

# SmartClass™ Home Full

## Inside Wiring and Networks Service Meter



- Key Features**
- Easy-to-use, accurate, and economical handheld test instrument
  - Conexant Accelity VDSL Chip Set
  - HPNA v3.1 tests mode B coax or twisted-pair nodes
  - Coax Mapping with splitter identification and location
  - Noise Immunity Test measures coax shield isolation
  - Coax cable identification through splitters and other coax network elements
  - Physical layer testing for coax, Cat3/Cat5/Cat5e/Cat6 cables
  - Ethernet testing, including port identification and ping
  - POTS butt-set with diagnostics and loudspeaker
  - 802.11b/g wireless signal testing

The SmartClass Home Full handheld service meter enables verification of very high-speed digital subscriber line (VDSL) and Home Phoneline Networking Alliance (HPNA) networks as well as the internal wiring at the customer premises for proper operation of voice, video, and data services. Use the SmartClass Home to test VDSL to the side of the premises, HPNA inside the premises, as well as the coax and twisted pair wiring inside the subscriber's location. The SmartClass Home provides an easy-to-use, accurate, and economical measurement tool for service technicians installing or troubleshooting triple-play services over existing or new networks.

The SmartClass Home includes a unique set of features to completely qualify the subscriber's premises for triple-play services that use VDSL and HPNA technologies as well as the physical media to deliver communication signals throughout the site. The Coax Map feature and the Noise Immunity Test can be used to assess quality and troubleshooting issues in a coax network. The Active ID can delineate multiple runs of coax in the building even through coaxial splitters. The integrated wiring tools can also be used to qualify twisted pair, including Cat3, Cat5, Cat5e, and Cat6 cables. The SmartClass Home saves time and effort in verifying and troubleshooting inside wiring problems before the subscriber notices them.

The SmartClass Home also includes a unique feature set for testing Ethernet data networks in residential and small-to-medium-sized business (SMB) locations. The built-in 802.11b/g wireless feature ensures correct WiFi functionality in and around the subscriber locations. Additional features include a fully functional built-in butt-set, which can be used to test POTS voice delivery along with wiring identification and toning to locate and identify cables.

Combined with an easy-to-use menu structure, the features of the SmartClass Home represent the best all-in-one service and wiring tester available.

### Applications

- Synch up over VDSL to verify rates are adequate to provide desired services
- Validate and troubleshoot live HPNA mode B networks
- Verify residential, MDU, and SMB internal wiring
- Eliminate carrying multiple wiring and internal network test devices
- Perform accurate tests to locate and troubleshoot disruptions for internal network data, voice, and video service
- Verify Ethernet, POTS, and 802.11b/g wireless functionality to ensure troublefree services

**VDSL** 100%

**Link State** Showtime

Loop Length: **3.2 k ft**  
 Uptime: **5 s** Sync Time: **32 s**

**Down**

Capacity:	<b>99 %</b>	Rate:	<b>28736</b> kbps
SNR Margin:	<b>9 dB</b>	Max. Line Rate:	<b>30828</b> kbps
Latency:	Interleave	Max. Usr Rate:	<b>28777</b> kbps
Delay:	<b>8 ms</b>	Attenuation:	<b>33</b> dB

**Up**

Latency:	Interleave	Rate:	<b>4928</b> kbps
Delay:	<b>8 ms</b>		

SAVE ERRORS ABORT

VDSL synch rates help the user determine if service can be maintained properly at the subscriber's location

### VDSL Testing

The SmartClass Home has a built-in VDSL modem, similar to the one built into the subscriber's residential gateway or VDSL modem, which allows it to synch up with the local Digital Subscriber Line Access Multiplexer (DSLAM) and establish the best attainable communication rates. Determining what the subscriber's drop can accommodate is critical, because various distributors can be present on it.

The VDSL synch test conducted with the SmartClass Home Full can be used to perform measurements of the subscriber's connection and display rates. Also while maintaining a VDSL synch, the SmartClass Home will show whether VDSL errors have occurred on the line since testing began. These results let technicians best determine if the subscriber's network path can carry bandwidth-intensive services, such as video, voice, and data, over the VDSL connection or if they must perform additional troubleshooting.

**VDSL Errors** 100%

**VDSL Errors**

FEC	160901
CRC	2299
Sev. Err. Frames	2291
Loss of Signal	723
<b>Line Errors</b>	<b>166214</b>

SAVE CLEAR

VDSL synch errors indicate that the subscriber's connection may need additional modifications

### HPNA Network Testing

HPNA, a technology standard developed by the HomePNA™ Alliance, builds on Ethernet and allows all the components of a home network to connect and integrate over an unpredictable wiring topology. The HPNA communication is used to pass information around a home to other HPNA-connected devices.

In HPNA mode, the SmartClass Home connects to, and communicates with, other HPNA-capable devices, or nodes, operating in spectral mode B on the same network.

By establishing itself as a network node on a live HPNA network, the SmartClass Home can test each of the various nodes on the network. SmartClass Home allows users to segment problem node paths, node-to-node communication issues, or to verify that the whole network is running correctly. The SmartClass Home lets users verify that HPNA networks are operating within expected service quality metrics and set up PASS/FAIL limits to help simplify testing.

**HPNA** Pass 64%

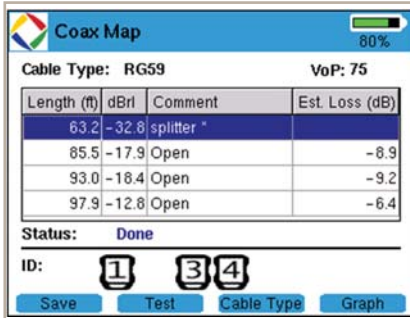
**Network Test**

Segment ID → ID	Rate, Mod Mbps	PER	SNR (dB)	Rx pwr (dBm)
3 → 2	128, 16/8	0.00e+00	44.02	-16.96
3 → 1	96, 16/6	0.00e+00	36.76	-33.18
2 → 3	128, 16/8	0.00e+00	42.38	-4.81
2 → 1	112, 16/7	0.00e+00	41.21	-3.40
1 → 3	112, 16/7	0.00e+00	38.34	-21.42
1 → 2	112, 16/7	0.00e+00	44.26	-4.37

SAVE REFRESH STATS

HPNA testing lets users test network metrics between HPNA nodes to verify or troubleshoot HPNA networks

## 3



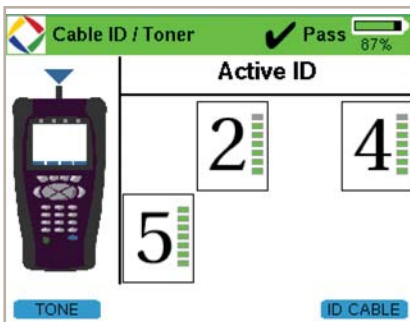
The Coax Map test lets technicians locate and troubleshoot problematic segments of coaxial cable

### Coaxial Cable Testing

Coax is gaining popularity as the medium of choice for transferring communications in and around customer premises. Whether the technology is broadcast or IP video, data over coax technologies, or whole-home digital video recorder (DVR) services, the SmartClass Home can ensure that the inside coaxial plant is properly connected. The SmartClass Home also helps technicians detect and eliminate unwanted coaxial elements such as hidden splitters, bad barrels, and damaged cables.

#### Coax Map

The Coax Map feature of the SmartClass Home is a single-ended coax physical layer test based on frequency domain reflectometry (FDR), a powerful technique used in analyzing RF transmission lines. The Coax Map test measures signal quality as it passes through the transmission line by identifying impairments that cause standing waves.



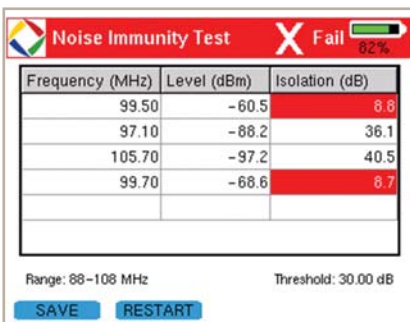
Cable ID mode with Active IDs enables technicians to identify connections for each segment of coaxial cable

#### Coax Active Identification

The SmartClass Home helps technicians quickly identify which cable goes to which room in a house. Using the Cable ID mode, technicians can determine coax wire endings for each room with a coax run. A common problem occurs when an unexpected splitter exists in the middle of the coax run. However, the Active IDs of the SmartClass Home work through splitters to display multiple IDs, which helps to locate the wall outlet or outlets that are connected via a splitter network.

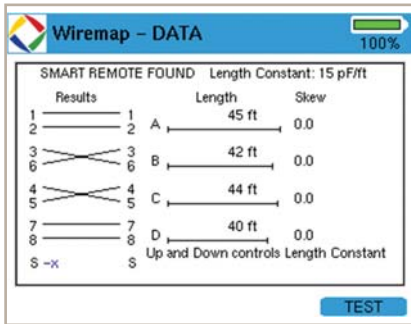
#### Noise Immunity Test

The Noise Immunity Test (NIT) provides good indications of coaxial cable shielding issues. Problems arise when the inside coax has staples, sheared jacketing, an exposed stinger, or an unterminated end present. The NIT gives technicians a better chance of catching impairments before subscribers experience service degradation. The NIT measures the signal strength of local FM carriers and compares them to the same measurement on the cable to determine the isolation of the coax to off-air ingress.

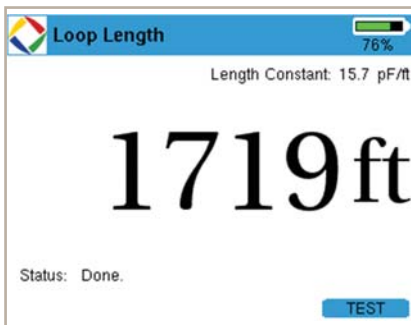


The NIT helps users locate isolation issues in coax cable to identify which legs contain faults that could allow ingress into the coax network

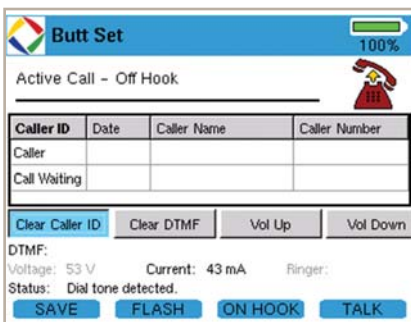
## 4



Twisted Pair Wire Map helps technicians find impairments and incorrect wiring in phone and Ethernet cables



Loop Length test measures the length of unterminated twisted pair cables



The built-in butt-set lets technicians verify and troubleshoot POTS voice issues

### Twisted Pair Testing

The SmartClass Home provides a suite of twisted pair measurements to ensure the correct connections and wiring of POTS and Ethernet cables.

### Twisted Pair Wire Mapping

The Twisted Pair Wire Map provides details about the cable length, distance to opens and shorts, skew, and the connection mapping of each wire when used with the SmartRemote. This information lets technicians quickly locate improper wire connections and the presence of physical layer issues. The SmartClass Home can map different types of twisted pair cables such as Cat5/5e/6 Ethernet and straight or Cat3 phone wiring.

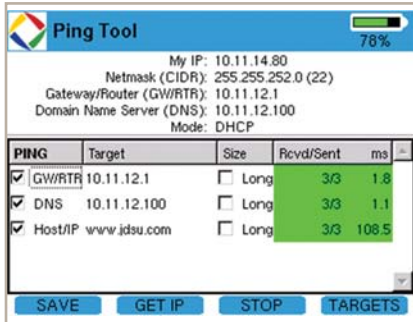
### Loop Length

The Loop Length test is an open capacitance test that calculates the length of the twisted pair cable. Intended more for lengthy twisted pair runs, the Loop Length test lets technicians easily verify cable run lengths.

### Butt-Set

The SmartClass Home has a built-in butt-set with speaker phone that helps technicians quickly verify voice communications and troubleshoot POTS issues. The results indicate voltage and current on the line as well as the number dialed and the status of the POTS line. Technicians can store a list of frequently called numbers for easy dialing. The butt-set provides call waiting and displays the caller ID for incoming calls. The speaker phone lets technicians listen for dial tone or voice and talk during calls without a separate headset.

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Ping mode lets technicians verify connectivity around and outside the customer premises

## Ethernet

The SmartClass Home includes a suite of Ethernet connectivity tests to help users quickly identify connectivity issues on customer premises equipment (CPE) connected to the network.

### Port Discovery

The Port discovery test displays the established link rate on the Ethernet connection between the SmartClass Home and a router. It also displays the available rates and the signal-to-noise ratios (SNRs) of each active twisted pair. This information helps technicians pinpoint connection issues between the CPE devices and the premises router.

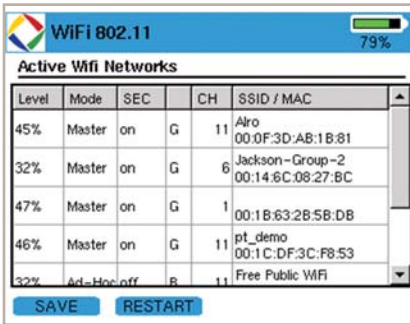
### Ping

Ping tests let technicians verify network connectivity to a particular Internet Protocol (IP) or Universal Resource Locator (URL) address. They can also verify that a particular location is capable of reaching either the Internet or a specific server on the network, which lets technicians avoid using customer equipment or a laptop to perform simple connectivity tests.

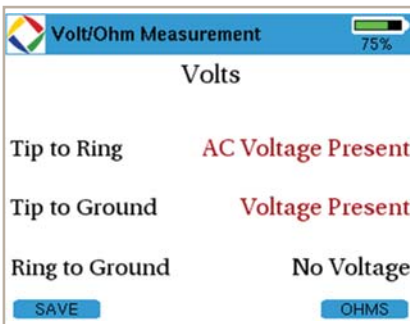
### Hub Flash

The Hub Flash test is an additional Ethernet test available on the SmartClass Home intended for locations with multiple Ethernet connections running to a central device. The Hub Flash will cause the port light to flash on the hub/switch/router indicating that the SmartClass is connected. This simple identification method lets technicians quickly determine which port is connected to a particular run.

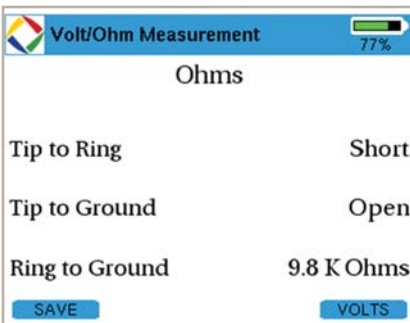
## 6



Wireless 802.11b/g test lets users verify that the subscriber's wireless network will work at a particular location or troubleshoot wireless 802.11b/g connectivity issues



The Volt/Ohm mode indicates AC and DC voltages



The Volt/Ohm mode identifies the presence of an open, short, or resistance on a line



File Manager is used to rename, delete, or export result files from the SmartClass unit

### Wireless 802.11b/g

The SmartClass Home provides optional WiFi wireless 802.11b/g testing capabilities to show the secure set identification (SSID), configured channel, 802.11 modulation, mode, and signal strength at the test location of each wireless 802.11b/g network in the area. It also indicates whether the network is secure or vulnerable to security threats. This capability lets technicians properly set up the subscriber's network and troubleshoot wireless connectivity or issues with web-surfing speed.

### Volt/Ohm Measurement

The SmartClass Home will indicate the presence of voltages on a line prior to connecting sensitive CPE devices. Measurements can be performed on either coax or twisted pair and indicates the presence of AC or DC voltages. The SmartClass Home also has a quick ohm measurement test that can be used to verify opens, shorts, or resistances between 100  $\Omega$  and 400 k $\Omega$ , which eliminates the need for technicians to carry separate tools to perform quick voltage or resistance checks.

### File Manager

Users can save the results for almost all tests for archival and future review. The unit saves the results in the common .csv format which can be opened using various spreadsheet and other applications. The files are exported via a common universal storage bus (USB) flash storage device. The SmartClass Home can hold thousands of result files that can be removed, renamed, and exported from the unit easily using the built-in File Manager application.

## Specifications and Features

### Available Configurations

VDSL synch, HPNA testing, Physical layer testing (coax and twisted pair), Ethernet, Butt-Set, Wireless 802.11b/g WiFi

### Physical Test Interfaces

Coax F-connector for coax mapping, NIT, and HPNA  
 RJ11 for POTS and HPNA testing  
 RJ11 for phone wiring and dry pair testing  
 RJ45 for Cat5/6 wiring and Ethernet testing  
 RJ11 for VDSL line testing  
 RJ45 for through mode VDSL testing  
 Connector LEDs for easy connector identification

### VDSL Specifications

#### Conexant Acclity CPE

##### Port Discovery

ITU-T G.993.1 (VDSL1)

ANSI T1-424

ETSI TS 101 270

##### Physical Layer Features

Link state

Actual achieved bit rate

Maximum line rate and user rate

Achieved capacity

SNR margin

Attenuation

Latency

Delay

##### VDSL Errors (displays the number of occurrences)

Forward error correction (FEC)

Cyclic redundancy check (CRC)

Severely errored frame (SEF)

Loss of sight (LOS)

Line errors

### HPNA Specifications

#### Coppergate CG3110 Chipset

Supports only Spectral Mode B: 12-28 MHz;

2, 4, 8, 16 MBauds

##### Standard Compliance

ITU-T G.995.4

##### Settings

Configurable Host of Client mode

Configurable Band plan

Configurable IP settings

##### General Connection Status

Link status

Operating mode

HPNA version

Device list including indication of test set and host

Device MAC identification

##### HPNA Network Results

Segment specific rate, constellation, and baud

Segment specific packet error rate (PER)

Segment specific SNR

Segment specific receive power

### Cable ID and Toning Specifications

#### Cable ID Features

Supports coax, Cat3/Cat5/Cat6 cable

Test via F-connector, RJ11, or RJ45

Supports 8 ID devices on each interface

#### Toning Features

Sends four types of tones on all leads

Constant High pitch (976 Hz)

Constant Low pitch (651 Hz)

High pitch then a low pitch

Low pitch with a short high pitch

### Coax Mapping Specifications

#### Settings

Support any cable coax type with configurable velocity of propagation (VOP) and cable compensation

#### Features

Measures cable length in feet (up to 500 ft at  $\pm 5$  ft)

Measures return loss in dBrl (up to 20 dBrl at  $\pm 2$  dB)

#### Cable Events Identified

Open, splitter, low-quality splitter, barrel/splice

### Noise Immunity Test Specifications

#### Features

Measures coax shield isolation vs. settable threshold

(def 30 dB)

#### Specifications

Test frequency of 88 to 108 MHz

### Active Identification Specifications

#### Features

Identifies coax cables through most coax network elements

Identifies multiple IDs attached to the branch of coax being tested

#### Specifications

IDs with up to 15 dB of signal loss between unit and ID

### Wiring Tool Specifications

#### General Features

Supports Cat3, Cat5/6, coax cable

Detects power present on cables being tested

Measures cable length based on capacitance setting

Detects opens, shorts, and crossed pairs and display wires mapping

### Dry Pair Specifications

#### General Features

Identifies resistive opens and shorts on dry twisted pair

Reports AC voltage presence or DC voltage presence on dry twisted pair (up to 120 VDC, 120 Vrms AC)

### WiFi Specifications

#### Features

Detects all available WiFi (802.11b/g) networks

Reports power level, operating mode, security setting, 802.11 version, channel, SSID, and MAC

### Ethernet Testing Specifications

#### Features

Supports 10/100 Mbps testing over RJ45 interface

#### Port Discovery

Identifies Ethernet setting on port

Displays link rate

Reports pair skew

Reports frequency offset in ppm

#### Ping Test

Supports manual or DHCP IP configuration

Reports packets sent and received

Reports average test packet delay

### Butt-Set Specifications

#### North American POTS Butt-Set Only

##### Features

Supports loop start dial tone POTS testing on twisted pair

Supports receiving a call

Supports line monitor mode with DTMF decode

Supports caller ID, call waiting, with caller ID errors

Microphone and speakerphone support

Measures voltage from 0 to 105 V,  $\pm 4\%$

Measures loop current from 14 to 108 mA  $\pm 4\%$

### General Specifications

#### Power Supply

Field replaceable, rechargeable lithium ion battery

Operating time approximately 4.5 hrs continuous (typical)

Charging time, internal 4-5 hrs from empty to full charge

DC input 12 V, 1.25 A

100/240 V, 50/60 Hz auto-sensing AC adapter for line

operation and charging

#### Permissible Ambient Temperature

Nominal range of use  $-5$  to  $+50^{\circ}\text{C}$  ( $23$  to  $+120^{\circ}\text{F}$ )

Storage and transport  $-30$  to  $+60^{\circ}\text{C}$  ( $-22$  to  $\pm 140^{\circ}\text{F}$ )

#### Humidity

Operating humidity

10 to 80% RHNC

#### Physical Specifications

4 in 320x240 high visibility color display

USB 2.0 interface for upgrades and data transfer

Full telephone keypad for fast access and dialing

**Ordering Information**

<b>Model</b>	<b>Part Number</b>	<b>Description</b>
SmartClass Home Full	SC-HOME-FULL	VDSL, HPNA, and inside wiring test tool for coax and twisted pair with included butt-set, WiFi, and Ethernet verification tools
<b>Accessories</b>		
Active IDs 1-8	SCHMACTIVEIDS	Active IDs 1-8 for identifying single or multiple coax run locations. Works through splitters.
6-pin Banjo	SCHM6PINADAPTER	6-pin adapter—6-pin banjo—Breaks out POTS connection for use with alligator clips
Toning Wand	SCHMTONERTRACER	Toner Tracer wand TT100
Vehicle Charger	SCHMCARCHGR	12 VDC vehicle charger adapter
<b>Replacement Accessories</b>		
Bed of Nails—Alligator Clips	SCHMBEDNAILS	Replacement Bed of Nails—Alligator clip to RJ11 cable
Coax Resistive IDs	SCHMCOAXRESID	Replacement coax resistive IDs 1-8 for locating single coax runs
Ethernet Resistive IDs	SCHMRJ45RESID	Replacement RJ45 resistive IDs 1-8 for locating single Ethernet runs
Phone Resistive IDs	SCHMRJ11RESID	Replacement RJ11 resistive IDs 1-8 for locating single POTS runs
Phone Patch Cable	SCHMRJ11 PATCH	Replacement RJ11 8-in patch cable
Ethernet Patch Cable	SCHMRJ45PATCH	Replacement RJ45 12-in patch cable
Phone to Coax Adapter	SCHMRJ11TOCOAX	Replacement RJ11-to-coax adapter cable for toning
Strand Hook	SCHMSTRANDHOOK	Replacement Stand Hook—clip to hold or hang unit
Smart Remote	SCHMSMARTREMOTE	Replacement SmartRemote—yellow RJ11 and RJ45 used to map out twisted pair connections
NIT Antenna	SCHMANTENNA	Replacement antenna for NIT calibrating off-air FM frequencies
Large Carrying Case	SCHMCARRYCASE	Replacement large carrying case for unit and accessories
Replacement Battery	SCHMLIONBATT4	Standard lithium ion battery for replacement or spare
Replacement Charger	SCHMCHARGER	Replacement AC charger—power supply and cable
Replacement Sleeve	SCHMSLEEVE	Replacement protective canvas sleeve to cover the unit

**Test & Measurement Regional Sales**

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