SD-4060 OCPLT4 PROGRAM
USERS' GUIDE

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GODDARD SPACE FLIGHT CENTER
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SD-4060 OCPLT4 PROGRAM USERS' GUIDE

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for

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ABSTRACT

This report contains a brief description of the Stromberg Datagraphixs 4060 (SD-4060) Orbit Comparison Plot (OCPLT4) Program, along with user information and a source program listing. This program was developed by Computer Sciences Corporation under Task Assignment 096 to supersede the SC-4020 OCPLT4 Program, which was developed in early 1970. The object program is currently on tape number 564M, and filed under Program Number 498 at GSFC Program library.

In addition to correcting several errors that existed in the original program, this program incorporates the following new features:

- For any satellite whose observations are processed by the Definitive Orbit Determination System (DODS), the orbital uncertainty estimates (OUE) can be obtained via appropriate card input with no major modification to the program.

- All satellite-related information (e.g., plotter scales, cutoff limits, plotting frequencies) is user controlled via card input.

- Not all components of OUE must be obtained. The user has the option of obtaining only the radial component if there is no need for the other two components.

- The altitude and time graph formats are controlled by the user and are not stored for specific satellites.
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<td>3-6</td>
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<tr>
<td>3-3</td>
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<td>3-7</td>
</tr>
<tr>
<td>4-1</td>
<td>JCL Setup for Executing the OCPLT4 Program (SD-4060 Version)</td>
<td>4-3</td>
</tr>
</tbody>
</table>
The purpose of the SD-4060 OCPLT4 Program is to generate an instruction tape for the Stromberg Datagraphixs 4060 (SD-4060) plotter (see Reference 1). The resulting graphs display component differences between two satellite position vectors within an overlapping time period. These differences are called the orbital uncertainty estimates (OUE). The following set of three orthogonal vector components is plotted:

- The radial component
- The component normal to the radial component in the orbital plane
- The component normal to the radial component and normal to the orbital plane

Each component is plotted on an individual graph.

The components can be plotted on either a linear or a logarithmic ordinate scale, and against an altitude or a time abscissa scale. The choice of abscissa scale is a function of the satellite's altitude. Low-altitude satellites with several revolutions per day are usually plotted against a time scale, and the results are called time graphs, whereas high-altitude satellites which complete only one revolution in several days are usually plotted on an altitude scale, and the results are called altitude graphs. When requested, these graphs also display the time distribution plots of observations used in obtaining the converged elements that provide the overlapping ephemerides. These graphs provide the experimenter with the OUE that can be used for analyzing definitive orbit results (see Reference 2).

OCPLT4 provides OUE graphs for any satellite whose observations are processed by the Definitive Orbit Determination System (DODS) on the IBM System/360.
Inputs to the SD-4060 OCPLT4 Program include the vector compare (VC) tapes, which are generated by DODS Ephemeris Comparison Subsystem; and a working-observations-file tape, which is generated by the DODS Differential Correction (DC) Subsystem.

Output from the SD-4060 OCPLT4 Program consists of a printout detailing what was accomplished by the run, and an instructions tape for the SD-4060 plotter to plot the OUEs. Usually, the SD-4060 plotter will provide 16-mm microfilm frames, one frame for each OUE graph, although 35-mm can be requested. Hard copies can be obtained from either film format upon request.

The SD-4060 OCPLT4 Program has been compiled under FORTRAN IV, level H, optimization level 2, on the Goddard Space Flight Center (GSFC) IBM System/360 Model 95, operating under OS using Release 19.6. No changes are necessary to run this program on the M&DO IBM System/360 Model 75.

The remaining sections of this user's guide present detailed information on program input (with sample deck setup), program output (including error messages), sample plotter output graphs, and operating information (with timing estimates). Also presented are the programming approach utilized, brief descriptions of subroutines, and a source program compilation listing.
SECTION 2 - PROGRAM INPUT

2.1 USER OPTIONS

All satellite-related variables are user controlled in this version of OCPLT4. Variables include satellite name, ID number, and date of run, all of which appear on the plots. Grid labeling and grid spacing are also user controlled to provide the flexibility required to process a wide variety of satellites. Other user inputs are the upper and lower cutoff limits for graphs. These inputs allow the user to control the overall appearance of the plots.

The user controls the following in a single job submission: the type of abscissa (altitude or time\(^1\)); the type of ordinate scale (linear or logarithmic); whether or not observation data distribution will be plotted; and whether the radial component only, or all three OUE components, will be plotted.

2.2 TAPE INPUT

OCPLT4 requires at least two input tapes. The first, the VC tape, is generated by DODS using function 1 of the COMPARE verb (see Reference 3). This is a nine-track EBCDIC tape which is loaded on any 2400 series tape drive. It contains the Orbit Comparison Report (see Reference 3). This report is obtained by comparing two overlapping ephemerides (satellite-position time histories). Both ephemerides must be generated at equally spaced and corresponding time points in the overlap region. The differences between the two satellite position vectors at each point in time are expressed as differences between three orthogonal components of the vectors. The Orbit Comparison Report consists of a tabulation of the two ephemerides, the three component differences (which are the OUEs), and the total vector difference as a function of time. Several Orbit Comparison Reports (also called VC Reports) could be written onto a single file.

\(^1\)Either plot, or both, may be generated from a single job submission.
on a tape, and several files could be written onto a single tape, but they must appear in ascending time order. OCPLT4 will process up to 24 VC files in a single job submission.

The second tape is the working-observations-file tape. This is a nine-track binary tape which is likewise loaded on any 2400 series tape drive. It contains the working observations data (see Reference 4), as generated by DODS using the SETDC verb (see Reference 3). It should contain the observations from a time period which extends by at least three hours on both sides of the period covered by all of the VC files to be plotted. These observations could be in concentric or nonconcentric time order. This is determined by the relationship between the epoch of elements and the start time used in creating the working-observations-file tape. When the epoch date precedes, or is equal to, the start time of data, observations will be in ascending time order (nonconcentric). If epoch is between start and end time, observations will be in concentric order. In case no data distribution plots are requested, a tape must still be mounted; it may be a dummy tape. When using the SETDC verb for this purpose, the standard DODS Job Control Language (JCL) should be overridden so that the working-observations-file data are output on tape instead of disk.

2.3 CARD INPUT

At least 15 data cards are required for each OCPLT4 run. These cards must appear in the data deck in the order indicated by card number (Card 1, Card 2, etc.). The format for each card is defined on the following pages.
<table>
<thead>
<tr>
<th>Format</th>
<th>Column</th>
<th>Internal Variable Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>1</td>
<td>CON</td>
<td>Indicates whether data on working observations file tape is concentric edited: = C, concentric edited ≠ C, not concentric edited</td>
</tr>
<tr>
<td>1X</td>
<td>2</td>
<td></td>
<td>Blank</td>
</tr>
<tr>
<td>A8</td>
<td>3-10</td>
<td>SNAME</td>
<td>Satellite name (e.g., SSS-1) (left justified)</td>
</tr>
<tr>
<td>1X</td>
<td>11</td>
<td></td>
<td>Blank</td>
</tr>
<tr>
<td>I5</td>
<td>12-16</td>
<td>ISAT</td>
<td>Satellite identification no. (e.g., 71961)</td>
</tr>
<tr>
<td>1X</td>
<td>17</td>
<td></td>
<td>Blank</td>
</tr>
<tr>
<td>I6</td>
<td>18-23</td>
<td>IRUN</td>
<td>Computer run date in YYMMDD format (e.g., 720912)</td>
</tr>
<tr>
<td>1X</td>
<td>24</td>
<td></td>
<td>Blank</td>
</tr>
<tr>
<td>H1</td>
<td>25</td>
<td>LOG</td>
<td>Indicates type of scale on Y-axis of graph: = 0, linear scale = 1, log scale</td>
</tr>
<tr>
<td>1X</td>
<td>26</td>
<td></td>
<td>Blank</td>
</tr>
<tr>
<td>H1</td>
<td>27</td>
<td>MANY</td>
<td>Controls labeling interval for the hours scale (X-axis) on the data distribution plot when altitude graphs are desired: = 0, label every hour = 1, label every 4 hours; this prevents overcrowding of the hours labels and as a rule should be used when there are more than 2 days between apogee and perigee</td>
</tr>
<tr>
<td>Format</td>
<td>Column</td>
<td>Internal Variable Name</td>
<td>Description</td>
</tr>
<tr>
<td>-------</td>
<td>-------</td>
<td>------------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>F10.0</td>
<td>1-10</td>
<td>XL</td>
<td>Lower limit of X-coordinate on altitude graph, thousands of km</td>
</tr>
<tr>
<td>F10.0</td>
<td>11-20</td>
<td>XR</td>
<td>Upper limit of X-coordinate on altitude graph, thousands of km</td>
</tr>
<tr>
<td>F10.0</td>
<td>21-30</td>
<td>YB1&lt;sup&gt;1&lt;/sup&gt;</td>
<td>Lower limit of Y-coordinate on altitude or time graph, radial component (km)</td>
</tr>
<tr>
<td>F10.0</td>
<td>31-40</td>
<td>YB2&lt;sup&gt;1&lt;/sup&gt;</td>
<td>Same as above except for in-plane component</td>
</tr>
<tr>
<td>F10.0</td>
<td>41-50</td>
<td>YB3&lt;sup&gt;1&lt;/sup&gt;</td>
<td>Same as above except for normal-to-plane component</td>
</tr>
<tr>
<td>F10.0</td>
<td>51-60</td>
<td>YT1&lt;sup&gt;1&lt;/sup&gt;</td>
<td>Upper limit of Y-coordinate on altitude or time graph, radial component (km)</td>
</tr>
<tr>
<td>F10.0</td>
<td>61-70</td>
<td>YT2&lt;sup&gt;1&lt;/sup&gt;</td>
<td>Same as above except for in-plane component</td>
</tr>
<tr>
<td>F10.0</td>
<td>71-80</td>
<td>YT3&lt;sup&gt;1&lt;/sup&gt;</td>
<td>Same as above except for normal-to-plane component</td>
</tr>
</tbody>
</table>

<sup>1</sup>When the log mode is being used, these limits must be integer powers of 10.
<table>
<thead>
<tr>
<th>Format</th>
<th>Column</th>
<th>Internal Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>F10.0</td>
<td>1-10</td>
<td>XGRID</td>
<td>Length of interval for drawing grid along the X-axis, altitude option only (thousands of km)</td>
</tr>
<tr>
<td>F10.0</td>
<td>11-20</td>
<td>XLABEL</td>
<td>Length of interval for labeling grid along the X-axis, altitude option only (thousands of km)</td>
</tr>
<tr>
<td>F3.1</td>
<td>21-23</td>
<td>FMTX</td>
<td>Format for labeling grid along the X-axis, altitude option only. FMTX is of the form W.D, where W is the maximum number of characters in a label, including decimal point but not the sign; and D is the number of places to be displayed to the right of the decimal. If the X-axis were to be labeled from 0. to 140., FMTX would be 4.0.</td>
</tr>
</tbody>
</table>

**NOTE:** This card must be included, but should be left blank when using the time option only.
<table>
<thead>
<tr>
<th>Format</th>
<th>Column</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>F10.0</td>
<td>1-10</td>
<td>YGRID1&lt;sup&gt;1&lt;/sup&gt; Length of interval for drawing grid along the Y-axis of altitude or time graph, radial component (km)</td>
</tr>
<tr>
<td>F10.0</td>
<td>11-20</td>
<td>YGRID2&lt;sup&gt;1&lt;/sup&gt; Same as above except for in-plane component</td>
</tr>
<tr>
<td>F10.0</td>
<td>21-30</td>
<td>YGRID3&lt;sup&gt;1&lt;/sup&gt; Same as above except for normal-to-plane component</td>
</tr>
<tr>
<td>F10.0</td>
<td>31-40</td>
<td>YLAB1&lt;sup&gt;1&lt;/sup&gt; Length of interval for labeling grid along the Y-axis of altitude or time graph, radial component (km)</td>
</tr>
<tr>
<td>F10.0</td>
<td>41-50</td>
<td>YLAB2&lt;sup&gt;1&lt;/sup&gt; Same as above except for in-plane component</td>
</tr>
<tr>
<td>F10.0</td>
<td>51-60</td>
<td>YLAB3&lt;sup&gt;1&lt;/sup&gt; Same as above except for normal-to-plane component</td>
</tr>
<tr>
<td>F3.1</td>
<td>61-63</td>
<td>FMTY1 Format for labeling grid along the Y-axis of altitude or time graph, radial component (see FMTX on card 3)</td>
</tr>
<tr>
<td>1X</td>
<td>64</td>
<td>Blank</td>
</tr>
<tr>
<td>F3.1</td>
<td>65-67</td>
<td>FMTY2 Same as above except for in-plane component</td>
</tr>
<tr>
<td>1X</td>
<td>68</td>
<td>Blank</td>
</tr>
<tr>
<td>F3.1</td>
<td>69-71</td>
<td>FMTY3 Same as above except for normal-to-plane component</td>
</tr>
<tr>
<td>1X</td>
<td>72</td>
<td>Blank</td>
</tr>
</tbody>
</table>

<sup>1</sup>These fields should be left blank when using the log mode, since the log mode provides its own grid generation and labeling for the Y-axis.
<table>
<thead>
<tr>
<th>Format</th>
<th>Column</th>
<th>Internal Variable Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>F10.0</td>
<td>1-10</td>
<td>ERRLO1</td>
<td>Lower cutoff limit. If the radial component is less than ERRLO1, the component is set equal to ERRLO1 and plotted. ERRLO1 is in km.</td>
</tr>
<tr>
<td>F10.0</td>
<td>11-20</td>
<td>ERRLO2</td>
<td>Same as above except for in-plane component</td>
</tr>
<tr>
<td>F10.0</td>
<td>21-30</td>
<td>ERRLO3</td>
<td>Same as above except for normal-to-plane component</td>
</tr>
<tr>
<td>F10.0</td>
<td>31-40</td>
<td>ERRHI1</td>
<td>Upper cutoff limit. If the radial component is greater than ERRHI1, the component is divided by 10 before plotting, and an appropriate message is displayed on the plotted output. ERRHI1 is in km. If, after dividing by 10, the value of ERRHI1 is still exceeded, data are plotted outside the graph (user should then increase the scale accordingly and resubmit this run).</td>
</tr>
<tr>
<td>F10.0</td>
<td>41-50</td>
<td>ERRHI2</td>
<td>Same as above except for in-plane component</td>
</tr>
<tr>
<td>F10.0</td>
<td>51-60</td>
<td>ERRHI3</td>
<td>Same as above except for normal-to-plane component</td>
</tr>
<tr>
<td>Format</td>
<td>Column</td>
<td>Internal Variable Name</td>
<td>Description</td>
</tr>
<tr>
<td>--------</td>
<td>--------</td>
<td>------------------------</td>
<td>------------------------------------------------</td>
</tr>
<tr>
<td>I6</td>
<td>1-6</td>
<td>IDAT</td>
<td>YYMMDD of start time of period to be plotted</td>
</tr>
<tr>
<td>I6</td>
<td>8-13</td>
<td>IDAT1</td>
<td>YYMMDD of end time</td>
</tr>
<tr>
<td>1X</td>
<td>7</td>
<td></td>
<td>Blank</td>
</tr>
<tr>
<td>Format</td>
<td>Column</td>
<td>Internal Variable Name</td>
<td>Description</td>
</tr>
<tr>
<td>--------</td>
<td>--------</td>
<td>------------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>I4</td>
<td>1-4</td>
<td>IH</td>
<td>Hours and minutes of start time (HHMM), where HH = hour-of-day MM = minute-of-hour (Cannot precede start time on first VC report to be plotted)</td>
</tr>
</tbody>
</table>
CARD 8

<table>
<thead>
<tr>
<th>Format</th>
<th>Column</th>
<th>Internal Variable Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A4</td>
<td>1-4</td>
<td>TIMEY&lt;sup&gt;1&lt;/sup&gt;</td>
<td>Indicates type of graph to be plotted. If = TIME, only time graphs are plotted; if left blank, both altitude and time graphs are plotted.</td>
</tr>
</tbody>
</table>

<sup>1</sup>For time graphs only--user must specify TIMEY = TIME and NSS6 = 0 or blank. For altitude graphs only--user must leave TIMEY blank and specify NSS6 = 1 (see Card 9).
CARD 9

<table>
<thead>
<tr>
<th>Format</th>
<th>Column</th>
<th>Internal Variable Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>I1</td>
<td>1</td>
<td>NSS1</td>
<td>Dummy, leave blank</td>
</tr>
<tr>
<td>I1</td>
<td>2</td>
<td>NSS2</td>
<td>Dummy, leave blank</td>
</tr>
<tr>
<td>I1</td>
<td>3</td>
<td>NSS3</td>
<td>Dummy, leave blank</td>
</tr>
</tbody>
</table>
| I1     | 4      | NSS4                   | Data distribution flag:  
\[= 1,\text{ eliminate data distribution part of graphs}\]  
\[= 0,\text{ do not eliminate data distribution part of graphs}\]  
| I1     | 5      | NSS5                   | Debug printout flag:  
\[= 1,\text{ suppress debug printout}\]  
\[= 0,\text{ do not suppress debug printout}\]  
| I1     | 6      | NSS6 \(^1\)           | Graph flag:  
\[= 1,\text{ suppress time graphs}\]  
\[= 0,\text{ generate both altitude and time graphs}\]  

\(^1\)For time graphs only--user must specify TIMEY = TIME and NSS6 = 0 or blank. For altitude graphs only--user must leave TIMEY blank and specify NSS6 = 1.
### CARD 10

<table>
<thead>
<tr>
<th>Format</th>
<th>Column</th>
<th>Internal Variable Name</th>
<th>Description</th>
</tr>
</thead>
</table>
| I1     | 1      | NCOMP                  | Indicates number of range difference vector components to be plotted:  
|        |        |                        | = 1, only the radial component is plotted  
|        |        |                        | = 3, all three components are plotted                                                                                                       |
| 1X     | 2      |                        | Blank                                                                                                                                         |
| F3.0   | 3-5    | TFREQ                  | Plotting interval for time graphs (minutes) (Equals the frequency of selecting points from VC report, must be integral multiples of T3DIFF × 60) (See Card 11) |
| 1X     | 6      |                        | Blank                                                                                                                                         |
| F8.0   | 7-14   | APOGEE<sup>1</sup>     | Satellite apogee (to nearest km)                                                                                                           |
| 1X     | 15     |                        | Blank                                                                                                                                       |
| F8.0   | 16-23  | PERIGE<sup>1</sup>     | Satellite perigee (to nearest km)                                                                                                          |

<sup>1</sup>Used to determine the plotting interval for altitude graphs.
CARD 11

<table>
<thead>
<tr>
<th>Format</th>
<th>Column</th>
<th>Internal Variable Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>F4.0</td>
<td>1-4</td>
<td>T3DIFF</td>
<td>Time between comparison points, in seconds (available from VC output)</td>
</tr>
</tbody>
</table>
### CARD 12

<table>
<thead>
<tr>
<th>Format</th>
<th>Column</th>
<th>Internal Variable Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A6</td>
<td>1-6</td>
<td>TAPE&lt;sup&gt;1&lt;/sup&gt;</td>
<td>VC tape number</td>
</tr>
<tr>
<td>1X</td>
<td>7</td>
<td>Blank</td>
<td></td>
</tr>
<tr>
<td>I2</td>
<td>8-9</td>
<td>IFILE&lt;sup&gt;2&lt;/sup&gt;</td>
<td>Number of VC reports on this tape</td>
</tr>
</tbody>
</table>

<sup>1</sup>One card per tape must be specified for each VC tape number for any combination of tapes and files on tape, up to 24 files. There may be more than one file per tape.

<sup>2</sup>There may be more than one VC report per file and more than one file per tape. IFILE = total number of VC reports on the specified tape.
<table>
<thead>
<tr>
<th>Format</th>
<th>Column</th>
<th>Internal Variable Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
<td>Blank card; delimiter for comparison tapes</td>
</tr>
</tbody>
</table>
**CARD 14**

<table>
<thead>
<tr>
<th>Format</th>
<th>Column</th>
<th>Internal Variable Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A6</td>
<td>1-6</td>
<td>TAPE</td>
<td>Working-observations-file tape number</td>
</tr>
<tr>
<td>1X</td>
<td>7</td>
<td>Blank</td>
<td></td>
</tr>
<tr>
<td>I2</td>
<td>8-9</td>
<td>IFILE</td>
<td>= 1</td>
</tr>
</tbody>
</table>

(Only one file will be processed per single submission. The time span of data must extend on both sides of the total VC reports time span.)
CARD 15

<table>
<thead>
<tr>
<th>Format</th>
<th>Column</th>
<th>Internal Variable Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
<td>Blank card; indicates end of card input.</td>
</tr>
</tbody>
</table>

**NOTE:** There can be more than 15 data cards because card 12 may be repeated up to 24 times.

Appendix A provides a sample deck input.
The SD-4060 OCPLT4 Program uses only one file, a temporary disk data set, FT22F001. This data set contains time-sorted information from the working-observations-file tape and is used in plotting the data distribution portion of altitude or time graphs. There is a record for each observation. These records have the following format.

<table>
<thead>
<tr>
<th>Format</th>
<th>Internal Variable Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1X</td>
<td>Blank</td>
<td>Blank</td>
</tr>
<tr>
<td>A4</td>
<td>NOSTOP</td>
<td>Indicates end of data. In the last record, NOSTOP is blank. In all other records, NOSTOP is ABCD.</td>
</tr>
<tr>
<td>3X</td>
<td>Blank</td>
<td>Blank</td>
</tr>
<tr>
<td>I6</td>
<td>ITIME8</td>
<td>YYMMDD</td>
</tr>
<tr>
<td>1X</td>
<td>Blank</td>
<td>Blank</td>
</tr>
<tr>
<td>I4</td>
<td>ITIME9</td>
<td>Hour-of-day and minute-of-hour (HHMM)</td>
</tr>
<tr>
<td>1X</td>
<td>Blank</td>
<td>Blank</td>
</tr>
<tr>
<td>I2</td>
<td>ITYPE</td>
<td>Type of observation:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>= 1, R range data</td>
</tr>
<tr>
<td></td>
<td></td>
<td>= 2, £ minitrack direction cosines</td>
</tr>
<tr>
<td></td>
<td></td>
<td>= 3, m data</td>
</tr>
<tr>
<td></td>
<td></td>
<td>= 9, Ń range-rate data</td>
</tr>
<tr>
<td></td>
<td></td>
<td>= 17, RAO-X radio antenna observation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>= 18, RAO-Y angles data</td>
</tr>
</tbody>
</table>
SECTION 3 - PROGRAM OUTPUT

3.1 TAPE OUTPUT

The program's output is a seven-track binary instruction tape (data set SC4060ZZ), which is used as input to the SD-4060 plotter. The format of this tape is described in Reference 5.

3.2 SYSTEM PRINTER OUTPUT

This section presents information on normal printer output and on error message output.

3.2.1 Normal Printer Output

As processing is initiated, the program prints out some of the input variables to enable the user to spot check possible input errors along with the start and end times of the first VC report to be plotted. As processing proceeds, the first task of the program is to rearrange the concentric sorted observations from the working-observation-file tape in ascending time order, when necessary. The time and type of the rearranged observations are printed out. Each rearranged time and type is preceded by the letters "ABCD."

When both altitude and time graphs are requested along with the data distribution plots, as in the sample output (see Appendix B), the program will first plot altitude graphs for each of the three OUE components from the first VC report, with the associated data distribution information and then the time graphs with the associated data distribution graphs. To indicate that the program has finished reading the VC report, a flag "AT 1004" is printed. The backspacing of this VC report, needed when both altitude and time graphs are requested, is shown by A3COMP=7 until the VC report is backed to the first data point. ITGPH indicates that the time plots will be plotted next. This sequence is repeated until all VC reports have been processed.
The main portion of the printout is concerned with the data distribution portion of the graphs. Because the data distribution is identical for all three OUE components, they appear in triplicate. When altitude graphs are plotted, the portion of orbit being plotted is indicated by apogee-to-perigee (A-P) or perigee-to-apogee (P-A) pass. The time span between A-P or P-A is indicated by the PERIOD PLOTTED, and the YYMMDD HHMM of the start and end times of the period, and also by the integer hour difference between the start and end times. For time graphs, this period is fixed at 24 hours.

The type and quantity of data available from the working-observation-file tape during the period being plotted is also indicated. The number denoted in the message "... PASSES PLOTTED xx" refers to the number of minutes containing one or more observations from a single station. Thus, if within 1 minute, one or more observations were obtained from one station; the number of passes is increased by one and one asterisk is plotted in the data distribution plot at a location corresponding to the hour and minute of the observation.

Refer to Appendix B for a more detailed description of normal printer output.

3.2.2 Debug Output

As a further aid to the user, debug printout will be displayed if column 5 on data card 9 is 0 or is left blank.

This printout, which supplements the normal printout, contains several flags to help identify where in the program the computation takes place, the values of several key variables, the computed location in plotter units of the first point to be plotted, the hours for altitude plots, and the geocentric distances for the time plots and their coordinates on the respective graphs.

3.2.3 Error Message Output

If the start year-month-day of the current VC report is greater than the end year-month-day of the previous report, the message TIME SPAN INCORRECT
ON THIS VC REPORT will be printed, along with the start and end year-month-day in question. Finally, the message OCPLT4 WILL PROCEED TO NEXT VC REPORT TO SEARCH FOR CORRECT TIME SPAN will be printed.

If the time period to be plotted extends beyond the end time of the time-sorted working observations file information on the temporary disk data set, the message REQUESTED TIME SPAN TO BE PLOTTED EXCEEDS OBSERVATION TIME will be printed, and program execution will terminate.

The Integrated Graphics Software (IGS) System is a subroutine library used by OCPLT4 to generate an instruction tape for the SD-4060 plotter. In the event that OCPLT4 gives an illegal command to the IGS System (such as a command to plot a number off scale), an appropriate error message from the IGS System will be printed. A complete list of these error messages can be found in Table 3-4 of Reference 1, and is reproduced verbatim in Appendix C.

3.3 GRAPHIC OUTPUT

The final products of this program are graphs which display the OUE for an orbit, along with the data distribution information. This section describes the two types of graphs (altitude and time) generated by the OCPLT4 Program. Appendix B illustrates a complete set of altitude and time graphs.

3.3.1 Altitude Graphs

Altitude graphs are usually requested when a satellite's orbital period is greater than 24 hours. An altitude graph presents the OUE components as a function of geocentric distance, and also includes a separate data distribution plot.

Six altitude graphs are normally generated for each orbital period. The abscissa of each graph represents the satellite's radial distance from the center of the earth in 1000-km units. The first three graphs (Figures B-2 through B-4) are plotted for one-half an orbit, from apogee to perigee; and the other three graphs (Figures B-5 through B-7) are plotted for the remaining half of the orbit,
from perigee to apogee. The ordinates of the three graphs for each half orbit are the three components of the range difference vector: the radial component, the component in the orbital plane normal to the radial component, and the component normal to the orbital plane. Two altitude graphs will be generated when user specifies radial component only.

At the bottom of each graph is a separate plot, which is produced at the user's request. The observations that are available from the working-observations-file tape are represented on this plot versus universal time (UT) (see Figures 3–1 and 3–2). The time span of this plot corresponds to half of the orbital period. Asterisks represent the data distribution for three sets of observation types: radio antenna observation (RAO) X and Y angles; Minitrack direction cosines ($\ell$ and m); and range and range rate (R and $\dot{R}$). The asterisks become darker as more observations are available at a given time, as from several stations (see Figure 3–3). When no observations are available on the tape, during the time interval of a plot, or if a blank observation tape is mounted, the message NO DATA FOR THIS PERIOD will appear in place of the asterisks (see Figure 3–2).

The following user input information appears in the title of each graph:

- Run date (e.g., 720912)
- Satellite name (e.g., SSS-1)
- Satellite ID (e.g., 71961)

The grid spacing and coordinate labeling are user controlled.

The numbers along the altitude OUE curve indicate UT in hours of day along the trajectory. These hour numbers start with the hour of apogee and end with the hour of perigee for the apogee-perigee graphs, and are in reversed order for the perigee-apogee graphs. As would be expected, these times are generally not equally spaced.
MISSION AND TRAJEKTORY ANALYSIS DIVISION, GODDARD SPACE FLIGHT CENTER

ORBITAL UNCERTAINTY ESTIMATE FOR SSS-1

Figure 3-1. Altitude Graph of Perigee-Apogee Radial Component
Figure 3-2. Altitude Graph of Apogee-Perigee Component Normal to Orbital Plane
Figure 3-3. Time Graph Component in Orbital Plane Normal to Radial
A similar time span is printed in the data distribution plot; however, the time spacing in this plot is uniform. The units here are also UT, and they correspond to the hours of the day for the data distribution. In addition, the observation dates appear on the data distribution plots. A date is printed for every computed day within the trajectory's time span (see Appendix B, Figure B-1).

3.3.2 Time Graphs

Time graphs are usually requested for satellites with short orbital periods (two or more revolutions per day). The time graph is basically similar to the altitude graph, with the following exceptions:

- Three graphs are normally generated, one for each component of the OUE, for each 24-hour period, starting at midnight UT.
- The abscissa of each graph is divided into hours of day UT.
- The numbers which appear along the OUE curves indicate radial distance from the center of the earth along the trajectory, in 1000-km units.

The remainder of the graph is similar to the altitude graph.

The data distribution plot in the time graph presents the same types of observational data as the altitude graph. The plot corresponds to the 24-hour period covered in the OUE portion of the graph.
4.1 OPERATING INFORMATION

This section describes the minimum system configuration for the OCPLT4 Program and gives timing estimates for program execution.

4.1.1 System Configuration

For the IBM System/360 Model 95 or Model 75, the minimum system configuration required to support the SD-4060 OCPLT4 Program consists of the following:

- Three nine-track tape drives.
- One seven-track tape drive.
- Direct access space for an intermediate file.
- Standard system input and output files.
- The system data set for the SD-4060 named SYS2.SC4060 or SYS2.SD4060.
- An SD-4060 plotter.

4.1.2 Timing

A reasonable IBM System/360-95 timing estimate for OCPLT4 to process and plot a period of 1 month of data for 90 time graphs using a program load module is as follows:

CPU = 3 minutes
I/O = 15 minutes

No timing estimate is needed for the SD-4060 plotter; however, turnaround is usually a few days.
4.2 JCL REQUIREMENTS

Figure 4-1 shows the Job Control Language (JCL) required to execute OCPLT4 using the program load module.

Data set SC4060ZZ is the seven-track output instructions tape used for input to the SD-4060 plotter. Data set FT20 is allocated to the nine-track VC tapes. There can be as many as 24 of these VC files or tapes. Each file requires an FT20 card. Data set FT23F001 is a nine-track working-observations-file tape. For detailed information on these tapes, see Subsections 2.2 and 3.1. Data set FT22F001 is a required intermediate disk file, described in Subsection 2.3.
//USER JOB CARD

//EXEC LOADER,REGION=390K,PARM='SIZE=390K'
//GO.SYSLIB DD DSN=SYS2.SC4060,DISP=SHR
//GO.SYSLIN DD DSN=OBJSET,UNIT=2400-9,DISP=(OLD,PASS),VOL=SER=XXXXX,'1
// DCB=(RECFM=FB,LRECL=80,BLKSIZE=3200),LABEL=(1,BLP)
//GO.FT06F001 DD DCB=BLKSIZE=141,SPACE=(CYL,(5,1))
//GO.SC4060ZZ DD DSN=BURKE3;UNIT=7TRACK,
// DCB=(DEN=1,TRTCH=C,RECFM=F,BLKSIZE=1024),
// LABEL=(1,BLP),DISP=(NEW,PASS),VOL=SER=BLANK3
//GO.FT20F001 DD UNIT=2400-9,VOL=SER=XXXXX;LABEL=(1,BLP),
// DCB=(LRECL=133,RECFM=F8A,BLKSIZE=3325),DISP=(OLD,KEEP),DSN=PHI1

NOTES:

1. OCPLT4 system tape number
2. Data set name for output tape (user-specified)
3. Output tape number (assigned by computer operator or user-specified)
4. VC tape number (user-specified). There may be as many as 24 FT20F0xx cards in a single OCPLT4 run. These cards must be in ascending time order, one for each VC file. See Appendix A for samples showing how data set names and labels change for succeeding files.
5. Working-observations-file tape number (user-specified)

Figure 4-1. JCL Setup for Executing the OCPLT4 Program (SD-4060 Version)
SECTION 5 - PROGRAMMING METHOD AND SUBROUTINE DESCRIPTIONS

5.1 PROGRAMMING METHOD

The first function performed by OCPLT4 is that of reading data cards and initializing variables for control of titling, grid generating, and grid labeling. Values read from input cards are carried into the grid drawing subroutine, TITLES. This information remains constant during execution of the entire program. Before the working-observations-file tape is processed for the data distribution portion of the plots, the tape is first time-sorted and rewritten on disk. This must be done in case the data on the working-observations-file tape was sorted concentrically.

During execution of the program for altitude graphs (see Figures 3-1 and 3-2), each P-A and A-P period is determined. Component values from the VC report are selected for plotting when the radial distance has changed by at least $\Delta R$ km for the previous value, where $\Delta R$ equals the quantity $(A-P)/100$.

Once a period has been completed, the subroutine DATAPT is called to plot data distribution within the time span of the period. The subroutine TIMTCK is also called to develop a time scale along the component curve to allow correlation between time and altitude. Time values are plotted on altitude graphs at 5-hour intervals for altitudes above a radial distance of 100,000 km, and at 1-hour intervals for altitudes below a radial distance of 100,000 km.

When time graphs are to be generated (see Figure 3-3), the three range difference vector components are plotted against time (one day per graph). Subroutine ALTCK is called to develop an altitude scale along the curve, for correlation with time. Altitude values to the nearest kilometer are plotted at 1-hour intervals along the time curves.
5.2 SUBROUTINE DESCRIPTIONS

This section lists the subroutines the OCPLT4 Program uses from the SD-4060 subroutine library, and describes the main routine (MAIN) and the calling sequences for the nine subroutines of the OCPLT4 source program. A listing of the source program appears in Appendix D.

5.2.1 SD-4060 Subroutines Used

The OCPLT4 Program uses the generalized subroutines for the SD-4060 (see Reference 1) to generate all plots. These subroutines do the plotting, generate the grids, and label the graphs and grids. The following is a list of the SD-4060 subroutines used by OCPLT4:

- PAGEG
- XNORMZ
- NUMBRG
- EXITG
- LEGNDG
- YNORMZ
- LABELG
- GRIDG
- OBJCTG
- SETSMG
- SUBJEG
- MODESG
- LINESG

5.2.2 OCPLT4 Source Program Subroutines

5.2.2.1 MAIN Routine

MAIN contains all the logic that controls the various options available to the user, computes all the coordinates for generating the OUE graphs, and also serves as the executive routine for all other subroutines. The following steps are the primary divisions of the MAIN routine:

1. After initializing constants and flags that identify the options requested by the user, reading input cards and checking requests for consistency, and printing several messages to the user, the program will proceed, if no inconsistencies exist; otherwise the job is terminated.
2. MAIN will rearrange the observations from the working observation file in time ascending order, if necessary.

3. MAIN will call on A5READ to read the first (next) VC report and will select and restore the OUE values along with the corresponding time and range to be used in generating the OUE graphs.

4. If altitude graphs are requested, MAIN will determine whether an A-P or P-A segment should be plotted next. Then the values of OUE components are checked by MAIN to ensure that they are within the requested limits. If a value is below the requested lower limit, it will be set to the lower limit and plotted. If it is above the upper limit, the value is divided by 10 and checked again. Should the new value exceed the upper limit, a message will be printed to that effect (see page 2-7). This process is continued until the entire graph for each OUE component is constructed from the information on one VC report. Similar activities take place when time plots are requested.

5. After each OUE graph is constructed, the corresponding data distribution plot is developed, if requested.

6. All the plotting information and instructions to generate the OUE graphs for each VC report are stored on the output tape. When one VC report is finished, the next report is read and processing starts with step 3. This is repeated until all VC reports have been processed. Then the program terminates.

5.2.2.2 Subroutine DATAPT

This subroutine computes coordinates for and plots the data distribution between the times bounding each graph.
The calling sequence for subroutine DATAPT is:

CALL DATAPT (ITME1, ITME2, ITME3, ITME4, XIX, INDTE)

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ITME1</td>
<td>Start YYMMDD</td>
</tr>
<tr>
<td>ITME2</td>
<td>Start HHMM</td>
</tr>
<tr>
<td>ITME3</td>
<td>End YYMMDD</td>
</tr>
<tr>
<td>ITME4</td>
<td>End HHMM</td>
</tr>
<tr>
<td>XIX</td>
<td>Location on page of left limit of data distribution graph computed in internal units used by the plotting routine</td>
</tr>
<tr>
<td>INDTE</td>
<td>Indicates whether it is an altitude or a time graph, and whether or not this pass-through requires reading of data tape or plotting of previously determined points: = 0, read and store data distribution points to be plotted for the altitude graph = 1, read and plot the stored points on the altitude graph = 3, same as 1, but for time graphs = 4, same as 0, but for time graphs</td>
</tr>
</tbody>
</table>

5.2.2.3 Subroutine TIMTCK

TIMTCK plots the hours along the OUE curves for the altitude graphs.

The calling sequence for subroutine TIMTCK is:

CALL TIMTCK (JK, JNDTE)

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>JK</td>
<td>Indicates number of values to be plotted</td>
</tr>
<tr>
<td>JNDTE</td>
<td>Indicates type of component to be plotted: = 0, radial component = 1, component in orbital plane normal to the radial component = 2, component normal to the orbital plane</td>
</tr>
</tbody>
</table>
5.2.2.4 Subroutine ALTCK

ALTCK plots the satellite's geocentric distance along the OUE curves for the time graphs.

The calling sequence for subroutine ALTCK is:

CALL ALTCK (KJ, JNDTE)

The ALTCK argument description is the same as for TIMTCK (with KJ replacing JK).

5.2.2.5 Subroutine TITLES

TITLES plots and labels the graphs.

The calling sequence for subroutine TITLES is:

CALL TITLES (MTYPE, MSKIP)

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTYPE</td>
<td>Indicates the component to be plotted:</td>
</tr>
<tr>
<td></td>
<td>= 1, radial component</td>
</tr>
<tr>
<td></td>
<td>= 2, component in the orbital plane normal to the radial component</td>
</tr>
<tr>
<td></td>
<td>= 3, component normal to the orbital plane</td>
</tr>
<tr>
<td>MSKIP</td>
<td>Indicates the part of the graph to be plotted or that cards are to be read:</td>
</tr>
<tr>
<td></td>
<td>= 0, plot altitude graph from apogee to perigee</td>
</tr>
<tr>
<td></td>
<td>= 1, plot time graph</td>
</tr>
<tr>
<td></td>
<td>= 2, plot altitude graph from perigee to apogee</td>
</tr>
<tr>
<td></td>
<td>= 5, read data cards</td>
</tr>
<tr>
<td></td>
<td>= 6, label titles above graphs</td>
</tr>
</tbody>
</table>

5.2.2.6 Subroutine TAPES

This subroutine reads and stores all VC tape numbers and the working-observations-file tape number, as well as the number of VC reports on each VC tape. This subroutine terminates program execution when all the VC reports on all input VC tapes have been processed.
The calling sequence for subroutine TAPES IS:

CALL TAPES (IBLAP)

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
</table>
| IBLAP    | Indicates whether input data cards 12 and 13 are to be read or whether to process the next VC report:  
          = 0, read the next VC report on file; if none is available, read next file on tape; if none, request the next tape to be mounted on tape drive; if none, proceed to terminate job.  
          = 5, read and store all tape numbers from cards 12 and 13. |

5.2.2.7 Subroutine BSFTAP

BSFTAP backspaces the current VC report on file to the beginning of that report, if necessary (i.e., when both the altitude and the time graphs are to be plotted and the program has finished the altitude graph, the report is back-spacing to do the time graph).

The calling sequence for subroutine BSFTAP is:

CALL BSFTAP (NF)

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NF</td>
<td>FORTRAN file number of VC report to be backspaced</td>
</tr>
</tbody>
</table>

5.2.2.8 Subroutine TCONV0

TCONV0, which was incorporated from DODS, converts times from DODS units to calendar units.

The calling sequence for subroutine TCONV0 is:

CALL TCONV0 (TIMDUT, IOUTIM, SEC)

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIMDUT</td>
<td>Number of DODS units of time (DUT) from 0h September 18, 1957, to the calendar time</td>
</tr>
</tbody>
</table>
5.2.2.9 Subroutine A5READ

A5READ reads data from the VC report and converts the components into a form useful for the main program. Conversion is done by separating the decimal and exponential portions of the components and of the range.

The calling sequence for subroutine A5READ is:

```
CALL A5READ (ITIME5, ITIME6, RAD1, IEXP1, RAD2, IEXP2, RAD3, IEXP3, RAN1, IEXP4, I3EOF)
```

5.2.2.10 Subroutine B5READ

B5READ reads UT from the working-observations-file tape and converts this time to calendar time.
The calling sequence for subroutine B5READ is:

CALL B5READ (I3YMD, I3HM, I3TYP)

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>I3YMD</td>
<td>YYMMDD of observation</td>
</tr>
<tr>
<td>I3HM</td>
<td>HHMM of observation</td>
</tr>
<tr>
<td>I3TYP</td>
<td>Type of observation:</td>
</tr>
<tr>
<td></td>
<td>- 1, R  range data</td>
</tr>
<tr>
<td></td>
<td>- 2, ( \lambda )  minitrack direction cosines data</td>
</tr>
<tr>
<td></td>
<td>- 3, m</td>
</tr>
<tr>
<td></td>
<td>- 9, ( \ddot{\mathbf{R}} )  range-rate data</td>
</tr>
<tr>
<td></td>
<td>- 17, X</td>
</tr>
<tr>
<td></td>
<td>- 18, Y  RAO angle data</td>
</tr>
</tbody>
</table>
APPENDIX A - SAMPLE INPUT DECK SETUP

The following list of cards is a sample input deck, including the JCL cards. The OUEs to be plotted are time graphs for the SSS-1 satellite for the time period August 11, 1972, to September 10, 1972. See Section 2.3 and Figure 4-1 for a description of card images. This sample input was not used to obtain the sample output (Appendix B), but is presented to show the changes on FT20F0xx cards for multiple VC report tapes.

//ZBNJBSSS JOB (G10141841E,P,G00080,005005),95.000,MSGLEVEL=11,1)
// EXEC.LOADER,REGION=390K,PARM='SIZE=390K'
//GO.SYSIB DD DSN=SYS2,SC4060,DISP=SHR
//GO.SYSLIN DD DSN=OBJSET,UNIT=2400-9,DISP=(OLD,KEEP),VOL=SER=1241M,
// DCFM=F,F,RECL=1680,BLKSIZE=3200),LABEL=(1,1)
//GO.FT06FO01 DD DCFM=F,F,RECL=1680,BLKSIZE=3200,DISP=(OLD,KEEP),VOL=SER=1241M,
// LABEL=(1,1),DCB=(RECFM=FB,LRECL=80,BLKSIZE=3200),DISP=(OLD,KEEP),DSN=PHI1
//GO.FT20FO01 DD DCB=(LRECL=133,RECFM=F,F,Recl=133,Blake=3325),DISP=(OLD,KEEP),DSN=PH1
//DCB=(LRECL=133,RECFM=F,F,Recl=133,Blake=3325),DISP=(OLD,KEEP),DSN=PHI2
//GO.FT20FO02 DD DCB=(LRECL=133,RECFM=F,F,Recl=133,Blake=3325),DISP=(OLD,KEEP),DSN=PHI3
//GO.FT20FO03 DD DCB=(LRECL=133,RECFM=F,F,Recl=133,Blake=3325),DISP=(OLD,KEEP),DSN=PHI4
//GO.FT20FO04 DD DCB=(LRECL=133,RECFM=F,F,Recl=133,Blake=3325),DISP=(OLD,KEEP),DSN=PHI5
//GO.FT20FO05 DD DCB=(LRECL=133,RECFM=F,F,Recl=133,Blake=3325),DISP=(OLD,KEEP),DSN=PHI6
//GO.FT20FO06 DD DCB=(LRECL=133,RECFM=F,F,Recl=133,Blake=3325),DISP=(OLD,KEEP),DSN=PHI7
//GO.FT20FO07 DD DCB=(LRECL=133,RECFM=F,F,Recl=133,Blake=3325),DISP=(OLD,KEEP),DSN=PHI8
//GO.FT20FO08 DD DCB=(LRECL=133,RECFM=F,F,Recl=133,Blake=3325),DISP=(OLD,KEEP),DSN=PHI9
//GO.FT20FO09 DD DCB=(LRECL=133,RECFM=F,F,Recl=133,Blake=3325),DISP=(OLD,KEEP),DSN=PHI10
//GO.FT20FO10 DD DCB=(LRECL=133,RECFM=F,F,Recl=133,Blake=3325),DISP=(OLD,KEEP),DSN=PHI11
// DCB=(LRECL=133,RECFM=FBA,BLKSIZE=3325),DISP=(OLD,KEEP),DSN=PH17
// GO.FT20FO08 DD UNIT=2400-9,VOL=SER=33976H, LABEL=(1, BLP),
// DCB=(LRECL=133,RECFM=FBA,BLKSIZE=3325),DISP=(OLD,KEEP),DSN=PH18
// GO.FT20FO09 DD UNIT=2400-9,VOL=REF=* .FT20FO08, LABEL=(2, BLP),
// DCB=(LRECL=133,RECFM=FBA,BLKSIZE=3325),DISP=(OLD,K EE),DSN=PH19
// GO.FT20FO10 DD UNIT=2400-9,VOL=REF=* .FT20FO08, LABEL=(3, BLP),
// DCB=(LRECL=133,RECFM=FBA,BLKSIZE=3325),DISP=(OLD,KEEP),DSN=PH20
// GO.FT20FO11 DD UNIT=2400-9,VOL=REF=* .FT20FO08, LABEL=(4, BLP),
// DCB=(LRECL=133,RECFM=FBA,BLKSIZE=3325),DISP=(OLD,KEEP),DSN=PH21
// GO.FT20FO12 DD UNIT=2400-9,VOL=REF=* .FT20FO08, LABEL=(5, BLP),
// DCB=(LRECL=133,RECFM=FBA,BLKSIZE=3325),DISP=(OLD,KEEP),DSN=PH22
// GO.FT20FO13 DD UNIT=2400-9,VOL=REF=* .FT20FO08, LABEL=(6, BLP),
// DCB=(LRECL=133,RECFM=FBA,BLKSIZE=3325),DISP=(OLD,KEEP),DSN=PH23
// GO.FT20FO14 DD UNIT=2400-9,VOL=REF=* .FT20FO08, LABEL=(7, BLP),
// DCB=(LRECL=133,RECFM=FBA,BLKSIZE=3325),DISP=(OLD,KEEP),DSN=PH24
// GO.FT22FO01 DD UNIT=DISK,DISP=(NEW,PASS),DCB=(BLKSIZE=22,RECFM=F),
// DSN=EB3,SPACE=(CYL,(4,2))
// GO.FT23FO01 DD UNIT=DISK,DISP=(NEW,PASS),DCB=(BLKSIZE=22,RECFM=F),
// DSN=EB3,SPACE=(CYL,(4,2))
// GO.FT22FO01 DD UNIT=DISK,DISP=(NEW,PASS),DCB=(BLKSIZE=22,RECFM=F),
// DSN=EB3,SPACE=(CYL,(4,2))
// GO.FT23FO01 DD UNIT=DISK,DISP=(NEW,PASS),DCB=(BLKSIZE=22,RECFM=F),
// DSN=EB3,SPACE=(CYL,(4,2))

CARD 1  C SSS-1  71961 7209191
CARD 2  0.0 0.0 40.0 .1 .1 .1 100. 100. 100. 100. 100. 100. 100. 100.
CARD 3  2.0 2.0 10.0 4.0
CARD 4    5.1 5.1 5.1
CARD 5  .52 .52 .52 100. 100. 100. 100.
CARD 6  720811 720910
CARD 7  0000
CARD 8  TIME
CARD 9  1
CARD 10  3 3.0 33200. 6700.
CARD 11  60.
CARD 12a  2924P 14
CARD 12b  33976H 14
CARD 13  2684P 01
CARD 14  2684P  01
CARD 15  /*

A-2
APPENDIX B - SAMPLE OUTPUT

The SD-4060 OCPLT4 Program output consists of two parts: the IBM System/360 printer output, and the SD-4060 plotter output.

The printer output provides the user with a description of the accomplished processing and reflects user input information, type of plot requested (time, altitude, or both), period to be plotted, plotting interval on graphs, input tape numbers, types and number of observations plotted in the data distribution box, and additional messages when appropriate or as requested by the debug option.

Figure B-1 is a sample printout for the SSS-1 satellite. Usually, only time plots are required for this satellite; however, in this run both time and altitude plots were requested. The definitions given below are numbered to correspond to the entries on Figure B-1.

1. Displays part of the input parameters. (See description of input card images.)

2. Total period to be plotted—July 12, 1972, to July 30, 1972.

3. Time and altitude plots are requested.

4. Apogee and perigee heights as input by user.

5. All three components of the OUEs are plotted (NCOMP). Interval between points on time graphs (TFREQ). Interval between points on altitude graphs (RFREQ).

6. Interval between comparisons on VC report.

7. VC tape number (contains 14 VC reports).

8. Working-observations-file tape number (with one file).

9. Start and end time of first VC report that is being processed (both at 0 hours).

B-1
10. Indicates that the data on working-observations-file tape from 720710 0534 to 720710 2047 was rearranged into time ascending order. The data from 720710 2048 to 720812 1838 was in proper time order. The total time span of the observations on tape 2814H is from 720710 0534 to 720812 1838.

11. The first portion of altitude graph to be plotted is an apogee-to-perigee pass.

12. The period plotted for this portion of the graph is from 720712 0001 to 720712 0349. The start time of the above period corresponds to the time of the first data point on the first VC report. However, it does not always correspond to an apogee or perigee point. Subsequent start times do correspond to proper labels.

13. These dates correspond to dates in item 12. The first date appears on the left corner of the data distribution box. The second date, if different, appears as the last date in the plot (see Figures B-2 and B-8).

14. The difference between the last and the first hour printed in the data distribution plots.

15. Type and quantity of data plotted in the data distribution plot. This reflects the contents of the observations in the working-observations-file tape (tape number 2814H). However, "passes" refers to the number of asterisks in the data distribution plot. Only one observation per minute is plotted and counted in this number.

16. Items 12 through 15 are repeated for each component of the OUE, if all three components are plotted.

17. Items 12 through 16 are repeated for all A-P and P-A passes until the entire VC report is plotted for altitude plots.
18. Indicates completion of a VC report.

19. Indicates the back spacing of the VC report to the beginning of
the report when both altitude and time graphs are requested. No
backspacing is needed when only one option is requested.

20. Indicates that time graphs are being prepared by the program.

21. IDATE is the start date; ITIME6 is the start hour of the data on
the time graphs. The data distribution box information, similar
to these described for the altitude graphs (items 12 through 16)
is repeated. This time the span of the graphs and plots is 24
hours.

22. When an entire VC report has been processed for both options, if
needed, the next VC report is called in and the start and end time
of the VC report is printed as is the information from 9 through
21. This is repeated until all VC reports on all VC tapes are
processed.

Because SSS-1 completes approximately three orbits in a 24-hour period,
there are six sets of altitude plots, two for each orbit (see Figures B-2
through B-7), and one set of time plots (see Figures B-8 through B-10).
Each set consists of the three OUE components.

The plotter output provides the graphic display of the OUE component (see
Section 3.3). Figure B-2 through B-10 show a typical set of altitude and time
graphs. The altitude graphs consist of two sets: apogee-perigee and perigee-
apogee.
Figure B-1. Sample Printout for the SSS-1 Satellite (1 of 2)
Figure B-1. Sample Printout for the SSS-1 Satellite (2 of 2)
Figure B-2. Altitude Graph for SSS-1 Satellite, Apogee–Perigee Radial Component
Figure B-3. Altitude Graph for SSS-1 Satellite, Apogee-Perigee Component in Orbital Plane Normal to Radial Component
Figure B-4. Altitude Graph for SSS-1 Satellite, Apogee-Perigee Component Normal to Orbital Plane
Figure B-5. Altitude Graph for SSS-1 Satellite, Perigee–Apogee Radial Component
Figure B-6. Altitude Graph for SSS-1 Satellite, Perigee-Apogee Component in Orbital Plane Normal to Radial Component
Figure B-7. Altitude Graph for SSS-1 Satellite, Perigee-Apogee Component Normal to Orbital Plane
Figure B-8. Time Graph for SSS-1 Satellite, Radial Component
Figure B-9. Time Graph for SSS-1 Satellite, Component in Orbital Plane Normal to Radial Component
Figure B-10. Time Graph for SSS-1 Satellite, Component Normal to Orbital Plane
**APPENDIX C - INTEGRATED GRAPHICS SOFTWARE (IGS)**

**ERROR CODE**

<table>
<thead>
<tr>
<th>No</th>
<th>Subroutine</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>QRTSMO</td>
<td>NO</td>
<td>Illegal mode set number in call.</td>
</tr>
<tr>
<td>2</td>
<td>LEGNDO</td>
<td>N</td>
<td>Illegal character count in call.</td>
</tr>
<tr>
<td>3</td>
<td>LINBSO</td>
<td>NO</td>
<td>Illegal number in call.</td>
</tr>
<tr>
<td>4</td>
<td>MODB5O</td>
<td>ITAPE</td>
<td>Illegal tape no. in call.</td>
</tr>
<tr>
<td>5</td>
<td>NUMBSO</td>
<td>FNT</td>
<td>Illegal format in call.</td>
</tr>
<tr>
<td>6</td>
<td>OBJCTO</td>
<td></td>
<td>Max x or y le min x or y in call.</td>
</tr>
<tr>
<td>7</td>
<td>PAO5O</td>
<td></td>
<td>Illegal arguments in call.</td>
</tr>
<tr>
<td>8</td>
<td>POINTO</td>
<td>N</td>
<td>Illegal number in call.</td>
</tr>
<tr>
<td>9</td>
<td>SGBNTO</td>
<td>N</td>
<td>Illegal number in call.</td>
</tr>
<tr>
<td>10</td>
<td>TABSO</td>
<td>N</td>
<td>Illegal number in call.</td>
</tr>
<tr>
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<td>LABELG</td>
<td></td>
<td>Illegal format in call.</td>
</tr>
<tr>
<td>12</td>
<td>GRIDO</td>
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<td>Grid too small to draw.</td>
</tr>
<tr>
<td>13</td>
<td>MLTPLG</td>
<td>MLINES</td>
<td>Illegal number in call.</td>
</tr>
<tr>
<td>14</td>
<td>TITLNG</td>
<td></td>
<td>Illegal arguments in call.</td>
</tr>
<tr>
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<td>SRTPGO</td>
<td></td>
<td>Illegal arguments in call.</td>
</tr>
<tr>
<td>16</td>
<td>SUBJEG</td>
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<td>Max x or y eq min x or y.</td>
</tr>
<tr>
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<td>LABELG</td>
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<td>Illegal arguments in call.</td>
</tr>
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<td>LABELG</td>
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<td>Grid too small to label.</td>
</tr>
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<td>LABELG</td>
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<td>Zero subject space.</td>
</tr>
<tr>
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<td></td>
<td>Illegal arguments in call.</td>
</tr>
<tr>
<td>21</td>
<td>SRTPGO</td>
<td></td>
<td>Not enough room to draw a grid.</td>
</tr>
<tr>
<td>22</td>
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<td></td>
<td>Density le 0.</td>
</tr>
<tr>
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<td>SRTSGO</td>
<td>N</td>
<td>Illegal mode set no in call.</td>
</tr>
<tr>
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<td>Grid will not fit on page.</td>
</tr>
<tr>
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<td>TEXTO</td>
<td>N</td>
<td>Illegal character count in call.</td>
</tr>
<tr>
<td>26</td>
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<td></td>
<td>Labels will not fit on page.</td>
</tr>
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<td>27</td>
<td>PACKZ0</td>
<td></td>
<td>No initialization call to MODB5O.</td>
</tr>
<tr>
<td>28</td>
<td>ORACO</td>
<td>N</td>
<td>Illegal argument in call.</td>
</tr>
<tr>
<td>29</td>
<td>SUBJEO</td>
<td></td>
<td>Minus value for log grid.</td>
</tr>
<tr>
<td>30</td>
<td>SRTPO</td>
<td></td>
<td>Too many cycles in log grid.</td>
</tr>
<tr>
<td>31</td>
<td>VECTZ0</td>
<td></td>
<td>No vector character font initialized.</td>
</tr>
<tr>
<td>32</td>
<td>SCALZ0</td>
<td>X</td>
<td>Bad x-coordinate.</td>
</tr>
<tr>
<td>33</td>
<td>VECTZ0</td>
<td>CHAR</td>
<td>Character not in font.</td>
</tr>
<tr>
<td>34</td>
<td>TITL0</td>
<td></td>
<td>Not enough room to title grid.</td>
</tr>
<tr>
<td>35</td>
<td>VECTZ0</td>
<td>CHAR</td>
<td>Request for non-existent vector char case.</td>
</tr>
<tr>
<td>36</td>
<td>NVBCZ</td>
<td>NP</td>
<td>Byte number is zero or negative.</td>
</tr>
<tr>
<td>100</td>
<td>PSUBZ0</td>
<td></td>
<td>Max. theta equal to min theta and/or max. radius equal to min. radius.</td>
</tr>
<tr>
<td>33</td>
<td>SCALZ0</td>
<td>Y</td>
<td>Bad y-coordinate.</td>
</tr>
<tr>
<td>101</td>
<td>PSUBZ0</td>
<td></td>
<td>Min. radius greater than max radius.</td>
</tr>
<tr>
<td>102</td>
<td>PORAPD</td>
<td>N</td>
<td>Illegal argument in call.</td>
</tr>
<tr>
<td>103</td>
<td>VECZ0</td>
<td></td>
<td>More than 36o. deg. of characters.</td>
</tr>
<tr>
<td>104</td>
<td>VECZ0</td>
<td>N</td>
<td>Illegal argument in call.</td>
</tr>
<tr>
<td>105</td>
<td>PLINHO</td>
<td>N</td>
<td>Illegal argument in call.</td>
</tr>
<tr>
<td>106</td>
<td>POLY0</td>
<td>N</td>
<td>Illegal argument in call.</td>
</tr>
<tr>
<td>107</td>
<td>PSBNO</td>
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<td>PNLTLG</td>
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<td>POL0</td>
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<td>PECZ0</td>
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</tr>
<tr>
<td>112</td>
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<td></td>
<td>Illegal axis.</td>
</tr>
<tr>
<td>113</td>
<td>PLALMG</td>
<td></td>
<td>Zero subject space.</td>
</tr>
<tr>
<td>114</td>
<td>PYBAZ0</td>
<td>N</td>
<td>Illegal argument in call.</td>
</tr>
</tbody>
</table>

**Table 3-4**

This table describes the meaning of each possible IGS error message. When an error occurs, subroutine ERRZZ is called to print out an error message. The error message will read as follows:

You have committed error no. 'NO' during the plotting of frame no. XX.

The error value was VALUE(D), VALUE(F), VALUE(A).

Control is returned after the message is printed--the job is not terminated.
<p>| | | | | | | | | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
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<th></th>
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<tr>
<td>115</td>
<td>BOXO</td>
<td>N</td>
<td>ILLEGAL ARGUMENT IN CALL.</td>
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<td></td>
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<tr>
<td>116</td>
<td>CLASFG</td>
<td>LEVEL</td>
<td>ILLEGAL ARGUMENT IN CALL.</td>
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<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>202</td>
<td>SUBJID</td>
<td>ZMIN</td>
<td>MINIMUM Z = MAXIMUM Z</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>201</td>
<td>SUBJID</td>
<td>YMIN</td>
<td>MINIMUM Y = MAXIMUM Y</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>200</td>
<td>SUBJID</td>
<td>XMIN</td>
<td>MINIMUM X = MAXIMUM X</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>117</td>
<td>PSETO</td>
<td>MODE</td>
<td>ILLEGAL ARGUMENT IN CALL</td>
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<td></td>
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</tr>
<tr>
<td>203</td>
<td>PLOTS3</td>
<td>X</td>
<td>X MAXIMUM X</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>204</td>
<td>PLOTS3</td>
<td>X</td>
<td>X MINIMUM X</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>205</td>
<td>PLOTS3</td>
<td>Y</td>
<td>Y MAXIMUM Y</td>
<td></td>
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<tr>
<td>206</td>
<td>PLOTS3</td>
<td>Y</td>
<td>Y MINIMUM Y</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>207</td>
<td>PLOTS3</td>
<td>Z</td>
<td>Z MAXIMUM Z</td>
<td></td>
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<tr>
<td>208</td>
<td>PLOTS3</td>
<td>Z</td>
<td>Z MINIMUM Z</td>
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</tbody>
</table>

C-2
This appendix presents a compilations listings of the SD-4060 OCPLT4 source program. The subroutines are listed as follows:

<table>
<thead>
<tr>
<th>Figure</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>D-1</td>
<td>JCL Used in Compilation of SD-4060 OCPLT4 Program</td>
<td>D-2</td>
</tr>
<tr>
<td>D-2</td>
<td>MAIN Routine</td>
<td>D-3</td>
</tr>
<tr>
<td>D-3</td>
<td>Subroutine DATAPT</td>
<td>D-16</td>
</tr>
<tr>
<td>D-4</td>
<td>Subroutine TIMTCK</td>
<td>D-22</td>
</tr>
<tr>
<td>D-5</td>
<td>Subroutine ALTCK</td>
<td>D-23</td>
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<tr>
<td>D-6</td>
<td>Subroutine TITLES</td>
<td>D-24</td>
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<tr>
<td>D-7</td>
<td>Subroutine TAPES</td>
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<tr>
<td>D-8</td>
<td>Subroutine BSFTAP</td>
<td>D-29</td>
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<tr>
<td>D-9</td>
<td>Subroutine TCONVO</td>
<td>D-30</td>
</tr>
<tr>
<td>D-10</td>
<td>Subroutine A5READ</td>
<td>D-33</td>
</tr>
<tr>
<td>D-11</td>
<td>Subroutine B5READ</td>
<td>D-34</td>
</tr>
</tbody>
</table>
//ZBJEPLT JOB (G10141E1E1P,CCC=50,CO1COI),000,MSGLEVEL=(1,1)
// EXEC FORTRAN,PARM=MAP,IC,OPT=2",REGION=500K
XXDEFAULT PROC FORTRAN=IEKAAD0C,NBLK=4G
XXSOURCE EXEC PGM=FORTRAN,REGION=300K
IEF652I SUBSTITUTION JCL - PGM=IEKAAD0C,REGION=300K
//SOURCE,SYSLIN DD DSN=FKL,UNIT=(2400-S,DEPER),DISP=(NEW,PASS),
  //CCB=(RECFM=FB,LRECL=6C,BLKSIZE=3200,DEN=3),
  //LABEL=(I,1,BL,I,DT),WCL=SEP=S64#
XXSYSLIN DD DSN=FKLJSC,SPACE=(J200,(NBLK,10),...RCUNC),UNIT=DISK,
  //SOURCE,SYSPRINT CC SPACE=(CYL,(),)
XXSYSPRINT DD SYSALT=A,CCE=(RECFM=VBA,LRECL=137,BLKSIZE=7265),
XX UNIT=(DISK,SEP=SYSLIN)
XXSYSPUNCH DD SYSALT=B,DCE=(RECFM=FB,LRECL=80,BLKSIZE=728C)
//SOURCE,SYSUDUMP DD SYSALT=A
XXSYSU1 DD SPACE=(TRK,(),),UNIT=(DISK,SEP=(SYSLIN,SYSPRINT))
XXSYSU2 DD SPACE=(CYL,()),
XX UNIT=(DISK,SEP=(SYSLIN,SYSPRINT,SYSUTI))
//SOURCE,SYSIN CC *
/*
IEF2361 ALLOC, FGF ZBJEPLT SOURC
IEF2371 OC3 ALLOCATED TO SYSLIN
IEF2371 J31 ALLOCATED TO SYSPRINT
IEF2371 332 ALLOCATED TO SYSUDUMP
IEF2371 333 ALLOCATED TO SYSUDUMP
IEF2371 334 ALLOCATED TO SYSSUT1
IEF2371 332 ALLOCATED TO SYSSUT2
IEF2371 233 ALLOCATED TO SYSIN

Figure D-1. JCL Used in Compilation of SD-4060 OCPLT4 Program
Figure D-2. MAIN Routine (1 of 13)
READ 3052, T30IFF
FORMAT (F4.0)
IF (T30IFF.NE.0.0) T30IFF=T30IFF/60.
IF (T30IFF.GT.60.0.) T30IFF = 00.00.
320 Format((T30IFF>60.0.)/60.0)+1
1010 IF (T30IFF.NE.0.0) GO TO 25
PRINT 1211,T30IFF
1011 FORMAT(*, 'T30IFF=', Y10.10,'X', 'CLNTIDAYS')
IF (ITIME(1).EQ.0.0) PRINT 3,T30IFF
3 FORMAT(*, 'T30IFF=', Y10.10,'X', 'MINUTES @T30IFF')
CALL TAPES(1,ULAP)
0046
CALL TAPES(1,ULAP)
0047
C = THE PURPOSE OF THIS SEGMENT IS TO DETERMINE END TIME AND
C = STATION TYPE VALUES
0048
10 CONTINUE
READ (5, END = 3150)
WRITE (5, *) 'MAIN Routine (2 of 13)
Figure D-2. MAIN Routine (2 of 13)
Figure D-2. MAIN Routine (3 of 13)
Figure D-2. MAIN Routine (4 of 13)
Figure D-2. MAIN Routine (5 of 13)
Figure D-2. MAIN Routine (6 of 13)
ISN 0542 IF (RAD1.LT.ERRLC2) RAD1 = ERRLC2
ISN 0544 IF (RAD2.LT.ERRLC1) RAD2 = ERRLC1
ISN 0546 IF (RAD3.LT.ERRLC0) RAD3 = ERRLC0
ISN 0548 IF (RAD1.GT.ERRHI1) BIG1 = 1
ISN 0550 IF (RAD1.GT.ERRH11) RAD1 = RAD1/10.
ISN 0552 IF (RAD2.GT.ERRH12) BIG2 = 1
ISN 0554 IF (RAD2.GT.ERRH12) RAD2 = RAD2/10.
ISN 0556 IF (RAD2.GT.ERRH13) BIG3 = 1
ISN 0560 TIMOLT = C.
ISN 0561 ICLTIM(1) = ITIME5/10000.
ISN 0562 ICLTIM(2) = ITIME6 - 10000*ICLTIM(1)/100
ISN 0563 ICLTIM(3) = ITIME7 - 100*ICLTIM(2)/100
ISN 0564 ICLTIM(4) = ITIME8/100
ISN 0565 CALL TCUNV0 (TIMDUT, ICLTIM, SEC)
ISN 0566 TIMDUL = TIMDUT * 36000.
ISN 0568 IF (ITIME8.EQ.0) GO TO 781
ISN 0570 ITJ = ITIME6/10000.
ISN 0572 XCHECK = XFLAT (ITIME6)
ISN 0573 XCL = ITIME6 - ITJ
ISN 0574 IF (XCL.EQ.0) IF (KL.GE.9) GO TO 722
ISN 0576 XCHECK = XCHECK/100.0.
ISN 0577 IF (ITIME6.EQ.0) GO TO 755
ISN 0578 GC TC 752.
ISN 0580 XCL = XCHECK/1000.0.
ISN 0582 XCHECK = XCHECK/100.0.
ISN 0584 XCHECK = XCHECK/100.0.
ISN 0586 XCHECK = XCHECK/100.0.
ISN 0588 XCHECK = XCHECK/100.0.
ISN 0589 XCHECK = XCHECK/100.0.
ISN 0590 XCHECK = XCHECK/100.0.
ISN 0591 XCHECK = XCHECK/100.0.
ISN 0592 XCHECK = XCHECK/100.0.
ISN 0593 XCHECK = XCHECK/100.0.
ISN 0594 XCHECK = XCHECK/100.0.
ISN 0595 XCHECK = XCHECK/100.0.
ISN 0597 XCHECK = XCHECK/100.0.
ISN 0599 XCHECK = XCHECK/100.0.
ISN 0601 XCHECK = XCHECK/100.0.
ISN 0603 XCHECK = XCHECK/100.0.
ISN 0605 XCHECK = XCHECK/100.0.
ISN 0607 XCHECK = XCHECK/100.0.
ISN 0609 XCHECK = XCHECK/100.0.
ISN 0611 XCHECK = XCHECK/100.0.
ISN 0613 XCHECK = XCHECK/100.0.
ISN 0615 XCHECK = XCHECK/100.0.
ISN 0617 XCHECK = XCHECK/100.0.
ISN 0619 XCHECK = XCHECK/100.0.
ISN 0621 XCHECK = XCHECK/100.0.
ISN 0623 XCHECK = XCHECK/100.0.
ISN 0625 XCHECK = XCHECK/100.0.
ISN 0627 XCHECK = XCHECK/100.0.
ISN 0629 XCHECK = XCHECK/100.0.
ISN 0631 XCHECK = XCHECK/100.0.
ISN 0633 XCHECK = XCHECK/100.0.
ISN 0635 XCHECK = XCHECK/100.0.
ISN 0637 XCHECK = XCHECK/100.0.
ISN 0639 XCHECK = XCHECK/100.0.

Figure D-2. MAIN Routine (7 of 13)
Figure D-2. MAIN Routine (8 of 13)
Figure D-2. MAIN Routine (9 of 13)
Figure D-2. MAIN Routine (10 of 13)
Figure D-2. MAIN Routine (11 of 13)
ISN 0976 MTYPE=1
ISN 0977 CALL TITLE (MTYPE, MSKIP)
ISN 0978 777 XIX=1NGQGM(AMODE.X3(1))
ISN 0979 XIX=XXRNZ(AMODE.X3(1))
ISN 0980 XIX=XXRNZ(AMODE.X3(1))
ISN 0981 I=I-1
ISN 0982 CALL SETSMG(AMODE.14.0+)
ISN 0983 CALL LINESG(AMODE.14.3+)
ISN 0984 CALL SETSMG(AMODE.14.3+)
ISN 0985 757 JNOTE=0
ISN 0986 CALL TIMTCK (JX.JNOTE)
ISN 0987 IF (IGOP.NE.0) GO TO 702
ISN 0988 GC TO 766
ISN 0989 7C2 XIX=XNORFLZ(AMODE.X3(1))
ISN 0990 7C2 XIX=XNOR4(AMODE.X3(1))
ISN 0991 7C2 XIX=XNORFLZ(AMODE.X3(1))
ISN 0992 7C2 XIX=XNOR4(AMODE.X3(1))
ISN 0993 JNOTE=1
ISN 0994 CALL TITLE (MTYPE, MSKIP)
ISN 0995 CALL SETSMG(AMODE.14.0+)
ISN 0996 CALL LINESG(AMODE.14.3+)
ISN 0997 7C2 XIX=XXRNZ(AMODE.X3(1))
ISN 0998 7C2 XIX=XXRNZ(AMODE.X3(1))
ISN 0999 CALL LINESG(AMODE.14.3+)
ISN 1000 CALL SETSMG(AMODE.14.3+)
ISN 1001 CALL TITLES (MTYPE. MSKIP)
ISN 1002 IF (IGOP.NE.0) GO TO 715
ISN 1003 MTYPE=2
ISN 1004 CALL SETSMG(AMODE.14.0+)
ISN 1005 CALL LINESG(AMODE.14.3+)
ISN 1006 IF (IGOP.NE.0) GC TO 766
ISN 1007 GC TO 766
ISN 1008 CALL SETSMG(AMODE.14.0+)
ISN 1009 CALL TITLES (MTYPE. MSKIP)
ISN 1010 CALL SETSMG(AMODE.14.3+)
ISN 1011 758 JNOTE=1
ISN 1012 CALL TIMTCK (JX.JNOTE)
ISN 1013 IF (IGOP.NE.0) GC TO 766
ISN 1014 GC TO 766
ISN 1015 CALL SETSMG(AMODE.14.0+)
ISN 1016 CALL LINESG(AMODE.14.0+)
ISN 1017 CALL LINESG(AMODE.X1X.170.+,9,9HPERICEE *)
ISN 1018 CALL SETSMG(AMODE.14.0+)
ISN 1019 7C7 JNOTE=1
ISN 1020 7C7 JNOTE=1
ISN 1021 IF (TOP(J.E.1.AND.I.GT.1)) GC TO 766
ISN 1022 GC TO 766
ISN 1023 IF (TOP(J.E.1.AND.I.GT.1)) GC TO 766
ISN 1024 CALL LINESG(AMODE.X1X.170.+,9,9HPERICEE *)
ISN 1025 MTYPE=2
ISN 1026 CALL TITLE (MTYPE, MSKIP)
ISN 1027 CALL LINESG(AMODE.X1X.170.+,9,9HPERICEE *)
ISN 1028 CALL CATAPT(ITME1, ITME2, ITME3, ITME4, INTE)
ISN 1029 CALL LINESG(AMODE.X1X.170.+,9,9HPERICEE *)
ISN 1030 CALL SETSMG(AMODE.14.0+)
ISN 1031 CALL SETSMG(AMODE.14.0+)
ISN 1032 CALL LINESG(AMODE.X1X.170.+,9,9HPERICEE *)
ISN 1033 CALL SETSMG(AMODE.14.0+)
ISN 1034 CALL LINESG(AMODE.X1X.170.+,9,9HPERICEE *)
ISN 1035 CALL SETSMG(AMODE.14.0+)
ISN 1036 CALL LINESG(AMODE.X1X.170.+,9,9HPERICEE *)
ISN 1037 CALL SETSMG(AMODE.14.0+)
ISN 1038 CALL SETSMG(AMODE.14.0+)
ISN 1039 CALL SETSMG(AMODE.14.0+)
ISN 1040 CALL SETSMG(AMODE.14.0+)
ISN 1041 710 JNOTE=1
ISN 1042 GC TO 766
ISN 1043 CALL LINESG(AMODE.X1X.170.+,9,9HPERICEE *)
ISN 1044 GC TO 766
ISN 1045 GC TO 766
ISN 1046 GC TO 766
ISN 1047 CONTINUE
C 800 BACKSPACE 5
ISN 1048 800 BACKSPACE 5
ISN 1049 JK=0
ISN 1050 JK=0
ISN 1051 IGMP = C
ISN 1052 IGMP = C
ISN 1053 JNOTE=0
ISN 1054 JNOTE=0

Figure D-2. MAIN Routine (12 of 13)
Figure D-2. MAIN Routine (13 of 13)
Figure D-3. Subroutine DATAPT (1 of 6)
Figure D-3. Subroutine DATAPT (2 of 6)
Figure D-3. Subroutine DATAPT (3 of 6)
Figure D-3. Subroutine DATAPT (4 of 6)
ISN 0303 C TO GET TOTAL NUMBER OF DAYS 1038
ISN 0304 ITIME(K)=ITIME(K)+2400*LDIF 1039
ISN 0305 IHR=ITIME9(K)/100 1040
ISN 0306 MINUTS=ITIME9(K)-IHR*100 1041
ISN 0307 YTI=FLOAT(IHR)+FLOAT(MINUTS)/60. 1042
ISN 0308 IF (ITYPE(K).EQ.1) GO TO 601 1043
ISN 0309 IF (ITYPE(K).EQ.2) GO TO 601 1044
ISN 0310 IF (ITYPE(K).EQ.3) GO TO 601 1045
ISN 0311 IF (ITYPE(K).EQ.4) GO TO 601 1046
ISN 0312 IF (ITYPE(K).EQ.5) GO TO 601 1047
ISN 0313 JJ=JJ+1 1048
ISN 0314 JJ=JJ+1 1049
ISN 0315 IF (ITYPE(K).EQ.6) GO TO 601 1050
ISN 0316 GO TO 595 1051
ISN 0317 GO TO 595 1052
ISN 0318 GO TO 595 1053
ISN 0319 GO TO 595 1054
ISN 0320 GO TO 595 1055
ISN 0321 GO TO 595 1056
ISN 0322 GO TO 595 1057
ISN 0323 GO TO 595 1058
ISN 0324 GO TO 595 1059
ISN 0325 GO TO 595 1060
ISN 0326 GO TO 595 1061
ISN 0327 GO TO 595 1062
ISN 0328 GO TO 595 1063
ISN 0329 GO TO 595 1064
ISN 0330 GO TO 595 1065
ISN 0331 GO TO 595 1066
ISN 0332 GO TO 595 1067
ISN 0333 GO TO 595 1068
ISN 0334 GO TO 595 1069
ISN 0335 GO TO 595 1070
ISN 0336 GO TO 595 1071
ISN 0337 GO TO 595 1072
ISN 0338 GO TO 595 1073
ISN 0339 GO TO 595 1074
ISN 0340 GO TO 595 1075
ISN 0341 GO TO 595 1076
ISN 0342 GO TO 595 1077
ISN 0343 GO TO 595 1078
ISN 0344 GO TO 595 1079
ISN 0345 GO TO 595 1080
ISN 0346 GO TO 595 1081
ISN 0347 GO TO 595 1082
ISN 0348 GO TO 595 1083
ISN 0349 GO TO 595 1084
ISN 0350 GO TO 595 1085
ISN 0351 GO TO 595 1086
ISN 0352 GO TO 595 1087
ISN 0353 GO TO 595 1088
ISN 0354 GO TO 595 1089
ISN 0355 GO TO 595 1090
ISN 0356 GO TO 595 1091
ISN 0357 GO TO 595 1092
ISN 0358 GO TO 595 1093
ISN 0359 GO TO 595 1094

Figure D-3. Subroutine DATAPT (5 of 6)
Figure D-3. Subroutine DATAPT (6 of 6)
Figure D-4. Subroutine TIMTCK
Figure D-5. Subroutine ALTCK
Figure D-6. Subroutine TITLES (1 of 3)
Figure D-6. Subroutine TITLES (2 of 3)
CALL LEGNUG(AMODE,244,980,12,32) ORBITAL UNCERTAINTY ESTIMATE FOR
1)
CALL SETNG(AMODE,46,75)
CALL LEGNUG(AMODE,266,1000,03.8,MISSION AND TRAJECTORY ANALYSIS
1 DIVISION, GODDARD SPACE FLIGHT CENTER RUN DATE)
CALL LEGNUG(AMODE,349,980,10,10)
CALL ELTSMG(AMODE,45,1,5)
CALL LEGNUG(AMODE,777,980,2,SKANE)
CALL SETNG(AMODE,49,75)
IF(MSKIP.EQ.1,1,IF(MSKIP.EQ.5,1,IF(MSKIP.EQ.6) GO TO 40
CALL LEGHUG(AMODE,412,121,54.
1 54 RADIAL DISTANCE FROM CENTER OF EARTH = 1000 KILOMETERS) )
40 RETURN
END

Figure D-6. Subroutine TITLES (3 of 3)
SUBROUTINE TAPES(1BLAP)

COMMCN

ITML(9999),ITTME9(9999),JTYPE(9999),MHDURS(00),PANGE5(10)

E9RPI(50),EPROR2(50),RANGE(J9),IHOUR(J10),AUSIC(J30)

SUBROUTINE TAPES(IBLAP)

COMMCN

ITML(9999),ITTME9(9999),JTYPE(9999),MHDURS(00),PANGE5(10)

E9RPI(50),EPROR2(50),RANGE(J30),IHOUR(J30),AUSIC(J30)

COMMCN

ITML(9999),ITTME9(9999),JTYPE(9999),MHDURS(00),PANGE5(10)

E9RPI(50),EPROR2(50),RANGE(J30),IHOUR(J30),AUSIC(J30)

C * BEGIN OCPCTJ SEQUENCE

CUMN N001,NS02,NS03,NS04,NS05,NS06,NS07,NS08,NS09,NS10,NS11

CMCN

ERSR31,ER9L02,EPRLO,EPRH11,ERRHI2,ERRHI3

REAL *

CTTSC

DIMENSION TAPE(25),IFILE(25)

DATA SORTST/SH*

END OCPLTJ SEQUENCE

INTEGR

A5, B7, B3, BS

C*

END OCPLTJ SEQUENCE

IF (IULAP.EG.0) GO TO 60

IF (IULAP.EG.1) GO TO 10

DO 10 I=1,25

READ 190, TAPE(I),IFILE(I)

PRINT 9190,TAPE(I) ,IFILE(I)

IF (TAPE(I).EU.Sortst) GO TO 40

CONTINUE

J=J-1

ICOP=I

IDC2=1

IVC=I

IDC=I

GO TO 200

60 ICOP=ICOP+1

GO TO 200

END OCPLTJ SEQUENCE

C * AD VANCE AS TO EOF

BACKSPACE A5

READ (A5,104) END=J550

104 FORMAT(7X,A4)

GO TO J540

250 CONTINUE

C * END OCPCTJ SEQUENCE

PRINT 250,TAPE(IVC)

250 FORMAT(131,20HOPERATOR PLEASE MOUNT TAPE,2X,A0,2X,20HMIN A-5 AND MI

IT START)

C PAUSE

C

GO TO 200

END OCPLTJ SEQUENCE

Figure D-7. Subroutine TAPES (1 of 2)
Figure D-7. Subroutine TAPES (2 of 2)
/* Subroutine BSFTAP */

THE PURPOSE OF THIS SUBROUTINE IS TO BACKSPACE TO THE BEGINNING.

OF A COMPARE TAPE SEGMENT

COMMON ITIME(9999), ITYPE(9999), IMHOURS(100), I RANGES(10)
  ERRORS(50), ERRORS2(50), ERRORS2(50), ERROR1(30), IHOURS(30), RANGES(30)
  RANGES1(30), RANGES2(30), IDAT1, IDAT2, IDAT3

COMMON ERRLO1, ERRLO2, ERRLO3, ERRPHI2, ERRPHI1, ERRPHI

COMMON N551, N552, N553, N554, N555, N556, A5, A7, B3, B5, IXIY

DATA CHK1/IH7/, CHK2/IH7/

INTEGER A5, A7, B3, B5

D0 010 DT JO30 J = 1, 34
D0 011 BSFTAPE NF
D0 012 READ (NF, JO30) A3COMP
D0 013 FORMAT (1X, A1)
D0 014 PRINT 4000, A3COMP
D0 015 FORMAT (6H, A3COMP, A1)
D0 016 IF (A3COMP .EQ. CHK1 .OR. A3COMP .EQ. CHK2) GO TO 3040
D0 018 DD J140 = 1, 8
D0 019 BSFTAPE NF
D0 020 READ (NF, JO30) A3COMP
D0 021 IF (A3COMP .EQ. CHK1 .OR. A3COMP .EQ. CHK2) GO TO 3040
D0 023 DD J150 = 1, 15
D0 024 BSFTAPE NF
D0 025 RETURN
D0 026 END

Figure D-8. Subroutine BSFTAP
Figure D-9. Subroutine TCONVO (1 of 3)
Figure D-9. Subroutine TCONVO (2 of 3)
C DETERMINES THE MONTH WITHIN THAT YEAR
IF (I.EQ.J) J=0
KUTIM(J) = K - NURDAY (I-1) - (J+1)
C DETERMINES THE NUMBER OF DAYS WITHIN THAT MONTH
RETURN
END

Figure D-9. Subroutine TCONVO (3 of 3)
SUBROUTINE A5READ (ITIMES, ITIMES, RAD1, LEXAP, REND, EXP1, EXP2, EXP3, EXP4, EPS, IEOFF)

C THE PURPOSE OF THIS SUBROUTINE IS TO PASS VALID ASCII VALUES FROM
THE VECTOR COMPARISON TAPE TO THE CALLING PROGRAM.

COMMON - ITIMES(9999), ITIMES(9999), ITIMES(9999), MHRM2(100), MHRM2(10)
ERROR(50), ERRM(50), ERROR2(50), RANGE7(30), HOUR2(30), ABSC1(30)
ABSC2(30), ABSC2(30), IOAT, IODAT, IOH
COMM ERRLO1, ERRLO2, ERRLO3, ERRM1, ERRM2, ERRM3
COMM N551, N552, N553, N554, N555, N556, A8, A7, A6, A5, A4
COMM NS1, NS2, NS3, NS4, NS5, NS6, NS7, A5, A7, A8, A9
COMMON A5, A7, A8, A9
DATA STT(12), RATING, RATING, RATING, RATING, RATING, RATING
DATA CHK1(1H6)/
DATA CHK2(1H7)/
DATA STT(12), RATING, RATING, RATING, RATING, RATING
DATA CHK1(1H6)/
DATA CHK2(1H7)/
DATA STT(12), RATING, RATING, RATING, RATING, RATING
DATA CHK1(1H6)/
DATA CHK2(1H7)/
DATA STT(12), RATING, RATING, RATING, RATING, RATING
DATA CHK1(1H6)/
DATA CHK2(1H7)/
DATA STT(12), RATING, RATING, RATING, RATING, RATING
DATA CHK1(1H6)/
DATA CHK2(1H7)/
DATA STT(12), RATING, RATING, RATING, RATING, RATING
DATA CHK1(1H6)/
DATA CHK2(1H7)/
DATA STT(12), RATING, RATING, RATING, RATING, RATING
DATA CHK1(1H6)/
DATA CHK2(1H7)/
DATA STT(12), RATING, RATING, RATING, RATING, RATING
DAT...
Figure D-11. Subroutine BSREAD
REFERENCES


End