EI-1050 TEMPERATURE/HUMIDITY PROBE

Electronic Innovations Corporation
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The EI-1050 is a digital relative humidity and temperature probe intended for use with the LabJack U3, U6, UE9, or U12. It combines a single chip sensor module with a selector chip and buffering components on a small PC board. The single chip sensor is manufactured by Sensirion and provides a 14-bit/12-bit (temperature/humidity) serial digital output for each reading. It is housed in a plastic tube (4.5 in by 0.625 in) with a 6 ft cable. The device includes two calibrated microsensors for relative humidity and temperature. Since the output is serial digital data, this results in superior signal quality, a fast response time and insensitivity to external disturbances (EMC). Each sensor is calibrated in a precision humidity chamber and the calibration coefficients are programmed into the OTP memory. These coefficients are used internally during measurements to calibrate the signals from the sensors. The interface to the EI-1050 is a 5-wire connection consisting of supply voltage, ground, clock, data, and enable. By using the enable line multiple probes can be connected to a LabJack at once.

For more information, contact:

Electronic Innovations Corporation (designcircuit.com)
LabJack Corporation (labjack.com)

Specifications:

Relative Humidity Sensor (RH)

Range:	0 to 100 % RH
Accuracy:	±3.5 %
Response time:	4 s
Reproducibility:	±0.1 % RH
Resolution:	0.03 % RH

Temperature Sensor

Range:	-40°C to 120°C
Accuracy:	0.5°C @ 25°C
	0.9°C from 0 to 40°C
Response time:	20 s
Reproducibility:	±0.1 °C
Resolution:	0.01 °C

Operating temperature: -40°C to 120°C

Electrical Data

Supply voltage range: 2.4 to 5.5 V
Input current during measurement: 0.6 mA
Input current standby: 0.12 mA
Cable Interface (LabJack U12 Terminal):

    Power   Red (3.3V for U3/UE9, 5V for U12)
    Ground   Black (GND)
    Data   Green (FIO0 or other for U3/UE9, IO0 for U12)
    Clock   White (FIO1 or other for U3/UE9, IO1 for U12)
    Enable   Brown

More detailed specifications can be found at Sensirion's web page on the SHT11 datasheet:

http://www.sensirion.com/

SPECIAL NOTICE REGARDING EI-1050 CABLE

Although the temperature sensor and associated electronics are rated for 120 degrees C, the cable is only rated for 80 degrees C. We have tested the cable at 120+ degrees C, and have noticed the cable gets soft at the high temperatures but continues to function. When the cable and probe were returned to normal temperatures, no degrading was observed in the cable or probe. Also at the low temperatures, the cable is only rated to -20 degrees C where the sensor and associated electronics are rated lower. Testing the probe with the wire at the lower temperatures showed normal operation and no degrading of the cable when returned to normal temperatures. The user should be aware that even though the probe itself can operate at the rated temperatures, the use of the cable in environments of over 80 degrees C and lower than 20 degrees C is at your own risk.

LabJack UD Series (U3/U6/UE9) Interface:

Red Wire (Power): Since the UD series devices have 3.3 volt digital logic, **the EI-1050 must be powered by 3.3 volts, not by the 5 volt VS terminals**. The simplest way to get 3.3 volts is by using a digital line configured as output-high. An analog output (DAC) can also be used. Note that a single FIO line can only provide enough power for up to 4 probes. An EIO/CIO/MIO line or DAC line can provide power for up to 20 probes. FIO6 is used in the pseudocode below.

Black Wire (Ground): Connect to any GND terminal.

Green Wire (Data): Any digital I/O line can be used. FIO4 is used in the pseudocode below.

White Wire (Clock): Any digital I/O line can be used. FIO5 is used in the pseudocode below.

Brown Wire (Enable): The probe is enabled when this line is pulled to the supply voltage (3.3 volts for UD series devices). The probe is disabled when this line is pulled to ground. This allows multiple probes to be connected to a single device using the same Data and Clock lines, and only a unique Enable line is required for each probe.

If only a single EI-1050 is being used, the Enable line can be left unconnected as there is an internal pull-up resistor to the Power line, but it is recommended that the Enable line be connected to the same terminal as the Power line for continuous enable.

If multiple probes are being used, they are all connected to the same Power/Ground/Data/Clock terminals. The Enable line on each probe is connected to a unique digital output, and all are set to output-low to disable all probes. To get measurements from a particular probe, the Enable line for that probe is set to output-high, readings are taken, and then the Enable line is set back to output-low.

The LabJack UD driver for Windows (V2.48+) has special support for the EI-1050. There is 1 IOType and 4 special channels:

```
LJ_ioSHT_GET_READING
LJ_chSHT_TEMP              // Used with IOType above.
LJ_chSHT_RH               // Used with IOType above.
LJ_chSHT_DATA_CHANNEL     // Used with LJ_ioPUT_CONFIG.
LJ_chSHT_CLOCK_CHANNEL    // Used with LJ_ioPUT_CONFIG.
```

Go to labjack.com for examples. The following pseudocode demonstrates retrieving measurements from a single probe:

```
//Set FIO6 to output-high to provide power to the EI-1050.
ePut (lngHandle, LJ_ioPUT_DIGITAL_BIT, 6, 1, 0);

//Specify the data and clock lines.
ePut (lngHandle, LJ_ioPUT_CONFIG, LJ_chSHT_DATA_CHANNEL, 4, 0);
ePut (lngHandle, LJ_ioPUT_CONFIG, LJ_chSHT_CLOCK_CHANNEL, 5, 0);

//Now, an add/go/get block to execute multiple requests.
//Request a temperature reading from the EI-1050.
AddRequest (lngHandle, LJ_ioSHT_GET_READING, LJ_chSHT_TEMP, 0, 0, 0);

//Request a humidity reading from the EI-1050.
AddRequest (lngHandle, LJ_ioSHT_GET_READING, LJ_chSHT_RH, 0, 0, 0);

//Execute the requests.  Will take about 0.5 seconds with a USB high-high
//or Ethernet connection, and about 1.5 seconds with a normal USB connection.
GoOne (lngHandle);

//Get the temperature reading result.
GetResult (lngHandle, LJ_ioSHT_GET_READING, LJ_chSHT_TEMP, &dblTemperatureKelvin);

//Get the humidity reading result.
GetResult (lngHandle, LJ_ioSHT_GET_READING, LJ_chSHT_RH, &dblHumidityPercent);
```

LabJack U12 Interface:

Multiple EI-1050 probes can be connected to a single LabJack U12 (www.labjack.com). When using multiple probes, the data and clock line from every probe connect to the same LabJack terminals (IO0 and IO1). An individual connection is needed for the enable line on each probe. The enable line is pulled high inside the probe, so the probe is enabled when this line is disconnected (not recommended), connected to +5V, connected to an analog output set to 5.0 volts, connected to a digital input, or connected to a digital output set high. The probe is disabled when the enable line is connected to GND, connected to an analog output set to 0.0 volts, or connected to a digital output set low. This can be accomplished using IO2, IO3, AOx, or Dx, providing multiple enable line connections. The example programs provided by LabJack Corporation, toggle the digital lines between input and output-low to enable and disable the probe (analog outputs are toggled between 0.0 volts and 5.0 volts). When the probe is disabled, it is powered-up, but there is no communication.

There are two example applications available from LabJack Corporation to experiment with the EI-1050 probe(s): LJSHT.exe and LJSHTmulti.exe. These are installed as part of the normal U12 Legacy installation and can be found in the start menu along with LJlogger, LJtest, and others. LJSHT acquires temperature and humidity readings from 1 or 2 probes and displays the information on a chart. LJSHTmulti acquires readings from many probes and displays the current readings in a table.

LabJack U12 drivers V1.10 and later have 3 new functions for communicating with the EI-1050 (and SHT1X sensors in general):

- SHT1X: This is the only function most programmers will use, and retrieves a temperature and/or humidity reading.
- SHTComm: A general function that sends and receives up to 4 bytes to/from a SHT1X sensor. Allows access to advanced features of the sensors.
- SHTCRC: Used with SHTComm. Checks the validity of a returned CRC byte.

For more information on the drivers functions, see the "LabJack U12 User's Guide".

LabJack U12 firmware V1.10 (serial numbers 100012000 and higher, 03/2003) and later has new functions to perform the SHT1X communication at a hardware level, such that one call to the LabJack U12 will send/receive up to 4 bytes of data. When using such hardware communication, it takes about 230 ms to get a 14 bit temperature reading and about 75 ms to get a 12 bit humidity reading. The LabJack U12 is busy during this time and unavailable for other operations.

When the LabJack U12 driver detects a firmware version earlier than V1.10, it reverts to software communication mode, and takes about 2 seconds to get a temperature or humidity reading. The LabJack U12 is busy during this time and unavailable for other operations. Firmware upgrade requires the replacement of a chip (which is socketed, not soldered). Contact LabJack Corporation for more information.