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DRL LI NO. 2,20

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Lyndon B. Johnson Space Center

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Aeronutronic Ford Corporation
Space Information Systems Operation
1002 Gemini Avenue
Houston, Texas 77058
COMPUTER OUTPUT MICROFILM (FR80)
SYSTEMS SOFTWARE DOCUMENTATION

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Prepared for
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
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SECTION 1
INTRODUCTION

1.1 PURPOSE

The purpose of this document will be to delineate the detailed program documentation for Computer Output Microfilm System A in Bldg. 30, NASA JSC (COMA).

1.2 SCOPE

Paragraph 1.3 of this document delineates the applicable documents which apply to this system. Paragraph 1.4 provides an overall view of the system and describes the functional relationship between the system software (described in SISO-TR531, Vol. I), the standard insert routines (described in SISO-TR531, Vol. I), and the applications programs (described in section 2 of this volume). Appendix A contains instructions for locating those documents delineated in paragraph 1.3. Appendix B contains Test Preparation Sheets, NASA JSC Form 1225, for all baseline and/or program modification acceptance tests. The documentation for each of the application programs (section 2) consists of the following major headings:

2.X TITLE OF PROGRAM

2.X.1 Background
   A. Author
   B. Intent
   C. Program History

2.X.2 Introduction

2.X.2.1 Hardware Requirements

2.X.2.2 Software Requirements
2.X.2.3 Assembly Parameters

2.X.2.4 Operator Commands

2.X.3 Analysis

2.X.3.1 Major Control Section

A. Description

B. Input/Output

C. Linkages (External and Internal)

2.X.3.2 Subroutines

2.X.3.3 Constants and Variables (External and Internal)

2.X.3.4 Flow Charts

1.3 APPLICABLE DOCUMENTS

The following documents, of the latest issue in effect, are applicable as specified herein.

1.3.1 Requirements Specifications

- PHO-TN598 - FR80 Gray Level Processing Requirements Specification

- SH-09607A - COM System Data Processing Requirements Specification

- SH-09832 - FR80 Skylab Solar Experiment S055 Processing Requirements Specification

- SH-09846 - Computer Output Microfilm System A (COMA) Univac 494 Print Processing Requirements Specification
SH-25703 - Computer Output Microfilm System A PDP Print Processing Requirements Specification

SH-25722 - FR80 Harvard College Observatory Solar Experiment S055 Processing Requirements Specification

SH-25752 - Computer Output Microfilm System Varian 73 Print Processing Requirements Specifications

SH-25812 - Computer Output Microfilm System A Large Area Crop Inventory Experiment Software Requirements Specification.

1.3.2 Test Specifications

PHO-TN605 - FR80 Gray Level Test Tape Requirements Specifications

SH-09606A - COM System Test Tape Requirements Specification

SH-09833 - Skylab Solar Experiment S055 Test Tape Requirements Specification

SH-09851 - Computer Output Microfilm System A Univac 494 Print Processing Test Tape Requirements Specification

SH-25713 - Computer Output Microfilm System A PDP Test Tape Requirements Specification

SH-25723 - FR80 Harvard College Observatory Solar Experiment S055 Test Tape Requirements Specification


1.3.3 Acceptance Test Procedure

SB-09613A - COM System Acceptance Test Procedure.
1.4 OVERVIEW

The Computer Output Microfilm System consists of a series of programs which converts digital data from magnetic tapes into alphanumeric characters, graphic plots, and imagery that is recorded on the face of a cathode-ray tube. A special camera photographs the face of the tube on microfilm for subsequent display on a film reader. The software which is used to accomplish this is divided into three distinct categories:

- Systems software (SISO-TR531, Vol. I)
- Standard insert routines (SISO-TR531, Vol. I)
- Applications software (section 2).

The systems software consists of the assembler and various utility programs. The assembler is a two-pass macro-assembler. The utility programs include the Text Editor, Tape Dump Reloader, Disk Dumper, Magnetic Tape Display, and Disk Audit Programs.

The standard insert routines are used in each of the application programs. They include the operating monitor, vector routines, character sets, character routines, magnetic tape routines and film advance routines.

Applications software has been developed for processing of print, graphic and imagery data tapes for the following systems:

- IBM 360/75
- Univac 494
- Varian 73
- PDP 11/45
- Digital television equipment 36- and 48-bit data format
- Harvard College Observatory (HCO) Solar Experiment SO55
- Large Area Crop Inventory Experiment (LACIE) print data.
SECTION 2
APPLICATION PROGRAMS

The application programs that follow have been developed on the COM System to process print, graphic, and image data from 7- or 9-track magnetic tapes to be output to 16 mm microfilm or 105 mm microfiche.

Information pertaining to control codes, character sets, input formats, output formats, etc. for each individual program can be found in that program's software requirements specification in Appendix A.

2.1 COMA DTE PROCESSORS FOR 16 mm FILM (16DT36, 16DT48) AND 105 mm FICHE (105DT6, 105DT8)

2.1.1 Background

A. **Author.** W. T. Jackson, Aeronutronic Ford Corporation.

B. **Intent.** The DTE Processors process 9-track magnetic tapes formatted in 36-bit and/or 48-bit digital television equipment (DTE) language as delineated in SH-09607A.

1. 16DT36 processes 9-track magnetic tapes formatted in 36-bit DTE on 16 mm microfilm.

2. 16DT48 processes 9-track magnetic tapes formatted in 48-bit DTE on 16 mm microfilm.

3. 105DT6 processes 9-track magnetic tapes formatted in 36-bit DTE on 105 mm microfiche.

4. 105DT8 processes 9-track magnetic tapes formatted in 48-bit DTE on 105 mm microfiche.

C. **Program History**

1. **Production Tape Date.** TBP

2. **Author.** W. T. Jackson
3. **Authorization.** EO-005F

4. **Test Case.** Acceptance test procedure SB-09613A


### 2.1.2 Introduction

#### 2.1.2.1 Hardware Requirements

- FR80 with 12K memory
- 9-track magnetic tape unit
- 16 mm unsprocketed camera
- 105 mm camera

#### 2.1.2.2 Software Requirements

The following files, found in I.I.I.'s SYM Directory, are required.

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<tr>
<td>III185</td>
<td>III186</td>
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#### 2.1.2.3 Assembly Parameters

The assembly parameters in III109 shall be set for the proper machine configuration. Assembly parameters specific to the DTE processors are as follows.

A. **CAMNUM.** If 2, indicates 16 mm unsprocketed camera; if 7, indicates 105 mm microfiche camera.

B. **TWOBUF.** If 1, indicates two magnetic tape buffers for higher throughput.
C. **BIGBUF.** If 0, allows maximum amount of operator functions with minimum buffer space.

D. **DASHED.** If 1, assembles code for generation of dashed vectors.

E. **CIRCLE.** If 1, assembles code for generation of circles and arcs.

F. **LOCASE.** Lower case character set required.

G. **EBCDIC.** Entire EBCDIC character set required.

H. **7TRACK.** If 0, 7-track magnetic tape handler not required.

I. **9TRACK.** If 1, 9-track magnetic tape handler is required.

J. **PTYPE = 3.** EBCDIC forms loader.

K. **MUMBLE.** If 1, defines system configuration output via teletype during assembly.

L. **FONT.** If 0, assembles standard III character font.

M. **TAPELB.** If 1, defines code to provide processing of IBM standard tape labels.

N. **DTE.** If 1, defines code specifically for the 36-bit DTE processors.

O. **NASA.** If 1, assemble NASA specific character set.

P. **D48.** If 1, defines code specifically for the 48-bit DTE processors.

Q. **ALLOW.** Defines code to allow form loading and processing.

R. **FTYPE.** If 105, defines code for generation of 105 mm microfiche.

S. **MANYUP.** If 1, defines code for multiple images per frame for 105 mm microfiche.
2.1.2.4 Operator Commands

A. The following commands are available for use with either the 16DT36 or 16DT48 Program.

TIME
FRAME
STRIP CHART
GO
CONTINUE
CLEAR
REWIND
SKIP
TRY AGAIN
STANDARD LABELS
UNLABELED
FOCUS
PULLDOWN
ROTATED
UPRIGHT
SETSIZE, PULL DOWN

B. The following commands are available for use with either the 105DT6 or 105DT8 Program.

TIME
FRAME
GO
CONTINUE
TITLE
END JOB
2.1.3 Analysis

2.1.3.1 Major Control Section

A. Description. Upon issuance of a GO command by the operator via the console teletype, the III routine PSTART transfers control to the DTE processing routine BEGIN. BEGIN initializes all switches, does initial camera advancing and positioning using the III routines FC7CLR, FRSPIC, and NEXPIC, determines the location and size of the data input buffer, calculates the X and Y scaling factors for centering the image in the 16K by 16K area, and transfers control to GETCOM.

GETCOM initializes parameters to access a DTE data word and transfers control to BITCNT. BITCNT, using the III routine MTBYTE, accesses the number of data bits requested by GETCOM and transfers control to GETOP with the data bits in the AC (up to 18 bits per access).

When a magnetic tape read is initiated, and it is the initial read for a job, a test is made by BITCNT for COM controls. If COM controls are not present, the data is ignored and the next data record is accessed. This procedure is repeated until the first COM control record is read. When the first COM control record is accessed, BITCNT checks for an S, T, F or I identifier in the second
byte of the record. When processing 16 mm, all COM control records are skipped, with control being passed to CUTMAK for output of cutmarks. Film is advanced to the next frame via NEXPIC, and control returns to BITCNT. When processing 105 mm and the identifier is an S or T, the record is moved to the buffer TITARE for output via the III routine FICTAP. When the identifier is an F, DTFORM switch is set for forms overlay processing and a check is made to determine if indexing is requested. If so, INXSSW is set, the position and number of characters for indexing is set, and control is returned to BITCNT. All records following the first COM control record are either 1) ignored for 105 mm processing until a second COM control record is accessed, or 2) processed by PROC76 as EBCDIC data, for 16 mm recording, until a second COM control record is accessed. BITCNT processes the second COM control record in the same manner as the first and transfers control to GETOP for processing of DTE data. When an EOF is accessed, the job is complete and control is returned to the operator. GETOP determines from the DTE op code the type of DTE data word to be processed. The following paragraphs delineate the processing done for each type of DTE data word.

When the DTE word is a command, GETOP transfers control to ENDLN. ENDLN does a check to determine if the word is a jump. When the word is not a jump, it is ignored and control is returned to GETCOM. When the word is a jump, control is transferred to NEXFRM for output of forms overlay or cutmarks and advance to next frame via NEXPIC. If the strip charting option has been selected, the cutmark output will be inhibited. Control is then returned to GETCOM.

When the DTE word is a vector, the \( X_1Y_1 \) and \( X_2Y_2 \) coordinates are calculated and placed in XHD, YHD, XTL, and YTL. Control is transferred to MAP, which scales the heads and tails to the image size specified by DFRSZ. The X and Y DAC's are set via SETXYS, the vector is output by DRWVEC, and control returned to GETCOM.
When a START PRINT word is accessed, TYPSW (the typewriter switch) is set to allow processing of typewriter words. The character and character size are then masked from the START PRINT word and used to calculate the corresponding FR80 character and character size. This size is used for all characters until changed by another START PRINT word. The INXSSW switch is checked, and if it is set, the X and Y coordinates of the START PRINT word are checked against those found in the form and index control record. When the coordinates do not match, control is transferred to NOINDX. When the coordinates match, control is transferred to STARTX. STARTX sets the STOCSW switch, which causes the next n-1 typewriter characters (n = number of characters specified in the index record) to be stored as the index record entry for this frame, sets the appropriate counters for storing the index data, and transfers control to NOINDX. NOINDX scales the X and Y start print coordinates to the FR80 image size via MAP, sets the X and Y DAC's using the III routine SETXYS, and outputs the START PRINT character via CHROUT. Control is then returned to GETCOM.

When the DTE word is TYPEWRITER, the typewriter switch (TYPSW) is checked. When TYPSW is not set, the system halts (i.e., no previous START PRINT word to give coordinates). When TYPSW is set, then each character of the typewriter word is output via CHROUT. CHROUT converts each DTE character to the appropriate FR80 character code and size, stores each character in the index field if the STOCSW (save index) switch is set, and outputs the character using the III routine VCHAR. When the last character of the typewriter word is processed, control is returned to GETCOM.

B. Input/Output

1. Input. Data input via 9-track magnetic tape consists of DTE 36- or 48-bit command, instruction, and data words, and COM control records. All input data tapes are recorded in a variable spanned length record format (blocked or unblocked). Detailed descriptions of the format(s) and data content of the magnetic data tapes are found in SH-09607A.
2. Output. Data is output to either 16 mm or 105 mm film. Each frame contains one DTE image. Data frames on 16 mm film may be abutted by utilization of the STRIP CHART operator command.

G. Linkages

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<td>BITCNT</td>
<td>ROTREC</td>
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### Subroutines

#### A. BITCNT
Entered with the AC containing the number of bits to be accessed. Uses MTBYTE to get bits requested, returning to the calling routine with the bits requested in the AC. Calling sequence:

```
LAC N (1≤N≤18)
JMS BITCNT
```

#### B. CCNTRL
Accesses eight-bit carriage control characters via GET and checks for COM control indicator; if there is not a COM control character, exits by CCNTRL. If there is, checks next byte for legitimate COM control function and branches to proper handler. Calling sequence: JMS CCNTRL

#### C. CHROUT
Entered with the AC containing a character to be output. Converts character to EBCDIC via CONVRT, outputs character via VCHAR, and returns control to calling routine. Calling sequence where \( N \) = eight-bit control character:

```
LAC N
CHROUT
```

#### D. CONVRT
Entered with DTE character in AC. Character is converted to EBCDIC via DTETAB table. Exit is to calling routine with converted character in AC. Calling sequence where \( N \) = DTE character:

```
LAC N
JMS CONVRT
```
E. **CUTMAK.** Routine utilized for 16 mm microfilm processing only. Called once per frame for output of three marks, four vectors in width, the position and size of which are delineated by MRKTOP, MRKBOT, MRKLFT, SDELTA, MDELTA, MARKS, and STROKS. Returns control to call routine. Calling sequence: JMS CUTMAK

F. **DTESZ.** Loads set size and pulldown as input from the TTY. Also sets scaling parameters for frame. Exits via MDONEX. Called via MONTOR.

G. **DTFLSH.** Builds and outputs DTE 1024 x 1024 forms overlay scaled to FR80 frame size via MAP. Output and coordinate positioning are controlled by DRWVEC, SETTL, and SETHD III routines. Exits to calling routine. Calling sequence: DTFLSH

H. **EBGET.** Converts EBCDIC numeric string, whose length is specified in SETXYS, to decimal. Numbers are accessed from magnetic tape via GET. Converted number is in AC on exit to calling routine. Calling sequence where N = length of numeric string:

```
LAM N
DAC SETXYS
JMS MVCOM
```

I. **EJECT.** Advances to next frame and outputs cutmark if required; resets X and Y page positioning, character deltas (CHDELX, CHDELY), and character size (CHRSIZ) via SETXYS and SETPLS. Outputs EBCDIC data via NEXTCH until next carriage control character is accessed, whereby BITCNT transfers control to the proper routine. Calling sequence: JMP EJECT

J. **ENDLN.** Checks command word for JUMP. If there is a JUMP, advances to next frame via NEXFRM and gets next DTE data word. If there is not a JUMP, data is ignored and next DTE data word is accessed. Control is transferred to GETCOM. Calling sequence: JMS ENDLN
K. **FRMREC.** For 105 mm film processing, sets DTFORM switch for overlay processing, accesses and sets control functions for indexing, and transfers control to IGNOR1. For 16 mm, advances film via NEXPIC, outputs cutmarks if strip charting is inhibited, and transfers control to IGNOR1. Called in CCNTRL upon decode of F type COM control record. Calling sequence: JMP FRMREC

L. **GETBLK.** Accesses 32 bits of data from magnetic tape via MTBYTE. Used to read record block and mask off block descriptor word (BDW). Exits to calling routine. Calling sequence: JMS GETBLK

M. **GETCOM.** For 36-bit DTE words, bit bucket four-bit pad, calls KYBLIS for operator interrupt processing, transfers control to GETOP. GETCOM is called for all DTE data word decodes. Calling sequence: JMP GETCOM

N. **GETCR.** Determines if 36-bit DTE word is a typewriter or a STARTPRINT word. Control is transferred to TYPSW or SETCR, respectively. Calling sequence: JMP GETCR

O. **GETOP.** Gets four-bit op code and determines if data word is a command or vector word. If it is neither, control is transferred to GETCR. If it is a command, control is transferred to ENDLN. Calling sequence: JMP GETOP

P. **GETSEG.** Gets logical record segment from tape input area. Determines segment control code, segment length, and carriage control from segment descriptor word (SDW). If the segment length is two or less, control is returned to GETSEG+1 for the next logical record segment. If the segment control code is 0 or 1, which specifies a COM control record, CCNTRL is called for processing of the COM control record. Upon return from CCNTRL, control is transferred to the calling routine. Calling sequence: JMS GETSEG

Q. **IGNORE.** Remains in loop ignoring data via BITCNT until next COM control record or logical segment is read, with control being transferred to the applicable routine by BITCNT.
R. **IGNOR1.** Sets applicable switches to remain within GETSEG routine until DTE data has been accessed.

S. **MAP.** Sets XHD, YHD, XTL and YTL DTE vector coordinates scaled to FR80 units. Coordinates are centered in 16K × 16K frame with XHD, YHD, XTL, YTL containing DTE vector coordinates. Returns to calling routine with XHD, YHD, XTL, YTL containing FR80 coordinates. Calling sequence: MAP

T. **MVCOM.** Transfers COM control data, as specified in the S or T record, into either buffer TITARE for 105 mm or MTTARE for 16 mm. Data is accessed from tape buffer one byte per access via GET with AC containing first titling character. Calling sequence: JMS MVCOM

U. **MVOVER.** Sets X and Y DAC's plus XHEAD's and YTAIL's for cutmark vectors. VHEADX = start point X₁, VHEADY = start point Y₁, VTAILX = end point X₂, and VTAILY = end point Y₂. Calling sequence: JMS MVOVER

V. **NEWSEG.** Reads in new logical segment; gets bits requested from old and new segment and returns to calling routine with data in AC. Calling sequence: JMP NEWSEG

W. **NEXFRM.** Outputs forms overlay, if requested. If 105 mm, sets titling intensity, advances to next frame, resets intensity, and exits to calling routine. If 16 mm, advances to next frame, outputs cutmarks if strip charting inhibited, and exits to calling routine. Calling sequence: NEXFRM

X. **NMGET.** Sets counter to get converted four-digit hexadecimal number via EBGET. Returns to calling routine with value in AC. Calling sequence: JMS NMGET

Y. **NMGET1.** Sets counter to get converted two-digit hexadecimal number via EBGET. Returns to calling routine with value in AC. Calling sequence: JMS NMGET1
Z. **NOINDX.** Entered with XHD and YHD containing DTE character coordinates and CHTEM containing eight-bit DTE character. Scales coordinates to FR80 units, sets X and Y DAC's, outputs character, and transfers control to GETCOM. Calling sequence: JMP NOINDX

AA. **PROC76.** Entered with AC containing an EBCDIC carriage control other than SKIP to Channel 11. Outputs EBCDIC data via NEXTCCH until COM control indicator is accessed, whereby control is transferred to BITCNT. EBCDIC carriage controls are interpreted by SPACE3 and EJECT. Calling sequence: JMP PROC76

BB. **RESET.** Sets switches specifying COM control; sets return address in GETSEG and BITCNT to return to calling routine. Calling sequence: JMS RESET

CC. **RESTOR.** Restores BITCNT and GETSEG parameters to condition previous to COM control loop. Calling sequence: RESTOR

DD. **RETRN.** Saves return address from BITCNT for original call. This is done prior to COM control processing. Calling sequence: JMS RETRN

EE. **ROTRC.** Decodes image rotation control record and sets image rotation via ROTATE. If 16 mm, advances to next frame and outputs cutmark, if applicable. Control is transferred to IGNOR1. Calling sequence: JMP ROtrRC

FF. **SAVADD.** Saves BITCNT and GETSEG return addresses prior to COM control loop. Calling sequence: SAVADD

GG. **SCAL.** Entered with AC containing DTE coordinate. Exits to calling routine with AC containing coordinate in FR80 units. Calling sequence:

```
LAC N 1≤N≤1023
SCAL
```
HH. SEPREC. Entered with AC containing first character of S record. Calls MVCOM, initializes for no forms or indexing, and if 105 mm, calls FICTAP for control record processing. Sets CH11SW and SEGSW for control record skip via BITCNT and if 16 mm, sets CCNTRL routine for processing of 76-record EBCDIC identification. Exits to IGNORE. Calling sequence: JMP SEPREC

II. SETCR. Sets TYPSW for typewriter word processing, converts DTE character size to appropriate FR80 size, and DTE character deltas to FR80 units (CHDELX, CHDELT). Sets deltas based on rotation via ROTTST and SETPLS. Accesses starting line coordinates by call to GET, storing X in XHD and Y in YHD. Checks coordinates against those specified by index control record. If they match, control is transferred to STARTX. If not, subroutine exits via NOINDX. Calling sequence: JMP SETCR

JJ. SPACE3. Called during processing of 76 record EBCDIC identification; executes CRT IOT for three lines. Control is transferred to NEXTCH. Calling sequence: JMP SPACE3

KK. STARTX. Initializes STOCSW for access of index data, blank fills MTTARE buffer prior to transfer of index data, sets line position, and indexes field length. Returns control to calling routine. CHRCNT will be set to the number of index characters desired prior to the call. Calling sequence JMS STARTX

LL. STOCH. Entered with AC containing index character n. Stores character in MTTARE buffer and exits to calling routine, if index character count is less than zero. If index character count is exhausted, resets STOCSW for no index, processes index data by a call to INXDO, and returns to calling routine with character n in AC. Calling sequence: JMS STOCH

MM. TITREC. Moves title data into TITARE (or MTTARE for 16 mm) via MVCOM, calls FICTAP for title processing, resets CCNTRL for DTE data processing, outputs cutmark (16 mm only), and transfers control to IGNORE. Calling sequence: JMP TITREC
NN. TYPLP. Processes DTE special characters NULL, CR, and MR if neither, outputs as print character via CHROUT until CNTR (character counter equal -5 for 48 or -4 for 36) is exhausted. Entered either thru TYPSW or JMP TYPLP. Exits to GETCOM.

2.1.3.3 Constants and Variables

A. Internal

1. BITNSV. Temporary save location of number of bits requested by GET macro in SAVADD and RESTOR routines.

2. BITNUM. Contains number of bits requested by GET macro.

3. BITSVAD. Temporary save location of return address from GET call.

4. CHRCNT. Word containing the number of characters in index entry as specified in F record.

5. CHTEM. Cell containing DTE character accessed from start print word.

6. CH11SW. Switch used for entry and exit into COM control processing. Set to JMS RESET after S COM record and NOP upon completion of second COM control record processing.

7. CNTR. Counter containing number of characters per DTE typewriter word.

8. DFRSZ. Constant containing frame size in FR80 units, either 13522 for 105 mm or 9600 for 16 mm.

9. DTESIZ. Temporary cell containing DTE character size (0-7) accessed from start print word.

0. DTETAB. Table containing DTE character codes, two characters per word.
11. **DTFORM.** Switch used to control forms overlay processing: NOP forces output, SKP ignores.

12. **DTXTAB.** Table containing character spacing values in DTE units for eight-character sizes.

13. **DTYTAB.** Table containing line feed values in DTE units for eight-character sizes.

14. **GETSGAD.** Temporary save location of GETSEG routine return address.

15. **INXSSW.** Switch used to control index processing; SKP delineates indexing; NOP indicates no indexing.

16. **MARKS.** Counter which contains repeat count (-3) for output of four vector cutmarks.

17. **MBITNM.** Variable containing number of bits requested by GET macro in BITCNT routine.

18. **MBITSV.** Temporary save location of number of bits requested. Referenced in SAVADD and RESTOR.

19. **MCHCNT.** Variable containing number of characters per index entry as delineated in F control record.

20. **MDELTA.** Delineates delta X increment between four vector marks which constitute cutmark.

21. **MRKBOT.** Constant delineating end point (Y2) of cutmark vectors.

22. **MRKLFT.** Starting X coordinate for cutmarks.

23. **MRKTOP.** Constant delineating start point (Y1) of cutmark vectors.

24. **NEWSGB.** Variable containing n bits (14 ≤ n ≤ 18) of data from next record segment.
25. **NEWSGC.** Variable containing number of bits required from next record segment to satisfy GET macro.

26. **OLDSGB.** Variable containing \( n \) bits (\( 1 \leq n \leq 18 \)) of data remaining in current record segment.

27. **OLDSGC.** Variable containing number of bits remaining in current record segment.

28. **RETTADD.** Cell containing BITCNT return address when processing COM control records.

29. **SAVCHT.** Temporary save location for non-COM control character in PROC76.

30. **SDELT A.** Delineates delta X increment between cutmark vectors.

31. **SEGCNT.** Counter containing number of bits in current record segment.

32. **SEGSW.** Switch used to reset BITCNT return address upon completion of COM control processing.

33. **STOC SW.** Switch used to control saving of index characters; NOP indicates no indexing; JMS STOCH indicates to save index character.

34. **STRIPF.** Switch used to determine output of cutmarks. NOP indicates output cutmarks; SKY in the strip chart mode indicates no cutmarks.

35. **STROKS.** Constant delineating number of vectors per mark for cutmarks.

36. **SZTAB.** Table containing character heights in DTE units for eight-character sizes.

37. **TITINT.** Constant delineating output light intensity for titling.
38. **XHD.** Contains starting X coordinate of DTE vector as accessed from DTE vector word.

39. **XINDX.** Contains X coordinate position of first DTE index character. Set by F COM control record.

40. **XOFF.** Starting X (or left-side margin) of DTE image in FR80 raster units.

41. **XOFFOV.** Starting X (or left margin) of EBCDIC identification frame in FR80 raster units.

42. **XSIGN.** Sign of X vector as defined by 36-bit DTE vector word.

43. **XTL.** Contains end X coordinate of DTE vector as accessed from DTE vector word.

44. **YHD.** Contains starting Y coordinate of DTE vector as accessed from DTE vector word.

45. **YINDX.** Contains Y coordinate position of first DTE index character. Set by F COM control record.

46. **YOFF.** Starting Y or top margin of DTE image in FR80 raster units.

47. **YOFFOV.** Starting Y or top margin of EBCDIC identification frame in FR80 raster units.

48. **YSGN.** Sign of Y vector as defined by 36-bit DTE vector word.

49. **YTL.** Contains end Y coordinate of DTE vector as accessed from DTE vector word.

B. **External**

1. **CHDELX.** Word location reserved for FR80 character delta X.

2. **CHDELY.** Word location reserved for FR80 character delta Y.
3. **CHRSIZ.** Word location reserved for FR80 character size.

4. **CURBUF.** Cell used for current magnetic tape buffer address (one of two magnetic tape buffers).

5. **EXPND.** Location used to define end of executable code.

6. **FCSUB.** One-word cell used either to decrease or increase margin between fiche.

7. **FCTTSW.** Switch used to control title extraction from tape or teletype.

8. **FICTB.** Address of fiche title table (i.e., titling buffer area).

9. **FLSHND.** Defines start of executable form flash code.

10. **FRAMNM.** One-word counter containing number of frames filmed.

11. **IFLASW.** Switch used to control output of index frame (SKP = output; NOP = no output).

12. **IXXLBN.** Variable delineating number of characters per index line.

13. **MAXTRW.** Constant used for multiple fiche title rows (always zero for DTE).

14. **MTTARE.** Contains teletype buffer address.

15. **NEXBUF.** Cell used for next magnetic tape buffer address (one of two magnetic tape buffers).

16. **PBUFPT.** Location used to define start of form flash communication area.

17. **PICNUM.** One-word counter containing number of images produced.
18. **RECPIN.** Word location reserved for FR80 light intensity value.

19. **SCSIZE.** Maximum available FR80 raster units (16384).

20. **SVROT.** One-word save location containing current rotation delineator.

21. **TITARE.** Address of fiche titling buffer.

22. **TPOINT.** Contains address of next available word in TITARE.

23. **VHEADX.** Word reserved for setting of starting X vector coordinate.

24. **VHEADY.** Word reserved for setting of starting Y vector coordinate.

25. **VTAILX.** Word reserved for setting of ending X vector coordinate.

26. **VTAILY.** Word reserved for setting of ending Y vector coordinate.

2.1.3.4 **Flow Charts.** See following pages.
BEGIN

INITIALIZE TAPE HANDLER SWITCHES: SE6SW, CH11SW, BLKSW

INDEXING?

N

Y

INITIALIZE INDEXING SWITCHES: IFLASW, INXSSW

105 mm?

N

A

Y

1

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
1

FC7CLR
INITIALIZE FICHE CAMERA

FRSPIC
MULTI IMAGES FICHE

MNBRIT
SET TITLING INTENSITY

A

NEXPIC
ADVANCE FILM FRAME

MNBRIT
RESET DATA INTENSITY

2
2

ADDRESS OF TAPE BUFFER IF NO FORM

FORM PROCESSING?

Y

ADDRESS OF BUFFER IF FORM

ADDRESS OF 1st MAG TAPE BUFFER CURBUF

N
DETERMINE ADDRESS OF 2ND BUFFER \( \Rightarrow \) NEXBUF

MTRINI
INITIALIZE MAG TAPE HANDLER

COMPUTE FRAME SIZE OF DATA PAGE

SET X AND Y OFFSETS FOR CENTERING IMAGE IN 16K

GETCOM

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
FLOWCHART

1. GETOP

2. BITCNT
   GET DTE OP CODE FROM TAPE

3.6 BIT DTE?
   N → B
   Y

4. COMMAND WORD?
   Y → ENDLN
   N

5. VECTOR WORD?
   N → GETCR
   Y
4

SET XSIGN FOR POS. OR NEG. VECTOR

5

SET YSIGN FOR POS. OR NEG. VECTOR

BITCNT

GET LENGTH OF VECTOR IN X

X

LENGTH OF VECTOR, +N- → XSIGN

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
5

BITCNT
GET LENGTH
OF VECTOR
IN Y

Y
LENGTH OF
VECTOR, + M
⇒ YSEL

BITCNT
10 BIT
X, COORD.

X₁ ⇒ XHD
XHD + XSIGN
⇒ XTL (X₁)

BITCNT
10 BIT
Y, COORD.

6
$Y_1 \rightarrow Y_{HD}$

$Y_{HD} + Y_{SGN}$

$\rightarrow Y_{TL}(Y_2)$

$C$
REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
SAVE CHAR HEIGHT, CLEAR CHARSIZE COUNTER, CHAR SIZE TAB \[ \text{SPLTAB} \rightarrow 11 \]

INCR. CHARSIZE (CHAR SIZE COUNTER) GET FROM CHAR SIZE

\[ \text{SIZE} \geq \text{DTE CHAR HEIGHT} \]?

\[ \text{Y} \]

USE DTE SIZE (DTE CHAR SIZE) AS INDEX INTO DTXTAB - DELTAX

\[ \text{SCL} \]

CONVERT DTE DELTAX TO FED20 UNITS

12

13
CONVERTED DTE DELTAX \( \rightarrow \) CHDELX

USE DTE SIZE AS INDEX INTO DTYTAB

DELTA Y

SCAL

CONVERT DTE CHAR DELTAY

CONVERTED DTE CHAR DELTAY \( \rightarrow \) CHDELT

RESET CHDELX AND CHDELY BASED ON ROTATION

13

14
BITCNT
START Y COOR FOR CHAR

Y CHAR. POSITION → YHD

INDEXING?
N → NOINDEX

X COOR MATCH?
N → NOINDEX

Y COOR MATCH?
N → NOINDEX

STARTX
SAVE INDEX CHAR.
17

CMA OF # OF CHARs PER INDEX ⇒ IXLEN (USED BY INDEX)

IXLEN ⇒ IXCHOUT
CHARS/INDEX FOR STOCHE ROUTINE

EXIT

CHRIN

CONVRG NET TO EBCDIC

INDEXING?

Y

STOCHE STORE CHAR VIA II

N

18

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR.
AC → VCHAR
TEMP SAVE
CHAR FOR
OUTPUT FILM

RESET STOCSW
FOR NO
INDEXING
NOP → STOCSW

INXDO
PROCESS INDEX
FIELD

VCHAR → AC
RETURN TO
CALLING ROUT.
WITH CHAR.

EXIT
ENDLN

SET COUNTER FOR ACCESS OF DTE COMMAND CODE

BITCNT
GET DTE OP CODE

DTE JUMP COMMAND?

Y
NEXFRM ADVANCE TO NEXT FRAME

N
BITCNT
BIT BUCKET DTE WORD

GETCOM
CONVRT

USE ⅔ DTE CHAR VALUE AS INDEX INTO DTETAB

GET WORD FROM DTETAB 2 CHARS/WORD

UPPER BYTE?

Y ➔ SHIFT WORD TO GET UPPER BYTE

N ➔ ISOLATE EBCDIC CHAR IN LOW AC

EXIT

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR.
DTFLSH

O → XHD
O → YHD
START COOR.
FOR BOTTOM VECTOR
OF FORM

MAP
SCALE AND FRAME POSITION

SETHD
SET X, Y, 
F22D
COORD.

1023 → XHD
O → YHD
END COOR.
FOR BOTTOM VECTOR

MAP
SCALE AND FRAME POSITION

20
20

SETTL
SET X1 Y2 FR8D COORD.

DRAWVEC
OUTPUT VECTOR TO FILM

SETHD
PREVIOUS X1 Y2 = X1 Y1

1023 -> XHD
1023 -> YHD
END COORD.
FOR RIGHT VECTOR

MAP
SCALE AND FRAME POSITION

SETTL
SET X2 Y2 FR8D COORD.

21
21

DRAWVEC
OUTPUT VECTORS TO FILM

SET HD
PREVIOUS
$X_2 Y_1 = X_1 Y_1$

1023 $\Rightarrow$ Y HD
$0 \Rightarrow$ X HD
END COORD.
FOR TOP VECTOR OF FORM

MAP
SCALE AND FRAME POSITION

SETTL
SET $X_2 Y_2$
FROM COORD.

DRAWVEC
OUTPUT VECTORS TO FILM

22
23

\[ \text{BLKCNUT} + \text{MBITNUM} \rightarrow \text{BLKCNUT} + \text{SET AC WITH REQUIRED BITS} \]

\[ \text{EXIT} \]

\[ \text{GETSEG} \]

\[ \text{GETSEC} \]

\[ \text{BLKCNUT} = 0 \]

\[ \text{Y} \]

\[ \text{GETBLK} \]

\[ \text{GET NEW RECORD BLOCK} \]

\[ \text{N} \]

\[ \text{BLKCNUT - 32} \rightarrow \text{BLKCNUT} \]

\[ \text{SUBT. 4 BYTE SDW LENGTH} \]

\[ 24 \]
AC = 0 COMPLETE SEG?

SEG CNT > 2?

SEG CNT = 2?

MT BYTE BIT BUCKET TRANSITORY RECORD

BLKCNT = 16 PUSH 2 BYTE TRANS. LENGTH

GETSG1
JMP PROC76
⇒ CONTROL+11.
SWITCH TO INITIATE EXDIC PROCESSING.

OUTMAK
OUTPUT FRAME OUTMARKS

IGNORE

TITREC

MVCOM
T. DATA FROM TAPE ⇒ TITARE

105mm FILM OUTPUT?

Y

FIETAP
PROCESS TITLE DATA

N

IGNOR1

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
Jmp I CONTROL
→ CONTROL+11.
RESET SWITCH
FROM EDC-DIC
TO DIE DATA

CUTMAK
OUTPUT
FRAME
CUTMARKS

IGNOR1

FRMREC

SKP → DTFORM
SET SWITCH
FOR FORM
OVERLAY

BITCNT
ACCESS FORM
NUMBER

30

31
B3

AC → XINDEX
START X COOR
FOR INDEX CHAR. ACCESS

NMGET1
2 EBCDIC CHAR. TAPE
→ BINARY

AC → CHREN1
# OF DTE CHARS FOR INDEX ENTRY

INDEXING ?

SET SWITCHES
FOR INDEX CAPTURE & FLASH.

Y

N

IGNOR1

2-70
ROTRC

BITCNT
8 BIT ROTATION CHARACTER

COMIC MODE REQUEST?

CINE
1 → AC
1 → SVROT
SVROT - SAVE CELL FOR PROC76

ROTATE
SET FR80 ROTATION REGISTER

16mm FILM OUTPUT?

JMP I CCNTL
CCNTL+11, RESET SWITCH FROM EBCDIC TO DICE DATA

34
SAVE "GET'S"
BITCNT, GETSEG, BITNUM CONTENTS
FOR RETURN OF CONTROL

EXIT

RESTORE "GET'S"
BITCNT, GETSEG, BITNUM CONTENTS
FOR CONTROL RETURN TO GET

EXIT
RESET

RETURN ADDRESS IN GETSEG TO RE-INITIATE GET
RESET RETURN ADDR IN BITCNT

EXIT
NEWSEG

# OF BITS IN CURRENT SEGMENT \( \rightarrow \) OLDSEG

MTBYTE
GET REMAINING DATA BITS OB 17

AC \( \rightarrow \) OLDSEG
REMJAING DATA BITS CURRENT SEG.

BLKCNT \( \rightarrow \) OLDSEG
\( \rightarrow \) BLKCNT DECREMENT FOR \# BITS ACCESSED

GETSEG
GET NEXT SEGMENT

35
SHIFT BITS FROM OLD SGB AND NEW SGB ⇒ AC FOR 
RETURN VIA BITCNT

EXIT

NMGET

SET COUNTER FOR FOUR EBCDIC CHAR FIELD

EBGET

GET CHARS, CONVERT BINARY ⇒ AC

EXIT

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
EBGET1

BITCUT
GET 8 BIT EBCDIC CHAR FROM TAPE

MASK TRUE HEX VALUE OF CHAR
⇒ V.CHAR

MVCOM * 10
⇒ AC
SHIFT, CURRENT VALUE 10'S PLACE

AC + V.CHAR
⇒ MVCOM
CURRENT TOTAL OF CONVERTED #'S

ALL CHARs CONVERTED?
⇒ EBGET1

Y
EXIT

N
MAP

SCAL
CONVERT DTE $X_1$ TO FR&D UNITS

$X_1 + X_{OFF} \rightarrow X_1$
START X COOR. PLUS CENTERING OFFSET

SCAL
CONVERT DTE $Y_1$ TO FR&D UNITS

$Y_1 + Y_{OFF} \rightarrow Y_1$
START Y COOR. PLUS CENTERING OFFSET

SCAL
CONVERT DTE $X_2$ TO FR&D UNITS

38
$X_2 + X_{off} \Rightarrow X_2$
END X COOR.
PLUS CENTERING OFFSET

SCAL
CONVERT DTE $Y_2$ TO FRSD UNITS

$Y_2 + Y_{off} \Rightarrow Y_2$
END Y COOR.
PLUS CENTERING OFFSET

EXIT
SCAL

NEG. COORDINATE?

MULTIPLY DTE COORD BY FRZD FRAME SIZE AS SPECIFIED IN FRZD2

DIVIDE BY 1023, (DTE FRAME SIZE) \Rightarrow AC FRZD COOR POSITION

EXIT

ERROR, FORCE TO ZERO COORDINATE POSITION

Y

N
STRIP

SKP $\rightarrow$ STRIPF
SWITCH TO INHIBIT $I_n$ CUTMARKS

MDONEX

MVOVER

SETXYS
SET $X_2 Y_2$ DACS FOR VECTOR

SETYDS
SET $X_1 Y_1$ FOR DREA VEC

SETYLS
SET $X_2 Y_2$ FOR DREA VEC

EXIT
CUTMAK

ROTATE
CUTMARKS ALWAYS UPRIGHT

-2 \rightarrow MARKS
# OF FOUR VECTOR GROUPS
PER CUTMARK

SET START
COORDINATES
\( x_1, y_1 \) AND \( x_2, y_2 \) FOR
CUTMARKS

MRKONG

-4 \rightarrow STROKES
SET # OF
VECTORS PER
GROUP

STROX

MOVEVER
SET X\&Y DAC'S
AND VECTOR
POSITION

39
DRWVEC
OUTPUT VECTOR TO FILM

UPDATE $X_1$ AND $X_2$
FOR NEXT VECTOR OUTPUT

STROKES = 0
VECTOR GROUP DONE?

UPDATE X
COORDINATES
FOR NEXT VECTOR GROUP

MARKS = 0
COMPLETED OUTMARK?

ROTATE
RESET TO PREVIOUS ROTATION

EXIT
PROC76

SAVE CARRIAGE CONTROL CHARACTER, AC => SAVCHT

ROTATE EBCDIC IV, FRAMES UPRIGHT

CALL, CALL = SPACE 3 LINES? 60

Y

SPACE3

N

C.C. = SPACE 3 LINES? 19

Y

SPACE3

N

C.C. = SKP CHN? F9

Y

EJECT

N

40

2-92
EJECT

16mm FILM OUTPUT?

MNBRIT
SET TITLE INTENSITY

NEXPIC
ADVANCE FILM FRAME

MNBRIT
SET DATA INTENSITY

NEXPIC
ADVANCE FILM FRAME

CUTMAK
OUTPUT 16mm CUTMARKS

SET COORDS, DELTAX, DELTAY, AND CHAR SIZE FOR EBCDIC OUTPUT

40
40

SETPLS
SET PL S HARDWARE REGISTERS

SETXYS
SET X Y DACS TO CHAR POSITION

SAVADD
SAVE ORIG. CALL PARAMS

BITCNT
GET 8 BIT EBCDIC CHARACTER

RESTOR
RESTORE ORIG. CALL PARAMS

VCHAR
OUTPUT CHAR TO FILM

NEXTCH

NEXTCH
2.2. COMA GRAY LEVEL, LANDSCAPE, AND CLASSIFICATION MAP PROCESSOR FOR 105 mm FICHE (CLAGRA)

2.2.1 Background

A. Author. W. T. Jackson, Aeronutronic Ford Corporation

B. Intent. CLAGRA processes 9-track magnetic tapes formatted for earth resources microfiche imagery generation as delineated in PHO-TN598.

1. Gray-Level (GRAY) processes 9-track magnetic tapes formatted for variable length gray-level imagery with each eight-bit byte representing one picture element.

2. Landscape (LAND) processes 9-track magnetic tapes containing 48-bit DTE/LANDSCAPE gray-level and data words.

3. Classification (CLASS) processes 9-track magnetic tapes formatted for variable length character map images with each eight-bit byte representing one character.

C. Program History

1. Production Tape Date: 15 May 1975

2. Author. W. T. Jackson

3. Authorization. Task Agreement - P-2G03

4. Test Case. PHO-TN605

5. Revisions. Reference Appendix B, paragraph B.2

2.2.2 Introduction

2.2.2.1 Hardware Requirements

• FR80 with 12K memory

• 9-track magnetic tape unit

• 105 mm camera

• 16 mm adapter disk.
2.2.2.2 Software Requirements. The following files, found in I.I.I.'s SYM Directory, are required.

<table>
<thead>
<tr>
<th>File</th>
<th>File</th>
<th>File</th>
</tr>
</thead>
<tbody>
<tr>
<td>III109</td>
<td>III147</td>
<td>III162</td>
</tr>
<tr>
<td>III166</td>
<td>III163</td>
<td>III161</td>
</tr>
<tr>
<td>III164</td>
<td>III186</td>
<td>III166</td>
</tr>
<tr>
<td>FILM</td>
<td>INVAR</td>
<td>ADVAN</td>
</tr>
</tbody>
</table>

2.2.2.3 Assembly Parameters. The assembly parameters in III109 shall be set for the proper machine configuration. Assembly parameters specific to the GRAY, LAND, and CLASS Processors are as follows.

A. **BIGBUF.** If 0, allows maximum amount of operator functions with minimum buffer space.

B. **FONT.** If 0, assembles standard III character font.

C. **EBCDIC.** If 1, assembles EBCDIC character set.

D. **TAPELB.** If 1, assembles code for processing of IBM standard tape labels.

E. **TITLE.** If 1, inserts routines for fiche title processing.

F. **PTYPE.** If 1, defines code for 105 mm microfiche title buffering.

G. **7TRACK.** If 0, 7-track is not required; therefore, assembles 9-track magnetic tape handler.

H. **TWOBUF.** If 1, utilizes two magnetic tape buffers, CURBUF and NEXBUF, for higher throughput.

I. **NASA.** If 1, includes NASA specific character descriptors in character set.

J. **LOCASE.** If 1, lower case character set is required.

K. **MANYUP.** If 1, defines code for multiple images per frame for 105 mm microfiche.
L. \underline{FASTTY.} If 1, assembles SYM code for teletype interrupt handler.

M. \underline{MUMBLE.} If 1, defines system configuration output via teletype during assembly.

N. \underline{NEXPAG = NEXPIC.} Equates NEXPAG to NEXPIC macro call.

2.2.2.4 \underline{Operator Commands.} The following commands, entered by the operator via teletype, are available for use with the CLAGRA Program.

\begin{itemize}
  \item TIME
  \item FRAME
  \item GO
  \item CONTINUE
  \item TITLE
  \item END JOB
  \item MAKE FILM
  \item CLEAR
  \item ADVANCE
  \item BACK
  \item USE
  \item REWIND
  \item SKIP
  \item TRY AGAIN
  \item STANDARD LABEL
  \item UNLABELED
  \item PITCH/MARGIN = 69, 52
  \item SIZE OF TITLE = 14500, 10500
  \item IMAGES PER FICHE = 6, 7
  \item HITS-CHARS, VEC, PTS, TITLE, CMARK = 1,1,1,1,1
  \item FOCUS
  \item ROTATION = 0
\end{itemize}
2.2.3 Analysis

2.2.3.1 Major Control Section

A. Description. Upon issuance of a GO command by the operator via the console teletype, the III routine PSTART transfers control to the GRACLA processing routine BEGIN. BEGIN initializes all switches; does initial camera advancing and positioning using the FC7CLR, FRSPIC, and NEXPIC subroutines; initializes the magnetic tape handler via MTRINI; and transfers control to BITCNT.

BITCNT accesses data from magnetic tape buffers via MTBYTE. For each new logical record (i.e., new data frame) control is transferred to CCNTRL for decoding and routing of COM control functions via TITREC, GRAYL, CLASSM, LANDS and DESCIL. Image size (character/line and lines/frame) as delineated in COM control records G, K, L, and D, is set via HEXOCT, and control is transferred to SETPT.

SETPT sets the frame position on film for GRAY, CLASS, and LAND, both data and overlay, via calls to SETGRA, SETCLS, and SETLND, respectively. When a control word other than GRAY, CLASS, or LAND has been accessed, SETPT transfers control to CTLERR.

Upon completion of frame positioning, control is transferred to GRADTA, DESDTA, CLSDTA, or LANDTA for GRAY, DESCRIPTOR, CLASS, and LAND data processing, respectively. Control remains within the aforementioned routines until completion of image generation for the given film frame, at which time control is transferred to OVLDTA. OVLDTA processes the remaining data within the logical tape record as DTE overlay data. Upon completion of overlay data processing, control is returned to BITCNT for next logical record.

Upon completion of each microfiche for GRAY and LAND, an eight-level density calibration wedge is output as the last frame.

When an EOF is accessed, control is returned to the operator for either job termination or continuation from a continuation tape.
B. **Input/Output**

1. **Input.** Data input via 9-track magnetic tape consists of COM control words; GRAY, CLASS and LAND data words; and DTE overlay data words. All input data tapes are recorded in variable spanned length record format (blocked or unblocked). Detailed descriptions of the format(s)/data content of the magnetic data tapes are delineated in PHO-TN598.

2. **Output.** Data is output to 105 mm microfiche. Each microfiche will be output in a 7-row by 6-column format. Row one shall contain titling, with each remaining row containing six unique GRAY, CLASS, or LAND images.

C. **Linkages**

1. **External**

<table>
<thead>
<tr>
<th>Routine</th>
<th>Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>FC7CLR</td>
<td>III166</td>
</tr>
<tr>
<td>FRSPIC</td>
<td>III166</td>
</tr>
<tr>
<td>NEXPIC</td>
<td>III166</td>
</tr>
<tr>
<td>MTRINI</td>
<td>III163</td>
</tr>
<tr>
<td>KYBLIS</td>
<td>III166</td>
</tr>
<tr>
<td>GETT</td>
<td>III163</td>
</tr>
<tr>
<td>SETXYS</td>
<td>III162</td>
</tr>
<tr>
<td>SETHD</td>
<td>III162</td>
</tr>
<tr>
<td>SETTL</td>
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<td>DRWVEC</td>
<td>III162</td>
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<tr>
<td>PSTLL</td>
<td>III166</td>
</tr>
<tr>
<td>SETPLS</td>
<td>III166</td>
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<td>VCHAR</td>
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<tr>
<td>MTBYTE</td>
<td>III163</td>
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<tr>
<td>FICTAP</td>
<td>III186</td>
</tr>
<tr>
<td>MONTOR</td>
<td>III166</td>
</tr>
<tr>
<td>FCFIN</td>
<td>III166</td>
</tr>
</tbody>
</table>
2. Internal Routines

<table>
<thead>
<tr>
<th>Routine</th>
<th>Arguments</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GET8BT</td>
<td>NEWSEG, HUNDRD, DTEVEC</td>
<td></td>
</tr>
<tr>
<td>SETPT</td>
<td>CCNTRL, TENS, GT8MK4</td>
<td></td>
</tr>
<tr>
<td>GRADTA</td>
<td>SAVADD, ONES, CALXS</td>
<td></td>
</tr>
<tr>
<td>CLSDTA</td>
<td>CKKERR, OVLDTA, CALYS</td>
<td></td>
</tr>
<tr>
<td>LANDTA</td>
<td>RESTOR, CHRBRN, DTESPT</td>
<td></td>
</tr>
<tr>
<td>CTLERR</td>
<td>TITREC, PNTOUT, DTETYP</td>
<td></td>
</tr>
<tr>
<td>GETCOM</td>
<td>GRAYL, CHROUT, LETCHR</td>
<td></td>
</tr>
<tr>
<td>DESDTA</td>
<td>CLASSM, GETCHR, LTEVEC</td>
<td></td>
</tr>
<tr>
<td>SETGRA</td>
<td>LANDS, CRTGET, LCALXS</td>
<td></td>
</tr>
<tr>
<td>SETCLS</td>
<td>DESCTL, CONVRT, LCALYS</td>
<td></td>
</tr>
<tr>
<td>BITCNT</td>
<td>GRACTL, NEWLOG, LTESPT</td>
<td></td>
</tr>
<tr>
<td>GETSEG</td>
<td>MCOM, CKVEC, LBARS</td>
<td></td>
</tr>
<tr>
<td>GETBLK</td>
<td>THOUSN, CKSPT, BARS</td>
<td></td>
</tr>
</tbody>
</table>

2.2.3.2 Subroutines

A. **BARCH**. Routine used to output character overlay for GRAY and LAND density wedge. Table CHXY contains X coordinate, Y coordinate, and character code for the overlay data.

B. **BARS**. Called once per fiche, in the GRAY mode, for output of an eight-level density calibration wedge plus overlay. Wedge dimensions are 1000 scan lines by 1000 pixels, with the first 500 scans containing shades 0 thru 7 at 125 pixels per shade, and the last 500 scans containing shades 7 thru 0. Vector and character overlay are output via a call to BARVC. Exits to calling routine via BARVC. Calling sequence: JMS BARS

C. **BARVC**. Routine used to set appropriate counters and table addresses for output of vector and character overlay via calls to BARVE and BARCH, respectively. Exits to calling routine via BARS or LBARS based on GRAYSW. Calling sequence: JMP BARVC

D. **BARVE**. Routine used to output vector overlay for GRAY and LAND density wedge. Table VCXY contains X1Y1 and X2Y2 vector coordinates for the overlay. Vector output is via DRWVEC. Calling sequence: JMS BARVE

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
E. **BITCNT**. Entered with the AC containing the number of bits to be accessed. Uses MTBYTE to get bits requested, returning to the calling routine with the bits requested in the AC. Calling sequence:

```
LAC N (1 ≤ N ≤ 18)
JMS BITCNT
```

F. **CALXS**. Entered with AC containing X coordinate in DTE units. Converts DTE to FR80 units (conversion factor in VDELX), adds frame offset (XOFFOV) and returns to calling routine with FR80 X coordinate in the AC. Calling sequence with AC containing DTE X coordinates: JMS CALXS

G. **CALYS**. Accesses 10-bit DTE Y coordinate via BITCNT, converts to FR80 units (conversion factor in VDELY), adds frame offset (YOFFOV) and returns to calling routine with FR80 Y coordinate in the AC. Calling sequence: JMS CALYS

H. **CCNTRL**. Accesses eight-bit character code via GET8BT and checks for COM control indicator (D9). If not a COM control, exits to CKKERR. When COM control, checks next byte for control function and branch to proper handler. Calling sequence: JMS CCNTRL

I. **CHROUT**. Entered with the AC containing a character to be output. Converts character to EBCDIC via CONVRT, outputs character via VCHAR, returns control to calling routine. Calling sequence, where N = 8-bit DTE character:

```
LAC N
CHROUT
```

J. **CKKERR**. When in GRAY or CLASS mode, exits to CTLERR. When in LAND mode, resets LNPERF and CHPERL, advances to next frame via NEXPIC, resets frame position via SETPT, and exits to LANDTA. Calling sequence: JMP CKKERR
K. **CLASSM.** Sets processing mode switches for CLASS MAP data; sets character deltas (CLDELY = -62, CLDELX = 46); and transfers control to GRACTL. Calling sequence: JMP CLASSM

L. **CLSDTA.** Entered with AC containing first eight-bit character. When in overlay mode, transfers control to OVLDTA. When in CLASS mode, sets hardware registers via SETPLS; sets X and Y start coordinates via SETXYS; and outputs characters via calls to CHROUT and CETCHR. At end of line, positions to next line via CLTGET. At end of frame, sets processing mode to overlay and transfers control to GETCOM. Calling sequence: JMP CLSDTA

M. **CLTGET.** Executes PSTLL for hardware ready, updates DAC's via SETXYS for next line, checks for operator interrupt via KYBLIS, transfers control to CNEWLN (entry point in CLSDTA) for next line of character output. Calling sequence: JMP CLTGET

N. **CETCHR.** Accesses next eight-bit character via GET8BT and transfers control to CLRGEN (entry point in CLSDTA), with character for output in the AC. Calling sequence: JMP CETCHR

O. **CONVRT.** Entered with DTE character in AC. Character is converted to EBCDIC via DTETAB table. Exit is to calling routine with converted character in AC. Calling sequence where N = DTE character:

```
LAC N
JMS CONVRT
```

P. **CTLERR.** Transfers control to MONOUX with address of control error message in the AC. Calling sequence: JMP CTLERR

Q. **DESCTL.** Sets processing mode switches for descriptor data, sets DTE to FR80 conversion factors (VDELX, VDELY), and sets PRSWT equal to NOP to ignore DTE overlay data until access of a start print word. Calling sequence: JMP DESCTL
R. DESDTA. Transfers control to OVLDTA, when there is overlay data. Otherwise, sets CHDELS, CHDELY and CHRSIZ for description data. Transfers control to CNITCH for CLASS, INITCH for GRAY, or LNITCH for LAND. (Entry points are in CLSDTA, GRADTA, and LANDTA, respectively.) Calling sequence: JMP DESDTA

S. DTESPT. Decodes DTE start print word as accessed via BITCNT. Converts DTE X and Y coordinates to FR80 units via CALXS and CALYS calls, respectively; sets PLS registers via SETPLS; and outputs character by call to CHRROUTE. Transfers control to GETCOM. Calling sequence: JMP DTESPT

T. DTETYP. Transfers control to IGNDTE when PRSWT signifies no start print word processing for this frame. Otherwise, processes DTE special characters NULL, CR, and MR; if there are none, outputs as print character via CHRROUTE until CNTR (character counter equal to 5) is exhausted. Exits to GETCOM.

U. DTEVEC. Decodes and converts DTE 48-bit vector word to FR80 X1Y1 and X2Y2 vector coordinates. Outputs vector via call to III routine DRWVEC. Exits to GETCOM. Calling sequence: JMP DTEVEC

V. GETBLK. Accesses 32 bits of data from magnetic tape via MTBYTE. Used to read record block and mask off block descriptor word (BDW). Exits to calling routine. Calling sequence: JMS GETBLK

W. GETSEG. Gets logical record segment from tape input area. Determines segment control code, segment length, and carriage control from segment descriptor word (SDW). If segment length is two or less, control is returned to GETSEG+1 for next logical record segment. If segment control code is 0 or 1, which specifies COM control record, CCNTRL is called for processing of the COM control record. Upon return from CCNTRL, control is transferred to calling routine. Calling sequence: JMS GETSEG
X. **GET8BT.** Used to access eight-bit data byte from magnetic tape buffer via BITCNT. Returns to calling routine with AC containing right-justified eight-bit byte. Calling sequence: JMS GET8BT

Y. **GRACTL.** Sets processing mode switches for GRAY data processing. Transfers control to HEXOCT. Calling sequence: JMP GRACTL

Z. **GRADTA.** Entered with AC containing first eight-bit character. When in overlay mode, transfers control to OVLDTA. When in GRAY, sets hardware registers via SETPLS, sets X and Y start coordinates via SETXYS, outputs characters via calls to CHRROUT and CHRRBN, and outputs pixels via PINTOUT. At end of line, positions to next line via CRTGET. At end of frame, sets processing mode to overlay and transfers control to GETCOM. Calling sequence: JMP GRADTA

AA. **GRAYL.** Sets processing mode switches for GRAY data, sets character deltas (CLDELX = 10, CLDELY = -10), and transfers control to GRACTL. Calling sequence: JMP GRAYL

BB. **GT8MK4.** Accesses eight-bit data byte from magnetic tape buffer via BITCNT. Masks low-order four bits of AC and returns to calling routine. Calling sequence: JMS GT8MK4

CC. **HEXOCT.** Utilized for decode and conversion of lines per frame (LNPERF) and characters per line (CHPERL) from G or K control record. Defaults to 439 by 612 respectively for LAND mode. Advances film via NEXPIC, sets start coordinates by call to SETPT, and transfers control to GETSG1. If LNPERF equals zero, sets CCTRSW for COM control processing. Calling sequence: JMP HEXOCT

DD. **HUNDRE.** Converts EBCDIC hundreds position character to decimal. Returns to calling routine with hundreds value in AC. Calling sequence: JMS HUNDRE

EE. **LANDS.** Sets processing mode switches for LAND data, sets character deltas (CLDELX = 10, CLDELY = 10), and transfers control to GRACTL. Calling sequence: JMP LANDS
FF. **LANDTA.** Entered with AC containing first eight-bit character. When in overlay mode, transfers control to OVLDTA. When in LAND, sets hardware registers via SETPLS, sets X and Y start coordinates via SETXYS, outputs characters via calls to CHROUT and LHRBRN, and outputs pixels via PNTOUT. At end of frame, sets processing mode to overlay and transfers control to GETCOM. Calling sequence: JMP LANDTA

GG. **LBARS.** Called once per fiche, in the LAND mode, for output of an eight-level density calibration wedge plus overlay. Wedge dimensions are 1000 scan lines by 1000 pixels, with the first 500 scans containing shades 0 through 7 at 125 pixels per shade and the last 500 scans containing shades 7 through 0. Vector and character overlay are output via a call to BARVC. Exits to calling routine via BARVC. Calling sequence: JMS LBARS

HH. **LCALXS.** Entered with AC containing X coordinate in RTCC 1024 units. Converts to DTE 612 units and computes corresponding FR80 raster address. Returns control to calling routine with X coordinate, in FR80 units, in the AC. Calling sequence with RTCC X coordinates:

```
JMS LCALXS
```

II. **LCALYS.** Accesses 10-bit Y coordinate in RTCC units, converts to DTE 439 units, and computes corresponding FR80 raster address. Returns control to calling routine with Y coordinate in FR80 units in the AC. Calling sequence: JMS LCALYS

JJ. **LMYSET.** Updates Y DAC for next line of LAND density wedge and resets X and Y DAC's via SETXYS. Calling sequence: JMS LMYSET

KK. **LTESPT.** Decodes LAND DTE start printword as accessed via BITCNT. Sets CHRSIZ, CHDELX and CHDELY from XSIZ table using DTE character size code as index. Converts DTE X and Y coordinates to FR80 units via LCALXS and LCALYS.
calls, respectively, sets PLS registers via SETPLX, outputs character by call to CHROUT, sets PRSWT for typewriter word processing, and transfers control to GETCOM. Calling sequence: JMP LTESPT

LL. LTEVEC. Decodes and converts DTE 48-bit vector word to FR80 $X_1Y_1$ and $X_2Y_2$ vector coordinates. Outputs vector via DRWVEC and transfers control to GETCOM. Calling sequence: JMP LTEVEC

MM. MVCOM. Transfers COM control data, as specified in the T record, into buffer TITARE for 105 mm. Data is accessed from tape buffer one byte per access via GET8BT. Calling sequence with AC containing first titling character: JMS MVCOM

NN. MYSET. Updates Y DAC for next line of GRAY density wedge and resets X and Y DAC's via SETXYS. Calling sequence: JMS MYSET

OO. NEWSEG. Reads in new logical segment; gets bits requested from old and new segment and returns to calling routine with data in AC. Calling sequence: JMP NEWSEG

PP. OVLDTA. Checks overlay data for legitimate DTE data words. Transfers control to CKVEC for vector words to CKSPT for start print words, to DTETYP for typewriter words, and to IGNDE for "bit bucket" non-DTE data words. Calling sequence with AC containing DTE data word bits 1-18: JMP OVLDTA

QQ. PNTOUT. Utilized for output of GRAY and LAND pixel data. Entered with AC containing left-justified pixel intensity. Calling sequence, where $n =$ three-bit intensity:

\[
\text{LAC } n \rightarrow \text{JMS PNTOUT}
\]

RR. RESTOR. Restores BITCNT and GETSEG parameters to condition previous to COM control loop. Calling sequence: RESTOR

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SS. SAVADD. Saves BITCNT and GETSEG return addresses prior to COM control loop. Calling sequence: SAVADD

TT. SETPT. Controls setting of overlay and data frame start coordinates for GRAY, CLASS, and LAND. Calling sequence: JMS SETPT

UU. TENS. Converts EBCDIC tens position character to decimal. Returns to calling routine with tens value in the AC. Calling sequence: JMS TENS

VV. THOUSN. Converts EBCDIC thousands position character to decimal. Returns to calling routine with thousands value in the AC. Calling sequence: JMS THOUSN

WW. TITREC. Moves title data into TITARE via MVCOM, calls FICTAP for title processing, sets TITSW for no film advance, and transfers control to GETSG1. Calling sequence: JMP TITREC

2.2.3.3 Constants and Variables

A. Internal

1. BITNSW. Temporary save location of number of bits requested by GET macro, in SAVADD and RESTOR routines.

2. BITNUM. Contains number of bits requested by GET macro.

3. BITSVAD. Temporary save location of return address from GET call.

4. CCTRSW. Switch used to initiate COM control record processing.

5. CHPERL. Counter for character-per-line variable.

6. CLASSW. Switch utilized in routing flow of program for classification map processing.

7. CLDELX. Character delta X for CLASS data.
8. **CLDELY.** Character delta Y for CLASS data.

9. **CNTR.** Counter containing number of characters per DTE typewriter word.

10. **DESCSW.** Switch used for designating descriptor data processing.

11. **DSDELX.** Character delta X for descriptor data.

12. **DSDELY.** Character delta Y for descriptor data.

13. **DTETAB.** Table containing DTE character codes, two characters per word.

14. **GETSGAD.** Temporary save location of GETSEG routine return address.

15. **GRAYSW.** Switch used for delineating GRAY image processing.

16. **LANDSW.** Switch used for delineating LANDSCAPE image processing.

17. **LNPERF.** Counter for lines per frame variable.

18. **MBITNM.** Variable containing number of bits requested by GET macro in BITCNT routine.

19. **MBITSV.** Temporary save location of number of bits requested. Referenced in SAVADD and RESTOR.

20. **NEWSGB.** Variable containing n bits (1 ≤ n ≤ 18) of data from next record segment.

21. **NEWSGC.** Variable containing number of bits required from next record segment to satisfy GET macro.

22. **OLDSGB.** Variable containing n bits (1 ≤ n ≤ 18) of data remaining in current record segment.
23. **OLDSGC.** Variable containing number of bits remaining in current record segment.

24. **OVERSW.** Switch used to initiate and/or inhibit overlay data processing.

25. **PRSWT.** Switch used to designate DTE start print word has been processed for current frame, thereby allowing processing of typewriter words.

26. **SEGCNT.** Counter containing number of bits in current record segment.

27. **SEGSW.** Switch used to reset BITCNT return address upon completion of COM control processing.

28. **XHD.** Contains starting X coordinate of DTE vector as accessed from DTE Vector word.

29. **XOFFDT.** Variable used for designation of starting X or left margin of GRAY, CLASS, and/or LAND image area in FR80 raster units.

30. **XOFFOV.** Variable used for designation of starting X or left margin of GRAY, CLASS, and/or LAND overlay area in FR80 raster units.

31. **XTL.** Contains end X coordinate of DTE vector as accessed from DTE Vector word.

32. **YHD.** Vector Y₁ coordinate.

33. **YOFFDT.** Variable used for designation of starting Y or top margin of GRAY, CLASS, and/or LAND image area in FR80 raster units.

34. **YOFFOV.** Variable used for designation of starting Y or top margin of GRAY, CLASS, and/or LAND overlay area in FR80 raster units.

35. **YTL.** Vector Y₂ coordinate.
B. External

1. CHDELX. Word location reserved for FR80 character delta X.

2. CHDELY. Word location reserved for FR80 character delta Y.

3. CHRSIZ. Word location reserved for FR80 character size.

4. CURBUF. Cell used for current magnetic tape buffer address (one of two magnetic tape buffers).

5. FCXCNT. Constant delineating number of columns per fiche.

6. FCYCNT. Constant delineating number of rows per fiche.

7. FICTB. Address of fiche title buffer area, as decoded by I11186.

8. NEXBUF. Cell used for next magnetic tape buffer address (one of two magnetic tape buffers).

9. OPRCON. Contains NOP op code.

10. PLSON. Switch used to control make film option.

11. RECSPT. Cell containing FR80 spot size being used in film generation.

12. SKPCON. Contains SKP op code.

13. TITARE. Interim fiche title record buffer.

14. TPOINT. Contains address of next available word in FICTB.

2.2.3.4 Flow Charts. See following pages.
BEGIN

INITIALIZE VARIABLE SPANNED RECORD CONTROL SWITCHES

INITIALIZE GRAY, CLASS, LAND, DESCRIPT CONTROL SWITCHES

SET FCXOUT FOR XTRA LENGTH "CLEAR" FICHE

FC7 CLR CLEAR FICHE FRAME

RESET FCXOUT FOR "GRAY" FICHE FORMAT

1
1

FRSPIC
INIT. FOR FIRST FILE FRAME

NEXPIC
ADVANCE FILM

MTRINI
INITIALIZE MAG TAPE HANDLER

GET8BT
GET 8 BIT CONTROL CHARACTER

AC -> BARUC
TEMP SAVE CONTROL CHARACTER

SETPT
SET FRAME COORDINATES

2
SETCLS

1447 \rightarrow \text{xoffov}
\text{overlay}
\text{x coordinate}

(1447) + (46 \times 6)
\rightarrow \text{xoffdt}
\text{class frame}
\text{x coordinate}

13292 \rightarrow \text{yoffov}
\text{overlay}
\text{y coordinate}

(13292) + (-62 \times 5)
\rightarrow \text{yoffdt}
\text{class frame}
\text{y coordinate}

EXIT
SETERA

3072 → XOFFOV
OVERLAY
X COORDINATE

(3072) + (40, × 6)
→ XOFFDT, XOFFPT
GRAY FRAME
X COORDINATE

13312 → YOFFOV
OVERLAY
Y COORDINATE

(13312) + (-50, × 5)
→ YOFFDT
GRAY FRAME
Y COORDINATE

EXIT
BITCUT

# OF BITS REQUESTED BY GETT → BITNUM

Two's Comp of BITNUM → MBITNUM: Used to decrement SEG + BITCUT

SEGMENT SO NEED NEW SEGMENT?

BITNUM > SEGMENTS?

MTBYTE GET REQUIRED BITNUM FROM TAPE

GET-SEG GET NEXT LOGICAL RECORD SEG

NEWSEG

Y

N

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4

MTBYTE
ACCESS TWO
BYTES OF
SDW

SEGMENT LENGTH
- 32 BIT SDW
LENGTH
- SEGCNT

MTBYTE
NEXT TWO
BYTES OF
SDW

ISOLATE
SEGMENT CONTROL CODE IN AC

AC > 1?
START
SEG?

Y
N

EXIT

5

2-121
AC = 0 COMPLETE SEC?

SEG-CNT > 2?

SEG-CNT = 2?

MTBYTE BIT BUCKET TRANSITORY RECORD

BLKCUT = 16 BLKCUT SUB. 2 BYTE TRANS. LENGTH

GET561
CCXPRL

SAVE ADDR
SAVE ORIG.
CALL RETR
ADRESSES

SET CHARACTER
DELTA X & Y
FOR CLASS
MAP

GET 8 BT
CARRIAGE
CONTROL
CHARACTER

SKIP
TO CHANNEL N
CONTROL?
(Y or N)

GET 8 BT
8 BIT COM
CONTROL
INDICATOR

G

2-124
7

LAND CONTROL "L"

Y → LANDS

N

DESCRIPTION CONTROL "D"?

Y → DESCTL

GRAYL

N

SET SWITCHES FOR PROCESSING OF GRAY DATA

SET CHARACTER DELTA X & Y FOR GRAY (PIXEL SPACING)

GRAYCTL
CLASSM

SET SWITCHES FOR PROCESSING OF CLASS MAP DATA

SET CHARACTER MAP DELTA X & Y

GRACIL
SET SCAN AND PIXEL COUNT FOR LANDSCAPE FRAME

NEXT PIC
ADVANCE FILM

SET PT
SET X & Y COORDINATES

LANDTA

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
ONES +
CHPERL
→ CHPERL

LAND
IMAGE?

Y

DEFAULT
ELEMENTS
PER LINE
TO 612.

N

CALCULATE
LINES PER
FRAME (LNPERF)
AS CHARACTERS
PER LINE

Y

DEFAULT
LINES PER
FRAME TO
439.

N

BITCNT
BIT BUCKET
#T

REPRODUCIBILITY OF THE
ORIGINAL PAGE IS POOR
TENS

GT8MK4
4 BIT TENS DIGIT

CONVERT TENS TO DECIMAL

EXIT

ONES

GT8MK4
4 BIT ONES DIGIT

EXIT
DESCTL

SET PROCESS
SWITCHES
FOR
DESCRIPTOR
DATA

SET CHAR
DELTA
KEY
FOR
DESCRIPTOR
DATA

NOP→ PRSwT
NO START
PRINT WORD
NZ TYPE WORDS
ILLEGAL

HEXACT

REPRODUCIBILITY OF THE
ORIGINAL PAGE IS POOR
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Vol. II

BEGIN

OVERLAY DATA?

Y -> OVLDTA

N

NOP -> CTRLSW
SET FOR COMM CONTROL CHECK ON NEXT RECORD

SET FRZ0
CHDELX, CHDELY
CHRIZE FOR GRAY DATA

INITCH

SETPLS
SET P.L.S HARDWARE REGISTERS

SEXTYS
SET STARTING X,Y FRAME COORD.

END
CHRE2D

CHROUT
OUTPUT CHARACTER

CHRCON

FINISHED LINE

LAST LINE OF FRAME?

SET OVRSW FOR OVERLAY PROCESSING

GETCOM

GETCHR

CRTGET

N

Y

Y
CRTGET

PSTLL
WAIT FOR HARDWARE READY

CRT (Jot)
CARRIAGE RETURN

KUBLIS
CHECK FOR OPERATOR INTERRUPT

DESCRIPTOR DATA?

Y

CRTRST

N

GT8MK4
GET 4 BITS OF INTENS

CRTCNT
DESDTA

OVERLAY DATA?

Y → OVLDTA

N

SET CHAR. SIZE CHAR DELTA X AND DELTA Y FOR DESCRIPTION DATA

CLASS MODE?

Y → CNITCH

N

NOP → CCTRSD
SET FOR COMM CONTROL PROCESSING

GRAY MODE?

Y → CNITCH

N

14
LAND MODE?

Y → LATCH

N → CTRLERR

CLSDTA

OVERLAY DATA?

Y → OVLDTA

N → SET CHAR. SIZE, CHAR DELTA X AND DELTA Y FOR CLASS- MAP DATA

SETPLS

SET P.L.I.S. HARDWARE REGISTERS

15

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
CETCHR

GET2BT
GET 8 BIT CHARACTER

CLRGEN

CLTGET

PSLLL
WAIT FOR HARDWARE READY

UPDATE Y COORDINATE FOR NEXT LINE

SETXYS
SET X+Y DACS

16
16

KYBLIS
CHECK FOR OPERATOR INPUT

GET8BT
ACCESS NEXT 8 BIT CHARACTER

CUEWL

DTE VECTOR WORD?
Y → CKVEC
N

START PRINT WORD?
Y → CKSPT
N

17
CKVEC

LAND MODE?

Y → LTEVEC

N → DTEVEC

CKSPT

LAND MODE?

Y → LTESPT

N → DTESPT

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Vol. II

DTEVEC

ACCESS AND SET VIA BITCNT X1Y1 + X2Y2 VECTOR COORDINATES

SETXYS
SET X & Y DACS

SETNDS

SETTLS

SETPLS
SET P.L.S. HARDWARE REGISTERS

DRWVEC
OUTPUT VECTOR TO FILM

GETCOM

2-155
(b)TXCorZ)
X(CIAVCAX)
CALCULATE CHAR
POSITION FOR X COOR
AC + XOFFOV
POSITION VECTOR
X COOR WITHIN
FRAME AREA
EXIT
CALYS

VECTOR
(DTE X COORD),
X(CHAR DELTA X)
AC
ACCESS 10
BIT Y-COOR
FROM TAPE
18
GRAY MODE?

- \( Y \): ADD 1 TO DIE COORD, \( y \), GRAY OFFSET
- \( N \):
  - \((\text{DIE Y COORD}) X (\text{CHAR DELTA Y}) \rightarrow AC\)
    - CALCULATE CHAR POSITION FOR Y VECTOR COORD.
  - \( AC + \text{Y OFFSET} \)
    - POSITION VECTOR Y COORD IN FRAME AREA
  - EXIT
SETPLS
SET P.L.S. HARDWARE REGISTERS

SETXYS
SET X & Y DAC COORD. POSITION

CHROUT
CHAR TO FILM

SET PSWIT TO PERMIT TYPEWRITER WORD PROCESSING

GETCOM

DTETYP

START PRINT BEEN PROC?

Y

N

SET COUNTER (CNTR) FOR # CHAR/TYPEWRITER WORD

Y

N

TYPEP

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
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Vol. II

20

CHROUT
OUTPUT CONVERTED DIE CHARACTER

TYPNL

CNTRYSO
LAST DIE CHARACTER

N
TYPLP

Y
GETCOM

TYPMA

PSTLL
WAIT FOR HARDWARE READY

CRTO
RETURN

TYP4
Typic

0 \rightarrow \text{XHD}
\text{YHD} + \text{DELAY} \rightarrow \text{YHD}

\text{PSTLL}
\text{WAIT FOR HARDWARE READY}

\text{CRT (IOT)}
\text{CARTRIDGE RETURN}

\text{TYPNL}
NEWSEG

# OF BITS IN CURRENT SEGMENT \( \rightarrow \) OLDSEC

MTBYTE
GET REMAINING DATA BITS 0 & 12

AC \( \rightarrow \) OLDSEC-B
REMAINING DATA BITS CURRENT SEG.

BLKCNT - OLDSEC \( \rightarrow \) BLKCNT
DECREMENT FOR # BITS ACCESSED

GETSEG-
GET NEXT SEGMENT

II
SAVADD
SAVE BITCNT
PARAMS.
ORIG. CALL

OLDSEC -
BITNUM
⇒ NEWSGC
# OF BITS REQ'D
FROM NEW SEGMENT

BITCNT
GET NEWSEC
BITS

AC ⇒ NEWSGB
BITS FROM
NEW SEGMENT
TO SATISFY
GET MACRO

RESTOR
RESET ORIG.
CALL BITCNT
PARAMS

22

REPRODUCIBILITY OF THE
ORIGINAL PAGE IS POOR
SHIFT BITS FROM OLD SUB AND NEW SUB
AC FOR RETURN VIA BITCUT

EXIT
SAVADD

SAVE "GET'S"
BITCNT, GETSEG,
BITNUM CONTENTS
FOR RETURN OF
CONTROL

EXIT

RESTOR

RESTORE "GET'S"
BITCNT, GETSEG,
BITNUM CONTENTS
FOR CONTROL
RETURN TO GET

EXIT
OVERLAY PROCESSING?

BITCNT
BIT BUCKET COMMAND + BEGIN FRAME WORDS

SAVE OFF INTENS. (8 BIT) VALUE FROM AC (2 PAXELS)

SET CHAR SIZE, DELTAX, DELTAY FOR LANDSCAPE PIXEL 4/6 CHAR

SETPLS
SET P.L.S. HARDWARE REGISTERS

23
LHRBRN

CHAR ROUT
CHARACTER TO FILE

LHRCON

LINE COMPLETE?

Y

FRAME COMPLETE?

Y

NOP OVERSW
SET FOR OVERLAY PROCESSING

GETCOM

LETCMR

LRTCET

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
LRTRST

GET 8 BT
8 BIT DESCRIPTOR CHARACTER

LRTCNT

AC -> SAVDATA
TEMP. SAVE DESCRIPTOR CHARACTER

LNEWLN

LTEVEC

BITCNT
REMAINING 6 BITS OF X1 COORD

AC + SAVDATA
TOTAL 10 BIT X2 COORD.

24

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
AC → XHD
START X FROM
COORD FOR
VECTOR

CALYX
Y COORD
IN FRBD
UNITS

AC → YHD
START Y FROM
COORD FOR
VECTOR

SETXYS
X & Y DACS

SETHDSD
START
COORD.

SETTLSE
END
COORDS.

25

26
26

O ⇒ RECEPPT
USE SPOT SIZE 0 FOR VECTOR

SETPLS
SET P.L.S. HARDWARE REGISTERS

DRAWVEC
OUTPUT VECTOR TO FILM

GETCOM

LOCALXS

CONVERT G12 FROM 1024 UNIT INPUT Positions CURVE Result In Frame Area

EXIT
LCALYS

BITCNT
10 BIT Y COORD

CONVERT 1024 BTCE UNIT TO 439 DTE UNIT;
POSITION COORD RESULT IN FRAME

EXIT

LTESPT

GET8BT
8 BIT BYTE;
LOW ORDER 3=CHR SIZE

27
27

USE DTE CHAR SIZE FULL INDEX INTO FRBD DELTA AND CHAR SIZE TABLES

SET CHDELX, CHDELY, CHRSIZE, O -> RECSPT SPOT SIZE O

GET8BT
8 BIT CHAR. CODE

BITCNT
4 FILL + 10 BIT X COORD

LCALXS
COMPUTE FRBD X COORD \( \rightarrow XHD \)

LCALYS
COMPUTE FRBD Y COORD \( \rightarrow YHD \)

28
LMYSET

SETXYS
X,Y DACS
FOR NEXT LINE

LMYSET

BARS

GRAY LEVEL
SET CHAR:
DELTA X
DELTA Y
SIZE
3 -> RECEPTE

SETPLS
SET P.L.S.
HARDWARE
REGISTERS

SETPT
SET GRAY
FRAME
COORDINATES

29
30

GRAY MODE?

Y
EXIT VIA BARS

N
EXIT VIA L'BARS

BARCH

ACCESS X*Y COORDINATES AND CHAR. CODE FROM CHARACTER TAB

SET X*Y DACES (XHD,YHD) CHAR. COORD.

V CHAR CHARACTER TO FILM

EXIT
BARVE

ACCESS $x_1y_1$ AND $x_2y_2$ VECTOR COORD. FROM VECTOR TABLE

SETXYS
SET X+Y DACS TO X,Y

SETHDS
$x_1y_1$ FOR DRWVEC

SETTLS
$x_2y_2$ FOR DRWVEC

SETPLS
SET P.L.S. HARDWARE REGISTERS

DRWVEC
OUTPUT VECTOR TO FILM

EXIT

2-189
2.3 COMA VARIAN 73 PRINT PROCESSOR FOR 16 mm FILM (VAR16)

2.3.1 Background

A. Author. B. Miller, Aeronutronic Ford Corporation.

B. Intent. The requirements for this program are specified in SH-25752.

C. Program History

1. Production Tape Date. 15 November 1974

2. Author. B. Miller

3. Authorization. Clarification form A15 and SH-25752


5. Reference. Appendix B, paragraph B.3

2.3.2 Introduction

2.3.2.1 Hardware Requirements

- FR80 with 12K memory
- 7- and 9-track tape units
- 16,mm camera

2.3.2.2 Software Requirements

<table>
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<th>VAR16</th>
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<th>III166 ADVAN</th>
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<td>III147</td>
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III164, III164 FILM, III185, III187, NULL, FORM1 thru FORM4

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2.3.2.3 Assembly Parameters

A. \textit{ALLOW}. Allows code for forms loading and flashing to be assembled.

B. \textit{ASCII}. Causes the 7-bit ASCII table to be assembled as VCHTAB.

C. \textit{BATCH}. Allows code for batch processing to be assembled.

D. \textit{BIGBUF}. If 0, allows the MONITOR to be assembled with a maximum number of features.

E. \textit{CAMNUM}. If 2, camera parameters for the 16 mm unsprocket camera are assembled.

F. \textit{FONT}. If 0, allows assembly of the character font FILM.

G. \textit{FTYPE}. If 16, indicates 16 mm film.

H. \textit{MTMANY}. If 0, code for using only one drive will be assembled in the tape routines.

I. \textit{MTPTR}. If 10, tape read routines will use auto-index register 10 as MTPTR.

J. \textit{MTSIZE}. Size of the teletype buffer.

K. \textit{MUMBLE}. If 1, allows assembler to output program configuration during assembly.

L. \textit{NUMCAM}. If 6, camera used may be changed at run time.

M. \textit{PTYPE}. If 3, indicates forms are assembled for EBC.

N. \textit{TWOBUF}. Allows code for double-buffered tape reads to be assembled.

O. \textit{7TRACK}. If 1, allows code for 7-track read to be assembled.
P. 9TRACK. If 1, allows code for 9-track read to be assembled.

2.3.2.4 Operator Commands

*TIME=15:48'3.8"
*FRAME=0
*CURRENT PAGE=0
*GO
*CONTINUE
*MAKE FILM=1
*CLEAR
*ADVANCE
*TAPE TYPE - 2,5,8 OR 9=9
*BACK
*PARITY=1
*USE=1
*REWIND
*SKIP
*TRY AGAIN=10
*FORM=NUL16 FORM1 FORM2 FORM3 FORM4
*OVERALL FORM=NO
*ERROR FORM=NO
*HITS-CHARS,VEC,PTS=1,1,1
*FOCUS
*CAMERA=2
*PULLDOWN=5
*LOAD=VAR16
*ROTATION=0
*CARRIAGE CONTROLS=2
1=NONE, 2=VORTEX, 3=TERMINAL
*LINES PER PAGE=60
2.3.3 Analysis

2.3.3.1 Major Control Section

A. Description. Prior to beginning processing of a tape, the operator has the capability to enter the type of carriage controls and the number of lines per page via MONITOR. The default values are VORTEX carriage controls and 60 lines per page.

After MONITOR receives the GO command, the program sets the location and length of the buffers (NEXBUF and CURBUF) to be used for the doubled-buffered tape read. MTRINI is then called to initialize all pointers for the double-buffered read and to read the first two records into the corresponding buffers. CTRLCK will continue reading the tape and processing control records until the first data record is encountered.

If no job separator record was found (S.FLAG = NOP), JOBTLE requests tape identification information (five characters) from the operator. Then JOBID outputs either the information in the job separator or the information from the operator in eyeball-sized letters. Prior to beginning outputting data, HEADER sets the PLS hardware for printing and TOPPAG sets the coordinates for the beginning of a page. VCHTAB, the table of 8- and 7-bit ASCII character code pointers, is loaded as the base address. Bit 0 is set when the base address is loaded so that the character generator will be in the eight-bit/byte mode.

Then the program enters the main print loop. Here, processing branches to one of three different sequences depending on whether the carriage control is NONE, VORTEX, or TERMINAL.

For processing with NONE carriage controls, the routine CTRLCK reads the next record and checks to see if it is a control record. If so, it is appropriately processed, and the next record is read and checked, and this sequence
continues until the print data is accessed. NEXTLN is then called to do a carriage return and line feed (or new page when the current page is full). The number of bytes in the record (MTCNT times 2) is loaded as the character count, and MTPTR, which contains the address of the current tape buffer, is loaded as the starting address. Then the character generator is started. After the line is plotted, the program returns to the beginning of the print loop where CTRLCK is called to read and check the next record.

When processing with VORTEX carriage controls, the routine CTRLCK performs the same function as above until a print record is accessed. GTCTRL then checks the first byte of this record and executes the carriage control. MTCNT times 2 plus 1 (to compensate for the carriage control byte) is loaded as the count for the character generator. The starting address has bit 0 set so that the character generator will start with the right-most byte of the first word. The character generator is then started. After the line is plotted, the program returns to the beginning of the print loop where CTRLCK is called.

Processing with TERMINAL carriage controls requires that each byte be checked, since a carriage control may be any byte(s) in the record. CTRLCK performs the same functions as above until a print record is accessed. SAVCNT (MTCNT times 2) is loaded and the character count and the contents of MTPTR is loaded as the starting address. The program then branches to GTINIT where MTCNT and MTPTR are initialized for GTBYTE. At GTNGO, GTBYTE is called to retrieve a byte from the current tape buffer. If the byte is not a carriage control, it is plotted on film. Then the 2's complement of the characters/record count (SAVCNT) is incremented. If the count is not exhausted, the program returns to GTNGO to get and process the next byte. When SAVCNT is exhausted, MTCNT is changed to a LAM so that the next record will be read. Then the program returns to the beginning of the print loop.

Terminal carriage control bytes are 214 (or 14), 212 (or 12), and 215 (or 15). If the byte retrieved at GTNGO is a 215 (or 15) the program branches to SAMLIN. A 214 (or 14) results in jumping to NXTPG and a 212 (or 12) causes the program to go to NXTLN.
At SAMLIN, THISLN is called to set up for the overprint. The program then returns to the instruction where SAVCNT is incremented. At NXTPG, NXPAGE is called. Then the program returns to the instruction where SAVCNT is incremented. At NXTLN, the routine NEXTLN executes the carriage return/line feed (or goes to a new page when necessary). The program then returns to where SAVCNT is incremented.

When an end-of-file is encountered, CUTMAK is called to output cutmarks on the current frame and NEXPAG flashes the forms (if any) on this final frame. Then JBSPCE spaces down 10 frames in order to separate the jobs on the tape. If this file is the last one in this batch to be processed, S.FLAG is initialized to a NOP. If no job separator was encountered, the file number in the JOBNAM buffer is updated. The file number (FILNUM) is incremented and the record counter (RECNUM) and form number (FRMNUM) are initialized to zero. Then the next file is processed. Upon finding a second end-of-file, S.FLAG and JOBTLE are reinitialized for processing a different tape.

B. Input/Output

1. Input. Input is a 7- or 9-track Varian 73 print tape.

2. Output. Output is to 16 mm film.

C. Linkages

1. External Routines

   CUTMAK KYBLIS MTLAC ROTTST
   FLASH MCRLF MTRINI SETPLS
   FRSPIC MDOUT NEXPIC
   GHTNUM MMESSG PSTLL

2. Internal Routines

   BMSTLL DFCTRL GTCTRL LDINFO NXTLN PPAGE
   CRGCTL FRFLAS HEADER LINES NXPAG THISLN
   CTRLCK GTBYTE JOBTLE NEXPAG PFLASH TOPPAG

3.3.2 Subroutines

A. JOBTLE. Called if no job separator record is encountered before the print data is accessed. The message ENTER TAPE
NUMBER: is output at the teletype via MMESSG. Then the input characters (five entries) are read and printed at the teletype. If a RUBOUT (ASCII 377) is encountered, the routine branches back to its beginning; otherwise, the entries are stored in the buffer JOBNAME as the instruction "LAC VCHTAB + (octal value of entry)." The sixth entry of JOBNAME is the current file number in ASCII configuration.

B. GTBYTE. Unpacks the 16 least significant bits of a word into two eight-bit bytes. The left-most byte is returned in the accumulator on the first call and the right-most byte is returned on the second call, etc. MTPTR points to the word to be unpacked.

C. HEADER. Loads the appropriate X delta, Y delta, spot size, character size, and intensity registers, and then sets the optical hardware via SETPLS.

D. NEXPAG. Finishes the current page by flashing the forms (if any) via PPAGE and FRFLAS, advancing to the next frame by calling NEXPIC, and initializing for the next page with routine TOPPAG.

E. TOPPAG. Resets the line count (LNCNT) and resets the X and Y DAC's to the beginning position for a page.

F. FRFLAS. Flashes the overall form if one has been loaded.

G. PPAGE. Flashes the error form when the error flag (ERFLAG) has been set if one has been loaded. Other forms (if loaded) will be flashed if FLASSW is set to a NOP.

H. THISLN. Is called when the carriage control is to over­print the next line. The X DAC is repositioned to the beginning of the current line, and BMSTLL allows the DAC's to settle before returning to the main loop.

I. NEXTLN. Called when the carriage control is a single space. The page line number (LNCNT) is incremented and checked to see if it is zero. If so, the page is full and the routine branches to NUPAGE where NXPAGE is called. If
LNCNT is not zero, CRT is executed and BMSTLL is called to allow the DAC's time to settle before processing the next line.

J. NXPAGE. Waits for all plotting to finish (PSTLL) and calls CUTMAK to output cutmarks on this frame. Then NEXPAG is called to flash forms on this frame and set up for the next one. KYBLTS then checks for teletype interrupts.

K. GTCTRL. Decodes the vortex carriage control bytes. The word from the tape buffer with the carriage control in the left-most byte should be in the accumulator prior to entering GTCTRL. The contents of the accumulator are shifted right eight bits and the six least significant bits are masked off and retained. A result of 61 causes the program to branch to NXPG, where the subroutine NXPAGE is called. If the result is 53, the program branches to SAMLIN where THISLN is called. If the carriage control is a 60, NEXTLN is called twice. Any other code results in NEXTLN being called.

L. BMSTLL. Allows a delay of 120 cycles.

M. CUTMAK. Draws three groups of five vectors in the upper left corner of the 16 mm frame.

N. JBSPCE. Spaces down 10 frames when an end-of-file is encountered.

O. CTRLCK. Calls MTLAC to read the next record and retrieve the first word from the current tape buffer. Then the 2's complement characters/line count (SAVGNT) is computed. The first byte of this record is then checked for being a 245, indicating a fiche control record. If it isn't, the program returns to the print loop where the record is output. Otherwise, the second byte is then checked. An S record is processed at SREC where bytes 15-20 are stored in JOBNAME as the tape identification. An F record is decoded at FREC to get the number for FRMNUM. T, C or E
records are skipped. (If a control record is none of the above, the program assumes that it is actually a print record and then returns to the print loop.) The program then goes back to the beginning of CTRLCK, where the next record is read.

P. JOBID. Outputs the six entries in JOBNAME in eyeball-sized characters, using DRWCHR. There are three characters on each of two frames with a cutmark on each one.

2.3.3.3 Constants and Variables

A. Internal

1. SAVCNT. Contains the 2's complement number of characters to be output in the current line. This number is computed by doubling the number of words (MTCNT) in the record just read. If processing with VORTEX controls, the carriage control byte is compensated for by adding one.

2. NEXBUF. Contains the address of the buffer to be used during the next tape read.

3. TMPCT. A multi-purpose variable.

4. CURBUF. Contains the address of the current tape buffer.

5. SV. Contains the first carriage control byte of a job (when processing with VORTEX controls).

6. LNCNT. Currently contains the 2's complement of the line's per page minus the current line number.

7. TEMP. A multipurpose location.

8. VCHYI. Contains the beginning Y coordinate for a page.

9. GTSAVE. Contains the word from the tape buffer currently being unpacked by GTBYTE.

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10. **TNMBR.** Counter used for reading teletype entries in **JOBTLF.**

11. **NTREE.** Contains the current entry from the teletype.

12. **JOBNAM.** Name of the buffer which contains the information input by operator as the first five entries and the file number in ASCII as the sixth.

13. **TNMMSG.** Name of the buffer containing the message **ENTER TAPE NUMBER:**.

14. **ILLEG1.** Name of the buffer containing the message **INVALID ENTRY.**

15. **CCTYPE.** Name of the buffer containing the message 1=NONE, 2=VORTEX, 3=TERMINAL, displayed on the monitor to explain the carriage control option.

16. **XORWRD.** If 400,000, indicates VORTEX carriage controls; otherwise, it is zero. Used to initialize the starting address for the character generator.

17. **CTRL.** Contains carriage control indicator (1 for NONE, 2 for VORTEX, or 3 for TERMINAL). This is operator-accessible via **MONITOR.**

18. **LNS.** Contains the maximum number of lines per page. The default value is 60. However, LNS is operator-accessible via the **MONITOR.**

19. **ERFLAG.** Indicates an error is set to a LAM. Allows error form (if one has been loaded) to be flashed on the page.

20. **ERFMFL.** Contains the address of the error form if this form has been loaded.

21. **FRMFNL.** Contains the address of the overall form if this form has been loaded.
22. **FRMNUM.** Contains the number of the form to be flashed (0, 1, 2, 3, or 4).

23. **FRMTAB.** A table of the addresses of the forms which have been loaded.

24. **LENGTH.** The 2's complement of the length of a single tape buffer.

25. **BUFFER.** Area reserved for the tape buffers.

26. **XFOFF.** Contains the X offset for using forms.

27. **YFOFF.** Y offset for using forms.

28. **SPCNUM.** Contains the number of scope points to be used for a character space.

29. **LNFDNM.** Contains the number of scope points to move during a line feed.

30. **FORMSW.** Indicates that a form has been loaded if it contains a SKP.

31. **FLASSW.** Allows the subroutine PFLASH to be called when set to a NOP. Should be set to a SKP when forms are not to be flashed.

32. **FRAME.** Frame counter for the JOBID routine.

33. **LETTER.** Letters per frame counter in the JOBID routine.

34. **VCHARD.** Contains the instruction for getting the appropriate character code pointer from VCHTAB before calling DRWCHR.

35. **FCXP.** Contains the starting X coordinate for the next eyeball-sized character to be output by DRWCHR.

36. **FCYP.** Contains the starting Y coordinate for the next eyeball-sized character to be output by DRWCHR.
B. External

1. **MTPTR.** Auto-index register 10, used for accessing words in the current tape buffer.

2. **PBUFSZ.** Contains the 2's complement of the length of a tape buffer.

3. **VCHTAB.** Table of eight- and seven-bit ASCII character code pointers.

4. **MVDATA.** Used as a temporary counter location.

5. **LEFTX.** Contains the X coordinate for the beginning of a page.

6. **FILCNT.** Contains the 2's complement of the number of files left to be processed in the current batch.

7. **FILNUM.** Contains the number of the current file.

8. **RECNUM.** Contains the record number of the record in CURBUF.

9. **CHDELX.** Contains the value to be loaded into the X delta register.

10. **CHDELY.** Contains the value to be loaded into the Y delta register.

11. **CHRSIZ.** Contains the value to be loaded into the size register by SETPLS.

12. **RECPIN.** Contains the value to be loaded into the brightness register by SETPLS.

13. **RECSPT.** Contains the value to be loaded into the spot size register by SETPLS.
14. **DECNUM.** Contains the decimal configuration of the number after `GETNUM` is called. If no number is found by `GETNUM`, `DECNUM` contains a LAM.

15. **MTCNT.** Contains the 2's complement number of words read into the tape buffer.

16. **TOPY.** Contains the beginning Y coordinate for a page.

17. **FRMPTR.** Points to the beginning of the form to be flashed.

3.3.3.4 **Flow Charts.** See following pages.
BEGIN

Set up for a double-buffered read

BEGIN DOUBLE-BUFFERED READ

ADVANCE TO NEXT FRAME

GET BEGINNING CONTROL RECORDS

WAS JOB SEPARATOR FOUND?

Y

A

N

B
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**Flowchart Diagram**

1. **B**
   - *JOB TITLE*
   - Get job id info from operator

2. **A**
   - *JOB ID*
   - Output eyeball size info
     - **SKIP** S.FLAG to indicate batch id entered

3. **C**
   - *HEADER*
   - Set hardware

4. **NEXT PAGE**
   - Set up for new page
Load VCHTAB as the base address for the character generator.

N O N E controls?

\[ \text{Y} \quad \text{N} \]
PRNTLP

CTRLCK
Read and check for control record

Y

VORTEX controls?

N

NONE controls?

Y

GT CTRL
Get and execute carriage control

N

NEXTLN
Go to next line

F

Load SAVCUT as character count for character generator

G

E

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
Load starting address for the character generator

Terminal control? Y

Start character generator and print line.

LAM -> MTENT so CTRUCK will read next record

PENTLP
GTINIT

Restore tape read parameters for GTBYTE

GTNGO

GTBYTE
Get next byte

Byte = 15 ?

Y: SAML
N:

Byte = 14 ?

Y: NXTPG
N:

Byte = 12 ?

Y: NXTLN
N:

H
Plot the character

This record finished?

Y

LAM\rightarrow MTENT so CTRUCK will read the next record

N

GTNGD

PRNTPP
```
SAMLIN

THIS LN
Set up for over-print

I

NXTPG

NXPAGE
set up for next page

I

NXTLN

NEXTLN
set up for next line

I
```
CAL

"CALL" → PINTUP+1
since carriage controls are
within record

"JMP GTINIT"
→ PINTGO
to branch to
single-plot loop

NOP → CTABLE
so all bytes
will be checked

MDOUB
NONE

HSXTO \rightarrow PRNTGO
Plot record at a time

0 \rightarrow XORRED
so generator will start with left byte

NOP \rightarrow CTUP + 6
so all bytes/record will be plotted

"JMS NEXTUP" \rightarrow PRNTUP + 1
to single space records

MOONER
"JMS CTRL" → PRNTUP + 1 to process carriage control

HSG0 → PRNTED to plot a record at a time

400000 → XORRED so generator will start with right byte

"AACL1" → CTLLCLK to compensate for 1st byte in ch. count

MDONEX
Get number of lines per page (LNS)

Display this number on the CRT

Reproducibility of the original page is poor
FRFLAS

Overall form loaded?

N

Y

Set up coordinates for overall form

FLASH

Flash overall form

Restore coordinates
PFLASH

1st form loaded?

Y

FLASH
Flash it

2nd form loaded?

Y

N

T
NOFORM

MONIT
"NO FORM" to TRY Return to MONITOR

"CONTINUE" begins executing here

O \rightarrow FRMNUM

PFLASX
5 \rightarrow \text{RECPIN} (Intensity) \\
0 \rightarrow \text{RECSPT} (spot size) \\

\text{SETPOS} \\
Set POS for cutmarks \\

Set first heads & tails coordinates \\

\text{MRKONE} \\

Set for 5 strokes \\

\text{STROX}
STROX

_\text{MVOVER}_
\text{set up for DRWVEC}

DRWVEC
\text{Draw the vector}

update x-coordinate

$5$ strokes for this mark done

Y

AA

N

STROX
Update x-coordinate for next mark

All 3 marks done?

N

Y

MKEONE
MOVE

SETXYS
set x- and y-position

SETHOS
set beginning coordinate of the vector

SETTUS
set end coordinate of the vector
CONTROL

K

MTLAC
Read next record

Compute number of characters in this record → SAVCNT

Get first byte in this record

Is it ASCII? Y N

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
J

Get second byte of this record

Is it ASCII S?

Y

SPEC

N

Is it ASCII F?

Y

FREE

N

Is it ASCII blank or T or C?

Y

LAM = MTONT so MTLC will read the next record

N

K

READIX
SREC

XX → JOBTUE
To indicate job info from Job Separator record

SKP → S.FLAG
To indicate job id info entered

Get bytes 17-23 of S record & store into JOBNAM as 'JOB VECTAB+VALUE'

READNX
FREC

MT4AC
Get next word

Get left-most byte of this word → FRMNUM

READNK
This line

Get beginning x-coordinate

PSTWL
Wait for all plotting to finish

Load x-DAC

BMSTWL
Allow time for DAC's to settle

Reproducibility of the original page is poor
This page full?

Y

Set up for next page

N

NEXTLN

PSTLL wait for all plotting to finish

NXPAGE

Do carriage return and line feed

BMSTLL allow DAC's time to settle
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NXPAGE

PSLTL
Wait for all plotting to finish

CUTMAK
Do cutmarks

NOP $\rightarrow$ FLASSW
So PPAVE will flash the forms (if any)

NXPAGE
Finish this page and set up for next

KYBLIS
Check for interrupts

.2-234

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
Enter with word containing the carriage control in the left-most byte. Used only for VORTEX controls.

- Get carriage control byte
- Is it a 61?  
  - Y: NEXTPG
  - N: SAMELN
- Is it a 53?
- Is it a 60?
  - Y: Go to the next line
  - N: m

m
Go to the next line

Go to next page

Set up for over print
BMSTLL

-40. → MVDATA

Increment MVDATA until zero.
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JOBUE

N

mcrle
Output carriage return line feed to TRY

TTYRD

Read and echo TRY entry

Is it a rubout?

Y

N

Form LAC VCHTAB+value instruction & store into JOBWAM

s entries made?

N

TRYRD

Y

REPRODUCIBILITY OF Ti
ORIGINAL PAGE IS POO.
Carriage return and line feed to TTY

Store FILNUM into JOBNAM in proper configuration

mcrur
GTBYTE

1st pass?

Y

Set up for second pass

Get next word and
→ GTSAVE

Get left-most byte
ZCDBYTH

Set up for first pass

Get rightmost byte in GTSAVE
Set the PHS for tiling.

FRM

NEXT

Advance to next frame

Get starting x-coordinate for this frame

Set letter counter for this frame (L1, L2)

LTR

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
LTR

Get instruction for finding this character pointer

Set FCNTX, FCNTY, CNTXY.

Get character pointer

DRAWCHAR

Draw the character

P
update x-position

3 characters done?

Y: OUTMAK
   Output a cutmark on this frame

N:

2 frames done?

Y: ROTATE
   Restore rotation

N: LTR

FRM

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
HEADER

Get x- and y- deltas (CHDBLK, CHDBLY)

14 -> CHRS12
Get character size.

7 -> RECPIN
Get intensity for print

0 -> RECSPT
Get spot size for print

Q
SET POS
set pos
hardware for print

G
NEXPAG

PPAGE
Flash forms (if any)

FRELAS
Flash overall form (if one)

NEXPIC
Advance to next frame

TOPPAG
Set DAC's for beginning this page

R
SKP → FLAS$10$
so forms don't flash
TOPPAK

RESET LNONT

Get beginning y coordinate

PSTLU
Wait for all plotting to finish

Load y - DAC

S
Get beginning x-coordinate

Load x-DAC
2.4 COMA VARIAN 73 PRINT PROCESSOR FOR 105 mm FICHE (VAR105)

2.4.1 Background

A. Author. B. Miller, Aeronutronic Ford Corporation

B. Intent. The requirements for this program are specified in SH-25752.

C. Program History

1. Production Tape Date. 26 November 1974
2. Author. B. Miller
3. Authorization. Clarification form A15; SH-25752
4. Test Case. TPS (JSC Form 1225) Number A5.
5. Revisions. Reference Appendix B, paragraph B.4

2.4.2 Introduction

2.4.2.1 Hardware Requirements

- FR80 with 12K memory
- 7- and 9-track tape drive
- 105 mm fiche camera

2.4.2.2 Software Requirements

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<td>III166 TABLE</td>
<td>III164</td>
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</table>
2.4.2.3 Assembly Parameters

A. ALLOW. Allows code for forms loading and flashing to be assembled.

B. ASCII. Causes the 7-bit ASCII table to be assembled as VCHTAB.

C. BATCH. Allows code for batch processing to be assembled.

D. BIGBUF. If 0, allows the MONITOR to be assembled with a maximum number of features.

E. CAMNUM. If 9, camera parameters are assembled for the fiche camera.

F. FINDEX. Allows code for indexing to be assembled.

G. FONT. If 0, allows the assembly of the character font FILM.

H. FTYPE. Indicates the camera type (105).

I. INDEX. Allows code for indexing to be assembled.

J. MANYUP. Allows code for fiche processing (multiple images/frame) to be assembled.

K. MTMANY. If 0, code for using only one drive will be assembled in the tape routines.

L. MTPTR. If 10, auto-index register 10 will be MTPTR.

M. MTSIZE. Size of the teletype buffer.

N. MUMBLE. If 1, allows assembler to output program configuration during assembly.

O. NUMCAM. If 1, camera may not be changed at run time.

P. PTYPE. If 3, indicates forms are assembled for EBC.
Q. **TITLE.** Allows code for processing and outputting title information to be assembled.

R. **TWOBUF.** Allows code for double-buffered tape reads to be assembled.

S. **VARIAN.** Allows specific changes in the SYM files for Varian to be assembled.

T. **42INDX.** Defines size of the buffer for storing index information for a fiche.

U. **7TRACK.** If 1, allows code for 7-track read to be assembled.

V. **9TRACK.** If 1, allows code for 9-track read to be assembled.

### 2.4.2.4 Operator Commands

*  
*TIME=15:47'23.9''
*FRAME=0
*CURRENT PAGE=0
*GO
*CONTINUE
*TITLE
*END JOB
*MAKE FILM=1
*CLEAR
*ADVANCE
*TAPE TYPE - 2, 5, 8 OR 9=9
*BACK
*PARITY=1
*USE=1
*REWIND
2.4.3 Analysis

2.4.3.1 Major Control Section

A. Description. Prior to beginning processing of a tape, the operator has the capability to enter the type of carriage controls and the number of lines per page via MONITOR. The default values are VORTEX carriage controls and 60 lines per page.

After MONITOR receives the GO command, the program sets the location and length of the buffers (NEXBUF and CURBUF) to be used for the doubled-buffered tape read. Then IXINIT is called to initialize indexing parameters. FRSPIC is called to initialize for multiple images per frame. A NOP is put in IFLASW so that the index form won’t be flashed on the blank fiche produced by FC7CLR. MTRINI is
then called to initialize all pointers for the double-buffered read and to read the first two records into the corresponding buffers. CTRLCK checks for and processes fiche control records. CTRLCK will continue reading the tape and processing control records until the first data record is encountered.

If no job separator record was found (S.FLAG = NOP), JOBTLE requests tape identification information (five characters) from the operator. Also, DFCTRL loads and processes default job separator and titling information.

Before starting to output data, HEADER sets the PLS hardware for printing and TOPPAG sets the coordinates for the beginning of a page. IFLASW is changed to a SKP so that the index form will flash. VCHTAB, the table of eight-and seven-bit ASCII character code pointers, is loaded as the base address. Bit 0 is set when the base address is loaded so the character generator will be in the 8-bit/byte mode.

Then the program enters the main print loop. Here, processing branches to one of three different sequences depending on whether the carriage control is NONE, VORTEX or TERMINAL. For processing with NONE carriage controls, the routine CTRLCK reads the next record and checks to see if it is a control record. If so, it is appropriately processed and the next record is read and checked. This sequence continues until the print data is accessed. NEXTLN is then called to do a carriage return and line feed (or new page when the current page is full). The number of bytes in the record (MTCNT times 2) is loaded as the character count, and MTPTR, which contains the address of the current tape buffer, is loaded as the starting address. Then the character generator is started. After the line is plotted, the program returns to the beginning of the print loop where CTRLCK is called to read and check the next record.

When processing with VORTEX carriage controls, the routine CTRLCK performs the same function as above until a print record is accessed. GTCTRL then checks the first byte of
this record and decides what carriage control to execute. MTCNT times 2 plus 1 (to compensate for the carriage control byte) is loaded as the count for the character generator. The starting address has bit 0 set so that the character generator will start with the right-most byte of the first word. The character generator is then started. After the line is plotted, the program returns to the beginning of the print loop where CTRLCK is called.

Processing with TERMINAL carriage controls requires that each byte be checked, since a carriage control may be any byte(s) in the record. CTRLCK performs the same function as above until a print record is accessed. SAVCNT (MTCNT times 2) is loaded and the character count and the contents of MTPTR is loaded as the starting address. The program then branches to GTINIT where MTCNT and MTPTR are initialized for GTBYTE. INDEXER is zeroed so that IXLOAD is never called in NEXTLN. GTBYTE is set up for a first pass and IXCHCK is called to check for indexing on the current line. At GTNGO, GTBYTE is called to retrieve a byte from the current tape buffer. If the byte is not a carriage control, it is stored in TITARE if the current line is the index line, and then is plotted on film. The character count for the current line (IXCNT) is then incremented. Then, at ISZCNT, the 2's complement of the characters/record count (SAVCNT) is incremented. If the count is not exhausted, the program returns to GTNGO to get and process the next byte. When SAVCNT is exhausted, MTCNT is changed to a LAM so that the next record will be read. Then the program returns to the beginning of the print loop.

Terminal carriage control bytes are 214 (or 14), 212 (or 12), and 215 (or 15). If the byte retrieved at GTNGO is a 215 (or 15) the program branches to SAMLIN. A 214 (or 14) results in jumping to NXTPG and a 212 (or 12) causes the program to go to NXTLN.

At SAMLIN, the routine IX.DO processes the index information if the current line is the index line. Then the characters/line count (IXCNT) is zeroed and THISLN is called to set up
The program then returns to ISZCNT. At NXTPG, NXPAGE is called. (If the last line output is the index line, the information in TITARE will be processed in NXPAGE.) IXCNT is initialized and IXCHCK is called to check for indexing with the first line. The program returns to ISZCNT. At NXTLN, IX.DO processes the indexing information if the line just filmed was the index line. NEXTLN then executes the carriage return/line feed (or goes to a new page when necessary). IXCHCK checks to see if the line to be output next is the index line. The program then returns to ISZCNT.

When an end-of-file is encountered, NEXPAG is called to finish the current page. Then FICFIN finishes the current fiche. If this file is the last one in this batch to be processed, S.FLAG is initialized to a NOP. If no job separator was encountered, the file number in the JOBNAME buffer is updated. The file number (FILNUM) is incremented and the record counter (RECNUM) and form number (FRMNUM) are initialized to zero. Then the next file is processed. Upon finding a second end-of-file, S.FLAG and JOBTLE are reinitialized for processing a different tape.

### B. Input/Output

1. **Input.** Input is a 7- or 9-track Varian 73 print tape.
2. **Output.** Output is to 105 mm microfiche.

### C. Linkages

#### 1. External Routines

- FCFIN
- FLASH
- INDXDO
- MDOUT
- MTRINI
- ROTTST
- FC7CLR
- FRSPIC
- KYBLIS
- MEMSSG
- NEXPIC
- SETPLS
- FICTAP
- GETNUM
- MCRLF
- MTLAC
- PSTLL

#### 2. Internal Routines

- BMSTLL
- FRPLAS
- IXCHCK
- IX.DO
- NEXPAG
- PPAGE
- CRGCTL
- GTBYTE
- IXINIT
- JOBTLE
- NEXTLN
- THISLN
- CTRLCK
- GTCTRL
- IXLOAD
- LDINFO
- NXPAGE
- TOPPAG
- DFCTRL
- HEADER
- IXPAGE
- LINES
- PFLASH
- 2SPACE

### 2.4.3.2 Subroutines

#### A. IXPAGE

Initializes each page for indexing by resetting the index line counter (INDXER), by putting a NOP in IXLDISW to indicate that the index information for this page has not been stored, and by blank-filling the index area of the buffer TITARE.
B. IXINIT. Called at the beginning of each job to default all indexing parameters. In the event that an indexing record is encountered, all the parameters will be reset. Otherwise the line number for indexing (INXLIN) shall be 1, indexing will start with the 32nd character (INXCHR), and the index field shall be 20 characters in length (IXXLEN).

C. IXLOAD. Used only for VORTEX and NONE processing. Loads the index line into the buffer TITARE and calls INDXO, which processes the index line. At the point in the program where IXLOAD is called, the data for the last line output is in the previous tape buffer, NEXBUF. The record, beginning with the second byte if processing with VORTEX controls, is transferred one byte per word into the buffer TITARE by the subroutine GTBYTE. A SKP is deposited in IXLDSW to indicate that the page has been indexed and MTPTR is restored for the print loop.

D. LDINFO. Used to load the default job titling and the job separator information into TITARE. Then the subroutine FICTAP is called to process the information in the buffer. LDINFO is called with the 2's complement of the number of entries to be transferred to TITARE in the accumulator. The next instruction after the JMS LDINFO should load the accumulator with the address of the buffer containing the information to be transferred minus one. This instruction is executed within LDINFO, and subsequently the return address of LDINFO is incremented.

E. JOBTLE. Called if no job separator record is encountered before the print data is accessed. The message ENTER TAPE NUMBER: is output at the teletype via MMESSG. Then the input characters (five entries) are read and printed at the teletype. If a RUBOUT (ASCII 377) is encountered, the routine branches back to its beginning; otherwise, the five entries are stored in the buffer JOBNAM. The sixth entry of JOBNAM is the current file number (in ASCII configuration)

F. DFCTRL. Loads and processes the default job separator and job title information if no job separator is initially encountered at the beginning of the file. The subroutine LDINFO is used to transfer the information in SEPREC (default job title information).
G. **GTBYTE.** Unpacks the 16 least significant bits of a word into two eight-bit bytes. The left-most byte is returned in accumulator on the first call and the right-most byte is returned on the second call, etc. MTPTR points to the word to be unpacked.

H. **HEADER.** Loads the appropriate X-delta, Y-delta, spot size, character size, and intensity registers, and then sets the optical hardware via SETPLS.

I. **NEXPAG.** Finishes the current page by flashing the forms (if any) via PPAGE and FRFLAS, advances to the next frame (or fiche when necessary) by calling NEXPIC, and initializes for the next page with the routines TOPPAG and HEADER.

J. **TOPPAG.** Resets the line count (LNCNT), resets the X and Y DAC's to the beginning position for a page, and calls IXPAGE to initialize for indexing this page.

K. **FRFLAS.** Flashes the overall form if one has been loaded.

L. **PPAGE.** Flashes the error form (if one) and other forms (if any) if FLASSW is set to a NOP. If FLASSW is a SKP, no forms will output.

M. **IXCHCK.** Used only when processing with TERMINAL carriage controls. This routine checks IXLDSW to set if this page has been indexed. If so, the subroutine exits. Otherwise, the current line count is checked for being the index line. If it isn't, IXSW is changed to a SKP to prevent storage of the bytes in TITARE, and the routine exits. If the current line is the index line, IXSW is changed to a NOP so that the non-carriage control bytes will be stored in TITARE.

N. **THISLN.** Called when the carriage control is to overprint the next line. The index line count (INDXER) is incremented and then checked for being zero. If it is, the line just filmed contains the index information and is transferred to TITARE by IXLOAD. Otherwise, the index line count is restored. Then the X DAC is repositioned to the
beginning of the current line, and BMSTLL allows the DAC's to settle before returning to the main loop.

Q. **NEXTLN.** Called when the carriage control is a single space. The index line count (INDEXER) is incremented and checked for being zero. If it is, the record just filmed is loaded into TITARE and processed by IXLOAD. Then the page line number (LNCNT) is incremented and checked for being zero. If it is, the page is full and the routine branches to NUPAGE where NXPAGE is called. If LNCNT is not zero, CRT is executed and BMSTLL is called to allow the DAC's time to settle before processing the next line.

P. **NXPAGE.** First checks IXLD SW to see if the current page has been indexed. If not, the blank-filled area of TITARE is processed as the index information by INXDO. Then FLASSW is changed to a NOP to allow forms to be flashed and NEXPAG is called. KYBLIS checks for interrupts before exiting NXPAGE.

Q. **GTCTRL.** Decodes the VORTEX carriage control bytes. The word from the tape buffer with the carriage control in the left-most byte should be in the accumulator prior to entering GTCTRL. The contents of the accumulator are shifted right eight bits and the six least significant bits are masked off and retained. A result of 61 causes the program to branch to NXPG, where the subroutine NXPAGE is called. If the result is 53, the program branches to SAMLIN and then calls THISLN. If the carriage control is a 60, 2SPACE is called to space down the first line (in case of indexing on the blank line) and then NEXTLN is called. Any other code results in NBXTLN being called.

R. **2SPACE.** First calls NEXTLN, then the line number of the line to be left blank is checked for being the index line. If it is, the blank-filled area of TITARE is processed as the index information for this page by IX.DO.

S. **BMSTLL.** Allows a delay of 120 cycles.
T. CTRLCK. Calls MTLAC to read the next record and retrieve the first word from the current tape buffer. Then the 2's complement characters/line count (SAVCNT) is computed. The first byte of this record is then checked for being a 245, indicating a fiche control record. If it isn't, the program returns to the print loop where the record is output. Otherwise, the second byte is then checked. An S record is processed at SREC, where JOBTLE and S.FLAG are set to indicate the tape ID information came from a control record, and then the program goes to CREC where the record, beginning with the 2nd byte, is stored into TITARE and decoded by FICTAP. F, T, C, or B records are processed at CREC. Then the program returns to the beginning of CTRLCK where MTLAC reads the next record. (If a control record is not one of the above type records, the program returns to the print loop where the record is output.)

2.4.3.3 Constants and Variables

A. Internal

1. SAVCNT. Contains the 2's complement number of characters to be output in the current line, computed by doubling the number of words (MTCNT) in the record just read. If processing with VORTEX controls, the carriage control byte is compensated for by adding one.

2. NEXBUF. Contains the address of the buffer to be used during the next tape read.

3. SAVICT. Contains the number of characters to be output in the current line (2's complement of SAVCNT).

4. IXXXX. Index line number, used only with terminal controls. A different scheme for indexing must be used since a line may consist of more than one record.

5. IXLCNT. SAVCNT for the previous read; the count used for moving the record into TITARE.
6. **IXCNT.** Character count for a line, used when processing with terminal controls for counting characters in a line that may be more than one record in length.

7. **TMPCT.** A multi-purpose variable.

8. **INDXER.** The 2's complement of the index line number.

9. **CURBUF.** Contains the address of the current tape buffer.

10. **SV.** Contains the first carriage control byte of a job (when processing with VORTEX controls).

11. **LNCNT.** Currently contains the 2's complement of the line's per page minus the current line number.

12. **TEMP.** Multipurpose location.

13. **VCHYI.** Contains the beginning Y coordinate for a page.

14. **GTSAVE.** Contains the word from the tape buffer currently being unpacked by GTBYTE.

15. **TNMBR.** Counter used for reading teletype entries in JOBTLE.

16. **NTREE.** Contains the current entry from the teletype.

17. **IXLINE.** Default index line number (= 1).

18. **IXSTRT.** Default beginning index character number (= 32).

19. **IXLONG.** Default length of the index field (= 20).

20. **SEPREC.** Name for buffer containing the default job separator information.

21. **JOBNAM.** Name of buffer within SEPREC which contains the information input by operator as the first five entries, and the file number in ASCII as the sixth.
22. **TLEREC.** Name of the buffer containing the default title record information.

23. **IXSW.** If NOP, allows storing of index information into TITARE; used only if processing with terminal controls.

24. **IXLDSW.** If NOP, indicates that index information has not been encountered. IXLDSW is changed to a SKP once the information for the current page has been processed.

25. **TNMMSG.** Name of buffer containing the message ENTER TAPE NUMBER:

26. **ILLEG.** Name of buffer containing message INVALID ENTRY.

27. **CCTYPE.** Name of buffer containing the message 1=NONE, 2=VORTEX, 3=TERMINAL, displayed on the monitor to explain the carriage control option.

28. **XORWRD.** For VORTEX carriage controls, equals 400,000; otherwise, it is zero. Used to initialize the starting address for the character generator.

29. **CTRL.** Contains the carriage control indicator (1 for NONE, 2 for VORTEX, or 3 for TERMINAL). This is operator-accessible via MONITOR.

30. **LNS.** Contains the maximum number of lines per page. The default value is 60; however, LNS is operator-accessible via MONITOR.

31. **ERFLAG.** Indicates an error if set to a LAM. Allows error form (if one has been loaded) to be flashed on the page.

32. **ERFMFL.** Contains the address of the error form if this form has been loaded.
33. **FRAMFL.** Contains the address of the overall form if this form has been loaded.

34. **FRMNUM.** Contains the number of the form to be flashed (0, 1, 2, 3, or 4).

35. **FRMTAB.** Table of the addresses of the forms which have been loaded.

36. **LENGTH.** The 2's complement of the length of a single tape buffer.

37. **BUFFER.** Area reserved for the tape buffers.

38. **XFOFF.** Contains X offset for using forms.

39. **YFOFF.** Contains Y offset for using forms.

40. **CHRSZ.** Contains character size to be used.

41. **SPCNUM.** Contains number of scope points to be used for a character space.

42. **LNFDN.** Contains number of scope points to move during a line feed.

43. **BLANK.** Contains tape code for a blank.

44. **FORMSW.** Indicates that a form has been loaded if it contains a SKP.

**B. External**

1. **TITARE.** Name of buffer where the fiche control records and index records are stored (one byte/word) before being processed.

2. **INXLIN.** Contains the line number of the line to be used for indexing.
3. **INXCHR.** Contains starting character position within the line for beginning indexing.

4. **IXXLEN.** Contains 2's complement of the length of the index field.

5. **MTPTR.** Auto-index register 10, used for accessing words in the current tape buffer.

6. **PBUFSZ.** Contains 2's complement of the length of a tape buffer.

7. **IFLASW.** Allows index form and information to be output if it contains a SKP. A NOP in IFLASW prevents index output.

8. **VCHTAB.** Table of eight- and seven-bit ASCII character code pointers.

9. **MVDATA.** Used as a temporary counter location.

10. **LEFTX.** Contains X coordinate for the beginning of a page.

11. **FILCNT.** Contains 2's complement of the number of files left to be processed in the current batch.

12. **FILNUM.** Contains number of current file.

13. **RECNUM.** Contains record number of record in CURBUF.

14. **CHDELX.** Contains value to be loaded into X delta register.

15. **CHDELY.** Contains value to be loaded into Y delta register.

16. **CHRSIZ.** Contains value to be loaded into size register by SETPLS.
17. RECPIN. Contains value to be loaded into brightness register by SETPLS.

18. RECSPT. Contains value to be loaded into spot size register by SETPLS.

19. DECNUM. Contains decimal configuration of the number after GETNUM is called. If no number is found by GETNUM, DECNUM contains a LAM.

20. MTCNT. Contains 2's complement number of words read into the tape buffer.

2.4.3.4 Flow Charts. See following pages.
BEGIN

Set up for double-buffer read

ASCII blank (240) → BLANK (for index form)

IXINIT
Initialize indexing parameters

ERSPIC
Initialize for file

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
Initialize TPOINT

NOP -> IFLASH
so index form won't flash on blank file.

FC7CLR
Produce blank file.

0 -> MAXTRW
Initialize MAXTRW

MTRINI
Begin double-buffered read.

DD
DD

CTALCK
Check for control records

Y

JOB TLE
Get job id information from operator

N

D E CTRL
Check for defaulting control record

ΕΕ

SKP= S.FLAG
Show job id info entered for this batch

ΕΕ

FF

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
Set PLS for print

Set up for beginning a new page

so indexing will now be output

Load VCHTAB as the base address for the character generator

'NONE' controls ?

Y

N

H H

GG

2-270
Load starting address (MTPTR) (Begin with rightmost byte if vertex)

Terminal controls?

Y

N

Start character generator and plot line

LAM = MTENT so CTTRCK will read next record

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
NN

Byte = 15 ?

Y         Y
  SAMLIN  \  \n
N         Y

Byte = 14 ?

N

Byte = 12 ?

Y

NXTLIN

Y

Is this the index line?

N

OO

Y

Store byte into TITARE

O.O
LL

Restore tape read parameters for GTBYTE

Initialize GTBYTE for a first pass

IXCHECK
See if this is the index line

GTBYTE
Get next byte

Mask off 7 LSB

NN
CARCON

GETNUM
Get # off TTY

Was any # entered?

Y

→ CTRL

N

Was it a 1?

Y

NONE

N

Was it a 2?

Y

VORTEX

N

AB

(Part of MONITOR)
Is it a 3?

Y

TERMINAL

N

MMFSSG
"ILLEGAL ENTRY"
to TTY

MDOSEX
"C Li" → PRINTPL
since carriage controls are
within record

"JMP GTINIT"
→ PRINTGO
to branch to
single-plot loop

NOP → CTRCK
so all bytes
will be checked

MODU8
NONE

HS40 → PRNTGD
Plot record at a time

0 → XORWRD
so generator will start with left byte

NOP → CRTRK + 6
so all bytes in record will be plotted

"JMS NEXT 100"
→ PRNTUP + 1
to single space records

MOONEX
"JMS CTRL" → PRINTUP + 1 to process carriage control

HSGO → PRINTED to plot a record at a time

400000 → XORRED so generator will start w right byte

"AAC.I" → CTRL.Key to compensate for 1st byte in ch. count

MONEY

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
(Part of Monitor)

GETNUM
Get the number at the TTY

was any number entered?

Y

→ UNS

N

format

format

Is the # ≤ 60?

Y

MPONEX

N
CAGCTL

Get contents of CTRL

MTIOUT

Display CTRL on the CRT

Get starting address of explanation buffer

MMESSG

Display message on the CRT
LINES

Get number of lines per page (LNS)

MOOUT
Display this number on the CRT

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
FRFLAS

Overall form loaded?

Y
Set up coordinates for overall form

N

FLASH
Flash the overall form

Restore coordinates
PRODUCIBILITY OF THE ORIGINAL PAGE IS POOR.
IXPAGE

Set index line counter for VORTEX and NONE controls (INDEXER)

Set index line number for TERMINAL controls (IXXXX)

NOP => IXLD5W to indicate this page not yet indexed

Blank-fill
TITARE

2-292
INIT

Default INXLIN (Index line) to 1

Default INXCHR to 32.

Default INXXLEN to 20.
IXLOAD

Make TPTR point to NEXBUF

Initialize GTBYTE

VORTEX CONTROLS?

GTBYTE Bypass carriage control

A

A

2-294
Make II point to TITARE

Get next byte

Store in TITARE

All bytes transferred?

Y

N

B

C
SISO-TR531
Vol. II

IXLCAD

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
LDINFO

contents of AC (word count) → TMPCT

make 11 point to TITLE

Get buffer address

make 12 point to buffer

D
Move word from buffer to TITARE

All words moved?

Y

FICTAP
Process information in TITARE

N
L

MTLAC
Read next record

Compute character count and → SAVCNT

2'S complement SAVCNT → SAVICT

Get first byte of the record
XX->JOBTLE to indicate information is from control record

SKIP->S.FLAG to indicate info for this batch entered

TITARE->II
Set up for storing into TITARE

Initialize GTBYTE

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
I

GTBYTE
Bypass "%"

J

GTBYTE
Get next byte

Store into
TITARE

All bytes transferred?

N

Y

K

J

CTRU CK
Blank-fill
TITARE

LAM = MTENT
so MTLAE
will read
next record

K

L
```
INXDO
Process information in TITARE

SKP = IXLDSW to indicate this page has been indexed

SKP = IXSW to stop storing into TITARE
```

Reproducibility of the original page is poor.
Reload X DAC

BMSTL:
Allow DAC's to settle
NEXTUN

Is this the index line?

move and process last record

Is this page filled?

Wait for all plotting to finish

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
Do a carriage return and line feed.

Allow DAC's to settle.

Set up for new page.
Get the carriage control byte

Is it 61?

Is it 53?

Is it 60?
2 SPACE
Watch for indexing on the blank line

T

NEXTLN
Go down to next line

R

NXPAGE
Go to next page

S

THISLN
Return to the beginning of this line
-40. → mvDATA

Increment mvDATA until zero
MCRLE
(Carriage return and line feed (TTY))

Make II point to JOBNAME

Output: ENTER TAPE NUMBER: at the teletype

Read and echo the keyboard entry

W

X

V

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
Is it a double (37)?

N

Store entry into JOBNAM

N

All five entries made?

Y

MCRLE
Carriage return and line feed

Y

Get ASCII configuration of file number and store into JOBNAM

N

W
GTBYTE

1st pass?

N

Y

set up for second pass

load indirect from mPTRA

Save word in GTSAVE for second pass

≠

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
Get left-most byte

Set up for 1st pass

Get right-most byte in GETSAVE
Get $\Delta x$ and $\Delta y$ according to rotation for print data

Get character size for print

Get intensity for print

Get spot size for print
REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
BB

HEADER
Reset PL5 for print

SKP→ FLASSW
so forms won't flash

2-321
TOPPAGE

Reset line counter (LNcnt)

Set x- and y-DAC's for beginning a new page

INDEX

Initialize indexing parameters

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
2.5 COMA HCO TABULAR PROCESSOR FOR 105 mm FICHE (HCOTAB)

2.5.1 Background

A. Author. Franklin C. Ashton, Aeronutronic Ford Corp.

B. Intent. HCOTAB processes 9-track and 7-track magnetic tapes formatted in 36-bit DTE language as delineated by SISO.

C. Program History

1. Production Tape Date. 26 November 1974
2. Author. Franklin C. Ashton
3. Authorization. EO-191F
4. Test Case. TPS No. A6
5. Revisions. Reference Appendix B, paragraph 5.5

2.5.2 Introduction

2.5.2.1 Hardware Requirements

- FR80 with 12K memory
- 9-track magnetic tape unit
- 7-track magnetic tape unit
- 105 mm camera

2.5.2.2 Software Requirements. The following files, found in III's SYM Directory, are required.

<table>
<thead>
<tr>
<th>III109</th>
<th>III164 FILM</th>
<th>III161</th>
</tr>
</thead>
<tbody>
<tr>
<td>III166</td>
<td>III163</td>
<td>III161 GO</td>
</tr>
<tr>
<td>III164</td>
<td>III147</td>
<td>III187</td>
</tr>
<tr>
<td>III162</td>
<td>III186</td>
<td></td>
</tr>
<tr>
<td>III185</td>
<td>PRINTF COMM</td>
<td></td>
</tr>
</tbody>
</table>
2.5.2.3 Assembly Parameters. The assembly parameters in III109 shall be set for the proper machine configuration. Assembly parameters specific to the HCOTAB Processor are as follows.

A. **TWOBUF.** If 1, indicates two magnetic tape buffers for higher throughput.

B. **BIGBUF.** If 0, allows maximum amount of operator functions with minimum buffer space.

C. **DASHED.** Assemble code for generation of dashed vectors.

D. **CIRCLE.** Assemble code for generation of circles and arcs.

E. **LOCASE.** Lower case character set required.

F. **EBCDIC.** Entire EBCDIC character set required.

G. **7TRACK.** If 1, 7-track magnetic tape handler required.

H. **9TRACK.** If 1, 9-track magnetic tape handler required.

I. **MUMBLE.** Defines system configuration output via teletype during assembly.

J. **FONT.** If 0, assemble standard III character font.

K. **TAPELB.** Assemble code for processing of IBM standard tape labels.

L. **DTE.** If 1, assemble code specific to 36-bit DTE processing.

M. **NASA.** If 1, include NASA-specific character descriptors in character set.

N. **MANYUP.** If 1, defines code for multiple images per frame for 105 mm microfiche.

O. **TITLE.** If 1, assemble routines for fiche titling.
2.5.2.4 Operator Commands. The following commands, entered by the operator via teletype, are available for use with the HCOTAB program.

TIME
FRAME
GO
CONTINUE
TITLE
END JOB
CLEAR
REWIND
SKIP
TRY AGAIN
STANDARD LABEL
UNLABELLED

2.5.3 Analysis

2.5.3.1 Major Control Section

A. Description. Upon issuance of a GO command by the operator via the console teletype, the III routine PSTART transfers control to the DTE processing routine BEGIN. BEGIN initializes all switches and does initial camera advancing and positioning using III routines FC7CLR, FRSPIC, and NEXPIC. A call is made to BATNO for input from teletype of the COM tape number, source tape number, and film roll number. BATNO initializes the fiche title routine, FICTAP, for the ID fiche. BEGIN then determines the location and size of the data input buffer, calculates the X and Y scaling factors for centering the image in the 16K by 16K area, and transfers control to GETCOM, which initializes parameters to access a DTE data word and transfers control
to BITCNT: BITCNT, using the III routine MTBYTE, accesses the number of data bits requested by GETCOM and transfers control to GETOP with the data bits in the AC (up to 18 bits per access).

When a magnetic tape read is initiated and it is the initial read for a job, a test is made by BITCNT for COM controls. If they are not present, the data is ignored and the next data record is accessed. This procedure is repeated until the first COM control record is accessed, when BITCNT checks for a S or T identifier in the second byte of the record. If it is found, the record is moved to buffer TITARE for output via the III routine FICTAP. All records following the first COM control record are ignored for 105 mm processing until a second COM control record is accessed. BITCNT processes the second COM control record in the same manner as the first and transfers control to GETOP for processing of DTE data. GETOP determines from the DTE op code the type of DTE data word to be processed. The following paragraphs delineate the processing done for each type of DTE data word.

When the DTE word is a COMMAND, GETOP transfers control to ENDLIN, which does a check to determine if the word is a JUMP. If not, it is ignored and control is returned to GETCOM. When the word is a JUMP, control is transferred to NEXFRM for advance to next frame via NEXPIC. Control is then returned to GETCOM.

When the DTE word is a VECTOR, the $X_1Y_1$ and $X_2Y_2$ coordinates are calculated and placed in $XHD$, $YHD$, $XTL$, and $YTL$. Control is transferred to MAP, which scales the heads and tails to the image size specified by DFRSZ. The X and Y DAC's are set via SETXYS, the vector is output by DRWVEC, and control is returned to GETCOM.

When a START.PRINT word is accessed, TYPSW (typewriter switch) is set to allow processing of typewriter words. The character and character size are then masked from the START.PRINT word and used to calculate the corresponding FR80 character and character size. This size is used for
all characters until changed by another START PRINT word. Control is transferred to NOINDEX. NOINDEX scales the X and Y START PRINT coordinates to the FR80 image size via MAP, sets the X and Y DAC's using the III routine SETXYS, and outputs the START PRINT character via CHROUT. Control is then returned to GETCOM.

When the DTE word is a TYPEWRITER, the typewriter switch (TYPSW) is checked. When TYPSW is not set, the system halts (i.e., no previous START PRINT word to give coordinates). When TYPSW is set, each character of the TYPEWRITER word is output via CHROUT. CHROUT converts each DTE character to the appropriate FR80 character code and size and outputs the character using III routine VCHAR. When the last character of the TYPEWRITER word is processed, control is returned to GETCOM.

B. Input/Output

1. Input. Data input via 9-track magnetic tape consists of DTE 36-bit command, instruction, and data words and COM control records. All input data tapes are recorded in a variable spanned length record format (blocked or unblocked). Detailed descriptions of the format(s)/data content of the magnetic data tapes are found in SH-09607A.

2. Output. Data is output to 105 mm film. Each frame contains one DTE image.

3. Message Output:
   a. ENTER SOURCE TAPE. Output to the teletype at job initialization. Operator inputs up to 12 characters of information, terminated by a carriage return.
   b. ENTER COM TAPE. Output to the teletype after ENTER SOURCE TAPE response. Operator inputs up to 12 characters of information, terminated by a carriage return.
C. Linkages

1. External

<table>
<thead>
<tr>
<th>Routine</th>
<th>Program</th>
</tr>
</thead>
<tbody>
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<td>III166</td>
</tr>
<tr>
<td>FRSPIC.</td>
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</tr>
<tr>
<td>MNBRIT</td>
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<tr>
<td>NEXPIC</td>
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</tr>
<tr>
<td>KYBLIS</td>
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</tr>
<tr>
<td>GETT</td>
<td>III163</td>
</tr>
<tr>
<td>SETXYS</td>
<td>III162</td>
</tr>
<tr>
<td>SETHD</td>
<td>III162</td>
</tr>
<tr>
<td>SETTL</td>
<td>III162</td>
</tr>
<tr>
<td>DRWVEC</td>
<td>III162</td>
</tr>
<tr>
<td>PSTLL</td>
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<tr>
<td>SETPLS</td>
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<tr>
<td>VCHAR</td>
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</tr>
<tr>
<td>MBYTE</td>
<td>III163</td>
</tr>
<tr>
<td>FICTAP</td>
<td>III186</td>
</tr>
<tr>
<td>MDONEX</td>
<td>III166</td>
</tr>
<tr>
<td>FCFIN</td>
<td>III166</td>
</tr>
<tr>
<td>FLASH</td>
<td>III187</td>
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</tbody>
</table>

2. Internal Routines

<table>
<thead>
<tr>
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<th>NOINDX</th>
<th>GETSG2</th>
<th>SAVADD</th>
</tr>
</thead>
<tbody>
<tr>
<td>GETCOM</td>
<td>SETCR</td>
<td>GETBLK</td>
<td>RESTOR</td>
</tr>
<tr>
<td>GETOP</td>
<td>CHROUT</td>
<td>CCNTRL</td>
<td>BTRN</td>
</tr>
<tr>
<td>GETCR</td>
<td>ENDLN</td>
<td>SEPREC</td>
<td>RESET</td>
</tr>
<tr>
<td>TYPMA</td>
<td>GETSEG</td>
<td>BATEND</td>
<td>MAP</td>
</tr>
<tr>
<td>TYPMA</td>
<td>GETSG1</td>
<td>IGNOR1</td>
<td>SCAL</td>
</tr>
</tbody>
</table>
2.5.3.2 Subroutines

A. BATEND. Outputs the trailing ID fiche at end of job. Calling sequence: JMS BATEND

B. BATNO. Accepts source tape number, COM tape number, and roll number from the operator. The subroutine is called to output the title fiche. Calling sequence: JMS BATNO

C. BITCNT. Entered with the AC containing the number of bits to be accessed. Uses MTBYTE to get bits requested, returning to the calling routine with the bits requested in the AC. Calling sequence, where 1 ≤ N ≤ 18:

\[ \text{LAC } N \]
\[ \text{JMS BITCNT} \]

D. BTTY. Accepts up to 12 characters from TTY and stores one character per word. If the user wishes to use less than 12 characters, he terminates the string of input characters with a carriage return and the routine will space-fill the rest of the buffer. The subroutine converts ASCII characters to EBCDIC. A rubout character will allow the user to start reinputting the character string. Calling sequence, where LAC is address of where to store character:

\[ \text{LAC} \]
\[ \text{JMS BTTY} \]

E. CCNTRL. Accesses eight-bit carriage control characters via GET and checks for COM control indicator. If it is not found, routine exits. If it is found, routine checks next byte for legitimate COM control function and branches to the proper handler. Calling sequence: JMS CCNTRL

F. CHROUT. Entered with the AC containing a character to be output. Converts character to EBCDIC via CONVRT, outputs character via VCHAR, and returns control to calling routine. Calling sequence, where N = eight-bit DTE character:

\[ \text{LAC } N \]
\[ \text{CHROUT} \]
G. **CONVRT.** Entered with DTE character in AC. Character is converted to EBCDIC via DTETAB table. Exit is to calling routine with converted character in AC. Calling sequence, where \( N = \) DTE character:

```
LAC N
JMS CONVRT
```

H. **DTESZ.** Loads set size and pulldown as input from theTTY. Also sets scaling parameters for frame. Exits via MDONEX. Called via MONTOR.

I. **EBGET.** Converts EBCDIC numeric string, length of which is specified in SETXYS, to decimal. Numbers are accessed from magnetic tape via GET. Converted number is in AC upon exit to calling routine. Calling sequence, where \( N = \) length of numeric string:

```
LAM N
DAC SETXYS
JMS MVCOM
```

J. **ENDLN.** Checks command word for JUMP; if found, advances to next frame via NEXFRM and gets next DTE data word. If not found, data is ignored and next DTE data word is accessed. Control is transferred to GETCOM. Calling sequence: JMS ENDLN

K. **GETBLK.** Accesses 32 bits of data from magnetic tape via MTBYTE. Used to read record block and mask off block descriptor word (BDW). Exits to calling routine. Calling sequence: JMS GETBLK

L. **GETCOM.** For 36-bit DTE words, "bit buckets" four-bit pad, calls KYBLIS for operator interrupt processing, and transfers control to GETOP. GETCOM is called for all DTE data word decodes. Calling sequence: JMP GETCOM

M. **GETCR.** Determines if 36-bit DTE word is a typewriter or start print word. Control is transferred to TYPSW or SETCR, respectively. Calling sequence: JMP GETCR
N. GETOP. Gets four-bit op code and determines if data word is a command or vector word. If neither, control is transferred to GETCR. If COMMAND, control is transferred to ENDLN. Calling sequence: JMP GETOP

O. GETSEG. Gets logical record segment from tape input area. Determines segment control code, segment length, and carriage control from segment descriptor word (SDW). If segment length is two or less, control is returned to GETSEG+1 for next logical record segment. If segment control code is 0 or 1, which specifies COM control record, CCNTRL is called for processing of the COM control record. Upon return from CCNTRL, control is transferred to calling routine. Calling sequence: JMS GETSEG

P. IGNORE. Remains in loop ignoring data via BITCNT until next COM control record or logical segment is read, with control being transferred to the applicable routine by BITCNT.

Q. IGNOR1. Sets applicable switches to remain within GETSEG routine until DTE data has been accessed.

R. MAP. Sets XHD, YHD, XTL and YTL DTE vector coordinates scaled to FR80 units. Coordinates are centered in 16K x 16K frame. Calling sequence, with XHD, YHD, XTL, YTL containing DTE vector coordinates (return to calling routine with XHD, YHD, XTL, YTL containing FR80 coordinates): MAP

S. MVCOM. Transfers COM control data, as specified in the S or T record, into buffer TITARE. Data is accessed from tape buffer one byte per access, via GET. Calling sequence, with AC containing first titling character: JMS MVCOM

T. NEWSEG. Reads in new logical segment; gets bits requested from old and new segment and returns to calling routine with data in AC. Calling sequence: JMP NEWSEG

U. NEXFRM. Sets titling intensity, advances to next frame, resets intensity, and exits to calling routine. Calling sequence: NEXFRM
V. **NOINDX.** Entered with XHD and YHD containing DTE character coordinates and CHTEM containing eight-bit DTE character. Scales coordinates to FR80 units, sets X and Y DAC's, outputs character, and transfers control to GETCOM. Calling sequence: JMP NOINDX

W. **RESET.** Sets switches specifying COM control; sets return address in GETSEG and BITCNT to return to calling routine. Calling sequence: JMS RESET

X. **RESTOR.** Restores BITCNT and GETSEG parameters to condition previous to COM control loop. Calling sequence: RESTOR

Y. **RETRN.** Saves return address from BITCNT for original call; this is done prior to COM control processing. Calling sequence: JMS RETRN

Z. **SAVADD.** Saves BITCNT and GETSEG return addresses prior to COM control loop. Calling sequence: SAVADD

AA. **SCAL.** Entered with AC containing DTE coordinate. Exits to calling routine with AC containing coordinate in FR80 units. Calling sequence, where $1 \leq N \leq 1023$:

```
LAC N
SCAL
```

BB. **SEPREC.** Entered with AC containing first character of S record. Calls MVCOM, calls FICTAP for control record processing. Sets CH11SW and SEGSW for control record skip via BITCNT. Exits to IGNORE. Calling sequence: JMP SEPREC

CC. **SETCR.** Sets TYPSW for TYPEWRITER word processing, converts DTE character size to appropriate FR80 size, and DTE character deltas to FR80 units (CHDELX, CHDELT). Sets deltas based on rotation via ROTTST and SETPLS. Accesses starting line coordinates by call to GET storing X in XHD and Y in YHD. Exits via NOINDX. Calling sequence: JMP SETCR
DD. TITREC. Moves title data into TITARE via MVCOM, calls FICTAP for title processing. Transfers control to IGNORE. Calling sequence: JMP TITREC

EE. TYPLP. Processes DTE special characters NULL, CR, and MR; if these are not present, outputs as print character via CHROUT until CNTR (character counter -4 for 36) is exhausted. Entered either through TYPSW or JMP TYPLP. Exits to GETCOM.

2.5.3.3 Constants and Variables

A. Internal

1. BATARE. Table for the BEGIN and END title fichè.

2. BEGN. Message BEGIN output on ID fiche.

3. BITNSV. Temporary save location of number of bits requested by GET macro in SAVADD and RESTOR routines.

4. BITNUM. Contains number of bits requested by GET macro.

5. BITSVAD. Temporary save location of return address from GET call.

6. BTABL. Table used for conversion of ASCII characters to EBCDIC.

7. BTCT. Variable used as counter in BATNO subroutine.

8. BTLN. Constant length of ID title.

9. CHTEM. Cell containing DTE character accessed from START PRINT word.

10. CH11SW. Switch used for entry and exit into COM control processing. Set to JMS RESET after S COM record, and NOP upon completion of second COM control record processing.

11. CMTAP. Buffer containing COM tape number as input from TTY. Output to ID fiche.
12. **CNTR**. Counter containing number of characters per DTE typewriter word.

13. **CTMES**. Message ENTER COM TAPE, output to teletype when accepting COM tape number for ID fiche.

14. **DFRSZ**. Constant containing frame size in FR80 units (13522 for 105 mm).

15. **DTESIZ**. Temporary cell containing DTE character size (0-7) accessed from start print word.

16. **DTETAB**. Table containing DTE character codes, two characters per word.

17. **DTXTAB**. Table containing character spacing values in DTE units for eight-character sizes.

18. **DTTYTAB**. Table containing line feed values in DTE units for eight-character sizes.

19. **ENEND**. Message END, output on trailing ID fiche.

20. **GETSGAD**. Temporary save location of GETSEG routine return address.

21. **MBITNM**. Variable containing number of bits requested by GET macro in BITCNT routine.

22. **MBITSV**. Temporary save location of number of bits requested. Referenced in SAVADD and RESTOR.

23. **NEWSGB**. Variable containing n bits (1 ≤ n ≤ 18) of data from next record segment.

24. **NEWSGC**. Variable containing number of bits required from next record segment to satisfy GET macro.

25. **OLDSGB**. Variable containing n bits (1 ≤ n ≤ 18) of data remaining in current record segment.
26. **OLDSGC.** Variable containing number of bits remaining in current record segment.

27. **RETTADD.** Cell containing BITCNT return address when processing COM control records.

28. **RLL.** Buffer where microfiche roll number is stored for ID fiche.

29. **RLMES.** Message ENTER ROLL, output to teletype when accepting roll number.

30. **SEGCNT.** Counter containing number of bits in current record segment.

31. **SEGSW.** Switch used to reset BITCNT return address upon completion of COM control processing.

32. **SRMES.** Message ENTER SOURCE TAPE, output to teletype when accepting source tape number for ID fiche.

33. **SRTAP.** Buffer containing source tape number for ID fiche.

34. **SVIND.** Address of teletype buffer for input information.

35. **SZTAB.** Table containing character heights in DTE units for eight-character sizes.

36. **TINFO.** Buffer where BEGIN or END is stored for ID fiche.

37. **TITINT.** Constant delineating output light intensity for titling.

38. **XHD.** Contains starting X coordinate of DTE vector as accessed from DTE vector word.

39. **XOFF.** Starting X or left-side margin of DTE image in FR80 raster units.
40. **XSIGN.** Sign of X vector as defined by 36-bit DTE vector word.

41. **XTL.** Contains end X coordinate of DTE vector as accessed from DTE vector word.

42. **YHD.** Contains starting Y coordinates of DTE vector word.

43. **YOFF.** Starting Y or top margin of DTE image in FR80 raster units.

44. **YSGN.** Sign of Y vector as defined by 36-bit DTE vector word.

45. **YTL.** Contains end Y coordinate of DTE vector as accessed from DTE vector word.

**B. External**

1. **CHDELX.** Word location reserved for FR80 character delta.

2. **CHDELY.** Word location reserved for FR80 character delta.

3. **CHRSIZ.** Word location reserved for FR80 character size.

4. **CURBUF.** Cell used for current magnetic tape buffer address (one of two magnetic tape buffers).

5. **EXPND.** Location used to define end of executable code.

6. **FCSUB.** One-word cell used to either decrease or increase margin between fiche.

7. **FCTTSW.** Switch used to control title extraction from tape or teletype.
8. FICTB. Address of fiche title table, i.e., titling buffer area.

9. FLSHND. Defines start of form flash executable code.

10. FRAMNM. One-word counter containing number of frames filmed.

11. MAXTRW. Constant used for multiple fiche title rows (always zero for DTE).

12. MTTARE. Contains teletype buffer address.

13. NEXBUF. Cell used for next magnetic tape buffer address (one of two magnetic tape buffers).

14. PBUFPT. Location used to define start of form flash communication area.

15. PICNUM. One-word counter containing number of images produced.

16. RECPIN. Word location reserved for FR80 light intensity value.

17. SCSIZE. Maximum available FR80 raster units (16384).

18. SVROT. One-word save location containing current rotation delineator.

19. TITARE. Address of fiche titling buffer.

20. TPOINT. Contains address of next available word in TITARE.

21. VHEADX. Word reserved for setting of starting X vector coordinate.

22. VHEADY. Word reserved for setting of starting Y vector coordinate.
23. \textbf{VTAILX}. Word reserved for setting of ending X vector coordinate.

24. \textbf{VTAILY}. Word reserved for setting of ending Y vector coordinate.

\textbf{2.5.3.4 Flow Charts.} See following pages.
BEGIN

INITIALIZE TAPE HANDLER SWITCHES: SEG5W, BLKSW, CH11 SW

INITIALIZE SWITCHES IFLASW, INXSSW FOR NO INDEXING

FC7 CLR
INITIALIZE FICHE CAMERA

FRSPIC
MULTI IMAGE FICHE

MNBRIT
TITLING INTENSITY
ADDRESS OF 1ST MAG. TAPE BUFFER -> CURBUF

DETERMINE AND SET ADDRESS OF 2ND TAPE BUFFER -> NEXBUF

INITIALIZE MAG TAPE HANDLER

COMPUTE FRAME SIZE FOR "DATA" PAGES

SET X & Y OFFSETS FOR CENTERING IMAGE IN 16K x 16K

GET com
3

SET XSIGN FOR POSITIVE OR NEGATIVE VECTOR DELTA X

SET YSIGN FOR POSITIVE OR NEGATIVE VECTOR DELTA Y

BITCNT LENGTH OF VECTOR DELTA X

X LENGTH OF VECTOR, → XSIGN

BITCNT LENGTH OF VECTOR DELTA Y

4

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
TYPCR

0 → XHD
YHD + DELTAY → YHD

PSTLL
WAIT FOR HARDWARE READY

CRT (IOT)
CARRIAGE RETURN

TYPNL
SETCR

SKP ⇒ TYPsw
ALLOW PROCESSING
OF DTE
TYPEWRITER
WORDS

BITCNT
GET DTE.
CHARACTER
SIZE

ACCESS
CORRESPONDING
CHAR. HEIGHT
FROM S2TAB

SCAL
CONVERT DTE
TO FPOD
UNITS

REPRODUCIBILITY OF THE
ORIGINAL PAGE IS POOR
7

SAVE CHAR.
HEIGHT; CLEAR
CHAR. SIZE COUNT;
CHAR. SIZE TABLE
= SPECTAB \rightarrow II

INCREMENT CHRSIZ2,
AND GET FREE
CHAR SIZE
FROM SPECTAB

N

FREE
CHAR SIZE
\geq DTE CHAR.
HEIGHT?

Y

USE DTE CHAR.
SIZE (DTE[SIZ])
FOR INDEX INTO
DTEXTAB - DELTA
X.

SCAL
CONVERT DTE
DELTA X TO
FREE UNITS

8
CONVERTED DTE DELTA X
⇒ CH'DELX
(CCHAR. DELTA)

ACCESS DELTA Y FROM DTYTAB

SCALE
CONVERT DTE CHAR. DELTA Y

CONVERTED DTE DELTA Y
⇒ CH'DELY
(CCHAR. DELTA Y)

RESET CH'DELX AND CH'DELY FOR PROPER ROTATION

9
ENDLN

SET COUNTER FOR ACCESS OF DTE COMMAND OP CODE

BITCNT
GET DTE OP CODE

DTE JUMP COMMAND?

Y

NEXT FRM ADVANCE TO NEXT FRAME

N

BITCNT
BIT BUCKET DTE WORD

GET CUR

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
CONVRT

USE ½ DTE CHAR VALUE AS INDEX INTO DTETAB

GET WORD FROM DTETAB 2 CHAR/WORD

UPPER BYTE?

Y
SHIFT WORD TO GET UPPER BYTE

N

ISOLATE EBCDIC CHAR IN LOW AC

EXIT
REPROducibility of the Original Page is Poor
BLK.CNT + MBITUM → BLK.CNT
SET AC WITH REQUIRED BITS

EXIT

GETSEG

GETSEG

GET.NEW.RECORD.BLOCK

BLK.CNT = 0
NEED NEW BLOCK?

Y

BLK.CNT = 32
→ BLK.CNT
SUBST. 4 BYTE SDW LENGTH

N
MTBYTE
Access two bytes of SDW

SEGMENT LENGTH = 32 BIT SDW LENGTH \rightarrow SEGMENT

MTBYTE
Next two bytes of SDW

ISOLATE SEGMENT CONTROL CODE IN AC

AC > 1
START SEG?

Y

N
EXIT

\[\text{13}\]

\[\text{14}\]

2-363
C RECORD?

Y

TITREQ

N

IGNOR1

TITREQ

MV COM T DATA FROM TAPE

FICTAP PROCESS TITLE DATA

IGNOR1
SEPREC

MV COM

S DATA FROM TAPE

INITIALIZE NO FORMS OR INDEX

FICTAP

PROCESS TITLE DATA

SET CHANNEL AND TAPE SWITCH FOR COM CONTROL PROCESSOR

IGNORE

2-370
SET SWITCHES TO PROCESS AS DTE AFTER NEXT CON STAT OR CONTROL RECORD

BITCNT
 IGNORI

e DATA IL NEXT SEC OR CONTROL RECORD

IGNORI
SAVADD

SAVE "GET's"
BITCNT, GETSEG, BITNUM CONTENTS
FOR RETURN OF
CONTROL

EXIT

RESTOR

RESTORE "GET's"
BITCNT, GETSEG, BITNUM CONTENTS
FOR CONTROL
RETURN TO GET

EXIT
RESET

RETURN ADDRESS IN GETSEG TO RE-INITIATE GET; RESET RETURN ADDR IN BITCNT

EXIT
NEWSEG

# OF BITS IN CURRENT SEGMENT \rightarrow OLDSEG

MTBYTE

GET REMAINING DATA BITS 0 or 1?

AC \rightarrow OLDSUB REMAINING DATA BITS CURRENT SEG.

BLK CNT = OLDSUB \rightarrow BLK CNT DECREMENT FOR # BITS ACCESS

GETSEG

GET NEXT SEGMENT

18

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
18

SAVE ADD
SAVE BITCNT PARAMS.
ORIG. CALL

OLDSEC -
BITNUM → NEWSEC
# OF BITS REQ'D
FROM NEW SEGMENT

BITCNT
GET NEWSEC
BITS

AC → NEWSGB
BITS FROM
NEW SEGMENT TO SATISFY
GET MACRO

RESTOR
RESET ORIG.
CALL BITCNT
PARAMS

19
SHIFT BITS FROM OLD SGB AND NEW SGB
RETURN VIA BITCUT
EXIT
MVCom

TITARE \to II
BUFFER FOR MVCom CONTROL SAVE

MVCom1

CHAR \to BUFFER VIA II INCREMENT II FOR NEXT BUFFER ENTRY

MVCom2

CHAR = $ ?

Y

CHKDOL

N

BITCUT
NEXT 2 BIT CHAR FROM TAPE

MVCom1

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
STORE IN COM CONTROL BUFFER VIA A.I.R. II

CHAR. = # ?

N
MVCOM2

Y

EXIT
MAP

SCAL
CONVERT DTE X₁ TO FREO UNITS

X₁ + XOFFSET → X₁
START X COOR. PLUS CENTERING OFFSET

SCAL
CONVERT DTE Y₁ TO FREO UNITS

Y₁ + YOFFSET → Y₁
START Y COOR. PLUS CENTERING OFFSET

SCAL
CONVERT DTE X₂ TO FREO UNITS

21
\[ X_2 + X_{\text{OFF}} \Rightarrow X_2 \]
END X COOR.
PLUS CENTERING OFFSET

SCAL
CONVERT DTE \( Y_2 \) TO FROM UNITS

\[ Y_2 + Y_{\text{OFF}} \Rightarrow Y_2 \]
END Y COOR.
PLUS CENTERING OFFSET

EXIT
SCAL

NEG. COORDINATE?

Y
ERROR. FORCE TO ZERO COORDINATE POSITION

N
MULTIPLY DTE COORD BY FR32 FRAME SIZE AS SPECIFIED IN DFR52

DIVIDE BY 1023. (DTE FRAME SIZE) \( \Rightarrow \) AC FR32 COOR POSITION

EXIT
BATNO

LOAD "BEGIN"
IN TITLE
AREA

MMASSG
OUTPUT TO TTY
"ENTER
SOURCE TAPE"

TTY
ACCEPT
SOURCE TAPE
# INPUT

MMASSG
OUTPUT TO TTY
"ENTER COM
TAPE"

TTY
ACCEPT COM
TAPE # INPUT

22
MMASSG
OUTPUT TO TTY
"ENTER ROLL"

TTY
ACCEPT ROLL
NUMBER
INPUT

LOAD COMPLETE
TITLE INFO
FOR 3D FRAME
IN TITLE AREA

FICTAP
PROCESS
TITLE DATA

EXIT
REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR

23

ILLEGAL CHARACTER?

N

CONVERT 6-BIT ASCII TO 8-BIT EBCDIC

STORE CHAR. IN BUFFER

12 CHARACTERS SAVED?

N

MCRLF CARR. RET LINE FEED ON TTY

EXIT
BTEND

FCEIN
FINISH FILE

LOAD "END" TO TITLE

CHANGE TO OUTPUT 3 TITLE LINES

MOVE TITLE TO TITLE AREA

FICTAP OUTPUT END TITLE FILE

EXIT
2.6 COMA PDP 11/45 PRINT PROCESSOR FOR 16 mm FILM (PDP16)

2.6.1 Background

A. Author. V. Pote, Aeronutronic Ford Corp.

B. Intent. The requirements for these programs are specified in SISO-generated document SH-25073. PDP16 is requested when a PDP 11/45 FORTRAN generated print tape has been submitted for data to be output to 16 mm film.

C. Program History

1. Production Tape Date. 17 September 1973
2. Author. V. Pote
3. Authorization. EO-165F
4. Test Cases. Test tape specification SH-25713

2.6.2 Introduction

2.6.2.1 Hardware Requirements

- FR80 with 12K memory
- 9-track tape unit
- 16 mm unsprocketed camera.

2.6.2.2 Software Requirements. The following files, found in I.I.I.'s SYM Directory, are required:

<table>
<thead>
<tr>
<th>File</th>
<th>File</th>
<th>File</th>
<th>File</th>
</tr>
</thead>
</table>
| III109| III196| III147| III161GO
| III166| III164| III162|
| III185| III163| III161|
2.6.2.3 Assembly Parameters

A. **9-TRACK.** If 1, indicates data will be coming from a 9-track tape drive.

B. **MUMBLE.** If 1, defines system configuration for output to the teletype.

C. **FONT.** If 0, defines standard I.I.I. character font I1I164.

D. **LOCASE.** If 1, defines lower case characters in the character set.

E. **IIISET.** If 1, assembles a dispatch tube for I.I.I. standard character codes.

F. **TWOBUF.** If 1, defines two magnetic tape buffers for higher throughput.

G. **EOFP.** If 1, defines end-of-file processing code is to be inserted.

H. **BIGBUF.** If 0, defines maximum amount of features with minimum buffer space.

I. **MTSIZE.** Magnetic tape buffer size (= 1001).

J. **MTTSIZ.** Teletype buffer size (= 210).

K. **FTYPE.** Camera indicator (= 16 mm).

L. **MANYUP.** If 1, defines code for multiple images per frame for 105 mm microfiche.

M. **CAMNUM.** If 2, indicates the 16 mm unsprocketed camera is to be used.
2.6.2.4 Operator Commands. The following commands shall be used for the PDP16 execution.

PDP16$J
*MONITOR (Returned by FR80)
GO/
XXXXXXXX ENTER TAPE NBR
(Operator enters tape No. after this MSS
END JOB/ )(when EOF has been returned)

2.6.3 Analysis

2.6.3.1 Major Control System

A. Description. The mainline code for this processor begins at BEGIN. The program first initializes all storage used by the program in order to make the program reusable. All flags and instruction switches are set to their initial values. Next, a FRSPIC is done to initialize the camera, and CURBUF, NEXBUF and PBUFSZ are initialized to current buffer address, alternate buffer address, and buffer size, respectively. Then control is passed to the III routine MTRINI to initialize the tape handler. Upon return, control is passed to the internal subroutine, JSEP, to interpret the tape label and place it on film as the job separator. JSEP first utilizes the internal subroutine ZRDS0 to convert each of the first three words in the 14-byte header from RADSO format to teletype ASCII, and then goes to an internal subroutine, NXTPC, which effects a NEXPIC and advances the film one frame. The III subroutine DRWCHR is utilized to draw the nine characters on the film in the case of 16 mm filming.

After the job separator has been processed, the main loop of the program is entered at GETCH. First the end-of-buffer codes are inserted at the end of the primary and secondary buffers; then the interrupt condition is enabled in VCHTAB to halt on the characters for end-of-buffer or carriage return. An initial dispatch address is calculated and the high-speed character generator is invoked by calling the subroutine QHSGO. Upon return
from QHSGO, the character code which caused the interrupt together with the next two character codes are extracted from the input tape buffer by calling subroutine EXDSP. If sense switch 12 is up and sense switch 13 has changed from the previous position, the high-speed character generator is reinvoked to display the current line being generated. Otherwise, processing continues upon the three codes which caused the interrupt.

First, the carriage control code (the third character) is checked for validity. If the code is invalid, a search is made for the next carriage return code and thus a new carriage control code. A single-space carriage control code causes a carriage return line feed to be executed. A double-space carriage control code causes a double carriage return/line feed to be executed. A page eject carriage control code causes a double carriage return/line feed to be executed, and subroutine NXTPC to be called to advance the film by one frame. The X and Y coordinates are then recalculated.

After the appropriate action has been taken based on the carriage control code, a new dispatch address is calculated and the program returns to GETCH to resume the high-speed character generator.

B. Input/Output

1. Input. Data will be input from a 9-track tape drive in variable length lines and physical record size of 512 bytes. The tape will contain a 14-byte header record containing in the first three words the table label in RAD50 format.

2. Output. Output of data is to 16 mm film. Page size is 64 lines maximum; line length is 132 lines maximum.

3. Error Message Output. ILLEGAL FORM is output when a form number greater than four has been requested.
C. Linkages

1. External

<table>
<thead>
<tr>
<th>Routine</th>
<th>Program</th>
<th>Routine</th>
<th>Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTRINI</td>
<td>III163</td>
<td>GETT</td>
<td>III163</td>
</tr>
<tr>
<td>NEXPIC</td>
<td>III166</td>
<td>DRWVEC</td>
<td>III162</td>
</tr>
<tr>
<td>SETPLS</td>
<td>III166</td>
<td>SETXYX</td>
<td>III166</td>
</tr>
<tr>
<td>KYBLIS</td>
<td>III166</td>
<td>SETTLS</td>
<td>III162</td>
</tr>
<tr>
<td>FRSPIC</td>
<td>III166</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DRWCHR</td>
<td>III162</td>
<td>MTBYTE</td>
<td>III163</td>
</tr>
</tbody>
</table>

2. Internal Routines

<table>
<thead>
<tr>
<th>Routine</th>
<th>Program</th>
<th>Routine</th>
<th>Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLMOUT</td>
<td>JSEP</td>
<td>GETC</td>
<td>TELKBW</td>
</tr>
<tr>
<td>NXTPC</td>
<td>CUTMAK</td>
<td>PUTC</td>
<td>OUTTY</td>
</tr>
<tr>
<td>PLSET</td>
<td>ZRD50</td>
<td>TELKBR</td>
<td>INTTY</td>
</tr>
<tr>
<td>JSEP2</td>
<td></td>
<td>QHSGO</td>
<td>EXDSP</td>
</tr>
<tr>
<td>PLCE</td>
<td></td>
<td></td>
<td>SETVCH</td>
</tr>
</tbody>
</table>

2.6.3.2 Subroutines

A. FLMOUT. Advances film 10 frames on end-of-file and automatically outputs the job separator information. Calling sequence: JMS FLMOUT (in III163).

B. NXTPC. There are no parameters passed to NXTPC. NXTPC will advance the film to a new frame and reset the X and Y coordinates for both forms and text to the top of the page. Before the advance, if forms were requested, NXTPC will call PPAGE to flash the form. Calling sequence: JMS NXTPC.

C. PLSET. Sets the delta X and Y, the intensity and the spot size, and calls SETPLS to initialize the DAC registers. Calling sequence: JMS PLSET.

D. JSEP. Reads the header label from the tape and decodes it from RAD50 format to ASCII. Using JSEP2, it then advances the film and if 16 mm film is being used, draws the nine ASCII characters on the film in eyeball-sized letters. Calling sequence: JMS JSEP.
E. **CUTMAK.** Outputs cutmarks. Calling sequence: JMS CUTMAK.

F. **ZRDS0.** Converts the contents of the AC from RAD50 to three seven-bit ASCII characters. Calling sequence: JMS ZRDS0.

G. **GETC.** Obtains a character from a specified line buffer in a specified position and places the character in the AC. The cell, LI32AD, should be loaded with the address of the line buffer and CHPOS should be loaded with the character position upon entry. Calling sequence: JMS GETC.

H. **PUTC.** Places the character contained in the AC into a specified line buffer at a specified character position. LI32AD should contain the line buffer address and CHPOS should contain the character position. Calling sequence: JMS PUTC.

I. **TELKBR.** Reads a character from the teletype and places it in the AC. Calling sequence: JMS TELKBR.

J. **TELKBW.** Writes the character contained in the AC to the teletype. Calling sequence: JMS TELKBW.

K. **OUTTTY.** Outputs a line to the teleprinter. The line buffer address should be loaded into the AC before entry, and the line buffer should be formatted in standard 9-track buffer format. The octal code 3778 denotes the end of the buffer. Calling sequence: JMS QUTTTY.

L. **INTTTY.** Inputs a line from the teletype. Upon entry, the AC should contain the line buffer address. The line buffer will be formatted in standard 9-track buffer format. A carriage return will terminate the input. Calling sequence: JMS INTTTY.

M. **QHSGO.** Invokes high-speed character generator from specified dispatch address and returns halt interrupt information. Calling sequence: JMS QHSGO.

N. **EXDSP.** Extracts character code from specified buffer position. The buffer position is specified in the AC in the form of a dispatch address. Calling sequence: JMS EXDSP.
O. **SETVCH**. Sets high-order bit of the character positions indicated in the specified list. Calling sequence: JMS SETVCH.

P. **JSEP2**. Advances the film and draws nine ASCII characters on the film in eyeball-sized letters. Calling sequence: JMS JSEP2.

Q. **PLCE**. Places last three digits of the tape number in the output. Calling sequence: JMS PLCE.

### 2.6.3.3 Constants and Variables

**A. Internal**

1. **ADVI**. When set, indicates to subroutine FLMOUT to advance film.

2. **ALPHX**. Text of initial X DAC register.

3. **ALPHY**. Text of initial Y DAC register.

4. **CHPOS**. Contains the character position of the line buffer.

5. **CHRCNT**. Location containing the number of characters that are to be used in the index frame.

6. **CLDELX**. Text X delta in scope points.

7. **CLDELY**. Text Y delta in scope points.

8. **CLRSIZ**. Text character size.

9. **CURBUF**. A word containing the address of the buffer currently being used.

10. **ERFLAG**. A flag that when set to zero indicates that the Error Form Flag is to be checked.

11. **ERFMFL**. Error Form Flag.
12. **FLASSW.** A flag used to determine if a form is to be flashed.

13. **FOLFTX.** Location containing the beginning raster point (X coordinate) for a form.

14. **FOTOPY.** Location containing the beginning raster point (Y coordinate) for a form.

15. **FRMINP.** Contains address of first form.

16. **FRMPTR.** Address of form to be flashed.

17. **FRMTAB.** Six-word table with each word giving the beginning address of a form.

18. **IFLG.** First-time flag for subroutine FLMOUT.

19. **LEFTXX.** Location containing the beginning X coordinate for a line of print.

20. **LI32AD.** Contains the address of the line buffer.

21. **LINCNT.** A word containing the number of lines that have been output.

22. **LNBUF.** Principal line buffer used in formatting text data.

23. **NEWTOP.** Location containing the Y coordinate of the line to be output.

24. **NEXBUF.** Word containing the address of the next buffer to be used.

25. **REM.** Location containing the remainder which indicates which byte of the word is to be used.

26. **SAVIRM.** Temporary location.

27. **SPCNUM.** Location containing the raster size for the X coordinate.
28. StOCSW. Flag used to initialize the indexing routine.

29. TEMP. Temporary reserved location used as a scratch work area.

30. TOPYY. Location containing the beginning raster point (Y coordinate) for all numbers which have been processed.

31. VCHAR. Location used to store digits temporarily until all numbers have been processed.

32. XINDEX. Word containing the character number on which the indexing is to start.

33. YINDEX. Location containing the line number that is to be used in the index frame.

B. External

1. CHDELX. Word used to set the delta X.

2. CHDELY. Word used to set the delta Y.

3. CHRSIZ. Contains the character size.

4. FRMNUM. Word containing the form number currently being used.

5. IFLASW. Flag used to determine if the index form is to be flashed.

6. INSXXW. Flag used to determine if indexing has been requested.

7. MAXTRW. When zero, indicates the T record has not yet been processed.

8. MTCNT. Word containing the number of words yet to be processed from one buffer (negative).

9. MTPTR. Word containing the address of the word in the buffer to be processed next.
10. **PBUFSZ.** Word containing the length of the tape buffers.

11. **RECPIN.** Contains intensity to be used.

12. **RECSPT.** Contains spot size.

2.6.3.4 **Flow Charts.** See following pages.
LPZTS
Read next page buffer

Set up high speed
channel gen digital
address at top of
current page buffer

Read and store
X, BY registers

QHSGO
output line from dispatch address
Store sense switch 12 setting

B

Overlay line?

Y

Reset x register

N

Store sense switch 12 setting
REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
SISO-TR531
Vol. II
All Characters output? 

Y: EXIT

N: E
REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
INTTY

TELKBK
Read a char. from teletype

PUTC
Place char in line buffer

Carriage return

N

Y

EXIT
L

Load Accumula
with word from
the location

left byke?

Shift accum.
5 bits right

Mash off
high order
bits and
save

N

Y

18

17
18

- Restore MQ register
- Load accum. with result
- EXIT
TELRBR

Keyboard busy?

Y

Load accumulator from TTY buffer

TELRBW

Write char to TTY

EXIT

N

REPRODUCIBILITY OF THE ORIGIN. A PAGE IS POOR
PUTC

Save MQ register

Right character position

Y

Stop initial character position

Calculate word displacement

N
Load accumulator with right char mask

Left character?

Y

Load accumulator with mask for entire word

N

Mask the last calculated and load character
Left char?

Y

Shift left 8 bits

N

OR character to calculated location and restore MR register

EXIT
Write character to TTY

TTY busy?

Carriage return?

Write line feed character to TTY

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
TTY busy?

EXIT
SETVCH

Save list address

Previously called?

N

Y

Store previous list address in location 16

Get next code in list.

A
End of list?

Y

N

Calculate corr cell in VECTAB and reset high order bit

A

Store current list address in location 16

B

Get first code in list

27
End of list?

Y

N

27

EXIT

B

Calculate core cell in VARAB and set high order bit.
Start high speed character gen HSGO

High speed char generator busy?

Yes

Read half addr using HSRA

No

Subtract 1 from half addr and store
Read step code using HSAB

Stopped because found stop char?  

Y

N

Load max char count using HSJC and continue using HSJCF

EXIT
Save step addr and destination addr.

Get word containing step char.

Is step char on left?

Shift step char to right side.
32

Store step character in destination

Calculate remaining dispatch addr.

Is step character at buffer end?

33

Y

LPETS
Read next tape buffer

N

33
Was orig step char a buffer end?

If yes (Y), go to A.
If no (N), set dispatch address to new tape buffer.
2.7 COMA PDP 11/45 PRINT PROCESSOR FOR 105 mm FICHE (PDP105)

2.7.1 Background

A. Author. V. Pote, Aeronutronic Ford Corp.

B. Intent. The requirements for these programs are specified in SISO-generated document SH-25073. PDP15 is requested when a PDP 11/45 FORTRAN generated print tape has been submitted for data to be output to 105 mm fiche.

C. Program History

1. Production Tape Date. 17 September 1973
2. Author. V. Pote
3. Authorization. EO-165F
4. Test Cases. Test tape specification SH-25713

2.7.2 Introduction

2.7.2.1 Hardware Requirements

- FR80 with 12K memory
- 9-track tape unit
- 105 mm unsprocketed camera.

2.7.2.2 Software Requirements. The following files, found in I.I.I.'s SYM Directory, are required:

<p>| | | | |</p>
<table>
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<tr>
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</thead>
<tbody>
<tr>
<td>III109</td>
<td>III186</td>
<td>III147</td>
<td>III161 GO</td>
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<tr>
<td>III166</td>
<td>III164</td>
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</tr>
<tr>
<td>III185</td>
<td>III163</td>
<td>III161</td>
<td>III187</td>
</tr>
</tbody>
</table>
2.7.2.3 Assembly Parameters

A. **9-TRACK.** If 1, indicates data will be coming from a 9-track tape drive.

B. **MUMBLE.** If 1, defines system configuration for output to the teletype.

C. **FONT.** If 0, indicates standard I.I.I. character font I1164.

D. **LOCASE.** If 1, defines lower case characters in the character set.

E. **IIISET.** If 1, assembles a dispatch tube for I.I.I. standard character codes.

F. **TWOBUF.** If 1, defines two magnetic tape buffers for higher throughput.

G. **BIGBUF.** If 1, defines minimum amount of features with maximum buffer space.

H. **MTSIZE.** Magnetic tape buffer size (= 1001).

I. **MTTSIZ.** Teletype buffer size (= 210).

J. **FTYPE.** Camera indicator (= 105 mm).

K. **MANYUP.** If 1, defines code for multiple images per frame for 105 mm microfiche.

L. **NOPISP.** If 1, indicates that monitor is not to be displayed.

M. **CAMNUM.** If 9, indicates that 105 mm unsprocketed camera is to be used.

N. **ALLOW.** If 600, allows forms flash.

O. **FINDEX.** If 1, allows Fiche indexing.
2.7.2.4 Operator Commands. The following commands shall be used for the PDP105 execution.

PDP105$J

*MONITOR (Returned by FR80)

GO/

ENTER TAPE NBR (Operator enters tape No. after this msg.)

ENTER COM CONTROL (Operator enters COM CONTROL). If only a is typed, processing continues.

END JOB/ (When EOF has been returned)

2.7.3 Analysis

2.7.3.1 Major Control Section

A. Description. The mainline code for this processor begins at BEGIN. The program first initializes all storage used by the program in order to make the program reusable. All flags and instruction switches are set to their initial values. Next, FRSPIC is called to initialize the camera, and CURBUF, NEXBUF and PBUFSZ are initialized to current buffer address, alternate buffer address, and buffer size, respectively. The control is passed to the III routine MTRINI to initialize the tape handler. Upon return, control is passed to the internal subroutine JSEP to interpret the tape label and place it on film as the job separator. JSEP first utilizes the internal subroutine ZRD50 to convert each of the first three words in the 14-byte header from RAD50 format to teletype ASCII. Next, JSEP goes to internal subroutine NXTPC which effects a NEXPIC and advances the film one frame.

After the job separator has been processed, the main loop of the program is entered at GETCH to read one character at a time, using the GETT macro. If the character read is not a control character, the program stores it in the line buffer which is the buffer used by the high-speed character generator to output a line to film. Control is then returned to GETCH to read the next character. However, if the character is a control character, actions depend on
the character. If it is a carriage return character, and if the previous character is a line feed, the internal subroutine FLMOUT is called to output the contents of the line buffer to film utilizing the high-speed character generator. If the initial character is a line feed, control is transferred to GETCH.

The first character in each line is interpreted as a FORTRAN carriage control character. If it is a +, control is returned to GETCH, indicating that the current line buffer will be partially overlayed with a new line before placing film. If it is not a + and the previous character was a line feed, the internal subroutine FLMOUT is called to output the line buffer to film. If the carriage control character is a 1, the indicator ADV1 is set to indicate to FLMOUT to advance a frame after output. If the carriage control character is a 0, then (upon return from FLMOUT) the program will execute a CRT, PSTLL combination to effect double spacing. Control is then returned to GETCH to read the next character.

FLMOUT is the internal subroutine which places the contents of the current line buffer on film. The first time FLMOUT is entered, a NEXPIC is executed to advance the film. The subroutine, ASCIIV, is called which utilizes the machine-level high-speed character generator to output the line to film. Upon return, a CRT, PSTLL combination is executed to position to the next line on film. The line count is incremented and if the number of lines exceeds 67, or if the advance indicator ADV1 is present, the film is advanced to the next frame and the line counter is reset.

Each time FLMOUT needs to advance to the next frame, the internal subroutine NXTPC is called. In addition to advancing the film, this subroutine ensures that the required form is flashed if it was requested. The DAC register coordinates are also set by this subroutine after the advance for both the forms coordinates and the text coordinates.
B. Input/Output

1. **Input.** Data shall be input from a 9-track tape drive in variable length lines with a physical record size of 512 bytes. The tape will contain a 14-byte header record containing in the first three words the table label in RAD50 format.

2. **Output.** Output of data is to 105 mm film. Page size is 64 lines maximum; line length is 132 lines maximum.

3. **Error Message Output.** ILLEGAL FORM is output when a form number greater than four has been requested.

C. Linkages

1. **External**

<table>
<thead>
<tr>
<th>Routine</th>
<th>Program</th>
<th>Routine</th>
<th>Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTRIWI</td>
<td>III163</td>
<td>DRWVEC</td>
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<tr>
<td>NEXPIC</td>
<td>III166</td>
<td>SETXYS</td>
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<td>SETHPS</td>
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<td>KYBLIS</td>
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<td>SETTLS</td>
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<td>DRWCHR</td>
<td>III162</td>
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</tr>
<tr>
<td>GETT</td>
<td>III163</td>
<td>MMFSSG</td>
<td>III166</td>
</tr>
</tbody>
</table>

2. **Internal Routines**

<table>
<thead>
<tr>
<th>Routine</th>
<th>Program</th>
<th>Routine</th>
<th>Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLMOUT</td>
<td>JSEP</td>
<td>GETC</td>
<td>TELKVW</td>
</tr>
<tr>
<td>NXTFC</td>
<td>CUTMAK</td>
<td>PUTC</td>
<td>OUTTY</td>
</tr>
<tr>
<td>PLSET</td>
<td>ZRD50</td>
<td>TELKBR</td>
<td>INTTY</td>
</tr>
</tbody>
</table>

2.7.3.2 **Subroutines**

A. **FLMOUT.** Outputs the contents of the line buffer onto a line of microfilm using the high-speed character generator.

**REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR**
When FLMOUT is called, LNBUF should contain up to 132 characters of data and CHRFCT should contain the number of characters to output. If IFLG is zero, initialization is assumed and a frame advance will be done.

B. NXTPC. There are no parameters passed to NXTPC. NXTPC will advance the film to a new frame and reset the X and Y coordinates for both forms and text to the top of the page. Before the advance if forms were requested, NXTPC will call PPAGE to flash the form.

C. PLSET. Sets the delta X and Y, the intensity, and the spot size, and calls SETPLS to initialize the DAC registers.

D. ASCIIV. Using the high-speed character generator, the character count is loaded with the complement of the AC, the Character Table address is loaded with VCHTAB reflecting the desired film font, and the initial byte address is loaded with the address of the line buffer. Then a HSGO command is given to output the line to film.

E. JSEP. Reads the header label from the tape, decodes it from RAD50 format to ASCII, advances the film, and if 16 mm film is being used, draws the nine ASCII characters on the film in eyeball-sized letters.

F. CUTMAK. Outputs cut marks.

G. ZRD50. Converts the contents of the AC from RAD50 to three seven-bit ASCII characters.

H. GETC. Obtains a character from a specified line buffer in a specified position and places the character in the AC. The cell L132AD should be loaded with the address of the line buffer and CHPOS should be loaded with the character position upon entry.

I. PUTC. Places the character contained in the AC into a specified line buffer at a specified character position. L132AD should contain the line buffer address and CHPOS should contain the character position.
J. **TELKBR.** Reads a character from the teletype and places it in the AC.

K. **TELKBW.** Writes the character contained in the AC to the teletype.

L. **OUTTTY.** Outputs a line to the teleprinter. The line buffer address should be loaded into the AC before entry, and the line buffer should be formatted in standard 9-track buffer format. The octal code 3778 denotes the end of the buffer.

M. **INTTY.** Inputs a line from the teletype. Upon entry, the AC should contain the line buffer address. The line buffer will be formatted in standard 9-track buffer format. A carriage return will terminate the input.

N. **TTYCRC.** Reads COM control information from teletype.

O. **FRMREC.** Initializes forms parameters (YINDEX, XINDEX, and CHRNS).

### 2.7.3.3 Constants and Variables

A. **Internal**

1. **ADVI.** When set, instructs subroutine FLMOUT to advance film.

2. **ALPHX.** Initial X DAC register text.

3. **ALPHY.** Initial Y DAC register text.

4. **CHPOS.** Contains the character position of the line buffer.

5. **CHRCNT.** Location containing the number of characters that are to be used in the index frame.

6. **CLDELX.** Text of delta X in scope points.
7. **CLDELY.** Text of delta Y in scope points.

8. **CLRSIZ.** Text of character size.

9. **CURBUF.** Word containing the address of the buffer currently being used.

10. **ERFLAG.** A flag that, when set to zero, indicates that the Error Form Flag is to be checked.

11. **ERFMFL.** Error Form Flag.

12. **FLASSW.** A flag in the program used to determine if a form is to be flashed.

13. **FOLFTX.** A location containing the beginning raster point (X coordinate) for a form.

14. **FOTOPY.** A location containing the beginning raster point (Y coordinate) for a form.

15. **FRMINP.** Contains address of first form.

16. **FRMPTR.** Address of form to be flashed.

17. **FRMTAB.** Six-word table with each word giving the beginning address of a form.

18. **IFLG.** First-time flag for subroutine FLMOUT.

19. **LEFTXX.** Location containing the beginning X coordinate for a line of print.

20. **L132AD.** Contains the address of the line buffer.

21. **LINCNT.** Word containing the number of lines that have been output.

22. **LINBUF.** Principal line buffer used in formatting text data.
23. NEWTOP. Location containing the Y coordinate of the line to be output.

24. NEXBUF. Word containing the address of the next buffer to be used.

25. REM. Location containing the remainder which indicates which byte of the word is to be used.

26. SAVIRM. Temporary locations.

27. SPNUM. Location containing the raster size for the X coordinate.

28. STOCSW. Flag used to initialize the indexing routine.

29. TEMP. Temporary reserved location used as a scratch work area.

30. TOPYY. Location containing the beginning raster point (Y coordinate) for all.

31. VCHAR. Location used to store digits temporarily until all numbers have been processed.

32. XINDX. Word containing the character number on which the indexing is to start.

33. YINDX. Location containing the line number that is to be used in the index frame.

B. External

1. CHDELX. Word used to set the delta X.

2. CHDELY. Word used to set the delta Y.

3. CHRNS. Number of characters in the index.

4. CHRSSIZ. Contains the character size.
5. **FRMNUM.** Word containing the form number currently being used.

6. **IFLASW.** Flag used to determine if the index form is to be flashed.

7. **INXSSW.** Flag used to determine if indexing has been requested.

8. **MAXTRW.** When zero, indicates the T record has not yet been processed.

9. **MTCNT.** Word containing the number of words yet to be processed from one buffer (negative).

10. **MTPTR.** Word containing the address of the word in the buffer to be processed next.

11. **PBUFSZ.** Word containing the length of the tape buffers.

12. **RECPIN.** Contains the intensity to be used.

13. **RECSPT.** Contains the spot size.

14. **XINDX.** X index value for indexing.

15. **YINDX.** Y index value for indexing.

2.7.3.4 **Flow Charts.** See following pages.
PDP

Zero FOT, CHART LEMENT, ADV, ENG
Set CURSOR, MEDIAN
Do PCR CLR, PREPCE

Initialize Icients
to SCP instruction,
INXSSW to NOP instruction

INIT INI
Initialize tape routines

J SEQ
Read, decode tape label to place on film
FLMOUT
Output contents of current line buffer to film

Reset line character pointer to zero

line feed 128

First character?

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
As a carriage return, line feed or film

First character = 1

PUT C
Place character in line buffer

A

A

A
Incsem en line count

Advance film?

NXT PC
Advance frame

Reset line counter

EXIT

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
Zero advance indicator

Set first time flag not zero

SETPLUS
Set precision light source

SETKYS
Set X,Y cords to top of page

Reproducibility of the original page is poor
T O P P A G

Add 73 scope points to text in Y direction

Subtract 10 scope points in X direction

Set X-Y page coordinates

E X I T
All Characters output?

Y

EXIT.
SISO-TR531
Vol. II

INTTY

TELKBK
Read a char from teletype

PUTC
Place char in line buffer

Carriage return?

EXIT
Load accumulator with word from the location

Left byte?

No

Shift accumulator & bits right

Most significant high order bits and save

Yes
Restore MQ Register

Load accum. with result

EXIT
PUTC

Save MQ register

Right character position

Stop initial character position

Calculate word displacement

Y
Load accumulator with right char mask

left character?

Y

Load accumulator with mask for entire word

N

Mask the location calculated and load character
Left Char?

Y

Shift left 9 bits

OR character to calculated location and restore MQ register

EXIT
TEKROW

Write character to TTY

TTY busy?

Carriage return?

A

Write line feed character to TTY

BS
SISO-TR551
Vol. II

REPRODUCIBILITY OF THE ORIGIONAL PAGE IS POOR

TTYCRC

INIT
Read message from TTY

Message contain carriage return only?

Y

CTLREC
Interpret the message as Com cmd/err

N

EXIT

2-471
CTL REC

? \text{Titling}

\text{Y} \rightarrow \boxed{F}

\text{N} \rightarrow \text{EXIT}

\text{Y} \rightarrow \boxed{\text{FurryS and Indexing}}

\text{N} \rightarrow \boxed{\text{EXIT}}

\text{Y} \rightarrow \boxed{\text{Initialize frame number from message size parameter}}

\boxed{\text{Initialize X, Y indexes and number of chars.}}
SISO-TR531  
Vol. II

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
TELKBR

Keyboard busy?

Y

N

Load accumulator from TTY buffer

TELKBW
Write char to TTY

EXIT
2.8 COMA HARVARD COLLEGE OBSERVATORY SOLAR EXPERIMENT S055 GRAY-LEVEL 9-TRACK PROCESSOR (S055)

2.8.1 Background

A. **Author.** F. C. Ashton, Aeronutronic Ford Corp.

B. **Intent.** S055 is requested when a Harvard College Observatory Solar Experiment S055 gray-level 9-track has been submitted for data to be output to 105 mm fiche.

C. **Program History**

   1. **Production Tape Date.** 28 November 1973
   2. **Author.** F. C. Ashton
   3. **Authorization.** FR80 microfilm system task A13
   4. **Test Case.** Test tape requirement, specification SH-25723.

2.8.2 Introduction

2.8.2.1 **Hardware Requirements**

- FR80 with 12K memory
- 9-track tape unit
- 105 mm fiche camera.

2.8.2.2 **Software Requirements.** The following files, found in I.I.I.'s SYM Directory, are required.

```
III109    III163    III162    III161 GO
III166    III185    III161    III186
III164    III147    III188
```
2.8.2.3. **Assembly Parameters.** The assembly parameters in III109 should be set for the proper machine configuration. Assembly parameters specific to S055 program are as follows.

A. **FONT.** If 0, indicates standard I.I.I. character font.
B. **TAPELB.** If 1, indicates standard IBM tape labels.
C. **NASA.** If 1, defines special characters used at JSC.
D. **EBCDIC.** If 1, indicates standard IBM EBCDIC character set.
E. **LOCASE.** If 1, indicates lower case character set.
F. **BIGBUF.** If 1, allows maximum amount of features with minimum buffer space.
G. **MTSIZE.** Defines length of system tape buffers (513 words).
H. **MTTSIZE.** Defines length of teletype buffer (192 words).
I. **MANYUP.** Indicates that page count is printed with frame count when the accounting information is output to the teletype.
J. **FTYPE.** Indicates the fiche camera.
K. **DSKMON.** Indicates that disk monitor routine to be assembled
L. **NEXPAG.** Equivalent to NEXPIC routine.
M. **NODISP.** Allows assembly without monitor display.
N. **TITLE.** Allows assembly with fiche title.
2.8.2.4 Operator Commands

* TIME=44.0"
* FRAME=0
* GO
* CONTINUE
* TITLE
* END JOB
* CLEAR
* REWIND
* SKIP
* TRY AGAIN
* STANDARD LABELS
* UNLABELLED
* PITCH/MARGIN
* SIZE OF TITLE=14500, 10500
* IMAGES/FICHE
* FOCUS
* LOAD=MONITO
*+ - ROTATED
*↑ - UPRIGHT
*
*DEBUG
2.8.3 Analysis

2.8.3.1 Major Control Section

A. Description. Control is given to the S055 Program at the location BEGIN. The tape handler is initialized by calling MTRINI, with MTAREA being set to the tape buffer address of EXPND and PBUFSZ set to 700 words. TPOINT, the pointer for fiche titles, is set to begin at the title table, FICTBS.

The program makes a call to the TREC Subroutine to process the title record. A call to the HDREC Subroutine processes three header lines per page of gray data. The starting X and Y coordinates for gray-level data are set by calling the SETXYS Subroutine. The number of records per gray-level page, LNCNT, is set to 60.

At the tag REPLN, the parameter for the Read Subroutine, RDWD, and the Get Subroutine, GTIN, are initialized. The address for the line identification is saved off by a call to SETAD. The subroutine PESET sets spacing for gray-level pixel.

At the tag RSMLN, the number of input pixels, PEXCT, is set to 120 and the subroutine GTIN is called to output a pixel line to film. The switch GTSW is set to NOP to pick-up pixel data from TABBUF Table. The same line of data is repeated nine times. The eight characters of line ID are output by calling the ECBCD Subroutine. Then a line of gray pixel is output again. The last four characters of the record are output.

The program returns to tag REPLN until 60 lines of pixel data have been processed. Then the fiche is advanced one frame. The program continues this loop starting at the tag HEADER until the end-of-file is reached.

B. Input/Outputs

1. Input. Data shall be input from a 9-track drive. The tape can be standard IBM label, nonstandard label or
unlabeled. The data shall be in a fixed length record format (blocked) with 1320 eight-bit bytes per block. Each logical record shall be 132 bytes in length. A logical record contains a title record or gray-level record. A title record has HEX D9 in the first byte of record. Byte 2 contains an EBCDIC T, followed by 130 bytes of title information. A gray-level record has eight bytes of EBCDIC characters, followed by 120 bytes of pixels and the four bytes of EBCDIC characters.

2. Output. Output of data is on 105 mm fiche (six rows by six columns). The first row is reserved for title information.

3. Message Output. CONTROL ERROR is output to the teletype when the first logical record on the file is not a title record. TITLE ERROR is output to the teletype when the title record is in error.

C. Linkages

1. External

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<tr>
<th>Routine</th>
<th>Program</th>
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<td>FC7CLR</td>
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<td>FICTAP</td>
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<td>FRSPIC</td>
<td>III166 ADVAN</td>
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2. Internal Routines

<table>
<thead>
<tr>
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<th>PLSET</th>
<th>SETAD</th>
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<tr>
<td>DUMRD</td>
<td>MVCOM</td>
<td>RDWD</td>
<td>TREC</td>
</tr>
<tr>
<td>ECBCD</td>
<td>PESET</td>
<td>RSRT</td>
<td></td>
</tr>
</tbody>
</table>

2.8.3.2 Subroutines

A. BUM. Subtracts 1 from read pointer address, MTPTR, and read word count, MTCNT. Calling sequence: JMS BUM.

B. DUMRD. Sets the read pointer to logical records and calls MTLAC when a new physical block of data is required. Calling sequence: JMS DUMRD.

C. ECBCD. Outputs a line of EBCDIC characters to film. Calling sequence where the first LAC is the address of the buffer and the second is the negative number of character:

```
LAC
DAC ADDSV
LAC
JMS ECBCD
```

D. GTIN. Gets a pixel value and outputs the pixel five times to film. When the GTSW switch is set to a SKIP, the pixel value is picked up from the tape buffer, complemented and stored in the table TABBUF. When the GTSW switch is set to NOP, the pixel is picked up from TABBUF. Calling sequence:

```
LAC (SKP OR NOP)
DAC GTSW
JMS GTIN
```

E. HDREC. Calls to check for console intervention, SETXYS to set the starting X and Y coordinate, and PLSET to set the spacing for ALPHA MODE. The subroutine outputs three lines of header information. Calling sequence: JMS HDREC.
F. **MVCOM.** Moves the title record from the tape buffer to the title buffer. Calling sequence: JMS MVCOM.

G. **PESET.** Sets the spacing and spot size for gray-level output. CHDELX, the X delta spacing, is set to 10 and CHDELY, the Y delta spacing, is set to 10. The spot size is set to 5. Calling sequence: JMS PESET.

H. **PLSET.** Sets the spacing and spot size for alphanumeric data. CHDELX, the X delta spacing, is set to 65 and CHDELY, the Y delta spacing, is set to 50. The character size is set to 6 and intensity to 48. Calling sequence: JMS PLSET.

I. **RDRT.** Saves the parameters for the tape handler. MTCNT is the word count; MTPTR is address of current line within the buffer. MTBYTW contains next half-word of line. MTBYTC is number of bits in last word. Calling sequence: JMS RDRT.

J. **RDWD.** Saves the first eight characters of the line in temporary buffer and stores intensity in INT. When the routine is initializing call for line, RDSW1 is set to skip and first eight characters saved. Then RDSW1 is set to NOP for access of the gray-level intensity. Calling sequence, where DAC RDSW1 initially calls for line data:

```
LAC (SKP)
DAC RDSW1
JMS RDWD
```

K. **RSRT.** Restores parameter for tape handler. Calling sequence: JMS RSRT.

L. **SETAD.** Loads address of character buffer into ADDSV. Calling sequence: JMS SETAD.

M. **TREC.** Checks first logical record for title control record. If record is not title record, the program prints out CONTROL ERROR and returns to MONITOR. If record is title record, the subroutine processes the title. Calling sequence: JMS TREC.
2.8.3.3 Constants and Variables

A. External

1. CHDELX. Variable that contains X spacing.
2. CHDELY. Variable that contains Y spacing.
3. CHRISIZ. Variable that contains character size.
4. FCXCNT. Constant that contains row count of 6.
5. FCYCNT. Constant that contains column count of 7.
6. FICMAR. Constant -100 fiche margin.
7. FICFRM. Constant -64 fiche pitch.
8. FICTB. Buffer where title information is stored.
9. MAXTRW. Variable used by I11185 title routine. The program initializes MAXTRW to zero.
10. MTAREA. Constant which has the address of tape buffer.
11. MTBYTC. Variable used to count number of bits used in I11163.
12. MTCNT. Variable containing number of words remaining in tape buffer.
13. MTPTR. Variable which is pointer into tape buffer.
14. MTARE. Constant which has the address of title buffer.
15. RECPIN. Variable to hold the intensity.
16. RECSPT. Variable to hold spot size.
17. **XTITS.** Constant starting X coordinate of title
   
   
   (= 14500).

18. **YTITS.** Constant starting Y coordinate of title
   
   
   (= 10500).

B. **Internal**

1. **ADDSV.** Variable containing address of character buffer
   
   **CHRBUF.**

2. **ALPHX.** Constant of 5042; starting X coordinate of
   
   alphanumeric characters.

3. **ALPHY.** Constant of 10047; starting Y coordinate of
   
   alphanumeric characters.

4. **CHDELX.** Constant of 65; X spacing for alphanumeric
   
   characters.

5. **CHDELY.** Constant of 50; Y spacing for alphanumeric
   
   characters.

6. **CTLMES.** Message CONTROL ERROR output to TTY when
   
   first record on tape is not a COM control record.

7. **INT.** Variable; temporary hold for intensity.

8. **INTHD.** Variable; transposed intensity.

9. **INTOUT.** Constant of 3; title intensity

10. **LNCNT.** Variable; line count per frame

11. **PEDELX.** Constant of 10; X spacing for gray-level
    
    pixel.

12. **PEDELY.** Constant of 10; Y spacing for gray-level
    
    pixel.

13. **PEXX.** Constant of 5446; starting X coordinate for first
    
    gray-level pixel of image.
14. *PEXY*. Constant of 10097; the starting Y coordinate for first gray-level pixel of image.

15. *PEXCT*. Variable used to hold pixels per line.

16. *PNTCT*. Variable used to hold number of pixel repeats.

17. *RRLN*. Variable to hold the repeat line count.

18. *SPSIZ*. Constant of 5; character size of EBCDIC character.

19. *TABBUF*. Variable buffer of 120 words where the transposed intensities are stored.

20. *TABINT*. Constant table of 64 words used to transpose intensity.


2.8.3.4 Flow Charts. See following pages.
SET TAPE BUFFER ADDRESS
SET TAPE BUFFER SIZE

INITIALIZE TAPE HANDLE

SET TPOINT TO FICTitious FILE TITLE TABLE

SET FCCUTS TO $SKO CUT MARK
ROPT
SAVE READ PAR

SETAD
SAVE OFF ADDRESS OF CHARACTER

RESET
SET SPACING FOR GAP LEVEL

ADD 4 TO MTCTR
READ WORD COUNT

ADD 4 TO MTPTR
READ POINTER

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
SET ROLN
REPEAT LINE COUNT
TO 9

SET PEXCT
PIXEL COUNT
TO 120

GT IN
OUTPUT LINE & P
GRAY LEVEL
OUTPUT FULL LINE

SET GETSW TO NOP

SET INDEX TO HOLD BUFFER

CRT
DO CARRAGE RETURN

REPEAT SAME LINE 9 TIMES

Y

N

B

A
SET X DAC FOR OUTPUT EBCDIC CHARACTER

PLSET
SET SPACE FOR EBCDIC CHARACTER

EBCDC
OUTPUT & EBCDIC CHARACTER

PESET
SET SPACING FOR PIXEL SPACING

SET PEXCT TO 120 NUMBER PIXEL PER LINE

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
MVCOM
MOVE TITLE RECORD TO TITLE AREA

FICTAP
SET UP FICHE TITLE

RERT
RESTORE READ PAR

BUM
SUBTRACT FORM READ PAR

DUMRD
READ NEXT LOG RECORD

RETURN
1. Subtract 1 from MTPTR
2. Read Pointer
3. Subtract 1 from MTCNT
4. Read Word Count
5. Return
`DUMRD`

`KEYBLIS`
- KEYBOARD LISTEN

ADD 66 TO MTCNT WORD COUNT

MTCNT -1

MTCNT > 0

ADD 66 TO MTPTR READ POINTER ZERO MTPTR

RETURN

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
MTLTFF
E&F MESSAGE

STORE -1
IN MTCNT
WORD COUNT

MTLCAC
READ PHY RECORD

BUM
ADD TO MTCNT, MTPRT

RETURN
**FLOWCHART**

1. **Character** (N)
   - **Y**
     - **GETTY**
       - **GET NEXT CHARACTER**
     - **STORE CHARACTER IN TTY BUFFER**
     - **ADD 1 TO CHARACTER COUNT**
     - **Character** (¥)
       - **Y**
         - **E**
       - **N**
         - **F**

---

**REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR**
SET HDON TO -3
THE NUMBER OF HEADER LINE

SET XY

SET XY COORD

PLSET
SET SPACING CHARACTER SIZE, INTEN

G-
SETAD
PICK HEADER
LINE ADDRESS

E045C0D
OUTPUT
132 CHARACTER
TO FILM

B0M45D
READ NEXT
L&G RECORD

CRT
DO A
CARRAGE,
LINE FEED

OUTPUT
3 LINE

Y

Y

G
PLSET

SET DELTA Y TO 65

SET DELTA Y TO 50

SET CHARACTER SIZE, INTENSITY TO 0.6

SET PLS REGISTER

RETURN

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
LOAD NUMBER CHARACTER TO OUTPUT

LOAD DISPATCH ADDRESS

LOAD ADDRESS OF BUFFER TO BE OUTPUT

OUTPUT THE BUFFER

RETURN
SET NUMBER OF TIME TO
REPEAT PIXELS TIME

PICK INTERF FROM TAPE

Y

TRANS INTERF TO
REV FOR DIRECT OUTPUT

STORE REV INTERF IN INTERF TABLE

N

PICK UP REV INTERF FROM INTERF TABLE
`INTENS POINT`
RESET

SET DELTA X TO 10

SET DELTA Y TO 10

SET SPOT SIZE TO 5

SET HARDWARE

RETURN
RDWD

PICK WHOLE WORD

SET PICK WHOLE WORD TO NO
NAP-DRD5W1

MTLAC
PICK WHOLE WORD FROM TAPE BUFFER

SAVE UPPER 8 BITS IN INT

SAVE LOWER 8 BITS IN HEL2C

RETURN

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
SET PICK whole
WORD TO YES
SKIP \rightarrow RDSW1

MOVE HL2C TO ENT

RETURN
SETAD

PICK UP
TABLE BUFFER
POINTER, SUBTRACT
I \rightarrow ADDSV

RETURN
SAVE READ
WORD COUNT
MTCNT \rightarrow
RDCNT

SAVE READ
BUFFER POINTER
MTPTR \rightarrow
RDTAR

RETURN
2.9 COMA IBM SYSOUT PRINT PROCESSOR (105PR, 16PRNT)

2.9.1 Background

A. Author. Information International Inc., 12435 West Olympic Boulevard, Los Angeles, California, 90064.

Intent. The IBM Sysout Print Processor processes magnetic tapes from the IBM 360/75's. 105PR is requested when 105 mm fiche is desired, and 16PRNT is requested when 16 mm film is desired.

Program History

1. Production Tape Date. 14 January 1975.
3. Authorization. EO-005F
4. Test Cases. AT procedures SB-09613A.

2.9.2 Introduction. This paragraph describes the usage and design of the Informational International IBM Sysout Print Processor Program. MONITOR and associated I/O driver routines are described in TR531, Vol. I.

2.9.2.1 Hardware Requirements:

- FR80 with 12K memory
- 9-track tape unit
- 16 mm or 105 mm camera.

2.9.2.2 Software Requirements

<table>
<thead>
<tr>
<th>III109</th>
<th>III166 ADVAN</th>
<th>III164</th>
</tr>
</thead>
<tbody>
<tr>
<td>III166</td>
<td>III166 TABLE</td>
<td>III164 FILM</td>
</tr>
<tr>
<td>III166 INVAR</td>
<td>III161</td>
<td>III186</td>
</tr>
<tr>
<td>III161 GO</td>
<td>III185</td>
<td>III187</td>
</tr>
<tr>
<td>III147</td>
<td>III162 MACRO</td>
<td>PRINTF COM</td>
</tr>
<tr>
<td>III162</td>
<td>III163</td>
<td>FLOAD</td>
</tr>
</tbody>
</table>
2.9.2.3 Assembly Parameters. The insert file III109 contains the standard assembly parameters for machine and camera configuration. Specific assembly parameters for the IBM Sysout Print Processor are as follows.

A. **EBCDIC.** Defines the EBCDIC character set.

B. **LOCASE.** Includes the lower case characters in the character set.

C. **TAPELB.** Defines code to provide automatic processing of standard labeled tapes.

D. **ALLOW.** Defines code to allow form loading and flashing.

2.9.2.4 Operator Commands. The following commands are available for operator use.

*TIME
*FRAME=0
*GO
*CONTINUE
*END JOB
*MAKE FILM=L
*CLEAR
*ADVANCE
*REWIND
*SKIP
*TRY AGAIN
*STANDARD LABELS
#UNLABELLED
*FORM
*INDEX FORM
*ERROR FORM
*ROTATION=0
2.9.3 Analysis

2.9.3.1 Major Control Section

A. Description. From location BEGIN, PINIT is called to initialize the PLS and to set character size, rotation, and deltas. If the tape is labeled, LBDATA is called to process the tape label. MTINIT is then called to initialize the magnetic tape routines, allocate the buffer areas, and read the first two records on the tape. Various program parameters are initialized (housekeeping) and NEXPAG is called to force a page eject. Control then goes to GETLNI, where magnetic tape records are checked to assure that they are larger than two bytes. Smaller records are ignored. If the record size is longer than two bytes, the line length is calculated from the data, and PRSETX is called to set the X DAC. If there are no carriage controls, the program jumps to GETLNI4, which sets up for the print loop. Otherwise, the carriage controls are interpreted by GETHC and GETLNI5. SKTOCH is called to process the carriage control or page eject and control goes to GETLNI4 to set up for the print loop. The print loop has three entrances, and the one used is determined by the byte position of the first character to be printed. If there are any characters to be printed, control then goes to the print loop; if not, the next line is processed. The print loop prints the entire line with the high-speed character generator, unless it has to check for a logical record mark, in which case it must print a character at a time. The print loop exits when the character count is exhausted or a record mark is encountered. Control then goes to GETLNI. Time is given here to read from magnetic tape, and any fiche control records or indexing records are processed. PKYBLS is called to check for an operator interrupt, and control goes to GETLNI. The program continues processing, one line at a time, until an end-of-file mark is encountered. At this point processing is terminated and control is returned to the teletype monitor.

B. Input/Output. Operator input and output is through the teletype. Data input is via 9-track magnetic tape, and output is on 16 mm or 105 mm film.
C. **Linkages**

### External Routine Calling Sequence

<table>
<thead>
<tr>
<th>Routine</th>
<th>Program</th>
<th>Calling Sequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>PINIT</td>
<td>III166</td>
<td>JMS PINIT</td>
</tr>
<tr>
<td>MDOUT</td>
<td>III166</td>
<td>JMS MDOUT</td>
</tr>
<tr>
<td>MONANT</td>
<td>III166</td>
<td>JMS MONANT</td>
</tr>
<tr>
<td>ACCTG</td>
<td>III166</td>
<td>JMS ACCTG</td>
</tr>
<tr>
<td>ADVANN</td>
<td>III166 ADVAN</td>
<td>ADVANN</td>
</tr>
<tr>
<td>MTTOUT</td>
<td>III166</td>
<td>JMS MTTOUT</td>
</tr>
<tr>
<td>MCRLF</td>
<td>III166</td>
<td>JMS MCRLF</td>
</tr>
<tr>
<td>NEXPIC</td>
<td>III166 ADVAN</td>
<td>JMS NEXPIC</td>
</tr>
<tr>
<td>KYBLIS</td>
<td>III166</td>
<td>JMS KYBLIS</td>
</tr>
<tr>
<td>FICTAP</td>
<td>III166</td>
<td>JMS FICTAP</td>
</tr>
<tr>
<td>MOOVT</td>
<td>III166</td>
<td>JMS MOOVT</td>
</tr>
<tr>
<td>MMASSG</td>
<td>III166</td>
<td>JMS MMASSG</td>
</tr>
<tr>
<td>DRWVEC</td>
<td>III162</td>
<td>JMS DRWVEC</td>
</tr>
<tr>
<td>SETXYS</td>
<td>III166</td>
<td>JMS SETXYS</td>
</tr>
<tr>
<td>SETTLS</td>
<td>III162</td>
<td>JMS SETTLS</td>
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<tr>
<td>MVDATA</td>
<td>III166</td>
<td>JMS MVDATA</td>
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<td>MNLSIZ</td>
<td>III166</td>
<td>JMS MNLSIZ</td>
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<td>FRSPIC</td>
<td>III166 ADVAN</td>
<td>FRSPIC</td>
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<tr>
<td>FLASH</td>
<td>III187</td>
<td>JMS FLASH</td>
</tr>
<tr>
<td>MONAUT</td>
<td>III166</td>
<td>JMP MONAUT</td>
</tr>
<tr>
<td>HDRTRL</td>
<td>III166</td>
<td>JMS HDRTRL</td>
</tr>
<tr>
<td>FCFIN</td>
<td>III166 ADVAN</td>
<td>FCFIN</td>
</tr>
<tr>
<td>FC7CLR</td>
<td>III166 ADVAN</td>
<td>FC7CLR</td>
</tr>
</tbody>
</table>

### Internal Routine Calling Sequence

<table>
<thead>
<tr>
<th>Routine</th>
<th>Calling Sequence</th>
</tr>
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<tbody>
<tr>
<td>LBDATA</td>
<td>JMS LBDATA</td>
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<tr>
<td>FINDCH</td>
<td>JMS FINDCH</td>
</tr>
<tr>
<td>SKTOCH</td>
<td>JMS SKTOCH</td>
</tr>
<tr>
<td>TYPLIN</td>
<td>JMS TYPLIN</td>
</tr>
<tr>
<td>PRLNFD</td>
<td>JMS PRLNFD</td>
</tr>
<tr>
<td>PSETEX</td>
<td>JMS PSETEX</td>
</tr>
<tr>
<td>PRLNFS</td>
<td>JMS PRLNFS</td>
</tr>
<tr>
<td>NEXPOK</td>
<td>NEXPOK</td>
</tr>
<tr>
<td>NEXPAG</td>
<td>NEXPAG</td>
</tr>
<tr>
<td>TOPPAG</td>
<td>TOPPAG</td>
</tr>
</tbody>
</table>
### Subroutines

<table>
<thead>
<tr>
<th>Routine</th>
<th>Calling Sequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>SETCHG</td>
<td>JMS SETCHG</td>
</tr>
<tr>
<td>PPAGE</td>
<td>PPAGE</td>
</tr>
<tr>
<td>PFLASH</td>
<td>PFLASH</td>
</tr>
<tr>
<td>PKYBLS</td>
<td>JMS PKYBLS</td>
</tr>
<tr>
<td>FCPROC</td>
<td>JMS FCPROC</td>
</tr>
<tr>
<td>FCAAAF</td>
<td>JMS FCAAAF</td>
</tr>
<tr>
<td>INXSET</td>
<td>JMS INXSET</td>
</tr>
<tr>
<td>MTINIT</td>
<td>JMS MTINIT</td>
</tr>
<tr>
<td>GETREC</td>
<td>JMS GETREC</td>
</tr>
<tr>
<td>GETEND</td>
<td>JMS GETEND</td>
</tr>
<tr>
<td>POKEMT</td>
<td>JMS POKEMT</td>
</tr>
<tr>
<td>POKAGN</td>
<td>JMS POKAGN</td>
</tr>
<tr>
<td>POKEMS</td>
<td>JMS POKEMS</td>
</tr>
<tr>
<td>CUTMAK</td>
<td>JMS CUTMAK</td>
</tr>
</tbody>
</table>

#### 2.9.3.2 Subroutines

A. **LBDATA.** Processes tape labels. If the tape is labeled, the logical record size, carriage controls, blocking factor, and blocking type will be set.

B. **SKTOCH.** Does the hardware carriage control processing; either skips to the appropriate line number or ejects the appropriate number of linefeeds. Only skips to channel 1 are processed as page ejects; all others are linefeeds. If CHANUM is negative, SKTOCH ejects the 1's compliment of linefeeds. If CHANUM is positive, the channel skip takes place.

C. **TYPLIN.** Types characters to the teletype.

D. **PRLNFD.** Does one, two, or three linefeeds, according to the value of NUMSPC. NUMSPC can specify single, double, or triple linefeed. PRNLFD calls PRLNFS.

E. **PRLNFS.** Does one linefeed and a page eject if at a page boundary.

F. **PRSETX.** Sets the X DAC (X position) to the left margin on the screen.
G. FINDCH. Updates the pointers to the next magnetic tape buffer. At exit, LWDTMP points to the current word, and LCHTMP points to the current byte position in the word.

H. NEXPOK. Calls NEXPAG to advance the camera and flash the forms, if any.

I. NEXPAG. Calls PPAGE to flash any requested forms, calls NEXPIC to advance the camera, and calls TOPPAG to reset the DAC's (beam position) to the top of page.

J. TOPPAG. Flashes cutmark if 16 mm, resets print line number, restores the page line count, and sets the DAC's to top of page.

K. SETCHG. Prints characters found in the AC and loads the base address for the high-speed character generator.

L. PPAGE. Calls PFLASH to flash the null and any requested forms if the current page is not blank.

M. PFLASH. Calls FLASH to flash forms; if form is not loaded, outputs error message.

N. PKYBLS. Calls KYBLIS to check for input from operator.

O. FCPROC. Is called if title record is found. FCPROC stores the fiche control line in the teletype buffer and calls NEXPAG before printing the next line.

P. FCAAAF. For 105 mm only, prints the index line and stores the data for the index frame.

Q. INXSET. For 105 mm only, sets up for the index data to be fetched and stored at the end of the current line.

R. CUTMAK. For 16 mm only, puts the cutmark on 16 mm film.

S. MTINIT. Initializes the magnetic tape buffers, reads the first record off of tape and sets data ready, and starts a read of the second record before exit.
T. GETREC. Updates the buffer pointers and calls POKEMT to read another record.

U. GETEND. Finds the last word in the most recent record read from tape.

V. POKEMT. Calls POKEMS to read a record off of tape if there is an empty buffer and checks for an end-of-file. If an error has occurred, the record is reread.

W. POKAGN. Backspaces the tape one record for a retry if an error occurred on read.

X. POKEMS. Reads one record off tape. POKEMS is called by POKEMT.

2.9.3.3 Constants and Variables

A. AUXCNT. Auxiliary control table. Any control that is unknown to the program is stored here.

B. CHANUM. Contains the space count if negative. If positive contains the channel number or form number.

C. CHARCT. Contains the negative character per line count used in the print loop.

D. HSLEBPW. Contains starting address of the Character Dispatch Table. Used as a base address for the high-speed character generator.

E. LCHPTR. Points to the current byte in the magnetic tape buffer. Initialized to zero after each read.

F. LWDPTR. Points to first word of magnetic tape data.

G. LWDTMP. Points to current word in tape buffer.

H. NFRNMNM. Contains current form number.

I. NUMSPC. Specifies single, double or triple linefeed mode.
J. **PAGCNT.** Contains the current page count.

K. **PLINUM.** Contains the current print line number.

L. **VBSIZ.** Contains the magnetic tape record size in words.

2.9.3.4 *Flow Charts.* See following pages.
BEGIN

PRINT
PRINT
INITIALIZE

STANDARD
LABELS

Y

LB
DATA
PROCESS
TAPE
LABEL

N

MT
INIT
INITIALIZE
TAPE
ROUTINES

SET FLAG FOR NO
ADVANCE ON
FIRST SKIP TO
CHANNEL

AA

REPRODUCIBILITY OF THE
ORIGINAL PAGE IS POOR
GETLN7

ASA
SKIP TO CHANNEL 11

Y
FPROC

N

CONTROL FOUND IN OTHTAB

Y
GETSBT

N

PRINT "UNKNOWN CONTROL" ON TTY AND DO SPACE BEFORE PRINTING

GETLN5
GETSBT

SET FOR SPACE AFTER IF BIT 9 IS SET

GETLN5

PROCESS BEFORE

GETLN4

SET UP FOR PRINT OR CAMERA SYNC

FCAAB

Y

SKETCH PROCESS CARRIAGE CONTROL

N
NEWJOB

INITIALIZE PRINT PARAMETERS

NEXTPAGE
FORCE PAGE EJECT

$105_{mm}$

Y

GETLN

PKYBLS
CHECK FOR OPERATOR INTERRUPT

N

GETLN

FCFIN
FINISH LAST FICHE

FRSPI
INITIALIZE FOR FIRST PICTURE

GETLN

2-535
GETLNG

PROCESS AFTER

Y

N

STEP TO NEXT LINE

GETNILU

SKETCH PROCESS CARRIAGE CONTROL
SET PHYSICAL RECORD SIZE FOR TAPE ROUTINES

SET LINE LENGTH FOR PRINTING

SET BLOCKING FACTOR AND SKIP FACTOR FOR NUMBER OF NON-PRINTING CHAR AT BEGINNING OF BLOCK
SKTOCH

CHANNEL SKIP

Y Y

NEW JOB

SEARCH FOR CHANNEL'S LINE NUMBER

PRACCG

N

N

SKTOCK

LINEFEED COUNT ZER0

Y

Y

SKTOCK

PLRNFD DO LINEFEED

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR.
SKTOCS

CHAN FOUND

N

PREPARE TO TYPE "NOT PUNCH"ED MESSAGE AND RETURN TO MONITOR

MONANT

Y

PRINT LINE EQ TO CHAN LINE

N

SKTOCS

Y

RESTORE BEFORE AFTER SWITCH TO BEFORE

SKTOCS

PRLNFS DO LINEFEED

SKTOCS
FINDCH

UPDATE POINTERS TO CURRENT' MAG TAPE WORD AND BYTE POSITION
PFLASH

FORM REQ

Y

SET POINTER FOR NULL FORM

FLASH FORM

CC

ANOTHER FORM REQ

Y

BB

N

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
FLOW CHART:

1. **INXSET**
2. **SINGLE**
3. **CHAR MODE**
4. **IF**
5. **Y**
6. **FORCE PRINT LOOP TO STORE INDEX LINE IN TITLE BUFFER**
7. **SET UP TO SKIP LEADING BLANKS IF REQUESTED**
8. **INITIALIZE TITLE BUFFER**
9. **ELSE**
10. **N**

Diagram: 2-553
FC AAA AF

SKIP LEADING BLANK MODE

Y

STORE CHAR IN TITLE BUFFER

N

IS CHAR A BLANK

Y

1ST NON-BLANK CHAR

N

GETAL

SET TO STORE ALL CHARACTERS

STORE CHAR IN TITLE BUFFER
CUTMARK

Plot CUTMARK in upper left corner of frame

GETEND

Compute last word address and place word in AC.

Reproducibility of the original page is poor.
MTINIT

SET ADDRESS FOR READ

MV DATA
READ ONE RECORD

EOF

Y
GETEOF

N

LONG RECORD

Y
LNGREC

N

CALCULATE RECORD SIZE

MTINBU
BUILD POINTERS IN BUFFER AREA FOR MULTI-BUFFERING

SET DATA READY ON 1ST BUFFER

POKEMS
START ANOTHER READ
DD

EOF

Y

GETEOF

N

GETEND
GET RECORD
LENGTH

REC TOO LONG

Y

LNGREC

N

PREPARE TO TYPE TYPE ERROR

EEE

2-559
EEE

MONANT
RETURN + O
MONITOR

INDICATE
BUFFER
READY

GETRC1

POKLER

SET FLAG
FOR TAPE
ERROR
GET TAPE STATUS

EOF

OTHER ERROR

RECORD TOO LONG

CHANGE BUFFER BUSY TO DATA AVAILABLE
CHANGE POINTER TO NEXT BUFFER

POKEOF

POKER
POKERR

RETRY COUNT EXHAUSTED

POKERR

POKAGN
BACKSPACE FOR RETRY
2.10 COMA HARVARD COLLEGE OBSERVATORY SOLAR EXPERIMENT S055 GRAY-LEVEL 7-TRACK OR 9-TRACK PROCESSOR (HCO)

2.10.1 Background

A. Author. F. C. Ashton, Aeronutronic Ford Corp.

B. Intent. HCO is requested when a Harvard College Observatory Experiment S055 gray-level 7-track or 9-track has been submitted for data to be output to 105 mm fiche.

C. Program History

1. Production Tape Date. 28 November 1973

2. Author. F. C. Ashton

3. Authorization. FR80 microfilm system task A13

4. Test Case. Test tape requirement, specification SH-25723

5. Revisions. Reference Appendix B, paragraph B.10

2.10.2 Introduction

2.10.2.1 Hardware Requirements

- FR80 with 12K memory
- 9-track or 7-track tape unit
- 105 mm fiche camera.

2.10.2.2 Software Requirements. The following files, found in I.I.I.'s SYM Directory, are required.

<table>
<thead>
<tr>
<th>III109</th>
<th>III105</th>
<th>III147</th>
<th>III188</th>
</tr>
</thead>
<tbody>
<tr>
<td>III166</td>
<td>III163</td>
<td>III162</td>
<td>III161 GO</td>
</tr>
<tr>
<td>PHOBAT</td>
<td>III185</td>
<td>III161</td>
<td>III186</td>
</tr>
</tbody>
</table>
2.10.2.3 Assembly Parameters. The assembly parameters in III109 should be set for the proper machine configuration. Assembly parameters specific to HCO program are as follows.

A. WEDGE. Defines code to allow nine step wedges to be placed on ID fiche.

B. 7-TRACK. If 1, indicates data will be coming from a 7-track tape drive.

C. FONT. If 0, indicates standard I.I.I. character FON™

D. TAPELB. If 1, indicates standard IBM tape labels.

E. NASA. If 1, indicates special characters used at JSC.

F. EBCDIC. If 1, indicates standard IBM EBCDIC character set.

G. LOCASE. If 1, indicates lower-case character set.

H. BIGBUF. If 0, allows maximum amount of features with minimum buffer space.

I. MTSIZE. Defines length of system tape buffers (513 words).

J. MTTSIZE. Defines length of teletype buffer (192 words).

K. MANYUP. Indicates that page count is printed with frame count when the accounting information is output to the teletype.

L. FTYPE. Indicates the fiche camera.

M. DSKMON. Indicates that disk monitor routine is to be assembled.

N. NEXPAG. Equivalent to NEXPIC routine.
2.10.2.4 Operator Commands

*TIME=1'26.1"
*FRAME=0
*GO
*CONTINUE
*TITLE
*END JOB
*MAKE FILM=1
*CLEAR
*ADVANCE
*TAPE TYPE - 2,5,8 OR 9=9
*BACK
*PARITY=1
*USE=1
*REWIND
*SKIP
*TRY AGAIN=10
*STANDARD LABELS=NO
*UNLABELLED=YES
*PITCH-MARGIN=44,97
*SIZE OF TITLE=9223,615(
*IMAGES PER FICHE=12,8
*HITS-CHARS,VEC,PTS,TITLE,CMARK=1,1,1,2,1
*FOCUR
*LOAD=HCO
*ROTATION=0
*PROCESS JOBS (0=ALL,N=N JOBS)=0
*LIST(0=NO,1=YES)=0
*
2.10.3 **Analysis**

2.10.3.1 **Major Control Section**

A. **Description.** Control is given the HCO Program at the location `BEGIN`. The tape handler is initialized by calling `MTRINI`, with `MTAREA` being set to the tape buffer address of `EXPND` and `PBUFSZ` set to 700 words. The job count, `JJOBID`, is initialized to zero. `TITSW2` is set to `NOP` for title search routine. `TPOINT`, the pointer for fiche titles, is set to begin at the Title Table, `FICTBS`.

The intensity of the PLS is set to 32. A call is made to the `BATNO` Subroutine, which accepts from teletype the COM tape number, the source tape, and film roll number. `BATNO` initializes the fiche title routine, `FICTAP`, for the ID fiche. On the ID fiche, the program outputs nine different gray-step pages. Each page is 600 pixels by 600 lines. The nine-step intensities are 1, 9, 17, 25, 33, 41, 49, 57, and 63. When each page is output, the image is rotated 90° to the title lines.

The program makes a call to the `TREC` Subroutine to process the title record. A call to the `HDREC` Subroutine is made to check for additional title records and skips records. Then `HDREC` rotates the image 90° to the title and processes three header lines per page of gray data. The starting X and Y coordinates for gray-level data are set by calling the `SETXYS` Subroutine. The number of records per gray-level page, `LNCNT`, is set to 60.

At the tag, `REPLN`, the parameter for the read subroutine, `RWWD`, and the get subroutine, `GTIN`, are initialized. The address for the line identification is saved off by a call to `SETAD`. The subroutine `PESET` sets spacing for the gray-level pixel.

At the tag, `RSMLN`, the number of input pixels, `PEXCT`, is set to 120 and the `GTIN` Subroutine is called to output a pixel line to film. The switch `GTSW` is set to `NOP` to pickup
pixel data from TABBUF Table. The same line of data is repeated nine times. The eight characters of line ID are output by calling the ECBCD Subroutine. Then a line of gray pixel is output again. The last four characters of the record are bypassed. The starting X coordinate is offset by 20 scope points to give a sawtooth effect.

The program returns to the tag REPLN until 60 lines of pixel data is processed. The image is then rotated back 90° to title rotation and the intensity of the PLS is set to 32. The fichê is advanced one frame. The program continues this loop, starting at the tag HEADER, until end-of-file is reached.

B. Input/Output

1. Input. Data is input from a 7-track or 9-track drive. The tape can be standard IBM label, nonstandard label or unlabeled. The data shall be in a fixed-length record format (blocked) with 1320 eight-bit bytes per block. Each logical record shall be 132 bytes in length. A logical record contains a title record, skip record, or gray-level record. A title record has HEX D9 in the first byte of the record. The second byte contains an EBCDIC T, followed by 130 bytes of title information. A skip record has HEX D9 in the first byte of the record. The second byte contains an EBCDIC J, followed by 130 bytes of EBCDIC blank. A gray-level record has eight bytes of EBCDIC characters, followed by 120 bytes of pixels and four bytes of EBCDIC blank.

2. Output. Output of data is on 100 mm fiche (3 rows by 12 columns). The first row of data is title information.

3. Message Output

a. CONTROL ERROR. This is output to the teletype when the first logical record on the file is not a title record.
b. \textbf{TITLE ERROR}. This is output to the teletype when the title record is in error.

c. \textbf{JOB ID NO}. The title information is output to the teletype along with this message.

d. \textbf{ENTER SOURCE TAPE}. This is output to the teletype and the mainline waits for the source tape number. The operator types up to 12 characters of information.

e. \textbf{ENTER COM TAPE}. This is output to the teletype and the mainline waits for the COM tape number. The operator types up to 12 characters of information.

f. \textbf{ENTER ROLL}. This is output to the teletype and the mainline waits for the roll number. The operator types in 12 characters of information.

C. \textbf{Linkages}

1. \textbf{External}

<table>
<thead>
<tr>
<th>Routine</th>
<th>Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>FCFIN</td>
<td>III166 ADVAN</td>
</tr>
<tr>
<td>FC7CLR</td>
<td>III166 ADVAN</td>
</tr>
<tr>
<td>FICTAP</td>
<td>III188</td>
</tr>
<tr>
<td>FRSPIC</td>
<td>III166 ADVAN</td>
</tr>
<tr>
<td>GETINAM</td>
<td>III161</td>
</tr>
<tr>
<td>GETT</td>
<td>III163</td>
</tr>
<tr>
<td>KLBLIS</td>
<td>III166</td>
</tr>
<tr>
<td>MDONEX</td>
<td>III166 INVAN</td>
</tr>
<tr>
<td>MDOOUT</td>
<td>III166</td>
</tr>
<tr>
<td>MCRLF</td>
<td>III166 ADVAN</td>
</tr>
<tr>
<td>MMESSG</td>
<td>III166 ADVAN</td>
</tr>
<tr>
<td>MTRINI</td>
<td>III163</td>
</tr>
<tr>
<td>NEXPIC</td>
<td>III160 ADVAN</td>
</tr>
<tr>
<td>MNBIRT</td>
<td>III166</td>
</tr>
<tr>
<td>PSTLL</td>
<td>III166</td>
</tr>
<tr>
<td>ROTATE</td>
<td>III166</td>
</tr>
<tr>
<td>SETPLS</td>
<td>III166</td>
</tr>
<tr>
<td>SETXYS</td>
<td>III160</td>
</tr>
</tbody>
</table>
2. Internal Routines

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>BATNO</td>
<td>HCOEXT</td>
<td>LSTON</td>
<td>SETAD</td>
<td></td>
</tr>
<tr>
<td>BATEND</td>
<td>HDREC</td>
<td>MVCOM</td>
<td>TITPUT</td>
<td></td>
</tr>
<tr>
<td>BTTY</td>
<td>HKPJBS</td>
<td>PRESET</td>
<td>TITSR</td>
<td></td>
</tr>
<tr>
<td>CKCOM</td>
<td>HOBMOD</td>
<td>PLSET</td>
<td>TTYIT</td>
<td></td>
</tr>
<tr>
<td>ECBCD</td>
<td>HOBSKJ</td>
<td>RDWD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GTIN</td>
<td>IDLST</td>
<td>RSRT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HBMODE</td>
<td>LSTID</td>
<td>SAVCH</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2.10.3.2 Subroutines

A. BATNO. Accepts source tape number, COM tape number, and roll number from the operator. The subroutine is called to output the title fiche. Calling sequence: JMS BATNO.

B. BATEND. Outputs the trailing ID fiche at end of job. Calling sequence: JMS BATEND.

C. BTTY. Accepts character from teletype and stores one character per word. The subroutine accepts up to 12 characters. If the user wishes to use less than 12 characters, he terminates string of input characters with a carriage return and routine will space fill the rest of the buffer. The subroutine converts ASCII characters to EBCDIC. A rubout character will allow the user to start reinputting the character string. Calling sequence, where LAC is the address of place to store character:

```
LAC
JMS BTTY
```

D. CKCOM. Checks for COM control record of J and T records. If a J control record is detected, a blank frame is recorded on fiche. When a T control record is detected, the count of number of jobs to be run is checked. If the title record is greater than the number of jobs, the routine ends the run. If the title record is less than or equal to the number of jobs, the new title is output to fiche. Calling sequence: JMS CKCOM.
E. **ECBCD.** Outputs a line of EBCDIC characters to film. Calling sequence, where the first LAC is the address of the buffer and the second is the negative number of characters:

```
LAC
DAC ADDSV
LAC
JMS ECBCD
```

F. **GTIN.** Gets a pixel value and outputs the pixel five times to film. When the GTSW switch is set to a SKIP, the pixel value is picked up from the tape buffer, complemented and stored in the table TABBUF. When the GTSW switch is set to NOP, the pixel is picked up from TABBUF. Calling sequence:

```
LAC (SKP or NOP)
DAC GTSW
JMS GTIN
```

G. **HBMODE.** Called by MONITOR to get the number of jobs to process. Calling sequence: DAC HBMODE.

H. **HCOEXT.** Called when END JOB is typed in. The subroutine rotates image, sets the title intensity, and outputs trailing ID fiche. Calling sequence: JMS HCOEXT.

I. **HDREC.** Calls KYBLIS to check for console intervention, CKCON to check for a COM control record, ROTATE to rotate the image, SETXYS to set the starting X and Y coordinates, and PLSET to set the spacing for ALPHA MODE. The subroutine outputs three lines of header information. Calling sequence: JMS HDREC.

J. **HKPJBS.** Called by MONITOR to display the title number. Calling sequence: DAC HKPJBS.

K. **HOBMOD.** Gets the number of jobs to process and store it in JOBCT. Calling sequence: JMS I HOBMOD.

L. **HOBSKJ.** Gets the number of titles to skip and stores it in TITRCT. The subroutine sets TITSW to JMS TITSR. Calling sequence: JMS I HOBSKJ.
M. **IDLST.** Displays the list ID YES or NO flag. Calling sequence: DAC IDLST.

N. **LSTID.** Gets the LIST ID flag and stores it at IDWHT (0 = no list, 1 = list). When the LIST ID flag is 0, LSTSW is set to NOP. When the flag is 1, LSTSW is set to JMS LSTON, and JITSW is set to TITSR. Calling sequence: JMP I LSTID

O. **LSTON.** Moves title record information to the title buffer and outputs title to the teletype. Calling sequence: JMS LSTON.

P. **MVCOM.** Moves the title record from the tape buffer to the title buffer. Calling sequence: JMS MVCOM.

Q. **PESET.** Sets the spacing and spot size for gray-level output. CHDELX, the X delta spacing, is set to 10 and CHDELY, the Y delta spacing, is set to 10. The spot size is set to 5. Calling sequence: JMS PESET.

R. **PLSET.** Sets the spacing and the spot size for alphanumeric data. CHDELX, the X delta spacing, is set to 65 and CHDELY the Y delta spacing, is set to 50. The character size is set to 6 and intensity to 48. Calling sequence: JMS PLSET.

S. **RDRT.** Saves the parameters for the tape handler. MTCNT is the word count; MTPTR is address of current line within the buffer. MTBYTW contains next half-word of line. MTBYTC is number of bits in last word. Calling sequence: JMS RDPT.

T. **RDWD.** Saves the first eight characters of the line in a temporary buffer and stores the intensity in INT. When the routine is initially calling for line data RDSWI is set to SKIP and the first eight characters are saved. Then RDSWI is set to NOP for access of the gray-level intensity. Calling sequence, where DAC RDSWI initially calls for line data:

   LAC (SKP)
   DAC RDSW1
   JMS RDWD

**REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR**
U. RSRT. Restores parameter for tape handler. Calling sequence: JMS RSRT.

V. SAVCH. Saves off alphanumeric characters in the character buffer, CHRBUF. Calling sequence, when $N =$ number of characters to save off:

\[
\text{LAM } \text{-N} \\
\text{JMS SAVCH}
\]

W. SETAD. Loads address of character buffer, CHRBUF, into ADDSV. Calling sequence: JMS SETAD.

X. TITINT. Loads address of the teletype output buffer TITTY into teletype pointer, TITPT, and calls TITWD to set up word count. Calling sequence: JMS TITINT.

Y. TITPUT. Stores three characters per word in the teletype buffer. Calling sequence: JMS TITPUT.

Z. TITSR. Reads down the tape $N$ number of title records. MONITOR's HOBSKP Subroutine stores $N$, the number of titles to be skipped. Calling sequence: JMS TITSR:

AA. TITWD. Initializes the teletype word buffer to zero and sets number of teletype characters to three. Calling sequence: JMS TITWD.

BB. TTYTIT. Outputs the title to teletype. The title information has to be stored in title buffer. The title buffer address is stored in MTTARE. Calling sequence: JMS TTYTIT.

2.10.3.3 Constants and Variables

A. External

1. BCKCOM. Constant used when backspacing tape via MVDATA.

2. CHDELX. Variable that contains $X$ spacing.

3. CHDELY. Variable that contains $Y$ spacing.
4. CHRSIZ. Variable that contains character size.
5. FCXCNT. Constant that contains row count of 12.
6. FCYCNT. Constant that contains column count of 8.
7. FICMAR. Constant containing fiche margin (-96).
8. FICFRM. Constant containing fiche pitch (-43).
9. FICTB. Buffer where title information is stored.
10. MAXTRW. Variable used by the III185 title routine. The program initializes MAXTRW to zero.
11. MDISIZ. Constant containing character size of monitor display (63).
12. MDISLF. Constant containing line spacing of monitor display (438 scope points).
13. MDISPL. Constant containing spacing between characters on monitor display (384 scope points).
14. MTAREA. Constant containing the address of tape buffer.
15. MTBYTC. Variable used to count number of bits used in III163.
16. MTBYTW. Variable used to save remainder of unused bits in III163.
17. MTCNT. Variable containing number of words remaining in tape buffer.
18. MTPTR. Variable containing pointer into tape buffer.
19. MTTARE. Constant containing address of title buffer.
20. PBUFFZ. Constant containing number of words in tape buffer (700).
21. **PGNAME.** Constant containing program name HCO.

22. **RECPIN.** Variable to hold the intensity.

23. **RECSPT.** Variable to hold spot size.

24. **VCHTAB.** Table to use to convert EBCDIC to ASCII.

25. **XTITS.** Constant containing the starting X coordinate of title (= 2200).

**B. Internal**

1. **ADDSV.** Variable containing the address of the character buffer `CHRBUF`.

2. **ALPHX.** Constant (5042) which is starting X coordinate of alphanumeric characters.

3. **ALPHY.** Constant (10047) which is starting Y coordinate of alphanumeric characters.

4. **BATARE.** Table for the BEGIN and END ID title fiche.

5. **BEGIN.** Constant; BEGIN for the ID fiche.

6. **BTABL.** Table used to convert characters from ASCII to EBCDIC.

7. **BTCT.** Variable used as counter in BATNO Subroutine.

8. **BTLN.** Constant length of the ID title.

9. **CHDELX.** Constant of 65; X spacing for alphanumeric characters.

10. **CHDELY.** Constant of 50; Y spacing for alphanumeric characters.

11. **CHRBUF.** Variable table to store EBCDIC character, two characters per word.
12. **CHRCT.** Variable running count of characters per record.

13. **CHRPT.** Variable pointer into character buffer, CHRBUF.

14. **CMTAP.** Variable buffer where the COM tape number for the ID fiche is stored.

15. **CRSCON.** Constant of 1 used to rotate image.

16. **CTLMES.** Message CONTROL ERROR output to teletype when record on tape is not a COM control record.

17. **CTMES.** Message ENTER COM TAPE output to teletype when accepting COM tape number for ID fiche.

18. **ENEND.** Message END put on tail fiche ID.

19. **IDWHT.** Variable used for display of answer for LIST (0 = NO; 1 = YES).

20. **INT.** Variable temporary hold for intensity.

21. **INTHD.** Variable transposed intensity.

22. **INTOUT.** Constant of 3; title intensity.

23. **JJOBID.** Variable; actual title number processed.

24. **JOBCT.** Variable; maximum number of titles to process.

25. **LNCNT.** Variable; line count per frame.

26. **NAMID.** Message JOB ID NO output to teletype when title is output.

27. **ORCON.** Constant of 16 used to offset X coordinate.

28. **OTHERC.** Constant of 0 used to rotate image.

29. **PEDELX.** Constant of 10; X spacing for gray-level pixel.
30. **PEDELY.** Constant of 10; Y spacing for gray-level pixel.

31. **PEXX.** Constant of 5446; starting X coordinate for first gray-level pixel of image.

32. **PEXY.** Constant of 10097; the starting Y coordinate for first gray-level pixel of image.

33. **PEXCT.** Variable used to hold pixels per line.

34. **PNTCT.** Variable used to hold number of pixel repeats.

35. **RDBYC.** Variable used as temporary hold for read byte count, MTBYTC.

36. **RDBYTW.** Variable used as temporary hold for MYBYTW.

37. **RDCNT.** Variable used as temporary hold for read word count, MTCNT.

38. **RDPTR.** Variable used as temporary hold for read pointe: MTPTR.

39. **RLL.** Variable buffer where the roll number is stored for ID fiche.

40. **RLMES.** Message ENTER ROLL, output to teletype when accepting roll number.

41. **RRLN.** Variable to hold the repeat line count.

42. **SPSIZ.** Constant (5) which is the character size of EBCDIC character.

43. **SRMES.** Message ENTER SOURCE TAPE, output to teletype when accepting source tape number for ID fiche.

44. **SRTAP.** Variable buffer when source tape number is stored for ID fiche.
45. **SVIND.** Variable save address of buffer where teletype is to store information.

46. **TABBUF.** Variable buffer of 120 words where the transpose intensities are stored.

47. **TABINT.** Constant table of 64 words use to transpose intensity.

48. **TITINT.** Constant (4) which is title output intensity.

49. **TITPT.** Variable pointer to output teletype buffer, **TITTY.**

50. **TITRCT.** Variable number of titles to skip before starting to process fiche.

51. **TITTY.** Variable buffer where title information is stored for teletype output.

52. **TMPCT.** Variable temporary storage and count.

53. **TIINFO.** Variable buffer where BEGIN or END is stored for ID fiche.

2.10.3.4 **Flow Charts.** See following pages.
\begin{align*}
  &\text{INITIALIZE} \\
  &\text{FRAME TO FILTER} \\
  &\text{SET FRAME TO TITLE} \\
  &\text{TITLE FRAME} \\
  &\text{INITIALIZE FRAME BUFFER} \\
  &\text{ZERO MATRICES} \\
  &\text{FRAME SWITCH} \\
  &\text{NEXT FRAME} \\
  &\text{ADVANCE FRAME}
\end{align*}
SISO-TR531
Vol. II
SET NO. LINE TO OUTPUT PER FRAME

PIECK INTEN

INTEN! 1048

SET INTEN TO 778

TRANS INTEN AND STORE IN HOLD INTEN
INTEGRATE
INTEGRATE

ROTATE
ROTATE 90°

SET XSYS
SET STARTING X+Y

RESET
SET DELTA X AND Y FOR PIXEL

SET NQ PIXEL PER LINE

\[ 2-536 \]
ROTATE
IMAGE 90°

SET INTEN
TO TITLE INTEN

SET LNCT
TO 4 FOR
NUMBER BLANK FRAMES

ADVANCE BLANK FRAME

4 BLANK FRAMES

PROCESS 1ST TITLE RECORD
SETAD
SET ADDRESS FOR EOCIC CHARACTER

PESET
SET SPACE FOR PIXEL SPECIFIC

SET RPLN
REPEAT COUNT TO 9

SET PEXCT TO 120 NUMBER PIXELS PER LINE

GTIN
OUTPUT PIXELS TIMES

1?
OUTPUT FULL LINE

SET CTSW TO NOP

SET INDEX TO HOLD BUFFER

CRT DO CLEAR RETURN

REPEAT SAME LINE 9 TIMES

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
SET X-DAC FOR 8 Output EBCDIC Character

PLSET
SET SPACE FOR EBCDIC CHARACTER

ECBCD
OUTPUT 8 EBCDIC CHARACTER

PESET
SET SPACING FOR PIXEL SPACING

SET PEEXT TO 128 NUMBER PIXEL PER LINE
TREC

GET CHAR COUNT TO 132

GETCHAR
GET CHARACTER FROM TAPE

CHARACTER (T)

CHARACTER (T)

GETCHAR
GET CHARACTER FROM TAPE BUFFER

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
SISO-TRS31
Vol. II

Diagram:

1. TTY TTY
2. OUTPUT TITLE TO TTY
3. FICTAP
   OUTPUT TO FLM
4. RETURN AF TREC
LOAD ADDRESS OF TTY BUFFER IN INDEX 11

STORE CHARACTER IN TTY BUFFER

IF CHARACTER (C $77)

GETTY
GET NEXT CHARACTER

ADD 1 TO CHARACTER COUNT

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
GET 8
GET NEXT CHARACTER
STORE CHARACTER IN TTY BUFFER
ADD 1 TO CHARACTER COUNT

CHARACTER (C)

Y
N

CHARACTER (C)

Y
N

G

G
\( \text{CHARACTER (N)} \)

\( \text{GET TTY} \)

\( \text{GET NEXT CHARACTER} \)

\( \text{STORE CHARACTER IN TTY BUFFER} \)

\( \text{ADD 1 TO CHARACTER COUNT} \)

\( \text{CHARACTER ($) } \)

\( \text{Y} \)

\( \text{N} \)

\( \text{F} \)

\( \text{C} \)
MARGE TWO CHARACTER IN ONE WORD

STORE WORD IN CHARACTER BUFFER

STORE ALL CHARACTER

RETURN SAUCHE

Y

N

ET
PLSET

SET DELTA Y to 65

SET DELTA Y to 50

SET CHARACTER SIZE, INTEN to 6

SET PLUS REINITIALIZE REGISTER

RETURN


Input GTIN

Set number of time to repeat pixel time

Pick input from tape

Yes

Trans input to rev input for direct output

Store rev input in input table

No

Pick up rev input from input table

Reproducibility of the original page is poor
SISO-TR531
Vol. II

Diagram:

1. INPUT POINT
2. SPACE OVER BY DELTA-X 6=10
3. REPEAT PIXEL 5 TIMES
   (If N then Y)
4. RETURN G.T.N.
RDWD

1ST TIME FOR LINE

SET 1ST TIME TO NO

SAUCH SAVE S CHARACTER IN CHARACTER QUEUE

GETTS GET INTER

RETURN

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR.
SETAD

LOAD ADDSU
WITH
ADDRESS OF
CHR0WF

RETURN
CKCOM

RDPT
SAVE TAPE POINTER

GETT S
GET 1ST CHARACTER FROM RECORD

IS COMM RECORD
N
Y

GETT S
GET 2ND CHARACTER FROM RECORD

IS TITLE RECORD
Y
N

J
K
SET CHACT TO 130

ADD 1 TO W#8 ID COUNT

DONE SPECIFY JOB

N

MTBFPP END PH FILE

N DONE
SAVE MAC TAPe WORD COUNT
SAVE MAC TAPe POINTER
SAVE MAC TAPe BW
SAVE MAC TAPe BIT COUNT
RETURN

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
ADD 1 TO JOB COUNT

LIST ONLY

Y

OUTPUT TIME TO TTY

SET 1ST TIME SW TO N

STEP DOWN TO NEXT LOC RECORD
RDP T
SAVE READ POINTER

GET 1st RECORD

COMP CONTROL 79

Yes

NO

STEP DOWN TO NEXT LOG RECORD

N

SISO-TR531
Vol. II

2-624
GETTY
GET 2ND CHARACTER

TITLE RECORD

Y

ADD 1 TO DB8 COUNT

LIST ON

N

LIST ON
OUTPUT TITLE TO TTY

N

Y

REPRODUCIBILITY OF THE ORIGINIAL PAGE IS POOR
SET BEGIN
BUFFER OF
TTY OUTPUT
ADDRESS

SET UP
TTY BUFFER

RETURN
ADD 1
TTY BUFFER
ADDRESS

ZERO
TTY BUFFER
WORD

SET NUMBER
OF CHARACTERS
PER TTY
WORD

RETURN
SET INDEX II
TO TITLE AREA

GET A CHARACTER FROM TITLE

CHARACTER (1)

SET WP TTY BUFFER

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
GET A CHARACTER FROM TITLE AREA

CHARACTER (L)

Y

OUTPUT (JOB ID NO)

N

OUTPUT DJ & PID

MER LF

DF CARRAGE LINE FEES

RETURN
TCHAR

PICK 8 BIT EBCDIC CODE FROM TITLE

CONVERT 8 BIT TO 6 BIT MACHINE CODE

RETURN
LM770

MVCM

MOVE TITLE TO TITLE AREA

TTYTIT

OUTPUT TITLE TO TTY

RETURN

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
FLOW CHART

1. STORE THE ADDRESS OF BUFFER
2. ACCEPT CHARACTER FROM TTY
3. ECHO CHARACTER
4. CHARACTER CARRAGE RETURN
5. CHARACTER RUB OUT

**REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR**
FLOWCHART:

1. Illegal Character:
   - If illegal, go to the next step.
   - If not, store character in buffer.

2. Store character in buffer.

3. Check character:
   - If character is valid, go to the next step.
   - If not, return to the previous step.


5. Return.
FILL OUT 10 CHARACTER WITH SPACE

RETURN

PICK BUFFER ADDRESS

RETURN

P
2.11 COMA UNIVAC 494 PRINT PROCESSOR FOR 105 mm FICHE (94U105)

2.11.1 Background

A. Author. I. J. Morgan, Aeronutronic Ford Corp.

B. Intent. Requested when a Univac 494 print 7-track magnetic tape has been submitted for data to be output to microfiche (105 mm film). The requirements for this program are specified in SH-09846.

C. Program History

1. Production Tape Date. 19 June 1973

2. Author. I. J. Morgan

3. Authorization. EO-204F

4. Test Cases. TPS (JSC Form 1225) No. A17

5. Revisions. Reference Appendix B, paragraph B.11

2.11.2 Introduction. This paragraph describes the usage and design of the Univac 494 Print Processor for 105 mm microfiche (94U105). The MONITOR and associated I/O driven routines are described in SISO-TR531, Vol. I.

2.11.2.1 Hardware Requirements

- FR80 with 12K memory
- 7-track tape unit
- 105 mm camera.

2.11.2.2 Software Requirements. The following files from I.I.I.'s SYM Directory are required.

<table>
<thead>
<tr>
<th>III109</th>
<th>III185</th>
<th>III162</th>
<th>III187</th>
</tr>
</thead>
<tbody>
<tr>
<td>III166</td>
<td>III163</td>
<td>III161</td>
<td>FLOAD</td>
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<tr>
<td>III164</td>
<td>III147</td>
<td>III161 G0</td>
<td>III186</td>
</tr>
</tbody>
</table>
2.11.2.3 Assembly Parameters. The assembly parameters in III109 should be set for the proper machine configuration. Assembly parameters specific to the 94U105 Print Processor are as follows.

A. 7-TRACK. If 1, indicates data will be coming from a 7-track tape drive.

B. MUMBLE. If 1, indicates system configuration for output to teletype.

C. CAMNUM. If 9, indicates 105 mm camera is being used.

D. PTYPB. If 3, ensures compatibility with EBC forms.

E. ALLOW. Defines code to allow form loading and flashing.

F. NUMCAM. If 6, facilitates camera change at run time.

G. TWOBUF. If 1, gives two magnetic tape buffers for higher throughput.

H. BIGBUF. If 1, allows maximum amount of features with minimum buffer space.

I. MTPTR. If 10, assigns the active buffer address to auto-index register 10.

J. MTSIZE. Magnetic tape buffer size.

K. MTTSIZ. Teletype buffer size.

L. PTYPE. 105 mm camera indicator.

M. FONT. Must be defined to direct the inclusion of a font at the end of III164; 0 = film.

N. MTWRDS. If 1, GETT (Get Bits Subroutine) will not be assembled.

O. FINDEX. Allows form indexing.
P. MANYUP. If nonzero, indicates page and frame number will be printed.

Q. NODISP. If defined, MONITOR command list will not be displayed.

R. UNIVAC. If 1, defines the Univac Fielddata character set.

2.11.2.4 Operator Commands. The following commands are available for use, but, since the command list is not displayed, none can be modified.

*TIME=0'0''
*FRAME=0
*CURRENT PAGE=0
*GO
*CONTINUE
*MAKE FILM=1
*CLEAR
*ADVANCE
*TAPE TYPE - 2,5 OR 8=8
*BACK
*PARITY=1
*USE=1
*REWIND
*SKIP
*TRY AGAIN=10
*FORM = NULL . 16FRM1 16FRM2 16FRM3 16FRM4
*ERROR FORM=NO
2.11.3 Analysis

2.11.3.1 Major Control Section

A. Description. This program is requested to be run by the operator when a 494 print tape is to be output to microfiche. The program is called by MONITOR (III166) through the PSTART Subroutine. Data is read into core from the tape by the double buffer process using MTRINI, a subroutine in III163. A buffer area of 360 words is reserved for this read. There are four logical records of 45 words each in each physical record of 180 words (see figure 2-1). The camera is advanced to the next fiche to assure that no overwriting occurs. Parameters are set to output 207 print pages per microfiche.

The first and second words of the first logical record are examined. If this is a job separator control record, the program goes to the JOBREC Routine. If not, the error message CONTROL ERROR is output and control is given back to MONITOR. JOBREC is executed when a job separator record is found. The job information to be output to the fiche is stored in TTYBUF. The previous job (if this is not the first one) is finished by the subroutine FICTAP. NEXPIC is called to advance to the next page and frame. HEADER and TOPPAG ready the fiche for the new job by setting the new X and Y coordinates, character size, and light intensity. The next logical record is then picked up. If this is another control record, it will go to the appropriate control routine as described below. Otherwise, the record is output as print data by the routine DATREC.

TREC processes the title control record. The information for the title is stored in the TTYBUF by the subroutine MVCOM. FICTAP is then called to decode and output both the job and title control record information. If there is no title control record, the job name will be output when the first data record is encountered. TOPPAG is called after the job and title information has been output to ready the fiche for the first data.
Figure 2-1 94U105 Buffer Area
FRMREC is called when a form control record has been encountered. The form number is found in the first byte of the third word of this record by the subroutine BYT3WD. It is stored in the location FRMNUM. If a form greater than four was requested, the message ILLEGAL FORM is output to the teletype, and the program returns to process the next record after storing a zero in FRMNUM. If the form number is zero, FLASSW is set so that a form will not be flashed. The subroutine BYT3WD is again called to get the second byte of the third word of the record. If this byte does not contain an I, the program processes the next logical record. An I indicates that indexing is being requested. The subroutine NMGET is called to pick up and convert from Fieldata to binary the line number to be indexed (stored in location YINDX); the beginning byte in the print line (stored in location XINDX), and the number of characters to be output for this line in the index frame (stored in location CHRCNT). The switches INXSSW and IFLASW are set for the index frame to be flashed at the end of the fiche.

When an image orientation record is encountered, ROTCOM causes the COMIC mode to be used.

DATREC is called when print data is found. A total of 132 characters are output. If this is the line that is to be used for indexing, INXOUT is called to save the necessary data for the index frame. The line skip number is found in the last word of the logical record. The number of carriage returns executed is equal to this number plus one, with the line count number, LNCNT, being incremented each time. When LNCNT equals 64, PPAGE flashes the form, if any, and NEXPIC is called to advance the page. NEXPIC will also output the index frame and advance to the next fiche if this is the last page of data for that fiche. TOPPAG then sets the X and Y coordinates for the new page.

After processing each data record, the program returns to pick up the next logical record. The program continues until an end-of-job, end-of-tape control record is encountered. The end-of-job, end-of-tape control record is encountered when all the jobs on a single or multiple tapes have been processed. PPAGE is called to flash the form on the last page, if one is present, and then the program goes to MTEOFF which goes to MONITOR and types out END OF FILE. END JOB/) is input by the operator to complete the last fiche.
B. Inputs/Output

1. **Input.** Data is input from a 7-track tape drive in logical units of 45 words each and in physical records of 180 words each.

2. **Output.** Output of data is to a 105 mm fiche (microfiche). Each microfiche has the capacity for 207 print pages with each page having a maximum of 64 lines per page, 132 characters per line.

3. **Error Message Output**
   
a. **CONTROL ERROR.** This is output when the first logical record of a job is not a control record.

b. **ILLEGAL FORM.** This is output when a form number greater than four has been requested.

c. **NO FORM.** This is output when the form number is equal to zero and FLASSW has not been properly set to prevent the logic from reaching this point.

C. **Linkages**

1. **External**
   
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<tr>
<th>Routine</th>
<th>Program</th>
<th>Calling Sequence</th>
</tr>
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<td>JMS MTLAC</td>
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<tr>
<td>SETOMU</td>
<td>III166</td>
<td>JMS SETOMU</td>
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</table>
Routine                      Program     Calling Sequence
SETPLS               III166     SETPLS
SETXYS               III166     JMS SETXYS
                     LAC X-COORDINATE
                     LAC Y-COORDINATE
FICTAP               II186      JMS FICTAP
FLASH                PRO187     FLASH

2. Internal

Routine                      Calling Sequence
BYT3WD                        JMS BYT3WD
EBGET                          JMS EBGET
HEADER                        JMS HEADER
INXOUT                        JMS INXOUT
MVCOM                         JMS MVCOM
NMGET                         JMS NMGET
NMGET1                        JMS NMGET1
NXWD                          JMS NXWD
PFLASH                        JMS PFLASH
PPAGE                         JMS PPAGE
RDPT                          JMS RDPT
RSPT                          JMS RSPT
SETBYT                        JMS SETBYT
STARTX                        JMS STARTX
TOPPAG                        JMS TOPPAG

2.11.3.2 Subroutines

A. BYT3WD. Used to access one particular byte in a word. Prior to BYT3WD being called the first time, SETBYT has been called to set flags to indicate that none of the three bytes have yet been processed. When none of the flags are set, the next word in the buffer is obtained. The word is divided into bytes with bits 0-5 being stored in word location UBYTE, bits 6-11 in word location UBYTE1, and bits 12-17 in UBYTE2. UBYTE is then passed to the calling routine. The next time BYT3WD is called, UBYTE1 will be passed, and on the third call, UBYTE2 will be passed unless SETBYT has been requested to reset these flags.
B. EBGET. Called by NMGET and NMGET1, which store the number of bytes to be converted in the location TEMP. EBGET calls BYT3WD to obtain each byte. The byte is converted from Fielddata to binary and added to the last digit converted, if this is not the first. EBGET continues to process bytes until all the bytes have been converted.

C. HEADER. Called at the beginning of a job to set the X delta, the Y delta, the character size, the intensity, and the spot size.

D. INXOUT. Called when a line is to be saved for the index frame. SETBYT is called to reset the byte flags. STARTX is then called to clear TTYBUF and to store the complemented character count in MCHCNT and IXXLEN. Each byte is moved into TTYBUF. When all information has been moved, INXDO is called to save the information for the index frame. IXXLEN is used by the subroutine INXDO.

E. MVCOM. Moves data for the job separator record and the title record into TTYBUF. It is entered with the first character in the MQ and processes bytes until an end-of-data ($) is encountered.

F. NMGET. Sets count for EBGET to process three Fielddata characters.

G. NMGET1. Sets count for EBGET to process two Fielddata characters.

H. PFLASH. Called by PPAGE to flash a form. When entered, it is determined if the FRMTAB, which contains the addresses to the forms, contains all zeros. If so, the program jumps to an error exit (NO FORM). If not, the address is obtained and FLASH is called to flash the form.

I. PPAGE. Called to determine if a form is to be flashed. If any characters were printed on the page, the program goes to PFLASH. If not, the program exits.

J. RDPT. Saves the count, MTCNT, and the address pointer, MTPTR, in the buffer.
K. **RSPT.** Restores MTCNT and MTPTFR to point to the next word to be processed.

L. **SETBYT.** Resets the flags for bytes to be processed by BYT3WD.

M. **STARTX.** Called by INXOUT to clear the teletype buffer; also complements and stores CHRCNT, the character count, in the locations MCHCNT and IXXLEN.

N. **TOPPAG.** Resets the X and Y coordinates for the top of the new page and for the next form. It calls SETXYS to actually set the X and Y DAC's.

2.11.3.3 Constants and Variables

A. **Internal**

1. **BUFFER.** Area reserved for two physical records of 180 words each.

2. **CURBUF.** Word containing the address of the buffer currently being used.

3. **CHRCNT.** Word containing the number of characters to be output for indexing.

4. **DBLADR.** Address of message, DOUBLE. END OF FILE.

5. **ERFLAG.** Flag that, when set to zero, indicates that the error form flag is to be checked.

6. **ERFMFL.** Error form flag.

7. **FLASSW.** Location in the program used to determine if a form is to be flashed.

8. **FOLFTX.** Location containing the beginning raster point (X coordinate) for a form.

9. **FRMINP.** Contains address of first form.
10. **FRMNUM.** Contains the number of the form to be flashed.

11. **FRMPTR.** Address of form to be flashed.

12. **FRMTAB.** Six-word table with each word giving the beginning address of a form.

13. **LEFTXX.** Location containing the beginning X coordinate for a line print.

14. **LENGTH.** Word giving half the total buffer size (a negative number).

15. **LNCNT.** Word containing the number of lines that are left to be output for this page (negative number).

16. **MCHCNT.** Location containing the number of bytes to process for indexing.

17. **LNFDNM.** Number of scope points to advance to the next line (negative).

18. **NEWTOP.** Location containing the Y coordinate of the line to be output.

19. **NEXBUF.** Word containing the address of the next buffer to be used.

20. **RDCNT.** Location used to save MTCNT.

21. **RDPTR.** Location used to save MTPTR.

22. **SAVIRM.** Temporary location.

23. **SPCNUM.** Location containing the raster size for the X coordinate.

24. **TEMP.** Temporary reserve location.

25. **TOPYY.** Location containing the beginning raster point (Y coordinate) for all pages.
26. UBYTE. Location used to store bits 0-5 of a particular word.

27. UBYTE1. Location used to store bits 6-11 of a particular word.

28. UBYTE2. Location used to store bits 12-17 of a particular word.

29. VCHAR. Location used to store digits temporarily until all numbers have been processed.

30. XINDX. Word containing the character on which the indexing is to start.

31. YINDX. Location containing the line number that is to be used for indexing.

B. External

1. PBUFSZ. Length of a single buffer.

2. MTCNT. Location containing the number of words yet to be processed (negative number).

3. MTPTR. Location containing the address of the word in the buffer to be processed next.

4. CHDELEX. Word used to set the delta X.

5. CHDELEY. Word used to set the delta Y.

6. CHRSIZ. Word containing the character size.

7. RECPIN. Word containing the intensity.

8. RECEPST. Word containing the spot size.

9. TPOINT. Location containing the address of FICTB.

10. MAXTRW. Flag that when set to zero indicates the Title Record has not been processed.
11. **INXSSW.** Flag used to determine if indexing has been required.

12. **IFLASHW.** Flag used to determine if the index form is to be flashed.

2.11.3.4 **Flow Charts.** See following pages.
SETBYT
RESET BYTE INDICATORS

MVCOM
COM RECORD

FICTAP
DECODE COM RECORD

TOPRAG
SETS X-Y COORD FOR NEW PAGE

SETUP TO DEFAULT TO COMIC MODE

ROTATE PROCESS THE MODE

RESET FLAGS IN 3 WORDS FOR BIT32D ROUTINE
ANY MORE CARRIAGE RETURNS

ADD ONE TO LINE COUNT

PDAGE
FLASH FORM

PAGE AND FRAME ADVANCE

KYBLIS
KEYBOARD LISTEN

TOPPAG
SETS X-Y COORD FOR NEW PAGE
MONITOR
OUTPUT MSG
'NO FORM'

FLASH
FLASH OVERALL FORM

RESET PARAMETERS

ROTATE
RESTORE PREVIOUS ROTATION

HEADER
SETS ALL PAGE PARAMETERS

SET X-Y DAC PARAMETERS FOR OVERALL FORM

OVERALL FORM TO BE FLASHED

ROTATE
UPRIGHT FORM IMAGE ROTATION

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
2.12 COMA UNIVAC 494 PRINT PROCESSOR FOR 16 mm FILM (94UV16)

2.12.1 Background

A. Author. I. J. Morgan, Aeronutronic Ford Corp.

B. Intent. Requested when a Univac 494 print 7-track magnetic tape has been submitted for data to be output to microfilm (16 mm film). The requirements for this program are specified in SH-09864.

C. Program History

1. Production Tape Date. 6 June 1973
2. Author. I. J. Morgan
3. Authorization. EO-204F
4. Test Cases. TPS (JSC Form 1225) No. A1

2.12.2 Introduction. This paragraph describes the usage and design of the Univac 494 Print Processor for 16 mm film (94UV16). The MONITOR and associated I/O driven routines are described in SISO-TR531, Vol. I.

2.12.2.1 Hardware Requirements

- FR80 with 12K memory
- 7-track tape unit
- 16 mm camera.

2.12.2.2 Software Requirements. The following files from I.I.I. SYM Directory are required.

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<thead>
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<td>III161</td>
<td>FLOAD</td>
</tr>
<tr>
<td>III164</td>
<td>III147</td>
<td>III161</td>
<td>GO</td>
</tr>
</tbody>
</table>
2.12.2.3 Assembly Parameters. The assembly parameters in III10 should be set for the proper machine configuration. Assembly parameters specific to the 94UV16 Print Processor are as follows:

A. **MTNOIS.** Defines code to throw away short noise records.
B. **7-TRACK.** If 1, indicates data will be coming from a 7-track tape drive.
C. **MUMBLE.** If 1, indicates system configuration for output to the teletype.
D. **CAMNUM.** If 2, indicates the 16 mm unsprocketed camera is being used.
E. **PTYPE.** If 1, ensures compatibility with BCD forms.
F. **ALLOW.** Defines code to allow form loading and flashing.
G. **NUMCAM.** If 6, facilitates camera change at run time from the 16 mm to 35 mm camera.
H. **TWOBUF.** If 1, gives two magnetic tape buffers for higher throughput.
I. **BIGBUF.** If 0, allows maximum amount of features with minimum buffer space.
J. **MTPTR.** If 10, assigns the active buffer address to auto-index register 10.
K. **MTSIZE.** Magnetic tape buffer size.
L. **MTTSIZ.** Teletype buffer size.
M. **FTYPE.** Indicator for 16 mm camera.
N. **DASHED.** If 1, defines dashed lines.
O. **CIRCLE.** If 1, allows arcs.
P. **UNIVAC.** If 1, defines the Univac Fielddata character set.
2.12.2.4 Operator Commands. The following commands are available for use, and can be modified.

*TIME=2'58.6'
*FRAME=0
*CURRENT_PAGE=0
*GO
*CONTINUE
*MAKE_FILM=1
*CLEAR
*ADVANCE
*TAPE_TYPE=2,5 OR 8=8
*BACK
*PARITY=1
*USE=2
*REWIND
*SKIP
*TRY_AGAIN=10
*FORM=NULL 16FRM1 16FRM2 16FRM3 16FRM4
*ERROR FORM=NO
*HITS-CHARS,VEC,PTS=1,1,1
*FOCUS
*CAMERA=2
*PULLDOWN=6
*LOAD-94UV16
*ROTATION=0
*
2.12.3 Analysis

2.12.3.1 Major Control Section

A. Description. This program is requested to be run by the operator when a 494 print tape is to be output to 16 mm film. The program is called by MONITOR (III1166) through the subroutine PSTART. Data is read into core from the tape by the double buffer process using MTRINI, a subroutine in III163. A buffer area of 360 words is reserved for this read. There are four logical records of 45 words each in each physical record of 180 words (see figure 2-2). The camera is advanced to the next frame to assure that no overwriting occurs.

The first and second words of the first logical record are examined. If this is a job separator control record, the program goes to the JOBREC Routine. If not, the error message CONTROL ERROR is output and control is given back to MONITOR. JOBREC is executed when a job separator record is found. The job information to be output on the first two frames is stored in TTYBUF. Then JOBNM outputs this information on film in eyeball-sized characters, three characters per frame. The ROTATE Subroutine in III166 is called to restore any rotation indication. NEXPAG is called to flash any forms, advance to the next frame, set the coordinates for the new frame, position the CRT beam, and reset the line count for 64 lines per page. The next logical record is then analyzed. If this is another control record, the program goes to the appropriate control routine, as described below, skipping any title control records. Otherwise, the record is output as print data by the routine DATREC.

FRMREC is called when a form control record has been encountered. The form number is found in the first byte of the third word of this record by the subroutine BYT3WD. It is stored in the location FRMNUM. If a form was requested greater than four, the message ILLEGAL FORM is output to the teletype, and the program returns to process the next record, after storing a zero in FRMNUM. If the form number is zero, FLASSW is set so that a form will not be flashed.
Figure 2-2 94UV16 Buffer Area
When an image orientation record is encountered, the ROTREC Routine decodes the record, saves the setting in locations ROTCOM and SAVROT, and calls ROTATE to appropriately set the DAC's recording in CINE or COMIC mode. The subroutines HEADER and TOPPAG are called to reset parameters for the new mode.

DATREC is called when print data is found. The latest X and Y coordinates are set by a call to the SETXY Subroutine. A total of 132 characters are output. The line skip number is found in the last word of the logical record. The number of carriage returns executed is equal to this number plus one, with the line count number, LNCNT, being decremented each time. When 64 lines of data have been output, a flag is set to cause the forms to flash, and the subroutine NEXPAG is called to flash the forms, advance the page, and reset the X and Y coordinates for the new page.

After processing each data record, the program returns to pick up the next logical record. The program continues until an end-of-job, end-of-tape control record is encountered. The end-of-job, end-of-tape control record is encountered when all the jobs on a single or multiple tapes have been processed. The ENDALL Routine is called to process this record. Flags are set to cause the DOUBLE END-OF-FILE message to be output. NEXPAG is called to flash the form on the last page, if one is present, and to finish the last page. The program then goes to the subroutine MTEOFF which goes to MONITOR and types out DOUBLE-END-OF-FILE.

B. Input/Output

1. Input. Data is input from a 7-track tape drive in logical units of 45 words each and in physical records of 180 words each.

2. Output. Output of data is to 16 mm or 35 mm film. Each frame contains one page, having a maximum of 64 lines per page with a maximum of 132 characters per line.
3. Error Message Output

a. CONTROL ERROR. This is output when the first logical record of a job is not a control record.

b. ILLEGAL FORM. This is output when a form number greater than four has been requested.

c. NO FORM. This is output when the form number is equal to zero and the FLASSW has not been properly set to prevent the logic from reaching this point.

C. Linkages

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<tr>
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<td></td>
<td>LAC TEMP (NO. OF CHAR)</td>
</tr>
<tr>
<td>EBGET</td>
<td>JMS EBGET</td>
</tr>
<tr>
<td>HEADER</td>
<td>JMS HEADER</td>
</tr>
<tr>
<td></td>
<td>LAC MQ</td>
</tr>
<tr>
<td>MVCOM</td>
<td>JMS MVCOM</td>
</tr>
<tr>
<td>NMGET</td>
<td>JMS NMGET</td>
</tr>
<tr>
<td>NMGET1</td>
<td>JMS NMGET1</td>
</tr>
<tr>
<td>PFLASH</td>
<td>PFLASH</td>
</tr>
<tr>
<td>PPAGE</td>
<td>PPAGE</td>
</tr>
<tr>
<td>RDPT</td>
<td>JMS RDPT</td>
</tr>
<tr>
<td>RSPT</td>
<td>JMS RSPT</td>
</tr>
<tr>
<td>SETBYT</td>
<td>JMS SETBYT</td>
</tr>
<tr>
<td>TOPPAG</td>
<td>TOPPAG</td>
</tr>
<tr>
<td>JOBNM</td>
<td>JMS JOBNM</td>
</tr>
<tr>
<td>NEXPAG</td>
<td>NEXPAG</td>
</tr>
<tr>
<td>FRFLAS</td>
<td>FRFLAS</td>
</tr>
</tbody>
</table>

#### 2.12.3.2 Subroutines

**A. BYT3WD.** Used to access one particular byte in a word. Prior to BYT3WD being called the first time, SETBYT has been called to set flags to indicate that none of the three bytes have yet been processed. When none of the flags are set, the next word in the buffer is obtained. The word is divided into bytes with bits 0-5 being stored in word location UBYTE, bits 6-11 in word location UBYT1, and bits 12-17 in UBYT2. UBYTE is then passed to the calling routine. The next time BYT3WD is called, UBYT1 will be passed, and on the third call, UBYT2 will be passed unless SETBYT has been requested to reset these flags.

**B. EBGET.** Called by NMGET and NMGET1, which store the number of bytes to be converted in the location TEMP. EBGET calls BYT3WD to obtain each byte. The byte is converted from Fielddata to binary and added to the last digit converted, if this is not the first. EBGET continues to process bytes until all the bytes have been converted.
C. **HEADER.** Called at the beginning of a job to set the X delta, the Y delta, the character size, the intensity, and the spot size.

D. **MVCOM.** Moves data for the job separator record and the title record into TTYBUF. It is entered with the first character in the MQ, and processes bytes until a slash is encountered.

E. **NMGET.** Sets count for EBGET to process three Fielddata characters.

F. **NMGET1.** Sets count for EBGET to process two Fielddata characters.

G. **PFLASH.** Called by **PPAGE** to flash the null and any requested form if loaded. When entered, it is determined if the FRMTAB, which contains the addresses to the forms, contains all zeros. If so, the program jumps to an error exit (NO FORM). If not, the address is obtained and FLASH is called to flash the form.

H. **PPAGE.** Called by NEXPAG to determine if a form is to be flashed. If any characters were printed on the page, the program goes to PFLASH. If not, the program exists.

I. **RDPT.** Saves the count, MTCNT, and the address pointer, MTPTR, in the buffer.

J. **RSPT.** Restores MTCNT and MTPTR to point to the next word to be processed.

K. **SETBYT.** Resets the flags for bytes to be processed by BYT3WD.

L. **TOPPAG.** Resets the line number to 1, resets the page count to default size, and resets the X and Y DAC's to their starting page position.

M. **JOBNM.** Outputs the six characters of job information in the teletype buffer to film in eyeball-sized characters, three characters per frame.
N. **NEXPAG.** Flashes all appropriate forms (including the cut-mark), advances the camera to the next page (**NEXPIC**), and resets all page parameters (**TOPPAG**).

### 2.12.3.3 Constants and Variables

#### A. Internal

1. **BUFFER.** Area reserved for two physical records of 180 words each.
2. **CURBUF.** Word containing the address of the buffer currently being used.
3. **DBLADR.** Address of message DOUBLE END OF FILE.
4. **ERFLAG.** Flag that, when set to zero, indicates the error form flag is to be checked.
5. **ERFMFL.** Error form flag.
6. **FLASSW.** Location in the program used to determine if a form is to be flashed.
7. **FXLEFT.** Location containing the beginning raster point (X coordinate) for a form.
8. **FYTOP.** Location containing the beginning raster point (Y coordinate) for a form.
9. **FRMINP.** Contains address of first form.
10. **FRMNUM.** Contains the number of the form to be flashed.
11. **FRMPTR.** Address of form to be flashed.
12. **FRMTAB.** Six-word table with each word giving the beginning address of a form.
13. **LEFTXX.** Location containing the beginning X coordinate for a line of print.
14. **LEFTX.** Location containing the beginning X coordinate for a line of print.

15. **LENGTH.** Word giving half the total buffer size (a negative number).

16. **LNCNT.** Word containing the number of lines that are left to be output for this page (negative number).

17. **LNFDNM.** Number of scope points to advance to the next line (negative).

18. **NEWTOP.** Location containing the Y coordinate of the line to be output.

19. **NEXBUF.** Word containing the address of the next buffer to be used.

20. **RDCNT.** Location used to save MTCNT.

21. **RDPTR.** Location used to save MTPTR.

22. **SAV12.** Temporary save location used in subroutine JOBNM.

23. **SAV13.** Temporary save location used in subroutine JOBNM.

24. **SAVIRM.** Temporary location.

25. **SAVROT.** Location containing a zero or one to indicate present rotation.

26. **SPCNUM.** Location containing the raster size for the X coordinate.

27. **TEMP.** Temporary reserve location.

28. **TOPYY.** Location containing the beginning raster point (Y coordinate) for all pages.
29. **TOPY.** Location containing the beginning raster point (Y coordinate) for all pages.

30. **UBYTE.** Location used to store bits 0-5 of a particular word.

31. **UBYT1.** Location used to store bits 6-11 of a particular word.

32. **UBYT2.** Location used to store bits 12-17 of a particular word.

33. **VCHAR.** Location used to store digits temporarily until all numbers have been processed.

**B. External**

1. **PBUFSZ.** Length of a single buffer.

2. **MTCNT.** Location containing the number of words yet to be processed (negative number).

3. **MTPTR.** Location containing the address of the word in the buffer to be processed next.

4. **CHDELX.** Word used to set the delta X.

5. **CHDELY.** Word used to set the delta Y.

6. **CHSIZ.** Word containing the character size.

7. **RECPIN.** Word containing the intensity.

8. **RECSPT.** Word containing the spot size.

9. **FCXP.** Contains beginning X coordinate of character to be drawn on a frame in the subroutine DRWCHR.

10. **FCYP.** Contains the beginning Y coordinate of character to be drawn by subroutine DRWCHR.

**2.12.3.4 Flow Charts.** See following pages.
PART OF TITLE?

FORM RECORD?

ROTATION RECORD?

END OF TAPE?

SET PARAMETERS TO OUTPUT DOUBLE END OF FILE.

NEXT PAGE AND FRAME ADVANCE.

FINISH FOR END OF RUN.

SET POINTERS TO PROCESS AS REGULAR DATA.
SETBYT
REINITIALIZE
BYTES

BYT3WD
GET BYTE
WITH FORM
NUMBER

FORM NUMBER=0?

FORM NUMBER=74?

SET FLASSW
TO EXECUTE
FLASHING

SET FLASSW
TO SKIP
FLASHING

MESSAGE
OUTPUTS 'ILLEGAL
FORM!

MCRLF
CARRIAGE
RETURN AND
LINEFEED

O -> FORM
NUMBER
SISO-TR531
Vol. II

SET FLAG TO FLASH FORM

NEXT PAGE
ADVANCE TO NEXT PAGE

KEYBLIS
CHECK FOR KEYBOARD INPUT

ANY MORE LINES TO SPACE?

Y

E

Q
MVCOM

SET PARAMETERS TO MOVE JOB NAME INTO TTYBUF

BYT3WD
GET NEXT BYTE

ALL CHARs MOVED?
N
W
Y
BYT3WD

SEPARATE BYTES AND STORE IN ONE WORD EACH. GET FIRST BYTE

X
SECOND BYTE PROCESSED
N
GET THIRD BYTE
Y
GET SECOND BYTE

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
2.13 COMA LACIE STATUS MODULE (PFG, COMA)

2.13.1 Background

A. Author. J. E. Bennett, Jr., Aeronutronic Ford Corp.

B. Intent. Stores status information on the disk when requested to do so by the calling program. Also at the request of the calling program, this information can be dumped to tape.

C. Program History

1. Production Tape Date. 7 April 1975
2. Author. J. E. Bennett, Jr.
3. Authorization. TIRF No. 2791
4. Test Case. TPS (JSC Form 1225) No. A16

2.13.2 Introduction

2.13.2.1 Hardware Requirements

- FR80 with disk
- 9-track tape drive.

2.13.2.2 Software Requirements. III109 and III166

2.13.2.3 Assembly Parameters. None.

2.13.2.4 Operator Commands

A. DUMP STATUS TAPE. Causes status tape to be written.

B. WIPE OUT STATUS BLOCKS. Clears status area on disk.
2.13.3 Analysis

2.13.3.1 Major Control Section

A. Description. The LACIE status routines stack 33-word (66-byte) sample segment entries into a disk area of 250 blocks. This disk area is reserved for this function and protected from the system. The 250-block area can hold 1750 sample segment entries. All necessary address pointers are kept on the disk and are independent of program loading and/or reloading. The core address of the newest sample segment entry is provided by the calling program. When called, the status routines look up the necessary addresses on the disk, stores the new entry, and exits. Control is returned to the calling program if no disk error occurs. Upon an error, control is returned to MONITOR with an error message. When requested by the calling program, the entire contents of the status area is dumped from disk to tape. Each sample segment entry is one physical record on tape.

B. Input/Output

1. Input. Data is provided by calling program and in core memory.

2. Output. Data is to 9-track tape in 66-byte records.

C. Linkages

1. External

<table>
<thead>
<tr>
<th>Routine</th>
<th>Program</th>
<th>Sequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>MONINT</td>
<td>III166</td>
<td>JMS MONINT</td>
</tr>
<tr>
<td>MONOUT</td>
<td>III166</td>
<td>JMP MONOUT</td>
</tr>
</tbody>
</table>
2. Internal Calling Routine Sequence

<table>
<thead>
<tr>
<th>Routine</th>
<th>Calling Sequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>STATUS</td>
<td>JMS STATUS</td>
</tr>
<tr>
<td>DREAD</td>
<td>JMS DREAD</td>
</tr>
<tr>
<td>DWRITE</td>
<td>JMS DWRITE</td>
</tr>
<tr>
<td>FINDIR</td>
<td>JMS FINDIR</td>
</tr>
<tr>
<td>DRDBLK</td>
<td>JMS DRDBLK</td>
</tr>
<tr>
<td>INSERT</td>
<td>JMS INSERT</td>
</tr>
<tr>
<td>DCLEAR</td>
<td>JMP DCLEAR</td>
</tr>
<tr>
<td>DDMT</td>
<td>JMP DDMT</td>
</tr>
<tr>
<td>DMTGO</td>
<td>JMS DMTGO</td>
</tr>
<tr>
<td>DCKRDY</td>
<td>JMS DCKRDY</td>
</tr>
<tr>
<td>DREWI</td>
<td>JMS DREWI</td>
</tr>
<tr>
<td>DMTWRT</td>
<td>JMS DMTWRT</td>
</tr>
<tr>
<td>DBKSP</td>
<td>JMS DBKSP</td>
</tr>
<tr>
<td>DRDEOF</td>
<td>JMS DRDEOF</td>
</tr>
</tbody>
</table>

2.13.3.2 Subroutines

A. **DBKSP.** Backspaces magnetic tape one record.

B. **DCKRDY.** Checks to see if tape unit is ready. Does not exit until tape unit is ready.

C. **DCLEAR.** Clears all status information on disk.

D. **DDMT.** Dumps all status information from disk to tape. Each sample segment entry is one record on tape. The data is ended with a double EOF.

E. **DMTGO.** Loads tape command found in DTCMD and starts tape controller.

F. **DMTWRT.** Writes one record on tape. Calls DMTGO.

G. **DRDBLK.** Loads disk command found in DCMWRD and starts disk controller.

H. **DRDEOF.** Checks the double EOF to make sure that it was correctly written.
I. **DREAD.** Sets up to read from disk and calls DRDBLK.

J. **DREWI.** Rewinds the magnetic tape drive.

K. **DWRITE.** Sets up to write on the disk and calls DRDBLK.

L. **FINDIR.** Finds the status area on the disk from the information in the master and user directories on the disk.

M. **INSERT.** Places a sample segment entry into the proper space in a disk block. There are seven entries per block.

N. **STATUS.** Reads the current block from the disk, calls INSERT to add the new data, and writes the block back on the disk.

### 2.13.3.3 Constants and Variables

A. **Internal**

1. **DBFAD.** Contains address of data to be saved on disk.

2. **DCMWRD.** Contains current disk command (WRITE or READ).

3. **DEOF.** Contains negative zero if writing or reading an EOF; otherwise it is zero.

4. **DIADRS.** Address of first status block on disk is placed here by FINDIR.

5. **DLASB.** Contains current disk block address.

6. **DLASBF.** Contains current buffer position.

7. **DPASS.** Contains 1 if this is the first pass (WRITE TAPE); contains 2 if this is the second pass (READ/COMPARE).

8. **DTAP.** Contains unit number of tape drive.

9. **DTCMD.** Contains current tape command for DMTGO.
10. **DWCD.** Contains WRITE command for first pass and READ/COMPARE for second pass.

11. **RPTIN.** Contains number of retries to be allowed for tape errors.

12. **RPTOUT.** Contains the number of skips to be allowed on write errors.

B. **External.** DATCOM contains the tape unit number.

2.13.3.4 **Flow Charts.** See following pages.
DRDBLK

DISK CONTROLLER READY

Y

LOAD ADDRESS, WORD COUNT AND COMMAND AND START DISK

N

DISK CONTROLLER READY

Y

DATA GOOD

N

DDSKRD

Y
FLOW CHART

1. *INSERT*

2. **COMPUTE**
   STARTING
   BUFFER
   ADDRESS

3. **IS**
   BUFFER
   FULL

   - **Y**
     **DFLL**
   - **N**

4. **FLAG**
   BUFFER
   AS
   FULL

5. **INSERT**
   NEW
   DATA
   BUFFER
   INTO
   BLOCK

**END**
DDMT

GET TAPE UNIT NUMBER AND SAVE IN DTAP

DEKR DY
WAIT UNTIL DRIVE READY

REW:1
REWIND TAPE

SET PASS TO 1
SET COMMAND TO WRITE

HAVE FIRST BLOCK ADDRESS

Y

N

FINDIR
GET FIRST BLOCK ADDRESS

DBF1

DBF1
DREW

SET COMMAND TO REWIND

DMTGO
REWIND TAPE

DBKSP

SET WORD COUNT TO 1
SET COMMAND TO BACKSPACE

DMTGO
BACKSPACE TAPE

DREWING

PREPARE TO TYPE NO WRITE RING MESSAGE

MONOUT

DTER

PREPARE TO TYPE TAPE ERROR MSG

MONOUT
DMTGO

CONTROLLER READY

Y

TRANSPORT READY

N

LOAD COMMAND AND GO

Y

CONTROLLER READY

N

Y
DMTWRT

SET RE-TRY NUMBER TO 10

PASS = 1

Y

SET SKIP NUMBER TO 3

DMTXX

SET TAPE COMMAND

N

SET SKIP NUMBER TO ZERO

DMTX1
DMTX1

EOF PASS

BUFF ADDRESS TO 33 (ADDR) -40 TO 32 (WORD COUNT)

DMTGO WRITE OR READ

DWTCK

BLOCK ADRS TO 33 (ADDR) 0 TO 32 (WORD COUNT)
2.14. COMA LACIE STATUS DISPLAY (REVEAL)

2.14.1 Background

A. Author. J. E. Bennett, Jr., Aeronutronic Ford Corp.

B. Intent. Displays on the monitor the status information currently written on the disk. This allows the operators to determine which jobs were run successfully, not run successfully, or not run at all.

C. Program History

1. Production Tape Date. 28 May 1975

2. Author. J. E. Bennett, Jr.

3. Authorization. JSC Form 994, TIRF No. 1700

4. Test Case. TPS (JSC Form 1225) No. A15

5. Revisions. Reference Appendix B, paragraph B.14

2.14.2 Introduction

2.14.2.1 Hardware Requirements

- FR80 with disk
- 9-track tape drive.

2.14.2.2 Software Requirements

<table>
<thead>
<tr>
<th>III109</th>
<th>III166</th>
</tr>
</thead>
<tbody>
<tr>
<td>III164</td>
<td>III164 FILM</td>
</tr>
</tbody>
</table>

DISK STATUS

2.14.2.3 Assembly Parameters

A. BIGBUF. If 0, allows full monitor with dispatch table display.
B. **7-TRACK.** If 0, prevents assembly of 7-track tape code.

C. **9-TRACK.** If 0, prevents assembly of 9-track tape code.

D. **CAMNUM.** If 0, prevents assembly of camera supervision code.

E. **NOFOCS.** If 0, prevents insertion of focus pattern.

F. **FONT.** If 0, selects I.I.I. film font.

G. **FASTTY.** If 1, inserts program interrupt teletype controls.

H. **EBCDIC.** If 1, inserts EBCDIC character code.

### 2.14.2.4 Operator Commands

*REVEAL STATUS INFO

*WIPE OUT STATUS BLOCKS

*DUMP STATUS TAPE

### 2.14.3 Analysis

#### 2.14.3.1 Major Control Section

**Description.** At location BEGIN, the first three blocks of the status area are read into core. The program then enters a loop which flashes the headers and then flashes the three data blocks, one line at a time. There are seven entries per block, so 21 entries are displayed on the monitor. The program remains in this loop until interrupted by the operator. The operator can have the program read the next block or back up one block (if not already at the beginning). The new block is inserted into position three, the other blocks move up, and the first block moves off the screen. The display rotates seven entries at a time.
B. Input/Output

1. Input. Input data is already on the disk.

2. Output. Output data is in the form of a visual display to the monitor or to 9-track tape.

C. Linkages

1. External

<table>
<thead>
<tr>
<th>Routine</th>
<th>Program 11166</th>
<th>Calling Sequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>FINDIR</td>
<td>DISK STATUS</td>
<td>JMS FINDIR</td>
</tr>
<tr>
<td>MDBUG</td>
<td>II1166</td>
<td>JMS MDBUG</td>
</tr>
<tr>
<td>MONINT</td>
<td>II1166</td>
<td>JMS MONINT</td>
</tr>
<tr>
<td>MERASE</td>
<td>II1166</td>
<td>JMS MERASE</td>
</tr>
</tbody>
</table>

2. Internal

<table>
<thead>
<tr>
<th>Routine</th>
<th>Calling Sequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEC</td>
<td>JMS CHEC</td>
</tr>
<tr>
<td>HEADPT</td>
<td>JMS HEADPT</td>
</tr>
<tr>
<td>DISBLK</td>
<td>JMS DISBLK</td>
</tr>
<tr>
<td>GETBLK</td>
<td>JMS GETBLK</td>
</tr>
<tr>
<td>LINE</td>
<td>JMS LINE</td>
</tr>
</tbody>
</table>

2.14.3.2 Subroutines

A. **CHEC.** Checks for keyboard entry from operator and takes proper action if required.

B. **DISBLK.** Controls the display of one block of data and calls LINE to display each line.

C. **GETBLK.** Reads a block from disk.

D. **HEADPT.** Plots the header for the display.

E. **LINE.** Plots one sample segment entry as one line of data.
2.14.3.3 Constants and Variables

A. BASEPT. Identifies message pointers for production completion code messages.

B. BLKCNT. Contains the number of lines remaining to be displayed in a block.

C. BLOCK1. Pointer to the first block to be displayed.

D. BLOCK2. Pointer to the second block to be displayed.

E. BLOCK3. Pointer to the third block to be displayed.

F. BLOC. Pointer to the current block to be displayed.

G. DEADLN. A dummy line of zero entries used as filler.

H. DSCAD. Contains the disk address of a block to be read.

I. HEADER. The first location of the header data.

J. LINEPT. Contains the address of the current line.

K. MEMAD. Contains the core address of a disk block to be read.

L. NEXT. Points to the address of the next block on the disk which can be displayed.

M. POINTR. Table which contains the disk addresses of the data blocks on the disk.

N. TABEL. Locates the monitor dispatch table for the ASR MONITOR.

O. XDE. X delta for spacing.

P. XST. X starting position on screen.

Q. YDE. Y delta for spacing.

R. YST. Y starting position on screen.

2.14.3.4 Flow Charts. See following pages.
REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
FIRST BLOCK DISPLAYED

Y

N

Block 1 → Block 2
Block 2 → Block 3
Block 3 → Block 1

GETBLK
READ NEW BLOCK INTO BLOCK 1

MOVE STACK POINTER BACK ONE

DO IT
HEADPT

INITIALIZE MONITOR

PLOT LINE OF HEADER

LAST LINE DONE

Y

N

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
2.15 COMA LACIE PRINT PROCESSOR FOR 105 mm FICHE (LACPRT)

2.15.1 Background

A. Author. F. C. Ashton, Aeronutronic Ford Corp.

B. Intent. Requested when LACIE print is to be output to 105 mm fiche.

C. Program History

1. Production Tape Date. 1 April 1975

2. Author. F. C. Ashton

3. Authorization. NASA/JSC Form 994, Transmittal/Information Request Form No. 2791

4. Test Case. TPS No. A16

5. Revisions. Reference Appendix B, paragraph B.15

2.15.2 Introduction

2.15.2.1 Hardware Requirements

- FR80 with 12K memory
- 9-track tape unit
- 105 mm fiche camera
- Disk.

2.15.2.2 Software Requirements. The following files found in I.I.I.'s SYM Directory are required:

<table>
<thead>
<tr>
<th>File</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRINTF COM</td>
<td>III164</td>
</tr>
<tr>
<td></td>
<td>III162</td>
</tr>
<tr>
<td></td>
<td>III186</td>
</tr>
<tr>
<td>III109</td>
<td>III163</td>
</tr>
<tr>
<td></td>
<td>III161</td>
</tr>
<tr>
<td></td>
<td>ASROUT</td>
</tr>
<tr>
<td>III166</td>
<td>III185</td>
</tr>
<tr>
<td></td>
<td>III188</td>
</tr>
<tr>
<td>DISK STATUS</td>
<td>III147</td>
</tr>
<tr>
<td></td>
<td>III161GO</td>
</tr>
</tbody>
</table>
2.15.2.3 Assembly Parameters. The assembly should be set for the proper machine configuration. Assembly parameters specific to LACPRT program are as follows.

A. TWOBUF. If 1, indicates double buffer.

B. FASSTTY. If 1, defines program interrupt teletype controls.

C. PTYPE. If 3, indicates EBCDIC forms.

D. FONT. If 0, indicates standard I.I.I. character font.

E. TAPELB. If 1, indicates standard IBM tape labels.

F. NASA. If 1, indicates special characters used at JSC.

G. EBCDIC. If 1, indicates standard IBM EBCDIC character set.

H. LOCASE. If 1, indicates lower case character set.

I. BIGBUF. If 0, allows maximum amount of features with minimum buffer space.

J. MTSIZE. Defines length of system tape buffers (513 words).

K. MTTSZ. Defines length of teletype buffer (192 words).

L. MANYUP. Indicates that page count is printed with frame count when the accounting information is output to the teletype.

M. FTYPE. Indicates the fiche camera.

N. DSKMON. Indicates the disk monitor routine to be assembled.

O. NEXPAG. Equivalent to NEXPIC Routine.

P. 7-TRACK. If 0, indicates no 7-track code to be assembled.
Q. **9-TRACK.** If 1, indicates 9-track code to be assembled.

R. **MUMBLE.** If 1, indicates that during assembly time print commands are output to TTY.

S. **ALLOW.** Defines number of words for save index information (2123).

T. **TITLE.** If 1, indicates title code to be assembled.

U. **FINDEX.** If 1, indicates index code.

V. **NDXBLK.** If 7, indicates number of words per index entry.

2.15.2.4 Operator Commands

* *TIME=4:52'2.6"
* *FRAME=0
* *CURRENT PAGE=0
* *GO
* *CONTINUE
* *TITLE
* *END JOB
* *MAKE FILM=1
* *CLEAR
* *ADVANCE
* *BACK
* *USE=1
* *REWIND
* *SKIP
* *TRY AGAIN=10
* *STANDARD LABELS=YES
* *UNLABELLED=NO
2.15.3' Analysis

2.15.3.1 Major Control Section

A. Description. Control is given to the LACPRT Program at location BEGIN. The program clears the status buffer, STABUF to EBCDIC spaces. The title number, BSTNO, and total fiche per title, BFICTOT, are set to zero. A (-1) is stored in location RECRT for record number. A call is made to subroutine INSET6 to set the print intensity. Then a call is made to the TOPPAG Subroutine to set the lines per page and the X and Y coordinates. The Tape Handler Subroutine is initialized by calling MTRINI. The fiche controller is initialized, and the fiche advances one blank fiche. Then a call is made to input the calendar date and calculate the Julian
date and to TTAPNO to accept the tape number. The spacing and rotation is set by calling SETPLS. The main print loop consists of subroutines RECGET, CKCOM, ACODE and RRTLN. The RECGET Subroutine gets one logical record at a time from the tape handler. The CKCOM Subroutine checks for COM control records and processes the COM controls. ACODE translates the first character of print image record as carriage control. The PRTLN Subroutine outputs the print image to fiche.

B. Input/Output

1. Input data is input from a 9-track tape drive. The tape can be standard IBM label, nonstandard label or unlabeled. The data is in a fixed-length record format (blocked) with 931 eight-bit bytes per block. Each logical record will be 133 bytes in length. A logical record contains a COM control record or print image record. A COM control record can be a job separator record, a title record, or an indexing record. A print image record is 133 bytes, with the first byte containing the standard ASCII carriage control and last 132 bytes containing EBCDIC characters.

2. Output. Output of data is to 105 mm fiche. The fiche contains 16 rows by 14 columns; the first row of data is title information.

3. Tape Output. The status of each job is output to tape. The status contains the job ID, the number of fiche output, the job number, and date of run. Each status record is 66 bytes long.

4. Message Output

a. TITLE ERROR. This is output to the teletype when the title record is in error.

b. TITLE INFORMATION. This is output to the teletype along with JOB ID NO.
c. **ENTER TAPE NUMBER.** This is output to the teletype and the machine waits for an answer, giving the source tape number. The operator types up to six characters of information.

d. **ENTER DATE.** This is output to the teletype, and the machine waits for an answer, giving the calendar date. The operator types up to six characters of information in the format MM/DD/YY.

C. **Linkages**

1. **External**

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<td>III163</td>
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<tr>
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<td>DDCL</td>
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<td>STUJOB</td>
<td></td>
</tr>
</tbody>
</table>

2.15.3.2 **Subroutines**

**A. ACODE.** Translates ASCII carriage control (EBCDIC character) to line spacing as follows.

- + = overprint
- Space = space one line
- 0 = space two lines
- - = space three lines
- 1 = skip next frame
- Any other character = space one line.

This subroutine sets the parameter CARCNT (carriage counts, or the right number of line spacings). When the carriage control is 1, the parameter LNCT (lines per frame) is set to -1. Calling sequence: JMS ACODE/CARRIAGE CONTROL IN AC.

**B. BLDREC.** Builds the status buffer from the title stored in the title area. When the switch, BLDSW, is set to a NOP, the status is not built. When BLDSW is set to a SKP, the status buffer is built. Calling sequence: JMS BLDREC.
C. **CARCON.** Does the line spacing for the frame of data. The subroutine is called after the ACODE Subroutine. The line spacing is contained in CARCNT. This subroutine counts the lines per frame in LNCT and does a frame advance when a total of 64 lines is reached. Calling sequence: JMS CARCON

D. **CKCOM.** Processes all COM control records (i.e., separator records, title records and index records). Calls MVCOM Subroutine to move separator and title records into the title area, and appends the tape number to the separator information. The routine does not return control to the main program until a print image (non-COM control record) is detected. Calling sequence: JMS CKCOM

E. **CHRGET.** Gets one character at a time from tape buffer. The character is returned to AC and MQ. Calling sequence: JMS CHRGET

F. **CHRPUT.** Stores a character at a time in the status buffer. Index register 12 contains the address of word that character is to be stored. The switch SWWCH tells in which part of the word to store the character (NOP in the second half, SKP in the first half). Calling sequence:

```
LAC CHARACTER
JMS CHRPUT
```

G. **COMEND.** Called to end fiche when in the title search mode. Calling sequence: JMP COMEND

H. **COMOST.** Converts the binary fiche count and title number to EBCDIC. Calls STATUS to write status buffer to disk. If there has been a new reel mounted, the new tape number is moved to separator area. Calling sequence: JMS COMOST

I. **CONVER.** Converts a three-digit binary number to EBCDIC number (one byte per word). Calling sequence:

```
LACA ADDRESS OF EBCDIC BUFFER
JMS CONVER
LAC BINARY VALUE
```
J. DDCL. Jumps to clear number which wipes disk status block clean. Calling sequence: JMP DDCL

K. DDST. Jumps to DDMT, which writes the disk status to tape. Calling sequence: JMP DDST

L. ERRTRM. Called when the run is aborted. Sets the error flag and writes out the status to disk. Calling sequence: JMP ERRTRM

M. FICOUNT. Adds 1 to fiche count when fiche is ended. Calling sequence: JMS FICOUNT

N. FRFLAS. Flashes index forms. Calling sequence: JMP FRFLAS

O. GTFNX. Jumps to GTFRIX to load index forms. Calling sequence: JMP GTFNX

P. INSET3. Sets the title intensity to 24. Calling sequence: JMS INSET3

Q. INSET6. Sets the print intensity to 48. Calling sequence: JMS INSET6

R. INXCK. Checks each print line for the index line. If the print line is to be indexed, the subroutine calls INXDO to save off index from print line. Calling sequence: JMS INXCK

S. JOBERR. Dummy subroutine used to display TERMINATION DUE TO ERROR. Calling sequence: JMS JOBERR

T. JOBSTU. Displays title search parameter, TITWD, and title number to be searched, I. Calling sequence: JMS JOBSTU

U. JULDAT. Accepts from the teletype the date of the run and calculates the Julian date. Calling sequence: JMS JULDAT

V. LACEOV. Entered from Tape Read Subroutine when a new reel of job has been mounted. The subroutine accepts the new tape number, and sets LATPCH in the subroutine COMOST to move the new tape number into the status buffer after the old status buffer is written out. Calling sequence: JMS LACEOV
W.  **LACEND.** Entered when end-of-file is detected on standard label files. The subroutine finishes the last fiche and writes the last status buffer to disk. Calling sequence: **JMS LACEND**

X.  **LEAP.** Entered when a leap year will affect the Julian date; adds 1 day when the number of the year is divisible by 4. Calling sequence: **JMS LEAP**

Y.  **MVCOM.** Moves COM control information to title area and saves the address where the title information is stored. Calling sequence: **JMS MVCOM**

Z.  **PRTLN.** Outputs a print image line to film and calls CARCC to set line spacing. Calling sequence: **JMS PRTLN**

AA.  **RECGET.** Gets a logical record from the tape buffer. The table RECPRT contains the address of each logical record. The subroutine loads the address of logical record in CHRADD and puts the first character of the record in AC and MQ. The routine calls MTLAC when physical record is required. Calling sequence: **JMS RECGET**

BB.  **STNOYE.** Displays the flag STANN for a status job. Calling sequence: **JMS STNOYE**

CC.  **STYENO.** Entered when STATUS JOBS is typed in; sets BLDSW (NOP for nonstatus jobs and SKP for status jobs). Calling sequence: **JMP STYENO**

DD.  **STUJOB.** Sets the title number for search title command. Calling sequence: **JMP STUJOB**

EE.  **SENEXT.** Searches down to next title when the NEXT TITLE command is given. Calling sequence: **JMP SENEXT**

FF.  **TITNX.** Dummy subroutine to display the next title. Calling sequence: **JMS TITNX**

GG.  **TOPPAG.** Sets the beginning X and Y coordinates for a frame and sets lines per frame to 64. Calling sequence: **JMS TOPPAG**

HH.  **TOTTY.** Outputs messages to the teletype and waits for input from it. Calling sequence: **JMS TOTTY**
II. **TTAPNO**: Outputs to the teletype the message ENTER TAPE NUMBER and waits for six-digit input. Calling sequence: JMS TTAPNO

JJ. **TTCHAR**: Translates an eight-bit EBCDIC character into a six-bit ASCII character. Register 11 is loaded with the address of the buffer containing the EBCDIC character. Calling sequence:

```
JMS TTCHAR
DAC CHARACTER, 6-BIT ASCII
```

KK. **TTTINT**: Initializes the teletype output buffer. Calling sequence: JMS TTTINT

LL. **TTPUT**: Stores three ASCII characters per word to teletype. Calling sequence:

```
LAC ASCII CHARACTER
JMS TTPUT
```

MM. **TTTWD**: Sets character count TTTCT to 3. Calling sequence: JMS TTTWD

NN. **TYFPRX**: Displays index form name. Calling sequence: JMS TYFPRX

2.15.3.3 Constants and Variables

A. External

1. **CHDELX**: Variable that contains X spacing.
2. **CHDELY**: Variable that contains Y spacing.
3. **CHRSIZ**: Variable that contains character size.
4. **CHRSZ**: Variable that contains character size.
5. **CURBUF**: Variable pointer to current tape buffer address.
6. **DECNUM.** Variable that contains decimal binary number after BEGIN converts ASCII to binary.

7. **EXPND.** Buffer used by Indexing Subroutine.

8. **GOND.** Buffer used by Indexing Subroutine.

9. **FC7SUB.** Instruction change (add two) when initializin the fiche camera in III186. Changes back to "subtract one" during run.

10. **FCENDJ.** Instruction to jump to UNLEND for the unlabeled end-of-job routine.

11. **FICTB.** Table for title buffer.

12. **FRANNM.** Variable frame count.

13. **INXDO-l.** Instruction to jump to FISCOUNT. Add to frame count.

14. **LEFTX.** Constant starting X coordinate.

15. **MAXTRW.** Variable used by III185 Title Routine; program initializes MAXTRW to zero.

16. **MCHTAB.** Table for six-bit ASCII teletype codes.

17. **MDISIZ.** Constant character size of monitor display (63).

18. **MDISPL.** Constant spacing between character on monitor display (384 scope points).

19. **MTCNT.** Variable number of words remaining in tape buffer.

20. **MTEOF2.** If -1, instruction to jump to LACEOV, the Standard Label End-of-Volume Routine.

21. **NEXEUF.** Variable pointer to next tape buffer.
22. **PBUFSZ.** Constant; the number of words in the tape buffer (466).

23. **PGNAME.** Constant; the program name LACPRT.

24. **RECPIN.** Variable to hold the intensity.

25. **REWCOM.** Rewind constant for tape handler.

26. **SPCNUM.** Constant containing Y spacing.

27. **VCHTAB.** Table used to convert EBCDIC to ASCII.

28. **TEOF.** Instruction to jump to LACEND, the End Fiche Routine.

29. **TEOV-1.** Instruction to jump to LACEOV, the End-of-Volume Routine.

30. **TITARE.** Constant pointer to temporary title buffer.

31. **TPOINT.** Variable pointer to title buffer.

32. **TOPY.** Constant containing Y starting coordinate.

33. **XFOFF.** Constant containing X offset.

34. **YFOFF.** Constant containing Y offset.

**B. Internal**

1. **ACTADD.** Variable; actual address of logical record.

2. **BLDSW.** Switch; when set to NOP, indicates status buffer is not to be output to disk; when set to SKP, indicates status buffer is to be output to disk.

3. **BFITOT.** Variable containing binary fiche count.

4. **BSTNO.** Variable containing binary number of title count.
5. **CARCNT.** Variable number of spaces between lines.

6. **CHRADD.** Variable address of current word in logical record.

7. **CHRSAV.** Variable used for temporary storage for second character of logical record.

8. **CHRSW.** Switch; when set to NOP, second character of logical record is unpacked; when set to SKP, first character of logical record is unpacked.

9. **COMCHR.** Constant hexadecimal D9 COM control character.

10. **COMINS.** Contains instruction LAC BSTNO or LAC SVBNO.

11. **COMESW.** Switch; set to NOP for multi-title or to SKP for single title jobs.

12. **COMSW.** Switch set to NOP for multi-title or to SKP for title search.

13. **DATADD.** Buffer to hold Julian date.

14. **DAY.** Number of days entered.

15. **DAYTAB.** Twelve locations used by JULDAT that contain the number of days in each month.

16. ** ENDATE.** Constant containing message ENTER JULIAN DATE.

17. **EFMFL.** Variable containing pointer for forms.

18. **EOTIF.** Constant containing message END OF TITLE.

19. **FDNDXP.** Variable pointer for indexing.

20. **FITOT.** Variable EBCDIC buffer for fiche count.

21. **FRAMF.** Variable pointer for indexing.

22. **FRMTAB.** Variable seven-word table for forms.

23. **FXFMFL.** Variable pointer for indexing.
24. **HLDCHR.** Variable used as temporary hold for first character of status word.

25. **HOLD11.** Variable used as temporary hold for register 11, address in status buffer.

26. **IFLASM.** Switch; NOP (no indexing) and SKP (indexing).

27. **JUL.** Table with length of 6; contains calendar date digits.

28. **JULA.** Pointer to JUL Table used in TOTTY.

29. **JULDAT.** Julian date calculated by JULDAT Subroutine.

30. **LATRCH.** Switch; NOP indicates same tape and SKP indicates that a new tape reel has been mounted and the tape number must be moved into status buffer.

31. **LINPOS.** Variable containing actual line count for indexing.

32. **LNCT.** Variable containing run count of lines per page.

33. **LOKDAS.** Switch; NOP indicates no check for slash in the title record and SKP indicates to check for slash.

34. **MONTH.** Month number entered in JULDAT.

35. **NAMID.** Constant containing message JOB ID NO.

36. **PROID.** Variable processing indicator (0 = no error; 1 = unrecoverable read error; 3 = recoverable read error).

37. **RECADD.** Variable containing logical record address.

38. **RECRT.** Variable containing logical record number.

39. **RECSW.** Switch; NOP indicates this is the first time the RECGET Subroutine has called; SKP indicates this is not the first time.
40. **SAVE11.** Variable used as temporary hold for register 11, pointer into title buffer.

41. **SAVE12.** Variable used as temporary hold for register 12, pointer into status buffer.

42. **SEPHLD.** Variable pointer to tape number separator record.

43. **STANN.** Variable containing display status flag.

44. **STVBNO.** Variable containing save title number.

45. **SWWCH.** Switch to pack two characters per word in status buffer; NOP indicates first character and SKP indicates second character.

46. **TAPBUF.** Tape buffer.

47. **TEMP.** Temporary storage location in LEAP.

48. **TITTW.** Variable containing title search flag.

49. **TITSK.** Variable containing title search count.

50. **TMPCT.** Variable containing working storage count for loop control.

51. **TITTY.** Teletype buffer for input.

52. **TMPHLD.** Variable containing holding address of binary number converted to EBCDIC.

53. **TORJ1.** Switch used in TOTTY: NOP-TOTTY indicates to accept calendar date; JMP TORJ3- accepts and processes tape number.

54. **TORJ2.** Switch used in TOTTY: JMP ASDEC-TOTTY indicates to process Julian date; NOP indicates no further processing.
55. **TPIDNO.** Constant EBCDIC message TAPE NO.

56. **TTEMP.** Variable containing working storage counter.

57. **TTPBUF.** Variable buffer to hold tape number from teletype.

58. **TTPMES.** Constant message ENTER TAPE NUMBER.

59. **TTTPT.** Variable pointer into teletype output buffer.

60. **TTTCT.** Variable counter containing number of characters per teletype word.

61. **WHICR.** Switch; indicates which carriage control.

62. **XXSAV.** Variable X coordinate.

63. **YEAR.** Year number entered in JULDAT.

64. **YYSAV.** Variable Y coordinate.

2.15.3.4 **Flow Charts.** See following pages.
LACPRT

SPACE THE STATUS BUFFER STABUF

SET THAT TITLE NUMBER BTINO, FICHE TOTAL, OBJECT TO ZERO

SET RECORD COUNT TO -1

RECRT

SET CARRAGE CONTROL, CMCHR TO 'C3' HEX

1
1

INSETG
SET PRINT INTENSITY

TAPPAG
SET PAGE PARAMETER

SET THE TAPE BUFFER ADDRESS, BUFFER SIZE

MTAINI
INITIALIZE TAPE HANDLE

SET 1ST TIME READ SWITCH TO NOP RECSW

2
SET IFASW
TO NOP
FOR INDEXING

PC7 CLR
OUTPUT
LEADING.
DIRECT

FCSPIC
SET UF
FICHER
CONTROL

LOAD ADDRESS
OF FICHE TABLE
FICTBPOINT

ZERO
MAXTABV

REPRODUCIBILITY OF THE
ORIGINAL PAGE IS POOR
RECOSET
GET A LOGICAL RECORD

CHKCPM
CHECK FOR CP&M CONTROL

ACODE
SET CARRIAGE CONTROL

PRTLN
PROCESS DATA LINE

4
CAL. NUMBER
LOG RECORD IN
BLOCK
NB OF WORD ⇒ REGDT
GO

SET LOG REC
ADDRESS TO
1ST ADDRESS
REC ADD ⇒

LOAD ADDRESS
OF LOG RECORD
⇒ ACTADD

LOG REC
START FULL
WORD

SET CHARSW
CHARACTER
SWITCH TO
NQP

Y
N

A

B

6
SET IS _TIME _CALLED TO
  NO

1

5
FLOW CHART

CHRGRT

2ND CHARACTER CHRSW

Y

SET 2ND CHARACTER TO YES
NAP \rightarrow CHRSW

PICK WHOLE WORD FROM ADDRESS IN CHARAD

SAVE 2ND CHARACTER IN CHRSV
1ST IN (AC) AND

RETURN

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
SET 2ND CHARACTER SW TO NO
SKP → CHR5W

ADD 1 TO
CHRADD

PICK 2ND CHARACTER
CHR5W → (AC 2 'M')

RETURN
SET CARGNT To -1

SET CARGNT To -2

SET CARGNT To -3
E

SET CNT TO 0

G

F

SET LMT TO ZERO

G

SET CNT TO \(-1\)

SET WAIUA TO NO

RETURN

Reproducibility of the original page is poor
CHRGGET
GET 2ND CHARACTER OF RECORD

(T) TITLE

(S) SEPARATOR

(R) ROTATE

MOVE 14
CHARACTER OF FORM RECORD

10

14

12

11

11

2-766
12

MOVE SEP RECORD TO TITLE AREA

MOVE "TAPe IN" TO SEP RECORD END IN TITLE AREA

SAVE ADDRESS OF WHERE STORE TAPE NUMBER (FILE)

STORE TAPE NUMBER IN TITLE AREA

STORE "T" AT END OF TAPE NUMBER

13

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
COMPOST

CREATE STATUS

N
Y

RETURN!

CONVERT
CONVERT
FICHE TOTAL
TO EBCDIC

CONVERT
CONVERT
TITLE COUNT
TO EBCDIC

MOVE
EBCDIC
FICHE TOTAL
TITLE COUNT
TO STATUS

STORE
PRO IV,
0, 1, 3

149

REPRODUCIBILITY OF THE
ORIGINAL PAGE IS POOR
19

STATUS
WRITE STATUS TO DISK

NEW TAPE

SET TITLE COUNT TO 1 BSLOG

RETURN

MOVE NEW TAPE NUMBER TO SEP AREA

SET NEW TAPE SW TO IV0 NOP LATCH

RETURN
INPUT

SHOW 3
?

IN
TTY BUFFER

MESSAGE
OUTPUT
TTY

TTY CHAR
GET A
CHARACTER
FROM TITLE

Y

CHARACTER
L

MD PUT
OUTPUT
TITLE
NUMBER

RETURN

1

2-778
INPUT

STORE 6 BIT CHARACTER IN TTY BUFFER WORD

3ND CHARACTER OF WORD

Y

TTY TWO
ADD 1 TO BUFFER WORD ADDRESS

RETURN

N

RETURN

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
LOAD START
BUFFER
ADDRESS #F
TTY BUFFER

GET WORD
COUNT

RETURN
21

CHAR GET
GET NEXT CHARACTER FROM COM REC

STORE CHARACTER IN TITLE BUFFER

CHARACTER ($)

Y

K

N

LOOK FOR ($)

Y

21

N

Y

Y

CHARACTER (Y)

21

22
STORE NOP
IN LOOP AS
TO STOP LOOKING

SAVE INDEX
OF WHERE (N) IS IN
TITLE BUFFER

CHGET
GET NEXT CHARACTER FROM COM RECORD

STORE CHARACTER
IN TITLE BUFFER

REPRODUCIBILITY OF THE
ORIGINAL PAGE IS POOR
23

CHARACTER (T)

Y

RETURN

N

CHARACTER (C)

Y

RETURN

N

CHARACTER

Y

CHRCET
GET NEXT CHARACTER FROM COMM RECORD

N

STORE CHARACTER IN TITLE BUFFER

24

2-786
CONVERT

STORE ADDRESS
WHERE EACH
NUMBER TO
BE STORE

STORE 3 IN
NUMBER OF
DIGIT TO
CONVERT

PICK THE
BINARY
NUMBER

CONVERT
3 BINARY
to
EOCIC

RETURN
CHAROUT

1ST.CHAR

SAVE 1ST CHARACER
HOLD CH
BIT 2-10

CHANGE CHRSW
TO 2ND CHARACTER
MP -> SWICH
RETURN

MEARE CHARACER
WITH 2 CHARACER AND
STORE IT

CHANGE CHRSW
TO 1ST CHARACTER
SKP -> SWICH
RETURN
27

2. ND
CHARACTER

N

SET SIGN BIT
IN BUFFER
ADDRESS

LOAD BUFFER
ADDRESS
AND START
CHARACTER
GEN

IN YCK
CHECK FOR
INDEX
LINE

Y

SKIP
BEFORE
PRINT

N

CARR
LINE
SKIP

RETURN

REPRODUCIBILITY OF THE
ORIGINAL PAGE IS POOR
LOAD X & Y COORDS EN DAC'S

SPACE COUNT

LINE ON PAGE

ADD Y SPACING IN Y BY X4
→ DAC'S

ADD 1 TO LINE POSITION

RETURN

L
SET THE X-DAC TO START X-CARD

FORM READ IN

Y

ADD YOFFSET TO TOPY Y-OFFSET

SET THE X-DAC TO START YCOORD

CLEAR CHARACTER GENERATOR

RETURN
Initialize addresses for Julian date calculation

Y

Error?

N

RETURN
Display and accept character type name (xxx)

Error?

Y

N

Return

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
Initialize message & storage locations

Output message to teletype

Accept & echo character

Tape # input?

N  A

30-1
Check for year divisible by 4 and add 1 if appropriate.

RETURN
2-808
STORE 1 IN TITLE SEARCH

GETNUM
GET TITLE SEARCH COUNT

STORE TITLE SEARCH COUNT → TEST

SKIP → COMSW, COMESW

DONE
SET TITLE
SEARCH SW
SKIP \rightarrow COMSW

SET ERROR
FLAG
1 \rightarrow APR1D

SAVE OFF
FICOUNT
AND REPLACE
WITH 0MP

C'KCOM
C'BEACH FOR
TITLE

RESET TITLE
COUNT

QA
APPENDIX A

SOFTWARE AND TEST TAPE
REQUIREMENT SPECIFICATIONS
AND ACCEPTANCE TEST PROCEDURES

The applicable documents listed in paragraph 1.3 of this volume may be obtained from the SISO Data Control Unit, 488-1270, ext. 393, if needed. Documents should be requested by document number as shown in paragraph 1.3.
APPENDIX B

PROGRAM REVISIONS AND TEST PREPARATION SHEETS

The following paragraphs list revisions to each program described in the text of this volume, including date and author of revision and test preparation sheet (TPS) number (JSC form 1225). Where applicable, copies of the TPS are included, along with additional explanatory material.

B.1 COMA DTE PROCESSORS FOR 16 mm FILM (16DT36, 16DT48), AND 10 mm FICHE (105DT6, 105DT8)

See paragraph 2.1. Revisions are as follows:

<table>
<thead>
<tr>
<th>Date</th>
<th>Author</th>
<th>EO/TPS No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 May 1972</td>
<td>W. T. Jackson</td>
<td>E0127F - TPS A1</td>
</tr>
<tr>
<td>31 October 1972</td>
<td>W. T. Jackson</td>
<td>E0127F - TPS A2</td>
</tr>
</tbody>
</table>

TPS No. A1 and A2 follow.
**TEST PREPARATION SHEET**

**NASA - MANNED SPACECRAFT CENTER**

<table>
<thead>
<tr>
<th>Part</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>PART 1 - DTE 7th SIZE CHARACTER</strong></td>
</tr>
<tr>
<td></td>
<td>1. LOAD 16DTE64-DUCAM PROGRAM</td>
</tr>
<tr>
<td></td>
<td>2. LOAD 7th SIZE DTE TEST TAPE</td>
</tr>
<tr>
<td></td>
<td>3. TYPE UNLABELED ON TELETYPE</td>
</tr>
<tr>
<td></td>
<td>4. TYPE GO TO INITIATE PROCESSING</td>
</tr>
<tr>
<td></td>
<td>5. NOTE DATA IS DISPLAYED ON CRT AS IT IS RECORDED</td>
</tr>
<tr>
<td></td>
<td>6. VERIFY EWU OF FILE MESSAGA ON TTY</td>
</tr>
<tr>
<td></td>
<td>7. TYPE END OF JOB TO TERMINATE PROCESSING</td>
</tr>
<tr>
<td></td>
<td>8. VERIFY RESULTS OF 132 CHAR/LINE, 64 LINE/PAGE</td>
</tr>
<tr>
<td>2</td>
<td><strong>PART 2 - 16mm CUTMARKS</strong></td>
</tr>
<tr>
<td></td>
<td>1. LOAD CLEAN 16mm CUTMARK PROGRAM</td>
</tr>
<tr>
<td></td>
<td>2. LOAD COM TEST TAPE 1A</td>
</tr>
<tr>
<td></td>
<td>3. TYPE GO TO INITIATE PROCESSING</td>
</tr>
<tr>
<td></td>
<td>4. NOTE DATA AND CUTMARKS ARE DISPLAYED ON CRT AS IT IS RECORDED</td>
</tr>
<tr>
<td></td>
<td>5. VERIFY RESULTS OF PROCESSING ON 16mm FILM (PRESENCE OF CUTMARKS)</td>
</tr>
</tbody>
</table>

**Prepared By**

L. S. Lockler

**Final Acceptance Date**

<table>
<thead>
<tr>
<th>Contract</th>
<th>Date</th>
<th>NASA</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>J. Lockler</td>
<td>6-20-71</td>
<td>J. Held</td>
<td>6-20-71</td>
</tr>
<tr>
<td>L. V. Wineman</td>
<td>6-20-71</td>
<td>M. Held</td>
<td>6-20-71</td>
</tr>
</tbody>
</table>
6. PROCESS FILM ON XEROX COPYFLO IN BUILDING 227
   TO VERIFY COMPATIBILITY

PART 1 (CONTINUED)

6. NOTE TAPE ERROR ON TTY

7. TYPE CONTINUE AND NOTE RETURN
   TO MONITOR

RETURN TO PAGE 1 FOR STEP 8.
The purpose of this test is to demonstrate the capability of the 16mm DTE Programs to output the Job ID Records (76 seconds) and to output cutmarks on either every frame or at the beginning of each job only, depending on the STRIP CHART option parameter.

1. This portion of the test demonstrates the ability to output the Job ID Records and to output cutmarks on each frame using DTE 36 Bit data.

a. At the tape transport:
   (1) Mount TAPE 3Q and set UNIT SELECT switch to Unit 1.

b. At the teletype:
   (1) Type CNTRL D to load Disk Debug. Verify page of previous program on the CRT.
II. This portion of the test demonstrates the ability to output the Job ID Records and to exercise the STRIP CHART option to output cutmarks once per job and on an end of file DTE 36 bit.

a. At the teletype:

(1) Type STRIP CHART/ on the teletype to exercise option of cutmarks once per job. Verify * OK is typed on the teletype.

(2) Type UNLABELLED/ . Verify * OK.
<table>
<thead>
<tr>
<th>DESCRIPTION (Print or Type)</th>
<th>Tech</th>
</tr>
</thead>
<tbody>
<tr>
<td>(3) Type GO/1 to initiate TAPE 3Q processing &amp; verify that the starting time, frame number, are typed on the teletype.</td>
<td></td>
</tr>
<tr>
<td>(4) Verify that elapsed job time, frame number, * END OF FILE is typed on the teletype.</td>
<td></td>
</tr>
<tr>
<td>(5) Type REWIND/1 to rewind TAPE 3Q. &amp; verify that * OK is typed on the teletype.</td>
<td></td>
</tr>
<tr>
<td>(6) Type CLEAR/1 at the teletype. Verify that * OK is typed on the teletype.</td>
<td></td>
</tr>
</tbody>
</table>

b. At the tape transport:

(1) Verify that TAPE 3Q is rewound to load point.

(2) Dismount TAPE 3Q.

---

III. This portion of the test demonstrates the ability to output the Job ID Records and to output cutmarks on each frame using DTE 48 Bit data.

a. At the tape transport:

(1) Mount TAPE 3Q and set unit select switch to Unit 1:

b. At the teletype:

(1) Type CNTRL D to load Disk Debug. & verify that DEBUG is typed on the teletype.

(2) Type FR8:16DT48$J to load the 16mm DTE 48 Bit program. Verify that * MONITOR is typed on the teletype.
## TEST PREPARATION SHEET

### CONTINUATION SHEET

NASA - MANNED SPACECRAFT CENTER

<table>
<thead>
<tr>
<th>DESCRIPTION (Print or Type)</th>
<th>Teletype</th>
<th>Info</th>
<th>NASA</th>
</tr>
</thead>
<tbody>
<tr>
<td>(3) Type UNLABELLED/\ for unlabelled tape processing.</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(4) Verify * OK is typed on the teletype.</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(5) Type GO/\ to XXXXXX initiate TAPE SQ processing. Verify that the starting time and frame number are typed on the teletype. NOTE - that all data is displayed on the CRT monitor as it is recorded.</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(6) Verify that elapsed time, frame number and * END OF FILE are typed on the teletype.</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(7) Type REWIND/\ to rewind TAPE SQ. Verify that * OK is typed on the teletype.</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(8) Type CLEAR/\ at the teletype. Verify * OK is typed on the teletype.</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### IV.

This portion of the test demonstrates the ability to output the Job ID Records and to exercise the STRIP CHART option to output cutmarks once per job and on an end of file. DTE 48 bit.

**a. At the teletype:**

(1) Type STRIP CHART/\ on the teletype to exercise option of cutmarks once per job and on receipt of end of file. Verify * OK is typed on the teletype.

(2) Type UNLABELLED/\ Verify * OK on teletype.
### TEST PREPARATION SHEET

**CONTINUATION SHEET**

**NASA - MANNED SPACECRAFT CENTER**

<table>
<thead>
<tr>
<th>TRN No</th>
<th>E.O.</th>
<th>S/C</th>
<th>Cat</th>
<th>No.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Sheet 5 of 5**

**DESCRIPTION (Prior or Typel**

<p>| | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(3) Type G0/I to initiate TAPE 50 processing. Verify that the starting time and frame number are typed on the teletype. NOTE: that all data is displayed on the CRT monitor as it is recorded.

(4) Verify that elapsed job time, frame number, and * END OF FILE is typed on the teletype.

(5) Type REWIND/1 to rewind TAPE 50. Verify that * OK is typed on the teletype.

(6) Type CLEAR/+ at the teletype twice. Verify that * OK is typed on the teletype after each clear.

**b. At the tape transport:**

(1) Verify that TAPE 50 is rewound to load point.

(2) Dismount TAPE 50.

**V.** Develop the film and verify that the Job ID and cutmarks are recorded as described in the tests. Verify that the frames of DTE data are identical to pages 50-64 of the COM System ATP. Note missing vectors in worst case Vector Test (page 59) and Vector Test (page 62) is same as original A/T. Data for vectors left off of data tapes.

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**Copy 1 of 1**

**REPRODUCIBILITY OF THE ORIGINAL PAGE IS PDEV**

B-8
B.2 COMA GRAY-LEVEL, LANDSCAPE, AND CLASSIFICATION MAP PROCESSOR FOR 105 mm FICHE (CLAGRA)

See paragraph 2.2. Revisions are as follows:

<table>
<thead>
<tr>
<th>Date</th>
<th>Author</th>
<th>EO/TPS No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>13 October 1972</td>
<td>W. T. Jackson</td>
<td>EO-155F - TPS A2A</td>
</tr>
<tr>
<td>13 October 1972</td>
<td>W. T. Jackson</td>
<td>EO-155F - TPS A2B</td>
</tr>
<tr>
<td>20 October 1972</td>
<td>W. T. Jackson</td>
<td>EO-155F - TPS A2C</td>
</tr>
<tr>
<td>14 May 1975</td>
<td>J. E. Bennett</td>
<td>TPS A3</td>
</tr>
</tbody>
</table>

TPS No. A2A, A2B, A2C and A3 follow. For TPS No. A2A, see also paragraph B.2.1, tables B-1 through B-4 and figures B-1 through B-3. For TPS No. A2B, see also paragraph B.2.2, tables B-5 through B-11 and figures B-4 through B-7. For TPS A2C, see also paragraph B.2.3, tables B-12 through B-16 and figures B-8 and B-9.
### Test Preparation Sheet

**Test Title:** Classification Map Software Acceptance Test

**Reason for Work:** To verify the software development on the COM system for the Classification Map Software as defined in PHO-TN598 and as required under E.I. #1, E.O. 155F.

<table>
<thead>
<tr>
<th>Item</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Type</td>
<td>A: Configuration Change, B: Non-Configuration Change</td>
</tr>
<tr>
<td>2. TPS No</td>
<td>E.O. 155F #E2A2</td>
</tr>
<tr>
<td>3. S/C Cat.</td>
<td>No</td>
</tr>
<tr>
<td>4. Mod Sheet Number</td>
<td></td>
</tr>
<tr>
<td>5. Page</td>
<td>1 of 3</td>
</tr>
<tr>
<td>6. S/C No / Model No</td>
<td></td>
</tr>
<tr>
<td>7. Date</td>
<td></td>
</tr>
<tr>
<td>8. Time</td>
<td></td>
</tr>
<tr>
<td>9. Need Date</td>
<td>13 October 1972</td>
</tr>
<tr>
<td>10. Drawings, Documents, OCP's, &amp; Part Number(s)</td>
<td></td>
</tr>
<tr>
<td>11. Contract Number</td>
<td>NAS 9-1261</td>
</tr>
<tr>
<td>12. Serial Number</td>
<td></td>
</tr>
<tr>
<td>13. System</td>
<td>Computer to Microfilm</td>
</tr>
<tr>
<td>14. Ref E.O Number</td>
<td>155F</td>
</tr>
<tr>
<td>15. TPS Short Title</td>
<td>Classification Map Software Acceptance Test</td>
</tr>
<tr>
<td>16. Wt Req.</td>
<td></td>
</tr>
<tr>
<td>17. Reason for Work</td>
<td>To verify the software development on the COM system for the Classification Map Software as defined in PHO-TN598 and as required under E.I. #1, E.O. 155F.</td>
</tr>
</tbody>
</table>

**18. Description**

Refer to the attached handout for a description of the tests and the test results.

**TEST PROCEDURES**

**a. At the Tape Transport:**

1. Mount Classification Map Acceptance Test Tape (Tape 1).

**b. At the Teletype:**

1. Type GRA;CLASS$J to load Classification Map Program. Verify that *MONITOR is typed on the teletype.

   (2) Type UNLABELLED/1. Verify that *OK is typed on the teletype.

---

**19. Prepared By**

L. S. Lockler

**20. Final Acceptance Date**

10/13/72

**Contractor**

Do: NASA

**21. Inp**

Tech: 21 CONT: 22 NASA

---

**REPRODUCIBILITY OF THE**

**NOTE: PAGE IS POOR**
b.  (3) Type CLEAR\downarrow twice to advance exposed film into the take-up magazine. Verify that *OK is typed on the teletype after each CLEAR/\downarrow.

(4) Type GO/\downarrow to initiate processing of the Classification Map Acceptance Test Tape (Tape 1). Verify that the starting time and frame number are typed on the teletype.

(5) Verify that elapsed job time, frame number, page number, and *END OF FILE are typed on the teletype to signal completion of data tape processing.

(6) Type END JOB/\downarrow to complete processing of the Classification Map Acceptance Test Tape (Tape 1). Verify that *OK is typed on the teletype.

(7) Type CLEAR/\downarrow twice to advance exposed film into the take-up magazine. Verify that *OK is typed on the teletype after each CLEAR/\downarrow.

(8) Type REWIND/\downarrow to rewind the Classification Map Acceptance Test Tape (Tape 1). Verify that *OK is typed on the teletype.
**TEST PREPARATION SHEET**

**CONTINUATION SHEET**

**NASA - MANNED SPACECRAFT CENTER**

<table>
<thead>
<tr>
<th>DESCRIPTION (Print or Type)</th>
<th>Tech</th>
<th>Imp</th>
<th>Cont</th>
<th>NASA</th>
</tr>
</thead>
<tbody>
<tr>
<td>c. At the Tape Transport:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1) Dismount the Classification Map Acceptance Test Tape (Tape 1).</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. Test Result Verification:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1) Process 105mm film containing results.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2) View the resulting 105mm microfiche on the Datagraphix, or have hardcopies made from the microfiche. Verify that the results match the tests described in the attached test description.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
B.2.1 Classification Map Acceptance Test. The Classification Map Acceptance Test utilizes a tape (tape 1) containing a series of four tests as described below and summarized in table B-1.

A. Test 1, Maximum Image Size. This test shall consist of classification data to build a classification map image of 200 lines containing 350 characters each. This image shall demonstrate maximum size. Display data shall consist of the alphabet with the first line containing all A's, the second all B's, the third all C's, etc. for a maximum of 200 lines as illustrated in figure B-1.

B. Test 2, Overlay Data. This test shall consist of the same data pattern as test 1. However, overlay data as defined in table B-2 and B-3 shall be included to demonstrate the overlay capability (see figure B-2).

C. Test 3, Multiple Images. This test shall consist of a COM control record for titling (see table B-4) followed by classification control and data records to generate 10 frames of images identical to those defined in test 2.

D. Test 4, Descriptor Frame. This test shall consist of data to build a descriptor frame of 64 lines containing 132 characters each. Display data shall consist of alphanumerical characters with the first line containing all A's, the second all B's, etc., for a maximum of 64 lines as illustrated in figure B-3. Preceding the data for this test are two descriptor control records with zero line and column parameters. This will cause two frames to be shipped before the descriptor frame is output.
TABLE B-I
CLASSIFICATION TESTS

<table>
<thead>
<tr>
<th>TEST NO.</th>
<th>FUNCTION</th>
<th>CONTENT/FORMAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TEST MAXIMUM CLASSIFICATION MAP IMAGE SIZE</td>
<td>SPANNED VARIABLE LENGTH RECORD TO TEST MAXIMUM CLASSIFICATION MAP IMAGE SIZE. (TEST DISPLAY DEFINED IN PARA. A.)</td>
</tr>
<tr>
<td>2</td>
<td>TEST OVERLAY CAPABILITY ON CLASSIFICATION MAP</td>
<td>SPANNED VARIABLE LENGTH RECORD TO TEST OVERLAY CAPABILITY (TEST DISPLAY DEFINED IN PARA. B.)</td>
</tr>
<tr>
<td>3</td>
<td>TEST MULTIPLE IMAGES PER FICHE WITH CLASSIFICATION DATA</td>
<td>SPANNED VARIABLE LENGTH RECORDS TO TEST MULTIPLE IMAGES PER FICHE. (TEST DISPLAY DEFINED IN PARA. C.)</td>
</tr>
<tr>
<td>4</td>
<td>TEST MAXIMUM SIZE DESCRIPTION FRAME. TEST FRAME SKIP OPTION.</td>
<td>SPANNED VARIABLE LENGTH RECORD TO TEST DESCRIPTOR FORMAT. (TEST DISPLAY DEFINED IN PARA. D.)</td>
</tr>
</tbody>
</table>
Figure B-1 Classification Map Data (200 Lines of 350 characters)
### TABLE B-2
NUMERIC OVERLAY INFORMATION FOR CLASSIFICATION TEST 2

<table>
<thead>
<tr>
<th>LINE NO.</th>
<th>CHARACTER POSITION</th>
<th>DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>6</td>
<td>0</td>
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<tr>
<td>4</td>
<td>6</td>
<td>1</td>
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<td>1</td>
<td>355</td>
<td>0</td>
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<td>5</td>
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</tr>
<tr>
<td>5</td>
<td>5</td>
<td>1</td>
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<td>204</td>
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<td>204</td>
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<td>0</td>
</tr>
<tr>
<td>204</td>
<td>5</td>
<td>0</td>
</tr>
</tbody>
</table>

### TABLE B-3
VECTOR OVERLAY INFORMATION FOR CLASSIFICATION TEST 2

<table>
<thead>
<tr>
<th>VECTOR</th>
<th>START</th>
<th>STOP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CHAR POS 6</td>
<td>CHAR POS 180</td>
</tr>
<tr>
<td></td>
<td>LINE 106</td>
<td>LINE 5</td>
</tr>
<tr>
<td>2</td>
<td>CHAR POS 6</td>
<td>CHAR POS 180</td>
</tr>
<tr>
<td></td>
<td>LINE 106</td>
<td>LINE 204</td>
</tr>
<tr>
<td>3</td>
<td>CHAR POS 180</td>
<td>CHAR POS 355</td>
</tr>
<tr>
<td></td>
<td>LINE 204</td>
<td>LINE 106</td>
</tr>
<tr>
<td>4</td>
<td>CHAR POS 355</td>
<td>CHAR POS 180</td>
</tr>
<tr>
<td></td>
<td>LINE 106</td>
<td>LINE 5</td>
</tr>
</tbody>
</table>
NOTE: DASHED LINES AND COORDINATES NOT INCLUDED ON DISPLAY; FOR REFERENCE ONLY.

Figure B-2 Classification Map Data with Overlays
TABLE B-4
USER FICHE TITLES

<table>
<thead>
<tr>
<th>TAPE NO.</th>
<th>TITLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CLASSIFICATION MAP TEST FICHE</td>
</tr>
<tr>
<td>1 (TEST 3)</td>
<td>MULTIPLE IMAGE AND DESCRIPTOR TEST FICHE</td>
</tr>
<tr>
<td>2</td>
<td>GRAY-LEVEL TEST FICHE</td>
</tr>
<tr>
<td>3</td>
<td>LANDSCAPE TEST FICHE</td>
</tr>
</tbody>
</table>
### Figure B-3 Descriptor Data (64 Lines of 132 characters)

<table>
<thead>
<tr>
<th>LINE NUMBER</th>
<th>LINE</th>
<th>CHARACTER POSITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A A A</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>2</td>
<td>B B B</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>3</td>
<td>C C C</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>4</td>
<td>D D D</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>5</td>
<td>Z Z Z</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>6</td>
<td>A A A</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>7</td>
<td>B B B</td>
<td>1 2 3 4 5</td>
</tr>
</tbody>
</table>

**NOTE:** DASHED LINES AND COORDINATES NOT INCLUDED ON DISPLAY; FOR REFERENCE ONLY.
**TEST PREPARATION SHEET**

**NASA - MANNED SPACECRAFT CENTER**

<table>
<thead>
<tr>
<th>Item</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Configuration Change</td>
<td>-</td>
</tr>
<tr>
<td>B. Non Configuration Change</td>
<td>-</td>
</tr>
<tr>
<td>4. Sheet Number</td>
<td>1</td>
</tr>
<tr>
<td>6. SC No.</td>
<td>1</td>
</tr>
<tr>
<td>7. Date</td>
<td>13 October 1972</td>
</tr>
<tr>
<td>8. Time</td>
<td>14:00</td>
</tr>
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<td>9. Need Date</td>
<td>13 October 1972</td>
</tr>
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<td>-</td>
</tr>
<tr>
<td>11. Contract Number</td>
<td>NAS 9-1261</td>
</tr>
<tr>
<td>12. Serial Number</td>
<td>-</td>
</tr>
<tr>
<td>13. System</td>
<td>Computer to Microfilm</td>
</tr>
<tr>
<td>15. TPS Short Title</td>
<td>Gray Level Software Acceptance Test</td>
</tr>
<tr>
<td>17. Reason for Work</td>
<td>To verify the software development on the CON System for the gray level software as defined in PHO-TN555 and as required under E.I. #1 of E.O. 155F</td>
</tr>
</tbody>
</table>

**DESCRIPTION (Print or Type)**

**TEST PROCEDURES**

1. **Gray-Level Acceptance Test - Tape 2**
   
   a. **At the Tape Transport:**
      
      (1) Mount Gray-Level Acceptance Test Tape (Tape 2).

   b. **At the Teletype:**
      
      (1) Type GRA,GRAY $J$ to load Gray-Level Program. Verify that *MONITOR is typed on the teletype.

      (2) Type UNLABELLED/½ Verify that *OK is typed on the teletype.

      (3) Type CLEAR/$J$ twice to advance exposed film into the take-up magazine. Verify that *OK is typed on the teletype after each CLEAR/$J$.

**Prepared By**

L. S. LOCKLER

**Final Acceptance Date**

10/13/72

**REFERENCES TO PROCEDURES FOR REQUIRED SIGNATURES**

**CONTRACTOR**

L. S. LOCKLER

**NASA**

10/13/72

**REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR**
| DESCRIPTION (Prod or Type)                                                                                                                                                                                                                                           |
|--------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| **b. (4)** Type GO/L to initiate processing of the Gray-Level Acceptance Test Tape (Tape 2). Verify that the starting time and frame number are typed on the teletype.                                                |
| **(5)** Verify that the elapsed job time, frame number, page number, and *END OF FILE are typed on the teletype to signal completion of data tape processing.                                                                 |
| **(6)** Type END JOB/L to complete processing of the Gray-Level Acceptance Test Tape (Tape 2). Verify that *OK is typed on the teletype.                                                                                                                                 |
| **(7)** Type CLEAR/L to advance exposed film into the take-up magazine. Verify that *OK is typed on the teletype after each CLEAR/L.                                                                                                                                     |
| **(8)** TypeREWIND/L to rewind the Gray-Level Acceptance Test Tape (Tape 2). Verify that *OK is typed on the teletype.                                                                                                                                                  |
| **(9)** Type CTRL D to return to DEBUG. Verify *DEBUG is typed on the teletype.                                                                                                                                          |
| **c. At the Tape Transport:**                                                                                                                                   |                                                                                                                                                                                                     |
| **(1)** Dismount the Gray-Level Acceptance Test Tape (Tape 2).                                                                                                                                                      |
### TEST PREPARATION SHEET

**CONTINUATION SHEET**

**NASA - MANNED SPACECRAFT CENTER**

<table>
<thead>
<tr>
<th>DESCRIPTION (Print or Type)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Gray-Level Acceptance Test - Tape 2A</td>
</tr>
</tbody>
</table>

#### a. At the Tape Transport:

1. Mount Gray-Level Acceptance Test Tape (Tape 2A).

#### b. At the Teletype:

1. Type GRA;GRAY$J to load Gray-Level Program. Verify that MONITOR is typed on the teletype.

2. Type SKIP/ to bypass the standard label on the tape. Verify that OK is typed on the teletype.

3. Type UNLABELLED/ . Verify that OK is typed on the teletype.

4. Type CLEAR/ to advance exposed film into the take-up magazine. Verify that OK is typed on the teletype after each CLEAR/.

5. Type GO/ to initiate processing of the Gray-Level Acceptance Test Tape (Tape 2A). Verify that the starting time and frame number are typed on the teletype.

6. Verify that the elapsed job time, frame number, page number, and END OF FILE are typed on the teletype to signal completion of data tape processing.

---

**REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR**
b. (7) Type END JOB/ to complete processing of the Gray-Level Acceptance Test Tape (Tape 2). Verify that *OK is typed on the teletype.

(8) Type CLEAR/ twice to advance exposed film into the take-up magazine. Verify that *OK is typed on the teletype after each CLEAR/.

(9) Type REWIND/ to rewind the Gray-Level Acceptance Test Tape (Tape 2A). Verify that *OK is typed on the teletype.

c. At the Tape Transport:
(1) Dismount the Gray-Level Acceptance Test Tape (Tape 2A).

d. Test Result Verification:
(1) Process 105mm film containing results.

(2) View the resulting 105mm microfiche on the Datagraphix, or have hardcopies made from the microfiche. Verify that the results match Test 1 as described in Paragraph 1 of the accompanying handout and Test 2, Test 3, and Test 4 as described in Paragraphs 2, 3, and 4 respectively.
B.2.2 Gray-Level Acceptance Test. The Gray-Level Acceptance Test utilizes two tapes (2 and 2A) consisting of the tests described below and summarized in Table B-5.

A. Test 1, Maximum Size and Overlay. This test shall be contained on tape 2 and shall consist of gray-level and overlay data to build eight images of 1024 lines and 1024 columns. This will demonstrate maximum size and multiple images per fiche. Gray-level data shall consist of 1000 lines, each line containing 1000 pixels. Overlay data shall be constructed as shown in figure B-4 and tables B-6 and B-7. Each image will be unique gray-level as defined in figure B-4.

B. Test 2, X Shade Bars. This test and tests 3 and 4 shall be contained on tape 2A. Test 2 shall consist of 1000 lines of gray-level data, each line containing 1000 pixels. This pattern shall demonstrate both ascending and descending shade bars in the X-axis and shall be constructed as illustrated in figure B-5. The first 500 lines shall be identical and shall consist of a descending shade pattern. The next 500 lines shall be identical and consist of an ascending shade pattern. The test 2 overlay information shall be included in the same logical record as the gray-level data. Overlay data is illustrated in figure B-5 and defined in tables B-8 and B-9.

C. Test 3, Y Shade Bars. This test shall consist of 1000 lines of gray-level data, each line containing 1000 pixels. This pattern will demonstrate both ascending and descending shade bars in the Y-axis, and shall be constructed as illustrated in figure B-6. The Test 3 overlay information shall be included in the same logical record as the gray-level data. Overlay data is illustrated in figure B-6 and defined in tables B-10 and B-11.

D. Test 4, Descriptor Frame. This test shall consist of data to build a descriptor frame of 64 lines containing 132 characters each. Display data shall consist of alphanumeric characters with the first line containing all A's, the second all B's, etc., for a maximum of 64 lines as illustrated in figure B-7.
<table>
<thead>
<tr>
<th>TEST NO.</th>
<th>FUNCTION</th>
<th>CONTENT/FORMAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TEST MAXIMUM GRAY-LEVEL IMAGE SIZE, MULTIPLE IMAGES PER FICHE, AND OVERLAY CAPABILITIES</td>
<td>SPANNED VARIABLE LENGTH RECORD TO TEST MAXIMUM IMAGE SIZE, MULTIPLE IMAGES PER FICHE, AND OVERLAY CAPABILITIES (TEST DISPLAY IS DEFINED IN PARA. A.)</td>
</tr>
<tr>
<td>2</td>
<td>TEST ASCENDING AND DESCENDING SHADE BARS IN X-AXIS</td>
<td>SPANNED VARIABLE LENGTH RECORD TO CHECK EIGHT GRAY LEVELS (TEST DISPLAY IS DEFINED IN PARA. B.)</td>
</tr>
<tr>
<td>3</td>
<td>TEST ASCENDING AND DESCENDING SHADE BARS IN Y-AXIS</td>
<td>SPANNED VARIABLE LENGTH RECORD TO CHECK EIGHT GRAY LEVELS (TEST DISPLAY IS DEFINED IN PARA. C.)</td>
</tr>
<tr>
<td>4</td>
<td>TEST MAXIMUM SIZE DESCRIPTOR FRAME</td>
<td>SPANNED VARIABLE LENGTH RECORD TO TEST DESCRIPTOR FORMAT (TEST DISPLAY IS DEFINED IN PARA. D.)</td>
</tr>
</tbody>
</table>
EACH ADDRESSABLE LOCATION IN THIS AREA WILL CONTAIN A PIXEL FOR GRAY LEVEL (0 FOR FRAME 1, 1 FOR FRAME 2, 2 FOR FRAME 3, ETC).

NOTE: DASHED LINES AND COORDINATES NOT INCLUDED ON DISPLAY; FOR REFERENCE ONLY.

Figure B-4 Maximum Size and Overlay for Gray-Level
### TABLE B-6
CHARACTER OVERLAY INFORMATION FOR GRAY-LEVEL TEST 1

<table>
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<th>LINE NO.</th>
<th>COLUMN</th>
<th>DATA</th>
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<td>0</td>
</tr>
<tr>
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<td>1023</td>
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### TABLE B-7
VECTOR OVERLAY INFORMATION FOR GRAY-LEVEL TEST 1

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</table>

B-27
NOTE: DASHED LINES AND COORDINATES NOT INCLUDED ON DISPLAY; FOR REFERENCE ONLY.

Figure B-5 X Shade Bars and Overlay for Gray-Level
### TABLE B-8

**CHARACTER OVERLAY INFORMATION FOR GRAY-LEVEL TEST 2**

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<th>LINE NO.</th>
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</table>
NOTE: DASHED LINES AND COORDINATES NOT INCLUDED ON DISPLAY; FOR REFERENCE ONLY.

Figure B-6 Y Shade Bars and Overlay for Gray Level
TABLE B-10
CHARACTER OVERLAY INFORMATION FOR GRAY-LEVEL TEST 3

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### TABLE B-11

VECTOR OVERLAY INFORMATION FOR GRAY-LEVEL TEST 3

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</table>

**B-33**
Figure B-7
Descriptor Data (64 Lines of 132 characters)

NOTE:
DASHED LINES AND COORDINATES NOT INCLUDED ON DISPLAY; FOR REFERENCE ONLY.
**TEST PREPARATION SHEET**

**NASA - MANNED SPACECRAFT CENTER**

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<th>Configuration Change</th>
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<th>A114</th>
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<tr>
<td>17. Reason for Work</td>
<td>To verify the software development on the COM System for the Landscape Software as defined in PHO-TN598 and as required under E.I. #1 of E.O. 155F. This is the final TPS under E.O. 155F.</td>
<td></td>
<td></td>
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</table>

**18 DESCRIPTION (Print or Type)**

Refer to the attached handout for a description of the tests and test results.

**TEST PROCEDURES:**

**a. At the Tape Transport:**

1. Mount Landscape Acceptance Test Tape (Tape 3).

**b. At the Teletype:**

1. Type GRA; LAND$J to load Landscape Program.
   
   Verify that *MONITOR is typed on the teletype.

2. Type UNLABELLED/1. Verify that *OK is typed on the teletype.

3. Type CLEAR/1 to advance exposed film into the take-up magazine. Verify that *OK is typed on the teletype after using CLEAR/1.

**Prepared By:**

L. S. LOCKLER

**Final Acceptance Date:**

10/27/72

**Contractor NASA**

Date

NASA Date

**Signature:**

L. S. LOCKLER

10/27/72

B-35
TEST PREPARATION SHEET
CONTINUATION SHEET
NASA - MANNED SPACECRAFT CENTER

<table>
<thead>
<tr>
<th>DESCRIPTION (Print or Type)</th>
<th>Tech</th>
<th>Cont</th>
<th>NASA</th>
</tr>
</thead>
<tbody>
<tr>
<td>(4) Type GO/1 to initiate processing of the Landscape Acceptance Test tape (Tape 3). Verify that the starting time and frame number are typed on the teletype.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(5) Verify that elapsed job time, frame number, page number, and END OF FILE are typed on the teletype to signal completion of data tape processing.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(6) Type END JOB/1 to complete processing of the Landscape Acceptance Test tape (Tape 3). Verify that *OK is typed on the teletype.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(7) Type CLEAR/1 twice to advance exposed film into the take-up magazine. Verify that *OK is typed on the teletype after each CLEAR/1.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(8) Type REWIND/1 to rewind the Landscape Acceptance Test tape (Tape 3). Verify that *OK is typed on the teletype.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

c. At the Tape Transport:
(1) Dismount the Landscape Acceptance Test tape (Tape 3).

d. Test Result Verification:
(1) Process 105mm film containing the results.
(2) View the resulting 105mm microfiche, or have hardcopies made from the microfiche. Verify that the results match the tests described in paragraphs 1 and 2 of the attached handout.
B.2.3 Landscape Acceptance Test. The Landscape Acceptance Test utilizes one tape (3) containing two tests as described below and summarized in table B-12.

A. **Test 1, X Shade Bars.** This test shall consist of a control word, background request word, and gray shade words for 439 lines of 612 pixels each. This pattern shall demonstrate both ascending and descending shade bars and shall be constructed as illustrated in figure B-8. The first 220 lines shall be identical and consist of a descending shade pattern. The next 219 lines shall be identical and consist of an ascending shade pattern. The X shade bar overlay information shall be included in the same logical record as the gray shade words as illustrated in figure B-8 and as defined in tables B-13 and B-14. Note that overlay data coordinates are given in 1024 x 1024 matrix, but are scaled down to 612 x 439 matrix by software.

B. **Test 2, Y Shade Bars.** This test shall consist of a control word, background request word, and gray shade words for 439 lines of 612 pixels each. This pattern shall demonstrate both ascending and descending shade bars in the Y axis and shall be constructed as illustrated in figure B-9. The Y shade bar overlay information shall be included in the same logical record as the gray shade words as illustrated in figure B-9, and as defined in tables B-15 and B-16. Note that overlay data coordinates are given in 1024 x 1024 matrix but are scaled down to 612 x 439 matrix by software.
### TABLE B-12
LANDSCAPE TESTS

<table>
<thead>
<tr>
<th>TEST NO.</th>
<th>PURPOSE</th>
<th>CONTENT/FORMAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TEST ASCENDING AND DESCENDING SHADE BARS IN X-AXIS</td>
<td>SPANNED VARIABLE LENGTH RECORD TO CHECK EIGHT GRAY LEVELS. TEST DISPLAY FOR THIS RECORD DEFINED IN PARA B.2.3,A.</td>
</tr>
<tr>
<td>2</td>
<td>TEST ASCENDING AND DESCENDING SHADE BARS IN Y-AXIS</td>
<td>SPANNED VARIABLE LENGTH RECORD TO CHECK EIGHT GRAY LEVELS. TEST DISPLAY FOR THIS RECORD DEFINED IN PARA B.2.3,B.</td>
</tr>
</tbody>
</table>

### TABLE B-13
CHARACTER OVERLAY INFORMATION FOR LANDSCAPE TEST 1

<table>
<thead>
<tr>
<th>LINE NO.</th>
<th>PIXEL_POS</th>
<th>DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>769</td>
<td>63</td>
<td>0</td>
</tr>
<tr>
<td>769</td>
<td>190</td>
<td>1</td>
</tr>
<tr>
<td>769</td>
<td>318</td>
<td>2</td>
</tr>
<tr>
<td>769</td>
<td>445</td>
<td>3</td>
</tr>
<tr>
<td>769</td>
<td>572</td>
<td>4</td>
</tr>
<tr>
<td>769</td>
<td>699</td>
<td>5</td>
</tr>
<tr>
<td>769</td>
<td>826</td>
<td>6</td>
</tr>
<tr>
<td>769</td>
<td>957</td>
<td>7</td>
</tr>
<tr>
<td>256</td>
<td>63</td>
<td>7</td>
</tr>
<tr>
<td>256</td>
<td>190</td>
<td>6</td>
</tr>
<tr>
<td>256</td>
<td>318</td>
<td>5</td>
</tr>
<tr>
<td>256</td>
<td>445</td>
<td>4</td>
</tr>
<tr>
<td>256</td>
<td>572</td>
<td>3</td>
</tr>
<tr>
<td>256</td>
<td>699</td>
<td>2</td>
</tr>
<tr>
<td>256</td>
<td>826</td>
<td>1</td>
</tr>
<tr>
<td>256</td>
<td>957</td>
<td>0</td>
</tr>
</tbody>
</table>
NOTE: DASHED LINES AND COORDINATES NOT INCLUDED ON DISPLAY; FOR REFERENCE ONLY.

Figure B-8 X Shade Bars and Overlay for Landscape
### TABLE B-14
VECTOR OVERLAY INFORMATION FOR LANDSCAPE TEST 1

<table>
<thead>
<tr>
<th>STARTING POINT</th>
<th>ENDING POINT</th>
</tr>
</thead>
<tbody>
<tr>
<td>LINE NO.</td>
<td>PIXEL POS</td>
</tr>
<tr>
<td>1023</td>
<td>0</td>
</tr>
<tr>
<td>513</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1023</td>
<td>0</td>
</tr>
<tr>
<td>1023</td>
<td>1023</td>
</tr>
<tr>
<td>1023</td>
<td>127</td>
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<tr>
<td>1023</td>
<td>254</td>
</tr>
<tr>
<td>1023</td>
<td>381</td>
</tr>
<tr>
<td>1023</td>
<td>508</td>
</tr>
<tr>
<td>1023</td>
<td>635</td>
</tr>
<tr>
<td>1023</td>
<td>763</td>
</tr>
<tr>
<td>1023</td>
<td>890</td>
</tr>
<tr>
<td>683</td>
<td>127</td>
</tr>
<tr>
<td>683</td>
<td>254</td>
</tr>
<tr>
<td>683</td>
<td>381</td>
</tr>
<tr>
<td>683</td>
<td>508</td>
</tr>
<tr>
<td>683</td>
<td>635</td>
</tr>
<tr>
<td>683</td>
<td>763</td>
</tr>
<tr>
<td>683</td>
<td>890</td>
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<tr>
<td>170</td>
<td>127</td>
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<tr>
<td>170</td>
<td>254</td>
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<tr>
<td>170</td>
<td>381</td>
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<td>508</td>
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<td>170</td>
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<tr>
<td>170</td>
<td>763</td>
</tr>
<tr>
<td>170</td>
<td>890</td>
</tr>
</tbody>
</table>
NOTE: DASHED LINES AND COORDINATES ARE FOR REFERENCE ONLY; NOT INCLUDED ON DISPLAY

Figure B-9  Y Shade Bars and Overlay for Landscape
<table>
<thead>
<tr>
<th>LINE NO.</th>
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<th>DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>954</td>
<td>256</td>
<td>7</td>
</tr>
<tr>
<td>819</td>
<td>256</td>
<td>6</td>
</tr>
<tr>
<td>692</td>
<td>256</td>
<td>5</td>
</tr>
<tr>
<td>566</td>
<td>256</td>
<td>4</td>
</tr>
<tr>
<td>441</td>
<td>256</td>
<td>3</td>
</tr>
<tr>
<td>315</td>
<td>256</td>
<td>2</td>
</tr>
<tr>
<td>189</td>
<td>256</td>
<td>1</td>
</tr>
<tr>
<td>63</td>
<td>256</td>
<td>0</td>
</tr>
<tr>
<td>954</td>
<td>768</td>
<td>0</td>
</tr>
<tr>
<td>819</td>
<td>768</td>
<td>1</td>
</tr>
<tr>
<td>692</td>
<td>768</td>
<td>2</td>
</tr>
<tr>
<td>566</td>
<td>768</td>
<td>3</td>
</tr>
<tr>
<td>441</td>
<td>768</td>
<td>4</td>
</tr>
<tr>
<td>315</td>
<td>768</td>
<td>5</td>
</tr>
<tr>
<td>189</td>
<td>768</td>
<td>6</td>
</tr>
<tr>
<td>63</td>
<td>768</td>
<td>7</td>
</tr>
</tbody>
</table>
TABLE B-16
VECTOR OVERLAY INFORMATION FOR LANDSCAPE TEST 2

<table>
<thead>
<tr>
<th>STARTING POINT</th>
<th>ENDING POINT</th>
</tr>
</thead>
<tbody>
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<td>LINE NO.</td>
<td>PIXEL POS</td>
</tr>
<tr>
<td>1023</td>
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<tr>
<td>2</td>
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<tr>
<td>755</td>
<td>0</td>
</tr>
<tr>
<td>629</td>
<td>0</td>
</tr>
<tr>
<td>504</td>
<td>0</td>
</tr>
<tr>
<td>378</td>
<td>0</td>
</tr>
<tr>
<td>252</td>
<td>0</td>
</tr>
<tr>
<td>126</td>
<td>0</td>
</tr>
<tr>
<td>881</td>
<td>341</td>
</tr>
<tr>
<td>755</td>
<td>341</td>
</tr>
<tr>
<td>629</td>
<td>341</td>
</tr>
<tr>
<td>504</td>
<td>341</td>
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<tr>
<td>378</td>
<td>341</td>
</tr>
<tr>
<td>252</td>
<td>341</td>
</tr>
<tr>
<td>126</td>
<td>341</td>
</tr>
<tr>
<td>881</td>
<td>853</td>
</tr>
<tr>
<td>755</td>
<td>853</td>
</tr>
<tr>
<td>629</td>
<td>853</td>
</tr>
<tr>
<td>504</td>
<td>853</td>
</tr>
<tr>
<td>378</td>
<td>853</td>
</tr>
<tr>
<td>252</td>
<td>853</td>
</tr>
<tr>
<td>126</td>
<td>853</td>
</tr>
</tbody>
</table>
**TEST PREPARATION SHEET**

**NASA - LYNDON B. JOHNSON SPACE CENTER**

**SISO-TR531**

**Vol. II**

1. **TYPE A**
   - Configuration Change

2. **TYPE B**
   - Non-Configuration Change

3. **Mod. Sheet Number**

4. **TPS No.**
   - A3

5. **Sheet No.**
   - 1

6. **Date**

7. **Time**

8. **Need Date**

9. **System**
   - COMA

10. **Contract Number**

11. **Serial Number**

12. **Ref. E O. Number**
   - TIRP #1699

13. **TPS Short Title**

14. **Reason for Work:** Verification of CLAGRA Program

15. **Description (Print or Type)**

<table>
<thead>
<tr>
<th>TECH</th>
<th>22 CONT</th>
<th>23 NASA</th>
</tr>
</thead>
</table>

**TESTS**

A. Load 105mm camera. Use a leader in the take-up magazine. Install the 16mm control disk.

B. At the teletype:
   1. Verify system is under DEBUG control.
   2. Type P$1.
   3. Focus the PLS according to the procedure on the inside of the camera bay door.
   4. Set the intensity to a value of 24 x 1.
   5. Enter space on TTY to return to DEBUG control.
   6. Enter GRA;GRAY$J on TTY.
   7. Verify that *MONITOR is typed by program.
   8. Enter CLEAR/(CR) on TTY. Verify that *OK is typed.
   9. Enter CLEAR/(CR) on TTY. Verify that *OK is typed.

19. **Prepared By**

20. **Inspec**

**REFER TO PROCEDURES FOR REQUIRED SIGNATURES**

**Contractor**

**Date**

**NASA**

**Date**

**3/1/75**

**COPY 1**

**REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR**
10. Mount gray level test tape #2A on 9-trk drive. Set unit select SW to 1.

11. Enter UNLABELLED/(CR) on TTY. Verify that *OK is typed.

12. Enter SKIP/(CR) to skip label on tape. Verify that *OK is typed.

13. Place data sw. 8 in the up position.

14. Enter GO/(CR) to start processing of the test tape. Verify that the start time and frame number are typed.

15. Verify that stop time, frame number and *END OF FILE are typed at completion of job.

16. Enter REWIND/(CR) to rewind test tape. Verify that *OK is typed.

17. Enter END JOB/(CR) to finish fiche. Verify that *OK is typed.

18. Dismount gray test tape and mount landscape test tape on tape drive.

19. Press START switch on console to get DEBUG control.

20. Enter LAND$J on TTY.

21. Same as step #7 above.

22. Same as step #11 above.

23. Same as step #14 above.

24. Same as step #15 above.

25. Same as step #16 above.

26. Same as step #17 above.

27. Dismount landscape test tape and mount class map test tape on tape drive.

28. Same as #19 above.
29. Enter CLASS$J on TTY.

30. Same as #7 above.

31. Same as #11 above.

32. Same as #14 above.

33. Same as #15 above.

34. Same as #16 above.

35. Same as #17 above.

36. Same as #19 above.

37. Enter CLAGRA$J on TTY.

38. Same as #7 above.

39. Same as #10 above.

40. Same as #11 above.

41. Same as #12 above.

42. Same as #14 above.

43. Same as #15 above.

44. Same as #16 above.

45. Same as #17 above.

46. Same as #18 above.

47. Same as #14 above.

48. Same as #15 above.

49. Same as #16 above.

50. Same as #17 above.

51. Same as #27 above.

52. Same as #14 above.
53. Same as #15 above.

54. Same as #16 above.

55. Same as #17 above.

56. Same as #8 above.

57. Same as #8 above.

58. Enter CNTRL D on TTY and verify that system returns to DEBUG control.

59. Unload camera and process film.

60. Save TTY scroll.

II VERIFICATION

1. Verify from TTY scroll that CLAGRA processed the three test tapes in less time than the old programs.

2. Verify that the data images from both old and new programs are the same.
B.3 COMA VARIAN 73 PRINT PROCESSOR FOR 16 mm FILM (VAR16)

See paragraph 2.3. Revisions are as follows:

<table>
<thead>
<tr>
<th>Date</th>
<th>Author</th>
<th>TPS No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 November 1974</td>
<td>B. S. Miller</td>
<td>Original TPS A4</td>
</tr>
</tbody>
</table>

TPS No. A4 follows.
TECH PREPARATION SHEET
NASA-MANNED SPACECRAFT CENTER

1. Tapes 1 and 1A will be used to test:
   (1) 7- or 9-track tape processing
   (2) Multi-job real
   (3) NONE, VORTEX, and TERMINAL carriage controls
   (4) Absence of COM control records
   (5) Variable page lengths
   (6) Variable record lengths
   (7) Character repertoire

1.1 Verify that the system is under DEBUG control.

1.2 Mount Tapes 1 and 1A on the 7- and 9-track drives respectively. Set switches to 1 and 2 respectively.

1.3 At the teletype:
   a. Type VAR16$J to load the program and pass control to the MONITOR. Verify that *MONITOR is printed and the command list is displayed on the CRT.
   b. Type TAPE TYPE/8 A. Verify the *OK is printed.
   c. Type CARRIAGE CONTROLS/1 A. Verify that *OK is printed.

Prepared By: ____________________________  Final Acceptance Date: ____________________________

Refer to procedures for required signatures: ____________________________  ____________________________

Contractor: ____________________________  Date: ____________________________

NASA: ____________________________  Date: ____________________________

Beverly Peters 11/15/74  Frederick Jones 11/15/74

NASA—MSC—Coml., Houston, Texas

Reproducibility of this original page is poor.
### TEST PREPARATION SHEET

**CONTINUATION SHEET**

**NASA - LYNDON B. JOHNSON SPACE CENTER**

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<th>Tech.</th>
<th>Insp.</th>
<th>Cont.</th>
<th>NASA</th>
</tr>
</thead>
<tbody>
<tr>
<td>d. Type LINE PER PAGE/50 ( \frac{\text{L}}{\text{V}} ). Verify that *OK is printed.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. Type GO/ ( \frac{\text{L}}{\text{V}} ). Verify that the start time and frame number are printed.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. Verify that the message ENTER TAPE NUMBER: is printed.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>g. Type 7NONE for 7-track; 9NONE for 9-track.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>h. Verify that the job time elapsed, frame number, and the messages *END OF FILE2 and *FILES DONE are printed and that control is returned to the monitor.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i. Type LINES PER PAGE/60 ( \frac{\text{L}}{\text{V}} ). Verify that *OK is printed.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>j. Type CARRIAGE CONTROLS/3 ( \frac{\text{L}}{\text{V}} ). Verify that *OK is printed.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>k. Type GO/ ( \frac{\text{L}}{\text{V}} ). Verify that the start time and frame number are printed.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>l. Verify that ENTER TAPE NUMBER: is printed. Type 7TERM for 7-track; 9TERM for 9-track.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>m. Verify that the job time elapsed, frame number and *END OF FILE3 and *FILES DONE are printed.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n. Type CARRIAGE CONTROLS/2 ( \frac{\text{L}}{\text{V}} ). Verify that *OK is printed.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>o. Type GO/ ( \frac{\text{L}}{\text{V}} ). Verify that the start time and frame number are printed.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>p. Verify that ENTER TAPE NUMBER: is printed. Type 7VRTX for 7-track; 9VRTX for 9-track.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>q. Verify that the job time elapsed, frame number, and <strong>DOUBLE END OF FILE</strong> are printed.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>r. Verify that the job time elapsed, frame number, and *<strong>DOUBLE END OF FILE</strong> are printed.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>s. Type USE/2 ( \frac{\text{L}}{\text{V}} ). Verify that *OK is printed.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>t. Type TAPE TYPE/2 ( \frac{\text{L}}{\text{V}} ). Verify that *OK is printed.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>u. Repeat the above: starting with step 3C.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>v. Type REINITIALIZE Verify that *OK is printed.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

*EC FORM 1225A (JUL 65)*

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*COPY*
**TEST PREPARATION SHEET**

**CONTINUATION SHEET**

NASA – LYNDON B. JOHNSON SPACE CENTER

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<th>Ins.</th>
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<tr>
<td>2. Tapes 2 and 2A will be used to test the following:</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>(1) 7- or 9-track tape processing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2) Multi-job reel</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(3) NONE, TERMINAL, and VORTEX carriage controls</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(4) Job separator, titling, forms and indexing records</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(5) Variable length pages</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(6) Variable length records</td>
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</tr>
<tr>
<td>2.1 Mount Tapes 2 and 2A on the 7- and 9-track tape drives, respectively. Set the unit select switches to 1 and 2, respectively.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.2 Verify that the system still under MONITOR control by the fact that the command list is displayed on the CRT.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.3 At the teletype</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Type TAPE TYPE/8. Verify the *OK is printed.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Type CARRIAGE CONTROLS/2. Verify that *OK is printed.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. Type GO/. Verify that the start time and frame number are printed.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. Verify that the job time elapsed, frame number, *END OF FILE 1 and FILES DONE are printed and control returns to the MONITOR.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. Type CARRIAGE CONTROLS/3. Verify that *OK is printed.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. Type GO/. Verify that the start time and frame number are printed.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>g. Verify that the job time elapsed, frame number, *END OF FILE 2 and FILES DONE are printed.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>h. Type CARRIAGE CONTROLS/1. Verify that *OK is printed.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i. Type LINES PER PAGE/55. Verify that *OK is printed.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>j. Type GO/. Verify that the start time and frame number are printed.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR**
<table>
<thead>
<tr>
<th>DESCRIPTION (Print or Type)</th>
</tr>
</thead>
<tbody>
<tr>
<td>k. Verify that the elapsed job time, frame number and</td>
</tr>
<tr>
<td><strong>DOUBLE END OF FILE</strong> are printed.</td>
</tr>
<tr>
<td>l. Type USE/2. Verify that &quot;OK&quot; is printed.</td>
</tr>
<tr>
<td>m. Type TAPE TYPE/9. Verify that &quot;OK&quot; is printed.</td>
</tr>
<tr>
<td>n. Repeat the above, beginning with 2.3.</td>
</tr>
<tr>
<td>Type REWIND/2. Verify that &quot;OK&quot; is printed.</td>
</tr>
</tbody>
</table>
B.4 COMA VARIAN 73 PRINT PROCESSOR FOR 105 mm FICHE (VAR105).

See paragraph 2.4. Revisions are as follows:

<table>
<thead>
<tr>
<th>Date</th>
<th>Author</th>
<th>TPS No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>26 November 1974</td>
<td>B. S. Miller</td>
<td>Original TPS A5</td>
</tr>
</tbody>
</table>

TPS No. A5 follows.
# TEST PREPARATION SHEET

**NASA - MANNED SPACECRAFT CENTER**

<table>
<thead>
<tr>
<th>Column 1</th>
<th>Column 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. TYPE</strong></td>
<td><strong>2. TPS No.</strong></td>
</tr>
<tr>
<td>Configuration Change</td>
<td>A 5</td>
</tr>
<tr>
<td>Non-Configuration Change</td>
<td></td>
</tr>
<tr>
<td><strong>3. S/C</strong></td>
<td><strong>4. Mod. Sheet Number</strong></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>5. Page</strong></td>
<td><strong>6. Date</strong></td>
</tr>
<tr>
<td>1 of 4</td>
<td>11/26/74</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>7. Time</strong></td>
<td><strong>8. Need Date</strong></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>9. Contract Number</strong></td>
<td><strong>10. Serial Number</strong></td>
</tr>
<tr>
<td>NAS-9-1261</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>11. Reference Code</strong></td>
<td><strong>12. Item No.</strong></td>
</tr>
<tr>
<td>COM/A</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>13. System</strong></td>
<td><strong>14. No.</strong></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>15. TPS Short Title</strong></td>
<td><strong>16. Description (Print or Type)</strong></td>
</tr>
<tr>
<td>A.I. Procedure for the VARIAN 73 105mm Print Processor</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>17. Reason for Work</strong></td>
<td><strong>18. Description (Print or Type)</strong></td>
</tr>
<tr>
<td>Allow output to microfiche of 7- or 9-track print tapes created on the VARIAN 73</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>19. Prepared By</strong></td>
<td><strong>20. Final Acceptance Date</strong></td>
</tr>
<tr>
<td>Beverly Miller</td>
<td>11/26/74</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>21. Inspe</strong></td>
<td><strong>22. Cont.</strong></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

1. Tapes 1 and 1A will be used to test:

   (1) 7- or 9-track tape processing
   (2) Multi-job reel
   (3) NONE, VORTEX, and TERMINAL carriage controls
   (4) Absence of COM control records
   (5) Variable page lengths
   (6) Variable record lengths
   (7) Character repertoire

1.1 Verify that the system is under DEBUG control.

1.2 Mount Tapes 1 and 1A on the 7- and 9-track drives respectively. Set switches to 1 and 2 respectively.

1.3 At the teletype:
   a. Type VARIAN/ to load the program and pass control to the MONITOR. Verify that
   *MONITOR is printed and the command list is displayed on the CRT.

---

**REFER TO PROCEDURES FOR REQUIRED SIGNATURES**

<table>
<thead>
<tr>
<th>Contractor</th>
<th>Date</th>
<th>NASA</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beverly Miller</td>
<td>11/26/74</td>
<td></td>
<td>11/26/74</td>
</tr>
</tbody>
</table>

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**REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR**
### TEST PREPARATION SHEET

**CONTINUATION SHEET**

**NASA – LYNDON B. JOHNSON SPACE CENTER**

<table>
<thead>
<tr>
<th>DESCRIPTION (Print or Type)</th>
<th>Tech.</th>
</tr>
</thead>
<tbody>
<tr>
<td>b. Type TAPE TYPE/8. Verify the *OK is printed.</td>
<td>✔️</td>
</tr>
<tr>
<td>c. Type CARRIAGE CONTROLS/1. Verify that *OK is printed.</td>
<td>✔️</td>
</tr>
<tr>
<td>d. Type LINE PER PAGE/50. Verify that *OK is printed.</td>
<td>✔️</td>
</tr>
<tr>
<td>e. Type GO/. Verify that the start time and frame number are printed.</td>
<td>✔️</td>
</tr>
<tr>
<td>f. Verify that the message ENTER TAPE NUMBER: is printed.</td>
<td>✔️</td>
</tr>
<tr>
<td>g. Type 7NONE for 7-track; 9NONE for 9-track.</td>
<td>✔️</td>
</tr>
<tr>
<td>h. Verify that the job-time elapsed, frame number, and the messages *END OF FILE1 and *FILES DONE are printed and that control is returned to the monitor.</td>
<td>✔️</td>
</tr>
<tr>
<td>i. Type LINES PER PAGE/60. Verify that *OK is printed.</td>
<td>✔️</td>
</tr>
<tr>
<td>j. Type CARRIAGE CONTROLS/3. Verify that *OK is printed.</td>
<td>✔️</td>
</tr>
<tr>
<td>k. Type GO/. Verify that the start time and frame number are printed.</td>
<td>✔️</td>
</tr>
<tr>
<td>l. Verify that &quot;ENTER TAPE NUMBER:&quot; is printed. Type 7TERM for 7-track; 9TERM for 9-track.</td>
<td>✔️</td>
</tr>
<tr>
<td>m. Verify that the job time elapsed, frame number and *END OF FILE2 and *FILES DONE are printed.</td>
<td>✔️</td>
</tr>
<tr>
<td>n. Type CARRIAGE CONTROLS/2. Verify that *OK is printed.</td>
<td>✔️</td>
</tr>
<tr>
<td>o. Type GO/. Verify that the start time and frame number are printed.</td>
<td>✔️</td>
</tr>
<tr>
<td>p. Verify that ENTER TAPE NUMBER: is printed. Type 7VRTX for 7-track; 9VRTX for 9-track.</td>
<td>✔️</td>
</tr>
</tbody>
</table>
TEST PREPARATION SHEET
CONTINUATION SHEET
NASA – LYNDON B. JOHNSON SPACE CENTER

TFS No. | A5
---|---
C/C | Cat. No.
Page 3 of 4

DESCRIPTION (Print or Type) Tech. Inspe.

q. Verify that the job time elapsed, frame number, and END OF FILE3 is printed.

r. Verify that the start time and frame number are printed.

s. Verify that the job time elapsed, frame number, and ***DOUBLE END OF FILE are printed.

t. Type REWIND/\#. Verify that *OK is printed.

u. Type USE/2\#. Verify that *OK is printed.

v. Type TAPE TYPE/9\#. Verify that *OK is printed.

w. Repeat the above starting with step 3C.

2. Tape 2 and 2A will be used to test the following:
   (1) 7- or 9-track tape processing
   (2) Multi-job reel
   (3) NONE, TERMINAL, AND VORTEX Carriage controls
   (4) Job separator, titling, forms and indexing records
   (5) Variable length pages
   (6) Variable length records

2.1 Mount Tapes 2 and 2A on the 7- and 9-track tape drives, respectively. Set the unit select switches to 1 and 2, respectively.

2.2 Verify that the system is still under MONITOR control by the fact that the command list is displayed on the CRT.

2.3 At the teletype
   (a) Type TAPE TYPE/8\#. Verify the *OK is printed
   (b) Type USE/1\#. Verify that *OK is printed.
   (c) Type CARRIAGE CONTROLS/2\#. Verify that *OK is printed.
<table>
<thead>
<tr>
<th>Description</th>
<th>Tech</th>
<th>Cont</th>
<th>NASA</th>
</tr>
</thead>
<tbody>
<tr>
<td>(d) Type GO/( \frac{d}{2} ). Verify that the start time and frame number are printed.</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>(e) Verify that the job time elapsed, frame number, *END OF FILE 1 and FILES DONE are printed and control returns to the MONITOR.</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(f) Type CARRIAGE CONTROLS/3 ( \frac{d}{2} ). Verify that *OK is printed.</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>(g) Type GO/( \frac{d}{2} ). Verify that the start time and frame number are printed.</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>(h) Verify that the job time elapsed, frame number, *END OF FILE 2 and FILES DONE are printed.</td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>(i) Type CARRIAGE CONTROLS/1 ( \frac{d}{2} ). Verify that *OK is printed.</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>(j) Type LINES PER PAGE/55 ( \frac{d}{2} ). Verify that *OK is printed.</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(k) Type GO/( \frac{d}{2} ). Verify that the start time and frame number are printed.</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>(l) Verify that the elapsed job time, frame number and ***DOUBLE END OF FILE are printed.</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(m) Type REWIND/( \frac{d}{2} ). Verify that *OK is printed.</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>(n) Type USE/2 ( \frac{d}{2} ). Verify that *OK is printed.</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>(o) Type TAPE TYPE/9 ( \frac{d}{2} ). Verify that *OK is printed.</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>(p) LINES PER PAGE/60 ( \frac{d}{2} ). Verify that *OK is printed.</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>(q) Repeat the above, beginning with 2.3 ( \frac{d}{2} ).</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
B.5 COMA HCO TABULAR PROCESSOR FOR 105 mm FICHE (HCOTAB)

See paragraph 2.5. Revisions are as follows:

<table>
<thead>
<tr>
<th>Date</th>
<th>Author</th>
<th>EO/TPS-No.</th>
</tr>
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<tbody>
<tr>
<td>17 June 1974</td>
<td>F. C. Ashton</td>
<td>EO-191F - TPS A6</td>
</tr>
<tr>
<td>12 July 1974</td>
<td>F. C. Ashton</td>
<td>TPS A7</td>
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</tbody>
</table>

TPS No. A6 and A7 follow.
### Test Preparation Sheet

**NASA - Lyndon B. Johnson Space Center**

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<thead>
<tr>
<th>Type A</th>
<th>Configuration Change</th>
<th>Type B</th>
<th>Non-Configuration Change</th>
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</thead>
</table>

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<thead>
<tr>
<th>1. TPS No.</th>
<th>A6</th>
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<table>
<thead>
<tr>
<th>2. SIC No.</th>
<th>Cat. No.</th>
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</table>

<table>
<thead>
<tr>
<th>3. Need Date</th>
<th>Page 1 of 4</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>4. Mod. Sheet Number</th>
<th></th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>5. Date</th>
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</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>6. Time</th>
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</table>

<table>
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<tr>
<th>7. Time</th>
<th></th>
</tr>
</thead>
</table>

<table>
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<tr>
<th>8. Contract Number</th>
<th>NAS9-1251</th>
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</thead>
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<table>
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<th>9. Serial Number</th>
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**Computers to Microfilm**

<table>
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<tr>
<th>10. E O Number</th>
<th>191-F</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>11. Ref E O Number</th>
<th></th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>12. Wt Req</th>
<th></th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>13. Reason for Work:</th>
<th>To verify the new version HCO will process both 7-Track and 9-Track.</th>
</tr>
</thead>
</table>

**Test Procedures**

1. HCO Acceptance Test
   a) AT the tape transports
      1) Mount 9-Track HCO - TAB tape number 2729 on the 9-Track unit.
      2) Mount 7-Track HCO - TAB tape number 3181 on the 7-Track unit.
   b) AT the teletype:
      1) Type PRO; HCO TAB $J to load the production HCO. Verify that *Monitor is typed on the teletype.
      2) Type Clear twice to advance exposed film into the take-up magazine. Verify that *OK is typed on the teletype after each clear.

**Prepared By**

**Final Acceptance Date**

**Contractor Date NASA**

**REFERENCES**

For additional information, refer to procedures for required signatures.

**Original Page is Poor**

B-59
<table>
<thead>
<tr>
<th>DESCRIPTION (Print or Type)</th>
<th>Tech</th>
<th>Imp</th>
<th>Cont</th>
<th>NASA</th>
</tr>
</thead>
<tbody>
<tr>
<td>b) 3) Type <strong>FOCUS</strong> to focus the camera.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4) Type <strong>CNTRL</strong> 1 to End the Focus Pattern.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5) Type unlabelled/`. Verify *OK is typed on teletype.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6) Type <strong>GO/</strong> to initiate processing of the 9-Track HCO Gray.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>However that the starting time and frame number are typed on the teletype.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7) Type <strong>End Job</strong> to complete processing of 9-Track HCO Gray Tape.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>However that *OK is typed on teletype.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8) Record the Elapse Run Time 357.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9) Type <strong>rewind/:</strong> to rewind the 9-Track HCO Gray. Verify that *OK.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10) Type <strong>CNTRL</strong> D to return to debug. Verify that *OK is typed on the teletype.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11) Type <strong>FCA; HCOTAB $J</strong> to load new version on HCO TAB.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12) Type unlabelled. Verify *OK is typed on the teletype.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13) Type <strong>GO/</strong> to initiated processing of 9-Track HCO Gray tape. Verify that the starting time and frame number are typed on the teletype.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14) Verify that the elapsed job time, frame number, page number and *End of File are typed on the teletype to signal completion of data tape processing.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Description</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>----------------------------------------------------------------------------------------------------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Type End Job to complete processing of 9-Track HCO Gray tape. Verify that *OK is typed on the teletype.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Record the elapsed run time.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>27' 40.7&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Type rewind/ to rewind the 9-Track HCO TAB verify that *OK is typed on the teletype.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Type CNTRL.D to return to debug. Verify *Debug is typed on the teletype.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Type FCA: HCO TAB $J$ to load the new version HCO TAB program verify that *Monitor is typed on the teletype.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Type USE/2 to change 7-Track unit. Verify *OK is typed on the teletype.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Type tape type/8 to change to 7-Track, 800 BPI. Verify *OK is typed on the teletype.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Type unlabelled/ verify *OK is typed on the teletype.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Type GD/ to initiate processing of 7-Track HCO TAB tape. Verify the starting time and frame number are typed on the teletype.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Verify that the elapsed job time, frame number, page number and * End of File are typed on the teletype to signal completion of Data Tape processing.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Time 5 2 59 59 9 F 16 P 01 P</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>Type end job/ to complete processing of HCO TA3 Tape. Verify that *OK is typed on the teletype.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Type Clear twice to advance exposed film into the take-up magazine. Verify that *OK is typed on the teletype.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DESCRIPTION (Print or Type)</td>
<td>Tech.</td>
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<tr>
<td>-----------------------------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
</tr>
<tr>
<td>b) 26) teletype after each Clear.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27) Type rewind/- to rewind the 7-Track HCO gray. Verify that *OK is typed on the teletype.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28) Type CTRL D to return to Debug verify * Debug is typed on the teletype.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c) AT the tape transport</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1) Dismount 9-Track HCO and 7-Track HCO tape.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d) Test result verification</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1) Process 105mm film containing results.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2) View the resulting 105mm microfiche on the Bell &amp; Howell viewgraph.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**TEST PREPARATION SHEET**

**NASA - LYNDON B. JOHNSON SPACE CENTER**

<table>
<thead>
<tr>
<th>2. TPS No.</th>
<th>A7.</th>
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<td>Cat.</td>
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<td>5. Page</td>
<td>1 of 2</td>
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<td>6 S/C No /Model No</td>
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<tr>
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</tr>
<tr>
<td>9. Need Date</td>
<td>27 July 74</td>
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<td>10. Drawings, Documents, Op's, &amp; Part Numbers</td>
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<td>11. Contract Number</td>
<td></td>
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<tr>
<td>12. Serial Number</td>
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<td>13. System</td>
<td>Computer to Microfilm</td>
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<td>14. Ref E. O Number</td>
<td></td>
</tr>
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<td>15. TPS Short Title</td>
<td>HCO Tab Title Acceptance Test</td>
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<td>16. Wt Req.</td>
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<tr>
<td>17. Reason for Work:</td>
<td>To verify Title File Development for HCO Tape</td>
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**(FR20 CLARIFICATION FORM A17)**

**TEST PROCEDURES**

1. HCO Tab Test
   a) At the 7-Track Tape Transport:
      (1) Mount Tape Number 3181.
   b) At the Teletype:
      (1) Type FCA; HCCTAB$ J TO LOAD program. Verify that *MONITOR is typed on the Teletype.
      (2) Type CLEAR/Δ to advance exposed film into the take-up magazine. Verify that *OK is typed on the Teletype.
      (3) Type UNLABELLED/Δ. Verify *OK is typed on the Teletype.
      (4) Type TAPE TYPE 8 Δ. Verify *OK is typed on the Teletype.
      (5) Type USE2 Δ. Verify *OK is typed on the Teletype.

**Prepared By**

**Final Acceptance Date**

**REFER TO PROCEDURES FOR REQUIRED SIGNATURES**

<table>
<thead>
<tr>
<th>Contractor</th>
<th>Date</th>
<th>NASA</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Franklin</td>
<td>7/12/74</td>
<td>Freddie</td>
<td>7/12/74</td>
</tr>
</tbody>
</table>

**Copy 1**
<table>
<thead>
<tr>
<th>DESCRIPTION (Print or Type)</th>
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</thead>
<tbody>
<tr>
<td>(6) Type GO*. Verify Time and Frame is typed on the Teletype.</td>
</tr>
<tr>
<td>(7) When ENTER SOURCE TAPE is typed on the Teletype, type 3299 -3181.</td>
</tr>
<tr>
<td>(8) When ENTER COM TAPE is typed on the Teletype, type 7-TRACK.</td>
</tr>
<tr>
<td>(9) When ENTER ROLL is typed on the Teletype, type HCO TAB.</td>
</tr>
<tr>
<td>(10) Type CNTRL A. Verify that *MONITOR is typed on the Teletype.</td>
</tr>
<tr>
<td>(11) Type REWIND-. Verify that *OK is typed on the Teletype.</td>
</tr>
<tr>
<td>(12) Type CLEAR. Verify that *OK is typed on the Teletype.</td>
</tr>
<tr>
<td>(13) Type CLEAR. Verify that *OK is typed on the Teletype.</td>
</tr>
<tr>
<td>(14) Type CNTRL D to return to DEBUG. Verify *DEBUG is typed on the Teletype.</td>
</tr>
<tr>
<td>a) At the 7-Track Transport, dismount the tape.</td>
</tr>
<tr>
<td>d) Test Result Verification:</td>
</tr>
<tr>
<td>(1) Process 105mm containing results.</td>
</tr>
<tr>
<td>(2) View the resulting 105mm microfiche on the Bell and Howell Viewgraph.</td>
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</table>
B.6 COMA PDP 11/45 PRINT PROCESSOR FOR 16 mm FILM (PDP16)

See paragraph 2.6. Revisions are as follows:

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<thead>
<tr>
<th>Date</th>
<th>Author</th>
<th>TPS No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>21 January 1974</td>
<td>V. D. Pote</td>
<td>TPS A8</td>
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</table>

TPS No. A8 follows.
**TEST PREPARATION SHEET**

NASA - LYNDON B. JOHNSON SPACE CENTER

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<thead>
<tr>
<th>Configuration Change</th>
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<td>1. PDP11 Tab Print Acceptance Test</td>
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</tr>
<tr>
<td>a. At the Tape Transport</td>
<td></td>
</tr>
<tr>
<td>(1) Mount Tab Test Tape</td>
<td></td>
</tr>
<tr>
<td>b. At the Teletype</td>
<td></td>
</tr>
<tr>
<td>(1) Type PRO;PDP16$J to load program. Verify that *MONITOR is typed on the teletype.</td>
<td></td>
</tr>
<tr>
<td>(2) Type CLEAR/4 twice to advance exposed film into take-up magazine. Verify that *OK is typed on the teletype after each CLEAR/4.</td>
<td></td>
</tr>
<tr>
<td>(3) Type GOJ to initiate processing of the tape. Verify that the starting time and frame number are typed on the teletype.</td>
<td></td>
</tr>
<tr>
<td>(4) Verify that Job Separator is written on film by monitoring the CRT.</td>
<td></td>
</tr>
</tbody>
</table>

**Prepared By:**

**Final Acceptance Date:** 1/2/74

**REFER TO PROCEDURES FOR REQUIRED SIGNATURES**

<table>
<thead>
<tr>
<th>Contractor</th>
<th>NASA</th>
<th>Refer to Procedures for Required Signatures</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
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</tbody>
</table>

**Copy 1**
(5) Verify that Job Separator and "ENTER TAPE NUMBER" are typed on the teletype.

(6) Enter a 7 digit number on teletype.

(7) Enter Rub-out Key. Verify that tape number if repeated excluding the last digit.

(8) Enter &. Verify that tape number is written on film in eyeball size characters by monitoring the CRT.

At this time, mark present time.

(9) Verify that processing is proceeding by monitoring the CRT.

(10) Watch for next job separator on film indicating the end of 1st file. Mark time.

(11) Watch for next job separator on film indicating the end of 2nd file.

(12) Stop processing with Reset Key and mark stop time.

(13) Enter CLEAR twice to clear exposed film.

2. PDP11 Tab Print Older Version

Restore production version of program and repeat step 1 excluding step b.(7).

3. Develop film and verify that film from both versions is identical.

4. Calculate manually the time savings of the new version using the timing statistics gathered.

New 4'28"
Old 6'10"
B.7 COMA PDP 11/45 PRINT PROCESSOR FOR 105 mm FICHE (PDP105)

See paragraph 2.7. There are no revisions to this program.
B.8 COMA HARVARD COLLEGE OBSERVATORY SOLAR EXPERIMENT SO55 GRAY-LEVEL 9-TRACK PROCESSOR (SO55)

See paragraph 2.8. Revisions are as follows:

<table>
<thead>
<tr>
<th>Date</th>
<th>Author</th>
<th>EO/TPS No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>28 November 1973</td>
<td>F. C. Ashton</td>
<td>Original EO-191 TPS A9</td>
</tr>
</tbody>
</table>

TPS A9 follows. See also paragraph B.8.1, tables B-17 and B-18 and figures B-10 through B-12.
**TEST PREPARATION SHEET**

**NASA - MANNED SPACECRAFT CENTER**

**Document Details**
- **Document Number**: NAS9-1261
- **Date**: 1 December 1973
- **Contractor Number**: NASA-1261
- **Serial Number**: 1911

**System**
- Computer to Microfilm

**TPS Short Title**
- S055 Software Acceptance Test

**Reason for Work**
- To verify the software improved through development on the COM System for the HCO as defined in PRO SH-09833 and as required under PRO 3055 for microfilm SYSTEM TASK A/B

**TEST PROCEDURES**

1. **S055 Acceptance Test - Tape 1**
   - **a. At the Tape Transport**:  
     1. Mount S055 Acceptance Test Tape 1
   - **b. At the Teletype**:
     1. Type PRO;S055 SJ to load S055 Program. Verify that *MONITOR is typed on the teletype.
     2. Type CLEAR/ twice to advance exposed film into the take-up magazine. Verify that *OK is typed on the teletype after each CLEAR/.
     3. Type UNLABELED/ to verify that *OK is typed on the teletype.
     4. Type GO/ to initiate processing of S055 Acceptance Test Tape (Tape 1). Verify that the starting time and frame number are typed on the teletype.

**Prepared By**
- Frank Ashton

**Original Page is Poor**
- Reproducibility of page is poor
<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>Tech</th>
<th>Cons.</th>
<th>NASA</th>
</tr>
</thead>
<tbody>
<tr>
<td>(5) Verify that the elapsed job time, frame number, page number and *END OF FILE are typed on the teletype to signal completion of data tape processing.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(6) Type END JOB/\ to complete processing of S055 Acceptance Test Tape (Tape 1). Verify that *OK is typed on the teletype</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(7) Type CLEAR/\ to advance exposed film into the take-up magazine. Verify that *OK is typed on the teletype after each CLEAR/\</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(8) Type REWIND/\ to rewind the S055 Test Tape (Tape 1). Verify that *OK is typed on the teletype.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(9) Type CTRL D to return to DEBUG. Verify *DEBUG is typed on the teletype.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. At the Tape Transport</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1) Dismount the S055 Acceptance Test Tape (Tape 1).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. S055 Acceptance Test Tape 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. At the Tape Transport</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1) Mount S055 Acceptance Test Tape (Tape 2).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. At the Teletype:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1) Type PRO:S055 SJ to load S055 program. Verify that *MONITOR is typed on the teletype.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2) Type SKIP/\ to bypass the standard label on the tape. Verify that *OK is typed on the teletype.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(3) Type UNLABELED/. Verify that *OK is typed on the teletype.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### TEST PREPARATION SHEET

**CONTINUATION SHEET**

**NASA - MANNED SPACECRAFT CENTER**

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<tr>
<th>DESCRIPTION (Print or Type)</th>
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<th>Imp.</th>
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<tr>
<td>(4) Type CLEAR/ to advance exposed film into the take-up magazine. Verify that *OK is typed on the teletype after each CLEAR/.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(5) Type GO/ to initiate processing of S055 Acceptance Test Tape (Tape 2). Verify that the starting time and frame number are typed on the teletype.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(6) Verify that the elapsed job time, frame number, and *END OF FILE are typed on the teletype to signal completion of data tape processing.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(7) Type END JOB/ to complete processing of the S055 Acceptance Test Tape (Tape 2). Verify that *OK is typed on the teletype.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(8) Type CLEAR/ twice to advance exposed film into the take-up magazine. Verify that *OK is typed on the teletype after each CLEAR/.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(9) Type REWIND/ to rewind the S055 Acceptance Test Tape (Tape 2). Verify that *OK is typed on the teletype.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**c. At the Tape Transport:**

(1) Dismount the S055 Acceptance Test Tape (Tape 2).

**d. Test Result Verification:**

(1) Process 105 mm film containing results.

(2) View the resulting 105 mm microfiche on the Bell & Howell viewgraph. Verify that the results match Test 1 as described in Paragraph 1 of the accompanying handout and Test 2 and Test 3 as described in Paragraphs 2 and 3.
Modifications to the SO55 Gray Level and Tab Programs

The Principal Investigators have requested that several changes be incorporated into the SO55 Gray Level and tab programs.

PHO is requested to implement the following changes:

**Gray Level**

1. Rotate images 90 degrees counterclockwise.
2. Change format to be 7 rows by 12 or more columns.
3. Change the "title" record to accommodate new title information. The new title information will be defined later.
4. Shift every other scan line (2, 4, 6, etc.) a fraction of a pixel. The fraction will be defined later. The characters on the right may be dropped.
5. Provide the capability to accept a control word to skip a data frame position on film.

**SO55 Tabs**

Implement the capability to handle the SO55 tabs formatted in the DTE language. The output will be on Fiche.

**INSTRUCTIONS**

1. All FMST's shall be routed through DSS secretary for assignment of control number.
2. Subject is the function to be changed or clarified.
3. Text shall be included in area provided or on attached sheets.

**DSS Approval**

**PHO Approval**

Cornelius J. Sullivan

Samuel D. Sanborn

J. Conlan

Harvard U.

F. E. Jones

DATE: 11/28/73

MSC Form 757 (Oct 72)

B-73
B.8.1 Test 1, 64 Shade-Frames. This test shall be contained on tape 1 and shall consist of header data and gray-level data to build 64 images of 60 lines of 120 pixels per image. This will demonstrate maximum image size, multiple images per fiche, multiple fiche per job, and all possible shades of gray. Header data shall consist of three lines per frame, each line containing 132 alphanumeric. Gray-level data shall be constructed as illustrated in figure B-10 and table B-17. Each image will be a unique gray-level as defined in figure B-10.

B.8.2 Test 2, 64 X-Shade Bars. This test and test 3 shall be contained on tape 2. This test shall consist of header data and gray-level data to build four frames of 60 lines of 120 pixels per image. This pattern will demonstrate ascending shade bars in the X-axis. Header data shall consist of three lines per frame, each line containing 132 alphanumeric. Gray-level data shall be constructed as illustrated in figure B-11 and table B-17. Each image will consist of 16 unique gray-levels as defined in figure B-11.

B.8.3 Test 3, Every Fourth Shade X-Bars. This test shall consist of header data and gray-level data to build four frames of 60 lines of 120 pixels per image. This pattern will test contrast levels between every fourth gray-level. Header data shall consist of three lines per frame, each line containing 132 alphanumeric. Gray-level data shall be constructed as illustrated in figure B-12 and table B-17. Each image will consist of 16 unique gray-levels as defined in figure B-12.
Each of the 60 scan lines will contain 120 pixels; FR80 gray-level 0 for frame 1, 1 for frame 2, 2 for frame 3, etc., up to 63 for frame 64.

Figure B-10 Test 1, Gray-Level Frame
<table>
<thead>
<tr>
<th>TEST/TAPE NO.</th>
<th>PURPOSE</th>
<th>CONTENT/FORMAT</th>
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</thead>
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<tr>
<td>1/1</td>
<td>TEST MAXIMUM IMAGE SIZE, MULTIPLE IMAGES PER FICHE, MULTIPLE FICHE PER JOB, AND 64 SHADES OF GRAY</td>
<td>THREE HEADER RECORDS AND 60 GRAY-LEVEL RECORDS PER FRAME, 64 FRAMES, IN FIXED-LENGTH RECORDS. BLOCKED AT 1320 BYTES PER BLOCK. TEST DISPLAYS FOR THE ABOVE MENTIONED RECORDS ARE DEFINED IN PARA B.8.1</td>
</tr>
<tr>
<td>2/2</td>
<td>TEST 64 ASCENDING X-SHADE BARS. FOUR FRAMES, 16 SHADES PER FRAME</td>
<td>THREE HEADER RECORDS AND 60 GRAY-LEVEL RECORDS PER FRAME, FOUR FRAMES, IN FIXED-LENGTH RECORDS BLOCKED AT 1320 BYTES PER BLOCK. TEST DISPLAYS FOR THE ABOVE MENTIONED RECORDS ARE DEFINED IN PARA B.8.2</td>
</tr>
<tr>
<td>3/2</td>
<td>COMPARE CONTRASTS BETWEEN EVERY FOURTH GRAY-LEVEL IN ASCENDING X-SHADE BARS</td>
<td>THREE HEADER RECORDS AND 60 GRAY-LEVEL RECORDS PER FRAME, FOUR FRAMES, IN FIXED-LENGTH RECORDS BLOCKED AT 1320 BYTES PER BLOCK. TEST DISPLAYS FOR THE ABOVE MENTIONED RECORDS ARE DEFINED IN PARA B.8.3</td>
</tr>
</tbody>
</table>

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR

B-76
Figure B-11 Test 2, X-Shade Bars
Figure B-12 Test 3, Every Fourth Shade X-Bars
### TABLE B-18

**USER FICHE TITLES**

<table>
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<tr>
<th>TAPE NO.</th>
<th>TITLE</th>
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<tr>
<td>1</td>
<td>SKYLAB SOLAR EXPERIMENT S055&lt;br&gt;TEST TAPE NO. 1&lt;br&gt;TEST 1 -- 64 FRAMES, UNIQUE&lt;br&gt;GRAY-LEVEL PER FRAME</td>
</tr>
<tr>
<td>2</td>
<td>SKYLAB SOLAR EXPERIMENT S055&lt;br&gt;TEST TAPE NO. 2&lt;br&gt;TEST 1 AND TEST 2&lt;br&gt;X-SHADE BARS</td>
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B.9 COMA IBM SYSOUT PRINT PROCESSOR (105PR, 16 PRNT)

See paragraph 2.9. Revisions are as follows.

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<th>Date</th>
<th>Author</th>
<th>TPS No.</th>
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<td>10 September 1974</td>
<td>F. C. Ashton</td>
<td>TPS A10</td>
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<tr>
<td>10 September 1974</td>
<td>F. C. Ashton</td>
<td>TPS A11</td>
</tr>
<tr>
<td>22 October 1975</td>
<td>J. S. Bennett</td>
<td>TPS A21</td>
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TPS No. A10, A11 and A21 follow.
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<th>11. Contract Number</th>
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<table>
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<tr>
<td>12K Print Programs - 105mm Camera</td>
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<table>
<thead>
<tr>
<th>17. Reason for Work:</th>
</tr>
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<tbody>
<tr>
<td>Installing the new 12K Print Program for 105 mm Camera</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>18. DESCRIPTION (Print or Type)</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTRODUCTION</td>
</tr>
<tr>
<td>The new 12K Print Program will be tested against the old Print Program. The new program is MON:105NAS; the old program is PRO:105PR.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>19. Prepared By</th>
<th>20. Final Acceptance Date</th>
</tr>
</thead>
<tbody>
<tr>
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<table>
<thead>
<tr>
<th>19. Preparod By</th>
</tr>
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<tbody>
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<table>
<thead>
<tr>
<th>REFER TO PROCEDURES FOR REQUIRED SIGNATURES</th>
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<table>
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<tr>
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<table>
<thead>
<tr>
<th>NASA MSC—Cont., Houston, Texas</th>
</tr>
</thead>
<tbody>
<tr>
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</tr>
</tbody>
</table>

---

**INTRODUCTION**

The new 12K Print Program will be tested against the old Print Program. The new program is MON:105NAS; the old program is PRO:105PR.

1) At the Tape Transport mount Test Tape 2.
2) At the Teletype, type MON:105NAS$J to load the new 105 Print Program.
3) At the Teletype, type FOCUS/7,0,1L to focus the system.
4) At the Teletype, type UNLABLELED. Verify that *OK is printed on the Teletype.
5) At the Teletype, type SKIP/J. To skip dummy label; verify that *OK is printed out on the Teletype.
6) At the Teletype, type GO/J. Verify that time and frame is printed out on the Teletype.
<table>
<thead>
<tr>
<th>DESCRIPTION (Print or Type)</th>
<th>Tech.</th>
<th>Imp.</th>
</tr>
</thead>
<tbody>
<tr>
<td>7) When END OF FILE is printed out on the Teletype, type END OF JOB.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8) Record the time and frame.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TIME 19'35.4 FRAME 70 PAGE 1470</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9) At the Teletype, type REWIND/ to rewind Tape.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10) At the Teletype, type FRAME/O to reset frame count.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11) At the Tape Transport</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A) Dismount Tape 2.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B) Mount Tape 2A.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12) At Teletype, type SKIP/. Verify that *OK is printed out on the Teletype.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13) At the Teletype, type GO//. Verify that time is printed out on the Teletype.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14) When END OF FILE is printed out on the Teletype, type END OF JOB.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15) At the Teletype, type REWIND/ to rewind to the tape.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16) Record the time, frame, page.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TIME 5'36.1 FRAME 1 PAGE 208</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17) At the Transport</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A) Dismount Tape 2A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B) Mount Tape 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18) At the Teletype, type FRAME/O to reset frame/count.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19) At the Teletype, type STANDARD LABELS/A to set check standard label.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20) At the Teletype, type GO//. Verify that time is printed out on the Teletype.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21) Record time, frame and page when END OF FILE is printed out.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TIME 6'36.1 FRAME 1 PAGE 803</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>Tech.</td>
<td>Cont.</td>
</tr>
<tr>
<td>-----------------------------------------------------------------------------</td>
<td>-------</td>
<td>-------</td>
</tr>
<tr>
<td>At the Teletype, type <strong>REWIND</strong> to rewind the tape.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>At the Tape Transport</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A) Dismount Tape 6.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B) Mount Tape 2.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>At the Teletype, type <strong>CNTRL D</strong> to enter <strong>DEBUG</strong>.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>At the Teletype, type <strong>PRO:105PR$J</strong> to load the old 105mm Print Program.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>At the Teletype, type **UNLABEL/**.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>At the Teletype, type **SKIP/**.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>At the Teletype, type **GO/**. Verify that time is printed out on the Teletype.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>When <strong>END OF FILE</strong> is printed out of the Teletype, <strong>type in END JOB</strong>.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Record time, frame, page.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TIME</strong> 19:20 <strong>FRAME</strong> 67 <strong>PAGE</strong> 1449</td>
<td></td>
<td></td>
</tr>
<tr>
<td>At the Teletype, type *<em>REWIND/*</em> to rewind Tape.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>At the Teletype, type <strong>FRAME/0</strong> to reset frame count.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>At the Tape Transport</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A) Dismount Tape 2.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B) Mount Tape 2A.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>At the Teletype, type **GO/**. Verify that time is printed out on the Teletype.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>When <strong>END OF FILE</strong> is printed out, <strong>type END JOB</strong>.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Record the time, frame, page.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TIME</strong> 1:9 <strong>FRAME</strong> 7 <strong>PAGE</strong> 205</td>
<td></td>
<td></td>
</tr>
<tr>
<td>At the Teletype, type *<em>REWIND/*</em> to rewind the tape.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>At the Teletype, type <strong>FRAME/0</strong> to reset frame count.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DESCRIPTION (Print or Type)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>39)</strong> At the Teletype, type STANDARD LABEL to check Standard Label Record.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>40)</strong> At the Tape Transport</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A) Dismount Tape 2A.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B) Mount Tape 6.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>41)</strong> At the Teletype, type GO/√. Verify that time is printed out on the Teletype.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>42)</strong> When END OF FILE is printed out on the Teletype, record time, frame and page.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TIME 6:24 PM</strong> FRAMES 7 PAGE 800</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>43)</strong> At the Teletype, type REWIND/√ to rewind the tape.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>44)</strong> At the Teletype, type two CLEAR/√ to clear film in the camera.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>45)</strong> Process the film.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Installing the new 12K Print Program for 16mm camera

**DESCRIPTION (Print or Type)**

**INTRODUCTION:**

The new 12K Print Program will be tested against the old Print Program. The new program is MON:NEW16; the old program is PRO:16PRNT.

1) At the Tape Transport mount the Test Tape 1.

2) At the Teletype, type MON:NEW15$J to load the new 16mm Print Program.

3) At the Teletype, type FOCUS/7,0,1 to focus the system.

4) At the Teletype, type GO/2. Verify that time, frame and JOB ID is printed out on the Teletype.

5) When *END OF JOB and *END OF FILE is printed out on the Teletype, record the time and frame count.

**TIME** 9:23:3  **FRAME** 79
<table>
<thead>
<tr>
<th>DESCRIPTION (Print or Type)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6) At the Teletype, type REWIND/\ to rewind the tape.</td>
</tr>
<tr>
<td>7) At the Teletype, type FRAME/0\ to reset the frame count.</td>
</tr>
<tr>
<td>8) At the Tape Transport</td>
</tr>
<tr>
<td>A) Dismount Test Tape 1</td>
</tr>
<tr>
<td>B) Mount Test Tape 1A</td>
</tr>
<tr>
<td>9) At the Teletype, type GO/1. Verify that time, frame and Job ID is printed out on the Teletype.</td>
</tr>
<tr>
<td>10) When *END OF JOB and *END OF FILE is printed out on the Teletype, record the time and frame count.</td>
</tr>
<tr>
<td>TIME 1:48.7 FRAME 170</td>
</tr>
<tr>
<td>11) At the Teletype, type REWIND/\ to rewind the tape.</td>
</tr>
<tr>
<td>12) At the Tape Transport</td>
</tr>
<tr>
<td>A) Dismount Tape 1A</td>
</tr>
<tr>
<td>B) Mount Tape 1</td>
</tr>
<tr>
<td>13) At the Teletype, type CLEAR/.</td>
</tr>
<tr>
<td>14) At the Teletype, type CNTRL to enter DEBUG.</td>
</tr>
<tr>
<td>15) At the Teletype, type PRO:16PRNTSJ.</td>
</tr>
<tr>
<td>16) At the Teletype, type GO/1. Verify that time, frame, and Job ID is printed out on the Teletype.</td>
</tr>
<tr>
<td>17) When *END OF JOB and *END OF FILE is printed out on the Teletype, record the time and frame count.</td>
</tr>
<tr>
<td>TIME 9:26.5 FRAME 356</td>
</tr>
<tr>
<td>18) At the Teletype, type REWIND/\ to rewind the tape.</td>
</tr>
<tr>
<td>19) At the Teletype, type FRAME/0\ to reset frame count.</td>
</tr>
<tr>
<td>20) At the Tape Transport</td>
</tr>
<tr>
<td>A) Dismount Test Tape 1</td>
</tr>
<tr>
<td>B) Mount Test Tape 1A</td>
</tr>
</tbody>
</table>
21) At the Teletype, type GO/1. Verify that time, frame and Job ID is printed out on the Teletype.

22) When *END OF JOB and *END OF FILE is printed out on the Teletype, record the time and frame count.

   TIME 14:2 FRAME 170

23) At the Teletype, type REWIND/1 to rewind the tape.

24) Process the film.
### TEST PREPARATION SHEET

**NASA - LYNDON B. JOHNSON SPACE CENTER**

---

#### 1. TESTS

**A.** Load the 105mm camera. Use a leader in the take up magazine.

**B.** At the teletype:

1. Verify that the system is under DEBUG control.
2. Enter P$J
3. Focus the PLS according to the procedure on the inside of the camera bay door.
4. Enter a space on the TTY to return to DEBUG control.
5. Enter 105PR$J on the TTY.
6. Verify that *MONITOR is typed by the program.
7. Enter CLEAR/(CR) on the TTY. Verify that *OK is typed.
8. Enter CLEAR/(CR) on the TTY. Verify that *OK is typed.

---

**Prepared By:**

---

**REFER TO PROCEDURES FOR REQUIRED SIGNATURES**

<table>
<thead>
<tr>
<th>Contractor</th>
<th>Date</th>
<th>NASA</th>
<th>Referee</th>
<th>Date</th>
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</thead>
<tbody>
<tr>
<td>&quot;Coomett&quot;</td>
<td>10/22/75</td>
<td></td>
<td>&quot;E. Jones&quot;</td>
<td>10/22/75</td>
</tr>
</tbody>
</table>

---

**COPY 1**
9. Place data switch 8 in the up position.

10. Mount COM test tape #D2 on the 9-TRK drive. Set the unit select switch to #1.

11. Enter GO/(CR) to start processing of the test tape. Verify that the start time and frame number are typed.

12. Verify that the stop time, frame number, and *END OF FILE are typed at completion of job.

13. Enter REWIND/(CR) to rewind test tape. Verify that *OK is typed.

14. Return the system to DEBUG control.

15. Dismount test tape #D2 and mount test tape #12762 on the 9-TRK drive.

16. Enter 105PR on the TTY.

17. Verify that *MONITOR is typed by the program.

18. Enter GO/(CR) to start processing of the test tape. Verify that the start time and frame number are typed.

19. Verify that the stop time, frame number, and *END OF FILE are typed at completion of job.

20. Enter REWIND/(CR) to rewind test tape. Verify that *OK is typed.

21. Enter CLEAR/(CR) on the TTY. Verify that *OK is typed.

22. Enter CLEAR/(CR) on the TTY. Verify that *OK is typed.

23. Return the system to DEBUG control.


25. Save TTY scroll.
II. Verification

A. Verify that the entries in the index page are listed sequentially down the page rather than across.

B. Verify that there are no multiple entries for any one page.
B.10  COMA HARVARD COLLEGE OBSERVATORY SOLAR EXPERIMENT SO55
GRAY-LEVEL 7-TRACK OR 9-TRACK PROCESSOR (HCO)

See paragraph 2.10. Revisions are as follows:

<table>
<thead>
<tr>
<th>Date</th>
<th>Author</th>
<th>EO/TPS No.</th>
</tr>
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<tbody>
<tr>
<td>28 November 1973</td>
<td>F. C. Ashton</td>
<td>EO-191F - TPS A12</td>
</tr>
<tr>
<td>17 June 1974</td>
<td>F. C. Ashton</td>
<td>EO-191F - TPS A13</td>
</tr>
<tr>
<td>12 July 1974</td>
<td>F. C. Ashton</td>
<td>TPS A14</td>
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TPS No. A12, A13 and A14 follow.
### TEST PREPARATION SHEET

**NASA - MANNED SPACECRAFT CENTER**

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<tr>
<th>1. Type A</th>
<th>Configuration Change</th>
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<tr>
<td>2. Type B</td>
<td>Non Configuration Change</td>
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| 4. Mod Sheet Number |  |

<table>
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<tr>
<th>5. Page</th>
<th>1 of 3</th>
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</table>


| 7. Date |  |

| 8. Time |  |

| 9. Need Date | December 73 |

| 10. Drawings, Documents, Oeps. & Part Number(s) |  |

| 11. Contract Number | NAS9-1261 |

| 12. Serial Number |  |

| 13. System | Computer to Microfilm |

| 14. Ref E O N. Line | 191F |

| 15. TPS Short Title | HCO Software Acceptance Test |

| 16. Wt Req |  |

| 17. Reason for Work | To verify the software development on the CON System for the HCO as defined in PHO SH-25722 and as required under HCO SH-25722 TASK 4.3 |

| 18. DESCRIPTION (Print or Type) |  |

| 19. Prepared By |  |

| 20. Final Acceptance Date |  |

**TEST PROCEDURES**

1. HCO Acceptance Test - Tape 2
   a. At the Tape Transport:
      1. Mount S055 Acceptance Test Tape 2
   b. At the Teletype:
      1. Type PRO; HCO $J to load HCO Program. Verify that *MONITOR is typed on the teletype.
      2. Type CLEAR/4 twice to advance exposed film into the take-up magazine. Verify that *OK is typed on the teletype after each CLEAR/4.
      3. Type UNLABELED/4. Verify *OK is typed on the teletype.
      4. Type SKIP/4 to bypass the standard label on the tape. Verify that *OK is typed on the teletype.

**REFER TO PROCEDURES FOR REQUIRED SIGNATURES**

**CONTRACTOR**

<table>
<thead>
<tr>
<th>Date</th>
<th>NASA</th>
<th>Final Acceptance Date</th>
</tr>
</thead>
</table>

**COPY**

**REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR**
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<th>Tech</th>
<th>Insp</th>
<th>Cont</th>
<th>NASA</th>
</tr>
</thead>
<tbody>
<tr>
<td>(5) Type GO/\ to initiate processing of S055 Acceptance Test Tape (Tape 1). Verify that the starting time and frame number are typed on the teletype.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(6) Verify that the elapsed job time, frame number, page number and *END OF FILE are typed on the teletype to signal completion of data tape processing.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(7) Type END JOB/\ to complete processing of S055 Acceptance Test Tape (Tape 1). Verify that *OK is typed on the teletype.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(8) Type CLEAR/\ to advance exposed film into the take-up magazine. Verify that *OK is typed on the teletype after each CLEAR/.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(9) Type REWIND/\ to rewind the S055 Test Tape (Tape 1). Verify that *OK is typed on the teletype.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(10) Type CNTRL D to return to DEBUG. Verify *DEBUG is typed on the teletype.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. At the Tape Transport</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1) Dismount the S055 Acceptance Test Tape (Tape 2).</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. S055 Acceptance Test Tape 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. At the Tape Transport</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1) Mount HCO Acceptance Test Tape (Tape 3).</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. At the Teletype:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1) Type PRO:HCO $J to load S055 program. Verify that *MONITOR is typed on the teletype.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2) Type UNLABELED/\ to load S055 program. Verify that *OK is typed on the teletype.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
(3) Type `CLEAR/Δ` to advance exposed film into the take-up magazine. Verify that `*OK` is typed on the teletype after each `CLEAR/Δ`.

(4) Type `GO/Δ` to initiate processing of S055 Acceptance Test Tape (Tape 2). Verify that the starting time and frame number are typed on the teletype.

(5) Verify that the elapsed job time, frame number, and `*END OF FILE` are typed on the teletype to signal completion of data tape processing.

(6) Type `END JOB/Δ` to complete processing of the HCO Acceptance Test Tape (Tape 3). Verify that `*OK` is typed on the teletype.

(7) Type `CLEAR/Δ` twice to advance exposed film into the take-up magazine. Verify that `*OK` is typed on the teletype after each `CLEAR/Δ`.

(8) Type `REWIND/Δ` to rewind the S055 Acceptance Test Tape (Tape 2). Verify that `*OK` is typed on the teletype.

C. At the Tape Transport:

(1) Dismount the HCO Acceptance Test Tape (Tape 3).
SISO-TR531
Vol. II

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>TPS No</th>
<th>S/C</th>
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<td>A</td>
<td>Configuration Change</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>Non-Configuration Change</td>
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**TEST PREPARATION SHEET**

| NASA - LYNDON B. JOHNSON SPACE CENTER |

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**TPS Short Title**

- HCO Gray 7-Track and 9-Track

**Reason for Work**

To verify the new version HCO will process both 7-Track and 9-Track

**DESCRIPTION** (Print or Type)

1. HCO Acceptance Test
   a) AT the tape transports
      1) Mount 9-Track HCO in Gray tape number 3165 on the 9-Track unit.
      2) Mount 7-Track HCO - Gray Tape number 3299 on the 7-Track unit.
   b) AT the teletype:
      1) Type PRO; HCO $J$ to load the production HCO. Verify that *Monitor is typed on the teletype.
      2) Type CLEAR twice to advance exposed film into the take-up magazine. Verify that *OK is type on the teletype after each CLEAR.
      3) Type Focus to Focus the Camera.

**Prepared By**

**Final Acceptance Date**

**REFER TO PROCEDURES FOR REQUIRED SIGNATURES**

**Contractor**

<table>
<thead>
<tr>
<th>NASA</th>
<th>Date</th>
<th>NASA</th>
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<td></td>
<td>6/17/74</td>
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**Refer to Procedures for Required Signatures**

**Copy 1**

B-95
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<tr>
<td>4) Type CNTRL I to end the focus pattern.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5) Type unlabelled 12. Verify *OK is type on Teletype.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6) Type GO to initiate processing of the 9-Track HCO Gray. Verify that the starting time and frame number are typed on the teletype.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7) Type End Job to complete processing of 9-Track HCO Gray tape. Verify that *OK is type on teletype.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8) Record the Elapse Run Time. 35 7.4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9) Type rewind/ to rewind the 9-Track HCO Gray. Verify that *OK.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10) Type CNTRL D to return to Debug. Verify that *OK is typed on the teletype.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11) Type FCA; HCO $ J to load new version on HCO Gray.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12) Type unlabelled. Verify * OK is typed on the teletype.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13) Type GO/ to initiate processing of 9-Track HCO Gray tape. Verify that the starting time and frame number are typed on the teletype.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14) Verify that the elapsed job time, frame number, page number and End of File are typed on the teletype to signal completion of data tape processing.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15) Type end job to complete processing of 9-Track HCO Gray tape. Verify that *OK is typed on the teletype.</td>
<td></td>
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<tr>
<td>SISO-TR531</td>
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**TEST PREPARATION SHEET**

**CONTINUATION SHEET**

NASA - LYNDON B. JOHNSON SPACE CENTER

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<tr>
<td><strong>b)</strong> 16) Record the Elapsed Run Time 29' 40.9&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17) Type rewind/ to rewind the 9-Track HCO Gray Verify that *OK is typed on the teletype.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18) Type CNTRL D to return to Debug. Verify *DEBUG is typed on the teletype.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19) Type FCA; HCO $J to load the new version HCO Gray program verify that *Monitor is typed on the teletype.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20) Type USE/2 to Change 7-Track unit. Verify *OK is typed on the teletype.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21) Type Tape Type/8 to change to 7-Track, 800 BPI. Verify *OK is typed on the teletype.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22) Type Unlabelled/ verify *OK is type of the teletype.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>23) Type GO/ to initiate processing of 7-Track HCO Gray tape. Verify the starting time and frame number are typed on the teletype.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24) Verify that the elapsed job time, frame number, page number and *End of File are typed on the teletype to signal completion of data tape processing.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25) Type end job/ to complete processing of HCO gray tape. Verify that *OK is typed on the teletype.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>26) Type Clear twice to advance exposed film into the take-up magazine. Verify that *OK is typed on the teletype after each Clear.</td>
<td></td>
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</table>
b) 27) Type rewind, to rewind the 7-Track HCO Gray. Verify that *OK is typed on the teletype.

28) Type CNTRL D to return to Debug. Verify *Debug is typed on the teletype.

c) AT the tape transport
   1) Dismount 9-Track HCO and 7-Track HCO tape.

d) Test result verification
   1) Process 105mm Film containing results.

   2) View the resulting 105mm microfiche on the Bell & Howell viewgraph.
## TEST PREPARATION SHEET

**NASA - LYNDON B. JOHNSON SPACE CENTER**

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<tr>
<th>15. TPS Short Title</th>
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</thead>
<tbody>
<tr>
<td>HCO Gray Title Acceptance Test</td>
</tr>
</tbody>
</table>

### TEST PROCEDURES

1. **HCO Gray Test**
   
a) At the 7-Track Tape Transport:
   1. **Mount Tape Number 3299**
   b) At the Teletype:
   
   1. **Type FCA;HCO$J** to load HCO program. Verify that *MONITOR is typed on the Teletype.
   2. **Type CLEAR/1** to advance exposed film into the take-up magazine. Verify that *OK is typed on the teletype.
   3. **Type UNLABELLED/1**. Verify *OK is typed on the Teletype.
   4. **Type TAPE TYPE 8/1**. Verify *OK is typed on the Teletype.
   5. **Type USE 2/1**. Verify *OK is typed on the Teletype.

### Reason for Work
- To verify that Title Fiche Development for HCO Gray
  (FR80 Clarification Form A17)

### Prepared By
- Frank Ashton

### Final Acceptance Date
- 7/12/74

### Contractor

**REFER TO PROCEDURES FOR REQUIRED SIGNATURES**
### TEST PREPARATION SHEET

**DESCRIPTION (Print or Type)**

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<td>Cat. No.</td>
<td></td>
</tr>
<tr>
<td>Page 2 of 2</td>
<td></td>
</tr>
</tbody>
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#### (6) Type GO Verify Time and Frame is typed on the Teletype.

#### (7) When ENTER SOURCE TAPE is typed on the Teletype, type 3299.

#### (8) When ENTER COM TAPE is typed on the Teletype, type 7-TRACK.

#### (9) When ENTER ROLL is typed on the Teletype, type HCO GRAY.

#### (10) Type CNTRL A. Verify that *MONITOR is typed on the Teletype.

#### (11) Type REWIND. Verify that *OK is typed on the Teletype.

#### (12) Type CLEAR. Verify that *OK is typed on the Teletype.

#### (13) Type CLEAR. Verify that *OK is typed on the Teletype.

#### (14) Type CNTRL D to return to DEBUG. Verify *DEBUG is typed on the Teletype.

c) At the 7-Track Transport, dismount the tape.

d) Test Result Verification:

1. Process 105mm film containing results.
2. View the resulting 105mm microfiche on the Bell and Howell Viewgraph.
B.11 COMA UNIVAC 494 PRINT PROCESSOR FOR 105 mm FICHE (94U105)

See paragraph 2.11. Revisions are as follows:

<table>
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<tr>
<th>Date</th>
<th>Author</th>
<th>EO/TPS No.</th>
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<td>6 November 1973</td>
<td>I. J. Morgan</td>
<td>EO-204F - TPS A17</td>
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TPS A17 follows. See also paragraphs B.11.1 through B.11.5, figure B-13, and tables B19 and B-20.
## Test Preparation Sheet

**NASA - Manned Spacecraft Center**

### Configuration Change

**Type:** A  
**Change:**

**Non Configuration Change:** B

### 4. Mod. Sheet Number

### 6. S/C No /Model No

**Date:** 7  
**Time:** 8  

**9. Need Dwn:** 9

**6-11-73**

### 10. Drawings, Documents, Ocps, & Part Number(s)

### 11. Contract Number

**NAS 9-1261**

### 12. Serial Number

### 13. System

**COMPUTER ON MICROFILM**

### 14. Ref. E O. Number

**204F**

**ET#1**

### 15. TPS Short Title

**UNIVAC 494 SOFTWARE ACCEPTANCE TEST FOR THE 105mm FILM**

### 16. Wt Req.

### 17. Reason for Work:

**To verify the software development on the COM System for the UNIVAC 494 Print Processor as defined in PHO SH-09846 and as required under E.O. 204F.**

### TEST PROCEDURES

**1. Univac 494 Print Processor Acceptance Test - Tape 1**

a. At the Tape Transport (7-track unit)
   
   (1) Mount Univac 494 Acceptance Test Tape 1.

b. At the Teletype:
   
   (1) Type PROJ:UNIVAC$J to load the Univac 494 105mm program. Verify that *Monitor is typed on the teletype.

   (2) Type CLEAR/\ twice to advance exposed film into the take-up magazine. Verify that *OK is typed on the teletype after each CLEAR/\.

   (3) Type GO/\ to initiate processing of Univac 494 Acceptance Test Tape (Tape 1). Verify that the starting time and frame number are typed on the teletype.

### 18. DESCRIPTION (Print of Type)

### 19. Prepared By

**LOCKLER**

### 20. Final Acceptance Date

**LOCKLER**

### 21. Insper.

<table>
<thead>
<tr>
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**REFER TO PROCEDURES FOR REQUIRED SIGNATURES**

**REFER TO PROCEDURES FOR REQUIRED SIGNATURES**

**Contractor**

**Date**

**NASA**

**Date**

**Copy 1**

---

**B-102**
TEST PREPARATION SHEET
CONTINUATION SHEET
NASA - MANNED SPACECRAFT CENTER

1. (4) Verify that the elapsed job time, frame number, page number and *END OF FILE are typed on the teletype to signal completion of data tape processing.
   (5) Type REWIND/\ to rewind the Univac Test Tape (Tape 1). Verify that *OK is typed on the teletype.
   c. At the Tape Transport
      (1) Dismount the Univac 494 Print Acceptance Test Tape (Tape 1).

2. Univac 494 Print Acceptance Test Tape 2
   (continuation of Job 2 from Tape 1)
   a. At the Tape Transport:
      (1) Mount the Univac 494 Test Tape 2.
   b. At the Teletype:
      (1) Type CONTINUE/\ to signify continuation of Job.
      (2) Verify that the elapsed job time, frame number, page number and *END OF FILE are typed on the teletype to signal completion of data tape processing.
      (3) Type END JOB/\ to complete processing of the Univac 494 Test Tape (Tape 2).
      (4) Type CLEAR/\ twice to advance exposed film into the take-up magazines. Verify that *OK is typed on the teletype after each CLEAR/\ .
      (5) Type REWIND/\ to rewind the Univac 494 Print Acceptance Test Tape (Tape 2).
      Verify that *OK is typed \HK on the teletype.
2. c. At the Tape Transport:
   (1) Dismount the Univac 494 Print Acceptance Test Tape (Tape 2).

d. Test Result Verification:
   (1) Process 105mm film containing results.
   (2) View the resulting 105mm microfiche on the Bell & Howell viewgraph. Verify that the results match the Jobs as described in the following paragraphs.
B.11.1 Job 1, Multifiche Test. This job shall be contained in its entirety on tape 1. It shall consist of the proper job separation and titling control records and shall contain data to build in excess of 207 full pages (64 lines of 132 alphanumeric characters each). Data pages shall be constructed as illustrated in figure B-13 with the first and second pages of that figure alternating. A control record for forms overlay and indexing shall precede every set of 64 data records. This job will demonstrate maximum page size, multiple pages per fiche, multiple fiches per job (two), complete character repertoire, the five forms, and variable indexing. See table B-19.

B.11.2 Job 2, Multireel Test. This job shall begin on tape 1 and continue to tape 2. A job separator control record shall separate jobs 1 and 2. Sixteen hundred physical blocks of data, to produce full pages as illustrated in figure B-13, shall be generated. Only 382 physical blocks of this data shall be placed on tape 1, followed by Univac's Standard End-of-File, as defined in Univac's 494 Uniservo VIII C Magnetic Tape Subsystem. The remaining data shall be on tape 2. A control record for forms overlay and indexing shall precede every set of 64 data records. The form number and indexing values (as specified for job 1) shall vary from one record to another. Job 2 shall demonstrate the COMA's ability to handle multireel per job and multireel per page. See table B-19.

B.11.3 Job 3, Carriage Control Test. A job separator control record shall separate jobs 2 and 3; shall be followed by a title control record and 1024 logical records of data. The data pages shall be constructed as illustrated in figure B-13. The line spacing count (byte 13510) of every 32nd data record will contain a number \(32\text{10}\) or greater. This shall cause 32 lines of data to appear on each page (frame). The line spacing count on all other records of data shall contain a zero; i.e., the data in the next record shall be printed on the next line. A forms and index control record shall not be present. This job shall show COMA's ability to properly process the line spacing count, and its ability to handle the absences of an index frame for the 105 mm film. See table B-19;
B.11.4 Job 4, Comic Mode Test. A job separator record, title control record, form and indexing control record, and an image orientation control record shall precede the data records. The image orientation control record shall indicate COMIC mode; i.e., a 1 shall follow the 1 as specified in the Computer Output Microfilm System A UNIVAC 494 Print Processing Requirements Specification. The data records shall be constructed to produce three full pages of data. The forms control record shall be set to a 4 without indexing. This job shall test COMA's ability to generate the COMIC mode. See table B-19.

B.11.5 Job 5, Cine Mode Test. A job separator record, title control record, forms and indexing control record, and an image orientation control record shall precede the data records. The image orientation control record shall indicate CINE mode; i.e., a 2 shall follow the 1 as specified in the Computer Output Microfilm System A UNIVAC 494 Print Processing Requirements Specification. The data records shall be constructed to produce a pattern as illustrated in figure B-13. One hundred ninety-two logical records of data shall be generated to produce three full pages of data. The forms record shall be set to a 4 without indexing. This data shall be followed by an end-of-file, end-of-tape control record. This job illustrates COMA's ability to handle the CINE mode and to recognize the end-of-file, end-of-tape as the last job to be processed from this tape. The end-of-file, end-of-tape control record shall be followed by Univac's standard end-of-file as defined in Univac's 494 Uniservo VIII C Magnetic Tape Subsystem. See table B-19.
Figure B-13 Alphanumeric Data (64 Lines of 132 characters)
<table>
<thead>
<tr>
<th>JOB/TAPE NO. &amp; JOB NAME</th>
<th>PURPOSE</th>
<th>CONTENT/FORMAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/1 COMA 1</td>
<td>TEST COMA'S ABILITY TO GENERATE CHARACTER REPERTOIRE AND MAXIMUM CHAR/LINE/PAGE</td>
<td>GENERATE FULL PAGES (64 LINES OF 32 CHARACTERS EACH) CONTAINING ALL POSSIBLE CHARACTER CODES. DATA PAGES SHALL BE CONSTRUCTED AS ILLUSTRATED IN FIGURE B-8 AND THESE TWO PATTERNS SHALL BE ALTERNATED PER FRAME.</td>
</tr>
<tr>
<td></td>
<td>TEST COMA'S ABILITY TO HANDLE TEST DATA OVERFLOW FROM FICHE TO FICHE</td>
<td>GENERATE SUFFICIENT DATA (4000 DATA BLOCKS) TO PRODUCE MORE THAN ONE FICHE.</td>
</tr>
<tr>
<td>2/1 &amp; 2 COMA 2</td>
<td>TEST JOB SEPARATOR CONTROL RECORD</td>
<td>GENERATE A JOB SEPARATOR CONTROL RECORD BETWEEN JOBS 1 AND 2. 1600 PHYSICAL BLOCKS OF DATA TO PRODUCE A PATTERN AS ILLUSTRATED IN FIGURE B-13 SHALL BE GENERATED FOR THIS JOB; 382 PHYSICAL BLOCKS OF DATA SHALL BE GENERATED ON TAPE 1 AND THE REMAINING DATA SHALL BE PLACED ON TAPE 2. A FORMS OVERLAY RECORD SHALL PRECEDE EVERY 64 DATA RECORDS.</td>
</tr>
<tr>
<td></td>
<td>TEST MULTIREEL/JOB AND MULTIREEL/PAGE</td>
<td></td>
</tr>
<tr>
<td>JOB/TAPE NO. &amp; JOB NAME</td>
<td>PURPOSE</td>
<td>CONTENT/FORMAT</td>
</tr>
<tr>
<td>-------------------------</td>
<td>---------</td>
<td>----------------</td>
</tr>
<tr>
<td>3/2 COMA 3</td>
<td>CARRIAGE CONTROL TEST CHECKS: COUNT = 778 AND LAST LINE PLUS COUNT ≥ 778</td>
<td>IN ADDITION TO THE CONTROL RECORDS, GENERATE 1024 LOGICAL RECORDS OF DATA. DATA SHALL BE CONSTRUCTED AS ILLUSTRATED IN FIGURE B-13. THE LINE SPACING COUNT (BYTE 135B) OF EVERY 32ND RECORD SHALL BE A NUMBER 3210 OR GREATER. THE LINE SPACING COUNT ON ALL OTHER RECORDS SHALL BE A 0. TEST ABSENCES OF THE FORM AND INDEX CONTROL RECORD NO FORM &amp; INDEX RECORD SHALL BE GENERATED PRIOR TO THE DATA RECORDS.</td>
</tr>
<tr>
<td>4/2 COMA 4</td>
<td>TEST COMIC MODE CONTROL RECORD FOR BOTH 16 MM AND 105 MM FILM</td>
<td>GENERATE A COMIC MODE CONTROL RECORD FOLLOWING THE JOB SEPARATOR, THE TITLING, AND THE FORMS AND INDEXING CONTROL RECORDS; 192 LOGICAL RECORDS OF DATA SHALL BE GENERATED.</td>
</tr>
<tr>
<td>5/6 COMA 5</td>
<td>TEST CINE MODE CONTROL RECORD FOR 16 MM FILM</td>
<td>GENERATE A CINE MODE CONTROL RECORD FOLLOWING THE JOB SEPARATOR, TITLING, AND FORMS AND INDEXING CONTROL RECORDS; 192 LOGICAL RECORDS OF DATA SHALL BE GENERATED.</td>
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TABLE B-20

USERS FICHE TITLES

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<th>JOB NO.</th>
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<td>UNIVAC 494 CINE MODE TEST</td>
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B.12 COMA UNIVAC 494 PRINT PROCESSOR FOR 16 mm FILM (94UV16)

See paragraph 2.2. Revisions are as follows:

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<td>6 November 1973</td>
<td>I. J. Morgan</td>
<td>EO-204F - TPS A18</td>
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TPS No. A18 follows. See also paragraphs B.12.1 through B12.5, figure B-14, and tables B-21 and B-22.
**UNIVAC 494 SOFTWARE ACCEPTANCE TEST FOR THE 16mm FILM**

**Reason for Work**
To verify the software development on the COMA System for the UNIVAC 494 Print Processor as defined in PHO SH-09846 and as required under E.O. 204F.

<table>
<thead>
<tr>
<th>Description (Print or Type)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Univac 494 Print Processor Acceptance Test - Tape 1</strong></td>
</tr>
<tr>
<td>a. At the Tape Transport (7-track unit)</td>
</tr>
<tr>
<td>(1) Mount Univac 494 Acceptance Test Tape 1.</td>
</tr>
<tr>
<td>b. At the Teletype:</td>
</tr>
<tr>
<td>(1) Type FRO;94UV16$J to load the Univac 494 16mm program. Verify that *Monitor is typed on the teletype.</td>
</tr>
<tr>
<td>(2) Type CLEAR/\ twice to advance exposed film into the take-up magazine. Verify that *OK is typed on the teletype after each CLEAR/\</td>
</tr>
<tr>
<td>(3) Type GO/\ to initiate processing of Univac 494 Acceptance Test Tape (Tape 1). Verify that the starting time and frame number are typed on the teletype.</td>
</tr>
<tr>
<td>(4) Verify that the elapsed job time, frame number, page number and *END OF FILE are typed on the teletype to signal completion of data tape processing.</td>
</tr>
</tbody>
</table>

**Prepared By**
R. A. MARKS

**Final Acceptance Date**

---

**REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR**
<table>
<thead>
<tr>
<th>Description</th>
<th>Tech</th>
<th>Imp</th>
<th>Cont</th>
<th>NASA</th>
</tr>
</thead>
<tbody>
<tr>
<td>(5) Type REWIND/\text{\textbackslash} to rewind the Univac Test Tape (Tape 1). Verify that *OK is typed on the teletype.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. At the Tape Transport</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1) Dismount the Univac 494 Print Acceptance Test Tape (Tape 1).</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Univac 494 Print Acceptance Test Tape 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Continuation of Job 2 from Tape 1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. At the Tape Transport:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1) Mount the Univac 494 Test Tape 2.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. At the Teletype:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1) Type CONTINUE/\text{\textbackslash} to signify continuation of Job.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2) Verify that the elapsed job time, frame number, page number and *END OF FILE are typed on the teletype to signal completion of data tape processing.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(3) Type END JOB/\text{\textbackslash} to complete processing of the Univac 494 Test Tape (Tape 2).</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(4) Type CLEAR/\text{\textbackslash} twice to advance exposed film into the take-up magazines. Verify that (\star) *OK is typed on the teletype after each CLEAR/\text{\textbackslash}.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(5) Type REWIND/\text{\textbackslash} to rewind the Univac 494 Print Acceptance Test Tape (Tape 2). Verify that *OK is typed on the teletype.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. At the Tape Transport:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1) Dismount the Univac 494 Print Acceptance Test Tape (Tape 2).</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**TEST PREPARATION SHEET**

CONTINUATION SHEET

NASA - MANNED SPACECRAFT CENTER

<table>
<thead>
<tr>
<th>DESCRIPTION (Print or Type)</th>
<th>Tech</th>
<th>Imp</th>
<th>NASA</th>
</tr>
</thead>
<tbody>
<tr>
<td>d. Test Result Verification:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1) Process 16mm film containing results.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2) View the resulting 16mm film on the viewer.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Verify that the results match the Jobs as described in the following paragraphs.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
B.12.1 Job 1, Multifiche Test. This job is contained in its entirety on tape 1. It contains data to build in excess of 207 full pages (64 lines of 132 alphanumeric characters each). Data pages are constructed as illustrated in figure B-14, with the first and second pages of that figure alternating. A control record for forms overlay precedes every 64 data records, causing each of the forms to be generated once every fifth page. This job will demonstrate maximum page size, complete character repertoire, and the five forms. See table B-21.

B.12.2 Job 2, Multireel Test. This job begins on test tape 1 and continues to test tape 2. A job separator control record separates jobs 1 and 2. Sixteen hundred physical blocks of data, to produce full pages as illustrated in figure B-14, are generated. Only 382 physical blocks of data are contained on test tape 1, and it is followed by Univac's standard end-of-file as defined in the Univac 494 Uniservo VIII C Magnetic Tape Subsystem. The remaining data is on test tape 2. A control record for forms overlay precedes every 64 data records. The form number (as specified for job 1) varies from one record to another. Job 2 demonstrates the COMA's ability to handle multireels per job and multireels per page. See table B-21.

B.12.3 Job 3, Carriage Control Test. A job separator control record separates jobs 2 and 3. It is followed by 1024 logical records of data. The data pages are constructed as illustrated in figure B-14. The line spacing count (byte 13510) of the 32nd data record contains 778. This causes 32 lines of data to appear on the first page (frame). The line spacing count on all other records of data contains a zero, with the exception of every 64th record after the 32nd record. Every 64th record contains a 778 line count. A forms and index control record shall not be present. This job shows COMA's ability to properly process the line spacing count, and its ability to handle the absences of forms and index control record. See table B-21.

B.12.4 Job 4, COMIC Mode Test. A job separator record, title control record, form and indexing control record, and an image orientation control record precedes the data records. The image orientation control record indicates COMIC mode; i.e., a 1 follows
the \( \text{I} \) as specified in the *Computer Output Microfilm System A UNIVAC 494 Print Processing Requirements Specification*. The data records are constructed to produce three full pages of data. The forms control record is set to a 4 without indexing. This job tests COMA's ability to generate the COMIC mode. See table B-21.

**B.12.5 Job 5, CINE Mode Test.** A job separator record, title control record, forms and indexing control record, and an image orientation control record precedes the data records. The image orientation control record shall indicate CINE mode; i.e., a 2 follows the \( \text{I} \) as specified in the *Computer Output Microfilm System A UNIVAC 494 Print Processing Requirements Specification*. The data records are constructed to produce a pattern as illustrated in figure B-14. One hundred ninety-two logical records of data are generated to produce three full pages of data. The forms record is set to a 4 without indexing. This data is followed by an end-of-file, end-of-tape control record. This job illustrates COMA's ability to handle the CLINE mode and to recognize the end-of-file, end-of-tape as the last job to be processed from this tape. The end-of-file, end-of-tape control record is followed by Univac's standard end-of-file as defined in the Univac 494 Uniservo VIII C Magnetic Tape Subsystem. See table B-21.
Figure B-14 Alphanumeric Data (64 Lines of 132 characters)
## TABLE B-21

### 94UV16 TESTS

<table>
<thead>
<tr>
<th>JOB/TAPE NO. &amp; JOB NAME</th>
<th>PURPOSE</th>
<th>FORMAT/CONTENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/1 COMA 1</td>
<td>TEST COMA'S ABILITY TO GENERATE CHARACTER REPETTOIRE AND MAXIMUM CHAR/LINE/PAGE</td>
<td>GENERATE FULL PAGE (64 LINES OF 132 CHARACTERS EACH) CONTAINING ALL POSSIBLE CHARACTER CODES. DATA PAGES ARE CONSTRUCTED AS ILLUSTRATED IN FIGURE B-14 AND THESE TWO PATTERNS ARE ALTERNATED PER FRAME.</td>
</tr>
<tr>
<td></td>
<td>TEST FIVE DIFFERENT FORMS AND INDEXING FOR FULL PAGES</td>
<td></td>
</tr>
<tr>
<td>2/1 &amp; 2 COMA 2</td>
<td>TEST JOB SEPARATOR CONTROL RECORD</td>
<td>GENERATE A JOB SEPARATOR CONTROL RECORD BETWEEN JOBS 1 AND 2. 1600 PHYSICAL BLOCKS OF DATA TO PRODUCE A PATTERN AS ILLUSTRATED IN FIGURE B-14 ARE GENERATED FOR THIS JOB. 382 PHYSICAL BLOCKS OF DATA ARE GENERATED ON TAPE 1 AND THE REMAINING DATA IS PLACED ON TAPE 2. A FORMS OVERLAY RECORD PRECEDES EVERY 64 DATA RECORDS.</td>
</tr>
<tr>
<td></td>
<td>TEST MULTIREELS PER JOB AND MULTIREELS PER PAGE</td>
<td></td>
</tr>
</tbody>
</table>

---

Vol. II
<table>
<thead>
<tr>
<th>JOB/TAPE NO.</th>
<th>PURPOSE</th>
<th>FORMAT/CONTENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/2 COMA 3</td>
<td>CARRIAGE CONTROL TEST CHECKS: COUNT = 778 AND LAST LINE PLUS COUNT ≥ 778</td>
<td>IN ADDITION TO THE CONTROL RECORDS, GENERATE 1024 LOGICAL RECORDS OF DATA. DATA CONSTRUCTED AS ILLUSTRATED IN FIGURE B-14. PAGES OF DATA ARE GENERATED.</td>
</tr>
<tr>
<td></td>
<td>TEST ABSENCES OF FORM AND INDEX CONTROL RECORD</td>
<td>NO FORM AND INDEX RECORD SHALL BE GENERATED PRIOR TO THE DATA RECORDS.</td>
</tr>
<tr>
<td>4/2 COMA 4</td>
<td>TEST COMIC MODE CONTROL RECORD FOR BOTH 16 MM AND 105 MM FILM</td>
<td>GENERATE A COMIC MODE CONTROL RECORD FOLLOWING THE JOB SEPARATOR, THE TITLING, AND THE FORMS AND INDEXING CONTROL RECORDS; 192 LOGICAL RECORDS OF DATA SHALL BE GENERATED.</td>
</tr>
<tr>
<td>4/6 COMA 5</td>
<td>TEST CINE MODE CONTROL RECORD FOR 16 MM FILM</td>
<td>GENERATE A CINE MODE CONTROL RECORD FOLLOWING THE JOB SEPARATOR, THE TITLING, AND THE FORMS AND INDEXING CONTROL RECORDS; 192 LOGICAL RECORDS OF DATA ARE GENERATED.</td>
</tr>
</tbody>
</table>
### TABLE B-22

**USERS FICHE TITLES**

<table>
<thead>
<tr>
<th>JOB NO.</th>
<th>TAPE NO.</th>
<th>USERS TITLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>UNIVAC 494 MULTI-FICHE TEST</td>
</tr>
<tr>
<td>2</td>
<td>1-2</td>
<td>UNIVAC 494 MULTIREEL TEST</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>UNIVAC 494 CARRIAGE CONTROL TEST</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>UNIVAC 494 COMIC MODE TEST</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td>UNIVAC 494 CINE MODE TEST</td>
</tr>
</tbody>
</table>
B.13 COMA LACIE STATUS MODULE (PFC, COMA)

See paragraph 2.13. Revisions are as follows.

<table>
<thead>
<tr>
<th>Date</th>
<th>Author</th>
<th>TPS No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 April 1975</td>
<td>J. E. Bennett</td>
<td>TPS A16</td>
</tr>
</tbody>
</table>

See paragraph B.15 for TPS A16.
B.14 COMA LACIE STATUS DISPLAY (REVEAL)

See paragraph 2.14. Revisions are as follows:

<table>
<thead>
<tr>
<th>Date</th>
<th>Author</th>
<th>TPS No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>28 May 1975</td>
<td>J. E. Bennett</td>
<td>TPS A15</td>
</tr>
</tbody>
</table>

TPS A15 follows.
### TEST PREPARATION SHEET

**NASA - MANNED SPACECRAFT CENTER**

<table>
<thead>
<tr>
<th>1. TYPE</th>
<th>2. TPS No.</th>
<th>3. S/C Cat.</th>
<th>4. Mod. Sheet Number</th>
<th>5. Page of</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Configuration Change</td>
<td>A15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. Non-Configuration Change</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>NASA-MANNED SPACECRAFT CENTER</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>TIRF #1700</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>17. Reason for Work:</th>
<th>18. DESCRIPTION (Print or Type)</th>
<th>19. Prep. By</th>
<th>20. Final Acceptance Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>VERIFICATION OF REVEAL PROGRAM</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### I. TESTS
- A. At the teletype, enter REVEAL$J.
- B. Verify that *MONITOR is typed by program.
- C. Enter REVEAL STATUS BLOCKS/(CR)

#### II. VERIFICATION
- A. Verify that the data displayed by the program is the same as the printout from R.T.O.S.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**REFER TO PROCEDURES FOR REQUIRED SIGNATURES**

**Contractor Date**
- Jack C. Submitted: 5/28/75

**NASA**
- Jones: 5/28/75

**Copy**
- 1

---

B-125
B.15 COMA LACIE PRINT PROCESSOR FOR 105 mm FICHE (LACPRT)

See paragraph 2.15. Revisions are as follows:

<table>
<thead>
<tr>
<th>Date</th>
<th>Author</th>
<th>TPS No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 April 1975</td>
<td>F. C. Ashton</td>
<td>Original</td>
</tr>
<tr>
<td>20 October 1975</td>
<td>J. Gummelt</td>
<td>TPS A16</td>
</tr>
</tbody>
</table>

TPS A16 and A20 follow.
<table>
<thead>
<tr>
<th>1. Configuration Change</th>
<th>TEST PREPARATION SHEET</th>
<th>2. TPS No</th>
<th>A16</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. Mod Sheet Number</td>
<td>4. Page 1 of 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. S.C. No. Model No</td>
<td>6. Date</td>
<td>8. Time</td>
<td></td>
</tr>
<tr>
<td>7. Date</td>
<td>9. Need Date</td>
<td>April 4, 1975</td>
<td></td>
</tr>
<tr>
<td>10. Drawings, Documents, Oscp's &amp; Part Number(s)</td>
<td>11. Contractor Number</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Serial Number</td>
<td>12. System</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. System</td>
<td>FR-BO MICROFILM SYSTEM (COM-A)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Ref E O Number</td>
<td>TIRF #2751</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. TPS Short Title</td>
<td>LACIE PRINT PROGRAM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Reason for Work</td>
<td>TO VERIFY THE NEW LACIE PRINT PROGRAM WITH STATUS TAPE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. Reason for Work</td>
<td>FOR THE COM-A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. DESCRIPTION (Print or Type)</td>
<td>19. DESCRIPTION (Print or Type)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test Tape</td>
<td>Test Tape</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Test Tapes are furnished by IBM LACIE Group.</td>
<td>The Test Tapes are furnished by IBM LACIE Group.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test File 1 - Reel 14360</td>
<td>Test File 1 - Reel 14360</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single Reel with 6 Title Records.</td>
<td>Single Reel with 6 Title Records.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test File 2 - Reels 917 and 13067</td>
<td>Test File 2 - Reels 917 and 13067</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Two Reel File containing three Title Records with indexing.</td>
<td>Two Reel File containing three Title Records with indexing.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Program PRO;105PR$J</td>
<td>Program PRO;105PR$J</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FRAMES</td>
<td>7</td>
<td>PAGE</td>
<td>147</td>
</tr>
<tr>
<td>TIME</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tapes 917, 13067</td>
<td>Tapes 917, 13067</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FRAMES</td>
<td>6</td>
<td>PAGES</td>
<td>36</td>
</tr>
<tr>
<td>TIME</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Program PCA;LACPR$J</td>
<td>Program PCA;LACPR$J</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tape 14360</td>
<td>Tape 14360</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type In: Julian Data 75095</td>
<td>Type In: Julian Data 75095</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tape Number A14360</td>
<td>Tape Number A14360</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Prepared By:

Contractor:

Date: 4/3/75

Final Acceptance Date:

Contractor:

Date: 4/3/75

Copy 1

NASA—MSC—Conl., Houston, Texas

B-127
4. New Program Multi-File
Program FCA:LACPRT$J
Tape 917, 13067
Type In: Julian Data 75095
    Tape Number A917
    Continue
    Tape Number A13067
FRAME 6    PAGE 766    TIME

5. New Program Single Title
Program FCA:LACPRT$J
Type In: Search Title /1, 1
        Julian Data 75095
        Tape Number B13067
FRAME 2    PAGE 123    TIME 1.31

6. New Program Unlabeled
Program FCA:LACPRT$J
Tapes 917, 13067
Type In: Unlabeled
        SKP
        Julian Data 75095
        Tape Number C917
        Rewind
        Continue
        Tape Number C13067
FRAME 6    PAGE 266    TIME

7. New Program Read Error
Program FCA:LACPRT$J
Tape 14360
Type In: Julian Date 75095
    Tape Number B14360
    Continue
    (After Forced Read Error)
8. New Program Termination Due to Error
   Program FCA;LACPRT$J
   Tape 14360
   Type In: Julian Date 75095
   Tape Number C14360
   Termination Due to Error
   (After CNTL I)
   Dump Status Tape
   (After Load Tape)

9. Status Tape Verification
   Program M$J
   Type In 9BETR

10. New Program - No Status
    Program FCA;LACPRT$J
    Tape Number 14360
    Type In: Status Job/1
          Julian Date 75095
          Tape Number D14360
          Dump Status Tape
          (After Load Tape)

11. No Status Verification
    Program M$J

12. New Program - Wipe Status Black
    Program FCA;LACPRT$J
    TAPE 14360
    Type In: Julian Data 75095
            Tape Number E14360
            Dump Status Tape
            (After Load Tape)
13. Verify Status Block Cleared
   Program M$J

14. Process Film and Verify Data Content, Titles
    Processed and Indexing.
<table>
<thead>
<tr>
<th>18. DESCRIPTION (Print or Type)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TESTS</td>
</tr>
<tr>
<td>2. TEST PROCEDURES</td>
</tr>
<tr>
<td>A. Normal Operation</td>
</tr>
<tr>
<td>1. Mount program tape on 9-track drive.</td>
</tr>
<tr>
<td>2. Type D$J on teletype.</td>
</tr>
<tr>
<td>3. Type R$J on teletype.</td>
</tr>
<tr>
<td>4. Type WIPE _ on teletype.</td>
</tr>
<tr>
<td>5. Type ALL _ on teletype.</td>
</tr>
<tr>
<td>Programs to be used will be read into core.</td>
</tr>
</tbody>
</table>

To verify validity of software developed to allow calculation of Julian Date from input calendar date. Previously the Julian date had to be input directly.
<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>Tech</th>
<th>Inspect</th>
<th>NASA</th>
</tr>
</thead>
<tbody>
<tr>
<td>7. Type FCA;LACPR$J. Monitor will display run options.</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>8. Type GO/2</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>9. Teletype will print: ENTER DATE</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Type today's date in the form MM/DD/YY.</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Teletype will print ENTER TAPE NUMBER.</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Type tape number 137312. Print tape will begin processing with frames displayed on monitor.</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Type Control A. Processing will halt when a complete page is done.</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Type TERM/2.</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Type CL/2 twice.</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Type Control D.</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. Type REV/M$J.</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. Type REV/2. Monitor will display status tables with Julian date.</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. Film (1 fiche) will reflect accurate information.</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
</tbody>
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<td>J. M. Anderson (1)</td>
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<td>F. Goodson (3)</td>
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<td>B. S. Miller (1)</td>
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