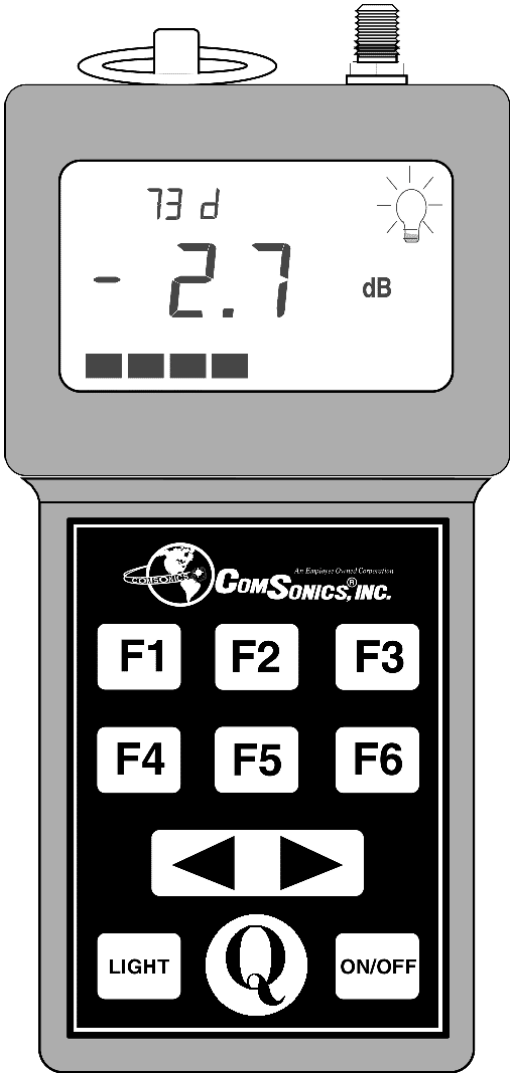
CyberTek™ QUALIFIER

USER GUIDE



SUPPLEMENT TO WINDOWLITE INSTALLER

Preliminary Copy

ComSonics, Inc. An Employee Owned Corporation

CSI Document 101xxx-001 Rev. A

Warranty

ComSonics, Inc. warrants this product to be free of material and workmanship defects for a period of one year from the original date of shipment.

Remedies provided under Warranty are exclusive and in lieu of all other warranties express or implied. The liability to ComSonics is limited to product repair or replacement at the discretion of ComSonics. ComSonics shall not be held liable for any incidental or consequential damages.

The following are not covered by this warranty:

1) Parts or components not supplied by ComSonics, or parts or components that have been modified.
2) Any product or part failure that results from accident, abuse, misuse, neglect, or unauthorized repairs or modifications by individuals other than ComSonics personnel.
3) Failures caused by use of this product in extreme climates or moisture conditions.
4) CyberTek Qualifier Battery Pack

Technical Support

ComSonics maintains a Technical Support Service for customer convenience. Should the need arise, contact a Technical Support Representative by phone at 1-800-336-9681 or 1-540-434-5965; Fax at 1-540-432-9794; or Email at tech-support@comsonics.com.

Return Information

Products returned for repair, calibration, etc., must be safely packed. Please enclose information on the reason for return. Ship the material prepaid.

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Agency Notice

Changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.

FCC ID: PYN12002A vehicle mounted device
FCC ID: PYN22002A hand held device

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.

CyberTek Qualifier™ and WindowLite® are trademarks of ComSonics, Inc.

Document No. 101xxx-001 Rev. A

Table of Contents

Qualifier Specifications

Transmitter

Power	5 watts
Frequency	27.450, 27.470, or 27.490 MHz
Size	TBD
Weight	TBD
Storage Temperature	-20°F ~ 150°F
Operating Temperature	0°F ~ 120°F
Humidity	5% ~ 95% (non condensing)

Receiver

Frequency	27.450, 27.470, or 27.490 MHz
Size	7.7” x 3.5” x 2.3”
Weight	23 oz.
Storage Temperature	-20°F ~ 150°F
Operating Temperature	0°F ~ 120°F
Humidity	Weather resistant

Supplemental Notice

This document contains the CyberTek Qualifier system functions and is supplemental to the WindowLite Installer User's Guide, CSI Document 100673-003.

System Overview

ComSonics Qualifier is a multipart system that provides a means of identifying internal shielding integrity quality without having to enter the potential customer premises. One of Qualifier's two transmitters, the Test Source Transmitter (TST) located within the service vehicle, provides an RF envelope that blankets the targeted premises. The second transmitter, the Test Key Transmitter (TKT) located within an optionally accessorized ComSonics' Window Installer, delivers the signal that triggers the remotely located TST and sets up the Installer to receive traces of TST signal finding their way into the upstream path. With the Installer connected to either the premises grounding block or the associated drop at the housetap, a press of Installer's "Q" button instructs TKT to trigger TST. When triggered by TKT, TST emits a brief, 5 watt pulse just above the CB radio band, and within the upstream spectrum at 27.45 MHz, 27.47 MHz or 27.49 MHz. TST then envelopes the premises with a signal of about +58 dBmV (assumes the service vehicle is about 75 feet from the premises). Shielding flaws within the in-home wiring invite the TST signal to infiltrate the upstream path. Once on the center conductor, the in-home wiring system funnels the TST signal to the Installer connection. The Installer measuring instrument takes a snapshot at precisely the right time to capture and readout that portion of the TST signal momentarily appearing at the selected connection point.

The basic steps for qualifying a home are as described below:

1. Park the service vehicle near the home no further than 150 ft and preferably about 75 ft from the house you are qualifying. Make sure the transmitter is powered.
2. Connect the Qualifier unit to the appropriate house drop that needs testing.
3. Press the "Q" button to put the Qualifier unit into Qualifier Mode.
4. Press the "Q" a second time to make the measurement. The transmitter light on the transmitter will power up.
5. The house will be illuminated with a 5W burst that blankets the house.
6. If the signal ingresses into the house, it can be read by the Qualifier Unit.
7. The Qualifier Unit will give the technician a read out of how many dB the unit the unit is above or below threshold. The threshold is determined by whether the unit is in Automatic or Manual mode which are described in the *Qualifier Unit Description*.

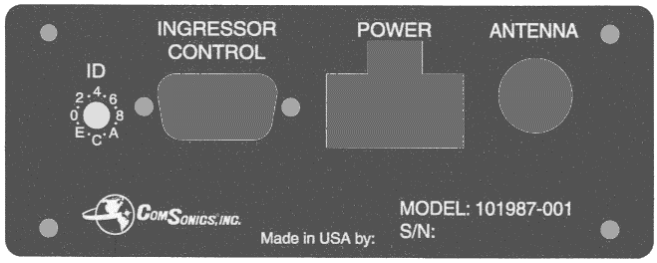
Component Operations

Transmitter

The transmitter unit is mounted in the van *(guidelines should be referenced here)* and connected to the antenna. Place the antenna on top of the van or truck preferably in the center of the roof of the vehicle. When transmitting, the unit will send a series of carrier bursts at the factory set frequency (27.45, 27.47, 27.49 MHz) radiated at 5W through the antenna. If the bursts ingress into the house, the Qualifier unit will measure the signal, then display its relevance to the internal threshold (*See Qualifier component).*

The transmitter is controlled by the Qualifier via the means of a Command Link, which is activated when the "Q" is pressed after putting the Qualifier unit in *Qualifier Mode.* This allows the Qualifier unit to command the transmitter when to send its carrier.

Elements of the transmitter device are:



Receiver User Identifier (RUID) Rotary Switch
The RUID Rotary switch has 0-F possible values. This allows a transmitter to transmit only from Qualifier units that send this RUID in the command link transmission. This would allow more than one transmitter and Qualifier units to service a neighborhood without interference from one another.

Power Light (Green)
After powering the transmitter, this light will illuminate after the unit has finished internal initialization and determined that no current fault modes are active. If a current fault is active, this light will not illuminate.

TX Light (Yellow)
When the unit receives a command from a Qualifier unit to transmit, this light will activate during the transmission to confirm the Command Link is functional and a signal has been radiated.

VSWR Light (Red)
This light activates when there is an improperly matched antenna. This will only occur when you try to transmit a signal. To correct, the technician must cycle the power and make an adjustment to the antenna.

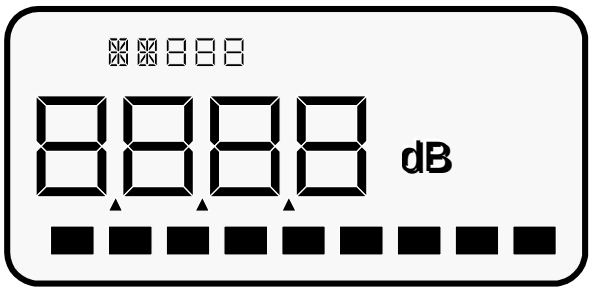
Temperature Light (Red)
This light will activate when the internal temperature exceeds the operating limits. The device will shutdown in this condition and will not function until an acceptable temperature range has been reached.

Qualifier Receiver

The Qualifier includes the same functions that are present in a ComSonics Installer Digital unit. The device also has a *Qualifier Mode* that is activated by pressing the "Q" button on the device. Once in this mode the following keys are active:

"Q" Key
Pressing this key when in *Qualifier Mode* enables the Command Link to a qualifying transmitter. The device will command the transmitter to send a burst of carriers in order to make a measurement. If the Qualifier unit detects the carriers, it will measure the signal strength and display that measurement relative to the internal threshold set. For example if the signal is 3 dB below the threshold, -3.0 dB will be displayed on the unit.

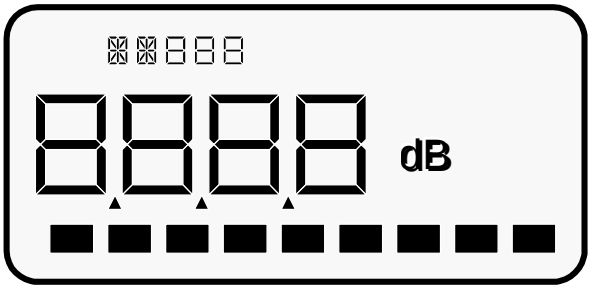
F1 Key (Automatic or Manual)
This key selects between using an Automatic Threshold ("A") or Manual Threshold ("M"). This determines which threshold will be used when making the qualifying measurements.



Automatic – At the factory the device threshold will be initialized to a default factory value (12 dBmV). Each subsequent measurement will be used in a rolling average to tailor the unit to the cable system's typical noise level. The threshold can be reset back to the factory default at any time by pressing the *F2 Key*.

Manual – The user can set a threshold between 2-22 dBmV using the *F3 Key* and the arrow keys.

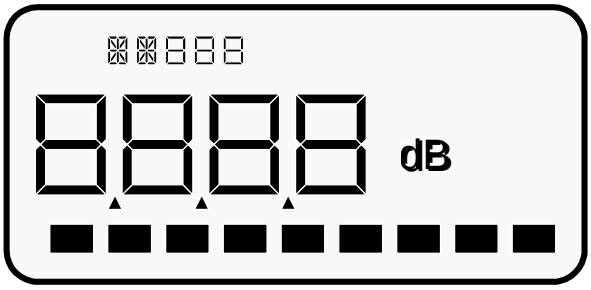
F2 Key (Automatic Reset)
This key will reset the Automatic Threshold back to the factory default and reinitialize the rolling average.



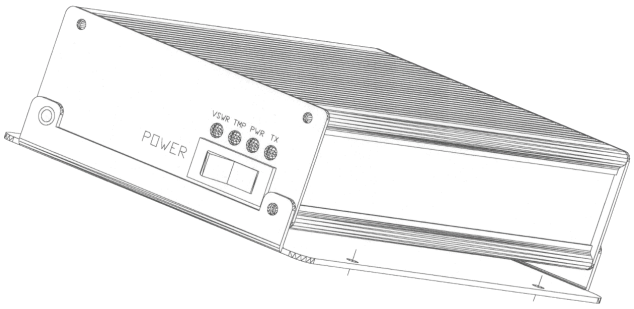
F3 Key (Manual)
This key will display the current manual threshold (initialized at the factory at 12 dBmV). The user can then use the Arrow keys (< or >) to change the value. The range of values are between 2-20 dBmV. Pressing the *F6 key* will take the unit back into the Main *Qualifier Mode*.

F4 Key (RUID)
Pressing this key will allow the user to set the Receiver User Identifier (RUID). The current setting will be displayed. The user can then use the Arrow keys (< or >) to change the ID. Valid ranges are 0-F. Pressing the *F6 key* will take the unit back into the Main *Qualifier Mode*. **Note: Qualifier and transmitters used in conjunction need to have the RUID number match in order for the Qualifier functions to work properly.**

F6 Key
Pressing this key will exit *Qualifier Mode* back into normal operation. If the user was setting a Manual threshold or the RUID, the unit goes back to the main *Qualifier Mode* display.



Hardware Installation



Install Transmitter

Mount Transmitter

Vehicular Device

Consists of:

Vehicular Mounted Receiver/Transmitter

Mount in an environmentally protected area of the vehicle

Mount with visibility to LED indicators

Receiver/Transmitter Powers from Vehicle

Transmitter produces output signal with unique signature

Transmitter can be factory set to one of three FCC approved frequencies

Transmitter switches between three fixed output power settings as controlled by the receiver section and commanded by the handheld device

Receiver section receives commands from handheld device

Turn transmitter on / off

Select transmitter output power

Power Transmitter

Wiring Harness for Receiver/Transmitter

Connect harness to battery of vehicle

Harness contains protection fuse

Maintain proper fuse rating

Protect harness from nicks, pinches, chaffing, damage.

Install Antenna

Mount Antenna

Route Antenna Cable

Vehicular Magnetic Mount Dual Band Antenna

50 ohm cable permanently connected to antenna

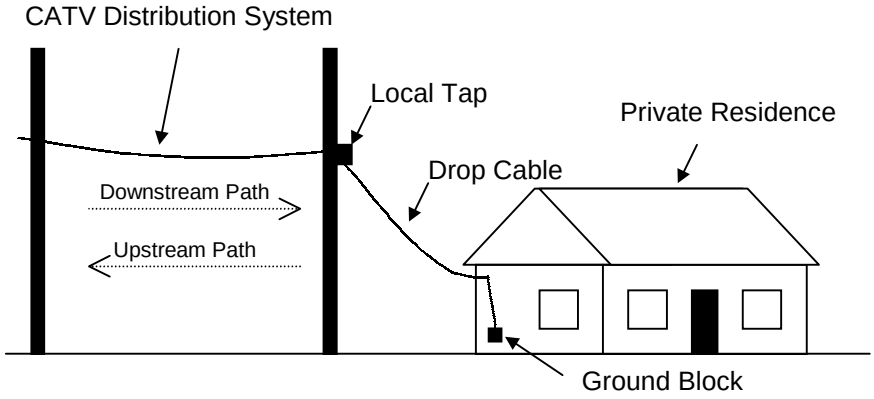
BNC connector to receiver/transmitter

Protect antenna cable from nicks, pinches, chaffing, damage

Place antenna in center of vehicle roof, clear of metallic objects

Metallic objects on vehicle roof may cause improper operation of the system

Theory of Operation

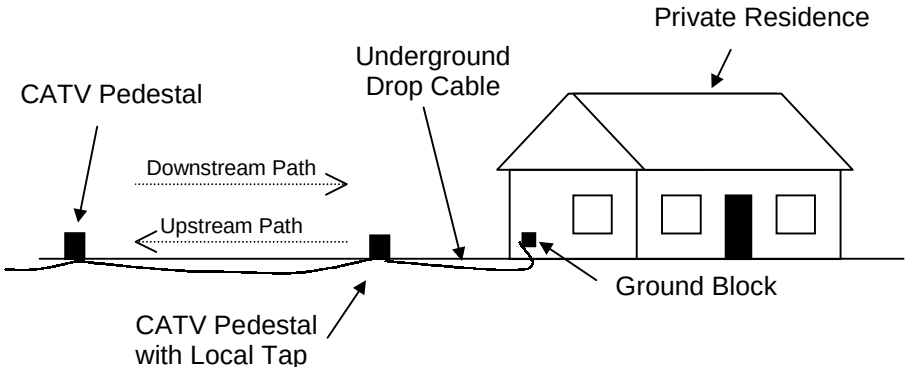


Typical CATV overhead routing to private residence.

A cable television system distributes signals by a cable suspended on utility poles or by a cable buried in the ground. A combination of both methods is not uncommon. From the main distribution cable, a device called a local tap is used to interface the distribution system cable to the subscriber. From one to eight and possibly more subscribers may be served from a single local tap location. A multitude of local taps is used through out the distribution system to provide cable services to subscribers.

From the local tap in overhead systems a drop cable is suspended from the local tap and secured to the residence at a safe distance from the ground. The drop cable is routed down the side of the residence to a device called a ground block. The ground block is a pass through device connected to an earth ground. It is used to prevent static build up between the cable system and the electrical power wiring of the residence. Thereby reducing the risk of electrical damage to devices within the residence that are connected to cable system.

From the ground block the cable enters the residence and is routed to the device/s within the residence. The cable within the residence may be split (branched) into a multitude of paths supplying cable services to many locations within the residence. Examples of devices connected to the internal cabling are television sets, VCRs, cable modems, digital carrier receivers, and special service transceivers.



Typical CATV underground routing to private residence.

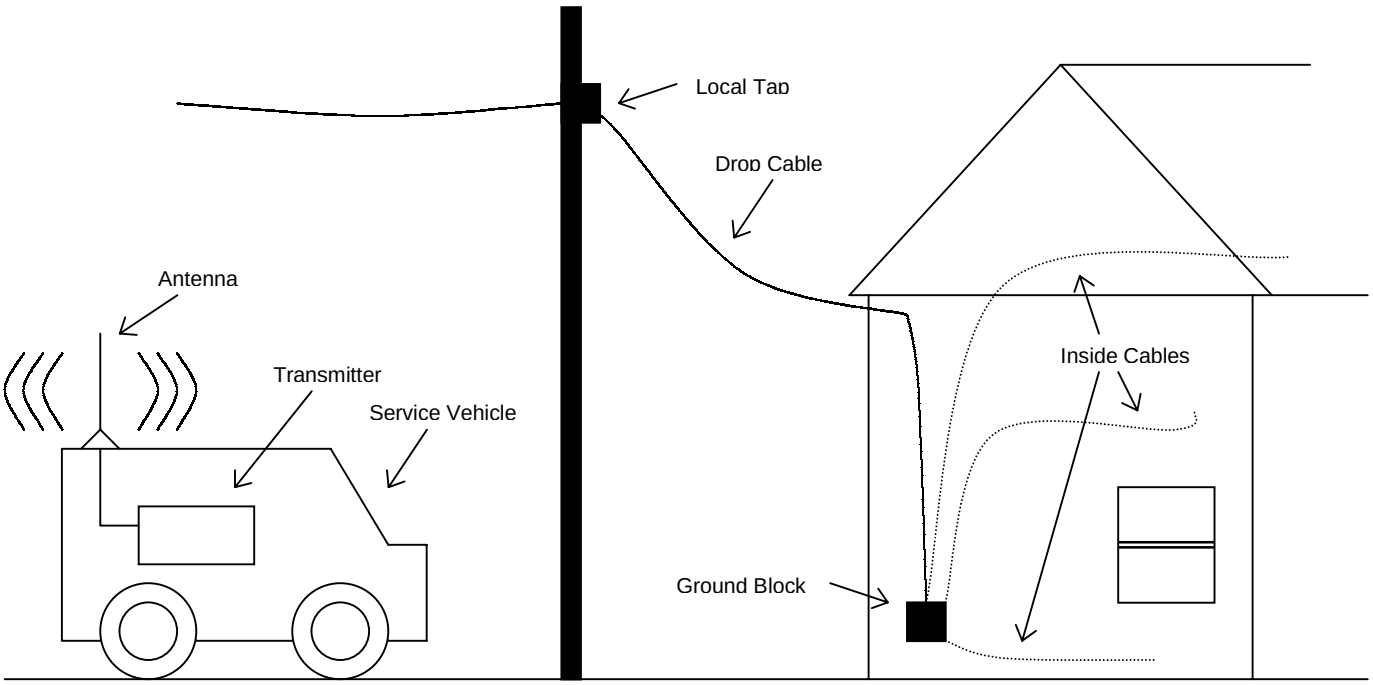
The underground distribution system has the cable buried in the ground. The cable only surfaces into above ground enclosures call pedestals. Opening a pedestal allows access to the cable system for maintenance. Distribution pedestals contain local taps and an underground cable is used to supply cable services to the residence. The underground drop cable usually surfaces just below the ground block.

Cable signals coming to the residence follow the downstream path. Downstream signals are in the 50 MHz to 1 GHz frequency range. To enable two way communications on a cable system, the upstream path is used for signals originating within the residence and traveling to a central location in the cable system. Upstream signals utilize the frequency range of 5 to 50 MHz. The upstream path is used for devices such as cable modems and special services devices. Examples of special service devices are burglar alarms, fire alarms, and personal health monitors.

Unfortunately, the reliability of the upstream path is vulnerable to the effects from devices that radiate electrical energy in the 5 to 50 MHz frequency range. The upstream path uses digital signals and as such is subject to very unreliable operation if interference signals find their way into the system. Examples of devices capable of causing interference are: CB radios, hair dryers, washing machines, food mixers, toasters, vacuum cleaners, and almost any home appliance that has a motor or a power switch. The interference effect may be for an instant or continuous while the device is on.

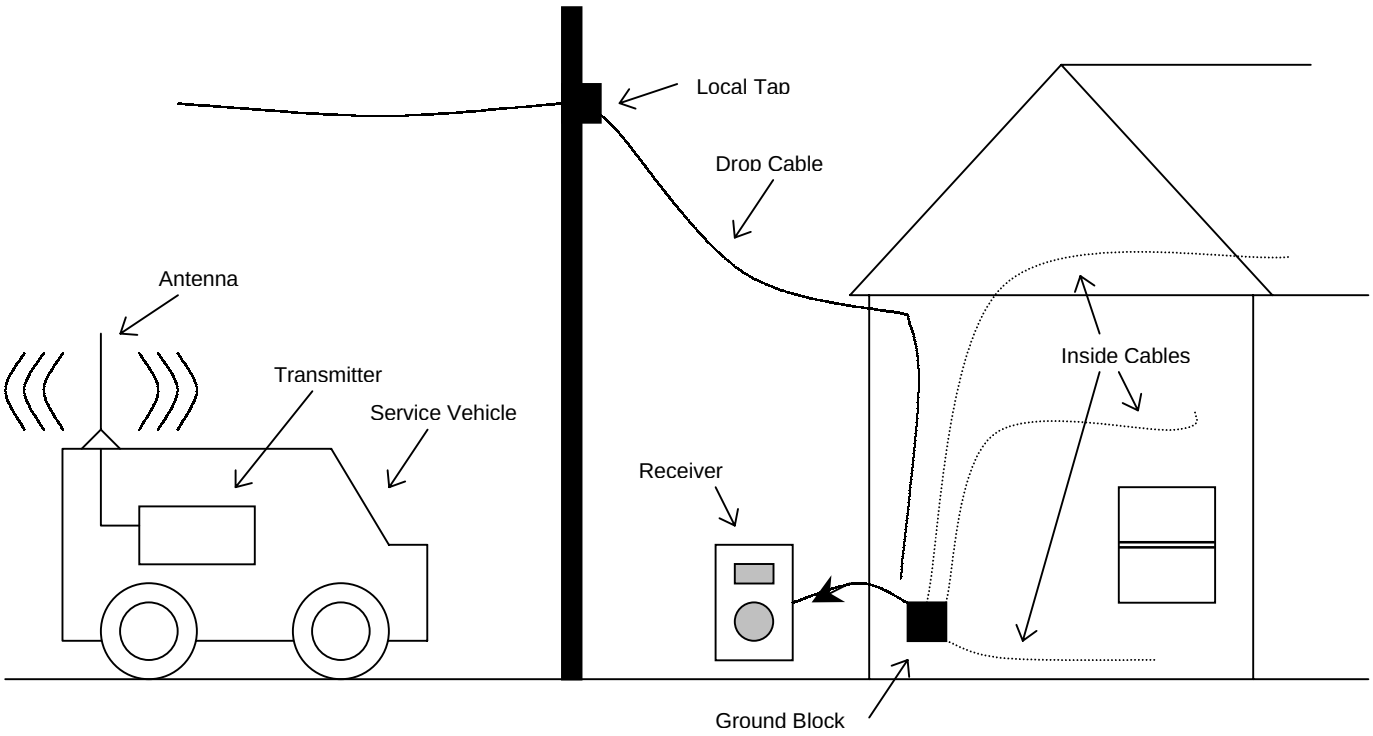
Quality CATV cabling practices utilized within the residence usually reduce or eliminate the susceptibility of interfering signal ingress.

Ingress problems in the upstream path are compounded by the multitude of residences connected to the CATV distribution system. Any one residence is capable of adding an interference signal on the upstream path and inhibiting communications. A multitude of residences, each only adding only a small amount of interference, can also render the upstream path useless. Interference signals add on a power basis.

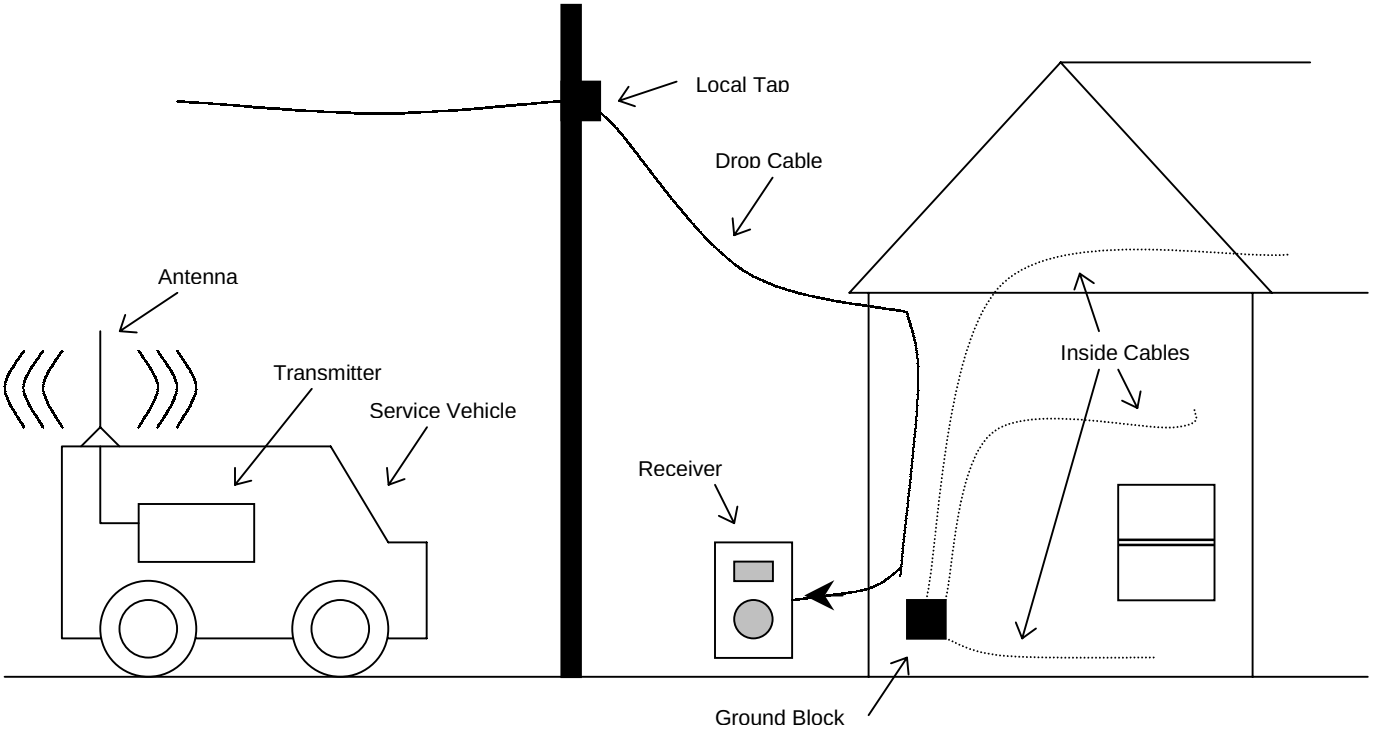


The CATV cabling inside a residence is usually hidden in areas such as craw spaces, behind walls, attics, and basements. The effects of aging on the cable (especially metal connectors), rodent damage, and possibly improper installation reduce the shielding integrity of the system within the residence. Poor shielding integrity allows the inside cabling to become a receiving antenna for interfering signals. A signal or noise entering (ingress) the internal cabling has the possibility of traveling to the upstream path and causing problems.

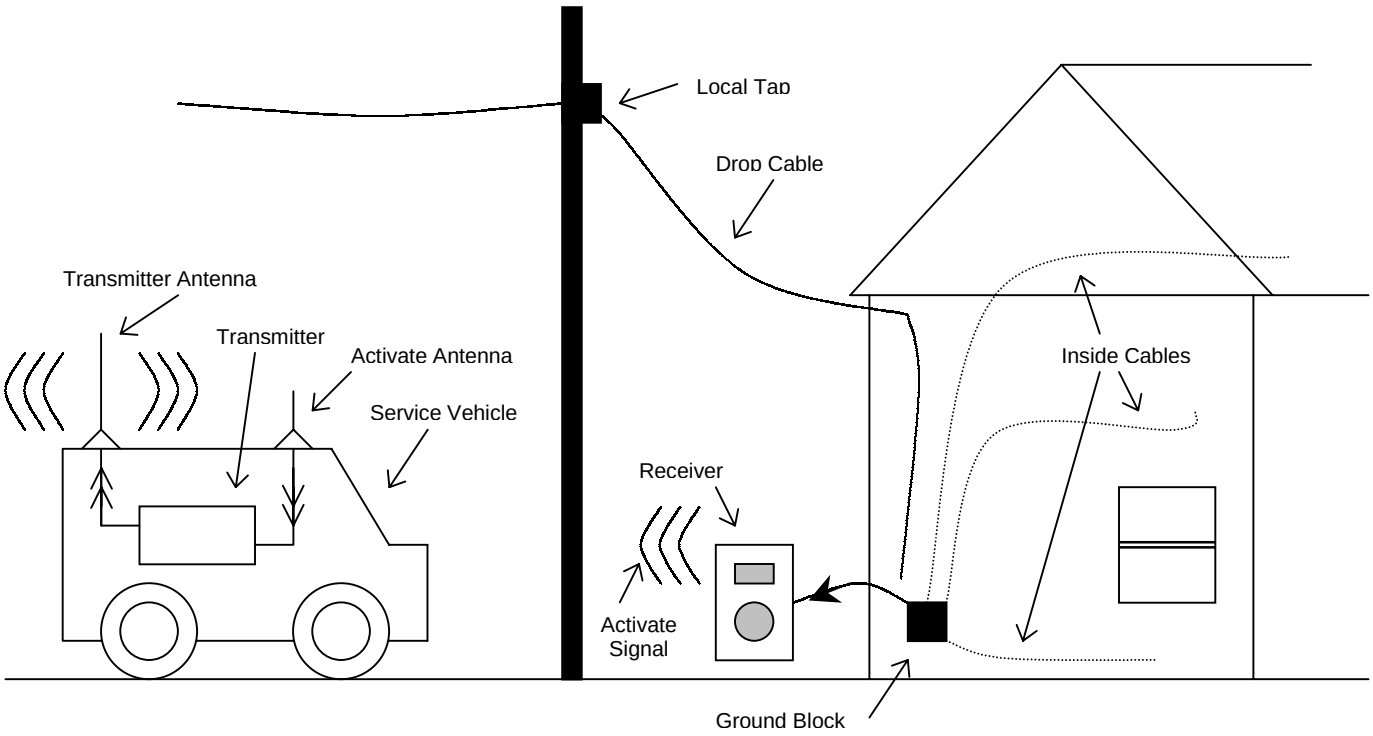
Since all residences have the potential to cause problems in the upstream path, a test is needed to qualify each individual residence. If the internal cabling is susceptible to ingress from devices within the residence, then it will also have ingress from a known signal source. The known signal source is a mobile transmitter operating on a frequency in the 5 to 50 MHz range. The mobile transmitter is usually mounted in a service vehicle and powered from the vehicle. The mobile transmitter also has a feature of variable power output. An omni-directional antenna is connected to the transmitter and mounted on the vehicle. The antenna is best mounted on the vehicle roof in an area clear of other metallic objects such as other antennas, ladders, and lifting apparatus. The vehicle is parked adjacent to the dwelling (within 100 feet) and the transmitter is powered on. The residence is radiated with the test signal. Test signal frequency should be chosen as not to cause interference with known upstream communications.



To qualify the shielding integrity of the cabling within the residence, the drop cable is disconnected from the ground block. A precision receiver is connected to the ground block (to the connection the drop cable was removed from) with a length of quality jumper cable. The receiver is tuned to the frequency of the transmitter and measures the level of test signal being received by the internal cabling. The level of the received test signal is compared to a reference standard to determine if the shielding integrity of the cabling within the residence is acceptable. Test signal level measurements may be indicated by the receiver in common units of measurement, such as µV or dBmV. The receiver may automatically perform the level comparison function and produce a Pass/Fail message. If the measured level of the test signal is greater than acceptable limits, each routing of the internal system may be tested individually to determine the fault. Usually a CATV signal splitter is located in close proximity to the ground block. Disconnecting individual cables from the splitter and retesting allows for insolating the faulty routing.



A further test involves testing the drop cable section of the residential system. The drop cable is disconnected from the ground block and the drop cable is connected to the precision receiver. With the mobile transmitter powered on and the receiver tuned to the frequency of the transmitter, the level of test signal is measured. The level of the received test signal is compared to a reference standard to determine if the shielding integrity of the drop cable is acceptable. Test signal level measurements may be indicated by the receiver in common units of measurement, such as μV or dBmV. The receiver may automatically perform the level comparison function and produce a Pass/Fail message. A greater than acceptable level measurement would most likely indicate a faulty connection at the local tap.



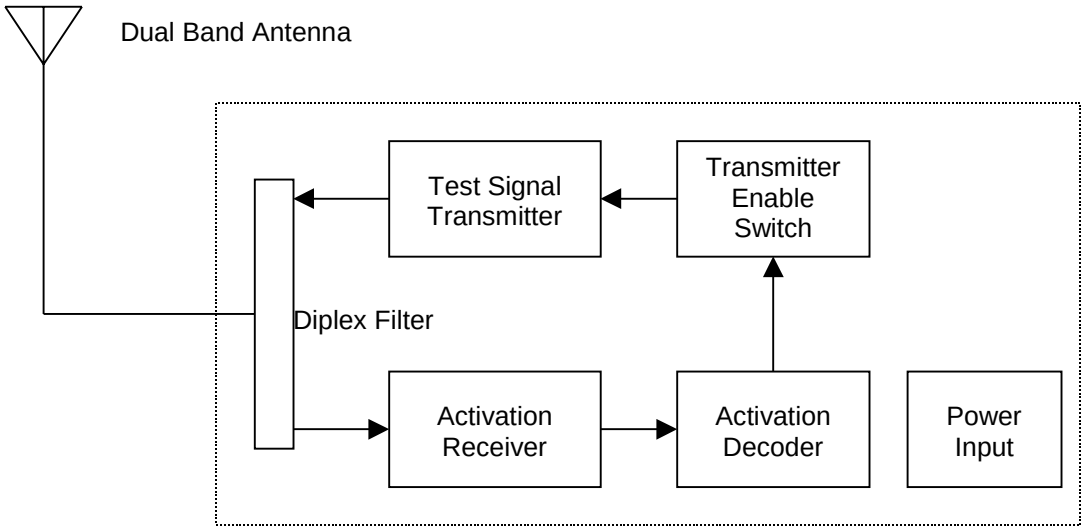
An enhancement to the integrity (ingress) test system is the function of the receiver activating the transmitter only when measurements need to be made. Thereby reducing vehicle power drain, transmitter heating, and general RF pollution. Additionally, the activation signal from the receiver is encoded and the transmitter recognizes the encoded activation signal. In this manner, false transmitter activation is eliminated. A multitude of activation codes is available allowing multiple test systems to be in operation in the same vicinity. Only the transmitter associated with a given receiver code activates when needed.

In practice the transmitter and activate antennas can be combined into one dual band antenna with a diplex filter at the transmitter/receiver.

A further enhancement is the coding of the transmitter signal. In this manner, the receiver can reject measurements not recognized as those from the test transmitter.

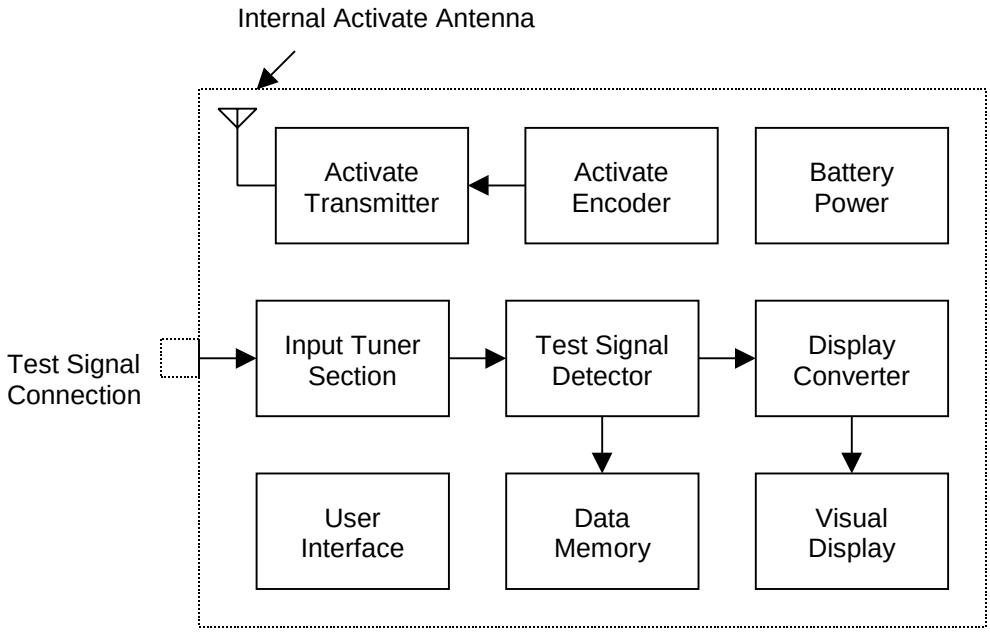
Other enhancements include: measurement data storage within the receiver for later retrieval and analysis, integration with GPS system for location and time data, integration with a cable modem or wireless device for data transfer to a central CATV location or internet access.

Transmitter Block Diagram



The transmitter is mounted in and powered from a vehicle. The antenna is mounted on the vehicle's roof. Preferably placed in a location free of other metallic objects. The dual band antenna receives a properly coded activation signal from a receiver. The diplex filter routes the activation signal to the activation receiver. The activation decoder determines a code match between the received signal and setting of the transmitter. If a code match occurs, the decoder activates the transmitter enable switch. Otherwise the transmitter remains powered off. The transmitter enable switch causes the transmitter to power on. The test signal is feed to the dual band antenna by the diplex filter. The diplex filter prevents the test signal from being routed to the activation receiver.

Receiver Block Diagram



The precision receiver is powered by an internal battery and is portable in design.

A test sequence consists of the following steps.
Receiver is connected to ground block of residence under test.
User interface powers on the activate encoder. The activate encoder has been previously setup to match the intended vehicle transmitter. The activate transmitter is powered on and the activate signal is radiated from the internal antenna.
The vehicle transmitter receives the activation signal and verifies the coding. If the coding matches, the vehicle transmitter powers on and radiates the residence with the test signal.
The input tuner section receives the test signal resulting from ingress into the residence. The test signal detector qualifies the test signal as originating from the test transmitter. If the test signal qualifies, the display converter sends the level measurements to the visual display. If the receiver is configured as such, a Pass / Fail message is displayed.
Measurement data is stored to data memory by the user interface.