GE Power & Water
Water & Process Technologies

Sievers 5310 C Laboratory and Portable Total Organic Carbon Analyzers

Operation and Maintenance Manual

Firmware Version 2.02 or later

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DLM 90888-01 Rev. A
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Identification Records

Default Security User ID: ADMIN

Default Security Password: GEAI

Analyzer Serial Number: _____
(This number appears on label located on the left side of the Analyzer.)

Date of Receipt and Installation of Analyzer: _____
(This is the warranty start date.)

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Revision History

Document Version	Firmware Version	Date
DLM 90888-01 Rev. A	Firmware v. 2.02	October 2010[1]

[1]Prior to this date, a separate operation and maintenance manual was published for the lab model. This revision includes the operation and maintenance information common to all 5310 C Lab and Portable TOC Analyzers and addresses the installation and operation information specific to the model, where applicable.

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The Analyzer described in this manual is covered by one or more patents issued to and owned or pending by General Electric Company, including the following:

US 6,271,043
US 6,228,325
US 5,976,468
US 5,902,751
US 5,837,203
US 5,820,823
US 5,798,271
US 5,750,073
US 5,443,991
US 5,132,094
EP 0 897 530
FR 0 897 530
GB 0 897 530
DE 697 02 516 0-08
and other patents pending

Confidentiality

Declaration of Conformity

A copy of the Declaration of Conformity for this product is available on our website at http://www.geinstruments.com/products-and-services/toc-analyzers-and-sensors/5310-c-laboratory-/sievers-5310-c-lab-specifications.htmls

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Warnings

Warning

This symbol on the instrument indicates that the user should refer to the manual for operating instructions.

Warning

The IOS System and vial ports contain sharp needles designed to pierce the septa of sample vials. Do not put fingers or inappropriate materials into the IOS System or vial port.

Warning

In Laboratory and Portable Analyzers, for continued protection against fire hazard, replace fuse with same type and rating.

Warning

In Portable Analyzers, water in the IOS System may be hot. Before inserting a vial into the IOS System, slide the door open and wait 30 seconds to allow sample to completely drain. Inserting a vial before draining can result in potentially hot water spray projecting upward out of the IOS System.

Warning

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.

Warning

Any operation requiring access to the inside of the Analyzer, including installation of maintenance items, could result in injury. To avoid potentially dangerous shock, turn off power and, if possible, disconnect from the power supply before opening the Analyzer.

Warning
The UV lamp and the display screen contain mercury and may be considered hazardous material in your local area. Dispose of these items in accordance with federal, state, or local government regulations.

Warning
Should the UV lamp become broken or damaged it should be handled in accordance with your organization's toxic waste handling procedure and disposed of in accordance with federal, state, or local government regulations.

Warning
To protect against accidental exposure to ultra-violet radiation, do not operate the UV lamp outside of its protective housing.

Warning
When servicing parts inside the Analyzer, keep hands clear of the reagent syringe assembly if the Analyzer is powered on. The syringes are controlled by moving parts that can pinch skin.

Warning
This is a Safety Class I product. It must be must be attached to a grounded power source.

Warning
If this instrument is used in a manner not specified by GE Analytical Instruments USA, the protection provided by the instrument may be impaired.

Warning
Hazardous reagents (ammonium persulfate 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.

Warning
Always stop analysis before turning off or unplugging the Analyzer.

Warning
Make sure the DI water Reservoir is full, particularly when running samples with high TOC or high salt concentrations. Always "clean-up" the Analyzer by running low-TOC DI water after running high TOC or salt samples.

Warning
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.

Warning
For performance within specifications on ozonated water systems, an Ozone Destruct Kit must be purchased from GE Analytical Instruments and installed according to instructions.

Warning
To avoid false TOC readings and possible damage to the Analyzer, always make sure the sample inlet is open and the DI water reservoir is filled before starting analysis.

Warning
If you experience an issue with the printed circuit assembly (PCA) that contains a lithium battery, please contact GE Analytical instruments 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.

Advertencias

Advertencia

Este símbolo del instrumento indica que el usuario debe consultar el manual para ver las instrucciones de manejo.

Advertencia

El sistema IOS y el puerto del vial contienen dos agujas afiladas diseñadas para perforar los tabiques de los viales que contienen las muestras. No coloque los dedos ni ningún material que no sea adecuado en el sistema IOS ni en el puerto del vial.

Advertencia

En los analizadores portátiles y de laboratorio, para disponer en todo momento de protección frente al peligro de incendio, sustituya los fusibles por otros del mismo tipo y capacidad.

Advertencia

En los analizadores portátiles, el agua del sistema IOS puede estar caliente. Antes de insertar un vial en el sistema IOS, abra la puerta deslizándola y espere durante 30 segundos a que la muestra se vacíe por completo. Si inserta un vial antes de que se vacíe es posible que agua potencialmente caliente se proyecte fuera del sistema IOS.

Advertencia

Este símbolo indica que para cumplir la Directiva 2002/96/CE de la Unión Europea sobre residuos de aparatos eléctricos y electrónicos (RAEE), el analizador debe desecharse por separado de los residuos normales.

Advertencia

Toda operación que requiera el acceso al interior del analizador, incluida la instalación de los elementos de mantenimiento, puede causar daños personales. Para evitar descargas potencialmente peligrosas, apague el analizador y, si es posible, desconéctelo de la fuente de alimentación antes de abrirlo.

Advertencia

La lámpara UV y la pantalla de visualización contienen mercurio, por lo que es posible que se consideren materiales peligrosos en su zona local. Deseche estos elementos de acuerdo con la normativa federal, del estado o del gobierno local.

Advertencia

Si se rompiese la lámpara UV o resultase dañada, deberá tratarse de acuerdo con el procedimiento de tratamiento de residuos tóxicos de la organización y desecharse de acuerdo con la normativa federal, del estado o del gobierno local.

Advertencia

Como protección frente a la exposición accidental a la radiación ultravioleta, no maneje la lámpara UV fuera de su alojamiento protector.

Advertencia

Cuando esté realizando el mantenimiento de piezas situadas en el interior del analizador, no coloque nunca las manos en el ensamblado de jeringas de reactivos si el analizador está encendido. Las jeringas están controladas por piezas móviles que pueden atravesar la piel.

Advertencia

Este producto es de clase de seguridad I. Debe conectarse a una fuente de alimentación con toma de masa.

Advertencia

Si este instrumento se utiliza de una manera no especificada por GE Analytical Instruments USA, la protección ofrecida por el instrumento puede verse reducida.

Advertencia

El analizador utiliza reactivos peligrosos (persulfato de amonio y ácido fosfórico). El flujo de residuos del instrumento es ácido y deberá desecharse adecuadamente. Consulte la normativa federal, del estado o del gobierno local.

Advertencia

Detenga siempre el análisis antes de apagar o desconectar el analizador.

Advertencia

Asegúrese de que el depósito de agua DI está lleno, en especial al procesar muestras con altas concentraciones de sal o carbono orgánico total (TOC). “Limpie” siempre el analizador procesando agua DI con bajos niveles de TOC después de procesar muestras con niveles altos de sal o de TOC.

Advertencia

Este producto es de clase A. En entornos domésticos, puede producir interferencias electromagnéticas en cuyo caso puede que se le requiera al usuario que tome las medidas oportunas para corregir la interferencia.

Advertencia

Para trabajar dentro de las especificaciones en sistemas de agua ozonizada, se deberá adquirir un kit de destrucción de ozono a GE Analytical Instruments e instalarlo de acuerdo con las instrucciones.

Advertencia

Para evitar falsas lecturas de TOC y posibles daños al analizador, asegúrese siempre de que la entrada de muestras está abierta y de que el depósito de agua DI está lleno antes de iniciar el análisis.

Advertencia

Si se presenta un problema con el conjunto de circuito impreso (PCA) que contiene una batería de litio, sírvase comunicarse con GE Analytical Instruments 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.

Avertissements

Avertissement

Ce symbole placé sur l'instrument indique que l'utilisateur doit se rapporter au manuel pour les instructions de fonctionnement.

Avertissement

Le système IOS et le porte-fiole contiennent deux aiguilles acérées conçues pour percer les septa des fioles. N'introduisez ni vos doigts, ni aucun objet dans le système IOS System ou le porte-fiole.

Avertissement

Pour une protection continue contre les risques d'incendie, remplacez les fusibles dans les analyseurs portables et de laboratoire par des pièces de même type et de même voltage.

Avertissement

Dans les analyseurs portables, l'eau contenue dans le système IOS peut être brûlante. Avant d'insérer une fiole dans le système IOS, ouvrez la porte en la faisant coulisser et attendez 30 secondes que l'eau s'écoule complètement. L'insertion d'une fiole avant le séchage complet peut entraîner une projection d'eau chaude en dehors du système IOS.

Avertissement

Ce symbole indique que, pour être en conformité avec la directive 2002/96/CE de l'Union européenne relative à l'élimination des appareils électriques et électroniques (Waste Electrical and Electronic Equipment, WEEE), l'analyseur doit être mis au rebut séparément des déchets courants.

Avertissement

Toute opération nécessitant d'accéder à l'intérieur de l'analyseur, y compris l'installation d'éléments de maintenance, peut entraîner des blessures. Afin d'éviter tout choc électrique potentiellement dangereux, mettez l'analyseur hors tension et, si possible, débranchez-le de la prise d'alimentation avant de l'ouvrir.

Avertissement

La lampe UV et l'écran contiennent du mercure et peuvent ainsi être considérés comme des éléments dangereux dans votre secteur. Jetez ces éléments conformément aux réglementations locales en vigueur.

Avertissement

Si la lampe UV venait à être cassée ou endommagée, elle devrait être remplacée conformément à la procédure en vigueur dans votre entreprise pour le remplacement de produits toxiques.

Avertissement

Afin d'éviter toute exposition accidentelle aux rayons ultra-violets, ne sortez pas la lampe UV de sa coque de protection.

Avertissement

Lors d'une intervention de maintenance à l'intérieur de l'analyseur, tenez vos mains hors du bloc de seringues de réactif chimique si l'analyseur est sous tension. Les seringues sont contrôlées par des éléments en mouvement qui peuvent pincer la peau.

Avertissement

Ce produit est de sécurité – classe I. Il doit être relié à une source d'alimentation mise à la terre.

Avertissement

Si cet instrument est utilisé de manière non conforme à ce qui est spécifié par le groupe GE Analytical Instruments USA, la protection fournie par l'instrument risque d'être réduite.

Avertissement

Des réactifs chimiques dangereux (persulfate d'ammonium et acide phosphorique) sont utilisés dans l'analyseur. Le flux résiduel de l'instrument est un acide qui doit être éliminé de manière appropriée. Pour ce faire, reportez-vous aux réglementations locales en vigueur.

Avertissement

Arrêtez toujours l'analyse avant de mettre l'analyseur hors tension ou de le débrancher.

Avertissement

Assurez-vous que le réservoir d'eau DI est plein, tout particulièrement lors de l'utilisation d'échantillons comportant des concentrés fortement salés ou à TOC élevé. Nettoyez toujours l'analyseur à l'aide d'eau DI à faible TOC après avoir utilisé des concentrés salés ou à TOC élevé.

Avertissement

Ce produit fait partie de la classe A. Dans un environnement domestique, il peut entraîner des interférences électromagnétiques. Dans ce cas, l'utilisateur doit prendre les mesures appropriées pour corriger ces interférences.

Avertissement

Pour des performances optimales avec les spécifications des systèmes d'eau ozonée, un kit de destruction d'ozone (Ozone Destruct Kit) doit être obtenu auprès d'GE Analytical Instruments et installé conformément aux instructions données.

Avertissement

Afin d'éviter les mesures TOC erronées et d'éventuels dommages de l'analyseur, assurez-vous toujours que l'entrée de l'échantillon est ouverte et que le réservoir d'eau DI est plein avant de commencer l'analyse.

Avertissement

Si un problème se présente avec l'ensemble du circuit imprimé (PCA) qui contient une batterie de lithium, contactez GE Analytical Instrument 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.

Warnungs

Warnung

Dieses Symbol auf dem Instrument zeigt an, dass der Benutzer die Bedienungsanleitung beachten sollte.

Warnung

Das IOS-System und der Vial-Port enthalten zwei scharfe Nadeln, mit denen die Septa der Proben-Vials durchstochen werden. Bringen Sie Ihre Finger oder ungeeignete Materialien nicht mit dem IOS-System oder dem Vial-Port in Berührung.

Warnung

Ersetzen Sie zum Schutz gegen Brandgefahr in den Analysegeräten Laboratory Analyzer und Portable Analyzer die Sicherung durch eine Sicherung der gleichen Art und Stärke.

Warnung

In den Portable Analyzers, kann das Wasser im IOS-System heiß sein. Bevor Sie das Vial in das IOS-System einsetzen, öffnen Sie die Tür und warten Sie 30 Sekunden, damit die Probe vollständig ablaufen kann. Das Einsetzen eines Vial, bevor das Wasser abgelaufen ist, könnte dazu führen, dass heißes Sprühwasser aus dem IOS-System herausspritzt.

Warnung

Dieses Symbol weist darauf hin, dass der Analysator in Übereinstimmung mit der Richtlinie 2002/96/EG der Europäischen Union über Elektro- und Elektronik-Altgeräte getrennt vom Normalmüll entsorgt werden sollte.

Warnung

Jeder Betrieb, der Zugriff auf das Innere des Analysegeräts erfordert, einschließlich Installation von Wartungsteilen, kann zu Verletzungen führen. Um gefährliche Verletzungen durch einen Stromschlag zu vermeiden, schalten Sie den Strom ab und trennen Sie, wenn möglich, das Analysegerät vor dem Öffnen vom Stromnetz.

Warnung

Die UV-Lampe und der Display enthalten Quecksilber und können regional als Gefahrgut angesehen werden. Entsorgen Sie diese Objekte gemäß den staatlichen oder regionalen Vorschriften.

Warnung

Sollte die UV-Lampe zerbrochen oder beschädigt sein, sollte sie gemäß den Vorschriften Ihres Unternehmens im Umgang mit Giftmüll gehandhabt und gemäß den staatlichen oder regionalen Vorschriften entsorgt werden.

Warnung

Betreiben Sie die UV-Lampe zum Schutz vor unbeabsichtigter ultravioletter Strahlung nicht außerhalb des schützenden Gehäuses.

Warnung

Achten Sie beim Warten von Teilen im Analysegerät darauf, dass Ihre Hände nicht mit der Reagenzienspritze in Berührung kommen, wenn der Analyser eingeschaltet ist. Die Spritzen werden von beweglichen Teilen gesteuert, die die Haut verletzen können.

Warnung

Dies ist ein Produkt der Sicherheitsstufe I. Es muss an eine geerdete Stromquelle angeschlossen werden.

Warnung

Wenn dieses Instrument in einer Art und Weise verwendet wird, die nicht von GE Analytical Instruments USA festgelegt ist, kann der durch dieses Instrument gebotene Schutz beeinträchtigt werden.

Warnung

Im Analysegerät werden gefährliche Reagenzien (Ammoniumsulfat und Phosphorsäure) verwendet. Der Abfallstrahl des Instruments ist säurehaltig und muss entsprechend entsorgt werden. Beachten Sie die staatlichen oder regionalen Vorschriften.

Warnung

Beenden Sie stets die Analyse, bevor Sie das Analysegerät ausschalten oder den Stecker herausziehen.

Warnung

Stellen Sie sicher, dass der DI-Wasserbehälter voll ist, besonders wenn Proben mit hohem Gesamtkohlenstoffgehalt (TOC) oder hohen Salzkonzentrationen analysiert werden. „Reinigen“ Sie stets das Analysegerät, indem Sie DI-Wasser mit geringem Gesamtkohlenstoffgehalt durchlaufen lassen, nachdem Sie Proben mit hohem Gesamtkohlenstoffgehalt oder hoher Salzkonzentration verwendet haben.

Warnung

Dies ist ein Produkt der Klasse A. In einer häuslichen Umgebung kann das Produkt elektromagnetische Störungen verursachen. In diesem Fall muss der Benutzer möglicherweise entsprechende Maßnahmen ergreifen.

Warnung

Für die Funktion gemäß Spezifikationen für sauerstoffangereicherte Wassersysteme muss ein Ozone Destruct Kit für GE Analytical Instruments erworben werden und gemäß den Anweisungen installiert werden.

Warnung

Stellen Sie vor dem Beginn der Analyse stets sicher, dass der Probeneinlauf offen und der DI-Wasserbehälter gefüllt ist, um falsche Gesamtkohlenstoffmesswerte und mögliche Schäden am Analysegerät zu verhindern.

Warnung

Wenn sich Probleme mit der bestückten Leiterplatte (PCA) ergeben, die eine Lithiumbatterie enthält, wenden Sie sich bitte wegen der Rücksendeanweisungen an GE Analytical Instruments. Beachten Sie bei jedem Wechsel der Lithiumbatterie die richtige Polung. Entsorgen Sie die gebrauchten Batterien gemäß den Herstelleranweisungen und den örtlichen Entsorgungsbestimmungen.

Avvertenze

Avvertenza

Questo simbolo posto sullo strumento indica che l'utente deve consultare il manuale per istruzioni sul funzionamento.

Avvertenza

Il sistema IOS e il sito per vial presentano due aghi creati per bucare le vial con campioni. Non mettere le dita o materiali non adatti nel sistema IOS o nel sito per vial.

Avvertenza

Per essere sempre protetti dal pericolo di incendi, negli analizzatori portatili e da laboratorio sostituire il fusibile con uno dello stesso tipo e portata.

Avvertenza

Negli analizzatori online e portatili, l'acqua nel sistema IOS può essere calda. Prima di inserire una vial nel sistema IOS, aprire lo sportello e attendere 30 secondi, in modo da consentire al campione di scolare completamente. Inserire una vial prima che sia trascorso questo tempo può portare alla fuoriuscita di uno spruzzo di acqua calda diretto verso l'alto dal sistema.

Avvertenza

Questo simbolo indica che l'analizzatore deve essere smaltito separatamente dagli altri rifiuti normali, in osservanza con la Direttiva dell'Unione Europea 2002/96/EC per i rifiuti di apparecchiature elettriche ed elettroniche (WEEE).

Avvertenza

Qualsiasi funzionamento che richieda accesso all'interno dell'analizzatore, inclusa l'installazione di componenti per la manutenzione, può portare a lesioni. Per evitare uno shock potenzialmente pericoloso, spegnere l'analizzatore e, se possibile, scollegarlo dall'alimentazione prima di aprirlo.

Avvertenza

La lampada UV e il display contengono mercurio. Questo elemento può essere considerato materiale pericoloso nell'area di utilizzo dell'apparecchio. Smaltire questi componenti nel rispetto delle normative di governo locali o nazionali in vigore.

Avvertenza

Se la lampada UV dovesse danneggiarsi o rompersi, maneggiarla come indicato dalla procedura di gestione delle sostanze tossiche e smaltirla nel rispetto delle normative di governo locali o nazionali in vigore.

Avvertenza

Per proteggersi da esposizione accidentale a radiazioni ultraviolette, non utilizzare la lampada UV al di fuori del relativo alloggiamento di protezione.

Avvertenza

Durante l'attività di manutenzione di componenti all'interno dell'analizzatore, fare in modo che le mani non tocchino il gruppo di siringhe con reagenti se l'analizzatore è acceso. Le siringhe sono controllate da componenti mobili che possono pungere la pelle.

Avvertenza

Questo è un prodotto che rientra nella classe di sicurezza I. Deve essere collegato a una sorgente di alimentazione con messa a terra.

Avvertenza

Se lo strumento viene utilizzato in modo diverso da quello specificato da GE Analytical Instruments USA, la protezione fornita dallo strumento può risultare compromessa.

Avvertenza

Nell'analizzatore vengono utilizzati reagenti pericolosi (persolfato di ammonio e acido fosforico). Lo scarico dallo strumento è acido e deve essere smaltito correttamente. Per ulteriori informazioni, vedere le normative di governo locali e nazionali in vigore.

Avvertenza

Interrompere sempre l'analisi prima di spegnere o scollegare l'analizzatore.

Avvertenza

Accertarsi che il serbatoio di acqua deionizzata sia pieno, in particolare quando si utilizzano campioni con concentrazioni di TOC (Total Organic Carbon, Carbonio Organico Totale) o di sale elevate. "Pulire" sempre l'analizzatore facendovi scorrere acqua deionizzata con basso livello di TOC dopo aver utilizzato campioni con contenuto elevato di sale o di TOC.

Avvertenza

Questo è un prodotto di Classe A. Se utilizzato in un ambiente domestico può generare interferenza elettromagnetica. In tal caso, l'utente deve prendere le misure necessarie per eliminare tale interferenza.

Avvertenza

Per un rendimento in linea con le specifiche su sistemi ad acqua ozonata, acquistare un Ozone Destruct Kit presso GE Analytical Instruments e installarlo nel modo indicato.

Avvertenza

Per evitare letture di TOC non corrette e possibili danni all'analizzatore, accertarsi sempre che l'ingresso del campione sia aperto e il serbatoio di acqua deionizzata sia pieno prima di iniziare l'analisi.

Avvertenza

Se si riscontrano problemi con l'assemblaggio del circuito stampato (PCA) contenente una batteria al litio, si prega di contattare GE Analytical Instruments 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.

Advertências

Advertência

Este símbolo no instrumento indica que o usuário deve consultar o manual e obter instruções de operação.

Advertência

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.

Advertência

Em analisadores portáteis e de laboratório, para obter proteção contínua contra riscos de incêndio, substitua o fusível por um do mesmo tipo e capacidade.

Advertência

Em analisadores portáteis, o agua no dispositivo "IOS" pode estar quente. Antes de inserir um frasco no dispositivo IOS, abrir a porta e esperar 30 segundos para permitir a drenagem da amostra. Colocando um frasco antes da drenagem pode causar a emissão de agua quente pelo dispositivo IOS.

Advertência

Este símbolo indica que, para estar de acordo com a Directiva 2002/96/EC da União Europeia para resíduos de equipamentos elétricos e eletrônicos (REEE), o Analisador deve ser descartado separadamente do lixo padrão.

Advertência

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.

Advertência

A lâmpada ea tela do monitor pode conter mercúrio, que pode ser considerado material perigoso na sua área local. Descarte esses itens de acordo com as regulamentações federais, estaduais ou municipais.

Advertência

Se a lâmpada UV quebrar ou tiver danificações, deve-se tomar cuidados de acordo com os procedimentos de manuseio com materias perigosos e descarte de acordo com as regulamentações federais, estaduais ou municipais.

Advertência

Para proteger contra exposição acidental a irradiação de ultra-violeta, não opere-se a lâmpada UV fora da sua caixa de proteção.

Advertência

Quando estiver fazendo serviço dentro do aparelho, favor não colocar as mãos perto das seringas de reagentes se o equipamento estiver ligado. As seringas fazem movimentos que podem machuca-lo.

Advertência

Este produto é um produto de Segurança Classe I. Ele deve ser ligado a uma fonte de energia com fio terra.

Advertência

Se o instrumento for usado de forma não especificada pela GE Analytical Instruments USA, a proteção fornecida pelo instrumento poderá ser prejudicada.

Advertência

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.

Advertência

Sempre interrompa a análise antes de desligar o Analisador.

Advertência

Mantenha o reservatório cheio de agua DI, particularmente quando estiver correndo amostras com alto nivel de TOC ou de sais. Sempre faça uma limpeza do analisador através de circulação de agua limpa.

Advertência

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.

Advertência

Para alcançar o desempenho conforme a especificação técnica em sistemas de aguas com ozónio, deve-se utilizar os Kits de Descomposição de Ozónio,, adquiridos pela GE Analytical Instruments e instalados conforme as instruções.

Advertência

Para evitar leituras falsas de TOC e danificações ao Analisador, verifique que e entrada da amostra esteja livre de obstruções e o reservatório cheio de agua desmineralizado antes de correr qualquer analise.

Advertência

Se tiver algum problema com as placas electronicas (PCA) que contem baterias de litium, entre-se em contato com GE Analytical instruments para instruções de devolução. Quando estiver trocando a bateria de litium, observe a polaridade coreta. Descarte as baterias usadas de acordo com as instruções do fabricante e as regulamentações federais, estaduais ou municipais.

警告

警告

機器上のこの記号は、ユーザーがマニュアルの操作手順を参照すべきであることを示します。

警告

IOS システムおよびバイアルポートには、サンプルバイアルの隔膜に刺し通すための 2 本の先の鋭いニードルが含まれています。指や不適切な物質を IOS システムやバイアルポートに入れないようにしてください。

警告

ラボ分析装置およびポータブル分析装置では、火災の危険を引き続き避けるために、同じ型式で定格のフューズと交換してください。

警告

オンライン分析装置およびポータブル分析装置では、IOS システム内の水が加熱している場合があります。バイアルを IOS システムに挿入する前に、ドアをスライドして開き、30 秒間待ち、サンプルが完全に排水されるようにしてください。排水前にバイアルを挿入すると、IOS システムから熱水が噴出するおそれがあります。

警告

このマークのある分析装置は、欧州連合指令 2002/96/EC の廃電気電子機器リサイクル規制（WEEE）に準拠するために、一般廃棄物とは別個に廃棄する必要があります。

警告

保守部品を取り付ける際など、分析装置の内部にアクセスする操作では、負傷につながるおそれがあります。感電を避けるために、分析装置を開く前に電源を切り、可能であれば、電源コードを抜いてください。

警告

UV ランプおよび表示画面には水銀が含まれており、地域によっては危険物質と見なされる場合があります。これらの部品は、連邦、州、または地方自治体の規制に従って破棄してください。

警告

UV ランプが壊れたり、損傷したりした場合には、組織の有毒廃棄物処理手順に従って処理し、連邦、州、または地方自治体の規制に従って破棄してください。

警告

不測の紫外線放射被爆を防ぐために、UV ランプは保護ハウジングから出して操作しないでください。

警告

分析装置の内部にある部品を修理する際、分析装置の電源が入っている場合は、試薬シリンジアセンブリに手を触れないでください。シリンジは、指を挟む危険のある機械的可動部品によって制御されています。

警告

これは安全基準クラス I の製品です。アース付き電源に接続する必要があります。

警告

GE Analytical Instruments USA が指定した方法以外の方法でこの装置を使用すると、装備されている保護機能が作動しないおそれがあります。

警告

分析装置には危険な試薬（過硫酸アンモニウムやリン酸）が使用されています。装置からの排水流は酸性なので、適切に破棄する必要があります。連邦、州、および地方自治体の規制を確認してください。

警告

分析装置の電源を切るか、電源コードを抜くときは、必ず分析を停止してください。

警告

DI 貯水槽が満杯になっていることを確認してください。特に、TOC または塩分の濃度が高いサンプルを使用する場合に重要です。TOC または塩分の濃度が高いサンプルを使用した後は、TOC の濃度が低い DI 水で必ず分析装置を洗浄してください。

警告

これはクラス A 製品です。家庭環境では、この製品によって電磁波干渉が発生するおそれがあります。そのような場合は、ユーザー自身で適切な対策を講じて干渉を回避する必要があります。

警告

オゾン水システムを使用した場合、仕様に記載されている性能を得るには、オゾン分解キットを GE Analytical Instruments 社から購入し、指示に従って取り付ける必要があります。

警告

TOC 値の誤った読み取りおよび分析装置の損傷を避けるために、サンプル注入口が開いており、DI 貯水槽が満杯になっていることを必ず確認してから分析を開始してください。

警告

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 GE Analytical Instruments 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。

警告

警告

仪器上标有此符号表示用户应参考手册上的操作说明。

警告

IOS 系统和试剂瓶槽包含两个锐利的针头，用于刺穿试样试剂瓶的封口膜。请不要将手指或其它不适当的物品放入 IOS 系统或试剂瓶槽。

警告

为预防火灾，在 实验室及便携式分析仪中请使用相同类型和规格的保险丝进行更换。

警告

在 便携式分析仪中，IOS 系统中的水为热水。在将试剂瓶插入 IOS 系统之前，请将门滑开并等待 30 秒，以使试样完全流尽。若在未流尽时插入试剂瓶可能导致热水从 IOS 系统上部溅出。

警告

这个符号表示根据欧盟废电机电子设备 (WEEE) 指令 2002/96/EC，分析仪应以不同于普通废品的方式处理。

警告

任何需要接触分析仪内部的操作，包括安装维修件，均可能导致人身伤害。为避免可能的电击伤害，在打开分析仪之前，请关闭电源开关并断开仪器与电源的连接 （如果可能）。

警告

紫外线灯和显示屏含有水银，在您所在的地区可能被视为危险材料。处理这些材料时，请遵循国家、州 / 省或地方政府的相关规定。

警告

如果紫外线灯破损或损坏，应根据您所在组织机构的有毒废料处理程序以及国家、州 / 省或地方政府的相关规定进行处理。

警告

为预防在紫外线放射下暴露导致伤害，请勿将紫外线灯置于保护罩之外。

警告

在分析仪电源打开的情况下，维修分析仪中的部件时，请不要将手靠近试剂洗涤器部件。洗涤器由移动部件控制，可能导致皮肤夹伤。

警告

本产品为 I 类安全产品。本产品必须连接具有接地端的电源。

警告

ﾈ郢走ｾﾒﾇﾆ? ｴｰｴｭｭ GE Analytical Instruments USA ｵﾄｹ多ｨﾊｹﾓﾃ」ｬﾒﾇﾆ? 盪ｳｵﾄｱ」ｻ､ｴ?ｳｿﾉﾄﾜｻ睫ｱﾐｱ。

警告

本分析仪使用危险试剂 （过硫酸铵和磷酸）。仪器排出的废液呈酸性，必须妥善处理。请遵循国家、州 / 省或地方政府的相关规定。

警告

在关闭或断开分析仪电源之前，必须停止分析。

警告

请确保 DI 水容器中装满水，特别是在测试高 TOC 或高盐浓度的试样时尤其如此。在测试完高 TOC 或高盐浓度的试样后，请务必使用低 TOC 的 DI 水清洗分析仪。

警告

本产品为 A 类产品。在家庭环境中，本产品可能导致电磁干扰，用户可能需要采取适当措施以减少干扰。

警告

为使臭氧水系统达到规定的性能，必须从 GE Analytical Instruments 购买臭氧解离装置并根据说明安装。

警告

为避免 TOC 读数错误或损坏分析仪，在开始分析前必须保证试样进口打开且 DI 水容器已满。

警告

如果带有锂电池的印刷电路组件 （PCA）出现故障，请联系 GE Analytical instruments 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。

Chapter 1. Introduction

The Sievers* model 5310 C Laboratory and Portable TOC Analyzers are members of the Sievers 5310 C Series of TOC Analyzers, which also includes an On-line Analyzer. The 5310 C TOC Analyzer is a specialized version of TOC Analyzers optimized for use in municipal water applications, including raw and finished drinking waters. The 5310 C Series TOC Analyzers are not designed or intended for pharmaceutical applications. The Analyzer complies with Standard Method 5310 C and EPA Method 415.3 and is accepted for compliance and regulatory monitoring under the USEPA's Disinfectants and Disinfection Byproducts Rule. The 5310 C may be used as a standalone instrument, or paired with a high-capacity GE Autosampler.

The Sievers 5310 C Series Total Organic Carbon Analyzers from GE Analytical Instruments are high-sensitivity Analyzers used to measure the concentration of total organic carbon (TOC), total inorganic carbon (TIC), and total carbon (TC = TOC + TIC) in water samples. (For patent information, see the section called “Trademarks and Patents” in the Revision History section.)

The Analyzer is based on the oxidation of organic compounds to form carbon dioxide (CO_2) using UV radiation and a chemical oxidizing agent (ammonium persulfate). Carbon dioxide is measured using a sensitive, selective membrane-based conductometric detection technique as described by Godec et al. (R. Godec et al., “Method and Apparatus for the Determination of Dissolved Carbon in Water,” U.S. Patent No. 5,132,094). For each TOC measurement, the concentration of inorganic carbon species (CO_2, HCO_3^-, and CO_3^{-2}) is determined and, after oxidation of the organic compounds, the total carbon (TC) content of the sample is measured. The concentration of the organic compounds is then calculated from the difference between the concentrations of TC and total inorganic carbon (TIC), generally referred to simply as inorganic carbon (IC).

(TOC = TC - IC)

The Analyzer can be used to monitor water samples ranging from 4 parts per billion (ppb) TOC to 50 parts per million (ppm) TOC. The Analyzer is easy to operate, with extremely low maintenance, and no special training or chemical knowledge is required. The Analyzer is calibrated at the factory, and calibration remains stable for approximately one year. Recalibration and verification can be easily performed at the customer's site.

The following instructions apply to both Sievers 5310 C Laboratory and Portable TOC Analyzer instrument models, except where noted.

Chapter 2. System Description

System Specifications[2]

System specifications for the Sievers 5310 C Laboratory and 5310 C Portable TOC Analyzers are provided on the following pages.

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

Sievers 5310 C Laboratory TOC Analyzer*

Linear range	4 ppb – 50 ppm TOC
Precision	<1% of RSD
Accuracy	±2% or ±0.5 ppb, whichever is greater
Analysis Time	4 minutes
Sample Flow Rate (nominal)	Analysis mode: 0.5 mL/min Fast Flush (between samples): 1.0 mL/min
Power requirements	100-240 ±10% VAC, 100 watts, 50/60 Hz
Fuses	T1.6 A, 250 VAC (SloBlo), size 5 x 20 mm(appliance inlet)
Ambient Temperature	10 °C to 40 °C
Normal Operating Environment	Intended for indoor use only
Maximum Relative Humidity	Up to 95%, non-condensing
Maximum Altitude	3,000 m (9,843 ft)
Calibration Stability	Typically stable for 12 months
Chemical Reagents (prepackaged)	300 mL acid; 300 mL or 150 mL oxidizer
Outputs	Serial (RS-232), USB, parallel printer port, Ethernet port
Installation/Overvoltage Category	II
Safety Certifications	CE, ETL listed. Conforms to UL Std. 61010-1 Certified to CSA C22.2 No. 61010-1.
Pollution Degree	2
Display	Color, touch-sensitive LCD
Size	48.3 cm height x 19.2 cm width x 48.0 cm depth (19.0 in x 7.6 in x 18.9 in)
Weight	14.3 kg (31.5 lbs)

*Not designed or intended for pharmaceutical applications.

Sievers 5310 C Portable TOC Analyzer*

Linear range	4 ppb – 50 ppm TOC
Precision	<1% of RSD
Accuracy	±2% or ±0.5 ppb, whichever is greater
Analysis Time	4 minutes
Sample Flow Rate (nominal)	Analysis mode: 0.5 mL/min Fast Flush (between samples): 1.0 mL/min
Required Sample Line Flow Rate:	50 mL - 300 mL/min (for On-Line Mode)
Power requirements	100-240 ±10% VAC, 100 watts, 50/60 Hz
Sample Temperature	1 °C to 95 °C via iOS[3] (withstands short-term steam exposure)
Ambient Temperature	10 °C to 40 °C
Normal Operating Environment	Intended for indoor use only
Maximum Relative Humidity	Up to 95%, non-condensing
Maximum Altitude	3,000 m (9,843 ft)
Calibration Stability	Typically stable for 12 months
Chemical Reagents (prepackaged)	300 mL acid; 300 mL or 150 mL oxidizer
Outputs	Serial (RS-232), USB, parallel printer port, 4–20 mA, Ethernet port
Installation/Overvoltage Category	II
Safety Certifications	CE, ETL listed. Conforms to UL Std. 61010-1 Certified to CSA C22.2 No. 61010-1.
Pollution Degree	2
Display	Color, touch-sensitive LCD
Size	35.6 cm height x 22.3 cm width x 46.5 cm depth (14.0 in x 8.8 in x 18.3 in)
Weight	12.5 kg (27.5 lbs)

*Not designed or intended for pharmaceutical applications.

[3]If the sample temperature and pressure are above 60° C and 100 psi, the stainless steel iOS is required.

System Overview

The Sievers 5310 C Laboratory and Portable TOC Analyzers consist of six major subsystems:

1. Sample inlet system and sample pump, including the Integrated On-Line Sampling (IOS) System for the *5310 C Portable TOC Analyzer* and the vial port for the *5310 C Laboratory TOC Analyzer*
2. Chemical reagent subsystem, including reagent reservoirs and syringe pumps
3. Oxidation reactor
4. Measurement module, comprising:
    - CO_2 transfer modules
    - Conductivity cells
5. DI water loop, comprising:
    - DI water reservoir
    - Ion exchange resin (resin bed)
    - DI water pump
6. Electronics subsystems, comprising:
    - Microprocessors and circuit boards
    - Data outputs

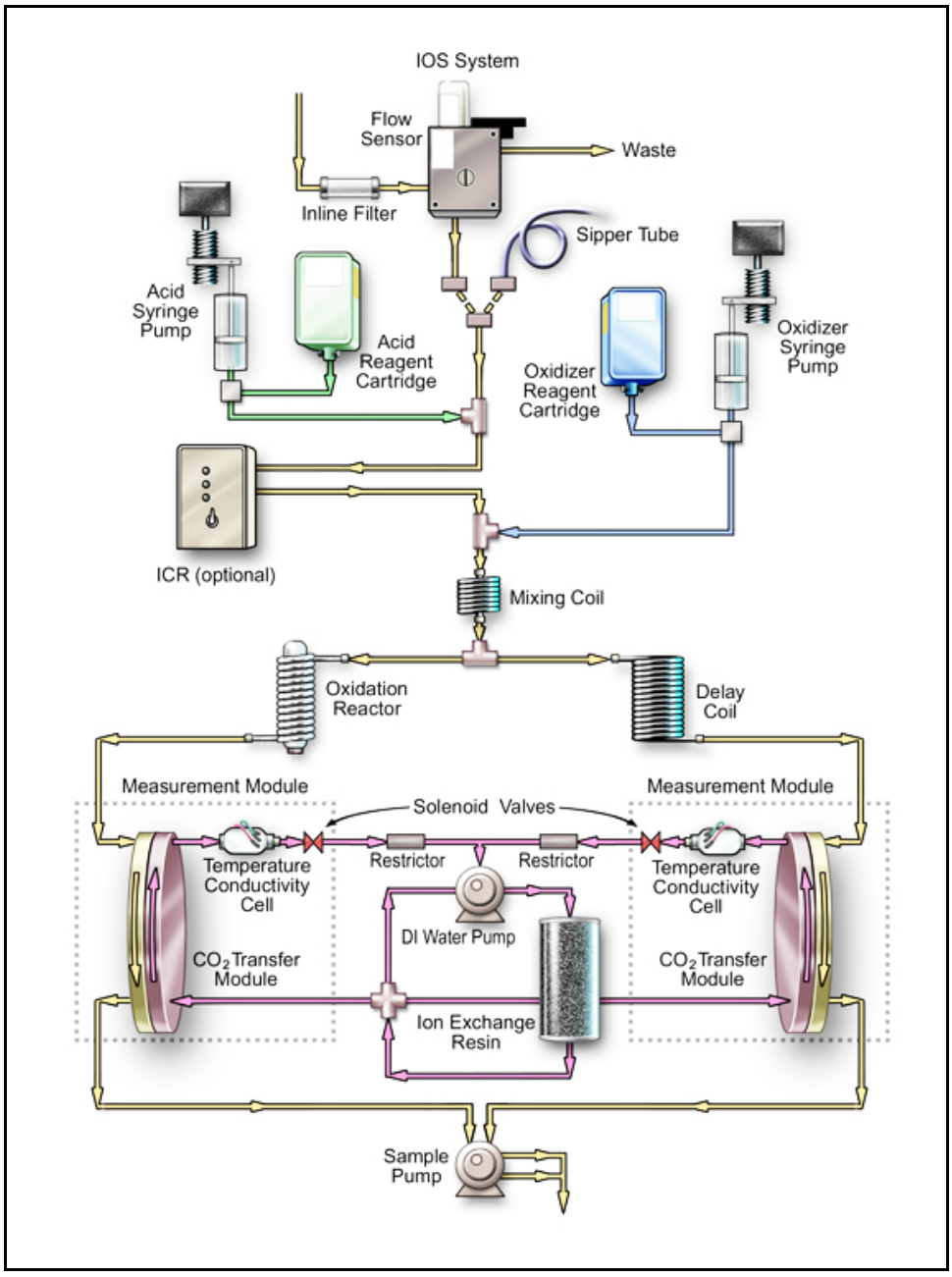


Figure 1: Analyzer Schematic — Portable Model

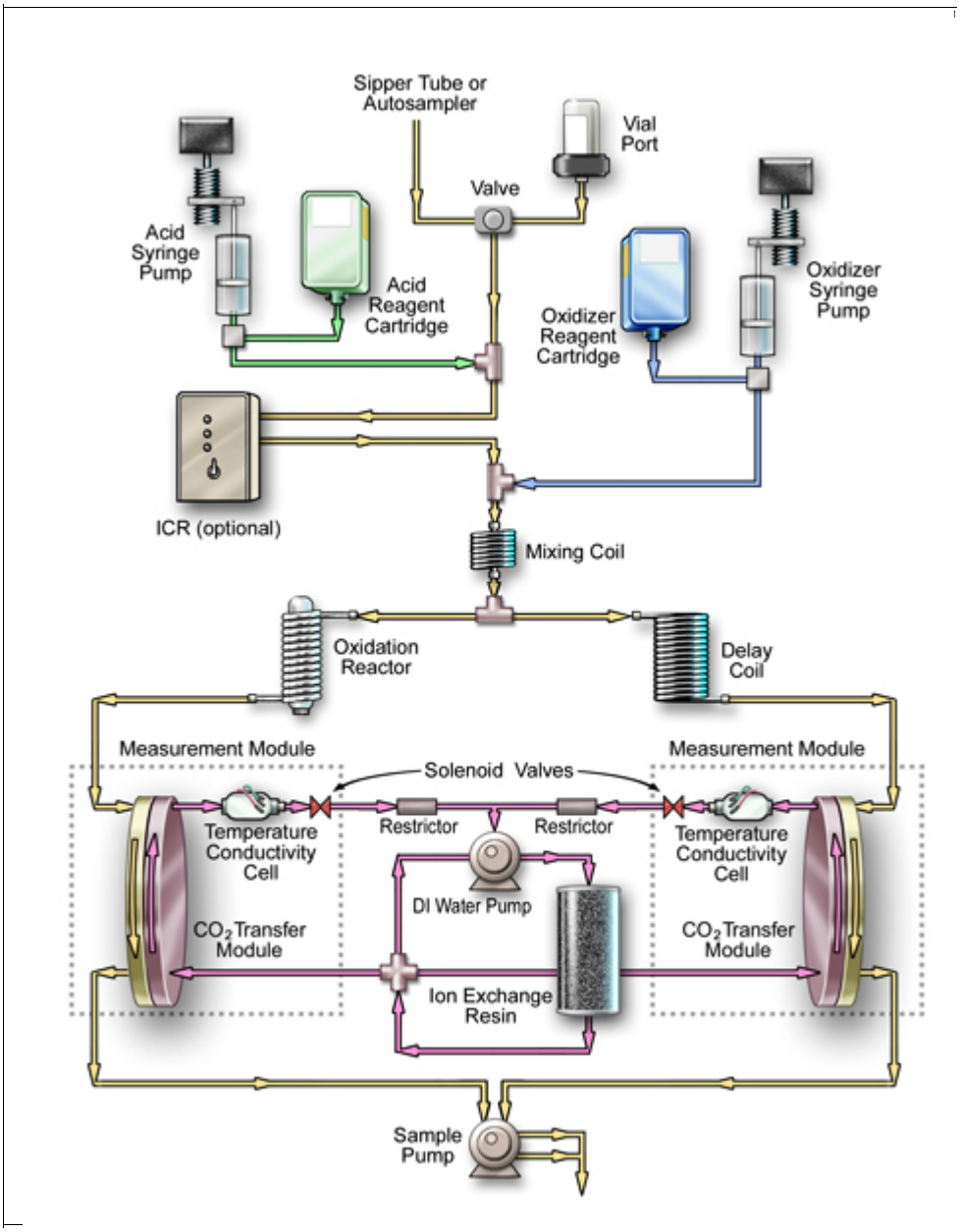


Figure 2: Analyzer Schematic — Laboratory Model with GE Autosampler

Sample Flow Path

The Sievers 5310 C Analyzers can measure discrete samples. This feature is specific to the model as follows:

- The *Sievers 5310 C Laboratory TOC Analyzer* measures discrete samples by inserting a filled 40 mL sample vial into the vial port on the front of the Analyzer, or via a sipper tube. The optional GE Autosampler can be used to introduce samples from up to 120 vials in vial racks through the sample inlet port on the left side of the Analyzer.
- The Sievers *5310 C* Portable TOC Analyzer measures discrete samples by inserting a filled 40 mL sample vial into the IOS System, or via a sipper tube by bypassing the IOS System. The optional GE Autosampler can be used to introduce samples from up to 120 vials in vial racks through the sample inlet port on the back of the Analyzer. Continuous monitoring is accomplished by plumbing a sample line to the inlet of the IOS system.

After sample is introduced into the Analyzer, 6M phosphoric acid (H_3PO_4) (referred to as **Acid** in the user interface) is injected into the sample at the programmed flow rate to reduce sample pH to between 2 and 3; this allows for accurate measurement of TOC and IC.

If the optional Inorganic Carbon Remover (ICR) unit is utilized, after acid is added to the sample, excess IC is removed by the ICR by vacuum degasification.

The acidified sample is then combined with 15% ammonium persulfate ($(NH_4)_2S_2O_8$) (referred to as **Oxidizer** in the user interface) to promote oxidation of the organics. The sample travels through a mixing coil and on to a stream splitter.

The stream splitter divides the sample stream into two equal but separate flows. One stream is processed for the measurement of IC; the other is processed for measurement of TC.

The TC stream passes to an oxidation reactor where the sample is exposed to UV light. The combination of UV light and, depending on the application, persulfate oxidizes the organic compounds in the sample, converting carbon to CO_2. The reactor is a spiral quartz tube wrapped around the UV lamp. The UV lamp emits light at 185 and 254 nm resulting in the formation of powerful chemical oxidizing agents in the form of hydroxyl radicals produced by the photolysis of water (eq. 1) and persulfate (eq. 2, 3):

$$H_2O + h\nu\ (185\ nm) \rightarrow OH\cdot + H\cdot \qquad (1)$$

$$S_2O_8^{-2} + h\nu\ (254\ nm) \rightarrow 2\ SO_4\cdot^- \qquad (2)$$

$$SO_4\cdot^- + H_2O \rightarrow HSO_4^- + OH\cdot \qquad (3)$$

The hydroxyl radicals (OH·) will completely oxidize organic compounds, converting the carbon atoms of the organic compound into CO_2.

$$\text{Organic Compounds} + OH\cdot \rightarrow CO_2 + H_2O \qquad (4)$$

When the TOC concentration in the sample is low (<1 ppm), complete oxidation can usually be achieved using only the hydroxyl radicals from the photolysis of water (eq. 1) without the addition of persulfate.

The IC stream passes through a delay coil, which is designed to make the total transit time of the IC stream through the Analyzer the same as the transit time of the TC stream through the Analyzer.

When the TC stream exits the oxidation reactor and the IC stream exits the delay coil, each stream moves to its respective CO_2 Transfer Module. The CO_2 Transfer Module is a patented design, utilizing a gas-permeable membrane that allows the transfer of CO_2 across the membrane. The membrane separates the sample side of the Analyzer from the DI side. The DI side of the Analyzer is a closed loop and consists of two conductivity cells—one for the TC stream and one for the IC stream—a DI water pump, DI water reservoir, and ion exchange resin (resin bed).

CO_2 from the sample passes through the membrane into the DI water supplied by the integrated DI Loop, while interfering compounds and other oxidation by-products are blocked by the membrane and remain on the sample side. The CO_2 forms carbonic acid upon reaction with water, and the carbonic acid disassociates into hydrogen ions and bicarbonate ions:

$$CO_2 + H_2O \leftrightarrow H_2CO_3 \leftrightarrow H^+ + HCO_3^- \qquad (5)$$

DI water is continuously pumped through the DI side of the Analyzer, collecting the H^+ and HCO_3^- ions and H_2CO_3 and CO_2 molecules from the CO_2 transfer modules, delivering it to the conductivity cell for measurement. Then the ion exchange resin removes the HCO_3^- and other ions. The water is then pumped back to the CO_2 transfer module to repeat the sequence.

The TC and IC conductivity cells each contain a thermistor, and all conductivity readings are temperature corrected. The CO_2 from the TC and IC sample streams are measured by the respective conductivity cells, and the conductivity readings are used to calculate the concentration of TC and IC. Once the values are measured, TOC is calculated as the difference:

$$TOC = TC - IC \qquad (6)$$

Additional System Components

Microprocessor Controller and Electronics

All operations of the Analyzer are controlled by a 32-bit microprocessor. Proprietary electronic board assemblies monitor and control Analyzer functions:

- **Main board**, including the 32-bit microprocessor, 1 MB of program memory, 1 MB of data memory, battery-backed nonvolatile memory for operator settings, digital I/O, QVGA color graphics controller, stepper motor controllers, printer output, interface to USB storage devices, RS-232 (serial) port, or Ethernet port[4]
- **Analog-to-digital conversion board** with integrated signal conditioning circuits for two conductivity and four temperature measurements
- **Color LCD QVGA display** with touch panel
- **Passive interconnect board**
- **ID board** with nonvolatile memory for system specific coefficients

Model Specific:

- *5310 C Portable TOC Analyzer* — I/O board containing interfaces to external devices via Ethernet[4] and 4-20 mA output

Data Outputs

Each Analyzer has serial (RS-232), USB, printer ports, and an Ethernet port (firmware version 2.02 or later) allowing flexibility for exporting encrypted data and printing data. Real-time and historical data can be transferred from the Analyzer via the serial or Ethernet port to a computer using communication software, such as HyperTerminal. (For details, see "Using HyperTerminal" on page 184.) Historical data can be transferred from the Analyzer via the USB port to a USB flash storage device (provided) and then transferred to any computer that supports USB. The *Sievers 5310 C Portable TOC Analyzers* also have one analog output (4-20 mA) which can be customized to track specific data values.

Note: The Analyzer cannot be directly connected to a computer via the USB port. Rather, the Analyzer's USB port can only be connected to a USB storage device, such as a USB flash memory drive.

[4]Available with firmware 2.02 and later only

Major Accessories and Configurations

Inorganic Carbon Remover (ICR) Unit

For water samples containing high levels of inorganic carbon (IC) compared to the TOC levels (such as some municipal water systems, groundwater supplies, and RO permeates), improved accuracy in TOC measurements can be achieved by removing most of the IC prior to TOC measurement. The Sievers 900 ICR consists of a vacuum degassing module, a vacuum pump, and a carbon and soda lime trap. In operation, the water sample is introduced into the Analyzer and acid is added to the sample as usual. The stream is then directed through the vacuum-degassing module. Carbon dioxide produced from the reaction of bicarbonate and carbonate with acid is removed from the sample stream by the vacuum. The sample is returned to the Analyzer and is directed by the stream splitter for measurement of IC and TC. Approximately 98% of the IC is removed at concentrations up to 25 ppm. The activated carbon/soda lime trap prevents contamination of the sample stream from organic compounds and CO_2 in the atmosphere.

Typically, if the TOC is 10% or less of the IC concentration, the ICR will be required. For example, if the IC is 50 ppm, then use the ICR if the TOC is 5 ppm or less for accurate TOC measurements. The Analyzer will calculate the TOC/IC ratio for each measurement; if this ratio is less than 0.1, a warning message will be issued and written to the Warnings/Errors list.

GE Autosampler System

The optional GE Autosampler System consists of:

- GE Autosampler
- Sievers DataPro 5310 C Software, running on a computer with a Windows® Operating System
- Sievers 5310 C Laboratory or Portable TOC Analyzer
- Printer (optional)

DataPro 5310 C software controls both the Analyzer and the GE Autosampler. Vials are screw-capped and have a Teflon®-lined septa. A stainless steel needle is used to transfer samples from the sample vials into the Analyzer. Results are displayed and stored on the computer via the DataPro 5310 C software.

Chapter 3. Installation

Overview

This chapter provides installation instructions for Sievers 5310 C Laboratory and Portable TOC Analyzers, and will help familiarize you with Analyzer design and function for the Laboratory and Portable models. An interior overview diagram of each Analyzer model is available in Chapter 7: Maintenance. If you need additional assistance, contact GE Analytical Instruments Technical Support at 303.444-2009 or 888.245.2595. Installation and training by a qualified service technician can also be provided. Technical Support in the United Kingdom is available at 44 (0) 161 864 6800. In other countries, visit www.geinstruments.co to locate your representative.

Warning
Original packing materials must be saved! If for any reason the Analyzer must be returned, it **must** be packed in the original carton to ensure that no damage occurs during shipment. There will be a charge if the Analyzer must be repackaged for return shipment. Insure the Analyzer for the return shipment.

Note: Hazardous reagents (ammonium persulfate and phosphoric acid) are used in the Analyzer. Before installing the reagents, please read the Material Safety Data Sheets (MSDS) contained in a pouch on the top of the reagent shipping box for proper handling precautions and spill or leak procedures.

Step 1: Unpack and Inspect the Analyzer

Before you begin

Download the *Operation and Maintenance Manual* from www.geinstruments.com. (The optional print version, if purchased, is shipped separately from the instrument.)

Open the shipping boxes and verify that they contain the following:

1. *Analyzer Quick Start Guide*
2. Sievers 5310 C Series TOC Analyzer
3. Accessory package:

   (Sievers 5310 C *Laboratory TOC Analyzer)*

   - 1/16"-OD Teflon tubing with 1/4" Valco® nut and ferrule (for container sampling, also referred to as a "sipper tube")
   - Replacement pump tubing assembly
   - 1/8" OD tubing with 1/8" SwageLok® fitting for waste line, approximately 50" long
   - 1/8" OD tubing with 1/8" SwageLok fitting for waste line, approximately 12" long
   - 3/32" Allen wrench, approximately 12" long
   - 1/4" open-end wrench
   - Water bottle (250 mL) with nozzle for filling DI water reservoir
   - USB flash memory drive
   - pH paper
   - 10-mL graduated cylinder

   (Sievers 5310 C *Portable TOC Analyzer)*

   - 1/4" sample inlet tubing with capsule filter (for sampling through IOS System)
   - 25/32" clamp for 1/4" sample inlet tubing
   - 1/16"-OD Teflon tubing with 1/4" Valco nut and ferrule (for container sampling, also referred to as a "sipper tube")
   - Replacement pump tubing assembly
   - 3/4" OD tubing for waste line (for on-line configuration)
   - 1/8" OD tubing with 5/16" SwageLok fitting for waste line (for grab configuration)
   - 3/32" Allen wrench

- 1/4" open-end wrench
- 9/16" open-end wrench
- Water bottle (250 mL) with nozzle for filling DI water reservoir
- USB flash memory drive
- pH paper
- Stainless steel metric tubing converter (1/4-in-to-6-mm tube)
- 1/8" OD tubing with 1/8" Swagelok fitting for waste line, approximately 12" long
- 10-mL graduated cylinder
- Rubber plug for IOS waste line

4. Reagent package containing:
   - Acid reagent cartridge
   - Oxidizer reagent cartridge

Note: Do not start the Analyzer until the reagents have been installed and the DI water reservoir has been filled with DI water.

   - Analyzer power cord
   - Certificate of Analysis
5. Certificate of Calibration

Additional Installation Equipment

To install the Sievers 5310 C Series TOC Analyzers, the following equipment is also required:

- Grounding strap for ESD protection
- Ethernet cable (optional)

Additionally, equipment needed for the specific model follows:

Sievers 5310 C *Portable TOC Analyzer:*

- Analog (4-20 mA) recorder (optional)

Step 2: Complete the Identification Records

Complete the Identification Records section on “Identification Records” on page 2 by recording the date of installation and the Analyzer serial number (found on the back of the Analyzer).

Step 3: Select a Location for the Analyzer

When selecting a location your Analyzer, refer to information in this section pertaining to your specific model of Analyzer.

Additionally, avoid direct sunlight and extreme temperatures. And, avoid operating at elevated temperatures (greater than 40 °C), since they can prevent proper operation; operating at low temperatures (lower than 10 °C) can cause errors in the measurements.

Place the Analyzer on a clean, unobstructed surface that can accommodate the Analyzer’s dimensions and weight. For details, refer to the specifications listed for your specific Analyzer model in Chapter 2, "System Description." For proper heat dissipation, ensure that 16 cm is available at the rear and on both sides of the Analyzer. For Online mode sampling in the Sievers 5310 C Portable TOC Analyzer, you should place the Analyzer within 3 m of the port or beaker to be tested. If you will be using the Analyzer with an GE Autosampler system, be certain there is adequate space to the left of the Analyzer for the GE Autosampler. Consult the *DataPro 5310 C Software with GE Autosampler Operation and Maintenance Manual* for details.

Step 4: Install the Reagent Cartridges

The oxidizer and acid reagents are shipped from GE Analytical Instruments in specific packaging for safety in transit. Carefully read the attached MSDS sheets prior to opening the packaging. Within the packaging are two reagent cartridges. Each reagent cartridge is identified with labels that indicate which cartridge contains ammonium persulfate and which cartridge contains phosphoric acid.

Warning
Installation of the reagents requires access to the inside of the Analyzer. To avoid potentially dangerous shock, disconnect the power cord before opening the side panels of the Analyzer.

Warning

To avoid exposure to the chemical reagents, wear acid-resistant gloves, protective clothing, and safety goggles or a face shield when changing the reagent supplies.

Warning

Reagent containers are for single-use only — **do not refill**. Refilling or reusing reagent containers will void all Analyzer and parts warranties and nullify any performance claims.

1. Open the Analyzer, as follows:
   - *Sievers* 5310 C *Laboratory TOC Analyzer* — Open the side panel by loosening the two preset thumb screws on the back and then pulling the panel away from the Analyzer.
   - *Sievers* 5310 C *Portable TOC Analyzer* — Open the side panels by unscrewing the two Phillips screws set into either side of the handle and then pulling away from the Analyzer.
2. Locate the reagent enclosure located at the top left-hand side of the Analyzer as you face the Analyzer, loosen the set screw, and then:
   - Lift the restraining bar.
3. Remove the reagent containers from the packaging. Record the expiration date of the acid and oxidizer, and the volume of the oxidizer in the Notes column, on the **Maintenance Worksheet.** (Table 15 on page 160.) You will need to enter these dates into the Analyzer in Step 8 of this section.
4. Locate the acid supply line indicated by the **Acid** label. Attach the PEEK nut to the acid reagent container and tighten finger-tight.
5. Slide the valve on the acid container to the open position by pushing the green button all the way in. Refer to the labeling on the container for proper positioning.
6. Slide the acid container into the reagent enclosure, with the valve pointing down and toward the front of the reagent enclosure.
7. Locate the oxidizer supply line indicated by the **Oxidizer** label. Attach the PEEK nut to the oxidizer container and tighten finger-tight.
8. Slide the valve on the oxidizer container to the open position by pushing the green button all the way in. Refer to the labeling on the container for proper positioning.
9. Slide the oxidizer container into the reagent enclosure, with the valve pointing down and toward the front of the reagent enclosure.
10. Do the following:
    - Lower the reagent restraining bar to the left to ensure that the reagent containers are secure.

Step 5: Fill the DI Water Reservoir

Fill the DI water reservoir with DI water, using the squeeze bottle provided in the accessories kit. Refer to Figure 3: Filling the DI Water Reservoir, as needed.

1. Fill the water bottle with DI water.
2. Remove the rubber inlet cover on the DI water reservoir.
3. Slide the bottle nozzle into the inlet hole and gently squeeze the bottle. Be sure to fill the reservoir until the water reaches the fill line, just below the inlet.
4. Replace the rubber inlet cover. Visually check for leaks from the reservoir after the reservoir has been filled.

Note: The DI water pump will not be properly primed unless you follow the instructions in the section called "Powering On the Analyzer" later in this chapter.

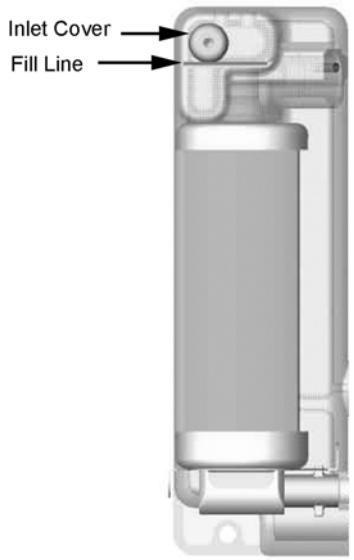


Figure 3: Filling the DI Water Reservoir

Step 6: Install External Devices

Installing the Analog Outputs (Portable Analyzer Only)

You can install analog outputs on the *Sievers 5310 C Portable Analyzer*.

If you will be using 4-20 mA output with your configuration, install it now. The Analyzer has one 4-20 mA output located on the back of the Analyzer. The wire should be 28-16 AWG, rated to 300 Volts. Strip length should be 8-9 mm (.33 in). To attach the output connections, completely loosen the screw on top of each connection, insert the wire, tighten the screw, and then gently pull on each connection to make sure the connection is secure. The maximum 4-20 mA load is 600 ohms, and power isolation level is 240 VAC rms.

Pin 1 = 4-20 mA + Output
Pin 2 = 4-20 mA - Output

Note: Before installing the wiring, put on a grounding strap for ESD protection.

If you need to temporarily re-locate the Analyze later, you can remove the output connector by loosening the screws on either side of the wires and pulling the connector straight out from the panel mount. When you replace the connector, be sure to tighten the screws firmly.

A sample wiring connection is shown in Figure 4: Wiring Diagram for the 4-20 mA Connection.

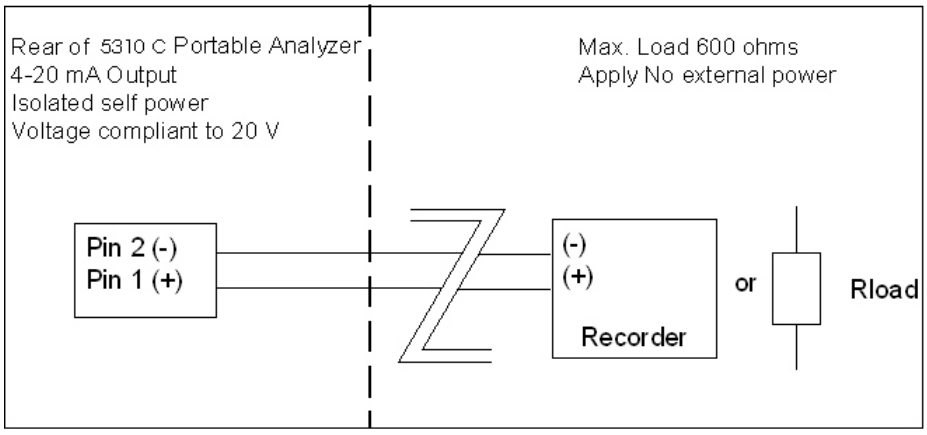


Figure 4: Wiring Diagram for the 4-20 mA Connection

Wiring the Ethernet Cable

Data from the Analyzer may be exported via Ethernet. Attach one end of the cable to the Ethernet port[5], and then attach the other end of the cable either to an Ethernet port on the your network or to a computer. You must also activate the Modbus feature, as described in "Using the Ethernet Connection and Modbus" on page 98.

Installing the Printer

The Analyzer has a 25-pin parallel (Centronics) printer port for connecting an optional printer. The printer must be IBM compatible or Epson FX 850 compatible. GE Analytical Instruments sells a Citizen printer for use with the Analyzer.

To install the printer, follow these steps:

1. Connect the printer's power converter to a grounded power source, and plug the cable in to the back of the printer.
2. Connect the printer cable to the port labeled **Printer** on the Analyzer, and secure with the captive screws.
3. Connect the other end of the printer cable to the printer, and snap the clips into place.
4. Consult the instructions that come with the printer for additional setup help. Load the paper, and make sure the printer is ready to print. (Depending on the printer model, press **SEL** or **Online** so that the green light is illuminated.)

Installing the USB Connection

The USB port is solely intended to provide data transfer to a USB flash memory drive. The flash memory drive 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 significant variance among USB devices, not all USB flash memory devices are compatible with the Analyzer.

To attach the USB flash memory drive, simply slide it into the USB port on the Analyzer. The location of the USB port for each Analyzer model is shown in Figure 5: Input and Output Connectors on page 66.

[5]The case enclosure of older model Sievers 5310 C Laboratory TOC Analyzers, manufactured prior to the release of firmware 2.0, does not contain an external Ethernet port.

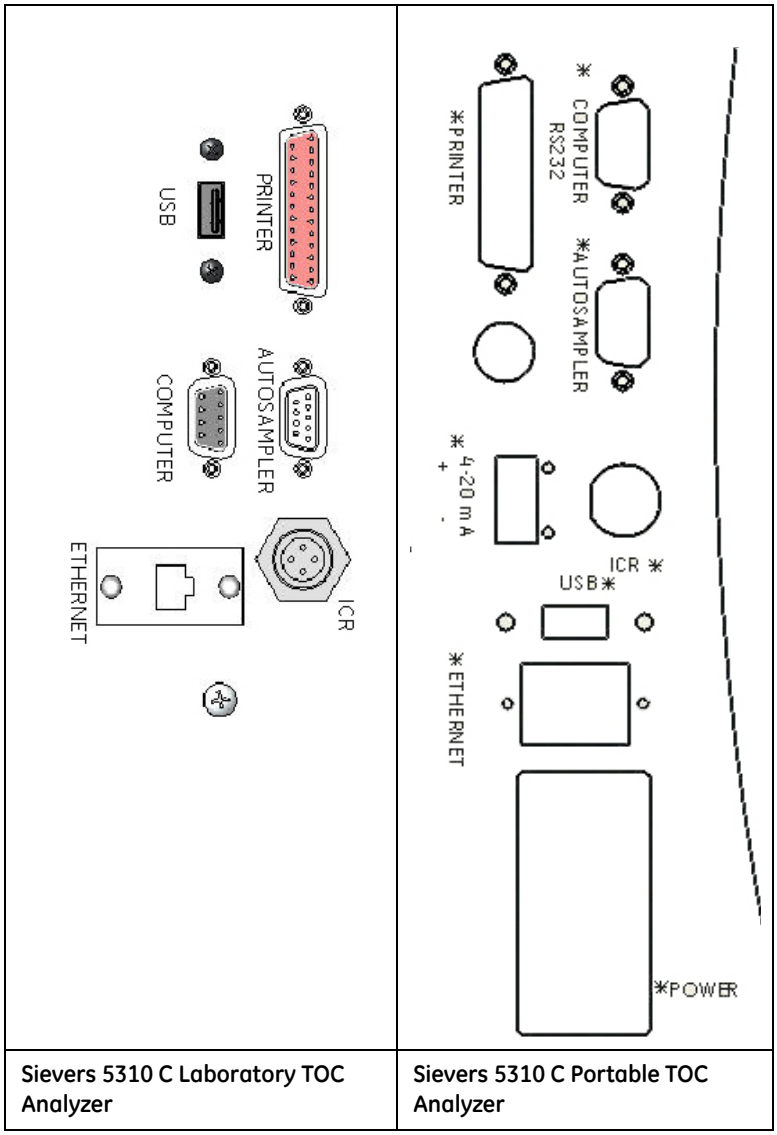
Installing the Serial Connection

The serial connection is optional and provides an additional means of capturing data from the Analyzer. Serial cables are available at many computer and office supply retail stores. To install the serial connection:

1. Connect the male end of the serial cable to the port on the Analyzer labeled **Computer RS232** and tighten the captive screws.
2. Connect the other end (female end) of the cable to the serial port on your PC and tighten the captive screws.

Note: Serial communication is supported only for computers running the Windows operating system.

For long distance connections (up to 1,000 feet or 305 meters), GE Analytical Instruments recommends use of either a RS-232 current loop converter or a RS-485 converter.



Sievers 5310 C Laboratory TOC Analyzer	Sievers 5310 C Portable TOC Analyzer

Figure 5: Input and Output Connectors

Connecting to a Power Supply

Both the *Sievers 5310 C Laboratory and Portable TOC Analyzers* come supplied with power cords. Attach one end of the power cord to the Analyzer and the other end to a grounded power source. Make sure the cord is seated securely at both ends.

Step 7: Connect the Sample Inlet System

Next, connect the sample inlet system for either online measuring (*Sievers 5310 C Portable TOC Analyzer*) or grab sampling (*Sievers 5310 C Laboratory and Portable TOC Analyzers*).

Note: If you are using the *Sievers 5310 C Laboratory* or *Portable TOC Analyzer* with a GE Autosampler, do NOT proceed with this section. Instead refer to the Sievers *DataPro 5310 C Software with GE Autosampler System — Operation and Maintenance Manual*. The information for connecting the sample tubing to the inlet port is located in the section, "Route the Sample Tubing."

Connections — Online Measuring

Sievers 5310 C Portable TOC Analyzers

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.

To install the integrated On-Line sample system

1. Connect the $^{1}/_{4}$" Teflon tubing with the capsule filter to the sample inlet on the IOS System. Tighten $^{1}/_{4}$ turn past finger-tight with a $^{9}/_{16}$" open-end wrench. Do not over-tighten the nut.

Warning
Operation of the Analyzer without the capsule filter on the sample inlet line will damage the Analyzer and void the warranty. To avoid damaging the Analyzer, install the filter and replace the filter element as needed.

Warning
To avoid false TOC readings and possible damage to the Analyzer, always make sure the sample is flowing through the IOS System, and the DI water reservoir is filled before starting analysis.

2. Connect the 3/4" OD waste line tubing to the waste outlet on the IOS System by sliding the tubing over the barb fitting.
3. To secure the connection to the waste outlet, place the hose clamp over the waste line and tighten.
4. Route the waste tubing to an appropriate waste outlet.

Note: The waste is gravity-drained, and, thus, the waste tubing cannot be routed above the level of the waste outlet on the IOS System.

5. After water flow to the IOS System has been established, the flow rate should be adjusted so that flow out of the waste line is between 50 - 300 mL/min. The flow rate is controlled by a needle valve, which is adjusted by the screw on the IOS. Turn the screw clockwise to decrease flow, and turn the screw counter-clockwise to increase flow.

Installing the Grab Sample Inlet System

Sievers 5310 C Laboratory TOC Analyzer

For Grab samples, place a 40 mL vial in the Analyzer's vial port and then operate the Analyzer in **Grab** mode. (For more information on **Grab** mode, see "Setting the Analyzer Mode" on page 80.) You can also collect the sample by connecting one end of a sipper tube to the Inlet port on the side of the Analyze and then placing the other end of the sipper tube in a sample container.

Sievers 5310 C Portable TOC Analyzer

To sample from a vial, place a 40 mL vial in the IOS System and operate the Analyzer in **Grab** mode. (See "Setting the Analyzer Mode" on page 80 for more information.) To run grab samples from a container, you must bypass the IOS System as described in the following steps:

To bypass the IOS system

1. Locate the 1/16" OD stainless steel tubing that runs from the IOS System to the bulkhead fitting labeled **Sample Inlet**. Use a 1/4" open-end wrench to loosen the Valco fitting at the **Sample Inlet** port. Carefully rotate the tubing away from the Analyzer so that tubing is clear of the inlet.
2. Locate the sipper tube (1/16" Teflon tubing with Valco nut) that is provided in the Analyzer's accessories kit.
3. Insert the Valco fitting into the **Sample Inlet** port on the left side of the Analyzer.
4. Tighten the Valco fitting until it is finger-tight, and then tighten an additional 1/8 turn using a 1/4" open-end wrench.

5. Place the open end of the sipper tube in the sample container, making sure that the end of the tubing is immersed in the sample. Place parafilm over the container opening. (Do not push the sipper tube through the parafilm or you may clog the tube.)
6. For Grab mode operation, you can use either of two waste outlet options:
   - To use the $^{3}/_{4}$" OD waste tubing, connect the tubing to the waste outlet on the IOS System by sliding the tubing over the barb fitting; place the hose clamp over the waste line to secure the connection to the waste oumtlet. A gravity drain must be provided for the waste.
   - To use the $^{1}/_{8}$" waste tubing, you must first disconnect the $^{7}/_{16}$" nut that connects to the port labeled **Waste**. Attach the Swagelok fitting to the **Waste** port on the back of the Analyzer, and tighten 1/4 turn past finger-tight using a $^{7}/_{16}$" open-end wrench.

Warning
The waste stream from the Analyzer is acidic and must be disposed of according to local regulations.

If you will be sampling from a container in On-Line mode, you must first disable the flow sensor. For details, see "Configuring the Flow Sensor" on page 106.

Step 8: Configure Basic Analyzer Settings

Before using the Analyzer, you will need to configure various basic settings. Some of these settings will not need to be changed again, unless you move the Analyzer or reconfigure the operational environment.

Powering On the Analyzer

1. Turn the Analyzer on using the main power switch. The Analyzer should power up and display the Startup screen. Push the **Main** button to display the **Main** screen.
2. The Analyzer may issue the alert, "It has been more than 24 hours since the last measurement. Press Flush to begin the operation." Press the **Cancel** button. You will perform a flush at the end of installation.
3. Turn the Analyzer off. To prime the DI water pump, power must be cycled in the following manner.
4. Wait 30 to 60 seconds, and then turn on the power again. Allow the DI pump to circulate water for at least 10 minutes.
5. After 10 minutes, open the Analyzer case, and check the tubing that leads to the resin bed (ion-exchange column). Most of the air originally in the tubing should be replaced with water. Tap or flick the tubes to move the air bubbles. If more than a few small bubbles remain in the tubing, repeat Steps 3 through 5.
6. If necessary, bring the level of DI water in the reservoir back up to the fill line.

7. Close the Analyzer case.
8. Press the **Menu** button.

Note: If the Analyzer emits a noise when you turn it on, or if water does not fill the tubing leading to the resin bed, it is possible the DI water pump was not properly primed. See the section called "Problems with the DI Water Pump" on page 168 for information on priming the pump.

Enabling Password Protection (Optional)

The Sievers 5310 C Series TOC Analyzers offers a Password Protection feature to provide a basic level of security.

If you will be using basic Password Protection, enable the feature now.

To Enable Password Protection

If you will be using basic Password protection, activate the password now by following the steps below.

1. Select the **Security*** tab.
2. Press the **Enable Password** button.

Once Password protection is enabled, you will immediately be required to log in to the Analyzer with the default Administrator User ID and Password:

User ID: ADMIN

Password: GEAI

For security purposes, change the default password. After you have logged in using the default password, follow these steps:

1. Select the **Security** tab.
2. Press the **Change Password** button.
3. Enter the old password (GEAI) and press **Enter**.
4. Enter the new password and press **Enter**.
5. Verify the new password and press **Enter**.
6. Record the new password in a secure location. All users will be required to enter this log-in information to access the Analyzer's menus.

Naming the Analyzer Location (Optional)

You can assign a name to the Analyzer, and this name will display with printed and exported data. This feature is particularly useful if you have multiple Analyzers at your facility and want to easily distinguish data collected from each unit. To assign a name, follow these steps:

1. Select the **Maintenance** tab.
2. Press the **Advanced** button.
3. Press the **Advanced Setup** button.
4. Press the **Location** button. Use the keypad to specify a name for the Analyzer and press **Enter**. Press the **Number** button and then the **Alpha** button to toggle between numbers and letters.
5. Press the **Back** button twice to return to the **Maintenance** tab.

Setting Reagent Expiration Dates

Because the reagents in your Analyzer are new, you must set the expiration dates so that the Analyzer can correctly monitor their consumption:

1. Select the **Maintenance** tab.
2. Press the **Consumables** button.
3. Press the **New Acid** button.
   - Enter the expiration date that was recorded on the **Maintenance Worksheet**: Press the **Day** button and use the numeric pad to specify the day of expiration. Press **Enter.** Repeat for the **Month** and **Year** buttons.
   - Press **Accept** after you have entered the complete expiration date.
   - You will be prompted to confirm the installation of new acid; press the **Confirm** button to continue.
4. Press the **New Oxid** button.
   - The oxidizer has a maximum 90-day life once it is installed. For the expiration date, enter the date 90 days from today, or enter the expiration date on the label and allow the Analyzer to adjust the date to 90 days from today: Press the **Day** button and use the numeric pad to specify the day of expiration and press **Enter.** Repeat for the **Month** and **Year** buttons.
   - Press the **Amount** button and confirm that the correct volume is selected, either **150 mL** or **300 mL**, as noted on the **Maintenance Worksheet**.
   - Press **Accept** after you have entered the complete expiration date and oxidizer volume.
   - You will be prompted to confirm the installation of new oxidizer. Press the **Confirm** button to continue.
5. Press the **Menu** button to exit the screen.

Setting the Analyzer Mode and Reagent Flow Rates

Before starting normal Analyzer operation, confirm that the mode settings match your configuration's needs.

1. Select the **Setup** tab. Confirm that the correct mode is selected.
   - Select **On-Line** to measure TOC continuously from a sample stream.
   - Select **Grab** to measure TOC directly from a sample flask or the vial port.

   For more information on mode selection, see "Setup" on page 80.
2. Press the **Configure** button.

   By default the Analyzer uses the reagent flow rates that are automatically calculated. If you know the specific flow rates you want to use for each reagent, you can manually set the flow rates, according to Table 3 on page 87 and Table 4 on page 87. For more information on setting flow rates, see "Setting Reagent Flow Rates" on page 83.
3. Press the **Menu** button to exit and save your settings.

Setting Up the Data History

Before taking measurements, review the **Archive Data** setting to ensure that data is collected in the best way for your environment. By default, data is stored in the Analyzer's flash memory, so that all measurements will be retained. If you want to change the **Archive Data** setting, follow these steps:

1. Select the **Data** tab.
2. Press the **Setup History** button.
3. Confirm that **Archive Data** is set to **On**.
4. Press the **Menu** button.

Turning off the **Archive Data** will result in data being overwritten after approximately 90 days.

Setting Up the Printer (Optional)

If you installed a printer in Step 6, configure the printer port to match the printer.

1. Select the **I/O** tab and press the **Printer** button.
2. Press the **Printer** button and select your printer model, either **Citizen, Seiko**, or **Epson**. If you do not have a printer, make sure **No Printer** is selected.
3. Press the **Header Freq.** button, and select **First Page** to print a header only on the first page of output, or select **All Pages** to print a header on all pages of output.
4. Press the **Print Freq.** button, and select how often you would like to print TOC data information.

Exporting and Printing Constants

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

To export the settings, follow these steps:

1. Select the **Maintenance** tab.
2. Press the **Advanced** button.
3. Press the **USB I/O** button. Make sure that the USB flash memory drive from the Analyzer's accessory kit is attached to the USB port; then press the **Save System** button. Archive the exported files in a secure location on your computer.
4. Press the **Back** button and then press the **Menu** button.

If you have a printer attached to the Analyzer, you can print these settings for future reference by following these steps:

1. Select the **Maintenance** tab.
2. Press the **Advanced** button.
3. Press the **Print Constants** button.
4. Press each of the four buttons, one at a time, to print the different constants.

Set Up Data I/O

If you are installing[6] the 4-20 mA output, configure settings for those features now. Select the I/O tab and configure the appropriate settings.

Note: You may need to consult with your remote operations center to determine some values. See Chapter 4 for details on configuring these settings.

Step 9: Flushing and Rinsing the Analyzer

Before placing the Analyzer into normal operation, you should perform a reagent flush to remove any gas bubbles that may have formed in the reagent lines, and then let the Analyzer run in On-line mode for 12 hours to thoroughly rinse the Analyzer.

[6]Not all of these I/O features are available in each Analyzer. Please refer to Chapter 3, "Installation" for the specific input/output features of these models.

For the reagent flush, the Analyzer must be connected to a supply of low DI water, either in a continuously flowing stream, 40 mL vial, or from a large flask (1000-2000 mL).

Before you begin

If you are running a *Sievers 5310 C Portable TOC Analyzer* in Grab mode for the flush, you must first bypass the IOS system, and then attach a sipper tube to the Sample Inlet port. Refer to "To bypass the IOS system" on page 68 for step-by-step instructions.

To flush and rinse the Laboratory or Portable Analyzer

1. Connect an online supply of DI water to the Analyzer, or connect a sipper tube from a container of DI water to the Analyzer's inlet port. Make sure that any online source of DI water is open and available to the Analyzer before continuing.
2. Verify that the Analyzer is powered *On*.
3. If you have an ICR, make sure the lever is set to the **Inline** position
4. Press the **Menu** button, and then select the **Setup** tab.
5. Press the **On-Line** button.
6. Select the **Maintenance** tab, and then press the **Consumables** button.
7. Press the **Flush...** button.
8. Press the **Both** button and then wait for the flush to complete. The Analyzer will not respond to additional commands until the flush is finished (after about 10 minutes). Do NOT disrupt power to the Analyzer while the flush is in progress.
9. When the flush is complete, turn off power to the Analyzer using the main power switch. Open the Analyzer case and visually inspect the Analyzer for leaks, especially around the DI water reservoir. If a leak is detected, make sure all fittings are tight and secure. Otherwise, close the Analyzer case and power the Analyzer *On*.

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Note: You must first turn off the flow sensor on the Portable Analyzer.

10. Press the **Start Analysis** button. Let the Analyzer run for 12 hours.
11. After 12 hours, press the **Stop Analysis** button.
12. Turn off power to the Analyzer with the main power switch. Open the Analyzer case and, again, visually inspect the Analyzer for leaks, especially around the DI water reservoir. If a leak is detected, make sure all fittings are tight and secure.
13. Remove the rubber inlet cover on the DI water reservoir, and use the water bottle to add more DI water, as the initial rinse down uses more DI water than normal operation.
14. Close the Analyzer case.

5310 C Laboratory TOC Analyzers

The Analyzer is now ready to take TOC measurements:

- *To use the Analyzer in an On-Line configuration*, attach the sipper tube to the Sample Inlet on side of instrument. Also, make sure the settings on the **Configure** screen (**Setup** tab → **Configure** button) are correct before starting your analysis. Refer to “Setup” on page 80 for additional details.
- *To use the Analyzer in **Grab** mode*, use the vial port in the front of the instrument. Select the **Setup** tab and press the **Grab** button. Also make sure the settings on the **Configure** screen (**Setup** tab → **Configure** button) are correct before starting your analysis. Refer to “Setup” on page 80 for additional details.
- *To use the Autosampler*, refer to the *DataPro 5310 C Software with GE Autosampler System* Operation and Maintenance Manual.

To customize additional settings, refer to Chapter 4, "Basic Analyzer Operation" for details.

5310 C Portable TOC Analyzers

The Analyzer is now almost ready to take TOC measurements:

- *To use the Analyzer in an On-Line configuration*, reattach the stainless steel fitting from the IOS. Also, make sure the settings on the **Configure** screen (**Setup** tab → **Configure** button) are correct before starting your analysis. Refer to “Setup” on page 80 for additional details.
- *To use the Analyzer in **Grab** mode*, you do not need to make additional sample configuration changes, however, you must change the analysis mode. Select the **Setup** tab and press the **Grab** button. Also make sure the settings on the **Configure** screen (**Setup** tab → **Configure** button) are correct before starting your analysis. Refer to “Setup” on page 80 for additional details. *To sample from a vial*, you must reconnect the IOS System. Disconnect the sipper tube from the **Sample Inlet** port using a $^{1}/_{4}$" open-end wrench. Then, attach the stainless steel tubing that runs from the IOS System to the **Sample Inlet** port by tightening the fitting with the $^{1}/_{4}$" open-end wrench $^{1}/_{8}$ turn past finger-tight.
- *To use the Autosampler*, refer to the *DataPro 5310 C Software with GE Autosampler System* Operation and Maintenance Manual.

To customize additional settings, refer to Chapter 4, "Basic Analyzer Operation" for details.

Chapter 4. Basic Analyzer Operation

Overview

The Sievers 5310 C TOC Analyzers utilize a touch-sensitive color LCD for all menu selection activities. An overview of the menu structure is given in "The Menu Screen" on page 79. An overview of hardware features starts on page 107.

When the Analyzer is first powered on, the Startup screen displays basic GE Analytical Instruments contact information and the firmware version number. The Analyzer then begins initialization to check the status of consumables and to prepare for taking measurements. When the Analyzer is done with initialization, the **Main** screen automatically appears. If you would like to return to the Startup screen, press the **Maintenance** tab, followed by the **System Info** button. If Password protection or DataGuard is enabled, you will be required to log in before starting analysis or proceeding to the **Menu** screen.

Note: Some menu options may not be available, depending on the mode in which the Analyzer is operating. In particular, when the Analyzer is performing analysis, menu options that can affect analysis are not available. (They appear "grayed out.")

Note: If your configuration will include a GE Autosampler system, consult the *DataPro 5310 C Operation and Maintenance Manual* for details on operating the Analyzer and GE Autosampler with the DataPro software.

The Main Screen

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

- Press the **Start Analysis** button to initiate TOC measurements with the most current Analyzer settings. Once analysis begins, the button changes to **Stop Analysis**.
- Press the **Menu** button to display the **Menu** screen and change the Analyzer's settings.

Note: If Password security is enabled, you will be required to log in before accessing the Menu screen or starting analysis. See "Using Password Protection" on page 111.

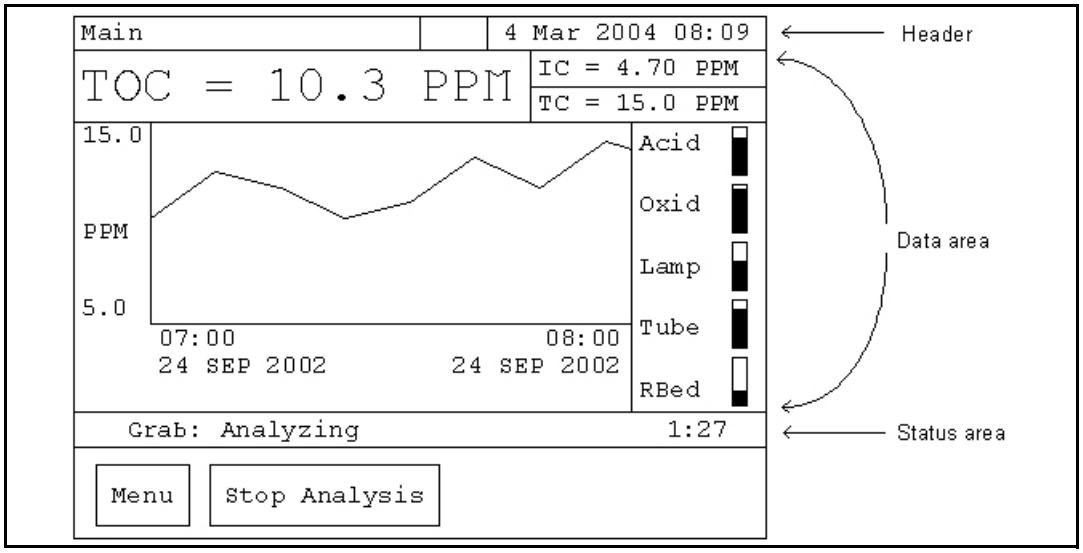


Figure 6: The Main Screen

Note: Unless otherwise noted, the screenshots in this chapter are taken from the *Sievers 5310 C Portable TOC Analyzer*. Some buttons may not display on the *Sievers 5310 C Laboratory*, as noted.

The **Main** screen is divided into three areas:

1. The Header contains the name of the screen, the date and time, and status icons representing the following conditions:
   - The Key icon ( ) appears when basic Password security is enabled.
   - The **W** icon appears when a warning has been issued, and the **E** icon appears when an error has been issued. (See "Reviewing Warnings and Errors" on page 102 for more information.)

2. The Data area shows indicators for the status of the Analyzer's primary consumables. (See "Displaying Consumables Status" on page 102 for more information.) Information about TOC measurements also appears, depending on which mode the Analyzer is in:
   - In On-Line mode, a trend graph appears on the **Main** screen; to change the scale and specify which readings display on the graph, see "Graphing Data History" on page 91.
   - In Grab mode, a table of sample statistics appears on the **Main** screen.
3. The Status area displays information about the current operation mode (On-Line or Grab), the Analyzer's current status (Initializing, Idle, Analyzing, etc.), a countdown timer showing the time remaining in the current analysis, and the repetition and rejection count, if applicable.

Taking TOC Measurements

After you have set the mode to **Grab** or **On-Line**, as described in "Setting the Analyzer Mode" on page 80, and have configured mode settings, you are ready to begin taking TOC measurements. Simply press the **Start Analysis** button to begin.

When the Analyzer is in Grab mode, as each measurement is completed, the repetition and reject numbers are updated on the **Main** screen, and the data from the last measurement are displayed.

When the Analyzer is in On-Line mode, as each measurement is completed, the data are plotted on the trend graph on the **Main** screen. To change the way the data display on the graph, see "Graphing Data History" on page 91.

The Menu Screen

The **Menu** screen provides you with access to all Analyzer settings and configuration options. Note that if Password protection is enabled, some options may be available only to certain users.

The **Menu** screen contains the five main configuration categories; press a tab to display the available options:

- **Setup** — Set the Analyzer mode and change parameters such as reagent flow rates and, in Grab mode, the number of repetitions and the number of rejects.
- **Data** — Display and export historical data stored in RAM.
- **I/O** — Configure the input and output of data from the Analyzer.
- **Maintenance** — Display information about the Analyzer's consumables levels, system information, and error messages. Also, perform calibration and operations.
- **Security** — Enable or disable password protection, or change the password.

Setup

Options on the **Setup** tab let you specify preferences and basic operation settings for the Analyzer configuration. If the sample conditions for your application remain relatively constant, you should seldom need to configure the settings here, especially if you use the Autoreagent flow rate setting.

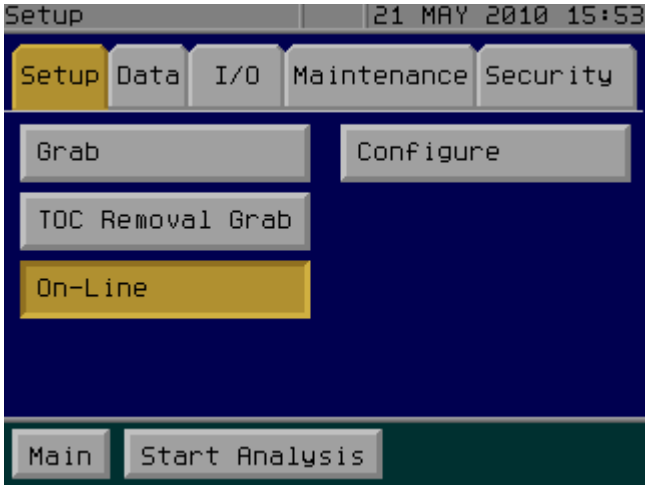


Figure 7: The Setup Tab

Setting the Analyzer Mode

The Sievers 5310 C TOC Analyzer can operate in three different modes. To set the Analyzer mode, follow these steps:

1. Select the **Setup** tab. (See Figure 7.)
   - Select **Grab** to measure TOC from 40 mL vials in the iOS System. After you select **Grab**, you will need to press the **Configure** button to configure the settings for Grab mode. See "Grab Measurement Setup" on page 82 for details.
   - Select **TOC Removal Grab** to calculate the TOC% removal values in Grab mode, from 40-mL vials. See "TOC Removal Percentage Calculations in Grab Mode" on page 81 for details.
   - Select **On-Line** to measure TOC continuously from a sample stream or sipper tube. If a sipper tube is used in the portable Analyzer, the Flow Sensor must be disabled; see "Displaying System Information" on page 107 for details.

On-Line Measurement Setup

When selecting On-Line mode, and pressing the configure button, you have the following options:

- **Reagent**: You can use either manual reagent settings or the Autoreagent feature. For details on the Autoreagent feature, see "Using the Autoreagent Function" on page 86.
- **Acid and Oxidizer**: Use these buttons to set the reagent flow rates. For complete information on reagent settings, see "Setting Reagent Flow Rates" on page 83.

TOC Removal Percentage Calculations in Grab Mode

To perform TOC Removal calculations in **Grab** mode from the sample in the vials, follow these instructions:

1. Select the **Setup** tab.
2. Press the **TOC Removal** button.
3. Press the **Start Analysis** button.
4. You will be prompted to put the vial containing the effluent into the vial port or IOS System. Press **Next** to continue. (See Figure 8.)

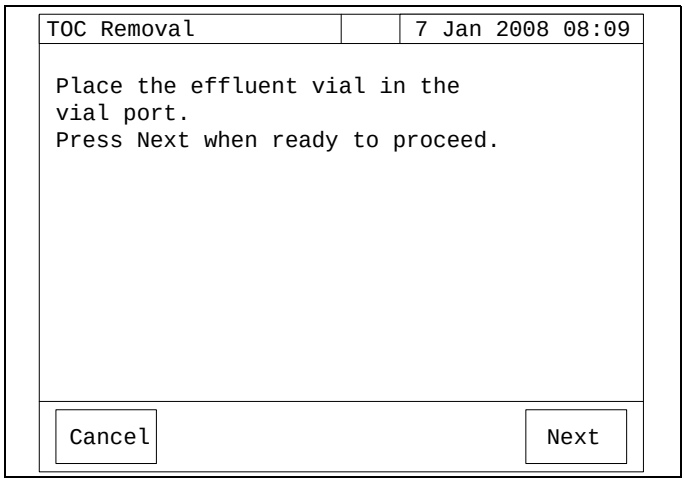


Figure 8: Starting the TOC Removal Analysis

5. When the Analyzer is finished with the effluent vial, you will be prompted to enter the influent vial into the vial port or IOS System. Remove the effluent vial, insert the influent vial, and then press **Next** to continue.
6. When the Analyzer is finished with the influent vial, the TOC Removal summary screen displays, showing the averaged TOC value and RSD for the influent and effluent, as well as the TOC removal percentage. (See Figure 9.)
   - Press **Print** if you want to print the results.
   - Press **Exit** to return to the **Setup** tab.

7. To maintain a record of TOC Removal Percentage protocols, export the data to a file via the Calibration History. (For details, see "Reviewing Calibration and Verification History" on page 134). You can also print data from the regular Data History, but this raw data does not include the removal percentage. (For details, see "Printing Data History" on page 92.)

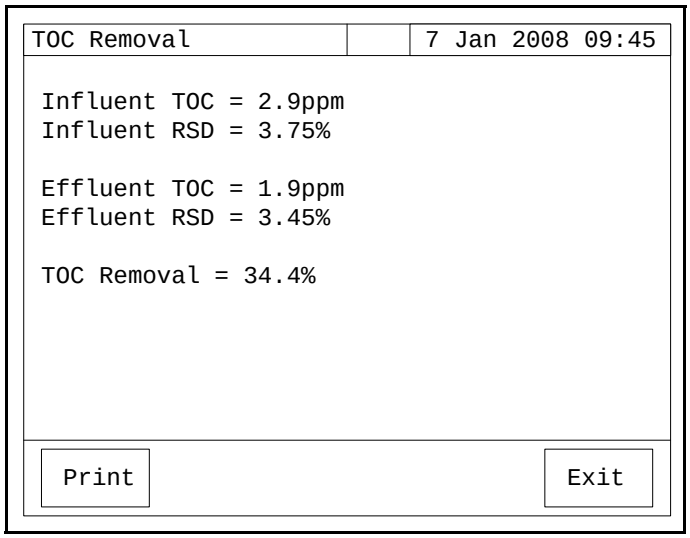


Figure 9: The TOC Removal Statistics Screen

Grab Measurement Setup

When selecting Grab mode, in addition to reagent settings (see "Setting Reagent Flow Rates" on page 83), you also need to specify the number of replicate measurements and rejects. Optionally you also can assign a label to grab measurements.

1. On the **Setup** tab, press the **Configure Mode** button.
2. Press the **Reps** button to set the number of replicate TOC measurements to be made on the sample. When you press the button, a number pad displays. Enter a number and press the **Enter** button to save the value, or press **Cancel** to retain the current setting without making any changes.
3. Press the **Rejects** button. This option determines how many of the replicate measurements will be rejected in calculating average values and standard deviations. When you press the button, a number pad displays. Enter a number and press the **Enter** button to save the value, or press **Cancel** to retain the current setting without making any changes.
4. Press the **Grab Label** button to assign an alphanumeric label of up to 7 characters to each grab sample. The label displays in the data history. After the analysis completes, the **Grab Label** resets to its default value.

In most cases, this first measurement will be close to the actual TOC but may be outside of the repeatability of the Analyzer. It is best to set the number of rejections to **1** or more to ensure an accurate TOC value. Using at least **4** repetitions allows rejection of the first value and calculation of a standard deviation using the remaining values.

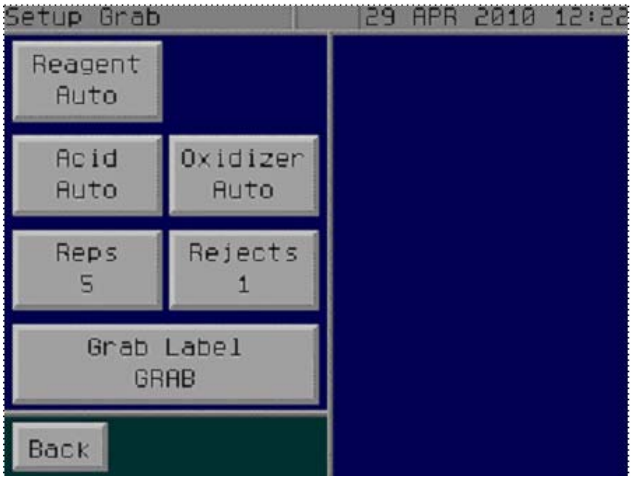


Figure 10: Configuring Grab Mode Settings

Setting Reagent Flow Rates

You can operate the Analyzer in Manual Reagents mode by manually selecting the proper reagent flow rates for the sample, as described in the section, "Setting Manual Flow Rates" on page 87. In another option, Autoreagent mode, the Analyzer will automatically calculate and implement the proper reagent flow rates. This feature simplifies the process of manually determining optimum reagent flow rates. GE recommends the use of manual reagents whenever possible.

When the Autoreagent function is active, the Analyzer performs a preliminary measurement of each new sample before it performs the measurements for which results are reported. The preliminary measurement is used by the Analyzer to determine the correct acid and oxidizer flow rates for the subsequent analyses of that sample. This preliminary measurement does consume additional reagents, so take this into consideration for reagent usage.

The acid flow rate is set according to the TC and IC concentrations estimated during the preliminary measurement. These concentrations may not exactly match the results of the subsequent analytical measurements, but, because there is a range of acceptable flow rates for any given sample concentration, they are accurate enough to establish the acid flow rate required for the analytical measurements.

Table 1: Acid Flow Rate (no ICR) — Preliminary Measurement with Autoreagent Function

Results of Preliminary Measurement	Selected Acid Flow Rate
TC < 500 ppb	0.3 μL/min
TC ≥ 500 ppb and IC < 50 ppm	1.0 μL/min
IC ≥ 50 ppm	2.0 μL/min

Table 2: Acid Flow Rate (with ICR) — Preliminary Measurement with Autoreagent Function

Results of Preliminary Measurement	Selected Acid Flow Rate
IC < 400 ppb	2.0 μL/min
IC ≥400 ppb	4.0 μL/min

To set the oxidizer flow rate during the preliminary measurement, the oxidizer syringe pump is turned on at a high flow rate (>20 µL/min) for a short time and then is turned off. (The actual flow rate depends on the age of the reagent.) This results in a pulse of persulfate in the sample stream. As this pulse flows into the oxidation reactor, diffusion causes the concentration of persulfate to "spread out." The concentration of persulfate in the UV reactor peaks, and then the concentration gradually decreases. There is a large excess of persulfate at the peak, but the concentration decreases until there is insufficient persulfate to completely oxidize the sample. Somewhere in-between, the persulfate concentration in the UV reactor is the optimum for the concentration of TOC in the sample at that moment.

When the persulfate concentration is the optimum, the maximum amount of CO_2, formed in the UV reactor, permeates through the membrane in the TC channel. If the TOC concentration is 10 ppm or greater, the conductivity at the TC conductivity cell peaks at a time that corresponds to when the persulfate concentration was optimum in the UV reactor. The instrument determines when the maximum conductivity occurs and then calculates the optimum oxidizer flow rate for that sample.

However, samples having lower TOC concentrations produce conductivity plateaus, rather than peaks. For those samples, the instrument calculates the optimum oxidizer flow rate from the conductivities and temperatures that exist during the plateau.

The Autoreagent function compensates for the aging of the persulfate reagent and the UV lamp. It does not compensate for changes in the sample flow rate, such as after the sample pump tubing is replaced. The sample flow rate increases when new tubing is installed, and the flow rate stabilizes after a few days of operation. For that reason, the tubing used in the Sievers 5310 C Series Analyzers has been "broken in" at the factory so that the flow rate is relatively stable immediately after it is installed.

Still, the sample flow rate will vary from one set of tubing to another. To compensate for this variability, Sievers 5310 C Series Analyzers can calibrate the sample flow rate so that it is optimized and the same whenever pump tubing is replaced.

The preliminary measurement is necessarily performed differently than a normal analysis because its purpose is to set the reagent flow rates. Therefore, its results are not reported by the Analyzer. It also should be noted that the time before the Analyzer reports its first results for the sample is extended by 14 to 16 minutes. The Autoreagent function is employed most productively when the concentration of the samples to be analyzed is expected to vary greatly, thus eliminating the need to run duplicate samples in order to determine optimum flow rates.

When the Analyzer is in Grab mode or operating with the Autosampler, and Autoreagent mode is activated, the Analyzer initially performs a preliminary measurement on each new sample vial. Following the preliminary measurement, the Analyzer sets the acid and oxidizer flow rates to be used on that sample, and the analytical measurements are then made in the normal fashion.

When the Autoreagent function is used in the On-line mode, the Analyzer performs a preliminary measurement when the analysis is started. Then the Analyzer performs analytical measurements of the sample stream in the normal fashion.

The acid flow rate is adjusted according to the IC concentration measurements made during those analytical measurements — if the IC concentration increases from 49.9 ppm to 50.0 ppm during the analytical measurements, the acid flow rate will increase from 1.0 to 2.0 mL/min. (The Analyzer makes these adjustments using averages of the IC measurements so that a single measurement of 50.0 ppm IC will not result in an abrupt increase in acid flow.)

Following the preliminary measurement, the Analyzer adjusts the oxidizer flow rate as the TOC concentration changes during the analytical measurements. To do this, the Analyzer calculates the ratio:

$$\frac{\text{Selected Oxidizer Flow Rate, } \mu\text{L/min}}{\text{TOC Measured During Prelim. Meas., ppb}}$$

This ratio is used to calculate the oxidizer flow rates to be used in the analytical measurements. The Analyzer uses an average TOC concentration in this calculation to avoid abrupt changes to the oxidizer flow rate caused by occasional higher or lower TOC measurements.

In the On-line mode, the preliminary measurement is repeated to allow the ratio of oxidizer flow rate to TOC concentration to be updated. The frequency of performing the preliminary measurement should be greater for sample streams that are expected to have more variable compositions. Therefore, the frequency is adjustable, with every 12 hours being the most frequent setting possible.

Persulfate is normally only added for TOC samples above 1 ppm. Below 1 ppm, the hydroxyl radicals formed from the photolysis of water achieve sufficient oxidation and a low oxidizer flow rate (0.1 to 0.7 µL/min) is used.

Manual reagent mode should be selected for samples that are expected to be below 1 ppm. For samples below 500 ppb, it is common to set the oxidizer flow rate to 0 or 0.1 µL/min. Between 500 ppb and 1 ppm, set flow rates manually between 0.1 and 0.7 µL/min. Once established, there should not be a need to modify the flow rates.

Autoreagent mode is optimized for samples where the TOC is unknown or highly variable; it should not be used for samples below 1 ppm as oxidizer injected during the preliminary measurement (used to determine the proper flow rates) can result in bubble formation if the pre-measurement sample is very low in TOC. It may take several minutes for the Analyzer to clear these bubbles and return to a stable condition.

If you know the specific flow rates you want to use for each reagent, you can manually set the flow rates, according to the tables on page 87.

Note: Analysis must be stopped prior to changing the reagent flow rates.

Using the Autoreagent Function

Set up the Autoreagent function by following these steps:

1. Select the **Setup** tab.
2. Press the **Configure Mode** button. (See Figure 7.)
3. Make sure the **Reagent** button is set to **Auto**. The Analyzer will automatically calculate the flow rates for both reagents.
4. To modify the automatically calculated acid flow rate, press the **Acid** button and select an adjustment value: **+10%**, **+20%**, **-10%**, or **-20%**. You can also return the value to **Auto**. For municipal water applications whose alkalinity is less than 100 mg/L as $CaCO_3$, we recommend selecting the adjustment value -20%for acid only.
5. To modify the automatically calculated oxidizer flow rate, press the **Oxidizer** button and select an adjustment value: **+10%**, **+20%**, **-10%**, or **-20%**. You also can return the value to **Auto**.

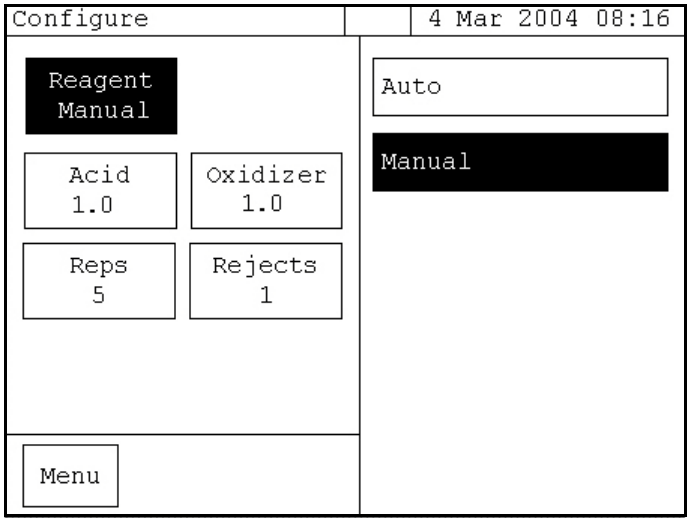


Figure 11: Selecting the Reagent Flow Method

Scheduling Autoreagent Adjustments in On-Line Mode

If you operate in On-Line mode and use the Autoreagent feature, the **Schedule Reagent** value determines how often the Analyzer repeats the preliminary measurement. Set this value by following these steps:

1. Select the **Setup** tab. Make sure On-Line mode is selected.
2. Press the **Configure** button. Make sure the **Reagent** button is set to **Auto**.
3. Press the **Schedule Reagent** button. A numerical pad appears on the right side of the screen. Enter a number to specify how often the Analyzer calculates the automatic reagent values; the unit of measure for the value entered here is hours.
4. Press **Enter** to continue.

Setting Manual Flow Rates

Manually set reagent flow rates by following these steps:

1. Select the **Setup** tab.
2. Press the **Configure Mode** button.
3. Make sure the **Reagent** button is set to **Manual**.
4. Press the **Acid** button and use the keypad to enter a value. Press the **Enter** button to save the value, or press **Cancel** to retain the current setting without making any changes.
5. Press the **Oxidizer** button and use the keypad to enter a value. Press the **Enter** button to save the value, or press **Cancel** to retain the current setting without making any changes.
6. Press the **Menu** button to return to the main **Setup** screen.

Table 3: Recommended Oxidizer Flow Rates

TOC Concentration	Oxidizer Flow Rate
25 - 50 ppm	2.8 - 13.5 µL/min
10 - 25 ppm	1.4 - 7.5 µL/min
5 - 10 ppm	0.7 - 2.8 µL/min
1 - 5 ppm	0.7 - 1.4 µL/min
<1 ppm	0.0 - 0.7 µL/min

Table 4: Recommended Acid Flow Rates

IC Concentration	Acid Flow Rate with No ICR or ICR Bypassed	Acid Flow Rate with ICR Inline
50 - 100 ppm	2.0 µL/min	4.0 µL/min*
0-50 ppm	1.0 µL/min	2.0 µL/min*
Deionized water	0.3 µL/min	1.0 µL/min*
For all samples, verify the pH of waste is between 2-3, but not <2, and adjust acid flow rate as necessary		

*GE recommends decreasing the acid flow rate to 1.0 µL/min for municipal water applications with an alkalinity of less than 100 mg/L as $CaCO_3$. The chart above was established based on worst-case alkalinity.

Understanding Analysis Times

Analysis times in Sievers 5310 C Series TOC Analyzers vary depending on the type of reagent settings you use, either Autoreagent mode or manual reagents mode. Analysis times for measurements using the Autoreagent setting will be longer (and the volume of sample consumed is greater), as the Analyzer must identify the correct flow rates to use before starting full analysis. Table 5 on page 88 shows a comparison of analysis times based on the reagent setting.

Table 5: Sample Analysis Times

Parameter	Manual Reagent Mode		Autoreagent Mode	
	No ICR or ICR Bypassed	ICR Inline	No ICR or ICR Bypassed	ICR Inline
Time to first measured value	12.2 min	13.7 min	26.4 min	29.5 min
Time for flush and four replicate measurements	24.2 min	25.7 min	38.4 min	41.2 min

Note: Additional time may be required if the reagent syringes must be filled during the analyses.

Managing Data History

The Analyzer stores the TOC measurement data history in RAM. On the **Data** tab, you can configure the way your Analyzer stores and displays the data history; you also can initiate printing and exporting of the data.

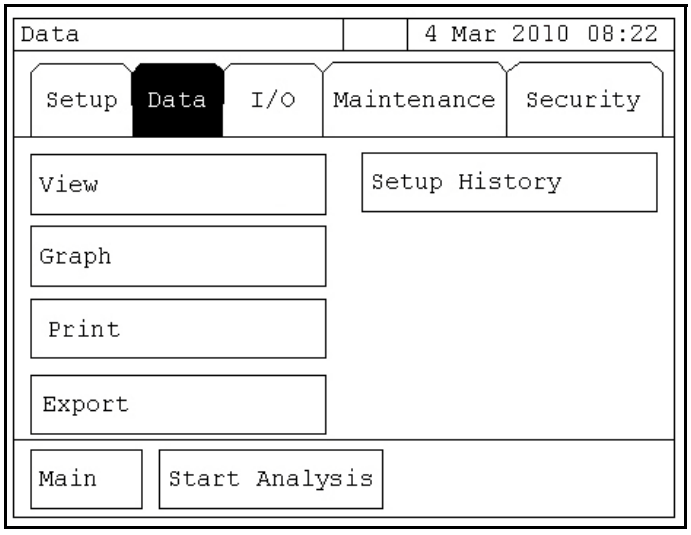


Figure 12: The Data Tab

Setting up Data History

The data history can accommodate approximately 33,000 entries (at least 90 days) of usage.

1. Select the **Data** tab.
2. Press the **Setup History** button.
3. Set the **Archive Data** option to *On* or *Off*. If you select *Off*, the data will automatically be overwritten when you reach the maximum storage capacity.
4. To set up an automatic download to USB flash memory drive, press the **Daily Download** button and select *On*. Then, press the **Download Time** button and enter a time for the download. When activated, every day at the specified time, the Analyzer will automatically download the previous 24 hours of data to the flash memory drive, if it is connected to the Analyzer's USB port.

Archiving Data History

When **Archive Data** is set to *On*, you will be prompted to archive your data when the data history is close to full.

To archive your data, follow these steps:

1. Select the **Data** tab.
   - Press the **Print Archive** button if you wish to print the data history archive.
   - Press the **Export Archive** button if you wish to export the data history archive to a file. You will be prompted to connect a storage device to the USB port.
2. After printing or exporting the archive, the data history will be overwritten with new measurements as additional data are collected.

Viewing Data History

You can view the data history stored in your Analyzer whether or not analysis is in progress. To display the **Data History** screen, follow these steps:

1. Select the **Data** tab.
2. Press the **View** button to display the data history.
3. Press the **Setup** button to change the type of data displayed in the data history list.
4. Press the **Values** button and select one of these options:
   - **TOC/IC/Mode** — Displays TOC and IC data and the mode in which the data was measured.
   - **TOC/IC/TC** — Displays TOC, IC, and TC data.
   - **TOC/Reagents** — Displays TOC data and reagent flow rates.
   - **TOC** — Displays TOC data only.
   - **TOC / Label** — Displays TOC data and the Grab label.

The data history list also displays the time of the analysis and the values for the items selected on the **Values** screen. The date in the header reflects the date of the highlighted measurement at the top of the list. For example, in Figure 13, the first line of data is highlighted, indicating the measurement was taken on March 1, 2004. Scroll up and down through the Data History list with the arrow keys, and move to the start or end of the list with the **Start** or **End** buttons.

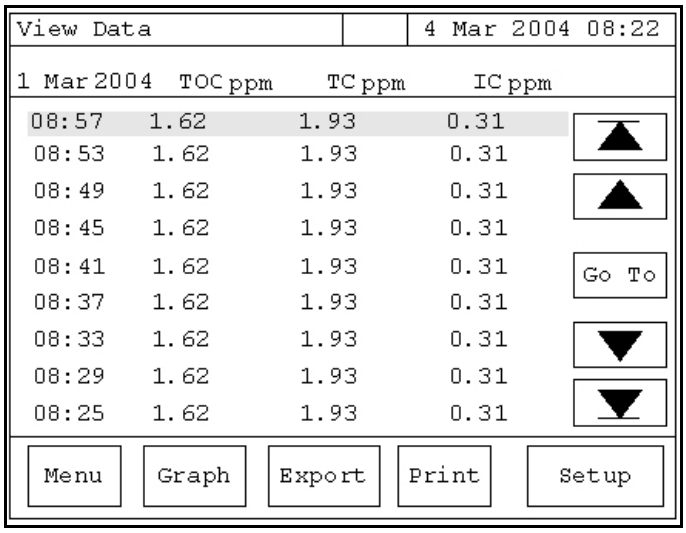


Figure 13: Specifying a Start Date on the View Data Screen

To display a specific portion of the data history, press the **Go To** button, use the numeric pad to enter the appropriate date and time settings, and then press the **Back** button. The first measurement for the date you entered is displayed at the top of the list. If you enter a date or time for which there is no data, the next closest date or time is displayed.

On the **View Data** screen, you also have the option to graph, export, and print data. See the following sections for details on using these screens.

Graphing Data History

You can set the time scale for the data that is displayed on the graph and specify which data are displayed. The settings you specify on the **Graph** screen also affect the graph that is displayed on the **Main** screen.

To customize the graph, follow these steps:

1. Select the **Data** tab.
2. Press the **Graph** button to display the data graph. (See Figure 14.)
3. Press the **Setup** button to specify the scale for the graph.
4. Press the **X Scale** button and select a time range for the X axis of the graph: **1 Hour**, **2 Hour**, **4 Hour**, **8 Hour**, **1 Day**, **2 Days**, **1 Week**.
5. Press the **Y Scale** button to select a TOC range for the Y axis.
   - Select **Auto** to have the Analyzer automatically calculate the appropriate TOC range.
   - Select **Manual** to enter specific TOC values in ppb. Press the **Min** button to enter the minimum TOC value, and press the **Max** button to enter the maximum TOC value.
6. Press the **Back** button to save your changes and return to the graph display.
7. Specify which data are displayed on the graph:
   - Press the **TOC** button to graph TOC data.
   - Press the **ALL** button to graph TOC, IC, and TC data.

   A color-coded key appears to help identify the graph lines for each type of data.
8. To begin the graph from a specific measurement, press the **Go To** button, enter the appropriate date or time values, press **Enter**, and press the **Back** button.

Note: Settings specified in the Setup screen affect the display of the graph on the Main screen, in addition to the graph displayed under the Data tab.

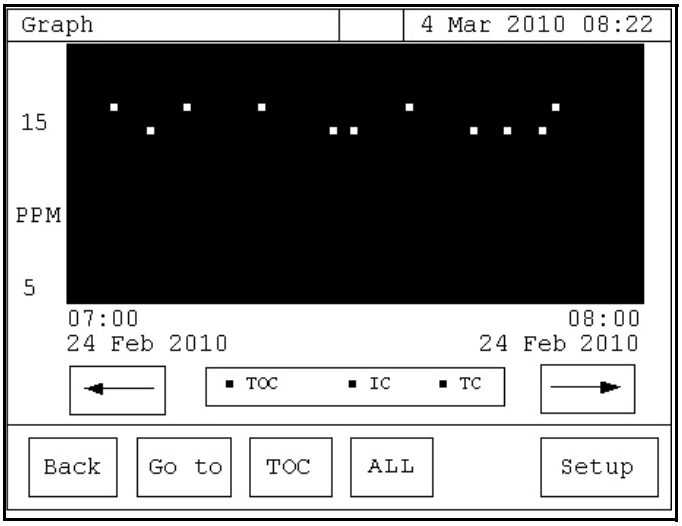


Figure 14: Graphing the Data History

Printing Data History

The Analyzer can print the data history for any valid time range that you specify. To print data, follow these steps:

1. Select the **Data** tab.
2. Press the **Print** button.
3. Press the **Range** button to specify a preset time range: **1 Day**, **1 Week**, **All**, or **Custom**.
   - If you select a **Custom** range, press the **To Date** and **From Date** buttons, and enter the desired time range values.
4. Press the **Values** button to specify which data will print:
   - **TOC/IC/Mode** — Prints TOC and IC data and the mode in which the data was measured.
   - **TOC/IC/TC** — Prints TOC, IC, and TC data.
   - **TOC/Reagents** — Displays TOC data and reagent flow rates.
   - **TOC** — Displays TOC data only.
   - **TOC/Label** — Displays TOC data and the grab label.
5. Press the **Print** button to print the data.

Note: Prior to printing, you may want to confirm your printer settings. See "Configuring Printer Settings" on page 97 for more information.

Exporting Data History

The Analyzer can export the data history for any valid time range that you specify, either to the serial (RS-232) port or the USB port.

To export data, follow these steps:

1. Select the **Data** tab.
2. Press the **Export** button.
3. Press the **Range** button to specify a preset time range: **1 Day**, **1 Week**, **All**, or **Custom**.
    - If you select a **Custom** range, press the **To Date** and **From Date** buttons, and enter the desired time range values.
4. Press the **Export** button. Make sure a USB device or serial cable is attached to the Analyzer prior to pressing the **Export** button.
5. Indicate the destination port by pressing the **USB** or **Serial** button to start the data export.

The data is exported in comma-separated format (.csv) and contains the following fields: Analysis mode, Date, Time, TOC, TC, IC, Acid, Oxidizer, Reagent mode, IC cell temperature, TC cell temperature, ICR state, and Grab label. Most spreadsheet programs, such as Microsoft Excel®, can open the .csv file without having to go through an import process.

The Analyzer also downloads the audit trail information at the time the data history is exported to a USB.

Setting Up Analyzer Input and Output

Menu selections on the **I/O** tab allow you to configure data for alarms, analog output, binary input, serial output and printing. Laboratory Analyzers do not have a 4-20 mA output.

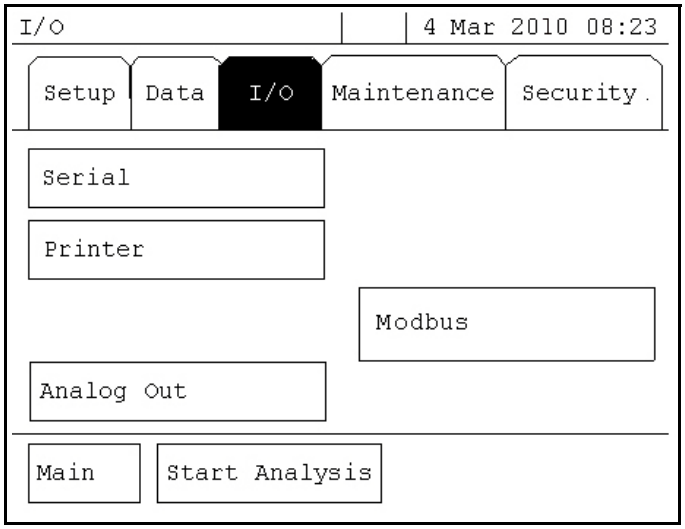


Figure 15: The I/O Tab

Setting Up Analog Output

Sievers 5310 C Portable TOC Analyzers Only

Select the output range for the 4-20 mA analog output by following the steps below. Instructions for wiring the 4-20mA output can be found in Chapter 3, "Installation."

1. Select the **I/O** tab.
2. Press the **Analog Out** button.
    - Press the **Min** button to set the minimum value (in ppb), corresponding to the minimum analog current. Enter a number and press the **Enter** button to save the value, or press **Cancel** to retain the current setting without making any changes.
    - Press the **Max** button to set the maximum value (in ppb), corresponding to the maximum analog current. Enter a number and press the **Enter** button to save the value, or press **Cancel** to retain the current setting without making any changes.
    - Press the **Error** button to set a value when the Analyzer issues an error (1, 2.5, 4, or 20 mA, or Last).
    - Press the **Warning** button to set a value when the Analyzer issues a warning (1, 2.5, 4, or 20 mA, or Last).

- Press the **Standby** button to set a value when the Analyzer switches out of analysis mode into standby mode (1, 2.5, 4, or 20 mA, or Last).

Note: The Analyzer automatically signals the Standby state for alarms and 4-20 outputs during syringe refill, Autozero, and Autoreagent activities.

Note: **Last** means that you will retain the last value: **TOC**, **TC** or **IC** value.

- Press the **Value** button to set the output value that will be sent to the analog output. The values can be TOC, TC, or IC. Press the **TOC**, **TC**, or **IC** button and then press **Enter** to change the value, or press **Cancel** to retain the current setting without making any changes.
- Press the **Protocol** button to set the analog output behavior when the Analyzer is running system protocols. Press either the **Analysis Results** or **Standby** button.
- To calibrate the values output via the 4-20 mA outputs, see "Setting Up Serial Output" below.

Setting Up Serial Output

To download data from the Analyzer directly to a computer, you must enable the **Output** option and set the **Baud Rate** for the serial (RS-232) port.

1. Select the **I/O** tab.
2. Press the **Serial** button.
3. Press the **Baud Rate** button. Select **9600**, **19200**, or **38400** and press the **Enter** button to save the value, or press **Cancel** to retain the current setting without making any changes. Consult your computer manual to determine the maximum baud rate for your computer's serial port. The default value is **9600**.

To capture the data via the serial (RS-232) port, you will need a computer that is running a serial port communications program, such as HyperTerminal. For information on setting up HyperTerminal to communicate with the Analyzer, see "Using HyperTerminal" on page 184 in the Appendix.

Note: For long-distance connections (up to 1,000 feet or 305 meters), GE Analytical Instruments recommends use of either a RS-232 current loop converter or a RS-485 converter. You can also use an Ethernet connection.

Interpreting Serial Output

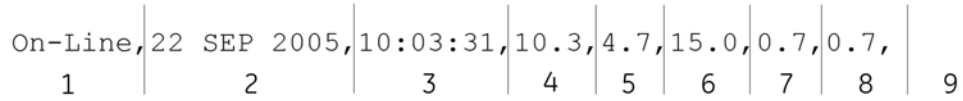
When serial output is set to **On**, for every measurement the Analyzer outputs the data show in Table 6.

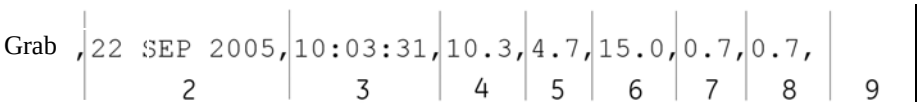
Table 6: Data Fields Output to the Serial (RS-232) Port

Field Number	Value
1	Mode
2	Date
3	Time
4	TOC (ppb)
5	IC (ppb)
6	TC (ppb)
7	Acid (µL/min)
8	Oxidizer (µL/min)
9	Stream Number
10	Removal Type
11	Lag Time
12	Removal Percent
13	Label

To view the data, you will need to use a communications program on your PC. For additional information, see the Appendix section called "Using HyperTerminal" on page 184.

An abbreviated example (showing the first 8 fields) of a successful measurement is shown below:





When the Analyzer takes a successful measurement, the Warning/Error value (Field 9) is null. If a Warning or Error is generated, the output would be as the abbreviated example below:

```
,|22 SEP 2005,|10:01:07,|,|,|,|,|,|Warning 2 - Analog Warning
1|      2     |    3    |4|5|6|7|8|            9
```

Also, in a warning or error condition, some values are not output because a measurement does not take place. After field 9, the Analyzer outputs a carriage return, followed by a line feed.

Issuing Serial Commands to the Analyzer

You can use a PC running a communications program, such as HyperTerminal, to issue commands to the Analyzer via a serial (RS-232) connection or Ethernet (port 23). The Analyzer accepts the following serial commands:

RUN	Start analysis
STP	Stop analysis

When the Analyzer receives one of these commands successfully, it returns **ACK** to the communications program on the PC. If the command fails or if a bad command is sent, the Analyzer returns **NAK**.
The serial port should be set to the following:

Bits Per Second: 9600

Data Bits: 8

Parity: None

Stop Bits: 1

Flow Control: Hardware

Configuring Printer Settings

You can change the way the Analyzer formats output sent to the printer.

1. Select the **I/O** tab.
2. Press the **Printer** button.
3. Press the **Printer** button and choose **Citizen, Seiko, or Epson**. If no printer is attached to the Analyzer, choose **No Printer**.
4. Set **Header Frequency** to **First Page** or **All Pages** to specify when a header will print. The header includes basic information about the Analyzer, including the firmware version, Analyzer serial number, and the current date.
5. Press the **Interval** button to print the average TOC value for the period of time specified. The options are as follows: **Every Sample**, **Every Hour**, **Every 2 Hrs.**, **Every 4 Hrs.**, or **Every 8 Hrs.**

Using the Ethernet Connection and Modbus

You can use Modbus, an industrial communications protocol that operates over Ethernet, on the Sievers 5310 C TOC Analyzer. Communications require third-party data acquisition software or a SCADA system with Modbus TCP/IP support. Modbus communications support the collection of *real-time* instrument data and status information. The instrument may also be started or stopped remotely via Modbus.

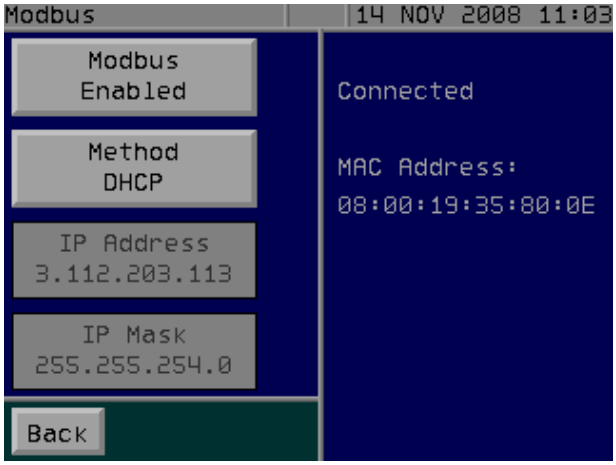
This section provides a basic overview of implementing Modbus on the Sievers 5310 C TOC Analyzer. This information is used in conjunction with third-party (non-GEAI) SCADA or other Modbus data acquisition software by your company's Process Engineering department It is difficult to provide all details as the bulk of the configuration and programming is completed within the third-party device. Various vendor SCADA systems are programmed differently. As noted in the following steps, some systems require memory addresses to be formatted in a unique way, while others label Modbus functions differently.

To enable Modbus

Before you can export data via Ethernet, you must enable Modbus and configure the Analyzer's IP address. The connection can be made using DHCP or a static IP address.

> **Note:** You may need assistance from your company's Process Engineering department to set the IP address correctly for your network.

1. Confirm that an active Ethernet cable is connected to the Analyzer. The Analyzer uses the Modbus communication protocol (port 502).
2. On the Analyzer, select the **I/O** tab.
3. Press the **Modbus** button. The **Modbus** screen appears.



4. Press the **Modbus** button, and then select **Enabled**.
5. Press the **Method** button, and then select either **DHCP** or **Fixed**. If you select **Fixed**, press the **IP Address** and **IP Mask** buttons and enter the appropriate addresses.
6. Press the **Connect** button.
7. Press the **Back** button to return the **Main** menu.

The Modbus Register Table

This Modbus Register table is a listing of the addresses and functions of Modbus capability. ReferenceTable 7, “Modbus Register Table,” on page 99. This register was derived from www.modbu-IDA.org, which contains the Modbus standard. If there are variations in your purchased SCADA software, you should contact your supplier to understand how their software compares to the Modbus standard.

Testing Modbus for the 5310 C TOC Analyzer

You will find the following information helpful when configuring Modbus with the 5310 C TOC Analyzer.

Note: This section refers to TOC values; however, other value types and information can also be configured within Modbus.

- For TOC data, the SCADA system will be reading the Modbus input registers at memory addresses 3300, 3301, and 3302. The “Function” for these memory addresses should be "04 Read Input Registers." Some software packages may refer to this function differently, such as "3x_bit" or something similar.
- The TOC data is made up of the first two input registers (two 16-bit unsigned registers) at memory address 3300 and memory address 3301. Some software packages may need the memory address formatted as 3301 or 330001, each referring to the first 16-bit register at memory location 3300.

Note: Units for the 5310 C Analyzer are shown in part per million (PPM).

- The two 16-bit registers referenced in this section need to be combined to create one 32-bit floating point TOC value. This is necessary as Modbus only supports 16-bit registers. Your SCADA software will have an option for combining these values.
- The input register at memory address 3302 can be read to display the TOC units, a value of 1=ppt, 2=ppb, 3=ppm even though the unit of measure is fixed for the 5310 C TOC Analyzer. This is also a 16-bit value.
- To read other values, refer to Table 7: Modbus Register Table for the correct memory addresses.
- If any issues are encountered during configuration, GE Analytical Instruments suggests contacting your SCADA software supplier for technical support, as there is often a simple software-related solution. If this is unsuccessful, please contact Technical Support at GE Analytical Instruments.

Table 7: Modbus Register Table

Register Type	Description	Function	Address	Bit
Discrete Inputs (read)	Status	2	1000	
	New Data			0
	Error			1
	Standby			2
				3
				4
				5
				6
	Activations	2	1002	
	Feature 1			0

Table 7: Modbus Register Table

	Feature 2			1
	Feature 3			2
	Feature 4			3
Coils (read)	State	1	2000	
	Run			0
	Stop			1
Coils (write)	Run	5	2000	*
	Stop	5	2001	*
Input Registers (read)	Instrument Family	4	3010	*
	Instrument Model	4	3011	*
	Serial Number	4	3012	*
	Firmware Version (Major)	4	3015	*
	Firmware Version (Minor)	4	3016	*
	Firmware Version (Engineering)	4	3017	*
	Current Mode	4	3099	*
	Reading Time - Year	4	3100	*
	Reading Time - Month	4	3101	*
	Reading Time - Day	4	3102	*
	Reading Time - Hour	4	3103	*
	Reading Time - Minute	4	3104	*
	Reading Time - Second	4	3105	*
	Error Type	4	3200	*
	Error Time - Year	4	3201	*
	Error Time - Month	4	3202	*
	Error Time - Day	4	3203	*
	Error Time - Hour	4	3204	*
	Error Time - Minute	4	3205	*
	Error Time - Second	4	3206	*
	TOC Value Low Word	4	3300	*
	TOC Value High Word	4	3301	*
	TOC Units	4	3302	*
	TC Value Low Word	4	3310	*
	TC Value High Word	4	3311	*
	TC Units	4	3312	*
	IC Value Low Word	4	3320	*
	IC Value High Word	4	3321	*
	IC Units	4	3322	*
Holding Registers (read/write)	not used			

*All Coils (write) and Input registers are 16-bit unsigned.

Notes

Values are IEEE 32-bit floats split into two 16-bit registers.
TOC, TC, IC units are: 1=ppt, 2=ppb, 3=ppm
Instrument Family: 500=0x3500, 500RL=0x004C, 500RLe=0x0065, 5310=0x5300, CheckPoint=0x4300, 900=0x3900, InnovOx=0x0044
Instrument Model:Lab=10, Portable=50
Installed units are: 0=Not Installed, 1=Installed
Enabled units are: 0=Disabled, 1=Enabled
Reject units are: 0=Not Rejected, 1=Rejected
Firmware Major is xx in xx.yy.zzz
Firmware Minor is yy in xx.yy.zzz
Firmware Engineering is zzz in xx.yy.zzz
Measurement Mode: IC=10, TC=20, TOC=30

Possible Mode values are as follows:
On-Line Mode = 0
Grab Mode = 1
TOC Autozero Mode = 4
TOC Calibration Mode = 5
TOC Verification Mode = 7

Managing Maintenance Information

Options on the **Maintenance** tab contain important operational information, including the Warnings/Errors list and consumables status. The **Maintenance** tab also provides access to calibration and verification functions, and other advanced features. Refer to Chapter 6, "Calibration and Verification" for more information on these functions. You can also access the system information screen from this tab.

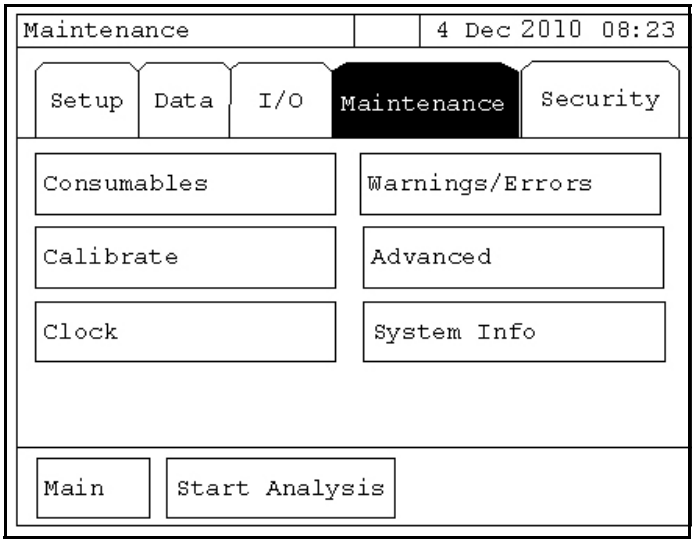


Figure 16: The Maintenance Tab

Displaying Consumables Status

The **Main** screen displays an overview graphic that indicates the relative life status of the Analyzer's consumables: UV lamp, pump tubing, resin bed, acid, and oxidizer. The reagents' status is based on remaining calendar life and an estimate of remaining volume (based on the history of usage), whichever is most limiting. Status indicators on the **Main** screen change color as the need for replacement nears.

To display more detailed information about consumables status, follow these steps:

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

The status of each of the consumables is displayed, with an estimate of remaining life and either the expiration date, the total days of usage, or the usage remaining.

If you need to install new consumables, follow the instructions in Chapter 7, "Maintenance" for each consumable you install; also be sure to follow the instructions in the section called "Setting the Installation or Expiration Date for New Consumables" on page 158.

Reviewing Warnings and Errors

The Analyzer issues two levels of messages:

1. **Warnings** — Warnings do not stop TOC measurements, but may indicate that corrective action is required to prevent eventual Analyzer shutdown or loss of data.
2. **Errors** — Errors are serious alerts and some stop TOC 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.

Warnings and errors issued by the Analyzer collect in the Warnings/Errors list after their initial display. The **W** icon appears in the **Menu** screen header when a warning has been issued and the **E** icon appear when an error has been issued; if both a warning and an error has been issued, then the **E** icon will display, as errors are more serious alerts than warnings.

To display the Warnings/Errors list

1. Select the **Maintenance** tab.
2. Press the **Warnings/Errors** button.
3. Use the scroll buttons to browse through the warnings and errors. For each warning/error, you have three options:
   - **Remove** — Remove the warning/error from the list.
   - **Export** — Send the warning/error to the serial (RS-232) or USB port.
   - **Print** — Send the warning/error to the printer.

The Analyzer displays the date, error number, error description, a brief suggestion for corrective action, time of last occurrence, and the number of times this warning or error has occurred. A complete listing of warnings and errors is given in “Warnings and Error Messages” on page 162.

Calibrating the Instrument

For detailed instructions on calibrating the 5310 C Analyzer, refer to Chapter 6: Calibration and Verification.

Advanced Analyzer Settings

Analyzer settings are considered to be advanced if they will not be regularly changed in the course of normal Analyzer operations. If Password Protection is enabled, logging in with a User ID is required in order to change these settings.

Printing and Exporting the Warnings and Errors List

You can print or export a full list of warnings and errors that includes the time each event occurred, even after you have removed items from the Warnings/Errors list. To do so, follow these steps:

1. Select the **Maintenance** tab.
2. Press the **Advanced** button.
3. Press the **Warn/Error Out** button.
4. Press either the **Print History** or **Export History** button.

   If you select **Export History**, you will be prompted to select the port for export. Press either **Serial** or **USB** to export the list of warnings and errors.

Working with the USB/IO Function

Saving System Settings

You can archive settings to the USB port and restore them at a later time. This feature provides a backup mechanism in the event that you need to return to previous settings, including calibration and user-configurable settings. Save your Analyzer’s system settings as follows:

1. Select the **Maintenance** tab.
2. Press the **Advanced** button.
3. Press the **USB I/O** button. Make sure that the USB flash memory drive is attached to the USB port.
4. Press the **Save System** button.

Restore System Feature

To use the restore feature, be sure that the USB flash memory drive containing the previously exported data is attached to the Analyzer's USB port, repeat Steps 1 through 3 above, and select **Restore System**.

Service Data Feature

Use this feature when exporting required data in order to troubleshoot the instrument.

Printing the Current Constants Values

Calibration constants, reagent flow rates, and other key parameters are stored in RAM. If you have a printer attached to the Analyzer, you can print these settings for future reference by following these steps:

1. Select the **Maintenance** tab.
2. Press the **Advanced** button.
3. Press the **Print Constants** button, and then select one of the following to print:
   - **System Configuration** — Prints basic user-configurable settings.
   - **System Constants** — Prints the factory-set constants for each conductivity cell.
   - **Calibration Constants** — Prints constants set by the most recent calibration.
   - **Consumables Settings** — Prints usage and expected life information about consumables.

Using the Advanced Setup Features

Adjusting Display Contrast Settings

For proper viewing in your environment, the Analyzer's color LCD can be adjusted on older versions of the display as follows:

Note: Adjusting display contrast is not applicable on all versions of the 5310 C Series TOC Analyzers.

1. Select the **Maintenance** tab.
2. Press the **Advanced** button.
3. Press the **Advanced Setup** button.
4. Press the **Contrast Adjust** button and use the keypad to change the contrast level of the display. Press **Enter** to change the contrast to the new value and then push **Menu** to exit. (If this functionality is not available on your Analyzer, the contrast adjust button will be grayed out.)

Setting the Time Zone

You can set the Analyzer Time Zone by following this step:

1. Press the **Time Zone** button, and specify the time zone via the two buttons on this screen:
   - **Time Zone** — Allows you to set a text descriptor for the time zone. Usually this is a three-letter code, such as "EST" for Eastern Standard Time or "GMT" for Greenwich Mean Time.
   - **GMT Difference** — Allows you to enter the offset from Greenwich Mean Time. Use the numeric pad and the **+/-** button to specify the offset. For example, for Eastern Standard Time you should enter `-5.00`.

Note: The Analyzer clock does **not** automatically update for time changes, such as the change to Daylight Savings Time in the USA.

Naming the Analyzer Location

You can assign a name to the Analyzer that appears on printed and exported data. This feature is particularly useful if you have multiple Analyzers at your facility and want to easily distinguish data collected from each instrument. To assign a name, follow these steps:

1. Select the **Maintenance** tab.
2. Press the **Advanced** button.
3. Press the **Advanced Setup** button.
4. Press the **Location** button.
5. Use the keypad to specify a name for the Analyzer and press **Enter**.

Changing the Display Mode

By default, the Analyzer displays the last TOC value in the largest size font on the main screen. If your application prioritizes IC or TC, you can change the display appropriately as follows:

1. Select the **Maintenance** tab.
2. Press the **Advanced** button.
3. Press the **Advanced Setup** button.
4. Press the **Display Mode** button.
5. Depending on which value you want displayed in the large font, select **TOC**, **IC**, or **TC**.

Using the Clean Screen Feature

To clean the display screen, select this button to freeze the screen for 30 seconds.

Selecting the Program Language

Sievers 5310 C TOC Analyzers support two program languages: English and Japanese.

To switch to a new program language

1.Select the **Maintenance** tab.

2.Press the **Advanced** button.

3.Press the **Advanced Setup** button.

4.Press the **Select Language** button. The Select Language screen appears.

5.Press the button for the new language.

Note: If you change the program language by mistake and need help navigating the menus to switch back to your native language, see "Changing the Program Language" on page 176.

Configuring the Flow Sensor

Sievers 5310 C Portable Analyzers

The Analyzer automatically detects the presence of the sample stream when it is working in On-Line mode. When the water flow is interrupted, the Analyzer issues an error and stops analysis. To change the **Flow Sensor** setting, follow these steps:

1. Select the **Maintenance** tab.
2. Press the **Advanced** button.
3. Press the **Advanced Setup** button.
4. Press the **Flow Sensor** button.
5. By default, the Flow Sensor is set to ***On***. To change the Flow Sensor Status, press the **Flow Sensor** button and then select ***On*** or ***Off***.

Note: Every time the Analyzer is placed in On-Line mode, the Flow Sensor automatically resets to On, to protect the Analyzer.

Press the **Flow Restart** button and set it to ***On*** or ***Off***. Setting the **Flow Restart** to ***On*** means the Analyzer will automatically begin analysis again after a temporary stoppage of sample flow, if it was taking measurements at the time sample flow stopped. If flow stops and power to the Analyzer is interrupted, the Analyzer automatically attempts to restart analysis when power is restored.

Warning
Operating the Analyzer in On-Line mode with the Flow Sensor off can result in erroneous measurements if there is no sample flow.

Working with System Diagnostics

For detailed information on the Diagnostics feature, refer to Chapter 8: Troubleshooting.

Setting the Analyzer Clock

You can set the Analyzer clock by following these steps:

1. Select the **Maintenance** tab.
2. Press the **Clock** button. The **Clock** screen appears.
3. Press each date component button, enter the appropriate value and press the **Enter** button.

Displaying System Information

If you need to contact GE Analytical Instruments about your Analyzer, you can find most essential information on a single screen.

1. Select the **Maintenance** tab.
2. Press the **System Info** button. The following unit information is displayed:
    - Location name
    - Firmware version number
    - Analyzer serial number
    - GE Analytical Instruments phone numbers and Web site information

Basic Hardware Operation Issues

Opening the Analyzer Case

The Sievers 5310 C Series TOC Analyzer cases are easy to open to facilitate routine maintenance tasks:

Sievers 5310 C Laboratory TOC Analyzer

Open the Analyzer side panel using a screwdriver to loosen the two preset thumb screws on the back and then pull the panel away from the Analyzer. When closing the panel, be sure to seat it properly on the Analyzer before attempting to tighten the thumb screws. Tighten the screws finger-tight, and then tighten an additional $^{1}/_{8}$ turn with a screwdriver.

Sievers 5310 C Portable TOC Analyzer

Open the side panels by unscrewing the two Phillips screws set into either side of the handle. Then, pull the panels away from the Analyzer. When closing the side panels, slide the foot tabs into the slots before replacing the two Phillips screws.

The Touch Screen

The Analyzer's touch screen is a quarter-VGA color LCD. The operator's finger is optimal for interacting with the display. To avoid scratching the display, do not use pens or pencils to press buttons. If you purchased an Ethernet upgrade for an older instrument, but the upgrade does not include a new display, a contrast adjustment may be required to the touch screen. In this case, a **Contrast** button appears on the **Advanced Setup** screen.

The IOS System

(Sievers 5310 C Portable TOC Analyzers Only)

The Integrated On-Line Sampling (IOS) System (see Figure 17) provides a convenient sample inlet for on-line sample sources and standards in 40 mL vials. When the IOS System is being used, the stainless steel tubing must connect the IOS System to the **Sample Inlet** port.

When the Analyzer is configured in an on-line configuration, you do not need to change the configuration to analyze a standard with the IOS System. Simply stop analysis, slide the IOS System door open, wait 30 seconds for the sample to drain from the IOS System, and then insert the 40 mL vial containing the standard.

After water flow to the IOS System has been established, the flow rate should be adjusted so that flow out of the waste line is between 30 - 300 mL/min. The flow rate is controlled by a needle valve, which is adjusted by the screw on the IOS. Turn the screw clockwise to decrease flow, and turn the screw counter-clockwise to increase flow.

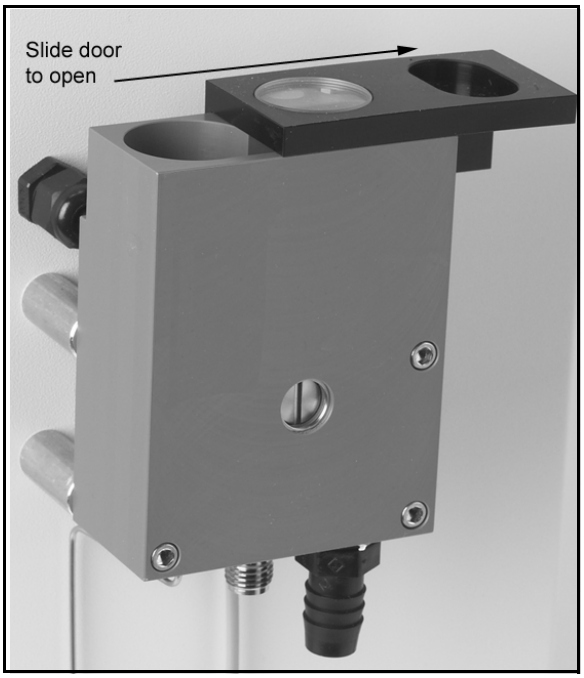


Figure 17: The IOS System

Always stop analysis before opening the IOS System door to avoid generating erroneous measurement data. If the flow sensor is ***On***, opening the IOS System door while analysis is taking place causes the flow sensor to activate and halt analysis. If the flow sensor is ***Off***, opening the IOS System door while analysis is taking place results in air being drawn into the Analyzer.

Warning

The IOS System contains sharp needles designed to pierce the septa of sample vials. Do not put fingers or inappropriate materials into the IOS System.

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Warning

Water in the IOS System may be hot. Before inserting a vial into the IOS System, slide the door open and wait 30 seconds to allow sample to completely drain. Inserting a vial before draining can result in potentially hot water spray projecting upward out of the IOS System.

Programming the TOC Autozero

The TOC Autozero is recommended only if the TOC concentration in the sample stream is 50 ppb or less, and if you perform on-line TOC measurements. It is unlikely that a 5310 C Analyzer would encounter these conditions; therefore, programming the TOC Autozero is not recommended unless directed to do so by technical support. The TOC Autozero function is described in more detail on page 119.

1. If the Analyzer is taking measurements, press the **Stop Analysis** button.
2. Press the **Menu** button, select the **Maintenance** tab, and press the **Calibrate** button.
3. Press the **Program Autozero** button.
4. Press the **State** button and select **On**.
5. Press the **Frequency** button and use the numeric keypad to enter how often you want to program the TOC Autozero function to work. The **Frequency** is measured in days; if you enter 7 the TOC Autozero will run every week, starting one week from the date you specify. For example, if you enter 14, it will run every two weeks.
6. Use the date and time buttons to specify the start date and time for the TOC Autozero.
7. Press **Back** when you are done..

Note: If the Analyzer is not running on-line when a TOC Autozero is programmed to occur, the scheduled TOC Autozero is skipped. If the composition of the water is changing too rapidly at the time the TOC Autozero is scheduled, the TOC Autozero will be stopped. In both cases, the next TOC Autozero will occur at its regularly programmed time.

Chapter 5. Password Protection

Overview

The Password Protection feature in the Sievers 5310 C TOC Analyzer provides a basic level of security. Password Protection allows for the use of one User ID and Password, which users are required to enter before starting and stopping analysis or gaining access to menu screens.

All security-related settings are configured on the **Security** tab.

Using Password Protection

Enabling Password protection ensures that only authorized personnel access the Analyzer. Once Password security is enabled, all users must enter the default User ID and Password. (See “Identification Records” on page 2.) You can change the default password, but not the default User ID, which is ADMIN.

Enabling Password Protection

Enable Password protection by following the steps below.

1. Press the **Menu** button and select the **Security** tab.
2. Press the **Enable Password** button.

When Password security is accepted, the Analyzer security settings are immediately put into effect, and you will be required to log in to the Analyzer with the default administrator User ID and Password, which can be found in the "Identification Records" on page 2, or directions for "Enabling Password Protection" on page 70 in Chapter 3.

3. Press the **Login** button and use the on-screen keyboard to enter the Login ID and Password.

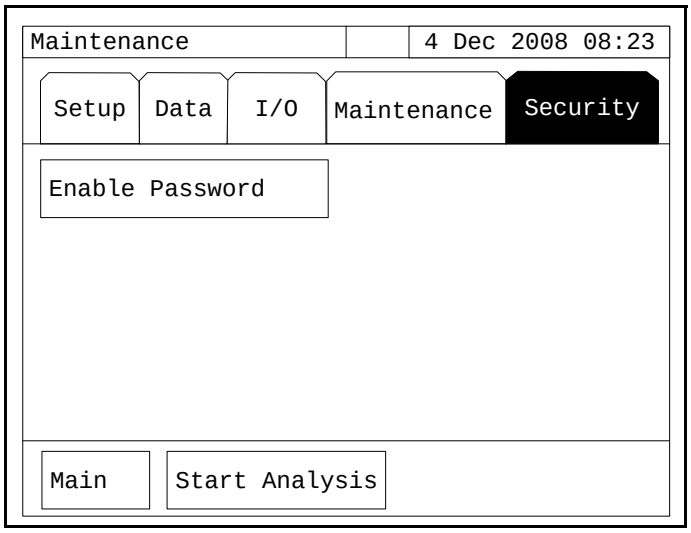

Figure 18: The Security Tab Prior to Enabling Password Protection

Changing the Password

After Password security has been enabled, you can change the default Password by following these steps:

1. Press the **Menu** button and select the **Security** tab.
2. Press the **Change Password** button.
3. Enter the old Password using the on-screen keyboard and press the **Enter** button.
4. Enter the new Password using the on-screen keyboard and press the **Enter** button.
5. Re-enter the same new Password for verification and press the **Enter** button.

   The new Password is now in effect, and you will need to use it starting with the next login.

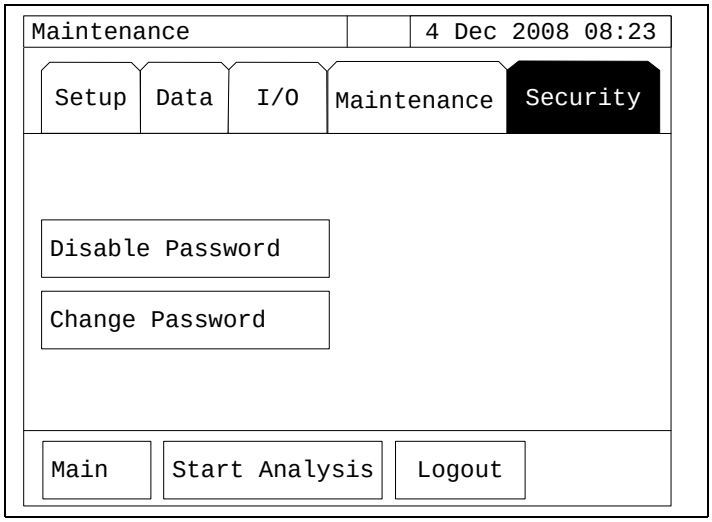

Figure 19: The Security Tab After Password Protection Has Been Enabled

Disabling Password Protection

To disable Password protection follow these steps:

1. Log in to the Analyzer with the User ID and Password.
2. Press the **Menu** button and select the **Security** tab.
3. Press the **Disable Password** button. When the confirmation window displays, press **OK**.

Note: Password protection is immediately disabled. Note that if you decide to re-enable Password protection, you will need to use the Password that was active at the time Password protection was disabled; if you changed the Password from the default administrative Password, you should write down the changed Password and store it in a secure location in case you want to re-enable Password protection in the future.

Chapter 6. Calibration and Verification

Overview

This chapter describes the calibration and verification procedures for Analyzers running in On-Line or stand-alone Grab mode without the use of an Autosampler.

The Analyzer is calibrated at the factory. When the pump tubing is replaced, perform the sample flow rate calibration. When replacing other items that affect analysis, such as the UV lamp, perform a verification of the calibration; only re-calibrate if the verification indicates that a new calibration is necessary.

The Model 5310 C TOC Analyzers can be calibrated using one of two methods: single-point calibration at 1, 5, 10, 25 *or* 50 ppm; or multi-point calibration at 250 ppb and 1, 5, 25 *and* 50 ppm. GE Analytical Instruments recommends that the Analyzer be calibrated in the field using a single-point calibration at a concentration that encompasses the range of interest. For customers typically operating below 1 ppm, GE Analytical Instruments recommends selecting the 1 ppm single-point calibration. Multi-point calibration calibrates the Analyzer over its entire operating range and is recommended for customers who plan on applying for certification to report TOC to their local regulatory agency. If you will be using the Autoreagent function, you must perform a multi-point calibration. The autoreagent function should not be used in applications where samples are expected to be less than 1ppm.

The Sievers 5310 C Series TOC Analyzers facilitate the calibration and verification process by handling the necessary calculations internally; you will have the opportunity to accept or reject the calibration during the procedure. Calibration and verification are accomplished using GEAI Standards in 40 mL vials, sampled via the Analyzer's IOS System (*Sievers 5310 C Portable TOC Analyzers*) or vial port (*Sievers 5310 C Laboratory TOC Analyzer).*

Note: Only a single-point calibration or a multi-point calibration needs to be performed. Do not perform both types of calibration.

Note: If the Analyzer does not have access to a continuous water supply (e.g., it is configured for Grab mode), one 40-mL vial of low-TOC (<50 ppb) DI water will be required for a reagent syringe flush prior to calibration.

If you use the Autoreagent feature, Autoreagent verification also should be performed, but only after the sample flow rate has been calibrated, and the Multi-Point TOC Calibration has been calibrated and verified.

Required Calibration Supplies

The number of standards required for the calibration procedure depends on whether you choose a multi-point or single-point calibration. Standards vials are inserted into the IOS System or vial port as prompted by the Analyzer's on-screen instructions. Refer to Table 8 through Table 12 for the standards required for multi-point calibration, single-point calibration, calibration verification, and system suitability.

A multi-point calibration should require approximately 5.5 hours to complete, and single-point calibration should require approximately 1.5 hours to complete.

GEAI Standards for all calibration and verification procedures should be purchased from GE Analytical Instruments. Standards sets for calibration and verification can be purchased individually, or as combined Calibration & Verification Sets. All standards are provided in 40 mL vials.

To purchase standards in North America or Canada, contact GE Analytical Instruments by phone at 800.255.6964 or 303.444.2009 or by e-mail at InsideSales@GEInstruments.com.

To purchase standards in the United Kingdom, contact GE Analytical Instruments at 44 161866 9337 or office@GEInstruments.co.uk.

To purchase standards in Europe, Asia, and other parts of the world, contact your local Sievers distributor.

GEAI multi-point calibration standards sets include all TOC and IC standards shown in Table 8.

Table 8: Standards Required for Multi-Point Calibration

TOC Calibration Standards
Calibration Blank
250 ppb TOC (as KHP)
1 ppm TOC (as KHP)
5 ppm TOC (as KHP)
25 ppm TOC (as KHP)
50 ppm TOC (as KHP)
IC Calibration Standards
1 ppm IC (as Na_2CO_3)
5 ppm IC (as Na_2CO_3)
10 ppm IC (as Na_2CO_3)
25 ppm IC (as Na_2CO_3)
50 ppm IC (as Na_2CO_3)

Note: 1 ppm = 1 mg C/L, 1 ppb = 1 µg C/L

GEAI single-point calibration standards should be purchased in a concentration that is appropriate for your application; sets include one vial of reagent water and one vial each of TOC and IC in the selected concentration. For customers typically operating below 1 ppm, GE Analytical Instruments recommends selecting the 1 ppm single-point calibration. The available concentrations are shown in Table 9.

Table 9: Standards Required for Single-Point Calibration

TOC Calibration Standards
Calibration Blank
1, 5, 10, 25, or 50 ppm TOC (as KHP)
IC Calibration Standards
1, 5, 10, 25, or 50 ppm IC (as Na_2CO_3)

Note: 1 ppm = 1 mg C/L

Calibration verification standards also should be purchased in a concentration that is appropriate for your application; sets include one vial of reagent water blank and one vial each of TOC and IC in the selected concentration. The available concentrations are shown in Table 10.

Table 10: Standards Required for Calibration Verification

Verification Standards (TOC and IC)
Verification Blank
1, 2, 5, 10, 25, or 50 ppm TOC (as sucrose)
1, 2, 5, 10, 25, or 50 ppm IC (as Na_2CO_3)

Note: 1 ppm = 1 mg C/L

Autoreagent calibration standards sets include the standards shown in Table 11.

Table 11: Standards Required for Autoreagent Calibration

Reagent Water
25 ppm TOC (as KHP)
50 ppm TOC (as nicotinamide)
25 ppm IC (as Na_2CO_3)

Note: 1 ppm = 1 mg C/L

Autoreagent verification standards sets include the standards shown in Table 12.

Table 12: Standards Required for Autoreagent Verification

Reagent Water
25 ppm TOC (as sucrose)
50 ppm TOC (as sucrose)
50 ppm IC (as Na_2CO_3)

Note: 1 ppm = 1 mg C/L

Table 13: Standards Required for Municipal Verification

Verification Standards (TOC and IC)
1 ppm TOC (as sucrose)
5 ppm (as sucrose)
10 ppm (as sucrose)

*Note: 1ppm = 1 mg C/L, 1ppb = 1 µg C/L

Preparing for Calibration

Export Current Constants

Prior to performing any calibration procedure, export the current constants, in the event they need to be re-loaded or referred to in the future. To export the constants, follow these steps:

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

   Press the USB I/O button. Make sure that the USB flash memory drive is attached to the USB port, and then press the Save System button.

Note: If you want to manually calculate the Single-Point Calibration formulas for your records, you must print the Calibration Constants from the Analyzer before and after performing the new calibration, in order to have access the values of the TC Slope and IC Slope.

Perform Annual Maintenance Tasks

Before calibrating the Analyzer, perform annual maintenance tasks as appropriate, such as replacing the sample pump tubing, UV lamp, chemical reagents, and resin bed. In particular, if the calibration coincides with the Analyzer's annual maintenance, first replace the consumables before proceeding; for more information, see "Replacing the Ion Exchange Resin (Resin Bed)" on page 153.

Perform a TOC Autozero

The optional TOC Autozero is not used for municipal water customers. It corrects for minor differences in the response of the two CO_2 sensors. This adjustment is critical only for the determination of low-level TOC concentrations. **Only perform this procedure before calibrating the Analyzer if you regularly analyze samples with TOC <50 ppb**.

The TOC Autozero requires that the on-line water supply (< 500 ppb TOC) be available to the Analyzer. Make sure the sample inlet is configured properly before continuing.

The TOC Autozero can require between 1-12 hours to complete, but it typically requires less than 2 hours when the Analyzer has been measuring water containing 50 ppb TOC or less.

Note: The TOC Autozero is part of the calibration procedure only if the Analyzer is being used with water that is less than 50 ppb TOC. If the Analyzer is being used off-line or to analyze water that is greater than 50 ppb, you do not need to perform a TOC autozero.

1. If the Analyzer is taking measurements, press the **Stop Analysis** button.
2. If you have an ICR unit, make sure the lever is in the **Inline** position.
3. Press the **Menu** button, select the **Maintenance** tab and press the **Calibrate** button.
4. Press **Run TOC Autozero**.
5. Make sure that a water source is connected and press **Start**.
6. Wait for the TOC Autozero to complete before proceeding with the calibration.

Perform a Sample Flow Rate Calibration

Prior to calibrating the Analyzer, replace the pump tubing as part of the annual maintenance on the Analyzer. (See “Replacing the Sample Pump Tubing” on page 151.) Then, perform a sample flow rate calibration, as described in this section.

Before proceeding, make sure you have saved the current Analyzer system settings, as described in “Export Current Constants” on page 119.

For the sample flow rate calibration, you will need the following items from the Analyzer's accessories kit:

- 10-mL graduated cylinder
- $^1/_8$" OD tubing with $^1/_8$" Swagelok fitting for waste line, approximately 12" long
- Plug for IOS waste line

Perform the sample flow rate calibration as follows:

1. If the Analyzer is taking measurements, press the **Stop Analysis** button.
2. Press the **Menu** button. Select the **Maintenance** tab, and then press the **Calibrate** button.
3. Press the **Flow Rate Cal** button.
4. Ensure the Analyzer is connected to a source of water, and then press **Next** to continue.
5. The Analyzer will then flush the acid and oxidizer out of the sample line.

6. When the flush is completed, the Analyzer will prompt guide you to attach the 12" waste line (from the Analyzer's accessories kit).

   To install the 12" waste line, your must first disconnect the $^{7}/_{16}$" nut that connects to the port labeled **Waste** on the back of the Analyzer and gently pull the tubing aside; attach the rubber plug to this tubing. Attach the 12" waste line by securing the fitting with a $^{7}/_{16}$" open-end wrench.

   When the 12" waste line is installed, press **Next** to continue.

7. The Analyzer will fill the waste line with sample water.

8. When the waste line is filled, the Analyzer will instruct you to insert the end of the waste line in a dry 10 mL graduated cylinder. Do so and then press **Next** to continue.

9. The Analyzer will pump water into the 10 mL graduated cylinder for exactly 10 min. Then the Analyzer will stop pumping, and it will ask you if the collection of the water was satisfactory (for example, no spilling occurred no substantial air bubbles were observed). If you want to repeat the water collection, dry the graduated cylinder and press **Repeat**. If the water collection was satisfactory, press **Next** to continue.

10. Measure the volume of water in the graduated cylinder to the nearest 0.1 mL. Using the keypad on the display, enter the volume and press **Enter**. The volume should be between 3.0 and 7.0 mL; if it is not, follow the on-screen prompts to resolve the problem.

11. The Analyzer will automatically adjust the sample flow rate, and it will request you to verify that the adjustment is accurate. To do so, first drain and dry the 10 mL graduated cylinder. After you replace the waste line into the graduated cylinder, press **Next** to continue.

12. The Analyzer will pump water into the 10 mL graduated cylinder for exactly 10 min. Then the Analyzer will stop pumping, and it will ask you if the collection of the water was satisfactory. If you want to repeat the water collection, dry the graduated cylinder and press **Repeat**. If the water collection was satisfactory, press **Next** to continue.

13. Measure the volume of water in the graduated cylinder to the nearest 0.1 mL. Enter the volume using the keypad on the display, then press **Enter**.

14. The sample flow rate calibration summary screen is then displayed. The Analyzer indicates if the sample flow rate calibration passed or failed based on the following criterion:

    - the adjusted sample flow rate must be between 0.48 and 0.52 mL/min

    If this condition is satisfied, press **Apply** to accept the sample flow rate calibration and continue.

    If this condition is not satisfied, press the **Cancel** button to reject the sample flow rate calibration. You may need to perform the sample flow rate calibration procedure again. However, first check that the sample tubing has been installed correctly. Also, look for any leaks inside the Analyzer and correct them. Consult the chapter called "Troubleshooting" (starting on page 161) to determine if there is another problem with the Analyzer.

15. Disconnect the 12" waste line and restore the original waste line.

To remove the 12" waste line, use a $^{7}/_{16}$" open-end wrench to loosen the fitting from the **Waste** port on the side of the Analyzer; store the 12" waste line in a secure, clean place. Then, reattach the waste tubing by removing the rubber plug and securing the $^{7}/_{16}$" nut to the **Waste** port.

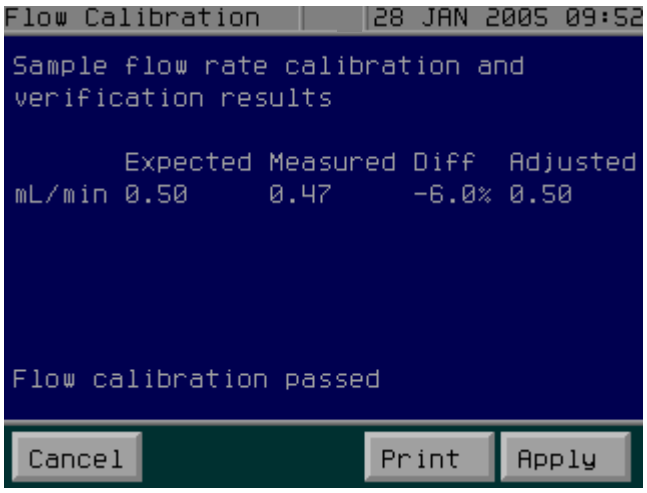

Figure 20: The Sample Flow Rate Calibration Summary Screen

Handling Standards

Because of the prevalence of both conductivity contaminants and organic carbon contaminants, sample preparation and control is extremely delicate. Special handling of the standard solutions is required.

Store standards at approximately 5 °C (±4 °), away from light, in a box or solid-door refrigerator. Warm standards to ambient temperature prior to starting analysis. Avoid touching the top of the vial to protect against introducing foreign particles, TOC, and conductivity.

After following these steps, proceed either to “Performing a Single-Point Calibration” below or to “Performing a Multi-Point Calibration” on page 125.

Performing a Single-Point Calibration

Before performing a single-point calibration, save the current Analyzer system settings, as described under the section called “Preparing for Calibration” on page 119.

GE Analytical Instruments recommends selecting a standards concentration that encompasses the normal range of TOC measurement for your application.

When you are ready to calibrate the Analyzer, follow these steps:

1. If the Analyzer is taking measurements, press the **Stop Analysis** button.

2. If you have an ICR unit, place the lever into the **Bypass** position. If you leave the lever in the **Inline** position, a warning message will display later.
3. Select the **Maintenance** tab and press the **Calibrate** button.
4. Press the **Single Pt Cal** button.
5. If you have not performed a reagent flush in the last 8 hours, you must perform one now. Make sure the Analyzer is connected to a water supply and press **Yes**.

   If you have performed a reagent flush in the last 8 hours, press **No** to skip the flush and proceed to Step 6.
6. When the flush is complete, press **OK** to continue, and remove the vial used for the flush. Open the bag containing the standards vials, and avoid touching the septa to protect against introducing foreign particles.
7. Press the **Cal. Standard** button, select the concentration of the standard you will be measuring, and push **Next**.

   At this point, the prompts on the Analyzer's display screen will help guide you through the calibration process.

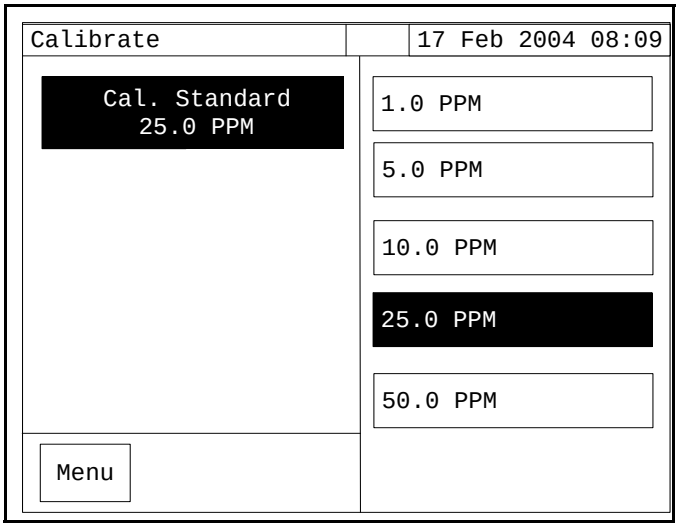

Figure 21: Selecting the Concentration for a Single-Point Calibration

8. Insert the Calibration Blank into the IOS System or vial port, and press **Next**.
9. When prompted, remove the Calibration Blank from the IOS System or vial port, insert the TOC Calibration Standard (as KHP), and press **Next**.
10. When prompted, remove the TOC Calibration Standard (as KHP) from the IOS System or vial port, insert the IC Calibration Standard (as Na_2CO_3), and press **Next**.
11. After the IC Calibration Standard (as Na_2CO_3) has been analyzed, the calibration summary screen is displayed. The Analyzer indicates if the calibration passed or failed based on the following criterion:

- The % Diff for the IC standard is ±10% or less.

If this condition is satisfied, press **Apply** to accept the calibration and continue.

If this condition is not satisfied, click the **Cancel** button to reject the calibration. You may need to perform the calibration procedure again. However, first consult the "Troubleshooting" chapter in the Analyzer's *Operation and Maintenance Manual* and applicable *Field Service Bulletins* to determine if there is a problem with the Analyzer.

Percent difference is calculated as follows:

$$\%\ \text{Diff} = \frac{\text{Measured Concentration - Expected Standard Concentration}}{\text{Expected Standard Concentration}} \times 100\%$$

The Expected TC Concentration equals the Certified TOC Concentration of the standard, plus the measured TOC Concentration in the Calibration Blank, plus the Measured IC Concentration of the standard.

$$TCexp = TOCstd + TOCblank + ICstd$$

Expected IC is the measured value, with the lamp off, from the TC channel for the IC standard, using the new TC calibration. The summary screen also displays the measured values using the existing calibration, the difference between measured and expected values and the values that would be obtained using the new calibration values (adjusted values).

$$ICexp = (TCreported + TOCoffset) \times \frac{\text{New TCslope}}{\text{Old TCslope}} - \text{TOC offset}$$

Note: If you want to manually calculate the Single -Point Calibration formulas for your records, you must print the Data History and the Calibration Constants from the Analyzer before and after performing the new calibration, in order to have access the values of the TC Slope and IC Slope.

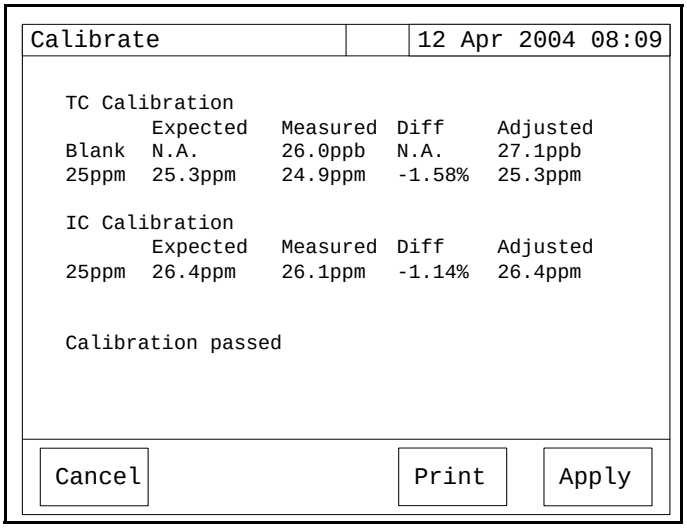

Figure 22: Reviewing TC and IC Values from a Single-Point Calibration

12. Remove the IC Calibration Standard from the IOS System or vial port.
13. You should now verify the calibration. Proceed to "Performing a Calibration Verification" on page 128 for instructions.

Performing a Multi-Point Calibration

Before performing a multi-point calibration, save the current Analyzer system settings, as described under the section called "Preparing for Calibration" on page 119.

When you are ready to calibrate the Analyzer, follow these steps:

1. If the Analyzer is taking measurements, press the **Stop Analysis** button.
2. If you have an ICR unit, place the lever into the **Bypass** position. If you leave the lever in the **Inline** position, a warning message will display later.
3. Press the **Menu** button, select the **Maintenance** tab, and then press the **Calibrate** button.
4. Press the **Multi Pt Cal** button.
5. Do one of the following:
   - If you have not performed a reagent flush in the last 8 hours, you must perform one now. Make sure the Analyzer has a vial of water in vial port, and press **Flush**. When the flush is complete, press **OK** to continue.
   - If you have performed a reagent flush in the last 8 hours, press **Skip** to ignore a flush.

6. Reconfigure the sample inlet, if necessary. At this point, the prompts on the Analyzer's display screen will help guide you through the calibration process. Open the bags containing the standards vials, and avoid touching the septa to protect against introducing foreign particles.
7. Insert the Calibration Blank into the IOS System or vial port, and press **Next**.
8. When prompted, remove the Calibration Blank from the vial port or IOS System, insert the 250 ppb TOC Calibration Standard (as KHP), and press **Next**.
9. When prompted, remove the 250 ppb TOC Calibration Standard (as KHP) from the vial port or IOS System, insert the 1 ppm TOC Calibration Standard (as KHP), and press **Next**.
10. When prompted, remove the 1 ppm TOC Calibration Standard (as KHP) from the vial port or IOS System, insert the 5 ppm TOC Calibration Standard (as KHP), and press **Next**.
11. When prompted, remove the 5 ppm TOC Calibration Standard (as KHP) from the vial port or IOS System, insert the 25 ppm TOC Calibration Standard (as KHP), and press **Next**.
12. When prompted, remove the 25 ppm TOC Calibration Standard (as KHP) from the vial port or IOS System, insert the 50 ppm TOC Calibration Standard (as KHP), and press **Next**.
13. After the 50 ppm TOC Calibration Standard (as KHP) has been analyzed, you will be prompted to enter the IC standards. Remove the 50 ppm TOC Calibration Standard (as KHP) from the vial port or IOS System, insert the 1 ppm IC Calibration Standard (as Na_2CO_3), and press **Next**.
14. When prompted, remove the 1 ppm IC Calibration Standard (as Na_2CO_3) from the vial port or IOS System, insert the 5 ppm IC Calibration Standard (as Na_2CO_3), and press **Next**.
15. When prompted, remove the 5 ppm IC Calibration Standard from the vial port or IOS System, insert the 10 ppm IC Calibration Standard (as Na_2CO_3), and press **Next**.
16. When prompted, remove the 10 ppm IC Calibration Standard from the vial port or IOS System, insert the 25 ppm IC Calibration Standard (as Na_2CO_3), and press **Next**.
17. When prompted, remove the 25 ppm IC Calibration Standard (as Na_2CO_3) from the vial port or IOS System, insert the 50 ppm IC Calibration Standard (as Na_2CO_3), and press **Next**.
18. After the 50 ppm IC Calibration Standard (as Na_2CO_3) has been analyzed, the calibration summary screen is displayed. (See Figure 23 and Figure 24.) Toggle between the values for each channel by pressing the **IC Data** and **TC Data** buttons. The Analyzer indicates if the calibration passed or failed based on the following criteria:

    - The R^2 is ≥0.990.
    - The % Diff for each IC standard is ±10% or less.

    If these conditions are satisfied, press **Apply** to accept the calibration and continue.

    If these conditions are not satisfied, click the **Cancel** button to reject the calibration. You may need to perform the calibration procedure again. However, first consult the "Troubleshooting" chapter in the Analyzer's *Operation and Maintenance Manual* and applicable *Field Service Bulletins* to determine if there is a problem with the Analyzer.

The % Difference value is calculated as follows:

$$\% \text{ Diff} = \frac{\text{Measured Concentration - Expected Standard Concentration}}{\text{Expected Standard Concentration}} \times 100\%$$

The Expected TC Concentration equals the Certified TOC Concentration of the standard, plus the measured TOC Concentration in the Calibration Blank, plus the Measured IC Concentration of the standard.

$$TCexp = TOCstd + TOCblank + ICstd$$

The IC standards are measured with the UV lamp off. Under those conditions, the readings of the TC channel are expected to match the readings of the IC channel. Therefore, the Expected IC concentration equals the measurement made by the TC channel, while the Measured IC concentration equals the measurement made by the IC channel.

Note: You will not be able to calculate the slopes created during a multi-point calibration.

19. Remove the 50 ppm IC Calibration Standard from the IOS System.
20. You should now verify the calibration. Proceed to "Performing a Calibration Verification" on page 128 for instructions.

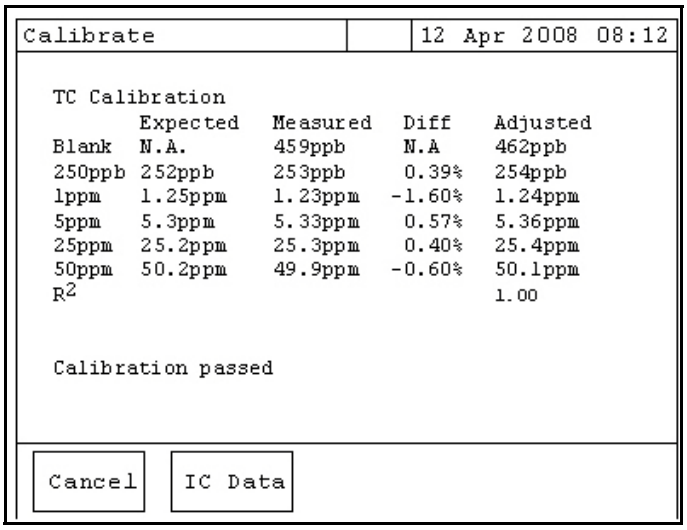

Figure 23: TC Values Summary Screen in a Multi-Point Calibration

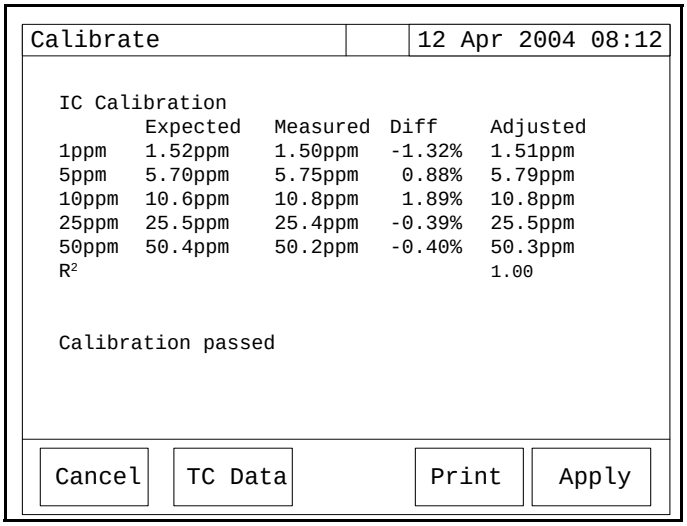

Figure 24: IC Values Summary Screen in a Multi-Point Calibration

Performing a Calibration Verification

Use the verification procedure to confirm that the Analyzer's current calibration is accurate. GE Analytical Instruments recommends performing a verification after replacement of consumables, such as the pump tubing, UV lamp, resin bed, or reagents, and after calibration.

The same verification procedure is used whether a multi-point or single-point calibration was performed. Verification occurs at a single concentration, which you can select. Choose a concentration that is appropriate for your application. Verification can be repeated at multiple concentrations if it is desirable to verify the entire analytical range of the instrument instead of verification near the range of interest only.

Follow these steps to perform a calibration verification:

1. If the Analyzer is taking measurements, press the **Stop Analysis** button.
2. If you have an ICR unit, make sure the lever is in the **Bypass** position. If you leave the lever in the **Inline** position, a warning message will display later.
3. Press the **Menu** button, select the **Maintenance** tab, and then press the **Calibrate** button.
4. Press the **Verify** button.
5. Do one of the following:
   - If you are performing the verification immediately after the calibration, press the **Skip** button to avoid flushing the reagent syringes. When the flush is complete, press **OK** to continue.
   - If there has been at least an eight-hour delay between performing the calibration and starting the verification, make sure the that Analyzer is connected to a water supply press **Flush** to perform a reagent flush now.

6. When the flush is complete, press **OK** to continue, and remove the vial used for the flush. Open the bag containing the standards vials, and avoid touching the septa to protect against introducing foreign particles.
7. Press the **Ver. Standard** button, select the concentration of the standard you will be measuring, and then push **Next**.

   At this point, the prompts on the Analyzer's display screen will help guide you through the verification process.
8. Insert the Verification Blank into the vial port or IOS System and press **Next**.
9. When prompted, remove the Verification Blank from the vial port or IOS System, insert the TOC Verification Standard (as sucrose), and press **Next**.
10. When prompted, remove the TOC Verification Standard (as sucrose) from the vial port or IOS System, insert the IC Verification Standard (as Na_2CO_3), and press **Next**.
11. After the IC Verification Standard (as Na_2CO_3) has been analyzed, the Verification summary screen is displayed. The Analyzer indicates if verification passed or failed based on the following criteria:
    - Blank RSD has no criteria.
    - RSD for the TOC standard is ≤3%.
    - RSD for the IC standard is IC ≤3% and TC ≤3%.
    - TOC % Diff is ±7% or less for a 1 ppm TOC standard.
    - TOC % Diff is ±5% or less for a 2, 5, 10, 25, or 50 ppm TOC standard.
    - IC % Diff is ±7% or less for a 1 ppm IC standard.
    - IC % Diff is ±5% or less for a 2, 5, 10, 25, or 50 ppm IC standard.

    If these conditions are not satisfied and verification fails, you may need to perform the calibration and then the verification procedures again. However, first consult the chapter called "Troubleshooting" on page 161 to determine if there is a problem with the Analyzer.

    The % Difference value is calculated as follows:

$$\%\ \text{Diff} = \frac{\text{Measured Concentration - Expected Standard Concentration}}{\text{Expected Standard Concentration}} \times 100\%$$

    The Expected TOC Concentration equals the Certified TOC Concentration of the standard, plus the measured TOC Concentration in the Calibration Blank.

$$\text{TOCexp} = \text{TOCstd} + \text{TOCblank}$$

    The IC standards are measured with the UV lamp off. Under those conditions, the readings of the TC channel are expected to match the readings of the IC channel. Therefore, the Expected IC concentration equals the measurement made by the TC channel, while the Measured IC concentration equals the measurement made by the IC channel.
12. Press the **OK** button to continue.

13. Remove the vial from the vial port or IOS System and slide the door closed.
14. If you have an ICR unit, return the lever to the **Inline** position.
15. If you use the Autoreagent feature, perform an Autoreagent calibration. (Proceed to "Performing an Autoreagent Calibration" below.)

Performing an Autoreagent Calibration

If you use the Autoreagent function, you should perform an Autoreagent Calibration after you have performed annual maintenance on the Analyzer, including a sample flow rate calibration (page 120), Analyzer Multi-Point Calibration (page 125), and Calibration Verification (page 128). The autoreagent function should not be used in applications where samples are expected to be less than 1 ppm.

When you are ready to perform the Autoreagent calibration, follow the steps described in "Preparing for Calibration" on page 119 and then follow this procedure:

1. If the Analyzer is taking measurements, press the **Stop Analysis** button.
2. If you have an ICR unit, make sure the lever is in the **Bypass** position.
3. If it has been more than 8 hours, perform a reagent flush.
4. Press the **Menu** button, select the **Maintenance** tab, and then press the **Calibrate** button.
5. Press the **Autoreagent Cal** button.
6. Open the bag containing the standards vials, and avoid touching the septa to protect against introducing foreign particles. At this point, the prompts on the Analyzer's display screen will help guide you through the Autoreagent calibration process.
7. Insert the Reagent Water into the vial port or IOS System, and press **Next**.
8. When prompted, remove the Reagent Water from the vial port or IOS System, insert the 25 ppm TOC (as KHP) standard, and press **Next**.
9. When prompted, remove the 25 ppm TOC (as KHP) standard from the vial port or IOS System, insert the 50 ppm TOC (as nicotinamide) standard, and press **Next**.
10. When prompted, remove the 50 ppm TOC (as nicotinamide) standard from the vial port or IOS System, insert the 25 ppm IC (as Na_2CO_3) standard, and press **Next.**
11. The Autoreagent calibration summary screen is displayed. This screen presents data obtained during preliminary measurements of the standards. (See Chapter 4 for a description of the preliminary measurement.)

    The peak times measured for the 25 ppm and 50 ppm TOC Standards are listed first. The median peak time for each TOC Standard is used in the Autoreagent calibration. The difference between the two peak times is a criterion to determine if the Autoreagent calibration passed or failed. The median peak time of the 50 ppm TOC Standard must be from 20 to 100 seconds less than the median peak time of the 25 ppm TOC Standard.

The summary screen then lists the measurements made on the 25 ppm IC Standard. Four measurements of the IC Standard were made after the preliminary measurement. The first of these is rejected, as in any calibration procedure. The remaining three measurements are statistically evaluated using the Q-test, and one of those three measurements may be rejected. The average of the two-to-three valid measurements is presented as the IC Expected Concentration. The TC Expected Concentration is calculated the same way. The RSDs of the valid IC and TC measurements also are listed.

The summary screen lists the average of ten preliminary measurements made at the IC and TC channels, along with the RSD of those preliminary measurements.

The Analyzer indicates if the Autoreagent Calibration passed or failed based on the following criteria:

- The median peak time of the 50 ppm TOC Standard is from 20 to 100 seconds less than the median peak time of the 25 ppm TOC Standard.
- The RSD of the valid expected IC and TC concentration measurements is 3% or less.
- The RSD of the IC and TC preliminary measurements is 5% or less

12. If the acceptance criteria are satisfied, press **Apply** to accept the Autoreagent calibration and continue.
13. Remove the 25 ppm IC (as Na_2CO_3) Standard from the vial port or IOS System.
14. You should now verify the Autoreagent calibration. Proceed to "Performing an Autoreagent Verification" on page 132 for instructions.

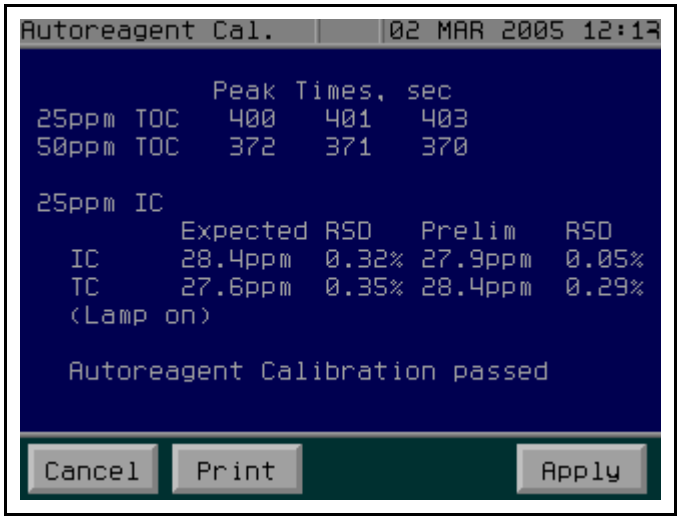

Figure 25: The Autoreagent Calibration Summary Screen

Performing an Autoreagent Verification

Use the Autoreagent verification to confirm the Analyzer's current Autoreagent calibration is accurate. GE Analytical Instruments recommends performing the Autoreagents verification after replacement of pump tubing and after Autoreagent calibration.

The sample flow rate calibration (see page 120) should always be performed after replacement of the pump tubing and before the Autoreagents verification.

To perform the Autoreagent verification, follow this procedure:

1. If the Analyzer is taking measurements, press the **Stop Analysis** button.
2. If you have an ICR unit, make sure the lever is in the **Bypass** position.
3. If it has been more than 8 hours, perform a reagent flush.
4. Press the **Menu** button, select the **Maintenance** tab, and then press the **Calibrate** button.
5. Press the **Autoreagent Ver** button.
6. Open the bag containing the standards vials, and avoid touching the septa to protect against introducing foreign particles.

   At this point, the prompts on the Analyzer's display screen will help guide you through the Autoreagent calibration verification process.
7. Insert the Reagent Water into the vial port or IOS System, and press **Next**.
8. When prompted, remove the Reagent Water from the vial port or IOS System, insert the 25 ppm TOC (as sucrose) standard, and press **Next**.
9. When prompted, remove the 25 ppm TOC (as sucrose) standard from the vial port or IOS System, insert the 50 ppm TOC (as sucrose) standard, and press **Next**.
10. When prompted, remove the 50 ppm TOC (as sucrose) standard from the vial port or IOS System, insert the 50 ppm IC (as Na_2CO_3) standard, and press **Next.**
11. The Autoreagent verification summary screen is displayed. This screen presents data obtained during the analysis of the standards using the Autoreagents function.

    The Expected TOC Concentrations for the 25 ppm and 50 ppm TOC Standards are listed first. These concentrations are the certified concentrations of the standards (i.e., 25.0 ppm and 50.0 ppm, respectively).

    The measured TOC concentrations are the average of the last three measurements made on each standard, using the acid and oxidizer flow rates selected by the Autoreagent function. The RSD of each measurement is listed, along with the % difference between the measured and expected concentrations.

    The % Difference is calculated as follows:

$$\%\ \text{Diff of TOC Standards} = \frac{\text{Measured Conc. - Expected Standard Conc.}}{\text{Expected Standard Conc.}} \times 100\%$$

The summary screen then lists the preliminary measurements made at the IC and TC channels for the 50 ppm IC Standard. The % Difference between the preliminary measurements at the IC channel and the TC channel also is shown, and is calculated as follows:

$$\%\ \text{Diff of IC Standard} = \frac{\text{Prelim. IC Conc. - Prelim. TC Conc.}}{\text{Prelim. TC Conc.}} \times 100\%$$

The Analyzer indicates if the Autoreagent calibration verification passed or failed based on the following criteria:

- RSD of the last 3 valid TOC readings for the 25 and 50 ppm TOC standards is 5% or less
- % Diff of the 25 and 50 ppm TOC standards is ±5% or less
- % Diff between the IC and TC preliminary measurements (for the 50 ppm IC standard) is ±10% or less (as compared to the TC value)

12. Press the **OK** button to continue.
13. Remove the 50 ppm IC (as Na_2CO_3) Standard from the vial port or IOS System.
14. If you have an ICR unit, return the lever to the **Inline** position.

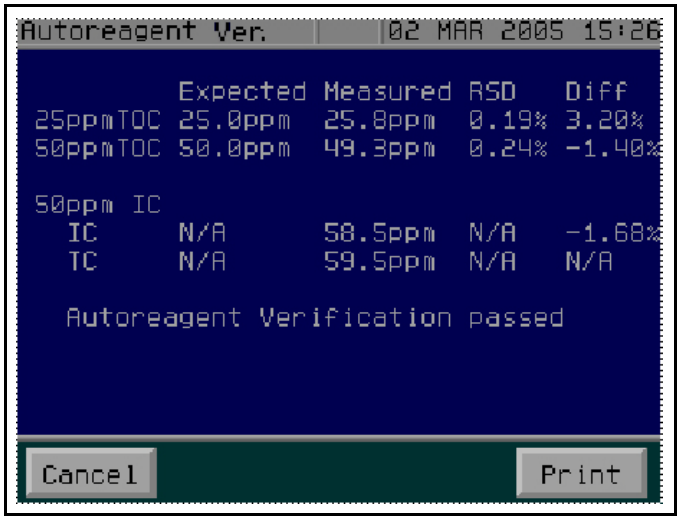

Figure 26: The Autoreagent Verification Summary Screen

Performing a Municipal TOC Set Verify Test

A set of TOC standards containing 1, 5, and 10 ppm vials is available for municipal customers. Use the municipal verify procedure as a rough check of the Analyzer's accuracy. There is no pass/fail criteria for this test, since there is no blank included and, therefore, should not be used to verify a calibration. Follow these steps to perform the check:

1. If the Analyzer is taking measurements, press the **Stop Analysis** button.
2. If you have an ICR unit, make sure the lever is in the **Bypass** position.
3. Press the **Menu** button, select the **Maintenance** tab, and then press the **Calibrate** button.
4. Press the **Muni Set Verify** button.
5. If you have performed a reagent flush in the last 8 hours, click **No** to skip the flush and proceed to Step 7.
6. When the flush is complete, click **OK** to continue. Remove the protective cap from the standards vials, and avoid touching the septa to protect against introducing foreign particles.
7. Insert the 1 ppm standard into the iOS system and then push **Next**.
8. When prompted, remove the 1 ppm standard from the iOS System, insert the 5 ppm standard, and then press **Next**.
9. When prompted, remove the 5 ppm standard from the iOS System, insert the 10 ppm standard, and then press **Next**.
10. After the 10 ppm standard has been analyzed, the result screen is displayed.
11. Press the **OK** button to continue.
12. Remove the vial from the iOS and slide the door closed.
13. If you have an ICR unit, return the lever to the **Inline** position.

Reviewing Calibration and Verification History

If you need to review the results summary of past calibrations, follow these steps:

1. Press the **Menu** button and select the **Maintenance** tab.
2. Press the **Calibrate** button.
3. Press the **Cal/Ver History** button.
    - Press the **Print History** button to output the calibration history to the printer.
    - Press the **Export History** button to output the calibration history to the USB port or the serial port in text (`.csv`) format.

If you want to review specific measurements from calibration or verification, you can display the data history as you normally would. The **Mode** column lists **TC Cal** and **IC Cal** for calibration results, **TC Ver** and **IC Ver** for verification results. These results also are included when you export the data history.

Worksheets

Worksheets for the Calibration and Verification protocols follow:

Sample Flow Rate Calibration Worksheet

Company Name _____ Date _____

Analyst Name _____ Firmware Version _____

Analyzer Serial Number _____

Sample pump tubing replaced before sample flow rate calibration (Y/N): _____ (Line 1)

Enter data for the sample flow rate calibration:

	Expected	**Measured**	**% Diff**	**Adjusted**
mL/min:	0.50	_____	_____	_____

$$\% \text{ Diff} = \frac{\text{Measured Flow Rate - 0.50}}{0.50} \times 100\%$$

Flow rate calibration pass/fail based upon the following criteria:

- The **Adjusted** sample flow rate is 0.48 to 0.52 mL/min

Sample Flow Rate Calibration Results: ☐ Passed ☐ Failed

Sample Flow Rate Calibration Action: ☐ Applied ☐ Canceled

Single-Point Calibration Worksheet

Company Name _____ Date _____

Analyst Name _____ Firmware Version _____

Analyzer Serial Number _____ Standards Lot Number _____

Reagent Flush Performed (Y/N): _____ (Line 1)

Concentration of Standard: _____ (Line 2)

Enter data for the TC Calibration:

	Expected	Measured	% Diff	Adjusted
Blank	N/A	_____	_____	_____
_____	_____	_____	_____	_____

Enter data for the IC Calibration:

	Expected	Measured	% Diff	Adjusted
_____	_____	_____	_____	_____

$$\% \text{ Diff} = \frac{\text{Measured Concentration - Expected Standard Concentration}}{\text{Expected Standard Concentration}} \times 100\%$$

Calibration pass/fail based upon the following criterion:

- The % Diff value for each IC standard is ±10% or less.

Calibration Results: ☐ Passed ☐ Failed

Calibration Action: ☐ Applied ☐ Canceled

Multi-Point Calibration Worksheet

Company Name _____ Date _____

Analyst Name _____ Firmware Version _____

Analyzer Serial Number _____ Standards Lot Number _____

Reagent Flush Performed (Y/N): _____

Enter data for the TC Calibration:

	Expected	**Measured**	**% Diff**	**Adjusted**
Blank	N/A	_____	_____	_____
250 ppb	_____	_____	_____	_____
1 ppm	_____	_____	_____	_____
5 ppm	_____	_____	_____	_____
25 ppm	_____	_____	_____	_____
50 ppm	_____	_____	_____	_____
R^2				_____

Enter data for the IC Calibration:

	Expected	**Measured**	**% Diff**	**Adjusted**
1 ppm	_____	_____	_____	_____
5 ppm	_____	_____	_____	_____
10 ppm	_____	_____	_____	_____
25 ppm	_____	_____	_____	_____
50 ppm	_____	_____	_____	_____
R^2				_____

$$\% \text{ Diff} = \frac{\text{Measured Concentration - Expected Standard Concentration}}{\text{Expected Standard Concentration}} \times 100\%$$

Calibration pass/fail based upon the following criteria:

- The R^2 is ≥0.990.
- The % Diff value for each IC standard is ±10% or less.

Calibration Results: ☐ Passed ☐ Failed

Calibration Action: ☐ Applied ☐ Canceled

Verification Worksheet

Company Name _____ Date _____

Analyst Name _____ Firmware Version _____

Analyzer Serial Number _____ Standards Lot Number _____

Concentration of Standard: _____

Reagent Flush Performed (Y/N): _____

Enter data for the TOC Verification:

	Expected	Measured	RSD	% Diff
Blank	N/A	_____	_____	_____
_____	_____	_____	_____	_____

Enter data for the IC Verification:

	Expected	Measured	RSD	% Diff
_____	_____	_____	_____	_____

$$\% \text{ Diff} = \frac{\text{Measured Concentration - Expected Standard Concentration}}{\text{Expected Standard Concentration}} \times 100\%$$

Pass criteria:

- RSD for the TOC standard is $\leq$3%.
- Blank has no criteria.
- RSD for the IC standard is IC $\leq$3% and TC $\leq$3%.
- TOC % Diff is ±7% or less for a 1 ppm TOC standard.
- TOC % Diff is ±5% or less for a 2, 5, 10, 25, or 50 ppm TOC standard.
- IC % Diff is ±7 or less for a 1 ppm IC standard.
- IC % Diff is ±5% or less for a 2, 5, 10, 25, or 50 ppm IC standard.

Verification Results: ☐ Passed ☐ Failed

Autoreagent Calibration Worksheet

Company Name _____ Date _____

Analyst Name _____ Firmware Version _____

Analyzer Serial Number _____ Standards Lot Number _____

Standard	Peak Time (sec)		
25 ppm TOC			
50 ppm TOC			

25 ppm IC Standard	Expected Conc. (ppm)	RSD (%)	Prelim. Meas. (ppm)	RSD (%)
IC				
TC				

Autoreagent calibration pass/fail based upon the following criteria:

- The median peak time of the 50 ppm TOC Standard is from 20 to 100 seconds less than the median peak time of the 25 ppm TOC Standard.
- The RSDs of the valid expected IC and TC concentration measurements are 3% or less.
- The RSDs of the IC and TC preliminary measurements are 5% or less

Autoreagent Calibration Results: ☐ Passed ☐ Failed

Autoreagent Calibration Action: ☐ Applied ☐ Canceled

Autoreagent Verification Worksheet

Company Name _____ Date _____

Analyst Name _____ Firmware Version _____

Analyzer Serial Number _____ Standards Lot Number _____

TOC Standard	Expected TOC (ppm)	Measured TOC (ppm)	RSD (%)	% Diff
25 ppm TOC	25.0			
50 ppm TOC	50.0			

50 ppm IC Standard	Preliminary Measurement	% Diff
IC		
TC		NA

$$\%\ \text{Diff of TOC Standards} = \frac{\text{Measured Conc. - Expected Standard Conc.}}{\text{Expected Standard Conc.}} \times 100\%$$

$$\%\ \text{Diff of IC Standard} = \frac{\text{Prelim. IC Conc. - Prelim. TC Conc.}}{\text{Prelim. TC Conc.}} \times 100\%$$

The Analyzer indicates if the Autoreagent verification passed or failed.

Autoreagents Verification pass/fail based upon the following criteria:

- RSD of the last 3 valid TOC readings for the 25 and 50 ppm TOC standards is 5% or less
- % Diff of the 25 and 50 ppm TOC standards is ±5% or less
- % Diff between the IC and TC preliminary measurements (for the 50 ppm IC standard) is ±10% or less (as compared to the TC value)

Autoreagent Verification Results: ☐ Passed ☐ Failed

Chapter 7. Maintenance

Replacing Consumables and Maintenance Items

To ensure optimum performance of the Analyzer, routinely replace Analyzer consumables and maintenance items. Refer to Table 14 on page 146 for the recommended maintenance schedule. Chemical reagents, the in-line filter, UV lamp, and pump tubing **must** be purchased from GE Analytical Instruments. The use of reagents from other sources or failure to replace the reagents on the prescribed replacement schedule will invalidate the Analyzer's warranty.

If you need additional assistance, contact GE Analytical Instruments Technical Support at 800.255.6964. Training by a qualified service technician also can be provided. Technical Support in the United Kingdom is available at 44 (0) 161 864 6800. In other countries, visit www.geinstruments.co to locate your representative.

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.

A one-year maintenance record log is provided for convenience to ensure that all required maintenance is performed when necessary. (See Table 15 on page 160.)

This following applies to both the Sievers 5310 C Laboratory and Portable TOC Analyzer instrument models, except where noted.

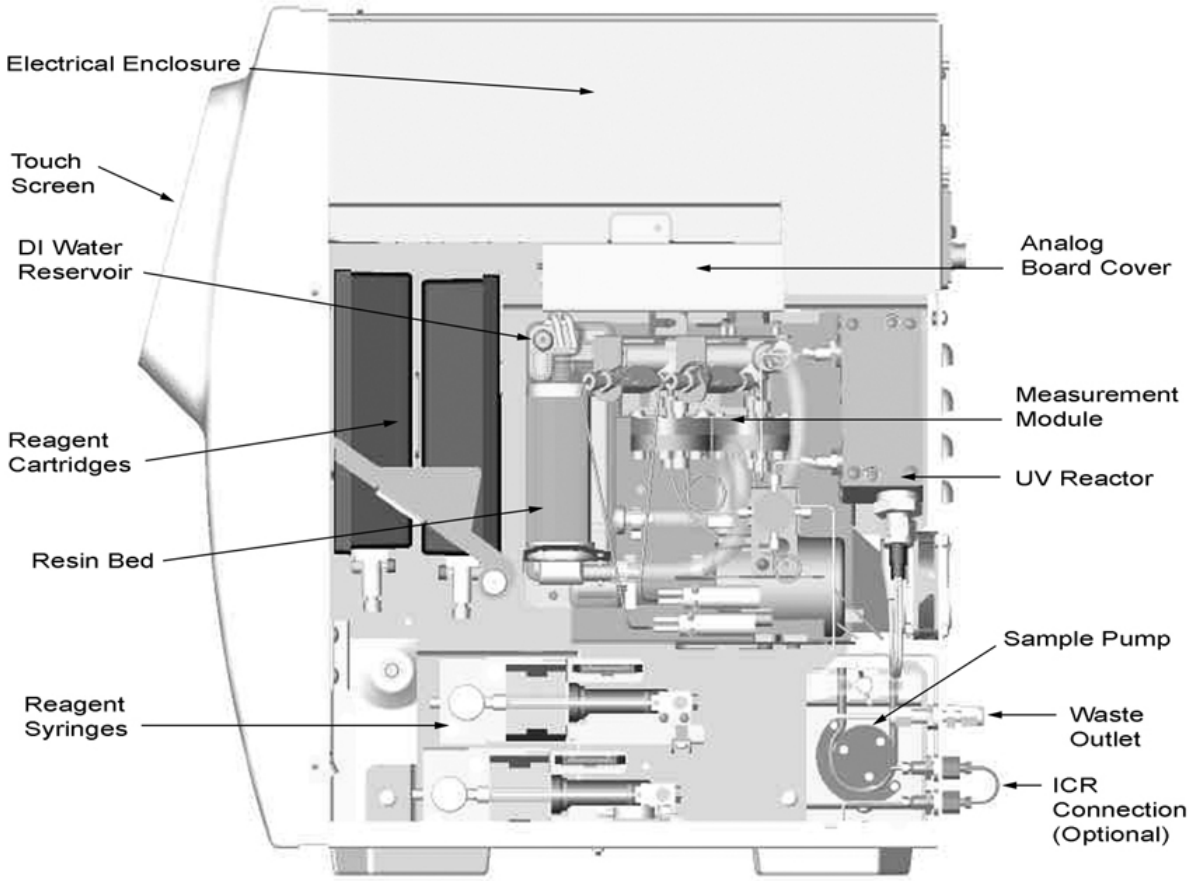

Figure 27: Interior Overview —Sievers 5310 C Laboratory TOC Analyzer

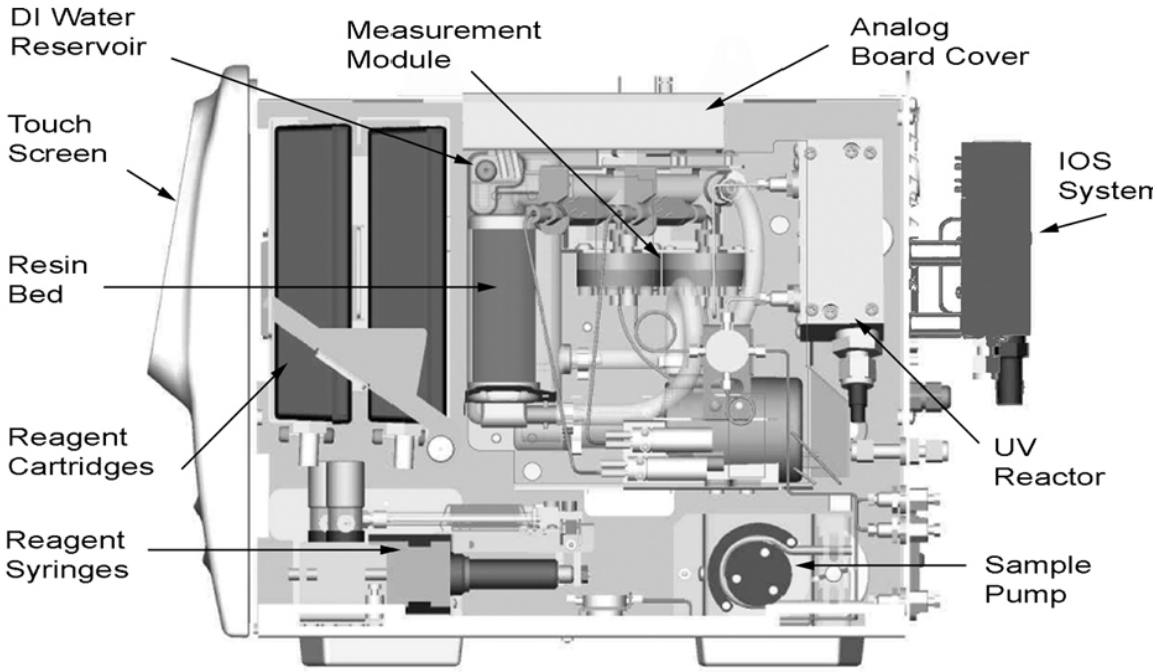

Figure 28: Interior Overview —Sievers 5310 C Portable TOC Analyzer

Table 14: Replacement Schedule for Sievers 5310 C Series Analyzer Consumables

Description	Typical Operating Life
DI Water Reservoir	Refill as needed (check when replacing reagents or UV lamp)
Oxidizer	3 calendar months maximum (depends on flow rate)
Acid	12 calendar months maximum (depends on flow rate)
UV lamp	6 months
Sample pump tubing	12 months
Resin Bed	Typically 12 Months (depends on water quality)
Capsule filter (on-line mode only for Portable)	Replace as needed (depends on water quality)

Checking and Refilling the DI Water Reservoir

The level of the DI water reservoir should be checked periodically and refilled as needed. For this procedure, you will need the water bottle from the TOC accessories kit filled with DI water. Refer to Figure 29 as needed.

To check the level of water in the DI water reservoir:

1. If the Analyzer is taking measurements, press the **Stop Analysis** button.
2. Turn off power to the Analyzer with the main power switch.
3. Open the Analyzer case and locate the DI water reservoir.
4. Locate the fill line on the DI water reservoir, just below the rubber inlet cover. The line indicates the maximum water level. If you notice a gap between the water level and the fill line, you need to add DI water to the reservoir.
5. Remove the rubber inlet cover.
6. Fill the water bottle from the Analyzer accessory kit with DI water and use the nozzle on the water bottle to fill the DI water reservoir. Fill the reservoir until the water level reaches the fill line.

Warning
Do not over-fill the DI water reservoir.

7. Replace the inlet cover by gently pushing it back into place on the reservoir.
8. If you need to replace other consumables, follow the procedures listed in the appropriate sections of this chapter. Otherwise, close the Analyzer case.

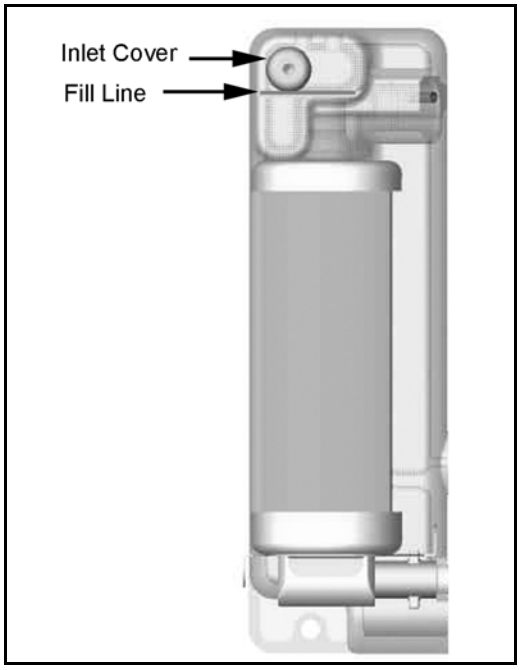

Figure 29: Filling the DI Water Reservoir

Replacing the Chemical Reagents

The oxidizer and acid reagents **must** be purchased from GE Analytical Instruments to ensure product purity and operating life. The use of reagents from other sources or failure to replace the reagents on the prescribed replacement schedule will invalidate the Analyzer's warranty.

Warning
Reagent containers are for single-use only: do not refill. Refilling or reusing reagent containers will void all Analyzer and parts warranties and nullify any performance claims.

Warning
To avoid exposure to the chemical reagents, wear acid-resistant gloves, protective clothing, and safety goggles or a face shield when changing the reagent supplies.

1. If the Analyzer is taking measurements, press the **Stop Analysis** button.
2. Turn off power to the Analyzer with the main power switch.
3. Open the Analyzer case and locate the reagent. Lift the containment bar.
4. For each cartridge that you are replacing:
    - Remove the cartridge from the enclosure.

- Push the red button to close the valve.
- Loosen the PEEK nut and disconnect the cartridge from the reagent syringe tubing.

Warning
Acid or oxidizer may spill from the containers if the valves are not closed.

Note: Reagent containers need to be disposed of according to local regulations. All reagent containers are shipped with Material Safety Data Sheets (MSDS). These sheets will provide instructions. GE Analytical Instruments can not accept containers for disposal.

5. Remove the new reagent container(s) from the packaging. Record the expiration date of the acid and oxidizer and the volume of the oxidizer in the Notes column on the **Maintenance Worksheet.** (See Table 15 on page 160.) You also will need to enter these dates into the Analyzer later.
6. For each reagent, follow these steps:
   - Locate the supply line for the reagent you are replacing, indicated by the **Acid** or **Oxidizer** label on the tubing.
   - Attach the appropriate PEEK nut to the reagent container and tighten finger-tight.
   - Press the green button all the way in to open the valve on the reagent container. Refer to the labeling on the container for proper positioning.
   - Slide the container into the reagent area, with the valve pointing down and toward the front of the reagent enclosure. Be careful to move tubing and wires out of the way while sliding the cartridges into the enclosure, so you do not inadvertently crimp tubing or loosen cable connections.
   - Return the containment bar to the closed position.
7. If you need to replace other consumables, follow the procedures listed in the appropriate sections of this chapter. Otherwise, close and latch the Analyzer door.
8. Power the Analyzer *On*.
9. Enter the installation and expiration dates for the reagents by following the procedures in "Setting the Installation or Expiration Date for New Consumables" on page 158 to ensure that the Analyzer correctly tracks the life of the new reagents.
10. To reduce the possibility of bubbles, perform a flush of the reagent syringes before resuming normal operation. Refer to "Flushing the Reagent Syringes" on page 159 for details.

Replacing the UV Lamp

The intensity of the UV lamp, particularly the emission of short-wavelength radiation, decreases over time. Replace the lamp after every six months of operation.

Warning
The UV lamp contains mercury and may be considered hazardous material in your local area. Dispose of the UV lamp in accordance with federal, state, or local government regulations.

	Warning
	Installation of the UV lamp requires access to the inside of the Analyzer. To avoid potentially dangerous shock, disconnect the power cord before opening the Analyzer's front panel.

Warning
Should the UV lamp become broken or damaged, it should be handled in accordance with your organization's toxic waste handling procedure and disposed of in accordance with federal, state, or local government regulations.

Note: A cotton glove to be worn during the installation is included with the replacement UV lamp to avoid leaving fingerprints on the quartz window of the lamp. Fingerprints absorb UV radiation and decrease the performance of the oxidation reactor. If necessary, use methanol to remove any fingerprints before installing the new lamp.

To replace the UV lamp

1. If the Analyzer is taking measurements, press the **Stop Analysis** button.
2. Turn off the Analyzer by using the main power switch, and unplug the power cord.
3. Open the Analyzer and locate the UV lamp enclosure at the right of the Analyzer. The UV enclosure has a brass nut at the bottom of the enclosure and a gray wire with a black connector extending from the nut.
4. Disconnect the black power connector from the power supply by turning the connector and then carefully pulling the two halves of the plug apart.
5. Loosen the brass nut on the UV enclosure. The nut should only be finger-tight, and a wrench should not be necessary.
6. Slowly slide the UV lamp out of the enclosure.

7. Put on the glove provided with the new UV lamp, to avoid leaving fingerprints on the quartz window of the lamp. Remove the new lamp from the packet and the nut and ferrules from the zip-top bag.
8. Slide the nut up the lamp housing (toward the connector cord), and then slide the ferrules up the lamp housing, until they are level with the black heat shrink tubing. Be careful when inserting the lamp into the Analyzer as the nut and ferrules may slide off. Refer to Figure 30 and Figure 31 for proper orientation of the ferrules.

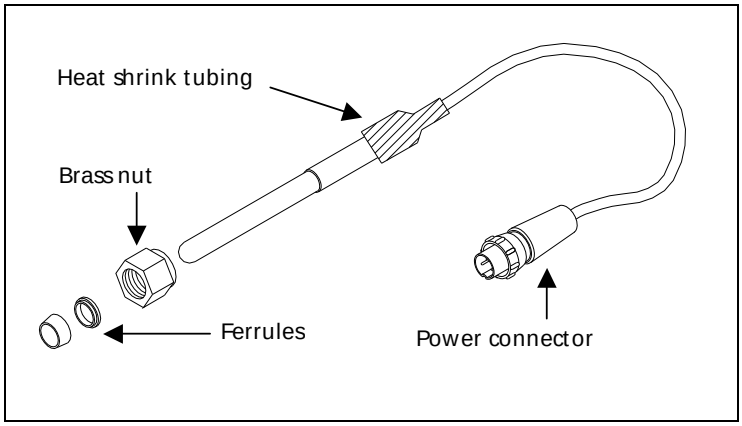

Figure 30: Relative Positioning of Components in the UV Lamp Assembly

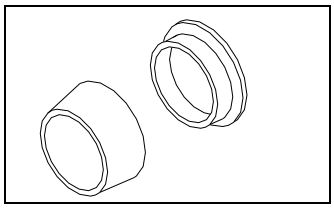

Figure 31: UV Lamp Ferrule Orientation Detail

9. Carefully slide the lamp assembly into the enclosure until you reach the heat shrink tubing. Stop if you feel any resistance, and realign the lamp in the reactor.
10. Tighten the brass nut finger-tight. While tightening the nut, make sure it stays level with the heat shrink tubing (Figure 30). Do **not** use a wrench.
11. Connect the power connector to the power supply by aligning the slot on the connector with the slot on the power supply. Tighten the connector screw. Gently pull on the power connector to make sure it is securely attached to the power supply.
12. Record the installation date for the lamp in the service log. (See Table 15 on page 160.)
13. If you need to replace other consumables, follow the procedures listed in the appropriate sections of this chapter. Otherwise, close and latch the Analyzer door.
14. Plug in the main power cord and turn the Analyzer on with the main power switch.

15. Enter the installation date for the UV lamp by following the procedures in "Setting the Installation or Expiration Date for New Consumables" on page 158.
16. After changing the UV lamp, perform a calibration verification. (See "Performing a Calibration Verification" on page 128.)

Replacing the Sample Pump Tubing

The tubing for the sample pump loses elasticity over time and must be replaced annually to ensure proper flow rates. The tubing must be purchased from GE Analytical Instruments; use of tubing from other sources or failure to replace the tubing on the prescribed replacement schedule will affect Analyzer functionality.

	Warning
	Installation of the pump tubing requires access to the inside of the Analyzer. To avoid potentially dangerous shock, disconnect the power cord before opening the Analyzer's front panel.

Warning
To avoid exposure to the acidified water in the tubing, wear acid-resistant gloves, protective clothing, and safety goggles or a face shield, when changing the pump tubing.

Have paper towels available during the procedure in case water leaks from the old pump tubing during the removal process. For an illustration of the parts mentioned below, refer to Figure 32 on page 152.

1. If the Analyzer is taking measurements, press the **Stop Analysis** button.
2. Turn off the Analyzer by using the main power switch and unplug the power cord.
3. Open the Analyzer case and locate the sample pump and tubing support bracket. The support bracket is a plastic piece just above the pump.
4. Loosen the wing nut in the center of the bracket. If loosening the bracket does not allow you to remove the tubing in Step 8 below, then you will need to remove the bracket completely and should take careful note of the bracket's orientation.
5. Remove the left Allen screw on the semicircular occlusion plate on the sample pump.
6. Rotate the occlusion plate so that it is out of the way.
7. Follow the sample pump tubing to the pieces of green tubing from the transfer modules. Disconnect the pump tubing from both pieces of the green tubing by pulling on the pump tubing while supporting the green restrictor tubing.
8. Disconnect the other end of the pump tubing from the waste outlet attached to the Analyzer bulkhead.

9. Remove the pump tubing from the pump, and then safely dispose of the old tubing.
10. Use a paper towel to clean up any liquid that may have spilled inside the Analyzer.

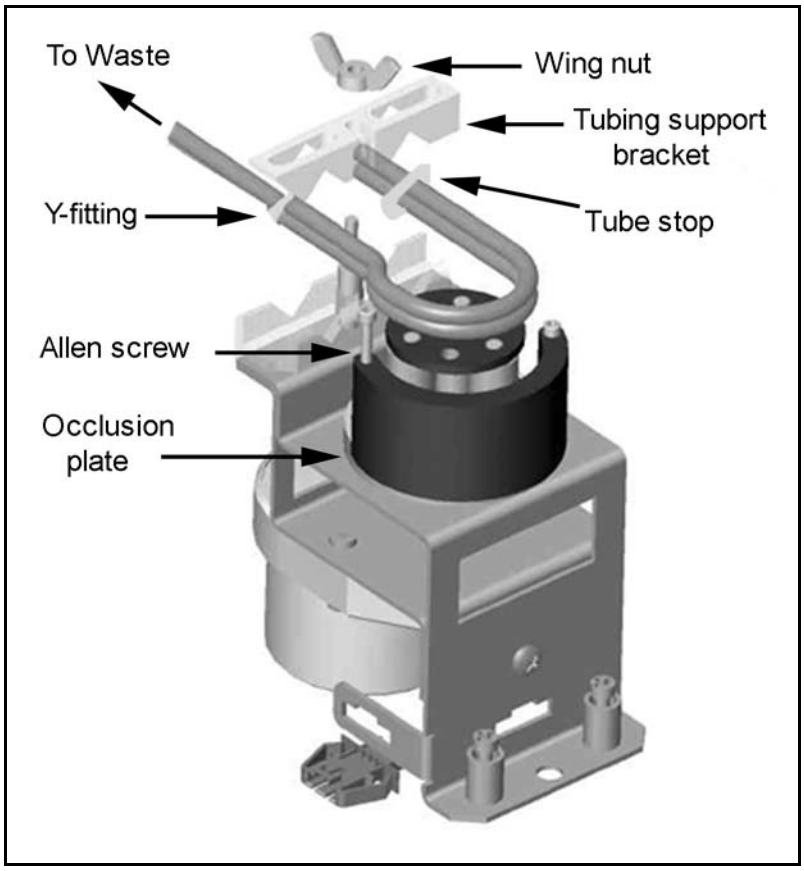

Figure 32: Replacing the Sample Pump Tubing

11. Remove the new pump tubing from the shipping container.
12. Connect the single end of the new tubing (below the Y-fitting) to the waste outlet on the Analyzer bulkhead (connect as much of the tubing as possible, or approximately $^{1}/_{4}$" to $^{1}/_{2}$" onto the waste fitting).
13. Position the tubing in the left slot of the support bracket.
14. Run the tubing counter-clockwise through the sample pump. Loosen the second screw on the occlusion plate if necessary. The tubing should sit side-by-side; be careful not to twist the tubing, and make sure it sits on the center of the rollers so it is even all around the pump.
15. Pull the tubing through the sample pump so there is no slack in the tubing.
16. Position the tube stop just above the right slot of the support bracket.
17. Tighten or, if necessary, replace the top piece of the bracket and secure with the wing nut. Do not pinch the tubing with the support bracket, and continue to ensure that there is no slack in the tubing.

18. Slide the occlusion plate, and secure the left Allen screw.
19. Attach the two ends of sample pump tubing to either of the two pieces of green tubing that lead to the transfer modules (attach the pump tubing about $^{1}/_{4}$" onto the tubing).
20. Tuck the tubing into the Analyzer so it is out of the way.
21. Record the installation date for the pump tubing in the service log. (See Table 15 on page 160.)
22. If you need to replace other consumables, follow the procedures listed in the appropriate sections of this chapter. Otherwise, replace the Analyzer case.
23. Plug in the main power cord and turn the Analyzer on with the main power switch.
24. Enter the installation date for the pump tubing by following the procedures in "Setting the Installation or Expiration Date for New Consumables" on page 158.
25. GE Analytical Instruments recommends that you now perform a sample flow rate calibration, as described on page 120.

Replacing the Ion Exchange Resin (Resin Bed)

The ion exchange resin (resin bed) depletes over time. With typical Analyzer use, the resin bed should be replaced after every 12 months of operation. To replace the resin bed, you will need the new resin bed; paper towels; and the water bottle from the accessories kit.

The procedure differs slightly depending on whether your Analyzer has the silver-colored bracket or the brass-colored bracket. Follow the procedure appropriate for your Analyzer's configuration.

If the DI pump cavitates (makes noises), follow the installation priming steps located in "Powering On the Analyzer" on page 69,

Resin Bed Replacement with a Silver-Colored Bracket

1. If the Analyzer is taking measurements, press the **Stop Analysis** button.
2. Turn off the Analyzer by using the main power switch, and unplug the power cord.
3. Remove the top of the water bottle and empty out any water in the bottle. Keep the water bottle available.
4. Remove the new resin bed from the packaging. The resin bed comes with a red plug inserted into the port at the bottom of the bed; remove this plug and keep it available.
5. Open the Analyzer case and locate the resin bed. The resin bed sits slightly in front and to the left of the DI reservoir. (See Figure 33 for positioning of the elements in the resin bed that are discussed in the following steps.)
6. Have a paper towel available to absorb water that may leak from the resin bed. Immediately after performing the next step, you will need to insert the plug into the bottom port on the resin bed to prevent additional water from leaking out.

7. Remove the DI water connector from the bottom of the resin bed as follows: rotate the connector tubing until the small tab is no longer extending through the slot on the set plate; then, pull the tubing out of the resin bed (do not remove the black clip from the tubing). After you remove the tubing from the resin bed, hold the tubing so that the nozzle faces up, to prevent water from leaking.
8. Insert the red plug into the port at the bottom of the old resin bed.
9. Place the water connector tubing into the water bottle.
10. Remove the rubber vent cover from the DI water reservoir. Let the water from the DI water reservoir completely drain into the bottle. When water stops flowing, remove the tubing from the water bottle and set it aside. Use the paper towels to dry any water that leaks out of the water connector tubing.
11. Remove the existing resin bed by pressing down on the metal set plate and then pulling the resin bed downward and away from the DI water reservoir. Safely discard the old resin bed.

Warning
Dispose of the resin bed in accordance with federal, state, or local government regulations.

12. Remove the red cap from the top of the new resin bed.
13. Depress the metal set plate and insert the post at the top of the new resin bed up into the DI water reservoir. When the resin bed is securely in place, release the set plate.
14. Attach the DI water connector tubing to the bottom of the new resin bed, making sure that the tab extends through the slot on the set plate by rotating the tubing.
15. Replace the top of the water bottle and fill the DI water reservoir to the fill line with DI water.
16. Replace the rubber vent cover on the DI water reservoir.
17. Record the installation date for the resin bed in the service log. (See Table 15 on page 160.)
18. If you need to replace other consumables, follow the procedures listed in the appropriate sections of this chapter. Otherwise, close the Analyzer case.
19. Plug in the Analyzer and turn on with the main power switch.
20. Enter the installation date for the new resin bed. Press the **Menu** button, select the **Maintenance** tab, press the **Consumables** button, press the **New...** button, and then press the **RBed** button. (See "Setting the Installation or Expiration Date for New Consumables" on page 158 for additional details, if necessary.)
21. Before resuming normal operation, check for leaks.

    After resuming normal operation it may take up to 12 hours for the resin bed to rinse down; during this time you may experience higher than normal IC values. If high IC values persist, then you should perform a Conductivity Autozero; follow the instructions in "Conductivity Autozero" on page 176.
22. After about 12 hours of operation, check the interior of the Analyzer for leaks, and add water to the DI water reservoir, if necessary.

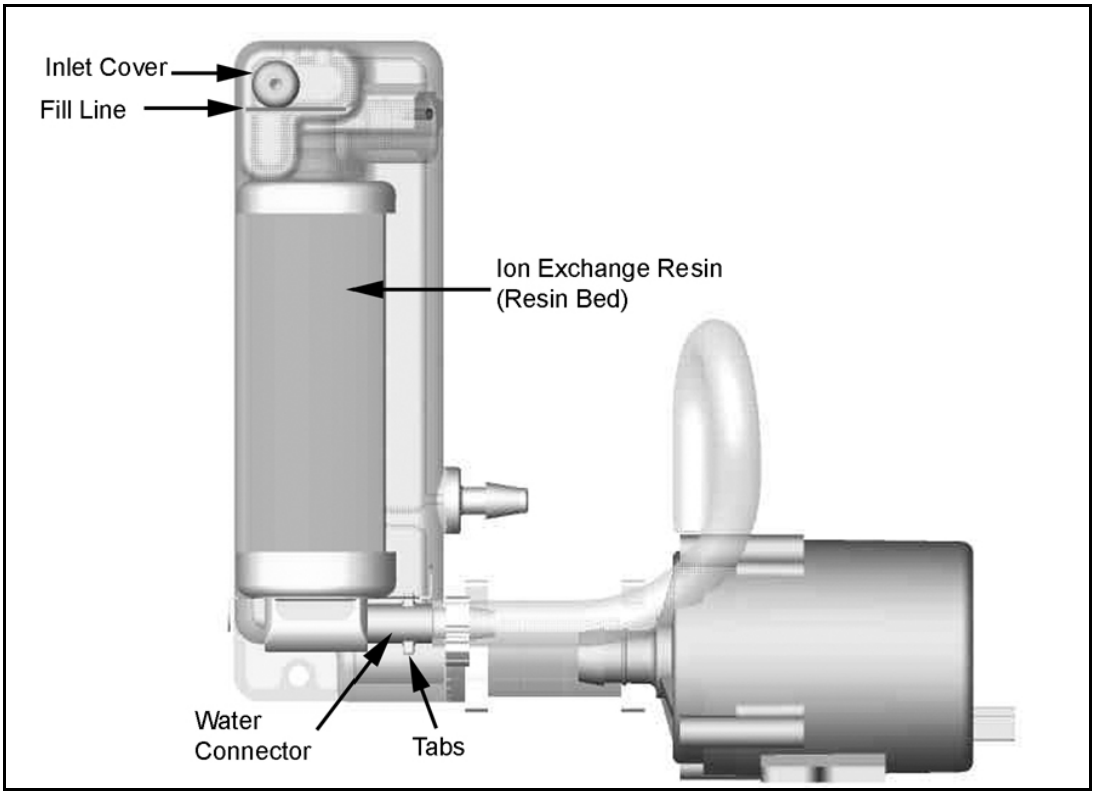

Figure 33: Resin Bed Connections

Resin Bed Replacement with a Brass-Colored Bracket

1. If the Analyzer is taking measurements, press the **Stop Analysis** button.
2. Turn off the Analyzer by using the main power switch, and unplug the cord.
3. Remove the top of the water bottle and empty out any water in the bottle. Keep the water bottle available.
4. Remove the new resin bed from the packaging. The resin bed comes with a red plug inserted into the port at the bottom of the bed; remove this plug and keep it available.
5. Open the Analyzer case and locate the resin bed. The resin bed sits slightly in front and to the left of the DI reservoir. (Refer to Figure 34 for positioning of the elements in the resin bed that are discussed in the following steps.)
6. Remove the metal resin bed cover by loosening the Phillips screw.
7. Pull the resin bed down and out of the DI water reservoir.
8. Have a paper towel available to absorb water that may leak from the resin bed. Immediately after performing the next step, you will need to insert the red plug into the bottom port on the resin bed to prevent additional water from leaking out.

9. Remove the DI water connector from the bottom of the resin bed by rotating and gently pulling the water connector nozzle out of the bottom port. After you remove the tubing from the resin bed, hold the tubing so that the nozzle faces up, to prevent water from leaking.
10. Insert the red plug into the port at the bottom of the old resin bed, and then dispose of the old resin bed.

Warning
Dispose of the resin bed in accordance with federal, state, or local government regulations.

11. Place the water connector tubing into the water bottle.
12. Remove the rubber vent cover from the DI water reservoir. Let the water from the DI water reservoir completely drain into the bottle. When water stops flowing, remove the tubing from the water bottle and set it aside. Use the paper towels to dry any water that leaks out of the water connector tubing.
13. Remove the red cap from the top of the new resin bed.
14. Attach the DI water connector tubing to the bottom of the new resin bed
15. Slide the new resin bed up into the bracket, making sure the port at the bottom of the resin bed points to the right.
16. Replace the metal resin bed cover by securing the screw.
17. Replace the top of the water bottle and fill the DI water reservoir to the fill line with DI water.
18. Replace the rubber vent cover on the DI water reservoir.
19. Record the installation date for the resin bed in the service log. (See Table 15 on page 160.)
20. If you need to replace other consumables, follow the procedures listed in the appropriate sections of this chapter. Otherwise, close the Analyzer case
21. Plug in the Analyzer, and turn on with the main power switch.
22. Enter the installation date for the new resin bed. Press the **Menu** button, select the **Maintenance** tab, press the **Consumables** button, press the **New...** button, and then press the **RBed** button. (See “Setting the Installation or Expiration Date for New Consumables” on page 158 for additional details, if necessary.)
23. Before resuming normal operation, check for leaks.

    After resuming normal operation it may take up to 12 hours for the resin bed to rinse down; during this time you may experience higher than normal IC values. If high IC values persist, then you should perform a Conductivity Autozero; follow the instructions in “Conductivity Autozero” on page 176.
24. After about 12 hours of operation, check the interior of the Analyzer for leaks, and add water to the DI water reservoir, if needed.

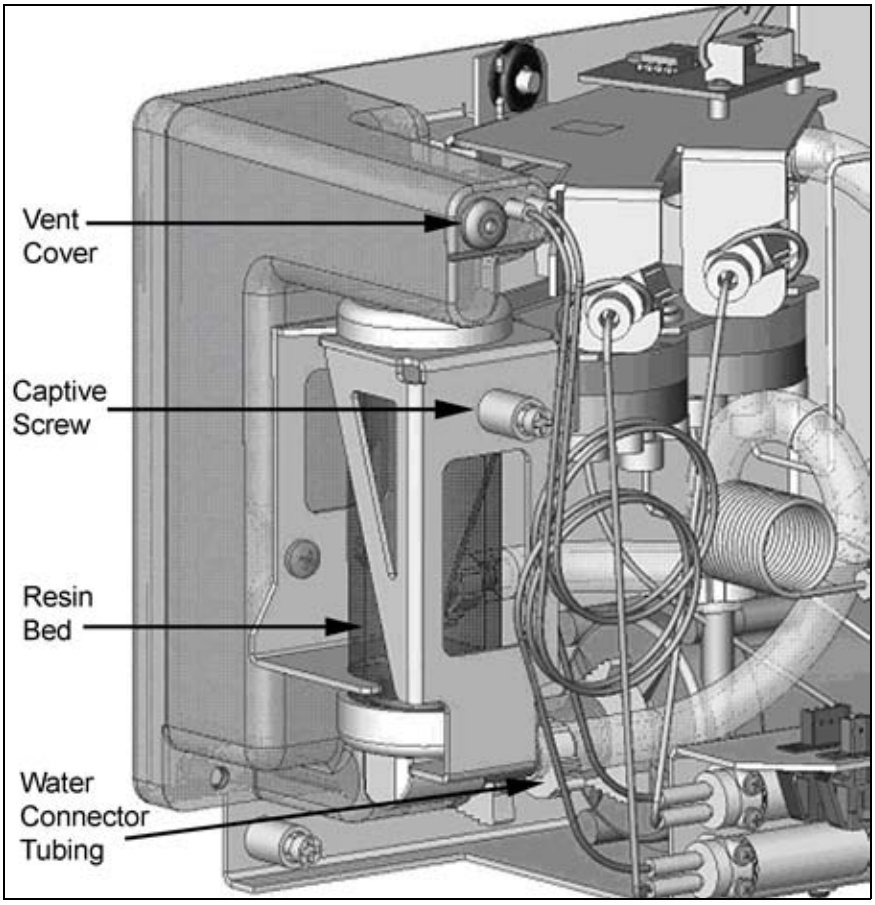

Figure 34: Brass-Colored Resin Bed Bracket

Replacing the Capsule Filter

Sievers 5310 C Portable TOC Analyzers Only

1. Replace the capsule filter as needed. Frequency depends on the level of particulates in the sample water. When replacing the capsule filter, visually inspect the sample inlet and waste lines to determine if they should be replaced as well.
2. If you are measuring raw source water, you should have additional filtration prior to the capsule filter. Replacing or cleaning any bag or filter as needed will extend the life of the capsule filter.

Setting the Installation or Expiration Date for New Consumables

When you replace a consumable, you must enter the date of installation or expiration to ensure that the Analyzer keeps an accurate record of usage and that the indicators on the Main screen remain accurate.

1. Press the **Menu** button and select the **Maintenance** tab.
2. Press the **Consumables** button.
3. Press the **New...** button that corresponds to the consumable you are installing.
   - If you choose **New Lamp**, **New Tube**, or **New RBed**, press the **Accept** button to enter today's date, or enter values for the appropriate Day, Month and Year and then press the **Accept** button.
   - If you choose **New Acid**, enter the expiration date that was listed on the acid packaging: press the **Day** button and use the numeric pad to specify the day of expiration and press **Enter**; repeat for the **Month** and **Year** buttons. Press **Accept** after you have entered the complete expiration date. You will be prompted to confirm the installation of new acid; press the **Confirm** button to continue.
   - If you choose **New Oxidizer**, enter the expiration date that was listed on the oxidizer packaging: press the **Day** button and use the numeric pad to specify the day of expiration and press **Enter**; repeat for the **Month** and **Year** buttons. Press the **Amount** button and confirm that the correct volume is selected, either **150 mL** or **300 mL**. Press **Accept** after you have entered the complete expiration date. You will be prompted to confirm the installation of new oxidizer; press the **Confirm** button to continue.
4. Repeat Step 3 for each consumable that you installed

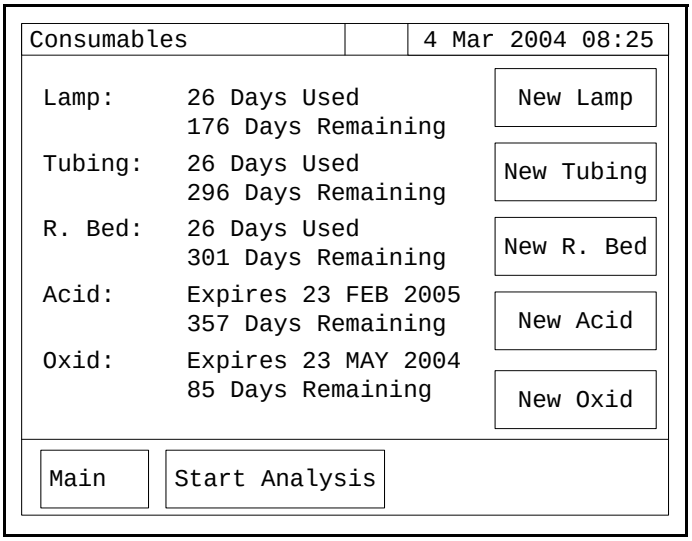

Figure 35: The Consumables Screen

Flushing the Reagent Syringes

If the Analyzer has not been used for over 24 hours, the decomposition of persulfate can produce oxygen bubbles in the syringe pump and the reagent addition lines. To prevent bubbles from entering the sample stream and interfering in the TOC measurement, a reagent flush is used to remove the bubbles and fill the syringe with fresh reagent. A reagent flush also is recommended after installing new chemical reagents.

For the reagent flush, it is recommend that the Analyzer must be connected to a water supply. A 40 mL vial of water, or on-line water, may be used for the reagent flush.

To initiate a syringe flush

1. If the Analyzer is taking measurements, press the **Stop Analysis** button.
2. Make sure the Analyzer is connected to a water supply.
3. Press the **Menu** button and select the **Maintenance** tab.
4. Press the **Consumables** button.
5. Press the **Flush...** button.
6. Press either the **Acid**, **Oxid**, or **Both** button, depending on which syringe(s) you want to flush.
7. Make sure a water source is connected to the Analyzer and press the **Flush** button.
8. Wait for the flush to complete. The **Flush** button will change colors to show that the process is underway and the Analyzer will not respond to additional commands. Do not disrupt power to the Analyzer while the flush is in progress.
9. When the flush is complete, a message will display. Press **OK** to continue.
10. If you used a vial for the flush, remove it from the vial port or IOS System after the flush has finished.

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 touch screen may be cleaned with a soft cloth or cotton pad. Methanol, or 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 touch screen sensitivity for 30 seconds by selecting the following option:

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

Table 15: Sievers 5310 C Series TOC Analyzer 1-Year Maintenance Worksheet

Item	Period	Installation Date	Expiration Date	Notes/volume
Oxidizer supply	Initial Install			
Acid supply	Initial Install			
DI water reservoir	Initial Install		**N/A**	
Oxidizer supply	3 months			
Acid supply	3 months			
DI water reservoir	Initial Install		**N/A**	
UV Lamp	6 months			
Oxidizer supply	6 months			
Acid supply	6 months			
DI water reservoir	Initial Install		**N/A**	
Oxidizer supply	9 months			
Acid supply	9 months			
DI water reservoir	Initial Install		**N/A**	
Pump Tubing	12 months			
UV Lamp	12 months			
Oxidizer supply	12 months			
Acid supply	12 months			
Resin Bed	12 months			
DI water reservoir	Initial Install		**N/A**	

NOTE: Interval suggestions are based on typical use. Reagent consumption depends on flow rate settings.

The DI water reservoir should be checked and filled as necessary as part of every maintenance.

Analyzer Serial Number _____ Date placed into operation _____

Dates of operation encompassed by this worksheet: from _____ to _____

Chapter 8. Troubleshooting

Overview

This chapter provides the starting point for troubleshooting basic issues with your Analyzer. If you need additional assistance, in the U.S. contact GE Analytical Instruments Technical Support at 888.245.2595. Technical Support in the United Kingdom is available at 44 (0) 161 864 6800. In other countries, visit www.geinstruments.co to locate your representative.

Step 1: Review Warnings and Errors

The best first step in troubleshooting erratic readings, poor reproducibility (>3%), or other operational problems is to review and print the Warnings/Errors list. (See “Printing and Exporting the Warnings and Errors List” on page 103.)

A complete list of warnings and errors is shown in the following page.

Warnings and Error Messages

3 - Acid Warning

Message: "The estimated amount of acid is less than 10%. Confirm the amount is low. Order a new acid container."
Explanation: Based on the flow rate and history of usage, the Analyzer estimates that only 10% of the acid reagent is remaining. Order a new acid container from GE now to avoid down time when the acid is exhausted.

4 - Oxid Warning

Message: "The estimated amount of oxidizer is less than 10%. Confirm the amount is low. Order a new oxidizer container."
Explanation: Based on the flow rate and history of usage, the Analyzer estimates that only 10% of the oxidizer reagent is remaining. Order a new acid container from GE now to avoid down time when the oxidizer is exhausted.

5 - UV Lamp Warning

Message: "The estimated lamp life is less than 15 days. Order a new UV lamp."
Explanation: Based on the history of usage, the Analyzer estimates that only 10% of the UV lamp life remains. Order a new UV lamp from GE now to avoid down time when the lamp expires.

6 - Tubing Warning

Message: "The estimated tubing life is less than 15 days. Order new tubing."
Explanation: Based on the history of usage, the Analyzer estimates that only 10% of the sample pump tubing life remains. Order new pump tubing from GE now to avoid down time when the tubing expires.

7 - Resin Bed Warning

Message: "The resin bed life is less than 15 days. Order a new resin bed."
Explanation: Based on the history of usage, the Analyzer estimates that only 10% of the resin bed life remains. Order a new resin bed from GE now to avoid down time when the resin bed expires.

9 - History Data Warning

Message: "The history data is nearly full. Archive the history data before taking more measurements."
Explanation: The data history can accommodate approximately 33,000 entries (about 90 days of usage when the Analyzer is not in the optional Turbo mode). This warning appears when the data history is 90% full (when approximately 31,941 entries have been saved).

10 - Audit Trail Warning

Message: "The audit trail is nearly full. Archive the audit trail before taking more measurements."
Explanation: The audit trail can accommodate approximately 1,200 entries. This warning appears when the audit trail is 90% full (when approximately 1,080 entries have been saved).

11 - Printer Timeout

Message: "Printer has timed out. Check that the printer is on and selected."
Explanation: The printer did not respond and is not ready to print. Confirm that the printer's selection light is green (you may have to press the **SEL** or **Online** button on the printer).

12 - High IC

Message: "The ratio of TOC to IC is less than 0.1. You may need an ICR unit for this application."
Explanation: This warning appears when the IC value is 10 times higher than the TOC value. If the message persists, you may be experiencing high enough IC levels to merit using an ICR unit in your configuration. This message also can be generated when analyzing samples with low concentrations of TOC; if the TOC measurements are negative, you may need to perform a TOC Autozero.

13 - Acid Warning

Message: "The estimated acid life is less than 15 days. Order a new acid container."
Explanation: Based on the expiration date, the Analyzer estimates that only 15 days of acid life remain. Order a new acid container from GE now to avoid down time when the acid expires.

14 - Oxid Warning

Message: "The estimated oxidizer life is less than 15 days. Order a new oxidizer container."
Explanation: Based on the expiration date, the Analyzer estimates that only 15 days of oxidizer life remain. Order a new oxidizer container from GE now to avoid down time when the oxidizer expires.

15 - ID Board Warning

Message: "A problem has been detected with the ID Board. Please contact GE."
Explanation: A communication error with the ID board has occurred. Turn the Analyzer off and on and restart analysis. If the warning persists, contact Technical Support.

16 - Acid Warning

Message: "The acid reagent needs to be replaced."
Explanation: Based on the flow rate and history of usage, the Analyzer estimates that the acid reagent has been completely consumed. Perform a visual check to confirm that there is no remaining acid before continuing analysis and order a new acid container from GE now.

17 - Oxid Warning

Message: "The oxidizer reagent needs to be replaced."
Explanation: Based on the flow rate and history of usage, the Analyzer estimates that the oxidizer reagent has been completely consumed. If you use oxidizer, perform a visual check to confirm that there is no remaining oxidizer before continuing analysis and order a new oxidizer container from GE now.

18 - UV Lamp Warning

Message: "The UV lamp needs to be replaced."
Explanation: Based on the history of usage, the Analyzer estimates that the UV lamp has expired. Order a UV lamp now. Continuing to use the expired UV lamp can result in incomplete oxidation and poor measurements.

19 - Acid Warning

Message: "The acid reagent has exceeded its recommended life. Replace the container."
Explanation: Based on the expiration date, the Analyzer estimates that the acid has expired. Order a new acid container from GE now."

20 - Oxid Warning

Message: "The oxidizer reagent has exceeded its recommended life. Replace the container."
Explanation: Based on the expiration date, the Analyzer estimates that the oxidizer has expired. If you use oxidizer, order a new oxidizer container from GE now."

21 - Tubing Warning

Message: "The tubing needs to be replaced."
Explanation: Based on the history of usage, the Analyzer estimates that the sample pump tubing has expired. Order new pump tubing from GE now."

22 - Resin Bed Warning

Message: "The resin bed needs to be replaced."
Explanation: Based on the history of usage, the Analyzer estimates that the resin bed has expired. Order a new resin bed from GE now."

24 - ICR Vacuum Decrease

Message: "Inspect data for instability. If ICR fault light remains lit for more than 30 minutes, refer to the 900 ICR Manual."
Explanation: This error generally appears when the ICR is not creating a vacuum but is set to Inline. Refer to the 900 ICR *Operation and Maintenance Manual* for troubleshooting suggestions.

25 - History Data Warning

Message: "A problem has been corrected in the history data. Contact GE if the warning persists."
Explanation: The Analyzer has detected a problem reading or writing to the data history memory; as much of the data history as possible is reconstructed. If the problem continues, contact GE Analytical Instruments technical support.

26 - System Restart Warning

Message: "The system has experienced an error and has automatically restarted. Contact GE if the warning persists.
Explanation: The Analyzer has restarted for a reason other than a power failure. If the problem continues, there may be a problem with the Analyzer and you should contact GE Analytical Instruments technical support.

27 - Acid Delivery Warning

Message: "Analysis was restarted due to a disruption in acid delivery."
Explanation: The Analyzer restarted analysis when acid delivery was disrupted. As a result, the data history may reflect a delay of several minutes between measurements, but no user action is required.

28 - ICR, Acid Delivery

Message: "The ICR or acid delivery system is not operating correctly."
Explanation: The ICR or acid delivery system is not operating correctly. You may need to contact Technical Support to confirm that these systems are functioning properly.

41 - System Restore Error

Message: "Failed to restore system."
Explanation: The attempt to restore the system settings failed. Make sure the USB drive that contains the saved system settings is attached to the Analyzer properly and try to restore again. If the error occurs again, try copying the files on the USB drive to a different USB drive, and then attempt to restore system settings again using the new USB drive. If the error message persists, contact GE Analytical Instruments technical support.

43 - Analog Error (IC or TC Cell Conductivity)

Message: "Measurement out of range. Please refer to the Oper. and Maint. Manual for recommendations."
Explanation: Ten (10) consecutive readings from the related channel are out of range. This warning generally displays when IC or TC cell conductivity is out of range. Confirm that there are no air bubbles in any tubing inside the Analyzer, and make sure the water level in the DI water cartridge is sufficient. Also confirm that sample water is flowing to the Analyzer. If necessary, turn the Analyzer off and on, and restart analysis. If the warning persists, contact Technical Support.

45 - Analog Error (Temperature)

Message: "Measurement is out of range. Please refer to the Oper. and Maint. Manual for recommendations."
Explanation: Ten (10) seconds of consecutive out-of-range readings have occurred on the sample cell conductivity channel. This warning generally displays when temperature is out of range. Confirm that there are no air bubbles in any tubing inside the Analyzer, and make sure the water level in the DI water cartridge is sufficient. Also confirm that sample water is flowing to the Analyzer. If necessary, turn the Analyzer off and on, and restart analysis. If the warning persists, contact Technical Support.

49 - USB Error

Message: "A problem has been detected with the USB device. Please refer to the Oper. and Maint. manual for info on supported devices."
Explanation: The Analyzer was unable to write to or read from the USB flash memory drive. Make sure the USB device is attached to the Analyzer properly and attempt the operation again. If you are not using the USB flash memory drive that was supplied in the Analyzer's accessories kit, it is possible your USB device is not compatible with the Analyzer. For a list of known compatible USB flash memory drives, follow the Sievers 900 TOC Analyzers link on our Web page, www.GEInstruments.com.

50 - Unstable Measurements Error

Message: "Unstable measurements detected during calibration/verification. Please refer to the Oper. and Maint. Manual for recommendations."
Explanation: This error appears when the results from calibration/verification are inappropriate and calibration/verification cannot continue. Follow the suggestions in the section called "Step 2: Visual Inspection" on page 167 before continuing with analysis. You may need to contact Technical Support to confirm that the Analyzer is functioning properly.

51 - History Flash Error

Message: "A problem has been detected in the history data flash. Please contact GE."
Explanation: The Analyzer experienced a problem when trying to store data in the flash memory. It is possible a section of the flash memory is damaged. To protect against losing data, stop analysis and contact Technical Support.

53 - History Data Error

Message: "The history data is full. Archive the history data before taking more measurements."
Explanation: This error appears when the data history is completely filled. Export (**Data** tab → **Export**) or Print (**Data** tab → **Print** the data) before proceeding.

55 - ICR Error

Message: "A problem has been detected with the ICR. Check the ICR indicator lights. Refer to the 900 ICR Manual for recommendations."
Explanation: This error generally appears when the ICR is not creating a vacuum but is set to Inline. Refer to the 900 ICR *Operation and Maintenance Manual* for troubleshooting suggestions.

56 - Acid Syringe Error

Message: "Error detected with the acid syringe. Inspect the syringe and cables. Refer to the Oper. and Maint. Manual for recommendations."
Explanation: This error appears when the syringe is not positioned in the location expected by the Analyzer. Confirm that the syringe's electrical connection is securely fastened and that no tubing is obstructing the syringe's movement. Turn the Analyzer off and on and restart analysis. If the error persists, contact Technical Support.

57 - Oxid Syringe Error

Message: "Error detected with the oxid syringe. Inspect the syringe and cables. Refer to the Oper. and Maint. Manual for recommendations."
Explanation: This error appears when the syringe is not positioned in the location expected by the Analyzer. Confirm that the syringe's electrical connection is securely fastened and that no tubing is obstructing the syringe's movement. Turn the Analyzer off and on and restart analysis. If the error persists, contact Technical Support.

64 - Fatal Error

Message: "Multiple errors within 24 hours. Contact GE."
Explanation: This error appears when multiple fatal errors, which require you to reset the Analyzer, occur within 24 hours. Contact Technical Support.

65 - Main Board Error

Message: "An error has been detected on the Main Board. Please refer to the Oper. and Maint. Manual. Contact GE if problem persists."
Explanation: A communication error with the main board has occurred. Turn the Analyzer off and on and restart analysis. If the error persists, contact Technical Support.

66 - Analog Error

Message: "An error has been detected on the analog board. Please refer to the Oper. and Maint. Manual. Contact GE if problem persists."
Explanation: A communication error with the analog board has occurred. Turn the Analyzer off and on and restart analysis. If the error persists, contact Technical Support.

67 - Internal Error

Message: "An internal error has been detected. Please contact GE."
Explanation: This error appears when a software error occurs in the Analyzer. Contact Technical Support.

Step 2: Visual Inspection

After confirming that there are no warning or error messages indicating a specific problem, proceed to a visual inspection of the Analyzer to identify any obvious physical problems or symptoms. Begin with an external visual inspection, and proceed to an internal visual inspection. If possible, perform the inspection with the Analyzer in analysis mode so you can verify that relevant modules are performing as usual (described below).

External Inspection

- Confirm that there are no leaks present at the sample inlet or the waste connections.
- If the Analyzer is taking measurements, confirm that water is flowing from the waste outlet.
- If you are experiencing erratic TOC readings, confirm that the pH of the waste stream is not too high. (See “pH of Sample Stream is Too High” on page 175 for details.)
- Confirm that all cables are securely attached to the Analyzer.
- If you are sampling from 40 mL vials, confirm that the needle in the vial port or IOS System is not obstructed. Loosen the $^{1}/_{4}$" fitting at the **Sample Inlet** port and check that water flows out of the stainless steel tubing when water is in the IOS System.

Internal Inspection

- Check for leaks throughout the Analyzer; there should not be moisture on the inside floor of the Analyzer case.
- Confirm that oxidizer and acid remain in the reagent containers; also confirm that the valve on each reagent container is open.
- Check the reagent syringes to make sure no large air bubbles are present (a small bubble does not adversely affect analysis). Also inspect the syringes for leaks, and confirm that the plunger moves during analysis. If excessive bubbles are present, a reagent flush should be performed.
- Confirm that the sample pump is turning. If the pump is turning, sample should be flowing from the waste stream.
- Check to make sure there are no leaks in the DI system, especially at valves and the stream splitters.
- Confirm that the DI water reservoir is full.
- If maintenance work has recently been performed on the Analyzer, confirm that electronics cables, such as the connector between the analog and ID boards, are securely attached.

Step 3: Review 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

The Analyzer's main power switch is a circuit breaker. If conditions cause the breaker to be switched to the Off position during normal operation, simply press the switch into the On position to resume operation; if the Analyzer was taking measurements when the power interruption occurred, it will automatically resume analysis when power is restored. If you are unable to switch the breaker to the On position (e.g., it repeatedly switches back to the Off position), you should contact Technical Support for assistance.

Problems with the DI Water Pump

If the Analyzer is making a loud squealing sound or if water is not filling the tubing that leads to the resin bed, it is likely that the DI water pump has not been properly primed. To prime the pump, you will need the water bottle from the Analyzer's accessories kit and a bottle or tray to collect water.

1. Make sure the Analyzer is powered off.
2. Remove the Lower tube (Item 1 in Figure 36) from the bottom of the resin bed. Place the tube into a bottle or tray, as water will drain from this tube.
3. Remove the inlet cover on the DI water reservoir (Item 3 in Figure 36). Water will drain from the tube when you remove the inlet cover.
4. When water starts flowing through the tube, replace the inlet cover.
5. Connect the tube back to the resin bed.
6. If necessary, add water to the DI water reservoir with the water bottle.
7. Turn on the Analyzer.
8. Wait 1 to 5 minutes and then turn off the Analyzer.
9. Wait 1 minute, and then power on the Analyzer. If you observe small bubbles in the tubing that leads to the resin bed, tap the tubes to dislodge the bubbles.
10. Allow the DI water pump to circulate water for at least 10 minutes.
11. After 10 minutes, open the Analyzer case and check the tubing that leads to the resin bed (ion exchange column). Most of the air originally in the tubing should be replaced with water. If more than a few small bubbles remain in the tubing, repeat Steps 6 through 10.

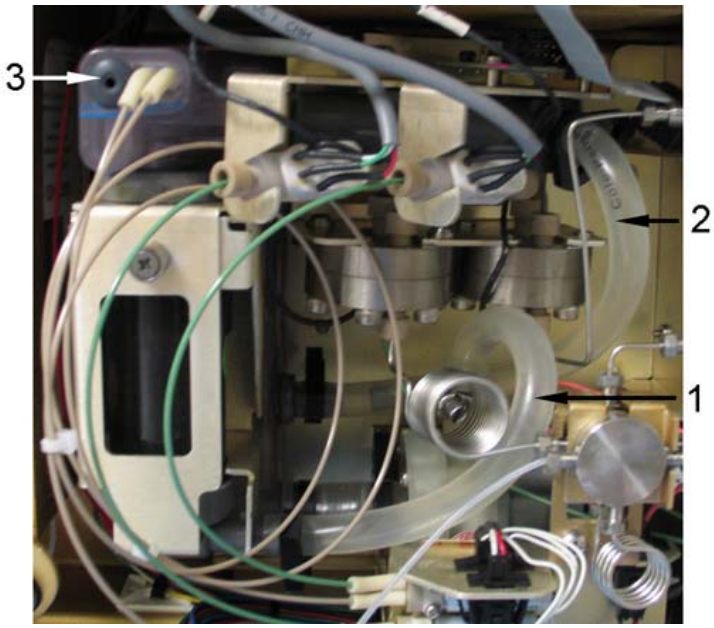

Figure 36: The DI Water Loop

To troubleshoot a lack of flow through the Analyzer, follow the steps in the next three sections: "Checking the Sample Pump," "Checking the Inlet Tubing," and "Backflushing the Analyzer."

Checking the Sample Pump

While the Analyzer is operating, open the cover and make sure the sample pump is turning. If the pump is not turning and the Analyzer is operating (the display screen indicates that analysis is taking place), contact GE Analytical Instruments Technical Support for instructions.

Warning
To avoid potentially dangerous shock, do not touch anything inside the Analyzer while observing the sample pump.

Checking the Inlet Tubing

If sampling from a container, you can confirm that sample is properly being drawn in to the Analyzer by introducing a small air bubble into the tubing and then tracking its movement. Simply remove the tubing from the liquid level in the container for a few seconds, and then replace the tubing. You should observe an air bubble in the tubing; if the bubble moves through the tubing and into the Analyzer, the inlet tubing is not obstructed.

No sample will flow through the Analyzer under the following conditions: the sample pump is not operating; the capsule filter (for on-line sampling) is clogged; or the 1/16"-OD Teflon inlet or outlet lines (for grab sampling) are over-tightened and have collapsed.

If air is still not drawn into the Analyzer or water is not flowing out of the Analyzer, replace the pump tubing.

Backflushing the Analyzer

When there is a lack of flow through the Analyzer, a flush of the sample side or DI side fluidics can clear clogs in the tubing. To flush the Analyzer, you will need the water bottle from the Analyzer's accessories kit, a small length of tubing (similar to the sample pump tubing), and paper towels. Make sure that the inlet and waste lines are still connected to the Analyzer; the sample pump will run during this procedure.

1. Power on the Analyzer and start analysis (if you prefer not to start analysis, you can turn the sample pump on by selecting **Maintenance** tab → **Advanced** → **Diagnostics** → **Test Pumps** → **Sample Pump** → **On**).
2. Open the Analyzer front panel.
3. The first task is to test the sample side for an obstruction. Disconnect the two pieces of sample pump tubing from the Y-fitting. (See Figure 37.)

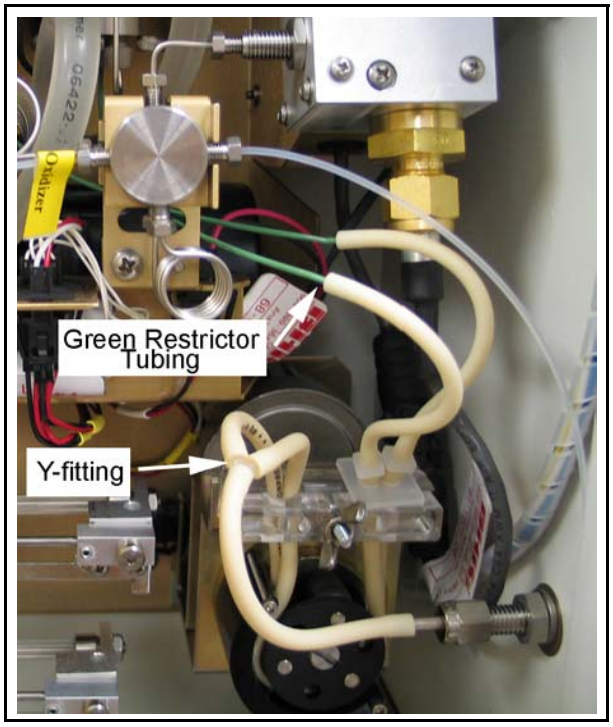

Figure 37: Preparing to Back Flush the Sample Side Fluidics

4. Water will be flowing through the two pieces of disconnected tubing. Compare the rate at which water drops from each piece of tubing.

   If the water drops at the same rate, there is no sample-side obstruction and you can proceed to Step 11 after replacing the pump tubing on the Y-fitting.

   If the water drops more slowly through one of the pieces of tubing than the other, proceed to the next step.

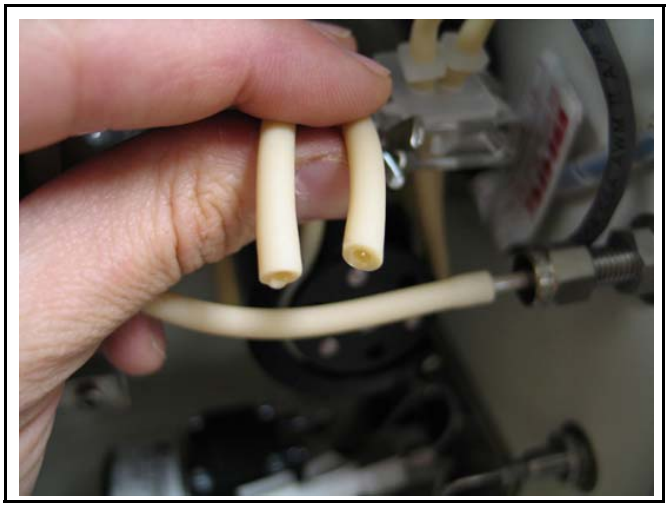

Figure 38: Comparing the Flow Rate Through the Sample Pump Tubing

5. Reconnect the pump tubing to the Y-fitting.
6. Follow the piece of tubing with the obstruction (the one with the slower flow) around the pump and up to the green tubing. Disconnect the pump tubing from the barb on the sample pump.
7. Attach the water bottle to the sample pump tubing.

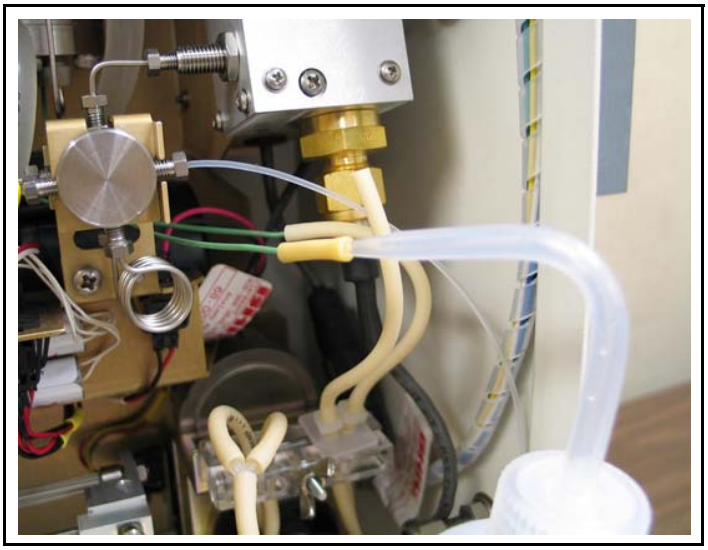

Figure 39: Flushing the Sample Side

8. Gently squeeze the water bottle to flush water into the green tubing. Note that water will come out the Analyzer's sample inlet line, vial port, or the IOS System; when the water flows out, the obstruction has been cleared.
9. Remove the water bottle and connector tubing from the green tubing, and reconnect the sample pump tubing to the green tubing.
10. Disconnect the two pieces of sample pump tubing from the Y-fitting and confirm that both sides are now flowing at the same rate. If they are not, you may need to repeat Steps 6 and 7. If the problem persists, contact Technical Support.
11. The second task is to test the DI fluidics side for an obstruction. If you placed the Analyzer into analysis while testing the sample side, press the **Stop Analysis** button now; if you used the **Diagnostics** menu to turn on the sample pump, turn it off now.
12. Disconnect the tan tubing from the connector tubing that connects to the DI water reservoir. (See Figure 40.)

    If the water drops at the same rate, there is no DI-side obstruction and you can replace the tubing on the DI water reservoir.

    If the water drops more slowly through one of the pieces of tubing than the other, proceed to the next step.

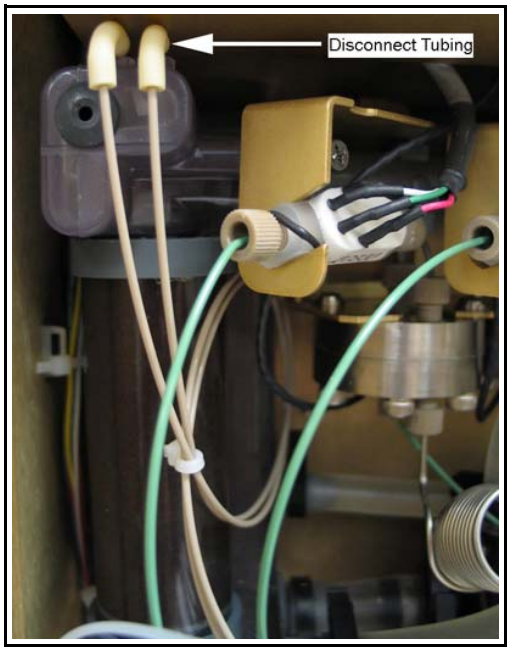

Figure 40: Disconnect the Tan Tubing that Connects to the DI Water Reservoir

13. Reconnect the tubing to the DI water reservoir.
14. Follow the piece of tubing with the obstruction down to the solenoid valve. (See Figure 41.)

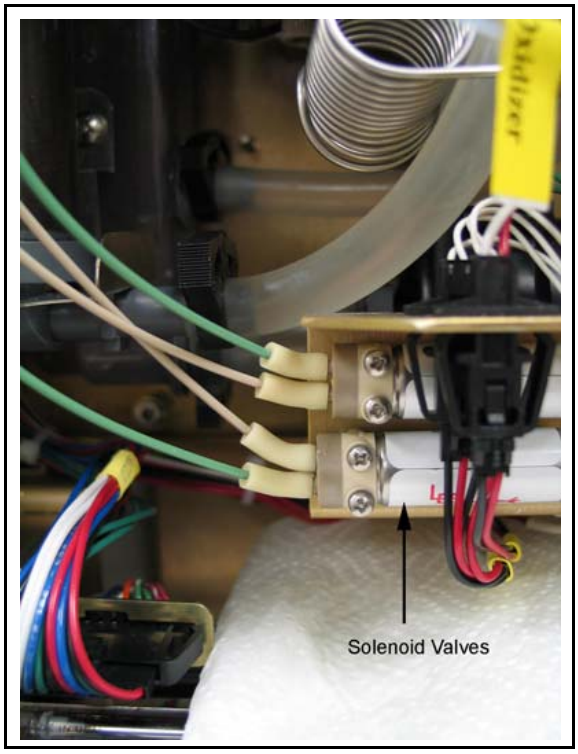

Figure 41: Preparing to Disconnect the Tubing from the Solenoid Valves

15. Place a paper towel under the solenoid valves, as water is likely to leak from the valve. Remove the obstructed tan tubing and the connector tubing from the solenoid valve.
    - If water leaks out the solenoid valve, remove the inlet cover from the DI water reservoir, attach the water bottle to the tan tubing and gently flush water through the tubing. Be sure to carefully monitor the water level in the DI water reservoir as you squeeze the water bottle, as you should avoid over-filling the reservoir. Reconnect the tan tubing to the solenoid valve and resume normal operation.
    - If water does not leak out of the solenoid valve, proceed to the next step.
16. Reconnect the tan tubing to the solenoid valve and disconnect the green restrictor tubing from the same solenoid valve.
    - If water leaks out the green restrictor tubing, the obstruction is in the solenoid valve. Connect the water bottle to the solenoid valve and gently flush water through the valve.
    - If water does not leak out the green restrictor tubing, the obstruction is in the tubing. Connect the water bottle to the green restrictor tubing, remove the inlet cover from the DI water reservoir, and gently flush water through the tubing. Again, carefully monitor the water level in the DI water reservoir as you squeeze the water bottle. Reconnect the restrictor tubing to the solenoid valve and resume normal operation.
17. If symptoms recur, contact GE Analytical Instruments Technical Support for assistance.

Gas Bubbles Are Present in Reagent Lines or Syringes

The presence of gas bubbles in the lines from the reagent containers to the syringe pumps and from the syringe pumps to the stainless steel cross can cause erratic TOC readings. Turn off the Analyzer and disconnect the power. Open the Analyzer case and inspect the $^{1}/_{16}$" Teflon tubing from the syringes. If you detect gas bubbles in the lines or a large (greater than 30 µL) gas bubble in the syringe, reconnect the power cord, turn on the Analyzer, and perform a syringe flush. For further information, see "Flushing the Reagent Syringes" on page 159.

pH of Sample Stream is Too High

If the pH of the sample stream is too basic (e.g., pH > 8), erratic readings and low TOC recovery may be observed. Increase the acid flow rate by 1-2 µL/min and determine if this eliminates the problem.

With the sample stream flowing and analysis taking place, tear off a strip of pH paper and hold the paper in the waste stream, if accessible.

Compare the color of the paper with the pH color scale on the side of the pH paper container. If the pH is not less than 3, not enough acid is being added to the sample stream. Possible reasons for high pH include:

- The valve on the acid reservoir is closed.
- Acid flow rate is too low. (See "Setting Reagent Flow Rates" on page 83 and increase flow rate if necessary.)
- Acid reservoir is empty or low (perform a visual check of the reservoir).
- Acid syringe is defective or not working (contact GE Analytical Instruments for instructions).

Erratic Readings Due to High IC

The Analyzer calculates TOC from the difference between TC and IC, and erratic readings of TOC can be observed in water samples containing high levels of IC, where the IC is greater than 10 times the TOC value. This is often the case for ground water samples, some municipal water supplies, and permeate from reverse osmosis systems.

To eliminate the problems encountered in TOC measurements of water samples containing high levels of IC, GE Analytical Instruments offers an ICR accessory. The module is installed on the Analyzer and uses a membrane-based system and vacuum to remove approximately 98% of the IC is at concentrations up to 30 ppm. For more information on the ICR, contact GE Analytical Instruments.

If sampling from a container, you can manually remove the IC from the sample as follows:

1. Add a few drops of acid (6 M H_3PO_4) to the sample.
2. Use an N_2 or He purge gas to remove CO_2 from the sample.

3. After purging for 5-10 minutes, analyze the sample.

Acidifying the sample and purging may introduce organic impurities into the sample, so treat a sample of low-TOC DI water in the same manner as a blank.

If the response of the IC CO_2 sensor is greater than the response of the TC CO_2 sensor, the Analyzer will report a negative TOC value.

Negative Measurements

Many of the previous steps in this chapter will help troubleshoot negative measurements. If the previous steps did not remedy the situation, you may need to perform a Conductivity Autozero; if IC values continue to be high, you may need an ICR for your system.

Conductivity Autozero

1. Make sure the Analyzer is not taking measurements.
2. Press the **Menu** button and select the **Maintenance** tab.
3. Press the **Advanced** button.
4. Press the **Cond. Autozero** button.

   The Conductivity Autozero can take between 1-6 hours, but generally does not take longer than 2 hours.

Changing the Program Language

If you change the program language out of your native language, it is possible that you will not be able to switch back easily since you cannot read the program menus. If this happens, follow these steps to navigate to the correct menu to change the program language back to your language:

1. Make sure the **Menu** screen is displayed. If the **Main** screen is displayed, press the button at the bottom left corner of the screen.
2. Select the fourth tab from the left (this is the **Maintenance** tab).
3. Counting from the top, press the second button in the right column (**Advanced**).
4. Press the fourth button in the left column (**Advanced Setup**).
5. Press the fourth button in the left column (**Select Language**).
6. Select your language by pressing the appropriate button. The program language changes immediately.

Step 4: Contact Technical Support

After pursuing Steps 1 through 3, in the USA contact GE Analytical Instruments Technical Support at 888.245.2595. Technical Support in the United Kingdom is available at 44 (0) 161 864 6800. In other countries, visit www.geinstruments.co to locate your representative.e. When you call technical support, please have basic Analyzer information from the System Information screen (**Maintenance** tab → **System Info**) available.

To send service data to Technical Support, insert a USB device in the instrument, and go to:

Maintenance tab → **Advanced** → **USB/IO**→ **Service Data.** Forward all files to Technical Support.

Step 5: Return the Analyzer to GE Analytical Instruments

In some instances, after consulting with GE Analytical Instruments Technical support, it will be necessary to return the Analyzer to the factory for repairs. **Only return the Analyzer to GE Analytical Instruments if Technical Support has issued you a Return Authorization (RA) number.**

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 GE Analytical Instruments GEAI at 888.245.2595 or 303-444-2009 to order shipping supplies. **Under no circumstances should you try to pack the Analyzer in anything other than the original shipping container.**

Warning
If the Analyzer is returned in anything other than an GE Analytical Instruments shipping container, you will be charged for any damage that occurs during shipping.

Before repackaging the Analyzer, prepare it for shipping as follows:

1. If the Analyzer is taking measurements, press the **Stop Analysis** button.
2. Press the **Menu** button and select the **Maintenance** tab.
3. Press the **Advanced** button and then press the **Empty Syringes** button. Press the **Yes** button. Wait for the reagent syringes to empty (approximately 3 minutes).
4. Disconnect the Analyzer from the sample source, so air will be introduced into the Analyzer sample stream.
5. Press the **Diagnostics** button under the **Advanced** options.
6. Select **Test Pumps**, and then select the **Sample Pump** button to turn on sample pump in order to drain instrument. Let the Analyzer run for approximately 10 minutres, so that no significant amount of water remains in the waste line. Push the **Sample Pump** button again to stop the instrument from draining.
7. Turn the Analyzer off with the main power switch
8. Open the Analyzer case.

9. Remove the acid and oxidizer reagent cartridges. For each cartridge, push the red button to close the valve and then loosen the PEEK nut and disconnect the cartridge from the reagent syringe tubing. (Store your reagents; you may reinstall the reagents when your Analyzer is returned.)
10. Locate the water bottle from the Analyzer's accessories kit. Remove the top of the water bottle and empty out any water in the bottle. Keep the water bottle available.
11. Locate the red resin bed plug from the Analyzer's accessories kit.
12. Have a paper towel available to absorb water that may leak from the resin bed. Immediately after performing the next step, you will need to insert the red plug into the bottom port on the resin bed to prevent additional water from leaking out.
13. Locate the resin bed. (See Figure 42 on page 179.)
14. Remove the DI water connector from the bottom of the resin bed as follows: rotate the connector tubing until the small tab is no longer extending through the slot on the set plate; then, pull the tubing out of the resin bed. After you remove the tubing from the resin bed, hold the tubing so that the nozzle faces up, to prevent water from leaking.
15. Insert the red plug into the port at the bottom of the old resin bed.
16. Place the water connector tubing into the water bottle (a beaker or flask also can be used).
17. Remove the rubber vent cover from the DI water reservoir. Let the water from the DI water reservoir completely drain into the bottle. When water stops flowing, remove the tubing from the water bottle and set it aside, with the connector pointing upward if possible. Use the paper towels to dry any water that leaks out of the water connector tubing.
18. Remove the resin bed by pressing down on the metal set plate and then pulling the resin bed downward and away from the DI water reservoir. Hold the resin bed over a flask, remove the red plug, and drain water from the resin bed. You may need to gently shake the resin bed to help the draining process.
19. Return the resin bed to the Analyzer. Depress the metal set plate and insert the post at the top of the resin bed up into the DI water reservoir. When the resin bed is securely in place, release the set plate.
20. Reattach the DI water connector tubing to the bottom of the resin bed, making sure that the tab extends through the slot on the set plate by rotating the tubing.
21. Empty the water in the water bottle and replace the water bottle cap.
22. Locate the green restrictor tubing that connects to each solenoid valve. (See Figure 43.)
23. Disconnect the restrictor tubing and pump tubing from each solenoid valve. To remove water from the measurement module, follow this step for both pieces of tubing: squeeze the water bottle; attach the nozzle of the water bottle to the tubing, gently release the pressure on the water bottle to suck the water into the water bottle; disconnect the water bottle from the pump tubing. (See Figure 44.)
24. Reattach each piece of green restrictor tubing and norprene tubing to the solenoid valves.
25. Close the Analyzer case.

    The second task is to drain the sample side of the fluidics.

26. Turn the Analyzer on with the main power switch.

27. Disconnect the **Sample Inlet** from the Analyzer, so that there is no sample source.
28. Press the **Start Analysis** button. Let the Analyzer run until sample stops flowing out of the waste tubing. As soon as sample stops flowing, press the **Stop Analysis** button.
29. Turn the Analyzer off with the main power switch.
30. Disconnect the waste tubing from the Analyzer.
31. Remove any printer, alarm, analog output, or computer cables and the power cord connected to the Analyzer. Note that you may need an electrician to help you disconnect the Analyzer from the power supply.

You can now repackage the Analyzer and ship it to GE Analytical Instruments.

For international shipments, coordinate with a GE Analytical Instruments representative to ensure quick passage through customs.

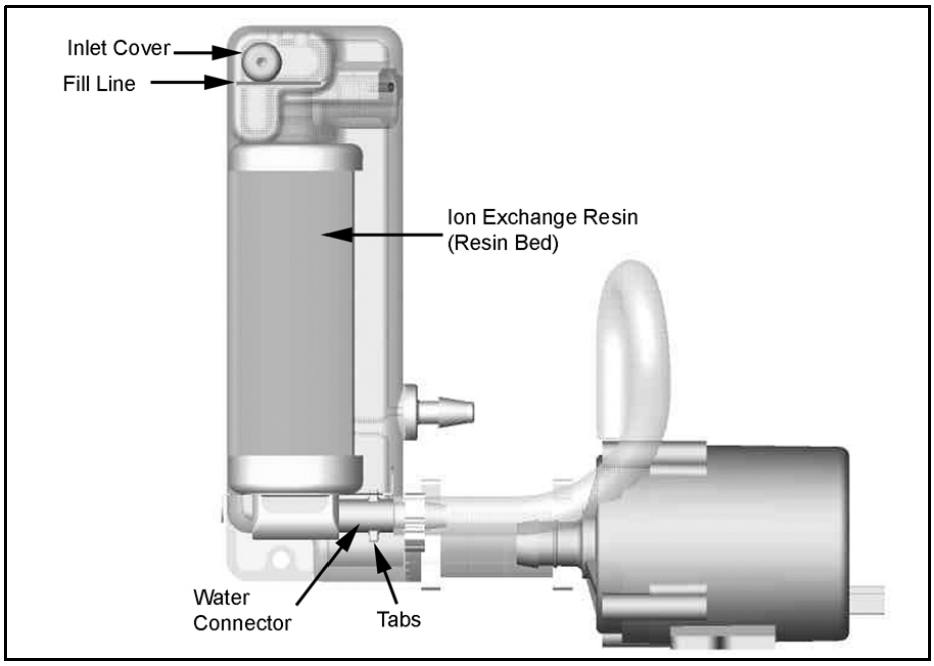

Figure 42: The DI Water Reservoir and Resin Bed

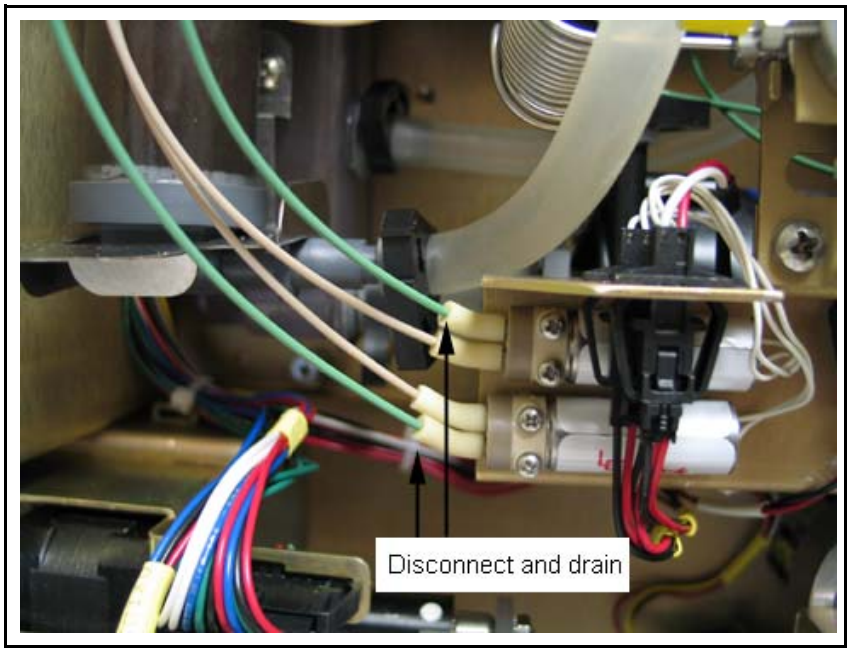

Figure 43: Disconnect the Green Restrictor Tubing

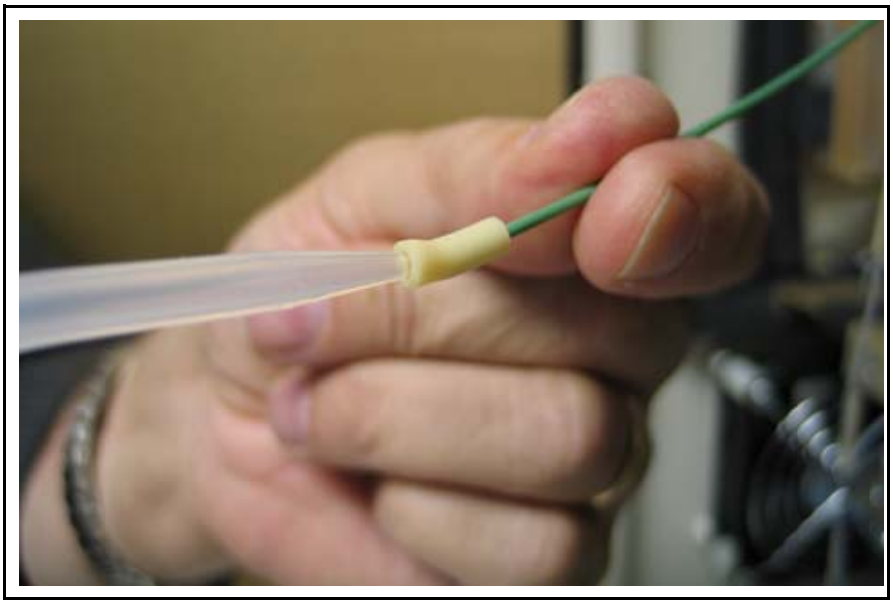

Figure 44: Draining the Measurement Module

Appendix A: Transferring Data to a PC

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 may spreadsheet or database programs. A common application involves exporting data from the Analyzer and importing the data into Microsoft Excel. This section describes how to accomplish this task.

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 flash memory drive. After exporting the data, remove the USB drive 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 serial port and capture the data using a program like HyperTerminal. (For more information on HyperTerminal, see "Using HyperTerminal" on page 184.)
2. On your computer, launch MS Excel.
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 press **Open**. The USB flash drive displays as a "Removable Disk" in the list of available drives.
5. If Excel opens the data in a spreadsheet, you do not need to continue with the next steps. You can work with the file as you would any other Excel file.
6. Depending on the version of Excel you have, Excel may automatically start the "Text Import Wizard" to help you create a spreadsheet from the data in the file. If the "Text Import Wizard" dialog box appears (Figure 45), make sure **Delimited** is selected and press the **Next** button.

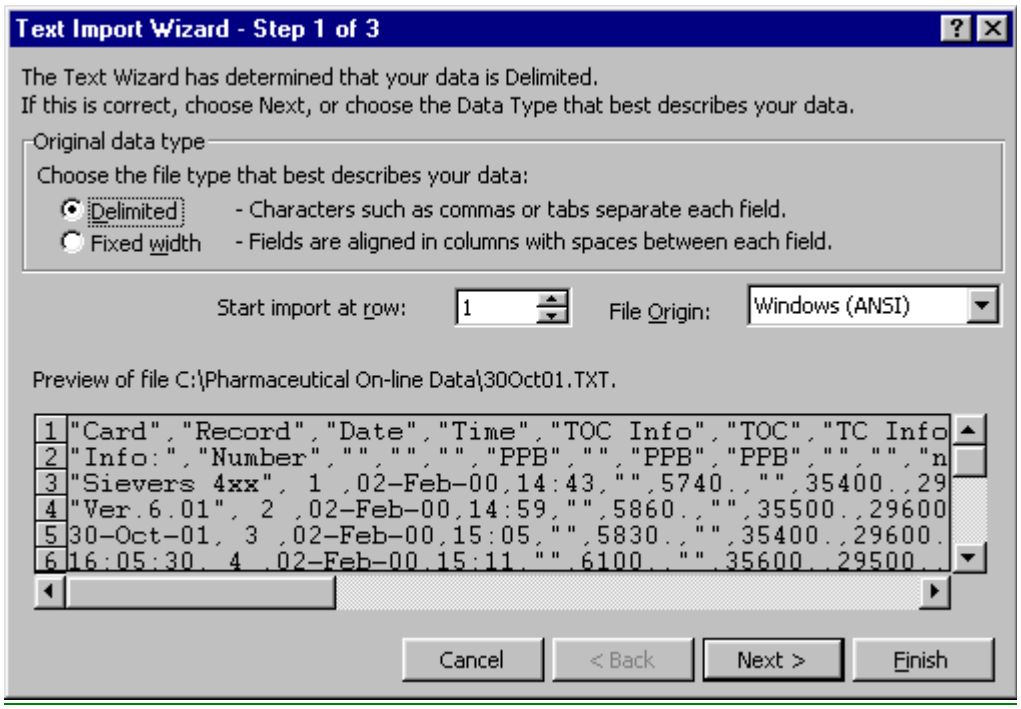

Figure 45: Step 1 of the MS Excel Text Import Wizard

7. Make sure the **Comma** check box is selected, to identify the file as being comma-delimited (Figure 46).

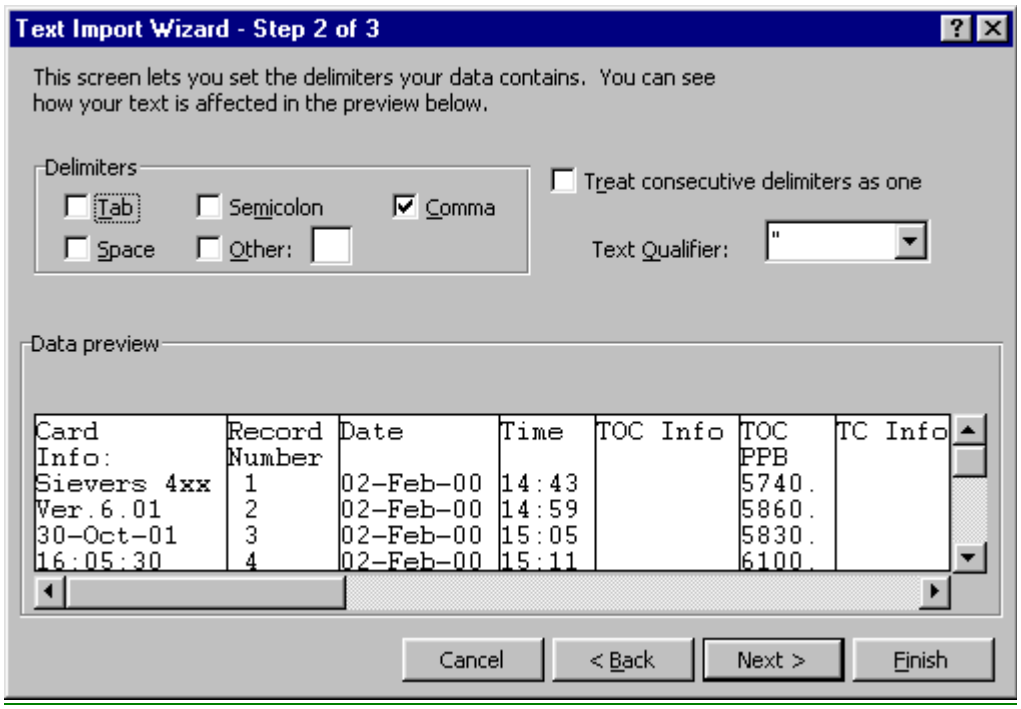

Figure 46: Step 2 of the MS Excel Text Import Wizard

8. Excel shows a preview of the data that will be imported. If desired, you can highlight a column and assign a **Column data format** (Figure 47). Press **Finish** to continue.

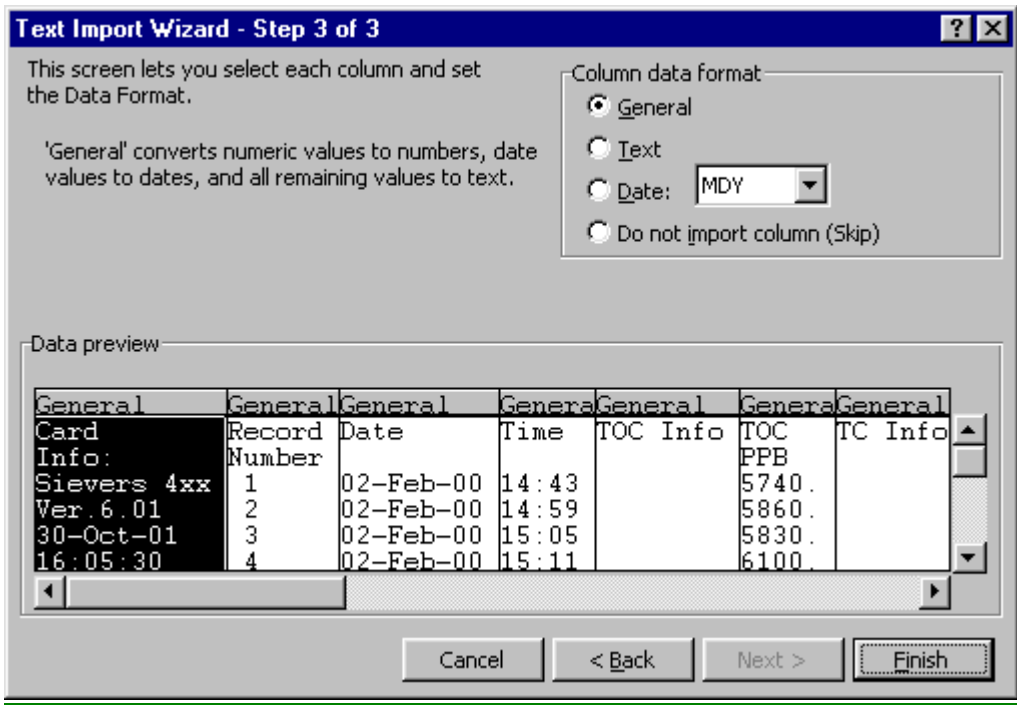

Figure 47: Step 3 of the MS Excel Text Import Wizard

9. A new spreadsheet containing your exported data opens. You can now modify the document as you would modify any other Excel file.

Using HyperTerminal

Hyperterminal is a Microsoft communications program that can be used to communicate with serial devices, such as the Analyzer. To use Hyperterminal, you must first connect your Analyzer to the computer with a serial (RS-232) cable.

To use Hyperterminal with the Analyzer:

1. Make sure the serial cable is connected to the Analyzer and the computer, and make sure the Analyzer is powered on.
2. Launch HyperTerminal using one of these methods:
   - The location of HyperTerminal varies from computer to computer. Often it can be launched by exploring the Start menu path as follows:
     Start → Programs → Accessories → Communications → HyperTerminal.
   - Select **Start** → Run, type `Hypertrm` in the **Open** field, and press **OK**.

3. When HyperTerminal launches, the **Connection Description** window appears. Enter a name in the Name field, such as `Sievers 900 TOC Analyzer`, and press **OK**.
4. When the **Connect To** window appears, select **Communications Port** from the **Connect Using** drop-down menu. Press **OK**. If more than one communications port is in the list and you're not sure which one to select, see "Determining Your Communications Port Number" on page 185.
5. In the **Com Settings** window, specify the following settings:

   Bits Per Second:9600

   Data Bits:8

   ParityNone

   Stop Bits:1

   Flow Control:Hardware

   After selecting these values, press **OK**.
6. The main HyperTerminal window appears. Select **Transfer → Capture Text**. Specify a location and name for the file and press **OK**. Include a file extension of either `.txt` or `.csv`. For example, `JulyData.csv`.
7. On the Analyzer, export the data you want to capture. Be sure to select **Serial** as your export destination.
8. When the export begins, you will see the data streaming in the HyperTerminal window. When the export is complete (activity stops in the HyperTerminal window), select **Transfer → Capture Text → Stop**.
9. The data is now saved in the file location you specified in Step 6. When you open the file in a spreadsheet or database program, you will need to browse to this folder in the program's **Open** dialog box.
10. Exit out of HyperTerminal. You will be prompted to save the connection information. Saving the information makes it easier to connect to the Analyzer the next time you want to capture data.

Determining Your Communications Port Number

If your computer has more than one serial port, it is possible that more than one communication port is in use. To try to determine which communication port is being used to connect to the Analyzer, you can follow these steps:

1. Display the **System Properties** window (select **System** in the **Control Panel** window).
2. Select the **Hardware** tab.
3. Press the **Device Manager** button.
4. Scroll down to **Ports (Com and LPT)** and expand the menu by pressing the plus sign (+).
5. The communication ports in use should be listed, along with device names.

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