Display Dash Installation Manual

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Introduction

Racepak part number 250-DS-IQ3 is an IQ3 display only dash. It does not have a built-in data logger, GPS or accelerometers as does the IQ3LD model. It can be used with any Racepak VNET capable data logger, such as the G2X, G2XPro and V300SD for use as a dash board display. This manual makes the assumption that you have installed the most current version of the DataLink PC software and IQ3 firmware. DataLink updates can be found at http://www.racepak.com/IQ3Dash/downloads.htm. As of this writing, the most current DataLink version is 3.5.1.

Items Included With the IQ3 Display Dash PN 250-DS-IQ3

| Item	Part Number
IQ3 Display Dash	UNIT-DS-IQ3
Wire Harness	280-CA-HARNIQ3
VNET Tee Cable, 36 inch length	280-CA-VM-T036
Installation Manual	MANL-IQ3LD

IQ3 Display Dash Features

28 programmable items on 4 pages
Programmable sequential shift lights
4 programmable warning lights with on-screen text warning
5 character programmable alpha/numeric text per display channel
Two Programming Button inputs
Shielded, anti-glare coated display for sunlight viewing
Blue backlight
Gear indicator
External Warning or Shift Light Output
Compatible with all Racepak VNET data loggers and sensors

Hardware Features

External Dimensions

2.1″ (5.3cm)

4.1″ (10.5cm)

7.3″ (18.6cm)

1″ (2.54cm)

::Racepak
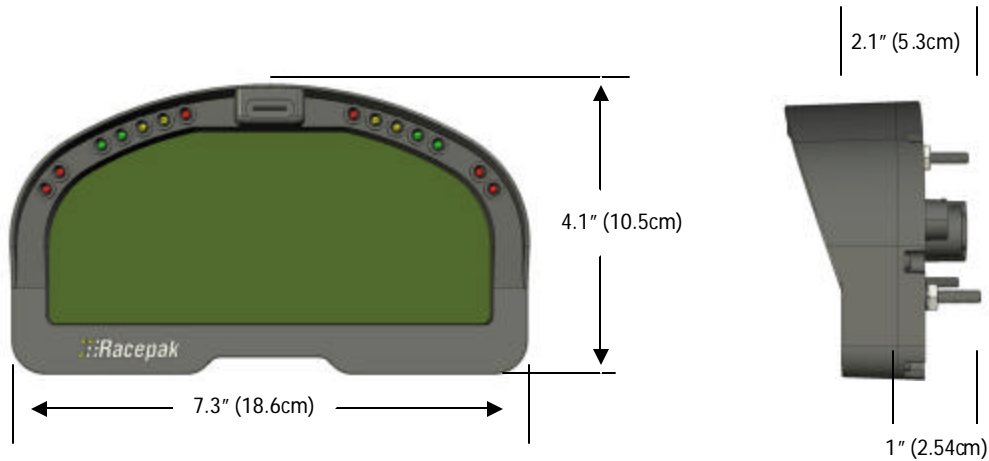
External Features – Front

Shift Lights

Shift Lights

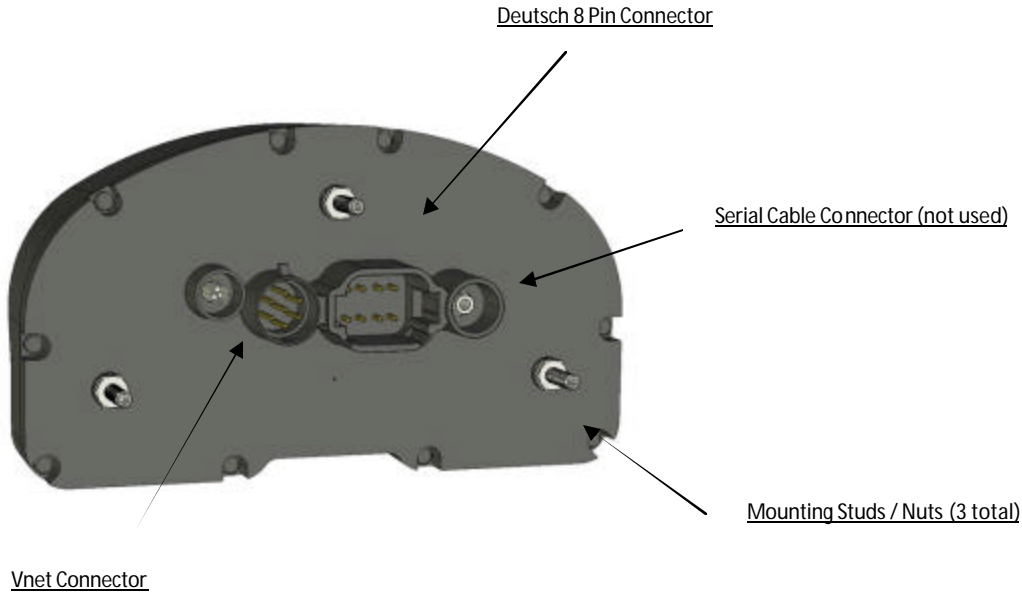Warning 2

Warning 3

Warning 1

Warning 4

::Racepak

Shift Lights	Fully programmable sequential shift lights
Warning Lights 1 &2	Fully programmable warning lights for Inputs 1 & 2
Warning Lights 3 & 4	Fully programmable warning lights for Inputs 3 & 4

External Features – Rear

Deutsch 8 Pin Connector

Serial Cable Connector (not used)

Mounting Studs / Nuts (3 total)

Vnet Connector

Vnet Connector	Provides connection to VNET data bus
Deutsch 8 Pin Connector	Provides input programming buttons and output for external warning or shift light
Serial Cable Connector	Provides input for serial communications (not used)
Mounting Studs & Nuts	Three #10 studs and 10-32 nuts facilitate mounting

Mounting Dimensions
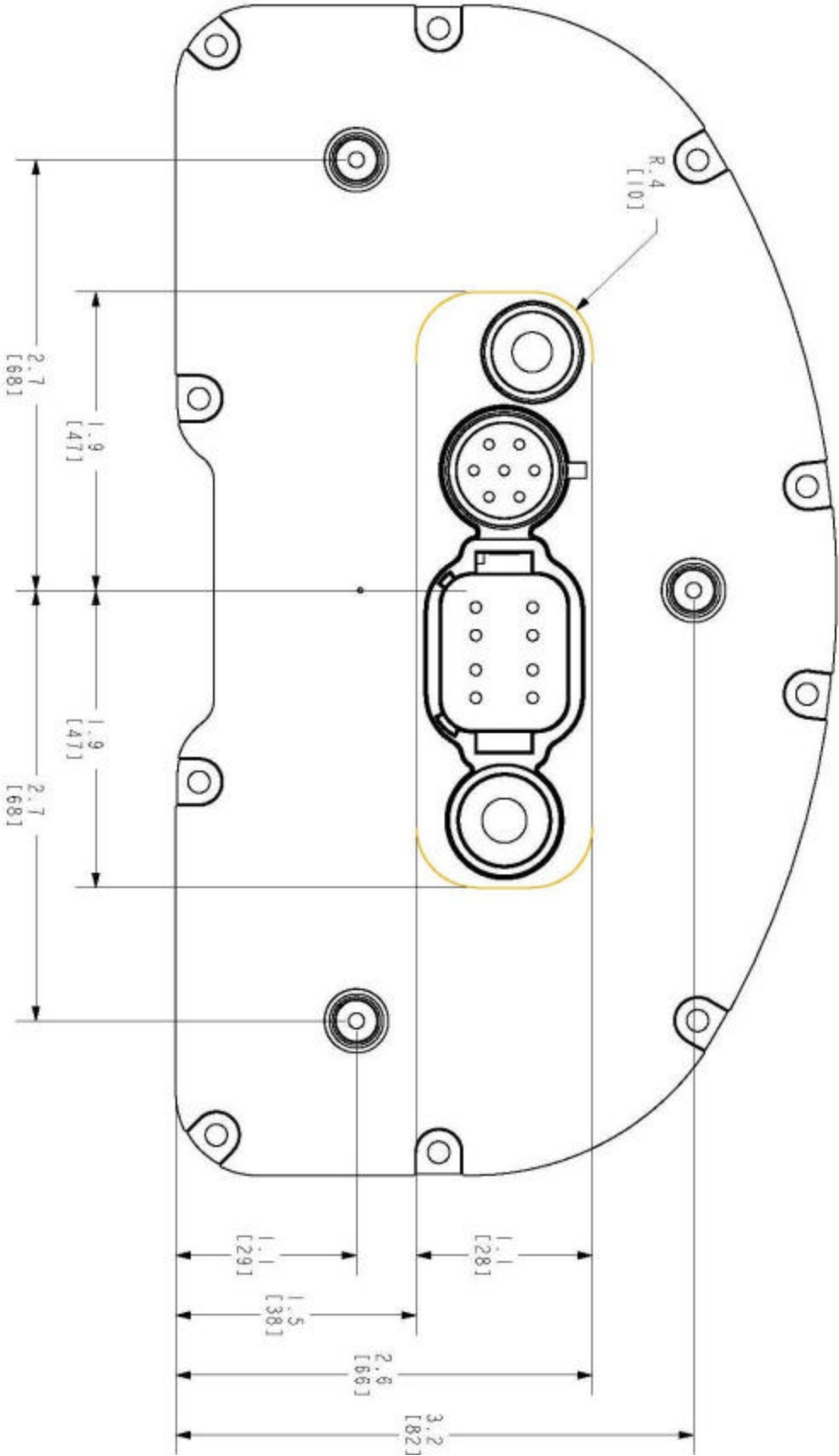
Installation

The design of the IQ3 greatly simplifies the installation process, as power and data is provided through a single VNET cable. However, there are a few basic guidelines that must be followed in order to insure correct operation of the product.

Mounting Location

The IQ3 is designed to be utilized in a race vehicle environment and as designed as such. However, there are external conditions that can influence the operation and longevity of the product.

Heat
Avoid excessive heat, such as generated from exhaust systems, transmissions, etc.

Electrical Interference
Avoid electrical interference. Race vehicles generate electrical interference from a variety of locations such as ignitions, alternators, ECU, spark plugs, coils and radio/telemetry antennas. This interference can affect the data generated by any or all of the sensors.

Moisture
Avoid excessive moisture. The IQ3 is designed to be water resistant but not waterproof. If washing the vehicle, cover before washing. Wipe any remaining moisture off of the IQ3, when finished.

Movement
It is important to insure the IQ3 cannot become dislodged during use. Three #10 studs are provided in order to provide secure mounting.

Mounting Method

Three #10 studs, washers and nuts are supplied with the IQ3, to be utilized for mounting. If desired, the studs can be unscrewed from the threaded inserts located in the dash housing.

VNET Connection

The supplied VNET tee cable is used to provide power to the IQ3 and communication with your data logger and sensors. When connecting any VNET display or sensor to your data logger care must be take to ensure you have properly installed the VNET termination caps that were provided with your data logger. Failure to properly install the termination caps can result in communication problems on the VNET data bus. Also, care must be taken not to route any VNET cable in close proximity to any of the vehicles secondary ignition components, i.e. ignition coil and spark plug wires.
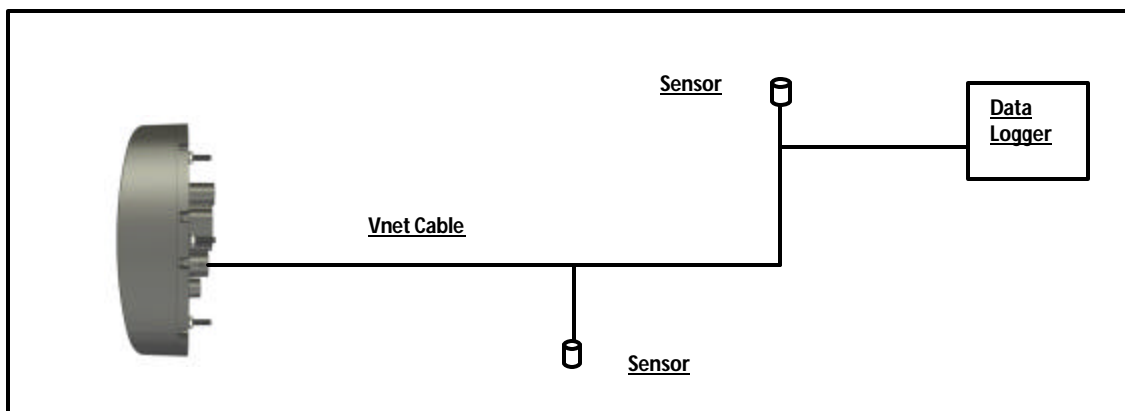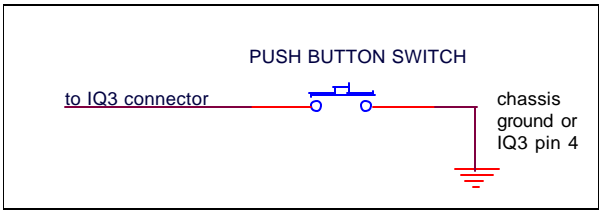
Programming Button Connection

The rear of the IQ3 contains an 8 position Deutsch connector. This connector provides connection to the external program button inputs and external warning or shift light output. The IQ3 is provided with the appropriate 8 position mating connector and wiring.

Pin Number	Function	Wire Color
1	Button 1	BLUE
2	Do Not Use	NOT USED
3	Button 2	WHITE
4	Button Ground	BLACK
5	Do Not Use	NOT USED
6	Do Not Use	NOT USED
7	Do Not Use	NOT USED
8	External Warning	ORANGE

External Programming Button and Warning Light Wiring Diagram

BUTTON WIRING DIAGRAM

PUSH BUTTON SWITCH

to IQ3 connector

chassis ground or IQ3 pin 4

EXTERNAL WARNING WIRING DIAGRAM

WARNING LIGHT

to IQ3 connector pin 8

to 12v vehicle power
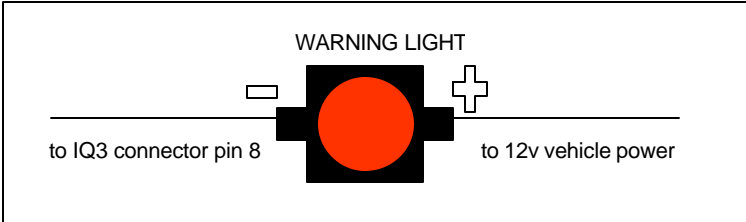
Programming the IQ3 Using the External Buttons

External Programming Buttons

A variety of IQ3 display functions can be controlled, displayed or programmed through use of two external programming buttons known as Button 1(RED) and Button 2 (BLACK). This enables the driver to make immediate changes, without the necessity of connecting a PC to the data logger. Instead of mounting the programming buttons in the dash, Racepak provided the ability to remote mount the two programming buttons, for better driver access.

Racepak offers a Programming Button Package PN: 280-SW-IQ3BTN or the customer may provide their own momentary contact button. If buttons other than Racepak are utilized, insure they are normal open momentary switches and they are capable of withstanding the environment in which they will be utilized.

Many of the programming functions found in the following section may also be performed through us of the DataLink software and users PC. Those instructions can be found in the section Programming the IQ3 Using the DataLink Software.

Factory Default Display Settings

From the factory, Page 1 of the IQ3 is programmed to display the following items. The remaining three display pages are not programmed from the factory, which allows for customized programming by the customer.

Note: The center position will display the number of satellites locked in when the vehicle speed is below 5 MPH/KPH.
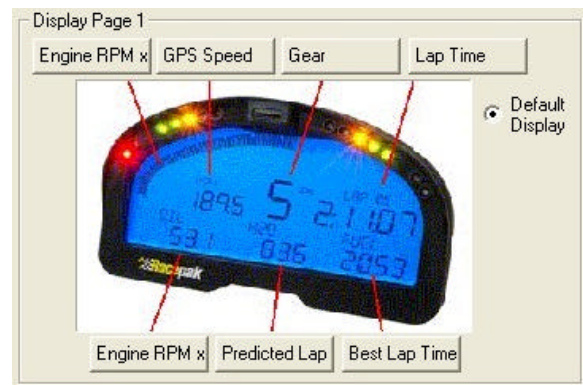
Programming Button Operation

Programming functions of the IQ3 are accessed by using Button 1 and Button 2. Button 1 is considered Left Button and Button 2 is considered Right Button. It is recommended the two programming buttons be mounted as Left and Right, in relation to the driver's position viewing the dash. Since the IQ3 only utilizes two buttons, it was necessary to allow multiple uses for each button. The length of time the button is held down determines the programming action taken. The shift lights are used to indicate the action taken with each button.

The following instructions will refer to short, medium and long button press lengths. This is the length of time the button is held down and the corresponding shift light blink.   The point at which the button is released determines the type press that is accepted. Releasing after the second shift light flash is detected as a medium length press.

Type of Button Press	Length of Time	Shift Light Flash
Short Press	.2 Second	One Flash Of Shift Lights
Medium Press	.5 Second	Two Flash Of Shift Lights
Long Press	2 Seconds	Three Flash Of Shift Lights
Auto Repeating Long Press	3 Seconds	Repeats Every .2 Seconds

While the IQ3 is in display mode, the programming buttons will perform the following functions:

Button	Short Press(1 flash)	Medium Press(2 flashes)	Long Press (3 flashes)
Button 1 (Blue wire)	Clear any Active Warnings	Enter Setup Mode 1	Set Start/Finish Line (GPS data loggers only)
Button 2 (White wire)	Advance to Next Display Page	Enter Setup Mode 2	Enter Lap Time Replay Mode (GPS data loggers only)

Programming Modes

There are two programming modes available.
Setup Mode 1 (Stationary): Utilized to program items such as screen brightness or pulses per revolution (tach programming).

Setup Mode 2 (Moving): Utilized to program the system while the vehicle is moving and or the engine is running. This is necessary as several settings utilize actual data taken from speed or rpm, in order to program.

Button Functions

| Button Type	Setup Mode 1	Setup Mode 2
Button 1 (left button)	Enters Programming Adjusts Settings	Advances To Next Page Saves Changes and Exits
Button 2 (right button)	Advances To Next Page Saves Changes and Exits	Enters Programming Adjusts Settings

Setup Mode 1 (stationary programming)

Setup Mode 1 is used to program the unit without the need to operate the vehicle.

Entering Setup 1
1. Press and hold Button 1 (left button) for TWO shift light blinks – MEDIUM press
2. **The Dash will display SETUP 1?**
3. Confirm by pressing Button 1 for ONE shift light blink – SHORT press

The following are in the order in which the individual programming features will appear.

Setting as Displayed on Dash	Program Setting Description	Programming Command ✿✿✿✿✿	Accept and Advance ⟹	Accept and Exit EXIT
BACKLIGHT	0 = Off 9 = Max Brightness	Short Press Button 2 to increase value	Short Press Button 1	Long Press Button 1
TACH PULSES GPS data logger only	Number of pulses ignition fires per revolution V8=4 4 Cyl=2 0=Min 20=Max	Short Press Button 2 to increase value	Short Press Button 1	Long Press Button 1
SHIFT STEP	Programs RPM between each shift light. Example: If shift point is 5000 rpm with a 100 step, first shift light illuminates at 4600 RPM. Multiply your Step setting by 4 and subtract from Shift Point to determine start of shift light	Short Press Button 2 Advances by 10 Medium Press Button 2 Decreases by 10 Long Press Button 2 Quickly advances	Short Press Button 1	Long Press Button 1
SHIFT GEAR X X=Gear number	Program shift point for each gear.	Short Press Button 2 Advances by 10 Medium Press Button 2 Decreases by 50 Long Press Button 2 Quickly advances	Short Press Button 1	Long Press Button 1

| Setting as Displayed on Dash	Program Setting Description	Programming Command ✿ ✿ ✿ ✿ ✿	Accept and Advance ⟹	Accept and Exit EXIT
GEAR RATIO X X=Gear Number	Ratio between engine RPM and GPS speed (not final drive ratio) Requires tach signal Recommend programming in Setup Mode 2	Short Press Button 2 Advances by .1 Medium Press Button 2 Decreases by 5 Long Press Button 2 Quickly advances	Short Press Button 1	Long Press Button 1
TIME ZONE GMT GPS data loggers only	Sets data and time stamp on run file, based on customer location time zone in relation to GMT. East coast standard time USA = -5 GMT	Short Press Button 2 Increases by 1 Medium Press Button 2 Decreases by 1	Short Press Button 1	Long Press Button 1
SPEED UNITS GPS data loggers only	Defines Speed in MPH or KMH for dash display purposes	Short Press Button 2 Toggles MPH and KPH	Short Press Button 1	Long Press Button 1
ODOMETER	Sets the current odometer value.	Short Press Button 2 Increase by 10 Medium Press Button 2 Decrease by 1000 Long Press Button 2 Increase by 100	Short Press Button 1	Long Press Button 1
DEFAULT DISPLAY	Default page on power up. If all positions are disabled, that page will not be displayed. 1 = Min 4 = Max	Short Press Button 2 Advances	Short Press Button 1	Long Press Button 1

Setup Mode 2 (moving programming)

Setup Mode 2 allows the user to utilize inputs from the moving vehicle, in order to automate the programming process.

The following are in the order in which the individual programming features will appear.

Entering Setup 2
1. Press and hold Button 2 (right button) for TWO shift light blinks – MEDIUM press
2. The Dash will display SETUP 2?
3. Confirm by pressing Button 2 for ONE shift light blink – SHORT press

Setting as Displayed on Dash	Program Setting Description	Calibrate Setting ✿✿✿✿✿	Accept and Advance ⟹	Accept and Exit EXIT
TACH CAL GPS data loggers only	Calibrate tach input with engine running. 1. With vehicle in parked position, start engine and bring to 2000 RPM and hold 2. Long Press Button 2	Long Press Button 2	Short Press Button 1	Long Press Button 1
GEAR RATIO X X=Gear Number	Calibrates gear ratio for Gear Indictor. 1. Insure tach input is functioning. The value -0.1 will display if no tach or speed. 2. Drive car in first gear 3. When speed and RPM are constant Long press Button 2 4. Dash gear indicator will advance to next gear 5. Repeat process for remaining gears. Program any unused gears the same as your highest gear.	Long Press Button 2	Short Press Button 1	Long Press Button 1
ACCEL CAL GPS data loggers only	Provides the ability to calibrate the accelerometers in the data logger. See the instructions for provided with your data logger for specific details.	Long Press Button 2	Short Press Button 1	Long Press Button 1

NOTE: Setup Mode 2 programming requires the vehicle to be running and/or in motion. Care

should be taken when driving the vehicle to insure safe operation. If possible, take a passenger along to operate the IQ3 and perform the calibration procedures.

Setting the Start/Finish Location (GPS Data Loggers Only)

To set the set start/finish position using the external programming buttons perform the following:

1) Press and hold Button 1 for 3 LED flashes or until the text SET START/FINISH appears on the bottom of the display.
2) Drive the vehicle at a speed no less than 10 MPH towards the start/finish location.
3) Press and release Button 1 (1 LED flash) at the point you wish to set the start/finish.
4) The dash will respond YES if successful and NO if unsuccessful.   Note: If you do not receive a YES|NO response, you will need to update your data logger firmware.

Reviewing Lap Times (Lap Time Replay Mode, GPS Data Loggers Only)

You can review your lap times from the previous session by entering in to Lap Time Replay Mode. To enter Lap Time Replay Mode enter a long button press (3 flashes) on button 2. The text "Lap Replay Mode" will display across the bottom of the display. While in Lap Time Replay Mode buttons 1 and 2 will perform the following functions.

| Type of Button Press	Button 1	Button 2
Short Press – 1 flash	Decrement Lap Number	Increment Lap Number
Medium Press – 2 flashes	Jump to Best Lap	Exit Lap Time Replay Mode
Long Press – 3 flashes	Jump to First Lap	Jump to Last Lap

Programming the IQ3 Using the DataLink Software

Many display functions of the IQ3 can be programmed utilizing the two external programming buttons, as outlined in the Programming the Display By External Buttons section of this manual, page 24. However, it is also possible to program many of these same functions along with additional functions, using the DataLink software and you data logger.

Serial Com Port Settings

Connect your PC to your data logger using the serial cable provide with your data logger. If your IQ3 is not connected to a Racepak data logger you can also program the dash through the serial communication port on the back of the IQ3. You will need to use the IQ3 programming cable provided in your IQ# Display Dash kit.

The DataLink software is set from the factory to communicate through COM3. If your PC is using a different COM port number, it will be necessary to match the DataLink and PC com port settings.

1. Open the DataLink II program. The connection to your PC is made through the 9 pin serial port, located at the back of the PC or via a USB to Serial Port adaptor.

2. Connect the supplied serial communication cable between your PC's serial port or USB to Serial adaptor and your data logger. Turn on the power to your data logger.

3. Click **Settings** on the main menu bar and select **Scan COM Ports**.

4. The DataLink program will check COM ports 1-9 for the presence of a Racepak data logger. If found, DataLink will automatically configure the proper COM port setting for you. If a Racepak data logger was not found, and you are using a USB to Serial Port adaptor, insure that you have properly installed the device adaptor driver on your PC. A driver disk should have been provided on a disk by the adaptor manufacturer at time of purchase. If you cannot find the device driver disk, the drivers are frequently available on the manufactures website as a free download.
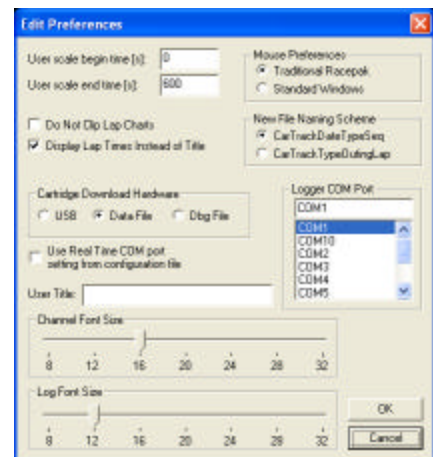
5. You can also manually configure the COM port settings under **Setting → Preferences**.

## *Adding the IQ3 Display to Your Data Logger Configuration File*

1. Open the DataLink software and select *File* from the main menu area
2. Select *Open Car Configuration* from the pull down menu.
3. A Select Configuration dialog window will open. A list of folders containing Configuration files will appear on the left side, while the actual Configuration files appear on the right side. If you are programming the IQ3 through a Racepak data logger then select the appropriate configuration file for your data logger. If you are programming the IQ3 through the serial port on the back of the dash then select IQ3 in the left window and select IQ3_NonLogger_Config in the right window.
4. Click *Edit* on the menu bar and select *Read VNET Config*.
5. A message log will appear and should begin reading your system configuration. When finished the message log should display ******DEVICES READ SUCCESSFULLY******.
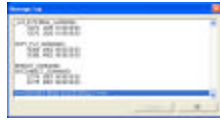
6. Click on the OK button. You should now see a new channel button labeled IQ3 Display.

Programming the IQ3

Right click over the IQ3 Logger Channel Button. This action opens the following window:
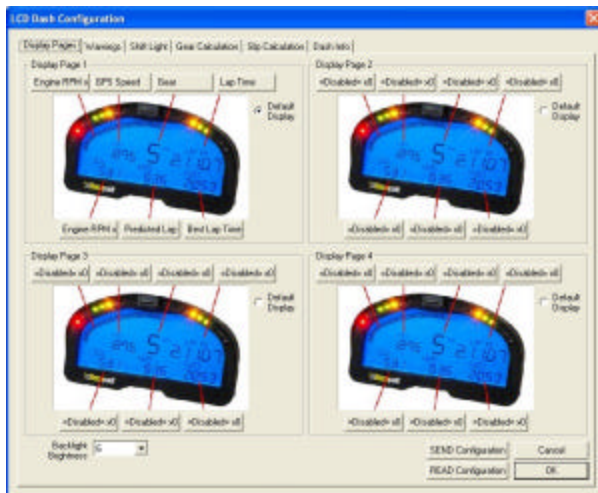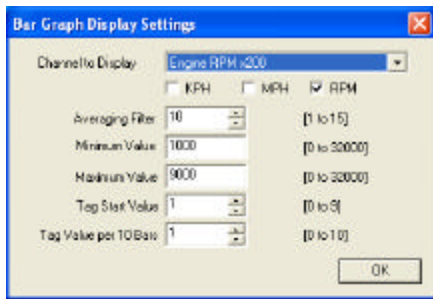

Each programming function is accessed by tabs located across the top of the page, as outlined in the following section.

All programming changes to the IQ3 must be finalized by selecting the **Send Configuration** button found in the bottom left corner of each programming page.

Bar Graph (Sweep Tach)

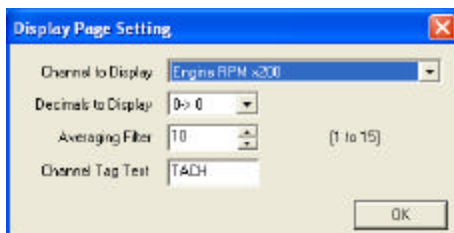| Function	Description
KPH MPH RPM	Selection defines channel name on dash
Channel to Display	Pull down arrow selects channel for bar graph data
Averaging Filter	Smooths displayed data. 10 is default
Minimum Value	Determines starting point for bar graph
Maximum Value	Determine ending point for bar graph
Tag Start Value	Determines start value for bar graph
Tag Value per 10 Bars	Determines value for each 10 bar segment. There are a total of 8, 10 bar segments for 80 total bars.
OK	Closes window following programming changes

Gear Indicator (center of dash)
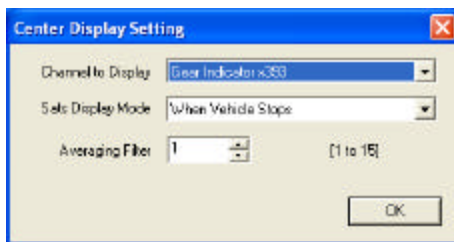
| Function	Description
Channel To Display	Pull down arrow selects sensor channel
Averaging Filter	Smooths displayed data. 10 is default
Sats Display Mode	Selects when to display the number of acquired Satellites in the center display.
OK	Closes window following programming changes

Remaining Inputs

Function	Description
Channel to Display	Pull down arrow selects sensor channel
Decimals to Display	Number of digits to display after decimal
Averaging Filter	Smooths displayed data. 10 is default
Channel Tag Text	Name displayed. 5 total characters

As shown above, to program an input area, simply locate the desired sensor channel by use of the pull down arrow, select the sensor channel, then define the remaining values for Decimals to Display, etc.

Warnings

The IQ3 provides the ability to program up to four individual warning channels. The face of the dash contains four warning lights. Each warning light is associated with a single warning channel. To program each individual warning channel.
1. Select the "Warnings" tab.
2. Next, left click on the warning light you would like to program. This action will open the Warning Light text box.
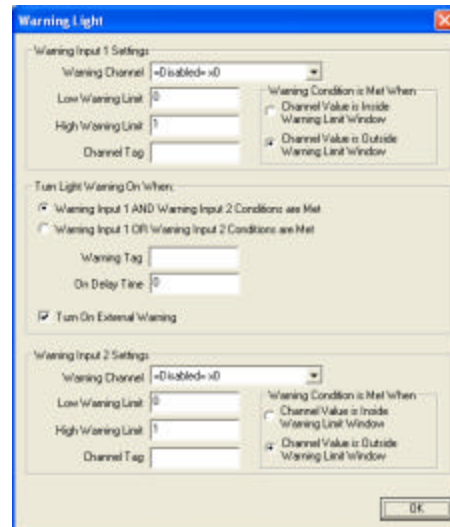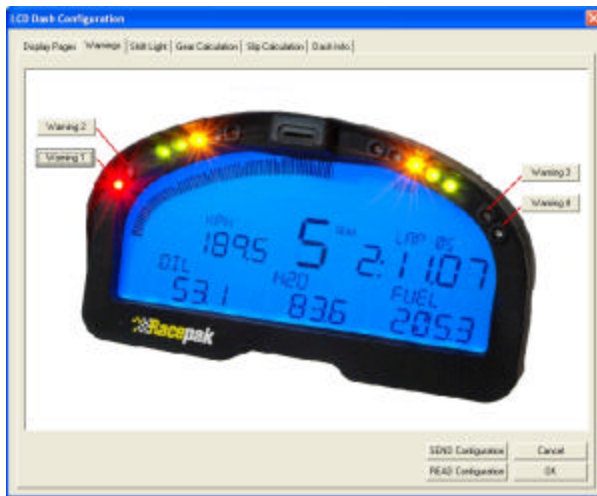

Warning Parameter	Description
Warning Channel	Sensor input to be used to trigger warning.
Low Warning Limit	Sensor value to trigger warning when below this value.
High Warning Limit	Sensor value to trigger warning when above this value.
Channel Tag	Text to be displayed above warning channel value when warning is activated. 5 chars max.
Channel Value is Inside Warning Limit Window	Triggers warning when sensor value is between Low and High Warning limits.
Channel Value is Outside Warning Limit Window	Triggers warning when sensor value is below Low Warning Limit and above High Warning Limit.
Warning Input 1 AND Warning Input 2 Conditions Are Met	Requires that warning 1 **and** warning 2 conditions are met to activate warning.
Warning Input 1 OR Warning Input 2 Conditions Are Met	Requires that warning 1 **or** warning 2 conditions are met to activate warning.
Warning Tag	Text displayed to the left of warning channel value(s) when warning is activated. 5 chars max.
On Delay Time	Time is seconds to delay before warning is activated.
Turn On External Warning	Turns on external warning when warning channel is activated.

Example Warning Setup

The dash warning setup allows the user to trigger a warning light based on one sensor channel or two sensor channels. In addition, a specific text warning may be programmed to display, when the warning parameters are met.

In the example setup below, the dash warning was programmed as follows:

Warning Channel One: Oil Pressure below 30 PSI	
Text Above Warning Channel One: OIL	
Warning Channel Two: Engine RPM above 1000	
Text Above Warning Channel Two: TACH	
Text To Display When Warning Values Are Met: OILP	
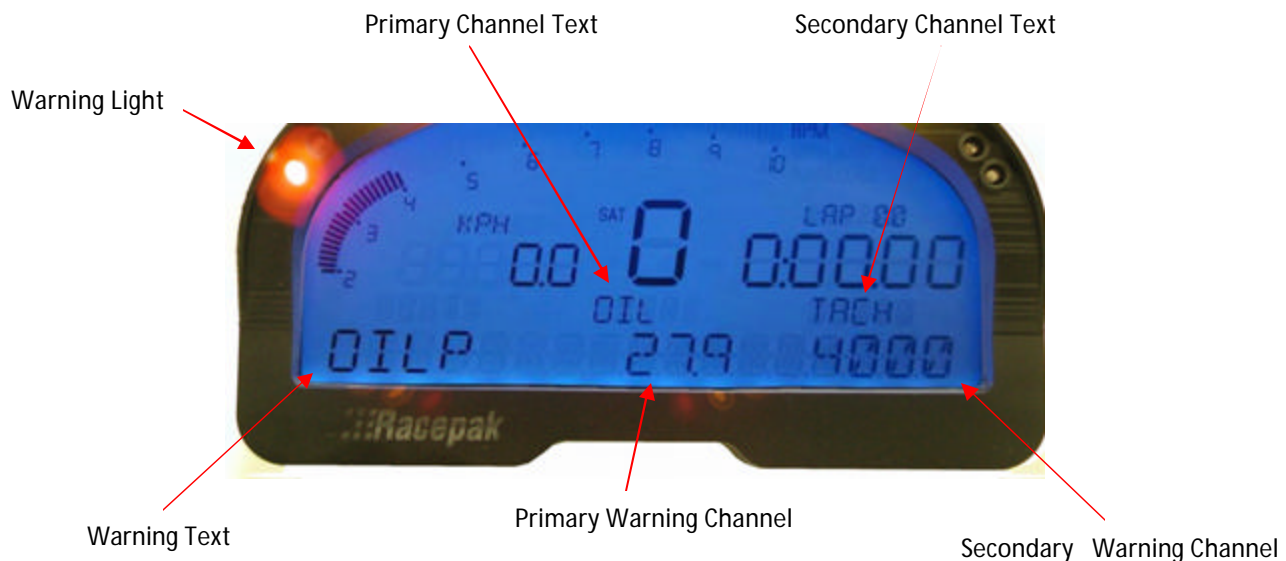
When at least one programmed warning channel is activated, the warning text will alternate between the warning channel data the normal display page data once a second.

To clear ALL active warning, enter a SHORT press on Programming Button 1. This will clear the warnings until the warning channel goes out of warning and then back in to warning again.

Shift Lights

To program the shift lights, simple determine the RPM Channel to activate the shift lights (typically Engine RPM) then select the shift point for each gear. Finally, select the RPM Interval between each shift light.

Example: Shift point for each gear is 5000 RPM. Interval is 100 RPM. With 5 shift lights in use (10 total lights that are displayed two at a time), the software will calculate back from the programmed shift point and start the shift lights at 4600 RPM and increment to 4700, 4800, 4900 and with all lights on at 5000.

Shift Light Formula: Shift Light Interval x 4 minus Shift Point = Starting Point of Shift Lights
100 x 4 = 400. 5000 – 400 = 4600 (start of shift lights)
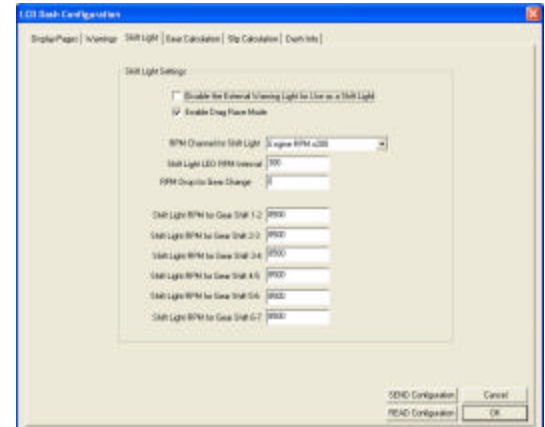
Drag Race Mode

When Drag Race Mode is enabled, the current gear is no longer calculated using RPM/Speed ratios input in the Gear Calculation tab. Instead, the current gear is determined by detecting and counting the RPM drop at each gear change. As the name suggest, Drag Race Mode should almost always be used in drag racing applications only.

Disable the External Warning Light for Use as a Shift Light

When enabled, the output driver on Pin 8 of the wire harness will operate as a shift light instead of warning light. The feature is most commonly used in drag racing applications.

Gear Calculation

The gear position is most easily configured using the IQ3 Setup Mode 2 programming. The IQ3 derives the gear position by calculating the ratio between the engine rpm and speed at the time each gear is programmed. The selected speed channel is also used to maintain the odometer.

It is also possible to manually enter the ratio values using the Gear Calculation page. However, the ratio value is not the transmission or final drive ratio, but instead is the ratio between engine rpm and GPS speed. DataLink can calculate these ratios for you by entering the transmission ratio for each gear and the final drive ratio in the transmission for FWD vehicles or differential gear ratio RWD vehicles. Enter the tire rollout in inches if the speed channel you have selected is in MPH units. Enter the tire
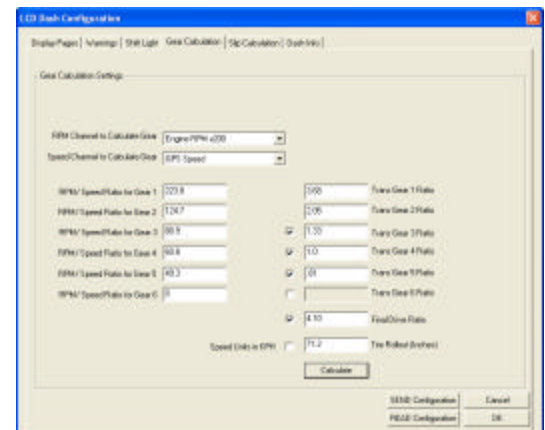
rollout in centimeters if the speed channel you have selected is in KPH units and check the "Speed Units in KPH" box. Uncheck all unused gears to disable them. After you have entered all of the required information click the "Calc" button to calculate and fill in the RPM/Speed ratios. Click the "SEND Configuration" to program the ratios in to the IQ3.

▽ Since only the RPM/Speed ratio values are programmed in to the IQ3, the transmission ratios and tire rollout values are not saved in the DataLink configuration file. You will need to reenter these values each time you need to make a change. The formula used to calculated the RPM/Speed ratio when speed in in MPH units is shown below.

1 / (Tire Rollout / 12 * 60 /5280) / (Gear Ratio (n) * Final Drive Ratio) = RPM/Speed Ratio for Gear(n)

Slip Calculation

The Slip Calculation provides the ability to display slip data based on propeller vs. speed or tire vs. speed for use with wheel driven vehicles. The slip calculation can only be used for display purposes. It is not recorded on microSD card. If you need to record a slip calculation, you can create one via the DataLink software math channel feature.

RPM Channel to Calculate Slip: Typically Engine RPM or the rpm channel that provides final drive to the propeller or wheels.
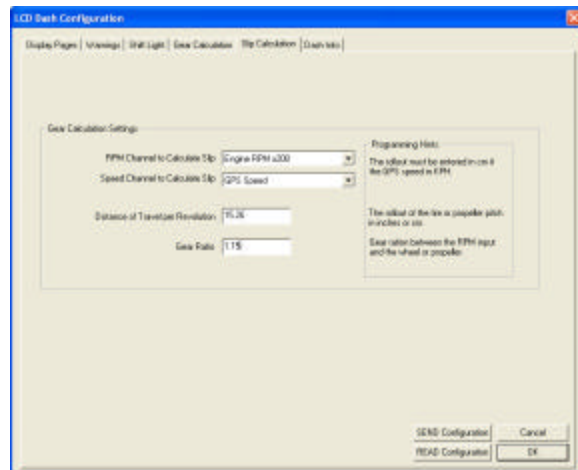
Speed Channel to Calculate Slip: The sensor channel that provides vehicle speed, which is GPS MPH in most instances.

Distance of Travel per Revolution: The propeller pitch in inches or centimeter (or drive wheel circumference).

Gear Ratio: The final drive ratio between the RPM input and the wheel or propeller. For vehicles that have more than one set of gearing between the engine and wheel or propeller, it will be necessary to calculate a final drive ratio.

Final gear drive formula for wheel driven vehicles:
Tire Circumference / Drive Ratio = Final Drive Ratio

This number can be entered in the Gear Ratio input area.