NASA TECH BRIEF

Lewis Research Center

REMOTE MEASUREMENTS BY TELEPHONE

Basic Telephone Measurement Device

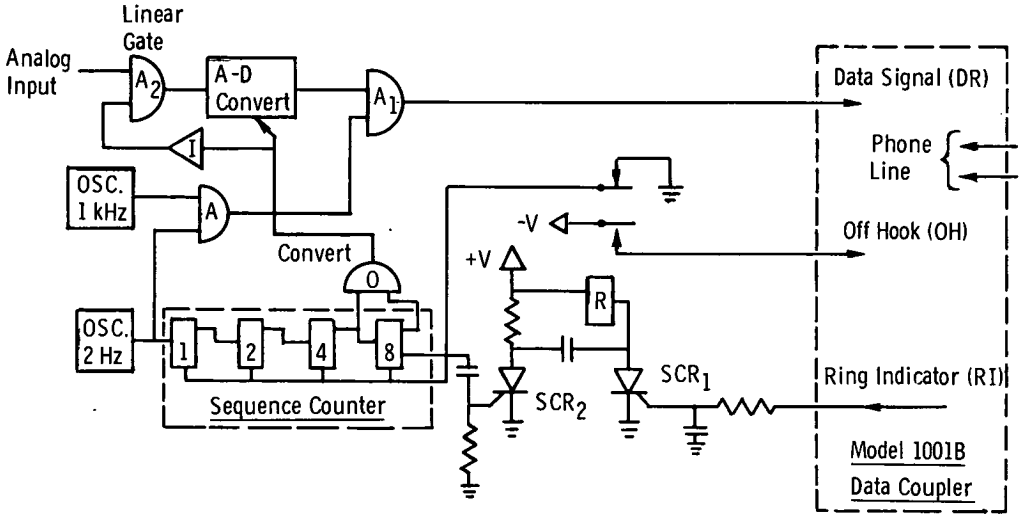

Figure 1

An inexpensive device, shown in Figure 1, permits the measurement and remote interrogation of variables such as voltage, temperature, pressure, or humidity by standard telephone equipment. When a caller dials the number to which the device is connected, it "answers" the telephone, measures the variable to which it is connected, and produces a series of zero to ten "beeps" proportional to the variable. The device then "hangs up" the telephone and awaits the next call.

This device connects to the telephone line through a Model 1001B Data Coupler manufactured by American Telephone and Telegraph Co. The coupler supplies a ring indicator (RI) signal when a call is received. It is instructed to answer the call by the off hook (OH) signal from the device, and is supplied with audio information on the data signal (DR) line.

Sequencing is accomplished by a 2 hertz oscillator and a sequence counter. When a RI signal is received, SCR_1 fires and pulls relay R. The relay contacts supply an OH signal to the coupler and remove a reset level from the sequence counter, allowing it to count pulses from the 2 hertz oscillator. During the first three counts, linear gate A_2 is open, connecting the input analog signal to the analog-to-digital (A-D) converter. A sample and hold circuit stores this analog voltage for later conversion. When the count reaches 4, at 2 seconds, a logic one level from the Or gate causes the conversion of the stored voltage to begin. At this time also, linear gate A_2 is turned off through the inverter. The A-D converter output goes positive for a time period proportional to the stored analog voltage. This allows a series of 1 khz pulse bursts, at a 2 hertz rate, to be gated out through A_1 to the coupler DR line. This results in a series of "beeps" proportional to the measurement.

(continued overleaf)

Multiple Input Configuration

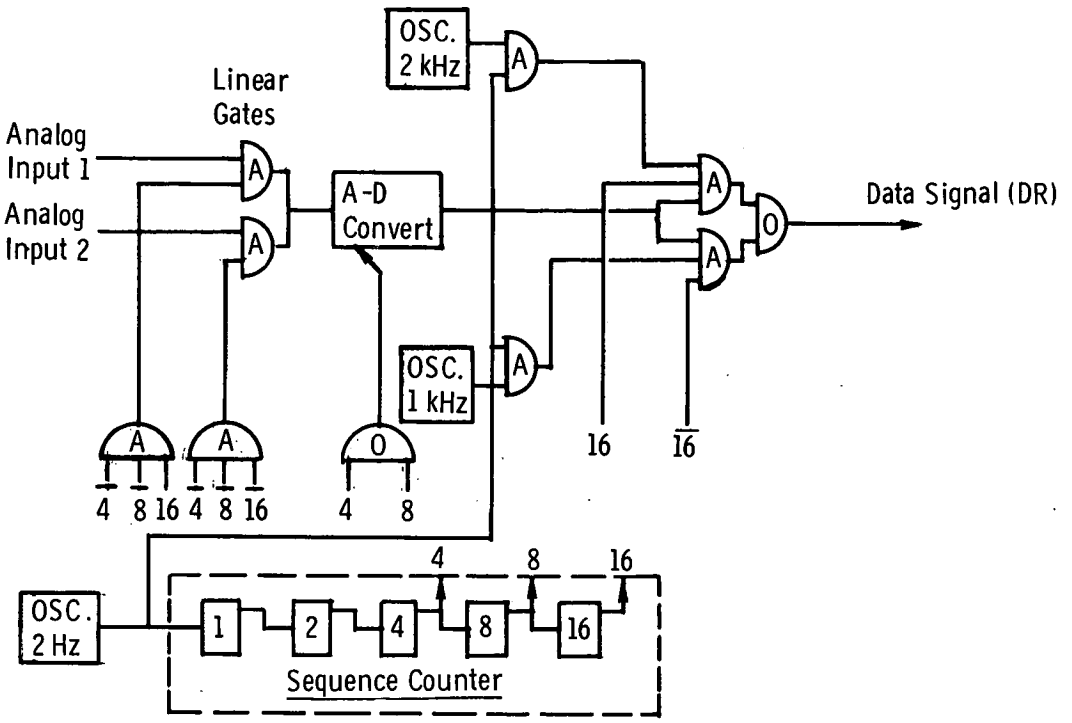

Figure 2

The convert level remains in the logic one state until the counter reaches 16, at 8 seconds, at which time SCR_2 is fired by the sequence counter carry pulse, and SCR_1 is reset. This drops relay R, removing the OH signal to the coupler, which "hangs up" the telephone.

Figure 2 shows how multiple analog inputs can be sampled in sequence by adding more stages to the sequencing counter. The analog inputs can then be gated into the A-D converter and read out in sequence by these additional stages. Different tone generators can also be used for each input to differentiate the inputs being sampled.

NOTES:

1. Non-inverting And and Or circuits were used throughout.
2. This device was designed to interrogate the status of two large time-sharing computer systems. Inputs were analog voltages proportional to computer usage. However, such applications as remote interrogation of temperatures or pressures in unattended installations can easily be accommodated. Remote interrogation of wind direction and velocity, humidity, or water levels on a flood-prone river are other possible representative uses for this device.
3. No additional documentation is available. Specific questions, however, may be directed to:
   Technology Utilization Officer
   Lewis Research Center
   21000 Brookpark Road
   Cleveland, Ohio 44135
   Reference: B73-10010

PATENT STATUS:

NASA has decided not to apply for a patent.

Source: Robert L. Miller
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(LEW-11704)