OPERATION AND MAINTENANCE MANUAL SUPPLEMENT FOR

90, 135, 175, 230 AND 350 AUTOSHAPE ®
CNC FORMING CENTER
MANUAL EM-286

OFF-LINE PROGRAMMER

CINCINNATI

PURPOSE

The Off-Line Programmer is a hardware/software package that will allow an AUTOSHAPE operator to work with part programs on an IBM PC, XT, or AT personal computer (PC). Following is a complete list of functions that can be performed on the Off-Line Programmer:

1. Generate programs within the PC.
2. Store a generated program to tape or disk.
3. Retrieve a program from tape or disk.
4. Delete a program from tape or disk.
5. List all program numbers on tape or disk.
6. Format (or erase) a tape.
7. Copy all programs from tape to disk.

The tapes used by the Off-Line Programmer are the same as those used by the AUTOSHAPE: Scotch brand (3M) DC100A. Tapes with programs created on the Off-Line Programmer may be used on the AUTOSHAPE and vice versa.

As an additional feature, the PC can be connected directly to the AUTOSHAPE if the AUTOSHAPE is equipped with an RS-232 port. This will allow the operator to transfer programs between the AUTOSHAPE and the PC.

A typical Off-Line Programmer set-up is shown in Figure 1. This set-up includes the IBM PC-XT with CINCINNATI INCORPORATED's Off-Line Programmer software and the Remote Tape Unit.

FIGURE 1

REQUIRED EQUIPMENT

A. Equipment Supplied by CINCINNATI INCORPORATED:

1. Off-Line Programmer software supplied on a floppy disk.

2. Remote tape unit (RTU) hardware.

3. RS-232 cable to connect the PC to the RTU.

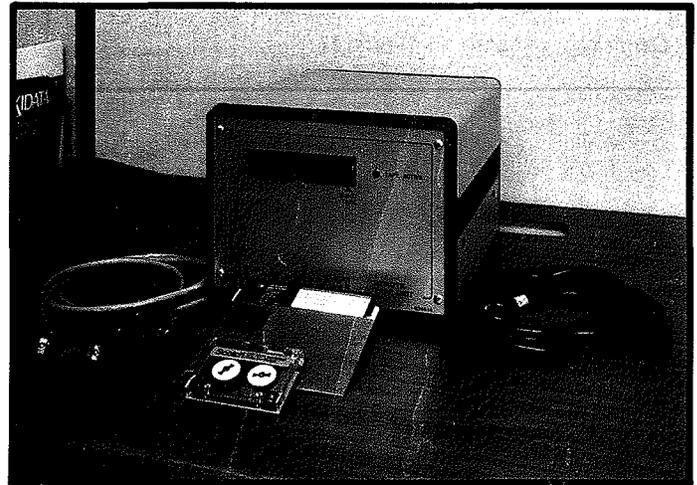The equipment supplied by CINCINNATI INCORPORATED is illustrated in Figure 2.

FIGURE 2

B. Equipment Purchased Separately:

a. Keyboard
b. Monochrome or color display
c. PC, XT, or AT personal computer
d. At least 256 K bytes user memory
e. One floppy disk drive and one hard disk drive
f. BASICA software
g. An RS-232 interface

OFF-LINE PROGRAMMER SOFTWARE

The Off-Line Programmer software allows the operator to use the PC to perform the functions listed above. This software, written in Basic, will handle all required system functions, e.g. accessing the disk drive and communicating via the RS-232 port, and will provide the operator with an easy to use, menu driven ability to work with part programs.

REMOTE TAPE UNIT HARDWARE

The remote tape unit (RTU) is the hardware package that allows the operator to create tapes off-line. This hardware basically consists of a 3M cassette tape drive, a microprocessor unit, and an RS-232 communications interface. Resident in the RTU is a software package that is specifically designed to communicate with the Off-Line Programmer software so part programs may be transferred between the PC and the tape.

All connections to the Remote Tape Unit are made on the rear of the device as shown in Figure 3.
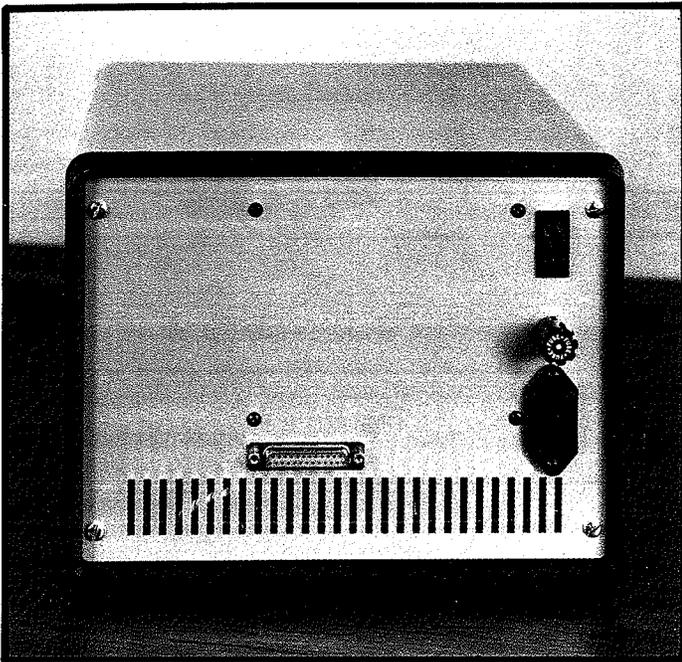

FIGURE 3

POWER FOR THE REMOTE TAPE UNIT

Plug the female end of the power cord into the back of the RTU and the male end of the power cord into a 110 volt, 60 Hz power outlet. The power switch turns power ON when in the up position.

RS-232 CABLES

Plug the male end of the RS-232 cable into the back of the RTU. The other end of this cable should be plugged into the RS-232 port on your IBM computer. This connector may need to be modified or an adapter used if your PC has a non-standard RS-232 connector. This cable may also be used to connect the PC to the AUTOSHAPE.

If the IBM PC is equipped with two RS-232 ports, it may be connected to both the RTU and the AUTOSHAPE at the same time. This arrangement will make it easier to switch between the RTU communications mode and the AUTOSHAPE communications mode. If using two RS-232 ports, the user will need to supply another RS-232 cable to connect the PC to the AUTOSHAPE. This cable should be wired the same as the cable supplied by CINCINNATI INCORPORATED . (See CABLE CONNECTIONS Sheet EM-306.)

LOADING THE OFF-LINE PROGRAMMER SOFTWARE

CINCINNATI INCORPORATED supplies the user with one copy of the Off-Line Programmer software. Immediately copy this software onto either the hard disk or onto a floppy disk which has been formatted for the PC.

Boot the IBM PC according to the instructions outlined in the IBM DOS manual. "Booting" is the process of powering-up the PC and starting execution of the system software.

Now insert the floppy disk containing the Off-Line Programmer software into one of the floppy disk drives. The name of the program on this floppy is "OFFLINE.BAS". Also stored on the floppy disk is a batch command file named "OLP.BAT". Copy both of these files onto the hard disk using the IBM's "COPY" command. Always use the batch command file "OLP.BAT" to start the Off-Line Programmer. Just type in "OLP" and press the carriage return.

Alternatively, a floppy disk containing DOS, BASIC, and the Off-Line Programmer software may be created. This floppy could then be used to boot the PC, enter into basic, and run the Off-Line Programmer software.

The first time the program is executed, it will ask which RS-232 port is being used for RTU communications and which port is being used for AUTOSHAPE communications. This feature allows those users with two RS-232 ports to dedicate one to the RTU and one to the AUTOSHAPE. Normally, these RS-232 ports are either COM1 or COM2. Consult the IBM manuals to determine into which communications port the RS-232 cable(s) is (are) plugged. If these port names must later be changed, this may be done by selecting the correct option on the Main Menu (see OPERATION). If using the same RS-232 port for both the RTU and the AUTOSHAPE, make sure the correct RS-232 cable is plugged into the PC whenever the communications mode is changed from RTU to AUTOSHAPE or vice versa.

The method of creating, storing and retrieving part programs on the PC is almost the same as on the AUTOSHAPE. The main differences are that some of the menus on the PC offer slightly different options and, of course, the PC Keyboard is very different than that of the AUTOSHAPE. It is assumed at this point that the user is familiar with the methods used on the AUTOSHAPE to create, modify, store and retrieve programs.

THE PC KEYBOARD

The PC Keyboard offers the user a full alpha-numeric character set. The AUTOSHAPE, however, will not allow the user to use lower case letters, so when entering or modifying programs, make sure the PC keyboard is in the upper case mode. If the user creates a program on the PC with a part number that contains lower case letters and then stores this program to the tape, it will be impossible to load this program on the AUTOSHAPE.

At many times during operation the user will need to enter a number or select an option. To do this, use the keyboard letters and numbers to type the correct number or option. If a mistake is made, use the cursor control keys to position the cursor to the incorrect character and then type over it with the correct character. When the entry is correct, press the carriage return key to "enter" the entry. This is similar to pressing the "ENT" key on the AUTOSHAPE.

NOTE: The process of typing something on the PC and then hitting the carriage return key is hereafter referred to as "entering" a response. For example, to enter a part number, type in the part number and hit carriage return.

On the AUTOSHAPE, the "PROGRAM/RETURN" button is often used to return to the Main Menu. On the IBM PC use the F9 function key. Instructions on the PC are always clear as to what should be done to return to a menu (if direct return is possible).

Two function keys are provided to assist the user in stopping execution of the Off-Line Programmer software. F1 will stop the program and return to DOS. F2 will stop the program and remain in BASIC.
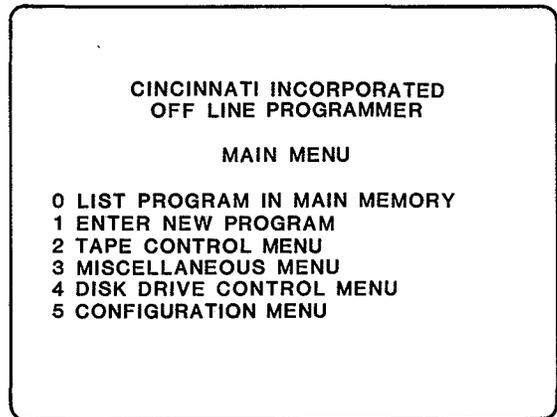
THE MENUS

The PC menus, as on the AUTOSHAPE, provide the user with an easy to use tool to create and modify programs and to access the tape or disk drives.

The structure, or hierarchy, of the menus shown in Figure 4 is very similar to that of the AUTOSHAPE.

NOTE: The purpose of Figure 4 is to show that it is not possible to go directly from one of the lower menus to another of the lower menus. For example, if the TAPE CONTROL MENU is displayed and the DISK DRIVE CONTROL MENU is desired, first return to the MAIN MENU and then go to the DISK DRIVE CONTROL MENU. All of the lower menus are accessible from the Main Menu.

Each time the program is started it will ask which type of IBM storage media will be used. Enter a letter corresponding to the disk drive that will be used for part program storage and retrieval. This will normally be a capital letter in the range from A through C. On many systems drive A is floppy drive 1, drive B is floppy drive 2, and drive C is the hard disk. Next, the operator will be asked the axis type of the AUTOSHAPE for which the program is being created. An explanation of axis types may be found in the CONFIGURATION MENU sections.

After answering the above two questions, the MAIN MENU will appear as shown in Figure 5.

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OFF LINE PROGRAMMER

MAIN MENU

0 LIST PROGRAM IN MAIN MEMORY
1 ENTER NEW PROGRAM
2 TAPE CONTROL MENU
3 MISCELLANEOUS MENU
4 DISK DRIVE CONTROL MENU
5 CONFIGURATION MENU
```

FIGURE 5

Whenever any menu is displayed, the user should enter the number corresponding to the function desired. For example, to enter the TAPE CONTROL MENU, enter the number 2.

Functions 0 and 1 are just the same as they are on the AUTOSHAPE. The only noteworthy exception is that when displaying the program in main memory and the change mode is selected (to change a parameter), an arrow does not appear next to the first parameter. The PC will instead display all parameters of the current step, one at a time, and allow the user to enter a new value if so desired. To retain the current value of a given parameter, hit the carriage return key without typing anything.

Selecting function 2 will cause the TAPE CONTROL MENU to be displayed, as shown in Figure 6.
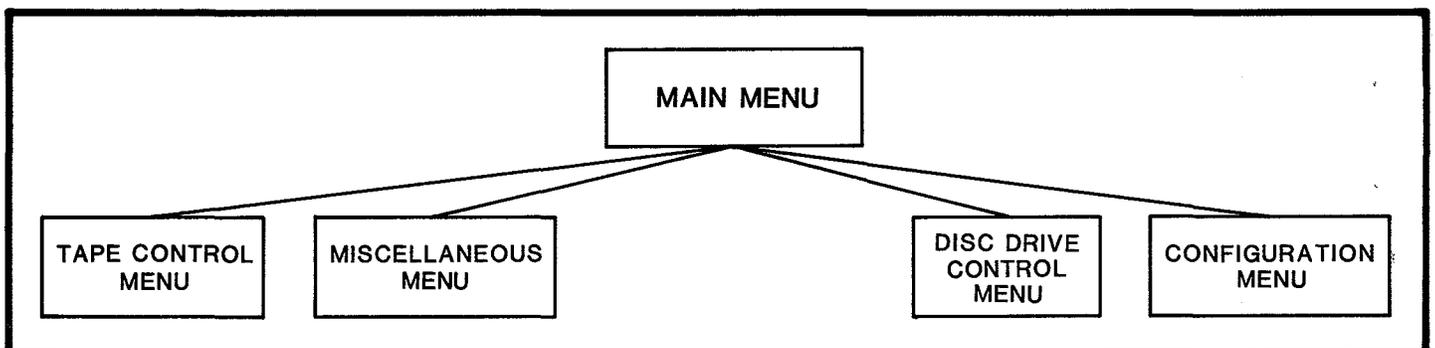
FIGURE 4

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            CINCINNATI INCORPORATED
             OFF LINE PROGRAMMER

              TAPE CONTROL MENU

    0 LIST PART NUMBERS ON TAPE
    1 LOAD PART FROM TAPE
    2 STORE CURRENT PART TO TAPE
    3 FORMAT (ERASE) THE TAPE
    4 DELETE PART FROM TAPE
    5 COPY ALL PARTS FROM TAPE TO DISK
    6 RETURN TO MAIN MENU
```

FIGURE 6

Functions 0 through 4 are the same as on the AUTOSHAPE. Function 5 allows the user to copy a tape onto a floppy or hard disk. If function 5 is selected and a program on the tape already exists on the disk, the program on the disk will be overwritten with the program from the tape. To prevent a disk program from being overwritten, rename either the program on the disk or the program on the tape.

Selecting function 6 will cause the MAIN MENU to be displayed again as shown in Figure 5. Selecting Function 3 of the MAIN MENU will cause the MISCELLANEOUS MENU to be displayed as shown in Figure 7.

```
            CINCINNATI INCORPORATED
             OFF LINE PROGRAMMER

             MISCELLANEOUS MENU

    0 INHIBIT GAGE
    1 INDEPENDENT/TAPERED GAGE
    2 ADJUST SPEED CHANGE
    3 CLAMP AND RETRACT
    4 RETURN TO MAIN MENU
```

FIGURE 7

The MISCELLANEOUS MENU offers almost the same options as does the AUTOSHAPE. Two functions that are not available on the PC are "GAGE REFERENCE POSITION" and "RAM LOCATION". These cannot be done on the PC because the PC is not in control of an AUTOSHAPE.

One other difference between the PC and the AUTOSHAPE is in how the PC handles the INDEPENDENT/TAPERED GAGE function. If function 1 is selected, the user will be asked to choose one of the following gage types:

    0   Standard Gage
    1   Tapered Gage
    2   Independent Gage

Since the PC is not controlling an AUTOSHAPE machine, it does not inherently know, as does the AUTOSHAPE, what type of gage is on the machine. Therefore the user must explicitly tell the PC what type of gage is on the machine for which the program is being created. If the Off-Line Programmer software has just started and a program has not been loaded from the tape or the disk, the gage will by default be set to Standard. Whenever a program is loaded from the tape or the disk into main memory, the gage option will be set to that of the program which was loaded.

The gage option affects the type of parameters required by the PC when a new program is entered. Figure 8 illustrates the parameters required based on the gage selected. Make sure that the correct gage type is selected before entering a new program.

GAGE TYPE	PARAMETERS REQUIRED
STANDARD	FLANGE DIMENSION, BEND ALLOWANCE
TAPERED	FLANGE DIMENSION, FLANGE ANGLE
INDEPENDENT	RIGHT ARM POSITION, LEFT ARM POSITION

FIGURE 8

To access the DISK DRIVE CONTROL MENU, select function 4 on the MAIN MENU (See Figure 5). The DISK DRIVE CONTROL MENU, shown in Figure 9, allows the user to store programs to and retrieve programs from the disk. The disk used by the software depends on which disk drive was selected at the start of the program.

```
            CINCINNATI INCORPORATED
             OFF LINE PROGRAMMER

             DISC DRIVE CONTROL MENU

    0 LIST PART NUMBERS ON DISK
    1 LOAD PART FROM DISK
    2 STORE CURRENT PART TO DISK
    3 DELETE PART FROM DISK
    4 RETURN TO MAIN MENU
```

FIGURE 9

The functions on the DISK DRIVE CONTROL MENU are self-explanatory. All of the functions behave just like the corresponding functions on the TAPE CONTROL MENU except the disk is accessed instead of the cassette tape.

The final option available on the MAIN MENU is Function 5, the CONFIGURATION MENU. As shown in Figure 10, the CONFIGURATION MENU allows the user to alter certain parameters used by the Off-Line Programmer software.

```
            CINCINNATI INCORPORATED
             OFF LINE PROGRAMMER

             CONFIGURATION MENU

    0 CHANGE RS232 PORT NAMES
    1 CHANGE IBM STORAGE MEDIA
    2 CHANGE AXIS TYPE
    3 RETURN TO MAIN MENU
```

FIGURE 10

As mentioned in Section 1, the user must define the RS-232 ports to be used for RTU and AUTOSHAPE communications the first time the program is executed. Function 0 allows the user to re-define the port names if that should later become necessary.

Function 1 allows the user to change the IBM storage media should that later become necessary.

Function 2 may be used to change the AUTOSHAPE axis type. Currently, there are 3 axis types. Figure 11 shows the selections.

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┌─────────────────────────────────────────┐
│                                           │
│        CINCINNATI INCORPORATED            │
│        OFF-LINE PROGRAMMER                │
│                                           │
│                                           │
│     SELECT AN AXIS TYPE:                  │
│                                           │
│     0 Standard Axis                       │
│     1 Six Axis                            │
│     2 Single Axis                         │
│                                           │
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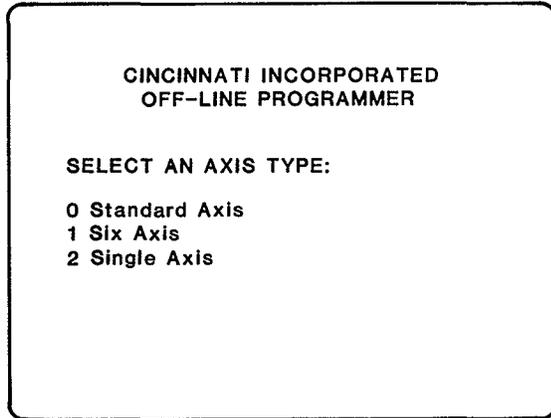
FIGURE 11

"Standard Axis" should be selected for a two-axis AUTOSHAPE. "Six Axis" should be selected for an AUTOSHAPE which can be programmed to move along the "R" and "Z" axes as well as the "X". "Single Axis" should be selected for an AUTOSHAPE which has no backgage.

AUTOSHAPE COMMUNICATIONS

The PC communicates with the AUTOSHAPE via the RS-232 ports on the PC and the AUTOSHAPE. The PC is able to communicate with the AUTOSHAPE at any time after the first two questions are answered (disk drive letter and axis type).

AUTOSHAPE communications must be initiated by the operator on the AUTOSHAPE. Two options exist:

1. Transfer a program from the AUTOSHAPE to the PC.

2. Transfer a program from the PC to the AUTOSHAPE.

If the PC is communicating with the AUTOSHAPE, off-line programming on the IBM will be temporarily suspended and a message will appear in the lower left corner of the screen indicating that the PC is either receiving or transmitting a program. When the communications function has been completed, control of the PC will return to the PC operator. These communications functions generally last between 5 and 15 seconds.

ERRORS

The Off-Line Programmer software is set-up to trap most errors that can occur. Listed below are the error messages that may be displayed and the necessary actions, if any, that the user should take.

RS-232 COMMUNICATIONS ERROR

1. An RS-232 communications error indicates that an error occurred during the transfer of data between the PC and the RTU or the AUTOSHAPE. If this error occurs, retry the last function attempted. If this error repeats, there may be a problem with the RS-232 cable. It may be too long or it may be damaged. Another cause of this error may be that the RS-232 port name defined by the user is invalid.

2. PROGRAM IS NOT ON THE TAPE

    This error is self-explanatory. Do a directory of the part programs on the tape. If the program does exist on the tape, retry the function that caused the error. If the error repeats, the tape may be corrupt.

3. PROGRAM ALREADY EXISTS ON THE TAPE

    This error is self-explanatory. The error occurs if the user tries to store a part to the tape and it is already on the tape. The PC will then ask whether or not the program on the tape should be overwritten.

4. TAPE IS NOT INSERTED IN THE DRIVE

    Make sure the tape is inserted all the way. If it appears to be inserted all the way, pop it out and then push it back in to make sure it was seated properly.

5. THE REMOTE TAPE UNIT RECEIVED AN INVALID COMMAND FROM THE PC

    This error will occur if the RTU was in the middle of performing a function requested by the PC and, before the function was completed, the PC requested the RTU to do a different function. If this error occurs, simply retry the function that caused the error; the error should not occur twice in a row.

6. THE TAPE IS NOT SET UP TO RECORD

    There is a slide switch located on the side of each cassette tape which either enables or disables writing to the tape. Make sure the switch is in the "record" position.

7. PROGRAM ON TAPE IS BAD

    This error usually occurs if the user tries to load a part from the tape which cannot be read properly. Retry the function that caused the error. If the error repeats, delete the program from the tape.

8. TAPE MAY NEED TO BE FORMATTED

    This error may mean that data on the tape has been corrupted. Retry the function that caused the error. If the error repeats, then the tape must be formatted (see TAPE CONTROL MENU).

9. TAPE IS FULL

    The tape can hold up to 100 programs. This error indicates that there are 100 programs on the tape. Use a new tape or delete an old program.
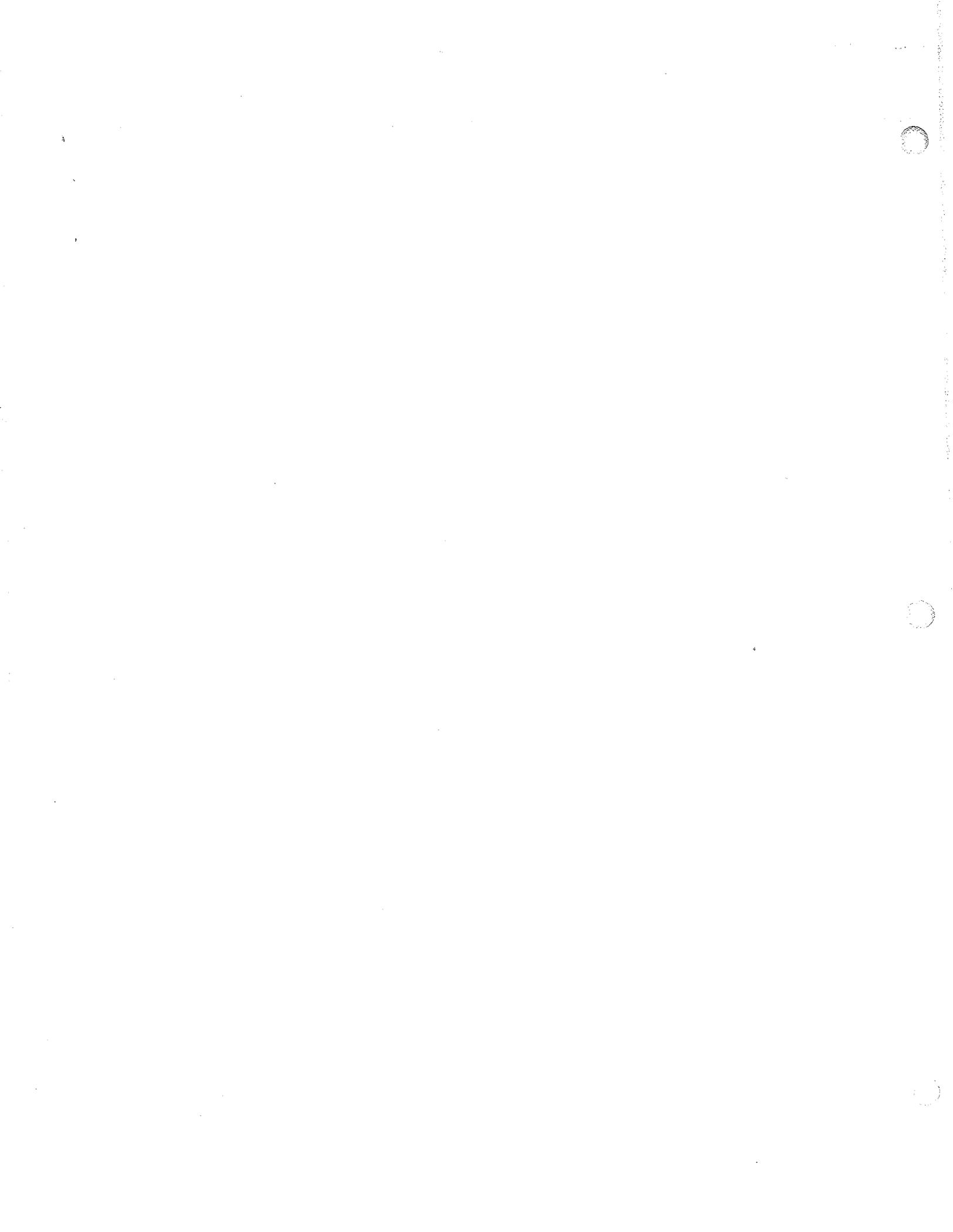
10. NO PROGRAM IN MAIN MEMORY

    This error occurs if the user tries to store the program in main memory to a tape or disk, or tries to list the program in main memory, and there is no program in main memory.

11. PROGRAM IS NOT ON THE DISK

    Similar to error No. 2 (Program is not on the tape).

Occasionally an error may occur which is not trapped by the Off-Line Programmer software. In this case, the PC will automatically stop execution of the program and display a system error message. The program can be restarted by entering the "RUN" command. If this type of error persists, contact a local CINCINNATI INCORPORATED representative.

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