



HIT-NOT Proximity System

Mechanized Area Monitor (MAC) User's Manual v1.0



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1 Overview

The Mechanized Area Controller (MAC) is an auxiliary device that provides complementary capabilities to a HIT-NOT® Proximity Protection System. It's main purpose is to initiate unique actions when a pedestrian wearing a Personal Alarm Device (PAD) and/or a moving vehicle with HIT-NOT® Magnetic Field Generator (MFG) and Collision Avoidance Module (CAM) are in a controlled area covered by the MAC. These actions are typically different from those normally occurring in areas away from the MAC controlled area. The MAC creates a pulsing 73 kHz magnetic field similar to the one generated by a HIT-NOT® Magnetic Field Generator (MFG), but is slightly modified. This difference allows a PAD or CAM to detect the MAC field and recognize that they are in a MAC-Controlled Area. A MAC is often installed above the controlled area, but can be installed in other positions relative to the controlled area. When a PAD or CAM is in a MAC magnetic field, the PAD or CAM sends a 916.48 MHz response to the MAC, but does not initiate a standard alert to the pedestrian or truck driver. Instead, the MAC responds to the 916.48 MHz RF signals and initiates selected actions. The exact nature of the actions vary depending on whether a PAD is in the MAC field, a CAM is in the MAC field, or PAD and CAM are both in the MAC field. The goal of these actions is to prevent pedestrians and trucks from occupying the controlled area at the same time.

An example of actions initiated by a MAC include flashing warning lights to warn of a truck in the controlled area, turning on other lights to alert a truck driver whether or not pedestrians are in the controlled area, or turning on horns/flashing other lights (e.g., overhead facility lights) when both pedestrians and a truck are in the controlled area at the same time.

The unique actions are initiated as discrete output signals to peripheral devices via wired connections to the MAC.

A MAC can also be used as a device to provide a Silent Zone for PADs. The silent zone option is selected during installation by a switch on the MAC Controller printed circuit board. In the silent zone mode, the MAC magnetic field is slightly modified from the standard MAC field. The silent zone mode only functions to create a silencing magnetic field and does not send signals to other peripheral devices.

1.1 Theory of Operation

Functions of the Mechanized Area Controller are:

- To generate a 73 kHz field in a fixed controlled area – typically to act as a protection zone to preventing pedestrians and moving vehicles from being in the controlled area at the same time. The MAC magnetic field is typically a rectangular shape created by a wire loop connected to a MAC Controller. It can alternatively be an elliptical shaped field created by a wire-wrapped ferrite; also connected to the Controller. Field size is

adjustable by the user.

- 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 MAC to a CAM in a Magnetic Field Generator on a moving vehicle. This signal only transmits data pertaining to proximity events when the truck enters the MAC magnetic field.
- Turn ON selected signal outputs when 916.48 MHz warning signals from a PAD and/or CAM are received.
- An optional function is to generate a slightly modified 73 kHz field that PADs recognize as a silencing field that causes PADs to ignore standard magnetic fields created by other HIT-NOT® Magnetic Field Generators.

Detection/analysis of the MAC 73 kHz magnetic field by a PAD or CAM is same process as explained in PAD and MFG/CAM User's Guides. However, MAC reactions resulting from PAD and CAM 916.48 MHz RF response signals are unique to the local controlled area at the MAC. The MAC magnetic field is slightly modified such that a PAD or CAM can recognize and realize that the magnetic field is generated by a MAC. This knowledge can be used by a MFG/CAM on the truck to initiate changes while the truck is in the MAC magnetic field. For example, the size of the magnetic field created by the MFG on the truck can be shrunk while the truck is in the MAC magnetic field; thus reducing the warnings to pedestrians that may be in a safe zone. Also, the MFG on the truck can issue a command to slow the speed of the truck.

Another MAC operation feature is that proximity events in the MAC zone are saved into a memory chip. These events are transmitted to a MFG when the MFG is in the MAC magnetic field. Events include times and PAD IDs when pedestrians enter the MAC zone and times and MFG IDs when trucks enter the MAC zone. This information can subsequently be transmitted from the MFG to users via an optional Data System.

Using a slide switch on the MAC Controller printed circuit board, the MAC can be switched to produce another slightly-modified magnetic field that PADs can recognize as a silencing field similar to those produced by other HIT-NOT® Silent Zone devices such as Room Silent Zone devices. The MAC design geometry can provide a larger silent zone field with a different shape. The MAC in silent zone mode does not provide signals to other peripheral warning devices.

1.2 Frequency of Operation

The MAC emits magnetic fields on a frequency of 73 kHz and it transmits and receives RF signals at 916.48 MHz.

1.3 FCC/IC Information

The FCC ID for the Mechanized Area Controller is QUI-HN-MAC 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 Range Adjust Tool, 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 not 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.*

Conformité aux normes FCC Cet équipement a été testé trouvé conforme aux limites pour un dispositif numérique de classe B, conformément à la Partie 15 des règlements de la FCC. Ces limites sont conçues pour fournir une protection raisonnable contre les interférences nuisibles dans une installation résidentielle.

Cet équipement génère, utilise et peut émettre des fréquences radio et, s'il n'est pas installé et utilisé conformément ment aux instructions du fabricant, peut causer des interférences nuisibles aux communications radio.

Rien ne garantit cependant que l'interférences ne se produira pas dans une installation particulière. Si cet équipement provoque des interférences nuisibles à la réception radio ou de télévision, qui peut être déterminé en comparant et en l'éteignant, l'utilisateur est encouragé à essayer de corriger les interférence par une ou plusieurs des mesures suivantes:

- Réorienter ou déplacer l'antenne de réception.*
- Augmenter la distance entre l'équipement et le récepteur.*

- Branchez l'appareil dans une prise sur un circuit différent de celui auquel le récepteur est connecté.*
- Consulter le vendeur ou un technicien radio / expérimenté.*

Les changements ou modifications à cet appareil sans expressément approuvée par la partie responsable de conformité pourraient annuler l'autorité de l'utilisateur de faire fonctionner cet équipement.

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.

Cet appareil est conforme avecx Industrie Canada exempt de licence Rss standard(s). Son fonctionnement est soumis aux deux conditions suivantes:

- (1) cet appareil ne peut causer d'interférence, et*
- (2) cet appareil doit accepter toute interférence, y compris des interférences qui peuvent provoquer un fonctionnement indésirable du périphérique.*

2 Operation

2.1 Installation Information

The most common mounting for a MAC is to suspend it approximately 11 feet above the center of a Controlled Area where unique actions are desired. This type mounting is a loop formed by a pair of wires approximately four inches apart extending along the Controlled Area. The length of the Controlled Area can vary between 30 – 160 ft. The length is requested by the user when an order is placed and is implemented into the hardware prior to shipment. Wires forming the loop are typically enclosed inside PVC pipes approximately four inches apart to create a long, narrow loop. The magnetic field from a wire loop is a circular field around the loop, forming a tube-shaped field along the wire loop. This results in a narrow rectangular magnetic field where the width is user-adjustable between 15 ft to 30 ft. The MAC Controller unit should be installed at the center of the wire loop.

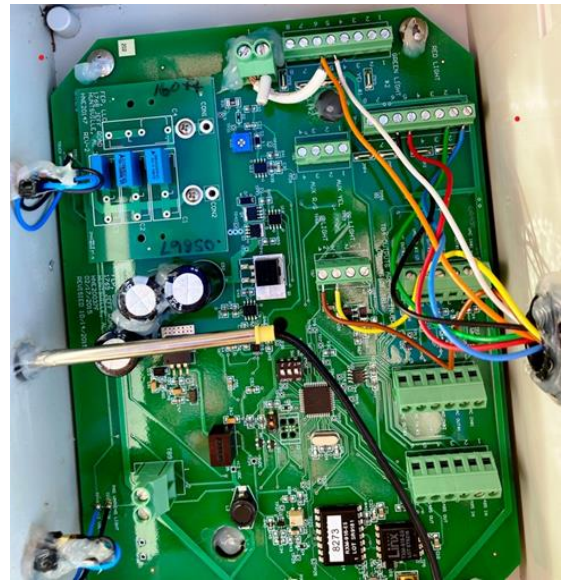
The MAC can initiate selected actions by peripheral devices connected to the MAC Controller via electrical wires (typically Thermostat Wire). Peripheral devices are typically activated by Switching Relay or Solid State Relay/Transformer connected to the Thermostat Wires. Two relays are included with each MAC shipment.

Other mounting possibilities include attaching the MAC loop or wound ferrite on a surface at the side of the Controlled Area. Specifics for these types of mounting depend on details of the specific Controlled Area and intended usage. Consult FEP for additional information.

Mounting of a MAC as a Silent Zone is similar to the description above except there are no peripheral devices connected to the MAC.

2.1.1 Wiring Connections for Peripheral Devices

The MAC Controller printed circuit board provides multiple terminal-block connection points for initializing discrete output signals via electrical wires. The following summary provides some typical actions available from three output connection options. Further details are available via an Install Guide that is provided with each MAC shipment.

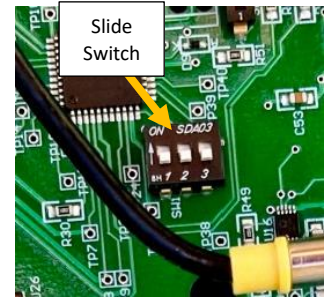


- **Pedestrian Present or Not-Present in the MAC Field** - Two separate connections provide an option to have separate indications for pedestrian(s) being Present and Not Present in the MAC magnetic field. For example, Present in the magnetic field can illuminate a red light in a Red/Green traffic light. Conversely, when no one is in the field, the green light will be illuminated.
- **Truck in the MAC magnetic field** - Another use of an output connection is to provide an alert to a peripheral device (example: LED light) while a truck is within the MAC magnetic field. The LED light also could be connected to a HIT-NOT® Area Monitor located outside-but-near the MAC Controlled zone so that the same LED light is illuminated when a truck is both approaching the MAC area and while the truck is within the MAC magnetic field.
- **Truck and Pedestrian in the MAC magnetic field** - Another output signal connection option is to a Solid State Relay/Transformer that can be used to signal when a pedestrian and a truck are both within the MAC magnetic field. For example, this connection can provide a signal to facility lights that flash or to horns that intermittently sound when both pedestrian and truck are in the field at the same time. LED facility lights is the preferred light fixtures for flashing lights - The flash rate is too fast for fluorescent or sodium lights.

- **Wire Loop or Ferrite Connection** - Both a Wire Loop magnetic field generator and a Wound Ferrite magnetic field generator have two connection wires. The two wires are routed into the Controller Box and connect to “pig tails” inside the controller using Wire
- Nuts.

2.1.2 Functional Options

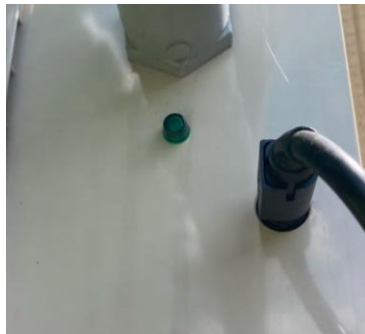
In addition to the functional options described in the previous section using wiring connections, there are two options that are selected via a three-switch slide switch on the MAC Controller printed circuit board. The first option selects whether the magnetic field size of the MFG on the truck will be reduced while the truck is within the MAC magnetic field. The truck MFG magnetic field will be shrunk when SW1 and SW2 are both in the OFF position. (OFF is when a switch is closest to the SW #). Conversely the truck MFG magnetic field will not be shrunk when SW1 is OFF and SW2 is ON. Position of SW3 does not matter.



The second option changes the basic function of the MAC to a Silent Zone field. The Silent Zone option is selected using the slide switch described above by putting SW1 in the ON position and SW2 and SW3 in the OFF position.

2.1.3 Inoperability Warning

A MAC does not generate inoperability warnings, but there are three small LED indicator lights on the outer surface of the MAC Controller that can be observed to verify proper operation. A green LED illuminates when power is applied to the MAC Controller. A yellow LED illuminates when a PAD is in the MAC magnetic field. A red LED illuminates when a truck is in the MAC magnetic field. These LEDs operate independently from other peripheral devices activated by discrete output signals from the MAC Controller.



2.2 Power Source/Charging

The MAC receives 12 VDC power from a Wall Wart Power Converter connected to a 110 – 240 VAC power source. There are no batteries in the MAC; thus, no charging is required.

2.3 Alerts

MACs do not issue alerts other than the discrete signals sent to peripheral devices and the LED indicators on the outer surface of the MAC Controller.

2.4 Maintenance

The MAC should be regularly cleaned to reduce buildup of dust and dirt. Daily checks should be performed to verify that:

- **Power is applied** - Verify that the green diagnostic LED on the outer surface of the MAC Controller is ON.
- **PADs are detected in the MAC Magnetic Field** – Verify that the yellow diagnostic LED on the bottom of the Controller comes ON when a pedestrian wearing a PAD walks into the MAC magnetic field.
- **Trucks with MFGs are detected in the MAC Magnetic Field** – Verify that the red diagnostic LED on the bottom of the Controller comes ON when a truck with a MFG drives into the MAC magnetic field.
- **Proper Operation of Peripheral Devices** – Verify that peripheral devices activated from the MAC wired outputs operate properly (e.g., horns, red/green stop lights, lights indicating truck approaching MAC controlled area, flashing lights indicating pedestrian and truck in the MAC magnetic field at the same time.
- **Verify Size of the MAC Controlled Area** - Use a pedestrian PAD to verify that the size or width of the MAC magnetic field is correct. This can be checked by verifying that the yellow diagnostic LED on the bottom of the Controller comes ON when the PAD passes the edge of the MAC field.

2.5 Adjustments

The size/width of the MAC magnetic field can be manually adjusted using a hand-held accessory device called a MAC Adjust PAD. This is accomplished by: (1) Walk into the MAC magnetic field holding the MAC Adjust PAD at the height that pedestrian PADs are normally worn. (2) apply power to the MAC Adjust PAD by removing the plastic pin from the PAD charge port – the MAC Adjust PAD will alarm for two seconds. (3) Take the MAC Adjust PAD to the desired boundary of the MAC magnetic field. (4) Hold the MAC Adjust PAD exactly at the desired boundary. The red and yellow LED diagnostic lights on the bottom of the MAC Controller should blink two times to

indicate the field is reset. (5) Wait two seconds and reinsert the plastic pin into the MAC Adjust PAD charge port.

2.6 Interferences

The MAC does not sense magnetic fields – hence EMI does not interfere with MAC operation. However since a MAC typically installs approximately 11 feet above the desired controlled area and creates 73 kHz magnetic fields, overhead steel facility structure that is transverse to a MAC wire loop can have local affects. This usually appears as a slight local widening of the MAC magnetic field at the transverse steel beam.

2.7 MAC Specifications

Model Number: HN-MAC

Size: 15" x 4" x 8" / 381 mm x 102 mm x 200 mm

Weight: 4.6 lbs ./ 2.08 kg

Input Voltage: 12 VDC

Magnetic Field Frequency: 73 kHz

Receiver Frequency: 916.48 kHz signal

Transmitter Frequency: 916.48 MHz

Transmitter Power: 0.001W (typical)

MAC Battery: none

Operating Temperature Range: -40°C to + 55°C ; -40°F to 130°F

Shipping Considerations: none

3 Revision History

3.1 Version 1.0 – April 2, 2021

Original Release. No revision history.