LP

LINKSYS-1W

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1

Overview

Adding a new level of performance…

LP-LINKSYS-1W Overview

The WRT54G or WRT54GS is one of the most popular wireless routers available on the market. When modified with the installation of the LP-LINKSYS-1W adapter and appropriate software it becomes a powerful tool for 1-Wire network users. Ideal for creating distributed 1-Wire based computing systems across a wired or wireless Ethernet backbone systems. With the built in standard 4–port full-duplex 10/100 switch for connecting wired Ethernet networks together, and a 802.11 g/b wireless access point with router functions in the basic LINKSYS unit, many of the problems in creating long distance 1-Wire networks disappear.

The above picture shows the final modified LINKSYS WRT54GS model with 1-Wire and RS232 ports added to the front panel. With the onboard intelligence of the WRT54G/GS processor (provided by a 200mhz ARM7 processor running a Linux kernel and the software such as the wonderful free open source OWFS software) much of the work associated with controlling a 1-wire network can be off loaded and

distributed to the LINSYS unit. The adapters 1-Wire bus master circuitry is located inside the LINKSYS case and therefore makes for a compact easily used installation. An optional 1-Wire environmental monitor circuit can be also located on the LP-LINKSYS-1W adapters PCB, allowing the LINKSYS to be useful for 1-Wire monitoring without any additional external components needed. External 1-Wire devices can of course be added as desired by connecting to the 8-pin min din 1-wire connector. And a serial port connection can be made through an optional PS/2 compatible 6-pin min din connector also. This allows full access to the LINKSYS units console port.

Optional full galvanic isolation of the 1-wire network and serial port can be added to the LP-LINKSYS-1W to isolate network or terminal problems from the LINKSYS hardware and help protect networks.

The LP-LINKSYS-1W adapter can be added to either the WRT54G or the WRT54GS models. We recommend the WRT54GS unit since it has more memory and is only a few dollars more.

Internal Features	**Model WRT54G**	**Model WRT54GS**
Processor Speea	200 Mhz	200 Mhz
Flash Memory	4MB	8MB
RAM memory	16MB	32MB
Wireless max speea	55Mbps	"Speedbooster" 108Mbps (Linksys proprietary extensions)

Chapter

2

Background

A review of the LINKSYS WRT54 series

A quick look at the WRT54G series...

There have been three significant versions of the WRT54G unit, 1.0, 1.1 and 2.0 (CDF5xxx) and version 1.0 of the WRT54GS unit. The LP-LINKSYS-1W is designed to work on the version 2.0 of the WRT54G and the 1.0 WRT54GS models of the unit. These units have brought out a serial line to the PCB and are therefore easily modified to provide the needed serial interface that the LP-LINKSYS-1W uses. It will not work with earlier models (1.0 or 1.1) of the WRT54G, which lack this port.

Figure 1 - Image of an unmodified WRT54G unit

A quick look at the WRT54GS…

Figure 2 - Image of an unmodified WRT54GS unit

Accessing the PCB

Access to the insides of the WRT54G or WRT54GS PCB can be achieved by:

1. First remove the power (unplug power cord from the LINKSYS unit)

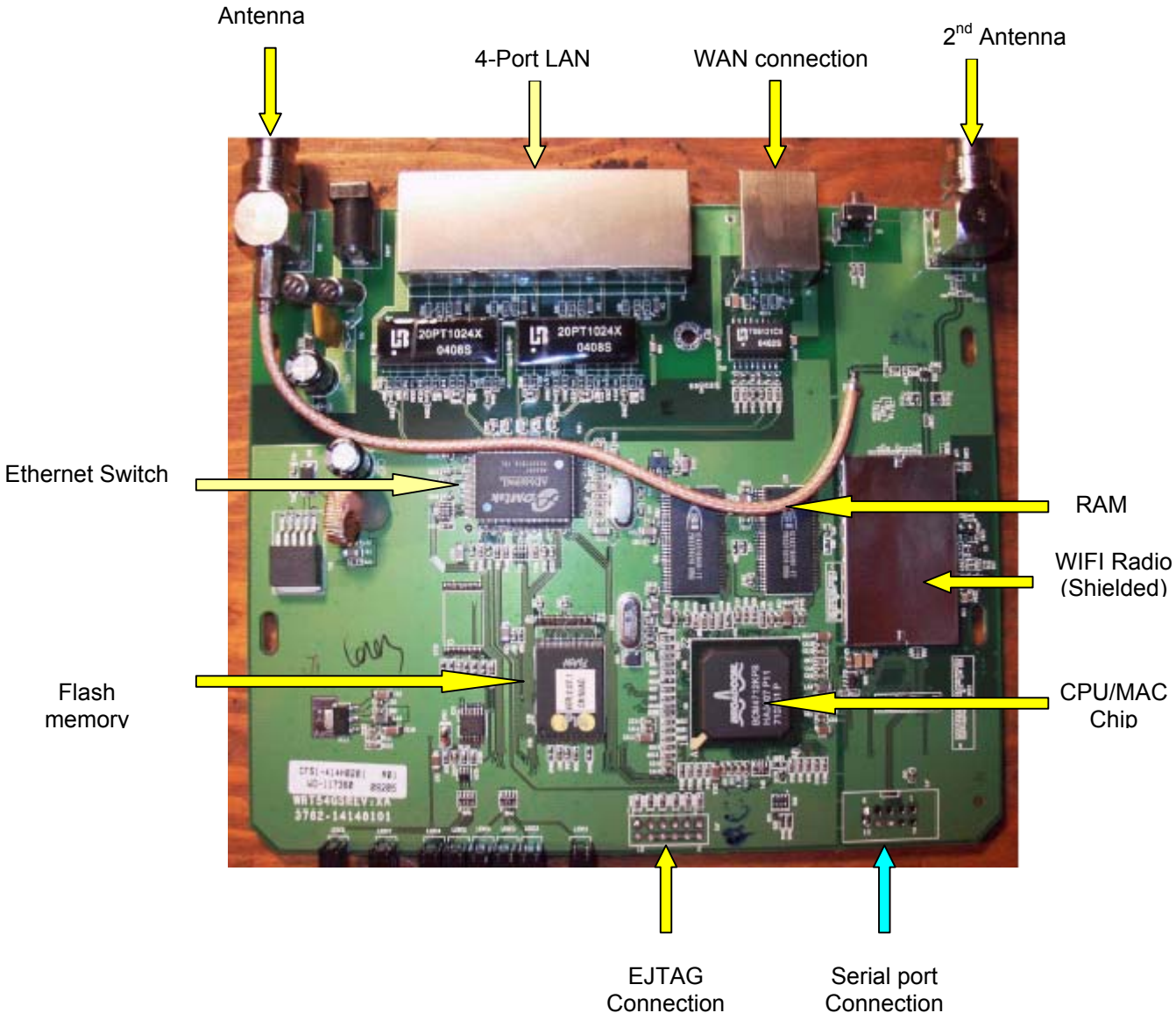
2. Remove the antennas (they unscrew).

3. Flip unit over onto its top, and slit the access seal (you will not be able to send the unit back to LINKSYS from this point on as you have now voided the warranty from LINKSYS)

4. Gently separate away the blue portion of the case away (front to back direction) from the black portion using your thumbs. The case is screw less and it's a pressure fit. Set aside the blue front part of the case.

5. Remove what was the top black cover of the case and put aside, the PCB will remain mounted to what was the bottom of the case.

Once opened, you will see something like this:



Principal features on the WRT54GS PCB. Of prime interest to us is the serial port connection (marked in blue). This is the only connection the LP-LINKSYS-1W adapter board makes to the LINKSYS PCB.

This is done by the addition of a 2x5 pin female .1" pin header to the LINKSYS PCB. The holes are cleaned out and the connector inserted and soldered into place. A female connector was used to provide maximum adapter board support and to also prevent the possibilities of accidental shorts when the adapter is removed. And image of the PCB is shown in the following image with the pin header installed.

Adding the Logic Interface connector

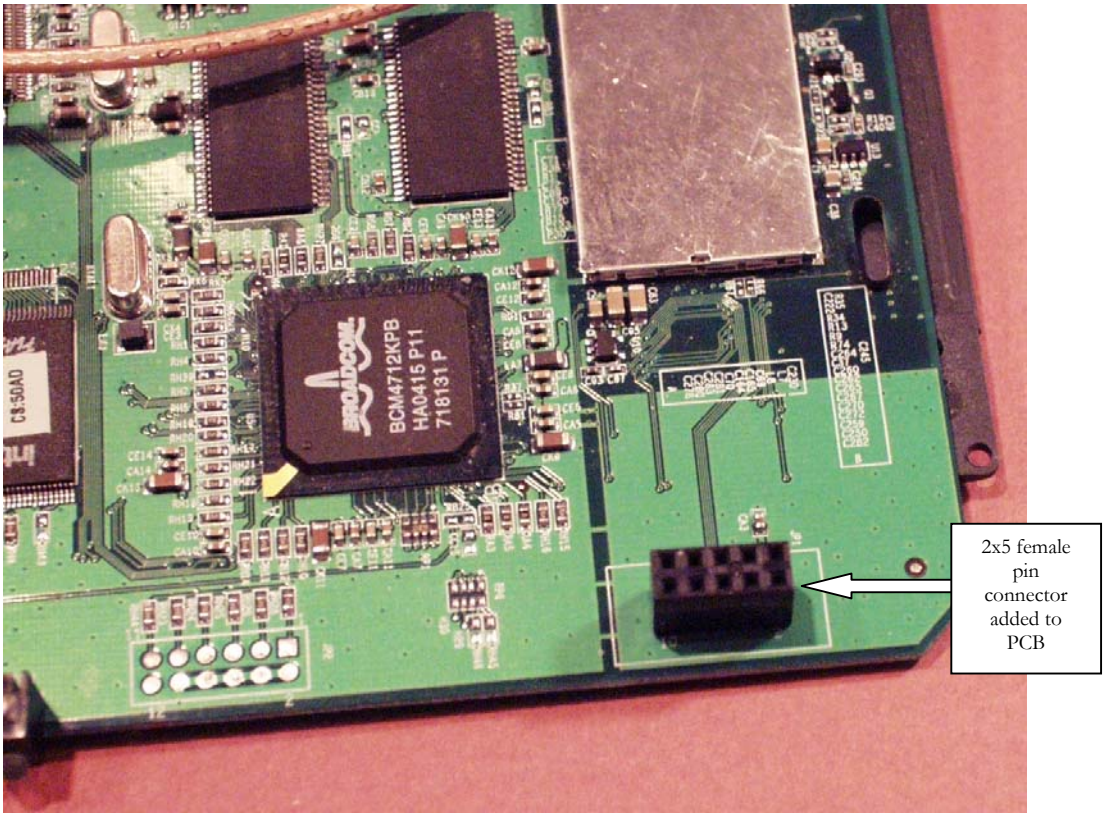


Figure 3 - Image showing a WRT54GS modified with the addition of a 2x5 female pin connector and ready to accept the LP-LINKSYS-1W board.

Pin 1 is to the upper right, and pin 10 to the lower left in this image. The small size of the connector does not obscure the PCB's silkscreen lettering unlike a larger connector would. Pin outs for the connector are as follows:

Pin 1	3.3 Volts DC from LINKSYS PCB
Pin 2	3.3 Volts DC from LINKSYS PCB
Pin 3	TX-S1 (Serial out #1) from LINKSYS
Pin 4	TX-S0 (Serial out #0) from LINKSYS
Pin 5	RX-S1 (Serial In #1) to LINKSYS
Pin 6	RX-S0 (Serial In #0) to LINKSYS
Pin 7	Not Used
Pin 8	Not Used
Pin 9	LINKSYS Ground
Pin 10	LINKSYS Ground

Chapter

3

The LP-LinkSys-1W adapter

A quick look at a modified WRT54GS case…

Figure 4 – LINKSYS WRT54GS modified with LP-LINKSY-1W installed. Note the new front label and the added Mini-Din jacks for 1-Wire and RS232 on the front of the unit. We have designed the case modifications to be as easy and simple as possible.

Figure 5 – Close-up of the front panel, showing the label and ports a bit better.

While it is possible to use the LP-LINKSYS-1W adapter without any modifications to the LINKSYS case, most users will want to bring out both the RS232-F and 1-Wire ports for external access. We have spent much time looking at the LINKSYS case, and have come up with a method that takes the minimal amount of modifications to the case and should be within the abilities of any careful worker.

Actual case modifications consist of drilling only two holes (for the Mini-din connectors) and replacing the front label of the unit. That's it. The screw holes for the Din connector are already drilled in the case. So this should be within reach of anyone with some very simple tools. The unit shown was dilled using only a simple hand held power drill and a knife to cut the holes in the new label. Step by step instructions are in the document called "Case modifications.pdf".

It only requires the drilling of two additional holes on the front panel of the case to accommodate the use of 2 min-din connectors (a 6 pin PS/2 style unit for the RS232-F connection, and a 8 pin connector wired for 1WRJ45 compatibility). The PS/2 style jack provides easy use with widely available PS/2 style cables, and PS/2 to 9 pin adapters are easily found.

We went with the 8-pin mini-din female connector for the 1-Wire connection because of its small size (allows both connectors to be on the front panel of LINKSYS unit), and the fact that it is much easier for most people to drill a hole rather than to punch a rectangular hole needed for a RJ-45 jack. It also prevents the accidental use of an Ethernet cable from being plugged into the unit. A matching male connector is provided so connections to existing networks can be made.

A custom label is used to replace the original LINKSYS label and serves to hide slight imperfections in the drilling and to help keep your unit looking professional. The template we used for the label is provided so you can print or modify the label, as you may desire.

A closer at the LP-LINKSYS-1W adapter...

Now that we have seen what changes have to be made to the LINKSYS unit inside the unit and what the case changes will be, lets take a closer look at the LP-LINKSYS-1W adapter that will be plugged into the Logic connector on the LINKSYS PCB.

LP-LINKSYS-1W Adapter Board Specifications

General

- +5 Volt Power supply indicator LED (Red)
- Optional 1-Wire Monitor activated indicator LED (Yellow)
- 2x5 male pin header interface to LINKSYS board
- Designed to support 3.3 to 5 volt signal levels on pin headers

Physical

- Board size 35.5mm x 47.5mm
- 2 PCB Mounting holes for use when mounted outside LINKSYS
- Double Sided PCB, with Solder Masks and Silk-screens on both sides
- Direct plug in connection to LINKSYS WRT54G/GS models for easy installation and minimal changes needed to unit.
  - 2-holes drilled in front panel of LINKSYS
    - 6 pin min-din for PS/2 compatible serial connections (see option 2 for the adapter)
    - 8 pin min-din connector for external 1-Wire wiring
  - Mounting of 10 pin connector on LINKSYS PCB (Solder holes already on LINKSYS PCB, just clean them out and solder in 2x5 female pin connector)

Features

- 1-Wire Interface
  - Based on industry standard DS2480B 1-Wire bus master
    - 1-Wire ESD protection circuitry and Line filter built in
    - Compatible with 1WRJ45 Wire Connection system
- Software Available for running OWFS inside LINKSYS box!
- Support additional feature with the addition of 3 optional circuitry options
- Can be used as a TTL or RS232 standalone 1-Wire bus master interface!

(Use of header pins sockets makes it great for prototypes or adding to new boards)

Power Supply

- Draws power from the LINKSYS board (no other supply needed)
- Board can act as the VCC (+5VDC) power source for 1WRJ45 compatible boards or sensors (Use to supply power to 1-Wire Temperature sensors for instance, for faster more stable response).

Multiple Adapter Options to fit custom needs

- **Option #1 – Power Isolation circuitry**
  - Allows for full galvanic isolation of 1-wire and serial from LINKSYS unit
  - Uses low power (2ma!) high speed logic isolators (2.5kvdc rms isolation) and DC-DC power isolator (3kvdc isolation)

- **Option #2 – Serial port circuitry**
  - Addition of RS232-F serial console port (up to 250kps)
  - Support full galvanic isolation with installation of Option #1

- **Option #3 – 1-Wire Environmental monitor circuitry**
  - On board selection through DS2409 Hub switch
  - AUX Channel
    - DS2433 provides 512 byte EEPROM for device tagging
  - MAIN Channel
    - DS2438 provides following features
      - Elapsed time counter (Use as a RTC)
      - Temperature (over the range of -55°C to +125°C in 0.03125°C increments).
      - Current A/D used for optional light sensor (BS520)
      - Voltage A/D used for either:
        - Optional HIH-3610 humidity sensor, other sensors possible
        - Or monitoring line level of A-SIG line for remote sensing needs (Use a remote pot or other 0-5V device)

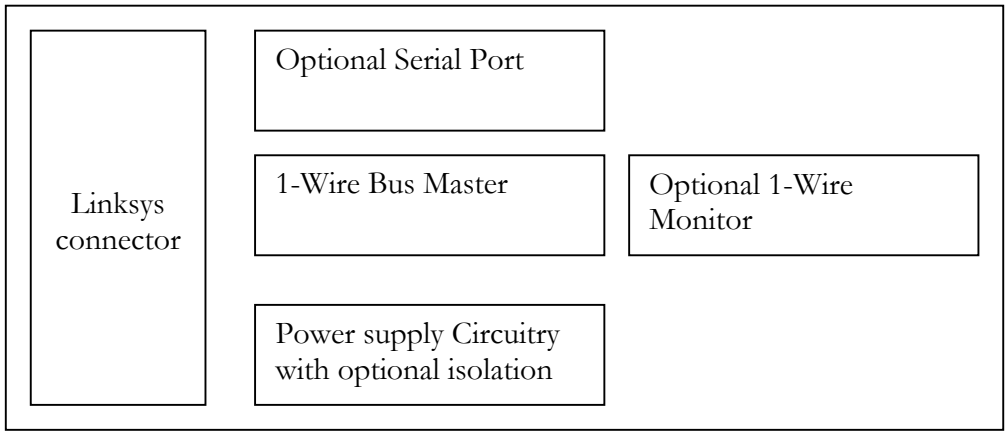
Figure 6 – Image of another LINKSYS WRT54GS unit, this time with only the addition of the RS232-F port. The 1-Wire was not brought out on the case since the internal 1-Wire functions were all that were needed for this particular unit.

Chapter 4

LP-LINKSYS-1W Adapter Design

A little bit of this… a little bit of that…

Adapter implementation



Block Diagram Overview

The LP-LINKSYS-1W can be seen as a device composed of five design elements. The full schematic can be seen here. We will look at each of these elements in detail over the next few pages. They are:

1) The LINKSYS connector
2) The Power Supply Circuitry
3) The 1-Wire Data Line protection Circuitry
4) The optional 1-Wire monitor circuitry
5) The optional Console serial port

The LP-LINKSYS-1W Connector

THE LOGIC CONNECTOR

The logic connector is used to interface the adapter board to the LINKSYS PCB. From the adapters side it actually accepts a wider range of signals levels, which allow the adapter to be used as a standalone 1-Wire bus master. More on this later. Till then note that the input power acceptable is between 3.3 volts and 5 volts. And that the serial logic levels can also be, either 3.3 or 5 volts (based on the power supply level).

The actual connector is a 2x5 (10 pin) .1" center male pin header. This allows easy use of this adapter to other project besides the LINKSYS units.

Pin 1	3.3-5 Volts DC regulated power supply
Pin 2	3.3-5 Volt DC regulated power supply
Pin 3	TX-S1 (Serial out #1)
Pin 4	TX-S0 (Serial out #0)
Pin 5	RX-S1 (Serial In #1)
Pin 6	RX-S0 (Serial In #0)
Pin 7	Not Used
Pin 8	Not Used
Pin 9	LINKSYS Ground
Pin 10	LINKSYS Ground

This is seen on theLP-LINKSYS-1W schematic like this:

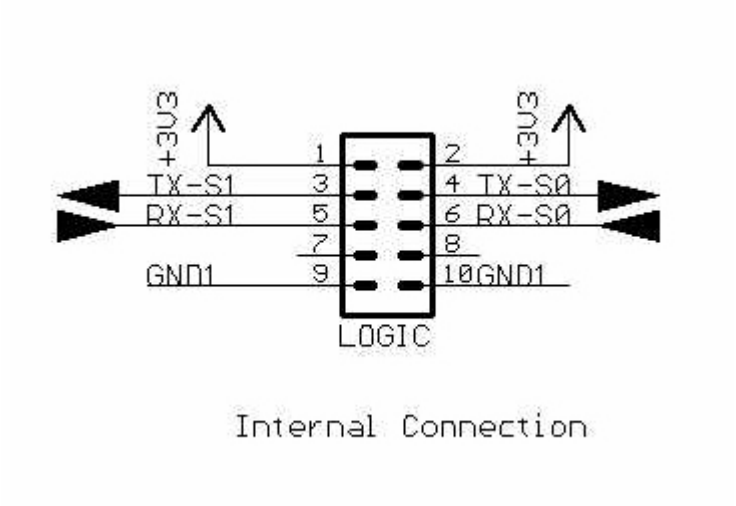


Figure 7 – PCB connector for power and serial lines

The LP-LINKSYS-1W Power Supply Circuitry

THE POWER SUPPLY

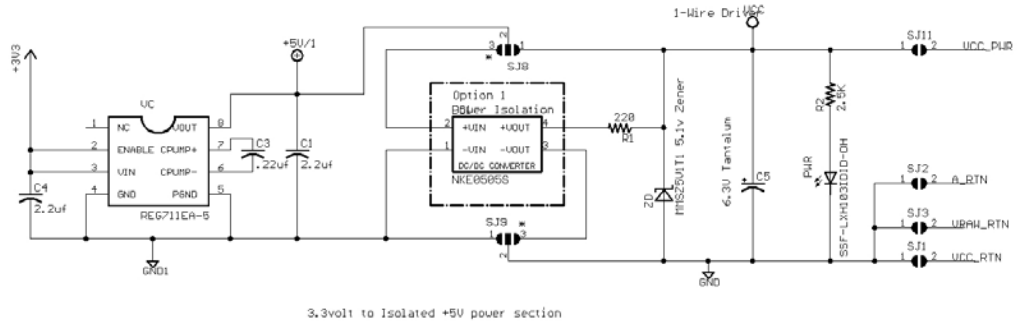


Figure 8 –Power supply section of the LP-LINKSYS-1W

Power for the LP-LINKSYS-1W unit is derived from the 3.3VDC power lines on the LINKSYS connector. However since the 1-Wire system is a +5 volt based system, the power has to be boosted to 5VDC for use by the board's circuitry.

This is done by the switched capacitor DC-DC converter, the REG711EA-5, which converts any voltage between 3.3 to 5 volts to a regulated 5-volt output at a max of 50ma. This wide range of input voltages is what makes the board useable both when mounted on a LINKSYS PCB (using 3.3VDC) and also able to be used when operated without the LINKSYS for standalone operation using 5 Volts and an external power supply. It doesn't matter the converter as long as it's a regulated supply in the range of 2.7-5 volts DC).

Now lets take a closer look at each section of the supply beginning with the REG711EA-5 converter we have been talking about.

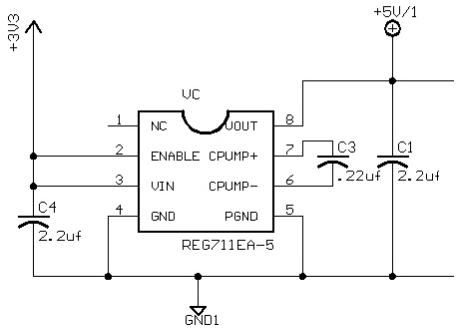


Figure 9 – The 3.3 or 5 volt converter to 5 volts

Incoming regulated supply Voltage

The incoming voltage (3.3volts when plugged into the LINKSYS) is first filtered by C4 (a 2.2 µf capacitor) and the switching capacitor used by the DC-DC is C3 (a .22 µf capacitor). The output is filtered by C1 (another 2.2 µf capacitor) to help remove some of the switching noise created by the switching action from the output line and to add to the circuit's stability.

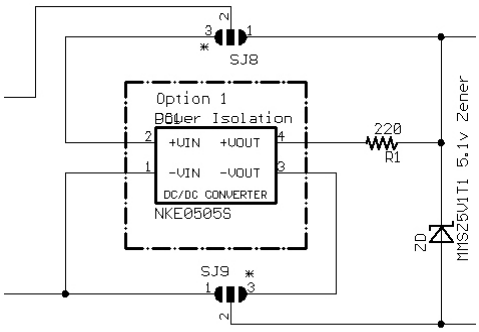


Figure 10 – The optional Isolation DC-DC converter used to provide galvanic isolation

Optional Power Isolation module

In order to provide full galvanic isolation from the LINKSYS system, option #1 (shown in the above image) can be installed and solder paste jumpers SJ8 (pin 2-3) and SJ9 (pins 2-3) are selected. This installs a NKE0505S isolated DC-DC converter. It takes its input from the REG711EA-5 and produces a galvanic isolated output. Since the unit expects a greater load on it than the board's circuitry puts, a resistor (R1) and a Zener Diode are used to keep its output at 5 volts. This section is only needed when full galvanic isolation is needed and is therefore optional.

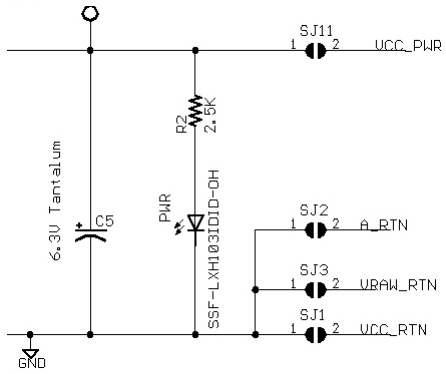


Figure 11 – Final supply filtering a 1WRJ45 wiring options

Power supply filtering and status

The output (directly from the RG711EA or the optional power isolation module) is also filtered again by C5 (a 6.8µf tantalum capacitor) to produce a clean stable output that is now isolated from the LINKSYS side.

Errata: *We have increase C5 with the addition of a 4.7uf tantalum cap in parallel with C5 to help smooth the ripple caused when the optional isolation DC-DC module is installed. Some units exhibit more ripple than others and this helps steady the supply voltage when the HIH-3610-003 sensor is also installed. It is not needed otherwise.*

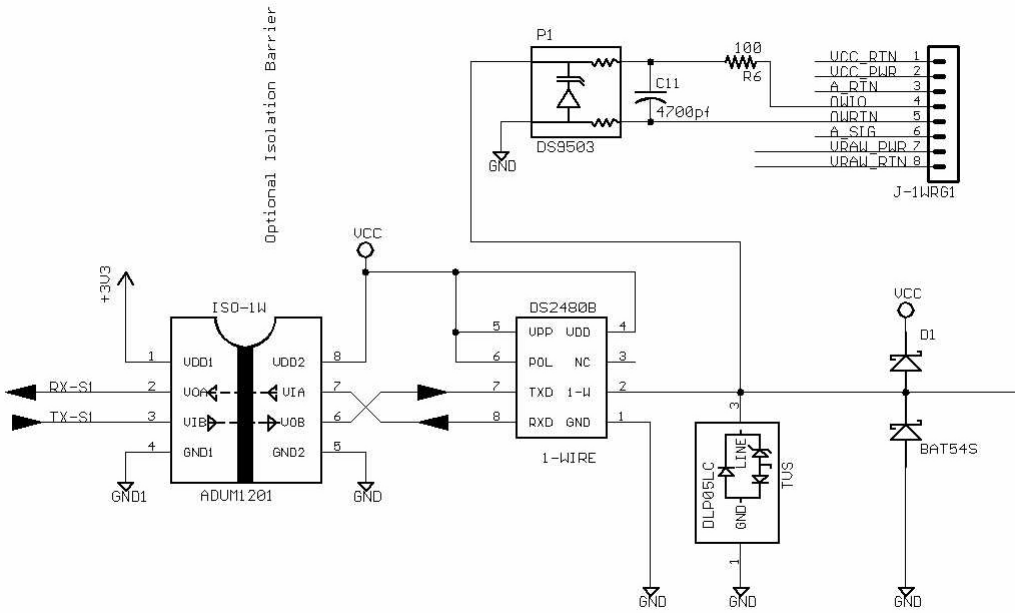
Indication of power is displayed by the PWR LED (Red) which is current limited by resistor R2 (2.5K) to 2 ma drive current for the LED.

Power supply connections for the 1WRJ45

Solder paste jumpers SJ1, SJ2, SJ3 and SJ11 are used to control how the output will be distributed to the connection for the 1-Wire 1WRJ45 connection. Careful readers of the 1WRJ45 specification will note that the power circuitry only produces limited power for external circuitry and doesn't produce +12 volts at all. This was a design trade off done to keep costs down and to only have minimal impact on the LINKSYS capabilities. If additional power is needed, the use of an external power module such as the LP-PWR may be desirable and is possible by setting the appropriate solder paste jumpers on the adapter.

The serial to 1-Wire Bus Master Circuitry

The following portion of the schematic shows the 1-wire circuitry.



From the LINKSYS connector

The internal LINKSYS connection provides two separate serial lines pairs. The first is the console serial port (TX-S0 and RX-S0) and the second is an available for use as a regular serial device. We use it (TX-S1 and RX-S1) to connect to our 1-Wire bus master circuitry.

The signals from the LINKSYS are 3.3-volt logic levels and our 1-Wire devices 5 volts logic levels. So we have to use a logic level converter to interface the two systems. To do this we use the ADUM1201. The ADUM1201 is actually a dual channel digital isolator using one of the latest technologies. It is similar in function to an opto-isolator in function, but requiring far less power and much faster. Power to the signal side of this chip is pulled directly from the LINKSYS connector. We take advantage of the fact that this particular chip will work with either 3.3 or 5-volt power, so it will work also when we are operating in a standalone mode without the LINKSYS unit.

Power to the other side of the chip is generated by the adapters power supply (VCC output). This output will be fully galvanic isolated assuming its output side power is also isolated. (This is true only when option 1, the optional Power isolation module is installed in the power supply). Otherwise it will act as just a logic level converter. So our serial data is converted from a 3.3-volt system to 5 volts logic levels by this chip.

The 1-Wire Bus master

We used the standard DS2480B 1-Wire bus master as our bus master device. While other bus masters exist that were designed to better drive long cable lengths, they make little sense in this case since the very idea of the LINKSYS-1W is to put the bus master closer to its devices. The DS2480B also has a smaller footprint, and is the reference design for all 1-wire software and systems.

The bus master takes the incoming TTL level serial data line (TX) and converts it into 1-wire bus commands and returns TTL level serial responses on the (RX) line. The 1Wire bus signals are generated on the 1-W line and are protected from out of range voltages that may occur from external devices by a low capacitance TVS with a breakdown voltage that starts at 6 volts), and a fast acting Schottky diode (D1) clamp use to limit excursion a diode drop above and below the power and ground lines.

Protection and line filter for 1-Wire devices

Further ESD protection when external 1-Wire devices are connected, is provided by the DS9503 (P1) with a built in current limiting resistor. The ESD protection level is raised to more that 27 kV (IEC 801–2 Reference model) on the external line with this chip. In case of abnormal ESD hits beyond its maximum ratings the DS9503 will eventually fail "short" thus preventing further damage. During normal operation the DS9503 behaves like a regular 7.5V Zener Diode. When the voltage exceeds the trigger voltage, the I/V characteristics of the device will "snapback" allowing the same or higher amount of current to flow, but at a significantly lower voltage. As long as a minimum current or voltage is maintained, the device will stay in the "snapback mode". If the voltage or the current falls below the holding voltage or holding current, the device will abruptly change to its normal mode and conduct only a small leakage current.

An impedance matching line filter made up of R6 and C11 is used to help match the output of the DS2480B to the cable characteristics of CAT5/6 cabling for the external 1-wire devices and help fight cable reflection problem transients.

1-Wire to 1WRJ45 compatible cabling

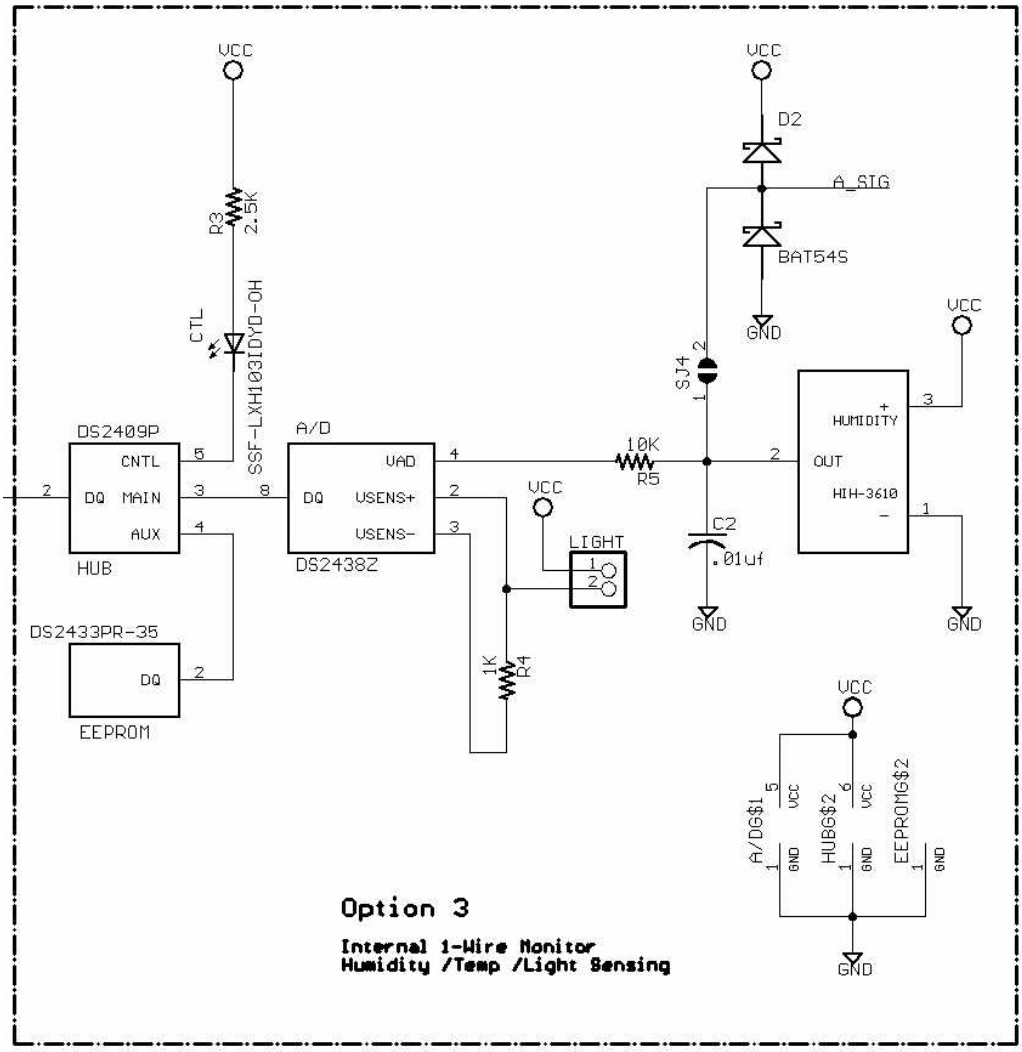
Cable connection to the 1-Wire bus is made though the J-1WRG1 connection points. This supports full 8 pin 1WRJ45 standard cabling. Note that the VRAW power line (+12 volts) is not connected but has been brought in for possible future devices.

Typically an 8-pin female mini-din connector is mounted on the front panel of the LINKSYS and connected to the J-1WRG1 connection points. An 8-pin male mini-din connector is then attached to the users 1-Wire network and plug in connection to the 1-wire can be made.

The Optional 1-Wire monitor circuitry

OVERVIEW

Because it would be convenient to have some environmental 1-wire functionality inside the LINKSYS case and reduce the need for any additional devices, the 1-Wire monitor option can be installed. This adds unit tagging capability, time functions, temperature monitoring, and light sensing abilities with the addition of a sensor and either Humidity or line voltage sensing abilities inside the box.

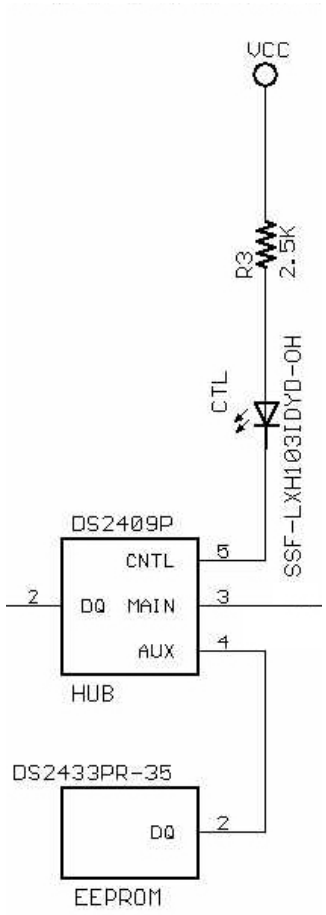


THE INTERFACE

Device selection

The 1-wire network signal shown as DQ connects to a DS2409 MicroLAN hub chip. This chip allows the other 1-wire devices on the monitor section to be selected as desired and allows the monitor to be selected on the 1-Wire bus. If a particular sensor or part of the monitor is shorted to ground the hub will automatically disconnect the failed branch from the 1-wire network and normal 1-Wire network operations can still occur. So this adds another level of protection to network operations.

The hub has two selectable branches: The AUX and a MAIN branches along with a open drain control switch marked CNTL in the schematic to the right.



MAIN Active LED

The CNTL output is normally used to switch a LED (Yellow) on when the MAIN channel is connected. This is controlled through the software operations of the DS2409. The LED is normally programmed to light every time the MAIN channel is selected in the DS2409 hub chip. Resistor R3 (2-2.5K) limits the current of the LED to between 2.5-2 ma.

Board Device Tagging

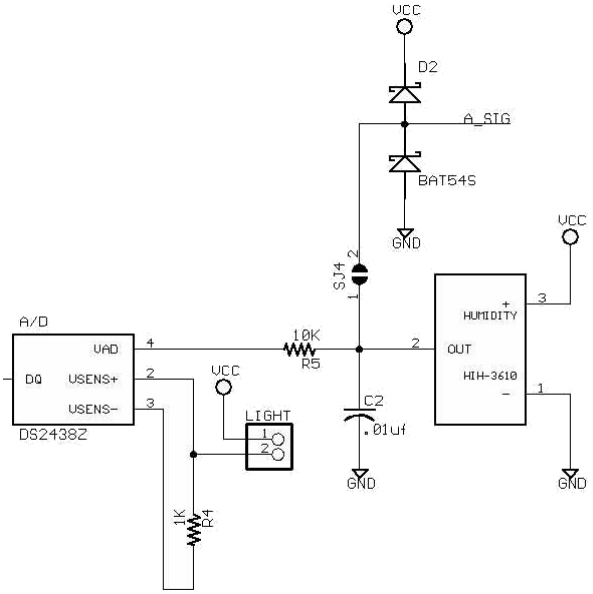
A DS2433 (EEPROM) is connected to the AUX branch. This device is an EEPROM (4096 bit or 512 byte capacity), which can be erased and reprogrammed through the network as desired. It is normally used to hold board device tagging information or unit identification for the LINKSYS. And can hold sensor specific details for the software such as formulas or correction factors or installation data. See the Tagging Procedures for more details.

For some users it may be desirable to all connect an Ibutton to the adapter. Connecting to the AUX channel is a logical point for such use. Either by replacing the EEPROM with wire connections or carefully wiring to its pads on the adapters PCB.

The DS2409's MAIN channel is connected to a DS2438. This versatile chip has on board ability of monitoring Temperature, an elapsed time counter (which can be used as part of a real time clock system) and 3 channels of 10-bit A/D.

THE A/D CONVERTER

A 10-bit DS2438 (A/D) is used as the prime sensor interface device. This chip is available only when the MAIN channel is selected. It proves five functions. A voltage A/D (VAD input, normally connected to the Humidity sensor circuit), a current sense ability (VSens, normally connected to a photodiode), a on board 13 bit temperature sensor (this sensor is a bit more sensitive to PCB board thermal heating which is why the DS18B20 makes a slightly better air monitoring temperature device. Use both devices to obtain more accurate temperature readings. Also on board this versatile chip is a small amount of EEPROM and the ability to monitor the supply voltage VCC (the +5 regulated output of the adapters onboard regulator). In addition the DS2438 as a built in elapsed time keeping time interval counter.



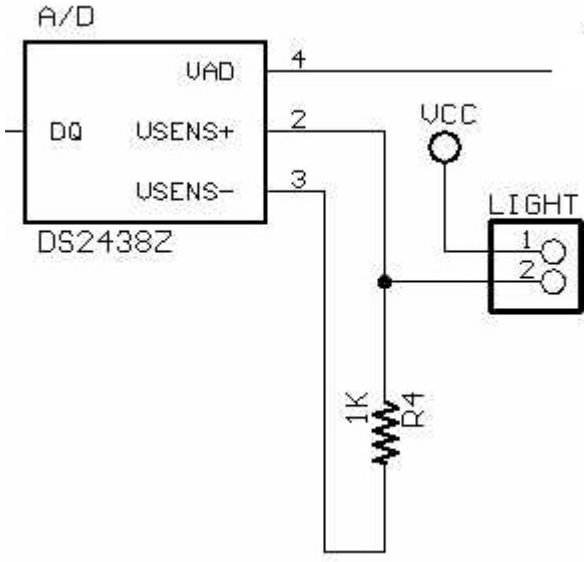
The VAD channel is wired through a sample filter made of R5 and C2 and cab be either connected to a HIH-3610 humidity sensor, or if desired to monitor the voltage level of the A_SIG line (0-5 volt range). To monitor an external device solder paste jumper SJ4 must be enabled. Schottky diode D2 is used to help clamp signals on the A_SIG line. A typical use of this line might be to attach an external pot on the line and use it o create an adjustable voltage on the A_Sig line. This voltage could then be monitored by the DS2438 and action taken as needed. Other uses might be for connection to external CO2 monitors or similar devices that create a slow changing 0-5 volt range signal.

The DS2438 can measure temperature over the range of -55°C to +125°C in 0.03125°C increments.

In addition the DS2438 has an addition 40 bytes of nonvolatile EEPROM storage.

THE (VSENS) PHOTODIODE LIGHT SENSOR

We will take a closer look at the components that make up the current sensing light sensor on the A/D unit. It is normally used for photodiode operations. Light striking the photodiode (attached at the header marked LIGHT in the schematic, generates photocurrents that in turn develop a voltage drop across the sense resistor that is read by the DS2438 ADC. The photodiode can be mounted externally (when pin headers are installed at LIGHT connection) or on the board itself at the LIGHT connection. R4 is used as the sense resistor to ensure that the voltage between the VSens+ and VSens- inputs does not exceed 250 millivolt, (the limit of theDS2438 device). And is normally set somewhere between 600-1.2K with 806 or 1K ohms being the default shipped value. You may need to change this value based on the mounting of the photodiode sensor used and the lens assembly used (if any) and the maximum light expected in your situation.



Many photodiodes are possible with this circuit and we normally provide a BS520 as a good general-purpose device. Its spectral sensitivity is akin to the human eye and peaks at around 560 nm. Consult the data sheet for further information.

An interesting variation of a solar radiance sensor can be constructed using an LED in reverse bias mode. Select an LED that has acceptable current levels when exposed to the sun at high noon on a clear day.

The resistor is sized to develop 250 mV maximum using the formula:

$R_{sens} = E/I$

Where:

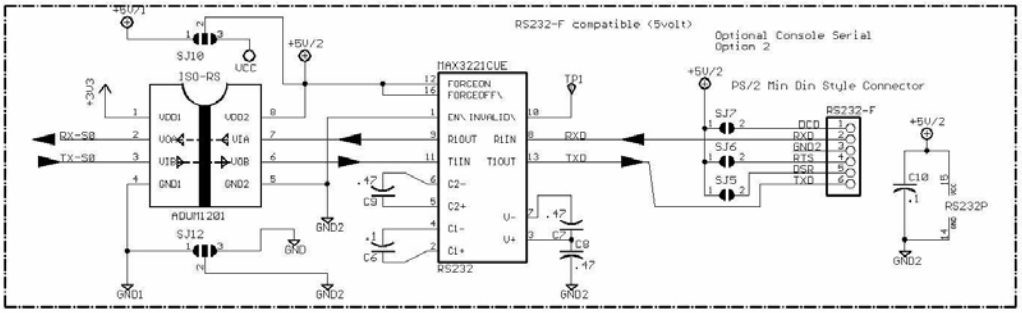
E = 0.25 V
I = maximum photocurrent generated

One example is the EFA5364X from Stanley. This is a super-bright orange ALGaInP LED with a peak response at 609nm and a narrow 15° spectral field of view. A 4.7K

sense resistor provides acceptable outdoor performance, which may be increased to 100K if the circuit is only to be used with indoor lighting. LEDs made from other compounds will have their peak response in a different portion of the spectrum making them useful in specific applications.

In addition the DS2438 has a current accumulator, so it could be used to measure the total amount of light for instance that the sensor used has been exposed to. Which can be useful for instance if the LINKSYS is located in area that is to receive limited light (such as a wine cellar) since you can measure the total amount of light exposure.

The optional Console serial port



As mentioned earlier the internal LINKSYS connection provides two separate serial lines pairs. The first is the console serial port (TX-S0 and RX-S0) and the second is used for the 1-Wire serial interface. The console serial lines (TX-S0 and RX-S0) are connected to our optional serial port circuitry to provide a RS232-F interface.

The signals from the LINKSYS are 3.3-volt logic levels and our 1-Wire devices 5 volts logic levels. So like before, we use a logic level converter to interface the two systems. To do this we use a 2nd ADUM1201 device. Each ADUM1201 is actually a dual channel digital isolator using one of the latest technologies available. It is similar in function to an opto-isolator in function, but requiring far less power and is much faster. Power to the RX-0, TX-0 side of the chip is pulled directly from the LINKSYS connector. (Shown as the 3.3VDC connection in the above schematic). As before, we take advantage of the fact that this particular chip will work with either 3.3 or 5-volt power, so it will work also when we are operating in a standalone mode without the LINKSYS unit. Its outputs are powered from the adapters onboard DC-DC circuitry and will be fully galvanic isolated assuming its output side power is also isolated, taking advantage of the isolation abilities of the chip. (Only when option 1, the optional Power isolation module is installed in the power supply). Otherwise it acts as just a simple logic level converter. So our serial data is converted from a 3.3-volt system to 5 volts logic levels by this chip.

Solder paste jumpers SJ10 and SJ12 are provided so we can control if the serial port circuitry is to be isolated from the 1-Wire circuitry or not. If we want to use the adapter as a standalone isolated bus master we must install option number 1 and select pins 1-2 of both Sj10 and SJ12. This puts the serial port on the same side as the logic pin header connection power source, with 1-wire circuits fully isolated from the serial port. So it is isolated from the 1-Wire circuitry.

If we are using the adapter inside a LINKSY we can protect the LINKSYS by making the serial port and 1-Wire share common grounds and power by selecting pins 2-3 of SJ10 and SJ12. The LINKSYS is then fully isolated from the 1-Wire and serial ports.

The serial line logic is converted to RS232-F standards by a MAX3221CUE whose Rs232 side is made available at the RS232-F connection points. Solder paste jumpers allow various RS232 lines to be pulled high as needed. The MAX3221CUE has built in ±15 KV ESD protection on its lines and meets or exceeds TIA/EIA-232-F and ITU v.28 Standards

Typically a female 6-pin min-din connector is attached to the RS232-F connection points and wired for PS/2 serial port compatibility. This lets users use common serial port connectors with the unit. The possibility of using the port for a PS/2 mouse input exists, but that is a software issue more than hardware one.

Chapter 5

Software

1-Wire drivers and where to find them…

Software for the LP-LINKSYS-1W

General

Springbok Digitronics is the developer of the hardware portion of the LP-LINKSYS-1W adapter. **We cannot answer any software questions**; please consult directly with the software provider or developers for any questions regarding software issues. We may include a version of some software to aid customers, but since we did not write it, we cannot support it.

Hardware questions about the LP-LINKSYS-1W adapter are welcome, though we have tried to provide as much detail as we can in the manuals. For hardware questions concerning the base LINKSYS unit we suggest you contact your LINKSYS dealer or distributor or the company directly. **Be aware by opening the LINKSYS unit (needed in order to install the LP-LINKSYS-1W adapter) you will terminate your product warranty from LINKSYS.**

Standalone Bus Master operation

The LP-LINKSYS-1W hardware when used as a standalone bus master outside of the LINKSYS does not require any special software beyond normal 1-Wire bus master driving software. Any software capable of driving a serial interface, and expecting to see a DS2480B bus master chip can drive the board. It appears to the software to be exactly like a DS9097U bus master device.

When used mounted inside the LINKSYS

The LINKSYS WRT54G/GS uses open source Linux code internally for its normal basic operations. Thanks to the efforts of Paul Alfille and Christian Magnusson the popular open source OWFS has also been ported to run in this box and provide the needed code to operate the LP-LINKSYS-1W adapter. This software allows full access to the adapters hardware features and is the recommended software at this time. Any questions about the software should be made through the OWFS Internet address.

We suggest you download the latest OWFS software release from the following link:

OWFS -- 1-wire filesystem for Linux.URL

http://owfs.sourceforge.net/WRT54G.html

Advanced users of the LINKSYS may wish to check out one of the many variations of the principal base Linux software for the WRT54G/GS units available. These can add many new and advanced basic functions to the LINKSYS.

A bit here, a bit there…

Additional datasheets have been provided on the CDROM when possible for quick reference. Consult the manufactures web sites for the latest versions of these datasheets.

Additional References

Bill of Materials

- A full bill of materials is provided as a separate PDF document on the CDROM

1-Wire references

- The latest 1-Wire product information and data sheets can be found at: **Dallas Semiconductor**

- Additional 1-wire resources for 1-Wire cablings standards and other interesting documents can be found at **http://www.1wire.org/**Chapter

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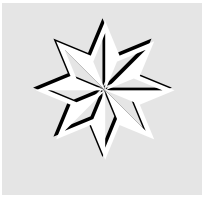
Adapter Wiring Reference

See the Connectors document in the Assembly folder on the CDROM

Final thoughts



A General Remark

The ideas presented in this document are part of Springbok Digitronics efforts to widen its focus by looking in a broad manner at particular problems. Much of the background data has been collected from a wide variety of sources and has not been checked for accuracy. No implied suitability for manufacturing or use is implied but all rights for original materials are reserved.