

**I** saac  
**N** ewton  
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**Release notes for SDSU software Version 2.1**

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Version 2.1 of the INGRID SDSU Timing board software is built upon Version 2.0 and incorporates minor changes to fix bugs, remove artefacts, and improve the software behavioural stability. It also serves to familiarise the author with the detector controller software. Please read SDSU INTERFACE CONTROL DOCUMENT VERSION 2.1 in conjunction with these notes.



	Ver	Bug Report	Current Status in V2.1
1	2.0	MRA Command accepts ZERO as valid input for number of readouts. Should either reject this with error or behave normally returning an image of size zero bytes. Currently it streams data in image mode.	MRA Command now accepts zero as valid number of reads and returns image of zero pixels. This can be used gainfully to test scripts without actually acquiring data.
2	ICD	ICD provides no way of setting required detector servo temperature.	See SDT command in ICD v2.1
3	ICD	How are version numbers encoded in 24 bit memory locations ?	As compact 3 character ASCII format. Version number '000' is reserved to indicate that no application program is present.
4	2.0	Software returns strange version numbers.	Version 2.1 of software now consistently returns string '2.1' as version for boot and application code at locations \$P:6 & \$P:7 respectively for utility and timing code.
5.	ICD	How is the temperature encoded in the 24 bit memory locations ?	Now returns temperature in units kelvin. See TEM command in ICD 2.1
6.	ICD	Specification for TEM command gives no way of checking whether command was accepted. Unlike with RDM and CHK commands which are resident in the boot code, this is an issue.	TEM command will either return an integer in the range of 0 – 333 Kelvin (hex 000000 – 00014D) or ascii code 'ERR'.
7	2.0	Attempt to read minimum exposure time from X:30 gives HED error.	ICD gave incorrect location to see minimum exposure time. See list of current locations below for correct location map.
8	ICD	ICD doesn't define mapping between physical location of pixels and order in which they are transmitted back to host.	No change – awaiting characterization efforts to arrive at optimum setting. The pixel order may change.
9	2.0	ABR command doesn't abort until middle of MNDR sequence. The preferred behaviour is that ABR will be processed at each end of array read.	ABR now asynchronously aborts a readout during the <b>integration stage</b> of any exposure sequence with correct reply sent (DON). This implies that the das system will be able to predict the exact amount of data that arrives (i.e. one complete MNDR sequence) to facilitate host FO switching (data / msg). The ABR command cannot abort readouts during an MNDR sequence due to limitations of the SDSU architecture.

Figure 1 Bug Fix status for Version 2.1.

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**Changes to Behavioural model.**

1. The Command sequence used to generate test data has been modified. The command DAT is now sent with one mode select variable between the ranges of 0 and 3 that corresponds to real image data, test generator 1 or test generator 2 respectively. In addition a 3<sup>rd</sup> mode (3) is incorporated that allows 'read up ramp' mode. This mode takes n integrations (where n is the variable n of the MRA command) of exp time p each. The variable p is the exposure time set by the 'SET' command. This sends one frame of data back after reset and then each p milliseconds for a total of n frames. The Default power on (and after CON command sent) is zero, real image data. Once the mode has been set it will remain in effect until cancelled by setting another mode value. The readout mode currently selected can be read back from the timing application at address \$X:3A
2. The MRA command now accepts as valid multiple readout values integers between 0 and 16,777,216 ( $2^{24}$ ).
3. A new command at the boot level is incorporated to allow simple testing of communication integrity to/from the sdsu controller. By issuing the command 'NOP' (no operation) the sdsu will respond with 'DON' (done). This command cannot unfortunately be used during a MNDR sequence as it compromises the timing integrity and competes for the fiber comms link (limitation of the SDSU controller), however, it will be queued and processed after an MNDR sequence finalizes.
4. Checksum values for code are now as follows:-

Timing Boot	B46057
Timing Application	61A2FA
Utility Boot	EE8C33
Utility Application	323D77

**Noted inconsistencies from version 2.0 for evaluation and ratification.**

1. Exposure timer is set running after completion of post reset MNDR sequence. This means that the effective integration time is the time for one MNDR sequence (Min exp time @ X:38) plus whatever integration value is set with the SET command. The minimum exposure time from the point of view of the host is therefore zero millisecs which will result in an integration equal to the minimum integration time of 0.847 secs. This inconsistency must be dealt with to provide accurate (0.1%) timing information to the user.
2. After boot or reset to the sdsu, all memory locations read back to the host will be at a value of 0xFFFFFFFF. This may confuse the host system if not aware that the application code is not available. This could happen by a spontaneous boot from the watchdog, etc.

Board	Address	Available	Type	Description
Timing	\$P:6	Boot	ASCII	Timing boot eeprom sw version
Timing	\$P:7	Appl	ASCII	Timing application code sw version
Timing	\$X:0	Appl	INT	Timing Application Mode Status Word <sup>(1)</sup>
Timing	\$X:1	Appl	INT	Target Integration time
Timing	\$X:2	Appl	INT	Elapsed Integration time
Timing	\$X:30	Appl	INT	Number of MNDR Reads in current exposure
Timing	\$X:31	Appl	INT	Delay between reset and first read.
Timing	\$X:35	Appl	INT	Number of reset pulses per pixel column
Timing	\$X:36	Appl	INT	Number of reset cycles per reset
Timing	\$X:37	Appl	INT	Time in ns for each pixel read
Timing	\$X:38	Appl	INT	Time in ms for full frame read (i.e min exp time)
Timing	\$X:39	Appl	INT	Number of preconditioning cycles per read
Timing	\$X:3A	Appl	INT	Current readout mode (0 = real, 1 & 2 test modes)
Utility	\$P:6	Boot	ASCII	Utility boot eeprom sw version
Utility	\$P:7	Appl	ASCII	Utility application code sw version

**Figure 2 List of active addresses within the SDSU enviroment.**

Notes:

1. Status word defined as:

Bit #	Significance
0	Application executive loop active
1	Continuous reset to detector active
2	Continuous video streaming mode active
3	Clock test mode active
4	Readout / integration in progress