



INSTRUMENTS

**65-2341-XXSS CT-7 Series
S2 Toxic Gas Transmitter
Operator's Manual**

Part Number: 71-0661

Revision: 0

Released: 3/11/25

WARNING

Read and understand this instruction manual before operating instrument. Improper use of the gas monitor could result in bodily harm or death.

Periodic calibration and maintenance of the gas monitor is essential for proper operation and correct readings. Please calibrate and maintain this instrument regularly! Frequency of calibration depends upon the type of use you have and the sensor types. For most applications, typical calibration frequencies are between 3 and 6 months but can be more often or less often based on your usage.

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 the 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. Parts must be returned to RKI Instruments, Inc. for repair or replacement. 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:

- Absorbent cartridges
- Fuses
- Pump diaphragms and valves
- Batteries
- Filter elements

Warranty is voided by abuse including mechanical damage, alteration, rough handling, or repair procedures not in accordance with instruction manual. This warranty indicates the full extend 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.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ANY AND ALL OTHER WARRANTIES AND REPRESENTATIONS, EXPRESSED OR IMPLIED, AND ALL OTHER OBLIGATIONS OR LIABILITIES ON THE PART OF RKI INSTRUMENTS, INC. INCLUDING BUT NOT LIMITED TO, THE WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL RKI INSTRUMENTS, INC. BE LIABLE FOR INDIRECT, INCIDENTAL, OR CONSEQUENTIAL LOSS OR DAMAGE OF ANY KIND CONNECTED WITH THE USE OF ITS PRODUCTS OR FAILURE OF ITS PRODUCTS TO FUNCTION OR OPERATE PROPERLY.

This warranty covers instruments and parts sold to users only 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. Warranty covers parts and labor performed at RKI Instruments, Inc. only, and does not cover field labor or shipment of parts back to RKI.

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Overview

This manual describes the 65-2341-XXSS toxic gas transmitter. This manual also describes how to install, start up, maintain, and calibrate the toxic gas transmitter when used with a gas monitoring controller. A parts list at the end of this manual lists replacement parts and accessories for the toxic gas transmitter.

The 65-2341-XXSS toxic gas transmitter can be used for various target gases which are listed in Table 1 below.

Specifications

Table 1 lists specifications for the toxic gas transmitter.

Table 1: Specifications

<p>Target Gas and Detection Range</p>	<p><u>Ammonia (NH₃)</u></p> <ul style="list-style-type: none"> • 65-2341-NH3-75S: 0 - 75.0 ppm • 65-2341-NH375LS: 0 - 75.0 ppm • 65-2341-NH3-1SS: 0 - 100 ppm • 65-2341-NH3-2SS: 0 - 200 ppm • 65-2341-NH3-5SS: 0 - 500 ppm <p><u>Chlorine (Cl₂)</u></p> <ul style="list-style-type: none"> • 65-2341-CL2-3SS: 0 - 3.00 ppm • 65-2341-CL2-5SS: 0 - 5.00 ppm • 65-2341-CL2-10S: 0 - 10.0 ppm • 65-2341-CL210AS: 0 - 10.0 ppm • 65-2341-CL2200S: 0 - 200 ppm <p><u>Chlorine Dioxide (ClO₂)</u></p> <ul style="list-style-type: none"> • 65-2341-CLO2-1S: 0 - 1.00 ppm • 65-2341-CLO2-3S: 0 - 3.00 ppm • 65-2341-CLO2-5S: 0 - 5.00 ppm <p><u>Hydrogen Chloride (HCl)</u></p> <ul style="list-style-type: none"> • 65-2341-HCL-SS: 0 - 20.0 ppm <p><u>Hydrogen Cyanide (HCN)</u></p> <ul style="list-style-type: none"> • 65-2341-HCN-15S: 0 - 15.0 ppm <p><u>Nitric Oxide (NO)</u></p> <ul style="list-style-type: none"> • 65-2341-NOSS: 0 - 100 ppm <p><u>Nitrogen Dioxide (NO₂)</u></p> <ul style="list-style-type: none"> • 65-2341-NO2SS: 0 - 15.0 ppm <p><u>Sulfur Dioxide (SO₂)</u></p> <ul style="list-style-type: none"> • 65-2341-SO2-10S: 0 - 10.0 ppm
<p>Sampling Method</p>	<p>Diffusion</p>

Table 1: Specifications

Accuracy	± 10% of reading or ± 5% of full scale (whichever is greater)
Signal Output	4 to 20 mA
Response Time	T90 in 60 seconds
Operating Temperature	-4°F to 104°F (-20°C to 40°C)

WARNING: When using the 65-2341-XXSS, you must follow the instructions and warnings in this manual to assure proper and safe operation of the 65-2341-XXSS and to minimize the risk of personal injury. Be sure to maintain and periodically calibrate the 65-2341-XXSS as described in this manual.

Description

This section describes the components of the toxic gas transmitter. The toxic gas transmitter is a 4 - 20 mA type detector head. It consists of the toxic detector, amplifier, and junction box.

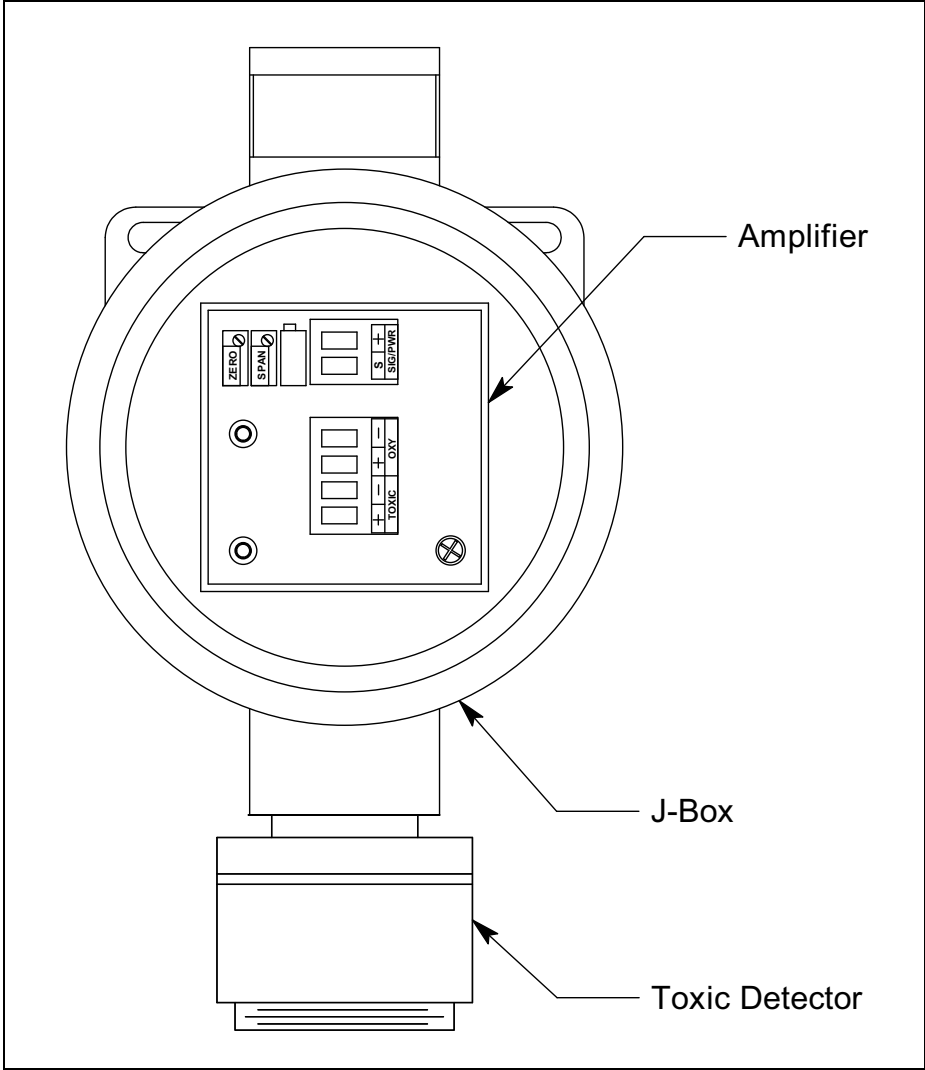


Figure 1: Toxic Transmitter Component Location

Toxic Detector

The toxic detector consists of the detector housing body, detector housing cap, cap gasket, and the plug-in sensor.

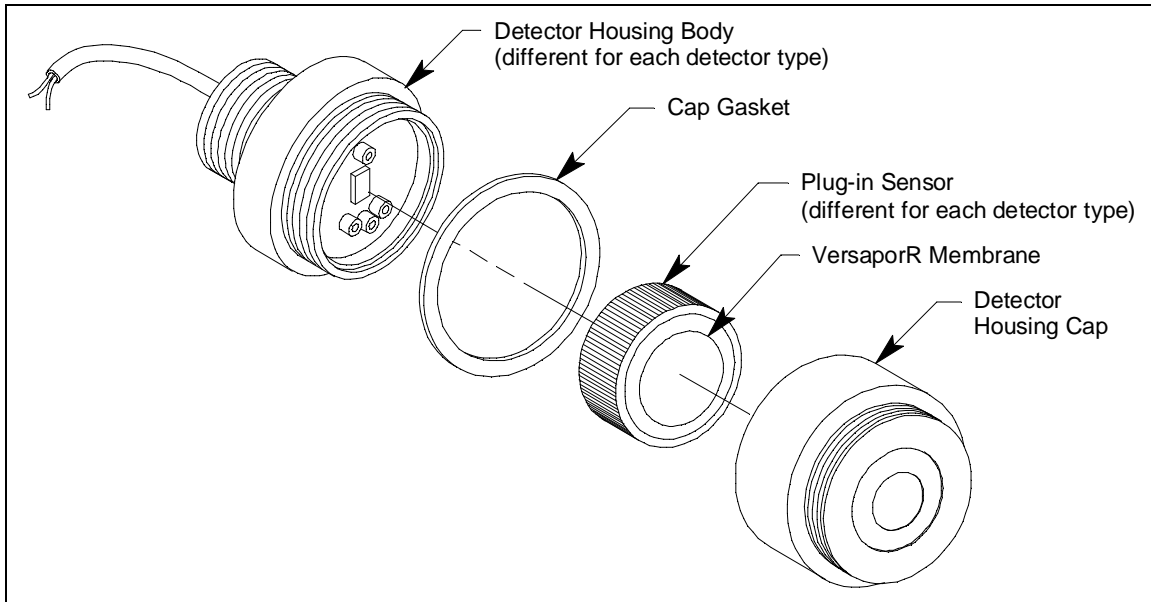


Figure 2: Toxic Detector Component Location

Detector Housing Body

The detector housing body protects the electronic components within the housing. Use the mounting threads at the top of the housing to screw the toxic detector into the 3/4 NPT hub on the bottom of the junction box. Two wires extend from the top of the detector housing body. Use these wires to connect the toxic detector to the amplifier. One of the wires is black and the other wire is color coded and may have a colored band of shrink tubing. See Figure 5 on page 13 for the color code assignments.

The housing body includes a four-socket pattern at the bottom of the housing body. The plug-in sensor mates to this socket pattern. A pre-amplifier located between the sockets and the two interconnect wires conditions the sensor's signal before the signal reaches the amplifier in the junction box. Each plug-in sensor type (Cl₂ for example) requires a different pre-amplifier, so there is a different detector housing body for each gas type.

Housing Cap and Cap Gasket

The housing cap screws onto the detector housing body. It retains the sensor and protects it from damage. A foam gasket inside the housing cap seals against the face of the sensor when the cap is screwed on the detector housing body. Unscrew the detector cap to access the sensor for replacement. A cap gasket seals the interface between the housing and cap.

Plug-In Sensor

The plug-in sensor is secured in the detector assembly by the housing cap. There is a different sensor for each target gas. Through a series of chemical and electrical reactions, the sensor produces an electrical output that corresponds to the detection range of the sensor. A VersaporR membrane is installed on the sensor face for protection from water and debris.

Amplifier

The amplifier converts the electrical output from the detector to a 4 to 20 mA signal that corresponds to the detection range and transmits the signal to a gas monitoring controller. A foam gasket that orients the amplifier and keeps it from rotating is installed on the bottom of the amplifier. The amplifier includes the detector terminal strip, controller terminal strip, zero pot, span pot, and test points.

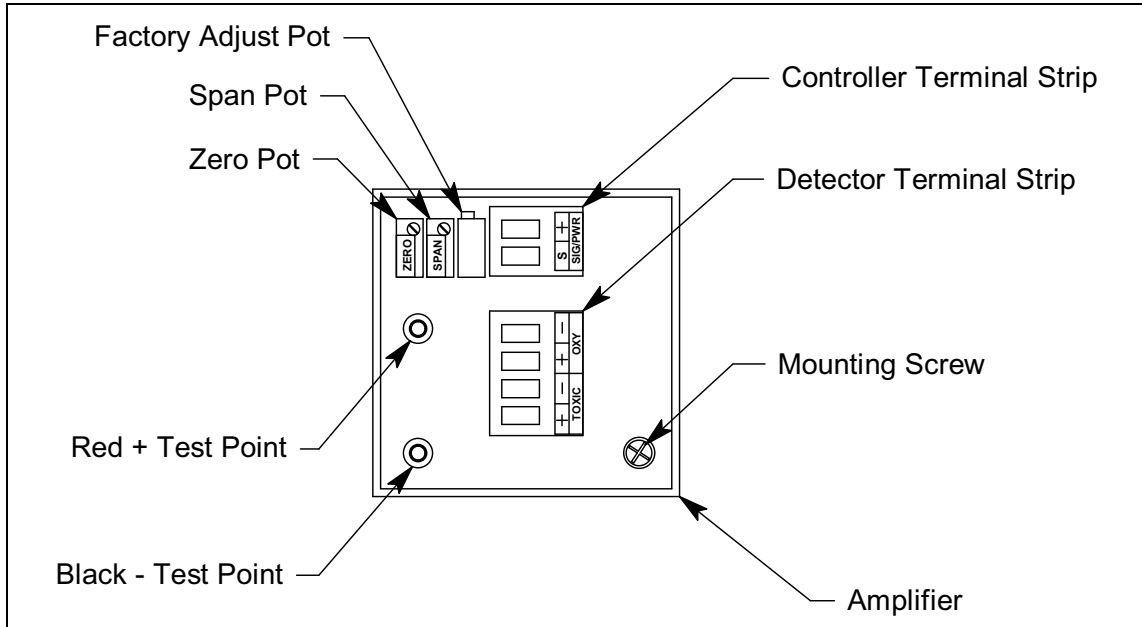


Figure 3: Amplifier Component Location

Controller Terminal Strip

The controller terminal strip is a two position plug-in style terminal strip located at the top edge of the amplifier. Use the controller terminal strip to wire the transmitter to a controller.

Detector Terminal Strip

The detector terminal strip is a four position plug-in style terminal strip located below the controller terminal strip. Two of the positions are for use with an oxygen sensor and are not used in the toxic gas transmitter. Use the two detector terminal strip positions that are labeled “TOXIC” to connect the detector to the amplifier.

NOTE: The detector is factory-wired to the detector terminal strip. See “Wiring the Toxic Gas Transmitter to a Controller” on page 11 for all wiring procedures related to the transmitter.

Zero Pot

The zero pot is located in the upper left corner of the amplifier (see Figure 3). Use a small flat blade screwdriver to turn the zero pot’s adjustment screw and adjust the amplifier’s zero (fresh air) output during the start-up and calibration procedures. Turn the adjustment screw clockwise to increase the zero output and counterclockwise to decrease the zero output.

Span Pot

The span pot is located to the right of the zero pot (see Figure 3). Use a small flat blade screwdriver to turn the span pot's adjustment screw and adjust the amplifier's gas response output during the calibration procedure. Turn the adjustment screw clockwise to increase the span output and counterclockwise to decrease the span output.

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

Test Points

The test points are on the left side of the amplifier (see Figure 3). The test points produce a 100 mV to 500 mV output that corresponds to the transmitter's 4 to 20 mA output. Use the test points and a voltmeter to measure the amplifier's output during the start-up and calibration procedures. The black test point in the lower left corner is the negative (-) test point and the red test point below the zero pot is the positive (+) test point.

Junction Box

The stainless steel, corrosion-resistant junction box allows you to install the transmitter at a mounting site that is remote from the controller. The junction box protects the amplifier and wiring connections made to the amplifier. Use the top 3/4 NPT conduit hub to connect wiring from the amplifier to the controller. An O-ring seals the interface between the junction box cover and the junction box base.

The detector and amplifier are factory installed in the junction box. Use the cover on the front of the junction box to access the interior of the junction box. A locking set screw on the junction box cover allows you to secure the junction box cover and prevent it from being removed.

Installation

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

Mounting the Toxic Gas 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 where the target gas is likely to be found first.

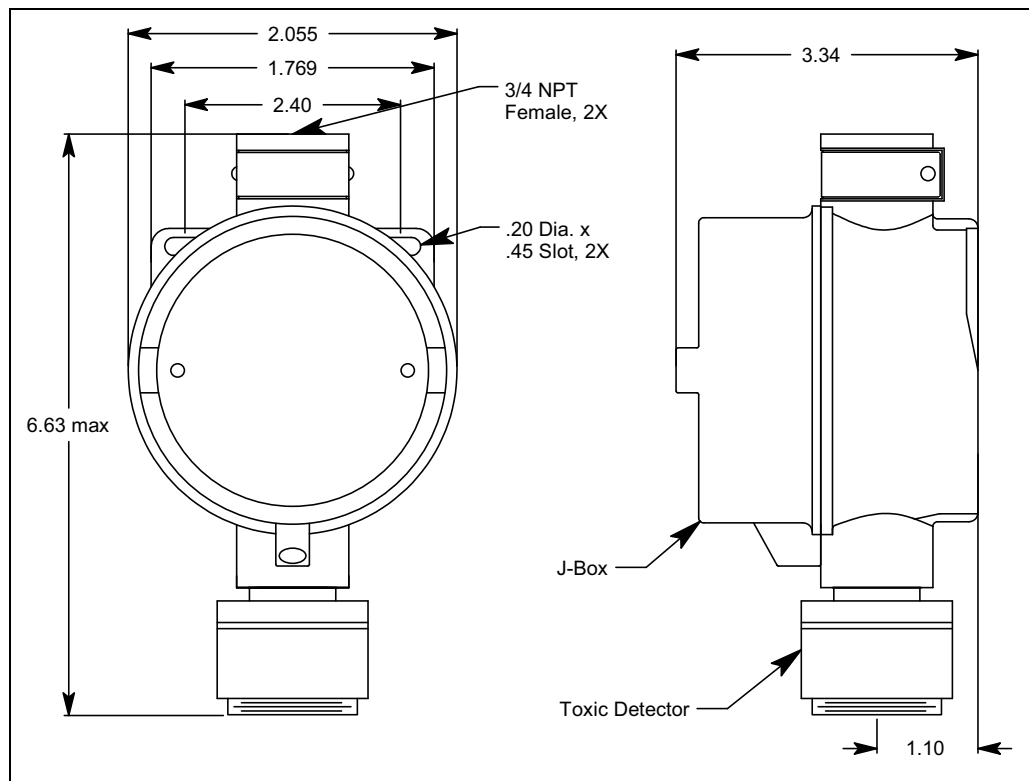


Figure 4: Mounting the Toxic Gas Transmitter

2. At the monitoring site you select, hang or mount the junction box with the detector facing down (see Figure 4).

Wiring the Toxic Gas Transmitter to a Controller

WARNING: Always verify that 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. The detector leads are factory wired. Verify that the detector leads are wired to the amplifier's detector terminal strip as shown in Figure 5.
5. To gain access to a plug-in terminal strip for wiring, pull it out of its socket by grasping the terminal strip and pulling. The detector strip is keyed so that the controller and detector terminal strips cannot be reversed inadvertently.
6. Guide a two-conductor, shielded cable or two wires in conduit through the top conduit hub of the junction box.

7. Pull out the controller terminal strip, and connect the two wires to the terminal strip as follows (see Figure 5).
 - Connect the positive wire to the **SIG/PWR “+”** terminal.
 - Connect the signal wire to the **SIG/PWR “S”** terminal.

CAUTION: *If shielded cable is used, leave the cable shield’s drain wire disconnected and insulated at the transmitter. You will connect the opposite end of the cable’s drain wire to the controller’s chassis (earth) ground.*

8. Reinstall the controller terminal strip into its socket.
9. Secure the junction box cover to the junction box.
10. Route the cable or wires leading from the toxic gas transmitter through one of the conduit hubs at the controller housing.

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

11. Connect the wires to the applicable detector/transmitter terminal strip at the controller as shown in Figure 5.

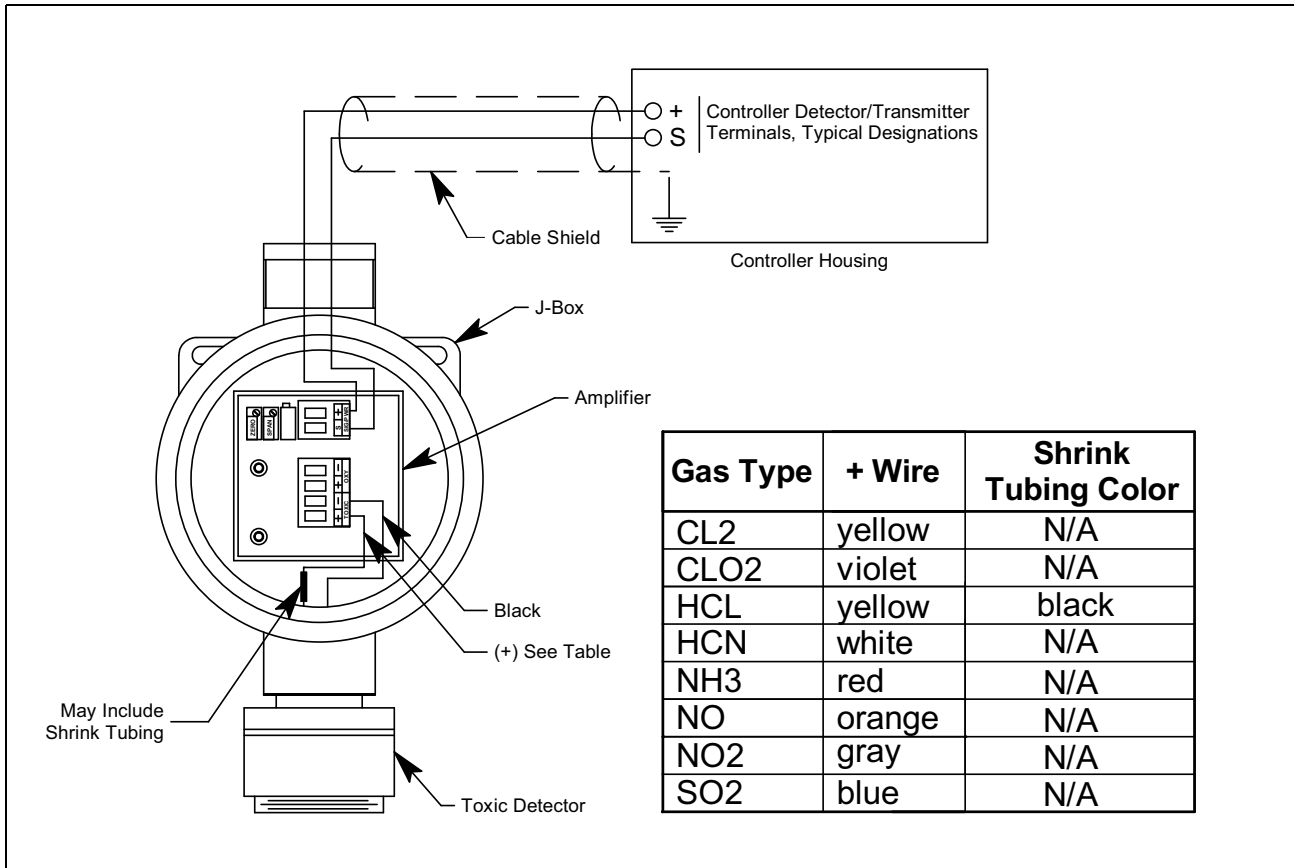


Figure 5: Wiring the Toxic Gas Transmitter to a Controller

12. If shielded cable is used, connect the cable's drain wire to an available chassis (earth) ground at the controller. RKI controllers typically have a ground stud that can be used to ground the cable's drain wire.

Start Up

This section describes procedures to start up the toxic gas transmitter and place the transmitter into normal operation.

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 power to the controller.
4. Turn on the controller.
5. Verify that the controller is on and operating properly. Refer to the controller operator's manual.

CAUTION: *For all gases except ClO₂, allow the detector to warm up for 15 minutes before you continue with the next section, "Setting the Zero Signal".*

For ClO₂, allow the detector to warm up for 2-3 hours before you continue with the next section, "Setting the Zero Signal".

Setting the Zero Signal

CAUTION: *If you suspect the presence of toxic gas in the monitoring environment, use the calibration kit and the zero air calibration cylinder to introduce "fresh air" to the detector and verify an accurate zero setting. See "Calibration" on page 21 for instructions to apply zero air when setting the zero signal.*

1. Verify that the transmitter is in a fresh air environment (environment known to be free of toxic gas 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 red + test point; plug the negative lead into the black - test point.
5. Verify a voltmeter reading of 100 mV (± 2 mV).
6. If necessary, use a small flat-blade screwdriver to adjust the zero pot until the voltmeter reading is 100 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 toxic gas transmitter. It includes daily and quarterly procedures.

Daily

Verify a display reading of 0 ppm at the controller. Investigate significant changes in the display reading.

Quarterly

Calibrate the toxic gas transmitter as described in “Calibration” on page 21 of this manual.

Troubleshooting

The troubleshooting guide describes symptoms, probable causes, and recommended action for problems you may encounter with the toxic gas 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 Toxic Gas 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 plug-in sensor is not properly plugged into the socket in the detector housing body. <p><i>NOTE: It could take up to 40 minutes for a disconnected NH₃ plug-in sensor to trigger a fail condition.</i></p> <ul style="list-style-type: none"> • The transmitter's zero reading is low enough to cause a fail condition. • The transmitter is malfunctioning. 	<ol style="list-style-type: none"> 1. Verify that the transmitter wiring is correct and secure. 2. Confirm that the plug-in sensor is installed properly. 3. Perform a zero (fresh air) adjustment. A full calibration is recommended. 4. If the fail condition continues, replace the plug-in sensor as described later in this section. 5. If the fail condition continues, contact RKI for further instruction.

Table 2: Troubleshooting the Toxic Gas Transmitter (Continued)

Condition	Symptom(s)	Probable Causes	Recommended Action
<p>Slow or No Response/Difficult or Unable to Calibrate</p>	<ul style="list-style-type: none"> • Unable to accurately set the zero or response reading during calibration. • Transmitter requires frequent calibration. <p><i>NOTE: Under “normal” circumstances, the transmitter requires calibration once every 3 months.</i></p> <p><i>Some applications may require a more frequent calibration schedule.</i></p>	<ul style="list-style-type: none"> • The plug-in sensor has been replaced and the shorting jumper has not been removed. • The calibration cylinder is low, outdated, or defective. • The incorrect calibration cup or regulator is being used. • The VersaporR membrane on the plug-in sensor face is blocked with dirt or some other particulate contamination. • The calibration gas is not an appropriate concentration. • The transmitter is malfunctioning. 	<ol style="list-style-type: none"> 1. Confirm the shorting jumper on the sensor pins has been removed. 2. Verify that the calibration cylinder contains an adequate supply of a fresh test sample. 3. Confirm that you are using the correct calibration cup and regulator. See “Parts List” on page 25 for the required calibration cup and regulator. 4. Check the plug-in sensor face and remove any particulate contamination if necessary. If the membrane appears saturated with contamination or damaged, replace the membrane as described in “Replacing the VersaporR Membrane” on page 19. 5. Verify that the calibration gas concentration is appropriate for the transmitter. The concentration should be in the detection range, preferably about half of the detection range. 6. If the calibration/response difficulties continue, replace the plug-in sensor as described later in this section. 7. If the calibration/response difficulties continue, contact RKI for further instruction.

Replacing Components of the Toxic Gas Transmitter

This section includes a procedure to replace the plug-in toxic sensor, the VersaporR membrane, the entire toxic detector assembly, and the amplifier. In most cases, it is not necessary to replace the entire detector assembly.

Replacing the Plug-in Toxic Sensor

CAUTION: *The plug-in sensor contains electrolyte which is a dilute acid. Do not disassemble the sensor when replacing it with a new one. If sensor electrolyte comes in contact with your skin, wash affected area thoroughly with soap and water.*

1. Turn off the controller.
2. Turn off or unplug power to the controller.
3. Unscrew the detector housing cap from the detector housing body. Make sure not to lose the cap gasket.
4. Unplug and remove the toxic sensor.
5. Remove the replacement sensor from its packaging and remove the wire jumper. This wire jumper is installed on the sensor pins for shipment or storage but must be removed for the sensor to operate properly when installed in a detector.

WARNING: *The toxic sensor will not operate properly if the wire jumper is not removed.*

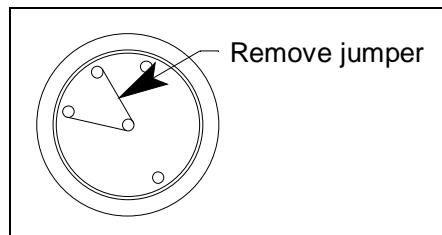


Figure 6: Plug-In Sensor Jumper Removal

6. Carefully plug the replacement sensor into the four-socket pattern located in the detector housing body.

WARNING: *You must replace the plug-in sensor with the same type of sensor that is installed. A detector cannot be converted from one type of detector to another by using a different plug-in sensor. For example, if you are replacing a Cl₂ sensor, you must replace it with a Cl₂ sensor.*

7. Make sure the cap gasket is in place and screw the detector housing cap back onto the detector housing body.
8. Turn on power to the controller.

9. Turn on the controller and place into normal operation.

CAUTION: *For all gases except ClO₂, allow the replacement sensor to warm up for 15 minutes before you continue with the next step.*

For ClO₂, allow the replacement sensor to warm up for 2-3 hours before you continue with the next step.

10. Calibrate the detector as described in “Calibration” on page 21.

Replacing the VersaporR Membrane

1. Turn off the controller.
2. Turn off or unplug incoming power to the controller.
3. Unscrew the detector housing cap from the detector housing body.
4. Unplug the plug-in sensor from the four-socket pattern in the detector housing body.
5. Gently pry up the edge of the white VersaporR membrane from the sensor face with a small flat blade screwdriver or a similar tool.
6. Peel off the VersaporR membrane. It may be necessary to clean off the sensor face to remove any residue left from the adhesive backed membrane.
7. Install the new membrane on the face of the plug-in sensor.
8. Plug the sensor back into the four-socket pattern in the detector housing body.
9. Make sure the cap gasket is in place and screw the detector housing cap back onto the detector housing body.
10. Turn on power to the controller.
11. Turn on the controller.

Replacing the Toxic Detector

NOTE: In most cases, it is only necessary to replace the plug-in sensor.

1. Turn off the controller.
2. Turn off or unplug power to the controller.
3. Remove the junction box cover.
4. Remove the detector terminal strip from its socket.
5. Disconnect the detector leads from the detector terminal strip. Note the position of the color-coded leads as you remove them.
6. Unscrew the detector from the junction box conduit hub.

7. 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. If necessary for environmental conditions, apply thread sealant or Teflon tape to the hub and/or detector threads to seal them.
8. Connect the detector leads to the appropriate detector terminal strip terminals. Connect the black wire to the terminal labeled “TOXIC -” and the color coded wire to the terminal labeled “TOXIC +”. See Figure 5 on page 13 for the detector wiring connections to the amplifier and the detector wire color coding.
9. Reinstall the junction box cover.
10. Turn on or plug in power to the controller.
11. Turn on the controller and place it into normal operation.

CAUTION: *For all gases except ClO₂, allow the replacement detector to warm up for 15 minutes before you continue with the next step.*

For ClO₂, allow the replacement detector to warm up for 2-3 hours before you continue with the next step.

12. Calibrate the replacement detector as described in “Calibration” on page 21.

Replacing the Amplifier

1. Turn off the controller.
2. Turn off or unplug power to the controller.
3. Remove the junction box cover.
4. Unplug the detector terminal strip and controller terminal strip from their sockets. You may leave the wires connected to the terminal strips.
5. Unscrew and remove the screw with the flat and lock washers that secures the amplifier to the junction box.
6. Remove the old amplifier.
7. Install the new amplifier into the junction box with the screw, lock washer, and flat washer you removed in Step 5 above. A foam gasket that orients the amplifier and keeps it from rotating is installed on the bottom of the amplifier. Make sure the amplifier is seated flat in the junction box.

8. Install the detector and controller terminal strips into their sockets on the new amplifier as shown in Figure 5 on page 13. If controller leads or detector leads were removed during this procedure, refer to Figure 5 on page 13 for the detector and amplifier connections.

NOTE: When a transmitter is first powered up with a new amplifier, the initial output may be either high or below zero depending on the setting of the zero pot. Be sure to make arrangements so that this does not cause unwanted alarms.

9. Turn on power to the controller.
10. Turn on the controller and place it into normal operation.
11. Allow the transmitter to warm-up for 15 minutes.
12. Calibrate the transmitter as described in “Calibration” on page 21 of this manual.

Calibration Frequency

Although there is no particular calibration frequency that is correct for all applications, a calibration frequency of every 3 months is adequate for most toxic gas transmitter applications. Unless experience in a particular application dictates otherwise, RKI Instruments, Inc. recommends a calibration frequency of every 3 months for the toxic gas transmitter.

If an application is not very demanding, for example detection in a clean, temperature controlled environment where toxic gas is not normally present, 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 or if toxic gas is often present, then more frequent calibration than every 3 months may be necessary.

Calibration

This section describes how to calibrate the toxic gas transmitter. It includes procedures to prepare for calibration, set the zero (fresh air) reading, set the span (response) reading, and return to normal operation. It describes calibration using a calibration kit that includes a calibration cup, calibration gas, sample tubing, and a fixed flow regulator with an on/off knob. RKI Instruments, Inc. recommends using a 0.5 LPM (liters per minute) fixed flow regulator.

WARNING: *RKI Instruments, Inc. recommends that you dedicate a regulator for use with chlorine (Cl₂) gas and that you do not use that dedicated regulator for any other gases, particularly hydrogen sulfide (H₂S).*

WARNING: *Not using the recommended calibration cup and sample flowrate will result in an inaccurate calibration. See “Parts List” on page 25 for the required calibration cup and regulator.*

Special Note About Calibrating a ClO₂ Detector

There are two ways to calibrate a ClO₂ detector: using a ClO₂ generator or using a Cl₂ cylinder and a 0.4 factor.

- If a Cl₂ cylinder is used for calibration, RKI Instruments, Inc. recommends using 2 ppm of Cl₂ and setting the ClO₂ reading to 0.8 ppm.
- If a ClO₂ generator is being used, the generator's flow rate should be set to 0.5 LPM. RKI Instruments, Inc. recommends that 0.5 ppm ClO₂ be used. The steps related to use of a calibration gas cylinder in the following instructions can be disregarded.

Preparing for Calibration

CAUTION: For all gases except ClO₂, confirm that the detector has been running for 15 minutes before performing a calibration.

For ClO₂, confirm that the detector has been running for 2-3 hours before performing a calibration.

1. Place the controller into its calibration mode or disable external alarms.

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

2. Unscrew and remove the junction box cover.
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 red + test point; plug the negative lead into the black - test point.
5. For all gases except ClO₂, use the following formula to determine the correct test points output for the calibrating sample.

$$\text{Output (mV)} = (\text{calibrating sample/fullscale}) \times 400 + 100$$

For example, with a calibrating sample of 2.00 ppm and a fullscale setting of 3.00, the correct output is 367 mV.

$$367(\text{mV}) = (2.00/3.00) \times 400 + 100$$

6. For ClO₂, use the following formula to determine the correct test points output for the calibrating sample.

$$\text{Output (mV)} = [(\text{Cl}_2 \text{ concentration} \times 0.4)/\text{fullscale}] \times 400 + 100$$

For example, with a calibrating sample of 2.00 ppm and a fullscale setting of 1.00, the correct output is 420 mV.

$$420(\text{mV}) = [(2.00 \times 0.4)/1] \times 400 + 100$$

7. Screw the calibration cup onto the bottom of the detector.

Setting the Zero (Fresh Air) Reading

NOTE: If you can verify that the toxic gas transmitter is in a fresh air environment, you do not need to apply zero air to the detector before adjusting the fresh air reading.

1. Screw the regulator into the zero air calibration cylinder.
2. Use the sample tubing to connect the regulator to the calibration cup.
3. Turn the regulator knob counterclockwise to open the regulator.
4. Allow the gas to flow for two minutes and verify a reading of 100 mV (± 2 mV). If necessary, use the zero pot on the amplifier to adjust the reading to 100 mV (± 2 mV).
5. Turn the regulator knob clockwise to close the regulator.
6. Unscrew the regulator from the zero air calibration cylinder. Leave the sample tubing connected to the regulator and the calibration cup.

NOTE: Depending on the size of your zero air cylinder, it is possible that you will have a different regulator for the zero air cylinder and toxic gas cylinder. If necessary to fit the calibration toxic gas cylinder, change the regulator.

Setting the Span (Response) Reading for Detectors Other Than HCl

1. Verify that the calibration gas is representative of the transmitter's target gas.
2. For toxic gas cylinders (like Cl_2), it is important to vent the regulator while installing it onto the cylinder. Venting the regulator during installation helps prevent air from getting into the cylinder and degrading the gas. Open the regulator by turning the knob counterclockwise and then install it onto the cylinder (or start the flow of gas from a generator).

WARNING: *When calibrating with a 20 ppm Cl_2 cylinder, it is important to wear a breathing apparatus to prevent inhalation of toxic gas.*

3. Allow the calibration gas to flow for two minutes and verify that the reading matches the response reading (± 2 mV) you determined earlier in Step 5 or Step 6. If necessary, use the span pot on the amplifier to adjust the reading to match the correct response reading.
4. Turn the regulator knob clockwise to close the regulator (or stop the flow of gas from a generator).
5. Unscrew the regulator from the calibration cylinder.

Setting the Span (Response) Reading for an HCl Detector

1. Verify that the calibration gas is representative of the transmitter's target gas.
2. Disconnect the regulator from the calibration tubing.
3. For toxic gas cylinders like HCl, it is important to vent the regulator while installing it onto the cylinder. Venting the regulator during installation helps prevent air from getting into the cylinder and degrading the gas. Open the regulator by turning the knob counterclockwise and then install it onto the cylinder.
4. Allow gas to flow for **5 minutes** to condition the regulator.
5. Reconnect the calibration tubing to the regulator and allow the calibration gas to flow for two minutes and verify that the reading matches the response reading (± 2 mV) you determined earlier in Step 5 or Step 6.
If necessary, use the span pot on the amplifier to adjust the reading to match the correct response reading.
6. Turn the regulator knob clockwise to close the regulator.
7. Unscrew the regulator from the calibration cylinder.

Returning to Normal Operation

1. Remove the voltmeter leads from the amplifier test points.
2. Unscrew the calibration cup from the detector. Make sure that you do not loosen the detector housing cap when you unscrew the calibration cup.

NOTE: For convenience, leave the regulator and calibration cup connected by the sample tubing.

3. Secure the junction box cover to the junction box.
4. When the controller display reading falls below the alarm setpoints, return the controller to normal operation.

NOTE: If you do not allow the gas reading to decrease below the alarm points, then unwanted alarms may occur.

5. Verify that the controller display reading decreases and stabilizes at 0 ppm.
6. Store the components of the calibration kit in a safe and convenient place.

Parts List

Table 3 lists replacement parts and accessories for the toxic gas transmitter.

Table 3: Parts List

Part Number	Description
06-1283RK	Calibration kit sample tubing, 3 foot Teflon w/flexible tubing on ends
07-0039RK	Detector housing cap gasket
07-7151RK	O-ring for junction box
10-5153RK	Lid locking set screw
18-0416RK-11	Junction box with cover, stainless steel
33-0157RK	VersaporR membrane for plug-in sensor face
57-1064RK-03	S2 series toxic amplifier
65-2015-01	Replacement plug-in sensor, 0 - 100 ppm NO, with membrane
65-2024-01	Replacement plug-in sensor, 0 - 10.0 ppm SO ₂ , with membrane
65-2049-01	Replacement plug-in sensor, 0 - 15.0 ppm HCN, with membrane
65-2051-01	Replacement plug-in sensor, 0 - 3.00 ppm, 0 - 5.00 ppm, and 0 - 10.0 ppm Cl ₂ , with membrane
65-2052-01	Replacement plug-in sensor, 0 - 1.00 ppm, 0 - 3.00 ppm, and 0 - 5.00 ppm ClO ₂ , with membrane
65-2053-01	Replacement plug-in sensor, 0 - 75.0 ppm, 0 - 100 ppm, and 0 - 200 ppm NH ₃ , with membrane
65-2054-01	Replacement plug-in sensor, 0 - 500 ppm NH ₃ , with membrane
65-2055-01	CT-7 Series plug-in sensor, 0 - 75.0 ppm NH ₃ , long-life/humidity resistant, with membrane
65-2056-01	CT-7 Series plug-in sensor, 0 - 10.0 ppm Cl ₂ , for low background gas applications, with membrane
65-2057-01	Replacement plug-in sensor, 0 - 200 ppm Cl ₂ , with membrane
65-2058-01	Replacement plug-in sensor, 0 - 15 ppm NO ₂ , with membrane
65-2060-01	Replacement plug-in sensor, 0 - 20.0 ppm HCl, with membrane
65-2302-CL2-3	Replacement detector assembly, Cl ₂ , 0 - 3.00 ppm range (includes plug-in sensor)
65-2302-CL2-5	Replacement detector assembly, Cl ₂ , 0 - 5.00 ppm range (includes plug-in sensor)
65-2302-CL2-10	Replacement detector assembly, Cl ₂ , 0 - 10.0 ppm range (includes plug-in sensor)
65-2302-CL2-10A	Replacement detector assembly, Cl ₂ , 0 - 10.0 ppm range (includes plug-in sensor), for low background gas applications

Table 3: Parts List

Part Number	Description
65-2302-CL2-200	Replacement detector assembly, Cl ₂ , 0 - 200 ppm range (includes plug-in sensor)
65-2302-CLO2-1	Replacement detector assembly, ClO ₂ , 0 - 1.00 ppm range (includes plug-in sensor)
65-2302-CLO2-3	Replacement detector assembly, ClO ₂ , 0 - 3.00 ppm range (includes plug-in sensor)
65-2302-CLO2-5	Replacement detector assembly, ClO ₂ , 0 - 5.00 ppm range (includes plug-in sensor)
65-2302-HCL	Replacement detector assembly, HCl, 0 - 20.0 ppm range (includes plug-in sensor)
65-2302-HCN-15	Replacement detector assembly, HCN, 0 - 15.0 ppm range (includes plug-in sensor)
65-2302-NH3-75	Replacement detector assembly, NH ₃ , 0 - 75.0 ppm range (includes plug-in sensor)
65-2302-NH3-75L	Replacement detector assembly, NH ₃ , 0 - 75.0 ppm range (includes plug-in sensor), long-life/humidity-resistant
65-2302-NH3-1	Replacement detector assembly, NH ₃ , 0 - 100 ppm range (includes plug-in sensor)
65-2302-NH3-2	Replacement detector assembly, NH ₃ , 0 - 200 ppm range (includes plug-in sensor)
65-2302-NH3-5	Replacement detector assembly, NH ₃ , 0 - 500 ppm range (includes plug-in sensor)
65-2302-NO	Replacement detector assembly, NO, 0 - 100 ppm range (includes plug-in sensor)
65-2302-NO2	Replacement detector assembly, NO ₂ , 0 - 15 ppm range (includes plug-in sensor)
65-2302-SO2-10	Replacement detector assembly, SO ₂ , 0 - 10 ppm range (includes plug-in sensor)
71-0660	<i>65-2341-XXSS CT-7 Series S2 Toxic Gas Detector Operator's Manual</i> (this document)
81-0076RK	Zero air calibration cylinder, 17 liter
81-0076RK-01	Zero air calibration cylinder, 34 liter steel
81-0076RK-03	Zero air calibration cylinder, 103 liter
81-0170RK-02	Calibration cylinder, 5 ppm SO ₂ in nitrogen, 58 liter
81-0170RK-04	Calibration cylinder, 5 ppm SO ₂ in nitrogen, 34 liter aluminum
81-0176RK-02	Calibration cylinder, 25 ppm NH ₃ in nitrogen, 58 liter
81-0176RK-04	Calibration cylinder, 25 ppm NH ₃ in nitrogen, 103 liter
81-0180RK-02	Calibration cylinder, 10 ppm NO ₂ in air, 58 liter
81-0180RK-04	Calibration cylinder, 10 ppm NO ₂ in air, 34 liter aluminum
81-0181RK-02	Calibration cylinder, 25 ppm NO in nitrogen, 58 liter
81-0181RK-04	Calibration cylinder, 25 ppm NO in nitrogen, 34 liter aluminum
81-0190RK-02	Calibration cylinder, 5 ppm Cl ₂ in nitrogen, 58 liter
81-0190RK-04	Calibration cylinder, 5 ppm Cl ₂ in nitrogen, 34 liter aluminum

Table 3: Parts List

Part Number	Description
81-0192RK-02	Calibration cylinder, 2 ppm Cl ₂ in nitrogen, 58 liter (can be used to calibrate all Cl ₂ ranges)
81-0192RK-04	Calibration cylinder, 2 ppm Cl ₂ in nitrogen, 34 liter aluminum (can be used to calibrate all Cl ₂ ranges)
81-0194RK-02	Calibration cylinder, 10 ppm HCl in nitrogen, 58 liter
81-0194RK-04	Calibration cylinder, 10 ppm HCl in nitrogen, 34 liter aluminum
81-0196RK-02	Calibration cylinder, 10 ppm HCN in nitrogen, 58 liter
81-0196RK-04	Calibration cylinder, 10 ppm HCN in nitrogen, 34 liter aluminum
81-1050RK	Regulator with gauge and knob, 0.5 LPM, for 17 liter and 34 liter steel calibration cylinders (cylinders with external threads)
81-1051RK	Regulator with gauge and knob, 0.5 LPM, for 34 liter aluminum, 58 liter, and 103 liter calibration cylinders (cylinders with internal threads)
81-1117RK	Calibration cup
81-9029RK-02	Calibration cylinder, 100 ppm NH ₃ in nitrogen, 58 liter
81-9082RK-02	Calibration cylinder, 20 ppm, Cl ₂ in nitrogen, 58 liter
81-F504RK25	Calibration kit, includes regulator, calibration cup, tubing, and 58 liter calibration cylinder of 25 ppm NH ₃ in nitrogen
81-F504RK25-LV	Calibration kit, includes regulator, calibration cup, tubing, and 34 liter aluminum calibration cylinder of 25 ppm NH ₃ in nitrogen
81-F605	Calibration kit, includes regulator, calibration cup, tubing, and a 58 liter calibration cylinder of 2 ppm Cl ₂ in nitrogen
81-F605-LV	Calibration kit, includes regulator, calibration cup, tubing, and a 34 liter aluminum calibration cylinder of 2 ppm Cl ₂ in nitrogen
81-F608	Calibration kit, includes regulator, calibration cup, tubing, and a 58 liter calibration cylinder of 20 ppm Cl ₂ in nitrogen
81-F819RK	Calibration kit, includes regulator, calibration cup, tubing, and 58 liter calibration cylinder of 10 ppm HCl in nitrogen
81-F819RK-LV	Calibration kit, includes regulator, calibration cup, tubing, and 34 liter aluminum calibration cylinder of 10 ppm HCl in nitrogen
81-F821RK	Calibration kit, includes regulator, calibration cup, tubing, and 58 liter calibration cylinder of 25 ppm NO in nitrogen
81-F821RK-LV	Calibration kit, includes regulator, calibration cup, tubing, and 34 liter aluminum calibration cylinder of 25 ppm NO in nitrogen
81-F822RK	Calibration kit, includes regulator, calibration cup, tubing, and a 58 liter calibration cylinder of 10 ppm HCN in nitrogen

Table 3: Parts List

Part Number	Description
81-F824RK	Calibration kit, includes regulator, calibration cup, tubing, and a 58 liter calibration cylinder of 10 ppm NO ₂ in air
81-F824RK-LV	Calibration kit, includes regulator, calibration cup, tubing, and a 34 liter calibration cylinder of 10 ppm NO ₂ in air