
Dakota Digital

VACUUM FLUORESCENT DIGITAL DASHBOARD

*The latest in digital dashboard technology for the
street rodder, car, and truck enthusiast.*

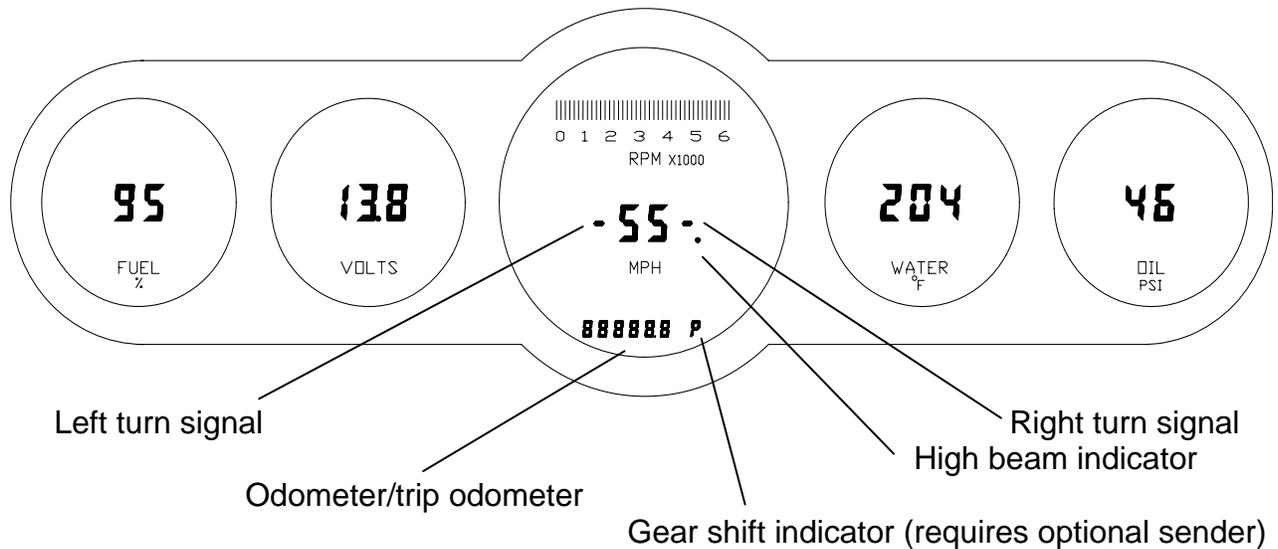
INSTALLATION AND OPERATION MANUAL

Please read this before beginning installation or wiring.

**MODELS STR2000, STR3B, STR3C,
STR4B, STR5B, STR6B, & STR6C**



Thank you for purchasing the Vacuum Fluorescent Digital Dashboard from DAKOTA DIGITAL, the leader in custom automotive electronics. Representing the latest electronics dashboard technology for the street rodder and car enthusiast alike, the digital instrumentation uses state of the art vacuum fluorescent display technology to give the driver up to date and accurate information on the operation of his or her vehicle. As used in several production automobiles, vacuum fluorescent displays give superior performance and visual appeal over LCD or LED display systems. Emitting a blue/green light that can be filtered to a wide variety of colors, the VFD system boasts excellent daytime visibility and while under computer control, automatically dims for nighttime driving. Using microprocessor technology, the digital dashboard gives the driver additional features and benefits not typically found on any other brand or type of instrumentation. Digital accuracy and solid state reliability will give you, the driver, quality service for miles down the road.



DISPLAY FEATURES

Your DAKOTA DIGITAL instrumentation panel has many features, some of which you will not be able to see until the instrumentation is completely wired and installed. The turn signals and the high beam indicators are part of the digital speedometer display therefore you will not see them before the instrumentation is installed. If your panel is a year specific street rod panel you may also have additional green and or red LED's which also can be used for turn signals and high beam indicators. These panels allow you to use either the indicators that are a part of your speedometer, or the LED's.

The odometer is the bottom display of the speedometer area. This is the same display that will function as the resettable trip-odometer. The digit furthest to the right of the odometer will become your gear shift indicator if you purchased the optional gear shift sending unit. Every DAKOTA DIGITAL instrumentation panel is equipped with this indicator. If you did not originally order a gear shift sending unit, and would like to have a gear shift indicator, you may order the sending unit at anytime and when properly installed, the gear shift indicator will operate.

WARNING

The vacuum fluorescent displays are made of glass and should be handled with care. Use extreme care around the glass evacuation tubes (small tubes at the bottom of each display) as bumping them may cause breakage and render the display useless.

MOUNTING DISPLAY SYSTEMS WITH SUBPANELS

When mounting instrumentation systems mounted to a Lexan subpanel, begin by removing the subpanel from the aluminum. Cut an opening in the dash just smaller than the outer dimensions of the aluminum panel. Remove all nuts and washers from the studs on the back side of the panel and insert into the hole. Next, install four washers or clips and secure with a nut on each. This is what holds the panel to the dashboard. Now, install a nut on each stud and set the display panel in place over the studs. If the studs were bent slightly inward from securing the aluminum panel, you may have to bend them outward to line up with the holes on the lectern subpanel. Always lay the display panel aside when not in use to avoid accidentally damaging the displays. Once aligned, secure it with an additional four nuts. Leave a gap of no less than 1/8" between the display glass and the front lens material. Be careful not to compress the glass against the front lens. Again, note that the displays are glass and should be handled with care. Use extreme care around the glass evacuation tubes (small tubes at the bottom of each display) as bumping them may cause breakage and render the display useless.

MOUNTING SYSTEMS WITH DISPLAYS MOUNTED TO ALUMINUM

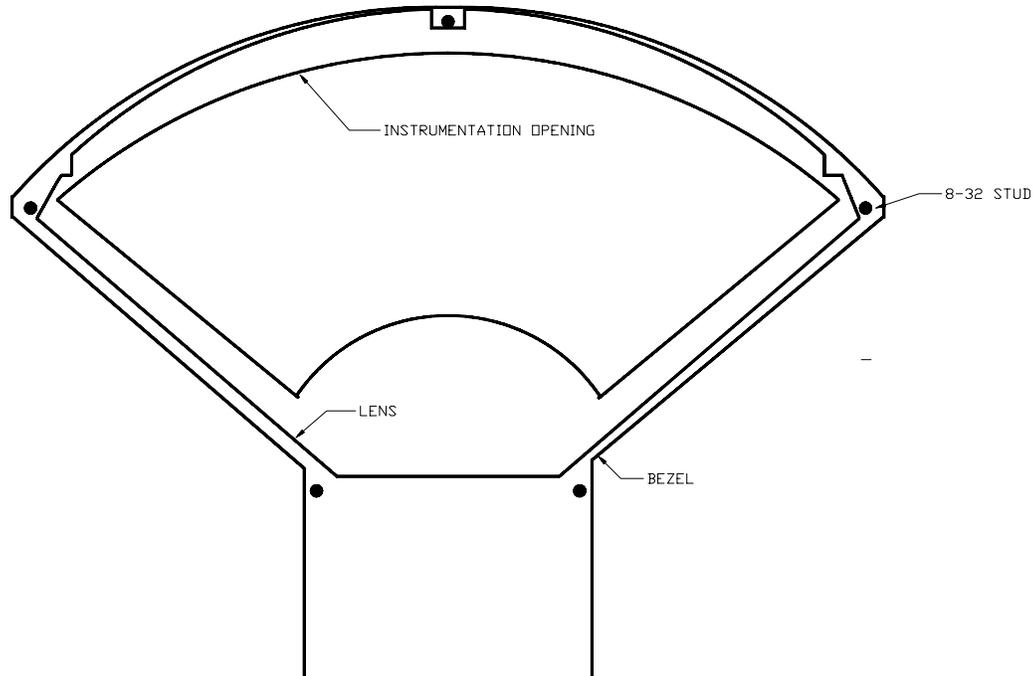
When mounting year specific aluminum panel, cut an opening into the dashboard if necessary and secure the entire panel with the instrumentation using the appropriate mounting hardware. Some panels are set into the front of the dash while others are installed from the rear of the dash. The exact mounting configuration will depend on what year car and panel you are installing.

MOUNTING SINGLE LENS SYSTEMS

Your DAKOTA DIGITAL single lens system will come to you with a single plexiglass lens and instrumentation that is mounted in an aluminum case. The lens and the instrumentation have corresponding mounting holes. After you have affixed the mounting studs of your choice to the backside of your dash, the lens piece should be slid over the studs followed by the display system. The lens can be secured with either washers and nuts, or by a bead of RTV around the back side of the lens and case. If RTV is used, the system will need to be held in place until it has had time to cure. The lens should be tight against the aluminum display case.

MOUNTING KITS INTO ORIGINAL DASHES

When installing the display system into the original bezel, several steps must be taken to prepare the bezel. The first is to remove the cluster from the dashboard and all instrumentation from the bezel. You should essentially be left with a bare chrome or metal bezel. Remove all felt inserts from the back side of the bezel that sit between the lens and the chrome.



55-56 Chevy car chrome bezel shown with lens and display opening outlines.

Next, take the supplied lens, with the lettering facing the front of the dash and place it in the chrome bezel. Lay a bead of RTV around the back side of the lens to secure it in place. After the RTV has cured, the display panel is ready to be placed on the bezel. If studs were supplied with the panel, screw them into the bezel and place a nut on them before placing the display system on it.

Be very careful not to hit the displays against anything as they are glass and will break. Adjust the height of the panel so that the glass displays are 1/8" away from the front lens. Applying a lock washer and nut to the studs behind the display panel, secure the display panel to the bezel. If screws were provided with the panel, secure them through the display panel and into the bezel. No additional holes should need to be drilled. All holes in the display systems are pre-drilled at the factory.

CONTROL BOX

Once the display panel is in place, mount the control box within the connecting cable's distance (approximately 3 feet) and secure to the underside of the dashboard. This case does not have to be mounted to metal, but by doing so you will provide a better ground to the control box. When connecting the display cable to the unit, be very sure to pay attention to the "up" side of the connector. Align the connector in the socket and press firmly into the control box. The connector locks will secure the connector.

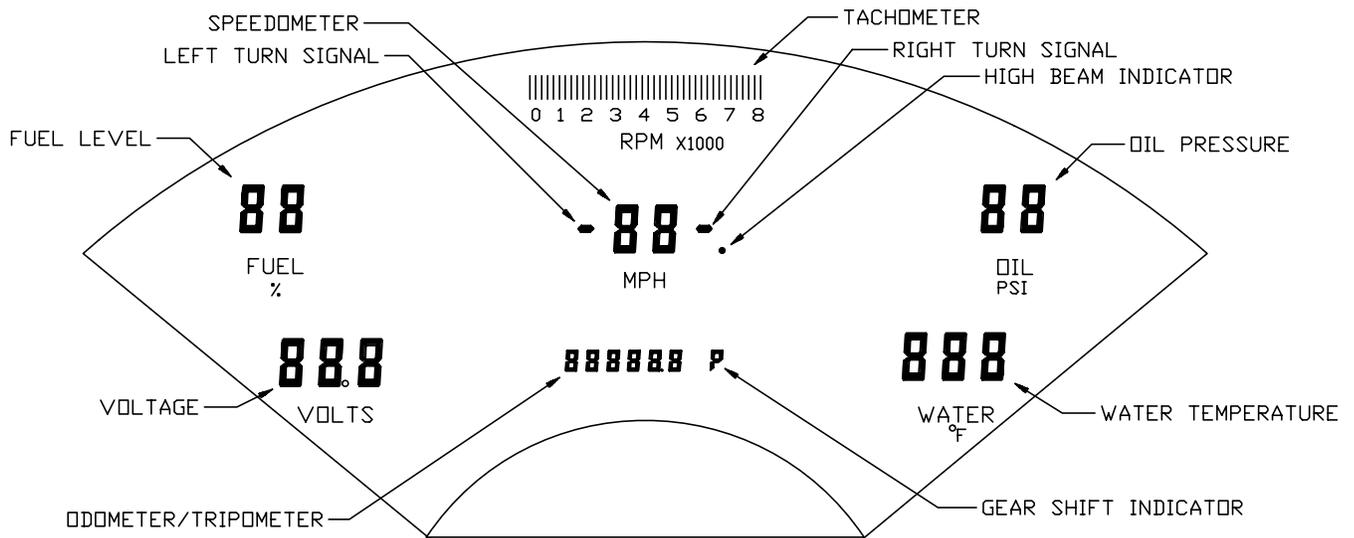


Fig. 3 Instruments and features found in STR3C display systems (55-56 Chevrolet shown)

SPEEDOMETER CONNECTION

The speedometer sender is connected to the transmission using the short adapter cable supplied with the DAKOTA DIGITAL system. The cable supplied will typically be set up for use with a GM transmission. GM transmissions use one cable and Ford and Chrysler use another. Different cables are available from Dakota Digital. For 700-R4 transmissions with an internal 4000 pulse per mile generator (and no place to connect a speedometer cable) the terminals on the plug in the transmission can be connected directly to the control box. The polarity of the wires is not important. One wire connects to the terminal marked "SPEED" and the other connects to the "GROUND" terminal. Both wires should be connected directly to the control box to eliminate any grounding problems causing erratic speed readings. Some newer GM transmissions have an internal speed generator designed for use with anti-lock brake systems (ABS). This has a high frequency signal that must pass through a speed buffer before it can be used by the speedometer, cruise control, or ECM. This buffer can be purchased from Dakota Digital if the vehicle is not equipped with one.

Some vehicles equipped with computer controlled fuel injection systems have a speed signal already available in the wiring harness. Your Dakota Digital display system can use either a 8000 pulse per mile or 4000 pulse per mile speed signal. To determine the wire location and color consult your vehicle service manual or fuel injection system wiring guide. Using this signal eliminates having to use the speedometer sender that was included with your system.

TACHOMETER CONNECTION

The tachometer signal is connected to the terminal marked "TACH" on the control box for the instrumentation. Run a single wire from the control box to the engine's ignition system. On vehicles using a separate ignition coil, the wire connects to the terminal marked "DIST" (the negative side) on the coil. For GM HEI ignition equipped motors, connect the tach wire to the terminal marked "TACH". Do not connect the wire to the secondary or high voltage side of the ignition coil. To ensure that the ignition system does not interfere with any other dashboard functions, do not run the tachometer wire close to the other hookup lines, especially the

speedometer input. Also **DO NOT USE solid core ignition wires with this dashboard system**. Solid core ignition wires cause a large amount of electromagnetic and radio frequency interference which can disrupt system operation.

OIL & WATER SENDERS

Using the oil pressure, water temperature, and oil temperature senders included, mount these to the motor using any necessary adapters and wire the senders to the control box location. **Do not use Teflon tape or thread sealant on the sender threads**. Also, locate the fuel sender signal wire and bring it to the terminal at the control box. Refer to the wiring diagram when making the connections to these terminals. The sending unit ground terminal, marked "SEND GND" can be connected directly to the "GROUND" terminal. This terminal is provided so that a separate ground connection can be wired directly from the engine block. Some vehicles will have a small voltage differential between the chassis ground and the engine block ground. This can cause oil pressure and water temperature readings to be slightly high or low. With the "SEND GND" terminal connected directly to the engine block, the readings will remain accurate with ground voltage differentials up to 0.8 volts between the block and the point where the control box is grounded.

WARNING

WARNING: If the separate ground connections are used, the negative terminal on the battery must be connected directly to the engine block. If this is not done, large voltage differences can develop between the ground terminals during engine starting which may damage the control box. The voltage reading displayed by the instrumentation's voltmeter is the voltage between the "+ 12V" terminal and the "SEND GND" terminal.

WIRING POWER TO THE CONTROL BOX

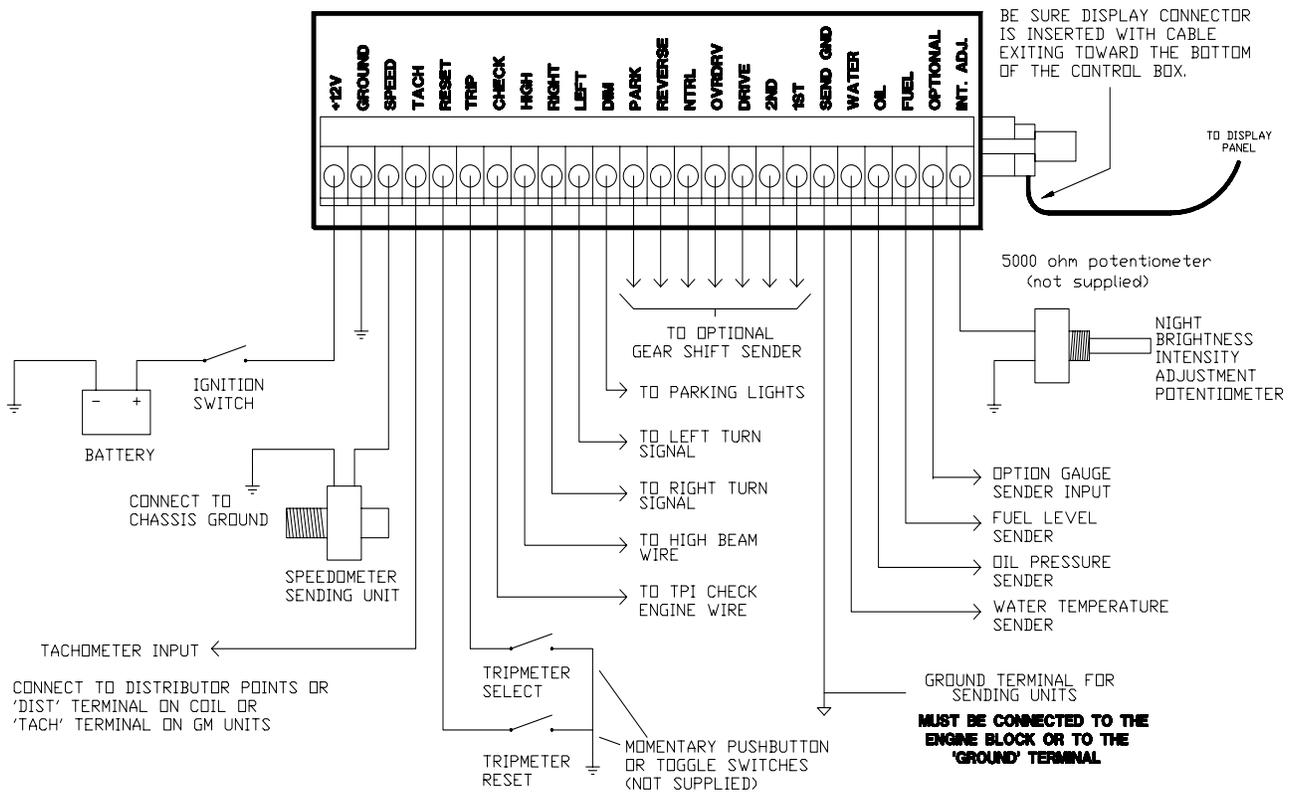
The +12V terminal should be connected to a circuit that is "on" when the key is in the run or accessory position. The control box does not require any power to remember the odometer mileage or calibration settings. The "GND" terminal is connected to the vehicle's ground. The +12V terminal has an internal 2 amp fuse to protect the control box.

In order for the automatic dimming feature of the display system to operate properly, the "DIM" terminal must be connected to the park light circuit. The display system will dim whenever the "DIM" terminal has 12 volts applied to it. The display intensity for nighttime driving is adjustable. There are two different ways to adjust the nighttime brightness intensity.

One method is to use the brightness adjustment located in a hole on the side of the control box labeled "brightness". With the display system on and the headlights on, use a 1/8" slotted screwdriver or a #1 Phillips screwdriver to turn the brightness adjustment. Clockwise increases the display intensity. Do not attempt to turn the adjustment past either stop. Once the desired intensity level is set, the display system will return to this brightness whenever the headlights are turned on.

The second method for adjusting the brightness is by using the optional dash mount intensity control. For the dash mount control to have full control of the display intensity, the brightness adjustment on the side of the control box should be turned fully clockwise. The dash mount intensity control is a 5000 ohm potentiometer, or 'pot'. It has three terminals on it. Connect a wire from the center terminal on the pot to the terminal marked "INT.ADJ." Connect a wire from the left terminal on the pot to ground. The third terminal is not used. The dash mount control will allow full control of the display intensity when the headlights are on. When the headlights are off, the display is always at full intensity.

CONTROL BOX TERMINAL STRIP



DIGITAL DASHBOARD WIRING DIAGRAM

The optional sender input will be used for the oil temperature sender on STR2000 systems

TRIPMETER

As an optional feature, the digital dashboard possesses a fully functional resettable trip meter. To use this, two push-button switches need to be connected to the "TRIP" and "RESET" terminals. These can be connected to either momentary push-button or toggle switches. The trip meter operates as follows:

Pressing the "TRIP" switch will activate the trip meter. Here, the odometer reading is replaced by the trip meter reading. Both the odometer and trip meter readings are updated, and continue to add mileage, even though only one is being displayed. Pressing the "TRIP" button again will return the display back to the odometer reading. This switch essentially toggles between the two readings, odometer and trip meter. When in the trip meter mode, pressing the reset button will reset the trip meter to a reading of "000.0". As shown in the wiring diagram, the switches used will only need to connect these terminals to ground for activation.

The "TRIP" terminal is also used to invoke the built in demonstration routine for show purposes. With power applied to the dashboard, press the button connected to the "TRIP" terminal and hold it for a minimum of seven seconds. The control unit will then switch into the demonstration mode, which runs through a real world scenario. To reactivate the normal dashboard functions, press and release the trip button. The dashboard will return to normal in a few seconds.

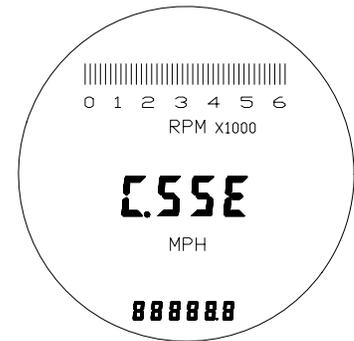
OPTIONAL INDICATORS

High beam and turn signal indicators may also be connected. Just connect the vehicle's high beam wire to the terminal marked "HIGH", and connect the vehicle's turn signal wires to the terminals marked "RIGHT" and "LEFT". Some year specific street rod panels have LED lights mounted in the panel. These systems have two sets of indicators. The LED's can be wired by connecting the black wire to ground and the red wire to high beam or turn signal wires. An optional gear shift indicator is also available. This uses an optional Dakota Digital gear shift sending unit which is easily connected to the control box terminals labeled "PARK", "REV", "NTRL", "DRV", "2ND", and "1ST". Refer to the information card supplied with the sender for more specific instructions, and to the wiring diagram. Call for current pricing information, or check with your local DAKOTA DIGITAL distributor.

PARK (P) -	P
REVERSE (r) -	r
NEUTRAL (n) -	n
OVERDRIVE (O) -	O
DRIVE (d) -	d
2nd (2) -	2
1st (1) -	1

CHECK ENGINE INDICATOR

For customers using computer controlled tune port injected motors, there is a check engine indicator available. The "check engine light" wire must be connected to the terminal marked "check" on the control box. A "C" and an "E" will be displayed and will flash one letter on each side of the speedometer. There is also a provision in the control box to allow a "dot" to be displayed to properly flash all of the engine trouble codes. This dot will be found opposite of the high beam indicator. The "check engine" indicator operates in the same manner as the popular Chevrolet check engine indicator does.



This input may also be used as a brake warning indicator.

To do this, connect it to the wire from the brake pressure switch located on the master cylinder.

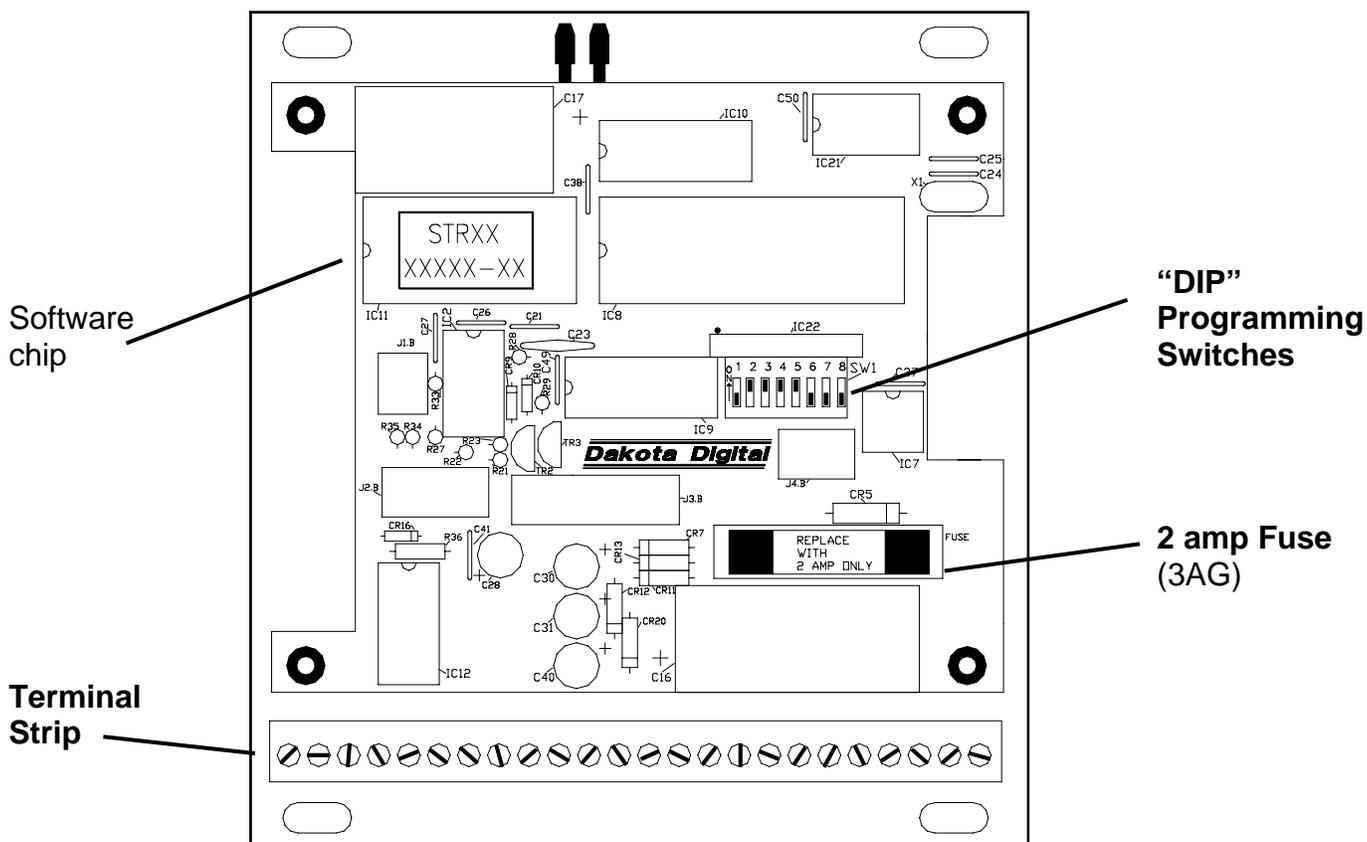
SETTING UP THE CONTROL BOX SPEEDOMETER CALIBRATION

Speedometer calibration is accomplished by adjusting the "SPEED" ADJ" control on the side of the control box. To accommodate different rear end ratios and tire sizes, the digital speedometer of the dashboard has a wide range of calibration. Merely drive down the road with another vehicle going at a constant, know speed. Then using a 1/8" slotted or a #1 Phillips screwdriver have someone adjust the pot (control) until the speedometer reads correctly. The adjustment has 3/4 rotation from stop to stop. **Do not turn the adjustment past either stop.** This adjustment also calibrates the odometer to give accurate mileage readings.

BRIGHTNESS ADJUSTMENT

During normal operation, the dashboard displays are at full intensity. When the vehicle's headlights are turned on, the intensity of the displays can be adjusted by the "Brightness" control, which is located on the side of the control box. This should be done at night with the lights on to activate the dimming circuit. The nighttime driving is adjustable two different ways. Refer to the "WIRING POWER TO THE CONTROL BOX" section of this manual for the instructions to wire both options.

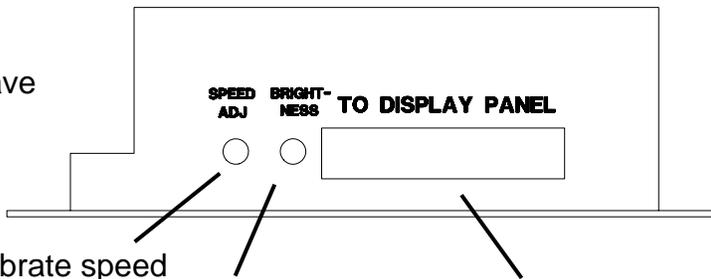
Vacuum/Boost Connection



INTERNAL ADJUSTMENTS

While there are no user adjustable controls on the inside of the unit, there is a bank of eight small switches which are used to set the dash up for different configurations. Your instrumentation was set up at the factory for your particular configuration, but can easily be adjusted to be compatible with different engines or fuel tank sending units by simply setting these switches. To set the DIP switches (the small "computer" style switches), remove the four screws on the top cover and slide the cover up and off. Note the location of the switches numbered 1 through 8 and the numbering on each. Switches 1, 2, and 3 allow the control box to be adjusted so the control box is compatible with many of the popular brands of fuel tank sending units. You should always turn the dashboard off before making any changes to the switch settings. After resetting any of the DIP switches, carefully replace the cover, being sure to line it up properly on the edges.

Speed and Brightness adjustments have $\frac{3}{4}$ rotation from stop to stop. Do not turn past either stop.



Speedometer adjustment – use to calibrate speed

Brightness control – use to adjust night brightness

Plug from display system

DIP SWITCH SETTINGS

The fuel sender selections are as follows:

Switch 1 2 3 sender

Off	Off	Off	VDO, 10-180 ohms
Off	Off	On	Ford, 73-10 ohms
Off	On	On	Stewart Warner & Sun, 240-33 ohms
Off	On	Off	GM, 0-90 ohms
On	On	Off	GM, 0-30 ohms

***** IMPORTANT NOTE *****

The control boxes are normally configured for the Stewart Warner setting. This range will cover the majority of the aftermarket senders available. If the fuel gauge does not operate properly, check the DIP switch settings.

The tachometer range is selected as follows:

Switch 4 range

off 0 - 6000 RPM

on 0 - 8000 RPM

Engine selection is as follows:

Switch	5	6	# of cylinders
	Off	Off	4 cylinder
	Off	On	6 cylinder
	On	Off	8 cylinder

Switch #7 allows you to change the instrumentation from Standard English to Metric readings. The switch should be in the "off" position for the Standard English readings, and in the "on" position when the metric equivalents are desired.

WARNING SYSTEM

The digital dashboard system incorporates an "idiot" light warning system that alerts the driver to any dangerous conditions or conditions that may indicate vehicle trouble. The fuel reading begins flashing when the reading gets below 10%. Voltage levels below 11 volts will prompt a warning as well will water temperatures above 250 degrees Fahrenheit. If the oil pressure drops below 10 PSI with the engine running, the reading flashes to warn the driver of possible serious engine trouble. These levels are built into the software and are not user changeable.

NOTE; A reading of "--" or "---" on any of the displays (instruments) indicate that the particular sending unit is not connected properly.

WIRE COLOR CODE FOR GM WIRING HARNESS

On the connector that originally plugged into the instrument cluster:

Function	Color
+12 volt	Pink/Black or Pink
Ground	Black
Oil sender	Tan or no wire if mechanical
Water sender	Dark green
Fuel sender	Pink or light brown (should not have power)
Left turn	Light blue
Right turn	Dark blue
High beam	Light green
Brake warn	Tan/white or tan

(this will light check engine indicator)

WARRANTY

All DAKOTA DIGITAL instruments are warranted free of defects in material and workmanship for the life of the vehicle in which they are originally installed. In the event of a problem with one of our products, 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.

The above warranties, both expressed and implied, do not cover damages caused by improper assembly, 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 damaged to vehicle, equipment, or non-DAKOTA DIGITAL products.

SERVICE AND REPAIR

DAKOTA DIGITAL offers complete service and repair of its product line. In addition, free 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 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. An authorization number for products being return for repair is not needed. Do not send any money. We will bill you for the repair charges.

TROUBLESHOOTING GUIDE

This is a list of some problems and their solutions which may be encountered when installing your instrumentation system. If you cannot determine what the problem is or how to solve it, please call our technical assistance line (605) 332-6513.

*** A note on vehicle grounding. ***

The most common cause of problems with electric gauges is poor ground connections. The engine block has the highest ground currents of any point in the vehicle. The ignition system, electric gauge senders, starter, alternator, etc. all use the engine block for a ground point. Since the alternator is grounded directly to the engine block all ground currents in the entire vehicle must pass through the engine block while the engine is running. A weak or loose connection can cause all kinds of random problems that may difficult to track down. The engine block should have heavy ground straps to both the chassis and the body. The main negative cable from the battery should be connected directly to the engine block.

Symptom	Possible Problem	Solution
System does not light up.	Control box may not be getting power.	Check if the control box has 12 volts connected to it. Check the fuse inside the control box. If it is blown, replace with a 2 amp fuse.
	The display system may not be getting power.	Insert the connector on the display system wiring harness into the slot on the side of the control box. Be sure the pins line up properly. Check the display system wiring harness for broken or cut wires.
	The control box may have an internal problem	Return the control box to Dakota Digital with a description of the problem and a phone number.
A display shows dashes.	The sending unit for that display is not connected to the control box.	Check the wire from sending unit to the control box for breaks. Make sure that the sending unit is wired to the correct terminal. Make sure the sending unit is grounded properly.
One display does not light up.	If the circle in the upper right corner of the display is white, the display is cracked or broken	Return the display panel to Dakota Digital for repair. Include a phone number and address.
The tachometer will not show a reading.	The control box is not connected to the engine properly	Make sure the control box is connected to your particular system properly.

Symptom	Possible Problem	Solution
The tachometer reading is incorrect.	<p>The tachometer signal wire is loose or broken.</p> <p>The control box is not set up for the proper number of cylinders or the proper tach range.</p>	<p>Check the connections at both ends of the wire.</p> <p>Refer to the Internal Adjustments section of the installation manual to set the control box properly.</p>
The speedometer will not show a reading.	<p>The speed sending unit is not connected to the control box properly.</p> <p>The speed sending unit being used is not compatible with the control box.</p> <p>The speed sending unit is not connected to the transmission properly.</p> <p>The sending unit wire is picking up noise from nearby wires.</p>	<p>Check that both speed sending unit wires are connected to the control box properly.</p> <p>Use the speed sending unit supplied with the display system.</p> <p>Check that sender is mounted properly.</p> <p>Check that transmission has the appropriate internal parts.</p> <p>Isolate the sending unit wire from motor and ignition wires.</p>
The fuel display reads backwards, incorrectly, or does not change.	<p>The control box may be set for the wrong type of fuel sender.</p> <p>The fuel sender may not be connected to the control box properly.</p> <p>The fuel sender may not be operating properly.</p> <p>The fuel sender may have a non-standard resistance range.</p>	<p>Refer to the Internal Adjustments section of the installation manual to ensure that the settings match your fuel sender.</p> <p>Check the connections at both ends of the fuel sender wire.</p> <p>Make sure the fuel sender is grounded properly.</p> <p>Check the fuel sending unit with a mechanical gauge or an electrical multi-meter.</p> <p>If the proper resistance range setting is not available with the control box settings, replace the fuel sender with a different style.</p>
The oil or water display reading is incorrect.	<p>The engine block may not be grounded to the chassis frame properly.</p> <p>The sending unit wire is picking up noise from nearby wires.</p> <p>The sending unit is not compatible with the control box</p> <p>The sending unit has failed.</p>	<p>Connect the SEND GND terminal directly to the engine block.</p> <p>Read the warnings in the manual</p> <p>Use a braided ground strap to ground the engine block to the chassis.</p> <p>Isolate the sending unit wire from motor and ignition wires.</p> <p>Use the sending unit provided the display system.</p> <p>Return the sending unit to Dakota Digital for replacement.</p>

Symptom	Possible Problem	Solution
The gear shift indicator does not light up.	The optional gear shift sending unit is not connected to the control box.	Connect the sending unit to the control box using the instructions supplied with the sending unit.
The gear shift indicator does not operate properly.	The gear shift sending unit is not connected properly.	Check the connections to the transmission linkage and to the control box. Connect 12 volts to the sending unit power wire.
The colored bulbs in the display panel for turn signals and high beam do not light up. (not found on all units)	The LED bulbs are not connected into the auto's electrical system. (these are not wired into the display system control box)	Connect the wires found on the back of the aluminum panel to your cars electrical system as explained in the Optional Indicators section of the manual.
The internal turn signal and high beam indicators do not light up.	The control box is not connected to the vehicle's electrical system properly.	Check the wires connected to the HIGH, LEFT, and RIGHT terminals on the control box.
The check engine indicator does not operate properly.	The control box is not connected to a TPI control module.	This feature is designed to work with engine control systems that provide an active low signal.
The check engine indicator stays on all of the time.	The Engine Control Module (ECM) needs to see the load of a light connected to it.	Connect a light or similar load to the ECM along with the control box.
Trip select and trip reset functions do not operate properly.	Select and reset switches are not connected to the control box.	Momentary push-button or toggle switches must be connected to the TRIP and RESET terminals as described in the Trip meter section of the installation manual
	The wrong type of switch is being used.	The switch terminal connected to the control box should normally be open. When the the switch is activated, the terminal should make contact to ground.
The display system starts up in the demonstration mode and remains in it.	The TRIP terminal is constantly connected to ground.	Disconnect or replace the trip select switch.

Dakota Digital

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