Flow Monitoring Instrumentation for Irrigation Applications

- Open Channel Flow Measurement
- Pipe Flow Monitoring
- Real-time display of Flow
- Remote Telemetry and Data Collection

Supplying Testing & Monitoring Instruments Since 1946
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Using SonTek’s proven pulsed acoustic Doppler technology, the **Argonaut-SW** is the superior choice for accurate flow measurements in natural streams, man-made channels, and pipes. Because it is a “fast sampling” velocity profiler, the SW accounts for variations in the velocity field to make the most accurate flow measurements possible.

Typically mounted on the bottom of a channel or pipe, the SW combines velocity and water level data with user-supplied channel geometry to compute total flow in real time. Its unique “all-in-one” transducer and electronics design features an internal recorder and requires no top-side processing.

**Display. Process. Analyze.**

Every Argonaut-SW comes with **ViewArgonaut** - a user-friendly software program for setting up your system and analyzing data. A flow configuration utility makes flow measurement simple!

ViewArgonaut consists of five modules:

- **Diagnostics** - Deployment site survey and diagnostics tool.
- **Recorder** - Extracts data from or erases the Argonaut’s internal recorder.
- **Deployment** - Sets up the Argonaut for an Autonomous or SDI-12 deployment.
- **Realtime** - Sets up the Argonaut to collect and display real-time data.
- **Processing** - Lets you play back and manipulate Argonaut data.

**Velocity-Indexing is a Snap with FlowPack Software!**

One of the main benefits to the Argonaut-SW is its ability to calculate flow using uniquely derived flow equations for individual channels via the velocity-index method. SonTek’s optional FlowPack software facilitates velocity-index rating development, making your data reporting process a whole lot friendlier and faster! FlowPack provides a simple method to store flow, velocity, and stage measurements and convert this information into comprehensive reports, helping you make better and more informed decisions.
Continuous Flow Monitoring Under Complex Conditions

Reversing flow? Rapid changes? Tidal influence? Pumping? Backwater? Under ice? Small, portable and easy to use, the Argonaut-SW is your friend for all these challenging shallow-water conditions. The SW operates in depths from 0.2 to 5.0 meters (0.7 to 16 ft) and automatically adjusts its velocity cell with changing water level while also reporting a velocity profile for subsequent analysis. Just provide power, and the SW can either output data in real time or record data internally for periodic downloads.

Features Include:
- Unique "all-in-one" design
- Provides 10 cells of velocity profiling
- Internal data recorder
- Real time output (RS 232/422, SDI-12, Modbus, analog)
- External flow display
- Total volume output
- Measures under ice

How it Works

The Argonaut-SW has three acoustic beams. When properly bottom-mounted (usually in a channel), one of these beams points straight up, and the other two point up/down stream at a 45-degree angle. The upward-looking beam measures water level. The two slanted beams measure the water velocity in two dimensions via the acoustic Doppler method.

Profiling water velocity provides a more accurate depiction of flow characteristics, enabling use under conditions where stratification exists. This level and velocity information is then used (together with the geometry of the channel) to compute flow, volume, mean velocity, and area.
Specifications

Standard Features
- 2-D velocity measurement (using 2 acoustic beams) along channel and vertical velocity components
- Water level measurement using vertical acoustic beam
- Automatically adjusts sampling volume location to measure the maximum possible portion of the water column
- RS-232/SDI-12 communication protocol
- Real-time flow calculations using user-supplied channel geometry
- 4 MB recorder capacity (over 50,000 samples)
- 4 MB recorder capacity (over 50,000 samples)
- Temperature sensor
  - Resolution: ±0.01º C
  - Accuracy: ±0.5º C
- ViewArgonaut Windows 2000/XP/Vista software for instrument setup, data collection, and post processing.
- PDA software (SonUtils and deployment module)
- Multi-cell current profiling
- Mounting plate

Velocity Profiling Range
- Maximum Depth: 5.0m (16ft)
- Minimum Depth: 0.3m (1ft)*

Water Level Measurement
- Minimum Depth:
  - Above transducer: 0.10m (0.3ft)
  - Total water depth: 0.20m (0.6ft)
- Maximum depth: 5.0m (16ft)
- Accuracy: ±0.1% of measured level, ±0.3cm (0.01ft)

Water Velocity
- Range: ±5 m/s (16 ft/s)
- Resolution: 0.1 cm/s (0.003 ft/s)
- Accuracy: ±1% of measured velocity, ±0.5 cm/s (0.015 ft/s)

Optional Features
- FlowPack velocity indexing software
- 4-20 mA and 0-5VDC output modules; possible variables are X velocity, Y velocity, velocity magnitude, temperature, SNR, stage, volume and flow.
- Custom mounting shoe (at left)
- Deployment sliding mount (at left)
- Flow Display (at left)
- Durable plastic shipping case
- RS-422 for cable runs longer than 100m

Physical Parameters
- Dimensions: 24.5cm (9.7 in) long by 10cm (4 in) wide by 6.3cm (2.5 in) high
- Weight:
  - In air: 1.2kg (2.6 lb)
  - In water: 0.15kg (0.3 lb)
- Pressure rating: 25m (80 ft)
- Operating temperature: -5ºC to 60ºC (23ºF to 140ºF)
- Storage temperature: 10ºC to 70ºC (14º to 158ºF)

Power Requirements
- Input power: 5-15 VDC
- Power consumption: 500 mW nominal

* Can operate in shallower depths down to 0.2m (0.7ft) with performance limitations. Contact SonTek for details.

Useful options and accessories make the Argonaut-SW a complete, turn-key solution!
FlowTracker in the Field

With rugged construction for any climate and a backlit display easily read during both day and night, the FlowTracker goes wherever you need it to go.

- Natural Streams
- Irrigation Canals
- Mining Channels
- Water Treatment
- Weirs/Flumes
- Storm Water
- Open Channels
- Lakes

The FlowTracker Advantage

It doesn’t matter if you are new to acoustic Doppler technology, or an old familiar friend, the FlowTracker provides unparalleled benefits you will only find with SonTek/YSI systems. Here is some of what sets the FlowTracker apart.

- Multi-language instrument and software (English, Spanish, French, Italian, and German)
- Proven velocity precision - accurate to as low as 0.001 m/s (0.003 ft/s) and up to 4.0 m/s (13 ft/s)
- Automatic discharge calculation - International techniques, including ISO and USGS standards
- Record changing gauge heights and rated flows, with comments in each measurement
- Automatic discharge uncertainty calculation to ISO standard.
- Measure velocities in water as shallow as 2 cm (less than an 1 inch)
- Keypad interface with real-time velocity and flow display
- Automatic quality control for accurate data collection
- Two or three dimensional velocity measurement
- Recorded data is shielded from power loss
- Lightweight, rugged, and waterproof
- No calibration required - ever!
- Built-in temperature sensor
FlowTracker

No other wading discharge device on the market comes with more useful options and accessories, making the FlowTracker a complete, turn-key solution.

Standard Features

- Low-profile 2-D ADV water velocity sensor on 2m flexible cable (measure in depths down to 2cm (1 inch))
- Automatic discharge computation protocols (ISO/USGS mid-section, mean-section, and Japanese)
- Handheld keypad interface with real-time display
- Velocity methods: ISO, USGS, under ice, Kreps, 5-point, and multipoint
- Languages supported: English, Spanish, German, Italian, and French
- Recorder space: up to 64 discharge measurements or over 150,000 individual velocity samples
- Data Set Documentation: up to 20 values of time-stamped user comments including gauge height and rated flow
- QA/QC: automated data review and discharge uncertainty calculations
- Communication protocol: RS232
- Software: Windows software with diagnostic beam-check, recorder access, data visualization and customizable reports
- Compatible with FlowPack Velocity Indexing software
- Temperature sensor
- Hard plastic case

Optional Features

- 2-D/3-D ADV side-looking probe
- 3m flexible cable
- Deluxe SonTek two piece, top-setting wading rod kit (1.2m Metric or 4 ft English) including case and mounting brackets
- Wading rod mounting bracket for controller/keypad
- Offset mounting bracket for ADV probe
- Temperature sensor
- Hard plastic case

Specifications

- Velocity range: ±0.001 to 4.0 m/s (±0.003 to 13 ft/s)
- Velocity resolution: 0.0001 m/s
- Velocity accuracy: ±1% of measured velocity, ±0.25 cm/s
- Sampling volume location: 10 cm from center transducer
- Power supply: 8 AA batteries
- Typical battery life: 25+ hours continuous operation (alkaline batteries)
- Weight: 1.8 kg/4.0 lbs
- Probe width: 130 mm (5.1 inches)
- Handheld controller/keypad: temporarily submersible to 1m
- Operating temperature: -20 to 50°C
- Storage temperature: -20 to 50°C

SmartQC is a built-in quality control feature that gives you the added assurance your FlowTracker data is correct. With each measurement, data is compared to a variety of adaptive QC criteria to ensure the best measurement possible.

SmartQC is our exclusive promise your SonTek/YSI system is performing at optimum standards and that your data is precise, reliable and exceeds your service expectations.
Exceed your expectations both during and after the measurement with RiverSurveyor Live software, a Windows XP/Vista® compatible package with the latest advancements for open channel hydraulics visualization.

- Load, view, and analyze multiple data sets simultaneously.
- Collect data and disconnect/reconnect again. Easily swap between phone and laptop mid-measurement.
- Automatic profiling set-up. Start collecting data in seconds!
- View multiple data results (bottom-track, GPS-GGA, and GPS-VTG) simultaneously.
- Quality status/data, statistics, and color coded graphical display for clear feedback in the field.
- Customizable interface, graphs, and tabular data.
- Reports & MATLAB® export.

*Hydroboard design and color subject to change.
RiverSurveyor

Useful options and accessories make the RiverSurveyor a complete, turn-key solution!

**SPECIFICATIONS**

**Velocity Measurement**
- Profiling Range (Distance): 0.06m to 5m
- Profiling Range (Velocity): +/− 20 m/s
- Resolution: 0.001 m/s
- Number of Cells: Up to 128
- Cell Size: 0.02m to 0.5m

**Accuracy**
- Up to +/- 0.25% of measured velocity; +/- 0.2cm/s

**Transducer Configuration**
- Five (5) Transducers;
  - 4-beam 3.0 MHz Janus at 25º Slant Angle;
  - 1.0 MHz Vertical Beam
- Nine (9) Transducers;
  - Dual 4-Beam 3.0 MHz/1.0 MHz Janus at 25º Slant Angle;
  - 0.5 MHz Vertical Beam

**Depth Measurement**
- Range: 0.20m to 15m
- Accuracy: 1%
- Resolution: 0.001m

**Discharge Measurement**
- Range with Bottom-Track: 0.3m to 5m
- Range with RTK GPS: 0.3m to 15m
- Computations: Internal

**Discharge Measurement**
- Computations: Internal

**S5/M9 Additional Specifications**
- Temperature Sensor:
  - Resolution: ± 0.01º C
  - Accuracy: ± 0.1º C
- Compass/Tilt (Solid State Type):
  - Range: 360º
  - Heading Accuracy: ± 2º
  - Pitch/Roll: ± 1º
- Internal Recorder Size: 8GB
- Power/Communications:
  - 12 - 18v DC
  - RS232 Communications
  - RS232 Serial GPS Input
  - Max Data Output Rate: 2 Hz
  - Internal Sampling Rate: Up to 70 Hz
- Physical/Environmental:
  - Depth Rating: 50m
  - Operating Temperature: -5º to 45º C
  - Storage Temperature: -10º to 70º C

**Power Communications Module Specifications**
- Batteries:
  - Type: Rechargeable
  - Capacity/duration: 8 hours of continuous operation (4 hours with RTK GPS enabled)
- Telemetry Options/Range:
  - Bluetooth (Phone): 60m
  - Bluetooth (Laptop): 200m
  - Spread Spectrum Radio: 2000m
- GPS Options:
  - GGA / VTG Accuracy: 1m
  - RTK Accuracy: 0.03m

**Floatable Platform Options**
- SonTek Hydroboard
- OS Trimaran

**RTK GPS**

- Available exclusively from SonTek, the optional RTK GPS solution is easy to use and offers an incredibly precise, fully integrated position solution that can augment or be an alternative to bottom tracking with moving bottom.

**Mobile Operation**

- RiverSurveyor runs on both PC and mobile phone platforms making system operation simple without any risk of losing data.

**Power/Communications**

- The RiverSurveyor Power/Communications module supports both the S5 and the M9. Featuring rechargeable battery packs, it can be factory-configured with Bluetooth®, spread spectrum radio, VTG GPS, or RTK GPS.

**Floatable Platform**

- The flexible design of the S5 and M9 systems enables use either over the side of a boat, or on a small floating/tetherable platform such as the SonTek Hydroboard or the OS Trimaran.

**RiverSurveyor-S5**
- Weight in Air: 1.1 kg (2.5 lb)
- Weight in Water: -0.3 kg (-0.7 lb)

**RiverSurveyor-M9**
- Weight in Air: 2.3 kg (5.0 lb)
- Weight in Water: -0.6 kg (-1.3 lb)
High accuracy with NO moving parts
Works great in dirty water too
No more broken propellers – ever
No more winter meter maintenance
Measures flow practically anywhere
Same insertion sensor will measure in full pipes 100mm to 2.54 meters diameter
Same strap mount sensor will measure in partially full pipes 150mm to 2.54 meters diameter
Open channel flow
- regular cross-sections
- irregular cross-sections
Low cost of ownership
Economical to purchase and install
Single unit with up to three sensors
No moving parts virtually maintenance-free
No pipe blockages – less maintenance
Total stream profile measurement
True average stream velocity
No point velocity measurements
Less straight run requirement
Versatile straight run requirements
Only 8 total diameters of straight run
AgriFlo can "look" upstream or downstream
Different sensor styles – versatile mounting options
Telemetry ready
ModBUS
SDI-12
GSM/GPRS modem

How does it benefit me?

How does it work?

Velocity
- Measured using continuous wave Doppler ultrasound
- Sound wave measures the speed of dirt, bubbles and other particles across the whole stream path to calculate a true average velocity.

Integral Depth
- Integral hydrostatic ceramic depth sensor measures the "weight" of the water above it and converts it to a depth.
- Mounting versatility is the key.
- This style of depth sensor can be mounted on the channel bottom or on the side, away from sand & silt.

Sensors
- 2" BSP insertion sensor
- Strap mount velocity only or combined velocity/depth sensor

FloCom+ Software
- Free to user
- Easy to use
- Configure, download, diagnostics

FloCalc Software
- Free utility for drawing complex channel shapes
- Powerful CAD-style interface
- Handy user conversion tools

Where can I use it?

1. Farm Turnout
2. Lateral Diversion with Multiple Pipes
3. Partially Full Pipe with Depth/Velocity Sensor
4. Gravity Fed Open Channel
5. Road Culvert
AGRIFLLO SERIES 3 SPECIFICATIONS

**GENERAL**
- **Weight**: 5 kg
- **Dimensions**: 360mm (H) x 260mm (W) x 170mm (D)
- **Enclosure rating**: IP66
- **Enclosure material**: UV stabilized polycarbonate
- **Operating temperature**: -15 to +50 degrees Celsius (with internal battery installed)
- **Operating temperature**: -20 to +65 degrees Celsius (with internal battery removed and external power used)
- **Flow display**: 16 character x 2 line alphanumeric LCD with backlight
- **Program memory**: 2 Mb flash
- **Power**: Internal 12 Volt 7.2 Ah battery with external solar panel or mains charger
- **Units of measure**: User definable (metric/US)
- **Application software**: FloCom+ PC software for system configuration, data downloading and velocity profile testing.
- **Factory backup**: AgriFlo Series 3 is backed by a 24 month parts and labour guarantee

**DEPTH MEASUREMENT:**
- **Method**: Ceramic pressure transducer with large flat sensing diaphragm which allows straight, undeflected flow over the sensing area to reduce drawdown effects at high stream velocities and provides for self cleaning with an impervious Alumina ceramic surface.
- **Full scale range**: 4 meters above the transducer face
- **Accuracy**: 0.2% of full scale at constant temperature in a static stream. 1% of full scale over a stream 5 to 55 degrees Celsius
- **Resolution**: 1 mm
- **Overrange**: 60 meters without damage

**VELOCITY MEASUREMENT**
- **Method**: Submerged Ultrasonic Doppler
- **Range**: ±0.025 m/sec to ±8.0 m/sec
- **Resolution**: 1 mm at 1.0 m/sec
- **Accuracy**: ±1% up to 3.0 m/sec,
- **Sensor cable**: PVC 9mm diameter up to 50 meters long

**DOPPLER FLOW SENSOR INPUT CARD**
- **Doppler velocity**: One standard Doppler velocity card included
- **Optionally, up to two additional MACE velocity only or combined MACE velocity/depth sensors (velocity card required for each)

**TELEMETRY OPTIONS**
- **Telemetry options**: Optional MACE FloSi card supports MODBUS, SDI-12, RS232, RS485.
- **Optional MACE data modem card**

**INSERT SENSOR (VELOCITY ONLY)**
- **Shaft dimensions**: 330mm long x 20mm diameter
- **Head dimensions**: 45mm diameter x 25mm high (2" BSP thread)
- **Pipe intrusion area**: 11.25cm² (2" BSP)

**STRAP MOUNT SENSOR (VELOCITY ONLY OR COMBINED VELOCITY/DEPTH)**
- **Dimensions**: 125mm length x 50mm wide x 16mm high
- **Pipe intrusion area**: 8cm²

**What instrument do I need?**

<table>
<thead>
<tr>
<th>Requirement</th>
<th>FloPro Series 3</th>
<th>FloCom Series 3</th>
<th>HydroMace 3000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log ONLY Flow rate and total</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Log ALL configured channels (e.g. depth, velocity, total, pH etc.)</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Accepts MACE Doppler flow sensor cards</td>
<td>Yes (up to 3)</td>
<td>Yes (up to 5)</td>
<td>No</td>
</tr>
<tr>
<td>Accepts MACE Input/Output cards</td>
<td>No</td>
<td>Yes (up to 4)</td>
<td>Yes (up to 5)</td>
</tr>
<tr>
<td>Accepts MACE FloSi (ModBus/SDI-12) telemetry cards</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>1. FloSi Outputs - Flow rate and Total ONLY</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>2. FloSi Outputs - All logged channels</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

NOTE TO END USERS:
THESE SPECIFICATIONS ARE SUBJECT TO CHANGE AT ANY TIME WITHOUT NOTICE. MACE TAKES NO RESPONSIBILITY FOR THE USE OF THESE FIGURES. PLEASE CONSULT MACE FOR THE LATEST SPECIFICATIONS BEFORE USING THEM IN TENDER SUBMISSIONS OR THIRD PARTY QUOTES ETC. MACE RESERVES THE RIGHT TO CHANGE SPECIFICATIONS WITHOUT PRIOR WARNING. ALL QUOTED FIGURES ARE BASED ON TEST CONDITIONS AND ARE SUBJECT TO VARIATION DUE TO SITE CONDITIONS.
Measure water quantity and quality, your total monitoring solution
- Measures flow practically anywhere
- Flexible monitoring and control
- High accuracy with NO moving parts
- Low cost of ownership

How does it benefit me?
- Measures flow practically anywhere
- Same insertion sensor will measure in full pipes 100mm to 2.54 meters diameter
- Same strap mount sensor will measure in partially full pipes 150mm to 2.54 meters diameter
- Open channel flow
- Regular cross-sections
- Irregular cross-sections
- Optional sensors for hazardous locations

Flexible monitoring and control
- Use multiple 3rd party water quality sensors
  - pH
  - Conductivity
  - Dissolved oxygen
- Use multiple 3rd party water quantity sensors
  - Downward looking ultrasonic depth sensor
  - Insert electromagnetic
  - Paddle wheels
  - Transit time

High accuracy with NO moving parts
- Works great in dirty water
- Works great in turbulent streams
- Reliable under difficult hydraulic conditions
- No more blocked pipes

Low cost of ownership
- Economical to purchase and install
- Single unit with up to 4 sensors
- No moving parts – virtually maintenance-free
- No pipe blockages – less maintenance

Total stream profile measurement
- True average stream velocity
- No point velocity measurements
- Less straight run requirement

Versatile straight run requirements
- Only eight total diameters of straight run
- FloPro can "look" upstream or downstream
- Different sensor styles – versatile mounting options

Telemetry ready
- ModBUS
- SDX-12
- GPRS/3G modem

Where can I use it?
- Lateral Diversion with Multiple Pipes
- Sewer Monitoring
- Sewer Treatment Plant
- Pump Station Discharge
- Open Stormwater Channel
- Road Culvert
- Animal Waste/Grey Water
- Lateral Diversion with Multiple Pipes

How does it work?

Velocity
- Measured using continuous wave Doppler ultrasound
- Sound wave measures the speed of dirt, bubbles and other particles across the whole stream profile to calculate a true average velocity.

Integral Depth
- Integral hydrostatic ceramic depth sensor measures the "weight" of the water above it and converts it to a depth.
- Mounting versatility is key. This style of depth sensor can be mounted on the channel bottom or on the side, away from sand & silt.

Electronics module
- Real-time digital display of data channels
- Integral data logger
- Solar or mains power versions

FloPro Series 3 supports seven sensor inputs and four control outputs per I/O card (standard configuration).

FloPro Series 3 is expandable to a maximum of four I/O cards.

Expansion
- Rain Gauge
- Conductivity Sensor
- pH Sensor
- DO Quality Multi-probe

How does it work?

Sensors
- 2" BSP insertion sensor
- Strap mount velocity only or combined velocity/depth sensor
- Downward Looking Ultrasound
- Water Quality Multi-probe

FloCom+ Software
- Free to user
- Easy to use
- Config, download, diagnostics

FloCalc Software
- Free utility for drawing complex channel shapes
- Powerful CAD-style interface
- Handy user conversion tools
Don’t need to measure Flow? use the HydroMace 3000

- Integrated solution - includes logger, solar regulator and battery all in one weather proof enclosure.
- Powerful easy to use Windows software for painless configuration
- Supports up to 5 Input / Output (IO) cards
- Easily installed into existing HydroMace 2000 sites

What instrument do I need?

| Log ONLY Flow rate and total | No | Yes | No |
| Log ALL configured channels (e.g. depth, velocity, total, pH etc.) | Yes | No | Yes |
| Accepts MACE Doppler flow sensor cards | Yes (up to 5) | Yes (up to 3) | No |
| Accepts MACE Input/Output cards | Yes (up to 4) | No | Yes (up to 5) |
| Accepts MACE FloSi (ModBus/SDI-12) telemetry cards | Yes | Yes | Yes |
| 1. FloSi Outputs - Flow rate and Total ONLY | No | Yes | No |
| 2. FloSi Outputs - All logged channels | Yes | No | Yes |
**MINISONIC® P**

- Non-Invasive External probes clamped on the pipe
- Easy and quick installation
- User friendly operation, set up by keypad or software
- Automatic control of ultrasonic signal using the ESC mode (Echo Shape Control)
- Automatic zero flow adjustment with “anti air bubble” signal processing

**Principle** *

The MINISONIC P calculates the (v) speed and the (Q) flow of the fluid by the measurement of the \(\Delta t\) difference of the transit times of ultrasonic waves \((t_{21} - t_{12})\):

\[
Q = f\left(\varphi, t_{12}, t_{21}\right)
\]

\[
\Delta t = t_{21} - t_{12} = K v
\]

with \(K\) : proportion coefficient

* The fluid should allow for the propagation of ultrasounds

**Typical applications** *

- Flows in all water applications: Network (potable water, raw water, sewage) – Pumping – Metering.
- Petrochemical and food industries Process – Metering, control.
- Climate and hydraulic engineering – Network balancing – Performance

* With exception for two phase or high viscosity liquids
SYSTEM DESCRIPTION
MINISONIC P uses the very latest electronic technology combined with highly efficient digital signal processing (D.S.P.) technique which maximises the system performance giving the user significant benefits. MINISONIC P gives outstanding measurement capability including the ability to adapt its operation to suit the most challenging site conditions. The system consists of a hand held control unit and two probes with support and cables.

SPECIFICATION
- 2 lines LCD display – 16 characters – Programmable backlight.
- Ergonomic keypad and menu configuration – access code if needed.
- Analog output (x2), relays (x2) and R/S 232 (or 485).
- High resolution time measurement < 0.1 ns
- Dynamic Gain up to 89 dB.
- Echo analyser with automatic control (ESC mode)
- Multiparameter: Flow, speed, gain, signal quality ratio......

PERFORMANCE
- Typical accuracy following dry calibration: 0.5 %
- (DN > 100 mm), linearity on test loop: 0.1 %,
- repeatability 0.05 %
- Practical accuracy with common liquids (water,.....):
  - DN ≤ 100 mm: +/- 2 % if v > 0.3 m/s if not +/- 5 mm/s
  - DN > 100 mm: +/- 1 % if v > 0.3 m/s if not +/- 2 mm/s
- Built-in correction for multiproduct or for laminar/turbulent transitions flow.
- Bi-directional measurement
- Volume metering. Choice of units from 0.001 to 100 m3

ELECTRICAL SPECIFICATION
- A CE product
- Internal battery 12 V – NIMH non pollutant
- Charger 90 V - 260 V AC – 12 to 14 h charging.
  - External supply option.
- Isolated output current 4-20 mA – 250 Ohm
- Static relay 100 V – 100 mA (x2)

MECHANICAL SPECIFICATION
- ABS enclosure with carrying pocket
  - Dimensions: 220 x 115 x 64 mm.
  - Converter weight: 850 g.
- IP 67 protection against dust and immersion
- Use temperature: -10 °C to +50 °C

KIT DESCRIPTION
MINISONIC P kit includes:
- 1 carrying bag for MINISONIC P, including pocket for cable (l=2.5 m, for pipes of approx ID 800 mm)
- 1 charger, 1 PC cable and software LS_600W (disk or CD)
- Extra : Probes and attaching system stored in separate carrying bag or case with a coupling agent
- Optional accessories include:
  - Extra cable length for probes (l=5 m for ND ≥ 500mm)
  - External data logger with software

PROBES AND SUPPORTS
Ultraflux offers a large range of conventional technology and microstructure technology probes with supports, designed for easy and secure installation.
MINISONIC® 600 - 2000 - SPEED - G

A range of ultrasonic flowmeters
Single or dual chord and dual pipe versions

Pipe sizes from DN 4 to DN 600 mm (liquids)
Pipe sizes up to 3300 mm (liquids)
Gas volume metering, DN size depending on pressure

Open channel velocity measurement

✓ Non-Invasive (clamp-on) probes (except G version) or intrusive (wetted) probes or spools
✓ Water resistant to IP 67
✓ On site “dry” calibration possible
✓ Automatic echo adjustment with ESC mode (Echo Shape Control)

Principle

The MINISONIC calculates the speed (v), the flow (Q) and the volume (Vol) of a fluid by measuring the \( \Delta t \) difference of transit time of ultrasonic wave \( (t_1 - t_2) \)

\[
Q = \frac{\pi \Delta t_0 x L^2 \Delta t}{25 \times t_{12} \times Kh}
\]

Vol = Q x t
C : speed of sound in the fluid
Kh : hydraulic coefficient

Typical applications *

- Water flow of all types of water: Network (potable water, waste water) – Pumping – Metering.
- Flow of various oil products – Refined – Crude oil – Multiproduct pipelines.
- Petrochemical and food industries process.
- Replacement of outdated equipment - retrofitting.

* With exception for two phase or high viscosity liquids
DESCRIPTION

Its new electronics allows MINISONIC to suit all cases, and this, thanks to an enhanced emission power, a greater received gain, to a better noise rejection (+20 to 30 dB at final) and a new digital signal and measurement processor.

A single chord metering unit consists of one converter, two probes with supports and cable.

A dual chord version (two speed measurements on the same pipe) is adaptable to hydraulic disturbances. A dual pipe unit allows the flow measurement on two different pipes.

RESOURCES

- 2 lines LCD display - 16 characters - Programmable backlight.
- Ergonomic keypad and menu driven configuration - access code if needed.
- Dynamic gain up to 89 dB.
- High resolution time measurement < 0.1 ns
- Echo analyser with zero flow automatic control (ESC mode): automatic mode when commissioning
- Multiparameter: Flow, speed, gain, signal quality ratio
- Windows software PC LS 600 W for extended calibration, expertise and data saving.

ESC MODE AND AUTOMATIC ZERO FLOW

The best accuracy would be achieved by a proper selection of probes together with a strict installation.
Good hydraulic conditions must be obtained:
upstream straight length >20D minimum.
The ESC mode which acts as an 'Auto focus' for the ultrasonic signals in order to optimise the global acoustic adjustment to ensure proper results.

PERFORMANCES

- Single chord system
  - Typical accuracy following dry calibration: 0.5 % (DN > 100 mm), Calibration curve can also be linearized
  - Practical uncertainty with common liquids (water...):
    - DN ≤ 100 mm: +/- 2 % if v > 0.3 m/s if not +/- 5 mm/s
    - DN > 100 mm: +/- 1 % if v > 0.3 m/s if not +/- 2 mm/s
  - Repeatability on test loop: 0.05%
- Bi-directional measurement +/- 15 m/s
- Volume metering. Choice of unit from 1 cl to 100 m3
- Built-in correction for multiproduct or for laminar/turbulent transitions flow.

ELECTRICAL CHARACTERISTICS

- A CE product
- Power supply: 9 to 36 VDC (option: 48 V)
or 7 to 25 VAC - extra: external transformer 110 V or 230 VAC or internal supply 110V/220V/24V
- Isolated output current 4-20 mA (x2) - 1500 Ohm depending on current - active output wiring available.
- Static relay (x2) 100 V/100 mA/10 VA max
- RS 232 or 485 output, 9600 Bauds maximum or JBus/ModBus protocol

MECHANICAL CHARACTERISTICS

- Aluminium cabinet - epoxy coated.
- IP 67 protection - Ambient T° = -25 + 50 °C
- Size - Weight:
  - Industrial type: 237 x 108 x 79 mm - 1.5 Kg
  - Wall or pipe mounting
    - Ex proof type (Exd) I: 244 x 130 x 232 mm - 6.6 Kg
- Large range of probes IP 55 to IP 68, insertion or external - Industrial support.

Certifications

MINISONIC EXD: CE0081 II 2 G EEEx d IIC T6
Probes CE0081 II 2 G EEEx m II T6
EEEx me II T6
EEEx md IIC T6
Probes CE0081 II 1 G EEEx ia IIB T3 to T6
Ultrasafe Barrier: CE0081 II (1) G EEEx ia IIB
DESCRIPTION
INW’s patented PS9800 submersible pressure transmitter represents the latest in state-of-the-art level measurement technology. Building on years of successful experience, this industry standard two-wire, 4-20 mA device offers improved noise immunity, thermal performance and transient protection. In addition to reverse polarity protection, under-current and over-current limitation is featured on both transmitter channels. An optional 4-20 mA temperature measurement is available as a second channel within the device.

The updated cable harness design reduces the probability of leakage and protects the cable jacket from damage by providing double-sealing; 316 stainless steel, Viton® and Teflon® construction increases corrosion resistance. The transmitter’s end cone is interchangeable with a 1/4” NPT inlet which allows for increased application use, easy hookup and field calibration. The modular-designed PS9800 may be easily factory serviced and repaired.

OPERATION
The PS9800 pressure transmitter is powered by a datalogger or control system. The internal electronic circuit controls the amount of current flowing through the loop based on the signal from the internal pressure sensor. An above-surface probe will draw 4 mA and once submerged, the current flow increases linearly with pressure (or depth). At full-scale pressure (depth), the transmitter will draw 20 mA. A data acquisition/or control system then measures this current and computes the pressure or level.

APPLICATIONS
Due to its rugged construction and proven reliability, the PS9800 is used successfully to monitor groundwater, well, tank and tidal levels, as well as for pump testing and flow monitoring.

FEATURES
- Industry standard, two-wire, 4-20mA configuration
- Small diameter
- Improved accuracy to 0.1%
- Optional temperature channel
- 316 stainless steel, Viton® and Teflon® construction
- Polyethylene, polyurethane and FEP Teflon® cable options
- Enhanced noise & transient protection
PS9800 SUBMERSIBLE PRESSURE TRANSMITTER (4-20 mA)

DIMENSIONS AND SPECIFICATIONS

HOW TO ORDER

- Choose the transmitter with the required pressure range.
- Determine cable type and specify length.
- Order options and accessories.
- Contact INW for a full list of accessories.

<table>
<thead>
<tr>
<th>PS9800 SUBMERSIBLE PRESSURE TRANSMITTER RANGES</th>
</tr>
</thead>
<tbody>
<tr>
<td>3C340</td>
</tr>
<tr>
<td>3C341</td>
</tr>
<tr>
<td>3C251</td>
</tr>
<tr>
<td>3C252</td>
</tr>
<tr>
<td>3C253</td>
</tr>
<tr>
<td>3C254</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PS9800 CABLE OPTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>6E540</td>
</tr>
<tr>
<td>6E542</td>
</tr>
<tr>
<td>6E543</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PS9800 MISCELLANEOUS OPTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>3C280</td>
</tr>
<tr>
<td>3C282</td>
</tr>
</tbody>
</table>

Information in this document is subject to change without notice.
The WATERLOG® H-3611 series radars are a family of SDI-12 water level sensors. Typical applications include non-contact measurement of river, lake and reservoir water level. The H-3611 family is easy to use and interface with any data recorder/logger that is SDI-12 compliant. The sensors measures Stage in units of Feet, Meters or other engineering units.

**Key Features**

- Non-contact level measurement eliminates the need for stilling wells and other infrastructure.
- Undamaged by ice, logs or debris
- ±3.0mm accuracy
- -40°C to +60°C operation
- NEMA 4x enclosure is suitable for outdoor installations
- Stainless steel horn
- Frequency range - approx 26 Ghz
- No FCC licence required
- Built-in LCD display for monitor and setup
- Free TofTool (Time-of-Flight) Windows™ based graphic configuration and diagnostic tool. The graphical user interface aids documentation, maintenance and setup of the radar unit.
- Low current operation (8.0 mA typical standby)
- Continuous operation, no warmup or “lock on”
- Simple to install, use, and maintain
- Mounting enclosures, radio communication links and other accessories are available.
STAGE DISCHARGE RECORDER
SDR-0001-1

Sutron’s ULTRA-RELIABLE SDI-12 OPTICAL ENCODER fused with Sutron’s STATE-OF-THE-ART SATLINK2LOGGER technology to create AN ENCODER THAT NEVER FORGETS.

- Dual Sensor: Setup SDR to measure a second stage using an analog* or SDI-12 sensor
- Rating Table: Compute discharge using a rating table with up to 50 points
- Averaging: Stage can be computed by averaging multiple samples over a user-set period
- 4-20mA output*: Output stage or discharge using the 4-20mA circuit

*requires SDR w/analog: SDR-0001-3 or -4

MORE FEATURES

- Using proven float-tape-counterweight technology, the STAGE-DISCHARGE RECORDER is a "plug compatible" replacement for a Stevens strip chart or punched-tape recorder.
- Saves your data in ultra-reliable Flash memory.
- NO BACKUP BATTERIES and you NEVER lose your data.
- Incorporates standard flume and weir equations
- Computes and logs discharge totals
- Displays discharge as well as flume/weir stage.
- Built-in event log tracks any time that someone views, downloads data, or makes changes to the setup.
- Runs up to 1 year on an industrial alkaline battery.
- Data delivered in easy-to-read & easy-to-open CSV (comma-separated variable) files
- All setup can be done from front panel
- Download utilities available for Pocket PC-compatible PDA’s & Windows laptop.

SUTRON RECOMMENDS

1. Stilling well with minimum 8” diameter
2. 5/16” shaft float wheel/pulley with circumference of 12", 18", & 375mm. If the float wheel does not have an insulating hub, a PVC float must be used. (See Ordering Options)
3. Beaded wire/tape compatible with the float wheel.
5. 12-volt alkaline battery with capacity of at least 20 amp-hrs. (See Ordering Options)

WOULD YOU LIKE TO ...

- Immediately see STAGE/ DISCHARGE at flume/weir sites?
- Download up to 6 MONTHS OF DATA to Pocket PC or Laptop?
- Have DATA IN SPREADSHEET-FORM for easy processing?
- Have a RECORD SHOWING WHEN A SITE WAS VISITED & WHAT CHANGED?
- Buy REPLACEMENT BATTERIES at a HARDWARE STORE?
- Have NO FEAR OF LOSING DATA if the battery does go dead?

TIRED OF...

- Processing data off of strip charts?
- Driving hundreds of miles several times a month to get strip charts?
- Recording devices that stop or record errors after the first freeze or close lightning strike?
EXTREMELY ACCURATE, LOW-NOISE ANALOG MEASUREMENT SYSTEM for:

- 0-5 V Sensors
- Low-Level Bridge Output Sensors
- 4 to 20 mA Sensors*

A switched 24-volt power supply provides everything needed to operate 4 to 20 mA loop sensors.

FEATURES

Supports the following (one at a time only):

- 0-5 V SINGLE ENDED ANALOG INPUT (General Purpose Analog Sensors)
- 0 to (+/-)39 mV Differential Analog Input (for BRIDGE TYPE PRESSURE SENSORS)
- 4-20 mA INPUT SENSORS

Also supports the following outputs:

- 2.5 V EXTERNAL VREF to support accurate references for sensors.
- SWITCHED BATTERY OUTPUT to power sensors and conserve battery power when not performing measurements
- 24 V OUTPUT to power 4-20 mA CURRENT LOOP SENSORS

Use Sutron’s Analog Stage Discharge Recorder when a shaft encoder cannot be used &/or when there is no stilling well. This SDR comes without a shaft encoder & can......

- READ A DIFFERENTIAL BRIDGE PRESSURE SENSOR (resistive bridge output sensors like Druck). The sensor, installed on the bottom of water being measured, is connected by terminal strip (provided) to the side of the SDR enclosure.
- READ virtually ANY 4-20 mA SENSOR either PRESSURE or ULTRASONIC LEVEL (for example) as the source of data for calculating stage discharge**.
- READ0 to 5V LEVEL SENSORS

- The system functions with input voltages as low as 5.5 V. However, if the SDR battery is supplying power to external sensors, the low battery operating point of the external sensors applies. 12 VOLT BATTERIES ARE RECOMMENDED FOR TYPICAL APPLICATIONS.
- Software provides additional slope & offset fields to convert output information to appropriate units.

### INSIDE SDR ENCLOSURE SPECIFICATIONS

<table>
<thead>
<tr>
<th>GENERAL</th>
<th>SPECIFICATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Voltage</td>
<td>8-16 Volts*</td>
</tr>
<tr>
<td>Temp Range</td>
<td>-40° to +60° C</td>
</tr>
<tr>
<td>Temp Coefficient</td>
<td>10 ppm/C max</td>
</tr>
<tr>
<td>2.5 Volt Ref</td>
<td>+/- 10 mv</td>
</tr>
<tr>
<td>Switched Batt</td>
<td>Short Protected</td>
</tr>
<tr>
<td>Lightning Protection</td>
<td>Sufficient for most installations</td>
</tr>
<tr>
<td>Miswiring tolerant</td>
<td>Protection on all inputs</td>
</tr>
</tbody>
</table>

| SINGLE ENDED | |
| Number of Bits | 24 |
| Full Scale | 0 to 5 Volts |
| Resolution | 0.298 uV |
| Noise (p/p) @25C | 6.5 uV (p/p) |
| Noise (rms) @25C | 3.4 uV RMS |
| Accuracy @25C | 0.02% |
| Input Impedance | >2M Ohm |

| DIFFERENTIAL | |
| Number of Bits | 24 |
| Full Scale | +/- 0.0390625 V |
| Resolution | 4.657 nV |
| Noise (p/p) @25C | 1.6 uV (p/p) |
| Noise (rms) @25C | 0.38 uV |
| Accuracy @25C | <0.01% |
| Input Impedance | >3M Ohm |

4-20mA INPUT

| Number of Bits | 24 |
| Full Scale | 20ma |
| Resolution | <1nA |
| Accuracy @25C | 0.02% |
| 24 Volt Current Loop Pwr | 24 Volt +/- 5% |
| 24 Volt | Short Protected |
Available Models Include:

**HOBO U30/GSM**
- Internet access to real-time data
- Double weather-proof, tamperproof enclosure
- Connect sensors, plug in battery, and go!

**HOBO U30/Wi-Fi**
- Connect sensors, plug in battery, and go!
- Ruggedized hardware, with integrated Wi-Fi
- Get notified of problems via cell phone or e-mail

**HOBO U30/ETH**
- Remote access to real-time data over Ethernet
- Connect sensors, plug in battery, and go!

**HOBO U30/NRC**
- Fast data offload via direct USB
- Optional analog inputs with sensor excitation

Research-Grade Dependability

The HOBO Remote Monitoring Systems deliver high accuracy measurements you can count on — in even the harshest environmental conditions. All at a fraction of the cost of competitive solutions.

Incorporating patented technology, all systems’ electronics are housed within a rugged double-weatherproof, tamper-proof enclosure. This provides twice the protection and ensures years of reliable monitoring performance.

Fast, Easy Deployment

The systems’ plug-and-play architecture enables any combination of Smart Sensors to be plugged in without extensive user programming, wiring, or calibration.

Wide Range of Measurements

The HOBO U30 Remote Monitoring System can be configured with any of the following research-grade Smart Sensors (see page 13-15 for details):
- Temperature
- Relative Humidity
- Rainfall
- Soil Moisture
- Wind Speed & Direction
- Leaf Wetsness
- PAR
- Solar Radiation
- Pulse Input
- Barometric Pressure

An optional analog sensor port provides two analog inputs, and power with user-selectable warm-up time.

Internal relay can be activated on user – defined alarm conditions.

See our outdoor monitoring systems comparison chart on page 12.
HOBOlink is a web-enabled software designed for HOBO U30 GSM, Ethernet, and Wi-Fi models. It allows you to easily access current and historical data, set alarm notifications, and relay activations, quickly view your data, and manage and control your HOBO U30 Remote Monitoring Systems.

A secure web-based platform, HOBOlink provides users with password-protected accounts and 128-bit encrypted connection. You can keep your data entirely private, or make it accessible to others with a “Public Access” feature. Data can be provided in either text or HOBOware® Pro format.

HOBOlink can automatically notify you via cell phone text message or e-mail when conditions exceed user-defined limits or if there is a sensor failure or low battery.
# HOBO Remote Monitoring Systems Specifications

## Technical Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GSM Wireless Communication</strong></td>
<td>Quad-Band GSM/GPRS 850/900/1800/1900 MHz</td>
</tr>
<tr>
<td><strong>Wi-Fi Wireless Communication</strong></td>
<td>2.412 - 2.484 GHz IEEE 802.11 b/g</td>
</tr>
<tr>
<td><strong>Ethernet</strong></td>
<td>IEEE 802.11 b/g</td>
</tr>
<tr>
<td><strong>Alarm Relay</strong></td>
<td>Can be activated, deactivated or pulsed on user-defined sensor alarms. The relay can be configured as normally open or normally closed, (30V, 1A Max)</td>
</tr>
<tr>
<td><strong>Alarm Notification Latency</strong></td>
<td>Logging interval plus 2 to 4 minutes (typical)</td>
</tr>
<tr>
<td><strong>Certifications</strong></td>
<td>FCC Certified. Check <a href="http://www.onsetcomp.com">www.onsetcomp.com</a> for the latest certifications.</td>
</tr>
<tr>
<td><strong>Smart-Sensor Inputs</strong></td>
<td>5 or 10</td>
</tr>
<tr>
<td><strong>Data Channels</strong></td>
<td>Maximum of 15 (some sensors use more than one data channel)</td>
</tr>
<tr>
<td><strong>Sensor Network Cable Length</strong></td>
<td>100 m (328 ft) maximum</td>
</tr>
<tr>
<td><strong>Normal Operating Range</strong></td>
<td>-20 to 40°C (-4 to 104°F)</td>
</tr>
<tr>
<td><strong>Extended Operating Range</strong></td>
<td>-40 to 60°C (-40 to 140°F) see battery life, Note: the GSM module will not communicate below -30°C (-22°F)</td>
</tr>
<tr>
<td><strong>Local Communication</strong></td>
<td>USB</td>
</tr>
<tr>
<td><strong>Data Storage Memory</strong></td>
<td>512K bytes local storage in non-volatile flash memory</td>
</tr>
<tr>
<td><strong>Operational Indicators</strong></td>
<td>LEDs show status of sensors, logging, alarms, and remote communication</td>
</tr>
<tr>
<td><strong>Logging Interval</strong></td>
<td>1 minute to 18 hours, user-specified</td>
</tr>
<tr>
<td><strong>Station-to-Internet Upload Interval</strong></td>
<td>10 minutes minimum, user-specified</td>
</tr>
<tr>
<td><strong>Power</strong></td>
<td>An Onset solar panel (1.2 w, 3 w, 6 w) or AC adapter is required</td>
</tr>
<tr>
<td><strong>Battery Type</strong></td>
<td>4 Volt, 10 AHR, or 4.5 AHR Rechargeable Sealed Lead Acid</td>
</tr>
<tr>
<td><strong>Battery Life</strong></td>
<td>Typical 3-5 years depending upon conditions of use. Regular operation outside of the normal operating range will reduce battery life to 1-2 years</td>
</tr>
<tr>
<td><strong>Environmental Rating</strong></td>
<td>Weatherproof; tested to NEMA 6</td>
</tr>
<tr>
<td><strong>Dimensions</strong></td>
<td>17.8 H x 11.7 D x 19.3 W cm (7.0 H x 4.6 D x 7.6 W inches)</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>2 kg (4.30 lbs)</td>
</tr>
<tr>
<td><strong>Mounting</strong></td>
<td>Up to 1.63 in (4.1 cm) mast or wall mount</td>
</tr>
<tr>
<td><strong>Enclosure Access</strong></td>
<td>Hinged door secured by two latches, which can be further secured with user-supplied padlocks</td>
</tr>
</tbody>
</table>

## Optional Analog Sensor Port

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Inputs</strong></td>
<td>2 channels - User-configured as either 0-20 mA or 0-20 VDC</td>
</tr>
<tr>
<td><strong>Sensor Power</strong></td>
<td>Switched 12 VDC, up to 50 mA: user-selectable warm-up from 5 milliseconds to 2 minutes</td>
</tr>
<tr>
<td><strong>Scaling</strong></td>
<td>Linear scaling to user units</td>
</tr>
<tr>
<td><strong>Accuracy</strong></td>
<td>±0.25% full scale</td>
</tr>
<tr>
<td>Product Number</td>
<td>HOBO Remote Monitoring System/GSM</td>
</tr>
<tr>
<td>----------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td></td>
<td>U30-GSM</td>
</tr>
</tbody>
</table>
| Remote
Communications | Yes                              | Yes                                 | Yes                                   | No                              | No                   | No                  |
| Internet access to real-time data | Yes                              | Yes                                 | Yes                                   | No                              | No                   | No                  |
| Enclosure      | Double weatherproof tamperproof | Double weatherproof tamperproof     | Double weatherproof tamperproof        | Double weatherproof tamperproof | Weatherproof         | Weatherproof        |
| Fully-integrated, expandable communications | Yes                              | Yes                                 | Yes                                   | No                              | No                   | No                  |
| * Solar power with rechargeable batteries | Yes*                             | Yes*                                | Yes*                                  | Yes*                            | No                   | No                  |
| Optional analog inputs with configurable sensor power | 2                                | 2                                   | 2                                     | 2                               | No                   | No                  |
| Smart Sensor compatible | Yes                              | Yes                                 | Yes                                   | Yes                             | Yes                  | Yes                 |
| # of inputs    | 5 expandable to 15                | 5 expandable to 15                   | 5 expandable to 15                     | 5 expandable to 15              | 10 expandable to 15  | 4                   |
| USB connectivity | Yes                              | Yes                                 | Yes                                   | Yes                             | Requires Adapter     | Requires Adapter    |
| Operating Range | - 20 to 40C normal operation - 40 to 60C extended range (some limitations) | - 20 to 40C normal operation - 40 to 60C extended range (some limitations) | - 20 to 40C normal operation - 40 to 60C extended range (some limitations) | - 20 to 40C normal operation - 40 to 60C extended range (some limitations) | - 20 to 50C standard - 40 to 70C with optional Lithium batteries | - 20 to 50C standard - 40 to 70C with optional Lithium batteries |
| Battery Life Without External Power: or Solar | 30 days (1hr connection interval) | 30 days (1hr connection interval)   | 30 days (1hr connection interval)     | 6 months (typical)             | 1 year (typical)    | 1 year (typical)    |
| Data Storage Memory: | Unlimited in HOBOlink          | Unlimited in HOBOlink               | Unlimited in HOBOlink                 | 500,000 measurements          | 500,000 measurements | 500,000 measurements |

* Solar panel purchased separately.
XLITE 9210 DATALOGGER
9210-0000

SUTRON’S MOST POWERFUL DATALOGGER
ENGINEERED FOR MAXIMUM VALUE! HIGHLY MODULAR WITH REMOVABLE MEDIA SUPPORT:
- SD CARDS
- MMC CARDS
- USB THUMB DRIVES

DESCRIPTION
The XLite 9210 Datalogger, a high performance data recorder & communications device for UNATTENDED REMOTE DATA ACQUISITION, CONTROL & COMMUNICATIONS, is a multi-tasking logger capable of making measurements & communicating SIMULTANEOUSLY.

- CONNECT A WIDE VARIETY OF SENSORS to the system using built-in high-precision analog & digital interfaces as well as via RS232, RS485, & SDI-12.
- EXPAND SENSOR CAPACITY via I/O modules plugged into the XLite’s I2C port.
- With 32 MB OF FLASH DISK for data storage, the 9210 also has 4 COMMUNICATIONS SERIAL PORTS for SATELLITE TRANSMITTERS, MODEMS, RADIOS & OTHER SERIAL COMMUNICATION DEVICES.
- Retrieve data using any communication interface, USB or SD MEMORY CARDS.
- VIEW DATA, CALIBRATE & ADJUST the XLite using its built-in LCD and buttons. Locally or remotely, ALL 9210 FUNCTIONALITY IS ACCESSED THROUGH COMMUNICATIONS PORTS using easy to-understand set-up, data display & system maintenance GUIs.
- EASILY CUSTOMIZE the 9210 with BASIC or C++ routines to become the core of virtually any hydrological, meteorological &/or control application including
  - Automatic Weather
  - Climatic Weather
  - Agricultural/AgMet
  - Rainfall Stations
  - Flood Warning
  - Stream Gaging
  - Synoptic Weather
  - Airport Weather
  - Oceanic, Tidal & Coastal
  - Water Distribution
  - Irrigation/Gate Control
  - Flow Monitoring
- Built-in I/O!
  - 8 digital I/Os & 10 Analog inputs
  - Expandable I/O capacity using modules
- BROAD SENSOR SUPPORT:
  - Analog & Digital Sensors (expandable w/add-on modules)
  - SDI-12 Sensors
  - Serial Sensors (RS-232 and RS-485)
- 32 MB EXPANDABLE FLASH MEMORY Standard for Log & Config Files
- Built-in ETHERNET
- Multiple Telemetry 4 SIMULTANEOUSLY!
  - GOES, INMARSAT, METEOSAT, INSAT, more!
  - VOICE/DATA MODEM
  - LOS RADIO
  - MODBUS
  - IIRIDUUM
- Wide Operating Temperature (-40 to +60°C)
- Secure Access (user names & passwords)
UNPARALLELED SENSOR SUPPORT
The XLite provides unparalleled sensor support through its expansive I/O capabilities & built-in program libraries. The XLite SUPPORTS A WIDE VARIETY OF MEASUREMENT TYPES: single voltage, differential voltage, resistance, 4-20mA, frequency, counter, binary, binary alarm, grey-code binary, smart serial (RS-232 and RS-485), SDI-12, etc.

Most Sensors are SUPPORTED SPECIFICALLY BY NAME using an XLite Sensor “Block” from the extensive built-in library. Support for new sensors not already in the Sensor Library can be easily added by writing a simple program in Xpert Basic. More complex custom processing tasks also can be added by writing a program in C++ (required development tools are available for free from Microsoft).

ROBUST LOGGING
XLite boasts 32 MB built-in memory expandable via removable media. Logged data is compressed and not affected by changes to the Setup. System events are logged independently of measurement data.

FLEXIBLE SCHEDULING
EACH MEASUREMENT CAN BE INDEPENDENTLY SCHEDULED. Sample intervals can be set from 1 sec. to 24 hr., in 1-second increments. Built-in functions to support min, max, average, and accumulation calculations are provided.

EVENT DRIVEN PROCESSING
Digital inputs can be configured to trigger measurement processing, including logging and telemetry transactions.

EASY TO USE DISPLAY
The XLite provides a 2-line LCD character display with 3 front panel control buttons, making it very simple to view data and make minor Setup changes in the field.

INTUITIVE SETUP
System Setup and configuration are performed using the XTerm program, providing the same intuitive graphical user interface (GUI) as Sutron’s mighty Xpert (both based on the familiar Microsoft Windows CE, intuitive and easy to use).

ORDERING

<table>
<thead>
<tr>
<th>Feature</th>
<th>9210-0000-2B XLite, basic</th>
<th>9210-SL2-2B XLite with SatLink2</th>
<th>9210-ENC-B XLite within rugged enclosure</th>
<th>9210-SL2-ENC-B XLite wSatLink within enclosure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enclosure for 9210 only (6661-1275-1)</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enclosure for 9210 &amp; SatLink2 (6661-1276-1)</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Size: 14.13” x 12/26” x 6.13”</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 DIN rails to mount optional equipment inside (ie, I/O modules, modem, etc.)</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protection Board Mounting Holes</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 digital, 4 analog, VREF, SW’D 12, 4 SDI-12, Input Power &amp; a phone line (RJ to Terminal block) supplied</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>3 PG-9 and 2 PG-11 plugs</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cable strain relief fittings for additional wires</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single point grounding connector</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GPS and RF-out connections</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>RF-out configured for panel-mounted Polyphaser Lightning Protection (in RF-out &amp; ground connections)</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>

SATLINK2 & XLITE: OPTIONS
XLite can be ordered with or without an enclosure and packaged with or without SatLink2 GOES Transmitter/Logger.

ENCLOSURE FEATURE | 9210-ENC-B | 9210-SL2-ENC-B
---|---|---
Enclosure for 9210 only (6661-1275-1) | ✓ | |
Enclosure for 9210 & SatLink2 (6661-1276-1) | | ✓ |
Size: 14.13” x 12/26” x 6.13” | ✓ | ✓ |
3 DIN rails to mount optional equipment inside (ie, I/O modules, modem, etc.) | ✓ | ✓ |
Protection Board Mounting Holes | ✓ | ✓ |
3 digital, 4 analog, VREF, SW’D 12, 4 SDI-12, Input Power & a phone line (RJ to Terminal block) supplied | | | ✓ |
3 PG-9 and 2 PG-11 plugs | ✓ | ✓ |
Cable strain relief fittings for additional wires | ✓ | ✓ |
Single point grounding connector | ✓ | ✓ |
GPS and RF-out connections | | | ✓ |
RF-out configured for panel-mounted Polyphaser Lightning Protection (in RF-out & ground connections) | | | ✓ |
<table>
<thead>
<tr>
<th>SPECIFICATIONS</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DIMENSIONS</strong></td>
<td>11&quot;x6&quot;x3&quot;: Aluminum, IP52 drip resistant when installed vertically. Suitable for gauge house, shelter, NEMA enclosure</td>
</tr>
<tr>
<td><strong>WEIGHT</strong></td>
<td>3.6 lbs.</td>
</tr>
<tr>
<td><strong>TEMPERATURES</strong></td>
<td>Operating: -40°C to +60° (-60°C to +60°C optional)</td>
</tr>
<tr>
<td><strong>DISPLAY (VIEWING) TEMP.</strong></td>
<td>-25 ≤ T ≤ +60°C</td>
</tr>
<tr>
<td><strong>SUPPLY VOLTAGE</strong></td>
<td>8-16 VDC recommended, 20 V max</td>
</tr>
<tr>
<td><strong>VOLTAGE MEASUREMENT</strong></td>
<td>5 V single ended ± 2.5 V differential</td>
</tr>
<tr>
<td><strong>REFERENCE VOLTAGE</strong></td>
<td>2.5 Volts</td>
</tr>
<tr>
<td><strong>POWER CONSUMPTION</strong></td>
<td>Quiescent: &lt;2.5 mA</td>
</tr>
<tr>
<td><strong>TYPICAL AVERAGE</strong></td>
<td>3 mA @ 15 min sample intervals of shaft encoder</td>
</tr>
<tr>
<td><strong>BATTERY BACKUP</strong></td>
<td>Internal lithium backup battery (for clock, not required for logged data) 2 years min</td>
</tr>
<tr>
<td><strong>TCXO REAL-TIME CLOCK</strong></td>
<td>Real-time clock accuracy better than 10 seconds per month (-40°C to +60°C)</td>
</tr>
<tr>
<td><strong>WATCHDOG TIMER</strong></td>
<td>System resets upon microprocessor failure</td>
</tr>
<tr>
<td><strong>AMBIENT RH</strong></td>
<td>0 to 95%</td>
</tr>
<tr>
<td><strong>MEMORY</strong></td>
<td>32 MB Flash Memory for log &amp; configuration files. Expandable! 16MB Flash Operating System 32 MB RAM</td>
</tr>
<tr>
<td><strong>SAMPLE INTERVALS</strong></td>
<td>Multiple Sample Intervals set from 1 sec. to 24 hr. in 1-second Increments</td>
</tr>
<tr>
<td><strong>DATA RETRIEVAL</strong></td>
<td>RS-232 Ports, Memory Cards</td>
</tr>
<tr>
<td><strong>ETHERNET</strong></td>
<td>802.3 10BaseT</td>
</tr>
<tr>
<td><strong>REMOVABLE MEDIA</strong></td>
<td>SD Cards, MMC Cards, USB Thumbdrives</td>
</tr>
<tr>
<td><strong>DISPLAY</strong></td>
<td>2 line by 20 character alphanumeric LCD</td>
</tr>
<tr>
<td><strong>EXTERNAL DISPLAY</strong></td>
<td>Full feature Windows display</td>
</tr>
<tr>
<td><strong>SERIAL PORTS</strong></td>
<td>4 RS-232 ports, 1 RS-485 port</td>
</tr>
<tr>
<td><strong>SDI-12</strong></td>
<td>Dedicated SDI-12 V1.3</td>
</tr>
<tr>
<td><strong>COMMUNICATIONS</strong></td>
<td>4 RS-232 ports Up to 4 of the following types: SIMULTANEOUSLY Satellite Radio, LOS Radio, Data &amp; V oice Modem, Direct Connect MODBUS</td>
</tr>
<tr>
<td><strong>DIGITAL INPUTS &amp; OUTPUTS</strong></td>
<td>8 digital I/O lines 2 input only 6 bi-directional 1 high frequency 8kHz)</td>
</tr>
<tr>
<td><strong>ANALOG INPUTS</strong></td>
<td>10 Inputs single ended, or up to 5 differential, expandable using external IC modules</td>
</tr>
<tr>
<td><strong>OUTPUT</strong></td>
<td>+12VDC SW power available</td>
</tr>
<tr>
<td><strong>DC EXCITATION OUTPUT</strong></td>
<td>+2.5, +12V Expandable using external IC modules</td>
</tr>
<tr>
<td><strong>I/O INTERNAL PROTECTION</strong></td>
<td>Operation mode is software selectable w/ frequency, analog &amp; counter inputs.</td>
</tr>
<tr>
<td><strong>OPERATION MODE</strong></td>
<td>7 bit gray code encoder (1 max) uses 7 digital inputs</td>
</tr>
<tr>
<td><strong>SHAFT ENCODERS</strong></td>
<td>Expandable using external IC modules</td>
</tr>
<tr>
<td><strong>TIPPING BUCKET</strong></td>
<td>Input: 100 Kohm pullup for switch closure software debounced uses 1 digital input each</td>
</tr>
<tr>
<td><strong>COUNTER INPUTS</strong></td>
<td>Input Frequency: 1 channel @ 8kHz max, 7 channels @ 1 kHz max.</td>
</tr>
<tr>
<td><strong>COUNTER ACCURACY</strong></td>
<td>± 0.1% with 32 bit resolution. Expandable by external IC modules</td>
</tr>
<tr>
<td><strong>ACCURACY RATIOIOMETRIC</strong></td>
<td>± 0.01% of full scale</td>
</tr>
<tr>
<td><strong>ABSOLUTE ACCURACY</strong></td>
<td>0.1% -40 to +60°C</td>
</tr>
<tr>
<td><strong>INPUT RANGE</strong></td>
<td>0-5 V full scale</td>
</tr>
<tr>
<td><strong>PRESSURE TRANSDUCER</strong></td>
<td>Bridge sensors require 2 channels Voltage output sensors require 1 channel. Current output sensors require external bridge completion resistor 1 channel.</td>
</tr>
<tr>
<td><strong>DATA RESOLUTION</strong></td>
<td>32 bit resolution displaying up to 6 decimal places, user selectable</td>
</tr>
<tr>
<td><strong>A/D RESOLUTION</strong></td>
<td>16 bits</td>
</tr>
</tbody>
</table>
The WATER LOG \textsuperscript{®} System 5000\textsuperscript{™} is a modular data acquisition system designed for remote battery powered operation.

Plug-in modules allow the data logger to be configured for a wide variety of monitoring, data logging and SCADA applications. The plug-in option modules currently include:

- Precision pressure sensor module
- Analog/Digital expansion module

Other configurations are available including additional expansion cards and an internal GOES transmitter.

**KEY FEATURES**

- Easy to read 5.7” 1/4 VGA TFT color display with LED backlight and touch screen
- Easy to use graphical user interface with built in help menus
- 32-bit, 192-MHz, Arm-9 processor
- LINUX operating system
- 1Gbyte internal data logging memory (expandable to 4Gbytes)
- Removable MM/SD-Card socket (32Mbyte to 8Gbyte cards available)
- 10/100 BASE-T IEEE 802.3 Ethernet port
- USB Host, full-speed, 2-ports (works with a thumb drive)
- USB Device, full-speed (can appear as a mass storage device)
- Two (2) RS-232 serial ports, 115.2 Kbps
- Built in speaker with digital audio
- Push-to-read button (view data without opening the cover)
- Temperature compensated real time clock with lithium backup battery
- Plug-in terminal strip connectors
- Fiberglass enclosure with lexan window
- Operating temperature range of -40\textdegree{} to 60\textdegree{}
- Programmability through BASIC interpreter

**Base Configuration Includes:**

- Four (4) digital input/outputs each programmable as:
  - Digital input (0-5V)
  - Digital output (0-5V)
  - Quadrature shaft encoder input (2-counters)
  - Quadrature shaft encoder output (2-channels)
  - Event detect/counting input (rain gauge)
  - Frequency input
- Four (4) analog inputs:
  - 24-Bit analog-to-digital converter
  - 0.0 - 5.0V input range
  - Four (4) single ended or two (2) differential
- Millivolt AC wind speed input
- Precision +5.0V excitation output
- Switched +12V output
- 4-20mA output (2-wire loop, optically isolated)
- SDI-12 (supports both Master and Slave modes)
- MODBUS Slave (TCP and serial line)
SPECIFICATIONS

Base Unit
Display
Type: 5.7", 1/4 VGA (320 x 240 pixels), TFT, color
LED back light, with touch screen
User Interface: Graphical, with built-in help menus.
Graphical user interface also accessible remotely via Ethernet or USB ports.
Speaker: Internal, for touchscreen key click and use interface
Push-to-read: Pushbutton allows viewing measured data without opening the cover.

Real Time Clock
Accuracy: 3.5ppm from -40 to +85°C
Battery: Replaceable lithium cell

General
Processor: 32-bit, 192-MHz, ARM-9
SDRAM: 64-Mbytes
Operating System: LINUX

Data Storage
Data Logging: 1Gbyte, expandable to 4Gbytes
Removable: Multi-Media / Secure Digital (SD) Card, (32Mbyte to 4Gbyte cards available)
Format: Microsoft™ FAT file system

Interface
USB Host: Two (2) ports, full-speed (works with a thumb drive)
USB Device: One port, full-speed (appears as a mass storage device)
Ethernet: RJ-45 10/100Base-T, IEEE 802.3
RS-232: Two (2) ports, 115.2Kbps, DB9, DTE, auto wake up
SDI-12: Two (2) ea, 3-pin connectors, 1200 baud (supports both Master and Slave modes)

+5V Excitation Output
Type: Switched, programmable "warmup" time
Voltage: 5.00V, ratio metric with A/D
Accuracy: ± 1.0 mV over load and temperature range
Current: 10mA max load

Switched +12 Output
Voltage: Depends on battery voltage
Current: 1A max, protected with polyfuse

4-20 mA Output
Type: 2-wire, loop powered, optically isolated
Resolution: 16-bits
Loop Voltage: 5.3V min, 35V max

Digital I/O
Channels: Four (4) channels, independently configured for input or output.
Internal 47K pullup resistor to 5.0V
Voltage: 0-5V (input & output)
Input Type: Schmitt, hysteresis: 0.7V min, 1.1V max
Input Voltage: Positive going: 2.6V min, 3.3V max
Negative going: 1.8V min, 1.1V max
Output Voltage: Low: 0.5V max @ 24mA
High: 3.8V min @ -24mA

Event, Frequency, Quadrature Input
Type: 4-inputs, switch closure or voltage pulse
Programmable rising or falling edge triggered
Minimum Pulse Width: 5 mS (event & quadrature)
Input Frequency: 16 KHz max
Counter resolution: 32-bit
Quadrature Output
Type: Synthesized quadrature encoder, 2-encoders
Outputs: 2-wire/encoder, 0-5V, 64Hz step rate

AC Frequency Input
Type: mV wind speed, dedicated input
Input Range: 1 to 10 KHz at ± 75mVolts or greater
1 to 15 KHz at ± 1 Volt or greater
Input Amplitude: ± 5.0 V Max
Accuracy: ± 0.1%
Resolution: 1/10000 * Reading

Analog Input
Channels: Four (4) single ended or two (2) differential
(each channel programable)
Resolution: 24-bit
Accuracy: ±0.05% FS
Input Range: 0 to 5 Volts (has built in transient protection)

GOES Radio
Works with a built-in or external H-222SE GOES radio via RS-232 port.

Power
Input Voltage: 10.0 to 16.0 volts DC
Input Current: Sleep: 8mA typical
Active: 60 mA typ (measuring, display off)
Active: 260 mA typ (measuring, display on)
Auto display shut-off after 3 minutes

Mechanical
Enclosure: Corrosion resistant fiberglass with clear Lexan® window
Size: 9.0 in. wide x 10.5 in. long x 6.3 in. deep
Weight: 5.75 lbs (no option cards)
Mounting: Hardware supplied for wall mounting
Expansion Slots: 3 slots
Connectors: Plug-in terminal strips (included)

Environment
Operating Range: -40° to +60°C
Storage Temperature: -40° to +80°C
TFT Display Operating Temperature: -20° to +60°C
Humidity: 0-95% non-condensing

Warranty
The WATER LOG ® H-5000™ is warranted against defects in materials and workmanship for one year from date of shipment.

Note
Specifications subject to change without prior notice due to ongoing commitment to product testing and improvement.
LR Mar 14, 2009
The ELPRO 905U range of wireless I/O provides a low cost alternative to expensive signal wire installations, over short or long distances. Transducer and control signals connected at one module (input signals) are transmitted to other modules where the signals are re-created as output signals, or passed via a data bus to a host device such as a PLC, DCS or SCADA system.

Easy to Use
The ELPRO 905U wireless I/O range is easy to use and simple to install. The modules are completely integrated, including micro controller, inputs/outputs (I/O) circuits, radio transceiver, RS485/232 serial port and power supply with battery backup facilities. Each module is housed in an industrial strength extruded aluminum case, with plug-in terminal strips for ease of wiring connection and maintenance.

905U Wireless I/O Modules
The 905U modules provide a wireless radio link for discrete (switch contact), pulse/counter and analog signals. The 905U also has a RS485 multipoint serial port, for communications to I/O expansion modules.

105S Serial I/O Modules
The 105S serial I/O modules communicate via RS485 multipoint. RS485 is a method of transmitting between many devices using a common twisted pair wire. The maximum length of the wire is typically 4000 feet (1200 m). 105S modules can be used as a dedicated twisted-pair I/O system, or as I/O expansion for 905U modules. Each 905U can connect to up to 31 serial modules. This combination of wireless and serial I/O provides a powerful I/O network for factory automation and process instrumentation.

Two-way Communications
The 905U internal radio is a transceiver - a transmitter and receiver. Because the 905U can communicate in both directions, each module is capable of both input and output signals. Both monitoring (input) and control (output) functions are provided on 905U and 105S modules.

Simple, Reliable and Secure!
The ELPRO 905U system uses a very reliable transmission protocol designed for secure communications. Because 905U modules use two-way transceivers, modules are able to communicate with each other to control the flow of information. By using “listen before transmit” technology, error-checking, handshake acknowledgments and auto re-transmissions, the 905U achieves an extremely high level of reliability even in the presence of external radio interference. The 905U uses exception-reporting messaging, transmitting when an input signal changes - that is, when a discrete (switch contact) input turns off or on, or when the value of an analog input changes by a user-configurable amount. The 905U provides immediate real-time communications with low radio band usage, which polling or time-scan systems cannot achieve. There are also regular self-checking update transmissions to check I/O values and to check the integrity of the communication path. Communication failure alarms can be configured for transmission-failure or fail-to-receive events.

Networking
The I/O network can comprise up to hundreds of modules, using peer-to-peer communications. There is no network master, and any module can communicate with every other module. Any input can be linked to any output using a simple network configuration program, provided with each module. Each input can be configured to several outputs at different remote modules. I/O modules are configured with a system address and a unit address. Only modules with the same system address will communicate within the same system. Multiple systems can operate within the same radio range without “cross-talk” or malfunction.

Security Encryption
The 905U uses high security data encryption and frequency encoding algorithms to protect against theft of wireless data (industrial espionage) or malicious wireless attack (“hacking”). Only other 905U modules with the correct security keys can understand the wireless messages.

Variety of I/O Configurations
There are four I/O versions available in the 905U and 105S modules. All modules in the ELPRO range use the same flexible and reliable operating protocol. Different I/O versions will operate together in the one system, and different 105S versions can connect to each 905U version. Modules provide different combinations of the following I/O:
- discrete inputs for switch devices such as limit switches, level switches, security sensors, motor starters, pushbuttons
- analog inputs (mA or voltage) for connecting transducers which measure parameters such as level, flow, pressure, temperature, vibration
- digital outputs (relay contacts or transistor) for controlling devices such as motor drives, indicating lights, alarms
- analog outputs (mA or voltage) for connection to meters or indicators to display measured parameters.
- pulse/counter inputs and outputs for transmitting totalization signals from flowmeters, energy meters etc.

Analog I/O
The 905U-1 module has two inputs which will accept 4-20mA analog signals. The first of these inputs has adjustable setpoints. The –1 module also has two 4-20mA outputs.

The 905U-2 module has six inputs which will accept 0-200-104-20 mA or 0-5V signals. The first four analog inputs have adjustable setpoints. The 905U-3 module provides eight analog outputs with a range of 0-20mA or 0-5V. These outputs will reflect the same value as the analog input linked by the configuration program.

Analog Setpoints
High and low setpoints can be configured for the analog inputs to control a remote discrete output. The discrete output will set (“on”) when the analog input value drops below the low setpoint and will reset (“off”) when the analog value exceeds the high setpoint. The high and low setpoints can be the same value such that the discrete output sets and resets at the same setpoint value.

Pulse I/O
The 905U modules can be configured to count a pulse input and transmit the accumulated count to a remote module. At the destination module the pulse signal is recreated - the accumulated value is used to ensure that all input pulses are output accurately. The 905U can also transmit the pulse input rate as a separate analog value and the rate signal is output as an analog value at the destination module. Pulse I/O will operate up to 100Hz. One pulse input (DI1) on the 905U-2 module will operate to 1000Hz, with a configurable 1/10 divider.

Fail-Safe Outputs
Discrete and analog outputs can be configured to individually reset if communications has failed to the module. The user can configure a “comms-fail” timeout - if no communications is received for this time period, the configured output will reset.

905U-1 105S-1 905U-2 105S-2 905U-3 105S-3 905U-4 105S-4

| Radio Port | | | | | | | |
| Serial Port | | | | | | | |
| Digital inputs | 4 | 4 | 4 | 4 | 0 | 0 | 4-16 |
| Digital outputs | 4 | 1 | 8 | 8 | 4-16 |
| Analog inputs | 2 | 6 | 0 | 0 | 0 | 0 |
| Analog outputs | 2 | 0 | 8 | 8 | 0 |
| Pulse inputs | 1 | 4 | 0 | 0 | 4 |
| Pulse outputs | 1 | 0 | 4 | 4 |

Pulse and digital I/O are same.
The 105-4 has 4 fixed inputs and 4 fixed outputs and 12 which may be either input or output.
Interfacing to Other Systems
A 905U network can include 905U-G Wireless Gateways - these modules interface to a wide variety of data buses such as Ethernet, Profibus, Modbus and Devicenet. A network comprising wireless I/O and wireless gateways is called a "WIB".

The ELPRO WIB
The ELPRO WIB, or Wireless Instrumentation Backbone, provides wireless inter-connectivity for different data buses and direct I/O. By using ELPRO’s neutral radio protocol, different data buses in various plant areas can be linked, without wiring. Direct I/O signals can be incorporated using the 905U wireless I/O modules.

The ELPRO WIB removes the largest cost component of collecting plant information - wiring; and solves the largest constraint to sharing plant information - data bus compatibility.

Water Supply Utilities
Radio Communications

The ELPRO 905U uses frequency hopping spread spectrum and operates in the license-free 900MHz radio band. These products can be used without a radio license.

Radio Range

Typical line-of-sight radio distances are:
- 20 miles in USA/Canada (4W ERP)
- 20 km in Australia/NZ (1W ERP)

The actual operating distance depends on many factors such as obstructions in the radio path, height of antennas and the type of antennas used. Line-of-sight is not necessary for short distances, as the radio signal will penetrate obstacles or reflect from surfaces. Typical distance in plant and factory environments is 3000 feet (1 km).

The 905U provides a measurement of both background radio noise and radio signal strength to assist with installation and testing.

Repeater Functionality

Each 905U module also provides a repeater function. If a reliable radio path cannot be established between two modules, the radio message can be passed via another 905U module working as a repeater. The repeater module acts as an intermediate module between the two ends of the radio link. Messages can be repeated up to five times by intermediate repeater units, allowing very long radio paths to be achieved. Repeaters are not dedicated units - they are normal modules with their own I/O.

Configuration

The 905U modules are easy to configure, using a Windows-based configuration program, supplied with each module. The configuration file can be downloaded or uploaded by connecting to the module RS232 serial port.

Configuration files can be password protected for secure archival.

Diagnostics & Testing

The 905U provides diagnostic and test functions via the configuration software. I/O and communication functions can be tested and verified.

The diagnostics features include radio signal measurement, allowing radio paths to be easily tested without any additional test equipment.

Power Supply

The ELPRO 905U includes a switch-mode power supply which will accept a variety of voltage sources. The 905U will operate from a DC supply of 11 to 30 volts or an AC supply of 15 to 24 volts. Connection to 110/240V power is made via a small transformer adaptor. The internal power supply includes a battery charger for battery backup, allowing the 905U to be powered from non-secure power circuits. The power supply also includes a solar regulator for direct connection of solar panels.

The power supply is intelligent and will automatically alarm on loss of normal supply, loss of solar charging or low battery voltage. These alarm signals can be transmitted to remote modules as discrete status signals; the battery voltage value can be transmitted as an analog value for remote trending.

Each module generates a 24V regulated supply (150mA) for analog loop power. The 24V is available for the full range of input supply voltage.

WHAT IS WIRELESS I/O?

Wireless I/O, or Radio Telemetry, is a method of transmitting information by radio. Signals such as switch status or analog signals can be transmitted to a remote location, and the signals "re-created".

APPLICATIONS
- Process plants
- Factories
- Warehouses
- Agriculture
- Mining
- Irrigation
- Security
- Overhead cranes
- Manufacturing plants
- Marine and ports
- Water and sewerage
- Tank farms
- Building management
- Lighting control
- PLC interconnection
- Mobile vehicles
- Rotating machinery
... anywhere you need a wire to carry a signal.
Specifications

General
- Temperature: -40 to 140 degF (-40 to 60 degC)
- Humidity: 0 - 99 %RH
- EMC: FCC Part 15, AS3548
- Housing: extruded aluminum case, 5.1” x 7.3” x 2.4” (130 x 185 x 60mm) with DIN rail mounting
- Removable terminals up to 12 gauge (2.5sqmm) wiring
- LED indication for power supply, OK status, digital I/O

Inputs and Outputs
Discrete Inputs
- Suitable for voltage free contacts or NPN transistor, contact wetting current 5mA, “debounce” delay configurable 0.1 - 8 sec
- 905-1: four inputs
- 905-2: four inputs
- 905-4: up to 16 inputs (4 fixed + 12 selectable)

Discrete Outputs
- 905-1: four relay contacts, Form A
- 905-2: one FET output 30VDC 500mA
- 905-3: eight FET outputs 30VDC 500mA
- 905-4: up to 16 FET output (4 fixed + 12 selectable)

Analog Inputs
- “Floating” differential inputs, common mode voltage 27V,
  - Loop power 24V provided, filtering configurable 0.1 - 8 sec
  - 905-1: two 4-20mA, resolution 15 bit, accuracy 0.1%
  - 905-2: six 0-20mA (0-5V factory option), resolution 12 bit, accuracy 0.1%

Analog Outputs
- Current sink to common, max loop voltage 27V, max loop resistance 1000 ohms
  - 905-1: two 4-20mA, resolution 15 bit, accuracy 0.1%
  - 905-3: eight 0-20mA (0-5V factory option), resolution 12 bit, accuracy 0.1%

Pulse Inputs
- Pulse inputs use discrete input channels
  - Max pulse rate 100Hz, pulse width min 5msec
  - 905-1: one input (Di1)
  - 905-2: four inputs (Di1-4); first PI (Di1) max 1kHz using configurable 1/10 multiplier
  - 905-4: four inputs (Di1-4); first PI (Di1) max 1kHz using configurable 1/10 multiplier

Pulse Outputs
- FET 30VDC 500mA max 100Hz
  - 905-1: one dedicated PO
  - 905-3: four (DO1-4)
  - 905-4: four (DO1-4)

Power Supply
- Battery supply 11.5-15.0 VDC
- Normal supply 12-24 VAC or 15-30 VDC, overvoltage and reverse power protected
- 110-250 VAC supply available via transformer adapter
- Battery charging circuit included for 1.2-12 AHr sealed battery
- Solar regulator for direct connection of solar panel (up to 30W) and solar battery (100AHr)
- Internal monitoring of normal supply fail, solar charge status, and battery voltage. These may be transmitted to remote modules for monitoring.
- An internal DC/DC converter provides 24VDC 150mA for analog loop supply.

Radio Transceiver
- Frequency hopping spread spectrum
  - USA/Canada: 902-928 MHz
  - Australia: 915-928 MHz
  - New Zealand: 921-928 MHz
- Approved to FCC Part 15.247, RS210
- Transmit power 1W
- Line-of-sight range, dependant on local conditions
  - USA/Canada: 4W ERP, 20 miles
  - Australia/NZ: 1W ERP, 20 km
- Typical range in industrial plants/factories 3000 feet (1 km)
- Range may be extended by using up to five intermediate 90SU modules as repeater units
- Antenna connector is SMA coaxial

Serial Port
- RS232/RS485: 9600 baud, 8 bits, no parity, 1 stop bit
- RS232: 9pin DB9 male connector
- RS485: terminal connector, max distance 4000' (1.2 km)

Data Transmission
- Data transmission uses exception reporting plus integrity update transmissions. The period for update transmissions is user-configurable.
- Radio protocol includes 64 bit security encryption, system and unit addressing, peer-to-peer I/O mapping, 16 bit CRC error checking, acknowledgement of error-free transmissions and automatic retries.
- Communications failure status may be configured as a discrete output. Resetting of outputs on communications failure is configurable.
- Transmission rates: Radio 19200 baud Serial 9600 baud
- Typical radio message transmission time 36 msec

Area Approval
- USA/Canada: Class 1 Div 2 Groups A, B, C, D Temp T6
Industrial Wireless and Remote Environmental Monitoring Systems

Elpro Radio telemetry Systems
Iridium Satellite Monitoring
Remote Camera Systems
Radio Survey’s / Radio System Engineering
Programming and Field Commissioning Services
Solar Packges
Custom Control Panels
Hoskin Scientific Limited has been supplying testing and monitoring instruments since 1946. Although our range is broad, we focus on three major markets including:

**Geotechnical & Materials Testing**  
**Environmental Monitoring**  
**Test & Measurement Instrumentation**

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