Ecofit Relay Datasheet

Description

The Ecofit Networks Inc. Relay is a low power long-range radio module targeted to the stationary fitness equipment market. The Relay has been designed from the ground up to allow easy, low investment and low risk networking of fitness equipment for the purpose of tracking utilization.

The proprietary Ecofit Wireless LPWAN is custom designed to maximize data delivery, range, noise immunity and network density. This targeted customization is made possible by direct hardware layer access to radio functionality.

The Ecofit Relay employs the Ecofit Communication Protocol (ECP), a derivative of the industry standard Fitlinxx C-SAFE protocol, to communicate with fitness equipment. Please see the Ecofit Communication Protocol document for further ECP specification.

Equipment Mounting Checklist

Relay and Gateway mounting distance should not exceed approximately 200m / 656ft.

Take care to avoid large metal bodies or other ground planes (such as metal console neck tubes) in close proximity when mounting the Relay unit.

Key Features

2.4 GHz ISM band operation.
Proprietary protocol custom designed to data extraction from stationary fitness equipment.

Excellent RF performance.
-96 dBm Receiver Sensitivity (BER 0.1%).
+19 dBm Output Power.
Up to 200 Meter Range.

Low current consumption.
Average operating current 32mA Peak Current 350 mA.

Easy mechanical integration.
Low profile.
Various mounting options available.
Intuitive diagnostic LED indicators.

Dimensions: 2.534 x 1.746 x 0.904 in.

FCC, IC and CE qualified.

Industry standard C-SAFE compatible interface.

Connection

The Relay's receptacle is a modular 8-pin (RJ-45) socket with the following connector pin assignments.
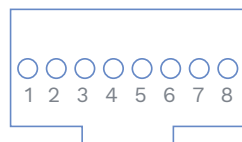
PIN	Name	Description
1	N/C	N/A
2	N/C	N/A
3	TX	RS-232 TX pin
4	RX	RS-232 RX pin
5	VCC	Supply voltage. See below for range.
6	N/C	N/A
7	GND	Supply ground
8	N/C	N/A

RS-232 Serial Interface

The Slave hardware must support an asynchronous communication mode of 9600 with 8 data bits, 1 stop bits and no parity. Hardware handshaking is not used.

Electrical Characteristics

Absolute Maximum Ratings

Note: These are absolute maximum ratings beyond which the module can be permanently damaged. These are not maximum operating conditions. The maximum recommended operating conditions are below.

Rating	Min	Max	Unit
Storage Temperature	-30	+85	°C
VCC	3.0	12	V

Recommended Operating Conditions

Rating	Min	Max	Unit
Storage Temperature	-30	+85	°C
VCC	3.7	10	V

Diagnostic LEDs

The Relay has two diagnostic LEDs found on the RJ-45 connector.

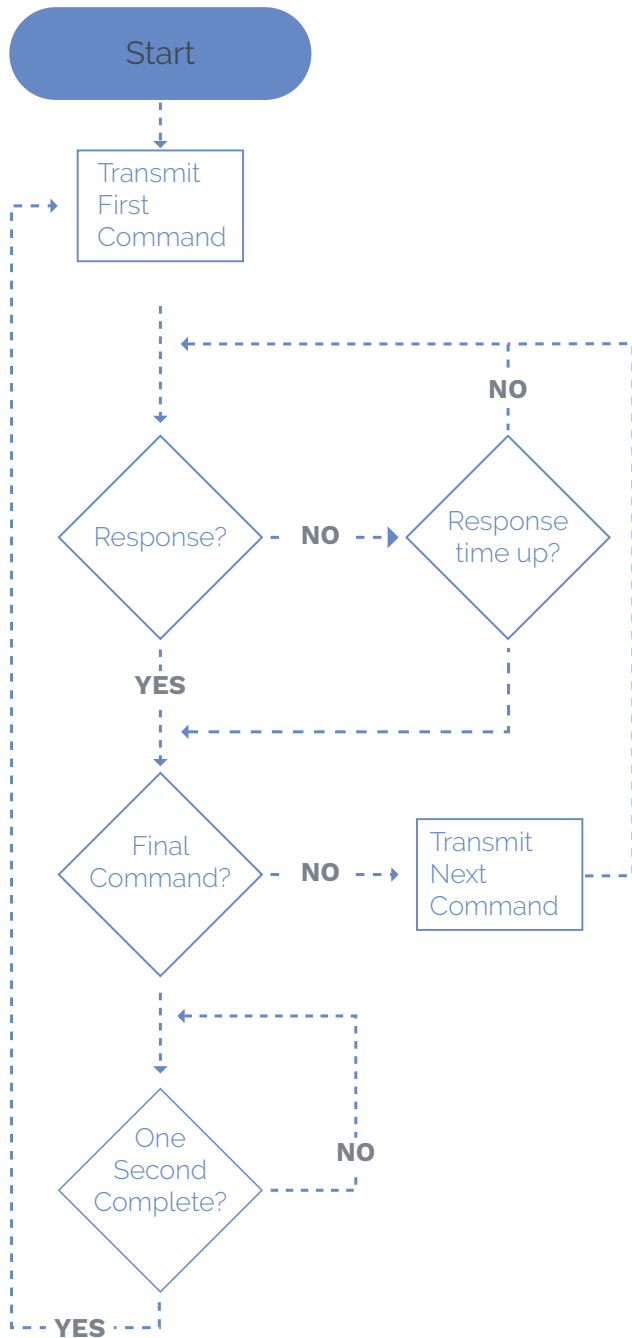| STATE	GREEN	ORANGE
NO NETWORK, NO CSAFE, NO DATA	SOLID	SOLID
NETWORK BEACON, NO CSAFE, NO DATA	SOLID	1HZ
NETWORK DATA, NO CSAFE, NO DATA	SOLID	4HZ
NO NETWORK, CSAFE, NO DATA	1HZ	SOLID
NETWORK BEACON, CSAFE, NO DATA	1HZ	1HZ
NETWORK DATA, CSAFE, NO DATA	1HZ	4HZ
NO NETWORK, CSAFE, DATA	4HZ	SOLID
NETWORK BEACON, CSAFE, DATA	4HZ	1HZ
NETWORK DATA, CSAFE, DATA	4HZ	4HZ

Csafe Communication Specification

The Relay acts as a CSAFE master, with specific requirements from the slave. Two communication techniques should be supported at the slave: Ecofit Relay legacy protocol, and Ecofit Relay P0.

Relay Protocol

The Relay legacy protocol is the protocol followed by a majority of Relays currently in the field. This protocol is very basic, in that the slave need only respond to requests for calories and/or horizontal distance in any state. Data requests are executed once every second.

Command	Hex Code	Description	Slave Data Bytes	Interpreted As	Valid Range
cmdGetHorizontal	0xA1	Accumulated (for the workout) Distance (horizontal)	2	Integer plus Unit* specifier	0 - 65,535
cmdGetCalories	0xA3	Accumulated Calories Burned	3	Integer	0 - 255

Flowchart

Start

Transmit First Command

Response? — NO → Response time up? — NO →

Response? YES ↓

Final Command? — NO → Transmit Next Command

Final Command? YES ↓

One Second Complete? — NO

One Second Complete? — YES →

The intention of this protocol is to be low impact on the slave. If the slave fails to respond to requests, the Relay will try again in one second.

NOTE: To maintain the objective of asset utilization tracking, the slave must correctly increment at least one of the two requested metrics while the equipment is in use.

Communication WiFi Impact

The Ecofit system uses a custom proprietary protocol which requires low data throughput and utilizes frequency hopping spread spectrum technology to minimize any club WiFi interference.

The protocol also does not require the full 500 clients to connect to the network at the same time to avoid network clogging.

Certification Information

FCC, IC AND CE
FCC ID: 2ADCN-RLY101

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

This device may not cause harmful interference, and

This device must accept any interference received, including interference that may cause undesired operation.

CAN ICES-3 (B)/NMB-3(B)
Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

The minimum distance where the maximum permissible exposure limit is reached is 3.4 cm from the RLY101 with the 1.3dBi antenna. It is recommended that the unit is positioned so that the typical distance from the antenna to the end user is 20cm or greater.

NOTE: THE MANUFACTURER IS NOT RESPONSIBLE FOR ANY RADIO OR TV INTERFERENCE CAUSED BY UNAUTHO-RIZED MODIFICATIONS TO THIS EQUIPMENT. SUCH MODIFICATIONS COULD VOID THE USER'S AUTHORITY TO OPERATE THE EQUIPMENT.

Change Log

Date	Version	Details
2015-01-26	V1.0	Initial Draft Created
2015-08-20	V1.1	Edited light pattern table.
2016-01-12	V1.2	Edited range.
2016-05-16	V1.3	Added more information on current consumptions.
2016-10-10	V1.4	Updated peak current. Added CSAFE communications specs.
2018-03-05	V2.0	Updated CSAFE Protocol section.
2018-11-15	V2.1	Added Relay Poll and updated style base.
2018-11-28	V2.2	Updated for design compliance.