XANDEM
Synergistic Sensing

Tomographic Motion Detection (TMD) User Guide

Revision C

September 10, 2013

XANDEM

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This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. Changes or modifications to this hardware not expressly approved by Xandem could void the user's authority to operate the equipment.

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: (1) Reorient or relocate the receiving antenna. (2) Increase the separation between the equipment and receiver. (3) Connect the equipment into an outlet on a circuit different from that to which the receiver is connected. (4) Consult an experienced wireless technician for help.

This equipment may not be certified by your country's governmental regulations, and you are fully responsible for all usage and testing of the system in this regard.

Introduction

Congratulations on purchasing your Xandem Tomographic Motion Detection (TMD) kit! This document provides detailed technical information and will guide you through the process of installing and configuring your system.

A Xandem TMD system is made up of two kinds of devices. The **nodes** are the devices that surround the area where motion is to be sensed. These nodes are not actually sensors because each one cannot sense anything by itself - they only work in tandem with other nodes. The more nodes you have, the more area you can cover per system.

The **processing unit (PU)** is the second kind of device which acts as a gateway for the motion detection signal. It has two normally-closed contacts for motion and trouble triggering that can be used to easily integrate the TMD kit with other systems, as shown in Figure 1. When the TMD system detects motion within the area surrounded by nodes, or when a trouble with the system is detected, a normally-closed relay on the processing unit is opened. This is a standard way in which most security and automation panel equipment is triggered.
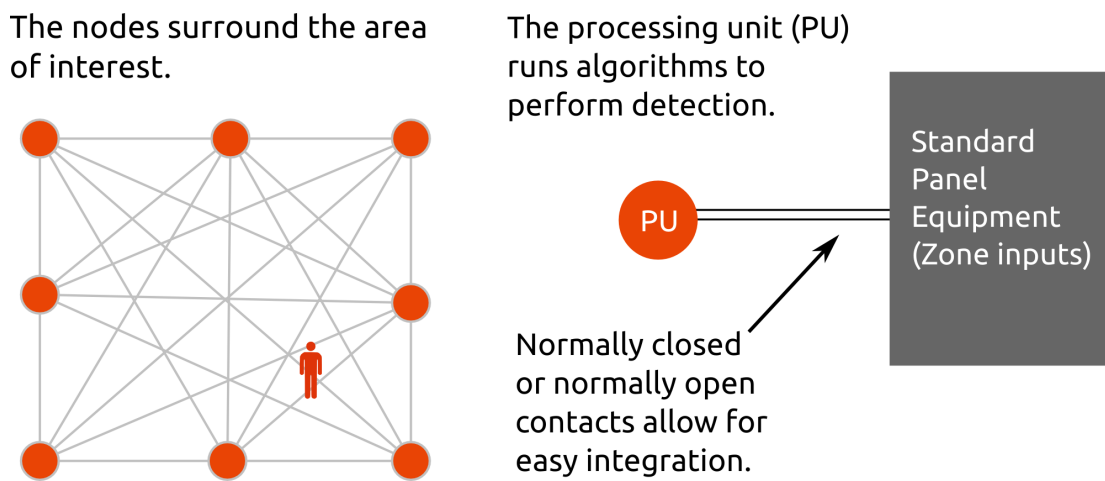
The nodes surround the area of interest.

The processing unit (PU) runs algorithms to perform detection.

Standard Panel Equipment (Zone inputs)

PU

Normally closed or normally open contacts allow for easy integration.

Figure 1: Xandem TMD architecture.

Hardware Specifications

Figure 2: A TMD processing unit (left) and plastic enclosure (right)

Specification	Node	Processing Unit
Supply voltage	3-12 Volts	3-12 Volts
Current per node/PU (typical)	34-50 mA	34-50 mA
Power per node/PU (typical at 6V)	240 mW	240 mW
Integration contacts	None	Normally closed relays for both motion and trouble
Max RF transmit power	4.5 dBm	4.5 dBm
RF frequency	Minimum: 2.403 GHz Maximum: 2.480 GHz Channel bandwidth: 5MHz Number of channels: 16	Minimum: 2.403 GHz Maximum: 2.480 GHz Channel bandwidth: 5MHz Number of channels: 16
Plastic enclosure dimensions	1.5 x 3.0 x 0.5 (inches)	1.5 x 3.0 x 0.5 (inches)

Table 1: Xandem TMD specifications.

Installation Instructions

Follow the Dos and Don'ts of Xandem TMD

DO:
- **Do test using a TMD demo kit before permanent installation.** The TMD demo kit is powered by batteries and enables fast testing in various environments. Testing with the demo kit will save you time and help you avoid installation problems.
- **Do place all nodes within range of each other.** Detection performance is maximized when all nodes are within wireless transmission distance of each other.
- **Do place the PU within range of all nodes.** The PU must be able to communicate with all nodes in the network. In some cases, this may require placing the PU near the area being sensed by the nodes and running a longer signal wire or wireless repeater from the PU to the panel.
- **Do place nodes 0.5-1.0 meters off the ground.** Nodes should be placed at approximately torso level of a human body so that detection performance is optimal.
- **Do mount nodes securely on sturdy structures.** If a node falls, shifts, or moves, it may lead to a false trigger. Make sure to secure the nodes firmly to something that will not move.
- **Do place nodes on the interior of the detection area walls.** When the area to be sensed is surrounded by walls, install the nodes on the interior side of the walls to maximize detection and minimize false triggering.
- **Do test perimeter sensitivity.** Walk or move vehicles around the outside of the area to make sure the threshold is not set so low that motion outside the perimeter causes false triggering.
- **Do use battery packs during configuration and testing.** It is recommended to test an area using portable battery power before hard-wiring an installation. This will ensure that the detection is successful before committing to a wired installation.
- **Do set sensitivity thresholds as high as possible.** To avoid false alarms, try setting the threshold at a high value upon installation. Test the system, and if it's not sensitive enough, decrease the threshold until it is. It's better to approach the optimum threshold from higher thresholds, and work your way to lower values to avoid false triggering.

DON'T:
- **Don't install nodes on the ground or against metal.** This will severely limit sensing performance and communication range of your TMD system. Place nodes at least .5 meters from the ground and do not mount to metal surfaces.
- **Don't install the sensing system around trees or foliage.** Moving branches and leaves can cause false triggering if they are within or near the network area. This is especially true when the area is open (not enclosed by dense walls like brick, concrete, masonry).
- **Don't instal nodes too high from the ground.** Placing nodes too high will raise the sensing plane and reduce sensitivity. EXCEPTION: If deploying the nodes in a three dimensional configuration, this rule can be ignored as long as links from node to node cross through the area to be sensed.
- **Don't place nodes around or near abrupt water flows.** Appliances such as dishwashers, toilets, ice makers, and washing machines may cause false triggering if they abruptly drain or load water. Large water pipes with abrupt streams may also cause a false trigger unless they are made of metal which naturally blocks the sensing from the moving water.

- **Don't install nodes on window sills.** Placing the nodes too close to windows may cause the system to be sensitive to motion outside.
- **Don't install the PU too far from the nodes.** The PU has to remain in a location where it can communicate with all of the nodes in the wireless network.
- **Don't mount nodes to structures that will move.** If the nodes move, false triggering may occur. Make sure to secure the nodes firmly to something permanent and sturdy.
- **Don't expose nodes to precipitation (rain, snow, hail).** Outdoor deployments of TMD are experimental. Precipitation may cause false triggering if water directly hits node enclosures. Make sure that all nodes are sheltered for any outdoor deployments.
- **Don't place nodes or PUs near microwave ovens.** Microwave ovens can cause interference to Xandem TMD systems. Make sure nodes remain at least 5 meters from microwave ovens.
- **Don't place nodes directly behind large metal objects.** This will cause some of the radio waves to reflect away from the interior of the network which decreases performance and creates possible sensitivity outside the detection area.
- **Don't mount nodes directly on metal.** Metal can distort the antenna patterns on the nodes and negatively affect detection performance. Keep large metal planes at least 1 foot away.

Choose a TMD kit size

TMD is sold in kits of 6, 10 and 15 nodes. The best kit size depends on the square footage of the area you want to cover, and the density of the obstructions within the area. Use the table below as a guideline for choosing a kit size. These sizes may vary depending on the environment.

TMD Kit Size (Number of nodes)	Light Obstructions (Drywall, plastic, thin wood)	Heavy Obstructions (Brick, concrete, large metal objects)
6 Nodes	500 square feet	500 square feet
10 Nodes	2000 square feet	1000 square feet
15 Nodes	5000 square feet	2000 square feet

Connect battery packs and power up nodes

It highly recommended that you perform a test usin[g]
a 3-12 VDC battery before permanent wiring. Inse[rt]
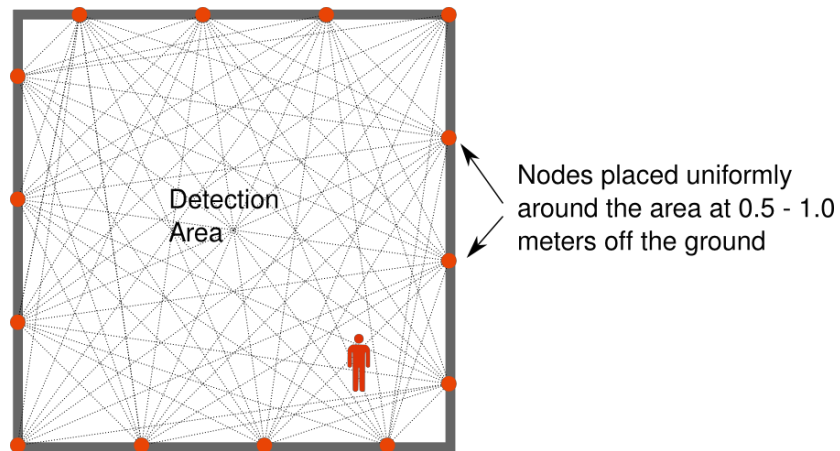battery pack wire leads into the TMD device
connectors as pictured.

**Be careful not to reverse the polarity (+/-) when
connecting the wires as this will permanently
damage the devices.**

Power up all nodes. After all nodes are on, the two
green LEDs should be illumnitated. If other LEDs
are lit, please see the "LED Status Indicators"
section of this document.

Deploy the nodes around the detection area

Place the nodes uniformly around the detection area at approximately 0.5 - 1.0 meter off the ground. Choose locations where you plan to mount the nodes permanently. Remember that each node is not actually a sensor, the connection "lines" going from node to node are what do the sensing. The more lines that cross a given location, the more sensitive the detection is.

Detection
Area

Nodes placed uniformly
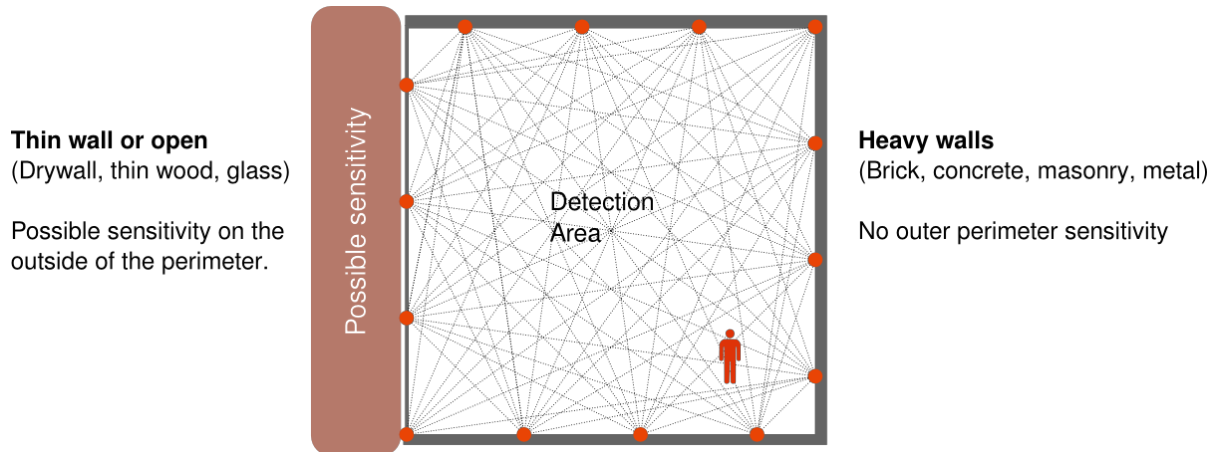around the area at 0.5 - 1.0
meters off the ground

Do not place nodes on or near the ground or the system will not function properly. Make sure the devices are completely stationary as movement of the nodes will cause false triggering.

Test motion detection and adjust sensitivity as needed

1. Power up the processing unit and wait for 20 seconds. The two green LEDs should be illuminated if it is receiving correctly from all nodes. After waiting the 20 seconds, if the orange or yellow LEDs are lit, a node may not be turned on or configured correctly, or the area may be too large for the number of nodes you are using. Please refer to the "LED Status Indicators" section for more information about how to interpret the LEDs.

2. Try moving around within the detection area to verify that motion is properly being sensed. The red LED on the PU turns on when motion is being detected. You may need to adjust the sensitivity to maximize detection performance (see instructions on how to change the sensitivity below). After movement has stopped, it may take a few seconds for the system to stop indicating motion. If nodes are moved, it will take longer for the motion detection to turn off after movement has stopped.

   If detection performance is poor even after adjusting the sensitivity threshold, the area may be too large for the number of nodes you are testing. Try using a larger kit, or reduce the total detection area by moving nodes closer together.

3. It is important to also test motion on the outside of the perimeter for false triggering. When the area is enclosed by heavy walls like brick, masonry, or concrete, outer perimeter motion will usually not be a problem. In open or thin-walled areas like drywall or thin wood, motion close to the perimeter of the detection area may cause false triggering. If this occurs, reduce sensitivity by raising the threshold as explained below, move nodes further inside the perimeter, or restrict access to the area just outside the perimeter by a few meters.

Thin wall or open
(Drywall, thin wood, glass)

Possible sensitivity on the outside of the perimeter.

Possible sensitivity

Detection Area

Heavy walls
(Brick, concrete, masonry, metal)

No outer perimeter sensitivity

4. Do not deploy the system around or near trees that may blow in the wind, as they may cause false triggering. If heavy walls surround the detection area, trees on the outside should not be a problem regardless of wind.

To check the current sensitivity threshold of the motion detection, do the following:
1. Click S1 on the PU one time.
2. Click S2 on the PU two times.
3. Count the number of times that the LEDs blink to determine the current setting for the motion sensitivity threshold.
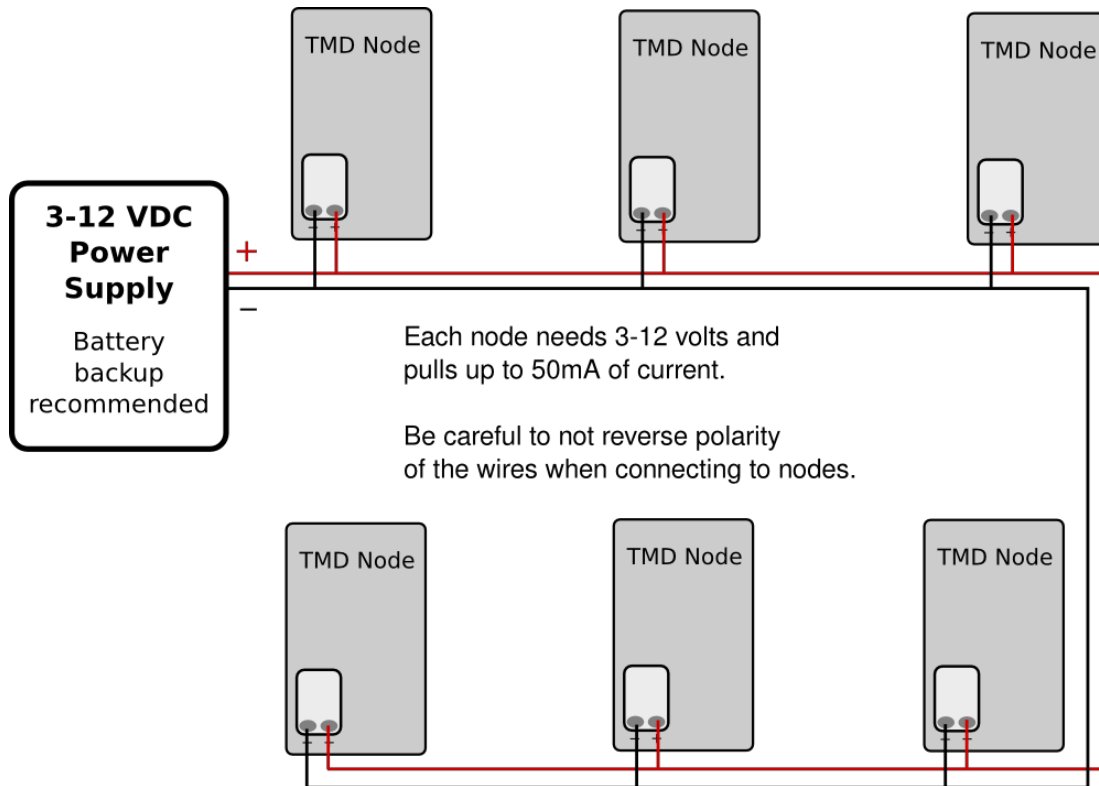
To adjust the sensitivity of the motion detection, change the threshold on the PU by doing the

following:

1. Click S1 on the PU one time.
2. Click S2 on the PU one time - Only the green LED on the right should be illuminated.
3. Click S1 the number of times that you want to set the sensitivity threshold to be set. One click is most sensitive (lowest threshold), with more clicks making it increasingly less sensitive.
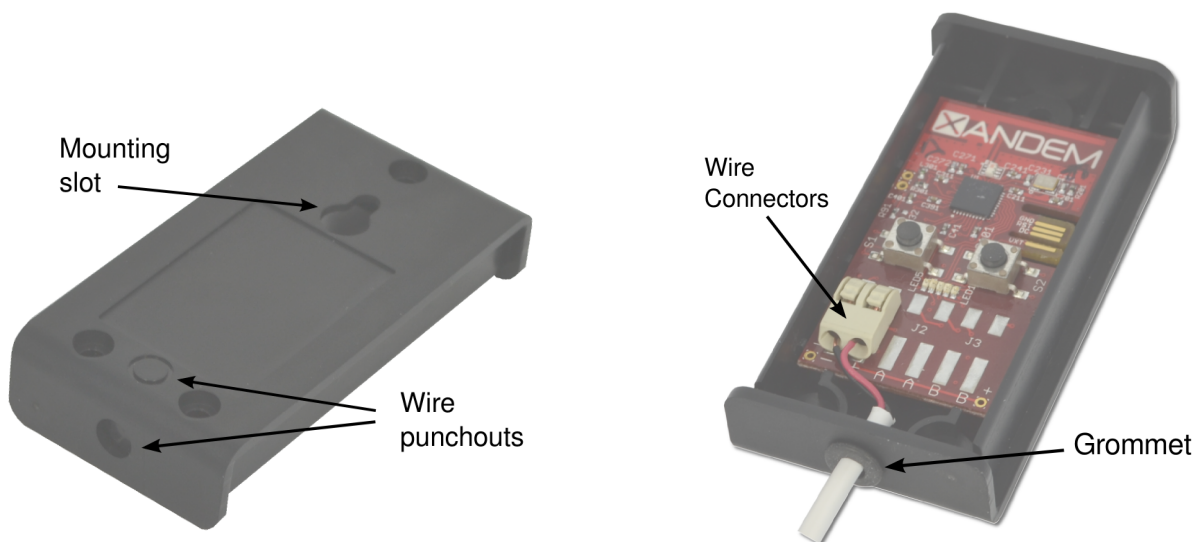4. Click S2 to save the new sensitivity threshold.

Install power supply and wiring (non-battery operated systems)

The TMD network can be powered by any DC power supply of 3-12 volts capable of providing 50mA of current to each node. It is recommended to use a battery backup system on the power supply to account for outages. For demonstration or portable deployments, batteries can be directly wired to the nodes and PU. The devices can be wired in parallel with the power supply, as shown in the illustration below.

Install grommet and thread power wires to each node

For each node location, choose a punch-out hole (bottom or back) on the plastic enclosure and punch it out using a screwdriver or other pointed tool. The bottom punch-out hole is convenient for wires that run along the inside wall, and the back side punch-out is useful when the wire comes straight out of the wall.

Insert a grommet on the interior of the punch-out hole. Thread the wire through the grommet and insert the power wire leads into the connector on each node. **Be careful not to reverse the polarity (+/-) of the power leads as this will permanently damage the devices.**

Place the node in the cradle of the enclosure, place the cover over the node, then finish the enclosure by placing and tightening the three enclosure screws on the back side.

Mount nodes to permanent and sturdy structures

Place a screw into the structure where the node will be mounted, then hook the head of the screw into the keyhole on the back side of the enclosure. Pull down to lock the enclosure into place. Make sure that the enclosure is firmly secured and will not shift during operation.

It is important that the nodes are mounted on sturdy structures as movement of nodes will cause false triggering.

Connect Processing Unit (PU)

The PU communicates with the network via wireless connections and does not need to be wired to the nodes. Choose a punch-out, insert a grommet, and thread the wire to the PU through the enclosure as done previously for the nodes. Connect power to the PU using the leftmost connector. **Be careful not to reverse the polarity (+/-) of the power leads or place in wrong connector as this may permanently damage the devices.**

Connect the relays as required by your application:

- **Motion detection relay (A)**: Connection A on the PU is a normally-closed relay that will open when motion is detected. Connect this relay to the panel or other equipment as required.
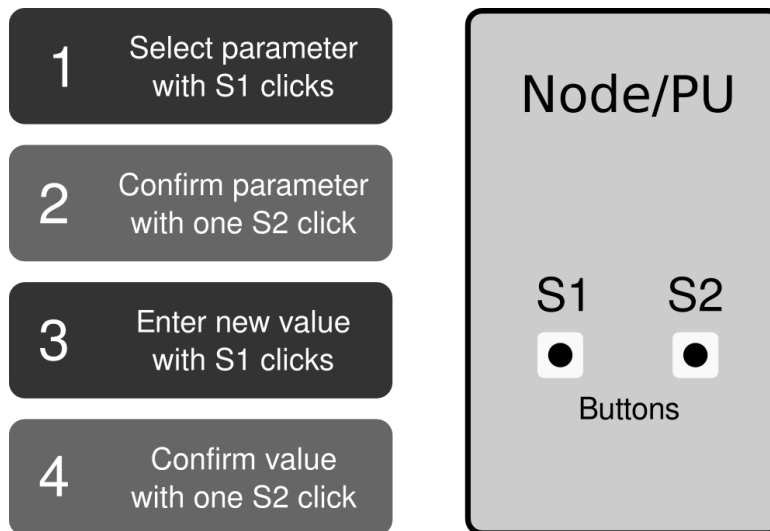
- **Trouble detection relay (B)**: Connection B on the PU is a normally-closed relay that will open when a trouble is detected. This may be the case if power is lost to a node, or if the processing unit fails to consistently receive data readings from the nodes.

Perform final walk test

Verify that the system is functional by walking the detection area and verifying that the panel or other integration equipment is reacting properly. Double-check motion around the outer perimeter to ensure that false triggering will not be an issue. Adjust sensitivity thresholds as necessary.

Configuration and Setting Parameters

- **Setting a parameter:** A configuration parameter is selected (see Table 2) by clicking S1 a certain number of times, and then confirming the selection by clicking S2. The LEDs will display a particular code to verify your selection. After the parameter is selected, the new value is set by another series of S1 clicks, followed by a second confirmation click of S2. The parameters are saved in memory, so even if the device is turned off, the configuration remains when power is restored.

1 Select parameter with S1 clicks	**Node/PU**
2 Confirm parameter with one S2 click	
3 Enter new value with S1 clicks	S1 S2
4 Confirm value with one S2 click	Buttons

- **Reading a parameter:** To find out the current value of a parameter, click S1 the number of times needed (see Table 2) to select the desired parameter, then click S2 twice. LEDs will blink the number of times that match the value of the given parameter. For example, if you choose Channel (2 clicks) it will blink 3 times if the channel is set to 3.

- **Resetting to factory default values:** Click S1 ten times, then click S2 to confirm. Click S1 another ten times then click S2 to confirm. A factory reset will occur after 10 LED blinks - all previously saved values

will be erased.

- If at any time you are unsure as to how many times you have clicked a button, turn the power off then back on, wait for the device to return to normal operation, and begin the process again.

The following table can be used to quickly reference how many clicks are required to set each parameter. See the documentation below for details.

Number of S1 clicks	Node	Processing Unit	LED Verification	Factory Defaults
1	Node ID	Motion Threshold	⬜⬜⬜⬜🟩	Node: See back of node PU: Threshold = 4
2	Channel	Channel	⬜⬜⬜🟧⬜	1
3	LED Indicators	LED Indicators	⬜⬜⬜🟧🟩	2 (On)
4	Number of Nodes	Number of Nodes	⬜⬜🟥⬜⬜	6, 10 or 15 depending on the kit
5	PAN	PAN	⬜⬜🟥⬜🟩	1
6	Channel Shift	Channel Shift	⬜⬜🟥🟧⬜	1
7	N/A	Trigger Count	⬜⬜🟥🟧🟩	1
8	N/A	Trigger Period	⬜🟨⬜⬜⬜	6 (60 seconds)
9	N/A	Quick Reset	⬜🟨⬜⬜🟩	2 (On)
10	Factory Reset	Factory Reset	⬜🟨⬜🟧⬜	N/A
11	N/A	Last outage	⬜🟨⬜🟧🟩	N/A
12	N/A	Jam Detection	⬜🟨🟥⬜⬜	1 (Off)
13	Node firmware version	PU firmware version	⬜🟨🟥⬜🟩	N/A
15	N/A	Reaction	⬜🟨🟥🟧🟩	3
16	N/A	Convergence	🟩⬜⬜⬜⬜	3

Table 2: Parameter selection guide

How to change the motion detection sensitivity threshold (PU Only)

The PU has an adjustable motion detection threshold. Lower threshold values will trigger easier than higher values. Good threshold values are highly dependent on the node density of the sensing network. For example, 10 nodes surrounding an area of 2,000 square feet will have lower thresholds than 10 nodes in a space of 1,000 square feet.

If the threshold is set too low, motion on the outside of the sensing network may trigger a motion detection. If the

threshold is set too high, motion may not be detected when motion occurs within the area of interest. Adjusting the threshold appropriately is critical to a successful installation.

To program the threshold:
1. Click S1 on the PU one time.
2. Click S2 on the PU one time to confirm you want to set the threshold.
3. Verify that only the right green LEDs is illuminated.
4. Click S1 N times, where N is the desired threshold.
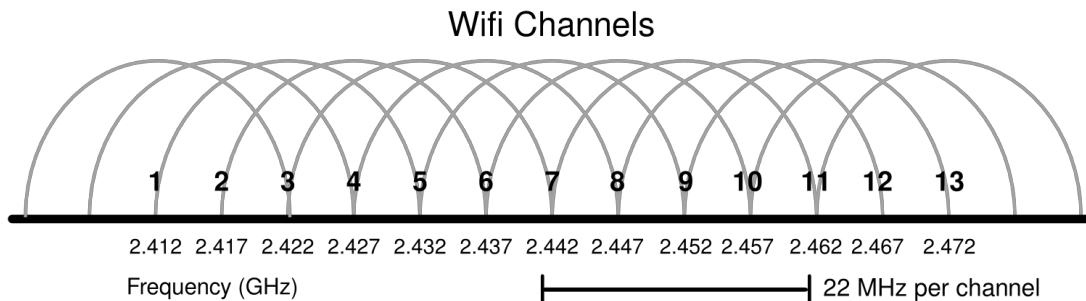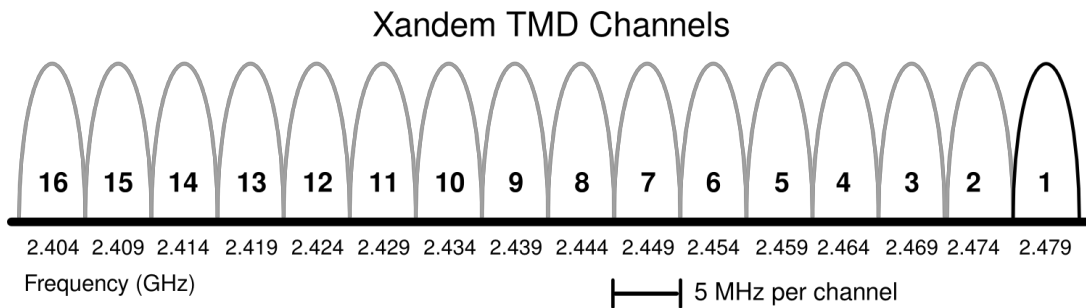5. Click S2 one time to confirm.

How to change the channel (center frequency)

The frequency channel of each node and processing unit can be changed, but all nodes and processing units in the sensing network must be set to the same channel. See Table 3 for channel center frequencies.

To change the channel for each node and PU:
1. Click S1 two times.
2. Click S2 one time to confirm you want to change the Channel.
3. Verify that only the orange LED is illuminated.
4. Click S1 N times, where N is the channel you wish to change to. Valid Channels are from 1-11.
5. Click S2 one time to confirm the new setting.
6. Repeat steps 1-5 for all nodes and PUs.

Channel 1 begins at frequency 2.479 GHz and moves toward lower frequencies in 5MHz steps at each channel.

Xandem TMD Channels

| 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |

2.404 2.409 2.414 2.419 2.424 2.429 2.434 2.439 2.444 2.449 2.454 2.459 2.464 2.469 2.474 2.479

Frequency (GHz)

|— —| 5 MHz per channel

Wifi Channels

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |

2.412 2.417 2.422 2.427 2.432 2.437 2.442 2.447 2.452 2.457 2.462 2.467 2.472

Frequency (GHz)

|———————| 22 MHz per channel

Channel 1	2479 MHz		Channel 9	2439 MHz

Channel 2	2474 MHz	Channel 10	2434 MHz
Channel 3	2469 MHz	Channel 11	2429 MHz
Channel 4	2464 MHz	Channel 12	2424 MHz
Channel 5	2459 MHz	Channel 13	2419MHz
Channel 6	2454 MHz	Channel 14	2414 MHz
Channel 7	2449 MHz	Channel 15	2409MHz
Channel 8	2444 MHz	Channel 16	2404 MHz

Table 3: TMD Channel center frequencies

How to change the motion detection reaction time

In some applications such as automated lighting it is desirable for the system to trigger as quickly as possible. In other applications false-trigger immunity is more important. The triggering speed of the system can be adjusted for these various applications by changing the reaction parameter. High reaction values will lead to faster triggering but may become more prone to false triggering. Low reaction values are more false-trigger immune but have a longer latency of motion detection.

Good values for typical applications are listed here but may require adjustment:

- Security: Set reaction to 3 as a starting point
- Automated lighting: Set reaction to 15 as a starting point

Please note that changing the reaction setting may require an adjustment to the sensitivity threshold. Always test the system thoroughly when adjusting reaction time.

To change the reaction parameter:
1. Click S1 15 times.
2. Click S2 one time to confirm you want to set the reaction parameter.
3. Verify that only the yellow, red, orange and right green LEDs are illuminated.
4. Click S1 N times, where N is the reaction parameter you wish to change to. Valid reaction settings are from 1-255.
5. Click S2 one time to confirm the new setting.

How to change the motion detection convergence time

How to enable/disable radio frequency jamming detection

For high-security applications, TMD comes equipped with RF jamming detection. If an adversary attempts to jam the system using RF interference, the nodes and processing unit will detect the interference and indicate the problem via Relay B.

To enable/disable jamming detection:
1. Click S1 12 times.
2. Click S2 one time to confirm you want to enable/disable jamming detection.
3. Verify that only the yellow and red LEDs are illuminated.
4. Click S1 one time to disable jamming detection, or two times to enable it.
5. Click S2 one time to confirm the new setting.

How to enable/disable LEDs

LEDs can be enabled or disabled on each node or processing unit.

To enable or disable the LED indicators:
6. Click S1 three times.
7. Click S2 one time to confirm you want to set the LED.
8. Verify that only the orange and right green LEDs are illuminated.
9. Click S1 one time to disable LED indicators, or two times to enable them.
10. Click S2 one time to confirm the new setting.

How to change the node ID (Nodes only)

This will not need to be changed unless you have damaged or lost a node. Each node is programmed with a unique ID in the range from 1 to the total number of nodes in the sensing network. The default node ID can be found labeled on the back of the node.
To program the node ID:
1. Click S1 one time on the node.
2. Click S2 one time to confirm you want to set the Node ID.
3. Verify that only the right green LED is illuminated.
4. Click S1 N times, where N is the node ID you wish to set for this particular node.
5. Click S2 one time to confirm the new setting.

How to change the total number of nodes

Each node and processing unit is programmed with the total number of nodes in the sensing network. Processing units do not count as nodes. When changing the total number of nodes, the node IDs must always begin with 1 and go to the number of nodes in the system. For example, when changing from a 15 node system to a 6 node system, use nodes 1-6. The node IDs are located on a label on the back of the circuit boards. If a node is damaged or lost, the ID can be reprogrammed (see the section on "How to change the node ID").

To change the total number of nodes:
1. Click S1 four times.
2. Click S2 one time to confirm you want to set the Node Count.
3. Verify that only the red LED is illuminated.
4. Click S1 N times, where N is the number of total nodes in the sensing network.
5. Click S2 one time to confirm the new setting.
6. Repeat steps 1-5 for all nodes and PUs.

How to change the PAN

The PAN is a same-channel filtering mechanism and stands for personal area network. Nodes and processing units that are on the same channel but have different PANs will not communicate, but may still interfere with each other. All nodes in the sensing network, including the processing unit must be set to the same pan. In most cases, this does not need to be changed from factory defaults. If you are trying to use multiple systems on the same channel, the PAN must be different in each system, and nodes from each system should be separated by as much physical space as possible to minimize interference.

To change the PAN:
1. Click S1 five times.
2. Click S2 one time to confirm you want to set the PAN.
3. Verify that only the red and right green LEDs are illuminated.
4. Click S1 N times, where N is the PAN you wish to change to. Valid PANs are from 1-255.
5. Click S2 one time to confirm the new setting.
6. Repeat steps 1-5 for all nodes and PUs.

How to change the channel shift

In general this is an advanced option and does not need to be changed. The center frequency on a channel can be shifted up in increments of 1 Mhz. Remember all nodes and processing units in the sensing network must be set to the same channel with the same shift. Channel 1 has an upper limit and will only shift 1 Mhz up.

To change the Channel Shift:
1. Click S1 six times.
2. Click S2 one time to confirm you want to set the Channel Shift.
3. Verify that only the red and orange LEDs are illuminated.
4. Click S1 N times, where N is the Channel Shift you wish to change to. Valid Channel Shifts are from 1-5. 1 being no shift, 5 shifting the channel 4 Mhz up.
5. Click S2 one time to confirm the new setting.
6. Repeat steps 1-5 for all nodes and PUs.

How to change the trigger count (PU Only)

The trigger count is the number of times the motion detection threshold must be exceeded before the Relay A is opened. For instance, if you set this to 3, the motion threshold must be exceeded 3 times within the specified period before the relay opens. Each trigger will reset the trigger period. See "How to change the trigger period" for more information.

To change the Trigger Count:
6. Click S1 seven times.
7. Click S2 one time to confirm you want to set the Trigger Count.
8. Verify that only the red, orange and right green LEDs are illuminated.
9. Click S1 N times, where N is the Trigger Count you wish to change to. Valid Trigger Counts are from 1-127. 1 being a single trigger, anything more being multiple triggers.

10. Click S2 one time to confirm the new setting.

How to change the trigger period (PU Only)

This setting will allow you to adjust the amount of time between triggers when the trigger count is greater than 1. Each time the motion threshold is exceeded, the trigger period will be reset. This setting is in multiples of 10 seconds. For example, 1 click is a 10 second trigger period, 2 clicks is 20 seconds, and so on.

To change the Trigger Period:
1. Click S1 eight times.
2. Click S2 one time to confirm you want to set the Trigger Period.
3. Verify that only the yellow LED is illuminated.
4. Click S1 N times, where N * 10 is the Trigger Period in seconds that you wish to change to. Valid Trigger Periods are from 1-255.
5. Click S2 one time to confirm the new setting.

How to change quick reset (PU Only)

This setting forces the PU to reset itself 4 seconds after motion is detected. It will quickly re-calibrate and be ready to detect motion again. If this is turned off, the motion score can remain above the motion threshold with Relay A open until motion stops long enough for the system to settle.

To change the Quick Reset:
1. Click S1 nine times.
2. Click S2 one time to confirm you want to set the Trigger Period.
3. Verify that only the yellow and right green LEDs are illuminated.
4. Click S1 1 time to disable quick reset, or 2 times to enable quick reset.
5. Click S2 one time to confirm the new setting.

How to restore firmware to factory defaults

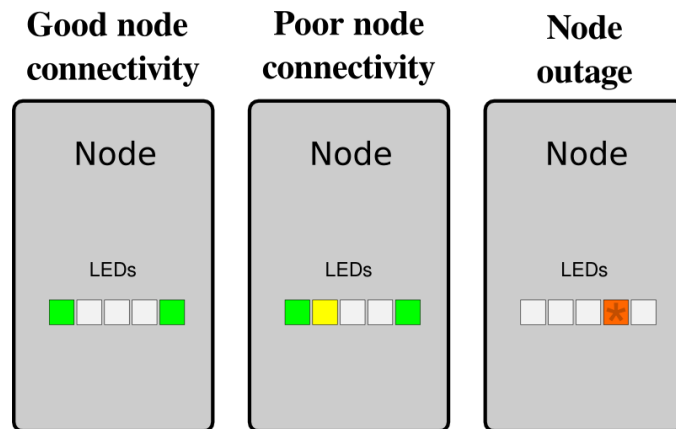To reset the nodes and PU to factory defaults:
1. Click S1 ten times.
2. Click S2 one time to confirm the factory reset.
3. Verify that only the yellow and orange LEDs are illuminated.
4. Click S1 ten more times.
5. Click S2 for a final confirmation to reset. This will be followed by 10 blinks.
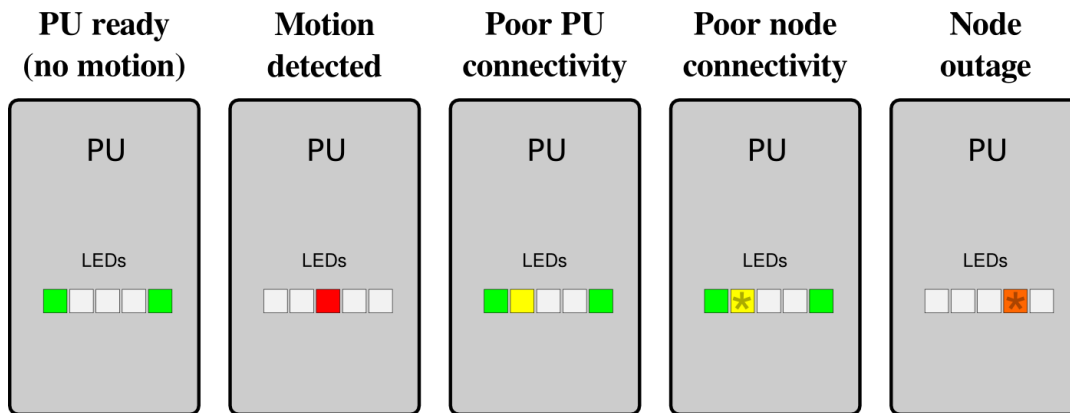

Interpreting the LED Status Indicators

The nodes and processing units will indicate status via the LEDs.

Node Status

Good node connectivity	Poor node connectivity	Node outage

- **Good node connectivity** is indicated when all nodes are communicating well with each other.

- **Poor node connectivity** is indicated when a node is not hearing from enough of the other nodes. The network could be stretched out too far, experiencing heavy interference, or the node itself could be in a bad position (i.e., behind a metal object). Try moving any poor health nodes to new positions or closer to the rest of the nodes.

- **Node outage** is indicated when a node has completely disconnected from the network. This can be caused by a power loss or a node that is on a different channel, PAN, or channel shift than the rest of the nodes. When a node is out, all other nodes will blink to indicate which node is missing. For example, if node 3 is out, all other nodes will repeat the pattern: blink 3 times - rest - blink 3 times - rest. If multiple nodes are missing, only the node with the lowest ID will be indicated.

Processing Unit Status

PU ready (no motion) | Motion detected | Poor PU connectivity | Poor node connectivity | Node outage

- **PU ready** is indicated when all nodes are communicating well with each other and with the PU.

- **Motion detected** is indicated when the motion score rises above the set threshold. When this indication is on the alarm relay will be open.

- **Poor PU connectivity** is indicated when the PU is not hearing from the network reliably. Try moving the PU closer to the network.

- **Poor node connectivity** is indicated when a node is not hearing from enough of the other nodes. When a node has poor health, the processing unit will blink to indicate which node it is. For example, if node 3 is unhealthy, the PU will repeat the pattern: blink 3 times - rest - blink 3 times - rest. If multiple nodes are unhealthy, only the node with the lowest ID will be indicated. Poor node health can be caused by the network being stretched out too far, experiencing heavy interference, or the node itself could be in a bad position (i.e., behind a metal object). Try moving any poor health nodes to new positions or closer to the rest of the nodes.

- **Node outage** is indicated when a node has completely disconnected from the network. When this indication is on the trouble relay will be open. This can be caused by a power loss or a node that is on a different channel, PAN, or channel shift than the rest of the nodes. When a node is out, all other nodes will blink to indicate which node is missing. For example, if node 3 is out, all other nodes will repeat the pattern: blink 3 times - rest - blink 3 times - rest. If multiple nodes are missing, only the node with the lowest ID will be indicated.

Troubleshooting

What do I do if I get false triggering?

False triggering is almost always caused by one of the following issues:

- **Sensitivity threshold is too low**
  With any detection device, there is a trade-off between detection sensitivity and false triggering. If other methods of reducing false triggering are not working, consider raising the sensitivity threshold to a higher value.

- **Abrupt water flows**
  Fast water flows through plastic pipes and appliances can cause false triggering.

  What to do:
    - Make sure nodes are at least 6 feet from any appliances that pump water (dishwashers, ice makers, condenser units, etc).
    - Make sure nodes are at least 6 feet from plastic water pipes.
    - Try setting the trigger count to 3 and trigger period to 1 minute.

- **Large movement near the perimeter of the detection area**
  When walls are thin materials like drywall and glass, the system may become sensitive when someone moves on the outside of the detection area.

  What to do:
    - Make sure that all nodes are at least 6" away from swinging doors on the outside of the detection area.
    - Make sure no nodes are placed in window sills.
    - Try placing a 12" x 12" sheet of foil or metal plating on the outside of the nodes to prevent the RF waves from traveling to the outside of the detection area.
    - Try moving nodes away from the problematic area.

- **Trees and wind**
  Xandem TMD is not designed to be used in areas near trees. When trees blow in the wind it can cause repeated false triggering.

  What to do:
    - Move the nodes further away from the trees.
    - Remove trees and foliage from the area.

- **Rain and snow**
  Heavy precipitation can cause TMD to false trigger.

  What to do:
    - Try placing nodes where precipitation will not directly hit the TMD node enclosures.
    - Try setting the trigger count to 3.
    - Try increasing convergence to 10.

If finding the cause of a false trigger becomes difficult, consider installing a **TMD Data Logger**. Contact us at info@xandem.com for more information about the data logger.

What do I do if a node or processing unit is indicating a status error via the LEDs?

Please review the LED Status Indicators section of this document. Status errors are the result of:
1. Nodes and PUs configured incorrectly - try factory resetting the devices and trying again.
2. Nodes and PUs are spaced too far apart - try condensing the network.
3. Nodes and PUs are receiving interference from other wireless devices - try changing the channel of each node and PU.

What do I do if I break a node?

If a node is broken, you can:
1. Purchase an extra device as a replacement. The serial number located on the back of the circuit board inside the plastic enclosure will be required.
2. Re-configure the number of nodes and node IDs as described in the configuration section of this document.