C1P and C1P MF INTRODUCTORY MANUAL

$6.95

OHIO SCIENTIFIC

CHALLENGER 1P AND 1PMF SERIES 2

INTRODUCTORY MANUAL

PLEASE!

For your protection, do not even remove the C1P or
C1PMF from the shipping carton before reading sec-
tions I through IV of this manual. For best results,
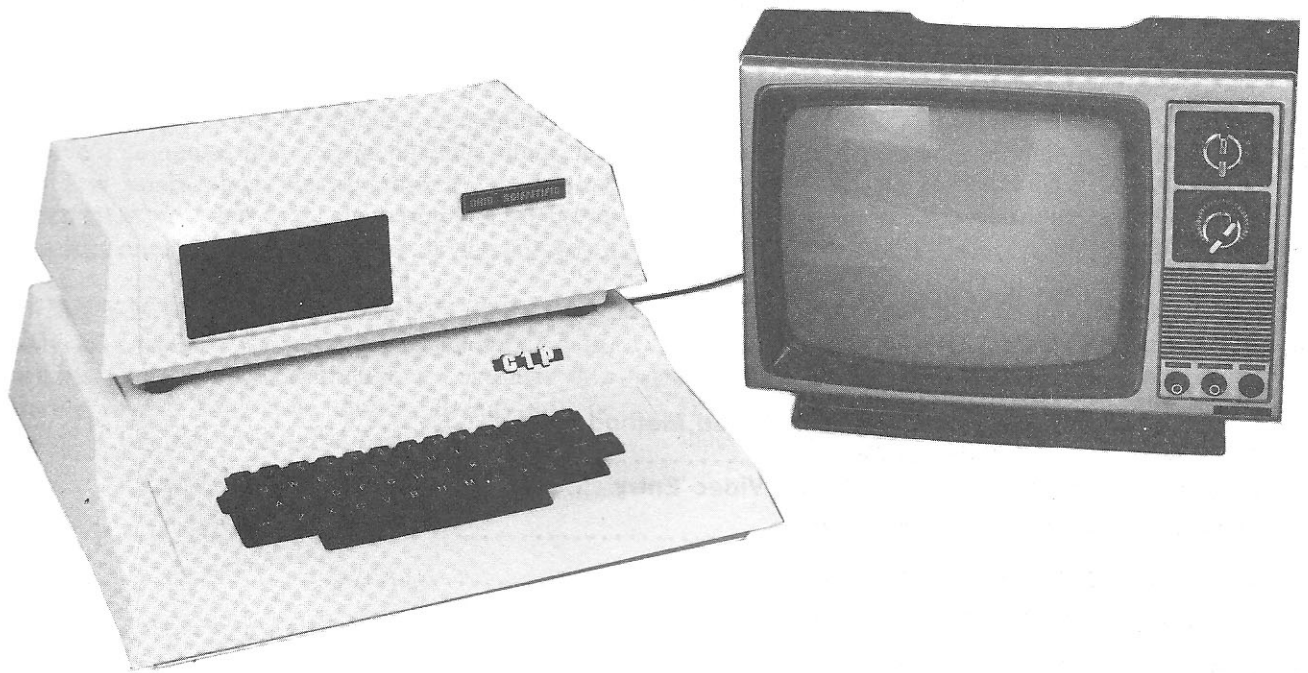follow the checklist procedure described in section I.

CIP Series 2 MF System

CIP Series 2 System

CONTENTS

SECTION 1

OVERVIEW

Welcome to the world of personal computing! You now have a computer that was technically impossible just a few years ago! We at Ohio Scientific are confident that you will find your computer to be an interesting, entertaining, and useful device for years to come.

So that you can get your computer operating as quickly as possible, we have provided detailed instructions to assist you. Although a computer is a relatively rugged solid-state device, it may still be damaged if you fail to observe power supply, accessory, or safe operating requirements. For your own protection and to ensure reliable performance, please follow carefully the instructions in this manual.

Section II contains a checklist covering what you need to know and do in order to set up properly the C1P or C1PMF and begin to operate it. The detailed instructions for each item on the checklist are on the following pages. When you have completed the instructions and are certain that the Challenger 1P or 1PMF is functioning properly, fill out the warranty sheet found in your C1P/C1PMF User's Manual.

SECTION 2

CHECKLIST

READ DETAILED INSTRUCTIONS BEFORE CHECKING EACH ITEM

SECTION 3

UNPACKING AND INSPECTION

The carton from which you obtained this manual contains only the C1P computer itself or the C1PMF together with the mini floppy disk drive. If you have ordered also a video monitor and a cassette recorder, they will arrive in separate boxes. The entire system may not arrive the same day. Each carton should be inspected carefully for signs of rough handling as it arrives. Punctures, crushed sides, torn seams, etc. will indicate possible damage to the item shipped in that carton. If there is evidence of rough handling, check the contents of the box, *preferably without removing the equipment*. If the equipment has been damaged, leaving it in the carton will make the determination of liability easier. If there is evidence of damage, notify the carrier immediately.

If there is no evidence of damage, carefully remove each system component from its box.

CAUTION: The C1PMF computer and the mini floppy disk drive are connected with a flat cable, but are NOT mechanically fastened together. Be careful when lifting the two units from the box.

The disk drive for the C1PMF is shipped with a cardboard dummy "disk" inserted and the door closed. Open the door by pressing the rectangular button below the protruding door handle. You will probably find it convenient to rest your fingers on the top of the door handle while pressing the release button with your thumb to cushion the snap-up of the door. Remove and save the cardboard "disk". It protects the disk head from vibration and should be re-installed when the disk drive is transported.

SAVE ALL PACKING MATERIALS! These may be needed later to transport or ship components of the system.

DO NOT PLUG IN or interconnent any parts of the system until you have read section 4 and 5 of this manual.

SECTION 4

PROPER ELECTRICAL OUTLETS

The Challenger 1P or 1PMF should be plugged into a *grounded 3-wire 110V* receptical. This assures that the computer's cabinet is grounded, which protects both the computer and you from possible electrical damage or shock.

Optionally, you can run a wire from the cabinet of the computer to a good ground such as a cold water pipe, and ONLY THEN use a two wire adapter on the computer's power cable.

THE ABOVE TWO OPTIONS ARE THE ONLY ACCEPTABLE POWER CONNECTIONS FOR THE CHALLENGER 1P or 1PMF.

WARNING

ANY POWER CONNECTIONS FOR THE CHALLENGER 1P or 1PMF OTHER THAN OUT-LINED ABOVE MAY LEAD TO COMPUTER DAMAGE VIA STATIC DISCHARGES. SUCH DAMAGES ARE SPECIFICALLY NOT COVERED UNDER THE WARRANTY.

The video monitor or TV set used as a video monitor may have a 3-wire grounded plug or a 2-wire polarized plug. A polarized plug has one prong wider than the other. A two-wire extension cord should never be used with a 3-wire plug and usually does not have a polarized socket. Be certain to locate your C1P or C1PMF system near an empty wall outlet or purchase a proper multi-outlet adapter or 3-wire extension cord before continuing with the setup procedure.

Figure 1: Rear Panel View of CIP Series 2

Figure 2: Proper Video and DAC Connections

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SECTION 5

VIDEO DISPLAY CONNECTION

There are three different methods of attaching a video display to the Challenger 1P or 1PMF computer. These are oulined as follows:

A. CLOSED-CIRCUIT VIDEO MONITORING—PREFERRED METHOD

Ohio Scientific offers the Model AC-3P 12″ monitor which is ideal for this application. (The unit doubles as a television when the video cable is disconnected.) If the AC-3P monitor has been purchased, use the supplied cable which has identical plugs on each end to connect it to the C1P or C1PMF as shown in Figure 2. The cable connects the upper jack on the back panel of the C1P or C1PMF to the video (VID) RCA-type phono jack on the back of the monitor.

If some other video monitor is used, connect the cable to the high impedance (Hi-Z) input. For details, consult the manufacturer's instructions. Be sure to observe the manufacturer's power recommendations. As mentioned earlier many video monitors have polarized plugs or 3-wire grounded plugs. Do not defeat the purpose of these plugs by using adapters.

B. RF MODULATOR—STANDARD TV

RF modulators are inexpensive and allow you to use almost any television with your computer. Connect the identical end cable supplied to the upper jack (video) on the back panel of the C1P or C1PMF then

to the RF modulator. Now connect the RF modulator to the antenna terminals of a television set. Consult the manufacturer's instructions included with the modulator for additional details.

SECTION 6

POWER ON; VIDEO ADJUSTMENTS

When you are certain that the power requirements for the C1P or C1PMF and for the video monitor have been met (section 4), and that the video monitor has been properly connected to the computer (section 5), plug both the computer and the video monitor into the 110V outlet. The disk drive with the C1PMF also can be plugged in at this time.

Turn on first the C1P or C1PMF (but not the disk drive) and then the video monitor. (It is a good idea to get in the habit of turning the computer on first and off last.) Allow the monitor to warm up. If you are using the OSI AC-3P video monitor or its equivalent, the channel setting makes no difference. In a short time, the display "D/C/W/M?" should appear in the lower left corner of the screen. The rest of the screen should be blank. If you are using an RF modulator, you will have to select the proper TV channel and possibly adjust the television's fine tuning slightly (consult the modulator instructions). In either case, it may be necessary to adjust the VERTICAL and HORIZONTAL controls to obtain a stable display. Some OSI monitors have a dual adjustment range for Horizontal Hold, the 2nd adjustment range is utilized by pulling the knob out about ⅜''.

NOTE: Some versions of the OSI AC-3P video monitor have a two position selector switch on the rear of the monitor. These positions are labeled "MON" and "TV." The monitor mode of operation corresponds to the "MON" position and the "TV" position allows the AC-3P to operate like a normal TV.

Figure 3: Operation Notes—C1P/C1PMF Keyboard

1. BREAK—Places computer in reset state after a 2 second delay any time after the system is powered up. It produces "D/C/W/M?" message and clears the screen.
2. SHIFT-LOCK—(latching key)—Must be in the locked (depressed) position before keyboard can be used when "D/C/W/M?" message is on video screen. In locked position, all letters typed are upper case.
3. D—May be pressed when "D/C/W/M?" is on video screen (C1PMF only). Prepares computer for use with BASIC and brings BASIC from

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diskette into RAM. Does *not* allow return to a program previously stored in RAM.

4. C—May be pressed when "D/C/W/M?" is on video screen. Prepares computer for use with BASIC in ROM. Does *not* allow return to a program previously stored in RAM. C stands for cold start.

5. W—May be pressed when "D/C/W/M?" is on video screen *except* when computer is first powered up (C must be used). Returns computer to BASIC stored in ROM. *Does* allow return to a program stored in RAM. W stands for warm start.

6. M—May be pressed when "D/C/W/M?" is on video screen. Computer enters machine language monitor (also called the 65V Monitor).

7. SPACE—Produces a space when pressed.

8. RETURN—Must be pressed after a line is typed. The computer will then process the line. This is also called a carriage return.

9. Shift-N—(Press and hold SHIFT, then type the letter N.) This will produce a ^ which is used for exponentiation (i.e., 2 cubed would be 2^ 3).

10. SHIFT-O—(Press and hold SHIFT, then type the letter O.)—Erases last character typed. (BASIC in ROM does not delete erased character.)

11. SHIFT-P—(Press and hold SHIFT, then press P.)—Erases current line being typed.

12. CONTROL-C—(Press and hold CONTROL, then press C.)—Terminates listing or execution of program.

13. CONTROL-S—(Press and hold CONTROL, then press S.)—Suspends listing or execution of program (Disk Operating System only). Continue with a CONTROL-Q.

14. CONTROL-Q—(Press and hold CONTROL, then press Q.)—Continues listing or execution of program after CONTROL-S has been used (Disk Operating System only.)

SECTION 7

GETTING THE COMPUTER OPERATIONAL

Computer and video monitor plugged in?

In the left margin you will find a summary outline of the steps needed to prepare your C1P or C1PMF to function in the language BASIC (*B*eginners *A*ll-purpose *S*ymbolic *I*nstruction *C*ode). This language is permanently stored in the computer in Read Only Memory (ROM) and can be used immediately after the computer is turned on. The C1PMF is also capable of functioning in a more flexible and powerful version of BASIC which is brought into the computer's memory from a diskette (See section 12).

Turn on the C1P or C1PMF, then turn on the video monitor.

The right-hand side of the page contains information which will help you to understand what is happening at each step.

As pointed out in the previous section, the "D/C/W/M?" message being displayed means that your C1P or C1PMF is ready for command from you. The command is in the form of pressing the key corresponding to one of the four letters in the message (See Figure 3). At this point the computer expects capital letters, therefore it is:

Check SHIFT-LOCK key.

It must be in the depressed position.

IMPORTANT—BEFORE GOING ANY FURTHER, BE CERTAIN THAT THE SHIFT-LOCK KEY IS IN THE DEPRESSED POSITION.

The letter D in the message on the screen stands for disk drive. Consequently the D command has meaning only for the C1PMF and will be used in Section 12.

The letter C stands for cold start and applies to both C1P and C1PMF models. The C command will prepare the computer for use in the BASIC language stored in ROM. The C command will clear the Random Access Memory (RAM). However, if cold start is used after you have activated the BREAK key to return the computer to its reset condition (see page 9), any program stored in RAM cannot be run or listed by using BASIC commands and is lost.

The letter W stands for warm start. The W command can be used only after you have been running the computer and have again reset it with the BREAK key. (See page 9) The W command will bring you back into BASIC in ROM, and will allow you to run or list or in any other way manipulate the program stored in RAM.

The letter M stands for machine language monitor. The M command is used by a person who is experienced with computers and who wishes to enter information directly into memory locations or inspect the contents of memory location. Refer to the 65V Primer, available from your OSI dealer, for more details.

Keyboard entries cannot damage or permanently alter the computer.

Before continuing, it is important to realize that the C1P or C1PMF cannot be damaged by pressing a wrong key. A mistake can result in the computer giving unexpected results or responses to keyboard entry. The computer can even "hang up" with the result that there is no response to pressing keys on the keyboard. However, there is always one key which will function and that is the BREAK key. The BREAK key is used to reset the computer, again bringing up the "D/C/W/M?" message. Simply press the key and hold it down until

the screen clears and the message appears (about one second). From this reset condition, the commands explained above can be used. Programs can be lost this way, important programs should be saved on tape (Section 10) or disk (Section 12).

At this point you should clear the computer using the C, cold start command. After C is pressed, the screen will scroll up one line and print the message "MEMORY SIZE?" You do not need to give an answer to this question. An experienced programmer may wish to reserve a portion of the computer memory for a special use and can do so at this point. To continue with the standard initialization, press the RETURN key (See Figure 3). The screen will scroll up one more line and print the question "TERMINAL WIDTH?"

This question refers to the number of characters which the computer sends out to a printer or to your video display before sending a signal to go to the next line. Again, the question can be ignored, in which case a line length of 72 characters is set. Your video display will automatically scroll and continue with the line up to the maximum of 72 characters. A numerical input at this point can give some control to the video monitor display, but may lead to problems when the cassette recorder is used to save the program on tape. Continue by pressing the RETURN key. The computer will reply:

```
XXXXX BYTES FREE
OSI 6502 BASIC VERSION X.X REV X.X
COPYRIGHT 1977 BY MICROSOFT CO.
OK
```

Note that only 24 characters can be shown on one line of the video screen, so a sequence of more than 24 characters will "wrap around" and continue on the next line down. See Figure 4. Your C1P Series 2 can also display 12 lines of 48 characters, this feature is discussed in Section 14 (pages 29 and 30).

The underline mark which appears on the line below OK is called the cursor. It indicates the location on the screen where the next entered character will appear. The message OK is called a prompt. It means that the system is ready to be programmed in BASIC.

The numbers which will appear in place of the X notation used above will depend on the computer which you have. The number before BYTES FREE is the result of a RAM test which is performed

Figure 4: This Screen Illustrates Number of Bytes Free

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each time the computer is reset. The 8K RAM C1P should give 7423. The 20K RAM C1PMF should give 19711. A 32K C1P should say 31999. If the number in your message does not agree with the RAM size of your computer, the computer probably has a faulty memory chip and you should consult your authorized Ohio Scientific Dealer for further instructions.

The Challenger 1P or 1PMF is now fully operational and can be programmed in BASIC. A simple use of this computer language is through the typing of one command which the computer can immediately execute. This is called the immediate mode. We will start with the command PRINT, followed by words or mathematical operations (or a combination of the two.) Try the following three examples by typing in each line exactly as it is shown (including spaces and punctuation), then pressing the RETURN key. If you make a mistake, press the RETURN key, ignore whatever the computer does, and start over. Other ways of correcting mistakes will be described in section 9.

If you hold the RETURN key down for a few seconds all of the displayed material will scroll off and clear the screen.

PRINT "TEST COMMAND" <RETURN>

PRINT 8+8−12/2<RETURN>

PRINT "ANSWER IS";6+8/3 <RETURN>

Most often, the computer is used in its programming mode whereby a series of commands which the computer executes sequentially is stored in the computer memory. If you are familiar with BASIC you may wish to try a few simple programs. However, you will not be able to save any programs until the cassette recorder has been connected as described in the next section. (OSI BASIC uses SHIFT-O to erase a character, SHIFT-P to erase a line and the command NEW to clear a program from memory. More details are given in section 9.)

SECTION 8

CONNECTING THE CASSETTE RECORDER

Any standard good quality cassette tape recorder can be used for program storage and playback with either the C1P or C1PMF. The recorder must have a microphone input jack and an audio output jack. The cassette output jack may be labeled "EARPHONE" or "SPEAKER" or "MONITOR." If you have purchased the C1PMF and will be using it exclusively with the disk drive, this and the next two sections can be ignored.

Lowest computer jack to recorder MIC jack.

Middle computer jack to recorder OUT jack.

Use the two supplied cables (each of which has an RCA phono plug on one end and a miniature phono plug on the other) to connect the recorder to the C1P or C1PMF as shown in Figure 5. Note that the bottom jack on the back of the C1P or C1PMF must be connected to the MIC input of the recorder while the middle C1P or C1PMF jack is connected to the recorder audio output. (The location of the jacks on your recorder may be different from that shown in Figure 5.) Plug the recorder into a 110V outlet and set the volume control to 7. The tone control setting should be at about mid range.

Recorder plugged in; volume properly set?

Be certain that the rotary switch on the back of the computer (Figure 1) is in its far counter clockwise position. The other switch settings will be explained in section 15A.
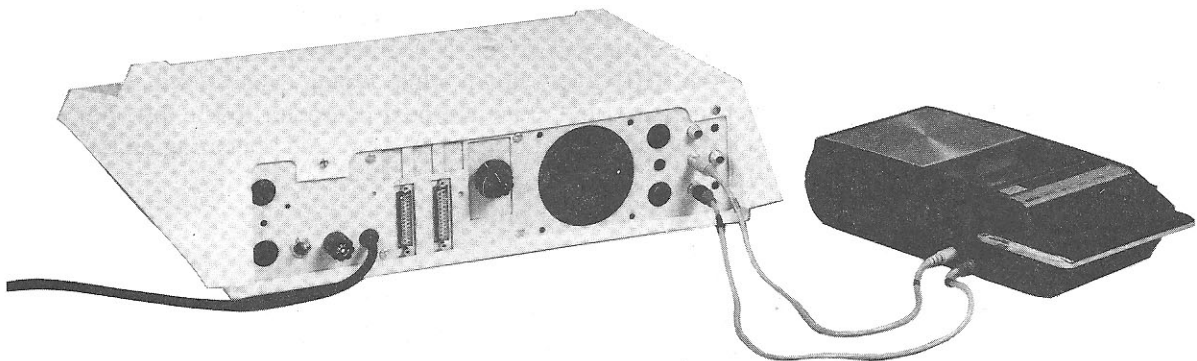

Figure 5: C1P Series 2 Cassette Connections

SECTION 9

RUNNING OF SAMPLER TAPE

This section describes the use of the C1P SAMPLER cassette which is included with the C1P. The instructions for loading the stored programs into the computer memory are, of course, applicable to any cassette software purchased from Ohio Scientific. If you have purchased the C1PMF, have attached a tape recorder, but do not have a cassette with previously stored programs, you may wish to skip to section 10.

Insert the C1P SAMPLER cassette into your recorder with the label side up. Be certain that the tape is completely rewound.

Margin outline for loading first program begins at the bottom of this page.

Type the word NEW then press the RETURN key. It is a good idea to get in the habit of clearing the memory with the NEW command just before loading a program from the cassette even when you know the memory is clear (as it will be right after a cold start.) If you forget to clear the memory when there is a program in it, that program and the one loaded will merge. The result is usually unusable.

If, while typing information into the computer, you make a mistake, it can be corrected in one of two ways.

SHIFT-O erases one character.

1. SHIFT-O (Erases one character at a time.)

While holding the SHIFT key down, type the letter O. A second underline mark will appear on the screen. The second underline mark means that the character just to the left of the first underline mark has been erased even though the character still appears on the screen. (A space is considered to be a character.) Each successive SHIFT-O (hold the SHIFT key down while typing each O) will produce a new underline mark and erase the next character to the left. For example, you have typed NWE instead of NEW and appearing on the screen is:
NWE_

Two SHIFT-O's will produce:
NWE_ _ _

The W and the E have been erased. Continue with typing E then W. The screen will show,
NWE _ _ _EW_

but the computer will receive the command NEW when you press the RETURN key.

SHIFT-P erases line.

2. SHIFT-P (Erases the entire line.)

While holding the SHIFT key down, type P. The character, @, will appear at the end of the line, the display will scroll up one line, and the cursor will appear at the beginning of the next line.

To load the first program:

1. Tape rewound?
2. Volume set?
3. Type NEW.
4. Press RETURN.

Back to the Sampler tape. Next, type the word LOAD. Do *not* press RETURN. Refer to Figures 6 and 7 while going through the rest of this section. Turn on the recorder in PLAY mode. Watch the take-up spool. As soon as the leader has passed and the tape (dark brown) begins to wind onto the spool, press RETURN. Random characters may appear on the video display. These represent noise on

5. Type LOAD.
6. Do *not* press RETURN.
7. PLAY the tape.
8. Watch for end of leader on take-up spool.
9. Press RETURN.

the tape and normally will not cause any problems. (Note: If the first character of the random set is a number, the program to be loaded will be modified. Press BREAK and start over.) In a few seconds, the first program will begin to load into the computer memory. It will be listed on the video display as it is entered. The loading takes about 2½ minutes.

Do not turn off the tape recorder before the loading is completed. You cannot damage the program which is stored on tape, but interrupting the loading procedure will alter the program which gets into the computer memory.

PANIC PROCEDURE

If while loading you realize something is wrong (e.g., you forgot to rewind and the program started loading in the middle or the wrong program is being loaded) do the following:

press SPACE bar
STOP recorder
press RETURN

10. Watch for

    OK
    ?S ⏎ ERROR
    OK

    message.

Now you can rewind the tape, use the NEW command to clear the computer memory, and start over.

When loading of the program is completed, the following message will appear in the lower left corner of the screen:

OK
?S ⏎ ERROR
OK

11. Press the SPACE bar.

As soon as the end of loading is signaled, press the SPACE bar then turn off the tape recorder. (There are four programs on the first side of the cassette and two on the second side. A time gap of about 15 seconds separates the programs.)

12. Turn off the tape recorder.

A time gap of about 15 seconds separates the programs.)

Note: The tape recorder can be turned off before the SPACE bar is pressed, but random characters may be entered. As before, this will not cause a problem unless the first character of the random set is a number.
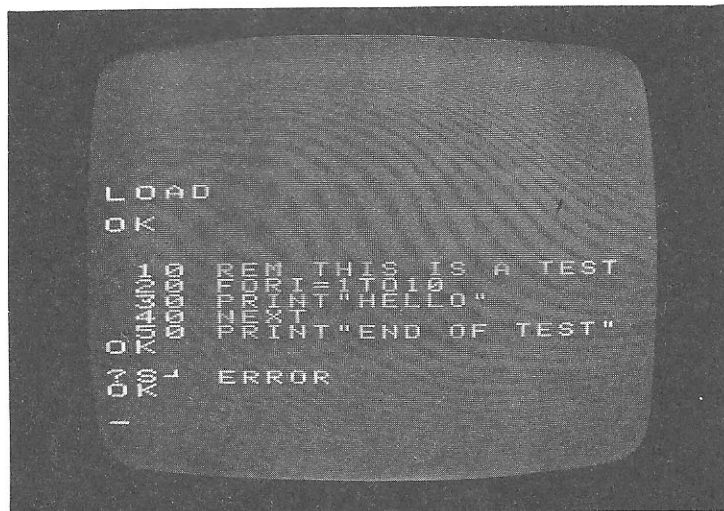

Figure 6: This Screen Illustrates a Typical Cassette "LOAD" Operation

13. Press RETURN.

Type RUN.

Press RETURN.

If the OK prompt appears, the RUN command will restart the program.

If BREAK key is activated, press W.

To load the next program:

1. Exit previous program. Note OK prompt.
2. Type NEW.
3. Press RETURN.
4. Type LOAD.
5. Start PLAY of tape.
6. Immediately press RETURN.
7. Watch for ?S⌐ ERROR.
8. Press SPACE bar.
9. Turn off recorder.
10. Press RETURN.

CTRL-C exits running program.

The ERROR message after the loading of a program from tape does not mean that a mistake has been made, but rather that the last signals entering the computer were not a part of the program being loaded.

Finally, press RETURN. The computer is now waiting for instructions from you.

The program as it exists in the computer memory can be viewed by using the LIST command which is explained in section 10, page 17. However, you probably will wish to have the computer run the program. To do this, type RUN, then press RETURN.

The program, BASIC MATH 2, at various places will ask for entry from you. Entry is made by typing that which is asked for, then pressing RETURN. At first, the entry will be numbers. Later, you will be asked for a YES or NO answer. In this case, the entering of Y or N will suffice.

You will exit the program by answering NO to the question, "WOULD YOU LIKE ANOTHER CATEGORY?" Alternatively, you can exit the program by simply pressing RETURN whenever you are asked to enter information (without typing what is asked for.) The prompt, OK, will appear whenever you exit the program. The RUN command will begin the program again.

At this point you may wish to become familiar with the warm start option after the BREAK key is activated. Press and hold the BREAK key. When the "D/C/W/M?" message appears, press W. (If C is pressed, you will have to load the program into memory again.) The prompt, OK, will appear and you may now use the RUN or LIST command to execute or display the program.

When you have finished reviewing the first program and have the OK prompt on the screen, load the second program following the procedure outlined in the left margin of this page. Note its similarity to the procedure for loading the first program. About 3 minutes are required to load the second program, Checking Account. Again, when running the second program, you may exit the program by pressing RETURN instead of entering the information requested.

The third program Trig Tutor takes about 4 minutes to load. This program, when run, incorporates features different from the first two. You will note that the first frame automatically is replaced after about 13 seconds. You cannot exit the program by pressing RETURN until half way through when you are asked to enter the answer to a quiz question. To exit the program before that point, you can activate BREAK, then press W. The RUN command will restart the program.

The last program on side one is a game called Star Wars. It will load in about 3 minutes. The two programs on the second side take about 5 minutes for the first and 6½ for the second.

The first program on side two is called Counter and can help to teach youngsters how to count from one to ten.

The second program on side two is called Presidents Quiz. You may wish to continue gaining familiarity with the use of your computer by running these programs.
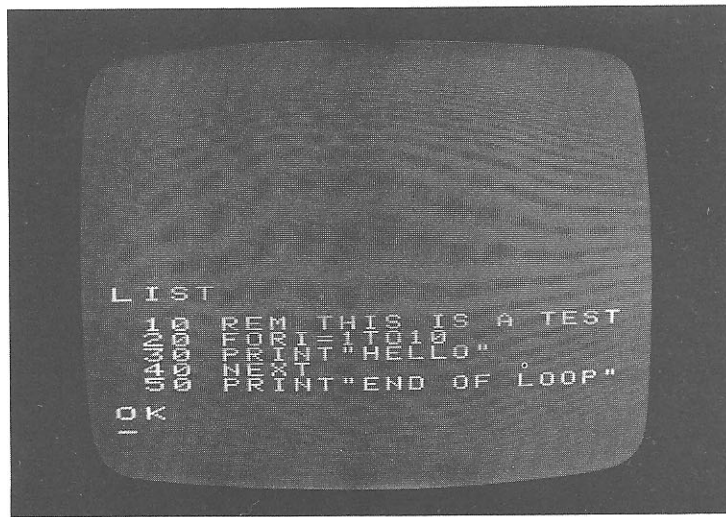
Figure 7: This Screen Illustrates a Typical Check of a Program Just Loaded.

SECTION 10

WRITING AND SAVING A SIMPLE PROGRAM

It is not the intent of this manual to teach you how to program in BASIC, but rather to show you how to use various capabilities of the C1P or C1PMF. However, in order to illustrate the saving of a program on cassette tape, a program needs to be put into the computer's memory. Of course, a program could be loaded from a cassette, but more commonly the program to be saved is typed into memory by way of the keyboard. The following program is one we will use as an example. If you have never programmed a computer before now, the example will have the additional advantage of illustrating a few of the capabilities of BASIC. For additional information, you should refer to an introductory book on programming in BASIC, such as *BASIC and the Personal Computer* by T. A. Dwyer and M. Critchfield available from your Ohio Scientific dealer.

A program is a sequence of instructions which the computer can carry out. Each instruction (or set of instructions) must begin with a number called a line number. The computer, after carrying out an instruction will go to the next sequential line number, unless told to go elsewhere. The following program uses the common practice of incrementing the line numbers by ten. Such a practice allows you to insert up to nine lines at any point if you need to add to the program after it has been typed into the computer. In addition, each line has only one instruction. For putting more than one instruction on one line, refer to a book on programming in BASIC.

Clear memory with NEW command.

The first step in entering a new program into the computer memory is to clear out any previous program. This is done with the NEW command (introduced in Section 9, page 12). After you have cleared the memory and have been given the OK prompt, type the program exactly as it is shown on page 17 including all spaces and punctuation. (Not all of the spaces shown are needed, but they make the program easier to read.) After typing each line, press the RETURN key.

Type program as shown with
RETURN after each line.

You will note that since the video monitor can display only 24 characters across the screen, the line you are typing will "wrap around." This is a display feature only. The computer will interpret that which follows each line number as being one line.

SHIFT-O erases one character.
SHIFT-P erases line.

If you make a mistake, use SHIFT-O or SHIFT-P as described in section 9, page 12. Alternatively, you can simply press RETURN and retype the line (including the line number). If you discover that a previously typed line has an error, you may retype the line at any time. Be careful, however, that you do not type an earlier line number only, then press RETURN. The line corresponding to that line number (including the line number) would be erased. This feature is normally used intentionally to erase a line you do not want.

Periodically, you will want to review what you have entered. Type the word LIST then press RETURN. You will note that the program is listed in order of line number and with each line in the form last entered regardless of the order in which lines were typed or how

many changes were made. The entire program used here as an example will fit on the screen of the video monitor. Usually, however, programs are longer than screen height and you will need to stop the listing process for display of the particular section you need to examine. If you use the LIST command by typing only the word LIST, the program will continue moving up the screen until the program end is reached. You can stop the listing by using CONTROL-C (see page 14.) Alternatively, you can select portions of the program by including line numbers after LIST. The options are:

LIST XX	Only line number XX is listed.
LIST -XX	The program from the beginning through line XX is listed.
LIST XX-	The program from line XX to the end is listed.
LIST XX-YY	The section from line XX through line YY is listed.

The program shown below is listed at the left exactly as you should type it into the computer. A brief explanation of each line is given to the right.

To view entered program, use LIST command.

```
10    REM SIMPLE EXAMPLE
20    FOR I = 1 to 24
30    PRINT
40    NEXT I
50    PRINT "I'M YOUR NEW
      COMPUTER."
60    PRINT
70    INPUT "DO YOU LIKE
      ME";A$
80    PRINT
90    IF A$="Y" OR A$="YES"
      THEN 140
100   PRINT "I'M SORRY TO HEAR
      THAT."
110   PRINT
120   PRINT "MAYBE WE CAN
      STILL"
130   GOTO 150
140   PRINT "IT'S NICE TO KNOW
      WE'LL"
150   PRINT "BE FRIENDS!"
160   END
```

10   Remark for programmer's convenience. Computer ignores remarks.
20   FOR. . . . NEXT loop
30   which produces 24
40   blank lines and thus clears screen.
50   Produces message on screen when program is run.
60   Produces blank line.
70   Produces message and stores keyboard entry in location A$, after you enter answer and press RETURN.
80   Produces blank line.
90   IF. . . . THEN branch which skips to program line 140 if entry is Y or YES. Program continues with line 100 for any other entry.
100   Produces message.
110   Produces blank line.
120   Produces message.
130   Skips to program line 150.
140   Produces message.
150   Produces common portion of final message.
160   Ends the program.

When you have finished entering the program, have listed it, and have carefully checked it for correctness, use the RUN command to see how the computer executes the program. Whenever the OK prompt occurs, the RUN command will restart the program.

Now we are ready to save the program on tape. See Figure 8. Insert a blank (fully erased or new) cassette into your tape recorder and be certain it is fully rewound. Type the word SAVE, then press RETURN. When the next OK prompt appears, type the word LIST but do *not* press RETURN. Turn on the cassette recorder in RECORD mode. When the tape (dark brown) begins winding onto the take-up spool, wait 5 seconds then press RETURN. The program will be stored on the tape as it is being listed on the screen. Note that the SAVE command used before the LIST command has directed the output of the computer to the tape recorder as well as the video monitor. Watch the screen. When the last line has been listed and the OK prompt appears, wait about 5 seconds then turn off the recorder.

Next we must return the computer to its state of interaction with

To save a program on tape:
1. Is tape clean?
2. Insert cassette and rewind.
3. Type SAVE, press RETURN.
4. Type LIST, do *not* RETURN.
5. Start RECORD mode.
6. Wait for 5 sec of tape then press RETURN.
7. Watch for OK prompt.
8. Wait for 5 sec then turn off recorder.
9. Type LOAD, press RETURN, press SPACE bar, press RETURN.

only the video monitor and keyboard. We do this by first using the LOAD command which sets up the computer for receiving information from the tape recorder. Then, from this condition (as was done in section 9, pages 13 and 14), we return the computer to keyboard use by pressing the SPACE bar then RETURN.

Note that the program is not cleared from memory as it is being saved on the tape.

When you begin developing programs which you wish to save permanently, label the cassette immediately after putting a program onto it. It is easy to forget which program went where. If you wish to protect the contents from accidental erasure, break out the appropriate record protect tab located on the cassette's rear edge (one tab for each side of the tape.) You can always defeat this protection later by putting a piece of tape over the hole.

If you are a C1P owner, you have had, at this point, sufficient experience with your computer to know that it is working properly. You should fill out and send in the warranty sheet found in the User's Manual.

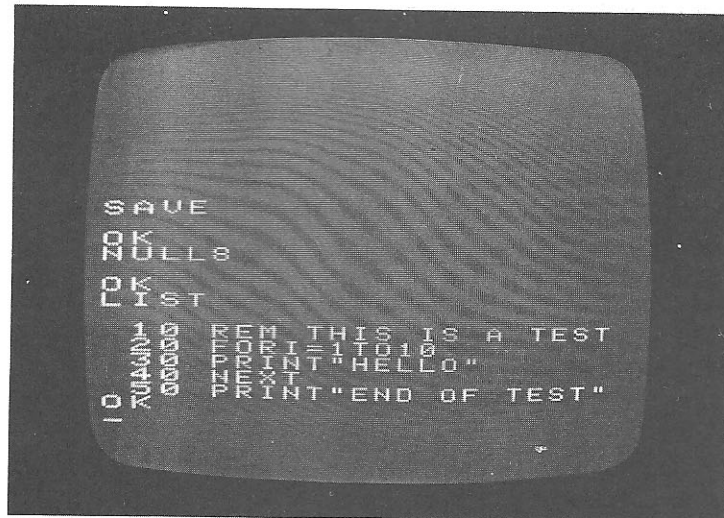If you have purchased the C1PMF, continue with the following sections.

Figure 8: Here is an Example of a Typical Cassette SAVE Operation. The NULL8 command is optional.

SECTION 11

PREPARING THE DISK DRIVE FOR USE (C1PMF ONLY)

If you have read through the earlier sections of this manual, you know that a great deal can be done with your C1PMF without even turning on the mini floppy disk drive. Many advantages are gained, however, when the disk version of BASIC is used and disk storage of programs is utilized.

Before turning on the disk drive be certain it is plugged into a grounded 3-wire outlet. The drive unit may be set on top of the C1PMF case or on the table beside the computer. Also, the video monitor may be set on top of the C1PMF case or on the table beside the computer.

HOWEVER, THE TV MONITOR MAY NOT BE SET ON TOP OF THE DISK DRIVE CASE WHILE THE DISK DRIVE IS FUNCTIONING.

Information on the diskette in the drive may be altered if the TV monitor is placed on top of the drive unit.

Check to be certain that the cardboard dummy "disk" has been removed from the drive and that the door is open.

NEVER TURN THE DISK DRIVE ON OR OFF UNLESS ITS DOOR IS OPEN.

It is good practice always to check the door and be certain the drive is empty before reaching for the power switch.

Now, with the computer already on, turn on the disk drive.

SECTION 12

INTRODUCTION TO USING THE OS-65D DISKETTE
(C1PMF ONLY)

You have received two OS-65D mini floppy diskettes with your C1PMF. These are development diskettes and are designed to be used when you wish to write and store your own programs. Software diskettes which are purchased from the educational, business, personal or game listings in the Ohio Scientific literature are menu oriented diskettes. These will be discussed at the end of section 13, page 25.

Carefully remove the OS-65D diskettes STILL IN THEIR OSI PAPER ENVELOPES from the clear plastic sheath. Figure 9 shows one disk still in its OSI paper envelope and one disk by itself. The clear plastic sheath is not shown. Before taking a diskette out of its envelope, read the proper handling instructions on the back of the envelope. Note also that each diskette has a notch in the upper right side but that one of the diskettes has tape over this notch. The tape is called a write-protect tab and prevents accidental alteration of information on the diskette. Programs cannot be transferred from the computer on to the diskette when the write-protect is in place. You may

wish to leave the tape on the one diskette and use only the other for storage of programs which you write.

Remove the diskette with the write-protect from its envelope and carefully insert it into the disk drive as shown in Figure 10. Be certain that the label is up and to the right. Push the diskette in until a click is heard or until the diskette is fully inside the slot. Upon releasing the diskette, it should stay fully inserted. Close the disk drive door (it should click).

Activate the BREAK key (by holding it depressed until the D/C/W/M appears). Check to be certain the SHIFT-LOCK key is in the depressed position, then press D. You will hear the disk drive searching for information on the diskette. As it finds the proper information, it will load this information into the computer RAM. This process is called booting up the computer. When the boot up process is completed, in a few seconds, the message shown in Figure 11 will appear on the screen.

Figure 9: Typical Mini Floppy, Also Called Disk or Diskette. Note the White Write Protect Tab on the Right Edge (These may also be black). Any Attempt to Write Data or Save a Program on This Disk Will Fail and Yield an Error #4 Message.
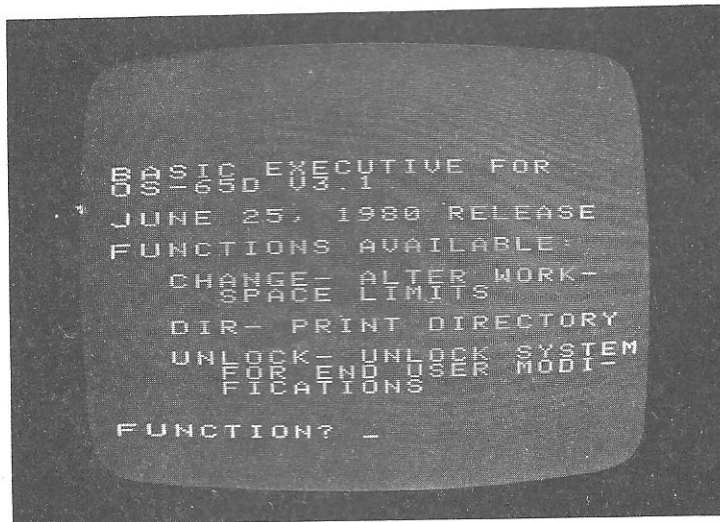
Figure 10: Proper Way To Insert Diskette.

Figure 11: This Screen Illustrates a Message Generated from the Booting Up Process.

The program which has produced this message is called the Basic Executive and is given the abbreviated title of BEXEC* (the asterisk is a part of the title.) This program now resides in the computer RAM. It was loaded from the diskette into RAM and was run automatically as part of the boot up process. It is now asking for input from you. See Figure 11.

There are several other programs stored on the diskette, two of which are accessible at this point. They are CHANGE and DIR (DIRectory). If you type in CHANGE or DIR (from now on we will not mention that RETURN must be pressed after information is typed), the program requested will be loaded into RAM (replacing BEXEC*) and will start

to run. However, unless the computer is ''unlocked'', the commands of NEW, LIST, and CONTROL-C will not function. Since most of the time when you are using an OS-65D development diskette you will want these commands to function, you will most often enter UNLOCK.

On page 8, it was mentioned that the diskette version of BASIC is more flexible and convenient. One of the conveniences will become evident when first you make a typing error and use SHIFT-O for correction. The cursor will move back with each SHIFT-O, erasing the one character to the left each time it goes. The corrected video display, then, looks like the copy entered into the computer.

Now enter UNLOCK, and the message,

SYSTEM OPEN

OK

will be given. You can now load and run any program on the diskette, or you can write your own program.

Remember, however, that the program BEXEC* is still in RAM and the NEW command must be used before you begin writing your own program.

CTRL-S suspends listing.

To view the BEXEC* program you can use the LIST command in any of its various forms as explained on page 14. In addition, you can use two new forms of the CONTROL key. After LIST has been entered, CONTROL-S will suspend the listing process so that you can examine what is on the screen. Then CONTROL-Q will continue the listing process. These two control functions can be used also to suspend and continue the running of any program. The computer does not have to be "unlocked" for these two control functions to be used.

CTRL-Q continues listing.

Frequently, you will need a list of the programs which are stored on a diskette. The program DIR will produce that list or directory. Remember that the program BEXEC* now is present in RAM. To use the program DIR, it first must be loaded from the diskette into RAM (replacing BEXEC*) and then run. All of this can be accomplished by entering:

RUN"DIR" <RETURN>

Upon doing this, you will find the message:

LIST ON LINEPRINTER INST
EAD OF DEVICE #2?

Respond by entering N. The computer will then produce the following table listing the programs stored on the OS-65D development diskette. (See Figure 12.)

(Note that with this many programs, the top two lines are off of the screen.) The directory program, DIR, will accept up to 64 names. The difference between 64 and the ENTRIES FREE number is the number of programs (also called files) listed in the directory (in this case 14.) The use of the programs is explained in your OS-65D Reference Manual and so most of them will not be covered here.

Remember that the program DIR now resides in the computer RAM. It can be used to produce a directory list from any diskette. If you were to replace the OS-65D diskette now in your drive with another diskette and then enter the command RUN, a directory list for that second diskette would be produced.

Frequently you will need to load a program from a diskette into memory without having it begin to run. For example, if you needed to obtain a directory listing from a diskette that does not have the DIR program stored on it, you could use your OS-65D disk to boot up the system, enter UNLOCK, then enter:

DISK!"LOAD DIR"

or simply

DISK!"LO DIR"

The space before DIR is necessary, the quotes after DIR are optional. The program DIR will be loaded and the OK prompt will appear. Then insert the other diskette and enter RUN.

Up to this point we have loaded a program into the computer by referencing its name as it appears in the directory listing. It is also possible to reference the track number, listed to the right of the name, on which the program resides. Each mini floppy diskette has 40 tracks numbered 0 through 39. Your OS-65D reference manual gives a complete explanation of the division of the diskette into tracks. The commands, will have the same effect as those commands using

RUN"21"

and

DISK!"LO 21

DIR instead of 21. If the program resides on more than one track, use the first track number of the set.

By now you have become familiar with the use of the disk drive to load programs into the computer RAM. Next we will give an example of how to store a program on the diskette.

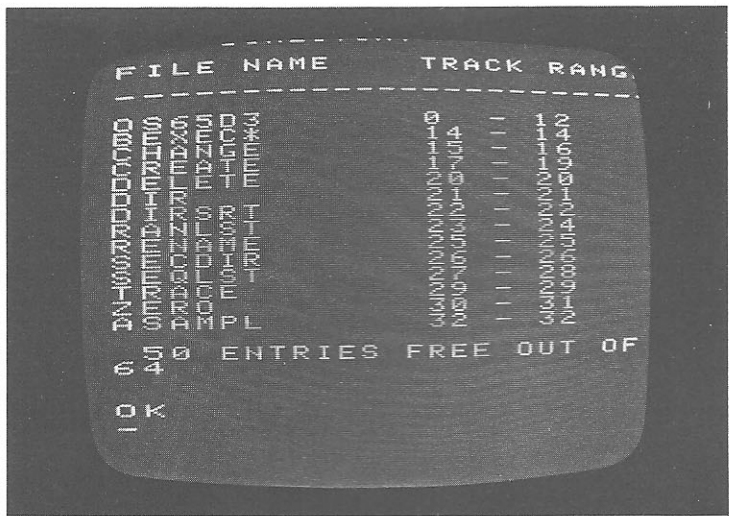For examples of all of these commands, examine Figures 13-15.

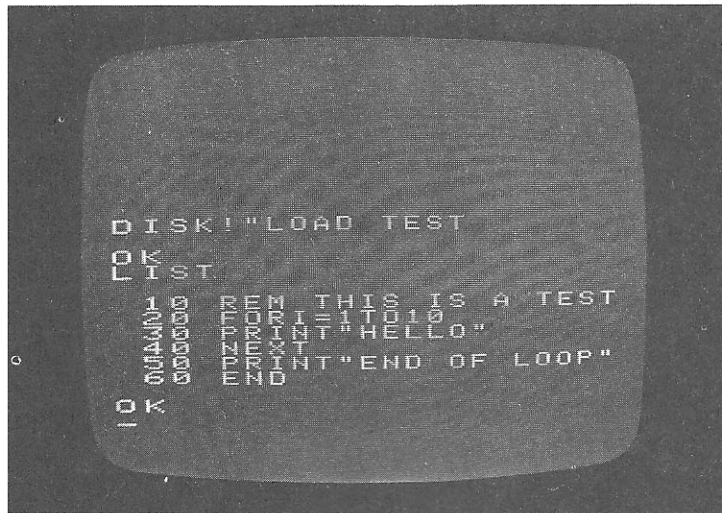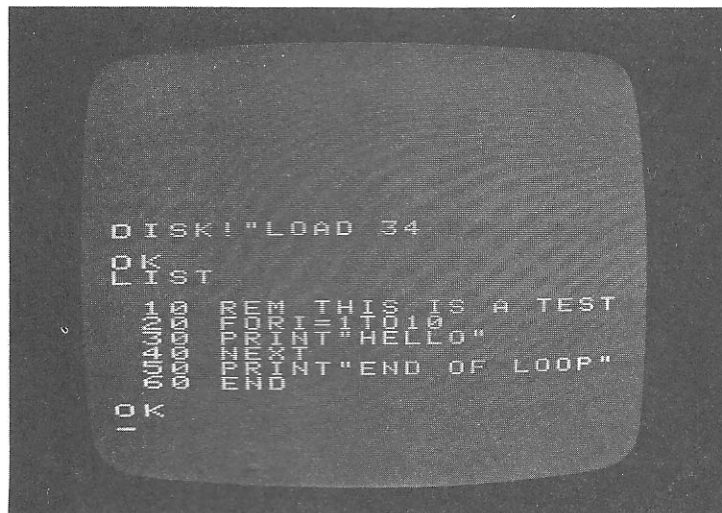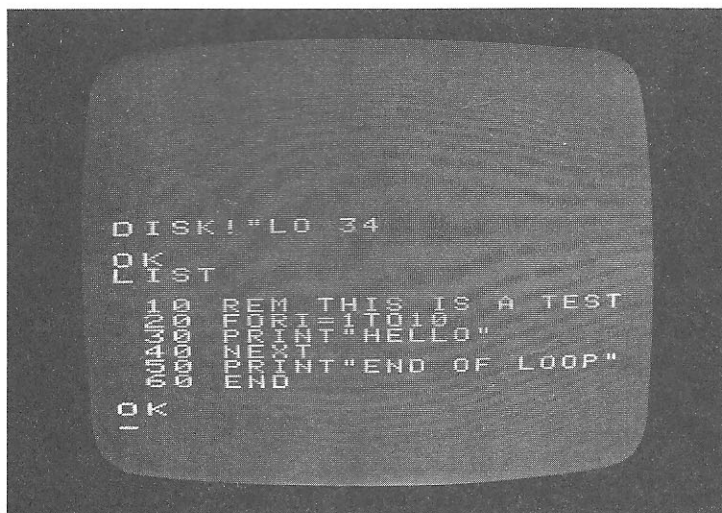Figure 12: Typical DIR Listing

Figure 13:

Figure 14:

Figure 15:

Figures 13, 14 and 15: These Screens Display Several Different Methods to Load Programs From Disk Into the Computer.

SECTION 13

WRITING AND SAVING A SIMPLE PROGRAM (C1PMF ONLY)

In section 12, the OS-65D diskette with the write-protect was used. If the computer is still booted up and unlocked, simply replace the write-protected diskette with the disk which has no tape over the notch. Otherwise, boot up the system with the write-able diskette, then UNLOCK. Next, remove any program from RAM by using the NEW command. Now type in the program shown on page 17.

One of two methods can be used for storing a program on a diskette. The first method is the simpler of the two, but less convenient, in the long run, than the second and so it is not used as often. This method stores the program according to track number. The OS-65D diskette now in your disk drive has information stored on tracks 0 through 32 (see Figure 12). Tracks 33-39 are free for additional storage. We will choose track 35 to store the sample program. Enter the command:

DISK!"PUT 35"

or simply

DISK!"PU 35

Your program will now be stored on track 35. See Figure 17 for an example. At any later time, the program can be loaded into computer RAM by using DISK!"LO 35. Note, however, that the directory will have no record of the stored program. Furthermore, if a number was inadvertently used for a track with previously stored information on it, the original information would be replaced. For example, if 18 had been used, the program CREATE (stored on tracks 17, 18, and 19) would have been drastically modified and in effect destroyed.

The second method of storage requires that a track (or several tracks) be reserved by way of a label called a file name. This is done by using the CREATE program which is run by using either RUN"CREATE or DISK!"LO CREATE. This will replace the program you have written and unless it has been stored in some manner, it will be lost. In our case, we have stored the sample program on track 35. (Refer to your OS-65D reference manual for other techniques which will help to avoid losing a program.)

Use the command RUN"CREATE. In answer to the question PASSWORD?, enter PASS. In answer to FILE NAME? enter EXAMPL, (a file name can be no more than six characters and must begin with a letter.) If an existing file name is entered, the computer will tell you that name is in use. When the question FIRST TRACK OF FILE? appears, enter 34. For the next question, enter 1. (Your OS-65D manual will explain how to determine the number of tracks needed for a long program.) Finally, enter Y or YES for the PAGES PER TRACK question. You may now use RUN"DIR to see that the file EXAMPL has been created on track 34. Next, use DISK!"LO 35 to load our sample program back into RAM. Finally, use,

DISK!"PUT EXAMPL"

or simply,

DISK!"PU EXAMPL

to store the sample program in the newly created file, named EXAMPL. See Figure 16. To see that the program has been stored, you can clear RAM with NEW, then use RUN"EXAMPL.

There are, of course many uses for your computer whereby you will not need to create or store programs or in any way use the OS-65D development diskettes. As mentioned on page 20, many menu oriented diskettes are available which cover many areas of interest. Each one of these diskettes will boot up your computer and begin to run giving instructions on your video monitor where needed.

By now you are familiar with many of the features of your C1PMF and have found that the computer is working properly. You should fill out and send in your warranty sheet found in the User's Manual.

Figure 16:

Figure 17:

Illustration of Two Ways to Put Programs on Disk

SECTION 14

ADDITIONAL FEATURES OF THE C1P AND C1PMF

A. AUTO REPEAT

The keyboard on Ohio Scientific computers has a built-in auto repeat feature. By depressing any key and holding it down, first that character (or function such as space) will be generated once and then after approximately one-half second, the character (or function) will be repeated at a rapid rate.

B. LOWER CASE

All Ohio Scientific computer systems are capable of generating lower case letters. It is simply a matter of releasing the SHIFT-LOCK key so that it is in the raised position. Then each alphabetic character will be entered as a lower case letter. However, with the SHIFT-LOCK key in the raised position, *only* the standard alphabetic characters and the SPACE bar (and of course, the BREAK key) will generate expected results. (The RETURN key will not move the cursor to the beginning of the next line.)

Furthermore, the left and right SHIFT keys have different functions when the SHIFT-LOCK key is raised. (They have the same functions when the SHIFT-LOCK key is down.) Depressing the left SHIFT key has the same effect as returning the SHIFT-LOCK key to its depressed position. That is, holding the left SHIFT key down while pushing any other keyboard key will have the same effect as when the SHIFT-LOCK key is in its depressed position and neither SHIFT key is being held down. On the other hand, depressing the right SHIFT key will give expected results only for keys with two characters on them. For example, with the right SHIFT key held down, pushing the 5 key will produce the % symbol and pushing the period key will produce the > symbol.

If you have occasion to use the keyboard with the SHIFT-LOCK key raised, be certain to depress it when you are finished.

REMEMBER: THE COMPUTER WILL NOT RESET AFTER THE BREAK KEY HAS BEEN ACTIVATED UNLESS THE SHIFT-LOCK KEY IS IN THE DEPRESSED POSITION (OR THE LEFT SHIFT KEY IS HELD DOWN).

C. GRAPHICS

In some programming applications, it is necessary to place letters, numbers, or other characters at specific locations on the video display screen. Ohio Scientific computers have the capability of placing any one of 254 characters (plus two separately coded blanks) at any desired location on the screen. Your C1P/C1PMF User's Manual gives a complete listing of these characters, and describes in detail their use. Our purpose here will be to give a simple illustration of character placement.

The generation of a character is accomplished by using the POKE command which is a part of Ohio Scientific BASIC. The command is descriptive of what happens. The code number corresponding to a particular character is brought (POKEd) into the memory location corresponding to the position on the screen where the character is to appear. The character will replace any other character which happens to be at that position on the screen. This feature provides one method used to remove characters from the screen. A blank is POKEd to the location which is to be cleared.

Now let's try a few. Code 16 corresponds to an arrow pointing up. Address 53711 corresponds to a position slightly above mid screen. Your User's Manual has a memory map of screen locations. Hold the RETURN key down until the screen is cleared. (This is not necessary, but it does make what is happening easier to see.) Type,

POKE 53711,16

then press RETURN. Note that if you do this again, without clearing the screen, the first arrow will be three rows above the second because of the scrolling

action of the screen. (The scrolling, you will note, took place right after the arrow appeared on the screen in order to make room for the OK prompt and the cursor.)

POKE commands can be used in BASIC programs. In the first program, lines 10 through 40 will put the first eight letters of the alphabet on the screen. (The codes for these letters are 65 through 72.) Lines 50 and 60 are a time delay of about five seconds. Lines 70 through 90 replace the letters with blanks. Again, clear the screen by holding down the RETURN key before running the program.

```
10 L=53707
20 FOR C=65 to 72
30 POKE L−65+C,C
40 NEXT C
50 FOR X=1 TO 5000
60 NEXT X
70 FOR B=0 TO 7
80 POKE L+ B, 32
90 NEXT B
100 END
```

If you would like to display all of the characters available, use the following program:

```
10 L=53605
20 FOR C=0 TO 255
30 I=I+1
40 POKE L+C,C
50 IF I=23 THEN L=L+9
60 IF I=23 THEN I=0
70 NEXT C
80 END
```

D. PROGRAMMABLE KEYBOARD

In certain types of programs (e.g., games) the keyboard needs to be used in special ways. It is possible to incorporate such special uses of the keys into a program.

The keyboard consists of rows and columns of conductors. When a key is depressed, contact between the row conductor and the column conductor is made. If we set (POKE) a row to be examined and look at (PEEK) a desired column, the computer can tell whether or not the key is depressed. The values which need to be POKEd and PEEKed are shown below in Table 1.

The memory location which is set and then examined is 57088. The commands, then, are:

POKE 57088,XXX

and

PEEK(57088).

Before using the POKE-PEEK combination to control the keyboard, it is necessary to disable CONTROL-C. Then, of course, it should be enabled again before the program is exited. The POKE commands which are needed for CONTROL-C are shown in Table 2. Note that the numbers are different depending on whether you have initialized the computer using the cold start or (C1PMF only) booted up using the OS-65D diskette.

Values found when PEEKed

		127	191	223	239	247	251	253	254
	127	1	2	3	4	5	6	7	
	191	8	9	0	:	-	RUB OUT		
Values to be POKEd	223		L	O	LF	RETURN			
	239	W	E	R	T	Y	U	I	
	247	S	D	F	G	H	J	K	
	251	X	C	V	B	N	M	,	
	253	Q	A	Z	SPACE	/	;	P	
	254	REPT	CTRL	ESC			L SHIFT	R SHIFT	SHIFT LOCK

Table 1.

	BASIC-in-ROM		OS-65D	
	POKE 530,X		POKE 203,X	
CTRL-C	OFF	ON	OFF	ON
VALUE OF X	1	0	96	173

Table 2.

As an example, let's use the R key to move an airplane character (code 237) to the right. In the program below (written for BASIC-in-ROM) note particularly lines 50, 60, and 70. They are where the program stays until the R key is pressed. Note also that before these lines and immediately upon exiting them, there are commands which disable and then enable CONTROL-C.

```
10 I=0
20 POKE 53610,237
30 I=I+1
40 POKE 530,1
50 POKE 57088,239
60 IF PEEK(57088)=223 THEN 80
70 GOTO 50
80 POKE 530,0
90 POKE 53609+I,32
100 IF I=15 THEN 10
110 POKE 53610+I, 237
120 GOTO 30
```

Line 100 limits the distance the airplane moves across the screen and transfers the program run sequence to line 10 which resets the incrementing variable, I.

You will be able to exit this program by activating the BREAK key or by using CONTROL-C while holding down the R key. If you activate BREAK, using the warm start command will allow you to run or list the program again.

E. VIDEO SCREEN FORMATING

The normal 24×24 screen format can be changed to 12 lines (double spaced) with 48 characters across the screen. Such a format is useful primarily for text display. The changing of the format is complex and is set up (BASIC-in-ROM initialized by cold start) or done for you (OS-65D BASIC brought in from diskette) by a program supplied by Ohio Scientific called C1P Series 2 Video Swap.

For either the C1P or C1PMF, the 12×48 utility program on cassette tape will set up your computer so that you can change format by means of POKE commands. To use this utility program, follow the procedure for loading the program from cassette tape as outlined in section 9, pages 12 and 13. However, *do not* press the SPACE bar after the ?S ⌐ ERROR message is given. In a few seconds, the word RUN will appear on the screen, then the screen will clear and you will receive the message:

XXXXX BYTES FREE.

OK

Now you should turn off the recorder.

The program not only was loaded, but it ran itself then cleared itself from the computer memory. The entire process takes about one minute.

The utility program sets up the computer so that the following POKE commands can be used:

POKE 251,0 Selects the 24×24 display mode

POKE 251,1 Selects the 12×48 display mode

The commands can be used either without line numbers if you wish to change the screen before writing a program, or with line numbers as a part of a BASIC program (be sure to include the video swap routine in your program). Be careful, however, that you do not change horses in mid stream. If there is a display on the screen when the format is switched, the previous display will be radically changed.
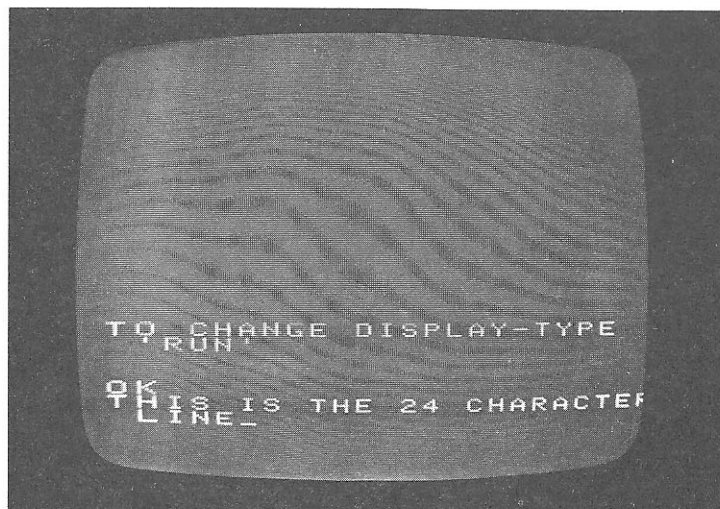

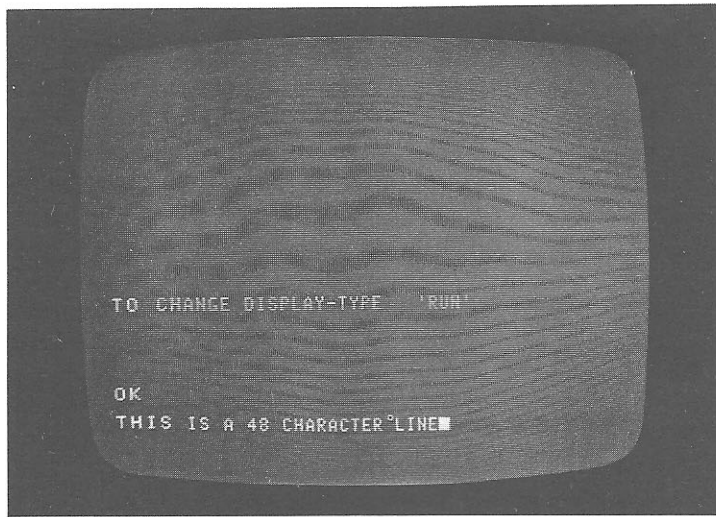Figure 18: This Screen Illustrates 24×24 Display Mode

Figure 19: This Screen Illustrates 12×48 Display Mode

WARNING: If you should activate the BREAK key after running the 12×48 utility program, warm start will *not* bring back the format change capability. You must repeat the procedure of loading and running the utility program from tape.

If you have purchased the C1PMF, you can use the program SWAP available on diskette. First boot up the system from diskette then run SWAP. Each time SWAP is run, it will change the format from the one currently in use to the other.

F. SOUND GENERATION (DAC)

Your C1P or C1PMF is capable of producing sounds ranging from single tones to musical selections with multiple parts. In order to hear the sound, however, you must have either a video monitor with an audio input jack (such as the Ohio Scientific AC-3) or an audio amplifier. Connect the DAC (Digital to Analog Converter) output jack on the back of your computer (middle far right as seen in Figure 1) to the video monitor audio input (Figure 2) or to the auxiliary input of an audio amplifier. You will hear a high pitched tone if you turn the volume up high. The DAC output is never completely turned off. The "turn off" condition is actually a reduction in the output level of the signal, this will reduce the volume until the tone is barely audible.

The programming techniques required to produce even a simple tune via the DAC are quite complex. Your User's Manual contains a relatively simple program written for BASIC-in-ROM which will produce a slide whistle effect. More sophisticated programs are available on diskettes. Our purpose here will be simply to demonstrate the DAC output by way of turning it on and off and varying the pitch of the sound by pressing keys on the keyboard.

For either BASIC-in-ROM or the disk system of the C1PMF, a POKE to location 55296 controls the

DAC output. The values to be POKEd are as follows:

POKE 55296,16 produces high level DAC output (ON)

POKE 55296,0 produces low level DC output (OFF)

Use the first of the above to turn on the tone. (Remember, a line number is needed only if you wish to use the command in a program.) Since the DAC and the keyboard share the same output port of the computer, pressing a key or key combination will vary the pitch of the tone. Press any one of the number keys. Now press the 3 and 4 keys simultaneously. Next press E and R simultaneously, then F and G simultaneously.

At this point, you may wish to look at the program in your User's Manual. As pointed out there, the use of machine language rather than BASIC is necessary for programming the DAC. However, it is possible to incorporate a machine language program into a BASIC program by using the USR(X) function and that is done in the sample program. The next part (part G) of this section explains how you can gain access to memory locations in order to program directly in machine code.

G. MACHINE CODE ACCESSIBILITY

When the BREAK key is activated, the message D/C/W/M? appears on the screen. Pressing the M key will call in the PROM (Programmable Read Only Memory) monitor which is necessary if you wish to examine or change the contents of memory locations.

After pressing M, you will note a display in the upper left portion of the screen. The first four characters give the address of a memory location in hexadecimal notation. The next two characters give the contents of that memory location (also in hex notation.)

After M is pressed, the monitor is in the address mode. That is, any memory location can be examined by typing in its hex code address. Note the RETURN key is not used in the address mode. The contents of the memory location is displayed as the address is typed.

Data mode: Type slash (/)

If you wish to change the contents of memory locations and thus enter a program using the PROM monitor, you must exit the address mode and get into the data mode. To do this, type a slash (/). Do not press RETURN. The change will be made although there is no evidence of the change displayed on the screen. Any two hex characters which you type will then be inserted into the location specified by the four character hex address to the left.

Address mode: Type period (.)

The normal procedure for entering programs via the monitor is to use consecutive memory locations. While still in the data mode, you can open the next address by pressing RETURN. Then new contents can be inserted from the keyboard or you can go on to the next address by again pressing RETURN. If you want to jump to a nonconsecutive location, you need to get back into the address mode by typing a period (.) without pressing RETURN. Then type the new address which you want. Type another slash to get back into the data mode and continue as before until you want to open a nonconsecutive address.

A simple example of the PROM monitor use can be given without having to write a program. Recall that graphics characters can be placed on the screen by POKEing a memory location with the character code. In part C of this section, memory location 53711 was POKEd with decimal code 16. The numbers were decimal numbers. The hexidecimal equivalents are $D1CF for the memory location and $10 for the character code. With the monitor in address mode, type D1CF. Then type / to get into the data mode. Next type 10. The upward pointing arrow will be displayed on your screen.

If you are familiar with machine language programming you will be able to enter a program through the PROM monitor. To run any program which you have entered, get into the address mode by typing a period, type the starting address of the program, then press the G key.

More information on this programming method can be found in the 65V Primer available from your OSI dealer.

SECTION 15

AND YET MORE

A. PRINTER AND MODEM CAPABILITY

There are two multipin connectors just to the left of the rotary switch on the back of your C1P or C1PMF. Any good quality serial printer can be plugged into the left of these connectors and a modem (modulator-demodulator) for telephone communication can be plugged into the right (see Figure 20 & 21). Selection between the cassette tape recorder, a printer or a modem is made with the rotary switch.

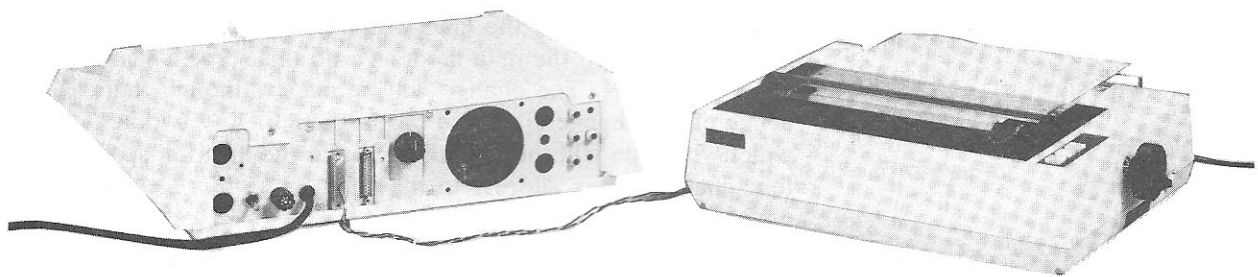Detailed instructions for use of a printer or modem are given in your User's Manual.

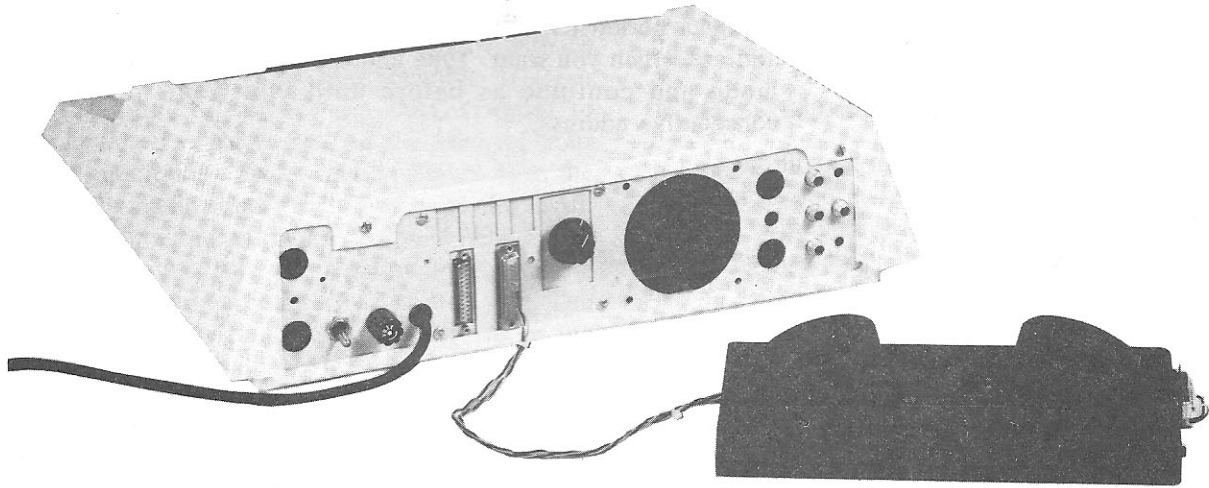Figure 20: C1P Connected to Printer

Figure 21: C1P Connected to Modem

B. EXPANSION CAPABILITIES

Would you like color, home appliance and light control, home security monitoring, joystick and keypad capability, simple programmable tone generation, and a general purpose input/output connector? They are all available. Either the C1P or C1PMF can be given these capabilities by having the 630 I/O Ex-
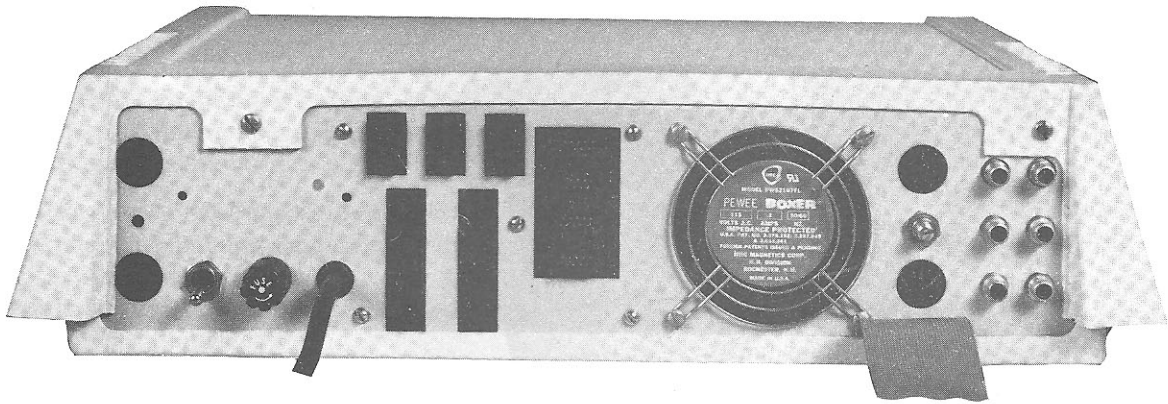
32

Figure 22: Rear panel of C1P Series 2 equipped with 630 I/O Expander

pander Board installed. When this is done, the rear panel of the computer will take on the new appearance shown below.

The video phono jack has not changed location, but it can now be connected to a color video monitor or a color TV. The connection procedure is the same as described in section V.

The two addition RCA phono jacks at the right are for a programmable tone generator and a control signal used in conjunction with a wireless AC remote control option (the Ohio Scientific AC-12P.) The programmable tone generator differs from the DAC in that tunes can be produced by way of simple BASIC programs. The AC control feature provides the capability for turning home appliances on and off, and for controling lights (brightness as well as on and off) according to a programmed time and sequence.

Four 9-pin connectors are added to the left of the fan. Two joysticks and two keypads can be connected here to enhance game capabilities. Certain game programs available from Ohio Scientific require the use of joysticks or keypads. See Figure 23.

A 16-pin connector above the printer and modem connectors makes possible connection to the Ohio Scientific AC-17P home security system. It is possible for the computer to continually monitor smoke detectors, window and door sensors, automobile break-in units, and portable personal emergency signalers while performing other tasks.

A second 16-pin connector is an I/O (Input/Output) bus interface which allows for the connection of 48 additional parallel I/O lines. This general purpose interface permits connection of your computer to electronic systems such as the Ohio Scientific CA-24 solderless prototyping board ideal for hobbyist and educator.

C1P owners will enjoy all of these capabilities at low cost but with some inconvenience brought on by the limitations of cassette tape storage. The 610 Expander Board can remove the inconvenience by turning your C1P into a C1PMF (with, of course, the purchase also of a disk drive.) See your Ohio Scientific dealer for expansion details and prices.

Figure 23: C1P Connected to Joysticks

APPENDIX

SMALL COMPUTER GLOSSARY

ACIA (Asynchronous Communications Interface Adapter) An IC used for serial data transfer between a device such as a small computer and a serial terminal.

A/D (Analog/Digital) Refers to changing an analog signal to a digital signal which the computer can use.

BACKPLANE (Sometimes called Mother Board) Allows simple interconnection between computer boards using the same bus.

BASIC (*B*eginners *A*ll-Purpose *S*ymbolic *I*nstruction *C*ode) A popular computer language ideally suited for use with Ohio Scientific computers. One of the simplest languages to learn, it can be used for a wide variety of applications.

BAUD A measure of the speed with which information can be communicated between two devices. For example, if the information is in the form of alphabetic characters, then 300 baud usually corresponds to about 30 characters per second.

BIT The smallest amount of information that can be known (one or zero.) Eight bits equal one byte.

BUS The means used to transfer information from one part of the computer to another.

BYTE A unit of information composed of 8 bits, which is treated by the computer as a single unit. A byte is usually used to represent an alphanumeric character or a number in the range of 0 to 255.

CASSETTE A compact magnetic tape medium for the electronic storage of data. Most personal computers use ordinary audio-cassette tape recorders and cassette tapes.

CENTRAL PROCESSING UNIT (CPU) The part of computer hardware responsible for interpreting data and executing instructions.

CHIP A small rectangular module which encapsulates an integrated circuit.

COMPUTER An electronic device which is programmable and which processes, operates on, and outputs information according to its stored program upon receipt of signals through an I/O device.

COMPUTER LANGUAGE A language that is used for programming a computer, e.g., BASIC.

CURSOR The marker (underline, rectangle, etc.) on a video monitor screen which indicates the location on the screen where the next character will appear.

DAC (Digital-to-Analog Converter) A device that changes digital signals into one continuous analog signal (voltage output.)

DATA The information units, or signals, that are processed by a computer.

DIGITAL Word used to describe information that can be represented by a collection of bits. Modern computers store information in digital form.

DISK A circular piece of rigid material which resembles a record and which has a magnetic coating similar to that found on ordinary recording tape. Digital information can be stored magnetically on a disk.

DISK DRIVE A peripheral which can store information on, and retrieve information from, a disk. A floppy disk drive can store and retrieve information from a floppy disk.

EPROM (Erasable Programmable Read Only Memory) Information stored in an EPROM IC (Integrated Circuit) can only be removed by special light sources or specific voltages (depending on the type of EPROM). Through the use of a special programming device, the user can store a set of information in the EPROM after it has been erased.

FLOPPY DISK A thin, pliable 8'' or 5-¼'' flexible media for storing data. 8'' disks store 3, or more, times as much information as 5-¼'' floppies and access the information faster.

FOREGROUND/BACKGROUND Operation term used to describe the ability of a computer to function with normal programs at the same time it monitors external devices, e.g., home appliances, security, etc.

HARD COPY Information printed on paper or any durable surface, as opposed to information temporarily presented on the CRT screen (see Monitor).

HARDWARE The physical equipment that makes up the computer system.

IC (Integrated Circuit) Many miniature electronic components (transistors, diodes, resistors, etc.) built into one small multicontact unit (chip) to produce a special purpose circuit.

I/O (Input/Output) Refers to bringing information into the machine in a form it recognized and allowing the machine to transmit information. In other words, communicating with the outside world.

INPUT Signals given to a computer for processing.

INTERFACE The connection between two systems. A printer interface, for example, connects the printer to the computer.

JOYSTICK Accessory equipment (peripheral) that permits the user to move the figures on the monitor. For example, when you and another person play a joystick computer game, you operate joysticks to perform the functions of the game.

K The initial "K" stands for "kilo", meaning 1,000. In computer language, K means 1,024 bytes of information that can be stored in a computer system. A computer with 16K memory, for example, has 16 times 1,024, or 16,384 bytes of memory.

LSI (Large Scale Integration) Descriptive of the type of circuit in an IC chip where thousands of electronic functions are included.

MEMORY The area in the computer for storage of data and instructions.

MICROCOMPUTER A computer based on a microprocessor.

MICROPROCESSOR The "brains" or CPU of a modern personal computer. All Ohio Scientific personal computers use the 6502 microprocessor, generally recognized as the fastest microprocessor available.

MINI-FLOPPY DISK A small 5-¼'' floppy disk that stores about ⅓ the information on an 8'' floppy disk.

MODEM Word derived from MOdulator-DEModulator. A device that allows the computer to communicate over telephone lines and other communicatons media by changing digital information into audio tones (modulating) and from audio tones into digital information (demodulating).

MONITOR A CRT or television screen. You can purchase an Ohio Scientific monitor to hook up to your computer or else simply use an ordinary TV set and attach it with an RF convertor.

OS Operating system.

PC BOARD (Printed Circuit Board) A card with foils (electronically conductive pathways) connecting electronic components which are mounted on the board.

PERIPHERAL Any device that can send information to and/or receive information from a computer, e.g., printer, modem, etc.

PIA Peripheral Interface Adapter, a programmable control IC.

PRINTER A peripheral device which makes hard copy of letters and numbers.

PROGRAM A set of instruction, arranged in a specific sequence, for directing the execution of a specific task, or the solution of a problem, by a computer

PROM (Programmable Read Only Memory) Memory which can have information stored on it once, but is not normally changeable.

PROMPT A signal given by a computer to indicate that a particular function is ready.

RAM (Random Access Memory) A storage device and main memory of any computer which can be read from and written into. Information and programs are stored in RAM, and they can be retrieved or changed by a program.

ROM (Read Only Memory) A memory storage device in which the information is stored once, usually by the manufacturer, and cannot be changed.

SOFTWARE Programs and operating systems used by the computer; they may be on cassette or on disk and in ROM.