NIFTI Application Guide

Sensor Harness Wiring for NIFTI Strain Gauge Sensor Node

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1 Introduction

This application guide provides an overview on how to use the External Sensor Port, on the NIFTI Strain Gauge Sensor Node, to interface with externally mounted sensors. The NIFTI Strain Gauge Sensor Node provides a general-purpose, three-channel analogue interface that connects to transducers placed onto locations of interest on a test body.

This guide describes the electrical characteristics of the External Sensor Port, as well as pinouts for the connector and an example circuit that utilises a quarter bridge circuit to interface with resistive transducers. With these characteristics in mind, the NIFTI Strain Gauge Sensor Node can be configured to capture sensor measurements to CSV files in microvolts, that can then be post-processed by applying a scale factor, based on the specific characteristics of the applied sensor.

Figure 1 illustrates a concept application using the NIFTI Strain Gauge Sensor Node, connected to three, single-channel strain gauge sensors. By detecting changes in a sensor's electrical resistance (measured as changes to the voltage across the sensor), this strain gauge application enables measurement of a body's deformation when force is applied, such as that of an aircraft wing.

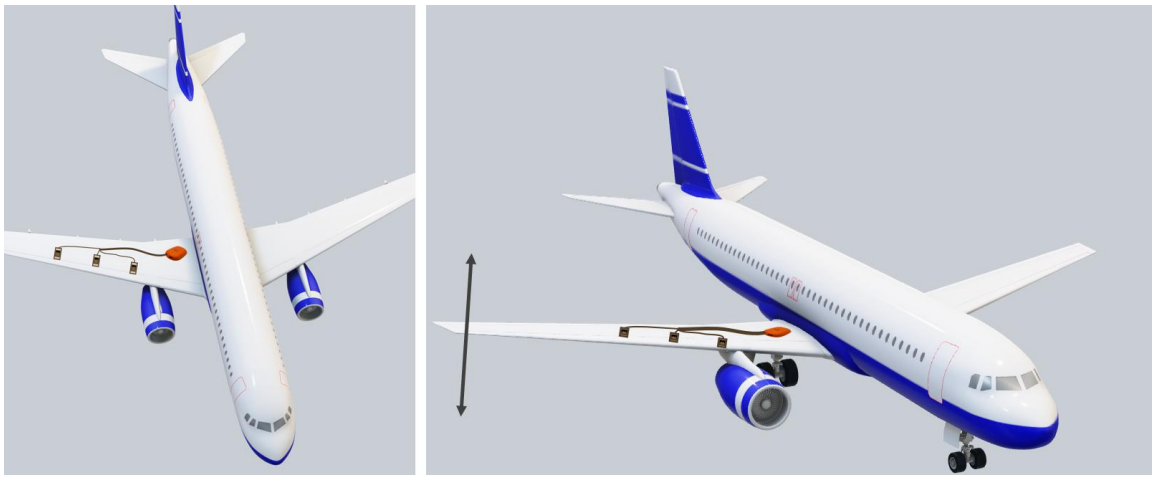

Figure 1. Concept application of NIFTI Strain Gauge Sensor Node connected to three quarter Wheatstone bridge strain gauges on the wing of an aircraft. NB: Illustration is not to scale.

2 External Sensor Port

The NIFTI Strain Gauge Sensor Node provides an External Sensor Port that interfaces with three sensors. The External Sensor Port provides the electrical connectivity to produce a 2.5v excitation voltage to sensors, and then to measure the differential voltages of both the applied excitation voltage (for environmental compensation), and the sensor's voltage. Voltages are measured by the NIFTI Sensor Node in microvolts at 24-bit precision.

Electrical Features

Minimum Channel + Sense (between + and – inputs)	0V
Maximum Channel + Sense (between + and – inputs)	3.3V
Maximum Channel Input Current	10mA
Maximum Channel Excitation Current	10mA
Channel Excitation Voltage	+2.5V
Connector Type	Micro HDMI

NB: The connector fitted to the NIFTI Strain Gauge Sensor Node is NOT compatible with other devices. Connecting the NIFTI Sensor Node to such devices may cause damage.

Cable Considerations

Maximum Length (from connector to transducer)	1m
Cable Type	Shielded, twisted pair

Pin Definitions

Pin	Signal Assignment
1	Excitation Voltage + (+2.5 VDC)
2	GND
3	Harness Detect (GND = Connected, O/C = Not Connected)
4	Channel 1 Excitation Voltage +
5	Channel 1 Sense Voltage +
6	Channel 1 Excitation Voltage -
7	Channel 1 Sense Voltage -
8	Channel 2 Excitation Voltage +
9	Channel 2 Sense Voltage +
10	Channel 2 Excitation Voltage -
11	Channel 2 Sense Voltage -
12	Channel 3 Excitation Voltage +
13	Channel 3 Sense Voltage +
14	Channel 3 Excitation Voltage -
15	Channel 3 Sense Voltage -
16, 17, 18, 19	Reserved / DO NOT CONNECT
20, 21, 22, 23	Shield / Backshell (GND)

3 Example Application – Strain Gauge Sensor

The schematic in Figure 2 below defines the circuit for a resistive strain gauge, connected to a single channel via a quarter Wheatstone bridge. Three of these circuits are shown wired into a 3-channel harness in Figure 3. This complete circuit connects to the NIFTI Strain Gauge Node using the External Sensor Port.

This circuit can also be used to interface a 3-axis rosette strain gauge node by connecting each strain gauge channel using the circuits illustrated below.

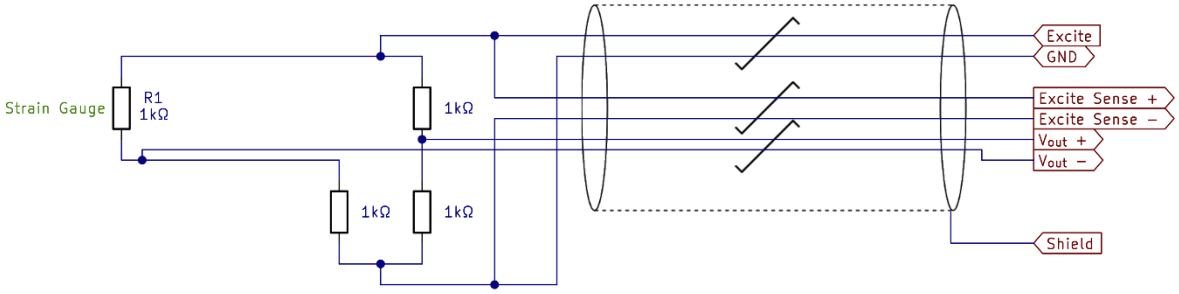

Figure 2. Quarter Wheatstone Bridge Strain Gauge Circuit (Per Channel).

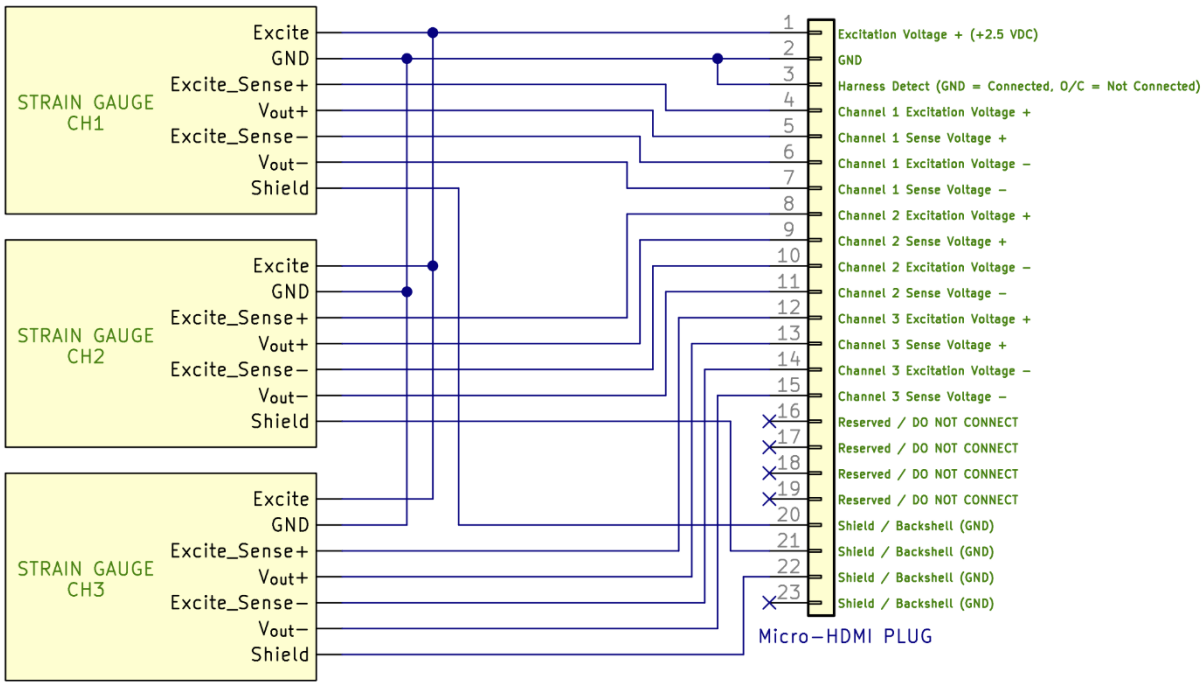

Figure 3. Example application for a complete strain gauge harness.