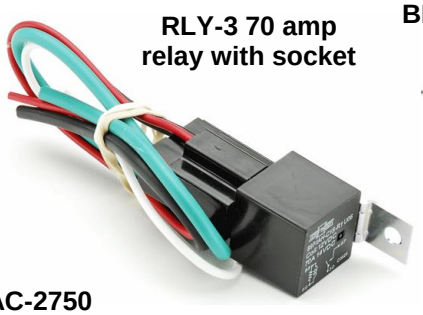
PAC-2750

ELECTRIC COOLING FAN CONTROLLER

Included components:

PAC-2750



RLY-3 70 amp relay with socket

130040-18 BIM AUX cable

394169 adapter cable

394193 BIM cable

Optional components sold separately:

- Second RLY-3 70 amp relay for dual fan or two speed fan operation
- Dakota Digital 300ºF temperature sender

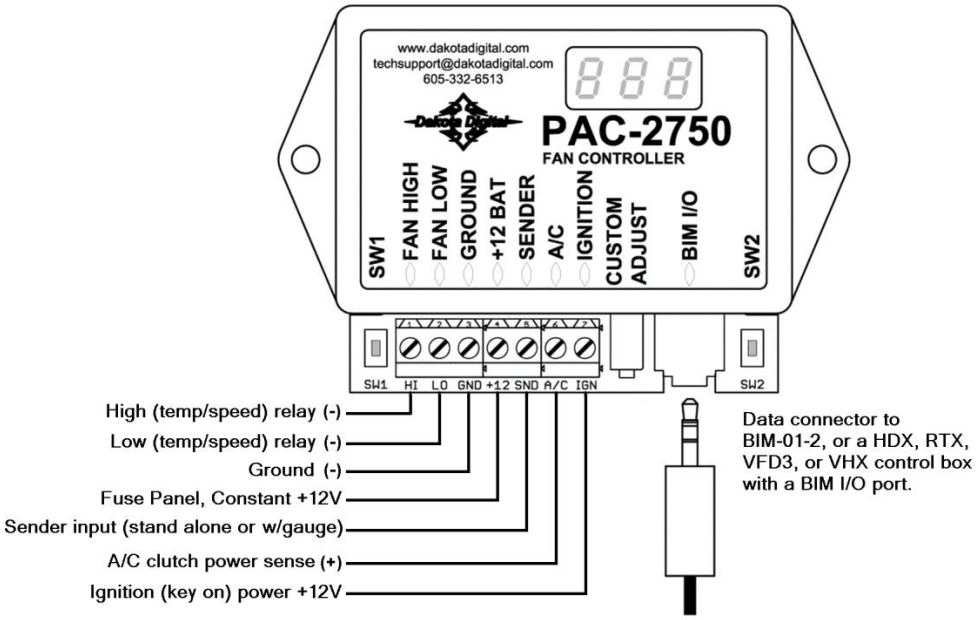
Installation

- Mount ONLY in vehicle cabin. Controller is not designed for engine compartment mounting.
- PAC-2750 does not need to be viewed or accessed for day-to-day use, but locate the module so it can be seen and the built-in programming switches can be reached for initial setup, future adjustments and troubleshooting.
- Settings for several aftermarket temperature gauges are included to make installation easier: Stewart Warner, Classic Instruments, VDO, and Autometer. If your gauge isn't listed, a custom calibration option allows the PAC-2750 to be calibrated to any gauge with clear numerical temp markings. The engine temperature can also be read directly from an OBDII diagnostic port with the use of a Dakota Digital BIM-01-X unit.

Wiring overview

PAC-2750 terminal strip connections:

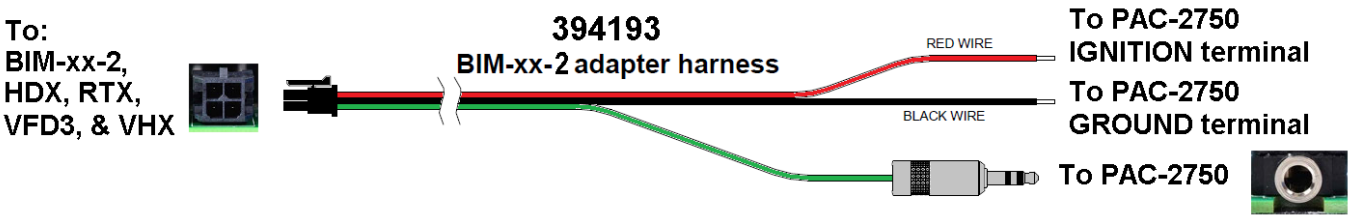
- FAN HIGH — Ground-trigger output; connect to the high fan relay harness white wire. (for single fan applications leave unconnected)
- FAN LOW — Ground-trigger output; connect to the low fan relay harness white wire.
- GROUND — Ground input for PAC-2750; connect to a good chassis ground.
- +12 BAT — Constant +12V input for PAC-2750. Use a quality 5A fuse.
- SENDER — Temperature sender input, connect to the engine temperature sender wire.
- A/C — +12V trigger from AC compressor cycle switch. (on systems without air conditioning leave unconnected)
- IGNITION — Switched +12V input for PAC-2750; key-on hot (ignition power) only. Use a quality 5A fuse.



RLY-3 relay wiring

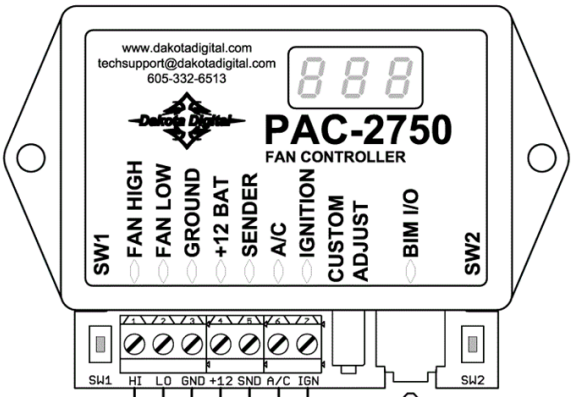
White	Ground-trigger input; connect to PAC-2750 output
Green	Relay input for fan power supply; fused, constant 12V battery input capable of supporting cooling fan AND is SEPARATE from the PAC-2750 +12V inputs
Red	Constant relay power, can share fused +12V battery connection with PAC-2750
Black	Relay output fan power supply; connect to cooling fan

BIM cable options



Wiring

Applications using a dedicated, standalone sender.



IMPORTANT NOTE:
The +12V for the controller should NOT be taken from the same circuit as the Fan Power 12V as this can cause the fan to cycle on and off.

See following pages for wiring relays

Ground

Fuse Panel, Constant +12V

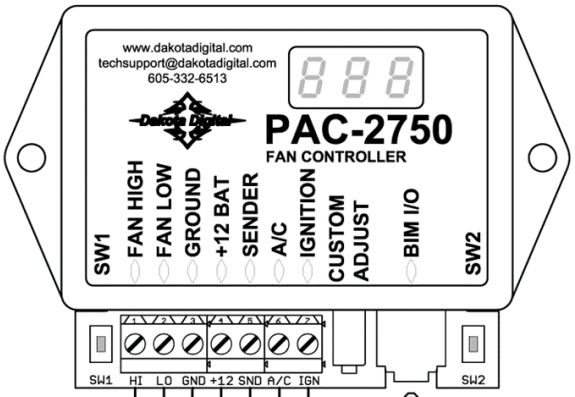
Stand alone Dakota Digital sender (Not used in BIM application)

Alternate to sender if a: BIM-01-2, HDX, RTX, VHX, or VFD3 controller is used. (Additional harness 394169 may be required)

+12V with key ON

A/C clutch cycle switch (+12V trigger)

Applications with an individual gauge and sender -or- Dakota Digital STR and VFD3 systems with metal control box.



IMPORTANT NOTE:
The +12V for the controller should NOT be taken from the same circuit as the Fan Power 12V as this can cause the fan to cycle on and off.

See following pages for wiring relays

Ground

Fuse Panel, Constant +12V

Stand alone gauge and sender combination. (Not used in BIM application)

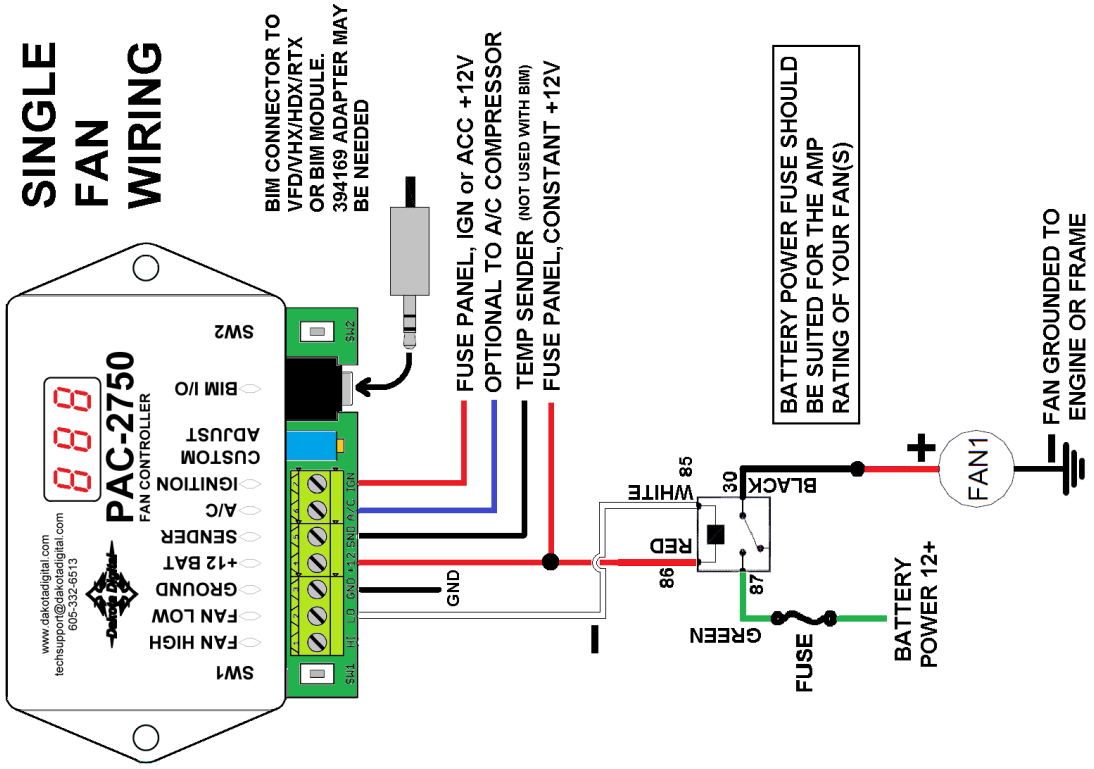
GAUGE

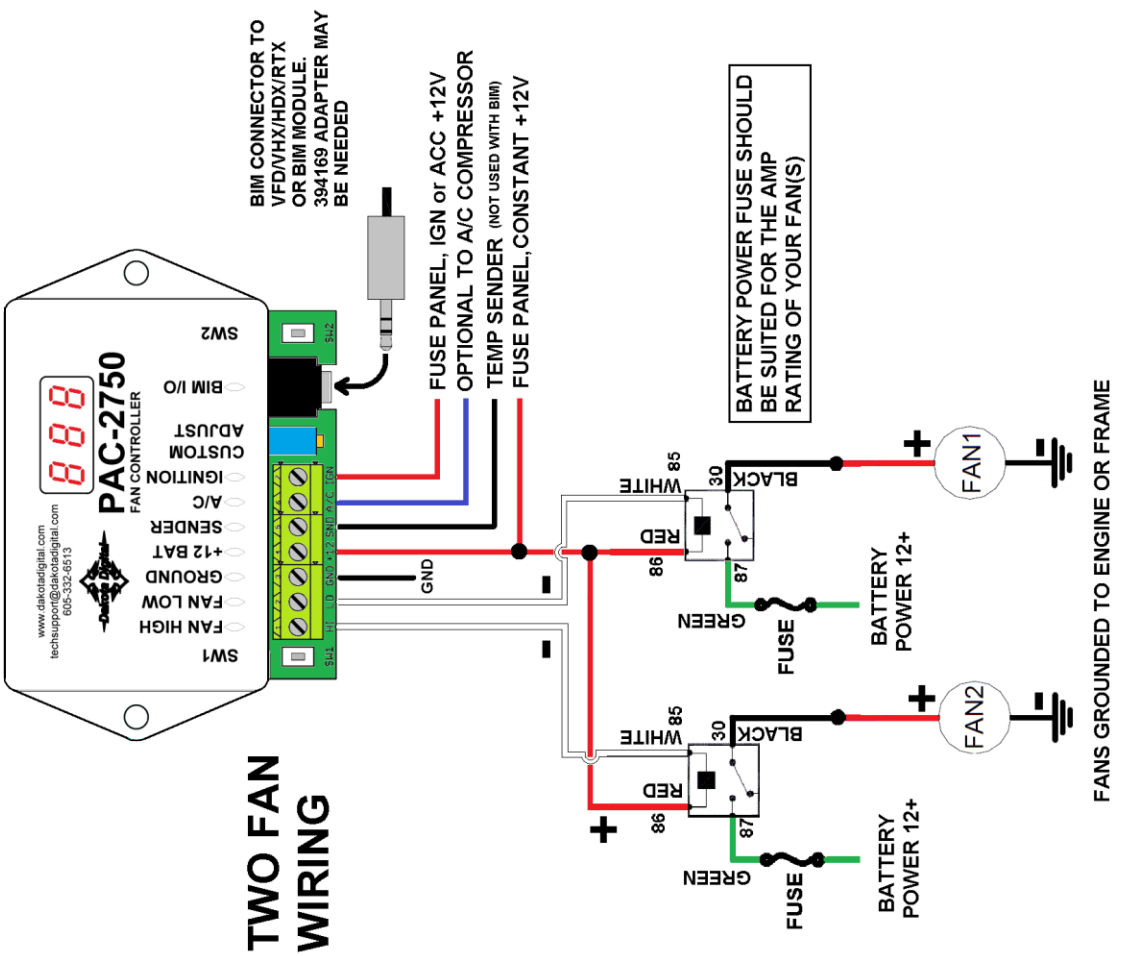
Alternate to sender if a: BIM-01-2, HDX, RTX, VHX, or VFD3 controller is used. (Additional harness 394169 may be required)

+12V with key ON

A/C clutch cycle switch (+12V trigger)

Wiring


SINGLE FAN WIRING
PAC-2750
FAN CONTROLLER
SW2
BIM I/O
CUSTOM ADJUST
IGNITION
A/C
SENDER
+12 BAT
GROUND
FAN LOW
FAN HIGH
SW1
BIM CONNECTOR TO VFD/VHX/HDX/RTX OR BIM MODULE. 394169 ADAPTER MAY BE NEEDED
FUSE PANEL, IGN or ACC +12V
OPTIONAL TO A/C COMPRESSOR
TEMP SENDER (NOT USED WITH BIM)
FUSE PANEL,CONSTANT +12V
GND
WHITE
RED
GREEN
BLACK
85
86
87
30
FUSE
BATTERY POWER 12+
BATTERY POWER FUSE SHOULD BE SUITED FOR THE AMP RATING OF YOUR FAN(S)
FAN1
FAN GROUNDED TO ENGINE OR FRAME


TWO FAN WIRING
PAC-2750
FAN CONTROLLER
SW2
BIM I/O
CUSTOM ADJUST
IGNITION
A/C
SENDER
+12 BAT
GROUND
FAN LOW
FAN HIGH
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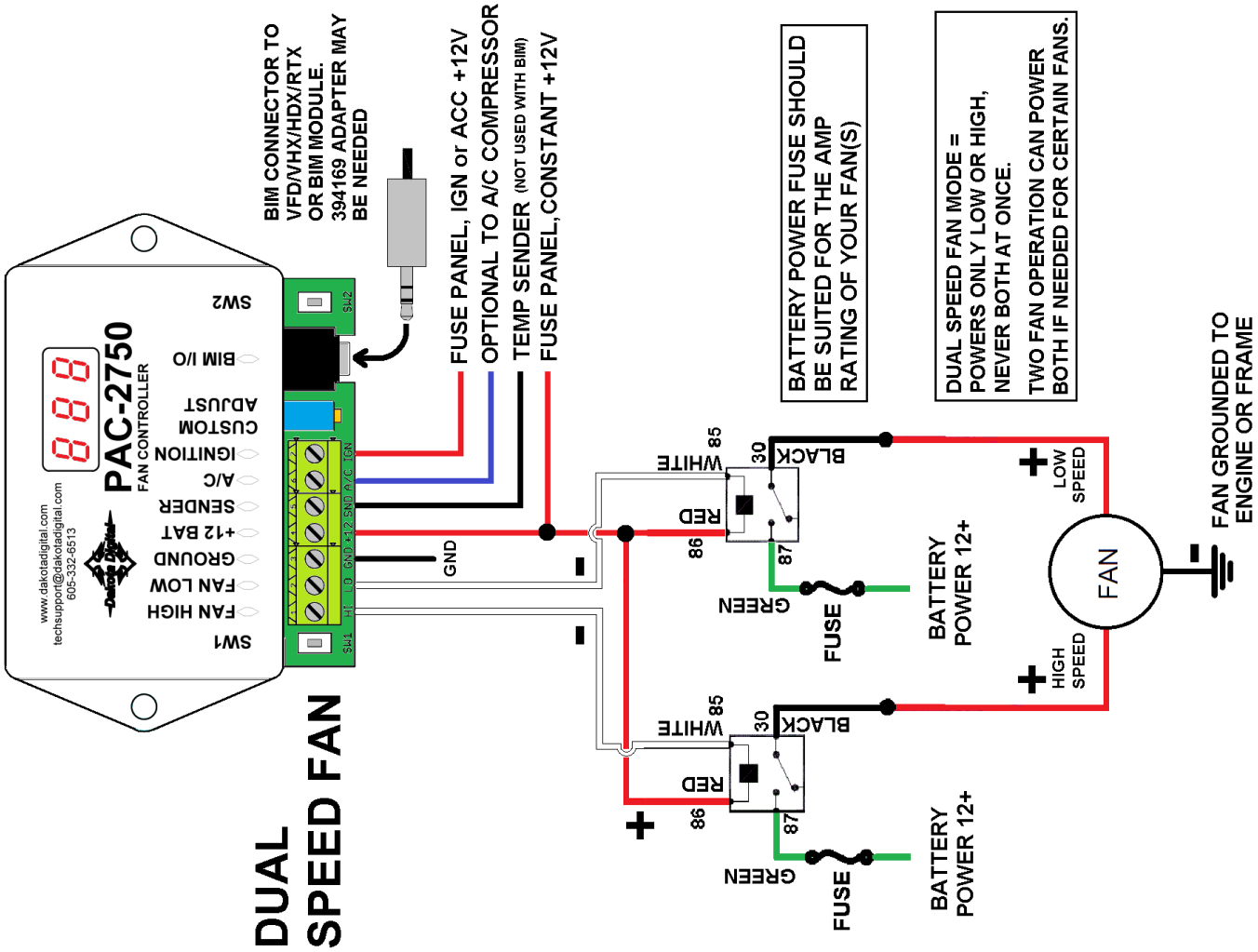
87
30
FUSE
BATTERY POWER 12+
BATTERY POWER FUSE SHOULD BE SUITED FOR THE AMP RATING OF YOUR FAN(S)
FAN1
FAN2
FANS GROUNDED TO ENGINE OR FRAME

Wiring


DUAL SPEED FAN
PAC-2750
FAN CONTROLLER
www.dakotadigital.com
techsupport@dakotadigital.com
605-332-6513
SW2
BIM I/O
ADJUST
CUSTOM
IGNITION
A/C
SENDER
+12 BAT
GROUND
FAN LOW
FAN HIGH
SW1
SU2
SU1
BIM CONNECTOR TO VFD/VHX/HDX/RTX OR BIM MODULE. 394169 ADAPTER MAY BE NEEDED
FUSE PANEL, IGN or ACC +12V
OPTIONAL TO A/C COMPRESSOR
TEMP SENDER (NOT USED WITH BIM)
FUSE PANEL, CONSTANT +12V
GND
BATTERY POWER FUSE SHOULD BE SUITED FOR THE AMP RATING OF YOUR FAN(S)
DUAL SPEED FAN MODE = POWERS ONLY LOW OR HIGH, NEVER BOTH AT ONCE.
TWO FAN OPERATION CAN POWER BOTH IF NEEDED FOR CERTAIN FANS.
WHITE
85
30
BLACK
RED
86
87
GREEN
FUSE
BATTERY POWER 12+
LOW SPEED
HIGH SPEED
FAN
FAN GROUNDED TO ENGINE OR FRAME

Operation

This 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, a gauge and its sender, or directly from a Dakota Digital BIM connection.

When the engine temperature goes above the user-adjustable set point, the fan is turned on with a relay. When the engine has cooled below the user-adjustable off-temperature, the fan is shut off. Separate on and off temperatures can be set for the high and low fan outputs.

The controller will also run the fan when the air conditioner requires, by detecting when the air conditioning clutch is engaged. When the temperature information is provided by a Dakota Digital BIM connection, a high speed shut-off is also available to disable the fans from turning on once the vehicle is above a user-adjustable speed.

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 five minutes. The display will countdown the seconds left before the fan is turned off. If the battery voltage drops too low, the fan will be turned off and a "Lo bAt" message will display for the remainder of the time.

**** WARNING ****

The fan will turn on and run continuously if the sender is disconnected as a failsafe. Always keep clear of the fan unless the battery is disconnected. When entering setup mode in a VHX or VFD3 instrument system with the PAC-2750 connected via BIM cable, the fan will begin running continuously after a two-minute delay.

-IMPORTANT INSTALLATION NOTES-

- *If pairing this unit with a gauge, 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 the gauge uses a two-wire temperature sender (such as Autometer full sweep) use of a dedicated Dakota Digital sender is required.*
- *If a gauge is not used, ONLY a Dakota Digital 300ºF sender should be used (Dakota Digital part SEN-04-1, SEN-04-2, SEN-04-4, SEN-04-5, SEN-04-6, SEN-04-7, or SEN-04-8). Other senders may not give a correct reading to the control unit.*
- *Custom gauge calibration requires numerical marks, stock "C-NORMAL-H" type gauges cannot be accurately calibrated to.*

Factory Presets

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

- Dakota Digital Sender only (no gauge, see note above for 300ºF sender options)
- One single speed fan (FAN LOW only)
- 205ºF on temperature
- 200ºF off temperature
- 30 second key-off run time (delay)

If the factory settings don't fit your application, follow the setup procedure on page seven.

- At anytime during the setup procedure, the key may be turned off and the settings up to that point will be saved.

Setup

1. Press and hold SW2, while turning 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 one second 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 when 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.
0.5	If fan was running at key off, it will continue to run for 30 seconds after key is turned off.
0.7	If fan was running at key off, it will continue to run for 45 seconds after key is turned off.
1.0	If fan was running at key off, it will continue to run for 1 minute after key is turned off.
2.0	If fan was running at key off, it will continue to run for 2 minutes after key is turned off.
3.0	If fan was running at key off, it will continue to run for 3 minutes after key is turned off.
5.0	If fan was running at key off, it will continue to run for 5 minutes after key is turned off.

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 *& some dual spd fans*	(high and low fan outputs both on for high temp, only 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 low 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 UAr; this should be left OFF. Press both switches to save setting.

10. Display will read Snd signaling to select a sender type. Press SW1 to move through the 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
no	No gauge, dedicated Dakota Digital sender only
dd 1	Dakota Digital individual temp gauge with sender
dd2	Dakota Digital instrument cluster with control box (ver. STR-D or later, older versions use CUS)
StE	Stewart Warner gauge and sender
CLS	Classic Instruments gauge and sender
Vdo	VDO gauge and sender
AtO	Autometer gauge and sender
bUS	Dakota Digital BIM connection
CUS	Custom calibrated gauge
CAL	Custom calibration (for gauge sets not listed above)

10a. If bUS is selected, the display will read the current BIM mode. 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
AUtO	Automatically select the bus operation mode (HDX and RTX systems).
SL 1	Connect to a VHX, VFD3 (SE47 or higher), or VFD3X (SE56 or higher) system.
SL2	Connect to a VFD3 (SE46 or earlier) or VFD3X (SE55 or earlier) system.
PAC	PAC-2750 is a master connected to a BIM-01-X or similar unit.

10b. If bUS is selected, following the BIM mode selection, the display will show d 15 and then allow a high speed disable to be set or turned off. The speed will be shown in MPH when the temperature is Fahrenheit or km/h when using Celsius. Use SW1 or SW2 to set the speed at which the fan should turn off. Press both switches to save the setting.

11. 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 12.

Setup - Custom Calibration

Note 1: If your engine is warm you may need to disconnect the sender wire to get the lower points on the gauge.
Note 2: If the key is turned off in custom setup, the previous gauge setting will be used and the custom gauge will not be saved.
Note 3: If your gauge does not have defined ticks with numerical temp readings, it is highly recommended to use a dedicated sender as calibration to the gauge is very inaccurate or impossible without temp markings.

CC1. Select CAL in Step 9 on the previous page. Display will read AdJ.

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 temperature tick** on the gauge. **Custom gauge must be calibrated starting at cold temperatures and moving to hot temperatures.**

Note: Turning potentiometer clockwise increases temperature reading.

CC3. Once the gauge is set to a tick, press SW1 or SW2. A temperature reading will appear on the display. Scroll to the temp reading that matches the tick temperature reading 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 tick on gauge until all the ticks 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. If there are more than 6 points on your gauge, select points over the full range of the gauge (cold to hot). This will give a better match to your gauge.

12. Unit will flash 888 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 the key on.
3. Display will read rES for reset
4. Display will flash 888 to indicate unit is reset. Factory reset values are listed on page six of this manual.

Checking set up (diagnostic mode #1)

This unit allows you to mimic normal operating temperatures using the adjustment pot. You can use this feature 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 11 in setup).

Testing Fan operation (diagnostic mode #2)

A second diagnostic mode allows you to test the fan operation for the mode you have set. This can be used to verify dual speed or dual fan operation without running the engine, regardless of engine temperature. 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. Release SW1 and SW2.
3. Press and hold SW1 and SW2 together until the display flashes "o-r", "oFF", the fans will be off.
4. Press and hold SW2 to turn the fan(s) on, one step at a time

4a. Press and hold SW1 to turn the fan(s) off, one step at a time.
The display will change to "o-r", "Lo", or "o-r", "Hi",to indicate what fan(s) are on

5. To exit this diagnostic mode, turn off the ignition.

This table will indicate the display and fan function, based off your fan configuration.

	Hold SW2	Hold SW2	Hold SW1	Hold SW1
1 Fan	"o-r", "Lo" = Low on	**N/A**	"o-r", "oFF" = Low off	**N/A**
2 Fan	"o-r", "Lo" = Low on	"o-r", "Hi" = High on, Low on	"o-r", "Lo" = High off, Low on	"o-r", "oFF" = Low off
Dual Speed	"o-r", "Lo" = Low on	"o-r", "Hi" = High on, Low off	"o-r", "Lo" = High off, Low on	"o-r", "oFF" = Low off

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-2750 is not in setup or diagnostic mode. The current temperature will be shown on the display until the SW1 is released. If the temperature is not shown and the dot on the display flashes rapidly then the ignition input on the PAC-2750 is not getting power when the key is on.

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 "Er 1" (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.
	Unit not connected to sender	Connect SENDER 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 SENDER 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.
Display reads "bAt" when attempting to go into setup	+12v terminal does not have constant power	Connect +12 BAT terminal to fused battery connection. This terminal should have constant power at all times.
Display alternates between "Lo" and "bAt"	Battery voltage dropped too low during key off extended fan on time	Ensure battery is fully charged. Check and replace weak battery. Shorten fan delay time to prevent excessive battery drain.
Fan turns on early, late, or not at all	Unit has no constant power. (Display will not show anything when SW1 is held)	Connect +12 BAT terminal to constant power and GROUND terminal to a good ground.
	Unit has no keyed power. (dot on display flashes rapidly when SW1 is held)	Connect IGNITION terminal to a circuit powered when the key is on.
	Broken/shorted wire to sender	Check wire to sender for breaks or shorts and repair.
	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 300ºF sender can be used. Other senders may not give a correct temperature reading.
	Wrong bus type set (for BIM gauge setup)	For early VFD3/3X systems select bUS – SL2 to read the temperature correctly.
	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.
	Display shows "SPd". Speed shut-off is set too low.	Turn off or raise the high speed disable setting.
	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.

TROUBLESHOOTING (continued)

PROBLEM	CAUSE	SOLUTION
Fan runs constantly	Controller has an error	Check display for error message.
	Fan off temp too low	Increase off temp in setup.
	Broken/shorted wire to sender	Check wire to sender for breaks or shorts and repair.
	Wrong gauge is selected	Select appropriate gauge in setup, or custom calibrate if your gauge is not supported.
Custom gauge setup displays "Err" and returns to "Snd" setup option	Not enough points used	Make sure that at least 4 points of gauge are set.
	Points not input in correct order	Set gauge points in order from cold points to hot points.
	Point entered twice	Each point set must be different than the point before it.
Fans cycle on-off especially when engine temp is close to On/off set point	+12v for controller taken from same circuit as the fan power +12V (green wire on relays)	Connect the +12V for the controller to a different circuit separate from the circuit connected to fan relays.

PAC-2750 specifications		
SETTINGS		
Minimum Fan On Temp	150° F (65 C)	
Maximum Fan On Temp	250° F (121 C)	
SUPPLY		
Voltage Input (+12) Range	6.3 to 22 V	
Key Off Current (+12)	< 0.001 A	
Key On Current (+12)	< 0.025 A	
INPUTS		
	Off voltage	On voltage
Ignition	< 2.2 V	> 5.6 V
A/C Clutch	< 2.2 V	> 5.6 V
OUTPUTS (to turn on relay)		
Fan Low, High (maximum)	1.5 A	

Included relay specifications	
Typical Coil Current	0.175 A
Relay Contacts Max Current	70 A (14VDC)

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 products. Please read through the Troubleshooting Guide. There, you will find the solution to most problems.

Should you ever need to send the unit back for repairs, please call our technical support line, (605) 332-6513, to request a Return Merchandise Authorization number.

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 the RMA number on the package, and include a complete description of the problem with RMA number, your full name and address (street address preferred), and a telephone number where you can be reached during the day. Any returns for warranty work must include a copy of the dated sales receipt from your place of purchase. Send no money. We will bill you after repair.

Dakota Digital 24 Month Warranty

DAKOTA DIGITAL warrants to the ORIGINAL PURCHASER of this product that should it, under normal use and condition, be proven defective in material or workmanship within 24 MONTHS FROM THE DATE OF PURCHASE, such defect(s) will be repaired or replaced at Dakota Digital's option.

This warranty does not cover nor extend to damage to the vehicle's systems, and does not cover removal or reinstallation of the product. This Warranty does not apply to any product or part thereof which in the opinion of the Company has been damaged through alteration, improper installation, mishandling, misuse, neglect, or accident.

This Warranty is in lieu of all other expressed warranties or liabilities. Any implied warranties, including any implied warranty of merchantability, shall be limited to the duration of this written warranty. Any action for breach of any warranty hereunder, including any implied warranty of merchantability, must be brought within a period of 24 months from date of original purchase. No person or representative is authorized to assume, for Dakota Digital, any liability other than expressed herein in connection with the sale of this product.

⚠ **WARNING:** This product can expose you to chemicals including lead, which is known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov

4510 W. 61st St. North
Sioux Falls, SD 57107
www.dakotadigital.com
dakotasupport@dakotadigital.com

Phone (605) 332-6513
Fax (605) 339-4106

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