

# ***Dakota Digital***

***SERIES II***

VACUUM FLUORESCENT DIGITAL DASHBOARD

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

INSTALLATION AND OPERATION MANUAL

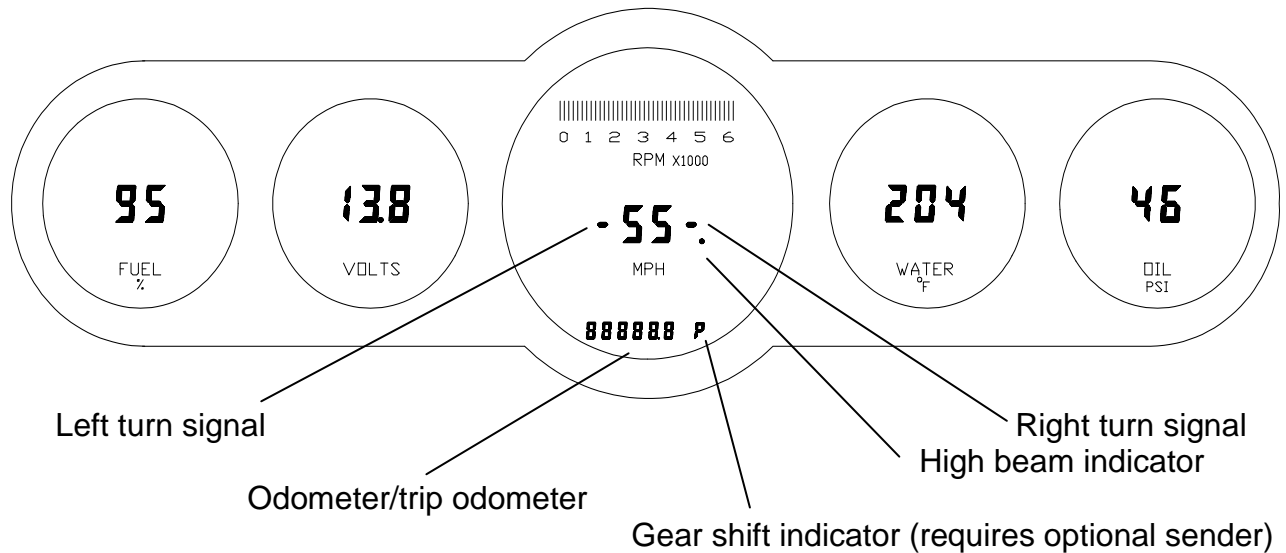
*Please read this before beginning installation or wiring.*

**MODELS STR3D, STR4D, STR5D, & STR6D**

***Dakota Digital***

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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, car, and truck 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.

A demonstration mode or "show" mode is also built into the system. Pressing and holding the TRIP switch for 7-8 seconds with power on will start the gauges going in an animated sequence. Pressing the RESET switch will exit the demonstration mode.

# 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.

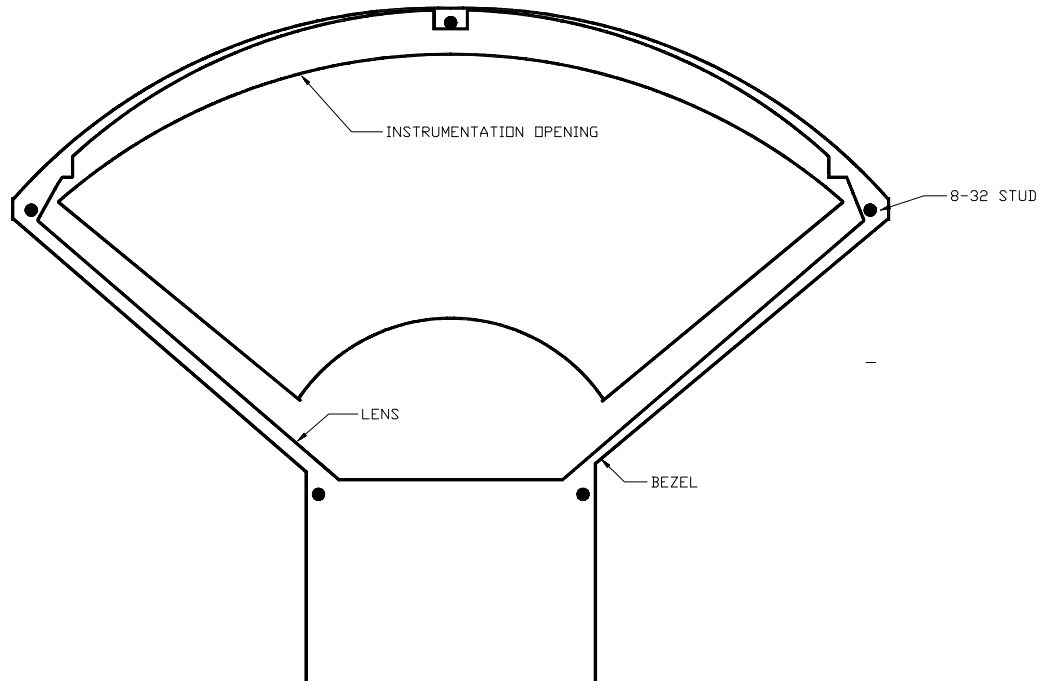
## ***MOUNTING KITS INTO ORIGINAL DASHES***

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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***

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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. Some systems also have a 2-wire connector from the display panel that must also be connected. This plugs in next to the flat gray cable.

## ***Wiring the control box into the vehicle.***

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### ***+12V***

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Connect the +12V terminal to accessory power from the fuse panel or vehicle wiring harness. This terminal should have power when the key is on or in accessory position. In addition to powering the display system, this is also where the voltmeter gauge senses the vehicle electrical system voltage.

Use 20 AWG or larger wire to ensure the system gets good power.

Never connect this to a battery charger alone. It needs to have a 12 volt battery connected to it. Battery chargers have an unregulated voltage output that will cause the system to not operate properly.

### ***GROUND***

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This is the main ground for the display system. A wire should be run from this terminal to the vehicle's main ground location at the chassis or engine block. *This ground wire should also be connected to the control box case.* One of the mounting screws or case lid screws can be used for this. Do not use the dash or a dash support brace for the ground connection.

Use 18 AWG or larger wire to ensure sufficient grounding. Proper vehicle grounding is extremely important for the gauges to read and operate correctly. The engine block should have heavy ground cables to the battery, frame, firewall, and body. Failure to properly ground the engine block or the control box can cause incorrect or erratic operation.

### ***DIMMING***

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The gauges are designed to dim down when the headlights are turned on. This is to reduce the display intensity at night so the gauges do not cause eye strain or reduced night vision. Connect this to the tail light or parking light circuit so that it has 12 volts whenever the headlights are on. When this terminal does not have power the display system will be at full brightness. When power is applied, the display dims to an adjustable level. The night brightness level is adjustable two different ways.

The default method is to have the system to dim to a preset level when the lights are turned on. This brightness is adjusted by turning the shaft protruding from right side of the control box, next to the display system connector. Turning the shaft clockwise will decrease the brightness. The shaft will rotate  $\frac{3}{4}$  turn from stop to stop. Do not attempt turn it past the stops. See DIM ADJ for a description of the second method.

### ***DIM ADJ***

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The second method allows you to have a dash mounted control to vary the brightness while the headlights are on. This requires a 10k potentiometer or Dakota Digital's DIM-1 kit. A stock headlight rheostat will not work. The dash mount dimmer has two wires, one connects to the DIM ADJ terminal and the other connects to ground. To allow the dash mount dimmer to have full control, the shaft on the side of the control box must be turned fully counter-clockwise. The dash mount dimmer will only vary the display brightness when the DIMMING terminal has power.

## SPEED

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The vehicle speed sensor (VSS) connects to this to tell the system how fast the vehicle is moving. For two wire speed sensors, like the one Dakota Digital supplies with this system, the polarity of the wires does not matter. Connect one wire to ground and the other to the speed terminal. The speed sensor ground wire should be brought back to the control box to ensure a proper signal is received. Twisting the ground and signal wires around each other provides an additional level of interference protection. The speed signal wire should not be routed along side ignition or other high current or high voltage wires.

For vehicles which already have a vehicle speed signal, tap into the VSS wire and connect it to the speed terminal. You may have to consult a vehicle service manual or wiring diagram to determine wire color and location.

This system can accept 4000 ppm – 128000 ppm speed signals. The sensor that Dakota Digital provides is an 8000 ppm type. The speedometer is fully adjustable and calibration is discussed in a later section. ***Failure to calibrate the speedometer may cause your odometer mileage to increase very rapidly if the speedometer is reading too fast.***

## TACH

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Depending on the type of system that you have there may be no tachometer, a bar graph tachometer, a digital tachometer, or both bar graph and digital readouts. Connect the tach terminal to the ignition system. On vehicles using a separate ignition coil, connect to the negative side of the coil. The negative side of the coil will be the wire that goes to the points or electronic ignition module. For GM HEI ignition equipped motors, connect the tach terminal to the terminal marked "TACH" or on some systems, to a single white wire with a spade terminal on it. On MSD ignition systems, connect to the TACH output terminal. With magneto system connect to the kill wire for the tach signal. Do not connect the TACH terminal 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 along side any other sender or input wires. **DO NOT USE SOLID CORE SPARK PLUG WIRES WITH THIS DASHBOARD SYSTEM.** Solid core ignition wires cause a large amount of electromagnetic and radio frequency interference which can disrupt the system operation.

The tachometer is compatible with 4, 6, 8, and 10 cylinder gasoline engines. There are DIP programming switches inside the control box that set the number of cylinders, tach bar graph full scale range, and tach display type. These settings are discussed later in the section on internal adjustments. If a diesel engine is being used and the alternator has a tach output, then Dakota Digital's DSL-1 interface will convert the alternator signal to operate the tachometer.

## WATER

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The water temperature sender included with this system must be used. Other senders will cause incorrect readings. The sender mounts on the engine block or into the intake manifold so that the end of the sensor is in the engine coolant flow. The sender gets its electrical ground connection to the engine block through its threads. ***Do not use Teflon tape or thread sealant on the sender threads.*** Doing so can cause incorrect readings or cause the gauge to display an out of range indication. A sender with 3/8 NPT thread size is normally included and 1/8 NPT thread size is available. If the engine you have requires a different thread size you will need to use an adapter to convert the thread size. Adapters can be found at your local auto parts dealer or hardware store.

A single wire should be run from the terminal on top of the water sender to the control box terminal marked WATER. If your wiring harness already has a wire routed through the vehicle for the water temperature then it may be used. Do not route the water sender wire along side a spark plug wire or other high current or high voltage wires. Doing so can cause incorrect or erratic gauge readings.

If the water display shows “---“ this indicates that the control box is sensing a short to ground or out-of-range error from the sender or sender wire. If the water display shows “EEE” this indicates that the control box is sensing an open circuit or out-of-range error from the sender or sender wire. If either indication remains on the display, inspect the sender wire for damage, check the routing of the sender wire, check the sending unit grounding, and check that the correct sending unit is connected. The sending unit should be stamped with “VDO” and “150°C”.

Replacement sender part numbers are:

	Dakota Digital	VDO equivalent
1/8" NPT	SEN-04-1	323 057
3/8" NPT	SEN-04-2	323 059
1/2" NPT	SEN-04-4	323 060
12mm	SEN-04-6	323 092

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## OIL

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The oil pressure sender included with this system must be used. Other senders will cause incorrect readings. If the sender mounting location is too small or is restricted, then pipe fittings may be required to move the sender away from the restrictions. Oil pressure line may also be used to remote mount the sender to the fire wall. The sender gets its electrical ground connection to the engine block through its threads. *Do not use Teflon tape or thread sealant on the sender threads.* Doing so can cause incorrect readings or cause the gauge to display an out-of-range indication. If the sender is being remote mounted away from the engine, make sure the sender case is ground well. The sender has 1/8 NPT thread size. If the engine you have requires a different thread size you will need to use an adapter to convert the thread size. Adapters can be found at your local auto parts dealer or hardware store.

A single wire should be run from the terminal on top of the oil sender to the control box terminal marked OIL. If your wiring harness already has a wire routed through the vehicle for the oil sender then it may be used. Do not route the oil sender wire along side a spark plug wire or other high current or high voltage wires. Doing so can cause incorrect or erratic gauge readings.

If the oil display shows “—“ this indicates that the control box is sensing a short to ground or out-of-range error from the sender or sender wire. If the oil display shows “EE” this indicates that the control box is sensing an open circuit or out-of-range error from the sender. If either indication remains on the display, inspect the sender wire for damage, check the routing of the sender wire, check the sending unit grounding, and check that the correct sending unit is connected.

Replacement sender part numbers are:

	Dakota Digital	VDO equivalent
100 psi	150015	360 086

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## FUEL

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The fuel gauge sending unit is not normally supplied with the system. The display system will usually use the fuel sending unit that is already in the tank. The sending units that are compatible with this system are as follows: GM, Ford, VDO, and Stewart Warner. The Stewart Warner sender type is used by most after-market gauges. **The DIP programming switches inside the control box must be set to indicate which sender type you are using.**

A single wire should be run from the fuel sender to the control box terminal marked FUEL. If your wiring harness already has a wire routed through the vehicle for the fuel sender then it may be used. If using a wire from an existing harness, make sure that the wire does not have power. The fuel sender gets power from the control box only. Fuel senders get their ground from the sender mounting plate. Make sure that a ground wire is connected from one of the sender mounting bolts to the vehicle frame.

The fuel sender type is selected using the DIP programming switches located inside the control box. The settings are discussed later in the section on internal adjustments.

If the fuel display shows “—” this indicates that the control box is sensing a short to ground or out-of-range error from the sender or sender wire. If the fuel display shows “EE” this indicates that the control box is sensing an open circuit or out-of-range error from the sender. If either indication remains on the display, inspect the sender wire for damage, check the routing of the sender wire, check the sending unit grounding, and check that the DIP programming switches are set correctly for the sending unit that is connected.

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## *TRIP*

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The TRIP terminal is used for the trip odometer function, for setting the oil warning set point (see WRN), and for speedometer calibration (see SPEEDOMETER CALIBRATION). The TRIP input is activated by a ground connection. The push button switch supplied (or any normally open switch) is wired by connecting one terminal to TRIP and the other terminal to a ground. When the trip button is pressed, the odometer display will switch from full odometer mileage to the trip mileage or from the trip mileage to the full odometer mileage. When the trip mileage is shown a lower case “t” will be displayed to the left of the trip meter reading. “t 000.0” Pressing and holding the trip button for 7-8 sec. will enter the demonstration mode.

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## *RESET*

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The RESET terminal is used for the trip odometer function, for setting the water warning set point (see WRN), and for the speedometer calibration (see SPEEDOMETER CALIBRATION). The RESET input is activated by a ground connection. The push button switch supplied (or any normally open switch) is wired by connecting one terminal to RESET and the other terminal to a ground. When the reset button is pressed and held for a few seconds, the trip miles will be reset to zero. This will not affect the full odometer mileage. Pressing the reset button will also exit the demonstration mode.

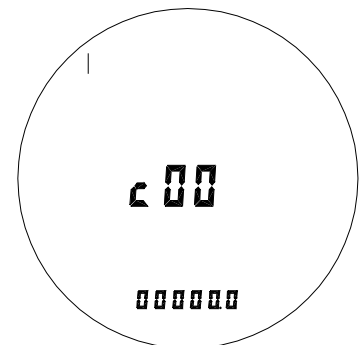
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## *CHECK*

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The check engine terminal is used with fuel injection ECM's to display engine problems and trouble codes. The CHECK input is activated by a ground signal from the ECM. Whenever the check input is grounded the system will display a lower case “c” to the left of the speedometer. When the ECM is placed into diagnostic mode trouble codes can be read by counting the flashes. Consult a service manual for the fuel injection system that you have for further information on trouble codes.

With some ECM's a 12 volt light bulb may need to be connected in addition to our CHECK input in order to provide proper current loading. In this case both the bulb and our display system indicator would both come on when the check engine wire was set.

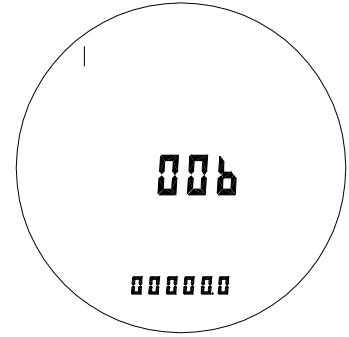


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## *BRAKE*

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The BRAKE terminal can be used as a brake system warning indicator. The BRAKE input is activated by a ground signal from the brake pressure switch on the master cylinder or from the parking brake set switch. Connect a wire from this terminal to the pressure switch on the master cylinder or consult a vehicle service manual to determine color and location of an existing wire. Whenever the BRAKE input is grounded the system will flash a “b” to the right of the speedometer.



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## *HI BEAM*

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The HI BEAM terminal is activated by a 12 volt signal from the headlight high beam wire. When the terminal has 12 volts, a dot will light up to the lower right of the speedometer display. An existing wire from the vehicle for the high beam indicator can be used or a new wire can be connected from the high beam side of the hi beam/low beam switch.

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## *LEFT*

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The LEFT terminal is activated by a 12 volt signal from the turn signal switch. When this terminal has 12 volts, a dash will light up to the left of the speedometer display. An existing wire from the vehicle for the left turn indicator can be used or a new wire can be connected from the turn signal switch.

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## *RIGHT*

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The RIGHT terminal is activated by a 12 volt signal from the turn signal switch. When this terminal has 12 volts, a dash will light up to the right of the speedometer display. An existing wire from the vehicle for the right turn indicator can be used or a new wire can be connected from the turn signal switch.

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## *WRN*

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The WRN terminal is a dual function input and output. The output is ground-activated when the preset rpm limit is exceeded. This output can turn on a 4 Watt or smaller 12 volt bulb or can activate a relay to turn on a larger bulb. To wire a warning light to this output, connect one wire from the bulb to 12 volt accessory power and connect the other wire to the WRN terminal.

The input is used to set the water, oil, and rpm warning set points. See the Gauge Warning section for a description of how to set these.

## MPH/KPH

The MPH/KPH terminal is activated by a 12 volt signal from a push button or toggle switch(not supplied). When the display system is in English mode (MPH & °F) by placing DIP programming switch #7 off, applying 12 volts to this terminal will convert the speed reading from MPH to KPH. The odometer will continue to accumulate miles correctly, but will display dashes. The bar speed display, if present, will not be affected.

When the display system is in Metric mode (KPH & °C) by placing DIP programming switch #7 on, applying 12 volts to this terminal will convert the speed reading from KPH to MPH. The odometer will continue to accumulate kilometers correctly, but will display dashes. The bar speed display, if present, will not be affected.

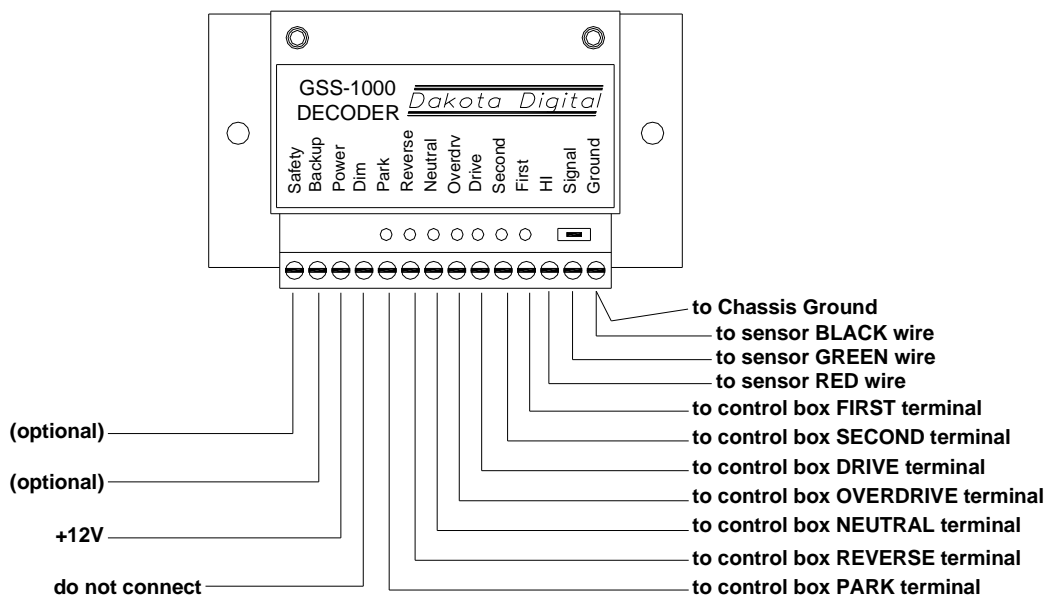
This input is provided to allow a convenient method of switching from MPH to KPH or from KPH to MPH while crossing borders or driving in areas with different speed markings.

## GEAR SHIFT INDICATOR INPUTS

The PARK, REVERSE, NTRL, OVRDRV, DRIVE, 2<sup>nd</sup>, and 1<sup>st</sup> terminals are used for the gear shift indicator. The inputs are activated by a 12 volt signal from a gear shift sending unit. The indicator is built into every system but it will not light up unless a Dakota Digital GSS-1000 or compatible gear shift sending unit is connected to tell it what gear the transmission is in. The gear shift sending unit is not included with the system and must be purchased separately.

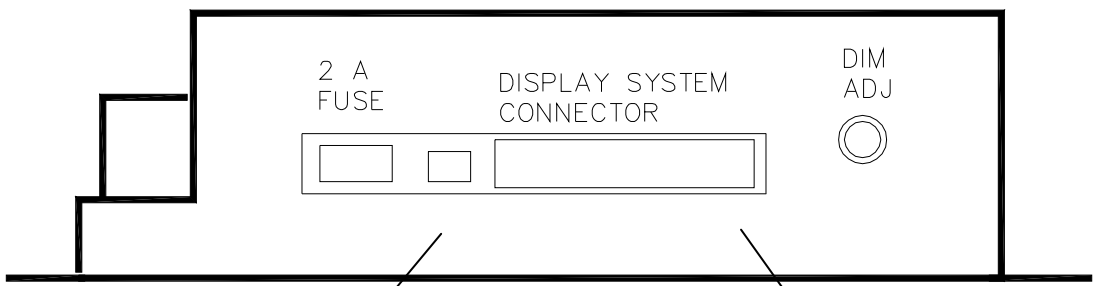
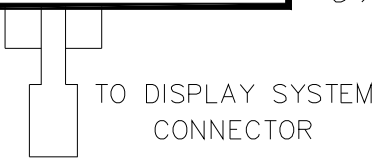
When the gear shift sending unit is connected, a letter will light up to the right of the odometer to indicate what gear the transmission is in. Below is a chart showing the display indicators for each of the gears and a wiring diagram using Dakota Digital's GSS-1000 adjustable gear shift sending unit. If you have a different gear shift sending unit, consult the wiring instructions supplied by the manufacturer.

PARK (P) –	<b>P</b>
REVERSE (r) –	<b>r</b>
NEUTRAL (n) –	<b>n</b>
OVERDRIVE (O) –	<b>O</b>
DRIVE (d) –	<b>d</b>
2nd (2) –	<b>2</b>
1st (1) –	<b>1</b>



CONTROL BOX TERMINAL STRIP DESCRIPTIONS

WATER TEMPERATURE SENDER INPUT	<input type="checkbox"/>	H2O	WATER
OIL PRESSURE SENDER INPUT	<input type="checkbox"/>	OIL	OIL
FUEL LEVEL SENDER INPUT	<input type="checkbox"/>	FUL	FUEL
CURRENTLY NOT USED	<input type="checkbox"/>	EX	EX
TRIP ODOMETER RESET INPUT	<input type="checkbox"/>	RS	RESET
TRIP ODOMETER SELECT INPUT	<input type="checkbox"/>	TR	TRIP
CHECK ENGINE INDICATOR INPUT	<input type="checkbox"/>	CK	CHECK
BRAKE SYSTEM WARNING INPUT	<input type="checkbox"/>	BK	BRAKE
HIGH BEAM INDICATOR INPUT	<input type="checkbox"/>	HI	HI BEAM
LEFT TURN SIGNAL INDICATOR INPUT	<input type="checkbox"/>	LT	LEFT
RIGHT TURN SIGNAL INDICATOR INPUT	<input type="checkbox"/>	RT	RIGHT
RPM WARNING OUTPUT/SET INPUT	<input type="checkbox"/>	RCL	WRN
SPEEDOMETER MPH/KPH CONVERSION INPUT	<input type="checkbox"/>	E/M	MPH/KPH
GEAR SHIFT INDICATOR PARK INPUT	<input type="checkbox"/>	P	PARK
GEAR SHIFT INDICATOR REVERSE INPUT	<input type="checkbox"/>	R	REVERSE
GEAR SHIFT INDICATOR NEUTRAL INPUT	<input type="checkbox"/>	N	NTRL
GEAR SHIFT INDICATOR OVERDRIVE INPUT	<input type="checkbox"/>	O	OVRDRV
GEAR SHIFT INDICATOR DRIVE INPUT	<input type="checkbox"/>	D	DRIVE
GEAR SHIFT INDICATOR 2nd INPUT	<input type="checkbox"/>	2nd	2nd
GEAR SHIFT INDICATOR 1st INPUT	<input type="checkbox"/>	1st	1st
TACHOMETER INPUT	<input type="checkbox"/>	TCH	TACH
VEHICLE SPEED SENSOR INPUT	<input type="checkbox"/>	SPD	SPEED
NIGHT DIMMING ADJUSTMENT INPUT	<input type="checkbox"/>	ADJ	DIM ADJ
GAUGE NIGHT DIMMING INPUT	<input type="checkbox"/>	DIM	DIMMING
+12 VOLT ACCESSORY POWER IN TO MAIN CHASSIS OR ENGINE GROUND	<input type="checkbox"/>	12V	+12V
	<input type="checkbox"/>	GND	GROUND



Optional display power connector found on some systems.

Insert cable with red stripe to right side.

## Setting up the control box

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### *SPEEDOMETER CALIBRATION*

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The speedometer calibration is done using the TRIP and RESET switches. There are two different ways to calibrate the speedometer. The first method control box uses an auto-cal mode where you drive one mile (1 km for metric) and the system automatically adjusts the speedometer calibration. The second method allows you to adjust the speedometer up or down as you drive.

To enter the auto-calibration mode, begin with the key off. Press and hold both the trip and reset switches at the same time while the vehicle is being started. The speed will display "CAL". Once the switches are released the control box will begin measuring. As you drive the odometer will display the number of pulses received from the sensor. If the reading stays at zero as you drive, then check the vehicle speed sensor and speed sensor wiring. Once you have driven exactly one mile (or km) press and hold both of the switches again. The system will calculate and store the new speed calibration. Once the switches are released the system will restart and go back to normal operation.

While the system is in the auto-cal mode the voltage, fuel, oil, and water gauges will remain blank will not change until the speed calibration is completed.

To enter the speedometer adjust mode, press and hold both the trip and reset switches at the same time while the system is on and operating. The switches will need to be held for about 4-6 seconds. The odometer will display "AdJUST" and the other gauges will function normally. Release the switches. Pressing and holding the TRIP switch will increase the speedometer reading. Pressing and holding the RESET switch will decrease the speedometer reading. Pressing and holding both the TRIP and RESET switches at the same time will store the current speed calibration and exit the speed adjust mode. While the system is in speed adjust mode the odometer will continue to accumulate normally, even though it is not displayed.

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### *FUEL DIP SWITCH SETTINGS*

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The control box can read 5 different types of fuel senders. The DIP programming switches are located inside the control box, so the cover must be carefully removed to get access to the switches. Make sure the key is turned off before opening up the control box so that there is no power to the system. The switches labeled 1, 2, and 3 are used to select the different sender types. Once the switches have been set, replace the cover before turning the system on. The sender types are listed below, along with their corresponding empty and full resistance readings. If you do not know what type of sender you have, use an ohmmeter to measure the fuel sender resistance when it is full and empty.

Sender type	Empty R	Full R	Switch #1	Switch #2	Switch #3
GM 0-30 ohm	0 ohms	30 ohms	ON	ON	OFF
GM 0-90 ohm	0 ohms	90 ohms	OFF	ON	OFF
GM 40-250	40 ohms	249 ohms	ON	ON	ON
FORD	73 ohms	10 ohms	OFF	OFF	ON
VDO	10 ohms	180 ohms	OFF	OFF	OFF
SW/SUN	240 ohms	33 ohms	OFF	ON	ON

SW/SUN is the default setting when systems are shipped.

## TACHOMETER DIP SWITCH SETTINGS

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The control box will work with 4, 6, 8, and 10 cylinder ignition systems. The DIP programming switches are located inside the control box, so the cover must be carefully removed to get access to the switches. Make sure the key is turned off before opening up the control box so that there is no power to the system. The switches numbers 5 and 6 select the number of engine cylinders. The settings are as follows:

Engine cylinders	Switch #5	Switch #6
4	ON	ON
6	OFF	ON
8	ON	OFF
10	OFF	OFF

Bar tach	Switch #4
6000 rpm	OFF
8000 rpm	ON

The default setting when systems are shipped from the factory is 8 cylinder.

Tachometer display type	Switch #8
Bar tach only (no digital numbers)	OFF
Both a digital and bar tach display	ON

In addition, the tachometer bar graph can be set to read 6000 rpm at full scale (switch #4 OFF) or 8000 rpm at full scale (switch #4 ON). This option would have been specified when the order was originally placed and the switch should be set to match the display system lens engraving. Systems with both a digital and bar graph tachometer are always set for 8000 full scale (switch #4 ON).

Because some systems have a digital speedometer with a bar graph tachometer directly above it (55 Chevy car) and some systems have separate digital speedometer and digital tachometer, each having their own bar graph readout (73 Chevy pickup), switch #8 selects which style display system is being used. For 5-gauge systems with a bar graph tachometer directly above the speedometer, turn switch #8 OFF. For 6-gauge systems with a bar graph speedometer directly above the digital speedometer, turn switch #8 ON. This is set correctly at the factory before shipping to match the display system that it is paired with.

## METRIC SELECTION DIP SWITCH SETTINGS

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Switch #7 selects whether the temperature will be displayed in °F or °C and also sets the speedometer for MPH or KPH. For MPH/°F turn switch #7 OFF. For KPH/°C turn switch #7 ON. Changing switch #7 does not change the speedometer calibration. Speedometer calibration is discussed in another section. This switch will be set from the factory to match the display system lens engraving. If this is changed, a new lens should be purchased so that the labeling matches the gauge readings.

## GAUGE WARNING FEATURE

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The gauges have the built in feature to alert you when they are outside their normal operation range. The fuel display will flash whenever the fuel level is below 10% to indicate low fuel. The voltage gauge will flash whenever the system voltage is below 11.0 volts and the engine is running. The water gauge will flash whenever the temperature is higher than the water warning set point. The oil gauge will flash whenever the oil pressure is below the oil warning set point and the engine is running. The WRN output will be activated whenever the rpm warning set point is exceeded. A single. lit bar on the right half of the rpm bar display shows the current rpm warning set point. The rpm warning set point can either be used as a shift indication or as a red line indication. The rpm warning output is triggered off the bar tach and is updated every 1/8 second.

The water, oil, and rpm warning set points are user adjustable. They are preset at the factory to 250 for water, 10 for oil, 4560 for 6000 bar tachs, and 6080 for 8000 bar tachs. The warning set points are adjusted using the TRIP, RESET, and WRN terminals.

To enter the warning adjust mode, ground the WRN terminal while the system is being turned on. The speedometer will display "AdJ". Release the ground from the WRN terminal. The current warning set points will be displayed. The RESET, TRIP, and WRN inputs adjust the water, oil, and rpm warning set points respectively. Once the set points have been changed, if an input is not activated for 8 seconds the values will be saved and the system will begin operating normally.

To change the water warning set point, press and hold the RESET button until the desired value is shown. The range is from 194 – 254°F in 2° increments (90 – 123°C).

To change the oil warning set point, press and hold the TRIP button until the desired value is shown. The range is from 2 – 30 psi in 2 psi increments.

To change the rpm warning set point, ground the WRN terminal until the desired value is displayed. For 0-6000 bar tachs, the range is from 2160-5760 rpm in 120 rpm increments. For 0-8000 bar tachs, the range is from 2880-7680 rpm in 160 rpm increments.

## GAUGE SPECIFICATIONS

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Gauge	Minimum reading	Maximum reading	Resolution	Accuracy
WATER	0°F (0°C)	302°F (150°C)	1 - 2°	±5°F(±3°C)
OIL	0 psi	99 psi	1 psi	±3
FUEL	0% (empty)	99% (full)	1 - 3%	±5 -- ±15
VOLT	8.0 volts	18.0 volts	0.1 volt	±0.1
SPEED	0 mph (kph)	255 mph (kph)	1	±1%
ODOMETER	00000.0 miles (km)	99999.9 miles (km)	0.1	±0.5%
TRIP METER	000.0 miles (km)	999.9 miles (km)	0.1	±0.5%
TACH bar	400 rpm	6000 rpm or 8000 rpm	120 or 160	±80 rpm
TACH digital	400 rpm	9990 rpm	10	±40 rpm

Power requirements: 11 – 15 volts dc  
(Battery chargers cannot be used for powering or testing this system.)

## **WIRE COLOR CODE FOR GM WIRING HARNESS**

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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

## **WARRANTY**

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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**

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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

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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 or email to dakotasupport@dakotadigital.com.

**\* 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. Do not use a battery charger to power the system. Check the fuse on the control box. If it is blown, replace with a <b>2 amp</b> 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.
The speed and tach light, but the fuel, volt, oil, and water do not.	Display power harness is not connected.	Plug the 2-wire harness into the control box. The mating connector is located next to the fuse.
One display does not light up at all, all others work correctly.	The display panel 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 ignition system properly.
	The control box is not set up correctly for your display system	Make sure switch #8 is OFF if you have a bar graph only.

Symptom	Possible Problem	Solution
The tachometer reading is incorrect.	The tachometer signal wire is loose or broken. The control box is not set up for the proper number of cylinders or the proper tach range.	Check the connections at both ends of the wire. Refer to the Internal Adjustments section of the installation manual to set the control box properly.
The speedometer will not show a reading.	The speed sending unit is not connected to the control box properly. The speed sending unit being used is not compatible with the control box. The speed sending unit is not connected to the transmission properly. The sending unit wire is picking up noise from nearby wires.	Check that both speed sending unit wires are connected to the control box properly. Use the speed sending unit supplied with the display system. Check that sender is mounted properly. Check that transmission has the appropriate internal parts. Isolate the sending unit wire from motor and ignition wires.
The speedometer is reading too fast or too slow.	The speedometer is not calibrated.	Refer to the Speed Calibration section of the installation manual.
With the engine running and the vehicle sitting still, the speedometer reads higher than zero.	A tachometer wire is too close to the speed sensor wire. There is a ground problem between the speed sensor and the control box.	Reroute or isolate the tachometer wire away from the speed wire. Make certain the ground wire for the speed sensor is connected directly to the control box ground.
A display shows "EE"	Sending unit for that gauge is not connected to the control box. Sending unit is not getting grounded. On the water or oil, the sending unit is not the correct type. On the fuel, the control box may be set for the wrong fuel sender.	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. Make sure the water and oil senders have clean threads. Use the water and oil senders that were supplied with the system. Refer to "Fuel DIP switch settings" section of the installation manual to ensure that the settings match your fuel sender.
A display shows "- -"	The sending unit wire for that gauge is shorted to ground.	Repair or replace shorted wire.
Fuel displays "FL"	The control box is set to an invalid fuel sender setting.	Refer to "Fuel DIP switch settings" section of the installation manual to ensure that the settings match your fuel sender.

Symptom	Possible Problem	Solution
The fuel display reads backwards, incorrectly, or does not change.	The control box may be set for the wrong type of fuel sender.	Refer to "Fuel DIP switch settings" section of the installation manual to ensure that the settings match your fuel sender.
	The fuel sender may not be connected to the control box properly.	Check the connections at both ends of the fuel sender wire. Make sure the fuel sender is grounded properly.
	The fuel sender may not be operating properly.	Check the fuel sending unit with a mechanical gauge or an electrical multi-meter.
	The fuel sender may have a non-standard resistance range.	If the proper resistance range setting is not available with the control box settings, replace the fuel sender with a different style.
The oil or water display reading is incorrect.	The engine block may not be grounded to the chassis frame or body properly.	Use heavy ground cables from the battery to the engine block. Make sure both ends of the cable have clean metal-to-metal connections. Use a braided ground strap to ground the engine block to the chassis. Use a large braided ground strap to ground the engine block to the body or fire wall.
	The threads are not grounding to the engine block.	Make sure no thread sealant is used on any of the threads.
	The sending unit wire is picking up noise from nearby wires.	Isolate the sending unit wire from motor and ignition wires.
	The sending unit is not compatible with the control box	Use the sending unit provided the display system.
	The sending unit has failed.	Return the sending unit to Dakota Digital for replacement.

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 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 wrong type of switch is being used.	
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.
The speed always shows "AdJ".	The WRN terminal is constantly connected to ground.	Check wiring to the WRN terminal for a short to ground.

# ***Dakota Digital***

## **CLOCK**

### Wiring instructions for VFD systems with a clock built in.

#### Introduction:

The clock displays the current time in 12 hour format with an AM/PM indicator. The AM/PM indicator appears as a dot that will be displayed in the upper left corner. The dot will be on every other 12 hour period (on during AM and off during PM). The high brightness display matches our other Odyssey and STR series gauges and has the same night brightness dimming capability. Features included are:

- Quartz accuracy.
- Night dimming feature.
- Very low standby power to prevent battery drain.
- High Visibility VFD display for sunlight readability.

#### Operation:

The gauge needs the red, orange, and black wires connected to operate. The red wire should have switched 12 volt power from an ACC. point on the fuse panel. The orange wire should have constant 12 volt power. The black wire should be connected to a good ground point. When the blue wire has 12 volts, it will dim the display for night viewing.

#### Setting the time:

Using a small, thin object such as a pen or hairpin, press “set” buttons through front lens access holes. The access holes are on the right side of the lens. Top “set” button advances hours, bottom “set” button advances minutes.

#### Wiring:

- |        |   |   |
|--------|---|---|
| BLACK  | - | connect to a good ground point in the vehicle.  |
| RED    | - | connect to switched 12 volt power point.<br>(An accessory terminal will work for this.) |
| ORANGE | - | connect to a constant 12 volt power point.<br>(This will keep the correct time.)        |
| BLUE   | - | connect to the tail light circuit.  |

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