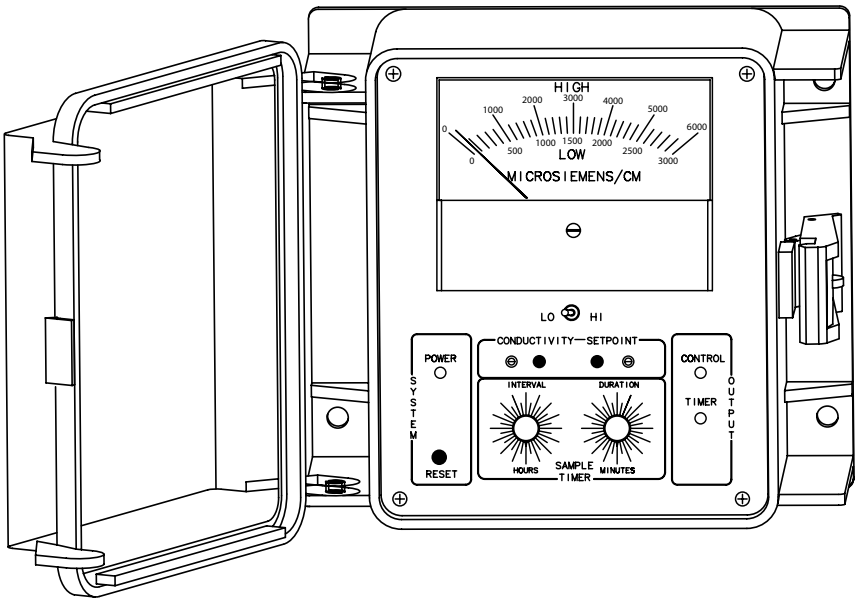
Advantage Controls — Manual

Analog

Boiler Controller

Installation
Maintenance
Repair
Manual



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Warranty

Advantage Controls warrants control systems of its manufacture to be free of defects in material or workmanship. Liability under this policy extends for 24 months from date of installation. Liability is limited to repair or replacement of any failed equipment or part proven defective in material or workmanship upon manufacturer's examination. Removal and installation costs are not included under this warranty. Manufacturer's liability shall never exceed the selling price of equipment or part in question.

Advantage disclaims all liability for damage its products caused by improper installation, maintenance, use or attempts to operate products beyond their intended functionality, intentionally or otherwise, or any unauthorized repair. Advantage is not responsible for damages, injuries or expense incurred through the use of its products. The above warranty is in lieu of other warranties, either expressed or implied. No agent of ours is authorized to provide any warranty other than the above.

30 Day Billing Memo Policy

Advantage Controls maintains a unique factory exchange program to ensure uninterrupted service with minimum downtime. If your controller malfunctions, call 1-800-743-7431, and provide our technician with Model and Serial Number information. If he is unable to diagnose and solve your problem over the phone, a fully warranted replacement unit will be shipped, usually within 48 hours, on a 30 Day Billing Memo. This service requires a purchase order and the replacement unit will be billed at current list price for that model less any applicable resale discount. Upon return of your old unit, credit will be issued to your account if the unit is in warranty. If the unit is out of warranty or the damage not covered, a partial credit will be applied based upon a prorated replacement price schedule dependent on the age of the unit. Any exchange covers only the controller or pump. Electrodes, liquid ends and other external accessories are not included.

I. Introduction

Analog boiler controllers control boiler water based on the conductivity or total dissolved solids. "Timed sampling" method controllers periodically sample the water in the skimmer blowdown line based on an integral timer with a user set sample interval. "Continuous sampling" type controllers, designed for use in boilers with a blowdown requirement that exceeds 5000 lbs/hr, allow a sample of boiler water past the probe continuously.

There are two basic styles of analog boiler conductivity controllers differentiated by the style of display used.

1. **Analog Dial Display -** Analog dial display units have a dial display for setting and control of the conductivity. Dial models covered in this manual include: **Timed Sampling B-7** and **2-B-7** and **Continuous Sampling B-8** and **2-B-8**.

2. **Analog Needle Meter Display** - Analog needle meter display units provide continuous needle meter for setting and displaying the conductivity. Needle meter models covered in this manual include: **Timed Sampling B-7M** and **2-B-7M** and **Continuous Sampling B-8M** and **2-B-8M.**

Model Numbering

Standard analog controllers have several optional features available. Your unit may be supplied with one or more of the options that are described in this manual. To determine what features apply to your unit, check the model number label located on the controller enclosure.

1	230 Volt 50/60 Hz
2	Recorder Output (0-1 mA)
3	High / Low Alarm relay
4	4-20 mA non-isolated output
5	Dry contact for alarm output
8	Unit Prewired- 8" Power Cord with Male plug, 11" output cord
8A	Prewired with 2 - 11" output cords for motorized ball valve
8B	Same as 8A with additional output cord for pump
8C	Power cord
8D	Same as 8A with both cords for N.O. Operation
9	0-24 hour sample time interval
A	High Temperature Scaling
A-1	Timed Sample Control Option
E	Time Delay Relay
K	Dry contact (N.O. and N.C. outputs)
Q	Additional Scales
R	Molex connector on electrode
S	NEMA 1 Heavy Duty Steel Enclosure
W-1	25 Amp power relay on main control output

II. Unit Description

Timed Sampling

Analog "timed sampling" units are dual range conductivity controllers for automatic skimmer boiler blowdown control. The timed sampling method of control is recommended for boilers with a blowdown rate that does not exceed 5000 lbs/hr. The standardly supplied conductivity probe is plumbed into the skimmer line. The controller's sample timer allows the control relay to activate a blowdown valve (supplied separately) in the same line at user defined intervals.

A sample of the boiler water is allowed past the probe at these intervals for a user defined duration. If the reading achieved during the sample periods is above the user defined set point, blowdown will continue until the set point has been satisfied. If the reading is below the set point at the end of the sample duration the control relay turns off. Once a sampling or blowdown period is completed, the unit will return to the set sampling interval.

Continuous Sampling

The continuous sample type unit is designed for use in boilers with a blowdown requirement which exceeds 5000 lbs/hr. A sample of boiler water is allowed past the probe continuously. If the reading is above the set point, blowdown will continue until the set point has been satisfied.

III. Installation

Electrical Wiring

Standard analog controllers have an internal regulated power supply that will operate in the range of approximately 105 to 135 VAC on the incoming wiring. Units and relays are protected with a replaceable fuse. Relay output's voltage will equal incoming line voltage.

Standard conduit units are predrilled at the factory and supplied with conduit knockouts for easy wiring to supplied connectors located in the back section of the controller. Optional prewired units are supplied with a 16 AWG cable with 3-wire grounded USA 115 volt plug for incoming power and 18 AWG 3-wire grounded receptacle cords for all control relay outputs.

NOTES:

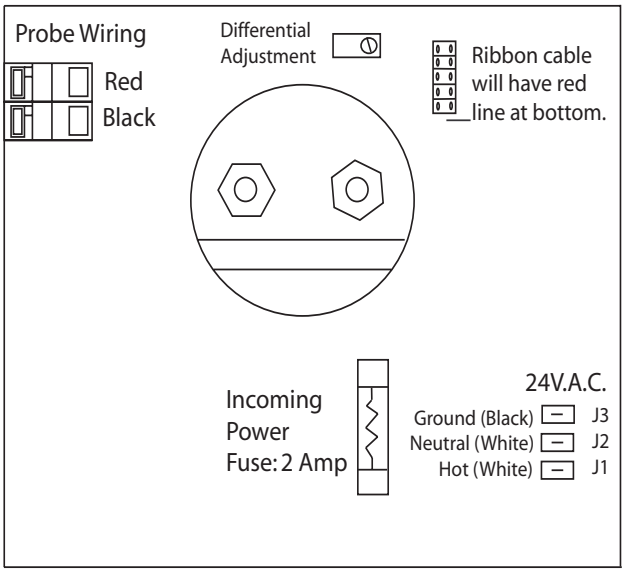
1. The conductivity probe two wire lead that runs between the controller and the probe should be approximately 22 gauge wire twisted pair.
2. Incoming line voltage and relay output wire should be approximately 16 gauge.

WARNINGS:

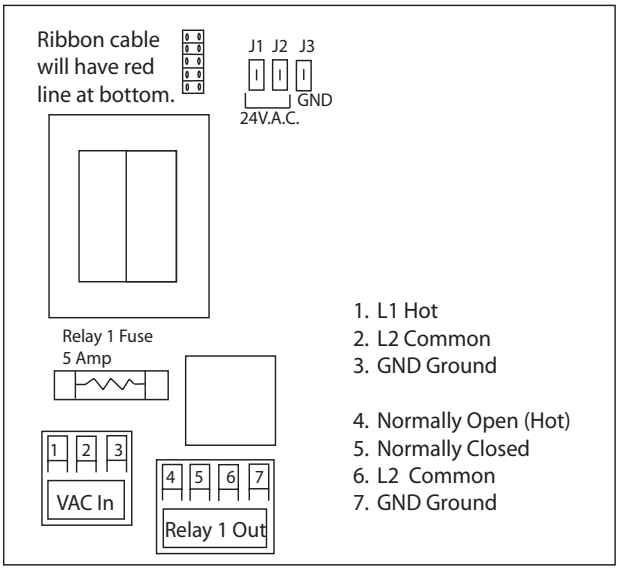
1. The controller should be connected to its own isolated circuit breaker and for best results the ground should be a true earth ground, not shared. Wiring must be done according to all applicable local codes.
2. Power (line voltage) must be disconnected while making any connections. If power is supplied to the unit, line voltage will be present on the relay card.
3. Low voltage signal wires (probes, flow switch, water meter, etc.) should never be run in conduit with high voltage wires.

Connections for New Style (Series 2)

Logic Board

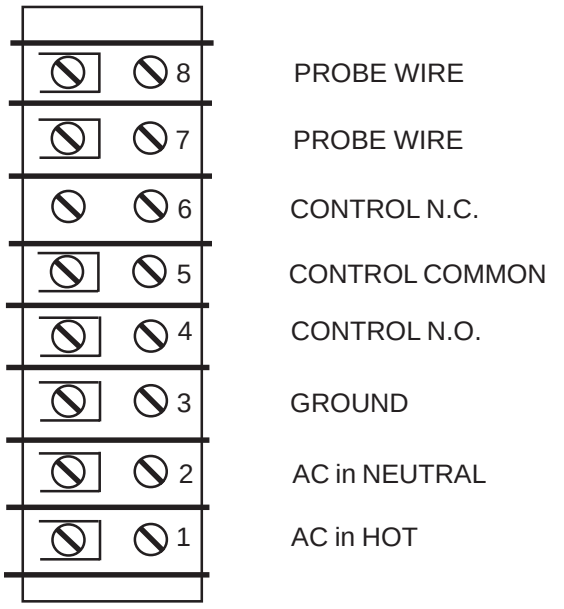


Relay Board

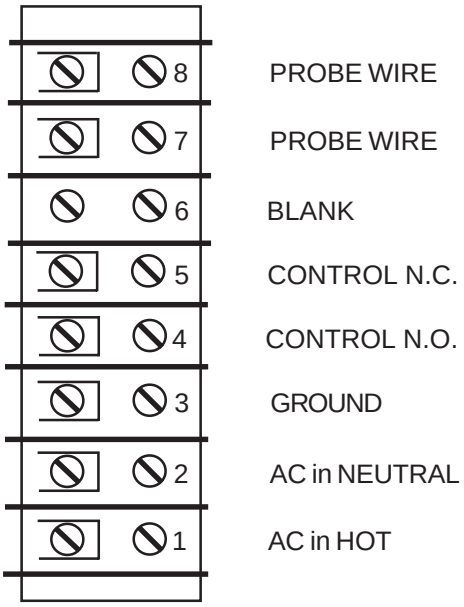


Connections for Older Style

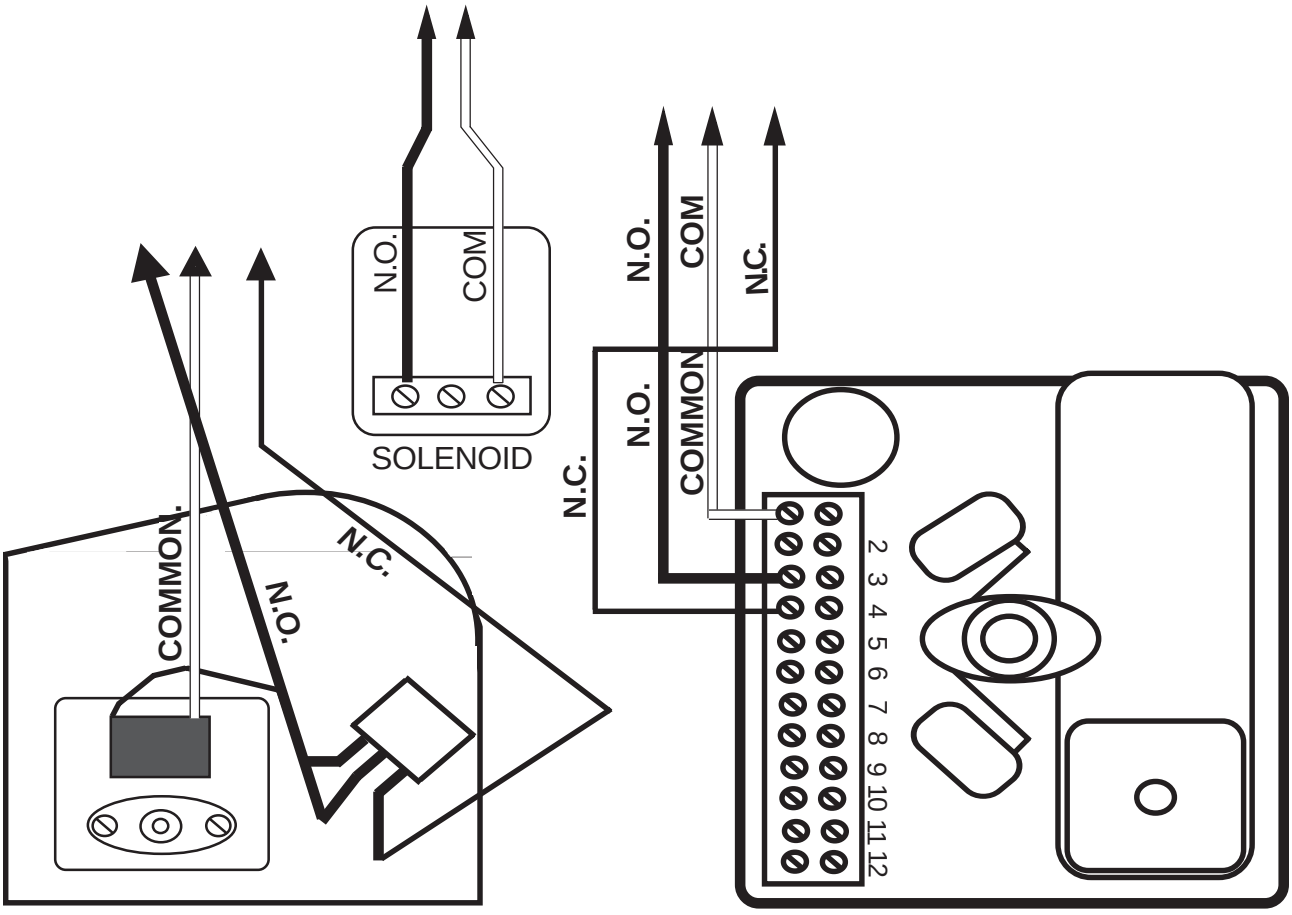
Terminal Legend for old
2-B7, 2-B8, 2-B7M and **2-B8M**



Terminal Legend for Models
B-7, B-8, B-7M and **B-8M**



Typical Blowdown Valve Connections



Mounting Instructions

Select a mounting location that provides the operator easy access to the unit and a clear view of the controls through the cover of the controller. The location should be convenient to grounded electrical connections, the required sample line plumbing, and installed on a stable vertical surface.

The electrode is designed for mounting in the skimmer(surface) blowdown line. For a successful installation, it is critical to observe the recommended distances and pipe sizes provided in the installation drawing.

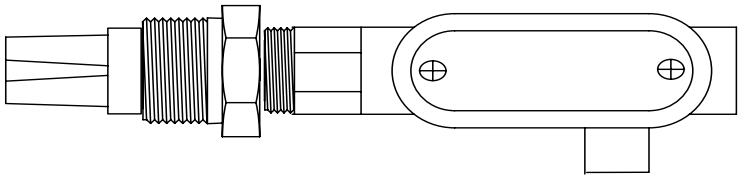
⚠ **WARNING:**

Avoid locations that expose the controller to direct sunlight, vapors, vibration, liquid spills or extreme temperatures; less than 0°F (-17.8°C) or greater than 120°F (50°C). EMI (electromagnetic interference) from radio transmissions and electric motors can also cause damage or interference and should be avoided.

Electrode Installation

For best results, the electrode cross should be mounted in a horizontal run of the 1"skimmer blowdown line within 4 feet of the boiler. The probe should be mounted perpendicular to the horizontal line pointing down into the water. Smaller line sizes and greater distances may affect the response time and accuracy of the electrode. Install a fully ported type valve between the electrode and the boiler. This allows the electrode to be isolated for removal and cleaning. It is recommended that a flushing line and 1/4 turn type ball valve be installed in the bottom of the cross (see installation drawing). This line is used to periodically “flush” sediment from the electrode chamber.

Threads of the BE-1C electrode are tapered. Before installing, Teflon tape should be appplied to probe threads. Insure proper threading in the cross. Once the probe is tight be sure the alignment arrows on the probe end up parallel to the flow.

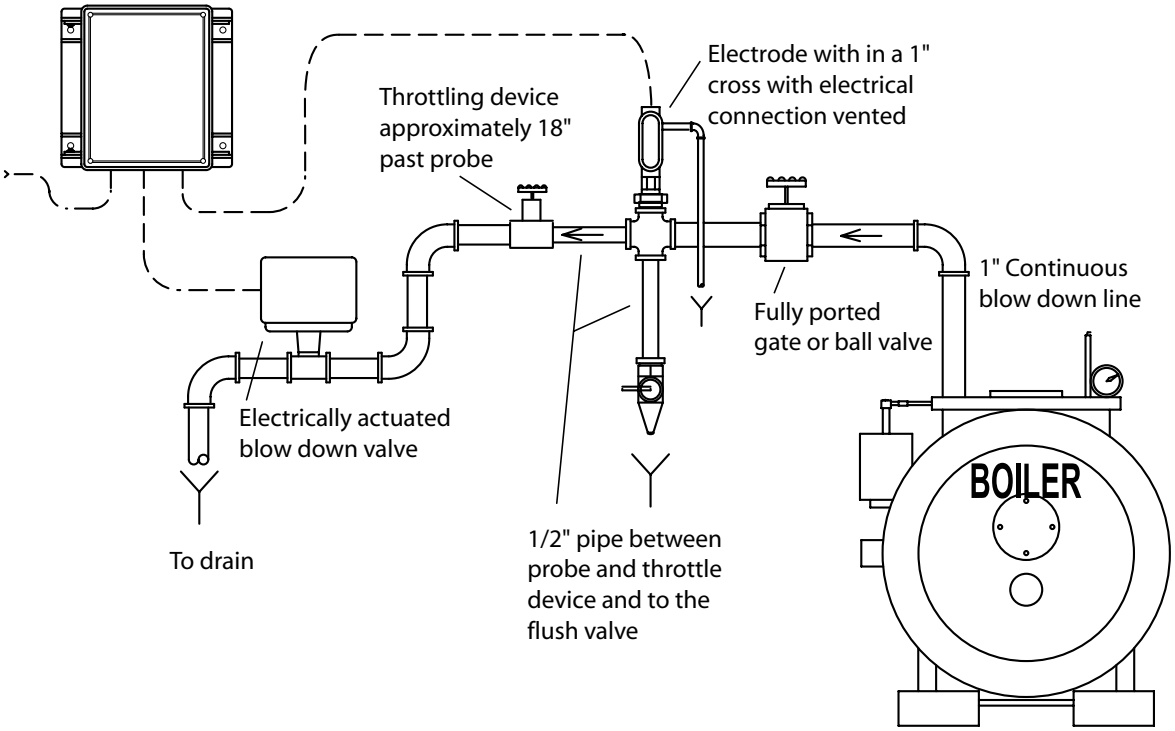


Throttling Device Installation

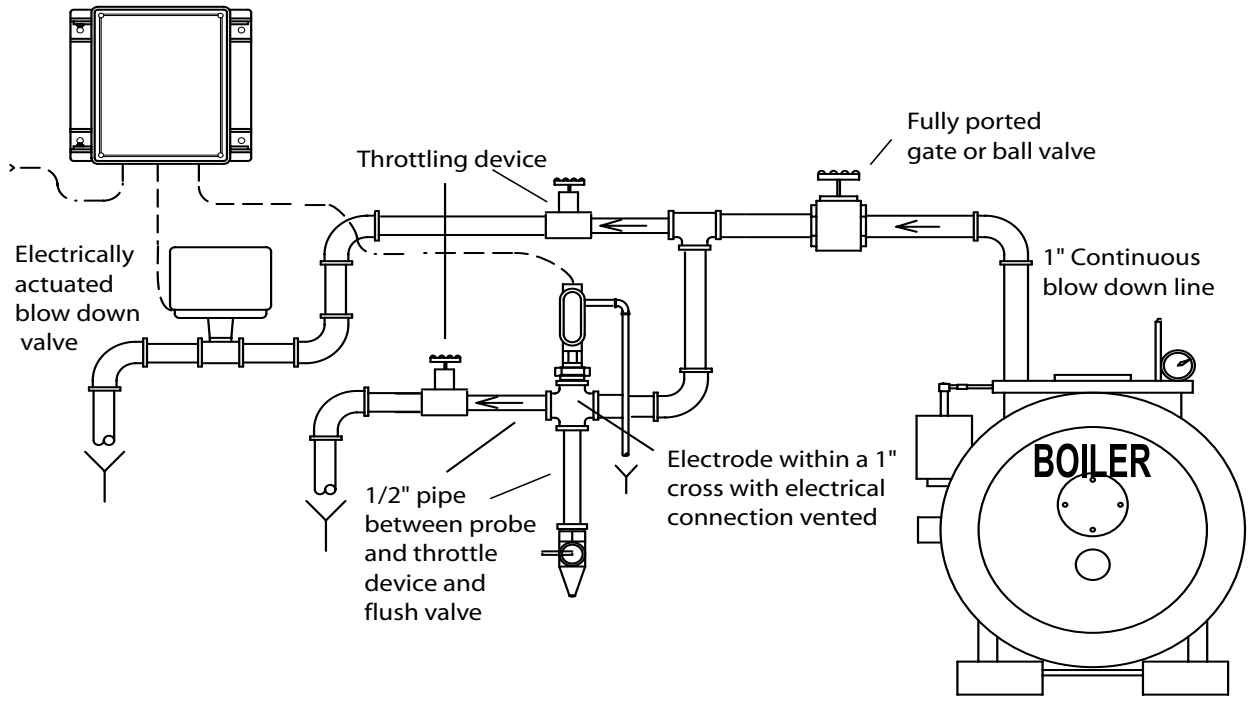
A flow throttling device (supplied separately) is required to ensure that the electrode is exposed to water and not steam. Properly installed and adjusted, this device will prevent flashing in the electrode chamber. The throttling device should be installed 1 to 3 feet after the electrode cross.

Note: Flashing occurs due to insufficient back pressure at the electrode. It occurs because the orifice size is too large, or the valve open setting is too great. Flashing is indicated by an unstable conductivity reading. If flashing occurs, reduce the size of the orifice at the flow control opening.

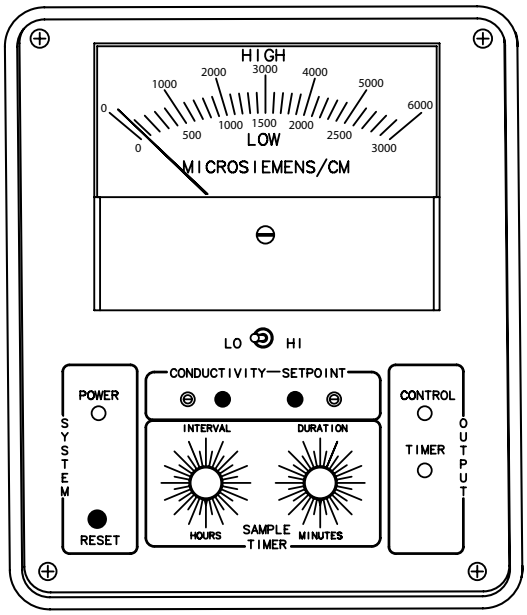
Typical Installation Drawings



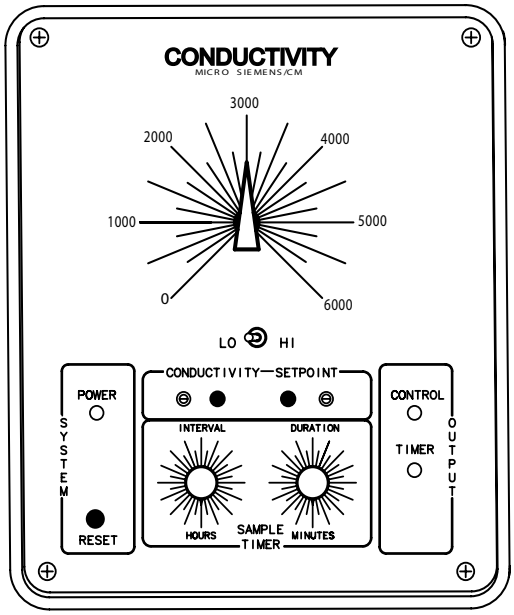
Timed Sample Method Recommended Installation



Continuous Sample Method Recommended Installation



2-B-7M



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IV. Front Panel Description

The front panel of the analog "timed sampling" boiler conductivity unit provides an easy to understand operator interface with clearly marked LED's, test switches and adjustment potentiometers and timer knobs on "timed sampling" unis. The functionality of each feature is described below based on the display type (dial or needle meter) with all common features listed together.

Needle Meter Display **Models B-7M, 2-B-7M, B-8M and 2-B-8M**

Conductivity Meter..... Used to read and set the conductivity value and set point.
Set Point Read Switch ..... When pressed, displays the current set point value on the meter.
Set Point Adjust Screw ..... Will change the set point value when turned.

Dial Display **Models B-7, 2-B-7, B-8 and 2-B-8**

Conductivity Dial ..... Points at current Set Point value and used to adjust and read the actual conductivity value. To determine the current reading, rotate the dial until the control LED just turns on or off.

Timed Sampling Units **Models B-7, B-7M, 2-B-7 and 2-B-7M**

Sample Interval Knob ..... Used to set the desired interval between samples.
Sample Duration Knob..... Used to set desired sample duration period.
Timer Reset Switch ..... When pressed resets timer and starts the sample duration timer.

Common Features

Power LED ..... Lights up whenever power is supplied to the controller.
Control LED ..... Lights up whenever the control relay output is activated.
Test ..... Only on 2-B7, 2-B8, 2-B-8M and 2-B-7M for forcing on the control relay.
Calibration Screw..... Used to change the current conductivity reading.
HI / LO Switch ..... For selecting between the HI and LO conductivity scale ranges.

V. Operations

System Start-Up

After the necessary mechanical and electrical installations have been completed follow the following steps.

1 Pick a scale that will position the set point as close as possible to the middle of the scale.
2. Check the unit's calibration against a reliable tester. Adjust the calibration as needed by following the calibration instructions on page 10.
3. Set the desired Set Point at which you want to keep the conductivity in the boiler.
4. On time sampling units set the timer's interval timer and duration timer to the desired values.

Setting the Sample Timers

Each application is different and will require some fine tuning of timer settings. However, some generalizations can be made:

1. The higher the blowdown requirement, the more frequent the sample intervals should be.

2. The farther the probe is located away from the boiler the longer the sample duration must be. This is because the electrode must be at the same temperatures as the boiler water to provide an accurate reading. The further the probe from the boiler, the longer it takes to heat up.

3. A good starting place is to set the sample interval at 1.5 hours and the duration at 2 minutes.

Fine tuning the sample timer

Interval setting - If the boiler only blows down during sampling intervals (never exceeds the set point) the interval is too frequent. If the blowdown continues for long periods following programmed sample periods the interval is too short.

Duration setting - The ideal duration setting is the amount of time required for the conductivity reading to stabilize. This stabilization occurs when the temperature of the electrode equals the temperature of the boiler water.

To determine the ideal setting, turn the DURATION dial to maximum. Press and release the RESET switch to open the blowdown valve. Observe the action of the meter or digital display. When the reading stops increasing, the temperature is stabilized. When the reading achieved becomes stable record the elapsed time. This will become the DURATION SETTING.

Notes:

1. Flashing occurs due to insufficient back pressure at the electrode. It occurs because the orifice size is too large, or the valve open setting is too great. Flashing is indicated by an unstable conductivity reading. If flashing occurs, reduce the size of the flow control opening.

2. Blowdown rate should be high enough to allow sufficient blowdown, but not too high as to allow the conductivity setting to change too rapidly. Several adjustments to the blowdown rate may be required before the ideal setting is achieved.

Calibration Instructions

Be sure the electrode is clean before calibration.

1. Use a reliable test method to determine the conductivity of the boiler water.
2. Open the blowdown valve by forcing the sample duration timer on or pressing the TEST switch. This will start a flow of water past the electrode. If the sample probe reading is higher than the set point, the valve will stay open after the button is released. If reading is below set point, the button must remain pressed to keep the valve open.
3. After blowing down for 1 to 2 minutes, adjust the CALIBRATE screw to make meter readings the same as your test sample reading.

   Example: You test boiler water and the reading is 3500 microSiemens, put the HI LO scale switch to HI scale and adjust CALIBRATE screw until meter reads 3500 microSiemens.

   Notes:
   1. Always calibrate to the same temperature type of tested sample. If a hot sample is used, always use a hot sample.
   2. If the analog needle is jumping dramatically, calibration will not be stable.
   3. If you change scales you will need to calibrate again.

Reset Switch (Timed Sampling Units Only)

This switch is used to test the operation of the unit and controlled devices. Pressing and releasing this switch initiates the programmed sample cycle on timed sampling units. The blowdown valve will open for the amount of time set on the SAMPLE DURATION dial. Once this sample cycle (and subsequent blowdown period if required) is completed, the unit will not sample again until the amount of time set on the SAMPLE INTERVAL dial has elapsed.

When this switch is depressed:
1. The blowdown valve should open.
2. The electrode will read the conductivity of the boiler water, and the unit may be calibrated.

VI. Maintenance

The only required maintenance for normal uninterrupted operation of your analog boiler controller is cleaning of the electrode.

Electrode cleaning is required only when the controller can no longer be calibrated. This means it should not be necessary to remove the probe very often. Ideally, it need only be removed when the boiler is shut down and cool.

Installation and regular use of a flush valve (see installation drawing) helps insure that the probe stays clean without removal.

Electrode Cleaning Procedure

1. Record the current conductivity reading.
2. Turn off water flow from boiler to the electrode, bleed pressure from the line and remove electrode.
3. Use a clean cloth and a mild cleaning solution to remove loose dirt etc., from the flat surface of the electrode.
4. If deposits such as scale are attached to the electrode surface, lay a piece of sandpaper (200 grit or finer) on a flat surface such as a bench top. Sand the electrode to remove stubborn deposits.
5. Reinstall the electrode in the system. After the reading stabilizes, calibrate the unit to a reliable test reading.

Many times an electrode can appear to be clean, but the unit still cannot be calibrated. Use the more aggressive electrode cleaning procedure listed in step 4 above. Recheck the calibration after completion of this procedure.

VII. Troubleshooting

The analog boiler controller is designed for many years of trouble free operation. Should a problem occur, refer to the following chart to help identify the problem.

SYMPTOM	POSSIBLE CAUSE	SOLUTION
False reading	Bad or dirty electrode Out of calibration	Clean, as needed Calibrate unit
Will not calibrate	Dirty electrode Faulty electrode Faulty wiring to electrode Defective unit	Clean electrode Replace controller or electrode as needed
No system power	Check power source Check fuse	 Replace as needed

If a problem persists, contact our customer service department with the model number and serial number of the unit for free factory technical assistance at 800-743-7431.

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- Feed Timers
- Filter Equipment
- Glycol Feed Systems
- Pre Fabricated Systems