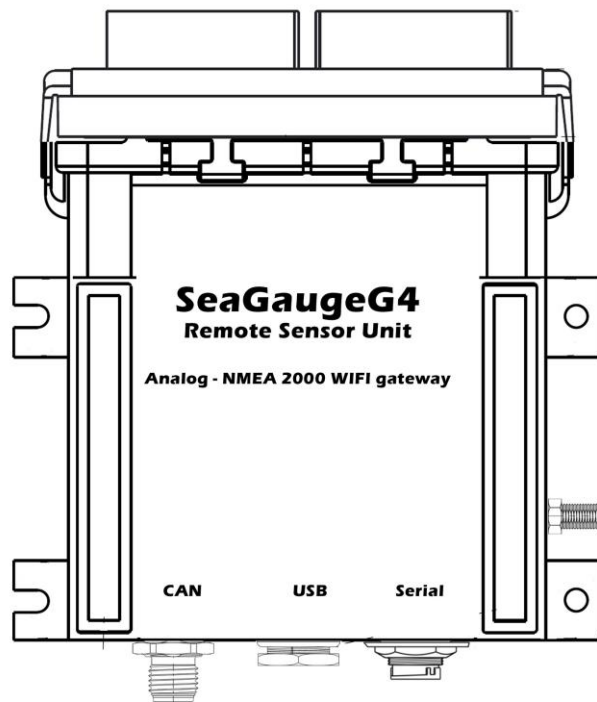


# Application Note

## ANSS024063001 – SeaGauge G4 Pulse Inputs



Chetco Digital Instruments, Inc

Revision 102624

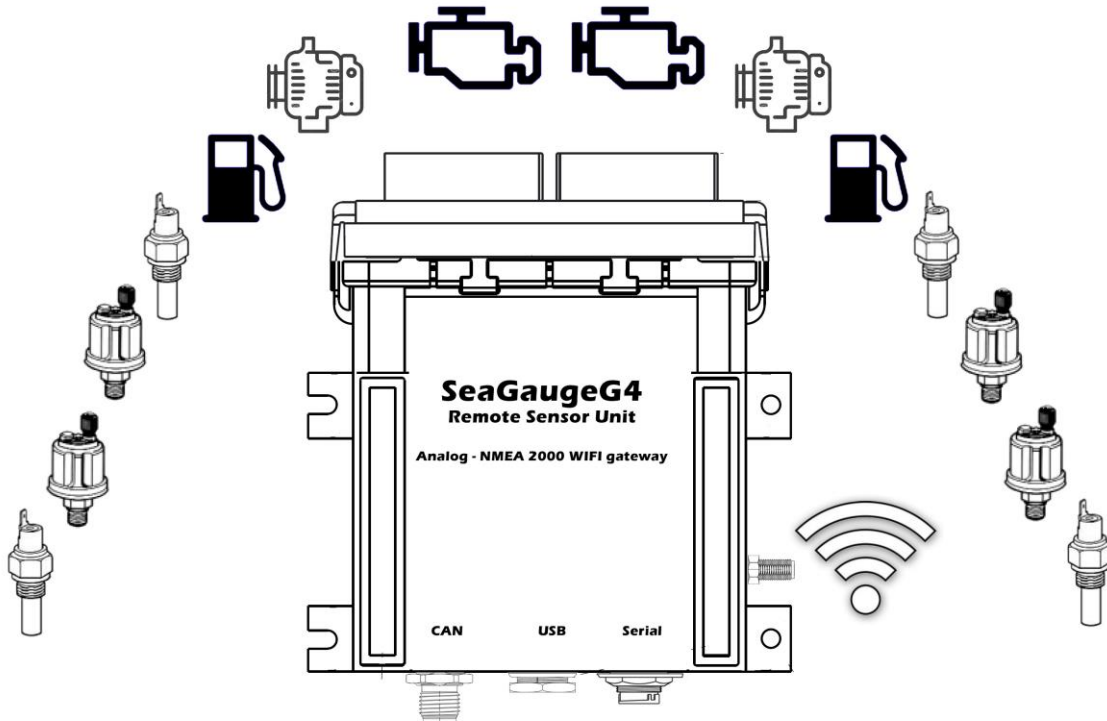
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SeaGaugeG4 supports up to 12 resistive or voltage style analog sensor inputs and 3 pulse style inputs.

SeaGaugeG4 also provides 4 additional indicator/status inputs (18VDC max) and 4 relay driver (12VDC) outputs

Sensors are connected to the dual 20 pin Molex style connectors and analog voltages converted to digital protocol compatible with CAN bus and WIFI interfaces.

SeaGaugeG4 can trigger multiple alarms based on sensor voltages from any of the 12 analog inputs and 3 pulse inputs



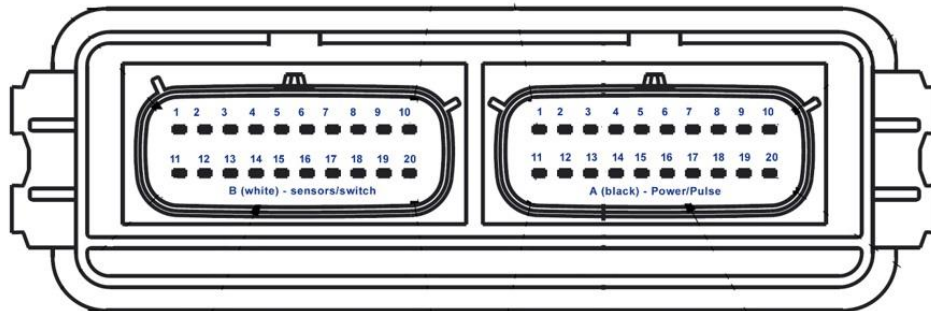
SeaGaugeG4 supports up to 3 pulse sensor inputs via a 20 pin Molex MX150 plug (white).

Molex style crimp pins are provided to attach 18 gauge tinned wire and insert into appropriate locations in supplied plugs.

The 3 pulse inputs (P0-P2) are used to provide Tachometer, Fluid Flow, and other rotational sensor inputs.

Each pulse channel has a runtime accumulator that counts the number of seconds the channel is active up to 16,777,216 seconds

**SeaGaugeG4 Header**



|                     |                     |                |             |
|---------------------|---------------------|----------------|-------------|
| B1 - NC             | B11 - NC            | A1 - SW5       | A11 - SW4   |
| B2 - NC             | B12 - NC            | A2 - SW7       | A12 - SW6   |
| B3 - SEN10 (SBOOST) | B13 - SEN11 (STRAN) | A3 - NC        | A13 - NC    |
| B4 - SEN04 (STEMP)  | B14 - SEN05 (SOIL)  | A4 - P1 (SRPM) | A14 - GND   |
| B5 - SEN06 (SFUEL)  | B15 - SEN07 (SBAT)  | A5 - P0 (PRPM) | A15 - GND   |
| B6 - SEN00 (PBAT)   | B16 - SEN01 (PFUEL) | A6 - P2        | A16 - GND   |
| B7 - SEN02 (PTEMP)  | B17 - SEN03 (POIL)  | A7 - 5VOUT     | A17 - 5VOUT |
| B8 - SEN08 (PBOOST) | B18 - SEN09 (PTRAN) | A8 - GND       | A18 - GND   |
| B9 - INC03          | B19 - INC02         | A9 - 12VIN     | A19 - 12VIN |
| B10 - INC01         | B20 - INC00         | A10 - NC       | A20 - NC    |

Two pulse inputs (P0-P1) are used to interface with common tachometer style sensors. They use a voltage clamped circuit that can accept AC signals from 1Vpp to 18Vpp commonly found in inductive pickup and spark coil style sensors

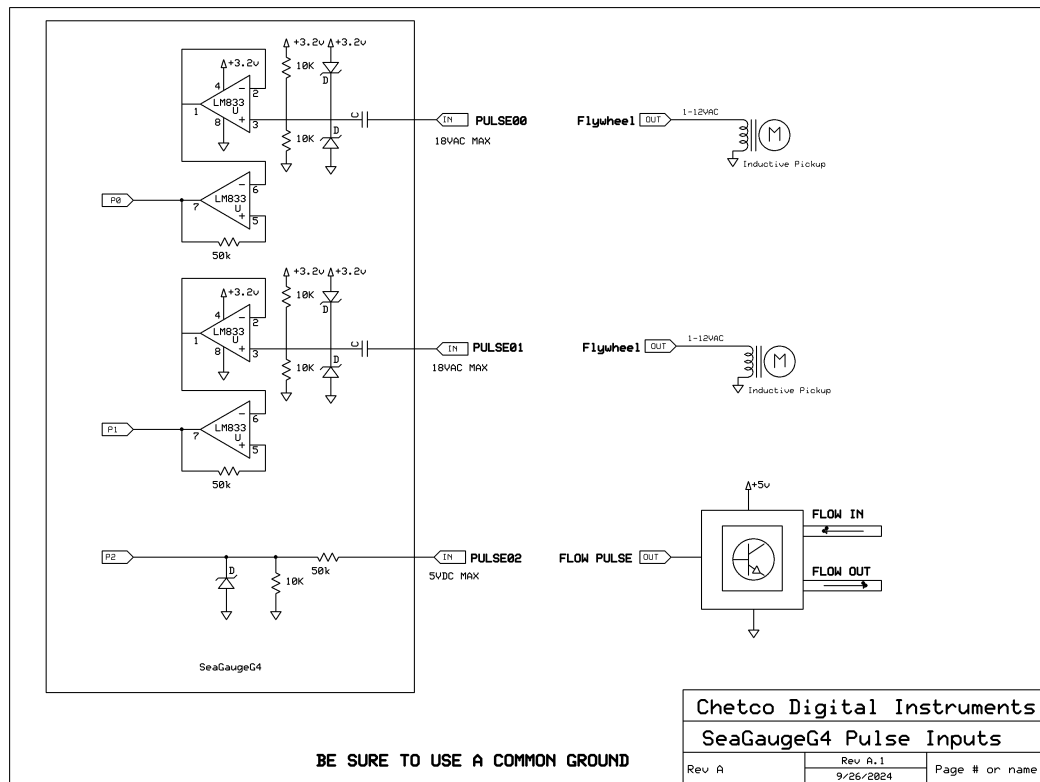
A third pulse input (P2) is used only for Hall effect style sensors such as fluid flow and is restricted to 5V ground based signals

Pulse inputs used as tachometers are mapped to CAN BUS PGN 127488 (0x01F200)

\$PCDIN,01F200,DTVV3F0D,AB,0068106528E17EFF\*37

A 2 byte value (0x1068 in this example) transmits the RPM in 0.25 resolution ( $4200 / 4 = 1050$  RPM in this example)

Pulse inputs P0-P1 can be used both inductive style and Hall Effect sensors while P2 is Hall effect only



Pulse inputs (P0-P2) have individual attached runtime timers with a resolution of 1 second and range to 16,777,216 seconds (4660 hours)

A second set of accumulators are used to store total fuel used when pulse inputs are configured for fuel flow sensors. They have a range of 65532 liters

The runtime values are stored in battery backed RAM and transmitted via CAN bus and embedded Web server using PGN 127489 (0x01F201) Engine Dynamic Engine Hours

\$PCDIN,01F201,DTVV3F0H,AB,006528FFFF7F60FF7FFF7F**981A0000**FFFFFFFFFFFFF0600007F7F\*33

Engine hours is 8 bytes = 4294267292 seconds

The CAN bus PGNs 127488 and 127489 can be displayed using the embedded Web server pages or uploaded to the HelmSmart Cloud service.

HelmSmart: joe@chetcodigital.com

Info

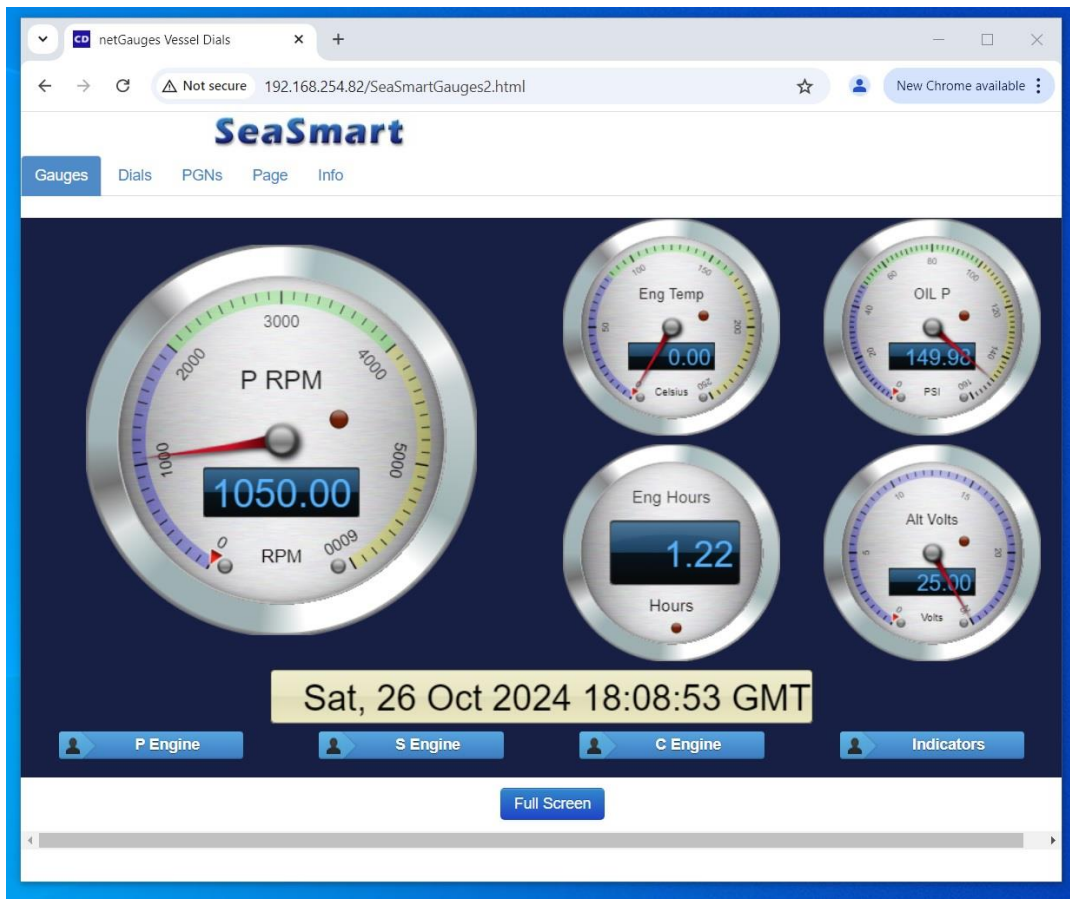
Device

Summary

Details

| Description        | Data  |
|--------------------|---|
| Timestamp          | Sat Oct 26 2024 11:17:16  |
| PGN                | 01F201  |
| Source             | AB  |
| Description        | engine_parameters_dynamic   |
| Payload            | {"discrete_status_1":"","discrete_status_2":"","engine_id":0,"engine_temp":24703,"oil_pressure":10341,"raw":"006528FFFF7F60FF7FFF7F981A0000FFFFFFFFFFFFF0600007F7F*35\\ |
| total_engine_hours | 5042  |
| raw                | 006528FFFF7F60FF7FFF7FB2130000FFFFFFFFFFFFF0600007F7F*35\\  |
| oil_pressure       | 10341   |
| engine_temp        | 24703   |
| engine_id          | 0   |
| discrete_status_2  |   |
| discrete_status_1  |   |

Engine RPM and Engine Hours can be displayed locally by using any web browser and selecting the Engine link from the main Home page

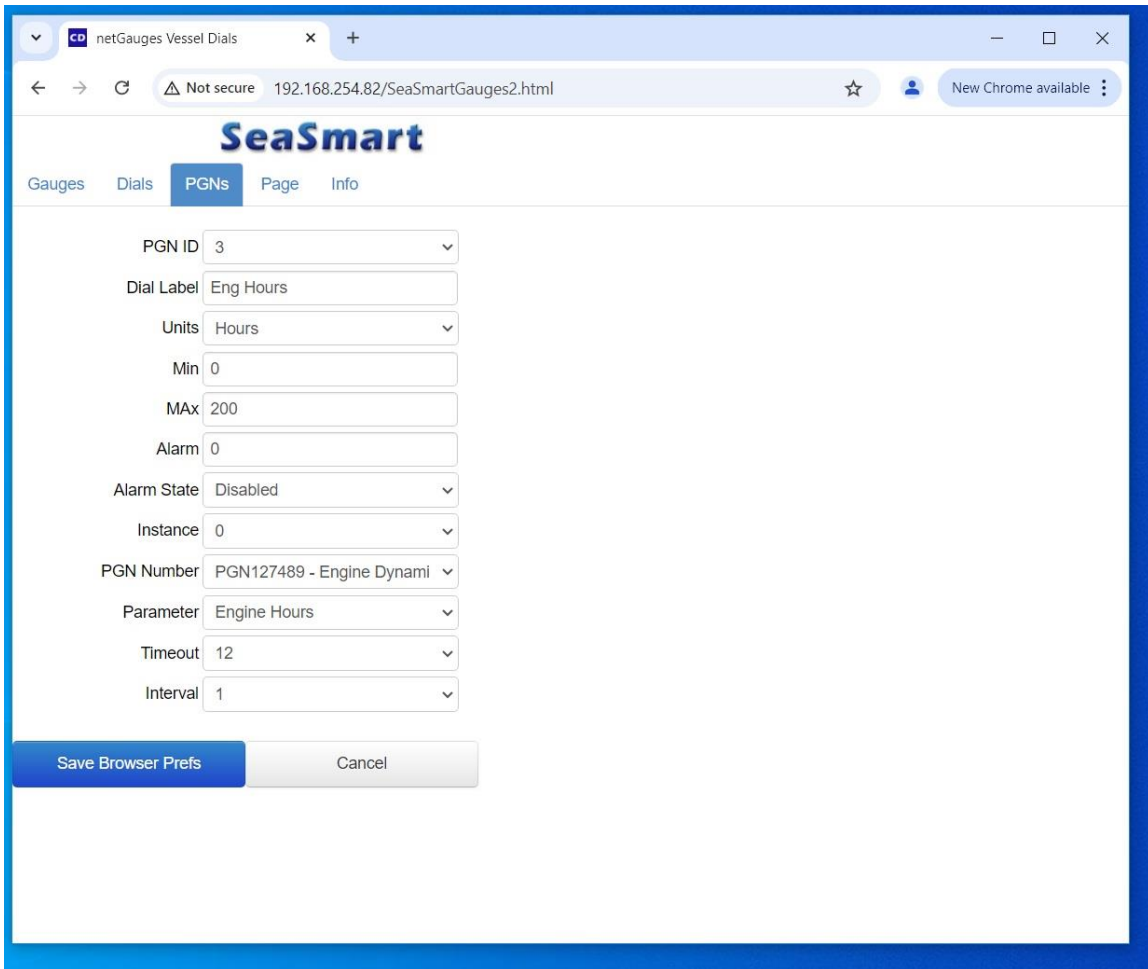


All web pages are user configurable and allow for custom gauge styles and layouts

Each individual gauge can be assigned to CAN bus PGN and parameter. Selecting a gauge and then the PGN tab will allow modification of the data displayed.

In this example, gauge 3 is configured to display ENGINE HOURS from PGN127489 that matches INSTANCE 0. It is important to match the PGN instance as that is used to determine the source engine since all engine data uses the same PGN127489

Normal convention is to use 0=PORT and 1=STARBOARD



netGauges Vessel Dials

Not secure 192.168.254.82/SeaSmartGauges2.html

SeaSmart

Gauges Dials **PGNs** Page Info

PGN ID 3

Dial Label Eng Hours

Units Hours

Min 0

Max 200

Alarm 0

Alarm State Disabled

Instance 0

PGN Number PGN127489 - Engine Dynami

Parameter Engine Hours

Timeout 12

Interval 1

Save Browser Prefs Cancel

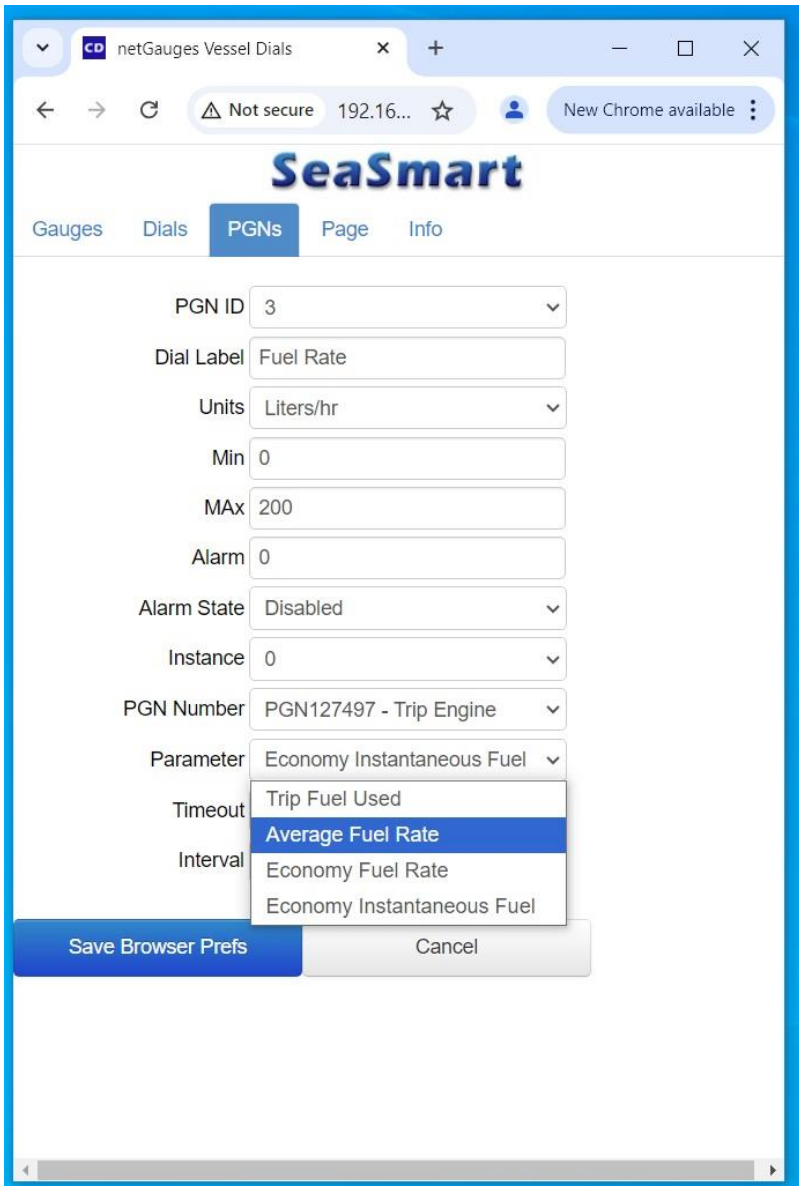
**Note that the PGN Number to view Engine Status is the standard PGN127489 and RPM is PGN127488**

Also be sure to set the desired UNITS and MIN/MAX values

Fuel Flow data is displayed using a different PGN 127497 and therefore needs to be selected separately on the PGN config page.

Again, be sure to select the correct INSTANCE and PARAMETER for the desired data

You must use separate gauges for both FUEL TOTAL and FUEL FLOW



netGauges Vessel Dials

SeaSmart

Gauges Dials **PGNs** Page Info

PGN ID 3

Dial Label Fuel Rate

Units Liters/hr

Min 0

Max 200

Alarm 0

Alarm State Disabled

Instance 0

PGN Number PGN127497 - Trip Engine

Parameter Economy Instantaneous Fuel

Timeout Interval

Trip Fuel Used

**Average Fuel Rate**

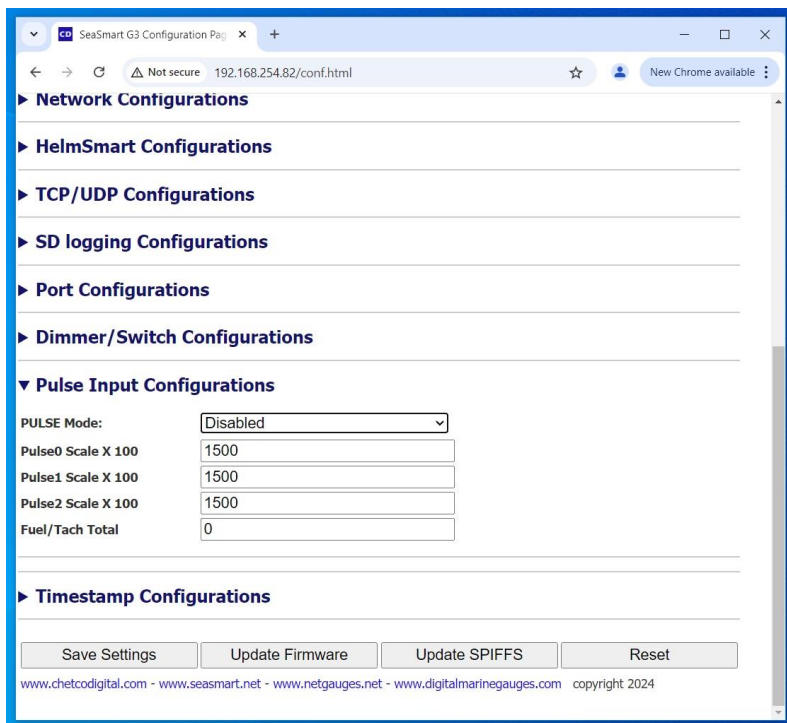
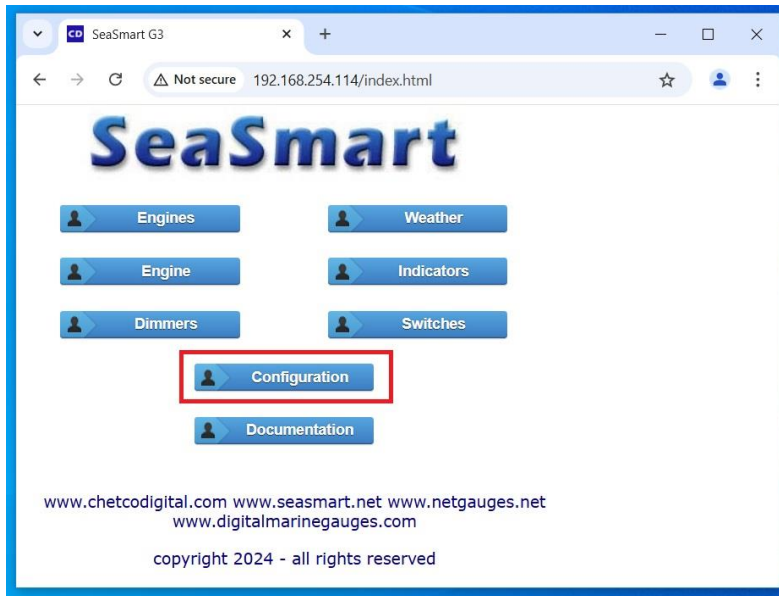
Economy Fuel Rate

Economy Instantaneous Fuel

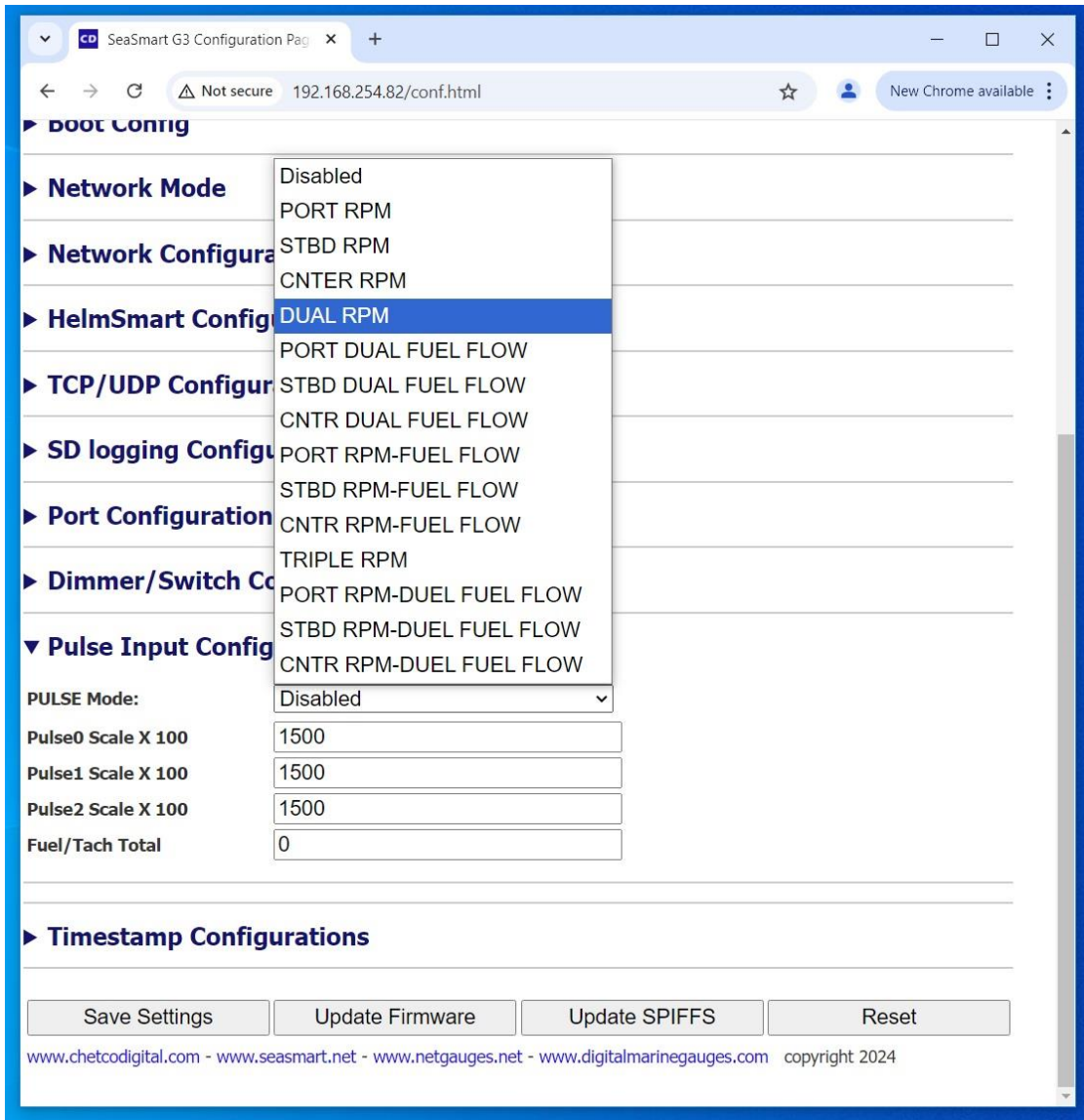
Save Browser Prefs Cancel



SeaGaugeG4 Pulse inputs can be configured using the embedded CONFIGURATION page under the PULSE INPUT section



The Pulse Mode drop down will allow enabling any of the 3 pulse inputs and assignment to either RPM or fuel flow sensors.



The screenshot shows the SeaSmart G3 Configuration Page in a web browser. The browser address bar shows "192.168.254.82/conf.html". The page has a sidebar with navigation links: Boot Config, Network Mode, Network Configuration, HelmSmart Configuration, TCP/UDP Configuration, SD logging Configuration, Port Configuration, Dimmer/Switch Configuration, and Pulse Input Configuration. The Pulse Input Configuration section is expanded, showing a dropdown menu for "PULSE Mode:" with the following options: Disabled, PORT RPM, STBD RPM, CNTR RPM, DUAL RPM (highlighted), PORT DUAL FUEL FLOW, STBD DUAL FUEL FLOW, CNTR DUAL FUEL FLOW, PORT RPM-FUEL FLOW, STBD RPM-FUEL FLOW, CNTR RPM-FUEL FLOW, TRIPLE RPM, PORT RPM-DUEL FUEL FLOW, STBD RPM-DUEL FUEL FLOW, and CNTR RPM-DUEL FUEL FLOW. Below the dropdown, there are input fields for "Pulse0 Scale X 100", "Pulse1 Scale X 100", "Pulse2 Scale X 100", and "Fuel/Tach Total". The "Pulse0 Scale X 100", "Pulse1 Scale X 100", and "Pulse2 Scale X 100" fields are all set to "1500". The "Fuel/Tach Total" field is set to "0". At the bottom of the page, there are buttons for "Save Settings", "Update Firmware", "Update SPIFFS", and "Reset". The footer text reads: "www.chetcodigital.com - www.seasmart.net - www.netgauges.net - www.digitalmarinegauges.com copyright 2024".

Note that DUEL FLOW requires using two pulse inputs (P1-P2), Since P2 is only used for Hall Effect flow sensors it is always used for flow sensors only

The following table summarizes the types of pulse connections that are used for the selected Pulse Modes.

| Pulse Mode              | Pulse 0 | Pulse 1     | Pulse 2     |
|-------------------------|---------|-------------|-------------|
| Disabled                | -       | -           | -           |
| PORT RPM                | P Tach  | -           | -           |
| STBD RPM                | S Tach  | -           | -           |
| CNTR RPM                | C Tach  | -           | -           |
| DUAL RPM                | P Tach  | S Tach      | -           |
| PORT DUAL FUEL FLOW     | -       | Supply FLOW | Return Flow |
| STBD DUAL FUEL FLOW     | -       | Supply FLOW | Return Flow |
| CNTR DUAL FUEL FLOW     | -       | Supply FLOW | Return Flow |
| PORT RPM-FUEL FLOW      | P Tach  | Supply FLOW | -           |
| STBD RPM-FUEL FLOW      | S Tach  | Supply FLOW | -           |
| CNTR RPM-FUEL FLOW      | S Tach  | Supply FLOW | -           |
| TRIPLE RPM              | P Tach  | S Tach      | C Tach*     |
| PORT RPM-DUEL FUEL FLOW | P Tach  | Supply FLOW | Return Flow |
| STBD RPM-DUEL FUEL FLOW | S Tach  | Supply FLOW | Return Flow |
| CNTR RPM-DUEL FUEL FLOW | S Tach  | Supply FLOW | Return Flow |

\* Must be a Hall Effect type of sensor

The following table summarizes the transmitted CAN Bus PGN and instance numbers for each Pulse Mode.

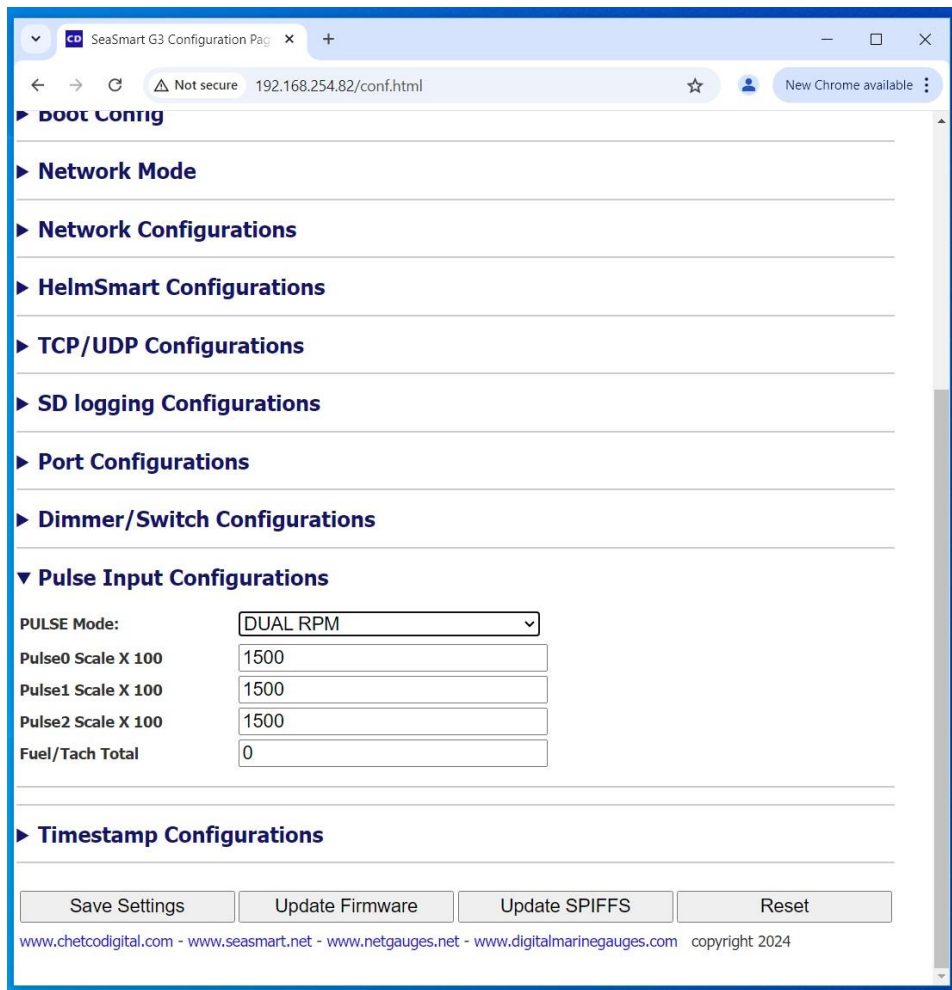
| Pulse Mode              | PGN127488 | PGN127497 |
|-------------------------|-----------|-----------|
| Disabled                | -         | -         |
| PORT RPM                | 0         | -         |
| STBD RPM                | 1         | -         |
| CNTR RPM                | 2         | -         |
| DUAL RPM                | 0,1       | -         |
| PORT DUAL FUEL FLOW     | -         | 0         |
| STBD DUAL FUEL FLOW     | -         | 1         |
| CNTR DUAL FUEL FLOW     | -         | 2         |
| PORT RPM-FUEL FLOW      | 0         | 0         |
| STBD RPM-FUEL FLOW      | 1         | 1         |
| CNTR RPM-FUEL FLOW      | 2         | 2         |
| TRIPLE RPM              | 0,1,2     | S Tach    |
| PORT RPM-DUEL FUEL FLOW | 0         | 0         |
| STBD RPM-DUEL FUEL FLOW | 1         | 1         |
| CNTR RPM-DUEL FUEL FLOW | 2         | 2         |

After selecting the desired pulse mode, specify the scale factor to be used to convert pulses per second (PPS) to revolutions per minute (RPM).

Each installation may require a different scale factor.

A 8 cylinder 4 cycle gasoline engine will produce 4 spark events per revolution.  
Therefore  $1 \text{ RPM} = 60 \text{ sec} / 4 \text{ pps} = 15$ . Pulse scale values are entered as  $\text{desired Scale} * 100 = 1500$

Other types of sensors like inductive flywheel for example may produce 100 PPS and therefore use a different scale factor



The screenshot shows a web browser window titled "SeaSmart G3 Configuration Page" with the address bar displaying "192.168.254.82/conf.html". The page contains a sidebar menu with the following items: "Boot Config", "Network Mode", "Network Configurations", "HelmSmart Configurations", "TCP/UDP Configurations", "SD logging Configurations", "Port Configurations", "Dimmer/Switch Configurations", "Pulse Input Configurations", and "Timestamp Configurations". The "Pulse Input Configurations" section is expanded, showing the following fields:

|                    |          |
|--------------------|----------|
| PULSE Mode:        | DUAL RPM |
| Pulse0 Scale X 100 | 1500     |
| Pulse1 Scale X 100 | 1500     |
| Pulse2 Scale X 100 | 1500     |
| Fuel/Tach Total    | 0        |

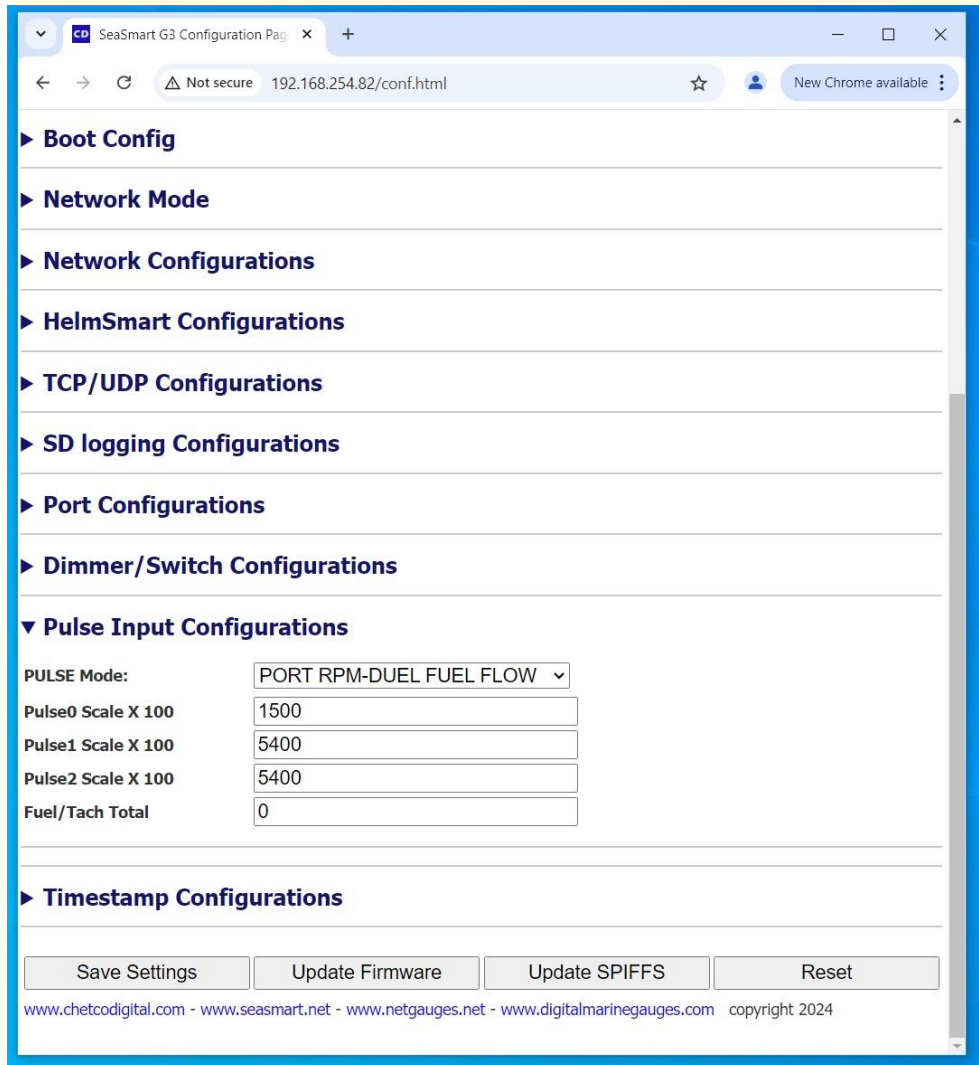
Below the "Pulse Input Configurations" section is the "Timestamp Configurations" section, which is currently collapsed. At the bottom of the page, there are four buttons: "Save Settings", "Update Firmware", "Update SPIFFS", and "Reset". The footer of the page contains the following text: "www.chetcodigital.com - www.seasmart.net - www.netgauges.net - www.digitalmarinegauges.com copyright 2024".

SeaGaugeG4 supports combining tachometer and dual flow sensors for each engine. Diesel engines normally require a pair of flow sensors to determine the difference between the injector rail supply flow minus the return flow to calculate fuel consumed.

In this case, you will need to enter different scale factors for the RPM and FLOW sensors.

SeaGaugeG4 flow sensors generate 1.5 ml per pulse. Thus to determine scale for L/hr, use  $0.0015 * 60 * 60 = 5.4 * 100 = 5400$ .

The CAN bus PGN 127497 uses flow rate resolution of Liters. Conversion to GPH is done by the attached display or embedded Web page



SeaSmart G3 Configuration Page

Not secure 192.168.254.82/conf.html

New Chrome available

- ▶ Boot Config
- ▶ Network Mode
- ▶ Network Configurations
- ▶ HelmSmart Configurations
- ▶ TCP/UDP Configurations
- ▶ SD logging Configurations
- ▶ Port Configurations
- ▶ Dimmer/Switch Configurations
- ▼ Pulse Input Configurations
  - PULSE Mode: PORT RPM-DUEL FUEL FLOW
  - Pulse0 Scale X 100: 1500
  - Pulse1 Scale X 100: 5400
  - Pulse2 Scale X 100: 5400
  - Fuel/Tach Total: 0
- ▶ Timestamp Configurations

Save Settings Update Firmware Update SPIFFS Reset

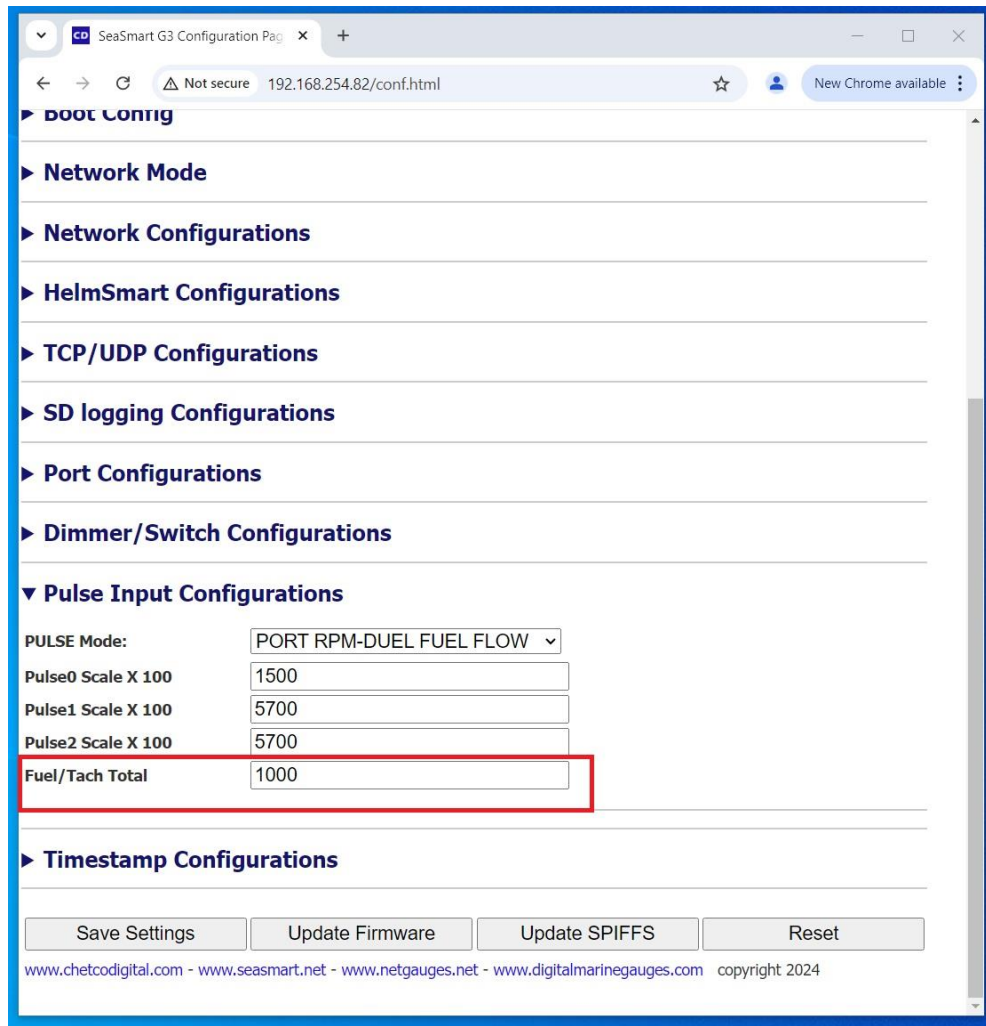
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SeaGaugeG4 stores total fuel consumed as calculated from attached flow sensors in a battery backed accumulator. This value is used in the PGN127489 TRIP FUEL USED.

Separate TRIP FUEL USED values are stored for each of 3 PGN instances based on the PULSE MODE selected.

All 3 stored values can be simultaneously reset by entering a non-zero value for the Fuel/Tach Total in Liters and resetting the unit.

Once reset, it is important to go back and reenter 0 for Fuel/Tach Total to avoid resetting again on next power cycle.



The screenshot shows a web browser window with the title "SeaSmart G3 Configuration Page". The address bar shows "192.168.254.82/conf.html". The page has a sidebar with expandable sections: "Boot Config", "Network Mode", "Network Configurations", "HelmSmart Configurations", "TCP/UDP Configurations", "SD logging Configurations", "Port Configurations", "Dimmer/Switch Configurations", "Pulse Input Configurations" (expanded), and "Timestamp Configurations".

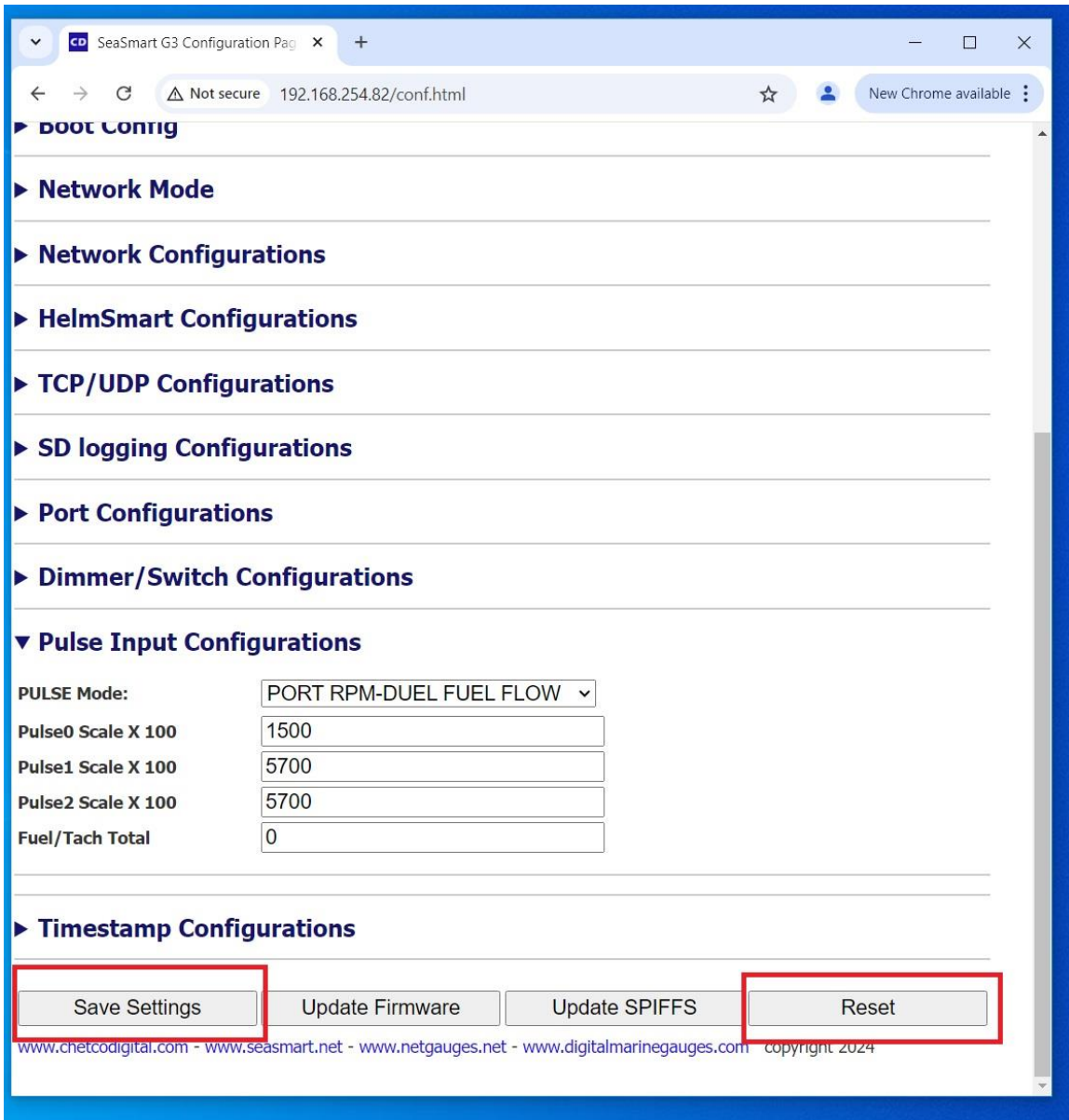
Under "Pulse Input Configurations", the following settings are visible:

|                    |                         |
|--------------------|-------------------------|
| PULSE Mode:        | PORT RPM-DUEL FUEL FLOW |
| Pulse0 Scale X 100 | 1500                    |
| Pulse1 Scale X 100 | 5700                    |
| Pulse2 Scale X 100 | 5700                    |
| Fuel/Tach Total    | 1000                    |

The "Fuel/Tach Total" field is highlighted with a red rectangle. Below these fields are buttons for "Save Settings", "Update Firmware", "Update SPIFFS", and "Reset". At the bottom, there is a copyright notice: "www.chetcodigital.com - www.seasmart.net - www.netgauges.net - www.digitalmarinegauges.com copyright 2024".



Once all pulse configurations are made it is important to SAVE SETTINGS and RESET device to avoid losing configuration changes



The screenshot shows the SeaSmart G3 Configuration Page in a web browser. The page is titled "SeaSmart G3 Configuration Page" and the URL is "192.168.254.82/conf.html". The page is divided into several sections, each with a expandable arrow icon. The sections are: "BOOT Config", "Network Mode", "Network Configurations", "HelmSmart Configurations", "TCP/UDP Configurations", "SD logging Configurations", "Port Configurations", "Dimmer/Switch Configurations", "Pulse Input Configurations", and "Timestamp Configurations". The "Pulse Input Configurations" section is expanded, showing the following fields: "PULSE Mode:" with a dropdown menu set to "PORT RPM-DUEL FUEL FLOW", "Pulse0 Scale X 100" with a text input field containing "1500", "Pulse1 Scale X 100" with a text input field containing "5700", "Pulse2 Scale X 100" with a text input field containing "5700", and "Fuel/Tach Total" with a text input field containing "0". Below the "Pulse Input Configurations" section is the "Timestamp Configurations" section, which is currently collapsed. At the bottom of the page, there are four buttons: "Save Settings", "Update Firmware", "Update SPIFFS", and "Reset". The "Save Settings" and "Reset" buttons are highlighted with red boxes. The footer of the page contains the following text: "www.chetcodigital.com - www.seasmart.net - www.netgauges.net - www.digitalmarinegauges.com - copyright 2024".

SeaSmart G3 Configuration Page

192.168.254.82/conf.html

Not secure

New Chrome available

▶ BOOT Config

▶ Network Mode

▶ Network Configurations

▶ HelmSmart Configurations

▶ TCP/UDP Configurations

▶ SD logging Configurations

▶ Port Configurations

▶ Dimmer/Switch Configurations

▼ Pulse Input Configurations

PULSE Mode: PORT RPM-DUEL FUEL FLOW

Pulse0 Scale X 100 1500

Pulse1 Scale X 100 5700

Pulse2 Scale X 100 5700

Fuel/Tach Total 0

▶ Timestamp Configurations

Save Settings Update Firmware Update SPIFFS Reset

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Engine Hours and Fuel used totals can be reset by using a config.xml file loaded into the CONFIG directory of the internal SD card

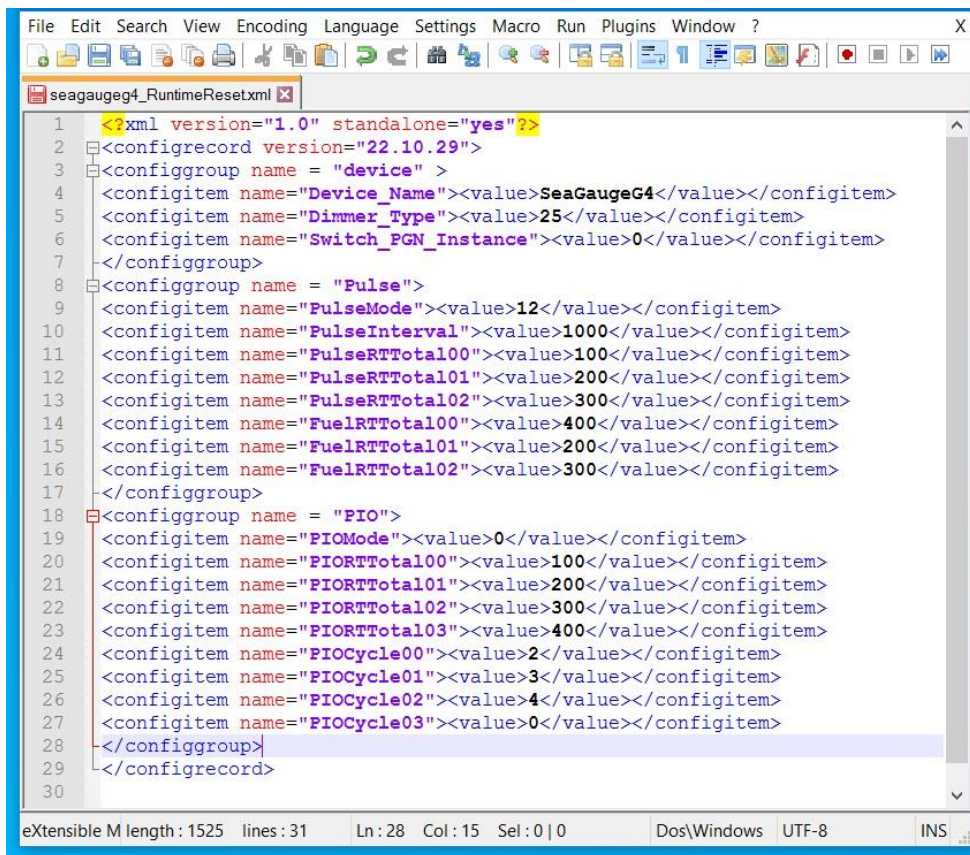
Since you can have multiple config.xml files in the directory – it is best to use a separate file just for resetting runtime values since you will need to delete the file after the unit is rebooted or else the values will reset on each power cycle.

If you do not want to reset a totalizer, remove the appropriate line from the config file

When SeaGaugeG4 is repowered, it will read the contents of the file and reset the appropriate values.

NOTE that the indicator runtime values are set in the PIO section and the RPM Hour meters/fuel flow totals are in the PULSE section.

Engine Hours values are in seconds and Fuel totals in Liters



```
File Edit Search View Encoding Language Settings Macro Run Plugins Window ?
seagauge4_RuntimeReset.xml
1 <?xml version="1.0" standalone="yes"?>
2 <configrecord version="22.10.29">
3   <configgroup name = "device" >
4     <configitem name="Device_Name"><value>SeaGaugeG4</value></configitem>
5     <configitem name="Dimmer_Type"><value>25</value></configitem>
6     <configitem name="Switch_PGN_Instance"><value>0</value></configitem>
7   </configgroup>
8   <configgroup name = "Pulse">
9     <configitem name="PulseMode"><value>12</value></configitem>
10    <configitem name="PulseInterval"><value>1000</value></configitem>
11    <configitem name="PulseRTTotal00"><value>100</value></configitem>
12    <configitem name="PulseRTTotal01"><value>200</value></configitem>
13    <configitem name="PulseRTTotal02"><value>300</value></configitem>
14    <configitem name="FuelRTTotal00"><value>400</value></configitem>
15    <configitem name="FuelRTTotal01"><value>200</value></configitem>
16    <configitem name="FuelRTTotal02"><value>300</value></configitem>
17  </configgroup>
18  <configgroup name = "PIO">
19    <configitem name="PIOMode"><value>0</value></configitem>
20    <configitem name="PIORTTotal00"><value>100</value></configitem>
21    <configitem name="PIORTTotal01"><value>200</value></configitem>
22    <configitem name="PIORTTotal02"><value>300</value></configitem>
23    <configitem name="PIORTTotal03"><value>400</value></configitem>
24    <configitem name="PIOCycle00"><value>2</value></configitem>
25    <configitem name="PIOCycle01"><value>3</value></configitem>
26    <configitem name="PIOCycle02"><value>4</value></configitem>
27    <configitem name="PIOCycle03"><value>0</value></configitem>
28  </configgroup>
29 </configrecord>
30
eXtensible M length : 1525 lines : 31 Ln : 28 Col : 15 Sel : 0 | 0 Dos\Windows UTF-8 INS
```