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Fleck Slave Node Specifications

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Table of Contents

Table of Figures

List of Tables

1 Introduction

The Fleck Slave Node is a remote unit that takes sensor measurements and communicates with the Fleck gateway. This document outlines the specification of the slave node. See Figure 1

The core of this product uses the Mandar Fleck radio tile pictured in Figure 2. The ARM processor inside the tile can perform all the functions required of the slave node. The tile will be compliant to 2014/53/EU (RE-D) and harmonised standard ETSI EN 300 220 Category 1. The unit is powered from two Energizer AA L91 batteries, and optionally, an external +12V sensor supply can be used when higher power sensors are used.

Figure 1 Fleck Slave Node

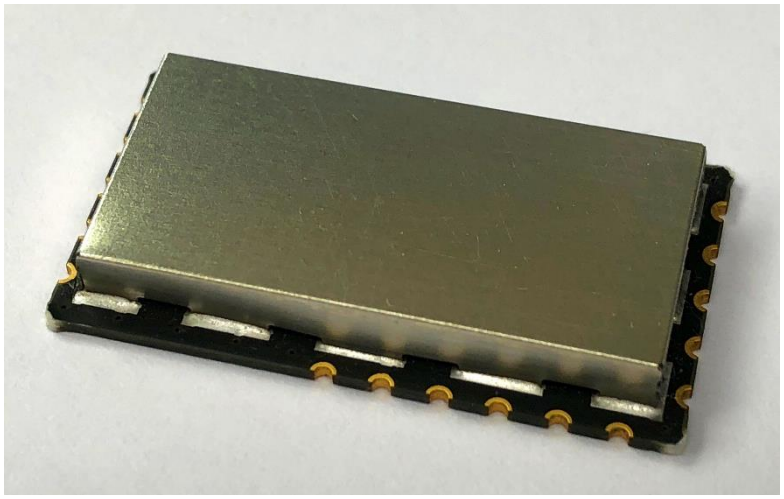

Figure 2 Fleck Radio Module

2 Electrical Specifications

2.1 Absolute Maximum Ratings

Parameter	Min	Typ	Max	Unit
Operating Temperature	-30[1]	+25	+60	°C
Supply Voltage Sensor External Power Input	9	12	15	V
Supply Voltage Internal 2 x AA Batteries	1.8	3	3.6	V
Sensor Current Consumption Internal Power			75	mA
Sensor Current Consumption External Power			1	A
RF Output Power	-	-	100	mW

Table 1 Absolute Maximum Ratings

2.2 General Characteristics

Parameter	Description	Min	Typ	Max	Unit
All operating conditions at 3.3V nominal supply	Receive Current	-	-	20	mA
	Sleep Current	-	-	8	µA
	Over air Data Rate	200	2400	100,000	bps
	Frequency Accuracy	-	-	±0.5	ppm
	RTC Accuracy	-	-	±5	ppm
Frequency 869.1-869.4MHz	RF Output Power	-	-	25	mW
	Transmit Current	56	62	67	mA
Frequency 869.4-869.65MHz	RF Output Power	-	-	100	mW
	Transmit Current	94	102	110	mA
Frequency 869.65-870.0MHz	RF Output Power	-	-	25	mW
	Transmit Current	56	62	67	mA

Table 2 General Electrical Characteristics

[1] Operating temperature range will be determined by the battery. Alkaline AA batteries will limit the unit to -20˚C +54˚C

2.3 Receiver Characteristics

Parameter	Min	Typ	Max	Unit
Sensitivity at 200 bps	-	-127	-	dBm
Sensitivity at 2400 bps	-	-117	-	dBm
Sensitivity at 100,000 bps	-	-104	-	dBm

Table 3 Receiver Characteristics

Under good line of sight conditions, it should achieve a range of at least 10km at its lowest data rate. Range is most affected by the terrain and antenna height. It has been tested at 28km at 2400bd for an ideal line of sight path.

3 Features

The device has the following features.

- A minimum of 18 months battery life (2 x Energizer L91 Lithium AA batteries) with a 15-minute measurement interval
- Modbus or SDI-12 serial interface (Switch selectable)
- Modbus 120R termination (switch selectable)
- Sensor warm-up time before readings
- Switchable +12V sensor output supply
- Pulse counter input
- Internal Battery voltage measurement
- Sensor external power voltage measurement
- Secure wireless communication
- Secure over air software update

To achieve the lowest power consumption the unit enters a low power sleep mode with the receiver turned off whilst measurements are not being taken. The slave node wakes up at the required interval to make a measurement, transmits the results to the Gateway, waits a short while to receive an acknowledgement, and then returns to low power sleep.

The slave node is configurable via the wireless channel from the Gateway, or optionally using a Fleck USB Configuration Tool.

4 Cable Connections

Connections are using Weidmuller Omnimate 5.08mm pitch connectors which have a terminal block that can be connected and disconnected to the main PCB. Cables pass through M16 (3-7mm cable diameter) IP68 cable glands fitted to the bottom of the enclosure case. Removable connectors allow engineers to quickly disconnect cabling from the PCB for testing. There is a provision for two cables, one sensor, and one sensor external power, with a blanking plug fitted if the external power input is not used.

Figure 3 Weidmuller Omnimate BL 5.08/2 connector

4.1 Sensor External Power Connector BL5.08/2

Pin	Signal
1	9-15V DC
2	0V

This is for connecting an external 12V battery supply when higher power sensors need to be used. The connection is fused, and reverse polarity protected. This input is only used to power the sensors, the internal AA batteries power the main board. The battery voltage is measured by the unit and reported to the Gateway.

4.2 Modbus/SDI-12 Connector BL5.08/6

Pin	Signal
1	Switched +12V DC
2	Modbus D-
3	Modbus D+
4	SDI-12
5	0V
6	0V

The supply to the sensor is switched on and off as required to save power.

4.3 Pulse Counter Input BL5.08/3

Pin	Signal
1	Pulse Count Input
2	0V
3	0V

This is an optional connector for future expansion. It counts on positive or negative edges, and detects a closure to ground. A 3-pin connector has been chosen to not confuse it with the sensor external power connector.

4.4 Programming Header

This connector allows the device to be programmed and is intended for factory use only,

5 Enclosure

The enclosure is a Deltron IP68 heavy duty black nylon coated box measuring 125mm x 125mm x 80mm.

6 Antenna

The PCB has a vertical SMA connector that the antenna cable connects to. For more difficult RF locations, the enclosure antenna can be disconnected, and an external mast mounted antenna can be connected.

7 Battery

Do not use 3.6V Lithium batteries as this would permanently damage the unit.

The unit is designed to work with two Energizer L91 AA batteries. These are cheap, readily available, and work well at low temperatures. The unit is protected from reverse polarity. The battery voltage is measured and reported to the Gateway.

8 Installation

The PCB has a push button on it which when pressed will perform a diagnostic test. An LED on the PCB indicates that the result of the diagnostic test was successful. This button is also used for commissioning, when a adding a new remote sensor to the Gateway.

9 Product Roadmap

The plan is to produce variants of the Fleck Slave Node at 169MHz, 434MHz, 458MHz and 915MHz bands. This will allow for operation in different parts of the world.

Appendices

Appendix A: Definitions

Term	Definition
AA	A common battery size
bps	Bits Per Second
dBm	Power level in dBs with respect to 1mW
LED	Light Emitting Diode
MHz	Megahertz. A unit of frequency. (10^6 Hz)
Modbus	Digital serial interface for intelligent sensors
PCB	Printed Circuit Board
ppm	Parts Per Million
RED	Radio Equipment Directive. Regulatory framework for placing radio equipment on the market
RF	Radio Frequency
SDI-12	Digital serial interface for intelligent sensors
SMA	A miniature screw on RF connector

Appendix B: Document Revision History

Revision	Description of Change	Author(s)	Date
Draft v0.1	Initial Draft	P. Benham	21/08/18
V1.0	Initial Release	P. Benham	23/08/2018