

XRT Data Verification Guide V3

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2008 March 4

Contents

1 Introduction

The purpose of this document is to explain and support the job of XRT Data Verification.

2 Job of XRT-DV

2.1 Duty cycle

The job of XRT-DV is usually assigned to one person for the duration of a week. The one-week assignment begins on Saturday. You are responsible for the data from Friday at 12UT to the next Friday at 12UT. However, no tasks are required until Monday, except monitoring the Housekeeping and Health & Safety information. The duty cycle ends at the end of Friday's tasks. As with being the XRT-CO or TRACE-Planner, you may expect this job to take most of your time during your week of duty. Everyone who is trained for this job is expected to participate on a regular basis.

The tasks can be separated into broad categories: monitoring latest data, organizing support for the XRT-CO, validating recent data against the observing plans and annotating that data, and reporting and archiving. These tasks are described in more detail in later sections.

Over the weekend, the Housekeeping temperatures and Health & Safety information need to be monitored several times per day. The weekend data will also have to be validated, eventually, but it is acceptable to catch up on this task during the regular work-week.

Data verification tasks should not be passed off to the following person just because some of those tasks are not urgent. You are responsible for your week's data, even if you have to complete your tasks after Friday. It is not fair to put off your work onto someone else, in the absence of other arrangements.

If you are one of the people who do this job, then you are expected to be proactive about finding times you can volunteer for that are consistent with your personal schedule.

The duty roster for the XRT-DV job can currently be found at:

<http://xrt.cfa.harvard.edu/missionops/roster/> .

(The `xrtco` username and password will be required for access.)

2.2 Description of tasks

This section merely details the tasks that comprise the XRT-DV job. Schedule and frequency of tasks is discussed in a separate section. There is a script to help with some of these tasks in `/data/solarb/XRT/dv/scripts`. The script is described in the relevant sections below.

1. *Check Housekeeping and Health & Safety (H&S) information.* (This is a high-priority task which needs to be performed more often than once per day.) The H&S system automatically checks vital instrument parameters and will send notification to all XRT-CO personnel in the event that a safety threshold is passed. The XRT-CO and XRT-DV share responsibility for always being in contact during their tour of duty, which runs 7 days per week, and for organizing any immediate response.

The Housekeeping webpage has lots of information. The temperatures, currents, and voltages should be monitored several times per day. Other values should be checked occasionally, to watch for strange developments. The HK webpage is currently here:

<http://xrt.cfa.harvard.edu/missionops/hks.php>.

Nominal values for the currents and voltages are found in Section ??.

These values should be checked again just before sending the daily report. The results and timestamp of this check should be noted in the report.

In case the HK data needs to be recovered as it is not updating on the SAO site, please see the website:

http://xrt.cfa.harvard.edu/missionops/howtos/howto.restart_hk.php .

Follow the instructions found here to restart the HK data. You will need to send

an email to xrt_co@solar.isas.jaxa.jp and xrt_manager@head.cfa.harvard.edu informing them of the restart.

2. *Check recent data.* (This is a high-priority task which needs to be performed more often than once per day.) This amounts to running **browser** for the very most recent few hours of data which have appeared in the archive. You only need to view a few hours, but you should view *all* of it. In other words, view every frame, of every FOV, and do not bin or over-process the image. (Viewing as a slow movie is alright.) The danger is that binning or processing may hide something.

The purpose of this check is to discover current dangerous situations in the state of the XRT or the CCD. At this point, you need not evaluate the scientific value of the data— you’re just looking for technical problems that require an immediate response. Unlike with the HK or H&S information, the XRT-CO probably will not be checking all of the recent data, so the XRT-DV job is really the only definite line of defense here. Therefore, this task should be performed at least 2x per day... first thing in the morning, and again just before sending the daily report. The results and timestamps of the most recently reviewed data should be noted in the daily report.

The XRT data archive at SAO can be found here:

`/archive/hinode/xrt/QuickLook/YYYY/MM/DD/` .

The default path in **browser** may need to be edited to reflect this.

3. *Organize operational support for XRT-CO requests.* (This is an occasional high-priority task which needs to be performed on a timescale appropriate to the request, usually same-day.) If the XRT-CO requests support from US-side personnel, the XRT-DV is responsible for catching the request and arranging for someone to do the work. Note that the XRT-DV job has many tasks, although few of those tasks need to be performed within 24 hours. It is expected that the XRT-DV may draw upon other XRT personnel to assist with XRT-CO support duties. Although the XRT-DV may not be the one to do the work, they are the one responsible for seeing that it gets done and that it is provided to the XRT-CO in a timely manner. This may require the XRT-DV person to follow up on the support provided by other people. All such provided support should be noted in the daily report. These requests should also be annotated in the DV Issues Database, at <https://www.quickbase.com/db/bcc8b72eq>, along with a description and the person who is assigned to resolve the issue. When the issue is resolved, the DV should enter the information about the

resolution in the “Comments” section of the database.

4. *Compare, validate, and annotate the most recently **completed** day of observations with its respective timeline plan.* (This is a medium-priority task. It may wait for a few days, but should be finished before the end of your week.) This task is one of the core purposes of the XRT-DV job, and is comprised of several elements which are usefully performed at roughly the same time.

The idea is to evaluate the data for a timeline plan which has completely finished running. (Dividing this job by timeline boundaries is the simplest way to handle this task.) Since new timelines will typically start running in the early morning of the Eastern time zone, the most recently completed timeline will typically have “yesterday’s” date. (For example, it is 9:00 am EST on Wed, Jan-10. The 20070110 timeline probably just started a few hours ago, and the 20070109 timeline is the most recently completed timeline.)

There is a script available to move all appropriate timeline files to the website in order to make viewing and validating easier. In order to run this script, log on as user solarb, and run the following commands:

```
prompt% cd /data/solarb/XRT/dv/scripts/  
prompt% dv_post_script.sh yyyy/mm/dd
```

replacing the yyyy/mm/dd with the date of the timeline to be verified.

This script will place on the web timeline archive
<http://xrt.cfa.harvard.edu/missionops/timelines/>.

The html file of the timeline will be copied there as well as a pdf version of the XOBs used in the daily timeline.

The script does the following things:

- (a) Creates the daily directory: `yyyymmdd_Plan/`.
- (b) Copies the following files from the timeline archive to `yyyymmdd_Plan/`
 - Data rate file: `dr_XRT_yyyymmddpppp.txt`
 - Data rate plot: `dr_plot_yyyymmdd.png`.
 - Data rate sim file: `dr_XRT_yyyymmddpppp.sim`.
 - Pointing file: `re-point_yyyymmddpppp.txt`.
 - ORL file: `XRT_yyyymmddpppp.orl`.
 - Timeline HTML file: `yyyymmdd_exported.htm`.
 - XOB explanation file: `xrt_plan_yyyymmdd.pdf`.

- (c) Edits the `yyyymmdd_exported.htm` file so that it contains the names and version numbers of the XOBs (this corrects a bug in the COT, and will be removed when that bug is fixed)
- (d) Edits the `index.php` file to add a link to the new timeline page.

Here are the tasks for which this information will be useful:

- (a) Verify that the actual sequences of data match observation plan sequences (aka “XOBs”). This is easy in **browser**. View the image list for the time period of each XOB in the timeline. The browser list will show the FOV, filter, and exposure duration, which should be sufficient to make sure the images are there. You should check the entire run of the XOB, not just one cycle, because you may find weird stuff that doesn’t happen right away. In addition, the `dr_XRT_yyyymmddpppp.sim` file is used to make the XOB pdf file. In the current version of COT, there might be times when an XOB is edited after this but before upload. Please speak to the CO to see if this is the case for any discrepancy you find in the XOBs.

- (b) Check the data again for technical problems, as was done for Task #2. Again, you should actually view every image for the timeline. Do not bin, as this could hide something. It is OK to view as a movie, but be ready to slow down or stop to investigate. Any strange things should be investigated further and/or forwarded to someone appropriate. Also, all such items need to be mentioned in the daily report

- (c) Note any missing blocks of images, and images with missing data. IDL programs are available to check for these things. Documentation is in the headers of these files. The syntax is:

```
IDL>dir='/archive/hinode/xrt/QLraw';change it to your XRT QL path
IDL>xrt_dv_find_missing_pixels,'03-OCT-2008 10:00','04-OCT-2008
10:00',xrtfiledir=dir
IDL>xrt_dv_find_missing_imgs,'03-OCT-2008 10:00','04-OCT-2008
10:00',xrtfiledir=dir
```

- (d) Validate the XOBs. Review whether they worked as intended. Annotate as appropriate. Things to check here are... Did the XOB do what was intended? Was the estimated data rate correct?
- (e) Review data for interesting scientific discoveries and events. Note events for the XRT Picture of the Week (XPOW).

- (f) Annotate data using software tools provided by LMSAL. (Not implemented as of 2008.Nov.6)

A note of warning: timelines are typically constructed to run for at least 48 hours, but the next timeline will typically overwrite it at approximately the 24-hour mark (as determined by the OP PERIOD), and there may be Real-Time pass commands which further perturb the earlier timeline. The details of the hand-off can cause the data list to look strange around that time, so be prepared to compare the image list to both timelines around the overlap.

URL = <http://xrt.cfa.harvard.edu/missionops/timelines/>

Directory =

[/data/solarb/XRT/web/htdocs/missionops/timelines/](#)

(Use the `solarb` username to edit the directories and files.)

Some of the files that are collected come from the SAO timeline archive:

Directory = [/archive/hinode/xrt/timelines/YYYY/MM/DD/](#) .

You should NOT use the post processing script for timelines which have not yet been uploaded. Timelines can change up to the time they are uploaded. Since there may be timelines “in preparation” in the archive, be careful about which ones you are working with. Since new timelines will typically start running in the early morning of the Eastern time zone, the most recently uploaded timeline will typically have “today’s” date. (For example, it is 9:00 am EST on Wed, Jan-10. The 20070110 timeline probably just started a few hours ago, and so it is the most recently uploaded timeline. There may be a 20070111 timeline which the XRT-CO has been preparing for tomorrow’s upload, but that one might still change between now and upload.)

5. *Prepare and send the daily XRT-DV report.* The daily report is an email sent to `xrt_co@solar.isas.jaxa.jp` after the day’s tasks have been finished. It should list all the tasks which were completed, including day- and time-stamps. It should also note any strange items which were discovered during any of the checks. It is a good idea to check the Housekeeping, Health & Safety, and most recent data (Tasks #1 and #2) one last time just before sending the report. look at recent reports for examples of the format of this email.

The email Subject line should be of the form: `xrt_co: XRT DV report: yyyy/mm/dd`, where the date is today’s date. Typically, you will be reporting on more than one timeline in your daily report, so it would be confusing to name the report according to a particular timeline. Just give the date of the day you did this work.

2.3 Schedule of tasks

Previous week. The new XRT-DV should start paying attention to current operations, and should attend all operations meetings and telecons.

Saturday to Friday. Monitor Housekeeping and Health & Safety (Tasks #1 and # 2). Organize support for XRT-CO requests (Task # 3).

Monday to Friday. All Tasks. The timelines from the preceding weekend should also be verified and archived.

Wednesday Attend XRT telecon and deliver DV report, summarizing DV results thus far, particularly highlighting any anomalies, outstanding questions, unusual events.

The following points also apply:

- The XRT-DV responsibility runs Saturday to Friday.
- The daily archive webpages must be prepared for the Saturday/weekend timeline *beginning* the duty week, through to the Friday timeline.
- The completed timelines should be verified for the Friday timeline *before* the duty week, through to the Thursday timeline.
- Daily reports should be filed Monday through Friday.
- For the weekend monitoring of HK and H&S, it is assumed that no news is good news.

Here is an example of the task order for the middle of the week. Assume it is Wednesday.

1. Check Housekeeping and Health & Safety (H&S) information. (Task # 1)
2. Check email for any requests from the XRT-CO. If these require other people to help, then get started right away. (Task # 3)
3. Use the script to collect all relevant files onto the website. (Task # 5)
4. Check recent data (from the Tuesday and Wednesday timelines, in this example). (Task # 2)

5. Finish or continue organizing responses to any XRT-CO requests. (Task # 3)
6. Validate the most recently completed timeline (from the Tuesday timeline, in this example). (Task # 4)
7. Check recent data (from the Tuesday and Wednesday timelines, in this example). (Task # 2)
8. Check Housekeeping and Health & Safety (H&S) information. (Task # 1)
9. Prepare and send the Daily Email Report. (Task # 6)
10. In the evening, check Housekeeping and Health & Safety (H&S) information. (Task # 1)

End example.

3 Voltages and Temperatures for Housekeeping Data

3.1 Voltage levels for Housekeeping Data

This section should serve as a reference for housekeeping values.

1. P_GND - System ground. Should be 0.
2. P_M15BV- Main line that handles bus current. The nominal range is (-14.7) - (-15.1).
3. P_P15BV - Main line that handles bus current. The nominal range is 14.7-15.1.
4. P_P280H - Operational heater. ***NOTE: Due to filter wheel issue we have been running with the operational heaters on and will continue to do so.***This graph is normally populated with nonsensical negative values when the operational heater is not in use. The thing to note is that: (1) If the operational heater is in use, these values should be positive; (2) If the operational heater is not in use and the values are positive, this means a circuit has been shorted and there is a problem. The nominal range, for when the operational heater is off, is any range of negative values.

5. P_P28IC - This is the main power line to all mechanisms and the MCU. The small spikes are caused by the filter wheel movements shutter movements. The large spikes correspond to MDP_XRT_CTRL_MANU commands. The nominal range is 142-162.
6. P_P28IV - This is the main power line to all mechanisms and the MCU. The nominal range 27-30 volts.
7. P_P5AV - Power supply to XRT-D. The nominal range is 5.20 - 5.215 volts.
8. P5BV - This value changes as discrete commands are issued (such as XOBs, synoptics, repoints and stops). The median value of this graph should not change by more than 0.2 volts.

3.2 Temperatures for Housekeeping Data

This is the reference for housekeeping data.

Note: Due to the filter wheel issue we run the +Z end of the telescope hotter than nominal. For TMP00,01,02,11,12,17 use the "Yellow" limits.

Note 4: Low 'e' Door but nominal 'e' sunshield (Possible 'drapped' case)

TMP No.as per SLRB-1299	Location Description	Flight Telemetry		Case 1 (note 1)	Case 2 (note 2)	Case 3 (note 3)	Case 4 (note 4)	Temperature Limits		
		Previous Contact	Current Contact					Normal Operating	YELLOW Limits	RED Limits
		Date/Time	Record Date/Time					Min/Max Deg C	Min/Max Deg C	Min/Max Deg C
TMP#		Date:	Date:	Expected Temperature (Deg C)	Expected Temperature (Deg C)	Expected Temperature (Deg C)	Expected Temperature (Deg C)			
		Time:	Time:							
TMP00	Telescope Tube +X/-Y, +Z end			30-36	50-69			-28.0 / +35.0	-35.0 / +55.0	-50.0 / +60.0
TMP01	Telescope Tube +Y, +Z end			30-36	50-69			-28.0 / +35.0	-35.0 / +55.0	-50.0 / +60.0
TMP02	Telescope Tube -X/-Y, +Z end			30-36	50-69			-28.0 / +35.0	-35.0 / +55.0	-50.0 / +60.0
TMP03	Telescope Tube -X, -Z end							-28.0 / +35.0	-35.0 / +55.0	-50.0 / +60.0
TMP04	Telescope Tube +X, -Z end							-28.0 / +35.0	-35.0 / +55.0	-50.0 / +60.0
TMP05	E-Box PWB			26-35	26-35			-45.0 / +60.0	-55.0 / +65.0	-60.0 / +70.0
TMP06	Telescope Tube -Y, Mid +Z end							-28.0 / +35.0	-35.0 / +55.0	-50.0 / +60.0
TMP07	Telescope Tube +Y, Mid +Z end							-28.0 / +35.0	-35.0 / +55.0	-50.0 / +60.0
TMP08	Telescope Tube -Y, Mid -Z end							-28.0 / +35.0	-35.0 / +55.0	-50.0 / +60.0
TMP09	Telescope Tube +Y, Mid -Z end							-28.0 / +35.0	-35.0 / +55.0	-50.0 / +60.0
TMP10	Sun Shield			-5 to 10	135-195			-60.0 / +35.0	-65.0 / +55.0	-70.0 / +60.0
TMP11	Mirror Support -X			32-33	60-62			-28.0 / +35.0	-35.0 / +55.0	-50.0 / +60.0
TMP12	Mirror Support +X			32-33	60-62			-28.0 / +35.0	-35.0 / +55.0	-50.0 / +60.0
TMP13	VLI Housing							-40.0 / +50.0	-45.0 / +55.0	-60.0 / +60.0
TMP14	VLI Motor Casing							-40.0 / +50.0	-45.0 / +55.0	-60.0 / +60.0
TMP15	Mounting Foot -X							-35.0 / +35.0	-45.0 / +55.0	-55.0 / +60.0
TMP16	Mounting Foot +X							-35.0 / +35.0	-45.0 / +55.0	-55.0 / +60.0
TMP17	Mounting Foot +Z							-35.0 / +35.0	-45.0 / +55.0	-55.0 / +60.0
TMP18	E-Box XRT-D			24-26	24-26			-45.0 / +60.0	-55.0 / +65.0	-60.0 / +70.0
TMP19	Telescope Tube -X, -Z end							-28.0 / +35.0	-35.0 / +55.0	-50.0 / +60.0
TMP20	Telescope Tube +X, -Z end							-28.0 / +35.0	-35.0 / +55.0	-50.0 / +60.0
TMP21	Focus Motor							-30.0 / +35.0	-35.0 / +55.0	-50.0 / +60.0
TMP22	Shutter Motor							-30.0 / +35.0	-35.0 / +55.0	-50.0 / +60.0
TMP23	Wax Actuator			-3 to 0	76-81			-28.0 / +35.0	-110.0 / +55.0	-150.0 / +80.0