Expand linear circuit functions with nonlinear design schemes

Circuits implementing logarithmic or exponential functions provide instrumentation and control designs with many features unobtainable using linear-only characteristics. Such circuits can gauge fuel level or a grape's ripeness.

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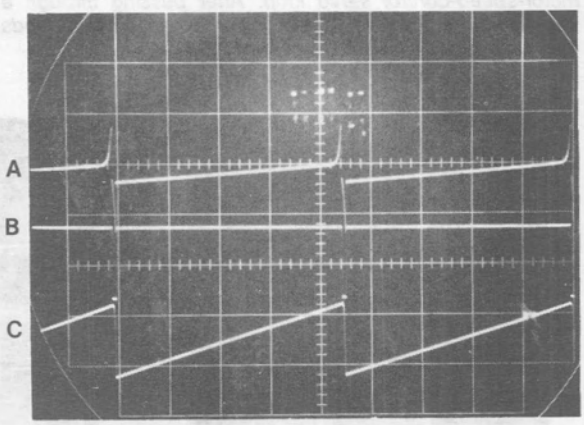
Just because a control or instrumentation design requires a logarithmic or exponential transfer function, don't assume that it must be complex, troublesome and expensive. It needn't be if you employ the correct basic circuit (see **box,** "Straightforward nonlinear circuits"). Indeed, the same concepts apply whether you must measure a tank's contents or control a motor's speed.

Govern a pump's rate

Although peristaltic pumps are generally driven by a continuously rotating motor, this technique isn't suitable when your application requires precise delivery at low rates as well as a high-throughput capability. (This situation often occurs in chemical or biological process-



TRACE	V/DIV
A	5
B	20
C	20

HORIZONTAL
(b) SWEEP = 200 μSEC/DIV

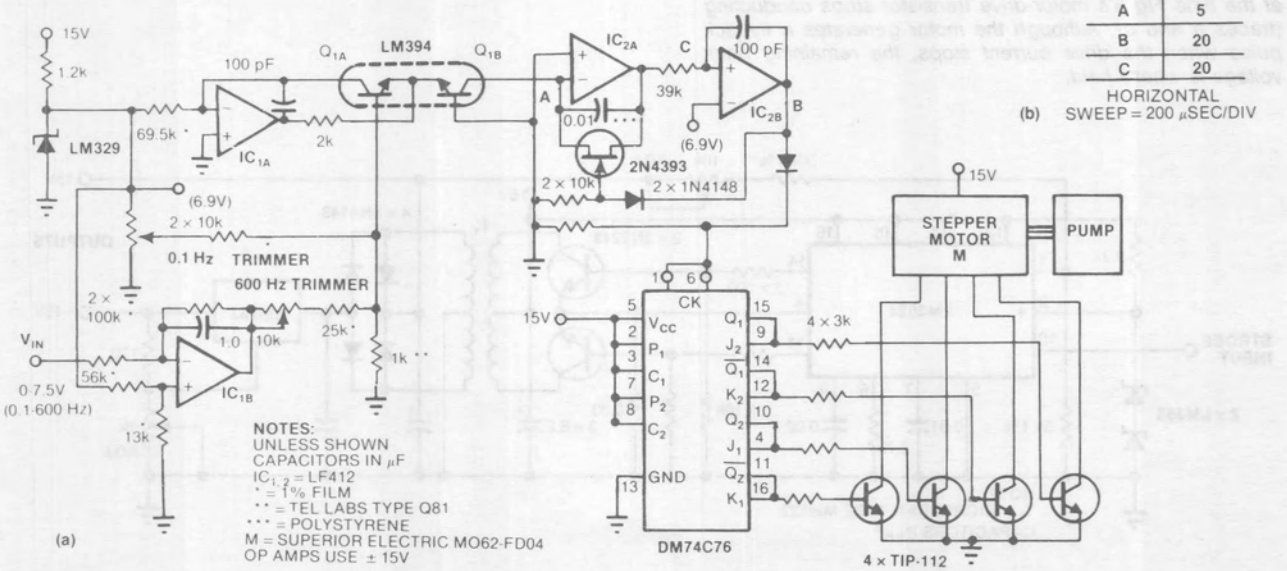


Fig 1—A stepper motor's speed varies exponentially *when driven by this voltage-to-4-phase converter. Using this approach, you can precisely govern a peristaltic pump's output flow for tight process control at low rates, yet speed it up for high throughputs. The waveforms correspond to points indicated on the schematic.*