

COMMUNICATIONS

for New or Existing Monitoring, Warning & Control Systems / Stations



#1 WORLDWIDE IN REMOTE DCP COMMUNICATIONS

Sutron transmits data via:

- ▶ **SATELLITE:** IRIDIUM, ARGOS, INMARSAT, THURAYA, VSAT (Lower Earth Orbit Constellations)
- ▶ **GEOSTATIONARY SATELLITE*:** GOES, MSG, FY, ARGOS, MTSAT, INSAT
- ▶ **MODEM:** Contact station on schedule, or station calls our control center
- ▶ **IP-ACCESSIBLE STATIONS:** Contact static IP on schedule, or station connects to us via dynamic IP
- ▶ **CELLULAR:** GSM/GPRS Modems
- ▶ **RADIO:** Line-of-Sight, Repeaters (Store & Forward Capability), UHF, VHF, Spread Spectrum
- ▶ **SERIAL** Direct Connection, Multiplexer, Terminal Server, Etc.
- ▶ **1 - 4 TRANSMIT OPTIONS PER STATION SIMULTANEOUSLY!**
i.e., A Hydro-Met Station might have GOES transmission solely (1 option) or a combination of GOES, IRIDIUM, GPRS/GSM & LOS (4 options).



WEB HOSTING & DATA DELIVERY

- ▶ Sutron's Web-Based Systems Software is compatible with existing & new systems
- ▶ Sutron's **Water/Weather Information Network, WIN** (www.sutronwin.com), is our advanced web service for hydro-meteorological data collection. We've eliminated the complexity of retrieving data from many different types of interfaces. And, we've mastered data delivery directly to you via the web *in any format you want, ready to use.*

IRIDIUM & GSM / GPRS

- ▶ *Sutron is the only hydro-met DCP supplier offering all of the following highly economical & uniquely reliable communication options worldwide: IRIDIUM, GOES (all geostationary satellites globally), GPRS.*
- ▶ Any hydro-met monitoring system can be configured with an IRIDIUM transceiver as a replacement for - or in addition to - a SatLink2 Transmitter. Iridium data can be provided in GOES format allowing decoding of IRIDIUM

VOICE COMMUNICATIONS

- ▶ Standard & User-Customized Voice Phrases
- ▶ Any Language - User Programmable
- ▶ Easy to Configure & Add To
- ▶ Voice Reports, Voice Alarms, Voice Polling, Voice On-Demand Data or Scheduled Reports



Delivered Directly in Real Time to Your Smart Phone (I-Phone, Blackberry, other Personal Device) On-Demand, Scheduled or Event Triggered

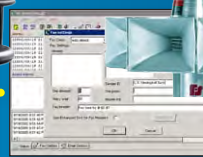
WEBCAM



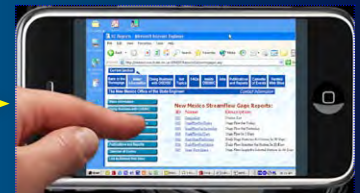
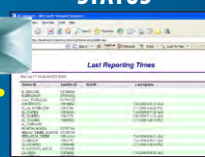
HYDRO-MET DATA



ALARMS



REMOTE STATION STATUS



**NOTE: See Page 2. SATLINK2 TRANSMITTER/LOGGER: Sutron manufactures its own GOES (MSG, FY, ARGOS, MTSAT, INSAT) Transmitters.*

SUTRON

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WWW.SUTRON.COM
SALES@SUTRON.COM

SATLINK2 TRANSMITTER/LOGGER

SL2-G312-1B WITH 3-YEAR WARRANTY



SL2 is the Most Economical, Practical & Technologically Advanced Transmitter both for Today's & for Future Applications.

SL2 with Display has Internal Voice Modem for Messaging & Alarms.

SL2 Has Front Panel Programming

SD Card Capability Extends SL2 Data Handling & Programming

SL2 Has a 3-Year Warranty.

SL2 Has a Battery Back-Up Clock.

USB for Downloads, Set-Ups, Upgrades.

SL2 has a Dedicated Tipping Bucket Input.

SATLINK2 HDR TRANSMITTER HAS A BUILT-IN DATALOGGER & CAN OPERATE AS A STANDALONE DCP.

- ▶ SatLink2 can function as a stand-alone DCP, thus *saving about \$2000 per station* by eliminating the need for a separate datalogger.
- ▶ SL2 Logger: 16 Independent Measurements, Easy Data Merge (logs own measurements & receives data from other loggers), SDI-12 Interface, Tipping Bucket Input, 4 Analog Inputs, & a powerful Mathematical Equation Editor.
- ▶ When integrated into a station with another datalogger, SL2 provides critical data redundancy & expansion options.

NOAA CHOSE SUTRON TO DEVELOP 2-WAY COMMUNICATIONS & COMMAND CAPABILITY FOR GOES TRANSMITTERS.

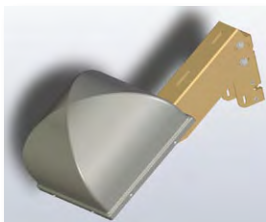
- ▶ Sutron won the SBIR to design & manufacture 2-way communications capability for GOES Transmitters, currently (8/2009) in development.
- ▶ When Sutron releases the new 2-way GOES Receiver (DCP Command), SL2 will support the new receiver with a software upgrade, with no hardware change necessary.

SATLINK2 IS THE ONLY HDR TRANSMITTER WITH "NO MORE HARDWARE SWAPS" CONTROL.

- ▶ Most other vendors rely on 3rd party manufacturers who may arbitrarily change size, functionality & design of their transmitters.
- ▶ Manufacturing our own Transmitter allows Sutron to maintain high quality standards keeping the product in the GOES-Transmitter leadership position.
- ▶ SatLink2 is field-proven & stable. It was one of the first High Data Rate GOES Transmitters certified by NESDIS in 2001. Size & design will remain stable.
- ▶ Sutron intends for future upgrades of SL2, i.e., transition to higher data rates & 2-way command, to be made via software downloads.

SATLINK2 IS THE ONLY TRANSMITTER THAT HAS 30-DAY TURN AROUND ON REPAIRS. OTHERS AVERAGE 3 MONTHS.

- ▶ Most other GOES Transmitters are manufactured by 3rd parties & sold through providers who do not repair the equipment. Thus, the average turn around on repairs for other Transmitters is 3 months.
- ▶ **One-Stop Accountability.** SatLink is designed, manufactured, supported, installed & integrated by Sutron. Sutron repairs all SatLinks in-house within 30 days.



DOMESATELLITE ANTENNA

- ▶ High reliability in remote locations & extreme meteorological conditions
- ▶ Wide Beamwidth illuminates at least two of the GOES Satellites - either the GOES East and the GOES Central or the GOES West and the GOES Central when pointed midway between the satellites
- ▶ High Gain - operates with DCPs transmitting at less than 10 Watts
- ▶ Solves satellite pointing & alignment problems while saving time, money & frustration in the field during deployment.

IRIDIUM[®] GLOBAL SATELLITE COMMUNICATIONS



IRIDIUM[®] Satellites provide data & voice messaging, alarm, paging & web solutions.

Since 2004, Sutron's Xpert & XLite Loggers & SatLink2 combined with IRIDIUM have provided Hydro-Met Solutions to some of the most remote sites on the planet.

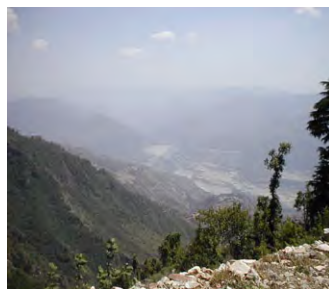


FEATURES

- ▶ IRIDIUM delivers essential communications services to & from remote areas where no other form of communication is available.
- ▶ The IRIDIUM constellation of Low-Earth Orbiting Satellites is the largest fully-meshed commercial satellite network in the world.
- ▶ Low-Earth Orbit Satellites provide benefits other satellites cannot, i.e., no significant transmission delays, lower transmit power for longer battery life, & total global coverage.

APPLICATIONS

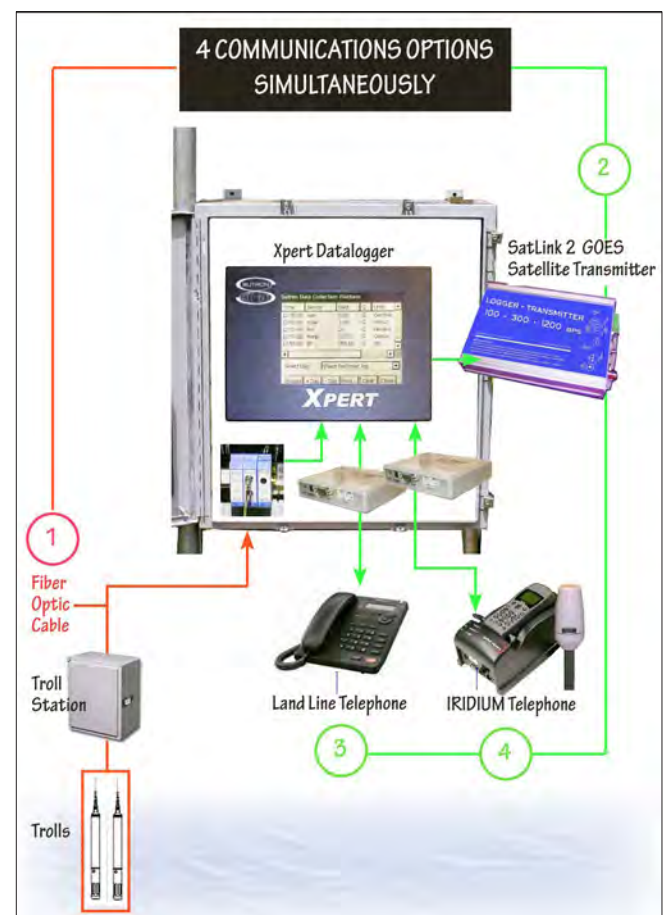
- ▶ IRIDIUM service is ideally suited for industries such as maritime, aviation, government/military, emergency/humanitarian services, mining, forestry, oil & gas, heavy equipment, transportation and utilities.
- ▶ IRIDIUM provides many services to the U.S. Department of Defense.
- ▶ Applications in extremely cold environments: Sutron has designed & installed IRIDIUM stations in Antarctica. We are currently (2009) developing a station prototype for Greenland & another prototype for the USACE's Cold Regions Research & Engineering Laboratory.



SERVICES

- ▶ Sutron will provide an authorized IRIDIUM Service Partner to manage equipment (landline or cellular), minutes or cellular, etc.
- ▶ IRIDIUM World Data Services
- ▶ Land & Marine Mobile Services
- ▶ Enhanced Mobile Satellite Services (EMSS) for US DoD: EMSS is a DoD enhancement providing low rate voice & data services & allows end-to-end encryption, interface to secure telephone equipment (STU/STE), & protection of sensitive user information. Authorized user terminals (handsets) support secure communications by adding a removable NSA-approved Communications Security (COMSEC) sleeve connected directly to an authorized user terminal. DoD includes U.S. Army Corps of Engineers.
- ▶ Global LRIT[®] Services: Zero equipment interference & reliable everywhere, the IRIDIUM LRIT application is dedicated, cost-effective, low latency & secure. It combines high-quality, low-latency pole-to-pole coverage with low-cost equipment based on Short Burst Data (SBD) Transceiver.

*Long Range Identification & Tracking



Example: IRIDIUM, Land-Line Telephone, & Fiber Optic Communications (integrated with Sutron's XPERT Datalogger) plus GOES communications (Sutron's SatLink2 Transmitter/Logger) in Canal Station, USACE, New Orleans

GSM/GPRS COMMUNICATIONS



Extremely Flexible & Reasonably Priced Communications for Flood Warning Systems, Hydrological Monitoring & Control Networks, Automatic Weather Stations & More

GSM/GPRS COMMUNICATIONS

- ▶ Provides real time data from current hydro-met measurements to users of GSM/GPRS networks.
- ▶ Robust, reliable, broad-based GSM/GPRS communication system that sends data in **text & image** formats.
- ▶ The GSM/GPRS network automatically gathers data as & when needed at user-defined time intervals and stores the data in the Server for analysis.
- ▶ Stations are configured to call the Server phone at user-specified times to transmit the GPRS message. If the transmission isn't successful, the station will retry transmission for a user-defined number of times. If the transmission in GPRS mode fails after x number of retries, each station switches over to GSM mode to transmit data.
- ▶ Each station includes a GSM/GPRS control terminal with everything needed for **wireless M2M capabilities** & to avoid delay in data reception caused by network congestion.
- ▶ Each GSM/GPRS RTU sends an automatic message at user selected intervals (i.e., every 10 minutes) to the Server. Sampling is programmable at intervals, 0 to 60 minutes.
- ▶ Data is transmitted in ASCII format to a Central Server. Data can also be routed to an **e-mail** address or sent as a **UDP** packet in GPRS to an address and port, that can be programmed via **SMS**.
- ▶ Each station can log & store data locally in flash memory, then later retrieve detailed logs.
- ▶ The Central Server has the ability to answer calls & communicate data using a **synthesized voice** (any language needed).
- ▶ The System also **responds to SMS requests for current data**.
- ▶ Provides automatic SMS alarms set at programmable levels for any parameter needed.



USE A GPS ANTENNA

The GSM Modem includes an integrated GPS Modem. Therefore, the station antenna is GPS which not only keeps station time accurate but eliminates the need for two separate antennas. The Sutron antenna is an integrated unit that receives GPS signals as well as Quadband RF signals.

- ▶ Sutron also provides System Software to manage the GSM/GPRS Network for troubleshooting & to return functionality in order to dramatically minimize down time.
- ▶ The System can display data & export data to Excel, Matlab & similar applications for graphical representations.
- ▶ Both the Server & Station Data Loggers are programmed to provide **event-triggered information & alarms** for sudden developments such gusts, squalls, thresholds of rainfall, rise in water level, current changes, etc.
- ▶ All data received in the Central Server is in standard exchangeable RDBMS format using SQL Server or Oracle. Each Station has the facility to be queried at any moment or at any intervals, regarding any parameter or sensor. GUI Server Software includes a statistical tool.
- ▶ Sutron will provide GSM/GPRS Service through the most reasonably priced Provider available.

GSM/GPRS DATA DELIVERY



MOBILE DEVICE (CELL PHONE, BLACKBERRY...), CSD, FAX

- ▶ Frequency: 900 / 1800 MHz
- ▶ GSM/GPRS Modem: Wireless M2M capability
- ▶ Remote Dial-Up Facility
- ▶ Transmission: Quad band design allowing for applications to be deployed worldwide
- ▶ Point-to-point mobile originated & mobile terminated SMS
- ▶ Concatenated SMS supported
- ▶ SMS cell broadcast
- ▶ Text & PDU modes
- ▶ CSD V.110: Asynchronous transparent circuit switched data (CSD) up to 14.4 kbps
- ▶ Asynchronous non-transparent CSD up to 9.6 kbps
- ▶ FAX V.110
- ▶ Embedded TCP/IP stack including TCP, IP, UDP, SMTP and FTP
- ▶ Sim Card 1.8V/3.0V, Externally accessible

AUDIO & VIDEO

- ▶ Full voice, SMS, Data
- ▶ Half rate, full rate, enhanced full rate & adaptive multi-rate voice codecs
- ▶ Telephony, emergency call
- ▶ HR, FR, EFR, AMR
- ▶ Superior echo cancellation & noise reduction
- ▶ DTMF
- ▶ 24-7 Web Cam with swivel control from password protected account

UDP & TCP/IP (INTERNET)

lines. Failures in any part of the primary site or its connections can be overcome by the secondary server site. Of course, it costs more for the secondary site to duplicate the primary site. However, this duplication is the only way to make sure that the system can continue running in spite of failures.

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IMD WEATHER FORECAST CENTER
SUNNY ZERO CHANCE OF RAIN
AIR TEMP - 43 DEG C
HUMIDITY - 40% HRS OF SUN 8
  
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ALARMS & DATA MESSAGES

- ▶ Voice alarms & messages
- ▶ Text alarm messages to mobile devices & email
- ▶ Internet alarm communications & reports
- ▶ Sirens & public announcements
- ▶ Public data access using the Internet
- ▶ LED Displays: External public announcement "slave" units for big screens ; displays more than 8 parameters
- ▶ Public data access using SMS.

The Voice Response System Server also handles SMS messages. It has a high speed connection to an SMS Center (SMSC) & uses SMPP to talk to the SMSC to reduce message charges. Incoming SMS messages are received through the SMPP interface to the Messaging Server. A script on the Server identifies the request and creates the reply message. For example, a user sends a text to the System phone number. The System then builds a reply message from data in the database and responds. Test drive it! Please dial up our SMS Demonstration Automatic Weather Station.

- ▶ Public data internet & SIP Trunk for phone

WMO MESSAGE FORMATS

- ▶ Sutron uses the following as references for WMO Software & configuration of our Automatic Weather Stations (AWS):
 - WMO Publication No. 8, 6th Edition, 1996.
 - WMO Publication No. 9, 1993 & supplements
 - WMO Publication No. 49, Technical Regulations
 - WMO Publication No. 100, 1990.
 - WMO Publication No. 305, 1993
 - WMO Publication No.306
 - WMO Publication No. 636,1998

WIN: Water/Weather Information Network

Web Hosting, Data Processing, Delivery, Storage & Alarms



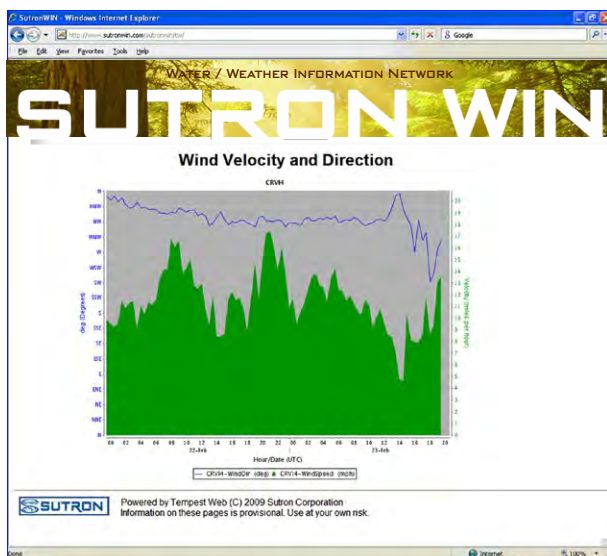
SUTRON WIN: WATER / WEATHER INFORMATION NETWORK

- ▶ *Web Service for Hydro-Meteorological Data Collection & Dissemination*
- ▶ *Data Delivery Directly to You via the Web, in Any Format You Want, Ready to Use*

We've solved the enigma of retrieving data from many different types of interfaces. And, we've mastered data delivery directly to you via the web in any format you want, ready to use.

FEATURES

- ▶ Secure password protected log-in
- ▶ Real-time data access from anywhere in the world
- ▶ GOOGLE map that shows the location of each Hydro-Met Station
- ▶ Dynamic bubble that shows current data, date and time when clicked
- ▶ Bubble changes from GREEN to RED or YELLOW based on RECEIVED ALERTS
- ▶ Data downloads & reports in tabular or graphical format
- ▶ Demo Site: <http://www.sutronwin.com/>



HOW IT WORKS

We collect your station data, process it according to your specifications, and deliver it to you via the web.

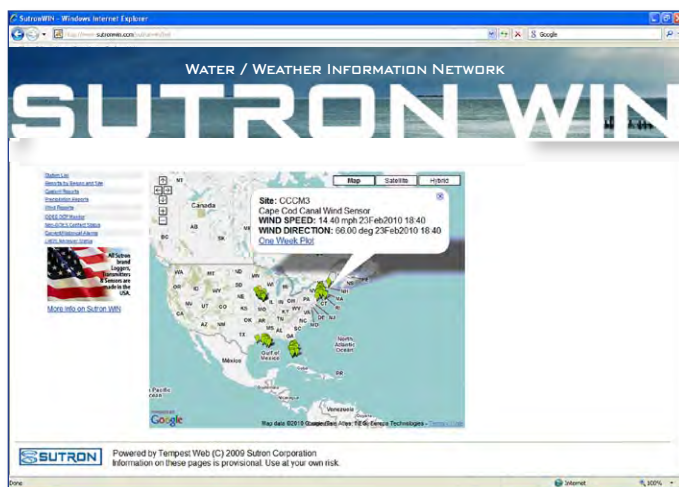
We decode the data into time-tagged engineering units, store it for 6 months (up to 10 years available with additional costs) in our SQL database, run computations for derived parameters, and perform automated limit-checking.

Then we provide a secure web-page to view your data graphically, on a map, or in tabular form. Links are provided to download data into your choice of commonly used formats: SHEF, .A/.E, Kisters ZRXP, CSV/TSV, Excel, Hydstra, USGS STDMSG, HTML, XML, Pi Historian, and many others.

Conversely, if you prefer to do your own processing, we will deliver raw data (as it is transmitted by the station). You will be provided with a secure download page which is updated immediately as your data arrives.

WIN: Water/Weather Information Network

Web Hosting, Data Processing, Delivery, Storage & Alarms



Wind Data
(22-Feb-2010 00:00 to 23-Feb-2010 20:43)

Time Series Table

Date/Time UTC	CRV4-WindSpeed	CRV4-WindDir	CRV4-US-day-Average	CRV4-UD-day-Average
23-Feb-2010 20:00	13.50	296.00	--	--
23-Feb-2010 19:30	13.06	276.00	--	--
23-Feb-2010 19:00	9.27	238.00	--	--
23-Feb-2010 18:30	6.00	227.00	--	--
23-Feb-2010 18:00	11.71	299.00	--	--
23-Feb-2010 17:30	8.55	289.00	--	--
23-Feb-2010 17:00	7.96	317.00	--	--
23-Feb-2010 16:30	7.96	270.00	--	--
23-Feb-2010 16:00	8.09	309.00	--	--
23-Feb-2010 15:30	10.23	321.00	--	--
23-Feb-2010 15:00	4.61	332.00	--	--
23-Feb-2010 14:30	4.76	356.00	--	--
23-Feb-2010 14:00	7.00	354.00	--	--
23-Feb-2010 13:30	8.35	336.00	--	--
23-Feb-2010 13:00	8.56	322.00	--	--
23-Feb-2010 12:30	9.48	316.00	--	--
23-Feb-2010 12:00	10.71	319.00	--	--
23-Feb-2010 11:30	10.05	316.00	--	--
23-Feb-2010 11:00	9.18	314.00	--	--
23-Feb-2010 10:30	11.06	312.00	--	--
23-Feb-2010 10:00	11.51	309.00	--	--
23-Feb-2010 09:30	10.21	313.00	--	--
23-Feb-2010 09:00	10.59	319.00	--	--
23-Feb-2010 08:30	11.26	321.00	--	--
23-Feb-2010 08:00	11.88	317.00	--	--
23-Feb-2010 07:30	11.49	316.00	--	--
23-Feb-2010 07:00	12.28	316.00	--	--
23-Feb-2010 06:30	12.46	314.00	--	--
20-Feb-2010 00:00	8.42	329.00	--	--

MORE FEATURES

- ▶ **DERIVED PARAMETERS:** Combine parameters (e.g. add with coefficients), USGS Stage/Flow Rating Calculation, Periodic Averages, Incremental Precip, Sum, Min/Max, etc.
- ▶ **LIMIT CHECKING:** Value and rate-of-change limits. Separate limits can be set for warning/critical levels.
- ▶ **ALARM NOTIFICATION:** via web
- ▶ **ALARM NOTIFICATION IS ALSO AVAILABLE VIA EMAIL AND SMS** Text message for an additional cost.
- ▶ **VOICE:** Standard & User-Customized (additional cost)
- ▶ **PRICING: AFFORDABLE.** Whether you receive data from a single station or hundred, we charge a one-time setup fee and then a low recurring fee per station. Some services such as GPRS or Iridium may also incur nominal costs from the service provider. Please ask for a customized quotation.
- ▶ Sutron also provides **BACKUP ON-LINE DATA COLLECTION, STORAGE AND ANALYSIS** at NO ADDITIONAL COST.
- ▶ Sutron can provide **ON-LINE WEB-HOSTING** through the new SutronWIN web site., WWW.SUTRONWIN.COM. Data is available via a web interface as shown here or your own customized web pages using your own logo, etc.
- ▶ **STORAGE:** GOES data is stored on the NESDIS server for 72 hours. However, using Sutron's ILEX Tempest LRGS and Sutron's own local ground station, we receive **ALL GOES DATA TRANSMITTED**. Therefore, we can store all GOES data, in addition to your station data, and keep it available as long as specified.

DATABASE EXPERTISE

BUREC HYDROLOGIC DATABASE (HDB) : In 2008 Sutron purchased Ilex Engineering, a successful Satellite System Software company. ILEX/Sutron Software presently operates in almost every office of the Army Corps of Engineers, the U. S. Geological Survey, the Bureau of Reclamation .

Since 2002 Sutron's Ilex Division has been responsible for the U.S. Bureau of Reclamation's **HYDROLOGIC DATABASE (HDB) PROJECT** (previously under the aegis of the University of Colorado's Center for Advanced Decision Support for Water and Environmental Systems (CADSWES) then ILEX Engineering).

Sutron's ILEX Division Database Administrator in Boulder, Colorado, provides full-time proprietary HDB support for USBR (US Bureau of Reclamation).

WIN NAVIGATION

- ◆ Station List
- ◆ Reports by Region and Site
- ◆ Custom Reports
- ◆ Precipitation Reports
- ◆ Wind Reports
- ◆ GOES DCP Monitor
- ◆ Non-GOES Contact Status
- ◆ Current/Historical Alarms
- ◆ LRGS Receiver Status

THE SUTRON ADVANTAGE



Highest ROI & Lowest Life-Cycle Cost of any Hydro-Met Systems



CONSISTENCY & DEPENDABILITY

Since 1975 Sutron Corporation has provided approximately 50,000 Automatic Hydro-Met Stations to 50 countries around the world. Because our systems and equipment are the highest quality (with the lowest power usage) available, our stations are known throughout the world for unparalleled levels of accuracy, reliability and longevity.

With proper maintenance a Sutron system will operate for over a decade, consistently supplying real-time hydrological and weather data to support forecasting, warning, planning and climatology study/analysis.

WORLD-WIDE EXPERIENCE

We have worked on every continent, and in every conceivable climate from tropical to arctic, regardless of humidity, temperature or environmental dangers. Moreover, each Sutron System Integrator has a degree in Electrical Engineering, extensive training in Meteorological and Hydrological Systems, and/or professional training in Electronics and Communications Systems. Sutron Systems Work!

TECHNICAL SUPERIORITY

Sutron's thorough knowledge of Hydro-Met Applications and comprehensive grasp of the latest technological advancements are the reason NOAA's National Ocean Service asked us to design its latest state-of-the-art Tide Stations. That's also why NOAA trusted only Sutron to design and manufacture its latest innovation in GOES Satellite Transmitters, DCP Command.

MODULAR, OPEN, EXPANDABLE, EASY-TO-UPGRADE HYDRO-MET SYSTEMS

When designing hydro-met systems, we always consider the possible future upgrade of each. We, therefore, take great care in designing a system that offers commonality of components and a uniform interface. Modular, open, distributed architecture allows the same core system to provide excellent performance regardless of the number of new sensors, field stations or base stations that might be added.