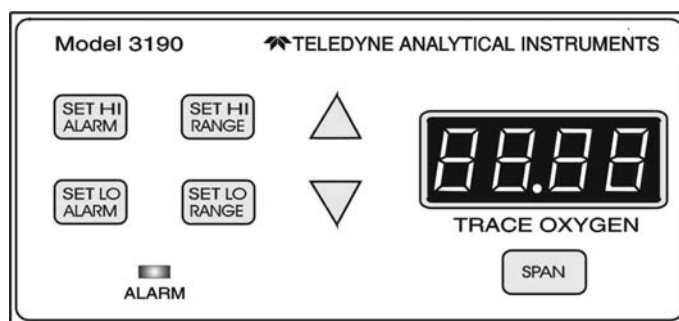

OPERATING INSTRUCTIONS FOR

Model 3190Z

Trace Oxygen Analyzer



P/N M3190Z

6/09/09



DANGER



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

Copyright © 2009 Teledyne Instruments/ Analytical Instruments

All Rights Reserved. No part of this manual may be reproduced, transmitted, transcribed, stored in a retrieval system, or translated into any other language or computer language in whole or in part, in any form or by any means, whether it be electronic, mechanical, magnetic, optical, manual, or otherwise, without the prior written consent of Teledyne Instruments / Analytical Instruments, 16830 Chestnut Street, City of Industry, CA 91749-1580.

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.

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: THE ANALYZER SHOULD ONLY BE USED FOR THE PURPOSE AND IN THE MANNER DESCRIBED IN THIS MANUAL.



IF YOU USE THE ANALYZER 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.

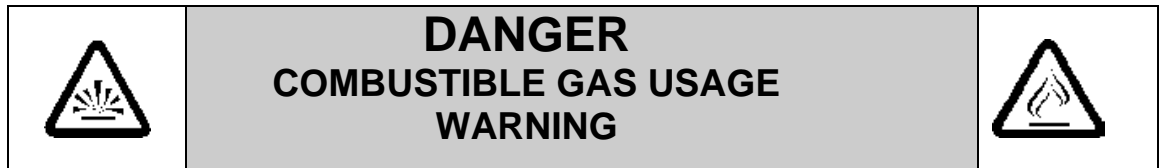
Occasionally, some instruments are customized for a particular application or features and/or options added per customer requests. Please check the front of this manual for any additional information in the form of an Addendum which discusses specific information, procedures, cautions and warnings that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

Table of Contents

Safety Messages	iii
Introduction	1
1.1 Overview	1
1.2 Main Features of the Analyzer	1
1.3 Front Panel Description	2
1.4 Rear Panel Description	3
Operational Theory	7
2.1 Introduction	7
2.2 Zirconium Oxide Sensors	7
2.2.1 Principles of Operation	7
2.2.2 The Effect of Pressure	8
2.3 Electronics	8
2.3.1 General	8
2.3.2 Signal Processing	9
3.1 Unpacking the Analyzer	11
3.2 Location and Mounting	12
3.2.1 Control Unit Installation	12
3.2.2 External Probe Installation	12
3.3 Electrical Connections	12
3.4 Gas Connections	16
3.5 Installation Checklist	16
Operation	17
4.1 Introduction	17
4.2 Using the Function and Data Entry Buttons	18
4.3 Setting the Analysis Ranges	18
4.3.1 HI Range	19

4.3.2 LO Range	19
4.4 Setting the Alarm Setpoints	19
4.4.1 HI Alarm	19
4.4.2 LO Alarm	19
4.4.3 Sensor Fail Alarm	20
4.5 Selecting a Fixed Range or Autoranging	20
4.6 Calibration	20
4.7 LED Display on StartUp	21
Maintenance	23
5.1 Replacing the Fuse	23
5.1.1 AC Powered Units	23
5.1.2 DC Powered Units	24
5.2 Sensor Installation or Replacement	24
5.2.1 When to Replace a Sensor	24
A.1 Specifications	25
A.2 Spare Parts List	26
A.4 Miscellaneous	27



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 Instruments/ Analytical Instruments, referred as TI/AI, no responsibility by TI/AI, its affiliates, and agents for damage or injury from misuse or neglect of this equipment is implied or assumed.

(This page intentionally left blank)

Introduction

1.1 Overview

The Teledyne Electronic Technologies Analytical Instruments (TETAI) Model 3190Z is a microprocessor-based trace oxygen analyzer for real-time measurement of trace amounts of oxygen in inert gases, or in a wide variety of gas mixtures. It features simple operation, fast response, and a compact, rugged construction.

1.2 Main Features of the Analyzer

The main features of the analyzer include:

- High resolution, accurate readings of oxygen content from 0-10 parts per million (ppm) through 0-1,000 ppm. Large, bright, light-emitting-diode meter readout
- Simple pushbutton controls
- Advanced Zirconium Oxide measuring technology sensors
- Fast response and recovery time
- Microprocessor based electronics: 8-bit CMOS with on-board RAM and 16 KB ROM
- Two user selectable ranges (depending on sensor configuration) allow best match to user's process and equipment
- Operator can select auto-ranging, allowing the analyzer to automatically select the proper preset range for a given measurement or lock the analyzer onto a single range
- Two concentration alarms with adjustable set-points
- Three analog outputs: two for measurement (0–10 VDC and negative ground 4–20 mADC) and one for range identification (0-10 VDC).

- Compact and rugged control unit with flush-panel case. Designed for indoor use. Front panel NEMA-4 rated.
- External probe

1.3 Front Panel Description

All controls and displays except the power switch are accessible from the front panel. See Figure 1-1. The front panel has seven pushbutton membrane switches, a digital meter, and an alarm indicator LED for operating the analyzer. These features are described briefly here and in greater detail in Chapter 4 - *Operation*.

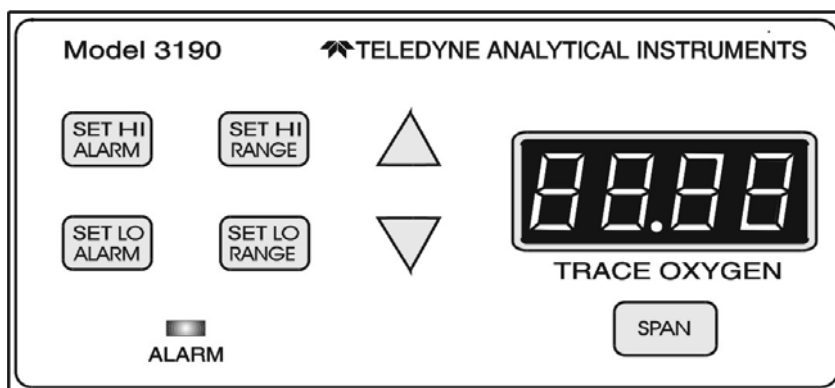


Figure 1-1: Front Panel

Function Keys: Seven pushbutton membrane switches are used to select the function performed by the analyzer:

- **Set HI Alarm** Set the concentration ABOVE which an alarm activates.
- **Set LO Alarm** Set the concentration BELOW which an alarm activates.
- **Set HI Range** Set the high analysis range for the instrument (up to 0-1,000 ppm).
- **Set LO Range** Set the low analysis range for the instrument (down to 0-1,000 ppm).
- **Span** Span-calibrate the analyzer.

Data Entry Keys: Two pushbutton membrane switches are used to manually change measurement parameters of the instrument as they are displayed on the LED meter readout:

- **Up Arrow** Increment values of parameters upwards as they are displayed on the LED readout.
- **Down Arrow** Increment values of parameters downwards as they are displayed on the LED readout.

Digital LED Readout: The digital display is a LED device that produces large, bright, 7-segment numbers that are legible in any lighting environment. It has two functions:

- **Meter Readout**
As the meter readout, it displays the oxygen concentration currently being measured.
- **Measurement Parameters Readout**
It also displays user-definable alarm set-points, ranges, and span calibration point when they are being checked or changed.

1.4 Rear Panel Description

The rear panel contains the electrical input and output connectors. Separate rear panel illustrations are shown in Figure 1-2 for the AC and DC powered versions of the instrument. The connectors are described briefly here and in detail in the Chapter 3 - *Installation*.

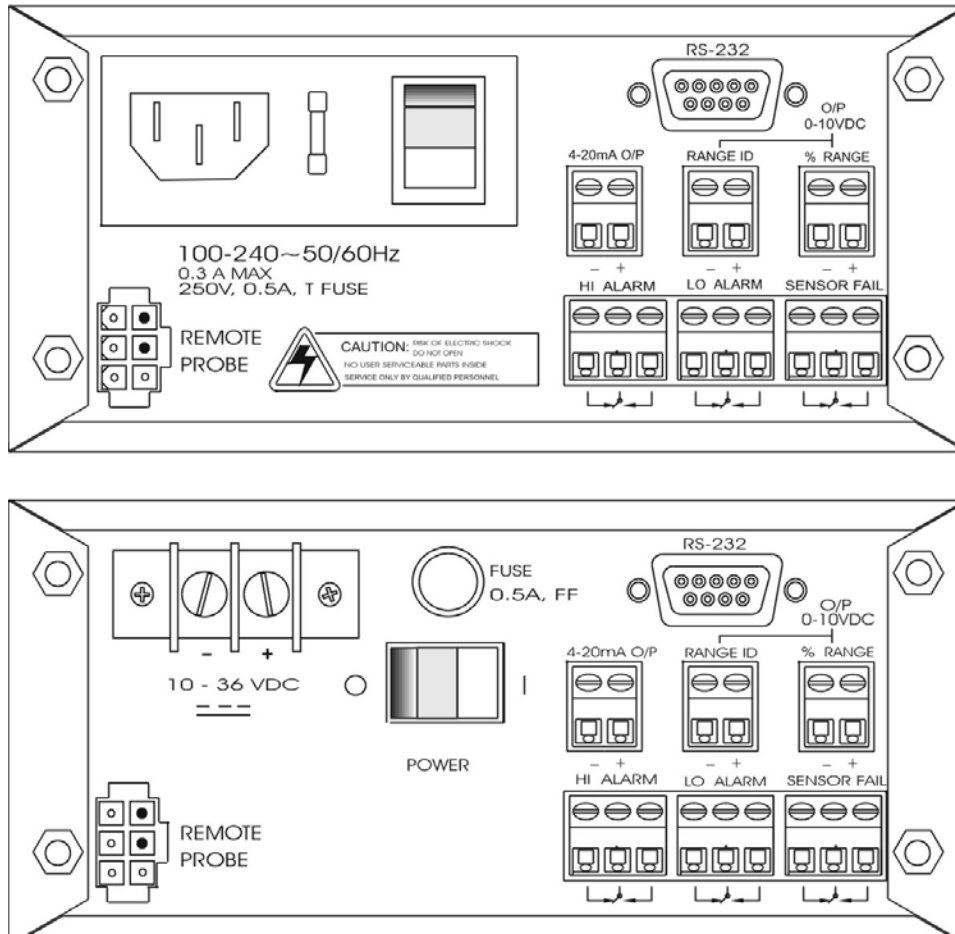


Figure 1-2 Rear Panel (AC and DC versions)

▪ **Power Connection**

AC version: 100–240 VAC, 50/60 Hz. The connector housing includes the fuse holder and the power switch.

DC version: Requires 10 - 36 VDC.

Fuse Holder: Replacing the fuse is described in Chapter 5 - *Maintenance*.

I/O Power Switch: Turns the instrument power ON (I) or OFF (O).

- **Analog Outputs** 0–10 VDC concentration output.
0–10 VDC Range ID (or optional over-range) output.
4–20 mADC concentration output, negative ground.
- **Alarm Connections** HI Alarm, LO Alarm, and Sensor Failure Alarm connections.
- **RS-232 Port** Serial digital output of concentration and range signals.
- **External Probe** Connects to the remote probe or remote analysis unit.

(This page intentionally left blank)

Operational Theory

2.1 Introduction

The analyzer is composed of three subsystems:

1. Analysis unit with zirconium oxide sensor(s)
2. Control unit with signal processing, display and controls
3. Interface unit, supplying signals between 1 and 2.

The analysis unit is designed to accept the sample gas and direct it to the sensitive surface of the zirconium oxide sensor.

The control unit processes the sensor output and translates it into an electrical concentration, which supplies the customer with range, alarm outputs, and a meter readout giving the trace oxygen level. It contains a microcontroller that manages all signal processing, input/output, and display functions for the analyzer.

The interface unit receives power from the control unit, and creates precision heater and bias voltages for the zirconium oxide sensor.

2.2 Zirconium Oxide Sensors

2.2.1 Principles of Operation

Teledyne's zirconium oxide sensor is a miniature solid state sensor. It uses a stabilized zirconia disc as an electrolyte with a sensing electrode (the cathode) and a counter electrode (the anode) on each side of the disc. The zirconia is heated to a temperature of about 500°C via a built-in heater. By applying a suitable reference voltage across the cathode and anode, the heated zirconia acts as an electrolyte which is capable of moving oxygen ions within its crystalline structure. This allows for the reduction of oxygen molecules reaching the cathode and the generation of a current equivalent to the amount of oxygen in a sample measured in parts per million (ppm).

The sensor is designed for long term stability with an operating life of 5 years.

This unit features one or two sensors, and can be custom-designed for a specific range of oxygen analysis.

2.2.2 The Effect of Pressure

In order to state the amount of oxygen present in the sample as a specific portion of the gas mixture, it is necessary that the sample diffuse into the sensors under constant pressure.

If the total pressure increases, the rate that oxygen reaches the sensors will also increase. The electron transfer, and therefore the external current, will increase, even though the proportion of oxygen has not changed. It is therefore important that the sample pressure at the sensors, (usually vent pressure) remain relatively constant between calibrations.

2.3 Electronics

2.3.1 General

The signal processing uses a microcontroller with on-board RAM and ROM to control all signal processing, input/output, and display functions for the analyzer. System power is supplied from a universal power supply module designed to be compatible with most international power sources.

The power supply circuitry is on the Power Supply PCB, which is mounted vertically, just behind the rear panel of the control unit.

The signal processing electronics, which includes the signal amplifiers, microcontroller, analog to digital converter, and digital to analog converter, are located on the Main PCB. It is mounted vertically just behind the front panel of the control Unit.

2.3.2 Signal Processing

Figure 2-4 is a block diagram of the signal processing electronics described below.

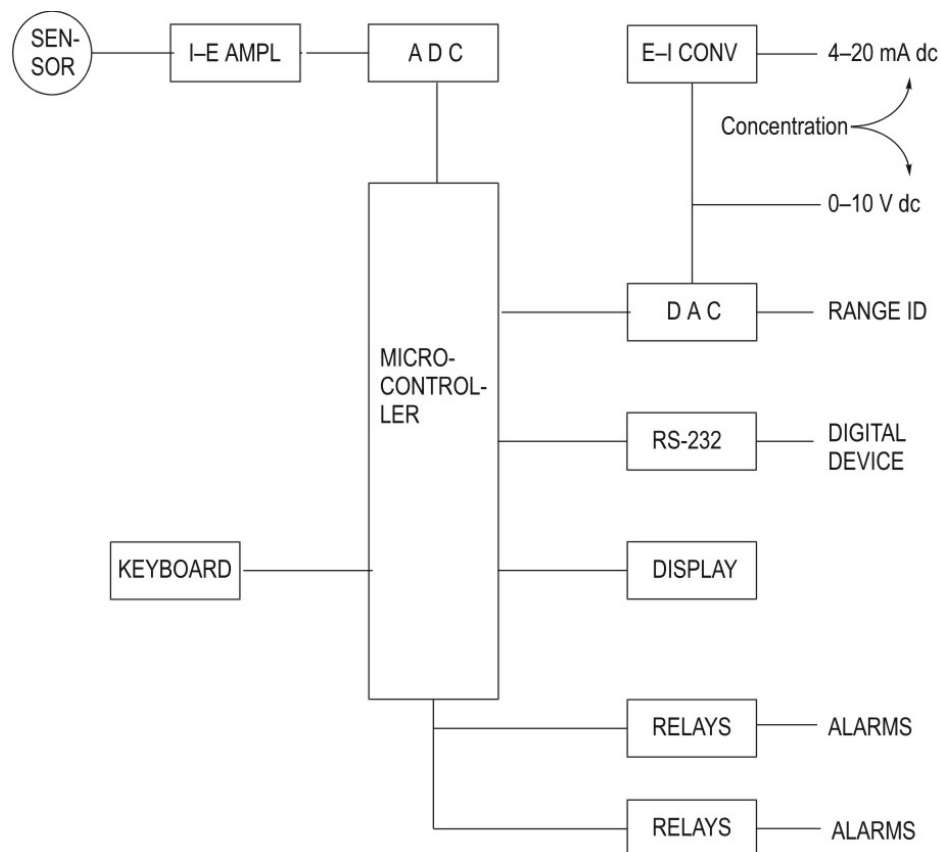


Figure 2-4: Block Diagram of the Signal Processing Electronics

In the presence of oxygen, the sensor(s) produce a current. A current to voltage amplifier (I-E AMPL) converts this current to a voltage.

The output from the I-E amplifier and subsequent buffer circuit (not shown) is sent to an analog to digital converter (ADC), and the resulting digital concentration signal is sent to the micro controller.

The digital concentration signal along with input from the front panel buttons (KEYBOARD) is processed by the micro controller, and appropriate output signals are directed to the display, alarm relays, and

RS-232 (optional) output. The same digital information is also sent to a 8-bit digital to analog converter (DAC) that produces the 0-10 VDC analog concentration signal and the 0-10 VDC analog range ID output. A current to voltage converter (E-I CONV) produces the 4-20 mADC analog concentration signal.



Installation

Installation of the analyzer includes:

1. Unpacking the system.
2. Mounting the control unit and external sample block.
3. Making the electrical connections.
4. Making the gas connections.
5. Testing the installation.

CAUTION: READ THIS CHAPTER IN ITS ENTIRETY BEFORE INSTALLING THE UNITS.



THE MODEL 3190Z IS FOR INDOOR USE ONLY.

THE SAMPLE MUST BE FREE OF ENTRAINED SOLIDS, WATER, OR COMBUSTIBLE COMPOUNDS.

3.1 Unpacking the Analyzer

As soon as you receive the instrument, carefully unpack and inspect control unit, external probe, and any included accessories for damage. Immediately report any damage to the shipping agent. The analyzer is shipped with all materials needed to install and prepare the system for operation.

3.2 Location and Mounting

3.2.1 Control Unit Installation

The 3190Z control unit is designed to be panel-mounted in a general purpose, indoor area, away from moisture and the elements. The unit should be installed at viewing level in a sheltered area.

CAUTION: FOR THE DC POWERED VERSION, THE CONTROL UNIT CHASSIS MUST BE ISOLATED FROM THE INPUT POWER GROUND.



Refer to the Outline Diagram for the physical dimensions of the analyzer, which can be found at the back of the manual.

3.2.2 External Probe Installation

The external probe should be installed as close as possible to the control unit

The standard Model 3190Z includes the external probe unit depicted in the Final Assembly and the Analysis Unit (probe) Outline. Dimensions are also given in the *Specifications* section in the Appendix.

For special applications, the type of external probe unit supplied may vary depending on the specific process. With these systems, specific installation and interconnect information is given in a separate probe manual or in an addendum to this manual depending on the model External Probe used. The addendum will reference the specific Outline and Interconnection Drawings in the Drawings section of this manual, and provides any other appropriate information.

3.3 Electrical Connections

Figure 3-2 shows the two alternate Model 3190Z rear panels. The first illustration shows the AC powered version, and the second illustration shows the DC powered version. The only difference between them is the power connections; all other connections are the same.

Primary Input Power (AC version): The power cord receptacle, fuse block and power switch are located in the same assembly. A 6-foot


standard AC power cord is supplied with the control unit. Insert the female plug end of the power cord into the power cord receptacle.

The universal power supply allows direct connection to any 100-240VAC, 50/60 Hz power source. The fuse block, to the right of the power cord receptacle, accepts a 5 × 20 mm, 0.5A time-delay fuse (see *Fuse Replacement* in Chapter 5 - *Maintenance*).

The power switch is located on the right-hand end of the power source input receptacle assembly.

Primary Input Power (DC version): The 10–36 VDC power is connected via the + and – terminals in the upper-left corner of the panel. The fuse receptacle, to the right of the power terminal strip, holds a 0.5A fast-acting fuse (see *Fuse Replacement* in Chapter 5 - *Maintenance*).

The Power switch is located below the fuse receptacle.

CAUTION:  **INSERT THE STRIPPED TIPS OF WIRES ENTIRELY INTO THE TERMINAL BLOCKS. DO NOT LEAVE EXPOSED WIRE OUTSIDE OF THE HOLES IN THE BLOCKS.**

CAUTION:  **THE CONTROL UNIT CHASSIS MUST BE ISOLATED FROM THE GROUNDING SYSTEM OF THE DC INPUT POWER.**

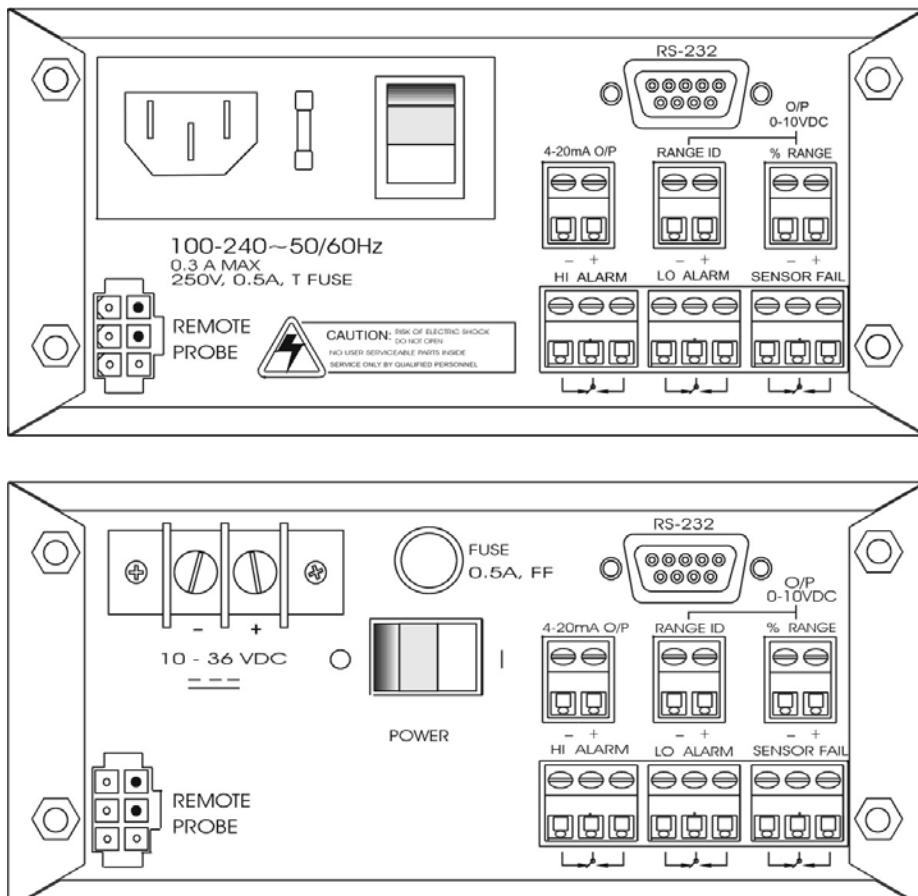


Figure 3-2 Rear Panel Electrical Connectors for AC and DC Units

Analog Outputs: There are three DC output signal connectors with screw terminals on the panel. There are two wires per output with the polarity noted. See Figure 3-3. The outputs are:

0–10 V Concentration: Voltage is proportional to oxygen reading, from 0 V at 0 ppm oxygen to 10 V at full scale ppm oxygen. (Full scale = 100% of programmed range).

0–10 V Range ID: 3.33 V = Low Range, 6.66 V = High Range

4–20 mA % Range: Current is proportional to oxygen reading, from 4 mA at 0 ppm oxygen to 20 mA at full scale ppm oxygen. (Full scale = 100% of programmed range).

Alarm Relays: The three alarm circuit connectors are screw terminals for making connections to internal alarm relay contacts. There is one set of contacts for each type of alarm. Contacts are Form C, with normally open and normally closed contact connections capable of switching up to 0.5A at 125 VAC into a resistive load.

The alarm relay circuits are designed for failsafe operation, meaning the relays are energized during normal operation. If power fails the relays de-energize (alarms activated).

The contact connections are indicated diagrammatically on the rear panel as normally closed (NC), common (C), and normally open (NO). Figure 3-3 explains how these act in failsafe operation.

The specific descriptions for each type of alarm are as follows:

HI Alarm	Configured as high alarm (actuates when concentration is above threshold). Can be set anywhere within the full range of the analyzer (1-1,000 ppm), but must be set ABOVE the threshold set for the LO Alarm.
LO Alarm	Configured as low alarm (actuates when concentration is below threshold). within the full range of the analyzer (1-1,000 ppm), but must be set BELOW the threshold set for the HI Alarm.
Sensor Fail	Not active in this product

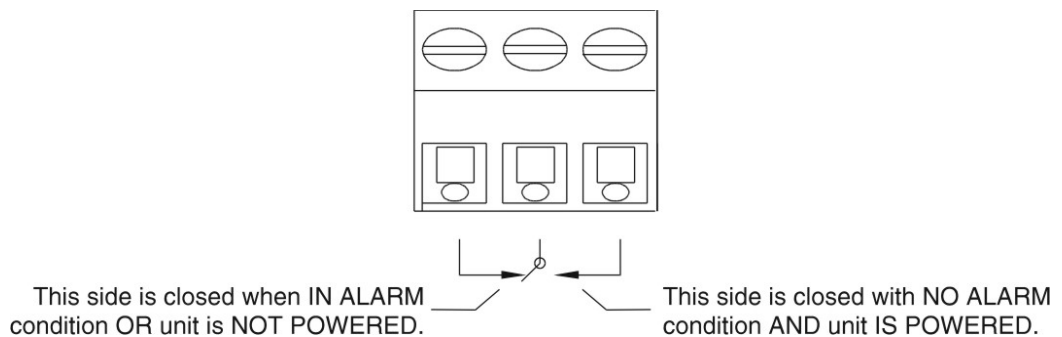


Figure 3-3: Contact ID for FAILSAFE Relay Operation

External Probe: The receptacle for the analysis unit cable is located in the lower left-hand corner of the rear panel. The 6-pin Minifit™ connector is keyed to fit only one way into the receptacle; do not force it. The other end of the cable consists of four separate wires. These should be connected to the terminal strip on the analysis unit as follows:

Red:	#1	White:	#3
Black:	#2	Green:	#4

Refer to the Final Assembly, located at the back of the manual.

3.4 Gas Connections

Gas connection instructions depend on the specific external probe used and any special requirements of the process being monitored.

The standard Model 3190Z External Probe has inlet and outlet fixtures only. Calibration gases must be externally piped into the sample inlet through appropriate valves. Quarter-inch tube fittings are used. For metric installations, quarter-inch to 6 mm adapters can be supplied.

In general, sample flow and pressure must not create significant backpressure past the sensor. For the standard probe, 2 SCFH (1 LPM) is the nominal recommended flow rate.

The pressure required will depend on the sampling system. The simplest method of pressure regulation is venting the outlet directly to atmosphere. If venting into a system of varying pressure, some form of pressure regulation is required.

3.5 Installation Checklist

Before connecting the instrument to a power source and applying power, make sure you have:

- Correctly installed the sample and exhaust gas lines
- Checked for leaks
- Set the sample pressure to 5-10 psig nominal

Once the above checks have been made, you can apply power. The instrument is now ready for operation.

Operation

4.1 Introduction

Once the analyzer has been mounted, the gas lines connected, and the electrical connections made, the analyzer can be configured for your application. This involves setting the system parameters as follows:

- Defining the user-selectable analysis ranges
- Setting alarm set-points.
- Calibrating the instrument

All of these functions are performed via the front panel controls, shown in Figure 4-1.

Analyzing a gas sample for the percent oxygen level through the cell block is the default mode of operation. The analyzer is monitoring the oxygen level as long as no front panel buttons have been pressed.

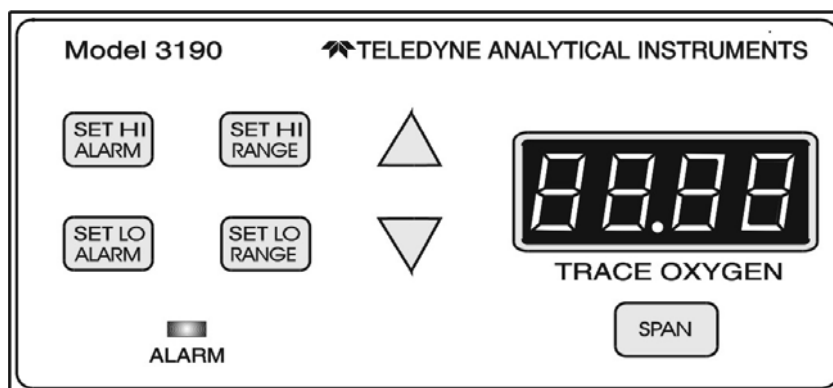


Figure 4-1: Front Panel Controls and Indicators

4.2 Using the Function and Data Entry Buttons

When one of the function buttons is being pressed, the analyzer is in the Setup mode or the Calibration mode.

The four setup function buttons on the analyzer are:

- SET HI ALARM
- SET LO ALARM
- SET HI RANGE
- SET LO RANGE

The Calibration mode button is:

- SPAN

The data entry buttons (Δ and ∇) adjust the value displayed on the TRACE OXYGEN meter while one of the function buttons is being held down.

- Δ : Increments the displayed value upwards.
- ∇ : Increments the displayed value downwards.

Any of the functions can be selected at any time by pressing the appropriate button.

Each function will be described in the following sections. Although the operator can use any function at any time, the order chosen in this manual is appropriate for an initial setup.

4.3 Setting the Analysis Ranges

The two user-definable analysis ranges are both capable of being adjusted from 0-10 ppm to 0-1,000 ppm oxygen concentration.

The analyzer automatically switches from the LO range to the HI range when the oxygen concentration reaches the LO range full-scale value. It will switch back to the LO range when the oxygen concentration falls below the LO range full-scale value

Note: The HI Range set-point MUST be set at a higher concentration than the LO Range set-point.

4.3.1 HI Range

Setting the HI Range full-scale value defines the LEAST sensitive analysis range to be used. To set the HI Range:

1. Press the SET HI RANGE function button once.
2. Immediately (within 5 seconds) press either the Δ or ∇ button to raise or lower the displayed value as required, until the display reads the desired full-scale concentration.

4.3.2 LO Range

Setting the LO Range full-scale value defines the MOST sensitive range to be used. To set the LO Range:

1. Press the SET LO RANGE function button once.
2. Immediately (within 5 seconds) press either the Δ or ∇ button to raise or lower the displayed value as required, until the display reads the desired full-scale concentration.

4.4 Setting the Alarm Setpoints

The alarm set-points can be adjusted over the full range of the analyzer (0-1,000 ppm oxygen content). The set-point values are expressed in ppm only.

Note: The HI Alarm set-point MUST be set at a higher concentration than the LO Alarm set-point.

4.4.1 HI Alarm

Setting the HI Alarm sets the value ABOVE which the HI Alarm will activate. To Set the HI Alarm:

1. Press the SET HI ALARM function button once.
2. Within 5 seconds press either the Δ or ∇ button to raise or lower the displayed value as required, until the display reads the desired concentration.

4.4.2 LO Alarm

Setting the LO Alarm sets the value BELOW which the LO alarm will activate. To set the LO Alarm:

1. Press the SET LO ALARM function button once.
2. Within 5 seconds press either the Δ or ∇ button to raise or lower the displayed value as required, until the display reads the desired concentration.

4.4.3 Sensor Fail Alarm

Not active in this product.

4.5 Selecting a Fixed Range or Autoranging

The Model 3290 can operate in fixed high, fixed low, or auto-ranging mode. To change modes:

1. Press and then release the SET HI RANGE and the SET LO RANGE buttons simultaneously.
2. Within 5 seconds press either the Δ or ∇ button until Auto, Lo, or Hi displays on the LCD, as desired.

After about three seconds, the analyzer resumes monitoring in the selected range mode.

4.6 Calibration

Power up the analyzer and allow the LED reading to stabilize. Wait at least ten minutes after powering, giving the heater and bias voltages enough time to reach operating voltage. Set the alarm set-points and the full-scale ranges to the desired values.

Procedure:

1. Apply calibration gas of a known concentration. A span gas containing an oxygen content of 60-100% of the range of the analyzer is recommended.

Note: If the analyzer output goes above the high alarm set-point or below the low alarm set-point, the front panel ALARM Indicator located beneath the SET function buttons will blink. When the SPAN key is pressed, the alarm indicator will stop blinking.

2. Press the SPAN button once.

3. Immediately (within 5 seconds) press either the Δ or ∇ button until the display is stable and displays the oxygen concentration of the applied calibration gas. Once set, the unit will enter Analyze Mode after approximately three seconds.

The unit is now calibrated.

If the output of the sensor is outside of the expected range, this may be caused by:

- a) Bad electrical connection between the control and analysis unit
- b) Improperly analyzed or entered calibration gas value
- c) Electronics failure

The unit will not accept the attempted calibration and will flash '0000' on the LED display unit a valid calibration is performed.

4.7 LED Display on StartUp

When the unit is powered, it will initially display "8.8.8.8" for a short period of time. This is to confirm all LED segments are functioning. Afterward, the LED display will initiate a delay countdown, allowing the sensor's heater to begin charging and capture a zero reading. Flowing "zero" gas or a sensor is **not** needed for this instrument adjustment.

(This page intentionally left blank)

Maintenance

Aside from normal cleaning and checking for leaks at the gas connections, the Model 3190Z should not require any maintenance beyond replacement of zirconium oxide sensors, and perhaps a blown fuse. Routine maintenance includes occasional recalibration, as described in Chapter 4 - *Operation*.

5.1 Replacing the Fuse

5.1.1 AC Powered Units

When a fuse blows, check first to determine the cause, then replace the fuse using the following procedure:

1. Disconnect the AC power and place the power switch located on the rear panel in the **O** position. Remove the power cord from the receptacle.
2. The fuse receptacle is located in the power cord receptacle assembly in the upper left-hand corner of the rear panel. See Figure 5-1.

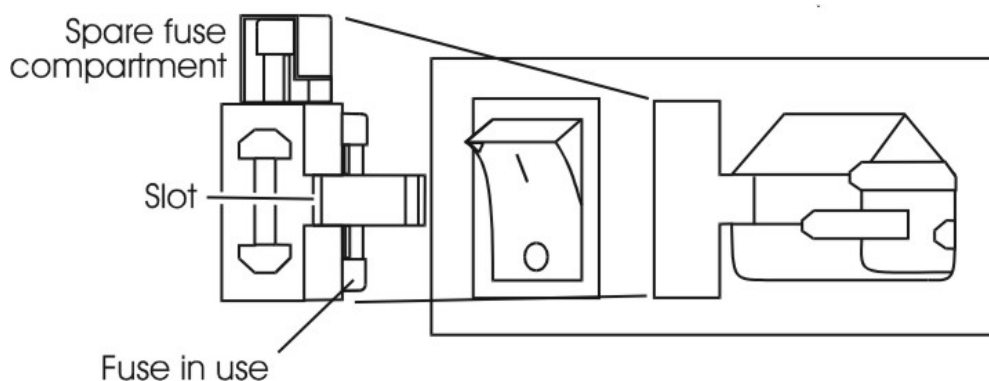


Figure 5-1: AC Fuse Replacement

3. Insert a small flat-blade screwdriver into the slot in the receptacle wall nearest the fuse and gently pry open the fuse receptacle. The fuse holder will slide out. The fuse in use is visible in the clip. To open the spare fuse compartment, push on one end until it slides out.
4. Remove the bad fuse and replace it with a 5×20 mm 0.5 A, 250 VAC, IEC, time lag (T) fuse (P/N F1128) for AC units.
5. Replace the fuse holder into its receptacle, pushing in firmly until it clicks.

5.1.2 DC Powered Units

In units with DC power, the fuse is located on the rear panel above the ON/OFF switch.

1. Open the fuse holder by unscrewing and removing the cap marked FUSE.
2. The fuse is located inside the receptacle, not inside the cap. Both terminals are on the same end of the fuse. Pull straight out without twisting to remove the old fuse from the receptacle, and replace it with a 0.5 A, 125 VDC, very quick acting (FF) Microfuse (P/N F51).
3. Replace the cap by screwing it back into the receptacle.

5.2 Sensor Installation or Replacement

5.2.1 When to Replace a Sensor

The sensors used in this product will typically last five years or longer in service. Typically, the sensors will fail either high or low. Inaccurate or erratic readings are a sign that one of the sensors may have failed. In most cases, we recommend the entire unit be returned to an authorized Teledyne Service Center for sensor replacement.



Appendix

A.1 Specifications

Ranges: Two user selectable ranges can be set between 0-10 ppm and 0-1,000 ppm oxygen. Default ranges are 0-100 ppm and 0-1,000 ppm oxygen

Signal Output: Voltage: 0–10 VDC, negative ground
Current: 4-20 mA, negative ground

Range ID: 0-10 VDC

Display: Light-emitting diode (LED) display

Alarms: One high alarm relay, adjustable; one low alarm relay, adjustable; one sensor failure relay. All alarms failsafe.

System Operating Temp: 0 - 50°C

Accuracy: ±2% of full scale at constant temperature
±5% of full scale over 0-50°C range once temperature equilibrium is reached (at 3% and 5% user defined ranges).

Response Time: 90% in less than 20 seconds at 25°C

System Power Requirements: AC (100-240 VAC, 47/440 Hz), or DC (10-36 VDC); user specified

System Enclosure: *Panel Mount:* 2.81" H × 6.0" W × 2.87" D (71.4 mm × 152.4 mm × 72.9 mm).
Face Plate: 3.75" H × 7.0" W (95.3 mm H × 177.8 mm W). Faceplate rated to NEMA-4

Sensor Type: Zirconium Oxide

Analysis Unit: 4.0" H × 6.0" W × 3.25" D (101.6 mm × 152.4 mm × 82.6 mm)

A.2 Spare Parts List

1*	C-64586A	PC Board, Power Supply (AC-version)
1*	C-64586B	PC Board, Power Supply (DC-version)
1	C-76491C	PCB Board, Main
1	C-76490C	Interface Unit
2*	F-1130	Fuse (AC), ½A, 250 VAC IEC Type T, 5x20mm
1*	F-51	Fuse (DC), ½A, 125 VDC Micro-fuse
1	S-1439	Sensor, 0-1,000 ppm, zirconium oxide

* - configuration-dependent

A minimum charge of US \$150.00 is applicable to spare parts orders.

IMPORTANT: Orders for replacement parts should include the part number and the model and serial number of the system for which the parts are intended.

Send orders to:

TELEDYNE ELECTRONIC TECHNOLOGIES
Analytical Instruments
16830 Chestnut Street
City of Industry, CA 91749-1580

Telephone: (626) 961-9221
TWX: (910) 584-1887 TDYANYL COID
Fax: (626) 961-2538

...or your local representative.

A.3 Drawing List

D-76533 Outline/Interconnection Diagram

A.4 Miscellaneous

The symbol: ~ is used on the rear panel of the model 3190Z to signify volts alternating current (VAC).