PAC-2000 REV A
ELECTRIC COOLING FAN CONTOLLER

Dakota Digital

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Operation
The electric cooling fan controller provides a way to run up to two electric engine cooling fans or one two speed cooling fan. (A second relay, sold separately, is required for two speed or dual fan operation). The controller monitors the engine temperature using a dedicated sender, or a gauge and its sender. When the engine temperature goes above a user adjustable set point, the fan is turned on with a relay. When the engine has cooled below a user selectable off temperature, the fan is shut off. Separate on and off temperatures can be set for the high and low fan outputs.

The unit can be set to keep the fan running, if the engine is hot enough, after the key is turned off. Several delay times are available from no delay to 1 minute. The controller will also run the fan when the air conditioner requires, by detecting when the air conditioning clutch is engaged.

Several gauge systems are included to make installation with a gauge easier. The included gauges are Stewart Warner, Classic, VDO, and Autometer. If the gauge being used isn't included, there is a custom calibration function that allows the system to be calibrated to any gauge with clear markings. This is accomplished by setting the controller to match the marks on the gauge with a few steps described in detail in the installation instructions.

IMPORTANT NOTE!!!: If using a gauge with this unit, always ensure that your gauge is working properly. If the gauge is not reading correctly, the fan control unit will not have correct temperature information and cannot be guaranteed to properly control the fan, possibly leading to overheating and engine damage.
        If a gauge is not used, ONLY a Dakota Digital 300°F sender should be used. Other senders may not give correct reading to control unit.

Required components for installation:
The PAC-2000 is shipped with necessary components for use with a single fan on a gauged system. These parts include:
- 1   PAC-2000 module
- 1   RLY-1 relay with wiring harness
- 1   Instruction manual

For some options of the PAC-2000 additional components are required. These are listed below.
        Second RLY-1 assembly (needed for dual fan or two speed fan operation)
        300°F sender, part # SEN-04-1 through SEN-04-8 (for operation without a gauge)

Installation
The terminal strip on this unit has 6 connections:
1. Fan high relay   Connect to the white wire on the high fan relay assembly
                                (for single fan applications leave unconnected)
2. Fan low relay   Connect to the white wire on the low fan relay assembly
3. Ground   Connect to a good chassis ground
4. Power   Connect to a fused 12V battery
5. Sender   Connect to the engine temperature sender wire.
6. A/C clutch   Connect to the cycle switch on systems with air conditioning
                                (on systems without air conditioning leave unconnected)
7. Ignition   Connect to a circuit which has +12V with the ignition key ON.

Relay wiring:

White	Connect to control unit
Green	Connect to fused 12V battery circuit that can run cooling fan
Red	Connect to fused 12V battery
Blue	Not Connected
Black	Connect to cooling Fan

A wiring diagram can be found after the troubleshooting section of this manual.

Set up
This controller comes preset to use a dedicated sender as follows:

> Dakota Digital Sender only (no gauge)
> One single speed fan
> 205 deg F on temperature
> 200 deg F off temperature
> 15 sec Fan off delay

If the factory settings don't fit your application you will need to go through the setup procedure below. At anytime during the setup procedure, the key may be turned off and the settings up to that point will be saved.

1. Press and hold SW2, then turn the key on.

2. Release SW2, then press and release sw1 to move onto the next step.

3. To select temperature scale to use, press and hold SW1 to select F (Fahrenheit) or press and hold SW2 for C (Celsius). Hold the switch for longer than 1 sec to select. Once a temperature scale is selected, the display will flash and go on to next setting.

4. Display will now read "Lon" indicating low fan on temperature is to be set. Use SW1 or SW2 to select the temperature at which the fan should turn on. Press both switches to save the setting. Display will flash once setting is saved.

    Note: SW1 increases the temperature, while SW2 decreases the temperature.

5. Display will now read "OFF" indicating low fan off temperature is to be set. Again, use SW1 or SW2 to set the temperature at which the fan should turn off. Press both switches to save the setting.

6. If two fan or dual speed fan mode was previously selected, Temperature settings for the high fan output are at this point in setup for convenience. If single fan mode is set up, setup will skip high temp settings and go to step 7.

    6a. Display will now read Hon indicating high fan on temperature is to be set. Use SW1 or SW2 to set the temperature at which the fan should turn on. Press both switches to save the setting.

    6b. Display will now read "Off" indicating high fan off temperature is to be set. Use SW1 or SW2 to set the temperature and press both switches to save the setting.

7. Display will read "dLy". Use SW1 or SW2 to cycle through the following options. Press both switches to select an option.

Display	Option
OFF	Fan will turn off when key is turned off.
15	Fan will run, if needed, for 15 sec after key is turned off.
30	Fan will run for 30 sec if needed.
45	Fan will run for 45 sec.
60	Fan will run for 1 minute after key off, if needed.

8. Display will read "Fan" indicating fan type is to be set. Use SW1 or SW2 to select the fan type used. Press both switches to save setting.

Display	Option	
" 1 "	one single speed fan	(only low fan output used)
" 2 "	two single speed fans	(high and low fan outputs both on for high temp, low fan output on for low temp)
"SPd"	one dual speed fan	(high fan output on, low fan off for high temp, high fan off, low fan on for high temp)

Note: If two fan or dual speed are selected and high fan temp setting was not set before, setup will return to step 6 to allow temp settings to be made.

9. Display will read "Snd" signaling to select a sender type. Press SW1 to move through list forward, press SW2 to back up. Press both switches to save setting. The supported senders are listed below with the display that represents each option.

Display	Option
n o	no gauge, dedicated Dakota Digital sender only
d.d.1	Dakota Digital individual temp gauge with sender
d.d.2	Dakota Digital instrument cluster with control box
S t E	Stewart Warner gauge and sender
C L S	Classic gauge and sender
U D o	VDO gauge and sender
A t o	Autometer gauge and sender
C U S	Custom calibrated gauge
C A L	Custom calibration (for gauge sets not listed above)

10. If your gauge is not supported in one of the options above, you will need to custom calibrate the controller for your gauge. (if CUS is selected and calibration has not been done, the calibration sequence will automatically be started). The following is the procedure for custom calibration. If your gauge system is listed above, skip this portion and continue at step 9.

Custom Calibration

CC1. Select C A L in Step 7 above. Display will read A d J.

CC2. Turn the potentiometer on the lower right corner of the unit (marked CUSTOM ADJUSTMENT) with a small flat screw driver. While doing so, watch your temp gauge and line up the needle with the **lowest** mark on the gauge. **Custom gauge must be calibrated starting at cold temperatures and moving to hot temperatures.**

Note 1: Turning potentiometer clockwise increases temperature reading.

Note 2: If your engine is warm you may need to disconnect the wire from your sender in order get to the lower points on the gauge.

CC3. Once the gauge is set to a mark, press SW1 or SW2. A temperature reading will appear on the display. Scroll to the temp that matches the mark on the gauge using SW1 to increase and SW2 to decrease. Press both buttons to save the number. Display will again read "AdJ".

CC4. Repeat steps CC2 and CC3 with the next lowest mark on gauge until all the marks on your gauge have been set. (up to 6 but no less than 4 points). Press both SW1 and SW2 at "Adj" to stop setting points if there are less than 6 points on your gauge.

11. Unit will flash "8.8.8." to indicate set up is complete. The unit now has been set up. If the wiring and setup have been properly completed the unit should begin normal operation at this point.

Resetting Factory presets
This procedure will return the device to the original factory presets and clear custom calibration settings.
NOTE: Calibration data for the custom gauge setup will be lost when reset to factory presets.

1. Turn key off.

2. Press and hold SW1 and SW2 and turn key on.

3. Display will read "r E S" for reset

4. Display will flash 8.8.8 to indicate unit is reset. Factory reset values are listed at the beginning of the setup portion of this manual.

Checking set up (diagnostic mode)
This unit comes with a feature to allow you to mimic normal operating temperatures using the adjustment pot. This can allow you to test the installation before ever starting the engine. Just follow these steps.

1. Turn the key on.

2. Press SW1 and SW2 at the same time and hold. A number representing the temperature will come up on the display. This number will blink once to indicate that the unit has entered diagnostic mode. SW1 and SW2 may now be released and the unit will remain in diagnostic mode until the key is turned off.

3. Adjust the potentiometer on the left side of the unit while watching the display and listening for the fan. The fan should start when the display reads hotter than the set on temp. It should again shut off when the display reads lower than the off temp.

4. You may also look at your water temperature gauge (if unit is using a gauge) and compare the temperature reading of the unit to the gauge. The temperatures should be within a few degrees. If not, the wrong gauge may be selected in the setup routine. Go through setup again by turning off the ignition, pressing and holding SW2 and turning ignition back on. If a selection cannot be found that closely matches your gauge you may have to custom calibrate to your gauge. (see step 8 in setup)

Checking the current reading
The current temperature reading can be displayed on the unit at anytime during normal operation, without going into the diagnostic mode. Simply press and hold SW1 while the key is on and the PAC-2000 is not in setup or diagnostic mode. The current temperature will be shown on the display until the SW1 is released.
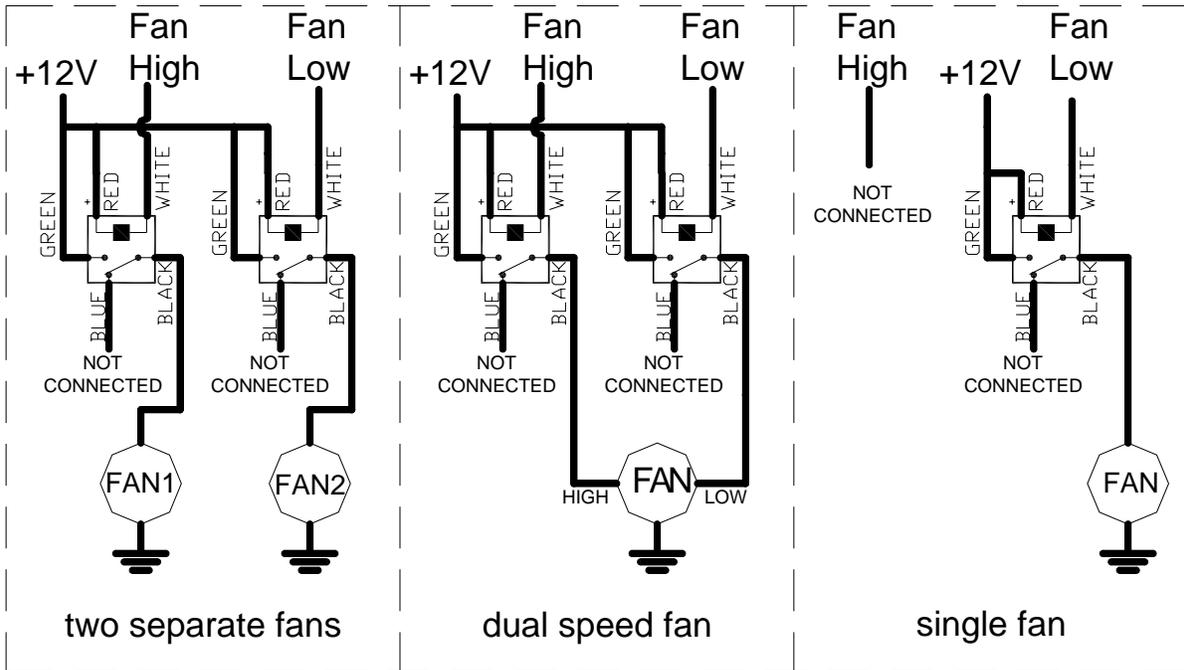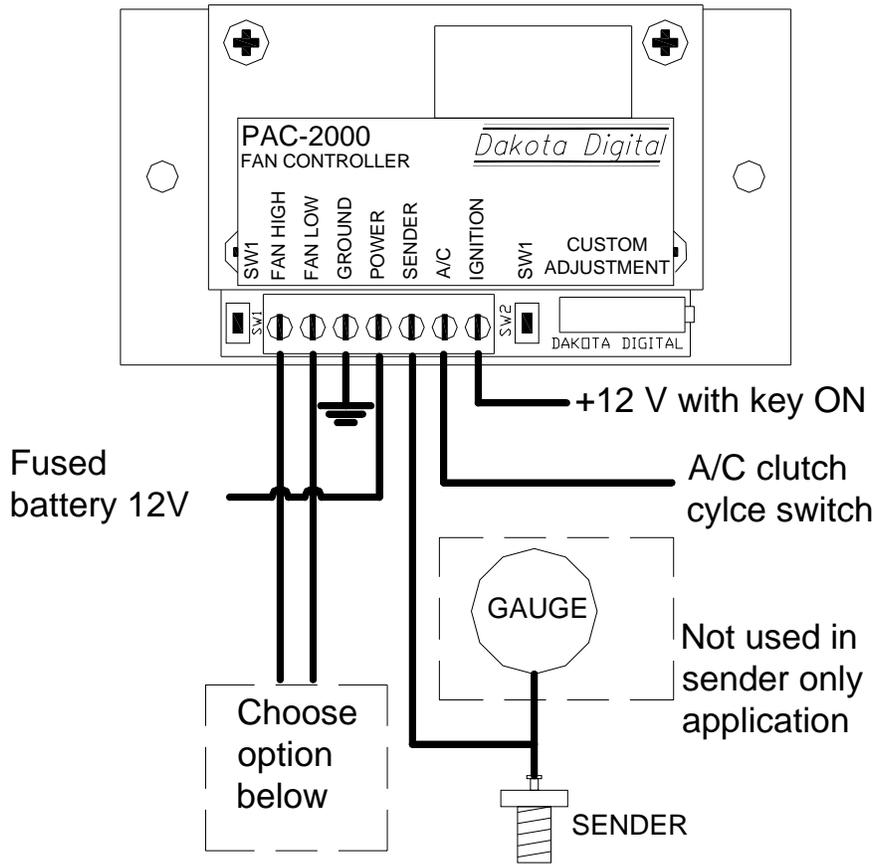
TROUBLESHOOTING

PROBLEM	CAUSE	SOLUTION
Display reads "Er0" (lost memory)	Setup memory lost, unit needs to be recalibrated.	Go through setup procedure, (see setup in this manual)
Display reads "Er1" (shorted sender)	Wrong gauge selected	Select proper gauge in setup or use custom cal if needed.
	Gauge disconnected from sender. (gauge option only)	Reconnect gauge to sender.
	Sender is shorted	Check sender wire for short to ground. Look for pinched sender wire or bare connection touching ground.

TROUBLESHOOTING (continued)

PROBLEM	CAUSE	SOLUTION
Display reads "Er1" (shorted sender) continued	Unit not connected to sender	Connect send terminal on unit to sender circuit
Display reads "Er2" (open sender)	Wrong gauge selected	Use setup to select proper gauge, or use custom cal if needed.
	Sender not connected.	Reconnect wire to sender
	Unit not connected to sender.	Connect send terminal on unit to sender circuit.
Display reads "Er3"	Setup data is out of valid range.	Go through setup again, custom cal may be incorrect if just set.
Fan turns on late, or not at all.	Unit has no power	With key on, hold SW1, if the display doesn't show a temperature after a few seconds, check Battery and ground connections.
	Wrong gauge is selected. (gauge setup)	Hold SW1, if temperature read is lower than expected or doesn't match gauge, redo setup.
	Wrong sender used (for no gauge setup)	For sender only applications ONLY a Dakota Digital 300°F sender can be used. Other senders may not give a correct temperature reading.
	On temperature in setup is too high	Hold SW1, if temperature read is above the desired on temperature, and fan is not running, redo setup.
	Fan not connected properly	Remove fan output from unit and short wire to ground. If fan does not run, check relay and fan connections.
	Alternator overcharging (Analog gauge applications only)	Use a voltmeter to measure the voltage at the battery while the engine is running. If this voltage is above 15v the unit may turn the fan on later than expected. Either correct overcharging problem or set on temp lower to compensate.
Fan runs constantly	Controller has an error	Check display for error message
	Fan off temp too low	Increase off temp in setup
	Wrong gauge is selected	Select appropriate gauge in setup, or custom calibrate if your gauge is not supported.

WIRING DIAGRAM

PAC-2000
FAN CONTROLLER

Dakota Digital

SW1 | FAN HIGH | FAN LOW | GROUND | POWER | SENDER | A/C | IGNITION | SW1

CUSTOM ADJUSTMENT

SW1 | SW2

DAKOTA DIGITAL

+12 V with key ON

Fused battery 12V

A/C clutch cylce switch

GAUGE

Not used in sender only application

Choose option below

SENDER

two separate fans

+12V | Fan High | Fan Low

GREEN | RED | WHITE

BLUE | BLACK

NOT CONNECTED | NOT CONNECTED

FAN1 | FAN2

two separate fans

dual speed fan

+12V | Fan High | Fan Low

GREEN | RED | WHITE

BLUE | BLACK

NOT CONNECTED | NOT CONNECTED

HIGH | FAN | LOW

dual speed fan

single fan

Fan High

NOT CONNECTED

+12V | Fan Low

GREEN | RED | WHITE

BLUE | BLACK

NOT CONNECTED

FAN

single fan

WARRANTY

All DAKOTA DIGITAL instruments are warranted free of defects in material and workmanship for 2 years from the date of purchase. In the event of a problem with one of our products within the warranty period, DAKOTA DIGITAL will replace or repair the instrument at no charge. (The decision to repair or replace is solely that of DAKOTA DIGITAL. DAKOTA DIGITAL is not responsible for shipping costs of products returned under warranty or for labor charges for product installation and removal.) This warranty becomes invalid if the product is misused, altered or installed incorrectly.

For warranty coverage, you must first call to receive an RMA#. Ship the product transportation prepaid via UPS or insured Parcel Post. A copy of the original invoice or dated bill of sale along with a description of the defect is also required. Make sure that the RMA number is clearly visible on the outside of the package as well as inside on the paper work.

The above warranties, both expressed and implied, do not cover damages caused by improper installation, misuse, abuse, fire, unauthorized modifications, floods or acts of God, or reimbursement of customer or shop time. The extent of the warranty is limited only to the product and does not cover any loss or damage to vehicle, equipment, or non-DAKOTA DIGITAL products.

SERVICE AND REPAIR

DAKOTA DIGITAL offers complete service and repair of its product line. In addition, technical consultation is available to help you work through any questions or problems you may be having installing one of our units.

Should you ever need to send the unit back for repairs, please package the product in a good quality box along with plenty of packing material. Ship the product by UPS or insured Parcel Post. Be sure to include your RMA#, a complete description of the problem, your full name and address (street address preferred), and a telephone number where you can be reached during the day. **A return authorization number (RMA#) for products being return for repair is required.** Do not send any money. We will bill you for the repair charges.

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