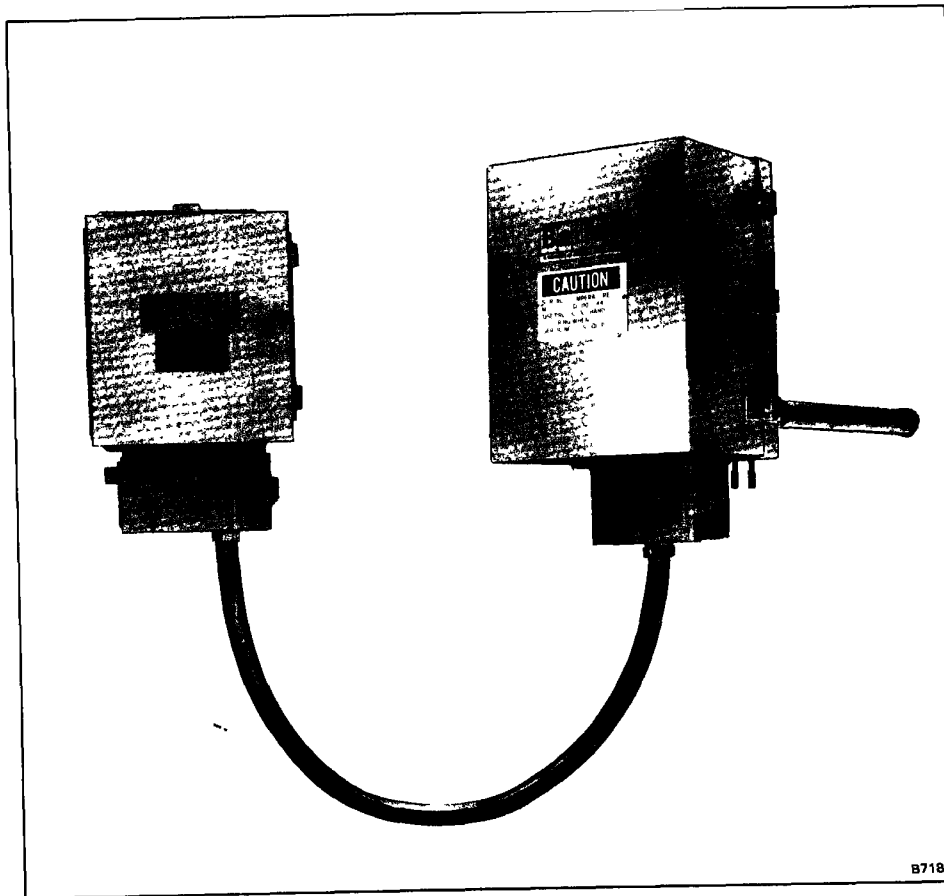


**Bailey Control Systems****Product Instruction  
E65-30****Oxygen Analyzer  
Type OJ111NN-1**

B7185

**WARNING****INSTRUCTIONS ON MANUALS**

DO NOT INSTALL, MAINTAIN OR OPERATE THIS EQUIPMENT WITHOUT READING UNDERSTANDING AND FOLLOWING PROPER Babcock & Wilcox Bailey Controls Co. U.S.A. INSTRUCTIONS AND MANUALS OTHERWISE INJURY OR DAMAGE MAY RESULT

**MANUELS D'OPERATION**

NE PAS METTRE EN PLACE, REPARER OU FAIRE FONCTIONNER CE MATERIEL SANS AVOIR LU COMPRENSIS ET SUIVRE LES INSTRUCTIONS REGLEMENTAIRES DE Babcock & Wilcox Bailey Controls Company, U.S.A. TOUTE NEGLIGENCE A CET EGARD POURRA ETRE UNE CAUSE D'ACCIDENT OU DE DEFALLANCE DU MATERIEL

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## Type OJ Oxygen Analyzer

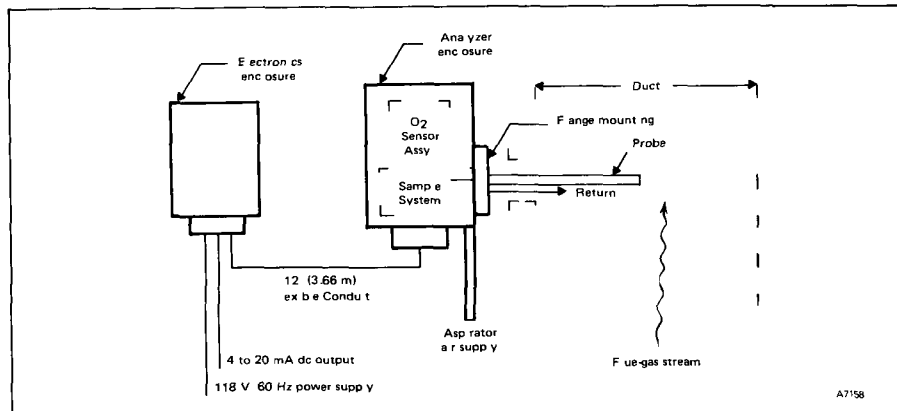


FIGURE 1 Oxygen Analyzer Functional Diagram

## INTRODUCTION

The Oxygen Analyzer, Type OJ includes the analyzer enclosure assembly and the probe assembly (right of the cover photo) and the electronics enclosure assembly with interconnecting flexible conduit (left and center of the cover photo). A functioning Oxygen Analyzer (Figure 1) draws gas samples from the flue gas stream via the probe and air-operated aspirator of the analyzer enclosure sample system. The sample system then functions in conjunction with the O<sub>2</sub> sensor assembly and the interconnected electronics of the electronics enclosure to perform gas analysis. Once analyzed, the sampled gas is returned to the flue gas stream via the exhaust of the sample system. Components of the sample system mounted in a stainless steel block that is kept at a temperature above the dew point thus eliminating conditions that could cause clogged passages in the sample system and the sensor assembly.

The Oxygen Analyzer operates to produce a continuous percent by volume measurement of the net oxygen left after combustibles present in the sample have been burned. The analysis is on the "wet" basis, since no moisture is removed during sampling. The system is designed for single and multipoint sampling (see Product Instruction E65 30-4 for multipoint sampling).

The Oxygen Analyzer is available with a probe filter, for high particulate application, and without a probe filter for clean gases, such as those resulting from gas and some oil fired processes.

At the factory the analyzer enclosure and the electronics enclosure are calibrated together using test gases. The enclosures are then paired by stamping the right inside of each enclosure's door with a matching identification number. Accordingly, to assure continuance of factory accuracy, matching identification numbers on an enclosure pair should be verified when an Oxygen Analyzer is installed.

## PRINCIPLES OF OPERATION

The analyzer enclosure is a combination hot sample system and ZrO<sub>2</sub> sensor bolted directly to the boiler flue or process gas duct wall (Figure 1). A non-clogging filter is added to the probe for applications involving dirty gases, such as boilers fired by pulverized coal.

The sample of gas to be analyzed is drawn thru passages of the sample system and the sensor cell by use of a small air-powered aspirator. The

**SPECIFICATIONS**

<b>Accuracy</b>	+2% of span
<b>Response Time</b>	Sensor less than 0.5 second Complete analyzer including probe 2.5 seconds for clean gas system depending on probe length one additional second for dirty gas system
<b>Probe Temperature Limits</b>	Stainless steel probe 1500°F (816°C) continuous standard Ceramic probe 2500°F (1371°C) continuous 2800°F (1538°C) intermittent
<b>Ambient Temperature Limits</b>	Analyzer enclosure 15 to +200°F (-26 to +93°C) Electronics enclosure 15 to +160°F (-26 to +71°C)
<b>Power Supply Requirements</b>	118 - 12 V ac 50/60 Hz 650 W start up 450 W operating
<b>Radio Frequency Interference</b>	RF protected per MIL Specs CS01 RS01 RS02 RS03 at a field strength of 15 volts per meter from the housing
<b>Ranges</b>	Factory calibrated to 0-10% O <sub>2</sub> with ranges between 0-1% O <sub>2</sub> and 0-30% O <sub>2</sub> available at extra cost or easily obtainable by calibration in the field
<b>Output Signal Range</b>	4-20 mA into maximum load of 625 ohms
<b>Air Supply</b>	0.6 scfm (0.017 m <sup>3</sup> /m n) @ 7 psig (48.3 kPa)
<b>Wiring</b>	12 ft (3.66 m) of standard flexible conduit with wiring comes attached to electronics enclosure for making connections with analyzer enclosure additional conduit and wiring can be added in the field to permit separation up to 100 ft (30.5 m)

<b>Enclosures</b>	Analyzer NEMA Type 3RCV rainproof and sealed resistor outdoor Electronics NEMA Type 4 watertight and dust tight outdoor
<b>Supply Pressure</b>	Normal clean gas 5 psig (34.5 kPa) @ 0.15 scfm (0.004 m <sup>3</sup> /m n) Normal dirty gas 7 psig (48.3 kPa) @ 0.6 scfm (0.017 m <sup>3</sup> /m n) Minimum 2 psig (13.8 kPa) Maximum 15 psig (103 kPa)
<b>Drift</b>	< 1% of span/month
<b>Temperature Effect</b>	-0.025% of span/°F
<b>Supply Voltage Effect</b>	+0.018%/V
<b>Input Impedance</b>	10M ohms
<b>Output Load Capability</b>	0-625 ohms
<b>Approvals/Certifications</b>	Factory Mutual FM approved against flash-back into duct Canadian Standards Assoc at on CSA) certified for electrical safety for use in ordinary non-hazardous locations
<b>Weight</b>	Analyzer enclosure approx 30 lbs (13.6 kg) Electronics enclosure approx 17 lbs (7.7 kg)

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

## Type OJ Oxygen Analyzer

## INSTALLATION

## UNPACKING

The Oxygen Analyzer is shipped in three boxes: the electronics enclosure with attached twelve foot flexible conduit, the analyzer enclosure packed in foam packing, and an accessory box which contains probe, probe support, clean gas nozzle assembly, reducer or filter as applicable (see Parts Drawing E65 30 9)

1 Check for any obvious damage to carton or contents

2 Remove all loose packing from carton

3 Unpack the electronics enclosure

**CAUTION** Unpack the analyzer with utmost care to avoid damaging the sensor assembly. If the unit is to be unpacked for checking and then transported to the installation site, the unit **MUST BE** repacked in the shipping carton with all foam packing in place.

**ATTENTION** On doit procéder avec le plus grand soin lorsqu'on déballe l'analyseur/detecteur pour protéger le montage du détecteur. Si l'on doit déballe ce matériel pour le vérifier, et ensuite le transporter au lieu de travail, **IL EST NECESSAIRE** de remballer l'élément dans son emballage de carton et de remettre en place tout la mousse de remplissage.

## SITE SELECTION

**WARNING** DO NOT INSTALL THE ANALYZER ENCLOSURE WHERE THE PROBE WILL BE DIRECTLY IMPACTED WITH STEAM OR WATER FROM PROCESS CLEANING OPERATIONS (E.C. SOOT BLOWER, SCRUBBER)

**AVERTISSEMENT** L'INSTALLATION DE L'ENCEINTE DE L'ANALYSEUR NE DOIT PAS SE FAIRE DANS DES CONDITIONS TELLES QUE LA SONDE SOIT EXPOSÉE À L'ARRIVÉE DIRECTE DE VAPEUR OU D'EAU PROCÉDANT D'OPÉRATIONS DE NETTOYAGE PRÉSCRITES PAR LE PROCÉDÉ (PAR EXEMPLE RAMONAGE, ÉPURATION ETC.)

**NOTE** Refer to Figure 3 for analyzer enclosure mountings that demonstrate correct and incorrect positioning of the intake end of the probe. The probe intake should be at least two feet from a bend in the duct to assure direction of gas flow has stabilized. Also, the protrusion line of the probe should be perpendicular to or angled away from the direction of flue gas flow and not pointing upward. This should assure that the force of gas flow or the pull of gravity will not help particles to lodge in the probe intake.

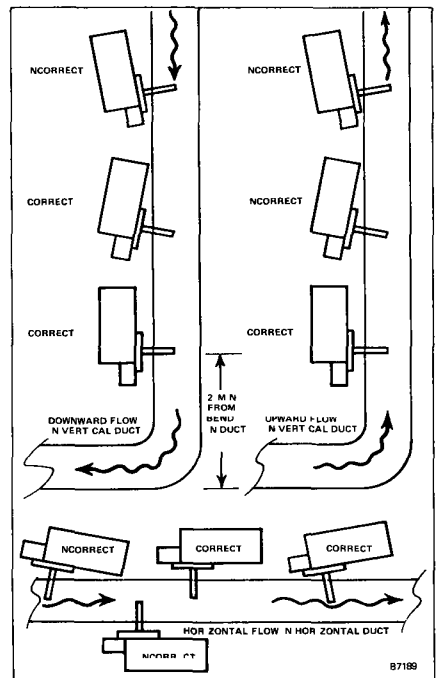


FIGURE 3 Side Views of Analyzer Enclosure Mountings Showing Correct and Incorrect Orientation of Probe to Gas Flow and Duct

**SITE PREPARATION**

1 Determine sampling location and cut hole in duct wall for a 3" I D pipe nipple. The duct wall must be able to support the weight of the analyzer assembly (approx 30 pounds)

2 Mount 3" I D nipple so it is perpendicular to flue gas flow

3 Weld a 3" NPT x 6" long pipe nipple to the opening (See Drawing D3049122 located at the rear of the manual )

4 Mount a 3" 150 lb flange on the nipple, holes aligned as shown in D3049122

5 Applications to 1500°F (816°C) Insulate the outside of the nipple as shown in D3049122

**EQUIPMENT INSTALLATION**

Analyzer Enclosure Installation For Oil, Coal or Other than Natural Gas Fired Processes with Flue Gas Sample Point below 1500°F (816°C)

1 Wrap Teflon tape around the threads on the probe, starting one thread back from the end (Starting one thread back will prevent clogging later the tape itself will ease removal of the probe after the unit has been in service )

2 Remove and discard plug from 3/4" nipple containing probe heater coil (see Parts Drawing E65 30)

3 Insert the 1/4" NPT sample probe carefully thru the center of the probe heater coil and tighten threads into the manifold block

NOTE See Parts Drawing E65 30 9 for lengths and temperature ranges of available probes. Standard length probes (high temperature probe excepted) may be cut to shorter lengths in the field

4 Unscrew, remove, and discard the 3/4" pipe nipple, holding the heater coil

5 Carefully pull out end of the probe heater coil. The heater should be stretched about 16 in / 446 mm or long enough to go from analyzer unit thru the duct wall and extend 6 in / 152 mm into the duct

6 Make certain coils are equally spaced (about 2 per inch)

CAUTION Do not leave any coils touching each other

ATTENTION Ne permettez pas aux boudins de se toucher

7 Put a molybdenum disulphide compound (such as Never Seez) on the threads of the 3/4" support pipe (do not cover the first thread at the end or it may clog the sampling system)

8 Slide the 3/4" support pipe over the probe and heater coils and tighten threads into the mounting flange

NOTE The support pipe is 2 in / 51 mm shorter than the sample probe. If the sample probe has been shortened, the support pipe must also be cut and rethreaded

9 Install gasket on the 3" 150 lb flange

10 Slide filter assembly over the probe and engage threads with those of the support pipe. When tightened the filter shield must be facing the direction of gas flow

11 Insert probe assembly thru hole in duct and bolt analyzer flange to mating flange on duct wall

NOTE If the probe length is greater than 8 ft / 3.6 m some type of in duct support for the probe must be devised. A rod or angle iron can be installed horizontally to support the probe end. The probe would then be angled upward when inserted, then rested on the rod when returned to the horizontal position and bolted to the 3" flange

Compressed Air Supply For Analyzer Enclosure

Oil, water or dirt in compressed air supply will not damage the aspirator or sensor. However, the aspirator and manifold block may require periodic cleaning under these conditions

To assure reliability when the Oxygen Analyzer is used in a control system, adherence to ISA S73 is recommended. Dry air is required if the air supply will be subjected to freezing temperatures

Type OJ Oxygen Analyzer

SA S7 3

Section 4.1.1

Outdoor installations (where any part of the instrument air system is exposed to the outdoor atmosphere)

The dew point at line pressure shall be at least 18°F (10°C) below the minimum local recorded ambient temperature at the point site

Section 4.2 Part Clearance

The maximum part clearance in the air stream at the instrument shall be three (3) millimeters

Section 4.2.0 Content

The maximum total sulfur hydrocarbon content exclusive of non condensables shall be as close to zero (0) W/W or V/V as possible and under no circumstances shall it exceed one (1) ppm W/W or V/V under normal operating conditions

1 Connect a pressure reducing valve (Bailey Pt No 19510293 or equivalent) into analyzer air line to maintain the aspirator inlet pressure (Part not supplied unless requested)

2 When starting up a cold Oxygen Analyzer the aspirating air used in pulling a gas sample should not be turned on until the analyzer manifold block reaches proper operating temperature to prevent possible condensation of the flue gas sample in the manifold block which can cause plugging of the sample passage Accordingly, installation of the SPDT relay and solenoid valve circuit shown in Figure 4 is recommended for automatic protection against this (These are not supplied unless requested)

NOTE The solenoid and SPDT relay must be mounted outside the analyzer enclosure as temperatures inside the enclosure will reach 500° to 600°F (260° to 315 °C)

3 Connect compressed air line to analyzer air supply tubing (item 17 of Parts Drawing E65 30) and set line pressure to 10 psig

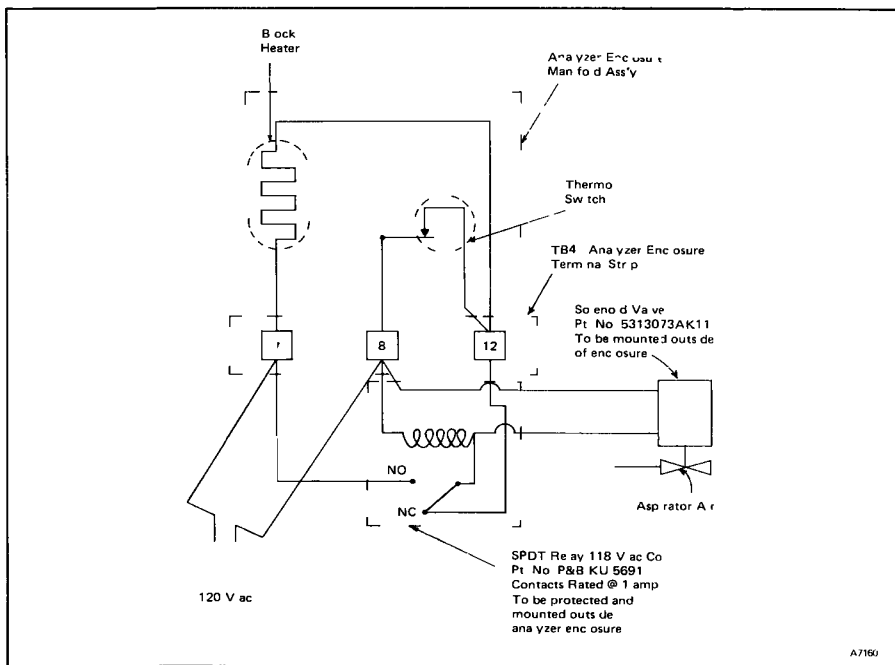


FIGURE 4 Typical Analyzer Enclosure Heater/Solenoid Interlock Wiring

Analyzer Enclosure Installation For Natural Gas Fired Processes with Flue Gases Void of Particulate Matter and Gas Temperatures below 1500°F (816°C) at Gas Sample Point

Perform the following steps

1 Apply a wrench to 3/4" hex of nozzle (item 11) and remove dirty gas nozzle assembly from manifold assembly (22)

2 Using screwdriver with 3/8" wide blade remove aspirator venturi (9) from manifold assembly

3 Using 3/16" allen wrench remove plug (7) which covers channel holding orifice (10) Using 5/32" allen wrench remove orifice

4 Using 3/4" allen wrench install plug (7) in

manifold assembly channel from which orifice was removed

5 Assemble clean gas nozzle components (44, 36, 34, and 12 on Drawing E65 30)

6 Insert clean gas nozzle assembly into manifold assembly aspirator channel and tighten using 3/4" wrench on the hex of clean gas nozzle (34)

7 Perform all the steps under "Analyzer Enclosure Installation for Oil, Coal, or other than Natural Gas Fired Processes "

8 Perform instructions under "Compressed Air Supply for Analyzer Enclosure" with step 3 changed to read " and set line pressure to 7 psig "

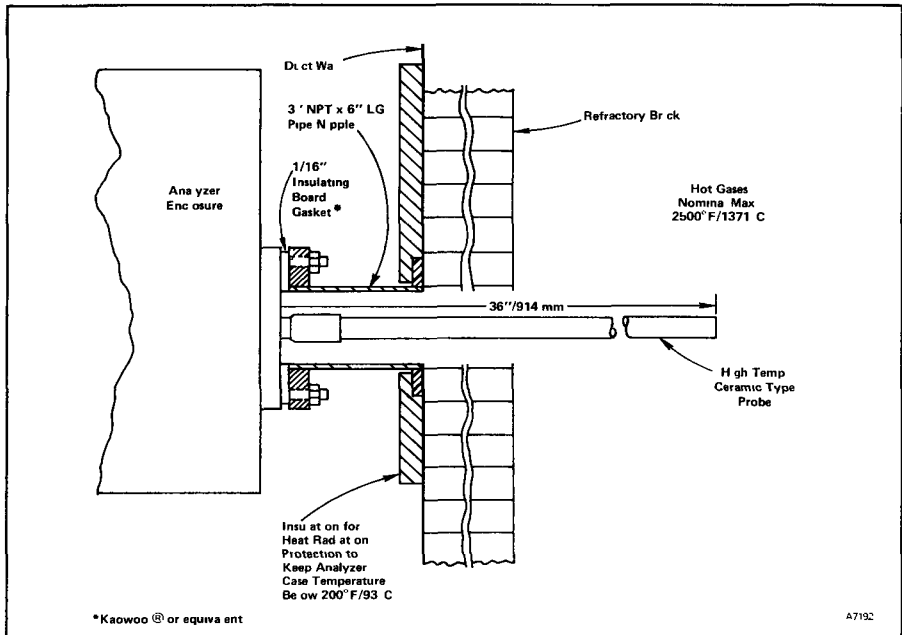


FIGURE 5 Recommended installation for High Temperature Applications of Oxygen Analyzer (above 1500°F/816°C)

Type OJ Oxygen Analyzer

Analyzer Enclosure Installation for Processes with Flue Gas Sample Points above 1500°F (815°C) and below 2500 F ( 371 C) Refer to Figure 51

NOTE Handle high temperature probe carefully as it is made of ceramic type material

1 Wrap Teflon tape around the threads on the high temperature probe, starting one thread back from the end to prevent clogging

2 Unscrew 3/4" nipple covering heater coil (see Parts Drawing E65 30). Cut off and discard heater coil

3 Insert the 1/4" NPT probe assembly and carefully turn threads into manifold block until tight

4 Install insulating kaowool board gasket on the 3" 150 lb flange

5 Insert probe assembly thru the hole in the duct and bolt analyzer flange to mating flange on duct wall

NOTE One to two feet of the high temperature probe should protrude into the flue gas stream. This will leave at least one foot of the probe inside the refractory wall at a point in the wall with a maximum temperature of 1500°F (810°C). Suitable stainless steel pipe and fittings may be used to extend the probe from this point to the analyzer enclosure. If the ceramic probe should break off it can be made usable by adding a 1/4" NPT nipple to the steel end of the probe. The nipple should be long enough to extend the ceramic end of the probe into the flue gases

6 Perform instructions under "Compressed Air Supply for Analyzer Enclosure" modifying step 3 to read "and set line pressure to 7 psig"

Mounting of Electronics Enclosure

NOTE Select a location for the electronics enclosure near the analyzer enclosure but far enough away from the hot wall of the flue duct to assure that the ambient temperature or radiant heat effect does not exceed 160°F (71°F). The flexible conduit connecting the two enclosures should be looped to permit removal and servicing of the analyzer enclosure without requiring disconnection of conduit wiring. If the electronics enclosure must be positioned more than 8' (2.4 m) from analyzer enclosure, follow instructions under "Remote Mounting of Electronics Enclosure"

1 Mount electronics enclosure at a distance of 8' (2.4 m) or less from analyzer enclosure (refer to Drawing D3049123 located at the rear of the manual)

2 Connect flexible conduit to analyzer enclosure making connections at GND #7 and TB3 and TB4 (see Figures 6 and 7) NOTE Verify that wires of twisted pair No. 4 from flexible conduit are not connected. These wires involve circuits used in the Combustibles Analyzer and should be tied back

3 Refer to Figure 6 and use #14 wire to connect customer supplied ac power to electronics enclosure as follows

- a Verify power supply is turned off
- b Connect white or neutral lead to TB1 5
- c Connect black or hot lead to TB1 6
- d Connect green or grounding lead to GND

NOTE Customer must install a fuse rated 10 A, 118 V ac 60 Hz, in the power supply line to the electronics enclosure

4 Connect the signal output wiring to TB 3 and TB-4 terminals of electronics enclosure. TB 3 is positive with respect to TB 4

NOTE Maximum load which can be connected to output terminals is 625 ohms

Remote Mounting of Electronics Enclosure

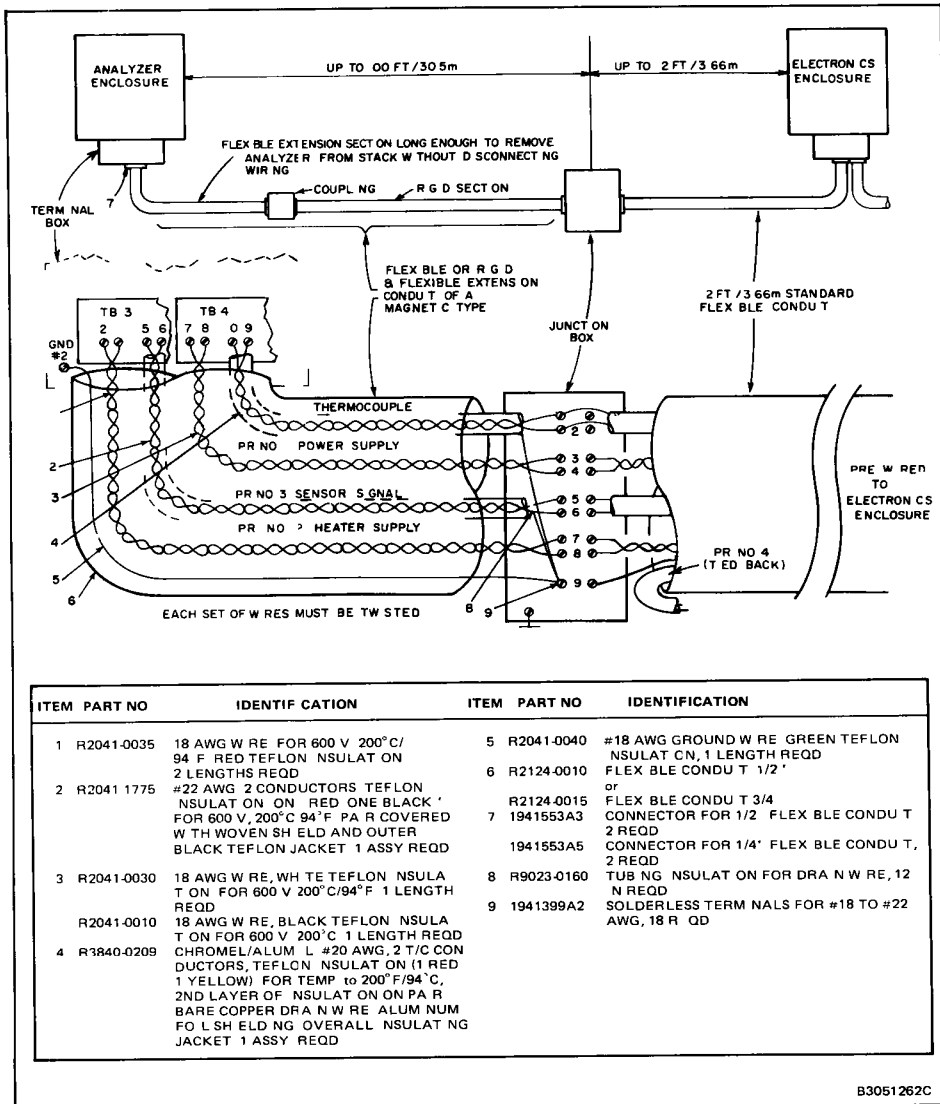
NOTE Mounting of the electronics enclosure more than 100' (30.5 m) from the analyzer enclosure is not recommended. Adherence to remote mounting wiring procedures is to assure that ground circulating currents and noise on signal lines are minimized. The enclosure is not intended to be mounted in a control room

1 Mount electronics enclosure at a suitable distance from analyzer enclosure (refer to Drawing D3049123)

2 Extend flexible conduit attached to electronics enclosure and mark a suitable location for installing a junction box similar to that shown in Figure 7

NOTE The remote installation described is for a typical installation





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FIGURE 7 Wir ng Diagram and Mater a s List for Remote Mount ng of E lectron cs Enc osure

3 Using wiring materials specified in Figure 7 equipment list, fabricate an extension conduit containing splice free wires which will connect the junction box and the analyzer enclosure. Materials required may be obtained locally or ordered from Bailey Controls Company. Extension conduit may be all flexible or part rigid and part flexible as shown in Figure 7. The flexible section of the extension should connect to the analyzer enclosure and be long enough to permit removal of analyzer from duct wall with out disconnecting conduit wires. It is recommended that a magnetic type of conduit be used.

4 Connect extension conduit to analyzer enclosure by performing step two of "Mounting of Electronics Enclosure"

5 Connect customer ac power and the signal outputs to the electronics enclosure by respectively performing step 3 and step 4 of "Mounting of Electronics Enclosure"

6 Refer to Figure 6 and connect extension conduit to standard 12 ft / 3.66 m flexible conduit at the junction box after noting the following wiring details

a Shields of extension conduit twisted pairs ending in the junction box are tied to common (terminal 9 which is also used to connect green wires). Shields of the extension conduit twisted pairs at the analyzer enclosure are left floating

b Installation of thermocouple wires joined at the junction box is stripped back 3/4th of an inch and wire ends are formed into loops. Respective loops of wires to be extended are then joined under one terminal screw to eliminate secondary thermocouple wire junctions

c Wires of twisted pair No 4 are tied back and not extended as circuitry involved is used only in Combustibles Analyzer applications

## START UP AND OPERATION

### START UP

Before starting up new or modified Oxygen Analyzer systems, perform the following installation check

1 Verify analyzer probe is mounted perpendicular to flue gas stream and is not located near a soot blower or damper

2 Verify wiring shields are tied to earth ground at only one point

3 Verify that % O<sub>2</sub> indicator or recorder has been calibrated and has had its earth ground lifted

4 Verify 4.20 mA output from analyzer enclosure to indicator or recorder has been checked for continuity

NOTE It is normal for % O<sub>2</sub> readings to be lower than corresponding readings for similar conditions which have been read with the use of a portable O<sub>2</sub> analyzer (see "Bailey Type OJ Results Compared with other Methods of O<sub>2</sub> Analysis" in this section)

### OPERATION

1 Turn power on and allow manifold block a two-hour warm up period. This will eliminate conditions which cause clogging of the sample passages. In about 20 minutes, the top of the sensor should be a dull orange color (which can be seen in the mirror on top of the furnace). The sensor temperature will be 1500° (816°C) at this time

**WARNING ANALYZER ENCLOSURE SURFACE TEMPERATURE MAY EXCEED 110°F/43°C. ANALYZER FURNACE ASSEMBLY SURFACE TEMPERATURE MAY EXCEED 440°F/227°C. USE PROTECTIVE HAND COVERING WHEN SERVICING THIS EQUIPMENT**

**AVERTISSEMENT LA TEMPERATURE A LA SURFACE DE L'ENCEINTE DE L'ANALYSEUR PEUT DEPASSER 110° FAHRENHEIT (43° CENTIGRADE), LA TEMPERATURE A LA SURFACE DU FOYER DE L'ANALYSEUR PEUT DEPASSER 440° FAHRENHEIT (227° CENTIGRADE) AYEZ LES MAINS COUVERTES DE GANTS DE PROTECTION LORSQUE VOUS FAITES L'ENTRETIEN DE CE MATERIEL**

Type OJ Oxygen Analyzer

It is important to monitor the temperature rise of the furnace during start up. The mV output of the T/C can be measured by placing a voltmeter across the T/C or terminals 9 & 10 in the analyzer or terminals 1 & 2 in the electronic terminal box or FL 1 and FL 2 in the electronic enclosure. The temperature rise of the furnace is approx 100°F/min. Do not allow the furnace temperature to exceed 1550°F. Remove power if furnace temperature starts to exceed 1550°F. If temperature is not correct readjust temperature set point R114 on PCB 1 (refer to "Block Thermostat Replacement and Adjustment" in the "Fault Isolation and Repair" section).

Cold Reference Junction °F/°C	T/C Output mV (Chromel Alumel) at 1500°F/816°C
0°F (-17.8°C)	34.6
32°F (0°C)	33.9
40°F (4.4°C)	33.7
50°F (10°C)	33.5
60°F (15.6°C)	33.3
70°F (21.1°C)	33.1
75°F (23.9°C)	32.9
80°F (26.7°C)	32.8
90°F (32.2°C)	32.6
100°F (37.8°C)	32.4
110°F (43°C)	32.2
120°F (49°C)	32.0
130°F (54°C)	31.7
140°F (60°C)	31.5
150°F (66°C)	31.2

NOTE: All T/C connecting wires must be under the same screw head. Crimped lugs must not be used.

2. Turn on air supply and adjust pressure level to that required for your type of installation.

3. The analyzer output should now respond to changes in the air ratio and should show the expected O<sub>2</sub> reading. If response is otherwise, review "Bailey Type OJ Results Compared with other Methods of O<sub>2</sub> Analysis" which follows. If problem still persists refer to "Fault Isolation and Repair" section.

NOTE: The power to the sensor heater, block heater and probe heater should be on, even when the process is shut down. Repeated cooling down of heater to ambient temperature has the effect of shortening its life.

Bailey Type OJ Results Compared with other Methods of O<sub>2</sub> Analysis

Oxygen values shown by the OJ may appear different than those obtained by other methods. These reported differences are real, but can be easily explained with the information provided here.

The most frequent application of the OJ Analyzer is to provide a measure of excess air in a combustion process, based on total oxygen content in flue gas emissions. The OJ continuously extracts a portion of flue gas and analyzes it for total O<sub>2</sub> content without conditioning. These results then represent a true "as fired" value on a total volume percentage basis for that combustion process (assuming complete combustion).

Other analysis methods condition the sample by cooling it to ambient temperature. In so doing the sample temperature is lowered below the dew point of the water vapor present as a normal product of combustion. Some water vapor is condensed out of the sample. As the remainder of the sample is analyzed the percentage volume of O<sub>2</sub> is seen as higher than existed in the original sample since the same level of O<sub>2</sub> content would in fact represent a greater portion of the total sample with the water vapor removed.

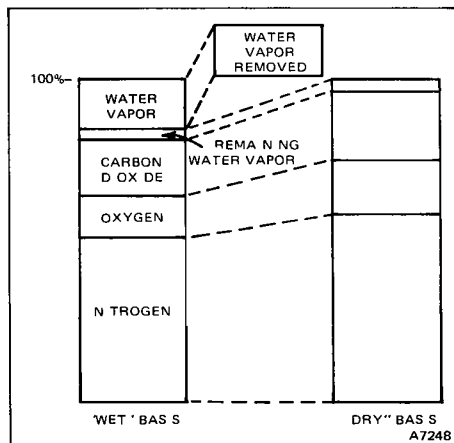


FIGURE 8 Typical Analysis of Gases Produced as Products of Combustion

Graphically, (Figure 8) it can be seen that if we remove most of a major component of a mixture of gases the percentage by volume represented by the remaining components must increase proportionately to make up the total 100% of the mixture. Essentially this is the difference between the two methods of analysis.

Some examples of methods thus altering the sample include the traditional Orsat and other portable apparatus as well as Bailey's older OA Analyzer and similar instruments such as Hays, L&N and Taylor paramagnetic types, Bechman polarographic, Teledyne and others using a water washed sample conditioning system.

The terminology applied to the two sampling techniques can be confusing. The above dew point method (i.e., Bailey OJ) is referred to as "wet basis", meaning that the sample's water content (in vapor form) is included in the total volume. The below dew point method (i.e., Orsat) is referred to as "dry basis", meaning that some of the water has been condensed out. The possible confusion arises because the "dry" method may use water in the sample handling mechanism and results in water being extracted from the sample.

By using the chart provided (Figure 9) a value obtained by one analysis method can be correlated with that expected from the other method. Note that the differences will vary with the fuel being used. In a natural gas fired system, the hydrogen present in the fuel creates 15.20% water vapor during the combustion process. This amount is significant enough to change the oxygen readings between the wet and dry sampling systems by about .38% O<sub>2</sub>. In a methane

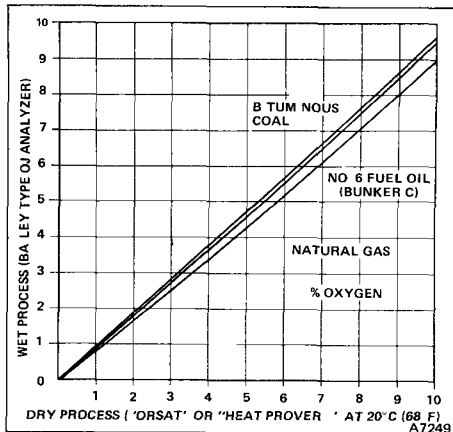


FIGURE 9 Comparison Chart for % O<sub>2</sub> Measurement by Oxygen Analyzers

gas fired process the difference in readings is about 0.33% O<sub>2</sub>, due to the lower amount of hydrogen present in the fuel. In an oil fired process the difference is about 0.11% O<sub>2</sub> and in a coal fired process the difference is insignificant.

More precise and complete calculations can be made, taking into account such factors as moisture content in the ambient air, temperature of the "dry" sampling system, and so on. For typical applications, however, such precision is seldom necessary on a routine basis, and results as determined by the provided graphs will be adequate.

## MAINTENANCE

Maintenance of the Oxygen Analyzer is generally limited to periodic checks of the sample system or sensor cell replacement. A clean filter or sampling system will usually keep the analyzer unit in good operating condition.

### PERIODIC MAINTENANCE

It is recommended that a calibration check be run every month. If a decrease in response is noted the entire sample system should be cleaned (see "Sample System Manifold Block Cleaning" in the "Fault Isolation and Repair" section).

## CALIBRATION CHECKS

### Calibration Check with Test Gas

This calibration check assumes that the sensor temperature control and output amplifier are operating properly. If not, refer to the "Fault Isolation and Repair" section in this Product Instruction. It also assumes that the 4.20 mA output is being observed on an indicator or recorder reading O<sub>2</sub> directly.

A difference will be noted when the output from the Type OJ Oxygen Analyzer which indicates on the wet basis, is compared with an Orsat or other analyzers which indicate on the dry basis (e.g., Bailey's OA, OE or OH or comparative model). For an explanation of this difference and the % O<sub>2</sub> reading variations when different fuels are used, refer to "Bailey Type OJ Results Compared with Other Methods of O<sub>2</sub> Analysis" in the "Operation" section.

Bailey Controls Company strongly recommends that the Oxygen Analyzer, Type OJ, be checked against certified gas cylinders purchased with an accuracy of +0.1%. The analysis of these certified gases is indicated on the tag.

**NOTE** It is recommended also that two cylinders of test gas be used: a zero test gas cylinder with an O<sub>2</sub> value between 0.1% and 30% of span, and a span test gas cylinder with an O<sub>2</sub> value between 70% and 95% of span. If only one gas is used, it should have a value close to that normally occurring in the process gas stream.

Zero and span test gases can be obtained which are within +0.1 O<sub>2</sub> of the nominal values ordered. For example:

	Nominal Value	Actual Value
Zero Gas	1.2% O <sub>2</sub> in N <sub>2</sub>	1.1 to 1.3% O <sub>2</sub> in N <sub>2</sub>
Span Gas	8.6% O <sub>2</sub> in N <sub>2</sub>	8.5 to 8.7% O <sub>2</sub> in N <sub>2</sub>

**WARNING** BAILEY HEAT PROVERT™ TEST GAS BOTTLES CONTAIN O<sub>2</sub> AND COMBUSTIBLES. USING THESE CYLINDERS WILL PRODUCE A FALSE O<sub>2</sub> READING LOWER THAN ACTUAL VALUE.

**AVERTISSEMENT** LES BOUTEILLES DE GAZ DE LA MARQUE DEPOSEE BAILEY HEAT PROVERT, POUR LES ESSAIS ET VERIFICATIONS, CONTIENNENT DE L'OXYGENE (O<sub>2</sub>) ET DES MATIERES COMBUSTIBLES. SI L'ON EMPLOIE CES CYLINDRES, LE RESULTANT PORTANT SUR LE TENEUR EN OXYGENE EST ERRONE, ET PLUS FAIBLE QUE LA VALEUR REELLE.

Calibration of the Oxygen Analyzer, Type OJ, is checked by applying test gases of known concentration. The test gases are applied thru the shut off valve at the side of the manifold block. At the same time, the aspirator air supply must be shut off.

The preferred method is to use a Flowmeter (Rotameter 10 CFH full scale) in the test gas line ahead of the check valve and after the pressure reducing valve on the calibrating test gas cylinder. Adjust the pressure regulator to maintain a test gas flow rate of 4.6 CFH.

1 Apply the zero test gas and, if necessary, adjust the min pot (R224) to make the readout correspond to the test gas value.

2 Apply the span test gas and adjust the max pot (R216) until the readout equals the known test gas value.

3 Repeat steps 1 and 2 until the indicated value agrees with the test gas values.

When the load resistor has a value of 500 ohms, the following equation can be used:

$$% O_2 = 1.25 E_o - 2.50$$

Where E<sub>o</sub> = Output (V dc)

% O<sub>2</sub> = Cylinder Tag Value

Rearranging,

$$E_o = \frac{\% O_2 + 2.50}{1.25}$$

Use this equation to determine what the output (E<sub>o</sub>) should be for the zero and span gas.

4 Apply the zero gas and adjust the min pot (R224) to the known test gas value.

5 Apply the span gas and adjust the max pot (R216) to the known test gas value.

6 Repeat steps 1 and 2 until the indicated value agrees with the test gas value.

#### Changing Range Calibration of Linear Converter

The Oxygen Analyzer produces a linear output in proportion to the oxygen concentration. The standard range calibrated by the factory is 0-10% O<sub>2</sub>.

Other possible ranges are

- 0.1% O<sub>2</sub>
- 0.2% O<sub>2</sub>
- 0.5% O<sub>2</sub>
- 0.25% O<sub>2</sub>  
(field calibrated)

The sensor millivolt output of the desired range can be determined from Figure 10. If the range is to be changed, substitute new values for those given in the following example.

**CAUTION** When the apparatus is connected to its supply terminals may be live and the openings of parts or removal of covers (except those to which access can be gained by hand) is likely to expose live parts.

Any adjustment, maintenance and repair of the opened apparatus with power on should be carried out only by a skilled person who is aware of the hazard involved.

**ATTENTION** Lorsque l'appareil est connecté à sa source d'alimentation les bornes peuvent se trouver sous tension, et si l'on ouvre certaines pièces ou enlève certains couvercles, on risque d'exposer des éléments en charge.

Tout réglage, entretien et réparation de l'appareillage, lorsque celui-ci se trouve ouvert et sous tension, doit être confié uniquement à une personne spécialisée en la matière et connaissant bien les risques de l'opération.

1 Turn power off

2 Remove the two leads labeled "sensor" at circuit board (PCB1 (wht/brn is positive pin 3))

3 Connect positive terminal of a millivolt supply to the negative terminal (and negative of supply to positive pin 3 on the board). Set for 120 millivolts.

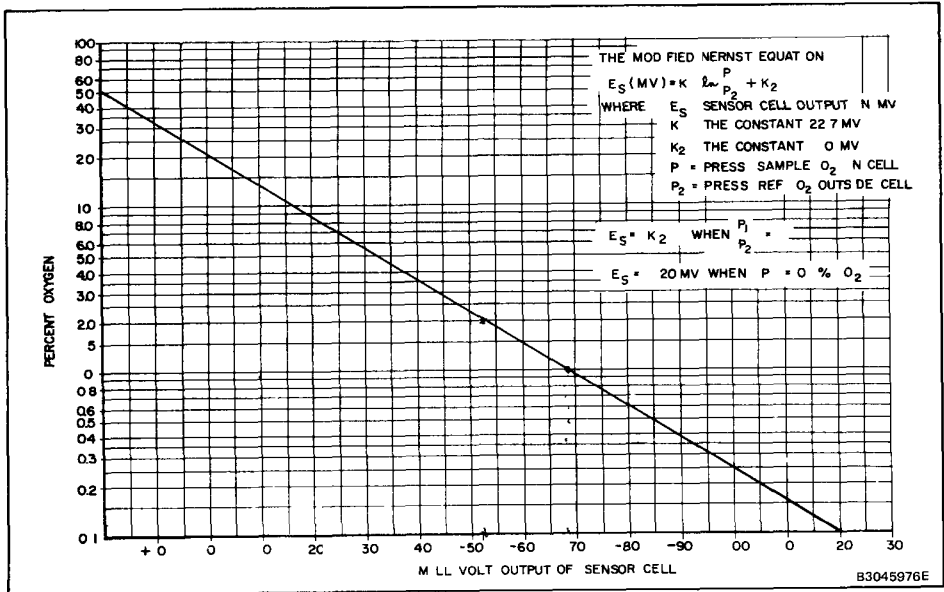


FIGURE 10 Typical Sensor Cell Output Curve

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4 Connect voltmeter to output terminals 3 and 4 after a 500 ohm resistor has been connected across the output terminals Terminal 3 is positive with respect to 4

5 Turn power on and refer to Table A to obtain voltage values for the selected range

This example is for a range of 0 to 10%

% O <sub>2</sub>	Input	Output (For a 500 ohm load)
0.1%	120 mV	2.08 V dc (+ 0.5 V)
5.0%	31.4 mV	6.00 V dc (+ 0.5 V)
10.0%	15.7 mV	10.00 V dc (+ 0.5 V)

6 With the supply at 120 millivolts, set the output to 2.08 volts by adjusting the 4 mA Adj (Pot R224 on amp PC board)

7 Set the input supply to 15.7 millivolts Set the output to 10.00 volts by adjusting the 20 mA coarse Adj (pot R220)

8 Set input signal to 31.4 millivolts Set output to 6.000 volts by adjusting the 12 mA mid Adj (pot R203)

9 Repeat steps 6 through 8 until all output readings are within 50 mA of their respective values

NOTE The 20 mA fine Adj (R216) should be used when trimming the 10 volt point the second time

10 Turn power off

11 Disconnect potentiometer leads and re-connect the sensor leads (wht/brn to the positive terminal and the gray lead to the negative terminal)

**TABLE A  
CALIBRATION CHART FOR LINEAR OUTPUT**

Range	Input mV	Output*		%O <sub>2</sub>
		1.5 V dc 250 Ω Load	2.10 V dc 500 Ω Load	
0.1%	120.1	1.40	2.80	0.1
	83.6	3.00	6.00	0.5
	67.9	5.00	10.00	1.0
0.2%	120.1	1.20	2.40	0.1
	67.9	3.00	6.00	1.0
	52.2	5.00	10.00	2.0
0.5%	120.1	1.08	2.16	0.1
	47.2	3.00	6.00	2.5
	31.4	5.00	10.00	5.0
0.10%	120.1	1.04	2.08	0.1
	31.4	3.00	6.00	5.0
	15.7	5.00	10.00	10.0
0.20 9% (Ambient Air)	120.1	1.02	2.04	0.1
	14.8	3.00	6.00	10.45
	+ 1.0	5.00	10.00	20.9
0.25%	120.1	1.015	2.03	0.1
	10.7	3.00	6.00	12.5
	+ 5.1	5.00	10.00	25.0

\* Load 500 ohm for 2.10 V dc output  
Load 250 ohm for 1.5 V dc output

## FAULT ISOLATION AND REPAIR

This section includes (1) a quick reference fault isolation chart (Table B) (2) fault isolation and repair instructions (3) component replacement instructions and (4) a schematic of the Oxygen Analyzer (Figure 11) Procedures which are located in other sections and are found useful in the fault isolation and repair processes are included in that process by cross reference Test point references used in fault isolation and repair instructions refer to test points in Figure 6 (Oxygen Analyzer Wiring Diagram)

### FAULT ISOLATION

**WARNING** ANALYZER ENCLOSURE SURFACE TEMPERATURE MAY EXCEED 110°F/43°C. ANALYZER FURNACE ASSEMBLY SURFACE TEMPERATURE MAY EXCEED 440°F/227°C USE PROTECTIVE HAND COVERING WHEN SERVICING THIS EQUIPMENT

**AVERTISSEMENT** LA TEMPERATURE A LA SURFACE DE L'ENCEINTE DE L'ANALYSEUR PEUT DEPASSER 110° FAHRENHEIT (43 CENTIGRADE) LA TEMPERATURE A LA SURFACE DU FOYER DE L'ANALYSEUR PEUT DEPASSER 440° FAHRENHEIT (227° CENTIGRADE) AYEZ LES MAINS COUVERTES DE GANTS DE PROTECTION LORSQUE VOUS FAITES L'ENTRETIEN DE CE MATERIEL

**CAUTION** When the apparatus is connected to its power supply, terminals may be live and the openings of parts or removal of covers is likely to expose live parts

Any adjustment maintenance and repair of the opened apparatus under voltage should be carried out only by a skilled person who is aware of the hazard involved

**ATTENTION** Lorsque l'appareil est connecté à sa source d'alimentation, les bornes peuvent se trouver sous tension et si l'on ouvre certaines pièces ou enlève certains couvercles (sauf ceux que l'on peut atteindre facilement à la main) on risque d'exposer des éléments en charge

Toute réglage, entretien et réparation de l'appareillage, lorsque celui-ci se trouve ouvert et sous tension doit être confié uniquement à une personne spécialisée en la matière et connaissant bien les risques de l'opération

**CAUTION** To prevent clogging problems ensure that all traces of Teflon tape are removed from threads when fittings are removed When applying tape, start the wrap one thread back from the end of the pipe to prevent shreds of tape from entering the flowing stream

**ATTENTION** Pour éviter tout obstruction, on doit s'assurer d'avoir éliminé les moindres traces de ruban Teflon pouvant se trouver sur les filetages lorsque l'on enlève les accessoires de tuyauterie Au moment de l'application enroulez le ruban en commençant à un pas de distance de l'extrémité du tuyau on évite ainsi d'introduire des morceaux de ruban dans le courant

Teflon tape should be used to seal fittings screwed into manifold block and to prevent galling of manifold block threads

**NOTE** All fault isolation is performed with the Oxygen Analyzer energized unless noted otherwise

1 Match trouble symptoms of Oxygen Analyzer to those in the trouble column of the Quick Reference Fault Isolation Chart (Table B) and read across the chart to determine the remedy

2 If the trouble symptom is other than those listed in the chart link it to a physical section of the Oxygen Analyzer and perform those component fault isolation and repair procedures in the following subsections that are appropriate

#### Furnace and Sensor Fault Isolation

1 Check for an orange red glow of the sensor thru the mirror above the exhaust hole in the top of the furnace assembly An orange glow gives a rough indication that the sensor temperature is near 1500°F/816°C If the sensor produces an orange glow go to step 8 If not proceed with step 2

2 If furnace is inoperative, check main circuit breakers

3 Check 107 to 130 V ac power supply to terminals 7 and 8 of the Analyzer terminal block TB4 (same as terminals 5 and 6 at TB1)

TABLE B  
QUICK REFERENCE FAULT SOLATION CHART

	Trouble	Possible Fault	Test	Remedy
A	Oxygen level shown by the recorder or indicator does not agree with expected process O <sub>2</sub> level or portable O <sub>2</sub> analyzer	1 Recorder or indicator is not calibrated	Disconnect OJ input and replace with an adjustable 420 mA or 1.5 V dc source	Calibrate the recorder or indicator
		2 Recorder or indicator 420 mA inputs reversed	Remove inputs Recorder should drive toward zero	Reverse inputs leads
		3 Actual process O <sub>2</sub> may be different from that expected	Put test gas into OJ to check its output vs O <sub>2</sub> in test gas	420 mA output does not read correctly see "Calibrate on Check with Test Gas" in "Maintenance" section of 420 mA outputs correct for test gas values check the process for air leaks through ports, air registers or unused burners, etc
		4 Ambient air is not circulate to sensor	Inspect end of reference air tube to verify that it is open	Remove possible blockage at end of tube (e.g. failure to remove past candle cap)
		5 System has earth ground at 2 or more points	Remove all earth grounds from recorder or indicator and from the shield for the twisted pair of signal wires from the controller or other devices in the system The indicator or recorder will change O <sub>2</sub> value as grounds are added	Make earth ground at one place preferably at OJ electronic enclosure (Refer to Figure 6 wiring diagram)
		6 OJ will give a lower O <sub>2</sub> reading than a portable analyzer	Refer to "Battery Type OJ Results Compared with other Methods of O <sub>2</sub> Analysis" (part of "Start up and Operation" section)	Compensate for the fact that the Type OJ Analyzer uses a "wet" basis for analysis
B	No 420 mA output from electronics	1 No power	Check for presence of power feed connect to electronics enclosure and/or check for blown fuse on electronics board of electronics enclosure	Replace blown fuse in customer's power line Replace blown fuse (F1) in analyzer enclosure junction box Verify power supply lines main power switch is "ON"
		2 Sensor broken or coated with a fuel gas residue	Refer to test in Sensor Broken or Coated with Residue Fault section	Replace broken sensor or clean residue from sensor
		3 Sensor furnace not up to temperature	A red glow should appear in mirror on top of the furnace and furnace should have a resistance value of about 54.4 ± 2.7 ohms at room temperature	If red glow is absent, see Possible Fault No. 1 of Trouble B Replace blown fuse (F2) on electronics enclosure board If furnace resistance is not close to 54.4 ± 2.7 ohms at room temperature, replace it

TABLE B (Cont.)

	Trouble	Possible Fault	Test	Remedy
C	Recorder or indicator slow to respond to changes in process fuel/ratio	1 Recorder or indicator dampening circuit causing delay  2 Sample transport system partially plugged	Check dampening adjustment  Remove inspect on pump with aspirator on at normal pressure inspect sample passage for deposits	Adjust dampening out of circuit  Clean out sample passage per "Sample System Manual Block Cleanng"
D	Analyzer has been operating satisfactorily but is now slow to respond to changes in process fuel/ratio changes	1 Refer to Possible Fault No. 1 of Trouble C  2 Sensor is coated with fuel gas residue	Refer to "Sensor Broken or Coated with Residue Fault" section	

4 If the voltage is zero, disconnect power to the electronics enclosure (terminals 5 and 6 at TB1)

↳ Check for open fuse F1

**WARNING IF FUSE F1 IS OPEN THEN CHECK THE SILICON CONTROLLED RECTIFIER Q107 AND CR113 FOR A SHORT OR OPEN THESE COMPONENTS MUST BE CHECKED OTHERWISE DAMAGE MAY RESULT TO TEMPERATURE CONTROLLER**

**AVERTISSEMENT SI LE FUSIBLE F1 SE TROUVE EN CIRCUIT OUVERT, ON DOIT VERIFIER SI LE REDRESSEUR AU SILICIUM (Q107 ET CR113), A UNE COUPURE OU UN COURT-CIRCUIT CES PIECES DOIVENT ETRE SOIGNEUSEMENT VERIFIEES, SINON ON RISQUE DE CAUSER DES DEGATS AU CONTROLEUR DE TEMPERATURE**

6 If furnace is still inoperative, check furnace coil for continuity as follows. Disconnect power to Analyzer. Disconnect the heater leads 7 and 8 at the printed circuit board (FCB1). Connect ohmmeter across the heater leads. Correct furnace coil resistance is 30 +5 ohms. If furnace coil is open, replace entire furnace assembly. If coil resistance is correct, proceed with the next step.

7 Check sensor thermocouple for continuity as follows. Disconnect leads 1 and 2 for thermocouple on PCB1, connect ohmmeter across the leads. Correct thermocouple resistance is 5 to 10 ohms. If thermocouple is open replace thermocouple.

8 Check exact sensor temperature (1500 +2°F/816 +1°C) by connecting dc DVM across thermocouple leads at terminals 1 and 2 of PCB1. A reading of 32.9 mV @ 75°F/24°C indicates a correct sensor temperature (see "Operation", in "Start up and Operation" section).

9 Check calibration of temperature control as described under "Circuit Board Replacement"

Occasionally, in a clean gas system a process load increases and the unit will read a high O<sub>2</sub> or will lack response to load changes. This may be caused by high velocity process gases flowing across the end of the sample probe, this creates a vacuum, overpowering the aspirator and reversing the flow thru the analyzer. Any of the following may correct the problem:

1 Clean aspirator

2 Increase aspirator air supply pressure (not to exceed 10 psi/690 kPa)

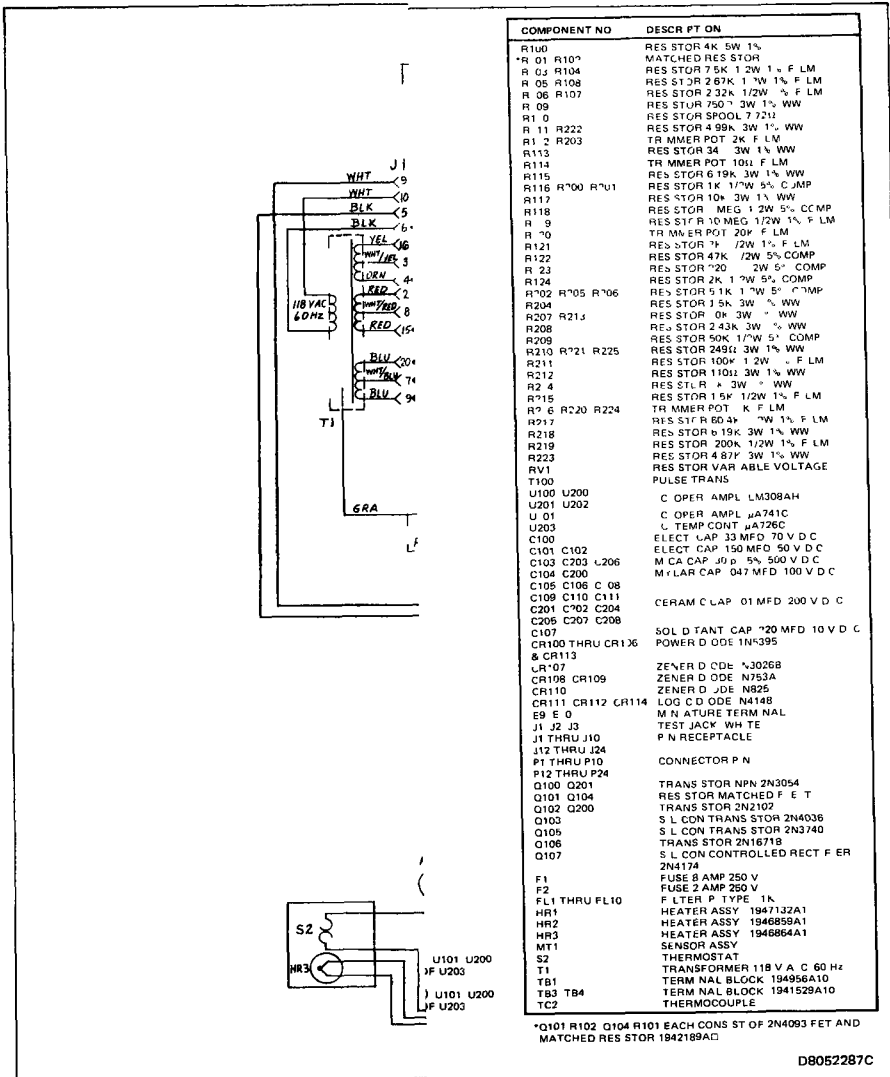
3 Install an exhaust tube by cutting a piece of 1/4" schedule 40 pipe shorter than the probe by 4" - 6" and installing it in the manifold block exhaust hole (Exhaust tube required for clean gas aspirator only.)

Sensor Operation Fault Isolation Using Test Gas

1 Connect a 10 SCFH rotameter to the "Test Gas" tubing inlet (refer to D2049122)

2 Adjust the flow thru the rotameter to 5 CFH after turning off the air supply to the aspirator

Type OJ Oxygen Analyzer



DB052287C

F GURE 11 Oxygen Analyzer Schematic



3 The sensor millivolt output signal should agree with the values shown in Figure 10

If calibration cannot be obtained when performing "Calibration Check with Test Gas"

1 Recheck for proper test gas flow

2 Measure sensor thermocouple output to confirm 1500°F/816°C temperature

3 Have bottle of test gas checked by local laboratory

If cell output voltage is incorrect

Check furnace temperature by connecting a dc DVM across thermocouple leads at terminals 1 and 2 of PCB1. A reading of 32.9 mV @ 75 F/24°C indicates correct sensor temperature

2 Check each terminal to ground with ohmmeter to be certain sensor cell is not shorted. Resistance should be 10 k ohms or greater

#### Sensor Broken or Coated with Residue - Fault Isolation

1 Remove analyzer enclosure inspection port plug, turn on aspirator air and check for positive or negative air at port

2 If air is negative - permit ambient air to circulate about sensor and proceed to step 4

3 If air is positive - turn off aspirator air, install a 5" lg. 1/4" NPT capped nipple on the matching threads inside the port, and again turn aspirator air on

4 Using a voltmeter readable to 1 mV (Fluke 8300 or equivalent) connect voltmeter to electronics enclosure terminal box (positive to TB3-3 negative to TB3-4) and verify a reading of +1 or +2 mV dc

5 If reading is otherwise, proceed with "Sensor Removal" until observed that sensor is either broken or coated with residue. If sensor is broken, replace sensor, retest it per step 4 above, and proceed to step 6. If sensor is coated with residue, remove, test and clean sensor per "Sensor Resistance Test and Cleaning" before retesting per step 4 and performing step 6

6 Disconnect voltmeter, remove 1/4 NPT nipple (if used), replace inspection port plug, and return Oxygen Analyzer to service

#### Sensor Resistance Test and Cleaning

1 Follow "Sensor Removal" procedure until sensor is freed from furnace assembly (sensor leads may be left connected to enclosure terminals if they are sufficiently long)

2 Fabricate the insulated wire probe shown in Figure 12 and attach the straight end of the probe to one lead of an ohmmeter

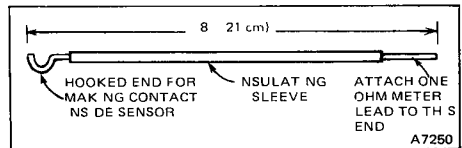


FIGURE 12 Soldered Copper Wire Probe for Resistance Test

3 With the probe lead of the ohmmeter touching the far end of the platinum coating on the inside of the sensor and the remaining ohmmeter lead connected to the lower sensor lead, measure 15 ohms or less across the sensor

4 If resistance is greater than 15 ohms, remove residue from sensor without scraping off platinum coating by washing gently with soap water, and bottle brush. Difficult to remove residue may be dissolved with the aid of lacquer remover or acetone, however, if used the safety precautions given on the containers of these solvents must be followed

5 After sensor has been cleaned and dried, remeasure resistance as described in step 3. If resistance is greater than 15 ohms, replace sensor. If resistance is 15 ohms or less, reinstall sensor

#### Sample System with Probe Filter - Fault Isolation

For sampling systems with a probe filter, a check can be made of the filter conditions by determining how long it takes to start to return to flue gas values from a shot of zero or span test gas (about 2 seconds for a 4 foot Bailey probe)

to 5 seconds for a 10 foot probe) An increase in aspirator air supply will shorten response time unless the probe is plugged

If the probe is plugged

1 Remove the inspection plug in the lower right hand corner of the manifold block

2 Insert a 1/8" NPT pipe nipple (4" long) into the hole and screw into 1/8" thread inside the block

3 Connect a high pressure air line to the 1/8" NPT pipe nipple and blow back. Pressure should be 75 100 psig/517 690 kPa and maintained for 1 3 sec

NOTE The compressed air must be dry and free of oil to eliminate liquid which could plug the filter. Bottled  $N_2$  can be used if a clean air supply is not available

After the blowback operation has been completed, check the other areas to be certain they are clean and free of obstructions

4 Remove the 1/8" pipe plug on the left side of the block and then remove the aspirator. The 0.036" diameter (#64 drill size) orifice now may be removed, inspected and cleaned (see item 10 on Parts Drawing E65 30)

#### Sample System without Probe Filter Fault Isolation

For those applications not using a filter, the following check out procedure should be used

1 Remove the inspection plug in the lower right corner of the manifold block and determine that the probe and internal passages are clean. If not, rod the probe out thru the inspection port hole. If the system is pressurized, be careful of hot escaping gases (which indicate that the probe is open). Replace inspection plug

NOTE Caution should be exercised when removing these plugs when the analyzer is installed on a pressurized duct

2 Remove the aspirator nozzle and determine that the area and the discharge port to the turbine is open. If not, rod it out. Replace the aspirator nozzle

3 Remove the pipe plug (1/8 NPT socket head) on the left side of the manifold block and determine that the cross passage is open and clear. Replace pipe plug

This completes initial checkout of the sample system. If problems persist, proceed with "Sample System Manifold Block Fault Isolation" which follows

#### Sample System Manifold Block Fault Isolation

1 Proper or satisfactory operation of the sampling system can be observed by noting the difference in sensitivity on the recorder chart. As the sampling system starts to plug, there is a decrease in response and sensitivity as noted on the chart

2 Check air supply pressure gage. It will be 7 psig/483 kPa for those applications using a filter and 5 psig/345 kPa for those clean applications with no filter

3 Check air supply to the aspirator by removing the aspirator nozzle assembly (lower left corner of block). Turn on air supply slowly until air discharges from the opening. Verify that entrance and exit air passages of the nozzle are clean and free of dirt before reinstalling nozzle

4 Check manifold block temperature. It must hold  $400 \pm 10^\circ F / 204 \pm 6^\circ C$  and maintain that temperature to eliminate plugging caused by condensate formation. Block temperature can be measured by turning off the aspirator air supply, removing the inspection port plug (item 21 of Parts Drawing E65 30) and inserting a thermocouple into the hole approximately 1.5 in/38 mm. To readjust the temperature setting, move the thermostat adjustment in small increments so that you do not exceed  $425^\circ F / 218^\circ C$ . The thermostat requires counter clockwise motion to increase block temperature (120°/Rev.). The limits of adjustment are found under "Block Thermostat Replacement and Adjustment"

CAUTION Do not adjust more than three turns from original position

ATTENTION Ne pas régler de plus de trois tours à partir de la position initiale

## Type OJ Oxygen Analyzer

5 The condition of the block internal passages can be checked by removing the inspection port plug and the nozzle assembly. A rod can be inserted thru the inspection port if necessary to check the entire length of the probe. The discharge port downstream of the nozzle assembly should be inspected to be certain that it is clean and clear. A rod can be used to be certain that the discharge port is clear into the duct. Further checks can be made of the internal passages by removing the 1/8" NPT socket head plug on the left side of the manifold block and two on the bottom of the block. Hold a mirror under the center bottom hole. You should be able to see the tip of the sensor glowing. If not, the tube may be plugged. *Carefully* insert a piece of wire into the center bottom hole and move it around. Dust should fall out into your hand. **DO NOT** poke the wire upward with any force or you may break the sensor. Be careful when removing the wire because it will be very hot.

NOTE Caution should be exercised when removing these plugs when the analyzer is installed on a pressurized duct.

NOTE When replacing the inspection port plug be certain that the gasket is in good condition. It is important that this be a leak tight joint. A leak at this point may cause false O<sub>2</sub> readings.

### Sample System Manifold Block Cleaning

Cleaning accumulated soot or dirt from inside the sample system block is not necessary unless the sample flow has stopped or analyzer response has become sluggish.

- 1 Turn off power to analyzer and allow to cool. Disconnect sensor, furnace heater and furnace heater T/C wires.
- 2 Remove furnace assembly and sensor assembly.
- 3 Remove all pipe plugs, inspection port plug, aspirator plug and shut off valve.
- 4 Blow out all passageways, sensor exhaust tube, and the annular opening at the base of the sensor in the manifold block.
- 5 Clean Teflon tape from all passages and threads.

6 Using new Teflon tape, install all pipe plugs and the shut-off valve.

7 Install inspection port plug and aspirator plug using new gaskets.

8 Install sensor using new sensor gasket.

9 Install furnace assembly and connect wiring.

Usually the dirt accumulates because the sample flow is too high. At *full load* of the process, reduce the aspirator air pressure until the % O<sub>2</sub> reading becomes steady, then raise the pressure until the O<sub>2</sub> output signal becomes active (this will be the minimum pressure which will draw a sample). *Do not* adjust at low loads because it may cause false high O<sub>2</sub> readings.

### Circuit Board Signal Converter Fault Isolation

Perform calibration check included with "Changing Range Calibration of Linear Converter" in the "Maintenance" section.

If signal converter outputs are correct, unit is working properly. Proceed to the next step. If outputs are incorrect, calibrate as outlined in calibrating check. If calibration cannot be obtained, replace the circuit board.

## COMPONENT REPLACEMENT

### Furnace Assembly Replacement

**WARNING WHENEVER ANALYZER IS DISASSEMBLED, EXTREME CARE MUST BE TAKEN TO PREVENT BREAKAGE OF THE CERAMIC SENSOR CELL DUE TO THERMAL OR MECHANICAL SHOCK.**

**AVERTISSEMENT AU COURS DU DE MONTAGE DE L'ANALYSEUR, IL FAUT PRENDRE UN SOIN EXTREME POUR NE PAS CASSER L'ELEMENT EN CERAMIQUE DU DETECTEUR PAR UN CHOC THERMIQUE OU MECANIQUE.**

Replacement of the furnace assembly as an entire unit is recommended. Refer to Parts Drawing E65 30 when performing the following steps.

- 1 Shut off aspirator air supply to analyzer
- 2 Turn off ac electrical power to analyzer and allow unit to cool (about 2 hrs ) with door open. If raining, place a temporary cover over the furnace so that runoff water will not contact the hot sensor
- 3 Remove screws holding deflector mirror and remove mirror
- 4 Loosen screws holding thermocouple retainers (item 61) and gently spring thermo couple (62) clear of heater assembly
- 5 Remove terminal designation strip (14) and disconnect the leads from the furnace assembly (27) at TB3 1 and TB3 2 of terminal block (15)

6 Remove the five screws and washers (50, 56) holding the furnace assembly (27) to the mounting plate (51). An offset screw driver is needed to remove the two rear screws

7 Remove furnace assembly (27) by lifting straight up slowly and avoiding damage the sensor assembly (25)

**CAUTION** Use care in lifting the furnace to prevent breakage of sensor cell

**ATTENTION** Soulevez le foyer avec les plus grandes precautions pour ne pas casser l'element detecteur

8 Install new furnace assembly by performing steps 1 thru 7 in reverse order

9 Check analyzer calibration as outlined under "Operation" in the "Start up and Operation" section

### Sensor Assembly Replacement

Refer to Parts Drawing E65 30 and perform the following procedures

#### Sensor Removal

1 Remove furnace assembly (item 27) as described in "Furnace Assembly Replacement"

2 After removing designation strip (14) disconnect the sensor leads from TB3 5 and TB3 6 of terminal block (15)

3 Remove the four screws and washers (48, 56) holding the mounting plate (51) and lift off mounting plate

4 Remove the two screws (46) cover plate (33) and gasket (35) from the support block (26)

5 Remove three screws (49) and springs (54) holding sensor (25) in support block (26)

6 Remove sensor and gasket (32) by lifting sensor straight up

**CAUTION** Be careful not to bump or bend the exhaust tube in the center of the sensor

**ATTENTION** Veillez a ne pas heurter ou deformer le tuyau d'echappement qui se trouve au centre du detecteur

**NOTE** It is not necessary to remove the support block unless the center exhaust tube has become distorted or bent. Perpendicularity of the center tube can be checked after removal of the support block. It is held in position with two screws. Use a small square (in two planes) to check perpendicularity of the center tube, and straighten if necessary. The center tube should not touch (short) the sensor inside diameter (which is the positive lead of the assembly)

With the sensor removed check to see that the center exhaust tube is clear and that there is no dirt or restricting material where the exhaust tube is pressed into the manifold block. Restriction here will reduce analyzer response

#### Sensor Installation

1 Insert the Gasket (32) (with support block in position)

2 Install the sensor assembly in the support block and start the three screws (with springs)

**NOTE** A "starter" screwdriver is needed

Rotate the sensor so that there is clearance between the screws and the lower sensor lead

Type OJ Oxygen Analyzer

**CAUTION** The power sensor lead must not short to ground

**ATTENTION** Le conducteur interieur du detecteur ne doit pas se trouver court-circuite vers la terre

Take up the three screws equally so that the sensor is uniformly compressed against the gasket. Tighten the screws until the coils of the springs are just touching (bottomed). Do not tighten further.

3 Run the sensor lead wires to the terminal block (15). Connect the positive lead (black band on white lead) at TB35 and remaining lead to TB6.

4 Place cover plate (33) and gasket (35) over leads and install two screws (46).

5 Position mounting plate (51) on support block (26) and fasten with four screws and washers (48, 56). Tighten cover plate screws (46).

6 Install furnace assembly by following "Furnace Assembly Replacement" procedure.

Block Thermostat Replacement and Adjustment

Before installing a new thermostat connect ohmmeter across leads and turn screw clockwise until the contacts open. This is the make break point of the contacts and is the ambient temperature set point. Turn the screw two full turns counterclockwise. The adjusting rate is approximately 170°F/40°C per revolution (80°F ambient +740 F - 370°F). Ins all in the manifold block and turn the power on. When the block temperature has stabilized reset the adjusting screw to obtain a block temperature of 400 +10°F 240 +6°C.

**NOTE** Do not turn the screw more than three revolutions in either direction without checking ambient set point. Exceeding this limit may render the thermostat inoperative. Block temperature above 430°F/221°C may damage seals.

Sensor Thermocouple Replacement and Adjustment

The thermocouple is located 1/16" above the end of the sensor. A new thermocouple should be inserted down thru the top vent hole

until it touches the sensor. Withdraw thermocouple 1/16" and then bend (general radius) the thermocouple to fit under the clamp. Bend it again at the outside furnace edge to fit the lower clamp. Installing and tightening the screws completes the replacement of the thermocouple.

Probe Replacement Applications to 1500°F (816°C)

It is often difficult to salvage used probe parts due to high temperature corrosion due to long exposure to hot flue gases. Therefore, it is recommended that all applicable probe parts, probe support, heater coil and reducer or filter assembly be replaced. Refer to Parts Drawing E65 30 9 for appropriate part numbers.

1 Remove analyzer enclosure from duct and remove old parts.

2 Wrap Teflon tape around threads of probe starting one thread back from the end to avoid clogging. Carefully insert the probe into the manifold block and tighten.

3 Replacement heater assembly comes loosely looped and bagged. Straighten wire to full 100 in/2450 mm length. Push long end of wire thru hole in enclosure from the *sensor* side *not* the probe side. It will emerge very close to the probe.

4 Coil the heater loosely around the probe. Pull out the end coil, spacing coils equally (about 3 per inch). It should be long enough to go from analyzer unit thru the duct wall and extend 6 in/152 mm into the duct.

**CAUTION** Do not leave any coils touching each other.

**ATTENTION** Ne permettez pas aux boudins de se toucher.

5 Install the 3/4" support pipe over the probe and heater coil and thread into the mounting flange.

**NOTE** The support pipe is 2 in/51 mm shorter than the sample probe. If the sample probe has been cut shorter, the support pipe must also be cut and may need to be rethreaded.

6 Clean gas system Install the 3/4" x 1/2" reducer over the probe and thread it onto the exposed end of the support pipe

Dirty gas system Install filter and shield assembly over the probe and thread it onto the exposed end of the support pipe

### Probe Replacement Applications Above 1500°F (816°C)

1 Remove analyzer enclosure from duct and remove old probe

2 Wrap Teflon tape around threads of probe, starting one thread back from the end to avoid clogging. Carefully insert the probe into the manifold block and tighten

### Aspirator Replacement

Order aspirator by kit number 258060 1 for clean gas systems (see Parts Drawing E65 30-4) or 258061 1 for dirty gas systems (see Parts Drawing E65 30 3)

NOTE If analyzer has been in service for a long period of time probe parts probably can not be salvaged due to high temperature corrosion and should be replaced

If a dirty gas system is to be changed to a clean gas system perform steps 1 thru 6 under "Analyzer Enclosure Installation for Natural Gas Fired Processes within" in the "Installation" section. If a Clean gas system is to be changed to a dirty gas system perform the following steps

1 Apply 3/4" wrench to hex of clean gas nozzle (item 34) and remove nozzle assembly from manifold assembly (7)

2 Using 3/16" allen wrench remove plug (7) covering channel in manifold assembly for orifice (10) Use 5/32" allen wrench to install orifice

3 Using 3/16" allen wrench, install plug (7) in manifold assembly channel holding orifice

4 Verify that manifold assembly's channel for aspirator venturi (9) is not blocked and use screwdriver with 3/8" wide blade to install aspirator venturi

5 Assembly dirty gas nozzle assembly components (44, 36, 11, and 12 on Drawing E65 30)

6 Apply 3/4" wrench to hex of dirty gas nozzle (11) and tighten dirty gas nozzle assembly into manifold assembly channel holding aspirator venturi

7 If the probe and probe support are not being replaced, remove reducer (item 2, Drawing E65 30 9) and tighten filter (Pt No 6629903 1) onto threads of probe support leaving shield of filter facing in direction of gas flow

### Circuit Board Replacement

NOTE Use a digital voltmeter readable to +0.1 mV (Fluke 8030A or equivalent) for all voltage checks

1 Remove all power from electronics enclosure

2 Disconnect leads on circuit board PCB1

3 Remove four screws (Parts Drawing E65 31, item 20) securing board. Remove board

4 On new circuit board position Temperature Control Gain pot (R120) two and one half turns from full CCW position

5 Set all remaining pots at mid position

6 Place replacement board in position and secure with four screws

7 Connect leads to circuit board in accordance with wiring diagram (Figure 6)

8 Turn power on and monitor the thermocouple temperature to determine that it does not run away. Refer to "Operation" in "Start up and Operation" section

9 Connect voltmeter across resistor R111. Adjust Cold Junction Compensation pot (R112) until voltage across R111 is 4.990 V dc ( $\pm 2$  mV)

10 Connect voltmeter across test jacks J1 and J3. Adjust Temperature Set Point pot (R114) until voltage reads 40.5 mV

11 Calibrate per "Changing Range Calibration of Linear Converter" in the "Maintenance" section

**REPLACEMENT PARTS**

Following are Parts Drawings that cover the Type OJ Oxygen Analyzer and its spare parts kits. Items with part numbers may be ordered separately. Items with kit numbers (without separate parts numbers) must be ordered by the kit number in which they are included.

These drawings will normally apply to the units furnished. However, there may be individual differences in specific assemblies due to

a design changes made since the printing of this Product Instruction, or

b special design of equipment furnished to make it suitable for a special application.

Therefore, when ordering individual parts or kits, ensure correct replacement by specifying on the order

a complete nomenclature and series number of equipment for which parts are desired, and

b the Parts Drawing number on which each part is illustrated and the title of the Parts Drawing (e.g., Parts Drawing E65 30, Analyzer Enclosure Pt. No. 6632289 □).

# E65-30 OXYGEN ANALYZER TYPE OJ

**Bailey Controls Company**  
Babcock & Wilcox a McDevitt Company

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*Bailey Controls Company Wickliffe Ohio 44092 a division of Babcock & Wilcox U.S.A*

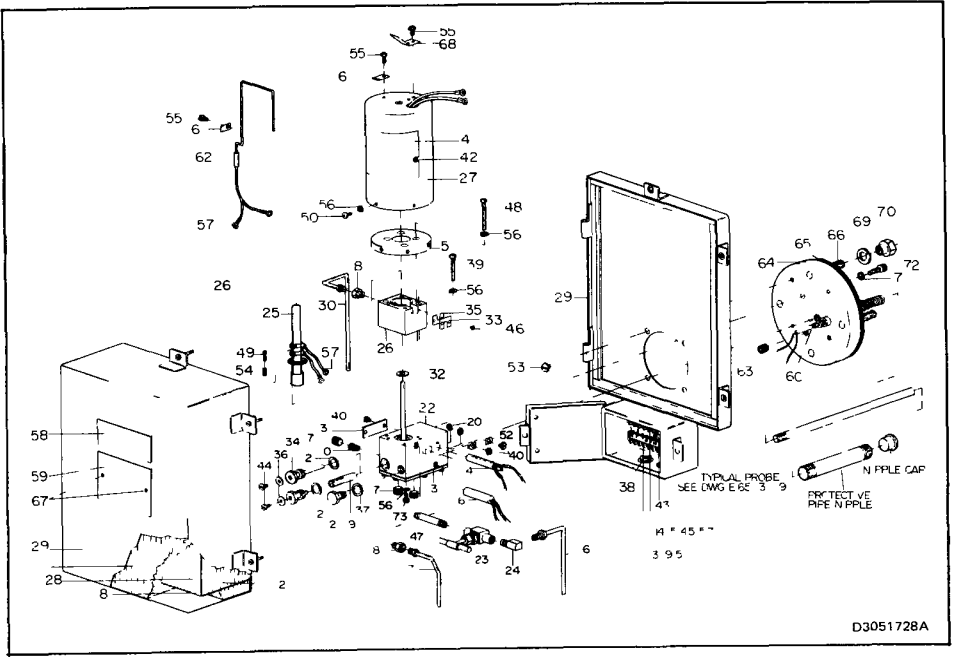
*Bailey Meter Australia Pty Ltd Regents Park, N S W Australia*  
*Bailey do Brasil, Sao Paulo Brazil*  
*Bailey Meter GMBH Mannheim, West Germany*

*Bailey Controls, Division of B&W Industries Ltd (Canada)*  
*Bailey Japan Company, Ltd, Niwayama-cho Japan*  
*Representatives in Other Principal Cities*

# Bailey Control Systems

# Parts Drawing E65-30

## OXYGEN ANALYZER ANALYZER ENCLOSURE PART NO. 6632289-□



PART NO *	ITEM 9	ITEM 10	ITEM 11	ITEM 12	ITEM 34	ITEM 36	ITEM 44
6632289 1*	1 REQD	1 REQD	1 REQD	1 REQD	OM T	1 REQD	1 REQD
6632289 2†	OM T	OM T	OM T	1 REQD	1 REQD	1 REQD	1 REQD

**SPECIFY ALL INFORMATION ON NAMEPLATE WHEN ORDERING**

# E65-30 Oxygen Analyzer Type OJ

NOTE Items listed with a part no. may be ordered separately. Items listed with parts drawing number must be ordered by the listing number of that parts drawing.

ITEM	PARTS DRAWING or PART NO	NAME	TEM	PARTS DRAWING or PART NO	NAME	TEM	PARTS DRAWING or PART NO	NAME
1	E65 30-8	INSULATOR	28	E65 30-8	RETAINER HOUSING ASSY	51	6679*82	MOUNTING PLATE
2	E65 30-8	INSULATOR	29	E65 30-8	HOUSING ASSY	52	E65 30-5	RETAINER PLATE
3	E65 30-2	HOOD	30	E65 30-7	REFLECTOR TUBE	53	E65 30-5	PAN HEAD STYL
4	E65 30-5	MAN FOLD GASKET	31	E65 30-5	RETAINER PLATE	54	E65 30-1	SEMI EXT 4 REQD
5	E65 30-5	HERMIGSTAT	32	E65 30-1	SENSOR GASKET	55	E65 30-6	SPRING REQD
6	E65 30-5	MAN FOLD PLATE	33	E65 30-1	NOZZLE	56	90*500	PAN HEAD STYL
7	E65 30-3	HEATER	34	E65 30-4	CLEAN GAS COVER GASKET	57	E65 30-5	THD FUL CR
8	E65 30-8	RETAINER REQD	35	E65 30-1	WEATHER LIGHT SEAL	58	90*500	TYPE AB 4 REQD
9	E65 30-3	VENTILATOR	36	E65 30-2	MAN FOLD GASKET	59	30	USE ON ALUM NUM COVERED FINANCE
10	E65 30-3	VENTILATOR	37	E65 30-2	JASPET	60	30	OR
11	E65 30-2	WASHER	38	E65 30-2	JASPET	61	90*500	PAN HEAD STYL
12	E65 30-4	WASHER	39	E65 30-2	JASPET	62	90*500	SEMS EXT 4 REQD
13	E65 30-4	WASHER	40	E65 30-2	JASPET	63	90*500	USED ON THEP
14	E65 30-4	WASHER	41	E65 30-2	JASPET	64	90*500	FRNACS
15	E65 30-4	WASHER	42	E65 30-2	JASPET	65	90*500	STYL STL REG
16	E65 30-7	TEST GAS TUBING	43	E65 30-2	JASPET	66	90*500	SPRING WASH 4 REQD
17	E65 30-7	TEST GAS TUBING	44	E65 30-2	JASPET	67	90*500	SOLDERLESS
18	E65 30-7	TEST GAS TUBING	45	E65 30-2	JASPET	68	90*500	TERMINO REQD
19	E65 30-7	TEST GAS TUBING	46	E65 30-2	JASPET	69	90*500	STYL LEPLATE
20	E65 30-2	TEST GAS TUBING	47	E65 30-2	JASPET	70	90*500	WARN NG PLATE
21	E65 30-2	TEST GAS TUBING	48	E65 30-2	JASPET	71	90*500	HEATER
22	E65 30-2	TEST GAS TUBING	49	E65 30-2	JASPET	72	90*500	RETAINER PLATE
23	E65 30-2	TEST GAS TUBING	50	E65 30-2	JASPET	73	90*500	REQD
24	E65 30-2	TEST GAS TUBING	51	E65 30-2	JASPET	74	90*500	THERM COUPLE
25	E65 30-2	TEST GAS TUBING	52	E65 30-2	JASPET	75	90*500	STYL M LLED STYL
26	E65 30-2	TEST GAS TUBING	53	E65 30-2	JASPET	76	90*500	N PLATED 4 REQD
27	E65 30-2	TEST GAS TUBING	54	E65 30-2	JASPET	77	90*500	FLANGE
28	E65 30-2	TEST GAS TUBING	55	E65 30-2	JASPET	78	90*500	FLANGE GASKET
29	E65 30-2	TEST GAS TUBING	56	E65 30-2	JASPET	79	90*500	STYL M LLED STYL
30	E65 30-2	TEST GAS TUBING	57	E65 30-2	JASPET	80	90*500	FLANGE 4 REQD
31	E65 30-2	TEST GAS TUBING	58	E65 30-2	JASPET	81	90*500	PAN HD STYL
32	E65 30-2	TEST GAS TUBING	59	E65 30-2	JASPET	82	90*500	THD FORM NG
33	E65 30-2	TEST GAS TUBING	60	E65 30-2	JASPET	83	90*500	JCR TYPE B REQD
34	E65 30-2	TEST GAS TUBING	61	E65 30-2	JASPET	84	90*500	DISP SH LD
35	E65 30-2	TEST GAS TUBING	62	E65 30-2	JASPET	85	90*500	CD PL STL REG
36	E65 30-2	TEST GAS TUBING	63	E65 30-2	JASPET	86	90*500	SPRING LK WASH 4 REQD
37	E65 30-2	TEST GAS TUBING	64	E65 30-2	JASPET	87	90*500	SEM FIN STL HE
38	E65 30-2	TEST GAS TUBING	65	E65 30-2	JASPET	88	90*500	FULL NUT 4 REQD
39	E65 30-2	TEST GAS TUBING	66	E65 30-2	JASPET	89	90*500	STYL STL REG SPR NG
40	E65 30-2	TEST GAS TUBING	67	E65 30-2	JASPET	90	90*500	LK WASH 3 REQD
41	E65 30-2	TEST GAS TUBING	68	E65 30-2	JASPET	91	90*500	STYL CAP SCR 3 REQD
42	E65 30-2	TEST GAS TUBING	69	E65 30-2	JASPET	92	90*500	HEX SOC HD STYL
43	E65 30-2	TEST GAS TUBING	70	E65 30-2	JASPET	93	90*500	HEX SOC HD STYL
44	E65 30-2	TEST GAS TUBING	71	E65 30-2	JASPET	94	90*500	HEX SOC HD STYL
45	E65 30-2	TEST GAS TUBING	72	E65 30-2	JASPET	95	90*500	HEX SOC HD STYL
46	E65 30-2	TEST GAS TUBING	73	E65 30-2	JASPET	96	90*500	HEX SOC HD STYL
47	E65 30-2	TEST GAS TUBING	74	E65 30-2	JASPET	97	90*500	HEX SOC HD STYL
48	E65 30-2	TEST GAS TUBING	75	E65 30-2	JASPET	98	90*500	HEX SOC HD STYL
49	E65 30-2	TEST GAS TUBING	76	E65 30-2	JASPET	99	90*500	HEX SOC HD STYL
50	E65 30-2	TEST GAS TUBING	77	E65 30-2	JASPET	100	90*500	HEX SOC HD STYL

Bailey Controls Company, Wickliffe Ohio 44092 a division of Babcock & Wilcox U.S.A.

Bailey Meter Australia Pty Ltd Regent Park N.S.W. Australia

Bailey do Brasil, Sao Paulo Brazil

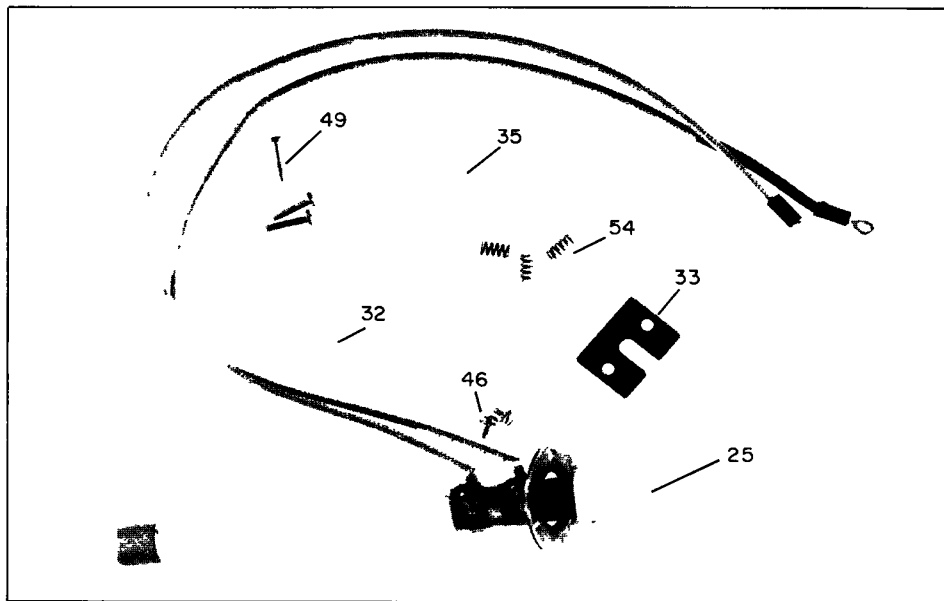
Bailey Meter GMBH Mannheim West Germany

Bailey Controls Division of B&W Industries Ltd (Canada)

Bailey Japan Company Ltd Nirayama cho Japan

Representatives in Other Principal Cities

**OXYGEN ANALYZER  
SENSOR SPARE PARTS  
TYPE OJ111NN-1  
KIT NO 258058-1**

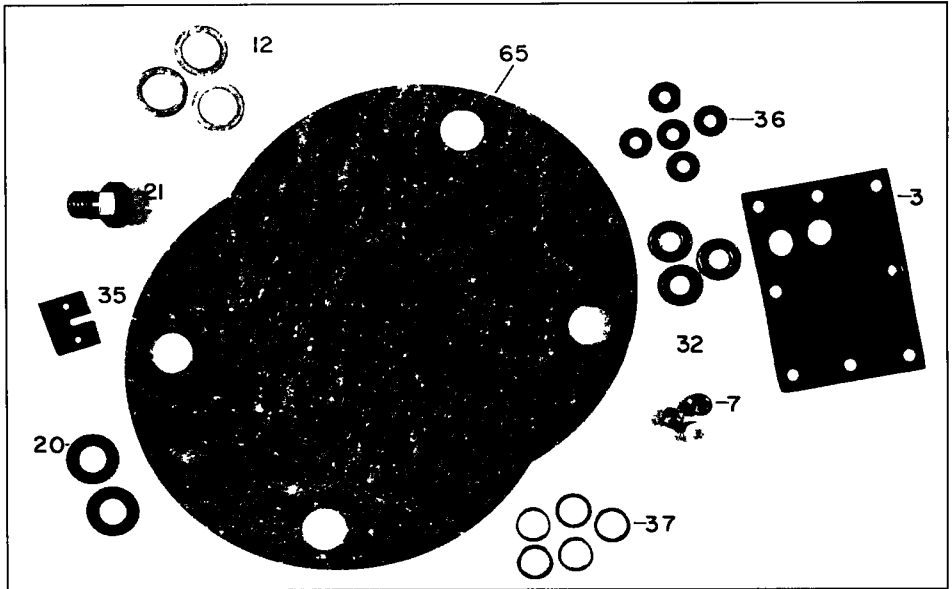


ITEM	NAME
25	SENSOR ASSEMBLY
32	SENSOR GASKET
33	COVER GASKET
35	COVER PLATE
46	112-40x 250 LG PAN HD STN STL SEMS EXT 2 NC
49	112-40x 500 LG PAN HD STN STL MACH SCR, 3 NC
54	SPR NG 3 NC

**SPECIFY ALL INFORMATION ON NAMEPLATE WHEN ORDERING.**



**OXYGEN ANALYZER  
GASKET & SEAL SPARE PARTS  
TYPE OJ111NN-1  
KIT NO 258059 1**

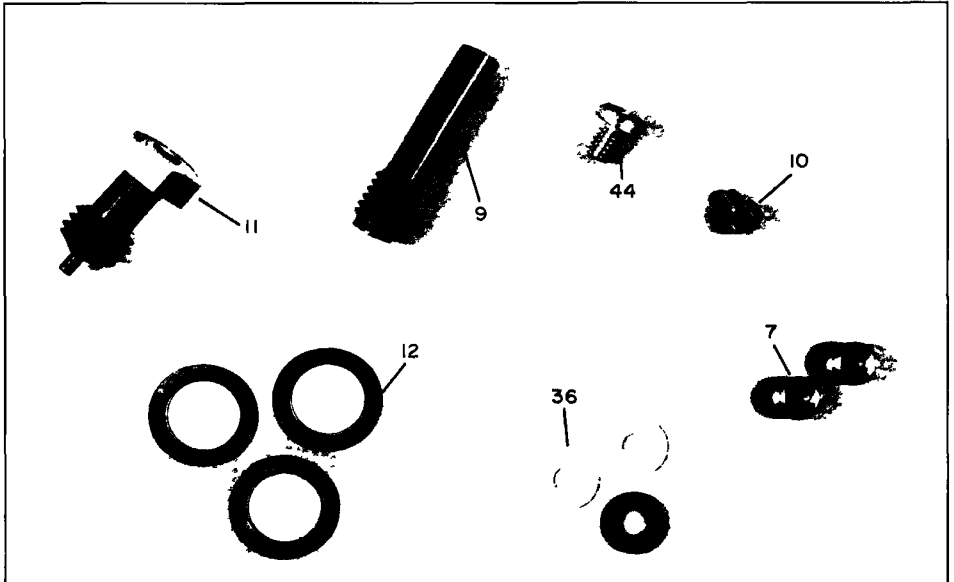


ITEM	NAME
3	MAN FOLD GASKET
7	SOCKET HD P PLUG 3 NC
12	WASHER, 3 NC
20	MAN FOLD GASKET 2 NC
21	PLUG
32	SENSOR GASKET, 3 NC
35	COVER GASKET
36	MAN FOLD GASKET 5 NC
37	GASKET 5 NC
65	FLANGE GASKET 2 NC

**SPECIFY ALL INFORMATION ON NAMEPLATE WHEN ORDERING**



**OXYGEN ANALYZER  
DIRTY GAS ASPIRATOR SYSTEM SPARE PARTS  
TYPE OJ111NN-1  
KIT NO. 258061-1**

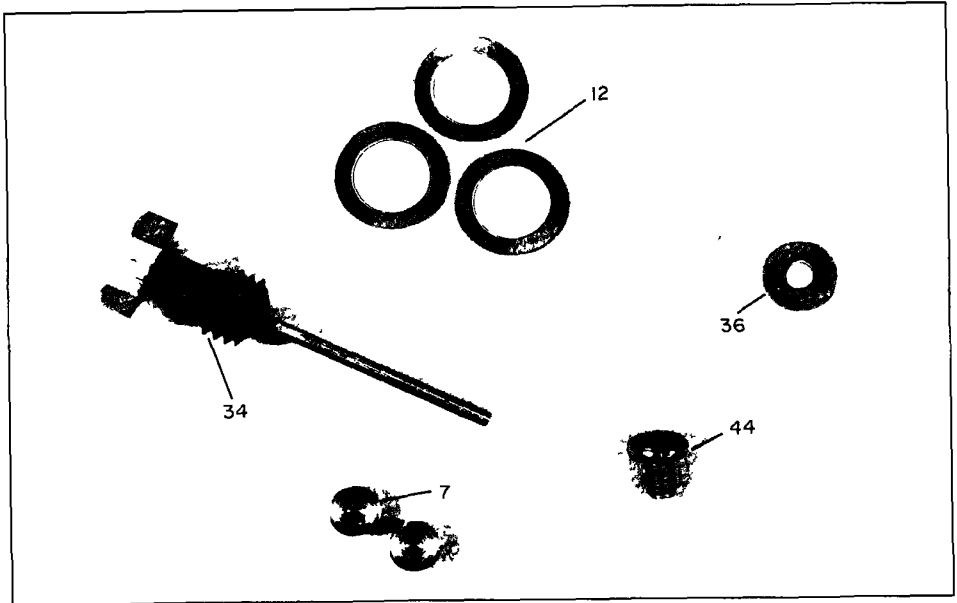


ITEM	NAME
7	SOCKET HD P PE PLUG 2 NC
9	ASPIRATOR VENTUR
10	OR F CE
11	NOZZLE, DIRTY GAS
12	WASHER 3 NC
36	MANIFOLD GASKET 3 INC
44	250 20x 380 LG PAN HD STN STL MACH SCR

**SPECIFY ALL INFORMATION ON NAMEPLATE WHEN ORDERING.**



**OXYGEN ANALYZER  
CLEAN GAS ASPIRATOR SYSTEM SPARE PARTS  
TYPE OJ111NN-1  
KIT NO. 258060-1**

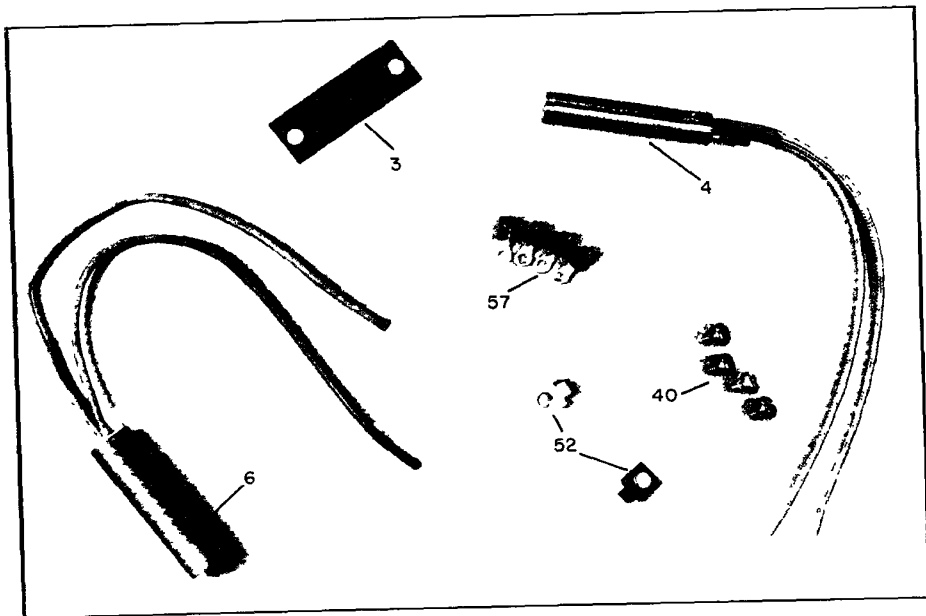


ITEM	NAME
7	SOCKET HD P PE PLUG 2 NC
12	WASHER 3 NC
34	NOZZLE CLEAN GAS
36	MAN FOLD GASKET 3 NC
44	250 20x 380 LG PAN HD STN STL MACH SCR

**SPECIFY ALL INFORMATION ON NAMEPLATE WHEN ORDERING.**



**OXYGEN ANALYZER  
HEATER & THERMOSTAT SPARE PARTS  
TYPE OJ111NN-1  
KIT NO 258062-1**

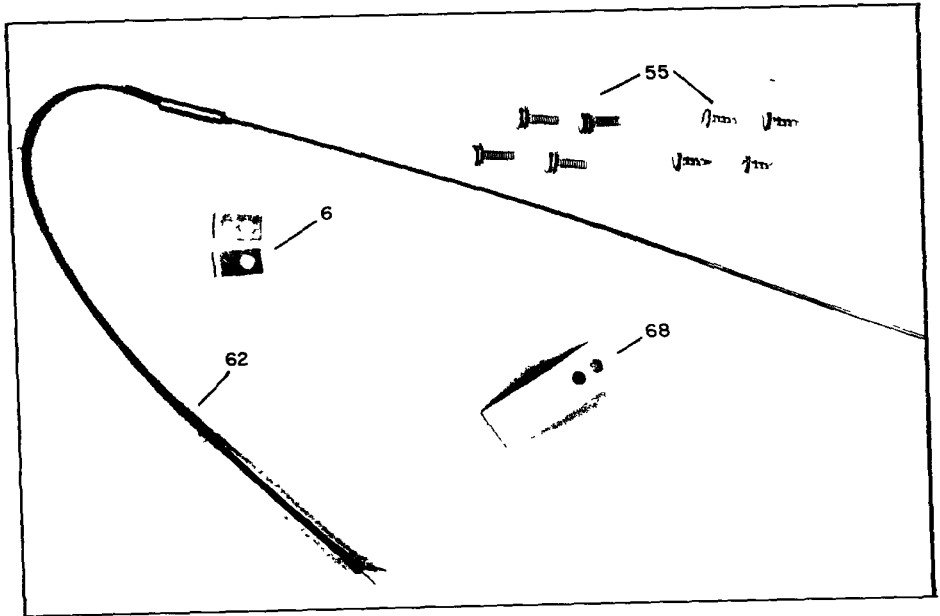


ITEM	NAME
4	THERMOSTAT
6	HEATER
31	RETAINING PLATE
40	190 32x 250 PAN HD STN STL SEMS EXT 4 NC
52	RETAINING CLIP 2 NC
57	SOLDERLESS TERMINAL (TERMINAL LUG) 4 NC

**SPECIFY ALL INFORMATION ON NAMEPLATE WHEN ORDERING.**



OXYGEN ANALYZER  
THERMOCOUPLE SPARE PARTS  
TYPE OJ111NN-1  
KIT NO. 258067 1

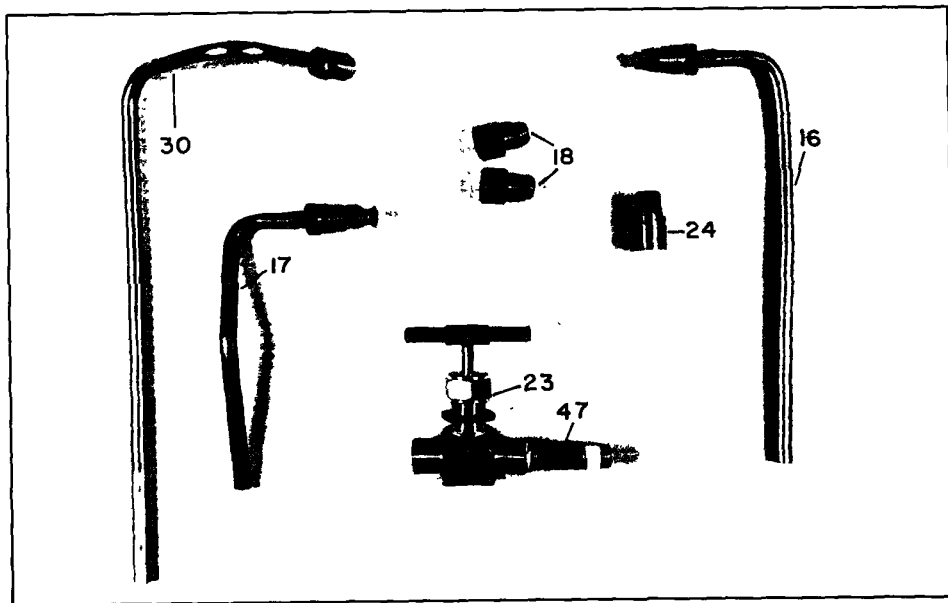


ITEM	NAME
55	190 32x 500 PAN HD STN STL SEMS EXT 4 NC USE ON ALUM NUM COVERED FURNACE)
or	190x 500 PAN HD STN STL THD FMG SCR TYPE AB 4 NC (USE ON OTHER FURNACES)
61	RETA N NG CL P 2 NC
62	THERMOCOUPLE
68	DR P SHIELD

SPECIFY ALL INFORMATION ON NAMEPLATE WHEN ORDERING.



**OXYGEN ANALYZER  
CHECK VALVE FITTINGS & TUBING SPARE PARTS  
TYPE OJ111NN-1  
KIT NO. 258068-1**

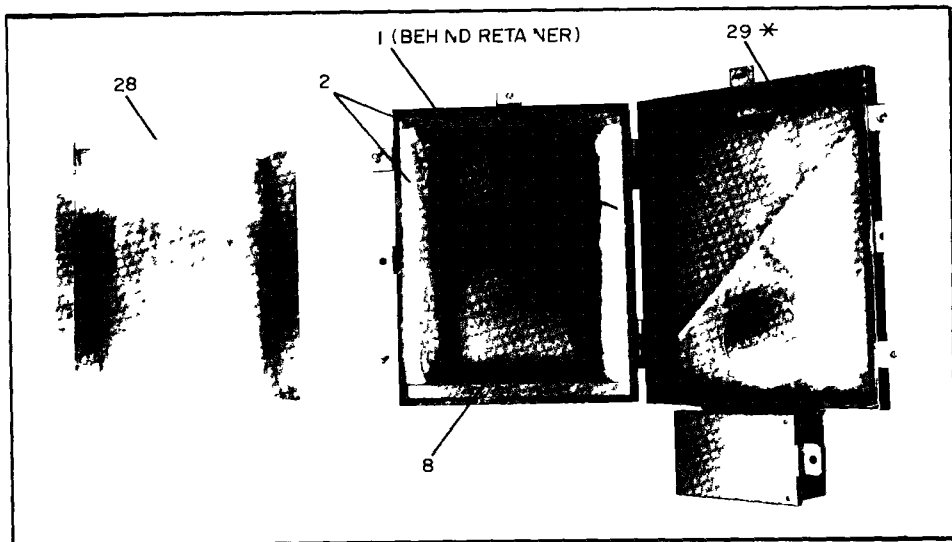


ITEM	NAME
16	TEST GAS TUBING
17	AIR SUPPLY TUBING
18	MALE CONNECTOR 2 INCH
23	SHUT-OFF VALVE
24	ELBOW CONNECTOR
30	REFERENCE TUBE
47	1/8x1.500 TYPE 304 STAINLESS STEEL PIPE

**SPECIFY ALL INFORMATION ON NAMEPLATE WHEN ORDERING.**



**OXYGEN ANALYZER  
HOUSING ASSY SPARE PARTS  
TYPE OJ111NN 1  
KIT NO 258069-1**



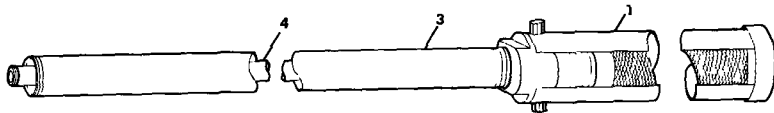
TEM	NAME
1	NSULATOR
2	NSULATOR 2 NC
8	RETA NER
28	RETA NER
*29	HOUS NG ASSY*

\* TEMS 1, 2, 8 AND 28 ARE  
SUBASSEMBL ES OF TEM 29

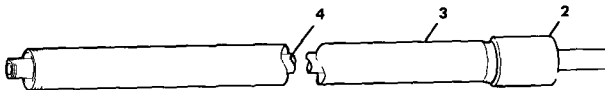
**SPECIFY ALL INFORMATION ON NAMEPLATE WHEN ORDERING.**



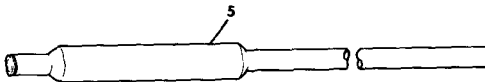
## TYPE OJ OXYGEN ANALYZER PROBE ASSEMBLY PT. NOS 6629247-□ & 6631348-1



Probe Assembly, Pt Nos 6629247 1, 2, 3



Probe Assembly, Pt Nos 6629247 4, 5, 6



Probe Assembly, Pt No 6631348 1

ITEM	PART NO	NAME
1	6629903	FILTER ASSY
2	1951542	3/4" x 1/2" STN STL REDUCER
3	1951468	4 FT PROBE SUPPORT
	1951468	7 FT PROBE SUPPORT
	1951468	10 FT PROBE SUPPORT
4	1951469	4 FT STN STL PROBE
	1951469	7 FT STN STL PROBE
	1951469	10 FT STN STL PROBE
5	6631348	3 FT CERAM C PROBE

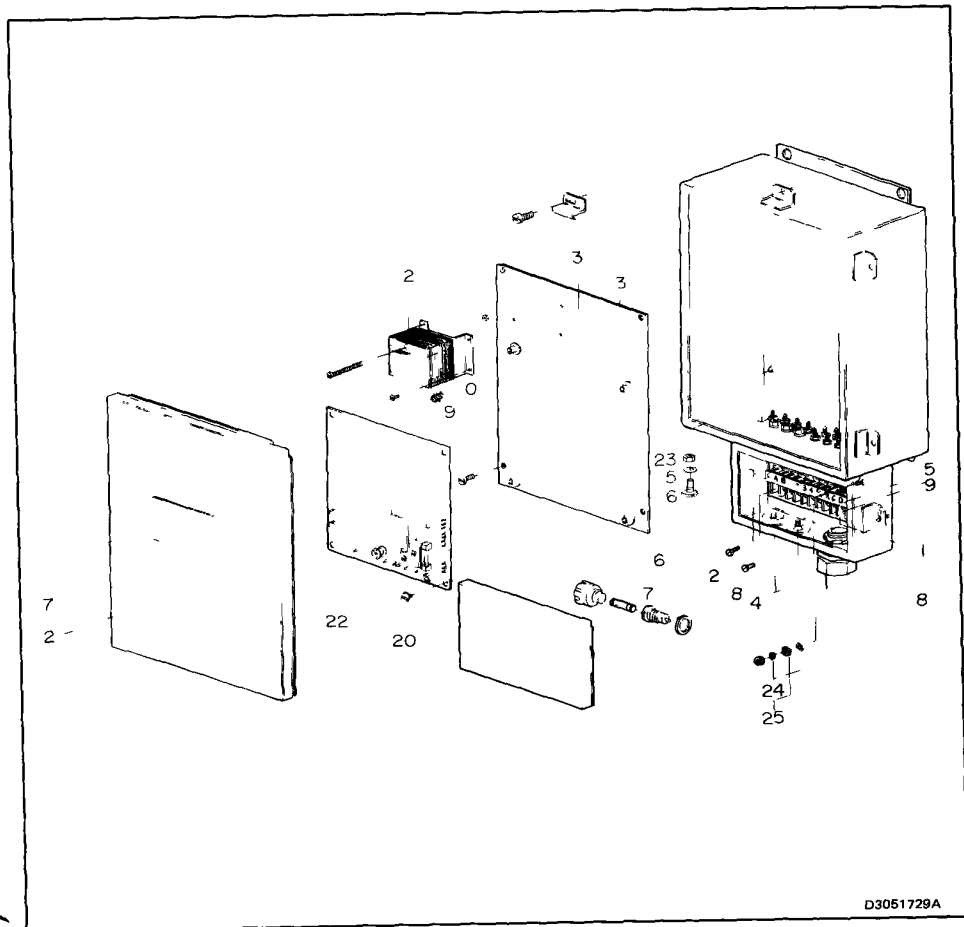
When any one of these parts needs to be replaced it is recommended that a probe assembly parts be replaced due to probable corrosion caused by long exposure to hot fumes. Order one of each item listed for appropriate application.

PROBE ASSEMBLY	TEMS	PROBE ASSY STD LGTHS	APPLICAT ON
6629247-4 5-6	2 3 4	4' (122 cm) 7' (213 cm) 10' (305 cm)	Clean gas to 1500° F (816° C)
6631348 1	5	3' (92 cm)	Clean gas to 2500° F (1387° C)
6629247 1 2 3	1 3 4	5' (152 cm) 8' (244 cm) 11' (335 cm)	Dirty gas to 1500° F (816 C)

**SPECIFY ALL INFORMATION ON NAMEPLATE WHEN ORDERING**



## ELECTRONICS ENCLOSURE PART NO. 6632290-1



D3051729A

**SPECIFY ALL INFORMATION ON NAMEPLATE WHEN ORDERING.**





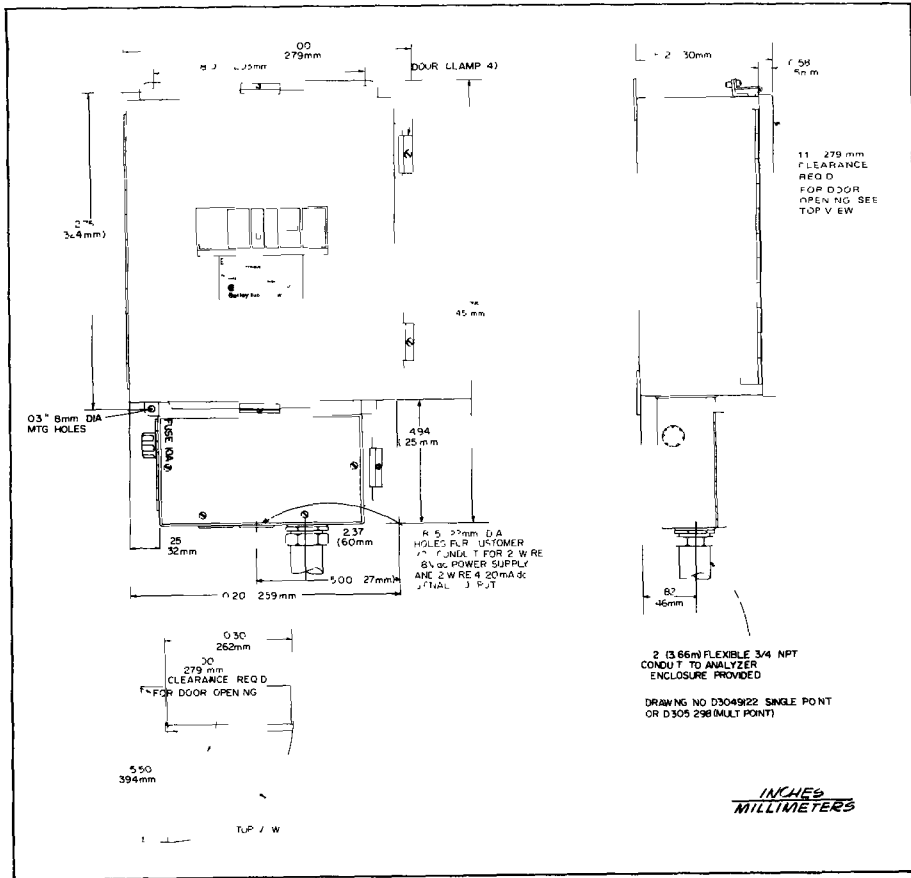


# Bailey Control Systems

# Certification Drawing D3049123-F

Certification valid only when signed below by authorized Bailey representative

## ELECTRONICS ENCLOSURE FOR TYPE OJ OXYGEN ANALYZER



CERTIFIED BY BAILEY CONTROLS CO FOR

ULT MATE CUST \_\_\_\_\_ BM JOB NO \_\_\_\_\_ ORDER NO \_\_\_\_\_  
 CERT BY \_\_\_\_\_ DATE \_\_\_\_\_ REV \_\_\_\_\_ TEM NO \_\_\_\_\_  
 CHKD BY \_\_\_\_\_ DATE \_\_\_\_\_ TAG NO \_\_\_\_\_  
 L th n U S A 380 Bailey Cont o s Company 1980

**Babcock & Wilcox**  
Bailey Controls Company

