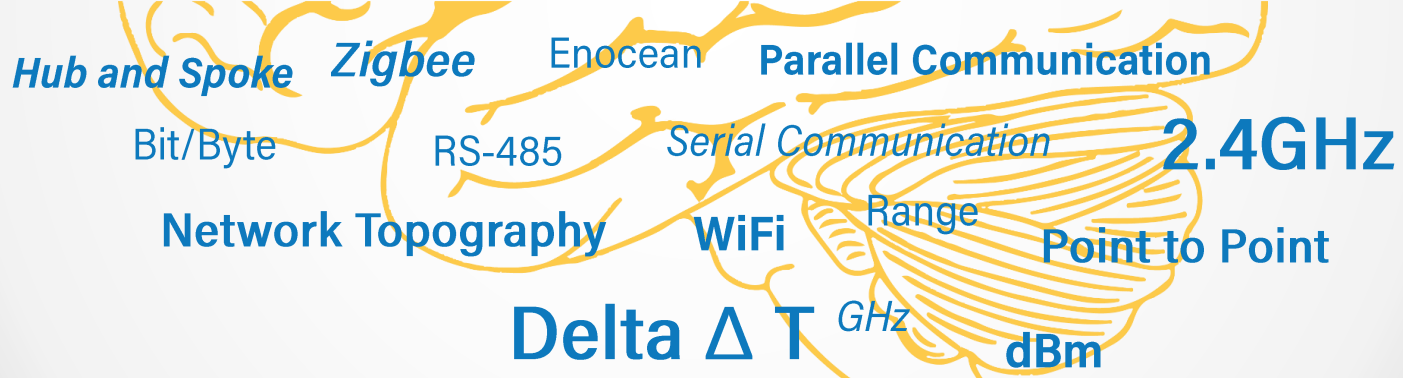


## WHAT WORDS COME TO MIND?



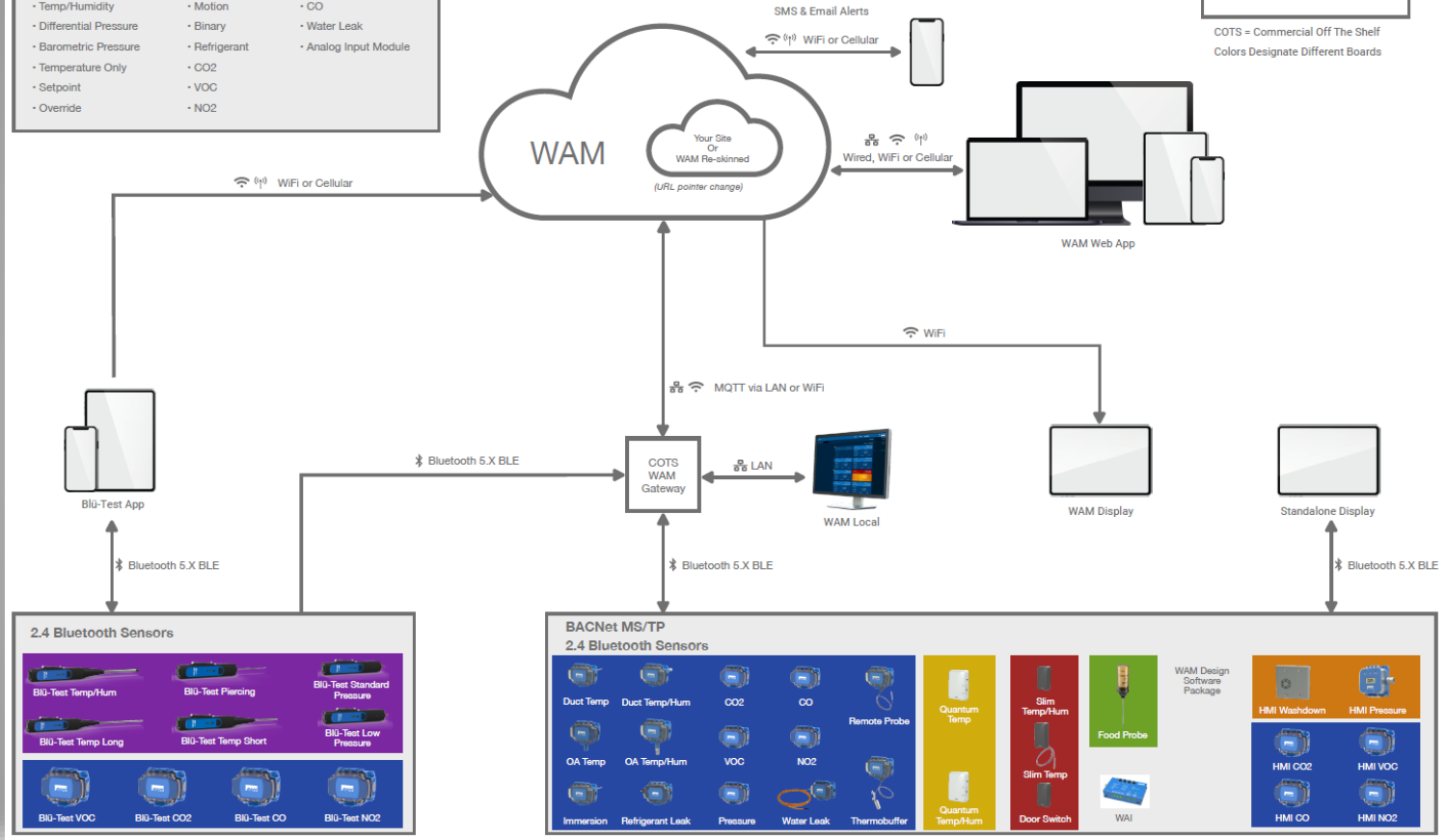
# Wireless Roadmap Overview

## Sensed Variables

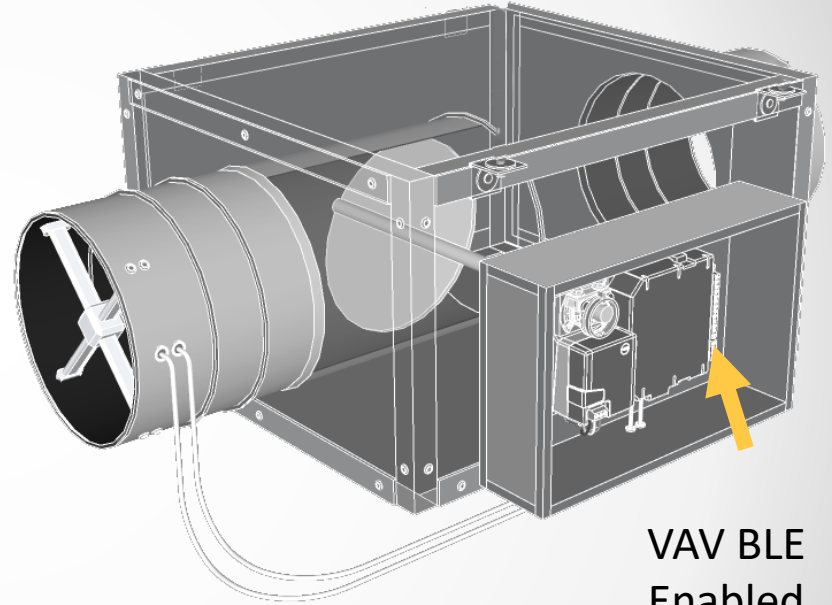
- Temp/Humidity
- Differential Pressure
- Barometric Pressure
- Temperature Only
- Setpoint
- Override
- Motion
- Binary
- Refrigerant
- CO2
- VOC
- NO2
- CO
- Water Leak
- Analog Input Module

Cellular    Wired  
 WiFi    Bluetooth

COTS = Commercial Off The Shelf  
Colors Designate Different Boards



# WIRELESS TO BLE ENABLED CONTROLLER, BACnet OUTPUT, BACnet MS-TP, AND MODBUS OUTPUT



VAV BLE Enabled Controller

# WIRELESS TO CUSTOMER CLOUD



# WIRELESS TO WAM



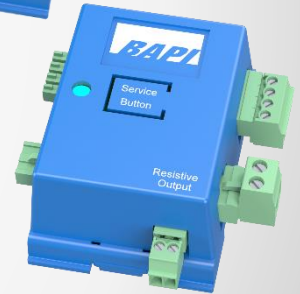
# WIRELESS TO ANALOG RECEIVER



Resistive Output



Voltage Output

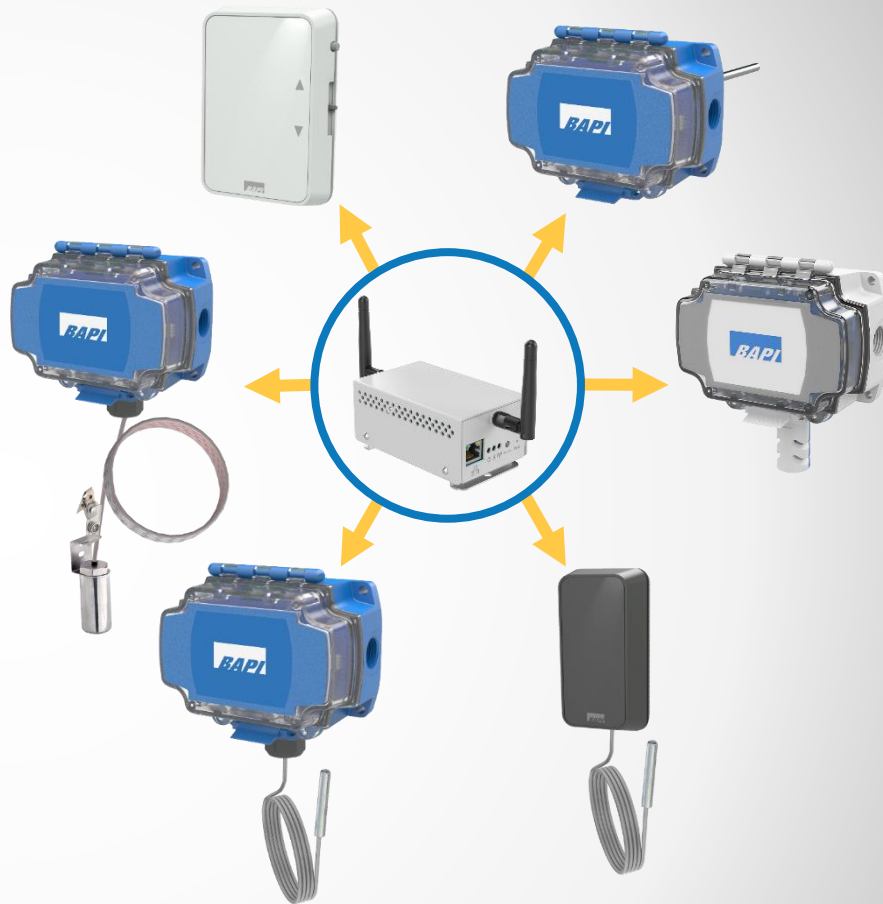


Voltage or Resistive Setpoint Output

# WIRELESS TO CLOUD

2.4GHz

Connects up to 32 sensors





## HOW DOES IT WORK?

① Sensors send readings to WAM Gateway.

② The WAM Gateway sends all of the readings to the cloud.

③ You can view readings and receive alerts from the cloud.

Cloud Service



The WAM website allows you to add sensors, setup user accounts, set parameters and alert notifications. You can customize alerts to be sent only to certain users and can be sent via email, text message or an automated phone call. You can also export sensor data to a .csv file to easily create your reports for HACCP or other safety regulations.

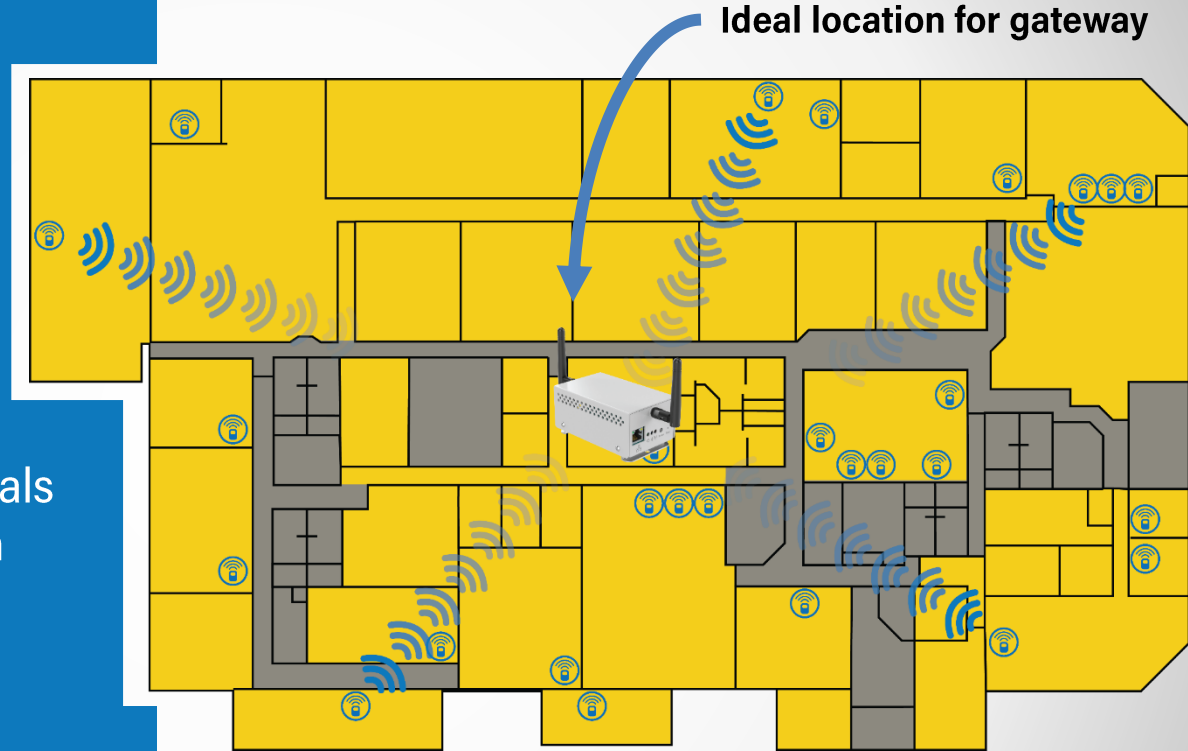
# CONSIDERATIONS

## Obstacles

- What blocks RF
  - Anything Metal
  - Walls
  - People
  - Forklifts or other equipment
  - Other wireless signals
  - Furniture directly in front of sensors

## What Can Help?

- Sensor orientation
- Antenna orientation





# WIRELESS SIMPLIFIED

Pair our wireless sensors and output modules to your BAS with our  
Wireless to Analog Receiver

***THE EASIEST WAY TO DO WIRELESS FOR HVAC***

1

Verify your site with a  
BLE scanner and our  
Quantum Slim



2

Verify your site with a  
BLE scanner and our  
Quantum Slim

Locations	Range Value
1	-71 dB
2	-66 dB
3	-45 dB



3

Place your order and we  
will ship it to you for an  
easy set up!



# THINGS WE CARE ABOUT - DISTANCE

## Distance Can Vary By Application

In-building range is dependent on obstructions such as furniture and walls and the density of those materials. In wide open spaces, the distance may be greater; in dense spaces, the distance may be less.

\*if you put a gateway in the center of your monitoring space, you could get a 400 square meter footprint on average.

# THINGS WE CARE ABOUT - BATTERY LIFE

Food Probe		
Calculated Battery Life**		
Transmit Interval	Sample Rate	Estimated Life (years)
30 sec	30 sec	0.25
1 min	1 min	0.42
3 min	1 min	0.55
5 min	5 min	1.45
10 min	5 min	1.96

Quantum		
Calculated Battery Life**		
Transmit Interval	Sample Rate	Estimated Life (years)
30 sec	30 sec	1.12
1 min	1 min	1.89
3 min	1 min	3.83
5 min	5 min	7.08
10 min	5 min	8.93

Quantum Slim		
Calculated Battery Life**		
Transmit Interval	Sample Rate	Estimated Life (years)
30 sec	30 sec	0.58
1 min	1 min	1.04
3 min	1 min	2.03
5 min	5 min	3.02
10 min	5 min	4.01

BAPI-Box		
Calculated Battery Life**		
Transmit Interval	Sample Rate	Estimated Life (years)
30 sec	30 sec	1.04
1 min	1 min	1.95
3 min	1 min	3.46
5 min	5 min	4.63
10 min	5 min	7.02

# THINGS WE CARE ABOUT - PRICE (INSTALL COST)

## F26 Wireless Gateway

Wireless

Rev. 06/01/23



### Features & Options

- Gateway provides data via MQTT to the cloud
- Each gateway supports up to 32 sensors that can be configured remotely via the Gateway and BAPI's WAM user interface

BAPI's Wireless Gateway receives the data from one or more sensors and provides the data to the cloud via MQTT using your local Wi-Fi connection. Sensors can be configured remotely via the gateway and BAPI's WAM user interface.

The gateway sends a confirmation signal to each sensor upon a successful reception. If the sensor doesn't receive this confirmation, then the sensor retains the readings in its onboard memory and transmits them once communication is re-established.

### ORDERING INFO:

BA/GTW-BLE: Wireless Gateway ..... \$735

### List Price

### Associated Sensors

BAPI offers a wide range of sensors that measure and send the data to the gateway.



### Specifications

**Supply Power:** 5 VDC @ 120mA via included USB cable or Power Over Ethernet (POE) via Ethernet Port. Ethernet port is for power only. TCP/IP is not enabled.

**Capacity/Unit:** Up to 32 sensors

**Antenna:** Thread-on Whip Antenna, 2.4 GHz

**Reception Distance:** Varies by application\* for both the Wi-Fi and Bluetooth signals

**Security:** TLS 1.2 authentication and encryption of Wi-Fi data. 128 AES for Bluetooth data. Configuration settings and device readings are user/password protected.

**Environmental Operation Range:**  
Temp: -4 to 158°F (-20 to 70°C)  
Humidity: 10 to 90%RH, non-condensing

**Frequency:** 2.4 GHz

**Receiver Sensitivity:** -97 dBm

**Mounting:** Wall or surface mount

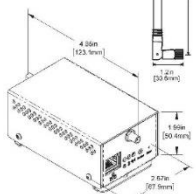
**Enclosure Material:** Powder coated steel

**Agency:** RoHS

\*In-building range is dependent on obstructions such as furniture and walls and the density of those materials. In wide open spaces, the distance may be greater; in dense spaces, the distance may be less.



Wireless Gateway and included USB to Micro USB Cable



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Rev. 06/01/23

## F27 Wireless Receiver

Wireless

### Features & Options

- Receiver output is converted to an analog voltage or resistance by the associated Analog Output Modules
- Supports up to 32 sensors and 127 Analog Output Modules
- User adjustable settings
- Surface, snaptrack or DIN rail mountable

The Wireless Receiver from BAPI receives the data from one or more wireless sensors. The data is then transferred to the Analog Output Modules and converted to an analog voltage or resistance. The receiver supports up to 32 sensors and up to 127 different Analog Output Modules.

### ORDERING INFO:

BA/RCV-BLE-EZ... Wireless Receiver... \$300

### List Price



Receiver (top) and Receiver with two Analog Output Modules mounted in 2.75" snaptrack (bottom)

Submital sheets without List Prices are available on our website at [www.bapivac.com](http://www.bapivac.com)

### Associated Products

• **Temp or Temp/Humidity Sensors**  
A wide range of sensors that measure and send the temp or temp/humidity data to the receiver.



Sensors



• **Analog Output Modules:**  
Converts the signal from the Receiver into an analog voltage or resistance.



### Specifications

**Supply Power:** 15 to 40 VDC or 12 to 24 VAC, halfwave rectified

**Power Consumption:** 30mA @ 24 VDC, 2.75 VA @ 24 VAC

**Capacity/Unit:** Up to 32 sensors and 127 different Analog Output Modules

**Reception Distance:** Varies by application\*

**Frequency:** 2.4 GHz (Bluetooth Low Energy)

**Bus Cable Distance:**

4,000 ft with shielded, twisted pair cable

**Environmental Operation Range:**

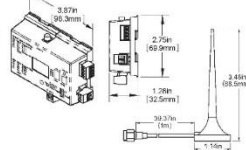
Temp: 32 to 140°F (0 to 60°C)

Humidity: 5% to 95% RH non-condensing

**Enclosure Material & Rating:**

ABS Plastic, UL94 V-0

**Agency:** RoHS



\*In-building range is dependent on obstructions such as furniture and walls and the density of those materials. In wide open spaces, the distance may be greater; in dense spaces, the distance may be less.



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# THINGS WE CARE ABOUT - PRICE (INSTALL COST)



## Outside Air Temp/Humidity Sensor F17

Wireless

### Ordering Information

#### BATTERY POWER UNITS List Price

**BAWTH-BLE-O-BB-BAT**  
Wireless Outside Air Temp/Humidity and Barometric Pressure Sensor, Battery Power ..... \$406

**BAWTH-BLE-LL-O-BB-BAT**  
Wireless Outside Air Temp/Humidity, Light Level & Barometric Pressure Sensor, Battery Power ... \$441

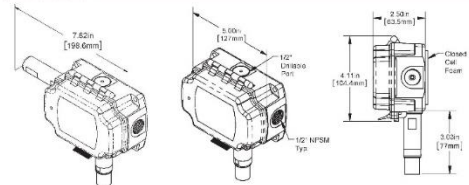
**BAL/L14505** 3.6V Lithium Battery.....\$3 (net Price)

#### WIRE POWER UNITS

**BAWTH-BLE-O-BB-PWR**  
Wireless Outside Air Temp/Humidity and Barometric Pressure Sensor, Wire Power ..... \$441

**BAWTH-BLE-LL-O-BB-PWR**  
Wireless Outside Air Temp/Humidity, Light Level & Barometric Pressure Sensor, Wire Power ... \$441

### Dimensions



### Wireless Receiver and Gateway

#### RECEIVER (Wireless-to-Analog)

The Wireless Receiver from BAPI receives the data from one or more wireless sensors. The data is then transferred to the Analog Output Modules and converted to an analog voltage or resistance. The receiver supports up to 32 sensors and up to 127 different Analog Output Modules.



#### GATEWAY

The Wireless Gateway from BAPI receives the data from one or more wireless sensors. The Gateway then provides the data to the cloud via MQTT. The Gateway also sends a confirmation signal to each sensor upon a successful reception of data. If the sensor doesn't receive this confirmation, it will retry its transmission to the Gateway. The Gateway supports up to 32 sensors.



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## BAPI-Stat "Quantum" Temp/Humidity Sensor F5

Wireless



### Ordering Information

#### BATTERY POWER UNITS WITH STANDARD MOUNTING BASE List Price

**BAWTH-BLE-Q-BAT**  
Wireless BAPI-Stat "Quantum" Temp/Humidity Sensor, Battery Power ..... \$300

**BAWTH-BLE-Q-S-BAT**  
Wireless BAPI-Stat "Quantum" Temp/Humidity Sensor, Setpoint, Battery Power ..... \$306

**BAWTH-BLE-Q-SO-BAT**  
Wireless BAPI-Stat "Quantum" Temp/Humidity Sensor, Setpoint, Override, Battery Power ..... \$311

**BAL/L14505** 3.6V Lithium Battery.....\$3 (net Price)

#### BATTERY POWER UNITS WITH 60MM MOUNTING BASE

**BAWTH-BLE-Q60-BAT**  
Wireless BAPI-Stat "Quantum" Temp/Humidity Sensor, Battery Power, 60mm Base ..... \$300

**BAWTH-BLE-Q60-S-BAT**  
Wireless BAPI-Stat "Quantum" Temp/Humidity Sensor, Setpoint, Battery Power, 60mm Base ..... \$306

**BAWTH-BLE-Q60-SO-BAT**  
Wireless BAPI-Stat "Quantum" Temp/Hum Sensor, Setpoint, Override, Battery Power, 60mm Base ... \$311

**BAL/L14505** 3.6V Lithium Battery.....\$3 (net Price)

#### WIRE POWER UNITS WITH STANDARD MOUNTING BASE

**BAWTH-BLE-Q-PWR**  
Wireless BAPI-Stat "Quantum" Temp/Humidity Sensor, Wire Power ..... \$300

**BAWTH-BLE-Q-S-PWR**  
Wireless BAPI-Stat "Quantum" Temp/Humidity Sensor, Setpoint, Wire Power ..... \$306

**BAWTH-BLE-Q-SO-PWR**  
Wireless BAPI-Stat "Quantum" Temp/Humidity Sensor, Setpoint, Override, Wire Power ..... \$311

#### WIRE POWER UNITS WITH 60MM MOUNTING BASE

**BAWTH-BLE-Q60-PWR**  
Wireless BAPI-Stat "Quantum" Temp/Humidity Sensor, Wire Power, 60mm Base ..... \$300

**BAWTH-BLE-Q60-S-PWR**  
Wireless BAPI-Stat "Quantum" Temp/Humidity Sensor, Setpoint, Wire Power, 60mm Base ..... \$306

**BAWTH-BLE-Q60-SO-PWR**  
Wireless BAPI-Stat "Quantum" Temp/Hum Sensor, Setpoint, Override, Wire Power, 60mm Base... \$311

### Wireless Receiver and Gateway

#### RECEIVER (Wireless-to-Analog)

The Wireless Receiver from BAPI receives the data from one or more wireless sensors. The data is then transferred to the Analog Output Modules and converted to an analog voltage or resistance. The receiver supports up to 32 sensors and up to 127 different Analog Output Modules.



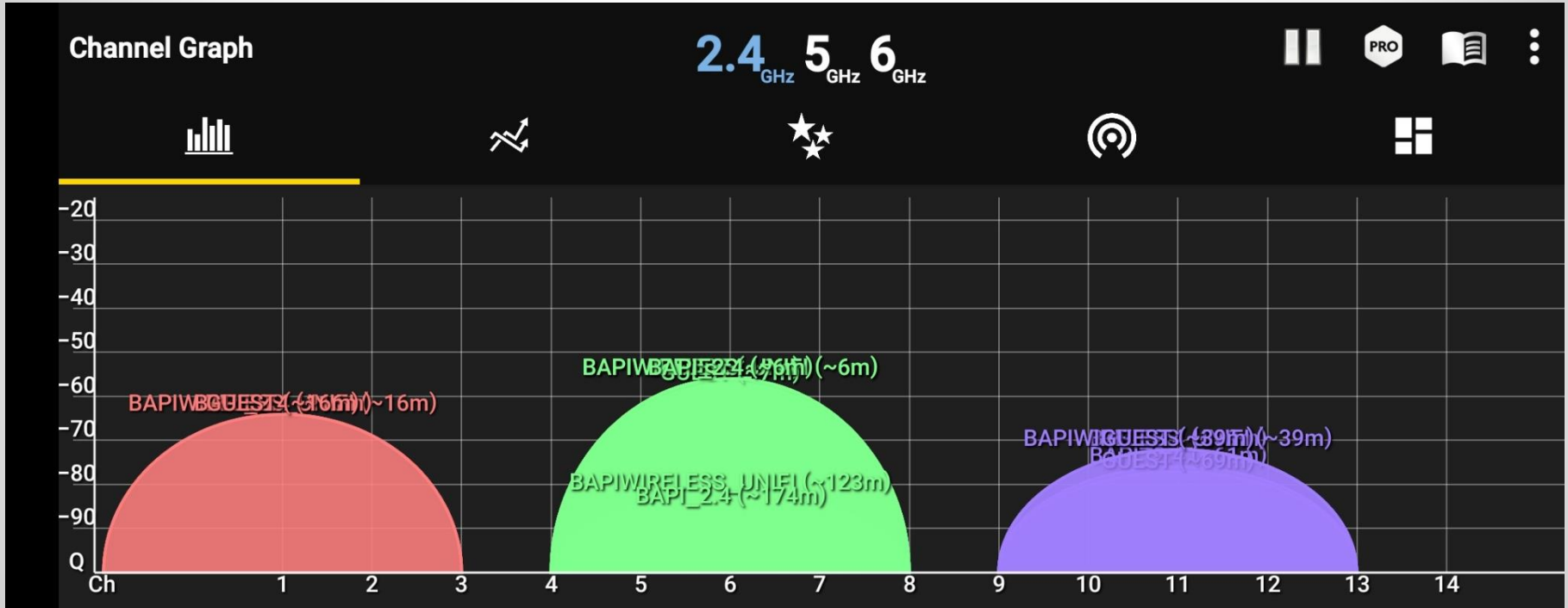
#### GATEWAY

The Wireless Gateway from BAPI receives the data from one or more wireless sensors. The Gateway then provides the data to the cloud via MQTT. The Gateway also sends a confirmation signal to each sensor upon a successful reception of data. If the sensor doesn't receive this confirmation, it will retry its transmission to the Gateway. The Gateway supports up to 32 sensors.



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# WIFI TO THE CLOUD: APPLICATION ENVIRONMENT CONDITIONS




# BLE – APPLICATION ENVIRONMENT CONDITIONS

The screenshot shows a mobile application titled "BLE Scanner" with a search filter set to "bapi". It displays three device entries, each with a signal strength indicator, name, MAC address, distance, and a "CONNECT" button. The first two entries are marked as "Paired" with blue arrows, and the third is marked as "Not Paired" with a red box around the name and a blue arrow.

Signal Strength	Device Name	MAC Address	Distance	Advertisement	Status
-71 dBm	BAIIPROBE	38:5B:44:90:41:C1	1.12 m	0 ms	Paired
-66 dBm	BAIIPROBE	38:5B:44:8D:A4:AF	0.63 m	0 ms	Paired
-71 dBm	BAIIPROBE	38:5B:44:90:41:C1	1.12 m	0 ms	Not Paired

# SENSOR EDITABLE ATTRIBUTES

**DEVICE LOCATION (PLACEMENT)**  
Where is this device located?

**IMAGE**  


**NOTES**

**BONDS**  
🗑️ Gateway d1e083445b38

**DEVICE SERIAL NUMBER**  
bda88d445b38

**LOW BATTERY ALARM**

**SAMPLE INTERVAL** 10 sec

**TRANSMIT INTERVAL** 30 seconds

**TEMPERATURE (DELTA T)** 0 °F/C

**HUMIDITY (DELTA T)** 0% RH

**TEMPERATURE OFFSET** -5 °F/C

**HUMIDITY OFFSET** -3% RH

**TEMPERATURE (DELTA MIN & MAX)**  
-40 MIN 85 MAX

Save

# WIRELESS ATTRIBUTES

## Power Options

- Batteries
- External Power
- Sensor Density
  - How many sensors are needed?
  - How many receivers/gateways?
    - Where will they be placed?

# WIRELESS USECASE

## Sensor Environments

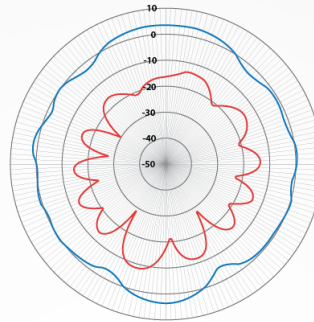
- Office buildings
- Hospitals
- Schools
- Apartment Complexes
- Coliseum
- Grow Facilities
- Labs
- On and on and on . . .



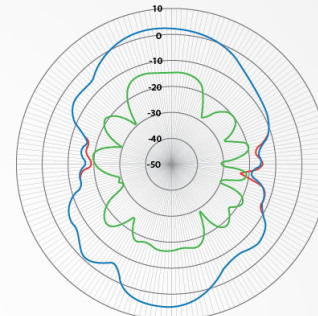
# ANTENNA

- Gain Plots
- Antenna Radiation
- Antenna Size

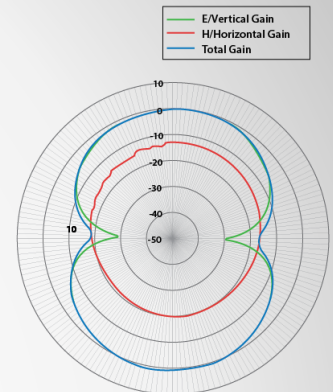
## Gain Plots



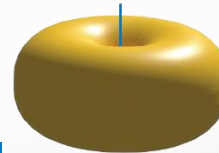
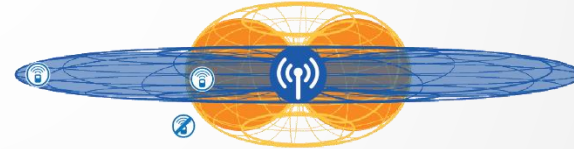
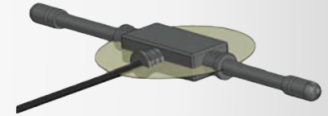
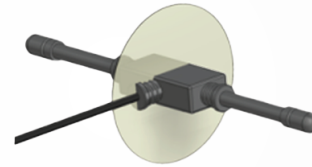
XZ-Plane Gain



YZ-Plane Gain



XY-Plane Gain



# SECURITY

- AES128 Encryption (BLE)
- TLS1.2 Encryption (WiFi)



# THINGS WE SHOULDN'T CARE ABOUT

Frequency: 2.4GHz is FCC approved

Protocol

# WIRELESS LINE



## Gateway

- Communicates with sensors
- Provides the data to the cloud and is available in the WAM System



## Duct Temp or Temp/Humidity Sensor

- IP66-rated BAPI-Box enclosure
- Stainless steel probes for 4" to 18"



## BAPI-Stat "Quantum" Temp or Temp/Humidity Sensor

- Optional temperature set point and override

# WIRELESS LINE



## Termobuffer Freezer & Cooler Sensor

- 2" or 4" attached chamber or 1" hanging bracket
- Tracks the temp of the contents, rather than the air temp



## Duct Temp or Temp/Humidity Sensor

- IP66-rated BAPI-Box enclosure
- Stainless steel probes for 4" to 18"



## Food Probe Temperature Sensor

- Remains in the food trays and eliminates hand recording of food temps
- Designed for wet, dusty or dirty environments in addition to food

# WIRELESS LINE



## Outside Air Temp or Temp/Humidity Sensor

- IP66-rated BAPI-Box
- Barometric pressure sensing and optional light level sensing



## BAPI-Stat "Quantum-Slim" Sensor

- Perfect for freezers, coolers, server racks & many other locations
- Internal sensor or remote sensor



## Immersion Temp Sensor

- IP66-rated BAPI-Box enclosure
- Stainless steel probes – 2", 4", & 8"