E.   Macros will be covered in a later section.

F.   Review of special ops and hardware

    1.   Data moves, scans   1410 p. 33

    2.   TLU   1410 p. 36

    3.   Changes from 1401 in arithmetic   1410 p. 20

Zone bits undisturbed in B field during
Add and Subtract (except for sign posi-
tion which may change)

No sign generated in B field unless un-
signed field becomes minus

Zones in B field are removed in Zero
and Add; and Zero and Subtract, ex-
cept for units position which is always
signed

    4.   NOP

May be any length. Does not go through
registers. Thus cannot be used to iden-
tify halts

Assembled as a single position NOP no
matter what operands are used

Use Autocoder NOPWM to reserve core
for dummy instructions

    5.   Numbered halts

Use SCNLS (n + 1) (n + 1) to number halts

Two-address halt is invalid length

    6.   Multiply-Divide hardware standard

    7.   Index registers - actually storage positions   1410 p. 27
        00025-00099

15 5-position registers standard. Word
marks are set during loading, registers
1-14 set to blanks, 15 set to zeros

A address fills A + B

A S ? ! / g ✗ J R X

A only

@ % E Z C W V . U D B G T K F

Console Ident

S - programmed stop
C - cycle
E - error stop
B - I address set
✗ - address set ABCEF or storage scan.
D - display
A - alter
I - console inquiry.
R - programmed WEP

CE manual indicates 1410 has B(I)K type mark test.

Objective:

The student will be provided with sufficient detail on
the console that he will be able to perform correctly
all operations presented.

Reference

VI. Console   1410 p. 46

    A.   Uses

        1.   Log of manual console operations.

        2.   Display storage.

        3.   Alter storage

        4.   Inquiries

        5.   Programmed messages

        6.   Print out contents of registers and units
             selected for channel 1 and 2 on manual
             stop, programmed halt, error stop

        7.   Explain each register on halt print out   1410 p. 47

        8.   Clear storage

        9.   Load programs

    B.   1415 Console   OPR 10
                                                                 1410 p. 50

        1.   Power on, off, DC on, ready.

        2.   Review Reader, Punch, Print ready operations.

        3.   Reset Keys - 3 levels

             First: Computer Reset - resets status
             indicators, op, d, A data register, parity

             Second: Program Reset - resets op, d,
             A data register, parity error, but does
             not reset status indicators.

             Third: Start key - resets parity error
             only

4-15

B. 1415 Console (cont'd)

    4. Mode switch

        Display
        Alter
        Address Set
        I/E - halt print out at end of I cycles.
        E cycles

        Discuss use of Inhibit Print Out Control
        switch

        CE - activates Storage Scan on CE console

C. CE Console

    1. Address Entry - can be set to allow alteration
       of contents of A, B, C, D, E and F registers.
       To alter I address, set at normal.

    2. Storage Scan - Load plus 1 can be used to re-
       store all of storage to a character set in sense-
       bit switches, i.e., blank, c-bit.

       Note: Other settings not of much use. Load
       plus 0 could be used to change 1 character in
       core. Regen plus 1 can be used to scan all of
       storage for non-parity character. Regen plus
       0 would check 1 core position for non-parity.

    3. Cycle Control - CE use

       Not of much use to programmer. On Logic
       Step - advances .75 us sub-cycle per depres-
       sion of Start. On Storage Cycle - advances
       one complete cycle (4.5 us) per depression
       of Start.

    4. Check Control

       Stop normal - CPU error causes halt, error
       print out. (No status indicators set on error
       print out.)

    5. Restart - CPU error causes halt and error
       print out, then program continues

C. CE Console (cont'd)

6. Reset and Restart - CPU error causes halt, error print out, then a computer reset occurs and a branch to 00001

7. Compatibility switch

   Note: 1401 compatibility discussed in later section.

8. I/O Check Reset

   I/O check stop - used in 1401 compatibility mode

9. Sense Switches

   Primary use in 1401 mode. Used in 1410 mode to clear storage.

10. Check Test - CE use only

11. Asterisk Insert

    If on, causes asterisk to be substituted for non-parity input character (data check status indicator will come on).

    If off, incorrect parity character stops system. Input area can then be displayed in the typewriter. The non-parity character will be underlined.

12. Inhibit Print-Out

    Normal causes register print out on manual stop, programmed halt and CPU error stop.

    Inhibit prevents print out on stops.

13. Disk Write Inhibit

    If on, prevents writing on disks. Used in program debugging.

C.   CE Console (cont'd)

14.   Start Print-Out

Use on a program hang-up that doesn't cause
print out. Will force print out of registers.
Can occur if give I/O command with non-
existent d character.

15.   Normal switch settings

Address Entry - normal
Storage Scan - off
Cycle Control - off
Check Control - stop normal
Disk Write Inhibit - off
Compatibility - 1410
Asterisk Insert - on
Inhibit Print-Out - normal

APPENDIX

This section presents information of value to the instructor in conducting this class. This is material collected from many sources and presented here for the instructor's convenience. You may wish to reproduce some sections of this appendix locally for class handouts.

APPENDIX 1

GENERAL OPERATING PROCEDURES

I. Power On Procedure

    1.   Press POWER ON

    2.   If after 5 minutes system is not ready press POWER
        ON again.

    3.   Press COMPUTER RESET and system is ready to
        run.

II. Power Off Procedure

    1.   Unload all tape drives and make sure all the heads
        are up.

    2.   Press POWER OFF

III. Ready the I/O Units

Note - Unlike the 1401, operating keys on the 1402 and 1403
affect those units only. The START key at the console is the
only key that can start the system.

    A.   Card Reader

        1.   Place cards in reader.
        2.   Press START
        3.   Press END-OF-FILE (must be pressed first if
            three cards or fewer are to be read)

    B.   Punch

        1.   Place cards in hopper
        2.   Press START

    C.   Printer

        1.   Insert forms
        2.   Press START if READY light is not lit.

    D.   Magnetic Tape

        1.   Load tapes

Appendix I (continued)

        2.   Set tape unit addresses

  E.   Ramac

        1.   There should be no operator action required.

IV. Program Loading

Operating is initiated by entering a load instruction into the
1410 through the console and then branching to that instruc-
tion.

  A.   Clear Storage to Blanks

        1.   Depress computer reset.
        2.   Set Sense-Bit switch A on; all others must be off.
        3.   Set storage scan switch to Load +1.
        4.   Set Mode switch to CE.
        5.   Depress START.
        6.   Enter 00000 (any valid 1410 address) into Console
              keyboard, press STOP.

  B.   Display area where load instruction is to be entered.
      (The location will depend on the particular program to
      be loaded.)

        1.   Mode Switch to DISPLAY
        2.   Depress START to get carriage return and print
              "D"
        3.   Type left most position of that portion of storage
              to be displayed.   The following occurs:

             (a)   Automatic Carriage return follows typing
                      of Fifth Address Character.
             (b)   Character "D" types followed by contents
                      of storage starting at position typed.
             (c)   Typing stops at word mark - depress
                      START
             (d)   Carriage returns at end of line - Depress
                      STOP to end type out.

    C.   Alter displayed location by entering load instruction. (Note -
        Core contents cannot be altered unless they are first dis-
        played.   The instruction entered will depend on the parti-
        cular program to be loaded.

      1.   Mode Switch to ALTER
      2.   Depress START to return carriage and print "A"
      3.   Type instruction or data to be entered into this portion of storage.

D.   'ADDRESS SET' (Branch) to address of instruction just entered.

      1.   Mode Switch to ADDRESS SET
      2.   Depress START to return carriage and print "B"
      3.   Type address to be branched to. Carriage returns.
      4.   Address is now in instruction register. Mode switch to RUN and depress START to begin there.

Note - If the START key is pressed with the mode switch in "Address Set" position, an address <u>must</u> be entered since blanks have been entered into the first two positions of the Instruction Address Register.

V.   Typical Operator Actions in "Unusual" Situations:

A.   Possible sources of error in program loading and corrective action.

      1.   CARDS

          a.   I/O interlock: Press computer reset, address set to the appropriate storage location, turn the MODE switch to RUN, and press START.

          b.   INSTRUCTION CHECK:

              (1)   "Five Card Loader" is missing or out of sequence. Run cards out of the reader. Correct "loader" and reinitialize.

              (2)   Instruction was entered improperly at console. Reinitialize.

          c.   Address check:

              (1)   A card other than an instruction card or execute was detected by the load program. Remove the last card selected in stacker

pocket # 1. Reinitialize and reload the entire program.

(2)   Instruction was entered improperly. Reinitialize.

d.   Data check: Card in which error has been detected will be in the normal stacker pocket. Examine the card for off-punching or invalid characters. Run out cards remaining in the reader and place corrected card in front of the cards just run out. Place these four cards in front of the cards remaining in the hopper. Ready the reader and press START at the console.

2.   TAPE

a.   I/O interlock: Follow the same procedure as for cards.

b.   Instruction check:

(1)   No load program on the tape. Discontinue run.

(2)   Instruction entered improperly. Reinitialize.

(3)   Two tape units dialed to the same address (data check light will be lighted probably). Correct tape unit addresses and restart job.

(4)   Unit called for in load instruction is not ready. Ready tape unit and reinitialize.

c.   ADDRESS CHECK:

(1)   Instruction entered at console improperly. Correct and restart.

(2)   Tape was created improperly. Discontinue run.

d.   OTHER

(1)   Asterisk insert switch is in off position.
Turn switch ON and restart job.

(2)   Group mark work mark is in the load
program read-in area.   Clear storage
and restart job.

B.   MACHINE "HANG UPS"

Under certain conditions, the machine will "hang up", and there
will be no error condition indicated either by a programmed
message or a system check light.   These "hang ups" usually
occur in connection with an Input/Output unit.   Some of these
conditions and the corrective actions are:

1.   Attempting to write on a tape which is file protected (no
ring in the tape reel or reel not properly mounted).

a.   INTERLOCK, WRITE, and either OVERLAP IN
PROCESS or NOT OVERLAP IN PROCESS lights will
be lighted.   Pressing the stop key on the console will
not affect the machine.   The only way to stop the
machine is to press computer reset.

Do this only as a last resort, because it might mean
that it will be necessary to start the job over.   Instead,
unload the tape and insert a ring or mount another tape
if the one first selected is to be saved.   Ready the tape
unit and the computer will resume processing without
further intervention.

2.   Attempting to print or punch a wrong length record.

a.   INTERLOCK, WRITE, either NOT OVERLAP IN PRO-
CESS or OVERLAP IN PROCESS lights will be on.
WRONG LENGTH RECORD may or may not be lit.   In
either case processing cannot continue.

If the machine was cleared to blanks properly before
the program was loaded, this is a programming error
and the run must be discontinued.

3.   The inquiry request key was accidentally pressed while operating in the priority alert mode.

a.   Press inquiry cancel and processing will continue.

4.   NO TRANSFER on either a stacker select and feed, a read card instruction without selection, or a forms control instruction is a programming error. The run must be discontinued.

C.   PROGRAMMED HALTS

A programmed halt is an instruction to the computer to stop. The type out identifier is a "S". Usually a programmed explanatory message precedes the halt.

1.   END OF JOB -- This is self-explanatory.

Set up next job.

2.   Allow Operator action -- This type of halt allows the operator to ready I/O units or perform similar actions necessary for successful running of the program. Action to be taken is usually indicated by console typewriter messages or pre-determined instructions. Processing is then resumed by pressing START.

3.   Permit operator decision - This type of halt requires that the operator make a decision. Examples would be to drop an unreadable tape record or attempt to correct it, whether or not to tape mark a tape, accept a tape label error, etc. Operating procedures for an installation usually spell out which action is to be taken.

4.   Permit correction of program detected error conditions -- This type of halt allows the operator to correct such occurrences as printer out of forms, I/O units not ready, etc. Processing is usually resumed by depressing START.

5.   Discontinuance of a run at other than End of Job (Dead End Halt) -- This halt occurs because the program has detected a situation which makes it impossible to continue the program.

Appendix I (continued)

VI. Typical Error Recording

In the event of an error the following steps should be followed:

1. Complete a console error sheet (see attached sample) indicating which lights were lit on the panel behind the console typewriter.

2. Obtain a storage print out or dump memory on a tape.

3. Tape mark any output tapes.

4. Mark the last card selected in each reader stacker.

5. Do the same for the punch (Remember to run out the cards!)

6. Remove all cards, print outs, tapes, etc., from the system before setting up for the next run.

SYSTEMS CONTROL

	OFF	ON
1401 Compatib.		
Priority Alert		
PROGRAM STOP		

PRIORITY ON

Normal — ON

PRINTER PAPER TAPE

READER PUNCH

SYSTEM CHECK

I/O Inter-lock	
Address Check	
RBC Inter-lock	
Instruction Check	

PROGRAM NAME

I/O CHANNEL STATUS

Not Ready	
Busy	
Data Check	
Condition	
Wrong Len. Record	
No Transfer	

I/O CHANNEL CONTROL

	#1	#2
Interlock		
RBC Interlock		
Read		
Write		
Overlap in Process		
Not Overlap in Process		

STATUS

B > A	
B = A	
B < A	
Overflow	
Divide Overflow	
Zero Balance	

RAMAC CONTROL

FILE	
PARITY	
ACCESS Ø	
ACCESS 1	
ACCESS 2	
Record Length	
Addr. Compare	
Addr. Invalid	

TAPE UNITS

Channel 1

Tape Unit Selected	
Tape Dens.	
File Prot.	
Tape Indic.	

Channel 2

Tape Unit Selected	
Tape Dens.	
File Prot.	
Tape Indic.	

REMARKS

OPERATOR: _____ DATE: _____

6. 8. 1

APPENDIX 2

SPECIFIC OPERATING PROCEDURES

I.   Autocoder, COBOL, RPG, and FORTRAN operating instructions.

Note -- For detailed instructions refer to write up -- PR-108 Processor Operating System.

1.   Mount Systems Tape (PR108) on Channel 1, Drive 2 and work tapes on Channel 1, Drives 3, 4, & 5. (Standard I/O Pool)

2.   Ready the reader with the symbolic deck preceded by a RUN card and followed by an END card.

3.   (Clear Storage) Turn the mode switch to C. E. , hit COMPUTER RESET and START then type in a valid five position address.

4.   Turn mode switch to DISPLAY, hit START and type in 00001. Allow the carriage to restore.

5.   Hit STOP. Turn mode switch to ALTER, hit START and type in L %B200011$..

6.   Turn mode switch to RUN, hit COMPUTER RESET and START.

II.   OBJECT PROGRAM LOADING

1.   Clear Storage

2.   Display 00247

3.   Alter to L%1100257$. . for card input or
              LXBY00257$ . . for tape input
                           X=% for channel 1, ⊄ for channel 2
                           Y = tape drive number

4.   Address Set to 00247

5.   Turn mode switch to RUN and hit START.

III.   1401 COMPATIBILITY on the 1410

Appendix 2 (continued)

To use the 1410 as a 1401

1. Set the COMPATIBILITY switch on the console to 1401

2. Set the IO CHECK STOP switch on

3. Press COMPUTER RESET

Tapes

Use tapes on channel 1 only

Sense Switches

The 1410 bit switches located on the console are sense switches when in the 1401 mode

Card Reader

To ready card reader, place cards in the hopper, press READER STOP, and then press READER START. The READER READY light will come on.

To sense end of file and read the last two cards, press END OF FILE, and then press READER START. The END OF FILE light (Button) indicates that the last two cards are being processed.

To run out cards, press READER STOP, and then press READER START.

Card Punch

To ready card punch, place cards in the hopper, press PUNCH START. The PUNCH READY light will come on.

To run out cards, remove remaining cards from the hopper and press PUNCH START.

PROGRAM LOADING

Clear Memory

1. Set STORAGE SCAN to LOAD + 1

2. Set MODE to CE

Appendix II (continued)

3.   Set all bit switches off except the check bit

4.   Press START; typewriter will type #

5.   Type any five digit address within core size of 1410

6.   Press STOP; ignore typing

Simulate Card Load or Tape Load

1.   Set MODE to DISPLAY

2.   Press START; typewriter will type D

3.   Type any address above 16000 and within core size of
     1410; typewriter will type blanks (small letter b)

4.   When typewriter has typed one full line of blanks, press
     STOP

5.   Set MODE to ALTER

6.   Press START; typewriter will type A

7.   Type instructions for loading; WM key is pressed before
     the character it is to be placed over

       -    -   -   -   -   -   -
     Card load: ,0011001.   Tape load: L%U1001R,001B001.

8.   Press STOP

Set Instruction Address Register

1.   Set MODE to ADDRESS SET

2.   Press START; typewriter will type B

3.   Type address which was used on step 3 above

Start Program

1.   Ready cards or tape (drive 1)

Appendix 2 (continued)

2.   Set MODE to RUN

3.   Press START

IV.   1401 Off Line Output from 1410 Assemblies

Considerable machine time can be saved if 1410 assembly output
is taken on-line on tape rather than on the punch and printer, and
then listed and punched off line on the 1401.

1.   To get this "mixed output" tape the standard I/O pool of
        the PR-108 Processor should be modified with CONFG
        cards to replace the on-line Punch and Printer with a
        tape drive.   These CONFG cards must precede the RUN
        card in the Symbolic deck.

        CARD FORMAT

           cc6   cc16   cc21
        PRINTELEM   CONFG   XY
        PUNCHELEM   CONFG   XY

                                    X = Channel
                                    Y = Unit

        (Channel and Unit must be the same for both Print Elem.
         and Punch Elem. , but they may not be the same as any
         other Channel and Unit used in the Assembly.)

2.   The resulting tape is mounted on the 1401.   (Unit 1)

3.   Press CHECK RESET and START RESET.

4.   Press TAPE LOAD.

5.   There will be a Halt at 376 (I-Register) Sense Switches
        should be set for the following options:

            A-ON   Print Assembly Listing and Punch Condensed
                      Deck. (Normal Option)
            B-ON   Bypass Printing
            C-ON   Bypass Punching Condensed Deck
            D-ON   Punch Symbolic Deck
            E-ON   Create a FORTRAN Program Tape on Drive 4

6.   Press START. End of File halt is at 276. For Batched Assemblies press START again.

V.   OFF-LINE UNIT RECORD OPERATIONS

1.   <u>80-80 LIST</u>

    a.   Place cards to be listed in card reader and ready reader.

    b.   Ready printer

    c.   Depress 'OFF LINE' key on 1414 III control panel.

    d.   Set switch on control panel to RD-PRT setting.

    e.   Depress 'RESET'

    f.   Depress 'START'

    g.   To stop operation at any point depress 'STOP'

2.   <u>80-80 REPRODUCE</u>

    a.   Place cards to be reproduced in card reader and ready reader

    b.   Ready punch

    c.   Depress 'OFF LINE' key on 1414 III control panel

    d.   Set switch on control panel to RD-PCH setting

    e.   Depress 'RESET'

    f.   Depress 'START'

    g.   To stop operation at any point depress START

To bring unit record equipment on line again set switch on 1414 III control panel to normal, depress 'RESET', depress 'OFF LINE'.

NOTE: When the 1402-2 is in the OFF LINE Mode, the ready lights on the reader and the punch do not function.