



CONNECTIVITY MODULES · PRODUCT BRIEF

Wi-Fi / Bluetooth Module

u-blox NINA-W131 · 802.11 b/g/n · Bluetooth 4.2 Classic & BLE · Plug-in module

Rev A · August 2026 | **Category:** Connectivity Modules | **Interface:** ARG Common Host API (UART)

- 802.11 b/g/n
- BT 4.2
- WPA2-Enterprise
- 2" × 1"

OVERVIEW

The ARG Wi-Fi Module is built around the u-blox NINA-W131, an ESP32-based SoC delivering 802.11 b/g/n Wi-Fi and Bluetooth 4.2 Classic/BLE on a single 2" × 1" plug-in card. It connects to any ARG host board via Samtec headers and exposes the ARG Common Host API.

ARG products are designed around a common comm module footprint and a hardware-agnostic Host API. The same host firmware runs unchanged whether the module inside is cellular, Wi-Fi, Power Line, or Modbus — decide connectivity at production time, or swap modules in the field.

Drop into any ARG host board. The same Host API works across all ARG comm modules — switch from Wi-Fi to cellular or Power Line with zero host firmware changes.

MODULE SPECIFICATIONS

Chipset	u-blox NINA-W131-03B (ESP32 dual-core Xtensa LX6, 240 MHz)
Wi-Fi Standard	IEEE 802.11 b/g/n, 2.4 GHz
Max Data Rate	72.2 Mbps (802.11n HT20, MCS7)
Wi-Fi Security	WEP, WPA, WPA2-Personal, WPA2-Enterprise (EAP-TLS, PEAP, EAP-TTLS)
Wi-Fi Tx Power	+18 dBm (802.11b) · +16 dBm (802.11g/n)
Bluetooth	Bluetooth 4.2 — Classic BR/EDR + BLE dual-mode
BT Tx Power	Up to +9 dBm (Classic & BLE)
Antenna	Integrated PCB trace antenna (NINA-W131-03B variant)
Flash / RAM	4 MB SPI flash · 520 KB SRAM
Supply Voltage	2.7 – 3.6 V (nom. 3.3 V)
Deep Sleep Current	<10 µA
Form Factor	2.0" × 1.0" (50.8 × 25.4 mm) carrier card
Connector	Samtec plug-in headers, 2mm pitch (both edges)
Certifications	FCC (XO9NINAW131), CE, IC, TELEC, KC, RCM, RoHS
Operating Temperature	–40°C to +85°C

HOST API INTERFACE

Protocol	ARG Binary Frame Protocol v0.1
Physical	UART, 460,800 baud, 8N1, hardware flow control (RTS/CTS)
Signals	TX, RX, RTS, CTS, nRST, PWR_EN
Frame Format	SOF (0xAA) + VER + TYPE + LEN[2] + PAYLOAD[0–512] + CRC16-CCITT[2]
Max Frame	519 bytes · Max payload: 512 bytes
CPU Burden	Zero — DMA + hardware flow control on both host and modem; CPU wakes only on complete frame
Compatibility	Protocol-identical across all ARG comm modules — cellular, Wi-Fi, G3-PLC, Modbus

KEY CAPABILITIES

Same Form Factor. 2" × 1" board, Samtec headers on 2mm centers. Every ARG comm module — cellular, Wi-Fi, Power Line, Modbus — fits the same footprint on the host PCB.

Same Host API. A single UART binary protocol — PUBLISH, STATUS_GET, RECEIVED — works identically across all module types. The host sends a payload and receives data without knowing the underlying radio.

Any Technology. Cellular for remote field sites. Wi-Fi for campus deployments. Power Line where wiring exists. Modbus for BMS integration. Select the module for each deployment — the product board never changes.

OTA Firmware Updates. 3.5MB NOR flash staging partition allows full over-the-air module firmware updates. The host streams the new image over UART; the modem validates, self-programs, and reboots autonomously.

Wi-Fi 802.11 b/g/n. u-blox NINA-W131 (ESP32 SoC). 2.4 GHz band, up to 72.2 Mbps on 802.11n HT20. Station and SoftAP modes simultaneously. Built-in TCP/IP stack and TLS 1.2 — secure cloud connectivity without a host TLS library.

Bluetooth 4.2 Classic & BLE. Dual-mode Bluetooth 4.2: BR/EDR Classic for audio and SPP profiles, BLE for low-energy sensor telemetry and mobile app pairing. Up to +9 dBm Tx power.

WPA2-Enterprise Security. WPA2-Personal and WPA2-Enterprise with EAP-TLS, EAP-TTLS/MSCHAPv2, and PEAP. Suitable for corporate and industrial networks requiring certificate-based authentication.

Open CPU or AT Command Mode. Run u-blox u-connectXpress AT firmware for simple host integration, or deploy custom application firmware directly on the ESP32 core via ESP-IDF or Arduino. OTA updates supported.