# You'll Get COLOR TV Sooner than You Think

**RCA's new tri-color tube mixes all three colors electronically—without lenses, disks, or mirrors.**

***By John F. Loosbrock***
*Drawings by Morris Cohen*

THANKS to a new tri-color tube, color TV has moved much closer to your living room. Maybe you'll even find a set under your 1951 Christmas tree. And the pictures will compare in quality with the best you can get on your black and white set, with the dividend of glowing color.

The bottleneck breaker is a new viewing tube, developed by RCA, that puts the colors back together after the color camera has torn them apart. And it does this electronically, without mirrors, lenses, or disks.

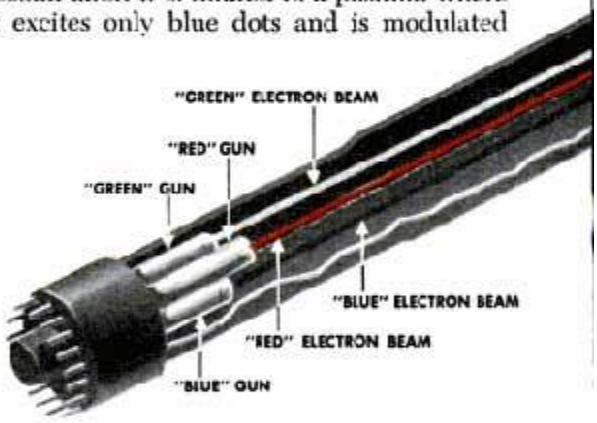
At present, there are two versions of the new tube. One uses three electron guns to paint the colors on the screen. The other uses one. Both employ a viewing screen coated with rows of small, closely spaced phosphor dots. These are arranged in triangular groups of three. Each triangle contains a dot that glows red, when hit by an electron stream, a dot that glows blue, and a dot that glows green. The hand-made models used in recent tests before the Federal Communications Commission in Washington had 351,000 such dots, 117,000 of each color.

The tube that looked best during the tests uses three electron guns mounted in the tube neck—one for each of the three primary TV colors. Between the guns and the screen is a metal mask having 117,000 tiny holes, one for each group of dots.

The three guns are so mounted in relation to the mask that the electron stream from each gun strikes only the dot emitting the particular color that the gun is painting. Thus, the red gun can hit only the red dot, the blue gun the blue dot, and so on.

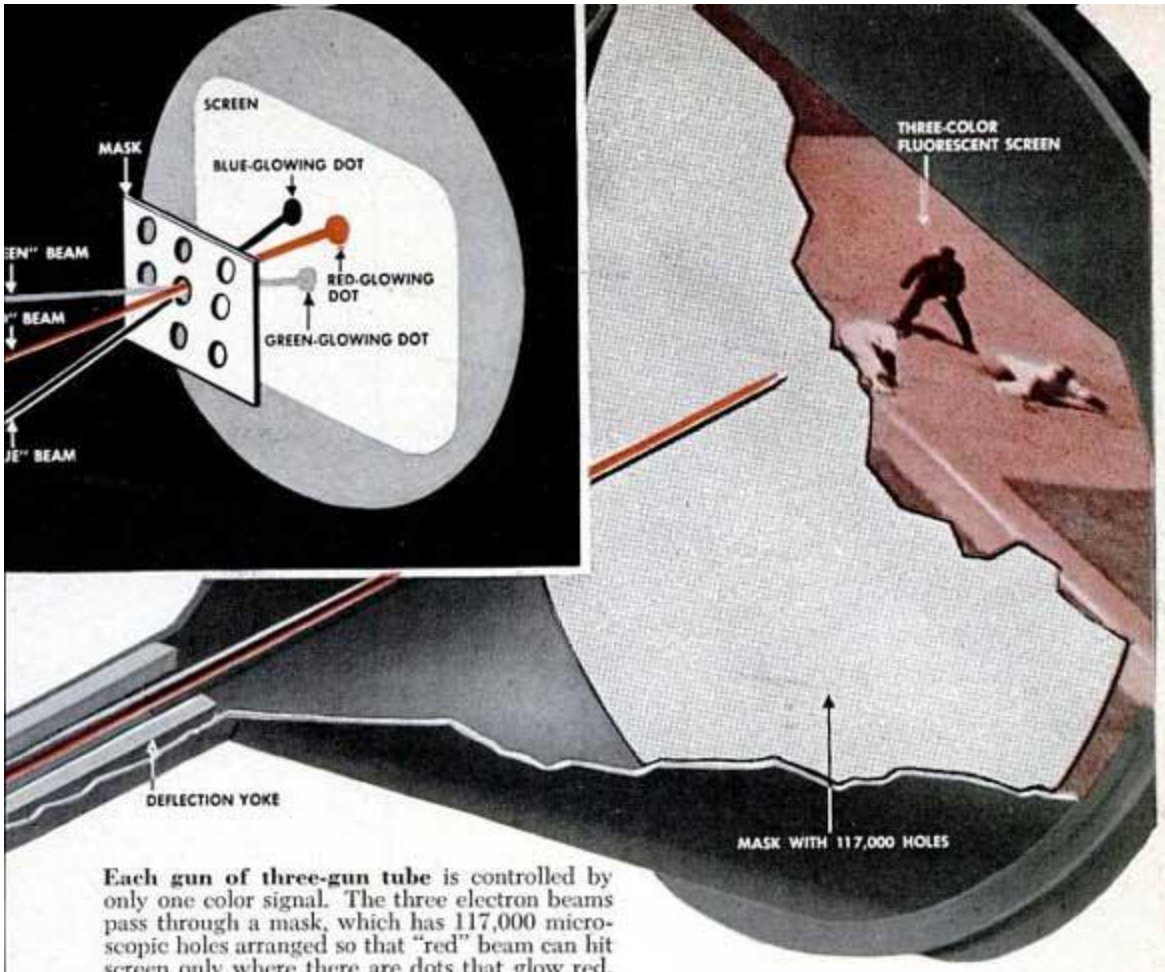
The second version uses essentially the same principle. The mask and the dot groups are identical. But it works with a single electron gun. Its beam is rotated magnetically so that it occupies, in sequence, the positions of the three guns in the three-gun kinescope.

Thus when the beam is in a position corresponding to the red gun of the three-gun tube, it is modulated only by the red component of the video signal, and strikes only the red phosphor dots. A tiny fraction of a second later, it is rotated to a position where it excites only blue dots and is modulated only by the blue component of the signal. The third position produces green. You see all three at once.



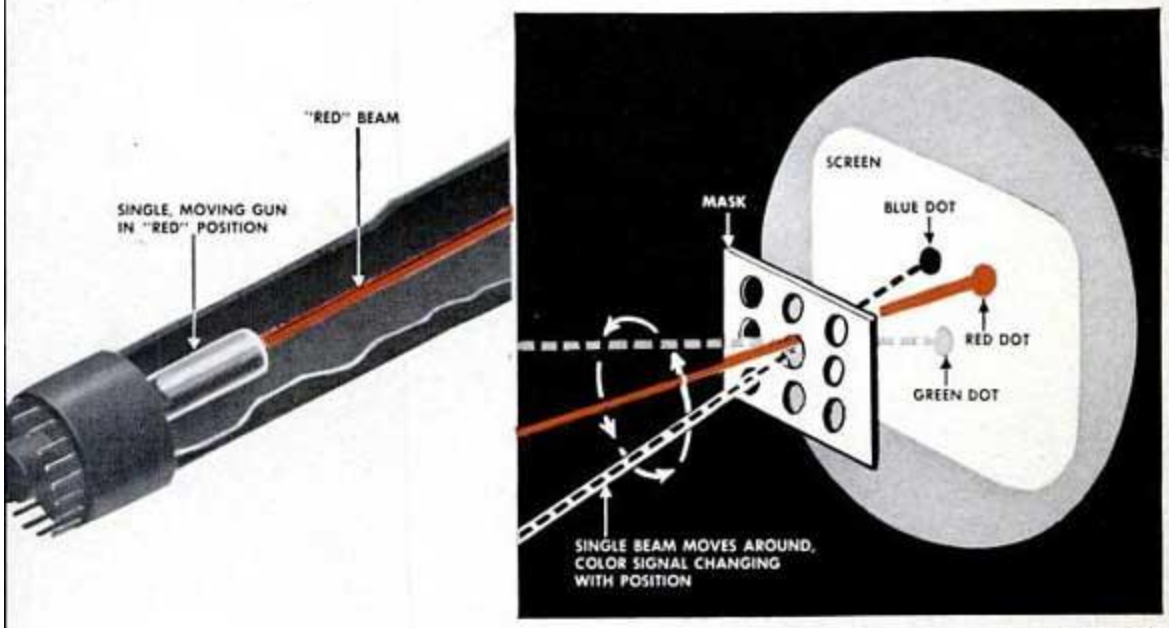

The pictures look good. I saw the new tube demonstrated in Washington. The colors were true and the pictures clear—at least as good as the best black and white picture, and you can't expect to do better with TV confined in its present bands.

Why is the tri-color single tube so important? It's because the most controversial part of the color TV problem to date has been that of putting the colors together for your eyes. As you've probably read, the color question is the nub of a hot controversy that the FCC must settle, one way or another, in the near future. Three warring systems have been beating the drums for their own particular product—RCA,

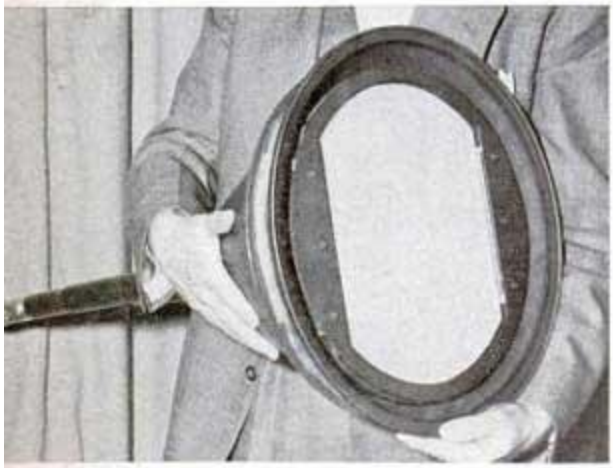



**Each gun of three-gun tube** is controlled by only one color signal. The three electron beams pass through a mask, which has 117,000 microscopic holes arranged so that "red" beam can hit screen only where there are dots that glow red, "green" beam can hit only green dots, and so on (see inset above). Individual colored dots, too tiny to be picked out by human eye, fuse together like dots in color engraving to give impression of smooth, continuous color picture.

**In one-gun tube** dots and mask holes are identical with three-gun job. But electron beam is rotated magnetically, changing "color" with position so one gun can do same work as three.

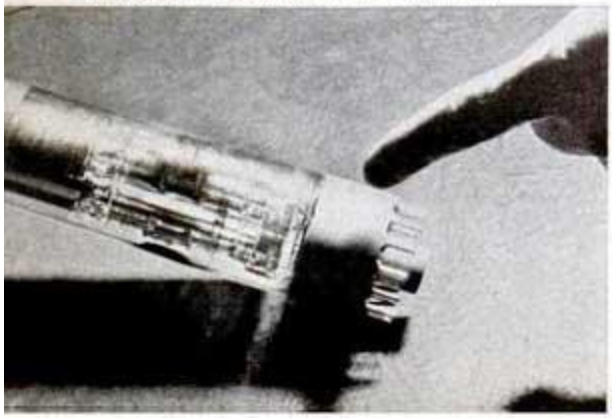


**RCA's tri-color camera** picks up telecast from station WNBW in Washington during demonstration of new RCA color tubes before the Federal Communications Commission.



**The one-gun, tri-color tube** looks like this. RCA engineers are working on improved models, with more dots. Tube can be used in some standard receivers, but needs extra circuits.

**Close-up shows neck** of three-gun tube. It fits into standard RCA receiver, beefed up with 19 more tubes for color synchronization, sampling, and additional power supplies.



Columbia, and Color Television, Inc.

Here's how the three systems differ:

***RCA.*** The camera directs red, blue, and green light from the subject into three different lenses. It does this with "dichroic" mirrors, each of which reflects only one color. Individual scanning tubes translate each image into signals for transmission.

In the receiver, RCA now uses the tri-color tube. In earlier tests it employed three tubes and a mirror system to put the colors back together on a screen.

***CBS.*** The color camera uses a mechanical device—a whirling disk divided into primary-color segments. This rotates behind the camera lens and filters the light so that the colors pass through in succession.

At the receiver CBS puts the images together in black-and-white on a screen. In front of this another color disk, synchronized with the one in the camera, colors the images. Recently, however, CBS demonstrated an all-electronic receiver that eliminates the often-criticized mechanical wheel. It projects a big picture with a lens-and-tube system like CTI's (see below).

***CTI.*** Like RCA it uses three lenses, with a dichroic-mirror setup to separate the colors. But these produce three small, separate images on the scanning tube face. Successive lines of red, blue, and green are then transmitted from the three images.

The CTI receiver uses a single tube, on which the three color images appear, greatly reduced and side by side. Another lens system magnifies and projects them.

One important virtue of the new RCA receiver tube is that it can be used with *any* of the three systems.

It eliminates the registry problem inherent in the projection systems used by RCA and CTI and now adopted by CBS. Or it could replace CBS's receiver disk, with its mechanical, size, and noise problems.

Each system has its own advantages and disadvantages, both in picture quality and in its effect on the some 5,000,000 persons who now own black and white sets. Let's take a critical look at all three, as I did.

CBS leads the parade in color quality, especially in the critical skin tones. Dr. Peter Goldmark of CBS, who started the color whirl back in 1940, says this is due to his "field sequential" system, which shows complete pictures in each color in rapid succession. But to get this, CBS must forego "compatibility." That means you can't watch a CBS color picture even in black

and white on your present set. To squeeze its signal into the six-megacycle band allotted to color TV, CBS had to cut down its picture lines from 525 (the black-and-white standard) to 405.

If you're willing to settle for black-and-white pictures of color programs, you could get a converter for an estimated $15 to $25. Conversion of your set to receive color would run around $75. New color sets would cost somewhat more than present black-and-white prices. CBS claims that its system is the cheapest, and the only one that could begin color broadcasting now.

For RCA, the big advantage claimed is that it's compatible, since it uses a 525-line picture, so that you can see a color broadcast in black and white with your present set. But even with the new tube, the colors are colder and skin tones are darker than those obtained by CBS. Initial cost of converting your present set will probably cost more than CBS, although RCA experts have made no forecasts. David Sarnoff of RCA says new color sets will probably run around 20 to 25 percent more than comparable black-and-white jobs. This presumes quantity production, which RCA says will take one to two years. RCA breaks each line into "dot sequential" system.

CTI is all-electronic and compatible. But it uses a "line sequential" system. Each line in the picture is alternately red, blue, and green. Overlapping creates the full-color illusion. However, the Washington tests I witnessed weren't good. Colors weren't true, nor were they in register.

### *FCC Must Decide*

Since the RCA single tube licks the receiving problems of all three systems, it's bound to bring color TV nearer. But until the FCC acts you can neither pay your money nor take your choice. The FCC can:

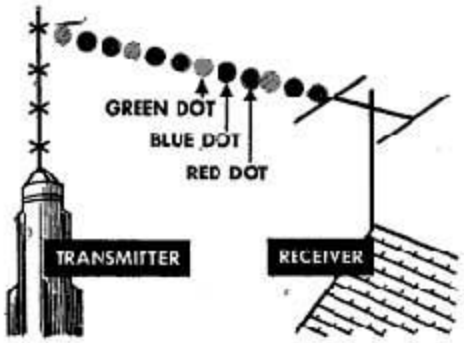
1) Approve one system;

2) Approve two, or all of them (which would toss the problem into the customer's lap, on a "let the best man win" basis); or

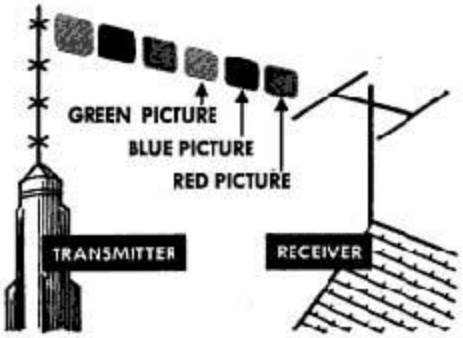
3) Approve none and tell the boys to go back to their labs. It did this once before.

But it must decide something. Because, until it does, no new TV stations can be built. And TV will have to stay within its present frequencies instead of moving up into the ultra-high bands. Besides, until industry engineers stop messing around with color, your black-and-white sets will get no better. END

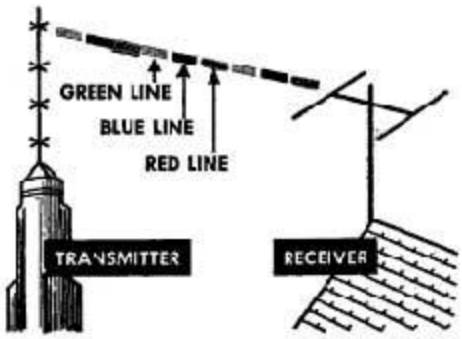
## How Color TV Systems Differ




**RCA's "dot sequential" system** breaks up each line into individual microscopic specks of red, blue, and green. These are transmitted one after another.




**CBS's "field sequential" system** sends complete picture in one color at a time. Successive pictures are red, blue, and green. New RCA tube can be used with it.




**CTI's "line sequential" system** transmits color in successive lines of red, blue, and green. These overlap in receiver in way that gives illusion of full color.