

Ammonia / Nitrate Analyzer 20 PPB Ammonia Sensitivity

Timberline Instruments, TL-2800 is a tubular membrane diffusion system for analysis of ammonia and nitrate + ammonia in aqueous solutions. The patented gas diffusion / conductivity principle provides results unaffected by turbidity, color, or particulate matter in the sample. Ultra sensitive conductivity detection down to the ppb level is easily achievable with the Standard Diffusion Membrane Cell. Typically, sample times are less than 2 minutes. The TL-2800 is ideal for analysis of Kjeldhal digests without distillation or titration, ammonia, and oxidized nitrogen in soil, plant matter, wastewater, fermentation broths, and process streams. Nitrate is easily analyzed via zinc reduction. The data acquisition hardware, internal micro-processor, and analytical module are all included in a compact enclosure. Only the reagent bottles and video monitor remain separate.



TL-2800 Ammonia Analyzer

**Now listed in Standard Methods Online
April 2004—Method 4500-N D
“Conductimetric Determination of Inorganic Nitrogen”**

Special Features

Standard Diffusion Membrane Cell

- ◆ Provides low level detection of ammonia (down to 20 ppb) with excellent reproducibility, low maintenance, and extended lifetime.

Smooth, Reliable Reagent Delivery

- ◆ 8-roller design of the pump head provides added precision and smooth flow.

Sensitive, Stable Detection

- ◆ A buffered absorbing solution provides for extremely low detection limits.

Built-in Data Acquisition System

- ◆ Provides for data processing and the complete automation of the TL-2800 and auto sampler

Analog Output 0-1V

- ◆ For use with a strip chart recorder or as an interface to PLC systems

Ethernet Port and 4 USB Ports

- ◆ Provides flexibility for data transfer and network connections

Switch control for optional nitrate manifold

- ◆ Allows for automated analysis of both ammonia and nitrate + ammonia

Types of Analysis

Ammonia

- ◆ Selective detection in virtually any aqueous solution.

Inorganic Nitrogen

- ◆ Zinc reduction reduces nitrate to ammonium.

Kjeldahl Digests

- ◆ Total Kjeldahl Nitrogen analysis without the requirement of distillation or titration.

20 ppb
Sensitivity

◆
Diffusion
Membrane
Cell

◆
Reliable
Peristaltic
Pump Reagent
Delivery

Theory of Operation

The Timberline Model TL-2800 Ammonia/Nitrate Analyzer is based on the principle of gas diffusion across a membrane coupled with electrical conductivity measurement as first described by Carlson.¹

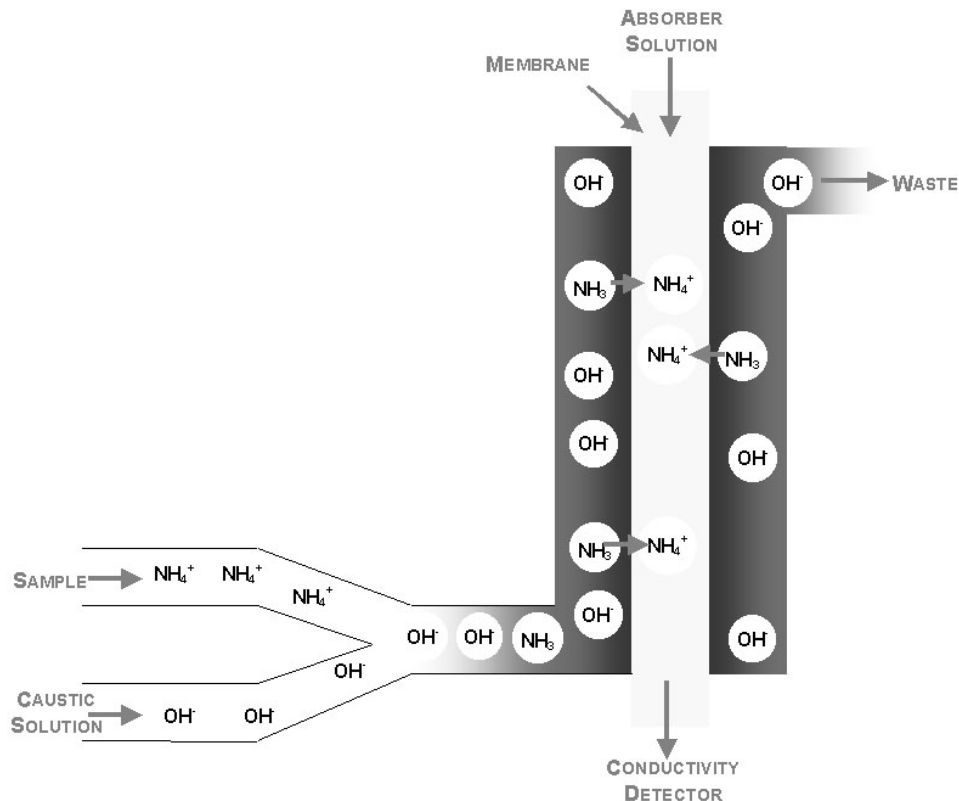
The 8-roller peristaltic pump directs the sample, caustic, and absorbing solutions into the diffusion cell. Within the cell, the sample is mixed with a caustic solution. The resulting solution has a pH sufficiently high (pH 11-13) to convert virtually all of the ammonium ion present in the sample to dissolved ammonia gas. This sample/caustic solution flows past one side of a membrane that is permeable to gases but not to liquids or ionic species. The dissolved ammonia gas in the sample / caustic mixture will diffuse across the membrane.

On the other side of the membrane, a buffered solution² absorbs the diffused ammonia gas. The buffered solution then flows into the conductivity detector. The flow passes through a low volume heat exchanger to establish thermal equilibrium of the solution before it reaches the conductivity cell. The conductivity cell measures the change in electrical conductance of the absorbing solution. This change is proportional to the concentration of ammonium in the original sample. Passing the sample/caustic mixture through an optional zinc reduction cartridge reduces nitrate and nitrite ions to ammonium, allowing measurement of the total inorganic nitrogen concentration.³

¹ Carlson, R.M.; *Anal. Chem.*, 50(1978) 1528.

² Patent number.; 6090267

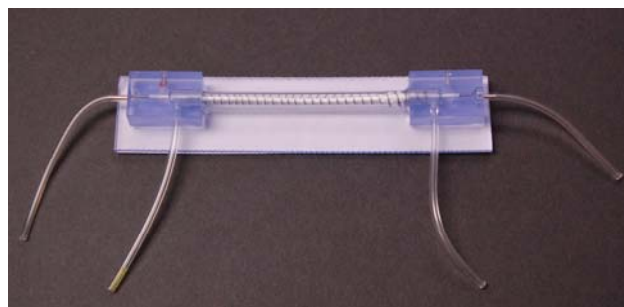
³ Carlson, R.M.; *Anal. Chem.* 58(1986) 1590



Principle of Operation of the Diffusion Cell

Sensitive, Stable Ammonia Detection

The conductivity detector is a single cell detector used for the detection of ammonia in the system. The TL-2800 uses a temperature controlled cell housing that is isolated from external temperature changes. A unique heat exchanger, placed before the cell, preheats the absorbing solution. The temperature controlled cell combined with the heat exchanger provides exceptional baseline stability even at high sensitivity ranges. Multiple ranges allow the determination of inorganic nitrogen in concentrations from ppb to %.



Diffusion Membrane Cell

The Heart of The System

The diffusion membrane cell directs the liquid flow through the tubular membrane to the conductivity detector. Each diffusion cell is encased in a compact box that is clearly labeled to assist in fluid line connections. The membrane is rugged and user friendly with an anticipated lifetime of greater than a year.

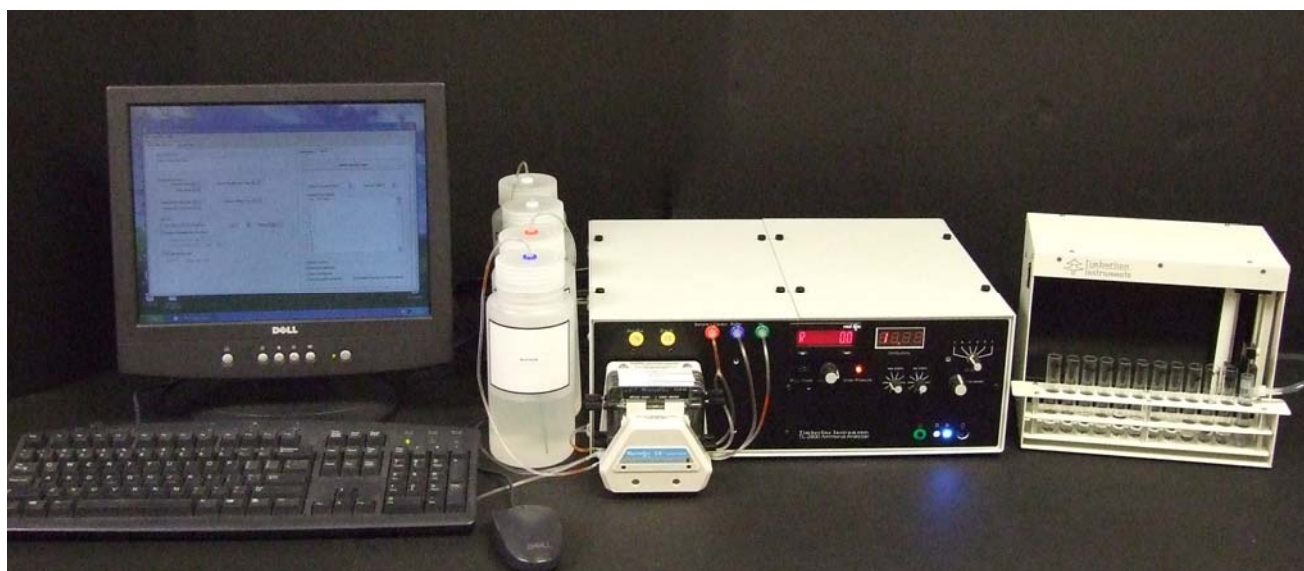
The detection of 20 ppb ammonia is easily achievable on a day to day basis.

The reduction cartridge, filled with zinc, is used to reduce nitrate and nitrite to ammonia. The transparent housing allows for observation of the zinc for timely replacement.

Smooth, Reliable Reagent Delivery

The variable speed peristaltic pump is supplied with a four-channel cartridge pump head. Each channel can be installed and removed independently from the others to allow easy tubing replacement. The 8-roller design of the pump head provides added protection and smooth flow.

The speed of the can be controlled and displayed via the front panel.

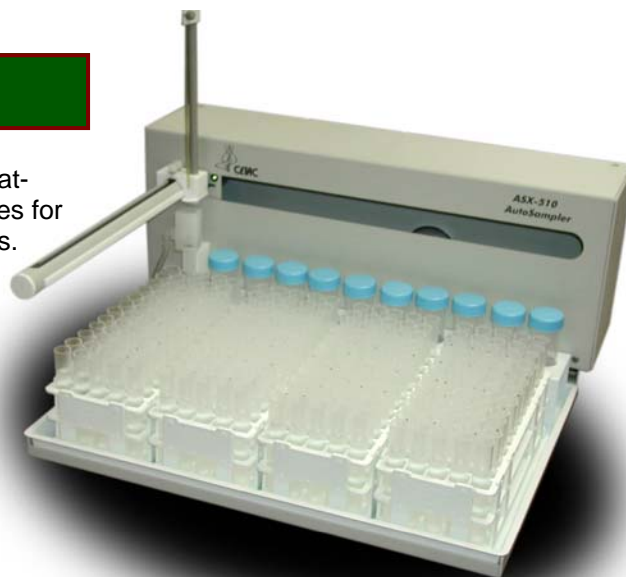


Complete System

Options

Auto-Samplers

240 Tube CETAC Auto sampler. Provides unattended operation. Holds 240 X 12mL test tubes for sample and 10 X 50ml test tubes for standards.
Foot print = 20" W X 18" D



CETAC Auto-Sampler, 240 Tube



120 Tube CETAC Auto sampler. Provides unattended operation. Holds 120 X 12mL test tubes for sample and 5 X 50ml test tubes for standards.
Foot Print = 12" W X 18" D

CETAC Auto-Sampler, 120 Tube

11 Tube Timberline Auto sampler. Provides unattended operation. Holds 11 X 12mL test tubes for sample.

Foot Print = 10" W X 7" D



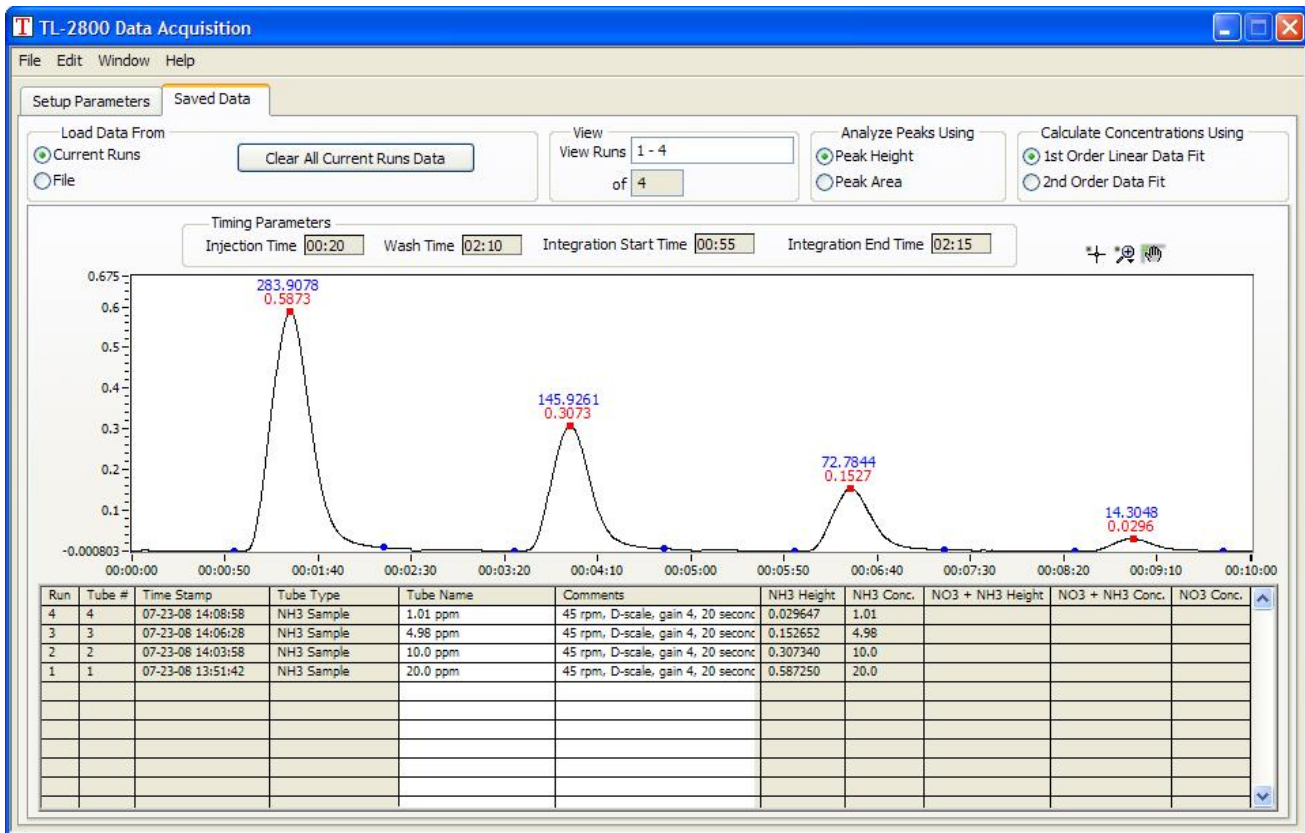
Timberline Auto-Sampler, 11 Tube

Data Acquisition System

The Ammonia / Nitrate Analyzer Data Collection Hardware / Software provides the complete automation of the Timberline TL-2800 and auto sampler. The software runs on a Microsoft Windows XP operating system and provides the user with an intuitive graphical interface.

The 24-bit analog to digital recorder provides a real time display of the Ammonia / Nitrate Analyzer signal. It also acts as the operations prompt to report the status of the current analysis.

The analysis portion of the software is the interface used to review saved data files. The calibration standards are identified, a calibration summary is generated, and a calibration table is prepared to record the concentration of the analyze in each sample. Collected data can be saved in HTML, Excel, or CSV file formats for additional computation or reporting.



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