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Engineering Note

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Project: D0 Tracking Electronics
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Subject: Reading the Sequencer Finisar Temps from 1553

1. Finisar Application Note AN-2010

Before proceeding it would be helpful to have Application Note 2010, an application note from Finisar, the company that makes the fiber drivers which have the built-in temperature reading. It can be obtained from: D0server6\projects\electronics\datasheets\AN2010.pdf.

Pages 1 and 2 give an overview of the link that provides us with the status of the device.

Page 6 says: "The first cycle sends the request to the module and the second retrieves the response." You'll see we do that below.

Page 9 shows that the request code is "36" (which is 24 hex) to get the temperature from the TX (Transmitter)

2. Excerpt from the SVX Sequencer operation manual

Below is the portion of the Sequencer manual that shows how to communicate with the Finisar. Further below I will show step-by-step the sequence of 1553 reads/writes to get the temperature.

4.4 Fiber Driver Status Link

The Finisar optical fiber drivers have a serial status link to view parameters such as temperature and optical power output. All four drivers are connected into this one status link viewable by communicating with subaddress 18. The bit definitions are in table 5.

Bit	Signal
0	**Serial bit into optical driver**
1	**Serial bit from optical driver**
2	**SCLK enable bit**
3	**READY bit from optical driver**
4	**CS to top optical driver**
5	**CS to second optical driver**
6	**CS to third optical driver**
7	**CS to bottom optical driver**

Table 5. Bit assignment for optical driver diagnostic register.

The host procedure is to read the register for READY low. Then the host writes one CS high; none will be enabled if more than one is chosen. The host then reads the register for READY high. If READY is low, drive CS low and retry. Host sends 8 writes, sending a probe-code as described in Finisar application note AN-2010; each write must have the CS line high and the SCLK line high. The host then writes 0 to disable CS, then writes the CS high again, along with SCLK enable. Read the register nine times to get the data encoded on bit 1. The last eight reads has the hex value returned from the Finisar. Write all zeroes when finished. Note that codes in AN-2010 are in decimal and values returned from the Finisar are in hex, MSB first.

3. Step by step instructions

Sequence of 1553 reads/writes: (all reads and writes are done to subaddress 18 (hex 12))

0) Reset both halves of the Sequencer, bit D07 high of subaddress 9

1) Read subaddress 18 for bit D3 to be low.

2) Write 0x10 (bit D4 high) (in this example we communicate with the TOP optical driver)

3) Read for bit D3 to be high.

4) Write 0x14 (bits high are CS-top and SCLK enable) and bit 0 is zero because it's the first bit in code 36 which is 24 hex which is 00100100 binary

5) Write 0x14 (bits high are CS-top and SCLK enable) and bit 0 is zero because it's the second bit in code 36 which is 24 hex which is 00100100 binary

6) Write 0x15 (bits high are CS-top and SCLK enable) and bit 0 is one because it's the third bit in code 36 which is 24 hex which is 00100100 binary

7) Write 0x14 (bits high are CS-top and SCLK enable) and bit 0 is zero because it's the fourth bit in code 36 which is 24 hex which is 00100100 binary

8) Write 0x14 (bits high are CS-top and SCLK enable) and bit 0 is zero because it's the fifth bit in code 36 which is 24 hex which is 00100100 binary

9) Write 0x15 (bits high are CS-top and SCLK enable) and bit 0 is one because it's the sixth bit in code 36 which is 24 hex which is 00100100 binary

10) Write 0x14 (bits high are CS-top and SCLK enable) and bit 0 is zero because it's the seventh bit in code 36 which is 24 hex which is 00100100 binary

11) Write 0x14 (bits high are CS-top and SCLK enable) and bit 0 is zero because it's the eighth bit in code 36 which is 24 hex which is 00100100 binary

12) Write 0x00 To stop the "request" portion of the transaction

13) Write 0x14 To begin the "response" portion of the transaction

14) Read subaddress 18 Do not record this number

15) Read subaddress 18 Record bit D1 as the MSB of the response

16) Read subaddress 18 Record bit D1 as the next bit of the response

17) Read subaddress 18 Record bit D1 as the next bit of the response

18) Read subaddress 18 Record bit D1 as the next bit of the response

19) Read subaddress 18 Record bit D1 as the next bit of the response

20) Read subaddress 18 Record bit D1 as the next bit of the response

21) Read subaddress 18 Record bit D1 as the next bit of the response

21) Read subaddress 18 Record bit D1 as the LSB of the response

22) Write 0x00 To stop the "response" portion of the transaction

23) Read for bit D3 to be low

To get the temperature in Celcius:

1) Assemble the last eight bits just read into a hex number and convert to decimal

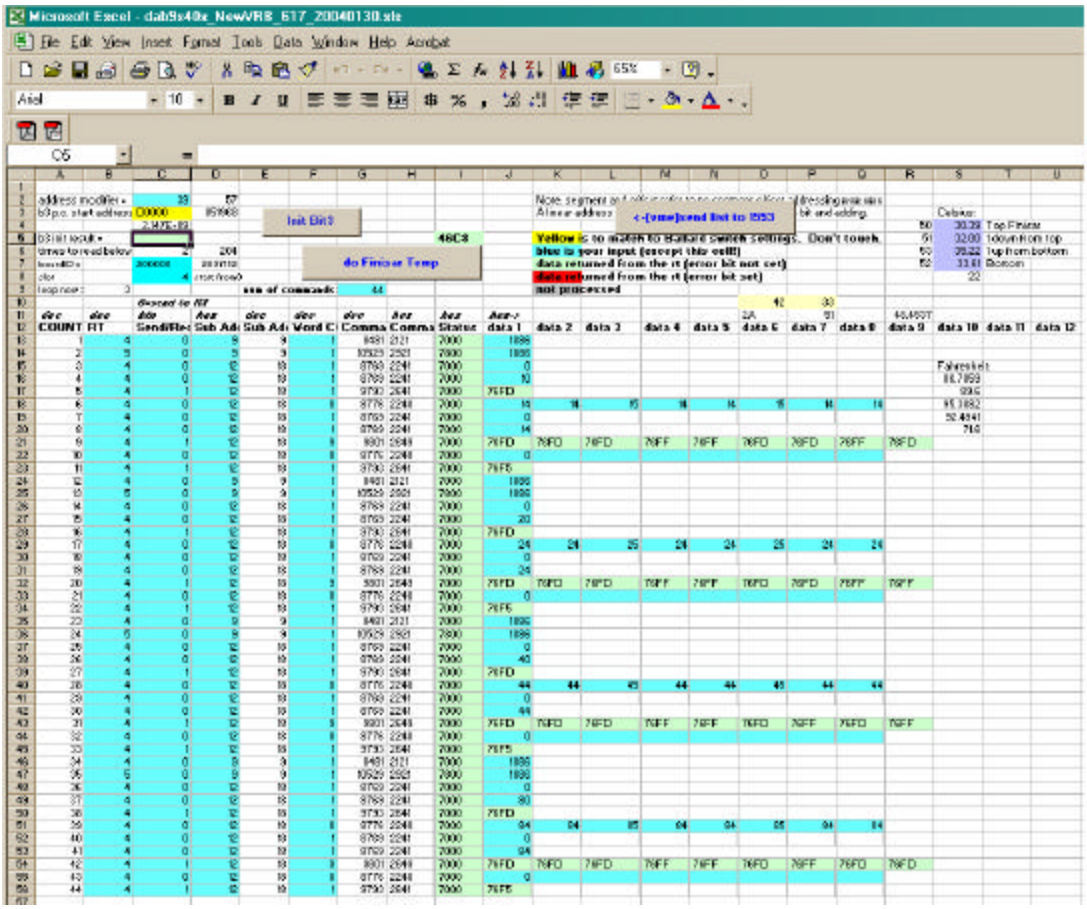
2) Apply temperature conversion formula A from page 14 of AN-2010 ===> TEMP[C] = Decimal Temp * 1.607843 – 50.

4. Spreadsheet Example

Be aware that a spreadsheet exists which shows this procedure. It is at:

d0server6\projects\electronics\spreadsheets\dab9x40x_NewVRB_617_20040130.xls

The sheet which reads the temperatures is shown below.



This spreadsheet shows the exact writes and reads to a Sequencer to read out the four Finisar temperatures.

In this spreadsheet, go to the sheet named FinisarTemp

Note that:

- RT4 handles both halves of the Sequencer, all four Finisars.

- When resetting subaddress 9 the reset bit is D07, the other bits are preserved from what was in the register.

- Observe the different columns: decimal RT, 0=write, 1=read, hex subaddress, word count, etc.

- Blue cells indicate writes, green cells indicate reads.

- All four Finisars are massaged similarly; only bit D4, D5, D6, or D7 is written high to determine which Finisar is controlled.

During reads such as in row 21, 76FD has bit D1 as low, 76FF has bit D1 as high. Bit D1 is the readback data bit.

The last eight reads of row 21 produced the binary 0011 0010 this is 32 hex which is 50 decimal 50 appears in cell R4. Cell S4 applies the formula "=(1.607843*R4)-50" which is the celcius temperature 30.39

The last eight reads of row 32 produced the binary 0011 0011 this is 33 hex which is 51 decimal 51 appears in cell R5. Cell S5 applies the formula "=(1.607843*R5)-50" which is the celcius temperature 32.00

The last eight reads of row 43 produced the binary 0011 0101 this is 35 hex which is 53 decimal 53 appears in cell R6. Cell S6 applies the formula "=(1.607843*R6)-50" which is the celcius temperature 35.22

The last eight reads of row 54 produced the binary 0011 0100 this is 34 hex which is 52 decimal 52 appears in cell R7. Cell S7 applies the formula "=(1.607843*R7)-50" which is the celcius temperature 33.61