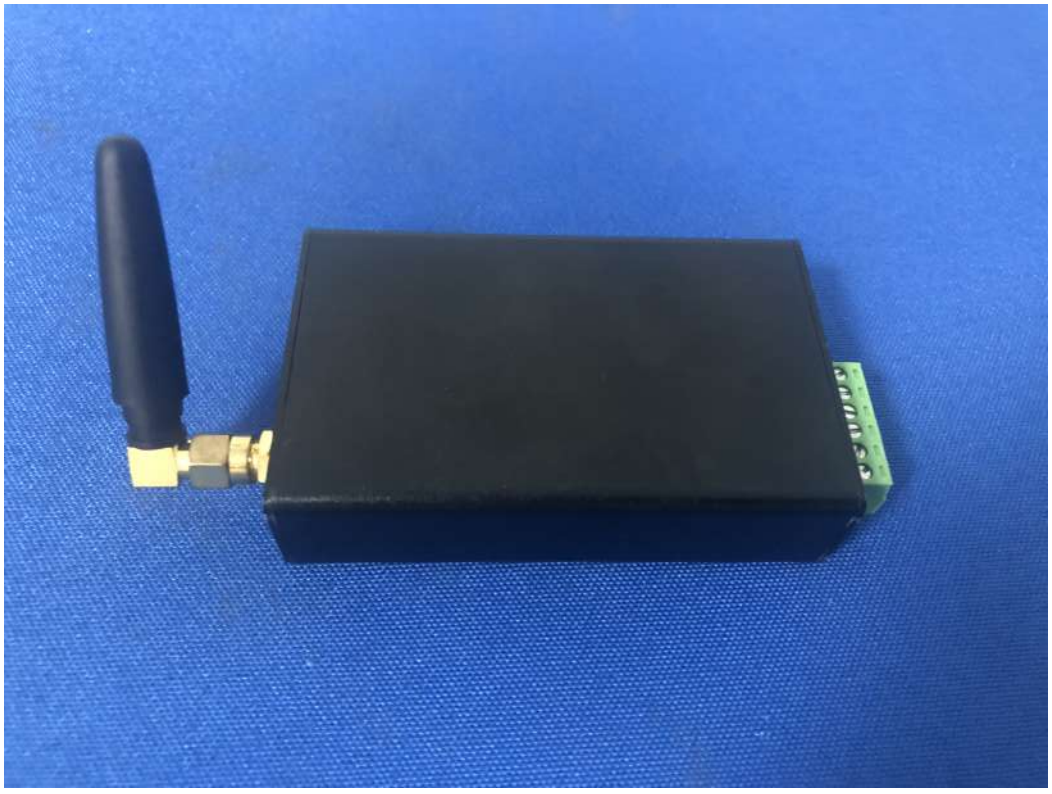
DT-UNIT-BASE-A Analog Output Base Station



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1. 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.

2. DT-UNIT-BASE-A Analog Output Base Station Overview

DT-UNIT-BASE-A is a data acquisition base station designed to configure, coordinate and collect sensor data from wireless sensor nodes. The gateway supports all sessions between data collection wireless nodes and hosts including: node parameter configuration, data collection and data logging.

DT-UNIT-BASE-A can also convert the collected data through digital-to-analog conversion and output 4 analog voltage signals. The output voltage signal range is 0-3V. In this way, it will be more convenient for industrial automation integration, secondary collection and other applications. The output signal will be output from the corresponding port of the terminal block on the rear end of the receiver.

DT-UNIT-BASE-A utilizes the USB interface to transfer data from the wireless node to the host for viewing, analysis and storage.

2.1 Interface and LED Indicator

	Behavior	Node Status
	OFF	Gateway is off
	ON green	Gateway is powered & idle

Device Status Indicator	Flashing blue	Sync sampling beacon enabled or incoming data from other sampling modes
	Pulsing green	Stop node
	Flashing red	WARNING: another gateway beacon is detected on the same frequency

Table 1 - Basic Indicator Behaviors

3. System Operation

The gateway is the interface between the wireless sensor node and the data collection computer. The gateway coordinates the configuration and sampling of nodes and can handle multiple nodes simultaneously. Communication between nodes and gateways is wireless.

DTWireless software program can be used to collect data from wireless sensor networks. This is a PC-based software used to configure gateways and nodes, select sampling modes and parameters, initialize data acquisition, and view and save data. .

3.1 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 1 - DTWireless Software installation package

3.2 System Connections

To acquire sensor data, the following components are required: a user-supplied external device, a wireless sensor node, a gateway, and a host computer with access to the data acquisition software. Sensor, node, gateway and software selection depends on the application, but the basic interface is the same.

3.3 The USB Base Station Communication

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 assignment. 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 2 - USB Base Station Communication

3.4 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.

3.4.1 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 3 - Node Discovered On Same Frequency

3.4.2 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 4 - 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 5 - Move Node

4. Configure Node

Node settings are stored in non-volatile memory and can be configured using DTWireless software. The configuration menu displays the channels and configuration options available for the node type used.

4.1 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 6 - Hardware Configuration Menu

4.2 Sampling Configuration

To start a sampling session, you can select nodes individually by selecting Node Name > Sampling, or select a group of nodes by selecting Base Stations > Sampling. As a group, they will all be set to the same sampling mode. After selecting a base station, all nodes will appear in the list with a check mark on the left, and all selected nodes will be included in the sample. Uncheck the nodes you want to exclude from sampling.

Figure 7 - Network Sampling

5. Base Station Configuration

5.1 Transmit Power

If power consumption is an issue or in an area with transmit power restrictions, the transmit power level may need to be adjusted. Reducing the power output reduces power consumption but also reduces the wireless communication range between the gateway and the nodes.

NOTE

Actual range depends greatly on how the nodes and gateways are installed and the conditions of the surrounding environment.

Setting	Power Output	Maximum Range
Extended	20 dBm (100 mW)	2 km
Standard	10dBm (10mW)	2 km
Low	0dBm (1mW)	2 km

Table 2 - Transmit Power Settings

From the base station, select Configuration > Power > Transmit Power to get a drop-down menu with five power options from 0 dBm to 20 dBm.

Figure 8 - Transmit Power Setting

5.2 Analog output configuration

Base stations and nodes must be configured correctly and start sampling in order for the data to be pushed out of the analog signal output. Here are the steps on the base station

Base Station>Configuration>Analog

1. Enable simulated pairing by checking the box

2. Select the analog output port to configure

3. Enter the node address listed under Base Station in the left column

4. The channel of the node where the input is to be sent to the analog output must match the selected channel on the node.

5. Enter the data type from the node.

6. This is the range of the analog output. will represent the measured value corresponding to the analog quantity. For example: If monitoring a strain gauge, typically the input signal will be positive and negative, setting 0V to -1000 µstrain and 3V +1000 µstrain, the analog output will be 1.5V at 0 µstrain. Another example: If you have a 500 lb load cell on a node, typically the signal will only propagate in the positive direction, i.e. 0 to 500 lbs. Set 0V to 0 lbs and 3V to 500 lbs, the analog output will be 1.5V at 250 lbs.

7. Click Apply Configuration

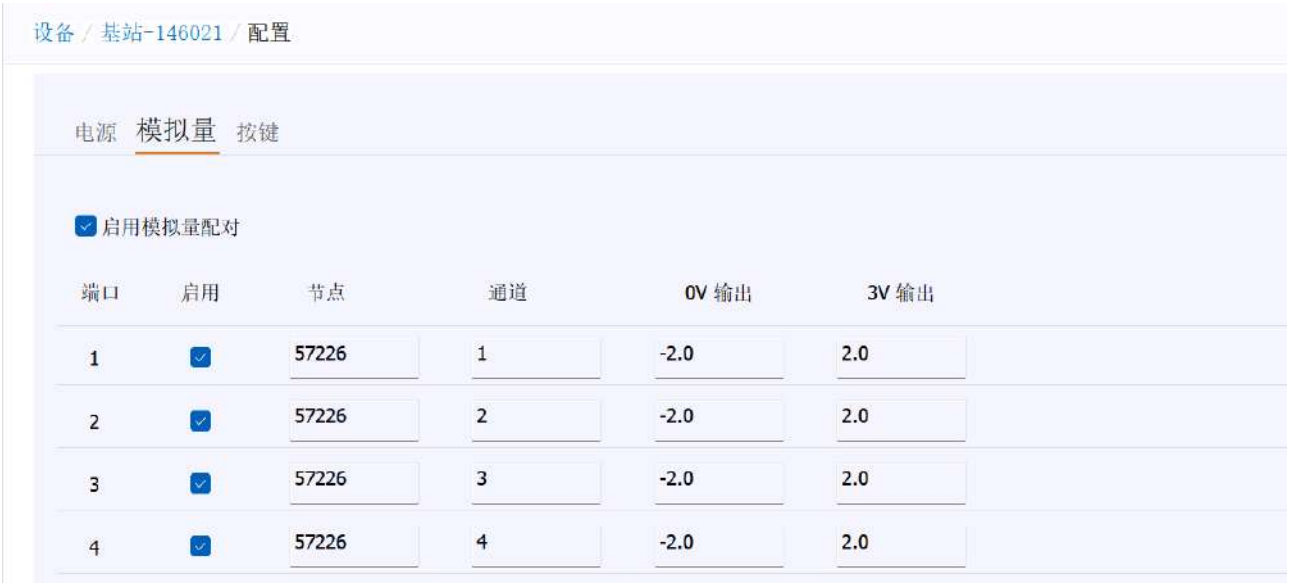

Figure 9 - Analog output channel configuration

5.3 Button configuration

The button function is mainly used to configure DT-UNIT-BASE-A. After leaving the software configuration, you can control the sampling, stop, sleep, restart and other functions of the node through the buttons.

Figure 10 - Button configuration

5.4 Change Frequency

There are 16 channels available between 2.405 and 2.470 GHz. Wireless nodes and gateways must be on the same channel to communicate. To move a node to a different frequency, select the base station and then select the Change Frequency tile.

Figure 9 - Base Station Frequency

5.5 Using the Beacon

In synchronized sampling, the beacon feature is used to coordinate sampling and transmission timing among multiple nodes. The main purpose is to avoid data conflicts, guarantee the time between samples from different nodes, and timestamp the data. Beacons cannot be used in any other sampling mode.

When beaconing is enabled, the gateway broadcasts a data message containing a (UTC) timestamp every second that updates each node's real-time clock (RTC). This continuous synchronization beacon, combined with the accuracy of the gateway and node clocks (+/-3 ppm drift), provides node-to-node synchronization within ±50 microseconds. The gateway receives UTC from the host, so the host must be connected to a UTC time server to achieve this accuracy.

There is some inherent lag in the Microsoft Windows distribution of UTC. This determines the overall accuracy of the timestamps, but due to the accuracy of the embedded RTC clock, the synchronization time between the gateway and the node will remain consistent.

When the beacon is active, the gateway device status light will flash blue once per second. When a node connected to the gateway is in synchronous sampling mode, the network can be put to sleep by turning off the beacon and then resume transmission after enabling the beacon. If the beacon is

activated, any node actively sampling in synchronized sampling mode at the same frequency as the gateway will automatically synchronize with it.

To avoid interference with other devices, it is recommended to disable beacons when not in use. Do not operate multiple gateways on the same frequency.

To enable and disable beacons, select On or Off from the Toggle beacons tile. A green pop-up window will appear confirming the success of the operation

Figure 10 - Using the Beacon

5.6 Set Nodes to Idle

To stop all (or selected) nodes on the network, select the Set nodes to idle tile and use checkmarks to indicate which nodes will be set to idle mode. If the broadcast option is enabled, a signal will be sent to all nodes (including unsolicited nodes) to request them to return to the idle state.

Figure 11 - Set to Idle

6. Real Time Data Monitor

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

Figure 12 - Real time data monitor

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.