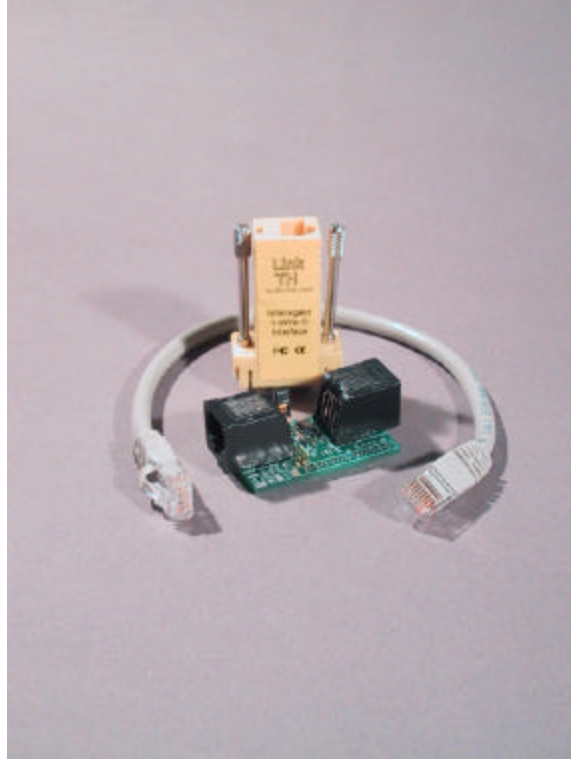


LinkTH

Owners Manual



Software Version 1.0e and higher

Overview:

The LinkTH is an ASCII Temperature and Humidity Interface.

It connects to a standard RS232 DB9 serial interface (COM port)

A minimum hardware set would consist of a LinkTH controller and a MS-T temperature sensor. This hardware set is pictured on the front cover.

The LinkTH controller is based on the standard Link45 hardware platform and is certified for FCC and CE use.

N sensors are supported. There is obviously a limit to how many sensors can be reported in a finite amount of time, however, there is no software restriction on the number of sensors.

Sensors supported:

Snaku 24 channel temperature sensor

TAI8540B combination temperature and humidity sensor (Out of production)

MultiSensor family of sensor boards

MS-T Temperature only

MS-TH ... Temperature and Humidity

MS-TL ... Temperature and Light Level

MS-TV ... Temperature and Analog Voltage (0-5V)

DS18S20 temperature sensor

DS18B20 temperature sensor

Features of the LinkTH are:

AutoReporting ... Report on a timed basis without action from the host.

The period between reports is user specified in 0.1 seconds.

The period has a range of 1-65535 (0.1 seconds to 109.225 minutes)

TOD Clock ... A Time of Day (TOD) Clock is provided.

The TOD clock is adjustable to achieve greater accuracy under field conditions. Note: there is no battery backup for the TOD clock.

If the LinkTH resets or is power cycled, the TOD clock will reset to 00:00:00.0

Persistent Settings ... Many settings are non-volatile.
Examples of persistent settings are:

- Serial baud rate
- Time Stamping on/off
- AutoReporting Period
- AutoReporting on/off

EEPROM User Data ... The LinkTH provides fifteen (15) 16 character EEPROM pages for storage of user information. The data is stored and retrieved in ASCII. Binary data can be stored using ASCII Hex.

ASCII Commands/Reports ... Only ASCII commands are necessary to communicate with and retrieve data from LinkTH.

Remote Access ... LinkTH can be accessed anywhere in the world via telnet.

Any terminal server can be used. The LinkTH is accessible via LAT or Telnet.

The LinkTH can be attached to the Aux port of a Cisco router or switch and be accessed from anywhere with access to that switch/router.

Field Upgradable ... Additional sensors can be added at any time. Issue the inventory command ("I") and the new sensor will be discovered. If AutoReporting is active, the new sensor will be discovered on the next AutoReport cycle.

Embedded Diagnostics ... The LinkTH can produce diagnostic data to assist the factory in troubleshooting.

Installing the LinkTH and Sensors:

The LinkTH attaches to your computer on a serial COM port. Locate an unused COM port and attach the LinkTH to the male DB9 connector.

Connect the sensors to the LinkTH using standard Cat5 cables which may be obtained from Home Depot, Radio Shack, etc.

Note: while the same cable type is used as for Ethernet, do not plug your sensors or the LinkTH into your Ethernet LAN. It simply won't work. It won't break, however, it won't work.

Each iButtonLink Sensor has two RJ45 cable connectors. They are interchangeable. Use one for the One-Wire network coming in, and the other for the One-Wire network leaving.

The LinkTH steals power from the serial port (COM port). The amount of power the serial port supplies may limit the number of sensors you can deploy. If you suspect you are running out of power, a power injector for the network is available from iButtonLink.com

Each sensor has a unique serial number associated with it. It is best to plug your sensors in one at a time and perform an inventory ("I") command. You should document which serial number was just added. Later on, you will probably want to associate the serial number with a physical location in your documentation.

The accompanying software (THmon) will allow you to associate a "friendly name" with the serial number.

Command Descriptions:

A . . . Set AutoReport Period

Supply a decimal number between 1-65535 followed by <Cr>
The units are 0.1 seconds.

Example: A1200 would specify an AutoReport Period of
2 minutes (1200 x 0.1 seconds = 120 seconds)

C . . . Set Time of Day (TOD) Clock

Supply an ASCII string in the form HH:MM:SS.T followed by <Cr>.

HH = Hours (0-23)
MM = Minutes (0-59)
SS = Seconds (0-59)
T = Tenths of Seconds

If only some of the parameters are supplied, the missing parameters
will be set to zero.

Example: c21:45:19.6 sets the TOD clock to 21:45:19.6
c21:45 sets the TOD clock to 21:45:00.0

D . . . Report current Link TH Data

The sensors are converted and the data is reported.

The data report is:

XXXXXXXXXXXXXXXXX ss,ccc.cc,fff.ff,hhh CrLf

XXXXXXXXXXXXXXXXX is the OW serial number of the sensor.

ss is the MultiSensor type

ccc.cc is Temperature in degrees Centigrade (1/32 degree
precision).

fff.fff is Temperature in degrees Fahrenheit (1/32 degree precision)

hhh is Humidity in % Relative Humidity (Only reported for MS-TH sensor)

If TimeStamping is enabled (See S command), the data report will be
followed by the current TOD clock value.

After the last sensor data line has been displayed, a line containing EOD<Cr><Lf> will be transmitted.

Sensor 1 is a 18S20 (Family code 10)

Sensors 4 is a 18B20's (Family code 28)

Sensor 5 is a MS-TH (Family code 26). Note: Humidity is reported in field 4.

Sensor 1,2 and 6-28 are channels on a single Snaku. Note that channel number is field 2, Temp C is field 3 and Temp F is field 4.

TimeStamping Off

1019E6630008001E, 24. 00, 75. 18
3029034510000051, 00, 23. 50, 74. 31
3029034510000051, 01, 23. 50, 74. 31
28EF283F00000007, 24. 31, 75. 75
264043150000000A 19, 23. 31, 73. 96, 39
3029034510000051, 02, 23. 50, 74. 31
3029034510000051, 03, 24. 00, 75. 18
3029034510000051, 04, 24. 50, 76. 09
3029034510000051, 05, 24. 00, 75. 18
3029034510000051, 06, 24. 00, 75. 18
3029034510000051, 07, 24. 00, 75. 18
3029034510000051, 08, 24. 50, 76. 09
3029034510000051, 09, 24. 50, 76. 09
3029034510000051, 10, 24. 50, 76. 09
3029034510000051, 11, 24. 50, 76. 09
3029034510000051, 12, 25. 00, 77. 00
3029034510000051, 13, 25. 00, 77. 00
3029034510000051, 14, 25. 00, 77. 00
3029034510000051, 15, 25. 00, 77. 00
3029034510000051, 16, 25. 50, 77. 90
3029034510000051, 17, 25. 50, 77. 90
3029034510000051, 18, 25. 00, 77. 00
3029034510000051, 19, 25. 00, 77. 00
3029034510000051, 20, 25. 50, 77. 90
3029034510000051, 21, 25. 00, 77. 00
3029034510000051, 22, 24. 50, 76. 09
3029034510000051, 23, 24. 00, 75. 18
3029034510000051, 24, 24. 00, 75. 18
EOD

TimeStamping On

1019E6630008001E, 24. 00, 75. 18, 00: 09: 55. 5
3029034510000051, 00, 23. 50, 74. 31
3029034510000051, 01, 23. 50, 74. 31, 00: 09: 55. 7
28EF283F00000007, 24. 31, 75. 75, 00: 09: 55. 8
264043150000000A 19, 23. 31, 73. 96, 39, 00: 09: 55. 9
3029034510000051, 02, 23. 50, 74. 31, 00: 09: 56. 3
3029034510000051, 03, 23. 50, 74. 31, 00: 09: 56. 7

3029034510000051, 04, 24. 00, 75. 18, 00: 09: 57. 2
3029034510000051, 05, 24. 00, 75. 18, 00: 09: 57. 6
3029034510000051, 06, 24. 00, 75. 18, 00: 09: 58. 0
3029034510000051, 07, 24. 50, 76. 09, 00: 09: 58. 5
3029034510000051, 08, 24. 50, 76. 09, 00: 09: 58. 9
3029034510000051, 09, 24. 50, 76. 09, 00: 09: 59. 4
3029034510000051, 10, 24. 50, 76. 09, 00: 09: 59. 8
3029034510000051, 11, 24. 50, 76. 09, 00: 10: 00. 2
3029034510000051, 12, 24. 50, 76. 09, 00: 10: 00. 7
3029034510000051, 13, 24. 50, 76. 09, 00: 10: 01. 1
3029034510000051, 14, 24. 50, 76. 09, 00: 10: 01. 6
3029034510000051, 15, 24. 50, 76. 09, 00: 10: 02. 0
3029034510000051, 16, 24. 50, 76. 09, 00: 10: 02. 4
3029034510000051, 17, 24. 50, 76. 09, 00: 10: 02. 9
3029034510000051, 18, 25. 00, 77. 00, 00: 10: 03. 4
3029034510000051, 19, 25. 50, 77. 90, 00: 10: 03. 8
3029034510000051, 20, 25. 50, 77. 90, 00: 10: 04. 3
3029034510000051, 21, 25. 50, 77. 90, 00: 10: 04. 7
3029034510000051, 22, 24. 50, 76. 09, 00: 10: 05. 1
3029034510000051, 23, 24. 00, 75. 18, 00: 10: 05. 6
3029034510000051, 24, 24. 00, 75. 18, 00: 10: 06. 0
EOD

d . . . Restore Factory Defaults

All persistent settings are returned to the factory defaults.
LinkTH is then restarted.

E . . . Echo on (P)

Characters received by the LinkTH are echoed back.

e . . . Echo off (P) (D)

Characters received by the LinkTH are not echoed back.

c . . . Adjust TOD clock Faster/Slower (P)

The TOD clock uses a counter of 625,000 ticks per second.
The "c-" command will reduce that value by 10.
The "c+" command will increase that value by 10.

If your Time of Day clock runs slow (loses time), use the c+ command.
Conversely, if your Time of Day clock runs fast (gains time), use the c-
Command to adjust the clock.

h . . . The LinkTH help page is displayed.

```
***** LinkTH Commands *****
A=Set AutoReport Period (P) (D=2 minutes)
B=AutoReport On (P)                b=AutoReport OFF (P)(D)
C=Set TOD Clock (HH:MM SS. T)      c=Adjust TOD clock rate (+-)
D=Report ALL LinkTH data           d=Reset to factory defaults
E=Echo On (P)                      e=Echo Off (P)(D)
  =Report LinkTH Version           h=Help (This command)
I=Report Sensor Inventory          k=Report Sensor Tuning Knob
K=Set Sensor Tuning Knob
R=Report Sensor (0W address)
S=AutoReport Time Stamp On (P)     s=AutoReport Time Stamp Off (P)(D)
T=Report Time of Day
W=Write LinkTH EEPROM page         w=Report LinkTH EEPROM page
, =19200 Baud (P)                 `=38400 Baud (P)
^=57600 Baud (P)                  . =9600 Baud (P)(D)
!=Dump Ram and Restart
```

**Command marked (P) are persistent across Power cycle or Restart
Commands marked with (D) are factory default settings**

I . . . Report Sensor Inventory

The LinkTH will display an inventory of all sensors on the One Wire bus and report the serial numbers of each sensor discovered.

Example output:

```
1019E6630008001E
3029034510000051
28EF283F00000007
264043150000000A
29984800000000E4
EOD
```

```
Number of MultiSensors : 1
Number of 18x20 sensors: 2
Number of Snaku sensors: 1
EOD
```

K ... Tuning Knobs

The Knob (K) command has the general format of Kxxy where:
xx is a two digit hexadecimal knob number.
yy is the value associated with the tuning knob.

All Hexadecimal value MUST be supplied in UPPER CASE.

The knobs are:

01 ... Maximum Snaku Channel to be processed. The tuning value is a two digit hexadecimal number from 1 to 18 (1 to 24 decimal).

02 ... Snaku Channel switch delay. The amount of time that LinkTH waits after switching Snaku Channels. The tuning value is a two digit hexadecimal number representing the wait time. The units are 10mS waits.

For example: K010E

A value of 0E will cause the LinkTH to wait 140 mS after switching channels before starting to access the Snaku Channel data. This is a system wide delay. If there are 5 Snaku sensors present, the LinkTH switches all Snakus to the same channel, then waits the period specified by this knob. The Default value of this knob is 05 (50mS).

03 ... Snaku Read Settle count. LinkTH has a settle (think of it as a debounce routine) associated with a Snaku Channel. LinkTH will read until Knob 02 number of consecutive reads is within +/- 30uV (4 ticks of the DS2760 voltage register) of each other. The default value for this knob is 06. There is a maximum read count of a Snaku Channel of 256.

Example: K0208

LinkTH will read the voltage register of the DS2760 chip a minimum of 9 times. There must be at least 8 CONSECUTIVE readings with a maximum deviation of 4 ticks before the Snaku Channel value will be used.

Consider the following values read for a Snaku Channel

FFD1,FFE0,FFD1,FFD1,FFD2,FFD1,FFD1,FFD3,FFD0,FFD1

Note that it took 10 reads to satisfy the Knob 02 settle count.

04 ... Snaku Report Format. A two digit hexadecimal number specifying the output format of Snaku Data. A value of 00 (the default) will output the Snaku Channel Data in degrees Centigrade and Fahrenheit. A value of 01 will output the raw sensor readings. This format is available for customers who wish to perform their own cold junction compensations.

05 ... Snaku Settle Debug Display. A two digit hexadecimal number specifying whether the debug information is reported during a Snaku Channel Settle operation. 00 (the default) is debug is OFF. A value of 01 will turn the Debug Information on.

Debug lines begin with S (For Settle) and will contain each reading the LinkTH retrieves during its read settle operation.

06 ... Snaku Offset adjustment. The K06 must be followed by a "+" (to increase the Snafku offset value) or a "-" (to decrease the Snaku offset value).

07 ... Define Multisensor type. All MultiSensors contain a DS2438 chip. LinkTH uses byte 0 of memory page 3 to determine the sensor type. Use this knob to change the sensor type. The format of the K07 command is:

K07xxxxxxxxxxxxxxxxSS where xxx...xxx is the serial number of the DS2438 and SS is the sensor type in Hex. The current sensor types are:

00 ... MS- T ... Temperature only
19 ... MS- TH ... Temperature and Humi di ty
1A ... MS- TV ... Temperature and Analog Vol tage

1B ... MS-TL ... Temperature and Light Sensor

Blank . . . Display LinkTH Banner

The current LinkTH software version will be displayed.

R . . . Report Individual Sensor data

Supply the 16 digit One Wire address of the sensor .

Example:

**R10B1D56300080029 would return the data for
The DS18S20 sensor with an address of 10B1D56300080029**

The data returned will depend on the sensor type.

S . . . Time Stamp On (P)

Turn TimeStamping on for commands D,T,H and AutoReport

s . . . Time Stamp Off (P)(D)

Turn TimeStamping OFF for commands D,T,H, and AutoReport

W . . . Write User EEPROM page. (P)

Supply a two hex page number (01-0F) followed by up to 16 characters of information to be stored followed by Carriage Return (Enter).

The LinkTH will not let you specify Page 00 for writing.

Example:

W05iButtonLink LLC. <CR>

**will store the value "i" in byte 0 of Page 05
"B" in byte 1 of Page 05
"u" in byte 2 of Page 05
"t" in byte 3 of Page 05
"t" in byte 4 of Page 05
"o" in byte 5 of Page 05
"n" in byte 6 of Page 05
"L" in byte 7 of Page 05
"i" in byte 8 of Page 05
"n" in byte 9 of Page 05
"k" in byte 10 of Page 05
" " in byte 11 of Page 05**

“L” in byte 12 of Page 05
“L” in byte 13 of Page 05
“C” in byte 14 of Page 05
“.” in byte 15 of Page 05

w . . . Report LinkTH EEPROM page

Supply a two digit hex page number (01-0F) . The contents of the LinkTH EEPROM page will be returned followed by <Cr><Lf>

Example:

W05

would return

iButtonLink LLC. <Cr><Lf>

.(Period) . . . 9600 Baud (P) (D)

Set the LinkTH serial interface to 9600 baud, 8 bit, no parity.
The change is immediate and persistent.

, (Comma) . . . 19200 Baud (P)

Set the LinkTH serial interface to 19200, 8 bit, no parity.
The change is immediate and persistent.

` (Back Tic) . . . 38400 Baud (P)

Set the LinkTH serial interface to 38400, 8 bit, no parity.
The change is immediate and persistent.

^ (Hat) . . . 57600 Baud (P)

Set the LinkTH serial interface to 57600, 8 bit, no parity.
The change is immediate and persistent.

! (Exclamation Point) . . . Force Crash, Dump Ram, and Restart

Cause a Crash Code 1. The state of the LinkTH controller is displayed along with the contents of RAM.

After the report is complete, LinkTH forces a restart.

This command is useful for sending data to the factory to troubleshoot problems. Your terminal emulator should be set up to capture the data sent so you can e-mail the results to tech support.

See Appendix A for an example of the output.

Appendix A:

Crash

CODE: 1 INTCON: C1 FSR: 42 STATUS: 1F W: 00

RAM Memory Dump

```
0000 00 FF 15 18 04 10 2F C0 00 00 08 41 11 00 7A DB
0010 21 00 00 DF 00 FC 68 00 90 20 21 9D 30 00 08 00
0020 04 41 00 00 00 BF 00 09 00 21 31 31 00 E2 FF 00
0030 00 00 20 00 00 0D 41 3F 08 00 26 86 39 15 00 00
0040 00 F7 0B 00 01 00 00 00 00 00 00 03 11 03 00 00
0050 00 DE 0B B0 04 01 00 26 1B 0A 00 00 0A 00 00 00
0060 00 00 00 01 42 00 00 00 00 00 00 00 00 00 00
0070 02 B1 0F 00 F1 C1 00 20 00 00 00 00 08 00 00 01
0080 00 7F 15 18 84 3F E3 80 00 00 08 41 01 00 00 00
0090 00 00 FF 00 00 00 00 00 24 40 00 00 07 00 00 00
00A0 60 04 00 00 41 40 0C 00 00 04 80 02 00 00 10 00
00B0 08 10 04 00 00 08 E0 00 01 20 04 04 20 80 08 48
00C0 02 21 00 A4 02 00 E0 00 00 00 00 00 02 00 01
00D0 00 00 00 00 00 02 00 00 04 01 00 00 10 02 00 00
00E0 01 00 00 04 00 00 00 18 41 00 00 04 00 00 00 20
00F0 02 B1 0F 00 F1 C1 00 20 00 00 00 00 08 00 00 01
0100 00 FF 15 98 04 00 2F 00 00 00 08 41 0A 26 00 1B
0110 00 08 00 01 01 00 00 00 00 08 40 00 00 80 00 00
0120 00 44 00 21 48 02 06 60 00 C0 00 00 00 00 00 20
0130 00 40 00 00 10 10 04 00 00 00 00 00 04 04 01
0140 00 00 00 20 00 10 00 00 00 00 C4 00 08 00 00 00
0150 04 00 40 00 01 00 09 02 00 00 00 C0 00 10 02 80
0160 40 00 00 40 00 01 44 00 44 41 00 00 00 02 00 01
0170 02 B1 0F 00 F1 C1 00 20 00 00 00 00 08 00 00 01
0180 00 7F 15 98 84 00 E3 00 00 00 08 41 88 00 00 00
0190 00 01 00 00 04 00 00 00 00 20 00 80 00 10 04 10
01A0 00 02 40 14 40 00 90 00 10 00 00 00 00 02 00 40
01B0 00 00 00 08 04 00 80 03 00 00 40 40 08 04 00 C4
01C0 12 10 02 00 00 40 00 00 01 08 00 00 08 01 0A 00
01D0 00 40 00 20 00 02 02 00 00 00 21 00 00 02 00 50
01E0 89 10 80 00 11 B6 00 01 00 00 0C 01 80 00 90 1D
01F0 02 B1 0F 00 F1 C1 00 20 00 00 00 00 08 00 00 01
```

EEPROM Memory Dump

```
0000 01 40 DE 0B B0 04 2C 01 01 40 DE 0B B0 04 2C 01
0010 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20
0020 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20
```

0030 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20
0040 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20
0050 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20
0060 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20
0070 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20
0080 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20
0090 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20
00A0 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20
00B0 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20
00C0 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20
00D0 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20
00E0 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20
00F0 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20

Appendix B - Error Messages

All error messages are of the form ?xx – yyyyyy...yyyyyy

Where:

xx is a two digit error number

yyyyyy.....yyyyyy is English text describing the error.

The error messages which might be issued by LinkTH are:

- ?01 - No sensor present.
- ?02 - Invalid hex digit encountered
- ?03 - Invalid decimal digit encountered
- ?04 - CRC8 error
- ?05 - CRC16 error
- ?06 - Snaku Channel did not settle within 256 reads
- ?07 - 1-Wire Bus shorted
- ?08 - 1-Wire Bus scan error

Appendix C ... Debugging Hints

LinkTH is returning "garbage" on the serial interface.

This is one of the most common problems. It is most likely caused by a mismatch between the LinkTH serial baud rate and your computer COM port. The LinkTH allows you to set the startup baud rate. If this has been set (say to 57600 baud) and you forget and connect to the LinkTH at 9600 baud ... the result is "garbage" on the screen. Sending a "break" character to the LinkTH will temporarily change the baud rate to 9600. This change is NOT persistent.

MultiSensor is returning the wrong data types:

This is caused by the sensor type variable inside the MultiSensor being set incorrectly. For example: If you have a MS-TH and the sensor type is set to zero, LinkTH will report data for a MS-T. Use Knob 07 to set the sensor type).

An interesting thing to try is to set the sensor type of a MS-TH to a MS-TV. LinkTH will then report the voltage of the humidity sensor instead of interpreting it for you.

Measuring the voltage of the OW bus:

Set the sensor type of the last (physically) MultiSensor to MS-TV. Now it will report the voltage of the OW-Bus at the far end. The voltage is reported in 10 millivolts. If the bus is lower than 4 volts, certain sensors will not work (in particular the humidity sensor which reports 0% humidity if the supply voltage is less than 4.0 volts).

Upgrading LinkTH firmware to the latest version:

Send your LinkTH back to the authorized iButtonLink dealer along with \$10.00 US for shipping and handling. Your LinkTH will be upgraded to the latest version and returned. Turn around time at the dealer is 1 business day.