INSTRUCTIONS FOR

Model 6700E Total Organic Carbon Analyzer

P/N M6700E
Date: 2/04/2020

DANGER

Toxic gases and or flammable liquids may be present in this instrument.

Personal protective equipment may be required when servicing this instrument.

Hazardous voltages exist on certain components internally which may persist for a time even after the power is turned off and disconnected.

Only authorized personnel should conduct maintenance and/or servicing. Before conducting any maintenance or servicing, consult with authorized supervisor/manager.

Warranty

This equipment is sold-subject to the mutual agreement that it is warranted by us free from defects of material and of construction, and that our liability shall be limited to replacing or repairing at our factory (without charge, except for transportation), or at customer plant at our option, any material or construction in which defects become apparent within one year from the date of shipment, except in cases where quotations or acknowledgements provide for a shorter period. Components manufactured by others bear the warranty of their manufacturer. This warranty does not cover defects caused by wear, accident, misuse, neglect or repairs other than those performed by TI/AI or an authorized service center. We assume no liability for direct or indirect damages of any kind and the purchaser by the acceptance of the equipment will assume all liability for any damage which may result from its use or misuse.

We reserve the right to employ any suitable material in the manufacture of our apparatus, and to make any alterations in the dimensions, shape or weight of any parts, in so far as such alterations do not adversely affect our warranty.

Important Notice

This instrument provides measurement readings to its user, and serves as a tool by which valuable data can be gathered. The information provided by the instrument may assist the user in eliminating potential hazards caused by his process; however, it is essential that all personnel involved in the use of the instrument or its interface, with the process being measured, be properly trained in the process itself, as well as all instrumentation related to it.

The safety of personnel is ultimately the responsibility of those who control process conditions. While this instrument may be able to provide early warning of imminent danger, it has no control over process conditions, and it can be misused. In particular, any alarm or control systems installed must be tested and understood, both as to how they operate and as to how they can be defeated. Any safeguards required such as locks, labels, or redundancy, must be provided by the user or specifically requested of TI/AI at the time the order is placed.

Therefore, the purchaser must be aware of the hazardous process conditions. The purchaser is responsible for the training of personnel, for providing hazard warning methods and instrumentation per the appropriate standards, and for ensuring that hazard warning devices and instrumentation are maintained and operated properly.

Teledyne Instruments/ Analytical Instruments, the manufacturer of this instrument, cannot accept responsibility for conditions beyond its knowledge and control. No statement expressed or implied by this document or any information disseminated by the manufacturer or its agents, is to be construed as a warranty of adequate safety control under the user's process conditions.

Specific Model Information

Instrument Serial Number: _____

Analyzer Range 1: _____

Zero Gas: _____

Span Gas: _____

Safety Messages

Your safety and the safety of others is very important. We have provided many important safety messages in this manual. Please read these messages carefully.

A safety message alerts you to potential hazards that could hurt you or others. Each safety message is associated with a safety alert symbol. These symbols are found in the manual and inside the instrument. The definition of these symbols is described below:

GENERAL WARNING/CAUTION: Refer to the instructions for details on the specific danger. These cautions warn of specific procedures which if not followed could cause bodily Injury and/or damage the instrument.

CAUTION: HOT SURFACE WARNING: This warning is specific to heated components within the instrument. Failure to heed the warning could result in serious burns to skin and underlying tissue.

WARNING: ELECTRICAL SHOCK HAZARD: Dangerous voltages appear within this instrument. This warning is specific to an electrical hazard existing at or nearby the component or procedure under discussion. Failure to heed this warning could result in injury and/or death from electrocution.

Technician Symbol: All operations marked with this symbol are to be performed by qualified maintenance personnel only.

No Symbol

NOTE: Additional information and comments regarding a specific component or procedure are highlighted in the form of a note.

CAUTION: **THIS INSTRUMENT SHOULD ONLY BE USED FOR THE PURPOSE AND IN THE MANNER DESCRIBED IN THIS MANUAL.**

IF YOU USE THIS EQUIPMENT IN A MANNER OTHER THAN THAT FOR WHICH IT WAS INTENDED, UNPREDICTABLE BEHAVIOR COULD RESULT POSSIBLY ACCOMPANIED WITH HAZARDOUS CONSEQUENCES.

This manual provides information designed to guide you through the installation, calibration operation and maintenance of your new analyzer. Please read this manual and keep it available.

Occasionally, some instruments are customized for a particular application or features and/or options added per customer requests. Please check the front of this manual for any additional information in the form of an Addendum which discusses specific information, procedures, cautions and warnings that may be peculiar to your instrument.

Manuals do get lost. Additional manuals can be obtained from TI/AI at the address given in the Appendix. Some of our manuals are available in electronic form via the internet. Please visit our website at: www.teledyne-ai.com.

Additional Safety Information

Use, maintenance and service of this analyzer must be performed only by qualified personnel fully trained on the analyzer's operations.

When the analyzer should be protected from intentional or unintentional powering on using a proper circuit breaker.

Before installation of the analyzer, please read through and fully understand this instruction manual for proper operation. Pay attention to all caution and dangers labels present on the analyzer and all caution and dangers statements contained in this manual.

Failure to understand the analyzer and/or non-observance of hazards and danger warnings contained within could result in death or serious injury to the operator and/or damage to the analyzer.

Before using the analyzer it is necessary to visually check for any damage to the safety devices and analyzer.

All analyzer's components are installed within two metal enclosures. The analyzer doors use a special key for opening. These keys should be entrusted to qualified maintenance personnel.

Vent Waste Gas

Waste gases emanating from the analyzer's oxidation process depend on the user's sample composition. Connections are labelled on the external side of the cabinet as VENT outlets. It is necessary to connect an extension tubing or to provide for safe venting to the atmosphere or to a classified safe area depending on the gases used.

Sample

Take appropriate precautions to avoid direct contact with the sample stream. It is responsability of the user to know the hazards of and invoke the appropriate precautions regarding physical, chemical, radiation and/or biological hazards and dangers coming from the sample stream and/or sample vapors. It is also responsibility of the user to

evaluate and act upon any potential hazard regarding the chemical and physical compatibility of the sample stream with analyzer materials.

UV Lamp Disposal

Used or replaced UV lamps contain a small quantity of mercury and must be disposed in accordance with all local and regional environmental regulations regarding hazardous and poisonous materials.

Table A: List of materials used in this analyzer

Pump tubing	Norprene,Tygon
Fittings	Polypropylene
Connection tubings	PFA
GLS,U Tube,	Glass
Scrubber, Condenser	
Halogens and sodalime filter body	PVC, polycarbonate
Filter contents	Copper wool (halogen filter),
	Sodalime (sodalime filter)
UV lamps	Quartz
Bypass valve	Noryl, viton
IR cell	Stainless steel
Gas dryer tubing	Nafion

Electrical Precautions and Hazards

This analyzer operates from a 230 VAC (or 115 VAC opt.) power and can represent an electrical shock or electrocution hazard if not installed or handled properly.

To protect all the personnel involved in analyzer use and maintenance, the doors of the two analyzer enclosures use a special key for opening. If it is necessary to perform service or other operations within the electrical enclosure while the analyzer is powered on, these operations must be performed only by qualified personnel in accordance

with national or local regulations who has been fully trained in the analyzer operation.

Before servicing the analyzer or any parts that are electrically powered, turn off all power to the analyzer. The analyzer should be installed with a breaker or isolating switch to ensure that there is no power within the area being serviced.

Users and qualified maintenance personnels must:

- Adhere to any electrical shock and/or electrocutions labels placed on the analyzer.
- Isolate power before servicing the analyzer.

Note: In the event of a loss of power and the analyzer stops functioning, it will automatically restart as soon as power is restored.

WARNING: THE UV LAMP POWER SUPPLY REACHES AN IGNITION VOLTAGE UP TO 3000 VOLTS; DO NOT PERFORM ANY SERVICE ACTIVITY WITHOUT FIRST REMOVING THE INSTRUMENT'S POWER CORD.

The analyzer's control circuitry is powered by 24 VDC and 12 VDC supplies. Inside the electrical enclosure the lower level of protection against direct contact is IP2X. Analyzer enclosures are IP54 (because of air fans holes).

Protection against indirect contacts is enabled by efficient grounding of all isolated metal masses.

A grounding bar is located inside the electrical enclosure in the upper left position below the protection cover.

It is the user's responsibility to check and ensure the efficiency of the analyzer's grounding.

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DANGER
COMBUSTIBLE GAS USAGE WARNING

This is a general purpose instrument designed for use in a non-hazardous area. It is the customer's responsibility to ensure safety especially when combustible gases are being analyzed since the potential of gas leaks always exist.

The customer should ensure that the principles of operating this equipment are well understood by the user. Misuse of this product in any manner, tampering with its components, or unauthorized substitution of any component may adversely affect the safety of this instrument.

Since the use of this instrument is beyond the control of Teledyne Analytical Instruments, referred as TAI, no responsibility by TAI, its affiliates, and agents for damage or injury from misuse or neglect of this equipment is implied or assumed.

Introduction

This manual provides general information regarding the principle of operation and for a proper installation and operation of the Model 6700E Total Organic Carbon Analyzer. The analyzer measures Total Organic Carbon in liquid samples using the EPA approved method based on UV persulfate oxidation and detection of generated carbon dioxide using a Non Dispersive Infrared detector. This method also meets the European ISO/CEN requirement guidelines. The analyzer has a measuring range from 0-5 mg/l to 0-20000 mg/l.

This analyzer conforms to EPA, DIN, CE, ASTM and NAMUR regulations.

Figure 1-1: Model 6700E Organic Carbon Analyzer

1.2 Applications

This analyzer measures Total Organic Carbon (TOC) in water continuously. It has been designed for the following applications:

- Industrial waste water
- Condensate and cooling water
- Drinking and river water
- Industrial water treatment plant inlet/outlet

For different applications or different aqueous backgrounds contact Teledyne Customer Service at the following address.

Teledyne Analytical Instruments
16830 Chestnut Street
City of Industry, CA 91748

Phone (626) 934-1500
Fax (626) 961-2538
Web: www.teledyne-ai.com

1.3 Analyzer Overview

The analyzer is assembled in two separated enclosures. See Figure 1-2. The left side (as you face the analyzer) is the LIQUIDS enclosure. It includes all the components involved in sample and reagents flows as well as their mixing in sparging and oxidation stages. This enclosure is properly vented by a fan to allow sufficient air flow and replacement within the cabinet. The second enclosure is the ELECTRICAL enclosure. It includes the main power supply, the carrier gas generation and flow adjustment devices, the controller PCB assembly as well as the infrared detector.

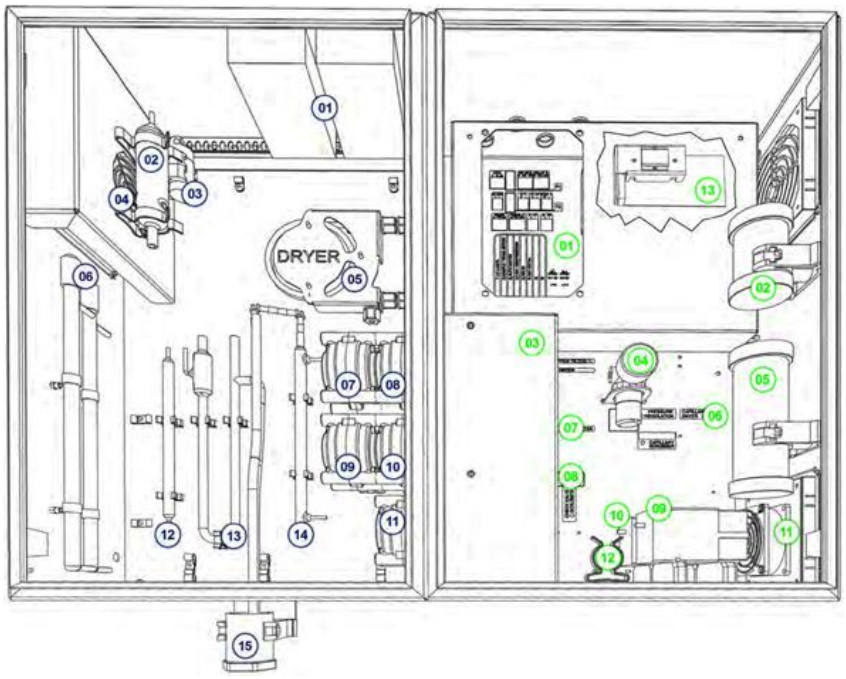


Figure 1-2: Internal Components

Liquids Enclosure		Electrical Enclosure	
1	UV lamps power supply	1	user connections
2	glass condenser	2	copper filter
3	bypass valve	3	pump motor
4	condenser fan	4	pressure regulator + flow capillary
5	dryer tubing	5	sodalime filter
6	uv reactor	6	dryer + scrubber capillaries
7	resample pump	7	flowmeter
8	sample pump	8	check valve
9	persulfate pump	9	carrier gas compressor
10	phosphoric acid pump	10	scrubber gas compressor
12	auto pump	12	fan
12	UV scrubber	12	air filter
13	U tube	13	NDIR
14	scrubber		
15	drain		

Principles of Operation

2.1 Sample Enclosure

2.1.1 Sample Flow

Water from the sample source (directly from the sampling point or through the optional filtration unit) is brought to a sampling device mounted externally on the left side of the analyzer. This device drains any sample excess and is equipped with a level sensor to check for the sample presence. This device resupplies sample and will place the analyzer in a stand-by condition in case a loss of sample is detected.

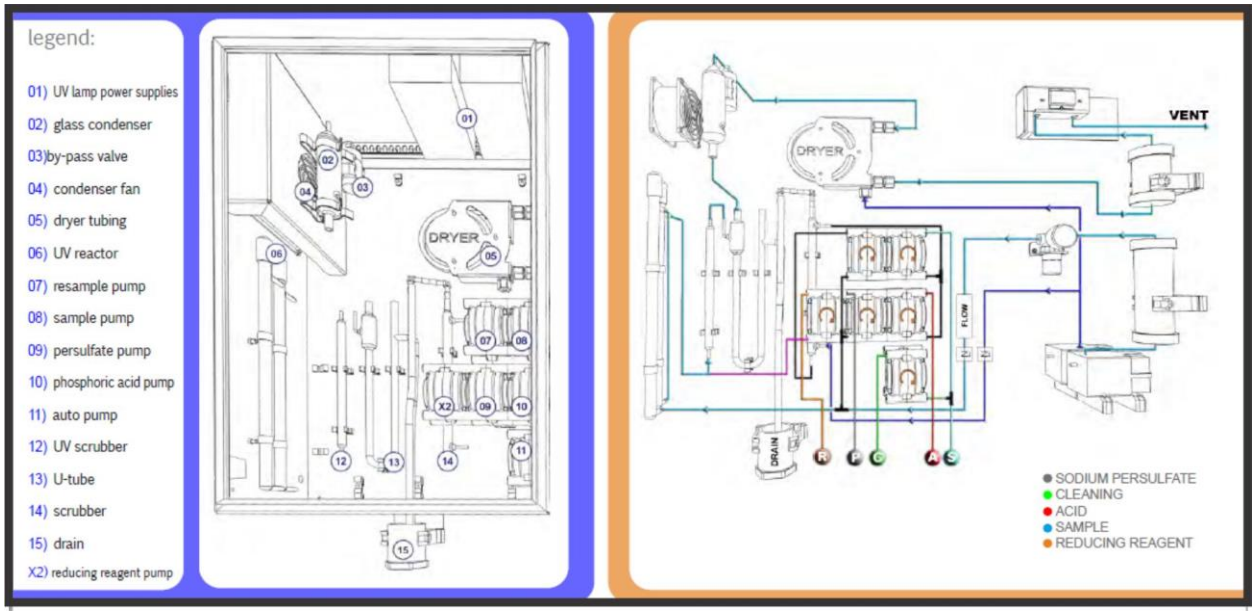


Figure 2-1: Flow Diagram

Referring to Figure 2-2, the sample is pumped by a peristaltic pump (08) to the inorganic scrubber (14) after mixing with acid (usually phosphoric acid) pumped by a second peristaltic pump (10).

The inorganic removal is performed using ambient air provided by an internal air compressor (10). This first process lowers the pH of the sample and convert the carbon carbonates to carbon dioxide. The carbon dioxide dissolved in water is then driven out by the sample to the vent using compressed air.

The acidified and sparged sample is then pumped from the scrubber bottom to the UV reactor (06) by the resample pump (07), after mixing with a strong oxidizing agent (usually sodium persulfate) pumped by a dedicated peristaltic pump (09).

The presence of a strong oxidizing agent combined with high level UV radiation causes the oxidation of organic compounds. The produced carbon dioxide is driven to the gas-liquid separator (12). The liquid sample is drained off while the air that containing carbon dioxide goes to the infrared detector (13), passing in sequence through a glass condenser (02), gas dryer tubing (05) and a halogens filter (02). These devices are present to prevent condensation and corrosion inside the stainless cell of the IR. The carrier gas used for the oxidation and detection stages is generated by a second internal air compressor (09) and is passed through a sodalime filter (05). The carbon dioxide free gas passes through a pressure regulator (04), a capillary tubing and a digital flowmeter (08) to reach finally the UV reactor. All these devices are necessary to guarantee high precision and stability of carrier gas flow as well as to control and be able to display the flow.

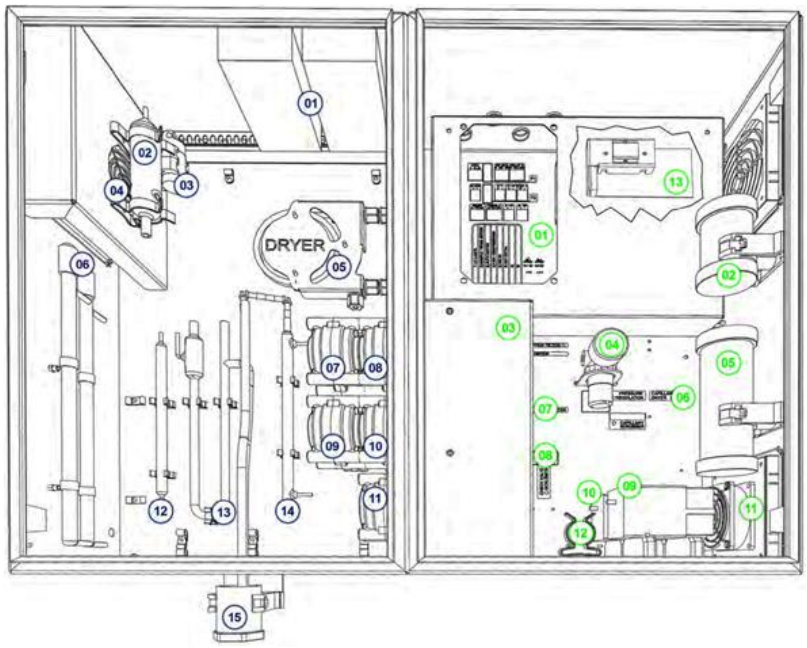


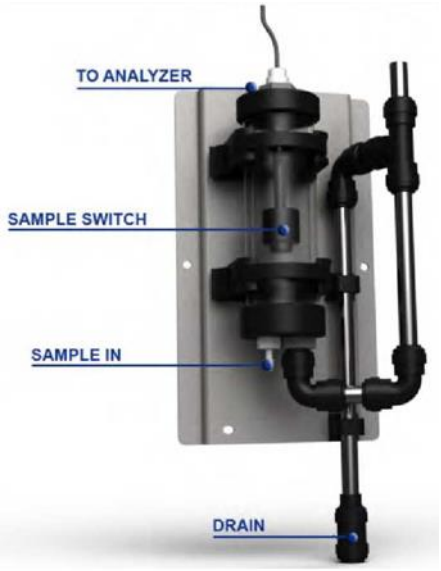
Figure 2-2 Internal Components

Table 2-1: Internal Components Legend

Liquids Enclosure		Electrical Enclosure	
1	UV lamps power supply	1	user connections
2	glass condenser	2	copper filter
3	bypass valve	3	pump motor
4	condenser fan	4	pressure regulator + flow capillary
5	dryer tubing	5	sodalime filter
6	uv reactor	6	dryer + scrubber capillaries
7	resample pump	7	flowmeter
8	sample pump	8	check valve
9	persulfate pump	9	carrier gas compressor
10	phosphoric acid pump	10	scrubber gas compressor
12	auto pump	12	fan
12	UV scrubber	12	air filter
13	U tube	13	NDIR
14	scrubber		
15	drain		

2.1.2 Fast Loop Reservoir

The external reservoir allows a fast circulation of the sample coming from the sampling point or from the optional filtration unit.



Inside the fast-loop reservoir the sample is at atmospheric pressure and this allows the sample pump to function with a constant delivery and no overpressure. In addition, the fast-loop reservoir provides a useful extra quantity of sample thus avoiding false alarms due to a shortage of sample. It also eliminates air bubbles arriving from the sample line or from the cleaning cycle of the optional filtration unit.

The stainless steel drain tube keeps a constant water level inside the container and allows for proper sample circulation thus avoiding suspended solids accumulation.

The sample flow should be adjusted to have a constant sample overflow through the stainless steel tube. Up to 3 level switches can be connected to the analyzer, e.g. Stream A, Stream B and dilution water. Two of the switches are normally connected to the terminals located on the left side of the analyzer. For a dual stream analyzer where dilution water is also required for one or both streams, the third level switch is connected to the user connection inside the analyzer (see page 37).

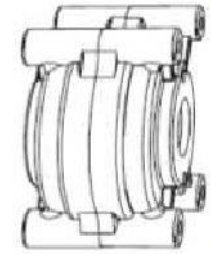
For a single stream analyzer, in the event of no sample or dilution water stream for a period longer than a preset time (normally set on installation to 30 s), an alarm - LOSS OF SAMPLE - is triggered and the analyzer switches to Standby. When the sample or dilution water stream is reestablished, the analyzer restarts automatically with a conditioning cycle.

In the case of a dual stream configuration, if no Stream A is present then the analyzer will continue to work only on Stream B until Stream A is reestablished, and vice-versa. If both streams are not present then again the alarm LOSS OF SAMPLE is triggered and the analyzer switches to Standby.

If either or both streams are being diluted and the dilution water stream is missing, then jumpers found alongside the internal Level 3 terminal can be used to make the analyzer work only on the undiluted stream or switch to Standby if both streams are diluted, again giving the alarm LOSS OF SAMPLE.

2.1.3 Peristaltic Pumps

In normal on-line conditions the TOC analyzer uses two pump motors with two pump heads each driven by a motor. An extra pump head driven by a specific motor is used in autocalibration, autovalidation or autocleaning cycles.



The sample pump head shown in flow diagram as (08) is driven by the M1 motor and is located in the upper position, closest to the motor. It pumps the sample from the external reservoir to the tee fitting connected on the other side to (10) the phosphoric acid pump head. Optimizing the sample pump flowrate is important to ensure a representative sample and to reduce the analyzer response time.

The phosphoric acid pump head (10) is driven by the M2 motor and is located in the middle position, closest to the motor. It pumps phosphoric acid from the phosphoric acid container to the tee fitting connected to sample pump head (08). The acid addition to the sample is necessary to lower the sample pH and to remove the inorganic carbon (IC) by gas sparging.

The resample pump head (07) is driven by the M1 motor and is located in the upper position, on the UV lamps side. It pumps the acidified and sparged sample from the bottom of the scrubber (14) to the tee connection where it mixes with the carrier gas coming from the air compressor (09) and is then directed to UV reactor (06).

The persulfate pump head (09) is driven by the M2 motor and is located in the middle position, on the UV lamps side. It pumps sodium persulfate from the persulfate container to the UV reactor (06), adding it to the mixture of sample and carrier gas coming from the resample pump (07). It is then directed to the UV reactor (06).

The auto pump head shown in flow diagram as (11) is driven by the M3 motor. It pumps the calibration/validation standard solution or the

cleaning solution from its container to the analysis circuit when requested by the user or when programmed as autocal/val/clean cycle.

The auto pump flowrate is higher than sample pump flowrate. This means that in case of an autocleaning cycle a portion of the cleaning solution will be driven towards the sample inlet, cleaning the sampling point.

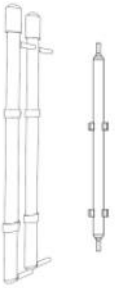
2.1.4 Scrubber

The scrubber (12) is located in a vertical position near the peristaltic pumps. It is a glass cylinder with the acidified sample inlet in upper right position. The acidified sample passes down by gravity through the scrubber and it is sparged by the carrier gas coming from air compressor (10), connected in the lower right position.

The carbon dioxide coming from the inorganic carbon present in the sample is sparged by the carrier gas flow and removed from the sample through the vent/drain tubing connected to the straight upper position of the scrubber. As a result, the sample at the scrubber bottom is IC free and it can be pumped by the resample pump (07) to the oxidation stage.

2.1.5 UV Reactor + UV Scrubber

The UV reactor (06) is located on the left side of liquids enclosure. It consists of two high energy UV lamps.

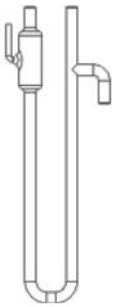


The reaction of oxidation is catalyzed by UV radiation with the decomposition of sodium persulfate and the creation of strongly oxidizing radicals. These conditions ensure the best recovery of organics present in the sample.

The second UV lamp is connected to UV scrubber (12). The oxidized sample at the UV lamps is sparged inside this device.

2.1.6 U-Tube

The U-Tube (13) is located in the middle position of liquids enclosure. It is a U shaped glass device, with two inlet and two outlet points.



It separates the analyzed liquid part of the sample coming from UV reactor from the gaseous stream directed to the infrared analyzer. It also drains the sample exaust and vents the sparging gas coming from the top of the scrubber.

The gas mixture coming from the oxidation stage is driven by the carrier gas to the drying devices through the upper right outlet of the gas-liquid separator, towards to the glass condenser (02).

2.1.7 Glass Condenser

The Glass Condenser (02) is positioned between U tube and the by-pass valve. The glass condenser uses the temperature difference between its glass body, cooled by a fan, and the hot treated sample coming from UV reactor.

2.1.8 Dryer

The dryer **(05)** is positioned between the BYPASS VALVE and the IR detector. It consists of a coil of two concentric tubes. The gas stream flows through the internal tubing to dry. This tubing is water vapor permeable so that the humidity passes to the external tubing. In the external tubing there is a countercurrent purge gas flow that removes the water vapor. The dryer prevents water condensation inside the IR cell.

CAUTION : DO NOT OVERTIGHTEN OR TWIST THE GAS DRYER ENDS WHEN INSTALLING OR SERVICING, AS THIS WILL RESTRICT THE AIRFLOW.

2.1.9 By-Pass Valve

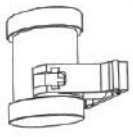
The By-Pass Valve shown in the diagram as **(03)** is activated during conditioning and cleaning phases. It vents the gas stream around the IR cell when required.

2.2 Electrical Enclosure

The enclosure on the right side as you face the analyzer is the electrical enclosure. See Figure 2-3

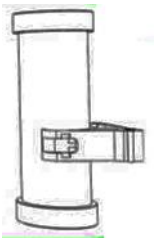
Figure 2-3: The Electrical Enclosure

2.2.1 Copper Filter



The copper filter (02) is located in the electrical enclosure immediately before the IR detector inlet. It is a plastic container filled with copper wool. The gas leaving the dryer tubing is forced through this device to prevent corrosive effects due to gases like chlorine or chlorine dioxide that could be generated in the oxidation stage.

2.2.2 Sodalime Filter



The sodalime filter (05) is located on the left side of electrical enclosure. It's a plastic container full of sodalime and it absorbs the carbon dioxide from atmospheric air providing the analyzer with CO_2 free air for its processes.

2.2.3 Pump Motor

The pump motors **M1**, **M2** and **M3** are positioned in the electrical enclosure, on the left side. See Figure 2-4. They drive multiple pump heads that move the sample and reagents through the different analyzer treatment stages.

Depending on the configurations there will be from three to six pump heads.

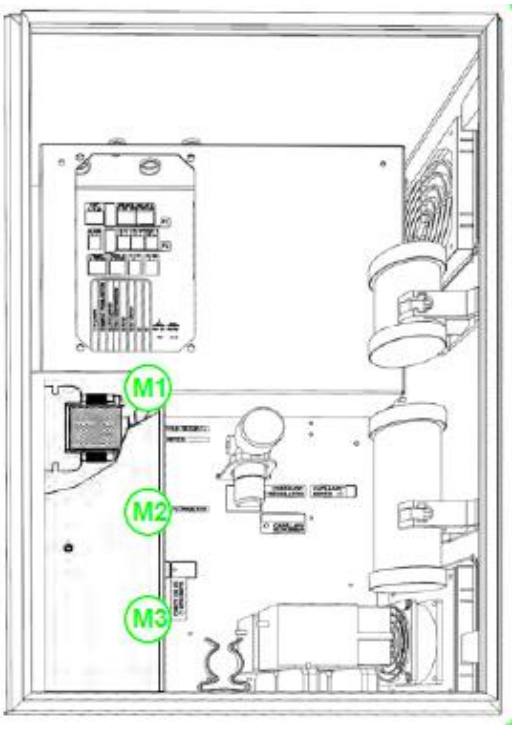
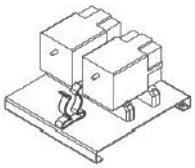


Figure 2-4: Motor Identification and Position

Pump Head	mL/rotation
14	0.21
16	0.8
15	1.7
24	2.8

Motor	RPM	Position	Driven Pumps
M1	05-06 rpm	Upper	Sample/resample
M2	1 rpm	Middle	Acid/persulfate/optional reducing reagent
M3	10-12 rpm	lower	Calibration/validation/cleaning

2.2.4 Air Compressors

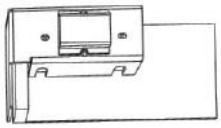


The air compressors (09) and (10) are located on the lower side of the electrical enclosure. Compressor (10) provides the sparging gas used in the scrubber and the counterflow gas in the dryer. The second compressor (09) provides the carrier gas for oxidation and detection stages. They eliminate the need for an external air treatment system and for compressed air as a requested utility.

2.2.5 Pressure Regulator, Capillary, and Flowmeter

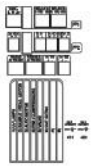
These devices (04) and (07) are located in the central part of the electrical enclosure with a pressure gauge on the front and are used to establish and regulate a highly precise and reliable carrier gas flow.

2.2.6 NDIR



The infrared detector (13) is located in the upper part of the electrical enclosure, on the right side. It is a PCB board fitted with a stainless steel cylinder (the IR cell). The NDIR is a Non Dispersive Infrared detector with high stability and reliability. The measuring scale of IR is related to the range of TOC analyzer.

2.2.7 User Connections



The 6700E Organic Carbon Analyzer provides the following outputs and electrical features:

- One 4-20 mA output (A01).
  (A second 4-20 mA output (A02) is available on dual channels analyzers).
- Two relays (RELAY A - programmable and RELAY B - fault)
- One extra relay (24Vdc)
- One digital input
- Level switch terminals
- RS485

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Installation

Installation of the Model 6700E Analyzer includes:

1. Unpacking
2. Mounting
3. Precommissioning
4. Electrical connections
5. Testing the system.

3.1 Unpacking the Analyzer

Carefully unpack the analyzer and inspect it for damage. Immediately report any damage to the shipping agent.

Use care when lifting or moving the analyzer for its weight is about 40 kg. Before moving the analyzer it is recommended that you manually empty the glass parts of liquids enclosure using an appropriate plastic syringe.

3.2 Location and Mounting

The analyzer should be moved to and installed in a suitable position. The location must be clean, covered and properly enclosed to provide good ventilation and a low dust concentration. Operating environmental conditions are: temperature between 5-45°C (41-113°F) at max 80% relative humidity.

Due to the chemicals used and waste gases it is absolutely necessary to choose a well ventilated location for the analyzer.

The Model 6700E Analyzer is supplied with four mounting brackets for wall or stainless steel support rack installation. Use 4 screws M8 to fix the analyzer.

The analyzer should be mounted to have the display at eye level for easier operations and access. See Figure 3-1 for dimensions.

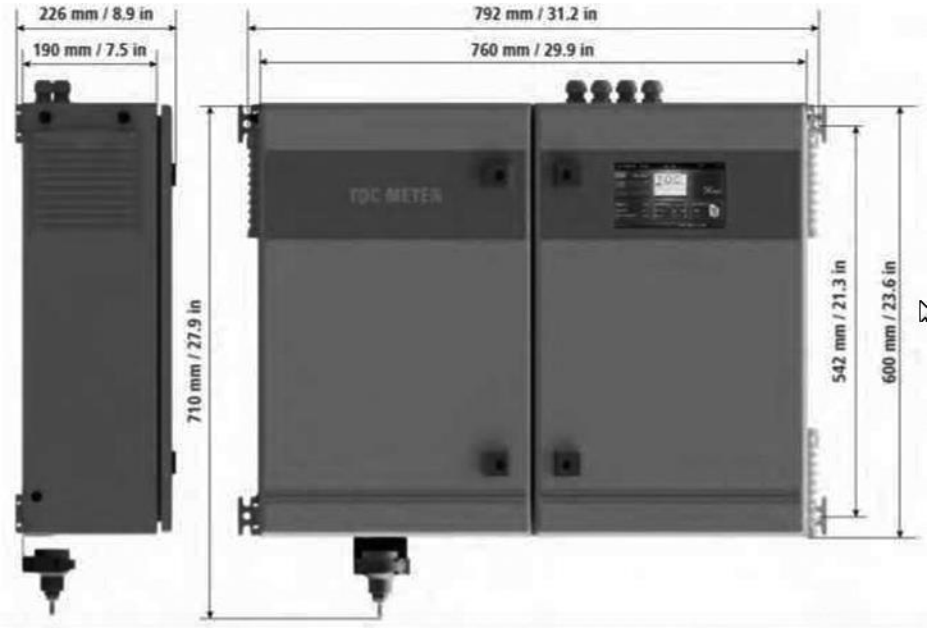


Figure 3-1: Analyzer Dimensions

3.3 Precommissioning

Below is a list of key points that must be followed for an ideal installation. See also Figure 3-2:

- The installation site should be as near the sampling point as possible to reduce any delay in response time.
- The drain line should be properly dimensioned and positioned at a downward slope to allow the analyzed sample and the overflow

coming from the external fast-loop reservoir (if the optional filtration unit is present) to drain via gravity. The drain pipe should be of a suitable size to accommodate the additional drainage from the filtration system fast-loop.)

- There should be adequate clearance of 20 cm on either side and 100 cm on the front.
- Sufficient space must be allotted for two 10 liters containers plus a 5 liter container beneath the analyzer. If necessary, the reagents containers could be positioned in a suitable basin in case of spills
- A dedicated waste gas line should be provided for safe venting ton atmosphere or in a well ventilated area.

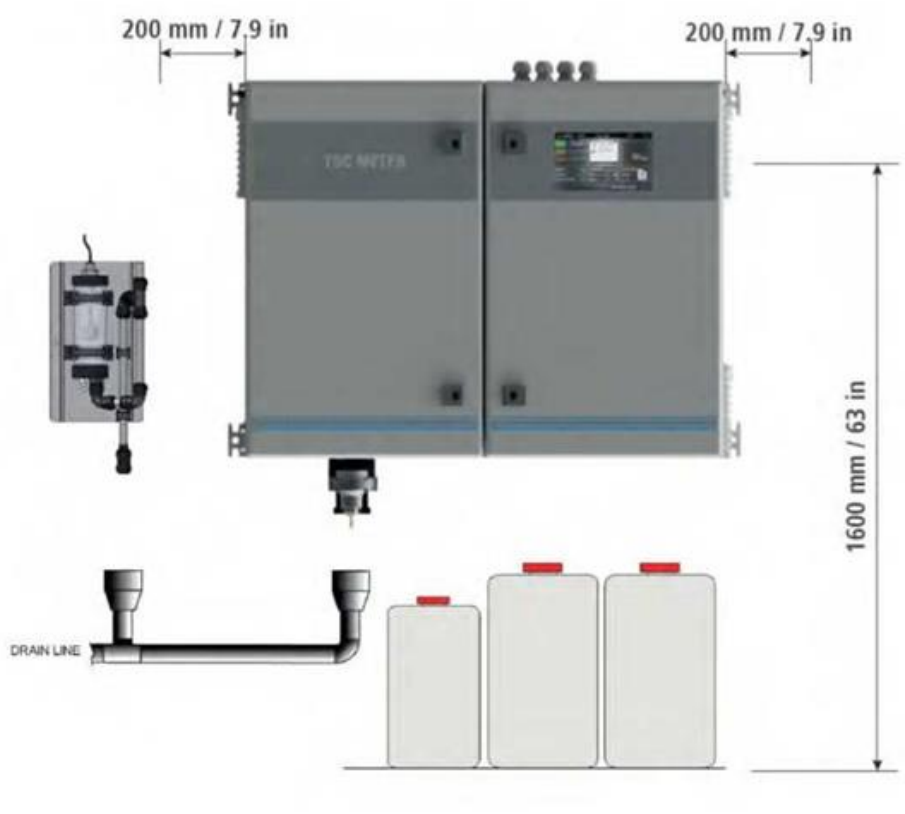


Figure 3-2: Drain Line Connections

WARNING: ***THE SAMPLE DRAIN MUST BE AT AMBIENT PRESSURE WITH NO RESTRICTION OR BACK PRESSURE.***

CAUTION: **DEPENDING ON THE SAMPLE COMPOSITION, OXIDATION COULD GENERATE HAZARDOUS GASES. IT IS ABSOLUTELY NECESSARY TO PROVIDE A SAFETY SYSTEM TO ALLOW WASTE GASES VENT TO THE ATMOSPHERE.**

3.4 Electrical Connections

All electrical connections should be made by qualified personnel in accordance with national or local codes and regulations.

Qualified Personnel means person who has been fully trained and has professional experience to avoid electricity hazards and dangers.

Service qualified personnel are to receive the special key to open the electrical enclosure.

A circuit breaker must be installed near the analyzer to allow easy and quick access for isolating power in case of an electrical problem and whenever service is performed on the analyzer.

It will be user's responsibility to periodically check and guarantee the efficiency of the analyzer's grounding.

CAUTION: **TO AVOID POTENTIAL FATAL ELECTRICAL SHOCK AND/OR ANALYZER DAMAGE ALWAYS DISCONNECT THE INPUT POWER BEFORE SERVICING THE ANALYZER.**

Figure 3-3 shows the location of the user connection panel within the Electrical Enclosure and Figure 3-3 identifies the connections.

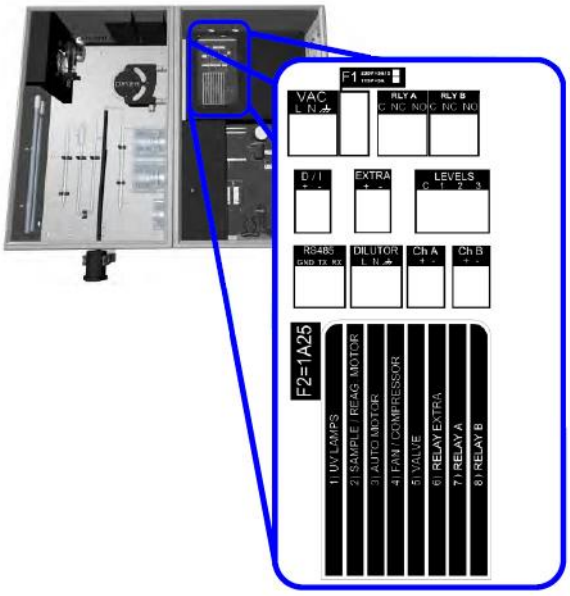


Figure 3-3: User Connection Panel Location

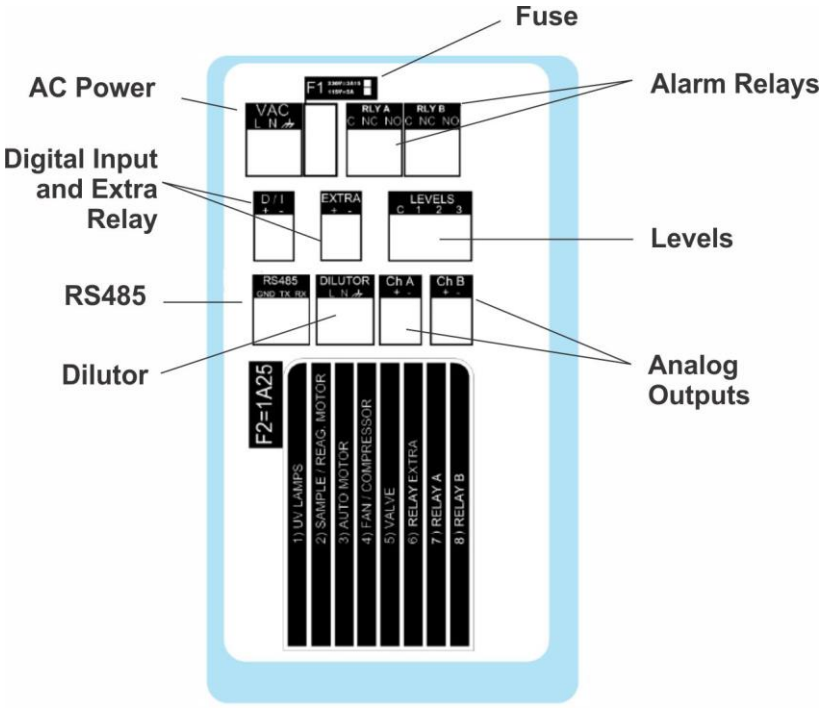


Figure 3-4: Electrical Connections

3.4.1 AC Power

The Model 6700E Analyzer is designed to operate from a 230VAC, 50/60 Hz power source. The unit ships with a 2 meter long power cord with an appropriate plug for your location. An optional configuration is available for use with 115 VAC 50/60 Hz power

The analyzer is delivered with the power cord line already connected at the user connection board as shown in Figure 3-4.

AC power enters the Electrical Enclosure from the top through the supplied power cord.

All the connections must be made in accordance with national or local regulations. It is recommended that the analyzer has its own dedicated circuit with a circuit breaker or an isolating switch installed near the unit.

3.4.2 Analog Output

The analyzer provides two optically isolated 4-20 mA analog outputs that are proportional to the measured concentration. Wiring connections use a twisted pair signal cable with shield connected to the A/01 or A/02 connector located on the user connection panel as shown in Figure 3-4.

3.4.3 Alarm Relays

The relays can be set as follows:

NO ALARM: C NC

ACTIVE ALARM: C NO

3.4.3.1 RELAY A

Relay A function is programmable from the general setup page. Listed below are the possible functions:

- Online (relay activated when analyzer is online).
- Offline (relay activated when analyzer is offline).
- Loss of sample (relay activated when loss of sample is detected).
- High alarm (relay is activated upon exceeding a setpoint

- Validation alarm (relay activated in case of validation alarm)
- Reagent alarm (relay activated in case of reagent's alarm)
- Calibration alarm (relay activated in case of calibration alarm)

3.4.3.2 RELAY B

Relay B is used as a fault alarm. Fault alarms occur when conditions arise that risk the analyzer giving incorrect results. They are as follows:

- Carrier gas flow too low
- Reagent levels too low
- Zero gas too high
- Emergency stop activated

3.4.4 RS 485

MODBUS RTU CONNECTION GUIDE		
RS 485 SETTINGS		
Baud Rate		9600
Data bits		8
Parity		E
Stop bit		1
PROTOCOL		
Slave I.D.		1
VALUES		
Address	format	alias
150	32-bits float (CD-AB)	result CH1
152	32-bits float (CD-AB)	result CH2
154	16-bit unsigned	analyzer status
STATUS VALUES		
Stand by		0
Conditioning (to drain)		3
Conditioning (purge detector)		4
Online		5
Zerogas		6
Zerogas		7
Auto Function		1
Stopped		8

3.4.5 Digital Input/Extra Relay

Digital input is a remote function available for the following features:

- Start / Stop
  The Digital Input's function is selectable by the user.

The Extra Relay is used for external operations. (24V DC available) for powering external devices. This output may be configured for separate ON and pause periods. The ON period is configurable between 1 and 99 seconds, the pause period is configurable between 1 and 999 minutes.

3.4.6 Levels

Level switch terminals:

Level 1 and Level 2 work according to the same logic as level switches left side connectors. An additional level (Level 3) can be configured using jumpers in order to be associated to 1, 2 or 1 & 2.

C is the common terminal.

3.4.7 External Dilutor Supply

This connections supplies 230/115 VAC to the external dilutor. It functions when the analyzer is in Conditioning and Online mode.

3.4.8 Fuses

The analyzer uses 2 fuses.

Fuse F1	Power Supply fuse	3.15A for 230 VAC 4A for 115 VAC
Fuse F2	IR Detector/Digital Flowmeter	1.25 A

3.5 Sample/Reagent Conections andTesting the System

Prior to starting the analyzer for the first time:

- Check the integrity and accuracy of the gas/liquid connections. Make sure there are no leaks.
- Check the integrity and accuracy of the electrical connections. Make sure there are no exposed conductors
- Connect the sample line inlet tubing (or filtered sample outlet coming from optional filtration system) to the fastloop reservoir (R) installed on the left side of the TOC analyzer
- Connect the drain fitting of the fastloop reservoir to the waste line
- Place the acid inlet tubing (red) in the phosphoric acid container beneath the analyzer and check that it is in the correct position at the bottom.
- Place the persulfate inlet tubing (white) in the sodium persulfate container beneath the analyzer and check that it is in its correct position at the bottom.
- Place the cleaning (or calibration or validation) solution inlet tubing (green) into the cleaning (or calibration or validation) solution container placed beneath the analyzer and check that it is in correct position beneath the analyzer.
- Connect the funnel beneath the analyzer to the waste DRAIN line.
- Check for sample presence in the fastloop reservoir and adjust the sample flowrate to 100-500 ml / min.
- Power up the analyzer. External fans, microprocessor and infrared analyzer should start.

Once started, the analyzer will proceed as follows:

- If the analyzer has been previously shut off from **ONLINE** status, it will start immediately with a conditioning cycle. The analyzer is totally operational but measurement and output

signals will not be accurate until the conditioning delay has expired.

- If the analyzer has been previously shut off from **STANDBY** status, it will stay in the **STANDBY** condition; to start the analyzer it is necessary to press the **ONLINE** button on the display panel. This forces the analyzer to start immediately with a conditioning cycle. The analyzer will be operational however measurement and output signals will not be accurate until the conditioning delay has expired.

After a few minutes it will be necessary to check:

- Sample presence in the scrubber and sample presence in the gas-liquid separator
- The drain is free with no restriction in the gas/liquid separator drain outlet. The drain tube must not be submerged and the exhausted sample must be free to flow via gravity.

*Note: It is not recommended to proceed with a **zero gas cycle** or **calibration cycle** until the analyzer has been online for 4/6 hours .*

Note: During analyzer's initial startup phase it is necessary to set either the cleaning (default) or validation or calibration as the default option.

This selection depends on the user's sample composition and characteristics: for dirty samples is highly recommended to use the default selection (cleaning) to avoid dirt accumulation inside the analyzer. This change should only made by qualified personnel.

When one option is selected as the automatic option the other two will be automatically disabled.

For example: if autocleaning is the automatic option enabled, then the autocalibration and autovalidation will be automatically disabled.

Operation

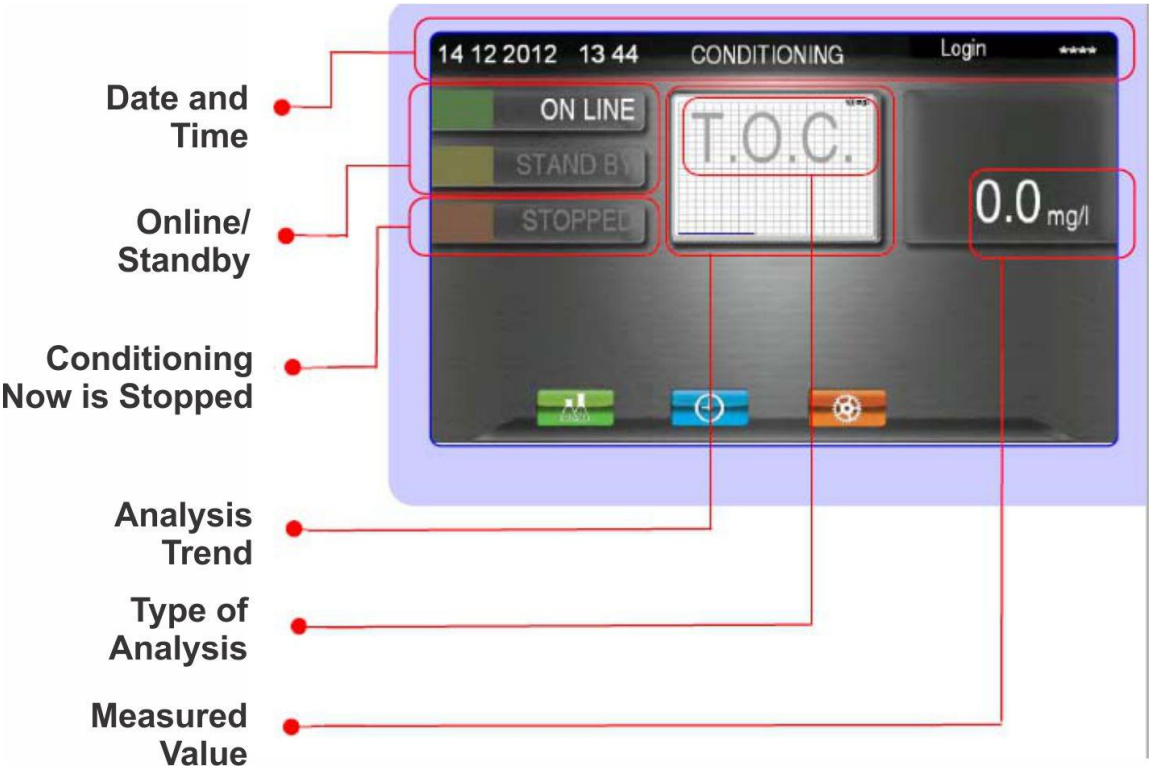
4.1 The User Interface

The user interface consists of the touchscreen on the front panel of the analyzer enclosure. All the output/input data, information, alarms and fault conditions are shown on the display and all the commands and settings are sent to the analyzer simply by pressing the touchscreen buttons.

The user interface is shown in Figure 4-1.

Figure 4-1: Various Interactive Screens from the User Interface

4.2 The Main Screen



The following functions are accessible from the main screen:

Date and time: Analyzer's status (online, conditioning, stopped, loss of sample...) Login **** window (two levels of password)

On Line/Standby: These commands (min. press 2 secs) starts or stops the analyzer (standby).

Stopped button: A read-only button which displays the status of the analyzer when it is stopped. To escape from Stopped condition (standby) press the Online or Standby button for 2 seconds.

Analysis Trend: This shows graphically the analyzer's value trend over time.

Type of Analysis: For example (TOC, TC, COD,...); Read only display.

Measured Value: Displays the measurement result. If the value is below 20, only one decimal place will be displayed.

4.2.1 Notepad Display

A result record is written every 3 min into a notepad that can be opened by touching the central result graph. In the notepad, data from the current day is shown. If an alarm condition is sensed by the analyzer the details will appear as a moving message at the bottom of the screen. The message will identify the type of the alarm and the time the alarm was activated. The message remains visible until the cause has been resolved.

4.2.2 Login

The login screen lets the user enter or create a password which will allow additional features of the analyzer to become available to the user.

Pressing the Login button on the top line of the main screen display allows the user to select:

- **BASIC**
- **ADVANCED**
- **SERVICE**

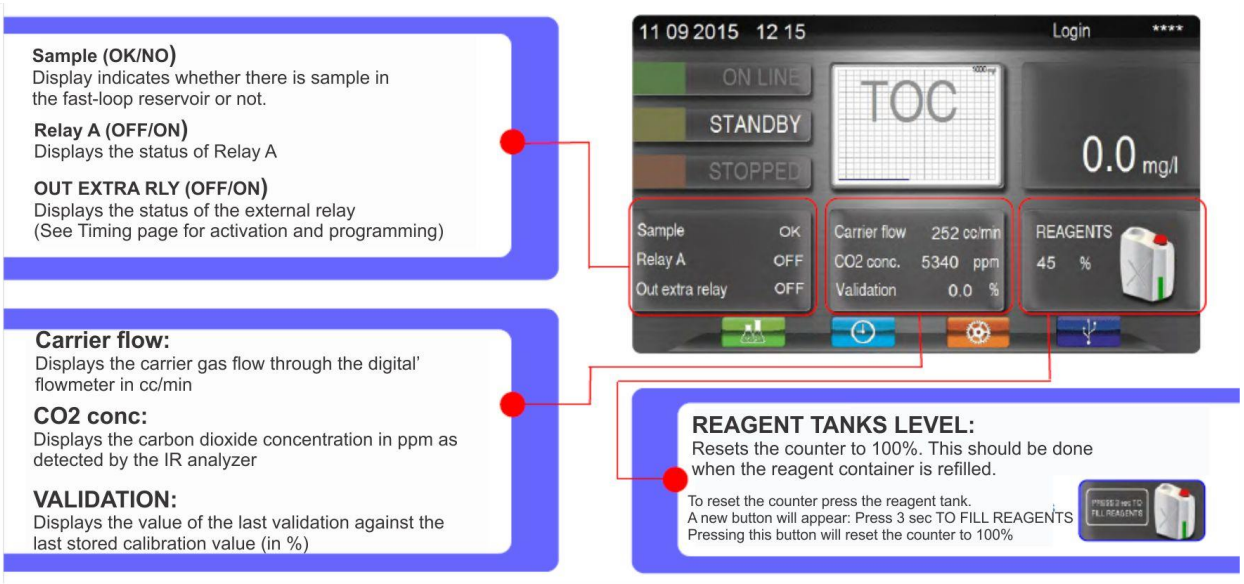
Pressing **** the user can enter a 4 digit password which will give access according to the password level selected from the drop down menu..

BASIC

ADVANCED (default password: 1111) allows access to calibration, timing and datalogger pages.

SERVICE This password is available from **Teledyne Customer Service** and is used to access the calibration, timing pages, and general setup pages plus the datalogger.

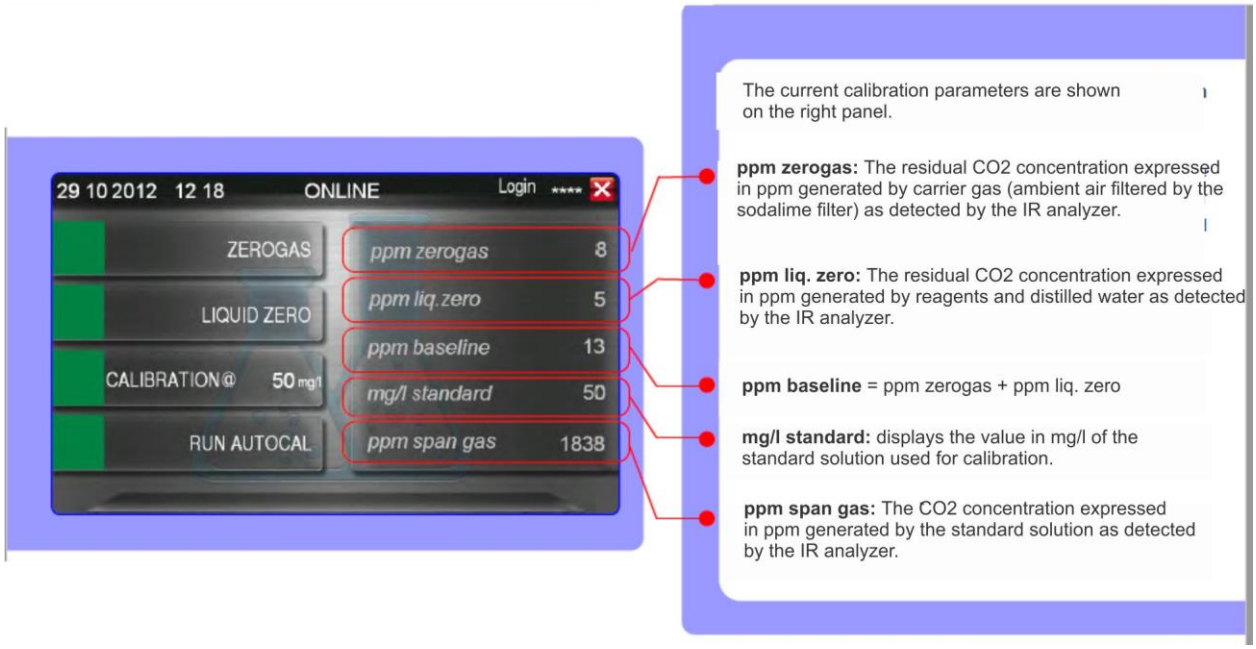
4.2.3 Main Screen and Process Values



4.3 Calibration Page

To enter the calibration page you must first enter the service password and then press the calibration button at the bottom of the main screen.

The following screen will appear:



Press **X** in the upper right corner of the page to return to the main page.

4.3.1 Zerogas

Pressing **Zerogas** starts a zerogas cycle and opens the zero calibration page.

The zero gas typically should be lower than 200 ppm.

The ZEROGAS value is expressed as CO2 ppm and is automatically stored in the analyzer database.

A ZEROGAS cycle can be performed automatically at the time and interval programmed in the timing menu or manually by pressing the **ZEROGAS** button for few seconds.

During a zerogas cycle the pumps and UV lamps are switched off and the carrier passes through to the NDIR. The CO2 concentration value displays in ppm as it is detected by the infrared analyzer and then decreases to a stable value after a programmed delay time. The resulting ZEROGAS value is the CO2 concentration in the zero gas.

The trend of the ppm of CO2 value over time as detected by the NDIR is shown together with a counter of the seconds programmed for the zerogas cycle, the measured CO2 value in ppm and the last zerogas value.

Frequent refreshing of this value is extremely important because the sodalime loses its capacity to adsorb CO2 from ambient air.

If the ZEROGAS exceed a certain preset limit, the “Zero too high” alarm will be triggered and the analyzer will display this alarm message.

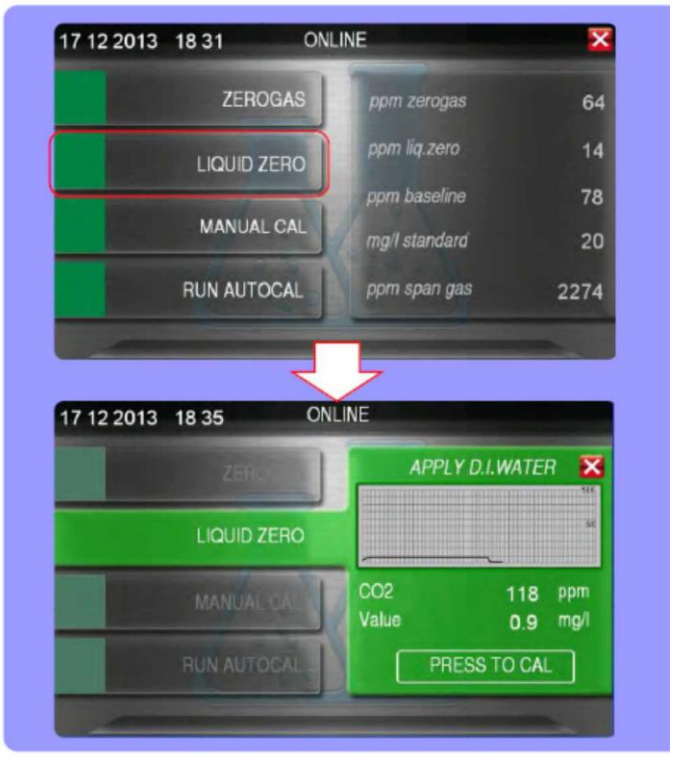
4.3.2 Liquid Zero

This function performs a zero calibration on the CO2 value in the distilled water. This calibration should be made manually every time the reagents are replaced and every time before a manual calibration.

The **LIQUID ZERO** cycle is performed by manually taking out the inlet tubing of the sample pump from the external fastloop reservoir and connecting it to the distilled water container (use an extension tube if necessary).

The distilled water is then pumped through the sample system until the operator decides that the CO2 concentration (in ppm) as detected by the infrared analyzer is stable.

To perform a Liquid Zero calibration, press the **LIQUID ZERO** button. the following screen will appear:



Wait for at least 30 minutes for a stable reading and then press the **PRESS TO CAL** button for few seconds. The screen will close and the CO2 concentration (ppm) as detected by the infrared analyzer will then be stored in the instrument.

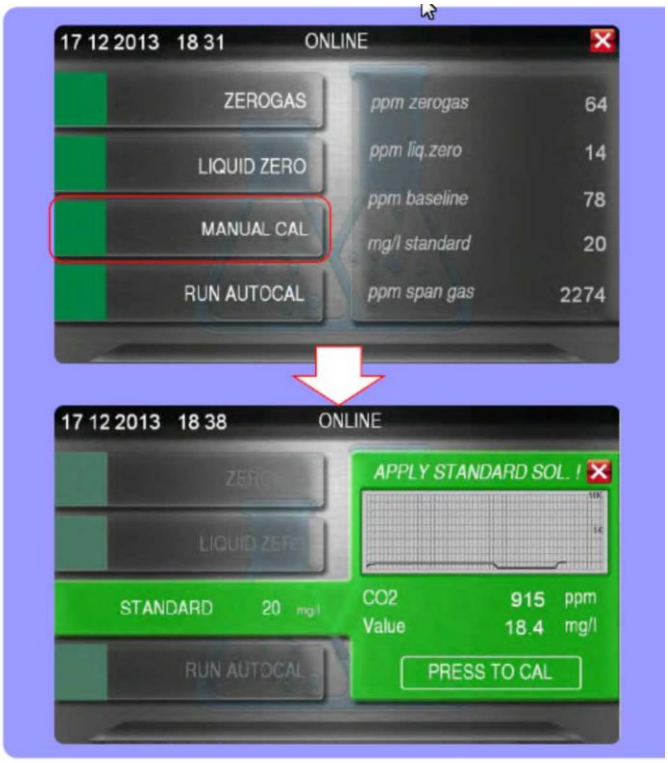
4.3.3 Manual Calibration

The Manual Calibration allows for storing the span CO2 value from the liquid span calibration procedure, performed with a standard solution using a manual procedure instead of a pre-programmed automatic calibration routine.

The suggested standard solution value to be used for calibration should be equal to at least 50% of analyzer full scale.

The CALIBRATION cycle is performed manually by taking out the inlet tubing of the sample pump from the external fast loop reservoir and connecting it to the selected standard solution container using an extension tube if necessary.

To begin the manual calibration press the MANUAL CAL button.



Press STANDARD to set the calibration solution value in mg/l. This will allow the standard solution to be pumped through the sample system. When the CO2 concentration value (in ppm) has stabilized, press the PRESS TO CAL button for few seconds. The screen closes, changes the last stored baseline value to the present span gas value.

If the CO2 concentration value detected by the infrared analyzer during the manual calibration is out of the tolerance range, the analyzer will abort the calibration and display an error message: “Calibration error” on the main page.

4.3.4 Auto Calibration (Autocal)

The Auto Calibration function allows the user to run a calibration cycle on a pre-programmed time schedule automatically. The schedule for auto calibration events is set in the Timing function. See Section 4.3.4.

To enable the Autocalibration function press RUN AUTOCAL from the last menu.

Use the same calibration solution as described in the Manual Calibration section above..

When enabled, the **AUTOCAL** cycle starts automatically at the time and interval programmed into the timing menu.

If autocalibration is the selected as the automatic option, the calibration pump **(11)** is switched on. The calibration solution is pumped from a container placed beneath the analyzer through the sample system for the number of minutes pre-programmed in timing menu.

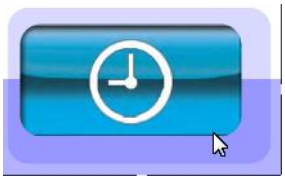
The CO2 concentration (in ppm) detected by the infrared analyzer will increase initially. A programmed delay is used to allow the concentration to stabilize at the known value of the calibration solution.

The screen updates the last stored value to the present span gas value.

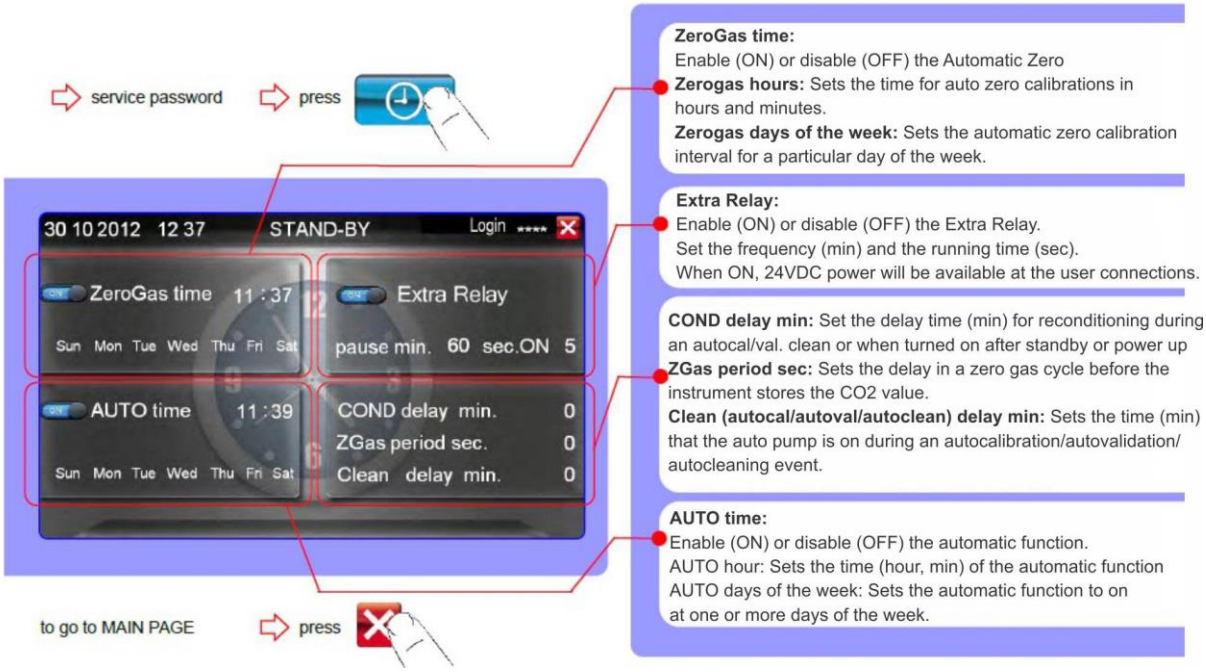
The trend of analysis values is displayed during the autocalibration cycle together with the CO2 measurement, last calibration stored, and the carrier flow.

To exit the RUN AUTOCAL screen, press the X in the top right corner of the screen.

4.4 Timing Page



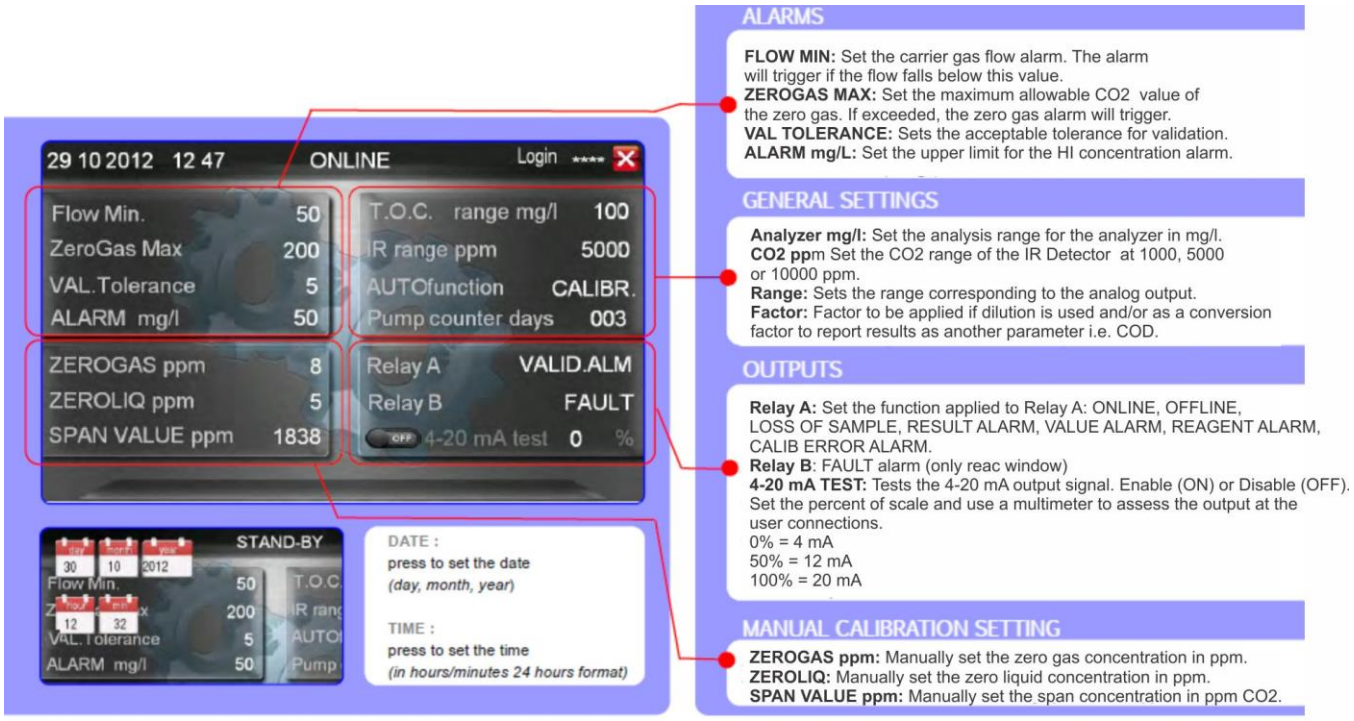
The Timing page requires a service password for access. Press LOGIN at the top of the main screen and then enter the service password. Once entered, press the Timing button on the main page. The following screen will appear:



4.5 Setup Page

The SETUP page allows the user to set various settings and properties of the analyzer.

To make changes on the Setup Page will require an Administrator password. From the MAIN page, press LOGIN, enter the Admin password and then press the SETUP icon.



To return to the MAIN page, press the red X in the upper right corner of the screen.

4.6 Data Logger Page

The DATA LOGGER Page requires a Service password. From the MAIN page, press LOGIN, enter the Service password and then press the DATA LOGGER icon.

The Result Notepad that is accessible from the MAIN screen shows results for the current day. Records for a longer time are stored on the instrument and can downloaded onto a USB stick.

Here results are recorded every 15 min for up to 30 calendar days. Once 30 days of data has been collected the files are overwritten on a FIFO basis.

To download results stored in the data logger you first need to insert a USB key.

Open the door of the electronic enclosure and insert a USB key into the port that is positioned on the cover behind the door.

Go to the data logger menu (violet USB logo),and press the button 

keeping it pressed until the software automatically exits back to the main screen. On the USB key there will now be a folder named 'datalog', and a second folder named ''TOC", where you will find one csv file for each day's data.

Additional buttons are available on the data logger screen.

CLEAR FIRST DAY – deletes the earliest day's data in the data logger memory.

CLEAR ALL – deletes all data in the data logger memory.

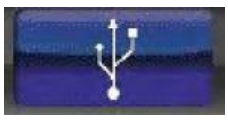
DTLG ON/OFF – switches on and off the data logger.

ALARM LOG - Alarm Log - It allows to access to the Alarm log page.

To return to the MAIN page, press the red X in the upper right corner of the screen.

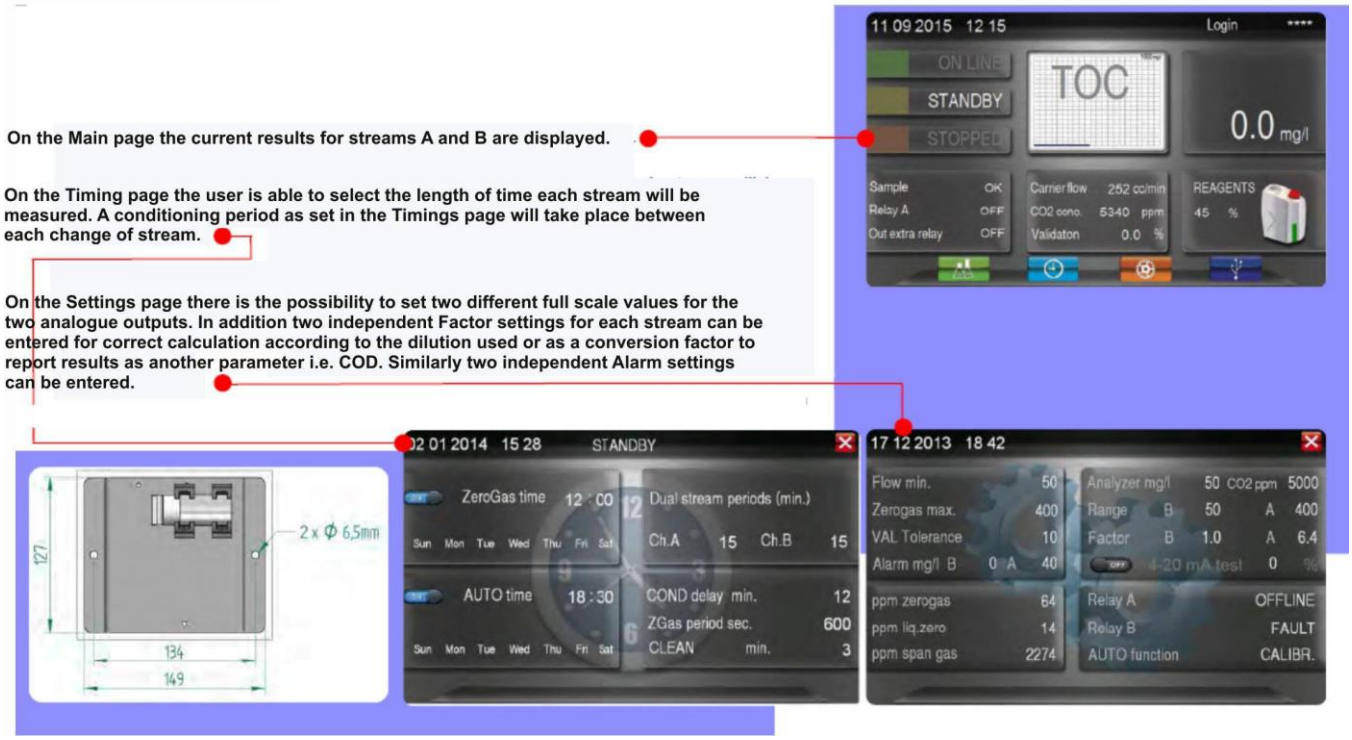
4.7 Alarm Log Page

The ALARM LOG Page requires a Service password. From the MAIN page, press LOGIN, enter the Service password and then press the DATA LOGGER icon followed by the ALARM LOG button.



4.8 Dual Stream Configuration Option

If the analyzer is configured as a dual channel instrument, the extra relay is used to control an external valve.



4.9 Dual Range Option

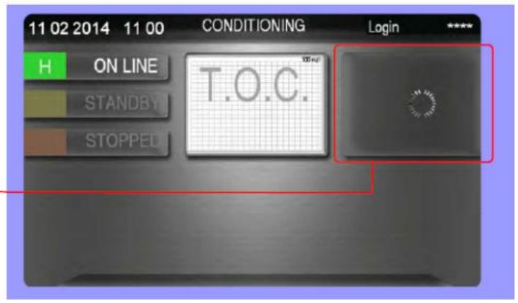
If the analyzer is configured as dual range instrument, the extra relay is used to control an external dilutor.

When the result exceeds the programmed threshold the analyzer will switch from range L (low) to range H (high) and the extra relay will be activated.

Every time the analyzer is turned ONLINE or after an OFF LINE operation (ZERO GAS, AUTOFUNCTION, LOSS OF SAMPLE), it starts from the high range condition (diluted sample).

A conditioning period will separate the two statuses during which no results will be displayed.

Conditioning Period Display



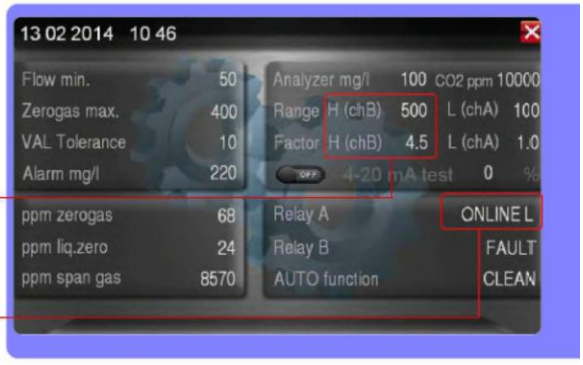
After conditioning the result is displayed on the high range.

The threshold for automatic range switching can be set within the DUAL RANGE function

Only the current range's analog output is active. The other outputs are forced to 0 (4mA)

External dilution factor determines the high range result calculation

Relay A can be used as for Range ID



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Maintenance

An adequate maintenance program to keep the analyzer clean and in good general condition is recommended for optimum analyzer performance.

Table 5-1: Maintenance Schedule

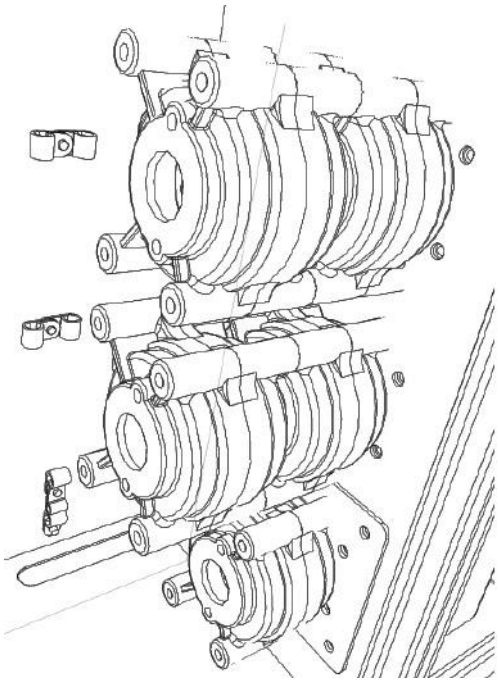
Operation	Frequency				
	Daily	Weekly	Monthly	Quarterly	Annually
Visual check of fault alarms	■				
Visual check of liquids enclosure for leaks	■				
Visual check of Halogen Filter	■				
Sample Fast Loop Reservoir cleaning		■			
Refill Reagents Containers			■		
Scrubber and Gas/Liquid separator cleaning			■		
Sodalime replacement in Sodalime Filter				■	
Copper wool replacement in Halogen Filter				■	
Pump tubing replacement				■	
UVR tubing connection check and leakage check				■	
Diagnostic check of Infrared Analyzer (qualified personnel only)					■
Analyzer general inspection (qualified personnel only)					■

5.1 Pump Tubing Replacement

The peristaltic pump heads are located in the Liquids Enclosure.

Before replacing the tubing, please read carefully Section 1 of this manual regarding hazards and dangers. It is recommended to wear appropriate clothing, gloves and eyes protection. Phosphoric acid, sodium persulfate and cleaning solutions should be handled with extreme care.

Proceed as follows:



a. With the analyzer in normal online operation, disconnect all solution and sample lines from their containers and reconnect them to a distilled water source. Leave the analyzer running in this way for at least an hour.

b. Place the analyzer in Standby. Pumps and UV lamps will be switched off.

c. Using the key, open the Liquids Enclosure.

d. Disconnect the pump tubing from their inlet and outlet fittings, taking care to note which fitting will be needed to reconnect to the correct pump.

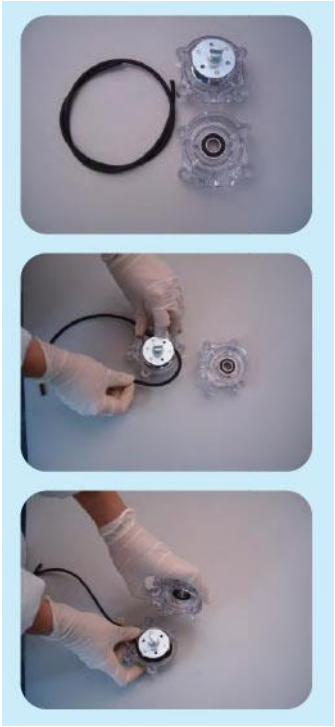
e. Undo the four wings nuts on the mounting screws that supports pump heads.

f. Slide the pump heads to left and remove them from the mounting screws.

g. Carefully separate the two halves, avoid dropping the rotor. Then remove the used tubing.

h. Place the pump half containing the rotor in one hand and move the rollers in the 2, 6 and 10 o'clock positions. Place tubing in the outer port and against the two rollers as shown while keeping your thumb on the tubing to hold it in place. Insert the tubing loading key on the back of the rotor shaft and push the rotor in as far as possible. The tubing should now be positioned deep into the pump head body. With the key firmly pressed against the

rotor, turn counterclockwise while pushing down until the tubing is fully in place around the rotor.



i. With the tubing in place, remove the key and position the other pump half onto the rotor shaft and snap it shut, being careful not to pinch the tubing between the plastic pump halves.

j. Check if the pump turns correctly using the key.

k. Holding the two parts of the pump head tightly together, slide it into the mounting screws moving the rotor block with the key or with a screwdriver until the shaft aligns with the motor drive.

l. Replace the four wing nuts, tightening them to finger tight to have a firm mounting of the pump head.

m. Repeat the steps from **D** to **L** for each additional pump head for where it is desired to replace the tubing.

n. Reconnect the acid and persulfate intake tubing to their containers, then run online the analyzer.

o. The analyzer will start the conditioning cycle. The status indicator will flash green until the conditioning time has expired. After the conditioning time of 30 minutes, the analyzer will start the normal online measurements.

5.2 Copper Wool Replacement

The Halogen Filter is located in the electrical enclosure. Replacing the copper wool should be made by qualified personnel.

To replace the copper wool in the filter:

a. Place the analyzer in standby mode, then open the analyzer electrical enclosure.
b. Disconnect the inlet and outlet tubing of the filter from their fittings.
c. Remove the filter plastic body from its support clamp.
d. Unscrew the top and bottom caps from filter body.
e. Using care and a proper tool, pull out the used wool from the plastic cylinder.
f. Replace the used wool with new wool and press it into place to form a compact pod.
g. Screw the top and bottom caps back on.
h. Place the filter in the clamp, connect fittings and turn the analyzer on.

5.3 Sodalime Replacement

The sodalime filter is located inside the electrical enclosure (refer section 1 for hazard warnings). This maintenance should be performed by qualified personnel.

WARNING: ***SODALIME (GRANULES) IS A STRONG OXIDIZER AND SHOULD BE HANDLED WITH EXTREME CARE. IT IS IRRITATING TO EYES, RESPIRATORY SYSTEM AND SKIN AND CAUSES BURNS.***

AVOID CONTACT WITH SKIN.
DO NOT BREATHE DUST.

WEAR SUITABLE GLOVES, FACE MASK, CLOTHES PROTECTION

Before proceeding with the sodalime replacement in the sodalime filter, please read the material safety data sheet supplied with this chemical and take all the appropriate precautions when handling this material.

Used sodalime must be disposed in accordance with national or local environmental regulations regarding hazardous and poisonous materials.

To replace the sodalime material:

a. Place the analyzer in standby mode and open the electrical enclosure.

b. Disconnect the inlet and outlet tubing from the filter.

c. Remove the filter plastic body from its support clamp.

d. Unscrew upper cap of the filter and pull out the wool disc. Then, with caution, discard the used sodalime in a proper container for disposal.

e. Fill the plastic body with new sodalime granules, insert the wool disc and screw the upper cap onto the filter.

f. Install the filter on its support clamp and reconnect inlet and outlet tubing. Then place the analyzer online.

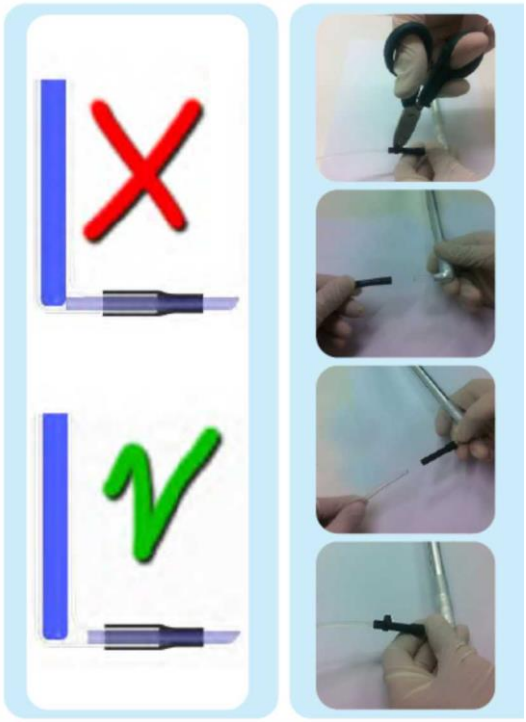
5.4 UV Tubing Connection Replacement

WARNING – UV LAMPS MAY BE HOT IF RECENTLY POWERED. HANDLE WITH SUITABLE GLOVES.

a. Place the analyzer in STANDBY mode.

b. Open the Liquid Enclosure.

c. Remove the UV lamps from their supports.



d. Cut the plastic clamp and the norprenetubing's connection and replace them with connectors.

e. Insert the Teflon tubing inside the quartz inlets and outlets of the UV lamps, taking care not to impede the liquid flow (see adjacent diagram).

f. The norprene tubing should cover the Teflon tubing and the arm of the quartz inlets/outlets of the UV lamps.

g. Use the black clamps supplied to fix the norprene tubing to the Teflon tubing.

h. Check that the clamp has been correctly positioned and that there are no leaks using a syringe with DI water connected at the same point used to drain the lamps.

i. If no leaks are found, then remount the UV lamps on their supports and switch on the analyzer.

j. Once the analyzer has been running for two hours check again for leaks at the connection to the UV lamps.

5.5 UV Lamp Replacement

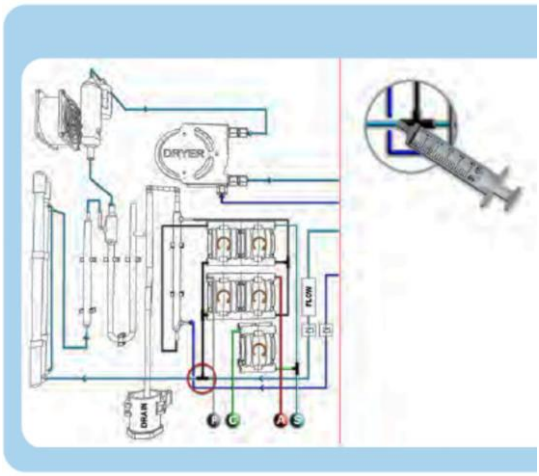
The UV lamps are located in the Liquid Enclosure.

WARNING – UV LAMPS MAY BE HOT IF RECENTLY POWERED. HANDLE WITH SUITABLE GLOVES.

a. With the analyzer in normal online operation, disconnect all solution and sample lines from their containers and reconnect them to a distilled water source. Leave the analyzer running in this way for at least an hour.

b. Place the analyzer in STANDBY. Switch off the power.

c. Using the key, open the Liquids Enclosure. Use a syringe to remove the remaining liquid from the UV lamps (see adjacent figure). Then reconnect the tubing to the tee.



d. Remove the wires from the cable guide at the top of the Liquid Enclosure.

e. Disconnect the UV lamp wires from the rear of the UV lamp power supplies, after first cutting the sleeve protecting the connection.

f. Remove the four screws supporting the lamps using a 3 mm Allen key or driver.

g. Cut the black clamp holding the tubing to the top and bottom of the lamps.

h. Connect the replacement lamps to the UV lamp power supply. First slip the supplied thermo–shrink sleeve over the end of the UV lamp wire. Then reconnect the wires with the UV lamp power supply and position the gains over the connections. Apply heat to contract the gain. The gain is required to protect the connection from humidity.

i. Reinsert the wires into the cable guide.

j. Reconnect the tubing to the top and bottom of the UV lamps following the instructions in Section 5.4.

5.5 Fuse Replacement

The fuses are located inside the analyzer electrical enclosure (refer to section 1 for hazards and dangers warnings).

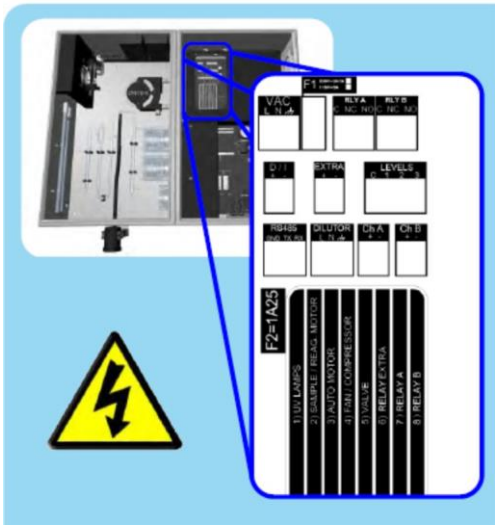
All operations in electrical enclosure should be made by qualified personnel in accordance with national or local codes and regulations.

Qualified Personnel means person who has been fully trained and has professional experience to avoid electricity hazards and dangers.

The Model 6700E analyzer has two fuses located within a compartment on the USER CONNECTIONS panel. These are labeled F1 and F2.

CAUTION: TURN OFF THE MAIN POWER TO THE ANALYZER BEFORE SERVICING THE ELECTRICAL ENCLOSURE.

a. Turn off main power.
b. Open the electrical enclosure door.
c. Remove the protection cover.
d. Remove the small protection cover of the fuse assembly.
e. Remove the fuse.
f. Check the fuse and if necessary replace it with a new one.



Chemical Preparation

The chemical solutions used with the Model 6700E analyzer in online standard operation are:

- Phosphoric acid, 10% solution v/v and sodium persulfate solution, 1M as reagents
- Standard solution in various concentrations depending on the analyzer range to calibrate or validate.
- Cleaning solution.
- Optional reducing reagent solution for applications involving high chloride content.

Before preparing these solutions, please read the material safety data sheets supplied with each chemical and take all the necessary precautions when handling the chemicals.

Chemicals must be handled by qualified personnel knowledgeable about the hazards and dangers associated with these materials..

Teledyne can supply all the chemicals required for operation as solutions or as pre-dosed packs.

6.1 Standard Solution Preparation

Use distilled water reagent grade in preparing the standard solutions and for the analyzer zero calibration.

Organic compounds usually used as standards are potassium hydrogen phthalate (KHP) reagent grade and ethylene glycol reagent grade.

Table 6.1 presents a list of other calibration solution compounds that have been approved for this use.

Before preparing the chosen solution, read the material safety data sheet and take the necessary precautions when handling the chemicals.

Always use suitable gloves, apron, and eye protection. When operating with powdered chemicals, wear a protective face mask or suitable respirator.

For standard solution preparation, prepare a stock solution by adding the quantity shown in Table 6.1 (according to the chosen compound and concentration in grams or ml) into a 1000 ml class A volumetric flask.

Dilute to volume with reagent water. If other concentrations are required, dilute accordingly or measure an appropriate ratio of the chemical.

Organic Compound	Amount
Ethylene glycol	2.33 ml
Potassium hydrogen phthalate (KHP)	2.12 g
Acetic acid	2.50 g
Sucrose	2.38 g

6.2 COD Standard Solution Preparation

Use distilled water reagent grade in the preparation of COD standard solutions and for the analyzer zero calibration.

Before preparing the chosen solution, read the material safety data sheet and take the necessary precautions when handling the chemicals. Always use suitable wears, gloves, and eyes protection. For use of powdered chemicals, wear a protective face mask or suitable respirator.

For 1000 mg/l standard solution preparation, prepare a stock solution by adding 0.85 g of potassium hydrogen phthalate (KHP) into a 1000 ml class A volumetric flask. Dilute to the required volume with reagent water. If other concentrations are required, dilute accordingly or take an appropriate ratio of KHP.

6.3 Persulphate Solution Preparation

Sodium persulphate is a strong oxidizer and should be handled with extreme care.

- Contact with combustible material may cause fire.

- Irritating to eyes, respiratory system and skin.
- May cause sensitization by inhalation and skin contact.
- Do not breathe dust.
- Avoid contact with skin.
- Wear suitable gloves, face mask, protective clothing and operate in an adequate environment.

Before preparing the sodium persulfate solution, please read the material safety data sheet and take the necessary precautions when handling the chemicals.

To make up the solution, add 5 liters of distilled water in a 10 liter container that has been previously cleaned and flushed with distilled water. Then add 2380 g. sodium persulfate and dilute to a 10 liter volume with distilled water, dissolving the powder by shaking. Seal the container and shake until all the persulfate has dissolved.

Wait for at least half an hour until the solution appears clear .

Consumption: 10 L/month for continuous operation.

6.4 Acid Solution Preparation

Phosphoric acid is a corrosive material and must be handled with extreme care.

- It can cause blindness and burns to the skin.
- Always wear chemical eye and clothes protection when handling.
- Avoid contact with skin.

Before preparing the phosphoric acid solution, please read the material safety data sheet and take the necessary precautions when handling the chemicals.

WARNING: ALWAYS ADD ACID TO WATER AND NEVER THE REVERSE.

Add 8 liters of distilled water in a 10 liter container that has been previously cleaned and flushed with distilled water. **SLOWLY** and with extreme care add 1175 ml. of 85% phosphoric acid and then dilute to 10 liter volume with distilled water to have a 10% solution.

Seal the container and shake the solution with care.

Note: When the quantity of TIC in the sample is high it is suggested to use a 20% phosphoric acid solution.

Consumption: 10 L/month for continuous operation.

6.5 Reducing Solution Preparation

Before preparing the reducing solution, please read the material safety data sheet and take the necessary precautions when handling the chemicals involved.

Add 8 liters of distilled water in a 10 liter container that has been previously cleaned and flushed with distilled water. Add 200 g hydroxylamine hydrochloride and dilute to 10 liter volume with distilled water.

Cap the container and dissolve the powder by agitating the container until the solution appears clear.

Consumption: 10 L/month for continuous operation.

6.6 Cleaning Solution Preparation

Before preparing the cleaning solution, please read the material safety data sheet and take the necessary precautions when handling the chemicals involved. Always wear eye protection as well as gloves and clothes protection when handling any chemicals involved.

The most suitable cleaning solution will depend on the specific application due to chemical and physical characteristics of the sample and the chemical compatibility of the analyzer materials.

Initially, unless a known cleaning solution is available for the specific application, it is recommended to use a 5% sulfuric acid solution. When searching for a good cleaning solution to use, consider

the different analyzer parts inherent in the sample system and take note of the points the sample system that progressively become more and more contaminated with dirt or other debris. In addition, try to establish the best interval for your cleaning cycle to optimize the dirt removal at these points.

Contact Teledyne Customer Service for any questions on this matter.

6.7 TC Reagent Solution Preparation

Sodium persulphate is a strong oxidizer and should be handled with extreme care.

- Contact with combustible material may cause fire.
- Irritating to eyes, respiratory system and skin.
- May cause sensitization by inhalation and skin contact.
- Do not breathe dust.
- Avoid contact with skin.
- Wear suitable gloves, face mask, protective clothing and operate in an adequate environment.

Before preparing the sodium persulfate solution, please read the material safety data sheet and take the necessary precautions when handling the chemicals.

WARNING: ALWAYS ADD ACID TO WATER AND NEVER THE REVERSE.

Add 7 liters of distilled water in a 10 liter container that has been previously cleaned and flushed with distilled water. **SLOWLY** and with extreme care add 1175 ml. of 85% phosphoric acid and dilute to a 10 liter volume using distilled water to arrive at a 10% solution.

Seal the container and shake with care to fully mix the acid with the water.

Add 2380 g. sodium persulfate, dissolving the powder by shaking. Seal the container and shake until all the persulfate is dissolved.

Wait for at least half an hour until the solution appears clear.

Consumption: 10 L/month for continuous operation.

Analyzer Shut Down

Rather than having the analyzer shut down for a short period (from 1 hour to 3 days) it is preferable to have the analyzer remain in continuous operation, if possible. The lamps should not be lit without liquid flowing through them and frequent switching on and off of the power should be avoided.

In this case it is recommended to disconnect all solution and sample lines from their containers and reconnect them to a distilled water source, and leave the analyzer running.

7.1 Log Duration Shutdown Procedure

For longer shutdown period, proceed as follows:

1. Disconnect all solution and sample lines from their containers and reconnect them to a distilled water source, leaving the analyzer running.
2. Under this condition, run the analyzer for at least 1 hour.
3. After 1 hour, place the analyzer on STANDBY.
4. Remove power from the analyzer by disconnecting the plug from the power line.
5. Dispose of remaining reagent solutions and standards according to local regulations.

If the analyzer is to moved or shipped to a new location then all liquid should be removed beforehand.

1. Proceed as above to rinse the analyzer with distilled water.
2. After 1 hour remove the tubing from the distilled water and run the analyzer for another 30 min.
3. Place the analyzer in STANDBY. Switch off the power.
4. Remove the remaining liquid from the U-tube by taking off the cap on the right arm and pulling any remaining liquid out using a suitable syringe and tubing.

5. Use a syringe to remove the remaining liquid from the UV lamps. Reconnect the tubing to the tee when finished.

Problem	Probable Cause	Check	Corrective Action
Fault Alarm	Loss of sample	Check for sample presence in the fastloop reservoir	Restore sample flow
	Low flow / reactor carrier gas	Check carrier gas flow value(cc/min)	Check carrier gas line coming from air compressor **(09)** to UV reactor outlet tubing for blockage and/or failure.
	Span calibration/ validation failed	Repeat calibration / validation	Check delivery of standard solution and persulfate. Prepare a fresh standard solution and double check its correct value. Verify that the infrared detector is working properly.
	Zero gas calibration failed	Repeat zero calibration and check the CO2 value (ppm).	Replace sodalime in sodalime filter. Check the gas line is free from obstruction from condenser to NDIR. Verify that the infrared detector is properly working
	Loss of reagents	Check the reagents 'tank level. Check reagents days counter	Check the reagent level in their containers Reset reagent counter.

Appendix

A.1 Specifications

TAI Sales Order Number:

Instrument Serial Number:

Sample System:	Per application.
\ **Inlet Pressure:**	Atmospheric
Outlet Pressure:	Atmospheric
Sample Flow rate:	100-500 ml/min (fast loop reservoir)
Sample Tubing:	Fast-loop reservoir fitting with flexible tubing 6 mm.
Range:	0-5 to 0-20000 mg/l (with dilution) Other ranges upon request.
Response Time:	From 5 min. depending on range.
Accuracy:	+/- 2% of full scale for non diluted ranges. +/- 4% of full scale for diluted ranges.
Repeatability:	+/- 4% of full scale for diluted ranges.
Drift:	less than 2% with autovalidation

Auto Cal/ Cleaning/Validation:
Selectable (specific pump head)

Power:	115-230 VAC 50/60 Hz
Power Consumption:	Max. 350 VA for 115 VAC or 250 VA for 230 VAC
Fuses:	3.15 A (230 V), 4A (115V)
Mounting:	Wall or support rack
Environmental:	5-45°C (41-113°F)

Humidity:	0-80%
Cabinet:	Cold rolled epoxy coated steel
Dimensions:	760 x 600 x 210 mm / 29.9 x 23.6 8.3 in
Weight:	37 kg / 81.57 lbs (approx.)
Reagents Consumption:	10 L per 28 days
Analog Output:	Two 4-20 mA optically isolated
Alarms:	2 SPDT contacts. Relay A is programmable (online, offline, loss of sample, result alarm, validation alarm, reagent alarm, calibration alarm. Relay B is a fault alarm

A.2 Spare Parts List

QTY	P/N	DESCRIPTION

IMPORTANT: Orders for replacement parts should include the model number, serial number, and range of the analyzer for which the parts are intended.

Orders should be sent to:

TELEDYNE ELECTRONIC TECHNOLOGIES
Analytical Instruments

16830 Chestnut Street
City of Industry, CA 91748

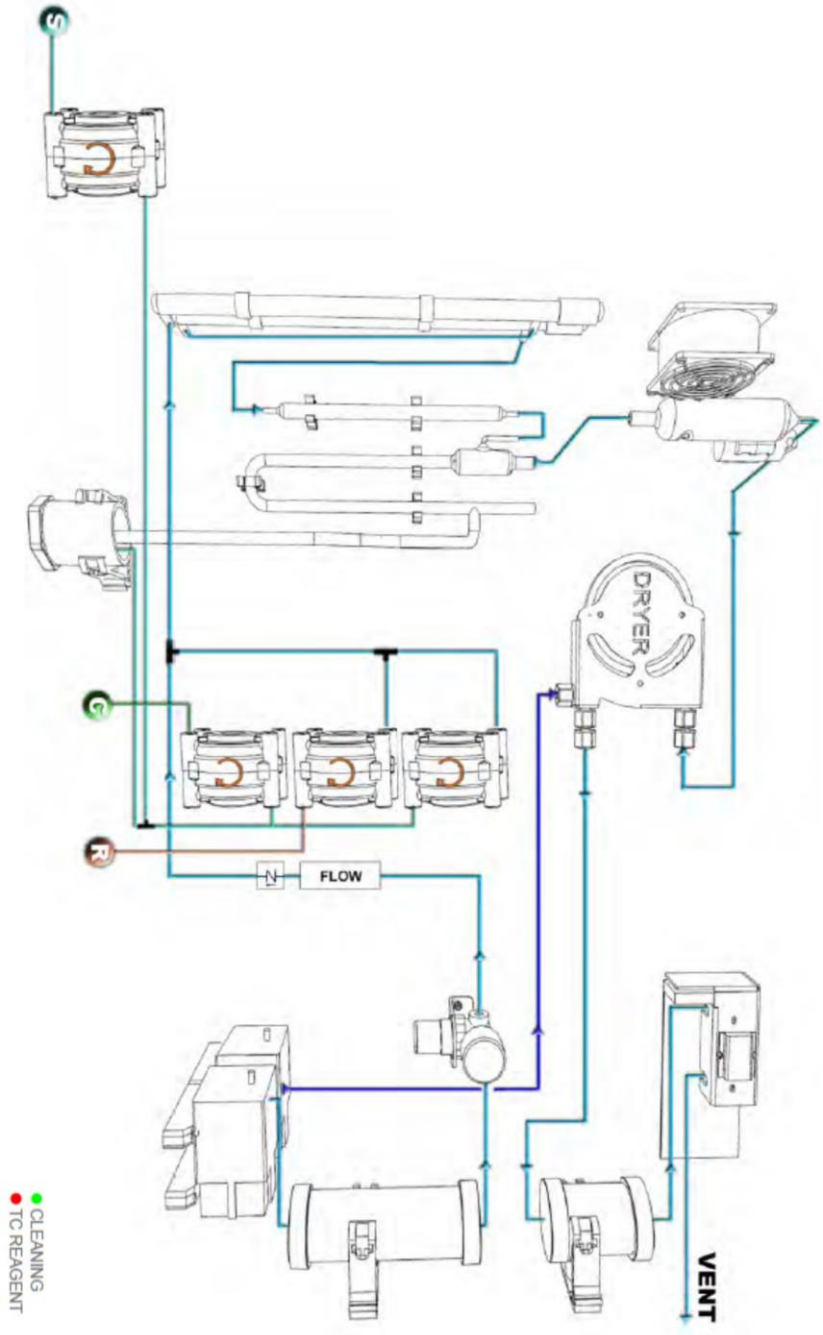
Telephone: (626) 934-1500
Fax: (626) 961-2538

Web: www.teledyne-ai.com
or your local representative

email: ask_tai@teledyne.com

A.3 Drawing List

TC Flow Diagram



Flow Diagram Using External Carrier Gas