

EN5040/EN5040-T/EN5040-20T High Power Repeater with Transformer

Installation and Operation Manual

1 Overview

The Inovonics high power repeater receives, decodes and retransmits signals at enhanced power from Inovonics devices. It acts as a range expander for any valid Inovonics transmission, including signals from other high power repeaters. High power repeaters can be layered as necessary, allowing Inovonics systems to scale from small commercial sites to complete campuses consisting of several buildings. The high power repeater features AC power loss and jam detection, as well as case tamper and wall tamper detection. Input power is provided by listed UL1310 class 2 transformer, MPI-NEO Co., Ltd. W48A-J1000-2T.

Note: For UL 2560 installations, refer to the *EN6080 Area Control Gateway Installation Instructions* or the *EN6040-T Network Coordinator Installation Instructions*; for other UL installations, refer to the *EN4216MR Installation and Operation Manual*, the *EN4232MR Installation and Operation Manual*, or the *EN7290 Installation Instructions*.

1.1 Maximum Number of Repeaters for a UL 2560 Installation

To achieve the 99.99% alarm message reliability required for UL 2560 compliance, system installations must operate within the following limits for end device and repeater counts.

End Devices	Maximum Repeaters
150	397
250	386
350	375
500	360
1000	313
2000	238
3000	184

1.2 Installing an Inovonics Security System

An EchoStream survey kit must be used to establish a UL system. The EchoStream survey kit measures the signal strength of high-power repeater and sensor messages to help optimize your EchoStream system.

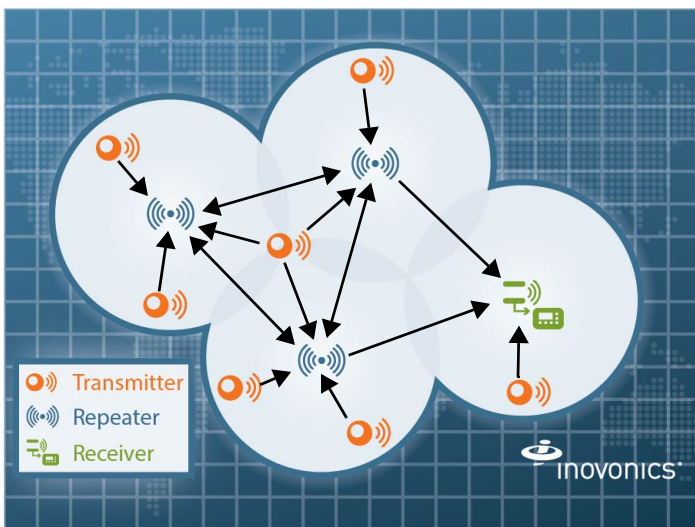


Figure 1 Sample EchoStream system

The EchoStream survey kit provides you with two signal strength measurements: signal level and signal margin.

Signal level

The signal level is the measurement of the overall decibel level of the message.

Signal margin

The signal margin is the measurement of the decibel level of the message, minus the decibel level of any interfering signals. Inovonics Wireless equipment should be placed within a facility such that all end-devices produce signal margin readings of at least 4 decibels.

Both the signal level and signal margin are measured in decibels. Because signal strength and signal margin are measured on a logarithmic scale, the difference between a decibel level of 3 (Weak) and a decibel level of 4 (Good) is a much larger difference than it would be on a linear scale.

Note: For more information about the EchoStream survey kit, see the *EN7016SK EchoStream™ Survey Kit Installation and Operation Manual* or the *EN7017 Survey Kit and App Installation and Site Survey Instructions*.

Caution: The EchoStream system should be tested regularly to ensure operation. To test: place the system in test mode, activate an end device, and ensure an appropriate response.

1.3 RF Signal Propagation

While wood, drywall and glass usually let the RF signals pass, some materials may inhibit or attenuate radio frequency (RF) signal propagation by blocking, reflecting, deflecting or absorbing RF signals.

Consider anything between transmitters and repeaters and/or the receiver. Is there concrete and steel construction? Are there earthen berms or hills? Are there a lot of trees? Devices should be mounted such that they are least affected by these elements.

For best results, transmitters and repeaters should be mounted at the optimal height to achieve line of sight to repeaters and/or the receiver. Usually this means they will be mounted as high as possible.

Following are some typical obstacles to RF signal propagation:

Material	Affect	Recommendation
Metal construction, including ductwork; pipes; studs; stucco, plaster or concrete with wire mesh; satellite dishes, metal-lined rooms such as walk-in coolers or freezers; metal siding, safes, etc.	Can reflect, absorb and/or disrupt RF signals.	Perform a site survey using an Inovonics wireless survey kit to verify the RF signal is acceptable, and, when necessary, to determine where to locate repeaters.
Completely enclosed metal boxes/enclosures.	Can restrict RF signals.	
Solar panels, cinder block walls, windows with built-in solar tinting.	Can absorb and/or reflect RF signals.	Add repeaters as issues arise.
Vegetation.	Can attenuate RF signals. The RF environment can alter as trees shed or sprout leaves.	
Automobile and truck traffic.	Can disrupt RF signals.	Mount Inovonics devices at a height sufficient to achieve line of sight above traffic.



1.4 Inovonics Contact Information



If you have any problems with this procedure, contact Inovonics technical services:

- E-mail: support@inovonics.com.
- Phone: (800) 782-2709; (303) 939-9336.

1.5 High Power Repeater Front Panel

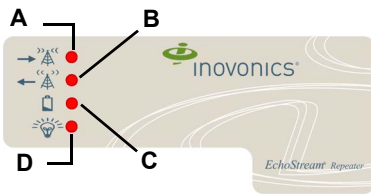


Figure 2 High power repeater front panel

- A** Decode LED **B** Transmit LED **C** Low Battery Fault LED
D Power LED

Operation LEDs

Decode LED: Flashes when any recognizable RF transmission is received.

Transmit LED Lit when transmitting an RF transmission.

Low Battery Fault LED: Lit when the high power repeater's battery is low or bad.

Power LED: Lit when receiving power. The LED lights green when the unit is receiving line power; red when receiving battery power.

Note: If mapped to an output, the high power repeater will send the AC loss message to the EN6080 area control gateway when receiving power from the backup battery.

1.6 High Power Repeater Internal Components

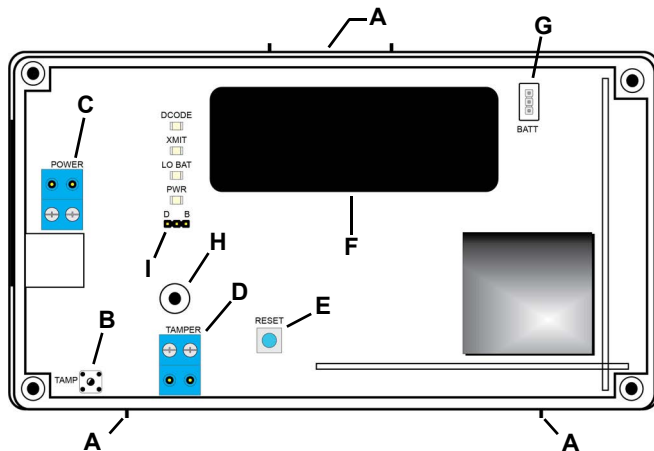


Figure 3 High power repeater internal components

- A** Housing release tabs **B** Tamper button spring **C** Power **D** Tamper input
E Reset button **F** Backup battery **G** Battery connector **H** Tamper mounting hole
I Messaging mode selection pins

2 Installation and Startup

2.1 Installation Notes

- These products are designed to be maintained by professional security technicians.
- Products are tested for indoor use.
- Do not mount wireless smoke detectors, CO detectors, initiating device transmitters or repeaters to removable surfaces, such as ceiling tiles.
- All products should be manually tested weekly.
- Installation shall be in accordance with CSA C22.1, Canadian Electrical Code, Part I, Safety Standard for Electrical Installations; CAN/ULC S302, Standard for the Installation, Inspection and Testing of Intrusion Alarm Systems; and CAN/ULC S301, Standard for Signal Receiving Centres Configurations and Operations. Locations where installations are not recommended shall also be included.

2.2 Choose Messaging Mode

The EchoStream commercial mesh network includes two kind of messaging: broadcast messaging and directed messaging. The high power repeater includes a messaging selection option to protect the integrity of your system. The high power repeater ships with a default setting of broadcast messaging. If you are installing the high power repeater in a directed messaging network, you will need to configure it.

Note: For UL2560 installations, directed messaging must be selected.

Note: If directed messaging is selected, you will need to configure the network ID (NID). To configure the NID, refer to your Inovonics RF gateway's installation and operation literature.

To set the high power repeater to directed messaging:

1. Use a small screwdriver to press the housing release tab on the top or bottom of the high power repeater; separate the housing.
2. Remove the jumper from the right two pins, marked B.
3. Place the jumper on the left two selection jumpers, marked D.
4. If the repeater has been powered up, press the reset button to complete configuration.

2.3 Connect Power Cabling

Power must be connected to the high power repeater. To connect power to the high power repeater:

1. Connect power cabling (Figure 4).
 - Wire should be two-conductor 20 AWG (or larger) stranded-tinned copper with PVC insulation rated to 300 volts at 26°C (80°F). Wire length should not exceed 100 meters (328 feet).

Note: For all UL installations, cabling must be UL Listed or Recognized, Class 2 wire suitable for the application. Use two-conductor 20 AWG (or larger) stranded-tinned copper, rated 300 volts, 60°C minimum. Wire length must not exceed 30 meters (98.5 feet).

- See section 1, "Overview" on page 1 for approved Class 2 transformers.
- Route the cable from the transformer to the unit through the left side of the repeater, or through the oval knock-out section in the rear.
- Torque screw terminal to 0.25 N-m (2.18 inch-pounds).

Note: Do not secure transformer for Canadian installations.

Note: Do not connect to a switch-controlled outlet.

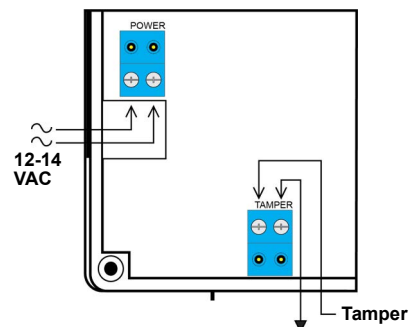


Figure 4 Power and tamper wiring

2.4 Connect Battery Power

Caution: Power cabling should be connected before the backup battery. Failure to do so can result in a low battery indication if the battery voltage is low at the time of installation. If it is not possible to connect power cabling before the battery, make sure to press the reset button after connecting power cabling.

The high power repeater is shipped with a backup battery. To connect the battery:

1. Plug the connector cable from the backup battery into the battery connector.
2. Press the repeater's reset button.

2.5 Register the High Power Repeater

Although the high power repeater is functional upon startup, Inovonics strongly recommends you register it. Inovonics recommends all high power repeaters be supervised. When supervised, the EN5040 and EN5040-T will send a check-in message to the receiver every three minutes; the EN5040-20T will send a check-in message every 20 minutes.

Note: In UL 2560 installations, the repeater sends a check-in message every 20 minutes.

Note: Registration and supervision are required for UL installations.

Caution: The reset bit will not be sent when the high power repeater has a low battery. Before registering the high power repeater, ensure the battery is fully charged.

Caution: A missing/inoperative repeater shall be reported as a latching trouble signal at the control panel within four hours or less.

2.6 Mount the High Power Repeater

Caution: Mount the high power repeater in a location removed from metal. Metal objects (duct work, wire mesh screens, boxes) will reduce RF range.

Caution: In UL 2560 installations, the unit must be mounted with the cable opening facing downward.

1. Use the provided anchors and screws to mount the high power repeater in a location accessible for future maintenance.
 - In large installations, high power repeaters should be mounted so that every transmitter has multiple transmission paths to the RF gateway. This kind of redundancy preserves system integrity in the event of temporary interruptions of any transmission path in the system.
 - For maximum efficiency, high power repeaters should be mounted with as few obstacles as possible between them and the RF gateway.
 - Always perform a walk test after mounting, activating each transmitter and ensuring an appropriate response.

2.7 Enable the Wall Tamper

The wall tamper must be enabled. If the high power repeater is removed from the wall, the cutout on the back of the housing will detach, activating a tamper alarm. To enable the wall tamper:

1. Attach one of the mounting screws to the wall through the tamper mounting hole.

2.8 Close the Housing

The housing must be closed and the tamper spring in place to ensure the security of your system.

1. Check that the tamper spring is in place and makes contact with the high power repeater housing.
2. Close the housing.

3 Troubleshooting

Problem	Possible Solutions
Repeater won't power up.	<ul style="list-style-type: none"> • Verify your power and ground wires are securely connected to VS and GND on the power terminals. • Meter incoming power to make sure it is operating at 14 VAC, 250mA. • Keep cable lengths as short as possible to minimize cable capacitance. Measure voltage supply at the receiver to ensure power requirement is met for long cable runs.
Tamper output not working.	<ul style="list-style-type: none"> • Verify tamper output wires meet specifications and are securely connected to the appropriate terminals.
No backup battery power.	<ul style="list-style-type: none"> • Make sure battery connector is firmly seated. • Check if battery has been discharged. Battery may be totally discharged if the repeater has been without power for 24 hours or more.
No messages are being sent to the receiver or network coordinator in directed messaging mode.	<ul style="list-style-type: none"> • Make sure the message mode jumper has been removed and repeater has been reset to enable directed messaging mode. • Make sure the repeater was put in a tamper state to accept the NID configuration for the network. • Make sure the repeater is close enough to the network coordinator or another repeater that is already part of the network. If not, no messages may be repeated, even though the repeater should still send check-ins.
No messages are being sent to the receiver or network coordinator in broadcast messaging mode.	<ul style="list-style-type: none"> • Make sure the message mode jumper has been installed and the repeater has been reset to enable broadcast messaging mode. • Make sure the repeater is close enough to the network coordinator or another repeater that is already part of the network. If not, no messages may be repeated and no check-in messages received.

4 Specifications

Housing: 6.5" x 3.6" x 1.1" (165 mm x 91 mm x 28 mm).

Weight: 7.14 oz (204 g).

Operating environment: All UL installations: 32 to 140°F (0 to 60°C), 90% relative humidity, non-condensing; all other installations: -4 to 140°F (-20 to 60°C), 90% relative humidity, non-condensing.

Power requirement: 14 VAC, 60 Hz, 250 mA.

Power supply: 120VAC@20VA/12VAC@1000mA.

Battery capacity: LG Energy Solution, LTD. (LG), Part No. INR18650F1L. Rated 3.63 V, nominal capacity is 3250 mAh minimum and 3350 mAh typical/maximum; E-One Moli Energy Corp. (Molicel), Part No. INR-18650-M35A. Rated: 3.6 V, nominal capacity is 3350 mAh minimum and 3500 mAh typical/maximum.

Typical back-up battery life: 24 hours.

Operating frequency: 915-928 MHz (Australia), 921-928 MHz (New Zealand), 902-928 MHz (USA).

Battery charger operating environment: 32 to 140°F (0 to 60°C), 90% relative humidity, non-condensing.

Accessories: ACC650: weatherproof plastic enclosure for outdoor installations; BAT851: replacement lithium-ion battery assembly.



Power supply specifications: Efficiency level VI, $\leq .210$ W max power in no-load mode.

Regulatory certifications: EN5040-T: Security Level 1 CAN/ULC S304:2016, UL 985, UL 1023, UL 2610; EN5040-20T: Certified for use in UL 2560 Listed Emergency Call Systems only; EN5040: Not evaluated by UL.

Note: For UL 985, if an EN5040-T repeater is required to be employed with smoke detectors or CO detectors, two repeaters must be installed to cover each smoke detector and/or CO detector. Do not mix fire alarm transmitters with burglar alarm or any other type of transmitter.

Compatible receivers for UL installations: EN4200, EN4204R, EN4216MR, EN4232MR, EN7290.

Note: Inovonics supports recycling and reuse whenever possible. Please recycle these parts using a certified electronics recycler.

Note: Contains FCC ID: HCQ3B6F; contains IC: 2309A-F.

Note: When disposing of this device or depleted batteries, please do so in accordance with federal, state and local regulations.

5 Television and Radio Interference

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

6 FCC Part 15 and Innovation, Science and Economic Development Canada (ISED) Compliance

This device complies with part 15 of the FCC Rules, and ISED license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Caution: Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

7 Radiation Exposure Limits

7.1 FCC

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. In order to avoid the possibility of exceeding the FCC radio frequency exposure limits, human proximity to the antenna shall not be less than 20 cm during normal operation and must not be co-located or operating in conjunction with any other antenna or transmitter.

7.2 ISED

This equipment complies with ISED RSS-102 radiation exposure limits set forth for an uncontrolled environment. This transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

Cet équipement est conforme avec ISED RSS-102 des limites d'exposition aux rayonnements définies pour un environnement non contrôlé. Cet émetteur doit être installé à au moins 20 cm de toute personne et ne doit pas être colocalisé ou fonctionner en association avec une autre antenne ou émetteur.