



AP100-LM/AP144-LC

Datasheet

Aiming to create better and safer working environments and life experiences through the products we deliver.



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LoRa Modbus Analog I/O Controller

AP100-LM/AP144-LC

Complete LoRa Controller for Analog In/Out, PWM Output, and RS485

The AP100-LM/AP144-LC utilizes the latest Low Power Wide Area (LPWA) technology to build Modbus/RTU communication for long-distance, wide-coverage, and low power consumption wireless IoT applications. Multiple analog inputs and outputs are supported in AP144-LC, such as voltage inputs and outputs, current inputs and outputs, PWM output and one RS-485 port for Modbus RTU slave. One AP100-LM RS485 Modbus RTU can connect up to 250pcs AP144-LC LoRa end nodes for two-way communications where field site analog signals are sent from AP144-LC and controlled by AP100-LM. The LoRa wireless distance can reach up to 3-6KM distance depending on the environment. The AP144-LC/AP100-LM offers great flexibility in wireless IoT applications, such as LED light control, environment sensors and meters reading for Smart City Applications such as Lighting, Smart Farming, Smart Environment Monitor, etc.



Modbus/RTU Extension by LoRa

- Transparent Two-Way Modbus Communication by LoRa
- AP100-LM Sends Modbus Control to AP144-LC LoRa End node
- AP144-LC Sends Modbus Data through AP100-LM Modbus Agent to Modbus Master Device

DMA – Auto Polling RTU function

- 20 Sets Constant RTU Registers
- AP144-LC Auto Polling & Mapping in Memory
- Reduce re-transmission time & performance

Tradition Modbus/RTU Operating Mode

- Utilize Modbus/RTU protocol for LoRa Agent / LoRa Node configure and communication
- Auto forward Modbus Data to Far-End node
- Auto re-present Far-End Modbus Data at Local Bus

Reliable LoRaMAC Radio Communication

- ECHO & Re-Send mechanism – LoRa Agent / LoRa Node
- Configurable Retransmit Mechanism- LoRa Agent

Secured Radio Communication

- AES 128 Data Encryption
- Configure Encryption Key by LoRa Utility

SF6~SF12 Configurable

- SF6, SF7, SF8, SF9, SF10, SF11, SF12
- Adjustable Spreading Factor for On-Air Reliability

0~10V Input / Output

- 2 Channels 0~10V High Impedance Input- Luminance Sensing
- 1 Channel 0~10V Open Drain Output, Dimmer Control

4~20mA Input / Output

- 2 Channels Current Sensing, 0.3% High Accuracy
- 1 Channel Current Output, 0.3% High Accuracy

PWM Output with Duty Cycle Control

- 5V PWM Output / 10V Open Collect (O.C.)
- Duty Cycle Adjustable - 100Hz~1Khz , 0.2% Accuracy

RS485-Modbus/RTU

- Modbus/ RTU Slave Mode – AP100-LM
- Modbus/RTU Host Mode – AP144-LC
- 2-Wires RS-485

Windows® Configure Tools

- User-Friendly, Model Auto Detection
- Analog IO Parameter Read and Write
- Micro-USB Interface

Industrial Application

- 10~30V DC wide power range input
- Low Power Consumption
- Radio Signal Coverage up to 6KM
- -40 ~ 75°C / 90%RH Operating Temperature / Humidity
- EN 301489 / EN300220 / EN62368-1 Compliance

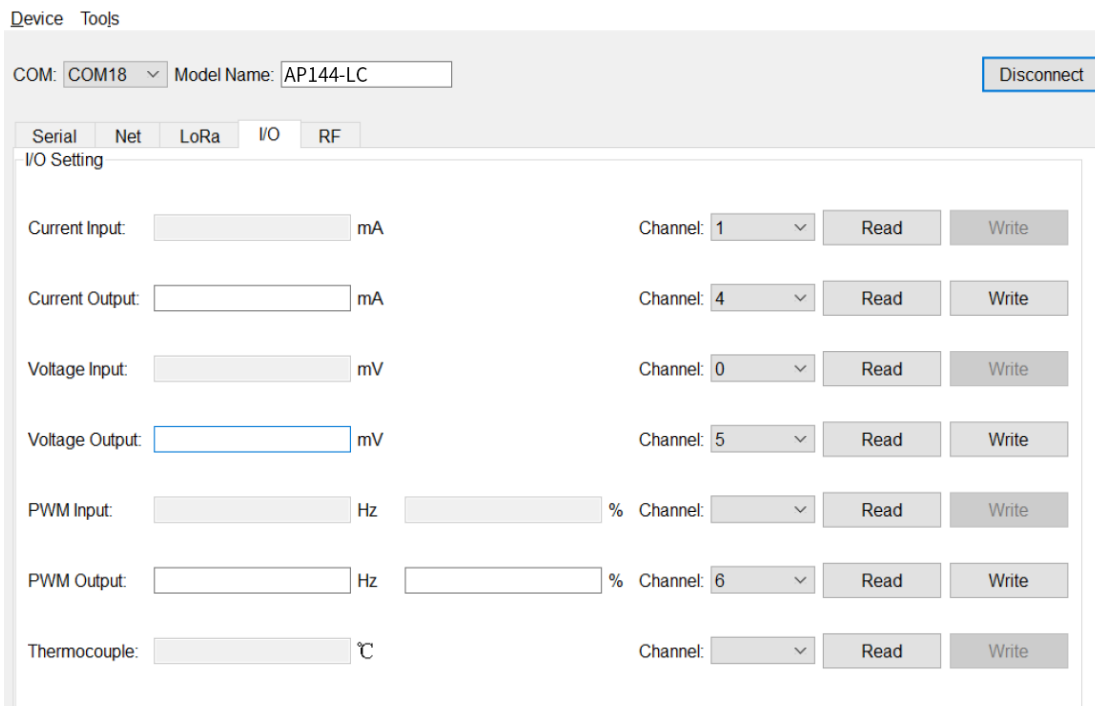


Product Features

- ✓ Transparent LoRa Communication to extend Two-Way Modbus Sensor Read and Control



- ✓ User Friendly Utility to configure Analog IO parameters





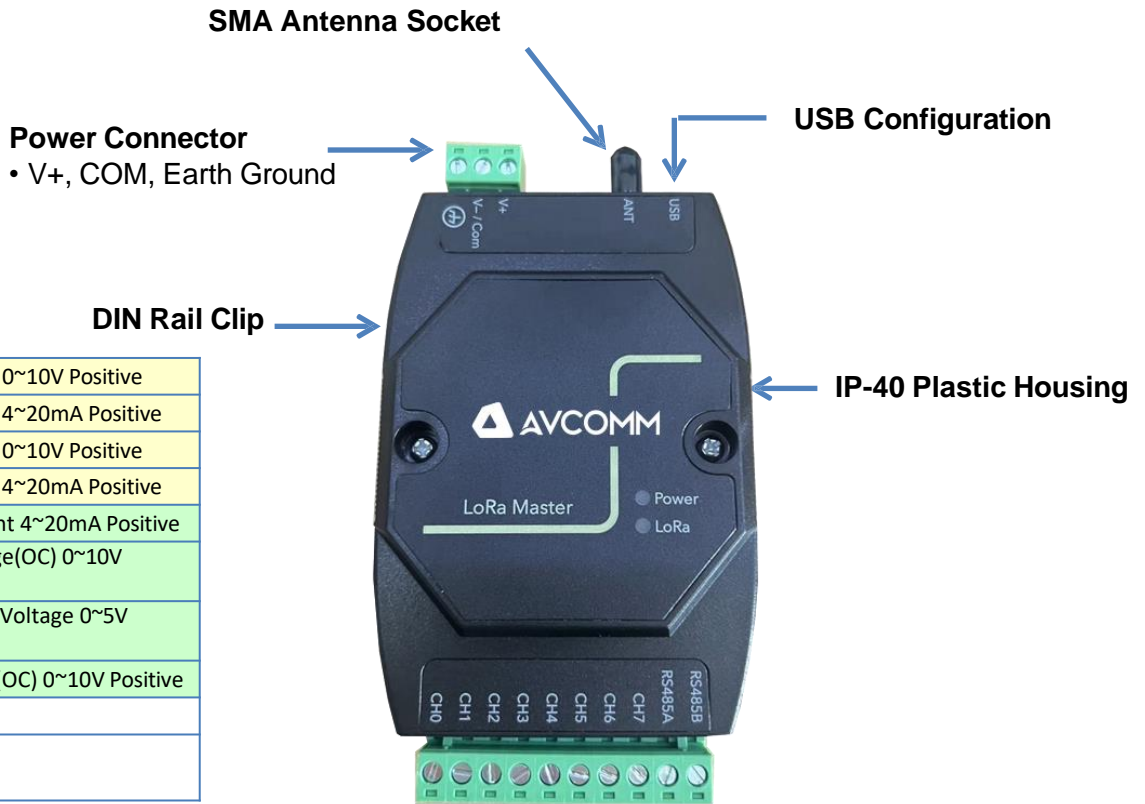
Ordering Information

Model Name	Description
AP100-LM-900	LoRa /Modbus RTU Client Agent 1 x RS-485 Slave 2-wire, 1 x SMA Antenna Connector Frequency: 850 ~930Mhz
AP100-LM-400	LoRa /Modbus RTU Client Agent 1 x RS-485 Slave 2-wire, 1 x SMA Antenna Connector Frequency:410 ~493Mhz
AP144-LC-900	LoRa End-Node, 8CH AIO, 1 Modbus RTU 485 Host 2 x 0~10V input, 0.2% accuracy 2 x 4~20mA input, 0.3% accuracy 1 x 0~10V Output, Open Collect (O.C.) Type, 0.2% accuracy 1 x 4~20mA Output, 0.3% accuracy 1 x PWM Output (0~5V), 200mA (max), 0.2%Duty_Cycle Accuracy @1khz 1 x PWM (0~10V), Open Collect (O.C.) Type, 200mA, 0.2% Duty Cycle accuracy @1Khz, 10V(Max) 1 x RS485 Host, 2-wire 1 x SMA /LoRa Antenna Connector Frequency:850~930Mhz
AP144-LC-400	LoRa End-Node, 8CH AIO, 1 Modbus RTU 485 Host 2 x 0~10V input, 0.2% accuracy 2 x 4~20mA input, 0.3% accuracy 1 x 0~10V Output, Open Collect (O.C.) Type, 0.2% accuracy 1 x 4~20mA Output, 0.3% accuracy 1 x PWM Output (0~5V), 200mA (max), 0.2%Duty_Cycle Accuracy @1khz 1 x PWM (0~10V), Open Collect (O.C.) Type, 200mA, 0.2% Duty Cycle accuracy @1Khz, 10V(Max) 1 x RS485 Host, 2-wire 1 x SMA /LoRa Antenna Connector Frequency:410 ~493Mhz

Wireless Specification	
Frequency	-900 model : Frequency Support EU 868Mhz, US915Mhz, AS 923Mhz, KR 920Mhz -400 model : Frequency Support EU 433Mhz Frequency adjust by Utility
Wireless Technology	Low Power Wide Area – LoRa MAC Technology
Radio TX Power	17dBm (50mW) (Maximum)
Radio RX Sensitivity	- 148dBm, SF=12 @ 250bps
Spreading Factor	SF5/SF6/SF7/SF8/SF9/SF10/SF12, Default SF7 Remote Configurable by ModBus RTU / Register writing command
Demodulator SNR	LoRa Demodulator Signal to Noise Ratio: -2.5dB ~ -20dB
Operating Mode	Modbus protocol over the Air (LoRa MAC Transparent Transmission) with configurable Echo time and retransmission technology
Forwarding Data Buffer	256Bytes FIFO Data Buffer for LoRa signal transmission
Data Encryption	128bits AES with configurable key
Management	
System Management	1 x Micro USB 2.0 port for system configuration
Software Utility	Windows [®] Based Utility
Remote Management	Remote Configure by Modbus RTU/ Read/Write Command
I/O Interface	
Antenna Connector	1x 50 ohm, Female SMA
Serial Interface	2-wires RS-485 Terminal Connector with 1kv isolation Connector Type: Removable Terminal Connector Supported Model: AP100-LM (Slave), AP144-LC (Host)
Serial Parameters	Baud Rate: 1200bps,2400bps, 4800bps, 9600bps Data Bits: 8 Parity Check: None, Even, Odd Stop Bit: 1,2
Current Input	2 Channels Detection Range: 4-20mA Accuracy Level: 0.3%
Voltage Input	2 Channels Detection Range: 0~10 V Accuracy Level: 0.2%
Current Output	1 Channel Output Range: 4-20mA @ Typical 24V Power Input Accuracy Level: 0.3%
Voltage Output	1 Channel Output Range: 0.03~10V Output Type: Open Collect (O.C.) Accuracy Level: 0.2%, Full Scale (F.S.)
PWM Output	Frequency: 100Hz~1KHz with 0.2% Duty-Cycle Accuracy Output Type-1: 5V, 200mA (Max) Output Type-2: Open Collect (O.C.), 10V /200mA (Max)
System Indication	
LED	Power (On): System Power applied LoRa (Blinking): LoRa RF Signal on Communication

Power Requirement	
Input Rating	Typical DC 24V, Rating: 10~30V 3-Pins Removable Terminal Connector for V+ ,Com and Earth Ground
Reverse Protection	Yes
Power Consumption	AP100-LM: 1 Watt @ DC 24V power input AP144-LC: 3 Watts @ DC 24V power input
Mechanical	
Installation	DIN Rail Mount
Enclosure Material	UL94v0, ABS , Anti- UV
Ingress Protection	IP 40
Dimension	26(D) x 102.5 (H) x 72 mm (W) / with wall mounting clip
Weight	115g
Environmental	
Operating Temperature	-40C~75C, 0% ~ 90%, Non-Condensing
Storage Temperature	-40C~80C, 0% ~ 90%, Non-Condensing
Reliability & Warranty	
MTBF	>20000 Hours
Warranty	5 Years
Standards	
Radio Equipment Directive	RED 2014/53/EU EMC: EN 301489-1 V2.2.3 (2019-11)/ EN 301489-3 V2.1.1 (2019-03) Radio: EN 300 220-1 v3.1.1 (2017-02)/ EN 300 220-2 v3.2.1 (2018-06) Health: EN 50663:2017 / EN 62479:2010 Safety: EN62368-1: 2014+ A11:2017
EMC	Compliance with EN 55032:2015/A11:2020, EN 55035:2017 IEC 61000-4-2 ESD IEC 61000-4-3 RS IEC 61000-4-4 EFT IEC 61000-4-5 Surge IEC 61000-4-6 CS IEC 61000-4-8 Pulse Magnetic Field

Function interface

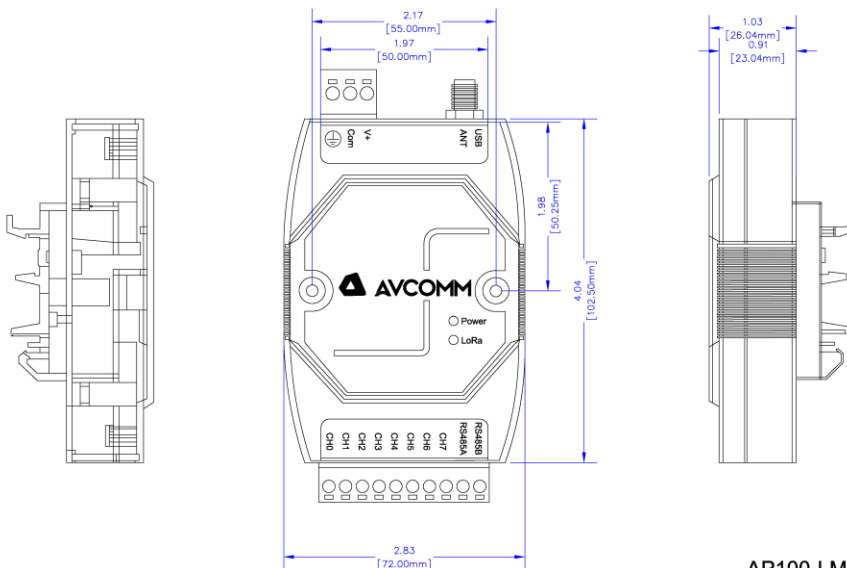


AP144-LC

CH0	Input Voltage 0~10V Positive
CH1	Input Current 4~20mA Positive
CH2	Input Voltage 0~10V Positive
CH3	Input Current 4~20mA Positive
CH4	Output Current 4~20mA Positive
CH5	Output Voltage(OC) 0~10V Positive
CH6	Output PWM Voltage 0~5V Positive
CH7	Output PWM(OC) 0~10V Positive
RS485A	
RS485B	

Installation dimensions

Unit: $\frac{\text{inch} \pm 0.040}{[\text{mm}] \pm 1.00}$



AP100-LM/AP144-LC

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