

LIMITED WARRANTY

The DS-4 is warranted against defects in workmanship and materials for two years from date of sale. This warranty does not apply to damage resulting from accident, misuse, or alteration nor where connected voltage is more than 5% above the configured operating voltage, nor to equipment improperly installed or wired or maintained in violation of this Owner's Manual. No other written or oral warranty applies. No employee, agent, dealer or other person is authorized to give any warranties on behalf of ASE.

The customer shall be responsible for all costs incurred in the removal or reinstallation and shipping of the product for repairs. Within the limitations of this warranty, inoperative units should be returned, freight prepaid, to ASE, and we will repair or replace, at our option, at no charge to you with return freight paid by ASE. It is agreed that such repair or replacement is the exclusive remedy available from ASE and that ASE IS NOT RESPONSIBLE FOR DAMAGES OF ANY KIND, INCLUDING INCIDENTAL AND CONSEQUENTIAL DAMAGE. Some states do not allow the exclusion or limitation of incidental or consequential damages so the above exclusion may not apply to you. The warranty gives you specific legal rights, and you may also have other rights which vary from state to state.



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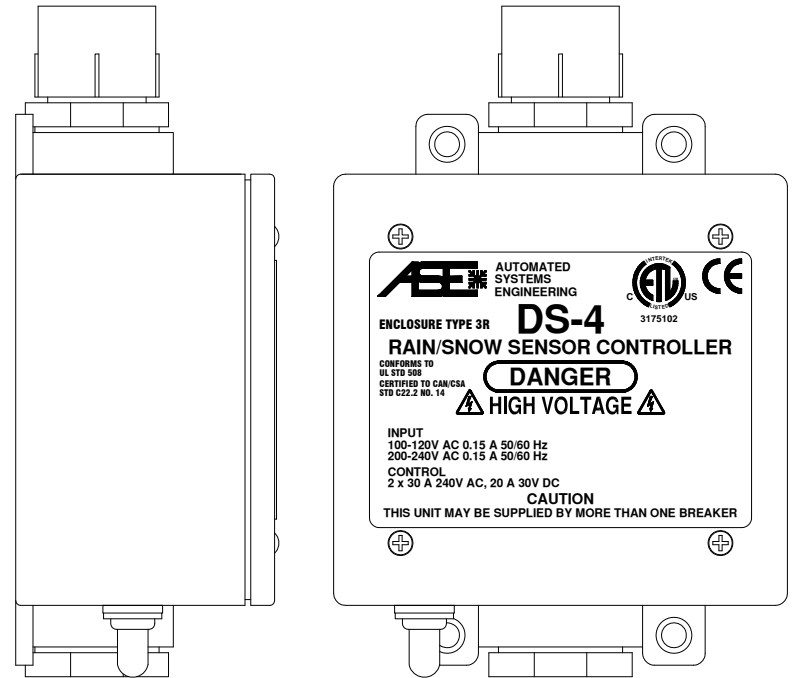


CAUTION: Read all instructions carefully before installation.
Save this Installation Manual for future reference.

DS-4

RAIN/SNOW SENSOR CONTROLLER

INSTALLATION MANUAL



Manufactured By



**AUTOMATED
SYSTEMS
ENGINEERING**

2519 East Saint Vrain St Colorado Springs, Colorado 80909

General Safety Instructions

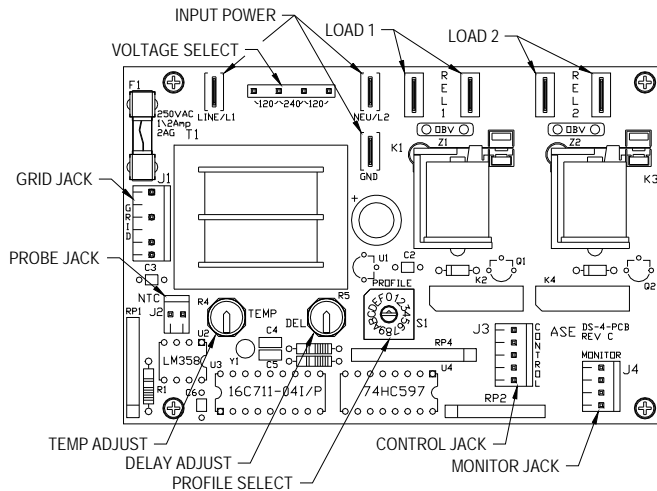
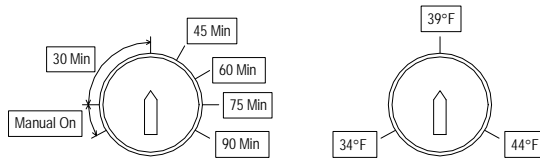
1. THIS UNIT SHOULD BE INSTALLED, OPENED, AND REPAIRED BY QUALIFIED PERSONNEL ONLY!
CETTE UNITÉ DEVRAIT ÊTRE INSTALLÉE, OUVERTE, ET RÉPARÉE PAR LE PERSONNEL QUALIFIÉ SEULEMENT!
2. To avoid shock hazard do not open the front cover with power connected to the DS-4 or any controlled equipment.
Pour éviter la décharge électrique déconnectez toute la puissance avant d'ouvrir la couverture du DS-4.
3. To avoid fire hazard replace fuse F1 with a 1/2 Amp 250 VAC 2AG fast acting fuse ONLY.
Pour éviter le risque d'incendie remplacez le fusible F1 par un fusible de 1/2 ampère 250 VCA 2AG SEULEMENT.

Introduction

Thank you for purchasing the DS-4 Rain/Snow Sensor Controller. Properly installed and maintained the DS-4 will provide years of trouble free service. The following paragraphs contain instructions on how to install, configure, operate, and maintain the unit.

Setting the Internal Adjustments

Delay and Trigger Temperature can be set on the DS-4. "Delay" refers to the minimum run time for the sensor after a detection when in a controller mode. When acting as a sensor "Delay" is not active. A "Manual On" function that activates the DS-4 is also included. This is triggered by adjusting "Delay" as shown. Reference the included profile sheet for the expected delay times and "Manual On" action for each profile.



DDC-400 Interface

Pin	Color	IB-2	Function
1	Black	TB1-7	Deice On
2	Red	TB1-8	Deice On
3	Green	TB1-5	Rain Div On
4	White	TB1-6	Rain Div On

The DS-4 can be used as a direct replacement for the DS-9B when controlling the DDC-400 Deicing Controller. An optional CS-4 Monitor Cable is required to extend the external monitor signals to the DDC-400. See the Optional Parts list. The DS-4 should be set for Profile B. The table lists the interconnects that should be made between the DDC-400 IB-2 interface board and DS-4 for proper operation.

DDC-500 Interface

Pin	Color	FCI-5	Function
1	Black	TB1-1	Low Temperature
2	Red	TB1-2	Low Temperature
3	Green	TB1-3	Precipitation
4	White	TB1-4	Precipitation

The DS-4 can be used as a direct replacement for the DS-11 and DS-12 when controlling the DDC-500 Deicing Controller. An optional CS-4 Monitor Cable is required to extend the external monitor signals to the DDC-500. See the Optional Parts list. The DS-4 should be set for Profile 1. The table lists the interconnects that should be made between the DDC-500 FCI-5 interface board and DS-4 for proper operation.

DS-12 Replacement

The DS-4 can be used as a direct replacement for the DS-12. Color codes are identical with the exception that the **ORANGE AND RED EXTERNAL CONTROL INPUT LEADS ARE REVERSED**. This was done to maintain compatibility with the DS-9B. The Profile Selection table should also be examined to find a profile compatible with the original DS-12. Most profiles have been maintained but profile numbers have been changed in some cases.

DS-4/DS-9B Operational Differences

When configured for Profiles 8, 9, or B the DS-4 is a functional replacement for the DS-9B but operates in a slightly different manner. Unlike the DS-9B, the DS-4 deice/rain diversion relay, Relay 2, will not close for 2-3 minutes at power up. It will, however, operate for 2 minutes after rain detection or for 2 minutes after deice Relay 1 has opened following a deicing cycle or a Deice Manual On activation. The Reset/Standby external control inputs for the DS-4 have the added functionality of resetting deicing and rain diversion delay cycles. The unit does not have to be powered down to clear the delay cycle as with the DS-9B. Note that the Rain Diversion Standby/Reset external input will reset the rain diversion delay and immediately open Relay 2 after rain detection. However, the Deice Standby/Reset external input will reset the deice delay, immediately open Relay 1, but reset Relay 2's delay to 2 minutes to allow for heating element cooldown.

Adjusting Trigger Temperature

The DS-4 features the capability to adjust deice trigger temperature from 34°F to 44°F. The DS-4 reads this setting constantly during operation. Since conditions conducive to snow change from site to site it is best to set the trigger temperature to mid-point (39°F), then adjust it for most reliable operation without excessive runtime. Careful adjustment of the trigger temperature point can yield reliable activation while keeping operational costs as low as possible.

Moisture Grid Replacement

It is recommended that the DS-4 be powered down and the grid wiped clean with clear water at least once every 4 months. However, after a number of years, the corrosive elements left behind when water is evaporated out of the moisture grid will eventually damage the grid rings. The moisture grid can be easily replaced by ordering and installing a new "Moisture Grid Assembly".

THIS PROCEDURE SHOULD ONLY BE PERFORMED BY QUALIFIED PERSONNEL!

Open all power and load breakers connected to the DS-4. Open the front cover and remove the cable from the Moisture Grid Jack (see figure above). While holding the reducing bushing, unscrew and remove the old moisture grid. Slide the new cable through the reducing bushing and screw the new grid into the bushing. Tighten the grid hand tight only. Reconnect the new cable to the Moisture Grid Jack. Confirm that the four connector pins are properly aligned with the jack. Close the front cover and reapply power.

DP-7B/DP-7EXB Interface

Cable	Color	DP-7B	Function
Control	Black	TB1-3	Deice Manual On
Control	Green	TB1-4	Deice Standby/Reset
Monitor	Red	TB1-1	Deice On Mon
Monitor	Black	TB1-2	Deice On Mon
Control	White	TB1-5	Ground

The DP-7B/EXB remote display panel can be used with the DS-4 when configured as a deice controller. An optional Control Cable and Monitor Cable are required to extend the external control/monitor signals to the DP-7B/EXB. See the Optional Parts list. The table lists the interconnects

that should be made between the DP-7B/EXB and DS-4 for proper operation. This table also applies to the DP-7B with serial M&C interface. Note that only three control leads and two monitor leads are required as only Relay 1 is controlled and monitored.

DS-9B Replacement

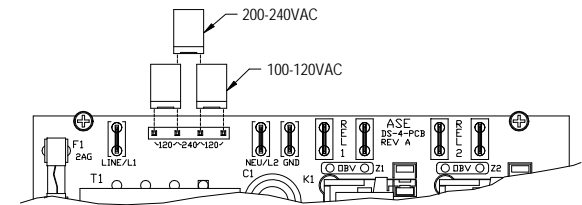
DS-9B Cable	Function	Connect To DS-4
Twisted Black	AC Line/L1	Black To Line/L1
Twisted White	AC Neutral/L2	White To Neu/L2
Rain Div #16 Red	Rain Div Control	Relay 2 #12 Yellow
Deice #12 Blue	Deice Control	Relay 1 #12 Blue
2 Conductor Red	Deice Monitor	4 Conductor Red
2 Conductor Black	Deice Monitor	4 Conductor Black
4 Conductor White	Digital Ground	5 Conductor White
4 Conductor Black	Deice Manual On	5 Conductor Black
4 Conductor Green	Deice Standby	5 Conductor Green
4 Conductor Red	Rain Manual On	5 Conductor Red

The DS-4 can be used to replace existing DS-9B deicing controllers. Profile 8 is used if the DS-9B is set for no rain diversion. Profile 9 is used if rain diversion is required. The table lists the required connections for DS-9B replacement. Depending on the specific installation some cables or individual leads may not be used and

are, therefore, not required. The optional CS-3 Control Cable and CS-4 Monitor Cable are required if external control and monitor functions are used with the existing DS-9B. This will be the case if the DS-9B was installed in conjunction with a DP-7 or DP-7EX remote display panel. The five conductor control and four conductor monitor cables replace the DS-9B four conductor control and two conductor monitor cables. The color codes for the external control/monitor cables are identical and the extra DS-4 control and monitor conductors can be disregarded but should be safely insulated during installation.

Voltage Selection, Power & Load Connection

Two voltage select jumpers are supplied with each DS-4. They are stored on the outside pins of the header. For 100-120 Vac operation both jumpers are used. For 200-240 Vac only one jumper is used. The load relays are rated for 240 Vac at 30 Amps. Consult local electrical



codes for the wire color and size for both power and load connections. The DS-4 can be mounted by screwing the hub onto an appropriate size conduit or by using the mounting holes in each corner of the enclosure. **DO NOT DRILL HOLES THROUGH THE ENCLOSURE FOR MOUNTING!** This can allow water into the enclosure causing a potential shock or fire hazard.

External Control/Monitor Operation

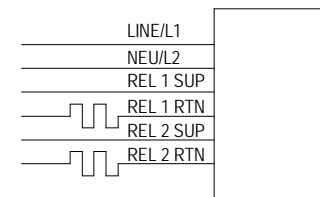
External Control		
Pin	Color	Function
1	Green	See Profile Table
2	Black	See Profile Table
3	Orange	See Profile Table
4	Red	See Profile Table
5	White	Ground

External control and monitor jacks are provided on the DS-4. The external control points allow the user to externally activate (Manual On) or disable and clear the delay (Standby/Reset) for the DS-4 relays. The profile table lists the function of each control lead. Connecting the White Ground lead to a control lead will activate the function listed. This can be performed using a switch or a low power relay contact. **DO NOT USE ANY POWERED SIGNAL TO DRIVE THE EXTERNAL INPUTS.** A "Standby/Reset" function will always override a companion "Manual On" function.

External Monitor		
Pin	Color	Function
1	Black	Relay 1 Monitor
2	Red	Relay 1 Monitor
3	Green	Relay 2 Monitor
4	White	Relay 2 Monitor

The external monitor points provide low power dry contact closures that mimic the operation of the load relays. These relays are rated at 24 Vac/Vdc at 400 mA. Order the optional CS-3 "Control Cable" and CS-4 "Monitor Cable" to access these points.

Typical Controller Wiring Diagram



Line/L1 and Neutral/L2 are isolated from the internal load relays. Therefore, the DS-4 can operate on a different voltage source than the controlled loads. Load power should be supplied to the "REL 1 SUP" and "REL 2 SUP" inputs. The appropriate load should then be connected to the "REL 1 RTN" and "REL 2 RTN" leads. The load relays can be used to directly control loads up to 30 Amps at 240 Vac. However, if the DS-4 is to be used as

a sensor for controlling low level signals it is recommended that the more sensitive monitor relays be used.

Profile Selection

The DS-4 was specially designed to be as adaptable as possible to different operating requirements. The mode of operation, called the "profile", can be selected by setting the Profile Select switch. A profile is selected by aligning the arrow on the screwdriver slot of the switch with the appropriate number or letter. The following table lists the operating characteristics of each profile. **A CHANGE IN PROFILE WILL NOT TAKE EFFECT UNTIL THE DS-4 HAS HAD POWER REMOVED, THEN REAPPLIED.** All profiles observe the 34°F to 44°F adjustable trigger temperature. Deice functions occur when temperatures are below or equal to the trigger temperature and precipitation is detected. Rain functions occur when temperatures are above the trigger temperature and precipitation is detected. Profiles noted as "Low Temp Cutoff" do not initially trigger below 15°F but will retrigger if triggered before temperatures drop below 15°F. "Delay" is the minimum time the relay will remain closed after a detection. All delays are restarted by a detection during the delay period. Functions for the external control leads are listed.

Profile 0 Low Temp/Precipitation Sensor with Low Temp Cutoff				
Profile 1 Low Temp/Precipitation Sensor without Low Temp Cutoff				
Relay	Function	Delay	Black	Low Temp Manual On
Relay 1	Low Temp	20 sec	Green	Low Temp Standby/Reset
Relay 2	Precip	20 sec	Red	Precip Manual On
			Orange	Precip Standby/Reset

Profile 2 Deice/Rain Diversion Sensor with Low Temp Cutoff				
Profile 3 Deice/Rain Diversion Sensor without Low Temp Cutoff				
Relay	Function	Delay	Black	Deice Manual On
Relay 1	Deice	20 sec	Green	Deice Standby/Reset
Relay 2	Rain	20 sec	Red	Rain Manual On
			Orange	Rain Standby/Reset

Profile 4 Deice/Rain Diversion Controller with Low Temp Cutoff				
Profile 5 Deice/Rain Diversion Controller without Low Temp Cutoff				
Relay	Function	Delay	Black	Deice Manual On
Relay 1	Deice	30-93 min	Green	Deice Standby/Reset
Relay 2	Rain	2 min	Red	Rain Manual On
			Orange	Rain Standby/Reset

Profile 6 Dual Deice Controller with Low Temp Cutoff				
Profile 7 Dual Deice Controller without Low Temp Cutoff				
Relay	Function	Delay	Black	Deice Manual On
Relay 1 & 2	Deice	30-93 min	Green	Deice Standby/Reset
			Red	Not Used
			Orange	Not Used

Profile 8 DS-9B Replacement with Delay, without Rain Diversion, and 2 Minute Cooldown				
Relay	Function	Delay	Black	Deice Manual On
Relay 1	Deice	30-93 min	Green	Deice Standby/Reset
Relay 2	Deice	Relay 1 + 2 min	Red	Not Used
			Orange	Not Used

Profile 9 DS-9B Replacement with Delay On, Rain Diversion and 2 Minute Cooldown				
Relay	Function	Delay	Black	Deice Manual On
Relay 1	Deice	30-93 min	Green	Deice Standby/Reset
Relay 2	Deice	Relay 1 + 2 min	Red	Rain Manual On
Relay 2	Rain	2 min	Orange	Rain Standby/Reset

Profile A Dual Deice Controller with 4°F Supercold Trigger				
Relay	Function	Delay	Black	Deice Manual On
Relay 1 & 2	Deice/Supercold	30-93 min	Green	Deice Standby/Reset
			Red	Not Used
			Orange	Not Used

Profile B DS-9B/DDC-400 Sensor Replacement				
Relay	Function	Delay	Black	Deice Manual On
Relay 1	Deice	20 sec	Green	Deice Standby/Reset
Relay 2	Deice	Relay 1 + 2 min	Red	Rain Manual On
Relay 2	Rain	2 min	Orange	Rain Standby/Reset

Profile C Deice/Rain Div Controller with Delay On, Rain Diversion and 30 Minute Cooldown				
Relay	Function	Delay	Black	Deice Manual On
Relay 1	Deice	30-93 min	Green	Deice Standby/Reset
Relay 2	Deice	Relay 1 + 30 min	Red	Rain Manual On
Relay 2	Rain	30 min	Orange	Rain Standby/Reset

Profile D Not Assigned				
Relay	Function	Delay	Black	
Relay 1			Green	
Relay 2			Red	
			Orange	

Profile E Not Assigned				
Relay	Function	Delay	Black	
Relay 1			Green	
Relay 2			Red	
			Orange	

Profile F Not Assigned				
Relay	Function	Delay	Black	
Relay 1			Green	
Relay 2			Red	
			Orange	