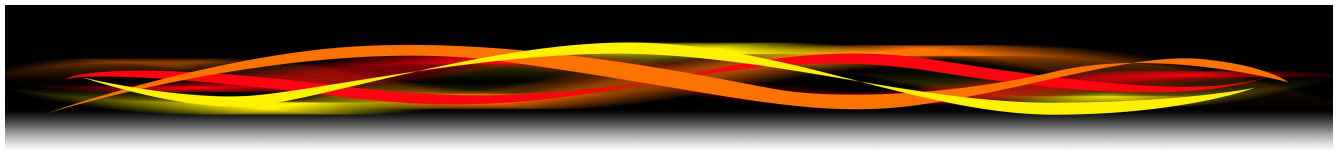
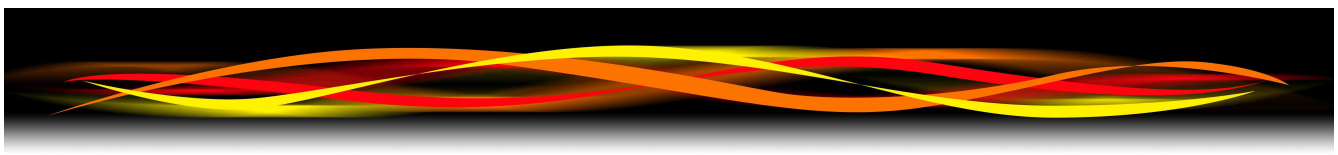


Newflow

NÅNO SIM

User Manual



Contact:

Newflow Ltd
George House
Derwent Road
Malton, North Yorkshire
YO17 6YB , UK

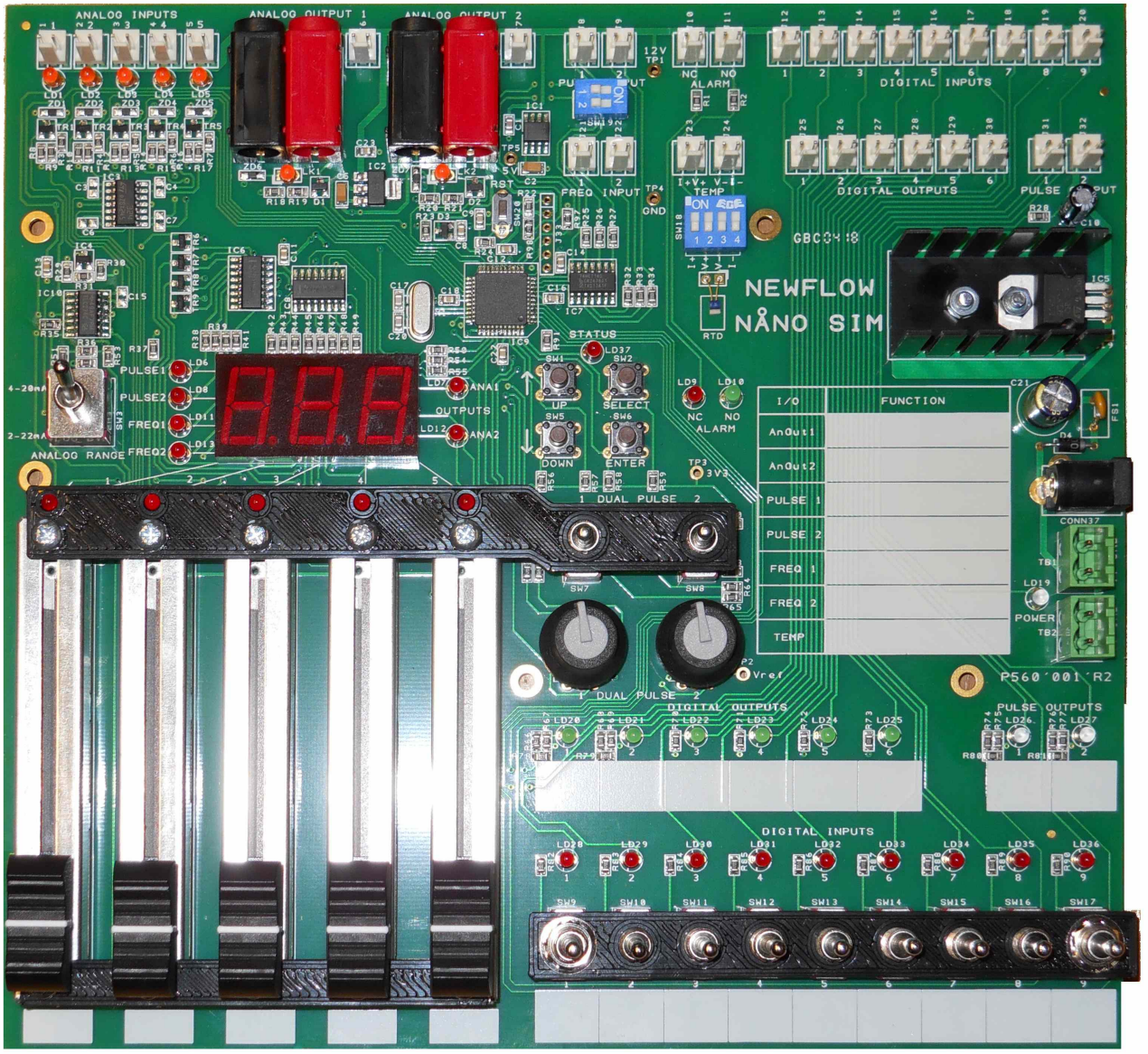
Tel: +44 1653 697 200
Fax: +44 8700 667 325
Email: sales@newflow.co.uk

Document Information

Document Name: NÅNO Simulator User Manual

Document Identifier NF_SIM_UM

Rev	Date	Changes	Prepared	Checked	Authorised
0	6 Apr 16	Original	MOB	DGS	MOB
1	20/02/18	Added PID	MOB	DGS	GPL



NÅNO Simulator PCB, without cables

Table of Contents

1 Introduction

The NÅNO Simulator has been designed to work with the Newflow NÅNO product range but is equally useful with 3rd party RTUs and Flow Computers.

1.1 I/O Simulation Provided

The NANO Sim provides the following facilities:

No of Channels	*Simulator Description*	*Connected to*
5	Linear Slide Potentiometers (Sliders) which produce a 4-20mA Analog Output to mimic field Transmitters	Current Mode Analog Inputs
1	Four wire Pt100 RTD	RTD temperature input
2	Turbine Pulse Simulation. These can operate independently or in dual pulse mode	Turbine Inputs/ Dual Pulse
2	Density Meter Simulation, Frequency Outputs	Density Meter Inputs
9	Switched Outputs	Digital Inputs
2	Current Measurement Inputs	Analog Outputs
8	Digital Status LEDs	Digital Outputs & Pulse Outputs
1	Alarm Relay position Indicators	Alarm Relay

Although the simulation can be used with a range of other instruments, the user manual assumes the user has wisely chosen to use the NÅNO measurement electronics.

A white, write on area is provided by the controls, and a dry wipe marker pen with fine nib can be used to annotate the use of each control, which can be useful especially during training and familiarization.

In default mode, when an Analog Input Slider or a Pulse Output rate potentiometer is moved, the Readout tell-tale LED will illuminate to indicate what has changed, and the Readout Display will show the current being driven in milliamps or the Pulse Output rate in Hz or KHz.

The turbine pulse simulation is very flexible, allowing two single pulse outputs, a Dual Pulse output with missing pulses or a PID loop simulator, depending upon operational mode selected.

1.2 Start up

When power is applied, the Blue power LED adjacent to the power connectors will come on, the Readout Display will Show 8.8.8. as a check that all segments of the display are working and the Readout tell-tale LEDs will light one at a time, apparently moving anti-clockwise, and stop at the Analog Input 1 LED.

The Readout Display will then briefly display the current firmware version (which was u 1.5 when the manual was released) and the Readout Display then will briefly indicate the operating mode.

The simulator can operate in 3 modes currently

Mode 1 - Normal Operation, shows nor on the three-digit 7-segment Readout Display

Mode 2 - Dual Pulse Mode, shows dP on the three-digit 7-segment Readout Display

Mode 3 - PID Simulator mode, shows P id on the three-digit 7- segment Readout Display

After briefly displaying the operating mode, the Readout Display will now indicate the current being driven by Analog Output 1.

1.3 Changing Operational Mode

The operational mode can only be changed when the following conditions are met:

Pulse Input 3-way control switches for both Pulse Inputs 1 & 2 are in the centre position

and

There are no residual pulses being delivered (Pulse input 1 and 2 tell-tale LEDs are off)

and

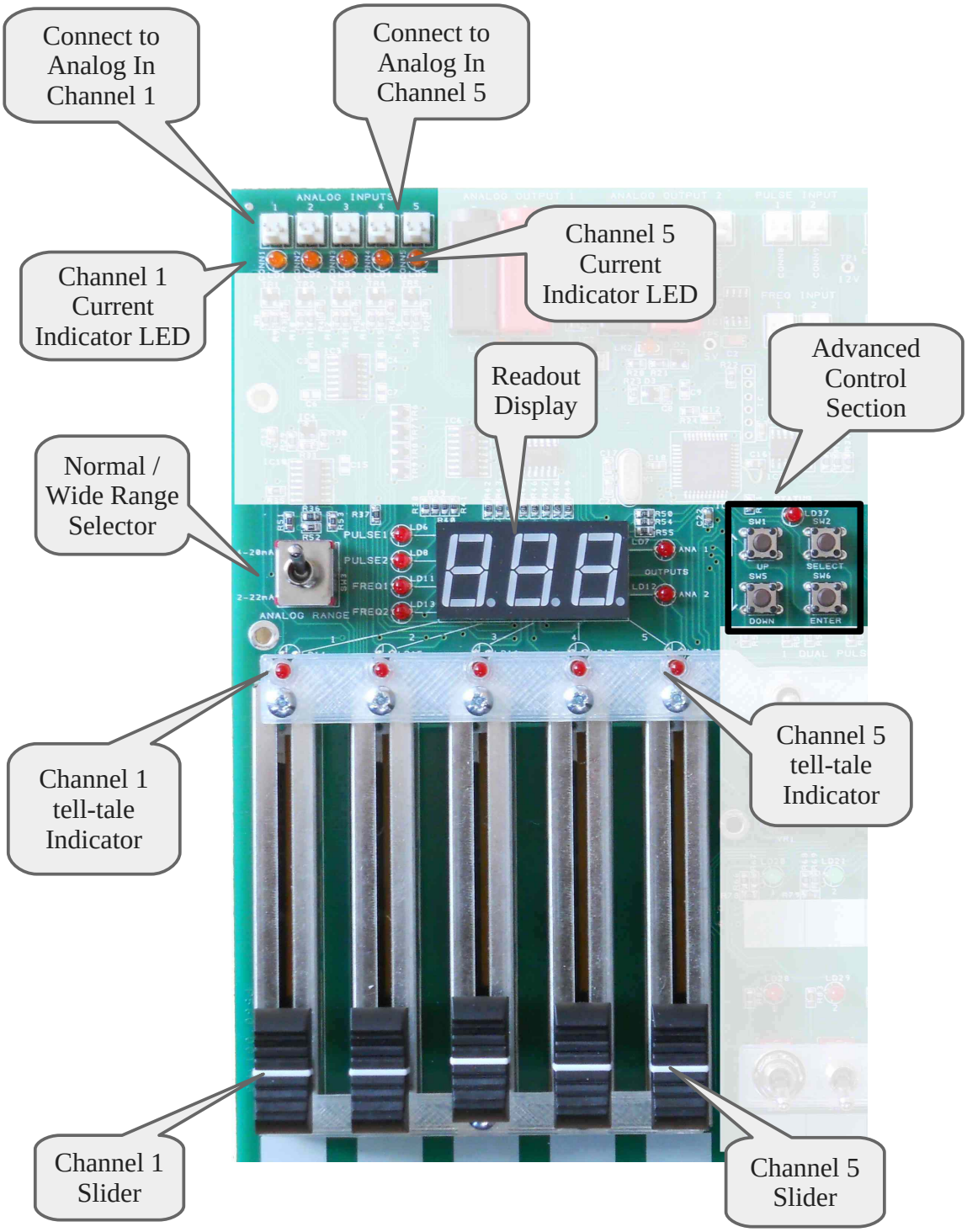
The Readout (tell-tale) LEDs are off (Note this is the state between Pulse Input 1 and Analog Out 1, see section 4.1 for further information

The readout Display will now show nor or dP or P id

If all these conditions are met, pressing the SELECT button (see section 6.1) cycles the mode to be selected, by pressing the button once or twice. Three presses takes you back to the start of the cycle.

The selected operational mode will be restored following a power cycle or reset.

2 Analog Input Simulation



With the Normal/Wide Range selection switch in the up position, each channel will drive a current of between 4 mA and 20 mA. The 5 sliders in the photograph above are in the 4 mA position, and pushing each one upwards, increases the loop current.

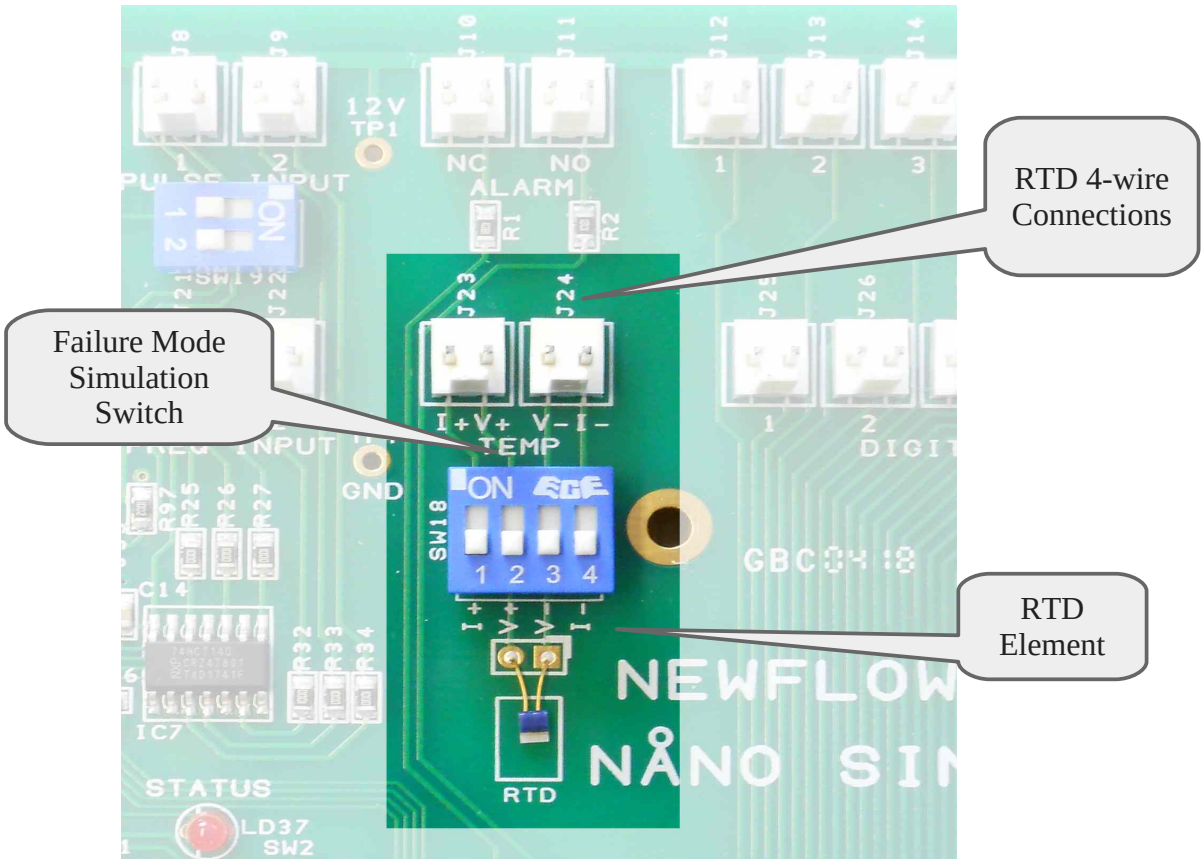
When a slider position is moved and the driven current changes, the readout tell-tale LED associated with the slider will be illuminated in RED and three-digit, 7 segment LED Readout Display will show the approximate current driven in milliamps, with a resolution of a tenth of a milliamp. So the display will show a value between 4.0 and 20.0 (+/- 0.1mA)

NOTE: This measurement is for indication only, and is not intended for calibration checking and similar high accuracy applications. It is accurate to around +/- 0.1 mA, but this figure is not guaranteed.

NOTE: If the channel wiring has not been connected, there will be NO current flowing, and the readout will not change. Each current channel has a separate connector and there is also an orange LED in the current loop. If the LED is not lit, then there is NO current flowing. Note the brightness of the orange LED will increase as the current in the loop increases.

If the Normal/Wide Range selection switch in the down position, then the bottom end of the sliders will generate around 2 mA and when the slider are at the top, 22 mA will driven. This is very useful feature for testing alarms or circuit fails.

2.1 Pt100 RTD



An RTD sensor is provided on the simulator to provide a real temperature element, that will respond to the changes that occur during the day and night. You can also place a finger on the device, to make a quick change to the temperature. When used with most apps, the trending will allow the user to see the regular day and night temperature changes.

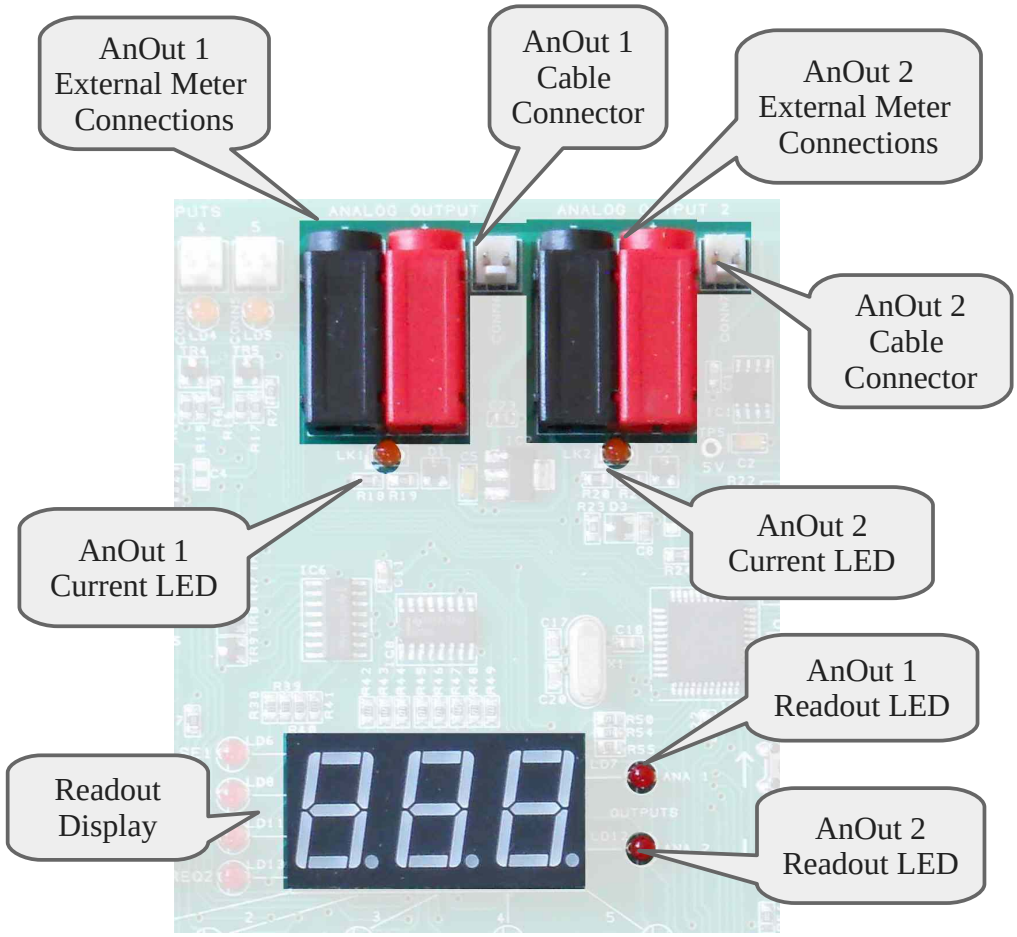
A four-way DIL switch is provide which allow the simulation of a range of failure modes, such as open circuiting one or all of the voltage and current measurements.

The 4-wire connections to the NÅNO controller are shown directly above the jumper block.

3 Analog Output Measurement

The NÅNO Sim can measure the current from two external 4-20 mA passive analog outputs.

NOTE: This measurement is for indication only, and is not intended for calibration checking and similar high accuracy applications.



The measurement circuit provides a current source of approximately 10 Volts together with a measurement circuit which will *indicate* the flowing current of between 0.0 mA and 25 mA. It is intended to be used with a current sinking Analog Output circuit, and **not** intended for use with a current sourcing Analog Output. It is accurate to approximately +/- 0.1 mA.

By default following a power on, the simulator will have the Readout tell-tale LED for Analog Out 1 (ANA 1) selected. Clicking the UP (clockwise) button will select Analog Out 2 measurement.

When current is flowing, the ORANGE current indication LED will glow, and the brightness will be current dependant.

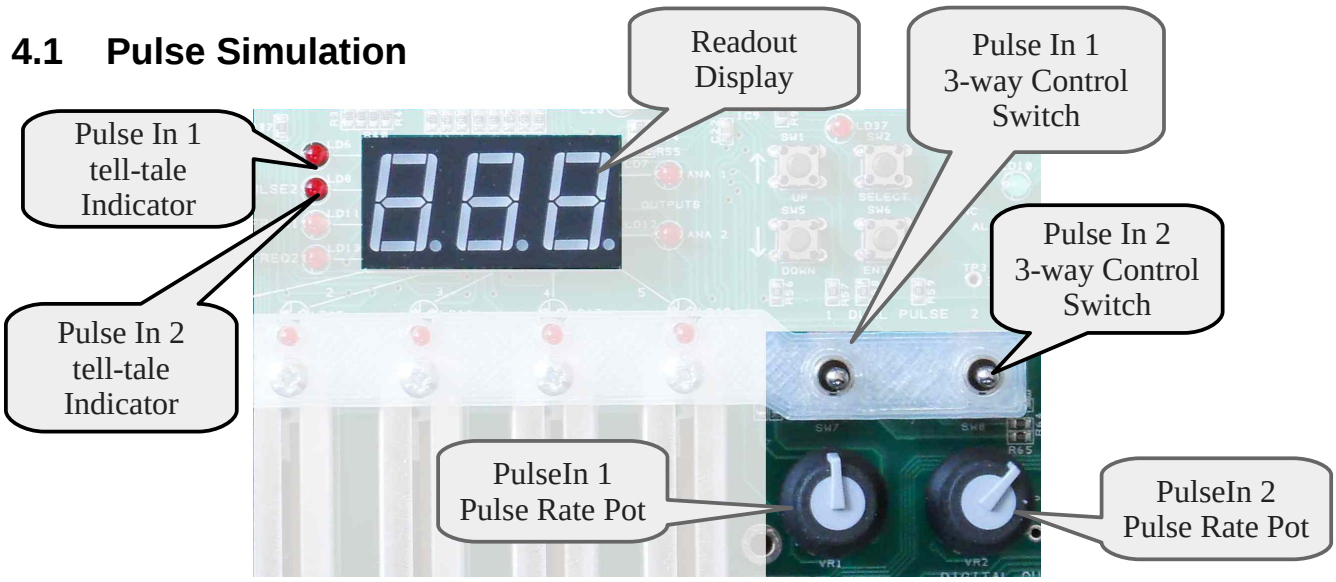
If both Analog Outputs want to be monitored simultaneously, 4mm terminals have been provided to allow the easy connection of an external 20 mA meter or DVM.

NOTE: When an external current meter is connected to the 4 mm terminals, the respective ORANGE current LEDs will not light up when current is flowing.

4 Pulse & Frequency Simulation

The NANO simulator can produce two separate pulse streams or one dual pulse stream, which can be continuous or provide a fixed number of pulses. In addition it can provide two separate continuous frequency outputs for simulating frequency mode density meters.

4.1 Pulse Simulation



In normal mode, nor , the two channels operate independently. The frequency of each channel is set using the rotary potentiometer, and the 3-way switch above it controls its basic operation. The switch is a centre off switch, which can be turned on by pushing upwards, or pulled down for a momentary action. When released, it will return to the centre off position.

By default, the pulse batch size for each channel is set to 1000 pulses.

Putting the switch upwards turns on the pulse generation, and pulses will be emitted at the rate determined by the rotary pot setting. If the rotary pot is fully anticlockwise, then the output frequency is set to DC, and no pulses will be generated. The readout display will show 0 (Hertz).

As the pot is turned clockwise, the pulse rate increases by fixed increments. These frequencies are

Range of frequencies available, in Hz (1000 and above displayed in KHz)								
0 - DC	1	2	5	10	15	20	25	30
40	50	75	100	150	200	233	267	300
400	450	500	600	750	1000	1250	1500	1600
1700	1800	1900	2000	2200	2400	2600	2800	3000
3200	3400	3600	3800	4000	4500	5000	5500	6000
6500	7000	7500	8000	8500	9000	9500	10000	Max

NOTE: When the pot is rotated, the Readout Display shows the pulse rate as it is changing and for a short time after the rotation has stopped. If there is no decimal place displayed, the rate is in Hertz. If the decimal place is shown, the rate is in KHz.

When the Pulse Mode switch is moved from UP (on) to the centre position, the pulse output will stop when the next whole number multiple of the batch size is reached. For example, assuming the default batch size of 1000 is still being used, and the switch happened to be moved to the centre (off) position as 4567 pulses had been generated, the pulses will continue to be generated until 5000 have been delivered, at which point, the output will stop.

Each time the switch is pulled down to the momentary on position, a number of pulses equal to the batch size will be delivered. If pulses are still being generated and the momentary action is triggered once more, it will be ignored until the previous batch has been completed.

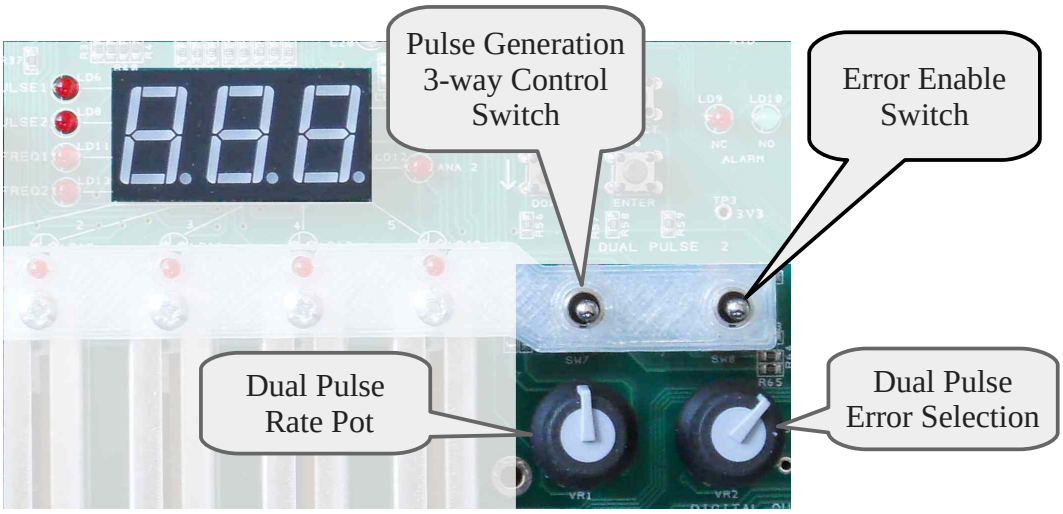
The batch size can be changed using the advanced setting mode, and the number of pulses can be selected from:

1, 10, 100, 500, 1,000, 5,000, 10,000, 50,000 or 65535 Pulses. Pulses of 1000 or over are displayed in thousands, 1000 being displayed as 1.00 on the Readout Display. 65535 pulses are shown as 65.5 on the Readout Display. Pulse count is retained following a power cycle or reset.

4.1.1 Dual Pulse Mode

Section 1.3 shows how to change operational mode. Select the dP mode.

When in Dual Pulse Mode, the left hand pot determines the pulse rate of both channels, and the 3 way control switch determines if the pulses are generated continuously or in batches, exactly as in normal mode.



If the error enable switch is in the centre position, there will be no error pulses generated. If the switch is pushed upwards, the right hand pot then selects the error. Fully anticlockwise will generated 1 in 10 pulses missing on channel A. Fully clockwise will generate a 1:10 error on the B channel, and the centre produces 1 in 10 errors on Both channels, at different times

4.1.2 Dual Pulse Mode, 3 Way Switch Positions

Left Hand Switch Position	Right Hand Switch Position	Action resulting
Centre/Off	Centre/Off	Pulse train is either off or completing the last batch, with no pulse errors.
Momentarily Down	Centre/Off	Delivers a batch of pulses with no pulse errors.
Up	Centre/Off	Delivers pulses continuously with no error.
Up	Momentarily Down	Pulses delivered continuously with one bad pulse set generated on each down press of the RH Switch.
Up	Up	Pulses delivered continuously with 1 in 10 bad pulses sets generated, depending upon position of the RH Potentiometer.

4.2 Density Meter Simulation

These provide two separate frequencies. By Default, Frequency 1 is 500Hz and Frequency 2 is 1KHz. Both of these defaults can be changed using the advanced setting mode, and will be restored following a power cycle or reset. The range of frequencies available is:

Density Meter Simulation Frequencies, in Hertz							
50	75	100	150	200	233	267	300
400	500	600	750	1000	1250	1500	1600
1700	1800	1900	2000	2200	2400	2600	2800
3000	3200	3400	3600	3800	4000	4500	5000

5 Digital I/O

5.1 Switched Outputs to drive Digital Inputs

Nine Switches are provided which will cover the Digital Input needs of the NANO. Since a Switch upwards may be assumed to be ON in the USA and Off in Europe, a red tell-tale LED is provided above each switch. The LED will be ON when the switch is on, and proving a wetted input to the Digital Inputs. Note, pushing a switch upwards leaves it turned on, but pulling it down will turn it until released.

5.2 Digital Outputs

Each digital output is equiped with a green LED mimic, LED on indicating Digital Output Energised/On

5.3 Pulse Outputs

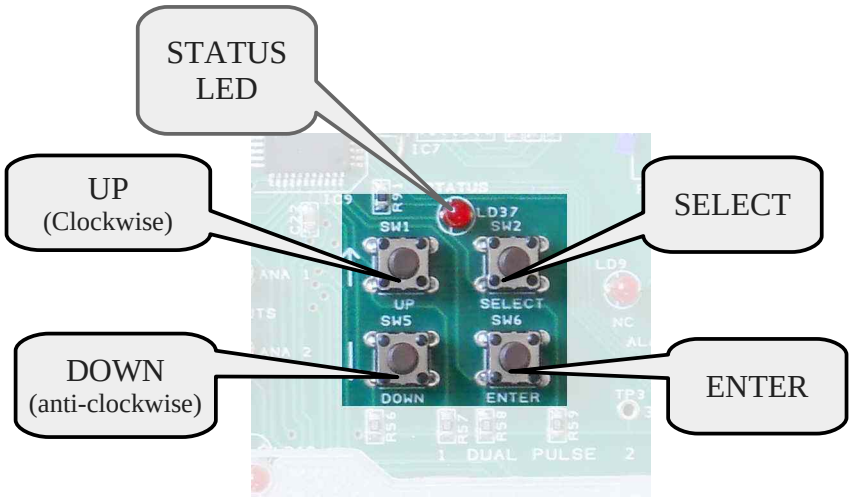
Each of the Pulse outputs is equipped with a Blue LED mimic which will flash in time with the pulse outputs. At faster pulse out frequencies, the blue LEDs will glow continuously, but will be dimmer.

5.4 Alarm Relay

The Alarm relay has both Normally open and Normally Closed Contacts. A Red LED is connected to the Normally closed contact and a Green LED to the Normally Open contact. When the NANO is operating, and has no alarms, then the relay will be energised, and the Normally open contacts will be closed, and a green light shows, indicating a healthy machine.

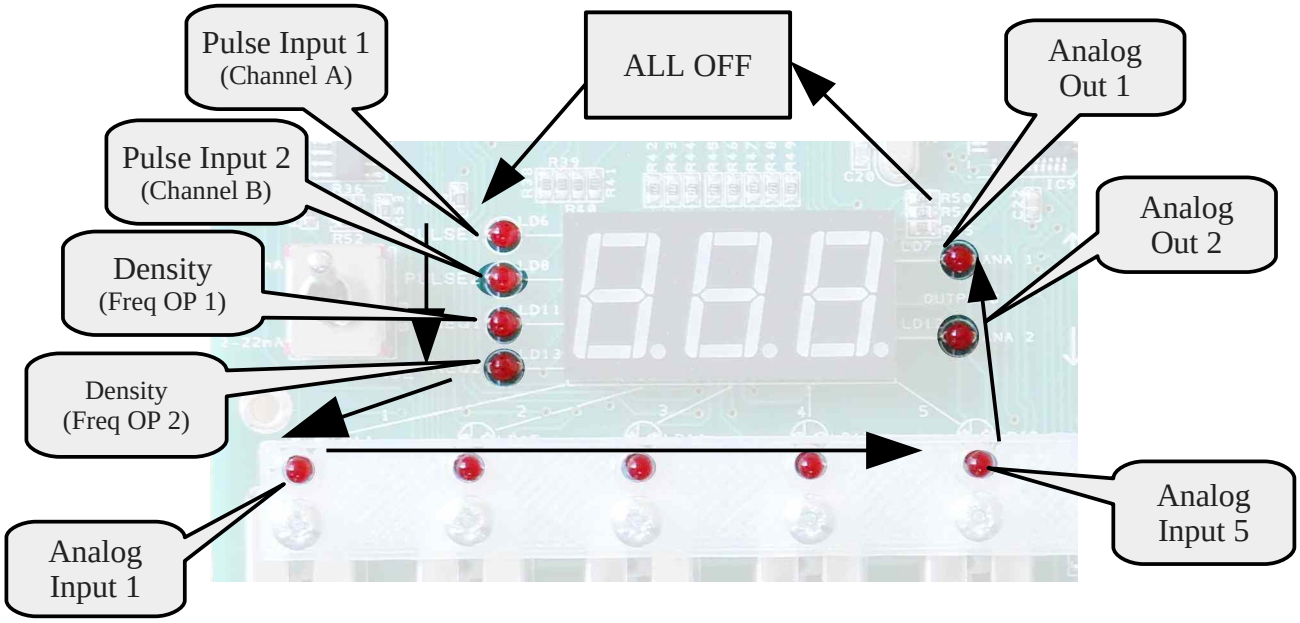
6 Advanced Settings

6.1 Changing Default Values



The advanced settings are controlled by the 4 switches, shown above, and the results of the advanced settings are shown by the Readout Display and by the Readout LEDs, which show which function is being displayed or modified.

Following a power-on, the Readout (tell-tale) LED for Analog Out 1 will be lit, and the readout display will show the current from Analog Output 1. To enter Advanced mode, firstly select the feature to be modified by moving the Readout (tell-tale) LED. by clicking the UP (clockwise) or DOWN (anti-clockwise) button



The arrows show the directions in which the single selection readout LED moves when the Down (anticlockwise) button is pressed. If the UP button is pressed, the direction of travel is the opposite way around.

NOTE: Only Pulse Input, Channels A & B or Density/Frequency Output 1 & 2 have advanced modes of operation.

When the appropriate Readout tell-tale LED is lit-up, click the SELECT button to modify the setting. Whilst the SELECT button was depressed, the Readout Display will indicate the mode being selected, and when released, the Readout Display will show the current value.

Mode	Advanced control	Readout Display
PC1	Pulse Count setting for Pulse Input 1 (channel A)	Pulse Count Batch Size in the range 1 to 65535
PC2	Pulse Count for setting Pulse Input 2 (channel B)	Pulse Count Batch Size in the range 1 to 65535
Fr1	Frequency Setting for Frequency/Density 1	Frequency in Hertz between 50 and 5.0 KHz
Fr2	Frequency Setting for Frequency/Density 2	Frequency in Hertz between 50 and 5.0 KHz

The Readout tell-tale LED will now flash twice per second to indicate that the value can be changed.

To modify the value, click the UP or DOWN buttons to move through the options provided. Note the buttons have auto-repeat with acceleration, so the user can quickly move through the options provided.

The Pulse Count can be set to the following pulse batch sizes

Pulse Count showing Readout Display (decimal point = thousands) and actual pulse counts								
1	10	100	500	1.0	5.0	10.0	50.0	65.6
1	10	100	500	1000	5000	10000	50000	65535

The Frequency can be set to any of the frequencies shown for the Pulse Input frequencies, but within the range of 50 Hz to 5.0 KHz. Once the desired Pulse Count or Frequency has been selected, press the ENTER Button (or the SELECT Button once more) and the Readout tell-tale LED will stop flashing.

6.2 Locking the Readout Display

In normal operation, the Readout tell-tale LED will go back to its last position following a change of Analog Slider or Pulse Frequency.

In order to stop the Readout Display from automatically moving when an Analog Input current or Pulse Input frequency is changed using the linear or rotary potentiometers, a Readout Display lock has been provided. To invoke the lock, select the feature of interest by turning on the appropriate Readout tell-tale LED, and then press and hold the ENTER button for two seconds. The STATUS LED above the 4 switches will be lit, and the Readout tell-tale LEDs will no longer follow manual input to the simulator. To cancel the feature, press the ENTER button again, the STATUS LED will be extinguished, and normal operation will occur once more.

6.3 PID Operation

The P560 NÅNO Sim can be used as a PID simulator. The unit produces a pulse frequency that is a function of the Analog Output current, provided by the NÅNO.

There are 6 different transfer functions, The vertical axis shows the nominal frequency generated, and the horizontal axis shows the current input required to produce the output frequency

Table 0, Linear Inverted 4-20ma

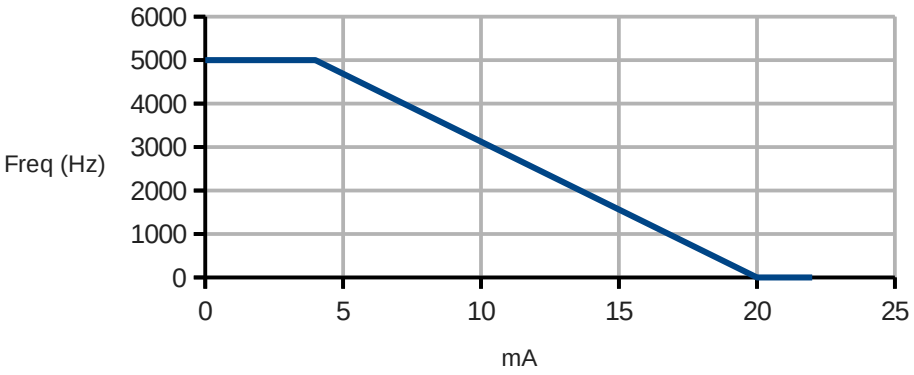


Table 1, Linear 4-20ma

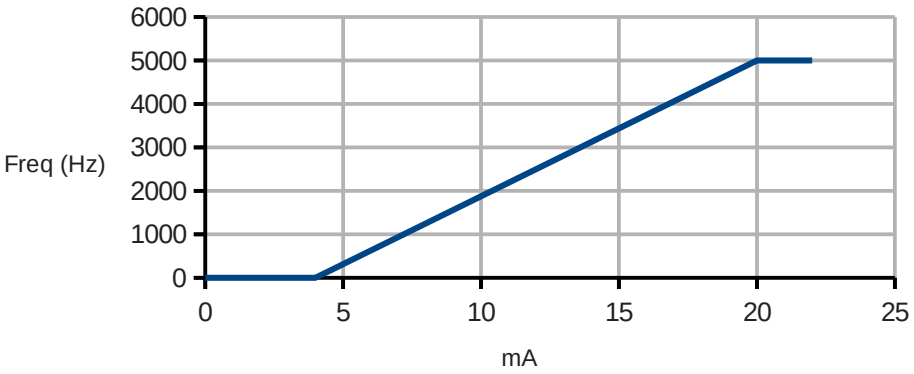


Table 2, Linear 0-25ma

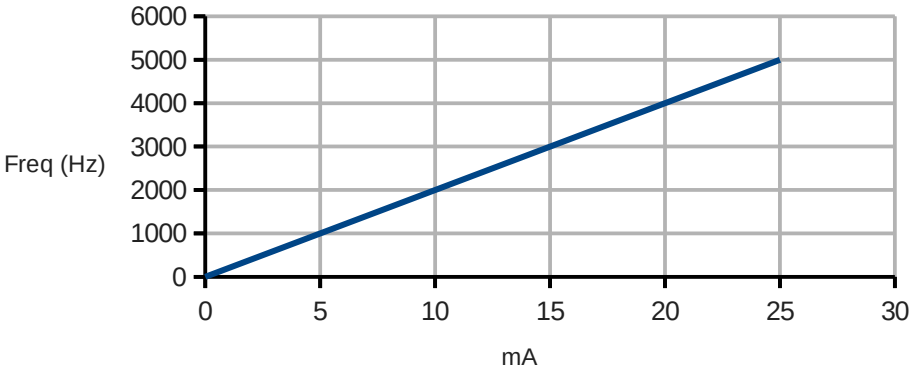


Table 3, Square Law 4-20ma

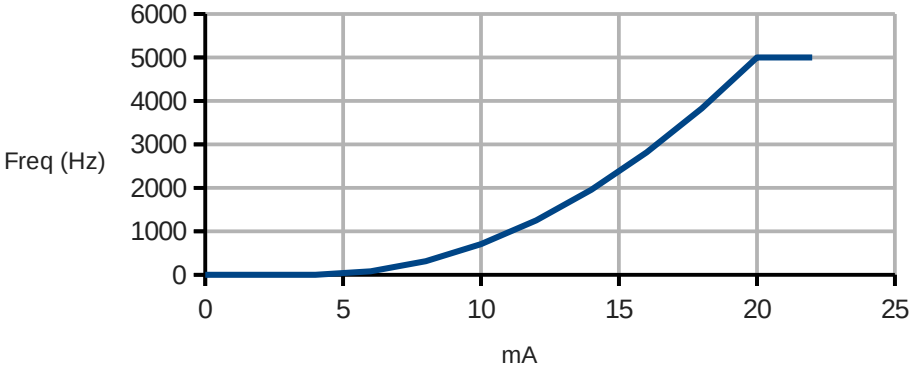


Table 4, Reverse Square Law 4-20ma

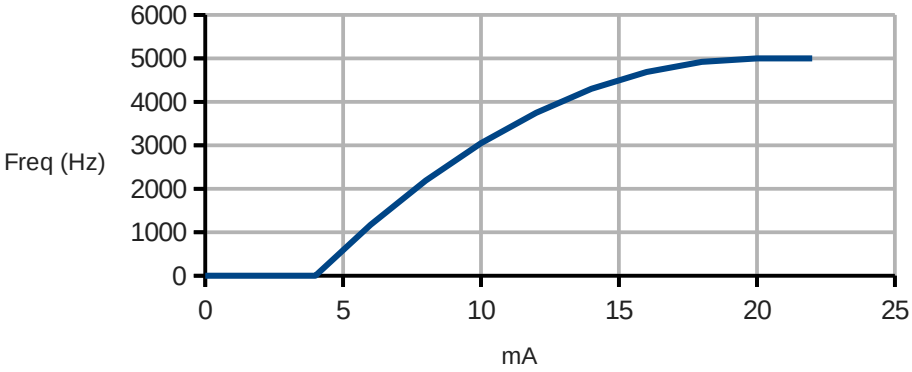
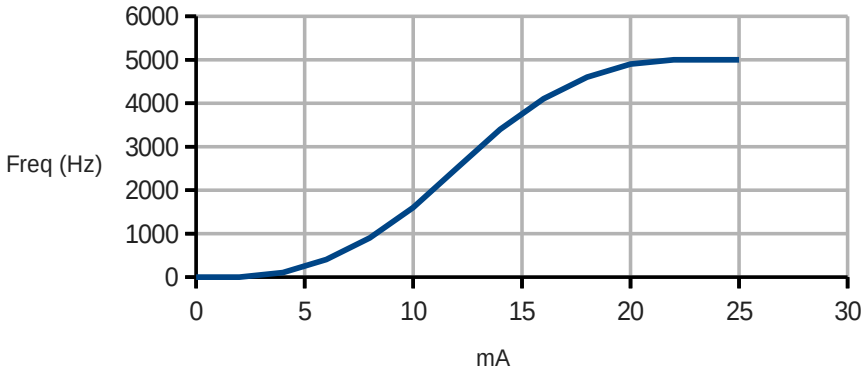


Table 5, Square Law (peak rate centered, tapered to limits) 2-22ma



To change the table in use, move the readout tell-tale to ANA 1, press the select button and then increase or decrease the table number in use using the Up and Down buttons.

The PID transfer function selected is then modified depending upon the setting of the two potentiometers. The left hand pot selects the delay or integration period. Fully clockwise gives the minimum delay, with the most coarse frequency steps, and fully anti-clockwise gives the maximum delay, and the finest discrete frequency steps.

The right hand pot is used to add an offset to the frequency being generated, for loop stability checks. Fully anti-clockwise add no offset, and fully clockwise adds a 1000Hz offset, with intermediate values produced between these two extremes.

7 DC Power Requirements

The NÅNO Simulator is equipped with a pair of 5mm terminal blocks and a single 2.1mm jack plug. All three connectors are wired in parallel, but there is a reverse protection diode to the simulator power-supply input. The simulator will run with an input between 12 V and 28 Volts, although for the highest analog stability, a 15 Volt minimum is preferred. The simulator will require up to 200mA for its own use, and can also be used to drive the NÅNO Measurement device as well

End of Manual.