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Transportation Safety Division

3M™ Impact Detection System Instructions for Installation and Initial Setup

Information Folder 6.1
May 2022

Initial Issue

1 Follow the Instructions

3M recommends only the standard practices outlined in this information folder. Procedures and materials which do not conform to these instructions are excluded. Device installation requires the Pi-Lit mobile device app and proper tools. Read these instructions in their entirety before beginning device installation.

For warranty information, see 3M Product Bulletin IDS.

2 Description

The 3M™ Impact Detection System ("**IDS**") can help improve critical infrastructure safety asset monitoring capabilities by automating the detection and reporting of both major and nuisance impacts on traffic safety assets. IDS sensors can increase visibility and decrease reporting time of both major and nuisance impacts on traffic safety assets. Major impacts can cause damage that is visibly obvious to law enforcement and roadway maintenance crews, damage caused by nuisance impacts may not be. Although the damage may not always be apparent, nuisance impacts can compromise safety assets, reducing their efficacies and creating dangerous situations for the motoring public. Unreported nuisance impacts can, therefore, represent an unknown safety risk to drivers. By increasing impact awareness and decreasing impact reporting times, IDS can increase agency awareness of nuisance impacts and decrease asset restoration times to help create significantly safer roads.

The IDS is made up of three main components: 3M™ Impact Detection Gateways (“**Gateways**”), 3M™ Impact Detection Nodes (“**Nodes**”), and the Web-Based Dashboard (“**Dashboard**”). The Gateways and Nodes are sensor devices (collectively referred to herein as “**Devices**”) that are installed on the assets being monitored. While Gateways and Nodes both have sensing and communications capabilities, Gateways have cellular modems which allow them to connect to the Cloud and transmit data to the Dashboard. The Nodes send data to the Gateways, which relay the data to the Dashboard. The Dashboard can be accessed via any web browser or using the dedicated phone app. The Dashboard is where the Devices' information is accessed and monitored and where data from any impacts or events detected by the Nodes or Gateways are saved and viewable. Impact and event notifications can be communicated via email, SMS text message, or app push notification, depending on user preference. More information on the IDS components is provided in 3M Product Bulletin IDS.

3 Health and Safety Information

Please read, understand, and follow all safety information contained in these instructions prior to IDS use. Retain these instructions for future reference.

Read all health hazard, precautionary, and first aid statements found in the Safety Data Sheets (SDS), Article Information Sheets, and products labels of any materials for important health, safety, and environmental information prior to handling or use. Also refer to SDSs for information regarding the volatile organic compound (VOC) contents of chemical products. Consult local regulations and authorities for possible restrictions on product VOC contents and/or VOC emissions. To obtain SDSs and Article Information Sheets for 3M products, go to 3M.com/SDS, contact 3M by mail, or for urgent requests call 1-800-364-3577.

3.1 Intended Use

The IDS is intended to provide critical traffic safety asset monitoring on roads and highways. It is expected that all users be fully trained in safe IDS operation. Use in any other application has not been evaluated by 3M and may lead to an unsafe condition.

Table 1. Signal word definitions.

Explanation of Signal Word Consequences		
⚠	DANGER	Indicates a hazardous situation which, if not avoided, will result in serious injury or death.
⚠	WARNING	Indicates a hazardous situation which, if not avoided, could result in serious injury or death.
⚠	CAUTION	Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury and/or property damage.

⚠ DANGER

To reduce the risks associated with fire, explosion, and impact from airborne Device:

- Follow all installation, maintenance, and use instructions for any products (e.g. adhesives/chemicals) used to attach Devices to asset.

To reduce the risks associated with general workplace hazards:

- Use appropriate personal protective equipment per workplace and industry standard operating practices and procedures.

To reduce the risks associated with chemicals or inhalation of chemical vapors:

- Follow all personal protective equipment recommendations in the SDSs for any products (e.g. adhesives/chemicals) used to attach Devices to asset.

⚠ WARNING

To reduce the risks associated with fire, explosion, and impact from airborne Device:

- Do not install Devices if they are visibly damaged or you suspect they have been damaged.
- Do not attempt to modify, disassemble, or service Devices. Contact 3M for service or Device replacement.

To reduce the risks associated with fire, explosion, and improper disposal:

- Dispose of lithium battery pack according to local environmental regulations. Do not dispose of in standard waste bins, in a fire, or send for incineration.

To reduce the risks associated with fire and explosion:

- Do not recharge, open, crush, heat above 185 °F (85 °C), or incinerate battery pack.
- Store Devices in a location where temperature will not exceed 86 °F (30 °C).

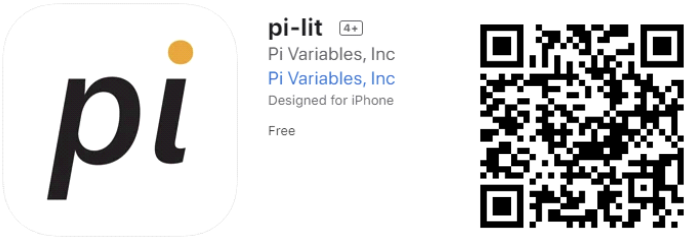
⚠ CAUTION

To reduce the risks associated with impact from airborne Device:

- Devices must be installed and maintained by road maintenance or road construction personnel in accordance with local codes and Device installation instructions.

4 Initial Setup

Before physically installing a Node or Gateway device onto an asset, the device must be enrolled in the Dashboard. This is done using the “Pi-Lit” app, available from the Apple App Store and Google Play Store.



Apple App Store: https://apps.apple.com/us/app/pi-lit/id1488697254

Google Play Store: https://play.google.com/store/apps/details?id=com.pilit

Once the app has been downloaded onto your mobile device, login. If logging in for the first time, create a profile, by setting a username and password. Once logged in, select the QR Code Capture Icon to open your mobile device's camera.

QR Code Capture Icon

Point the camera at the QR code on the label of the Gateway or Node and hold it steady until the app identifies and reads the QR code. You may need to slowly move the mobile device closer or farther from the QR code to achieve the focus required to read the QR code. Once the QR code has been read, the Pi-Lit app will open this asset's information. Select "Add Image" at the top right to open the camera and take a picture of the newly installed device. This picture will be linked to the asset for easy identification.

- Once a device has been installed on an asset and enrolled in the Dashboard, the sensor's impact alert sensitivity is set to a default value. The required sensitivity setting may vary depending on the asset type and location, thus the sensor's individual sensitivity can be adjusting from the Dashboard. If the default sensitivity is used, it is recommended to monitor the device in the first week after installation to determine if the sensitivity level requires adjustment.

5 Installation

Nodes and Gateways must be installed on compatible application surfaces using the methods outlined in this document. Always consult the appropriate product bulletin and information folder prior to application. If additional information is needed, contact your 3M representative.

The 3M Impact Detection Gateway and 3M Impact Detection Node can operate within a temperature range of -4–149 °F (-20–65 °C) and relative humidity range of 0–95% and have an exposure tolerance range of -29–165 °F (-34–74 °C).

Horizontal installations, those with the label of the Node or Gateway facing skywards, are the most stable. A direct line of sight to the sky is also required to achieve the best cellular connection and GPS reception. The installation process varies with asset type and material.

If installing a Node or Gateway on a crash cushion, it is best to install it towards the back of the crash cushion. Install the device at the mid point of a cross member if possible.

Ideal installation locations allow for strong device connectivity to the network and are on surfaces that are well protected from potential impacts. Do not install Nodes outside the range of a Gateway with verified Cloud connectivity. This means that for projects that include both Gateway and Node installations, the Gateway must be installed first and its connection verified. This in turn allows the Gateway to confirm its Nodes' connectivities once they have been installed.

Prior to installing a Node or Gateway on a traffic safety asset, power on the device to confirm connectivity. Connectivity confirmation should be done as close to the final installation location as possible. To power on the device, hold down the power button until the LED flashes green two times. If the LED flashes red two times, it means the device has been powered off. If this occurs, press and hold the power button again until the LED flashes green two times.

Once the device has been powered on, it will cycle through a LED flash sequence - The device will then contact the Cloud server to verify that it is connected. If successful, a confirmation response will be received via SMS text message.

If Node activation is unsuccessful, check the distance between it and the next Node or Gateway. If the distance is too great, the newly installed Node will not be able to connect. This can be remedied by:

1 Installing another Node between the non-connected Node location and the closest connected Node, or
2 Installing a Gateway at the current location instead of a Node.

Optimal communication performance can be achieved at distances of up to 500 ft unobstructed line-of-sight between Nodes and 300 ft unobstructed line-of-sight between Nodes and Gateway, as indicated in Table 2. However, maximum communication distance depends on each device's surroundings. For example, buildings and hills will interfere with communication and reduce the maximum communication distance.

Table 2. Maximum optimal unobstructed line-of-sight communication distances for Nodes and Gateways.

	Maximum Optimal Unobstructed Line-of-Sight Distance Between Devices (ft)
Node to Gateway	300
Node to Node	500

If installing devices when the ambient temperature is below 50 °F, keep Gateways and Nodes near the vehicle's heater on the passenger's side floor to help minimize any effects the cold temperature might have on the devices' adhesive prior to installation. Only remove devices from the heated area to affix them to assets. When transporting devices from the heated area to the asset, place them inside your jacket with the adhesive side against your body to keep it warm until installation.

5.1 Recommended Equipment

- Device with included 3M™ VHB™ Tape
- 3M™ Scotch-Brite™ 7447 Pro Hand Pad
- 70/30 isopropyl alcohol (IPA) wipes
- A Thermocouple (an IR Thermometer can also be used effectively on aluminum substrates)
- Propane Torch
- Personal Protection Equipment

5.2 Installation on Aluminum

When installing a Node or Gateway device on an aluminum substrate, prepare the substrate properly and affix the device using the included VHB tape. Minimum device installation temperature is 20 °F. A thermocouple or infrared thermometer may be used to determine substrate temperature. To properly prepare the substrate, follow these steps:

1. Use a Scotch-Brite hand pad to scrub the installation surface.
2. Use a 70% IPA wipe to clean the installation surface. Confirm IPA has dried before continuing to next step.
3. If substrate temperature is:
    a. **Less than 60 °F (16 °C)**: Using a propane torch, perform a flame sweep to warm up the installation surface to a temperature of 120–250 °F (50–120 °C). **NOTE:** Follow appropriate safety precautions when using a hand-held propane torch. Go to step 4.
    b. **Greater than 60 °F (16 °C)**: Go to step 4.
4. Peel off the VHB tape liner, adhere the VHB tape and Device to the installation surface. Press down on the Device with both hands for 10 seconds. Do not apply pressure to power button during this step.

5.3 Installation on Galvanized Steel

When installing a Node or Gateway device on a galvanized steel substrate, prepare the substrate properly and affix the device using the included VHB tape. Minimum device installation temperature is 20 °F. A thermocouple or infrared thermometer may be used to determine substrate temperature. However, IR thermometers may not perform well with all galvanized steel substrates; thermocouple may be more suitable. To properly prepare the substrate, follow these steps:

1. Use a Scotch-Brite hand pad to scrub the installation surface.
2. Use a 70% IPA wipe to clean the installation surface. Confirm IPA has dried before continuing to next step.
3. Using a propane torch, perform a flame sweep to warm up the installation surface to a temperature of 120–250 °F (50–120 °C). **NOTE:** Follow appropriate safety precautions when using a hand-held propane torch.
4. Peel off the VHB tape liner, adhere the VHB tape and Device to the installation surface. Press down on the Device with both hands for 10 seconds. Do not apply pressure to power button during this step.

5.4 High Density Polyethylene (HDPE)

When installing a Node or Gateway on a galvanized steel substrate, prepare the substrate properly and affix the device using the included 3M™ VHB™ tape. Minimum device installation temperature is 20 °F. To properly prepare the substrate, follow these steps:

1 Use a 70% IPA wipe to clean the installation surface. Confirm IPA has dried before continuing to next step.
2 Depending on local regulations, either:

   a Using a propane torch, flame treat the HDPE substrate as described in Section 5.4.1, or
   b Apply 3M™ High Strength 90 Spray Adhesive, 3M™ Adhesion Promoter 111, or 3M™ Tape Primer 94. Check recommended product application temperatures and follow all application procedures. **Note:** Test any other spray adhesive for compatibility with substrate and VHB tape prior to use.

3 Peel off the VHB tape liner, adhere the VHB tape and Device to the installation surface. Press down on the Device with both hands for 10 seconds. Do not apply pressure to power button during this step.

5.4.1 Flame Treatment

Flame treatment is an oxidative process that can increase the surface energy of a plastic substrate to improve adhesion. To achieve a proper flame treatment, the surface must be exposed to an oxygen-rich flame plasma (blue flame) at the proper distance and for the correct duration, typically a distance of one-quarter to one half (¼–½) inches and a speed of ≥1 inch/second. Proper flame treatment distance and duration vary and must be determined for any given substrate or device.

The surface to be flame treated must be clean and free of all dirt and oil prior to flame treatment. To achieve an effective flame treatment, the flame should be adjusted to produce a highly oxygenated blue flame. A poorly oxygenated (yellow) flame will not effectively treat the surface. Flame treating is **not** heat treating. Heat is an unwanted by-product of the process and does not improve surface properties. Improper flame treating operations that overheat the plastic can soften or deform the substrate. A properly flame treated surface will not experience a significant rise in temperature.

5.5 Installation Matrix

Table 3. Device Installation Matrix

<table>
<tr><th colspan="3">3M Impact Detection System - Gateway and Node Installation Matrix
3M™ VHB™ Tape Application Procedures</th></tr>
<tr><th rowspan="2">Substrate</th><th colspan="2">Application Temperature</th></tr>
<tr><th><60 °F
(<16 °C)</th><th>≥60 °F
(16 °C)</th></tr>
<tr><td>Aluminum</td><td rowspan="2">1) 3M Scotch-Brite™ 7447 Pro Hand Pad Scrub
2) 70% IPA wipe
3) Use flame sweep to heat substrate to 120–150 °F (50–65 °C)</td><td>1) 3M Scotch-Brite 7447 Pro Hand Pad Scrub
2) 70% IPA wipe</td></tr>
<tr><td>Galvanized Steel</td><td>1) 3M Scotch-Brite 7447 Pro Hand Pad Scrub
2) 70% IPA wipe
3) Use flame sweep to heat substrate to 120–150 °F (50–65 °C)</td></tr>
<tr><td>HDPE</td><td>1) 70% IPA wipe
2) Flame treat or apply compatible adhesive</td><td>1) 70% IPA wipe
2) Flame treat or apply compatible adhesive</td></tr>
<tr><td colspan="3">* Keep Devices in heated cab (passenger floor heat) during install. Before installation, place Device in jacket with 3M VHB Tape against body to keep tape warm until installation. Remove liner and apply to prepared/heated surface.</td></tr>
</table>

6 Replacing a Gateway or Node

When a Gateway or Node must be replaced, a serrated cable saw should be used to cut through the adhesive tape used to mount the device. Use a steady back and forth motion to pull the serrated cable saw when cutting through the adhesive to separate the Device from the asset. It is a best practice to remove all residue from the asset before applying the replacement Gateway or Node. A cutting tool with a thin oscillating blade can be used to remove tape residue from the asset after the Device has been removed. If unable to remove all residue, consider the following options:

1 Identify another suitable location on the asset within 20 feet of the original Device's location and follow installation steps as outlined above.
2 If the replacement Device must be placed in the same location and local regulations permit, apply 3M™ High Strength 90 Spray Adhesive, 3M™ Adhesion Promoter 111, or 3M™ Tape Primer 94 over the remaining adhesive residue prior to installing the new Device. Check recommended product application temperatures and follow all application procedures. Ensure that the spray adhesive has dried before beginning the replacement Device's installation process as outlined above.

Once the replacement Device has been installed on the asset, the Dashboard will identify the new Device and its location.Once the replacement Device has been installed on the asset, the Dashboard will identify the new Device and its location. The history and data records of the Device being replaced can be transferred to the new Device to help ensure no events, data, or history is lost. Please contact support to request a data transfer.

7 Other Product Information

Always confirm that you have the most current version of the applicable product bulletin, information folder, or other product information from 3M's Website at http://www.3M.com/roadsafety.

8 Literature References

3M PB IDS 3M™ Impact Detection System
3M™ VHB™ GPH Series Product Data Sheet
3M™ Tape Primer 94 Technical Data Sheet
3M™ Adhesion Promoter 111 Technical Data Sheet
3M™ Hi-Strength 90 Spray Adhesive (Aerosol) Technical Data Sheet

For Information or Assistance
Call: 1-800-553-1380
In Canada Call:
1-800-3M HELPS (1-800-364-3577)

Internet:
http://www.3M.com/roadsafety

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