Rutherford Laboratory

Technical leaflet

A12

PROPOSED DATA LOGGER FOR NIMROD

A Data Logger is being designed and built for rapidly diagnosing and correcting faults on Nimrod. It will measure up to 400 different quantities, at the rate of 50 per second, checking each one against pre-set limits. Those off-limit will be shown immediately on a special indicator and punched out onto paper tape as a permanent record. The equipment will be adapted from an existing high speed recording system which comprises analogue to digital converters, paper tape punching equipment, and a 400 address by 100 bit word ferrite core store.

General Description

At the centre of the system is the store which provides all the memory functions required. Each parameter has its individual address in which is stored:

(1) The current value of the parameter.

(2) Upper and lower limits.

(3) The result of comparing the current value with the limits.

(4) A flag to indicate if the information has been punched out onto tape.

Room is left in the address for signalling if any special action has to be taken should the parameter be off-limit.

To measure the parameters, each one (in the form of a voltage) is selected in turn, by a reed switch in the scanner located near the equipment in which it originates. After amplification to the required level it is measured with an analogue to digital converter. The result, appearing as a serial binary coded decimal number, is sent to the central equipment along with clock pulses where it is assembled in parallel form. The limits are read from the store, a comparison made and the result (off-limit flag) returned to the store with the value of the parameter. If it is off-limit a simple warning device is switched on to draw the attention of the operator to the existence of an off-limit parameter. While the next parameter is being selected and measured, the indicator section of the system (described below) scans through all the off-limit flags and displays them on a cathode ray tube. They appear as points of light which are brightened or darkened respectively if the parameter is too high or too low. Those which are off-limit are transferred to a register for punching onto paper tape.

Some of the parameters appear as pulse counts representing time intervals frequencies or similar quantities. For these, the A.E.R.E. 2000 series access scalers are used, the results appearing in parallel at the input register.

At any moment, the store contains a complete picture of the state of all the parameters up-dated to the last 8 seconds, so if any particular occurrence in the machine needs analysing in detail, measurement can be stopped and the contents punched onto paper tape.

Indicator Section

The design of this section has been completed and a working bread-board version of it is shown.

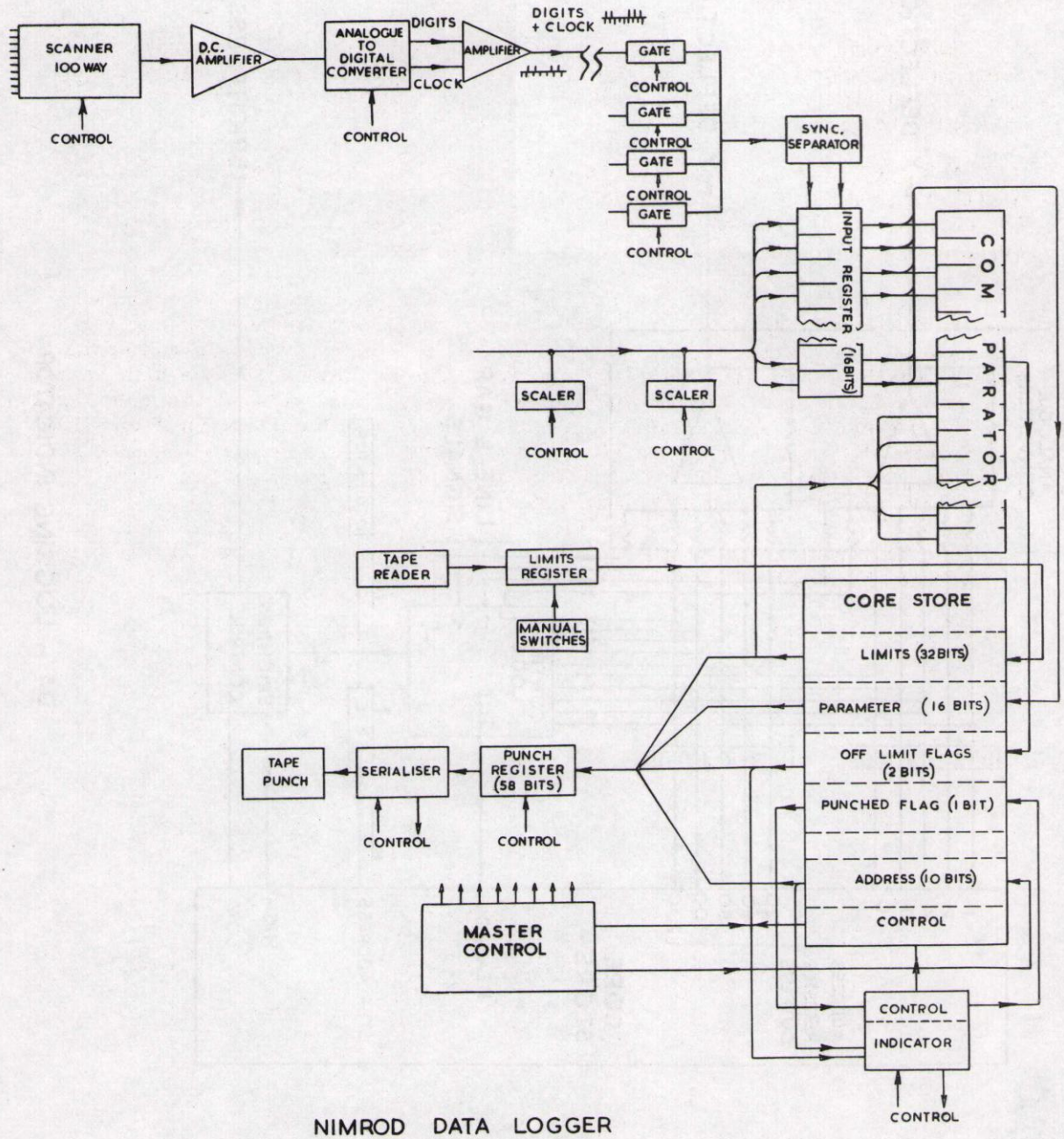
Each point of the grid seen on the cathode ray tube screen corresponds to a single parameter. If it is too high, the point is brightened while if too low it disappears. To assist reference to the various points they are divided into groups of 25.

The grid is generated by shifting the spot step by step through the 400 positions in turn. At each position the off-limit flags are read out from the appropriate address of the store. Bright-up or black-out pulses are applied to the grid of the cathode ray tube as required.

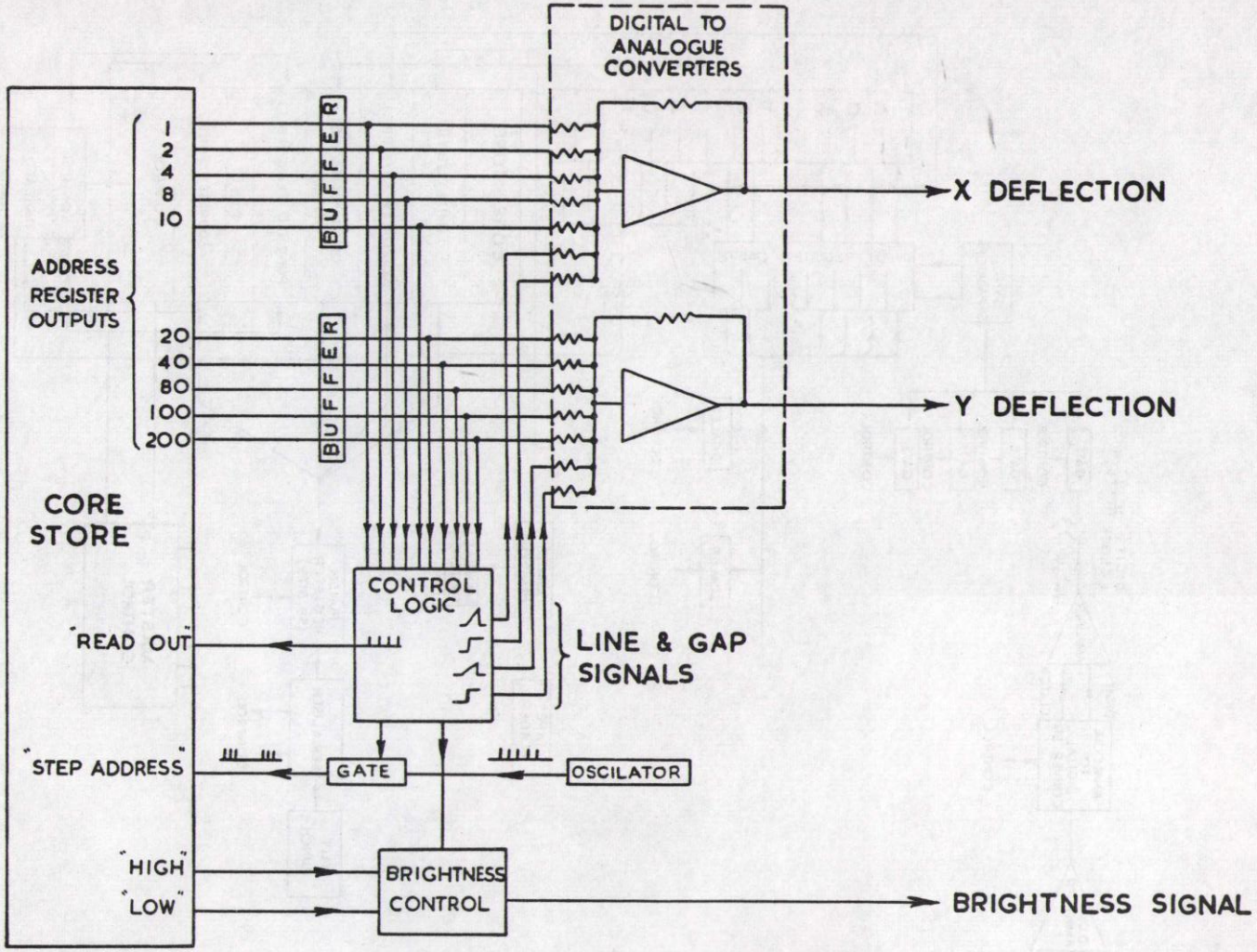
The deflection signals for the spot are obtained from the store address numbers by converting them into proportional analogue voltages with digital to analogue converters. The address is held in a register within the control section of the store as a 10-bit binary coded decimal number. The bits have the values 1, 2, 4, 8, 10, 20, 40, 80, 100, 200 respectively and the x deflection signal is generated from bits 1, 2, 4, 8, 10 while the γ deflection comes from the remainder 20, 40, 80, 100, 200. In this way a 20x20 grid is generated. Subsidiary circuitry generates dividing lines and gaps by adding in extra potentials and ramps at the appropriate times.

The equipment to be incorporated into the system can be seen at the far right hand end of the Main Control Room.

The bread-board form of the indicator is on display in R.25.



NIMROD DATA LOGGER



DATA LOGGING INDICATOR