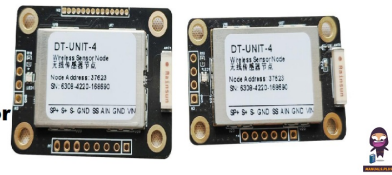**Manuals+** — User Manuals Simplified.

IDQ Science

DT-UNIT-4
Wireless Sensor

IDQ Science DT-UNIT-4 Wireless Sensor User Manual

Contents

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IDQ Science DT-UNIT-4 Wireless Sensor

Product Specifications

- Wireless Sensor Network Overview
- Node Overview
- Interface: Wireless
- Channels: Dual-channel analog input
- Sampling Rate: Up to 1 kHz
- Operational Modes: Active, Sleep, Idle
- Range: Up to two kilometers
- Compatibility: DT-UNIT-BASE gateway

Product Usage Instructions

Wireless Sensor Network Overview

The DT Wireless sensor network is designed for high-speed, \scalable sensor data collection and network systems. Each system includes a wireless sensor interface node, data collector gateway, and software platform. The two-way wireless communication allows data collection and configuration from up to two kilometers away.

Node Overview

The DT-UNIT-4 is a small, wireless, dual-channel analog input \sensor node suitable for OEM integration. It features high-resolution data collection at sampling rates up to 1 kHz. The node is ideal for connecting to various sensor types.

Interface and Indicators

The node status indicator provides information on the device status:

- OFF: Node is off
- Rapid green flashing on start-up: Node is booting up
- 1 (slow) green pulse per second: Node is idle and waiting for a command
- 1 green blink every 2 seconds: Node is sampling
- Blue LED during sampling: Node is resynchronizing
- Red LED: Built-in test error

Node Operational Modes

The sensor nodes have three operational modes:

1. Active: Node is sampling data
2. Sleep: Node is in ultra-low power sleep mode
3. Idle: Node is idle and can be used for configuring settings

Frequently Asked Questions

- **Q: How far can the wireless sensor network collect data from?**

- A: The wireless sensor network can collect data from sensors up to two kilometers away.
- **Q: What types of sensors can the DT-UNIT-4 node connect to?**
  - A: The DT-UNIT-4 node can connect to various sensors including strain gauges, pressure sensors, load cells, and displacement sensors.

Wireless Sensor Network Overview

DT Wireless sensor network is a high-speed, scalable sensor data collection and sensor network system. Each system consists of a wireless sensor interface node, a data collector gateway and a software platform based on the host computer. Two-way wireless communication between nodes and gateways enables sensor data collection and configuration from up to two kilometers away. The gateway can be locally connected to the host computer for real-time data collection and analysis. Some gateways also have analog output capabilities that can transmit sensor data directly to a stand-alone data acquisition device or \directly interface with industrial control equipment such as PLCs. The selection of available nodes allows interfacing with many types of sensors, including accelerometers, strain gauges, pressure sensors, load cells, torque and vibration sensors, magnetometers, 4 to 20 mA sensors, thermocouples, RTD sensors, soil moisture and Humidity sensors, inclinometers and displacement sensors. Some nodes come with integrated sensing devices such as accelerometers. A single gateway can coordinate multiple nodes of any type, and multiple gateways can be managed from one computer using a host computer software platform.

Node Overview

The DT-UNIT-4 is a small, wireless, low-cost, dual-channel analog input sensor node ready for OEM integration. Featuring one differential and one single-ended analog input channel and an internal temperature sensor, the DT-UNIT-4 is capable of collecting high-resolution, low-noise data at sampling rates up to 1 kHz. Other features of the DT-UNIT-4 include an adjustable PGA, digital low-pass filter, flash memory, automatic strain gauge calibration using on-board shunt resistors, and a pulse input channel for RPM measurements. This wireless sensor is ideal for connecting to a variety of sensor types, including strain gauges, pressure sensors, load cells, and displacement sensors. To acquire sensor data, DT-UNIT-4 is used together with the DT-UNIT-BASE gateway.
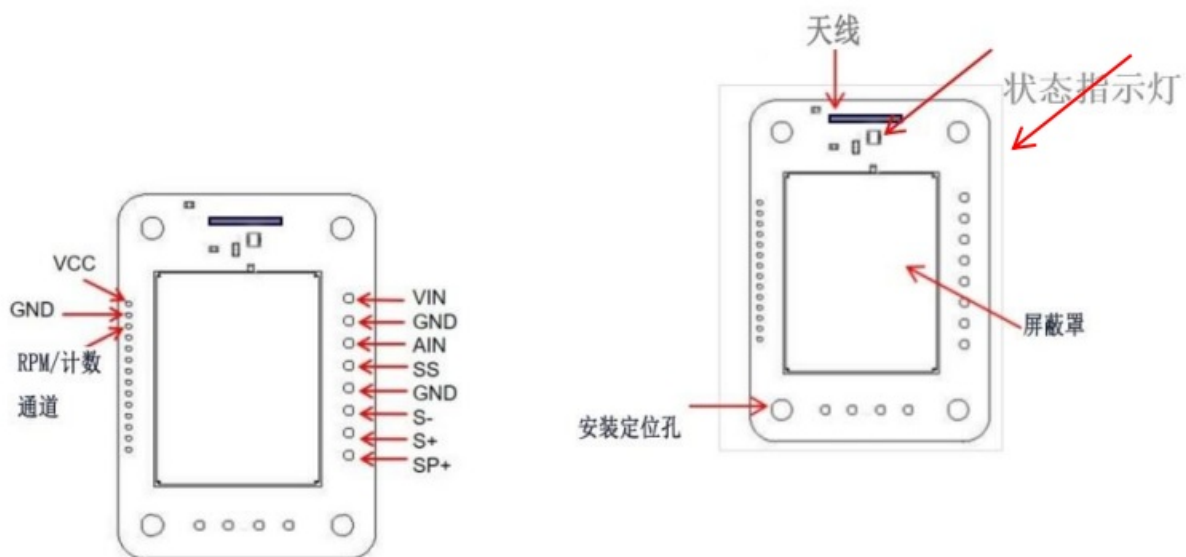
Interface and Indicators

Figure 1 - - Interface and Indicators

Indicator	Behavior	Node Status
Device status indicator	OFF	Node is OFF
	Rapid green flashing on start-up	Node is booting up
	1 (slow) green pulse per second	Node is idle and waiting for a command
	1 green blink every 2 seconds	Node is sampling
	Blue LED during sampling	Node is resynchronizing
	Red LED	Built-in test error

Node Operational Modes

Sensor nodes have three operational modes: active, sleep, and idle. When the node is sampling, it is in active mode. When sampling stops, the node is switched into idle mode, which is used for configuring node settings, and allows toggling between sampling and sleeping modes. The node will automatically go into ultra-low-power sleep mode after a user-determined period of inactivity
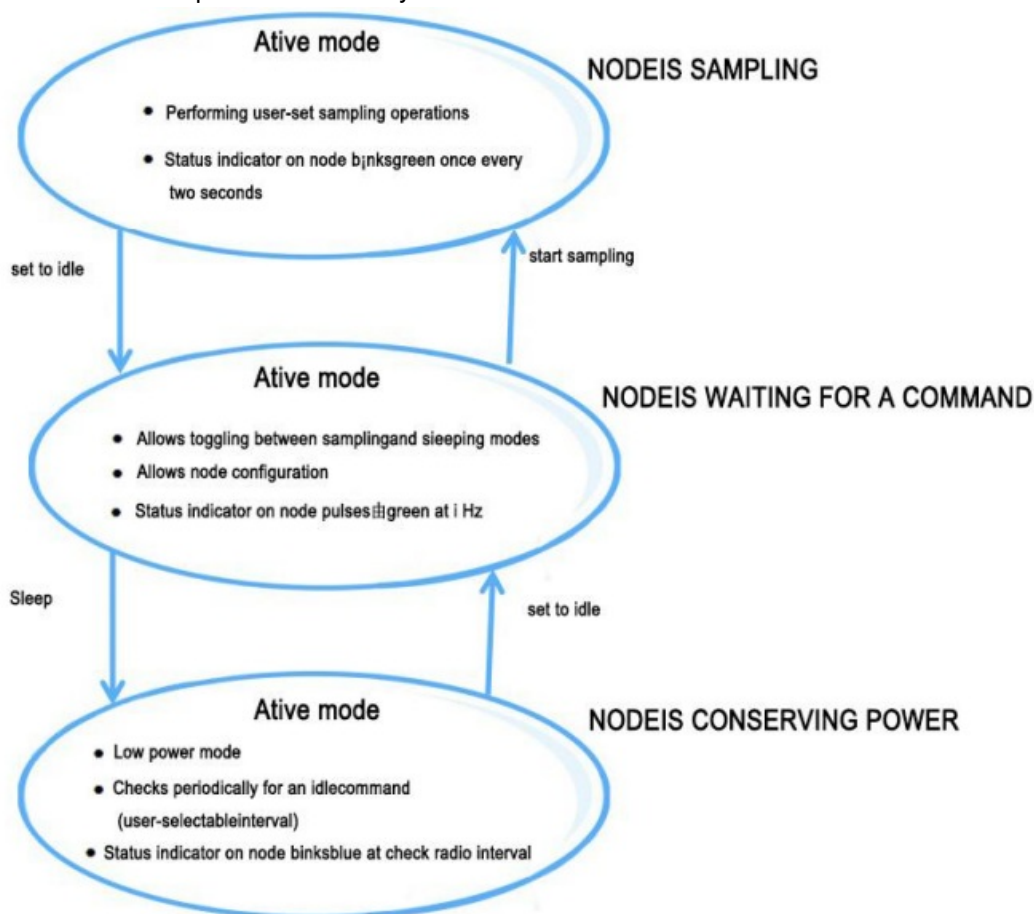

Figure 2 - Node Operational Modes

Connect to the Base Station and the Nodes

Software Installation

Before connecting any hardware, first install the host computer DT Wireless software on the host computer. To obtain the software installation package, please contact the relevant sales engineer or technical service engineer

Figure 3 - DT Wireless software installation package

Gateway Communications portland

Drivers for the USB gateway are included with the DT Wireless software installation. After installing the software, as long as the gateway is plugged in, the USB gateway will be automatically detected

1. Power the gateway via USB connection. Verify that the gateway status light is on, indicating that the gateway is connected and powered on.
2. Open the DT Wireless software.
3. The gateway should automatically appear in the controller window with the communication port assigned. If the gateway is not discovered automatically, verify that the port on the host is active and then unplug and replug the USB connector.

Figure 4 - USB Gateway Communication

Connect to Nodes

In DT Wireless software, you can use several methods to establish communication with nodes: automatic node discovery on the same frequency, automatic node discovery on different frequencies, and manual node addition.

Automatic Node Discovery on Same Frequency

If the base station and node are on the same operating frequency, the node will automatically appear below the base station list when the node is powered on.

Figure 5 – Node Discovered On Same Frequency

Automatic Node Discovery on Different Frequency

If a red circle with a number appears next to a base station, the node may be operating on a separate radio frequency

Figure 6 - Node On Other Frequency

Select a base station and then select the node tile on a different frequency. Tick the new node to be added and select "Apply" to move the node to frequency

Figure 7 - Move Node

Wireless Sensor Configuration

Hardware Configuration

Node settings are stored in non-volatile memory and can be configured using DT Wireless software. This chapter

describes user-configurable settings

Figure 8 - Hardware Configuration Menu

Input Range

Set up the programmable gain amplifier (PGA) to limit the sensor input range. Increasing gain will improve signal resolution, while decreasing gain will allow a wider input range. Available ranges are ±2.5 V, ±1.25 V, ±625 mV, ±312.5 mV, ±156.25 mV, ±78.125 mV, ±39.0625 mV or ±19.5313 mV

Low Pass Filter

A SINC4 digital low-pass filter is used to reduce noise. Set the filter to a high frequency for a fast settling time and longest battery life. Set the filter to a lower

Calibration Configuration

Analog channels can be independently calibrated using linear calibration coefficients. Use the Calibration Tool wizard to easily calibrate strain gauges or mV/V sensors, or output raw units such as volts and ADC counts.

Figure 9 - Wireless Sensor Calibration Menu

Sampling Configuration

DT-UNIT-4 has two user-configurable sampling options, including lost beacon timeout and diagnostic information interval. It can be entered from the following menu: Configuration > Sampling menu

Figure 10 - Sampling Configuration Menu

Power Automate

The DT-UNIT-4 has multiple user-settable power options, including default operating mode in the wireless node, user inactivity timeout, check radio interval and transmit power. Configuration > Power Menu

11 - Node Configuration Power Menu

Default operating mode

After powering on, the node will enter the default operating mode. In idle mode, if the node does not receive any commands within the selected time, it will automatically enter sleep mode. If active is selected in the default operating mode, the node will automatically re-enter the sampling mode last executed with all current settings.

User inactivity timeout

Disable user inactivity timeout to avoid nodes automatically changing state.

Check Radio Interval

In sleep and sample modes, check how often the radio interval setting node checks the radio channel for the "set to idle" command. Reducing the check radio interval will shorten the time required to wake the node into idle mode, but at the expense of reduced battery life. Increasing the check radio interval can extend battery life but at the cost of increasing the time required to wake the node into its idle mode.

Transmit Power

Set the radio's output power to a value between 0dBm and +20dBm. Transmit power affects communication range and battery life.

Wireless Sensor Sampling Configuration

Start Collecting Data

There are several ways to collect data from nodes, including from a single node, a network of nodes, or restarting the last used sampling mode.

Single node

Device/Select the corresponding node ID > Sampling > Application to complete the data collection of a single node

Figure 12 - Single Node Sampling

Network of the Node

Device > Base Station > Sampling > Check the node to be sampled > Apply and start sampling. Complete synchronized data collection of multiple nodes in the entire wireless network system

Figure 13 - Network of Nodes Sampling

Real-time data monitor

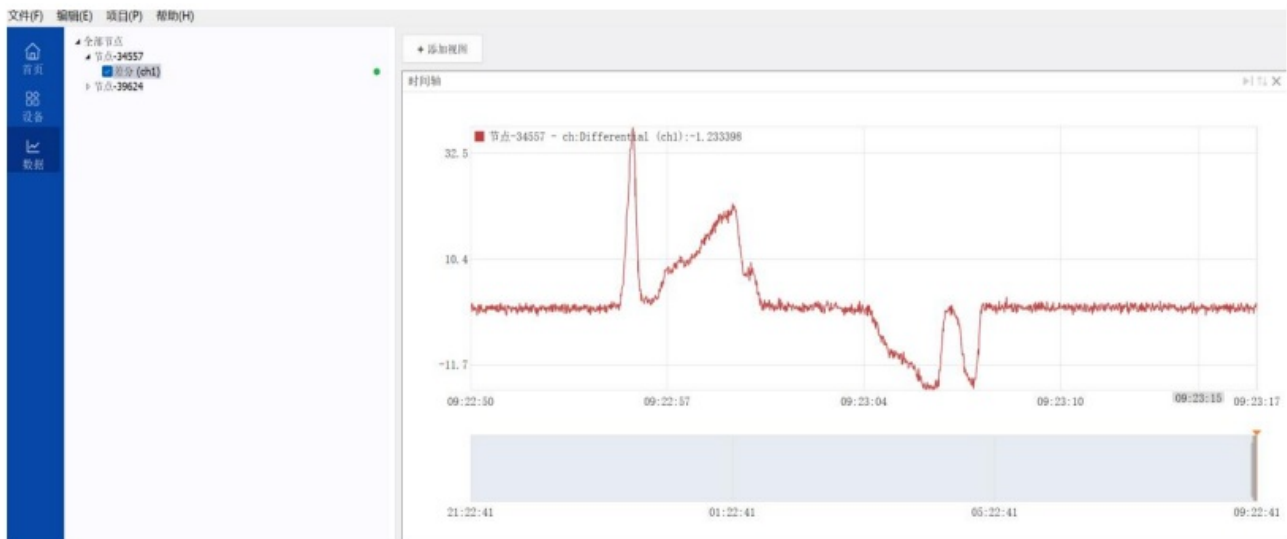Data > Add View > Check the data channels you want to view

Figure 14 - Real time data monitor

FCC Statement

FCC Warning

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. this device must accept any interference received, including interference that may cause undesired operation.

NOTE 1: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio

communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

NOTE 2: Any changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

RF Exposure Statement

To maintain compliance with FCC'S RF Exposure guidelines, This equipment should be installed and operated with minimum distance of 20cm between the radiator and your body. This device and its antenna(s) must not be co-located or operation in conjunction with any other antenna or transmitter.

Integration instructions for host product manufacturers according to KDB 996369 D03OEM Manual v01

List of applicable FCC rules

FCC Part 15 Subpart C 15.249 &15.209 &15.207.

Specific operational use conditions

The module can be used for mobile applications with a maximum 1dBiMax antenna. The host manufacturer installing this module into their product must ensure that the final composite product complies with the FCC requirements by a technical assessment or evaluation to the FCC rules, including the transmitter operation. The host manufacturer has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module. The end user manual shall include all required regulatory information/warning as show in this manual.

Limited module procedures

The device is a Single module and complies with the requirement of FCC Part 15.212.

Trace antenna designs

Not applicable, The module has its own antenna, and doesn't need a host sprinted board micro strip trace antenna etc

RF exposure considerations

The module must be installed in the host equipment such that at least 20cm is maintained between the antenna and users " body; and if RF exposure statement or module layout is changed, then the host product manufacturer required to take responsibility of the module through a change in FCC ID or new application The FCC ID of the module cannot be used on the final product In these circumstances, the host manufacturer will be responsible for re-evaluating the end product (including the transmitter)and obtaining a separate FCC authorization

Antennas

- Antenna Specification are as follows:
- Type of antenna: AN1003 Multilayer Chip Antenna
- Gain of antenna: 1dBiMax.

This device is intended only for host manufacturers under the following conditions: The transmitter module may not be co-located with any other transmitter or antenna; The module shall be only used with the internal antenna(s) that has been originally tested and certified with this module. The antenna must be either permanently attached or employ a "unique" antenna coupler As long as the conditions above are met, further transmitter test will not be required However, the host manufacturer is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc)

Label and compliance information

Host product manufacturers need to provide a physical or e-label stating " Contains FCC ID: 2BFFE-DT-UNIT-4"with their finished product

Information on test modes and additional testing requirements

Host manufacturer must perform test of radiated & conducted emission and spurious emission, e.t.c according to the actual test modes for a stand-alone modular transmitter in a host, as well as for multiple simultaneously transmitting modules or other transmitters in a host product. Only when all the test results of test modes comply with FCC requirements, then the end product can be sold legally.

Additional testing, Part 15 Subpart B disclaimer

The modular transmitter is only FCC authorized for FCC Part 15 Subpart C 15.249 &15.209 &15.207 and that the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. If the grantee markets their product as being Part 15 Subpart B compliant (when it also contains unintentional-radiator digital circuit), then the grantee shall provide a notice stating that the final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed

Federal Communication Commission Statement (FCC,U S)

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules These limits are designed to provide reasonable protection against harmful interference in a residential installation This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications However, there is no guarantee that interference will not occur in a particular installation If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna-Increase the separation between the equipment and receiver
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or an experienced radio/TV technician for help

This device complies with Part 15 of the FCC Rules Operation is subject to the following two conditions: (1)This device may not cause harmful interference, and (2)this device must accept any interference received, including interference that may cause undesired operation Any changes or modifications not expressly approved by the

party responsible for compliance could void the user's authority to operate this equipment

IMPORTANT NOTES

Co-location warning:

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter

OEM integration instructions:

This device is intended only for OEM integrators under the following conditions:

The transmitter module may not be co-located with any other transmitter or antenna The module shall be only used with the external antenna(s)that has been originally tested and certified with this module
As long as the conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.).

Validity of using the module certification:

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter),then the FCC authorization for this module in combination with the host equipment is no longer considered valid and the FCC ID of the module cannot be used on the final product In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter)and obtaining a separate FCC authorization.
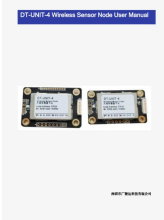
End product labeling:

The final end product must be labeled in a visible area with the following: "Contains Transmitter Module FCC ID: 2BFFE-DT-UNIT-4"

Information that must be placed in the end user manual:

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product that integrates this module The end user manual shall include all\ required regulatory information warning as show in this manual

Documents / Resources

IDQ Science DT-UNIT-4 Wireless Sensor [pdf] User Manual
2BFFE-DT-UNIT-4, 2BFFEDTUNIT4, DT-UNIT-4 Wireless Sensor, DT-UNIT-4, Wireless Sensor, Sensor

References

- **User Manual**