

SAWS

SUTRON



SUTRON AIRPORT WEATHER SYSTEMS

AVIATION WEATHER MONITORING



SUTRON

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Unique AWOS Valued-Added Expertise

Sutron's Airport Weather System Division has far-reaching experience in the design, integration, installation and maintenance of Airport Weather Systems.

The Division is headed by Roberto Arpino who holds several U.S. and international patents for automation of weather reporting systems. Mr. Arpino is the designer of both the first commercial Automated Weather Observing System (AWOS) to receive operational approval from the FAA as well as the first commercial Automated Surface Observing System (ASOS) to receive operational approval from the NWS.

He is also the founder of Artais, which was later sold to Vaisala, Finland.

Mr. Arpino participated in the development of several generations of AWOS and ASOS and in the evaluation of the meteorological sensors used in automated systems. He participated in and supplied sensor interface and data collection systems for evaluation studies of Cloud Height and Visibility/RVR sensors conducted at Arcata Airport (CA), Hanscom AFB and at the NWS Test and Evaluation center in Sterling, Va.

In collaboration with the FAA and the NWS, Mr. Arpino contributed to the development of weather processing algorithms used in current AWOS/ASOS systems as well as development of AWOS/ASOS testing and maintenance schedules and procedures.





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Sutron Introduction and Company Profile

Since 1975, Sutron has been a recognized leader in Meteorological and Hydrological Monitoring and Control Systems, providing reliable remote real-time monitoring equipment and systems, that meet or exceed World Meteorological Organization, FAA and NWS standards.

1. **VALUE ADDED BENEFIT. Product Integrity from Design to Support** Because our equipment and systems are *designed by Sutron, manufactured by Sutron, integrated by Sutron, installed by Sutron and maintained by Sutron*, our customers receive the best Customer Service in the industry.

Our Customer Service technicians completely understand our equipment and systems. And, if there's ever a question our technicians cannot answer, *they go directly to the engineer who designed and/or integrated the system or equipment for fast, accurate answers.*

No other industry competitor, who by default must rely on third party installation, customer service, equipment and/or systems integration, can make that claim.

To illustrate, Sutron is the only Meteorological Systems Provider who manufactures its own GOES* Satellite Transmitter. All others must buy their GOES transmitters from an outside manufacturer.

2. **PRODUCTS.** Sutron Corporation supplies real-time data collection, telemetry, and technical expertise to monitor, control, manage, model, and forecast activities in meteorologic, hydrologic and oceanic areas.

**also certified for INSAT, METEOSAT, FY2C, ARGOS/SCD, & GSM*

3. **SUTRON SPECIALIZES** in engineering, manufacturing, and integration of cutting-edge, microprocessor-controlled wireless data collection platforms, equipment (sensors, dataloggers, transmitters, etc.), telemetry, and software which we integrate into complete, easy-to-understand, turn-key network systems .
4. **DEPTH OF EXPERIENCE with Large Meteorological Monitoring Systems** With a solid 30 years experience and nearly 40,000 stations installed worldwide, our knowledge of real-time meteorological products, systems, software, and services, significantly enhanced by recent large system projects, set Sutron apart as the Contractor to most efficiently deliver and best meet Remote Monitoring System needs.
5. **ISO CERTIFIED.** Sutron's software, equipment and systems have been **manufactured in the United States to exacting ISO Quality Standards** for over 30 years.
6. **TECHNICAL CREDIBILITY** Our knowledge of existing systems and equipment, regardless of manufacturer, and our thorough understanding of technological improvements achieved over the last 30 years gives us the advantage over companies that have emerged only recently.
7. **EXTENSIVE EXPERIENCE INTEGRATING, INSTALLING AND SUPPORTING AWOS SYSTEMS.**
8. Sutron sets the standard for **QUALITY, LOW-COST, UNDER-BUDGET AND ON-TIME PROJECT DELIVERY**

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Sutron Introduction (cont'd)

9. **UNEQUALLED HIGH LEVEL OF CUSTOMER SERVICE AND AFTER SALES SUPPORT.** Sutron is dedicated to providing our Customers with state-of-the-art products, systems and services with the highest degree of professionalism and integrity. Which is why we consider our customers, over 500 strong around the globe, as Customers for Life.
10. **STRONG MAINTENANCE PROGRAMS.** Our systems are backed up by strong maintenance programs that include ready availability of spares and trained technicians.

In concert with SAWS, Sutron's Integrated System Division (ISD) manages projects that deliver equipment and services per the customer's precise requirements. This division has personnel and facilities to support the rapid response frequently required for Airport Weather Observation Systems.

Sutron's Integrated System Division is backed up by our Research and Development (R&D) group that designs all electronics and hardware produced by the company.

Final delivery of production items made for all phases of the contract is fulfilled by the company's Hydromet Products Division (HPD), the production arm of the company. The combined expertise and focus of these divisions, the rapid project-



Sutron ISD & CSD Installing SAWS Station in Caribbean

oriented ISD, the engineering power of R&D and the production capabilities of HPD, enable Sutron to consistently deliver our projects on schedule and under budget.

Sutron's Customer Service Division (CSD) is unsurpassed in our industry for customer support and product repair. ISD and CSD combine forces to support the initial training and deployment of stations into the field. Customer Service then continues support, training and maintenance over the life of the contract.

ADDITIONAL ISD ENGINEERING SERVICES

Site Selection & Survey

Communication Analysis

Economic Analysis

Data Collection & Analysis

System Design & Specifications

Radio Path Study

Field Strength Study

Web Hosting





With 40,000 Stations in 50 Countries Worldwide

... we are proud to have earned our reputation for providing the highest caliber of field-tested, dependable products and systems available, at a very competitive price. Representative List..

Antigua	World Meteorological Organization (WMO)
Aruba	World Meteorological Organization (WMO)
Australia	Bureau of Meteorology
Bahamas	World Meteorological Organization (WMO)
Barbados	World Meteorological Organization (WMO)
Benin	HYDRONIGER Data Collection Network
Burkina	HYDRONIGER Data Collection Network
Cameroon	HYDRONIGER Data Collection Network
Canada	Canadian Environment & Met Service
Cayman Islands	Meteorological Department
Chile	Direccion General de Aeronautica Civil
China	Chinese Academy Meteorological Studies (CAMS)
Colombia	Columbian Air Force Direction de Aviacion Civil
Colombia	IDEAM
Costa Rica	Instituto Costarricense de Electricidad
Cote d'Ivoire	HYDRONIGER Data Collection Network
Cuba	World Meteorological Organization (WMO)
Dominican Repub	World Meteorological Organization (WMO)
Ecuador	Instituto Nacional de Meteorologia e Hidrologia
El Salvador	Servicio Nacional de Estudios Territoriales, SNET
England	ELE International, Inc.
Faso	HYDRONIGER Data Collection Network
Grenada	World Meteorological Organization (WMO)
Grenadine	World Meteorological Organization (WMO)
Guatemala	INSIVUMEH
Guinea	HYDRONIGER Data Collection Network
Guyana	World Meteorological Organization (WMO)
Haiti	World Meteorological Organization (WMO)
Honduras	COPECO & ENEE; PNUD
India	India Meteorological Department (IMD)

Indonesia	Indonesia Meteorological Service
Iraq	Meteorology Department
Italy	Italian Air Force Meteorological Service
Jamaica	World Meteorological Organization (WMO)
Mali	HYDRONIGER Data Collection Network
Mexico	Servicio Nacional de Meteorologia
Montserrat	World Meteorological Organization (WMO)
Morocco	Souss-Massa Integrated Water Management Project
Netherlands	Meteorology Service of the Netherlands Antilles
Nevis	World Meteorological Organization (WMO)
New Zealand	Meteorological Service
Nicaragua	Instituto Nicaraguense de Estudios Territoriales
Niger	Niger Basin Authority(ABN)
Nigeria	HYDRONIGER Data Collection Network
Norway	Norwegian Meteorological Institute
Pakistan	SUPARCO
Panama	Autoridad del Canal de Panama
Peru	Servicio Nacional de Meteorologia e Hidrologia
Poland	Institute of Meteorology and Water Management
Portugal	Instituto de Meteorologia
Puerto Rico	USGS Puerto Rico
Romania	National Institute of Meteorology and Hydrology
Saudi Arabia	Meteorology and Environmental Protection
Singapore	National Environmental Agency (NEA)
St. Christopher	World Meteorological Organization (WMO)
St. Lucia	World Meteorological Organization (WMO)
St. Vincent	World Meteorological Organization (WMO)
Sweden	Sweden Meteorology and Hydrology Institute
Switzerland	Swiss Meteorological Institute
Taiwan	CWB
Thailand	Loxley, Inc.
Trinidad/Tobago	World Meteorological Organization (WMO)
Turks & Caicos	World Meteorological Organization (WMO)
Ukraine	State Water Management Committee
Venezuela	CVG EDELCA

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Sutron Products & Applications*

AIRPORT WEATHER APPLICATIONS

AUTOMATED AIRPORT WEATHER SYSTEMS

- Sutron Airport Weather Systems
- RVR Systems
- Wind Systems



*Sutron Airport Weather System
Cayman Islands International
Airport*

HYDROLOGICAL APPLICATIONS

- Water Resources Monitoring & Control
- Surface Water
- Ground Water
- Hydropower Monitoring & Control
- Canal Automation & Control
- Flood Warning—ALERT & Two-Way
- Geotechnical
- Dam Safety Monitoring
- SCADA Systems for Lift Stations
- Well House
- Pump Station Control
- Water Quality Monitoring
- Real-Time Flow Monitoring

METEOROLOGICAL APPLICATIONS & STATIONS

- Automatic Weather Stations (WMO Standard)
- Synoptic
- Climate—COOP, GCOS
- Rainfall—ARS
- Portable Weather Stations
- Agri-Met Stations
- Hazmat Stations
- Air Quality Monitoring Stations

HYDRAULIC & HYDROLOGIC ENGINEERING

- Flow Equation Development
- Agricultural Engineering
- Design
- Flood & Stormwater Management
- Water Quality & Wetlands
- River & Stream Analysis
- Watershed Management

SCADA

- Telemetry
- Networking
- RF Studies

DATA SERVICES

- Stream Gaging Networks
- Ground Water Monitoring
- Water Quality Monitoring
- Design, Build, Operate
- Web Hosting of Data



MODELING

- Hydrodynamic
- Water Quality
- Ground Water
- Surface Water & Ground Water Interaction

NATIONAL OCEAN SERVICE APPROVED OCEANIC APPLICATIONS & STATIONS

- Coastal Weather
- Tsunami & Storm Surge Monitoring
- Coastal Monitoring Systems (NWLON)
- Physical Oceanographic Real-Time System (PORTS)
- Great Lakes Water Level Monitoring Network
- Tidal & Sea Level Monitoring Stations

BUOY SYSTEMS

- Sutron-Manufactured GOES & INSAT Certified
- 40W Transmitter for Data Buoy Applications



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Sutron Products & Applications (cont'd)

TURN-KEY SERVICES

- Installation of Remote Stations
- Annual Maintenance for Large Data Collection Networks
- Hydrological Modeling
- Data Collection & Analysis
- Stream Gauging, Rating Curves, Etc.
- Custom Hydro-Met Applications, Systems & Stations

DCP EQUIPMENT & SENSORS

- Dataloggers/Controllers
- Satellite Transmitters
- Telemetry Equipment
- Hydrological & Meteorological Sensors (All)
- Rainfall (Tipping Bucket)
- Shaft Encoder
- Bubbler
- Radar Sensor
- Submersible Pressure Sensor
- Water Temperature
- Water Quality Multi-Sonde Probes
- Vibrating Wire Sensors
- Wind Direction
- Wind Speed
- Air Temperature/Relative Humidity
- Barometric Pressure
- Pyranometer/Solar Radiation
- Soil Moisture & Soil Temperature
- Leaf Wetness
- Evaporation
- Visibility
- RVR
- Present Weather
- Cloud Height
- Sky Cover
- Dew Point Temperature
- QNH/QFE
- Barometric Pressure
- Other Meteorological Observations

COMMUNICATIONS

- SATELLITES
 - GOES
 - ARGOS/SCD
 - INSAT/KALPANA
 - METEOSAT
 - FY-2
 - INMARSAT
- LOS RADIOS
 - UHF/VHF Radios
 - Spread Spectrum
 - ERICSSON Trunking Radios
 - Ethernet/IP Radios
- CELLULAR MODEMS
 - CDPD, GPRS, GSM & CDMA
- SPEECH MODEMS
 - Data & Voice via Land Lines
- DIRECT CONNECT
 - RS-232/Ethernet (Converter)
 - TCP/IP, UDP Protocols
- MODBUS PROTOCOL



SOFTWARE

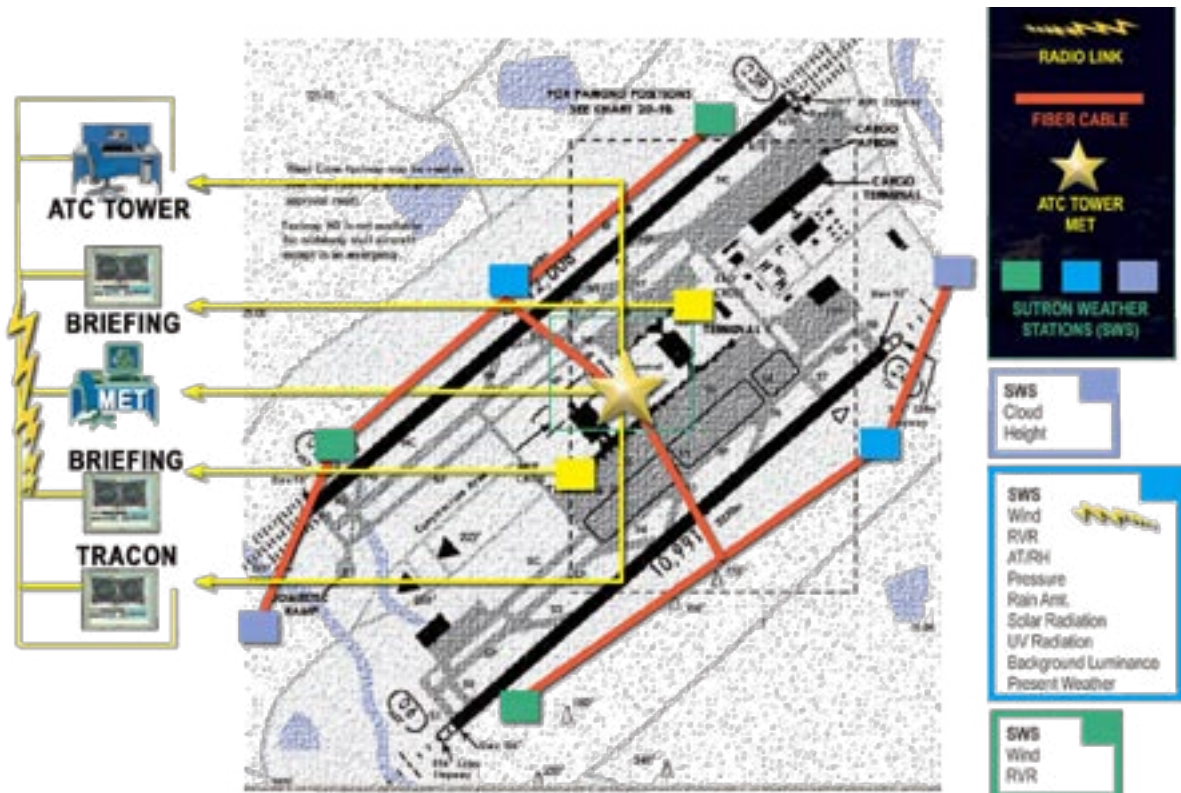
- Data Acquisition Storage & Processing Software - Open Database (ODBC,) Standard SQL
- Data View, Trending, Editing, Automated Calculations & Statistical Processing, Web Hosting





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SAWS Real-Time Data - Uninterrupted & Verified for Quality



SAWS built-in redundancy prevents the biggest problem associated with the traditional AWOS "star" configuration - total system failure if even one station or one sensor fails. The red lines show cable communications among SAWS stations. The yellow lines and lightning bolt indicate radio communications among larger, multi-sensor stations and receive sites: ATC Tower, MET, TRACON, 2 Briefing Sites.

SAWS

- Real-time Weather Data in Support of Aircraft Operations
- Hourly & Special Observations
- Meteorological Data for Forecasting & Climatology
- Unattended or Attended Operation 24-7-365
- Voice Transmission of Real Time Weather
- Integrates Information from Single or Multiple Runways
- Integrates with ATIS
- Follows ICAO, WMO & FAA Regulations





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Open, Distributed Architecture for 1 -100 Runways

REAL-TIME ATC INFORMATION

- Wind Direction including Variable Winds
- Wind Speed including Gust
- Visibility
- RVR including Variable (max and min) & Tendency
- Present Weather
- Cloud Height & Sky Cover including Obscuration (Vertical Visibility)
- Air Temperature
- Dew Point Temperature
- QNH, QFE (hPa, inches-Hg or both)
- Density Altitude

SYSTEM PRODUCTS

- METAR-SPECI-LOCAL, MET REPORT - SPECIAL Observations
- SYNOP Observation
- Relative Humidity
- Sea Level Pressure
- Barometric Pressure Tendency & Amount
- Precipitation Amount (Hourly & Synoptic)
- Other Synoptic Data as required
- Climatological Data as required
- Rain Rate (mm/minute & mm/hour)



SAWS STATION FEATURES

- Open design accommodates a wide variety of sensors
- Local processing
- Touch screen
- PCMCIA for local logs
- Communication via fiber, cable, LOS radio
- Built in diagnostic and RMM
- Powered by Mains, Solar, UPS
- Distributed architecture obviates the use of servers
- Lightning and surge protection
- OOP modular design
- On line redundancy
- Connection points for easy expansion and customizing
- User configurable operation and user interfaceS

PRESENT WEATHER & RAIN AMOUNT

- Weather, as reported from a present weather sensor
- Weather, as inferred from available data (e.g. FG, BR, RA, SQ)
- Rain accumulation in units of mm or inches
- Last minute accumulation amount
- Last hour accumulation amount
- Hourly amounts for past 24 hours
- Total amount (so far) for current day
- Total daily amounts

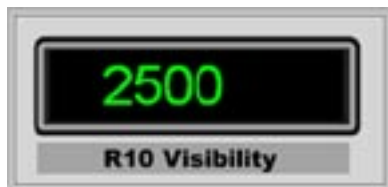




SAWS (CONT'D)

WIND

- User defined averaging time
- Selectable discontinuity
- Units: Kt, mph, Km/h, mps
- Direction/Speed
- Maximum
- Minimum
- Gust
- Variable
- Head/Tail Wind
- Crosswind
- Squall
- User defined alarms



SKY CONDITIONS & HEIGHT OF CLOUDS

- Single or multiple ceilometers
- Individual cloud hit height
- Three layers (plus CB layer if augmented by specialist)
- Coverage reported as SKC, FEW, SCT, BKN, OVC

VISIBILITY/RVR

- User defined averaging time
- Visibility and RVR Alert\Alarms
- Visibility units (miles, meters)
- Directional visibility (with multiple sensors)
- RVR
- RVR tendency
- Background luminance
- Runway lights indicators

PRESSURE & ALTIMETRY

- Pressure (hPa, inHg, mmHg)
- QNH, QFE, QFF
- Transition level
- Tendency

TEMPERATURE, DEW POINT & RELATIVE HUMIDITY

- Current Temperature, Dew Point Temperature and Relative humidity
- Maxima and minima during last hour
- Hourly Maxima and minima for past 24 hours
- Maxima and minima (so far) for current day



SAWS

Representative Experience



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CUSTOMER	VALUE*/DATE	TASKS	EQUIPMENT & SERVICES
US Air Force Electronic Systems Center Air Force Materiel Command Hanscom AFB, MA 01731-2100	\$1,500,000 2005	Design & delivery field-tested prototype FMQ-13 Wind Speed & Wind Direction Sensors. Purpose: to gather data on horizontal wind direction & wind speed used in military base weather stations & flight line systems worldwide. Units integrate into operating FMQ-13 weather systems previously supplied by Sutron.	350 Airport Wind Systems using Solid State (no moving parts) Digital Wind Sensors Maintenance, Training, & Technical Support
US Air Force Logistics Command McClellan Air Force Base Sacramento, CA	\$9,000,000 2005	Designed, manufactured, integrated, installed, maintain digital wind-measuring systems USAF, USN & Army bases	Over 1,000 Airport Wind Systems using Solid State (no moving parts) Digital Wind Sensors Maintenance, Training, & Technical Support
US Geological Survey 12201 Sunrise Valley Dr. Reston, VA 22092 Frank Henry	\$17,000,000 2001	Designed, manufactured, integrated, installed, maintain systems that monitor stream-flow thruout continental USA	7,369 DCPs, dataloggers with satellite/LOS/phone telemetry & sensors
US Bureau of Reclamation 1150 N. Curtis Rd Boise, ID 83706 Jim Doty	\$3,500,000 2001	Designed, manufactured, integrated, installed, maintain real-time flood control, hydro-power, irrigation monitoring & control systems	1,000 DCPs, GOES receive sites, custom system software & sensors thruout western USA
US Army Corps of Engineers 9501 John J. Pershing Dr. Omaha, NE 6812	\$5,000,000 1980-2001	Designed, manufactured, integrated, installed, maintain flood control & monitoring systems, thru cont. USA	1,435 DCPs, satellite telemetry, GOES receive sites, sensors & software
NOAA, NOS 1305 East West Highway Silver Spring, MD 20910 Thomas Mero	\$5,000,000 2001	Designed, manufactured, integrated, installed, maintain water level measurement systems entire USA coastline & other international tide projects	250 DCPs, tide gauges, sensors, software
Direccion General de Aeronautica Miguel Claro 1314 Santiago, Chile	\$1,000,000 1998	Designed, manufactured, integrated, installed, maintain GOES satellite receive stations & AWOS at 29 airports	29 systems provide real-time data at domestic airports
WMO SIDS-Caribbean Project , joint venture with government of Finland, WMO	\$1,000,000 2003	Design, manufacture, integrate, install, maintain AWS, AWOS, Agri-Met & Synoptic Weather Stations/ Systems, airports, etc.	32 AWS, 17 receive stations, dataloggers, sensors. 13 countries
Cayman Islands Meteorological Department	\$100,000 2003	AWOS Automated Weather Observation System installed at Cayman Islands International Airport.	Wind direction/speed, AT/RH, precip, barometric pressure, cloud height & horizontal visibility/RVR
Netherlands Antilles International Airports Aruba, Curacao and St, Martin	\$100,000 2005	Automatic Airport Weather Stations	Systems monitor airport weather and other meteorological parameters in real-time. Collects data then transmits real-time information to pilots and airport personnel

**total rounded off*



Sutron Warranty



WARRANTY AND ASSISTANCE

The Sutron Corporation warrants that the equipment manufactured by its manufacturing division shall conform to applicable specifications and shall remain free from defects in workmanship and material for a period of 24 months or two years from the date of shipment from Sutron's plant.

Sutron's Customer Service is second to none and we are happy to respond to calls from customers in the field from 7:00 am to 6:00 pm EST. Sutron has 6 full time customer service engineers to service our 800 plus customers in 38 countries.

SUTRON COMMERCIAL WARRANTY

The Sutron Corporation warrants that the equipment manufactured by its Manufacturing Division shall conform to applicable specifications and shall remain free from defects in workmanship and material for a period ending two years from the date of shipment from Sutron's plant.

Sutron's obligation under this Warranty shall be limited to repair at the factory (21300 Ridgetop Circle, Sterling, VA 20166), or at its option, replacement of defective Product. In no event shall Sutron be responsible for incidental or consequential damages, whether or not foreseeable or whether or not Sutron has knowledge of the possibility of such damages. This Warranty shall not apply to Products that have been damaged through negligence, accident, misuse, or acts of nature such as floods, fires, earthquakes, lightning strikes, etc. Sutron's liability, whether in contract or in tort, arising out of warranties or representations, instructions or defects from any cause, shall be limited exclusively to repair or replacement parts under the aforesaid conditions.

Sutron requires the return of the defective electronic Products or parts to the factory to establish claim under this Warranty. Transportation charges to the factory shall be prepaid by the customer. Transportation for the return of the repaired equipment to the customer shall be paid by Sutron when the validity of the damage claim has been established. Otherwise, Sutron will prepay shipment and bill the customer. All shipments shall be accomplished by best-way surface freight. Sutron shall in no event assume any responsibility for repairs or alterations made other than by Sutron. Any Products repaired or replaced under this warranty will be warranted for the balance of the warranty period or for a period of 90 days from the repair shipment date, whichever is greater. Products repaired at cost will be warranted for 90 days from the date of shipment.

NON-SUTRON MANUFACTURED EQUIPMENT

The above Warranty applies only to Products manufactured by Sutron. Equipment provided, but not manufactured by Sutron, is warranted and will be repaired to the extent of and according to the current terms and conditions of the respective equipment manufacturers.



Sutron Warranty (cont'd)



REPAIR AND RETURNS POLICY

Repairs to Sutron equipment are handled by our Customer Service Department. When repair service is needed, please follow the following procedure: First call Customer Service at (703)406-2800 for a Returned Material Authorization (RMA) number. Then return the equipment to our factory at the address listed below, clearly indicating the RMA number on shipping papers and carton. Transportation charges to return the equipment are paid by the customer. In addition to the equipment, please include with your shipment a statement clearly stating the fault or problem you are experiencing with the equipment.

Repair turn around time is normally 30 days after equipment is returned to Sutron (45 days for the Accubar). After repair, each unit is tested thoroughly to ensure that it meets original equipment specifications. This includes complete environmental testing from -40°C to +50°C, as well as 72 hours of burn-in at +55°C.

Sutron maintains a repair department at the factory, 21300 Ridgetop Circle, Sterling, VA 20166. Turn around time normally ranges from 10-30 days after equipment is returned to Sutron for repair. Call Customer Service at (703) 406-2800 for a return authorization number. Return the defective equipment to the factory, transportation charges paid.

WARRANTY ITEMS

Sutron manufactured equipment is warranted for two years. Equipment not manufactured by Sutron is warranted by the equipment manufacturer. See the full text of the Sutron Commercial Warranty. Remember, that this warranty does not cover damage due to misuse or acts of nature. Please call Customer Service before returning equipment to discuss the problem you are having with the equipment.

OUT OF WARRANTY ITEMS

Defective equipment that is out of warranty should be returned to Sutron, transportation charges prepaid by the customer. Include in your documentation the RMA number obtained from Customer Service. The repair cost will include time and materials. Repaired equipment is warranted for a period of 90 days from date shipment.

EXTENDED WARRANTY AND ON-SITE MAINTENANCE

Extended warranty and on-site maintenance contracts are available. Price quotations may be obtained from Sutron Customer Service representatives.

LOANER EQUIPMENT

Some loaner items are available for use while equipment is being repaired. Call Customer Service for availability.

