

PIC Calibar tv generator
 Investigating Brown's gas
 Television broadcast mags
 Understanding meta studies
 Comparing energy densities

Once again, we do seem to have a fascinating mixture of pseudoscience and real science topics this month. Only this time, "they" almost (but not quite) did get the pseudoscience part right. Let's start off with...

The PIC Calibar

Tim Jenison of *NewTek* just sent me one of his new *Calibar* television test generators. This \$349 pen-sized instrument shown in figure one can replace an entire studio full of pro NTSC (never the same color) tv test gear. This generates the twenty-four precision test patterns shown. Either in the field from a two hour internal battery or on the bench from a small wall wart ac supply.

The Calibar also can double as a station master sync generator.

The ergonomics here provide new meaning to my search for *elegant simplicity*. The user interface consists of a pushbutton! You briefly hit the button twice for turnon. If you don't like the current pattern, keep hitting your button until the one you want comes around. Hold the button down to turn power off. A single red LED lights if the Calibar is active.

Internal ten bit digital accuracy is used for highest waveform precision. Baseband video gets output from a male BNC connector. Their included adaptors get you into phono plugs, phono jacks, or female BNC. There's also a "magic" set of blue glasses you wear for chroma balance.

Let us review some NTSC tv. The crucial frequency is called a *Chroma Reference* and is always a precise 3.579545 Megahertz. As figure two shows us, that zero degree or *burst reference phase* corresponds to a color very slightly on the purple side of blue. As you shift the phase of your current signal with respect to this reference, the "color wheel" or "vectorscope display" is generated nearly as shown. Thus, the phase of your 3.58 color subcarrier sets the color, while its amplitude sets the saturation for you. Actually, a *color*

difference amplitude scheme is used so that very little subcarrier is needed with whites or pastels. Chroma shift adjustments are also made to favor facial and skin tones.

The chroma reference gets divided by 227.5 to produce a *horizontal scan frequency* of 15,735 Hertz. Providing 63.55 microseconds for each H scan line. Their further division by 262.5 produces a *vertical field frequency* of 59.94 Hertz. Two fields are combined into a single interlaced scan, giving you a frame rate of a tad under thirty frames per second.

Back to our horizontal scan line. The line is separated into a live scan time of around 55 microseconds and the blanking time of slightly over 8 microseconds. Blanking gives your classic CRT "picture tube" electron beam enough time to reset from right screen back to left.

Baseband video is normally set so

that one volt is white, a tad over a quarter volt is black, and zero volts are "blacker than black" *sync tips*.

H blanking interval includes a five microsecond wide *horizontal sync pulse* and an eight cycle long *chroma reference burst* on its "back porch". These are used to *synchronize* or lock transmitter to receiver.

Their vertical blanking interval is more complex. The vertical blanking is needed to give your electron beam time to get back to the top of the screen. Various "hidden" services are also provided in here, including close captioning, test signals, and timing standards. The vertical blanking also provides a *vertical sync pulse* as the third locking signal.

Some fancy *equalizing* "teeth" are placed in the vertical sync pulse to preserve horizontal sync extraction and to take care of the half line offset between even and odd fields.

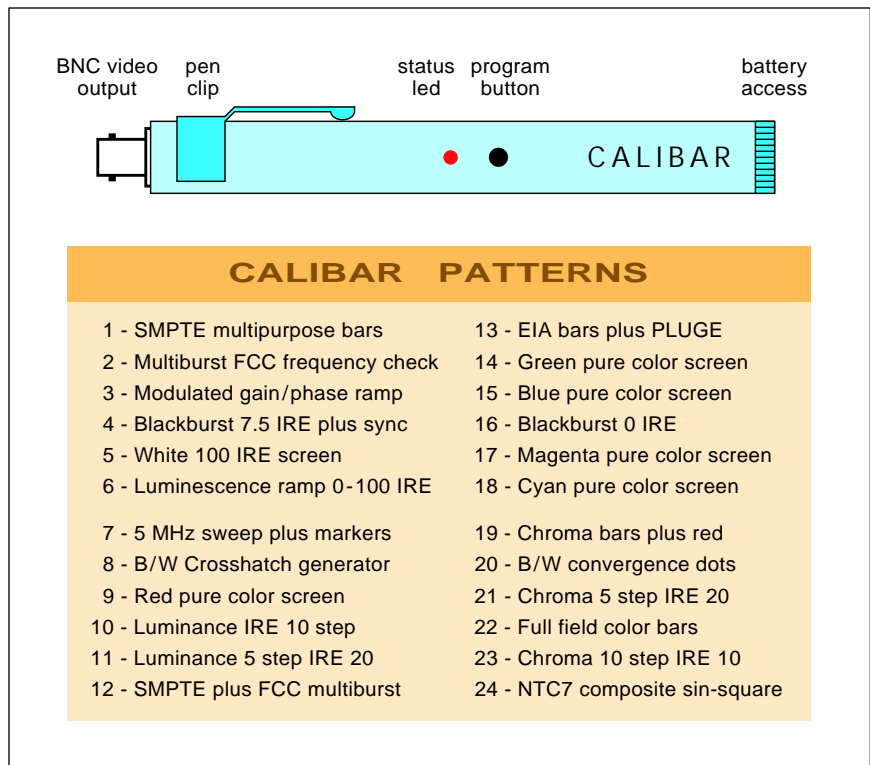


Fig. 1 – PEN SIZED AND PIC BASED CALIBAR from NewTek replaces a whole studio full of television test instruments. The twenty four standard precision test patterns are generated as shown.

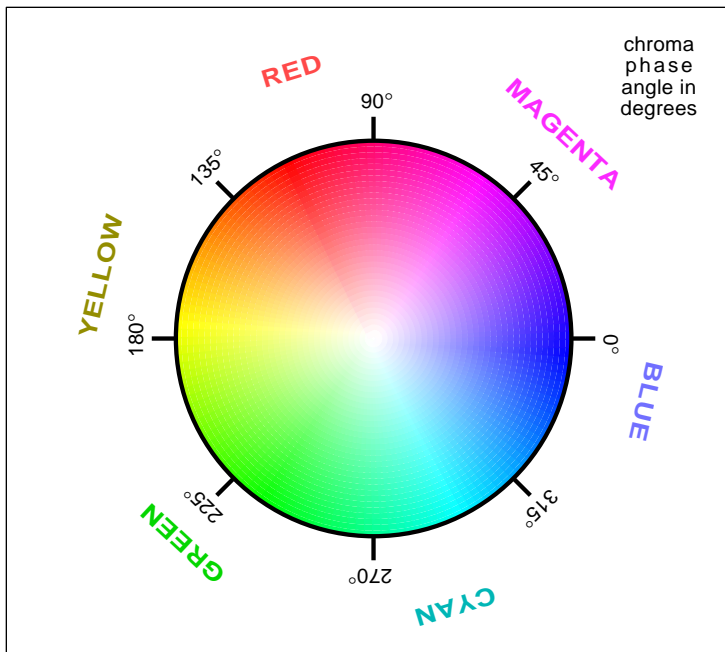


Fig. 2 – THE NTSC CHROMA SUBCARRIER PHASE determines the hue, while its relative amplitude sets the color saturation.

Inner Details

Figure three shows you a rough block diagram of Tim's Calibar. The PIC 16C57 microprocessor used is not quite fast enough to directly generate the highest speed video timing. But it does *all* of the slower tasks. Such as

a *partial* pattern timing, horizontal scan line generation, pattern picking, pushbutton housekeeping, sync, and the frame rate timing. The usual 4X chroma frequency of 14.318 MHz is used as a master system clock.

The heart of the circuit is a high speed, low power, ten bit *Harris* D/A

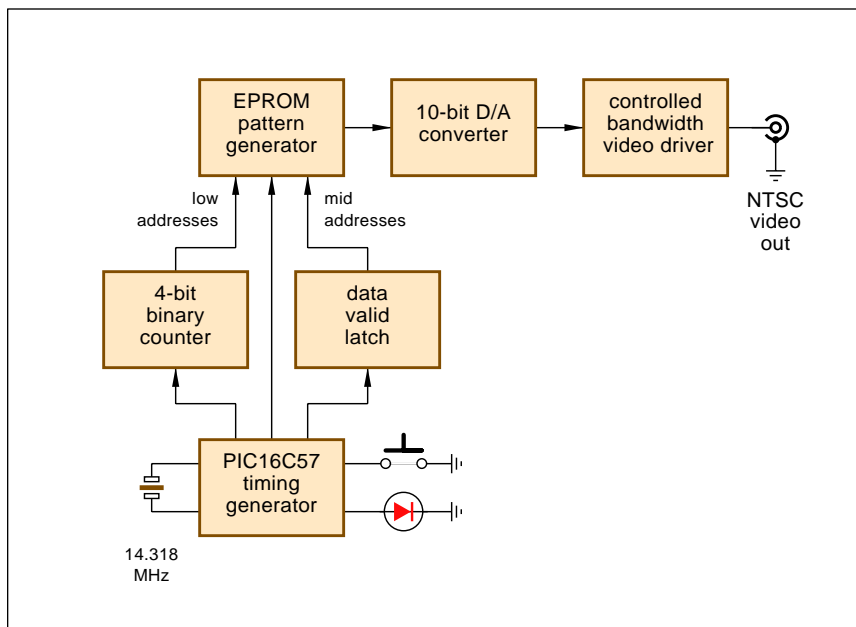


Fig. 3 – AN APPROXIMATE BLOCK DIAGRAM of the Calibar. Table lookup of 4X chroma samples get provided to ten bit accuracy. The PIC controls most table access and does all the synchronization and low frequency timing.

converter, followed by a fast video op amp driver of carefully controlled bandwidth. The D/A is driven from a large EPROM pattern generator. Low address bits of this pattern generator do get continuously and sequentially accessed when you scan across each horizontal line. Upper address bits pick the pattern for the particular lines being output.

A resettable 4-bit CMOS binary counter does the fastest of the pattern addressing. The PIC does everything else! Their PIC apparently executes one instruction cycle every chroma cycle of 3.58 MHz.

My best guess as to how the "half cycle" at the end of each H line gets done is by using H line pattern *pairs*.

Again guessing, I suspect that the need for any half or odd H lines is eliminated by generating a full two frames of four fields. Special line pair sync patterns would be needed for each case of even or odd field and even or odd frame.

Clearly, there is some innovative programming going on here.

There's 910 samples of 4X chroma per line, so ten address bits ($2^{10} = 1024$) should handle your sequential addressing for one H line. Or eleven address bits for H line pairs.

With a 64K word EEPROM, this leaves you with five address lines to access up to 32 possible line patterns. Many of these will be needed for the exotic synchronization. Some others can be reused in several modes.

The nice thing about this scheme is its *content independence*. You don't have to try and logically define all of the patterns; all you do is stash their values in a lookup table. Not all that many live patterns should be required because any selected screen display mode does not change much in the vertical direction. And certain screen modes are simply combinations of earlier ones.

All patterns are *exact*. As precise as 10-bit samples allow.

I was sort of joking to Tim that he should also offer the classic "indian head" pattern. Done as lookup, this would require a somewhat oversize EPROM. With some folding, around eight megs might do it.

Do note that the Calibar is NTSC *only*. It is *not* intended for VGA or other computer monitor uses. Owing

Gasoline	9000 Wh/l	13,500 Wh/Kg
Lithium	350 Wh/l	150 Wh/Kg
Flywheel	210 Wh/l	120 Wh/Kg
Lead Acid	40 Wh/l	25 Wh/Kg
Hydrogen	3.5 Wh/l	39,000 Wh/Kg

Fig. 4 – COMPARING SOME POPULAR ENERGY DENSITIES.

to differences in scan rates and how colors are generated and distributed. But I'd guess that similar computer monitor testers are in the works.

As an aside, NewTek is not in Kansas anymore. Took the dog, but left Aunt Em. Note their new Texas address. Their website does remain as www.newtek.com.

More on elegant simplicity in my [ELESIMP.PDF](#). I will try to work up some PIC video demos in a future column. Meanwhile, much more on PIC apps appears on the [PIC Library Shelf](#) and the pair of PIC Web Link pages on www.tinaja.com.

Good sources for video in general are that older *Television Engineering Handbook* from McGraw Hill. And that newer *Video Demystified* from Harris Semiconductor.

More tv and video info appears as this month's resource sidebar.

Meta Studies

How can you honestly evaluate a controversial technical concept? One older scientific tool that's seeing new life is called the *Meta Study*. Where you simply "study the studies." You *objectively* and *without bias* gather together *everything* you can find on the subject. Both pro and con.

Only *after* everything is gathered do you try to judge both sides for relevance, scientific rigor, timeliness, hidden agendas, vested interests, and overall credibility.

From there, you go on to decide whether you want to spend the time and effort to further involve yourself. The argument "But you haven't done the experiment" cuts no ice here. The chances are "the experiment" (or its interpretation) will be dead wrong anyhow. A meta study usually will clearly tell you whether there is any

point in getting further involved.

It all comes on down to a simple matter of probabilities.

A meta study is similar to a civil jury trial, where "preponderance of evidence" is carefully sought. Along with the suitable "motive, means, and opportunity." After you have run a few meta studies, obvious "looks like a duck - quacks like a duck" patterns emerge. The big picture patterns that easily let you separate science from pseudoscience.

Or the scams, all of the "not even wrong" bad labwork, and the thuzzy finking from real opportunities and genuine breakthroughs.

The web sure makes doing meta study searches simple and easy. I've got lots of brand new search tools at www.tinaja.com/webwb01.html But my favorite search tool remains good old *Hotbot*.

Meta studies work in nearly any field. As one practice non-electronic ferinstance, punch *L-Carnitine* into *Medline* and you'll probably reach the same conclusions that I did. That this nutritional supplement *does* seem highly useful and effective for certain cardiovascular problems but *does not* normally provide stamina or energy benefits for fitness jocks. More on this in [DONTSICK.PDF](#).

Free Medline links are found on www.tinaja.com/beewb01.html

A custom meta study service is at www.tinaja.com/info01.html

It's a Gas

I decided to apply a meta study to *Brown's Gas*, one currently popular web pseudoscience topic. I found a fascinating mixture of legit science, highly unexpected though apparently valid "gee whiz" results, along with outrageously unsupported claims.

The bottom line is that I spotted nothing here to get personally excited about. Although a PostScript and PIC controlled flutterwumping precision torch just might make for a rather interesting project.

Firstoff, note that any decent torch person can pull off all sorts of magic tricks. At Thatcher Fire Department, we have a *Broco* oxy-iron torch we use as the "master key" to vaporize anything between where we are and where we want to go. I've personally used a Broco to cut through cement blocks and to burn the bottom out of a bucket full of water.

From the inside.

Let's start with the remixed gas a chemist would get from the classic electrolysis of water. This will be a *stoichiometric* mixture of very nearly two parts of hydrogen and one part of oxygen by volume. For semantics, let's call this one *stokegas*. On the off chance that Brown's Gas might really be something else.

Stokegas is one of the most highly combustible substances known to man. For this reason, stokegas gets normally generated and used *only* as it is needed. Storage is a big time no-no. Specialized torches seem to be a good on-demand match here.

Stokegas burns with an extremely hot but remarkably low energy flame. The degrees are there but the BTU's are not. Ferinstance, gasoline offers 9000 watt hours of energy per liter. Stokegas at normal temperature and pressure delivers only 2.4 watt hours per liter.

Stokegas theoretically burns at 5120 degrees F or 3100 degrees C. Hydrogen in air theoretically burns at 3860 degrees F or 2400 degrees C. By contrast, acetylene in air burns at a *hotter* 4770 F or 2670 C.

Claims that you can *briefly* place your hand *near* a stokegas flame do appear true. But do *not* try it! The reason is that despite the extreme temperature, there is not enough heat energy present to briefly do you any significant harm.

A claim that stokegas "adjusts" its temperature to suit the task at hand is apparently rotten labwork. Infrared thermometers are based on emissivity and there is darn little to emiss. The correct method to make an accurate reading is to place an object in the

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Television Quarterly

111 W 57th St
New York NY 10019
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TV Technology

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Falls Church VA 22041
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flame and heat it. Then measure the object's emitted radiation.

Even then, interpretation can get rather tricky.

Is a hydrogen flame invisible? Haz mat folks think so. Especially during that hot summer afternoon tanker rollover in the Phoenix desert. Where they had to "joust" with a rag on a pike pole to find the flame front. In the lab, you can in fact see the flame. Albeit it a rather weak one. Reasons for the near invisibility include an emission primarily in the ultraviolet, the lack of carbon particles, and the low total energy involved.

Valid hydrogen proponents are taking steps to make their flames more visible. Similar to placing that *methyl mercapan* odorant in natural gas. Which otherwise has no smell whatsoever. It seems that whenever they first tried natural gas odorants, they used a chemical that smelled *good*, rather than bad. Which made people purposely leave their gas jets open to act as room air fresheners!

Does stokegas implode rather than explode? Not really. However, *if* the container walls are cool enough, the generated steam *will* condense and *will* provide you with an amazingly reduced final pressure. Perhaps down around 1 PSI or so.

Giving you an explosion rapidly followed by condensation. There are two rather distinct but overlapping processes here. After demonstrating this effect several times in a row, the container walls and the accumulated

water usually seem to heat up enough that positive pressures result.

The claims that an "implosion" can lead to any "subvacuum" pressures or pressures below the vapor pressure of liquid water have no apparent basis in fact. Tain't likely McGee.

Could a reduced pressure engine be developed? Possibly. Would it be useful or efficient? Almost certainly not. Why? Because of inherent and fundamental thermodynamic cycle limitations.

More on all these thermodynamic cycles in [HACK64.PDF](#).

Certain Brown's gas proponents claim they are generating something that's different than stokegas. Yet the schematics I looked at seemed to be sending more or less plain old current through more or less plain old water.

Brown's gas proponents claim to *melt* tungsten. This is believed to be impossible with stokegas. However; reversible tungsten side reactions that can involve oxidation, ablation, or a

sublimation appear to be credible mainstream explanations for all of the observed effects.

Proponents also claim significant generation and long term storage of *monoatomic* oxygen and hydrogen. Which I find highly unlikely, and a chemist finds so hilarious they won't even talk about it. As far as anyone knows, monoatomic hydrogen and oxygen very rapidly recombine into their diatomic forms or quickly enter into other reactions at most realistic temperatures and pressures.

Certain Brown's gas proponents also claim overunity generation and the ability to neutralize radioactivity. The strongest evidence for these last three extraordinary claims so far is a GIF image of a large orange box.

Which clearly is radiating at 590 nanometers. Uh, nice try.

As to doing overunity hydrogen generation, it *does* turn out that up to *one sixth* of electrolysis energy can *sometimes* in fact come from waste heat rather than input electricity. But this modest "gain" happens only at low production rates and is usually swamped by other cell losses.

There is also classic EE student lab blunder #01-A. Where you'll fail to accurately measure rms power when dealing with any unusual waveforms. More on this in [MUSE112.PDF](#).

Claims that any electrolysis cell "stays cool" are easily explained by staying in the endothermic generation region between 1.23 and 1.47 volts.

More details in Peavey's ineptly

NEED HELP?

Phone or write all your US Tech Musings questions to:

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US email: don@tinaja.com
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Morris Plains NJ 07950
(201) 292-5100

John Wiley
605 Third Ave
New York NY 10158
(212) 850-6088

misnamed *Fuel From Water*, stocked by *Lindsay Publications*.

I've found nothing whatsoever to convince me that Brown's gas is in any way, shape, or form any different from stokegas. But the simple mass spectrographic proof has apparently has never gotten done.

Other web proponents claim to be able to somehow "resonate" a water molecule, aiding its dissociation. In some vaguely overunity manner. The problem is that the frequencies they are using seem *ten million* times too low. And even if resonance worked, I personally see absolutely *no way* that any energy gain could possibly result in the process.

Claims that a hydrogen powered car can be run with "a few watts of electricity" are usually demonstrated by running the few watts for a long time, dangerously accumulating the gas, and then idling the car for a brief instant. Otherwise known as using a *piggy bank* effect.

Unless such extraordinary claims can be solidly backed up by lots of independent tests and extraordinary

evidence, these on-board "miracle" hydrogen electrolysis generators will remain totally useless for cars. Why? Because you'd be ridiculously better off sending the electricity directly to wheel motors in the first place.

Lots more about Brown's Gas is on the net. Be sure to remember that *net* clearly stands for *Not Entirely True*. There is no Brown's Gas torch or information supplier that I can honestly recommend. First because of highly questionable claims and endemic bad labwork. And second, because I strongly feel the *Broco* is a vastly better choice for any hazmat, rescue, underwater, or maintenance.

More on hydrogen can be found in <http://www.glib/muse115.pdf>

An Energy Density Summary

It never ceases to amaze me how figures that people do not want you to see sometimes are extremely hard to pin down. Such as a simple and direct comparison of energy density. Or the fact that the currently highly touted electric car has a theoretical *maximum* energy storage equivalent

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to less than six pints of gasoline.

Less than your lawn mower.

As a review, a *fuel* is something (such as gasoline) that is capable of delivering net BTU's worth of "on the books" energy. The fact that the sun and some swamp labored eons to pre-concentrate the energy does not seem to count. What does count by today's economics is just how much energy you get back for the energy and "energy equivalents" you put in.

Using today's dollars.

By contrast, any *energy transport means* (such as hydrogen or lead acid) does *not* deliver any net "on the books" BTU's or watt hours. These are simply ways of *moving* already existing energy to a more convenient time or place. But *always* done at an efficiency and energy loss.

At any rate, two very important measures of "how good" either a fuel or an energy transport means are: How heavy is it? How much room does it take up? A useful measure of "how heavy" is in *watt hours per kilogram*. The "how much room" can be in *watt hours per liter*.

Figure four gives you the direct comparisons for conventional and alternate energy densities.

Form your own conclusions.

New Tech Lit

What just might be *the* long sought inside secret to photosynthesis *may* have appeared in *Science* for Sept 26, 1997. Check out "A Metalloradical Mechanism for the Generation of

Oxygen from Water in Photosynthesis. By Hoganson and Babcock. On pages 1953-1956.

Their key process may involve a manganese compound which goes through five reaction states. The first state accepts water and solar energy and kicks off both an electron and a hydrogen ion. States two, three, and four also kick off an electron and a hydrogen ion. State five burps out a new diatomic oxygen molecule as a "waste product", and reverts itself back to state one.

From *SenSym* an update on their fine *Solid State Pressure Sensors Handbook*. *Dallas Semiconductor* has their latest *Short Form Catalog* on clock, temperature, digital pot, and other unique chips.

Our two featured trade journals this month: *Biocard International* on hand print and related security, and *Weighing Technology* on scales.

The *Secrets of Building a Plastic Injection Molding Machine* forms the latest title from *Lindsay Publications*. It shows you how to recycle ordinary plastics into custom items. Vince and Dave Gingery are the authors. \$15.95.

Website: www.keynet.net/~lindsay

One Internet marketing book I am rather impressed with is *Increasing Hits and Selling More from your Web Site*. Authored by Greg Helmstetter and published by *Wiley*.

Amazon Books sells it at \$19.96. While largely nontechnical, it seems to nicely complement some of the ideas and concepts you'll find in the

Webmaster Library Shelf files of my www.tinaja.com.

Free and detailed specs on new *PostScript Level III* are now available from www.adobe.com. Level III is more about "formalizing" high end publishing and networking options, rather than about adding new low level features. Although there is a unique curvetracing feature (spline interpolation of sampled data), that I will be looking at closely. Sadly, the transparency options you'll need for video apps do still seem to be either lacking or well hidden.

Brand new opportunities in PIC PostScript robotics can be found in my [POSTFLUT.PDF](#)

My ongoing *Blatant Opportunist* columns are now in ezine format at www.tinaja.com/blat01.html The latest two include [BANNYEAR.PDF](#) on profiting from internet advertising banners; and [TRIMODE.PDF](#) about tri-mode paper, electrons, and plastic publishing options.

For details on starting up your own tech venture, do take a gander at my *Incredible Secret Money Machine II*. Per my nearby *Synergetics* ad. Or on my *Guru's Lair* website you'll find at www.tinaja.com/ismm01.html

As usual, most of the mentioned items should appear in the *Names & Numbers* or the *Television Resources* sidebars. Always check here before you phone our US technical helpline shown in that *Need Help?* box you'll find nearby.

Let's hear from you. ♦