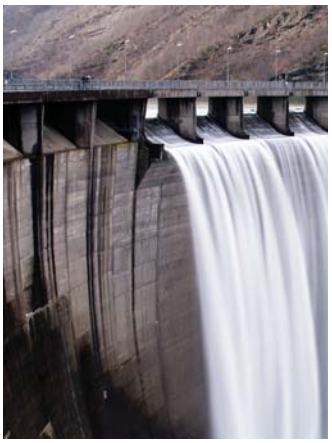


FlexNet™

Network Communications System

Redefining Intelligent Utility Communications

SENSUS

Technology that takes you from today to tomorrow.

FlexNet™ – Technology you can trust

FlexNet is a robust, high-powered solution based on open standards. It gives electric, gas and water utilities a communications network that is designed and built specifically for smart grid applications. Working with smart meters, FlexNet provides utilities a dedicated and secure two-way communications highway over which to transmit and receive customer usage data – the hallmark of Advanced Metering Infrastructure (AMI) solutions. Utilities can more effectively monitor and manage the distribution and use of electricity, water or gas.

With automatic delivery and analysis of consumption data, utilities are able to match supply with consumer demand, resulting in much better utilization of resources with the least amount of waste. Customers can be billed based on actual usage patterns and be encouraged to use resources more wisely. They can receive early notification of water or gas leaks, tampering, equipment problems or outages.

With these advantages and more, Sensus is redefining the standard for utility AMI.

In the FlexNet environment, smart meters communicate data throughout the day – such as electric power consumed from the grid and returned to the grid by customers who generate alternative energy – or water leaks in a home or business. In-home devices inform customers of their energy or water usage patterns. Utilities gain new visibility through infrastructure monitors that can sense trouble conditions and trigger an alert to the need for corrective action.

Customers are empowered to participate in demand response programs that save them money while conserving resources.

A Dedicated and Protected Communications Highway

Reliable, secure and cost-effective. Unlike other utility networks that operate on costly power line infrastructures or low-powered, shared radio frequencies, FlexNet uses primary use radio spectrum, protected by law from interference and bundled into the network solution. This strategy presents essential advantages that other systems cannot offer.

No frequency sharing, no interference, no problems – period. While other systems fight interference and signal noise in shared bands, FlexNet transmits with a clarity and security that is protected by federal law.

The highest signal power and range in the industry. FlexNet wireless devices can transmit at up to two watts, potentially 10 to 100 times more power than devices on unlicensed spectrum. High signal power and low noise combine to significantly extend network reach. Instead of a fraction of a mile between endpoints, a FlexNet network can transmit up to 40 miles from point to point.

A simpler, more manageable infrastructure. One tower gateway can cover 30 to 300 square miles, depending on population density and terrain. In hard-to-reach areas, smart meters can pass along data for each other. That means less equipment to buy, deploy and operate.

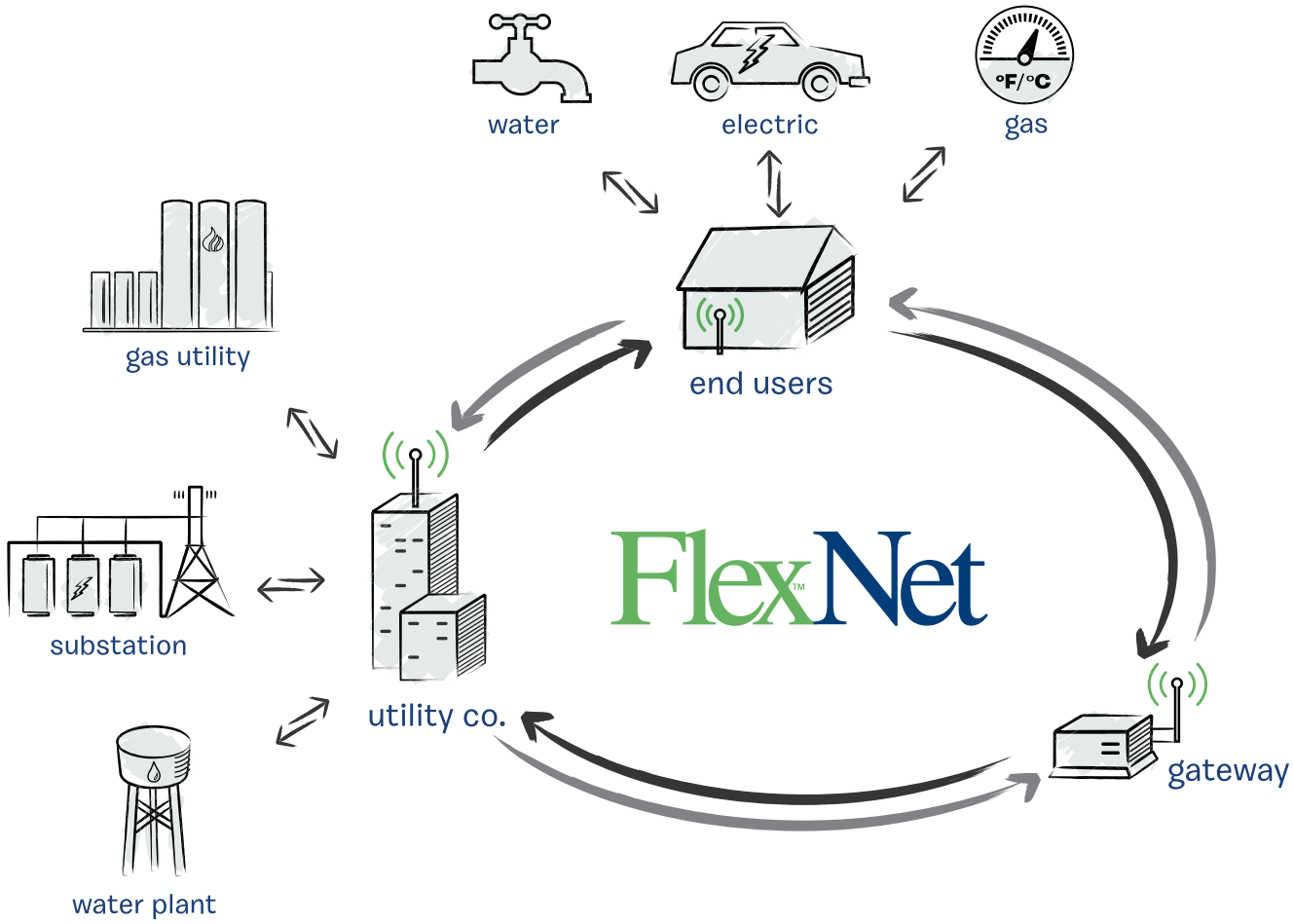
More reliable communications. FlexNet's dedicated highway for data transmission makes communication more reliable than other systems that require channel hopping over radio frequencies.

Cost-effective, rapid build-out. FlexNet systems have access to more than 4,000 tower sites covering more than 90 percent of the U.S. population. The tower-based architecture can be quickly deployed without concern for easement and access issues. And because FlexNet transmits stronger over a wider signal area, initial infrastructure build-out and ongoing maintenance costs are reduced.

Multilayered security to protect data privacy and integrity. Federal law prohibits infringement on licensed spectrum. On top of that, the FlexNet system adds multiple layers of built-in security, from strong AES-256 encryption to multilevel authentication, access controls and more for premium protection. With less traffic to interfere with communication, data is transmitted more securely.

Meeting utility needs today and tomorrow. FlexNet gives gas, water and electric utilities the ability to add functionality to keep up with utility growth. Demand response, distribution automation, home area network and new applications can easily be incorporated into a utility's operations over the FlexNet network, a future-proof investment.

Conserve capital while maintaining flexibility and ensuring scalability, whether you want to serve a few thousand homes or a few million.



FlexNet™ – Technology that delivers

Sensus Smart Meters at customer premises communicate consumption, status and diagnostic data to the FlexNet network for monitoring and billing purposes.

Energy meters also accept control instructions and software upgrades from the utility to intelligently manage consumption and remotely upgrade features and services.

Wireless communication between meters and towers is securely carried on licensed radio spectrum for distances of up to 40 miles, depending on the environment.

Sensus Tower Gateway Base Stations (TGBs) installed on existing towers (50–600 feet tall) communicate with SmartPoint meters and with the Regional Network Interface (RNI).

Backhaul communication between towers and the utility data center can be wireless, wired or satellite, whichever best suits the utility's business case.

Sensus Regional Network Interface (RNI) servers at the utility's data center manage network communications and data storage and processing.

Sensus FlexWare software provides an intuitive, Web-based interface to manage the system and its data.

The **Sensus FlexServer** Web-based portal enhances utility monitoring and management, expands consumer participation and improves public outreach.

Sensus is redefining the standard for utility AMI systems.

- The highest data transmission power in the industry
- No interference from other broadcasters
- Blanket coverage of your entire area
- Maximum range, reliability and security
- Minimal infrastructure for flexible and rapid build-out
- Robust, direct, secure communications

FlexNet™ – Technology without limits

FlexNet Water

FlexNet gives water utilities an acoustic leak detection solution that saves not only valuable natural resources but also lost revenue due to leaks in utility lines.

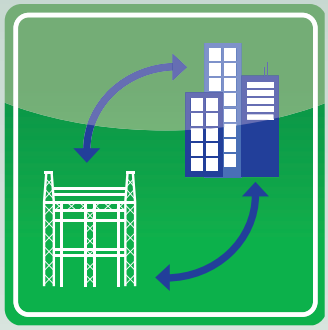
FlexNet SmartPoint M2 series transceivers offer water utilities two-way, fully migratable, AMR-to-AMI solutions and unprecedented freedom to expand and modify system capabilities without having to replace or revisit meters and equipment.

Smart utilities are using FlexNet data capabilities to inform and interact with customers and promote good conservation practices.

FlexNet Electric

The Sensus Smart Grid solution provides electric utilities with a standards-based, secure, dedicated, two-way, long-range wireless data communications network that will future-proof their AMI investment.

Electric utilities of all sizes benefit from our FlexNet dedicated RF spectrum with the ability to assign separate communications channels for discrete applications, such as distribution automation, demand response and SCADA.



The unparalleled RF design and operational efficiencies of Sensus can blanket a utility's entire service territory to deliver ubiquitous coverage.

FlexNet Gas

FlexNet allows gas utilities to increase meter reading accuracy, reduce overhead costs and enhance customer service – all while keeping more utility trucks off the road.

The innovative gas product line produced by Sensus combined with the FlexNet secure, reliable communications network delivers a gas AMI solution that expands easily and meets the requirements for safety and accuracy. Minimal infrastructure means lower maintenance cost and ease of installation.

FlexNet lets gas utilities excel in safety, reliability, efficiency and environmental responsibility, because no one has energy to burn.

We're not just promising results. We're delivering the smart grid today.

With roots that go back more than a century, Sensus is redefining the way utilities think about metering. Not only are we the world's largest manufacturer of water meters, we are now a leading innovator and installer of utility communications and automation systems that put the "smart" in smart metering.

We are literally building on that foundation every day as we manage hundreds of deployments and install millions of endpoints in the United States, Canada and Europe.

Whether your utility is rural or urban – electric, gas, water or a combination – a FlexNet solution can deliver superior communications on a secure network that scales to meet your current and future needs.

Find out more about how the Sensus FlexNet system redefines the possibilities for intelligently managing costs, resources, infrastructure and customer engagement.

Visit us on the Web at **www.sensus.com** or call **1-800-638-3748**.

AMI-120 R3

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Licensed versus Unlicensed Spectrum for Utility Communications

White Paper

A side-by-side comparison of infrastructure, performance and cost

The emerging Smart Grid will redefine power transmission and distribution with new levels of transparency, intelligence and control. From utility substations to end users, the grid will be more secure, resilient and efficient. Monitors on transmission equipment will sense trouble conditions and automatically trigger corrective action. Smart meters will communicate power data throughout the day—both power consumed *from* the grid and returned *to* the grid by customers who generate alternative energy. In-home devices will inform customers of their utility usage patterns and intelligently shift loads to reduce overall and peak demands. In the process, the power grid will be transformed from one that simply broadcasts power from a few central power generators to a large number of users into one that can intelligently route and manage power to respond to changing conditions and to bill customers differently according to their usage patterns.

New Expectations for Utility Communications

As the Federal administration presses forward toward the Smart Grid vision, the requirements for utility communications are being fundamentally redefined by the following trends:

- The imperative to use energy more wisely throughout the grid
- The increasing incidence of renewable energy being pushed back into the grid
- Growing number of smart devices at customer endpoints, such as smart meters and controls
- Desire for more granular information, such as more frequent and detailed meter sampling

Utility networks will have to provide higher performance, range and availability for communications, both to receive monitoring and consumption data and to send control commands and system firmware upgrades.

The initial focus has been on smart meters that can be read from a distance of up to 50 feet by receivers in drive-by trucks. However, given a choice, many if not most utilities would prefer a fixed network for meter reading.

With a fixed network, data can be gathered at any time—even several times per hour—not just when a truck is driven past the meter. Day-to-day delivery of meter information enables the utility to better manage the entire power system. Continuous communication will be essential for the more advanced applications that are part of the Smart Grid plan, such as the ability to send consumers information about their energy use and to manage in-home devices over the utility network.

Therefore, fixed-based networks have been widely perceived as the Holy Grail of automatic meter reading (AMR) technology, especially for utilities with wide-ranging service territories. However, fixed based networks have historically had difficulty competing with the inherently lower-cost drive-by systems, primarily due to high infrastructure costs and associated support implications. New options are changing that picture.

The Inevitable Shift to Wireless Communication

Three key communications methods are presently used to enable connectivity between Smart Grid and Advanced Metering Infrastructure (AMI) elements:

- Power line carrier, using the utility's power lines for connectivity
- Wireless networks based on unlicensed "free" spread radio spectrum
- Wireless networks based on radio spectrum licensed from the U.S. Federal Communications Commission (FCC)

Power line communication offers the advantage that it operates on the utility's existing infrastructure and rights of way. One-way and two-way systems have been successfully used for decades.

However, the disadvantages are slow data rates and the need for a large number of repeaters. Options for higher data rates require adding high pass filter hardware infrastructure at every transformer and substation node.

Furthermore, the network is unavailable during power failures; during abnormal substation, feeder or phase switching events; or when protective switch gear has opened the power lines, making the communications path unavailable. Smart grid applications require higher availability and throughput than power line carrier systems can provide.

Some utilities have installed fiber-optic cables on existing towers to create a parallel broadband communication network (perhaps with power line carrier as a backup), but that option is costly—and cost-prohibitive for remote or lightly populated areas.

These realities, along with new technology and standards, have ushered in the wireless communications era. "Two-way, real-time communications among critical utility assets can be accomplished efficiently and economically with wireless technologies," states the Utilities Telecom Council in its January 2009 report, *The Utility Spectrum Crisis: A Critical Need to Enable Smart Grids*. "These technologies support machine-to-machine communications that form the backbone of energy distribution."

Almost immediately, unlicensed spread spectrum radio was widely touted as the technology that would finally free utilities from wires and meter readers altogether. However, a spate of new problems, including range limitations, spectrum interference and reliability issues—compounded by a utility workforce still firmly rooted in the business-as-usual mindset of electromechanical metering—kept the wireless revolution at bay for the better part of a decade.

There were obstacles to overcome. Until recently utilities have not had a viable wireless network approach that could satisfy their business cases, due to high initial and lifecycle costs for networks based on unlicensed radio spectrum.

Those wireless networks have typically needed hundreds (sometimes thousands) of cellular pole-top or meter-based data concentrators, collectors or repeaters to adequately cover a large metropolitan area. Mountainous terrains and densely built metro areas further compounded connectivity problems. The extra equipment needed to mitigate those problems was usually quite expensive and difficult to install and maintain.

Utilities and companies are now looking more holistically at the real costs associated with "free" unlicensed radio spectrum for wireless communication. They are asking whether Smart Grid wireless networks would be better run on licensed wireless spectrum, in which the airwaves are owned by the customer and protected by federal law.

Let's take a look at the two options—unlicensed and licensed radio spectrum—comparing infrastructure costs, bandwidth and performance for each.

Wireless Communications on Unlicensed Radio Spectrum

Unlicensed wireless devices on the Smart Grid operate in one of the bands set aside by the FCC for Industrial Scientific or Medical (ISM) applications—for the most part either 902-928 megahertz (MHz) or 2400-2483 MHz. Devices can operate in these radio bands license-free but must adhere to FCC rules set out for the ISM bands, most notably requiring that devices:

- Transmit one watt or less of power
- Not cause harmful interference
- Accept any interference received without causing undesired operation

The interference requirements are addressed by the use of "spread spectrum" techniques, which essentially disallow transmitting in a single channel and instead "spread" the energy out using one of two techniques:

Direct sequence, where a high-speed sequence is used to greatly spread the radio energy over a large band.

Frequency hopping (more common), where the radio channel changes or "hops" to a different channel for every message or several times during a message.

As long as the receiver knows the code used to spread the radio energy, it can use the same code to un-spread or tune to the correct frequency channel.

Unlicensed Spectrum—Pros and Cons

The advantage to (and ironically the disadvantage of) spread spectrum is that it is free and available to all users. Free spectrum attracts hundreds of millions of products, but without FCC protection or assurances.

Products that operate using spread spectrum must bear a label that states: "(1) this device must accept harmful interference from others, including that harmful interference which may cause misoperation; and (2), this device must not cause harmful interference to others."

The result is that utility communication devices, even critical Smart Grid elements, have no recourse to interference. Worse, the utility is liable for interference that Smart Grid products would cause to other products, such as home area network equipment, baby monitors, telephones and wireless video games.

As more and more ISM-band devices are added to the environment, the level of "noise" from incidental interference continues to rise. The basic law in radio

telemetry is that the communication signal must be stronger than the background noise by a specified amount—an acceptable *signal-to-noise ratio*—in order for messages to be correctly received. It is analogous to talking during a party; once the guests arrive the only way to hear is to get closer (reduce range) and talk louder (more power).

However, a utility cannot move its customers closer together, and devices operating on unlicensed ISM bands are constrained to one watt of output. That means the network must contain many more concentrators and repeaters arranged in a mesh configuration. Messages go through a series of hops from one device to another to reach their destination. A single message could easily take half a dozen hops on its way. This scenario presents three key problems.

Higher infrastructure requirements—Because the range of a signal is limited, the network requires a high number of intermediate nodes, which adds greatly to the cost of deploying, operating and maintaining the network. In rural areas, or anywhere there is a long distance between endpoints, or for large-footprint systems (such as state-wide), a mesh network is generally not an economically viable option.

Higher bandwidth requirements—Each hop requires a slice of radio spectrum. A communication path with two hops consumes spectrum twice. Every additional hop is essentially another message on the network, consuming more bandwidth from a limited supply.

Slower communications—Each hop requires additional processing, so latency can become an issue, particularly if the network is used for real-time communications, such as voice.

As more and more Smart Grid services roll out, utilities will need a better business case and more bandwidth than unlicensed spectrum can provide.

> "Unfortunately, many highly critical utility control networks currently operate on radio frequency bands that must be considered suspect. Far too many have only secondary (interference-accepting, non-interference causing) status on the 150-512 MHz bands allocated primarily for mobile voice systems. Many more operate on unlicensed spectrum, mostly in the 900 MHz band, sharing it with hundreds of millions of other devices, from cordless phones to wireless Internet service providers and RFID tags. These are not the best environments for such mission-critical networks."
>
> ***—The Utility Spectrum Crisis: A Critical Need to Enable Smart Grids,*** Utilities Telecom Council, January 2009

Wireless Communications on Licensed Radio Spectrum

Licensed spectrum devices operate within the portion of the radio spectrum designated by government regulators (the FCC in the United States) to be reserved for organizations that have been granted licenses. Licensed operators have exclusive use of part of the radio frequency (RF) band over a designated geographic area.

With exclusive rights, a license holder operates without interference or spectrum crowding. The FCC provides legal protection and enforcement to prevent other operators from transmitting over the same frequency in the same geographic area.

Devices on the Smart Grid operate in a variety of channels and frequency bands originally used for SCADA (supervisory control and data acquisition), paging and other services. Communications in these bands tend to be "narrowband" in nature, using a single frequency carrier and do not have the power limitations of ISM-band devices.

Licensed Spectrum—Pros and Cons

The FCC provides that a primary use license holder has the presumption of perpetual license renewal providing that spectrum is being used for the public good (the Smart Grid clearly counts).

Operating on a dedicated frequency, utilities have clear advantages over unlicensed spectrum for maintaining an excellent signal-to-noise ratio:

- Higher signal power—Devices operating on licensed spectrum can transmit more power, potentially 10 to 100 times more power in the case of a central collector, for example.
- Low noise floor—Since the spectrum is protected by the FCC, and a designated band is reserved for the utility's exclusive use, the noise in licensed bands is usually nearly non-existent, typically at least a 30 to 40 dB advantage.

Strong signal and low noise combine to dramatically increase the range, throughput and performance of communications. Instead of a fraction of a mile between endpoints, a wireless network can transmit 20 miles between endpoints, up to

100 times farther than on unlicensed spectrum. Towers and endpoints can communicate directly without intermediate network equipment to buy, install, maintain and repair.

On the downside, available licensed spectrum is a scarce resource, difficult and expensive to acquire. Available bandwidth can be an issue.

For example, a basic system might have only 100 kilohertz and a few channels available, perhaps one for outbound communications from towers, one that meters use to send data back to towers, one reserved for private conversations between the tower and a radio, and another reserved for alarms, power restores or emergency messages. The utility could max out available channels unless additional spectrum is acquired.

Sensus addressed these issues by acquiring nationwide protected spectrum that it supplies turnkey to its customers. Utilities currently have access to 325 kilohertz of bandwidth, plus the highest RF power in the industry. Sensus continues to aggressively pursue the acquisition of additional spectrum as well.

Summary Comparison—Licensed versus Unlicensed Spectrum

	Unlicensed Spectrum	Licensed Spectrum
Availability	Widely available at no cost	Limited to license holders
Signal-to-noise ratio	Variable, diminished by one watt limitation on devices and high potential for interference	Excellent, due to exclusive use of the band (virtually no interference) and higher signal power collectors
Range	Limited and variable depending on network conditions, typically up to 0.25 miles between network nodes and endpoints	Extensive, consistent and predictable Up to 20 miles between network nodes and endpoints
Infrastructure requirements	High number of repeaters needed	Minimal due to long range Direct tower-to-endpoint communications
Bandwidth	1-8 kbps per channel after hops Channels freely available	Up to 172 kbps per channel full-duplex Limited to licensed spectrum/channels
Latency	Potentially high and variable (several seconds to many seconds), proportional to the number of hops required and interference sustained	Low and predictable (typically sub-100ms LAN), due to direct tower-to-endpoint communications and no interference
Reliability	Can be compromised in high-interference environments and by network complexity	High, due to exclusive access to spectrum and streamlined network architecture
Security	Network-agnostic; provided by encryption, physical controls and security policies	

The Sensus Approach

With the acquisition of AMDS in 2006, Sensus also gained the expertise of the team that designed the first fixed-based AMI system ever deployed. This pioneering system used direct sequence spread spectrum technology in the 900 Mhz, license-free band. Field experience with unlicensed spectrum throughout the 1990s cemented the team's conviction that the Smart Grid requires nothing less than licensed, protected spectrum.

So when Sensus developed the FlexNet™ utility communications solution, the company bet on licensed spectrum and focused on five key criteria that would provide exceptional range without the high infrastructure costs previously associated with wireless utility networks:

- Use the tallest existing radio towers and efficient high-gain antennas;
- Acquire clear nationwide primary use licensed radio spectrum with a low noise floor;
- Design of high power endpoints (two watts) with all-digital modulation techniques;
- Design of highly sensitive receiver base stations using all digital signal processing (DSP);
- Development of a meter-to-meter "buddy" relay mode for hard to reach meters (such as those in basements or behind line-of-sight barriers).

As a result, FlexNet wireless networks cover a large area with minimal infrastructure. One tower can cover tens of thousands of meters. For example, the city and surrounding suburban areas of Birmingham, Alabama, are completely covered by only three tower gateway basestations (TGBs). The FlexNet system in New Orleans, Louisiana, regularly delivers two-way communications ranges of more than 15 miles from tower to meters. Rural ranges of more than 40 miles are possible.

Through an arrangement with USA Mobility, FlexNet systems have access to more than 4,000 tower sites covering more than 90 percent of the U.S. population.

> "We discovered years ago that there was a fair amount of interference for unlicensed spectrum. Licensed spectrum is yours alone to ensure a 'right of way.' It is like having a private highway, compared to having to share traffic with other devices."
>
> **—Britton Sanderford, Chief Technology Officer, Sensus**

Where Does the Industry Go From Here?

Spectrum requirements will continue to expand, due to increased expectations for security of critical utility resources, more sophisticated power network communications and intelligence, and more reliable emergency communications in disaster conditions.

As a step toward achieving those objectives, the Utilities Telecom Council (www.utc.org) is calling for the federal government to make 30 MHz of contiguous bandwidth available directly to utilities, as it did previously for the public safety community.

Evolving standards are the other factor that will influence the future direction of the Smart Grid. The National Institute of Standards and Technology (NIST) and the Institute of Electrical and Electronics Engineers (IEEE) are working on interoperability standards to drive universal availability of these devices. The IEEE Working group (P802.15) for wireless personal area networks (WPANs) has drafted an amendment for that proposes interoperability standards for the next generation of Smart Grid equipment.

The new standard, known as 802.15.4G, will have provisions to support both licensed and unlicensed radio equipment. That means utilities will still have choice in their wireless network deployments. However, utilities would be wise to consider all the costs associated with "free" unlicensed radio spectrum and consider not just today's communications requirements, but also the requirements of tomorrow's optimized and intelligent utility grid.

About Sensus

Sensus leads in innovative and evolving technology solutions that enable intelligent use and conservation of critical energy and water resources. Sensus has led the discovery, development, and implementation of technologies for the energy and water industries for more than a century. Water, gas, and electric utility customers around the world benefit from the company's open, flexible products and solutions to help them optimize their resources – today and tomorrow. Headquartered in Raleigh, N.C., USA, Sensus serves customers from locations throughout the Americas, Europe, Africa and Asia. For more information, visit www.sensus.com.

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SENSUS

Sensus
Essential Water Analytics

Management insight as clear as the water you deliver.

Now that's refreshing.

Sensus Essential Water Analytics provides the core business functionality you need to streamline customer service and operations.

Part of our suite of intelligent infrastructure software, this bundle of applications equips you with user-friendly dashboards, so you can make informed decisions quickly and confidently. Our powerful data management tools aggregate information from your AMI, AMR and other sources. And these intuitive apps are delivered by a secure connection to the cloud right to your desktop, tablet or smart phone - just a click, tap or touch away - wherever and whenever you want.

Role-based access allows service providers to share information across the organization - from customer service and operations to accounting and rates - for improved productivity, visibility and decision-making.

Sensus Essential Water Analytics:

Data Store - a secure, cloud-based information warehouse that stores system and network data for the applications. Three years of storage is included.

Report Access - a management tool that offers a menu of reports that instantly summarize the information you need to know right away

Device Access - a customer service tool that presents detailed usage history and trends, identifies anomalies and enables custom alert programming to track specific issues

Billing Access - a billing interface tool that previews and audits billing extracts for issues, enabling the utility to take corrective action, then generates final billing files for production

Meter Insight - a validation tool that provides a summary of incoming network meter data from and identifies issues to be addressed

Big data doesn't have to be a big deal.

We believe in making data easy to work with. That's why Sensus Analytics offers you the flexibility to purchase single applications or pre-bundled packages of our most popular apps to harness the power of big data for energy and water utilities.

Our cloud-based platform aggregates data from different information systems across your company into intuitive applications that are easy to use and quick to implement. That means less reliance on IT resources and lengthy training and more customer satisfaction, service reliability, quality and operational efficiency.

Here's how we do it:

App-based
Each purpose-built application accesses data from multiple systems and presents it in user-friendly dashboards

Flexible
Select a package of tools for billing and system management or single applications that help achieve key initiatives

Accessible
Our secure, cloud-based delivery platform puts your information within reach no matter where you are

Affordable
There's no need to purchase, install, update or maintain special software, licenses or hardware - or set aside valuable office space to house it

Fresh
Applications are continuously updated as information enters the system, so you can make decisions based on the latest data

Integratable
Sensus Analytics draws information from many systems through the cloud, so there's little time and cost required for standard systems integration

Scalable
Our Data Store and three years of included cloud-based storage enables you to add applications, or increase storage, quickly – often in hours

Visible
Role-based access allows information sharing across the organization - from customer service and operations to accounting and rates - for improved efficiency and cross-functional understanding

Ready to learn more?

Visit sensus.com/analytics, click the "request a demo" button to schedule a personal demonstration with one of our analytics specialists.

Corporate Information

Corporate Headquarters
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About Sensus

Sensus helps a wide range of public service providers—from utilities to cities to industrial complexes and campuses—do more with their infrastructure to improve quality of life in their communities. We enable our customers to reach farther through the application of technology and data-driven insights that deliver efficiency and responsiveness. We partner with them to anticipate and respond to evolving business needs with innovation in sensing and communications technologies, data analytics and services. Learn more at sensus.com and follow us on Facebook, LinkedIn and Twitter through @sensusglobal.

Sensus Hosted Solutions

Optimizing and Protecting your Network Investment

Smart Grid initiatives, resource management, system control and security are changing the way utilities have traditionally conducted business. Challenged with navigating the deployment of new network technology, organizations need to consider:

- How to deploy and support a network efficiently and economically
- How to assure network service for mission-critical infrastructure
- How to deploy new system features and applications quickly and efficiently
- How to manage and maintain this investment for the long term

Hosted Solutions from Sensus

To meet these needs, help is available. Sensus offers comprehensive hosted service solutions for a variety of applications including smart metering, distribution automation, lighting control and demand response. Sensus Hosted Solutions provides a service assurance business model that is proven in its value for simplifying network management.

Sensus Hosted Solutions provide:

- Accelerated and simplified deployments
- Increased network reliability and performance
- Better resource and capital planning
- Reduced capital and overhead costs
- Minimal IT impact – no software or server hardware to maintain
- Full and continuous access to system via web portal
- System support and updates
- Faster issue response and less system downtime
- Back up monitoring/disaster recovery
- State-of-the-art data centers

Unified Network Management Solutions

Sensus can optimize and support a utility's investment by providing:

- 24x7 network operations center (NOC) surveillance and support services such as:
  - Trouble ticket generation
  - Advanced security monitoring
  - Preventative maintenance and monitoring
  - Detailed reporting of outages, exceptions, reads and alarms
- Technical support, management and escalation processes to minimize service interruptions
- Data retention and disaster recovery using fault tolerant data centers
- Head end hardware and software, including software maintenance and upgrades
- Remote firmware maintenance
- Secure customer login access
- Continuous network optimization & system tuning
- Centralized and uniform operational processes
- Compliance with National Institute of Standards and Technology (NIST) security standards

Additional System Support Elements

To provide the most comprehensive solution to Sensus customers, Sensus includes additional elements in its hosting solution:

- FCC spectrum license and license maintenance for USA customers
- Replacement parts for FlexNet™ Base Stations

Freedom, Stability, Cost Effectiveness and Customer Control

Sensus currently hosts over 300 utilities, and our expertise enables our customers to focus on their core operations. Sensus' network management expertise and resources deliver world class system uptime, maintenance and support.

From small municipalities to large investor owned utilities, a partnership with Sensus will deliver superior solutions and provide the service and support needed for your deployment. For more information, please contact your local Sensus representative or visit us at www.sensus.com today.

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Description

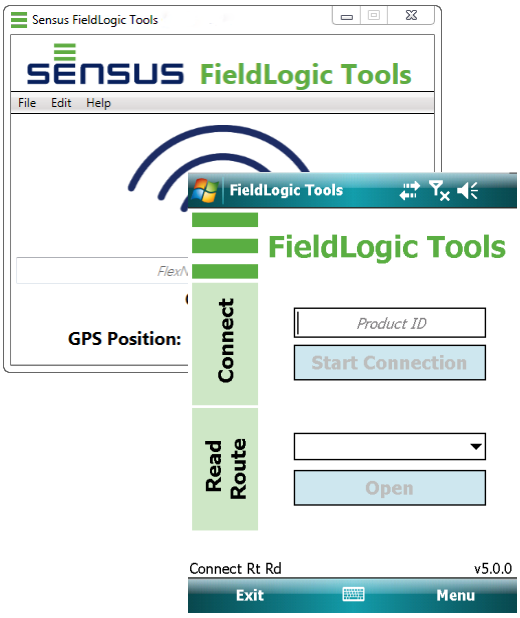
FieldLogic is a suite of tools designed to simplify programming and reading Sensus endpoint devices.

Benefits of FieldLogic include:

- Easy management of multiple handheld devices
- A fast and simple one-step installation process
- Simultaneous RadioRead and SmartPoint device reading
- Improved business process integration with a work order tool interface

FieldLogic Software contains two applications: FieldLogic Hub and FieldLogic Tools.

- FieldLogic Hub is a PC-based application for device configuration and route management setup
- FieldLogic Tools is a handheld or PC-based application for working with SmartPoint® devices and meters and route reading.
- FieldLogic Tools replaces the existing handheld functionality in AutoRead, FlexPro, UniPro and SMSHHApp tools.



Features

FIELDLOGIC HUB

Hub allows utilities to manage multiple handheld devices which in turn configure/read SmartPoint or RadioRead modules. Hub manages devices, configuration bundles, and the import/export of routes.

Configuration bundles are set up prior to fieldwork by the utility to control the handheld functionality and configuration of endpoints. This reduces the time it takes to accomplish tasks in the field such as reading meters, new installation, or meter changes.

Routes can be imported from a billing system, loaded on to a handheld, read, and then exported back through Hub to a billing system.

FIELDLOGIC TOOLS: CONNECT

Connect communicates with and programs Sensus endpoints. Connect uses Bundles to preconfigure the options installers see when setting up Sensus endpoints in the field. This simplifies the installation process, improving the speed at which installers can perform their job while decreasing the opportunity for errors. Connect also is used to deactivate and troubleshoot endpoints.

FIELDLOGIC TOOLS: READ ROUTE

Read Route is used to collect meter reading data from Sensus endpoints. It provides field personnel with route information along with other pertinent information the utility configures. Alarms are provided in the field, allowing problem investigation to occur while field personnel are at the location. The tool supports simultaneous reading of SmartPoint, RadioRead and TouchRead technologies, eliminating the need for field personnel to carry multiple devices.

For more information, visit us at **sensus.com**

FlexNet M400B Base Station

Economical Solution with Unparalleled Capacity

The FlexNet M400B is a state-of-the-art base station transmitting data from the Regional Network Interface (RNI) to the FlexNet SmartPoint™ radio modules across water, gas or electric utility networks. The M400B has been designed for pole mount installation, requiring minimal infrastructure and O&M costs. The M400B is strategically deployed to deliver wide-spread coverage in the most densely populated areas.

FlexNet M400B Base Station transceivers utilize primary-use, FCC-licensed frequencies in the 900 MHz narrowband PCS or MAS radio spectrum. It supports several applications including AMI, DA, HAN, water, gas, lighting, and more. With up to 16 receivers communicating simultaneously, the M400B delivers superior performance and signal clarity. Additionally, it has significantly less radio infrastructure as compared to networks relying on unlicensed/unprotected frequencies.

Applications

FlexNet Base Stations offer true two-way communications with a variety of applications:

- Advanced Meter Infrastructure (AMI) designed for electric, water and gas
- Distribution Automation (DA)
- Demand Response (DR)
- Home Automation Networks (HAN)
- Lighting Control

Features

- GPS receiver with 1ms sampling
- IP-addressable power supply with hot-swap capability
- 8-hour battery backup
- Alarms and reporting capability
- Backhaul via Ethernet/IP
- Heated cabinet for cold weather environments
- Modular construction for easy serviceability

SENSUS

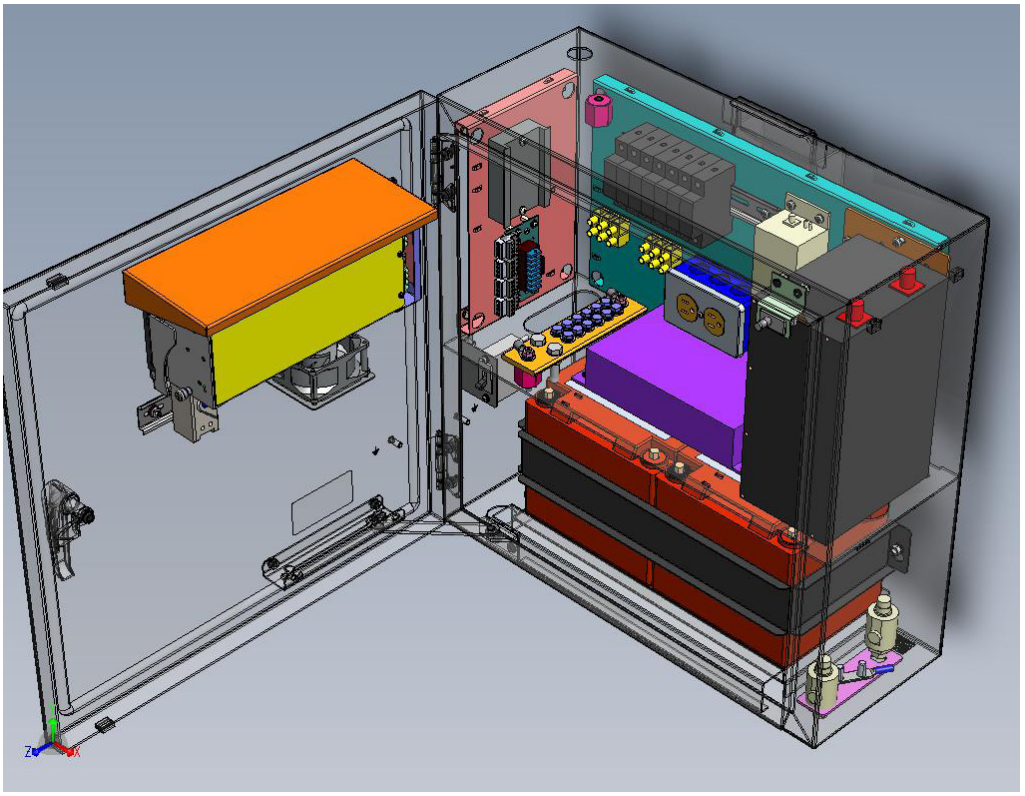
FlexNet M400B Base Station

Configurations

Model	M400B
Bandwidth	200 KHz
Transceivers	One
Spectrum	Licensed PCS/MAS
Receiver Sensitivity	
Normal	-122 dBm
1/2 Baud Rate	-125 dBm
Boost	-132 dBm
Demodulation	
Normal Mode	7 FSK, 8 kbps
C&I Mode	7 FSK, 4 kbps
Priority Mode	13 FSK, 8 kbps
Boost Mode	7 FSK, 8 kbps
Double Density Mode	13 FSK, 16 kbps

Transmitter	
Output Power	8W/39 dBm
Modulation	2 FSK (5/10 kbps)
Frequency Stability	± 1.0 PPM
FCC Type Acceptance	Part 15, 24, 101
Enclosure Options	**Outdoor**
Height	22 in. (55.9 cm)
Width	22 in. (55.9 cm)
Depth	10.5 in. (26.7 cm)
Max. Capacity	1 transceiver
Ambient Temperature	-40º to +50º C
Voltage	120 VAC

M400B Illustration



For more information, visit us at sensus.com

8601 Six Forks Road, Suite 700
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1-800-638-3748

FieldLogic® Handheld Device / Programmer

Description

Standard Model - FL6501-S (Standard), FL6501-GB (GPS + Barcode Scanner)
RadioRead™ Model - FL6502-GB (GPS + Barcode Scanner)

The Sensus FieldLogic® Hand-Held Device [HHD] is primarily designed to collect and store utility meter readings with built-in capability for expanded uses. The HHD interfaces to a personal computer [PC] through Wi-Fi® or an ethernet-enabled charging stand used for uploading pre-programmed meter reading route information. The computer must be equipped with Sensus FieldLogic System software.

The Model FL6501 accepts meter reading data entered manually on a built-in keypad or electronically through the TouchRead® System AutoGun, or wirelessly with the CommandLink or FMT. AutoGun options include cable-connected and RF (no cable required) styles.

The Model FL6502 includes all features of the Model FL6501, plus it can read Sensus RadioRead® Meter Transceiver Units [MXUs].

Features

PROGRAMMING

The Sensus 6500 Series HHD provides flexibility for utilities needing a reliable electronic hand-held meter reading and programming device. They are designed for collecting meter readings as well as programming RadioRead MXUs, FlexNet™ SmartPoint™ modules, and Sensus registers. In addition to accepting meter readings via its keypad, the HHD also accepts readings from TouchRead® System and RadioRead® System equipped meters where those systems are used. All meter reader activity is stored for later analysis, including multiple data entries, bad readings, and management system analysis.

ERGONOMIC DESIGN

The HHD's ergonomic-minded design offers a well-balanced, easy-to-handle unit. It includes a Transflective (TFT) LCD screen for ease of viewing during operation. Transflective displays appear brighter in direct sunlight, and use less power than other display technologies. Brightness can be adjusted to accommodate personal preference. The HHD can be manually carried during operation, or function in the optional HHD carrier harness.

BACKLIGHTING

The backlit keypad feature provides illumination to the LCD for convenience in data entry and ease of reading data in areas with insufficient lighting.

CONSTRUCTION

The HHD is housed in a weather-resistant, high impact, UV-stabilized plastic. Surface-mounted circuitry in the specially designed, watertight case allows the HHD to be used in rugged field conditions over a wide range of temperatures.

REPLACEABLE BATTERY

The rechargeable, self-contained Lithium Ion battery pack is field-replaceable to minimize downtime. The HHD is also equipped with a lithium battery backup to maintain date and time.

AUDIBLE VERIFICATION/WARNING

The audible tone confirms completed TouchRead, RadioRead, and FlexNet System readings, or alerts the user to faulty or out-of-limit readings. Tones can also be programmed with notes to alert the meter reader to hazardous situations or to respond to field survey questions.

INTEGRATED GPS AND CAMERA

The GB[1] version of the FL6500 Series offers an integrated GPS, barcode scanner and a five (5) mega-pixel camera for more convenient field data capture. The integrated GPS can acquire accurate position data in less time and in challenging locations, without the need for an add-on module. The 5 mega-pixel camera enables capture of high resolution, full-color images as well as the ability to obtain barcode data with the same device.

SERVICE AND WARRANTY

No service should be necessary if reasonable care is given during normal use. Sensus offers the Sensus Equipment Maintenance Program (SEMP) to extend the protection of HHDs and related equipment beyond the standard two (2) year warranty covering materials and workmanship. Warranty and service policy details are available from Sensus representatives and authorized AMR distributors.

1 The "S" version does not have the GPS, barcode scanner, or camera, making it the perfect device for Direct Read, TouchRead, or FlexNet Walk-By applications.

FEATURES WITH THE SENSUS TOUCHREAD AUTOGUN

FLEXIBLE DATA ENTRY

When used with an AutoGun, the HHD automates the reading process. Reading data from Sensus and compatible absolute encoder equipped meters is obtained and stored in the HHD.
Manual entries can also be made using the keypad, which features elastomeric, tactile response keys. Pre programmed “high” and “low” range limits, calculated and passed from the utility billing software, can be sent to alert the user of possible reading errors. In addition, the Model 6502 provides expanded features for reading and programming Sensus RadioRead MXUs as well as FlexNet SmartPoints.

AUTOMATIC, ERROR-FREE DATA COLLECTION

When used with an AutoGun, the HHD collects and stores readings automatically from Sensus or compatible absolute encoders. Regardless of the route sequence programmed into memory, the HHD software identifies each meter encoder using the encoder’s internal identification number. The software then searches the route program and automatically stores the meter reading in the correct customer account. When the utility’s meter readers hear an audible alert tone from the HHD, it is alerting them to a special condition or hazard. They need only refer to instructions on the HHD screen on how to proceed. This process eliminates errors and increases meter reading speed.

CORDLESS AUTOGUN

Used in conjunction with the 6500 Series HHD, the cordless Sensus TouchRead AutoGun provides the ability to perform TouchRead readings without the need for cables from the AutoGun to the HHD. Information is stored in the AutoRead HHD through a bi-directional, low-power RF link.

SPECIFICATIONS

PRIMARY	Hand-held electronic meter reading collection and data storage device for manual, TouchRead System, RadioRead, and FlexNet meter reading.
OPTIONAL	Programmer for Sensus SmartPoints and Sensus registers.
PHYSICAL CHARACTERISTICS	Case material molded of high impact, UV-stabilized plastic. Grey color standard. Reading device/programmer connection built in. Carrying harness included.
DIMENSIONS	10.2” [259.08 mm] (H) x 5.4” [137.16 mm] (W) at display and 3.1” [78.74 mm] (W) at its narrowest point x 2.75” [69.85 mm] deep and 1.6” [40.64 mm] at its shallowest.
WEIGHT	32.03 oz (908 grams)
OPERATING SYSTEM	Microsoft® Windows® Embedded Handheld 6.5.3 Microprocessor: 1.0 GHz ARM Cortex, A8 1.MX53 Processor Operating Memory: 512 MB SDRAM Data Storage Memory: 8GB
KEYPAD	QWERTY keyboard. Large keys can be operated while wearing gloves. Adjustable backlit keys.
DISPLAY	Backlit and Transflective color LCD screen. Will display meter reading information, route information from hand-held, and any additional system information.
READING COMPATIBILITY	Able to read Sensus encoders, Sensus MultiRead Modules, Badger ADE® and Neptune Proread™ (ARB® VI).
CAMERA	5 MP resolution with autofocus, LED illuminator, and video capture
GPS	High-sensitivity GPS/GLONASS/SBAS receiver Accurate to five (5) meters or better
POWER SUPPLY	Intelligent Lithium Ion battery, 3.7VDC at 10600 mAh, 38.7 Whr 20 hour battery life, achieves full charge in 2-4 hours Field-replaceable battery
OPERATING TEMPERATURE	-22° F to 140° F (-30° to 60° C); Bluetooth® rated to -4° F (-20° C)
HOUSING	Tested to withstand being dropped on any surface from a 4 foot height without damage. Tested to MIL-STD 810G and IP68 for waterproof, dustproof, and shockproof (drop) standards.
INCLUDED ACCESSORIES	Hand Strap, Wall Charger, Micro USB SyncCable, Stylus with tether
OPTIONAL ACCESSORIES	Vehicle Charger, Replacement Battery, Single Docking Station, Quad Docking Station, Holster Carrying Case, Screen Protector, Input/Output Replacement Module
DOCKING STATION	Holds one HHD per stand. Microprocessor controlled. Load/Unload speed: 115k Baud Communications Interface: USB or Micro USB Bluetooth® Class I approved Plugs into 120 Volt, 60 Hz, AC wall outlet, power usage is 2 watts standby and 4 watts while charging Dimensions: 8.5” [215.9 mm] (H) x 6.0” [152.4] (W) x 5.5” [139.7] (D) Certifications: FCC Class B, EN60950

FLEXNET CommandLink

You're in command.

The FlexNet® CommandLink is a wireless interface that allows utility personnel to access a complete suite of functional controls within a gas, water or electric SmartPoint. The Bluetooth-enabled CommandLink directs the SmartPoint's activation, programming, and diagnostic settings as well as performing on-demand interrogation of the device. CommandLink is capable of communicating with any Hand-Held Device (HHD) enabled with Bluetooth technology, Windows Mobile 6 GPS and 50 MB of available memory as well as laptop computers with Windows XP or Windows Vista, Bluetooth technology and GPS. What's more, this versatile device features rechargeable, field replaceable batteries giving technicians the power to program up to 250 SmartPoints over a two-day period on a single charge. CommandLink System Software includes a simple programmer for ad hoc programming and a route programmer for more structured programming.

Programming:

It couldn't be simpler. Following the physical installation of the SmartPoint, position the CommandLink on the SmartPoint (use the included strap to hold CommandLink in place, if necessary). CommandLink will automatically connect to the HHD or Laptop Computer via Bluetooth wireless technology, allowing personnel to communicate with the SmartPoint and begin the programming process. If programming adjustments are necessary, just follow the simple programming instructions displayed on the HHD or Laptop Computer screen.

Troubleshooting-one-call resolution

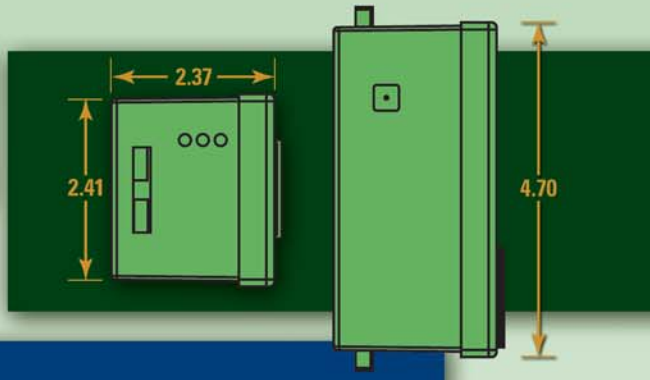
CommandLink provides instant access to the SmartPoint's programmed and stored information. With just a few keystrokes, the operator can pull setup information, validate readings, and verify or reprogram settings for optimal performance. You get immediate results. When finished, the CommandLink will initiate communication between the SmartPoint and TGB. Transmit reading, setup, binding or alarm information directly to the database, providing instant confirmation of any changes.

CommandLink

CommandLink Specifications

Primary Function

Electronic tool permitting on-site wireless installation, interrogation and programming of FlexNet water and gas SmartPoints.



Physical

Length	Width	Height	Weight
4.7"	2.41"	2.37"	16 oz.

Exterior: high-impact, injection-molded plastic
Strap: elasticized "bungee" material
Accessories: AC/DC charger (included)

Environmental

	MIL-STD 810F			Method
Temperature – shock	-20° – 103° F			503.4
Temperature – storage	-31° – 140° F			501.4
Temperature – operation	-20° – 130° F			501.4
Humidity	90% rel. -29/+54			507.4
Water	Procedure I			512.4
Drop	No.	Ht.	surface	temp.
	6	5 ft.	concrete	-20° F
	5	5 ft.	concrete	70° F
	6	5 ft.	concrete	130° F
				516.5
Sand/Dust	Procedures I, II; IEC-529-IP-X6			510.3

Electrical

Batteries:	Three (3) "AA" rechargeable or Energizer brand disposable NH-15AA
Replaceable:	Yes
AC Charger:	Yes
DC Charger	Yes
Charge Time:	Approximately 4 hours
Indicators:	LED; power, Bluetooth communication, charging
Firmware:	Upgradable via Bluetooth interface

RF Communication

CommandLink complies with FCC Part 15, FCC Part 15 Class B and Canadian ICES-003 requirements.

Bluetooth:	Class 2
Sensus:	Inductive at SmartPoint, TouchRead capable

Hand-Held Compatibility

	Windows Mobile6®	USB Interface	Bluetooth®
Sensus AR5500[1]	X	X	X
Trimble Nomad[1]	X	X	X
Juniper Archer[1]	X	X	X

[1]HHDs listed at left are capable of completing 250 installations over a two day period on a single charge. Other HHDs that meet the Hand-Held Compatibility requirements must have 50 MB of internal memory to operate CommandLink software; however, battery life may not meet the Sensus standard of 250 intallations.

UniPro
Software Tool

Description

The Sensus UniPro Software tool provides programming, data log downloading, and accuracy testing, reporting and error log capabilities when used with Sensus water metrology products. A UniPro communicator device is used with the Sensus electronic registers on the following products:

- iPERL
- Electronic Register
- ICE registers
- ICE-Opto registers
- OMNI R, T, C, F
- accuMAG

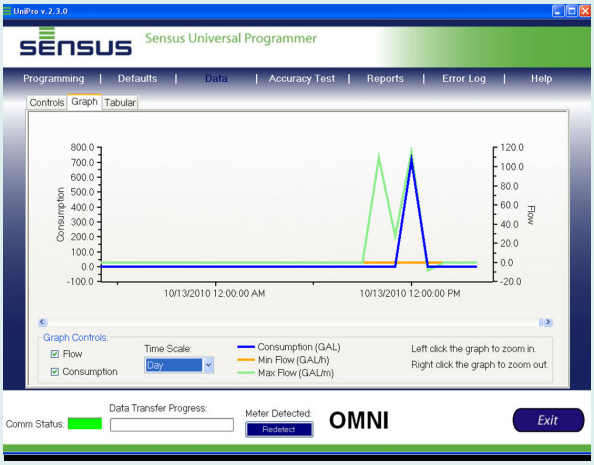
For PC use, the communicator is supplied with a USB cable end connector. For AR5500 handheld use, the communicator is supplied with an RS232 cable end connector.

The AutoGun is not applicable with the PC based solution.

Features

PROGRAMMING CAPABILITIES

		Meter/Register						
Parameters	**Definition**	**ICE**	**ICE-Opto**	**Electronic Register**	**iPERL**	**OMNI R**	**OMNI T, C, F**	**accuMAG**
Customer ID	Register ID sent for AMR/AMI	X	X	X	X	X	X	X
Programmable Text	Customer programmable information	X	X	X	X	X	X	X
AMR Digits	Digits sent for AMR/AMI	X	X	X	X	X	X	
Unit of Measure	Unit of Measure			X	X	X	X	
Rate of Flow Unit	Amount of water that flows over a given rate of time			X				
Alarm Save Duration (Days)	Number of days to save an alarm notification				X			
Leak Duration (Hours)	Number of consecutive hours flow must occur for a leak to be detected				X			
Datalog Interval	Time Interval for data log information				X			
History Masks	Used to determine what events should be logged				X			
Alarm Masks	Used to determine what alarms should be logged				X			
Pulse Output	Used to select the wheel to trigger the pulse output signal						X	
Display Mode	Upon initial lid opening to view AMR digits or totalizer (all 8 digits)					X	X	



DATA LOG CAPABILITIES

The iPERL and OMNI meters capture interval data. The data is downloaded via the UniPro software tool. The data can be viewed in a graphic or tabular layout.

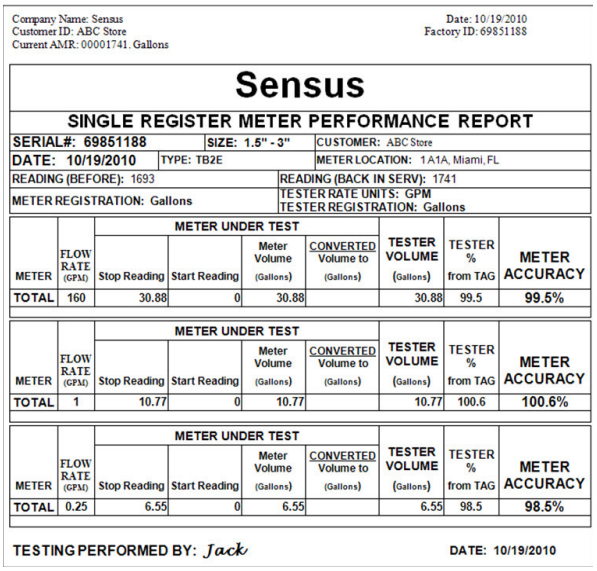
		Meter/Register	
Interval Data Collected	**Definition**	**iPERL**	**OMNI T, C, F**
Consumption	Volume of water passed through the meter during the measuring interval	X	X
Maximum Flow	Peak flow of water passed through the meter during the measuring interval	X	X
Minimum Flow	Lowest flow of water passed through the meter during the measuring interval		X

REPORTING CAPABILITIES

Parameters	Definition	ICE	ICE-Opto	Electronic Register	iPERL	OMNI R	OMNI T, C, F	accuMAG
Meter Programming	Date, time and specific meter information for progamming parameters	X	X	X	X	X	X	X
Data logging	Tabular view of the data log				X		X	
Accuracy Testing	Accuracy performance report						X	
Alarms	List of the alarms that are reported, active and saved				X			
History	Date, time, event history and alarms				X			
Lifetime	Meter age, lifetime used, date of manufacture, projected end of life				X			

ACCURACY TESTING CAPABILITIES

The Accuracy Testing feature in UniPro provides utilities a step by step procedure to collect information during an OMNI meter accuracy test. At the conclusion of the accuracy test, a performance report is provided.



Company Name: Sensus
Customer ID: ABC Store
Current AMR: 00001741. Gallons

Date: 10/19/2010
Factory ID: 69851188

Sensus

SINGLE REGISTER METER PERFORMANCE REPORT

SERIAL#: 69851188	SIZE: 1.5" - 3"	CUSTOMER: ABC Store
DATE: 10/19/2010	TYPE: TB2E	METER LOCATION: 1 A1A, Miami, FL
READING (BEFORE): 1693		READING (BACK IN SERV): 1741
METER REGISTRATION: Gallons		TESTER RATE UNITS: GPM TESTER REGISTRATION: Gallons

		METER UNDER TEST						
METER	FLOW RATE (GPM)	Stop Reading	Start Reading	Meter Volume (Gallons)	CONVERTED Volume to (Gallons)	TESTER VOLUME (Gallons)	TESTER % from TAG	METER ACCURACY
TOTAL	160	30.88	0	30.88		30.88	99.5	99.5%

		METER UNDER TEST						
METER	FLOW RATE (GPM)	Stop Reading	Start Reading	Meter Volume (Gallons)	CONVERTED Volume to (Gallons)	TESTER VOLUME (Gallons)	TESTER % from TAG	METER ACCURACY
TOTAL	1	10.77	0	10.77		10.77	100.6	100.6%

		METER UNDER TEST						
METER	FLOW RATE (GPM)	Stop Reading	Start Reading	Meter Volume (Gallons)	CONVERTED Volume to (Gallons)	TESTER VOLUME (Gallons)	TESTER % from TAG	METER ACCURACY
TOTAL	0.25	6.55	0	6.55		6.55	98.5	98.5%

TESTING PERFORMED BY: *Jack*

DATE: 10/19/2010

TouchRead® AMR

Advanced Meter Reading Technology for Utilities

Description

THE TOUCHREAD® SYSTEM OFFERS FAST, ACCURATE METER READING AND BILLING

Since 1984, the TouchRead System has helped thousands of utilities increase meter reading speed and efficiency with fewer errors compared to manual entry reading methods. Using the TouchRead System, a utility meter reader can electronically read meters equipped with Sensus Encoder Registers in less than two seconds.

The patented[1] TouchRead System is highly flexible. It can be used as a meter reading system or for solving reading problems, such as large underground meters located in hazardous areas. Reading data can be obtained by electronic reading guns or manually entered, when required.

The TouchRead System provides an excellent migration path to a Sensus RadioRead® or FlexNet® meter reading system.

1 Equipment covered under patent numbers 3,748,654, 4,132,981, 4,758,836 others pending.

Features

SPEED AND EFFICIENCY

Reads inside sets and pitset meters with "just a touch." Cuts reading time by one half or more.

Using the wireless feature of the Sensus AutoGun, inside meter remote TouchPads or underground meters equipped with TouchRead PitLid (TR/PL) units are read in less than two seconds.

FLEXIBLE AND VERSATILE

Manual readings, route surveys, and exception notes can be entered on the handheld device's (HHD) built in keypad.

At the utility office, the handheld devices are connected to a PC where the information is downloaded. The data can be used to generate useful management reports or for the automatic printing of customer invoices.

ADVANCED DESIGN

TouchRead System registers from Sensus incorporate a visual eight-wheel odometer for higher resolution and a combination testing pointer and leak detector. The data collected electronically will depend on the particular register version used by the utility. Utilities billing meters in common units, such as thousands of gallons or hundreds of cubic feet are able to use the electronic meter readings without performing intermediate calculations.

IMPROVED RESOLUTION FOR TESTING AND VISUAL READING

With its eight active odometer wheels, testing the accuracy of a water meter fitted with an Sensus Encoder Register is greatly enhanced. Visual readings are more precise by a factor of one hundred, thereby enabling a precise comparison with the volume "standard" of the testing equipment. Decimal points on the dial face are used to separate whole units from fractional measurement units. Following tradition, the meter's unit of measurement, gallons, cubic feet or cubic meters, is imprinted on the dial face.

EASE OF USE

Meter readers are guided along their routes as each address is displayed on the handheld device's (HHD) display screen. This allows for meter reading in or out of route sequence. Readings are verified by audible and visual signals.

The TouchRead system is easily migratable to TouchCoupler technology as well.

ELIMINATES ERRORS

No more errors caused by incorrect manual entries in route books or computers. In addition, the TouchRead system eliminates pump-outs and OSHA confined space entry restrictions and operates accurately in flooded pits or vaults.

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www.sensus.com/water

FlexNet

Vehicle Gateway Basestation VGB

APPLICATION

The Sensus FlexNet Vehicle Gateway Basestation (VGB) is a portable radio-based device used for the acquisition of data from utility meters and other field-based diagnostic instuments. The VGB is compact and portable, allowing it to be used in any vehicle providing 12-volt DC power. The operator simply places the unit in the vehicle cabin, loads the desired meter reading route into the laptop computer and drives along the prescribed route. Meter data is collected as the vehicle travels within proximity to the selected meters. The complete VGB package includes everything needed to read meters and ancillary (such as acoustic monitoring) devices that are equipped with FlexNet M2 or RadioRead+ SmartPoints.

OPERATION

The VGB sends an alert signal to the meter SmartPoint or ancilary device. Upon receipt of the alert, the SmartPoint responds by transmitting its most recent reading. Once received, the SmartPoint returns to a low-power listening mode. The operator has the option of directing the VGB to signal all endpoints within range (blind reading mode), or to select endpoints (geographic reading mode).

SYSTEM RELIABILITY

FlexNet and RadioRead+ utilize primary-use radio frequencies to communicate with SmartPoints. The combination of FCC-protected frequencies and shear transmission power of the SmartPoints ensure reliable communication from meters and ancillary devices. What's more, SmartPoint M2 and RadioRead+ SmartPoints provide infrastructure detail by monitoring their operating conditions and reporting meter tamper, continuous flow, leak detection (when equipped), high or low consumption and low battery alarms.

PORTABILITY

Through the use of advanced design, the radio electronics of the VGB are contained in a portable enclosure about the size of a small briefcase. With the addition of a laptop computer, connecting cables and antenna, the complete VGB package can be set up in any vehicle within minutes. The compact, portable VGB instantly turns almost any vehicle – even a compact car – into a meter reading machine.

SPECIFICATIONS

SERVICE	Radio-based mobile utility meter reading system
PHYSICAL CHARACTERISTICS	VGB in metal case with folding handle: Length: 14.5" x Width: 11.25" x Height: 5". Includes Laptop computer, USB cables, magnetic-mount antenna and hard shell carrying case.
WEIGHT	15.2 lbs. (6.8 kg)
POWER	12-volt DCDC adapter through VGB (with battery back-up; computer only)
COMMUNICATIONS	901-902 Mhz.
MEMORY	Non-Volatile
APPROVALS	Licensed Operation
US:	FCC CFR 47, Part 24D, Part 101C, Part 15
CANADA:	Industry Canada (IC) RSS-134, RSS-210

Vehicle Gateway Basestation (VGB)

USER FRIENDLY SOFTWARE

The VGB utilizes AutoVu, a software program especially designed for operating Sensus drive-by meter reading equipment. AutoVu features a convenient, user-friendly pull-down menu system for directing the meter reading process. Operators are also able to input information, such as route notes, manually via the PC's keyboard. The operator can also easily edit route data configurations when necessary. Back at the office, Sensus AutoRead processes the information gathered by AutoVu and provides the utility's billing software with a simple plug-and-play interface, no matter what Sensus reading system is utilized.

SENSUS SYSTEMS MAKE READING UTILITY METERS FAST, EASY AND RELIABLE

Our user-focused equipment and software provides utilities with tremendous meter reading efficiency, with fewer limitations compared to other types of radio-based meter readying systems. And because our software platforms operate with all of our reading packages, utilities can transition systems without downtime for operator training. Discover the power of Sensus, the measure of the future.

AUTHORIZED SENSUS DISTRIBUTOR

SENSUS

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F: 1-800-888-2403
www.sensus.com/water
h2oinfo@sensus.com

AutoVU

Software Module

User-friendly full color MS Windows screen and graphics

INTRODUCTION

Graphic on-screen mapping for the Sensus RadioRead™ system. The AutoVU software module enhances vehicle-based radio reading.

Note: This installation sheet is only for the AutoVU Software Module. For instructions on installing other AMR devices, please request and refer to the individual installation instructions for those devices.

GENERAL INFORMATION

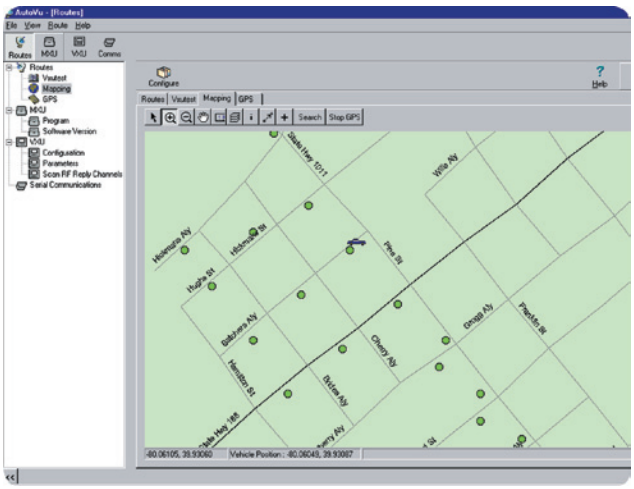
Participation in the Sensus Systems Support Program is strongly recommended, requisite in nature. This recommendation is made so that all customers will receive the same consistent product support and service benefits available in the program.

The fee for the first year of the Sensus Systems Support Program is included in the price of the AutoRead software. Initial program coverage begins on the ship date of the Sensus AutoRead System software to customer. Yearly renewal notices will be mailed to customers approximately 60 days prior to their first year expiration date. Customers who do not choose to renew during their renewal period can contact Sensus at any time in future years to enroll in the System Support Program.

PROGRAM FEATURES

- Provides GPS based mapping interface to graphically depict the location of each meter along a meter reading route and instantly verify each reading
- Uses precise locating and mapping technology made possible by existing low earth orbiting Global Positioning Satellites (GPS)
- Meter locations along each RadioRead route can be optionally set by the utility to change color or disappear from screen as each meter reading is successfully collected by the Vehicle Transceiver Unit (VXU)
- The on-screen map automatically shifts position when used with the GPS System, keeping the meter reading vehicle location "positioned" on the map as it travels along the meter reading route
- Provides ability to include map layers - i.e., water, street names, etc. when the maps are displayed.
- Shortens meter reading time and helps reduce costs
- On-screen instant reading verification helps eliminate the need to re-drive the complete meter reading route to obtain readings which may have been missed
- Helps eliminate guesswork in establishing the most efficient routes for VXU radio based meter reading
- Alerts the meter reader of "high" and "low" reading limit discrepancies and MXU low battery signals
- Non-radio equipped meters can be depicted on the digital route maps to alert the VXU user that manual or special readings are required at specified locations

Reading route statistics are saved and displayed as the routes are loaded and being read.



Route maps are automatically repositioned as the vehicle moves along

Each meter location is shown and readings are verified as the route is traversed

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