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## BEFORE YOU BEGIN

### Introduction to T201

The Ekahau T201 Wi-Fi tag is part of Ekahau RTLS (Real-Time Location System) that consists of the award-winning Ekahau T201 tags and Positioning Engine (EPE) software platform, enabling real-time people and asset tracking in any standard Wi-Fi network. The T201 tags can be attached to any mobile object or asset, and can be carried by people as well. The Ekahau Positioning Engine software continuously reports the tag coordinates, area, heading, and speed within the Wi-Fi coverage area both indoors and outdoors.

- Works with standard 802.11b and 802.11g Wi-Fi networks
- Configurable button, motion, and periodic location reporting parameters
- Two status indication LED and for helping in locating the tag
- Buzzer for audio signals for helping in locating the tag
- Intelligent battery-life management with motion sensor
- Ekahau Manager application for creating and testing location-specific Positioning Models for accurate tracking
- High-performance Positioning Engine for solving several hundred locations per second
- Flexible Java™ and Ekahau YAX™ application interfaces for quickly integrating the location information with external party applications.



The T201 splash proof enclosure has a power / call button, two status LEDs, buzzer and a configuration /charging port.



## CHAPTER 1: Getting Started

### Status Indication LED

Category	TAG Status	LED Indication
Scanning	Network data scanned and sent to EPE	Green flash after scanning and sending data to EPE
Button (Call Feature)	Button pressed (only if button detection is on)	Continuous green light indicates when the button is pressed down
Button (Power ON)	Button down for 3s	<ul style="list-style-type: none"> <li>Continuous green light after 3s (release the button for power on)</li> <li>Flashing red light indicate too low battery to start</li> </ul>
Button (Power OFF)	Button down for 3s	Continuous green light for 3s, then continuous red light (release the button for power off)
Battery	Charging	<ul style="list-style-type: none"> <li>Continuous green light</li> <li>All other LED indications off</li> </ul>
Battery	Charging complete	Returns from continuous green light (charging) to normal LED indications
Battery	Low	Continuous 3s red light every 30s
Battery	Empty	No light
EPE (Positioning Engine) error	<ul style="list-style-type: none"> <li>Authentication error</li> <li>Connection refused</li> <li>Connection timeout</li> <li>Protocol error</li> <li>EPE error response</li> </ul>	1 red flash when the error occurs



WLAN error	<ul style="list-style-type: none"> <li>• Association error</li> <li>• No IP address from DHCP after 20s when scan data should be sent to EPE</li> </ul>	2 red flashes when the error occurs
TAG error	<ul style="list-style-type: none"> <li>• Scan error</li> <li>• Other error</li> </ul>	3 red flashes when the error occurs.
Application defined	A sequence defined and activated by configuration parameters.	Any sequence.

## System Requirements

1. Laptop or Tablet PC with at least Windows® XP or 2000, 1 GHz processor, 256 MB RAM, and 200 MB of disk space.
2. The laptop must provide a standard 9-pin serial connector for the tag's configuration cable. If your laptop has USB connectors only, purchase an external USB–serial cable (9-pin) adapter.
3. Ekahau splitter cable for connecting the tag to the serial cable and to a power adapter.
4. Supported Wi-Fi adapter (see <http://www.ekahau.com/devices> or Ekahau Client Release Notes) to create a Positioning Model. Communication with the tags can be facilitated via the Wi-Fi adapter, or Ethernet cable, provided that your Ethernet network is connected to your Wi-Fi network.
5. The Ekahau Positioning Engine (EPE) software, license keys, and license files, fully installed on the laptop PC.
6. At least 3 operational Wi-Fi access points (802.11b/g).
7. Map image of the facility or area (JPG or PNG). You can draw a map image yourself with any drawing tool, if necessary.



## NOTE

For quick evaluation and development setup, install all EPE components on the laptop PC and refer to the EPE User Guide on creating a Positioning Model using the Ekahau Manager. Test the Positioning Model by walking around the site with the laptop while observing your location on the map. Then save the model in the Positioning Engine.

## Charging T201 Tags

T201 internal battery needs to be charged before use.

1. Apply the charger provided by Ekahau. If you want to use your own charger, see Chapter 3: Technical Specifications.
2. Plug the flat end of the splitter cable to the T201 tag.
3. Attach the cable from the charger into the round plug of the splitter cable.
4. The green status LED will turn off once the charging is complete. This may take up to 6 hours depending on charger. You can use the tag normally while it is being charged, but the LED status lights are not displayed during charging.

## CHAPTER 2: Configuration

### Accessing the Configuration Interface (CLI)

The T201 tag provides a Command Line Interface (CLI) for configuring its settings. The CLI can be accessed with the included serial cable. You need to configure at least each tag's communication settings to let it associate with your Wi-Fi network and communicate with the Positioning Engine software. To configure a tag, follow these steps:

1. Plug the flat end of the splitter cable into the T201 tag.
2. Plug the 9 pin serial connector of the splitter cable to your laptop.



3. Open any terminal program, such as Windows HyperTerminal. Click **Start > Programs > Accessories > Communications > HyperTerminal**.

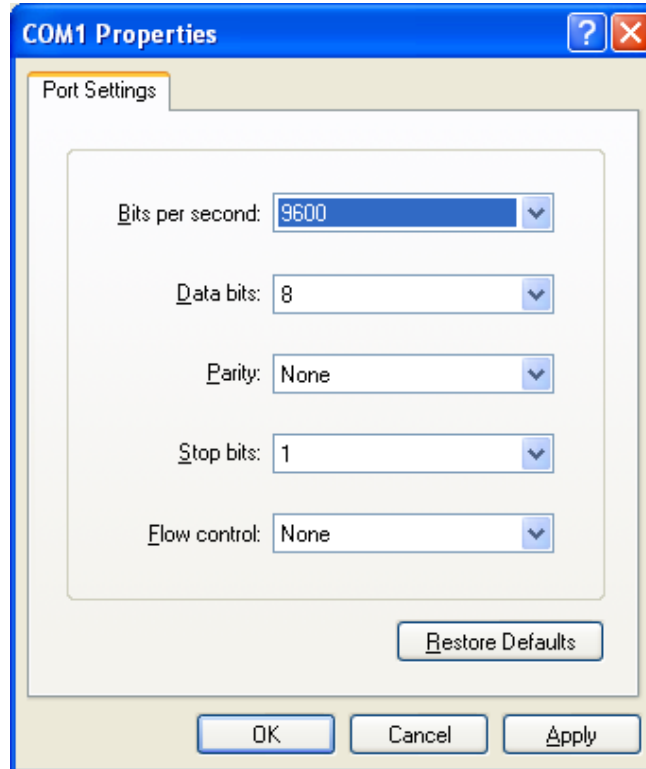
Creating a New Connection with HyperTerminal on Windows® XP.



4. Name a New Connection, such as “T201”, and connect using a COM port, such as COM1. If you cannot access the tag’s CLI, try another COM port number until you find the correct port.
5. Select the communication parameters. The acceptable line parameters are 9600,8,N,1, meaning 9600 bits/s, 8 data bits, no parity bit, and 1 stop bit. **Flow Control must be set to “None”.**



The correct COM port settings. If you cannot access the CLI, try a different COM port number, such as COM2 or COM3.



6. Switch on the tag by keeping the call / on-off button **pressed down for 5 seconds**. Release when green status LED appears. It may take up to 10 seconds until the tag displays its CLI prompt. If the battery is too low or empty, you will get red status LED or no light at all. Then plug the power cable in and try again.

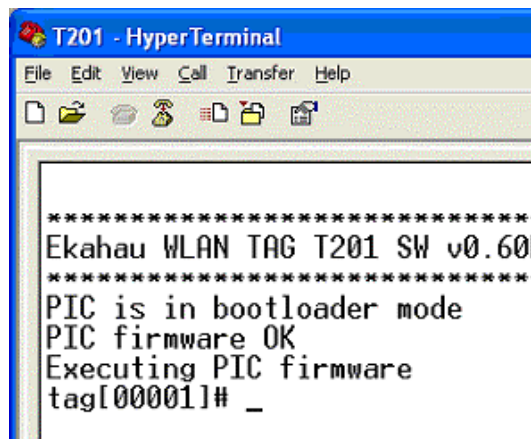
**NOTE**

If the tag is already switched on, you may need to press the **Enter** key once or twice to bring up the CLI prompt.





The CLI prompt displays the Ekahau tag software version and serial number (or friendly name).



```
*****  
Ekahau WLAN TAG T201 SW v0.60  
*****  
PIC is in bootloader mode  
PIC firmware OK  
Executing PIC firmware  
tag[000011]# _
```

## Using the Configuration Interface

- Execute CLI commands with the **Enter** key.
- When you execute CLI commands, they are **activated immediately** without asking for confirmation.
- List all configuration parameters by typing **config**<Enter>.
- Save the configuration changes to permanent memory by typing **save**<Enter>. Any unsaved changes will be lost during the next tag sleep or power-off period.
- The command line is editable. You can move the cursor freely left and right and delete single characters from the line.
- The command history is 10 previous input lines. You can scroll through the command history with **up** and **down arrow** keys
- You can complete commands with the **Tab** key.
- Type **help**<Enter> to display the list of available commands.
- Successfully executed commands will not generate any output.
- Invalid commands will display an error message.
- The command prompt format is **tag[serial number OR name]#**



## Setting Parameter Value

Parameter values are set by typing the full parameter string and its value to the command line. E.g. setting the associated network's name (SSID) to "test-wlan" and saving it to tag's permanent memory:

```
tag[00001]# wlan ssid "test-wlan"<Enter>
```

```
tag[00001](unsaved)# save<Enter>
```

Any unsaved changes will be lost during the next tag sleep or power-off period. Successful execution gives no feedback to the user.

Most text parameters such as **SSID** and **Engine password** can be set without double quotes (" ") if the text does not contain empty spaces. **WEP** key however always requires the double quotes, when typed in as plain text. The text itself cannot contain double quotes ("").

## Displaying Parameter Value

Parameter values are displayed by typing the full parameter name string to the command line. E.g. displaying the motion scan rate:

```
tag[00001]# motion scan rate<Enter>
```

```
tag[00001]# motion scan rate = 2 seconds
```

## Error Messages

If the user enters an invalid command, one of the two error messages may appear:

- Parameter name not valid
- Invalid parameter value

E.g. setting an invalid parameter value

```
tag[00001]# periodic scan interval -1<Enter>
```

Error: Invalid parameter value



## Minimum Configuration

To allow T201 associate with your Wi-Fi network and communicate with the Positioning Engine, you must configure at least:

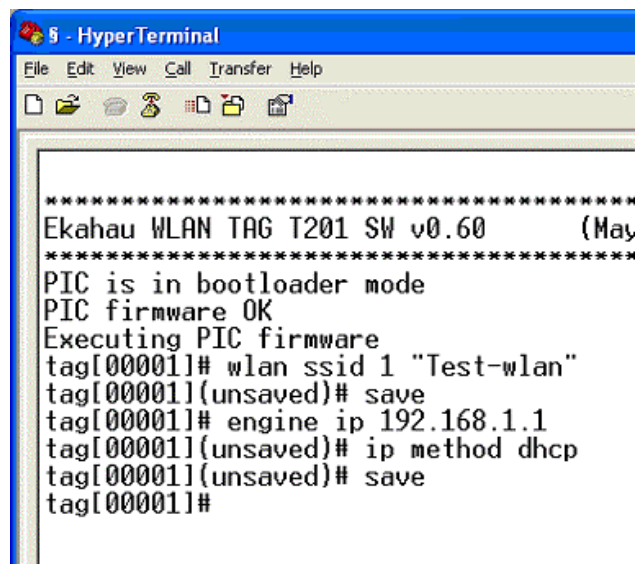
- **SSID** (network name is always required)
- **Positioning Engine IP address** (always required)
- **WEP** key as a string or hex bytes (if WEP is enabled)
- **T201 IP address** or method (if DHCP service is not available)
- **T201 friendly name** (optional but recommended)

It is recommended to name each T201. The name will be displayed in Ekahau Manager instead of IP address, and developers can read the names via Ekahau SDK and YAX device property **GENERAL.NAME**.

Minimum configuration with example values:

```
tag[00001]# wlan ssid 1 MyNetworkName<Enter>
tag[00001]# wlan wep 1 "HaRdeR2Hacker"<Enter> (if WEP enabled)
tag[00001]# engine ip 192.168.1.1<Enter>
tag[00001]# ip method static<Enter> (if DHCP is not available)
tag[00001]# ip address 192.168.1.2<Enter> (if DHCP is not available)
tag[00001]# name Robert<Enter> (optional but recommended)
tag[00001]# save<Enter>
```

The simplest configuration with SSID and Engine IP address if DHCP is available and there is no WEP.



```
*****
Ekahau WLAN TAG T201 SW v0.60      (May
*****
PIC is in bootloader mode
PIC firmware OK
Executing PIC firmware
tag[00001]# wlan ssid 1 "Test-wlan"
tag[00001](unsaved)# save
tag[00001]# engine ip 192.168.1.1
tag[00001](unsaved)# ip method dhcp
tag[00001](unsaved)# save
tag[00001]#
```



## Configuring Multiple Tags

To configure tags faster, it is helpful to create a text file that contains the preferred configuration settings, and send the file to the CLI with any terminal program.

1. Open Windows Notepad or similar plain text tool, and write a configuration parameter on each row. For example:

```
wlan ssid test-net<Enter>  
engine ip 192.168.1.1<Enter>  
wlan wep 1 26:4d:29:42:34:28:4d:69:44:30:24:4d:29<Enter>  
save<Enter>
```

2. Save the file for example as T201\_settings.txt.
3. Connect a T201 tag to your computer and open a terminal program, such as HyperTerminal (see the previous chapters).
4. Select **Transfer > Send Text File...** If your terminal program supports several file transfer protocols, select ASCII.
5. Browse for the T201\_settings.txt and click **Send**.

Type **config**<Enter> to verify the new configuration.

## Changes from T101 Tags

If you have used the Ekahau T101 tags, please note the following changes and modify your configuration scripts accordingly:

- T201 supports up to 4 different wep keys. The index of the wep key has been added to the parameter 'wlan wep key'.
- T201 supports up to 4 different SSIDs. The index of the SSID has been added to the parameter 'wlan ssid'.
- The T201 does not support passive scanning. Scan mode passive parameter is not available.



## Communication Parameters

These parameters are required to let the tag associate with the Wi-Fi network and communicate with the Positioning Engine. You must configure at least the **SSID**, the tag's **IP address** (automatic DHCP or manual configuration), and Positioning Engine's **IP address**.

### WLAN

Parameter	Syntax	Factory	Min	Max	Type
WLAN SSID index	<code>wlan ssid 1 "SSID" OR off</code> <ul style="list-style-type: none"> <li>Configures up to 4 SSIDs</li> <li>Tag attempts to use SSIDs from index 1 to 4.</li> <li>Attempts to use different SSIDs, if roaming has been activated.</li> </ul>	Ekahau	1	4	R/W
WLAN SSID Roaming	<code>wlan ssid roaming 0 OR 1</code> <ul style="list-style-type: none"> <li>Activates WLAN roaming using different SSIDs</li> <li>"1" = roaming active</li> </ul>	0	0	1	R/W
WLAN WEP index	<code>wlan wep 1 "key" OR xx:xx:xx:xx OR off</code> <ul style="list-style-type: none"> <li>configure up to 4 wep keys</li> <li>tag attempts to use keys from index 1 to 4</li> <li>apply strings (") around plain text</li> <li>apply colons (:)</li> </ul>	Wep 1 off wep 2 off wep 3 off wep 4 off	1	4	R/W



	<ul style="list-style-type: none"> <li>between hex bytes use exactly 5 or 13 characters (or hex bytes) for 40/104 bit encryption</li> <li>Note! The tag does not give any notification, if a wep key is not valid.</li> </ul>				
IP method	ip method dhcp OR static	dhcp	-	-	R/W
IP address	ip address 10.10.10.10	10.10.10.10	-	-	R/W
IP netmask	ip netmask 255.255.255.0	255.255.255.0	-	-	R/W
IP gateway	ip gateway off	off	-	-	R/W
Engine protocol	engine protocol udp OR tcp	udp	-	-	R/W
Positioning engine IP	engine ip 192.168.0.2	192.168.0.2	-	-	R/W
Positioning engine tcp port	engine tcp port 8548	8548	-	-	R/W
Positioning engine udp port	engine udp port 8549	8549	-	-	R/W
Password	engine password Llama	Llama	-	-	R/W
Engine Retries	engine retries 1 <ul style="list-style-type: none"> <li>number of retries (if WLAN or EPE connection drops) before giving up</li> </ul>	1	1	10	R/W
Scanned	scan channels 1-14	1-14	-	-	R/W



channels					
Scan send limit	<b>scan send limit 1</b> <ul style="list-style-type: none"> <li>how many Wi-Fi scans are sent to EPE per message</li> </ul>	1	1	50	R/W

## Limiting the Scanned Channels

Make sure that the **scan channels** setting complies with your national 802.11b channel restrictions:

- Channels 1-11 are allowed in the US
- Channels 1-13 are allowed in Europe, Middle-East, and Africa
- Channels 1-14 are allowed in Japan

You can also limit the channels if certain channels are not used at all in your network.

Set the allowed channels for example as: **scan channels 1-3, 6-11**.

## Periodic Parameters

These parameters allow the tag to ‘wake up’ periodically, for example every 2 minutes, perform a network scan, communicate the results to the Positioning Engine, and go back to ‘sleep’ to save battery.

Parameter	Syntax	Factory	Min	Max	Type
Periodic Active	<b>periodic active 1 OR 0</b> “0” = no periodic wakeups	1	0	1	R/W



Periodic Wakeup	<b>periodic wakeup interval 120</b> <ul style="list-style-type: none"> <li>time between the periodic wakeups</li> </ul>	120 (s)	0	86400	R/W
Periodic Scan Count (after waking up)	<b>periodic scan count 3</b> <ul style="list-style-type: none"> <li>number of scans per periodic wakeup</li> </ul>	3	0	50	R/W
Periodic Scan Interval (after waking up)	<b>periodic scan interval 2</b> <ul style="list-style-type: none"> <li>time between the scan(s) during a wakeup</li> </ul>	2 (s)	1	10	R/W

## Motion Parameters

These parameters allow the tag to react to movement. Using these settings wisely can significantly extend the tag's battery life. It also removes the need to query the tag location, as the tag will automatically report its location whenever it is moved.

Special parameters are included for scanning after the tag has detected that motion has ended. This is especially useful for asset tracking applications.

Parameter	Syntax	Factory	Min	Max	Type
Motion Active	<b>motion active 1 OR 0</b> "0" = no motion detection	1	0	1	R/W
Motion Sensitivity	<b>motion sensitivity 10</b> <ul style="list-style-type: none"> <li>1 = most sensitive</li> <li>100 = least sensitive</li> </ul>	3	1	100	R/W
Motion Poll Interval	<b>motion poll interval 100</b> <ul style="list-style-type: none"> <li>time between polls</li> </ul>	0.2 (s)	0	100	R/W





Motion Threshold	<p><a href="#">motion threshold 1</a></p> <ul style="list-style-type: none"> <li>how many sequential positive accelerometer polls are determined as a motion event</li> </ul>	5	1	10	R/W
Motion Dead Time	<p><a href="#">motion dead time 5</a></p> <ul style="list-style-type: none"> <li>after a motion event accelerometer is not polled until dead time has elapsed. Used to reduce too frequent motion events</li> </ul>	5.0 (s)	0	3600	R/W
Motion Scan Count	<p><a href="#">motion scan count 3</a></p> <ul style="list-style-type: none"> <li>number of scans triggered by a single motion event</li> </ul>	3	0	50	R/W
Motion Scan Interval	<p><a href="#">motion scan interval 1.5</a></p> <ul style="list-style-type: none"> <li>scan interval for the motion-triggered scans (if more than 1)</li> </ul>	1.0 (s)	1	10	R/W
Aftermotion active	<p><a href="#">aftermotion active 1 OR 0</a></p> <ul style="list-style-type: none"> <li>enables scanning after motion has ended</li> <li>"0" = no after motion scanning</li> </ul>	0	0	1	R/W
Aftermotion scan count	<p><a href="#">motion scan count 3</a></p> <ul style="list-style-type: none"> <li>number of scans triggered after end of motion was detected</li> </ul>	3	0	50	R/W
Aftermotion scan interval	<p><a href="#">motion scan interval 1.5</a></p> <ul style="list-style-type: none"> <li>scan interval after end of motion was detected</li> </ul>	1.5 (s)	1	10	R/W



## Call / On-Off Button Parameters

These parameters allow the tag to react to call button press. The button can be used for example as a call or alarm feature. **Press the button down for 5 seconds** to switch the tag on/off.

Parameter	Syntax	Factory	Min	Max	Type
Button active	<code>button active yes OR no</code> <ul style="list-style-type: none"><li>no = no call button feature, on/off still works</li></ul>	yes	-	-	R/W
Button scan Interval	<code>button scan interval 2</code> <ul style="list-style-type: none"><li>Time between scans based on button-activation</li></ul>	2 (s)	1	10	R/W
Button scan Count	<code>button scan count 3</code> <ul style="list-style-type: none"><li>Number of button-activated scans</li></ul>	3	0	50	R/W
Button call period	<code>button call period 100</code> <ul style="list-style-type: none"><li>The time period the tag sends the 'call button active' information to the server</li></ul>	60 (s)	0	3600	R/W

## Buzzer operation

The buzzer parameters control the operation of the internal audio buzzer. The buzzer can be used for helping in finding the tag. The tag audio signal and duration can be controlled using configuration parameters from the command line interface. For activating the



buzzer remotely see Ekahau Device Manager documentation for instructions.

Parameter	Syntax	Factory	Min	Max	Type
Buzzer pattern	<p>buzzer pattern 01234567 OR buzzer pattern OCDEFGAB</p> <ul style="list-style-type: none"> <li>Each number represent different buzzer frequency</li> <li>0 = not active, 1 = note C = 2093 Hz, 2 = D = 2349 Hz, 3 = E = 2637 Hz, 4 = F = 2794 Hz, 5 = G = 3136 Hz, 6 = A = 3520 Hz, 7 = B/H = 3951 Hz</li> <li>Sequence may include any number of tones</li> <li>The length of a sequence is 96ms</li> </ul>	-	-	32 digits	R/W
Buzzer duration	<p>buzzer duration 1</p> <ul style="list-style-type: none"> <li>Number of repetitions of buzzer sequence</li> </ul>	1	-	-	R/W

## LED operation

The buzzer parameters control the operation of the internal audio buzzer. The buzzer can be used for helping in finding the tag. The tag audio signal and duration can be controlled using configuration parameters from the command line interface. For activating the



buzzer remotely see Ekahau Device Manager documentation for instructions.

Parameter	Syntax	Factory	Min	Max	Type
Led pattern	<p>led pattern GG-R</p> <ul style="list-style-type: none"> <li>Each character represent different color or blank</li> <li>R = red, G = green, - = not active</li> <li>Sequence may include any number of tones</li> </ul>	-GGRRGG-	-	32 digits	R/W
Led duration	<p>led duration 1</p> <ul style="list-style-type: none"> <li>Number of repetitions of led sequence</li> </ul>	1	-	-	R/W

## Maintenance operation

Maintenance parameters control the setting of tag parameters remotely from the Ekahau Device Manager (EDM) server. The parameters define the server address and interval in seconds that the tag requests new parameters from the EDM server. See more information in the EDM documentation.

Command	Syntax	Factory	Min	Max	Type
Maintenance active	<p>maintenance active 0</p> <ul style="list-style-type: none"> <li>Maintenance active/inactive</li> </ul>	0	0	1	R/W
Maintenance period	<p>maintenance interval 100</p> <ul style="list-style-type: none"> <li>Time interval</li> </ul>	-	0	86400	R/W



	between maintenance requests				
Maintenance ip	<b>maintenance ip</b> <b>10.10.10.11</b> <ul style="list-style-type: none"> <li>Ekahau Device manager server ip address</li> </ul>	10.10.10.11	-	-	R/W
Maintenance port	<b>maintenance port 8000</b> <ul style="list-style-type: none"> <li>Ekahau Device manager server port number</li> </ul>	8000	-	-	R/W

## Other Parameters

These optional configuration parameters allow for example adding user-defined value-key pairs that are available from the Positioning Engine's application interface.

Parameter	Syntax	Factory	Min	Max	Type
name	<b>name mytagname</b> <ul style="list-style-type: none"> <li>This is the device name displayed in Ekahau Manager</li> <li>Name can be read via Ekahau SDK and YAX protocol from device property <b>GENERAL.NAME</b></li> </ul>	None	-	-	R/W
Low Battery Limit	<b>alarm battery low 3.4</b>	3.4 (volts)	3.2	4.0	R/W
WLAN Powersave	<b>wlan powersave on OR off</b> <ul style="list-style-type: none"> <li>NOTE: Enabling this option may improve</li> </ul>	off			R/W



	battery life up to 50%				
Sleep WLAN	<p><code>sleep wlan 1 OR off</code></p> <ul style="list-style-type: none"> <li>After this period of time has elapsed without event, the WLAN module may be put to sleep</li> <li>WLAN module will not sleep in case of upcoming periodic, motion, or button event</li> <li>off = never sleep</li> </ul>	off	off	10	R/W
Sleep CPU	<p><code>sleep cpu 20</code></p> <ul style="list-style-type: none"> <li>after this period of time has elapsed without event, the CPU may be put to sleep</li> <li>However, CPU will not sleep in case of upcoming periodic, motion, or button event</li> <li>off = never sleep</li> </ul>	20 (s)	off	3600	R/W
User defined keys	<p><code>user key=value OR user clear &lt;key&gt;</code></p> <ul style="list-style-type: none"> <li>These device properties are displayed in Ekahau Manager and can be read via Ekahau Java SDK and YAX</li> </ul>	(empty)	-	-	R/W



## Commands

The tag commands are used for saving settings, displaying status, calibrating, viewing statistics, help screen and upgrading the embedded software.

Command	Syntax	Description
Configuration	<code>config</code>	Shows all configuration parameters
Calibrate	<code>calibrate</code>	Starts quick network scanning and sending for calibration purposes <ul style="list-style-type: none"><li>Select the corresponding T201 tag as the calibration client from Ekahau Manager's File &gt; Preferences dialog</li><li>Exit the calibration mode by pressing ESC in the terminal</li></ul>
Debug level	<code>debug level &lt;n&gt;</code> <code>n = 0 OR 1, 2, 3</code>	Debug display level for error messages. Please note that the setting cannot be saved.
Info	<code>info</code>	Displays static information <ul style="list-style-type: none"><li>MAC-address</li><li>Serial number</li></ul>
Help	<code>help</code>	Displays CLI-help
Ping	<code>ping &lt;IP-address&gt;</code>	PING-utility
Reset	<code>reset</code>	Resets the factory default settings
Save configuration	<code>save</code>	Saves unsaved configuration to permanent memory
Status	<code>status</code>	Displays TAG-status information <ul style="list-style-type: none"><li>IP-address</li></ul>



		<ul style="list-style-type: none"> <li>• battery charge</li> </ul>
Software update	<p>swupdate  <a href="https://user:pass@10.10.10.15/t201_070.zip">https://user:pass@10.10.10.15/t201_070.zip</a></p> <p>OR</p> <p>swupdate  <a href="http://10.10.10.15/t201_070.zip">http://10.10.10.15/t201_070.zip</a></p> <p>OR</p> <p>swupdate  <a href="ftp://10.10.10.15/t201_070.zip">ftp://10.10.10.15/t201_070.zip</a></p>	<p>Fetches and upgrades tag's embedded software from a server in the network.</p> <ul style="list-style-type: none"> <li>• Supports http, https and ftp protocols</li> <li>• When upgrading the tag software plug the tag to the charger to avoid accidental loss of power in middle of upgrade.</li> <li>• Username and password are optional.</li> <li>• Use software packages provided by Ekahau only.</li> </ul>

## Configuration Tips

This section provides tips that guide you in selecting the optimal configuration for your tags.

- For best performance in accuracy it is recommended let T201 to scan two times before sending both results to engine. This improves Engines throughput and accuracy.
- Ekahau recommends to use UDP protocol instead of TCP with larger amount of T201's that frequently send data to the Engine. This is because of smaller overhead of the UDP protocol. Note that UPD protocol transmission is not guaranteed.
- To save battery power it is recommended to always use "Sleep WLAN" option.
- Ekahau recommends to use UDP protocol instead of TCP with larger amount of T201's that frequently send data to the Engine. This is because of smaller overhead of the UDP protocol. Note that UPD protocol transmission is not guaranteed.
- TCP protocol is recommended for applications were it is essential for the engine to receive all packets from the T201's. TCP protocol transmission is always guaranteed.





- T201 gives mistaken status "Associated" even if the WEP key is not correct. This is because WLAN driver gives correct response that it has "associated" to access point, but it does not inform if "Authentication" was successful. To avoid problems with the authentication make sure that the WEP key(s) are set correctly.
- T201 supports roaming between different SSIDs. This is implemented by scanning all audible networks and selecting the SSID in index 1. If that is not audible then index 2 and so on. However, if the signal of SSID index 1 is low enough, lower than -80dBm, the index 2 is tried to use and so on. This way T201 ensures that it establishes good connection to network even when the prior (index 1) network is audible with too low signal strength.
- Following settings have proven to work well with the motion sensor:
  - motion sensitivity = 3
  - motion poll interval = 0.200 seconds
  - motion threshold = 5
  - motion dead time = 5.000 seconds

## CHAPTER 3: Technical Specifications

### Enclosure

- Outside Dimensions (mm): 49 x 56 x 23
- Weight (g): 85
- Power switch with configurable Call button function
- Tag and battery status indication with two 2-color LED
- Buzzer for voice signals
- Operating Temperature: 0 to 50 °C [32...140°F]
- Storage Temperature: -10 to 70 °C[-4...158°F]
- Humidity: From 20% to 90 % non-condensing, relative humidity
- Environmental Protection: IP53/NEMA12, protected against dust and spraying water

### Wi-Fi

- Supported Wi-Fi Specification: v1.1
- Supported IEEE Standards: 802.11b/g/d



- Modulation Scheme: Direct Sequence Spread Spectrum (DSSS)
- Media Access: CSMA/CA
- Receiver Sensitivity: -82dBm@11Mbps
- Output power: 14 dBm +/- 1.0 dBm
- Frequency Range: 2.412 - 2.484 GHz
- Supported Networking Protocols: TCP/IP, UDP/IP, DHCP
- Security: WEP Encryption 40/128 Bit
- Antenna Type: Internal omni-directional ceramic multilayer
- Average Antenna Gain: -3dBi

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**NOTE**

The T201's 802.11b chipset works with 802.11g access points, but, as any standard 11b device, will decrease the associated 802.11g access point's data rate to the maximum of 11 Mbps.

## Operating Ranges from an Access Point

- Open Space: 100m (330ft)
- Typical Office: 30m (100ft)

## Configuration

- Command Line Interface (CLI)
- Connectivity: Serial cable (included)
- Terminal Emulation: VT100
- Line Parameters: 9600 bps, 8 data bits, no parity bit, and 1 stop bit
- Minimum Configuration: SSID, tag IP method, Engine IP address
- Optional Configuration: WEP, motion/button/periodic scan on/off, scan intervals, sensitivity to motion, etc.

## Battery Life

- Can be used with external power source (5V DC, 800mA)
- Battery: Integrated 1800mAh Li-Ion rechargeable
- The T201 has power for approximately 2500 wakeups, network scans, and data deliveries, depending on network load, using the WLAN powersave option



- Expected 3-5 day battery life with 5 min periodic wakeup
- Expected 24 hour battery life with 10 sec periodic wakeup

## Application Interface (EPE)

- Ekahau Positioning Engine 3.1 (EPE) provides a flexible Java™ and Ekahau YAX™ application interfaces for reading the location information

## Certifications

### FCC Rules

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.

FCC ID of this device is: TA7-T201-2.

Note: 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.



## FCC RF Radiation Exposure Statement

This equipment complies with FCC Radio Frequency Electromagnetic Signal (RF) exposure limits set forth for an uncontrolled environment of portable transmission. This product has been evaluated for RF exposure at a distance of 0,5 cm (0,2 inches). Operation at a separation distance less than 0,5 cm (0,2 inches) from the radiating element to nearby persons will expose nearby persons to RF levels that exceed the FCC rules for RF exposure.

## CE Marking

This device has been tested and meets the Electromagnetic Compatibility (EMC) requirements of EN50082-1 and EN50022 for the CE Declaration of Conformity (DoC).

# CHAPTER 4: Care and Limited Warranty

## Care and Maintenance

The tag is a product of superior design and craftsmanship and should be treated with care. The suggestions below will help you to fulfill any warranty obligations and to use this product for many years.

- Keep the tag dry. Precipitation, humidity and all types of liquids or moisture can contain minerals that will corrode electronic circuits.
- Do not use or store the tag in dusty, dirty areas. Its moving parts can be damaged.
- Do not store the tag in hot areas. High temperatures can shorten the life of electronic devices, damage batteries, and warp or melt certain plastics.
- Do not store the tag in cold areas. When it warms up (to its normal temperature), moisture can form inside, which may damage electronic circuit boards.
- The operating temperature of the tag is 0 to 50 °C. Do not operate the tag outside this temperature range.
- Do not attempt to open the tag. Non-expert handling may damage it.
- Do not drop, knock or shake the tag. Rough handling can break internal circuit boards.



- Do not use harsh chemicals, cleaning solvents, or strong detergents to clean the tag.
- Do not paint the tag. Paint can clog the moving parts and prevent proper operation.
- Use a soft, clean and dry cloth to clean the tag.
- Use only the supplied antenna. Unauthorized antennas, modifications or attachments could damage the tag and may violate regulations governing radio devices.

All of the above suggestions apply equally to your tag, battery, charger or any accessory.

## Limited Warranty

Ekahau warrants that the Tags will operate in accordance with and substantially conform to their published specifications when shipped or otherwise delivered to the end user and for a period of **180 days** thereafter, provided, however, that Ekahau does not warrant any claim or damage under this Warranty if such claim or damage results from:

1. Misuse, neglect, accident or improper installation or maintenance of the Tags,
2. Tags that have been altered, modified, repaired, opened or tampered with by anyone other than Ekahau,
3. Use of the Tags not in compliance with their respective documentation, user manuals, instructions, and any usage restrictions contained therein, including, but not limited to, the provisions relating to the environment and ranges where the tags must be used, or
4. Accident, fire, power failure, power surge, or other hazard.

Otherwise, the Tags are sold AS IS. In no event does Ekahau warrant that the Tags are error free or that end user will be able to operate the Tags without problems or interruptions.

End User is responsible for using the Tags within their specifications as contained in the Documentation.



## Notice of Warranty Claims

The End User must contact Ekahau promptly if he/she has a valid warranty claim with respect to the Tags. To be valid, the claim must be made within two hundred (200) days of shipment or other delivery to the End User. The contact must be made to Ekahau customer support and must contain a detailed written description of the suspected claim/malfunction, the date of purchase, and the serial numbers of the Tags. Ekahau customer support email address is [support@ekahau.com](mailto:support@ekahau.com).

The End User shall cooperate with Ekahau in providing such additional information as may be required for Ekahau to investigate whether the user has a valid warranty claim, including shipping the Tags back to Ekahau, if so requested.

The End User agrees that he/she shall return, or contact Ekahau regarding, warranty claims for a minimum of 10 Tags at one time. Ekahau shall not have any obligation to handle warranty claims for a shipment or a call relating to less than 10 Tags at one time.

