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COLOR

NEWS

* LARGE MEMORY PROGRAMS (Part 1)
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* VIDEO REVERSER (Hardware Project)
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DYNAMIC COLOR NEWS is published monthly by DYNAMIC ELECTRONICS, INC., P.O. Box 896, Hartselle, AL 35640, phone (205) 773-2758. Bill Chapple, President; Alene Chapple, Sec. & Treas.; John Pearson, Ph. D. Consultant; Bob Morgan, Ph. D., Consultant.

 Subscriptions are $15/yr for U.S.A. & Canada, $30 other foreign.

The purpose of this newsletter is to provide instruction on Basic & Machine Language programming, Computer theory, operating techniques, computer expansion, plus provide answers to questions from our subscribers.

The submission of questions, operating hints, and solutions to problems to be published in this newsletter are encouraged. All submissions become the property of Dynamic Electronics if the material is used. We reserve the right to edit all material used and not to use material which we determine is unsuited for publication.

We encourage the submission of Basic and Machine Language Programs as well as articles. All Programs must be well documented so the readers can understand how the program works. We will pay for programs and articles based upon their value to the newsletter. Material sent will not be returned unless return postage is included. Basic & ML programs should be sent on a tape or disk & comments should be sent as a DAT or BIN file.

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* DYNAMIC COLOR NEWS *
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* February 1985 *
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* Editor and Publisher *
* Bill Chapple *
* *
* Secretary *
* Deanna Hill *
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CONTENTS

EDITOR'S COMMENTS

This issue marks the beginning of our second year of publishing this newsletter. It has been a very rewarding experience and the recent response has been very encouraging. With the plans we have for expanding the newsletter, we can predict a tremendous growth in subscribers in 1985. We applied for a bulk postage rate which means we can now mail newsletters for 11 cents instead of the 37 cents it cost us for First Class Mail. We will be sending out a lot of samples in order to increase our subscribers. The more subscribers we have, the more articles we can afford, which means the newsletter will contain more information for you. With our low Classified and Commercial advertising rates you can sell your software and hardware items, or advertise for items you need with minimum cost.

In this issue is a Cummulative index of articles printed in our first year's newsletters. There were 11 issues since we combined June and July. We have been told that we covered as much information about computers as the Magazines. Although we did not have the volume of articles that the magazines had, I hope that the articles that we presented were understandable and helpful to you our readers. Our purpose is to show you how computers work and how to write programs to make them do what you want them to do. There are many more subjects that can be covered and we will be presenting them in the comming issues.

As stated last month we are starting an editorial series on writing programs for larger memories. If you have a 128K memory how do you write a program to make maximum use of it? What about programs for 64K computers? Most of the programs available now are for 32K computers and do not use the extra 32K available within 64K computers. It is generally hard to modify existing programs especially if they are written in machine language codes. So we will show you how to use the extra 32K memory bank in 64K computers and how to write programs for 128K or larger memories.

In this issue we are starting a series on Color Computer Graphics. There is a tremendous amount of material to cover and we will be doing several editorials on this subject. As mentioned last month we are presenting a hardware project you can build. Reversed video is very nice for normal operation and we have a construction article on a video reverser.

Due to the recent response to our Computer Programming Class we are going to present editorials on "How to Write Programs". This will start next month. It is not hard to write programs but you have to know the rules. So if you want to really get proficient at writing programs then you will want to study our notes. The way we teach is to give a few instructions on a programming command and then give the students an assignment to write a simple program using the concepts covered. Involvement is what is required if you want to learn to write programs. We will cover a few concepts each week and give examples of how to write programs using the concepts covered.

Some subscribers have asked us about the availability of back issues. They are available for $1.95 or 3 for $5 postpaid. All issues are available except March 1984.

LARGE MEMORY PROGRAMS
PART 1

One question that has been asked many times is "How much memory will I have if I expand to 64K, 128K, or larger"? When you enter "? MEM" the computer displays the amount of available memory that is left. However, this is based on a 32K maximum computer. It would be nice if for a 64K computer the Basic software could be configured so that the other 32K could be included in the memory for programs. However, this is not the case and special techniques have to be used to access the additional memory. We want to explore some of these methods so you can have a technique for using the extra memory in 64K or larger computers.

Data Handling

Let's discuss methods of handling data. One method is to define information within a basic program.

```
40 X$="John Jones": X=50.35
```

For the above statement the string variable "John Jones and the numerical variable X are defined within the basic statement. This method is good if there are only a few variables to define. However it takes a lot of typing to use this method and would not be desireable for large memory programming.

A second method is the use READ and DATA statements.

```
100 READ X$,X
110 DATA John Jones, 50.35
```

The preceeding statements show how to use READ and DATA statements. The advantage of these is that the information can be typed into the DATA statement without parenthesis and equal marks. The disadvantage is that the information is part of the program. Why is this a disadvantage? Since we can not easily extend the program into additional memory banks, we want to use the additional memory for data and "PULL" the data from the extended memory as we need it.

Program Division

A method we have used very sucessfully is to divide the program into parts and put part in one memory bank and part in the other. Our 96KX software allows the 64K memory to be used as two 32K memory banks. If the information in the first bank is transferred to the second bank, then a program can be run in the second bank. What if a program is started in the first 32K bank, can it be continued into the second bank? The answer is "YES". This method eliminates many problems because software to move data from one bank to the other is not required. However, each bank must be initialized for Basic and put into the "RUN" mode. We will show how to do this with a 64K computer using both 32K banks. We will also develop software to allow you to use the second bank.

If you have several short programs then you can stack several of them in each bank using software such as our "MULTIPROGRAM MANAGER" which appeared in the first issue of this newsletter. This is similar to a "RAM DISK" except you go to the program and run it from the memory location it occupies. A disk drive brings the program from the disk into a designated memory area starting with the vector in locations 25 and 26. A cassette program does

the same thing. We can bring programs into the first bank from the second bank or from another memory bank. This technique will also be presented in this series so that you can have several options to use for your programming needs.

Separate Data Files

How can you handle data separately from the program? As mentioned earlier data can be part of the program as designated variables or it can be read in with data statements. Also, it can be carried within remark statements. We devoted several issues last year to handling information in remark statements. Remember the advantage was to be able to find the data. We could say go to statement number 2500 and get the information from the remark statement. We use this approach for many of our files such as the subscriptions for this newsletter and our invoices. By having a separate file for data we are able to load in different files. This is not possible if the information is contained within the program. It also gives you the advantage of desiging the control program to suit your needs for any type file. A good example is a word processor which creates text files which can be saved, loaded, appended, or edited. Also with separate data files you have the advantage of loading a file from a memory bank similar to the disk drive.

You might wonder how information can be passed from one bank to the other. What is common to all banks in the computer? Well the registers within the microprocessor are common as well as the PIA registers. Data can be stored in one of these registers and transferred by them from one bank to another. So there needs to be additional software to handle the data transfer. This should not be a shock because disk drive controllers contain software. The software we will need is not too complicated and we will show how to develop the software and how to write programs for transferring files, data, and programs from one bank to another.

The SAM Chip

The Synchronous Address Multiplexer (SAM) chip actually controls most functions of the computer. It allows the memory to be partitioned as Map type "0" for the lower 32K as RAM and the upper 32K as ROM. This is the normal power up mode for color computers. In this mode it also allows you to switch from memory bank 0 to bank 1. Nothing will happen when this switch occurs unless bank 1 is initialized for basic or a machine language program is in the bank. This we will explain in detail so you will know why things do or don't work.

The SAM also allows the memory to be partitioned as all RAM which is called memory map type 1. You have to do something to use this because there is no operating system with this configuration. The Basic, Extended Basic, and Disk Drive ROMS have to be copied into corresponding RAM memory areas. This doesn't buy you much, only about 8K more memory for a disk drive system. So we will concentrate on using map type 1 with two 32K memory banks. You will be shown how to initialize the second bank and how to write Basic and Machine Language Programs for this purpose.

SAM Pokes

Next month we will give you a program that will allow you to access the second 32K Bank in 64K computers. What will be

required is to address some locations in the SAM to perform bank switching and memory map changing. A summary of what is required follows:

Map Type	Address
0 *	65502 (FFDE)
1 (All RAM)	65503 (FFDF)

* 32K RAM and 32K ROM

Bank switching in map type 0

Bank	Address
0	65491 (FFD4)
1	65492 (FFD5)

Next month we will show how to change the memory map type and how to write a program to fully utilize the second 32K memory bank for map type 0.

128K and Larger Memories

For these larger memories we will show how to use the registers as tools for transferring data from one bank to another. Our 128K memories consist of two identical 64K memories. If you know how to fully use a 64K memory computer then you can use a second 64K memory with the same technique. Once you develop techniques that you can use then it is easy to write programs for 256K, 512K or larger computer systems.

COMPUTER GRAPHICS
Part 1

During this series of editorials we want to discuss computer graphics in a similar style that we used for our recent "Computer Sound" series. How does a television display our information and what do the terms relating to television mean? Did you know that a low powered television transmitter is built into your computer? The computer has an output that connects directly to the antenna of a television through a box. The box has a switch that allows the selection of either the computer or an antenna. Also there is a switch on the rear of the computer to select either channel 3 or channel 4 on the television. The only way for this to work is for the computer to be sending a television signal to the television set.

What about "Video"? Is a video monitor better than a television set? We want to begin by discussing video and how it is generated. Let's take a look at the Video Display Generator (VDG) chip the MC 6847.

VDG Chip

This powerful chip in conjunction with the SAM chip allows several Alphanumeric and Graphic display options. These are listed in the programming manual for the computer. Let's look at a few of its features.

1. The Alphanumeric mode displays 32 characters by 16 lines. An external ROM can be used to generate special characters such as real lower case or Foreign Language characters.

2. Full graphic modes offer 64 X 64, 128 X 64, 128 X 96, 128 X 192, or 256 X 192 densities.

3. Generates 4 different Alphanumeric Display Modes, 2 Semigraphic Modes, and 8 Graphic Modes.

4. Full Graphic Modes use one of two 4-Color sets or one of two 2-Color sets.

It is really nice having all of these options. The engineers at Motorola did a very good job when they designed the VDG chip. Probably the most objectional feature of the VDG is the reversed characters. An external

character generator can be used to give real lower case characters. Video is the composite signal generated by the VDG. By composite we mean that several signals are combined to form a composite video signal. For use on a television, the Video signal is modulated or mixed with a Radio Frequency oscillator that is on channel 3 or 4 on standard television sets.

How Video Works

A good analogy of how video works is to compare it to a printer. When a document is being printed the printer starts at the upper left hand element of the document. Let's assume we have an 80 column printer and use 66 lines. The printer will print the first character and then move to the next. When it gets all the way to the right the print head returns to the left and the paper advances one line.

When the document is completed then the paper is rolled out of the printer and a new page is started in the upper left corner.

A complete picture for video is called a frame. A frame is composed of two interlaced fields. Again we can use the printer analogy. Some printers allow double printing characters to give better resolution. This is what the two fields for a video frame do. The video tube in a monitor or television is controlled by electronic signals.

A horizontal sync pulse causes the electronic beam to position to the left side of the screen. It then moves from left to right and causes dots of varying intensities to be displayed on the screen. When the last dot is displayed the beam is turned off and returned to the left of the screen. Also it moves down a line to start the next scan. When the last line is scanned the beam is turned off and positioned to the top left position for the next field to be scanned and displayed. This procedure involves fairly accurate timing. A horizontal sync signal is generated by the VDG as well as a vertical sync. We are all familar with a television that rolls either vertically or has horizontal distortion. These sync signals are not working properly to keep things in proper order.

Let's look at some facts about the video display generated by the MC 6847. This information is in the Motorola data book on the MC 6847 chip.

1. 242 usable lines per field.
2. Top Border is 25 lines.
3. Bottom Border is 26 lines.
4. 192 lines make up the alphanumeric display area.
5. There are 256 horizontaldots.
6. There are 192 vertical dots.

You don't have to worry about the mechanics of generating the dots to program the VDG; however, some information about its operation is useful.

Television or a Monitor?

A video signal can modulate a television transmitter to produce a television signal. As mentioned earlier this is what happens inside the color computer. If super high resolution is required then a monitor should be considered. A video amplifier has to be added to the VDG signal to allow it to drive a monitor. For most applications a television will be sufficient.

Next month we will continue with this discussion and unravel the mysteries associated with video and develop techniques for writing graphic programs.

VIDEO REVERSER
Hardware Project

The standard display for color computers gives a dark border around the display area. The display area is bright and capital characters are dark against the bright background. Lower case characters are formed by reversing the character area and displaying the character as a capital against the dark background. This is not very pleasing to the eye and will cause eye strain after a long period of time. The MC 6847, which is the powerful Video Display Generator (VDG) was designed by Motorola to provide numerous alphanumeric and graphic displays. The alphanumeric display is usable but would be much easier to read if the display could be reversed giving bright characters against a dark background.

Fortunately the video can be reversed by inverting the signal on pin 1 of the MC 6847 VDG chip. This pin is directly wired to pin 32. A 74LS04 Hex Inverter chip can be mounted onto the 6847 with glue or double sided tape to provide the inversion. The procedure is to cut pin 32 of the VDG chip and wire it to the output of one of the inverters in the 74LS04. The input of the inverter is wired to pin 2 of the VDG chip. Ground is connected to pin 1 and plus 5 volts is connected to pin 17.

Wiring Instructions

Turn off the power and locate the MC 6847 VDG chip. Notice the "key" or "notch" at one end. The pin to the left of the "key" is pin 1 and the pin to the right is pin 40. Pins are counted by going down the left of the chip to the last pin which is pin 20. Pin 21 is the lower pin on the right side. Remove the VDG from the socket and bend pin 32 out so that it will not make connection when the VDG is plugged into the socket. Reinsert the VDG into the socket with the key oriented the same as originally. If your VDG is soldered then cut pin 32 and bend it out.

Mount the 74LS04 onto the VDG and make the following wiring connections.

6847 VDG	74LS04
1 (GND)	7
2 (Input)	13
17 (+ 5V)	14
32 (Output)	12

The pins on the 74LS04 are counted with the one to the left of the key being pin 1. Pin 7 is the last pin on the left. Pin 8 is the bottom right pin, and pin 14 is the top right pin to the right of the key.

When the modification is completed turn the computer on and the video should be reversed. The modification is automatically disabled in the graphics mode.

CUMMULATIVE INDEX
for 1984
Dynamic Color News

April 1984 (Vol. 1 No. 3) ASCII Part 1; Basic Prog., Arrays, Data and Read Statements; ML Prog., Data Relocacation, Branching and Conditional Tests, Compare Instr, Branch Instr; Oper Hints; Q & A.

May 1984 (Vol. 1 No. 4) ASCII Part 2; ML Prog., Interrupts, Enabling the Interrupts; Installing an Interrupt Switch; 128K Memory Expanders, Info. Editoral; 64K Memory Solution, Info Editorial; Utility Prog.; Oper. Hints; Q & A.

June/July 1984 (Vol. 1 No. 5) Powerful Remarks-Part 1, WP, Statement Number Subroutine, Using Subroutines, WP Prog.; ASCII Part 3, Interfacimg ASCII Devices, Connecting Two Color Computers Together; Uninterrupted Power Sources, Power Inverters, Motor Generators, Battery Backup Power; ML Prog, Interrupt Examples; Oper. Hints.

August 1984 (Vol. 1 No. 6) Powerful Remarks - Part 2, Data in Remarks; WP, Modifying WP, Writing Basic Programs, Composing Files, Writing Text; ML Prog., Prog. Development; Letters.

September 1984 (Vol. 1 No. 7) ML Prog., Writing Position Independent Codes, Scratch Pad Memory, ML Language Programs with Fixed SP Memories, ML Prog. with Indexed SP Memories; Powerful Remarks - Part 3, Relocating the ML Subroutine, Calling the Subroutimes From Basic; Q & A.

October 1984 (Vol. 1 No. 8) Basic Prog., Data Handling Techniques; ML Prog., Memory Searching, ML Subroutime, The Basic Program; 96KX Notes; Operating Hints.

November 1984 (Vol. 1 No. 9) Computer Generated Sound - Part 1; Basic Prog. , Sorting Info.; Oper. Hints; Q & A.

December 1984 (Vol. 1 No. 10) Random Numbers, Randon Soumds, Shuffling Cards; Computer Generated Sound - Part 2, CoCo D/A, PIA Chips, Basic Sounds, Sound Waves; Sound Learning Prog., ML Subroutine; Sound Demonstration Prog., ML Subroutine, High Frequency Sound; Sound Prog. Listing; Oper. Hints.

January 1984 (Vol. 1 No. 11) Random Numbers - Part 2; Card Shuffling, Prog. Listing; Shuffling Program; Computer Sounds - Part 3, Sine Wave, Square Wave, Triangle Wave, ML Subroutine; Sound Program Discussion; Oper. Hints; Q & A.

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Want to buy Books, Back Issue Magazines, & Software pertaining to Color Computer I. Especially interested in listable software. Please send list. Stephanie Ring; Box 132, HCR RTE 3; Staples, MN 56479
(218) 587-2838

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NEXT MONTH: We will continue our series on writing Large Memory Programs plus the series on Computer Graphics. Also we will start a new series on how to write programs.

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BACK ISSUES are available for $1.95 each or 3 for $5 post-paid. Foreigners other than Canada add $2 for Airmail Postage.

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PRODUCT REVIEWS

We want to add a Product Review Section where we give our evaluation of CC Software & Hardware. We will be writing letters to CC Software & Hardware suppliers offering this free service to them. This should start in a couple of months.

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