ehon

Solus

Automatic Tank Gauge

User Guide

Document Version: 1.0

Contents

1. Introduction

The EHON SOLUS is an advanced Automatic Tank Gauging (ATG) system designed to monitor up to 4 tanks simultaneously. It provides real-time volume measurements, alarm monitoring, and data logging capabilities.

Key features include:

- Multi-Tank Monitoring: Monitor up to 4 tanks simultaneously
- Accurate Measurement: 4-20mA pressure sensor input with advanced filtering
- Flexible Configuration: Support for custom strapping charts and tank geometries
- Alarm System: Four-level alarm system (HIGH-HIGH, HIGH, LOW, LOW-LOW) per tank
- Multiple Products: Configure up to 4 different products with custom densities
- Data Logging: Automatic event and alarm logging to SD card
- Communication: Modbus RTU/TCP and OCIO protocol support
- Network Ready: Ethernet connectivity for remote monitoring

2. Device Overview

2.1 Physical Components

- LCD Display:

  16 × 4-character display showing tank information.

- Keypad:

  5-button keypad:
  - UP / DOWN: Navigate menus, adjust values.
  - LEFT / RIGHT (BACK/NEXT): Move between fields, navigate menus.
  - SELECT: Confirm selections and enter menus.

- LED Indicators:

  Green LED: System power/status.
  Blue LED: Network/Server connectivity status.

- Communication Ports:

  PORT A: Serial port (RS485) – configurable for Modbus RTU, OCIO, PIUSI, or Relay Board.
  PORT C: Serial port (RS485) – configurable for Modbus RTU, OCIO, PIUSI, or Relay Board.
  Ethernet Port: RJ-45 connector for TCP/IP networking.

- Probe Connections:

  Terminal blocks for up to 4 tank level probes (T1–T4).

- SD Card Slot:

  For data logging and configuration storage.

2.2 Default Settings

- Default PIN: 1234.
- Network: DHCP enabled by default (network connection required).
- Keypad Tone: ON.
- Alarm Tone: ON.
- Volume Units: Litres only.
- Level Units: Millimetres.

3. Menu System

3.1 Accessing the Menu

To enter the menu system, hold SELECT for 2 seconds from any main display screen, then enter the PIN when prompted. To exit the menu, select EXIT from the main menu, press and hold LEFT at the root menu level, or allow the menu to time out after 60 seconds of inactivity.

3.2 Menu Navigation

- UP/DOWN: Navigate through menu items.
- SELECT: Enter a submenu or execute an action.
- LEFT: Go back to the previous menu level.
- RIGHT: Not used in menus (reserved for field navigation).
- Menus time out after 60 seconds of inactivity, returning to the main display with a "TIMEOUT" message.

3.3 Main Menu Structure

- DATE/TIME
- STATUS
- PRODUCTS
- CHARTS
- TANK SETUP

    - TANK 1
    - TANK 2
    - TANK 3
    - TANK 4
- SYSTEM
    - SOUND SETTINGS
        - ALARM TONE
        - KEYPAD TONE
    - COMMS SETTINGS
        - SERIAL PORTS
        - NETWORK
    - FORMAT DEVICE
    - CHANGE PIN
- REBOOT
- EXIT

4. Configuration

The configuration menus allow you to set the system clock, check device status, manage products and strapping charts, configure each tank, and adjust system-wide settings such as sound and communications.

4.1 Date and Time Menu

Path: Main Menu → **DATE/TIME**

Use this menu to set the internal clock. The date and time are only required for accurate timestamps in log files and event records.

1. Navigate to **DATE/TIME** in the main menu.
2. Use **UP/DOWN** to change the currently selected value.
3. Use **NEXT/BACK** to move between fields:
    - Day (DD)
    - Month (MM)
    - Year (YY) – 2000-based (e.g. 25 = 2025)
    - Hour (HH) – 24-hour format
    - Minute (MM)
4. Press **SEL** to save and return to the main menu.

If you exit or time out without pressing **SEL**, any changes are discarded.

4.2 Status Menu

Path: Main Menu → **SYSTEM** → **STATUS**

The **STATUS** menu shows live system information and diagnostics.

Tank Status

- Shows connection status for each configured tank (T1–T4).
- **CONNECTED** – Probe is communicating correctly.
- **NO PROBE** – Sensor not detected or communication failure.

System Diagnostics

- **CPU TEMP** – Internal processor temperature (°C).
- **CPU VOLT** – Internal CPU core voltage (V).
- **SYS VOLT** – Main power supply voltage (V).

System Information

- **FW** – Firmware version.
- **SN** – Serial Number, used for support and warranty identification.

Navigation

- Use **UP/DOWN** to scroll through the status items.

- Press **BACK** to return to the **SYSTEM** menu.

Tips

- Record the Serial Number (SN) when contacting technical support.
- Typical CPU temperature range: **25–60°C**.
- If **NO PROBE** is shown, check probe wiring, probe power and tank configuration.

4.3 Products Menu

Path: Main Menu → **PRODUCTS**

Use the **PRODUCTS** menu to create or edit product names and densities used in volume calculations.

Viewing Products

- Select **PRODUCTS** from the main menu and press **SEL**.
- Use **UP/DOWN** to scroll through the product list.
- Press **BACK** to return to the main menu.

Default products:

- **Diesel** – 0.840 g/mL
- **AdBlue** – 1.090 g/mL
- **UNKNOWN** – 1.000 g/mL (fallback product)

Adding a New Product

1. In **PRODUCTS**, scroll to **<ADD NEW>** and press **SEL**.
2. **Edit Name**
    - Use **UP/DOWN** to select characters (A–Z, 0–9, space).
    - Use **NEXT/BACK** to move between character positions.
    - Maximum 19 characters.
3. **Set Density**
    - Enter density in g/mL (e.g. 0.755).
    - Use **UP/DOWN** to change digits.
    - Use **NEXT/BACK** to move between digit positions.
4. Press **SEL** to save.

Editing a Product

1. Select a product and press **SEL**.
2. Choose **EDIT** and press **SEL**.
3. Modify the name or density as required.
4. Press **SEL** to save, or **BACK** to cancel.

Deleting a Product

1. Select a product and press **SEL**.
2. Choose **DELETE** and press **SEL**.
3. Confirm deletion or press **BACK** to cancel.

Products currently assigned to any tank cannot be deleted.

4.4 Charts Menu

Path: Main Menu → **CHARTS**

Use the **CHARTS** menu to create and manage strapping charts (height-to-volume tables) used for tank volume calculations.

Chart limits

- Maximum charts: 4
- Maximum rows per chart: 50
- Row format: Height in mm and Volume in L (litres)

Viewing Charts

- Select **CHARTS** from the main menu and press **SEL**.
- Use **UP/DOWN** to scroll through the chart list.
- Press **SEL** to open the selected chart.
- Press **BACK** (**LEFT**) to exit.

Adding a New Chart

1. In **CHARTS**, scroll to **<ADD NEW>** and press **SEL**.

2. A new chart is created with a default name (e.g. NEW1, NEW2).

3. The chart menu opens automatically; select **RENAME** to set a meaningful name.

Renaming a Chart

1. Select a chart and press **SEL**.

2. Choose **RENAME** and press **SEL**.

3. Edit the name:

- Use **UP/DOWN** to change the current character (A–Z, 0–9, space, and "-").
- Use **LEFT/RIGHT** to move between character positions.
- Maximum 12 characters.

4. Press **SEL** to save.

5. To cancel, press and hold **BACK** (**LEFT**).

If the name already exists, the unit displays **NAME EXISTS** and the rename is not saved.

Editing Chart Rows (Height/Volume Table)

1. Select a chart and press **SEL**.

2. Choose **ROWS** and press **SEL**.

3. Use **UP/DOWN** to select a row, **<ADD ROW>**, or **BACK**.

Row display format

- Rows are shown as: H=#### V=######
- After saving, rows automatically sort by height (you can enter rows in any order).

Adding a Row

1. In **ROWS**, select **<ADD ROW>** and press **SEL**.

2. Edit Height (mm):

- Use **LEFT/RIGHT** to select a digit.
- Use **UP/DOWN** to change the digit.
- Press **SEL** to move to Volume.

3. Edit Volume (L):

- Use **LEFT/RIGHT** to select a digit.
- Use **UP/DOWN** to change the digit.

4. Press **SEL** to save.

5. To cancel, press and hold **BACK** (**LEFT**).

Validation rules when saving a row

- Heights must be unique within the chart.
- Volumes must be unique within the chart.
- Volume must increase with height:
    - If the entered volume is too large for its height, the unit shows **VOL TOO HIGH**.
    - If the entered volume is too small for its height, the unit shows **VOL TOO LOW**.

Editing or Deleting a Row

1. In **ROWS**, select an existing row and press **SEL**.

2. Choose:

- **EDIT** to change height/volume (same entry method as adding a row), or
- **DELETE** to remove the row.

Deleting a Chart

1. Select a chart and press **SEL**

2. Choose **DELETE** and press **SEL**

4.5 Tanks Menu

Use the **TANK SETUP** menu to configure each tank (**TANK 1–TANK 4**). Each tank has the same set of sub-menus:

- **ENABLE/DISABLE**: show/hide the tank on the main display
- **NAME**: set the tank display name
- **DIMENSIONS**: set capacity, shape, and physical dimensions
- **PRODUCT**: assign the product used for density/volume calculations
- **SET ALARMS**: set high/low alarm thresholds (in litres)
- **SET CHART**: assign a strapping chart (or set to none)
- **CALIBRATE**: calibrate the probe using a known volume

General navigation notes

- **UP/DOWN**: move through menu items
- **SEL**: select/edit
- **BACK** (**LEFT**): return to the previous menu
- Most edit screens timeout after 60 seconds of no key presses and exit without saving.
- On most edit screens, press and hold **BACK** (**LEFT**) to cancel.

4.5.1 Enable/Disable

Path: **TANK SETUP** → **TANK 1** (or **TANK 2** / **TANK 3** / **TANK 4**) → **ENABLE/DISABLE**

- Use **LEFT/RIGHT** to toggle between **ON** and **OFF**.
- Press **SEL** to save.
- Press and hold **BACK** (**LEFT**) to cancel.

When disabled, the tank is not shown on the main display.

Name

Path: **TANK SETUP** → **TANK 1** (or **TANK 2** / **TANK 3** / **TANK 4**) → **NAME**

Use **NAME** to set the tank's short display label.

1. Use **LEFT/RIGHT** to move the cursor between character positions.

2. Use **UP/DOWN** to change the character (A–Z, 0–9, space, and "-").

3. Maximum 6 characters.

4. Press **SEL** to save or press and hold **BACK** (**LEFT**) to cancel.

Dimensions (Capacity / Shape / Size)

Path: **TANK SETUP** → **TANK 1** (or **TANK 2** / **TANK 3** / **TANK 4**) → **DIMENSIONS**

The **DIMENSIONS** editor contains a list of fields and a **SAVE** / **CANCEL** option.

Capacity

- Shown as **CAP**=###### L
- Maximum 999999 L
- If the entered value is too large, the unit shows **EXCEEDS MAX**.

Shape

- VERTICAL CYL (**V-CYL**)
- HORIZONTAL CYL (**H-CYL**)
- RECTANGULAR (**RECT**)

Dimensions (mm)

For **VERTICAL CYL**:

- **HEIGHT** (mm)

- **DIAMETER** (mm)

For **HORIZONTAL CYL**:

- **DIAMETER** (mm)
- **LENGTH** (mm)

For **RECTANGULAR**:

- **HEIGHT** (mm)
- **WIDTH** (mm)
- **DEPTH** (mm)

To edit a numeric field:

- Use **LEFT/RIGHT** to select a digit.
- Use **UP/DOWN** to change the digit.
- Press **SEL** to accept the value.

To finish:

- Select **SAVE** and press **SEL** to apply changes.
- Select **CANCEL** (or press and hold **BACK** (**LEFT**)) to exit without saving.

Note: after saving a new capacity, existing high-level alarms are clamped to the new capacity where required.

Product

Path: **TANK SETUP** → **TANK 1** (or **TANK 2** / **TANK 3** / **TANK 4**) → **PRODUCT**

1. Use **UP/DOWN** to scroll through products.

2. Press **SEL** to assign the selected product to the tank.

3. Press **BACK (LEFT)** to exit without saving.

If no products exist, the unit shows **NO PRODUCTS**!

Tip: assign the correct **PRODUCT** before calibrating, since density is used in the probe-to-height calculation.

Set Alarms

Path: **TANK SETUP** → **TANK 1** (or **TANK 2** / **TANK 3** / **TANK 4**) → **SET ALARMS**

Alarms are entered in litres and shown as 6-digit values:

- HI_HI (High-High)
- HIGH
- LOW
- LO_LO (Low-Low)

Editing an alarm

1. Select an alarm type and press **SEL**.

2. Use **LEFT/RIGHT** to select a digit.

3. Use **UP/DOWN** to change the digit.

4. Press **SEL** to save or press and hold **BACK (LEFT**) to cancel.

Rules and messages

- Alarm values cannot exceed the tank capacity. If exceeded, the unit shows **EXCEEDS CAPACITY**.
- For HIGH and HI_HI, entering 000000 sets the alarm to the tank's full capacity.
- HIGH must be ≤ HI_HI (otherwise MUST<=HI_HI LVL).
- LOW must be ≥ LO_LO (otherwise MUST>=LO_LO LVL).
- If you set HI_HI below the existing HIGH, HIGH is automatically lowered to match.
- If you set LO_LO above the existing LOW, LOW is automatically raised to match.

Set Chart

Path: **TANK SETUP** → **TANK 1** (or **TANK 2** / **TANK 3** / **TANK 4**) → **SET CHART**

Use **SET CHART** to assign a strapping chart to the tank (or set it to none).

1. Select: **SELECT CHART** / **CHANGE CHART** and press SEL.

2. Choose one of the following:

- **<NONE>** (disables chart usage for this tank), or
- A chart name from the list.

3. Press **SEL** to save, or **BACK (LEFT)** to cancel.

If there are no charts, the unit shows **NO CHARTS!**

Calibrate

Path: **TANK SETUP** → **TANK 1** (or **TANK 2** / **TANK 3** / **TANK 4**) → **CALIBRATE**

Use **CALIBRATE** to calibrate the probe by entering a known current volume in the tank.

1. Enter the known volume (litres):

- Use **LEFT/RIGHT** to select a digit.

- Use **UP/DOWN** to change the digit.

2. Press **SEL** to calibrate.

3. The unit displays **CALIBRATED**! on success, or **ERROR** if calibration failed.

4. Press and hold **BACK (LEFT)** to cancel.

Tip: for best results, set **DIMENSIONS**, **PRODUCT**, and (if used) **SET CHART** before calibrating.

4.6 System Menu

4.6.1 Sound Settings

Path: Device Settings → SOUND SETTINGS. Configure ALARM TONE and KEYPAD TONE as ON or OFF using UP/DOWN/LEFT/RIGHT to toggle and SELECT to save. By default, both the alarm tone and keypad tone are ON.

4.6.2 Communication Settings

Path: Device Settings → COMMS SETTINGS. Configure network and serial port settings using the following options: MODBUS TCP/IP and BACK.

4.6.2.1 Modbus TCP/IP (Ethernet) Settings

Path: Comms Settings → MODBUS TCP/IP. The Ethernet port is used exclusively for Modbus TCP/IP communication. DHCP can be toggled ON or OFF. When DHCP is OFF, static IP settings (IP address, netmask, and gateway) can be configured by entering each octet using UP/DOWN and LEFT/RIGHT and saving with SELECT. The default setting is DHCP enabled.

4.6.2.2 Serial Port Configuration

Path: Comms Settings → PORT A or PORT C. Configure serial port modes for connected devices using the available modes: DISABLE, MODBUS (Modbus RTU slave mode), OCIO (OCIO device connected), PIUSI (PIUSI FMS device connected) and RELAY (relay board control mode). For modes requiring a tank selection or FMS number, you will be prompted to enter these details. Settings are saved immediately.

4.6.3 Format Device

Path: Device Settings → FORMAT DEVICE. WARNING: Formatting the device permanently erases all user data including tank configurations, alarm settings, products, strapping charts, and configuration. Hardware settings are preserved. A double confirmation is required before formatting and rebooting. After formatting, default products and tanks are recreated and the PIN is reset to 1234. Back up important data before performing this action.

4.6.4 Change PIN

Path: Device Settings → CHANGE PIN. Change the access PIN by entering a new 4-digit value, confirming it, and saving with SELECT. If the two entries do not match, a PIN mismatch message is displayed, and the process must be repeated. The PIN must be four digits and cannot be empty. For security, choose a PIN that is not easily guessed.

4.7 Reboot

- **REBOOT**: reboots the console

4.8 Exit

- **EXIT**: exits back to the main screen

5. Tank Calibration

Calibration ensures accurate volume reading by adjusting the probe offset to match a known reference volume. Tank configuration is performed through the online portal, not through the device menu. Only calibration is performed directly on the device.

5.1 When to Calibrate

- When the tank is at a known, stable level.
- After probe installation or replacement.
- After significant tank or system maintenance.
- When reading appears inaccurate.

5.2 Calibration Procedure

1. From the main display, hold SELECT for 2 seconds.
2. Enter the PIN when prompted.
3. Select CALIBRATION from the main menu.
4. Use UP/DOWN to highlight the desired tank (TANK 1–4) and press SELECT.
5. When prompted with "ENTER KNOWN VOLUME", use UP/DOWN to adjust each digit (0–9) and LEFT/RIGHT to move between digits.
6. Enter the current known volume in litres and press SELECT to save.
7. The system calculates the probe offset automatically, updates the volume display immediately, and returns to the tank selection screen.

5.3 Calibration Tips

Recommended reference sources include:

- Delivery receipts showing delivered volume.
- Dipstick measurements with known conversion.
- Tank gauge readings (if verified accurate).
- Empty tank (0 litres) for zero-point calibration.

Best practices:

- Calibrate when the tank is stable (not during delivery or transfer).
- Use reliable reference sources wherever possible.
- Calibrate at mid-range volumes where practicable.

- Verify calibration at other levels to confirm accuracy.

6. Troubleshooting

6.1 Display Issues

If there is no display or the screen is blank, check the power connection and LED status. Confirm the power adapter is connected and the green LED is on. If the display shows "NO PROBE" for a tank, check probe wiring and connections, verify the correct terminal block, and recalibrate the tank if necessary. For incorrect volume readings, recalibrate the tank at a known volume and verify tank configuration in the online portal.

6.2 Alarm Issues

If alarms are not sounding, check that the alarm tone is enabled in Device Settings → Sound Settings and that alarm thresholds are properly set. False alarms can often be resolved by adjusting thresholds to account for normal level fluctuations, ensuring the tank is stable, and checking for noise or interference.

6.3 Communication Issues

For Modbus TCP/IP issues, verify Ethernet cabling and IP settings (DHCP or static), confirm the device IP address in the Status menu, test network connectivity from another device, and review any firewall settings.

For serial port problems, ensure the port is enabled, the correct mode (Modbus RTU, OCIO device, PIUSI FMS device, etc.) is selected, and the connected device is configured properly. Test with a known working device if possible.

6.4 Menu Issues

If the menu appears to time out immediately or navigation is unreliable, check the keypad for stuck or unresponsive buttons, press keys firmly, and reboot the device. If settings cannot be saved, verify the SD card is inserted and not full, and consider formatting the device if the SD card is suspected to be corrupted (back up data first).

6.5 General Issues

If the device is not responding, attempt a reboot via the menu (REBOOT → Confirm). If unresponsive, power cycle the device, check for error LEDs, and review log files on the SD card. Unstable or jumping volume readings may indicate probe instability, mechanical vibration, or product movement. Ensure the probe is securely mounted and recalibrate the tank.

If the PIN is forgotten, use the default PIN (1234) if it has not been changed, contact support to obtain a master PIN.

Appendix A: Keypad Reference

Button	Function
UP	Navigate up, increase value, cycle characters.
DOWN	Navigate down, decrease value, cycle characters.
LEFT (BACK)	Go back, move left in fields.
RIGHT (NEXT)	Move right in fields.
SELECT	Confirm, enter menu, save value.

Special actions:
- Hold SELECT for 2 seconds: Enter menu from main display.
- Double tap SELECT: Silence alarm on tank display.
- Hold LEFT: Go back (in some editors).

Appendix B: Default Values

Setting	Default Value
PIN	1234
Network Mode	DHCP enabled
Keypad Tone	ON
Alarm Tone	ON
Volume Unit	Litres
Level Unit	Millimetres
Port A	Disabled
Port C	Disabled

Appendix C: Specifications

Display

Type: ST7920 LCD.

Size: 16 characters × 4 lines.

Backlight: Auto-dim after approximately 30 seconds.

Communication

- Ethernet: 10/100 Mbps, RJ-45 (Modbus TCP/IP only).
- Serial Ports: 2 × RS485 configurable.
- Protocols: Modbus TCP/IP, Modbus RTU.

Tank Monitoring

- Maximum tanks: 4.
- Probe resolution: 3 mm.
- Tank Height: Up to 3 metres
- Volume range: 0 to 999,999 litres.
- Display update rate: approximately 10 seconds.
- Background update rate: higher for connected devices and online monitoring.

Power

Input: 9–48 V DC

Support and Contact

For technical support, firmware updates, or additional documentation, contact your supplier or system integrator. Provide the device serial number from the Status menu and a detailed description of the issue.