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Gravity Probe B Relativity Mission

Processing Data from High-resolution to an Averaged Data Set

GP-B Procedure P0905 Rev -

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Data Processing

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1. Revision History

Rev Level	Comments/notes	Date	Revised By
-	First release of this operational procedure	22-Mar-02	J Mullins

2. Scope

- 2.1. This operational procedure details the steps required to process high-resolution telemetry data from the Level 1 analog data table into the Level 1 average data table in Sybase using a subset of "TDP" (Telemetry Data Processing) software, particularly the program called average_analog.pro. The above data tables are detailed in S0331 and S0401, the Data Management Plan and Stanford Post-Processing Operations for Science Mission Data, respectively.

3. Operational Personnel Responsibilities and Qualifications

- 3.1. Operators must be competent working in a Unix environment and must understand such concepts as environment variables and working directories. Operators should be familiar with the Data Management Plan, S0331. If they are not familiar with this plan, they should read it before performing this operation. Operators should also have read and understood S0401.
- 3.2. Operator familiarity with basic commands in UNIX, Sybase and IDL is required.
- 3.3. If there are anomalies while performing this operation, these anomalies must be logged by the operator in the MOC anomaly reporting system.

4. Requirements

4.1. Hardware and Software Requirements

Operations are performed on the Sun server machine known as "science " or a science client using data in the Sybase GPB_L1A database TManalog table. Sybase server must be running and IDL software must be currently licensed. Using the science server is recommended for processing speed.

4.2. Configuration Requirements

The operator must be on the science server in /apps/supported/lasp/src/tdp directory. **Data awaiting averaging is assumed to be of known duration. A start and end date and time (and any required associated cycle number) for averaging must be known before executing this procedure.** If the user does not know the averaging time interval or the cycle number, the work cannot be properly accomplished. If the user does not know the time interval to be averaged or the cycle number during that interval, s/he should stop now and obtain this information.

4.3. Verification and Success Criteria

Success criteria for averaging is defined to be a complete and correct processing of TMIDs in the TMavgid table for the day and year requested. Proper interpretation of the status report issued at the end of the averaging process will supply all data necessary to the user for meeting the success criteria. The report informs the user of such things as the TMID of the monitors processed. An example report is shown and explained in detail in section 10. Simply as an intuitive check, the user should compare the report against his or her expectations of the data being averaged and look for any discrepancies, though this is not strictly necessary.

5. Reference Documents

- 5.1. Data Management Plan, S0331
- 5.2. Post-Processing Operations for Science Mission Data, S0401
- 5.3. TCAD/TDP Version Description Document, S0503

6. Test Facilities

- 6.1. Mission Operations Center at Gravity Probe B, Stanford University.

7. QA Provisions

- 7.1. QA notification of use of this procedure is not required. Its purpose is to explain how to average satellite telemetry using average routines in TDP. The validation of TDP software is reviewed separately by QA.

8. Test Personnel

This operational procedure is for use by the following personnel:

Jennifer Mullins
Samantha Patterson
Randy Davis
Paul McGown

9. General Instructions

- 9.1. Test operators shall **read this procedure in its entirety** and resolve any apparent ambiguities prior to beginning any tests that reference this procedure.
- 9.2. Any nonconformance or operational anomaly should be reported by a Discrepancy Report. Refer to the Quality Plan, P0108, for guidance. Do not alter or break operational configuration if a failure occurs; notify the database administrator and/or quality assurance.

10. Software Operational Procedure

This section describes how to: log on to the workstation; verify Sybase server's presence; average data from full resolution to 5 minute resolution in the Level 1 database; interpret the status report; and end the session.

- 10.1. Doing data processing in the right place. Data processing should be done on science server (as opposed to a client or on the MOC server).
- 10.2. Logging on to the science server as user local. If you are already logged on or have ssh'd over from the moc-server network, then skip to step 10.2

Enter science server console login: local

Enter password: [user local's password entered here]

- 10.3. Looking for Sybase.

Open a terminal (window) and look for your science server prompt: {local@science}

Type "showserver" at the prompt. Expect to see four (4) instances of Sybase server, one of which is a backup server.

```
{local@science:4} showserver
UID  PID  PPID  C   STIME TTY      TIME CMD
root  4696  4695  0   Apr 10 ?        1:07 /apps/licensed/sybase11.9.2/bin/dataserver -
sscience_server -d/dev/rdisk/clt2d0s3 -e
root  4693  4692  0   Apr 10 pts/7   0:00 /apps/licensed/sybase11.9.2/bin/backupserver -
Sscience_server_back -e/apps/licensed
```

```
root 4805 4696 0 Apr 10 ? 0:01 /apps/licensed/sybase11.9.2/bin/dataserver -
ONLINE:1,0,0x101a92e,0xdfc00000,0x1
root 4806 4696 0 Apr 10 ? 0:01 /apps/licensed/sybase11.9.2/bin/dataserver -
ONLINE:2,0,0x101a92e,0xdfc00000,0x1
```

If only one line of all-caps data is returned:

```
UID PID PPID C STIME TTY TIME CMD
```

that means that the Sybase server is not running and needs to be restarted. Present working directory is irrelevant to the expected output from Sybase and all users can issue the showserver command. The only reason the user might see the above line when in actuality Sybase is running is the user is logged into a client machine and not into the science server proper. Make sure you're actually on the machine "science" and not one of its clients before becoming concerned. Call the database administrator or the systems administrator for assistance if Sybase is down. If the Sybase server is running, proceed to the next step.

10.4. Start the average_analog routine and average a day of data.

Set your environment variables as follows:

```
{local@sci4:30} cd /apps/supported/lasp-1.6/src/tdp
{local@sci4:28} setenv GPBDB /apps/supported/lasp-1.6/src
{local@sci4:29} setenv IDL_STARTUP idl_startup.pro
{local@sci4:31} idl -32
```

10.5. You should see the following information on the monitor:

```
IDL Version 5.4 (sunos sparc). (c) 2000, Research Systems, Inc.
Installation number: 103338-1.
Licensed for use by: Stanford University
```

```
% Compiled module: NEW_DT.
% Compiled module: DT_ADD_SECS.
% Compiled module: DT_DIF.
% Compiled module: CLOCK_TO_DT.
% Compiled module: DT_TO_STRING.
% Compiled module: STRING_TO_DT.
% Compiled module: CURRENT_DT.
% Compiled module: NEW_SCT.
% Compiled module: SCT_ADD_TICKS.
% Compiled module: SCT_DIF.
% Compiled module: DT_TO_SCT.
% Compiled module: SCT_TO_DT.
% Compiled module: DB_CONNECT.
% Compiled module: DB_DISCONNECT.
% Compiled module: DB_SELECT_PACKETS.
% Compiled module: DB_GET_PACKETS.
% Compiled module: DB_SELECT_EVENTS.
% Compiled module: DB_GET_EVENTS.
% Compiled module: DB_SELECT_SCTIME.
% Compiled module: DB_GET_SCTIME.
% Compiled module: DB_SELECT_TMDISCRETE.
% Compiled module: DB_GET_TMDISCRETE.
% Compiled module: DB_SELECT_TMANALOG.
% Compiled module: DB_GET_TMANALOG.
% Compiled module: DB_SELECT_TMAVERAGE.
% Compiled module: DB_GET_TMAVERAGE.
% Compiled module: DB_GET_TMINFO.
% Compiled module: DB_GET_SUBSYSTEMS.
```

```
% Compiled module: DB_GET_NAMES.  
% Compiled module: DB_GET_MNEMONIC.  
% Compiled module: DB_GET_TMDECOM.  
% Compiled module: DB_GET_TMAVGID.  
% Compiled module: DB_GET_CALIBRATION.  
% Compiled module: DB_GET_STATES.  
% Compiled module: DB_GET_LIMITS.  
IDL>
```

Once you get to the waiting IDL prompt, type in:

```
>.run average_analog
```

This will compile the routines needed to average data.

You should receive the following confirmations of compilations with possible additions:

```
% Compiled module: AVERAGE_ANALOG.  
% Compiled module: AVERAGE_ONE_ANALOG.
```

10.5.1. At the next prompt type in the routine name to process the data to be averaged and the year and day of the data to be averaged. This will average the data for exactly 24 hours from midnight on the day specified up to midnight of the next day. At the time of this writing, **averaging should not be run in parallel**. If running averaging more than once at the same time is attempted, at least one of the processes will be annihilated.

```
IDL> average_analog, 2001, 317, /debug
```

10.5.2. Afterwards, you should see the following data returned:

```
DE_GMA_SW__SV10      568  
% Compiled module: UNIQ.  
  0          30  
  1          30  
  2          30  
  3          30  
  4          30  
  5          30  
  6          30  
  7          30  
  8          30  
  9          30  
 10          30  
 11          30  
 12          30  
 13          30  
 14          30  
 15          30  
 16          30  
 17          30  
 18          12  
 38          17  
 39          30  
 40          30  
 41          30  
 42          30  
 43          30  
 44          15
```

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67	7
68	30
69	28
70	30
71	30
72	30
73	30
74	30
75	30
76	30
77	30
78	30
79	30
80	30
81	30
82	30
83	30
84	30
85	30
86	30
87	30
88	30
89	30
90	30
91	30
92	30
93	30
94	30

Averaging completed 1 processed

Starting copy...

288 rows copied.

Clock Time (ms.): total = 1 Avg = 0 (288000.00 rows per sec.)

IDL>

Proper interpretation of this report is important.

The first portion (very short in this example) DE_GMA_SW__SV10 568 shows which mnemonic(s) and associated TMID(s) were averaged. Here the mnemonic DE_GMA_SW__SV10, TMID 568, was averaged.

The second portion shows data averaging statistics for the mnemonic. Think of these as five-minute "bins". The first number (left side) shows the bin number, and the second number shows number of data points averaged together. In this case, the zeroth bin (first five-minute averaging interval) contained 30 data points. Notice that the 38th bin only contained 17 data points, so data was not available from the spacecraft telemetry consistently over the time interval.

0	30
1	30
2	30
3	30
...	
38	17
39	30
40	30
41	30
42	30

The final part of the summary:

```
Averaging completed          1 processed  
  
Starting copy...  
  
288 rows copied.  
Clock Time (ms.): total = 1  Avg = 0 (288000.00 rows per sec.)
```

describes the number of mnemonics processed and how many rows of data were copied into the TMaverage table in Sybase. Note that even though the averaging processes the data into the TMaverage table, it does **not** remove it from the TManalog table.

After the summary, you will be returned to the prompt.

```
IDL>
```

10.6. Exit IDL at the prompt:

```
IDL> exit
```

10.7. Report a successful averaging or debug an unsuccessful import of data. Call for help if necessary or file a DR if required.

10.8. View Level 1 averaged telemetry using TCAD if desired. See P0827 for details.

10.9. Log out of the science server if no further work is to be done.