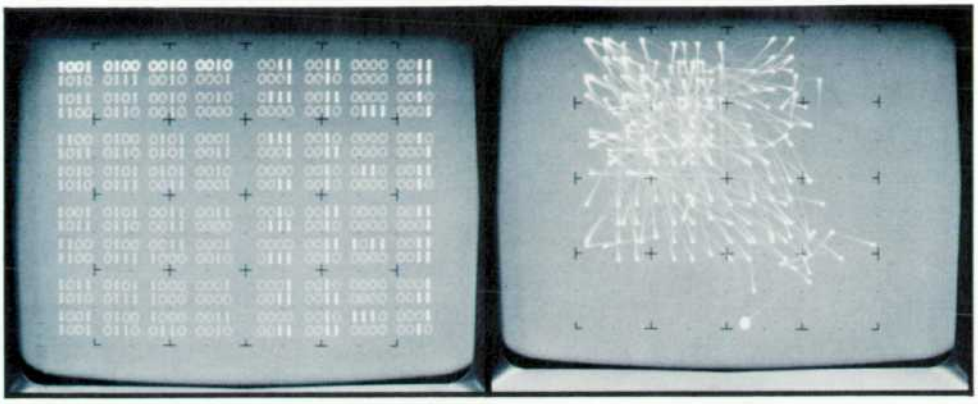

Fig. 4. *(Left) In the COMPARISON mode, 1's in the array on the right half of the display show where bits displayed on the left half differ from a stored sequence.* **Fig. 5.** *(Right) In the MAP mode, digital words are presented as dots on the display, each word having a unique position. Vectors trace the digital sequence from word to word. The cursor at bottom is a small circle positioned by the TRIGGER WORD switches.*

sition. Consequently, each word has a unique position on the CRT display.

In addition, the instrument traces lines from dot to dot as it steps through a sequence of digital words so each sequence of words generates a characteristic pattern (Fig. 5). Once familiar with the patterns generated by particular sequences of words, the user can instantly recognize whether or not a particular pattern is correct without having to do a state-by-state study of the tabular listing.

The MAP mode also gives an indication of the relative frequency of occurrence of any state—the more often a state repeats, the brighter its dot. In looking at memory address lines, for example, this mode gives a highly visible indication of which memory addresses are most often used and which are not used at all.

Map Expansion

A display of 65,536 dots would be difficult to interpret so an EXPAND mode can be used with the map. In the NORMAL MAP mode, only the six most significant bits of each half of the word are used for positioning, bits 10 through 15 for the vertical position and bits 2 through 7 for the horizontal position. Bits 0, 1, 8, and 9 do not affect the positioning. In effect, 4096 dot positions are displayed.

The EXPAND mode displays one of 16 area subdivisions expanded to full screen. Bits 0, 1, 8, and 9 then affect the dot position. The area to be expanded is selected by a cursor, a small circle positioned by the trigger-word switch register (Fig. 5). Positioning the cursor anywhere within one of the sixteen areas, outlined by marks fixed permanently on the CRT faceplate, selects that area for expansion.

When the map is expanded, the cursor can be positioned over any dot of interest. This dot then becomes the trigger word when the instrument is switched back to the TABLE DISPLAY mode.

Accessory Logic State Analyzer

Model 1607A Logic State Analyzer (Fig. 3) is functionally similar to Model 1600A but it does not have the auxiliary memory, the map mode, nor a CRT display. It has X, Y, and Z outputs, however, so it can use almost any CRT monitor or oscilloscope for its display. This arrangement is attractive in some situations because the oscilloscope can also be used for time-domain analyses, once Model 1607A working in the data domain has pinpointed the problem.

Model 1607A can work with Model 1600A to form a logic state analyzer with 32 data channels. Data entered by way of Model 1607A is presented on the right half of Model 1600A's CRT display. The resulting display may show words 32 bits wide, or data may be presented on part of the display while corresponding addresses or other signals are presented on the remaining part.

When used with the 1600A, Model 1607A adds some special capabilities to the combination. For example, the two instruments may operate with independent clocks but in a "bus trigger" mode such that triggering does not occur until trigger conditions are met in both instruments simultaneously. This mode might be used, for instance, when two digital machines communicate with each other but without synchronization of their clocks. Machine I is in state M when it transmits data over the interconnecting bus to Machine II, and Machine II must be in state R to receive the data. The bus trigger mode then detects when states M and R exist simultaneously so the state flow of Machine II can be monitored immediately following the receipt of data.

The Model 1607A may also supply the "arm" signal for the Model 1600A so triggering of the 1600A can be inhibited until some other trigger word is first detected by the 1607A.

Technical Details

The design of the new logic state analyzers involves three general areas:

1. Trigger recognition and delay;
2. Data acquisition;
3. Data display.

Although conceptually the trigger recognition and

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