Computer Output Microfilm (FR80)
Systems Software Documentation

(NASA-CR-147419) COMPUTER OUTPUT MICROFILM
(FR80) SYSTEMS SOFTWARE DOCUMENTATION,
VOLUME 2 (Aeronutronic Ford Corp.) 966 p HC
$23.75 CSCL 09B Unclas
63/61. 18689

Contract NAS 9-1261
DRL LI NO. 2,20

prepared for
National Aeronautics and Space Administration
Lyndon B. Johnson Space Center

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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FOREWORD

This document is provided by Space Information Systems Operation (SISO) in accordance with the requirements of Task Order (TO) P-2F00 as established under modification No. 105 of contract NAS 9-1261, Schedule V.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>1.1</td>
<td>Purpose</td>
</tr>
<tr>
<td>1.2</td>
<td>Scope</td>
</tr>
<tr>
<td>1.3</td>
<td>Applicable Documents</td>
</tr>
<tr>
<td>1.3.1</td>
<td>Requirements Specifications</td>
</tr>
<tr>
<td>1.3.2</td>
<td>Test Specifications</td>
</tr>
<tr>
<td>1.3.3</td>
<td>Acceptance Test Procedure</td>
</tr>
<tr>
<td>1.4</td>
<td>Overview</td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>2.1</td>
<td>COMA DTE Processors for 16 mm Film (16DT36, 16DT48) and 105 mm Fiche (105DT6, 105DT8)</td>
</tr>
<tr>
<td>2.1.1</td>
<td>Background</td>
</tr>
<tr>
<td>2.1.2</td>
<td>Introduction</td>
</tr>
<tr>
<td>2.1.2.1</td>
<td>Hardware Requirements</td>
</tr>
<tr>
<td>2.1.2.2</td>
<td>Software Requirements</td>
</tr>
<tr>
<td>2.1.2.3</td>
<td>Assembly Parameters</td>
</tr>
<tr>
<td>2.1.2.4</td>
<td>Operator Commands</td>
</tr>
<tr>
<td>2.1.3</td>
<td>Analysis</td>
</tr>
<tr>
<td>2.1.3.1</td>
<td>Major Control Section</td>
</tr>
<tr>
<td>2.1.3.2</td>
<td>Subroutines</td>
</tr>
<tr>
<td>2.1.3.3</td>
<td>Constants and Variables</td>
</tr>
<tr>
<td>2.1.3.4</td>
<td>Flow Charts</td>
</tr>
<tr>
<td>2.2</td>
<td>COMA Gray-Level, Landscape and Classification Map Processor for 105 mm Fiche (CLAGRA)</td>
</tr>
</tbody>
</table>
TABLE OF CONTENTS (CONT'D)

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.2.1</td>
<td>Background</td>
</tr>
<tr>
<td>2.2.2</td>
<td>Introduction</td>
</tr>
<tr>
<td>2.2.2.1</td>
<td>Hardware Requirements</td>
</tr>
<tr>
<td>2.2.2.2</td>
<td>Software Requirements</td>
</tr>
<tr>
<td>2.2.2.3</td>
<td>Assembly Parameters</td>
</tr>
<tr>
<td>2.2.2.4</td>
<td>Operator Commands</td>
</tr>
<tr>
<td>2.2.3</td>
<td>Analysis</td>
</tr>
<tr>
<td>2.2.3.1</td>
<td>Major Control Section</td>
</tr>
<tr>
<td>2.2.3.2</td>
<td>Subroutines</td>
</tr>
<tr>
<td>2.2.3.3</td>
<td>Constants and Variables</td>
</tr>
<tr>
<td>2.2.3.4</td>
<td>Flow Charts</td>
</tr>
<tr>
<td>2.3</td>
<td>COMA Varian 73 Print Processor for 16 mm Film (VAR16)</td>
</tr>
<tr>
<td>2.3.1</td>
<td>Background</td>
</tr>
<tr>
<td>2.3.2</td>
<td>Introduction</td>
</tr>
<tr>
<td>2.3.2.1</td>
<td>Hardware Requirements</td>
</tr>
<tr>
<td>2.3.2.2</td>
<td>Software Requirements</td>
</tr>
<tr>
<td>2.3.2.3</td>
<td>Assembly Parameters</td>
</tr>
<tr>
<td>2.3.2.4</td>
<td>Operator Commands</td>
</tr>
<tr>
<td>2.3.3</td>
<td>Analysis</td>
</tr>
<tr>
<td>2.3.3.1</td>
<td>Major Control Section</td>
</tr>
<tr>
<td>2.3.3.2</td>
<td>Subroutines</td>
</tr>
<tr>
<td>2.3.3.3</td>
<td>Constants and Variables</td>
</tr>
<tr>
<td>2.3.3.4</td>
<td>Flow Charts</td>
</tr>
<tr>
<td>2.4</td>
<td>COMA Varian 73 Print Processor for 105 mm Fiche (VAR105)</td>
</tr>
<tr>
<td>2.4.1</td>
<td>Background</td>
</tr>
<tr>
<td>2.4.2</td>
<td>Introduction</td>
</tr>
</tbody>
</table>
TABLE OF CONTENTS (CONT'D)

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.4.2.1 Hardware Requirements</td>
<td>2-251</td>
</tr>
<tr>
<td>2.4.2.2 Software Requirements</td>
<td>2-251</td>
</tr>
<tr>
<td>2.4.2.3 Assembly Parameters</td>
<td>2-252</td>
</tr>
<tr>
<td>2.4.2.4 Operator Commands</td>
<td>2-253</td>
</tr>
<tr>
<td>2.4.3 Analysis</td>
<td>2-254</td>
</tr>
<tr>
<td>2.4.3.1 Major Control Section</td>
<td>2-254</td>
</tr>
<tr>
<td>2.4.3.2 Subroutines</td>
<td>2-257</td>
</tr>
<tr>
<td>2.4.3.3 Constants and Variables</td>
<td>2-261</td>
</tr>
<tr>
<td>2.4.3.4 Flow Charts</td>
<td>2-266</td>
</tr>
<tr>
<td>2.5 COMA HCO Tabular Processor for 105 mm Fiche (HCOTAB)</td>
<td>2-323</td>
</tr>
<tr>
<td>2.5.1 Background</td>
<td>2-323</td>
</tr>
<tr>
<td>2.5.2 Introduction</td>
<td>2-323</td>
</tr>
<tr>
<td>2.5.2.1 Hardware Requirements</td>
<td>2-323</td>
</tr>
<tr>
<td>2.5.2.2 Software Requirements</td>
<td>2-323</td>
</tr>
<tr>
<td>2.5.2.3 Assembly Parameters</td>
<td>2-324</td>
</tr>
<tr>
<td>2.5.2.4 Operator Commands</td>
<td>2-325</td>
</tr>
<tr>
<td>2.5.3 Analysis</td>
<td>2-325</td>
</tr>
<tr>
<td>2.5.3.1 Major Control Section</td>
<td>2-325</td>
</tr>
<tr>
<td>2.5.3.2 Subroutines</td>
<td>2-329</td>
</tr>
<tr>
<td>2.5.3.3 Constants and Variables</td>
<td>2-333</td>
</tr>
<tr>
<td>2.5.3.4 Flow Charts</td>
<td>2-338</td>
</tr>
<tr>
<td>2.6 COMA PDP 11/45 Print Processor for 16 mm Film (PDP16)</td>
<td>2-392</td>
</tr>
<tr>
<td>2.6.1 Background</td>
<td>2-392</td>
</tr>
<tr>
<td>2.6.2 Introduction</td>
<td>2-392</td>
</tr>
</tbody>
</table>
TABLE OF CONTENTS (CONT'D)

Section                                                                 | Page
---                                                                      | ---
2.6.2.1 Hardware Requirements                                           | 2-392
2.6.2.2 Software Requirements                                           | 2-392
2.6.2.3 Assembly Parameters                                             | 2-393
2.6.2.4 Operator Commands                                              | 2-394
2.6.3 Analysis                                                         | 2-394
  2.6.3.1 Major Control Section                                         | 2-394
  2.6.3.2 Subroutines                                                  | 2-396
  2.6.3.3 Constants and Variables                                      | 2-398
  2.6.3.4 Flow Charts                                                  | 2-401
2.7 COMA PDP 11/45 Print Processor for 105 mm Fiche (PDP105)           | 2-436
  2.7.1 Background                                                      | 2-436
  2.7.2 Introduction                                                    | 2-436
  2.7.2.1 Hardware Requirements                                         | 2-436
  2.7.2.2 Software Requirements                                         | 2-436
  2.7.2.3 Assembly Parameters                                           | 2-437
  2.7.2.4 Operator Commands                                            | 2-438
  2.7.3 Analysis                                                        | 2-438
    2.7.3.1 Major Control Section                                       | 2-438
    2.7.3.2 Subroutines                                                | 2-440
    2.7.3.3 Constants and Variables                                    | 2-442
    2.7.3.4 Flow Charts                                                | 2-445
2.8 COMA Harvard College Observatory Solar Experiment S055 Gray-Level 9-Track Processor (S055) | 2-475
  2.8.1 Background                                                      | 2-475
  2.8.2 Introduction                                                    | 2-475
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.8.2.1 Hardware Requirements</td>
<td>2-475</td>
</tr>
<tr>
<td>2.8.2.2 Software Requirements</td>
<td>2-475</td>
</tr>
<tr>
<td>2.8.2.3 Assembly Parameters</td>
<td>2-476</td>
</tr>
<tr>
<td>2.8.2.4 Operator Commands</td>
<td>2-477</td>
</tr>
<tr>
<td>2.8.3 Analysis</td>
<td>2-478</td>
</tr>
<tr>
<td>2.8.3.1 Major Control Section</td>
<td>2-478</td>
</tr>
<tr>
<td>2.8.3.2 Subroutines</td>
<td>2-480</td>
</tr>
<tr>
<td>2.8.3.3 Constants and Variables</td>
<td>2-482</td>
</tr>
<tr>
<td>2.8.3.4 Flow Charts</td>
<td>2-484</td>
</tr>
<tr>
<td>2.9 COMA IBM SYSOUT Print Processor (105PR, 16PRNT)</td>
<td>2-516</td>
</tr>
<tr>
<td>2.9.1 Background</td>
<td>2-516</td>
</tr>
<tr>
<td>2.9.2 Introduction</td>
<td>2-516</td>
</tr>
<tr>
<td>2.9.2.1 Hardware Requirements</td>
<td>2-516</td>
</tr>
<tr>
<td>2.9.2.2 Software Requirements</td>
<td>2-516</td>
</tr>
<tr>
<td>2.9.2.3 Assembly Parameters</td>
<td>2-517</td>
</tr>
<tr>
<td>2.9.2.4 Operator Commands</td>
<td>2-517</td>
</tr>
<tr>
<td>2.9.3 Analysis</td>
<td>2-518</td>
</tr>
<tr>
<td>2.9.3.1 Major Control Section</td>
<td>2-518</td>
</tr>
<tr>
<td>2.9.3.2 Subroutines</td>
<td>2-520</td>
</tr>
<tr>
<td>2.9.3.3 Constants and Variables</td>
<td>2-522</td>
</tr>
<tr>
<td>2.9.3.4 Flow Charts</td>
<td>2-523</td>
</tr>
<tr>
<td>2.10 COMA Harvard College Observatory Solar Experiment S055 Gray-Level 7-Track or 9-Track Processor (HCO)</td>
<td>2-567</td>
</tr>
<tr>
<td>2.10.1 Background</td>
<td>2-567</td>
</tr>
<tr>
<td>2.10.2 Introduction</td>
<td>2-567</td>
</tr>
</tbody>
</table>
TABLE OF CONTENTS (CONT'D).

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.10.2.1 Hardware Requirements</td>
<td>2-567</td>
</tr>
<tr>
<td>2.10.2.2 Software Requirements</td>
<td>2-567</td>
</tr>
<tr>
<td>2.10.2.3 Assembly Parameters</td>
<td>2-568</td>
</tr>
<tr>
<td>2.10.2.4 Operator Commands</td>
<td>2-569</td>
</tr>
<tr>
<td>2.10.3 Analysis</td>
<td>2-570</td>
</tr>
<tr>
<td>2.10.3.1 Major Control Section</td>
<td>2-570</td>
</tr>
<tr>
<td>2.10.3.2 Subroutines</td>
<td>2-573</td>
</tr>
<tr>
<td>2.10.3.3 Constants and Variables</td>
<td>2-576</td>
</tr>
<tr>
<td>2.10.3.4 Flow Charts</td>
<td>2-581</td>
</tr>
<tr>
<td>2.11 COMA Univac 494 Print Processor for 105 mm Fiche (94U105)</td>
<td>2-641</td>
</tr>
<tr>
<td>2.11.1 Background</td>
<td>2-641</td>
</tr>
<tr>
<td>2.11.2 Introduction</td>
<td>2-641</td>
</tr>
<tr>
<td>2.11.2.1 Hardware Requirements</td>
<td>2-641</td>
</tr>
<tr>
<td>2.11.2.2 Software Requirements</td>
<td>2-641</td>
</tr>
<tr>
<td>2.11.2.3 Assembly Parameters</td>
<td>2-642</td>
</tr>
<tr>
<td>2.11.2.4 Operator Commands</td>
<td>2-643</td>
</tr>
<tr>
<td>2.11.3 Analysis</td>
<td>2-644</td>
</tr>
<tr>
<td>2.11.3.1 Major Control Section</td>
<td>2-644</td>
</tr>
<tr>
<td>2.11.3.2 Subroutines</td>
<td>2-648</td>
</tr>
<tr>
<td>2.11.3.3 Constants and Variables</td>
<td>2-650</td>
</tr>
<tr>
<td>2.11.3.4 Flow Charts</td>
<td>2-653</td>
</tr>
<tr>
<td>2.12 COMA Univac 494 Print Processor for 16 mm Film (94UV16)</td>
<td>2-668</td>
</tr>
<tr>
<td>2.12.1 Background</td>
<td>2-668</td>
</tr>
<tr>
<td>2.12.2 Introduction</td>
<td>2-668</td>
</tr>
<tr>
<td>Section</td>
<td>Page</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>2.12.2.1 Hardware Requirements</td>
<td>2-668</td>
</tr>
<tr>
<td>2.12.2.2 Software Requirements</td>
<td>2-668</td>
</tr>
<tr>
<td>2.12.2.3 Assembly Parameters</td>
<td>2-669</td>
</tr>
<tr>
<td>2.12.2.4 Operator Commands</td>
<td>2-670</td>
</tr>
<tr>
<td>2.12.3 Analysis</td>
<td>2-671</td>
</tr>
<tr>
<td>2.12.3.1 Major Control Section</td>
<td>2-671</td>
</tr>
<tr>
<td>2.12.3.2 Subroutines</td>
<td>2-675</td>
</tr>
<tr>
<td>2.12.3.3 Constants and Variables</td>
<td>2-677</td>
</tr>
<tr>
<td>2.12.3.4 Flow Charts</td>
<td>2-679</td>
</tr>
<tr>
<td>2.13 COMA LACIE Status Module (PFC, COMA)</td>
<td>2-695</td>
</tr>
<tr>
<td>2.13.1 Background</td>
<td>2-695</td>
</tr>
<tr>
<td>2.13.2 Introduction</td>
<td>2-695</td>
</tr>
<tr>
<td>2.13.2.1 Hardware Requirements</td>
<td>2-695</td>
</tr>
<tr>
<td>2.13.2.2 Software Requirements</td>
<td>2-695</td>
</tr>
<tr>
<td>2.13.2.3 Assembly Parameters</td>
<td>2-695</td>
</tr>
<tr>
<td>2.13.2.4 Operator Commands</td>
<td>2-695</td>
</tr>
<tr>
<td>2.13.3 Analysis</td>
<td>2-696</td>
</tr>
<tr>
<td>2.13.3.1 Major Control Section</td>
<td>2-696</td>
</tr>
<tr>
<td>2.13.3.2 Subroutines</td>
<td>2-697</td>
</tr>
<tr>
<td>2.13.3.3 Constants and Variables</td>
<td>2-698</td>
</tr>
<tr>
<td>2.13.3.4 Flow Charts</td>
<td>2-699</td>
</tr>
<tr>
<td>2.14 COMA LACIE Status Display (REVEAL)</td>
<td>2-720</td>
</tr>
<tr>
<td>2.14.1 Background</td>
<td>2-720</td>
</tr>
<tr>
<td>2.14.2 Introduction</td>
<td>2-720</td>
</tr>
</tbody>
</table>
TABLE OF CONTENTS (CONT'D)

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.14.2.1 Hardware Requirements</td>
<td>2-720</td>
</tr>
<tr>
<td>2.14.2.2 Software Requirements</td>
<td>2-720</td>
</tr>
<tr>
<td>2.14.2.3 Assembly Parameters</td>
<td>2-720</td>
</tr>
<tr>
<td>2.14.2.4 Operator Commands</td>
<td>2-721</td>
</tr>
<tr>
<td>2.14.3 Analysis</td>
<td>2-721</td>
</tr>
<tr>
<td>2.14.3.1 Major Control Section</td>
<td>2-721</td>
</tr>
<tr>
<td>2.14.3.2 Subroutines</td>
<td>2-722</td>
</tr>
<tr>
<td>2.14.3.3 Constants and Variables</td>
<td>2-723</td>
</tr>
<tr>
<td>2.14.3.4 Flow Charts</td>
<td>2-723</td>
</tr>
<tr>
<td>2.15 COMA LACIE Print Processor for 105 mm Fiche (LACPRT)</td>
<td>2-735</td>
</tr>
<tr>
<td>2.15.1 Background</td>
<td>2-735</td>
</tr>
<tr>
<td>2.15.2 Introduction</td>
<td>2-735</td>
</tr>
<tr>
<td>2.15.2.1 Hardware Requirements</td>
<td>2-735</td>
</tr>
<tr>
<td>2.15.2.2 Software Requirements</td>
<td>2-735</td>
</tr>
<tr>
<td>2.15.2.3 Assembly Parameters</td>
<td>2-736</td>
</tr>
<tr>
<td>2.15.2.4 Operator Commands</td>
<td>2-737</td>
</tr>
<tr>
<td>2.15.3 Analysis</td>
<td>2-738</td>
</tr>
<tr>
<td>2.15.3.1 Major Control Section</td>
<td>2-738</td>
</tr>
<tr>
<td>2.15.3.2 Subroutines</td>
<td>2-741</td>
</tr>
<tr>
<td>2.15.3.3 Constants and Variables</td>
<td>2-745</td>
</tr>
<tr>
<td>2.15.3.4 Flow Charts</td>
<td>2-750a</td>
</tr>
</tbody>
</table>

Appendix | Page |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A SOFTWARE AND TEST TAPE REQUIREMENTS SPECIFICATIONS AND ACCEPTANCE TEST PROCEDURES</td>
<td>A-1</td>
</tr>
<tr>
<td>Appendix</td>
<td>Program Revisions and Test Preparation Sheets</td>
</tr>
<tr>
<td>----------</td>
<td>---------------------------------------------</td>
</tr>
<tr>
<td>B.1</td>
<td>COMA DTE Processors for 16 mm Film (16DT48) and 105 mm Fiche (105DT6, 105DT8) B-1</td>
</tr>
<tr>
<td>B.2</td>
<td>COMA Gray-Level, Landscape and Classification Map Processor for 105 mm Fiche (CLAGRA) B-9</td>
</tr>
<tr>
<td>B.3</td>
<td>COMA Varian 73 Print Processor for 16 mm Film (VAR16) B-48</td>
</tr>
<tr>
<td>B.4</td>
<td>COMA Varian 73 Print Processor for 105 mm Fiche (VAR105) B-53</td>
</tr>
<tr>
<td>B.5</td>
<td>COMA HCO Tabular Processor for 105 mm Fiche (HCOTAB) B-58</td>
</tr>
<tr>
<td>B.6</td>
<td>COMA PDP 11/45 Print Processor for 16 mm Film (PDPl6) B-65</td>
</tr>
<tr>
<td>B.7</td>
<td>COMA PDP 11/45 Print Processor for 105 mm Fiche (PDPl05) B-68</td>
</tr>
<tr>
<td>B.8</td>
<td>COMA Harvard College Observatory Solar Experiment S055 Gray-Level 9-Track Processor (S055) B-69</td>
</tr>
<tr>
<td>B.9</td>
<td>COMA IBM SYSOUT Print Processor (105PR, 16 PRNT) B-80</td>
</tr>
<tr>
<td>B.10</td>
<td>COMA Harvard College Observatory Solar Experiment S055 Gray-Level 7-Track or 9-Track Processor (HCO) B-91</td>
</tr>
<tr>
<td>B.11</td>
<td>COMA Univac 494 Print Processor for 105 mm Fiche (94U105) B-101</td>
</tr>
<tr>
<td>B.12</td>
<td>COMA Univac 494 Print Processor for 16 mm Film (94UV16) B-112</td>
</tr>
<tr>
<td>B.13</td>
<td>COMA LACIE Status Module (PFC, COMA) B-123</td>
</tr>
<tr>
<td>B.14</td>
<td>COMA LACIE Status Display (REVEAL) B-124</td>
</tr>
<tr>
<td>B.15</td>
<td>COMA LACIE Print Processor for 105 mm Fiche (LACPRT) B-126</td>
</tr>
</tbody>
</table>
LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-1</td>
<td>94U105 Buffer Area</td>
<td>2-645</td>
</tr>
<tr>
<td>2-2</td>
<td>94UV16 Buffer Area</td>
<td>2-672</td>
</tr>
<tr>
<td>B-1</td>
<td>Classification Map Data</td>
<td>B-15</td>
</tr>
<tr>
<td>B-2</td>
<td>Classification Map Data with Overlays</td>
<td>B-17</td>
</tr>
<tr>
<td>B-3</td>
<td>Classification Map Descriptor Data</td>
<td>B-19</td>
</tr>
<tr>
<td>B-4</td>
<td>Maximum Size and Overlay for Gray-Level</td>
<td>B-26</td>
</tr>
<tr>
<td>B-5</td>
<td>X Shade Bars and Overlay for Gray-Level</td>
<td>B-28</td>
</tr>
<tr>
<td>B-6</td>
<td>Y Shade Bars and Overlay for Gray-Level</td>
<td>B-31</td>
</tr>
<tr>
<td>B-7</td>
<td>Gray-Level Descriptor Data</td>
<td>B-34</td>
</tr>
<tr>
<td>B-8</td>
<td>X Shade Bars and Overlay for Landscape</td>
<td>B-39</td>
</tr>
<tr>
<td>B-9</td>
<td>Y Shade Bars and Overlay for Landscape</td>
<td>B-41</td>
</tr>
<tr>
<td>B-10</td>
<td>Test 1, Gray-Level Frame</td>
<td>B-75</td>
</tr>
<tr>
<td>B-11</td>
<td>Test 2, X Shade Bars</td>
<td>B-77</td>
</tr>
<tr>
<td>B-12</td>
<td>Test 3, Every Fourth Shade X-Bars</td>
<td>B-78</td>
</tr>
<tr>
<td>B-13</td>
<td>94U105 Alphanumeric Data</td>
<td>B-107</td>
</tr>
<tr>
<td>B-14</td>
<td>94UV16 Alphanumeric Data</td>
<td>B-118</td>
</tr>
</tbody>
</table>

LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>B-1</td>
<td>Classification Tests</td>
<td>B-14</td>
</tr>
<tr>
<td>B-2</td>
<td>Numeric Overlay Information for Classification</td>
<td>B-16</td>
</tr>
</tbody>
</table>

-xii-
<table>
<thead>
<tr>
<th>Table</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>B-3</td>
<td>B-16</td>
</tr>
<tr>
<td>B-4</td>
<td>B-18</td>
</tr>
<tr>
<td>B-5</td>
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<tr>
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<td>B-27</td>
</tr>
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</tr>
<tr>
<td>B-11</td>
<td>B-33</td>
</tr>
<tr>
<td>B-12</td>
<td>B-38</td>
</tr>
<tr>
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<td>B-38</td>
</tr>
<tr>
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<td>B-40</td>
</tr>
<tr>
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<td>B-76</td>
</tr>
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<td>B-79</td>
</tr>
<tr>
<td>B-19</td>
<td>B-109</td>
</tr>
<tr>
<td>B-20</td>
<td>B-111</td>
</tr>
<tr>
<td>B-21</td>
<td>B-120</td>
</tr>
<tr>
<td>B-22</td>
<td>B-122</td>
</tr>
</tbody>
</table>
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
1.3.2 Test Specifications

- 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.

1.3.3 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


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.

<table>
<thead>
<tr>
<th>File</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>III109</td>
<td>Film</td>
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<tr>
<td>III163</td>
<td>GO</td>
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<tr>
<td>III164</td>
<td>FLOAD</td>
</tr>
<tr>
<td>III185</td>
<td></td>
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</tbody>
</table>

#### 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
CLEAR
REWIND
SKIP
TRY AGAIN
STANDARD LABELS
UNLABELED
FORM
INDEX FORM

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

1. External

<table>
<thead>
<tr>
<th>Routine</th>
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</thead>
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<tr>
<td>FC7CLR</td>
<td>III166</td>
</tr>
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<td>FRSPIC</td>
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2. Internal Routines

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<thead>
<tr>
<th>GETCOM</th>
<th>CHROUT</th>
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<td>BITCNT</td>
<td>ROTREC</td>
<td>NMGET1</td>
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2.1.3.2 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:

\[ \text{LAC } N \text{ (} 1 \leq N \leq 18) \]
\[ \text{JMS BITCNT} \]

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:

\[ \text{LAC } N \]
\[ \text{CHROUT} \]

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:

\[ \text{LAC } N \]
\[ \text{JMS CONVRT} \]
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 START PRINT 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 $16K \times 16K$ 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 \( X_1 \), \( VHEADy = \) start point \( Y_1 \), \( VTAILx = \) end point \( X_2 \), and \( VTAILy = \) end point \( Y_2 \). 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 NEXTCH 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. **ROTREC.** 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 ROTREC

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:

\[ \text{LAC N } 1 \leq N \leq 1023 \]

\[ \text{SCAL} \]
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 TYP5W 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
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 per index entry as specified in F record.

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

6. CHILSW. 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.

10. 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. **MDELT A.** 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. **RETCNT.** Cell containing BITCNT return address when processing COM control records.

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

30. **SDELTA.** 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. **STOCSW.** Switch used to control saving of index characters; NOP indicates no indexing; JMS STOCH indicates to save index character.

34. **STRIPS.** 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. **IXXLEN.** 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, RBLKSW

INDEXING?

Y

INITIALIZE INDEXING SWITCHES: IFLASW, INXSW

105 mm?

N

A

Y

1

N

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
FC7CLR
INITIALIZE FICHE CAMERA

FRSPIC
MULTI IMAGES FICHE

MNBBRIT
SET TITLING INTENSITY

A

NEXPIC
ADVANCE FILM FRAME

MNBBRIT
RESET DATA INTENSITY

2

2-22
2

ADDRESS OF TAPE BUFFER IF NO FORM

FORM PROCESSING?

Y

ADDRESS OF BUFFER IF FORM

ADDRESS OF 1st MAG TAPE BUFFER $\Rightarrow$ CURBUF

3
3

DETERMINE ADDRESS OF 2ND BUFFER ⇒ NEXBUF

MTRINI INITIALIZE MAG TAPE HANDLER

COMPUTE FRAME SIZE OF DATA PAGE

SET X AND Y OFFSETS FOR CENTERING IMAGE IN 16K

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
GETCON

48 BIT DTE?

Y

BITCUT
GET 4 BIT FILL

N

IGNORE 4-BIT FILL ZEROS PRECEDING 36 BIT WORD

KYBLIS
TEST FOR OPERATOR INTERRUPT

GETOP
SET XSIGN FOR POS. OR NEG. VECTOR

SET YSIGN FOR POS. OR NEG. VECTOR

BITCNT
GET LENGTH OF VECTOR IN X

X
LENGTH OF VECTOR, \( +n - \) \( \rightarrow \) XSIGN

5

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
5

BITCNT
GET LENGTH OF VECTOR IN Y

Y LENGTH OF VECTOR, + - → Yseg

BITCNT
10 BIT X, COORD.

X₁ → XHD
XHD + XSIGN → XTL (X₁)

BITCNT
10 BIT Y₁ COORD.

6
$Y_1 \Rightarrow Y_{HD}$

$Y_{HD} + Y_{SGN}$

$\Rightarrow Y_{TL}(Y_2)$
Y₁ → YHD
VECTOR START POINT

MAP
SCALE X & Y TO FRQD UNITS

SETXYS
SET X & Y DAC'S

SETADS
SET START COORD FOR DRWVEC

SETLTS
SET END COORD. FOR DRWVEC
10

TYPEWRITER word?

Y

TYPsw

N

SETCR

TYPsw

START CRT word processed?

N

HALT

Y

SET CNTR equal to two's of 4 chars per type writer word (4x5)

TYPLP

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
SETCC

SKIP TYP5W
ALLOW PROCESSING OF DTE TYPEWRITER WORDS

BITCNT
GET DTE CHAR SIZE

ACCESS CORRESPONDING CHAR HEIGHT FROM S2TAB

SCAL
CONVERT DTE TO FR2D UNIT

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
SAVE CHAR
HEIGHT, CLEAR
CHARSIZE COUNTER,
CHAR. SIZE TAB
SPLTAB ⇒ 11

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

SIZE ≥ DTÉ
CHAR. HEIGHT?

Y

USE DTÉSIZE
(DTÉ CHAR SIZE)
AS INDEX INTO
DTXTAB - DELTAX

SCAL
CONVERT DTÉ
DELTAX TO
FRACTION UNITS

12
N

13

2-39
CONVERTED DTE DELTAX → CHDELX

USE DTESIZ AS INDEX INTO DTYTAB DELTAY

SCALE
CONVERT DTE CHAR DELTAY

CONVERTED DTE CHAR DELTAY → CHDEL

RESET CHDELX AND CHDELY BASED ON ROTATION

13

14
NCINDEX

MAP
SCALE X & Y TO FIXED SIZE

ENSURE FIT OF CHAR WITHIN Y.
IF NOT, YHD = 0

ENSURE FIT OF CHAR WITHIN X.
IF NOT, O → XHD

SETXYS
SET X & Y COORDS AS SPECIFIED IN XHD, YHD

16
CHTEM → AC
START PRINT CHARACTER

CHROUT
CONVERT DBC TO EBCDIC
OUTPUT TO FMIN

GETCOM
CMA OF # OF CHARSEN PER INDEX ⇒ INXLEN (USED BY IXADG)

INXLEN ⇒ MCHOUT CHAR/S/INDEX FOR STOCH ROUTINE

EXIT

CHRROUT

CONVRT DTE TO EBCDIC

INDEXING? Y

STOCH STORE CHAR VIA II

N

18
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 OP CODE

BITCNT
GET DTE OP CODE

DTE JUMP COMMAND?

Y
NEXT FRM ADVANCE TO NEXT FRAME

N

BITCNT
BIT BUCKET DTE WORD

GETCOM
DTFISH

0 → XHD
0 → YHD
START COOR.
FOR BOTTOM VECTOR OF Form

MAP
SCALE AND FRAME POSITION

SETHD
SET X, Y, F17 COORD.

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

MAP
SCALE AND FRAME POSITION

2O
SETTL
SET \( x_1, y_1 \) FG8D COORD.

DRAWVEC
OUTPUT VECTOR TO FILM

SET HD
PREVIOUS \( x_2, y_2 = x_1, y_1 \)

1023 \( \rightarrow \) XHD
1023 \( \rightarrow \) YHD
END COORD.
FOR RIGHT VECTOR

MAP
SCALE AND FRAME POSITION

SETTL
SET \( x_2, y_2 \) FG8D COORD.

21
21

DRAWVEC

OUTPUT VECTOR TO FILM

SET HD

PREVIOUS

X2Y2 = X1Y1

1023 ⇒ YHD
0 ⇒ XHD END COORD.
FOF TOP VECTOR OR FORM

MAP

SCALE AND FRAME
POSITION

SETTL

SET X2Y2 FROM
COORD.

DRAWVEC

OUTPUT VECTOR TO FILM

22

2-54
BITCNT

# OF BITS REQUESTED BY GETT
\rightarrow \text{BITNUM}

Two's Comp of BITNUM
\rightarrow \text{mBITNUM};
used to decrement SEC+BLKNT

SEGNT < 0
NEED NEW SEGMENT?

Y

GET-SEG
GET NEXT LOGICAL RECORD SEG.

N

BITNUM > SEGNT?

Y

NEWSEG

N

MTBYTE
GET REQUIRED BITNUM FROM TAPE

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
BLKCNT + MBITNUM

SET AC WITH REQUIRED BITS

EXIT

GETSEG

GETSEG

BLKCNT=0

NEED NEW BLOCK?

Y

GETBLK

GET NEW RECORD BLOCK

N

\[ \text{BLKCNT - 32} \]

SUBT. 4 BYTE SDW LENGTH

24
GETS62

CCNT RL
Com Control Processor

EXIT

GETBLK

MT BYTE
ACCESS 16 BIT BLOCK LENGTH

(BLOCK LENGTH) * 8 - 32 \rightarrow BLKCNT
\# OF BITS IN RECORD BLOCK - BDW

MT BYTE
BIT BUCKET UPP3R 2 BYTES OF BDW

EXIT
JMP PROC76
⇒ CONTROL+11,
SWITCH TO
INITIATE BASIC
PROCESSING

CUTMAX
OUTPUT FRAME
CUTMARKS

IGNORE

TITREC

MVCOM
T. DATA FROM
TAPE ⇒ TITARE

105 mm
FILM OUTPUT?

Y

FICTAP
PROCESS TITLE
DATA

N

30

REPRODUCIBILITY OF THE
ORIGINAL PAGE IS POOR
Jmp I CTRL
→ CTRL+III
RESET SWITCH
FROM EDC/DIC
to DIE DATA

CUTMARK
OUTPUT
FRAME
CUTMARKS

IGNORI

FRMREC

SKP → DTFORM
SET SWITCH
FOR FORM
OVERLAY

BITCNT
ACCESS FORM
NUMBER

30

31
FORM # 27

16mm FILM OUTPUT?

NEXT PIC
ADVANCE FILM TO NEXT FRAME

16mm FILM OUTPUT?

STRIP CHART MODE?

CUTMAK OUTPUT FRAME CUTOFFMARKS

F

Y

N

F

32

N

Y

NOP = DT FORM
ILLEGAL FORM REQUESTED:
NO FORM

JMP I CTRL
CCNLCTRL+110.
RESET SWITCH FROM EBCDIC TO DTF DATA
AC → XINDX
START X COOR
FOR INDEX
CHAR. ACCESS

NMGET1
2 EBCDIC
CHAR. TAPE
→ BINARY

AC → CHRNCT
# OF DTE
CHARS FOR
INDEX ENTRY

INDEXING
?

SET SWITCHES
FOR INDEX
CAPTURE &
FLASH,

Y

N

IGNOR1

2-70
34

NEXT PIC
ADVANCE FILM

STRIP CHART MODE?

N
CUTMAK
OUTPUT CUTMARKS

Y

IGNORE

SET SWITCHES TO PROCESS AS DTE AFTER NEXT COM CNTRL RECORD

IGNORE

BITCUT
IGNORE DATA TILL NEXT SEC. OR COM. CNTRL RECORD

IGNORE

REPRODUCIBILITY OF THIS ORIGINAL PAGE IS POOR

2-72
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
SET RETURN ADDRESS IN BIT CUT TO RE-INITIZE GET MACRO

EXIT

RESET

1st COM CONTROL?

Y

RESET1

N

SET COM RECORD SWITCHES FOR 2nd COM RECORD

RESET1
RESET

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

EXIT
NEWSEG

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

MTBYTE
GET REMAINING DATA BITS 0K12

AC \(\rightarrow\) OLDSGC
REMAINING DATA BITS CURRENT SEG.

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

GETSEG
GET NEXT SEGMENT

35
SAVE BITCNT PARAMS, ORIG. CALL

OLDSEG - BITNUM → NEWSGC
# OF BITS REQ'D FROM NEW SEGMENT

BITCNT
GET NEWSGC BITS

AC → NEWSGB
BITS FROM NEW SEGMENT TO SATISFY GET MACRO

RESTOR
RESET ORIG. CALL BITCNT PARAMS

36
SHIFT BITS FROM OLDSEG AND NEWSEG \(\rightarrow\) AC FOR
RETURN VIA BITCNT

EXIT

NMGET

SET COUNTER FOR FOUR EBCDIC CHAR FIELD

EBGET
GET CHARS, CONVERT BINARY \(\rightarrow\) AC

EXIT

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
37

BITCUT
NEXT CHAR.

STORE IN COM CONTROL BUFFER VIA AIR II

CHAR = #? N

Y

EXIT

MVCOM2
MAP

**SCAL**
CONVERT DTE $X_1$ TO FRID UNITS

$X_1 + XOFF \rightarrow X_1$.
START X COOR. PLUS CENTERING OFFSET

**SCAL**
CONVERT DTE $Y_1$ TO FRID UNITS

$Y_1 + YOFF \rightarrow Y_1$.
START Y COOR. PLUS CENTERING OFFSET

**SCAL**
CONVERT DTE $X_2$ TO FRID UNITS

38
\[ X_2 + X_{\text{OFF}} \Rightarrow X_2 \]
\[ \text{END X COOR. PLUS CENTERING OFFSET} \]

\[ \text{SCAL} \]
\[ \text{CONVERT DTE Y}_2 \text{ TO FRDO UNITS} \]

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

\[ \text{EXIT} \]
SCAL

NEG. COORDINATE?

ERROR: FORCE TO ZERO COORDINATE POSITION

Y

MULTIPLY DTE COORD BY FRZD FRAME SIZE AS SPECIFIED IN DFRS2

N

DIVIDE BY 1023, (DTE FRAME SIZE) ⇒ AC FRZD COORD POSITION

EXIT
STRIP

SKP → STRIPF
SWITCH TO INHIBIT "H"
CUTMARKS

MDONEX

MVOVER

SETXY'S
SET X & Y DACS FOR VECTOR

SETH'DS
SET X1Y1 FOR DRAW VEC

SETTL'S
SET X2Y2 FOR DRAW VEC

EXIT
CUTMAK

ROTATE
CUTMARKS
ALWAYS
 UPRIGHT

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

SET START
COORDINATES
x_1 y_1 \& x_2 y_2
FOR
CUTMARKS

MRKONG

-4 \rightarrow STROK
SET # OF
VECTORS PER
GROUP

STROX

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

39
39

DRAWVEC
OUTPUT VECTOR TO FILM

UPDATE $x_1$ & $x_2$
FOR NEXT VECTOR OUTPUT

STROKES=0
VECTOR GROUP DONE?
Y

UPDATE X
COORDINATES
FOR NEXT VECTOR GROUP

MARKS=0
COMPLETED OUTMARK?
Y

ROTATE
RESET TO PREVIOUS ROTATION

EXIT

STROK

MRKONE

N
SET COUNT FOR 3 LINE EJECTS

PSWLL
WAIT FOR HARDWARE READY

CRT (IOT)
CARR. RET.

DONE 3 LINES?

NEXTCH

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
40

SETPLS
SET P,L,S HARDWARE REGISTERS

SETXYS
SET X$Y DACS TO CHAR POSITION

SAVEADD
SAVE ORIG. CALL PARAMS

BITCNT
GET 8 BIT EBCDIC CHARACTER

RESTOR
RESTORE ORIG. CALL PARAMS

VCHAR
OUTPUT CHAR TO FILM

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 tape 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 FILM</td>
<td>III186</td>
<td>III166 INVAR</td>
</tr>
<tr>
<td></td>
<td>III185</td>
<td>III166 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. FASTTY. If 1, assembles SYM code for teletype interrupt handler.

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

N. NEXPAG = NEXPIC. Equates NEXPAG to NEXPIC macro call.

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

TIME
FRAME
GO
CONTINUE
TITLE
END JOB
MAKE FILM
CLEAR
ADVANCE
BACK
USE
REWIND
SKIP
TRY AGAIN
STANDARD LABEL
UNLABELED
PITCH/MARGIN = 69, 52
SIZE OF TITLE = 14500, 10500
IMAGES PER FICHE = 6, 7
HITS-CHARS, VEC, PTS, TITLE, CMARK = 1,1,1,1,1
FOCUS
ROTATION = 0
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>
<td>III162</td>
</tr>
<tr>
<td>DRWVEC</td>
<td>III162</td>
</tr>
<tr>
<td>PSTLL</td>
<td>III166</td>
</tr>
<tr>
<td>SETPLS</td>
<td>III166</td>
</tr>
<tr>
<td>VCHAR</td>
<td>III147</td>
</tr>
<tr>
<td>MTBYTE</td>
<td>III163</td>
</tr>
<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

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: JMP 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 \(X_1Y_1\) and \(X_2Y_2\) vector coordinates for the overlay. Vector output is via DRWVEC. Calling sequence: JMS BARVE
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 CHDELX, 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 CHROUT. 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 CHROUT until CNTR (character counter equal to 5) is exhausted. Exits to GETCOM.

U. **DTEVEC.** Decodes and converts DTE 48-bit vector word to FR80 $X_1Y_1$ and $X_2Y_2$ 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. **GRACBT**. Sets processing mode switches for GRAY data processing. Transfers control to HEXOCT. Calling sequence: JMP GRACBT

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 CHROUT and CHRBRN, and outputs pixels via PNTOUT. 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 GRACBT. 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. **HUNDRED**. Converts EBCDIC hundreds position character to decimal. Returns to calling routine with hundreds value in AC. Calling sequence: JMS HUNDRED

EE. **LANDS**. Sets processing mode switches for LAND data, sets character deltas (CLDElx = 10, CLDEly = 10), and transfers control to GRACBT. 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
     in AC
```

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 X1Y1 and X2Y2 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 IGNDTE to "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:

```
LAC n
JMS PNTOUT
```

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

**REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR**

2-107
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 \((1 \leq n \leq 18)\) 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 \((1 \leq n \leq 18)\) of data remaining in current record segment.
23. **OLDSCG.** 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 $Y_1$ 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 $Y_2$ 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 FIII186.

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, DESCRIp. CONTROL SWITCHES

SET FCXCUF FOR XTRA LENGTH "CLEAR" FICHE

FC7 CLR
CLEAR FICHE FRAME

RESET FCXCUF FOR "GRAY" FICHE FORMAT

1
1

FRSPIC
INIT FOR FIRST FRAME

NEXPIC
ADVANCE FILM

MTRINI
INITIALIZE MAG TAPE HANDLER

GET SST
GET 8 BIT CONTROL CHARACTER

AC-> BARUC TEMP SAVE CONTROL CHARACTER

SETPT
SET FRAME COORDINATES

2
GRAY DATA?

CLASS DATA?

LAND DATA?

Y

Y

Y

GRADTA

CLSOTA

LANDTA

CTLERR

N

N

N

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SETPT

GRAY DATA

Y → SETGRA

N

CLASS DATA

Y → SETCLS

N

LAND DATA?

Y

5132. ⇒ XOFFVOV, XOFFDT, XOFFPT
X FRAME COORDINATE

N → CTRLERR

5997. ⇒ YOFFDI, YOFFOV
Y FRAME COORDINATE

EXIT
BITCUT

# OF BITS REQUESTED BY GETT
\rightarrow \text{BITNUM}

TWO'S COMP OF BITNUM
\rightarrow mBITNUM; USED TO DECREMENT SEG + BITCUT

SEGMENT NEED NEW SEGMENT?

\begin{align*}
\text{Y} & \rightarrow \text{GETSEG} \rightarrow \text{GET NEXT LOGICAL RECORD SEG} \\
\text{N} & \rightarrow \text{NEWSEG}
\end{align*}

\begin{align*}
\text{BITNUM} > \text{SEGMENTS?} \\
\text{Y} & \rightarrow \text{NEWSEG} \\
\text{N} & \rightarrow \text{MBYTE}
\end{align*}

GET REQUIRED BITNUM FROM TAPE

\rightarrow 3

\text{REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR}
3

BLK CNT + MBITNUM
→ BLK CNT ↓
SET AC WITH
REQUIRED. BIT

EXIT

GETSEG

GETSEG-1

BLK CNT = 0
NEED NEW
BLOCK?

Y

GETBLK
GET NEW
RECORD. BLOCK

N

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

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

Y
AC > 1
START SEG?
N
EXIT

5
CLASSM

SET SWITCHES FOR PROCESSING OF CLASS MAP DATA

SET CHARACTER MAP DELTA X & Y

GRACITL
LANDS

SET SWITCHES FOR PROCESSING OF LANDSCAPE DATA

SET CHARACTER DELTA X & Y (PIXEL SPACING)

GRACtl

OTL En

LOAD ABR. OF CONTROL ERROR MESSAGE

MONOUX
TITREC

MVCOM
MOVE TITLE DATA TO TITLE BUFFER

RESTOR
RESET BITCNT RETURN ADDRESSES

FICTAP
PROCESS TITLE

SKP ≠ TITSW NO FILM ADVANCE AFTER TITLE OUTPUT

GETSGI
MVCom

TITARE ⇒ II
BUFFER FOR COM CONTROL SAVE

MVCom1

CHAR ⇒ BUFFER VIA II INCREMENT II FOR NEXT BUFFER ENTRY

MVCom2

CHAR = # ?

Y → CHKDL

N → BITCNT
NEXT 8 BIT CHAR FROM TAPE

MVCom1
GET PROCESSING SWITCHES FOR GRAY DATA

SAVE BITCUT ADDRESSES

BITCUT
BIT BUCKET BYTES 344 OF CONTROL RECORD

THOUSN
GET THOUSANDS COUNT

CLASS DATA?

Y

AC
CLASS NEVER OVER HUNDREDS

N
9
START

OVERLAY DATA?

Y

SET FOR COM CONTROL CHECK ON NEXT RECORD

N

SET FOR CODELX, CODELY CHSIZE FOR GRAY DATA

INITCH

SETPLS

SET P.L.S

HARDWARE REGISTERS

SETXYS

SET STARTING X,Y FRAME COORD

12

END
MNSPOT
USE SPOT SIZE 3

SET LINE PER FRAME COUNTER FOR IS2

NEWLN

SET CHAR PER LINE COUNTER FOR IS2

DESCRIPT. DATA?

Y CHARBRN

N

PNTOUT OUTPUT PIXEL

CHRCON

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CRTGET

PSTLL
WAIT FOR HARDWARE READY

CRT (JoT)
CARRIAGE RETURN

KYBLIS
CHECK FOR OPERATOR INTERRUPT

Y

Y

DESCRIPTR DATA?

N

GT&MKY
GET 4 BITS OF INTENS

CRTTEST

CRTCNT

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
13

SPC (IOT)
INCR. ADDR
FOR NEXT
PIXEL

EXIT

CONVRT

DTE CHAR.
CODE ÷ 2
+ DTETAB ADDR;
GET EBCDIC
CHAR. WORD

RIGHT MOST
CHARACTER?

SHIFT OUT
UNUSED
LOW ORDER
CHARACTER

Y

MASK 8
LOWER BITS
HAVE EBCDIC
CODE FOR
DIE CHAR

EXIT

N

EXIT
DES Daten

OVERLAY DATA?

Y ➔ OVLDTA
N

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

CLASS MODE?

Y ➔ CNITCH
N

NOP ➔ CTRSW
SET FOR COMM CONTROL PROCESSING

GRAY MODE?

Y ➔ INITCH
N

14
14

LAND MODE?

Y → LNITCH
N → CTLERR

CLSDDTA

OVERLAY DATA?

Y → OVLDTA
N

SET CHAR. SIZE CHAR DELTA X AND DELTA Y FOR CLASS MAP DATA

CNITCH

SETPLS
SET P.L.S. HARDWARE REGISTERS

15

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
GETCHR

GET2BT
GET 8 BIT CHARACTER

CLRGEN

CLTGET

PSTLL
WAIT FOR HARDWARE READY

UPDATE Y COORDINATE FOR NEXT LINE

SETXYS
SET X+Y DACS

16
CKVEC

LAND MODE? Y LTEVEC
N DTEVEC

CKSPT

LAND MODE? Y LTESPT
N DTESPT

PRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
DTEVEC

ACCESS AND SET VIA BITCNT
X1, Y1, and X2, Y2 VECTOR COORDINATES

SETXYS
SET X, Y DACS

SETNDS

SETTLS

SETP8S
SET P.L.S. HARDWARE REGISTERS

DRUVEC
OUTPUT VECTOR TO FILM

GETcom
VECTOR
(DTE X COORD), X (CHAR DELTA X)
→ AC
CALCULATE CHAR POSITION FOR X COOR

AC + XOFFOV
POSITION VECTOR
X COOR WITHIN
FRAME AREA

EXIT

CALYS

BITCNT
ACCESS 10
BIT Y-COOR
FROM TAPE

18
GRAY MODE?

Y: ADD 1 TO DIE COORD, \( y \),
GRAY OFFSET

N

\((\text{DIE Y COORD}) - X(\text{CHAR DELTA Y}) \rightarrow \text{AC}\)
CALCULATE CHAR
POSITION FOR
Y VECTOR COORD.

\(\text{AC} + \text{YOFF}\)
POSITION VECTOR
Y COORD IN
FRAME AREA

EXIT
DTESP

BITCUT
8 BIT CHAR CODE

BITCUT
10 BIT X COORDINATE

GRAY MODE?

Y
ADD 1 TO DTE X COORD; GRAY OFFSET

N

CALXS
CALCULATE X COORD IN SCOPE PTS

CALYS
CALCULATE Y COORD IN SCOPE PTS

19
SETPL5
SET P.L.S.
HARDWARE
REGISTERS

SETXYS
SET X & Y DAC
COORD. POSITION

CHROUT
CHAR TO
FILM

SET PRSWT
TO PERMIT
TYPEWRITER
WORD PROCESSING

GETcom

DTE TYP

START
PRINT
FINISHED
Y
N

SET COUNTER
(CNTR) FOR
CHARS
TYPEWRITER
WORD

IGNITE

TypEP

2-160
TYPCL

O \rightarrow XHD
YHD \rightarrow YHD

PSTLL
WAIT FOR HARDWARE READY

CRT (IOT)
CARRIAGE RETURN

TYPNL
NEWSEG

# OF BITS IN CURRENT SEGMENT → OLDSEG

MTBYTE
GET REMAINING DATA BITS 0.E.12

AC → OLDSEG-B REMAINING DATA BITS CURRENT SEG.

BLKCNT - OLDSEG → BLKCNT DECREMENT FOR # BITS ACCESSED

GETSEG- GET NEXT SEGMENT

II
21

SAVADD
SAVE BITCNT
PARAMS.
ORIG. CALL

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

BITCNT
GET NEWSEC
BITS

AC ⇒ NEW SEC
BITS FROM
NEW SEGMENT
TO SATISFY
GET MACRO

RESTORE
RESET ORIG.
CALL BITCNT
PARAMS

22

REPRODUCIBILITY OF THE
ORIGINAL PAGE IS POOR
SHIFT BITS
FROM OLD56B
AND NEW56B
AC FOR
RETURN USA BITCNT

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
LHRBRN

CHROUT
CHARACTER
TO FILE

LHRCON

LINE COMPLETE?

FRAME COMPLETE?

N

Y

NOP OVEw SW
SET FOR OVERLAY
PROCESSING

LETCHR

LRTGET

GETCON

REPRODUCIBILITY OF THE
ORIGINAL PAGE IS POOR
LCALXS
CONVERT COOR. TO
FIELD UNITS

AC \rightarrow XTL
END X FIELD
COORD. FOR
VECTOR

LCALYS
Y2 COOR IN
FIELD UNITS

AC \rightarrow YTL
END Y FIELD
COORD. FOR
VECTOR

· BITCUT
ACCESS 10
BIT X1
COORD.

LCALXS
CONVERT
COORD. TO
FIELD UNITS

25

2-174
25

AC → XHD
START X FRPD COORD FOR VECTOR

LCALYS
Yi COORD IN FRPD UNITS

AC → YHD
START Y FRPD COORD FOR VECTOR

SETXYS
XY DACS

SETHDS
START COORD.

SETTLS
END COORD.

26
26

O \Rightarrow RCSP
USE SPOR
SIZE 0 FOR
VECTOR

SETPLS
SET P.L.S.
HARDWARE
REGISTERS

DRAWVEC
OUTPUT VECTOR
TO FILM

GETCOM

LCALXS

CONVERT 612
FROM 1024 UNIT
INPUT, POSITION
COOR, RESULT IN
FRAME AREA

EXIT
27

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

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

GET8BT
8 BIT CHAR. CODE

BITCNT
4 FILL + 16 BIT X COORD

LCALXS
COMPUTE FRBD X COORD -> XHD

LCALYS
COMPUTE FRBD Y COORD -> YHD

28
LANDSCAPE
SET CHAR:
DELTA_X
DELTA_Y
SIZE
3->RECSPT;
BAR CHARACTERS

SET PLS
SET PLS;
HARDWARE
REGISTERS

SET XSYS:
X+Y DAC'S
BAR START
COORD.

125->PEXCT
500->LINCOT
# PÍXELS/LINE
# LINES/H FRAME

SET END OF
TEST AND
SHADE INCRE.
MODE

LBARS 1

REPRODUCIBILITY OF THE
ORIGINAL PAGE IS POOR
SISO-TR531
Vol. II

The diagram illustrates a flowchart with the following steps:

1. LBARS1
2. END OF LINE?
   - Y: LBARS2
   - N: PBOUT
3. PBOUT
   - OUTPUT PIXEL
   - LBARS1
4. LBARS2
5. END OF INTENSITY?
   - Y: LBARS4
   - N: LBARS3
6. LBARS3
   - INCREMENT TO NEXT INTENSITY;
   - 125 → PLEXCT
   - #PIXELS/LINE
   - LBARS1

The flowchart branches and loops through these steps to process pixel data.
GRAY MODE?

Y

EXIT VIA BARS

BARCH

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

SET XYS X, Y DACS (XHD, YHD) CHAR. COORD.

VCHAR CHARACTER TO FILM

EXIT
BARVE

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

SET $x y$ DACS TO $x y$

SET $d$s FOR DRWVEC

SET $t l$s FOR DRWVEC

SET $p l$s. HARDWARE REGISTERS

DRWVEC OUTPUT VECTOR TO FILM

EXIT
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>
<thead>
<tr>
<th>VAR16</th>
<th>III161</th>
<th>III162</th>
<th>III163</th>
<th>III164</th>
</tr>
</thead>
<tbody>
<tr>
<td>III109</td>
<td>III161 GO</td>
<td>III164 FILM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>III166</td>
<td>III147</td>
<td>III185</td>
<td></td>
<td></td>
</tr>
<tr>
<td>III166 INVAR</td>
<td>III162</td>
<td>III187</td>
<td></td>
<td></td>
</tr>
<tr>
<td>III166 ADVAN</td>
<td>III162 MACRO</td>
<td>NULL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>III166 TABLE</td>
<td>III163</td>
<td>FORM1 thru FORM4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2.3.2.3 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 2, camera parameters for the 16 mm unsprockete camera are assembled.

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

G. FTYPE. If 16, indicates 16 mm film.

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

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

J. MTSIZE. Size of the teletype buffer.

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

L. NUMCAM. If 6, camera used may be changed at run time.

M. PTYPE. If 3, indicates forms are assembled for EBC.

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

O. 7TRACK. If 1, allows code for 7-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 NXTDG 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 | TXTLN | PPAGE |
   | CRGCTL | FRFLAS | HEADER | LINES  | NEXPAG| THISLN|
   | CTRLCL | 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 JOBNAM 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.
10. **TNMBR.** Counter used for reading teletype entries in **JOBTLE.**

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. **ILLEG.** 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. **FRAMFL.** 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

MTRINI
Begin double-buffered read

NEXPIC
Advance to next frame

CHECK
Get beginning control records

Was separator found?

Y

N

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
A

B

JOB TUE
Get job id info from operator

JOB ID
Output eyeball size info

SKP S_FLAG to indicate batch id entered

HEADER
Set hardware

NEXPAGE
Set up for new page

C
Load VCHTAB as the base address for the character generator.
PRNTLP

CTRLCK
Read and check for control record

VORETX controls?

NONE controls?

Load SAVCUT as character count for character generator

NEXTLN
Go to next line

GETCTRL
Get and execute carriage control

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

Terminal control?

Start character generator and print line.

Send &MTENT so CTLOOK will read next record.

G

GTINIT

PRENTLP
GTINIT

Restore tape read parameters for GTBYTE

GTNGD

GTBYTE
Get next byte

Byte = 15 ?

Y

SAMLIN

N

Byte = 14 ?

Y

NXTPG

N

Byte = 12 ?

Y

NXTLN

N

H

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
Plot the character

This record finished?

Y

LAM→MTENT so CTRUCK will read the next record

N

GTNGD

PRNTLP
Is it a 3?

Y

TERMIN

N

IMMEDSG
"ILLEGAL ENTRY"
TO TTY

MDONEX
CALL PRINT+1 since carriage controls are within record

"JMP G:INIT" -> PRNTGO to branch to single-plot loop

NOP -> CTRLX4 to check so all bytes will be checked
NONE

HSLO → PRNTO
Plot record at a time

O → XORWD
so generator will start in left byte

NOP → CTRUCK +6
so all bytes/record will be plotted

"JMS NEXT 64"
→ PRNTUP +1
to single space records

MOONER
"JMS CTRL" -> PRINTUP + 1
to process carriage control

HSGO" -> PRINTED
to plot a record at a time.

400000 -> XORED
so generator will start w right byte.

"AACL" -> CTELEK
so compensate for 1st byte in ch. count.

REPRODUCIBILITY OF THE ORIGINAL PAGE TO BE
(Part of Monitor)

GETNUM
Get the number at the IV

Was any number entered?
Y
→ UNS

Is the # ≤ 60?
N
→ FORMAT

MDDNEX

Y

FORMAT

N
CAGCTRL

Get contents of CTRU

MTTOUT

Display CTRU on the CRT

Get starting address of explanation buffer

MMESSAGE

Display message on the CRT
Get number of lines per page (INS)

Display this number on the CRT

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
FRFLAS

Overall form loaded?

Set up coordinates for overall form

FLASH

Flash the overall form

Restore coordinates

N

Y

SISO-TR531
Vol. II
$T$

If a 3rd form loaded? $\rightarrow$ Get 3rd form

If the FRMNUM form loaded? $\rightarrow$ NOFORM

If Flash $\rightarrow$ Flash it

Reset PL$S$ for print again

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
NOFORM

MONITOR
"No form" to
Try Return
to Monitor

"CONTINUE" begins
executing here

O 

PFLASX
CUTMAK

5 → RECPIN (intensity)
0 → RECSPT (spot size)

SETPOS
Set POS for cutmarks

Set first heads & tails coordinates

MRKONE

Set for 5 strokes

STROX

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR.
STROX

MOVEVER
set up for DREWVEC

DREWVEC
Draw the vector

Update x-coordinate

5 strokes for this mark done?

N
Y

STROX

AA
update x-coordinate for next mark

all 3 marks done?

N

Y

MARK ONE
MOVE

SETXYS
set x- and y-position

SETHOS
set beginning coordinate of the vector

SETTUS
set end coordinate of the vector
CTRUCK

K

MTUAC

Read next record

Compute number of characters in this record \( \rightarrow \text{SAVCNT} \)

Create first byte in this record

Is it ASCII? \( \rightarrow Y \) \( \rightarrow N \)

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
Get second byte of this record

Is it ASCII S?

Y

SPEC

N

Is it ASCII F?

Y

FREEC

N

Is it ASCII blank or T or C?

Y

LAM = MNTENT so MTHAC will read the next record

N

READUX

K

2-229
SREC

XX → JOBTUE
  to indicate job id 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 'LAC VENTAB+value'

READMX
FREC

MTwAC
Get next word

Get left-most byte of this word → FRMNUM

READNK
Get beginning x-coordinate

WAIT FOR ALL PLOTTING TO FINISH

LOAD X-DAC

ALLOW TIME FOR DAC'S TO SETTLE

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
NEXTUN

This page full?

Y

PXPAGE
Set up for next page

N

PSTULL
wait for all plotting to finish

Do carriage return and line feed

BMSTLL
allow DAC's time to settle

2-233
Enter with word containing the carriage-control in the left-most byte. Used only for VORTEX controls.
BMSTLL

-40. $\rightarrow$ MVDATA

Increment MVDATA until zero.
mcRLF
Output carriage return & line feed to TTY

Read and echo TTY entry

Is it a rubout?

Form LAC VEH T4 4 A+B value instruction & store into JOBNAM

5 entries made?

N

N

TRYRD

Y

Y

0

TRYRD

REPRODUCIBILITY OF 'T1
ORIGINAL PAGE IS POO:
STORE FILENAME INTO JOBNAME IN PROPER CONFIGURATION

RETURN AND LINE FEED TO TTY

0
Set up for first pass

Get right-most byte in GTSAVE
**Set the BUS for titling**

**FRM**

**NEXPIC**

- Advance to next frame

**Get starting x-coordinate for this frame**

**Set letter counter for this frame (LRME)**

**LTM**

**REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR**
LTR

Get instruction for finding this character pointer

Set FCNTX, FCNTY, CNTXY.

Get character pointer

DRAWCHR

Draw the character

P
Get x- and y-delta's

CHDELX, CHDELY

CHRS12
Get character size.

RECPIN
Get intensity for print.

RECSPT
Get spot size for print.
NEXPAG

PPAUE
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 $\Rightarrow$ FLASH0
so forms don't flash
TOPPAG

RESET UNONT

Get beginning y coordinate

PSICU

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

<table>
<thead>
<tr>
<th>VAR105</th>
<th>III161</th>
<th>III164 FILM</th>
</tr>
</thead>
<tbody>
<tr>
<td>105SUB</td>
<td>III161 GO</td>
<td>III185</td>
</tr>
<tr>
<td>III109</td>
<td>III147</td>
<td>III187</td>
</tr>
<tr>
<td>III166</td>
<td>III162 NULL</td>
<td></td>
</tr>
<tr>
<td>III166 INVAR</td>
<td>III162 MACRO FORM1 thru FORM4</td>
<td></td>
</tr>
<tr>
<td>III166 ADVAN</td>
<td>III163</td>
<td></td>
</tr>
<tr>
<td>III166 TABLE</td>
<td>III164</td>
<td></td>
</tr>
</tbody>
</table>
2.4.2.3 Assembly Parameters

A.xebow. 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 \( (S.\text{FLAGS} = \text{NOP}) \), 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. 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.

### E. 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
   - MESSG
   - NEXPIC
   - SETPLS
   - FICTAP
   - GETNUM
   - MCRLF
   - MTLAC
   - PSTLL

2. **Internal Routines**
   - BMSTLL
   - FRFLAS
   - IXCHCK
   - IX.DO
   - NEXPAG
   - PPAGE
   - CRGCTL
   - GTBYTE
   - IXINIT
   - JOBTLE
   - NEXTPG
   - 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 IXLDSW 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 MMESG. 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. 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 NXPAGE, 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 JOBTE.

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. **TLCRER**: 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. **TNMSGR**: Name of buffer containing the message ENTER TAPE NUMBER:

26. **ILLEGGL**: 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. \textbf{RECPIN}. Contains value to be loaded into brightness register by SETPLS.

18. \textbf{RECSPT}. Contains value to be loaded into spot size register by SETPLS.

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

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

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

Set up for double-buffered read

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

IXINIT
Initialize indexing parameters

ERSPIC
Initialize for file

CC

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
Initialize TPOINT

NOP→IFLASH so index for run won't flash on blank file.

FC7CLR
Produce blank file.

O→MAXTRW
Initialize MAXTRW

MTRINI
Begin double-buffered read.

DD
HEADER
Set PLS for print

TOPPAG
set up for beginning a new page

SKIP => IFLASW
so indexing will now be output

Load VCHTAB as the base address for the character generator

"NONE" controls ?

Y

N

GG
Load starting address (MTPTR) (Begin with right-most byte if vortex)

**TERMINAL controls?**

- **Y**
- **N**

Start character generator and plot line

If MTENT so CTTRCK will read next record

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
Byte = 15

Y: SAMLIN

N:

Byte = 14

Y: NEXTPG

N:

Byte = 12

Y: NEXTLN

N: 00

Is this the index line?

Y:

Store byte into TITARE

N: 00

2-274
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 USB

NN
Plot the character

Increment IXCENT (characters per line counter)

All bytes in this record done?

Y

LAM=MTENT
so CTRECK will read next record

N

PRINTUP
REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
CARCON

(GETNUM

Get ad
TTY

Was any
# entered?

N

FORMAT

Y

→ CTRL

Is it a 1?

Y

NONE

N

Is it a 2?

Y

VORTEX

N

AB

(Part of MONITOR)
Is it a 3?

Y

N

MMFFSG
"ILLEGAL ENTRY"
to TTY

MDONEX

TERMAL
"CLR" → PRNTUP+1
since carriage controls are within record

"JMP GTINLT" → PRNTGO
to branch to single-plot loop

NOP → CTRCK
so all bytes will be checked
NONE

'b$0' $PRTGo
plot record
at a time

0 $XORWrD
so generator
will start \( \bar{w} \) left byte.

NOP + CTRL+6
so all bytes/record will
be plotted

'SMs NEXT6N''
$PRTUp + 1
'to single space
records

MOONEX
VORTEX

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

HSGD → PRINTGD to plot a record at a time

400000 → XOPRED so generator will start w right byte

"AAC 1" → CTRLCRL to compensate for 1st byte in ch. count

MOD#EX

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
UNPAGE

(GETNUM
Get the number at the TTY

was any number entered?

Y \rightarrow UNS

N FORMAT

Is the # < 60?

Y

MDONEX

N FORMAT

PANT OF MONITOR
CAGCTRL

Get contents of CTRL

MTOUT

Display CTRL on the CRT

Get starting address of explanation buffer

MMESSG

Display message on the CRT

2-285
Get number of lines per page (lun)

Display this number on the CRT

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
FRFLES

Overall form loaded?

N

Y

Set up coordinates for overall form

FLASH
Flash the overall form

Restore coordinates
Error flag set?  

Y  

Error form loaded?  

Y  

Flash form  

N  

Flash other forms  

N  

PFLASH  

Flash other forms (if any)
FLASH
Flash it

1st form loaded?

Y

2nd form loaded?

Y

N

N

T
Is a 3rd form loaded?

Is the "FRMNUM" form loaded?

FLASH
Flash it

HEADER
Reset PLS for print again

Get 2nd form

NOFORM

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
"CONTINUE" begins executing here
IXPAGE

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

Set index line number for TERMINAL controls (IXXXXX)

NOP $ IXLD5W to indicate this page not yet indexed

Blank-fill TITARE
IXINIT

Default

INXLIN
(index line)
to 1

Default

INXCHR
to 32.

Default

IXXLLEN
to 20.
IXLOAD

Make MTPTR point to NEXBUF

Initialize GTBYTE

Vortex Controls?

GTBYTE

Bypass carriage control

A

A
A

Make II point to TITARE

B

GETBYTE
Get next byte

C

STORE in TITARE

B

all bytes transferred?

Y

N
SKP ⇒ IXLD5G

To indicate this page indexed

INXDO

Process index line

Make MTPTK
Point to CURBUF

Reproducibility of the original page is poor
LDINFO

Contents of AC (word count) → TMPCT

Make II point to TITARE

Get buffer address

Make 12 point to buffer

D
LDINFO

D

Move word from buffer to TITARE

All words moved?

N

Y

FICTAP
Process information in TITARE

D
L

MTLAC
Read next record

Compute character count and -> SAVCNT

2's complement SAVCNT
-> SAVICT

Get first byte of the record

E.

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
Is it ASCII %?

Yes: Get second byte of the record

Is it ASCII S?

Yes: F

No: Is it ASCII F?

Yes: G

No: Is it ASCII T?

Yes: H

No: N
XX \rightarrow \text{JOBLTE to indicate information is from control record}

\text{SKP} \rightarrow \text{S.FLAG to indicate info for this batch entered}

TITARE \rightarrow \text{II}
Set up for storing into \text{TITARE}

\text{Initialize GTBYTE}

\text{REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR}
1

IF BYTE

Bypass "%"

J

IF BYTE

Get next byte

STORE INTO TITARE

All bytes transferred?

N

J

Y

K
\textit{Blank-fill} \\
\textit{TITARE} \\
\textit{LAM} \Rightarrow \textit{MTCNT} \\
so \textit{MTLAE} \ will \ read \ next \ record
INXDO
Process
information
in TITARE

SKP = IXLD SW
to indicate
this page has
been indexed

SKP = IXSW
to stop
storing into
TITARE

REPRODUCIBILITY OF THE
ORIGINAL PAGE IS POOR
THIS

Is this the index line?

Y

IXLOAD
Move and process last record

M

Get starting x-coordinate

PSSL
Wait for plotting to finish

N
Reload X DAC

BMSTLL: Allow DAC's to settle
NEXT

Is this the index line?

N

O

Y

IXLOAD
move and process last record

O

Is this page filled?

Y

P

N

PSLL
Wait for all plotting to finish

Q

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

Allow DAC's to settle

Set up for new page
Enter with first word of the tape buffer in the accumulator

Get the carriage control byte

Is it 61?

Y: R

N

Is it 53?

Y: S

N

Is it 60?

Y

N: T

U

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
\textbf{BMSTLL4}

\begin{itemize}
  \item -$40 \rightarrow \text{MVDATA}$
  \item \textit{Increment MVDATA until zero}
\end{itemize}
MCRLF
(Carriage return and line feed (TTY))

Make II point to JOBNAME

Output: ENTER TAPE NUMBER: at the teletype

Read and echo the keyboard entry

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
Is it a rubout (317)?

- If yes (Y),
  - Store entry into JOBNAME
- If no (N),
  - All five entries made?
    - If no (N),
      - MCRLE (Carriage return and line feed)
      - Get ASCII configuration of file number and store into JOBNAME
    - If yes (Y),
GTBYTE

1st pass?

Y

set up for second pass

N

load indirect from mPTR

Z

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 Get SAVE
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.
AA

SETPLUS
Set hardware

Δ
REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
BB

HEADER
Reset PLS for print

SKP→ FLASSW
so forms won't flash

2-321
TOPPAGE

Reset line counter (LNCTR)

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

XPAGE

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 ENDLN, 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 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 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. **ENTER ROLL.** Output to the teletype after ENTER COM 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>
<tr>
<td>FC7CLR</td>
<td>III166</td>
</tr>
<tr>
<td>FRSPIC</td>
<td>III166</td>
</tr>
<tr>
<td>MNBRIT</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>SETTTL</td>
<td>III162</td>
</tr>
<tr>
<td>DRWVEC</td>
<td>III162</td>
</tr>
<tr>
<td>PSTLL</td>
<td>III166</td>
</tr>
<tr>
<td>SETPLS</td>
<td>III166</td>
</tr>
<tr>
<td>VCHAR</td>
<td>III147</td>
</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>
</tr>
</tbody>
</table>

2. **Internal Routines**

<table>
<thead>
<tr>
<th>BATNO</th>
<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>RTRN</td>
</tr>
<tr>
<td>GETCR</td>
<td>ENDLN</td>
<td>SEPREC</td>
<td>RESET</td>
</tr>
<tr>
<td>TYP5W</td>
<td>CONVRT</td>
<td>TITREC</td>
<td>NEWSEG</td>
</tr>
<tr>
<td>TYP1P</td>
<td>NEXFRM</td>
<td>IGNORE</td>
<td>EBGET</td>
</tr>
<tr>
<td>TYPNL</td>
<td>BITCNT</td>
<td>BTTY</td>
<td>MVCOM</td>
</tr>
<tr>
<td>TYPMA</td>
<td>GETSEG</td>
<td>BATEND</td>
<td>MAP</td>
</tr>
<tr>
<td>TYP5R</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 \(1 \leq N \leq 18\):

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

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 the TTY. 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 NBXFRM 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 $16K \times 16K$ 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 ≤ N ≤ 1023:

   \[
   \begin{align*}
   & LAC N \\
   & SCAL
   \end{align*}
   \]

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 fiché.

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

27. **RETADD.** 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. **TIINFO.** 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. FLHND. 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. **VTAILX.** Word reserved for setting of ending X vector coordinate.

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

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

INITIALIZE
TAPE HANDLER
SWITCHES:
SEG5W, BLKSW,
CH12SW

INITIALIZE
SWITCHES
IFLASW, INX5SW
FOR NO
INDEXING

FC7 CLR
INITIALIZE
FICHE
CAMERA

FRSPIC
MULTI
IMAGE
FICHE

MNBRT
TITLING
INTENSITY

1

REPRODUCIBILITY OF THE
ORIGINAL PAGE IS POOR
1

BATNO
ACCEPT TAPE AND ROLL NUMBERS

NEXPIC
ADVANCE FILM

MNBRIT
DATA INTENSITY

ADDRESS OF TAPE BUFFER IF NO FORM

FORM PROCESSING Y
ADDRESS OF TAPE BUFFER IF FORM

N

2
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

GETCOM

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
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, \( \rightarrow x\) SIGN

BITCNT LENGTH OF VECTOR DELTA Y

4.

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
4

LENGTH
of vector, + n → YSIGN

BITCUT
10 BIT
X₁ COORD

X₁ → XHD
XHD + XSIGN → XTL (X₂)

BITCUT
10 BIT
Y₁ COORD

Y₁ → YHD
YHD + YSIGN → YTL (Y₂)

5
MAP
SCALE DTE X*Y TO FRB8 UNITS

SETXYS
SET X*Y DAC'S

SETHDS
SET START COORDS. FOR DRWVEC

SETLTS
SET END COORDS FOR DRWVEC

DRWVEC
OUTPUT DTE VECTOR TO FILM

GETCOM
GETCR

MASK 3-BIT DTE OP CODE IN AC

TYPEWRITER WORD?

Y

TYPSW

N

SET CR

TYPSW

START PRNT: WORD PROCESSED

Y

SET CNTR FOR 4 CHAR.
PER TYPEWRITER WORD

N

HALT. NO COORD. FOR CHAR.

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR.
SETCR

SKP ⇒ TYPSW
ALLOW PROCESSING
OF DTE
TYPEWRITER
WORDS

BITCNT
GET DTE
CHARACTER
SIZE

ACCESS
CORRESPONDING
CHAR. HEIGHT
FROM SZTAB

SCAL
CONVERT DTE
TO FK80
UNITS

REPRODUCIBILITY OF THE
ORIGINAL PAGE IS POOR
SAVE CHAR. HEIGHT; CLEAR CHAR. SIZE COUNT;
CHAR. SIZE TABLE = SPCTAB \rightarrow II

INCR. CHRSIZE, AND GET FIRST CHAR. SIZE
FROM SPCTAB

N

FRST CHAR. SIZE ≥ DTE CHAR. HEIGH?

Y

USE DTE CHAR. SIZE (DTESIZE) FOR INDEX INTO DTXTAB - DELTA X.

SCAL
CONVERT DTE DELTA X TO FRST UNITS

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

ACCESS DELTA Y
FROM DTYTAB

SCALE
CONVERT DTE
CHAR. DELTA Y

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

RESET CH'DELX
AND CH'DELY
FOR PROPER
ROTATION

9
NOJUDX

MAP
SCALE X & Y
COORD. TO
FR&D UNIT

ENSURE FIT
OF CHAR
WITHIN Y LIMIT;
IF NOT, YHD = 0

ENSURE FIT
OF CHAR
WITHIN X LIMIT;
IF NOT, 0 = XHD

SETXYS
SET X & Y DAC'S
AS SPECIFIED
BY XHD, YHD

II

REPRODUCIBILITY OF THE
ORIGINAL PAGE IS POOR
CHTEM → AC
CHAR FROM
START PRINT
WORD

CHROUT
OUTPUT CHAR
TO FILM AT
XHD, YHD

GETCOM
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
MUBRIT
TITLE
INTENSITY

NEXPIC
ADVANCE
FILM

MUBRIT
DATA
INTENSITY

EXIT

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
12

BLKCNT + MBITUM → BLKCNT +
SET AC WITH REQUIRED BITS

EXIT

GETSEG

GETX-1

BLKCNT = 0
NEED NEW
BLOCK?

Y

GETBLK
GET NEW
RECORD
BLOCK

N

BLKCNT = 32
→ BLKCNT
SUBT. 4 BYTE
SDW LENGTH

13
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

2-363
GETS62

CCONTRL
Com Control Processor

EXIT

GETBLK

MTBYTE
Access 16 Bit Block Length

(Block Length)*8 - 32 \rightarrow BLKCONT
# of Bits in Record Block - BDW

MTBYTE
Bit Bucket Upper 2 Bytes of BDW

EXIT
SEPREC

MVCOM
S DATA FROM TAPE

INITIALIZE NO FORMS OR INDEX

FICTAP
PROCESS TITLE DATA

SET CHANNEL AND TAPE SWITCH FOR COM CONTROL PROCESSOR

IGNORE
SET SWITCHES
TO PROCESS
AS DTE AFTER
NEXT COM
CONTROL RECORD

BITCNT
IGNORE DATA
TIL NEXT SEC
OR CONTROL
RECORD

IGNORE

IGNORE

IGNORE
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
RETN

SET RETURN ADDRESS IN BITCNT TO RE-INITIATE GET MACRO

EXIT

RESET

1st Com Control?

Y

RESET1

N

SET COM RECORD SWITCHES FOR 2nd Com RECORD

RESET1
RESET

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

EXIT
SAVADD
SAVE BITCNT
PARAMS. ORIG. CALL

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

BITCNT
GET NEWSEC
BITS

AC \rightarrow NEWSGB
BITS FROM
NEW SEGMENT
TO SATISFY
GET MACRO

RESTOR
RESET ORIG.
CALL BITCNT
PARAMS

19
SHIFT BITS FROM OLD SGB AND NEW SGB \rightarrow AC FOR RETURN VIA BITCNT

EXIT
MVCom

VALIDATE → II
BUFFER FOR COM CONTROL SAVE

MVCom1

CHAR → BUFFER VIA II INCREMENT II FOR NEXT BUFFER ENTRY

MVCom2

CHAR = $ ?

Y

CHK DOL

N

BITCUT
NEXT 8 BIT CHAR. FROM TAPE

MVCom1

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
MAP

SCAL
CONVERT DTE X₁ TO FRED UNITS

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

SCAL
CONVERT DTE Y₁ TO FRED UNITS

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

SCAL
CONVERT DTE X₂ TO FRED UNITS

21

2-381
\[
\begin{align*}
X_2 + X_{\text{OFF}} & \Rightarrow X_2 \\
\text{END } X \text{ COOR.} & \text{ PLUS CENTERING OFFSET} \\
\text{SCAL} & \\
\text{CONVERT DTE } Y_2 \text{ TO} & \text{ FROM UNITS} \\
Y_2 + Y_{\text{OFF}} & \Rightarrow Y_2 \\
\text{END } Y \text{ COOR.} & \text{ PLUS CENTERING OFFSET} \\
\text{EXIT} & 
\end{align*}
\]
SCAL

NEG. COORDINATE?

Y

ERROR FORCE TO ZERO COORDINATE POSITION

N

MULTIPLY DTE COORD BY FRM FRAME SIZE AS SPECIFIED IN DFRS

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

EXIT
SISO-TRS31
Vol. II

DTESZ

GETANm
GET SETSIZE FROM TTY INPUT

SETSIZE ➔ DFRSZ
IMAGE SIZE IN FRZ8 UNITS

GETl11m
GET SECOND VALUE FROM TTY

16mm FILM OUTPUT?
Y ➔ AC ➔ PULLING NUMBER OF CAMRA PULL-DOWNS/ADVANCE
N ➔ CALCULATE LEFT AND TOP FRAME MARGINS FXLEFT FYTOP ➔ MDONEX
MMASSG
OUTPUT TO TTY
"ENTER ROLL"

TTY
ACCEPT ROLL
NUMBER
INPUT

LOAD COMPLETE
TITLE INFO
FOR TITLE FRAME
IN TITLE AREA

FICITAP
PROCESS
TITLE
DATA

EXIT
REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
BEGIN

FINISH FILE

LOAD "END" TO TITLE

CHANGE TO OUTPUT 3 TITLE LINES

MOVE TITLE TO TITLE AREA

OUTPUT END TITLE FILE

EXIT
odecext

minbrit

titrning

intensity

set pls

set p.l.s.

hardware

registers

btend

end fiché

enfin

finish fiché

0 -> picnum

reset page

count

m done

reproducibility of the original page is poor
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>Tapes</th>
<th>Tapes</th>
<th>Tapes</th>
<th>Tapes</th>
</tr>
</thead>
<tbody>
<tr>
<td>III109</td>
<td>III196</td>
<td>III147</td>
<td>III161 GO</td>
</tr>
<tr>
<td>III166</td>
<td>III164</td>
<td>III162</td>
<td></td>
</tr>
<tr>
<td>III185</td>
<td>III163</td>
<td>III161</td>
<td></td>
</tr>
</tbody>
</table>
2.6.2.3 Assembly Parameters

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

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

C. **FONT.** If 0, defines 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. **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/)
XXXXXXXXX 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 PBUSZ 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 RAD50 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>SETHPS</td>
<td>III162</td>
</tr>
<tr>
<td>FRSPIC</td>
<td>III166</td>
<td>SETTLS</td>
<td>III162</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>
</tr>
</thead>
<tbody>
<tr>
<td>FLMOUT</td>
<td>JSEP</td>
</tr>
<tr>
<td>NXTPC</td>
<td>CUTMAK</td>
</tr>
<tr>
<td>PLSET</td>
<td>ZRD50</td>
</tr>
<tr>
<td></td>
<td>TELKBR</td>
</tr>
<tr>
<td></td>
<td>OUTTY</td>
</tr>
<tr>
<td></td>
<td>EXDSP</td>
</tr>
<tr>
<td></td>
<td>PLCE</td>
</tr>
<tr>
<td></td>
<td>INTTY</td>
</tr>
<tr>
<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. **ZRD50.** Converts the contents of the AC from RADS0 to three seven-bit ASCII characters. Calling sequence: JMS ZRD50.

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.


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. **FOLPTX.** 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. **STOCSSW.** 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. **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. **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.
PDP

Zero FOR, CURR, LEN, CUR, LNC
Set CUR, MN, MN, and POFT13
Do RC7 CLR, FASPIC

Initialize fields to STOP instruction
INX; SW to NOP instruction

MTRINI
Initialize tape routines

SEP
Read, decode
tape label
place on film

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
NXT PC

Inducing active?

Y

first time?

Y

TOP PAC
Position forms coordinates to top of page

PP PAC
Flash form

I0

N
Zero advance indicator

Set first line flag not zero

SETILL
Set precision light source

SETRYS
Set x,y coords to top of page

---

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
All Characters output?

Y

EXIT

N

E
OUTTY

GETC
Get a char from a line buffer

TELKBW
Output char to teletype

End of line buffer?

Y

EXIT

N'

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
INTTY

TELLBK
Read a char. from teletype

PUTC
Place char in line buffer

Carriage return

N

Y

EXIT
GETC

Save 17g register

Right char position?

Y: Step intnl/charac position

N: Calculate word displacement

1,7
Load accumulator with word from the location

Left byte?

Y

Shift accumulator 8 bits right

N

Mask off high order bits and save

18
18

Restore MQ register

Load accum. with result

EXIT
**SISO-TR531**
**Vol. II**

```
TELRBR

Keyboard busy?

Y

Load accumulator from TTY buffer

TELKBW

Write char to TTY

EXIT

N

REPRODUCIBILITY OF THE ORIG. A PAGE IS POOR
```

2-421
Load accumulator with right char mask

Left character?

Load accumulator with mask for entire word

Mask the loading calculated and load character
Algorithm flowchart:

1. **Left Char?**
   - If **Y** (Yes), proceed to next step.
   - If **N** (No), exit the algorithm.

2. **Shift left 8 bits**
   - OR character to calculated location and restore MG register.

3. **EXIT**
Write character 77Y

TTY busy?

Carriage return?

Write line feed character 77Y

A

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
SETVCH

Save list address

Previously called?

Store previous list address in location 16

Get next code in list.
End of list?

Y

N

Calculate core cell in VENTAB and reset high order bit

Store current list address in location 16

Get first code in list

26

A

27

B
End of list?

Y

N

EXIT

calculate corr cell in vectraB and set high order bit.
Load
Receive
Load max
character count using HSLC
Load vector table address into Buf Addr using HSLB
Load data dispatch address using HSLA
QH5GO
Save dispatch addr and destination address

REPRODUCIBILITY OF THIS ORIGINAL PAGE IS POOR
Start high speed character gen HS0

High speed char generator busy?

Y

N

Read half addr using HSRA

Subtract 1 hour position from half addr and store
Read step code using HSAB

Stopped because found step char?

Yes (Y)

No (N)

Load max char count using HSIC and continue using HSICF

EXIT
EX DSP

A

Save step addr and destination addr.

Out word containing step char

Is step char on left?

Y

No

Shift step char to right side

N

J2

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
32.

Store step character in destination

Calculate returning dispatch address

Is step char a buffer end?

Y 33

N

LP3TS
Read next tape buffer

33
Was orig stop char a buffer end?

Y

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:

<table>
<thead>
<tr>
<th>III109</th>
<th>III186</th>
<th>III147</th>
<th>III161 GO</th>
</tr>
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<tbody>
<tr>
<td>III166</td>
<td>III164</td>
<td>III162</td>
<td>III166</td>
</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 III164.

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>
<td>III162</td>
</tr>
<tr>
<td>NEXPIC</td>
<td>III166</td>
<td>SETXYS</td>
<td>III166</td>
</tr>
<tr>
<td>SETPLS</td>
<td>III166</td>
<td>SETHPS</td>
<td>III162</td>
</tr>
<tr>
<td>KYBLIS</td>
<td>III166</td>
<td>SETTLS</td>
<td>III162</td>
</tr>
<tr>
<td>FRSPIC</td>
<td>III166</td>
<td>MTBYTE</td>
<td>III163</td>
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<tr>
<td>DRWCHR</td>
<td>III162</td>
<td>MCRLF</td>
<td>III166</td>
</tr>
<tr>
<td>GETT</td>
<td>III163</td>
<td>MMFSSG</td>
<td>III166</td>
</tr>
</tbody>
</table>

2. **Internal Routines**

   | FLMOUT | JSEP | GETC | TELKVW | QHSGO | JSEP2 | NXTFC | CUTMAK | PUTC | OUTTY | EXDSP | PLCE | PLSET | ZRDSO | TELKBR | INTTY | SETUCH |

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.
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 (YINDX, XINDX, 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. **LNBUC.** 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. **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.

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. **CHRNSZ.** 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 FOR, CHARKEY
LEMCNT, ADV, EPG
Set CURBOF, NEXTPE
and PMUF5B
Do FC7 CLR, FR3PEC

Initialize factors
to SKIP instruction,
INXSSW to NOP
instruction

INITI0
Initialize tape
routines

SEP
Read, decode
tape label as
place on film

REPRODUCIBILITY OF THE ORIGI NAL PAGE IS POOR
FLOWOUT
Output contents of current line buffer to film

Reset line character pointer to zero

line feed 12\h

first character?

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR

2-448
Flowchart:

1. Check control character.
   - Yes: Proceed to step A.
   - No: Check previous character.

2. Check previous character.
   - Yes: Feed 130.
   - No: Check control character.

3. FLIM OUT
   - Set ADV.
   - Output a line of characters.

4. KVGLES
   - Enter monitor for interrupts.

5. Check control character.
   - Yes: Proceed to step A.
   - No: Proceed to step N.
As a carriage return, line feed or film

First character = /

PUT C
Place character in line buffer

A
FLMOUT

First time?

Y

Advance film

N

ASCII V output contents of line buffer

Do carriage return line feed on film
Incsem en e line count

Advance film?

Yes

NXT PC Advance frame

Reset line counter

EXIT

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
SISO-TR531
Vol. II

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
TOPPING

Add 73 scope points to text in Y direction

Subtract 10 scope points in X direction

Set x-y page coordinates

EXIT
JSEP

EROS

3 words complete?

N

Y

NXTPC
Advance frame

E

DRWCHR
Draw a char on film

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
All Characters output?

Y

EXIT

E
OUTPUT

GETC
Get a char from a line buffer

TELKBW
Output Char to teletype

End of Line Buffer?

Y

EXIT

N
INITTY

TELEKBK
Read a char from teletype

PUTC
Place char in line buffer

Carriage return?

EXIT
Load accumulator with word from the location

Left byte?

Yes

Shift accumulator & bits right

No

Most bits high order bits and save

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
Restore MQ Register

Load accum. with result

EXIT
PUTC

Save MQ register

Right character position

Yes

Stop initial character position

Calculate word displacement

Yes

...
Load accumulator with right char mask

left character?

Y

Load accumulator with mask for 12-bit word

N

Mask the location calculated and load character

22
Left Char?

Y

Shift left 9 bits

N

OR character to calculated location and restore MQ register

EXIT
```
TEKROW

Write character to TTY

TTY busy?

Carriage return?

Write line feed character to TTY
```
TTYCRC

INITY
Read message from TTY

Message contain carriage returns only?

Y

N

ctlrec
Interpret the message as control message

EXIT

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
ctl rec

is this Y

f

no

for y and indexing

no

exit

initialize frame number from message id to parameter

initialize x as y indexes and number of chars
TELKBR

Keyboard busy? Y N

Load accumulator from TTY buffer

TELLBW
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

<table>
<thead>
<tr>
<th>Routine</th>
<th>Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>FCFIN</td>
<td>III166 ADVAN</td>
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<td>FC7CLR</td>
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<td>FICTAP</td>
<td>III188</td>
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<td>FRSPIC</td>
<td>III166 ADVAN</td>
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2. Internal Routines

<table>
<thead>
<tr>
<th>BUM</th>
<th>GTIN</th>
<th>PLSET</th>
<th>SETAD</th>
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<tr>
<td>DUMRD</td>
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<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 initialing 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. CHRSIZ. 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 III185 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 III163.
12. MTCNT. Variable containing number of words remaining in tape buffer.
13. MTPTR. Variable which is pointer into tape buffer.
14. MTTARE. 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.

21. **TMPCT**: Variable temporary storage and count.

### 2.8.3.4 Flow Charts

See following pages.
SISO-TR531
Vol. II

SET TAPE
BUFFER ADDRESS
& BUFFER SIZE

MTRNIS
INITIALIZE TAPE HANDLE

SET TPIONT
TO $ICTB
FICHE TITLE TABLE

SET FCCUTS
TO $IC0
CUT MARK

REPRODUCIBILITY OF THE
FINAL PAGE IS POOR
ROPT
SAVE READ PAR

SETAD
SAVE OFF ADDRESS OF CHARACTER

RESET
SET SPACING FOR GAP LEVEL

ADD 4 TO MTCNT
READ WORD COUNT

ADD 4 TO MTPTAR
READ POINTER
SET ROLN REPEAT LINE COUNT TO 9

SET PEXCT PIXEL COUNT TO 120

GTJN OUTPUT LINE F GRAY LEVEL

B
SET X DAC FOR OUTPUT EBCDIC CHARACTER

PLSET
SET SPACE FOR EBCDIC CHARACTER

EBCDC
OUTPUT EBCDIC CHARACTER

PESET
SET SPACING FOR PIXEL SPACING

SET PEXT TO 120 NUMBER PIXEL PER LINE

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
SISO-TR531
Vol. II

SET X COORD

GO LINES

NEYPIC
ADVANCE FRAME

A

2-494
TREC

GETTY
GET 1ST CHARACTER FROM TAPE

COM CONTROL RECORD (DA)

Y

GETTY
GET 2ND CHARACTER FROM TAPE

(T)

N

MONOLY (CONTROL ERROR)

EXIT MONITOR

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
MTEFF
E&F MASSAGE

STORE -1
IN MTCNT
WORD COUNTER

MTLAC
READ
PHY RECORD

BUMP
ADD TO
MTCNT, MTPRT

RETURN
MVCOM

LOAD ADDRESS OR TTY BUFFER IN INDEX II

STORE CHARACTER IN TTY BUFFER

CHARACTER (C97)

GET 8
GET NEXT CHARACTER

ADD 1 TO CHARACTER COUNT

Y

N
SISO-TR531
Vol. II

```
\[ N \]

\[ \text{CHARACTER (M)} \]

\[ Y \]

\[ \text{GET TY} \]

\[ \text{GET NEXT CHARACTER} \]

\[ N \]

\[ \text{STORE CHARACTER IN TTY BUFFER} \]

\[ \text{ADD 1 TO CHARACTER COUNT} \]

\[ \text{CHARACTER ($$)} \]

\[ Y \]

\[ E \]

\[ F \]

\[ N \]

\[ F \]

\[ E \]

REPRODUCIBILITY OF THIS ORIGINAL PAGE IS POOR
```
PSET

SET DELTA X TO 65

SET DELTA Y TO 50

SET CHARACTER SIZE, INTENSITY TO 6

SET PLS, REINITIALIZE REGISTER

RETURN

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
GTIN

SET NUMBER OF TIME TO REPEAT PIXELS TIME

PICK INTERN FROM TAPE

Y

TRANS INTEN TO REV FOR DIRECT OUTPUT

STORE REV INTEN IN INTEN TABLE

N

PICK UP REV INTEN FROM INTEN TABLE

V

V
$\text{INTENS POINT}$

SPACE OVER BY $\Delta X$ 6F10

REPEAT PIXELS TIME

RETURN & FIN
REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
SET PICK whole
WORD TO YES
SKP -> RDSW1

MOVE H12C TO ENT

RETURN
SETAD

PICK UP
TABLE BUFFER
POINTER, SUBTRACT
1 = ADDSV

RETURN
R5PT

RESTORE
READ WORD
COUNT
RD CNT >
MT CNT

RESTORE
READ BUFFER
POINTER
RD PTR =>
MT PTR

RETURN
2.9 COMA IBM SYSSOUT 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 GETLN4, which sets up for the print loop. Otherwise, the carriage controls are interpreted by GETHCD and GETLN5. SKTOCH is called to process the carriage control or page eject and control goes to GETLN4 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.
### External Linkages

<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>MTOUT</td>
<td>III166</td>
<td>JMS MTOUT</td>
</tr>
<tr>
<td>MCRLF</td>
<td>III166</td>
<td>JMS MCRLF</td>
</tr>
<tr>
<td>NEXPIC</td>
<td>III166 ADVAN</td>
<td>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>
</tr>
<tr>
<td>MVDATA</td>
<td>III166</td>
<td>JMS MVDATA</td>
</tr>
<tr>
<td>MNLSIZ</td>
<td>III166</td>
<td>MNLSIZ</td>
</tr>
<tr>
<td>FRSPIC</td>
<td>III166 ADVAN</td>
<td>FRSPIC</td>
</tr>
<tr>
<td>FLASH</td>
<td>III187</td>
<td>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 Linkages

<table>
<thead>
<tr>
<th>Routine</th>
<th>Calling Sequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>LBDATA</td>
<td>JMS LBDATA</td>
</tr>
<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>PRSETX</td>
<td>JMS PRSETX</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>
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. PRLNFD calls PRLNFS.

E. PRLNFS. Does one linefeed and a page eject if at a page boundary.

F. PRSCTX. 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. FCAAFF. 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. NFRMNNM. 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

LDATA
PROCESS
TAPE
LABEL

MTINIT
INITIALIZE
Tape
Routines

SET FLAG FOR NO
ADVANCE ON
FIRST SKIP TO
CHANNEL

AA

REPRODUCIBILITY OF THE
ORIGINAL PAGE IS POOR
AA

INITIALIZE FOR NOT FLASH FOAM

10^5 mm

Y

N

FRS PIC
INITIALIZE FOR FIRST PICTURE

NEXT PAGE
FORCE PAGE EJECT

GETLINE
GETLN1

GETREC

GET POINTERS TO MAGNETIC TAPE DATA

GETNULL

FINDCH

UPDATE POINTERS

ENOUGH CHARACTERS IN RECORD

Y

GETLN1

CALCULATE LINE LENGTH AND BYTE COUNT

GETIBM

N
GETLN3

FINDCH
GET CARRIAGE CONTROL

REMARK

Y
GETNL

N

III FORMAT

Y
GETLSA

N

CONVERT CARRIAGE CONTROL TO I.I.II FORMAT

GETLSA
GETLN5

ASA
SKIP TO CHANNEL 11

N

CONTROL FOUND IN OTHTAB

Y

GETSBT

PRINT "UNKNOWN CONTROL" ONTTY AND DO SPACE BEFORE PRINTING

Y

FPROC

GETLN5
FCPROC

SET FLAG FOR PROCESS AFTER

NEXPAG
GO TO NEXT PAGE

SET PRINT LOOP TO STORE AWAY FICHE CONTROL LINE

FCAAB
NEWJB1

INITIALIZE
PRINT
PARAMETERS

NEXPAG
FORCE
PAGE
EJECT

105 mm

GETLN

PKYBL5
CHECK FOR
OPERATOR
INTERRUPT

GETLN

FRSPIC
INITIALIZE
FOR FIRST
PICTURE

FCFIN
FINISH
LAST
FICHE

REPRODUCIBILITY OF THE
ORIGINAL PAGE IS POOR
LBDATA

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

Yes

New Job

Search for Channel's Line Number

No

Prcgg

Sktoc5

Y

Linefeed: Count 2eed

No

Sktoc5

Y

Prlnpd: Do Linefeed

Reproducibility of the Original Page is Poor
REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
TOP PAG

RESET LINE NUMBER AND COUNT

RESET Y DAC AT STARTING POSITION

PRESET X
RESET X DAC
PFLASH

FORM REQ

SET POINTER FOR NULL FORM

FLASH FORM

CC

ANOTHER FORM REQ

BB

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR

2-551
BB

REQ FORM LOADED

Y

N

PREPARE TO TYPE NO FORM MESSAGE TO OPERATOR

MONANT

FLASH FORM

CC

PKYBLIS

KYBLIS

CHECK FOR INTERRUPT FROM OPERATOR
INSET

SINGLE CHAR MODE

N

Y

FORCE PRINT LOOP TO STORE INDEX LINE IN TITLE BUFFER

SET UP TO SKIP LEADING BLANKS IF REQUESTED

INITIALIZE TITLE BUFFER
CUTMAK

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.
BUILD POINTERS IN BUFFER AREA FOR MULTI-BUFFERING

SET DATA READY ON 1ST BUFFER

POKEMS
START ANOTHER READ
GET TAPE STATUS

EOF

OTHER ERROR

REC TOO LONG

CHANGE BUFF BUSY TO DATA AVAILABLE
CHANGE POINTER TO NEXT BUFFER

POKEOF

POKERR

POKER
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>File</th>
<th>File</th>
<th>File</th>
<th>File</th>
</tr>
</thead>
<tbody>
<tr>
<td>III109</td>
<td>III104</td>
<td>III147</td>
<td>III188</td>
</tr>
<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. \textbf{WEDGE}. Defines code to allow nine step wedges to be placed on ID fiche.

B. \textbf{7-TRACK}. If 1, indicates data will be coming from a 7-track tape drive.

C. \textbf{FONT}. If 0, indicates standard I.I.I. character FONT.

D. \textbf{TAPELB}. If 1, indicates standard IBM tape labels.

E. \textbf{NASA}. If 1, indicates special characters used at JSC.

F. \textbf{EBCDIC}. If 1, indicates standard IBM EBCDIC character set.

G. \textbf{LOCASE}. If 1, indicates lower-case character set.

H. \textbf{BIGBUF}. If 0, allows maximum amount of features with minimum buffer space.

I. \textbf{MTSIZE}. Defines length of system tape buffers (513 words).

J. \textbf{MTTSIZE}. Defines length of teletype buffer (192 words).

K. \textbf{MANYUP}. Indicates that page count is printed with frame count when the accounting information is output to the teletype.

L. \textbf{FTYPE}. Indicates the fiche camera.

M. \textbf{DSKMON}. Indicates that disk monitor routine is to be assembled.

N. \textbf{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, RWD, 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 fiche 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 153 mm fiche (8 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. **TITLE ERROR.** This is output to the teletype when the title record is in error.

c. **JOB ID NO.** The title information is output to the teletype along with this message.

d. **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. **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. **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. **Linkages**

1. **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>MDOUT</td>
<td>III166</td>
</tr>
<tr>
<td>MDOWNEX</td>
<td>III166 INVAN</td>
</tr>
<tr>
<td>MCRLF</td>
<td>III166 ADVAN</td>
</tr>
<tr>
<td>MMESSG</td>
<td>III166 ADVAN</td>
</tr>
<tr>
<td>MONOUT</td>
<td>III166 INVAR</td>
</tr>
<tr>
<td>MTRINI</td>
<td>III163</td>
</tr>
<tr>
<td>NEXPIC</td>
<td>III160 ADVAN</td>
</tr>
<tr>
<td>MNBRTI</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>

2-572
2. Internal Routines

<table>
<thead>
<tr>
<th>Routine</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BATNO</td>
<td>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.</td>
</tr>
<tr>
<td>BATEND</td>
<td>Outputs the trailing ID fiche at end of job. Calling sequence: JMS BATEND.</td>
</tr>
<tr>
<td>BTTY</td>
<td>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</td>
</tr>
<tr>
<td>CKCOM</td>
<td>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.</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 LBTID

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 RDSWI
JMS RDWD
```
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:

\[
\text{LAM} -N
\]

\[
\text{JMS SAVCH}
\]

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 addresses 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. **PBUFSZ.** Constant containing number of words in tape buffer (700).
21. **PGNAME.** Constant containing program name HCO.
22. **RBCPIN.** 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. **BEGN.** 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. **CHDE LX.** 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.
SET TAPE
BUFFER
ADDRESS
AND SIZE

INITIALIZE
TAPE HANDLER

ZERO JOB
COUNT

SET TITLED
TO NAP

COUNT JOB

Y
N
REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR.
SET NO. LINE TO OUTPUT PER FRAME

PICK INTEN

INTEN

10^4

N

SET INTEN TO 77

TRANS INTEN AND STORE IN HOLD INTEN

Y
IN TEN = IN TEN + 8

ROTATE
ROTATE 90°

SETXYS
SET STARTING XY

RESET
SET DELTA X AND Y FOR PIXEL

SET " 9 PIXEL PER LINE

END
OUTPUT FULL LINE

SET GETSW TO NOP

SET INDEX TO HOLD BUFFER

CRT DQ CARRAGE RETURN

REPEAT SAME LINE 9 TIMES

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
SET X_DAC
FOR OUTPUT
EBCDIC CHARACTER

PLSET
SET SPACE
FOR EBCDIC CHARACTER

ECBCD
OUTPUT &
EBCDIC CHARACTER

PSSET
SET SPACING
FOR PIXEL SPACING

SET_PSEXCT
TO 120
NUMBER PIXEL
PER LINE
LOAD ADDRESS OF TTY BUFFER IN INDEX II

STORE CHARACTER IN TTY BUFFER

CHARACTER (C=77)

GETTY
GET NEXT CHARACTER

ADD 1 TO CHARACTER COUNT

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
MERGE TWO CHARACTERS IN ONE WORD

STORE WORD IN CHARACTER BUFFER

STORE ALL CHARACTER

RETURN SAGH
PLSET

SET DELTA \( \gamma \)
To 65

SET DELTA \( \tau \)
To 50

SET CHARACTER
SIZE, INTEN
To 6

SET PL
REINITIALIZE
REGISTER

RETURN
Diagram:

1. **ECU**
2. **Load number character to output**
3. **Load dispatch address**
4. **Load address of buffer to be output**
5. **Output the buffer**
6. **Return**
TRANSPORT INTEN TO REV FOR DIRECT OUTPUT

STORE REV INTEN IN INTEN TABLE

PICK UP REV INTEN FROM INTEN TABLE

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR

2-608
REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR.
B'TEND
END BATCH
ID

ECEN
FINISH
THE
ETCHE

ZERO
PAGE COUNTER

MDONE
RESET

SET DELTA X TO 10

SET DELTA Y TO 10

SET SPOT SIZE TO 5

SET HARDWARE

RETURN
RDWD

1ST TIME FOR LINE

No

SET 1ST TIME TO NO

SAUCH
SAVE A CHARACTER IN CHARACTER QUEUE

GETCS
GET INTER

RETURN

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR.
SKIP FRAME REC

Y

N

NO

RETURN

RETURN

YES

WAS NEW RECORD READ?

N

Y

MV DATA BACKSPACE 1 BLOCK

RETURN

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR.
STEP THRU THE RECORD

NEXT
ADVANCE A FRAME

I
RSPT

RESTORE
MAC TAPE
WORD COUNT

RESTORE
MAC TAPE POINTER

RESTORE
MAC TAPE SW

RESTORE
MAC TAPE BIT COUNT

RETURN
ADD 1 TO JOB COUNT

LIST ONLY

Y

LIST ON

OUTPUT
TIME TO TTY

SET 1ST TIME SW TO N

STEP DOWN TO NEXT LOC RECORD
GETTS
GET 2ND CHARACTER

TITLE RECORD

ADD 1 TO DB8 COUNT

LISTON

LISTON
OUTPUT TITLE TO TTY
SISO-TR531
Vol. II

- SKIP SPEC TITLE
- YT
- RSR
- RESTORE POINTER
- SUBTRACT 1 FROM JOB COUNT
- RETURN
REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
SISO-TR531
Vol. II

Diagram:

1. TTCHAR
   GET A CHARACTER FROM TITLE AREA

2. CHARACTER (L)
   Y
   - MMESSG
     OUTPUT JOB ID NO
   N
   - MDIRT
     OUTPUT JOB BID
   - MER LP
     DF CARRAGE LINE FEED
   RETURN
TTCHAR

PICK 8 BIT EBCDIC CODE FROM TITLE

CONVERT 8 BIT TO 6 BIT MACHINE CODE

RETURN
LISTEN

MOVE TITLE TO TITLE AREA

OUTPUT TITLE TO TTY

RETURN

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR

2-634
SISO-TR531
Vol. II

LOAD
(BEGIN)
IN TITLE
AREA

MESSAGE
DISPLAY
CENTER
SOURCE TAPE

TTY
ACCEPT
SOURCE
TAPE

MESSAGE
DISPLAY
CENTER COM
TAPE

TTY
ACCEPT
COM PAPB

X
ILLEGAL CHARACTER

TRANS 6 BIT AS CD2 TO 8 BIT EBCDIC

STORE CHARACTER IN BUFFER

$D CHARACTER STORE

MCR LF & CARRISE RETURN

RETURN
FILL OUT 12 CHARACTER WITH SPACE

RETURN

PICK BUFFER ADDRESS

RETURN
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>
</tr>
<tr>
<td>III164</td>
<td>III147</td>
<td>III161 GO</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. **PTYPE.** 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

 LINE SKIP NO. = 0 THRU 63

 45 WORDS
   1 LOGICAL
   RECORD

 180 WORDS
   1 PHYSICAL
   RECORD =
   1 BUFFER

DOUBLE
BUFFER
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 Fielddata 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

<table>
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<tr>
<th>Routine</th>
<th>Program</th>
<th>Calling Sequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTLAC</td>
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<td>ROTATR</td>
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<tr>
<td>SETOMU</td>
<td>III166</td>
<td>JMS SETOMU</td>
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</table>
2. Internal Calling Routine Sequence

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<th>Program</th>
<th>Calling Sequence</th>
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<td>III166</td>
<td>SETPLS JMS SETXYS</td>
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<td>SETXYS</td>
<td>III166</td>
<td>LAC X-COORDINATE</td>
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<td>FICTAP</td>
<td>I1I186</td>
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<tr>
<td>FLASH</td>
<td>PRO187</td>
<td>FLASH</td>
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</table>

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 ($T) 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 MTPTR 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 completes and stores CHRCNT, the character count, in the locations MCHCNT and IXLEN.

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. **RDPTTR.** 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. **UBYT1**. Location used to store bits 6-11 of a particular word.

28. **UBYT2**. 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. **CHDELX**. Word used to set the delta X.

5. **CHDELY**. Word used to set the delta Y.

6. **CHRSIZ**. Word containing the character size.

7. **RECPIN**. Word containing the intensity.

8. **RECSPT**. 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. **IFLASW.** Flag used to determine if the index form is to be flashed.

2.11.3.4 **Flow Charts.** See following pages.
[Diagram showing flowchart with labeled nodes: SETBYT, RESET BYT INDICATORS, MVCOM, COM RECORD TTYBUF, FICTAP, DECODES RECORD & FINISH PREV FILE, HEADER, READY'S PROG FOR NEW FICHE, TOPPAG, SETS X-Y COORD FOR NEW PAGE, RSPT, POINTERS TO NEXT LOGICAL RECORD, RDPT, SAVE POINTERS TO BUFFER, MTLAC, GET NEXT WORD FROM BUFFER, CONTROL RECORD?, N, Y, MTLAC, GET SECOND WORD OF CONTROL, JOB, SEPARATOR RECORD? N, Y]
SET POINTERS TO PROCESS AS REGULAR DATA

END OF TAPE?

Y
N

SET PARAMETERS TO OUTPUT DOUBLE END OF FILE

NEXT PAGE AND FRAME ADVANCE

FINISH FOR END OF RUN

MONOX OUTPUT 'CONTROL ERROR' TO CONSOLE

PART OF TITLE?

Y
N

FORM RECORD?

Y
N

ROTATIONAL RECORD?

Y
N

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR.
SISO-TR531
Vol. II

E

SETBYT
RESET BYTE
INDICATORS

MYCOM
COM RECORD
→ TTYBUF

DICTAP
DECODE
COM RECORD

TOPRAG
SETS X-Y
COORD FOR
NEW PAGE

J

SET UP TO
DEFAULT TO
COMIC MODE

ROTATE
PROCESS
THE MODE

C

SETBYT

RESET FLAGS
IN 3 WORDS
FOR BYT3WD
ROUTINE

C

2-657
PROCESS AND OUTPUT 132 CHAR IN TTYBUF

ADD ONE TO LINE SPACING COUNT

LINE FOR INDEXING?

MLTAC GET LINE SKIP NUMBER

LINE COUNT = 0?

COMPLIMENT COUNT

LOAD AC WITH A -1.

SETXYS RETURN

FULL PAGE?

2-659
INXOUT

SETBYT
RESET BYTES

STARTX
CLEAR TTY INDEX

DETERMINE BEGINNING WORD AND BYTE IN BUFFER

BYTE2WD
GET BYTE TO BE MOVED

BYTE TO BE STORED?

STORE BYTE

ALL BYTES STORED?

INKDO
SAVE INFO FOR INDEX FRAME

RESTORE INSTRUCTION IN BYT3WD

BYTE3WD
GET BYTE TO BE STORED

P
S
Q
R
STARTX

SET SWITCH FOR INDEXING

SET UP COUNTER FOR NUMBER CHAR TO GET

TOPPAG

SET UP X-Y COORD AND NEW LINESCNT FOR PAGE AND FORMS

SETXYS
SETS THE X-Y DACS

BYTE2WD

Y

ALL THREE BYTES PROCESSED

W

SEPARATE BYTES AND STORE IN ONE WORD EACH. GET FIRST BYTE

W

SECOND BYTE PROCESSED

Y

GET THIRD BYTE

N

GET SECOND BYTE

GET SECOND BYTE
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.

<table>
<thead>
<tr>
<th>III109</th>
<th>III185</th>
<th>III162</th>
<th>III187</th>
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<tbody>
<tr>
<td>III166</td>
<td>III163</td>
<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
*

2-670
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 (III166) 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 SETXYS 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

1. External

<table>
<thead>
<tr>
<th>Routine</th>
<th>Program</th>
<th>Calling Sequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTLAC</td>
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Flash

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LAC X-COORDINATE
LAC Y-COORDINATE

(DAC FRMPTR)

FLASH
## 2. Internal Calling Routine Sequence

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### 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 JOBNN.

23. **SAV13.** Temporary save location used in subroutine JOBNN.

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. **UBYTE1.** Location used to store bits 6-11 of a particular word.

32. **UBYTE2.** 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.
(1)

MATLAB
READ NEXT WORD

JOB SEPARATOR RECORD?

Y

C

NEW PAG
PAGE AND FRAME ADVANCE

HEADER READIES PROG. FOR NEXT JOB.

SET PARAMETER TO SKIP FLASHING

D

B

MONOUX
OUTPUT CONTROL ERRORS TO CONSOLE

WAIT FOR OPERATOR COMMAND

D

SETBYT
RESET BYTE INDICATORS

MVCOM
JOB RECORD TTYBUF

JOBNM
SIX CHAR JOB NAME OUTPUT

2
PART OF TITLE?

FORM RECORD?

ROTATION RECORD?

END OF TAPE?

SET PARAMETERS TO OUTPUT DOUBLE END OF FILE

NEXT PAGE AND FRAME ADVANCE

MTE OFF FINISH FOR END OF RUN

SET POINTERS TO PROCESS AS REGULAR DATA

G

I

J

K
SISO-TR531
Vol. II

MVCOM

SET PARAMETERS TO MOVE JOB NAME INTO TTYBUF

BYT3WD

GET NEXT BYTE

ALL CHARS MOVED?

Y

W

N

NXWD

GET NEXT WORD FROM STORAGE

BYT3WD

ALL 3 BYTES PROCESSED

N

Y

SEPARATE BYTES AND STORE IN ONE WORD EACH. GET FIRST BYTE

SECOND BYTE PROCESSED

GET THIRD BYTE

GET SECOND BYTE

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
SET NEW
DELTA X AND Y,
CHAR SIZE AND
INTENSITY

SET PLS
UN BLANKS
PRECISION
LIGHT SOURCE

NMGET

PROCESS
3 CHARS.

EBGET
CONVERT TO
BINARY

NMGET

EBGET
CONVERT TO
BINARY

Y

BVT3WD
GET NEXT
BYTE

MULT, LAST
DIGIT BY 10; ADD
TO LAST DIGIT,
STORE

ALL DIGITS
PROCESSED

N

Y

2-691
2.13 COMA LACIE STATUS MODULE (PFC, 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

STATUS JMS STATUS
DREAD JMS DREAD
DWRITE JMS DWRITE
FINDIR JMS FINDIR
DRDBLK JMS DRDBLK
INSERT JMS INSERT
DCLEAR JMP DCLEAR
DDMT JMP DDMT
DMTGO JMS DMTGO
DCKRDY JMS DCKRDY
DREWI JMS DREWI
DMTWRT JMS DMTWRT
DBKSP JMS DBKSP
DRDEOF JMS DRDEOF

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.
FINDIR

DREAD
READ
MASTER
DIRECTORY

USER
DIRECTORY
ON
DISK

Y

DNODIR

N

DREAD
READ
USER
DIRECTORY

FILE
ON
DISK

N

DNODIR

Y

DGDIR

SAVE ADDRESS
OR FIRST
BLOCK
(DIADDR)

IS
ADDRESS
ZERO

N

DNODIR

Y

DGDIR

REPRODUCIBILITY OF THE
ORIGINAL PAGE IS POOR
INSERT

COMPUTE STARTING BUFFER ADDRESS

IS BUFFER FULL

Y

DFLL

N

FLAG BUFFER AS FULL

INSERT NEW DATA BUFFER INTO BLOCK
DDMT

GET TAPE UNIT NUMBER AND SAVE IN DTAP

DCKRDY WAIT UNTIL DRIVE READY

REWIND TAPE

SET PASS TO 1
SET COMMAND TO WRITE

HAVE FIRST BLOCK ADDRESS

N
GET FIRST BLOCK ADDRESS

Y
DBF1

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
DBF1

DREAD
READ
DISK
BLOCK

SET DIA5BF
TO
1

DBF2

COMPUTE
BUFFER
STARTING
ADDRESS

BUFFER
FULL

N
DPAS2

Y

DBC
Algorithm:

1. **DPAS2**
2. **FIRST PASS**
   - **Y**: 
     - **DRDEOF**: CHECK DOUBLE . EOF
     - **DREWI**: REWIND TAPE
   - **N**: 
     - **DMTWRT**: WRITE EOF
3. **DMTWRT**: WRITE EOF
4. **SET PASS TO 2**: 
   - **SET COMMAND TO READ/COMPARE**: 
     - **DREWI**: REWIND TAPE
     - **DBF1**
DMTWRT

SET RE-TRY NUMBER TO 10

PASS = 1

Y

SET SKIP NUMBER TO 3

DMTXX

SET TAPE COMMAND

DMTX1

N

SET SKIP NUMBER TO ZERO
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

A. **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**

   **Routine** | **Program** | **Calling Sequence**
   --- | --- | ---
   FINDIR | DISK STATUS | JMS FINDIR
   MDBUG | III166 | JMS MDBUG
   MONINT | III166 | JMS MONINT
   MERASE | III166 | JMS MERASE

2. **Internal**

   **Routine** | **Calling Sequence**
   --- | ---
   CHEC | JMS CHEC
   HEADPT | JMS HEADPT
   DISBLK | JMS DISBLK
   GETBLK | JMS GETBLK
   LINE | JMS LINE

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. BLOCK. 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 FlowCharts. See following pages.
BEGIN

FINDIR
GET FIRST BLOCK ADDRESS

ADDRESS TO DISK ADRESSES TO MEM ADRES

GET BLK
READ FIRST BLOCK

SET DISK ADRESSES AND MEM ADRESSES FOR 2ND BLOCK

DABC

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
DABC

GETBLK
READ SECOND BLOCK

SET ADDRESSES FOR 3RD BLOCK

GETBLK
READ 3RD BLOCK

SET UP STACK POINTER

DO IT
REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR

2-727
UP

LAST BLOCK DISPLAYED

Y

N

BLOCK 2 → BLOCK 1
BLOCK 3 → BLOCK 2
BLOCK 1 → BLOCK 3

GET BLK
READ NEXT BLOCK INTO BLOCK 3

UPDATE STACK POINTER, SAVE NEW CHAIN WORD

DO IT
DOWN

FIRST BLOCK DISPLAYED

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
REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
ZROLN

PLOT DUMMY LINE OF ALL ZERO ENTRIES

DSCL

ASK OPERATOR IF CERTAIN CLEAR IS DESIRED

ANS

YES

Y

N

MERASE

DCLEAR
DISBLK

CHECK
CHECK FOR OPERATOR INT

COMPUTE START ADDRESS OF NEXT LINE

LINE
DISPLAY LINE

LAST LINE OF BLOCK

Y

N
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>
<th>Version</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRINTF COM</td>
<td>III164</td>
<td>III162</td>
<td>III186</td>
</tr>
<tr>
<td>III109</td>
<td>III163</td>
<td>III161</td>
<td>ASROUT</td>
</tr>
<tr>
<td>III166</td>
<td>III185</td>
<td>III188</td>
<td></td>
</tr>
<tr>
<td>DISK STATUS</td>
<td>III147</td>
<td>III161 GO</td>
<td></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. **MTTSIZ.** 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
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

<table>
<thead>
<tr>
<th>Routine</th>
<th>Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACCTG</td>
<td>III166</td>
</tr>
<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>GETIN</td>
<td>III161</td>
</tr>
<tr>
<td>GETNUM</td>
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</tr>
<tr>
<td>KYBLIS</td>
<td>III166</td>
</tr>
<tr>
<td>MDONEX</td>
<td>III166 INVAN</td>
</tr>
<tr>
<td>MDOUT</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>MONOUT</td>
<td>III166 INVAN</td>
</tr>
<tr>
<td>MTRINI</td>
<td>III163</td>
</tr>
<tr>
<td>MTLAC</td>
<td>III163</td>
</tr>
<tr>
<td>NEXPIC</td>
<td>III166 ADVAN</td>
</tr>
<tr>
<td>MNBRT</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>III166</td>
</tr>
</tbody>
</table>
2. Internal Routines

<table>
<thead>
<tr>
<th>ACOME</th>
<th>DDST</th>
<th>JULDAT</th>
<th>TITNX</th>
</tr>
</thead>
<tbody>
<tr>
<td>BLDREC</td>
<td>ERRTRM</td>
<td>LACEOV</td>
<td>TOPPAG</td>
</tr>
<tr>
<td>CARCON</td>
<td>FICOUNT</td>
<td>LACEND</td>
<td>TOTTY</td>
</tr>
<tr>
<td>CKCOM</td>
<td>FRFLAS</td>
<td>LEAP</td>
<td>TTAPNO</td>
</tr>
<tr>
<td>CHRGET</td>
<td>GTFNDX</td>
<td>MVCOM</td>
<td>TTCHAR</td>
</tr>
<tr>
<td>CHROUT</td>
<td>INSET3</td>
<td>PRTLN</td>
<td>TTTINT</td>
</tr>
<tr>
<td>COMEND</td>
<td>INSET6</td>
<td>RECGET</td>
<td>TTTPUT</td>
</tr>
<tr>
<td>COMOST</td>
<td>INXCK</td>
<td>STNQYE</td>
<td>TTTWD</td>
</tr>
<tr>
<td>CONVER</td>
<td>JOBERP</td>
<td>STNENO</td>
<td>TYPFRX</td>
</tr>
<tr>
<td>DDCL</td>
<td>JOBSTU</td>
<td>STUJOB</td>
<td></td>
</tr>
</tbody>
</table>

2.15.3.2 Subroutines

A. ACOME. 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 ACOME/CARRIAGE CONTROL IN AC.

B. BLREC. 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 BLREC.
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:

\[
\text{JMS TTCHAR} \\
\text{DAC CHARACTER, 6-BIT ASCII}
\]

KK. TTTINT. Initializes the teletype output buffer. Calling sequence: JMS TTTINT

LL. TTTPUT. Stores three ASCII characters per word to teletype. Calling sequence:

\[
\text{LAC ASCII CHARACTER} \\
\text{JMS TTTPUT}
\]

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-1.** 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. **MTBOF2.** If -1, instruction to jump to LACEOV, the Standard Label End-of-Volume Routine.

21. **NEXEUF.** Variable pointer to next tape buffer.
22. **PBUEFSZ.** 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-l.** 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. IFLASW. 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. **TTTEMP.** 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.
SPACE THE STATUS BUFFER STABUF

SET THAT TITLE NUMBER BSTNO, FICHE TOTAL, BIT ZEROTO ZERO

SET RECORD COUNT TO -1
RECRT

SET CARRAGE CONTROL, COMCHR TO 'C3' HEX

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
1

INSERT
SET PRINT INTENSITY

TAPPOAG
SET PAGE PARAMETER

SET THE TAPE BUFFER ADDRESS, BUFFER SIZE

MTRAINI
INITIALIZE TAPE HANDLE

SET 1ST TIME READ SWITCH TO NOP, RECSW

2
SET IFLASW TO NOP FOR INDEXING

PC CLR
OUTPUT LEADING RICH.

FRSPIC
SET UF PICH CONTROL

LOAD ADDRESS OF FICHE TABLE FICTBUTPOINT

ZERO MAX_TAQU
RECOGET
GET A LOGICAL RECORD

C/KC&M
CHECK FOR C&M CONTROL

ACODE
SET CARRIAGE CONTROL

PRTLN
PROCESS DATA LINE
CAL, NUMB.
LOG REC RD IN
BLACK
NB OF WRD > REG QT
GO

SET LOG REC
ADDRSS TO
1ST ADDR
LOG REC
ADD

LOAD ADDR
OF LOG REC
REG
ACT ADD

LOG REC
STRT FULL
WORD
Y

N
SET CHR SW
CHAR
SWITC/H TO
NQP

A

B

6
DFGGET

2ND CHARACTER CHRSW

SET 2ND CHARACTER TO YES
NAP \rightarrow CHRSW

PICK WHOLE WORD FROM ADDRESS IN CHARND

SAVE 2ND CHARACTER IN CHRSV
1ST IN (AC)
AND

RETURN

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
RETURN

SET CNT to 0

SET LNT to zero

SET CNT to -1

SET WAIC to NO

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
MOVE SEP RECORD TO TITLE AREA

MOVE "TAPE IN" TO SEP RECORD END IN TITLE AREA

SAVE ADDRESS OF WHERE STORE TAPE NUMBER IN SEP FIELD

STORE TAPE NUMBER IN TITLE AREA

STORE "T" AT END OF TAPE NUMBER

13

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
SET TITLE INTENSITY

FICTITIOUS
OUTPUT TITLE

SET PRINT INTENSITY

SET PAGE PARAMETER

1ST TITLE

Y

N

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR.
CONVERT
CONVERT FICHE TOTAL TO EBCDIC
CONVERT
CONVERT TITLE COUNT TO EBCDIC
MOVE FBCDIC FICHE TOTAL TITLE COUNT TO STATUS
STORE PROFIV, 0, 1, 3
191
RETURN!

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
1. WRITE STATUS TO DISK

2. NEW TAPE
   - Y: SET TITLE COUNT TO 1
     - BSING
     - MOVE NEW TAPE NUMBER TO SEP AREA
     - SET NEW TAPE SW TO "NAP - LATCH"
     - RETURN
   - N: RETURN
20

INPUT

SINGLE 3
('?') IN TTY BUFFER

MMESG
OUTPUT TTY

TTYCHAR
GET A CHARACTER FROM TTY

CHARACTER (C)

Y

MQPUT
OUTPUT TITLE NUMBER

RETURN
1. INPUT

2. STORE 8BIT CHARACTER IN TTY BUFFER WORD

3. 2ND CHARACTER OF WORD

   Y
   
   4. TTY TWO
      ADD 1 TO BUFFER WORD ADDRESS
      RETURN

   N
   
   5. RETURN

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
LOAD START
BUFFER ADDRESS OF
TTY BUFFER

GET WORD COUNT

RETURN
SET CHARACTER PER TTY WORD TO 3

ADD 1 TO TTY BUFFER ADDRESS

RETURN
LOAD INDEX WITH TITLE BUFFER ADDRESS

STORE 1ST CHARACTER OR COM CONTROL RECORD

CHARACTER (T)

STORE SKP IN LOYDAS TO LOOK FOR DASH

STORE NOP IN LOYDAS T & NOT LOOK FOR DASH

Y

N

21

21
START

GET NEXT CHARACTER FROM COM REC

STORE CHARACTER IN TITLE BUFFER

CHARACTER (\$) Y

CHARACTER (Y) Y

LOOK FOR (Y) N

LOOK FOR (Y) Y

STOP
STORE NOP IN LOOP AS TO STOP LOOKING

SAVE INDEX OF WHERE (1) IS IN TITLE BUFFER

CHGET
GET NEXT CHARACTER FROM COM RECORD

STORE CHARACTER IN TITLE BUFFER
CONVERT

STORE ADDRESS WHERE DECIMAL NUMBER TO BE STORE

STORE 3 IN NUMBER OF DIGIT TO CONVERT

PICK THE BINARY NUMBER

CONVERT 3 BINARY DIGIT TO DECIMAL

RETURN
BLDREC

BLUID STATUS

Y

LOAD ADDRESS OF STATUS BUFFER INTO INDEX REG 12

INITIZE CHARACTER PUL SW TO SKIP

LOAD ADDRESS OF TITLE INTO INDEX REG 11

CHAPTER STORE CHARACTIPE NUMBER

RETURN

N
If the second character is not the start character:
- Set sign bit in buffer address
- Load buffer address and start character
- If there is a line check for index:
  - Skip if before print
  - If print:
    - Carriage line skip
    - Return

Reproducibility of the original page is poor.
LOAD X Y CORD EN DAC'S

L

SPACE COUNT

Y

RETURN

N

END LINE ON PAGE

Y

ADD Y SPACING TO Y IN YB5A

N

ADD 1 TO LINE POSITION

L

2-795
SET THE X-DAC TO START X-CARD

FORM READ IN

Y

ADD YOFFSET TO TOP Y-OFFSET

SET THE X-DAC TO START YCOORD

CLEAR CHARACTER GENERATOR

RETURN

N
Initialize addresses for Julian date calculation

Y

Error?

N

RETURN

JULDATE

Y

Y

Accept calendar date, calculate Julian date, convert to DEC.

2-801
TAPNO

TOTTY
Display as accept character type (e.g., number, <null>)

Y

Error?

N

Return

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
T0TRY

Initialize message & storage locations

Output message to teletype

Accept & echo character

Tape # input?

N

A

30-1

B
Flowchart:

1. Convert to EBCDIC and store
2. RETURN
3. A
4. Convert to EBCDIC and store
5. All characters typed in?
   - YES: RETURN
   - NO: B

Variables:
- A
- B
LEAP

Check for year divisible by 4 and add 1 if appropriate.

RETURN
LACEND

INSERT
SET TITLE
INTENSITY

FINISH FICHE TITLING

COMPOST
WRITE STATUTS

RETURN

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
Python

MMSSC

DISPLAY
NAME

RETURN

P-COUNT

ADD TO
PICHET COUNT

RETURN

REPRODUCIBILITY OF THE
ORIGINAL PAGE IS POOR
32

STORE 1 IN TITLE SEARCH

GET NUM
GET TITLE SEARCH COUNT

STORE TITLE SEARCH COUNT \( \rightarrow \) TEST

SKIP \( \rightarrow \) COMSW/COMESW

DONE
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. 395, 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><strong>PART 1 - DTE 7th SIZE CHARACTER</strong></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>LOAD 16DTE48-UCAM PROGRAM</td>
</tr>
<tr>
<td>2.</td>
<td>LOAD 7th SIZE DTE TEST TAPE</td>
</tr>
<tr>
<td>3.</td>
<td>TYPE UNLABELED ON TELETYPET</td>
</tr>
<tr>
<td>4.</td>
<td>TYPE GO TO INITIATE PROCESSING</td>
</tr>
<tr>
<td>5.</td>
<td>NOTE DATA IS DISPLAYED ON CRT AS IT IS RECORDED</td>
</tr>
<tr>
<td>6.</td>
<td>VERIFY RESULTS OF 132 CHAR/LINE, 64 LINE/PAGE</td>
</tr>
<tr>
<td><strong>PART 2 - 16mm CUTMARKS</strong></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>LOAD CLEAN 16mm CUTMARK PROGRAM</td>
</tr>
<tr>
<td>2.</td>
<td>LOAD COM TEST TAPE 1A</td>
</tr>
<tr>
<td>3.</td>
<td>TYPE GO TO INITIATE PROCESSING</td>
</tr>
<tr>
<td>4.</td>
<td>NOTE DATA AND CUTMARKS ARE DISPLAYED ON CRT AS IT IS RECORDED</td>
</tr>
<tr>
<td>5.</td>
<td>VERIFY RESULTS OF PROCESSING ON 16mm FILM (PRESENCE OF CUTMARKS)</td>
</tr>
</tbody>
</table>

Prepared By: L. S. Lockler

**CONTRACTOR**

<table>
<thead>
<tr>
<th>Contractor</th>
<th>Date</th>
<th>NASA</th>
</tr>
</thead>
<tbody>
<tr>
<td>L. S. Lockler</td>
<td>6-10-71</td>
<td></td>
</tr>
<tr>
<td>L. S. Lockler</td>
<td>6-20-71</td>
<td></td>
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</table>

**REFER TO PROCEDURES FOR REQUIRED SIGNATURES**

<table>
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<th>Contractor</th>
<th>Date</th>
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<tbody>
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</tbody>
</table>

**REMARKS**

Step 8. **Result:** 2/17

**FINAL ACCEPTANCE DATE:** 6-20-71
<table>
<thead>
<tr>
<th>No.</th>
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<th>Tech</th>
<th>Ins.</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>PROCESS FILM ON XEROX COPYFLO IN BUILDING 227 TO VERIFY COMPATIBILITY</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PART 1 (CONTINUED)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>NOTE TAPE ERROR ON TTY</td>
<td>☑</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>TYPE CONTINUE AND NOTE RETURN TO MONITOR</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

RETURN TO PAGE 1 FOR STEPS 8.
**TEST PREPARATION SHEET**

**NASA - MANNED SPACECRAFT CENTER**

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
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<tbody>
<tr>
<td>Type</td>
<td>Type</td>
</tr>
<tr>
<td>Design</td>
<td>Design</td>
</tr>
</tbody>
</table>

**Vol. II**

**SISO-TR531**

**Page 1 of 5**

**TPS No**

**E.O.**

**127F**

**A2**

**Contract Number**

**Serial Number**

**Ref. E.O. Number**

**127F**

**TPS Short Title**

**16mm DTE 36/48 Bit Cutmarks & Job ID**

**Wt. Req**

**16**

**Reason for Work.**

To A/T the 16mm DTE Programs to provide for modifications as defined in E.O. 127F, Section 2.2a.

---

**DESCRIPTION (Print or Type)**

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.

---

**Prepared By**

**Signature**

**Final Acceptance Date**

---

**PROCEDURES FOR REQUIRED SIGNATURES**

**Contractor**

**Date**

**NASA**

**Date**

---

**Copy 1**

---

**B-4**
## TEST PREPARATION SHEET

### DESCRIPTION (Print or Type)

<table>
<thead>
<tr>
<th>Tech</th>
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<th>Case</th>
<th>NASA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. **Type** FR8; 16DT36SJ to load the 16mm DTE 36 Bit program. Verify that *MONITOR is typed on the teletype.

2. **Type** UNLABELLED/\(\) for unlabelled tape processing.

3. **Verify** *OK is typed on the teletype.

4. **Type** GO/\(\) to initiate TAPE 3Q processing. Verify that the starting time and frame number are typed on the teletype. **NOTE** that all data is displayed on CRT monitor as it is recorded.

5. **Verify** that elapsed job time, frame number, and *END OF FILE are typed on the teletype.

6. **Type** REWIND/\(\) to rewind TAPE 3Q. Verify that *OK is typed on the teletype.

7. **Type** CLEAR/\(\) at the teletype. Verify that *OK is typed on the teletype.

### 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.
### 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>(3) Type GO/1 to initiate TAPE 3Q processing. Verify that the starting time, frame number, are typed on the teletype. <strong>NOTE</strong> - that all data is displayed on the CRT monitor as it is recorded.</td>
<td></td>
<td></td>
<td></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>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(5) Type REWIND/1 to rewind TAPE 3Q. Verify that * OK is typed on the teletype.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(6) Type CLEAR/1 at the teletype. Verify that * OK is typed on the teletype.</td>
<td></td>
<td></td>
<td></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 5Q and set unit select switch to Unit 1:

**b. At the teletype:**

(1) Type CNTRL D to load Disk Debug. Verify * DEBUG is typed on teletype.

(2) Type FR8:16DT48$ 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

DESCRIPTION (Print or Type)

(3) Type UNLABELLED/ for unlabelled tape processing.

(4) Verify * OK is typed on the teletype.

(5) Type GO/  to XXXX XXXX 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.

(6) Verify that elapsed time, frame number and * END OF FILE are typed on the teletype.

(7) TypeREWIND/ to rewind TAPE SQ. Verify that * OK is typed on the teletype.

(8) Type CLEAR/ at the teletype. Verify * OK is typed on the teletype.

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

**DESCRIPTION** (Prior or Type)

1. Type GO/ to initiate TAPE 5Q 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.

2. Verify that elapsed job time, frame number, and * END OF FILE is typed on the teletype.

3. Type REWIND/ to rewind TAPE 5Q. Verify that * OK is typed on the teletype.

4. 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 5Q is rewound to load point.

2. Dismount TAPE 5Q.

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 59-64 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.
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

**NASA - MANNED SPACECRAFT CENTER**

<table>
<thead>
<tr>
<th>1. <strong>TYPE</strong></th>
<th>2. <strong>TPS No</strong></th>
<th>3. <strong>S/C</strong> Cat. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A: Configuration Change</td>
<td>E.O. 155F #2A20</td>
<td></td>
</tr>
<tr>
<td>B: Non-Configuration Change</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| 4. **Mod. Sheet Number** | 5. **Page** of 3 | |
|-------------------------|-----------------||
| | 1 | |

<table>
<thead>
<tr>
<th>6. <strong>S/C No./Model No.</strong></th>
<th>7. <strong>Date</strong></th>
<th>8. <strong>B Time</strong></th>
<th>9. <strong>Need Date</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>13 October 1972</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>10. <strong>Drawings, Documents, Ope’s, &amp; Part No(s).</strong></th>
<th>11. <strong>Contract Number</strong></th>
<th>12. <strong>Serial Number</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NAS 9-1261</td>
<td></td>
</tr>
</tbody>
</table>

<table>
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<tr>
<th>13. <strong>System</strong></th>
<th>14. <strong>Ref E O Number</strong></th>
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<tbody>
<tr>
<td>Computer to Microfilm</td>
<td>155F</td>
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</table>

<table>
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<tr>
<th>15. <strong>TPS Short Title</strong></th>
<th>16. <strong>Wt Req.</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Classification Map Software Acceptance Test</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>17. <strong>Reason for Work</strong></th>
</tr>
</thead>
<tbody>
<tr>
<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>

<table>
<thead>
<tr>
<th>18. <strong>DESCRIPTION (Print or Type)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Refer to the attached handout for a description of the tests and the test results.</td>
</tr>
</tbody>
</table>

#### 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.
   1. Type UNLABELLED/2. Verify that *OK is typed on the teletype.

---

**Prepared By:**

L. S. LOCKLER

**Final Acceptance Date:**

10/13/72

---

**Contractor:** NASA

**Do:** NASA

**Date:** 10/13/72
**TEST PREPARATION SHEET**

**CONTINUATION SHEET**

NASA - MANNED SPACECRAFT CENTER

<table>
<thead>
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<th>Description (Print or Type)</th>
<th>Tech</th>
<th>Imp</th>
<th>NASA</th>
</tr>
</thead>
<tbody>
<tr>
<td>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</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(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.</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/\downarrow to complete processing of the Classification Map 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/\downarrow twice to advance exposed film into the take-up magazine. Verify that *OK is typed on the teletype after each CLEAR/\downarrow</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(8) Type REWIND/\downarrow to rewind the Classification Map Acceptance Test Tape (Tape 1). 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>
<td>Cont</td>
<td>NASA</td>
</tr>
<tr>
<td>-----------------------------</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 Classification Map Acceptance Test Tape (Tape 1).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. Test Result Verification:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1) Process 105mm film containing results.</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>
</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-1
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>
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<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>
</tr>
<tr>
<td>4</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>355</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>355</td>
<td>3</td>
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<tr>
<td>3</td>
<td>355</td>
<td>5</td>
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<td>0</td>
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<tr>
<td>204</td>
<td>5</td>
<td>0</td>
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</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>
<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)
TEST PREPARATION SHEET

NASO-MANNED SPACECRAFT CENTER

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 GRAYGRAY $J$ to load Gray-Level Program
      Verify that *MONITOR is typed on the teletype.
      (2) Type UNLABELLED$\dagger$ Verify that *OK is typed on the
          teletype.
      (3) Type CLEAR$\dagger$ twice to advance exposed film into the
          take-up magazine. Verify that *OK is typed on the
          teletype after each CLEAR$\dagger$.
<table>
<thead>
<tr>
<th>DESCRIPTION (Proc or Type)</th>
<th>Tech</th>
<th>Imp</th>
</tr>
</thead>
<tbody>
<tr>
<td>b. (4) Type GO/\ 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.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(5) Verify that the elapsed job time, frame number, page number, and &quot;END OF FILE&quot; are typed on the teletype to signal completion of data tape processing.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(6) Type END JOB/\ to complete processing of the Gray-Level Acceptance Test Tape (Tape 2). Verify that *OK is typed on the teletype.</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>
</tr>
<tr>
<td>(8) Type REWIND/\ to rewind the Gray-Level Acceptance Test Tape (Tape 2). Verify that *OK is typed on the teletype.</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>
</tr>
<tr>
<td>c. At the Tape Transport:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1) Dismount the Gray-Level Acceptance Test Tape (Tape 2).</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
TEST PREPARATION SHEET
CONTINUATION SHEET
NASA - MANNED SPACECRAFT CENTER

2. Gray-Level Acceptance Test - Tape 2A
   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-22
### TEST PREPARATION SHEET

**CONTINUATION SHEET**

**NASA - MANNED SPACECRAFT CENTER**

<table>
<thead>
<tr>
<th>DESCRIPTION (Print or Type)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(7) Type END JOB/₁ to complete processing of the Gray-Level Acceptance Test Tape (Tape 2). Verify that *OK is typed on the teletype.</td>
</tr>
<tr>
<td>(8) 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>
</tr>
<tr>
<td>(9) Type REWIND/₁ to rewind the Gray-Level Acceptance Test Tape (Tape 2A). Verify that *OK is typed on the teletype.</td>
</tr>
</tbody>
</table>

**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 B-5

GRAY-LEVEL TESTS

<table>
<thead>
<tr>
<th>TEST NO.</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TEST MAXIMUM GRAY-LEVEL IMAGE SIZE, MULTIPLE IMAGES PER FICHE, AND OVERLAY CAPABILITIES</td>
</tr>
<tr>
<td>2</td>
<td>TEST ASCENDING AND DESCENDING SHADE BARS IN X-AXIS</td>
</tr>
<tr>
<td>3</td>
<td>TEST ASCENDING AND DESCENDING SHADE BARS IN Y-AXIS</td>
</tr>
<tr>
<td>4</td>
<td>TEST MAXIMUM SIZE DESCRIPTOR FRAME</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CONTENT/FORMAT</th>
</tr>
</thead>
<tbody>
<tr>
<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>SPANNED VARIABLE LENGTH RECORD TO CHECK EIGHT GRAY LEVELS (TEST DISPLAY IS DEFINED IN PARA. B.)</td>
</tr>
<tr>
<td>SPANNED VARIABLE LENGTH RECORD TO CHECK EIGHT GRAY LEVELS (TEST DISPLAY IS DEFINED IN PARA. C.)</td>
</tr>
<tr>
<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 FR80 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>
<thead>
<tr>
<th>LINE NO.</th>
<th>COLUMN</th>
<th>DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>23</td>
<td>0</td>
<td>0</td>
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<tr>
<td>23</td>
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<td>0</td>
</tr>
<tr>
<td>23</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>23</td>
<td>15</td>
<td>0</td>
</tr>
<tr>
<td>23</td>
<td>20</td>
<td>1</td>
</tr>
<tr>
<td>1023</td>
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<tr>
<td>1023</td>
<td>5</td>
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<td>1023</td>
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<td>1023</td>
<td>20</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>23</td>
<td>0</td>
</tr>
<tr>
<td>11</td>
<td>23</td>
<td>0</td>
</tr>
<tr>
<td>17</td>
<td>23</td>
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<td>23</td>
<td>23</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>1019</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>1019</td>
<td>0</td>
</tr>
<tr>
<td>17</td>
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<td>0</td>
</tr>
<tr>
<td>23</td>
<td>1019</td>
<td>0</td>
</tr>
</tbody>
</table>

### TABLE B-7
VECTOR OVERLAY INFORMATION FOR GRAY-LEVEL TEST 1

<table>
<thead>
<tr>
<th>STARTING POINT</th>
<th>ENDING POINT</th>
</tr>
</thead>
<tbody>
<tr>
<td>LINE</td>
<td>COL</td>
</tr>
<tr>
<td>523</td>
<td>23</td>
</tr>
<tr>
<td>1023</td>
<td>23</td>
</tr>
<tr>
<td>1023</td>
<td>523</td>
</tr>
</tbody>
</table>
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**

<table>
<thead>
<tr>
<th>LINE NO.</th>
<th>COLUMN POSITION</th>
<th>DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>273</td>
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<td>0</td>
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<tr>
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<tr>
<td>273</td>
<td>335</td>
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<td>273</td>
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<td>3</td>
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<tr>
<td>273</td>
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<td>4</td>
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<tr>
<td>273</td>
<td>710</td>
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<tr>
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<tr>
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<td>773</td>
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<td>773</td>
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<td>773</td>
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<td>773</td>
<td>835</td>
<td>1</td>
</tr>
<tr>
<td>773</td>
<td>960</td>
<td>0</td>
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<tr>
<td>STARTING POINT</td>
<td>ENDING POINT</td>
<td></td>
</tr>
<tr>
<td>----------------</td>
<td>--------------</td>
<td></td>
</tr>
<tr>
<td>LINE NO.</td>
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<td>LINE NO.</td>
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</tbody>
</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>
<thead>
<tr>
<th>LINE NO.</th>
<th>COLUMN POSITION</th>
<th>DATA</th>
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<tr>
<td>85</td>
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<tr>
<td>210</td>
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<td>6</td>
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<td>335</td>
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<tr>
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<tr>
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<td>4</td>
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<td>5</td>
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</tr>
<tr>
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</tr>
</tbody>
</table>
### TABLE B-11.
VECTOR OVERLAY INFORMATION FOR GRAY-LEVEL TEST 3

<table>
<thead>
<tr>
<th>STARTING POINT</th>
<th>ENDING POINT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LINE NO.</strong></td>
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<td>148</td>
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<td>523</td>
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<td>898</td>
<td>873</td>
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</tbody>
</table>
NOTE: DASHED LINES AND COORDINATES NOT INCLUDED ON DISPLAY; FOR REFERENCE ONLY.

Figure B-7 Descriptor Data (64 Lines of 132 characters)
<table>
<thead>
<tr>
<th><strong>TEST PREPARATION SHEET</strong></th>
<th><strong>NASA - MANNED SPACECRAFT CENTER</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. ITYPE</strong></td>
<td><strong>Configuration Change</strong></td>
</tr>
<tr>
<td><strong>2. E.O.</strong></td>
<td><strong>155F</strong></td>
</tr>
<tr>
<td><strong>3. S/C</strong></td>
<td><strong>Cat</strong></td>
</tr>
<tr>
<td><strong>4. Sheet Number</strong></td>
<td><strong>No.</strong></td>
</tr>
<tr>
<td><strong>5. Page</strong></td>
<td><strong>1</strong></td>
</tr>
<tr>
<td><strong>6. S/C No.</strong></td>
<td><strong>Model No.</strong></td>
</tr>
<tr>
<td><strong>7. Date</strong></td>
<td><strong>10/27/72</strong></td>
</tr>
<tr>
<td><strong>8. Time</strong></td>
<td><strong>Need Date</strong></td>
</tr>
<tr>
<td><strong>9. Contract Number</strong></td>
<td><strong>NAS 9-1261</strong></td>
</tr>
<tr>
<td><strong>10. Serial Number</strong></td>
<td><strong>155F</strong></td>
</tr>
<tr>
<td><strong>11. Ref. E.O. Number</strong></td>
<td><strong>155F</strong></td>
</tr>
<tr>
<td><strong>12. System</strong></td>
<td><strong>Computer to Microfilm</strong></td>
</tr>
<tr>
<td><strong>13. TPS Short Title</strong></td>
<td><strong>Landscape Software Acceptance Test</strong></td>
</tr>
<tr>
<td><strong>14. Reason for Work</strong></td>
<td><strong>To verify the software development on the COM System for the</strong></td>
</tr>
<tr>
<td><strong>15. Landscape Software as defined in PHO-TN598 and as required under E.I. #1 of</strong></td>
<td></td>
</tr>
<tr>
<td><strong>16. E.O. 155F. THIS IS THE FINAL TPS UNDER E.O. 155F.</strong></td>
<td></td>
</tr>
<tr>
<td><strong>17. DESCRIPTION</strong></td>
<td><strong>Refer to the attached handout for a description of the tests</strong></td>
</tr>
<tr>
<td><strong>18. TEST PROCEDURES:</strong></td>
<td><strong>and test results.</strong></td>
</tr>
<tr>
<td>a. At the Tape Transport:</td>
<td></td>
</tr>
<tr>
<td>(1) Mount Landscape Acceptance Test Tape (Tape 3).</td>
<td></td>
</tr>
<tr>
<td>b. At the Teletype:</td>
<td></td>
</tr>
<tr>
<td>(1) Type CRA;LANDSJ to load Landscape Program.</td>
<td></td>
</tr>
<tr>
<td>Verify that &quot;MONITOR is typed on the teletype.</td>
<td></td>
</tr>
<tr>
<td>(2) Type UNLABELLED/½. Verify that &quot;OK is typed on the teletype.</td>
<td></td>
</tr>
<tr>
<td>(3) Type CLEAR/½ to advance exposed film into the take-up magazine. Verify that &quot;OK is typed on the teletype after wash CLEAR/½.</td>
<td></td>
</tr>
</tbody>
</table>

**Prepared By**: L. S. LOCKLER |

**Final Acceptance Date**: 10/27/72

**Contractor Date NASA**: 10/27/72

**Other Signatures**: 10/27/72

---

**MSC FORM 1253 (UL. 43)**

**NASA - MSC - Cont., Houston, Texas**

**Copy 1**

---

**B-35**
<table>
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<tr>
<th>DESCRIPTION (Print or Type)</th>
<th>Tech</th>
<th>Cont.</th>
<th>NASA</th>
</tr>
</thead>
<tbody>
<tr>
<td>(4)</td>
<td>Type GO/# 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>
</tr>
<tr>
<td>(5)</td>
<td>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>
</tr>
<tr>
<td>(6)</td>
<td>Type END JOB/# to complete processing of the Landscape Acceptance Test tape (Tape 3). Verify that *OK is typed on the teletype.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(7)</td>
<td>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>(8)</td>
<td>Type REWIND/# to rewind the Landscape Acceptance Test tape (Tape 3). Verify that *OK is typed on the teletype.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c.</td>
<td>At the Tape Transport:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1)</td>
<td>Dismount the Landscape Acceptance Test tape (Tape 3).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d.</td>
<td>Test Result Verification:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1)</td>
<td>Process 105mm film containing the results.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2)</td>
<td>View the resulting 105mm microfiche, or have hardcopies made from the microfiche. Verify that the results match the tests described in paragraphs 1 &amp; 2 of the attached handout.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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 × 1024 matrix, but are scaled down to 612 × 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 × 1024 matrix but are scaled down to 612 × 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>
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<tr>
<td>256</td>
<td>572</td>
<td>3</td>
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<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>LINE NO.</th>
<th>PIXEL POS</th>
<th>LINE NO.</th>
<th>PIXEL POS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1023</td>
<td>0</td>
<td>1023</td>
<td>1023</td>
</tr>
<tr>
<td>513</td>
<td>0</td>
<td>513</td>
<td>1023</td>
</tr>
<tr>
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<td>1023</td>
</tr>
<tr>
<td>1023</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1023</td>
<td>1023</td>
<td>0</td>
<td>1023</td>
</tr>
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<td>853</td>
<td>127</td>
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<tr>
<td>1023</td>
<td>254</td>
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<td>254</td>
</tr>
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<td>1023</td>
<td>381</td>
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<tr>
<td>1023</td>
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<td>853</td>
<td>890</td>
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<td>683</td>
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<td>343</td>
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<tr>
<td>683</td>
<td>254</td>
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<tr>
<td>LINE NO.</td>
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</table>

NOTE: DASHED LINES AND COORDINATES ARE FOR REFERENCE ONLY; NOT INCLUDED ON DISPLAY

Figure B-9  Y Shade Bars and Overlay for Landscape
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<th>LINE NO.</th>
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</tbody>
</table>
## TEST PREPARATION SHEET

**NASA - LYNDON B. JOHNSON SPACE CENTER**

### 17. Reason for Work:
Verification of CLAGRA Program

### 18. DESCRIPTION (Print or Type)

<table>
<thead>
<tr>
<th>1 TESTS</th>
<th>2 TPS No</th>
<th>3 S/C</th>
<th>4 Cat No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Load 105mm camera. Use a leader in the take-up magazine. Install the 16mm control disk.</td>
<td>A3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. At the teletype:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Verify system is under DEBUG control.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Type PL2.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Focus the PLS according to the procedure on the inside of the camera bay door.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Set the intensity to a value of 24 x 1.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Enter space on TTY to return to DEBUG control.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Enter GRA;GRAY$J on TTY.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Verify that *MONITOR is typed by program.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Enter CLEAR/(CR) on TTY. Verify that *OK is typed.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Enter CLEAR/(CR) on TTY. Verify that *OK is typed.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 19. Prepared By

<table>
<thead>
<tr>
<th>Contractor</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Signature]</td>
<td>[Date]</td>
</tr>
</tbody>
</table>

### 20. Final Acceptance Date

<table>
<thead>
<tr>
<th>NASA</th>
<th>[Date]</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Signature]</td>
<td>[Date]</td>
</tr>
</tbody>
</table>

**REFER TO PROCEDURES FOR REQUIRED SIGNATURES**

**REFER TO PROCEDURES FOR REQUIRED SIGNATURES**

**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.
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<tr>
<th><strong>18. DESCRIPTION (Print or Type)</strong></th>
<th>21</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Tapes 1 and 1A will be used to test:</strong></td>
<td></td>
</tr>
<tr>
<td>(1) 7- or 9-track tape processing</td>
<td></td>
</tr>
<tr>
<td>(2) Multi-job real</td>
<td></td>
</tr>
<tr>
<td>(3) NONE, VORTEX, and TERMINAL carriage controls</td>
<td></td>
</tr>
<tr>
<td>(4) Absence of COM control records</td>
<td></td>
</tr>
<tr>
<td>(5) Variable page lengths</td>
<td></td>
</tr>
<tr>
<td>(6) Variable record lengths</td>
<td></td>
</tr>
<tr>
<td>(7) Character repertoire</td>
<td></td>
</tr>
<tr>
<td><strong>1.1 Verify that the system is under DEBUG control.</strong></td>
<td>✓</td>
</tr>
<tr>
<td><strong>1.2 Mount Tapes 1 and 1A on the 7- and 9-track drives respectively. Set switches to 1 and 2 respectively.</strong></td>
<td>✓</td>
</tr>
<tr>
<td><strong>1.3 At the teletype:</strong></td>
<td></td>
</tr>
<tr>
<td>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.</td>
<td>✓</td>
</tr>
<tr>
<td>b. Type TAPE TYPE/8 l. Verify the *OK is printed.</td>
<td>✓</td>
</tr>
<tr>
<td>c. Type CARRIAGE CONTROLS/1 l. Verify that *OK is printed.</td>
<td>✓</td>
</tr>
</tbody>
</table>

**Prepared By:**

**Final Acceptance Date:**
<table>
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<tr>
<th>DESCRIPTION (Print or Type)</th>
<th>Tech</th>
<th>Inspect</th>
<th>Cont</th>
<th>NASA</th>
</tr>
</thead>
<tbody>
<tr>
<td>d. Type LINE PER PAGE/50. Verify that *OK is printed.</td>
<td>☑</td>
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<td>☑</td>
</tr>
<tr>
<td>e. Type GO/3. Verify that the start time and frame number are printed.</td>
<td>☑</td>
<td>☑</td>
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<tr>
<td>f. Verify that the message ENTER TAPE NUMBER: is printed.</td>
<td>☑</td>
<td>☑</td>
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<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 FILE1 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. Verify that *OK is printed.</td>
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<tr>
<td>j. Type CARRIAGE CONTROLS/3. Verify that *OK is printed.</td>
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<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>k. Type GO/3. 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 &quot;ENTER TAPE NUMBER:&quot; 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 FILE2 and *FILES DONE are printed.</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>n. Type CARRIAGE CONTROLS/3. Verify that *OK is printed.</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>o. Type GO/2. 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 7VXTX for 7-track; 9VXTX 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 END OF FILE3 is printed.</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>r. Verify that the job time elapsed, frame number, and ***DOUBLE END OF FILE are printed.</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>s. Type USE/2. Verify that *OK is printed.</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>t. Type TAPE TYPE/9. 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>
</tbody>
</table>
## TEST PREPARATION SHEET

### CONTINUATION SHEET

NASA – LYNDON B. JOHNSON SPACE CENTER

<table>
<thead>
<tr>
<th>DESCRIPTION (Print or Type)</th>
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<tbody>
<tr>
<td>Tapes 2 and 2A will be used to test the following:</td>
</tr>
<tr>
<td>(1) 7- or 9-track tape processing</td>
</tr>
<tr>
<td>(2) Multi-job reel</td>
</tr>
<tr>
<td>(3) NONE, TERMINAL, and VOYTEX carriage controls</td>
</tr>
<tr>
<td>(4) Job separator, titling, forms and indexing records</td>
</tr>
<tr>
<td>(5) Variable length pages</td>
</tr>
<tr>
<td>(6) Variable length records</td>
</tr>
</tbody>
</table>

2. 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 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. **CARRIAGE CONTROLS/2. Verify that *OK is printed.**

   c. Type GO/. Verify that the start time and frame number are printed.

   d. Verify that the job time elapsed, frame number, *END OF FILE 1 and FILES DONE are printed and control returns to the MONITOR.

   e. Type CARRIAGE CONTROLS/3. Verify that *OK is printed.

   f. Type GO/. Verify that the start time and frame number are printed.

   g. Verify that the job time elapsed, frame number, *END OF FILE 2 and FILES DONE are printed.

   h. Type CARRIAGE CONTROLS/1. Verify that *OK is printed

   i. Type LINES PER PAGE/55. Verify that *OK is printed.

   j. Type GO/. Verify that the start time and frame number are printed.

---

**REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR**
k. Verify that the elapsed job time, frame number and

***DOUBLE END OF FILE are printed.

l. Type USE/2 b. Verify that **OK is printed.

m. Type TAPE TYPE/9 a. Verify that *OK is printed.

n. Repeat the above, beginning with 2.3 b.

Type REWIND/2. Verify that *OK is printed.
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**

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<thead>
<tr>
<th>Type</th>
<th>Configuration Change</th>
<th>Non-Configuration Change</th>
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<tbody>
<tr>
<td>A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mod. Sheet Number</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Description (Print or Type)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Tapes 1 and 1A will be used to test:</td>
</tr>
<tr>
<td>(1) 7- or 9-track tape processing</td>
</tr>
<tr>
<td>(2) Multi-job reel</td>
</tr>
<tr>
<td>(3) NONE, VORTEX, and TERMINAL carriage controls</td>
</tr>
<tr>
<td>(4) Absence of COM control records</td>
</tr>
<tr>
<td>(5) Variable page lengths</td>
</tr>
<tr>
<td>(6) Variable record lengths</td>
</tr>
<tr>
<td>(7) Character repertoire</td>
</tr>
</tbody>
</table>

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 `VAR/TO` to load the program and pass control to the MONITOR. Verify that `MONITOR is printed and the command list is displayed on the CRT.`

## 19 Prepared By

Beverly Miller

## 20 Final Acceptance Date

11/26/74

---

**REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR**
<table>
<thead>
<tr>
<th>DESCRIPTION (Print or Type)</th>
<th>Tech.</th>
<th>Cont.</th>
<th>NASA</th>
</tr>
</thead>
<tbody>
<tr>
<td>b. Type TAPE TYPE/8. Verify the *OK is printed.</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. Type CARRIAGE CONTROLS/1. Verify that *OK is printed.</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. Type LINE PER PAGE/50. Verify that *OK is printed.</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. Type GO/1. Verify that the start time and frame number are printed.</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>
</tr>
<tr>
<td>g. Type 7NONE for 7-track; 9NONE for 9-track.</td>
<td>✓</td>
<td></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>
<td></td>
<td></td>
</tr>
<tr>
<td>i. Type LINES PER PAGE/60. Verify that *OK is printed.</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>j. Type CARRIAGE CONTROLS/3. Verify that *OK is printed</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>k. Type GO/2. Verify that the start time and frame number are printed.</td>
<td>✓</td>
<td></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>
<td></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>
<td></td>
<td></td>
</tr>
<tr>
<td>n. Type CARRIAGE CONTROLS/2. Verify that *OK is printed.</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>o. Type GO/2. Verify that the start time and frame number are printed.</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>
</tr>
</tbody>
</table>
TEST PREPARATION SHEET
CONTINUATION SHEET
NASA - LYndon B. Johnson Space Center

<table>
<thead>
<tr>
<th>DESCRIPTION (Print or Type)</th>
<th>Tech.</th>
<th>Insp.</th>
</tr>
</thead>
<tbody>
<tr>
<td>q. Verify that the job time elapsed, frame number, and END OF FILE3 is printed.</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>r. Verify that the start time and frame number are printed.</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>s. Verify that the job time elapsed, frame number, and ***DOUBLE END OF FILE are printed.</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>t. Type REWIND/1. Verify that *OK is printed.</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>u. Type USE/2. Verify that *OK is printed.</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>v. Type TAPE TYPE/9. Verify that *OK is printed.</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>w. Repeat the above starting with step 3C.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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 that *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 (Print or Type)</th>
<th>Tech.</th>
<th>Cont.</th>
<th>NASA</th>
</tr>
</thead>
<tbody>
<tr>
<td>(d) Type GO/1. 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 §. Verify that *OK is printed.</td>
<td>✓ ✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(g) Type GO/1. 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 §. Verify that *OK is printed.</td>
<td>✓ ✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(j) Type LINES PER PAGE/55 §. Verify that *OK is printed.</td>
<td>✓ ✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(k) Type GO/1. 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/1. Verify that *OK is printed.</td>
<td>✓ ✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(n) Type USE/2. Verify that *OK is printed.</td>
<td>✓ ✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(o) Type TAPE TYPE/9 §. Verify that *OK is printed.</td>
<td>✓ ✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(p) LINES PER PAGE/60 §. Verify that *OK is printed.</td>
<td>✓ ✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(q) Repeat the above, beginning with 2.3</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>
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<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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TPS No. A6 and A7 follow.
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<tbody>
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<tr>
<td><strong>S/C No.</strong></td>
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<thead>
<tr>
<th>Mod. Sheet Number</th>
<th>Page 1 of 4</th>
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<tr>
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<thead>
<tr>
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</thead>
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<td>Serial Number</td>
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<table>
<thead>
<tr>
<th>Computer to Microfilm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference E.O. Number</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Reason for Work:</th>
</tr>
</thead>
<tbody>
<tr>
<td>To verify the new version HCO will process both 7-Track and 9-Track.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Description (Print or Type)</th>
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</thead>
</table>

<table>
<thead>
<tr>
<th>Test Procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. HCO Acceptance Test</strong></td>
</tr>
<tr>
<td>a) <strong>AT the tape transports</strong></td>
</tr>
<tr>
<td>1) Mount 9-Track HCO - TAB tape number 2729 on the 9-Track unit.</td>
</tr>
<tr>
<td>2) Mount 7-Track HCO - TAB tape number 3181 on the 7-Track unit.</td>
</tr>
<tr>
<td>b) <strong>AT the teletype:</strong></td>
</tr>
<tr>
<td>1) Type PRO; HCO TAB $J to load the production HCO. 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>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Prepared By</th>
<th>Final Acceptance Date</th>
</tr>
</thead>
</table>

**REFER TO PROCEDURES FOR REQUIRED SIGNATURES**

<table>
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<tr>
<th>Contractor</th>
<th>Date</th>
<th>NASA</th>
<th>Date</th>
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<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 I</strong> 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. 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>7) Type <strong>End Job</strong> to complete processing of 9-Track HCO Gray Tape. Verify that *OK is typed on teletype.</td>
<td></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>
<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 D</strong> 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>DESCRIPTION (Print or Type)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------------------</td>
<td>---</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>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16) Record the elapsed run time.</td>
<td>29'40.7&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17) Type rewind/ to rewind the 9-Track HCO TAB verify that *OK is typed on the teletype.</td>
<td></td>
<td></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>
<td></td>
<td></td>
</tr>
<tr>
<td>19) 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>
<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>
<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>
<td></td>
<td></td>
</tr>
<tr>
<td>22) Type unlabelled/ verify *OK is typed on the teletype.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23) Type GO/ 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>
<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>T 1 v w E 7 5 / 5 9 . 9 F/6 P 014</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25) 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>
<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.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
b) 26) Teletype after each Clear.

27) Type rewind/- to rewind the 7-Track HCO gray. Verify that *OK is typed on the teletype.

28) Type CTRL 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

---

**1. Configuration Change**

- **Type:** A

**2. TPS No.**

| A7 |

**3. S/C Cat. No**

- **S/C No:**
- **Model No:**

**4. Mod. Sheet Number**

- **Date:**
- **Time:**

**5. Page of**

- **Page 1**

**6. S/C No / Model No**

- **Date:** 27 July 74

**7. Date**

**8. Time**

**9. Need Date**

**10. Drawings, Documents, OCP's, & Part Number(s)**

**11. Contract Number**

**12. Serial Number**

**13. System**

- **Computer to Microfilm**

**14. Ref E.O Number**

**15. TPS Short Title**

- **HCO Tab Title Acceptance Test**

**16. Wt Req.**

**17. Reason for Work:**

- **To verify Title Fiche Development for HCO Tape**

---

**(FR50 CLARIFICATION FORM A17)**

**18. DESCRIPTION (Print or Type)**

**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.
      - Verifies that *MONITOR is typed on the Teletype.
      - (2) Type CLEAR/ to advance exposed film into the take-up magazine. Verify that *OK is typed on the Teletype.
      - (3) Type UNLABELLED/ . Verify *OK is typed on the Teletype.
      - (4) Type TAPE TYPE 8 . Verify *OK is typed on the Teletype.
      - (5) Type USE2$ . Verify *OK is typed on the Teletype.

---

**19. Prepared By**

**20. 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>[Signature] 7/10/74</td>
<td>[Signature] 7/12/74</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**Copy 1**

---

B-63
TEST PREPARATION SHEET

CONTINUATION SHEET

NASA – LYNDON B. JOHNSON SPACE CENTER

<table>
<thead>
<tr>
<th>DESCRIPTION (Print or Type)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(6) Type GOV. 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>c) 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>
</tr>
</tbody>
</table>
B.6 COMA PDP 11/45 PRINT PROCESSOR FOR 16 mm FILM (PDP16)

See paragraph 2.6. Revisions are as follows:

<table>
<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>
</tr>
</tbody>
</table>

TPS No. A8 follows.
**TEST PREPARATION SHEET**

<table>
<thead>
<tr>
<th>Configuration Change</th>
<th>TEST PREPARATION SHEET</th>
<th>NASA - LYNDON B. JOHNSON SPACE CENTER</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>2. TPS No A8</td>
<td></td>
</tr>
<tr>
<td>B Non-Configuration</td>
<td>3 S/C Cat. No.</td>
<td></td>
</tr>
<tr>
<td>Change</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Mod. Sheet Number</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Page 1 of 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. S/C No./Model No.</td>
<td>7 Date 8 Time</td>
<td>9 Need Date</td>
</tr>
<tr>
<td>10. Drawings, Documents, Ops, &amp; Part Numbers</td>
<td>11 Contract Number</td>
<td>12 Serial Number</td>
</tr>
<tr>
<td>System</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computer to Microfilm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. TPS Short Title</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PDP11 Tab Print Software Acceptance Test</td>
<td>18. Wt. Req</td>
<td></td>
</tr>
<tr>
<td>17. Reason for Work:</td>
<td>To verify the software improvement on the COM System for microfilm output of PDP11 FORTRAN generated Tab Tapes.</td>
<td></td>
</tr>
<tr>
<td>18. DESCRIPTION (Print or Type)</td>
<td>21. Inspect.</td>
<td></td>
</tr>
<tr>
<td>TEST PROCEDURES</td>
<td>22. CONT. 23. NASA</td>
<td></td>
</tr>
<tr>
<td>1. PDP11 Tab Print Acceptance Test</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. At the Tape Transport</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1) Mount Tab Test Tape</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. At the Teletype</td>
<td></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>
<td></td>
</tr>
<tr>
<td>(2) Type CLEAR/\ twice to advance exposed film into take-up magazine. Verify that *OK is typed on the teletype after each CLEAR/.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(3) Type GO; to initiate processing of the tape. Verify that the starting time and frame number are typed on the teletype.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(4) Verify that Job Separator is written on film by monitoring the CRT.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Prepared By: [Signature]

Refer to Procedures for Required Signatures:

Contractor: [Signature]  Date: 1/2/74

NASA: [Signature]  Date: 1/2/74

Copy 1
<table>
<thead>
<tr>
<th>No.</th>
<th>DESCRIPTION</th>
<th>Tech.</th>
<th>Cont.</th>
<th>NASA</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Verify that Job Separator and &quot;ENTER TAPE NUMBER&quot; are typed on the teletype.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Enter a 7 digit number on telewriter.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Enter Rub-out Key. Verify that tape number if repeated excluding the last digit.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Enter &amp;. Verify that tape number is written on film in eyeball size characters by monitoring the CRT. At this time, mark present time.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Verify that processing is proceeding by monitoring the CRT.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Watch for next job separator on film indicating the end of 1st file. Mark time.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Watch for next job separator on film indicating the end of 2nd file.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Stop processing with Reset Key and mark stop time.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Enter CLEAR twice to clear exposed film.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. FDP11 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.

\[
\text{New: } 4'28'' \\
\text{Old: } 6'20''
\]
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 S055 GRAY-LEVEL 9-TRACK PROCESSOR (S055)

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</td>
</tr>
<tr>
<td></td>
<td></td>
<td>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.
<table>
<thead>
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<th>Part Number(s)</th>
<th>11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contract Number</td>
<td>NASA9-1261</td>
</tr>
<tr>
<td>Serial Number</td>
<td>191F</td>
</tr>
</tbody>
</table>

**TEST PROTOCOLS**

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 $J 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/\. Verify *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 numbers are typed on the teletype.

**Prepared By**

Frank Ashton

**Final Acceptance Date**

11/28/73

**FINAL CHECK**

[Signatures]

**DATE**

11/28/73

**NASA—MSC—Cont., Houston, Texas**

**REPRODUCIBILITY OF**

**ORIGINAL PAGE IS POOR**
### TEST PREPARATION SHEET

**CONTINUATION SHEET**

**NASA - MANNED SPACECRAFT CENTER**

<table>
<thead>
<tr>
<th>DESCRIPTION (Part or Type)</th>
<th>Tech</th>
<th>Comp.</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 SO55 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 SO55 Test Tape (Tape 1). Verify that *OK is typed on the teletype.</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(9) Type CNTRL D to return to DEBUG. Verify that *DEBUG is typed on the teletype.</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**1. SO55 Acceptance Test Tape 1**

a. At the Tape Transport

   (1) Dismount the SO55 Acceptance Test Tape (Tape 1).

b. At the Teletype:

   (1) Type PRO: SO55 SJ to load SO55 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 UNLABELED to. Verify that *OK is typed on the teletype.

**2. SO55 Acceptance Test Tape 2**

a. At the Tape Transport

   (1) Mount SO55 Acceptance Test Tape (Tape 2).

b. At the Teletype:

   (1) Type PRO: SO55 SJ to load SO55 program.
(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 S055 Acceptance Test Tape (Tape 2). Verify that the starting time and frame number are typed on the teletype.

(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.

(7) Type END JOB/ to complete processing of the S055 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 S055 Acceptance Test Tape (Tape 2). Verify that *OK is typed on the teletype.

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.
Subject: Modifications to the S055 Gray Level and Tab Programs

TEXT:
The Principal Investigators have requested that several changes be incorporated into the S055 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 FMS'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.

SISO-TR531
Vol. II
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; 1 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>
</tr>
</thead>
<tbody>
<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
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>
<thead>
<tr>
<th>TAPE NO.</th>
<th>TITLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SKYLAB SOLAR EXPERIMENT S055 TEST TAPE NO. 1 TEST 1 -- 64 FRAMES, UNIQUE GRAY-LEVEL PER FRAME</td>
</tr>
<tr>
<td>2</td>
<td>SKYLAB SOLAR EXPERIMENT S055 TEST TAPE NO. 2 TEST 1 AND TEST 2 X-SHADE BARS</td>
</tr>
</tbody>
</table>
B.9  COMA IBM SYSOUT PRINT PROCESSOR (105PR, 16 PRNT)

See paragraph 2.9. Revisions are as follows.

<table>
<thead>
<tr>
<th>Date</th>
<th>Author</th>
<th>TPS No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 September 1974</td>
<td>F. C. Ashton</td>
<td>TPS A10</td>
</tr>
<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>
</tr>
</tbody>
</table>

TPS No. A10, A11 and A21 follow.
## 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 UNLABELED. Verify that *OK is printed on the Teletype.
5) At the Teletype, type SKIP/_. To skip dummy label verify that *OK is printed out on Teletype.
6) At the Teletype, type GO/_. Verify that time and frame is printed out on the Teletype.

---

**Prepared By**

<table>
<thead>
<tr>
<th>Contractor</th>
<th>Date</th>
<th>NASA</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Final Acceptance Date**

<table>
<thead>
<tr>
<th>Date</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
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**REFER TO PROCEDURES FOR REQUIRED SIGNATURES**

REFER TO PROCEDURES FOR REQUIRED SIGNATURES

---

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<thead>
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<th>DESCRIPTION (Print or Type)</th>
<th>Tech.</th>
<th>Imp.</th>
<th>Cont.</th>
<th>NAS</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>
<td></td>
<td></td>
</tr>
<tr>
<td>8) Record the time and frame.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TIME 19:33:4 FRAME 70 PAGE 1470</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9) At the Teletype, type REWIND/\ to rewind Tape.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10) At the Teletype, type FRAME/0 to reset frame count.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11) At the Tape Transport</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A) Dismount Tape 2.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B) Mount Tape 2A.</td>
<td></td>
<td></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>
<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>
<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>
<td></td>
<td></td>
</tr>
<tr>
<td>15) At the Teletype, type REWIND/\ to rewind to the tape.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16) Record the time, frame, page.</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>TIME 5:41 FRAME 1 PAGE 208</strong></td>
<td></td>
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</tr>
<tr>
<td>17) At the Transport</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A) Dismount Tape 2A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B) Mount Tape 6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18) At the Teletype, type FRAME/0 to reset frame/count.</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>19) At the Teletype, type STANDARD LABELS/ to set check standard label.</td>
<td></td>
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</tr>
<tr>
<td>20) At the Teletype, type GO/. Verify that time is printed out on the Teletype.</td>
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</tr>
<tr>
<td>21) Record time, frame and page when END OF FILE is printed out.</td>
<td></td>
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<tr>
<td><strong>TIME 6:36:1 FRAME 1 PAGE 803</strong></td>
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TEST PREPARATION SHEET
CONTINUATION SHEET
NASA – LYNDON B. JOHNSON SPACE CENTER

DESCRIPTION (Print or Type)

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<th>TPS No.</th>
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Page 3 of 4

22) At the Teletype, type REWIND to rewind the tape.

23) At the Tape Transport
   A) Dismount Tape 6.
   B) Mount Tape 2.

24) At the Teletype, type CNTRL D to enter DEBUG.

25) At the Teletype, type PRO;105PR$J to load the old 105mm Print Program.

26) At the Teletype, type UNLABEL/1.

27) At the Teletype, type SKIP/1.

28) At the Teletype, type GO/1. Verify that time is printed out on the Teletype.

29) When END OF FILE is printed out of the Teletype, type END JOB.

30) Record time, frame, page.

TIME 1:50 FRAME 67 PAGE 1449

31) At the Teletype, type REWIND/1 to rewind Tape.

32) At the Teletype, type FRAME/0 to reset frame count.

33) At the Tape Transport
   A) Dismount Tape 2.
   B) Mount Tape 2A.

34) At the Teletype, type GO/1. Verify that time is printed out on the Teletype.

35) When END OF FILE is printed out, type END JOB.

36) Record the time, frame, page.

TIME 1:28 FRAME 1 PAGE 208

37) At the Teletype, type REWIND/1 to rewind the tape.

38) At the Teletype, type FRAME/0 to reset frame count.
### TEST PREPARATION SHEET

**CONTINUATION SHEET**  
NASA – LYNDON B. JOHNSON SPACE CENTER

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<tr>
<td>39) At the Teletype, type STANDARD LABEL to check Standard Label Record.</td>
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</tbody>
</table>
| 40) At the Tape Transport  
A) Dismount Tape 2A. 
B) Mount Tape 6. |       |       |       |      |
| 41) At the Teletype, type GO/✓. Verify that time is printed out on the Teletype. |       |       |       |      |
| 42) When END OF FILE is printed out on the Teletype, record time, frame and page.  
TIME 4:24" FRAME 7 PAGE 800 |       |       |       |      |
<p>| 43) At the Teletype, type REWIND/✓ to rewind the tape. |       |       |       |      |
| 44) At the Teletype, type two CLEAR/✓ to clear film in the camera. |       |       |       |      |
| 45) Process the film. |       |       |       |      |</p>
<table>
<thead>
<tr>
<th>24</th>
<th>16K PRINT PROGRAMS - 16MM CAMERA (16PRNT)</th>
<th>25</th>
<th>1</th>
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<tbody>
<tr>
<td>26</td>
<td>Installing the new 12K Print Program for 16mm camera</td>
<td>27</td>
<td>9</td>
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**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/1. 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:** 59
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<tr>
<td>6) At the Teletype, type REWIND/ to rewind the tape.</td>
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<tr>
<td>7) At the Teletype, type FRAME/0 to reset the frame count.</td>
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<tr>
<td>8) At the Tape Transport</td>
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<tr>
<td>A) Dismount Test Tape 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B) Mount Test Tape 1A</td>
<td></td>
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<tr>
<td>9) At the Teletype, type GO/ to verify that time, frame and Job ID is printed out on the Teletype.</td>
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<tr>
<td>10) When *END OF JOB and *END OF FILE is printed out on the Teletype, record the time and frame count.</td>
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<tr>
<td>TIME 148.7 FRAME 170</td>
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<td>11) At the Teletype, type REWIND/ to rewind the tape.</td>
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<td>12) At the Tape Transport</td>
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<tr>
<td>A) Dismount Tape 1A</td>
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<td></td>
<td></td>
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<tr>
<td>B) Mount Tape 1</td>
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<tr>
<td>13) At the Teletype, type CLEAR/</td>
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<tr>
<td>14) At the Teletype, type CNTRL to enter DEBUG.</td>
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<tr>
<td>15) At the Teletype, type PRO:16PRNT$J.</td>
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</tr>
<tr>
<td>16) At the Teletype, type GO/ to verify that time, frame, and Job ID is printed out on the Teletype.</td>
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<tr>
<td>17) When *END OF JOB and *END OF FILE is printed out on the Teletype, record the time and frame count.</td>
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<td>TIME 9'26.5 FRAME 355</td>
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<td>18) At the Teletype, type REWIND/ to rewind the tape.</td>
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<td>19) At the Teletype, type FRAME/0 to reset frame count.</td>
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<tr>
<td>A) Dismount Test Tape 1</td>
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<td></td>
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<tr>
<td>B) Mount Test Tape 1A</td>
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<tr>
<td>21) At the Teletype, type GO/ \n  Verify that time,</td>
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<tr>
<td>frame and Job ID is printed out on the Teletype.</td>
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<td>22) When *END OF JOB and *END OF FILE is printed out</td>
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<tr>
<td>on the Teletype, record the time and frame count.</td>
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<tr>
<td>TIME 146.2 FRAME 170</td>
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<td>23) At the Teletype, type REWIND/ \n  to rewind the</td>
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<tr>
<td>tape.</td>
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<tr>
<td>24) Process the film.</td>
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**TEST PREPARATION SHEET**

**NASA - LYNDON B. JOHNSON SPACE CENTER**

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<tr>
<th>Reason for Work</th>
<th>17</th>
</tr>
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</table>

**Verification of Piche Print Program (105PR) index form and index flash modifications.**

### I. 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.

### 18 DESCRIPTION (Print or Type)

<table>
<thead>
<tr>
<th>Tech</th>
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**Refer to procedures for required signatures**

---

**Prepared By**

<table>
<thead>
<tr>
<th>19</th>
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</table>

**Final Acceptance Date**

<table>
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<th>20</th>
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**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:

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<td>28 November 1973</td>
<td>F. C. Ashton</td>
<td>EO-191F - TPS A12</td>
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<td>17 June 1974</td>
<td>F. C. Ashton</td>
<td>EO-191F - TPS A13</td>
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<td>12 July 1974</td>
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TPS No. A12, A13 and A14 follow.
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<td>To verify the software development on the CON System for the HCO as defined in PHO SH-25722 and as required under HCOT</td>
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<th><strong>23.</strong> NASA</th>
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</table>
(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.

(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.

(7) Type END JOB/ to complete processing of S055 Acceptance Test Tape (Tape 1). Verify that *OK is typed on the teletype.

(8) Type CLEAR/ 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 S055 Test Tape (Tape 1). Verify that *OK is typed on the teletype.

(10) Type CNTRL D to return to DEBUG. Verify *DEBUG is typed on the teletype.

c. At the Tape Transport

(1) Dismount the S055 Acceptance Test Tape (Tape 2).

2. S055 Acceptance Test Tape 2
a. At the Tape Transport
   (1) Mount HCO Acceptance Test Tape (Tape 3).

b. At the Teletype:
   (1) Type PRO;HCO $J to load S055 program. Verify that *MONITOR is typed on the teletype.

   (2) Type UNLABELED/3. Verify that *OK is typed on the teletype.
(3) Type CLEAR/\(\) to advance exposed film into the take-up magazine. Verify that *OK is typed on the teletype after each CLEAR/\(\).  

(4) 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. 

(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/\(\) to complete processing of the HCO Acceptance Test Tape (Tape 3). Verify that *OK is typed on the teletype. 

(7) Type CLEAR/\(\) twice to advance exposed film into the take-up magazine. Verify that *OK is typed on the teletype after each CLEAR/\(\). 

(8) Type REWIND/\(\) 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).
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**TEST PREPARATION SHEET**

NASA - LYNDON B. JOHNSON SPACE CENTER

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</tr>
<tr>
<td>a) At the tape transports</td>
</tr>
<tr>
<td>1) Mount 9-Track HCO in Gray tape number 3165 on the 9-Track unit.</td>
</tr>
<tr>
<td>2) Mount 7-Track HCO - Gray Tape number 3299 on the 7-Track unit.</td>
</tr>
<tr>
<td>b) At the teletype:</td>
</tr>
<tr>
<td>1) Type PRO; HCO $J to load the production HCO. 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 Focus to Focus the Camera.</td>
</tr>
</tbody>
</table>

**Reason for Work:** To verify the new version HCO will process both 7-Track and 9-Track.
<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 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.</td>
<td>35'7.4</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>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### TEST PREPARATION SHEET

**CONTINUATION SHEET**
NASA – LYNDON B. JOHNSON SPACE CENTER

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<thead>
<tr>
<th>DESCRIPTION (Print or Type)</th>
<th>Tech.</th>
<th>Insp.</th>
</tr>
</thead>
<tbody>
<tr>
<td>b) 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 PQA; 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 typed on 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>
<td></td>
</tr>
</tbody>
</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.
<table>
<thead>
<tr>
<th>1. Type</th>
<th>A</th>
<th>Configuration Change</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
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### TEST PREPARATION SHEET

**NASA - LYNDON B. JOHNSON SPACE CENTER**

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<tr>
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<th>Column 3</th>
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<tbody>
<tr>
<td>S/C Cat. No.</td>
<td>Page</td>
<td>of 2</td>
</tr>
<tr>
<td>1.</td>
<td>A</td>
<td>14</td>
</tr>
<tr>
<td>2. TPS No.</td>
<td>A</td>
<td>14</td>
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**S/C No./Model No.**

<table>
<thead>
<tr>
<th>Column 4</th>
<th>Column 5</th>
<th>Column 6</th>
</tr>
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<tbody>
<tr>
<td>Date</td>
<td>Time</td>
<td>Need Date</td>
</tr>
<tr>
<td>7</td>
<td>8</td>
<td>27 July 74</td>
</tr>
</tbody>
</table>

**Drawings, Documents, Ocp's, & Part Number(s)**

<table>
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<tr>
<th>Column 7</th>
<th>Column 8</th>
</tr>
</thead>
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<tr>
<td>Contract Number</td>
<td>Serial Number</td>
</tr>
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<td>11</td>
<td>12</td>
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**System**

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<tr>
<th>Column 9</th>
<th>Column 10</th>
<th>Column 11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer to Microfilm</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**TPS Short Title**

<table>
<thead>
<tr>
<th>Column 12</th>
<th>Column 13</th>
</tr>
</thead>
<tbody>
<tr>
<td>HCO Gray Title Acceptance Test</td>
<td></td>
</tr>
</tbody>
</table>

**Reason for Work**

To verify that Title Fiche Development for HCO Gray (FR80 Clarification Form A17)

<table>
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<tr>
<th>Column 14</th>
<th>Column 15</th>
<th>Column 16</th>
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<tr>
<td>DESCRIPTION (Print or Type)</td>
<td>Inspect.</td>
<td>21. NASA</td>
</tr>
<tr>
<td>18</td>
<td>Tech. 22 CONT</td>
<td></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:HCOSJ to load HCO program.

   Verify that *MONITOR is typed on the Teletype.

   (2) Type CLEAR/ to advance exposed film into the take-up magazine. Verify that *OK is typed on the teletype.

   (3) Type UNLABELLED/.

   Verify *OK is typed on the Teletype.

   (4) Type TAPE TYPE 8.

   Verify *OK is typed on the Teletype.

   (5) Type USE 2.

   Verify *OK is typed on the Teletype.

**Prepared By**

Frank Ashton

**Final Acceptance Date**

Fred Deane, Jr. 7/12/74

**Contractor Date**

7/12/74

**Copy**

1
(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>
<thead>
<tr>
<th>Date</th>
<th>Author</th>
<th>EO/TPS No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 November 1973</td>
<td>I. J. Morgan</td>
<td>EO-204F - TPS A17</td>
</tr>
</tbody>
</table>

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**

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<th>Non Configuration Change</th>
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<tbody>
<tr>
<td>A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 1. S/C J 5 Page-1 of 3 6. S/C No/Madal No

### 2. TPS No. E.O. 204F A17

### 3. S/C Cat. No.

### 4. Mod. Sheet Number

### 5. Page 1 of 3

### 7. Date

### 8. Time

### 9. Need Dm C 11·73

### 10. Drawings, Documents, Op's & Part Number(s)

### 11. Contract Number NAS 9-1261

### 12 Serial Number

### 13. System COMPUTER ON MICROFILM

### 14. Ref E.O. Number 204F E I #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.

### 18. DESCRIPTION (Print or Type)

#### 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 PROJUNIVAC$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.

#### 19. Prepared By

| L. LOCKLER |  |

#### 20. Final Acceptance Date

Refer to procedures for required signatures

**Contractor**

<table>
<thead>
<tr>
<th>Date</th>
<th>NASA</th>
</tr>
</thead>
</table>

**N.A.S.A.**

MSC—Cont., Houston, Texas

Copy 1

---

B-102
### TEST PREPARATION SHEET

**CONTINUATION SHEET**

**NASA - MANNED SPACECRAFT CENTER**

<table>
<thead>
<tr>
<th>Page</th>
<th>2 of 3</th>
</tr>
</thead>
</table>

####DESCRIPTION (Print or Type)

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.

   (3) TypeREWIND/ to rewind the Univac Test Tape (Tape 1). Verify that *OK is typed on the teletype.

   (2) 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) TypeREWIND/ to rewind the Univac 494 Print Acceptance Test Tape (Tape 2).

Verify that *OK is typed XH 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 3210 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 (Cont'd)
<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></td>
<td>TEST FIVE DIFFERENT FORMS AND INDEXING FOR FULL PAGES AND FULL MICROFICHE</td>
<td>GENERATE A CONTROL RECORD FOR FORMS OVERLAY AND INDEXING. THIS RECORD SHALL PRECEDE EVERY 64 DATA RECORDS. THE FORMS OVERLAY RECORDS SHALL OCCUR IN THE FOLLOWING ORDER:  * BLANK FORM  * A BOX ENCLOSED THE 11 x 14 PRINTER PAGE  * 65 LINES  * A BOX ENCLOSED THE 11 x 14 PRINTER PAGE WITH 65 LINES  * A BOX ENCLOSED THE 11 x 14 PRINTER PAGE WITH 65 HORIZONTAL LINES AND 132 VERTICAL LINES THE INDEXING VALUES SHALL VARY ON EACH OF THE FORM CONTROL RECORDS.</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.</td>
</tr>
<tr>
<td></td>
<td>TEST MULTIREEL/JOB AND MULTIREEL/PAGE</td>
<td>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>
</tbody>
</table>
### TABLE B-19 (CONT'D)

<table>
<thead>
<tr>
<th>JOB/TAPE NO. &amp; JOB NAME</th>
<th>PURPOSE</th>
<th>CONTENT/FORMAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>TEST ABSENCES OF THE FORM AND INDEX CONTROL RECORD</td>
<td>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>
</tr>
<tr>
<td>JOB NO.</td>
<td>TAPE NO.</td>
<td>USERS TITLE</td>
</tr>
<tr>
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<td>UNIVAC 494 MULTIREEL TEST</td>
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<tr>
<td>3</td>
<td>2</td>
<td>UNIVAC 494 CARRIAGE CONTROL TEST</td>
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<td>2</td>
<td>UNIVAC 494 COMIC MODE TEST</td>
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<tr>
<td>5</td>
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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:

<table>
<thead>
<tr>
<th>Date</th>
<th>Author</th>
<th>EO/TPS No.</th>
</tr>
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<tr>
<td>6 November 1973</td>
<td>I. J. Morgan</td>
<td>EO-204F - TPS A18</td>
</tr>
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</table>

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

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.

DESCRIPTION (Print or Type)

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 PRO;UV16$J to load the Univac 494 16mm 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.
      (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.

Prepared By
R. A. Marks

Final Acceptance Date

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR
## TEST PREPARATION SHEET
### CONTINUATION SHEET
NASA - MANNED SPACECRAFT CENTER

<table>
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<th>DESCRIPTION (Print or Type)</th>
<th>Tech</th>
<th>Imp</th>
<th>Con</th>
<th>NASA</th>
</tr>
</thead>
<tbody>
<tr>
<td>(5) <strong>Type REWIND/[ch]</strong> to rewind the Univac Test Tape</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Tape 1). Verify that <strong>OK</strong> is typed on the teletype.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. <strong>At the Tape Transport</strong></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>
</tbody>
</table>

2. **Univac 494 Print Acceptance Test Tape 2**
   (Continuation of Job 2 from Tape 1)
<p>| a. <strong>At the Tape Transport:</strong> | | | | |
| (1) Mount the Univac 494 Test Tape 2. | | | | |
| b. <strong>At the Teletype:</strong> | | | | |
| (1) <strong>Type CONTINUE/ch</strong> to signify continuation of Job. | | | | |
| (2) Verify that the elapsed job time, frame number, page number and <strong>END OF FILE</strong> are typed on the teletype to signal completion of data tape processing. | | | | |
| (3) <strong>Type END JOB/ch</strong> to complete processing of the Univac 494 Test Tape (Tape 2). | | | | |
| (4) <strong>Type CLEAR/ch</strong> twice to advance exposed film into the take-up magazines. Verify that <strong>OK</strong> is typed on the teletype after each <strong>CLEAR/ch</strong>. | | | | |
| (5) <strong>Type REWIND/ch</strong> to rewind the Univac 494 Print Acceptance Test Tape (Tape 2). Verify that <strong>OK</strong> is typed on the teletype. | | | | |
| c. <strong>At the Tape Transport:</strong> | | | | |
| (1) Dismount the Univac 494 Print Acceptance Test Tape (Tape 2). | | | | |</p>
<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. 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 precede the data records. The image orientation control record indicates COMIC mode; i.e., a 1 follows
the 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 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 REPertoire 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>
</tbody>
</table>
|                         | TEST FIVE DIFFERENT FORMS AND INDEXING FOR FULL PAGES | GENERATE A CONTROL RECORD FOR FORMS OVERLAY AND INDEXING. THIS RECORD PRECEDES EVERY 64 DATA RECORDS. THE FORMS OVERLAY RECORDS OCCUR IN THE FOLLOWING ORDER:  
  - BLANK FORM  
  - A BOX ENCLOSING THE 11 x 14 PRINTER PAGE  
  - 65 LINES  
  - A BOX ENCLOSING THE 11 x 14 PRINTER PAGE WITH 65 LINES  
  - A BOX ENCLOSING THE 11 x 14 PRINTER PAGE WITH 65, HORIZONTAL LINES AND 132 VERTICAL LINES. THE INDEXING VALUES VARY ON EACH OF THE FORM CONTROL RECORDS. |
| 2/1 & 2 COMA 2          | TEST JOB SEPARATOR CONTROL RECORD | 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. |
|                         | TEST MULTIREELS PER JOB AND MULTIREELS PER PAGE | |

B-120
### TABLE B-21 (CONT'D)

<table>
<thead>
<tr>
<th>JOB/TAPE NO. &amp; JOB NAME</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. TEST ABSENCES OF FORM AND INDEX CONTROL RECORD</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 ARE 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>
<tr>
<td>JOB NO.</td>
<td>TAPE NO.</td>
<td>USERS TITLE</td>
</tr>
<tr>
<td>---------</td>
<td>----------</td>
<td>----------------------------------</td>
</tr>
<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>
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B.13 COMA LACIE STATUS MODULE (PFC, COMA)

See paragraph 2.13. Revisions are as follows.

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<th>Author</th>
<th>TPS No.</th>
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<tr>
<td>3 April 1975</td>
<td>J. E. Bennett</td>
<td>TPS A16</td>
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See paragraph B.15 for TPS A16.
B.14 COMA LACIE STATUS DISPLAY (REVEAL)

See paragraph 2.14. Revisions are as follows:

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<tr>
<th>Date</th>
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<th>TPS No.</th>
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<tbody>
<tr>
<td>28 May 1975</td>
<td>J. E. Bennett</td>
<td>TPS A15</td>
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TPS A15 follows.
**TEST PREPARATION SHEET**

**NASA - MANNED SPACECRAFT CENTER**

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<th>Non-Configuration Change</th>
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<th>Model No.</th>
<th>5</th>
</tr>
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<tr>
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<th>7</th>
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<thead>
<tr>
<th>Time</th>
<th>8</th>
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<table>
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<tr>
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<th>9</th>
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<th>Ref E O Number</th>
<th>14</th>
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<th>TPS Short Title</th>
<th>15</th>
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<th>Reason for Work:</th>
<th>17</th>
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</thead>
</table>

**TPS No.** | A15 |

**Page** | 5 of |

**DESCRIPTION (Print or Type)**

<table>
<thead>
<tr>
<th>I. TESTS</th>
<th>18</th>
</tr>
</thead>
</table>

| A. At the teletype: enter REVEAL$J. | ✔ |

| B. Verify that *MONITOR is typed by program. | ✔ |

| C. Enter REVEAL STATUS BLOCKS/(CR) | ✔ |

<table>
<thead>
<tr>
<th>II. VERIFICATION</th>
<th>19</th>
</tr>
</thead>
</table>

| A. Verify that the data displayed by the program is the same as the printout from R.T.O.S. | ✔ |

**Prepared By** | 19 |

**Final Acceptance Date** | 20 |

**REFER TO PROCEDURES FOR REQUIRED SIGNATURES**

<table>
<thead>
<tr>
<th>Contractor</th>
<th>Date</th>
<th>NASA</th>
<th>Date</th>
</tr>
</thead>
</table>

Jack E. B. Smith | 5/28/75 | F. E. Jones | 5/28/75 |
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 TPS A16</td>
</tr>
<tr>
<td>20 October 1975</td>
<td>J. Gummelt</td>
<td>TPS A20</td>
</tr>
</tbody>
</table>

TPS A16 and A20 follow.
### Test Preparation Sheet

**NASA - Manned Spacecraft Center**

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<td>A16</td>
</tr>
<tr>
<td>S.C. Cat. No.</td>
<td></td>
</tr>
<tr>
<td>Page</td>
<td>1 of 4</td>
</tr>
<tr>
<td>Date</td>
<td>April 4, 1975</td>
</tr>
<tr>
<td>Contract No.</td>
<td></td>
</tr>
<tr>
<td>Serial Number</td>
<td></td>
</tr>
<tr>
<td>System</td>
<td>FR-80 Microfilm System (COM-A)</td>
</tr>
<tr>
<td>TPS Short Title</td>
<td>Lacie Print Program</td>
</tr>
<tr>
<td>Reason for Work</td>
<td>To verify the new Lacie print program with status tape for the COM-A</td>
</tr>
</tbody>
</table>

#### Test Tape

The Test Tapes are furnished by IBM LACIE Group.

**Test File 1 - Reel 14360**
- Single Reel with 6 Title Records.

**Test File 2 - Reels 917 and 13067**
- Two Reel File containing three Title Records with indexing.
  - 1. Base Line Single Reel File
    - Program PRO:105PR$J
    - Frames: 7 Pages: 1 PAGES TIME
  - 2. Base Line Multi-Reel File Program PRO:105PR$J
    - Tapes 917, 13067
    - Frames: 6 Pages: 3 G6 TIME
  - 3. New Program Single Reel File
    - Program PCA:LACPR$TJ
    - Tape 14360
    - Type In: Julian Data 75095
    - Tape Number A14360

**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></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4. New Program Multi-File
   Program FCA;LACPRT$J
   Tape 917, 13067
   Type In: Julian Data 75095
   Tape Number A917
   Continue
   Tape Number A13067

5. New Program Single Title
   Program FCA;LACPRT$J
   Type In: Search Title /1, 1
   Julian Data 75095
   Tape Number B13067

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

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 Date 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.
**TEST PREPARATION SHEET**

**NASA - LYNDON B. JOHNSON SPACE CENTER**

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<thead>
<tr>
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<td></td>
<td>Non-Configuration Change</td>
</tr>
</tbody>
</table>

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<th>A19 A20</th>
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<tr>
<td>5. Page</td>
<td>1 of 2</td>
</tr>
<tr>
<td>7. Date</td>
<td>October 20, 1975</td>
</tr>
<tr>
<td>8. Time</td>
<td></td>
</tr>
<tr>
<td>9. Need Date</td>
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<tr>
<td>10. Drawings, Documents, UoP's, &amp; Part Numbers</td>
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</tr>
<tr>
<td>11. Contract Number</td>
<td></td>
</tr>
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<td>12. Serial Number</td>
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<tr>
<td>13. System</td>
<td>COMA</td>
</tr>
<tr>
<td>14. Ref. E/O Number</td>
<td>TIF 17G1</td>
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<td>15. TPS Short Title</td>
<td>LACIE Print - Julian Date Calculation</td>
</tr>
<tr>
<td>16. Wt. Req</td>
<td></td>
</tr>
</tbody>
</table>

**Reason for Work**

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.

**DESCRIPTION (Print or Type)**

**TESTS**

**1. GENERAL**

1.1 Tape Input. This tape is a LACIE Print Tape.

1.2 Teletype Input. Date to be converted will be entered from teletype.

1.3 Film, 105mm Film will be output.

1.4 Status Tables. Files containing information on files statused will be displayed on the monitor.

**2. TEST PROCEDURES**

**A. Normal Operation**

1. Mount program tape on 9-track drive.

2. Type D$J on teletype.

3. Type R$J on teletype.

4. Type WIPE on teletype.

5. Type ALL on teletype. Programs to be used will be read into core.


---

**Prepared by:**

Jim Gummelt

**Final Acceptance Date:**

10/20/75

---

**COPY A**
<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>Tech.</th>
<th>Insp.</th>
<th>Cont.</th>
<th>NASA</th>
</tr>
</thead>
<tbody>
<tr>
<td>7. Type FGA;LACPRT$J. Monitor will display run options.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Type GO/2.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Teletype will print: ENTER DATE</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Type today's date in the form MM/DD/YY.</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Teletype will print ENTER TAPE NUMBER.</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Type tape number 13731. Print tape will begin processing with frames displayed on monitor.</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Type Control A. Processing will halt when a complete page is done.</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Type TERM/</td>
<td>.</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Type CL/ twice.</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Type Control D.</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. Type REV$AL$J.</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. Type REV/</td>
<td>. 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>
<td></td>
</tr>
</tbody>
</table>
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**T.O./E.O.:** 5-2E00

**FREQUENCY:** A/R

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<td>FS2</td>
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<td>F. Goodson (3)</td>
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