HIT-NOT DDAC-PDS-C-2 Magnetic Field Generator User Manual

HIT-NOT Proximity System
Magnetic Field Generator
Model: DDAC-PDS-C-2
User's Manual v1.0

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Contents

Overview

The Magnetic Field Generator (MFG), model DDAC-PDS-C-2, is part of a complete HIT-NOT® Proximity Detection System from Frederick Energy Products that installs on lift trucks or other moving vehicles and creates pulsing magnetic fields sensed by other devices. The other devices detect the magnetic fields and determine when they are too close to the lift truck. For example, a pedestrian wearing a Personal Alarm Device (PAD), model DDAC-PAD, can detect the fields from MFGs and provide warnings to the pedestrian and the truck operator to alert them both that the pedestrian is too close to the truck and is in a dangerous situation. The MFG also includes an internal Collision Avoidance Module (CAM) that detects magnetic fields from MFGs on other moving trucks to provide warnings when there is a risk of collision with another truck. The operation of the CAM is similar to that of a PAD, but a different LED/Sounder pattern is used to differentiate between a truck in a magnetic field and a pedestrian in a magnetic field. The MFG also includes a Bluetooth Module that can provide proximity-event data to remote users. Proximity-event data are stored in MFG memory and the Bluetooth Module transmits the proximity events to a Bluetooth Relay when the MFG is near a relay. The relay then sends the data to the remote user via Cloud Services.

Theory of Operation

The primary functions of the MFG are:

- To generate a 73 kHz field around a truck to act as a protection zone for collision avoidance between trucks and for the protection of pedestrians.
- To receive a 916.48 MHz RF signal from a Personal Alarm Device (PAD) and/or a Collision Avoidance Module (CAM).
- To transmit a 916.48 MHz signal from the CAM to a Magnetic Field Generator in another truck.
- To collect and store proximity events that can be transmitted by an internal Bluetooth Module to a Bluetooth Relay for subsequent transmission to remote users via Cloud Services.

The MFG has an internal 73 kHz generator and a wire-wrapped ferrite radiator that creates a field to serve as a cautionary zone around the lift truck. It also contains a Collision Avoidance Module (CAM) that detects magnetic fields emitted by MFGs from another truck. When a PAD or another lift truck with CAM is in close proximity to the

MFG, the PAD or CAM will detect the 73 kHz magnetic field from the MFG and analyze its field strength. If the 73 kHz field strength received by the PAD or CAM is above a certain threshold, indicating the distance to the PAD or CAM is close enough to signify a Warning condition, then the PAD or CAM will reply to the MFG with a 916.48 MHz transmission. The MFG has its 916.48 MHz transceivers ON when it is generating the 73 kHz magnetic field and is “listening” to receive any 916.48 MHz transmissions from a PAD or CAM. If the MFG receives an indication that a Warning or Danger condition exists, it will turn ON a connected Warning Module with LED and sounder.

The Bluetooth Module is a component mounted on the printed circuit that transfers data collected/saved by the MFG to Bluetooth Relay(s) installed at selected locations in a facility. The transfer occurs when the MFG passes in the vicinity of a Bluetooth Relay, where the Bluetooth Module and Relay link-up and the data exchange occurs. The Bluetooth Relay(s) subsequently transmits the data to remote users via Cloud Servers.

Operating Frequency

The MFG creates pulsing magnetic fields on a frequency of 73 kHz and receives RF signals on a frequency of 916.48 MHz. The transceiver in the MFG transmits signals from its own Collision Avoidance Module on a frequency of 916.48MHz. The CAM detects magnetic fields from MFGs on other trucks on a frequency of 73kHz, but the CAM is programmed to not recognize the 73 kHz magnetic field from its own MFG.

FCC/IC Information

The FCC ID for the MFG is QUI-DDAC-PDS-GEN2 and complies with Part 15 of the FCC Rules.
Operation is subject to the following conditions:

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

Any intentional or unintentional changes or modifications to the configuration of the Personal Alarm Device not expressly approved by Frederick Energy Products LLC could void the user’s authority to operate the equipment.

Note: This equipment has been tested and found to comply with the limits for a 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 uses 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/technician for help.

The required notices are specified in the RSS documents (including RSS-Gen) applicable to the equipment model. These notices are required to be shown in a conspicuous location in the user manual for the equipment or to be displayed on the equipment model. If more than one notice is required, the equipment model(s) to which each notice pertains should be identified. Suppliers of radio apparatus shall provide notices and user information in both English and French.

This device complies with Industry Canada license-exempt RSS standards (s). Operation is subject to the following two conditions:
(1) this device may not cause interference, and
(2) this device must accept any interference, including interference that may cause undesired operation of the device.

Operation

Installation Information

The MFG is mounted on a vehicle or piece of machinery. Mounting schemes and locations can vary depending on truck models and design. Metal near the MFG may impact performance by reducing the field size. A non-metallic mounting arm is the default mounting that if used per instructions will usually circumvent interference by a vehicle steel structure. Also, CAM detection can be affected by other close-by components on the truck that emit electromagnetic interference (EMI). These components include a Xenon strobe light or a cab silencer if installed within 21 inches of the MFG. After installing the MFG on the truck, the performance of the unit should be verified by operation and test.

Inoperability Warning

The MFG CAM operation may experience erratic responses when in very close proximity to some electronic devices. Electrical devices may transmit an electrical field and noise that may cause interference with the CAM. A safe guideline is to keep the MFG at least 4in or 100mm away from any electrical devices including but not limited to methane monitor, radio, mobile phone, GPS, PDA, battery charger, and laptop computers.

Charging

The MFG does not require charging. It is directly powered when the ignition of the truck is turned on.

Alerts

Magnetic Field Generators are designed to automatically adjust and maintain the original magnetic field size. If the truck supply voltage changes or changes occur resulting in a reduction of field sizes, the system will automatically adjust as much as 5% to ensure that the field size remains where it was initially set. If the processor senses a significant power reduction, the alarm may sound for a period of time. When the sounder is activated, power must be cycled to restore normal operation. If the problem persists, then service is required. The generator tolerates voltage fluctuations from 12-15 VDC. A power converter is needed for voltages greater than 18VDC.

Maintenance

The MFG should be regularly cleaned to reduce the buildup of dust and dirt. The user should check to see if the LEDs are working before using the system each day. There is a blue power-LED visible on the MFG housing. There also is an LED that indicates the alarm status of the MFG and works in tandem with a Warning Module connected to the MFG

Adjustments

Magnetic field size and sounder volume of the Warning Module Volume are adjustments that can be made by the user. These adjustments are made remotely using a Range Adjust Tool, Model No. HN-RANADJ, described in a User's Manual specifically for the Range Adjust Tool.

There are other available functional options that can be selected via switches on the printed circuit board. These options are configured by the manufacturer during assembly but may also be changed during generator installation. Changing the setting of these switch options can be made by removing the MFG cover. Options are:

- Collision Avoidance Module Alarm Timing – This option, set using Switch "USER20", selects whether or when a CAM alert "times out" and whether re-alerts occur. The available selections are:

➢ Continuous – Alarms as long as the truck is in the magnetic field of another MFG. Set when Sw1 is OFF and Sw2 is ON. Switch “User20 ”

➢ Two Second Alarm, no Re-alert. Set when Sw1 is ON and Sw2 is OFF. Switch “User10”

➢ Two Second Alarm, Re-alert after 30 seconds. Set when Sw1 is ON and Sw2 is ON.

➢ Two Second Alarm, Re-alert after 60 seconds. Set when Sw1 is OFF and Sw2 is OFF.

- Dual Volume Tone for Warning Module Sounder – This option determines whether the sounder in the HIT-NOT® Warning Module is at a constant volume level or whether the sound volume starts at a high level but is reduced to a lower level after a short time. The intent of this option is to first obtain the operator’s attention and then reduce the volume to a less intrusive level. Switch “Sw1” in the Switch “USER10” determines which setting will be applied. When “Sw1” is ON, the volume level remains constant throughout. When “Sw1” is of the dual volume level is set.

  These adjustments must be made ONLY by an approved person.

Interferences

The Magnetic Field Generator may receive false triggering (generate an alarm) signals from some RF-based devices including high-power radios and cell phones. Such devices will need to be moved further away from the generator. If the devices may not be moved, then the path may need to be marked to indicate areas of interference of the system. If possible the route may need to be changed.

Generator Specifications

Part Number: DDAC-PDS-C-2
Size: 30” x 3.11” x 4.375” with Mounting Arm; 8.875” x 3.06” x 3.52” without Mounting Arm
Weight: 3.8 lbs./ 1.724 kg
Input Voltage: 12 VDC (nominal)
Magnetic Field Frequency: 73 kHz pulsing AC field. Magnetic field pulses occur approx. 3% of the time.
Maximum Current Draw: Less than 5A. It is not a constant draw with a magnetic field pulsing at 3% of the time. The current draw between pulses is very low and the overall current draw is low.
Transceiver Transmit/Receive Frequency: 916.48 MHz
Transmitter Power: 0.001 W (typical)
Bluetooth Module: RN4020
Operating Temperature Range: -30°C to + 55°C; -22°F to 131°F

Safety Consideration

The driver and pedestrian should not be in close proximity while the truck is in gear. The driver must turn OFF the

truck while a pedestrian is standing next to the truck.

Revision History

Version 1.0 – April 12, 2021

Original Release. No revision history.

Documents / Resources

	**HIT-NOT DDAC-PDS-C-2 Magnetic Field Generator** [pdf] User Manual DDAC-PDS-GEN2, DDACPDSGEN2, QUI-DDAC-PDS-GEN2, QUIDDACPDSGEN2, DDAC-PDS-C-2 Magnetic Field Generator, DDAC-PDS-C-2, Magnetic Field Generator