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TECHNICAL MEMORANDUM

(TM Series)

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Computer Program Acceptance Specifications
for the 1164 Flight Support Tape
Milestone 6

by

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Preface

This document was produced by System Development Corporation and constitutes validation and acceptance test specifications for the 1164 Flight Support Tape available as of the date of this publication.

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1.0 Introduction

The purpose of this document is to outline a series of validation and acceptance tests designed to show the capability of the 1164 Flight Support Tape available as of the date of publication, in performing those functions required to support a satellite under a set of given conditions. As such, it supersedes document TM-(L)-1023/000/00 and will become the base document for later volumes in a series produced for the 1100 series flights.

It was the intention of SDC to design tests of such caliber that, after validation at the CPDC, the 6594th Test Wing could be reasonably assured of success when relying on the tape in an actual flight.
The tests, therefore, have been designed in five phases for logical sequence and convenience. Other phases will be included later in subsequent volumes as required. The five phases currently included are:

Ascent
Orbit Determination
Prediction and Commanding
Re-Entry
Tracking Stations

Each phase is described in detail later in this document, including its purpose, methods employed in its achievement, and requirements. The longer phases have been further broken down into a series of short tests. The following benefits are obtained from such a breakdown:

a. Since the majority of these tests takes less than one half hour, complete validation of a tape can be accomplished without using long stretches of computer time.

b. Due to the closely knit nature of these tests, they can be run with little or no intervention thus the validators are freed for analysis of the output.

c. The output from these tests is easily analyzed since there are just a few major points to be checked in each set of test results.

d. If difficulty is encountered, a test may be restarted and not more than a few minutes of computer time will have been lost.

e. Additional tests for future flights may be inserted into its logical position without lapse of continuity.

Detailed procedures necessary to run the tests, approximate computer run time and an analysis of the resulting output are included for each specific test.

For Flight Support Tapes of subsequent vehicles, other volumes of this document will be distributed with any additions, deletions or changes in the existing tests as required to conform to flight specifications.

2.0 System Tests

2.1 Ascent Phase

2.1.1 Purpose:

To operate those functions which are used during the pre-orbital period. Specifically, the exercising of two capabilities:

2.1.1.1 The provision of acquisition and ephemeris information for the nominal ascent trajectory based on the 6-D ephemeris tape.

2.1.1.2 To provide ephemeris information and an injection vector based on a fit to radar data.

2.1.2 Method

2.1.2.1 The 6-D tape will be used to provide ephemeris, acquisition and simulated radar data.

2.1.2.2 A fit to the simulated radar data will be made to produce an injection vector.

2.1.2.3 Ephemeris information based on the injection vector will be produced.

2.1.2.4 The resulting output will be analyzed.

2.1.3 Requirements

2.1.3.1 Input

Tapes - see Test VAL11A01

Function cards - see Appendix A

2.1.3.2 Equipment

1604 computer

On-line printer

Card reader-punch

Eight tape units

Off-line printer

Paper tape punch and reader

2.1.4 Test

2.1.4.1 Ascent - Test VAL11A01

2.1.4.1.1 Procedures

1. Mount the following tapes:

   unit 1 - 1100 series Flight Support Tape.
   unit 2 - blank reset tape.
   unit 3 - blank output tape.
   unit 4 - nominal data package.
   unit 5 - blank transfer tape.
   unit 6 - 6-D tape.
   unit 9 - blank reset tape.
   unit 10 - blank reset tape.

2. Initialize reset tapes 2, 9 and 10.
3. Write nominal reset tapes from the data package.
4. Input the run number VAL11A01.
5. Enter the time of launch.
6. List the computed times of events on and off-line.
7. List the 6-D tape using the following options:
   a. Local pad radar coordinates.
   b. Local pad rectangular coordinates.
   c. Local pad curvilinear coordinates.
   d. Local pad rectangular velocity components.
   e. A plot of the local pad radar coordinates.
8. Generate acquisition and ephemeris information from the 6-D tape. Specifically:
   a. Acquisition programmer tape for COOK.
   b. Space track message for COOK.
   c. Local track listing for COOK, PAD, DIEGO, and HORSE.
   d. Simulated MODII data tape from COOK and DIEGO.
   e. Inertial ephemeris of the ascent trajectory.
9. Enter nominal event times for vernier cutoff, Agena 1st ignition and Agena 1st burn-out.

10. List the simulated MODII data tape using the following options:

    a. Local rectangular coordinates.
    b. Local rectangular velocity components.
    c. Radar coordinates.

11. Define an orbit based on a fit to ascent data using the simulated MODII data.

12. Generate a 6-D transfer tape based on the ascent data fit.

13. Produce an inertial ascent ephemeris and local track listing, using the 6-D transfer tape, for station COOK.

14. Remove the reset tapes and label one of the latest VALllA01.

15. List the output from this test off-line.

2.1.4.1.2 Analysis of Output

1. Inspect the first time of events listing. The time intervals between the calculated events must be equal to the data package nominal delta times.

2. The plot from the 1st running of CCOORD should be identical to the local track listing for station COOK by NASCENT.

3. The taus in the time of events table output by ASCENT should equal those entered by the TIME cards.

4. The Striebel fit made by ASCENT on the MODII data must converge and the resulting tau vector should be very close to the nominal injection vector output by ASCENT.

5. That portion of the inertial ascent ephemeris listed by NASCENT from the 6-D transfer tape must agree with that listed by NASCENT from the 6-D tape.

6. Check that all other output specified in 2.1.4 is complete and free from obvious errors.

2.1.4.1.3 Timing Requirements

Approximately 35 minutes excluding off-line printing.

2.2 Orbit Determination Phase

2.2.1 Purpose

On the basis of nominal injection conditions and simulated data, to test the performance of those functions on the 1100 series Flight Support Tape involved in data generation, reduction, fitting to the orbit, and orbit adjust.

2.2.2 Method

2.2.2.1 Establish the nominal orbit vector.

2.2.2.2 Generate simulated data tapes.

2.2.2.3 Perform orbit adjusts.

2.2.2.4 Perturb the orbit.

2.2.2.5 Obtain local and combined Powell cards for later reconstruction of the orbit on selected revs.

2.2.2.6 Analyze the resulting output.

2.2.3 Requirements

2.2.3.1 Input

Tapes - see individual tests.

Function cards - see appendix B.

2.2.3.2 Equipment

1604 computer

card reader and punch

Six tape units

Paper tape punch and reader

Off-line printer

2.2.4 Tests

2.2.4.1 Nominal Set Up - Test VAL11D01

2.2.4.1.1 Procedures

1. Mount the following tapes:

   unit 1 - 1100 series Flight Support Tape.
   unit 2 - blank reset tape.
   unit 3 - blank output tape.
   unit 4 - nominal data package.
   unit 9 - blank reset tape.
   unit 10 - blank reset tape.

2. Initialize reset tapes 2, 9 and 10.
3. Write nominal reset tapes from the data package.
4. Input the run number VAL11D01.
5. Enter the time of launch.
6. List the computed times of events on and off line.
7. Generate the Look and Station Requirements Table for the ship stations HORSE and MINT.
8. Generate a nominal injection vector.
9. Generate the Acquisition Table for revs .5 - 2.0.
10. List the Acquisition Table on and off line.
11. Generate a nominal orbital ephemeris from PREDICT for revs .5 - 20.0.
12. Generate a nominal orbital ephemeris from EPHFUN for revs .5 - 20.0.
13. Generate simulated ship data tapes for revs .5 - 2.0.
14. Generate the Look and Station Requirements Table for stations BOSS, ANNE, KODI, HUIA, COOK and THULE.
15. Set the Acquisition duration time to 300 seconds.
16. Generate the Acquisition Table for revs .5 - 20.0.

17. List the Acquisition Table on and off line.
18. Remove the reset tapes and label the two latest VAL11D01.
19. List the output from this test off line.

Reset tapes retained at the end of this test:

VAL11D01 - 2 copies - Contents:

Look Table

Nominal injection vector

Acqtable for revs .5 - 20.0

These reset tapes will be used in Test VAL11D02 and Test VAL11D03.

2.2.4.1.2 Analysis of Results

1. Check computed times of events as output in #6; these should agree with those computed in the Ascent Phase.
2. Investigate the Look and Station Requirements Table to see that it reflects the stations and the corresponding requirements as requested on the function card.
3. Investigate the Acquisition Table to see that only the stations in the Look Table are present and that the duration time is equal to or greater than 300 seconds.
4. Compare the orbital ephemeris as computed by PREDICT with that from EPHFUN. These should agree.

2.2.4.1.3 Timing Requirements

Approximately 35 minutes excluding off-line printing.

2.2.4.2 Data Tapes, Local Fit - Test VAL11D02

2.2.4.2.1 Procedures

1. Mount the following tapes:

   unit 1 - 1100 series Flight Support Tape.
   unit 2 - reset tape VAL11D01.
   unit 3 - blank output tape.
   unit 9 - blank reset tape.
   unit 10 - blank reset tape.

2. Initialize reset tapes 9 and 10.
3. Input the run number VAL11D02.
4. Generate simulated MODII data tapes for revs .5 - 20.0.
5. Compare the data tapes generated with the nominal orbit on the reset tapes.
6. Reduce some of the data tapes generated above doing local fits - save all local Powell cards and label VAL11D02.
7. Remove the reset tapes and label one of the latest VAL11D02.
8. List the output from this test off-line.

Reset tape retained at the end of this test:

VAL11D02 - 1 copy - Contents:

Time of events

Look Table

Vector at the end of rev 19 obtained through local fits of the simulated data tapes through ONAGER.

2.2.4.2.2 Analysis of Results

1. Check the listings of the data tapes and the first differences when the data is compared to the nominal orbit. The data should be acceptable.

2. Check the on-line print-outs during the reduction steps; no difficulty should be encountered in making local fits on the data. Compare the final tau vector with that of #4 in Test VAL11D03 and #9 in Test VAL11D04. Verify that a set of combined, as well as local Powell cards, is punched.

2.2.4.2.3 Timing Requirements

Approximately 35 minutes excluding off-line printing.

2.2.4.3 Cards, Local Fits - Test VAL11D03.

2.2.4.3.1 Procedures

1. Mount the following tapes:

   unit 1 - 1100 series Flight Support Tape.
   unit 2 - reset tape VAL11D01.
   unit 3 - blank output tape.
   unit 9 - blank reset tape.
   unit 10 - blank reset tape.

2. Initialize reset tapes 9 and 10.
3. Input the run number VAL11D03.
4. Fit the local Powell cards punched in Test VAL11D01 - fit to the nominal orbit on the reset tape one card at a time.
5. Remove the reset tapes and label one of the latest VAL11D03.
6. List the output from this test off-line.

Reset tape retained at the end of this test:

VAL11D03 - 1 copy - Contents:

Time of events

Look Table

Vector at the end of rev 19 obtained through local fits by LBWRED.

2.2.4.3.2 Analysis of Results

Compare the on-line output with that of #6 in Test VAL11D02, these should be very much alike. The final tau vectors should be identical.

2.2.4.3.3 Timing Requirements

Approximately 8 minutes excluding off-line printing.

2.2.4.4 **Data Tapes, Combined Fit - Test VAL11D04**

2.2.4.4.1 Procedures

1. Mount the following tapes:

   unit 1 - 1100 series Flight Support Tape.
   unit 2 - blank reset tape.
   unit 3 - blank output tape.
   unit 4 - nominal data package.
   unit 5 - blank scratch tape for ONAGER.
   unit 9 - blank reset tape.
   unit 10 - blank reset tape.

2. Initialize reset tapes 2, 9 and 10.
3. Write nominal reset tapes from the data package.
4. Set the Acquisition time to 300 seconds.
5. Input the run number VAL11D04.
6. Input the time of launch.
7. Generate the Look and Station Requirements Table for stations 1, 3, 4, 5, 6 and 9.
8. Generate a nominal injection vector.
9. Reduce the data tapes generated in Test VAL11D02 doing a combined fit - save the combined Powell cards and label VAL11D04.
10. Remove the reset tapes and label the two latest VAL11D04.
11. List the output from this test off-line.

Reset tapes retained at the end of this test:

VAL11D04 - 2 copies - Contents:

Times of events

Look Table

Acquisition Time equal 300"

Vector at the end of rev 19 obtained through a combined fit of the data tapes by ONAGER.

One copy will be used in Test VAL11D05.

2.2.4.4.2 Analysis of Results

Compare the on-line output from #9 in this test to #6 in Test VALllD02 and #4 in Test VALllD03;they should be very much alike. The final tau vectors from these three tests should agree. Verify that one set of Powell cards is punched.

2.2.4.4.3 Timing Requirements

Approximately 30 minutes excluding off-line printing.

2.2.4.5 Data Tapes, Combined Fit - Test VAL11D05

2.2.4.5.1 Procedures

1. Mount the following tapes:

   unit 1 - 1100 series Flight Support Tape.
   unit 2 - reset tape VAL11D04.
   unit 3 - blank output tape.
   unit 5 - blank scratch tape for ONAGER.
   unit 9 - blank reset tape.
   unit 10 - blank reset tape.
2. Initialize reset tapes 9 and 10.
3. Input the run number VAL11D05.
4. Generate the Acquisition Table for revs 20.0 - 40.0.
5. List the Acquisition Table on and off-line.
6. Generate simulated MODII data tapes for revs 20.0 - 40.0.
7. Reduce some of the data tapes generated above doing a combined fit - save the combined Powell cards and label each VAL11D05.
8. Remove the reset tapes and label the two latest VAL11D05.
9. List the output from this test off-line.

Reset tapes retained at the end of this test:

VAL11D05 - 2 copies - Contents

Look Table

Vector at the end of rev 39 obtained through doing a combined fit on the data tapes by ONAGER.

One copy will be used in Test VAL11D06.

2.2.4.5.2 Analysis of Results

1. Check the Acquisition Table to see that only the stations in the Look Table are entered and that the duration time of each pass is 300 seconds or more.

2. Check the on-line print-out in the reduction of data; no difficulty should be encountered in doing a combined fit to the orbit. Verify that combined Powell cards are punched.

2.2.4.5.3 Timing Requirements

Approximately 30 minutes excluding off-line printing.

2.2.4.6 Orbit Adjust, Tapes and Fit - Test VAL11D06

2.2.4.6.1 Procedures

1. Mount the following tapes:

   unit 1 - 1100 series Flight Support Tape
   unit 2 - reset tape VAL11D05.
   unit 3 - blank output tape.
   unit 5 - blank scratch tape for ONAGER.
   unit 9 - blank reset tape.
   unit 10 - blank reset tape.

2. Initialize reset tapes 9 and 10.
3. Input the run number VAL11D06.
4. List the tau vector on and off-line.
5. Do an orbit adjust at apogee on rev 40.
6. List the tau vector on and off line.
7. Reconstruct the orbit to conditions before the adjust.
8. List the tau vector on and off-line.
9. Do a second orbit adjust.
10. Do a third orbit adjust.
11. Do a fourth orbit adjust.
12. Do a fifth orbit adjust.
13. Reconstruct the orbit to conditions prior to the third adjust.
14. List the tau vector on and off line.
15. Generate the Acquisition Table for revs 40.0 - 60.0.
16. List the Acquisition Table on and off line.
17. Generate simulated MODII data tapes for revs 40.0 - 60.0.
18. Reduce some of the data tapes generated above doing a combined fit - save the combined Powell cards and label VAL11D06.
19. Remove the reset tapes and label the two latest VAL11D06.
20. List the output from this test off line.

Reset tapes retained at the end of this test:

VAL11D06 - 2 copies - Contents

Look Table

Vector at the end of rev 59 which reflects one orbit adjust obtained by doing a combined fit on the data tapes through ONAGER.

One copy will be used in Test VAL11D07.

2.2.4.6.2 Analysis of Results

1. The tau vector output in #4 should be identical to the final vector output in #7 of Test VAL11D05.
2. Investigate the output from the first orbit adjust #5; compare it to the tau vector output in #6.
3. Verify that the tau vector output in #8, after the first reconstruction, corresponds to the tau vector before the first orbit adjust.
4. Verify from the on-line output that the latest three adjustments are retained on the reset tapes.
5. Verify that after the orbit reconstruction in #13, the orbit presently on the reset tape is the same as was output after the second adjust.
6. Verify that the Acquisition Table is complete and free from obvious error.
7. Check the on-line print-out during reduction of the data tapes. No difficulty should be encountered in doing a combined fit.

2.2.4.6.3 Timing Requirements

Approximately 30 minutes excluding off-line printing.

2.2.4.7 Orbit Perturbed, Tapes and Fit - Test VAL11D07

2.2.4.7.1 Procedures

1. Mount the following tapes:

   unit 1 - 1100 series Flight Support Tape.
   unit 2 - reset tape VAL11D06.
   unit 3 - blank output tape.
   unit 5 - blank scratch tape for ONAGER.
   unit 9 - blank reset tape.
   unit 10 - blank reset tape.
2. Initialize reset tapes 9 and 10.
3. Input the run number VAL11D07.
4. Output on and off line the current tau vector.
5. Perturb the orbit; the height by +10,000 feet and the latitude by .2°.
6. Generate the Acquisition Table for revs 60.0 - 80.0.
7. List the Acquisition Table on and off-line.
8. Generate simulated MODII data tapes for revs 60.0 - 80.0.
9. Reduce some of the data tapes generated above by doing a combined fit - save the combined Powell cards and label VAL11D07.
10. Remove the reset tapes and label one of the latest VAL11D07.
11. List the output from this test off line.

VAL11D07 - 1 copy - Contents:

Look Table

Vector at the end of rev 79 obtained through combined fit by ONAGER. Reflects perturbation.

2.2.4.7.2 Analysis of Results

1. Verify that the tau vector output in #4 is identical to that output in #18 of Test VAL11D06.

2. Verify from the tau vector output in #5 that the orbit has been perturbed by the amounts stated requested on the function card.

3. Verify that the Acquisition Table is complete and free from obvious errors.

4. Check the on-line print-out during reduction of the data tapes representing the perturbed orbit.

5. From the on-line output verify that the vectors from the latest 21 data tapes are being retained, including those from previous tests.

2.2.4.7.3 Timing Requirements

Approximately 30 minutes excluding off-line listing.

2.3 Prediction and Commanding Phase

2.3.1 Purpose

To test, on the basis of simulated data, those functions on the 1100 series Flight Support Tapes involved in orbit reconstruction, prediction, and vehicle commanding.

2.3.2 Method

2.3.2.1 Re-establishment of nominal orbit vector.

2.3.2.2 Generation of acquisition, commands, and associated data.

2.3.2.3 Reconstruction of the orbit at the end of selected revs.

2.3.2.4 Exercise Timer commands, (skip, repeat, steps, and reset).

2.3.2.5 Investigate acquisition and commanding problems in a perturbed orbit.

2.3.2.6 Analyze the resulting output.

2.3.3 Requirements

2.3.3.1 Input

Tapes - see individual tests.

Function cards - see Appendix C.

2.3.3.2 Equipment

1604 Computer

Card reader and punch

Tape units - seven

Paper tape punch

Off-line printer

2.3.4 Tests

2.3.4.1 BAK/NUNN - Test VAL11P01

2.3.4.1.1 Procedures

1. Mount the following tapes:

   unit 1 - 1100 series Flight Support Tape.
   unit 2 - blank for reset.
   unit 3 - blank for output.
   unit 4 - nominal data package.
   unit 9 - blank for reset.
   unit 10 - blank for reset.

2. Initialize the blanks on 2, 9 and 10.
3. Write nominal reset tapes from the data package.
4. Input the run number VAL11P01.
5. Enter the time of launch.
6. List the time of events table off and on-line.
7. Generate the Station Requirements Table for the Baker-Nunn stations.
8. Set up a nominal orbit.
9. Initially update the Timer Summary Table with correctors.
10. Initially update the Timer Summary Table without correctors.
11. Generate the Acquisition Table for revs 1.0 - 21.0.
12. List the Acquisition Table on and off-line.
13. Reset RMN event in subcycle 1 to time of crossing the reset latitude.
14. Generate acquisition times and camera parameters for the Baker-Nunn stations for revs 1.0 - 21.0.
15. Remove the reset tapes and label the two latest VAL11P01.
16. List the tape from unit 3 off-line.

Reset tapes retained at the end of Test VAL11P01:

VAL11P01 - 2 copies - Contents

Look Table

Nominal Injection Vector

Acquisition Table, revs 1.0 - 21.0

Timer Tables reset on subcycle 1.

2.3.4.1.2 Analysis of Output

1. Inspect the time of events listing. Launch time must equal entered launch time. The time intervals between the calculated events must be equal to the data package nominal delta times.
2. Investigate the Station Requirements Table to verify that the stations and corresponding requirements are listed.
3. Check the nominal tau vector to see that it compares with those generated in the first two phases.
4. Compare the Timer Summary Table with a listing of the data package. Are all commands present? Is the timer period equal to the nominal tape period? Does the reset time equal launch time plus timer delay? Have the correctors been inserted into the proper places?
5. Compare the second Timer Summary Table with the first. They should be identical except for the correctors inserted in the previous run. These should have been replaced by the nominal values from the data package.
6. Check the Acquisition Table to verify that acquisitions are shown only for those stations in the Look Table, that data is given only for the period requested and that pass durations and mid-times appear logical.
7. Check the on-line printout to see that the current subcycle number is one.

8. Inspect the Baker-Nunn predictions for the following:

   a. Light event on and off times are in agreement with the Timer Tables.

   b. That the visible stations do see the bird during the interval indicated by comparing with the Acquisition Table.

   c. That the timer period and hence number of steps required agree with the Timer Tables.

2.3.4.1.3 Timing Requirements

Approximately 20 minutes excluding tape setup and off-line printing.

2.3.4.2 Orbit Nominal - Test VAL11P02

2.3.4.2.1 Procedures

1. Mount the following tapes:

   unit 1 - 1100 Series Flight Support Tape.
   unit 2 - reset tape VAL11P01.
   unit 3 - blank for output.
   unit 4 - nominal data package.
   unit 9 - blank for reset.
   unit 10 - blank for reset.

2. Initialize the blanks on 9 and 10.
3. Input the run number VAL11P02.
4. Do a follow-on initial update of the Timer Tables to enter a correction.
5. Generate the Station Requirements Table for stations HULA, BOSS, THULE, KODI, ANNE, COOK, MINT, and HORSE.
6. Generate the Acquisition Table for revs 0.5 - 3.0.
7. List the Acquisition Table on and off-line.
8. Predict for rev 0.5 - 1.9

   a. Acquisition messages
   b. Acquisition programmer tapes
   c. See messages
   d. Local track listings
   e. Space track messages
   f. Ephemeris

9. Update the Timer Tables by repeating subcycle 1, resetting the RMN event in subcycle 1 to the time of crossing the reset latitude during rev 2, and increasing the timer period by 5 steps.
10. Generate acquisition messages for revs 2.0 - 3.0.
11. Update the Timer Tables by skipping subcycle 1, resetting the RMN event in subcycle 2 to the time of crossing the reset latitude during rev 2, and decreasing the timer period by 5 steps.

12. Generate acquisition messages for revs 2.0 - 3.0.
13. Generate the Acquisition Table for revs 15.0 - 19.0.
14. List the Acquisition Table on and off-line.
15. Update the Timer Tables by resetting to subcycle 17.
16. Generate acquisition messages for revs 17.0 - 18.0.
17. Update the Timer Tables by resetting the RMN event in subcycle 17 to RSL crossing time in rev 17 and changing steps as indicated by the acquisition messages for rev 17.
18. Predict for revs 17.0 - 18.0

    a. Acquisition messages
    b. Acquisition programmer tapes
    c. See messages
    d. Local track listings
    e. Space Track messages.

19. Remove the reset tapes and label the two latest VAL11P02.
20. List the tape from unit 3 off-line.

Reset tapes retained at the end of Test VAL11P02:

VAL11P02 - 2 copies - Contents

Look Table

Nominal Injection Vector

Acquisition Table revs 15.0 - 19.0

Timer Tables reset on subcycle 17 with nominal period.

2.3.4.2.2 Analysis of Output

1. The Timer Summary Table must agree with the last one from test VAL11P01 except it must contain the corrections added.
2. Investigate the Station Requirements Table to verify that the stations and corresponding requirements are listed.
3. Check the Acquisition Table as previously stated.
4. Check the output of PREDICT for all options requested. Do the Acquisition messages reflect the commands and times for the given interval in the Timer Summary Table? Are the reset times and timer periods correct?
5. Subcycle n should correspond to rev n+1 in the Timer Summary Table. The reset time should equal the RSL time in rev 2. The timer period must equal the nominal period plus 5 times the stepsize.
6. The Acquisition messages must reflect the above changes to the Timer Summary Table.
7. Subcycle n should once again correspond to rev n. The reset time should equal the RSL time in rev 2. The timer period should be be back to nominal.
8. The Acquisition messages must reflect the changes back to nominal of the Timer Summary Table.
9. Check the second Acquisition Table as previously stated.
10. The on-line printout should indicate that the current subcycle is 17.
11. After the timer update, as dictated by the Acquisition messages, the next set of Acquisition messages should indicate no updates required.

2.3.4.2.3 Timing Requirements

Approximately 20 minutes excluding tape setup and off-line printing.

2.3.4.3 Reconstructed Nominal Orbit - Test VAL11P03

2.3.4.3.1 Procedures

1. Mount the following tapes:

   unit 1 - 1100 series Flight Support Tape.
   unit 2 - reset tape VAL11P02.
   unit 3 - blank for output.
   unit 9 - blank for reset.
   unit 10 - blank for reset.

2. Initialize the blanks on 9 and 10.
3. Input the run number VAL11P03.
4. Reconstruct the orbit at the end of rev 39 with Powell cards numbered VAL11D05.
5. Generate the Acquisition Table for revs 46.0 - 49.0.
6. List the Acquisition Table on and off-line.
7. Update the Timer Tables by resetting to subcycle 47 and increasing the period by 20 steps.
8. Generate acquisition messages for revs 47.0 - 48.0.
9. Update the Timer Tables by resetting the RMN event in subcycle 47 to the time of crossing the reset latitude in rev 47 and by entering the actual period.
10. Predict for revs 47.0 - 48.0

    a. Acquisition messages
    b. Acquisition programmer tapes
    c. See messages
    d. Local track listings
    e. Space track messages
    f. Ephemeris

11. Remove the reset tapes and label the two latest VAL11P03.
12. List the tape from unit 3 off-line.

Reset tapes retained at the end of Test VAL11P03:

VAL11P03 - 2 copies - Contents

Look Table

Orbit at end of rev 39.

Acquisition Table for revs 46.0 - 49.0.

Timer Tables reset on subcycle 47 with orbital period.

2.3.4.3.2 Analysis of Output

1. After reconstructing the orbit at the end of rev 39, the resulting tau vector should be identical to that at the end of Test VAL11D05.
2. Do the passes covered by the Acquisition messages agree with the Acquisition Table? Are the twenty steps reflected?
3. After making the adjustments to the Timer Tables requested by the last set of Acquisition messages, does the following set indicate no more changes needed? Do the See messages, Acquisition messages, and Local Track listings reflect the passes indicated in the Acquisition Table for the given time interval?

2.3.4.3.3 Timing Requirements

Approximately 20 minutes excluding tape setup and off-line printing.

2.3.4.4 Adjusted Orbit - Test VAL11P04

2.3.4.4.1 Procedures

1. Mount the following tapes:

   unit 1 - 1100 series Flight Support Tape.
   unit 2 - reset tape VAL11P01.
   unit 3 - blank for output.
   unit 9 - blank for reset.
   unit 10 - blank for reset.

2. Initialize the blanks on 9 and 10.
3. Input the run number VAL11P04.
4. Reconstruct the orbit at the end of rev 59 with Powell cards numbered VAL11D06.
5. Generate the Acquisition Table for revs 59.0 - 79.0.
6. List the Acquisition Table off and on-line.
7. Generate acquisition messages for revs 59.0 - 62.0.
8. Reset the Timer Tables to the time of crossing the reset latitude in rev 60 and add steps to the period as required by the Acquisition messages for rev 60.
9. Generate acquisition times and camera parameters for the Baker-Nunn stations for revs 60.0 - 79.0.
10. Do an alternate 1 update on the Timer Tables. Reset the second RMN event in subcycle 60 to a time twenty days after that of the latest reset. Output the Timer Tables.
11. Remove the reset tapes and label the two latest VAL11P04.
12. List the tape from unit 3 off-line.

Reset tapes retained at the end of Test VAL11P04:

VALllP04 - 2 copies - Contents

Look Table, Baker-Nunn Stations
Orbit at end of rev 59
Acquisition Table, revs 59.0 - 79.0
Timer Tables, alternate 1.

2.3.4.4.2 Analysis of Output

1. After reconstructing the orbit at the end of rev 59, the resulting tau vector should be identical to that at the end of Test VALllD06.
2. Does the first set of Acquisition messages reflect passes from the Acquisition Table and the new orbital period?
3. The time of reset in the updated Timer Tables should be equal to the RMN time in subcycle 60 and this should equal the RSL time. Also the steps requested by the Acquisition messages to bring the Timer period up to the orbital period should have been added.
4. Inspect the Baker-Nunn predictions for the following:
   a. Light event on and off times are in agreement with the Timer Tables.
   b. Compare with the Acquisition Table to see that the visible stations indicated for the given revs are indeed visible.
   c. The timer reset message should indicate no need for Timer Table updates.
5. The Timer Summary Table must be headed "alternate 1". The second RMN event in subcycle 60 must occur at the reset time input on the function card and all other command times should have been adjusted around this new reset point.

2.3.4.4.3 Timing Requirements

Approximately 20 minutes excluding tape setup and off-line printing.

2.3.4.5 Perturbed Orbit - Test VAL11P05

2.3.4.5.1 Procedures

1. Mount the following tapes:

   unit 1 - 1100 series Flight Support Tape.
   unit 2 - reset tape VAL11P03.
   unit 3 - blank for output.
   unit 9 - blank for reset.
   unit 10 - blank for reset.
   unit 11 - blank for binary ephemeris.

2. Initialize the blanks on 9 and 10.

3. Input the run number VAL11P05.

4. Reconstruct the orbit at the end of rev 79 with Powell cards numbered VAL11D07.

5. Generate the Acquisition Table for revs 80.0 - 100.0.

6. List the Acquisition Table off and on-line.

7. Generate acquisition messages for revs 80.0 to 81.0.

8. Reset in subcycle 80 to the time of crossing the reset latitude and add steps as required by the acquisition messages.

9. Predict for revs 80.0 - 85.0

   a. Acquisition messages
   b. Acquisition programmer tapes
   c. See messages
   d. Local Track listings
   e. Space track messages
   f. Ephemeris

10. Do a follow-on-initial update of the Timer Tables.

11. Predict for revs 80.0 - 100.0

    a. Acquisition messages
    b. Acquisition programmer tapes
    c. See messages
    d. Local Track listings
    e. Space track messages
    f. Ephemeris

12. Generate an orbital ephemeris for revs 88.0 - 94.0.
13. Remove the reset tapes and label the two latest VAL11P05.
14. List the tape from unit 3 off-line.

Reset tapes retained at the end of Test VAL11P05.

VAL11P05 - 2 copies - Contents

Look Table

Orbit at end of rev 79

Acquisition Table, revs 80.0 - 100.0

Timer Tables, reset in subcycle 80, with period of rev 80.

2.3.4.5.2 Analysis of Output

1. After reconstructing the orbit at the end of rev 79, the resulting tau vector should be identical to that at the end of Test VAL11D07.
2. Subcycle 80 must be shown as the current subcycle after the reset and step change is made according to the Acquisition messages.
3. The prediction for revs 80.0 - 85.0 must give all options requested. The Acquisition messages should reflect the commands in the Timer Summary Table for the given intervals. These intervals should agree with the passes indicated for these revs by the Acquisition Table as should the See messages and Local Track listings. A need for further updating of the Timer Tables should not be indicated.
4. The current subcycle must be the first subcycle in the new Timer Summary Table. The reset time and Timer period should be the same as after the last update. The commands and their times in the current subcycle should be identical with those after the last update. Any overlapping subcycles brought in should also have been updated so that they are identical to those

after the last update. The number brought in, of course, will depend on the size and quantity of subcycles on the data package.

5. That portion of the prediction which corresponds to the last one must be identical to the last one.

6. The orbital ephemeris for revs 88.0 - 94.0 should be identical to that produced by the prediction for those revs.

2.3.4.5.3 Timing Requirements

Approximately 40 minutes excluding tape setup and off-line printing.

2.3.4.6 Type 8 Timer - Test VALl1P06

2.3.4.6.1 Procedures

1. Mount the following tapes:

   unit 1 - 1100 series Flight Support Tape.
   unit 2 - reset tape VALl1P02.
   unit 3 - blank for output.
   unit 9 - blank for reset.
   unit 10 - blank for reset.

2. Initialize the blanks on 9 and 10.
3. Input the run number VALl1P06.
4. Set stepsize equal to zero on the reset tapes.
5. Update the Timer Tables by entering an actual period of 5700.0 and setting up for retro-mode prediction.
6. Generate acquisition messages for rev 17.
7. Enter on actual and desired time for the DMT event in rev 17.
8. Generate acquisition messages for rev 17.
9. Enter on actual and desired time for the DMT event in rev 17, but fix the period to nominal.
10. Generate acquisition messages for rev 17.
11. Take the acquisition messages out of retro-mode.
12. Generate acquisition messages for rev 17.
13. Update the Timer Tables by subtracting an increment of time from the current Timer period.
14. Generate acquisition messages for rev 17.
15. Remove the reset tapes and label the two latest VALl1P06.
16. List the tape from unit 3 off-line.

2.3.4.6.2 Analysis of Output

1. The first set of acquisition messages should indicate a timer period of 5700.0 and no step indications should be printed out. The retro flag should be on but the messages are normal at this point.
2. The second set of acquisition messages should indicate a timer period of 5700.0. Since the message is now in retro-mode a reset should have been calculated which will cause the DMT event in subcycle 17 to occur at the desired time.
3. The third set of acquisition messages should calculate a reset which will cause the DMT event in subcycle 17 to occur at the desired time but based on the nominal timer period.
4. The fourth set of acquisition messages should be in the normal mode.
5. The Timer Summary Tables should show the new period resulting from the increment entered by the function card. The command times will have been recalculated on the basis of this new period.
6. The fifth set of acquisition messages should reflect the new timer period and the new command timer.

2.3.4.6.3 Timing Requirements

Approximately 15 minutes excluding tape setup and off-line printing.

2.4. Re-entry Phase

2.4.1 Purpose

To test, using nominal conditions and simulated data tapes, the performance of those functions on the 1100 series Flight Support Tape involved in the recovery of a capsule.

2.4.2 Method

2.4.2.1 Set up a nominal orbit vector.

2.4.2.2 Test the RE-ENTRY modules based on:

a. Nominal re-entry
b. A time prior to nominal TAU12.
c. A time later than nominal TAU12.
d. A re-entry out of the orbit plane.
e. A South to North re-entry.
f. An extended re-entry.

2.4.3 Requirements

2.4.3.1 Input

a. Tapes - see individual tests.
b. Function cards - see appendix D.

2.4.3.2 Equipment

1604 reader and punch

Tape units-six

Off line printer

On line printer

Paper tape punch and reader

2.4.4 Tests

2.4.4.1 Nominal Set Up - Test VAL11R01

2.4.4.1.1 Procedures

1. Mount the following tapes:

   unit 1 - 1100 series Flight Support Tape.
   unit 2 - blank reset tape.
   unit 3 - blank output tape.
   unit 4 - nominal data package.
   unit 9 - blank reset tape.
   unit 10 - blank reset tape.

2. Initialize reset tapes 2, 9 and 10.
3. Write nominal reset tapes from the data package.
4. Input the run number VAL11R01.
5. Input the time of launch.
6. Generate the Look and Station Requirements Table for stations 1, 3, 4, 5, 6, and 27.
7. Generate a nominal injection vector.
8. Generate the Acquisition Table for revs 1.0 - 30.0.
9. Initially update the Timer Summary Table.
10. Reset the Timer to the subcycle corresponding to the primary re-entry rev and put the Timer in the retro mode.
11. Remove the reset tapes and label the two latest VAL11R01.
12. List the output from this test off line.

Reset tapes retained at the end of this test:

VAL11R01 - 2 copies - Contents:

Launch time

Look Table

Nominal Injection vector

Timer set to re-entry subcycle and in the retro mode.

Acquisition Table for revs 1 - 30.

One copy will be used in Test VAL11R02.

2.4.4.1.2 Analysis of Results

1. Investigate the Acquisition Table to verify that only the stations in the Look Table are listed and that data is given for the revs called for on the function card.
2. Verify from the listing of the Timer Summary Table from #9 that the time increments are the same as those listed in the nominal data package.
3. Verify from the on-line output and the Timer Summary Table listing output in #10 that the Timer has been reset to the appropriate subcycle and that it is in the retro mode.

2.4.4.1.3 Timing Requirements

Approximately 14 minutes excluding off-line printing.

2.4.4.2 Nominal Re-entry - Test VAL11R02

2.4.4.2.1 Procedures

1. Mount the following tapes:

   unit 1 - 1100 series Flight Support Tape.
   unit 2 - reset tape VAL11R01.
   unit 3 - blank output tape.
   unit 6 - blank ephemeris tape.
   unit 9 - blank reset tape.
   unit 10 - blank reset tape.

2. Initialize reset tapes 9 and 10.
3. Input the run number VAL11R02.
4. Determine retro ignition time for a North to South pass on the primary re-entry rev based on the nominal impact latitude.
5. Output on and off line the Times of Events Table containing the nominal retro fire time computed above.
6. Special command for the Timer - present and desired time obtained from #4.
7. Re-entry from tau 12; determine time, latitude and longitude of impact.

   a. Binary ephemeris
   b. Teapot message

8. Generate re-entry ephemeris output.

   a. Listable ephemeris
   b. Local track listings and
   c. Simulated MODII data tapes for KODI, HULA and TERN.

9. Process the MODII data tapes and generate a binary ephemeris.
10. Generate re-entry trajectory output.

    a. Listable ephemeris
    b. Local track listings for KODI, HULA and TERN.

11. Determine retro ignition time based on the DTimer start time.

12. Enter the commands to be listed in the Acquisition message.
13. Generate Acquisition messages for the primary re-entry rev.
14. Remove the reset tapes and label the latest two VAL11R02.
15. List the output from this test off line.

Reset tapes retained at the end of this test:

VAL11R02 - 2 copies - Contents:

In addition to the contents of VAL11R01 it contains nominal retro fire time.

One copy will be used in Test VAL11R03, the other will be used in VAL11R05.

2.4.4.2.2 Analysis of Results

1. Investigate the on-line output describing impact conditions as determined by operating COMPT, TAU12, DATA and DTIMER using the same input. The impact conditions should agree.
2. The times of events table output in #5 should contain the nominal retro fire time as computed by COMPT and should be written on the reset tape to be used by TAU12. The on-line output of COMPT should list the present Timer setting and the desired setting, i.e., the setting required to actuate the DTimer.
3. The local track listings from #8 should agree with that output in #10.
4. Investigate the Acquisition messages output in #13 - the retro mode should be reflected and all the commands, including the DMT should be listed.
5. Investigate the re-entry ephemeris as output in #6 and #8, these should agree.

2.4.4.2.3 Timing Requirements

Approximately 15 minutes excluding off-line printi

2.4.4.3 Early Retro Fire Time - Test VAL11R03

2.4.4.3.1 Procedures

1. Mount the following tapes:

   unit 1 - 1100 series Flight Support Tape.
   unit 2 - reset tape VAL11R02.
   unit 3 - blank output tape.
   unit 6 - blank ephemeris tape.
   unit 9 - blank reset tape.
   unit 10 - blank reset tape.

2. Initialize reset tapes 9 and 10.
3. Input the run number VAL11R03
4. Input tau 12 twelve seconds prior to the nominal retro fire time.
5. Re-entry from tau 12; determine time, latitude and longitude of impact.

   a. Binary ephemeris
   b. Teapot message

6. Generate re-entry ephemeris output.

   a. Listable ephemeris
   b. Local track listings and
   c. Simulated MODII data tapes for HULA, KODI and TERN.

7. Process the MODII data tapes and generate a binary ephemeris.
8. Generate re-entry trajectory output.

   a. Listable ephemeris
   b. Local track listings for HULA, KODI and TERN.

9. Remove the reset tapes and label both of the latest VAL11R03.
10. List the output from this test off line.

Reset tape retained at the end of this test:

VALllR03 - 2 copies - Contents:

In addition to the contents of VALllR01 it contains the early retro fire time.

One copy will be used in Test VALLllR04 the other will be used in Test VALllR07.

2.4.4.3.2 Analysis of Results

1. The on-line output describing impact conditions, as determined by TAU12, and DATA using the same input, namely the retro fire time should be investigated. The impact conditions should agree.

2. Investigate the re-entry ephemeris as output in #6 and #8. These should agree.

3. The local track listings as output in #6 and #8 should be checked and should correspond.

2.4.4.3.3 Timing Requirements

Approximately 8 minutes excluding off-line printing.

2.4.4.4 Late Retro Fire Time - Test VAL11RO4

2.3.4.4.1 Procedures

1. Mount the following tapes:

   unit 1 - 1100 series Flight Support Tape.
   unit 2 - reset tape VAL11RO3
   unit 3 - blank output tape.
   unit 8 - blank ephemeris tape.
   unit 9 - blank reset tape.
   unit 10 - blank reset tape.

2. Initialize reset tapes 9 and 10.
3. Input the run number VAL11RO4.
4. Input tau 12 forty seconds after nominal retro fire time.
5. Re-entry from tau 12; determine time, latitude and longitude of impact.

   a. Binary ephemeris
   b. Teapot message

6. Generate re-entry ephemeris output.

   a. Listable ephemeris
   b. Local track listings and
   c. Simulated MODII data tapes for HULA, KODI and TERN.

7. Process the MODII data tapes and generate a binary ephemeris.
8. Generate re-entry trajectory output.

   a. Listable ephemeris
   b. Local track listings for HULA, KODI and TERN.

9. Remove the reset tapes and label the latest VAL11RO4.
10. List the output from this test off line.

Reset tapes retained at the end of this test:

VAL11RO4 - 1 copy - Contents:

In addition to the contents of VAL11RO1 it contains the late retro fire time.

2.4.4.4.2 Analysis of Results

1. Again verify that the impact conditions determined by the separate functions TAU12 and DATA agree. See that the ephemeris produced in #6 and #8 also agree. Verify that the local track listings from #6 and #8 agree.

2.4.4.4.3 Timing Requirements

Approximately 8 minutes excluding off-line printing.

2.4.4.5 Perturbed Retro Performance - Test VAL11R05

2.4.4.5.1 Procedures

1. Mount the following tapes:

   unit 1 - 110C series Flight Support Tapes
   unit 2 - reset tape VAL11R02.
   unit 3 - blank output tape.
   unit 6 - blank ephemeris tape.
   unit 9 - blank reset tape.
   unit 10 - blank reset tape.

2. Initialize reset tapes 9 and 10.
3. Input the run number VAL11R05.
4. Correct the reset tape

   a. Retro yaw attitude = $+20^{\circ}$
   b. Retro pitch attitude = -110°

5. Re-entry from nominal tau 12; determine time, latitude and longitude of impact.

   a. Binary ephemeris
   b. Teapot message

6. Generate re-entry ephemeris output

   a. Listable ephemeris
   b. Local track listings and
   c. Simulated MODII data tapes for HULA, KODI and TERN.

7. Process the MODII data tapes and generate a binary ephemeris.
8. Generate re-entry trajectory output.

   a. Listable ephemeris
   b. Local track listings

9. Enter the commands to be listed in the Acquisition message.
10. Generate Acquisition messages for the re-entry rev.
11. Correct the reset tape - return yaw and pitch attitude to their nominal values.

12. Remove the reset tapes and label one of the latest VAL11R05.

13. List the output from this test off-line

Reset tape retained at the end of this test:

VAL11R05 - 1 copy - Contents:

Same as reset tape VAL11R02.

This tape will be used in Test VAL11R06.

2.4.4.5.2 Analysis of Results

1. Verify that the impact conditions determined from operating TAU12 and DATA agree.
2. Check the re-entry ephemeris as output in #6 and #8 for agreement.
3. The local track listings as output in #6 and #8 should correspond.
4. Check the Acquisition messages as output in #10 - the retro mode should be reflected and the commands should correspond to those output in #13 Test VAL11R02.

2.4.4.5.3 Timing Requirements

Approximately 15 minutes excluding off-line printing.

2.4.4.6 South to North Pass - Test VAL11R06

2.4.4.6.1 Procedures

1. Mount the following tapes:

   unit 1 - 1100 series Flight Support Tape.
   unit 2 - reset tape VAL11R05.
   unit 3 - blank output tape.
   unit 6 - blank ephemeris tape.
   unit 9 - blank reset tape.
   unit 10 - blank reset tape.

2. Initialize reset tapes 9 and 10.
3. Input the run number VAL11R06.
4. Take the Timer Summary Table out of the retro mode.
5. Generate Acquisition messages for revs 17.0 - 30.0.
6. Compute retro ignition time for a south to north pass based on the nominal impact latitude.
7. Re-entry from tau 12; determine time, latitude and longitude of impact.

   a. Binary ephemeris
   b. Teapot message

8. Generate re-entry ephemeris output.

   a. Listable ephemeris
   b. Local track listings and
   c. Simulated data tapes for HULA, XMAS and TERN.

9. Process the MODII data tapes and generate a binary ephemeris.
10. Generate re-entry trajectory output.

    a. Listable ephemeris
    b. Local track listings for HULA, TERN and XMAS

11. Remove the reset tapes and label the latest one VAL11R06.

12. List the output from this test off line.

Reset tape retained at the end of this test:

VAL11R06 - 1 copy - Contents:

Retro fire time on the alternate re-entry rev on a south to north pass.

2.4.4.6.2 Analysis of Results

1. Investigate the Timer Summary Table listing to verify that it is back in the normal mode and that no reset has been sent.
2. Check the Acquisition messages generated in #5 as a further check on the mode and the last reset.
3. Investigate the on-line impact conditions as determined by COMPT, TAU12, and DATA - these again should agree. The on-line output from COMPT should state that no DMT is present on this rev and no Timer settings should be listed. The retro fire time should be computed and written on the reset tape for TAU12 to operate.
4. Check the listable ephemeris and local track listings as output in #8 and #10 as before.

2.4.4.6.3 Timing Requirements

Approximately 15 minutes excluding off-line printing.

2.4.4.7 Extended Re-entry - Test VAL11R07

2.4.4.7.1 Procedures

1. Mount the following tapes:

   unit 1 - 1100 series Flight Support Tape.
   unit 2 - reset tape VAL11D03.
   unit 3 - blank output tape.
   unit 6 - blank ephemeris tape (use a full tape).
   unit 9 - blank reset tape.
   unit 10 - blank reset tape.

2. Initialize reset tapes 9 and 10.
3. Input the run number VAL11R07.
4. Generate local track listings for station 1, 3, 4, 5, 6 and 27 and a local ephemeris for revs 17.0 - 25.0 through PREDICT.
5. Correct the reset tape - set the integration cutoff time to 45,000 seconds for the subroutine REPHWRT; burn time equals 0.
6. Input the nominal tau 12 for the primary re-entry rev.
7. Re-entry from tau 12; generate a binary ephemeris.
8. Generate local track listings for stations 1, 3, 4, 5, 6 and 27 and a listable ephemeris through REEPH.
9. Remove the reset tapes and label one of the latest VAL11R07.
10. List the output from this test off line.

Reset tape retained at the end of this test:

VAL11R07 - 1 copy - Contents:

Same as VAL11R03 except that the retro fire time is nominal and the integration cutoff time is 45,000 seconds.

2.4.4.7.2 Analysis of Results

1. Compare the local track listings as output by PREDICT with those output by REEPH, these should correspond.
2. Compare the ephemeris listings as output by PREDICT and by REEPH, these too should agree.

2.4.4.7.3 Timing Requirements

Approximately 45 minutes excluding off-line printing.

2.5 Tracking Station Phase

2.5.1 Purpose

To exercise those functions on the 1100 Series Flight Support Tape and the Station Master Tape involved in the transmission and reception of information between the STC and the tracking stations.

2.5.2 Method

2.5.2.1 Simulate the production of a pre-pass plan by the STC.

2.5.2.2 Simulate the reception and use of the pre-pass plan by a tracking station.

2.5.2.3 Simulate the production of post pass data by a tracking station.

2.5.2.4 Simulate the reception and use of post pass data by the STC.

2.5.3 Requirements

2.5.3.1 Input

Tapes - see Test VAL11S01.

Function cards - See Appendix E.

2.5.3.2 Equipment

1604 Computer

Card reader

Paper tape reader and punch

Tape units - nine

Off-line printer

2.5.3.3 Timing Requirements

Approximately 20 minutes, excluding tape setup and off-line printing.

2.5.4 Test

2.5.4.1 Test VAL11S01

2.5.4.1.1 Procedures

1. Mount the following tapes:

   unit 1 - 1100 series Flight Support Tape.
   unit 2 - Reset Tape VAL11P02.
   unit 3 - blank for output.
   unit 4 - blank for transfer.
   unit 6 - blank for work.
   unit 7 - blank for binary record of track
   unit 8 - blank for transfer
   unit 9 - blank for reset
   unit 10 - blank for reset

2. Initialize tapes 9 and 10.
3. Input the run number VAL11S01
4. Punch a paper tape pre-pass plan. Use a good pass from the final Acquisition Table in Test VAL11P02. Read the tape back in for verification.
5. Replace the tape on unit 1 with an 1100 Series Station Master.
6. Input the pre-pass plan to the pre-pass program.
7. Input the pre-pass transfer for track magnetic tape to the pass program. Use the simulate track, no-interrupt, and no PICE options. Put jump switch 1 up for the lock-on bit.
8. Input the track transfer magnetic tape from the pass program to the post pass program. Use the plane method and Schmitt method to reduce the data. Produce post pass data paper tape. Read the tape back in for verification.
9. Replace the tape on unit 1 with an 1100 series Flight Support Tape.
10. Update the orbit using the post pass data paper tape.
11. List the tape from unit 3 off-line.

2.5.5 Analysis of Output

1. The rise vector produced by PROPHECY should compare favorably with the information given by a See message for the same station card rev.
2. If the reconstruction of the pre-pass message was completed, the resulting vector, after unit conversion, should be identical to that produced by PROPHECY.
3. There must be a complete pass ephemeris produced by the pass program, that is a point every second from rise to set time. The rise time should agree closely with that input by the prepass message. The pass duration should agree closely with that given in the Acquisition Table for the particular station and rev. Lock-on should occur fairly soon after the bird appears and be lost within a couple of degrees of declination of the bird going out of sight. Assuming a good fix, input declination and azimuth will be approximately equal to output declination and azimuth.
4. The vectors produced in post pass by the plane method and the Schmitt method will be fairly close to each other unless one of the methods rejected an excessive number of points.
5. If the post pass vectors have been accepted for fitting to the current orbit, inspect the resulting tau vector. It will, of course, depend on how well the data fitted the current orbit as well as on the weight of both the orbit and the data.

2.5.5 Analysis of Output

1. The rise vector produced by PROPHECY should compare favorably with the information given by a See message for the same station card rev.
2. If the reconstruction of the pre-pass message was completed, the resulting vector, after unit conversion, should be identical to that produced by PROPHECY.
3. There must be a complete pass ephemeris produced by the pass program, that is a point every second from rise to set time. The rise time should agree closely with that input by the prepass message. The pass duration should agree closely with that given in the Acquisition Table for the particular station and rev. Lock-on should occur fairly soon after the bird appears and be lost within a couple of degrees of declination of the bird going out of sight. Assuming a good fix, input declination and azimuth will be approximately equal to output declination and azimuth.
4. The vectors produced in post pass by the plane method and the Schmitt method will be fairly close to each other unless one of the methods rejected an excessive number of points.
5. If the post pass vectors have been accepted for fitting to the current orbit, inspect the resulting tau vector. It will, of course, depend on how well the data fitted the current orbit as well as on the weight of both the orbit and the data.

3.0 Appendices - Function Cards

3.1 Appendix A - Ascent Phase

```
*REM     TEST  VAL11A01
* 3 IRT                    2 9 10
* 3 WNRT            1100   4 -3
* 3 RUNNUM          1100   VAL11A01
* 3 TIME            1100   1 1 2 1 0 0 0.0
* 3 TIME            1100   2 3
* 3 CCOORD          1100   4 0.2 , -1 6 0
* 3 NASCENT         1100   2 1 0 0 0.0 0 4 0 0 4 1 12 51 12 21 4
* 3 TIME            1100   1 2 2 1 0 2 35.16
* 3 TIME            1100   1 3 2 1 0 3 9.42
* 3 TIME            1100   1 4 2 1 0 7 12.48
* 3 CCOORD          1100   4 0.2
* 3 ASCENT    10    1100
* 3 NASCENT         1100   2 1 0 0 0.0 1 4 0 0 4 1 7 51 7 21 7
* EOT  3
```

3.2 Appendix B - Orbit Determination Phase

```
*REM      TEST  VAL11D01
* 3 IRT  2 9 10
*3 WNRT              1100  4 -3
* 3 RUNNUM           1100  VAL11D01
* 3 TIME             1100  1 1 2 1 0 0 0.0
* 3 TIME             1100  2 3
* 3 TABLE            1100  1 20 41 21 41
* 3 INJFUN           1100  0
* 3 ACQTABLE         1100  .5 0 0 0 0 2.0 0 0 0 0
* 3 ACQTABLE         1100  -3
* 3 PREDICT          1100  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 .5 20.0 0
* 3 EPHFUN           1100  0 5 60.0 .5 0 0 0 0 20.0 0 0 0 0
* 3 PREDICT          1100 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 .5 2.0 0
* 3 TABLE            1100  1 1 41 3 41 4 41 5 41 6 41 9 41
* 3 WNRT             1100  0 0
ACQ1      DEC        300
          END
* 3 ACQTABLE         1100  .5 0 0 0 0 20.0 0 0 0 0
* 3 ACQTABLE         1100  -3
*EOT  3
```

```
*REM     TEST  VAL11D02
* 3 IRT  9 10
* 3 RUNNUM          1100  VAL11D02
* 3 PREDICT         1100  0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 .5 20.0 0
* 3 COMPARE         1100  1 0 27
* 3 ONAGER          1100  2 0 0 0 0
* 3 ONAGER          1100  2 0 0 0 0
* 3 ONAGER          1100  2 0 0 0 0
* 3 ONAGER          1100  2 0 0 0 0
* 3 ONAGER          1100  2 0 0 0 0
* 3 ONAGER          1100  0 0 0 0 0
*EOT  3
```

```
*REM      TEST  VAL11D03
* 3 IRT  9 10
* 3 RUNNUM          1100  VAL11D03
* 3 LBWRED          1100  1
(*Z9 X5(((X(((*XP((**)(V$**X*)('*P  *)X*((((X*('((.(P.),X((P('((*)*)*)()*)*)(PG*
(*Z9-.,(*P*X*((**)'R*((*(((P*(=**(*M*)**(((P**(X*(('*(**((*SXXXXPS',(*((*G*(*$(*
(XR9 V5(((U(((((*(P)('*(((X'X(*X$(*X  *(O(X(PG(8))X(((*GG(((P(((6FN(P(*(((P,(X(*'7
(XR9(*(*((((N*P(*,O(*)=,(X(X(*()*,*,P)XX(*(X*G7)*(*(N(()(*U(XP***P7$X'(X*((SP*)*
(*R9 U5,**X)X()P*G(X*(*)*G*5(XZ)*U  *(((((((((P(((((*PG((X(()(X)**X)X**((*(()(P(*
(*R9(P*'P()*N)(XP)(((**R(((7**Z.(N*U(*(('(R)(P(*X*.(**('(((''XX*(P**)(PXG)*E.ZP*()
($89975ZP*7X(XX(*)((*)'(*,X*(Z'(*D  *X)'(7.(((',7(X*GP)(P((UU(((6*,)=*(G*****(,XX
($89((*'(X*(*((xP().**ZZ(XZZ*(((N*U0*()(7(=*)P***(**G,((PG'('((N)*(*(P**XZP*7'(
(G=9975XPV(X(W*(*)*P*)*(*XX(((***S  *(X(((('(X((((P(*(W$('M*(*((**('*X)X*)(X('*$
(G=9((X'(7'X*,*Z**(P*.',(7((N))$N.'(*X*((*G>***G*)'*NG,*((*X(('(N*('*(((*))P*((P
END
* EOT  3
```

```
*REM     TEST  VAL11D04
* 3 IRT  2 9 10
* 3 WNRT            1100  4 -3
* 3 WNRT            1100  0 0
ACQ1     DEC       300
         END
* 3 RUNNUM          1100  VAL11D04
* 3 TIME            1100  1 1 2 1 0 0 0.0
* 3 TABLE           1100  1 1 41 3 41 4 41 5 41 6 41 9 41
* 3 INJFUN          1100  0
* 3 ONAGER          1100  1 0 0 0 0
     FOLLOWED BY AS MANY CARDS AS REQUIRED, FINALLY
* 3 ONAGER          1100  0 0 0 0 0
* EOT  3
```

```
*REM     TEST  VAL11D05
* 3 IRT  9 10
* 3 RUNNUM          1100  VAL11D05
* 3 ACQTABLE        1100  20.0 0 0 0 0 40.0 0 0 0 0
* 3 ACQTABLE        1100  -3
* 3 PREDICT         1100  0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 20.0 40.0 0
* 3 ONAGER          1100  1 0 0 0 0
     FOLLOWED BY AS MANY CARDS AS REQUIRED.  FINALLY
* 3 ONAGER          1100 0 0 0 0 0
* EOT  3
```

```
*REM     TEST  VAL11D06
* 3 IRT  9 10
* 3 RUNNUM          1100  VAL11D06
* 3 TIME            1100  4 3 3
* 3 LBROAD          1100  1 0 2 2 11 37 34.7
* 3 TIME            1100  4 3 3
* 3 LBROAD          1100  0 0 2 2 11 37 34.7
* 3 TIME            0  4 3 3
* 3 LBROAD          1100  1 0 2 2 11 37 34.7
* 3 LBROAD          1100  1 0 2 2 11 37 34.7
* 3 LBROAD          1100  1 0 2 2 11 37 34.7
* 3 LBROAD          1100  1 0 2 2 11 37 34.7
* 3 LBROAD          1100  0 0 2 2 11 37 34.7
* 3 TIME            0  4 3 3
* 3 ACQTABLE        1100 40.0 0 0 0 0 60.0 0 0 0 0
* 3 ACQTABLE        1100  -3
* 3 PREDICT         1100  0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 40.0 60.0 0
* 3 ONAGER          1100  1 0 0 0 0
     FOLLOWED BY AS MANY CARDS AS REQUIRED, FINALLY
* 3 ONAGER          1100  0 0 0 0 0
* EOT  3
```

```
*REM     TEST  VAL11D07
* 3 IRT  9 10
* 3 RUNNUM          1100  VAL11D07
* 3 TIME            1100  4 3 3
* 3 INJFUN          1100  0 -2539.2 +18 +36.0 +125.9 -1182891.64 -.8 2 4 13 6 0.0 57
* 3 ACQTABLE        1100  60.0 0   0 0 80.0 0 0 0 0
* 3 ACQTABLE        1100  -3
* 3 PREDICT         1100 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 60.0 80.0 0
* 3 ONAGER          1100  1 0 0 0 0
     FOLLOWED BY AS MANY CARDS AS REQUIRED, FINALLY
* 3 ONAGER          1100  0 0 0 0 0
* EOT  3
```

3.3 Appendix C - Prediction and Commanding Phase

```
*REM     TEST  VAL11P01
*   IRT  2  9  10
* 3 WNRT            1100 4 -3
* 3 RUNNUM          1100  VAL11P01
* 3 TIME            1100 1 1 2 1 0 0 0.0
* 3 TIME            1100 2 3
* 3 TABLE           1100 1 72 12 73 12 75 12 76 12 77 12 78 12 79 12 80 12 81 12
* 3 INJFUN          1100 0
* 3 TIME            1100 3 3 1
SPC446   BCD        2XYZ     0 151840.
         END
* 3 TIME            1100 3 3 0
* 3 ACQTABLE        1100 1.0 0 0 0 0 21.0 0 0 0 0
* 3 ACQTABLE        1100 -3
* 3 TIME            1100 3 2 2 1 5286 0 0 0 -1 0 +0
* 3 BAK/NUNN        1100 1100 1 21
* 3 EOT  3
```

```
*REM     TEST  VAL11P02
*   IRT      9  10
* 3 RUNNUM          1100  VAL11P02
* 3 TIME            1100 3 4 1
SPC526   BCD        2bCN    0 174280.
         END
* 3 TABLE           1100 1 1 59 3 59 4 59 5 59 6 59 9 59 20 59 21 59
* 3 ACQTABLE        1100 .5 0 0 0 0 3.0 0 0 0 0
* 3 ACQTABLE        1100 -3
* 3 PREDICT         1100 3 30 30 0 0 30 0 1 0 0 0 0 0 0 0 0 0 1 .5 1.9 0
* 3 TIME            1100 3 2 2 1 11280 0 1 0 1 0 +5 0 1 1
* 3 PREDICT         1100 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2.0 3.0 0
* 3 TIME            1100 3 2 2 1 11280 0 2 0 1 0 +5 0 2 1
* 3 PREDICT         1100 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2.0 3.0 0
* 3 ACQTABLE        1100 15.0 0 0 0 0 19.0 0 0 0 0
* 3 ACQTABLE        1100 -3
* 3 TIME            1100 3 2 2 2 6000 0 3 0 1 0 +0 0
* 3 PREDICT         1100 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 17.0 18.0 0
* 3 TIME            1100 3 2 2 2 6048 0 3 0 1 0 -10 0
* 3 PREDICT         1100 3 30 30 0 0 30 0 3 0 0 0 0 0 0 0 0 0 1 17.0 18.0 0
* 3 EOT  3
```

```
*REM     TEST  VAL11P03
*   IRT      9  10
* 3 RUNNUM          1100  VAL11P03
* 3 LBWRED          1100 3
END
* 3 ACQTABLE        1100 46.0 0 0 0 0 49.0 0 0 0 0
* 3 ACQTABLE        1100 -3
* 3 TIME            1100 3 2 0 47 0 0 0 0 -1 0 +20
* 3 PREDICT         1100 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 47.0 48.0 0
* 3 TIME            1100 3 2 2 3 82563 0 0 0 -1 0 +0
* 3 PREDICT         1100 3 30 30 0 0 30 0 3 0 0 0 0 0 0 0 0 0 0 0 1 47.0 48.0 0
* 3 EOT  3
```

```
*REM     TEST  VAL11P04
*   IRT      9  10
* 3 RUNNUM          1100  VAL11P04
* 3 LBWRED          1100 3
(*R9 U5,**X)X()P*G(X*(*)*G*5(XZ)*U  *(((((((((P((((((*PG((X(()(X)**X)X**((*(()(P(*
(*R9(P*(P()*N)(XP)((**R(((7**Z,(N*U(*(((*(R)(P(*X*,(**(*(((*XX*(P**)(PXG)*C.ZP*()
END
* 3 ACQTABLE       1100 59.0 0 0 0 0 79.0 0 0 0 0
* 3 ACQTABLE       1100 -3
* 3 PREDICT        1100 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 59.0 62.0 0
* 3 TIME           1100 3 2 2 2          0 0 0 -1 0 +    0
* 3 BAK/NUNN       1100 1100 60 79
* 3 TIME           1100 3 2 2 22 6038 0 1 0 1 0 +0 0 60 2
* 3 EOT  3
```

```
*REM     TEST  VAL11P05
*   IRT      9  10
* 3 RUNNUM          1100  VAL11P05
* 3 LBWRED          1100  3
(*R9 U5,**X)X()P*G(X*(*)*G*5(XZ)*U  *(((((((((P((((((*PG((X(()(X)**X)X**((*(()(P(*
(*R9(P*!P()*N)(XP)(((**R(((7**Z,(N*U(*(((!(R)(P(*X*,(**(!(((!!XX*(P**)(PXG)*E.ZP*()
END
* 3 ACQTABLE       1100 80.0 0 0 0 0 100.0 0 0 0 0
* 3 ACQTABLE       1100 -3
* 3 PREDICT        1100 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 80.0 81.0 0
* 3 TIME           1100 3 2 2 6           0 0 0 -1 0 +
* 3 PREDICT        1100 3 30 30 0 0 30 0 3 0 0 0 0 0 0 0 0 0 1 80.0 85.0 0
* 3 TIME           1100 3 4 0
* 3 PREDICT        1100 3 30 30 0 0 30 0 3 0 0 0 0 0 0 0 0 0 1 80.0 100.0 0
* 3 EPHFUN         1100 4 5 60 88.0 0 0 0 0 94.0 0 0 0 0
* 3 EOT  3
```

```
*REM     TEST  VAL11P06
*   IRT       9  10
* 3 RUNNUM          1100  VAL11P06
* 3 WNRT            1100 0 3
TIM3001  DEC        0
         END
* 3 TIME            1100 3 2 0 17 0 0 0 2 1 0 +0 5700.0
* 3 PREDICT         1100 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 17.0 18.0 0
* 3 TIME            1100 3 1 2 2 5982 6041 0 0
* 3 PREDICT         1100 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 17.0 18.0 0
* 3 TIME            1100 3 1 2 2 5982 6041 5439.3 0
* 3 PREDICT         1100 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 17.0 18.0 0
* 3 TIME            1100 3 2 0 -1 0 0 0 0 -1 0 +0
* 3 PREDICT         1100 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 17.0 18.0 0
* 3 TIME            1100 3 2 0 17 0 0 0 0 1 0 -16.2 0
* 3 PREDICT         1100 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 17.0 18.0 0
* 3 EOT  3
```

3.4 Appendix D - Re-Entry Phase

```
*REM     TEST  VAL11R01
* 3 IRT  2 9 10
* 3 WNRT            1100  4 -3
* 3 RUNNUM          1100  VAL11R01
* 3 TIME            1100  1 1 2 1 0 0 0.0
* 3 TABLE           1100  1 1 41 3 41 4 41 5 41 6 41 9 41 27 41
* 3 INJFUN          1100  0
* 3 ACQTABLE        1100  1.0 0 0 0 0 30.0 0 0 0 0
* 3 TIME            1100  3 3 0
* 3 TIME            1100  3 2 0 17 0 0 1 2 1 0 +0 0
* EOT   3
```

```
*REM      TEST  VAL11R02
* 3 IRT   9 10
* 3 RUNNUM          1100  VAL11R02
* 3 REENTRY COMPT   1100  0 0 +17 0 0 0 0
* 3 TIME            1100  2 3
* 3 TIME            1100  3 1 2 2 5982 6041 0 0
* 3 REENTRY TAU12   1100  0 0 0 0 0 0 0 0 1
* 3 REEPH                 0 4 3 5 3 27 3
* 3 REENTRY DATA    1100  0 2 +2 0 0 0 0
* 3 REEPH                 0 4 1 5 1 27 1
* 3 REENTRY DTIMER  1100  1 2 17 0 0 0 0
* 3 TIME            1100  0 0 TM1 BCN TPI DMT PAN INT TM2 TRE
* 3 PREDICT         1100  3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 17.0 18.0 0
* 3 TIME            1100  3 1 2 2 5982 6041 5474.00 0
* 3 PREDICT         1100  3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 17.0 18.0 0
*  EOT  3
```

```
*REM    TEST  VAL11R03
* 3 IRT  9 10
* 3 RUNNUM          1100  VAL11R03
* 3 TIME            1100  1 12 2 2 1 41 51.0
* 3 REENTRY TAU12   1100  0 0 0 0 0 0 0 0 1
* 3 REEPH                 0 4 3 5 3 27 3
* 3 REENTRY DATA    1100  0 2 +2 0 0 0 0
* 3 REEPH                 0 4 1 5 1 27 1
* EOT  3
```

```
*REM     TEST  VAL11R04
* 3 IRT  9 10
* 3 RUNNUM          1100  VAL11R04
* 3 TIME            1100  1 12 2 2 1 42 43.13
* 3 REENTRY TAU12   1100  0 0 0 0 0 0 0 0 1
* 3 REEPH                 0 4 3 5 3 27 3
* 3 REENTRY DATA    1100  0 2 +2 0 0 0 0
* 3 REEPH                 0 4 1 5 1 27 1
* EOT  3
```

```
*REM     TEST  VAL11R05
* 3 IRT  9 10
* 3 RUNNUM          1100  VAL11R05
* 3 WNRT            1100  0 0
DAT23    DEC       20.0
DAT24    DEC       -110.0
         END
* 3 REENTRY TAU12  1100  0 0 0 0 0 0 0 0 1
* 3 REEPH                0 4 3 5 3 27 3
* 3 REENTRY DATA   1100  0 2 +2 0 0 0 0
* 3 REEPH                0 4 1 5 1 27 1
* 3 TIME           1100  0 0 TM1 BCN TPI DMT RMN INT TM2 TRE
* 3 PREDICT        1100  3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 17.0 18.0 0
* 3 WNRT           1100  0 0
DAT23    DEC       0.0
DAT24    DEC       -122.0
         END
* EOT  3
```

```
*REM     TEST  VAL11R06
* 3 IRT  9 10
* 3 RUNNUM          1100  VAL11R06
* 3 TIME            1100  3 2 0 -1 0 0 2 0 1 0 +0 0
* 3 PREDICT         1100  3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 17.0 30.0 0
* 3 REENTRY COMPT   1100  0 2 -17 0 0 0 0
* 3 REENTRY TAU12   1100  0 0 0 0 0 0 0 0 1
* 3 REEPH                 0 5 3 27 3 28 3
* 3 REENTRY DATA    1100  0 2 +2 0 0 0 0
* 3 REEPH                 0 5 1 27 1 28 1
* EOT  3
```

```
*REM     TEST  VAL11R07
* 3 IRT  9 10
* 3 RUNNUM          1100  VAL11R07
* 3 PREDICT         1100  0 30 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 17.0 25.0 0
* 3 WNRT            1100  0 0
DAT265   DEC        45000.0
DAT49    DEC            0.0
         END
* 3 TIME            1100  1 12 2 2 1 42 3.13
* 3 REENTRY TAU12   1100  0 0 0 0 0 0 0 0 1
* 3 REEPH                 0 1 1 3 1 4 1 5 1 6 1 27 1
* EOT  3
```

3.5 Appendix E - Tracking Station Phase

```
*REM     TEST  VAL11S01
*   IRT       9  10
* 3 RUNNUM          1100 VAL11S01
* 3 PROPHECY        1100 0 2 3 16 22
* 3 PREPASS         VAFB 1100 PT
* 3 SVPAS           SIM NINT NPICE
* 3 POSTPASS        TDSCH TDPLA
* 3 HISTORY         1100 1 1 1 0 2 2                    1.0 1.0
* 3 EOT  3
```

UNCLASSIFIED

System Development Corporation,
Santa Monica, California
COMPUTER PROGRAM ACCEPTANCE
SPECIFICATIONS FOR THE 1164
FLIGHT SUPPORT TAPE MILESTONE 6
Scientific rept., TM(L)-1080/000/00,
by T. D. Court, G. B. Dant. 8 March 1963,
83p.
(Contract AF 19(628)-1648, Space Systems
Division Program, for Space Systems
Division, AFSC)

Unclassified report

DESCRIPTORS: Programming (Computers).
Satellite Networks. UNCLASSIFIED

Supersedes TM(L)-1023/000/00. Outlines UNCLASSIFIED
a series of validation and acceptance
tests designed to show the capability
of the 1164 Flight Support Tape in
performing functions required to support
a satellite under a set of given
conditions. UNCLASSIFIED