

Navionics Telemetry

PC-Compatible Wireless Telemetry And Control Systems

Turnkey System Integration. Navionics offers a broad range of in-house experience in telemetry system design, integration, and installation. Leveraging the most advanced non-proprietary computer platforms available, and supported by complete paper and internet-based documentation, we can provide an easy-to-use turnkey telemetry and control solution to your rural water or wastewater district.



Your Investment In Wireless Telemetry Will Earn Its Keep. You'll begin to receive the payoff benefits of your new Navionics WiSTAR wireless telemetry and control system beginning with the first day of operation. Our customers report a drastic reduction in the amount of mileage spent monitoring the remote sites. And when there is a problem, such as a sump pump failure in an underground pump station, the telemetry alerts the utility personnel immediately - before the problem escalates. With centralized and automated history charting on the C³ operator interface, our customers invariably gain new insights into the hydraulic dynamics of their system.

And ultimately, because we use the most dependable wireless data communication equipment and algorithms available, our customers experience a much greater reliability than leased-line-based telemetry systems - and without the recurring leased-line charges.

Partner With A Stable Technology That Will Be There Tomorrow.

Navionics is committed to providing wireless telemetry and control solutions in a non-proprietary, open format. The computer platform which we have selected is perhaps the most widely-accepted and stable electronic standard in history - the IBM PC architecture. Leveraging the expandable computing and I/O power inherent in the PC architecture, the Navionics WiSTAR system represents the cutting edge of programmable industrial control. And Navionics' philosophy of providing full product documentation and manuals, in support of non-proprietary hardware, assures the customer of a system which is maintainable by Navionics, third-party support, or customer in-house personnel.



NAVIONICS RESEARCH

<http://wireless-telemetry.com>

Saint Louis, Missouri USA

(888)993-3554

When Control Requirements Change, You'll Be Ready. The Navionics WiSTAR RTU is an expandable, field-programmable industrial controller. Because the WiSTAR RTU is "software-intensive", the overall control system complexity is vastly reduced - featuring far fewer auxiliary devices along with simplified installation and wiring procedures. And as your control requirements evolve over time, additional analog, digital, and pulse inputs and outputs can be easily added, along with the programming logic needed to control them. In most cases, logic upgrades can be transmitted via modem or the internet from our facility to yours.

Because each RTU has a single microprocessor, the control and wireless communication processes are very tightly integrated. For example, at Jersey County (IL) Rural Water Company, the Grafton booster pump station bases its pump control decisions upon the water level in the remote Grafton Elevated Tank. However, when an extended power outage at the tank exceeded its battery backup reserve in June of 1999, the pump station had to "fly blind" for approximately 8 hours. Because the control process was always "aware" of the communication status, the pump station was able to automatically fail over smoothly into a "local pressure" control strategy - and thereby maintain water storage in the system.

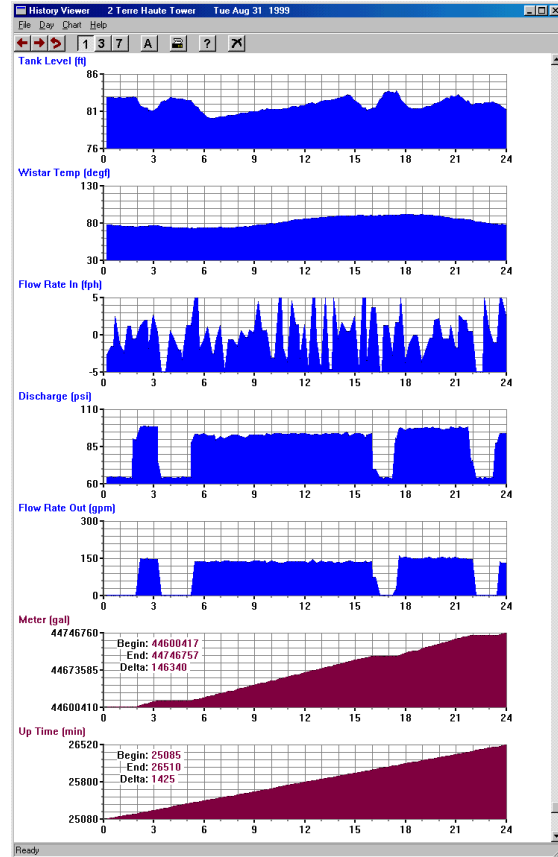
Designed For Wireless Communications.

The Navionics WiSTAR RTU was designed for wireless communications. For instance, difficult terrain is easily overcome with built-in repeating capability - and the adaptive re-routing algorithm can alter communications paths on-the-fly to compensate for a missing repeater. Channel usage is kept to a minimum by a judicious combination of "polling" and "report-by-exception". And by leveraging the most modern military communication technology available, data errors and interference problems are completely eliminated.



The Windows-Based Operator Interface Offers Realtime Data, Pager Alarms, and Detailed History Charts.

With the "WiSTAR2000" C³ (Communications, Command, & Control) Graphical Operator Interface, Navionics is an established leader in the wireless telemetry and control interface arena. And thanks to the many customer suggestions over the years, WiSTAR2000 offers a wealth of operator-oriented features.



For example, even though the C³ Interface has full remote-control and setpoint modification capabilities, it is not a "Master-Slave" design. Navionics has always maintained the integrity of its "Peer-to-Peer" strategy. And changing or adding an "RTU site" is a snap - no software rebuilds are required.

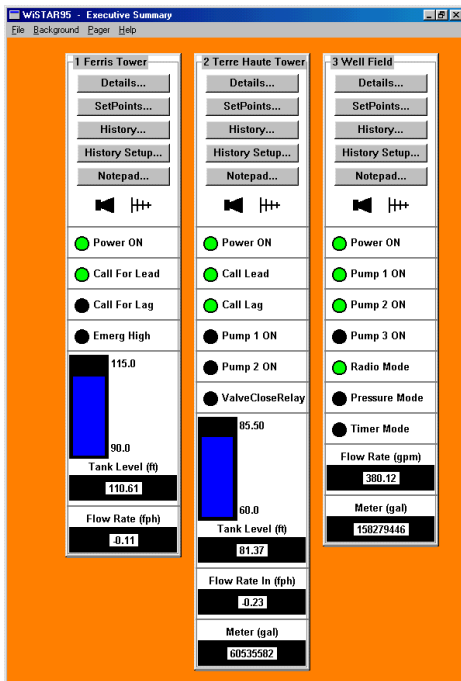
Another unique feature is the C³ Interface's ability to automatically archive history data on-the-fly. The end-result is that the C³ computer is able to hold up to 200 years of history data, as opposed to many competitive systems which can only hold 30-60 days of history. And being able to view old history charts from previous years has proven to be such a useful feature that Navionics has donated its dial-up client software free-of-charge to all of our customers so that they can share performance data with their consulting engineers over a

telephone modem. If something goes wrong in the field, the C³ Interface alerts the operator with an audible alarm, as well as a flashing graphic. If the operator is away from the computer, then the C³ Interface sends an alarm code to his pager.

Portable Operator Interface Provides Telemetry To The Operator While On The Road Or At Home. Perhaps the most revolutionary achievement for WiSTAR2000, though, has been the development of the "Portable C³ Unit", a notebook-based graphical operator interface.



Navionics implementation, which is both powerful and unique, was inspired by suggestions from Mr. Jim Green (Consolidated Water Service), Mr. Steve Fletcher (Washington County Water) and Mr. Wally Cox (Heneghan & Associates).



At Washington County Water (Nashville, IL), Mr. Fletcher stages his PC³ both at his home and in his SUV. A sophisticated algorithm inherent in the software automatically detects the PC³'s location, and modifies the radio communication relay paths accordingly. In this way, Mr. Fletcher is able to maintain a continuous telemetry data link to all his water towers and pump stations while working in the field. The operation is completely hands-free, and it even works while the vehicle is

in motion. Also, if Mr. Fletcher travels beyond radio range, he can dial into the telemetry system over a standard phone line for full C³ monitoring and control capability. The dial-in capability was also installed at their engineer's office, Heneghan & Associates (Centralia and Jerseyville, IL), so that WCWC can share their system's hydraulic history data. This seamless link between The Water Company, Heneghan's, and Navionics has enabled all players involved to work together more closely and efficiently.

True "Distributed Control". One of the most prevalent telemetry strategies in the water and wastewater industries is the "Master-Slave" scheme. In a "Master-Slave" network, all remote RTU's report their status to a central computer, which then returns the control commands. However, if the central computer is down for any reason (e.g. power outage or repairs), the entire control network stops functioning. This can be catastrophic for rural water or wastewater districts which are often spread out over hundreds or even thousands of square miles.

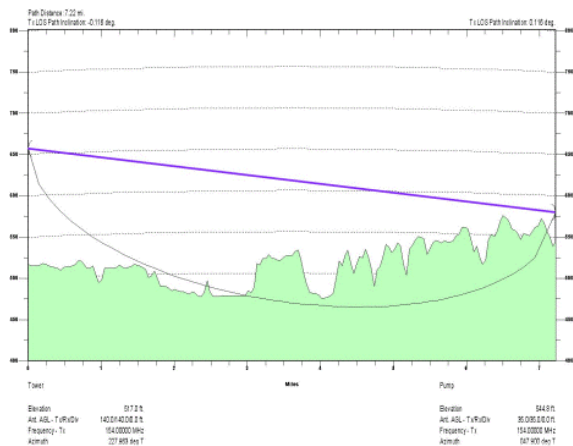
Navionics has been committed, from the beginning, to a rejection of "Master-Slave" schemes in favor of providing fault-tolerant "Peer-To-Peer" telemetry and control systems. In a "Peer-to-Peer" network, all RTU's operate in a smart, stand-alone mode at all times. Just ask Raccoon Water Company of Centralia, IL. When a tornado damaged their main office in April of 1998, their C³ computer was without power for 3 days. However, while they were busy repairing the office, their remote water towers and pump stations, which did have power, continued to operate as normal - keeping all customers supplied with water. In the face of a natural disaster, their telemetry and control system was one thing they didn't have to worry about.

Automatic Failovers Provide An Extra Level Of Fault Tolerance. Another benefit of distributed control is the automatic failover capability. For example, if a pump station were to experience a communication failure to its controlling water tower (or if the pressure transducer at the water tower were to fail), then the RTU at the pump station is configured to automatically failover to a backup control method so as to maintain pressure and storage in the system. For instance, the Operator can select, at his discretion, pressure, software-timer, or

hardware-timer as his preferred backup control. And although the need for this feature is admittedly rare, it is good to know that it is there if needed.

Pre-Job Radio Analysis Eliminates The Guesswork From Telemetry System Design.

Before a project is started, the exact coordinates of the future telemetry sites are obtained from either a GPS survey or from the customer's engineering data. Then, the proper selection of radio frequency band, transmitter power levels, antenna heights, antenna gains, and antenna boresight angles is achieved through a pre-job computer radio simulation. This simulation, which takes into account a terrain model imported from the digitized US Geological Survey database, ensures that any obstructions are located and overcome early in the design phase of the project. Since we do the homework up front, our telemetry systems provide solid inter-site communications "right out of the box".



The Hewlett-Packard Palmtop – The Ultimate Economical Operator Interface.

Another useful feature of the WiSTAR telemetry system is the "Palmtop Interface" port built-in to every RTU. Take Washington County Water (Nashville, IL)... Their field personnel, who are each outfitted with a Hewlett-Packard Palmtop terminal, can plug-in to any RTU in the system and view the detailed status of any water tower or pump station in the system. Furthermore - and this is very powerful – their personnel can use the palmtop to change setpoints at ANY remote site in the system.



As an example, personnel at the Biddleborn pump station on the far west side of the system can force a pump ON or OFF over at the Waltonville pump station on the far east side of the system – normally about a 2 hour round trip. Using the palmtop, personnel can even send wireless "t-mail" from a remote RTU to personnel at office's WISTAR2000 Graphical Operator Interface.

Detail-Coded Pager Alarms Lend Peace-Of-Mind While You're Away From The Office.



If any problem should develop, then the C³ Operator Interface at the office immediately signals the operations personnel with a detail-coded alarm message on their pager(s). The pager code contains information describing both the location and nature of the problem - and if the alarm is a "low-water-tower-level" for example, the alarm code even spells out how much water is in the tower. If an alarm condition clears itself (say, for example, a power outage that lasts only 30 minutes), then the paging system sends a detail-coded page to personnel with this information. This feature can make a world of difference for a rural water or wastewater company whose operations personnel are often spread out away from the office throughout the course of the day.

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