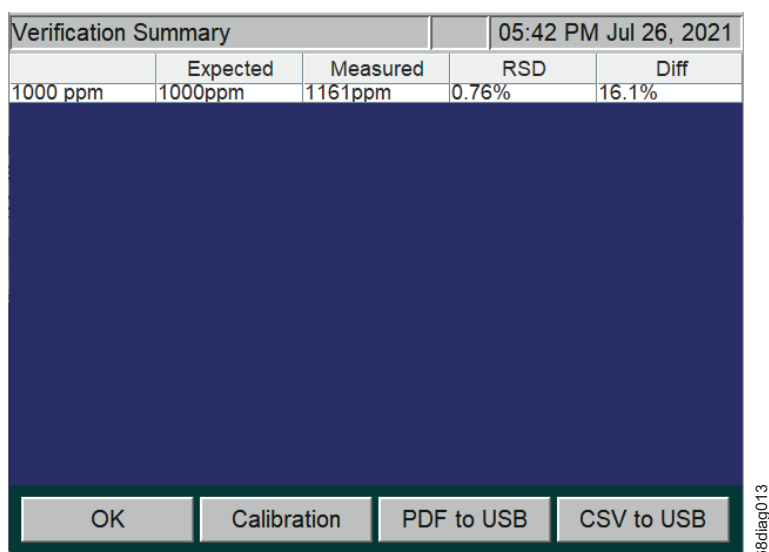
*NOTE: Use the **Measurements** button to adjust the Verification measurement values. After editing any reject states, the values on the Verification Summary screen will be updated to reflect the new state.*

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.

- Press the **View** button to view the *Verification Summary* screen ([Figure 47 on page 133](#)).
- Press the **Calibration** button to see a list of available *Calibrations*.

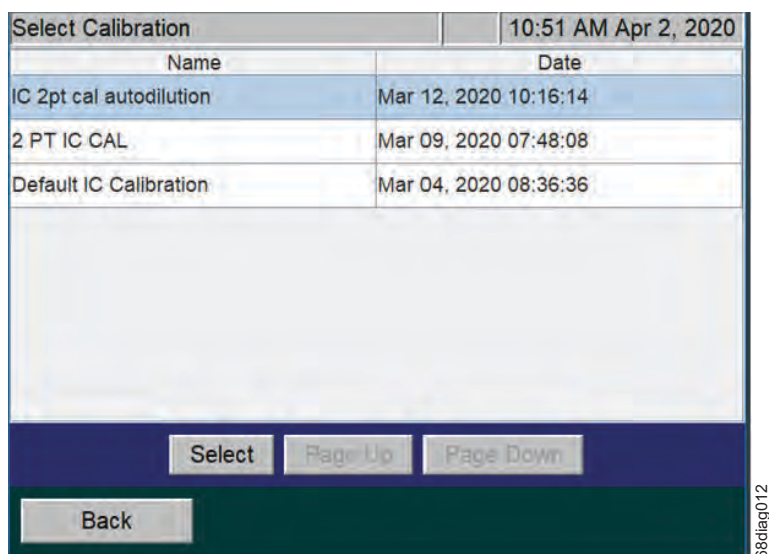


The screenshot shows the 'Verification Summary' screen. At the top, there's a header bar with the title 'Verification Summary' on the left and the timestamp '05:42 PM Jul 26, 2021' on the right. Below this is a table with five columns: 'Expected', 'Measured', 'RSD', and 'Diff'. The first row of data shows '1000 ppm' for Expected, '1161ppm' for Measured, '0.76%' for RSD, and '16.1%' for Diff. The rest of the screen is a large dark blue area. At the bottom, there's a navigation bar with four buttons: 'OK', 'Calibration', 'PDF to USB', and 'CSV to USB'. A vertical label '68diag013' is on the right side of the screen.

Expected	Measured	RSD	Diff
1000 ppm	1161ppm	0.76%	16.1%

Figure 48: Verification Summary Screen; from the Verification History menu

- From the *Select Calibration* screen, select an available calibration from the list and press the **Select** button to apply ([see Figure 49](#)). To cancel the process, select the **Back** button.



The screenshot shows the 'Select Calibration' screen. At the top, there's a header bar with the title 'Select Calibration' on the left and the timestamp '10:51 AM Apr 2, 2020' on the right. Below this is a table with two columns: 'Name' and 'Date'. The first row of data shows 'IC 2pt cal autodilution' for Name and 'Mar 12, 2020 10:16:14' for Date. The second row shows '2 PT IC CAL' for Name and 'Mar 09, 2020 07:48:08' for Date. The third row shows 'Default IC Calibration' for Name and 'Mar 04, 2020 08:36:36' for Date. Below the table is a large white area. At the bottom, there's a navigation bar with four buttons: 'Select', 'Page Up', 'Page Down', and 'Back'. A vertical label '68diag012' is on the right side of the screen.

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

Figure 49: Select Calibration Screen

- 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. Only one USB memory device should be inserted at a time in one of the three available USB ports.
 - From the *Verification Summary* screen, select either **Export PDF** or **CSV to USB**, depending on the desired data format ([see Figure 48](#)).

NOTE: For more information on this task, see [“To review and export Verification History” on page 136](#).

Table 13 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 Table 13, but the maximum number of repetitions that can be selected is 20.

Table 13: Approximate Number of Verification Repetitions Possible

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

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

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 calibration 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 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.*

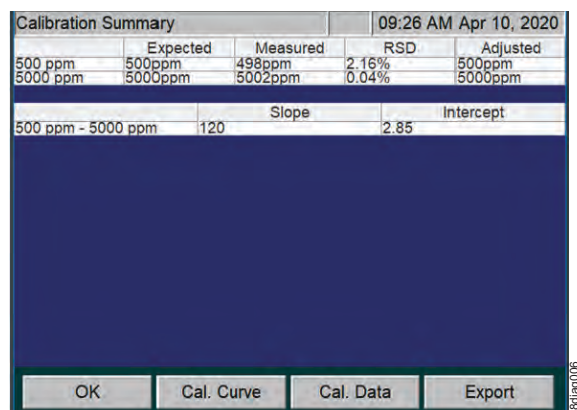
4. To review or export an individual *Calibration Summary* (which is recommended after performing a Calibration of the Analyzer), select a calibration to view by scrolling up or down the list to highlight a selection, and then press the **View** button. A summary of the selected calibration appears.

*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**.*

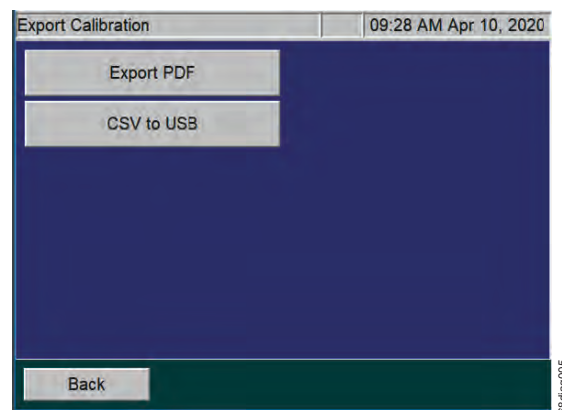
5. Use the **Cal. Curve** button and the **Cal. Data** button to review the *Calibration Summary* data.
6. To export the calibration summary, select the **Export** button to open the *Export Calibration* screen ([see Figure 50](#)).
7. Select either **Export PDF** or **CSV to USB**, depending on the 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 **Cal/Ver** history is also available.*



Calibration Summary screen



Export Calibration screen

Figure 50: 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 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 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 **Ver. CSV to Ethernet** button.

4. To export an individual *Verification Summary* (which is recommended after performing 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 verification summary, select either the **PDF to USB** button or the **CSV to USB** button, depending on the desired data format ([see Figure 51](#)).

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.

Figure 51: Verification Summary screen; export options

Chapter 6. Analyzer Operation

Overview

The Sievers InnovOx On-Line TOC Analyzer utilizes 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 important status information for the Analyzer. As shown in [Figure 52](#), the *Main* screen identifies the type of measurement the Analyzer is set up to make (Online, Check Standard, or Grab), and it identifies its state (either Standby or Analyzer Status when making a measurement).

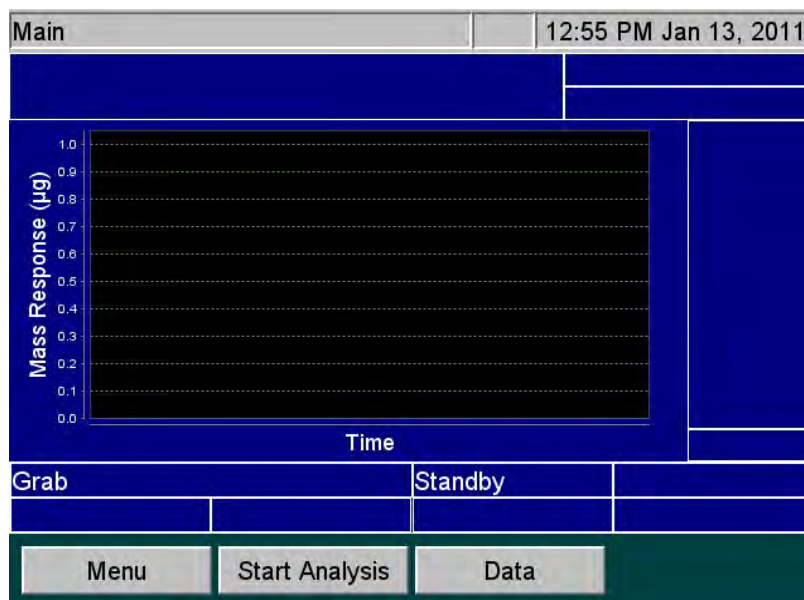


Figure 52: The Main Screen (Grab Mode)

When the Analyzer is set up to perform **Online** measurements, tabs appear along the top of the screen that identify the sample streams that are enabled, and whether or not the Check Standard is enabled. For example, when Stream 1 is enabled, the **S1** tab appears, and so on. When the Check Standard is enabled, the **CS** tab appears ([Figure 53](#)).

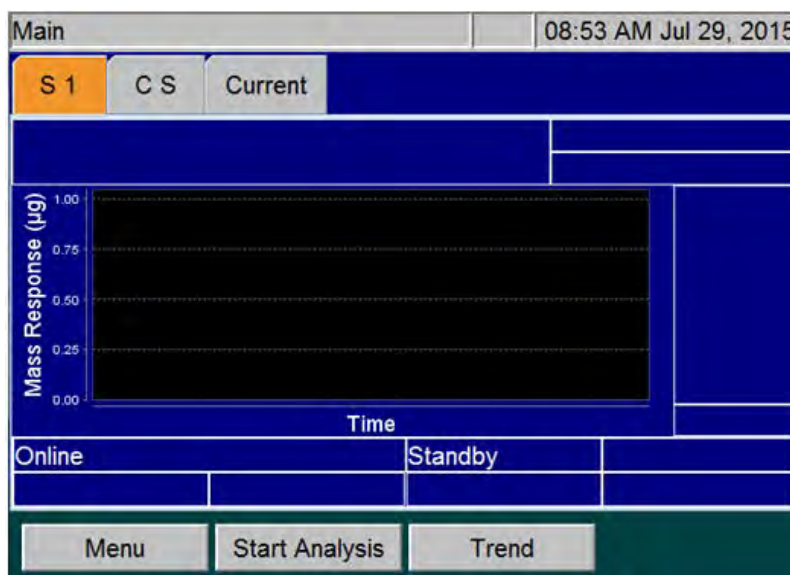


Figure 53: The Main Screen (Online Mode)

The *Main* screen provides the following options:

- **Menu** button — Press this button to display the *Menu* screen and change the Analyzer's settings.
- **Start Analysis** button — Press this button to initiate measurements with the most current Analyzer settings. After analysis begins, the button changes to **Stop Analysis**.
- **Trend** or **Peaks** button — When making Online measurements, press the **Trend** or **Peaks** button to toggle the display between a graphical view of the most recent seven days of measurement results (Trend) and a graphical view of the CO₂ peaks produced during each measurement (Peaks).
- **S1, S2, S3, S4, and S5** tabs — When making Online measurements, select any of these tabs to display peaks or data from each *enabled* stream.
- **CS** tab — When making Online measurements, select this tab to display peaks or data from the Check Standard, if it is enabled.
- **Current** tab — Select this tab to see the CO₂ peaks from whichever stream (or Check Standard) the Analyzer is currently measuring.

NOTE: If no stream tabs (such as S1, S2, and so on) appear, this indicates that the Analyzer is set to perform one or more manual measurements, such as a Check Standard or Grab measurement.

When the Analyzer is taking Grab or Check Standard measurements, the Main screen provides slightly different information.

The Menu Screen

The *Menu* screen ([Figure 54](#)) 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.

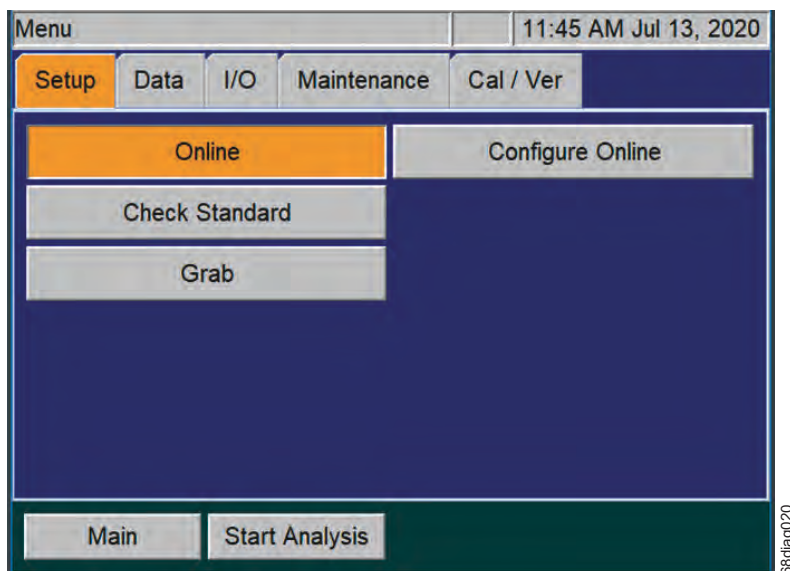


Figure 54: The Menu Screen

Select an appropriate tab to display its available options:

- **Setup** — Set the Analyzer mode and specify analysis parameters. (The buttons for the four basic modes of operation (Online, Check Standard, 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 171.](#))
- **I/O** — Configure the Analyzer’s input and output interfaces. (Information for using this tab is described in [“The I/O Tab” on page 175.](#))
- **Maintenance** — Set up Analyzer Advanced settings, Upgrade Option, get system information, archive data history, shut down the Analyzer. (Information for using this tab is described in [“The Maintenance Tab” on page 186.](#)) For more information about running diagnostics, implementing Conversion Factors, retrieving error messages, and performing other maintenance tasks, see [Chapter 8, "Maintenance"](#).
- **Cal/Ver**— Calibrate the Analyzer and perform calibration verification. Also, view past calibration and verification data. (Refer to [Chapter 5, "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 Measurements

Use the Setup tab to define the measurement settings for the Analyzer. The Setup tab includes the following options:

- **Online** — Set up a selected number of online measurements on each (one or more) enabled sample streams and the check standard (if it is enabled).
- **Check Standard** — Set the Analyzer to check the performance of the Analyzer by performing one or more number of measurements on the check standard, and then stopping.
- **Grab** — Select up the number of measurements (up to 20) for the sample in the vial port. The Analyzer will then calculate the average of those measurements, and also report precision (Relative Standard Deviation) of those measurements.

Online Measurements

This section provides an overview of planning for online measurements, including: working with continuous measurements, operation with multiple streams, cycle frequency, and calculated run time.

Continuous Measurements

By turning **Continuous On**, the Analyzer makes continuous measurements of the enabled sample streams and the Check Standard (if it is enabled). Continuous measurement of Stream 1 is shown in [Figure 55](#). Only Stream 1 and the Check Standard are enabled in this example, so measurements of Stream 1 are made without a pause, with two exceptions.

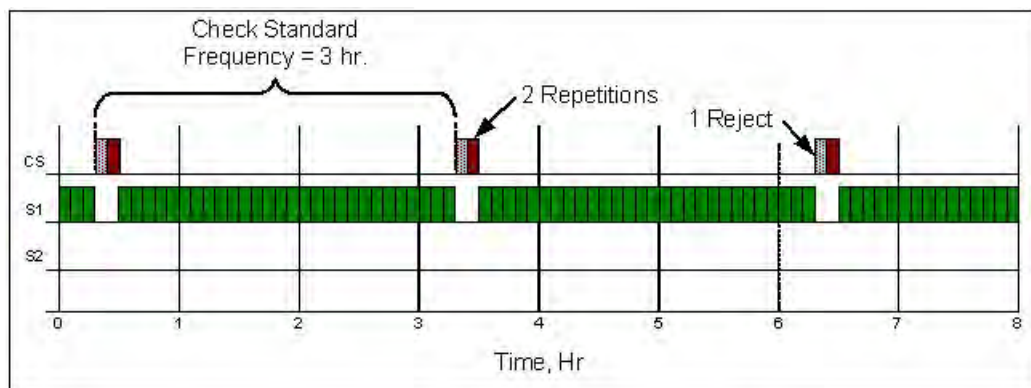


Figure 55: Continuous Operation

The first exception is the Check Standard, since it is enabled. Measurements of the Check Standard are made according to the schedule established by the operator. In the example shown in [Figure 56](#), the check standard is measured every three hours (the Check Standard Frequency). Since two **Repetitions** have been selected, the check standard is measured twice every three hours. The first measurement is ignored because it has been designated as a **Reject**.

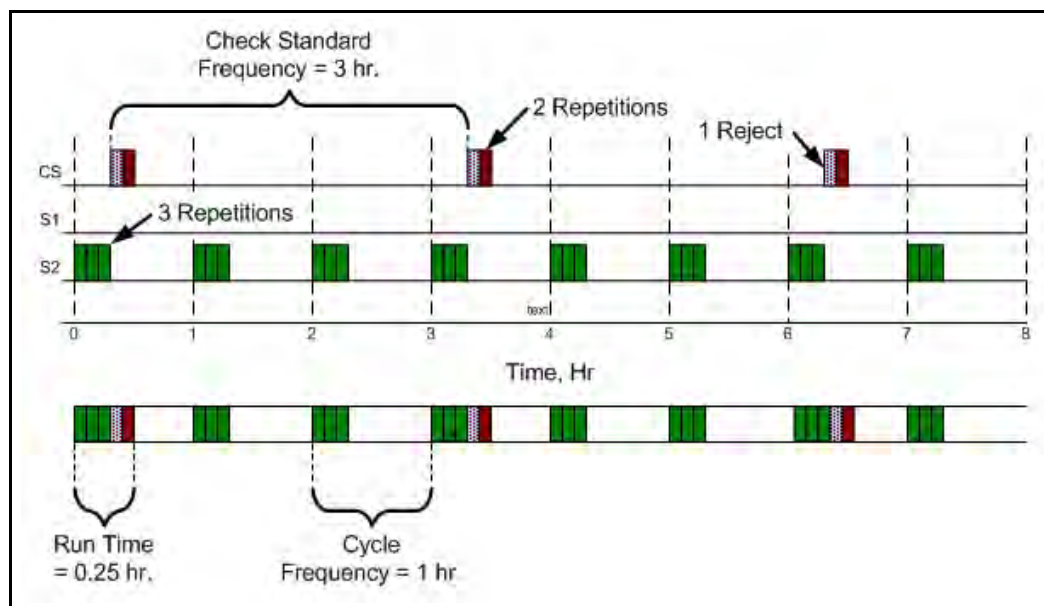


Figure 56: Operation with a Cycle Frequency of One Hour

The second exception is the **Daily Prime**. Once every 24 hours of online operation, the Analyzer primes the reagents, dilution water, and check standard. The time of day that the prime occurs is selected by the operator. The operator also may choose to have the sample inlets back-flushed with acid as part of the flush by enabling the **Back-flush** function.

Cycle Frequency

Many users prefer to obtain a TOC measurement of each stream every hour, every two hours, and so on. The **Cycle Frequency** setting makes it easy to make these periodic measurements.

To set the **Cycle Frequency**, the **Continuous** setting must be *Off*. In the example shown in [Figure 57](#), the **Cycle Frequency** is set to one (1) hour. Only one Stream is enabled, so measurement of that stream starts every hour.

In the example shown in the following figure, [Figure 57: Operation with Five Streams and the Check Standard](#), five Streams are enabled. The **Cycle Frequency** is set to two (2) hours, so measurement of the enabled Streams starts every two hours.

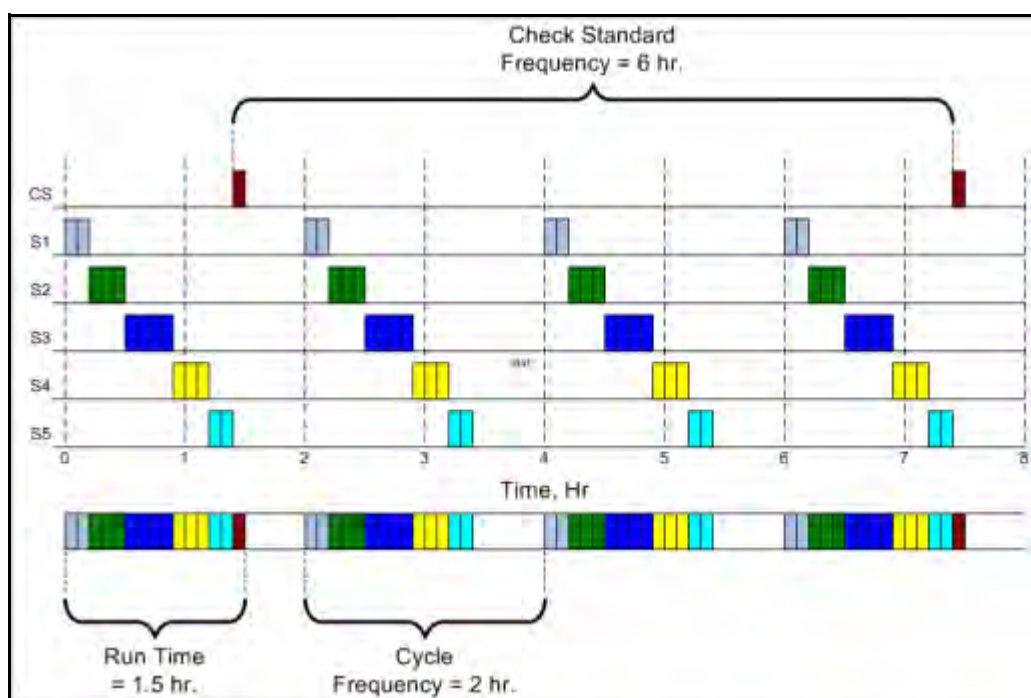


Figure 57: Operation with Five Streams and the Check Standard

Calculated Run Time

It is important to know the **Run Time** of the selected measurements. The **Run Time** is the time required to measure all of the enabled streams and the check standard. **Run Time** is a function of:

- The number of streams that will be measured
- Whether or not the check standard is measured
- The number of repetitions that are selected for each stream and the check standard

- The number of Dilution Water and Sample Flushes selected
- The type of measurement selected (NPOC, TOC, and so on)
- Whether or not Auto Range is selected

In the example shown in [Figure 57](#), the **Run Time** is 1.5 hours. As the graph indicates, the **Run Time** must be less than the **Cycle Frequency**. If you select an incorrect **Cycle Frequency** that is less than the **Run Time**, the Analyzer will automatically display a notification message and will not start analysis.

To aid in the setup process, the Analyzer calculates the **Run Time** for the current Online configuration. On the *Configure Online* screen, press the **Calc Run Time** button. A *Total Run Time* message appears with the calculated run time (such as 0.83 hours) of the current protocol (see [Figure 58](#)). The message also prompts you with an opportunity to set the **Cycle Frequency**. Press **Yes** if you want to increase the **Cycle Frequency**. If the **Cycle Frequency** is already greater than the **Run Time**, or to adjust the **Run Time** instead of the **Cycle Frequency**, press **No**.

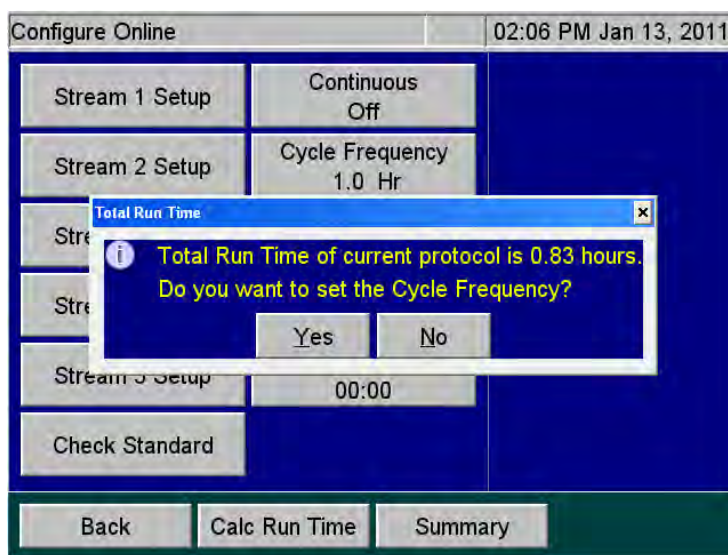


Figure 58: Calculating the Run Time

Adjust the **Run Time** by reducing the number of repetitions on one or more Streams or the check standard. Also, consider making the measurements in ways that take less time. **Auto Range** measurements require more time than when a particular Range is selected. Possibly one or more measurements can be made with fewer or no Sample Flushes.

Online Measurements — Configuration

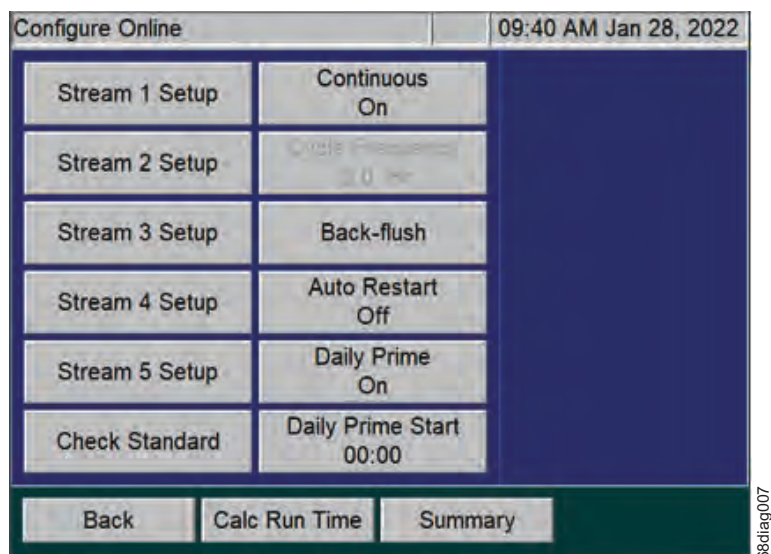


Figure 59: Configure Online Screen

You can use the *Configure Online* screen (**Setup** tab → **Online** → **Configure Online**) to set up Online measurements for the following:

- Operation with Multiple Streams
- Check Standards (Scheduled or Manual)
- Continuous (Online measuring)
- Cycle Frequency
- Back-flush

NOTE: The **Back-flush** button has replaced the **Clean Inlet** button. For information on this feature, refer to [“Back-flush” on page 154](#).

- Auto Restart
- Daily Prime
- Daily Prime Start

You can also calculate Run Time and view a Summary of Online configuration on this screen.

NOTE: The **Fail Safes** button, previously located on this screen, has been moved to the **Advanced** screen (**Maintenance** tab > **Advanced**). For information on this feature, refer to [“Setting the Fail Safe Option” on page 190](#).

Operation with Multiple Streams

The Sievers InnovOx On-Line TOC Analyzer may be used to monitor multiple streams. The base configuration can monitor two streams, and five streams can be monitored with the optional 5-Stream configuration. With the exception of the number of streams, both Analyzers are set up the same way.

When multiple streams are measured, the Analyzer measures the enabled streams in numerical order. For example, Stream 2 follows Stream 1. Any disabled streams are skipped. If the Fail Safe option is employed, streams are also skipped whenever a stream stops flowing. When flow resumes in that stream, the Analyzer will measure it again in its original sequence.

NOTE: To increase the accuracy and speed of the measurements, observe the concentrations in adjacent sample streams. Minimize the concentration difference between adjacent streams. It takes more time to get an accurate measurement because more Sample Flushes are required, when one stream is a much higher concentration than the following stream.

To set up stream measurements

1. On the **Setup** tab, press the **Online** button.
2. Press the **Configure Online** button. The *Configure Online* screen appears.
3. Press a stream button (such as **Stream 1 Setup**) to configure making measurements for this stream. The setup screen for the selected stream appears.

Stream 1		08:34 PM Jul 25, 2021
Stream 1 Enabled	Range (ppm) Up To 1,000	Auto
Measure TOC	Advanced Setup	Up to 100
Acid 5.0 %	Oxidizer 15.0 %	Up To 1,000
Reps 5	Flush / Blowback Setup	Up To 5,000
Conversion Factor None	Analog Out Setup	Up To 20,000
Calibration Factory Default		Up To 50,000
Back		

Figure 60: Stream 1 Screen

NOTE: The **Presets** button, previously located on this screen, has been removed.

NOTE: If the stream button is disabled, press the **Enabled** button that appears to the right. At least one stream must always be enabled in Online mode.

4. Press the **Range** button to display the range buttons. Press a button for the specified range (such as **Up To 1,000**) or press **Auto** to have the Analyzer use the Auto Range function. (For more information on the Auto Range function, see [“Auto Range” on page 162.](#))
5. Press the **Measure** button to specify which value to measure: IC, NPOC, TOC, or TC.
6. Press the **Advanced Setup** button to display the following options:
 - **Blank Correction** button — Set the Blank Correction feature to *On* or *Off*.
 - **Sparge** button — Change the default sparging time (in minutes), when measuring in NPOC mode.
 - **Outlier Setup** button — Set up this feature to ignore any value above a set *outlier* threshold for one to three consecutive measurements. (The value is NOT stored in the instrument nor viewable on the data screen.) Configure this outlier rejection feature (for use when operating in NPOC mode) by setting the following:
 - **Outlier Rejection** button — Enable or disable the Outlier feature. The default value is *Disabled*. If you switch modes (to IC, TC, or TOC) and then return to the NPOC, you will need to enable this feature again.

- **Outlier Threshold** button — Set the value (ppm) that when surpassed will not be stored by the instrument nor appear on the data screen.
- **Rejected Outliers** button — Set the number of consecutive outliers (1, 2, or 3) acceptable, before the instrument stores the value and displays it on the data screen.

For additional information on this feature and its applicability, refer to ["Appendix B: Acronyms and Definitions."](#)

7. Press the **Acid** button to specify the percent of this reagent to use in the protocol.
8. Press the **Oxidizer** button to specify the percent of this reagent to use in the protocol (NPOC, TOC, or TC Modes Only). For additional information on what Oxidizer settings to use, refer to ["Step 11: Perform a Test Analysis" on page 110](#) and ["Oxidizer" on page 163](#).
9. Press the **Reps** button to change the default setting for the number of measurements (repetitions) the Analyzer will make for this stream.
10. Press the **Flush/Blowback Setup** button to configure flushes and/or the blowback operation of the optional Filter Panel. (See [Chapter 7, "Operation with the Filter Panel"](#) for information on the blowback operation.)
 - Press the **Dilution Water Flush** button to rinse out salts or particulates from the reactor and its seals.
 - Press the **Sample Flushes** button to flush the Analyzer with the new sample. Up to 5 Sample Flushes may be selected. Use Sample Flushes to quickly reach steady-state response when the Analyzer will be switching from one stream to another and the two streams have very different concentrations.
 - If you have an InnovOx Filter Panel installed (ONLY), press the **Blowback Pulses** button to set the number of pulses (Maximum of 10 pulses).
 - Press the **Sample Flow Time** to specify the amount of time for the Sample Flushes.
 - Press the **Sample Pump** button to Enable or Disable the Sample Pump.
11. Press the **Analog Out Setup** button to configure the 4-20 mA analog output for Stream 1. The *Analog Output Stream 1* screen appears with the following options:
 - **Range Max (ppm)** and **Range Min (ppm)** buttons — Set the maximum and minimum concentrations (in ppm) that will cause currents of 20 mA and 4 mA to be output, respectively.
 - **Error Level**, **Warning Level**, and **Standby Level** buttons — Set the current to be output when the Analyzer detects an Error, Warning, and when it is in Standby (that is not measuring sample streams). For these three states, you can select from 0, 1.0, 2.5, 4.0, or 20.0 mA. The Warning Level also includes a **Disable** option. The Standby

Level includes an additional option to **Hold Last** where the last measurement output will be maintained during Standby rather than going to the Standby level.

NOTE: *If a Warning is generated during operation, and if a new measurement is available, it will output the measured 4-20 mA value for 30 seconds and then return to outputting the Warning level. However, if Disable is selected for the Warning output, all warnings will be ignored on the 4-20 output.*

- **No Flow Level** button — Set the current to be output when the Analyzer detects a No Flow Warning. You can select from 0, 1.0, 2.5, 4.0, or 20.0 mA. The No Flow Level also includes a **Disable** option.

NOTE: *If there is a “No Flow Warning” for a stream, then the output shall be the “No Flow Level” selected output for that stream. If the “No Flow Level” is disabled, then the analog output shall not change when flow stops and starts.*

12. Press the **Conversion Factor** button to apply a configurable factor to the final result. You can configure up to five conversion factor equations with unique alphanumeric units by clicking on **Maintenance** tab → **Conversion Factor**. For additional information, refer to [“Configuring Conversion Factors” on page 165](#).

13. Press the **Calibration** button to specify which calibration should be used in this protocol.

NOTE: *You can ONLY select calibrations for the appropriate analysis mode and range (specified previously using the **Range** button). If you selected the Auto Range option, you can specify the **Calibration Group** to use with the protocol. For more information, see [“Calibration Groups” on page 122](#).*

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

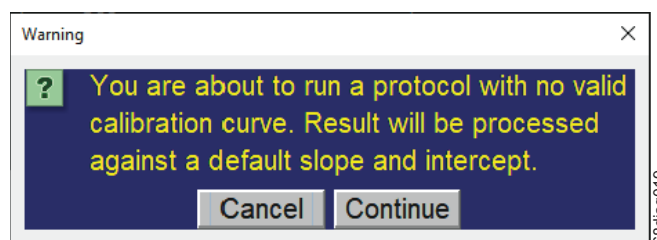


Figure 61: Warning; No valid calibration curve

14. After you have configured this stream, press the **Back** button to return to the *Configure Online* screen, and then configure any other streams you want to monitor.

15. Continue to the next section to define the setup for the check standard.


Check Standards

Check standard measurements provide a way of checking that the Analyzer is operating properly and that its calibration has not changed. The Analyzer can make measurements of this check standard—a solution of known concentration— as part of a scheduled Online operation or as a separate, manually-started analysis. Use the **Check Standard** button to manually initiate measurements of the check standard. For information on setting up scheduled online operations of the check standard, see [“To set check standard measurements \(Scheduled\)” on page 151](#).

NOTE: Any changes made to the Check Standard Measurement (Manual Start) are also applied to the Check Standard Measurement (Scheduled). See [page 151](#).

To set check standard measurements (Scheduled)

1. On the *Configure Online* screen (**Setup** tab>**Online** button>**Configure Online** button), press the **Check Standard** button. The *Check Standard* screen appears



The screenshot shows a software interface for configuring check standard measurements. The window title is 'Check Standard' with a timestamp of '01:59 PM Jan 13, 2011'. The interface is divided into two main sections. The left section contains five buttons: 'Check Std. Setup', 'Frequency 1 Hours', 'Start Time 08:00', 'Concentration 0.0 ppm', and 'Tolerance 5.0 %'. The right section is currently empty. At the bottom of the window is a 'Back' button.

Figure 62: Check Standard Screen (with Check Std. Setup button)

2. Press the **Frequency** button to set how often to measure the check standard.
3. Press the **Start Time** button to set the start time using a 24-hr. clock format (e.g., use 13:00 for 1 p.m.).
4. Press the **Concentration** button to set the ppm concentration of the check standard.
5. Press the **Tolerance** button to set the acceptable range of concentrations for the measurement of the standard. For example, if the **Tolerance** is set at 20%, then the acceptable concentration is 20% below or 20% above the **Concentration** value.

6. Press the **Check Std. Setup** button. The following buttons appear on the *Check Standard* screen.

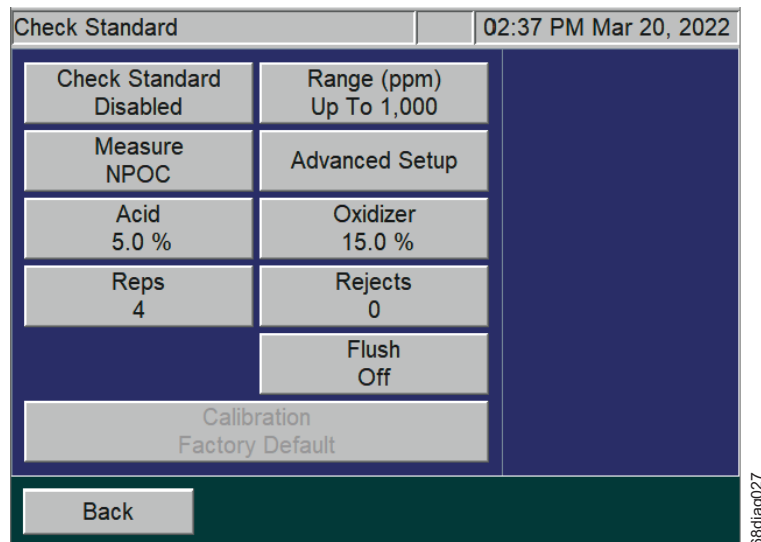


Figure 63: Check Standard (with Setup Buttons) Screen

7. If Check Standard is disabled, press the **Check Standard** button and then press the **Enabled** button that appears to the right.
8. Press the **Range** button. The range buttons appear to the right. Press a button for the specified range (such as **Up To 1,000**) or press **Auto** to have the Analyzer use the Auto Range function. (For more information on the Auto Range function, see ["Auto Range" on page 162.](#))
9. Press the **Measure** button to specify which value to measure: IC, NPOC, TOC, or TC.
10. Press **Advanced Setup** → **Blank Correction** to specify whether the Blank Correction feature should be set to *On* or *Off*.
11. Press the **Acid** button to specify the percent of this reagent to use in the protocol.
12. Press the **Oxidizer** button to specify the percent of this reagent to use in the protocol.
13. Press the **Reps** button to change the default setting for the number of measurements (repetitions) the Analyzer will make for this stream.
14. Press the **Rejects** button to change the number of check standard measurements the Analyzer should exclude from its calculations.

NOTE: *The number of rejects must be less than the number of repetitions selected for the check standard. Rejects applies to the initial measurements of the check standard, as shown in [Figure 55: Continuous Operation](#) on [page 143](#). Use this feature to exclude initial measurements when the concentration of the check standard is different from the previously measured sample, so that the average of the check standard measurements is accurate.*

15. Press **Advanced Setup** → **Sparge** to change the default sparging time (in minutes) when NPOC is measured.
16. Press the **Flush** button to configure flushes:
 - Press the **Dilution Water Flush** button to rinse out salts or particulates from the reactor and its seals.
 - Press the **Sample Flushes** button to flush the Analyzer with the new check standard. Up to five Sample Flushes may be selected. Use Sample Flushes to quickly reach steady-state response when the Analyzer will be switching from one stream to another and the two streams have very different concentrations.
17. Press the **Calibration** button to specify the calibration to be used.
18. When finished, press the **Back** button to return to the *Check Standard* screen, and then press the **Back** button. The *Configure Online* screen appears.
19. Continue to the next section to complete the configuration for online measurements.

To set up check standard measurements (Manual Start)

1. On the **Setup** tab, press the **Check Standard** button. The **Check Standard Setup** button appears to the right.
2. Press the **Check Standard Setup** button. The *Check Standard Setup* screen appears.

Check Standard Setup		02:31 PM Mar 20, 2022
Check Standard Disabled	Range (ppm) Up To 1,000	
Measure NPOC	Advanced Setup	
Acid 5.0 %	Oxidizer 15.0 %	
Reps 4	Rejects 0	
	Flush Off	
Calibration Factory Default		
Back		68diag028

Figure 64: Check Standard Setup Screen

3. Press the **Measure** button to specify which value to measure: IC, NPOC, TOC, or TC.
4. Press **Advanced Setup** → **Blank Correction** to specify whether the Blank Correction feature should be set to *On* or *Off*.

5. If Check Standard is disabled, press the **Check Standard** button and then press the **Enabled** button that appears to the right.
6. Press the **Range** button. The range buttons appear to the right.
7. Press a button for the specified range (such as **Up To 1,000**) or press **Auto** to have the Analyzer use the Auto Range function. (For more information on the Auto Range function, see [“Auto Range” on page 162.](#))
8. Press the **Acid** button to specify the percent of this reagent to use in the protocol.
9. Press the **Oxidizer** button to specify the percent of this reagent to use in the protocol.
10. Press the **Reps** button to change the default setting for the number of measurements (repetitions) the Analyzer will make for this stream.
11. Press the **Rejects** button to change the number of check standard measurements the Analyzer should exclude from its calculations.

NOTE: *The number of rejects must be less than the number of repetitions selected for the check standard. Rejects applies to the initial measurements of the check standard, as shown in [Figure 55: Continuous Operation](#) on [page 143](#). Use this feature to exclude initial measurements when the concentration of the check standard is different from the previously measured sample, so that the average of the check standard measurements is accurate.*

12. Press the **Flush** button to configure flushes:
 - Press the **Dilution Water Flush** button to rinse out salts or particulates from the reactor and its seals.
 - Press the **Sample Flushes** button to flush the Analyzer with the new check standard. Up to five Sample Flushes may be selected. Use Sample Flushes to quickly reach steady-state response when the Analyzer will be switching from one stream to another and the two streams have very different concentrations.
13. Press **Advanced Setup** → **Sparge** to change the default sparging time (in minutes) when NPOC is measured.
14. Press the **Back** button and then press **Start Analysis**. The Analyzer will perform the selected number of repetitions and then stop analysis.

Back-flush

The Analyzer is able to back-flush each stream individually using a custom **Timer Frequency** and **Start Time**. The Analyzer will back-flush the enabled sample stream inlet(s) with a User specified mixture of sample source, acid, oxidizer, and dilution water. The **Back-flush** function aids in controlling biological growth in the sample cup and inlet tubing. This applies to Online configuration and can be enabled and disabled for each stream.

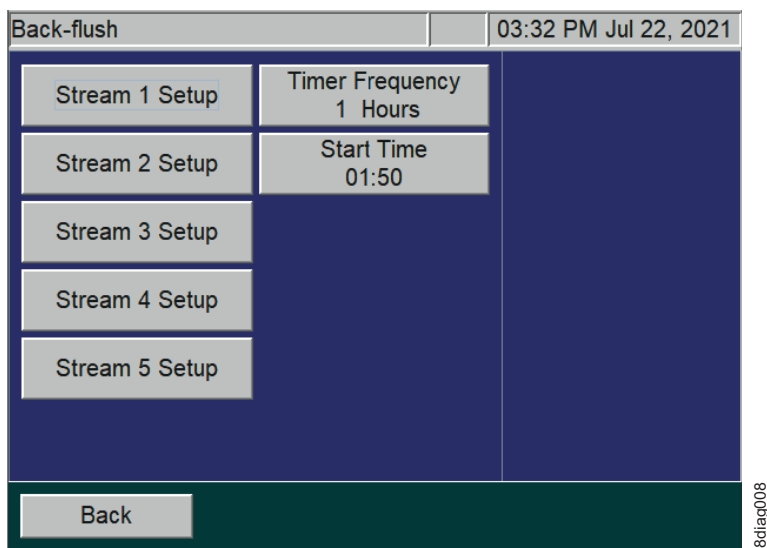


Figure 65: Back-flush screen

To enable Back-flush function

1. Select the **Back-flush** button from the *Configure Online* screen (see [Figure 59 Configure Online Screen page 146](#)).
2. Next choose the **Stream Setup** button (such as **Stream 1 Setup** button) to customize the following settings for each applicable stream (see [Figure 65: Back-flush screen](#) and [Figure 66: Stream 1 Back-flush screen](#)).

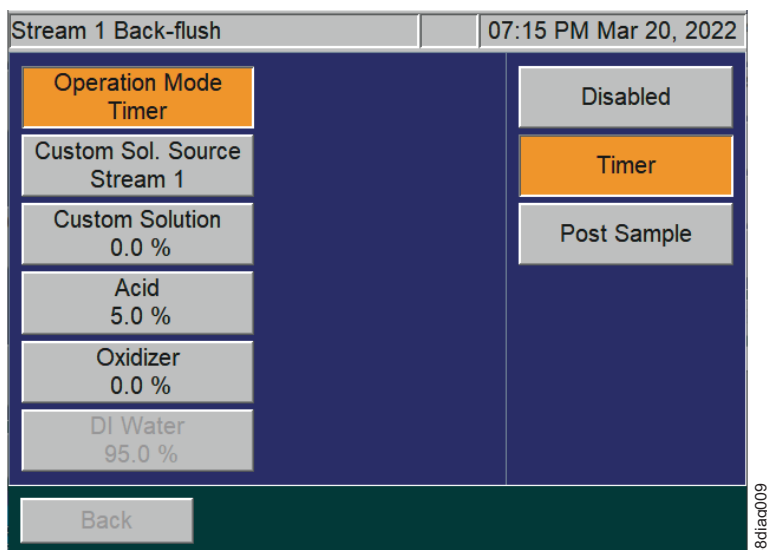


Figure 66: Stream 1 Back-flush screen

- **Operation Mode** — this is the state of the Back-flush function.

- When the state is **Disabled**, no back-flush will be performed on the selected stream.
- When the state is set to **Timer**, the back-flush will be done based on the back-flush timer configured on the *Back-flush* screen.
- When the state is **Post Sample**, the back-flush will be done after every sample measurement.
- **Custom Sol. Source** — use this menu to select a custom sample source for the back-flush. Sample source can be set to **Stream 1**, **Stream 2**, **Stream 3**, **Stream 4**, **Stream 5**, or **Vial Port**.
- **Custom Solution** — use the numeric keyboard to select the percentage of the back-flush solution that will contain *Custom Sol. Source*, as defined in the **Custom Sol. Source** menu.
- **Acid** — use the numeric keyboard to select the percentage of the back-flush solution that will contain *Acid*.
- **Oxidizer** — use the numeric keyboard to select the percentage of the back-flush solution that will contain *Oxidizer*.
- **DI Water** — the *DI Water* (or dilution water) percentage is calculated by the Analyzer. It reflects the remainder of the solution, whatever percentage that has not been allocated to a different back-flush solution.

NOTE: An error will occur if the percentages of all solution sources exceed 100% in total.

3. After completing the *Back-flush setup* for each applicable stream, select the **Back** button to exit.

Auto Restart

When the **Auto Restart** function is *On*, the Analyzer will resume analysis when power is restored after a power outage. When **Auto Restart** is *Off*, the Analyzer will remain in Standby when power is restored.

Daily Prime

The **Daily Prime** function causes the Analyzer to prime the reagents, dilution water, and check standard every 24 hours of online operation. This maintains the accuracy of the measurements by eliminating bubbles that accumulate in the tubing during normal operation.

You may want to set the Daily Prime for non-continuous operation. Set the Daily Prime to *On* for non-continuous operation, and then set a specific daily start time. You will want to set the Daily Prime to *Off* if you run online continuously.

To turn on or turn off the Daily Prime

1. On the *Configure Online* screen, press the **Daily Prime** button. An *On* button and an *Off* button appear to the right.
2. Press either the *On* or *Off* button, as needed.
3. Proceed to the next instruction to set the Daily Prime start time.

To set a Daily Prime start time

1. Before you begin, ensure that you have turned *On* the Daily Prime, as directed in the previous section.
2. On the *Configure Online* screen, press the **Daily Prime Start** button. A numerical keypad appears to the right.
3. Enter the start time in an HH:MM, 24-hour format.

Summary

You can use the *Configure Online* screen (**Setup tab** → **Online button** → **Configure Online**) to display the current configuration for all streams and the check standard, press the **Summary** button. The summary is a convenient way to verify the configuration before starting the analysis.

Grab Measurements

Use the Grab option to specify settings for Grab analysis when performing analysis on samples contained in 40-mL vials placed in the Vial Sampler.

To specify Grab analysis settings

1. On the **Setup** tab, press the **Grab** button. The **Analysis Protocol** button appears on the right.
2. Press the **Analysis Protocol** button. The *Protocol* screen appears with a listing of protocols.

Protocol		01:04 PM Jan 13, 2011
Name	Date	
Default GRAB	Oct 19, 2010 10:56:19	
Modify	Print	Delete
Page Up	Page Down	
Back		

Figure 67: The Protocol Screen

3. Touch the protocol name on the screen.
4. To modify this protocol, press the **Modify** button. The *Grab (Setup)* screen appears.

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

Figure 68: The Grab (Setup) Screen

5. Make changes to the protocol, as needed:
 - Press the **Measure** button to specify which value to measure: IC, NPOC, TOC, or TC.
 - Press the **Range** button to specify one of the five range buttons, or select the **Auto** button for the Auto Range function (see [“Auto Range” on page 162](#)).

- Press the **Acid** and **Oxidizer** buttons to specify the percent of each reagent to use in the protocol.
- Press the **Reps** button to change the default setting for the number of measurements (repetitions) the Analyzer will make for this sample. If **Repeat Criteria** is **ON**, then this field will be grayed out and uneditable.
- Press the **Rejects** button to change the default setting for the number of measurements the Analyzer should exclude from its calculations. If **Repeat Criteria** is **ON**, then this field will be grayed out and uneditable.

NOTE: *The number of rejects must be less than the number of repetitions.*

- 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. 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 stop after the Max Reps number is realized and list the final value in the report.
- Press the **Flush** button if you want to include one to five sample flushes, or a dilution water flush, in the protocol. This flush occurs prior to the first measurement.
- Press the **Conversion Factor** button to apply a configurable factor to the final result. You can configure up to five conversion factor equations with unique alphanumeric units by clicking on **Maintenance** tab → **Conversion Factors**.
- 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 for NPOC mode.
- Press the **Calibration** button to specify which calibration to use in this protocol.

NOTE: *Only the calibration profiles for the appropriate analysis type and range appear for selection, as specified via the **Range** button. When the Auto Range function is initiated, you can specify the **Calibration Group** to use with the protocol. For more information, see [“Calibration Groups” on page 122](#).*

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

- Press the **Save** button to overwrite the modified protocol or press the **Save As** button to save as a unique name.
 - Enter a name for the new protocol, and then press the **Save** button. If the **Save As** button is selected, you will be prompted to enter a new name. The new protocol now appears on the *Protocol* screen.
6. Press the **Start Analysis** button. The *Sample Name* screen with a keypad appears. Enter the name of the sample for future reference, and press the **Enter** button. The Analyzer will start analysis and the *Setup* screen appears. A "Running Grab" message also appears at the top-left of the *Menu* screen.
 7. Press the **Main** button to view the CO₂ peaks or analysis data.

The following table 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 when using 40-mL vials. The possible number of repetitions varies according to the size of the vials used in the protocol.

Table 14: Vial Port - Repetitions Possible

Vial Port: Approximate Number of Repetitions Possible using Completely Filled 40-mL Vials					
	Flushes				
Mode	None	1 Sample	2 Sample	3 Sample	Dilution Water
Auto Range					
NPOC	7	6	5	3	7
TOC	3	2	1	0	3
IC	7	6	3	1	7
TC	3	2	1	0	3
100 ppm Range					
NPOC	6	5	4	2	6
TOC	3	2	1	0	3
IC	6	5	3	1	6
TC	3	2	1	0	3

1,000 ppm Range					
NPOC	7	6	5	3	7
TOC	3	2	1	0	3
IC	7	6	4	2	7
TC	3	2	1	0	3
5,000 ppm Range					
NPOC	14	13	12	10	14
TOC	12	11	10	5	12
IC	14	13	11	9	14
TC	12	11	10	9	12
20,000 ppm Range					
NPOC	20	20	20	20	20
TOC	20	20	20	20	20
IC	20	20	20	20	20
TC	20	20	20	20	20
50,000 ppm Range					
NPOC	20	20	20	20	20
TOC	20	20	20	20	20
IC	20	20	20	20	20
TC	20	20	20	20	20

Measurement Settings

Measure

The Analyzer allows you to make NPOC, TOC, TC, and IC measurements. NPOC is measured by adding sample, acid, oxidizer, and dilution water to the sparger. The solution is mixed, and any IC in the solution is converted to CO₂ by the acid. Then, CO₂-free gas is bubbled through it to remove that CO₂. A portion of the sparged solution is then introduced into the reactor, where the organics in the solution are oxidized to CO₂ and are subsequently measured in the NDIR.

When TOC, 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 (TOC = TC - 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 (see Table 15). Select the range that best matches the most likely TOC levels in the current sample. The range can be used for a sample that has a concentration less than the range listed in Table 15. 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. (For 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, as described in the following table.

Table 15: Analyzer Ranges with Default Reagent Settings

<i>The following ranges for the Sievers InnovOx On-Line TOC Analyzer are based the default reagent settings of 1% acid and 15% oxidizer, with the exception of the Up to 100 ppm range, which is based on 1% acid and 5% oxidizer.</i>				
Range	Sample Volume (mL)	Acid Volume (mL)	Oxidizer Volume (mL)	Dilution Water Volume (mL)
Up to 100 ppm	2.82	0.04	0.20	0.94
Up to 1,000 ppm	2.00	0.04	0.60	1.36
Up to 5,000 ppm	0.80	0.04	0.60	2.56
Up to 20,000 ppm	0.20	0.04	0.60	3.16
Up to 50,000 ppm	0.08	0.04	0.60	3.28

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 122](#).

Acid

The solution must be acidified to a $\text{pH} \leq 2$ to convert IC to CO_2 and to ensure that CO_2 produced in the reactor is properly expelled from the Gas-Liquid Separator. Since the concentration of the acid reagent is 3N to 6M, 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. For more information, see [“Acid considerations” on page 288](#).

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 289](#). Reference the following as needed: [“Step 11: Perform a Test Analysis” on page 110](#).

Repetitions

Set the number of repetitions to the number of measurements to make on a Grab sample, Online, or Check Standard measurement. The maximum number of repetitions is 20.

Rejects

You may opt to have the first few measurements on a Grab sample or Check Standard omitted from the 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

For **Grab Sample Analysis**, use **Repeat Criteria** to allow the Analyzer to follow configurable logic to determine the number of repetitions to run. If selected as **ON**, you will be able to 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.

Sparge

The duration of the sparging during the NPOC measurements is set. Because of the high efficiency of the Sparging Chamber, a sparge time as short as 0.8 min. often is sufficient for all ranges, except the *Up to 100 ppm* range, which has a sparge time of 2 min. The minimum sparge time for all ranges is 0 min. in NPOC mode. However, the composition of the sample can affect this. The Sparging Chamber also may become contaminated during use, requiring longer sparge times. Therefore, the sparge 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 (if required), 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 first, followed by the sample flush(es).

Manual Dilution

Some users prefer to dilute the sample manually before it is introduced into the Analyzer for grab measurements. 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 69](#).

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 168](#).

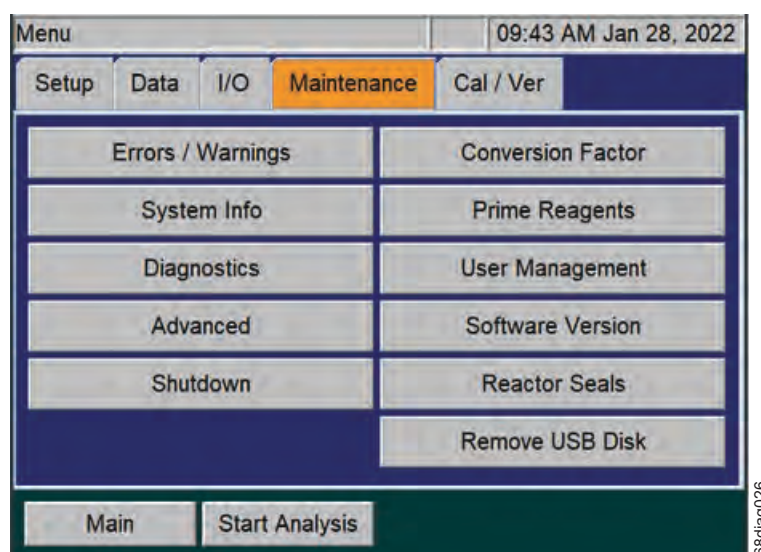


Figure 69: The Maintenance Tab

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 69](#)) 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 70](#)).

Figure 70: Configuring a Conversion Factor

- 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.)

Figure 71: Configuring the Factor Equation

- Press the **Save** button to save the equation and return to the *Factor* screen.

- 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 72](#)).

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 72: Configuring the Factor Units

- Press the **Save** button to save the units and return to the *Factor* screen.
- Press the **Factor Name** button and use the alpha/numeric keypad to type a name for the conversion factor ([Figure 73](#)).

Factor Name 10:35 AM Aug 14, 2015

BOD <<<

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 73: Configuring the Factor Name

- 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.

Each configured conversion factor now appears when setting up Stream measurements or Grab measurements ([Figure 74](#)), as described earlier in this chapter. To apply a conversation factor, press its button from this screen.

The screenshot shows a configuration screen titled "Default GRAB" with a timestamp of "02:56 PM Mar 20, 2022". The screen is divided into several sections:

- Measure NPOC**: Range (ppm) Up To 1,000. A button labeled "None" is next to it.
- Acid 5.0 %**: Oxidizer 15.0 %. A button labeled "Factor 1" is next to it.
- Reps 4**: Rejects 1. A button labeled "Factor 2" is next to it.
- Repeat Criteria Off**: Flush Off. A button labeled "Factor 3" is next to it.
- Conversion Factor None**: Advanced Setup. A button labeled "Factor 4" is next to it.
- Calibration Factory Default**: A button labeled "Factor 5" is next to it.

At the bottom, there are three buttons: "Back", "Save", and "Save As". A vertical label "68diag030" is on the right side of the screen.

Figure 74: 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. Toggle the **User Management Enabled/Disabled** button to the desired setting.

4. To set up unique users, ensure that the User Management is set to **Enabled** and press the **Admin** button to log in as the Administrator.
5. Press **User Name** to enter a unique user ID, and then press **Enter**.
6. Press **Password** to enter a unique user password, and then press **Enter**. 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 keycode that appears on the Login screen.

7. Repeat steps [5](#) and [6](#) to set up Users 2 and 3.

Blank Correction

The reagents and dilution water contain organic contaminants that are included in the TC, TOC and NPOC measurements. Those contaminants make a significant contribution to the TC, 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 sample streams are to be measured using the same Acid and Oxidizer settings used in the calibration, 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 as follows) is inactivated.

If you analyze the samples with different Acid and Oxidizer settings other than those used in the calibration, consider using the automated Blank Correction feature. This feature gives the advantage of measuring 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.

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

NOTE: 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 low-level (<10 ppm) 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.

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 1000 ppm range. 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

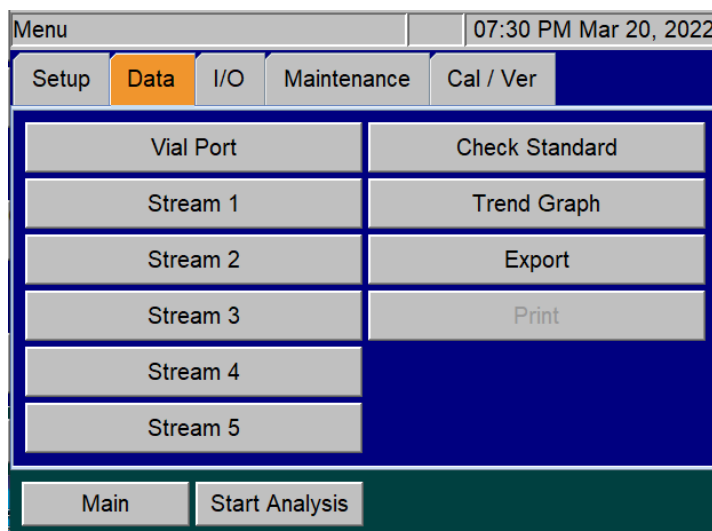


Figure 75: The Data Screen

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 button for the data to view:
 - **Stream 1, Stream 2, Stream 3, Stream 4, or Stream 5** — Displays the data collected for the corresponding stream.
 - **Vial Port** — Displays data obtained from measurements made at the Vial Port.
 - **Check Standard** — Displays the check standard measurements.
3. 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.
4. 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 76](#)). 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	
<div> <div>Back</div> <div>Calibration</div> </div>		

Results Details screen with **Calibration** button

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 76: Result Details and Select a new Calibration

Exporting Data

This section describes how to export historical data from the Analyzer directly to a USB memory device (.pdf or .csv file), or export to a computer or computer network via an Ethernet connection (.csv file). For information on how to import this data into a spreadsheet program, see ["Appendix C: Importing Analyzer Data into a Spreadsheet."](#)

To export real-time data, refer to [“Collecting Historical and Real-Time Data”](#) on page 180.



Figure 77: Export (Data) Screen

To export data history

To export data using the Ethernet port, you must first configure the Analyzer's IP address (see [“Configuring a Network Connection” on page 178](#)).

1. Select the **Data** tab, and then press the **Export** button. The *Export* screen appears.
2. 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.)

- Press the **Export** button. The *Export Data* screen appears.

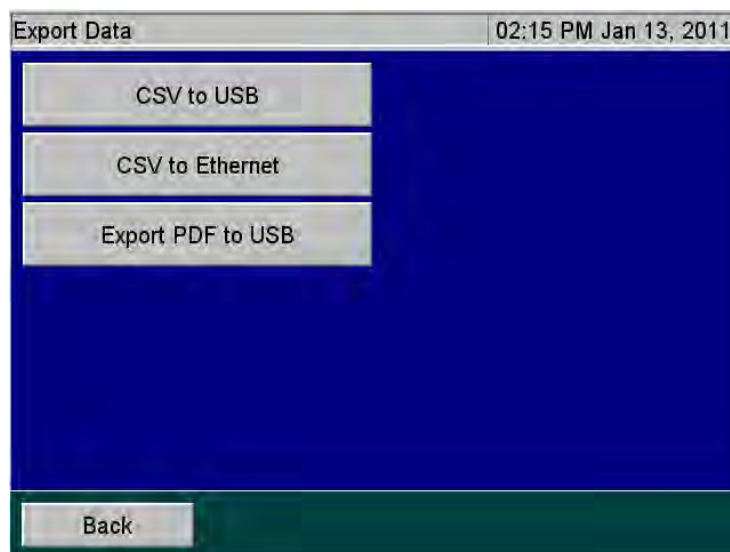


Figure 78: Export Data Screen

- 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.
- 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 16: 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 16: Data Fields Output

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 ₂ (mg)	Mass of CO ₂ 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

The I/O Tab

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 177](#).

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.

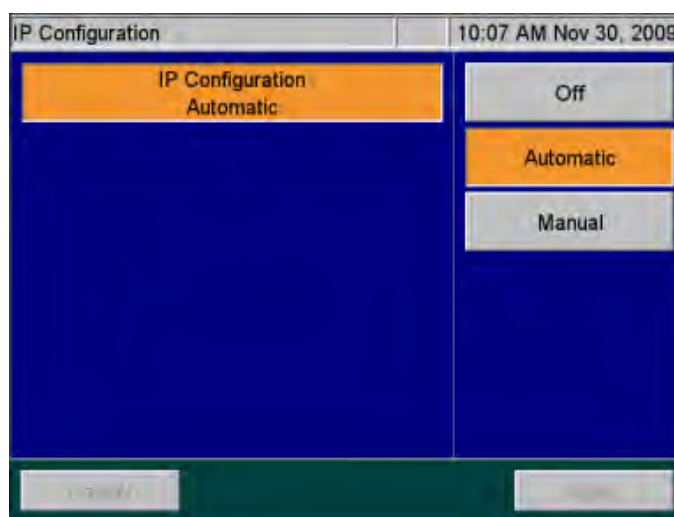


Figure 79: IP Configuration Screen

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 octets⁸ of the Analyzer IP Address **MUST** be the same as those of the *Direct Connection* 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 179](#).

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 179](#).
5. Press the **Apply** button.

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

Connecting to the Analyzer via Ethernet

The Analyzer can be connected to a *Network* or *Direct Connection* computer via an Ethernet cable. For more information on the cable configurations, [“Installing the Ethernet Connection” on page 84](#).

- 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.

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

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.

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 175](#) 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.



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*, 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 175](#) and follow the directions for setting up a **Manual IP Configuration** for a *Direct Connection* 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.

NOTE: When using the *Direct Connection* computer to control the Analyzer, 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 Historical and Real-Time Data

Collect historical or real-time measurement data from the Analyzer using Ethernet and a data acquisition program. For additional information, see [“Installing the Ethernet Connection” on page 84](#). 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 16 on page 174](#).

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.

NOTE: The following Telnet port numbers are used to collect real-time data:

- 10802 - Historical Data(Data History or Cal/Ver History)
- 10801 - Real-Time Data (Generated during Measurements)

Using the Ethernet Connection and Modbus

To use Modbus, first ensure that the Ethernet cable is attached to the System/Controller board. Then follow the procedure in [“Collecting Historical and Real-Time Data” on page 180](#).

The Sievers InnovOx On-Line TOC Analyzer uses the standard Modbus port 502 for Ethernet communication. The Modbus map for the Analyzer is provided in ["Appendix D: Modbus Map."](#)

Configuring Alarm Outputs

The Analyzer has four binary alarm outputs, which can provide an alarm on any stream when the concentration in that alarm exceeds a threshold value.

NOTE: These alarms will only trigger relays on the I/O board and will not be indicated on the display. See [“Step 5: Install Input/Output, Cables, and Accessories” on page 77](#) for I/O Board configuration information.

To set the alarms

1. Select the **I/O** tab.
2. Press one of the alarm output buttons (such as the **Alarm Output 1** button). The *Alarm Output* screen appears.

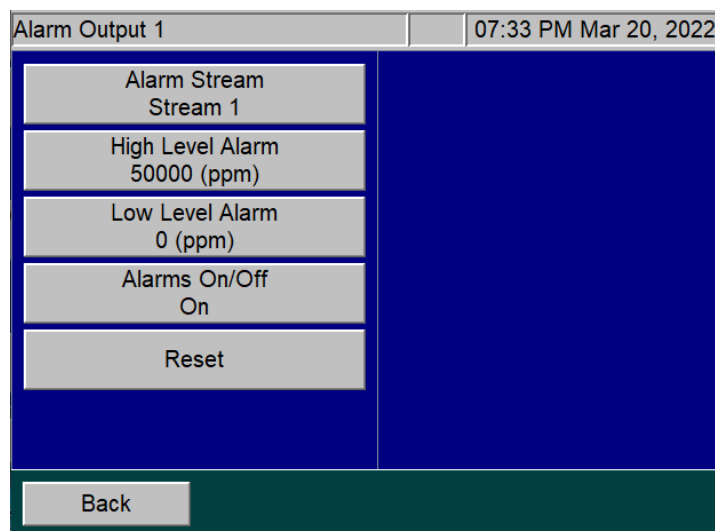


Figure 80: Alarm Output Screen

3. Press the **Alarm Stream** button. Buttons for each stream appear to the right.
4. Press the stream button you want the alarm to respond to (such as the **Stream 1 button** or **Stream 2** button).
5. Press the **High Level Alarm** button and use the numeric keypad that appears to the right to set the threshold concentration (in ppm units⁹). Any measurement above this threshold will trigger the alarm.
6. Press the **Low Level Alarm** button and use the numeric keypad that appears to the right to set the threshold concentration (in ppm units⁹). Any measurement below this threshold will trigger the alarm.

NOTE: The low-level set point value must be less than the high-level set point value.

7. To activate the alarms, press the **Alarm On/Off** button, and then press the **On** button that appears.

*NOTE: The high and low threshold concentrations refer to the parameter the stream is configured to measure. For example, if Alarm 1 responds to Stream 1, and Stream 1 is configured to measure TOC, then the **High Level Alarm** and the **Low Level Alarm** are in the units of ppm TOC.*

⁹. The unit of measure appears in the default ppm unit or another unit measure if the stream's *Setup* screen has been configured with a conversion factor.

Changing the Alarms On or Off Setting

You can turn the alarms on or off, as needed. The state selected (*On* or *Off*) appears on the **Alarm On/Off** button.

1. Select the **I/O** tab.
2. Press the button for the Alarm Output that is to be reset (such as the **Alarm Output 1** button), The corresponding *Alarm Output* screen appears.
3. Press the **Alarm On/Off** button, and then press either the **On** or **Off** button that appears.

Resetting Alarms

You can reset an alarm while it is being output by the Analyzer.

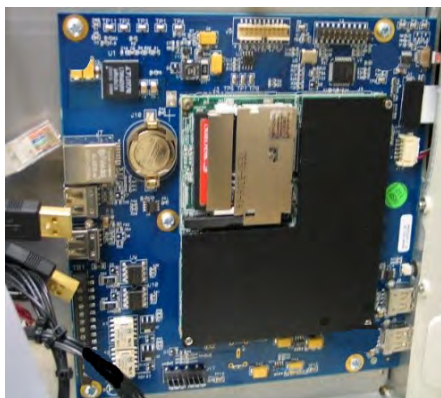
To reset an alarm

1. Select the **I/O** tab.
2. Press the button for the Alarm Output that is to be reset (such as the Alarm Output button), The *Alarm Output* screen appears.
3. Press the **Reset** button. The Analyzer resets the alarm. The alarm is still active and will be output the next time the concentration exceeds the selected threshold value.

Printer Setup

You can print data from the Analyzer directly to a USB-connected 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 81: Controller Board Types](#) — This system controller board communicates with HP printer drive package 1.6.10.
- **Type B** System Controller Board shown in [Figure 81: 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 81: 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 powered 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.

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 : Running Online		01:38 PM Jan 13, 2011
Name	Date	
Default ONLINE	Jan 13, 2011 13:36:16	
Default GRAB	Jan 13, 2011 13:36:08	

Print

Page Up

Page Down

Back

Figure 82: Print Data Screen

Liquid Sensor Setup

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 liquid 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 the factory-technician use to enable the liquid sensor before a new Analyzer is shipped.

To enable a liquid sensor

(Used by factory technicians ONLY.)

1. Verify that the Analyzer has a liquid sensor installed on the inside floor of the Analyzer ([Figure 83](#)). (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 **Main Enclosure Liquid Sensor** button. The **Enabled** and **Disabled** buttons appear.

4. 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.

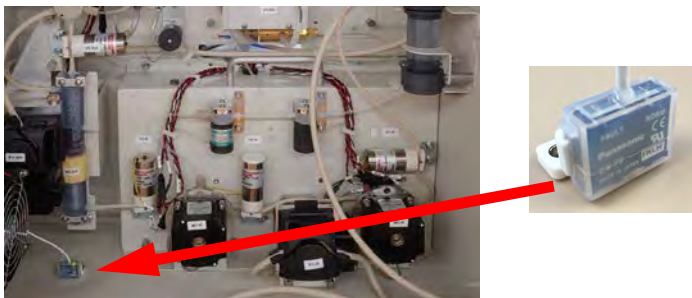


Figure 83: Liquid Sensor Location — Analyzer Enclosure

The Maintenance Tab

Configuring Advanced Setup

Advanced setup consists of general parameters and periodic functions (those that will not be regularly changed during normal Analyzer operation) on the *Advanced* screen, such as system properties and other settings that are fixed for consistent periods of time.

To access the *Advanced* screen, select the **Maintenance** tab, and then press the **Advanced** button.

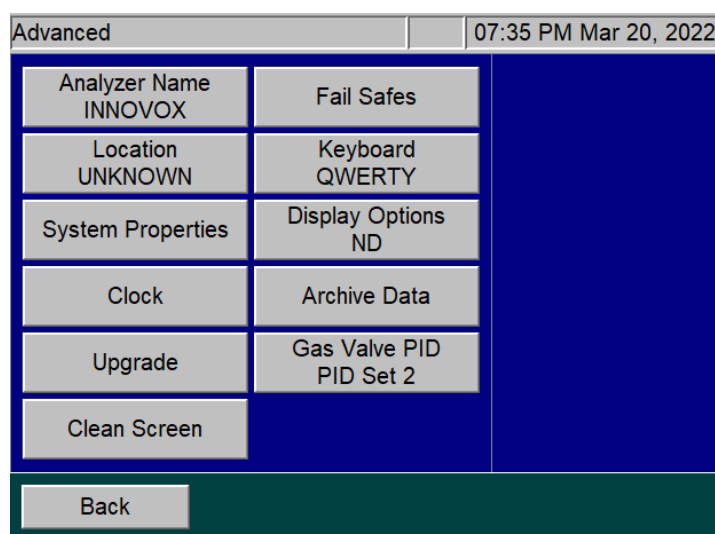


Figure 84: The Advanced Screen

Setting Analyzer Name and Location

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

To set a name for the Analyzer

1. Select the **Maintenance** tab.
2. Press the **Advanced** button. The *Advanced* screen appears.
3. Press the **Analyzer Name** button, and use the keypad to specify a name for the Analyzer.
4. Press the **Set Name** button. The *Advanced* screen appears again.

To set a location for the Analyzer

1. Press the **Location** button, and use the keyboard that appears to specify the location of the Analyzer.
2. Press **Set Location**. The *Advanced* screen appears again. Press the **Back** button to return to the **Maintenance** tab.

Setting System Properties

Calibration constants and other key parameters are stored in the Analyzer's memory. However, you may need to refer to the original factory settings. Before you begin customizing the parameters and running analysis data, export and save these system properties.

To save and export the system properties

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

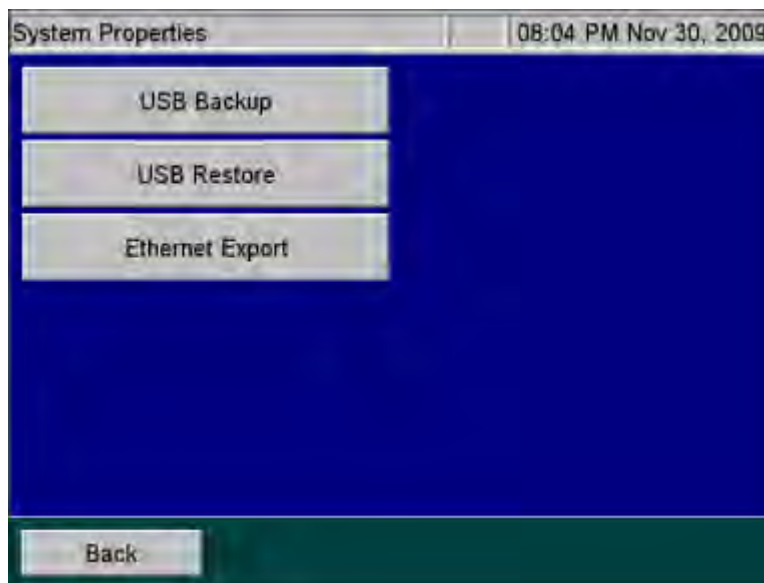


Figure 85: System Properties Screen

4. To overwrite the system properties with factory settings that you have previously exported to a USB memory device, insert the drive into the Analyzer and press the **USB Restore** button.
5. Press the **USB Backup** button or **Ethernet Export** button.

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. The *Advanced* screen appears.
3. Press the **Clock** button, and using the keypad that appears specify the correct date and time.
4. Press the **Save** button.

Upgrade Option

You will use the **Upgrade** button on the *Advanced* screen when you install firmware upgrades. For complete instructions, please refer to the instruction sheet shipped with the firmware USB memory device.

If you downloaded the upgrade files from our 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.

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 ≤ 3.06 to versions ≥ 3.08 , 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 86](#), 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 86](#), 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.

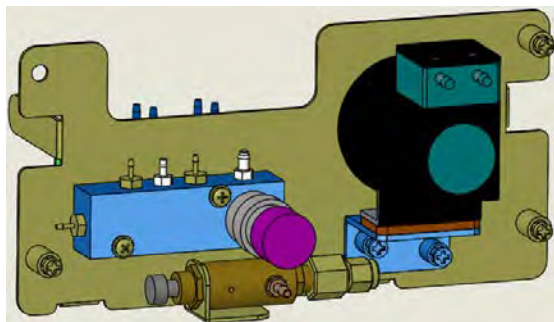
NOTE: The **Run PID Test** button also appears and is typically used by the Factory or On-Site Service. The test activates an automatic diagnosis and setting by the Analyzer for the type of gas manifold currently installed. The Run PID Test can take several minutes, after which the Analyzer displays 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 86](#)):
 - For a *Legacy Model* gas manifold — Press the **PID Set 1** button.

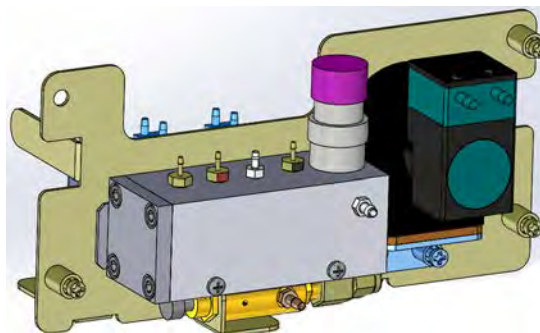
- For a *Current Factory-Install and Replacement Model* gas manifold — Press the **PID Set 2** button.

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 86: Comparing Gas Manifold Types / PID Settings

Cleaning the Analyzer Screen

You can deactivate the touchscreen for 30 seconds to allow you to clean the screen without activating any features.

To deactivate the screen

1. Select the **Maintenance** tab.
2. Press the **Advanced** button. The *Advanced* screen appears.
3. Press the **Clean Screen** button.

Setting the Fail Safe Option

If the Fail Safe accessory is installed, the Analyzer is fitted with level sensors in each sample inlet to detect when flow has stopped in any sample stream. Level sensors are installed in the reagent, dilution water, and Check Standard carboys. These level sensors allow the Analyzer to automatically alert you when a carboy should be refilled.

You must set the Fail Safe option to *On* in order to set the instrument to inform the Analyzer NOT to analyze a stream that is not flowing. When flow resumes in that stream, the Analyzer will measure it again in its original sequence. You can also set the Fail Safe option to *Off* to disable

the Fail Safe option, which is helpful when performing maintenance procedures. All the fail safe sensors can be enabled individually (*On or Off*).

To set the Fail Safe option

1. Select the **Maintenance** tab.
2. Press the **Advanced** button.
3. Press the **Fail Safes** button.
4. Select the *Fail Safe* to enable (*On or Off*).

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 Options** button will either be set to **Display Options Negative** or **Display Options ND**. Press the button to choose 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 for at least 15 seconds before selecting this

feature. After exporting 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.

NOTE: Archiving data will erase all measurement data from the Analyzer when it moves it to the USB memory device.

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.

5. Press **Continue** at the prompt to archive the data or press **Abort** to cancel.

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. Touch the screen to restore the Analyzer or turn the power switch to *off* to shut down the Analyzer.

NOTE: The Analyzer is not shut down until the power switch is turned to Off.

5. If you are planning to perform maintenance inside the Analyzer, make sure to shut down and power off the Analyzer.

To resume Analyzer Operation

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

1. Ensure that AC power is connected and the power switch is in the *On* position.
2. Press the touchscreen to start the Analyzer.

Checking the Software Version

You can view the software version of the Analyzer for your reference or to aid in troubleshooting activities.

To check to the software version

1. Select the *Maintenance* tab.
2. Press the **Software Version** button.

The main software version appears on top. (This is the same version number that displays when the Analyzer starts up.) The embedded software versions of the different modules in the Analyzer also appear.

Cal / Ver tab

For information on using the functions within this tab, see [Chapter 5, "Calibration and Verification"](#).

Chapter 7. Operation with the Filter Panel

The Sievers InnovOx Filter Panel (also referred to as “Filter Panel”) is an optional accessory that should be used to filter sample streams that contain high levels of suspended solids or solids having diameters larger than 200 µm. The Sievers InnovOx On-Line TOC Analyzer is designed to control up to five Filter Panels.

Refer to the *Sievers InnovOx Filter Panel Operation and Maintenance Manual* for instructions on the installation and setup of the Filter Panel.

Operation of the Filter Panel with a Sample Pump

The Filter Panel must be installed so that the water to be filtered flows through the Filter Panel. In some cases, the water pressure in the feed line is not sufficient to flow through the Filter Panel, through the filter screen, and to the Analyzer. In those cases, it is necessary to pump the filtered water from the Filter Panel to the Analyzer.

The Sievers InnovOx On-Line TOC Analyzer can accommodate an optional external peristaltic sample pump to overcome inadequate line pressure. The pump is controlled by the Analyzer to draw filtered water from the Filter Panel prior to each Sample Flush and measurement.

Control of Filter Panel

The Analyzer has two parameters related to the operation of the Filter Panel: **Blowback Pulses** and **Sample Flow Time**. These parameters operate the blowback feature, which automatically cleans the filter screen in the Filter Panel. [Figure 87](#) illustrates a measurement using a Filter Panel. The measurement was set up to include one Sample Flush and the measurement itself consists of two repetitions. The **Blowback Pulses** parameter was set to 2. This means that the filter is back flushed twice with compressed air prior to the Sample Flush and prior to each measurement repetition. The duration of each pulse is 0.5 seconds followed by a 2.0 second delay for a total time of 2.5 seconds for each pulse. Depending upon the composition of the sample stream, the number of pulses can be set to any value between 0 and 10.

NOTE: *The number of pulses required is highly dependent on the composition of the sample water. Use the fewest Blowback Pulses for your particular sample water that produces a reliable flow of filtered water to the Analyzer.*

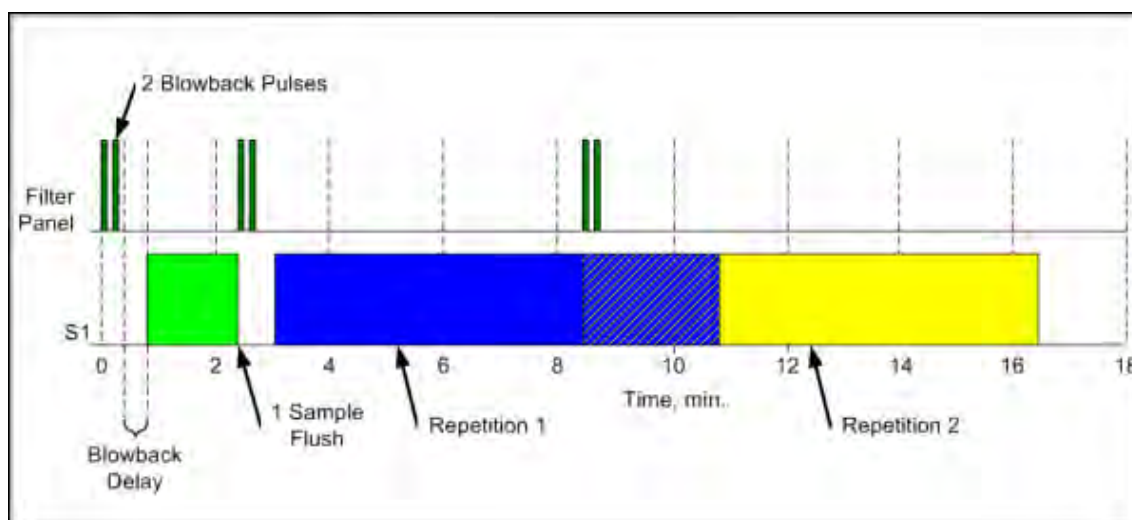


Figure 87: Blowback Pulses and Sample Flow Time

The Sample Flow Time establishes a delay time between the last pulse and the start of sampling of the filtered water by the Analyzer. This delay is evident before the Sample Flush and before sampling begins for the first repetition. It also exists before sampling begins for the subsequent repetitions, but it is less evident because the Analyzer is completing repetition 1 while it is preparing the sample to be used in repetition 2.

To set up operation of the Filter Panel

1. Stop any analysis.
2. Confirm that sample water is flowing through the Filter Panel (Reference the *Filter Panel Operations and Maintenance Manual*, as needed.)
3. Confirm that the filtered water tube is connected to the Filter Panel and to the Analyzer. The tube should be connected either to the Inlet port of the sample cup, or to the Inlet port on the optional peristaltic sample pump.
4. Configure the following for the stream, as needed. Press the appropriate button and enter the desired value using the keypad that appears to the right, and then press **Enter**.
 - **Sample Flushes** — Number of flushes to include
 - **Pulses** — Number of pulses to include
 - **Sample Flow Time** — Delay time in seconds
5. Press the **Sample Back-Flush** button and then press either the **Enabled** or **Disabled** button that appears. When enabled, this flush will occur at the end of every measurement.
6. Repeat this procedure for each stream installed with a filter panel.

Chapter 8. Maintenance

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

This chapter covers replacement instructions for all routine maintenance items that are replaced on a regular schedule; instructions for non-routine maintenance items are provided in those items' packaging.

Maintenance Schedules

Suggested maintenance schedules varies with two types of applications: **Harsh** and **Extreme (Monthly Service)**. A flowchart to help determine which maintenance schedule to use is included in [Table 17, “Maintenance Schedule Type \(by Industry Application\),” on page 198](#).

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:

- **Harsh Applications** — [Table 18, “Recommended Maintenance Schedule — Harsh Applications,” on page 199](#)
- **Extreme (Monthly Service)** — [Table 19, “Recommended Maintenance Schedule — Extreme \(Monthly\) Applications,” on page 200](#).

Table 17: Maintenance Schedule Type (by Industry Application)

Sievers* InnovOx On-Line 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)	Extreme
	Urea, AN & UAN Fertilizers	Harsh
Leak Detection	Cooling Tower	Normal
	Boiler Condensate	Normal
Industrial Effluent & Processes	Petroleum Refinery Desalter & Brine Effluent	Extreme
	Mine Ore	Harsh
	Metal Plating Solutions	Harsh
	Food & Beverage	Harsh [†]

[†] - If running food & beverage samples that contain high amounts of sugars, an Extreme Maintenance schedule may be necessary.

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Sievers* InnovOx On-Line TOC Analyzer recommended maintenance schedule

harsh applications

Table 18: 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 68052-XX
Check Standard Level	✓	✓	✓	✓	✓	✓	✓	-
Check For Leaks	✓	✓	✓	✓	✓	✓	✓	-
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	✓	✓	✓	✓	✓	✓	✓	-
Clean Vial Port and Needles (If Used)	✓	✓	✓	✓	✓	✓	✓	APK 68052-XX
Replace Oxidizer	✓	✓	✓	✓	✓	✓	✓	-
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 All Pinch Tubing†	✓	✓	✓	✓	✓	✓	✓	APK 68865-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 Purifier Filters (If Regenerative Air Purifier Used)	✓	✓	✓	✓	✓	✓	✓	APK 68991-XX
Estimated Time to Complete Service (Minutes)	5	10	15	120	130	120	150	
Service Kits available — contact your local Sievers Sales Representative or Field Service Technician for more information.								

† - 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.

Table 19: Recommended Maintenance Schedule — Extreme (Monthly) Applications

VEOLIA
Sievers* InnovOx On-Line TOC Analyzer recommended maintenance schedule
monthly service & 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 68052-XX
Check Standard Level	✓	✓	✓	✓	✓	✓	✓	-
Check For Leaks	✓	✓	✓	✓	✓	✓	✓	-
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		✓	✓	✓	✓	✓	✓	-
Clean Vial Port and Needles (If Used)		✓	✓	✓	✓	✓	✓	-
Replace Oxidizer			✓	✓	✓	✓	✓	APK 68052-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 All Pinch Tubing†			✓	✓	✓	✓	✓	APK 68865-XX
Clean the Sparger			✓	✓	✓	✓	✓	-
Replace Waste Tubing			✓	✓	✓	✓	✓	APK 68130-XX
Lubricate Syringe				✓	✓	✓	✓	APK 68306-XX
Replace NDIR Filler				✓	✓	✓	✓	HFL 68100-XX
Replace All Gas Tubing							✓	APK 68140-XX
Replace Air Purifier Filters (If Regenerative Air Purifier Used)							✓	APK 68991-XX
Estimated Time to Complete Service (Minutes)	5	10	90	120	120	120	150	
Service Kits available — contact your local Sievers Sales Representative or Field Service Technician for more information.								

† - 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 kits to ensure spare parts are readily available, as needed (Yearly maintenance kits are also available.):

- Reactor Seal Kit
- Pinch Tubing Kit (On-Line)
- 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.

Periodic Inspections

To ensure optimum performance of the Analyzer, inspect the following items periodically.

1. **Check Reagent levels.** Inspect the Reagent and Dilution Water carboys to ensure that there is adequate Acid, Oxidizer, and Dilution Water to perform the analyses¹⁰. Prepare the Reagents, if necessary. See [“To prepare the Acid” on page 288](#) and [“To prepare the Oxidizer \(sodium persulfate oxidizing solution\)” on page 290](#).
2. **Check Standard level.** Inspect the Check Standard carboy to ensure that there is adequate solution to perform the analyses¹⁰.
3. **Check Reagent, Check Standard, and Dilution Water tubes.** Ensure that the ends of the reagent, Check Standard, and Dilution Water tubes extend into their respective liquids. If the Fail Safe accessory is installed, check the level sensors to ensure that they are operating properly.

¹⁰. This inspection is automatically performed by the Analyzer if the Fail Safe accessory is installed and activated.

4. **Prime Reagents, if necessary.** Ensure that the tubing from the Reagent, Check Standard, 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 Reagents**. For more information see, [“Performing a Prime Reagents” on page 202](#)
5. **Check calibration.** Analyze one or more Check Standards to confirm that the Analyzer is operating properly and that its calibration is accurate¹¹.
6. **Check GLS 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. For more information, see [“Cleaning the Gas-Liquid Separator” on page 203](#).
7. **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. For more information, see [“Replacing the Pinch Valve Tubing” on page 212](#).
8. **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. For more information, see [“Replacing the Peristaltic Pump Head Tubing” on page 215](#).
9. **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

Fill the “Dilution Water” 19 L (5 US gal) carboy with deionized water or the best-quality water available to you.

Performing a Prime Reagents

When installing new reagents, perform a **Prime Reagents** to clear the tubing of bubbles and old solution.

¹¹. The Analyzer can be set to automatically perform the Check Standard measurements.

To perform a Prime Reagents

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 Oxid(izer)**: Primes the oxidizer.
 - **Prime Dilution (Water)**: Primes the dilution water.
 - **Prime Check Standard**: Primes the check standard.
 - **Prime All**: Primes the Acid, Oxidizer, Check Standard, and Dilution Water.

NOTE: The Check Standard must be the **Enabled** state.

Cleaning the Analyzer

You can clean the external housing of the Analyzer with a damp cloth using water or non-abrasive cleaners. Turn off power to the Analyzer and disconnect it from main power prior to cleaning. 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.

To deactivate the screen

1. Press the **Menu** button and select the **Maintenance** tab.
2. Press the **Advanced** button, and then press the **Clean Screen** button.

Cleaning the Gas-Liquid Separator

The Gas-Liquid Separator requires periodic cleaning, when residue builds up inside. Water in the Gas-Liquid Separator is acidic. Refer to [Figure on page 205](#) and [Figure on page 206](#) as needed.

To clean the Gas-Liquid Separator

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 turn off power to the Analyzer using the main power switch on the side of the Analyzer.
3. Open the door of the Analyzer.
4. Disconnect the tubing that connects to the barbs on the Gas-Liquid Separator.
5. Loosen the screw that secures the Gas-Liquid Separator bracket, and pull the Gas-Liquid Separator away from the Analyzer.
6. 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.

7. 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.)
8. Carefully pour DI Water into the clear tube of the Gas-Liquid Separator until the water level reaches the pressure ring.

NOTE: Ensure the pressure rings are installed correctly.

9. 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 and ensure flow can resume.

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

11. Reconnect the tubing to the correct barbs. See [Figure on page 205](#) and [Figure on page 206](#).
12. Perform other maintenance tasks, or close the Analyzer door and return the Analyzer to normal operation.

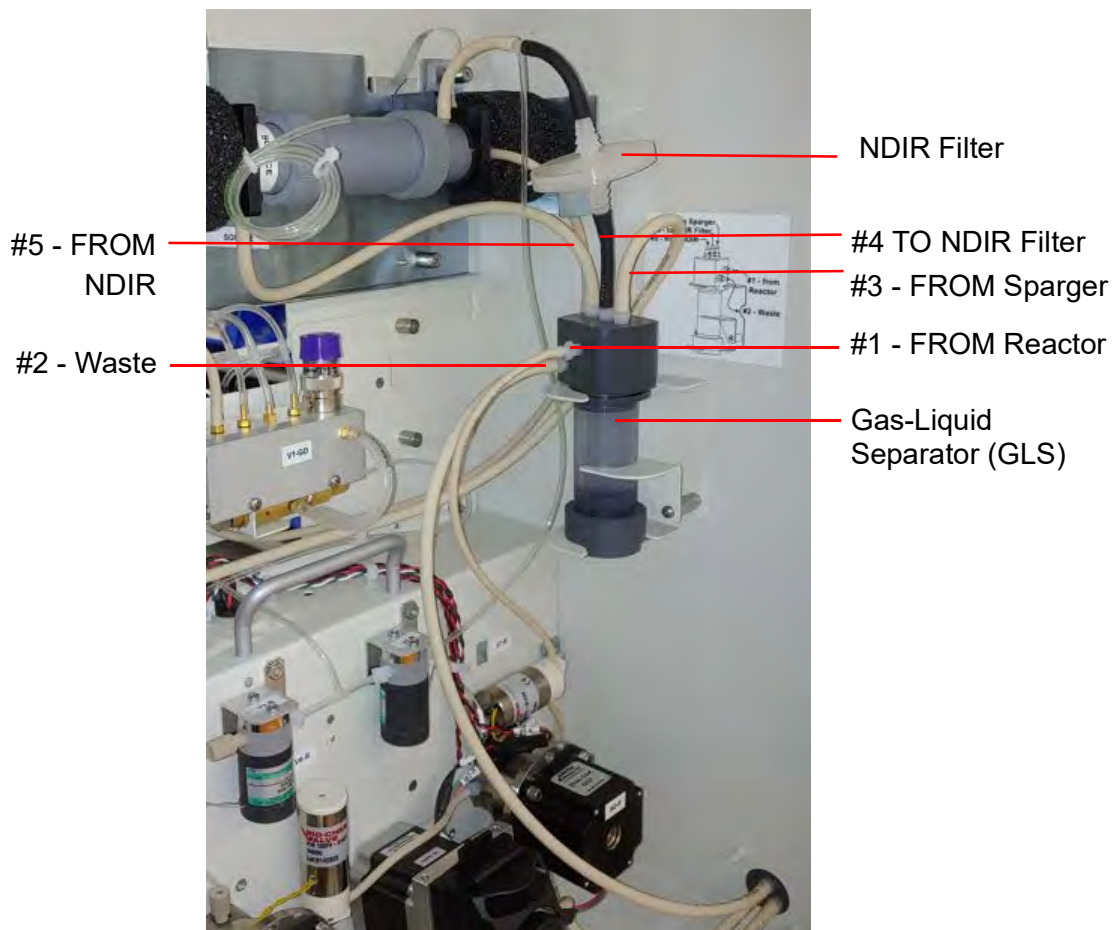


Figure 88: The Gas-Liquid Separator

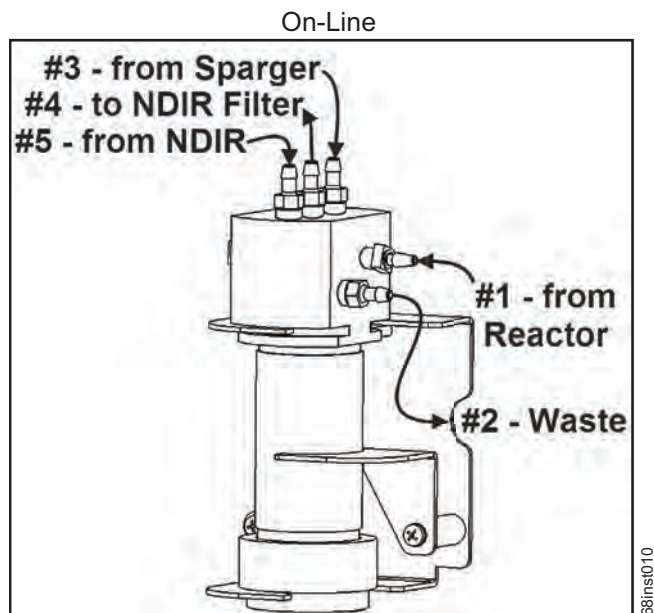


Figure 89: Gas-Liquid Separator (GLS), Label

Cleaning the Sparger

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

Warning

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

To clean the sparger

1. Shut down the Analyzer via the on-screen menu (**Maintenance** → **Shutdown**).
2. Wait for the display to turn off, and then turn off power to the Analyzer using the main power switch on the side of the Analyzer.
3. Open the door of the Analyzer.
4. Disconnect the tubing from the four barbs.
5. Loosen the four Allen screws that connect the Sparger to the bracket.
6. Remove the Sparger from the Analyzer.
7. Disconnect the electrical connector attached to the mixer on the Sparger (M2 - SH).
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 close the Analyzer door and return the Analyzer to normal operation.

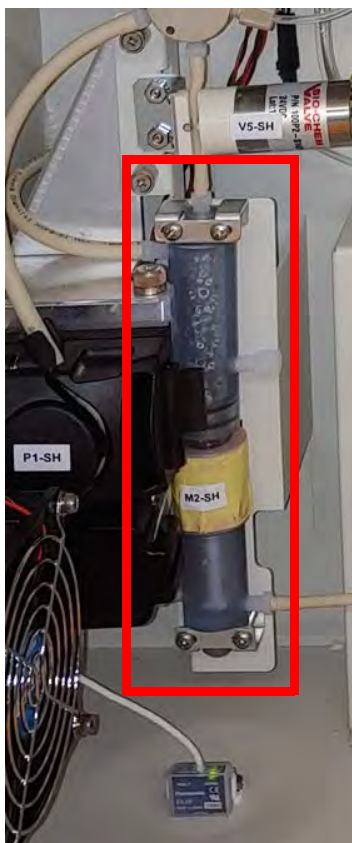


Figure 90: The Sparger

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** → **Multi Stream Valves** → **V7-MS** → **Back** → **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, followed by V7-MS.
5. Exit the **Diagnostics** and **Maintenance** menus.
6. Remove the emptied vials.

Lubricating the Syringe

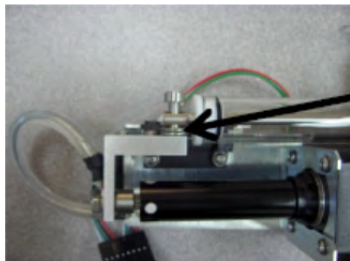
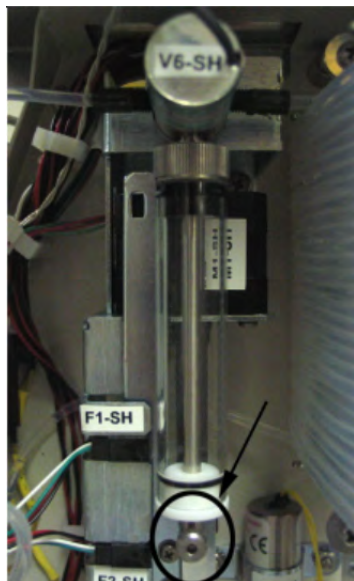
Perform this instruction after every three months of operation to ensure that the Analyzer is operating with adequately lubricated syringes.

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. Turn off the water supply to the Analyzer. If the Analyzer is taking measurements, press the **Stop Analysis** button.
2. Using the Maintenance screen, shut down the Analyzer.
3. Turn off the power to the Analyzer, and unplug the power cord or disconnect the main power.
4. Open the door of the Analyzer.

- Using a 3/32 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.*

Figure 91: Locating the Syringe Screw and Washers

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

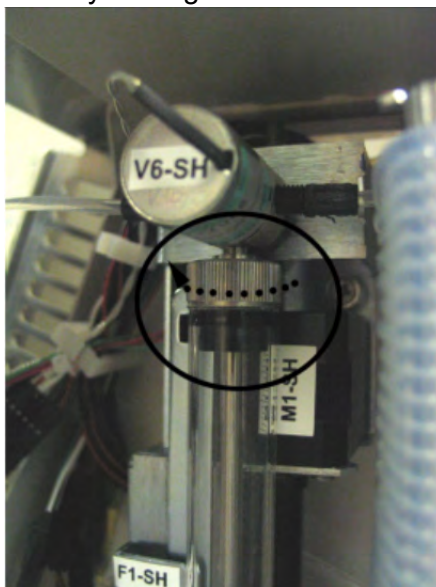


Figure 92: Unscrewing the Syringe Base

7. 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.

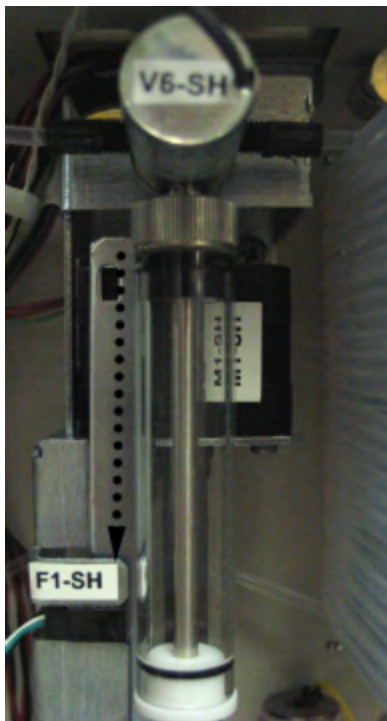


Figure 93: Removing the Syringe

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



Figure 94: Pulling Out the Plunger

9. 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 95: Removing the Stopper

10. 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.
11. 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.

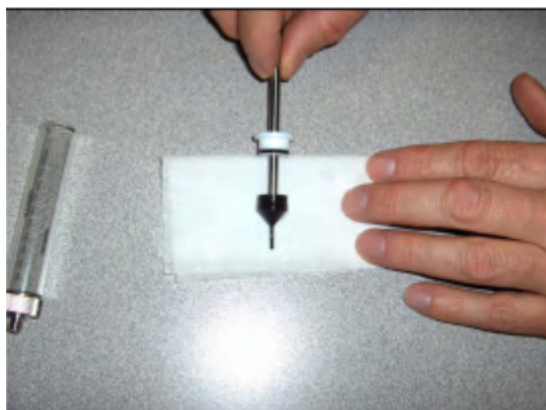


Figure 96: Distributing the Lubricant

12. 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.*

13. Screw the syringe base into the threading in the valve by turning the base to the right.

14. Using a 3/32 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.
15. Restore power to the instrument.

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.
16. Close the door to the Analyzer.

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 every 3 months or sooner depending on the specific application.

To replace the tubing

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

Refer to [Figure 97](#), as needed.

1. Open the door of the Analyzer.
2. 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:

Two Stream and Five Stream Configurations

NOTE: Depending on the Analyzer configuration, some of these valves may use black pinch tubing rather than tan.

Valve Names

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

*Additional values for the Five Stream Configuration ONLY*Valve Names

V3-MS
 V4-MS
 V5-MS

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

NOTE: [Figure on page 214](#) identifies the valves and their locations.

- Press the specific valve button (such as *V1-SH* on the *Sample Handler Valve* 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. **V6-R** is *normally open* so the first press will close the valve.

- Pull the sample tubing out of the valve and then disconnect the tubing from the barb at both ends.
- 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.
- After connecting each piece of tubing, return to the Analyzer screen to toggle the valve closed again.
- After replacing the last piece of tubing, press the **Back** button to return to previous screens and reach the *Maintenance* tab screen.
- Perform other maintenance tasks, or close the Analyzer door and return normal Analyzer operations.

*Valves V3, V4, and V5-MS are installed in 5-Stream option only.

Regenerative Air Purifier (optional),
when installed
is located in this area



V1-MS (rear)
thru V6-MS
(front)*

V7-MS

V6-SH

V2-SH

V3-SH

V1-SH

V7-SH

V5-SH

V2-R

Sparger

P1-SH

V3-R

V6-R

V4-R

NDIR

NDIR Filter

V1-GD

Gas-Liquid
Separator
(GLS)

V1-R

V7-R

V5-R

P1-R

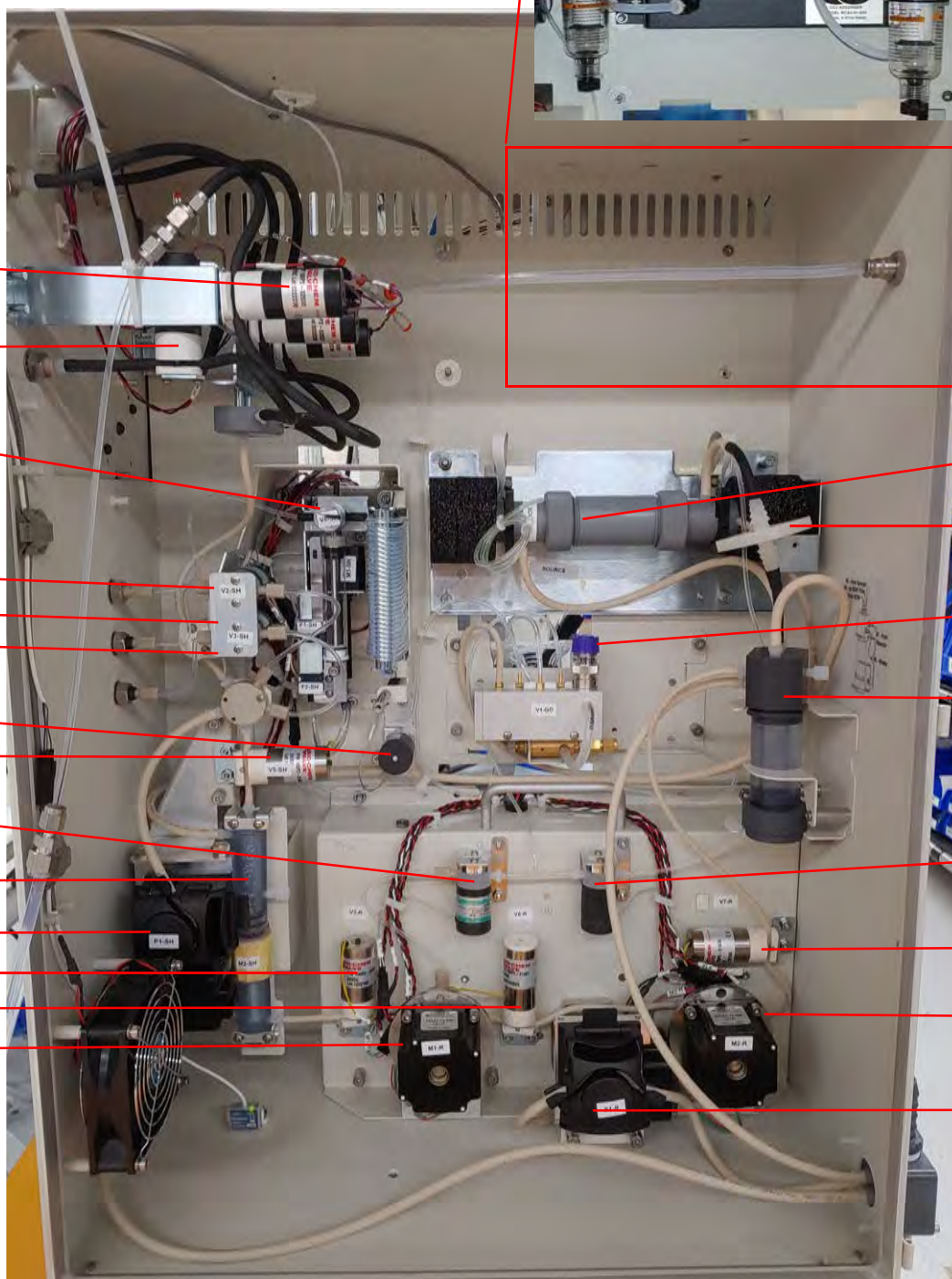


Figure 97: Valve Locations - Sievers InnovOx On-Line TOC Analyzer

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. We recommend replacing the pump tubing monthly.

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. Open the door 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 close the Analyzer door and return the Analyzer to normal operation.

Replacing the NDIR Filter

The NDIR filter ([Figure 98](#)) should be replaced if the filter has become plugged with aerosols, if liquid has gotten into the NDIR from the Gas-Liquid Separator, or after 3 months. Replacement of the NDIR filter is indicated when the carrier gas flow rate is too slow and the CO₂ 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

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 turn off power to the Analyzer using the main power switch on the side of the Analyzer.
3. Open the door of the Analyzer.
4. Disconnect the tubing from each end of the filter, and remove the filter from the Analyzer.
5. Dispose of the filter.
6. Attach the new filter to the tubing. Ensure the “INLET” side is correctly oriented.
7. Perform other maintenance tasks, or close the Analyzer door and return the Analyzer to normal operation.

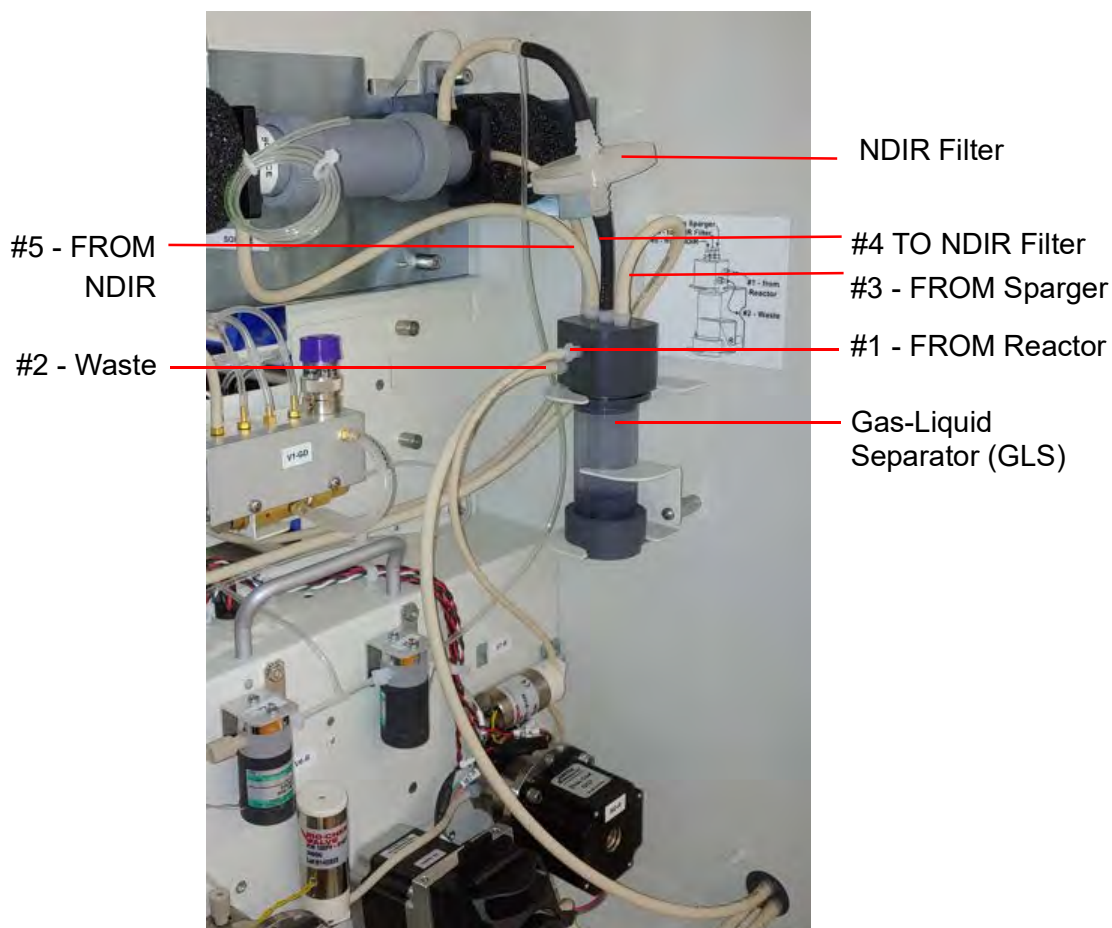


Figure 98: Replacing the NDIR Filter

Other Maintenance Tasks

Other maintenance tasks are performed only when required and as indicated in this section.

Replacing the High Pressure Valve Seals

Warning

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

The Sievers InnovOx On-Line TOC Analyzer has two high pressure valves (V4-R and V5-R). These valves are identified in [Figure 97](#) on page 214. Each valve contains a seal that wears over time. The seals should be replaced after one month of operation. The Analyzer issues a warning

when the seals are starting to leak. Replace the seals using the following procedure if that warning is reported.

To replace the High Pressure Valve Seals

1. Shut down the Analyzer via the on-screen menu (**Maintenance → Shutdown**).
2. Wait for the display to turn off, and then turn off power to the Analyzer using the main power switch on the side of the Analyzer.
3. Open the door of the Analyzer.
4. Remove the four screws that secure the valve motor to the Analyzer, using a 5/32 in. Allen wrench (hex key).
5. Pull the motor away from the Analyzer ([Figure 99](#)). The seal is threaded on the motor shaft.
6. Remove the seal from the end of the shaft, using a 3/8 in wrench ([Figure 99](#) and [Figure 100](#)).
7. Locate the new seal and inspect the valve seating surface. Clean the valve seal surface with a paper towel and water, if needed.
8. Secure the new seal to the end of the valve shaft, and then using a 3/8 in. wrench tighten the seal 1/4 turn past finger-tight. Do not over-tighten the seal.
9. Replace the motor and secure it with the four screws.
10. Repeat steps [4](#) through [9](#) for the other motor. Always replace both seals.
11. Perform other maintenance tasks, or close the Analyzer door and return the Analyzer to normal operation.
12. 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 99: The High Pressure Valve Seal — Before Removal



Figure 100: The High Pressure Valve Seal — After Removal

NOTE: *Recommended maintenance intervals are for typical applications. Particularly harsh applications, such as $\text{pH} \leq 2$, high levels of insoluble particles, and near-saturated brine solutions require more frequent maintenance intervals. Contact Technical Support or your local service provider for specific details on your application.*

Chapter 9. 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

The Analyzer issues two types of messages:

- **Warnings** — Warnings do NOT stop measurements, but may indicate that corrective action is required to prevent eventual Analyzer shutdown or loss of data.
- **Errors** — Errors are serious alerts and some stop measurements to prevent the collection of erroneous data or to protect the Analyzer from damage. Corrective action should be taken before the Analyzer can resume normal operation.

To review the warnings and errors list

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 appear on the screen of the Analyzer if the condition occurs. The warnings and error messages appear in the Status area located on lower portion 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.

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 ["Comparing Gas Manifold Types / PID Settings" on page 190](#). Next, verify the appropriate PID option is activated in the Analyzer

(Maintenance > Advanced). Refer to [“Gas Valve PID Parameters” on page 189](#) for additional configuration details. After confirming the configuration, perform the *Gas Leak Check* diagnostics ([“Gas Leak Checks” on page 249](#)) to identify any other possible problems. If the error continues, contact Technical Support or your local service provider for further guidance.

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 the Diagnostics, Liquid Flow section on [“Liquid Flow Check” on page 248](#).

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 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 (see [Figure 102 on page 233](#)), 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.

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: CO₂ was detected by the NDIR when no CO₂ 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 249](#). Rinsing the NDIR's center tube with warm tap water can also fix this problem.

6412 – Acid Error

Message: “The acid container needs attention.”

Explanation: The level sensor in the acid container indicates that the container should be refilled.

6413 – Oxidizer Error

Message: “The oxidizer container needs attention.”

Explanation: The level sensor in the oxidizer container indicates that the container should be refilled.

6414 – Dilution Water Error

Message: “The dilution water container needs attention.”

Explanation: The level sensor in the dilution water container indicates that the container should be refilled.

6415 – Check Standard Error

Message: “The check standard container needs attention.”

Explanation: The level sensor in the check standard container indicates that the container should be refilled.

6416 – Stream 1 Flow Warning

Message: “Stream 1 flow stopped.”

Explanation: Check that water is flowing in the sample cup and the inlet valve (if installed) is properly adjusted. If the problem persists, please export the warnings and contact Technical Support or your local service provider for further instructions.

6417 – Stream 2 Flow Warning

Message: “Stream 2 flow stopped.”

Explanation: Check that water is flowing in the sample cup and the inlet valve (if installed) is properly adjusted. If the problem persists, please export the warnings and contact Technical Support or your local service provider for further instructions.

6418 – Stream 3 Flow Warning

Message: “Stream 3 flow stopped.”

Explanation: Check that water is flowing in the sample cup and the inlet valve (if installed) is properly adjusted. If the problem persists, please export the warnings and contact Technical Support or your local service provider for further instructions.

6419 – Stream 4 Flow Warning

Message: “Stream 4 flow stopped.”

Explanation: Check that water is flowing in the sample cup and the inlet valve (if installed) is properly adjusted. If the problem persists, please export the warnings and contact Technical Support or your local service provider for further instructions.

6420 – Stream 5 Flow Warning

Message: “Stream 5 flow stopped.”

Explanation: Check that water is flowing in the sample cup and the inlet valve (if installed) is properly adjusted. If the problem persists, please export the warnings and contact Technical Support or your local service provider for further instructions.

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.

6425 – Check Standard Warning

Message: “Check Standard is outside tolerance limits. Replace the check standard and repeat the measurement. If the warning persists, the Analyzer may require calibration. Refer to the Operation and Maintenance Manual.”

Explanation: The Check Standard solution may have changed concentration, the tolerance limits may need to be adjusted, or the Analyzer may have to be calibrated.

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

Message: “An error was detected during communication. First, evaluate LEDs on 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. Next, shut down the Analyzer; turn off power. Check that all connections on 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.”

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.

Explanation: The bus referred to in this discussion is the communications bus internal to the Analyzer. This error will also occur if an Auto Range protocol is started and one or more calibrations in the Calibration group have been deleted. Archiving the *Datastore* manually may

alleviate the issue. [See “Archiving the Data History” on page 191](#) for instructions. If this error persists, please contact Technical Support or your local service provider.

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 191](#) 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 242](#)

Other software errors are listed in [Table 20, “Other Software Errors,” on page 230](#). These errors are grouped according to the module in which the error is found.

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 [“Printer Setup” on page 183](#) 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.

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 20. These errors are grouped according to the module in which the error is found.

Table 20: 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 (identified in [Figure 101](#)) are performing as usual.

*Valves V3, V4, and V5-MS are installed in 5-Stream option only.

Regenerative Air Purifier (optional),
when installed
is located in this area



V1-MS (rear)
thru V6-MS
(front)*

V7-MS

V6-SH

V2-SH

V3-SH

V1-SH

V7-SH

V5-SH

V2-R

Sparger

P1-SH

V3-R

V6-R

V4-R

NDIR

NDIR Filter

V1-GD

Gas-Liquid
Separator
(GLS)

V1-R

V7-R

V5-R

P1-R

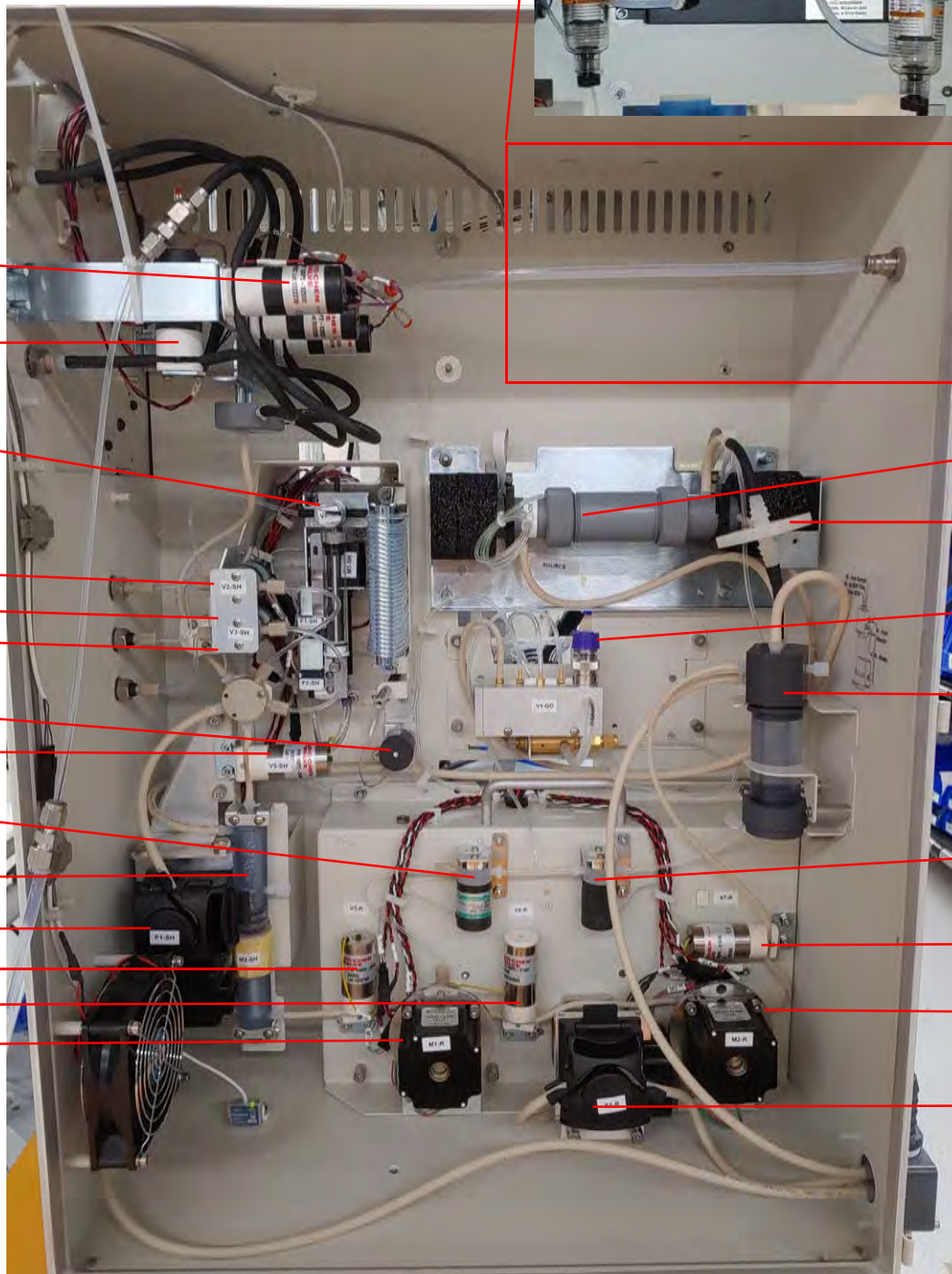


Figure 101: The Fluidics Side of the Analyzer

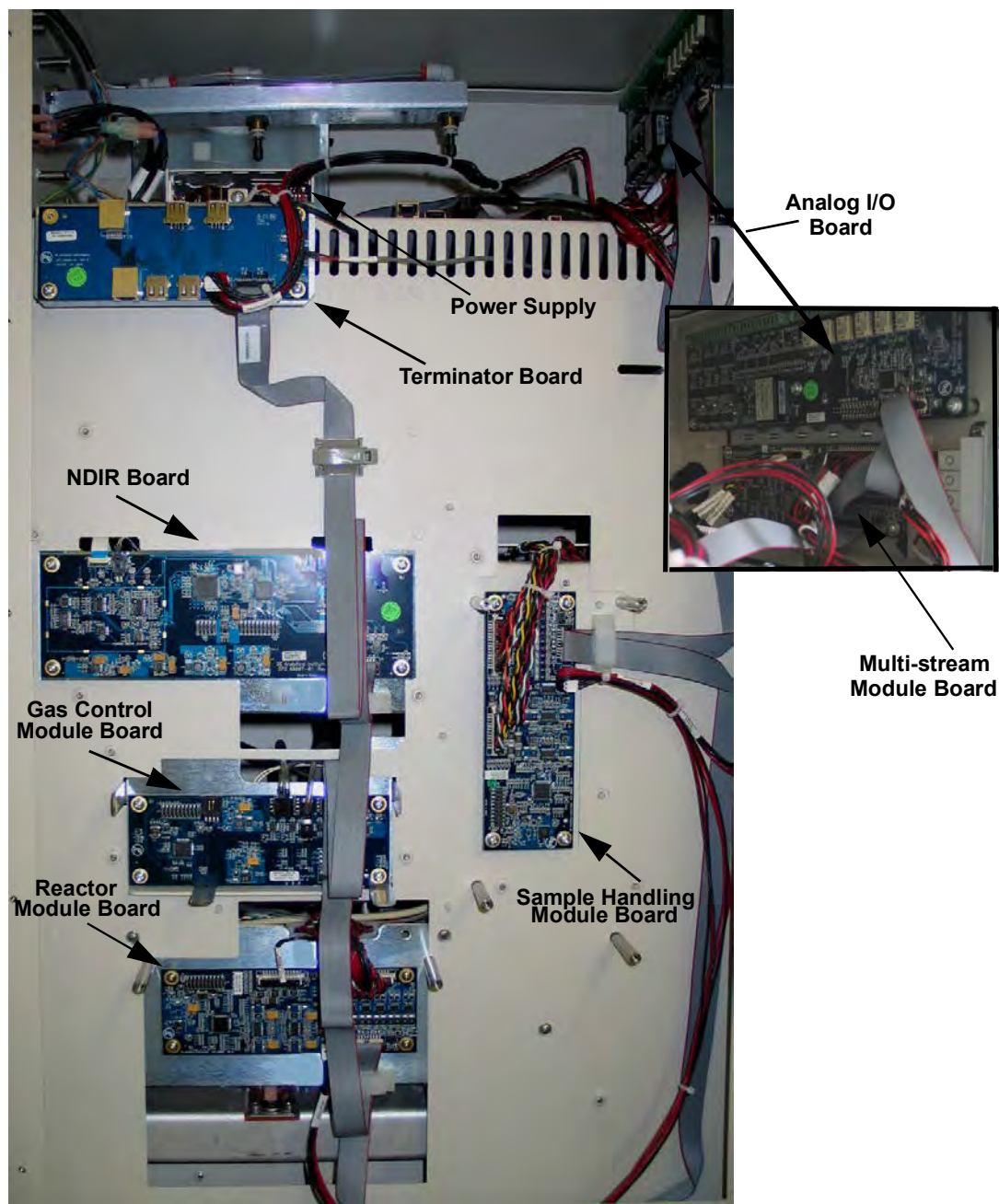


Figure 102: The Electronics Side of the Analyzer

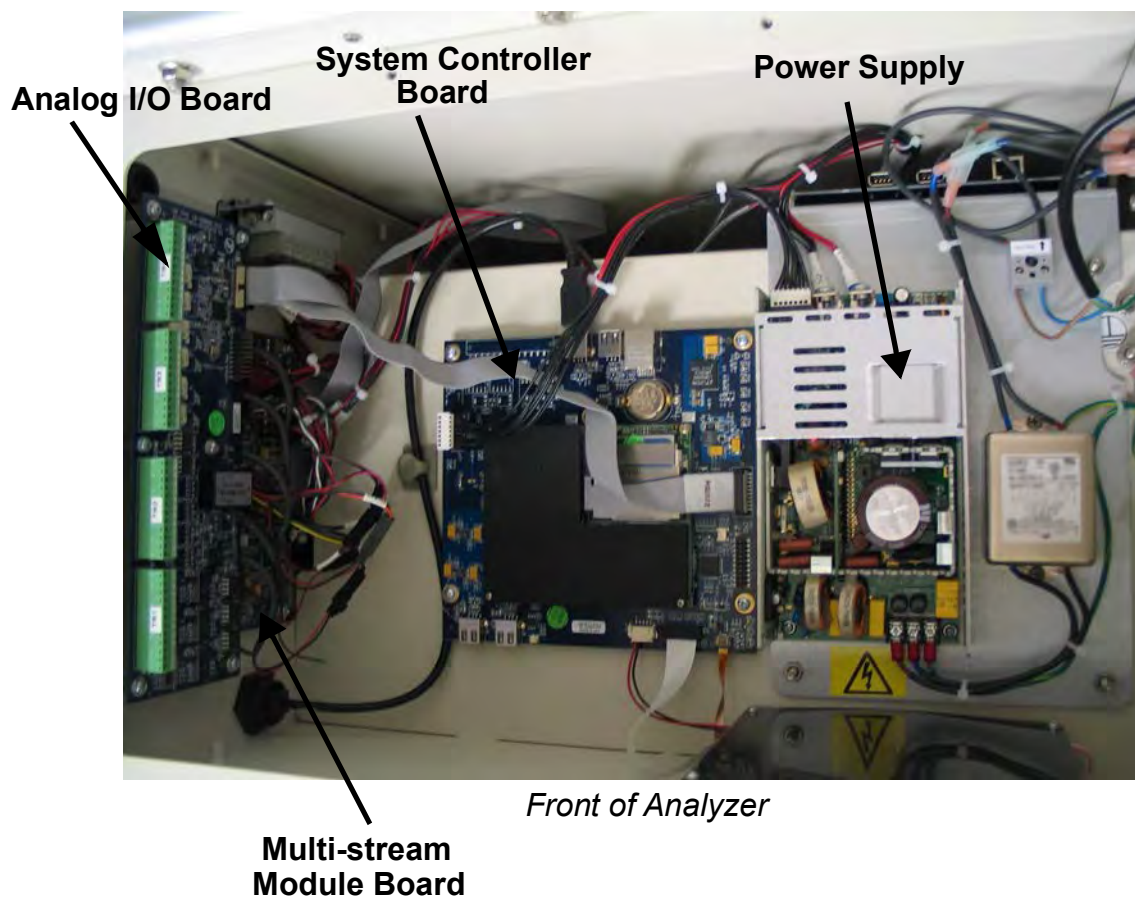


Figure 103: Electronics in the Top of the Analyzer

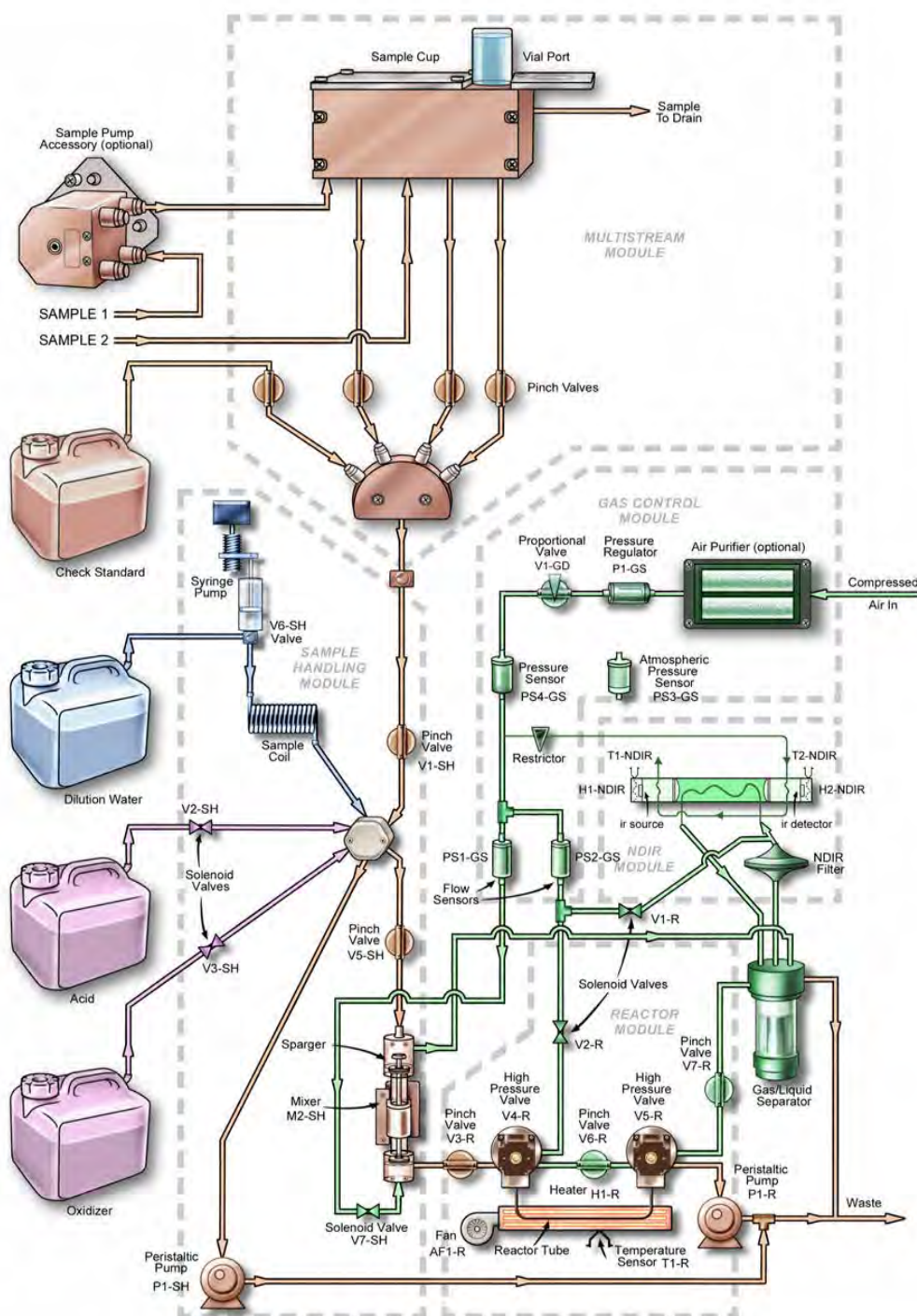


Figure 104: Analyzer Schematic

External Inspection

- Confirm that the display is illuminated.
- Confirm that there are sufficient volumes of Acid, Oxidizer, Dilution Water, and Check Standard (if used) in the carboys.
- Confirm that there are no leaks present at the sample inlet, reagent inlets, dilution water inlet, Check Standard inlet, or the waste connections. Ensure that the tubes for these tubes do not contain air or a large volume of bubbles.
- Confirm that there are no liquid leaks under the Analyzer.
- Ensure that there is no paper or other material blocking the reactor cooling air inlet on the bottom of the Analyzer.
- 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 the Analyzer is making measurements:
 - And, if you are using a vial in the Vial Sampler, confirm that air bubbles enter the vial when the Analyzer draws sample out of the vial.
 - Confirm that gas is flowing from the Waste outlet of the Gas/Liquid Separator.
 - Sample, dilution water, 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 Waste outlet. Insert the tube from the Waste Gas/Liquid Separator port into a flask of water to confirm that gas is flowing.
 - Confirm that the reactor cooling air blows out reactor Exhaust on the right side of the Analyzer prior to each NPOC / TC measurement. The exhaust should be noticeably warm when the cooling air starts flowing.
 - If the optional Sample Peristaltic Pump is installed, confirm that it operates periodically and that there are no leaks at its fittings or tubing.
 - If the optional Filter Panel is installed, confirm that there are no leaks and that liquid flows to the Analyzer periodically. Confirm that the blowback is operating correctly.

Internal Inspection

- Check for leaks throughout the Analyzer; there should not be moisture on the inside of the Analyzer case.
- Confirm that the reagent, dilution water, and check standard tubes inside the Analyzer are full of liquid, or contain only a few bubbles. If excessive bubbles are present, a Prime

Reagents should be performed. Look to see if air flows into the reagent lines during priming.

- Check that the sample coil is full of liquid. If excessive bubbles are present, a dilution water flush should be performed. Watch the operation of the syringe pump to ensure that the syringe is not leaking, and few if any, bubbles are introduced into the coil.
- 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 105](#) and [Figure 106](#)) and that all tubes are properly connected.
- If maintenance work has recently been performed on the Analyzer, confirm that electronics cables are securely attached.

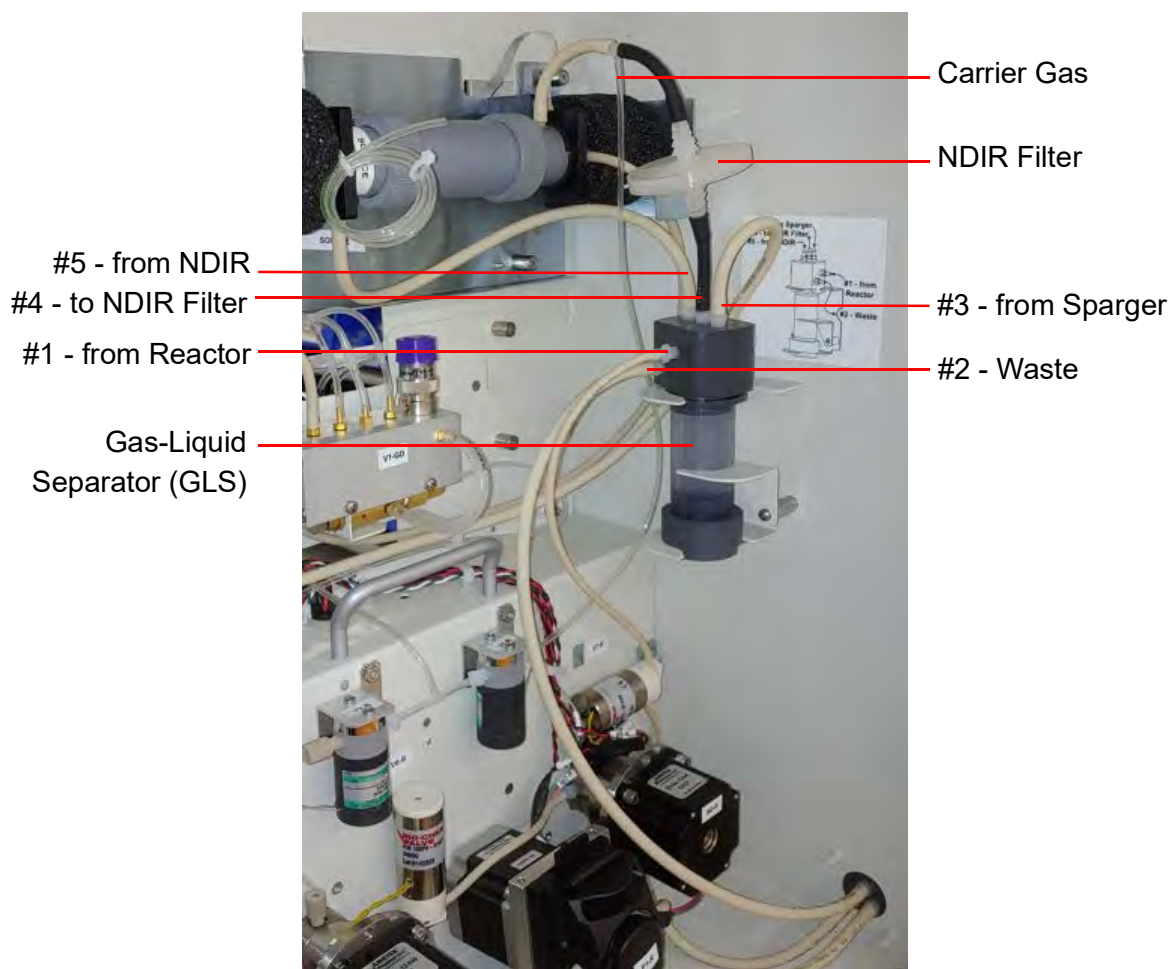


Figure 105: Connections to the Gas-Liquid Separator

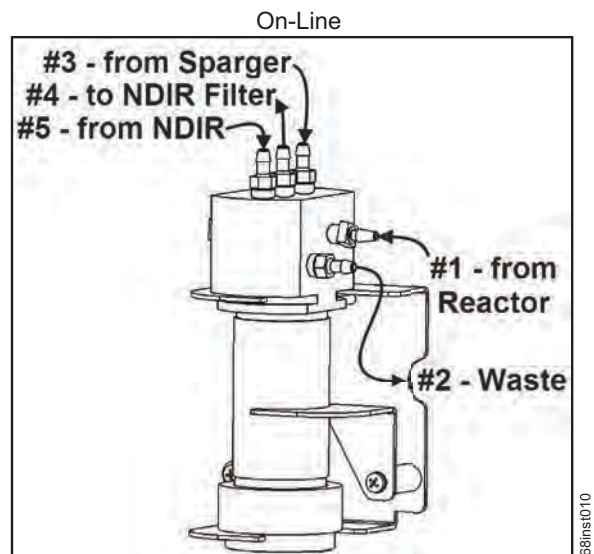


Figure 106: Gas-Liquid Separator (GLS), Label

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 power switch is on, 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.

Diagnostics

The Diagnostics menu options are designed to help you troubleshoot Analyzer issues with a Technical Support representative or your local service provider.

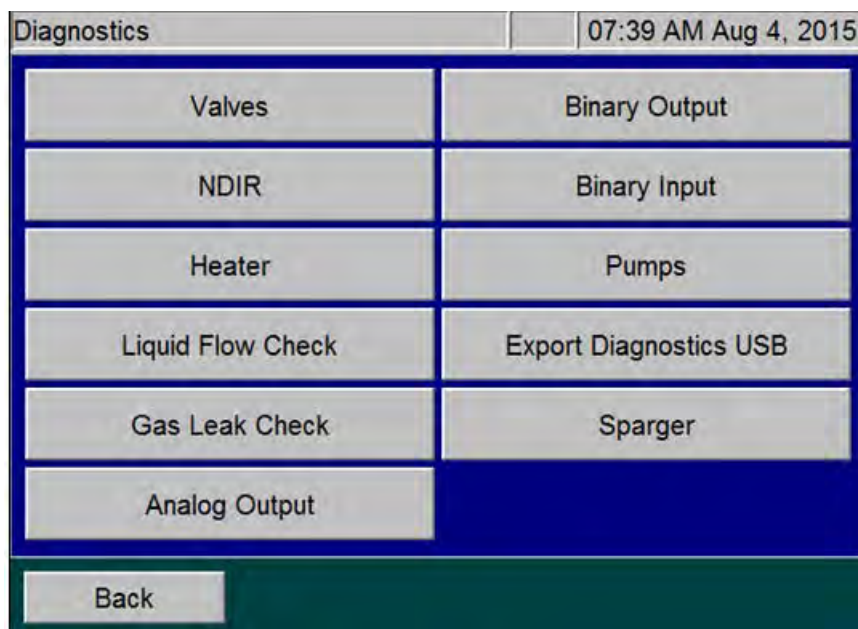


Figure 107: The Diagnostics Screen

When the *Diagnostics* screen appears (**Maintenance** → **Diagnostics**), all of the Analyzer components (valves, heaters, fans, pumps, etc.) are in their safe unpowered condition. When starting any one of the diagnostic tests, only the specific components defined are activated. When you press the **Cancel** or **Back** button and navigate to the main *Diagnostics* screen, the Analyzer immediately turns off the activated components. Multiple buttons on a screen may be pressed to simultaneously activate multiple components. When you are finished performing each diagnostic test, the component returns its safe (unpowered) condition.

Valves

On the *Valves* screen, there is a button for each valve type, including Flow Control Valves, Gas Valves, and Pneumatic Valves ([Figure 108](#)).

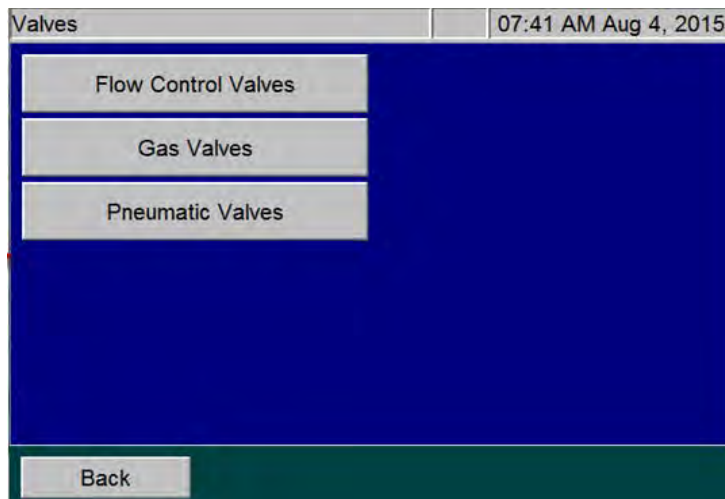


Figure 108: The Valves Screen

Flow Control Valves

The *Flow Control Valve* screen contains buttons to test the Multi Stream valves, Sample Handler Valves, and the Reactor Valves.

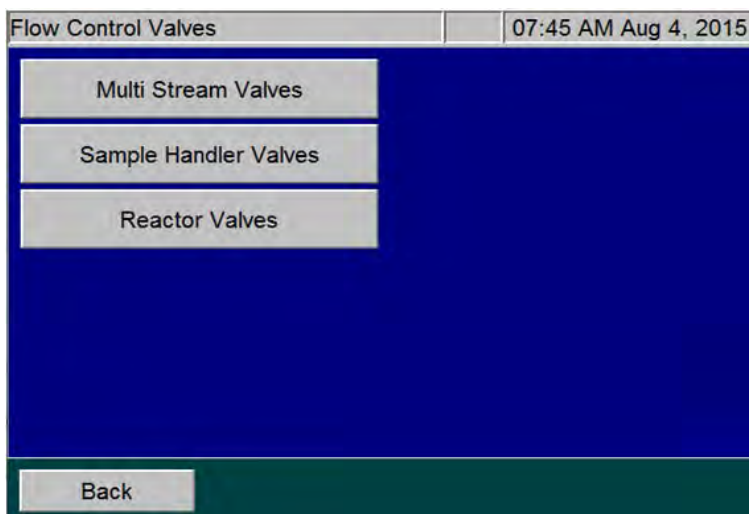


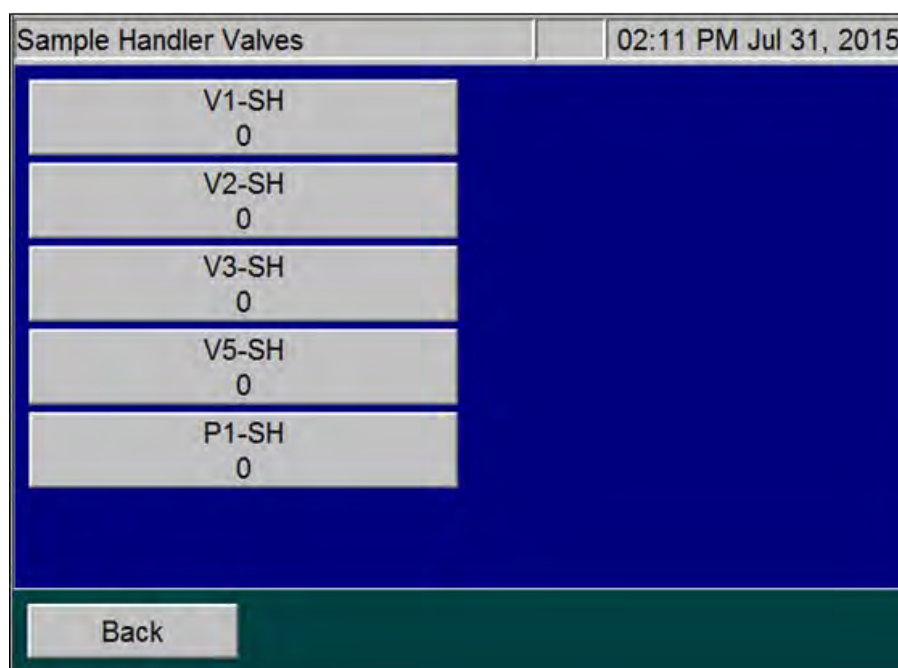
Figure 109: The Flow Control Valve Screen

Press the corresponding button to view the detail screen containing buttons for all the valves of that type.

For example, press the *Sample Handler Valves* button to display the *Sample Handler Valves* screen ([Figure 110](#)) that contains buttons for each of the sampler handler valves (*V1-SH*, *V2-SH*, *V3-SH*, *V5-SH*, and *P1-SH*). Pressing each of these buttons causes the valve on the Analyzer to toggle *open* or *closed*. The state of the valve appears as “1” (active) or “0” (inactive) on the button under the valve name. Each valve is open in its active state or closed in its inactive state, with the one exception of V6-R, which is open in its inactive state. Sample Handling Pump P1-SH can also be activated from this screen to aid in troubleshooting flow issues.

When a valve is working properly, you can hear a click when the valve is activated or deactivated. You can also feel the “click” with your hand by touching the valve body during activation or deactivation.

Refer to [Figure 97 on page 214](#) for the name of all the valves and their locations in the Analyzer.



1 = Active state
0 = Inactive state

Figure 110: Sampler Handler Valves Screen

Gas Valves

The *Gas Valve* screen contains buttons for testing the gas valves V7-SH, V1-R, and V2-R ([Figure 111](#)).



Figure 111: The Gas Valves Screen

When you press one of the three gas valve buttons, a Gas Valve Test begins. The button turns to an orange color during the test and the gas flow rate appears to the right of the buttons. After the 20-second flow test, the *Diagnostic Result* dialog box with a pass or fail result ([Figure 112](#)).

To stop the Gas Valve Test while it is in progress, press the *Valve* button again or press the **Back** button.

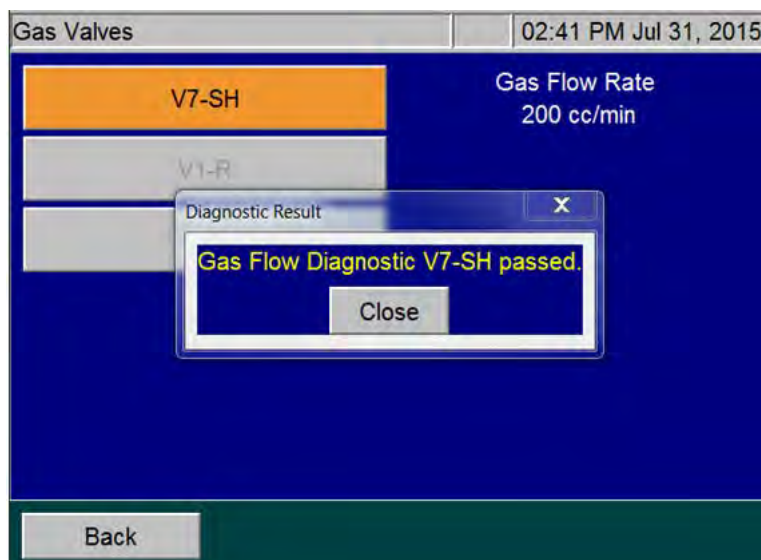


Figure 112: Diagnostic Result Screen

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 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.

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.
- Sparge 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.

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.

- 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.

Pneumatic Valves

NOTE: The pneumatic valves information included in this section only applies if the Analyzer is configured for use with the Filter Panel.

The *Pneumatic Valve* screen ([Figure 113](#)) contains buttons for testing the pneumatic valves, which control the optional Filter Panel.

To test a pneumatic valve, first ensure that the source of compressed air is connected to the Analyzer. Press the appropriate button for the pneumatic valve to test. The pneumatic valves are identified with a “PV” prefix followed by the position number. For example, “PV1-MS” refers to the pneumatic valve in position 1, “PV2-MS” refers to the pneumatic valve in position 2, and so on. The state of the valve appears as “1” (active or open) or “0” (inactive or closed) on the button under the valve name.

After pressing a pneumatic valve button, you should hear compressed air exit from the selected valve. (The pneumatic valves are mounted on the left side of the Analyzer).

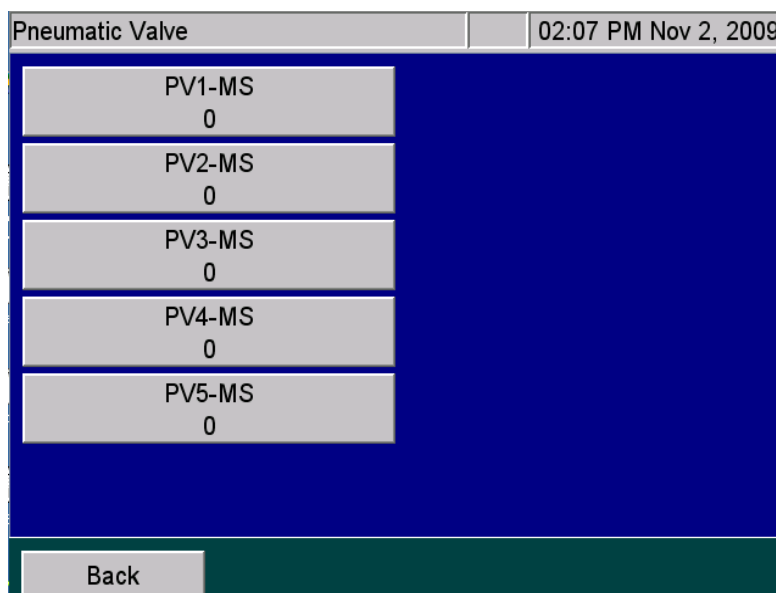


Figure 113: Pneumatic Valve Screen

NDIR

Use the *NDIR* screen to test NDIR temperatures to help facilitate troubleshooting.

To test NDIR temperatures

1. On the *Diagnostics* screen, press the **NDIR** button to display the *NDIR* screen with the current source and detector temperatures ([Figure 114](#)).

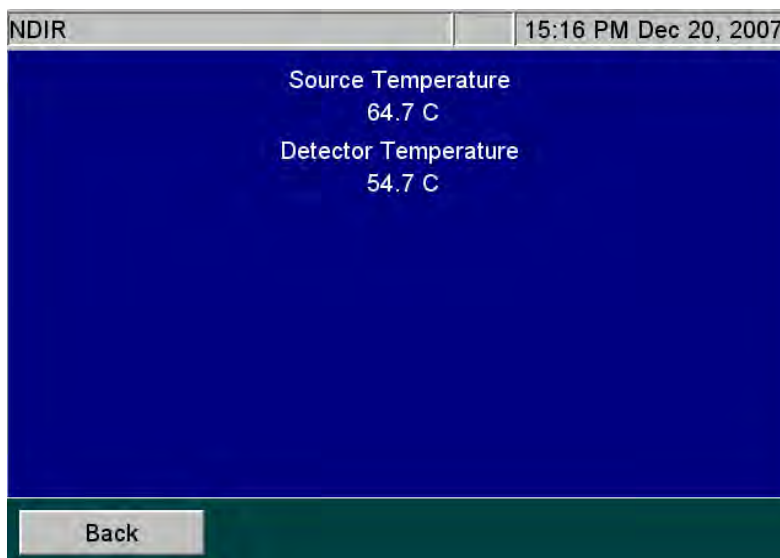


Figure 114: The Temperatures Display on the NDIR Screen

2. Compare the temperatures appearing on the screen with the following criteria:
 - The Source Temperature is maintained at $65\text{ }^{\circ}\text{C} + 2\text{ }^{\circ}\text{C}$.
 - The Detector Temperature is maintained at $55\text{ }^{\circ}\text{C} + 2\text{ }^{\circ}\text{C}$.

Heater

The heater test is an examination 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 115](#)). 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 50 seconds. At the end of this time frame, the measured temperature value appears.

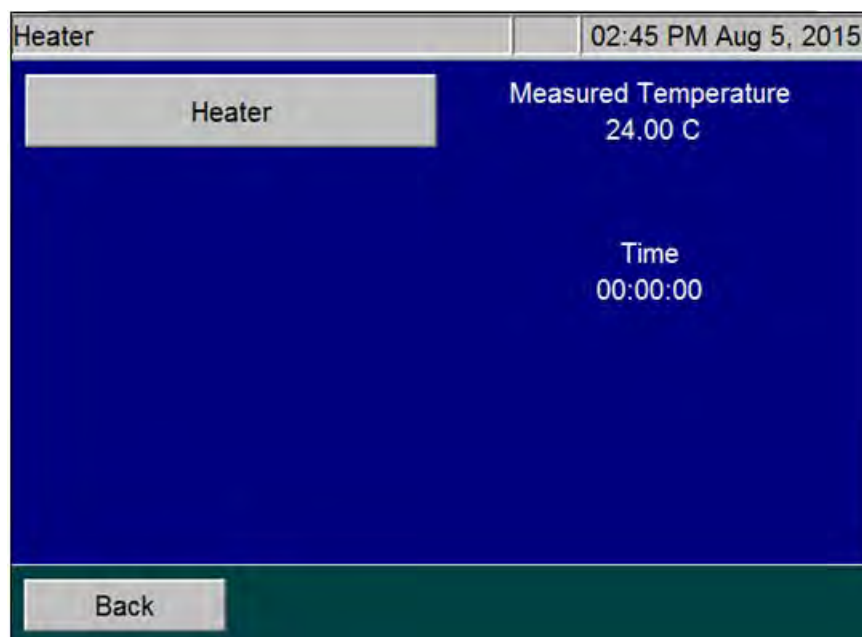


Figure 115: The Heater Screen

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 $355\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$. A message indicating the actual heater temperature and results of the test is shown on the screen.

NOTE: The $355\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ temperature is an indirect measurement of a controlled reactor temperature. This control point has been demonstrated to achieve a reactor temperature of $375\text{ }^{\circ}\text{C}$ 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:

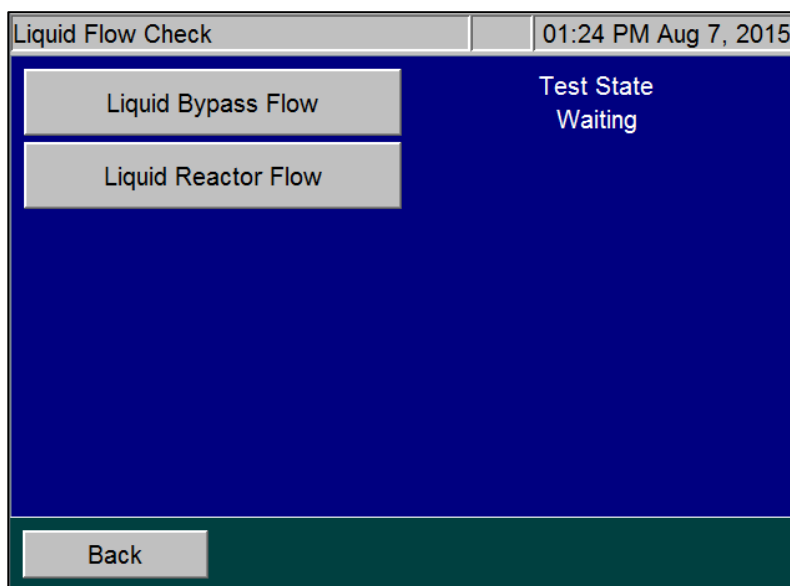


Figure 116: The Liquid Flow Check Screen

To perform the Liquid Bypass Flow test

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 the gas inlet to the Analyzer is connected to a source of compressed gas 1.3 - 6.8 Bar (20 - 100 psig). For more information, refer to [“Step 9: Connect the Compressed Gas Source” on page 108](#).

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 valves 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 118 on page 252](#).

1. Verify that the Analyzer is set with the correct PID setting, as described in [“Gas Valve PID Parameters” on page 189](#).
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 117](#)). The pressure reading at the Pressure Sensor PS4-GS and a timer [initially is set to 00:00 (min:sec)] appear.

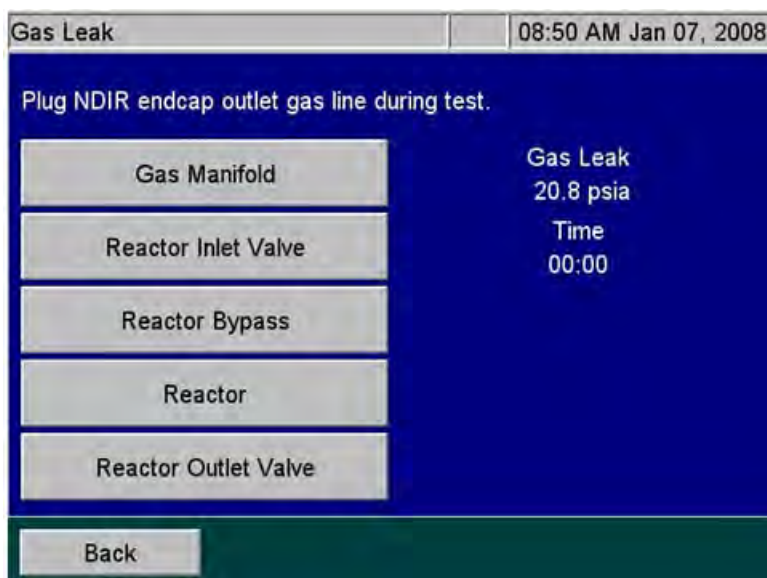


Figure 117: The Gas Leak Check Screen

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 ≤ 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.

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.

7. 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.

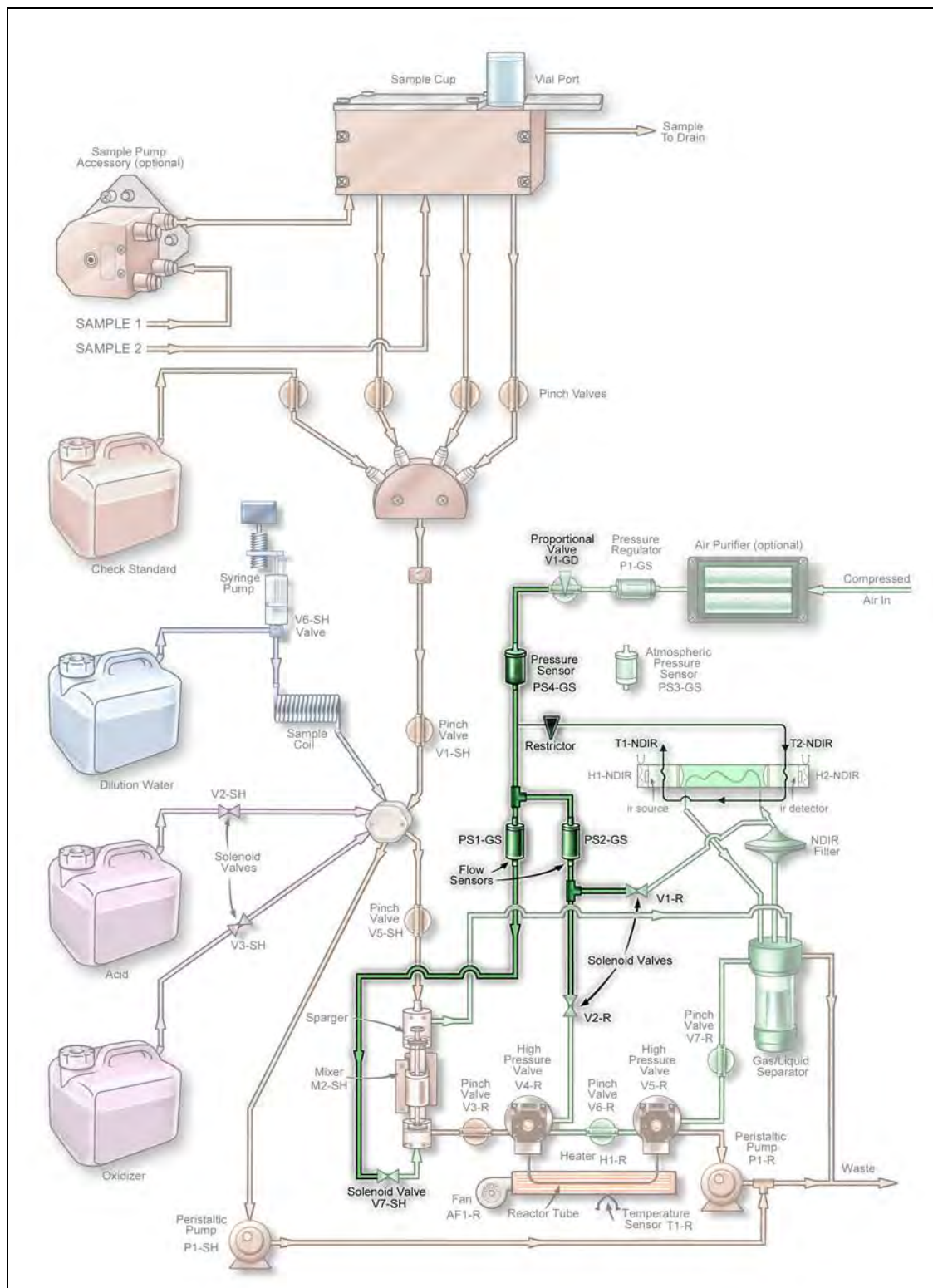


Figure 118: Gas Manifold Leak Check

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 119](#).

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 Valves 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 ≤ 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.

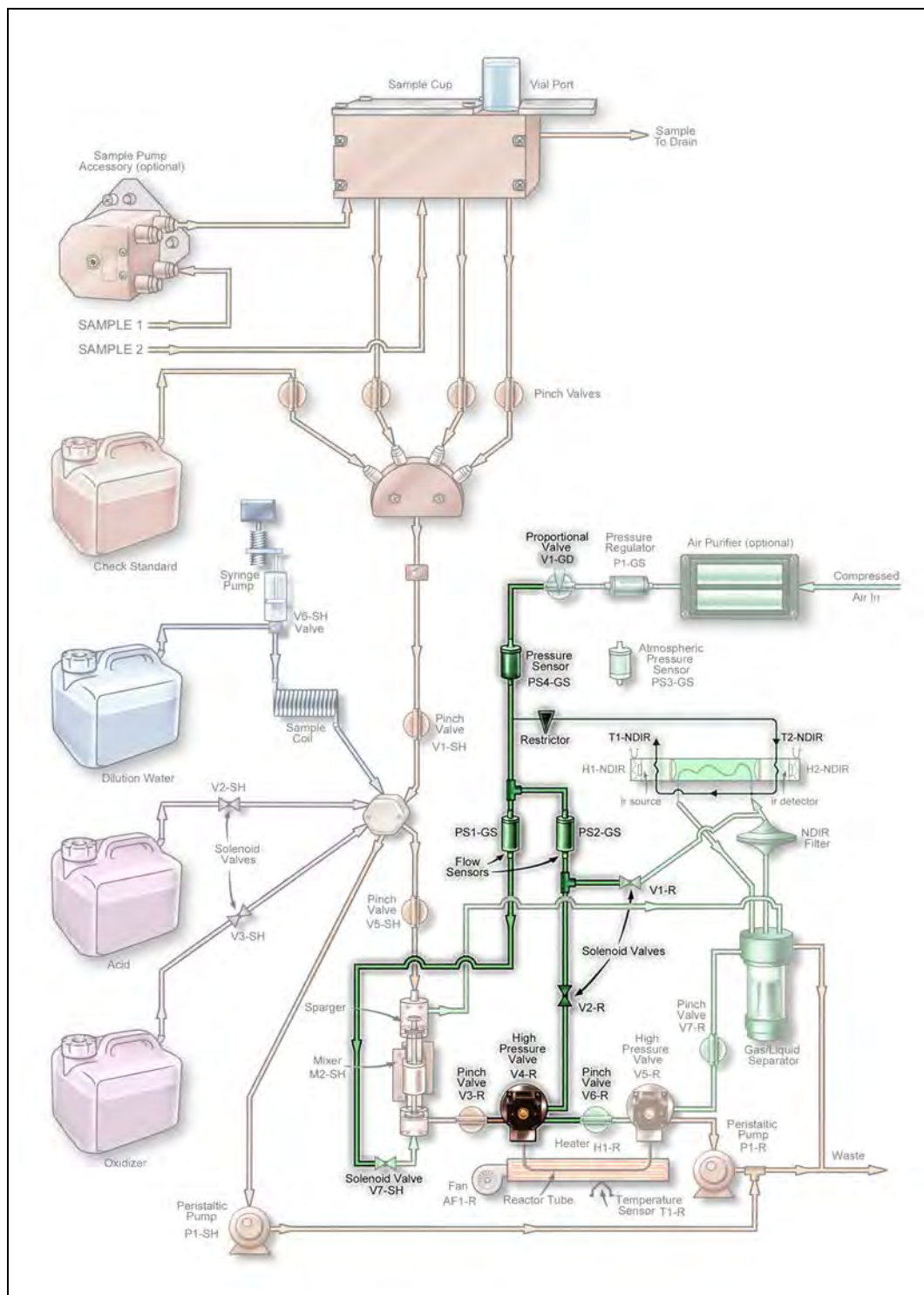


Figure 119: Reactor Inlet Valve Leak Check

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 120](#).

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 ≤ 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.

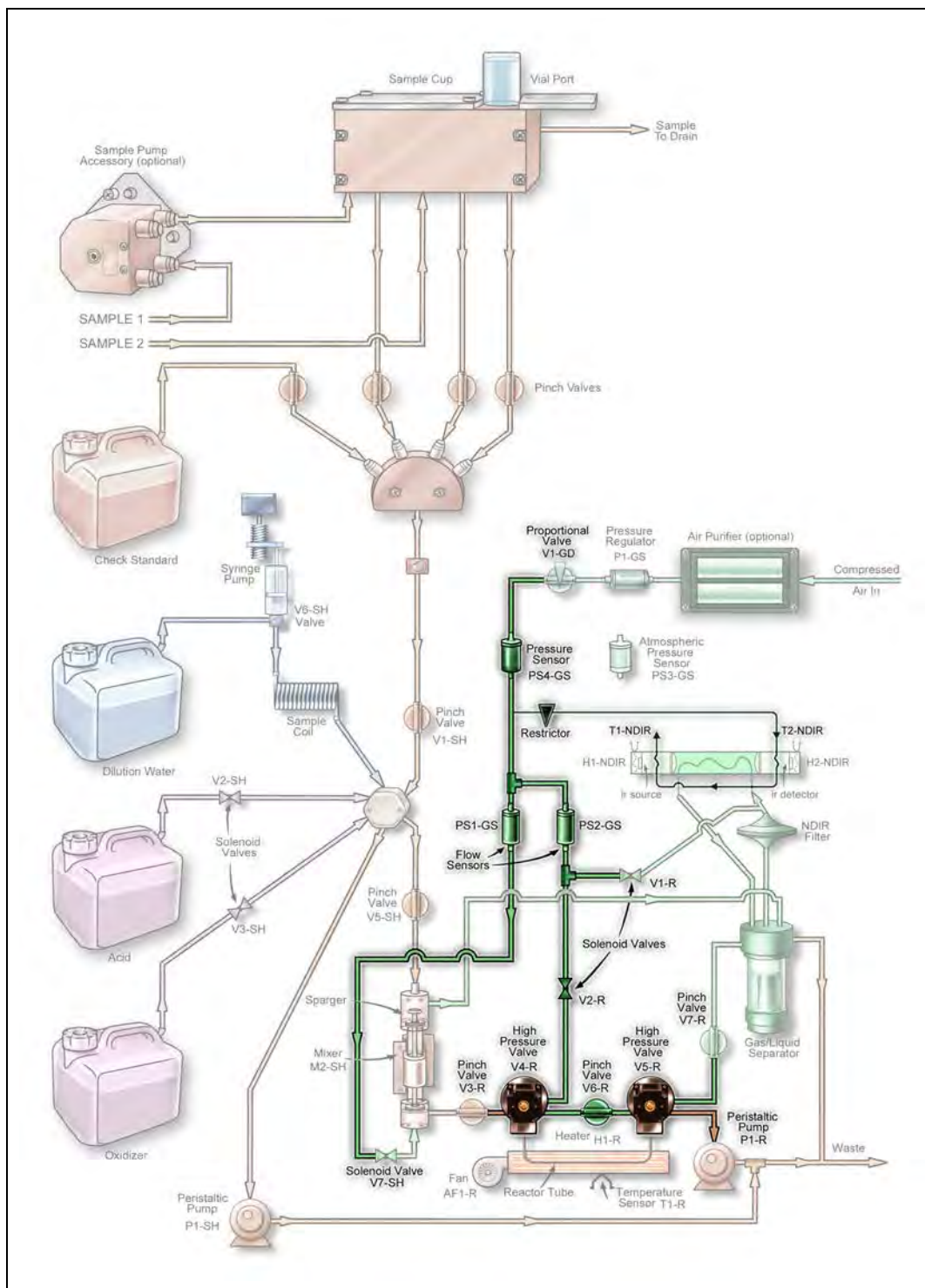


Figure 120: Reactor Bypass Leak Check

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 121](#).

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, V6-R, and V5-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 ≤ 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.

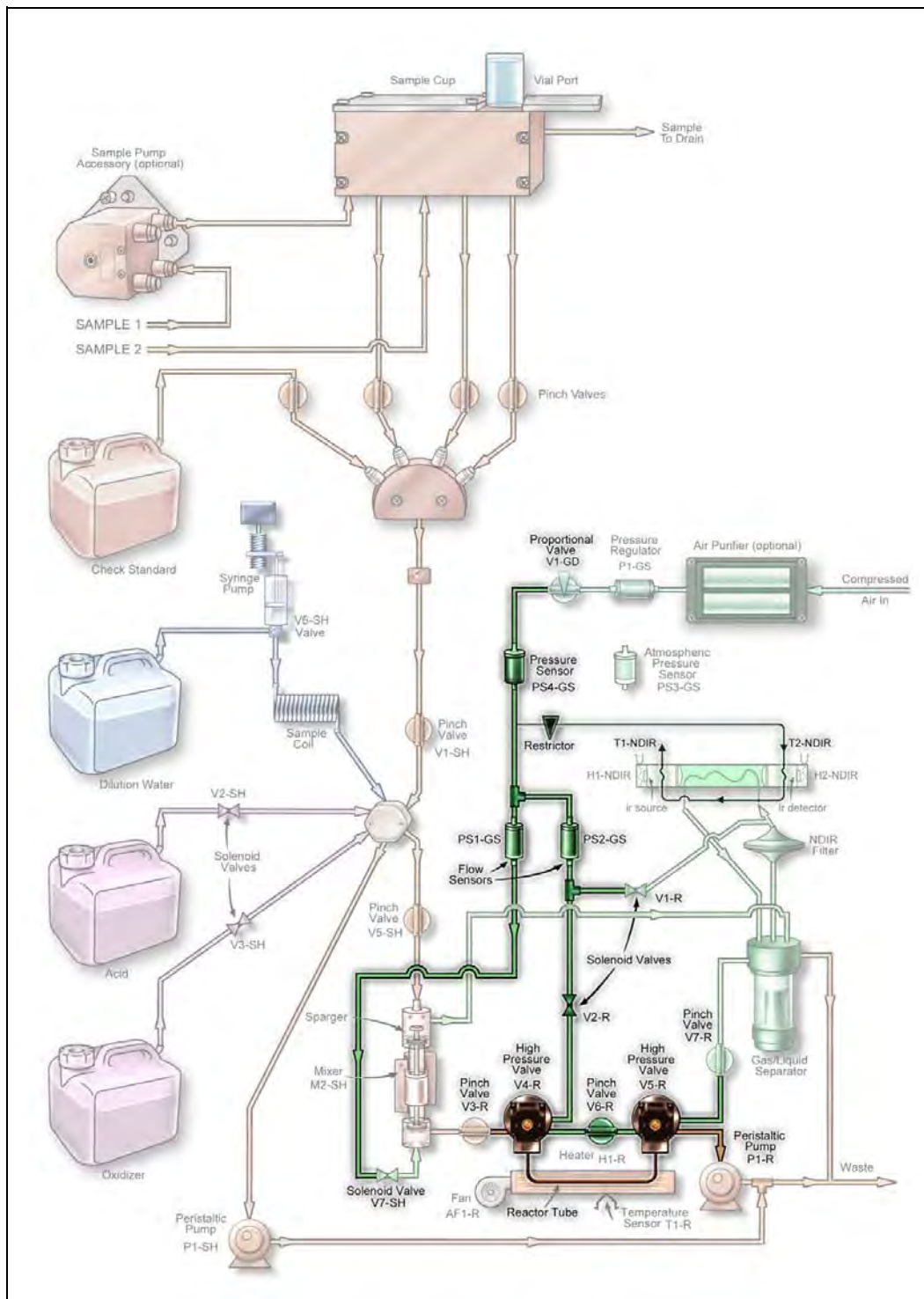


Figure 121: Reactor Leak Check

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 122](#).

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.

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 ≤ 0.5 psi.
4. If the test fails, but all previous Leak Tests passed, the seal in V5-R may need to be replaced.
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 \(Check 6\) Gas-Liquid Separator, NDIR Filter, NDIR Sample Path and Sparger Leak Check.”](#) Otherwise, remove the plug for normal operation.

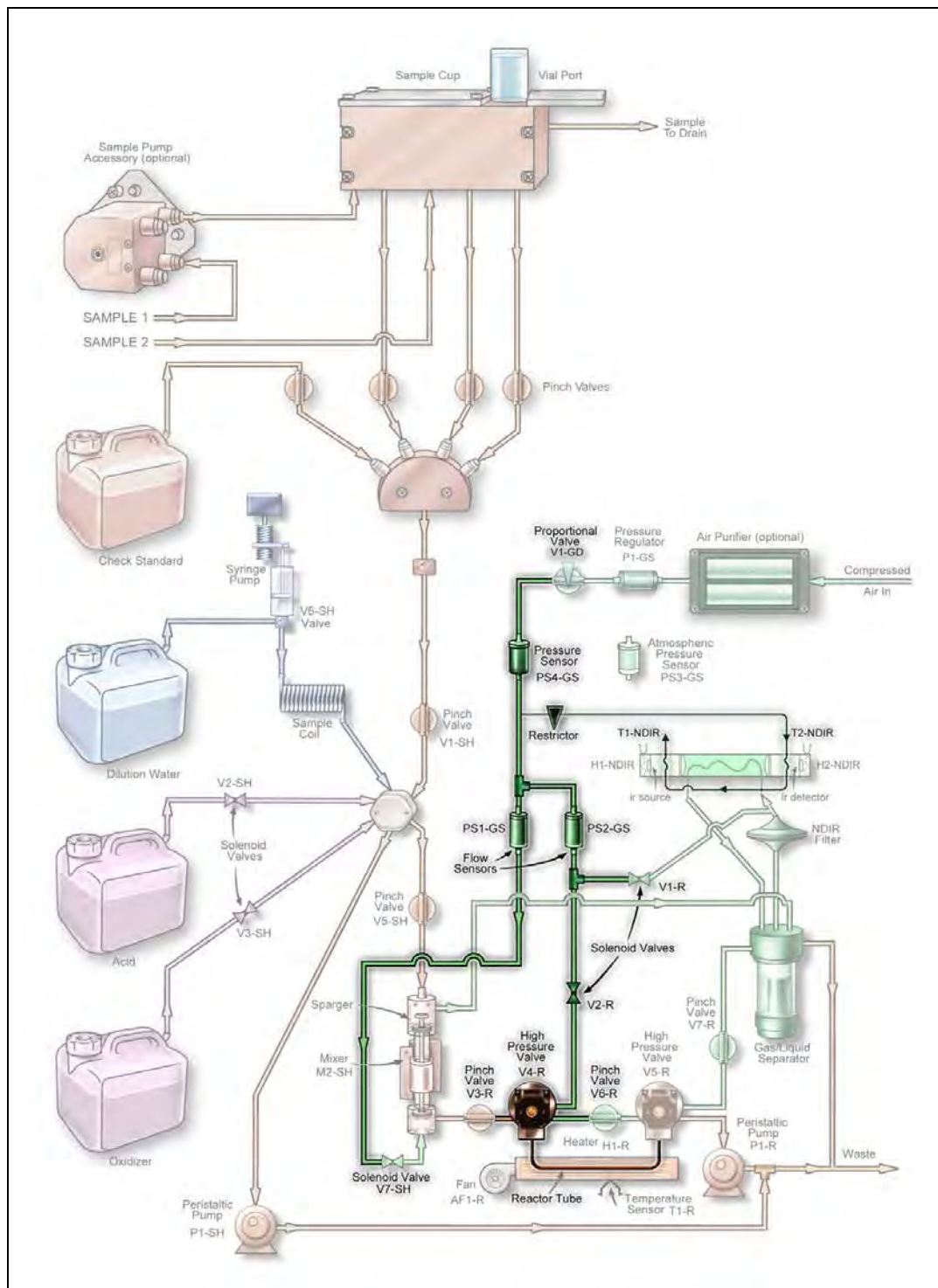


Figure 122: Reactor Outlet Valve Check

To perform the (Check 6) Gas-Liquid Separator, 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 240](#) for instructions on how to open the valve to facilitate removal of the tubing.
3. Place a clamp on the Gas-Liquid Separator (GLS) waste line (the tube that extends from the Gas-Liquid Separator and out of the Analyzer). The GLS will pressurize slightly during this test; ensure that it is installed correctly and its bracket screw is fastened securely.
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 ≤ 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. Remove the clamp from the GLS waste tube. Reinstall the pinch tubing into V7-SH.
9. Remove the plug on the NDIR end cap outlet gas line.

Analog Output

The performance of the 4-20 mA outputs can be checked. Press the **Analog Output** button on the *Diagnostics* screen, and the *Analog Output* screen appears. If the Analog 1 button is pressed, Three buttons will appear on the right side of the screen: 0 mA, 4.0 mA, and 20.0 mA, as shown in [Figure 123](#).

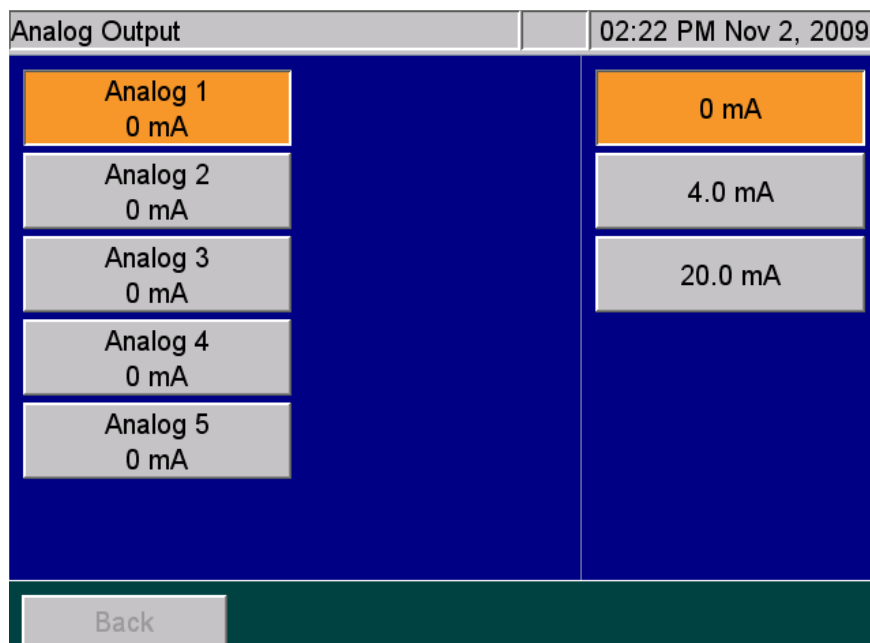


Figure 123: Analog Output Check

The performance of the analog outputs may be checked by connecting an ammeter to the appropriate terminals in terminal block **TB1** (see [“Analog Outputs \(TB1\)” on page 78](#)). For example, to test Analog 1 connect the ammeter across pins 1 and 2 in **TB1**. When the Analyzer is in Standby mode, the Analog Output will initially be 1.0 mA until you press one of the buttons on the right side of the screen. Press one of the **0 mA**, **4.0 mA**, or **20.0 mA** buttons. The ammeter displays the selected current.

Binary Output

The Binary Outputs consist of the Analysis Complete output, the System Fault alarm, and the four user-configurable alarms. They can be checked by pressing the **Binary Output** button on the *Diagnostics* screen ([see Figure 107 on page 239](#)).

Refer to Tables 3 and 4, which show the electrical connections in terminal blocks **TB3** and **TB4**. An ohmmeter must be connected to the appropriate connections in the terminal blocks to monitor the outputs. Depending upon which pins the ohmmeter is connected to, it will either show contact

closure when the buttons are pressed on the *Binary Output* screen, or it will detect the opening of the relay contacts.

NOTE: When the *Binary Output* screen first appears, it will show the current state of the outputs. When you exit the *Binary Output* screen, the outputs return to their original states.

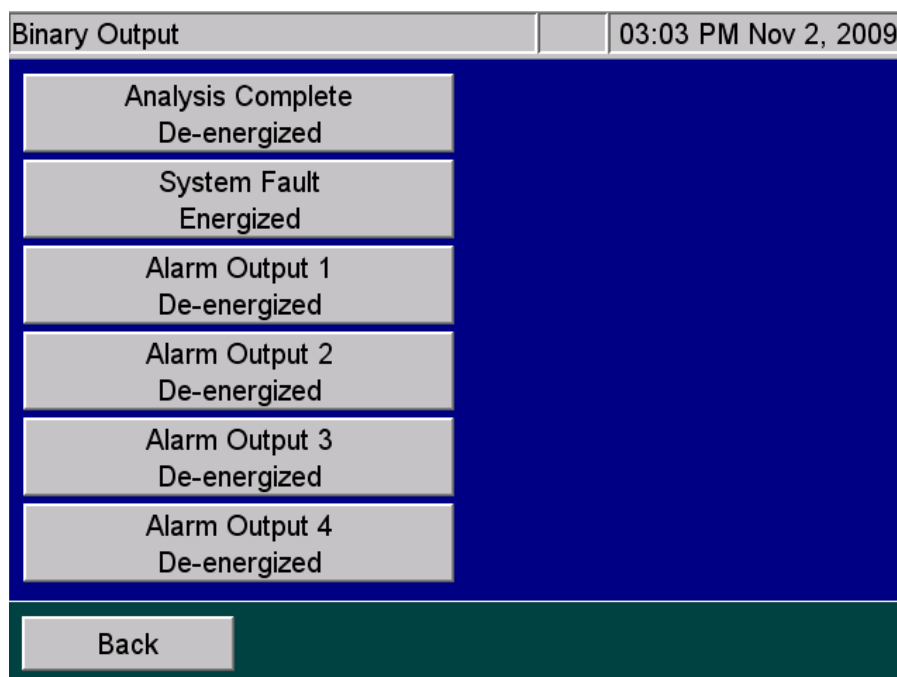


Figure 124: Binary Output Check

Binary Input

The binary inputs include the Analysis Start/Stop input, the leak liquid detectors, and the level sensors that are included in the Fail Safe accessory. Some of the optional level sensors are located in the sample cups and Wastewater Samplers, and they are used to detect when the flow of any of the sample streams has stopped. The other level sensors are located in the Check Standard, Acid, Oxidizer, and Dilution Water carboys.

Press the **Binary Input** button to display the *Binary Input* screen ([Figure 125 on page 264](#)). If the Fail Safe accessory is not installed, the **Level Sensors** button includes a "Not Installed" notation. Otherwise, each level sensor should be accessed and its float should be moved up and down. The screen will indicate the float position by alternating between "High Liquid" and "Low Liquid." The level sensors in the sample cups may be accessed by unscrewing the stainless steel cover from the plastic sample cups. The level sensors on the Wastewater Sampler are non-contact capacitive sensors. They can be triggered by grasping the individual sampler tube and sensor with your hand.

The Analysis Start/Stop binary input [Figure 9: "Wiring Option — Binary Input using Analyzer's Internal Supply," on page 83](#) is located on pins 1 and 2 in terminal block, [Table 8, "Binary Input \(TB2\)," on page 79](#). [Figure 9: "Wiring Option — Binary Input using Analyzer's Internal Supply," on page 83](#) and [Figure 10: "Wiring Option — Binary Input using Analyzer's External Supply," on page 83](#) illustrate ways of wiring the input. If the Analysis Start/Stop binary input is activated when the *Binary Input* screen appears, the **Analysis Start/Stop** button will change from *Off* to *On*. However, the Analyzer will not start or stop analysis.

If a leak sensor is installed in the Analyzer and the leak sensor is enabled, the **Main Enclosure Leak Sensor** button appears with either a *No Liquid Detected* or *Liquid Detected* state.

Binary Input		09:58 AM Apr 11, 2016
Level Sensors Not Installed	Check Standard High Liquid	
Stream 1 High Liquid	Acid High Liquid	
Stream 2 High Liquid	Oxidizer High Liquid	
Stream 3 High Liquid	Dilution Water High Liquid	
Stream 4 High Liquid	Analysis Start / Stop Off	
Stream 5 High Liquid	Main Enclosure Leak Liquid Detected	
<input type="button" value="Back"/>		

Figure 125: Binary Input Check

Pumps

You can test the Analyzer's pumps using the *Diagnostics* screen. External Pump 1 and 2 refer to the optional Peristaltic Sample Pumps mounted on the left exterior side of the Analyzer. Each external pump has the capacity to service two streams.

P1-SH and P1-R are the sample pumps located in the interior of the Analyzer.

To test a pump

1. On the *Diagnostics* screen (**Maintenance** → **Diagnostics**), press the **Pumps** button. The *Pumps* screen appears.

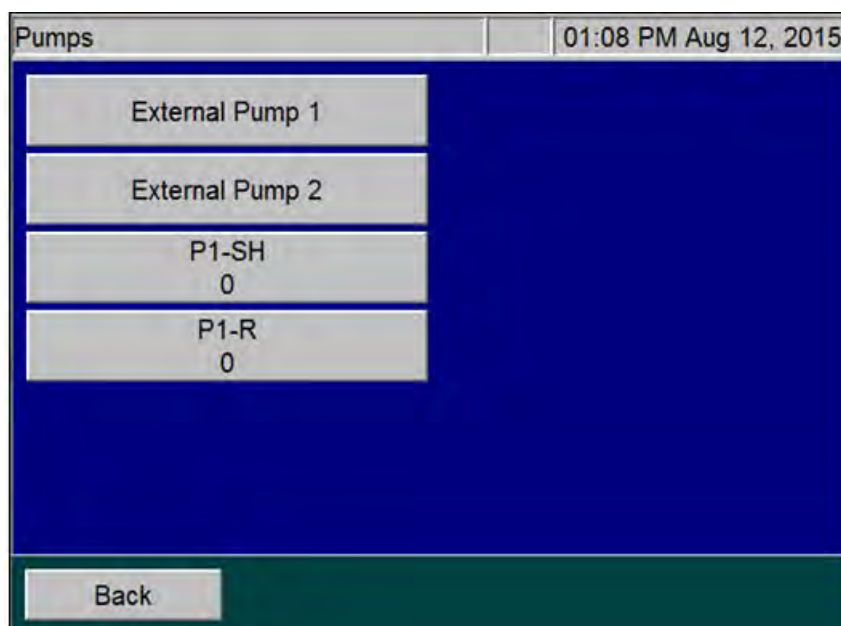


Figure 126: The Pumps Screen

NOTE: The External Pump 1 and External Pump 2 buttons only appear on the screen if your Analyzer has one or two optional pumps installed. If the Analyzer has only one external pump installed, the button appears as "External Pump 1."

2. To test the external pump1, press the **External Pump 1** button. The pump will start pumping. It is normal for the pump to ramp up its speed when the button is pressed to start the test.
3. Press the button again to stop the pump. The pump will ramp down its speed to stop.
4. Repeat steps [2](#) and [3](#) to test each pump installed on the Analyzer.
5. Press the **Back** button to return to the *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 ([see Figure 107 on page 239](#)).
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.

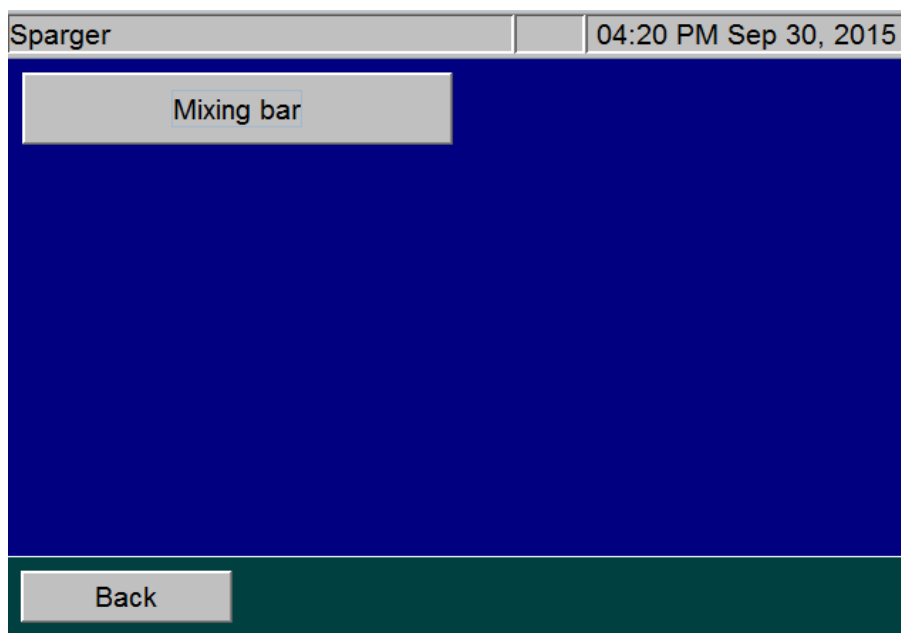


Figure 127: Sparger Diagnostics Screen

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” on page 239](#)). 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 Veolia

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.**

To prepare the Analyzer for shipping

Before repackaging the Analyzer, prepare it for shipping.

Warning

If the Analyzer is returned in anything other than a Veolia shipping container, you will be charged for any damage that occurs during shipping.

1. If the Analyzer is making measurements, press the **Stop Analysis** button. Then press **Yes** to confirm you want to stop the analysis.
2. Remove the sample inlet line(s) from the left side of the Analyzer.

3. Prime all lines with DI Water. Place all four tubes on the left side of the Analyzer (Acid, Oxidizer, Check Standard, and Dilution Water) into a container of DI water. Select **Menu → Maintenance → Prime Reagents → Prime All**.

NOTE: The Check Standard **MUST** be in the **Enabled** state. To verify this, on the **Setup** tab, press the **Check Standard** button and then press the **Check Standard Setup** button. Verify that the **Check Standard** button appears as "Enabled." If this feature is disabled, press the **Check Standard** button, and then press the **Enabled** button to the right.

4. Remove the four tubes from the DI water and then press the **Prime All** button again to drain water from the Analyzer's lines.
5. Remove the reagent tubes, Check Standard tube, and the tube to the dilution water from the left side of the Analyzer.
6. Select the **Maintenance** tab, and press **Shutdown**.
7. When the display is dark, turn off the power switch and unplug the conduit.
8. Open the door of the Analyzer.
9. 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.
10. Drain the Gas-Liquid Separator by turning it over. It is acceptable for the Gas-Liquid Separator to contain a few drops of liquid.

Warning

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

11. Reinstall the Gas-Liquid Separator.
12. Close the door on the Analyzer.

You can now repackage the Analyzer in the original packaging 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.

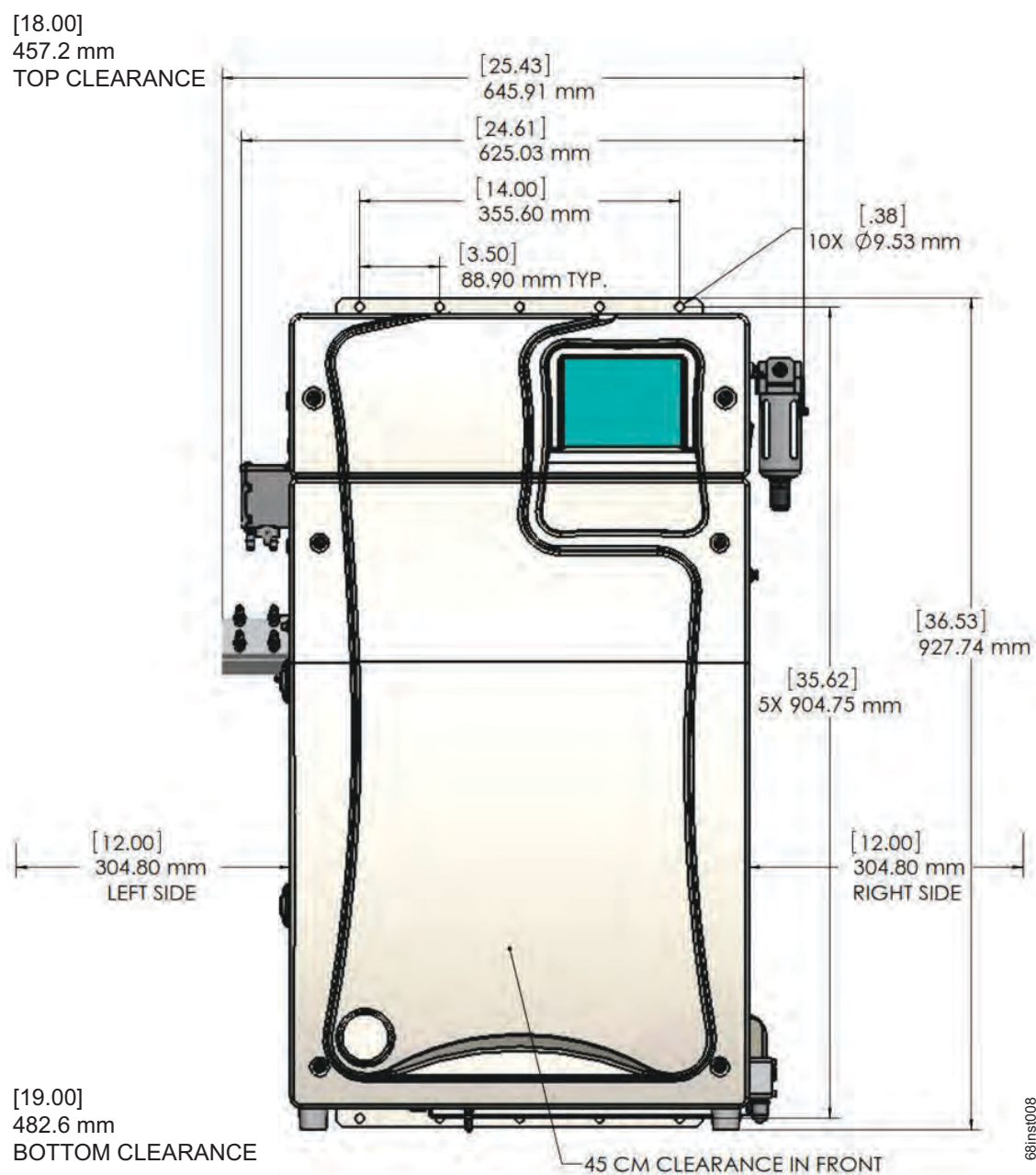


Figure 128: Analyzer Dimensions (Front View)

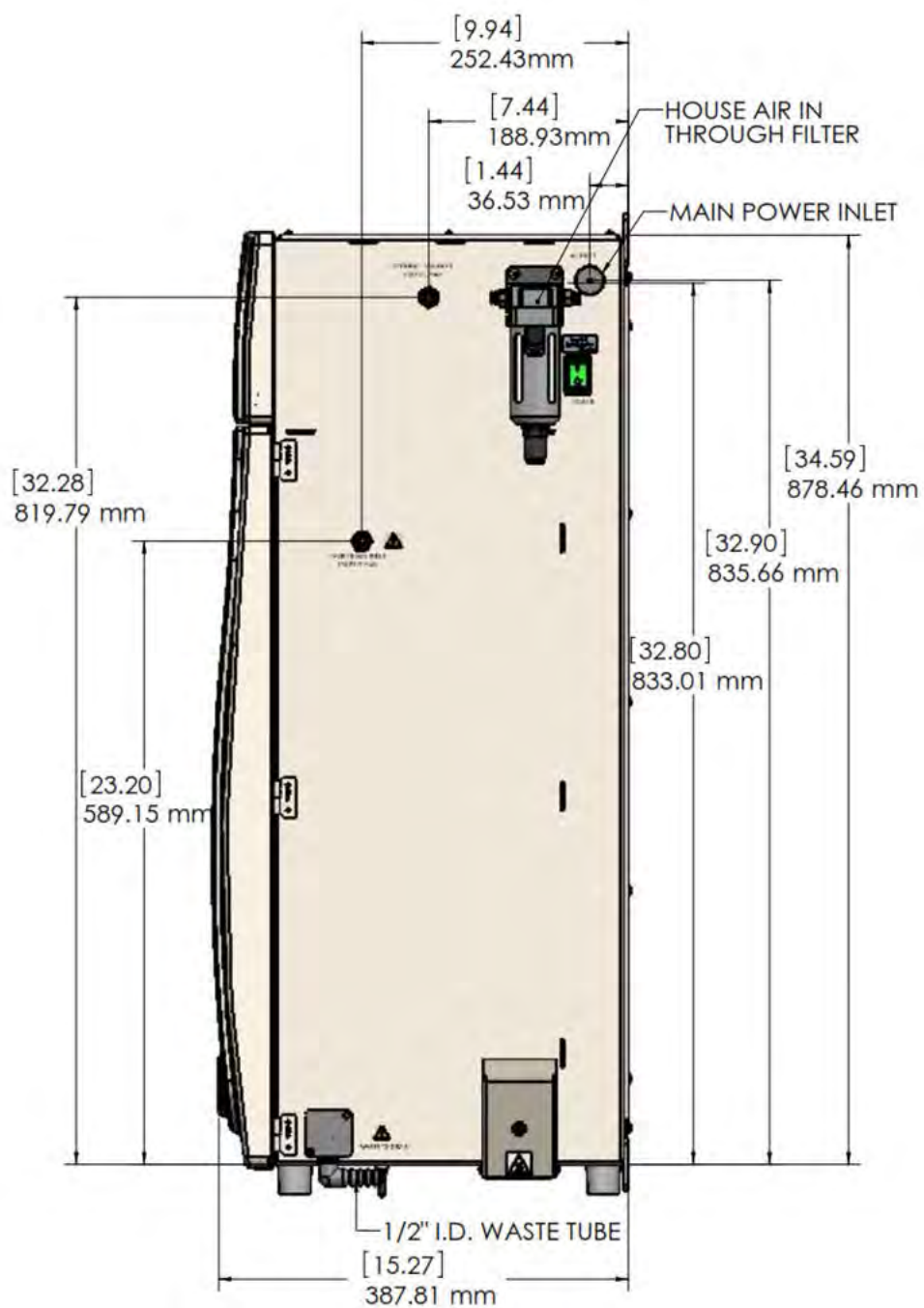


Figure 129: Analyzer Dimensions (Right Side View)

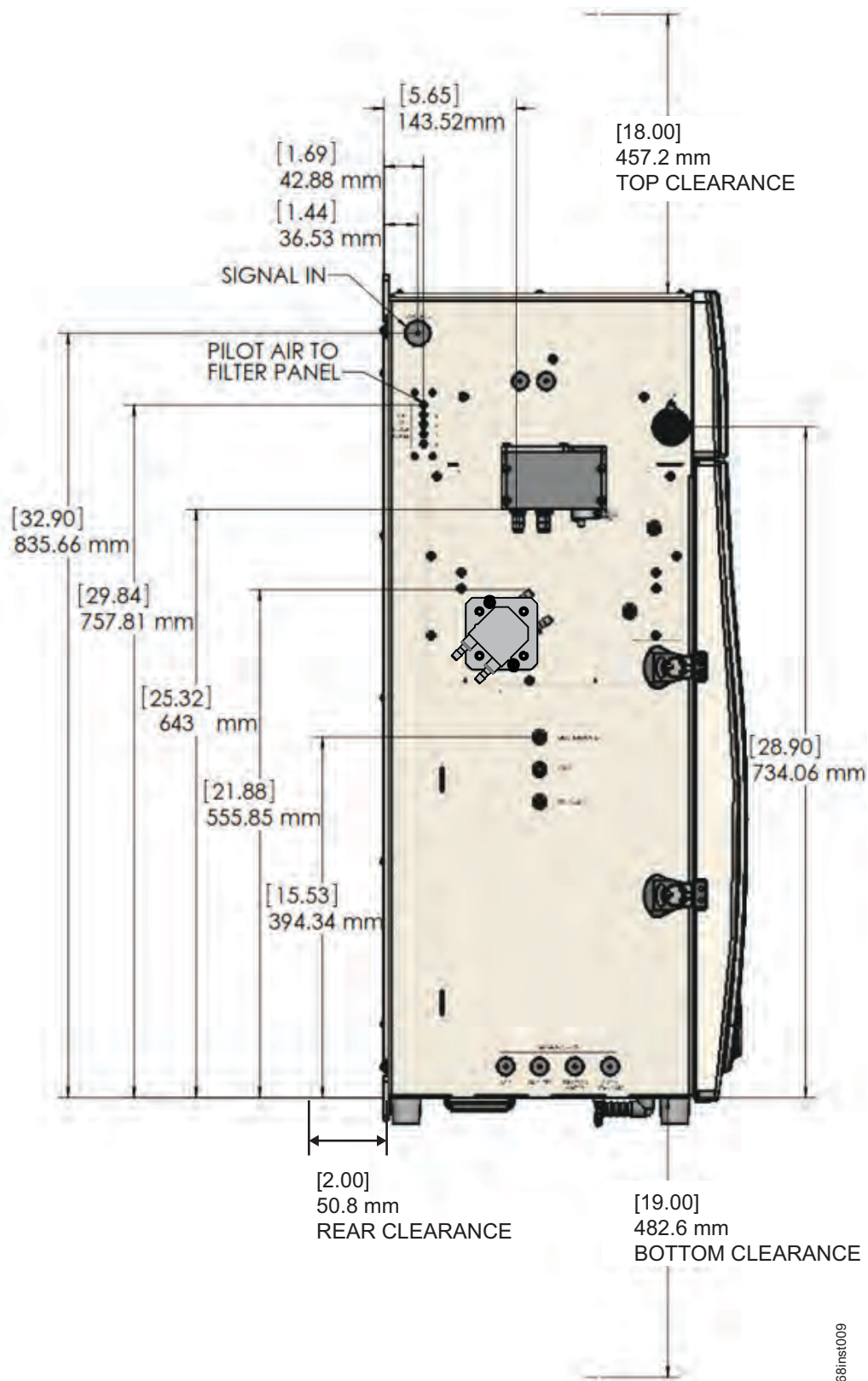


Figure 130: Analyzer Dimensions (Left Side View)

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 in the sparger 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 On-Line 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 On-Line 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 (defined later in this section). The Auto range can use default calibrations.
Auto Restart	The Auto Restart feature sets the Analyzer to resume analysis after a power outage. When the Auto Restart feature is <i>Off</i> , the Analyzer will remain in Standby when power is restored.
Back-flush	The Back-flush feature allows for each stream to individually be flushed using a custom Timer Frequency and Start Time .
Blank	<p>Blank refers to the measurement of the carbon concentrations in the acid, oxidizer, and dilution water. The Analyzer performs this measurement automatically when the Blank button is pressed. The Blank button is found on 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 Blank Correction is <i>On</i> 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. The Blank Correction feature should be performed when reagents or dilution water are changed.</p>
Blank Corrected	Carbon concentration measurements that have had the contribution of carbon in the reagents and dilution water subtracted.
Calibration	Adjustment of the Analyzer's response, following measurement of one or more standards, having accurately known concentrations. Calibrations performed in the Sievers InnovOx On-Line 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.
Calibration Group	The four calibrations that the user selects for use with Auto Range are assigned to a Calibration Group. Calibration Groups are named and saved in the same way that individual Calibrations are saved.
Check Standard	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.
Cycle Frequency	The Cycle Frequency setting allows you to preset periodic TOC measurements of each stream, such as every hour, every two hours, and so on.
Daily Prime	The Daily Prime function causes the Analyzer to prime the reagents, dilution water, and check standard every 24 hours of online operation. This maintains the accuracy of the measurements by eliminating bubbles that accumulate in the tubing during normal operation.

Fail Safe	The Fail Safe accessory includes level sensors fitted to the Analyzer that trigger an automatic alert when each reagent, dilution water, and Check Standard carboy should be refilled. It also automatically skips analysis of sample streams when flow stops.
Flush	The Sievers InnovOx On-Line TOC Analyzer can perform two types of flushes: Sample Flushes and Dilution Water Flushes (defined later in this section).
<i>Sample Flush</i>	Sample Flushes should be performed only when there is a very large concentration difference between one sample and the next. Up to five 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.
<i>Dilution Water Flush</i>	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.
Grab Mode	A sampling method used to sample directly from a vial that is placed in the Analyzer's Vial Port.
IC	Inorganic Carbon
IR	Infrared
Manual Dilution	Some users prefer to manually dilute samples before analysis. The Manual Dilution button allows those users to enter the dilution ratio that was used. The concentration reported by the Sievers InnovOx On-Line TOC Analyzer is then multiplied by that factor. When no manual dilution was performed, Manual Dilution should be set to "1.0."
NDIR	Non-dispersive Infrared
NPOC	Non-purgeable Organic Carbon
Online Mode	In the Online mode , the Sievers InnovOx On-Line TOC Analyzer can monitor up to two sample streams, or in the optional 5-stream configuration, it can monitor up to five sample streams.
Outlier Feature	To help eliminate any unnecessary reporting of high values, the Analyzer firmware has the capability to ignore the erroneously high values with the Outlier Feature. When running process water that is high in particulate matter, it is not uncommon for the Analyzer to give an erroneously high value on a periodic basis. This is due to particulate matter that collects in the tubing leading up to the Analyzer, and then breaking free to flow to the sample cup. Because the Analyzer has such a high oxidation capacity, the carbon contribution from this particulate matter will show up in the reported result. These "events" are infrequent and can cause some confusion as to the state of the water system. This feature can be <i>enabled</i> or <i>disabled</i> when running in NPOC mode, and has a set Outlier Threshold and Reject Outlier value.

Outlier Threshold	This value is utilized in the Outlier Feature. When any measurement is greater than the Outlier Threshold value, the instrument will not display the value on the <i>Data</i> screen or store it in the instrument. The limit to the number measurements that are ignored is one (1), two (2), or three (3) and is set by the Rejected Outlier value.
Rejected Outlier	This value is utilized in the Outlier Feature. The number of consecutive outliers (greater than the Outlier Threshold) before the instrument displays the value on the <i>Data</i> screen and stores it in the instrument. Options for this value are 1, 2, or 3.
Over Range	The Analyzer will display an Over Range error message when the measured value is larger than the upper concentration limit in the current range.
Oxidizer %	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 in the sparger will be oxidizer.
Prime Reagents	Perform a <i>Prime Reagents</i> to clear the tubing of bubbles and old solution.
Protocol	“Protocol” refers to the settings used to make a measurement with the Sievers InnovOx On-Line TOC Analyzer, including the calibration that is used. Protocols can be named and saved in the Analyzer’s memory for later use.
Protocol Date	Date that the protocol was created and saved on the Analyzer.
Protocol Name	Name used to identify a saved protocol.
Range	<p>The concentration ranges that Analyzer measures. These ranges are designated as:</p> <ul style="list-style-type: none">Up to 100 ppmUp to 1,000 ppmUp to 5,000 ppmUp to 20,000 ppmUp to 50,000 ppm <p>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.</p>
Reagent Water	Reagent-grade water, having a TOC concentration less than 0.1 ppm. Sievers reagent water is available in 40 mL vials with a concentration of less than 0.05 ppm from Veolia.
Rejects	The number of initial measurements for a sample in the Grab, Check Standard, Calibration, or Verification mode that will be omitted from the Analyzer’s calculations. If Reject is set to 2 , the first two measurements will be omitted.
Repetition	The number of measurements to be made on a sample.
Rinse Down	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.

Runtime	The time required to analyze the enabled sample streams and Check Standard (if enabled).
Sparge	Passing CO ₂ -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.
TC	Total Carbon (i.e., $TC = TOC + IC$)
TDS	Total Dissolved Solids
TOC	Total Organic Carbon
TSS	Total Suspended Solids
Verification	Following calibration of the Sievers InnovOx On-Line 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.
VOC	Volatile Organic Carbon
V/V	Volume of the solute divided by the total volume of the solution. Used when a concentration is expressed as a percentage.
W/V	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 a Microsoft® Excel® spreadsheet program. This section describes how to accomplish this task.

To import data into a spreadsheet program

1. Export data from the Analyzer via one of two methods.
 - Export to the Analyzer's USB port 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."
 - 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 Historical and Real-Time Data" on page 180](#).
2. On your computer, launch the Microsoft 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 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 Microsoft Excel spreadsheet program file.
6. Depending on the version of Microsoft 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 ([see Figure 131](#)), make sure **Delimited** is selected and click the **Next** button.

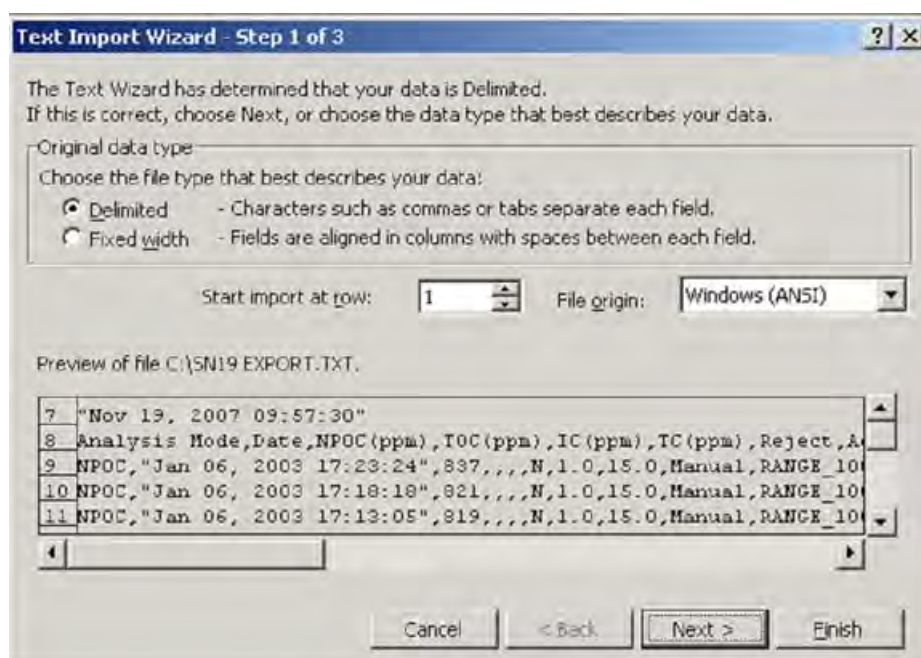


Figure 131: Microsoft Excel Spreadsheet Screen — Text Import Wizard - Step 1

7. Make sure the **Comma** check box is selected, to identify the file as being comma-delimited ([see Figure 132](#)).

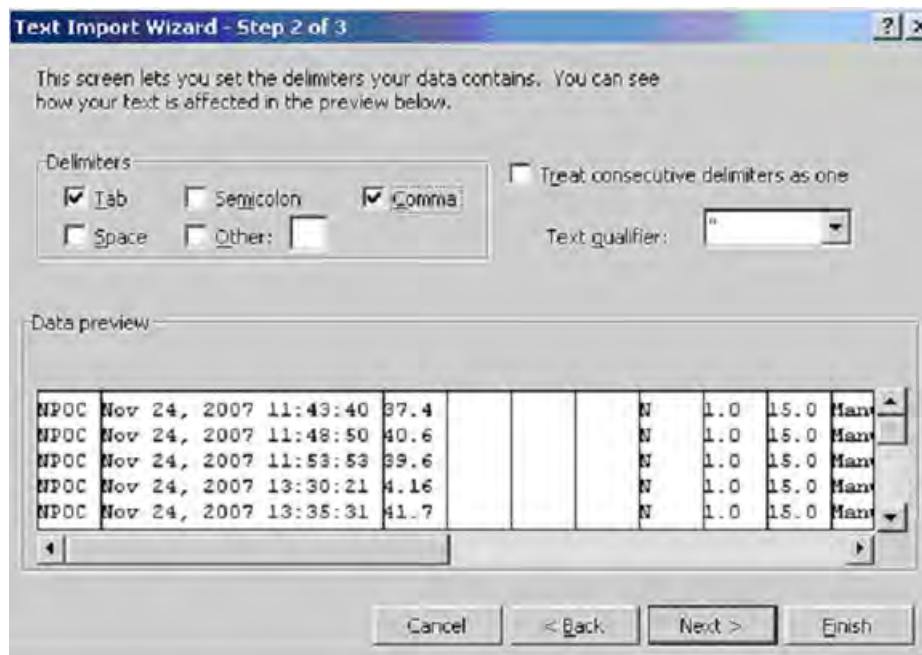


Figure 132: Microsoft Excel Spreadsheet Program — Text Import Wizard - Step 2

- 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** (see Figure 133). Click **Finish** to continue.



Figure 133: Microsoft 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 Microsoft Excel spreadsheet program file.

Appendix D: Modbus Map

Register Type	Description	Function	Address	Notes
Discrete Inputs (read)	Status	2	1000	
	New Data			Bit 0
	Error			Bit 1
	Standby			Bit 2
	Alarm 1			Bit 3
	Alarm 2			Bit 4
	Alarm 3			Bit 5
	Alarm 4			Bit 6
Coils (read)	State	1	2000	<i>See Footnote 1</i>
	Run			Bit 0
	Stop			Bit 1
	Check Standard Enabled		2002	<i>See Footnote 2</i>
	Stream 1 Enabled		2003	

	Stream 2 Enabled		2004	
	Stream 3 Enabled		2005	
	Stream 4 Enabled		2006	
	Stream 5 Enabled		2007	
	Reject Measurement		2008	
Coils (write)	Run	5	2000	<i>See Footnote 3</i>
	Stop		2001	
	Check Standard Enabled		2002	
	Stream 1 Enabled		2003	
	Stream 2 Enabled		2004	
	Stream 3 Enabled		2005	
	Stream 4 Enabled		2006	
	Stream 5 Enabled		2007	
	Check Standard Run		2008	<i>See Footnote 4</i>
	Check Standard Stop		2009	
Input Registers (read)	Instrument Family	4	3010	68 = InnovOx
	Instrument Model		3011	16 bit unsigned
	Serial Number		3012	16 bit unsigned
	Firmware Version (Major)		3015	16 bit unsigned
	Firmware Version (Minor)		3016	16 bit unsigned
	Firmware Version (Engineering)		3017	16 bit unsigned
	Measurement Mode		3098	16 bit unsigned
	Current Mode		3099	16 bit unsigned
	Measurement Time - Year		3100	16 bit unsigned

	Measurement Time - Month		3101	16 bit unsigned
	Measurement Time - Day		3102	16 bit unsigned
	Measurement Time - Hour		3103	16 bit unsigned
	Measurement Time - Minute		3104	16 bit unsigned
	Measurement Time - Second		3105	16 bit unsigned
	Error Number		3200	See Footnote 5
	Error Time - Year		3201	16 bit unsigned
	Error Time - Month		3202	16 bit unsigned
	Error Time - Day		3203	16 bit unsigned
	Error Time - Hour		3204	16 bit unsigned
	Error Time - Minute		3205	16 bit unsigned
	Error Time - Second		3206	16 bit unsigned
	TOC Value Low Word		3300	16 bit unsigned
	TOC Value High Word		3301	16 bit unsigned
	TOC Units		3302	16 bit unsigned
	TOC Stream		3303	16 bit unsigned
	TC Value Low Word		3310	16 bit unsigned
	TC Value High Word		3311	16 bit unsigned
	TC Units		3312	16 bit unsigned
	TC Stream		3313	16 bit unsigned
	IC Value Low Word		3320	16 bit unsigned
	IC Value High Word		3321	16 bit unsigned
	IC Units		3322	16 bit unsigned
	IC Stream		3323	16 bit unsigned
	NPOC Value Low Word		3330	16 bit unsigned

	NPOC Value High Word		3331	16 bit unsigned
	NPOC Units		3332	16 bit unsigned
	NPOC Stream		3333	16 bit unsigned

Footnotes:

1. Reverse notation: RUN = 0; STOP = 1
2. ENABLED = 1; DISABLED = 0
3. Supply 1 to Start the analysis at address 2000. Supply 1 to Stop the analysis at address 2001.
4. Supply 1 to Start Check Standard analysis at address 2008. Supply 1 to Stop Check Standard analysis at address 2009.
5. Refer to [“Analyzer Warnings and Error Messages” on page 221](#).

TOC, TC, IC, and NPOC units are:

Units	Value
ppt	1
ppb	2
ppm	3

Stream	Value
Stream 1	1
Stream 2	2
Stream 3	3
Stream 4	4
Stream 5	5
Vial Port	10
Check Standard	20

	Value
--	-------

IC	10
TC	20
TOC	30
NPOC	40

Current Mode	Value
Continuous	0
Grab	1
Autosampler	2
Blank	3
Calibration	4
Verification	5
IC Calibration	6
Mock	7
Online	8
Check Standard	9

Instrument Model	Value
Laboratory	10
Online	20

Appendix E: Sample Considerations, Reagents, and Method Development

This appendix describes Sample Considerations, Reagents, 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⁻, Br⁻, and I⁻)

- Nitrite (NO_2^-)

This is much less of a problem in the Sievers InnovOx On-Line TOC Analyzer than in other wet chemical analyzers because the Sievers InnovOx On-Line 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 288](#)
- [“Oxidizer considerations” on page 289](#)

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.

Acid considerations

Select the correct Acid for your sample

The Sievers InnovOx On-Line TOC Analyzer is designed to operate with either of two different acids: 6M phosphoric acid (H_3PO_4) and 3N hydrochloric acid (HCl). Select the best choice for your sample based on the following:

- 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 288](#).
2. Transfer the selected acid into the “Acid” carboy.
3. Insert the tube assembly into the carboy.

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 On-Line TOC Analyzer.

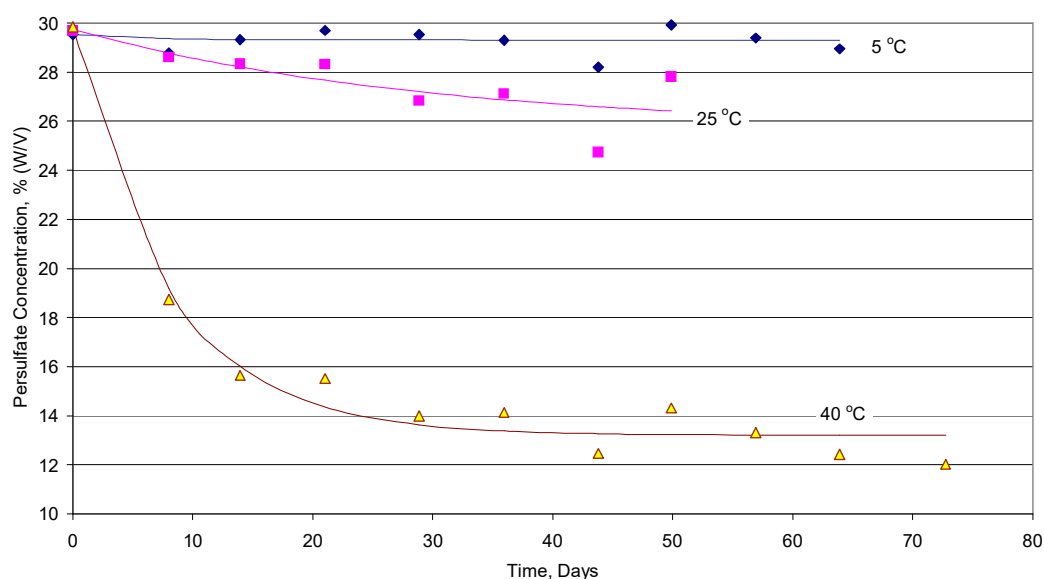


Figure 134: Aging of 30% (W/V) $\text{Na}_2\text{S}_2\text{O}_8$ in HDPE Bottles

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)

To prepare the oxidizer solution using increments, follow the directions printed on the carboy label. 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.

Dissolving 4 kg of the oxidizer powder in deionized water (or comparable water) to the 4th fill line [indicated on the 13.2 L (3.5 US gal) carboy] makes 13.2 L of 30% oxidizer reagent.

1. Pour 1, 2, 3, or 4 kg of the oxidizer powder into the empty “Oxidizer”, 3.5 US gallon carboy.
2. Fill the carboy with deionized (or comparable) water until it reaches the appropriate (1, 2, 3, or 4 kg) fill mark identified on the carboy label.
3. Agitate the carboy to mix the oxidizer powder with the water until the powder is completely dissolved.
 - **IMPORTANT!** Wait a few minutes and agitate the carboy again to ensure **all oxidizer powder is dissolved**. Ensure **all oxidizer powder is dissolved** before connecting to the Analyzer.
4. Insert the tube assembly into the carboy.

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 H₃PO₄ 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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