



FEATURES

- 3 YEARS, UP TO 7 YEARS ON A SINGLE AA SIZE BATTERY
- STABLE READING WITH PULSES DOWN TO ONE PULSE EVERY 5 MINUTES
- UNIVERSAL INPUT, UP TO 100 Hz
- ISOLATED 4-20mA, 12 BIT ANALOG OUTPUT
- 7 DIGIT RATE AND THREE 7 DIGIT TOTALS WITH PROGRAMMABLE DECIMAL PLACES
- KFACTORS FROM 0.001 TO 9,999,999
- MILLILITERS, LITERS, GALLONS, CUBIC FEET, CUBIC METERS, ACRE FEET
- SEPARATE VOLUME UNITS FOR RATE AND TOTAL
- PER SECOND, PER MINUTE, PER HOUR, PER DAY
- 100V/100mA OPEN DRAIN OUTPUT THAT CAN BE PROGRAMMED TO BE:
 - RATE ALARM, HIGH OR LOW
 - PULSE OUTPUT, UP TO 480 PULSES PER MINUTE (METERING PUMPS)
- 64 DAYS DATALOGGER (TOTAL FOR EACH 24 HOURS)
- PROGRAMMABLE SLEEP MODE FOR THE DISPLAY TO SAVE POWER
- SETTINGS LOCK/UNLOCK FOR SECURITY
- HIGH CONTRAST IN THE ENTIRE TEMPERATURE RANGE
- BATTERY LOW INDICATOR
- SIMPLE PROGRAMMING, SMALL SIZE

APPLICATIONS

- FLOW RATE AND TOTAL MEASUREMENT AND CONTROL
- PRECISE CONTROL OF METERING PUMPS FOR DOSING APPLICATIONS
- IRRIGATION

1. DESCRIPTION

NFC101 is a micro power battery powered flow computer totalizer with an outstanding combination of excellent features, extremely long battery life, universal input, up to 100 Hz. It accepts open drain/collector npn, reed switch, dry contact, waves and logical signals. NFC101 has an open drain 100V/100mA output that can be programmed to work as a rate alarm, high or low, with +/- 1 % hysteresis, or pulse output.

Regardless of the type of the output chosen, NFC101 stores up to 64 totals for each 24 hours that can be easily viewed on the liquid crystal display.

The device has a version in one inch wider enclosure – NFC101E and another version in DIN 72x72 mm panel mount enclosure.

The NFC101 software implements a special design for register flow meters which produce very low frequency pulses. Special proprietary algorithms allow NFC101 to accept low frequency pulses like one pulse every 5 minutes and still have a stable reading and analog output. In the same time the flow reading can be cleared in half second by external “no flow” switch.

NFC101 is the perfect solution for flow measurement and control applications that require high accuracy and reliability, small size, industrial grade performance and low maintenance.



2. ABSOLUTE MAXIMUM RATINGS *

Operating temperature	-20 °C to +70 °C The electronics system is industrial (-40 °C to +85 °C) and higher grade . The Liquid Crystal Display (LCD) limits the temperature range.
Digital Output current	100 mA DC
Digital Output voltage	100 V
Input voltage (“S” to “-”)	5 VDC

*** NOTICE: Stresses above those ratings may cause permanent damage to the device.**

3. CHARACTERISTICS

Parameter	Conditions	Min	Typ	Max	Units
Input					
Voltage for the sensor	-20 °C to +70 °C, DO NOT EXCEED 50-100 uA		3	3.7	V DC
Input threshold, high	Rectangular wave 5 V, 50 % duty cycle		1.75		V
Input threshold, low	Rectangular wave 5 V, 50 % duty cycle		1.25		V
Input frequency				100	Hz
Analog Output					
Power supply	-20 °C to +70 °C, Note 1	7.5		36	V DC
Resolution	-20 °C to +70 °C, 7.5 – 36 V		4		uA
Error	250 ohm load, 24 V, 25 °C, Note 2			0.05	% FS
Power supply error	7.5-36V, no load, output disabled, 25 °C			0.5	uA/V
Temperature coefficient	-20 °C to +70 °C, 24 V		35		ppm/°C
Current, output disabled	SET20 = 0.0, 24 V DC supply, 25 °C		3.85		mA
Digital Output					
Output ON resistance	-20 °C to +70 °C, 100 mA			1.5	ohm
Output OFF leakage	-20 °C to +70 °C, 100 V DC			1	uA
Pulse duration			62.5		ms
Pause duration		62.5			ms
Pulse rate				480	p/min

Note 1: The minimum voltage for the 4-20 mA output to operate is $V = 7.5 + R \text{ load [ohm]} * 0.020$ [V DC]
For a NFC101 with a load of 250 ohm, the minimum voltage would be 12.5 V DC.

Note 2: The parameter includes all errors, non-linearity and noise at constant voltage and temperature

3.1. BUTTONS

There are three buttons: **SET** , **UP**  and **RIGHT**  :

- **SET** is used to enter and exit menus and confirm options chosen
- **UP** is used to change the data
- **RIGHT** is used to move the cursor (blinking digit or icon) to the right

Additional button functions:

There are two types of buttons accepted by the NFC101 flow computer:

- Short is when the button is pressed and released in less than 0.5 second



- Long is when it is kept pressed for more than 5 seconds
- All other durations are ignored

NOTE: The UP button will not change the value if the settings are locked.

3.2. INPUTS

NFC101 has two inputs:

- Pulse input from flow sensors. This input can power micro power sensors. It accepts open drain/collector npn sensors, reed switches, dry contacts, waves and logical signals.
- “**NO FLOW**” switch input. This input is used to immediately clear the rate reading and the analog output. It can, for an instance, be connected to a pressure switch in the pipe or to a pump's pressure switch which closes when the pump stops and its pressure drops.

3.3. OUTPUT

NFC101 has one digital and one isolated analog output.

3.3.1. Digital output

The digital output is 100VDC/100mA DC open drain (sinking) with reverse polarity protection. It can be programmed to be:

- Rate alarm, high or low, with +/- 1% hysteresis.
Example: If the alarm is programmed at 100.00 GPM and to **high**, the output will turn on (sinking current) when the flow rate exceeds 101.00 GPM and will turn off when it drops below 99.00 GPM. With **low** alarm the action will be reversed.
- Pulse output. This feature is intended for use with metering / dosing pumps.
Example: You are adding chlorine or fertilizer to the water and have connected the control input of a pump to this pulse output. You program the “**SETP**” factor at 3.762 Gallons per pulse. The pump will produce one pulse every 3.762 gallons and add the chlorine or the fertilizer in an exact proportion to the water.

3.3.2. Analog output

The isolated analog output is 4-20 mA, two wire, passive, 12 bit, with reverse polarity and surge protection, high accuracy and reliability. Using the **SET20** menu, it can be programmed to represent the flow rate.

3.4. DISPLAY

The liquid crystal display (LCD) has 7 digits with 1,2 or 3 decimal places and multiple icons. It shows rate, total and all the variables and options that can be set or programmed. The rate and the totals have programmable auto, none, 1, 2 or 3 decimal places.

When the display shows rate, a “**RATE**” icon is displayed. If it shows total, a “**TOTAL**” icon will be displayed along with “**A**”, “**B**” or “**C**” (NFC101 has three totals).



When input pulses are present, an “INP” (input) icon will be displayed.
If the total on the LCD is allowed to be reset, a “RESET” icon will be displayed.

3.4.1. Volume and time units

- NFC101 flow computer has milliliters (**mL**), liters (**L**), gallons (**G**), cubic feet (**CF**), cubic meters (**M³**) and acre feet (**AF**) PER second (**S**), minute (**M**), hour (**H**) and day (**D**). It has separate volume units for rate and total, so for an instance the rate can be in GPM, but the total in AF.

3.4.2. Normal mode

Automatically after replacing the battery or exiting a menu, NFC101 enters the normal mode. Normal mode displays:

- Rate
- Total A, B or C. Total A reset can be enabled or disabled. It is stored in a non-volatile memory every 50 seconds or immediately when cleared.
If a total is allowed to be reset, the **RESET** icon is shown. Reset a total with long **RIGHT** button.
- To switch between rate and total on the display, use short **UP** button.

3.4.3. Menus

To enter the menus, use long **SET** button in normal mode. About 5 seconds after pressing (and holding pressed) the **SET** button, the first menu will appear on the LCD:

- In the “**Total volume units**” (**vU**) menu, use **UP** to choose the volume units for the total among **mL**, **L**, **G**, **CF**, **M³** and **AF**. While in this menu all the settings can be locked/unlocked. Use long **SET** to go to lock/unlock menu.
 - Then use short **UP** to lock/unlock the settings. Then use short **SET** to go back to “**Total volume units**” menu.
 - If the settings are locked, they can be viewed, but not changed.

Press short **SET** to move to the “**rate volume unit menu**.”

- In the “**Rate volume units**” (**vU**) menu, use **UP** to choose the volume units for the flow rate among **mL**, **L**, **G**, **CF**, **M³** and **AF**. Press short **SET** to move to the “**time unit**” menu.
- Use **UP** to choose among **S**, **M**, **H** and **D**. Press short **SET** to move to the next menu.
- **KFACTOR** icon along with a blinking decimal point and the KFACTOR number is shown. The decimal places for the KFACTOR can be programmed using **UP** button. KFACTORs ranging from 0.001 to 9,999,999 can be entered this way. To move from the blinking decimal point away and start entering the KFACTOR digits use the **RIGHT** button. The main **KFACTOR** for the particular flow meter connected to the NFC101 can be entered. This is how many **pulses** the flow computer will receive **per total volume unit**.

NOTE: the computer will not accept zero for the KFACTOR.

- Press short **SET** to move to the “**Rate decimal Places**” menu where (using short **UP**) auto, none, 1, 2 or 3 decimal places for the rate can be programmed.



- Press short **SET** to move to the “Total decimal Places” menu (using short **UP**) auto, none, 1, 2, or 3 decimal places for all totals can be programmed.
- Press short **SET** to move to the “**delay**” menu and program the delay that will keep the display showing stable flow rate at the very low frequency of the input pulses. Generally the delay should be higher than the highest interval between two input pulses, expected.
- Press short **SET** to move to the **Total A Reset enable/disable** menu. In this menu using **UP** button the total A reset can be enabled or disabled.
If enabled and NFC101 is in normal mode displaying total A, the **RESET** icon will also be displayed and long **RIGHT** will clear total A. Press short **SET** to move to the next menu.
- In the **SET20** menu, set the flow rate at which you want the analog output to be 20.00 mA. Analog output will be 4.00 mA at no flow. If **SET20** = 0.0 the analog output will stay about 3.85 mA and will not change with the rate. Press short **SET** to move to the “**OUT Type**” menu.
- In the output type menu, use **UP** to choose the type of the output among **alarm** or **pulse**. Press short **SET** to move to the next menu or press long **SET** to enter the **DATALOG** menu.

* If alarm has just been chosen, the next menu will be the “**alarm type**” menu where using **UP** button **high** or **low** alarm can be chosen. Press short **SET** to move to the **alarm value** menu.

If pulse output has been chosen, the next menu will be **SETP**.

- The value of the alarm must be in **rate volume units per time unit**
- The value for **SETP** must be in **total volume units per pulse**

Note that the computer will not accept zero for those settings.

- Press short **SET** to move to the **SLEEP** menu.
In the **SLEEP** menu, (using **UP** button) the sleep of the LCD feature can be enabled or disabled.
If this feature is enabled the NFC101 computer will turn off the LCD after not having any input pulse or button pressed for one minute, extending the battery life.

NOTE: Only the LCD is powered down during sleep. The computer is fully functioning and no input pulse or button press will be missed. The computer will turn the LCD on immediately after the first input pulse or button pressed.

If this feature is disabled, the LCD is always powered but the total consumption of the NFC101 computer will be higher and the battery life will be reduced.

Because the **SLEEP** menu is the last one, pressing long **SET** will move the computer to the **LOCK** menu. Use **UP** to lock the settings and press short **SET** to go back to **SLEEP** menu. General practice would be to unlock the settings at the first menu. Settings can be changed and locked again before exiting at the last menu (**SLEEP** menu). Press short **SET** to exit. After a couple of seconds during which all the setting are checked, validated and stored into the non-volatile memory, the computer will return to normal mode.

NOTE: The software time out feature will reset the computer and force it to the normal mode WITHOUT saving any changes made in any of the menus. The changes will only be saved after exiting the SLEEP menu by pressing short SET.



NOTE: Even in menu mode, the computer always continues to measure and calculate rate and total and control the outputs so no total will be lost. In some circumstances, such as changing the KFACTOR, the total accumulated will be invalidated. The user must take appropriate actions after changing the settings, such as resetting the total or returning it to the previous state.

- If long **SET** has been pressed in the **output type** menu, the computer will move to the **DATALOG** menu.

“**DAYS back 00**” will appear on the LCD. Pressing **UP** will display the total after the last full 24 hours. Pressing **RIGHT** will bring back the **DAYS back XX** menu. Pressing **RIGHT** again will increment the **days back** number. The totals for up to 64 previous days are available.

The 24 hour total begins in two ways: upon battery installation/replacement or after a **DATALOG INIT**.

Example: Changing the battery at 11 a.m. will start the 24 hour clock, which will cycle at 11 a.m. the next day, etc. The **DTALOG INIT** menu can change the clock setting.

- Press short **SET** to move the computer to the **DATALOG RESET** menu. Choose **YES** or **NO** using **UP** button. Choosing **YES** will reset the data log to zero for all the totals (1 to 64 days back).
- Press short **SET** to move to the **DTALOG INIT** menu. Choosing **YES** will initialize the data log – all the totals for all days back will remain untouched, but the time for completing 24 hours total will change to the moment at which the short **SET** after **YES** was pressed. After the short **SET**, the computer will return to the **OUTput TYPE** menu.

3.5. Checking the LCD

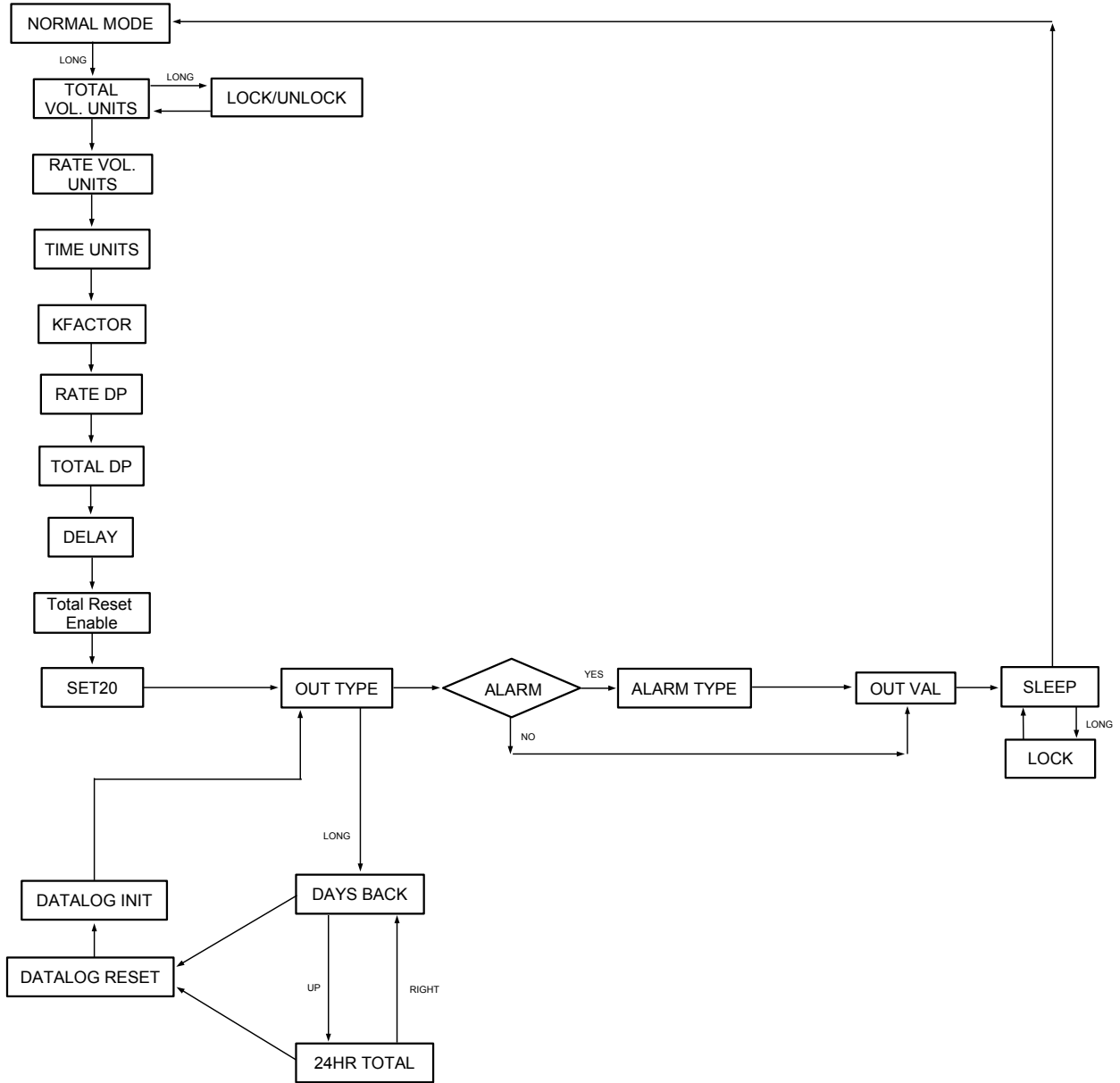
All the icons of the LCD can be checked by pressing and holding the **RIGHT** button while replacing the battery or after exiting the **SLEEP** menu. Releasing the button will allow the computer to return to normal mode.

NOTE: Removing the battery will clear total B and total C, the data log totals and the time elapsed since last 24 hour total was saved.

Total A is stored in the non-volatile memory every 50 seconds.
Before removing the battery make sure that there was no flow for the last minute.
All important settings are stored in a non-volatile memory and will not be lost.

4. MENU DIAGRAM

The menu diagram for NFC101 flow computer / totalizer is shown below.



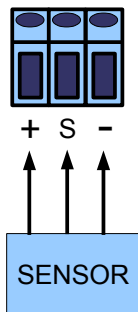
5. APPLICATION

5.1. ELECTRICAL

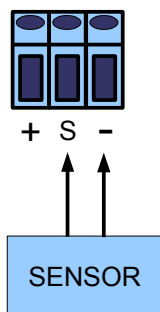
5.1.1. Wiring the sensor

NFC101 accepts a variety of sensors. See below for wiring specifications.

5.1.1.1. NPN Open Drain, Open Collector

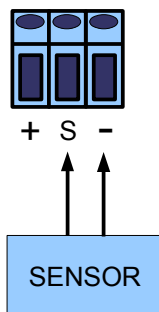


5.1.1.2. Reed Switch, Dry Contact



NOTE: A small capacitor in parallel may be needed. Different reed switches and dry contacts have different bouncing time. Test and evaluate carefully to determine the right capacitor.

5.1.1.3. Wave (square, sine, triangle, saw etc.), Logical Signal (CMOS, TTL etc.)



5.2. VERSIONS



WALL MOUNT NFC101



WALL MOUNT NFC101E



PANEL MOUNT
NFPC101

6. ORDERING

For ordering please use the following G Instruments part numbers:

<i>Description</i>	<i>G Instruments PN</i>
NFC101 flow computer with a "AA" size battery	30610
NFC101 flow computer with a "C" size battery	30612
NFC101E flow computer with a "AA" size battery	30613
NFC101E flow computer with a "C" size battery	30614
NFCP101 flow computer with a "AA" size battery	30611



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