

SDI-12 SUPPORT GROUP NEWS

SERIAL DATA INTERFACE AT 1200 BAUD

THE SDI-12 SUPPORT GROUP

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TROXLER ELECTRONIC LABORATORIES, INC.

THE U.S. GEOLOGICAL SURVEY

VALCOM LIMITED

YSI, INC.

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A Non-Profit Corporation

135 East Center, Logan, Utah 84321

(801) 752-4200 fax (801) 752-1691

SDI-12 Specification Completion

NR Systems, Inc. has finished the final version of the revised SDI-12 specification. As explained in last summer's newsletter, this rewrite was done by NR Systems, Inc. and Campbell Scientific Inc. The most recent version of this document is 7 July 1994. The final version differs little from the 30 November 1993 draft. Some phrases were reworded, some punctuation was changed, and some examples of SDI-12 command usage were clarified. No changes in technical content were made.

A special thanks to Sutron, Campbell Scientific, and the Hydrologic Instrumentation Facility of the USGS for their help in preparing this document.

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Next SDI-12 Meeting

The next meeting of the SDI-12 Support Group will be held at the 30th Annual Conference of the American Water Resources Association (AWRA), which will be held November 6 to 10, 1994, at the Fairmont Hotel, in Chicago, Illinois. An announcement telling the exact time and location of the SDI-12 meeting will be mailed to all SDI-12 Support Group members at least 30 days prior to the conference.

TAVIS PROPOSES TWO NEW COMMANDS

Because one of the primary reasons for the SDI-12 Interface Standard was to allow for a multi-drop system of multiple sensors on one data bus, Tavis Corporation has been including two command features on its SDI-12 products that we would recommend become required standard commands and/or features with a future version of the SDI-12 Standard.

The first new command proposed as a standard command is called an **Address Query Command** (format "\$!"). This command would allow the user to connect one sensor of an unknown address to the SDI-12 bus, and find its address by issuing this command. Thus, any sensor with any address would respond to this command, and the response would be an "acknowledge" or "a<CR><LF>". In fact, any command can be issued with the "\$!" characters used as the address, and the single sensor on the bus would respond to the command as usual.

Some of our customers have dozens of Tavis SDI-12 sensors, and this command has been extremely useful to them in keeping track of the variety of sensor addresses they use. Without this command, the user could potentially have to go through every possible ASCII character to find out the address of an unknown

sensor, a very tedious task.

The second feature that Tavis employs and recommends be adopted by a future SDI-12 Standard version is a release of the data line by the sensor/datalogger during long measurement processes. This means that the sensor does not issue a service request when it completes a long measurement, allowing the datalogger to move on to another sensor and

Tavis DISI-1200 (address #8). He or she elects to program the sensor to measure the average water level over a 5-minute period, to reduce the effects of the wave action of the stream. Our sensor responds initially with a 5-minute time-out value, and then allows the datalogger to move on to another task (another sensor) while the DISI-1200 performs the measurement. At the end of 5 minutes,

the Tavis sensor **does not** send a service request.

Meanwhile, the datalogger keeps track of the time-out duration while performing other tasks, and comes back to address #8 sometime after 5 minutes and asks for the data with a "aDO!" command as usual. Currently, the SDI-12 Standard only allows the datalogger to stay dedicated to a single sensor

during the entire measurement process.

Try to imagine what some of our users actually go through presently when they have a few different sensors connected to the same datalogger. If each sensor takes a 5 minute measurement, and there are 6 sensors on the datalogger, then by the time data from the last sensor is taken, 30 minutes have elapsed since taking data from the first sensor! Measurement conditions may have changed greatly, and any correlation between the sensors may be

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another task. Tavis allows this to happen when the user programs one of our DISI sensors to compute an average pressure/water level over an extended period of time. When the measurement is complete, no service request is sent. After all, every sensor must issue an initial time-out value anyway, telling the datalogger when the measurement will be complete.

An example here may help clarify this feature. Suppose a technician is monitoring the water level of a turbulent stream with a

Continued on page 2.

Continued from page 2.

meaningless.

Tavis Corporation feels that the above features would greatly enhance the capabilities of SDI-12 devices. Our customers have also shown a strong desire to make these features standard in all SDI-12 products.

For input on the ideas presented here, feel free to contact:

Martin Kudela
Tavis Corporation
3636 Highway 49 South
Mariposa, CA 95338
(209) 966-2027 phone
(209) 966-4930 fax

Editors Note: As of this writing (September 1994) this proposed change is under review by the SDI-12 Technical Committee. If you have comments on it, please call:

Bill Fletcher (801) 753-2212
Mike Jablonski (801) 752-4200

Accusonic Flowmeter Systems

The Accusonic Division of O.R.E. International, Inc. is a manufacturer of flowmeter systems used in rivers, channels and pipelines.

Over 1,000 Accusonic systems are installed in the field, 140 of them working for the USGS in their surface water (river) monitoring program.

The most popular instrument for this application is the Model 7300 AVM (acoustic velocity meter) which consists of an electronics unit and two (or more) acoustic transducers mounted on the river bank. The system interfaces to a data logger via the SDI-12 interface.

O.R.E. International, Inc. has manufactured acoustic flowmeters for over 20 years. The firm em-

loys 55 people and is headquartered in Falmouth, Massachusetts. O.R.E. has offices in Denver, Houston and in the U.K. An aggressive R&D program is addressing the current and future need for flow measurement at remote sites, wastewater treatment plants, municipal water distribution systems and in hydroelectric plants.

For further information, please contact:

Accusonic Division
O.R.E. International, Inc.
P.O. Box 709
Falmouth, MA 02541
(508) 548-5800 phone
(508) 540-3835 fax

Handar's Model 555F

Handar's latest instrument incorporating SDI-12 interface capability, already field installed, is the model 555F Programmable Transmitter and Data Logger. The 555F offers users VHF/UHF data transmission capability, utilizing the ALERT format, as developed by the NWS for flood warning applications.

Other products manufactured by Handar offering SDI-12 capability are the 560A and 570A

DCP, the all-new 555 line of data acquisition systems, and the 436B series incremental shaft encoders.

A unique and powerful attribute of the SDI-12 design is its "multi-drop" feature. This feature allows users to interface up to 32 SDI-12 Handar shaft encoders on a single SDI-12 bus. An example of this capability being put to good use can be seen at numerous lock and dam sites along our nation's largest rivers. Here, multiple dam gates and their positions are monitored

using the Handar 436B Shaft Encoder. Some dam sites have over 17 shaft encoders interfaced to a single Handar GOES DCP, which then transmits data to the GOES satellite.

For more information, contact:

Joe Allen
Handar, Inc.
1288 Reamwood Ave.
Sunnyvale, CA 94089-2233
(408) 734-9646 ext. 344

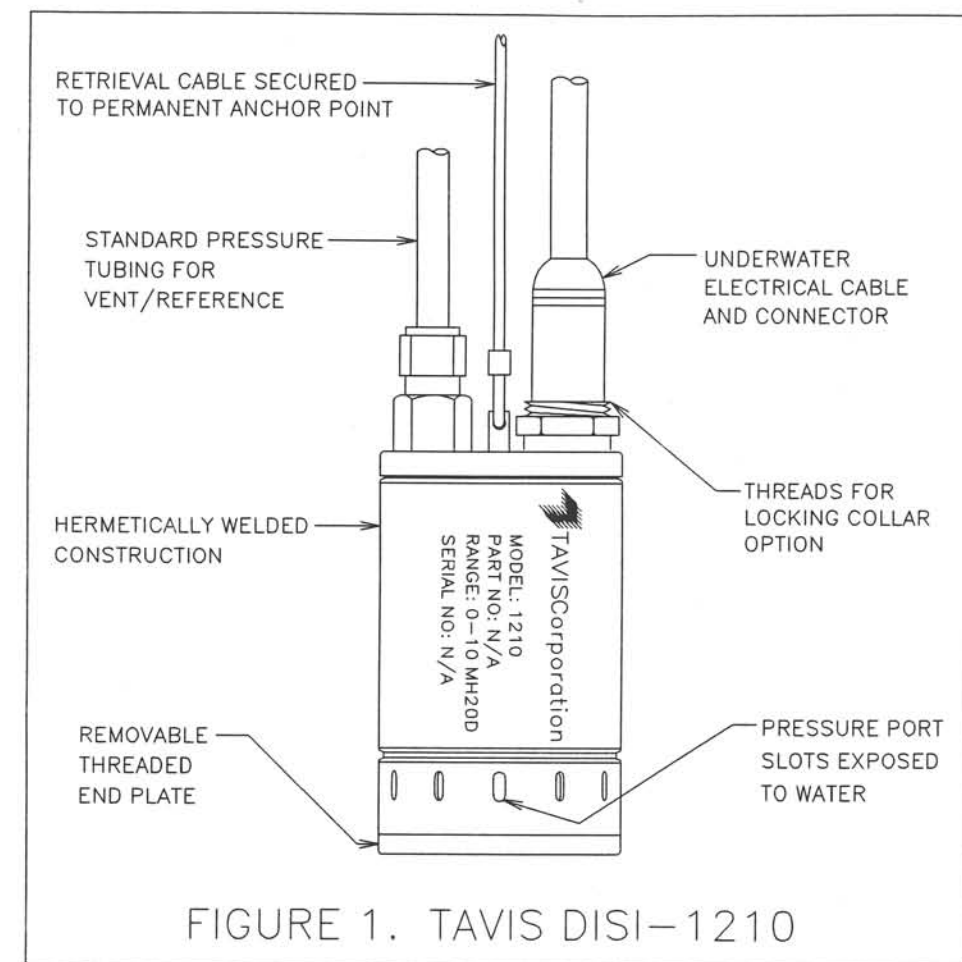
New TAVIS SDI-12 Submersible, Easy Cleaning & Conversion

The Model DISI-1210 submersible water level sensor from Tavis Corporation has been redesigned with unique features not available on other SDI-12 submersible sensors. As a result of our extensive development program, including suggestions from many water monitoring field personnel, the new Tavis design overcomes common problems experienced with submersible sensors.

Due to the variable reluctance sensing and construction techniques employed at Tavis, the DISI-1210 has a reference port completely isolated from its electronics by stainless steel gold-brazed tubing. This allows the vent tube to be completely separate from the electrical cable; expensive and complex vented cabling is not used.

Another unique feature of the DISI-1210 is the **removable end plate** (see Figure 1). The submersible end plate is threaded onto the bottom of the sensor, protecting the sensing diaphragm. This plate can be removed for easy access cleaning (silt, algae, debris) of the diaphragm area.

In addition to removing the standard end plate for cleaning



and inspection, a different end plate can be threaded onto the bottom of the DISI-1210 to convert it from a submersible sensor to one with pressure port fittings (for use as a bubbler-type water level sensor for example). This ported end plate has a 1/8 NPT port, and blocks off the

slotted holes at the base of the sensor to allow for gas pressurization.

For further information contact:
Tavis Corporation
3636 Highway 49 S
Mariposa, CA 95338
(209) 966-2027 phone
(209) 966-4930 fax

Enviro-Systems Ground & Surface Water Specialists

Enviro-Systems, Div. of JGS Enterprises, Inc., Thousand Oaks, Ca., is an electronics systems manufacturer of meteorological and hydrological sensors and systems. Enviro-Systems specializes in groundwater and surface water instrumentation and customized weather stations. We also provide consulting engineering and computer software services.

Specific products developed by Enviro-Systems for this market include:

1. Signal Data Converter, Model SC-800, for conversion of data from various weather or water quality sensors into PC Computer compatible form for storage in the computer or for telemetry to a remote base station computer. Output signals are either RS-232 or SDI-12 compatible.

2. Data Logger, Model DL-800, for storage of converted sensor data in remote locations or

for telemetry to a local base station. A portable data logger, Model DL-800P, can be used for on-site groundwater monitoring.

3. Optical Digital Shaft Encoder, Model SE-105, for precision water level monitoring. Signal output from this micropro-

cessor based encoder is either RS-232 or SDI-12 compatible.

*"Enviro-Systems specializes in
groundwater and surface water
instrumentation and customized
weather stations."*

cessor based encoder is either RS-232 or SDI-12 compatible.

4. Air Temperature and Relative Humidity sensor, Model AT-400RH, for air quality measurements. Signal output from this sensor is 0-5vdc or 4-20 ma. When used with the Signal Data Converter, SDI-12 compatible

output is available.
5. Water and Soil Temperature, Model WT-100, employing polyurethane shielded cables for excellent performance in rugged environmental conditions. When used with the Signal Data Converter, SDI-12 compatible output is available.

6. Computer software for establishing PC Computer links by radio or telephone to remote air and water quality sensors.

Please feel free to call on us if you have any questions or need more information on our products, as well as on your repair and service needs. We appreciate the opportunity to be of

service. For Sales and Service call:

Enviro-Systems
901 W. Mountain St.
Glendale, CA 91202
Gina or Al Ladine
(818) 242-6096 phone
(818) 242-2516 fax

Join Us

If you are interested in joining the SDI-12 Support Group or would like a copy of the SDI-12 Specification, call Lew Ross or Mike Jablonski. See page 8.

Increased Interest in SDI-12

Since September 1, 1993, over 30 companies and two federal agencies have requested copies of the SDI-12 Specification from the SDI-12 Support Group. These

companies do not make SDI-12 compatible products, but are considering the use of SDI-12 in new products.

Mike Jablonski, Secretary

SDI-12 Verifier and the USGS

From the USGS Hydrologic Instrumentation Facility

The USGS has significant experience in the use of SDI-12 products. Over the last few years, we've evaluated more than 30 different sensors and data recorders with the interface and are today using about 4,000 such products in our data networks. In operation, the interface is simple, reliable, and allows users to easily assemble data systems to fit a variety of needs.

Until recently, however, it has not been easy to determine whether an SDI-12 product conforms fully to the standard. While the protocol appears to be

straightforward, much of its success relies on rigorous adherence to subtle features which are not particularly easy to test with standard laboratory instruments. The SDI-12 Verifier, developed by NR Systems, Inc., appears to have solved this problem.

USGS acquired the Verifier late in 1993 and has since used it to retest its family of SDI-12 products. These tests were performed in 10-15 percent of the time of the original tests and, in some cases, turned up problems with the interface that were not previously detected. On reporting them to

the manufacturers, we found that most had discovered the problems themselves using the Verifier and were taking steps to correct them.

USGS is planning to use the Verifier as a standard for determining SDI-12 compliance. We recently contracted with NR Systems to train our staff in its theory of operation and we are currently developing procedures to assure its consistent and proper use.

*Hydrologic Instrumentation Facility
U.S. Geological Survey*

A Note on the Tavis Proposal

Tavis's proposed change means that a sensor would not abort its measurement procedure upon detection of a break. SDI-12 requires that a sensor stop its measurement procedure if a data recorder transmits a break while the sensor is taking its measurement.

This way, if the data recorder issues a break after an M com-

mand but before the sensor has finished taking a measurement, the sensor should abort the measurement procedure. A data recorder can move on to another sensor. The first sensor stops its processing upon receipt of the break.

If the proposed change by Tavis is adopted, then a sensor would be required to continue its processing when a break is detected. This is

because the data logger could issue a break to get another sensor started. Under the proposal by Tavis, however, more than one sensor can be taking measurements at the same time. Requiring a sensor to abort a measurement upon receipt of a break would defeat the intent of the Tavis proposal.

The Editor

FCI's Fiber Optic Chemical Sensors

Over the past year FCI has brought to market a range of new fiber-optic chemical-sensing products which bring a new generation of capabilities to the monitoring of petroleum hydrocarbons in the environment. FCI develops and manufactures fiber optic chemical sensor (FOCS™) which detect and measure pollutants in the air, water and soil. The two systems currently in distribution are aimed primarily at the petrochemical industry for detecting leaks in

above-ground
and below-ground
storage tanks,
and for
monitoring
the

"...new fiber-optic chemical-sensing products which...detect and measure pollutants in the air, water and soil."

remediation of sites. These instruments are the PHA-100 PetroSense® portable analyzer and the CMS-5000 continuous monitoring system.

For real time monitoring of leaks from both underground and above-ground petroleum storage tanks, the FCI Petrosense Continuous Monitoring System, CMS-5000, provides a complete in-situ system incorporating up to 16 individual probes. The probes and the data logger used in the CMS-5000 system are SDI-12 compatible. An optional alarm unit provides audible and visual alarms, and visual system status.

The information and alarm conditions can be accessed either by direct connection to the logger unit or via the built in telephone modem. An autodial feature allows a remote location to be notified whenever the system detects alarm conditions. This system offers sensitivities "dramatically" better than the 0.2 gallons/hr required by the EPA.

The SDI-12 compatible digital hydrocarbon probes are available independent of the CMS-5000

and can be incorporated into systems using other SDI-12 compatible data loggers. The probes respond

to aromatic hydrocarbons and have a linear range of 0-10,000 ppm as BTEX in vapor, and 0-750 ppm as BTEX dissolved in water. There is no response to naturally occurring hydrocarbons such as methane. There is a 95% trend correlation with gas chromatograph data. The fiber optic sensor is reversible so the probe can be used to monitor the results of remediation efforts as well as to monitor for increases in hydrocarbon levels.

FCI Environmental, Inc.
1181 Grier Drive, Bldg. B
Las Vegas, NV 89195-9408
(800) 510-3627 toll free

The SDI-12 Verifier

NR Systems, Inc. completed the SDI-12 Verifier last fall. The Verifier is a tool to help test SDI-12 sensors and data recorders for compliance with the standard. Twenty-five Verifiers have been shipped to companies that make and use the SDI-12 products. Our customers are happy with the Verifier and have saved considerable time using it to test SDI-12 devices.

The Verifier uses an IBM PC or compatible computer to test SDI-12 sensors and data recorders. It interfaces to the SDI-12 bus using the serial port on the PC. The SDI-12 Verifier hardware converts the RS-232 signals from the PC into SDI-12 signals, which lets the PC communicate with SDI-12 sensors and data recorders.

The SDI-12 Verifier uses the hardware in the PC to work with the SDI-12 sensors and data loggers. It interfaces directly with the timer chip in the PC, the 8250 UART, and the interrupt controller chip. By interfacing directly to this hardware, the Verifier generates precise breaks, precise marking periods, and time events on the SDI-12 bus.

For information about the SDI-12 Verifier, please call or write:

NR Systems, Inc.
135 East Center
Logan, Utah 84321
(801) 752-4200 phone
(801) 752-1691 fax

Our Mission

The mission of the SDI-12 Support Group is to:

- Maintain the forward compatibility of all SDI-12 options.
- Minimize the obsolescence of any SDI-12 option.
- Maintain the SDI-12 Specification.
- Contribute to the technical longevity of the SDI-12 architecture.
- Support and educate the environmental monitoring industry on SDI-12.

SDI-12 Support Group Officers

Lew Ross, President/Treasurer
Sutron Corporation
3098 South Highland, Suite 4406
Salt Lake City, Utah 84106
(801) 466-6495 phone
(801) 466-6498 fax

Michael Jablonski, Secretary
NR Systems, Inc.
135 East Center
Logan, Utah 84321
(801) 752-4200 phone
(801) 752-1691 fax

The SDI-12 Support Group is a non-profit corporation in the state of Utah.

SDI-12 Technical Committee

The following people are on the SDI-12 Technical Committee. The purpose of this committee is to review, and vote upon, any proposed changes to the SDI-12 Specification. All SDI-12 Support Group members, however, are invited to submit ideas on how to improve SDI-12 or how to better describe SDI-12 in the SDI-12 Specification. Comments are welcome at any time.

Bill Fletcher, chairman (Design Analysis Associates, Inc.)
Rick Billings (USGS)
Gerald Calhoun (Sutron)
Mike Jablonski (NR Systems)
Rick Lockyer (Handar)
Joe Thurston (Campbell Scientific)