TOC SYSTEMS INC

StarTOC *
Ultrapure

On-Line TOC Analyzer

Features

- TOC-True
  or
- NPOC

- Microsoft Windows Touch Screen Computer

- Digital Injection Sample Sample System

- 2 Alarm Levels 1 Master Fault Alarm

- 4-20 mA Outputs

- RS-232C

- Separate Electronics & Liquid Compartments

- Rugged FRP Enclosure

Options

- Dual NDIR Analyzers

- Correlated BOD/COD

- Benchmark/Auto Validation

- Auto-Cal/Auto-Clean

- Automatic Multi-Range

- Multi-Stream Analysis

- 485 Output

- Network Ready

ON - LINE ULTRAPURE
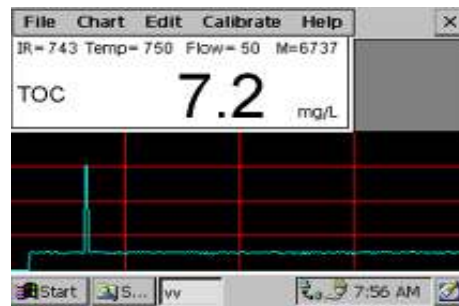

-CHOICE OF PLATFORMS-

Microprocessor

- Interactive Menus

Windows CE Computer with Touch Screen

- Touch Screen
- VGA Color
- Network Ready
- Paperless Chart Recorder
- PCMCIA Slot
- Solid State Data Storage

Description

TOC Systems, Inc. uniquely offers all methods of TOC analysis* and recommends Ultrapure as the method of choice for many applications.

Only the StarTOC analyzers offer the features and reliability of operation associated with its team's pioneering experience in TOC analysis since 1969**.
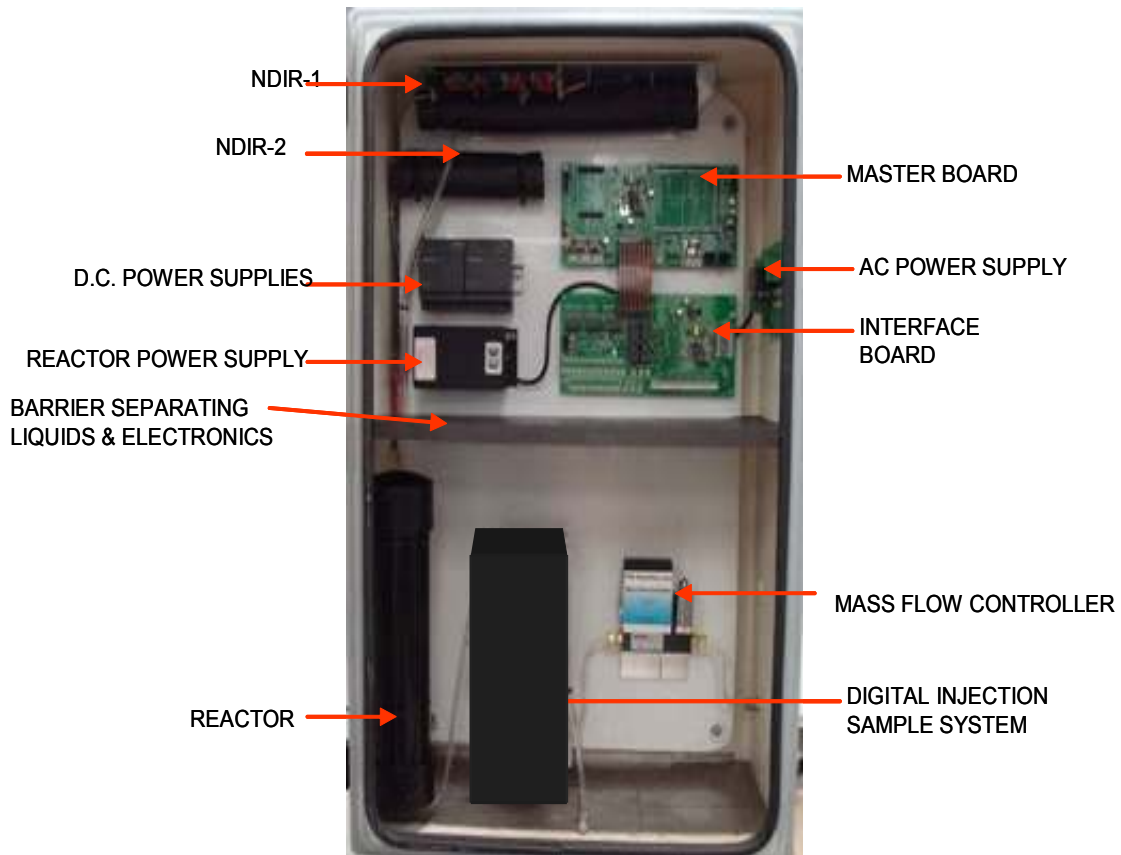
Because we offer a full line of High Temperature Combustion, UV/Heated Persulfate, Ozone Promoted and Ultra-Pure TOC Analyzers, we are able to offer you objective, unbiased advice and can therefore fully commit our total resources to providing you the best possible installation.

View and listen to a short video, approximately 2 minutes about TOC Systems.
http://tocsystemsinc.com/impactmovie

*StarTOC™ is a brand of TOC Systems, Inc.

StarTOC ULTRAPURE METHOD

NDIR-1

NDIR-2

MASTER BOARD

D.C. POWER SUPPLIES

AC POWER SUPPLY

REACTOR POWER SUPPLY

INTERFACE
BOARD

BARRIER SEPARATING
LIQUIDS & ELECTRONICS

MASS FLOW CONTROLLER

DIGITAL INJECTION
SAMPLE SYSTEM

REACTOR

- Most Accessible for Service

    - No Local Repair

        - Parts Exchange Service Policy
        (overnight delivery of replacement modules)

- Oxidizes particles up to 3 mm in diameter.

    (No sample valves to clog or jam)

- Rugged FRP Enclosure allows direct outside installation
  and integral heating, cooling and purging, without requiring
  additional costly shelters.

ELIMINATE Analyzer-Sample System Interface Problems -

Sample System

Features & Benefits:

A single package, sample system fully integrated with the analyzer assures proper overall system operating conditions

- AND -

A single source of total analytical responsibility, accountable to project management for its sucess.

- WITH   Analyzer Side Panel-Mounted Complete Sample Systems

Sample Pump

Fast By - Pass

Heat Exchanger Sample Cooler

Self-Cleaning Filters

Custom Sample Systems
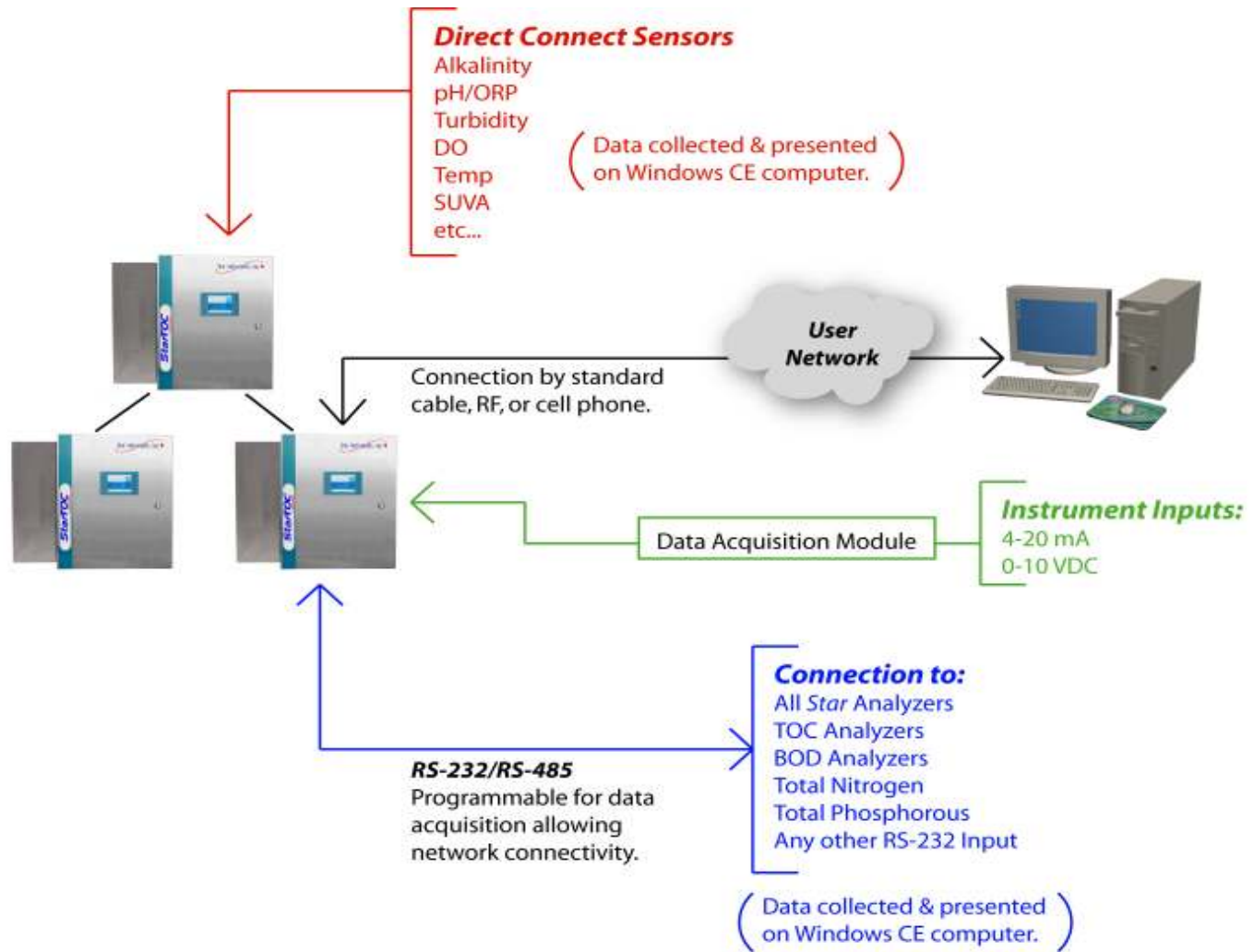
(No Filtration Sample System)

(Blow Back Sample System)

(Heat Exchanger and
Sample-Conditioner System)

Network Enabled

Utilization of an onboard Windows CE computer allows direct networking. Central control of analyzer operation and data management are easily facilitated.

Direct Connect Sensors
Alkalinity
pH/ORP
Turbidity
DO
Temp
SUVA
etc...

Data collected & presented on Windows CE computer.

User Network

Connection by standard cable, RF, or cell phone.

Instrument Inputs:
4-20 mA
0-10 VDC

Data Acquisition Module

RS-232/RS-485
Programmable for data acquisition allowing network connectivity.

Connection to:
All *Star* Analyzers
TOC Analyzers
BOD Analyzers
Total Nitrogen
Total Phosphorous
Any other RS-232 Input

Data collected & presented on Windows CE computer.

Preferred Application

Difficult industrial samples requiring accurate TOC analysis with minimum maintenance.

Saline samples up to 26% salts without interference.

Other difficult to oxidixe samples.

[2] *The Pitfalls of Process TOC Analysis and How to Avoid Them*
1999 Instrument Society of America Tutorial

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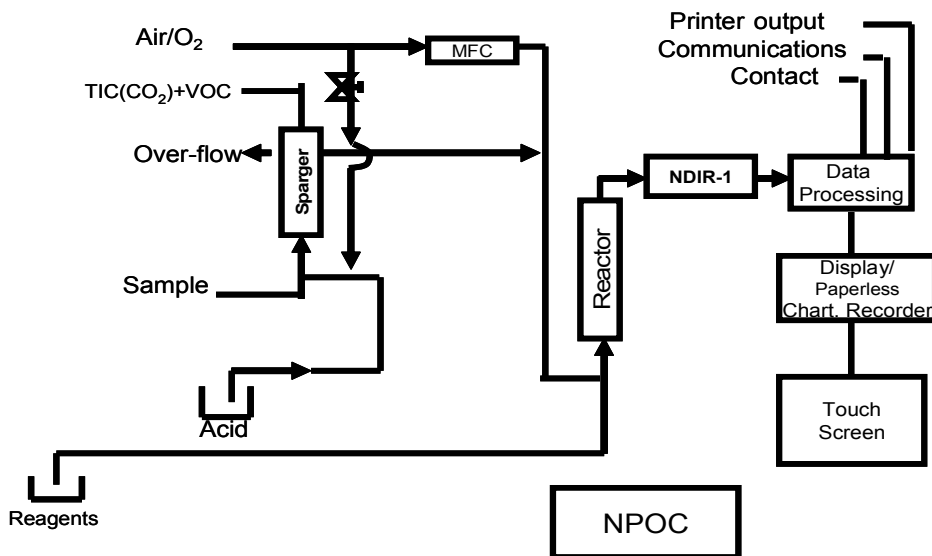
NPOC Analysis

"NPOC" (Non-Purgeable Organic Carbon) mode is preferred for accuracy when no volatile organics are in the sample. Pump (P-1) delivers the sample to the sparger, where it is mixed with acid by pump (P-3) to lower its pH to approximately 2.0. At this pH, the inorganic carbon in the sample is converted to dissolved CO_2 and is stripped (sparged) from the sample by air/O_2 and vented to atmosphere, along with any purgeable/volatile organics. The carbonate-free sample is drawn from the sparger by pump (P-2) and delivered to the Reactor, where the remaining NPOC is oxidized to CO_2, which is measured by the NDIR (Non-Dispersive Infrared Analyzer) as a direct correlation of NPOC in the sample. **NPOC is often erroneously reported as "TOC".**
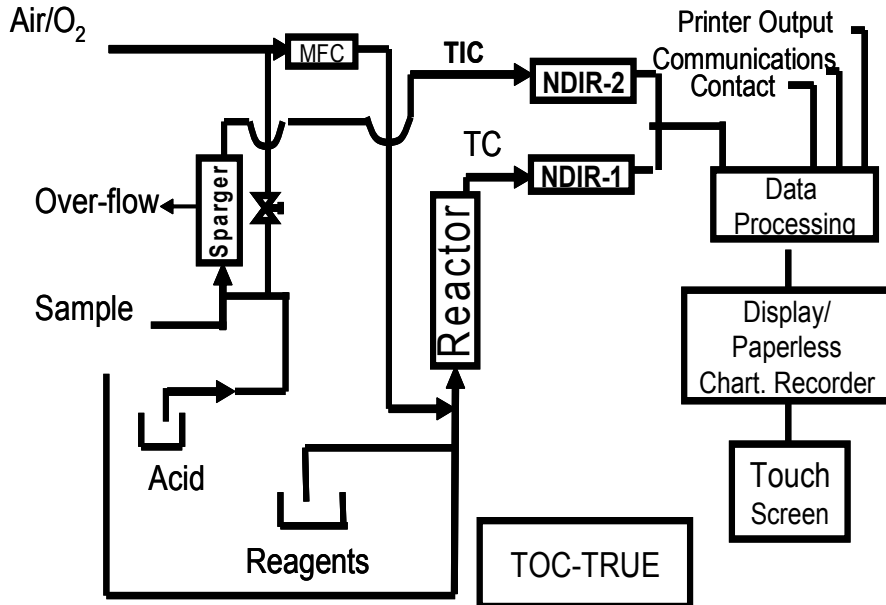
TOC-True Analysis

TOC-True mode is the preferred method of use if any volatile hydrocarbons are present in the sample, which would be lost in the Inorganic Carbon removal sparging stage in an "NPOC" analysis. The TOC-True method measures both TC (Total Carbon) and TIC (Total Inorganic Carbon) for a more accurate and complete analysis of the total organics in the sample, including the purgeable/volatile organic carbon. By subtracting the TIC from the Total Carbon in the sample, **all species of organic carbon are measured, not just the NPOC.**

Benchmark/Auto-Validation

Benchmark[2] is the validation technique, whereby on command a chemical calibration standard is automatically introduced to the analyzer and the response is compared to the previous analyzer calibration. If the response falls within a certain specified limit, the computer/output indicates "Benchmark Passed". If the response falls outside specified performance limits, either a "Maintenance Request" or a "Fault" alarm is activated, depending on preset tolerances. Thus, in cases of process spills, when the analyzer performance is questioned, Benchmark can rapidly and automatically validate analyzer performance. It eliminates time consuming and unnecessary recalibration cycles, which take the analyzer out of service just when it is most critically needed. Benchmark may be on-demand, or operator programmed for designated day and time activation on a repetitive basis.

Auto-Cal and Auto-Clean utilities are also included in this option p/n 18039-1.

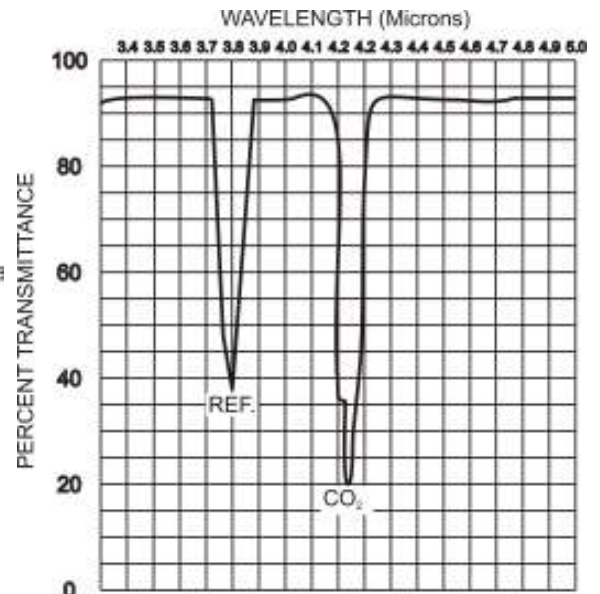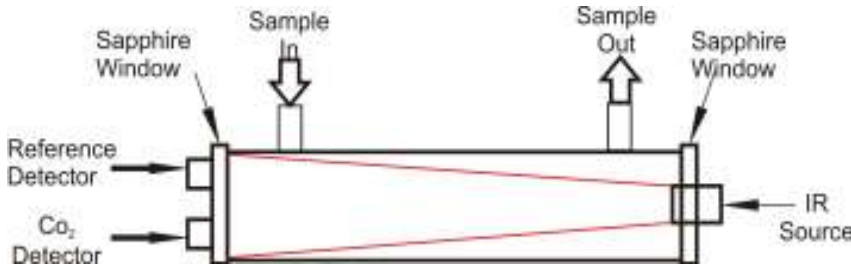# NDIR (The key component for reliable TOC analysis.)

IR Detectors

Sample Cell

IR Source
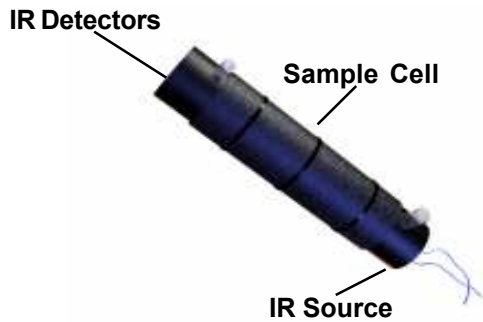
- Specific, Interference-Free CO_2 Detection
- Dual-Wavelength Ratioing Compensates for Drift
- Computer-Controlled for Accuracy
- Sapphire Protected Optics
- Non Corrosive, Non-Reflective Sample Cell (Borosilicate)

- No Moving Parts or tools required for Easy Maintenance and Service
- No Critical Realignment Required

Detection Technique

The NDIR CO_2 detector uses a solid-state, dual-wavelength system with a single borosilicate glass sample cell that requires no wall reflectivity. There is a reference and a CO_2 specific detector in the sample path. Use of the true zero filter eliminates water vapor interference and the requirement for chemically removing acid gases prior to detection. An infrared source is cycled on and off to avoid mechanical choppers required in alternate NDIRs. The StarTOC NDIR has **no moving parts**.

Sapphire Window — Sample In — Sample Out — Sapphire Window

Reference Detector

CO_2 Detector

IR Source

WAVELENGTH (Microns)
3.4 3.5 3.6 3.7 3.8 3.9 4.0 4.1 4.2 4.2 4.3 4.4 4.5 4.6 4.7 4.8 4.9 5.0

PERCENT TRANSMITTANCE

100 / 80 / 60 / 40 / 20 / 0

REF.

CO_2

Automatic gain control (AGC) is employed during the reference/sample cycle to compensate for such factors as NDIR source deterioration, dirty optical windows, and detector gain changes. When the AGC level reaches a predetermined threshold, the output alerts the Operator to check the NDIR . Malfunctions of major NDIR components are detected as an alarm, providing fail-safe operation. Signal detection is completely synchronous and , because of the differential technique of ratioing the Zero and CO_2 outputs, zero drift is virtually eliminated. All critical optics are protected by sapphire windows. The sample cell can be easily removed and the windows cleaned within 15 minutes, without realignment or the use of any tools.

This absolute measuring, dual-line spectra comparison NDIR provides simple, direct measurement of all CO_2 contributing factors (including background) for a true and accurate calibration and precisely offsets these effects for very accurate TOC determinations. The consequences of water vapor interferences in low-level precision TOC analysis are avoided.

Installation Requirements

The StarTOC™ Ultrapure Method Process model can handle suspended solids up to 3 mm without filtration, thus providing a truly representative sample.

TOC Systems, Inc. furnishes recommended installation drawings. The user must provide the following:

1. Electrical Source (110/220 VAC 10 Amp service with cutoff switch)

2. Gravity fed drain with air break or StarTOC return to process pump option.

3. A source of CO_2-free air, or oxygen with a maximum flow rate of 300 cc/minute at 15 psig.

   (Optional Star Oxygen Generator requires electricity only.)

Specifications

Nominal at 25°C. Subject to custom application requirements.

Measuring Range (Std)	0-1 ppm through 0-100 ppm without dilution
Repeatability	+/- 3% of Full Scale
Drift	Compensated, self calibrated NDIR (+/- 2% non-accumulative)
Response Time T_{90}	From 9 minutes, depending on range
Analog Outputs	4-20 mA (2 each)
Relay Outputs	2 TOC adjustable level alarms
Computer/ Display	Microsoft Windows CE Touch Screen Computer. Color VGA Display, Solid-Stage Data Storage, Paperless Chart Recorder, PCMCIA Slot, Network-Ready & Optional RS-485 or
Power Supply	110/ 220 VAC 10 Amp service recommended
Enclosure	Fiberglass (FRP)
Dimensions (HxWxD)	76 x 61 x 31 (cm) 30 x 24 x 12 (in.)
Weight	23 Kg. 50 Lbs
The analysis range and precision are affected by sample introduction, sample homogeneity, sample container cleanliness, reagent purity, chemical	

Purchase Specifications

The Analyzer shall use the Ultrapure (UV/NDIR) Method. An onboard Windows CE Computer shall be used to control all analyzer functions automatically and be configured with a touch screen, paperless chart recorder and be network-ready. It shall store time/date stamped historical data records for a minimum of 3 months (Std). CO_2 detection shall be by a solid-state, single path length non-dispersive infrared analyzer (NDIR), having no moving parts. It shall be self-calibrated and interference-free. A computer controlled Mass Flow Controller shall be used to provide maximum analytic stability and reliability of results. The Analyzer shall be housed in a FRP enclosure to avoid corrosion and have separate compartments for liquid handling and electrical systems. The Analyzer shall be a TOC Systems, Inc. StarTOC™ [1] Ultrapure model, suitable for the on-line designated application.

Ordering Information

DESCRIPTION	ORDER NUMBER
StarTOC Ultrapure method, Microsoft Windows-CE Computer based , Single Stream Analyzer, Bench-mark, Auto-Calibrate, Auto-Clean, Paperless Chart Display, Historical Records Digitally Stored for a minimum of three (3) months.	

(Specify "TOC-True or 'NPOC")
     TOC Configuration ('NPOC")
     TOC Configuration ('TOC-True")
	StarTOC Model UPD
	StarTOC Model UPT

Multi-stream Sequencer to Multiplex Up to 6 Streams, Std. (Requires Microsoft Windows Computer) 2-Stream Sequencer with independent 4-20 mA 3-Stream Sequencer with independent 4-20 mA 4-Stream Sequencer with independent 4-20 mA 6-Stream Sequencer with independent 4-20 mA	 MSS-2 MSS-3 MSS-4 MSS-6

(1)Microsoft is a registered trade mark of Microsoft Corporation)

CORRELATED PROCESS COD/BOD

(option available for all StarTOC on-line models)
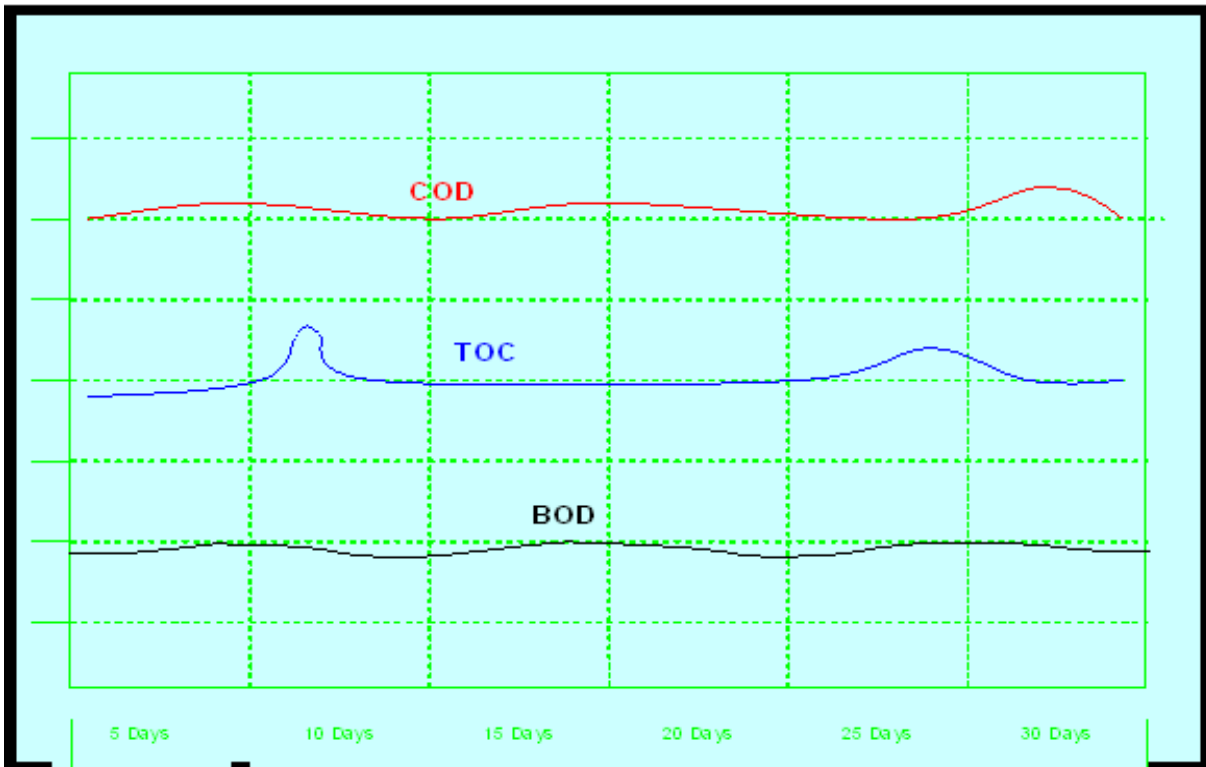
Benefits

- **Excellent Correlation (Requires initial correlation of Lab analysis with "grab samples").**

Procedure

- **Collect representative grab samples from analyzer & press "Store TOC" button.**

- **Send grab samples to lab for BOD or COD analysis.**

- **After receipt of lab analysis, enter BOD or COD analysis values as prompted by the Microsoft Windows CE Computer. This automatically correlates in time with the TOC measurement previously taken.**
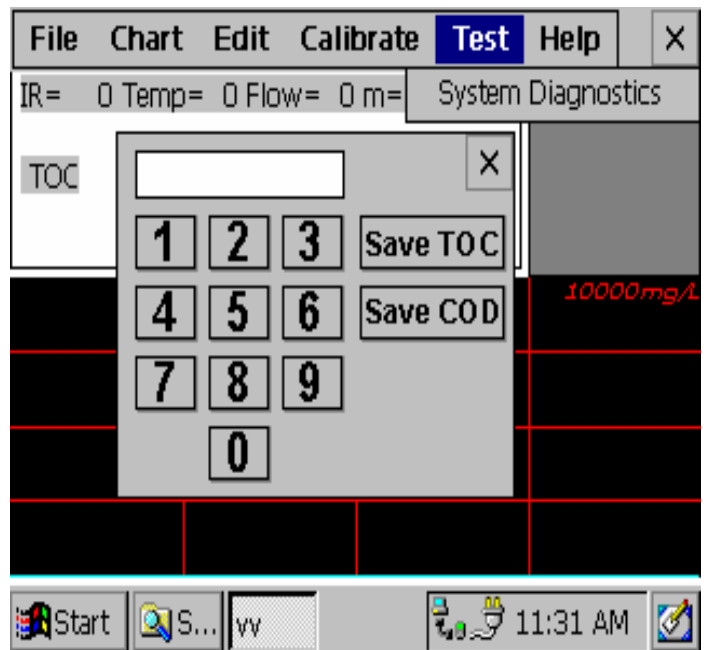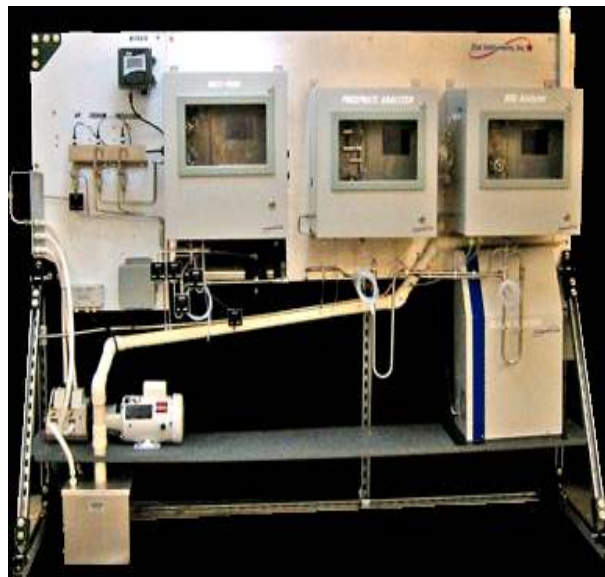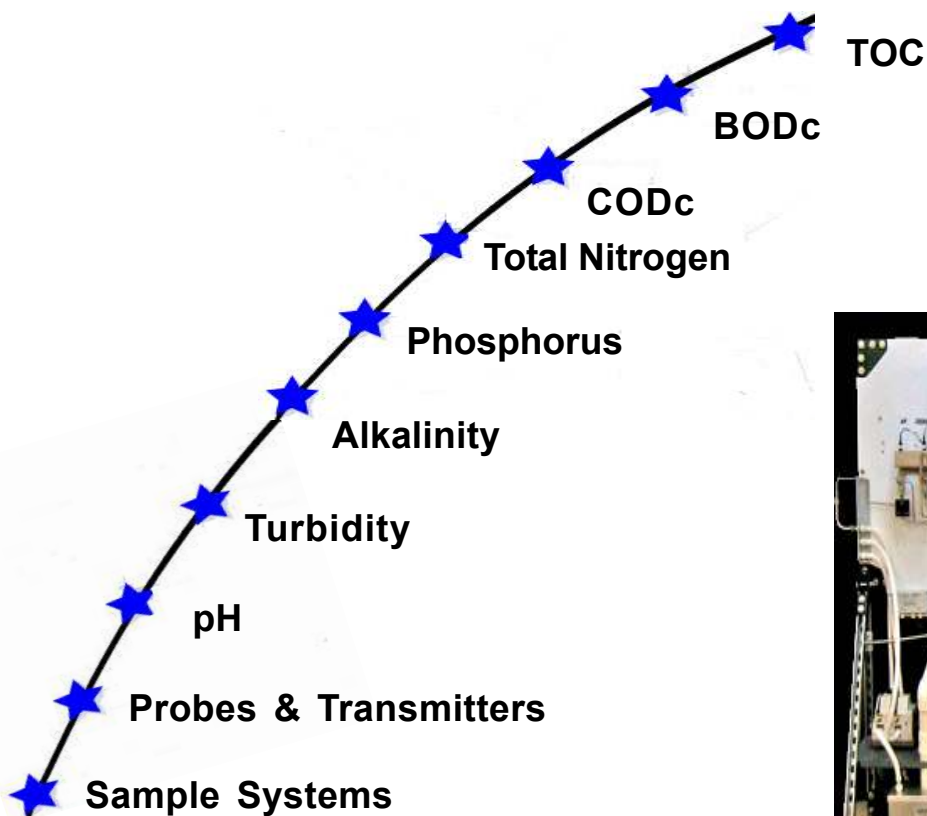

- **Thereafter organic values are displayed in units of choice (BODc, CODc or TOC).**

We also Offer Complete, Turn-Key, Analyzer & Sample Systems

Pre-engineered and custom packages , including small shelters with all utilities installed and ready to be delivered to your site.

- **Effluent Monitoring**
- **Waste Treatment**
- **Drinking Water**
- **Process Monitoring**
- **Panels & Small Shelters**
- **Custom Packages**

TOC

BODc

CODc

Total Nitrogen

Phosphorus

Alkalinity

Turbidity

pH

Probes & Transmitters

Sample Systems

StarTOC™ Family of TOC Analyzers (Partial).

FOR THE LAB / BENCHTOP

Automatic   **Semi-Automatic**   **Solids, Slurries, Liquids**

FOR THE ON - LINE / PROCESS

Continuous Pump Sample System

Digital Injection Sample System

- **UV/ Persulfate**   • **Ozone / Hydroxyl Radical**   • **Total HC**   • **Combustion**

- **Ultra-Pure**   • **Oil-in-Water**   • **Dual Oxidation Methods**

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View and **listen** to a short video, approximately 2 minutes about TOC Systems. http://tocsystemsinc.com/impactmovie