

TRACE ANALYTICAL
MODEL ta3000R
Gas Purity Monitor
User Manual



PN T900-016 Rev. A



Process Instruments

Western Research
455 Corporate Boulevard
Newark, DE 19702

OFFICES

USA - Delaware
455 Corporate Blvd., Newark DE 19702

Tel: 302-456-4400
Fax: 302-456-4444

USA - Pennsylvania
150 Freeport Road, Pittsburgh PA 15238

Tel: 412-828-9040
Fax: 412-826-0399

CANADA - Alberta
2876 Sunridge Way N.E., Calgary, AB T1Y 7H9

Tel: +1-403-235-8400
Fax: +1-403-248-3550

WORLDWIDE SALES AND SERVICE LOCATIONS

USA - Texas

Tel: 713-466-4900, Fax: 713-849-1924

CHINA

Beijing / Tel: 86 10 8526 2111, Fax: 86 10 8526 2141

Chengdu / Tel: 86 28 8675 8111, Fax: 86 28 8675 8141

Shanghai / Tel: 86 21 6426 8111, Fax: 86 21 6426 7818

FRANCE

Tel: 33 1 30 68 89 20, Fax: 33 1 30 68 89 29

GERMANY

Tel: 49 21 59 91 36 0, Fax: 49 21 59 91 3639

MIDDLE EAST - Dubai

Tel: 971 4 881 2052, Fax: 971 4 881 2053

SINGAPORE

Tel: 65 6484 2388, Fax: 65 6481 6588

www.ametekpi.com

© 2004 AMETEK Process & Analytical Instruments Division

This document contains Information for the use of the Model ta3000R Gas Purity Monitor. Data herein has been verified and validated and is believed adequate for the intended use of this instrument. If the instrument or procedures are used for purposes over and above the capabilities specified herein, confirmation of their validity and suitability should be obtained; otherwise, AMETEK does not guarantee results and assumes no obligation or liability. This publication is not a license to operate under, or a recommendation to infringe upon, any process patents.

Contents

About This Document	5
Safety Notes	5
Grounding.....	6
Important Safety Information.....	6
Warning Labels.....	7
Electromagnetic Compatibility (EMC)	8
General Safety Considerations.....	9
Electric Hazard	9
UV Light	9
Mercury Vapor.....	9
Warranty and Claims.....	10
Overview 11	
Model ta Gas Purity Monitor.....	11
Introduction	11
Functional Overview	11
Flame Ionization Detection	11
Sample Introduction.....	11
Operating System.....	12
Specifications 13	
Model designation and detection.....	13
Performance	13
Carrier Gas supplies.....	14
Gas Ports	14
Sample Gas.....	14
Calibration.....	14
Outputs.....	15
Com Ports	16
Analyzer Description 17	
Front Panel and User Interface.....	17
Display Screen.....	19
Installation 20	
Unpacking and Inspection	20
Location and Environment.....	20
Electrical Preparations and Connections.....	21
Regulators and Plumbing	22
Hardware and Gas Connections	23
Damage Prevention	23
Installation Instructions	24
Suggested Tools	24
Making Gas Connections.....	24
View of Gas and Power connections.....	25

Connect AC Power and Communication Cables	25
Start Up and Operation	26
Power Up	26
Using the Menu Keys	27
Operator state diagram	28
Warm Up.....	29
Main Menu Screens	30
Page Screens.....	31
Systems Setting Page	32
Setting the Clock	32
Print Chromatograms.....	32
Diagnostic Print Key	33
Saving Changes Non Volatile RAM.....	33
Temperatures.....	33
Calibration.....	34
Run	35
Run Screens.....	35
Super User Mode.....	36
Concentration and Response	37
Super User Run Screen.....	37
Super User Menus.....	38
Super User State Diagram.....	38
Shut Down	39
Description of Internal Components	40
Error Messages	41
Dimensional Drawings.....	42

About This Document

This manual is intended as a guide for operation of the ta3000R. This manual is not intended as a service guide and does not contain service information. The ta3000R should only be operated by personnel who have been properly trained in the procedures required for safe operation of the ta3000R. These considerations are in addition to all site specific safety procedures.



All photographs included in this manual are for example only, and may not reflect the actual as-purchased configuration of the analyzer.

Safety Notes

Warnings, cautions, and notes contained in any document and in this User Manual emphasize critical instructions as follows:



Improper installation, operation, or service of the analyzer may Result in permanent damage



If an electrical fire occurs on or inside the analyzer, extinguish it using class A, B, or C extinguishers. If a purifier fire occurs, extinguish it using sand or an extinguisher intended for class D (metal) fires only.



Any purifiers installed in the analyzer are designed for a specific Gas application. Do not expose these purifiers to any gas other than the specified application gas. If these purifiers are exposed to gases other than the specified application gas, they could rapidly and uncontrollably overheat and could cause a fire or permanent damage to the purifier or the analyzer.



The analyzer must have electrical power, instrument air pressure, and applicable gas pressure for proper operation. If proper electrical power, instrument air pressure, or applicable Gas pressure are not supplied, the analyzer could be permanently damaged and the warranty will be void.



Operators should not attempt to repair the analyzer. Any repairs attempted without first consulting Ametek customer service shall void the manufacturer's warranty.

Grounding



Instrument grounding is mandatory. Performance specifications and safety protection are void if instrument is operated from an improperly grounded power source.

Verify ground continuity of all equipment before applying power.

Important Safety Information

Before working on the ta3000R, read and understand the following Notes, Warnings, and Cautions, regarding safety and other required information.

Additional Notes, Warnings, and Cautions included in individual procedures in this manual indicate special conditions to consider during installation, before working on it.



All electrical connections, adjustments, or servicing of the ta3000R should be performed only by properly trained and qualified personnel.

All electrical connections, materials, and methods (plus all safety standards and procedures) must be made in compliance with local wiring regulations and electrical code for the hazardous area, as specified by the Owner Company, local electrical-inspection authority, and National/EU regulations.

Follow appropriate regulatory and/or company procedures to lock out the heater while working on the heater electronics.



Verify ground continuity of all equipment before applying power. For electrical shock protection, the heater must be operated from a grounded power source that has a securely connected protective ground contact.

Warning Labels

These symbols may appear on the instrument to alert you of existing conditions.



PROTECTIVE CONDUCTOR TERMINAL
(BORNIER DE L'ECRAN DE PROTECTION)
Schutzerde



CAUTION - Risk of electric shock
(ATTENTION-RISQUE DE DÉCHARGE ÉLECTRIQUE)
Achtung - Hochspannung Lebensgefahr



CAUTION - Refer to accompanying documents
(ATTENTION-SE RÉFÉRER AUX DOCUMENTS JOINTS)
Achtung (Beachten Sie beiliegende Dokumente)



CAUTION - Hot Surface
(ATTENTION-SURFACE CHAUDE)
Achtung - Heiße Oberfläche

Environmental Information (WEEE)

This AMETEK product contains materials that can be reclaimed and recycled. In some cases the product may contain materials known to be hazardous to the environment or human health. In order to prevent the release of harmful substances into the environment and to conserve our natural resources, AMETEK recommends that you arrange to recycle this product when it reaches its "end of life."

Waste Electrical and Electronic Equipment (WEEE) should never be disposed of in a municipal waste system (residential trash). The Wheelie Bin marking on this product is a reminder to dispose of the product properly after it has completed its useful life and been removed from service. Metals, plastics and other components are recyclable and you can do your part by one of the following these steps:



- When the equipment is ready to be disposed of, take it to your local or regional waste collection administration for recycling.
- In some cases, your "end-of-life" product may be traded in for credit towards the purchase of new AMETEK instruments. Contact your dealer to see if this program is available in your area.
- If you need further assistance in recycling your AMETEK product, contact our office listed in the front of the instruction manual.

Electromagnetic Compatibility (EMC)



Read and follow the recommendations in this section to avoid performance variations or damage to the internal circuits of this equipment when installed in harsh electrical environments.

The various configurations of the Heater should not produce, or fall victim to, electromagnetic disturbances as specified in the European Union's EMC Directive. Strict compliance to the EMC Directive requires that certain installation techniques and wiring practices are used to prevent or minimize erratic behavior of the Heater or its electronic neighbors. Below are examples of the techniques and wiring practices to be followed.

In meeting the EMC requirements, the various Heater configurations described in this manual rely heavily on the use of metallic shielded cables used to connect to the customer's equipment and power. Foil and braid shielded I/O and DC power cables are recommended for use in otherwise unprotected situations. In addition, hard conduit, flexible conduit, and armor around non-shielded wiring also provides excellent control of radio frequency disturbances. However, use of these shielding techniques is effective only when the shielding element is connected to the equipment chassis/earth ground at both ends of the cable run. This may cause ground loop problems in some cases. These should be treated on a case-by-case basis. Disconnecting one shield ground may not provide sufficient protection depending on the electronic environment. Connecting one shield ground via a 0.1 microfarad ceramic capacitor is a technique allowing high frequency shield bonding while avoiding the AC-ground metal connection. In the case of shielded cables the drain wire or braid connection must be kept short. A two-inch connection distance between the shield's end and the nearest grounded chassis point, ground bar or terminal is highly recommended. An even greater degree of shield performance can be achieved by using metallic glands for shielded cable entry into metal enclosures. Expose enough of the braid/foil/drain where it passes through the gland so that the shield materials can be wrapped backwards onto the cable jacket and captured inside the gland, and tightened up against the metal interior.

Inductive loads connected to the low voltage "Alarm Contacts" are not recommended. However, if this becomes a necessity, adhere to proper techniques and wiring practices. Install an appropriate transient voltage suppression device (low voltage MOV, "Transzorb," or R/C) as close as possible to the inductive device to reduce the generation of transients. Do not run this type of signal wiring along with other I/O or DC in the same shielded cable. Inductive load wiring must be separated from other circuits in conduit by using an additional cable shield on the offending cable.

In general, for optimum protection against high frequency transients and other disturbances, do not allow installation of this Heater where its unshielded I/O and DC circuits are physically mixed with AC mains or any other circuit that could induce transients into the Heater or the overall system. Examples of electrical events and devices known for the generation of harmful electromagnetic disturbances include motors, capacitor bank switching, storm related transients, RF welding equipment, static, and walkie-talkies.

General Safety Considerations

Components and Functions

The following safety items must be observed to avoid personal injury and to prevent damage to the ta3000R analyzer. All personnel involved in installation, operation or service of the analyzer should be thoroughly familiar with these items. These considerations are in addition to all site specific safety procedures.

Electrical Hazard



Be sure that the top cover is securely in place before operating the ta3000R. Since some service procedures require the cover to be removed while the power is on, be aware that electric shock can occur. Therefore, only trained or otherwise qualified personnel should service the ta3000R. The ta3000R is supplied with a 3-conductor power cord providing a protective earth ground connection when plugged into a properly wired receptacle. Proper receptacle grounding must be verified.

UV Light



In RGD-equipped instruments, do not look directly at the ultraviolet lamp. Since UV light causes eye damage, use appropriate safety glasses whenever the UV lamp is exposed.

Mercury Vapor



In RGD-equipped instruments, be sure the Mercury vapor scrubber is connected before operating the ta3000R and plan on replacing the scrubber after 6 months of continuous operation or with each HgO bed replacement.

Warranty and Claims

We warrant that any equipment of our own manufacture or manufactured for us pursuant to our specifications which shall not be, at the time of shipment thereof by or for us, free from defects in material or workmanship under normal use and service, will be repaired or replaced (at our option) by us free of charge, provided that written notice of such defect is received by us within twelve (12) months from date of shipment of portable heaters or within eighteen (18) months from date of shipment or twelve (12) months from date of installation of permanent equipment, whichever period is shorter. All equipment requiring repair or replacement under the warranty shall be returned to us at our factory, or at such other location as we may designate after obtaining a Returned Material Authorization (RMA) number, transportation prepaid. Such returned equipment shall be examined by us and if it is found to be defective as a result of defective materials or workmanship, it shall be repaired or replaced as aforesaid. Our obligation does not include the cost of furnishing any labor in connection with the installation of such repaired or replaced equipment or parts thereof, nor does it include the responsibility or cost of transportation. In addition, instead of repairing or replacing the equipment returned to us as aforesaid, we may, at our option, take back the defective equipment, and refund in full settlement the purchase price thereof paid by Buyer.

Process photometric analyzers, process moisture analyzers, and sampling systems are warranted to perform the intended measurement, only in the event that the customer has supplied, and AMETEK has accepted, valid sample stream composition data, process conditions, and electrical area classification prior to order acknowledgment. The photometric light sources are warranted for ninety (90) days from date of shipment. Resale items warranty is limited to the transferable portion of the original equipment manufacturer's warranty to AMETEK. If you are returning equipment from outside the United State, a statement should appear on the documentation accompanying the equipment being returned declaring that the goods being returned for repair are American goods, the name of the firm who purchased the goods, and the shipment date.

The warranty shall not apply to any equipment (or part thereof) which has been tampered with or altered after leaving our control or which has been replaced by anyone except us, or which has been subject to misuse, neglect, abuse or improper use. Misuse or abuse of the equipment, or any part thereof, shall be construed to include, but shall not be limited to, damage by negligence, accident, fire or force of the elements. Improper use or misapplications shall be construed to include improper or inadequate protection against shock, vibration, high or low temperature, overpressure, excess voltage and the like, or operating the equipment with or in a corrosive, explosive or combustible medium, unless the equipment is specifically designed for such service, or exposure to any other service or environment of greater severity than that for which the equipment was designed.

The warranty does not apply to used or secondhand equipment nor extend to anyone other than the original purchaser from us.

THIS WARRANTY IS GIVEN AND ACCEPTED IN LIEU OF ALL OTHER WARRANTIES, WHETHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION AND WARRANTIES OF FITNESS OR OF MERCHANTABILITY OTHER THAN AS EXPRESSLY SET FORTH HEREIN, AND OF ALL OTHER OBLIGATIONS OR LIABILITIES ON OUR PART. IN NO EVENT SHALL WE BE LIABLE UNDER THIS WARRANTY OR ANY OTHER PROVISION OF THIS AGREEMENT FOR ANY ANTICIPATED OR LOST PROFITS, INCIDENTAL DAMAGES, CONSEQUENTIAL DAMAGES, TIME CHANGES OR ANY OTHER LOSSES INCURRED BY THE ORIGINAL PURCHASER OR ANY THIRD PARTY IN CONNECTION WITH THE PURCHASE, INSTALLATION, REPAIR OR OPERATION OF EQUIPMENT, OR ANY PART THEREOF COVERED BY THIS WARRANTY OR OTHERWISE. WE MAKE NO WARRANTY, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF FITNESS OR OF MERCHANTABILITY, AS TO ANY OTHER MANUFACTURER'S EQUIPMENT, WHETHER SOLD SEPARATELY OR IN CONJUNCTION WITH EQUIPMENT OF OUR MANUFACTURE. WE DO NOT AUTHORIZE ANY REPRESENTATIVE OR OTHER PERSON TO ASSUME FOR US ANY LIABILITY IN CONNECTION WITH EQUIPMENT, OR ANY PART THEREOF, COVERED BY THIS WARRANTY.

OVERVIEW

Introduction

The ta3000R Process Gas Analyzer is a trace level gas chromatograph capable of detecting ppb concentrations of contaminants in sample gas matrices. The system consists of a microprocessor controlled gas chromatograph utilizing Ametek's, Trace Analytical unique Reduction Gas Detector (RGD) supplied by Ametek Process Instruments.

Functional Overview

In order to achieve specified performance, the ta3000R performs these primary functions:

Carrier Gas Purification

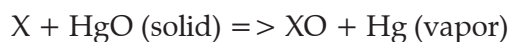
A catalytic combustor is included as an integral component of the carrier gas flow path. Reactive impurities are reduced to a level of less than 1 ppb.

Sample Introduction and Component Separation

Samples are introduced into the instrument via air actuated gas sampling valves or manual injections. Components of interest are separated in a 1/8" Column(S) inside a heated, column oven.

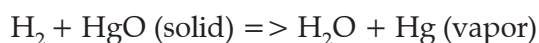
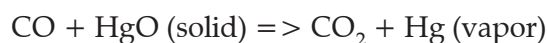
Reduction Gas Detection

Species eluting from the RGD column set pass immediately into the heated bed of mercuric oxide (HgO) and the photometric detector. Within the HgO bed, the general reaction occurs:



where X is any appropriate reducing gas. The resulting mercury vapor is quantified by means of an ultraviolet photometer located immediately downstream of the mercuric oxide bed. The relative ease of measuring mercury vapor at low concentrations lends the technique its inherent sensitivity.

For carbon monoxide and hydrogen, the equilibrium reactions are as follows:



Under continuous operation, the effective life of the mercuric oxide bed is approximately one year. Contamination of carrier gases with reactive compounds such as sulfides, chlorides, and aromatics will irreversibly impair reactivity and will necessitate bed replacement. Care should be taken to bypass the instrument if these compounds are present in the sample gas stream.

High concentrations of hydrogen and carbon monoxide will use up the active sites in the reaction bed faster than lower level concentrations.

Operating System

A six-button keypad enters commands to the microprocessor, which monitors detector operation, controls heated zones, and operates all internal valve functions. External signal outputs for a data collection system or host computer are located at the rear panel.

The microprocessor control system allows complete unattended operation of the ta3000R. This onboard system performs necessary operational and analytical functions such as:

- Analyzer Status Control
- Contaminant identification
- Concentration Calculations
- Calibration
- Sampling Frequency
- Data Output
- Alarm Output

Data is presented via the front display panel. Alternatively data may be obtained through an RS232 serial computer interface and HP parallel printer interface located on the rear panel.

With optional interface kits, two components may be assigned to separate trend channels to provide a continuous signal proportional to the concentration of the assigned component. These trend signals are updated following each run and can be tracked by a data logger or host computer.

Specifications

Model designation and detection limit specifications

Sample Gas	Model	Lower Detection Limit	
		H2 ppb	COppb
Nitrogen	ta3000R-N2	25	10
Argon	ta3000R-Ar	25	10
Helium	ta3000R-He	*	10
Oxygen	ta3000R-O2	25	10
Propylene	ta3000R-H2	-	10
Ethylene	ta3000R-H2	-	10
Air	ta3000R	25	10

* Can be detected when specified with Helium as Carrier Gas

Performance

Accuracy

Greater of ± 10 ppb H₂; ± 5 ppb CO; $\pm 10\%$ of reading

Range

0 to 3 ppm (Higher are available as an option)

Response Time

Length of Analysis is dependant on the application.

Response time is independent of sample concentration.

Ambient Operating Temperature.

60 to 90° F (16 to 32° C)

Sample Compatibility

Specific models available for various applications

Resolution, Display 0.1 ppb

Resolution, Communication Ports

0.01 ppb

Carrier Gas Supplies (On-Line Installation)

Inlet Pressure Range	70 to 90 psig (4.8 to 6.1 bar)
Inlet Pressure Stability	± 2%, regulator required
Return Pressure	Atmospheric vent is optimal, ± 0.5 psig maximum
Flow Rate	50 cc/min minimum, bypass at 50 cc/min.
Temperature	60 to 100 °F (16 to 38 °C), optimum when maintained ± 2°C
Maximum Impurity Levels	Varries by application. An external purifier may be required

Gas Ports

Sample Inlet	1/16-inch VICI compression fitting
Carrier	1/16-inch VICI compression fitting
Sample Vent	1/16-inch VICI compression fitting
Aux	1/16-inch VICI compression fitting

Sample Gas

Inlet Fitting	1/16-inch VICI compression fitting
Flow Rate	20 - 100 sccm minimum
Inlet pressure stability	± 2%, UHP regulator required
Vent pressure	Atmospheric pressure vent is optimal, ± 0.5 psig maximum

Calibration Gas

Inlet Fitting	1/16-inch VICI compression fitting (Uses Sample Inlet)
Cylinder concentration	H ₂ , CO, Balance nitrogen, depends on level of detection
Cylinder volume	100 cubic feet minimum (2800L)

Chassis

Dimensions	7" (18cm) H x 16.8" (43cm) W x 26.5" (67cm) D
Weight	35 lb. (15.9 kg)
Power	100 - 120 VAC, 50/60 Hz; 200-240 VAC, 50/60 Hz

Outputs

Display	LCD graphics, backlit, 100mm x 150mm
Printer Port	Concentration, chromatogram, and diagnostic reports
Serial PLC Port	Concentration data and general alarm via RS232
4 to 20ma (optional)	Concentration signals

ta3000 PLC Output Format

The concentration data, status, and other detail information is sent from port 2 of the ta3000 automatically at the end of every run. The format used is called Comma Separated Variable or CSV. This format is one of the common MS EXCEL formats.

The fields within each record are defined in Table 1. Fields 1 – 6 are the record identification fields and fields 7 & 8 are the impurity fields.

The next impurities will be at fields 9 – 10, 11 – 12, 13 – 14, 15 – 16, and 17 – 18. This string is terminated by a CR, carriage return, and LF, line feed, characters.

The parameters are 9,600 baud, 8 data bits, 1 stop bit and no parity.

Field 1	Field 2	Field 3	Field 4	Field 5	Field 6	Field 7	Field 8
Date & Time of RUN	Analyzer Serial #	Run / Maintenance	EDL / Single Analysis	Stream Selection #	ta3000 Error Status	Impurity Name	Concentration in ppb x 100

The following defines each field:

DDDD-DD-DD TT:TT:TT,#,R,S,A,EEEEEEEE,NNNNN,C, ...

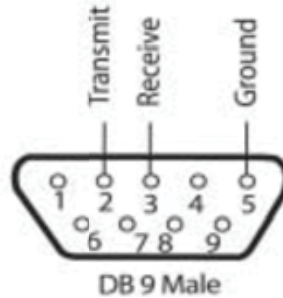
DDDD-DD-DD	= Date (2000-03-23)
TT:TT:TT	= Time (12:23:44)
#	= Analyzer Serial Number
R	= Run or Maintenance (Calibration) Mode
A	= EDL or Single Analysis Mode
S	= Stream Number
EEEEEEEE	= Eight digits of error status (0=Not Error, 1=Error)
1.	General Alarm (MSD)
2.	Spare
3.	Spare
4.	Spare
5.	Spare
6.	Spare
7.	Spare
8.	Spare (LSD)
NNNNN	= Name of impurity
C	= Concentration in ppb x 100

The following is an example of this output string:
 2001-08-16 14:35:00,99,R,S,1,10000000,H2 ,0,CO ,2483, , , , , ,

Com Ports - COM 1, COM 2, and COM 3

All three of these ports are 9-pin male D-type connectors. Pin 2 is used to transmit data to other equipment. The analyzer uses Pin 3 to receive data. Pin 5 is a common ground. All other pins are unused.

Com 1, 2, and 3 on back of Analyzer

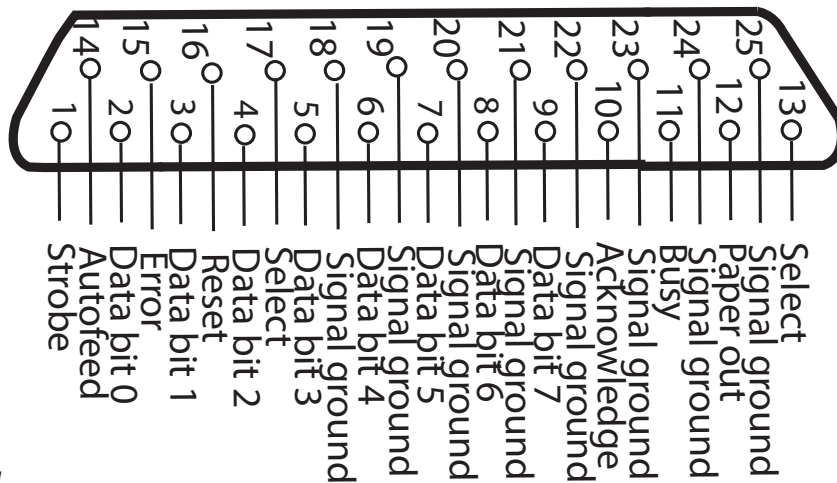


COM PORTS

Parallel Printer Port (LPT1)

The Parallel Printer Port uses a standard 25-pin female D-type connector. The printer port follows standard parallel printer protocols. The analyzers are compatible with Hewlett Packard printer's model numbers HP-6xx, HP-7xx, and HP-8xx. Ametek recommends using one of these suggested models.

DB 25 male



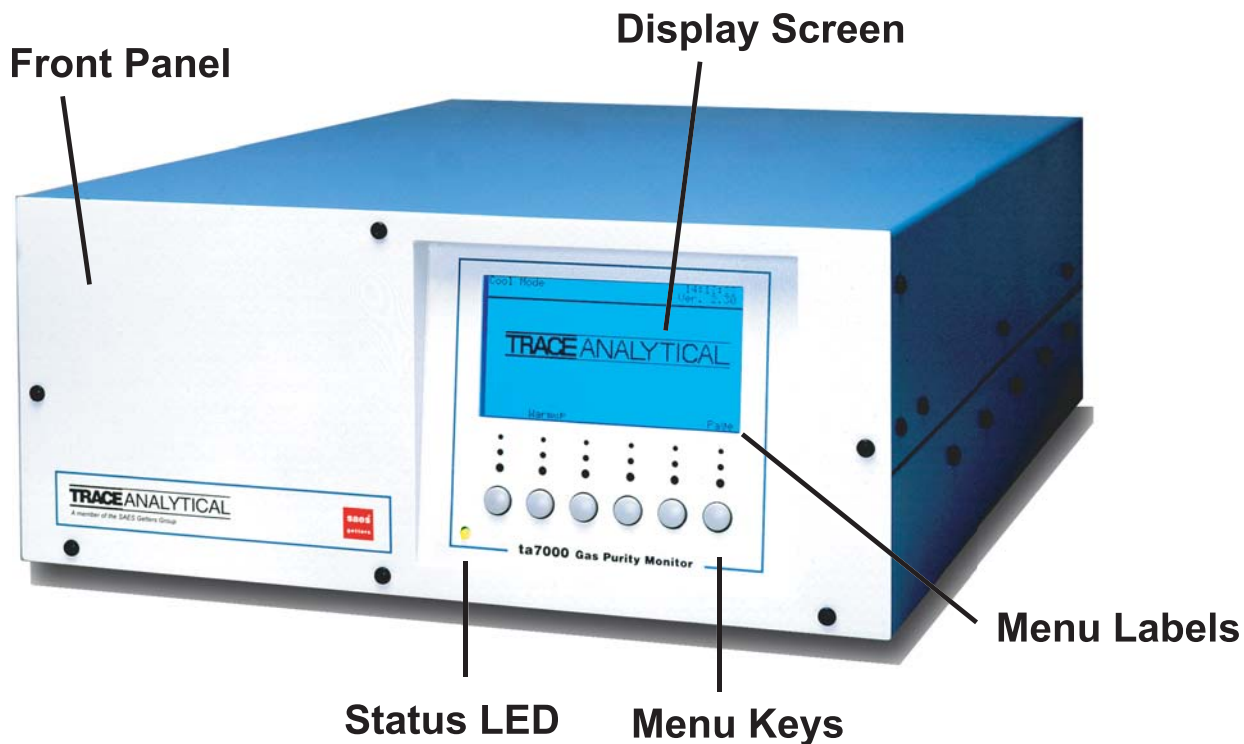
Parallel Printer Port LPT1

ANALYZER DESCRIPTION

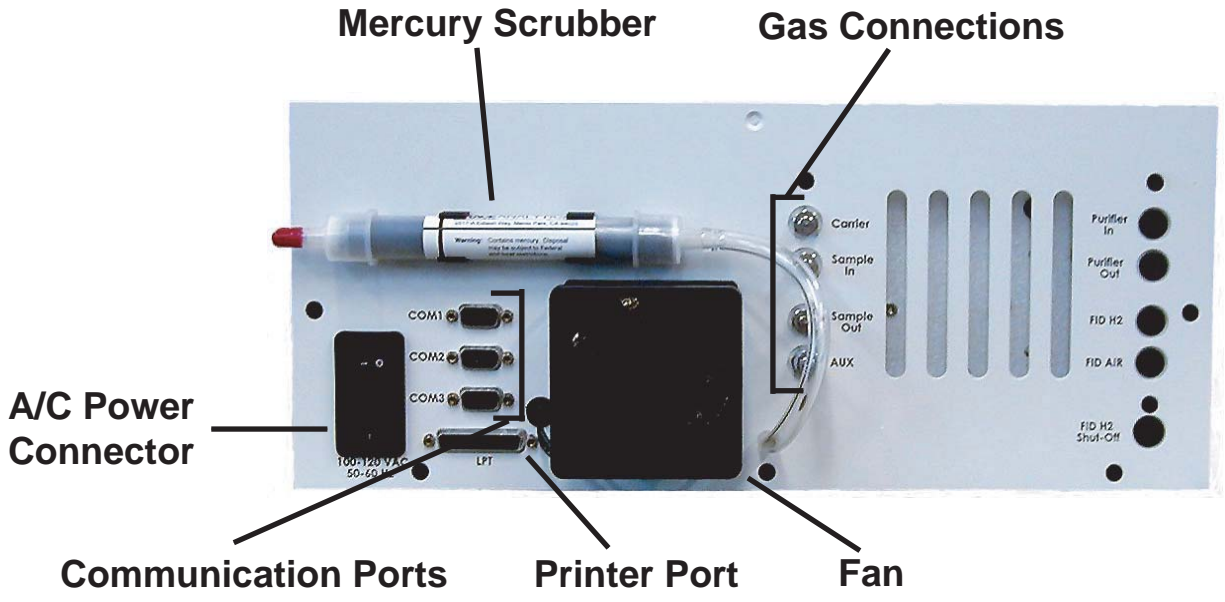
Description of the ta3000R Analyzer

Front Panel and User Interface

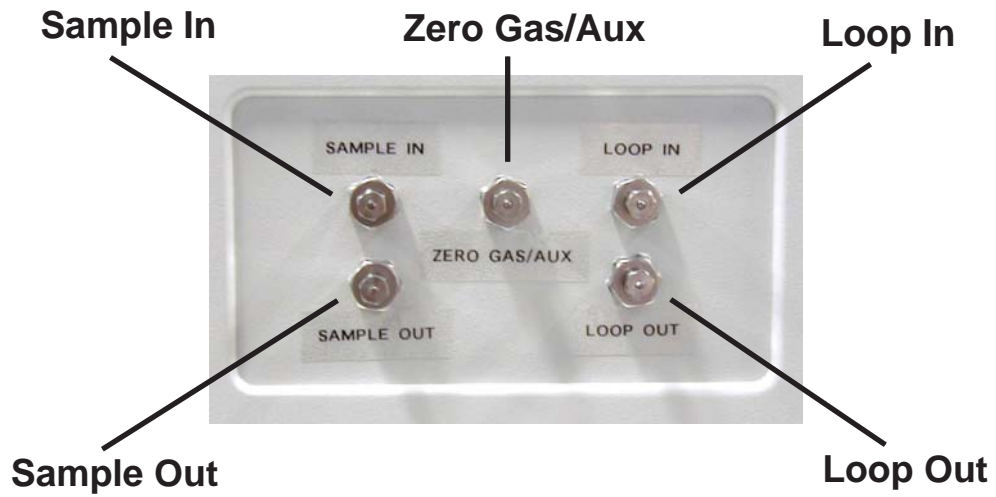
The front panel of the ta3000R is where the user interface is found. The user interface is a combination of the display screen and menu keys. The display screen shows information and options for running the ta3000R. The Menu Keys correlate to menu labels on the display screen and are used for all input to the operating system. The status LED is a light that will shine green when the power is on and the system is working properly, and will turn red when the power is on and system errors exist (see Error Messages Page 42 for information on errors).



Front Panel



Rear Panel



Front Injection Panel Option

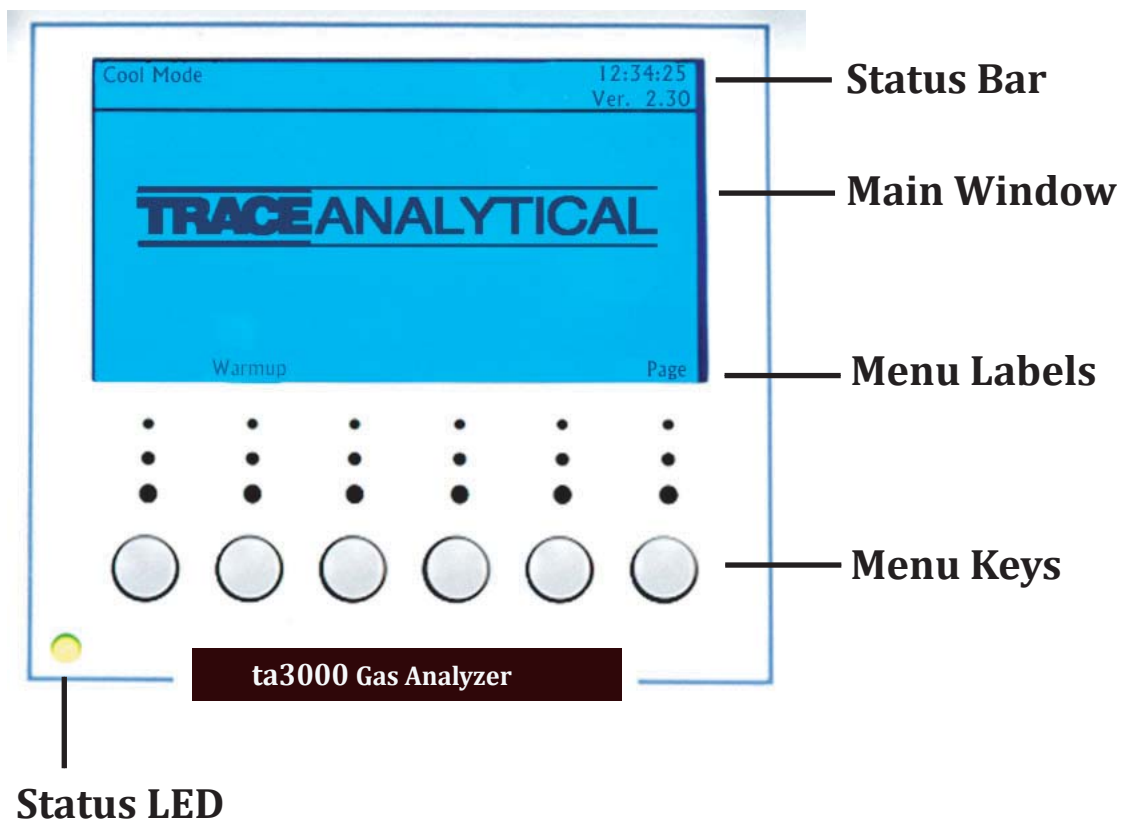
Display Screen

The display screen is where the instrument displays all current information and options. The display is separated into three sections.

The top section of the screen is the Status Bar. This is where the instrument displays the current status. This bar will also display which screen is currently selected, the time and date and other important Status information.

The center area is the Main Window. This is where the instrument displays active information and user input fields. This could be information about the last analysis run, calibration, or options for future runs.

The bottom area is the Menu Bar. The menu bar is where menu labels are displayed for user input.



Display Screen

INSTALLATION

Installation of the ta3000R

In order to have a smooth installation of the ta3000R Analyzer and to get the maximum performance, out of this instrument, several aspects should be considered. This guide clarifies the important points for a successful installation.

Unpacking and Inspecting the ta3000R

Perform the following inspection to assure that the analyzer has not been damaged during shipment.:

- Inspect the shipping container exterior for evidence of damage or indications of excess moisture before unpacking.
- Carefully open the shipping container and remove the analyzer. Inspect the exterior of the analyzer for noticeable damage.
- Do not discard the shipping container until installation is complete.

Upon receipt of the ta3000R analyzer, check the interior of the shipping container for the following items:

- ta3000R Analyzer and Power Cord
- Operating Manual
- Accessories purchased with the ta3000R

If any evidence of damage exists, immediately contact the shipping company, save the original shipping container, and notify Ametek Process Instruments as soon as possible for consultation.

Location and Environment

1. The area where the ta3000R Gas Analyzer is to be operated should be clean with minimum particulate matter and dust in the air. Install the instrument in an area where there are no vibrations to affect the electronics and detector. There should not be any draft directly on the instrument

from air conditioners or extreme temperature fluctuations in the room.

2. Support gases for the instrument should be located near the analyzer. A uniform temperature environment for cylinders and regulators is essential in order to keep constant pressure and flow rate. Always keep gas containers inside the building where temperature fluctuations are at a minimum.
3. Have adequate ventilation around the instrument area without any high flow velocity draft directly onto the analyzer. If a combustible gas stream is connected to the instrument it is essential to have proper venting to avoid any possible explosion hazards. Be sure not to block any vent slots in the rear or top of the analyzer since limited air circulation will cause overheating and poor performance.
4. Gas Purifiers for support gases should be installed within 20-30 feet (6-9 Meters) or less from the analyzer. This minimizes tubing length and the amount of impurities picked up from the lines.
6. All connections to the instrument should be made with 1/16th inch stainless steel tubing (maximum 0.030" ID). Coil some extra 1/16th inch gas lines behind the analyzer. This allows for flexibility when moving or turning the instrument for service and routine maintenance.
7. Situate the ta3000R in such a way that there is always access to the rear panel for easy hook up of the gases, as well as ease of service components. Allow approximately 30 inches service clearance at the rear of the instrument.

Electrical Preparations and Connections



Always verify that the voltage on the label located on the rear of the instrument matches the supplied power before connecting.

1. The electrical requirements for the ta3000R Gas Analyzer can be 100, 115, 220, or 240 VAC, and 50 or 60 Hz, depending on the voltage option ordered. AC power must be free from cyclic RMS voltage variations, spikes or drops greater than 1.5%. A minimum of 5 amperes current must be available.
2. Good grounding of the AC power circuit is required; verify proper receptacle grounding before connecting the instrument.

3. It is recommended to connect the ta3000R analyzer and low powered accessories to a dedicated electrical circuit. Do not plug the analyzer into a circuit that is shared with other equipment with large intermittent current loads. Line voltage spikes can have detrimental effects on the analytical capabilities. Where there are noisy circuits, a power line conditioner should be considered to even out spikes and other fluctuations.

4. Frequent power failures in the area where the analyzer is used are best taken care of by installing an uninterruptible power supply (UPS). The UPS will supply power instantly from batteries when the main power is interrupted. Proper power will be supplied for minutes or hours depending upon the size of the battery. Since the ta3000R **needs less than 5A** of current, the UPS battery pack can be relatively small.

Support Gas Utilities Preparations

The ta3000R needs support gases in order to run properly. Please refer to Specifications, page 14 for detailed gas specifications for purchasing gases in cylinders. In order to achieve the low detection limits, it may be essential to further clean the gases with external purifiers.

General Notes on Regulators and Plumbing

1. Ultra High Purity (UHP) regulators and gauges are suggested for all incoming gas streams.



2. Carrier gas should always flow through the ta3000R. Do not use an automatic shut-off valve for the sample/carrier gas supply that would stop flow in event of power failure. It is essential to always have flow through the RGD to prevent mercury build-up in the photometer cell and on the cell windows. Mercury build-up will decrease sensitivity of the detector. It is recommended to install a spare carrier gas cylinder into the carrier gas supply line for the RGD. The spare cylinder can be plumbed in through a tee in the line. Use a shut-off valve to isolate the spare cylinder when not in use. This extra cylinder provides a safety margin in order to maintain flow through the analyzer. Immediately order a new cylinder when the spare begins to be used

3. Use Cajon VCR fittings with gaskets to connect to UHP regulators. Do not use pipe thread fittings since they are not clean and are not leak-tight for trace gas analysis.

Suggested Hardware for Gas Connections

UHP Regulators for Carrier and Sample Gases

Dual stage stainless steel, 0 to 150 psig outlet with gauges and 1/16-inch VICI female fittings.

Nut and ferrule, 1/16-inch VICI

8 each required for use with analyzer.

Tubing, 1/16-inch OD x 0.03-inch ID, Stainless Steel

4 each approximately 72" lengths for gas supply umbilical.

Guidelines for prevention of damage



PLEASE STUDY THIS MANUAL THOROUGHLY BEFORE INSTALLING OR OPERATING THE INSTRUMENT.

Carrier gas

The RGD detectors can be destroyed if operated at temperature without flow. The carrier gas should remain flowing until all heated zones are below 50o C (2 to 3 hours).

Line voltage

Do not connect the power cord to line voltage without checking the correct operating voltage on the label located on the rear of the instrument.

Carrier gas purifiers

External purifiers must be completely conditioned with gas flowing through them before connection to the analyzer. Failure to properly condition purifiers can result in serious contamination.

FID Flameignition

Do not ignite the FID flame unless the FID is at operation temperature. Moisture will condense in an un-heated FID and will short-out the electrometer input leads.

Shut down

Be sure all heated zones are shut off prior to disconnecting gas supply lines. The carrier gas should remain flowing until all heated zones are below 50o C (2 to 3 hours). After shutting off carrier gas, immediately cap all open rear panel gas ports

Electrical signal cables

Turn power off before connecting or disconnecting electrical signal cables. Damage to circuit boards could result.

INSTALLATION INSTRUCTIONS



The installation instructions must be strictly followed for safe and reliable operation of the analyzer.



If any inconsistencies are encountered during installation, stop immediately. Do not continue the installation without direction from Ametek customer service.

Tools Suggested for Installation

All connections are made using U.S. standard size connectors.
Open end wrenches: 1/4", 3/8", Phillips head screwdriver
Flow Meter (Digital in the sccm range)
Mirror
Magnet

Making Gas Connections

Prepare for Gas Connections

Remove the red plastic shipping cap from the Hg vapor trap (scrubber).
Remove any 1/16" VICI plug from the rear or front panel(s). Remove all other shipping caps immediately prior to connection of gas supplies.

Connect Carrier Gas (Actuator Gas Supply)

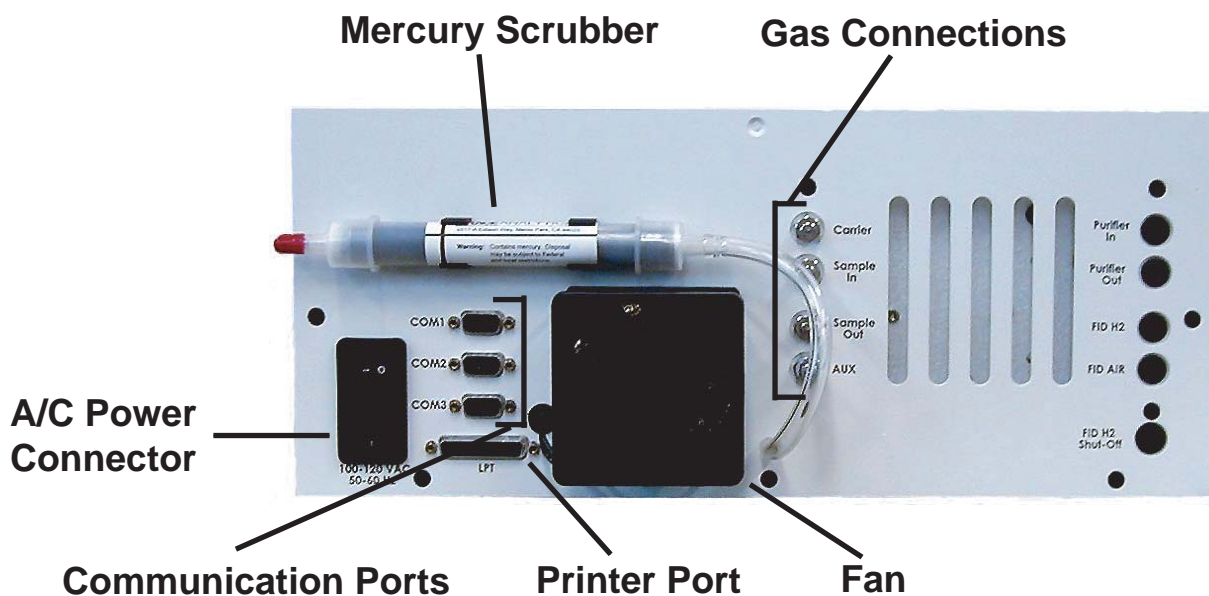
The ta3000 analyzer uses a chromatographic carrier gas that is also used internally as actuator gas. Matching the carrier gas to the sample will prevent upsets caused by the elution of the extraneous balance peak. See gas specifications for Carrier Gas on page 14, Specifications for details. The instrument connection is made at the "CARRIER" 1/16" VICI port on rear panel. Pressurize external line to 80 psig (Minimum 70 psig, Maximum 90 psig).

Connect Sample Gas without Front Injection Panel option

The ta3000 analyzer can be used for process or single gas sample analysis. On-line process sample line should be connected to the "SAMPLE IN" 1/16" VICI fitting on the rear panel. Optimal results are achieved with constant flow rates (20-100 sccm).

Connect Sample Gas - with Front Injection Panel option

The ta3000 analyzer can be used for process or single gas sample analysis. Single sample analysis is made easier with the Front Injection Panel option. With this option, access is via the front panel 1/16" VICI fitting labeled "SAMPLE IN"



Rear View showing gases and power connections

Connecting AC Power and Communications Cables



IMPORTANT: Verify that the operating voltage of the instrument matches the available AC power. The ta3000R does not auto select for varying power line voltages.

Correct instrument operating voltage is labeled on the rear panel directly above the DIN connector / power switch.

Confirm the instrument power switch is OFF ("O" is Depressed)
Connect DIN power cord to instrument
Connect DIN power cord to AC voltage source

CONNECT COMMUNICATIONS CABLES (if applicable)
COM1, COM2, COM3 port, PARALLEL PRINTER port

START-UP AND OPERATION

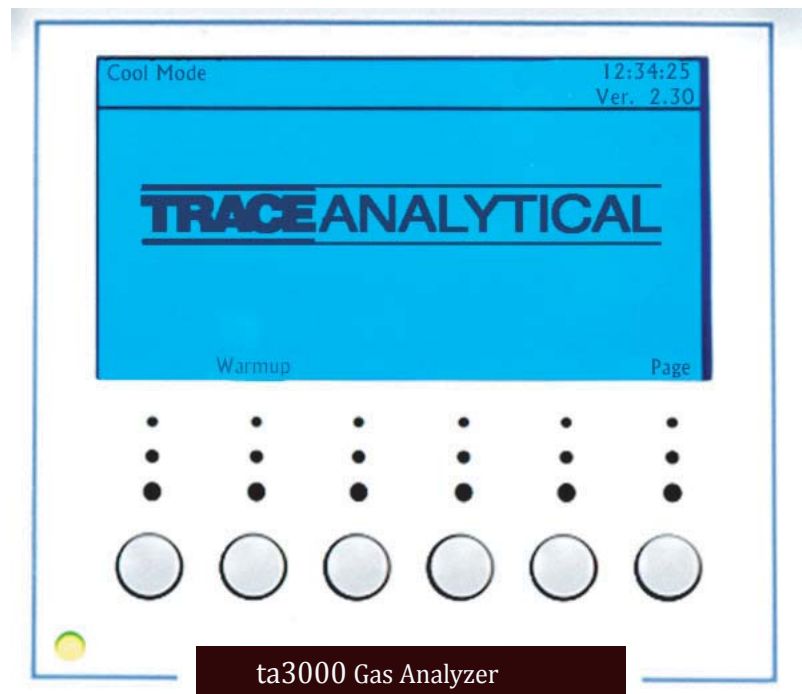
Power Up



: Do not continue with this section until all procedures in the previous section have been completed.

Adjust incoming gas supply pressures as specified in the Specifications pages 14-16 of this manual.

Turn the instrument on by depressing the power DIN switch (1 is depressed) on the back panel of the analyzer. The Power/Status LED on the front panel and the rear cooling fan should activate and the opening screen should appear within a few seconds. If any of these does not occur, turn the power off immediately and contact Ametek customer service or your local authorized service agent.

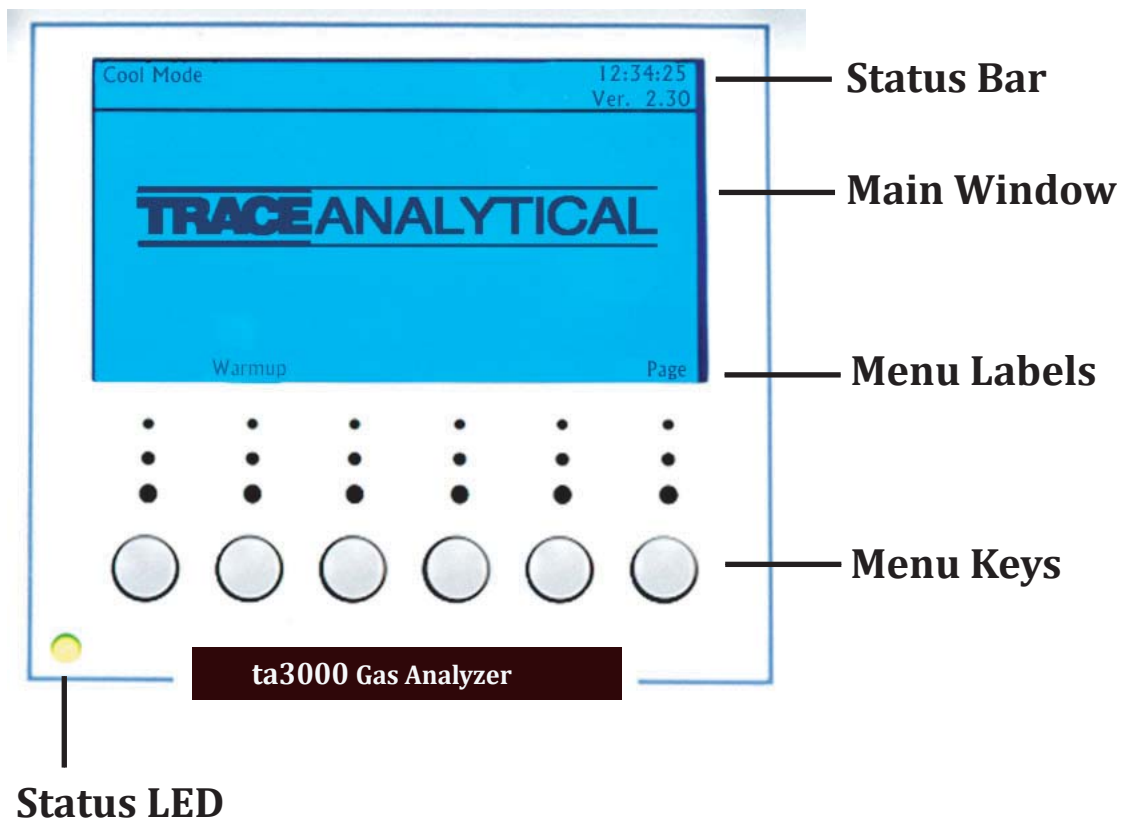


Opening screen at AC power-up

Using the Menu Keys

The analyzer displays a set of labels across the bottom of the display screen. The set is called a menu because it presents the user with choices. Each choice on the menu will either lead to another menu or will perform a function.

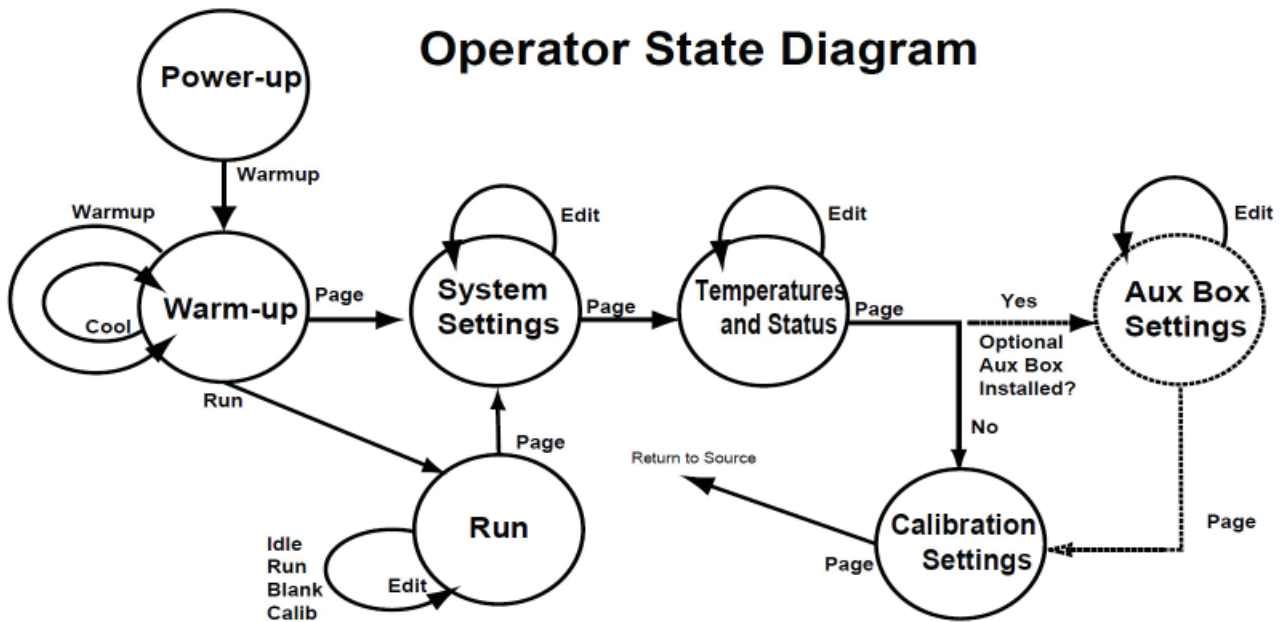
The push button keys located below the display correlate to the text labels along the bottom of the LCD display. The text labels describe what the keys do. The six keys are called menu keys; the text labels are called menu labels. All operator input to the analyzer occurs through the 6 menu keys.



Menu Labels

Menus

Operator State Diagram



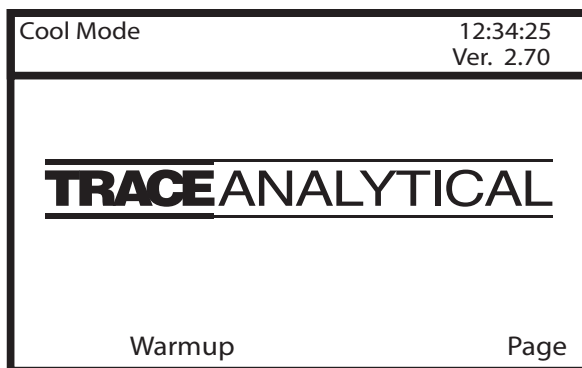
State Diagram for Normal User Mode

State Diagram Screen.

This chart illustrates how the menus are arranged in Normal User mode. Each large circle represents a screen that is displayed on the instrument. The names printed above each arrow represent a menu label and menu key. The arrows indicate where pressing the key associated with that label will take the user.

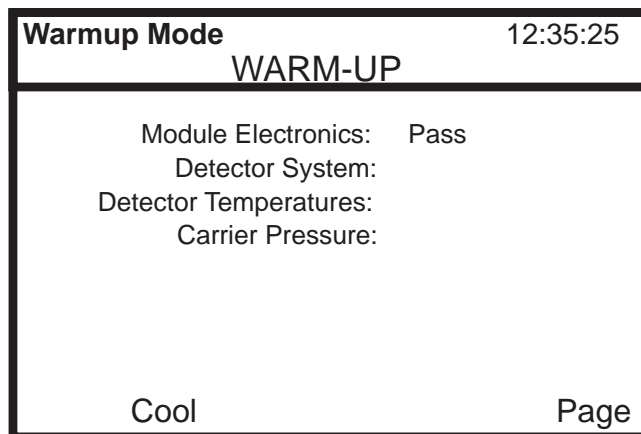
Warm-up

The Power-up screen will display two menu items. Pressing *Warmup* will start the instrument in the warm-up cycle. This cycle will put the instrument in a ready state for analysis. Pressing *Page* will take you to the First of 3 system setup pages (covered later).



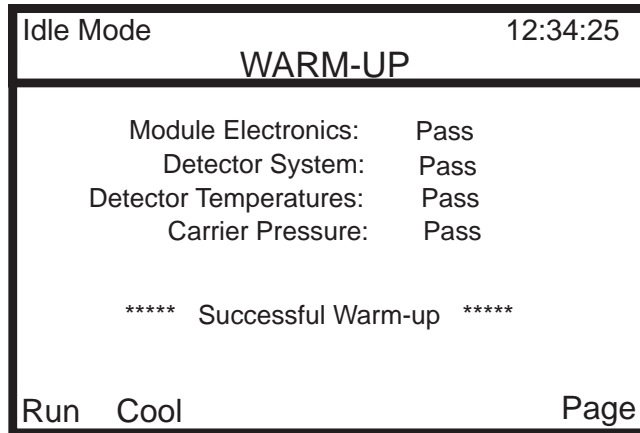
Power On Screen

After pressing *Warm-up* the instrument will perform a series of system tests and will begin heating critical zones. The results from these tests will appear on the Warm-up screen. The *Warmup* menu item will also change to Cool. If you wish to stop the Warm-up process, press the *Cool* key and the instrument will start to cool down. Do not stop the carrier gas until all the measured temperatures reach below 50⁰ C. These temperatures are displayed on the Temperature and Status screen. If any errors occur during the Warm-up process the system will stop the Warm-up process. Proceed to Page 41 - error messages for more detail.



Warm-Up Screen

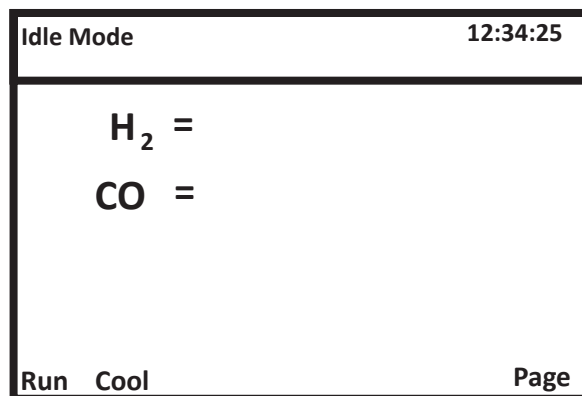
The Warm-up process typically takes 20 to 30 minutes. When the warm-up process has completed successfully a *Run* menu label will appear. Pressing the *Run* key will take the user to the main screen where the Main menu will be available.



Warm-up Pass Screen

Main Menu

After warm-up has completed successfully the main menu will be displayed. The main menu is a set of primary choices leading to other menu options. The following table shows the choices available from the main menu.



Main Menu

Menu Label	What the Item Does
Run	Opens the RUN screen and prepares the instrument for routing sample analysis.
Cool	Reverses the automatic warm-up cycle and returns the instrument to a neutral state.
Page	Opens the first of three Information Screens. These pages give info about the instrument, errors and analytical trends.

Main Menu Table

Page Screens

Each time Page is pressed another user setup screen will be displayed. The following table shows a summary of information available from each page. If a page allows input, the cursor will be displayed and arrow keys will be available as menu items.

Some fields have a selection of pre-programmed settings that the user can select. When a field has a selection of preset settings a Toggle menu label will appear. Press the key for the Toggle menu label to toggle between the preset settings.

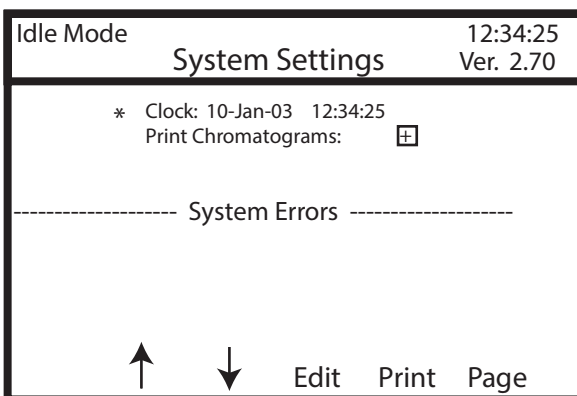
An Edit menu label appears if there are fields that allow the user to enter information

Screen	What Information is available
Page 1	System Settings.
Page 2	Temperatures and Status
Page 3	Calibration

Page Screens

System Settings Page

The first Page Screen is for general configuration settings. The following list shows the function of each option for this screen



System Settings Screen

List Item	What it does
Clock	Set time and date
Print Chromatograms	Prints chromatograms after each run

Table of functions on the System Settings Screen

Setting the Clock

Use the arrow keys to move the cursor in front of the clock field. Press the Edit key. Move the cursor to the first number and use the up and down arrows to make changes. The time format is DD-MMM-YY HH:MM:SS; where DD is the numeric day, MMM is the first three letters of the month, YY is the last two digits of the year, HH is the hour in 24 hour time format, MM is the minute, and SS is the seconds. When finished making changes, press the Esc key and the time will be set.

Print Chromatograms

Select this feature to print chromatograms after each run. Using the arrow keys move the cursor in front of the Print Chromatograms field. Press the Toggle key to toggle this feature on or off.

Diagnostic Print Key

The Print key appears when setting the clock. Pressing the *Print* key from this page will print a complete report of all system settings, calibration settings, temperatures and status and the chromatogram from the last run of the analyzer. This is a system diagnostic tool which can be used to troubleshoot problems with the analyzer.

Saving changes into Non-Volatile RAM

After changes have been made to any of these fields, the system LED will turn red. This indicates that there is a system error or system state change.

Use the *Page* key to move to the System Settings page. Any change made will be shown under the System Errors line. Use the arrow keys to move the cursor in front of the change you wish to *Accept* and press the key under the Accept menu label. Next, press the *Save* key to save the accepted changes into Non-Volatile RAM.

The instrument must be in "Idle" mode to accept the changes.



Any change made will be lost if the instrument is turned off before the changes have been accepted on the System Settings page.

Temperatures and Status Page

Press the Page key to display the Temperatures and Status page. This page shows status information about the critical heated zones and status of the detector. No user input is allowed on this page in normal user mode.

Idle Mode	12:34:25
Temperatures & Status	
	Meas Set
RGD Bed =	265 # 265
RGD Column =	128 # 130
RGD Lamp =	On
RGD Vout =	36187
RGD Vsig =	1978.4
----- Pressure -----	
Carrier =	20.3
	Page

Image of Temperatures and Status Screen

CalibrationScreen

Press the Page key to display the calibration information page.

The calibration page is used to calibrate the instrument and shows information about the most recent run. Name is the gas species to be measured. Conc. is the concentration (or blend) of the calibration gas connected to the instrument. Area is the peak area of the impurity detected during the last analysis run for each impurity type.

Rfactor is the response factor calculated by the system on the most recent calibration. Rfactor is used to calculate the concentration of impurities. RT is retention time of the impurity. This is the time corresponding to the top of each peak calculated from the start of the most recent analysis run.

Idle Mode		Calibration				12:34:25
Name	Conc.	Area	Rfactor	RT		
* H2	50			15025		
CO	50			62341		

Conc. Factor 1

↑ ↓ Edit Page

Calibration Screen

Pressing page again will exit the page screens.



It is recommended to use the Ametek's/Trace Analytical MGB1000 Micro Gas Blender to blend the calibration gas to the desired level when calibrating the ta3000R.

Run

From the Run Screen press *Run* and automatic operation of the analyzer will begin. The ta3000R will display the time left, in seconds, for the current cycle in the status window. The results will be updated in the screen as the concentration is determined

Run Mode 235	12:55:30
Cycle Run	
H ₂ = 16.1	
CO = 12.7	
Idle	Page

Run Mode Screen

To stop the instrument press the *Idle* key and a Pound sign will appear next to "Run Mode" in the status window. This Pound sign indicates that the instrument will stop running at the end of the current cycle. To continue running the instrument after the *Idle* key has been pressed, simply press the *Idle* key again and the Pound sign will disappear and the instrument will continue to automatically run samples

indicates cycle run will end

↓

Run Mode# 235	12:55:30
Cycle Run	
H ₂ = 16.1	
CO = 12.7	
Idle	Page

Run Mode With Pound #

Super User Mode

Super user mode is intended for those who are highly trained in chromatography and for applications of the ta3000 other than on-line process analysis, or those who wish to change operating parameters.

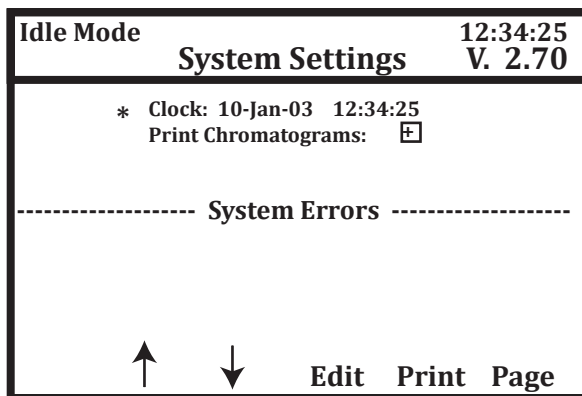


DO NOT enter super user mode if you have not been factory trained on its use. There are some capabilities in this mode that can / will by-pass safety mechanisms inherent to Normal User mode. Improper use of the analyzer in Super User Mode can result in damage to the instrument and will void the factory warranty.

How to enter Super User Mode

Please contact Ametek Service about entering the Super User Mode.

Once you have accessed this mode, you will see the Super User mode name appear in the left corner of the screen. If "Normal User" appears in the left corner you were already in Super User. The same way is used to toggle back to Normal User Mode.



Super User Temperature & Status Page

Depressing the "Zero" key will manually zero the detector.
Depressing the "Bias" key will toggle the lamp on and off.
Depressing the "Edit" key will provide a new menu of options above the keys to:

1. Toggle the heaters on and off
2. Change the heater set points

Super User Calibration Page

The calibration screen has the same appearance as in Normal User mode, but you now have the option to modify the Rfactor and Concentration Factor in addition to the Concentration (Conc). For this instrument the Concentration Factor must be 1 for proper operation.

Concentration and Response Factor Calculation

$$RF = (AREA / (CONC \times VsigAdj)) \times Cal\ Ratio \times 65535.0$$

$$GAS_CONC = (AREA / (RF \times VsigAdj)) \times 65535.0$$

RF = Response Factor

VsigAdj = Response Factor Adjustment due to RGD lamp intensity

CONC = Concentration (or blend) of Calibration Gas Cylinder in ppb

VSIG = RGD detector analog voltage in A/D counts

Cal Ratio = 1 (Concentration Factor)

65535.0 = factor used to adjust software VsigAdj based on VSIG, lamp intensity (VsigAdj = VSIG A/D counts \times 2500 / 65535)

Super User Run Screen

The run screen in Super User mode is very different than the functionality and appearance of Normal User mode.

1. The top line provides current mode, current viewable time, current attenuation, and current time respectively.
2. With the asterisk on the top line, one can toggle between single, cycle and rerun as analysis options. Single will run one event if the "Run" key is depressed. Cycle will continuously run the loaded event program until IDLE is depressed. Pressing IDLE in Super User Mode will immediately stop the cycle. This can result in the valve remaining in the inject position. If this happens the valve should be manually returned to load position (see number 5 below). Rerun will reanalyze the previous chromatogram with any database changes and display the new results, although, the new analysis cannot be printed.

3. Analysis Database (Anal DB) contains the parameters set at the factory used to integrate peak data. Adjustments to these factory settings are at the risk of the user.

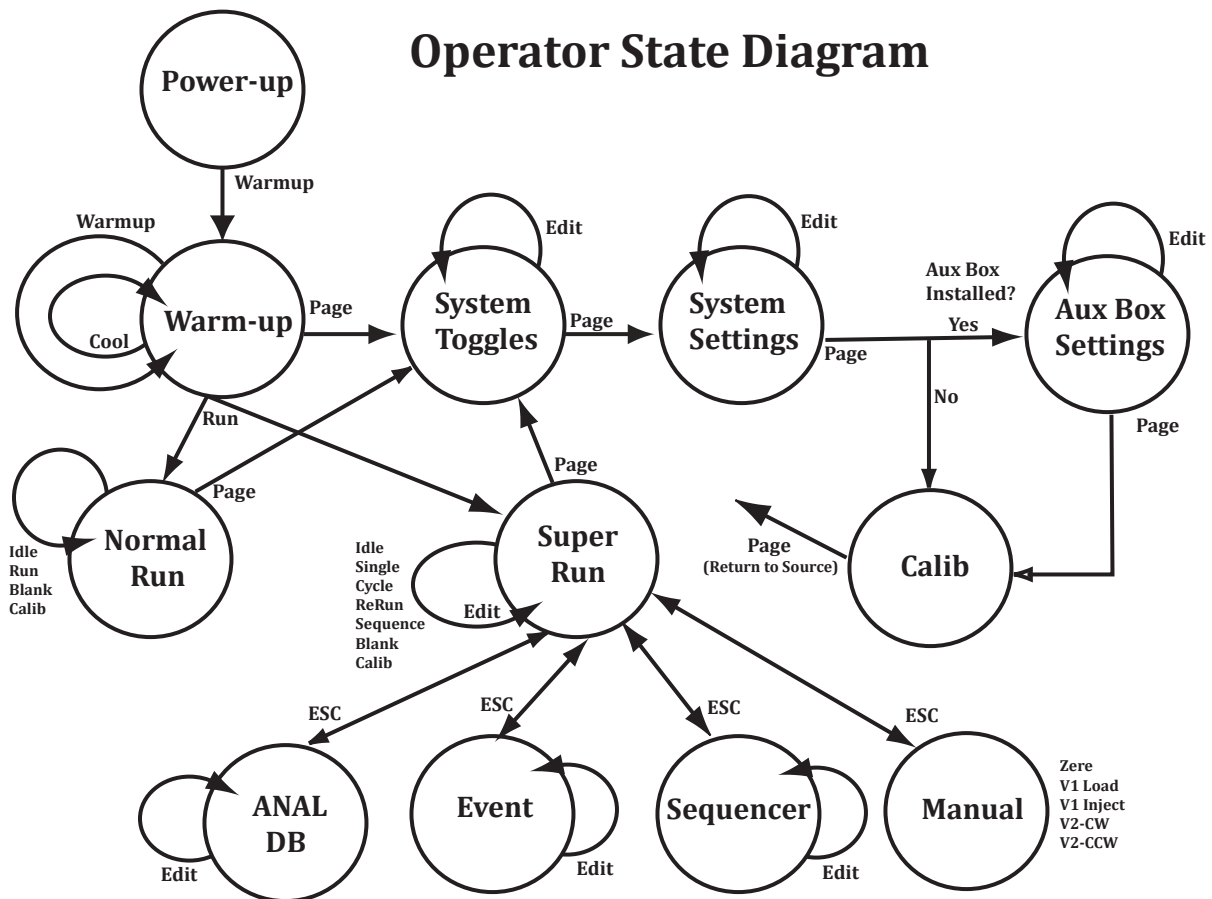
4. Depressing the "Edit" key next to the Event line will prompt the Event screen. Program 1 is the factory program automatically loaded when in the Normal User mode. Any modifications to the event screen are at the risk of the user.

5. With the asterisk next to the *Manual* line provides a new menu which you can toggle the valve and zero the detector for troubleshooting and service issues. Manual valve actuation should only be performed by an individual who completely understands the operation of the instrument. Improper use can result in damage to the instrument in certain applications.

System Settings

The functionality of this screen is consistent with Normal User.

Super User Menus



This chart illustrates how the menus are arranged in Super User Mode. Each large circle represents a screen that is displayed on the instrument. The names printed above each arrow represent a menu label and menu key. The arrows indicate where pressing the key associated with that label will take the user.

Shut Down

System shut down for maintenance or for any other reason is very simple. If shut down is due to an emergency or for any safety reason, simply switch the instrument off using the A/C DIN Switch located on the rear panel of the analyzer (0 depressed is off).



Carrier gas to the instrument must not be stopped until all temperatures are below 50°C.

To shut down the analyzer:

From the main menu press the Idle key to stop analysis.

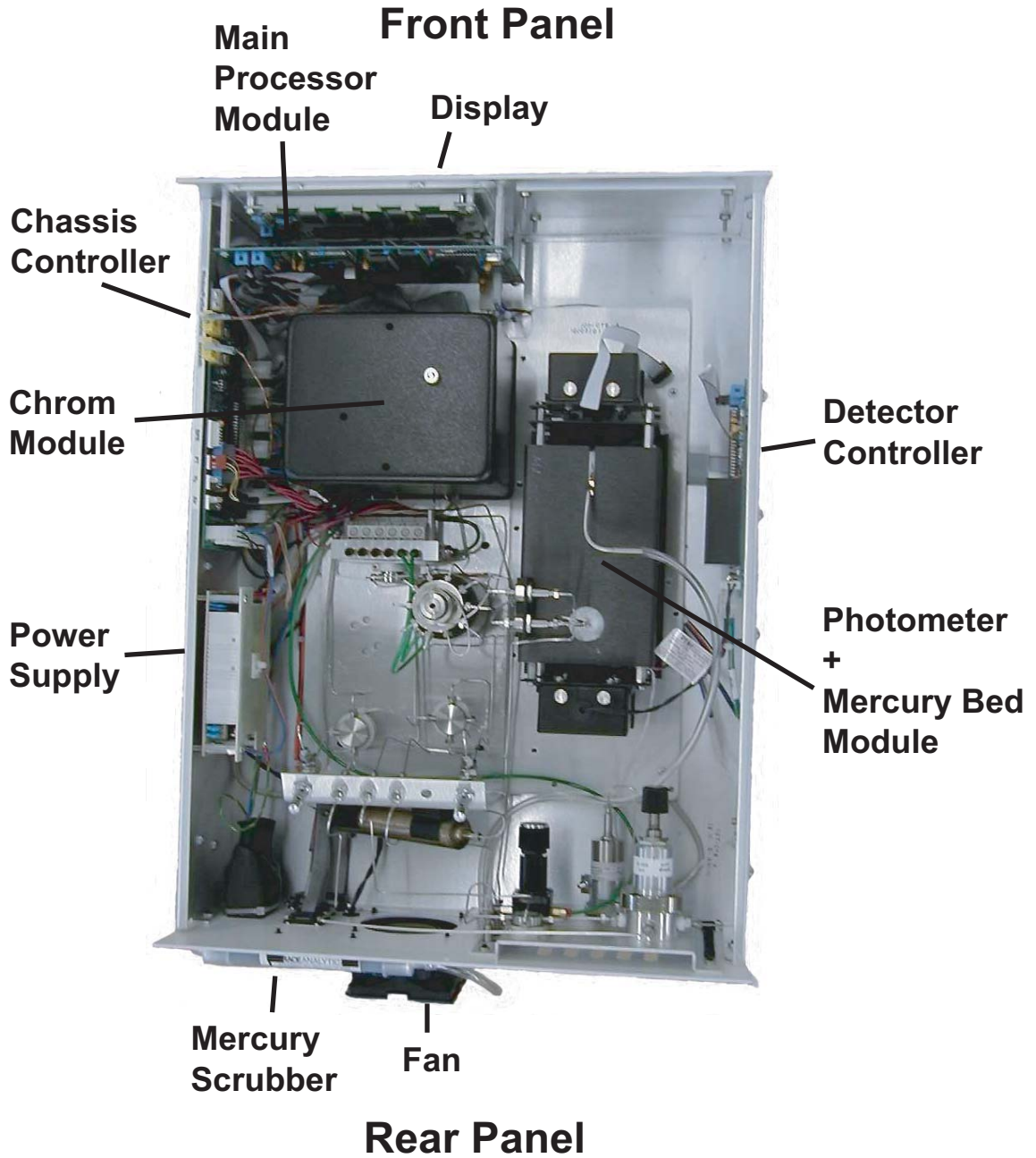
Shut off any support gasses except for the carrier gas.

Press the Cool key and allow the analyzer to cool down for two to three hours.

Switch the analyzer and all other components off.

Shut off the carrier gas.

DESCRIPTION OF INTERNAL COMPONENTS



ERROR MESSAGES

Error Messages

Error Messages are viewed and acknowledged on the System Settings screen. When the Status LED on the front panel is red this indicates that there are system errors or the status of the analyzer has changed. The System Status page displays error messages that the system has encountered. See the Run section for more information on the System Settings page (35).

Chassis Controller Error

Internal electronics failure - Call manufacturer or qualified service representative.

Detector Controller Error

Internal electronics failure - Call manufacturer or qualified service representative.

Temperature Out of Range

Either the temperature zone is 2 degrees over the set point, or the temperature zone has been disabled. Perform the Warmup procedure to clear this error.

Vsig Out of Range (Lamp Off?)

During the Warmup cycle the analyzer performs a system test of the RGD lamp. If the RGD lamp is not within operating range this error will be displayed

Carrier Pressure Out of Range

External carrier pressure is not within specified limits. Verify external carrier pressure supply.

Analog Signal Zeroing Error

The instrument has failed to zero the detectors analog signal.

Vsig Minimum Voltage Limit

This fault will occur if the RGD detector does not have the minimum Vsig (1000mv) for proper analysis. Typical Values are 1750-2250. Vsig cannot be above 2500. Incorrect values could indicate that the RGD lamp is defective or has degraded due to normal usage.

Event Program Error

Internal event program has not been correctly entered, is missing, or has been corrupted.

Printer Error

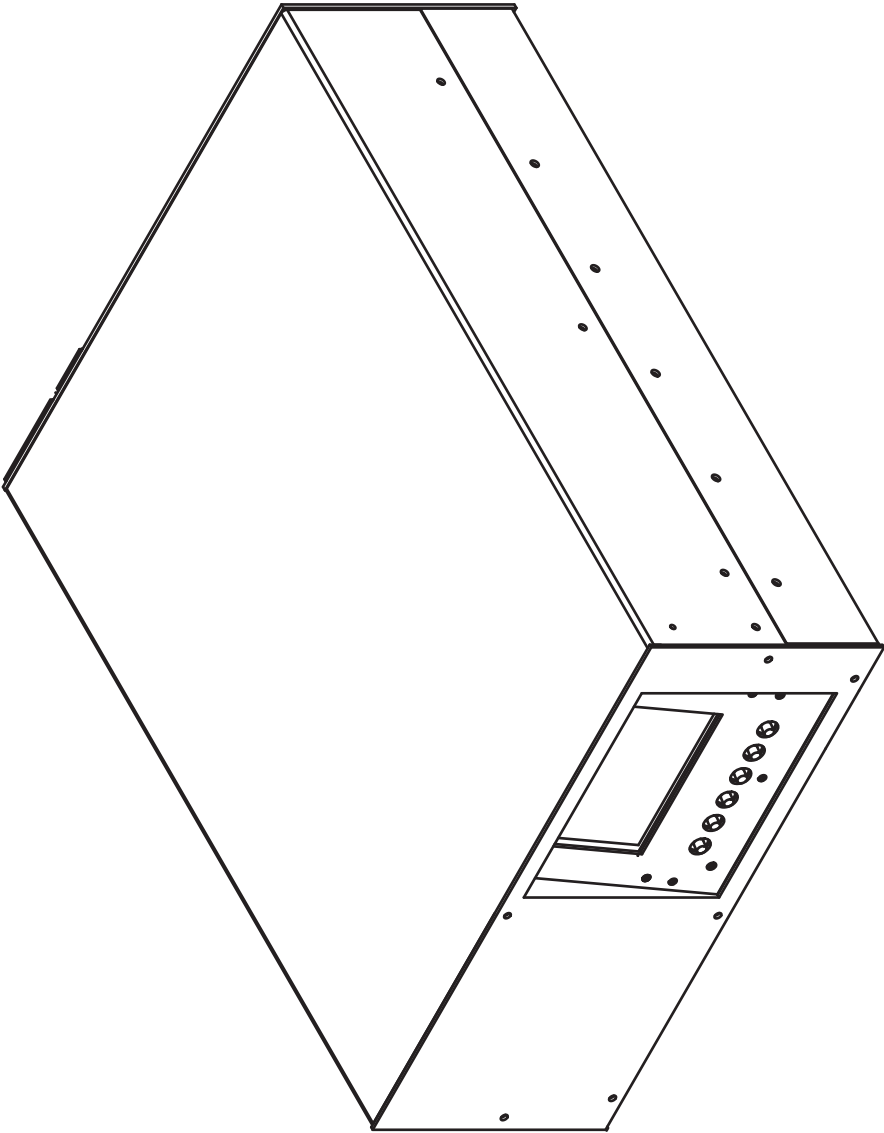
Printer is not connected, is turned off, or is not functioning properly.

Database Change, Update NV RAM

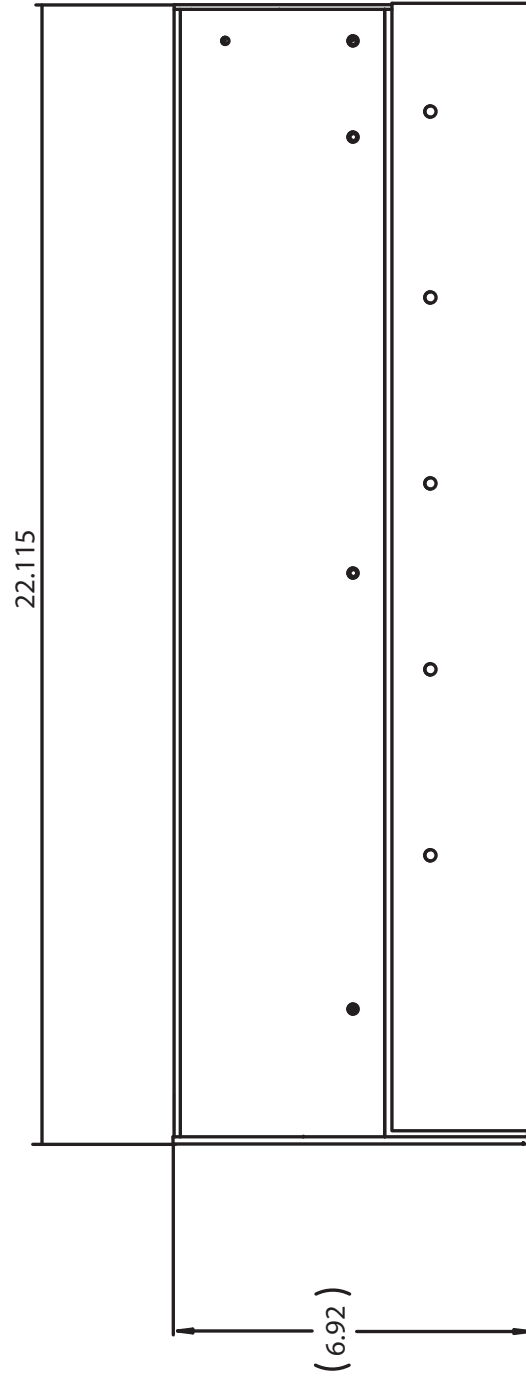
This fault will occur if any of the system parameters have been changed. The most common system parameters that are changed are the response factor due to performing a calibration run. This fault can only be updated during warmup or Idle.

(See Saving Changes into Non-Volatile RAM in the Run Section of this manual, page 36).

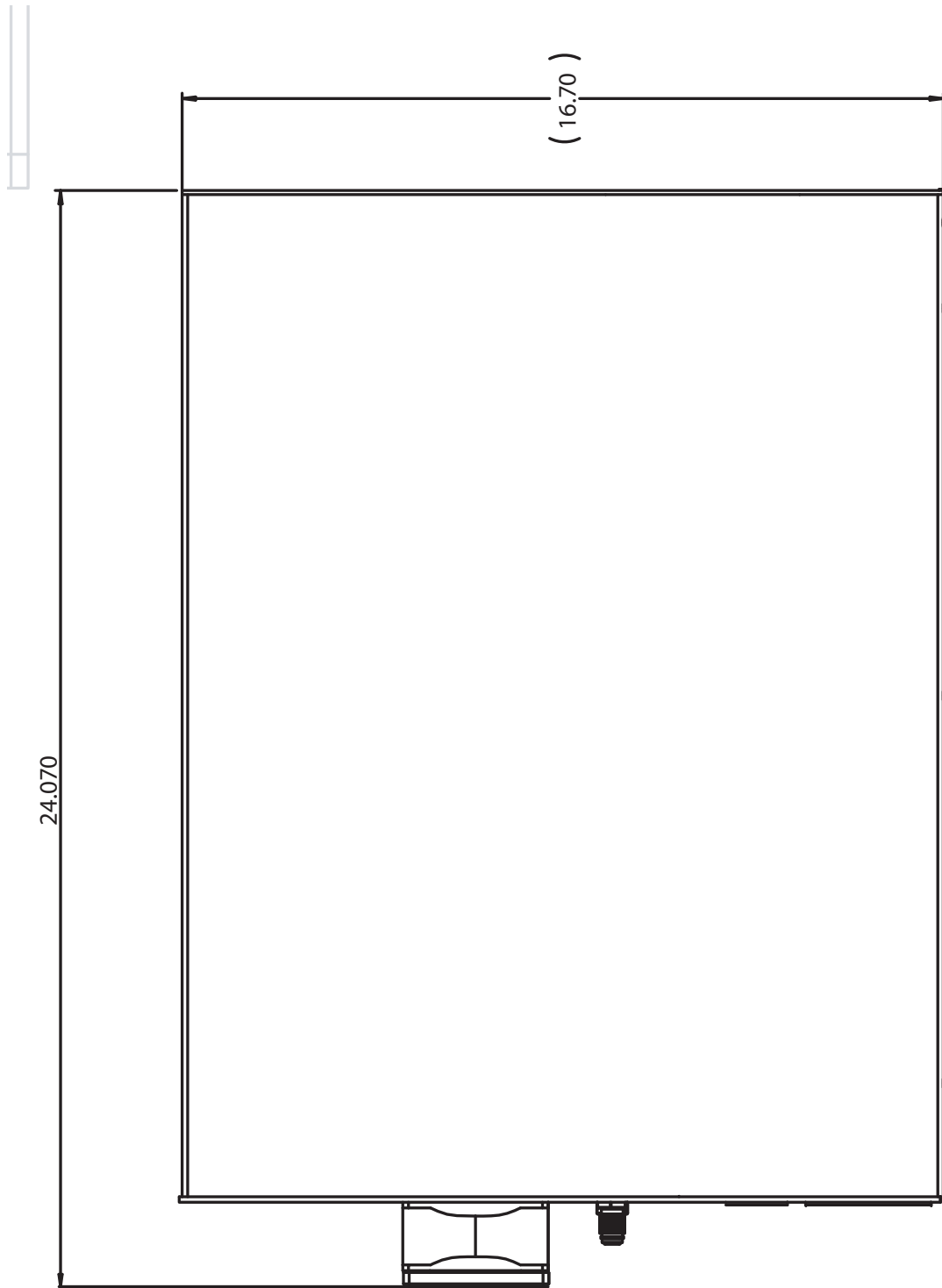
DIMENSIONAL DRAWINGS



ta3000R Top View



ta3000R Side View



Outer Dimensions - 3D View

This page intentionally left blank