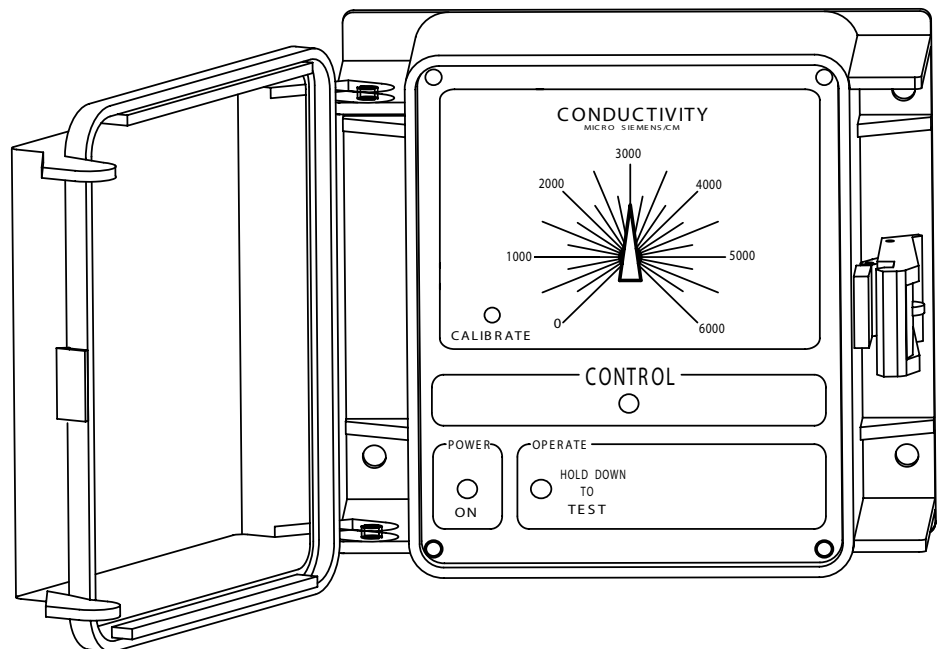


A Minus Tower Controller

***Installation
Maintenance
Repair
Manual***



Advantage Controls
P.O.Box 1472
Muskogee, OK 74402
Phone: 800-743-7431
Fax: 888-686-6212
www.advantagecontrols.com

Model A MINUS Instruction & Maintenance Manual Table of Contents

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Manufacturer's Product 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 caused by its products 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

Model A Minus controllers are single scale analog style controllers for the control of conductivity in recirculating water applications, such as cooling towers. Conductivity is set and read on an analog dial display.

Model Numbering

Model A Minus 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 which features apply to your unit, check the model number label located on the controller enclosure. This list represents our most popular options.

Optional Features

3	Conduit connections	J	PVC flow switch
5	Mounted flow switch	L-1	0-1000 mS/cm scale
7	Additional electrode wire length	L-2	0-3000 mS/cm scale
D	Reverse Set Point	L-3	User specified scale

Description of Unit

The Advantage Controls Model A Minus is a single range conductivity controller for cooling towers. The conductivity set point is adjusted using the large linear dial on the face of the controller. A TE-2 non-temperature electrode is included with the Model A Minus.

Each time the conductivity of the system water exceeds the operator selected set point the unit will energize the control relay. Once the conductivity falls below the set point (plus the differential), the relay will be turned off.

An LED indicator is supplied for system POWER as well as an LED marked CONTROL which indicates when the control relay is energized.

A front panel spring loaded toggle switch marked TEST is provided. This allows the user to determine (1) if the unit is working properly, and (2) if the controlled devices are functioning properly.

II. Installation

Electrical Installation

The standard A Minus has a voltage regulated internal power supply capable of operating in the range of approximately 105 to 135 VAC. Use a supply voltage of 110 to 120 VAC for best results. Relay outputs are protected by a replaceable 12 amp fuse.

Prewired units are supplied with a 16 AWG cable with 3-wire grounded USA 115 volt plug for incoming power and 16 AWG 3-wire grounded receptacle cords for all control relay outputs.

Conduits are predrilled at the factory and supplied with conduit knockouts for easy hard wiring to supplied connectors located in the lower section of the controller. Remove the panel screws to access.



Warnings:

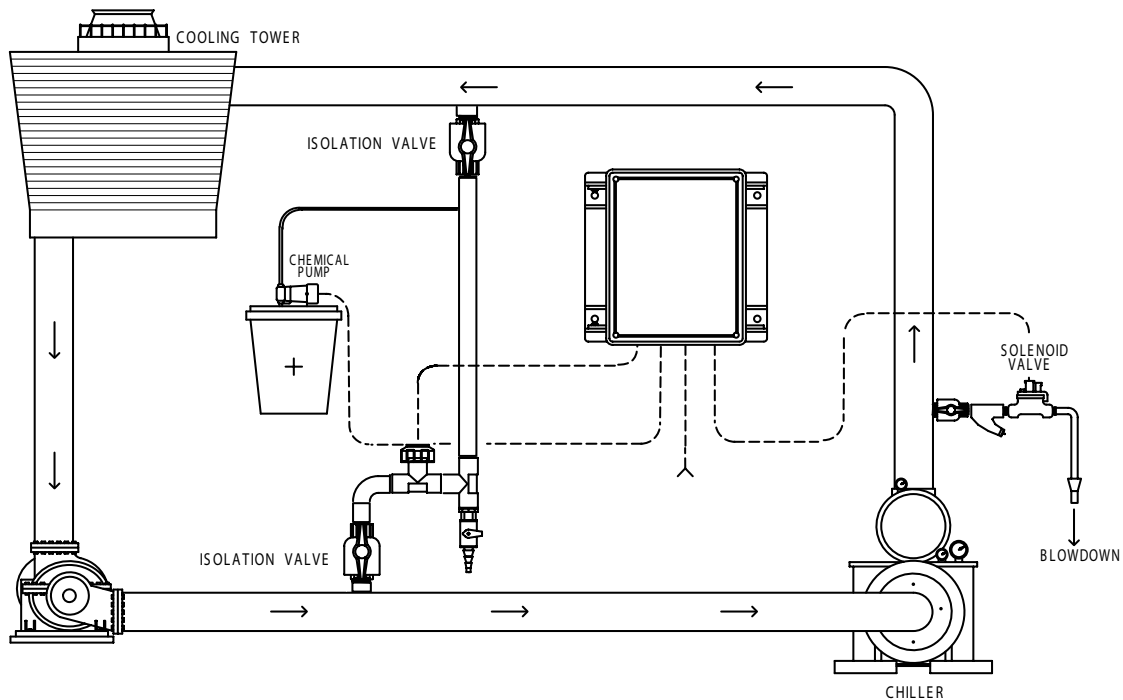
- 1. The controller should be connected to its own isolated circuit breaker and for best results the ground should be a true earth ground, not shared. Wiring must be done according to all local codes.**
- 2. Power (line voltage) must be disconnected while making any connections. If power is supplied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

Mounting

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 needed sample line plumbing and on a stable vertical surface.

! 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.

Typical Installation



Electrode Installation

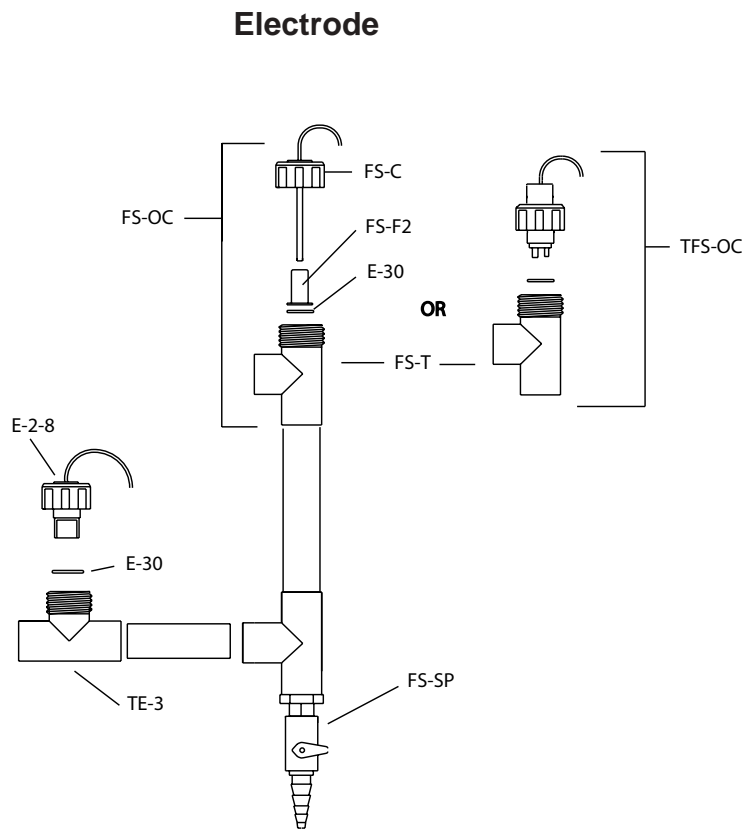
The standard probe and optional flow assembly for cooling tower installations is constructed of schedule 80 PVC and supplied with 3/4" slip fittings for installing into a sample line. To insure proper operation the sample line must have a flow rate of 3-10 gpm. Inlet pressure must be higher than outlet pressure in order for water to flow past the electrode(s) to achieve the required rate. The probes are temperature compensated for increased accuracy.

- NOTES:**
1. Install an isolation valve on either side of the flow assembly so electrodes can be easily isolated for removal and cleaning.
 2. A line strainer is recommended upstream from the probes to protect against fouling and damage.
 3. Units with a flow switch require the needed flow rate to operate the relay outputs.

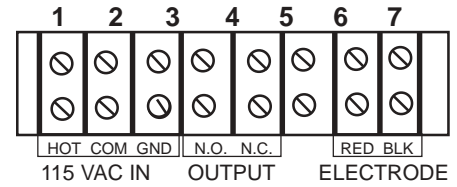
! WARNINGS:

1. Electrodes are O-ring sealed, which if damaged will cause a leak.
2. Do not exceed a water temperature range of 32°F to 140°F.
3. Do not exceed a maximum pressure of 150 psi.

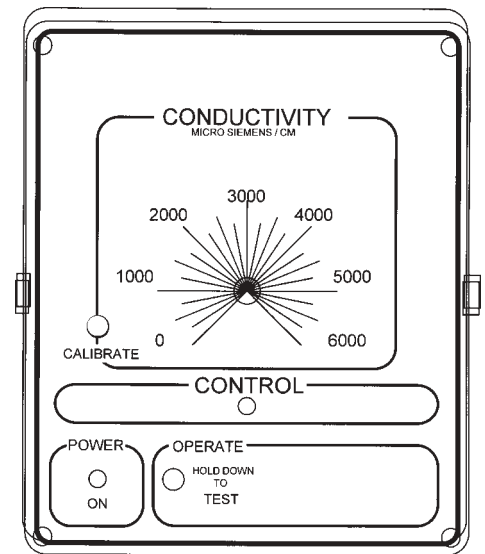
Electrode Diagram



Optional Conduit Connections



Front Panel



III. Front Panel Description

- CONDUCTIVITY DIAL:** Used to adjust the set point and to determine the current conductivity level. To determine the current conductivity, rotate the dial until the CONTROL LED just lights or turns off. The dial reading at this point equals the current conductivity reading. (Scale may vary with option L.)
- CALIBRATE:** Used to change the current conductivity reading. To use, set the dial at the conductivity reading to which you want to calibrate. If the CONTROL LED is on, turn the calibration adjustment until the LED just goes out. If CONTROL LED is off, adjust the calibration potentiometer until the CONTROL LED just lights. Readjust the dial to the desired set point.
- POWER ON LED:** Lights whenever power is supplied to the controller.
- CONTROL LED:** Lights whenever the conductivity exceeds the set point.
- OPERATE/TEST SWITCH:** Used to test the conductivity circuit. When the switch is pushed and held in the down position, it simulates a full scale conductivity reading. This switch also activates the control relay. If the unit has a flow switch, the test switch will not activate the control relay if the unit does not have flow.

IV. Start Up

1. Install the unit per the installation drawing on Page 3.
2. Connect all externally controlled devices and supply power to the unit.
3. Calibrate the unit per the instructions below.
4. Set the large dial to the set point desired to activate control relay.
5. Place the OPERATE/TEST switch in the TEST position. This should activate the solenoid valve. Release switch.

Calibration Instructions

Before attempting to calibrate the unit, ensure that electrode is properly cleaned. (See Page 6)

1. Use a reliable test method to determine the conductivity of the system water. Insure that the sample used is the same as that is going through the probe tee. If an alternate conductivity tester is not available us a solution of known conductivity. Do not allow the electrode to touch the bottom of the sample container.
2. Set the large dial on the front of the Model A Minus controller to the reading achieved in step 1 above.
3. If the CONTROL LED is on, rotate the CALIBRATION screw counter clockwise until the light just goes out. (With Option D rotate screw clockwise until light goes off.
4. If the CONTROL LED is off, rotate the CALIBRATION screw clockwise until the control light just lights. (With Option D rotate screw counterclockwise until the control light lights.)

V. Maintenance

The only required maintenance for normal operation of your Model A Minus controller is cleaning the electrode.

After initial start up, it is a good idea to clean the electrode weekly until a schedule based on need has been developed. Since each application is unique, it is difficult to estimate the required frequency of cleaning. The first cleaning should take place after one week of the system being on line.

To determine the required cleaning frequency, record the reading on the controller before the electrode is removed for cleaning. After cleaning, record the new reading. If a change is observed in the two readings, the electrode was dirty. The more significant the change, the dirtier the electrode. If no change occurs, cleaning needs to be done less often.

Electrode Cleaning Procedure

1. Record the current conductivity reading.
2. Turn off water flow through the electrode loop, bleed pressure from the line and re move 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 the electrode has deposits such as scale attached to the electrode surface a more aggressive cleaning approach will be needed. There are several ways to do this. Use the method that is easiest for you.
 - a. Use a mild acid solution to dissolve deposits.
 - b. Use a pocket knife to scrape across the probe surface *perpendicular* to the carbons.
 - c. 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. Turn the water flow back on. 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. If this is the case use the TEST switch to determine that the unit itself is working properly. (See page 9 of this manual.)

If the controller checks out, but still cannot be calibrated, use one of the more aggressive electrode cleaning procedures listed in step 4 above. Recheck the calibration after completion of this procedure. If no change was observed in the reading, replace the electrode. If a change occurred but the unit still will not calibrate, repeat procedure as many times as necessary.

Using TEST Button to Troubleshoot

If a unit cannot be calibrated to a known solution, this switch can be used to determine if the problem lies with the unit or with the electrode. When the switch is depressed the probe is disconnected by an internal calibration resistor and the control simulates a full scale reading.

1. Turn the set point dial all the way to the right (full scale).
2. Press and hold the TEST button down.
3. Turn the CALIBRATION screw until the CONTROL LED just goes out (if it was on) or just comes on (if it was off).
4. If step 3 can be accomplished, the problem is the electrode or electrode wiring.
5. If step 3 above cannot be completed, the problem lies within the unit itself. Unit will require replacement.

VI. Troubleshooting

The Advantage Model A Minus 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. See Page 6.
Will not calibrate	Dirty electrode Faulty electrode Faulty wiring to electrode Out of Calibration	Clean electrode. P.8) Replace controller or electrode as needed. Calibrate unit, See Page 6
No system power	Power source	Check power source
Blown fuse	Check fuse	Replace as needed.
No output	Check flow switch	Clean or replace as needed

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

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