USER'S MANUAL AND
INSTALLATION GUIDE FOR
DENMAT RF TRANSMITTER MODULE
033989500

Created on October 22, 2013

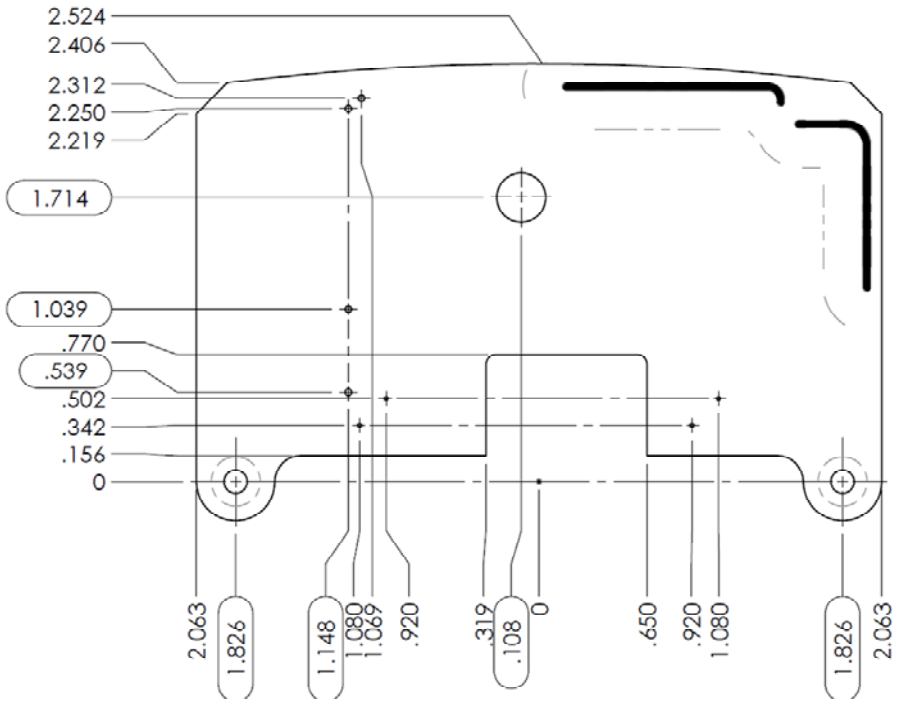
I. DESCRIPTION

Denmat 033989500 RF Transmitter Module is a radio frequency transmitting device intended for integration into professional products requiring a wireless link. An example of the end product is a wireless Footpedal. This RF Transmitter Module, herein referred to as Module, does not contain the receiver necessary to complete the wireless link. It implements a one-way communications architecture.

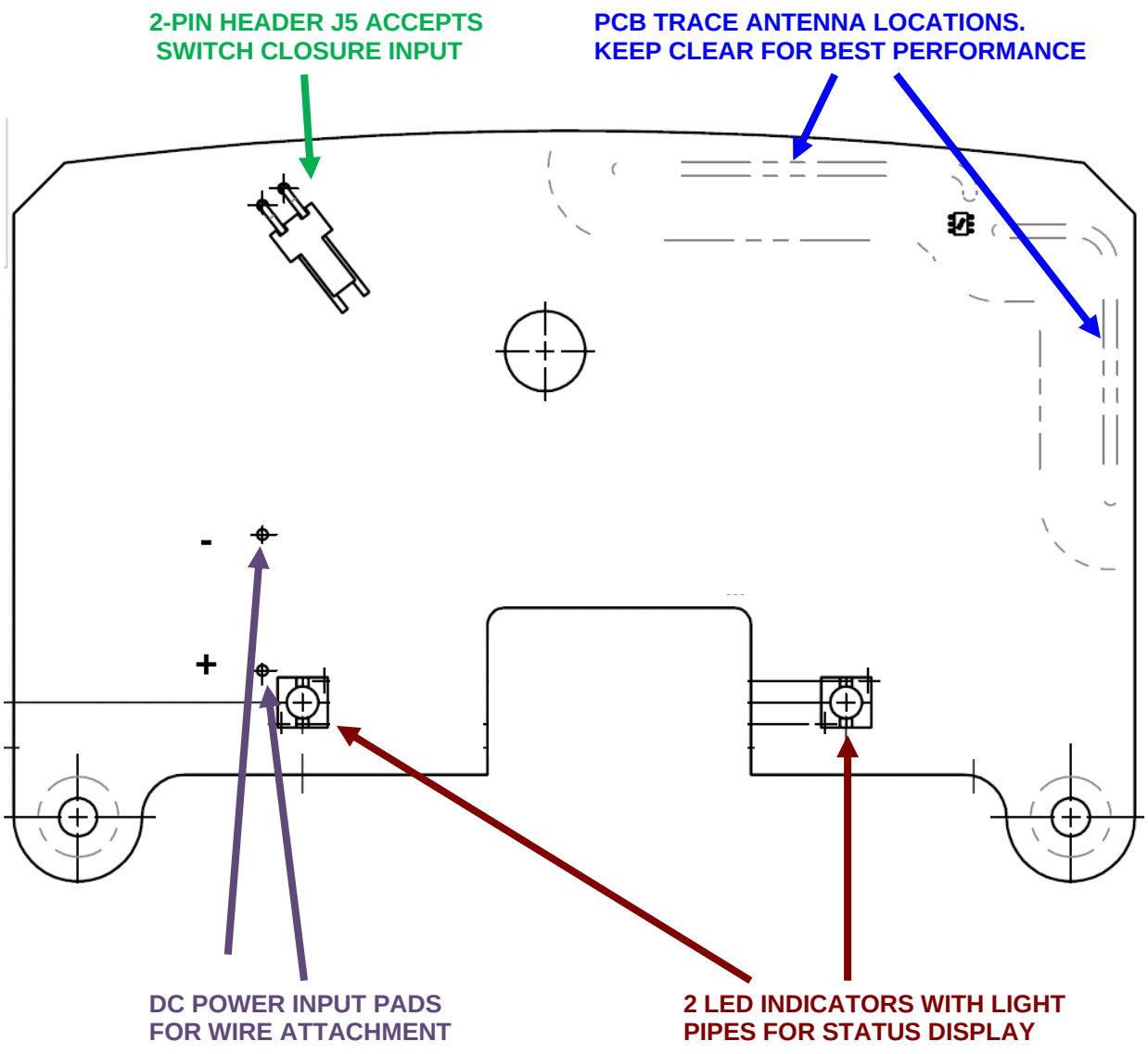
II. MODULE SPECIFICATIONS AND REQUIREMENTS

a. Mechanical Specifications

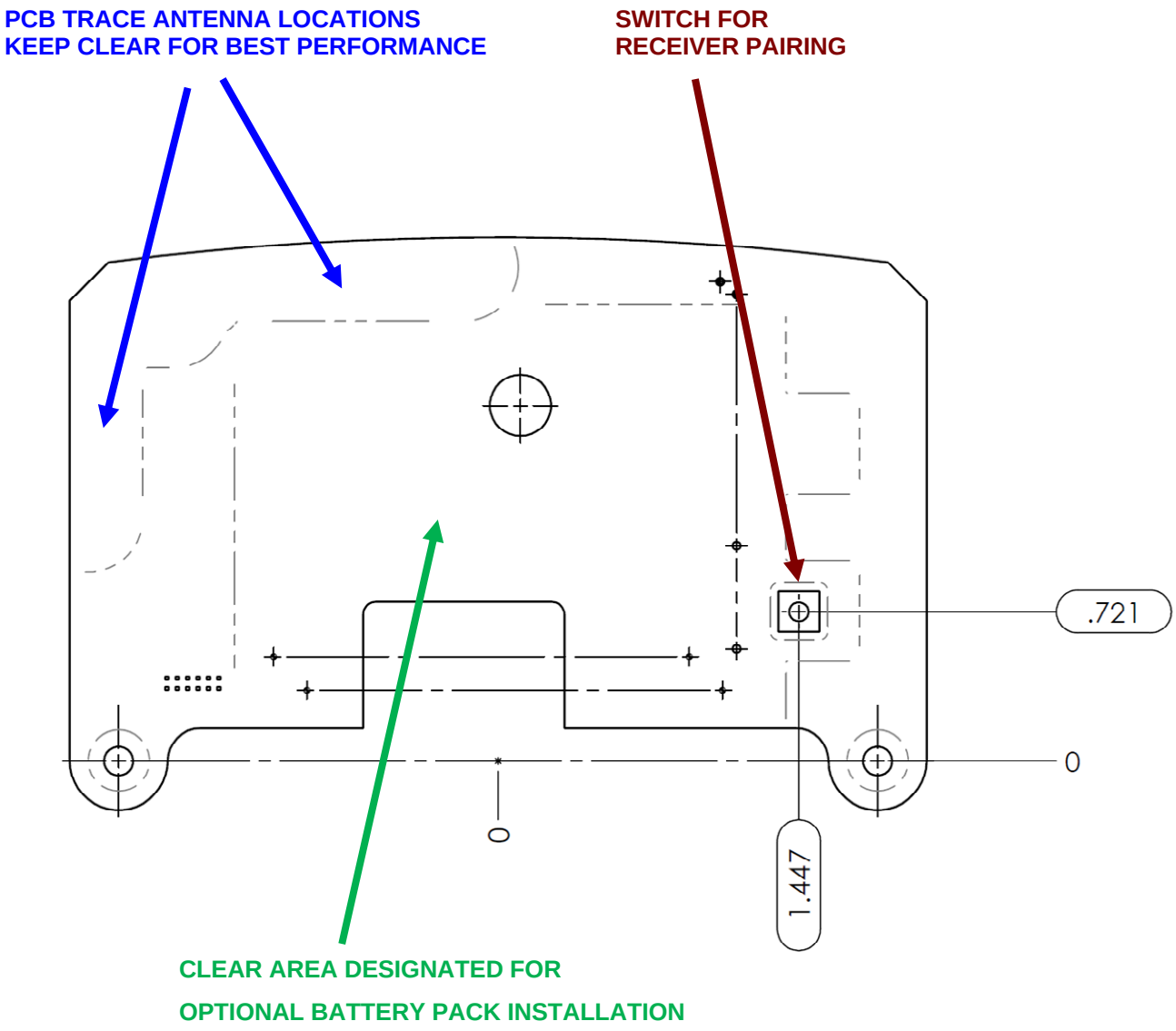
TOP VIEW DIMENSIONS



TOP VIEW COMPONENT LOCATIONS



BOTTOM VIEW


PCB TRACE ANTENNA LOCATIONS
KEEP CLEAR FOR BEST PERFORMANCE
SWITCH FOR
RECEIVER PAIRING
.721
0
1.447
CLEAR AREA DESIGNATED FOR
OPTIONAL BATTERY PACK INSTALLATION

b. Electrical Specifications

Operating voltage range:	3.1VDC to 4.7VDC
Operating current consumption:	< 50mA (in active transmitting mode)
Recommended power source:	3 primary AA size Alkaline or Lithium cells, 1.5V each (not included)
Recommended battery holder module:	keystone Electronics 2464 (not included)

c. Switch Interface Specifications:

The 2-pin header, J5, has the following interface specifications:

- Voltage sourced from this header: 3VDC nominal
- Current sourced out of this header: 1mA maximum
- Maximum switch resistance expected: 100 Ohms
- Manufacturer and part number for J5 header: Molex 0022122024 or equivalent
- Recommended mating connector: Molex 0022012027 housing
  Molex 0008550102 contacts
  or equivalent

d. Environmental Specifications

- Operating temperature: 0ºC to +50ºC
- Storage temperature: -20ºC to +70ºC
- Relative Humidity: 10% - 95% RH non-condensing

e. RF Communications Specifications

The radio section of this module is categorized as an intentional transmitter within the unlicensed 2.4GZ ISM band. The details of communications protocol are described in a separate document which is available upon request from DenMat Holdings, LLC.

The possible frequencies of operation are:

Channel #	Frequency [MHZ]
1	2403
2	2408
3	2413
4	2418
5	2423
6	2428
7	2433
8	2438
9	2443
10	2448
11	2453
12	2458
13	2463
14	2468
15	2473

There are 15 channels of normal operation and one channel specially assigned for transmitter-receiver pairing purposes.

During the pairing process, both a new channel number and a new address are selected by this Module and get communicated to the external receiver.

Each time it is paired with a receiver, the Module increases the frequency by 2 channels, meaning 10MHZ increments. The change is always in the ascending order and wraps around once the maximum normal operating channel number (channel 15) has been exceeded. For example, if starting at channel 1, then the following are the order of channel numbers every time pairing is performed:

1, 3, 5, 7, 9, 11, 13, 15, 2, 4, 6, 8, 10, 12, 14, 1, 3, ……

III. OPERATING INSTRUCTIONS

a. Indicators:

There are 2 LED indicators on the top side of the Module. The left one, D13, indicates RF transmission and pairing status while the right one, D15, indicates the power supply/battery level status. Here are the indication types and what they mean:

LEFT SIDE LED (D13)			
SYMBOL	**COLOR**	**SOLID/FLASHING**	**STATE**
	NONE	SOLID OFF	EITHER OF THE FOLLOWING : • IN SLEEP MODE • IN AWAKE MODE BUT WITH NO RF TRANSMISSIONS
	BLUE	FAST FLASHING	NORAML RF TRANSMISSIONS IN PROGRESS
	BLUE	SLOW FLASHING	PAIRING RF TRASMISSIONS IN PROGRESS

RIGHT SIDE LED (D15)			
SYMBOL	**COLOR**	**SOLID/FLASHING**	**STATE**
	NONE	SOLID OFF	IN SLEEP MODE AND BATTERY LEVEL IS NOT LOW
	GREEN	SOLID ON	IN AWAKE MODE AND BATTERY LEVEL IS HIGH
	YELLOW	SOLID ON	IN AWAKE MODE AND BATTERY LEVEL IS MEDIUM
	RED	FAST FLASHING	IN AWAKE MODE AND BATTERY LEVEL IS LOW
	RED	SLOW FLASHING	IN SLEEP MODE AND BATTERY LEVEL IS LOW

b. Pairing With a Receiver:

i. The receiver (a separate unit not supplied with this module) must be put into Pairing mode in order to start the pairing process. This means that it must be on the particular pairing frequency and pairing address as specified by this Module.

ii. Then, the pairing button on this Module must be pressed continuously until the left side indicator starts flashing in blue color in slow speed. This usually takes about 1 second or longer.

iii. Once the indicator has started flashing in blue, release the button and the Module will continually transmit Pairing packets for about 5 seconds. The pairing mode packets contain the new wireless address and new channel for the receiver to learn. At the end of the pairing mode, the Module will save the newly assigned channel and address in its non-volatile memory and then automatically goes to sleep mode.

c. Sleep and Wakeups:

The Module enters a low power sleep mode as soon as power is applied to it. In this sleep mode the only time an indicator would be visible is when the power supply/battery level is in the low range, in which case the left side LED slowly flashes in red color. Either pressing the Pairing button or a switch closure at header J5 can wake up the unit as long as the power supply/battery level is not in the depleted (below low level) range.

d. Transmitting and Idle Modes:

Once a switch closure has been detected at J5, the unit enters active mode and will start transmitting normal packets. While transmitting, the left side LED flashes rapidly in blue color. While in active mode, the right side LED displays the current state of the power supply/battery level as described in previous sections. As soon as the switch closure is no longer detected, the module transmits multiple STOP packets before entering idle mode. It stays in Idle mode (still indicating supply/battery level) for up to 2 minutes before entering sleep mode.

IV. REGULATORY REQUIREMENTS

a. Labeling

When fully integrated in to the final product, it is required by United States and Canada regulatory agencies to have a label on the exterior of the final product with wording as shown below:

"**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**."

In addition, the FCC and Industry Canada (IC) certificate numbers must appear on the label as follows:

"**Contains FCC ID: SYS-SOL, IC: 11076A-SOL** "

An example of such label is shown below:

YOUR COMPANY NAME Model: 033989500
CONTAINS FCC ID: SYS-SOL, IC: **11076A**-SOL
This device complies with Part 15 of the FCC rules subject to the following two conditions:

1) This device may not cause harmful interference.
2) This device must accept all interference received, including interference that may cause undesired operation.

For use in other countries, contact DenMat Holdings, LLC.

b. Information for the User:

FCC requires certain information to be provided in the final product User's Manual. The following text must appear in the manual:

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.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil nedoit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement

This equipment has been tested and found to comply with the limits for 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 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**

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

"Les changements ou modifications non expressément approuvés par la partie responsable de la conformité pourraient annuler l'autorité de l'utilisateur à utiliser cet équipement."

c. Per Industry Canada RSS rules:

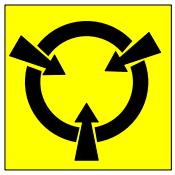
This device complies with Health Canada's Safety Code. The installer of this device should ensure that RF radiation is not emitted in excess of the Health Canada's requirement. Information can be obtained at http://www.hc-sc.gc.ca/ewh-sem/pubs/radiation/radio_guide-lignes_direct-eng.php

Cet appareil est conforme avec Santé Canada Code de sécurité 6. Le programme d'installation de cet appareil doit s'assurer que les rayonnements RF n'est pas émis au-delà de I'exigence de Santé Canada. Les informations peuvent être obtenues: http://www.hc-sc.gc.ca/ewhsemt/pubs/radiation/radio_ guide-lignes_direct-eng.php

V. INSTALLATION NOTES

Follow these general installation guidelines when integrating the Module into the final product:

1. For best transmission distance, do not shield the antenna side of the Module with electrically conductive or magnetic materials.
2. The Module can be powered with a DC power supply as described in previous sections. Alternatively, it can be powered using 3 primary cells of Alkaline or Lithium type, each being of the nominal 1.5V.
3. Certification will be void if any circuitry on this Module is modified or tampered with. Contact DenMat Holdings, LLC for all such information or for any other questions regarding safe and legal installation of this device.
4. The product housing should be designed in such a way as to not allow liquid spillage on this Module.
5. Components on this assembly are static sensitive. Handle using proper Electrostatic Discharge (ESD) protective equipment.



VI. MAINTENANCE AND CARE

No periodic maintenance is required for this module.