ComSonics®

Qualifier X-Ray

Non-Intrusive
***D**welling **I**ngress **I**ntegrity*
Measurement System

USER GUIDE

CSI Doc. 101399-001

Limited Warranty (brief)

Hardware: ComSonics, Inc. (ComSonics) warrants to the original end user (Customer) that the new ComSonics branded products will be free from defects in workmanship and materials, under normal use, for one (1) year from the date of original shipment. ComSonics warrants repaired and refurbished ComSonics products for ninety (90) days from date of shipment.

Agency Notice (brief)

Hand Held Device
FCC ID: PYN2007HHD
IC: 4261A-2007HHD

Vehicle Mounted Device
FCC ID: PYN2007VMD
IC: 4261A-2007VMD

Complete Limited Warranty and Agency Notice documentation is printed in the back section of this user guide.

Technical Support

ComSonics maintains a Technical Support Service for customer convenience. Contact a Support Representative at 1-800-336-9681 or 1-540-434-5965; Fax 1-540-432-9794; or Email tech-support@comsonics.com.

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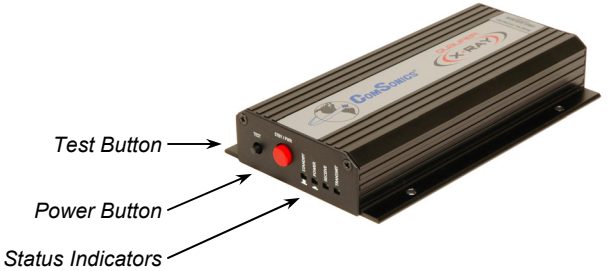
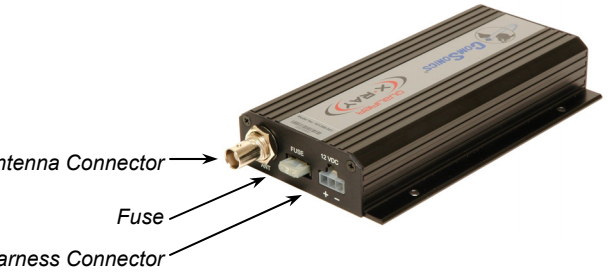
Major Components





Introduction

FCC License Requirement
A FCC license is required to operate the Qualifier X-Ray System, specifically the vehicle mount transmitter component (VMD).

Refer to the ***Qualifier Transmitter Licensing*** section on our website at www.comsonics.com/downloads.html for application instructions and templates.

If you need assistance, please call our Customer Service Department at 1-800-336-9681.

Unpacking
The Qualifier X-Ray System and accessories are shipped in a single container designed to provide maximum protection during transit. Immediately upon receipt, inspect the container and contents for signs of physical damage. Notify the freight forwarder of any damage detected.

Installation Caution!
The Qualifier X-Ray System is designed only for vehicles equipped with a 12-volt negative ground electrical system.

Qualifier X-Ray System Overview
The ComSonics Qualifier X-Ray System provides a method for identifying the internal shielding integrity of the CATV network in a subscriber's residence without the need to enter the premises.

A test activation transmitter is located within the Qualifier hand held device *(HHD)*. The transmitter provides an activation signal to the Qualifier Vehicle Mounted Device *(VMD)* and sets up the HHD to measure levels of ingress from the VMD signal appearing in the return upstream path.

With the HHD connected to either the residential ground block or the drop tap, a press of the HHD button activates the VMD to generate a brief 5-watt signal pulse at a frequency, just above the CB radio band, within the upstream frequency spectrum.

The VMD test signal envelopes the residence with a level of about +58 dBmV (assuming the service vehicle is about 75 feet from the residence). Shielding flaws, within the residential cabling, allow the VMD signal to enter the return upstream path. The HHD detects the VMD test signal and displays a shielding integrity value based on the ingress level measured.

The threshold setup function in the HHD determines the indication of *PASS* or *FAIL* with the integrity measurement.

Shielding Integrity Measurement
The Qualifier X-Ray System utilizes a unique measurement method to determine the relative shielding integrity of a customer premise without a need to enter the structure. This method provides the user with a numeric display representing a calculated shielding factor, in dB, of the premise under test.

The type of flexible coaxial cable used for drops and house wiring typically has a shielding integrity factor in the range of 60 to 80 dB. But with the addition of connectors, splitters, VCRs, televisions, PC modems, and other devices along with improper installation techniques; the total overall shielding integrity can degrade appreciably. The possibility of noise ingress (undesirable signals) increases greatly if the shielding integrity is not sufficient. Noise ingress causes interference with the return path signals and reduces the reliability of two-way signal communications.

The Qualifier X-Ray System enables the user to obtain a shielding integrity reading in the range of 80 dB (very good) to 25 dB (very poor). Each measurement reading includes a PASS or FAIL indication, based on a user selectable threshold value, for easy measurement status determination. The threshold function can be turned off.

Formula for calculating the shielding integrity reading:

D2I = Pmax [+85] - (antenna gain [2.5] + free space loss [25]) - measured value

*D2I is the acronym for **D**welling **I**ngress **I**ntegrity

General Information

Hand Held Device
The Hand Held Device (HHD) is a small pocket size unit containing the test activation transmitter and the ingress test signal receiver.

Battery Installation
The HHD is powered by three standard AAA alkaline batteries. To install the batteries, loosen the battery compartment screw and remove the cover. Install the batteries, all three with the positive end in the same direction, as indicated. Replace the cover and tighten the screw. Use care not to over tighten the screw.

Be sure to recycle or properly dispose of old batteries.

The HHD automatically powers off when the battery condition is low to protect the batteries from excessive discharge and possible leakage. Periodically remove the battery cover and inspect the batteries for signs of leakage.

Caution: Do not store the HHD for extended periods of time with the batteries installed. Failures due to battery leakage are not covered under warranty.

Single Button Control
The HHD is controlled by one multi-function button.

To power the HHD on:
Press and hold the Button for one second.

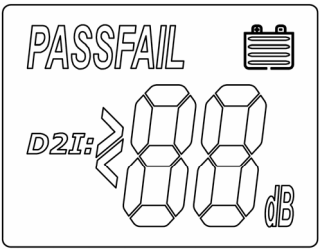
To activate an integrity measurement cycle:
Press the Button once.
This also resets the back light and power auto-off timers.

To access the PASS/FALL threshold setup mode:
Press the Button twice within one second.
Press the Button to set the threshold level.

To power the HHD off:
Press and hold the Button for one second.

Auto Power Off
The HHD automatically powers off sixteen seconds after the last Button press. The back light turns off in six seconds and the HHD powers off ten seconds later.

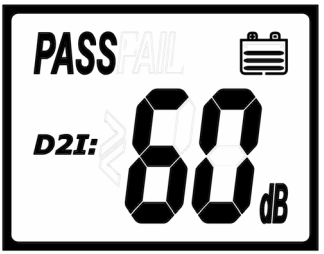
Display Screen
The Display screen provides information on the battery condition, units of measure, shielding integrity value, and if enabled, the PASS/FAIL status of the measurement. A back light illuminates the display.

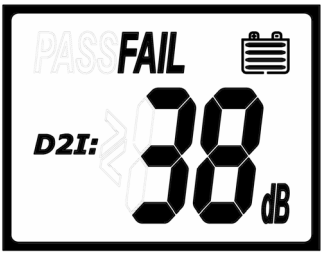


Battery Level
A fresh set of batteries is indicated by four bars. Each bar represents approximately 25% runtime capacity. A low battery condition is indicated by no bars showing. The HHD automatically powers off when the battery state is low. Note: The accuracy of the battery level indicator is relative and will vary with the battery type and manufacturer.

Shielding Integrity Measurement Value
When a measurement is made, by a single press of the Button, the level of the ingress signal is displayed as a shielding integrity value in dB units-of-measure. The value range is 80 dB (very good shielding) to 25 dB (very poor shielding).

PASS / FAIL Function
The HHD can be setup with a measurement threshold value to determine if the integrity reading is acceptable. PASS is displayed if the measured integrity value is higher (better) than the threshold value. FAIL is displayed if the measured integrity value is lower (worse) than the threshold value. The PASS/FAIL threshold value is user selectable. This function can be disabled as described on the next page.





Threshold Value Setup
To access the threshold value setup mode, press the Button twice within one second when the HHD is on. The PASSFAIL readout activates and two digits display the current threshold value. Press and hold the Button to scroll to the desired threshold value. Release the Button to stop rapid scrolling and then use single presses of the Button to the desired value. If a lesser value is desired, continue to hold the Button as the value wraps around from 80 and then back down to 25 dB. Release the Button and allow the HHD to auto power off (six seconds). At the next power up, the newly set threshold value is enabled and the PASS or the FAIL indicator will display accordingly. See the next sections for the procedure to disable or enable the PASS / FAIL function.

Disable the PASS / FAIL Function
The HHD PASS / FAIL function can be disabled by setting the threshold value to 80 dB. In this mode, neither the PASS nor the FAIL indicator appears.

Enable the PASS / FAIL Function
To enable the HHD PASS / FAIL function, set the threshold value to a setting other than 80 dB.

Test Signal Verification
The combined PASSFAIL label is displayed along with the integrity reading if the HHD is unable to clearly receive the VMD test signal. The HHD performs a pretest signal level measurement prior to triggering the VMD and then compares that level with the measurement made during the VMD transmit interval. If the VMD signal level is no greater than the pretest level, then the combined PASSFAIL label is shown. The test signal verification function is not affected by disabling the Threshold function.

Vehicle Hardware Installation

Vehicle Mount Device (VMD)
The Qualifier X-Ray system requires installation of the Qualifier Vehicle Mounted Device (VMD) and a Dual Band Antenna.

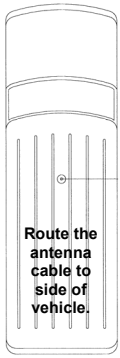
Installation Precautions
Please observe the following during installation.

- Wear eye protection when installing the system.
- The vehicle must have a 12-volt negative ground electrical system.
- Insure that no mounting hardware makes contact with any wiring, fuel/brake lines or other components.
- Insure the mounting position of the VMD is clear of obstacles.
- Protect the system from metal debris.
- Do not route cabling or wiring through sharp edged openings or potential pinch points to prevent future failures and safety hazards.
- Maintain at least one inch of clearance around the VMD for proper cooling.

Install the Antenna

Place the Magnetic Mount Dual Band Antenna on a flat roof surface of the vehicle. Position it near as possible to the center of the roof away from nearby metallic objects; such as other antennas, booms, or ladders. Route the cable, perpendicular to the center-line of the roof, to the point where the antenna cable enters the vehicle. Use caution to prevent damage to the cable. Coil any excess cable in a loose loop inside the vehicle. Secure the cable as needed.

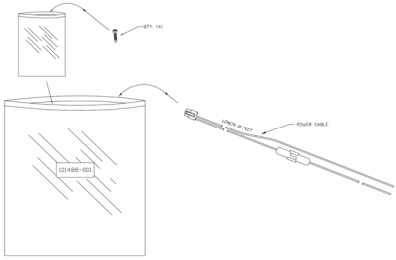
Note: Periodically remove the antenna and clean dust and grit from the vehicle surface and bottom of the antenna to reduce abrasion to the vehicle finish.



Install the Vehicle Mounted Device (VMD)

Check the hardware in your Qualifier VMD Installation Kit (part number 101488-001) to the illustration.

- Four screws
- Power cable



Use the hardware contained in the kit to install the VMD as follows:

Place the VMD over the selected mounting location. Allow at least a two inch clearance beyond the rear panel for installation of cables. Mark the location of the four mounting holes using a center punch. Alternate mounting methods may be required in certain installations.

Protect the VMD from debris and use a 1/4-inch nut driver attached to a power screwdriver or variable speed drill to install four (4) one-inch self-drilling screws. *DO NOT OVER TIGHTEN THE SCREWS!* Remove any debris remaining from the drilling operation.

Connect the antenna cable to the VMD.

Install the VMD Power Harness
Connect the RED lead to the vehicle (+12V) ignition or accessory fuse block circuit. Connect the BLACK lead to the vehicle ground. A 2-ampere safety fuse is used in the red lead.

Connect the power harness to the VMD.

The red Standby indicator is on with power applied and the VMD Power Switch set to OFF.

Check / Select the VMD Transmit Frequency
Push the VMD power switch to the ON position; wait a few seconds for the VMD to initialize, and the green Power indicator to illuminate. Then, press and hold the Test button for 2 seconds. The orange Receive indicator flashes showing the operating frequency by the following patterns:

One flash and a pause	frequency 1 = 27.45 MHz
Two flashes and a pause	frequency 2 = 27.47 MHz (factory default)
Three flashes and a pause	frequency 3 = 27.49 MHz

To select a different transmit frequency while a code is flashing; press the Test button to step to the next frequency. The frequency select sequence wraps around from frequency 3 back to frequency 1.

The VMD returns to normal operating mode after the indicator flashes the code sequence for 10 seconds. The selected operating frequency is retained regardless of powering conditions.

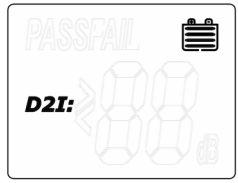
In accordance with FCC License requirements, the operating frequency may need to be changed. Refer to the ***Qualifier Transmitter Licensing*** section on our website at 'www.comsonics.com/downloads.html' for application instructions and templates.

Test the VMD Installation
Push the VMD power switch to the ON position and wait a few seconds for the VMD to initialize. Momentarily press the Test button and the yellow Transmit indicator comes on for a few seconds as the VMD generates the output power signal to the antenna.

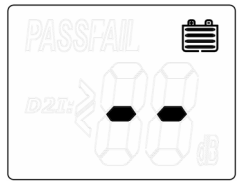
Warning: The Dual Band Antenna must be properly mounted on the vehicle and connected to the VMD before performing this test or operating the Qualifier system. Improper operation of the system may result in permanent damage to the VMD and is not covered under warranty.

Qualifier System Installation Verification

1. Power-on the VMD and wait a few seconds for it to initialize.
2. On the HHD, connect a ≈ 2 inch stub antenna to the BNC connector. (Example: Use a straightened paperclip inserted into a BNC-to-F adapter.) Make sure the HHD batteries are fresh.
3. Stand about 10 feet from the vehicle and hold the HHD with a vertical orientation of the stub antenna.
4. Power on the HHD and then press the Button.
5. The VMD orange Receive indicator flashes once and then the yellow Transmit indicator comes on for a moment.
6. The HHD displays *' - - dB'* briefly and then shows a reading between 25 and 80 dB.
   Note: If the HHD shows *'> 80 dB'* and the *'PASSFAIL'* label, check the Dual Band Antenna connection and repeat the 'Test the VMD Installation' procedure.
7. Set the HHD Threshold to a value less than the displayed reading.
8. Repeat the test and note that *PASS* is displayed.
9. Set the HHD Threshold to a value greater than the displayed reading.
10. Repeat the test and note that *FAIL* is displayed.
11. Set the HHD Threshold Level to 80 dB.
12. Repeat the test and note that neither PASS nor FAIL is displayed.
13. Reset the HHD Threshold to a value for system test operation.



Initial Power On



Measurement in Process

Troubleshooting Notes:
If the trigger signal from the HHD is marginal, the VMD orange Receive indicator flashes several times and the yellow Transmit indicator does not come on.

If the VMD is triggered by the HHD and the orange Receive indicator flashes once (as normal) but the yellow Transmit indicator does not come on, there is a problem with the antenna or the internal transmitter section of the VMD.

If the TEST button on the VMD is pressed momentarily and the yellow Transmit indicator does not come on, there is a problem with the antenna or the internal transmitter section of the VMD.

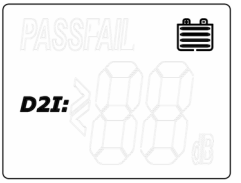
The reliability of the HHD triggering the VMD may be reduced in these test location scenarios:

- The elevation of the HHD test location is significantly lower than the VMD vehicle antenna.
- The residence under test, located between the HHD and the VMD vehicle, significantly blocks or absorbs the HHD trigger signal.

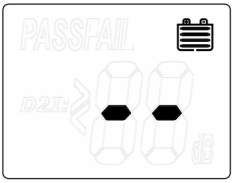
Using the Qualifier X-Ray System

Residential Shielding Integrity Measurement Procedure:

1. Locate the Qualifier VMD equipped vehicle about 50 to 75 feet from the test residence.
2. Set the VMD power switch to ON.
3. Disconnect the CATV drop cable from the residence ground block or splitter. As an alternative method, disconnect and test at the tap or pedestal.
4. Use a BNC-to-F adapter and a short jumper cable to connect the Qualifier HHD to the open residential terminal. If using the tap or pedestal method, connect the HHD to the free end of the drop cable. If needed, use a quality extension cable and a F-81 barrel. Tighten connections as needed.
5. Power on the HHD.
6. Press the HHD Button to activate the measurement sequence.
7. The HHD displays *'- - dB'* briefly and then shows the shielding integrity reading. *PASS* or *FAIL* may also be displayed, based on the Threshold value setting.
8. Repeat the measurement sequence a second time to insure the reading.
   - For a low integrity reading from a tap or pedestal location, retest from the residence ground block or splitter location.
   - For a low integrity reading when connected to the input of the residential splitter, disconnect each cable from the splitter output (one at a time) and retest to determine the path of ingress.
   - If the *PASSFAIL* label appears, the indication of not clearly receiving the VMD test signal, check the HHD connection and the VMD operation. Integrity readings in the range of 25 to 80 with the *PASSFAIL* label showing may indicate excessive noise signals.
9. Disconnect the HHD jumper cable and reconnect the drop cable.
10. Weather-proof the connection as needed.



Initial Power On



Measurement in Process

Specifications

Hand Held Device (HHD)	
Operational Control	Single Button
Input Frequency Range	27.45 to 27.49 MHz
Input Level Range	-30 to +30 dBmV
Integrity Measurement Range	25 to 80 dB (shielding effectiveness)
Accuracy	± 2.0 dB (input level to converted reading)
Threshold Function Range	25 to 79 dB (user selectable, 80 disable)
Power Source	AAA Alkaline x 3 cells
Custom Display	1.2" x 1.5" (30 mm x 39 mm), with backlight
Auto Power Off	16 seconds
Size	5.5" x 2.5" x 1.75" (140mm x 64mm x 44 mm)
Weight	0.5 lbs (0.23 kg)
Operating Temperature	0ºF to 120ºF (-18ºC to 49ºC)
Storage Temperature	-20ºF to 150ºF (-29ºC to 66ºC)
Humidity	Moderate Rainfall

Vehicle Mount Device (VMD)	*(FCC license required)*
Output Frequency (User Selectable)	27.45 MHz, 27.47 MHz*, or 27.49 MHz
Output Power	5 Watts, EIRP
User Controls	Power On/Off and Test/Output Frequency
Indicators	Standby, Power, Receive, and Transmit
Power Source	12 VDC negative ground, < 12 Watts
Size	6" x 3.5" x 1" (150 mm x 90 mm x 26 mm),
Mounting	Fixed
Operating Temperature	0ºF to 140ºF (-18ºC to 60ºC)
Storage Temperature	-20ºF to 150ºF (-29ºC to 66ºC)
Humidity	0 ~ 95% non-condensing

* Factory Default Setting

Accessories / Parts

System Package - Qualifier X-Ray Hand Held Device, Holster, Vehicle Mounted Device, Power Harness, Dual Band Antenna, and User Guide	101396-001SC
Qualifier Hand Held Device (HHD)	101393-001
Qualifier Vehicle Mounted Device (VMD)	101396-001
Qualifier Dual Band Vehicle Magnetic Antenna	101272-001
Holster for Qualifier Hand Held Device (belt clip type)	101240-001
Power Harness for Qualifier Vehicle Mounted Device	101488-001
Battery for Qualifier Hand Held Device (3 required)	BB-542
Qualifier X-Ray User Guide	101399-001

Limited Warranty

Hardware: ComSonics, Inc. (ComSonics) warrants to the original end user (Customer) that the new ComSonics branded products will be free from defects in workmanship and materials, under normal use, for one (1) year from the date of original shipment. ComSonics warrants repaired and refurbished ComSonics products for ninety (90) days from date of shipment.

Exclusions
This warranty excludes:

- Damage to the physical surface of the product, including cracks or scratches to any part.
- Damage caused by misuse, neglect, improper installation or testing, unauthorized attempts to open, repair, or modify the product, or any other cause beyond the range of the intended use.
- Damage caused by accident, fire, power changes, other hazards, or acts of nature.
- Use of the product with any non-recommended device or service if such device or service causes the problem.

Any third party products, including software, included with ComSonics products are not covered by this ComSonics warranty and ComSonics makes no representations or warranties on behalf of such third parties. Any warranty on such products is from the supplier or licensor of the product.

Exclusive Remedies
Should a covered defect occur during the warranty period and you notify ComSonics, your sole and exclusive remedy shall be, at ComSonics sole option and expense, to repair or replace the product. If ComSonics cannot reasonably repair or replace then ComSonics may, in its sole discretion, refund the purchase price paid for the product. Replacement products or parts may be new or reconditioned or comparable versions of the defective item. ComSonics warrants any replaced or repaired product, or part for a period of ninety (90) days from shipment, or through the end of the original warranty, whichever is longer.

Obtaining Warranty Service: Customer must contact ComSonics Technical Support or Customer Service within the applicable warranty period. Products or parts shipped by Customer to ComSonics must be sent postage-paid and packaged appropriately for safe shipment. ComSonics is not responsible for damage occurring in transit from Customer to ComSonics. Repaired or replacement products will be shipped to Customer at ComSonics' expense. All products or parts that are replaced become the property of ComSonics. ComSonics shall not be responsible for Customer's software, firmware, information, or memory data contained in, stored on, or integrated with any products returned to ComSonics for repair, whether under warranty or not.

WARRANTIES EXCLUSIVE: THE FOREGOING WARRANTIES AND REMEDIES ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, CORRESPONDENCE WITH DESCRIPTION, AND NON-INFRINGEMENT, ALL OF WHICH ARE EXPRESSLY DISCLAIMED BY COMSONICS AND ITS SUPPLIERS.

LIMITATION OF LIABILITY: NEITHER COMSONICS NOR ITS SUPPLIERS SHALL BE LIABLE FOR INCIDENTAL, CONSEQUENTIAL, INDIRECT, SPECIAL, OR PUNITIVE DAMAGES OF ANY KIND, LOSS OF INFORMATION OR DATA, OR OTHER FINANCIAL LOSS ARISING OUT OF OR IN CONNECTION WITH THE SALE OR USE OF THIS PRODUCT, WHETHER BASED IN CONTRACT, TORT (INCLUDING NEGLIGENCE) OR ANY OTHER THEORY, EVEN IF COMSONICS HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. COMSONICS ENTIRE LIABILITY SHALL BE LIMITED TO REPLACEMENT, REPAIR, OR REFUND OF THE PURCHASE PRICE PAID, AT CONSONICS' OPTION.

Disclaimer: Some countries, states, or provinces do not allow the exclusion or limitation of implied warranties or the limitation of incidental or consequential damages so the above limitations and exclusions may be limited in their application to you. When implied warranties may not be excluded their entirety, they will be limited to the duration of the applicable written warranty. This warranty gives you specific legal rights; you may have other rights that may vary depending on local law. Your statutory rights are not affected.

Governing Law: This Limited Warranty shall be governed by the laws of the State of Virginia, U.S.A., and by the laws of the United States, excluding their conflicts of laws principles. The United Nations Convention on Contracts for the International Sale of Goods is hereby excluded in its entirety from application to this Limited Warranty.

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June 1, 2007

Agency Notice

FCC Part 15

Qualifier X-Ray, Hand Held Device
FCC ID: PYN2007HHD

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.

FCC Part 15 for Handheld Devices

To comply with FCC RF exposure requirements, this device must be operated in the hand with a minimum separation distance of 23 cm or more from a person's body. Other operating configurations should be avoided.

Note: This equipment has been tested and found to comply with the limits for a Class A 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. If not installed and used in accordance with the instructions, the equipment may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at own expense.

Qualifier X-Ray, Vehicle Mounted Device
FCC ID: PYN2007VMD

FCC Compliance and RF Exposure Information

This product is certified by the FCC as compliant with CFR.47 Part 90. Changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.

Industry Canada

Qualifier X-Ray, Hand Held Device
IC: 4261A-2007HHD

This Class A digital apparatus complies with Canadian ICES-003. Cet appareil numérique de la Classe A est conforme à la norme NMB-003 du Canada.

Qualifier X-Ray, Vehicle Mounted Device
IC: 4261A-2007VMD

This Class A digital apparatus complies with Canadian ICES-003. Cet appareil numérique de la Classe A est conforme à la norme NMB-003 du Canada.

The installer of this radio equipment must ensure that the antenna is located or pointed such that it does not emit RF field in excess of Health Canada limits for the general population; consult Safety Code 6, obtainable from Health Canada's website www.hc-sc.gc.ca/rpb.

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