

## Data Acquisition Hardware

If you have a ZX/TS with 16K RAM and a VOTEM analog interface, you already have all the hardware you need, If you don't have a VOTEM, you should consider purchasing either a complete or partial kit (any combination of bare board, documentation and V-F chip). (they are still available. ed.) Down East Computers' prices are not out of line, and their unit is the best approach if you're not willing to build a V-F board from scratch.

For those of you who don't mind a little hardware hacking, I'm printing a "rip-off" circuit for the LM331 V-F chip, derived from the National Semiconductor application notes for this device, It is accurate, inexpensive, and quite readily obtainable (if you can't find it at your local jobbers', check with the nearest location of Avnet/Hamilton.) Values shown are for a 1 volt full-scale sensitivity, you can easily sense higher ranges by preceding the V-F with a resistive voltage divider, The absolute precision of the other parts is non-critical, since we'll calibrate the final — circuit anyway (using a software scale constant). What IS important is that the timing parts be stable with temperature; the timing capacitor should be polystyrene or polycarbonate, and the resistors should be metal-film. Avoid extreme temperature changes around the V-F board if possible. Wiring is non-critical, and you can use wire-wrap on a perf board to do the actual construction. You can power the V-F from the computer supply, or use a small battery (especially recommended if you'll be locating the interface remotely.)

You can use the Radio Shack 276-1790 V-F, F-V IC. Applications notes are provided with the part. (Though we won't be using it, this unit also allows you to convert from a frequency back to a voltage ~- you could conceivably work up a circuit which will translate a frequency - such as you can make available at the MIC jack - into an analog voltage, which can be used to control such things as proportional heaters, motors, etc. More about this in a future installment.)

If you're using a VOTEM, you should disconnect capacitor C8 at the input to the V-F, or replace it with a much smaller unit (e.g. .01 uF), otherwise

you'll get considerable waveform distortion due to its filtering effect. (A 20 Hz. square wave won't look the least bit "square.")

Whatever V-F circuit you use, the maximum output frequency should be limited to about 25 kHz, At higher frequencies you'll rapidly get inaccuracy due to "strobing" effects, since the rate at which the sampling loop runs is about 65 kHz. The amplitude requirement is that the "on" voltage should be 2-5 volts, and the "off" voltage should be a few tenths of a volt maximum, Duty cycle (ratio of On-time to total cycle time) is non-critical, but shouldn't deviate too far from 50% for best results. Run the output to the EAR jack, and the hardware and interfacing is complete.