

65-2513RK Oxygen Transmitter Operator's Manual

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Product Warranty

RKI Instruments, Inc., warrants gas alarm equipment sold by us to be free from defects in materials, workmanship, and performance for a period of one year from date of shipment from RKI Instruments, Inc. Any parts found defective within that period will be repaired or replaced, at our option, free of charge. This warranty does not apply to those items which by their nature are subject to deterioration or consumption in normal service, and which must be cleaned, repaired, or replaced on a routine basis. Examples of such items are:

- a) Absorbent cartridges
- b) Pump diaphragms and valves
- c) Fuses
- d) Batteries
- e) Filter elements

Warranty is voided by abuse including mechanical damage, alteration, rough handling, or repair procedures not in accordance with the operator's manual. This warranty indicates the full extent of our liability, and we are not responsible for removal or replacement costs, local repair costs, transportation costs, or contingent expenses incurred without our prior approval.

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This warranty covers instruments and parts sold to users by authorized distributors, dealers, and representatives as appointed by RKI Instruments, Inc.

We do not assume indemnification for any accident or damage caused by the operation of this gas monitor; and our warranty is limited to the replacement of parts or our complete goods.

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Overview

This instruction manual describes the oxygen transmitter. This manual also describes how to install, start up, configure, maintain, and calibrate the transmitter when using it with a gas monitoring controller. A parts list at the end of this manual lists replacement parts and accessories for the oxygen transmitter. See the controller operator's manual for information specific to the controller.

Specifications

Table 1 lists specifications for the oxygen transmitter.

Table 1: Specifications

Description	Specification
Target Gas	Oxygen (O ₂)
Area Classification	Explosionproof for Class I, Groups B, C, and D
Input Voltage	24 VDC (24 VDC is typical input. Transmitter will operate from 11 - 30 VDC)
Sampling Method	Diffusion
Signal Output	4 - 20 mA
Detection Range	0 to 25.0% volume
Response Time	90% in 30 seconds
Operating Temperature	-20° C to 45° C

Description

This section describes the components of the oxygen transmitter. The transmitter consists of the oxygen detector, amplifier, and junction box.

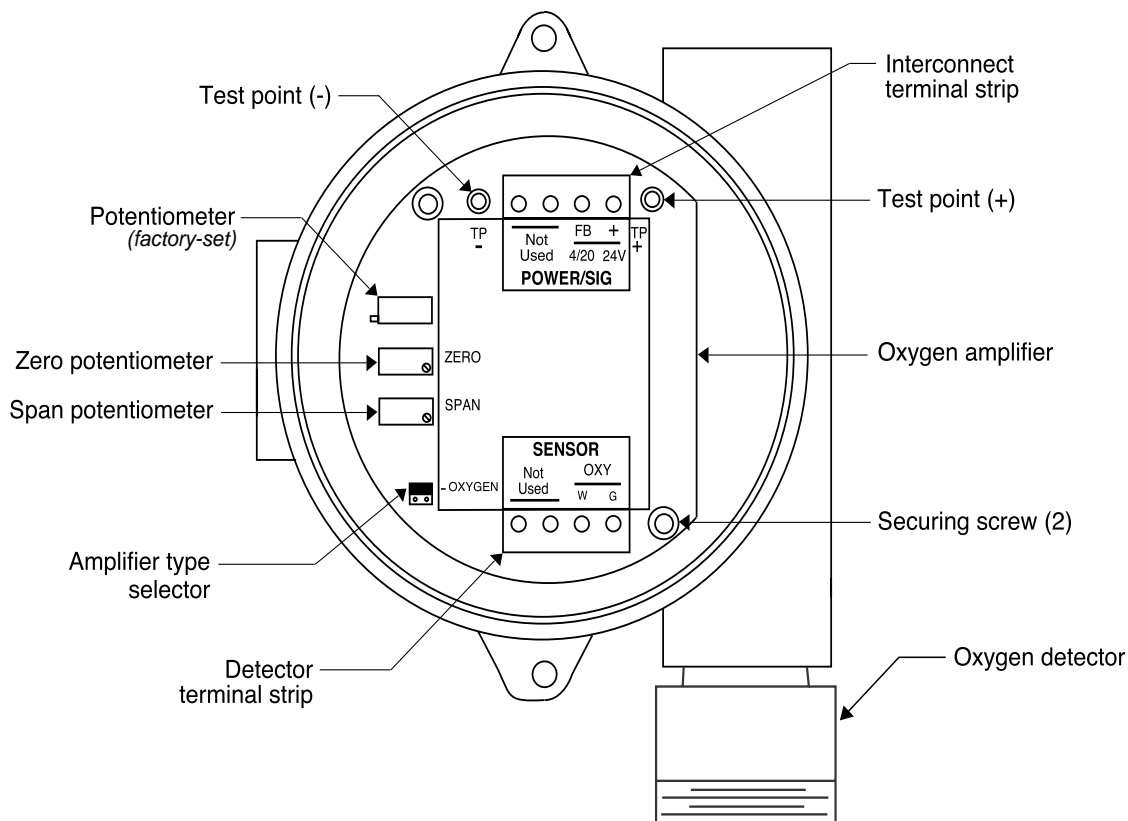


Figure 1: Oxygen Transmitter Component Location

Oxygen Detector

The detector's sensing element along with signal conditioning components are encapsulated within a conduit mounting black anodized aluminum housing. The sensing element used is a capillary type that is not susceptible to output changes with changes in atmospheric pressure. Through a series of chemical and electronic reactions, the detector produces a millivolt output that is proportional to the detection range. 3/4" NPT mounting threads at the top of the detector allow you to mount the detector to the junction box or a 3/4" NPT conduit fitting. Two color-coded leads extend from the top of the detector. The leads allow you to connect the detector to the amplifier.

Amplifier

The amplifier converts the millivolt output from the oxygen detector to a 4 - 20 mA signal that is proportional to the detection range and transmits the signal to the controller via 2 wires. The amplifier includes the amplifier type selector, detector terminal strip, interconnect terminal strip, span potentiometer, zero potentiometer, and test points (see Figure 1).

Amplifier type selector

The amplifier type selector is near the bottom left corner of the amplifier. It is below the span potentiometer and to the left of the detector terminal strip.

The amplifier included with the oxygen transmitter is designed for use with RKI's oxygen and toxic gas transmitters. The amplifier type selector determines for which transmitter the amplifier is intended. For oxygen transmitters, a jumper block is installed over the **OXYGEN** selector (see Figure 1).

Detector terminal strip

The detector terminal strip is the four-point terminal strip near the bottom of the amplifier. Use the detector terminal strip to connect the oxygen detector to the amplifier.

NOTE: The oxygen detector is factory-wired to the amplifier. See the Installation section of this manual for all wiring procedures related to the transmitter.

Interconnect terminal strip

The interconnect terminal strip is the four-point terminal strip near the top of the amplifier. Use the interconnect terminal strip to connect the amplifier to the controller.

Span potentiometer

The span potentiometer is on the left side of the amplifier. Of the three potentiometers, the span potentiometer is closest to the bottom of the amplifier. Use the span potentiometer to adjust the transmitter's response output during the start-up and calibration procedures.

Zero potentiometer

The zero potentiometer is directly above the span potentiometer. Use the zero potentiometer to adjust the transmitter's oxygen-free output during the calibration procedure.

CAUTION: *The amplifier includes an additional potentiometer above the zero potentiometer. It is factory-set. Do not adjust it.*

Test points

The test points (labeled **TP-** and **TP+**) are directly to the left and right of the interconnect terminal strip. The test points produce a 100 - 500 mV output that is proportional to the transmitter's 4 - 20 mA output. Use the test points and a voltmeter to measure the transmitter's output during the start-up and calibration procedures.

Junction Box

Use the junction box to install the oxygen transmitter at a mounting site that is remote from the controller. The junction box also protects the amplifier and wiring connections made to the amplifier. Use the two 3/4 in. conduit hubs to mount the detector to the junction box (bottom hub) and connect wiring from the amplifier to the controller (top hub).

NOTE: The oxygen detector and amplifier are factory-mounted to the junction box.

Use the junction box's two mounting holes to mount the oxygen transmitter to a vertical surface at the monitoring site. Use the cover on the front of the junction box to access the interior of the junction box.

Installation

This section describes procedures to mount the oxygen transmitter in the monitoring environment and wire the transmitter to a controller.

Mounting the Oxygen Transmitter

1. Select a mounting site that is representative of the monitoring environment. Consider the following when you select the mounting site.
 - Select a site where the transmitter is not likely to be bumped or disturbed. Make sure there is sufficient room to perform start-up, maintenance, and calibration procedures.
 - Select a site that is at normal breathing level.

CAUTION: Mount the oxygen transmitter with the detector facing down (see Figure 2).

2. At the monitoring site, use #10 screws through the junction box's two mounting holes to secure the junction box to a vertical surface (see Figure 2).

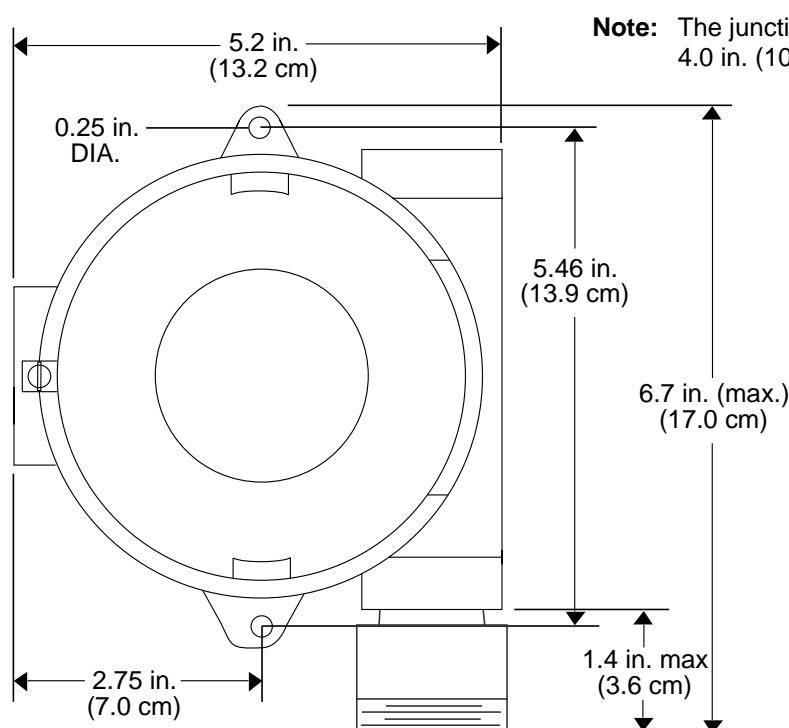


Figure 2: Mounting the Oxygen Transmitter

Wiring the Oxygen Transmitter to a Controller

WARNING: *Always verify that the controller is off and power to the controller is off before you make wiring connections.*

1. Turn off the controller.
2. Turn off power to the controller.
3. Remove the junction box cover.
4. Verify that the detector leads are wired to the amplifier's detector terminal strip. If necessary, connect the leads to the detector terminal strip as shown in Figure 3.
5. Verify that the jumper block is installed over the **OXYGEN** selector of the amplifier type selector as shown in Figure 3.
6. Install an appropriate cable bushing or conduit fitting on the top conduit hub of the junction box.
7. Guide a two-conductor, shielded cable or two wires in conduit through the top conduit hub of the junction box.
8. Connect the two wires to the interconnect terminal strip as follows (see Figure 3.)
 - Connect the positive wire to the terminal labeled **24V +**.
 - Connect the feedback wire to the terminal labeled **FB 4/20**.

CAUTION: *If using shielded cable, leave the cable drain (shield) wire insulated and disconnected at the transmitter. You will connect the opposite end of the cable's drain wire at the controller.*

9. Secure the junction box cover to the junction box.
10. Route the cable or wires leading from the oxygen transmitter through one of the conduit hubs at the controller. Install an appropriate cable bushing or conduit fitting at the conduit hub.

CAUTION: *Do not route power and transmitter wiring through the same conduit hub. The power cable may disrupt the transmission of the transmitter signal to the controller.*

11. Connect the wires to the applicable transmitter terminal strip at the controller as shown in Figure 3.

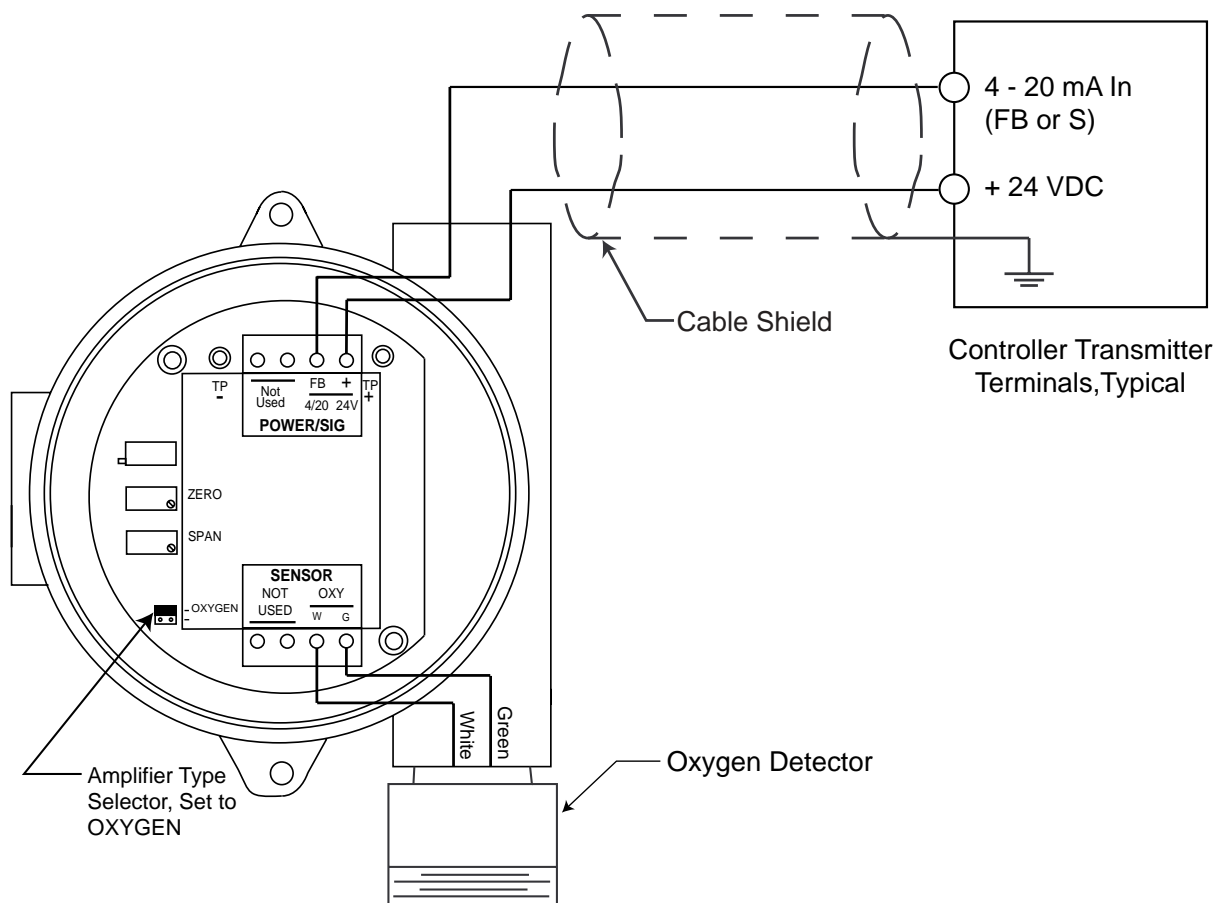


Figure 3: Wiring the Oxygen Transmitter to a Controller

12. At the controller, connect the cable's drain wire to an available chassis ground.

Start Up

This section describes procedures to start up the oxygen transmitter and place the transmitter into normal operation with a controller.

Introducing Incoming Power

1. Complete the installation procedures described earlier in this manual.
2. Verify that the power wiring to the controller is correct and secure. Refer to the controller operator's manual.
3. Turn on or plug in the incoming power, then turn on the controller.
4. Verify that the controller is on and operating properly. Refer to the controller operator's manual.

CAUTION: *Allow the detector to warm up for 5 minutes before you continue with the next section, "Setting the Fresh Air Signal."*

Setting the Fresh Air Signal

CAUTION: *If you suspect that the monitoring environment is not a fresh air environment, use the zero air calibration cylinder to introduce "fresh air" to the detector and verify an accurate fresh air reading.*

1. Verify that the transmitter is in a fresh air environment (environment known to be free of toxic and combustible gasses and of normal oxygen content, 20.9%).
2. Unscrew and remove the junction box cover from the junction box.
3. Set a voltmeter to measure in the millivolt (mV) range.
4. Plug the voltmeter leads into the test points on the amplifier. Plug the positive lead into the test point labeled **TP+**; plug the negative lead into the test point labeled **TP-**.
5. Verify a voltmeter reading of 434 mV (± 2 mV).
6. If necessary, use a flat-blade screwdriver to adjust the span potentiometer until the voltmeter reading is 434 mV (± 2 mV).
7. Remove the voltmeter leads from the test points.
8. Secure the junction box cover to the junction box.

Maintenance

This section describes maintenance procedures. It includes preventive maintenance, troubleshooting, and component replacement procedures.

Preventive Maintenance

This section describes a preventive maintenance schedule to ensure the optimum performance of the oxygen transmitter. It includes daily, monthly, and quarterly procedures.

Daily

Verify a display reading of 20.9% oxygen at the controller. Investigate significant changes in the reading.

Monthly

This procedure describes a test to verify that the oxygen transmitter responds properly to oxygen deficiency.

NOTE: Performing a response test on the oxygen transmitter may cause alarms. Be sure to put the controller into its calibration program or disable external alarms before performing this test

Preparing for the response test

1. Verify that the display reading for the channel you are testing is 20.9% oxygen.
If the display reading is not 20.9% oxygen, set the fresh air reading of the transmitter as described in “Start Up” on page 10 of this manual, then continue this procedure.
2. Set a voltmeter to measure in the millivolt (mV) range.
3. Remove the junction box cover, then plug the voltmeter leads into the test points on the amplifier. Plug the positive lead into the test point labeled **TP+**; plug the negative lead into the test point labeled **TP-**.

Performing the response test

1. Exhale into the bottom of the oxygen detector.
2. Stop exhaling into the bottom of the detector, then verify that the reading on the voltmeter decreased from the normal reading (434 mV).

NOTE: If the reading does not decrease, calibrate the transmitter as described in “Calibration” on page 15 of this manual.

3. Remove the voltmeter leads from the amplifier test points, then secure the junction box cover to the junction box.
4. When the display reading rises above the decreasing alarm setpoint, return the controller to normal operation.

Quarterly

Calibrate the detector as described in “Calibration” on page 15. See the calibration frequency discussion in the calibration section to determine if a quarterly calibration schedule fits your needs.

Troubleshooting

The troubleshooting guide describes symptoms, probable causes, and recommended action for problems you may encounter with the oxygen transmitter.

NOTE: This troubleshooting guide describes transmitter problems only. See the controller operator's manual for problems you may encounter with the controller.

Table 2: Troubleshooting the Oxygen Transmitter

Condition	Symptom(s)	Probable Causes	Recommended Action
Fail Condition	<ul style="list-style-type: none">Controller indicates a fail condition.	<ul style="list-style-type: none">The transmitter wiring is disconnected or misconnected.The transmitter is malfunctioning.	<ol style="list-style-type: none">Verify that the transmitter wiring is correct and secure.Calibrate the transmitter.If the fail condition continues, replace the oxygen sensor.If the fail condition continues, contact RKI for further instruction.
Slow or No Response/ Difficult or Unable to Calibrate	<ul style="list-style-type: none">Transmitter responds slowly or does not respond to response test.Unable to accurately set the fresh air or zero reading during calibration.Transmitter requires frequent calibration. <p><i>Note: Under "normal" circumstances, the transmitter requires calibration once every three months. Some applications may require a more frequent calibration schedule.</i></p>	<ul style="list-style-type: none">The calibration cylinder is low, out-dated, or defective.The transmitter is malfunctioning.	<ol style="list-style-type: none">Verify that the calibration cylinder contains an adequate supply of a fresh test sample.If the calibration/response difficulties continue, replace the oxygen sensor.If the calibration/response difficulties continue, contact RKI for further instruction.

Replacing Components of the Oxygen Transmitter

This section includes procedures to replace the oxygen detector and amplifier.

Replacing the oxygen detector

1. Turn off the controller
2. Turn off power to the controller.
3. Remove the junction box cover.
4. Disconnect the detector leads from the detector terminal strip. Note the position of the color-coded leads as you remove them.
5. Unscrew the detector from the junction box.
6. Guide the detector leads of the replacement detector through the bottom conduit hub of the junction box, then screw the mounting threads of the detector into the conduit hub and tighten firmly.

7. Connect the detector leads to the amplifier's detector terminal strip as shown in Table 3 below and Figure 3 on page 9 of this manual.

**Table 3:Reconnecting the Oxygen Detector
to the Amplifier**

Detector Lead	Detector Terminal Strip
White	OXY W
Green	OXY G

8. Turn on power to the controller
9. Turn on the controller.
10. Calibrate the replacement detector as described in "Calibration" on page 15 of this manual.

Replacing the amplifier

1. Turn off the controller
2. Turn off power to the controller.
3. Remove the junction box cover.
4. Disconnect the detector leads from the detector terminal strip.
5. Disconnect the wiring that connects the oxygen transmitter to the controller from the amplifier's interconnect terminal strip.
6. Unscrew and remove the two screws that secure the amplifier to the junction box. The screws are at the top left and bottom right of the amplifier.
7. Remove the amplifier.
8. Place the new amplifier in the same position as the amplifier you removed in the previous step.
9. Use the two screws you removed in step 6 to secure the amplifier to the junction box.
10. Reconnect the wiring that connects the controller and oxygen transmitter to the amplifier's interconnect terminal strip as shown in Table 4 below and Figure 3 on page 9 of this manual.

**Table 4:Reconnecting the Oxygen Amplifier
to the Controller**

Amplifier Interconnect Terminal Strip	Controller Transmitter Terminal Strip
4/20	4 - 20 (FB)
24V	+ (24 VDC)

11. Reconnect the detector leads to the amplifier's detector terminal strip as shown in Table 5 below and Figure 3 on page 9 of this manual.

**Table 5:Reconnecting the Oxygen Detector
to the Amplifier**

Detector Lead	Detector Terminal Strip
White	OXY W
Green	OXY G

12. Turn on power to the controller
13. Turn on the controller.
14. Calibrate the oxygen transmitter as described in "Calibration" on page 15 of this manual.

Calibration

This section describes how to calibrate the oxygen transmitter. It includes procedures to assemble the calibration kit, set the fresh air reading, set the zero reading and return to normal operation. It describes calibration using a fixed flow regulator which has no on/off knob and allows sample to flow as soon as it is screwed into a cylinder. RKI Instruments, Inc. recommends using a 0.5 LPM (liters per minute) fixed flow regulator.

Calibration Frequency

Although there is no particular calibration frequency that is correct for all applications, a calibration frequency of every 3 to 6 months is adequate for most applications. Unless experience in a particular application dictates otherwise, RKI Instruments, Inc. recommends a calibration frequency of every 3 months (quarterly).

If an application is not very demanding, for example detection in a clean, temperature controlled environment, and calibration adjustments are minimal at calibration, then a calibration frequency of every 6 months is adequate.

If an application is very demanding, for example if the environment is not well controlled, then more frequent calibration than every 3 months may be necessary.

NOTE: Calibrating the oxygen transmitter may cause alarms. Be sure to put the controller into its calibration program or disable external alarms before continuing.

Setting the Fresh Air Reading

1. Place the controller into its calibration program or disable external alarms.
2. Verify that the oxygen transmitter is in a fresh air environment (environment known to be free of toxic and combustible gasses and of normal oxygen content, 20.9%).
3. Set a voltmeter to measure in the millivolt (mV) range.
4. Remove the junction box cover, then plug the voltmeter leads into the test points on the amplifier.

Plug the positive lead into the test point labeled **TP+**; plug the negative lead into the test point labeled **TP-**.
5. Verify a voltmeter reading of 434 mV (± 2 mV).
6. If necessary, use a flat-blade screwdriver to adjust the span potentiometer on the amplifier until the voltmeter reading is 434 mV (± 2 mV).

Setting the Zero Reading

1. Screw the calibration cup onto the bottom of the oxygen detector.
2. Connect one end of the sample tubing to the regulator.
3. Connect the opposite end of the sample tubing to the calibration cup.
4. Screw the regulator into the 100% nitrogen calibration cylinder. Gas will begin to flow.
5. Allow the gas to flow for two minutes and verify a reading of 100 mV (± 2 mV).
6. If necessary, use the zero potentiometer on the amplifier to adjust the reading to 100 mV (± 2 mV).
7. Unscrew the regulator from the calibration cylinder.

8. Unscrew the calibration cup from the oxygen detector.

NOTE: For convenience, leave the components of the calibration kit connected by the sample tubing.

9. Remove the voltmeter leads from the amplifier test points.
10. Secure the junction box cover to the junction box.
11. When the display reading rises above the decreasing alarm setpoint, return the controller to normal operation.

NOTE: If you do not allow the oxygen reading to increase above the decreasing alarm point, then unwanted alarms may occur.

12. Verify that the display reading increases and stabilizes at 20.9% volume.
13. Store the components of the calibration kit in a safe and convenient place.

Parts List

Table 6 lists replacement parts and accessories for the oxygen transmitter.

Table 6:Parts List

Part Number	Description
06-1248RK	Sample tubing (3/16 in. x 5/16 in.; specify length when ordering)
18-0405RK-01	Junction box (does not include lid)
18-0406RK	Junction box lid
57-1062RK	Amplifier for oxygen detector
65-2511RK	Oxygen detector, capillary type, conduit-mounting
65-2513RK	Oxygen transmitter (includes detector and amplifier)
71-0111RK	<i>Oxygen Transmitter Operator's Manual</i> (this document)
81-F301RK-LV	Calibration kit, 34 liter
81-0076RK-01	Zero air calibration cylinder (34 liter)
81-0078RK	Calibration cylinder (100% nitrogen, 17-liter)
81-0078RK-01	Calibration cylinder (100% nitrogen; 34-liter)
81-1003RK	Regulator, 0.5 liter/minute; continuous flow (for 17- and 34-liter calibration cylinders)
81-1117RK	Calibration cup