

# Decelerometer – NAC DFD

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Optional Computer System

Operators Manual



Specializing in Friction Measurement Technologies

## **CE – Conformity**

The product complies with the following standards :

EMC : EN 61326-1

Safety Regulations : EN61010-1 : 1993 / A2:1995

## **Scope of supply**

- NAC Dynamic Friction Decelerometer – **NAC DFD**
- Velcro Fixing Kit
- Installation CD ROM
- Operators manual

## **Optional**

- Computer System

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## **Warranty**

Each product passes through a quality process. Nevertheless, if failure occurs please contact the customer service at once. The warranty period covers 6 months starting on the delivery date. Warranty does not apply to damages, which result from misuse or neglect. The warranty also expires if you open the water sealed control box. NAC Dynamics is not liable for consequential damage.

If a failure occurs during the warranty period the product will be replaced, re-calibrated or repaired without further charges. The freight costs will be paid by the sender. NAC Dynamics reserves the right to exchange components of the product instead of repairing it. If the failure results from misuse the user has to pay for the repair. In that case you may ask for a cost estimate beforehand.

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## NAC DFD

Thank you for choosing the **NAC DFD** sensor.

The **NAC DFD** is designed to measure a vehicles acceleration forces to determine surface frictional properties or vehicle braking system performance.

The primary role of the **NAC DFD** is to calculate the Maximum Peak Deceleration of the vehicle from an initial set speed to zero speed.

Multiple tests can be performed and summarized in a single report for printing or exporting to a PDF format.

The **NAC DFD** comes with a pre-installed 6 feet USB cable and an installation CD ROM. If you have purchased the optional computer system the software will have already been installed.



## Installation of the NAC DFD

### *Software Installation*

If you have purchased your **NAC DFD** with a computer system the software installation will have already been performed for you. If you have purchased your **NAC DFD** without a computer system then use the supplied Installation CD ROM to perform the following.

Insert the Supplied CD ROM in to the appropriate drive on your computer and browse to the

*:/NAC DFD* folder

Run the NACDECELSETUP.MSI file.

Follow the on screen instructions to complete the installation.

**NOTE** : make sure that **Microsoft .net Framework 3.0** is installed on the computer. If not connect the computer the to internet and download from Microsoft Windows Update

## Software Drivers

After installation of the **NAC DFD** software you may be required to install the appropriate software drivers for the **NAC DFD**.

Firstly insert the USB cable in to an appropriate USB port on your computer.

A message will appear asking if you wish to log on to the internet to install the driver. **Select NO**.

On the next screen select **Advance** and locate the Driver Folder – *this will be found on the CD ROM installation disk*.

*Click* **OK**

The Driver will load automatically. When prompted you are ready to use the **NAC DFD**.

The **NAC DFD** software will be installed into the Windows Program Directory. Locate the Dynamic Friction Decelerometer folder and run the program.

## ***Mechanical Installation***

The **NAC DFD** is supplied with a Velcro<sup>®</sup> fitting kit. For easy installation and removal, use the Velcro<sup>®</sup> strips. If a more permanent installation is required use the mounting lugs with appropriate fixing screws.

The **NAC DFD** must be mounted within the vehicle with the direction arrow facing upward and forward to the direction of travel of the vehicle.

The **NAC DFD** must also be installed as level as possible.

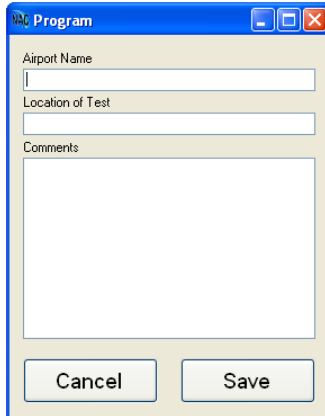
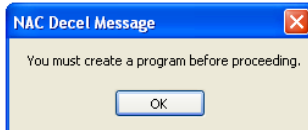
Note : *the software will compensate if the sensor has not been mounted level up to 10 degrees.*

Make sure that the USB cable is protected and is not vulnerable to damage.

## Software Guide

### Create Program

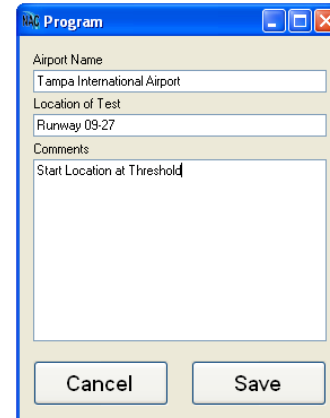
The first time you open the **NAC DFD** software you will have to create a program. Follow the steps below to create a program.



Use the computers keyboard to enter the required information.

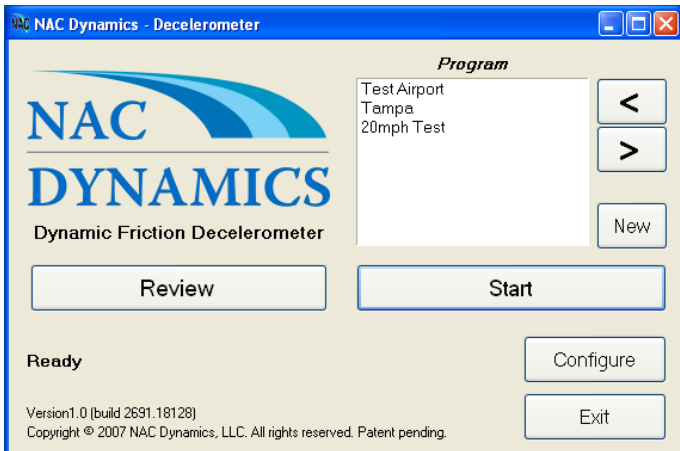
Additional notes about the test can be entered in to the **Comment** window.

Click **SAVE** when you have created your first program.



## Main Menu Screen

When the software is opened the main menu screen is displayed as shown below. From the main menu screen you can access all other areas of the software.



Note :

If the **NAC DFD** device is not connected via the USB cable the following message will appear.

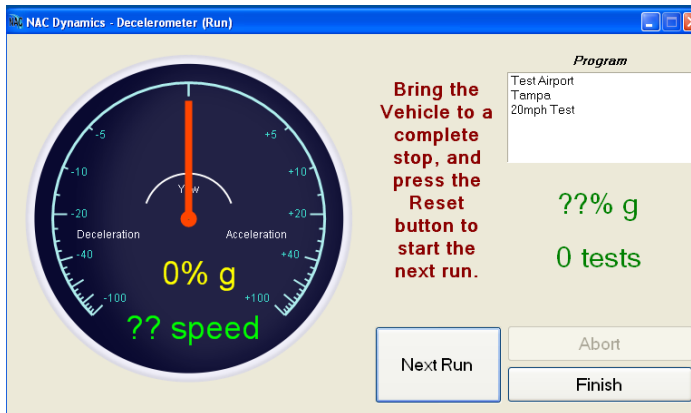
*“Can not find decelerometer”*

You will not be able to proceed to other areas within the software if you are not connected to the **NAC DFD**, however you will be able to review test data you have already captured.

Exit the **NAC DFD** software – connect the device with the USB cable and then re-open the software.

## Pre-Run Screen

From the Main Menu if the START button is pressed you will be taken to the Pre-Run Screen as shown below.



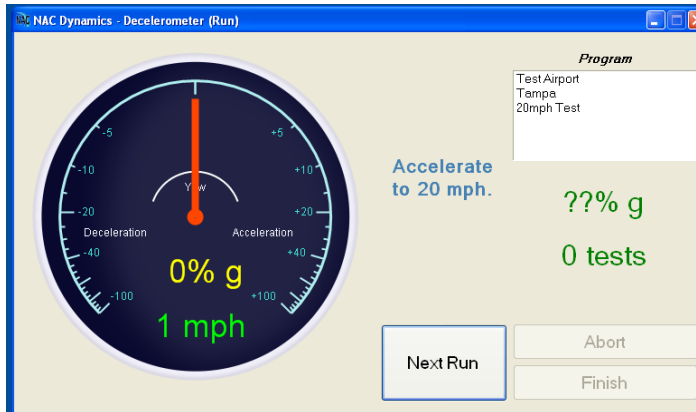
This screen displays the current accelerations of the vehicle, positive or negative.

**IT IS IMPORTANT TO START EACH TEST FROM A STATIONARY POSITION.**

If the vehicle is in motion this will distort the resultant measurement.

If the **NAC DFD** has not been correctly leveled and aligned you may also see an acceleration (speed). Please see [CONFIGURE](#) for further information.

When the vehicle has been brought to a complete stop and you are ready *and it is safe to proceed*, press the NEXT RUN button.



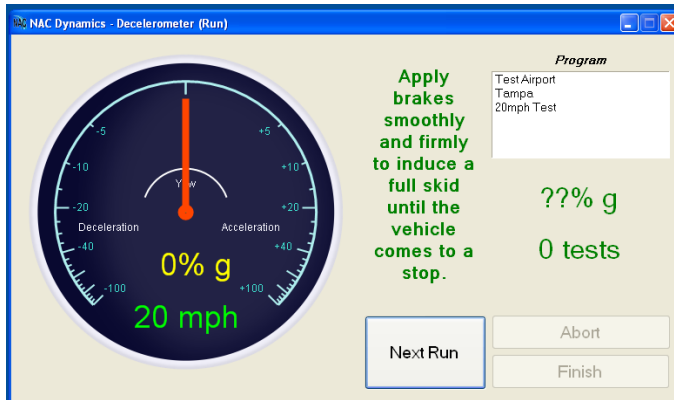
This tells the software to begin the test and display the calculated vehicle speed.

You must then accelerate the vehicle to the required test speed.

Progress to the test speed quickly and smoothly. Hold the vehicle straight as possible.

If during the acceleration phase the vehicle turns, this will distort the displayed vehicle speed.

If you accelerate over the test speed the screen will inform you to reduce the speed down to the required test speed. You will not be able to perform the test unless you are at the required speed.



When you are at the correct test speed the software will inform you to :

*Apply brakes smoothly and firmly to induce a full skid until the vehicle comes to a stop*

As you brake the deceleration of the vehicle is monitored.

When the vehicle has come to a stop the maximum peak braking effort achieved will be displayed on the screen.

### **Surface Friction Test.**

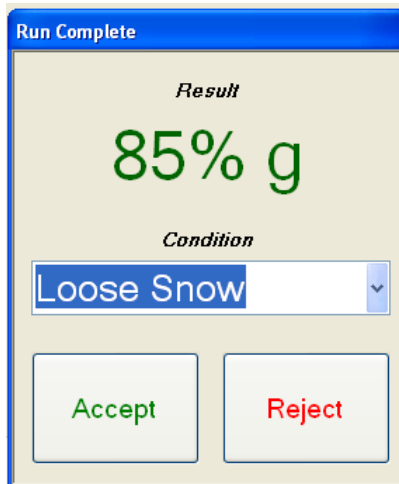
If you are performing this type of test you must **FULLY LOCK** the vehicle tires to induce a skid.

### **Vehicle Braking System Performance Test**

If you are performing this test **DO NOT LOCK** the vehicle tires during the test.

## Result Screen

When the test vehicle has been brought to a complete stop the Result Screen is displayed giving maximum braking effort for this single test. You can select from a pull down menu a number of pre-describe surface condition.



finish testing.

In this example the maximum deceleration measured during the test was **85% of gravity**.

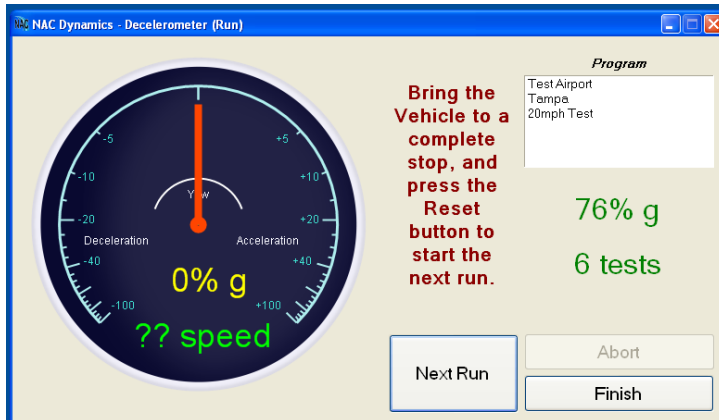
If the displayed units were in the RCR format this would have given a direct correlation reading of **27 RCR**.

A value of 100% g = 32.2 RCR

If the test was performed satisfactory then press ACCEPT. If you wish to delete this test press REJECT.

If you Accept or Reject this test you will be taken back to the Pre-Run screen, where you can continue to perform tests or

Multiple tests can be performed and the average maximum braking value for all of the tests will be displayed on the screen.



In this example a total of 6 tests have been performed giving a total average braking effort of 76% of gravity.

When the total number of tests has been completed click the **FINISH** Button

## Review Screen

This screen allows the operator to review the completed test data. Entering Operator information and Offset is optional.

Avg	1/3	2/3	3/3
76%	79%	68%	82%
6	2	2	2

Operator:

Offset:

As the primary mode of operation for the **NAC DFD** is for Airport use the output is sub-divided in to 3 sections, namely, Touchdown (1/3), Midpoint (2/3) and Rollout (3/3).

The computer will automatically sub divide the batch of tests in to equal 1/3rd information.

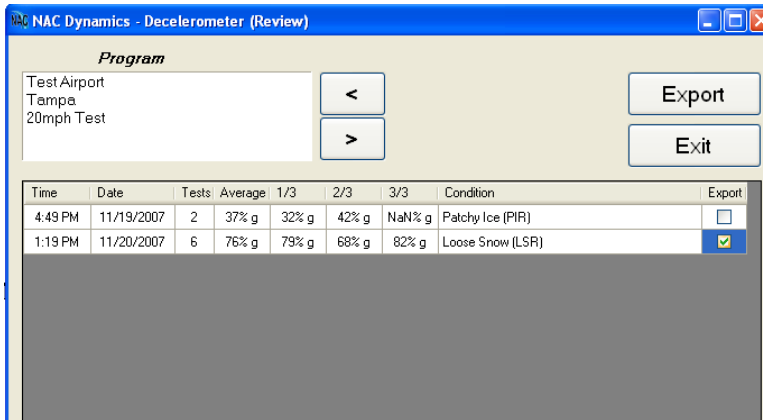
In this example there were 6 tests in total, therefore 2 tests were performed in each third of the runway.

The operator can either **ACCEPT** or **REJECT** the entire survey, both option reverts back to the main menu.

## ***Export Data – Output Display***

From the Main Menu screen click the REVIEW button. This will list all of the tests performed under this program. If multiple programs have been created click the direction arrows to cycle through them.

Use this screen to review previously collected data.

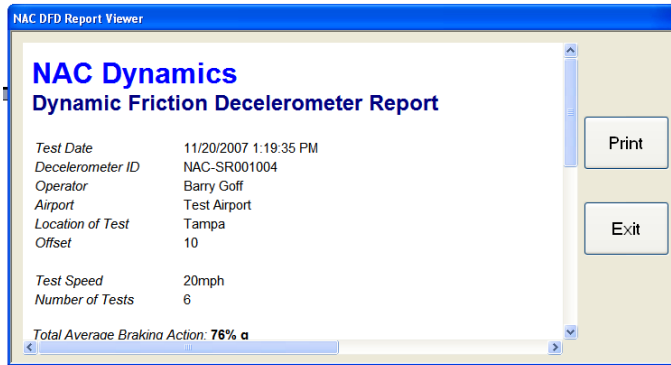


If you wish to export a particular test or group of tests insert a tick next to the test in the EXPORT column.

Next click the EXPORT button.

This will open a full preview of the entire survey as shown below.

All of the survey tests can be reviewed, including each individual test.



By clicking the PRINT button a printed report is outputted. This will depend on the computers default printer settings.

#### NOTE

By setting the computers default printer settings to an Adobe PDF output this will create an electronic copy of the report as shown below.

The printed output document will look like this example below. Total average values and each test will be listed.

**NAC Dynamics**  
**Dynamic Friction Decelerometer Report**

Test Date 11/20/2007 1:19:35 PM  
Decelerometer ID NAC-SR001004  
Operator Barry Goff  
Airport Test Airport  
Location of Test Tampa  
Offset 10

Test Speed 20mph  
Number of Tests 6

Total Average Braking Action: 76% g

Average Friction  
1/3 79% g  
2/3 68% g  
3/3 82% g

Test	Braking Action	Date & Time	Condition
1	85% g	11/20/2007 12:46:13 PM	Loose Snow (LSR)
2	72% g	11/20/2007 12:57:37 PM	Loose Snow (LSR)
3	61% g	11/20/2007 12:57:54 PM	Loose Snow (LSR)
4	75% g	11/20/2007 12:58:11 PM	Loose Snow (LSR)
5	90% g	11/20/2007 12:58:22 PM	Loose Snow (LSR)
6	74% g	11/20/2007 12:58:38 PM	Loose Snow (LSR)

FAA NOTAM Number Issued by

Signed:

## Configure

Many different regulations and procedure exist to determine vehicle deceleration values. The **NAC DFD** is capable of being configured to perform all of the internationally recognized braking action tests.

Enter the CONFIGURE screen from the main menu to set up your **NAC DFD** for your local requirements.

**NAC Dynamics - Decelerometer (Configuration)**

**General Options**

Language: English

Monitor Interval: 100 ms

**Measurement Units**

Imperial  Metric

**Force Units**

Percent g  RCR

**Velocity / Speed**

Target Stopping Speed: 20 mph

Tolerance (+/-): 1.0 mph

Minimum Recording Speed: 5.0 mph

**Automatic Calibration**

Axis	Live Data	Live Calibration	Stored Calibration
X	0% g	0	1
Y	0% g	0	0
Z	103% g	-103	-102

Align

Save

Defaults

Exit

## ***General Options***

**Language** – *Default English.*

Contact NAC Dynamics if an alternative language is required.

**Monitoring Intervals** – *Default 100ms*

This is the sample rate taken from the in **NAC DFD** milliseconds. Maximum sample rate 2ms.  
WARNING. Adjusting the sample rate will change the calculated braking action reading.

## ***Measuring Units***

Imperial or Metric

Change the display from mph to kmph

## ***Force Units***

Percentage of Gravity or Runway Condition Reporting.

## ***Velocity / Speed.***

**Target Stopping Speed** – *Default 20mph.*

This is the speed that needs to be achieved prior to the braking action test being performed.

**Tolerance +/-** - *Default 1mph*

This is the tolerance allowed on the speed to perform the test.

**Minimum Recorded Speed** – *Default 5mph*

This is the speed the test data will stop collecting.

NOTE : to maintain consistent test results the vehicle speed needs to be reduced to a stationary stop.

***Automatic Calibration***

When mechanically mounting the **NAC DFD** make sure that it is level. Firstly drive the vehicle to a flat level ground. Use the live values displayed on this screen to determine the amount of out-of-alignment. For a perfect installation the values should be 0% g for the X and Y coordinates and 100% g for the Z coordinate. Click the **ALIGN** button to re-set these values.

At the start of each brake test the software automatically re-aligns itself to compensate for surface gradient and road camber. But periodic Automatic Calibration will monitor if the **NAC DFD** has moved on it mounting or has become out of calibration.

When you have made your required changes in the Configure Screen click **SAVE** or **Exit** as required.

## Annual Calibration

It is recommended that the **NAC DFD** be returned to the factory every two years for an inspection and calibration.

Please return the **NAC DFD** in the same packaging as supplied with the device.

## Maintenance

In case of problems or questions which may arise when using the **NAC DFD**, please contact our service department. The customer service staff will support you with questions concerning the operation, procedures and calibration of the **NAC DFD**.

There are no customer serviceable parts, including the preinstalled USB cable.

## Trouble Shooting Guide

Computer does not recognize the **NAC DFD**

- Confirm you have installed the software drivers – see [software installation](#).
- Confirm you have inserted the USB cable from the **NAC DFD** to the computer system.
- Make sure there is no damage to the USB cable.
- Confirm that the Green LED on the **NAC DFD** is flashing.
- Shut Down and restart the computer.

When on the Pre-Run screen and the vehicle is stationary, speed is indicated.

- Perform an [Alignment](#) of the **NAC DFD** within the [Configure](#) section.
- Check the mounting and orientation of the **NAC DFD**

The displayed speed on the **NAC DFD** is not the same as the odometer indication on the vehicle.

- Perform an [Alignment](#) of the **NAC DFD** within the [Configure](#) section.
- Check the mounting and orientation of the **NAC DFD**

## **Appendix**

### ***List of Reference Documents***

[FAA AC 150 5200-30b – Airport Winter Safety + Operations.](#)

[ASTM E2101-00\(2005\) Standard Test Method for Measuring the Frictional Properties of Winter Contaminated Pavement Surfaces Using an Averaging-Type Spot Measuring Decelerometer](#)

## ***Note on ABS Enabled Vehicles***

When using the **NAC DFD** or any other style of Decelerometer the operator is guided to the following document.

CERTALERT NO. 93-05

ADVISORY

TO: AIRPORT CERTIFICATION PROGRAM INSPECTORS

TOPIC: STANDARDS FOR DECELEROMETERS

Quote from this CERTALERT

*“When using a decelerometer, preliminary studies by the Canadian Government has shown that use of a full ABS vehicle will result in significantly lower decelerometer readings than a vehicle equipped with standard disc and/or drum brakes”*

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