NIV-X Programming Guide

Model: NIV-X Digital Tank Level Gauge
Interface: 4-button faceplate
Powered by: AJAX Solutions
Website: www.ajax-sol.com

1. Product Overview

The NIV-X is a digital tank level monitoring system for diesel, water, heating oil, and other non-volatile liquids in non-ATEX environments. It provides continuous level measurement via a submersible pressure sensor, with optional alarm and communication outputs.

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2. Button Functions (Left to Right)

Symbol	Function
☰ (Menu)	Enter/ Exit menu
✙ (Plus)	Increase value / Scroll up
▬ (Minus)	Decrease value /Scroll down
⏻ (Power)	Confirm / enter / power on/off

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3. Basic Operation

Power On/Off

- If in Battery mode-Press and hold the ⏻ (Power) button for 2 seconds to turn the unit on or off.

LCD Screen: Shows Power type, Level, Ullage or fault status.

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4. Menu Navigation

To Enter Programming Mode:

1. Press ☰ (Menu) once to enter Setup Mode. - *When in Menu mode the LCD will be BLUE*
2. Passcode required ******Contact reseller******
3. Using the ☰ button will move the cursor through value segments
4. Enter passcode press ⏻
5. Use ✚ or ▬ to scroll through the menu options.
6. Use to ⏻ enter menu step and ✚ or ▬ to change values.
7. Press ⏻ to confirm
8. To exit to the main screen, wait for time out, or press the ☰ button.
9. The ☰ button will switch between the main screen and the menu.

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5. Programming Parameters

Menu Item	Description	Typical Range/Options
Height Units	Preferred measurement system	e.g. m, mm, inch, ft
Volume Unit	Preferred measurement system	e.g. Litres-Gallons
Product SG	The SG of the product being measured	e.g. Water, Diesel or custom
Sensor Range	The measuring range of the senor	e.g. 3m for 0-3m range ,5m for 0-5m range. ****Indicated on the sensor housing****

Menu Item	Description	Typical Range/Options
Sensor Offset:	The distance if the sensor is installed off the bottom of a tank	e.g. 0.5 cm 50mm off the base of the tank
Tank Type	Enter the tank type (shape)	Rectangular, Vertical cyl Horizontal cyl or Tank strapping table
Tank Height	Height of tank to **safe working capacity**	e.g. 250cm, 2.5m
Tank Volume	Nominal Volume of tank	e.g. Litres, Gallons
Low Lel (Senor)	Low Level Alarm (Based on Pressure Sensor output)	e.g. 0-99% value- Leave at 0% if not being used
High Lev (Sensor)	High Level Alarm (Based on Pressure Sensor output)	e.g. 0-99% value- Leave at 0% if not being used
Overfill / Bund Alarm	Overfill/ Bund Alarm - Mechanical switch	e.g. Enabled/Disabled
Relay	External Relay	e.g. Enabled/ Disabled
Sounders	Alarm Buzzer- Internal and optional external sounder	e.g. Enabled/ Disabled independent or dual
Input Type	Sensor Input Type	e.g. Voltage / Current- ****Indicated on the sensor housing****
Demo Mode	Turns the unit on permanently in battery mode to allow for demonstration	e.g. Enabled / Disabled

Menu Item	Description	Typical Range/Options
Software Version	Installed Software	e.g. Software-May 6- 2025

Example1: Set Tank Height to 851 mm

1. Press ☰
2. Scroll to "Tank Height"
3. Press ⏻ to enter
4. Use ✚/▬ to set value to **851**
5. Press ⏻ to confirm
6. Press ☰ to exit back to the main screen

Example2: Set Low Vol Alarm to 10%

7. Press ☰
8. Scroll to "Low Vol Alarm"
9. Press ⏻ to enter
10. Use ✚/▬ to set value to **10%**
11. Press ⏻ to confirm
12. Press ☰ to exit back to the main screen

10. NIV-X Modbus Communication Specification

Overview

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The NIV-X communicates as a Modbus RTU slave over RS-485.
It supports Modbus Function Code 3 (FC3) – *Read Holding Registers* – to allow external systems to retrieve live process data.

⚠ Note: The Modbus interface is only active when the NIV-X is mains powered.
It is not available during battery operation.

Communication Settings

Parameter	Default	Description
Device ID	2	Default Modbus slave address (Master typically uses ID = 1)
Baud Rate	9600	User-configurable via device menu
Data Bits	8	Fixed
Parity	None	Fixed
Stop Bits	1	Fixed
Protocol	Modbus RTU	Big-endian data, little-endian CRC

Addressing Note

The NIV-X adheres to the **original Modicon Modbus specification**:

- Holding registers begin at **address 40001**.
- The **wire address** (the address sent in the Modbus frame) begins at **0**.
    - Example: To read register 40001, the master must send a start address of 0x0000.
- Data is **big-endian**, while the **CRC checksum** is **little-endian**.

For a detailed explanation of FC3 operation, see:
🔗 https://www.simplymodbus.ca/FC03.htm

NIV-X Modbus Memory Map

Reg #	Modbus Address	Description	Units / Scaling
0	40001	Raw PXT %	% × 10
1	40002	Raw PXT current	mA × 10
2	40003	Raw PXT voltage	V × 100
3	40004	Battery voltage	V × 10
4	40005	Volume (high word)	—
5	40006	Volume (low word)	litres (combine regs 4–5)
6	40007	Ullage (high word)	—

Reg #	Modbus Address	Description	Units / Scaling
7	40008	Ullage (low word)	litres (combine regs 6–7)
8	40009	Height	cm
9	40010	Free space	cm
10	40011	Alarms	bitfield
11	40012	Counter (increments each packet processed)	integer

Register 10 (Alarms) Bitfield Definition

Bit #	Description	Active State
0	Bund alarm	1 = In alarm
1	Overflow alarm	1 = In alarm
2	Low volume alarm	1 = In alarm
3	High volume alarm (example)	1 = In alarm

All other bits are currently reserved and will return 0.

Combining 32-bit Values

The **Volume** and **Ullage** values are represented using two 16-bit registers.
To reconstruct these as 32-bit values:

32-bit value = (High Word × 65536) + Low Word

Example:
If High Word = 0x0001 and Low Word = 0xA410,
then Volume = (1 × 65536) + 42000 = **107,536 litres**.

Scaling

Some parameters are scaled to maintain decimal precision:

Scaling	Meaning
×10	Divide by 10
×100	Divide by 100

Example:
A register value of **1234** for "Battery voltage (×10)" = **123.4 V**

Example Modbus Packet: Read Volume

Master request to read volume (registers 40005–40006):

Field	Description	Example (hex)
Device ID	Slave address	0x02
Function Code	Read Holding Registers (FC3)	0x03
Start Address (High)	—	0x00
Start Address (Low)	40005 → wire address 4	0x04
Register Count (High)	—	0x00
Register Count (Low)	2 registers (for 32-bit value)	0x02
CRC (Low)	—	0x85
CRC (High)	—	0xF9

Master Packet (hex):

02 03 00 04 00 02 85 F9

Slave Response Example:

Field	Description	Example (hex)
Device ID	Slave address	0x02
Function Code	FC3	0x03
Byte Count	Number of data bytes	0x04

Field	Description	Example (hex)
Data (High Word)	Volume high word	0x00 0x00
Data (Low Word)	Volume low word	0x01 0xA4
CRC (Low)	—	0xC9
CRC (High)	—	0x18

Slave Packet (hex):

02 03 04 00 00 01 A4 C9 18

In this example:

- High Word = 0x0000 → 0
- Low Word = 0x01A4 → 420 (decimal)

✅ Result: Volume = 420 litres

If the high word were nonzero, its value would be multiplied by 65,536 and added to the low word.
All volume and ullage values are reported in litres, regardless of the display unit configured on the NIV-X.
The master system should perform any required unit conversion.

7. User Checks & Maintenance

Task	Frequency	Notes
Check level readings	As needed	Compare with physical level if in doubt
Inspect sensor cable	Every 12 months	Avoid kinks, tension, or damage
Clean sensor	Yearly or as needed	Gently wipe, no solvents
Replace 9V battery	Every 12–18 months	Or if backup fails

8. Important

⚠ Do not use with petrol, aviation fuel, or ATEX-classified substances.
⚠ Only trained personnel should modify wiring or configuration.
⚠ Do not submerge the main enclosure. Sensor only should be immersed.

Warranty & Support

- 12-month manufacturer's warranty (parts only)
- Warranty void if misused, installed incorrectly, or used with unsuitable liquids

Support Contact:
📧 support@ajax-sol.com
🌐 www.ajax-sol.com
📞 +44 (0)1234 567890

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7. More Information

Installation Guide: Refer to the full setup and configuration instructions included in the box or download at:
👉 www.ajax-sol.com/downloads