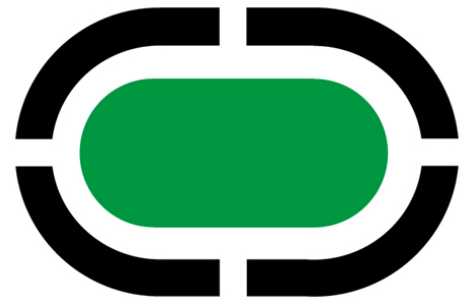


Preliminary

**D00001279**  
**FIT1/E USER MANUAL**  
**REV 0.A**

**COMPANY CONFIDENTIAL**



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SHEET: 1 of 9

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## 1 PURPOSE

The purpose of this document is to provide a user overview of the FIT1/e Module, for RF certification and regulatory purposes.

## 2 OVERVIEW

The FIT1 and FIT1e (denoted 'FIT1/e' in shorthand) are OEM Printed Circuit Board Assemblies (PCBAs) that are designed specifically for integration inside fitness equipment to enable communication with RF devices such as heart rate monitors (HRMs) and watches.



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The FIT1 is a RF-only module, which operates on the 2.4 GHz license-free band and is capable of bidirectional communication. The FIT1e includes the FIT1 functionality but also incorporates an electromagnetic (EM) receiver coil that is capable of receiving 5 kHz inductive pulses from legacy HRM transmitters. The intention is for either module to be pre-certified as intentional transmitters, providing customers with ease of integration and reduced time to market. This document reviews the operational characteristics, applicable markings, labels and warning required for the various regulatory jurisdictions.

## 3 FIT1/E OPERATION

### 3.1 Proximity Linking

Pairing between FIT1/e and compatible RF-based HRMs and watches is accomplished through a process called 'proximity linking', which discriminates against non-proximal devices using received signal strength indication (RSSI). In practice, proximity linking is performed by having the user bring the RF device close to the fitness console, where the FIT1/e module is located. Once linked, the devices maintain communication within a much larger tracking zone. If an EM-based HRM is being used, then the pairing process is not applicable.

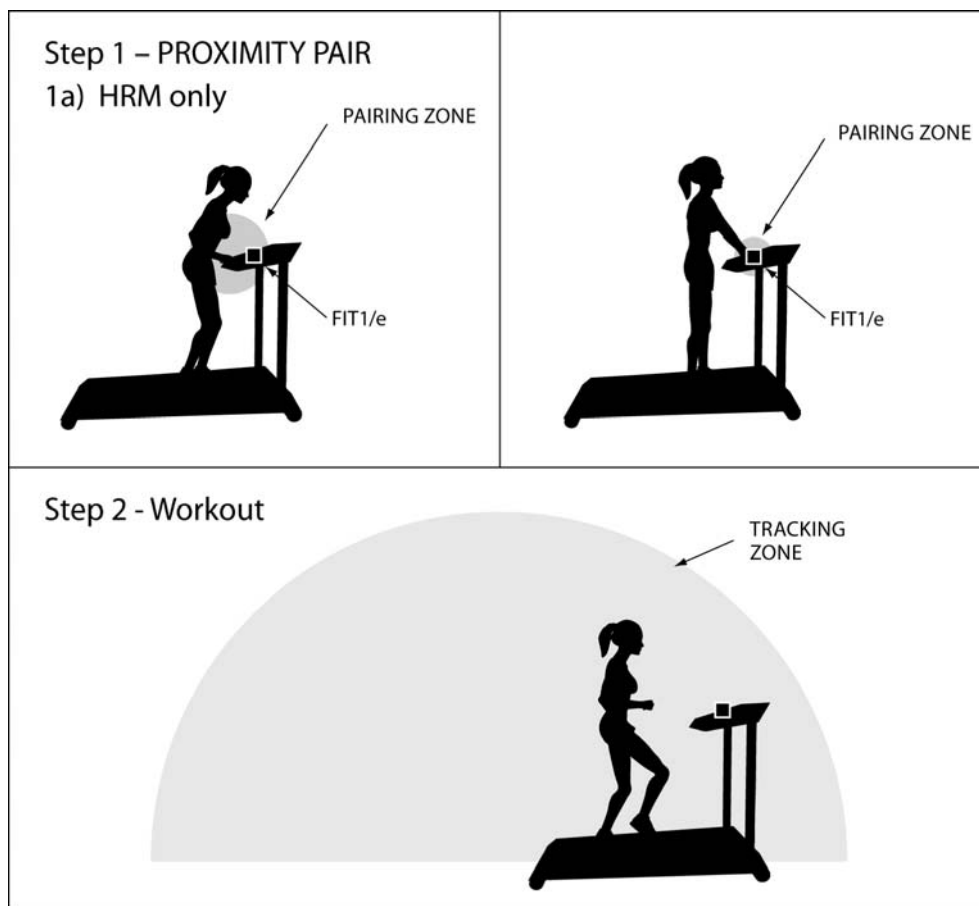


Figure 1 – FIT1/e Proximity Linking Process

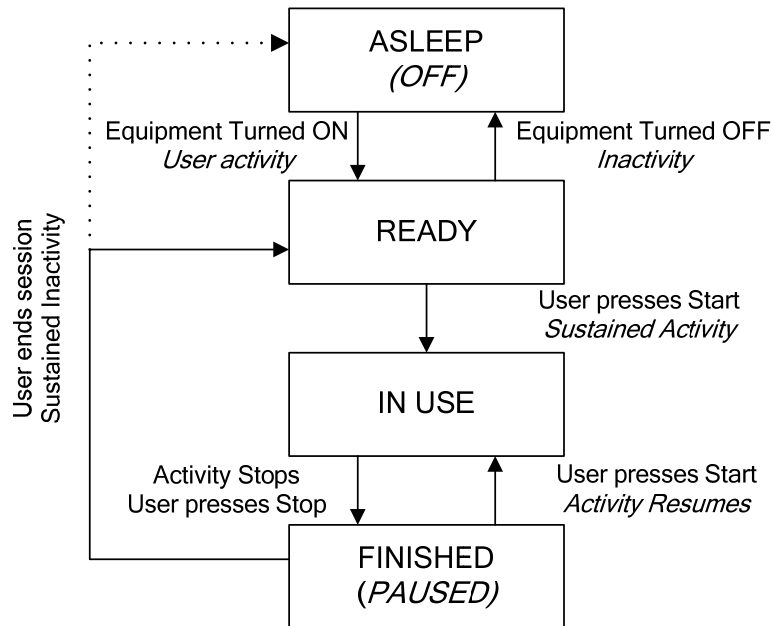


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## 3.2 Fitness Equipment States

It is important for the FIT1/e to know the state of the fitness equipment. The fitness equipment state determines when the FIT1/e will search for devices and allows the FIT1/e to send control messages (start/stop) to a paired watch. These functions are handled by the FIT1/e in order to:

- 1) Simplify the implementation for fitness equipment manufacturers.
- 2) Provide a consistent end-user experience across different fitness equipment implementations.
- 3) Provide optimal power management



FE State Descriptions	FIT1e Activities
ASLEEP (OFF) – This state applies any time that the FIT1e is turned off or in a power saving sleep mode.	FIT1e is in low power mode.
READY – When the FIT1e is turned on or activated, it will start in READY state, waiting for a user to initiate a workout session.	FIT1e is searching for heart rate monitors and watches to pair to. Because some FE, like treadmills, may be in READY state for indefinite periods of time, the FIT1e pairing search does not time out.
IN USE – This state corresponds to an active session on the FE. The chronometer begins running.	The FIT1e continues searching for heart rate monitors or watches for 30 seconds after the FE state switches to IN USE. If none are found, the FIT1e goes to a power saving mode. If the FIT1e is paired to a heart rate monitor, it receives heart rate data and passes it to the FE. If the FIT1e is paired to a watch, it: 1) sends a message to the watch to start its chronometer



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	2) receives watch files, and 3) begins broadcasting FE data to the watch
FINISHED – This state applies when the user stops a workout session, either to pause or to finish.	The FIT1e remains paired. If there is a watch paired, the FIT1e sends a message to stop the watch’s chronometer.

## 4 FIT1/E INTERFACE

### 4.1 Electrical Interface

0.050” (1.27mm) dual row 12 Pin header, with pinout as follows:

<i>Pin</i>	<i>Function</i>	<i>In/Out</i>
1	Heart rate pulse	Out
2	FIT1_Baud0	In
3	VBATT	Power
4	GND	Ground
5	FIT1_RXD	In (FE → FIT1)
6	FIT1_Baud1	In
7	FIT1_TXD	Out (FIT1 → FE)
8	FIT1_RTS	Out (FIT1 → FE)
9	FIT1_RST	In, active low
10	Reserved	Out
11	TEST (Tie to GND)	
12	Reserved	

FIT1 and FIT1e operating voltage limits: 3.0 to 10.0 V

Baud rate adjustable: 9600, 19,200 & 57,600 baud rates supported.

### 4.2 Mechanical Interface and OEM Installation Guidelines

For the FIT1/e to operate correctly it is important to note some restrictions for mounting the module:

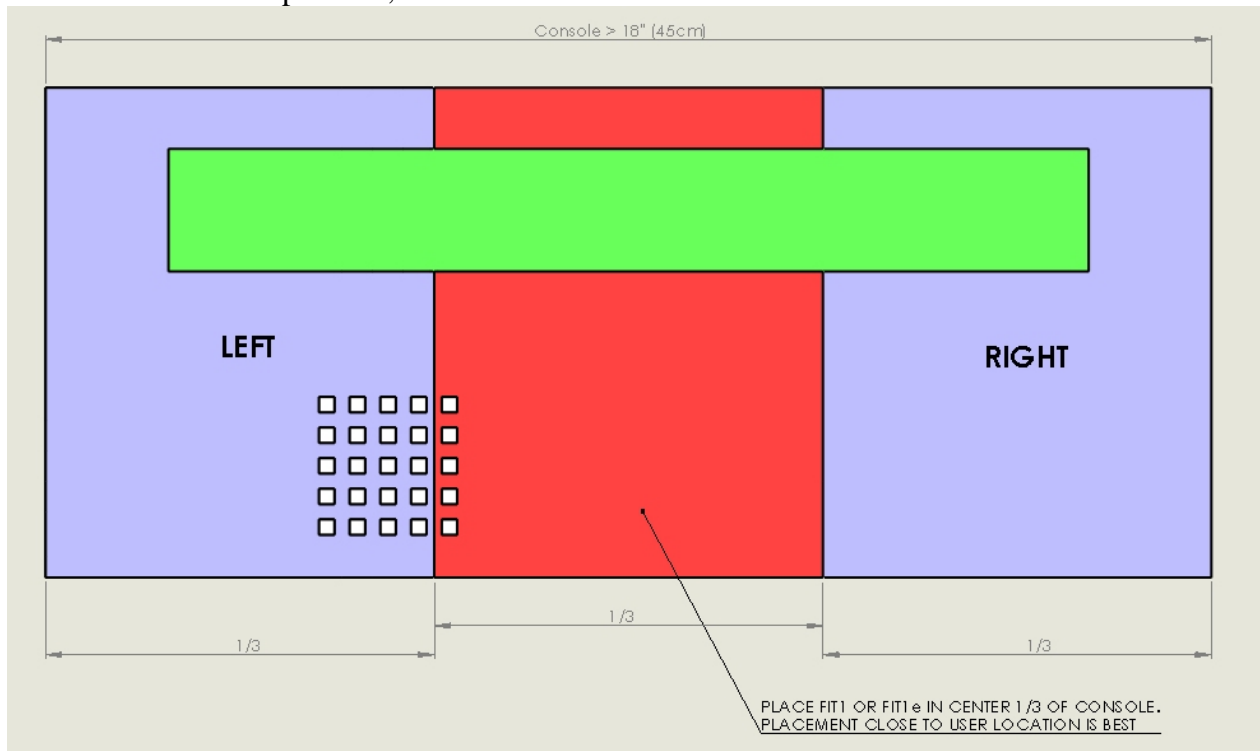
1. Do not place metallic objects in contact with the Antenna, Shield, EM coil (on FIT1e) or any other components on the PCB, with the exception of the electrical connection to the header and fastening screws. See Figure 3 for component identification.
2. Reducing the quantity and volume of metallic objects in the vicinity of the FIT1/e will allow for improved RF and EM (on FIT1e) performance.
3. The use of non-metallic paint is required for all enclosures for the FIT1/e. Using metallic paint will severely degrade RF and EM (on FIT1e) performance, affecting pairing ability and module communication.



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4. For large consoles (width greater than about 1.5' or 45 cm), the FIT1/e should be located in the middle third of the console, not to the right or left sides. This requirement helps to ensure that the FIT1/e pairs with the user on the equipment and not a neighbor or passer-by. Please see Figure 2 for details. For the FIT1/e to achieve optimal EM range, place the FIT1/e as close to the user as possible within the console.
5. When determining mechanical fastening methods minimize material on or around printed antenna (on both sides of PCB) and the EM coil (on FIT1/e). Placing material in these areas will affect the radiation pattern, potentially degrading performance. See "Printed Antenna Keepout" in Figure 3. If possible, the module should be placed on or close to the front plastics of the console or enclosure.
6. It is important that the FIT1/e is not placed behind the LCD or PCBs of other electronics within the console/ enclosure. The RF and EM (on the FIT1/e) circuit provide much greater reliability if line of sight is available between the module and the user, with only the console/ enclosure plastics in between. In some applications space does not allow for the module to adhere to this guideline. In these cases the module can partially sit behind PCB material provided that it is free of ferrous or nickel metals. This case should be avoided if possible.

For the FIT1/e, it is important that the module is positioned away from sources of electric noise such as fans, motors, generators etc. Devices causing large amounts of electrical noise, degrading EM signal. LCD screens may also cause noise to the EM circuit. If possible position the FIT1/e away from LCD screens. If this is not possible, maximize the distance from the LCD screen to the module.



**Figure 2 - Large Console Positioning**



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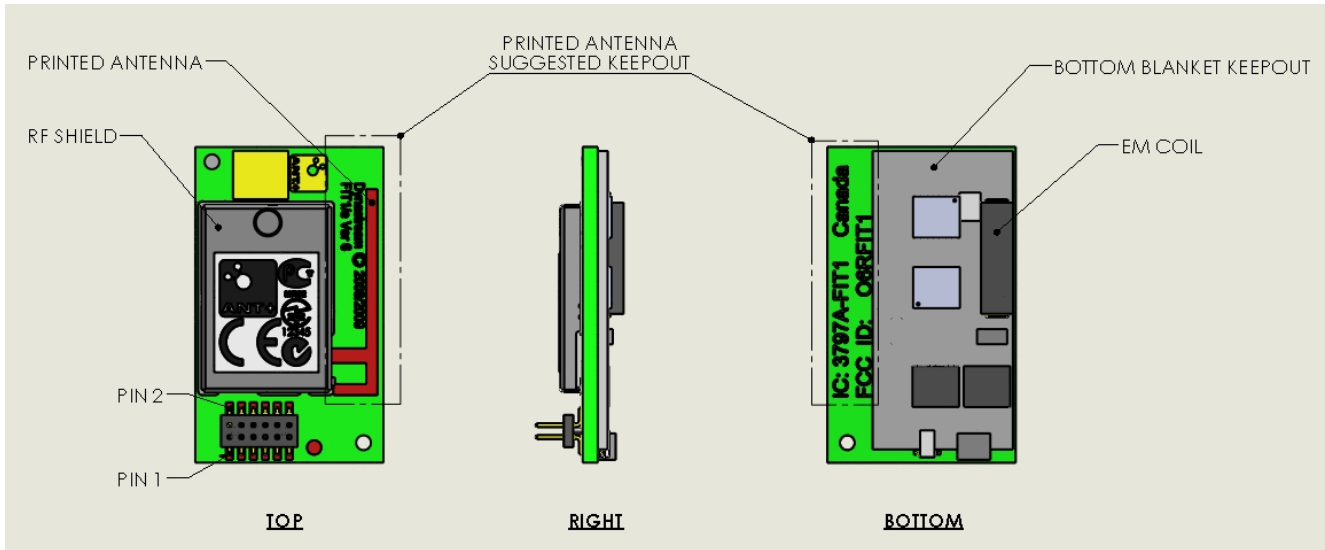


Figure 3 - FIT1e Keepouts and Major Components

## 4.3 FIT1/e Orientation inside Fitness Equipment Console

The module orientation is an important factor to mounting the FIT1/e. Acceptable orientations differ between FIT1 and FIT1e, as a result of EM functionality. As there are many factors that affect radiation patterns the best results can be achieved by experimenting with the orientations on an individual device basis.

In general the FIT1 should be positioned such that the antenna sits horizontal to the user's HRM (i.e. the long side of the FIT1 is parallel to the floor). Other orientations are possible for the FIT1 but are not recommended as they will reduce the effectiveness of the RF circuit.

The FIT1e requires that the EM coil sit horizontal to the user's HRM (i.e. the long side of the module is parallel to the floor). This is due to the limitations of the RF radiation pattern. Because of this requirement FIT1e units have few possible orientations.

## 5 REGULATORY REQUIREMENTS

The FIT1/e is pre-certified to meet the following regulatory standards

### 5.1 FCC Classification

This device has been tested and found to comply with Part 15 of the FCC interference limits for Class B devices. Operation is subject to the following two (2) 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.





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To comply with FCC regulations, it is required that fitness equipment containing the FIT1/e display a label referring to the enclosed module. This exterior label must use wording similar to the following:

“Contains FCC ID: O6RFIT1” (note: First Character is the letter O, not the # 0)

This equipment generates, uses and can radiate radio frequency energy and may cause harmful interference to radio communications if not installed and used in accordance with the instructions. 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 of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet that is on a different circuit from the receiver.
- Consult the dealer or an experienced radio/TV technician for help.

This product does not contain any user-serviceable parts. Unauthorized repairs or modifications could result in permanent damage to the equipment, and void your warranty and your authority to operate this device under Part 15 regulations.

## 5.2 Industry Canada Compliance

Category I radio communication devices comply with Industry Canada Standard RSS-210.

To comply with Industry Canada regulations, it is required that fitness equipment containing the FIT1/e display a label referring to the enclosed module. This exterior label must use wording similar to the following:

“Contains IC ID: 3797A-FIT1”

## 5.3 CE Declaration of Conformity

This device is declared to be in conformance with the essential requirements and other relevant provisions of Directive 1999/5/EC, as a low-powered unlicensed transmitter:

- EN 60950-1:2001 Safety of Information Technology Equipment
- EN 300 440-2 v 1.1.2 Electromagnetic compatibility and Radio Spectrum Matters (ERM): Short range devices.
- EN 301 489-3 v 1.4.1 Electromagnetic compatibility and Radio Spectrum Matters (ERM): Short range devices.
- EN 61000-6-1 Generic Immunity Standard

## 5.4 Japan

This device complies with ARIB STD-T66

## 5.5 Australia & New Zealand

This device complies with AS/NZS 4268:2003 Radio equipment and systems – Short range devices.

