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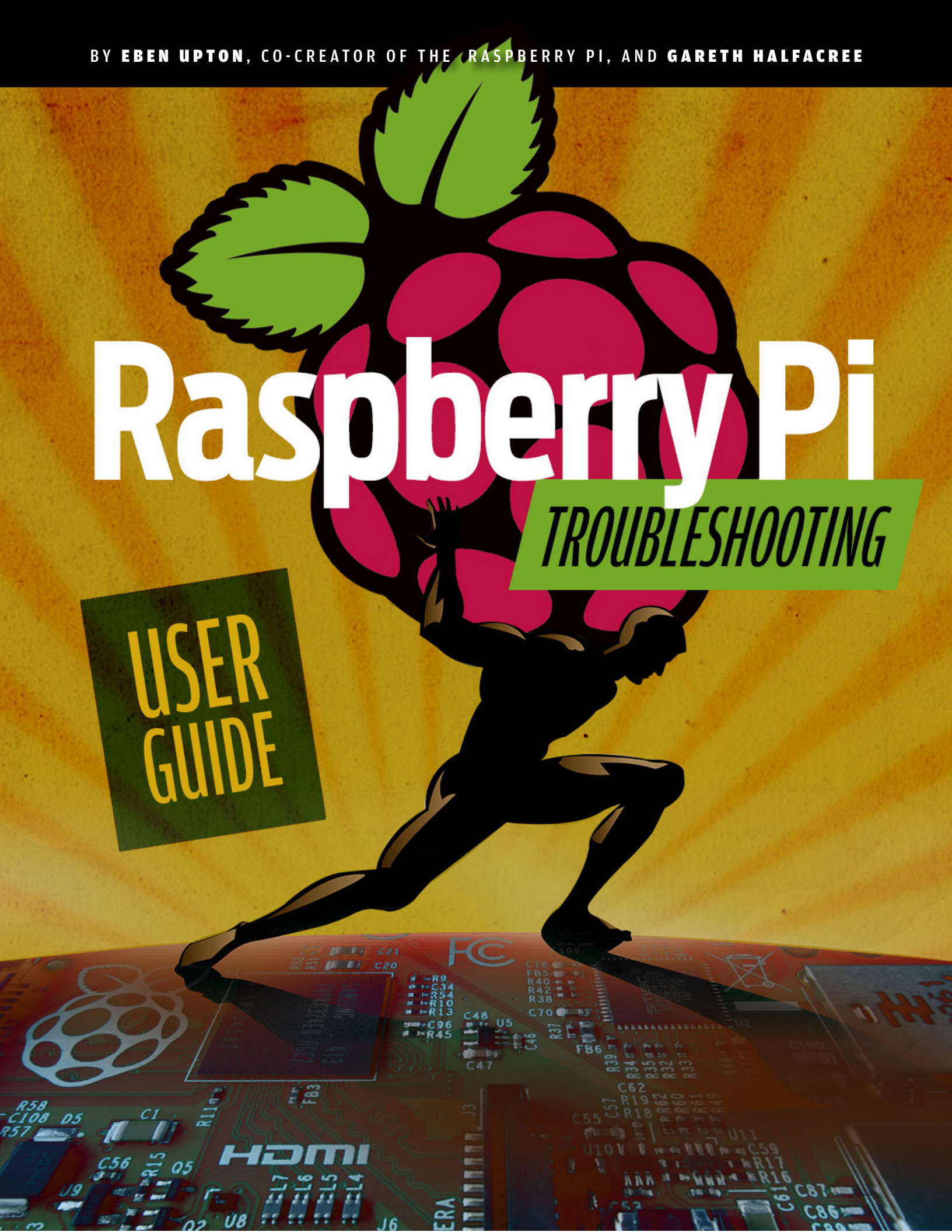
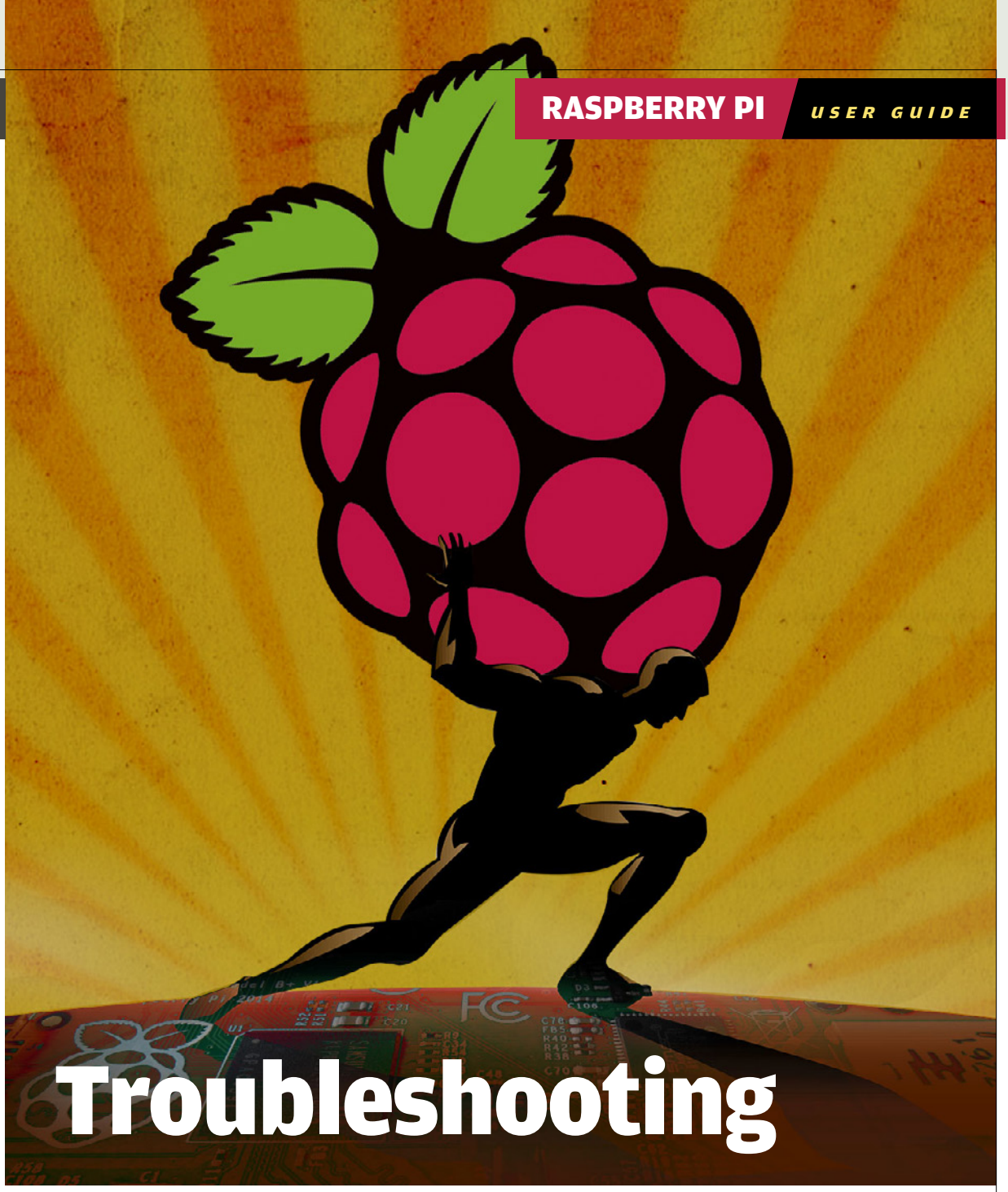
Raspberry Pi

TROUBLESHOOTING

USER GUIDE





Troubleshooting

Keyboard and Mouse Diagnostics

PERHAPS THE MOST common problem that users experience with the Raspberry Pi is when the keyboard repeats certain characters. For example, if the command `startx` appears onscreen as `stttttttttartxxxxxxxxxxx`, it will, understandably, fail to work when the Enter key is pressed.

There are typically two reasons why a USB keyboard fails to operate correctly when connected to the Raspberry Pi: It's drawing too much power, or its internal chipset is conflicting with the USB circuitry on the Pi.

Check the documentation for your keyboard or the label on its underside to see if it has a power rating given in *milliamps (mA)*. This is how much power the keyboard attempts to draw from the USB port when it's in use. The Pi's USB ports are not able to provide as much power as those of a full-size laptop or desktop computer. This can be a problem for keyboards that have built-in LED lighting, which require far more power to operate than a standard keyboard. If you find that your USB keyboard may be drawing too much power, try connecting it to a powered USB hub instead of directly to the Pi. Doing so allows the keyboard to draw its power from the hub's power supply unit, instead of from the Pi itself. Alternatively, swap the keyboard out for a model with lower power demands. The repeating-letter problem may also be traced to an inadequate power supply for the Pi, which is addressed in the next section, "Power Diagnostics".

The issue of compatibility, sadly, is harder to diagnose. The overwhelming majority of keyboards work just fine with the Pi, but a few exhibit strange symptoms. These range from intermittent response to the repeating-letter syndrome, or even crashes that prevent the Pi from operating. Sometimes, these issues don't appear until other USB devices are connected to the Pi. If your keyboard was working fine until another USB device, in particular a USB wireless adapter, was connected, you might have an issue of incompatibility, or your particular USB dongle may be drawing too much power.

If possible, try swapping out the keyboard for another model. If the new keyboard works, your old one might be incompatible with the Pi. For a list of compatible keyboards, visit the eLinux wiki at **http://elinux.org/Rpi_USB_Keyboards**, but be aware this list is user-generated and is far from exhaustive.

The same advice on checking compatibility in advance applies to problems with the mouse. The majority of USB mice and trackballs work fine, but some exhibit incompatibility with the Pi's USB circuitry. This usually results in symptoms like a jerky or unresponsive mouse pointer, but it can sometimes lead to the Pi failing to load or crashing at random intervals. If you're looking to buy a new mouse, a list of models known to work with the Pi is available at the eLinux wiki site at **http://elinux.org/RPi_USB_Mouse_devices**.

TIP

The formal USB standard states that devices should draw no more than 500 mA, with even that level of power available only to the device following a process called negotiation. The Pi doesn't negotiate for power, which can cause problems when trying to power the Pi from a PC's USB port. While lower-power models such as the Raspberry Pi Zero may work, higher-power models like the Raspberry Pi 2 and 3 should never be powered from a PC's USB port.

Power Diagnostics

MANY PROBLEMS WITH the Raspberry Pi can be traced to an inadequate power supply. While the low-power Model A draws a maximum of 500 mA, the high-performance Raspberry Pi 3 can draw up to 1,200 mA (1.2 A), a figure which increases the more accessories are added. Not all USB power adapters are designed to offer this much power, even if their labelling claims otherwise. If you're having intermittent problems with your Pi—particularly if it works until you connect something to a USB port or start a processor-intensive operation like playing video—the chances are that the power supply in use is inadequate. The power LED of the Raspberry Pi acts as an in-built voltage test, letting you know if the power supply you're using is below the standard required for stable operation. If the power LED is flashing or unlit, your power supply is providing less than 4.65 V—well below the 5 V USB standard—and should be replaced.

Another warning sign for inadequate power is the appearance of a square of rainbow colours in the top right of the display. If your power is borderline, you might see this square appear and disappear as you change the amount of power the system is drawing by running something that uses the graphics processor, for example, or by connecting hardware to the GPIO header.

If you want to get a better idea of the power your Pi is receiving, the easiest way is to buy a *USB power meter*. A simple form of *multimeter*, a USB power meter is designed to sit in-between your USB power supply and the Raspberry Pi and measure the voltage and amperage.

WARNING

There are contact points on the Raspberry Pi you can use with a traditional multimeter's probes to take a reading of the voltage from your power supply, but you should not use these because there is too great a risk of accidentally shorting a probe to nearby pins.

A USB cable suitable for use with your USB power meter should be connected to the USB power meter's input, and a micro-USB cable should be connected from its output to the Raspberry Pi. When connected to power, the USB power meter starts reading out statistics about the quality of the power from the power supply. These statistics include the voltage, typically labelled with a V for volts on the display, and the current, labelled with an A for amps (see Figure 1).

Figure 1: A USB power meter, reading the power flowing into a Raspberry Pi 2

The voltage reading on the USB power meter should be somewhere between 4.65 V and 5.2 V. If it's lower than 4.65 V, this indicates that the Pi is not being provided with enough power. Try swapping the USB adapter for a different model, and check that the label says it can supply 700 mA or more for lower-powered Raspberry Pis including the Model A and Pi Zero, 1.8 A or more for the A+, B+, and Raspberry Pi 2, and 2.5 A or more for the Raspberry PI 3. Beware of cheap power supplies and thin micro-USB cables: They sometimes have inaccurate labelling and fail to supply the promised current. Genuine branded power supplies such as the official Raspberry Pi model rarely have this problem, but cheap unbranded devices—often sold as compatible adapters—should be avoided.

The current reading can be used to determine how close you are to the upper limit of your power supply's output. If the readout says "0.62 A", for example, this means you are currently drawing 620 mA (milliamps, thousandths of an amp), which is above the rated output of a 500 mA power supply but safely below that of a 1 A or greater power supply. A Raspberry Pi in normal operation should draw less than 500 mA, but this figure can increase if you connect additional hardware such as Wi-Fi dongles, onboard displays, or wireless keyboards and mice. A USB power meter is the easiest and safest way to keep track of the current being used.

Display Diagnostics

ALTHOUGH THE PI is designed to work with almost any HDMI, DVI, or composite video display device, it simply might not work as expected when you plug it in. For example, you could find that your picture is shifted to the side or not fully displayed, or is only visible as a postage-stamp-sized cutout in the middle of the screen or in black and white—or even missing entirely.

First, check the type of device to which the Pi is connected. This is especially important when you're using the composite connection to plug the Pi into a TV. Different countries use different standards for TV video, meaning that a Pi configured for one country may not work in another. This is the usual explanation for a Pi showing black-and-white video. You find out how to adjust this setting in Chapter 7, "Advanced Raspberry Pi Configuration".

When you use the HDMI output, the display type is usually automatically detected. If you're using an HDMI to DVI or VGA adapter to plug the Pi into a computer monitor, this occasionally goes awry. Common symptoms include snow-like static, missing picture portions, or no display at all. To fix the problem, note the resolution and refresh rate of your connected display, and then jump to Chapter 7 to find out how to set these manually. Another issue is a too-large or too-small image, either missing portions at the edge of the screen or sitting in the middle of a large black border. This issue is caused by a setting known as *overscan*, which is used when the Pi is connected to TVs to avoid displaying on portions of the display that may be hidden under a bezel/surround. As with other display-related settings, you learn how to adjust—or even completely disable—overscan in Chapter 7.

Boot Diagnostics

THE MOST COMMON cause for a Pi to fail to boot is a problem with the SD (or microSD) card. Unlike a desktop or laptop computer, the Pi relies on files stored on the SD card for everything. If the Pi can't talk to the card, the Pi won't display anything on the screen or show any signs of life at all.

If your Pi's PWR (power) light glows when you connect the micro-USB power supply but nothing else happens and the ACT (activity) light isn't flickering to indicate data access, you more than likely have an SD card problem. First, ensure that the card works when you connect it to a PC and that it shows the partitions and files expected of a well-flashed card.

If the card works on a PC but not on the Pi, it may be a compatibility problem. Some SD cards don't operate correctly when connected to the Pi's onboard SD card interface. You can find a list of cards known to be compatible with the Pi on the eLinux wiki at **http://elinux.org/RPi_SD_cards**.

Sadly, if you have an incompatible card, you will probably need to replace it with a different card in order for the Pi to work. As the Pi's software base is developed, however, work is being carried out to ensure that a wider range of cards operates correct-

ly with the Pi. Before giving up on it completely, check to see if an updated version of your chosen Linux distribution is available.

If you've been changing the speed of your Raspberry Pi by overclocking, it might not boot correctly. To temporarily disable the overclock and run the Pi at its default speed, hold down the Shiftkey as the boot messages appear on-screen. ■