User Manual

User Manual GW 3030v2

side 2..16 (regulatory text on side 15, page 14)

User Manual MR3000v2

side 17..30 (regulatory text on side 29, page 13)

User Manual

This is a draft user manual of a not yet released product. All its contents is subject to change.

Product Code(s):	900.100.010.003 (AMB GW3030v2) 901.100.000.003, 901.100.004.003

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1 Table of Contents

2 Preface

2.1 What is the Gateway GW3030 v2.0?

The Gateway GW3030 v2.0 is a self-configuring mesh-routing device in the 3000 Series wireless network. It is intended to be used in warehouses, trailers etc. to act as interface between a 3000 Series network and a PC application (for example AmbientStudio). For this purpose, the device is equipped with a USB port (type mini B) and a RS232 port (RJ11 connector). The Gateway allows the user –via a serial protocol- to interact with SmartPoints, MicroRouters and the Gateway itself e.g. to receive temperature samples, to request information or to configure devices.

The Gateway operates on mains power and is equipped with a rechargeable backup battery. It can be powered through USB.

2.2 Features

1. **Self-configuring and self-healing mesh network**
   The Gateway operates completely autonomous in establishing a self-healing mesh network. It receives messages from SmartPoints and MicroRouters and decides what the best route is for messages to reach their final destination. It adapts its routing to wireless dynamics. If a certain connection is temporarily blocked, messages are sent on a detour to reach their destination. The Gateway GW3030 v2.0 can serve up to 31 MicroRouters.
2. **Support for security**
   The Gateway supports secure transfer of messages. Message payloads can be encrypted and network keys are required to join a network.
3. **Mains power and rechargeable battery**
   The Gateway is intended to be statically deployed in warehouses, trailers and so on. It is designed to be mains powered via power adapter or via USB, however, if mains power fails, it is powered from a rechargeable backup battery with enough capacity to last for 72 hours.
4. **Long range**
   The Gateway has a combined Power Amplifier (PA) & Low Noise Amplifier (LNA) offering maximum radio range.
5. **Easy installation, low maintenance**
   Due to its self-configuration capabilities, the Gateway is easy to install and requires low maintenance. Periodically it reports network connectivity information that can be used to increase overall performance. LED feedback is available to assess device status in one glance.

2.3 Conventions

This user manual uses the following typographical conventions to mark certain portions of text: new terms, foreign phrases, and other important passages are emphasized in *italics*.

Everything that represents input or output of the computer, in particular commands, program code, and screen output, is shown in a `mono-spaced font` and separated by borders. Within such passages, italics (`example`) indicate place-holders; you must insert an actual value instead of the place-holder. On occasion, parts of program code are emphasized in bold face (**`example`**), if they have been added or changed since the preceding example.

Important comments or reminders are indicated in bold and separated by borders, as follows:

Example

An *administrator* is generally a person who is in charge of installing and running Ambient Studio or any other related system software. A *user* could be anyone who is using, or wants to use, any part of the Ambient Studio system or the devices of the 3000 Series Network. An *engineer* is generally a person who is in charge of physically installing, deploying, or maintaining 3000 Series network devices.

These terms should not be interpreted too narrowly; this user manual does not have fixed presumptions about system administration procedures.

3 Introduction

3.1 About This Manual

This manual provides practical information for using the GW3030 v2.0. It addresses its first-time use, installation and mounting instructions, storage conditions, and so forth.

3.2 Related Documentation

Document	Description
Data Sheet: GW3030 v2.0	The data sheet of the GW3030 v2.0 contains detailed information on the specifications.
User Manual: 3000 Series 3rd Generation Active RFID	Contains detailed information about installing, deploying, and configuring 3000 Series network products.
User Manual: Ambient Studio	Contains detailed information about Ambient Studio, our software package that can be used for configuring devices, support with installations, maintain networks, set up remote connections, and so forth.
Driver Specifications:	IFS_DDI_00-System-R1A, IFS_DDI_03-Network-R2A

Data Sheets, White Papers, DDI Specifications and Manuals can be downloaded from the support section of our website www.ambient-systems.net.

3.3 Required Tools

In order to verify proper operation of the Gateway, the following devices and tools are required:

1. **USB cable (mini)**
   The Gateway 3030 v2.0 uses USB communication by default
2. **Laptop/PC**
   A laptop or PC is required to run Ambient Studio
3. **Ambient Studio**
   Ambient Studio needs to be installed on the laptop or PC. Please ensure that you have a valid license for Ambient Studio. A temporary license can be requested by following instructions via menu bar "Help -> License.." in AmbientStudio. This manual assumes that Windows® 8.1 is being used.

4 Installation

4.1 Preparation

Before the Gateway can be installed, please ensure you have all the required tools available. It is strongly recommended to first read the User Manuals on the Ambient 3000 Series 3rd Generation Active RFID and Ambient Studio. Knowledge of Ambient Studio is a pre-requisite in order to verify the operational status of the Gateway and its configuration.

4.2 First Time Use

1. **Prepare the Gateway**
   Prior to turning on the Gateway, take the device out of its protective box. Remove any protective material such as the plastic cap on the antenna connector. Attach the antenna to the Gateway. Make sure that it is firmly attached.

!! Never use the Gateway GW3030 v2.0 without antenna. Doing so might damage the device!

Verify that the power adapter –if used- has the correct plug and that power sockets are available at the location where the device is being installed.

2. **Install and identify the COM port**
   Connect the Gateway via a USB cable to the laptop/PC. After a few moments, the Gateway begins to show LED status feedback. The laptop/PC install the driver for the Gateway GW3030 v2.0 and shows a "Installing Device…" message box (often this is only shown in the taskbar).

!! Use the Gateway only with USB or RS232 cable shorter than <3 meter

Once the installing has completed, open the Device Manager (right click the "Start" button on the taskbar and select Device Manager). In the group "Ports (COM & LPT)" find "USB Serial Port (…)" and remember the COM port indicated (e.g. COM6). The port is required in AmbientStudio to establish communication with the Gateway.

3. **Ambient Studio**[1]
   Open AmbientStudio and enter the COM port. To do so, select in the menu bar "Connectivity -> Serial Port -> Configure". Set the port to the COM port identified in step 1 and use the following settings:

```
Baudrate:          230400
Data bits:         8 bit
```

[1] Ensure your Ambient Studio version is the latest version available and that you have all required DDI XML files

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```
Parity:          None
Stop bits:       1 bit
Flow control:    none
Protocol:        SPP
```

Click on Apply and Close. Now open the Serial Port.

4. **Observe the Gateway appear in Ambient Studio**
   Each Gateway has an unique number. This number can be found on the label on the product and begins with "00:00:..". This unique number is used to identify the Gateway. In the Serial Devices tab of AmbientStudio, the Gateway appears after opening the Serial Port.

!! The Gateway GW3030 v2.0 uses newer versions of DDI drivers compared to the GW3030 v1.x. Please make sure you use the latest DDI XML's in Ambient Studio

The Gateway now accepts DDI calls from AmbientStudio and outputs messages from other 3000 Series devices.

5. **Set the current time on the Gateway**
   Before the Gateway turns on its networking functionality, date and time must be set on the device. Since the Gateway ensures that each device in the network is able to accurately time stamp messages, it is of importance that the time and date are set correctly.
   AmbientStudio sets the time and date automatically, however, this can take up to 3 minutes to do so. The time can manually be set using function SetTime of the Network:Gateway driver (3:2:1).

!! Only when time and date are set in the Gateway device it will turn on its networking functionality. Time and date need to be set again when the device is reset.

If no valid time is set, MicroRouters in the network will remain in offline state (indicated also by LEDs on those devices) and SmartPoints and Extended SmartPoints will not be able to send sensor samples (these might be logged however, depending on the configuration of those devices)

The Gateway is now online and other devices become visible in Ambient Studio. In its default configuration, the Gateway will report network status information every 41 seconds and power status every 5 minutes.
In the 'DDI' tab of Ambient Studio, set the filter to select the ID of the device and leave all the other fields untouched. The received queue should then first shown a version DDI(0:2:1) message, DDI(3:4:1) messages and DDI(0:6:1) messages.
If the aforementioned messages are being received, the device has started correctly and is operational.

!! Initially it can take up to 8 hours to charge the rechargeable battery. If disruptions in mains power occur during this period, the device might not remain operational on backup battery

4.3 Installation

Once the Gateway has been turned ON, it is ready to be installed and mounted. Please have a look at the User Manual of the 3000 Series on how to go about installing 3000 Series networks e.g. to determine where to install a Gateway and how to orient antennas.

For correct operation of the device, none of the communication cables (USB and RS232) must have a length larger than 3 meters.

4.4 Mounting

The Gateway is best mounted using the *GW/MR/ESP Mounting Bracket* (order number 900.200.060.001). Please, follow the instructions that come with the bracket.

4.5 Verifying Operational Status

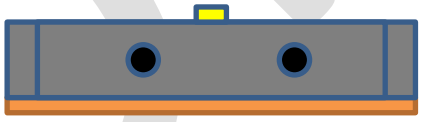
Once Gateway has been mounted, its operational status can once more be verified by using Ambient Studio. Use the Ambient Studio 'Map' view to visualize the links in the system and in particular that of the device in question. The operational status can also be verified using the LED indication on the device.

4.6 Periodic monitoring

5 LED Behavior

5.1 Position of the LEDs

The Gateway is equipped with two LEDs, one provides an indication of the power source and one provides feedback on the network status. Please note that in the picture below the antenna is oriented to the upper side.

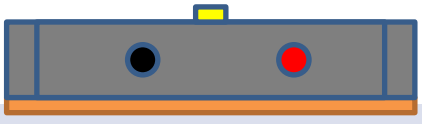


Power LED Network LED

A solid color in the LED figures indicates that the LED burns constantly in the particular color. A dotted color means that the LED blinks in the indicated color.

5.2 Boot

When the Gateway is powered on, the device will initiate a short boot sequence of a few seconds. During this period the RED network status LED will burn for a short period.



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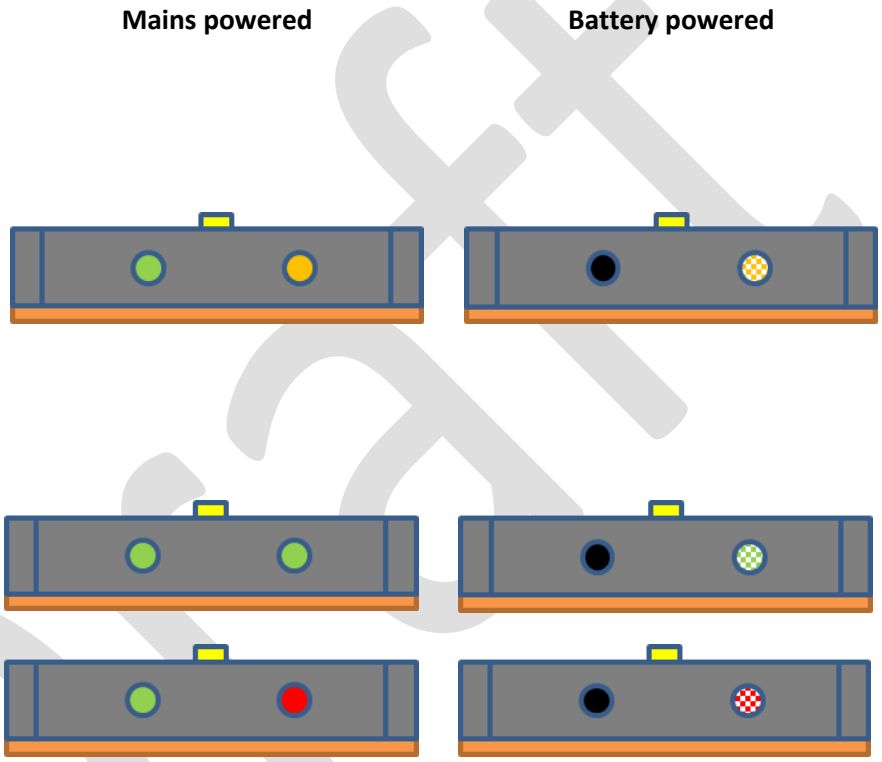
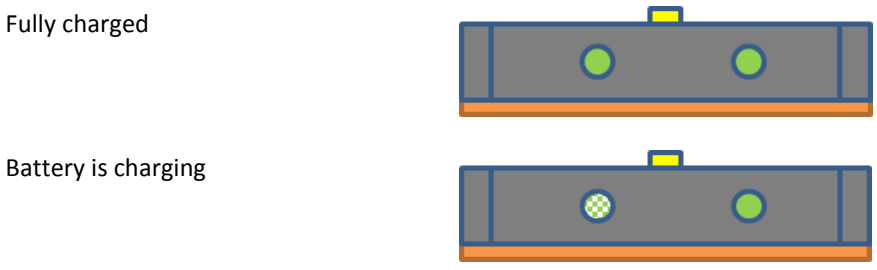
5.3 LED indications of network status

After the boot sequence is completed, the Gateway will commence normal operation. The figure below indicates how the Gateway will display the three network states: (1) Waiting until time and date are set or –in case of operation on battery- waiting on restoring of mains power (configuration option), (2) normal operation mode, the Gateway acts as node in the mesh network (i.e. it interacts with devices in the network and via a USB or RS232 connection with a PC) and (3) the Gateway is temporarily offline due to a change of configuration, no user intervention required.

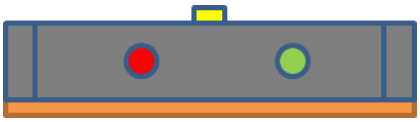


5.4 LED indications of power status

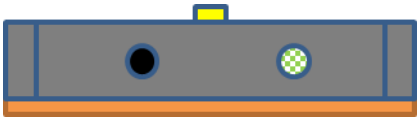
When the device operates on battery, the network status LED will blink, as explained in the previous section, while the power status LED is off. The figure below indicates the various states:



Battery charging is (temporarily) suspended



Operating on battery



5.5 LED indications invoked by the System::Led driver (0:5)

In some cases, Gateways can be installed out of range e.g. on the ceiling of a warehouse. In order to facilitate easy recognition of the Gateway or to test the USB/RS232 connectivity, a uniquely LED flashing pattern is implemented, which can be triggered using the System::Led driver (0:5).

Use Ambient Studio to request/invoke the DDI function (0:5:1) and locate the device with alternately blinking RED power and network status LEDs. After roughly 2 minutes, the LED indication will display the current device status again.

6 Powering Options

6.1 Battery

The Gateway can operate for 72 hours on a fully charged battery. It will automatically charge the battery again, when mains power is restored. If mains power fails before the charge cycle is complete, the Gateway might operate less than 72 hours on battery. Also, the age of the battery and the number of charge cycles it has experienced reduce the duration it can operate on battery power.

The duration the Gateway can function on backup battery decreases with battery age and charge/discharge cycles. It also may take a few charge/discharge cycles for the battery to reach its full capacity

For a longer battery lifetime, the battery should be discharged and charged once per month.

6.2 Battery charging

Once mains power is applied to the Gateway, its internal battery charging circuitry assesses the state of the battery and automatically begins a charge cycle, if needed. The state of the battery is reflected by LED indication.

There are a few reasons that can abort an ongoing charge cycle:

- A defect battery: it takes too long to charge or another defect;
- Battery temperature is out of bounds: the temperature needs to be between ~0°C and ~40°C to charge normally. If the temperature is below 0°C, the Gateway automatically reduces the battery charge current to prevent damage to the battery and it takes longer to complete a charge cycle. If the internal temperature is below -25°C or above 40°C a charge cycle is interrupted for as long as the internal temperature is out of these bounds;
- Too much current consumption by other components. To protect the power supply, the charging is suspended. E.g. if the product is powered through USB, it adheres to the requirements of the USB standard, which limits the peak current an appliance may use.

Most of these suspend reasons have a temporary nature, however, if errors persist, please contact Ambient Support. The power status LED will indicate a 'suspended battery charging' with a RED led.

!! Below 0°C and above 40°C the battery in the Gateway will charge with a very small charging current to prevent damage to the battery

In some cases, in particular when the battery is deeply discharged, the Gateway may make a hissing noise. This is normal and does not indicate a defect.

Typically, a battery charge cycle is completed within 4-8 hours.

6.3 System::Power (0:6)

The System::Power (0:6) driver reports information about the power status. It generates periodical reports indicating the internal temperature of the product, time it took to charge the battery, how long it has operated on the battery and so on. When the product operates on mains power, a report is generated once every 15 minutes, otherwise every 5 minutes an update is provided.

If the mains power is lost, the device immediately generates an alert.

6.4 Configuring the use of the backup battery

Since the Gateway uses the USB port for both communication to a PC and powering of the device, the Gateway is configured by default to turn off the network once mains power fails.

!! By default, the Gateway GW3030 v2.0 will turn off its networking functionality is not mains powered. This behavior can be configured. Changing the setting is in particular useful when using RS232 as communication port option

This behavior can be configured with the Network::Gateway driver to enable or disable the network when the battery is the only available power source.

7 Communication port options

By default, the Gateway GW3030 v2.0 uses the USB port to communicate with a PC, however, the device is also equipped with a RJ11 socket for RS232 communication.

!! By default, the Gateway GW3030 v2.0 uses the USB port for communication

The communication port to use can be selected in the Network::Gateway driver. The selection is accepted after a device reset (System::Reset:Reset). Until a reset the current active port remains active.

!! Only one of the communication ports is operational at a time. The used communications port can only be selected through the current active port

8 DDI Drivers

The following DDI drivers are installed on the Gateway GW3030 v2.0:

- DDI(0:0) System::DDI
- DDI(0:1) System::Echo
- DDI(0:2) System::Version
- DDI(0:3) System::FileSystem
- DDI(0:4) System::Reset
- DDI(0:5) System::LED
- DDI(0:6) System::Power
- DDI(0:8) System::SwitchMode
- DDI(0:13) System::KeyManager
- DDI(3:1) Network::DNCP
- DDI(3:2) Network::Gateway
- DDI(3:3) Network::DataDissemination
- DDI(3:4) Network::InfrastructureNetInfo
- DDI(3:5) Network::RapidClient
- DDI(3:6) Network::DNCPAccess
- DDI(3:8) Network::SmartPointQueue

The support section on the Ambient website contains detailed descriptions of these drivers and their configuration.

!! The Gateway GW3030 v2.0 uses newer versions of DDI drivers compared to the GW3030 v1.x. Please make sure you use the latest DDI XML's in Ambient Studio

9 Other information

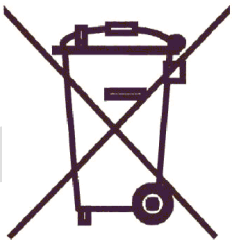
9.1 Storage

The Gateway GW3030 v2.0 should be stored in a dry area at room temperature.

If the Gateway GW3030 v2.0 is stored in deactivated mode, the battery will still be subject to a minute leakage. If the device is stored for an extended period of time, it is advised to remove the battery from the product.

9.2 Disposal

All Gateway GW3030 v2.0 products are considered WEEE and should be disposed of accordingly. If you have any questions on this matter, please contact our Support Department.



9.3 Changes

9.3.1 Hardware

1.x → 2.0

- **Mains power option (automotive rated, 5-48V, 500mA, fused)**
- **Back-up battery option (rechargeable Lithium polymer battery)**
- **Tricolor LED (RED, ORANGE, GREEN) for network status**
- **Bicolor LED (RED, GREEN) for power status**
- **New enclosure**
- **New transceiver with PA & LNA**

9.3.2 Firmware

2.0p5-pre1 → 2.0p5-pre14

- **Added LED driver (0:5) v2.0p0. This driver enables the user to initiate a LED blink pattern to ease the identification of a particular device.**
- **Added selection of communications port and enable/disable of network on battery power**

9.4 Regulatory information

!! The Gateway GW3030 v2.0 has not been formally tested. The text in this section is an example of what will appear in the released manual

FCC INFORMATION (USA):

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: 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.

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

IC INFORMATION (CANADA):

Industry Canada Statement:

This device complies with RSS-210 of the Industry Canada Rules. Operation is subject to the following two conditions: 1) this device may not cause interference and 2) this device must accept any interference, including interference that may cause undesired operation of the device.

IC Radiation Exposure Statement: This equipment complies with IC radiation exposure limits set forth for an uncontrolled environment.

Avis d'Industrie Canada: Cet appareil est conforme à la norme CNR-210 des règlements d'Industrie Canada. Son fonctionnement est sujet aux deux conditions suivantes: 1) Cet appareil ne doit pas provoquer d'interférences et 2) Cet appareil doit accepter toutes les interférences, y compris celles pouvant entraîner son dysfonctionnement.

Avis d'Industrie Canada sur l'exposition aux Rayonnements: Cet appareil est conforme aux limites d'exposition aux rayonnements d'Industrie Canada pour un environnement non contrôlé.

EU INFORMATION (EUROPEAN UNION):

We, Ambient Systems, Demmersweg 66, 7556 BN Hengelo, The Netherlands declare that Gateway, model GW/MR3000v2 is in compliance with the essential requirements and other relevant provisions of the Radio & Telecommunications Terminal Equipment (R&TTE) Directive 1999/5/EC and ROHS Directive 2002/95/EC. R&TTE test standards applied: EN 300 328 (Radio), EN 301 489-1 & 17 (EMC), EN 62311:2008 (EMF) EN 60950-1:2006+A11:2009+A1:2010+A12:2011 (Electrical Safety)

Hengelo, xx xx xx

Signature:

PACKAGING INSTRUCTIONS

If the Gateways GW3030 v2.0 are repacked and shipped by passenger or cargo airplane, the following packaging instructions must be followed: ICAO/IATA Packaging Instruction 967, Section II.

10 Appendices

10.1 Appendix A: Technical Support

All customers can contact Ambient Systems technical support through our web site or by email. Before you contact technical support, please have the following ready:

1. Ambient Studio version (see About Box)
2. Device ID, model number
3. Number/ID of the Connect Box
4. Number/ID of the ConnectGate

Also, if you have encountered any problems visit the support section of our website where you can find software updates and user documentation as well as Frequently Asked Questions (FAQ) and answers to technical issues.

Website:	www.ambient-systems.net Then browse to the support section
E-mail:	support@ambient-systems.net

User Manual

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Product Code(s):	900.100.010.003 (AMB MR3000v2)

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2 Preface

2.1 What is the MicroRouter MR3000 v2.0

The MicroRouter MR3000 v2.0 is a self-configuring mesh-routing device in the 3000 Series wireless network. It is intended to be used in warehouses, trailers etc. to extend the wireless coverage for wireless sensors. It operates on mains power and is equipped with a rechargeable backup battery.

2.2 Features

1. **Self-configuring and self-healing mesh network**
   The MicroRouter operates completely autonomous in establishing a self-healing mesh network. It receives messages from SmartPoints and other MicroRouters/Gateways/ConnectGates and decides what the best route is for messages to reach their final destination. It adapts its routing to wireless dynamics. If a certain connection is temporarily blocked, messages are sent on a detour to reach their destination.
2. **Support for security**
   The MicroRouter supports secure transfer of messages. Message payloads can be encrypted and network keys are required to join a network.
3. **Mains power and rechargeable battery**
   The MicroRouter is intended to be statically deployed in warehouses, trailers and so on. It is designed to be mains powered, however, if mains power fails it is powered from a rechargeable backup battery with enough capacity to last for 72 hours.
4. **Long range**
   The MicroRouter has a combined Power Amplifier (PA) & Low Noise Amplifier (LNA) offering maximum radio range.
5. **Easy installation, low maintenance**
   Due to its self-configuration capabilities, the MicroRouter is easy to install and requires low maintenance. Periodically it reports network connectivity information that can be used to increase overall performance.

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These terms should not be interpreted too narrowly; this user manual does not have fixed presumptions about system administration procedures.

2.4 Further Information

Besides the contained in this user manual, there are other resources available that provided related information on the MicroRouter MR3000 v2.0:

1. **FAQ**
   The FAQ list contains continuously updated answers to frequently asked questions.
2. **Web Site**
   The Ambient Systems support web site carries details on the latest release and other information to make your work or play with Ambient Studio more productive. The support website is available at:

   www.ambient-systems.net

   And then browse to the Support section. For the internal support section a login is required. Please contact Customer Support on support@ambient-systems.net if you have not yet received these login details.

3 Introduction

3.1 About This Manual

This manual provides practical information for using the MR3000 v2.0. It addresses its first-time use, installation and mounting instructions, storage conditions, and so forth.

3.2 Related Documentation

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User Manual: 3000 Series 3rd Generation Active RFID	Contains detailed information about installing, deploying, and configuring 3000 Series network products.
User Manual: Ambient Studio	Contains detailed information about Ambient Studio, our software package that can be used for configuring devices, support with installations, maintain networks, set up remote connections, and so forth.
Driver Specifications:	IFS_DDI_00-System-R1A, IFS_DDI_03-Network-R2A

Data Sheets, White Papers, DDI Specifications and Manuals can be downloaded from the support section of our website www.ambient-systems.net.

3.3 Required Tools

In order to verify proper operation of the MicroRouter, the following devices and tools are required:

1. **Gateway 3030**
   A Gateway 3030 or similar type Gateway with power adapter and serial cable
2. **Laptop/PC**
   A laptop or PC is required to run Ambient Studio
3. **Ambient Studio**
   Ambient Studio needs to be installed on the laptop or PC
4. **USB to Serial converter**
   In case the laptop or PC does not have a COM port, a USB to serial converter

!! In some configurations, the ConnectGate blocks certain messages from MicroRouters (e.g. DDI 3:4). If you have no prior experience with 3000 Series network products, please use a GW3030 as indicated in the Required Tool section

4 Installation

4.1 Preparation

Before the MicroRouter can be installed, please ensure you have all the required tools available. It is strongly recommended to first read the User Manuals on the Ambient 3000 Series 3rd Generation Active RFID and Ambient Studio. Knowledge of Ambient Studio is a pre-requisite in order to verify the operational status of the MicroRouter and its configuration.

Experienced users

4.2 First Time Use

1. **Prepare 3000 Series Network & Ambient Studio**[1]
   The first step to take is make sure that Ambient Studio is running and a Gateway is powered and properly connected to the PC. The Gateway needs to show its 'online' status in Ambient Studio. The green LED of the Gateway needs to light up. Download and install the latest DDI driver descriptions in XML from the Ambient support website.
   MicroRouters and other SmartPoints can be added to the network as long as care is taken with regards to the network congestion. Navigate to the 'Drivers' tab in Ambient Studio and, if necessary, unfold the MicroRouters branch in the tree control on the left of the screen.

2. **Prepare the MicroRouter**
   Prior to turning on the MicroRouter, take the device out of its protective box. Remove any protective material such as the plastic cap on the antenna connector. Attach the antenna to the MicroRouter. Make sure that it is firmly attached.

!! Never use the MicroRouter MR3000 v2.0 without antenna. Doing so might damage the device!

   Verify that the gland is tightly closed around the power cable. Verify that the power adapter has the correct plug and that power sockets are available at the location where the devices is being installed.

3. **Activate the MicroRouter**
   The MicroRouter is activated by applying mains power i.e. plug in the adapter in a power socket. Within a few seconds the LEDs on the product will come to life. If not, verify that the socket provides indeed power.

4. **Observe the MicroRouter appear in Ambient Studio**
   Each MicroRouter has an unique number. This number can be found on the label on the product and begins with "02:01:..". This unique number is used to identify the MicroRouter.
   Once the device is activated, it will boot up and start its default operational status. The device sends a DDI(0:2:1) version message once it has properly booted and connected to the network; this can take up to 30 seconds.
   The MicroRouter is now visible in Ambient Studio. In its default configuration, the MicroRouter will report network status information every 41 seconds and power status every 5 minutes.

[1] Ensure your Ambient Studio version is the latest version available and that you have all required DDI XML files

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In the 'DDI' tab of Ambient Studio, set the filter to select the ID of the device and leave all the other fields untouched. The received queue should then first shown a version DDI(0:2:1) message, DDI(3:4:1) messages and DDI(0:6:1) messages.

!! The MicroRouter MR3000 v2.0 uses newer versions of DDI drivers compared to the MR3000 v1.x. Please make sure you use the latest DDI XML's in Ambient Studio

If the aforementioned messages are being received, the device has started correctly and is operational.

!! Initially it can take up to 8 hours to charge the rechargeable battery. If disruptions in mains power occur during this period, the device might not remain operational on backup battery

4.3 Installation

Once the MicroRouter has been turned ON, it is ready to be installed and mounted. Please have a look at the User Manual of the 3000 Series on how to go about installing 3000 Series networks e.g. to determine where to install a MicroRouter and how to orient antennas.

4.4 Mounting

The MicroRouter is best mounted using the *GW/MR/ESP Mounting Bracket* (order number 900.200.060.001). Please, follow the instructions that come with the bracket.

4.5 Verifying Operational Status

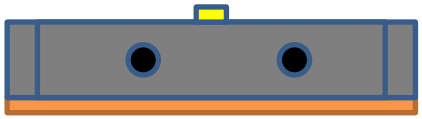
Once MicroRouter has been mounted, its operational status can once more be verified by using Ambient Studio. Use the Ambient Studio 'Map' view to visualize the links in the system and in particular that of the device in question. If the reported RSSI values are close to the lower limit, either a MicroRouter needs to be added to the network (between the device in question and the Gateway), or the device needs to be moved closer to a nearby MicroRouter or Gateway.

The operational status can also be verified using the LED indication on the device.

5 LED Behavior

5.1 Position of the LEDs

The MicroRouter is equipped with two LEDs, one provides an indication of the power source and one provides feedback on the network status. Please note that in the picture below the antenna is oriented to the upper side.

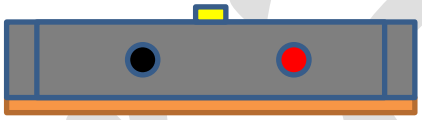


Power LED Network LED

A solid color in the LED figures indicates that the LED burns constantly in the particular color. A dotted color means that the LED blinks in the indicated color.

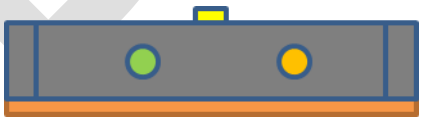
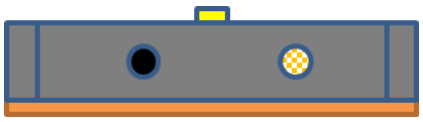
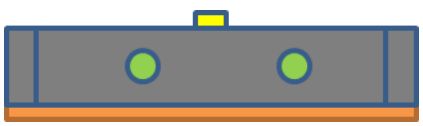
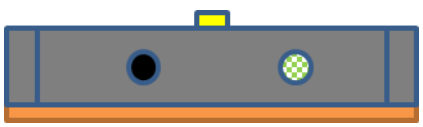
5.2 Boot

When the MicroRouter is powered on, the device will initiate a short boot sequence of a few seconds. During this period the RED network status LED will burn for a short period.

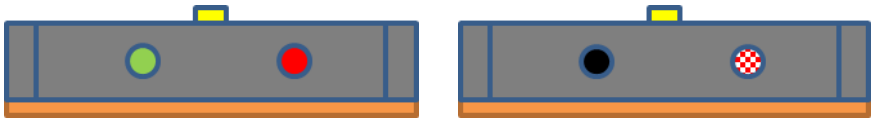


5.3 LED indications of network status

After the boot sequence is completed, the MicroRouter will commence normal operation. The figure below indicates how the MicroRouter will display the three network states: (1) Discovering a network or registering with a network, (2) normal operation mode, the MicroRouter acts as node in the mesh network (i.e. registration successful) and (3) the connection is lost or registration unsuccessful, it waits a certain amount of time before trying to discover and register again.

	Mains powered	**Battery powered**
Discovering or registering with a network		
Registered with a network. This is the desired state of the device		

Lost connectivity. The device waits in this state before trying again to discover and register



5.4 LED indications of power status

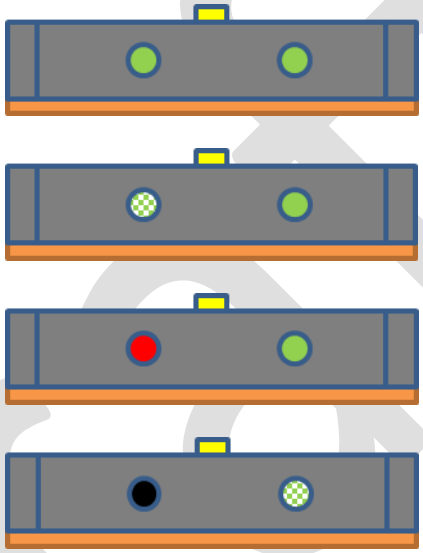
When the device operates on battery, the network status LED will blink, as explained in the previous section, while the power status LED is off. The figure below indicates the various states:

Fully charged

Battery is charging

Battery charging is (temporarily) suspended

Operating on battery



5.5 LED indications invoked by the System::Led driver (0:5)

In some cases, MicroRouters can be installed out of range e.g. on the ceiling of a warehouse. In order to facilitate easy recognition of a particular MicroRouter devices, a uniquely LED flashing pattern is implemented, which can be triggered using the System::Led driver (0:5).

Use Ambient Studio to request/invoke the DDI function (0:5:1) and locate the device with alternately blinking RED power and network status LEDs. After roughly 2 minutes, the LED indication will display the current device status again.

6 Powering Options

6.1 Battery

The MicroRouter can operate for 72 hours on a fully charged battery. It will automatically charge the battery again, when mains power is restored. If mains power fails before the charge cycle is complete, the MicroRouter might operate less than 72 hours on battery. Also, the age of the battery and the number of charge cycles it has experienced reduce the duration it can operate on battery power.

The duration the MicroRouter can function on backup battery decreases with battery age and charge/discharge cycles. It also may take a few charge/discharge cycles for the battery to reach its full capacity

For a longer battery lifetime, the battery should be discharged and charged once per month.

6.2 Battery charging

Once mains power is applied to the MicroRouter, its internal battery charging circuitry assesses the state of the battery and automatically begins a charge cycle, if needed.

There are a few reasons that can abort an ongoing charge cycle:

- A defect battery: it takes too long to charge or another defect;
- Battery temperature is out of bounds: the temperature needs to be between ~0°C and ~40°C to charge it;
- Too much current consumption by other components. To protect the power supply, the charging is suspended.

Most of these suspend reasons have a temporary nature, however, if errors persist, please contact Ambient Support. The power status LED will indicate a 'suspended battery charging' with a RED led.

!! Below 0°C and above 40°C the battery in the MicroRouter will not charge to prevent damage to the battery

In some cases, in particular when the battery is deeply discharged, the MicroRouter may make a hissing noise. This is normal and does not indicate a defect.

Typically, a battery charge cycle is completed within 4-8 hours.

6.3 System::Power (0:6)

The System::Power (0:6) driver reports information about the power status. It generates periodical reports indicating the internal temperature of the product, time it took to charge the battery, how long it has operated on the battery and so on. When the product operates on mains power, a report is generated once every 15 minutes, otherwise every 5 minutes an update is provided.

If the mains power is lost, the device immediately generates an alert.

7 DDI Drivers

The following DDI drivers are installed on the MicroRouter MR3000 v2.0:

- DDI(0:0) System::DDI
- DDI(0:1) System::Echo
- DDI(0:2) System::Version
- DDI(0:3) System::FileSystem
- DDI(0:4) System::Reset
- DDI(0:5) System::LED
- DDI(0:6) System::Power
- DDI(0:8) System::SwitchMode
- DDI(0:13) System::KeyManager
- DDI(3:3) Network::DataDissemination
- DDI(3:4) Network::InfrastructureNetInfo
- DDI(3:5) Network::RapidClient
- DDI(3:8) Network::SmartPointQueue

The support section on the Ambient website contains detailed descriptions of these drivers and their configuration.

8 Other information

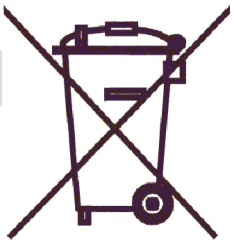
8.1 Storage

The MicroRouter MR3000 v2.0 should be stored in a dry area at room temperature.

If the MicroRouter MR3000 v2.0 is stored in deactivated mode, the battery will still be subject to a minute leakage. If the device is stored for an extended period of time, it is advised to remove the battery from the product.

8.2 Disposal

All MicroRouter MR3000 v2.0 products are considered WEEE and should be disposed of accordingly. If you have any questions on this matter, please contact our Support Department.



8.3 Changes

8.3.1 Hardware

1.x → 2.0

- **Mains power option (automotive rated, 5-48V, 500mA, fused)**
- **Back-up battery option (rechargeable Lithium polymer battery)**
- **Tricolor LED (RED, ORANGE, GREEN) for network status**
- **Bicolor LED (RED, GREEN) for power status**
- **New enclosure**
- **New transceiver with PA & LNA**

8.3.2 Firmware

2.0p5-pre1 → 2.0p5-pre2

- **Added LED driver (0:5) v2.0p0. This driver enables the user to initiate a LED blink pattern to ease the identification of a particular device.**

8.4 Regulatory information

!! The MicroRouter MR3000 v2.0 has not been formally tested. The text in this section is an example of what will appear in the released manual

FCC INFORMATION (USA):

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: 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.

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

IC INFORMATION (CANADA):

Industry Canada Statement:

This device complies with RSS-210 of the Industry Canada Rules. Operation is subject to the following two conditions: 1) this device may not cause interference and 2) this device must accept any interference, including interference that may cause undesired operation of the device.

IC Radiation Exposure Statement: This equipment complies with IC radiation exposure limits set forth for an uncontrolled environment.

Avis d'Industrie Canada: Cet appareil est conforme à la norme CNR-210 des règlements d'Industrie Canada. Son fonctionnement est sujet aux deux conditions suivantes: 1) Cet appareil ne doit pas provoquer d'interférences et 2) Cet appareil doit accepter toutes les interférences, y compris celles pouvant entraîner son dysfonctionnement.

Avis d'Industrie Canada sur l'exposition aux Rayonnements: Cet appareil est conforme aux limites d'exposition aux rayonnements d'Industrie Canada pour un environnement non contrôlé.

EU INFORMATION (EUROPEAN UNION):

We, Ambient Systems, Demmersweg 66, 7556 BN Hengelo, The Netherlands declare that MicroRouter, model MR3000v2 is in compliance with the essential requirements and other relevant provisions of the Radio & Telecommunications Terminal Equipment (R&TTE) Directive 1999/5/EC and ROHS Directive 2002/95/EC. R&TTE test standards applied: EN 300 328 (Radio), EN 301 489-1 & 17 (EMC), EN 62311:2008 (EMF) EN 60950-1:2006+A11:2009+A1:2010+A12:2011 (Electrical Safety)

Hengelo, xx xx xx

Signature:

PACKAGING INSTRUCTIONS

If the MicroRouters MR3000 v2.0 are repacked and shipped by passenger or cargo airplane, the following packaging instructions must be followed: ICAO/IATA Packaging Instruction 967, Section II.

9 Appendices

9.1 Appendix A: Technical Support

All customers can contact Ambient Systems technical support through our web site or by email. Before you contact technical support, please have the following ready:

1. Ambient Studio version (see About Box)
2. Device ID, model number
3. Number/ID of the Connect Box
4. Number/ID of the ConnectGate

Also, if you have encountered any problems visit the support section of our website where you can find software updates and user documentation as well as Frequently Asked Questions (FAQ) and answers to technical issues.

Website:	www.ambient-systems.net Then browse to the support section
E-mail:	support@ambient-systems.net