

# TOC



# StarTOC™

UV/Heated Persulfate

## On-Line TOC Analyzer



### Features

- TOC-True  or  NPOC
- Microsoft Windows Touch Screen Computer
- 2 Alarm Levels  
1 Master Fault Alarm
- 4-20 mA Outputs (2 each)
- RS-232C/485 Outputs
- Separate Electronics & Liquid Compartments
- Low Maintenance

### Options

- Correlated BOD/COD
- Dual NDIR Analyzers
- Benchmark/Auto Validation
- Auto-Cal/Auto-Clean
- Automatic Multi-Range
- Multi-Stream Analysis
- Network Ready
- Stainless Steel Enclosure
- NEMA 4X / IP66



Microsoft  
Windows-CE  
Computer  
Platform

### On-Line UV/Heated Persulfate UVPW

#### Description

Star Instruments, Inc. uniquely offers all methods of TOC analysis\* and recommends **UV/Heated Persulfate** as the method of choice for many applications. The basic analyzer is configured to provide maximum utility with either a Microprocessor based platform or an advanced Microsoft<sup>(1)</sup> Windows-based computer with touch screen. **Please try our FREE test drive at [www.starinstruments.com](http://www.starinstruments.com).**

Only Star offers the features and reliability of operation associated with its team's pioneering experience in TOC analysis since 1969\*\*.

For difficult or questionable streams, we invite you to send a sample for our complimentary analysis to verify the adequacy of this method. In return, we will provide a confidential report and recommendation for the best method for your application.

Because we offer a full line of High Temperature Combustion, UV/Heated Persulfate, Ozone Promoted and Ultra-Pure TOC Analyzers, we feel we are able to offer you objective, unbiased advice. We can therefore fully commit our total resources to providing our customers the best possible installation available.

#### Preferred Applications

Excellent TOC accuracy from low parts-per-billion to moderate concentration levels of salt-free samples, with minimum maintenance.

*Standard Method 5310 C/D*  
*EPA 415.1*  
*EPA 9060*  
*ASTM D 4839-88*  
*ASTM D 4779-88*

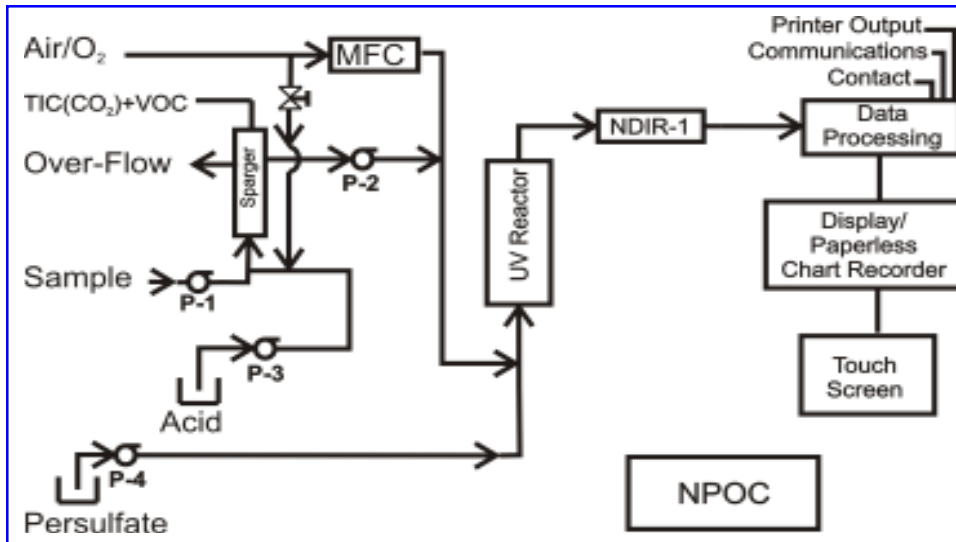
*Boiler Feedwater*  
*Cooling Water*  
*Drinking Water*  
*Wastewater (Limited)*  
*River Water*  
*Oil In Water*

\* Visit our website at [www.starinstruments.com](http://www.starinstruments.com) to view our entire family of TOC analyzers.

\*\*Former Owners of Astro International Corporation

<sup>(1)</sup> Microsoft is a Registered Trademark of Microsoft Corporation

## Flow Diagram: NPOC

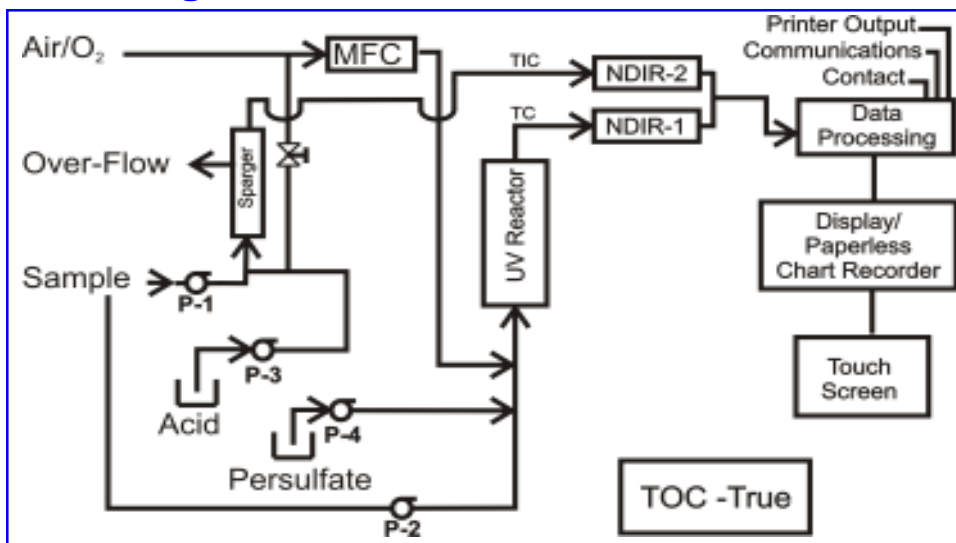


## Analysis

“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<sub>2</sub> and is stripped (sparged) from the sample by air/O<sub>2</sub> 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<sub>2</sub>, 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”.

## Flow Diagram: 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 detected, not just the NPOC.

## Benchmark/Auto-Validation

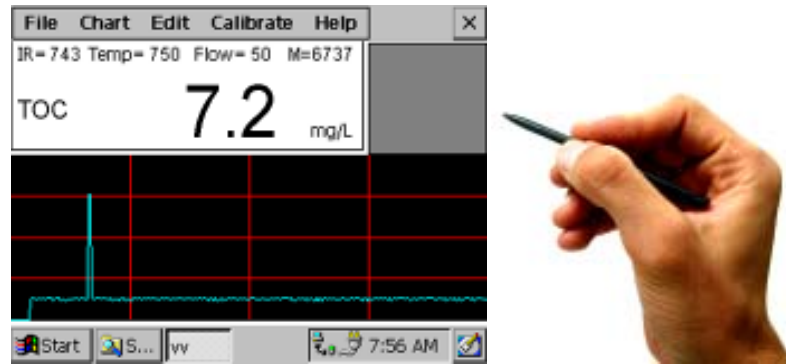
Benchmark<sup>(2)</sup> is the validation technique, whereby on command a chemical calibration standard is automatically introduced to the analyzer and the response is compared to the previous analyzer calibration. If the response falls within a certain specified limit, the computer/output indicates “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 available.

<sup>(2)</sup> *The Pitfalls of Process TOC Analysis and How to Avoid Them*  
1999 Instrument Society of America Tutorial by John W. Small

# Advanced Technology, Today and Tomorrow

Star analyzers use Microsoft Windows CE to ensure that you are always up-to-date with the latest technologies. By incorporating a modular software design, Star is capable of offering advanced options unavailable elsewhere. For cost considerations, Star offers an alternative computer with an LCD display.

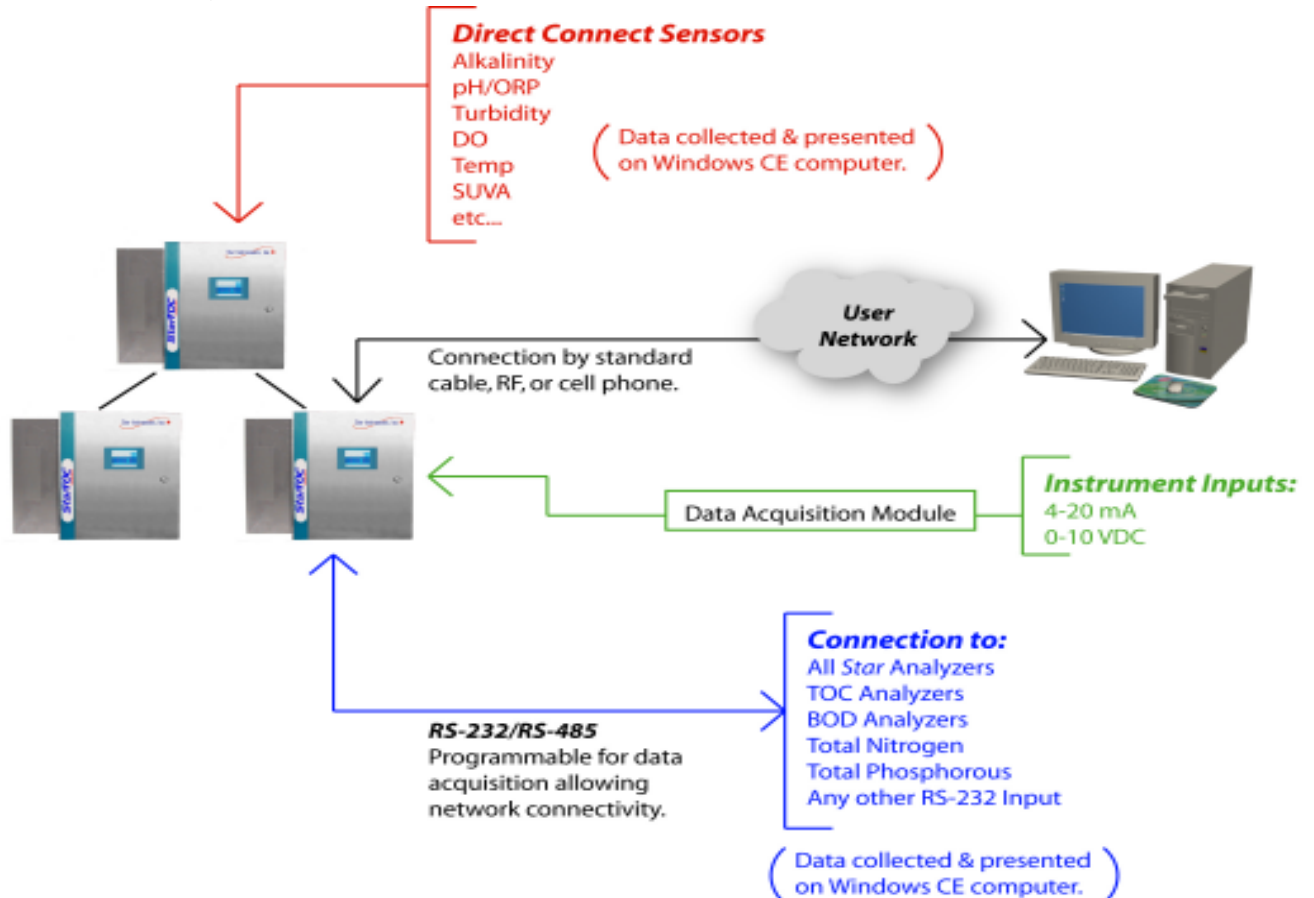


## Windows CE Computer with Touch Screen Control

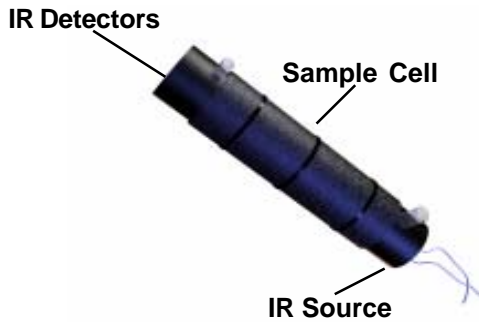
- Touch Screen
- VGA Color Display
- Network Ready
- Paperless Chart Recorder
- PCMCIA Slot
- Solid State Data Storage

## Network Enabled

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



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



- Specific, Interference-Free CO<sub>2</sub> Detection
- Dual-Wavelength Ratioing Compensates for Drift
- Computer-Controlled for Accuracy
- Sapphire Protected Optics
- Non Corrosive, Non-Reflective Sample Cell (Borosilicate)

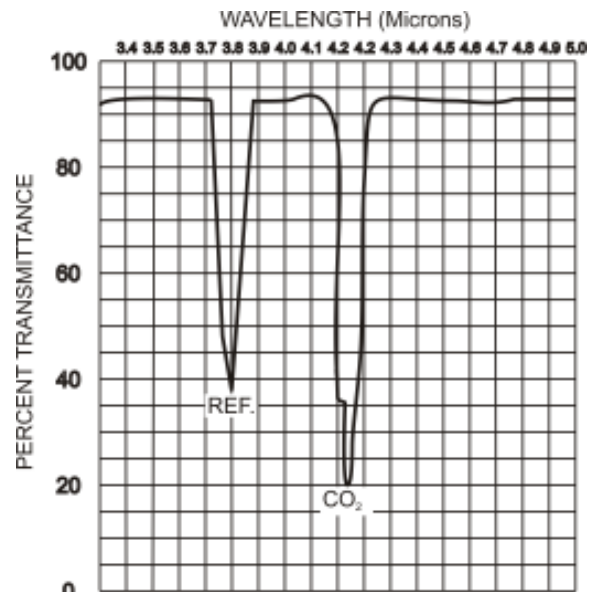
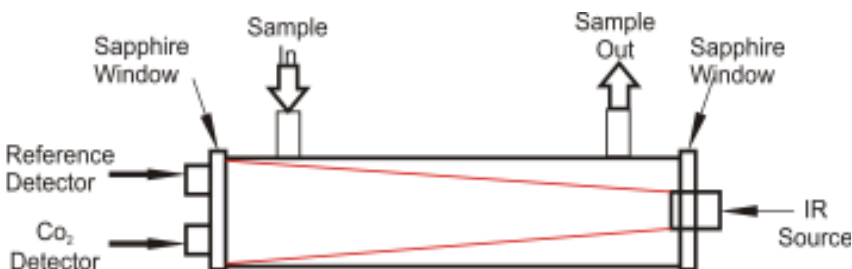
- No Moving Parts or tools required for Easy Maintenance and Service
- No Critical Realignment Required



**“Unique with All Star TOCs”**  
**5 Year Warranty on NDIR Sample Cell**  
**2 Year Warranty on Complete NDIR Bench**

## Detection Technique

The NDIR CO<sub>2</sub> 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<sub>2</sub> 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 Star NDIR has **no moving parts**.



Automatic gain control (AGC) is employed during the reference/sample cycle to compensate for such factors as IR source deterioration, dirty optical windows, and detector gain changes. When the AGC level reaches a predetermined threshold, an optics alarm indicator and a relay are activated. Malfunctions of major IR 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<sub>2</sub> 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 3 minutes, without realignment or the use of any tools.

This absolute measuring, dual-line spectra comparison NDIR provides simple direct measurement of all CO<sub>2</sub> 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, including blanks - a major source of error - are avoided.

# Specifications

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

<b>Measuring Range (Std.)</b>	0-10 ppm through 0-1,000 ppm without dilution 0-10,000 ppm with dilution
<b>Repeatability</b>	+/- 2% of Full Scale
<b>Drift</b>	Compensated, self-calibrated NDIR (+/- 2% non-accumulative)
<b>Response Time T<sub>90</sub></b>	From 9 minutes, depending on range
<b>Analog Outputs</b>	4-20 mA (2 each)
<b>Relay Outputs</b>	2 TOC adjustable level alarms 1 master fault alarm
<b>Computer/Display</b>	Microsoft Windows CE Touch Screen Computer: Color VGA Display, Solid-State Data Storage, Paperless Chart Recorder, PCMCIA Slot, Network-Ready, RS-485 Modbus - OR - Microprocessor Based System
<b>Power Supply</b>	110/220 VAC 10 Amp service recommended
<b>Enclosure</b>	Powder Coated Steel
<b>Dimensions (HxWxD)</b>	50.8 x 50.8 x 38.1 (cm) 20 x 20 x 15 (in.)
<b>Weight</b>	34 Kg. 75 Lbs.

# Ordering Information

<b>Description</b>	<b>Order number</b>
<b>Microsoft Windows-CE Computer based, Single Stream Analyzer, Benchmark, Auto-Calibrate, Auto-Clean, Paperless Chart Display, Historical Records Digitally Stored Up to One Year</b>  (Specify "TOC-True <b>or</b> "NPOC") TOC Configuration ("NPOC") TOC Configuration ("TOC-True") TC Configuration	UVPW UVPW-4 UVPW-1
<b>Multi-Stream Sequencer to Multiplex Up to 6 Streams, Std. (Requires Microsoft Windows Computer)</b>  2-Stream Sequencer with independent 4-20 mA 3-Stream Sequencer with independent 4-20 m 4-Stream Sequencer with independent 4-20 m 6-Stream Sequencer with independent 4-20 m	MSS-2 MSS-3 MSS-4 MSS-6
<small>(<sup>1</sup>) Microsoft is a Registered Trade Mark of Microsoft Corporation</small>	

# Purchase Specifications (See Detailed Engineering Specifications)

The Analyzer shall use the EPA, ASTM and Standard Methods for TOC analysis. It shall utilize UV/Heated Persulfate principle. It shall utilize peristaltic pumps. An onboard Microsoft 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 provide time/date stamped historical data records for up to two (2) years. CO<sub>2</sub> detection shall be by a solid-state non-dispersive infrared analyzer (NDIR), having no moving parts. The NDIR 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 have separate compartments for liquid handling and electrical systems. The Analyzer shall be a Star Instruments, Inc. Model "StarTOC UV/Heated Persulfate Analyzer".

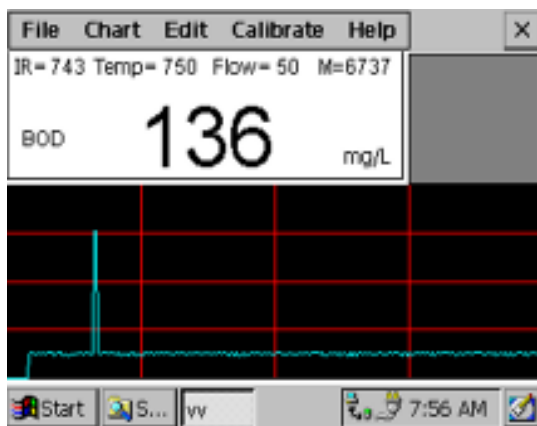
# CORRELATED PROCESS COD/BOD

*(Available For All StarTOC On-line Models)*

- Completely Automatic
- Microsoft Windows CE Computer
- Operator Prompting Menus
- Correlated COD



- Self-Calibrated NDIR
- Paperless Chart Recorder
- Auto-Cal/ Benchmark
- Correlated BOD



- Touch Screen
- VGA Color Display
- Solid State Data Storage
- Paperless Chart Recorder
- PCMCIA Slot
- RS-485 (MODBUS)

**Microsoft Windows  
CE Computer**

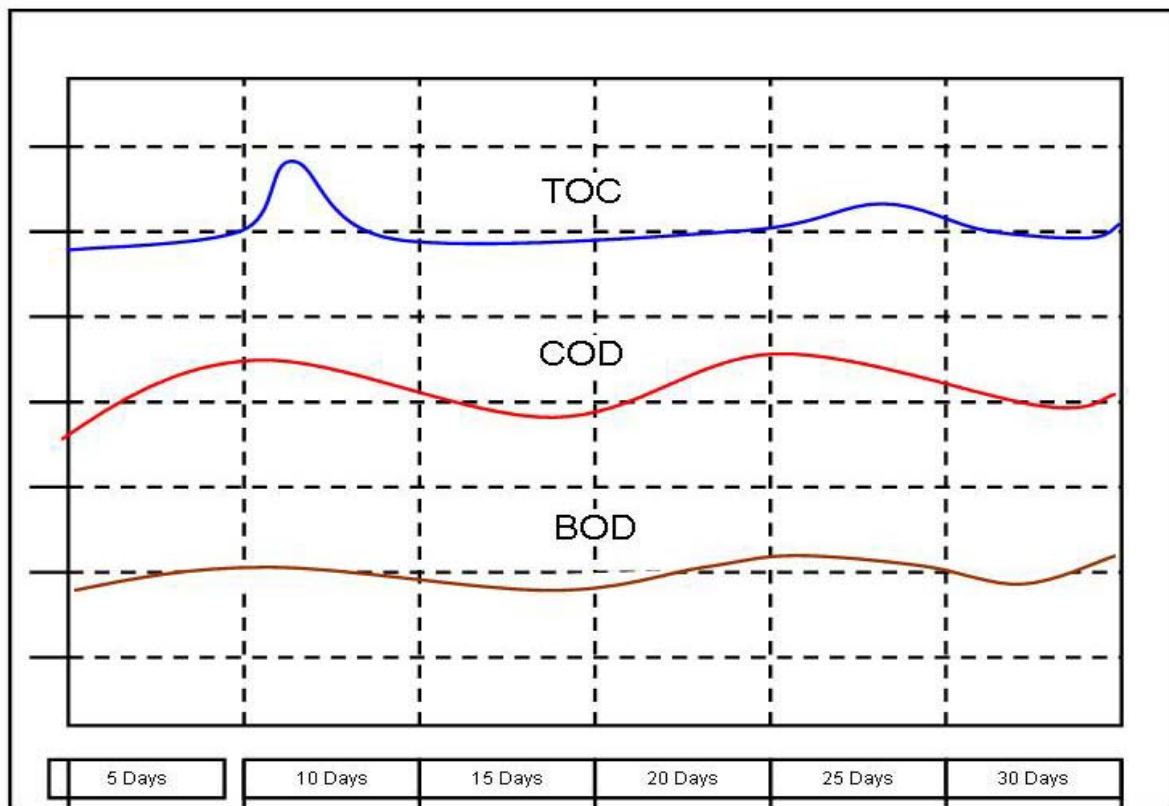


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**“Committed To Keeping You On Line”**

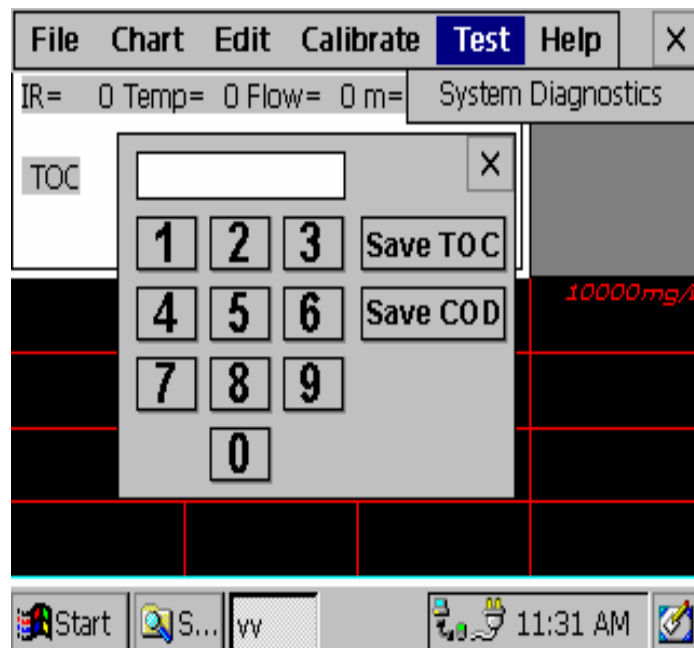


## Benefits

- Excellent Correlation
- Rapid Response
- More Adequately Relates

## Procedure

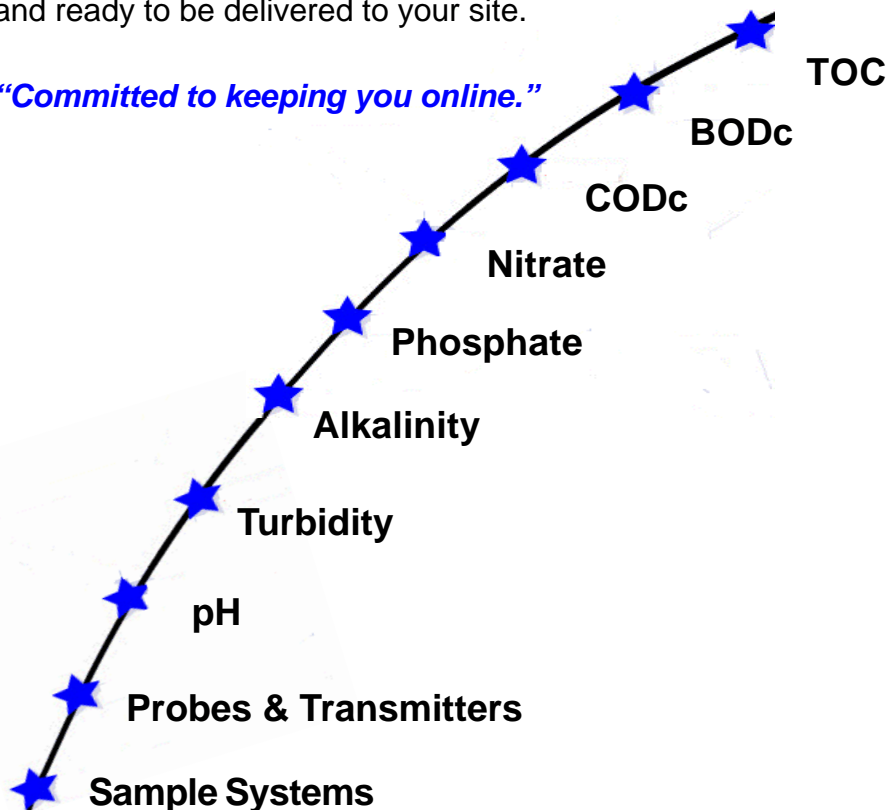
- Collect representative grab samples from analyzer & press “Store TOC” button.
- Send grab samples to lab for BOD or COD analysis.
- After receipt of lab analysis, enter BOD or COD analysis values as prompted by the Microsoft Windows CE Computer. This will automatically correlate in time with the TOC measurement previously taken.
- Thereafter organic values are displayed in units of choice.



## Pre-Engineered Online System Packages and Enclosures

Star also provides pre-engineered and custom systems, including small shelters with all utilities installed and ready to be delivered to your site.

*"Committed to keeping you online."*



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### Offering Complete Analyzer & Sample Systems

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- Custom Packages

