Section 1: The A-1000 TOC Analysis System

1.1 General Information

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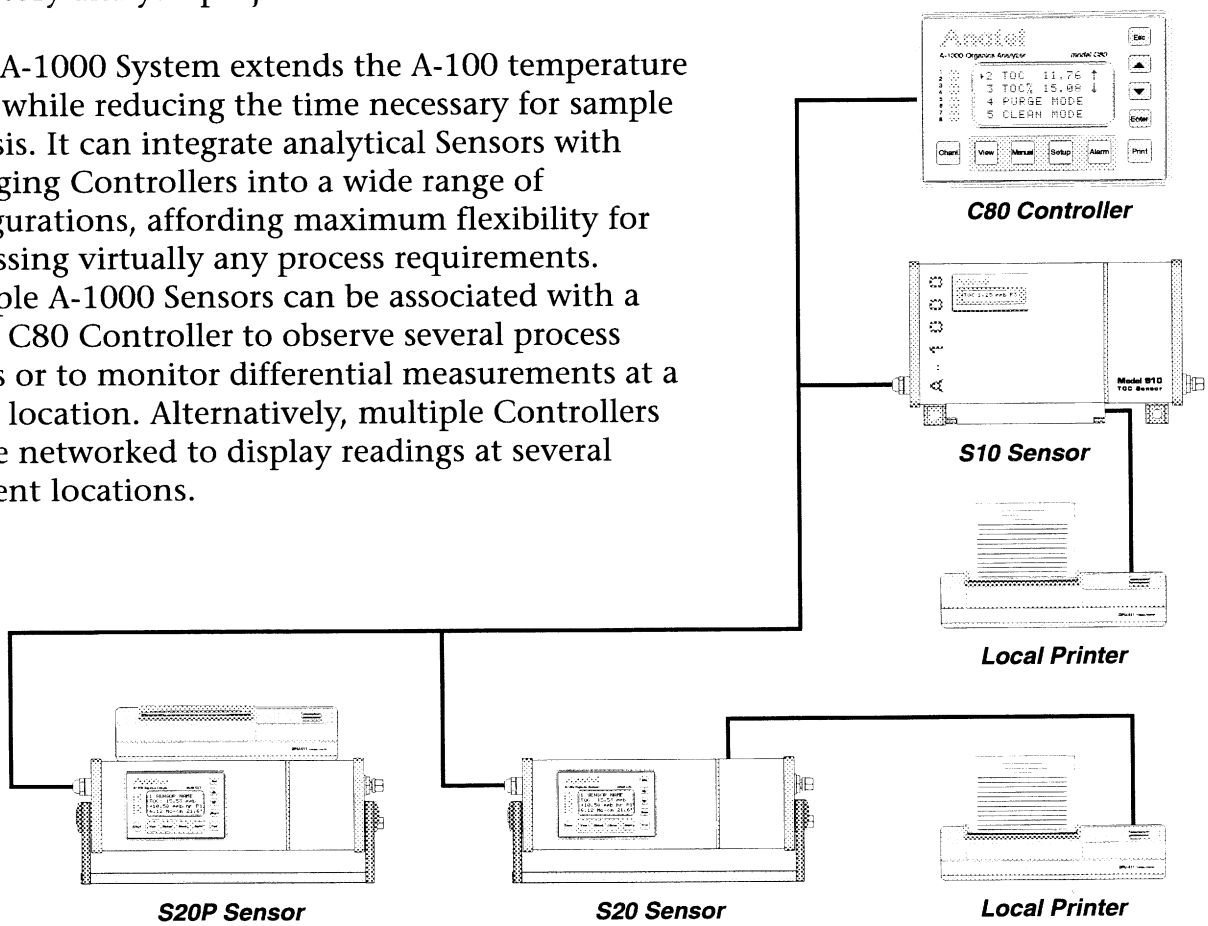
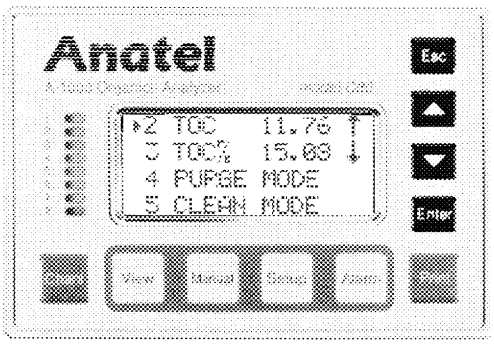
The A-1000 TOC Analysis System represents Anatel Corporation's most recent generation of on-line instrumentation. Building on the proven success of Anatel's A-100 SE and A-100P SE Organics Analyzers, the A-1000 System offers new measurement and networking capabilities for even the most demanding ultrapure water applications. Some typical A-1000 applications include organic contamination detection in semiconductor manufacturing, pharmaceutical and power generating plants as well as biochemical and laboratory analysis projects.

The A-1000 System extends the A-100 temperature range while reducing the time necessary for sample analysis. It can integrate analytical Sensors with managing Controllers into a wide range of configurations, affording maximum flexibility for addressing virtually any process requirements. Multiple A-1000 Sensors can be associated with a single C80 Controller to observe several process points or to monitor differential measurements at a single location. Alternatively, multiple Controllers can be networked to display readings at several different locations.



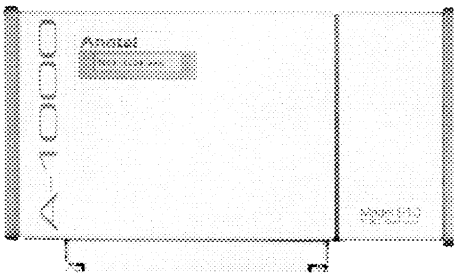
1.2 The A-1000 TOC Analysis System

The A-1000 TOC Analysis System is comprised of the following components:



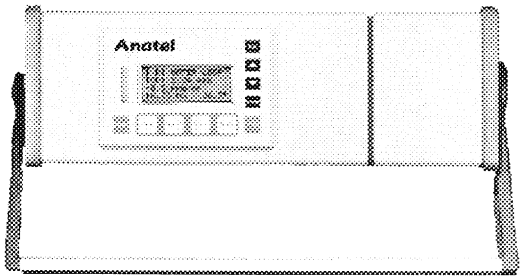
C80 Controller

The C80 Controller is the control/display device for the A-1000 System. The C80 allows operational and reporting parameters for as many as eight associated Sensors to be programmed independently. Its 4-line by 16-character display communicates such Sensor information as current TOC in ppb, trend, resistivity (or conductivity), temperature and operating mode. The alarm status of each active Sensor is reported via a corresponding Channel LED.



S10 Sensor

The S10 Sensor is the basic A-1000 analysis device. Its 1-line by 16-character display visually reports the instrument's current TOC values. In conjunction with a C80 Controller, it can be networked with other Sensors to perform either individual or differential TOC measurements. Or, a single S10 Sensor can be linked to as many as eight C80 Controllers to offer data display and operational control from multiple remote sites.

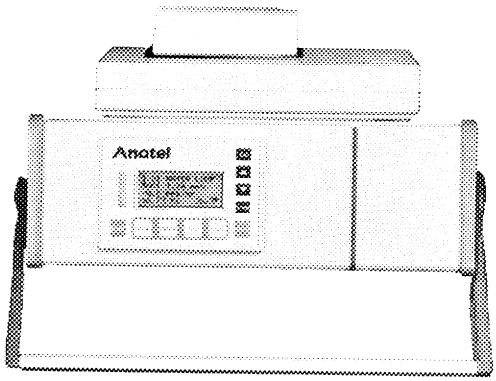


S20 Sensor

The S20 Sensor combines the analytical and interface capabilities of the S10 Sensor with a C80 Controller. This union allows the control and reporting of multiple Sensors to be integrated into a single portable enclosure to perform spot analyses. The S20 Sensor can stand alone or it can become a component of the A-1000 Network configuration.

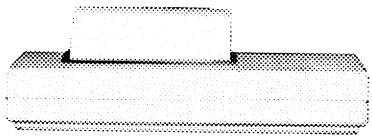
S20P Sensor

The S20P combines the attributes of the S20 Sensor with an integral 40-column thermal printer to provide total instrument portability with point-of-use reporting capabilities. The S20P Sensor is designed for maximum application flexibility within a facility by furnishing spot TOC measurements in addition to providing immediate hardcopy printouts.



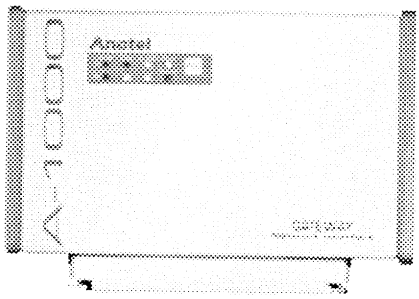
Printer

A stand-alone version of the thermal printer that is part of the S20P Sensor can be connected directly to any S10 or S20 Sensor to provide local printouts.



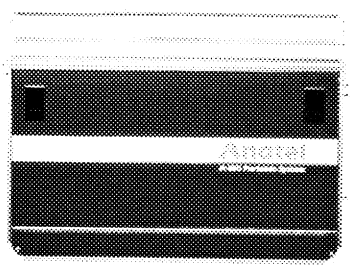
Gateway

Gateway is a custom Local Area Network (LAN) interface that allows a host PC computer to oversee the entire A-1000 System. A single A-Net serial printer can provide hardcopy reports for all connected Sensors, furnishing a comprehensive view of the facility's entire process.



A-100 Compatibility

In addition to supporting A-1000 Sensors, C80 Controllers and host devices, the A-Net can also accommodate Anatel A-100 SE and A100P SE Organics Analyzers through a Gateway interface. Incorporation of these instruments into the A-1000 Network preserves their usefulness and minimizes installation impact on existing systems.



1.3 A-1000 System Features

The Anatel A-1000 TOC Analysis System offers several unique advantages in the monitoring of ultrapure water systems:

- ***Fast Analysis Mode***
  Rapid analyses ensure that results are available as soon as possible and that all necessary data are recorded in order to capture even the briefest TOC excursions. The Sensor's patented measurement cell can provide accurate assessment of trace organics within a few minutes and results reported in as little as 2 minutes (depending on the water's TOC level) when operated in the "Fast Mode."

- ***Differential TOC Measurement***
  Critical applications often demand the water immediately before and after the point-of-use be monitored in order to understand the process and maintain efficiency. The A-1000 System is ideal for such measurements because it allows the data from two Sensors to be compared in real time to obtain prompt differential readings.

- ***Hot Water Application***
  With an effective operating range of 0–100°C, the A-1000 System can be incorporated directly into hot DI water processes, eliminating the need for heat exchangers to reduce the sample's temperature. Combined with a corresponding pressure range up to 100 psig, the A-1000's on-line TOC measurements ensure optimum water quality management in otherwise difficult conditions.

- ***Individual Alarm Monitoring***
  Single-point or differential TOC levels may be monitored for all connected Sensors and compared to user-defined alarm limits for each instrument. The user is alerted to any limit excursions by the C80 Controller which flashes its LCD display as well as the Sensor's corresponding LED. An audible beep may be enabled for additional warning.

- ***Networking Capability***
  The ability to network as many as eight A-1000 Sensors to a single C80 Controller provides timely readings of TOC levels even at the most distant and crucial areas of the water system. The C80 Controller can be mounted wherever convenient to make the TOC levels at several key locations immediately available on a single display. Analog, Digital I/O, Serial and 12 VDC Bias connections allow quick and easy connection to any external device to further enhance System capabilities.

1.4 Operational Overview

A-1000 Sensors require no reagents or gases to measure TOC; a patented analysis method measures the conductivity of the sample before and after its oxidation by ultraviolet (UV) light.

The water sample is isolated from the ambient environment to eliminate external contamination and the TOC concentration is determined using an algorithm that measures the change in the sample's conductivity. The change in conductivity is a direct function of the amount of organic carbon present and its oxidation to carbon dioxide ($C0_2$), allowing the TOC content of the sample water to be calculated. The A-1000 Sensors can accurately detect TOC levels between 0.05 and 9,999 parts per billion (ppb). The available water system pressure is then employed to rinse and fill the measurement cell prior to the next sample analysis.

The results of each sample analysis are digitally displayed on the front panel of the corresponding Sensor, and its supervisory C80 Controller, as a concentration of TOC in ppb. Additionally, resistivity (in megaohm-cm, corrected to 25°C) and sample temperature (in °C) are measured and displayed on the associated C80 Controller. An assortment of system printouts are available.

An integral alarm scheme reports any abnormalities detected during Sensor operation. A TOC limit excursion is automatically output to a printer and logged for display on associated C80 Controllers.

The Sensors also perform ongoing TOC trend analyses to facilitate water quality management. Each instrument measures the change in TOC over the past hour and reports its directional trend. By further examining the exact TOC values on a printout, the user can determine if the trend is critical and then respond accordingly.