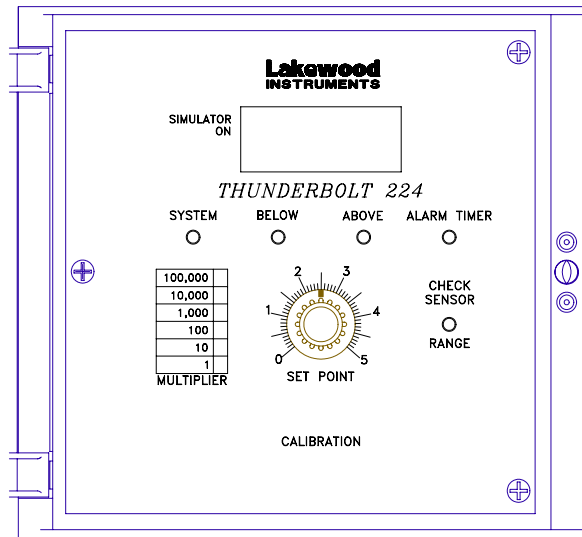


LAKWOOD INSTRUMENTS MODEL 222S & 224S

CONDENSATE CONDUCTIVITY ANALYZER

INSTRUCTION MANUAL

SERIAL #: _____



Lakewood Instruments

7838 North Faulkner Road, Milwaukee, Wisconsin 53224 USA

Phone (800) 228-0839 • Fax (414) 355-3508

<http://www.lakewoodinstruments.com>

Lakewood Instruments

We thank you for your selection and purchase of a Lakewood Instruments product.

With proper care and maintenance, this device should give you many years of trouble-free service. Please take the time to read and understand this Installation and Operation Manual, paying special attention to the sections on **OPERATION** and **MAINTENANCE**.

If, in the future, any parts or repairs are required, we strongly recommend that only original replacement parts be used. Our Customer Service Department is happy to assist you with your parts or service requests.

 **Lakewood Instruments Customer Service and Technical Support Departments can be reached by calling (800) 228-0839 or faxing (414) 355-3508, Monday through Friday, 7:30 a.m. - 5:00 p.m. CST.**

 **Mail should be sent to:**

**Lakewood Instruments
7838 North Faulkner Road
Milwaukee, WI 53224 USA**

MODEL 222S & 224S

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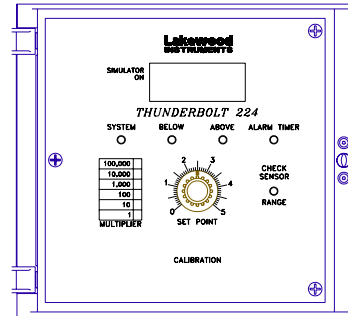
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INTRODUCTION

MODEL 222S & 224S CONDENSATE CONDUCTIVITY ANALYZER

Lakewood Instruments Models 222S and 224S are conductivity condensate analyzers. The 222S has a 2-electrode sensor for use in clean condensate returns that seldom foul. The 224S uses 4-electrode technology for industrial applications where contaminants foul the electrodes.

Maximize control and minimize labor costs with a 224S Analyzer that uses a 4-electrode conductivity sensor to compensate for electrode fouling. When excessive fouling occurs, an alarm tells the operator to clean the sensor.



APPLICATIONS

- Boiler condensate monitoring (222S)
- Process condensate monitoring (224S)
- Hot water chemical control (224S)
- Softener/demineralizer regeneration (224S)


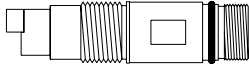
BENEFITS

- Prevents contaminated condensate from entering the boiler.
- Accurate conductivity control even at extremely high cycles of concentrations.
- Automatic temperature compensator check assists with troubleshooting. (222S)
- Reduces calibration costs.
- Compensators and simulators reduce labor costs.

FEATURES

- The 224S, with a 4-electrode sensor, provides steady and accurate conductivity control even in dirty solutions.
- Electrode fouling compensation. (224S)
- The 224S alerts the operator when electrode fouling finally exceeds compensation.
- Push-button electrode test circuits make it easy to check the electrode's temperature compensator. (222S)
- Automatic temperature compensation.
- Watertight enclosure.

SENSOR/RANGES

222S — 2 Electrode	224S — 4 Electrode
540-4-10R	543L-4-7R
0-100 μ S	0-500.0 μ S
	

SPECIFICATIONS

Sensor Simulator	Switch behind the panel Set your own value
Setpoint Range	0 to 100 (222S); 0 to 500 (224S)
Deadband	Adjustable 1 to 10%
Accuracy	Depends on range/sensor/solution.
Auto. Temp. Comp.	32 to 212°F (0 to 100°C)
Temp. Comp. Check	Switch behind the panel
Display	LCD—3 digits (i.e., 500, 50.0)
Analog Output	4-20 mA with -35 Option
Alarm Timer	User select—15 sec., 15, 30 & 60 min. Locks out chemical feed if used.
Fouled Sensor Alarm	LED indicator (224S)
Above & Below Alarms	Setpoint LED indicator
Direct/Reverse Setpoints	User-selectable
Power	120 or 240 VAC 50/60 Hz, 10 Watts
Relay	1/6 HP max. 2 @ 5 Amps inductive
Ratings	UL Listing pending
Enclosure	NEMA 4X corrosion & waterproof
Water Max.	To 392°F (200°C)—see sensor ratings
Ambient	32 to 158°F (0 to 70°C)

Front Panel Description

SIMULATOR ON

An arrow in the LCD points to these words when the unit is in simulation mode. The simulator switch is on the front circuit board (PCB).

LCD

A liquid crystal Display with a hidden ON/OFF switch on the front circuit board (PCB). The decimal point is determined by the range selected.

SYSTEM

The **SYSTEM** light is **ON** when there is power to the monitor.

BELOW

This light comes on whenever the conductivity level is **BELOW** the setpoint value.

MULTIPLIER

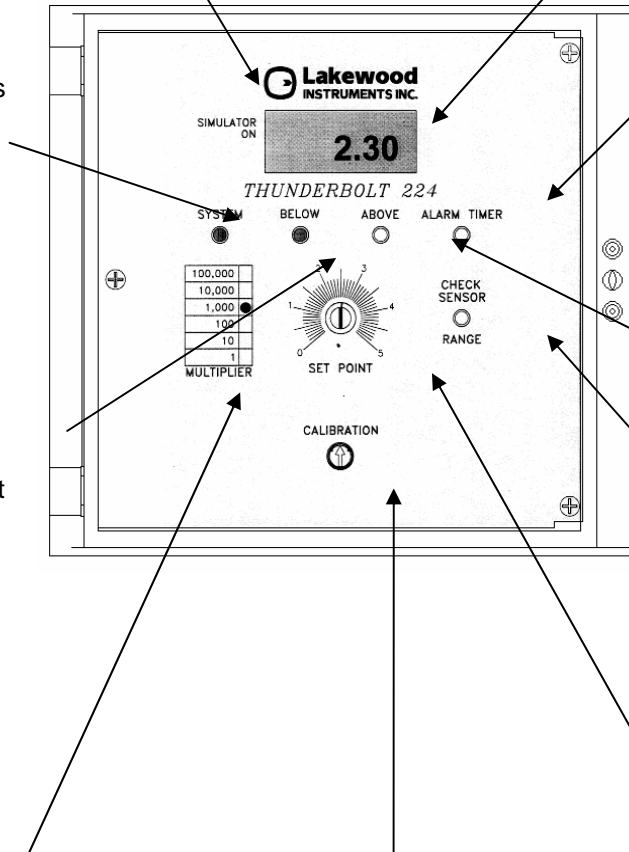
This is the multiplier for the setpoint scale.

CALIBRATION

Use this knob to calibrate your unit by turning it until the LCD reads the same as the conductivity of your flow cell sample.

SETPOINT

The setpoint level you select, based on your water treatment engineer's recommendation, will determine the conductivity level that the controller will maintain. When the conductivity level rises above the setpoint, the output relay is activated.



ALARM TIMER

This light comes on when the alarm has timed out to let you know that the diverter valve has failed to satisfy the setpoint.

ABOVE

This light comes on whenever the conductivity level is **ABOVE** the setpoint value.

CHECK SENSOR RANGE

This light comes on if the sensor fouling has exceeded the 224S's compensation capability or if the conductivity level has exceeded the range selected.

INSTALLATION

Checking

Inspect the shipping carton for obvious external damage. Note on the carrier's bill-of-lading the extent of the damage, if any, and notify the carrier. Save the shipping carton until your Model 222S or Model 224S analyzer is started up.



If there was shipping damage, call the Lakewood Instruments Customer Service Department at (800) 228-0839 and return the analyzer to the factory in the original carton.

Mounting

Mount the Model 222S or Model 224S analyzer on a FLAT, NON-VIBRATING wall.

Avoid drilling or punching additional holes in the analyzer enclosure, or it will no longer meet NEMA 4X protection standards. Damage incurred as a result of any alteration to the enclosure is not covered under the Lakewood Instruments product warranty.

NOTE: EXCESSIVE HEAT AND/OR DIRECT SUNLIGHT EXPOSURE WILL DARKEN THE LCD DISPLAY SCREEN, MAKING IT DIFFICULT TO READ, AND MAY SHORTEN THE LIFE OF OTHER ELECTRONIC COMPONENTS.

Plumbing

Condensate Monitoring

Make sure you locate the sensor where the pipe is **ALWAYS** full of water.

- The controller diverts contaminated condensate to waste and keeps it out of the boiler. Always install the sensor in the bottom of a "U" to make sure the pipe is full.
- If the condensate contaminants are oily or animal fats, use the Model 224S controller and the 543L-4-8 sensor for 4-electrode fouling compensation.
- The alarm timer may be used for a delayed remote alarm indicator.

WARNING: DO NOT USE PVC OR CPVC PLUMBING.

Wiring

See drawings for wiring instructions.

Setup and Calibration

Check the Operation

Programming and calibrating the Model 222S or Model 224S is easy. Just start at the beginning and work all the way through this section.

After installation is completed, follow these instructions:

- All the plumbing and wiring needs to be properly attached before turning the power on to your unit.
- Make sure you locate the sensor where the pipe is **ALWAYS** full of water.
- Check for loose wire connections.

Setup Procedure

The Model 222S reads condensate conductivity in the range of 0-100 μS at the factory.
The Model 224S reads condensate conductivity in the range of 0-500 μS at the factory.

Set the Alarm Timer

The alarm timer can be used as a delayed alarm to alert the operator if a poisoned condensate condition persists. While you have the front panel open, locate the **S2** switch to select the alarm time. The **TIMER** light on the front panel will come on after the time you select expires.

To select the alarm time, set the **S2** switch to the proper setting based on this chart:

SWITCH ON	TIME
1	15 sec.
2	15 min.
3	30 min.
4	60 min.
None	Timer

For example, if you want the alarm set for 30 minutes, then set switch **3** to **ON**. Switch **1** (15 sec.) is useful for testing purposes.

EXAMPLE: 30 min.	
	OFF/ON
1	■
2	■
3	■
4	■

Calibration

In order to calibrate your unit, you must first measure the sample water. You can use an Lakewood Instruments calibrated hand-held conductivity meter, a Myron L unit or other similar meters. A small, straight screwdriver may also be needed to adjust the **CALIBRATE** shaft.

Measure the Sample Water

- Measure the water conductivity level with a calibrated hand-held conductivity meter. If you do not have a meter, contact your water treatment engineer for instructions or a service call.
- Make careful note of the conductivity level since you will use it to calibrate your unit.

Now You Can Calibrate the Analyzer

- Make sure there is flow in the system and the system light is **ON**.
- You should adjust the **CALIBRATE** shaft until the LCD reads the same as the sample read on the hand-held meter. For example, if the meter read **35 μS** , then the LCD should read: **35.0**, assuming a multiplier of 1.

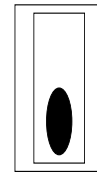
Establish the Conductivity Setpoint

- Now adjust the setpoint to the value your water treatment engineer recommends.

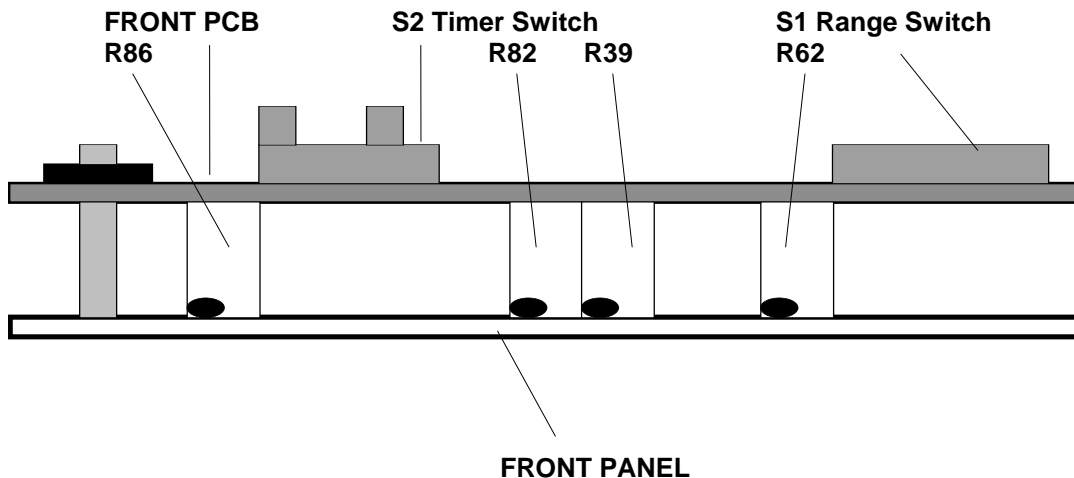
Simulator Switch

On the front circuit board (PCB), a simulator switch allows you to calibrate your outputs without tampering with the unit's calibration.

- Turn and pull on the front panel lock screw to access the front PCB.
- The switch is on the front PCB, numbered **S4**. Push the slide down for **SIMULATOR ON** mode. The LCD on the front panel should have an arrow pointing to **SIMULATOR ON**.



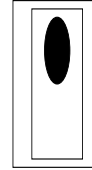
Simulator **ON** position.



- Push and hold the temperature compensator button (**S3**), located on the back of the front board, while you turn the sensor simulator pot (**R82**) to make the conductivity reading on the LCD read your personal number. Any number will do, but make it three (3) digits (i.e., 123).

NOTE: YOU MUST CALIBRATE YOUR MONITOR TO THE WATER BEFORE SETTING YOUR PERSONAL NUMBER.

- Return the simulator slide to the **OFF** position.
- Now any time the front panel calibration potentiometer is moved, your personal number will be changed, indicating someone has tampered with the calibration.
- To check for tampering, access the front PCB, push the simulator slide to the **ON** position and push in the temperature compensator button. The LCD should display your personal number.



Simulator **OFF** position.

Hidden LCD ON/OFF Switch

If you decide that you do not want the LCD to be readable, an easy-to-use ON/OFF push-button (**S5**) has been included for your convenience. Simply open the front panel and push the **S5** button once to turn the LCD **OFF**. Push it again to turn it back **ON**.

Temperature Compensation Simulator

You can use the temperature compensation simulator button (**S3**) to check your probe's temperature compensator. When you push and hold the button in, it simulates the temperature compensation you would get from water at 25° C. If you have an erratic reading, you can push the button in and it will bring the reading back to normal if the temperature compensator is bad in your probe.

Fouling Compensator — Model 224S Only

The Model 224S will compensate for fouling. When the **CHECK SENSOR** light is on, it means that fouling has exceeded the compensation capability and the sensor should be removed and cleaned (SEE: **Maintenance** for cleaning procedures).

NOTE: DON'T FORGET TO SET UP YOUR OPTIONS AS SHOWN BELOW.

Options Setup

-35 Isolated 4-20 mA Output Option

The Model 222S and Model 224S monitors can be equipped with isolated 4-20 mA outputs for a recorder or computer. This option allows you to monitor your system from a remote location. This interface card plugs into the back PCB. The output is factory-preset for 0 conductivity = 4 mA and the full scale = 20 mA. The **ZERO** and **SPAN** adjustments allow you to scale the output whenever you change the conductivity range. The charts below are examples of these calibrations. Before you calibrate, wire the recorder or computer to terminal block **TF**.

NOTE: IF YOU WANT BOTH THE-35 AND -42 OPTIONS, YOU NEED THE -44 OPTION.

- Unplug your inhibitor pump and blowdown valve.
- Connect a DC Voltmeter (DVM) to the **-35** card — [(+) to **TP-2** and (-) to **TP-1**]
- Disconnect the conductivity sensor and expose it to the air until the LCD on the front PCB reads **0** — the 4 mA value.
- Then turn the **R-14 (ZERO)** adjustment screw on the **-35** card until your DVM reads **0** Volts — the 4 mA value. Then replace and secure the sensor.
- On the back of the front PCB, push the simulation switch to **SIMULATOR ON**, then turn the simulator pot (**R82**) until the LCD on the front panel reads the full scale value you have established for your unit (i.e., **50**) — the 20 mA value.
- Finally, turn the R-17 (SPAN) adjustment screw on the **-35** card until your DVM reads 4 Volts — the 20 mA value.
- Because the extreme ranges have been set, the mid-ranges should be automatic. To check the proportional adjustments, turn the simulator pot (**R82**) until the LCD reads the half scale value (i.e., **25**). The DVM should read **2** Volts — the 12 mA value.
- On the front PCB, push the simulation switch to the **OFF** position.
- Reconnect your inhibitor pump and blowdown valve.

Range: 0-100 μ S

Conductivity	mA	TP _{1 and 2} Volts
0	4	0
50	12	2
100	20	4

Range: 0-500 μ S

Conductivity	mA	TP _{1 and 2} Volts
0	4	0
250	12	2
500	20	4

Please refer to the Lakewood **-35, -42, -44 Option Card Instruction Manual** for more information.

-42 High/Low Alarms Option

Extra High and Low Alarms for remote alarm status or computer alarm log are available with this option. The **-42** card plugs into the back PCB.

NOTE: IF YOU WANT BOTH THE-35 AND -42 OPTIONS, YOU NEED THE -44 OPTION.

- Unplug your inhibitor pump and blowdown valve.
- On the front PCB, push the simulator switch to **SIMULATOR ON**. Then turn the simulator pot (**R82**) until the LCD on the faceplate reads the value you desire for your Low Alarm trip point.
- Then open the front panel again. On the **-42** card, turn the Low Alarm screw (**R-1T**) counterclockwise until the alarm is activated. Your Low Conductivity Alarm is now set.
- Now turn the simulator pot (**R82**) until the LCD reads the value you desire for your High Alarm trip point.
- On the **-42** card, turn the High Alarm screw (**R-2T**) clockwise until the alarm is activated. Your High Conductivity Alarm is now set.
- On the front PCB, push the simulation switch to the **OFF** position.

Please refer to the Lakewood *-35, -42, -44 Option Card Instruction Manual* for more information.

-44 Isolated 4-20 mA Output & High/Low Alarms Option

The -35 and -42 options are combined on one card so you can operate a 4-20 mA output and the High/Low Alarms at the same time. Refer to the setup procedures for both cards described above.

Please refer to the Lakewood *-35, -42, -44 Option Card Instruction Manual* for more information.

-RP Option

For remote preamp switch settings and wiring information, see attached prints.

The simulator switches for conductivity, temperature and the fouled sensor LED are not used with the -RP option.

Jumper Settings


The jumper settings are factory-preset.

RECOMMENDATION:  **CONTACT THE LAKEWOOD INSTRUMENTS SERVICE DEPARTMENT FOR ADDITIONAL INSTRUCTIONS FOR SPECIFIC CHANGES.**

YOUR MONITOR IS NOW READY FOR USE.

Maintenance and Technical Service

Technical Service

 **Technical Support for Lakewood Instruments can be reached by calling (800) 228-0839 or faxing (414) 355-3508, Monday through Friday, 7:30 a.m. - 5:00 p.m. CST.**

 **Mail and returns should be sent to:**

**Lakewood Instruments
7838 North Faulkner Road
Milwaukee, WI 53224 USA**

When any merchandise is returned to the factory, please call and obtain a return material order (RMO) number and have the following information available:

- Customer's name, address, phone and fax numbers.
- A purchase order number (no exceptions) for cases where parts are required that are not under warranty.
- A contact person's name and phone number to call if the equipment is beyond repair or to discuss any other warranty matter.
- Equipment model and serial numbers.
- Reason for return (i.e., repair, warranty, incorrect part, etc.).

We will then fax to your attention an RMO form that must accompany the returned item.

NOTE: THE RMO NUMBER MUST BE CLEARLY WRITTEN ON THE OUTSIDE OF THE PACKAGE(S) BEING RETURNED.

Parts List and Service Guide

When calling Lakewood Instruments, please have the controller's complete model number and serial number available, so that the technician can better assist you.

When any parts are returned to the factory, please indicate:

- Customer's name and address
- Individual at customer location to send the repaired controller or new part to
- The person (and phone number) to call if the equipment is beyond repair or for any warranty matter

PART NUMBER	DESCRIPTION
700277 K=.1-4	2-electrode conductivity sensor
700543-L-4	4-electrode conductivity sensor

Write your controller's complete model number, serial number, software version and software revision here so that you will have them available if you wish to contact an Lakewood Instruments technician.

Model Number:

Serial Number:

Maintenance

Conductivity Sensor

Clean the electrode end of the conductivity sensor once a month if you have the Model 222S. The Model 224S has a fouling compensator which reduces the need for sensor cleaning. The fouling alarm will tell you when the sensor is too fouled to provide accurate readings. You must clean the sensor at that time. Follow the instructions listed below:

- Turn sample flow off.
- Remove the sensor.
- Use a soft brass brush to gently clean the sensor tips.
- Replace the sensor.
- Turn sample flow back on.
- Calibrate the controller, then allow the controller to operate for several minutes in order to stabilize the electrodes. Then you can recalibrate the controller for best accuracy.

Troubleshooting

PROBLEM	CHECK	CORRECTIVE ACTION
Conductivity not working or reading too low.	<ol style="list-style-type: none">1. Clean the sensor.2. Turn ON the CONDUCTIVITY SIMULATOR switch (S4). The LCD should be above 000.3. Check the TEMP. COMP. Push and hold in the SIMULATOR button (S3). The LCD reading should not change by more than 20%.	<ol style="list-style-type: none">1. SEE: Maintenance section in this manual.2. If it is not, replace the front PCB.3. If it does, replace the sensor.

For more information call toll free in the USA (800) 228-0839

Manufactured in the USA

Lakewood Instruments

7838 North Faulkner Road, Milwaukee, WI 53224 USA

Phone (800) 228-0839 • Fax (414) 355-3508

<http://www.lakewoodinstruments.com>