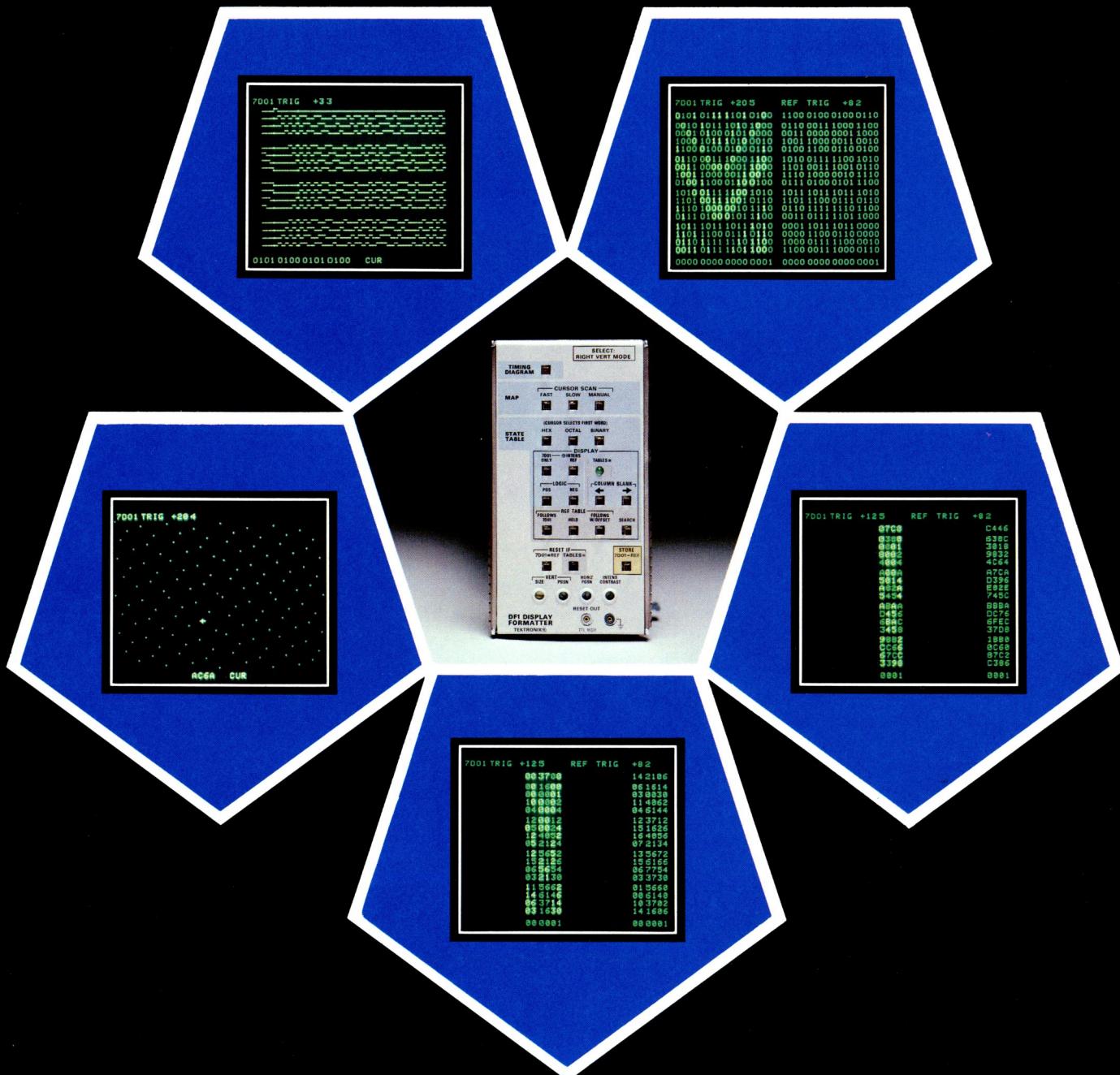
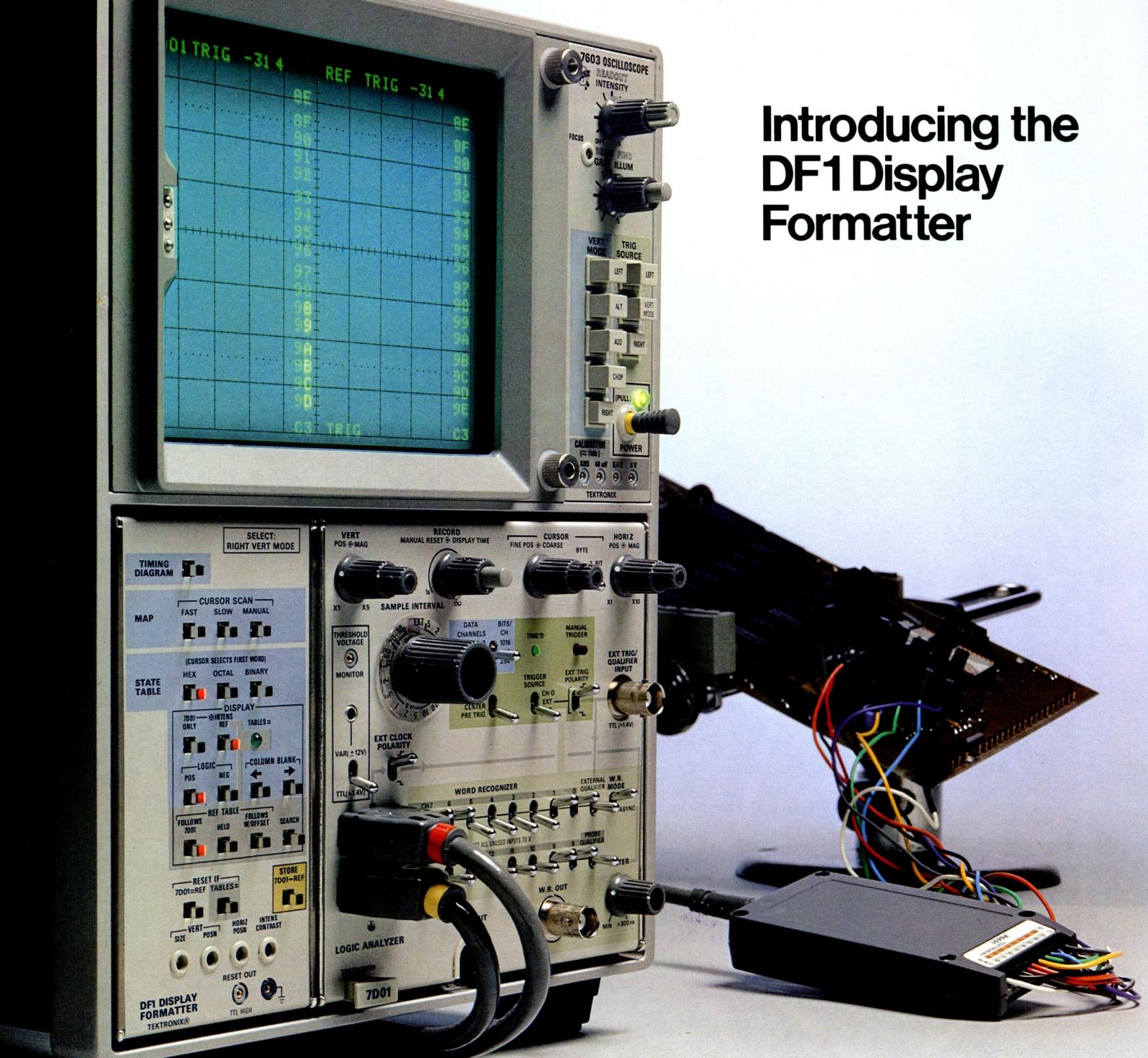


# TEKTRONIX DF1 Display Formatter

# for the 7D01 Logic Analyzer



# Introducing the DF1 Display Formatter



We've added something new to our expanding logic analyzer line. It's the DF1 Display Formatter, a dedicated companion for the 7D01 Logic Analyzer. Now you can select one of five modes . . . timing, map, hex, octal, or binary . . . to display data acquired by the 7D01. You still have all the 7D01 capabilities, including: a 4k formattable memory (4 channels by 1024 bits, 8 x 512, and 16 x 256), a built-in word recognizer, and two active, multichannel, high impedance probes.

This new high-performance 7D01/DF1 logic analysis package offers an EXCLUSIVE OR feature in the binary, hex, and octal display modes. This can be used to easily compare newly acquired data with reference data stored in the DF1. There is also a mapping mode for quick evaluation of programs. And now, because the crt readout is generated by the DF1, you can view the 7D01 simultaneous timing diagram and state display with either hex, octal, or binary readouts.

The 7D01 and the DF1 operate in any 7000-Series mainframe, and they belong to the growing line of Tektronix logic analysis equipment. If you're just starting out in logic analysis, you might choose the 7603 three-compartment mainframe for a dedicated logic analysis package, or you might choose the 7704A four-compartment mainframe for additional measurement versatility. If you already own a 7000-Series scope, you're ready to move from analog to digital right now.

### **The multiple display concept for the data domain**

The logic analyzer has rapidly become a necessary tool for logic designing and

troubleshooting, but, until now, it has been display limited: it could only display data in one or two formats. That's where the new DF1 Display Formatter comes in. The DF1, which is a dedicated companion for the 7D01, allows you to choose the format you need, whether it's the 7D01 timing-diagram display, hex, binary, or octal state-table displays, or a mapping display.

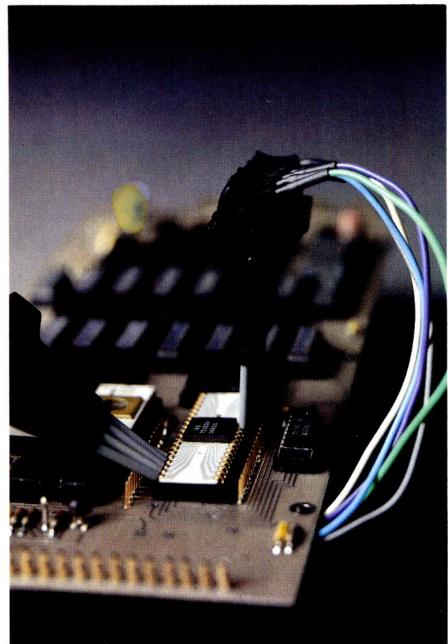
Some logic analyzer capabilities are essential for working with digital systems: multichannel data acquisition; pretrigger capability for viewing data before a fault condition; multichannel word recognition for triggering on a selected word or pattern; long memory capacity for storing large amounts of data.

Also desirable in a logic analyzer are high-impedance probes that won't load down the circuit under test, simultaneous timing and state information, convenience features that make the display easy to read or useful for photographic records, and easy operation with an oscilloscope. (The oscilloscope isn't designed for multichannel logic analysis, but it's still essential for real-time electrical analysis of digital problems, and it's often the last step in a complete digital troubleshooting procedure.)

All these capabilities are offered in the 7D01 Logic Analyzer.

However, several additional capabilities are required for troubleshooting microprocessors, minicomputers, octal-base systems, and many other digital systems. A mapping mode is useful for a speedy analysis of program flow. The ability to convert between binary and octal or hex facilitates the troubleshooting procedure, and so does the ability to compare state tables and spot the differences between displayed and reference data. With these features, it becomes an easy matter to locate the problem in the timing-diagram display and examine it in real time with the oscilloscope.

These capabilities are offered in the DF1 Display Formatter. No longer are you limited to one or two types of displays; now you can get five, all in the same instrument. Together the 7D01 and DF1 represent the multiple display concept for the data domain.



Tektronix new P6451 high Z probes limit circuit loading and let you test virtually any logic family.

# Five ways to look at logic

## The timing diagram

The DF1 Display Formatter adds hex or octal readout to the familiar 7D01 Logic Analyzer timing-diagram display with binary readout. Since the Formatter generates the crt readout, the word marked with the 7D01 cursor on the timing diagram can be read out in hex, octal, or binary code.

## Three state tables: hex, binary, octal

With the Display Formatter, you can display state information in the mode your application requires hex, binary, or octal. The unique EXCLUSIVE OR feature allows you to compare incoming data with data stored in the DF1—with unlike bits intensified.

Suppose that you're comparing the data in each memory (as shown in the octal display, figure 3.) First, data is transferred from the 7D01 memory and entered into the DF1 memory as a reference (STORE 7D01 REF). DF1 data is displayed on the right, 7D01 data on the left.

If both tables are equal, the TABLES= light comes on; you can tell at a glance that the data matches. The DF1 can reset automatically for the next comparison; each time it resets a positive pulse is available to trigger external equipment such as a production line advance system. If the two tables are not equal, the EXCLUSIVE OR feature allows you to identify faulty bits immediately. Each bit that doesn't agree with the DF1 display is intensified (see figure 5). Now you can go right to the timing-diagram display and locate the problem.

Let's suppose, using the binary display shown here as an example, that you're paging through the long 7D01 memory. When you step through the memory with the 7D01 cursor control, you select and display 17 words. The top word in each display repeats the bottom word from the last table, so you can be sure of your "place" in memory. An 18th word, the trigger word, is displayed at the bottom of the crt. It serves as a convenient reference to subsequent table displays.

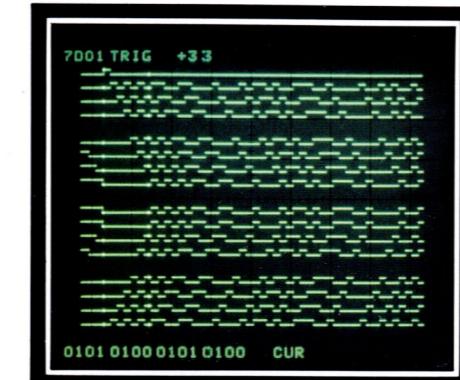
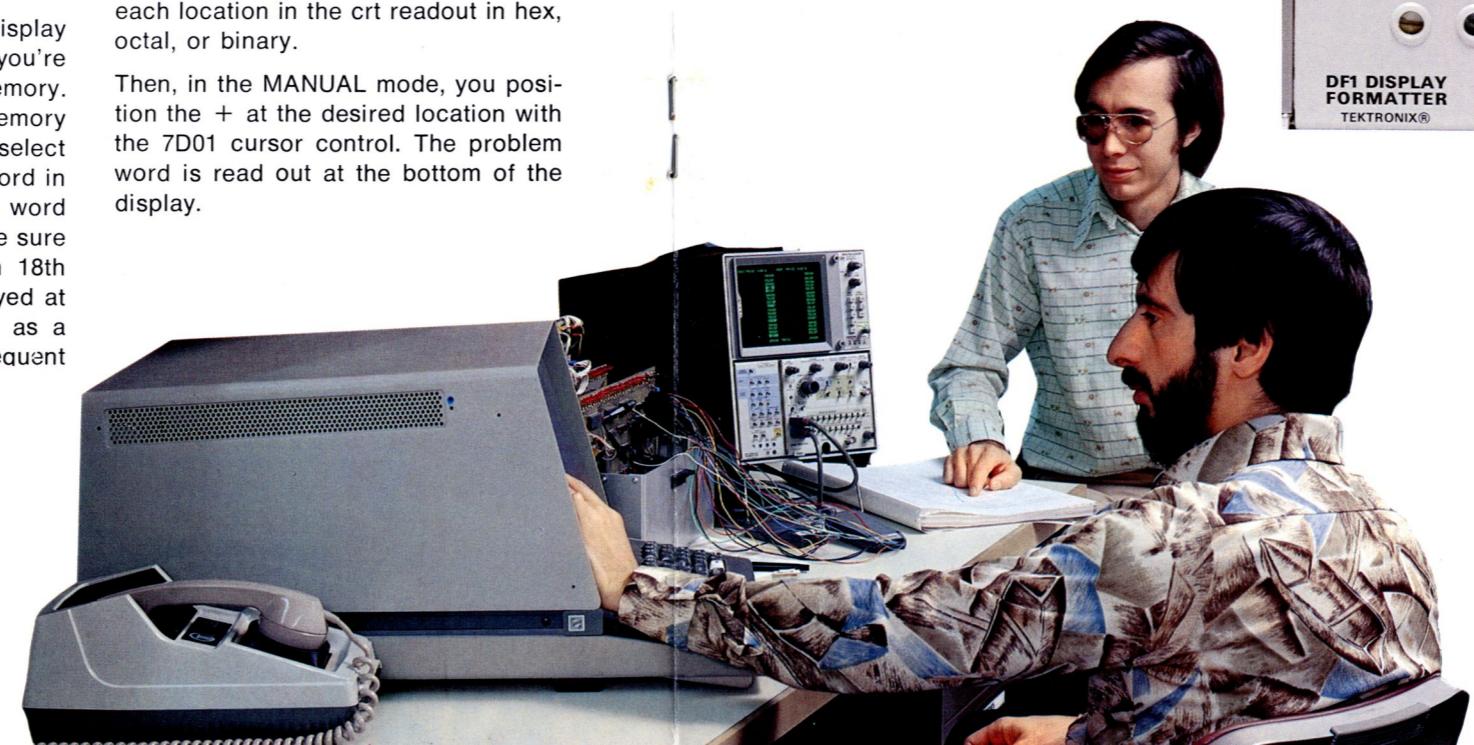
## Mapping

The Display Formatter provides three mapping modes, FAST, SLOW, and MANUAL. 64k unique memory locations can be displayed; the most significant half of a hexadecimal word positions it vertically, the least significant half positions it horizontally. Data is scanned with a + symbol in the same order it was entered in memory.

The map display lets you zero in on software problems. In the FAST mode, you watch the + move quickly over the display. Since there's no vector effect, each data word shows up clearly. An experienced operator can learn to tell when there's a fault in the program just from this type of display.

Once the approximate problem area has been identified, you switch to the SLOW mode. The + steps slowly from spot to spot, identifying the word at each location in the crt readout in hex, octal, or binary.

Then, in the MANUAL mode, you position the + at the desired location with the 7D01 cursor control. The problem word is read out at the bottom of the display.



1. Timing



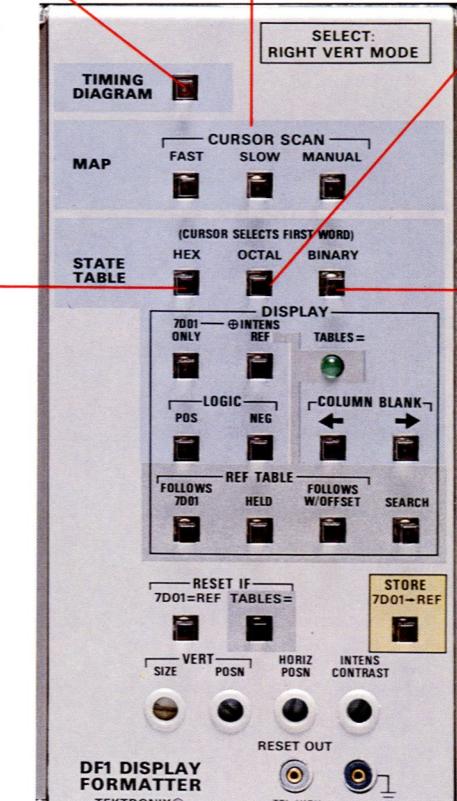
2. Mapping

7D01 TRIG +125	REF TRIG +82
003700	142106
001600	061614
000001	030030
100002	114062
040004	046144
120012	123712
050024	151626
124002	164056
052124	072134
125052	135672
152126	155166
065054	067754
032130	033730
115662	015660
146146	006148
063714	103702
031630	141606
000001	000001

3. Octal

7D01 TRIG +125	REF TRIG +82
07C0	C446
0380	638C
0001	3018
0002	9832
4004	4C64
A00A	A7CA
5014	D396
A02A	E82E
5454	745C
A00A	BBBA
D456	DC76
6BAC	6FEC
3458	37D8
9B22	1BB8
CC66	0C60
67C0	87C2
3390	C386
0001	0001

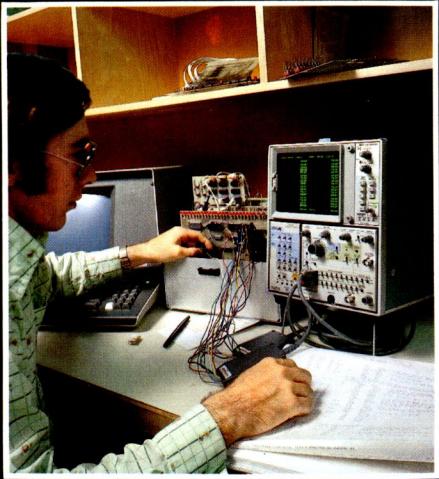
4. Hexadecimal



5. Binary

7D01 TRIG +205	REF TRIG +82
010101111010100	1100010000100010
0010101110101000	0110001110001100
0001010001010000	0011000000010000
1000101110100010	1001100000110010
1100010001000100	0100110000101000
0110001110001100	0101011110010100
0011000000010010	1101000011001110
1001100000110010	0111010001011000
0100110000101100	0111010001011000
1010011110001010	1010101110101010
1101001110001010	1011010001011010
1110010000101100	0110111110101000
0111010000101100	0011011110101000
1011010110101010	0001101110101000
1101011000111010	0000011000110000
0101011110101000	0000001110000010
0001011110101000	0000000000000001

# The overall picture

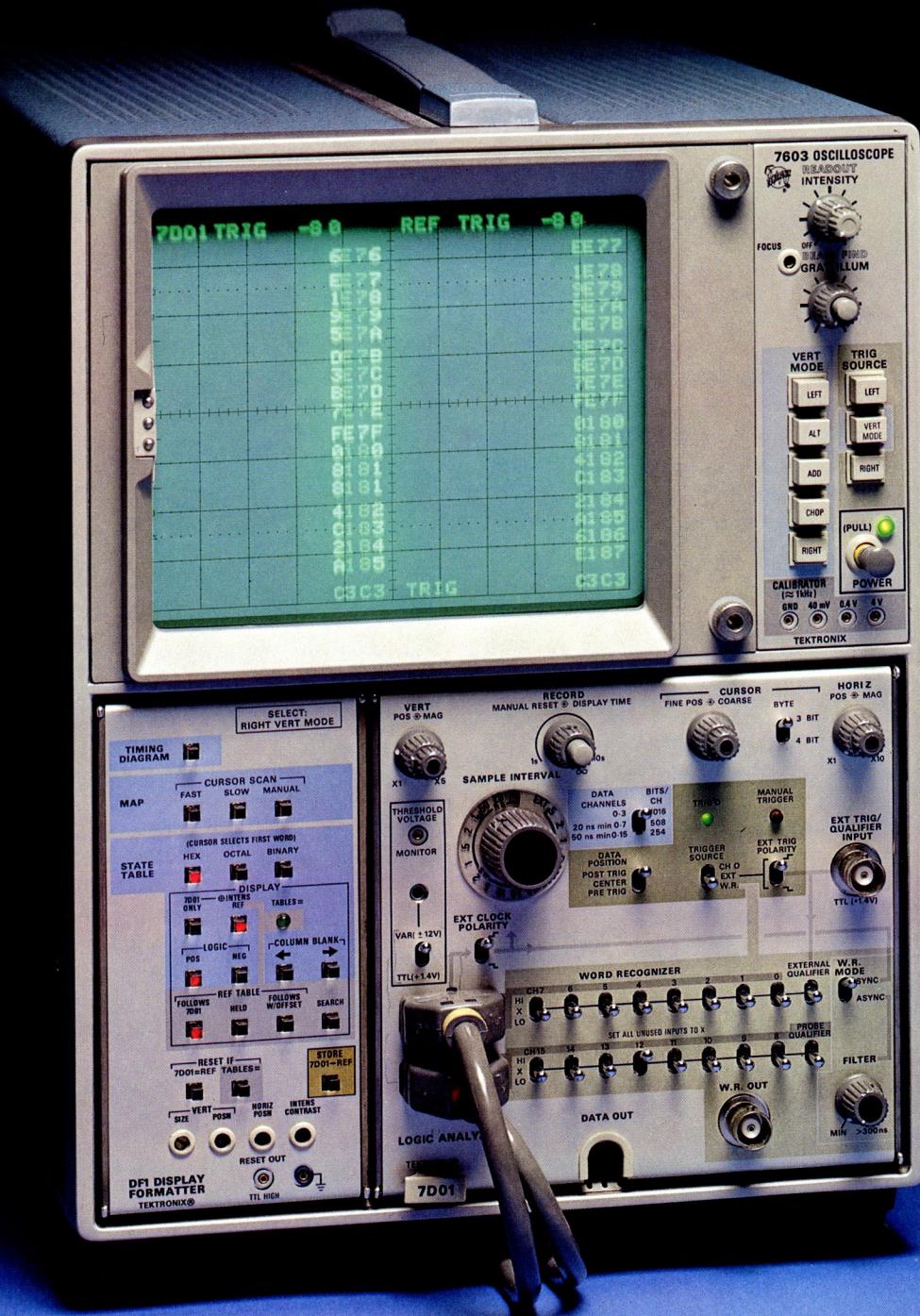


How do you put all five modes together? Let's take a typical microprocessor application as an example, checking for faulty address lines. You evaluate program flow with the 7D01 and the DF1 in the mapping mode. When you spot and track down a problem word, you switch to the hex state-display mode to identify the problem more precisely. In EXCLUSIVE OR, incoming data is compared to the data stored in the DF1; the problem is located when intensified bits indicate that the two tables are not equal. Then you switch to the binary state-table display to find the address line with the incorrect level. The timing diagram indicates a set up and hold problem between the clock and the address line. Typically you will have found the problem by now. If you need to go farther, simply hook the logic analyzer up to an oscilloscope, triggering with the 7D01 word recognizer, for an analog display. Although the 7D01 and DF1 may be operated in any 7000-Series mainframe, two configurations are particularly recommended.

## A basic but complete logic analyzer

With a 7603 three-compartment mainframe, you have a dedicated logic analysis package. Because the DF1 generates crt readout, you can even order the 7603 without mainframe crt readout for a lower cost package.

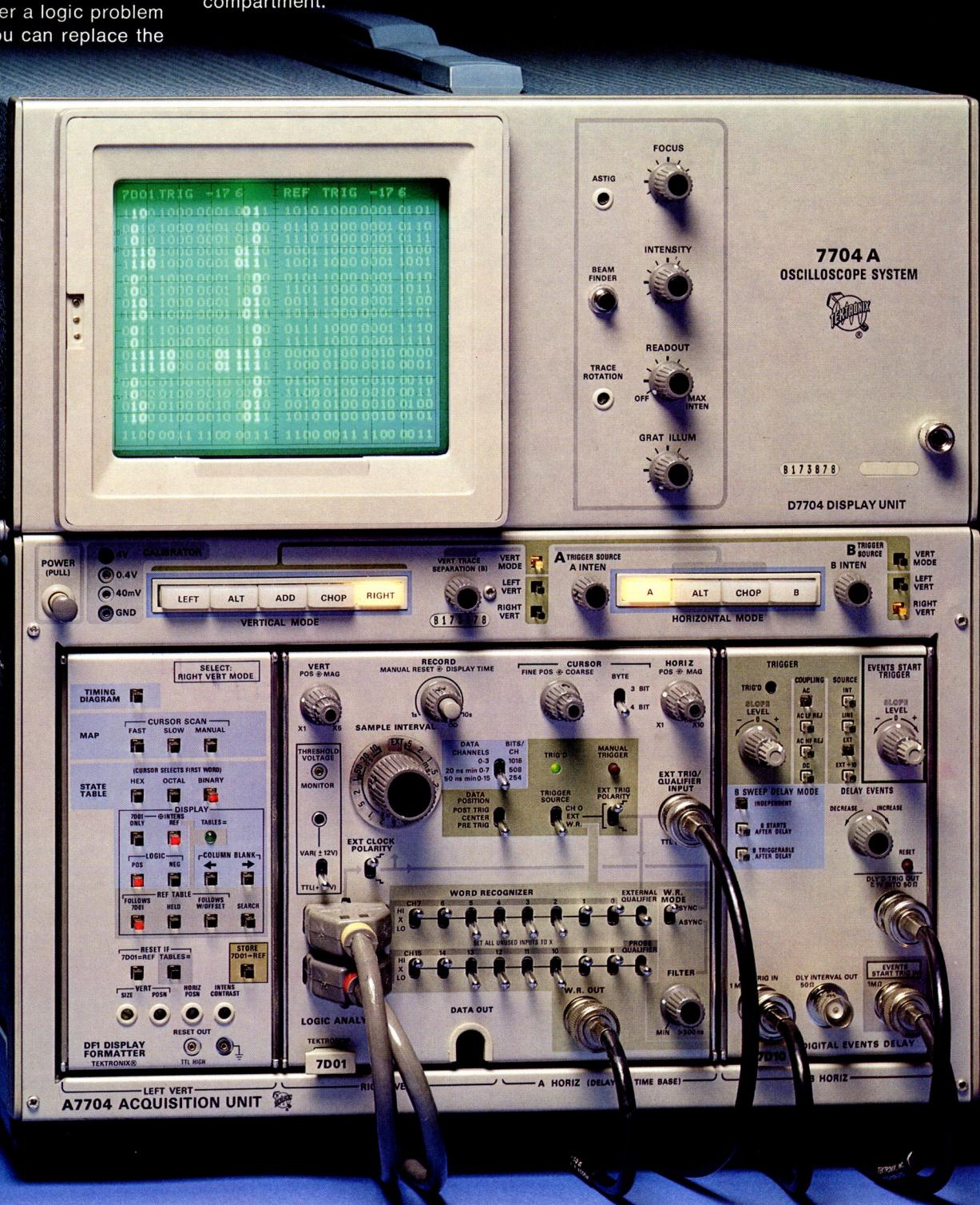
Other three-compartment mainframes suitable for operation with the 7D01 and DF1 include: AN/USM-281 (7603N Opt. 11S), 7633, 7623A, 7613.



## A powerful logic analyzer

A 7704A four-compartment mainframe gives you the more powerful package. You can incorporate a 7D10 digital delay-by-events plug-in for additional logic-analysis capability. Or, by leaving the 7D01 in place after a logic problem has been located, you can replace the

other units with standard oscilloscope plug-ins for electrical troubleshooting. Other possible four-compartment mainframes are: 7904 or 7844. A 7D10 or a 7D11 will add digital delay capabilities and are useful plug-ins in the fourth compartment.



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