MAGTEK®
SECURITY FROM THE INSIDE

DynaWave

OEM Contactless NFC Module
Installation and Operation Manual

July 2022

Document Number:
D998200265-20

REGISTERED TO ISO 9001:2015

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Table 0-1 - Revisions

Rev Number	Date	Notes
10	Sep 26, 2018	Initial release
11	Mar 14, 2019	Section **3.7** add extreme temperature considerations
12	June 17, 2020	Updated figure 3-3 with new cut out dimensions
20	July 19, 2022	Include DynaWave Low Profile.

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- 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.

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Table of Contents

1 Introduction

This document provides guidelines and technical information for designing solutions that integrate **DynaWave**, MagTek's contactless NFC module for OEM solutions.

1.1 About DynaWave

DynaWave, MagTek's contactless NFC module, allows you to add NFC (near-field communication) contactless transactions to your payment solution. NFC allows for faster payments with a quick tap for transaction processing. Whether you need to accept D-PAS®, PayPass™, payWave®, ExpressPay®, Apple Pay®, Android Pay® or any other mobile wallet that supports contactless, DynaWave is ready.

1.2 Applications

Accept contactless payments in almost any environment. DynaWave is a perfect fit for contactless payment environments including mobile point of sale applications, point of transaction kiosks, and unattended payment terminals. DynaWave also works great in other NFC contactless environments, including electronic identity locations, and key cards / fobs.

1.3 Security

DynaWave uses 3DES encryption coupled with DUKPT (Derived Unique Key Per Transaction) key management to secure your transaction data.

1.4 Integration

Designed for easier development, DynaWave is available with USB and UART connections so developers can choose the connection that works best for the solution. Contact a representative to find the best fit for your application and to request the software developer kits (SDKs) and documentation.

1.5 About DynaWave Components

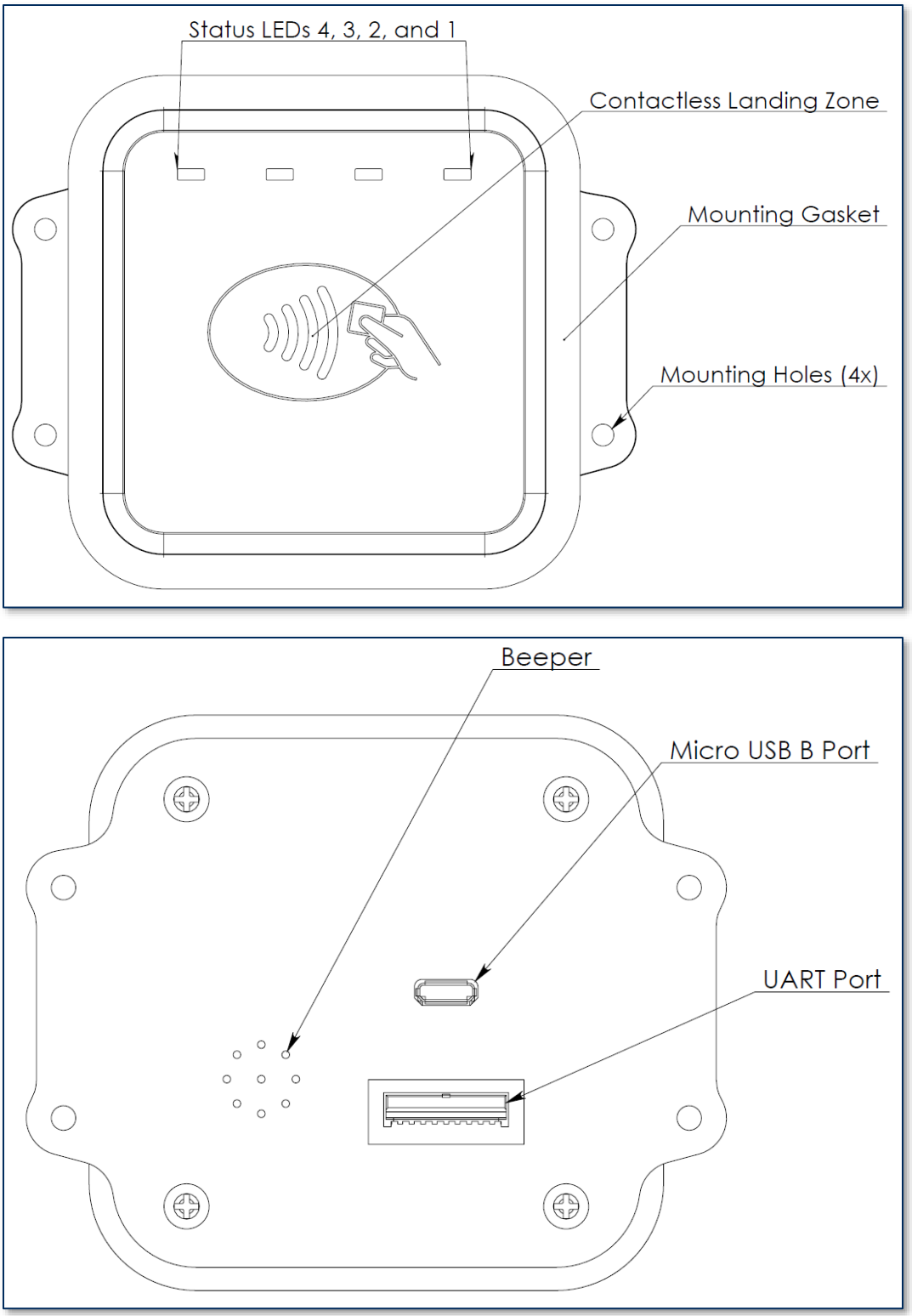


Figure 1-1 - DynaWave Major Components

1.6 About Terminology

In this document, DynaWave is referred to as the **device**. It is designed to be connected to a **host**, which is a piece of general-purpose electronic equipment which can send commands and data to, and receive data from, the device. Host types include PC computers/laptops, tablets, smartphones, and custom boards. Generally, the host must have **software** installed that communicates with the device and is capable of processing transactions. The combination of device(s), host(s), software, firmware, configuration settings, physical mounting and environment, user experience, and documentation is referred to as the **solution**. During a transaction, the host and its software interact with the **operator**, such as a cashier or bank teller, while the device interacts with the **cardholder**.

1.7 About Solution Planning

A smooth deployment of a solution that integrates DynaWave requires some up-front planning and decision-making:

- Determine the overall **functional requirements** and desired **user experience** of the solution DynaWave will be integrated into.
- Determine what **documentation** and **training** will be required from solution design through testing and field deployment.
- Determine what type of **host** DynaWave will connect to, and what **connection type** it will use. The host can be a computer or specialty board with a USB port or UART port (for example, MagTek's mDynamo EMV Contact Reader / Transaction Hub Module). When planning, include any additional support or devices required by the host and its connection, such as physical locations, mounting, and power connections. **Table 1-1** provides a list of available compatible devices and accessories.
- Determine what **software** will be installed on the host and how it will be configured. Software can include operating system, transaction processing software, security software, board firmware, and so on. Include any additional support required by the software, such as network connections.
- Determine how DynaWave should be **configured**, and specify that when you order devices. MagTek or your reseller can advise. For deep detail about configuration options and how they affect device behavior, see ***D998200215 DYNAWAVE PROGRAMMER'S MANUAL (COMMANDS)***.
- Determine how the solution design will integrate DynaWave electrically (see section **2 Electrical Integration** for details).
- Determine how the solution design will integrate DynaWave mechanically (see section **3 Mechanical Integration** for details).
- Develop an **installation procedure**. Basic device installation steps are provided in section **4 Installation**, but installing technicians will need solution-specific materials. If DynaWave will be incorporated into a solution before shipping, the installation procedure would be an assembly drawing or assembly and test work instructions.
- Determine how the solution will be **tested** and, if appropriate, how it will be **certified**.
- Determine how the solution will be **maintained**. See section **6 Maintenance** for guidance on maintaining the DynaWave portion of the solution.
- Determine how the solution will be **regularly inspected**. Proper inspection requires additional solution-specific training, instructions, and visual references for inspecting the entire solution for tampering, unauthorized added components such as eavesdropping or skimming devices, and so on.

Table 1-1 - Available Accessories

Part Number	Description	Related Sections
21079812	MDYNAMO	**UART Port [J6]**
1000003798	CABLE, UART, DYNAWAVE	**UART Port [J6]**
1000004824	ESD HARNESS CABLE, DYNAWAVE	**Grounding / ESD Protection** **UART Port [J6]**
1000002547	CABLE, USB A PLUG TO RIGHT ANGLE MICRO USB B PLUG	**USB Device Port [J3]**

1.8 Handling

⚠ CAUTION

Proper handling of the device throughout delivery, assembly, shipping, installation, usage, and maintenance is very important. Not following the guidelines in this document could damage the device, render it inoperable, and/or violate the conditions of the warranty.

From device delivery through assembly, shipping, installation, usage, and maintenance, the device must not be exposed to conditions outside the ratings in **Appendix A Technical Specifications**.

If the device is exposed to cold temperatures, adjust it to warmer temperatures gradually to avoid condensation, which can interfere with the operation of the device or cause permanent damage.

Upon receiving the device, inspect it to make sure it originated from an authentic source and has not been tampered with.

Do not drop or shake the device.

The device should be transported/stored inside an anti-static bag at all times.

Before removing the device from the package, remove any static charge from your body by touching an earth-grounded metal surface.

Avoid touching the exposed pins on the connectors when handling the device.

For information about ongoing maintenance of the device, such as cleaning, see section **6 Maintenance**.

2 Electrical Integration

2.1 Overview

⚠ CAUTION

This document describes how to use DynaWave safely and securely. Not following the guidelines in this section could damage the device, render it inoperable, and/or violate the conditions of the warranty.

This section provides information and guidelines for designing the electrical aspects of a solution that incorporates DynaWave. MagTek strongly recommends vetting and testing solution designs before finalizing and deploying them, to make sure the design meets all requirements (e.g., functional, legal, security, certification, safety, and so on).

When designing the electrical portions of a solution that incorporates DynaWave, consider the following:

- Review section **1.5 About DynaWave Components** for an overall introduction to the device's physical features and what they are called.
- Review **Appendix A Technical Specifications**.
- See all the subsections below for options and constraints involving cable design, signals, power, and other aspects of electrical integration. To coordinate with the solution's mechanical design team about cables, see section **3.6 Cabling**.
- Consider additional factors that may affect the electrical aspects of the solution design. See section **3.7 Miscellaneous Considerations**.
- Review safe handling practices in section **1.8 Handling** to make sure the logistical aspects of the solution design meet the device's handling requirements.
- Review recommended installation practices in section **4 Installation**. The steps provided in that section depend on the solution design team to customize the steps or fill in solution-specific details before distribution to installation technicians.
- Review section **6 Maintenance**. Depending on the solution design, the maintenance procedures may require modifications, or the solution may require additional maintenance not covered in the general guidelines provided here.
- Review any additional requirements from other agencies, such as PCI certification requirements, building codes, and so on, which may introduce additional constraints to the solution design.

2.2 About the Connectors

DynaWave provides the following connections (see section **1.5 About DynaWave Components**):

- A **USB Device port**, which can be connected to a USB-capable host for power and full-speed bidirectional communication. For details, see section **2.5 USB Device Port [J3]**.
- A **UART port**, which can be connected to a UART-capable host (usually a custom board) for bidirectional TTL-level serial communication. It can also be used in solutions that need a separate connection for attaching external earth ground. For details, see section **2.3 Grounding / ESD Protection** and section **2.5 USB Device Port [J3]**.

2.3 Grounding / ESD Protection

To guard against ground loops and to protect the device against electrostatic discharge (ESD), it is important for the solution design to ground the device correctly by connecting it to the lowest impedance return path available. MagTek strongly recommends checking whether the host's communication ports provide earth ground, and whether the cable carries that ground all the way to the port on the device. This will help make an informed decision about proper grounding.

MagTek strongly recommends solution designs bring in earth ground to the device using ONE AND ONLY ONE of the possible paths:

- Bring in earth ground through the USB cable's metal connector shell to the **USB Device Port [J3]**. In this case, it is very important to make sure the host and cable carry earth ground all the way to the device. If they do not, use a single-wire cable and ground the **UART Port [J6]** as described below.
- Bring in earth ground through pin 10 of the **UART Port [J6]**. This can be done using an O-ring connector at the other end of the cable, to be mounted to the nearest available earth ground, such as an earth grounded enclosure (see **Figure 2-1**). If there is no enclosure, or if the enclosure does not provide earth ground, use a custom harness to bring in earth ground from another source.

If it is not practical to connect earth ground using only one of the available paths (for example, if the solution uses multiple shielded cables that provide earth ground from the host), the solution design must ensure that every source of external earth ground is at the same electrical potential, to prevent damaging ground loop currents from occurring.

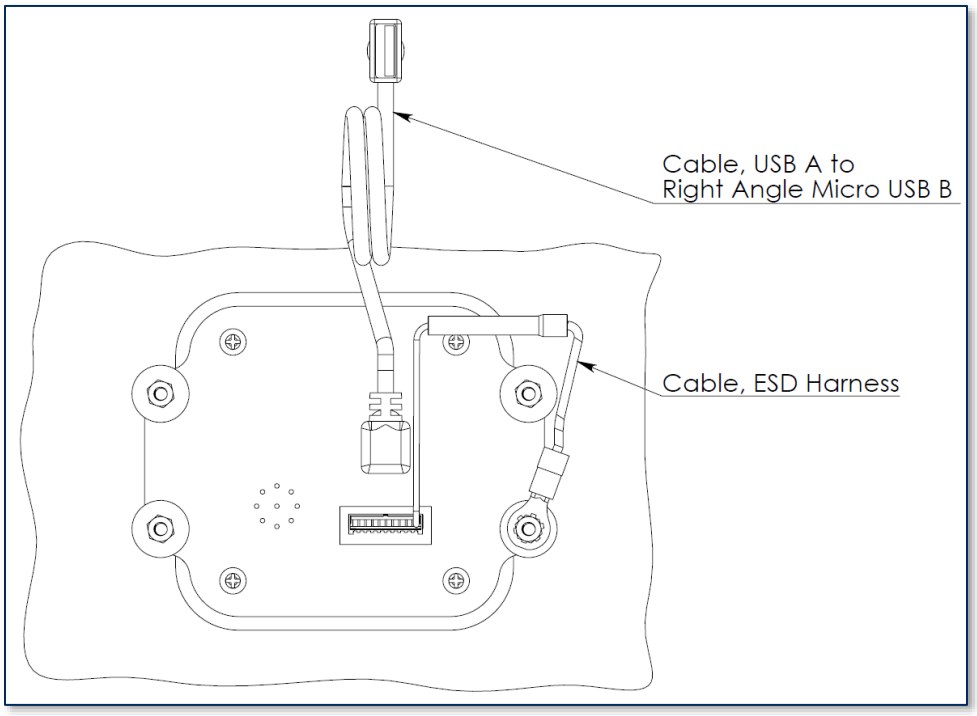


Figure 2-1 - Cable Configurations for Earth Ground

2.4 Shielding and Conditioning

MagTek recommends using shielded cables to provide noise immunity and to prevent radiated emissions. The device itself has been tested by an FCC lab for Class B radiated emissions and susceptibility, and has no special shielding requirements. For details, see the FCC information provided at the beginning of this document.

MagTek also recommends that all communication cabling should be draped together where possible, and isolated from the earth grounding cable to DynaWave and any other unrelated wiring at the installation site that could potentially couple noise into the device.

The device has no special requirements for power conditioning or signal conditioning.

2.5 USB Device Port [J3]

⚠ WARNING

Do not provide power to DynaWave through both the USB Device Port and UART Port at the same time. Doing so could present a safety hazard and / or permanently damage the device and connected equipment. Solution designs should include safeguards against accidental double connections throughout the device's lifecycle.

The USB Device port J3 can be used to provide power and full-speed bidirectional communication with a USB-capable host. It is a Micro-USB B receptacle designed to mate with a standard connector found on commercially available Micro-USB B cables. See **Table 1-1** on page **13** for a list of available cables and accessories MagTek has tested with the device. See section **3.6** for further information about cabling.

When powered through the USB port, the device draws a maximum of 350mA in steady state. Solutions should build in a safety margin that anticipates potential peaks up to 500mA.

Programmers should see section **7 Developing Host Software** for cross-references to programming tools and documentation for communicating via this port.

2.6 UART Port [J6]

⚠ WARNING

Do not provide power to DynaWave through both the USB Device Port and UART Port at the same time. Doing so could present a safety hazard and / or permanently damage the device and connected equipment. Solution designs should include safeguards against accidental double connections throughout the product's lifecycle.

The UART port **J6** can be used to provide power and bidirectional TTL-level serial communication with a UART-capable host, which is generally a custom board designed specifically for the solution. The UART port can also be used to provide earth ground in cases where earth ground is not available to the **USB Device Port [J3]** (see section **2.3 Grounding / ESD Protection**). The port connector is a ***JST B10B-ZR-SM4-TF*** header designed to mate with a ***JST ZHR-10*** connector or equivalent. **Table 2-1** provides the port's pinout definitions, and **Figure 2-2** shows the physical location of pin 1.

Table 2-1 - Pinout Specification for UART Port [J6]

UART Signal	Connector Pin
GND	1
5V	2
5V	3
Device_RX_Data	4
5V	5
Device_TX_Data	6
Not connected	7 (no pin present)
Not connected	8 (no pin present)
GND	9
EARTH GND	10

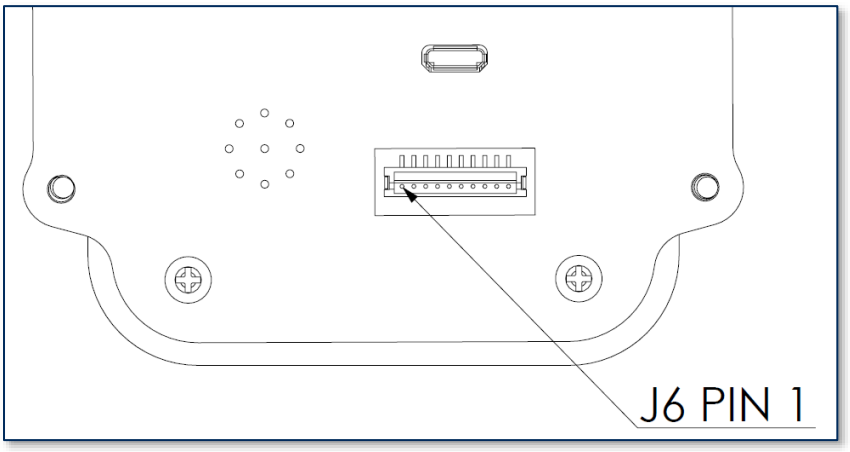


Figure 2-2 - DynaWave J6 Pin 1 Location

The 5V pins and GND (digital ground) pins must be connected across the terminals of a power supply. For optimal performance, use a 5VDC ±5% power supply with a current capacity of 500mA or greater. The worst-case ripple voltage at the power supply's 5VDC output must not exceed 100mV RMS.

When powered through the UART port, the device draws a maximum of 350mA in steady state. Solutions should build in a safety margin that anticipates potential peaks up to 500mA.

MagTek recommends 22AWG wires for all signal and power lines. The connector contacts must have a minimum of 15µ" of selective gold plating over nickel.

MagTek recommends enclosing all wires in a shielded earth-grounded jacket, and a maximum length for the combination UART/power cable of 32 feet (10 meters). Actual cable length may vary based on cable material and environmental factors. **See Figure 2-3** for an example cable design. See **Table 1-1** on page **13** for a list of available cables and accessories MagTek has tested with the device. See section **3.6** for further information about cabling.

The communication settings for the UART port are shown in **Table 2-2**. The host must begin communication using existing device settings, then can use that connection (or the **USB Device Port [J3]**) to reconfigure the port settings. Programmers should see section **7 Developing Host Software** for cross-references to programming tools and documentation for communicating through this port and configuring the device.

Table 2-2 - UART Communication Settings

Parameter	Value / Default
Signal Voltage	3.3V (TTL)
Transmission Protocol	Asynchronous
Duplex	Full
Data Length	8 bits (Bit 7: MSB, Bit 0: LSB)
Parity	None
Start bits	1 bit
Stop bits	1 bit
Flow Control	None
Transmission Speed (baud rate)	115200 baud

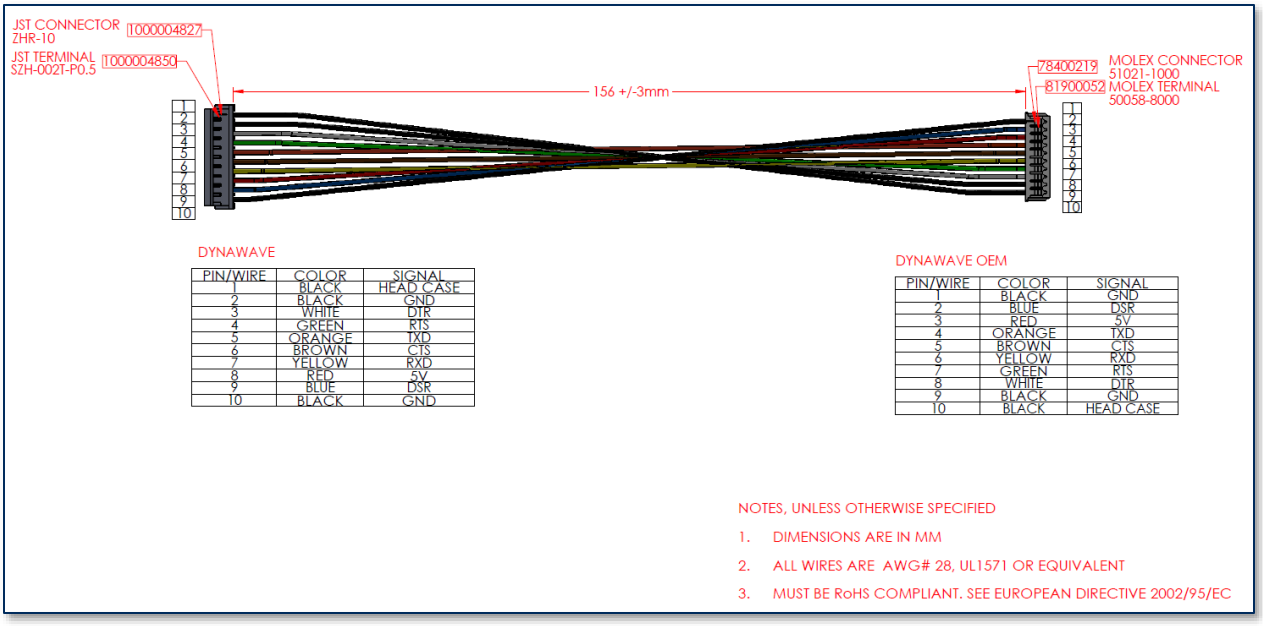


Figure 2-3 - Example UART / Power Cable

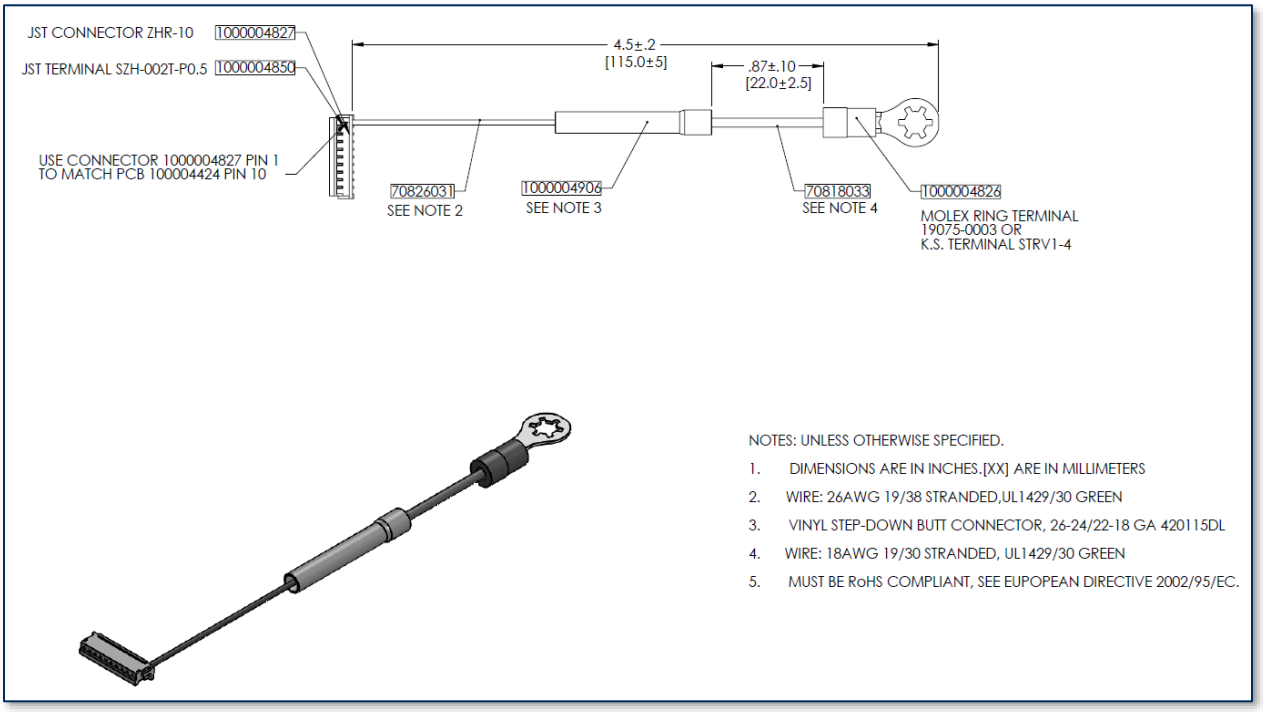


Figure 2-4 - Example Ground Cable

3 Mechanical Integration

3.1 About Mechanical Integration

⚠ CAUTION

This document describes how to use DynaWave effectively, safely, and securely. Not following the guidelines in this section could damage the device, render it inoperable, and/or violate the conditions of the warranty.

This section provides information and guidelines for designing the mechanical aspects of a solution that incorporates DynaWave. MagTek strongly recommends vetting and testing solution designs before finalizing and deploying them, to make sure the design meets all requirements (e.g., functional, legal, security, certification, safety, and so on).

When designing the mechanical portions of a solution that incorporates DynaWave, consider the following:

- Review section **1.5 About DynaWave Components** for an overall introduction to the device's physical features and what they are called.
- Review **Appendix A Technical Specifications**.
- See section **3.2 Dimensions** and section **3.3 Orientation** for overall device dimensions and requirements on mounted orientation.
- If the solution includes an enclosure, design the enclosure front panel. Information about fitting the device into a panel cutout are in section **3.4 Enclosure Design**.
- Determine how the device will be mounted. See section **3.5 Mounting** for details. Coordinate with the electrical design team to make sure the enclosure design, mounting hardware, and solution-specific installation instructions meet electrical requirements.
- Coordinate with the electrical design team to plan cable routing and fastening. See section **3.6 Cabling** for details.
- Consider additional factors that do not fit these categories. See section **3.7 Miscellaneous Considerations**.
- Review safe handling practices in section **1.8 Handling** to make sure the logistical aspects of the solution design meet the device's handling requirements.
- Review recommended installation practices in section **4 Installation**. The steps provided in that section depend on the solution design team to customize the steps or fill in solution-specific details before distribution to installation technicians or production line personnel.
- Review section **6 Maintenance**. When installed in the solution-specific enclosure, the maintenance procedures may require modifications, or the solution may require additional maintenance not covered in the general guidelines provided here.
- Review any additional requirements from other agencies, such as PCI certification requirements, building codes, and so on, which may introduce additional constraints to the design.

3.2 Dimensions

Overall dimensions of the device are shown in **Figure 3-1**. For solutions that include an enclosure, the dimensions of the enclosure panel cutout required to accommodate DynaWave are specified in section **3.4 Enclosure Design**. Overall dimensions for DynaWave Low Profile are shown in **Figure 3-2**.

On request, MagTek can provide a 3D model of the device's envelope to assist with the mechanical portion of solution design. MagTek strongly recommends building and testing prototypes with actual devices before finalizing the solution design.

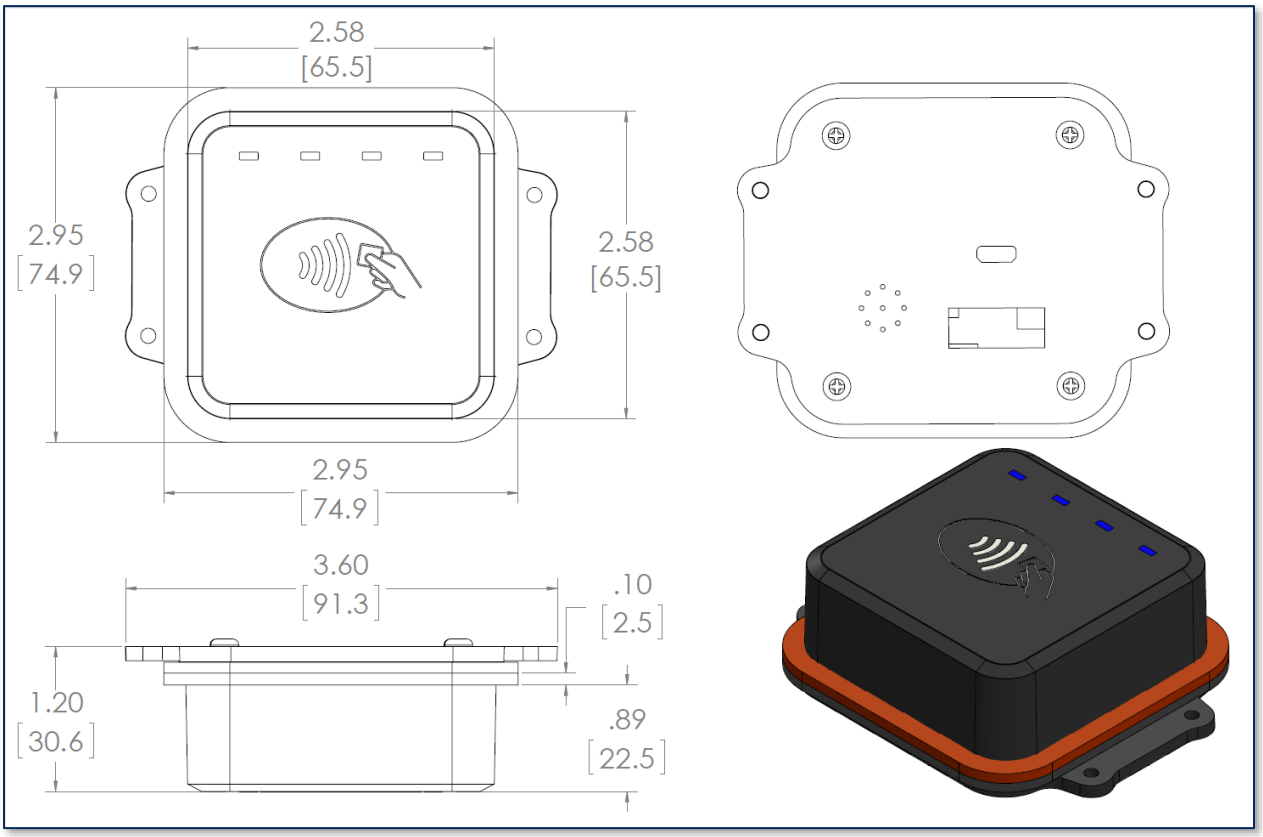


Figure 3-1 - DynaWave Mechanical Dimensions in mm [inches]

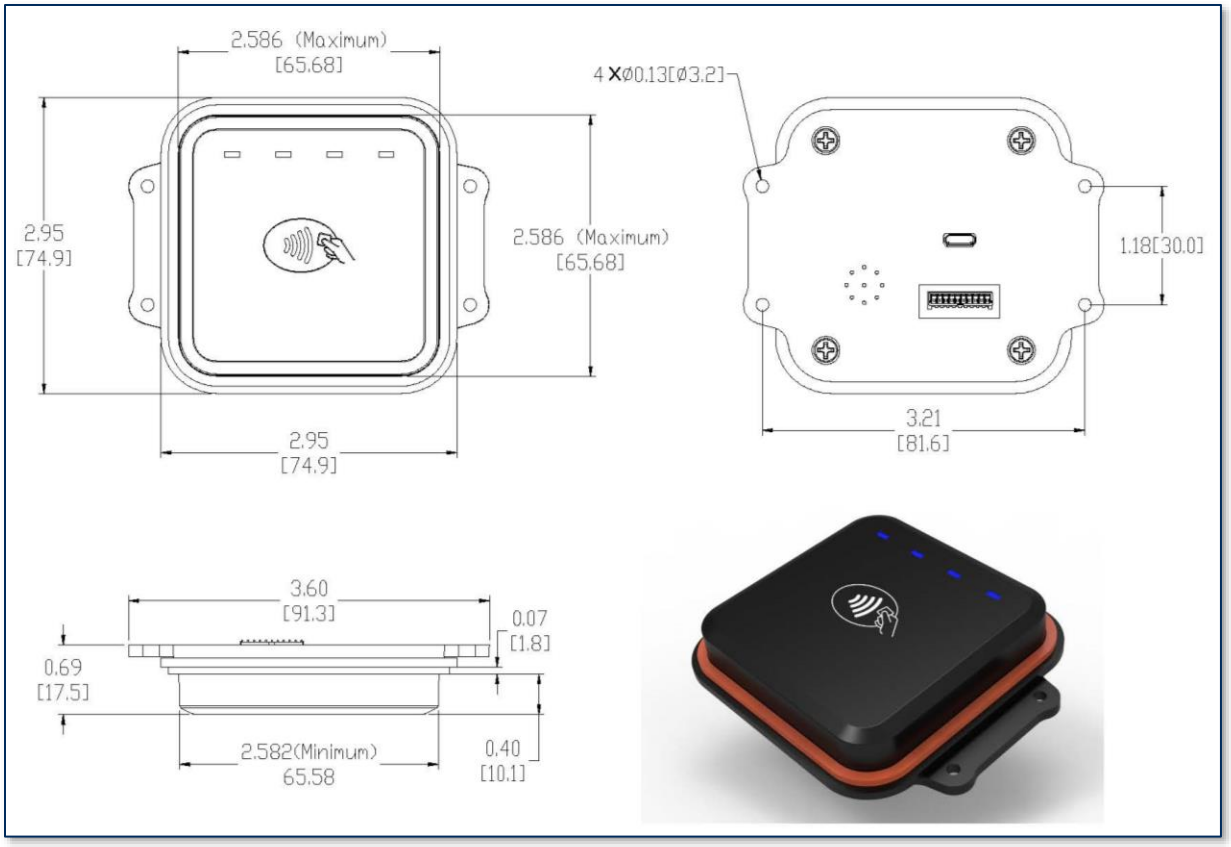


Figure 3-2 – DynaWave (Low Profile) Mechanical Dimensions in mm [inches]

3.3 Orientation

The device is designed only to be oriented with the LEDs on top and facing the cardholder, as shown in **Figure 3-3**. The Contactless Indicator mark on the face of the device is a trademark of EMVCo, LLC, and may convey additional requirements to the solution design. See EMVCo usage guidelines.

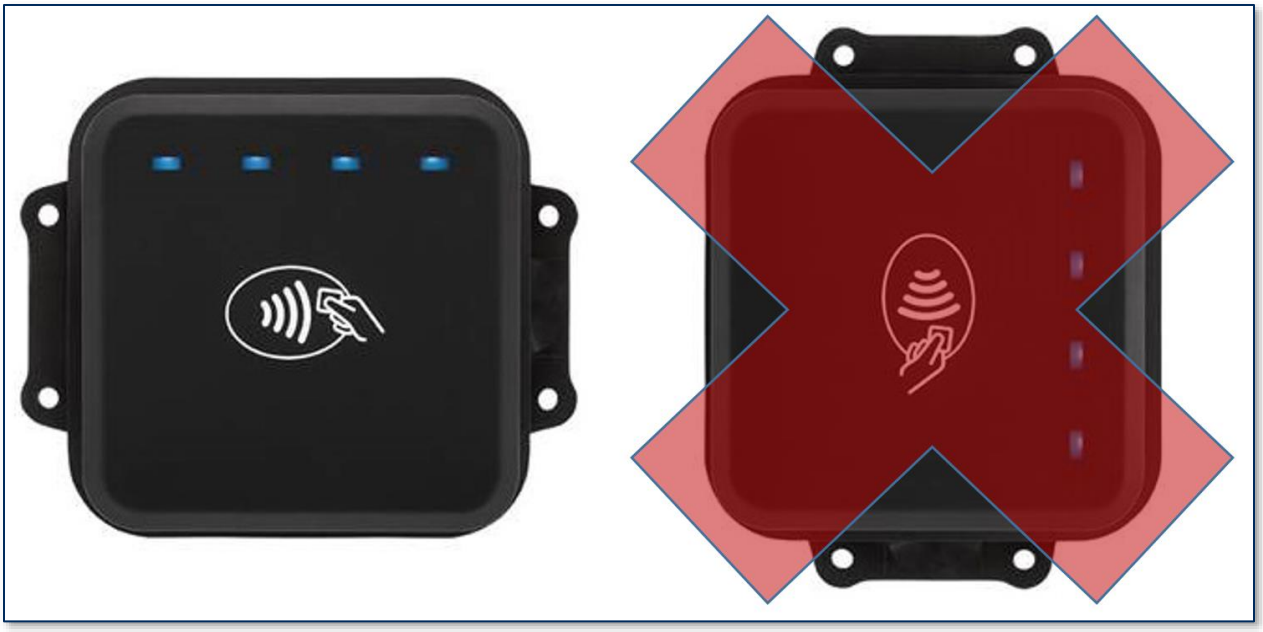


Figure 3-3 - DynaWave Mounting Orientations

The device must be installed such that cardholders have an unobstructed path to tap cards or contactless devices (such as smartphones).

The device does not incorporate drain holes, so there are no additional requirements for installation pitch angle to facilitate drainage.

3.4 Enclosure Design

Some solution designs may include an enclosure for security, protection from environmental factors, or even to add trade dress. This section supports those solutions by providing important enclosure design considerations.

The solution enclosure must include a cutout sized to expose the device's main body. Reference dimensions for the enclosure cutout, including the location of either screw holes or threaded studs, are shown in **Figure 3-4**. The cutout dimensions should account for thermal expansion and contraction of the enclosure, deformation due to mechanical stresses on the enclosure, and so on. Poorly toleranced cutouts may result in being unable to install the device in the enclosure or uninstall the device from the enclosure for maintenance or replacement, or may leave too much gap between the enclosure and the device. Section **3.2 Dimensions** provides detailed dimensions of the device's installation face.

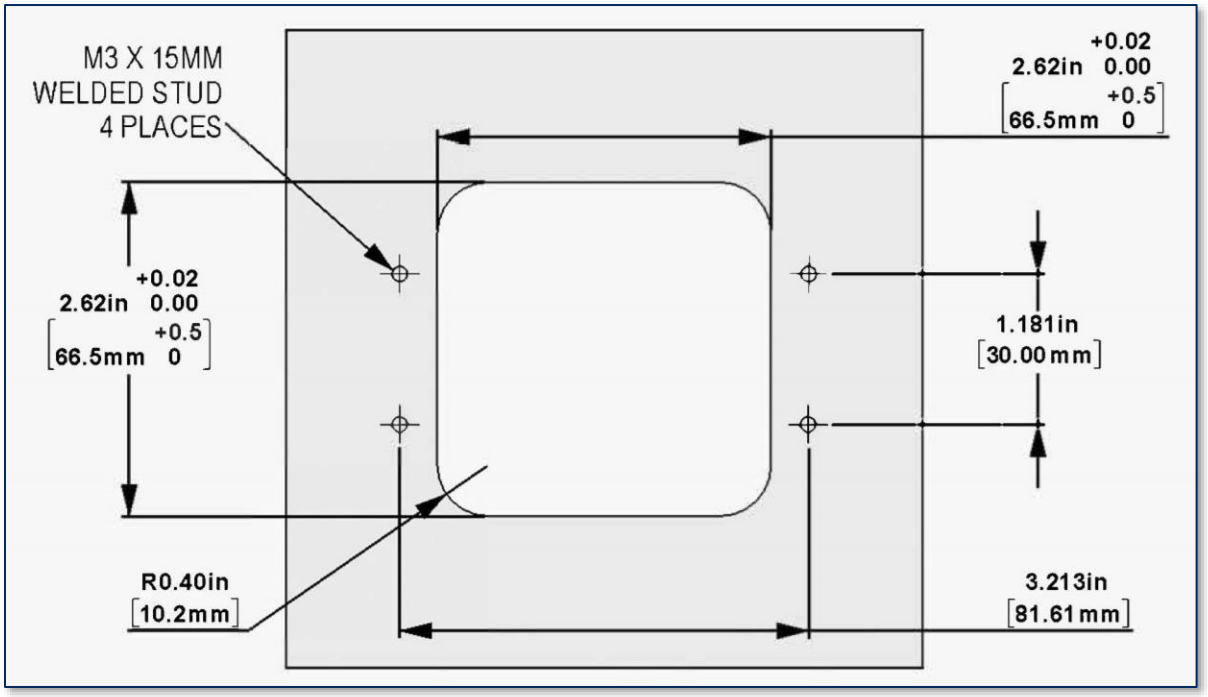


Figure 3-4 - DynaWave Panel Cutout Dimensions in Inches [mm]

If the solution will be exposed to the elements, the enclosure must protect the device. The device includes a removable gasket which can be used on its installation face to create a seal with the enclosure. The device is designed for ingress protection from the gasket forward, but the rear of the device behind the gasket must be protected. In solutions that require a seal, the enclosure cutout must fully engage the gasket, which generally means the areas where the gasket contacts the enclosure must be flat and rigid, and the mounting hardware and torque specifications must be selected carefully to create a solid seal (see section **3.5 Mounting** for details).

In addition, if the enclosure contains ferromagnetic material such as steel, the solution design team must carefully consider the enclosure's radio frequency (RF) absorbing effects on NFC contactless performance. The device must protrude from such a mounting panel as much as possible (see **Figure 3-5**) to avoid adverse effects on NFC communication range. For example, assuming a flat sheet steel panel, the panel thickness should not exceed 0.25 in. (6.5mm). Designers may also wish to consider hybrid designs that use a larger cutout and a "surround" of non-ferromagnetic material such as plastic, which further decouples the device from RF absorbing effects of the mounting panel.

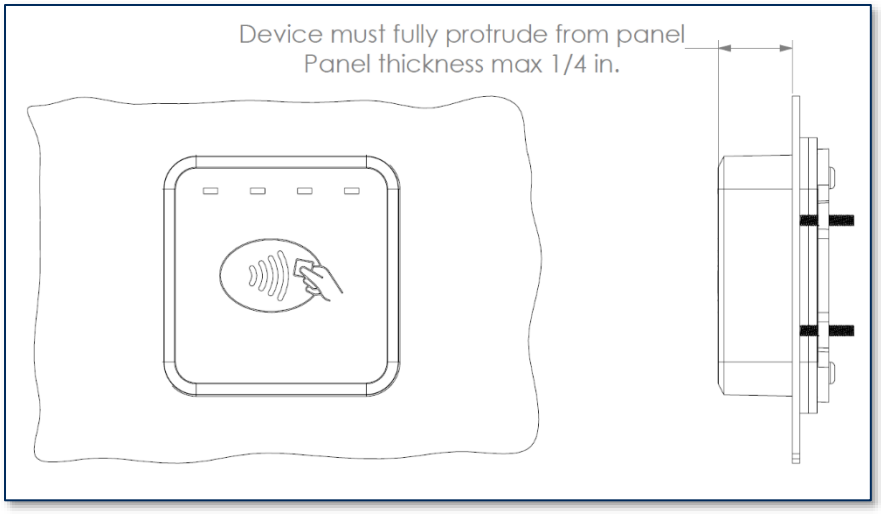


Figure 3-5 - DynaWave Protrusion from Panel

Further, if the area around the device includes any protrusions beyond the plane of the mounting panel that contain ferromagnetic material (such as privacy shields or weather shields, or a recessed sheet metal panel design like **Figure 3-6**), those protrusions may also affect NFC performance, and the solution design should include adequate clearance distances between those features and the device.

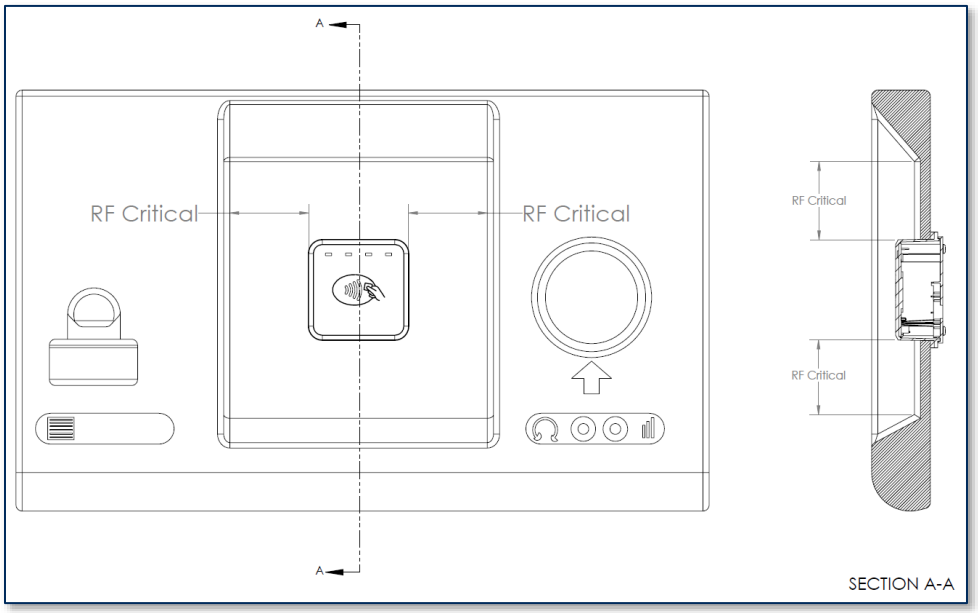


Figure 3-6 - DynaWave Protrusion Clearance Example

3.5 Mounting

The device is designed to be mounted into an enclosure using threaded studs, nuts, and washers (see **Figure 3-7**). It can also be mounted using screws, nuts, and washers, and some solutions may not include an enclosure. Studs or screws should be size **#4** or **M3**. The washers help spread the load more evenly, and can either be 4 ea. round washers, 2 ea. long flat washers, or one fixing plate. MagTek recommends 2 ea. long washers. See **Figure 3-6** for recommended washer / fixing plate dimensions.

If the solution will be exposed to the elements, it must include an enclosure, and the mounting hardware and torque specifications must apply adequate force to create a water-tight seal between the enclosure and the gasket. For example, for M3 threaded rods and nuts, the torque may be in the range of 5 to 6 in-lbs. (0.5 to 0.7 N-m).

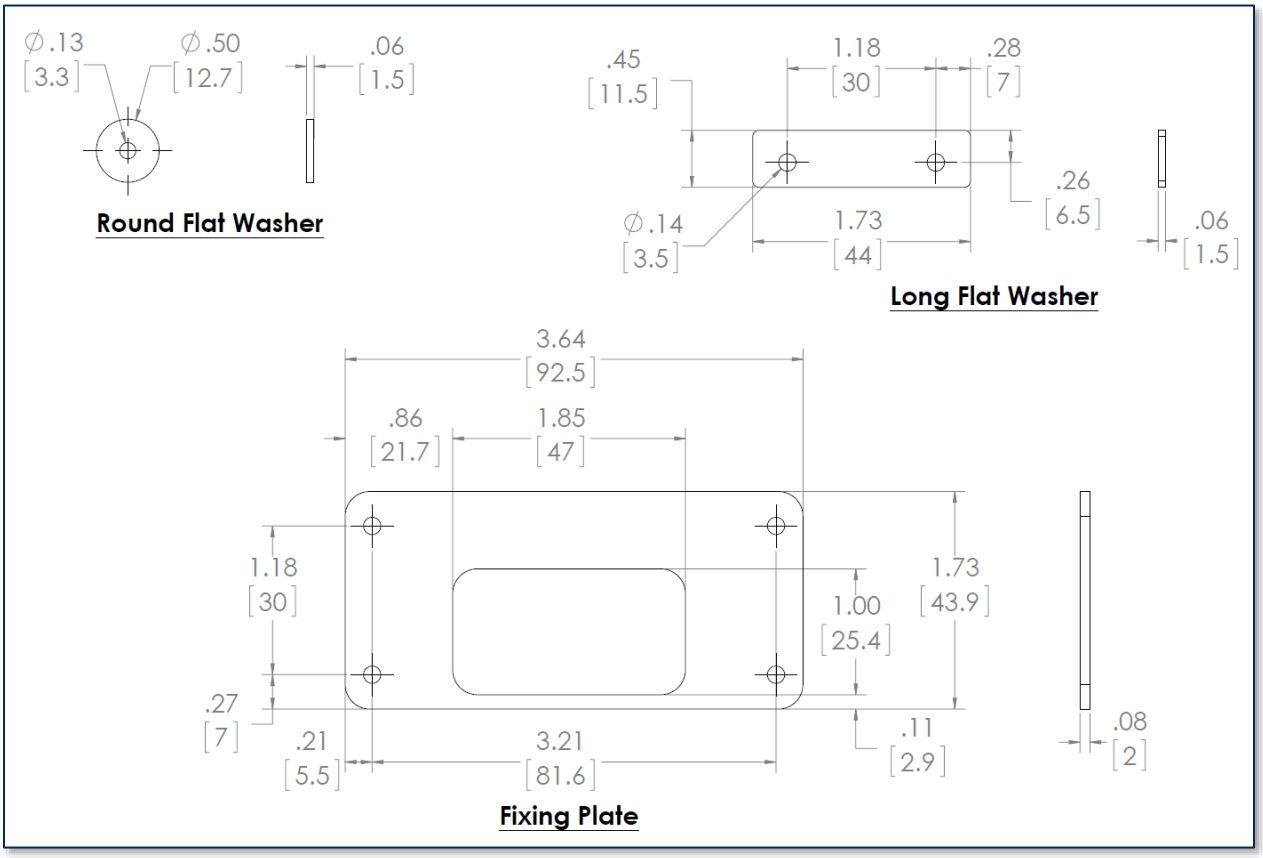


Figure 3-6 - Example Mounting Washer Designs

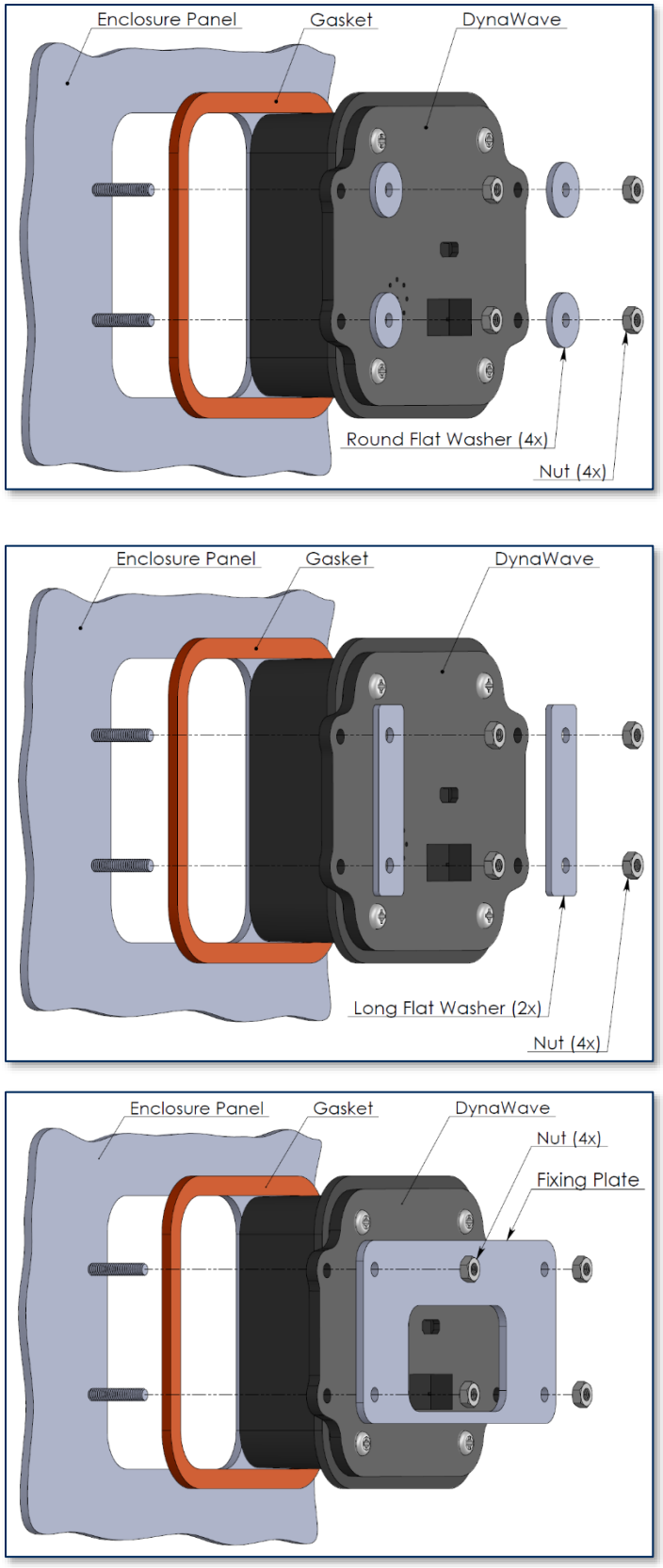


Figure 3-7 - DynaWave Threaded Stud / Nut Mounting

3.6 Cabling

This section provides information about mechanical integration of cables into a solution design. For details about electrical aspects of integrating the device, see section **2 Electrical Integration**.

MagTek recommends incorporating cable ties (not included) in the solution design to make sure the cables stay connected during use, and provide strain relief for the device's connectors.

If the solution design includes an enclosure, the enclosure should include adequate clearance for installation and maintenance personnel to connect and disconnect all mechanical hardware and cables. If the solution uses cable ties for strain relief, it should provide additional clearance to cut and re-tie them. It should also provide support for the device when cables are being connected and disconnected.

Installation technicians will need to be provided detailed instructions for installing the cabling. For some basic guidelines, see section **4 Installation**.

3.7 Miscellaneous Considerations

3.7.1 Temperature

The device operates on low power, so no special cooling should be necessary. However, if the solution design includes an enclosure, there must be adequate clearance around device for heat to escape, and the enclosure must not be an isolated thermal system that traps indefinite amounts of heat.

When communicating with the host using the USB connection, DynaWave may require up to 120 seconds to re-initialize after a power disconnect event occurs.

Upon power-up after a power interruption, DynaWave automatically attempts to reestablish USB communication with the host. In most cases, the USB connection will be available within a few seconds. However, in certain environmental conditions (such as extreme temperature), up to 120 seconds may pass before the USB connection is available. No action is required from the host or operator. At the conclusion of the re-initialization period (5 to 120 seconds) DynaWave will resume operation.

3.7.2 Sound

The device incorporates a beeper for auditory feedback to cardholders and operators (see section **1.5 About DynaWave Components**, section **5.3 About Sounds**). The solution design should take this into account to avoid accidentally making the beeper inaudible.

4 Installation

This section provides an example of possible instructions to install DynaWave in a specific solution. They are not designed to be distributed as-is to installing technicians. The solution design team must develop solution-specific installation instructions, and may use these steps as a starting point.

⚠ DANGER

FIRE RISK: If the device is being installed in a location near combustible materials, it is critical to power down the whole system where it is being installed before installation to avoid risk of fire or explosion. In these cases, follow the installation site's standard Lock-Out/Tag-Out procedures to prevent accidental power-on before installation is complete. IF YOU CAN NOT GUARANTEE POWER WILL REMAIN OFF DURING INSTALLATION, DO NOT PROCEED.

1) See section **1.8 Handling** for important information about handling the device before installation.
2) Make sure the power supply to the whole system is turned off and locked off.
3) Route all cables, then connect the ground cable first, then connect all other cables.
4) Tie cables down as specified by the solution design.
5) Line up the four holes on the mounting face of the device with the mounting hardware (usually studs or screws) on the enclosure's mounting panel. If the solution design includes an enclosure, make sure the gasket is installed, then insert the device into the mounting hole cutout.
6) Inspect the device and enclosure from the front to make sure the device is pushed all the way into the cutout. The device should be square, even, and flush with all four sides of the cutout. Some enclosures with tighter tolerances may require additional force to push the device into place.
7) Tighten the mounting hardware to half of the final torque using a diagonal pattern (e.g., upper right, lower left, upper left, lower right). This is important to create even pressure around the whole gasket.
8) Re-inspect to make sure the device is still positioned properly in the cutout.
9) Tighten the mounting hardware, again in a diagonal pattern, to the full torque.
10) Finish up any additional installation steps specified by the solution design, such as re-securing the enclosure, cleaning the device, and installing any trade dress.
11) Restore power to the system.
12) Test the connection between the host and the device.

5 Operation

5.1 Card and Contactless Device Reading / Transactions

Transactions begin when the host software initiates them. Cardholders should tap cards or contactless devices in the contactless landing zone on DynaWave's front face (see section **1.5 About DynaWave Components**).

The host software may choose to use the notifications from the device as events to trigger additional guidance (such as audible, visual, or tactile feedback) to the cardholder or operator.

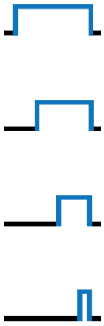
Before and during transactions, an operator may control or monitor the device using the host software, LEDs, and/or beeper (see section **5.2 About the LEDs**, section **5.3 About Sounds**).

Programmers of host software should see section **7 Developing Host Software** for cross-references to programming tools and documentation for communicating with the device.

5.2 About the LEDs

DynaWave provides four LEDs (see **Figure 1-1**) that provide feedback to operators and cardholders about transaction progress and the internal state of the device. **Table 5-1** shows how to interpret the LED patterns.

Table 5-1 – General Status LED Meaning

Color	Flashing Pattern		Meaning
Off	Off		The device is not receiving power or is in a mode where the host is updating firmware.
Blue	Flashing Periodically		The device flashes LED4 every 5 seconds when it is connected and powered, ready for the host to send it a command.
Blue	Solid On		LED 4 is lit blue when the host has initiated an EMV transaction that allows the cardholder to present a contactless card or contactless device.
Blue	LEDs 4, 3, 2, 1 Light **In Sequence**		LEDs 4, 3, 2, and 1 light in sequence when contactless communication is in process. After all 4 LEDs are lit, the cardholder can safely remove the card or contactless device from the contactless landing zone.
Blue	LEDs 4, 3, 2, 1 Light **Simultaneously**		The device has just been powered on and is performing a self-test.

5.3 About Sounds

DynaWave's beeper provides feedback to operators and cardholders about the internal state of the device:

- The device sounds one short beep on startup to test the beeper and indicate the device is powered on.
- The device sounds one short beep after it has successfully read a contactless tap, and the cardholder can safely remove the card or contactless device from the contactless landing zone.
- The device sounds two beeps when an operator cancels a pending EMV transaction.
- The device sounds two short beeps when it fails to read a nearby contactless card or contactless device.

6 Maintenance

6.1 Mechanical Maintenance

⚠ CAUTION

The device does not contain any user-serviceable parts. Do not open the enclosure.

Periodic cleaning of DynaWave's exterior may be required. To clean the outside of the device, wipe down the unit with a soft, damp cloth and then wipe with a dry cloth.

Solution training should direct assemblers, operators, and maintenance personnel to use a clean, dry cloth to clean the device. Do not use chemicals or solvents.

6.2 Updates to Firmware, Documentation, Security Guidance

In addition to the security guidance in the product manuals, MagTek may provide updates to this document, as well as supplemental security guidance or notices regarding vulnerabilities, at www.magtek.com. MagTek advises checking the product's home page periodically for the most up-to-date information.

MagTek may also contact customers when it is necessary to update firmware to address critical product bugs or security vulnerabilities. For details about obtaining and updating the device's firmware, contact MagTek Support Services or your reseller. The general firmware update process is as follows:

1) Obtain the firmware image to install (usually a **.bin** file or a **.hex** file) and make it available on the filesystem of a Windows-based update workstation, which may simply be the solution's primary host.
2) Make sure the device is connected to the update workstation via USB.
3) In a web browser on the update workstation, navigate to https://rs.magensa.net/rs2/app/publish.htm to download the **MagTek Reader Configuration Program**.
4) Install any necessary prerequisites.
5) Run the application. If Windows presents security prompts, make sure the security information is legitimate, then select the options to proceed.
6) When prompted to log in, press the **Use Public Account** button.
7) In the **Device List**, select the device you wish to update.
8) Make sure the application shows device information, including its **Firmware** part number and revision number. This indicates the application has successfully connected to the device.
9) Make sure the **Firmware** part number for the device matches the filename you have received (for example, if the application reports the device has firmware ***1000001234A00*** installed, the filename should contain ***1000001234***). If it does not, contact MagTek Support Services for assistance.
10) In the **Key** list, select **MAGENSA PROD UIK 9014500**.
11) Press the **Download Firmware** button.
12) When prompted whether you are using DynaWave, press the **Yes** button to launch the **Open** window for file browsing.
13) Browse to the new firmware image file on the update workstation's filesystem and press the **Open** button. The application shows ongoing status reports.
14) Wait until the application reports **Firmware loaded successfully**, the device automatically resets, and the application reconnects and reports refreshed device information.

15) Confirm the reported **Firmware** part number and revision now match the firmware you installed.

16) Close the **MagTek Reader Configuration Program** window.

6.3 Removal from Service

DynaWave does not retain any sensitive data when it is not powered. To remove from service, simply dispose of the device according to standard electronic waste disposal practices in your region.

7 Developing Host Software

MagTek produces software development kits (SDKs) with documentation and libraries that wrap higher-level functions around the device's various available communication protocols. These libraries simplify the development of host software for solutions that use DynaWave, and include:

- ***99510132 SOFTWARE, SDK, DYNAMAG / DYNAMAX / EDYNAMO / UDYNAMO / ADYNAMO / MDYNAMO / TDYNAMO / DYNAWAVE (WINDOWS .NET)***
- ***99510133 DYNAMAG, DYNAMAX, EDYNAMO, MDYNAMO, TDYNAMO, DYNAWAVE SDK FOR WINDOWS***
- ***99510109 DYNAMAG, DYNAMAX, EDYNAMO, UDYNAMO, ADYNAMO, BULLET, MDYNAMO, TDYNAMO, DYNAWAVE SDK FOR ANDROID***

In addition to the SDK libraries, custom software on any operating system can communicate directly with the device using native libraries and protocols. For details, see ***D998200215 DYNAWAVE PROGRAMMER'S MANUAL (COMMANDS)***.

For more information about developing custom applications that integrate with DynaWave, see the MagTek web site or contact your reseller or MagTek Support Services.

Appendix A Technical Specifications

DynaWave Technical Specifications	
Reference Standards and Certifications	
ISO/IEC 14443 (Type A, Type B) EN55024-2010 Information Technology Equipment - Immunity Characteristics TDEA (3DES)-CBC using DUKPT FCC Title 47 Part 15 Class B EMVCo Type Approval – ESD Terminal Evaluation – Test Cases IEC 61000-4.2 Edition 2.0 Electromagnetic Compatibility (EMC) CE Class B EMC, CE Safety UR/CUR UL Recognized, UL 94V-0 Safety of Flammability of Plastic Materials MasterCard TQM ANSI/IEC 60529-2004 Degrees of Protection Provided by Enclosures IPC-A-610-2010 Acceptability of Electronic Assemblies, Class II Assembly EU Directive Waste Electrical and Electronic Equipment (WEEE) EU Directive Restriction of Hazardous Substances (RoHS) California Proposition 65 (California) Universal Serial Bus Specification 2.0	
Physical Characteristics	
Dimensions (L x W x H):	3.60 in. W x 2.95 in. H x 1.20 in. D (91.3 mm x 74.9mm x 30.6mm)
Weight:	2.3 oz. (64g)
Supported Mounting Options:	Solution-specific enclosure using nuts on threaded studs/screws
Physical Characteristics (DynaWave Low Profile)	
Dimensions (L x W x H):	3.59 in. W x 2.94 in. H x 0.68 in. D (91.3 mm x 74.9 mm x 17.5 mm)
Weight:	2.04 oz. (58g)
Supported Mounting Options:	Solution-specific enclosure using nuts on threaded studs/screws
Card Read Characteristics	
Magnetic Stripe Reader:	Not Applicable
Magnetic Stripe Decoding:	Not Applicable
Magnetic Swipe Speeds:	Not Applicable
Contact Chip Card Reader:	Not Applicable
Contactless Reader	EMV Contactless, D-PAS®, PayPass™, payWave®, ExpressPay®, Apple Pay®, Google Pay, Samsung Pay®
User Interface Characteristics	
Status Indicators:	Four Blue LEDs
Keypad:	Not Applicable

DynaWave Technical Specifications	
Security Characteristics	
Certifications:	Not Applicable
Electrical Characteristics	
Power Inputs:	Micro USB-B
Voltage Requirements:	5 VDC
Current Draw:	Idle: 70mA Active: Up to 350mA
Power Outputs:	None
Data Storage:	Non-volatile memory for storage of configuration parameters
Communication Characteristics	
Wired Connection Types:	Micro-USB B, compatible with USB 2.0 and higher UART
Software Characteristics	
Tested Operating System(s):	Windows 7, Windows 8.1, Windows 10, Android 4.4.2 and above on devices with USB On-The-Go (OTG) support
Environmental Resistance	
Ingress Protection:	IP65 Compliant
Operating Temperature:	-22°F to +158°F (-30°C to +70°C)
Operating Relative Humidity:	10% to 90% non-condensing
Storage Temperature:	-22°F to +158°F (-30°C to +70°C)
Storage Relative Humidity:	10% to 90% non-condensing
Vibration Resistance:	Not Applicable
Shock Resistance:	Not Applicable
ESD Tolerance (EMVCo):	Not Applicable
ESD Tolerance (FCC/CE):	±4kV contact discharge / ±8kV air discharge when properly grounded
Vapor Resistance:	Not Applicable
Reliability	
Shelf Life:	5 years minimum
Magnetic Read Head Life:	Not Applicable
ICC Read Head Life:	Not Applicable