

## **SDI-12 Technical Committee Meeting 11/16/98**

The meeting was held in concurrence with the AWRA conference in Point Clear, Alabama.

Technical Committee Members present:

Jerry Calhoun, Sutron  
Paul-Emile Bergeron, Environment Canada  
Mike Jablonski, NR Systems  
Roy Johnson, USGS  
Rick Lockyer, Handar  
Joe Thurston, Campbell Scientific

Also in attendance were:

Alan Ballweg, Adcon Telemetry  
Boyd Bringhurst, Campbell Scientific  
Albrecht Dorr, Ott Hydrometry  
Jan Matthews, Druck

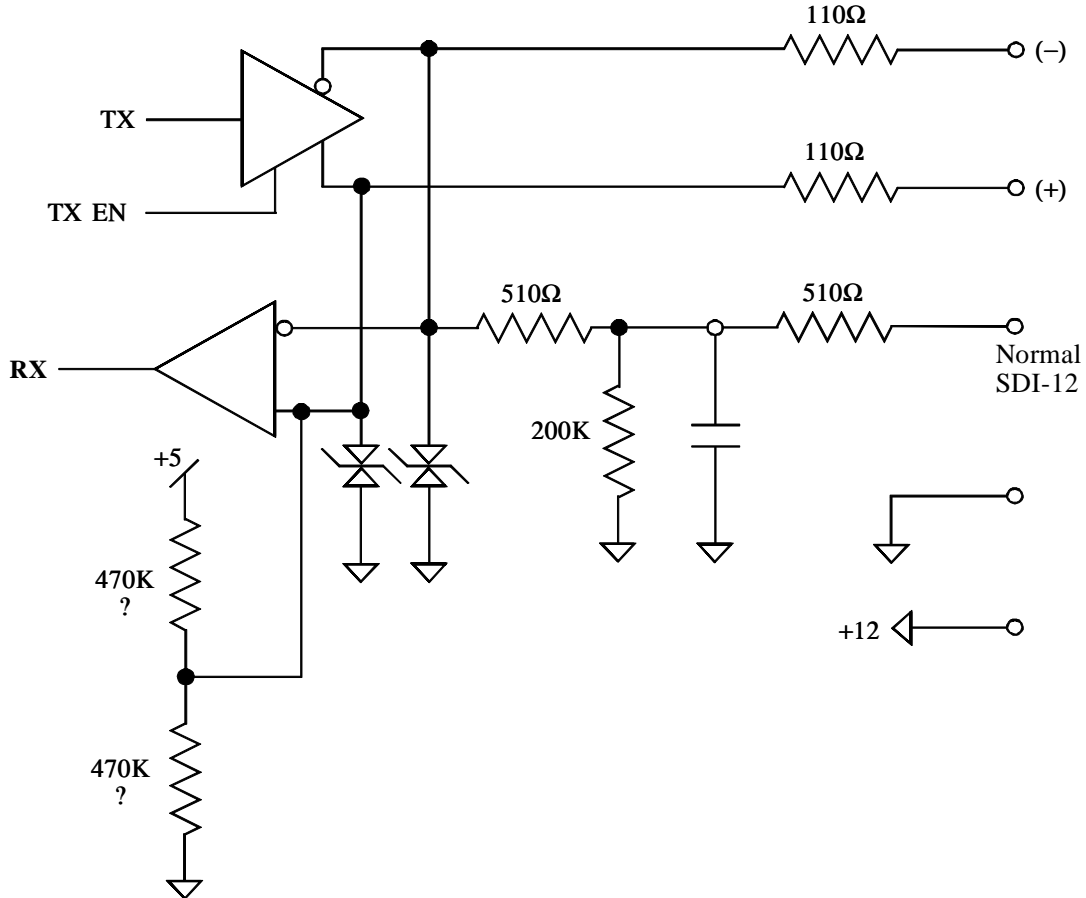
### **CRC-16**

A discussion was held on implementing the specifics of the CRC-16 Error Checking Scheme that was presented in the newsletter. There was a question as to whether the CRC should be transmitted as a two byte binary value or as three byte printable ASCII. After it was pointed out the possible difficulty for some manufacturers to transmit Even Parity 7-bit SDI-12 messages and an 8-bit no parity CRCs, it was decided that the three byte printable ASCII transmission was best. For CRC calculation it was decided that the CRC calculation would have the least significant bit of the address character be the highest order term of the originating polynomial. The remainder would be initialized to zero. The CRC would be calculated on the 8 bit character values before parity was added. The CRC calculation would not include the <CR><LF> sequence. And the generating polynomial would be the ANSI polynomial ( $X^{16}+X^{15}+X^2+1$ ).

The discussion then moved on to the question of whether the CRC request for data was initiated via a lower case Send Data command or whether it was requested by a new command. There were concerns about creating new commands that were lower case and there were concerns about the time required for a sensor to compute the CRC-16. It was decided that new measurement commands were best. This ensures that the sensor does not have to compute a CRC-16 on the fly and can include the CRC-16 calculation time in the reported measurement time. To ensure maximum compatibility with existing sensors, the measurement commands with CRC-16 requested utilize the existing command letters with a C appended. Namely: aMC!, aMC1! ... aMC9!, aCC!, aCC1! ... aCC9!, and aRC0! ... aRC9!

### Differential SDI-12

The question of possible support for differential SDI-12 to support longer data lines was reviewed. The question was whether differential support could be added in a manner that also supported conventional single ended SDI-12 in the same unit and would allow intermixing the two types in the same system. The following topology was suggested as a solution. This topology will be evaluated before being proposed as a specification amendment.



Alan Ballweg, of Adcon Telemetry, expressed a strong concern that the differential SDI-12 circuit be subjected to rigid field testing prior to recommending its use to the membership of the SDI-12 Support Group.

### Data line "OFF" impedance

The data line off impedance in version 1.2 is specified as 200K + 10% by virtue of not having an explicit tolerance or range of values called out. It was decided that this was unnecessarily restrictive and that the specification should be changed to an explicit range of values. It was decided to submit a proposal to change the off impedance from the 200K with the implied 10% tolerance to an explicit range of 160K to 360K ohms.

### ***Inductive loading and recommended connection to 12V***

It was decided that the 1st sentence of the 2nd paragraph of section 3.3 should be changed to:

For sensors connected to the 12-volt line that exhibit an inductive load, a series diode is recommended. See Appendix A for suggested circuit. The diagram in appendix A would be updated to show a series diode in the 12-volt line connection.

### ***Low-power standby mode***

Due to confusion by some manufacturers, it was decided that a clarification should be added to Section 5 of the specification. The clarification would be the following note.

Note: The low-power standby mode, in addition to being a power consumption state, is a protocol state and a break is required to leave that state.

### ***Wireless***

The subject of wireless SDI-12 was revisited. It was concluded that SDI-12's timing constraints preclude having a transparent SDI-12 wireless link. It was noted that one company sells an SDI-12 wireless radio system. Representatives of the company made a presentation and presented their product. It is not a transparent wireless link. Configuration commands, and commands that give instantaneous responses are not supported across the link. The link supports the start measurement and send data in response to start measurement command. The link adds an overhead time of 7 seconds to the required measurement time reported to the data recorder. The system does give the appearance of wireless SDI-12 in applications that requires only the use of the Start Measurement and Send Data commands.

It was decided that without a transparent mode that a wireless SDI-12 is not feasible.

### ***Conclusions***

It was agreed that the above changes would be formally described, as if they were part of the SDI-12 Specification, and presented to the membership for a vote. Upon a two-thirds approval of each item, as required by the Bylaws of the Group, each approved item would be added to the SDI-12 Specification. A means for a differential SDI-12, however, will not be proposed as a formal addition to the specification at this time.

### ***Motions That Were Made at the Meeting (summary):***

1) Motion to adopt a CRC, using:

a) new commands MC,CC,RC;

b) a CRC in a 3 byte, ASCII format, placed before the <CR><LF>, using the ANSI polynomial ( $X^{16}+X^{15}+X^2+1$ );

- c) maximum number of characters that can be returned in a response to a command increases by three;
- d) a pseudo code example will be used to demonstrate how the CRC is calculated.

Motion made by Jerry Calhoun and seconded by Joe Thurston; it passed unanimously.

- 2) Motion to change the data line off impedance to an explicit range of 160K to 360K ohms.

Motion made by Rick Lockyer and seconded by Jerry Calhoun; it passed unanimously.

- 3) Motion to change the 1st sentence of the 2nd paragraph of section 3.3 to:

"For sensors connected to the 12-volt line that exhibit an induction load, a series diode is recommended. See Appendix A for a suggested circuit."

The diagram in appendix A will be updated to show a series diode in the 12-volt line connection.

Motion made by Jerry Calhoun and seconded by Rick Lockyer; it passed unanimously.

- 4) Motion to clarify the definition of low-power standby mode by adding this text to the specification:

"Note: the low-power standby mode, in addition to being a power consumption state, is a protocol state and a break is required for a sensor to leave that state".

Motion made by Joe Thurston and seconded by Jerry Calhoun; Joe and Jerry voted in favor of the motion, all others abstained from voting. The motion carried.

### ***Technical Committee Members***

At the start of the meeting it was reported that Terrell Fletcher, of Design Analysis Associates, Inc., no longer wishes to serve on the technical committee. Albrecht Dorr, Ott Hydrometry, and Jan Matthews, Druck, Inc. were added to the technical committee, subject to the approval of the SDI-12 Support Group. This brings the membership of the SDI-12 Support Group's Technical Committee to ten members. (By ballot on the summer 1997 newsletter, the maximum size of the Technical Committee was increased from nine to ten members.) The intention in 1997 was to increase the size of the Technical Committee to 12 members. By mistake, however, the number 10 (not 12) appeared on the actual ballot that went out to the membership in 1997. The Technical Committee agreed that because 10 was on the ballot that the committee must be limited to 10 until the membership approves increasing the size of the committee.

Albrecht and Jan attended this meeting of the technical committee and participated in all discussions--they did not, however, vote on any motions made during the meeting.

## **SDI-12 Support Group, General Meeting 11/17/98**

The meeting was held in concurrence with the AWRA conference in Point Clear, Alabama.

### SDI-12 Support Group Members Present

Mike Jablonski, NR Systems  
Jerry Calhoun, Sutron  
Alan Ballweg, Adcon Telemetry  
Evan Gilbert, Adcon Telemetry  
Boyd Bringhurst, Campbell Scientific  
Paul-Emile Bergeron, Environment Canada  
Rick Lockyer, Handar  
Jan Matthews, Druck  
William Thomas, Amass Data  
Albrecht Dorr, Ott Hydrometry

Mike Jablonski chaired the meeting and welcomed all present.

Jerry Calhoun presented a brief summary of the conclusions reached at the Technical Committee meeting which was held the previous day.

Mike Jablonski reported that the Group published two newsletters since the last meeting of the SDI-12 Support Group and that the Group has a web page.

Mike Jablonski reported that the group maintains 501(a) Tax Exempt status with the Internal Revenue Service, as a non-profit corporation in Utah. He also reported the financial status of the group as follows:

\$1,525.00 in cash

no financial liabilities at present, although travel expenses for the Board of Directors to this meeting would be reimbursed by the SDI-12 Support Group

revenues for the past year of \$ 3,120.00, from membership dues

expenses for the past year of \$ 7,131.88, for a deficit of (\$4,011.88)

Mike explained that the deficit was due to the large expense of \$5,250 for the creation and maintenance of the web page, which was paid to Amass Data Technologies, as they designed the web page for the Group. Other expenses included:

FAX/Phone/Copying/Postage/Shipping:	\$ 146.36
Government Filing Fees:	\$ 5.00
Newsletter Production:	\$ 384.00
Travel Expenses (for the 1997 meetings)	\$ 1,346.52

As the next order of business, the Technical Committee, to be comprised of the following people, was approved by the Group:

Jerry Calhoun, Sutron  
Paul-Emile Bergeron, Environment Canada  
Albrecht Dorr, Ott Hydrometry  
Jim Betzhold, South Florida Water Management  
Terry Dickey, Hydrolab  
Mike Jablonski, NR Systems  
Roy Johnson, USGS  
Rick Lockyer, Handar  
Jan Matthews, Druck  
Joe Thurston, Campbell Scientific

Jerry Calhoun agreed to continue in his position of Chair of this group for the upcoming year.

Mike Jablonski was approved to continue as the Chair of the SDI-12 Support Group for the upcoming year. William Thomas was approved to continue as the Secretary/ Treasurer of the Group for the upcoming year.

### ***Other***

Paul-Emile Bergeron, of Environment Canada, suggested that some users would appreciate manufacturers adding a dump settings command to their sensors. The format of the command would be: aSn?! Where a is the address and n is a number. The manufacture would start at 1 and for each number return the setting value followed by text indicating what the value represents. Once n exceeds the number of settings in the unit, the unit would return nothing, nothing being indicated by only the address followed by a <CR><LF>. For example, for aS1?! A shaft encoder might return a+1.5 feet per rev<CR><LF> meaning that it had been setup to support an 18" wheel. Paul said the he would write a description of this for review by the Technical Committee. It was decided that a written proposal for this feature was necessary before taking further action on this subject.

Alan Ballweg, Adcon Telemetry, asked if he could join the Technical Committee. All present were in favor of this. It was noted, however, that all ten positions on the Committee are filled. It was agreed that he could be added to the Committee subject to the approval of the membership increasing the size of the Technical Committee.