Tektronix, Inc. Company

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field engineering news

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7104 Keeps Pace with Technology

Should your customers be buying the 7104 Oscilloscope for its high visual writing rate capability?

Let us consider where digital IC technology is headed. IC manufacturers are continually striving to make devices smaller, with one result — a continual increase in speed. Figure 1 (page 2) is a chart taken from a recent issue of **Electronics** magazine. It shows that high-speed logic will get faster. Designers will need the 7104 writing rate as well as high bandwidth to build these devices into their systems.

System designers working with ECL, TTL, or microprocessors, recognize the need for oscilloscopes to help them identify device switching speeds, propagation delays, and overall system performance. There are many types of instrumentation available today for logic work: logic analyzers, storage oscilloscopes, and sampling oscilloscopes. All are considerably less expensive than the price that the 7104 commands.

It is difficult for designers to justify, to their management, a capital expenditure twice that of other instruments. However, system designers who have struggled to detect glitches that cause their systems to crash every few hours soon begin to question the initial cost savings, considering the time spent and frustration endured. A visual identification of a glitch allows for a speedier cure. The 7104, with a writing rate 1,000 times that of the next fastest oscilloscope, makes it easier to see glitches.

Managers, on the other hand, understand capital expenditures. In addition to acquisition cost, they are concerned about:

- The high cost of CRT replacement and other repairs.
- Downtime caused by "bugs" not completely worked out of new-technology products.
- Only a one-year warranty for such an expensive item.

To help you respond to these concerns, LID Marketing offers the following for your consideration:

- As the 7104 leaves the factory, reserve performance is available in the CRT. Trace brightness is a function of the microchannel plate (MCP) bias. As the tube ages, the bias can be adjusted to return the trace to its original brightness. Figure 2 (page 2) is a composite photo showing the difference in brightness at various bias settings. The photos in figure 3 (page 2) show a difference in visual usefulness between the 7104 and the 7904 — a lab standard in most digital environments. The 7904 is a new instrument and its CRT is at maximum drive. Notice the 7104 MCP drive is coasting at 900 volts. Truly more visible by over 1,000 times!

- Although the 7104 has state-of-the-art performance, it is not achieved by driving the circuitry to the maximum of its capability, just to meet specs. The 7000 Series Manufacturing group claims the 7104 is easier to calibrate than the 7904, mostly due to improved IC technology.

- The one-year warranty is not an expression of the useful life of the instrument. That typically is several years. We don't expect the 7104 will be an exception.

There are many applications today that don't require *all* of the performance built into the 7104. But some of the capabilities, in particular the high visual writing rate, are needed now and will reduce engineering time and help produce better designs.

In the late 1980s, when projected gallium-arsenide technologies become realities and engineers need 100 picosecond/division resolution, they will require both the 7104's gigahertz bandwidth and visual writing rate.

Thus, the 7104 is a good investment for today, and for the future. ■

TECHNOLOGY CHOICES

Property	Current Technology, 1979 – 1980								Future, 1985 – 1990	
	Bipolar				MOS				Silicon on Sapphire	Gallium Arsenide
	TTL	LS TTL	ECL	I^2L	p-MOS	n-MOS	C-MOS (bulk)	C-MOS (SOS)		
Logic complexity (number of components per two-input gate)	12	12	8	3 to 4	3	3	4	4	3 to 4	2
Packing density (gates/mm²)	10 to 20	20 to 40	15 to 20	75 to 150	75 to 150	100 to 200	40 to 90	100 to 200	200 to 500	300 to 1,000
Propagation delay (ns) (typical value)	6 to 30 (10)	2 to 10 (5)	0.7 to 2 (2)	7 to 50 (20)	30 to 200 (100)	4 to 25 (15)	10 to 35 (20)	4 to 20 (10)	0.2 to 0.4 (0.3)	0.05 to 0.1 (0.07)
Speed power product (pJ)	30 to 150	10 to 60	15 to 80	0.2 to 2.0	50 to 500	5 to 50	2 to 40	0.5 to 30	0.1 to 0.2	0.01 to 0.1
Probability of improvement	low	low	low	moderate	low	high	moderate	high	high	high

From: ELECTRONICS, April 17, 1980, pg. 547

Figure 1. As integrated circuit technology continues to advance, packing densities and speed will substantially increase.

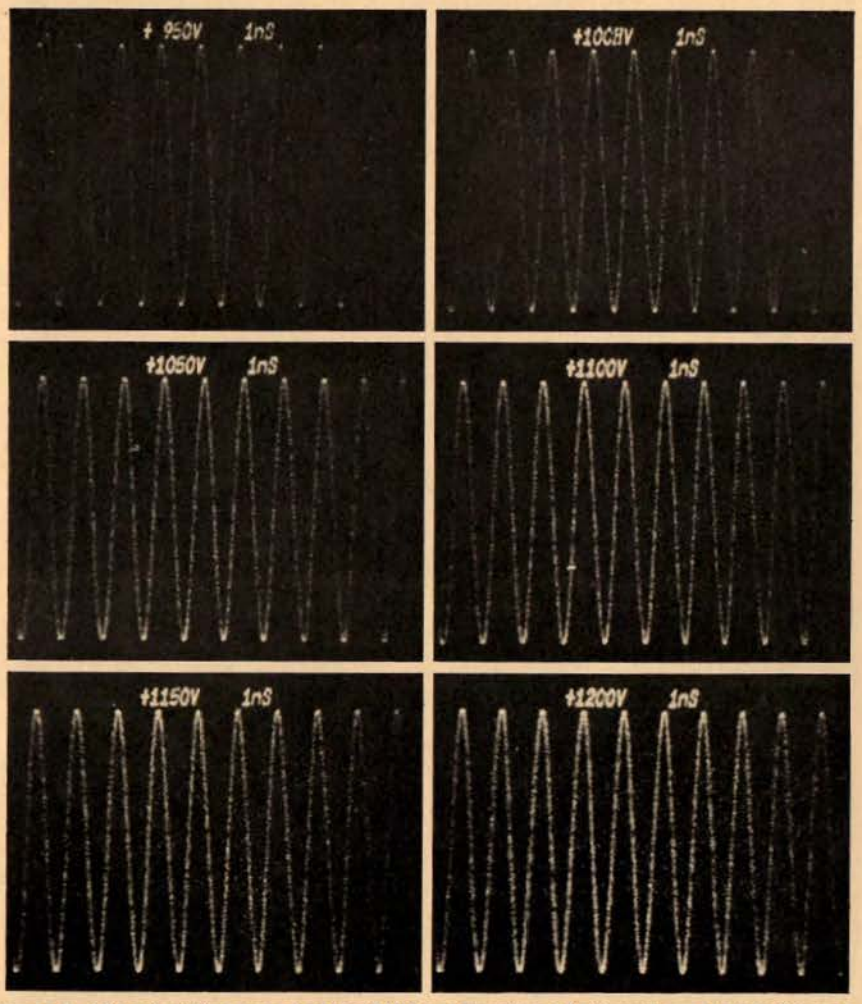

Figure 2. Visual writing speed of the 7104 is a function of microchannel plate bias as shown in this series of photos.

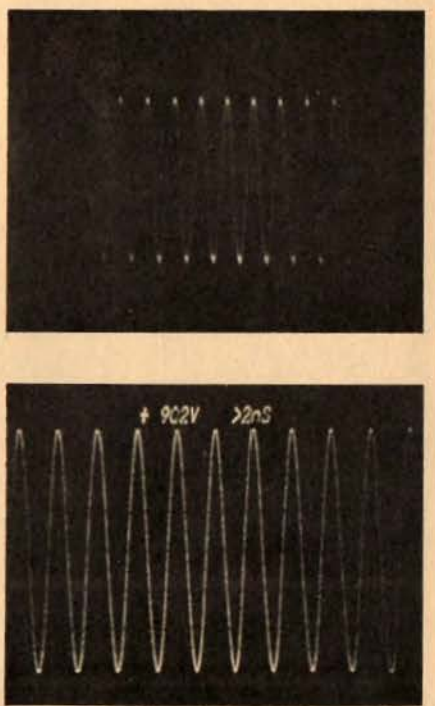

Figure 3. Relative visual writing speed of 7904 (top) and 7104 (bottom) is illustrated in these two photos. Microchannel plate bias on 7104 is set at 900 volts.