DS1615K/DS1616K Temperature/Data Recorder Evaluation Kit

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DESCRIPTION

The DS1615K and DS1616K are designed to demonstrate, exercise, and control the features of the DS1615 Temperature Recorder or DS1616 Temperature and 3-Input Data Recorder.   In addition, these kits can also be used to program the registers, memory, date, alarm, and trip points of both devices. As shown in Figures 1 and 2, the evaluation board includes a DS1615 or DS1616 integrated circuit, support components, and connectors.   The kit also comes with an RS-232 cable, and two disks containing the documentation and software to operate the kit and design with the DS1615.   The DS1615K may be used in a Windows95 or Windows98 environment.   The kit source code in C++ is available upon request from the factory.
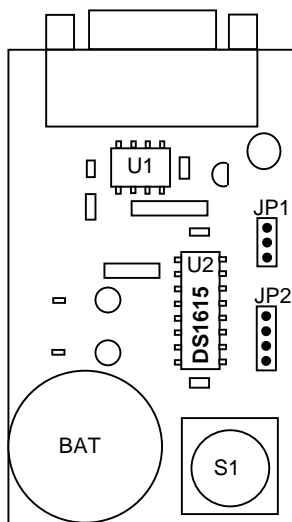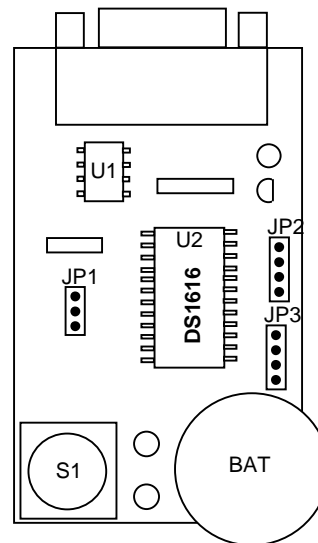
Figure 1. **DS1615 Evaluation Board**   Figure 2. **DS1616 Evaluation Board**

HOST SYSTEM MINIMUM REQUIREMENTS

- Pentium or equivalent
- Microsoft Windows95 or Windows98 operating system
- 3.5" disk drive
- Serial port for interfacing over serial port cable with the evaluation board

052400

INSTALLATION
To install the software included with this evaluation kit, put Disk 1 into the A (or B) disk drive:

1. Click on the "Start" button or press the windows "Start" key on the keyboard.
2. From the "Start" command box choose "Run…".
3. From the "Run…" command box type A:Setup (or B:Setup) and choose "OK." This will start the "Setup Wizard".
4. Press the "Next" button to continue the installation.
5. The "Setup Wizard" will pick the default directory to locate this program as a sub-directory of the "Programs" directory. To use the default click the "Next" button or select a different directory and click the "Next" button.
6. You will then have a chance to review all of the information that you have selected. Click the "Next" button to begin loading files from the disk drive.
7. When requested to do so, replace Disk 1 with Disk 2 and click "OK". This will complete the software installation and will create an icon on your desktop.
8. A screen may appear telling you that one or more .dll files have not self registered. This is not a problem. Your system already contained the required files so the copy we provided was not used. The program will operate correctly with the files already installed on your system. There do seem to be potential problems running the software on systems that have WindowsNT installed as the primary or secondary operating system.

NOTE:
All of the available documentation for the DS1615, and DS1616, the evaluation kits and application note 116 are available on the Dallas Semiconductor web sight at: http:/www.dalsemi.com/DocControl/index.html. The source code is available on Disk 2. All of the latest executable and source code for both kits is available on our ftp sight at: ftp.dalsemi.com/pub/thermal/1615k.

COMMUNICATION WITH PC
In order for the evaluation kit to communicate with your PC, you must connect the evaluation kit board to a free serial port with the included serial port cable. The cable has a standard 9-pin DB9 connector. If your system is equipped with a 25-pin connector, you can purchase a 25-pin to 9-pin adapter at most computer stores.

When the software is run for the first time, a dialog box will request the user to specify which serial port is connected to the evaluation board.

Many laptop PCs do not have the required 5 volt minimum output from the RS-232 port to power the evaluation board and therefore will not communicate with the evaluation kits. With less than 5 volts to power the board, the regulated Vcc level never exceeds the 4 volt threshold for communications. One way around this problem is to disconnect the Vdrive_in circuit from pin 4 of the RS-232 connector which will isolate the Vdrive_In circuit from the RS-232 port of the PC. This signal will normally be used to power the evaluation board. If the Vdrive_In circuit is then connected to the positive terminal of a 9-volt battery or other power supply of greater than 5-volt, the device will work without a problem, as long as the power source is connected prior to initiating any RS-232 communications. If the PC tries to communicate with the board while the power source in not connected or less than 5 volts, the RS-232 driver on the board may latch-up. The power source is only required for communication with the board. All other board functions can be supplied by the 3.6 volt battery on the board itself.

EVALUATION BOARD CONFIGURATION

Configuring the DS1615 or DS1616 evaluation board is simply a matter of choosing which communication method is desired – synchronous or asynchronous. The asynchronous option is internally selected automatically with a pulldown resistor inside the chip itself. The software included with this kit was developed to communicate with the evaluation board over an asynchronous, RS-232 serial port. To select asynchronous communication, pins 2 and 3 on jumper JP1 should be shorted together. To select synchronous communication, short pins 1 and 2 together. When synchronous communication is selected, interfacing with the device is facilitated by the SCLK, I/O, and RST# pins which are available on jumper JP2. The board will require 5-volt power when using the synchronous communications just like when using the RS-232, but there is no ability to steal the power from the incoming signal lines as was done with the RS-232. For this reason, 5 volt must be applied to the board either through pin 4 of the RS-232 connector set to 5 volt or greater, or pin 1 of the 5 volt regulator. Future revisions of the board will have a Vin pin on the J2 header with the 3-wire signal lines. Consult the datasheet for the functionality of these pins.

Table 1: J1 Pin Descriptions

Pin	Signal
1	Asynchronous
2	ComSel pin
3	Synchronous

Table 2: J2 Pin Descriptions

Pin	Signal
1	SCLK – serial clock
2	I/O – input/output
3	RST# - communication reset
4	INT# - Interrupt output

MENU DRIVEN INTERFACE

The evaluation kits includes user-friendly software that provides a simple mechanism for communicating with the DS1615 or DS1616 integrated circuit. This communication is facilitated by a series of menus which are described below.

MAIN MENU

The main menu provides a quick visual display of the data collected by the DS1615 or DS1616 as well as a simple interface for starting and stopping the collection of data. The Icons on the main menu also provide a method to jump to other menus.

Before starting a mission, the memory must be cleared by clicking "Clear Memory" radio button. The Real Time Clock/Calendar and Alarm, Temperature Trip Points, Analog to Digital Converter trip points (DS1616 only), and User memory must be programmed, if desired. Last, but most important, the "Main Menu" options must be selected. On the "Main Menu" screen, the "Sample Rate" and "Start Delay" must be programmed. If rolling over the data when the Data Log memory becomes filled is desired, the "Enable Rollover" radio button must be selected. For the DS1616, the "Channels" must also be selected at this point. The channels will be discussed below.

The main menu provides the method of programming the sample rate and start delay. The sample rate is programmed by writing a value from 1 to 255 in the Data Sample Rate text box. This represents the number of minutes between samples and must be a non-zero number in order to start the mission. The value written to the Start Delay text box determines the number of minutes of delay before the first data sample is taken after the datalog mission has been initiated.

The method of starting a datalog mission is determined by clicking "Pushbutton" or "Serial Command" radio button. If the "Serial Command" option is selected, the mission will commence when the "Begin Mission" button is clicked from the main menu screen. If the "Pushbutton" option is selected, the "Set" radio button must be clicked in order to send the programmed data to the device. The mission will then begin when the pushbutton on the evaluation board is depressed. Note that the pushbutton has a one-half second debounce feature that requires the user to depress the button for one-half second before the mission starts. Clicking the "End Mission" button on the main menu screen stops the mission, but does not clear the data. Once the mission has started, trying to change or write any information to the part will also end the mission, therefore, anything that is to be programmed, must be programmed before initiating the start mission sequence.

The DS1616 has some additional buttons and features that the DS1615 does not have that are used with the 3-inpout Analog to Digital Converter (ADC). The parts of the main screen described above apply to both the DS1615 and DS1616.
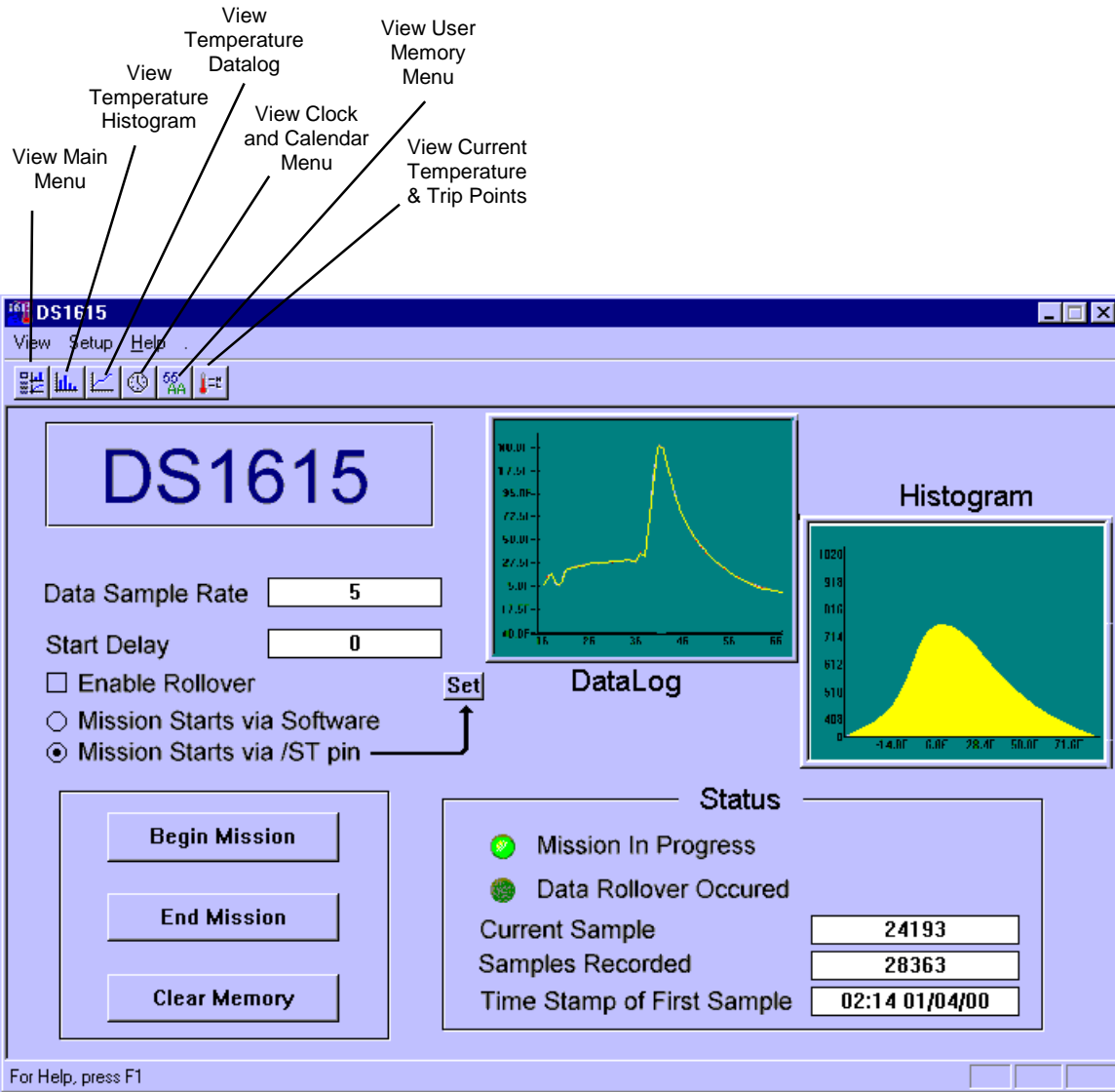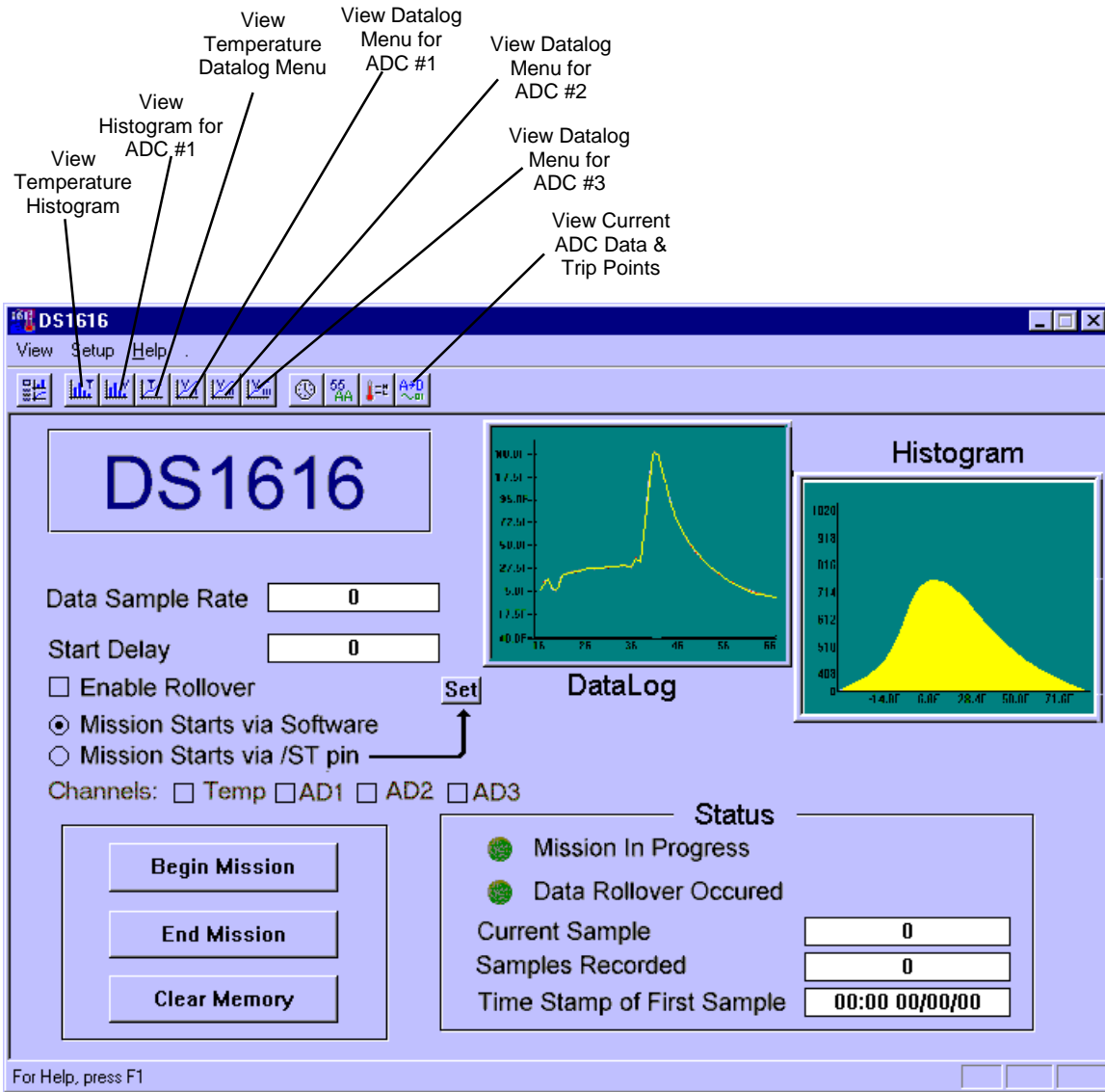
Figure 3: **DS1615K MAIN MENU SCREEN**

Figure 4: **DS1616K MAIN MENU SCREEN**

The DS1616K requires that the "Channels" to be data logged be selected in order to access and set the parameters for those channels and later to view the data collected. This is accomplished by clicking the radio buttons for the appropriate channel, "Temp" for the temperature sensor, "ADC1" for the Analog to Digital Converter channel 1, "ADC2" for the Analog to Digital Converter channel 2, and "ADC3" for the Analog to Digital Converter channel 3. This must be complete prior to starting a mission.

CLOCK AND CALENDAR MENU

The Clock and Calendar Menu provides a simple interface for entering the current time and date. The user can set the time, date, and alarm by simply pressing the Set button next to the appropriate display. When setting the time, date, and alarm, input all information as numeric values. The year should be input as a two digit number. The day of the week should be a value between 1 (Sunday) and 7 (Saturday). The clock and calendar data must be entered before starting a datalog mission.

An alarm indicator is also included on the menu. This indicator illuminates whenever a time/date alarm has been generated that will trigger the alarm to be active.

Figure 5: **DS1615K CLOCK AND CALENDAR MENU**
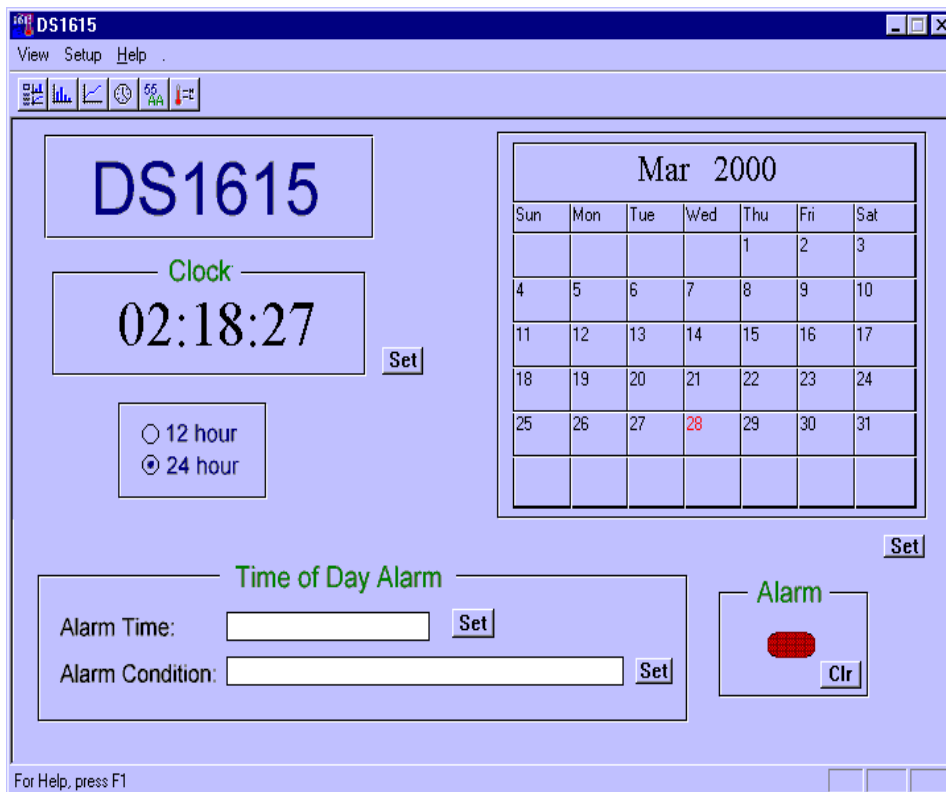
Figure 6: **DS1616K CLOCK AND CALENDAR MENU**
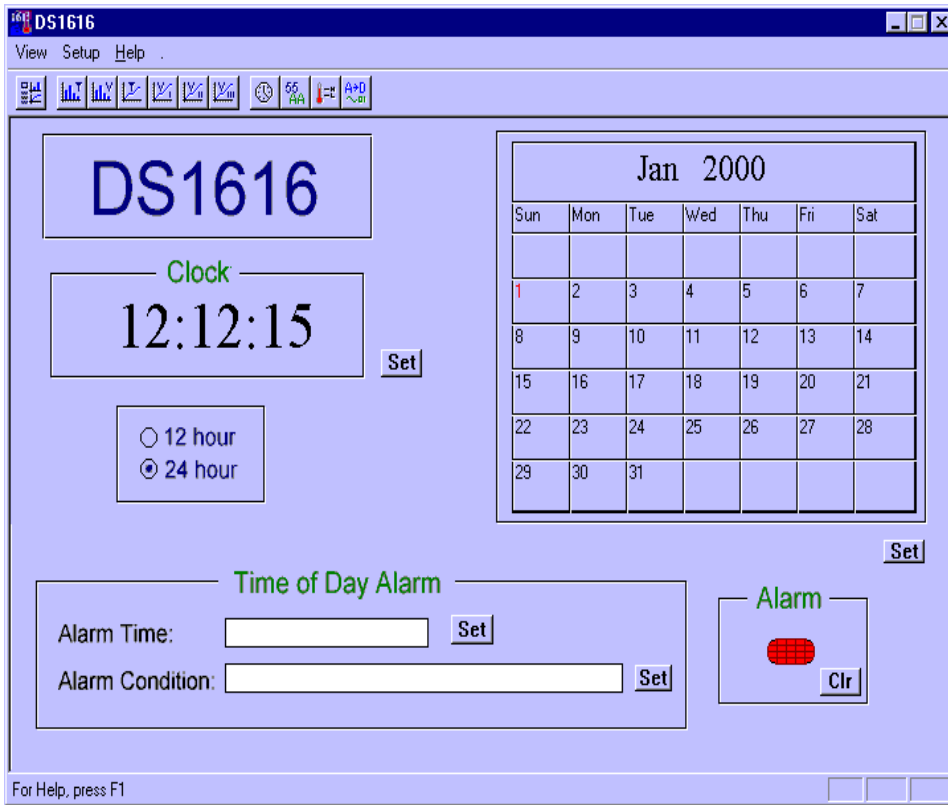
CURRENT TEMPERATURE / THRESHOLD SET MENU

The Current Temperature / Threshold Set Menu allows the user to view the most recently sampled temperature in both Fahrenheit and Celsius and set the temperature alarm thresholds. To set the alarm thresholds, the user simply writes a Celsius value (between –40°C and +85°C in 0.5°C increments) into both the Temperature High and Temperature Low Threshold registers. This needs to be done prior to starting a datalogging mission. If one or more temperature samples are outside of the threshold window set by these registers, the "Temperature Low Flag" or "Temperature High Flag" indicator will be illuminated. Also note that the status of the temperature samples can be obtained by holding the pushbutton on the evaluation board down for one-half second. If the temperature is out of spec, the red LED will flash four times. If the temperature is in spec, the green LED will flash four times.

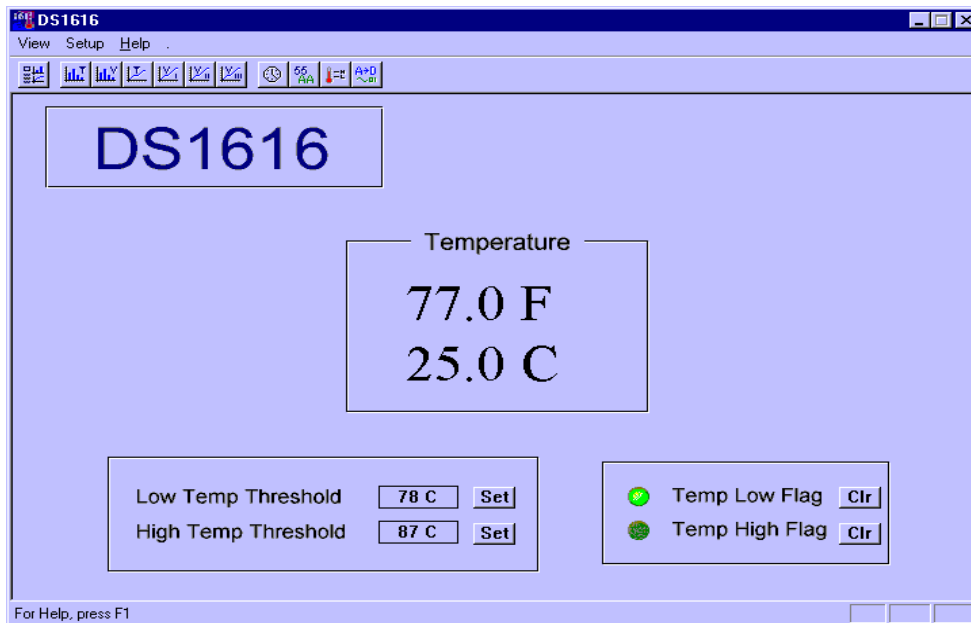Figure 7: **DS1615K CURRENT TEMPERATURE / THRESHOLD MENU**
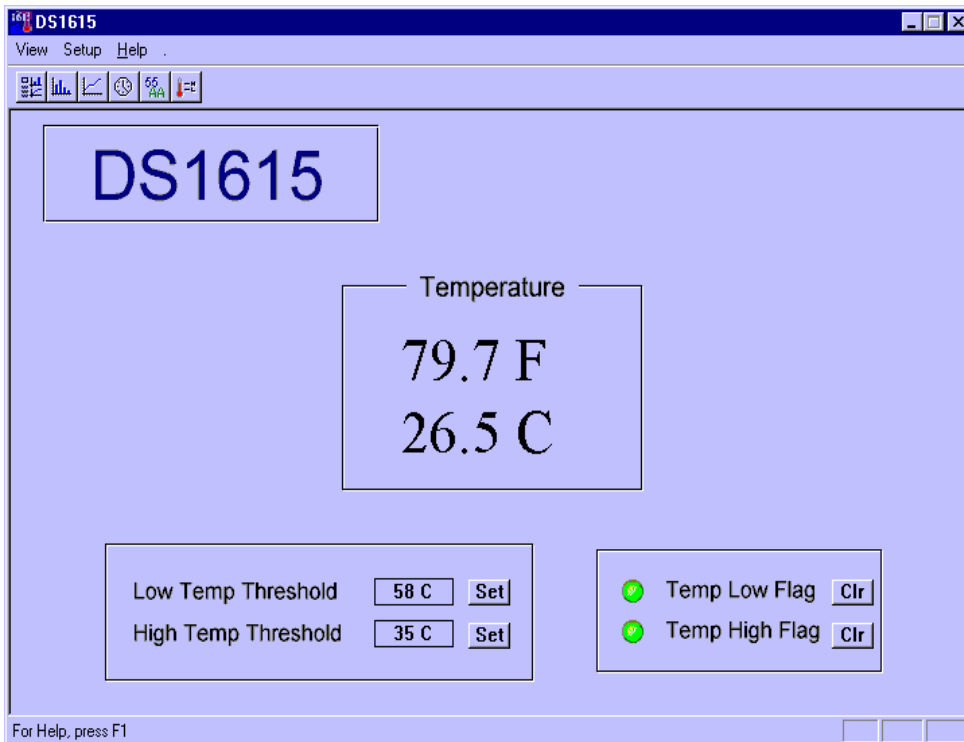
Figure 8: **DS1616K CURRENT TEMPERATURE / THRESHOLD MENU**

CURRENT ANALOG to DIGITAL CONVERTER VALUE / THRESHOLD SET MENU (DS1616 only)

The Current ADC Value/Threshold Menu allows the user to see the most recent values that the ADC channels have obtained. The current voltage thresholds are displayed and can be edited by clicking the Edit button and turning the knobs to the desired threshold level. The High and Low Alarm Flags can also be observed for violations and cleared with the CLR button.

Figure 9: **DS1616K CURRENT ADC VALUES/THRESHOLDS/FLAGS MENU**

Figure 10: **DS1616K ADC THRESHOLD SET MENU**
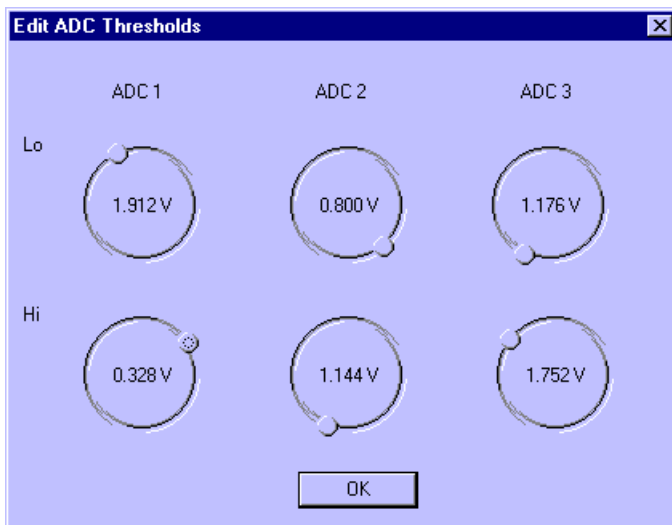
USER MEMORY MENU

The User Memory Menu allows the user to program the nonvolatile user memory or view the RTC memory. The contents of user memory can be cleared to all zeroes by clicking the "Clear" button. Data can be input as a series of hexadecimal or string values by clicking the appropriate pattern button.

The memory data is displayed in three columns of numbers/characters. The first column provides the starting address for eight consecutive bytes of data. The second column displays the hexadecimal values for the eight successive bytes of memory starting at the address indicated in the first column. The third column shows the ASCII equivalent of the data.

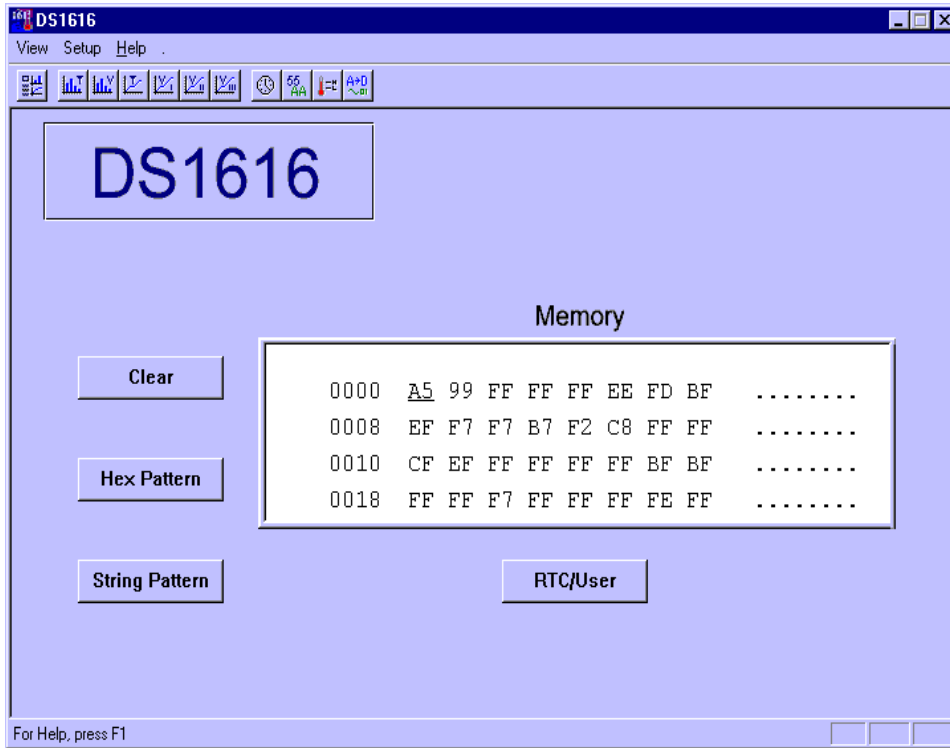Figure 11: **DS1615K USER MEMORY PROGRAMMING MENU**
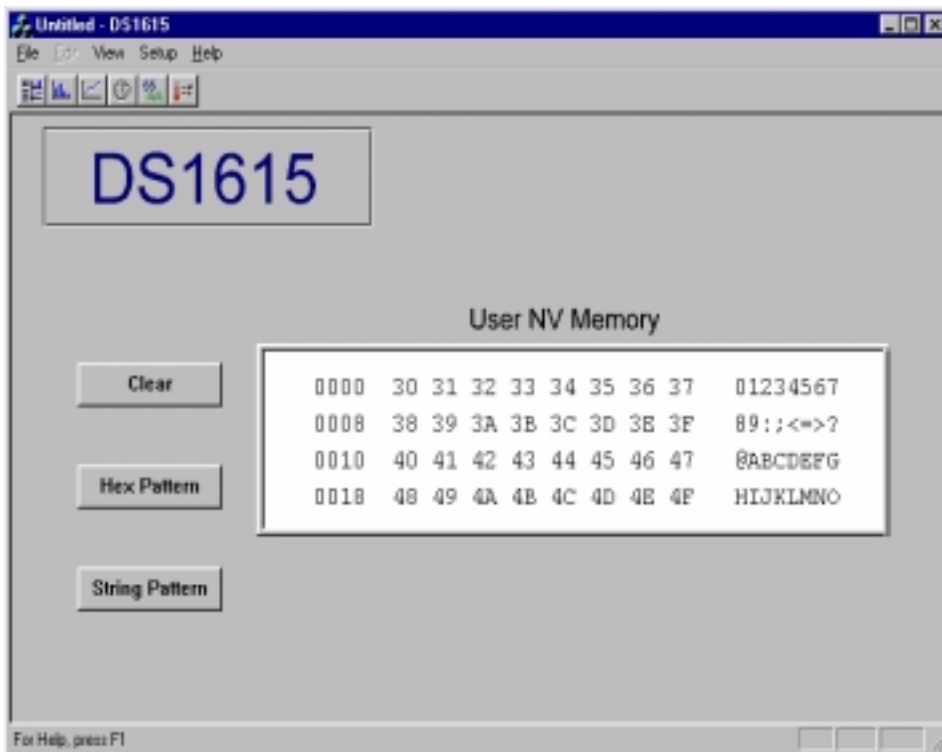
Figure 12: **DS1616K USER MEMORY PROGRAMMING MENU**

DATALOG DISPLAY MENU

The Datalog Display Menu illustrates the collected temperature or voltage data. The resolution of the elapsed time scale (x-axis) and the temperature scale (y-axis) are automatically adjusted. The data can be stored to a file, retrieved from a file, enlarged or condensed and scrolled through for easier viewing.
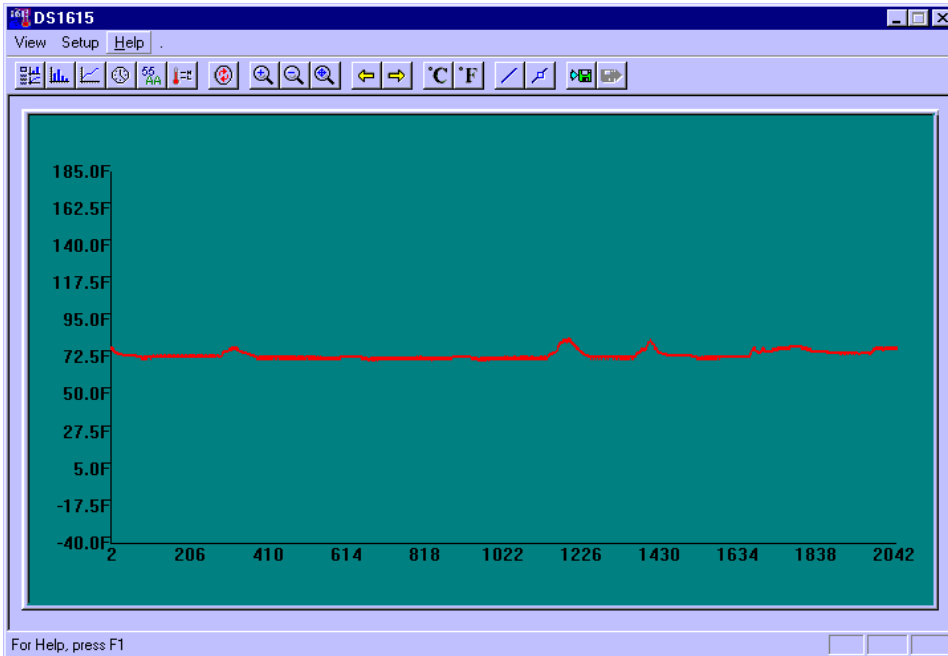
Figure 13: **DS1615K TEMPERATURE DATALOG DISPLAY MENU**
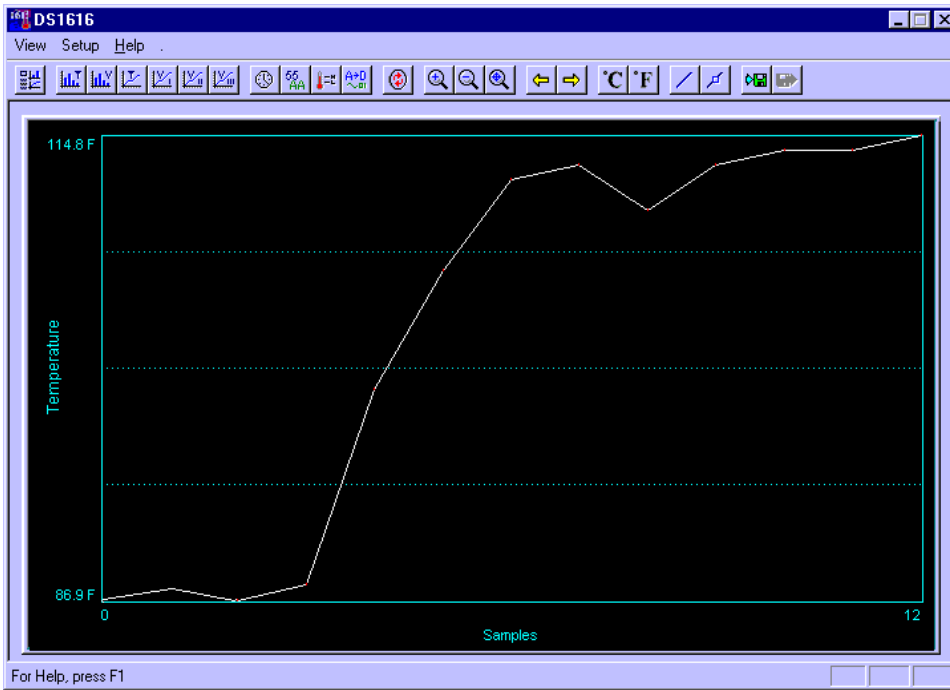
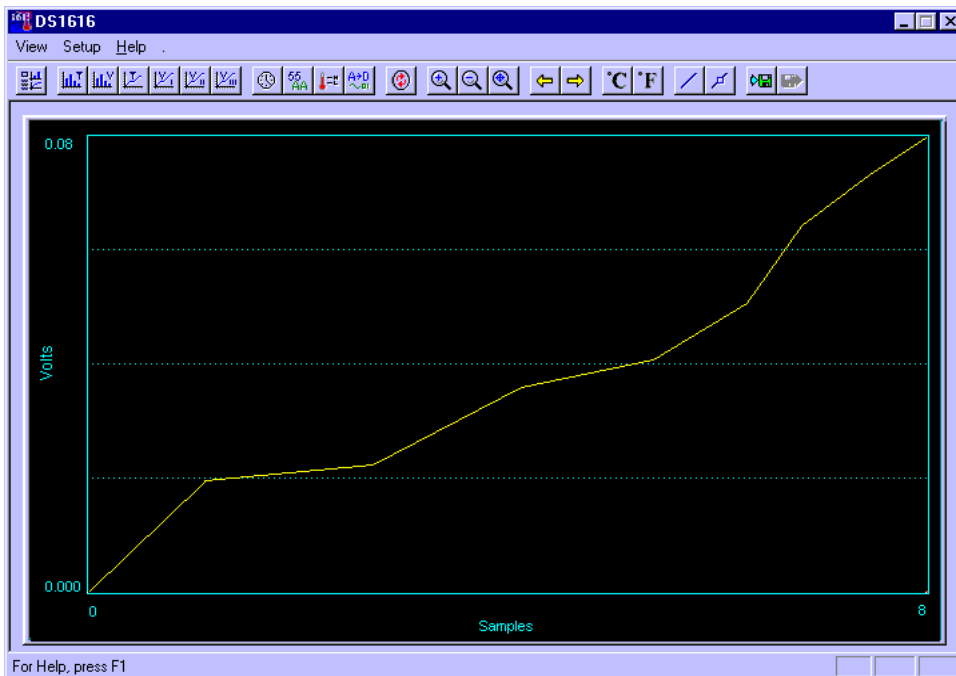Figure 14: **DS1616K TEMPERATURE DATALOG DISPLAY MENU**

Figure 15: **DS1616K ADC VOLTAGE DATALOG DISPLAY MENU**

HISTOGRAM DISPLAY MENU

The Histogram Display Menu illustrates the collected temperature and voltage data in a histogram format. The x-axis displays the various temperatures values that were sampled and the y-axis displays the number of times each specific temperature value was sampled. The resolution of both axes are automatically adjusted. The data can be stored to a file, retrieved from a file, enlarged or condensed and scrolled through for easier viewing.

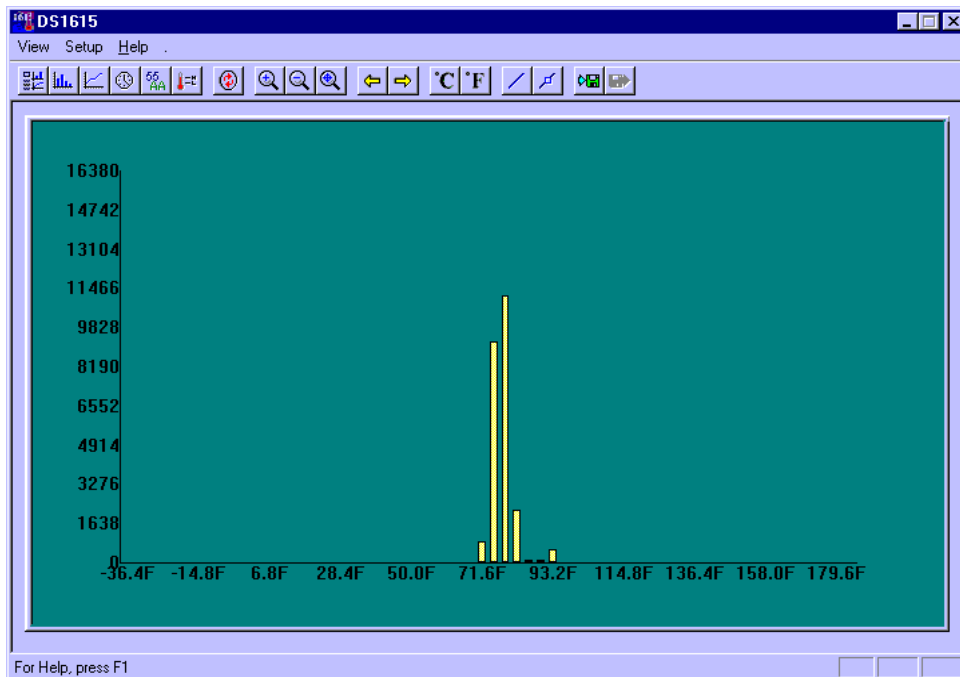Figure 16: **DS1615K TEMPERATURE HISTOGRAM DISPLAY MENU**

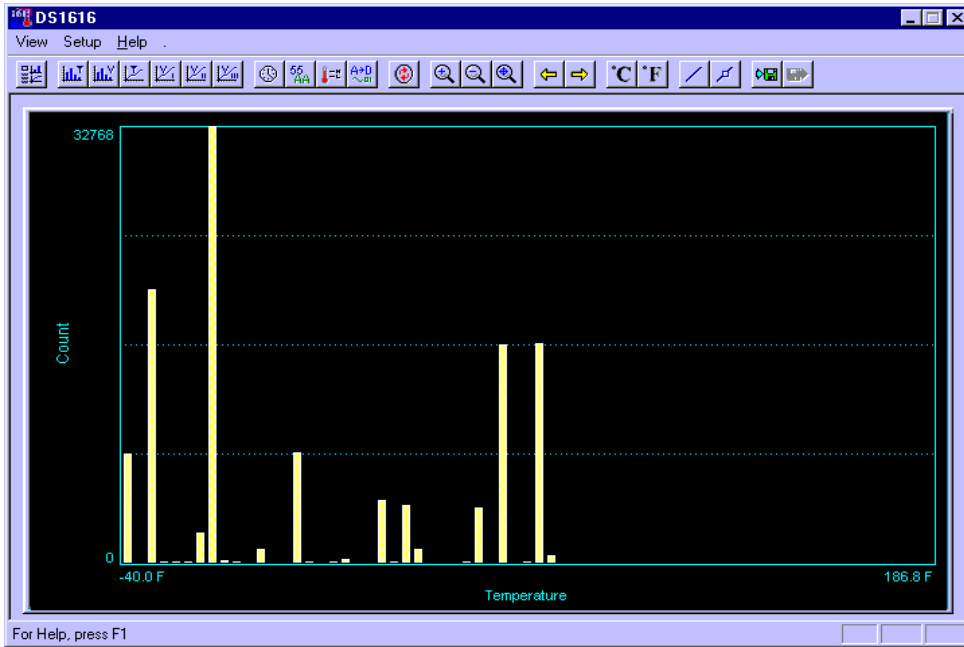Figure 17: **DS1616K TEMPERATURE HISTOGRAM DISPLAY MENU**

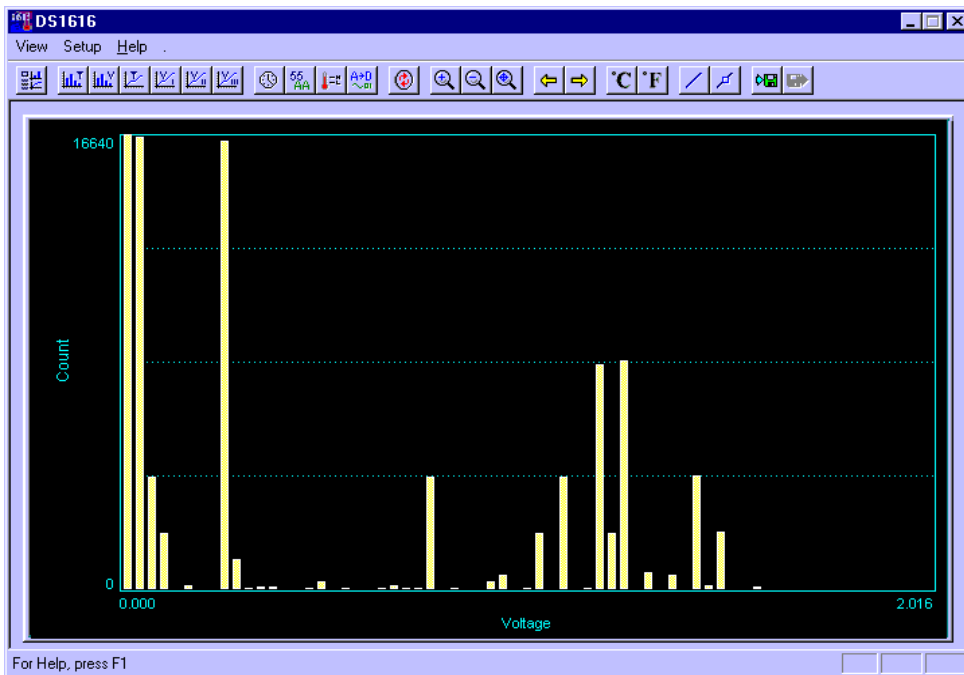Figure 18: **DS1616K ADC CHANNEL 1 VOLTAGE HISTOGRAM DISPLAY MENU**

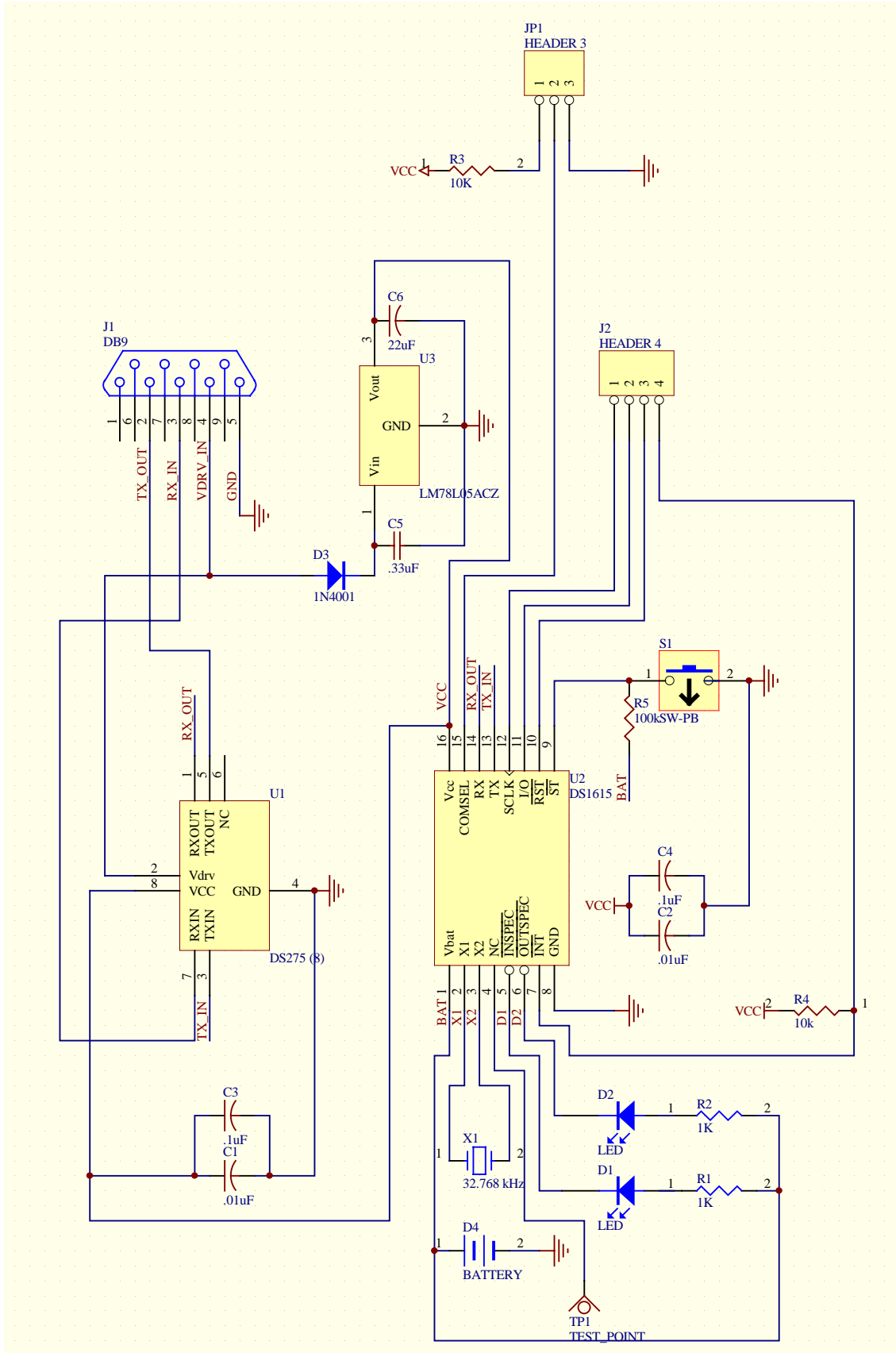# Figure 19: **EVALUATION BOARD SCHEMATIC – DS1615K**
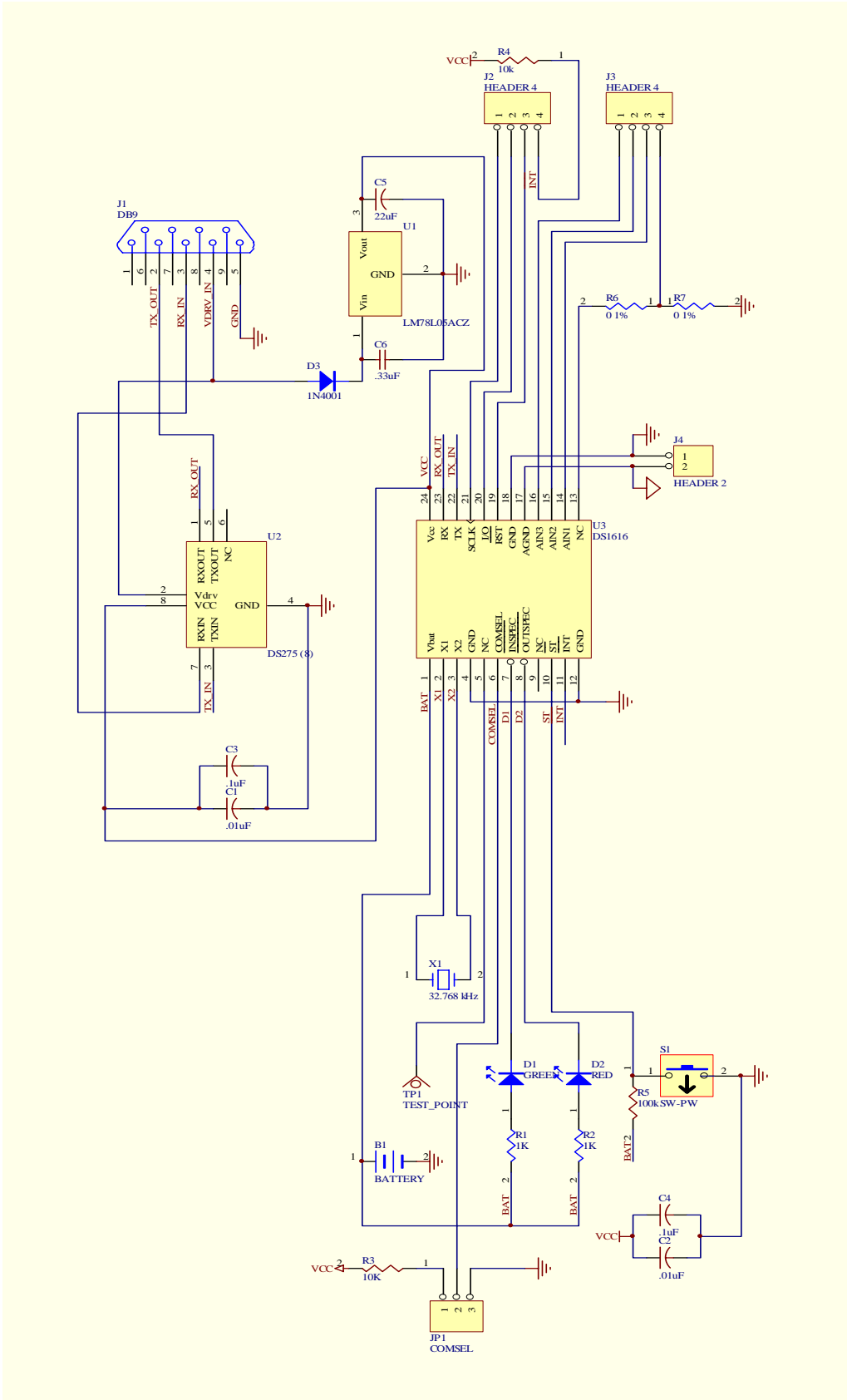
Figure 20: **EVALUATION BOARD SCHEMATIC – DS1616K**

Table 3: **DS1615 AND DS1616 EVALUATION BOARD BOM**

Designator	Part Type	Description
C1	.01 uF	.01 uF 50V Ceramic
C2	.01 uF	.01 uF 50V Ceramic
C3	.1 uF	.1 uF 50V Ceramic
C4	.1 uF	.1 uF 50V Ceramic
R3	10k	10k
R2	1k	1k
R1	1k	1k
D3	1N4001	1N4001 General Diode
C5	0.33 uF	0.33 uF Ceramic
C6	22 uF	22 uF Tantalum
D4	BATTERY	TL-5186 Tadiran Coin Cell Battery [1]
X1	CRYSTAL	C-Type Watch Crystal, Seiko Epson [2]
J1	DB9	DB9 90 degree PCB connector
U2	DS1615	DS1615 Temperature Recorder
U2	DS1616	DS1616 Temperature Recorder
U1	DS275	DS275 Line Powered RS-232 Transceiver
JP1	HEADER 3	3 Pin Header
J2	HEADER 4	4 Pin Header
J3	HEADER 4	4 Pin Header (DS1616K only)
J4	HEADER 2	2 Pin Header (DS1616K only)
D1	LED	Low Current LED (Green)
D2	LED	Low Current LED (Red)
S1	SW-PB	Pushbutton Switch
U3	VOLTREG	L7805 LDO Voltage Regulator[3]

[1] For more details and contact information, see: http://www.tadiranbat.com
[2] For more details and contact information, see: http://www.epson.co.jp/epson/english/device/lineup/crystale.htm
 or consult Dallas Semiconductor's Application Note 58, Crystal Considerations with Dallas Real Time Clocks which is available on our web site. (http://www.dalsemi.com/)
[3] For more details and contact information, see: http://www.two.st.com/stonline/books/index.htm