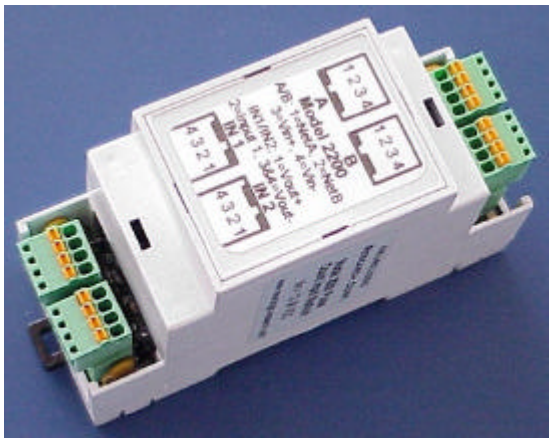
2-CHANNEL PULSE COUNT INPUT NETWORK NODE



- 2-Independent pulse count inputs with a 0-36 VDC input range.
- Simultaneous interpretation of each input as frequency, pulse-count accumulator, or discrete input.
- Frequency measurement range is 0 to 65 KHz. Frequency measurement can be averaged over multiple samples.
- Internal pulse accumulator has a capacity of 2,147,483,648 counts. Pulse input can be scaled.
- Configurable pull-up and pull-down circuit on each input.
- Threshold and hysterisis voltages for each input can be setup by user via the network.
- Jumper-less design. All configuration parameters are done via communication network.
- Input power is distributed to each sensor's terminal block to cut down on external wiring.
- Output power to each sensor is reverse voltage protected and fused.
- Compact DIN Rail mount enclosure that is only 36 mm (1.42") W x 90 mm (3.54") L x 58 mm (2.28") H.
- All data is available using Standard Network Variables (SNVT)

DESCRIPTION

The Model 2200 is a Pulse Count Input Network Node that is housed in a compact DIN rail enclosure. It allows integration of up to 2 digital pulse inputs into the LONWORKS distributed digital network. Input devices such as relays, conditioned proximity sensors, conditioned capacitive sensors as well as ultrasonic sensors are all supported.

The Model 2200 has a flexible front-end that supports direct wiring of NPN, PNP, TTL, as well as dry-contact type inputs. Pull-up resistor, pull-down resistor, threshold voltage, hysterisis voltage, and signal inversion can all be changed via configuration network variables. There are no jumpers to set.

Added to the flexible hardware front-end is a very flexible firmware layer. The firmware simultaneously calculates the accumulated pulse count, frequency, and, for steady state signals, allows the discrete digital state to be read. The frequency measurement rate is in excess of 65 KHz and the accumulated pulse count can be up to 2,147,483,648. The pulse accumulator can be scaled in such a way as to allow multiple pulses to be counted as a single event. The frequency input can be averaged over multiple samples. Finally, to allow a smooth interface with LONWORKS devices, the frequency and count data is also available as a percentage of a user-configurable range.

Using the Model 2200 allows multiple sensors to be used over a simple four-wire bus installation. Two wires are used for power, the other are used for digital communication. The communication interface is the FTT-10 transceiver.

All connections to the Model 2200 are made via high quality removable terminal blocks. Power into the Model 2200 is reverse voltage protected, individually fused, and finally made available to the sensor terminal blocks. This feature allows simple power distribution to each pulse output device.

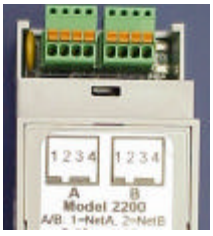
WIRING AND INSTALLATION

Input power and network communication is done via two identical 4-position terminal blocks labeled A and B. The terminal blocks are duplicated to allow easy in/out bus wiring of multiple units. Please see the wiring diagram below for attaching power and network wiring. If the A/B connectors are used to daisy chain multiple devices, please keep the overall current going through any one Model 2200 to less than 3 amps. The Model 2200 can be powered by a voltage source between 12 and 36 VDC. Please see the table below for identification of each position on the A/B terminal blocks.

The on-board Service switch and LED allow installation on to the LONWORKS network. The Service LED is in the upper left hand corner to the right of the 'B' terminal block. The Service Switch can be found under the top cover. The top cover can be removed using a small screwdriver and gently pulling up on the side of the top cover.

A & B Terminal Blocks	Connection
1	***NetA:*** Position 1 and 2 labeled NetA and NetB connect the Model 2200 to the LONWORKS FTT-10 network. These wires are not polarity sensitive.
2	***NetB:*** See above
3	***VIN+:*** Positive end of input voltage source to power the unit. 12 –36 VDC is allowed. This voltage after being fused and reverse voltage protected is supplied to the VOUT+ connectors on IN1& IN2 terminal blocks.
4	***VIN-:*** Negative connection of DC input voltage source. This terminal is essentially connected directly to the VOUT- terminals of IN1 & IN2.

IN1 & IN2 Terminal Blocks	Connection
1	***VOUT+:*** *Output voltage source to pulse input devices. This output is essentially the voltage at the VIN+ terminal on A/B terminal blocks minus about 1 volt. The VOUT+ terminal is individually fused with 100 mA resettable fuse and reverse voltage protected.*
2	***INPUT:*** This pin is where the input signal is applied to the Model 2200. Please see the wiring diagrams that follow.
3&4	***VOUT-:*** Negative connection of output DC voltage source. This terminal is essentially connected directly to the VIN- terminals of A/B.



Each pulse input is attached to the Model 2200 via a 4-position removable terminal block labeled IN1-2. Please see the table above for identification of each position on the IN1-2 terminal blocks. Not all connections are used on all installation. There is one such terminal block for each of the 2 inputs. Each terminal block is used to provide output power as well as connection of the actual input signal. Please see the following sections for a complete explanation of how the Model 2200 processes the input signal as well as wiring diagram for different input types.

How the Input Signal is Processed

A block diagram of the input circuit and the input signal path is shown in Figure 1. Please note, that the name, nciXxxx, of the Configuration Network Variable controlling each specific feature is shown. The default values are shown in parenthesis. Figure 2 shows how the Input Signal Processing block processes the input signal. Please note, by default the counting is done on the high to low signal transition and a signal above the threshold voltage considered OFF. This is done to accommodate the more common input types: dry contact, sinking or NPN. This can be changed by Setting nciInvert to 'ON':

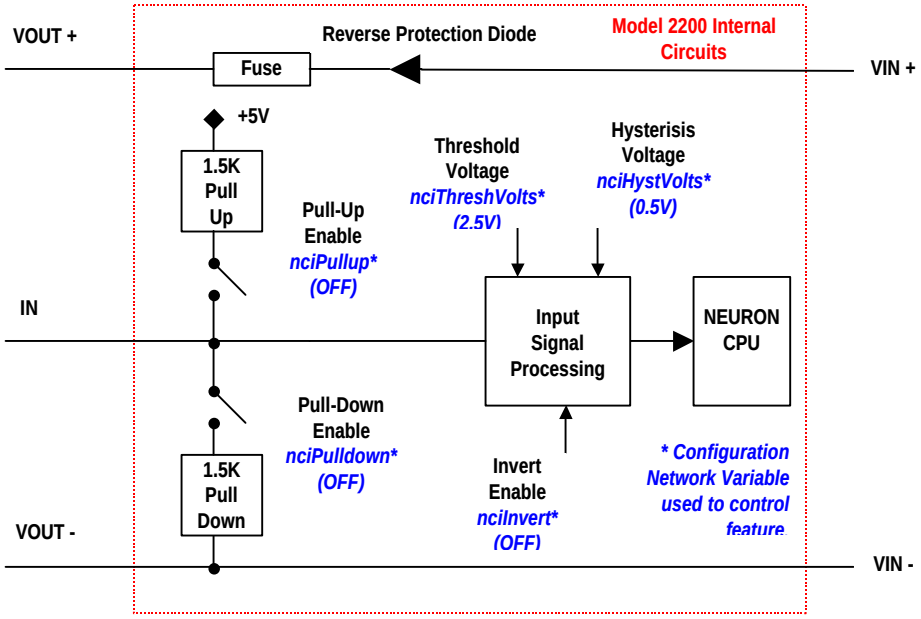


Figure 1: Model 2200's Internal Block Diagram of Each Channel

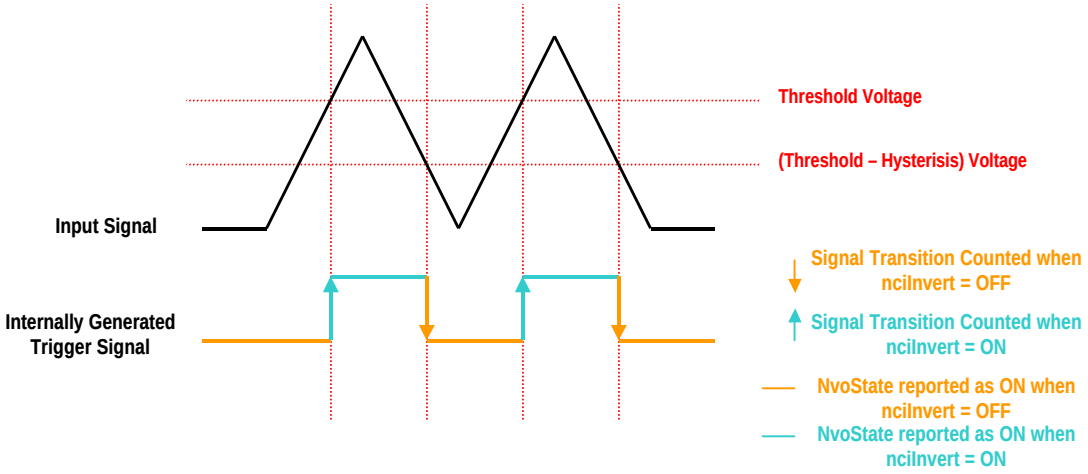


Figure 2: Model 2200 Processing of Input Signal

Dry Contact Input Interface

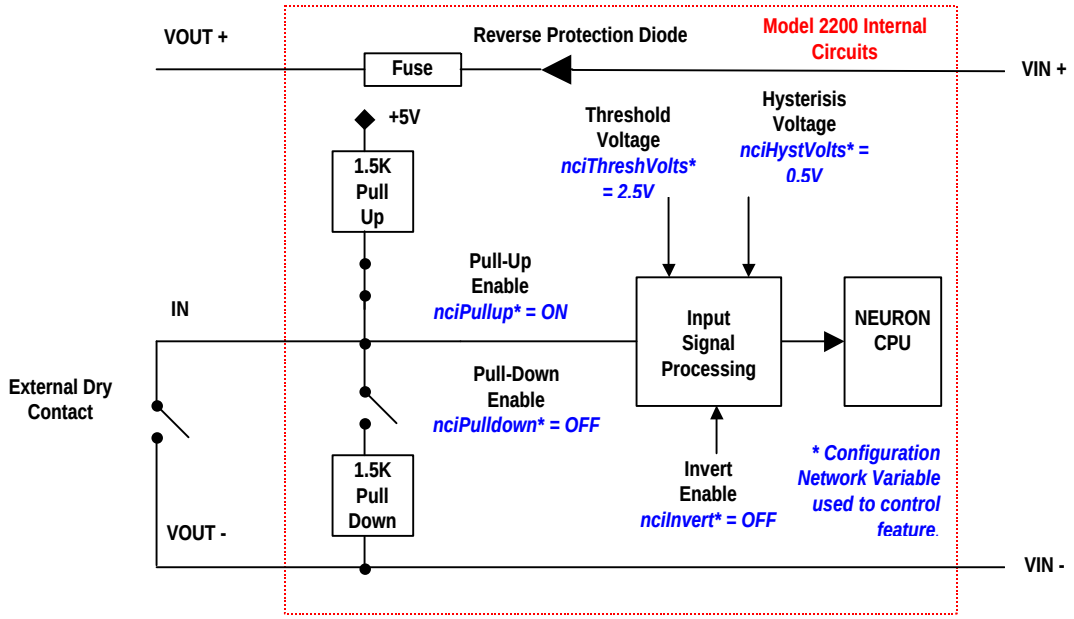


Figure 3: Dry Contact Connection and Configuration Network Variable Setup

NPN (Sinking) Input Interface

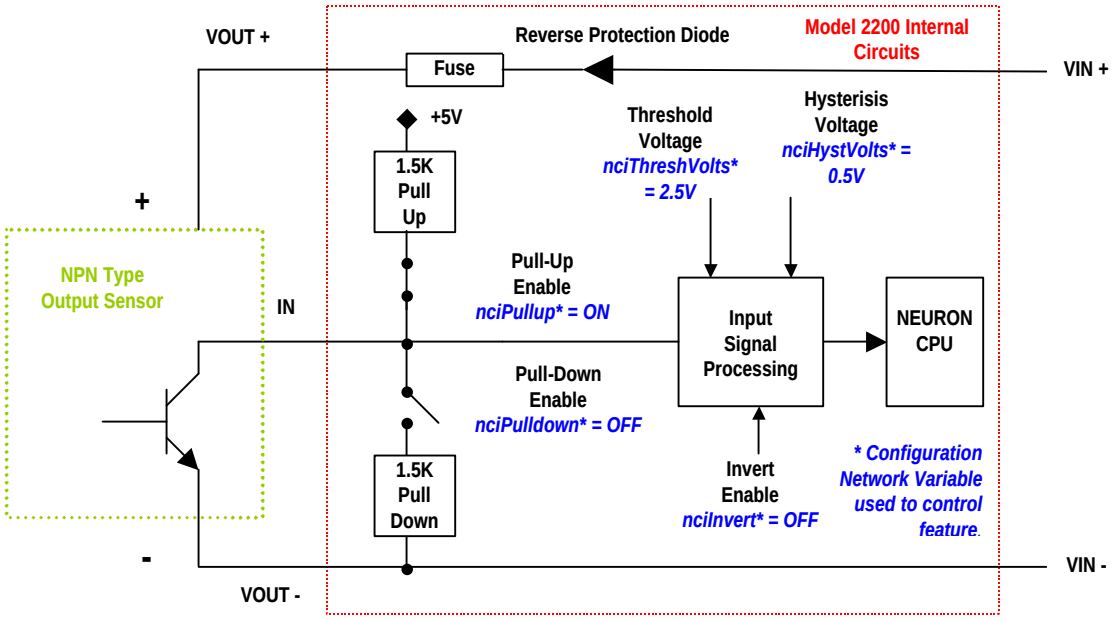


Figure 4: NPN (Sinking) Sensor Connection and Configuration Network Variable Setup

PNP (Sourcing) Input Interface

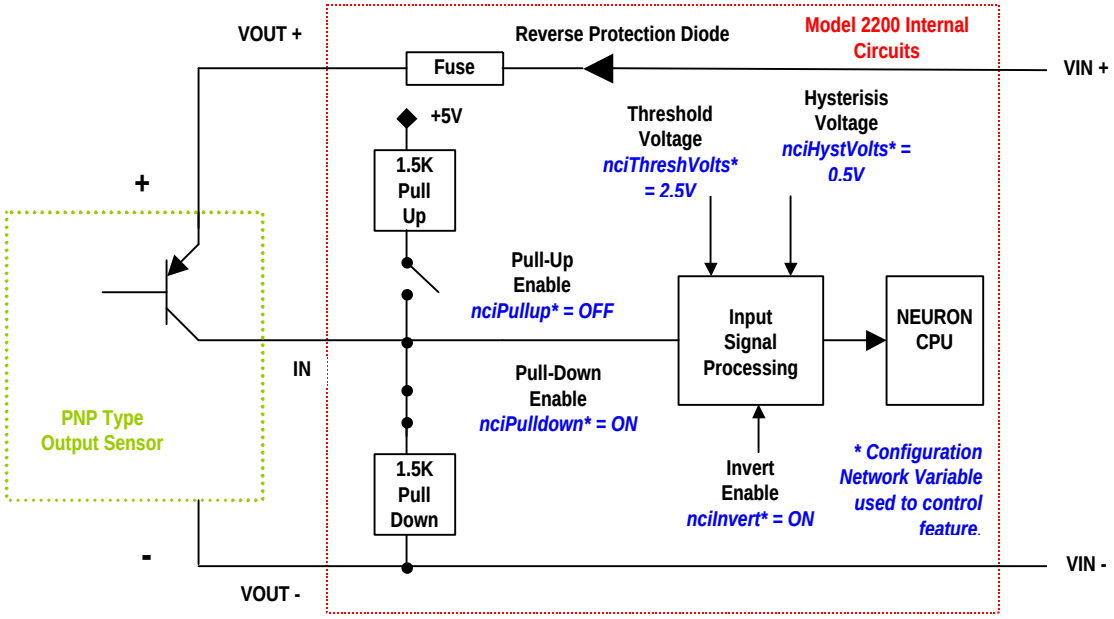


Figure 5: PNP (Sourcing) Sensor Connection and Configuration Network Variable Setup

TTL / Frequency Generator Input Interface

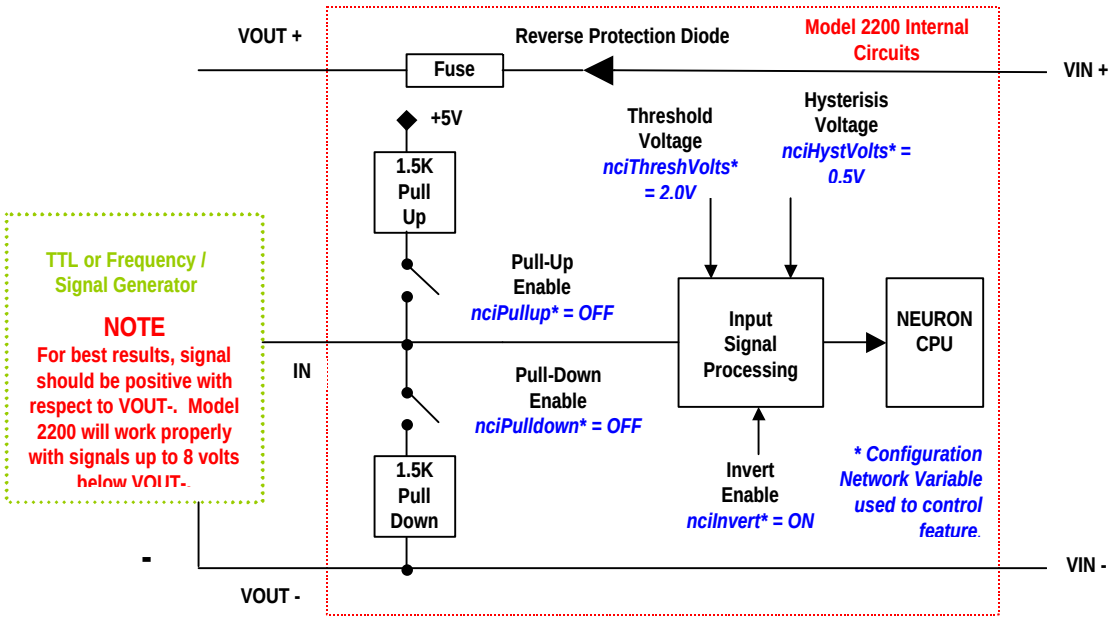


Figure 6: TTL or Frequency Generator Connection and Configuration Network Variable Setup

How The Pulse Accumulator Works

The internal pulse accumulator has a count capacity of 2,147,483,648. It can handle high-speed pulse trains with a period down to 15 microseconds. However, the pulse width must be at least 1 microsecond wide. By default, the Model 2200 counts the high to low pulse transition. See the section titled "How the Input Signal is Processed" for more detail. This can be inverted by setting the nciInvert Configuration Network Variable to 'ON'.

The Standard Network Variable Type of SNVT_count has a capacity of only 65535. This data is available using the nvoCount network variable. When the maximum value is reached, the nvoCount will rollover and start again from 0. The Model 2200 makes a second network variable available, nvoRolloverCount. It will increment once each time the nvoCount value rolls over. By looking at both values, very large count accumulations can be realized. The actual value of the total count is nvoRolloverCount*65535 + nvoCount.

Another feature of the pulse accumulator is that it can be scaled down using the nciCountScale Configuration Network Variable. This feature allows multiple pulses to be reported as a single count. For example, if you want to count every 5 physical pulses as a single event, simply set nciCountScale to 5. The nvoCount network variable will then report the internal count divided by 5. nciCountScale can actually be changed on the fly. For example, if you operate the unit with nciCountScale at 5 and then realize it should really be a 3, simply change it to 3. nvoCount will then report the correct value for a scale of 3.

The firmware also supports reporting the count as a percentage value via the nvoPcntCount network variable. The percentage value returned is the value of nvoCount as a percentage of the nciMaxCount Configuration Network Variable. By default, this value is set to 65535. However, it can be changed. This is handy when interfacing to other LONWORKS devices that may not support the SNVT_count type network variable.

Finally, the user can actually reset the count to any starting value by writing to the nviCountStart value. When this value is written, the actual internal accumulator is updated with the value written into nviCountStart multiplied by the nciCountScale value.

How Frequency Measurement Works

Frequency is calculated approximately once per second for both channels. The hardware supports frequency input in excess of 65 KHz. There are two types of standard network variables used to express frequency: SNVT_freq_hz and SNVT_freq_kilohz. The SNVT_freq_hz value has a range of 0 to 6553.5 with 0.1 Hz resolution. The SNVT_freq_kiloz network variable type has a range of 0 to 6553.5 KHz with 0.1 KHz resolution. The Model 2200 supports both since neither one alone can handle the frequency measurement range of the Model 2200's firmware.

The nvoFreqHz network variable is used to read the frequency if it is less than 6553.5 Hz. If the input frequency is higher than 6553.5 Hz, nvoFreqHz will be set to its maximum value of 6553.5 and higher frequencies can be read using the nvoFreqKiloHz network variable.

Multiple frequency measurements can be averaged over 1 to 8 samples. Use the nciFreqAvgSize Configuration Network Variable to change it. The default is 3. The Model 2200 is accurate within 0.5 Hz with 3 samples and 1 Hz with no averaging.

The firmware also supports reporting the frequency as a percentage value via the nvoPcntFreq network variable. The percentage value returned is a percentage scaled between two values set by the following Configuration Network Variables: nciMinFreq and nciMaxFreq. The defaults are 0 and 1000 respectively but can be changed by the user. This is handy when interfacing to other LONWORKS devices that may not support the SNVT_freq_hz or SNVT_freq_kilohz network variable types.

Looking at Input as a Discrete Digital

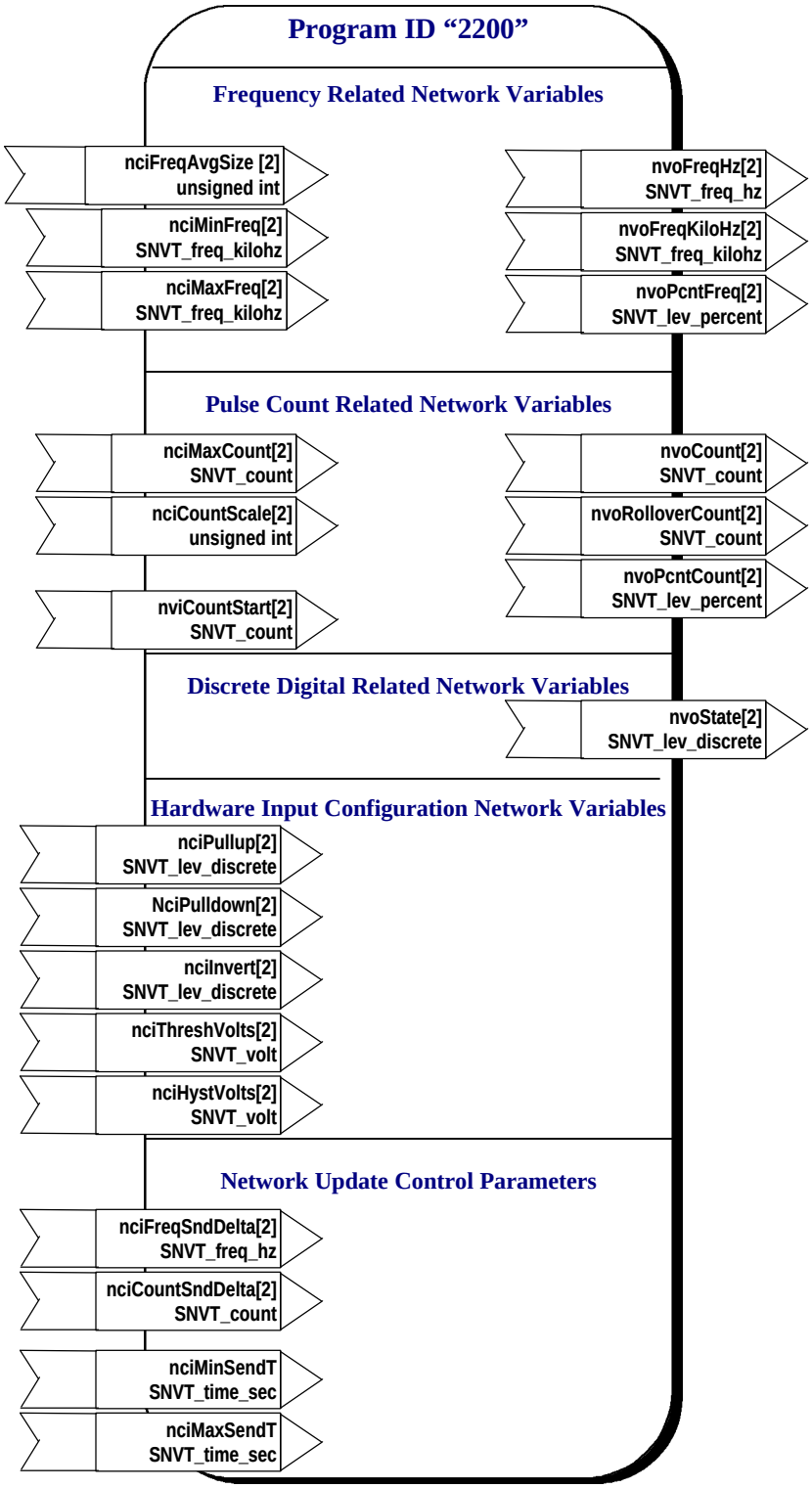
For steady state input signals, the nvoState network variable reports the ON / OFF state of the input signal. The digital state is sampled by the firmware 10 times per second.

By default nvoState will report the OFF condition when the input voltage is above the nciThreshVolts value. This can be reversed by setting nciInvert to ON. Factory default for nciThreshVolts is 2.5 volts but can be changed between 0.3 volts and 5 volts. Please see Figure 1 and 2 for more detail.

MODEL 2200

NETWORK OBJECTS

The Model 2200 has the following network variable interface. Parameters will appear under a single Virtual Block in the LonMaker installation tool.



GENERAL SPECIFICATION

General

CPU	3120 Neuron
Operating Temperature	-40 – 85 C
Operating Humidity	0-95% Relative Humidity non-condensing
Input Power	12 to 36 VDC
Input Power Protection	Input power is fused and transient voltage protected. (Fuses do not need to be replaced)
Current Consumption	35 mA typical plus power used by external sensors.
Network Transceiver Type	Echelon FTT-10A transceiver at 78 kbps. DC blocking capacitors for LPT10 network.
Input Power and Network Wiring	Removable terminal blocks. Accepts up to 20 GA wire. Input power is reverse voltage protected. Network wiring is polarity insensitive.

Inputs

Inputs	2
Input Types	Simultaneous frequency measurement, pulse accumulator, and discrete digital input
Input Voltage Range	0-36 VDC
Threshold Voltage Range	0.3 – 5 VDC Hardware and firmware limited
Hysterisis Voltage Range	0.1 to Threshold Voltage-0.1 VDC Hardware and firmware limited
Frequency Accuracy	+/- 1 Hz with no averaging. +/-0.5 Hz with 3 sample averaging
Frequency Averaging	1 – 8 samples
Frequency Measurement Range	0 – 65 KHz
Minimum pulse width detected.	1 microsecond.
Minimum pulse period	15 microsecond.
Pulse Accumulator Size	2,147,483,648
Pulse Accumulator Scaling	1-100
Software Update Frequency	All channels are processed once per second
Protection	Can tolerate up to +/- 40 VDC without damage. However, proper operation only guaranteed if input signal is limited to –8 volts below the VOUT- terminal.

Dimension and Materials

External Dimension	36 mm (1.8”) W x 90 mm (3.54”) L x 58 mm (2.28”) H
Enclosure Type	DIN rail mount to 35 mm rail
Enclosure Material	Grey frame retardant Noryl UL94_V0

ORDERING INFORMATION

2200	**Model 2200 2-Channel Pulse Count Input Network Node**

Code	**Network Transceiver Option**
-0	TP/FTT-10A

2200	**-0**	**Model 2200 with FTT-10A transceiver**

ASSOCIATE PRODUCTS

Model 60 AC Voltage Detector

Model 65 Sensor Logic Block

