NID-2000/NID-2000P

Precision Dynamic Signal Simulator

User manual

(Version 1.2.4)

March, 2021

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This manual should be read carefully

before using

NID-2000/NID-2000P

Precision Dynamic Signal Simulator

</div>

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2. NID-2000/NID-2000P In Brief

Precision Dynamic Signal Simulator NID-2000/NID-2000P is an easy to use, battery powered instrument, suitable for simulation of various kinds of sensor and transmitter outputs. Selecting different operating modes is done through a menu system shown on the calibrator's LCD screen. Navigation through the menu and submenu systems is done by push buttons located on the front panel of the instrument. Simulator is powered from four, internal mounted, rechargeable Ni-MH batteries, charged by external Charger 9V DC supplied with this instrument. Simulator also has a LEMO® (ODU®) USB 2.0 Connector for setting the Simulator output parameters using PC Software. An interface cable is also supplied.

It is suitable for inspecting/calibrating measurement lines according to the ISO 10816 standards. It is especially designed for inspecting/calibrating Condition Monitoring Systems (CMS) and Vibration Monitoring Systems (VMS) that can be connected to the SCADA/DCS Systems.

Technical Characteristics of NID-2000

Inputs/Outputs
- mV - Sinusoidal AC Voltage Output (Single Ended)
- IEPE - Integrated Electronic Piezo Electric (ICP®) Output
- pC - Charge Output (Single Ended and Differential Output)
- 4-20 mA - DC Current Output (2 Wires Loop Powered)
- TTL - Digital Output for Speed/Flow (TTL Level)
- OSO® - Optical Speed Output
- BOV – Bias Output Voltage Input

Frequency Range	1Hz to 10 kHz
Output Range	10 mV to 10,000mV AC RMS; 10pC to 10,000pC

Transfer Characteristics
Amplitude Accuracy	±0.5% of settings on any range
Amplitude Stability	0.03%/°C maximum change from -10°C to +65°C
Frquency Accuracy	±0.02% of settings on any range
Frequency Stability	±0.5% of maximum change from -10°C to +65°C
Harmonic Distortion	≤0.1% from 1Hz to 2kHz; ≤0.5% from 2kHz to 10kHz

Enviromental Characteristics
Temperature		
	Operating from	-10°C to +65°C
	Storage from	-18°C to +65°C
Humidity		95% R.H. maximum

Power
Battery	4 x AA rechargable Ni-MH Accus (supplied with calibrator)
Autonomy	More than 5 hours when fully charged

Physical Characteristics
Dimensions	208 mm x 100 mm x 40 mm
Weight	0.5 kg typical
Case	ABS molded plastic
Connection	mV , IEPE, BOV, 4-20mA and TTL – BNC Connectors
	pC (single ended and differential) – Microdot Connectors
	USB 2.0 – LEMO® (ODU®) Connector
Front Panel Controls	Keyboard with five sealed keys: ▲ Up, ▼ Down, ⬛ Enter, ⬅ Back and ⏻ ON/OFF
Front Panel Display	64 Characters (4 Lines x 16 Characters) Alphanumeric Dot Matrix LCD with Backlight

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Enviromental Characteristics
Temperature
      Operating from   -10°C to +65°C
      Storage from   -18°C to +65°C
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Front Panel Controls   Keyboard with five sealed keys: ▲ Up, ▼ Down, ◄ Enter, ↵ Back and ⏻ ON/OFF
Front Panel Display   64 Characters (4 Lines x 16 Characters) Alphanumeric Dot Matrix LCD with Backlight

3. Map and Legend

Figure 1 NID-2000/NID-2000P Legend
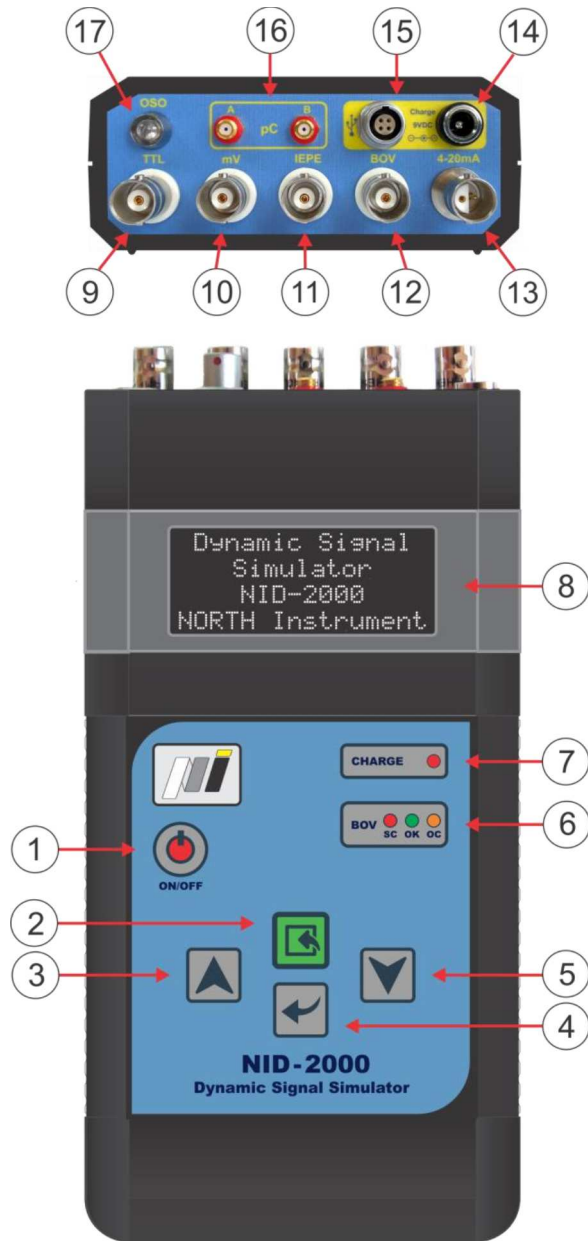
LEGEND

1 - POWER Button, ON/OFF switch

2 - ENTER Button, used for entering and confirmation

3 - UP Arrow, used for navigation through the menu

4 - BACK Button, used for menu exit

5 - DOWN Arrow, used for navigation through the menu

6 - BOV Test Semaphore

7 - Charging LED

8 - LCD display

9 - BNC Connector for TTL output

10 - BNC Connector for mV output

11 - BNC Connector for IEPE output

12 - BNC Connector for BOV testing

13 - BNC Twinax Connector for mA output

14 - Connector for the external charger connection

15 - ODU Connector for USB connection

16 - Microdot Connectors for Charge output

17 - OSO Optical Speed Output

4. Starting to Use NID-2000/NID-2000P

Before using Precision Dynamic Signal Simulator NID-2000/NID-2000P, delivered NiMH Rechargeable Batteries should be properly inserted in the batteries compartment (*See Figure 2*). *Inserting batteries with incorrect polarity may damage the unit!* Turn NID-2000/NID-2000P to its backside. Batteries compartment cover is marked by two wide arrows. Carefully slide down the cover in the arrow direction labeled OPEN. Please insert a battery with proper polarity as it is shown at the bottom of the batteries compartment. After inserting the batteries, gently close the batteries compartment with its cover, moving it to the arrow direction labeled CLOSE.

Figure 2 Inserting NiMH Batteries

Pressing briefly ON/OFF Push Button ⏻ located at the top left of the front panel (*Figure 1*) will switch the device ON, whereas pressing the ON/OFF Push Button ⏻ long will switch the device OFF. After switching the device ON, the next message will appear on LCD (*See Figure 3*):
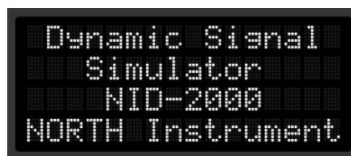

Figure 3 First Screen

Selection of the operating modes is done using the keyboard located on the front panel. The keyboard consists of five keys and four LEDs for visual indication of different measuring states. The CHARGE LED is lit when the device is connected to the external Charger of 9V DC.

Four keys in the middle of the keyboard are used for navigating through Menu system and for choosing a desired function of the device. The keys signed with arrows Up ⏶ and Down ⏷ are used for moving through the menu system, as well as for changing output parameters. ENTER ⏎ is used for confirming the chosen function, for entering/exiting the desired operating mode and for running/stopping the selected function of the instrument.

5. Main Menu

The Main Menu consists of ten Items and each of them represents a function for itself. The Items, as it appears in the Main Menu, are as follows: U[mV], Q[pC], IEPE, SPEED, BOV, FLOW, CURRENT, TRANSMITTER, VELOMITOR and SETTINGS. This User Manual describes in details the use of each Operating Mode to produce an adequate output. Navigation through the Menu system is done by keys Up ▲ and Down ▼, whereas choosing of the function is done by pressing Enter ⬛ key. The back key is signed with ⬅ sign.
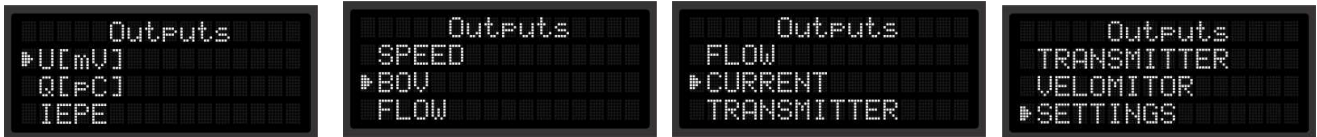

Figure 4 Main Menu Items

5.1 Menu Item U [mV]

By using this Operating Mode it is possible to set adequate voltage and frequency values for a sinusoidal output signal. After choosing the U[mV] Mode (*See Figure 5*), and before it is possible to set the output voltage and frequency, a message (*See Figure 6*) will appear on the screen warning the user that the mV Output (mV BNC connector) must be used for the desired output (*See Figure 7*).
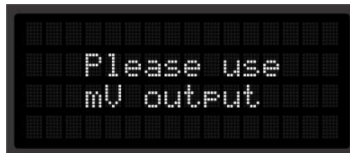

Figure 5 Mode U[mV]   *Figure 6 Warning Message*   *Figure 7 mV Output Selection*

After this message, the next sub-menu (*See Figure 8*) will appear on the LCD screen.
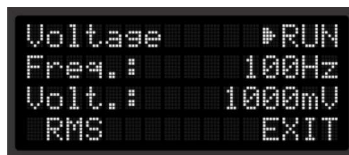
Figure 8 Submenu Screen

User can navigate through the offered options by Using Up ▲ and Down ▼ keys. These options consist of several functions. If the user sets the cursor in the Frequency position (*See Figure 9*), after Enter ⬛ pressing, Up-Down arrow will appear signaling the device has entered the mode for changing frequency value. By using Up ▲ and Down ▼ the user can increase or decrease the desired frequency value. Pressing long Up

or Down key will automatically increase or decrease frequency value. When the user sets an appropriate value for frequency, pressing Enter will confirm it and return to Menu.

If the user sets the cursor to Voltage, after pressing Enter , Up-Down arrow will signal the device has entered the mode for changing Voltage value output (*See Figure 10*). Using Up and Down the user can increase and decrease voltage value. Pressing these keys long will automatically increase or decrease this value.

Figure 9 Changing Frequency

Figure 10 Changing Voltage

When the user sets an appropriate value for voltage, pressing Enter will confirm it and return to the previous Menu.

By pressing Back the user will also return to the previous Menu. By setting the cursor on the position RMS and by pressing Enter the user can change the desired signal generating mode. User can change the mode depending on how the output voltage is to be displayed: RMS (Root Mean Square) value (*See Figure 11*), 0-P (Zero to Peak) value (*See Figure 12*) or P-P (Peak to Peak) value (*See Figure 13*).
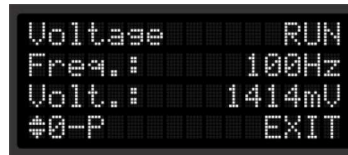

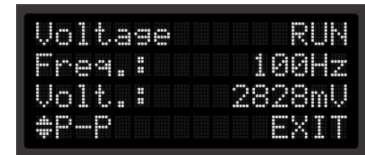*Figure 11 Output as RMS Value*

Figure 12 Output as 0-P Value

Figure 13 Output as P-P Value

By setting the cursor on **EXIT** and by pressing Enter the user will return to the Main Menu**.** The same will happen by pressing Escape at any position in this Menu.

If the user sets the cursor on **RUN** and presses Enter , an adjusted sinusoidal voltage and frequency will appear on the mV output. The indication that the device is in **RUN** mode and that the output is generated is represented by a **STOP** sign (■) instead of **RUN** sign (▶). By pressing Enter again, the Simulator stops generating the output voltage and the cursor switches back to **RUN** (▶). This can be also done by pressing Back at any cursor position. The view of the screen while generating voltage on its output is given below (*See Figure 14*).
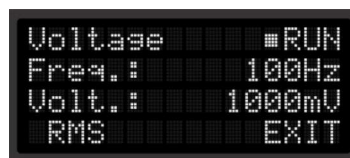

Figure 14 Simulator in RUN Mode

Application Notes: Instructions on how to use this NID-2000/NID-2000P function can be found in Chapter 11, Item 11.1, on Page 38

5.2 Menu Item Q [pC]

Generating Charge Output (pC) is suitable for vibration sensors simulation, giving charge as its output. When selecting this operating mode (*See Figure 15*), a message will appear on the LCD (*See Figure 16*) warning user to use an output(s) signed with **pC** (Microdot Connectors A and B) for the desired output. (*See Figure 17*).
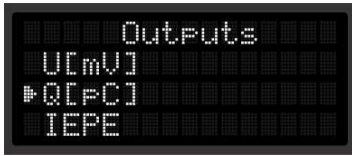

Figure 15 Mode Q[pC]
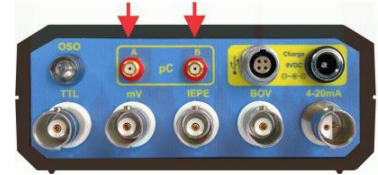

Figure 16 Warning Message

Figure 17 pC Output Selection

After this warning message, a sub-menu will appear on the screen (*See Figure 18*), allowing the user to change frequency and sensor sensitivity parameters. User can adjust the desired frequency value in the range from 1Hz to 1kHz (*See Figure 19*). For sensitivity value user can only choose between 50pC/g and 100pC/g (*See Figure 20*).
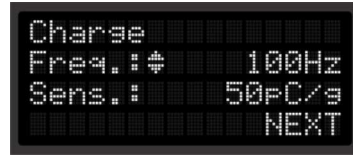

Figure 18 S   *Figure 19 Changing Frequency*   *Figure 20 Changing Sensitivity*

Up 🔼 and Down 🔽 keys are used for navigating through the menu system. By pressing Enter (**E),** the mode for changing values is entered. Instead of the Cursor sign (▶), the bolded Up-Down arrows appear on the screen, indicating that the selected values can be changed. In order to change values, please press Up 🔼 or Down 🔽. By pressing Enter 🔘, the value the user has set is saved and the program returns to the previous menu. This can also be done by pressing Escape ↵. The cursor shape then returns to its previous shape (▶), indicating the value is saved successfully. If the user moves the cursor to indicate NEXT Item and presses Enter 🔘**,** this will open the sub-menu for selecting a parameter which the user wants to simulate. By pressing Back ↵ the user will return to the Main Menu.

This operating mode of NID-2000/NID-2000P enables the device to simulate one of three vibration parameters – Velocity, Displacement or Acceleration. Using Up 🔼 and Down 🔽 ys and confirming by Enter 🔘 key**,** user can select which of these parameters he or she wants to simulate (*See Figure 21*).

Figure 21 Selecting Parameter for Simulation

If adjusted values exceed the range of the selected parameter, the following Error messages will appear on LCD, depending on the selected function (Displacement – *See Figure 22* or Velocity – *Figure 23*). Software will take a step back in order to enable the user to change frequency and sensitivity.

Figure 22 Displacement Error

Figure 23 Velocity Error

If the values which the user has previously set fit into the range the Simulator can generate, one of the screens will appear depending on the user's previous choice, as it is shown below (Velocity – *See Figure 24*, Displacement – *Figure 25* and Acceleration – *Figure 26*). Each of them enables the user to set the final output value.

Figure 24 Choice of Velocity

Figure 25 Choice of Displacement

Figure 26 Choice of Acceleration

By using the keys Up ▲**,** Down ▼, Enter ⏎ and Back ⏎ the user can navigate through the offered options and change the output value for Vibration Velocity, Displacement or Acceleration in a similar way it has already been described. The output value can be displayed as RMS, P-P (Peak to Peak) or 0-P (Zero to Peak) value for Displacement, while for Velocity and Acceleration it can be displayed as RMS value or 0-P (Zero to Peak) value.

Figure 27 Output as RMS Value

Figure 28 Output as 0-P Value

Figure 29 Output as P-P Value

When the user selects RUN from the Menu, by pressing Enter ⏎ the Simulator will start generating the output signal according to the adjusted parameters (*See Figure 30*). For Vibration Velocity, the output value is given in **mm/s** for Metric Units mode, ie. in **in/s** for Imperial Units mode (*See Chapter 5.10, Menu Item SETTINGS*). For Vibration Displacement, the output is given in **µm** for Metric Units mode, while in Imperial Units mode **mils** unit is used. For Vibration Acceleration, in Metric Units mode **m/s^2** unit will be used, while in Imperial Units mode **g** units will be used. On LCD there is also information in square brackets about the selected Frequency in the previous step.
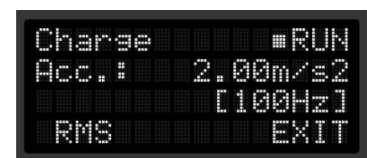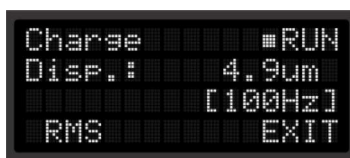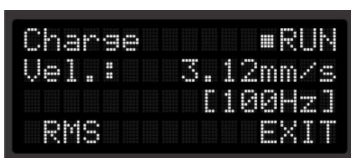

Figure 30 Simulator in RUN mode

When the Simulator is started, the cursor will be changed from Run sign (▶) to Stop sign (■). By pressing Enter ⏎ again, generating of signal will be stopped and the cursor will regain its previous shape, Run sign (▶). Generating can be also stopped by pressing Back key ↵. With this the mode for changing Velocity, Acceleration or Displacement parameters will be entered again, depending which type of measurement was previously selected, as it has been described before.

Application Notes: Instructions on how to use this NID-2000/NID-2000P function can be found in Chapter 11, Item 11.2 on Page 38

5.3 IEPE Menu Item

This operating mode is suitable for simulation of different kinds of sensors which are powered by IEPE (ICP®) Power Supply (DC Constant Current Source 2...20mA, DC Voltage 18...30V). As a result, for using this output, IEPE power supply needs to be used. In this operating mode it is possible to set displacement, velocity or acceleration parameter. After starting the calibrator, this parameter will be converted to the sinusoidal AC output voltage, whose scale is based on the given values (displacement, velocity or acceleration), frequency and the sensor sensitivity in mV/g units. After selecting IEPE Menu Item and before the possibility to set any of the stated parameters (*See Figure 31*), a warning message will appear on LCD (*See Figure 32*) warning the user to use the IEPE output (*See Figure 33*).

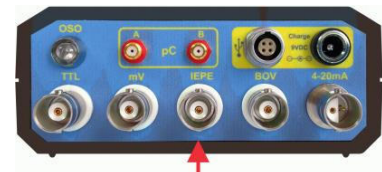*Figure 31 Mode IEPE*

Figure 32 Warning Message

Figure 33 IEPE Output Selection

After choosing IEPE mode (*See Figure 34*), the next step is to set the desired frequency (*See Figure 35*) at which voltage which is proportional to displacement, velocity or acceleration value will be generated. Sensor Sensitivity Parameter can also be set to the next values: 50mV/g, 100mV/g, 500mV/g or 1000mV/g (*See Figure 36*).
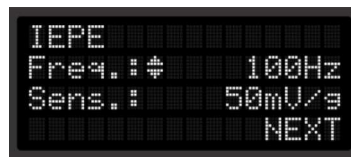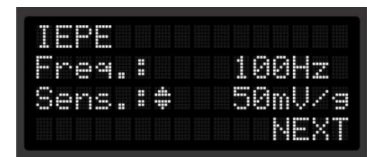

Figure 34 Submenu Screen

Figure 35 Changing Frequency

Figure 36 Changing Sensitivity

Navigation through submenus is done by Up ⬆ and Down ⬇ keys. By pressing Enter ⏎, the user selects values which he or she would like to change and the cursor shape is changed to bold Up-Down arrows, signaling that one has successfully entered into the mode for changing parameters. The selected parameters are changed by Up ⬆ and Down ⬇ keys. By pressing Enter ⏎, the user confirms the choice of the new

value for the selected parameter and returns to the previous menu selection. This can also be done by pressing Back key ⏎.

After setting the cursor to point to the NEXT Item and by pressing Enter ⬛, the user enters the submenu system for selecting a parameter for simulation (See *Figure 37*). The user can select the following: Velocity, Displacement or Acceleration. By pressing Back key ⏎ one will return to the Main Menu.

*Figure 37 Parameter selecting for simulation*

Using Up ▲ and Down ▼ keys, the user navigates through menu. By pressing Enter ⬛ will select the desired function.

If the adjusted frequency and sensitivity values for the selected function deviate from minimal or maximal output voltage value, an Error message will appear on LCD (*See Figures 38* and *39*).

If an Error has occurred, software returns to the option for setting frequency and sensitivity parameters again. This kind of Error may only occur if the selected function is Displacement or Velocity.


Figure 38 Displacement Error
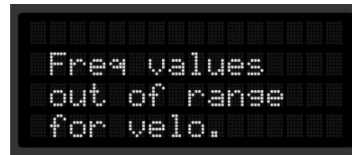
Figure 39 Velocity Error

If the adjusted values are adequate for the selected operating mode, the user can set the desired output values for Displacement, Velocity or Acceleration. The Displacement output value can be displayed as RMS value (*See Figure 40*), 0-P (Zero to Peak) Value (*See Figure 41*) or P-P (Peak to Peak) value (*See Figure 42*), while the Velocity and Acceleration output values can be displayed as RMS or 0-P (Zero to Peak) value.
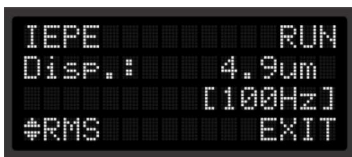
Figure 40 Output as RMS Value
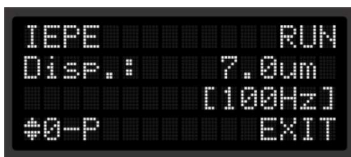
Figure 41 Output as 0-P Value
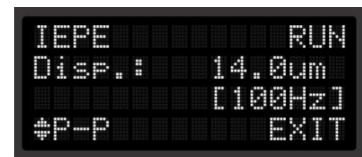
Figure 42 Output as P-P Value

Depending on the selected mode, one of the following screens will appear (*See Figures from 43 to 45*).

Figure 43 Choice of Velocity

Figure 44 Choice of Displacement

Figure 45 Choice of Acceleration

If the user selects Displacement function, the parameter can be changed into **μm** for Metrical Units, whereas in case of Imperial Units it can be changed into **mils**. Parameter for Velocity is given in **mm/s** in case Metr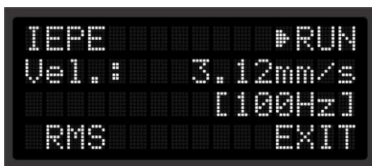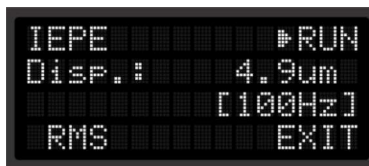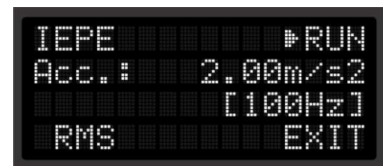ical Units System is set, whereas the **in/s** is used in case of Imperial Units System. For Acceleration, **m/s²** is used as a Metrical unit, and **g** as an Imperial unit. Instructions how to change units in which the simulated parameter will be expressed is given in Chapter 5.10

Each of these functions has several possibilities. If the user sets the cursor to point to **RUN** Item and presses Enter 🔘 **,** this will start the simulation which is directly proportional to the given parameter for Displacement, Acceleration or Velocity (*See Figure 46*). While generating the output signal, the cursor shape will change into a Stop sign (■), informing the user the Simulator is active and the AC voltage is present on the selected Output connector.
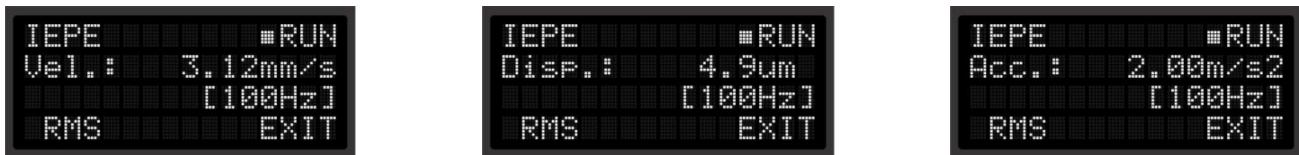

Figure 46 Simulator in RUN mode

If any of these operating modes is activated, the cursor will change into Stop sign (■). By pressing again Enter 🔘, generating of the output signal will be stopped and the cursor will return to its previous shape (▶). User can also stop the signal generating by pressing Back key ↵. When the cursor is set to point on the desired parameter and Enter 🔘 is pressed, this will activate the mode for changing parameters for Velocity, Acceleration or Displacement function, depending on which simulation mode is selected. Output parameters can be changed by using Up 🔼 and Down 🔽 keys. When the desired parameter is adjusted, by pressing Enter 🔘 one returns to the previous menu and the adjusted value becomes valid.

<div style="border:1px solid black; padding:10px; text-align:center;">
Application Notes: Instructions on how to use this NID-2000/NID-2000P function can be found in Chapter 11, Item 11.3, on Page 39
</div>

5.4 Menu Item SPEED

Digital speed output is suitable for simulating speed sensors or transmitters which on its outputs generate a wave of rectangular pulses depending on the measured RPM value. The voltage level on this output is at the TTL level (+5V DC Pulse, 0V Pause) with the Duty Cycle of 50%. The **OSO**® output (**O**ptical **S**peed **O**utput) represents small Stroboscope which generates the adjusted RPM by flashing the OSO LED. In both cases the range is from 10 RPM to 60,000 RPM, resolution of 1 RPM.

When this function is selected (*See Figure 47*), a warning message appears on the LCD (*See Figure 48*) informing the user to use the TTL Output (*See Figure 49*).

Figure 47 SPEED Mode

Figure 48 Warning Message

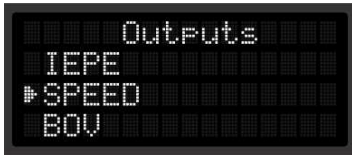*Figure 49.TTL Output Selection*

After this message, the next submenu (*See Figure 50*) will appear on the LCD screen.
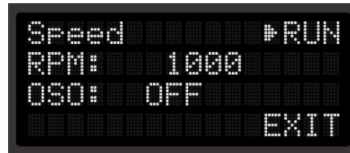
Figure 50 Submenu Screen

User can change the value for revolution per minute (RPM) (*See Figure 51*), as well as set the OSO® optical output ON or OFF (*See Figure 52*).
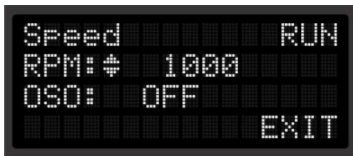
Figure 51 Changing the RPM Value
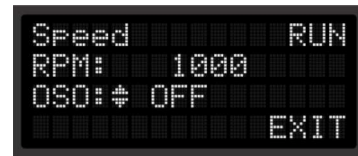
Figure 52 Changing the OSO Status

Using Up and Down keys, the user can navigate through this submenu. Pointing to the menu item and pressing Enter will select the parameter which the user wants to change. Bringing the cursor to point to RUN and pressing Enter will start generating the output signal based on the adjusted values.

If OSO® Output is ON, generating of light pulses will start together with generating the TTL Output. As in other operating modes, the Stop sign (■) near RUN menu item, indicates that the system is active and is generating square wave signal on the TTL Output, as well as OSO® Output if it is selected (*See Figure 53*).
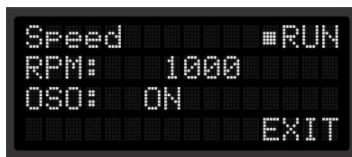
Figure 53 Simulator in the RUN Mode with OSO® Output Enabled

Pressing Enter again will stop generating the TTL Output (and OSO® Output, if it was selected) and will return the device to the mode for changing parameters, which can be done again by using Up **,** Down and Enter keys.

Application Notes: Instructions on how to use this NID-2000/NID-2000P function can be found in Chapter 11, Item 11.4, on Page 40

5.5 Menu Item BOV

The purpose of this function is to determine fast the functionality status of the IEPE (ICP®) Sensor and its cabling by measuring the sensors BOV (**B**ias **O**utput **V**oltage) voltage. To perform this test, it is necessary to power the sensor under test by the IEPE Power Supply which is installed into NID-2000 (24V DC at constant Current of 3mA). Performing the BOV test presents a fast way for identifying several types of malfunction of the IEPE (ICP®) Sensors. Depending on the measured BOV voltage, the user can determine the functionality state of the tested Sensor. There is also a visual indication of the satus of the Sensor under test (*See Figure 54*).

Figure 54 Visual Indication of BOV Status

After selecting the BOV function(*See Figure 55*), the warning message will appear on LCD (*See Figure 56*), informing the user to use the BOV labeled output (*See Figure 57*).
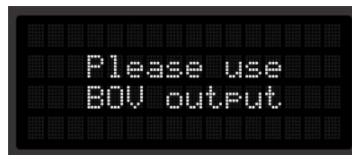
| *Figure 55 Mode BOV* | *Figure 56 Warning Message* | *Figure 57 BOV Output Selection* |

After this warning message, the next submenu will appear on the LCD (*See Figure 58*):
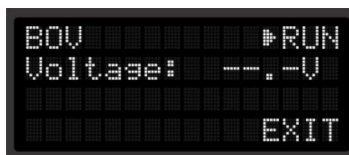
*Figure 58 Submenu Screen*

The user can navigate through this submenu by using Up ▲ and Down ▼ key. Pointing to the menu item and pressing Enter ⏎ the parameter the user wants to change will be selected. By bringing the cursor to point to the RUN Item and by pressing Enter (**E**) will start measuring BOV voltage of the connected IEPE Sensor and the Cursor shape will change from the Run sign (▶) to the Stop sign (■). After the measurement, which takes about 2 seconds, the Cursor will return to its previous shape (▶).

After the BOV Test is completed, the test results are displayed on LCD and are also indicated on BOV Test LEDs. Regarding the measured BOV voltage value, there are only three possible states of the tested IEPE sensor and its cabling: SHORT CIRCUIT, NORMAL and OPEN CIRCUIT.

If the measured BOV is below 7V DC, IEPE sensor (or cabling) is damaged (SHORT CIRCUIT). (*See Figure 59)*

Figure 59 BOV Test - SHORT CIRCUIT

If the measured BOV is between 7V DC and 15V DC, the IEPE sensor (and cabling) is good (NORMAL). (*See Figure 60)*

Figure 60 BOV Test - NORMAL

If the measured BOV is higher than 15V DC, the IEPE sensor (or cabling) is also damaged, or there is no IEPE sensor connected, or the IEPE sensor cabling is broken (OPEN CIRCUIT). (*See Figure 61)*

Figure 61 BOV Test - OPEN CIRCUIT

Setting the cursor to point to EXIT and pressing Enter will return the user from this submenu to the Main menu. User can also do this by Back pressing .

Application Notes: Instructions on how to use this NID-2000/NID-2000P function can be found in Chapter 11, Item 11.5, on Page 41

5.6 Menu Item FLOW

This NID-2000/NID-2000P operating mode is suitable for simulating Flow Sensors and Flow Transmitters which on their outputs generate a wave of rectangular pulses depending on the measured Flow rate. Voltage level on this output is at the TTL level (+5V DC Pulse, 0V Pause) with the Duty Cycle of 50%.

When this mode is selected (*See Figure 62*), a warning message appears on LCD (*See Figure 63*) informing the user to use the TTL Output (*See Figure 64*).

Figure 62 Mode FLOW

Figure 63 Warning Message

Figure 64 TTL Output Selection

After the warning message, the next submenu will appear on the LCD (*See Figure 65*):


Figure 65 Submenu Screen

The user can navigate through this submenu by using Up ▲ and Down ▼ key. By pointing to the submenu item and by pressing Enter ↵ the following parameter can be selected: Flow Rate value (*See Figure 66*) or Flow Ratio (*See Figure 67*).
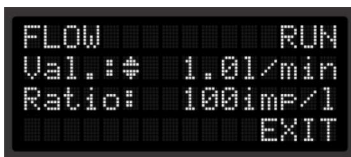
Figure 66 Changing Flow Rate Value
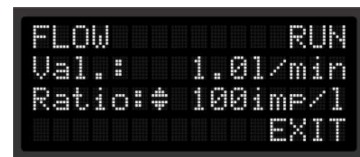
Figure 67 Changing Flow Ratio

For Metric Units Mode, Flow Rate Value is given in **l/min** (liters per minute), while Flow Ratio is given in **imp/l** (impulses per liter). For Imperial Units Mode, Flow Rate Value is given in **g/min** (gallons per minute) while Flow Ratio is given in **imp/g** (impulses per gallon) (*See Chapter 5.10, Menu Item SETTINGS*).

By bringing the cursor to point to the RUN Item and by pressing Enter ↵ the simulation of Flow Sensor or Flow Transmitter based on the adjusted parameters will be started and the Cursor shape will change from the Run (▶) to the Stop sign (■). (*See Figure 68*)
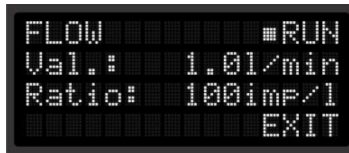
Figure 68 Simulator in RUN Mode

By pressing Enter 🔄 again, the user will stop the simulation. By setting the cursor to point to the EXIT Item and by pressing Enter 🔄 the user will return from this submenu to the Main menu. This can also be done by pressing Back ↵.

Application Notes: Instructions on how to use this NID-2000/NID-2000P function can be found in Chapter 11, Item 11.6, on Page 42

5.7 CURRENT Menu Item

This NID-2000/NID-2000P operating mode enables the user to generate the calibrated DC Current on its current output. The calibrated DC Current ranges from 4mA to 20mA. The current source inside the Simulator is Loop Powered, meaning that the external DC Power Supply is needed for proper operation, nominally voltage from 12V to 30V DC.

When this mode is selected (*See Figure 69*), a warning message appears on LCD (*See Figure 70*) informing the user to use the 4-20mA Output (*See Figure 71*).
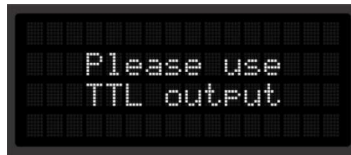

Figure 69 Mode CURRENT

Figure 70 Warning Message

Figure 71 4-20mA Output Selection

After the warning message, the next submenu will appear on LCD (*See Figure 72*):

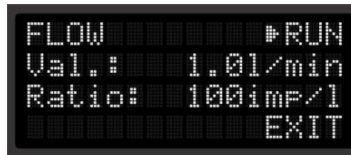
Figure 72 Submenu Screen

Using Up 🔼 and Down 🔽 keys, user can navigate through this submenu. By pointing to the submenu item and pressing Enter 🔄 the user will select the parameter which he/she would like to change. Inside this submenu, user can adjust the calibrated DC current value (*See Figure 73*) and start or stop the calibrator. (*See Figure 74*)

Figure 73 Changing the Output Current Value
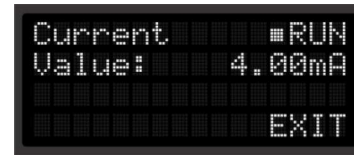
Figure 74 Simulator in RUN Mode

By setting the cursor to point to RUN submenu item and by pressing Enter 🔲 the user will set off generation of calibrated output current. The cursor shape will change from Run (▶) to the Stop sign (■).By pressing Enter 🔲 again the output generation will be stopped and the cursor will revert to its previous shape, Run sign (▶). By setting the cursor to point to EXIT and by pressing Enter 🔲 the user will return from this submenu to the Main menu.

> Application Notes: Instructions on how to use this NID-2000/NID-2000P function can be found in Chapter 11, Item 11.7, on Page 43

5.8 TRANSMITTER Menu Item

This NID-2000/NID-2000P operating mode enables the user to simulate various types of sensors and transmitters which are Loop Powered and on their outputs generate the DC output current in the range from 4mA to 20mA. To operate properly, the internal current source inside the Simulator needs to be powered from the external DC Power Supply, nominally voltage from 12V to 30V DC.

When this mode is selected (*See Figure 75*), a warning message appears on LCD (*See Figure 76*) informing the user to use the 4-20mA Output (*See Figure 77*).
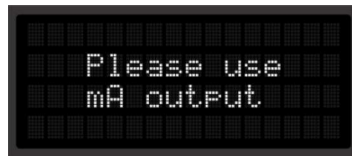

Figure 75 TRANSMITTER Mode

Figure 76 Warning Message

Figure 77 4-20mA Output Selection

After the warning message, the next submenu will appear on the LCD (*See Figure 78*):

Figure 78 Submenu Screen 1

The user can navigate through this submenu by using Up 🔼 and Down 🔽. By pointing to the submenu item and by pressing Enter 🟩 the user will select parameters which he/she would like to adjust. Pressing Enter 🟩

will also confirm the adjusted value. Inside this submenu, the user can adjust measuring units of the simulated output parameter (*See Figure 79*).

Figure 79 Changing Output Measuring Unit

Options for this submenu item are listed as follows: K (Kelvin Degrees for Temperature), °F (Fahrenheit Degrees for Temperature), psi (**Pounds per Square Inch for Air Pressure),** lb **(Pound for Force),** ft^3/s **(Cubic Feet per Second for Flow Rate),** ft^3/min **(Cubic Feet per Minute for Flow Rate),** ft^3/h **(Cubic Feet per Hour for Flow Rate),** gal/s **(Gallons per Second for Flow rate),** gal/min **(Gallons per Minute for Flow Rate),** gal/h **(Gallons per Hour for Flow Rate),** g **(Gravity Unit for Acceleration),** in/s **(Inches per Second for Velocity),** ips **(Inches per Second for Velocity) and** mils **(1/1000 of Inch for Displacement)**

After setting the cursor to point to NEXT and by pressing Enter (E) the user enters the new submenu system (See *Figure 80*) which allows adjusting of Maximal (Max.) (See *Figure 81*) and Minimal (Min.) (See *Figure 82*) Value of the previously selected Measuring Unit.

Figure 80 Submenu Screen 2
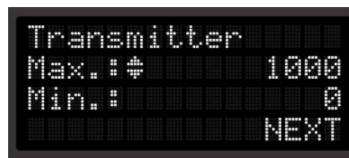
Figure 81 Changing Maximal Value

Figure 82 Changing Minimal Value

By using Up ▲ and Down ▼ the user can adjust the selected value for Max. and Min. (it can also be a negative value). Pressing Enter (E) will confirm the adjusted value. The program inside the Simulator will automatically span the output DC current to fulfill the condition for adjusted Min. value to be 4mA and for adjusted Max. value to be 20mA.

After setting the cursor to point to NEXT and by pressing Enter ⬅ the user will enter the final submenu system (See *Figure 83*).

Figure 83 Submenu Screen 3

The user navigates through this submenu system by using Up ▲ and Down ▼ keys, which allows user to adjust the output value, ranging from the adjusted Min. value to the adjusted Max. value (See *Figure 84*). By pressing Enter ◙ the adjusted value will be confirmed.

Figure 84 Changing Value

User can also Start or Stop generating of the output DC Current (See *Figure 85*). By pressing Enter ◙ the user will Start simulation of Transmitter and the cursor shape will change from Run (▶) to Stop sign (■). By pressing Enter ◙ again the output generation will be stopped and the cursor will revert to its previous shape, Run (▶). The adjusted Measuring Unit is displayed in the squared brackets.
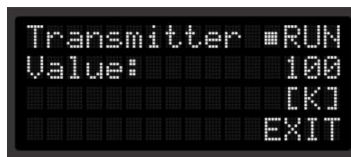
Figure 85 Simulator in RUN Mode

By setting the cursor to point to EXIT and by pressing Enter ◙ the user will return to the Main menu. The same can be done by pressing Back ↵.

Application Notes: Instructions on how to use this NID-2000/NID-2000P function can be found in Chapter 11, Item 11.8, on Page 44

5.9 VELOMITOR Menu Item

This operating mode is suitable for simulation of different kinds of Velomitor Sensors, which produce the AC voltage output signal proportional to the measured vibration velocity value. These sensors can be of electro-dynamic or IEPE (ICP®) Type. After selecting this operating mode (See *Figure 86*), the user should select which type of Velomitor Output he/she would like to simulate (See *Figure 87* and *Figure 88*).

Figure 86 VELOMITOR Mode
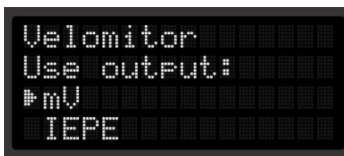
Figure 87 Selecting Electrodynamic Velomitor Output
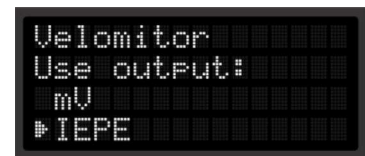
Figure 88 Selecting IEPE Velomitor Output

If the user selects the mV Option (Electro-dynamic Velomitor), the next warning message (See *Figure 89*) will appear on LCD.As Electrodynamic Velomitors directly produce the AC mV Output, mV Output needs to be used for their simulation. (See *Figure 90*).
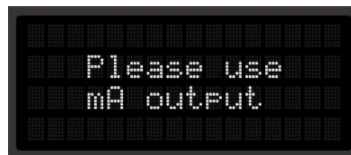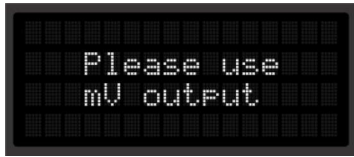

Figure 89 Warning Message

Figure 90 mV Output Selection

Otherwise, if the user selects IEPE Option (IEPE (ICP®)
Velomitor), the next warning message (See *Figure 91*) will appear on LCD. IEPE (ICP®) Velomitors need to be powered from external IEPE (ICP®) Power to produce the correct AC voltage output (See *Figure 92*).
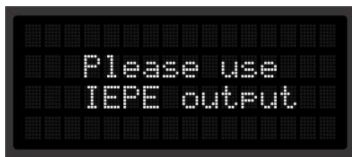
Figure 91 Warning Message
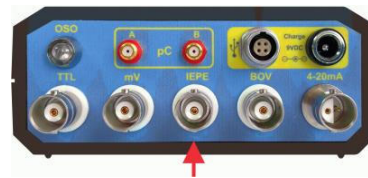
Figure 92 IEPE Output Selection

After this selection, the next submenu will appear on LCD (See *Figure 93*), allowing the user to adjust the Velomitor Sensitivity in the range from 2.0 to 500.0 mV/mm/s (See *Figure 94*).
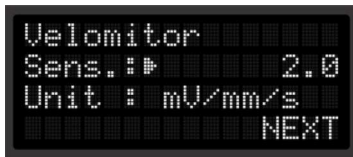
Figure 93 Submenu Screen 1

Figure 94 Changing Velomitor Sensitivity

User can navigate through this submenu by using Up ▲ and Down ▼ keys. By pointing to the submenu item and by pressing Enter ↵ the user will select a parameter which he or she would like to change. The selection of the desired Velomitor sensitivity is confirmed by pressing Enter ↵. Pointing to the Menu Item NEXT and pressing Enter ↵ will bring the final submenu system (See *Figure 95*), which allows the user to set the desired Velomitors output value (See *Figure 96*) and frequency of the output signal (See *Figure 97*).
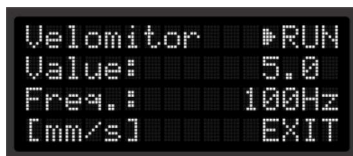
Figure 95 Submenu Screen 2
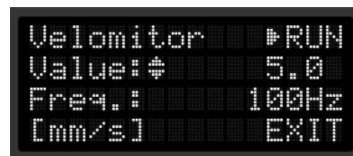
Figure 96 Changing the Value
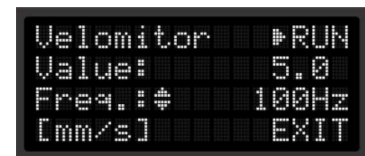
Figure 97 Changing the Frequency

The user can navigate through this submenu by using Up ▲ and Down ▼. By pointing to the submenu item and by pressing Enter ↵ the user will select the parameter which he/she would like to change.

After the desired Velomitor parameter is adjusted, this selection is confirmed by pressing Enter ⏎. Pointing to RUN and pressing Enter ⏎ will start generating of the Velomitor Output (See *Figure 98*).

Figure 98 Simulator in RUN Mode

The cursor shape will change from Run (▶) to Stop sign (■). By pressing Enter ⏎ again, the output generation will be stopped and the cursor will revert to its previous shape, Run (▶). The measuring unit is displayed in the squared brackets. By setting the cursor to point to EXIT and by pressing Enter ⏎ the user will return to the previous menu. This can also be done by pressing Back ⏎.

Application Notes: Instructions on how to use this NID-2000/NID-2000P function can be found in Chapter 11, Item 11.9, on Page 44

5.10 SETTINGS Menu Item

After selection of this Menu Item (See *Figure 99*), the next submenu will appear on the LCD (See *Figure 100*), allowing the user to select and set the Measurement Unit System and Language for LCD.

Figure 99 SETTINGS Mode

Figure 100 Submenu Screen

Using Up ▲ and Down ▼ keys, the user can navigate through this submenu and move the cursor to point at the displayed item which could be edited. By pressing Enter ⏎ the user will enter the mode for adjusting the selected parameter. For Measuring Units System, the user can choose between IMPERIAL or METRIC (See *Figure 101*). The NID-2000/NID-2000P will display the measuring units depending on this selection. This setting influences the next function of the device: Q[pC], IEPE and FLOW.

User can also set the Language for displaying the Menu Text and Messages (See *Figure 102*).

Figure 101 Selecting Measuring Units System

Figure 102 Selecting Language

After finishing the adjustment and pressing Enter ⬚, the selected values are saved in the internal memory and kept even when an NID-2000 is switched Off and On again. If the user sets the cursor to point to EXIT and presses Enter ⬚, the system will return to the previous menu. The user can also do the same by pressing Back key ⬚.

6. PC Connection

The outer terminal of each BNC Output Connector, except the 4-20mA BNC Connector, is connected by the USB Interface Cable to the Personal Computer Case, which is usually grounded. In this operating mode, the user should take care to prevent the possibility of occurrence of Grounding Loops. (e.g. Battery operation of Notebook Computer, disconnecting PC or Notebook Computer from LAN, etc.)

The NID-2000/NID-2000P Outputs can also be controlled by using a Personal Computer (PC) or a Notebook through the USB 2.0 Interface. For this purpose, it is necessary to use the attached USB 2.0 Interface Cable (See *Figure 103*). User should connect the 4 pole LEMO (ODU) Cable Plug to the USB connector on the front panel of NID-2000 (See *Figure 104*)

Figure 103 USB2.0 Interface Cable
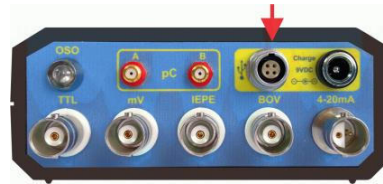
Figure 104 NID-2000/NID-2000P USB Connector

To connect this plug successfully to the NID-2000/NID-2000P USB Connector, please observe that two RED Dots (Circled in Red Color, Red Dot • on the Plug and Red Dot • on the Connector) are in line during connection (See *Figure 105*). The other side of this interface cable should be connected to the PCs USB 2.0 Port (See *Figure 106*).

Figure 105 Properly Connected USB Plug

Figure 106 USB Plug Connected to PCs USB Port

When the connection is established, the confirmation message will appear on the LCD (*See Figure 107*).
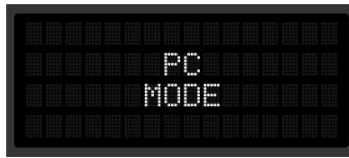
Figure 107 PC Connection established

NID-2000/NID-2000P is ready for use in the PC Mode. In this operating mode, the keyboard panel is disabled! For communication and setting up the output parameters the user may use the PC program NID - 2000 Control or any other Serial Port Communication Program which supports the serial communication in binary mode!

The default Serial Communication Parameters are: **9600** Bauds**, No** Parity**, 8** Data bits**, 1** Stop bit**.**

NOTICE: The user is not able to change these Communication Parameters!

The Communication Protocol Frame format is $\boxed{: b_1\ b_2\ b_3\ b_4\ b_5\ b_6\ b_7\ b_8\ \#}$ The frame consists of two special characters, ':' and '#' , plus eight bytes that carry the information. Every Communication Frame starts with a special character ':' and ends with second special character '#'. In the middle of the Communication Frame, there are eight bytes which carry information for setting the NID-2000/NID-2000P Outputs. The first three bytes ($b_1\ b_2\ b_3$) carry information about the output voltage value (byte b_1 is Most Significant!); another three bytes ($b_4\ b_5\ b_6$) carry information about the output frequency value (byte b_4 is Most Significant!); the seventh byte b_7 carries information about Starting or Stopping the generation of output signal, while the eighth byte b_8 carries information regarding the chosen output function of NID-2000/NID-2000P.

The desired output voltage must be multiplied by 100 and parsing to the three bytes array ($b_1\ b_2\ b_3$). Using this method, the user can obtain two decimal places of precision for the desired output voltage value. The desired output frequency value must also be multiplied by 100 before parsing it to the three bytes array ($b_4\ b_5\ b_6$). Using this method, two decimal places of precision will be obtained for the desired output frequency value.

Explanation of Communication Protocol Frame Bytes

- **b_1** – Most significant Byte of the output Voltage value (24 bit to 17 bit of voltage value)

- **b_2** – 2nd Byte of the output Voltage value (16 bit to 9 bit of voltage value)

- **b_3** – Least significant Byte of the output Voltage value (8 bit to 1 bit of voltage value)

- **b_4** – Most significant Byte of the output Frequency value (24 bit to 17 bit of frequency value)

- **b_5** – 2nd Byte of the output Frequency value (16 bit to 9 bit of frequency value)

- **b_6** – Least significant Byte of the output Frequency value (8 bit to 1 bit of frequency value)

- **b₇** – Start/Stop byte (If the user wants to Start the output generation, this byte should be set to binary value 1 or otherwise to binary value 0)

- **b₈** – Output Function Byte (<u>BINARY VALUE not ASCII !</u>)

  Functions: mV- binary value **0,** Battery Voltage - binary value **1,** OSO On - binary value **2,** OSO Off **-** binary value **3,** Ping – binary value **4,** IEPE – binary value **5,** pC – binary value **6,** TTL – binary value **7,** Current – binary value **8**

The Calculation Example

Desired output voltage value: 10,000.00 mV (10.00 V)

This value should be multiplied by 100.

10,000.00 x 100 = 1,000,000

This value should be parsed into three bytes. This can easily be done by using the following procedure:

1. To calculate the MSB (Most Significant Byte) divide 1,000,000 by 65,536

   1,000,000 / 65,536 = 15.2587

   For MSB the integer value of the result should be used.

   MSB = **15**

2. To calculate the Voltage 2nd Byte, first multiply 65,536 by the value of MSB.

   65,536 x 15 = 983,040

   Subtract this value from 1,000,000

   1,000,000 – 983,040 = 16,960

   Divide the result by 256

   16960 / 256 = 66.25

   For 2nd Byte the integer value of the result should be used.

   2nd Byte = **66**

3. To calculate the LSB (Least Significant Byte), first multiply 256 by the value of 2nd Byte.

   256 x 66 = 16,896

   Subtract this value from 16,960

   16,960 – 16,896 = 64

   LSB = **64**

4. Checking the calculations:

    (65,536 x **15**) + (256 x **66**) + **64** = 1,000,000

    Converting to the output voltage value:

    1,000,000 / 100 = 10,000.00 mV

    The calculation for the MSB, 2nd Byte and the LSB is correct!

Following this procedure, the user can calculate the MSB, 2nd Byte and the LSB of any output Voltage value in the range from 10.00 mV$_{RMS}$ to 10,000.00 mV$_{RMS}$ (10.00 V$_{RMS}$), the MSB, 2nd Byte and the LSB of any output Frequency value in the range from 1.00 Hz to 10,000.00 Hz (10.00 kHz) and the MSB, 2nd Byte and the LSB of any output DC Current value in the range from 4.00 mA to 20.00 mA.

NID-2000/NID-2000P cannot generate the output voltage higher than 10,000.00 mV$_{RMS}$ (10.00 V$_{RMS}$) and the output frequency higher than 10,000.00 Hz (10.00 kHz)!

Communication Protocol

After each command sent to NID-2000/NID-2000P, the communication program will receive an appropriate answer from a calibrator.

Examples of certain Functions:

a) For voltage output generation without IEPE, the user should use the Function **0.**

    Function numbers are binary values, not the ASCII values!

    The command is*: v$_1$v$_2$v$_3$f$_1$f$_2$f$_3$ss0#*

    v$_1$, *v$_2$* and *v$_3$* are three bytes that carry information about the desired output voltage value, *f$_1$*, *f$_2$* and *f$_3$* are three bytes that carry information about the desired output frequency value, *ss* byte (Start/Stop byte) may be binary value **1** to Start or binary value **0** to Stop the generation of the output at the mV Output.

    If NID-2000 receives parameters without errors and the values for output voltage and frequency are in the allowed ranges (10.00 mV$_{RMS}$ to 10,000.00 m V$_{RMS}$; 1.00 Hz to 10,000.00 Hz), it will send the confirmation *:OK#*

    If any of the output values is out of the allowed range, NID-2000/NID-2000P will send*:E0#* as an error message.

b) To get the information about Battery voltage, the user should use Function **1**
    The command is*: 00000001#*

    The answer from NID-2000/NID-2000P consists of 4 bytes, *:b$_1$b$_2$#*
    Battery voltage can be calculated as:

    $$U_{bat} = (b_1 * 256 + b_2) / 100$$

c) To enable the OSO® (Optical Speed Output), the user should use Function **2**
The command is*: 00000002#*

The answer from device will be*: O1#*

d) To disable the OSO® (Optical Speed Output), the user should use Function **3**
The command is*: 00000003#*

The answer from device will be*: 00#*

e) For Ping testing, the user should use Function **4**
The command is*: 00000004#*

If there is an NID-2000/NID-2000P connected, the user will receive an answer*: !!#*

This function is very useful if there are many communications ports on the PC and the user would like to find the one on which the NID-2000/NID-2000P is connected.

f) For the IEPE voltage mode generation, the user should use Function **5**
The command is*: $v_1v_2v_3f_1f_2f_3ss5#$*

v_1, v_2 and v_3 are three bytes that carry information about the desired output voltage value,
f_1, f_2 and f_3 are three bytes that carry information about the desired output frequency value,
ss byte (Start/Stop byte) may be binary value **1** to Start or binary value **0** to Stop the generation of the output at the IEPE output.

If NID-2000 receives parameters without errors and the output voltage and frequency values are within the allowed ranges (10.00 mV$_{RMS}$ to 6,000.00 mV$_{RMS}$; 1.00 Hz to 10,000.00 Hz), it will send the confirmation **: OK#**

If any of the output values is out of the allowed ranges, NID-2000/NID-2000P will send the following message*: E0#*

This function enables accurate generation of the output voltage up to 6 V$_{RMS}$!

g) For the Charge Output generation (pC), the user should use Function **6**
The command is*: $p_1p_2p_3f_1f_2f_3ss6#$*

p_1, p_2 and p_3 are three bytes that carry information about the desired output Charge value (pC),
f_1, f_2 and f_3 are three bytes that carry information about the desired output frequency value,
ss byte (Start/Stop byte) may be binary value **1** to Start or binary value **0** to Stop the generation of the output at the pC output.

If NID-2000 receives the parameters without errors, and the output voltage and frequency values are within the allowed ranges from 10.00 pC to 10,000.00 pC ; from 1.00 Hz to 10,000.00 Hz, it will send the confirmation **:OK#**

If any of the output values is out of the allowed range, the NID-2000/NID-2000P will send the following message*: E0#*

h) For the TTL Output generation, the user should use Function **7**

The command is***: 000f₁f₂f₃ss7#***

The command is***: $000f_1f_2f_3ss7\#$***

f_1, f_2 and f_3 are three bytes that carry information about desired output frequency value,
ss byte (Start/Stop byte) may be binary value **1** to Start or binary value **0** to Stop the output generation at the TTL output.

If NID-2000/NID-2000P receives the parameters without errors and the output frequency value is within the allowed range (1.00 Hz to 10,000.00 Hz), it will send the confirmation***: OK#***

If the output frequency value exceeds the allowed range, the NID-2000/NID-2000P will send the following message***: E0#***

i) For the 4-20 mA Current Output generation, the user should use Function **8**

The command is***: $c_1c_2c_3000ss8\#$***

c_1, c_2 and c_3 are three bytes that carry information about desired output DC Current value,
ss byte (Start/Stop byte) may be binary value **1** to Start or binary value **0** to Stop the output generation at the 4-20 mA output.

If NID-2000/NID-2000P receives the parameters without errors and the output current value is within the allowed range from 4.00 mA to 20.00 mA, it will send the confirmation***: OK#***

If the output current value exceeds the allowed range, NID-2000/NID-2000P will send the following message***: E0#***

In each command, the first and the last bytes, '**:**' and '**#**', are given as the ASCII Codes. Since this is the Binary Protocol, the user should use ASCII values from the ASCII Table. The ASCII value of '**:**' character is 58 dec. or 3A hex., while the ASCII Code of the '**#**' character is 35 dec. or 23 hex. Except these two bytes, all other values are binary values, not the ASCII! Please note, when communication program receives an answer from the NID-2000, the received bytes are coded and displayed as the ASCII values, but for further calculations the user should convert them and use their binary values!

Caution

Using described protocol to make custom applications is highly recommended for the ADVANCED USERS ONLY! The improper use of this protocol can damage NID-2000/NID-2000P. Higher rates of the output voltage can also damage user's equipment (especially in the IEPE Mode).

NORTH Instruments LLC DOES NOT ACCEPT any responsibility for damages of user's test equipment caused by improper use of this option.

For the safest use of the NID-2000/NID-2000P, the user should obtain the manufacturer's PC Application, which can be downloaded from the official NORTH Instruments LLC Web Site: **www.north-instruments.com**

7. Charging Rechargeable Batteries

When the installed Rechargeable Batteries are empty, the user will get the warning message on LCD (*See Figure 108*)

Figure 108 The Empty Battery Warning Screen

About 10 seconds after displaying this message on LCD, NID-2000/NID-2000P will be automatically switched Off, to prevent the generation of output signals which are outside of the specified accuracy. When this occurs, it is necessary to connect the external charger (*See Figure 109*) to the Charge Connector (*See Figure 110*)

Figure 109 Charging Adapter 9V$_{DC}$

Figure 110 NID-2000/NID-2000P Charging Connector

This connector is used for connecting the external regulated power supply of 9 V$_{DC}$. When the Charger is connected, the Charge LED is lit (*See Figure 111*).

Figure 111 Charging LED

During the charging process, DO NOT use the device to generate any of the output signals because the output signals will not be within specified accuracy ranges!

The charging time to obtain the fully charged batteries depends on the capacity of the batteries and may takes a few hours. The embedded charger electronics will automatically stop the charging process after the batteries are fully charged.

8. Technical Notes

NID-2000 and NID-2000P are precision instruments and should be treated as such. In functional terms, both devices are identical, with the difference that the declared accuracy of the NID-2000 device is 0.5%, while the accuracy of the NID-2000P device is 0.1%.

Maintenance and Calibration

Various factors such as aging of electronics components or temperature can cause an errors in the analog output electronics and because that the device should be checked every six months.

The characteristic check point procedures are given bellow and should be performed using the precision 6 ½ or 8 ½ digits digital multi-meter (DMM).

Checking the devices performances

Check point 1

a. Select the option **U[mV]** from the Main Menu.
b. Set the output frequency value to 100 Hz.
c. Step by step, set the output voltages value to: 20 mV, 100 mV, 500 mV, 999 mV, 2000 mV, 5000 mV and 10000 mV.
d. For each of these set values, measure and record the output voltage value.

The measured output voltage values for model NID-2000 should be within Set Voltage ±0.5% or better.
The measured output voltage values for model NID-2000P should be within Set Voltage ±0.1% or better.

Check point 2

a. Select the option **U[mV]** from the Main Menu.
b. Set the output voltage value to 999 mV.
c. Step by step, set the output frequency value to: 10 Hz, 20 Hz, 100 Hz, 500 Hz, 1 kHz, 2 kHz, 5 kHz and 10 kHz.
d. For each of these set values, measure and record the output voltage value.

The measured output voltage values for model NID-2000 should be within Set Voltage ±0.5% or better.
The measured output voltage values for model NID-2000P should be within Set Voltage ±0.1% or better.

Check point 3

a. Select the option **U[mV]** from the Main Menu
b. Set the output voltage value to 500 mV
c. Step by step, set the output frequency value to: 2 Hz, 10 Hz, 50 Hz, 100 Hz, 200 Hz, 500 Hz, 1 kHz, 2 kHz, 5 kHz and 10 kHz.
d. For each of these values, measure and record the output frequency value.

The measured output frequency values for both models should be within Set Frequency ± 0.1%

<u>Check point 4</u>

    a. Select the option **CURRENT** from the Main Menu.
    b. Step by step, set the output current value to: 4.00 mA, 8.00 mA, 12.00 mA, 16.00 mA and 20.00 mA.
    c. For each of these values, measure and record the output current value.

The measured output current values for both models should be within Set Current ±0.1%

If any of measured values are out of declared tolerance, please consider to send the device to your NORTH Instruments representative for calibration.
To maintain the high measurement accuracy, device requires to be calibrated every two years!

Storage

Use the carrying case for transporting and for making on-site measurements. If NID-2000 or NID-2000P is not used for lengthy periods, stow the device in the case and connect it periodically to the charger to avoid the battery from completely discharging.

Make sure that:
    - the storage location is dry
    - the device is not stored near electronic equipment which can generate strong electro magnetic fields.
    - the measurement instrument is not exposed to temperatures above 70°C / 156°F or under -20°C /-4°F.
    - the humidity is not more than 90%.

Cleaning

If lightly soiled, the carrying case and the housing of instrument can be wiped with a damp cloth. In cases of more stubborn soiling, use a household mild cleanser. Use a soft and dry cloth to clean the display.

Never use solvents or other strong cleaning agents!

Spare parts, accessories

Only original spare parts and accessories may be used. Information on these parts is given in the NID-2000/NID-2000P User Manual, page 34. The current edition of User Manual can be downloaded from the NORTH Instruments homepage (www.north-instruments.com).

Disposal

Dispose of the instrument and the battery at the end of its lifetime according to the applicable environmental regulations. The battery should be handed in at the local communal disposal facility in a discharged condition. The battery is empty when the message 'BATTERY EMPTY' appears on the screen. For safety, cover the metal contacts of the battery with sticky tape.

Under no circumstances may these products be disposed of in household or municipal waste!

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9. Accessories

For proper and adequate use of NID-2000/NID-2000P and also in order to obtain the stated output characteristics, it is necessary to use only the Accessories which are originally supplied with the device, in its Carrying Case.

The included accessories are:

a) Charging Adapter, output voltage 9V$_{DC}$, 500 mA

Purpose: For Charging the installed Rechargeable Batteries, when they goes Low (or Empty)

Figure 112 Charging Adapter

b) USB 2.0 Interface Cable, LEMO to USB 2.0 Type A Connector

Purpose: For controlling NID-2000/NID-2000P Functions using a PC or a Notebook via USB 2.0 Interface.

Figure 113 USB 2.0 Interface Cable

c) BNC to BNC Adapter Cable

Purpose: For connecting NID-2000/NID-2000P to DUT (Device Under Test)
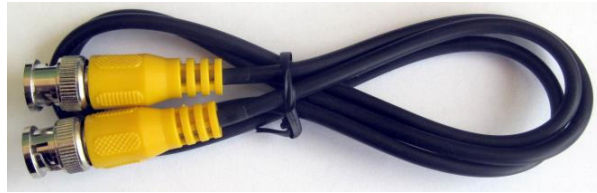
Figure 114 BNC to BNC Adapter Cable

d) BNC to Banana Plugs Adapter Cable with Crocodile Crimps

Purpose: For connecting NID-2000/NID-2000P to DUT (Device Under Test)

Figure 115 BNC to Banana Plugs Adapter Cable with Crocodile Crimps

e) BNC Twinax Adapter Cable

Purpose: For connecting NID-2000/NID-2000P to DUT (Device Under Test)

Figure 116 BNC Twinax Adapter Cable

10. Device Dimensions

Figure 117 Device dimensions in millimeters

Figure 118 Device dimensions in inches

11. Application Notes

11.1 Using mV Output
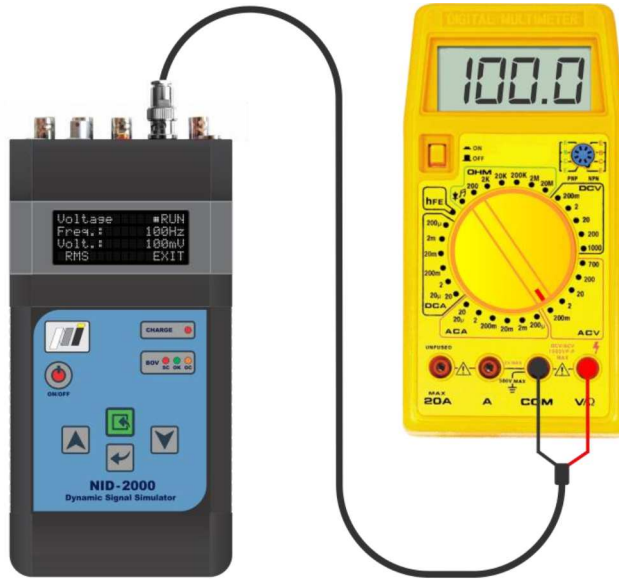
Figure 119 Testing Digital Multi Meter

11.2 Using pC Output

Figure 120 Testing Charge Amplifier

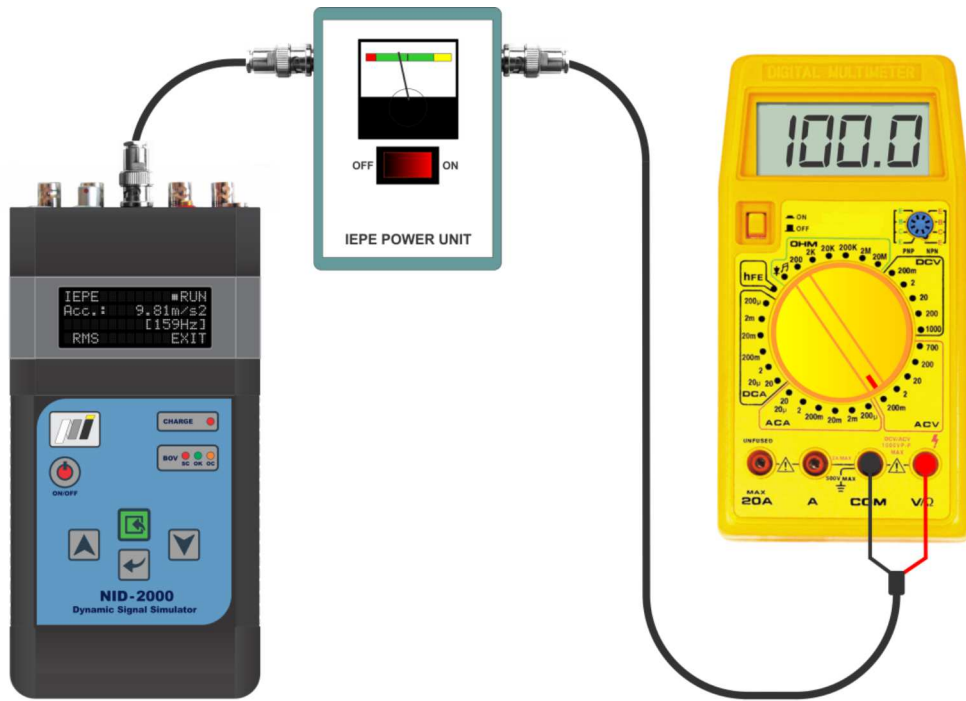## 11.3 Using IEPE Output

Figure 121 Testing Vibration Meter

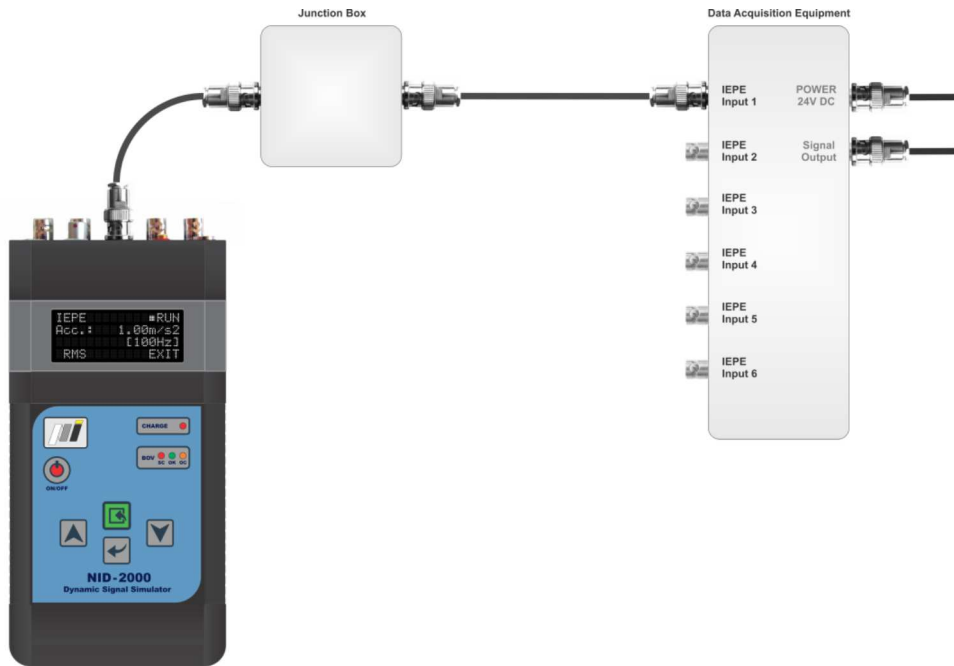
Figure 122 Testing IEPE Power Supply

Figure 123 Testing Acquisition Unit including Cables and Junction Box

11.4 Using SPEED Output

Figure 124 Testing RPM Meter
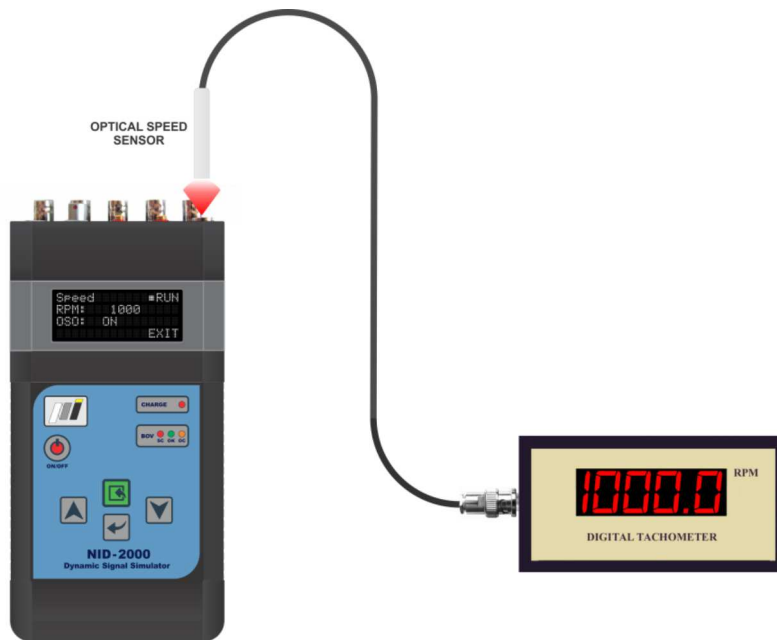
Figure 125 Testing RPM Meter with optical sensor

Figure 126 Testing Frequency Counter

11.5 Using BOV Input

Figure 127 Testing IEPE Sensor

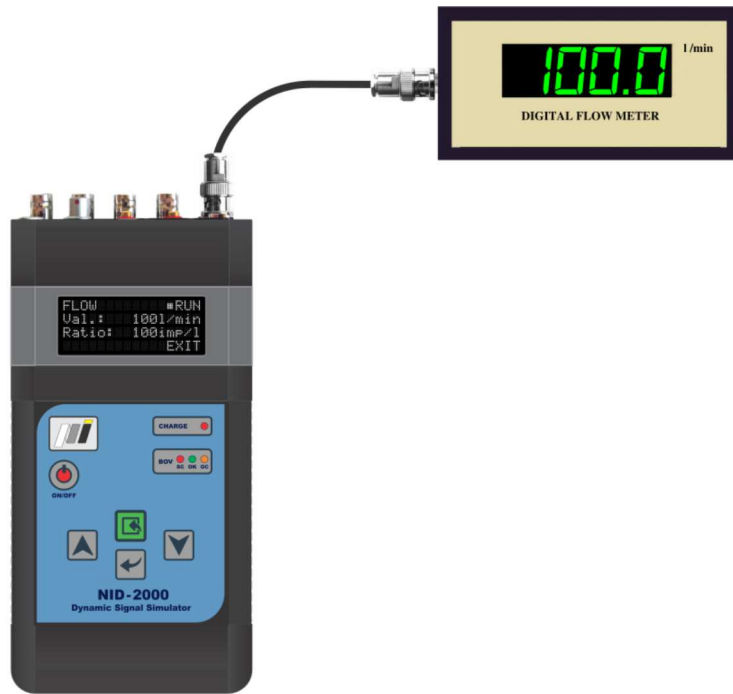*Figure 128 Testing IEPE Sensor including Cables and Junction Box*

11.6 Using FLOW Output

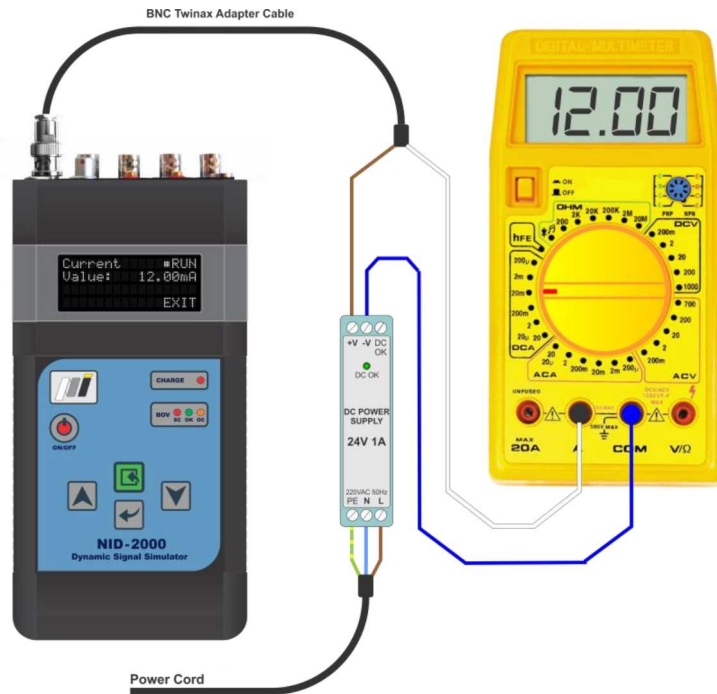*Figure 129 Testing Digital Flow Meter*

11.7 Using CURRENT Output

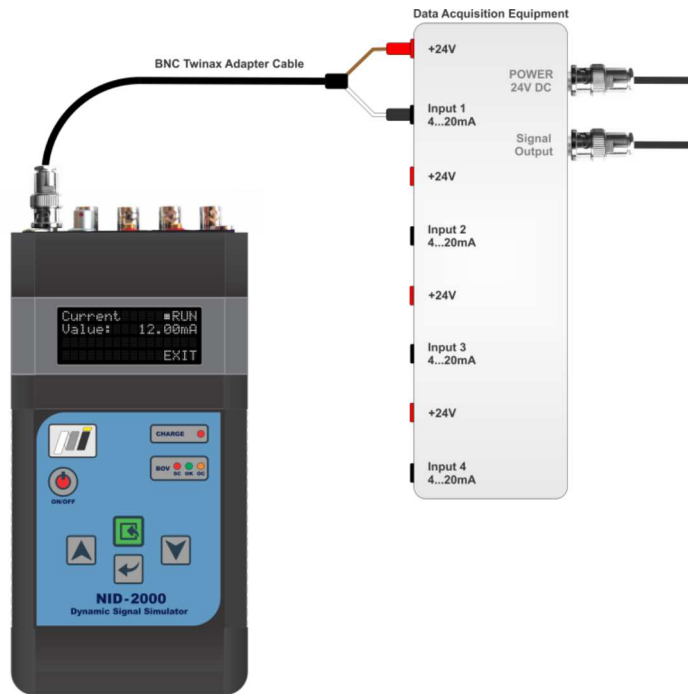*Figure 130 Testing Digital Multi Meter DC mA Range*

Figure 131 Testing Data Acquisition Unit Current Inputs (4...20mA DC, 2 Wires, Loop Powered)

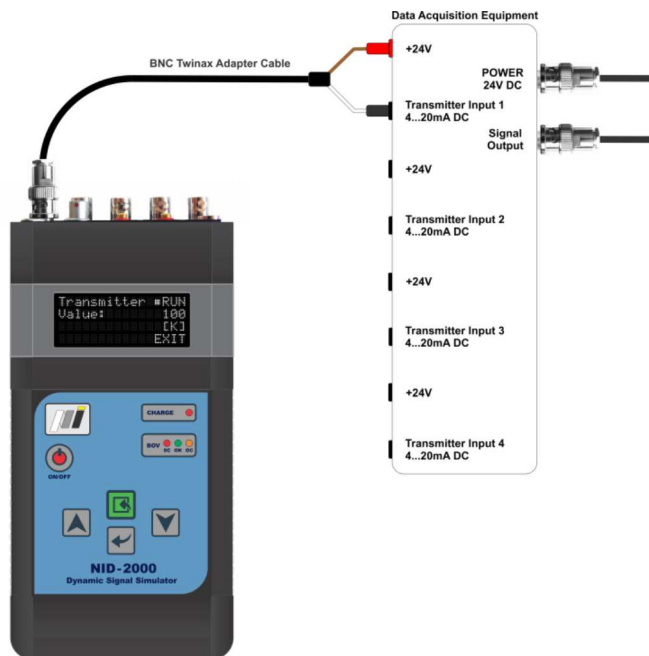## 11.8 Using TRANSMITTER Output

Figure 132 Testing Acquisition Unit Transmitter Inputs (4...20mA DC, 2 Wires, Loop Powered)
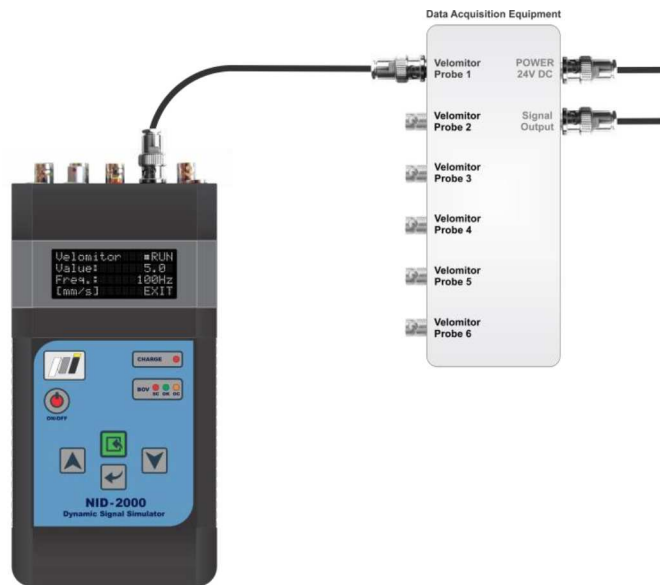
11.9 Using VELOMITOR Output

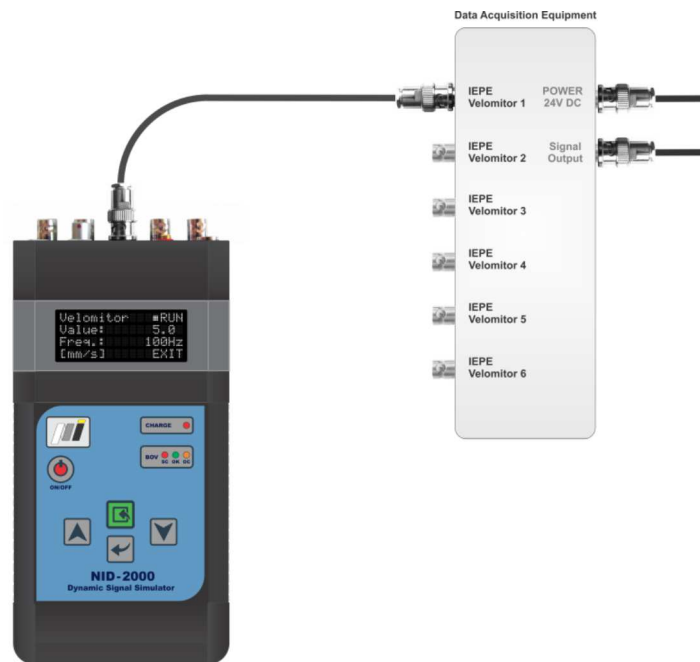*Figure 133 Testing Acquisition Unit AC Voltage Velomitor Inputs*

Figure 134 Testing Acquisition Unit IEPE Velomitor Inputs

12. Notes