AfiAct II Reader 2 Description

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AfiAct II Reader 2 Description.docx

afimilk®

Table of Contents

1. AfiAct II Reader 2 Description

1.1 General Description

AfiAct II is an estrus and fertility monitoring system that provides, at a glance, a full picture of cows and heifers in estrus. The monitoring system provides thorough tracking of fertility related data for the dairy farm herd. It can be implemented either as a standalone system or as part of a comprehensive Afimilk system.

The AfiAct II Reader 2 is an outdoor unit, pole mounted under a roof on a farm, intended for working in an ambient temperature from -20° to +50°C. It consists of a plastic enclosure housing the RF communication cards with 2 internal WiFi antennas and 2 internal 915 MHz ISM band antennas. The reader is powered from an isolating, double insulated from the mains, 75W, 21.6 to 27.5Vac transformer.

1.2 Principle of Operation

The following diagram shows the data flow in the AfiAct II system.

Figure 1: AfiAct II system data flow

AfiAct II uses Long Range (LR) communication to collect data from cow tags (AfiTag II sensors) and transfers the information via a standard network (IP based Wi-Fi communication) to a PC based analysis.

Tags are placed on the cows' legs. The AfiTag II holds the unique ID of its cow, and records its number of steps, standing time, rest time and bout. The tags use LR (Long Range) RF (Radio Frequency) communication to send this data periodically (every 15 minutes) to an antenna located in the lower part of the AfiAct II Reader 2 device (two antennas that provide optimal coverage).

AfiAct II Reader collects data from the cows' tags which are within its receiving range. The Reader 2 uses either wired or Wi-Fi communication to send the data to the PC for analysis (the 2 upper antennas are for Wi-Fi.

The AfiAct II software, located on the PC, uses the collected activity data of each cow to calculate when the cow is in estrus and find the best time for breeding. The application generates reports and alerts the farmer.

1.3 Function

1.3.1 Main Function

The main function of the Reader 2 is to communicate, in the 915 MHz ISM band, with AfiAct II RF tags worn by cows in it's vicinity of reception. The Reader 2 communicates the received tag and diagnostic information to a configured WiFi network making it available to a Real Time controller PC or smart phone running Afimilk software. The Reader 2 is connected by an input power cable. It receives 24Vac at 550 mA from an external isolation transformer.

1.3.2 Radio Functions

The Reader 2 has two Sub-G radio transceivers operating in the 915 MHz ISM band with up to 15 dBm transmit power. Each Radio is connected to it's own 50Ohm 0dBm antenna.

The Reader 2 has a WiFi module conforming to the standard PCIe mini-connection requirements that fits into the PCIe mini slot on the Host board. It has up to 20 dBm output power and 2 WiFi type a,b,g and N transceivers for the 2.4GHz and 5 GHz ISM bands. Only the 2.4GHz band is used. Each transceiver is connected to it's own 50 Ohm antenna

1.3.3 Basic Radio Operation

A 12ms radio beacon is almost continuously transmitted every 150mS. In between beacons, the radios are either listening for tag transmissions or acknowledging receipt of a tag transmission. The radios alternate at transmitting beacons. Tags receiving these beacons will transmit accumulated logged data once every 15 minutes. Any tag not receiving radio beacons will stop transmitting it's data and store it until read by the system's low frequency RFID reader.

1.4 Reader Picture

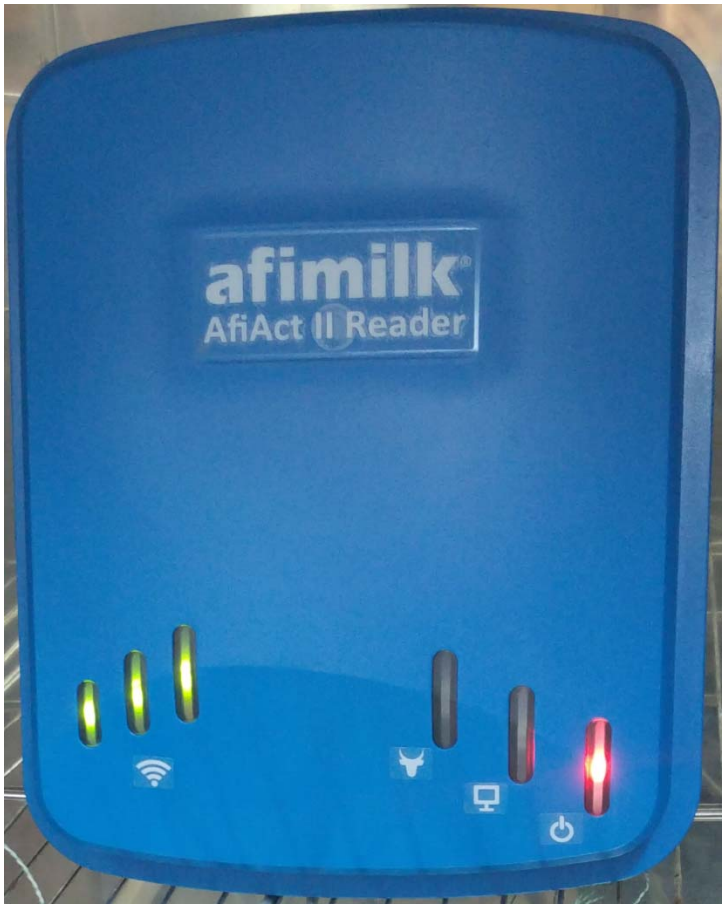

Figure 1: READER 2 Picture

1.5 Frequency Sources

CPU IC crystal Clock	4.0 MHz.
Radio 1&2 TCXO	32MHz.
Host Board CPU crystal Clock	32MHz.
Host Board Ethernet crystal Clock	32MHz.
Host Board PCIe mini Clock	33.33MHz.
Host Board Wi-Fi Tx/Rx	2142MHz. to 2462MHz.

1.6 Antenna Descriptions

The Reader 2 has 2 enclosed Wi-Fi antennas and 2 enclosed antennas for the 915 MHz ISM band depending on the country of use.

1.6.1 Wi-Fi Antenna Description

The Wi-Fi antenna is a 5.4 inch long, coax sleeve design, omnidirectional, 2.4GHz ISM band vertical antenna with 2 dBi gain. The antenna has a reverse polarity SMA plug connector.

ELECTRICAL SPECIFICATIONS

Frequency.	2400MHz. to 2500MHz.
Gain.	2 dBi.
Impedance.	50Ohm.
VSWR.	>2.0
Polarization.	Vertical.

1.6.2 916MHz. ISM Band Antenna Description

The 916MHz antenna is a 4.7 inch long, ½ wave center feed, dipole, 916MHz ISM band, omnidirectional vertical antenna with 0dBi gain. The antenna has a reverse polarity SMA plug connector.

Frequency.	900MHz to 930MHz
Gain.	1.2 dBi
Impedance.	50Ohm.
VSWR.	>1.9
Polarization.	Vertical.