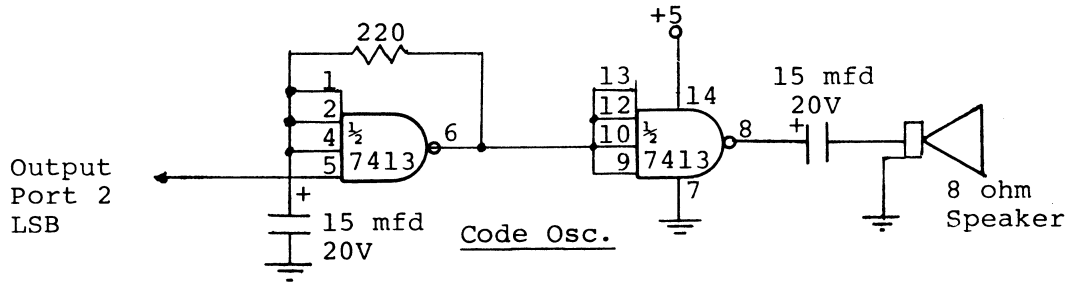
Digital Group Z-80 Distribution Cassette

The included cassette contains the Z-80 Operating System program plus 5 other demonstration or diagnostic programs, all of which will operate in a 2K or larger system.

The Z-80 Operating System program is described separately.

A second program included is a computerized Amateur Radio (Ham) demonstration. This cassette contains a "CW Keyboard" routine and a "RTTY Receive" routine. After loading, entering a "5" will cause a branch to the "CW Keyboard" routine. A special page then requests the desired output CW speed. After entering a 1,2, or 3, the operator may then enter the desired message to be translated into code. Besides being outputted via the LSB of Output Port 2, the TV monitor will display the message as it is entered. A 256 character software FIFO allows typing up to 256 characters ahead of the actual CW character being outputted. A different speed or a new program may be requested by pressing the "Reset/Start" switch. The output is a "1" TTL level equals keydown. A quick and dirty code oscillator shown below can be used to demonstrate the program.



Code Osc.

Another routine included in the "Ham Demo" is a RTTY receive routine which converts Frequency shifted 60 WPM Baudot to ASCII and displays the characters on the TV Monitor. Three lookup tables are used, which result in Upper Case, Lower Case, or the Greek letter equivalents to the English letters. These Output formats are selected by options 6,7, or 8 respectively. The RTTY is inputted to the Digital Group Z-80 Op System via the cassette interface. The 2125/2975 shift of the cassette is equal to the wide shift frequencies of Ham RTTY. The output of the short wave receiver may simply be connected to the cassette cable used for reading data from the cassette. Since few stations use wide shift any more, a simple modification to the cassette interface allows its use as a terminal unit. Modify the 2975 Active Filter of the Cassette Interface to Narrow Shift tone generally used on Ham RTTY now. I would suggest a switch mounted conveniently somewhere to select 2975/2295. Be sure to return the switch to 2975 for normal cassette operations. See July '76 Byte for further details.

This set of routines does not have attached read, write, dump, and program routines. To start up other programs, you will have to

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power down, then turn on the power for normal cassette initialize restart operation. Pressing "Reset/Start" will permit respecifying the routines in this demo program.

Another demonstration program included is one which synthesizes music. This program plays the Star Spangled Banner while it prints the US Flag on the TV monitor (So what else for the Bicentennial?)

The various data paths of the Digital Group Z-80 CPU card have resonant frequencies. By frequency modulating these data paths with different timing loops, music results. Play the programmed music by setting an AM radio tuned to around 1250 KHz on top of the CPU card. Slightly varying the tuning as well as the placement will result in the best tone. You may replay by pressing any keyboard key except "R" or "r". These keys will reset into the Operations Monitor.

This program also does not have the usual routines, so to start up other programs, you will have to power down, then turn on power for normal cassette initialize/restart operations.

The next program following a 5 second interval is a computer game called "Brain Teaser".

Game Example - Brain Teaser

This puzzle uses a three by three matrix. Each of the nine board postions must contain either 0 or 1. The object is to manipulate the patterns of 0's and 1's until a pattern is obtained that contains a 0 in the center position and 1's in all other positions. To change the board pattern you must choose a square by entering the square's position number according to the following diagram:

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1 2 3
4 5 6
7 8 9
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You may only select a square that contains a 1. Choosing a square in the center of an edge causes all positions along that edge to change state. (0's become 1's and 1's become 0's.) Choosing a corner square causes the corner square and the three adjacent squares to change state. Choosing the center square causes all squares to change state except for the four corner squares.

At the beginning of each game the microprocessor picks a random board pattern that contains either one or two 1's. Limiting the number of 1's to two assures that reaching the winning pattern will require at least 6 moves. The most difficult pattern requires only eleven moves if the proper square is always chosen. An all zero pattern loses.

Not only is the board pattern displayed on the TV, but also the move number. Press "Reset/Start" to replay. Power off, then back on to run other routines.

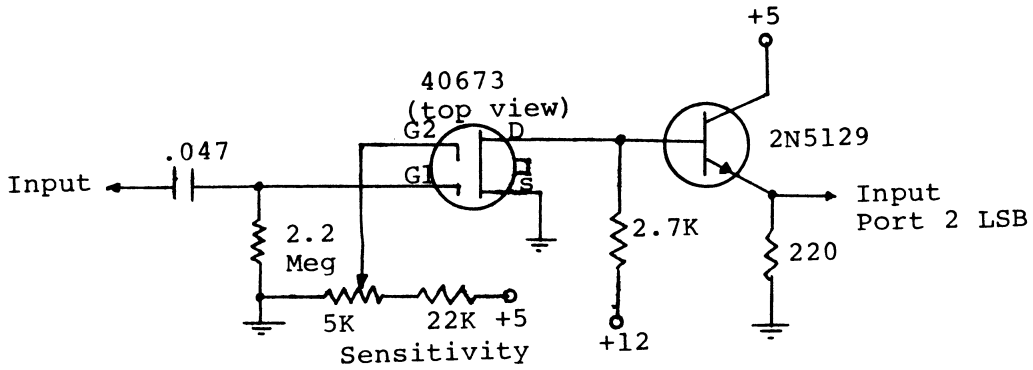
A sample memory routine follows.

Option "6" tests memory, and will print out the IC number of any IC's or wiring found to be defective. Your CPU or 8K memory board construction guide's component layout will then direct you to the offending memory IC. The memory "Bank" numbers are as follows:

Bank Ø = 0K - 8K
1 = 8K - 16K
etc. etc.
7 = 56K - 64K

If you have one or more supplemental 8K boards, try pulling out any IC, and watch the program find it. The program is self-adjusting to the amount of storage you might have in your system. An α (alpha) is printed after each successful complete memory bank cycle. When any error occurs, the offending IC's location is printed out and the program stops. Restart by pressing "Reset/Start" and Option "6".

The final routine is a programmed 15 Hz - 10 KHz frequency counter. This is made possible by the fact that the Digital Group's CPU card uses a crystal to precisely control the cycle times. After sampling an audio signal from Input Port 2, LSB, for 1/2 second, the number of 1/2 cycles occuring are displayed on the TV monitor. This routine could be used to check the frequency of the cassette's VCO if desired. Since the input port requires a TTL compatible level input, some form of signal conditioning is generally required. Many different counter input circuits of varying sophistication and quality are useable, but the simple circuit shown below should work adequately for most purposes. Precise trimming of the counter is accomplished by varying the timing value at 6244 (LSB) and 6245 (MSB).



Note: 40673 available from: Circuit Specialists, Box 3047, Scottsdale, Arizona 85257 for $1.65 including shipping.

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This set of software is provided without listings so that users may have low cost (the major expense of software is documentation) programs which are simple yet powerful demonstrations of the Digital Group's Microprocessor Systems. We hope that the software giants among you will not be unduly offended by the lack of a hardcopy.

We would suggest that you be very careful with the cassette, since it represents the sole means by which you can run your system. The cassette may be duplicated for backup by using two cassette recorders, although some quality degradation will result. The major programs of "Z-80 Op Sys", "Memory Test", and "Frequency Counter" may be system duplicated via their included "Write Cassette" routine. Separate duplicate copies of this cassette and operation guide are available postpaid USA from the Digital Group for $10.00. Order #Z-80 Op Sys Cassette.

This cassette was made using a 16K Digital Group Z-80 System into a Superscope C-104 cassette recorder. Every cassette is individually played back into the system under marginal conditions and checked for a perfect tape byte/bit count.

Dr. Robert Suding

WØLMD