

# Router Trouble-Shooting Guidelines

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**Note:** The concepts in this document may apply to any router. This is a guideline; not exact directions. If you have the TP-Link TL-R401M router, the examples are closer to actual. Regardless, the terms used should be in your own router's manual.



We are not responsible for any failure to reconnect your PC to the internet. We will not fix settings on your modem, router or PC. **If you do not have the appropriate administrative rights or the skill to adjust router or switch settings, then please contact an appropriate resource for assistance.**

## Definitions

**Default** – the setting pre-configured by the vendor based on most common usage expectations.

**Dynamic Host Configuration Protocol (DHCP)** – the ability to assign an IP address.

**Electronic Device** – examples include a PC, router, switch, gateway or any component that contains electronic circuitry and (for this discussion) is capable of performing network or internet communication.

**Internet Protocol (IP) Address** – a specific numeric label required on an electronic device before it can communicate over the internet. The format of an IP address is 4 blocks of numbers 1-3 digits in length separated by periods (e.g. ###.##.###.##).

**LAN** – Local Area Network (for our purposes the computers connected inside your building).

**Media Access Control (MAC) Address:** a unique identifier assigned to every electronic device that will access a network or the internet. The format of a MAC Address is XX-XX-XX-XX-XX-XX for which XX can be a letter or number.

**Modem** – a device that translates specific types of communication (e.g. cable or DSL internet service).

**Network** – any two or more electronic devices connected for shared communication.

**Router** – a device that connects two or more devices via its DHCP ability to assign IP addresses. Technically, a router can be hardware or software, but our examples use the hardware type.

**Static IP** – an IP registered in the electronic device that is manually set so it will not change.

**Switch** – it looks like a router and connects devices, but it cannot assign DHCP. When DHCP is turned off in a router, it functions as a switch.

**TCP/IP** – the communication language of most networks and the internet.

**WAN** – Wide Area Network (for our purposes the computers outside your house).

## Router Rules

1. Only one device can serve as your router and use DHCP to assign IP addresses.
2. Any additional network devices must be configured as switches to prevent DHCP conflict.

**Tip:** The sudden inability to communicate on the network or internet is a potential symptom of DHCP conflict.

## Router Issues

### Router Needs a Reboot

Any electronic component that is “always on” can experience content errors (e.g. after a power interruption, static electricity, etc.). If you have service problems, reboot the router before pursuing any changes in router configuration or seeking support. There is usually a reboot command in the router menu, but a simple power cycle (e.g. turn unit off, wait 10 seconds, turn on again) will usually clear any memory errors.

If you have knowledge of an interruption in service, it can be best to reboot everything: cable/dsl modem, router, and PC. Then retest your connections.

### Router is Cabled Wrong

The single most common error we see is cabling in the router incorrectly. This section assumes **DHCP is enabled**, so it is a router. To trouble-shoot cabling, you trace wires from the wall to the computer.

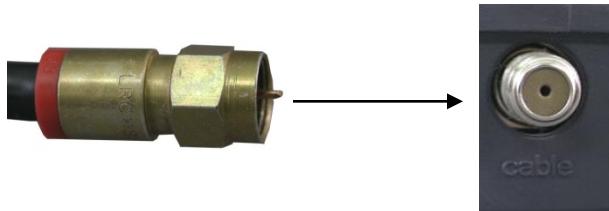
The most common configuration is:

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1. Your cable or dsl service comes into the house and the first cable goes to the cable/dsl modem provided by your ISP (pictures are illustrative only).



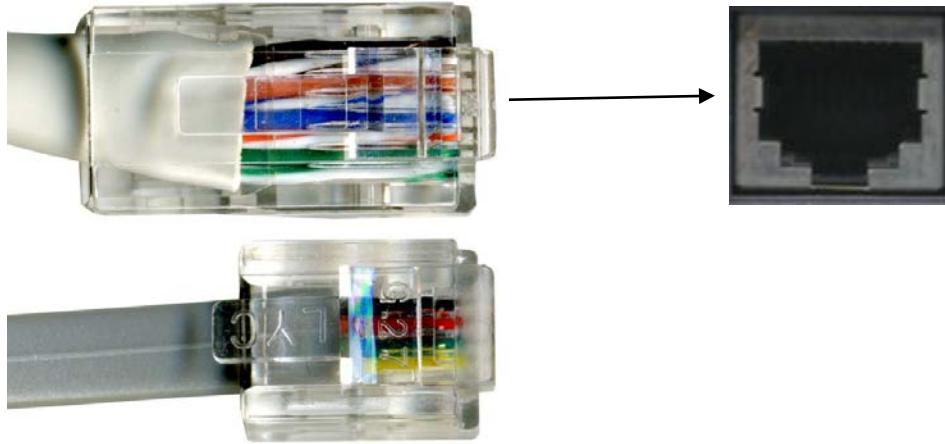
- o In cable service, the first cable is a standard coax cable connection:



- In dsl service, the first cable is standard RJ-11 telephone line.



2. Then a cat5e RJ-45 network cable (white cable below) is attached to the Ethernet port on the cable/dsl modem. (**Note:** A network cable looks like phone line but is larger.)



3. Next, the other RJ-45 end of the cat5e network cable plugs into the WAN port of the router. **Note:** The WAN port usually has some differentiation from the bank of (approximately) 4 standard LAN ports on the back.



4. Lastly another RJ-45 cat5e network cable plugs into a LAN port on the router at one end, and the other end plugs into your Ethernet → port on the computer (with another one eventually going to the standard gateway).



5. After the PC is connected through the router to the cable/dsl modem, any other devices are connected to the remaining LAN ports on the router (with more cat5e RJ-45 network cables).

**Reminder:** If the router has DHCP on, each device connected must also have DHCP turned on in **tcp/ip Properties** so it requests an IP address. If the device is a standard gateway, the configuration information is in the Gateway Advanced Setup software.

## Router Limits IPs Available

From time to time we see IP limits set in a router. There are several varieties of this scenario:

1. **The limit is set in the DHCP assignment range.** When DHCP is enabled, you specify a range that is available to assign to requesting electronic devices. In the default TP-Link configuration (see below), 100 possible IPs are available.

**DHCP Settings**

DHCP Server:	<input type="radio"/> Disable <input checked="" type="radio"/> Enable
Start IP Address:	192.168.1.100
End IP Address:	192.168.1.199

Where the household owns a desktop and a laptop, we've seen the range limited to two IPs: e.g. 192.168.1.100 to 192.168.1.101. This works with two devices but when an additional device enables DHCP requests (e.g. standard gateway), there is no IP for it.

**Note:** A static IP can still connect to a router configured this way.

2. **The subnet mask limits IPs.** The default Subnet Mask is 255.255.255.0, which means it will allow a maximum of 256 devices (hosts) to connect. Specifying a subnet mask is common in corporate networks to separate portions of the network but in a home, this is like having no limit because few private environments contain that many items.

**LAN**

MAC Address:	
IP Address:	192.168.1.1
Subnet Mask:	255.255.255.0

**Save**

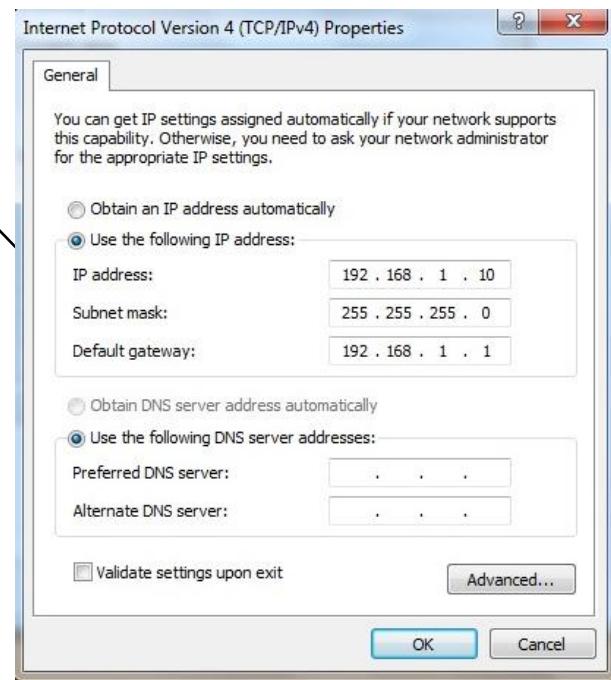
Occasionally, we see a router where a different subnet mask exists. This is ok, if it allows a sufficient number of connections, but it becomes a problem when you need one more connection than the router allows.

As a simple example to limit the router to a small number of connections in a home:

Subnet Mask	Number of Connections
255.255.255.252	4
255.255.255.248	8
255.255.255.240	16

**Warning:** If other than the default 255.255.255.0 subnet mask is used for the router, then the new subnet mask needs to be updated in the tcp/ip Properties window on every device connecting to this router as well.

**Subnet mask:** Home users usually keep the default 255.255.255.0. If the router uses a different value, then the PC, standard gateway and any other hardware connecting to this router must have the same subnet mask.



3. **The router limits IP usage time (address lease).** The router can be set to limit the length of time any IP can stay connected to it (see Address Lease Time below). The default setting on the TP-Link router is 120 minutes. If this number is set very small, it becomes almost impossible for a connected device (e.g. the standard gateway) to finish a data download.

## DHCP Settings

DHCP Server:	<input type="radio"/> Disable <input checked="" type="radio"/> Enable
Start IP Address:	192.168.1.100
End IP Address:	192.168.1.199
Address Lease Time:	120 minutes (1~2880 minutes, the default value is 120)

## MAC Filter is On

When you use the TP-Link router as a firewall, the default usually is **MAC Filter Off**. If you enabled the MAC Filter or if the default on your router is **MAC Filter On**, then you need to specifically add each device's MAC address to the filter (e.g. on TP-Link you do so from the configuration screen's **Add New** button).

**Repeat:** If the MAC Filter is ON, every device (e.g. PC, the standard Gateway, etc.) must be registered in the router for specific permission by exact MAC Address to connect.



Your MAC address is private information. The only need-to-know basis of this number is your network administrator or a qualified support person working on your router issues.

The screenshot shows the 'MAC Address Filtering' page of a TP-Link Cable/DSL Router (Model No.: TL-R402M). The left sidebar contains a navigation menu with items like Status, Basic Settings, Quick Setup, Network, Advanced Settings, DHCP, Forwarding, Security, Firewall, IP Address Filtering, Domain Filtering, MAC Filtering, Remote Management, Ping, Static Routing, Maintenance, and System Tools. The main content area displays 'Firewall Settings (You can change it on Firewall page)' with three entries: 'Enable Firewall: Disabled', 'Enable MAC Address Filtering: Disabled', and 'Default Filtering Rules: Deny these PCs with enabled rules to access the Internet'. Below this is a table with columns ID, MAC Address, Description, Status, and Modify. At the bottom of the table are buttons for 'Add New...', 'Enable All', 'Disable All', and 'Delete All'. To the right of the table is a 'MAC Address Filtering Help' panel containing instructions for adding entries, modifying existing ones, and deleting them. It also provides examples and notes about the MAC address format (XX-XX-XX-XX-XX-XX where X is a hexadecimal digit) and the need to enable Firewall and MAC Filtering on the Firewall page before setting up MAC filtering entries.

Examples of how to locate an electronic device's MAC address:

- For a PC, go to a command prompt window. Type **ipconfig /all** and press **Enter**. The **Physical Address** is your network card's MAC Address (e.g. the format is 6 sets of two characters each separated by hyphens XX-XX-XX-XX-XX-XX).
- For the standard gateway, the MAC Address will be displayed in the Gateway Advanced Setup software:
  - Weather Direct: <http://www.weatherdirect.com/help/software.aspx>
  - La Crosse Alerts Mobile:  
[http://support.lacrossealertsmobile.com/uploads/3/1/1/3/31139267/gatewayadmin\\_install.exe](http://support.lacrossealertsmobile.com/uploads/3/1/1/3/31139267/gatewayadmin_install.exe)
- Some devices print the MAC address on the tag that displays the model number.

## Device Menu Lacks DHCP Settings

When a user cannot find the DHCP menu, we sometimes discover they have a switch rather than a router. If you have the login information for the device, a router will usually make the DHCP access menu reasonably available.

The best way to verify any device is to locate the actual description label on the device - find the specific information after the phrase "Model No." For example, the TP-Link says "TL-R402M" on a label on the bottom of the device.

With the model number, you can use any search engine (e.g. [www.google.com](http://www.google.com), [www.yahoo.com](http://www.yahoo.com), [www.bing.com](http://www.bing.com), etc.) and type it as the search criteria (without quotes). You should then be able to find more information on the device.

**Note:** The model # tag on the device may also contain other useful information, like the IP to log into the unit or confirming words like "Cable/DSL Router".

## Unit is old or incompatible

Sometimes, no matter what configuration is set in the router, it simply does not work. This is likely when the router is too old to be compatible with current internet or network communication protocols. Strictly speaking, routers have been available for over 30 years, but a modern or router must be able to support internet communication.

The current version for internet communication is tcp/ip V4, with tcp/ip V6 in concurrent use. Our standard gateway is tcp/ip V4. We cannot guarantee the compatibility of any router.

## Unit is defective or partially so

As a manufactured item, any electronic component has a certain failure rate. If you buy a new router or a switch, know your return time limit and warranty or repair options. We have assisted customers with our internet-enabled products on various brands of routers, and on occasion a new router is simply defective (e.g. LAN port 1 fails but 2-4 are ok). For this reason, keep all documentation and packaging so that you can locate both the vendor and the manufacturer should the unit fail since if it is new, you will want a replacement if entitled to it.

Additionally, as units age some aspect of them naturally begin to break down. Those of us who work in the computer industry may own routers in which say port #3 is defective, but we mark the unit so that the broken port is never used again by mistake.

## If you are shopping:

- If you need DHCP to obtain an IP address, then keep saying “router, router, router” and check the package. Look for a router that states “broadband router” or “cable/dsl router”.
- If you already have DHCP but don’t have enough network ports, then keep saying “switch, switch, switch”. A switch is generally less expensive than a router but you need the router first. This package should say “switch”.
- If you don’t know or the prices are close, then find the best router price.
- A router becomes a switch when DHCP is disabled, but a switch is a cheaper way to add network ports to a router.

## Home Installation of the TP-Link Router as a Switch



**Reminder:** This information is provided as a convenience for skilled people to resolve router issues. We are not responsible for supporting your ability to disconnect and reconnect to your network or internet service. In the final analysis, your router vendor is the ultimate authority on router or switch configuration.

To reconfigure any router as a switch (e.g. TP-Link), you may temporarily disconnect a PC from your network and/or internet service. This removes the PC from the **currently active DHCP router**.

Before changing any settings, you need to capture and save your existing network configuration information. Our examples use Windows, but any operating system uses similar terms because the concepts all come from the tcp/ip (internet) protocol system.

### Capture your existing network configuration

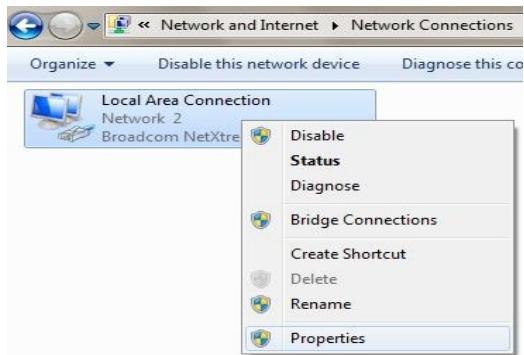
In Start|Accessories|Command Prompt – open a command prompt window. Make note of the path you are given (e.g. **c:\users\<username>**) or use a preferred location so to store all reconstruction information in the same place:

- At the command prompt, type the following: **ipconfig /all > config.txt**
- press the **enter** key.
- Next type: **type config.txt** and press the **enter** key. Information should scroll in the command prompt window, which tells you the existing network configuration is captured.

### Withdraw from DHCP

In Windows 8, use the Windows button on your keyboard for the Windows App screen, then type **View Network Connections** in the Search. From there it should be similar to Windows 7.

In **Windows 7/Vista** go to **Start|Control Panel|Network and Internet**. Select the **Network and Sharing Center**, and then select **Change adapter settings** (left side of window). You should see a **Local Area Connection** icon in the window. **Right click for a menu**, and select **Properties**.

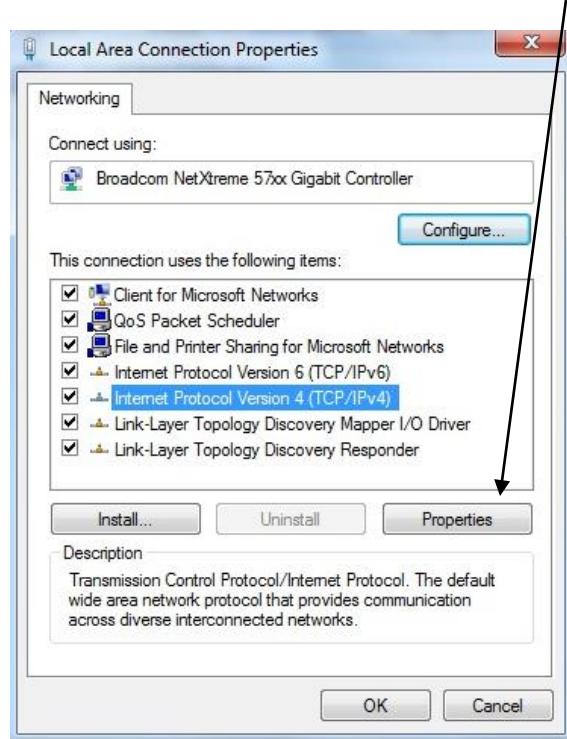


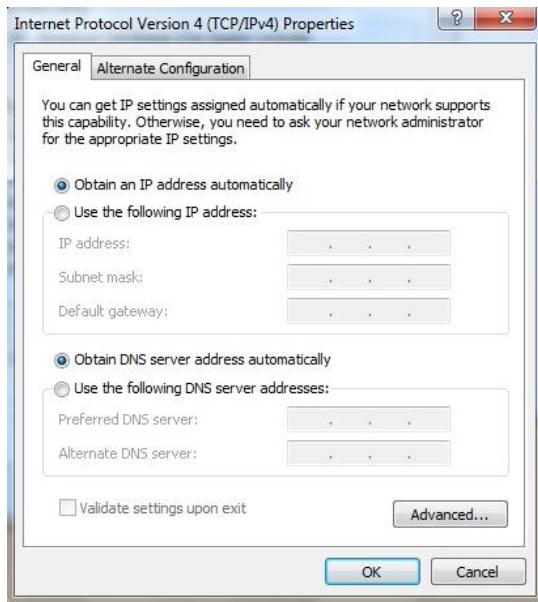
**Note:** Leave the **Command Prompt** window open, as you will use it again several times.

In **Windows XP**, **Start|Control Panel** will take you to **Network Connections**. The **Local Area Connection** then displays. Right click for a menu, and select **Properties**.

**Note:** The **Properties** information is similar in all versions of Windows, but it may be worded slightly different. In previous versions of Windows, there may only be a single **Internet Protocol (TCP/IP)** choice available.

In the **Local Area Connection Properties** window, select the line item **Internet Protocol Version 4 (TCP/IPv4)**. Once it is highlighted, click on the **Properties** button.





At the **Internet Protocol Version 4 (TCP/IPv4) Properties** window, either print screen the values, or write them down very carefully because ***you will need to restore this information later***. Most people will have DHCP on (e.g. "obtain an IP address automatically"):

### Create a temporary static IP

Unplug the network cable in the back of the PC. Make note of which port you pulled it from and mark which cable end was originally in the PC (e.g. tie shoestring, wrap a post-it etc.).



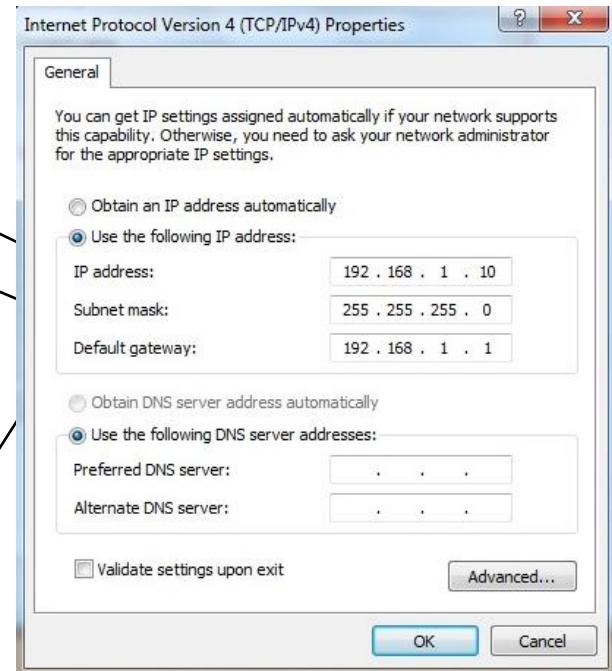
**Repeat:** Record your existing settings before proceeding.

Edit the **Properties** window (as below). To explain the entries conceptually:

**Default gateway:** The TP-Link router's default address is 192.168.1.1. You want to find the router IP here because it is your gateway, or starting point, for IP address assignment.

**IP address:** This is a static IP you will temporarily give your PC. Normally, a router or network administrator takes the default gateway number and increments the last digit to assign an IP address (e.g. 192.168.1.2). We use for example **192.168.1.10** as a static IP to avoid accidental conflict. The router and your PC will temporarily become a little network.

**Subnet mask:** Home users will keep the default 255.255.255.0. Alternate numbers are more common in a corporate environment, where different groups (or subnets) exist.



### Connect the temporary private network

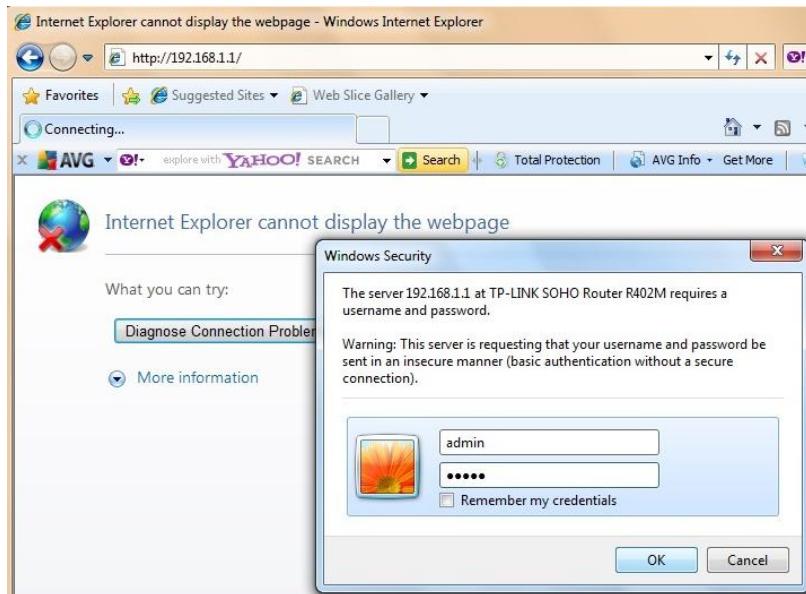
Select **OK**. Each operating system will vary in the series of approvals you need to make. Once you have closed out the **Properties** information, take the extra network cable you have, plug one end into the back of the PC (where you removed the network cable), and **the other end into the LAN port #1 on the back of the TP-Link router**. **Note:** When a router becomes a switch, you do **not** use the WAN port on the unit.

Go back to the **command prompt** window you left open earlier. These commands load you manually assigned static IP. At the command prompt type (*there is a space after ipconfig*):

- **ipconfig /release**
- press **enter**
- then type **ipconfig /renew**
- press **enter**.

### Deactivate DHCP on the router

Now open a browser window, type <http://192.168.1.1> and press **enter**. This will call the login screen for the TP-Link router. The default login are the entries **admin** and **admin**. (If this was changed, you need to obtain the correct entries from whoever made the changes.) Click the **OK** button.



If your login information is correct, you should see the TP-Link status and configuration menu.

The screenshot shows the 'Router Status' page of a TP-Link TL-R402M router. The left sidebar lists navigation options: Status, Basic Settings, Quick Setup, Network, Advanced Settings, DHCP, Forwarding, Security, Static Routing, Maintenance, and System Tools. The main content area is titled 'Router Status' and contains three sections: LAN, WAN, and Traffic Statistics. The LAN section shows MAC Address (00-1D-0F-D4-EA-16), IP Address (192.168.1.1), and Subnet Mask (255.255.255.0). The WAN section shows MAC Address (00-1D-0F-D4-EA-17), IP Address (0.0.0.0, Dynamic IP), Subnet Mask (0.0.0.0), Default Gateway (0.0.0.0), and DNS Server (empty). Below these sections is a 'Traffic Statistics' table with columns Received and Sent. The table shows Bytes (0) and Packets (0) for both Received and Sent. At the bottom, it shows 'System Up Time: 0 day(s) 01:20:54' and a 'Refresh' button.



If you cannot get the login to work and no one has the user name and password information, then you need to consult vendor information to reset the factory defaults on the router. Doing so, however, requires a complete re-configuration of all router settings and is not our responsibility.

**Note:** If your router is combined into a cable/dsl modem, sometimes your ISP maintains control of that information to reduce support concerns.

**To disable DHCP**, go to the left side of the router menu (picture above), under the **Advanced Settings** menu, and select **DHCP**. On the **DHCP Settings** screen, you will select the **Disable** button (picture below) for the DHCP Server feature and click the **Save** button. This will return you to the TP-Link status and configuration menu.

The screenshot shows the 'DHCP Settings' page. It features a 'DHCP Server' section with two radio buttons: 'Disable' (selected) and 'Enable'. Below this are two input fields: 'Start IP Address' (192.168.1.100) and 'End IP Address' (192.168.1.199).

On the left side under the Maintenance menu, select **System Tools**, then select the **Reboot** option. Click on the Reboot button and follow directions on the screen.



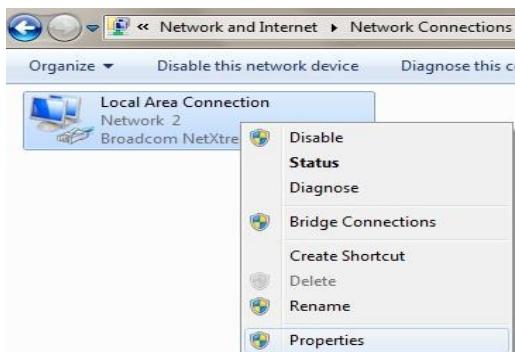
The TP-Link Router is now the TP-Link switch. It will no longer provide DHCP addressing.

#### Restore the PC's TCP/IP Configuration

Now you need to restore your PCs network/internet connection and cable in the switch.

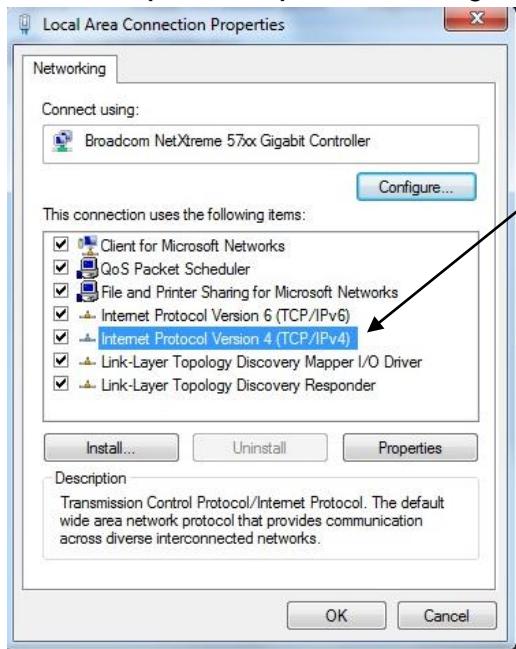
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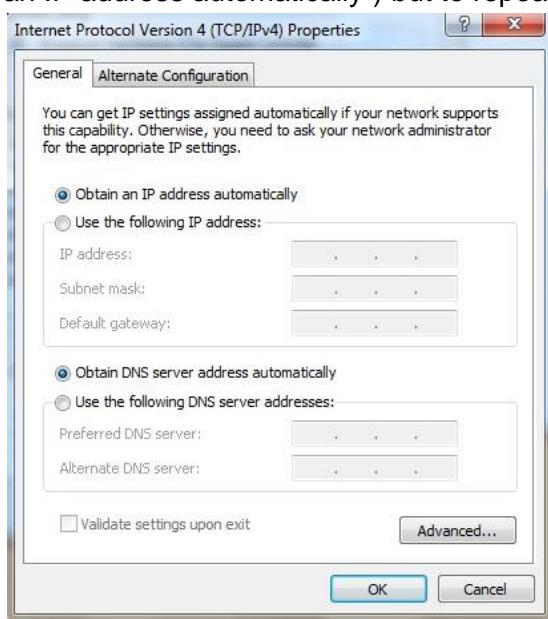


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In the **Local Area Connection Properties** window, select the line item **Internet Protocol Version 4 (TCP/IPv4)**. Once it is highlighted, click on the **Properties** button.



The result should display the **Internet Protocol Version 4 (TCP/IPv4) Properties** window. Type in the original information saved on page 4. Most people will need DHCP on (e.g. "obtain an IP address automatically") but to repeat, you must have a router (somewhere) to use DHCP.



Select **OK**. Each operating system will vary in the series of approvals you need to make.

Once you have closed out the **Properties** information, take the loose network cable end marked earlier and plug it into any available LAN port on the back of the TP-Link router.

In essence if you check the cables you will see: the modem and router are cabled to the TP-Link switch, and the switch is cabled to the PC where the modem used to be plugged in.

Now go back to the **command prompt** window you left open earlier. At the command prompt type (*there is a space after ipconfig*):

- **ipconfig /release**
- press **enter**
- then type **ipconfig /renew**
- and press **enter**.

Now recheck a few internet web sites you are familiar with in your browser.

## Common Switch Setup Errors

If you have any problems:

- Recheck **all** cables as a switch's path should be: wall incoming internet service to the modem, then modem to the router, then router to the switch, then the switch to the PC (using the LAN ports on the switch – not the WAN port).
- Each device has a power cable connected, and some light active to indicate power is on.
- If you can't find a cable problem, then reboot everything – modem first, then your PC. Remove and replace the TP-Link power cable in this process.
- Recheck the internet access again.
- You have now added at least 2 network ports to your router via the switch (e.g. for a standard gateway).