

New products

Linear 'LSI' shrinks scope for field work

By Stephen Wm. Fields, San Francisco bureau manager

Three ICs hold most of circuitry in battery-powered instrument; new gain cell controls sensitivity variation

A new low—in size, that is—has been reached with the introduction of the model 211 portable oscilloscope from Tektronix. The 211 is a single-channel, laboratory-quality, 500-kilohertz, battery-operated scope that measures 3-by-5-by-9 inches and weighs about 2.5 pounds.

The 211 is aimed at field maintenance applications where small size and low power drain are important. Vertical calibration is variable from 1 millivolt per division to 50 volts per division. Horizontal sweep rates are variable from 5 microseconds per division to 200 milliseconds per division, and a continuously variable sweep magnifier provides uncalibrated sweep rates to about 1 μ s per division. CRT viewing area is 3 by 5 centimeters.

One of the keys to the 211's small size is large scale integration. Most of the 211's circuitry is contained in three monolithic integrated circuits, all proprietary to Tektronix. According to David Allen, the designer of the 211, "two of the ICs contain 70% of the active circuitry—sort of like linear LSI." One IC contains the sweep circuit, the trigger circuit, and the horizontal amplifier, and is made up of both npn and pnp transistors. This device, says Allen, is manufactured with a compatible FET/bipolar process that is proprietary to Tektronix.

Another IC contains both the vertical and horizontal output ampli-

fiers. It provides the 4-milliamp vertical drive current and the 1-mA horizontal drive current required by the CRT. The third IC is a quad op amp in which two act as current sources and the other two are the vertical amplifier.

According to Allen, the biggest problem in designing the ICs was in "squeezing in all of the components. When you are putting 104 transistors on a 65-by-65-mil chip, you run into signal path problems and parts placement problems. For example, during one of the early designs, we had the trigger interfering with the sweep circuit." As a result of this, about 90% of the silicon surface is used—there are even devices placed between the bonding pads.

Power supply design was also an obstacle in reducing the scope's size. Allen says that the sensitivity of an oscilloscope is a function of the CRT

intensity. In standard-size scopes, the power supplies are regulated twice—once at the input and once at the high-voltage output. But to save space in the 211, only input regulation (2 to 5%) is employed. To control the intensity/sensitivity variations, the 211 uses a gain cell in a feedback loop. This gain cell is a Tektronix development that's based on a circuit whose gain is dependent on the input current. In the 211, as the intensity control is turned up, the voltage goes down and the sensitivity goes up. "To correct this," says Allen, "we feed back high voltage through the gain cell." This approach is employed in both the horizontal and vertical circuits.

The 211 will be available by the end of this year at a price of about \$500.

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On the spot. Portable scope weighing 2.5 pounds is designed for field maintenance jobs.

