


# TOC

# StarTOC

Combustion

™  
On-Line TOC  
Analyzer (Pumpless)

## Features

- Adjustable Temperature
- With or without catalyst
- TOC-True  or
- NPOC
- Microsoft Windows Touch Screen Computer
- 2 Alarm Levels  
1 Master Fault Alarm
- 4-20 mA Outputs
- RS-232C/485 Outputs
- Separate Electronics & Liquid Compartments

## Options

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

**On-Line High  
Temperature  
Combustion**



**Microsoft  
Windows-CE  
Computer  
Platform**

## Description

Star Instruments, Inc. uniquely offers all methods of TOC analysis\* and recommends **High Temperature Combustion** as the method of choice for many applications. The reactor temperature may be adjusted by the operator & configured for catalytic or non-catalytic oxidation. The analyzer platform is an advanced Microsoft<sup>(1)</sup> Windows-based CE Computer with touch screen.

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 provide 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-million to high TOC concentration levels of moderately salt-containing samples, with minimum maintenance. This is the best method for samples with particulates.

*Standard Method 5310 C/D*  
*EPA 415.1*  
*EPA 9060*  
*ASTM D 2579*  
*AOAC 973.47*

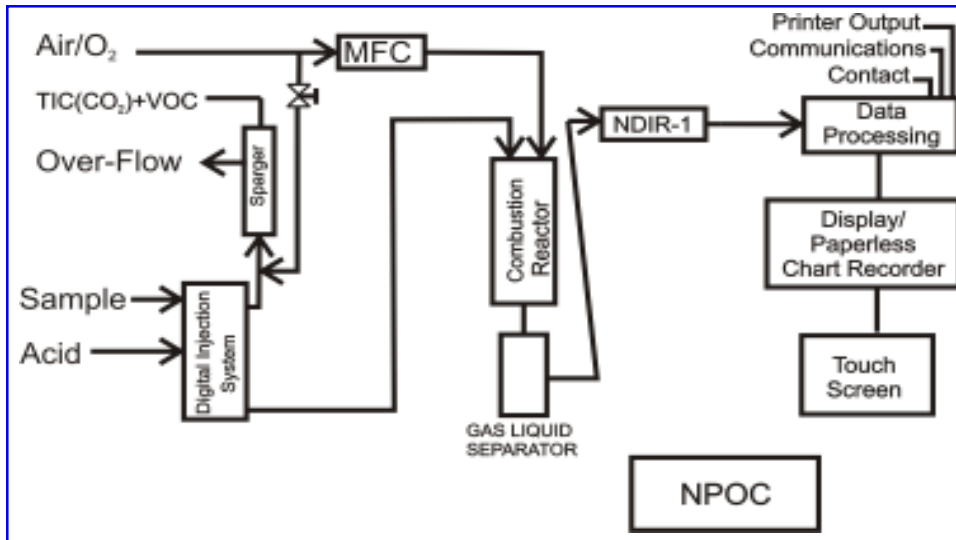
*Wastewater*  
*River Water*  
*Process Control*  
*Difficult to Oxidize Streams*  
*No/Low Salt Samples*

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

\*\*Former Owners of AstroInternational Corporation

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

## Flow Diagram: NPOC

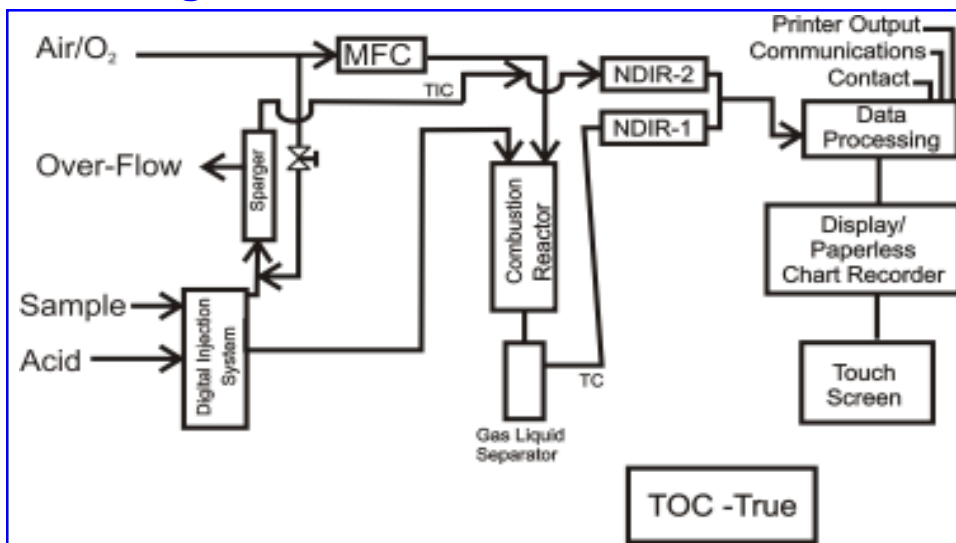


### Analysis

“NPOC” (Non-Purgeable Organic Carbon) mode is preferred for accuracy when no volatile organics are in the sample. The injector delivers the sample and acid to the sparger, where it is mixed 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 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

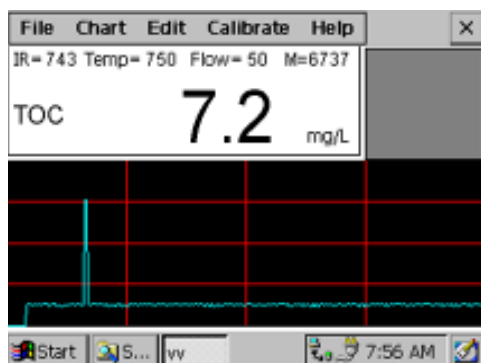
Benchmark<sup>(2)</sup> is the validation technique, whereby on command a chemical calibration standard is automatically introduced to the analyzer and the response is compared to the previous analyzer calibration. If the response falls within a certain specified limit, the computer/output indicates “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<sup>(1)</sup> Windows CE Computers 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.

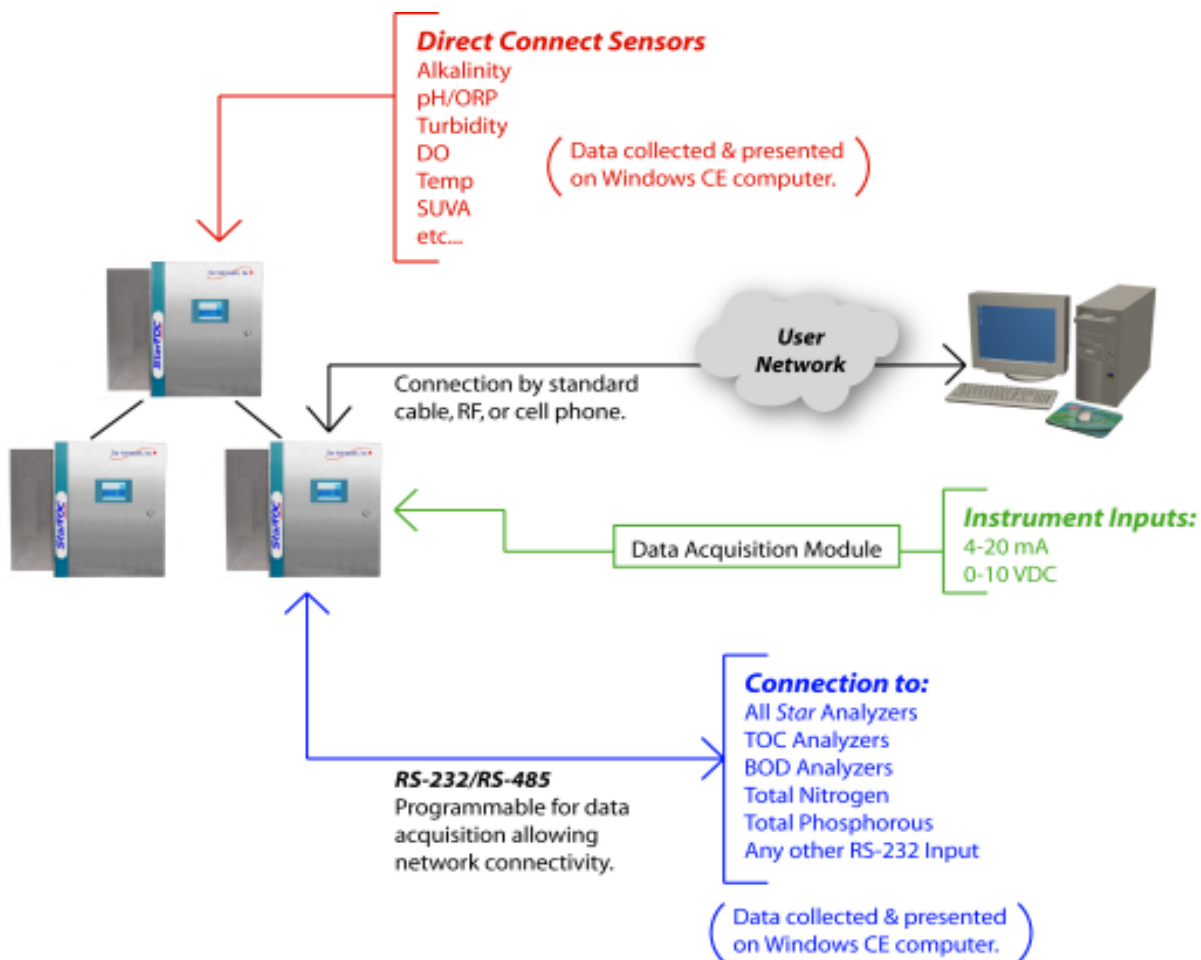


Microsoft Windows CE Computer with Touch Screen Control

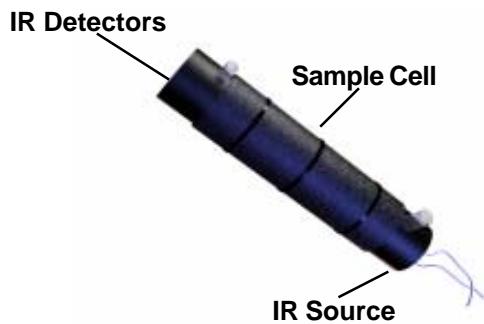
- VGA Color Display
- Network Ready
- Paperless Chart Recorder
- PCMCIA Slot
- Solid State Data Storage

## 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 Ratioring Compensates for Drift
- Computer-Controlled for Accuracy
- Sapphire Protected Optics
- Non Corrosive, Non-Reflective Sample Cell (Borosilicate)

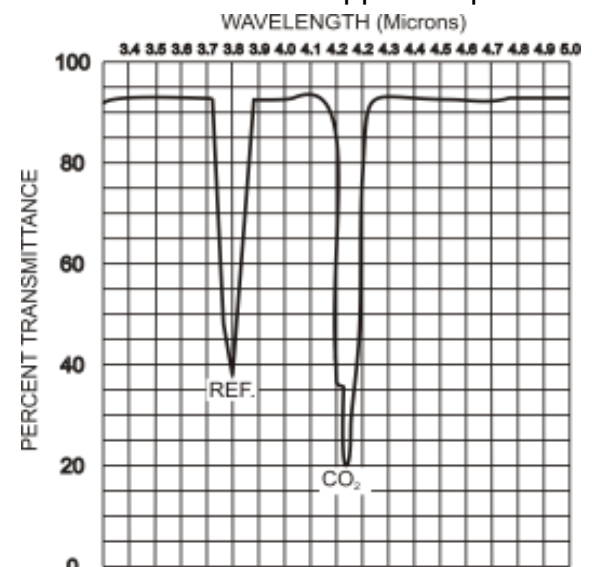
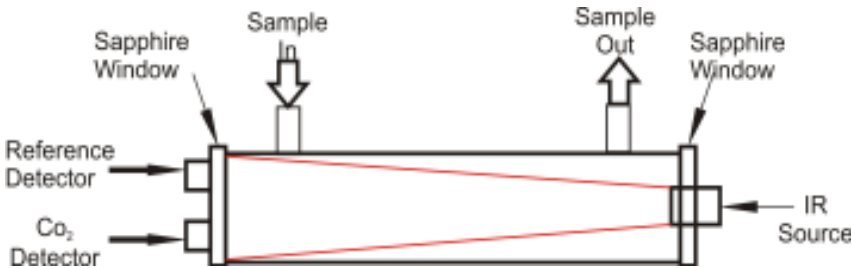
- No Moving Parts or tools required for Easy Maintenance and Service
- No Critical Realignment Required



**“Unique with all StarTOCs”**  
**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 ratioring 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 through 0-10,000 ppm
<b>Repeatability</b>	+/- 3% of Full Scale
<b>Drift</b>	Compensated, self-calibrated NDIR (+/- 2% non-accumulative)
<b>Response Time</b>	3 minutes, depending on application
<b>Analog Output</b>	4-20 mA (2 each)
<b>Relay Outputs</b>	2 TOC adjustable level alarms 1 master fault alarm
<b>Display/Computer</b>	Microsoft Windows CE Computer*
<b>Power Supply</b>	110/220 VAC 10 Amp service recommended
<b>Enclosure</b>	Powder Coated Steel
<b>Dimensions (HxWxD)</b>	114.3 x 50.8 x 38.1 (cm) 45 x 20 x 15 (in.)
<b>Weight</b>	68 Kg 150 Lbs.

# Ordering Information

<b>Description</b>	<b>Order number</b>
<p><b>Single Stream Analyzer, Benchmark, Auto-Calibrate, Auto-Clean, Paperless Chart Display, Historical Records Digitally Stored Up to One Year (Requires Windows CE Option)</b></p> <p style="text-align: center;">(Specify "TOC-True" or "NPOC")</p> <p>TOC Configuration ("NPOC")</p> <p>TOC Configuration ("TOC-True")</p> <p>TC Configuration</p>	<p>HTPW</p> <p>HTPW-1</p> <p>HTPW-2</p>
<p><b>Multi-Stream Sequencer to Multiplex Up to 6 Streams, Std. (Requires Windows CE Option)</b></p> <p><i>Note: Additional streams may be added, but not recommended, due to system response time.</i></p> <p>2-Stream Sequencer</p> <p>3-Stream Sequencer</p> <p>4-Stream Sequencer</p> <p>6-Stream Sequencer</p>	<p>MSS-2</p> <p>MSS-3</p> <p>MSS-4</p> <p>MSS-6</p>
<p><small>(1) Microsoft is a Registered trade Mark of Microsoft Corporation</small></p>	

# Installation Requirements

The StarTOC™ Ozone Promoted Hydroxy/Radical Oxidation Model can handle suspended solids up to 500 microns without filtration, thus providing a truly representative sample.

Star furnishes recommended installation drawings. The user must provide the following:

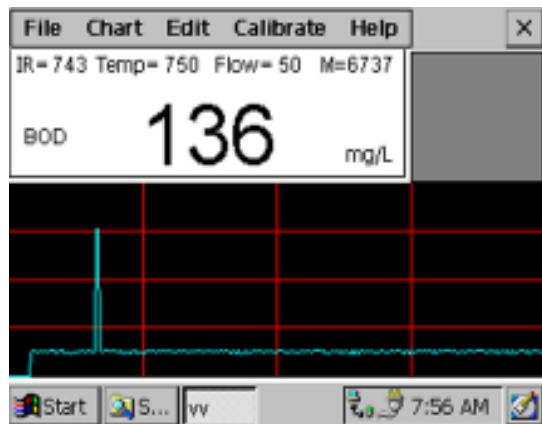
1. Electrical Source (110/220 VAC 10 Amp service with cutoff switch)
2. Sample flow of a minimum of 10 ml /minute. A fast bypass loop is recommended.
3. Gravity fed drain with air break.
4. A source of CO<sub>2</sub>-free air, or oxygen with a maximum flow rate of 300 cc/minute at 15 psig.

**(Optional Star Oxygen Generator requires electricity only.)**

# CORRELATED PROCESS COD/BOD

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

<ul style="list-style-type: none"><li>• Completely Automatic</li><li>• Microsoft Windows CE Computer</li><li>• Operator Prompting Menus</li><li>• Correlated COD</li></ul>	 <p>TOC ANALYZER HIGH TEMPERATURE COMBUSTION</p>	<ul style="list-style-type: none"><li>• Self-Calibrated NDIR</li><li>• Paperless Chart Recorder</li><li>• Auto-Cal/ Benchmark</li><li>• Correlated BOD</li></ul>
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- Touch Screen
- VGA Color Display
- Solid State Data Storage
- Paperless Chart Recorder
- PCMCIA Slot
- RS-485 (MODBUS)

**Microsoft Windows  
CE Computer**

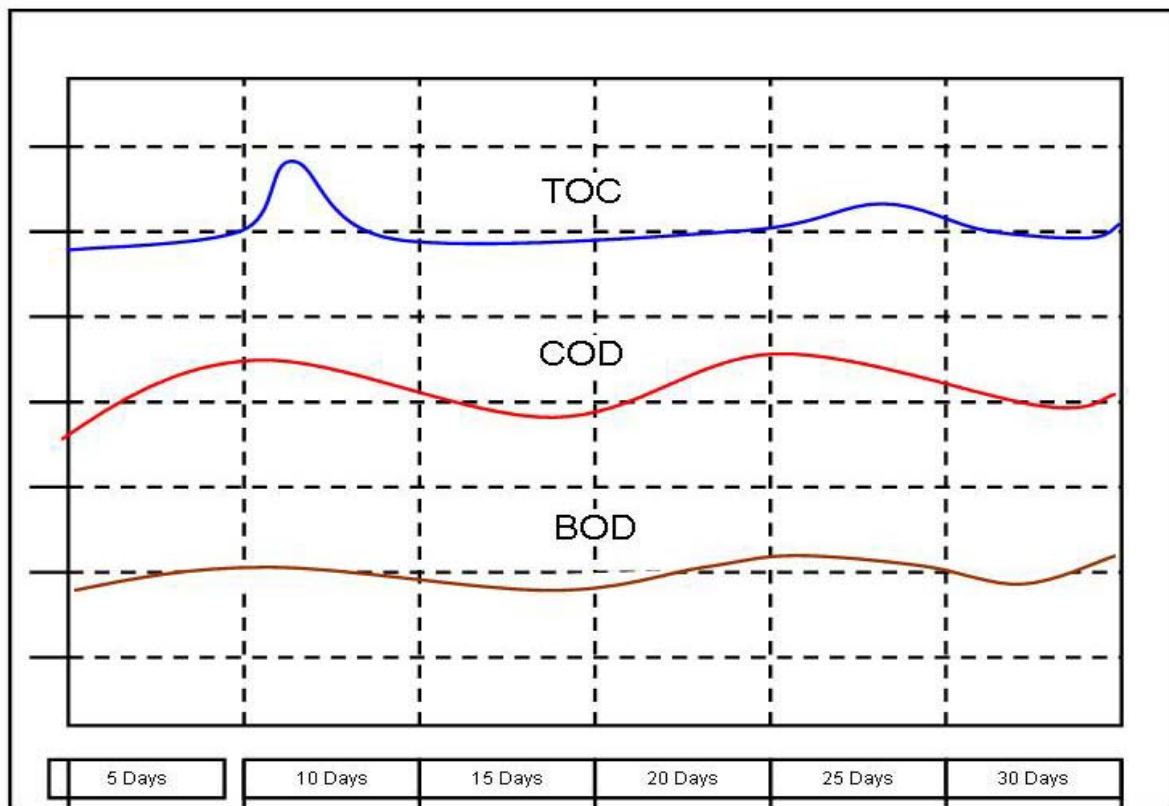


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**“Committed To Keeping You On Line”**

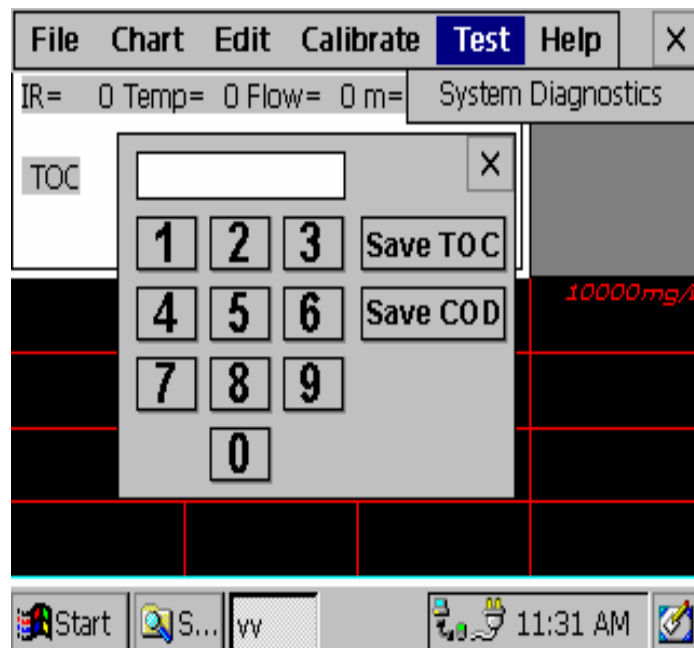


## Benefits

- Excellent Correlation
- Rapid Response
- More Adequately Relates

## Procedure

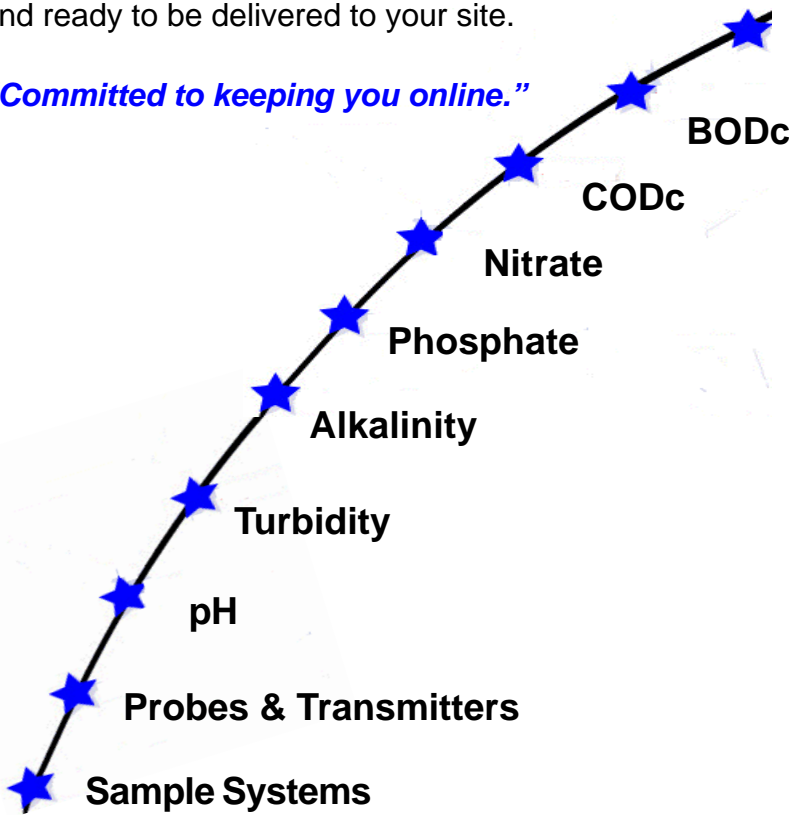
- Collect representative grab samples from analyzer & press “Store TOC” button.
- Send grab samples to lab for BOD or COD analysis.
- After receipt of lab analysis, enter BOD or COD analysis values as prompted by the Microsoft Windows CE Computer. This will automatically correlate in time with the TOC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