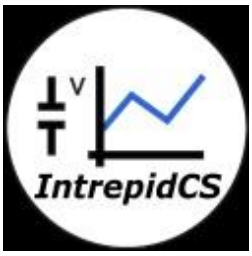

Intrepid Control Systems, Inc.

How data is stored on an SD Card for CoreMini Capable Hardware.

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1. **Introduction:**

   This document is written to describe how data is stored on the SD card for CoreMini enabled hardware such as the neoVI-ION, neoVI-Plasma, neoVI-Fire, and neoVI-Red. In contrast to traditional storage of data on a traditional computer system such as a Windows PC, or Android Phone, data logger hardware from Intrepid is based off a proprietary files system that exists inside of standard Windows FAT32 files with the extension VSA. The proprietary system was created to minimize the risk of data loss as a result of file system corruption from a sudden and unexpected data loss and to provide for a mechanism of pre-trigger storage as the CoreMini does not use a RAM buffer for this purpose.

2. **Structure of the SD Card:**

   SD cards used in the data logger hardware are formatted using a standard Windows FAT32 system. This is done so that a standard Windows PC can recognize and read data off of the SD card. There are 3 types of files that are put on the SD card:

   1. Extract.exe is a program to extract network data, excluding video, to a PC if that PC does not have Vehicle Spy installed.
   2. Readme.txt contains the latest information and notes about the SD card files.
   3. All files that start with "log_da" and end with "vsa" are container or shell files that hold data from the data logger. Since FAT32 is used the maximum file size is 2^{32} = approx. 4,193,280KB in size. If an SD Card larger than 4G is used, then more than one "vsa" file is used to fill the card.

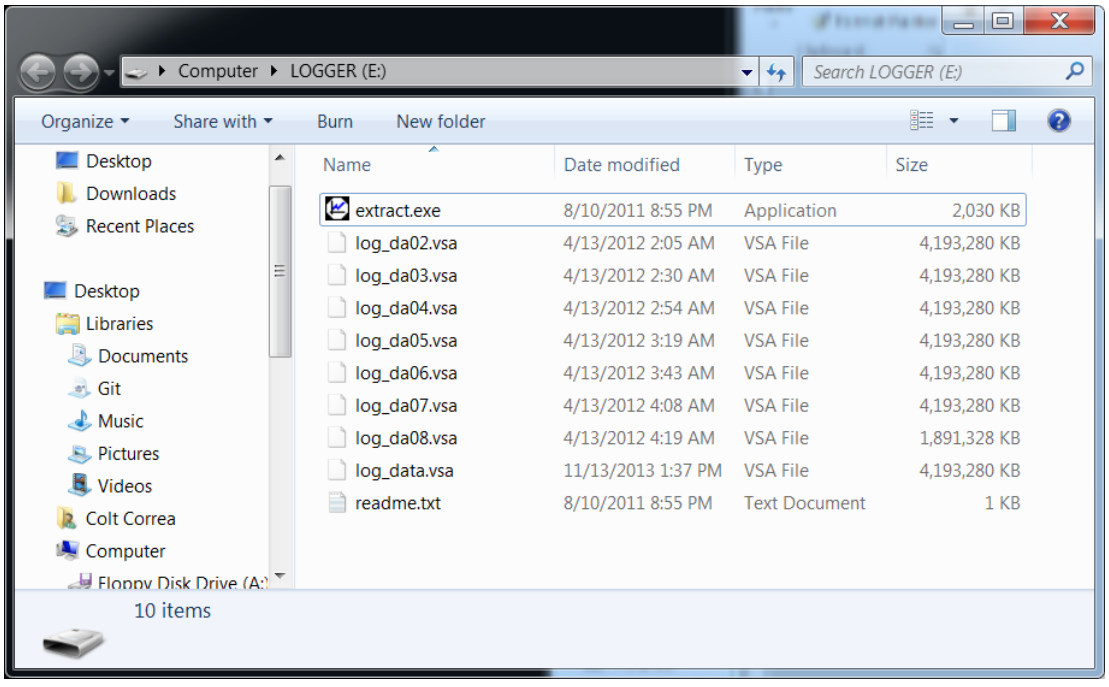
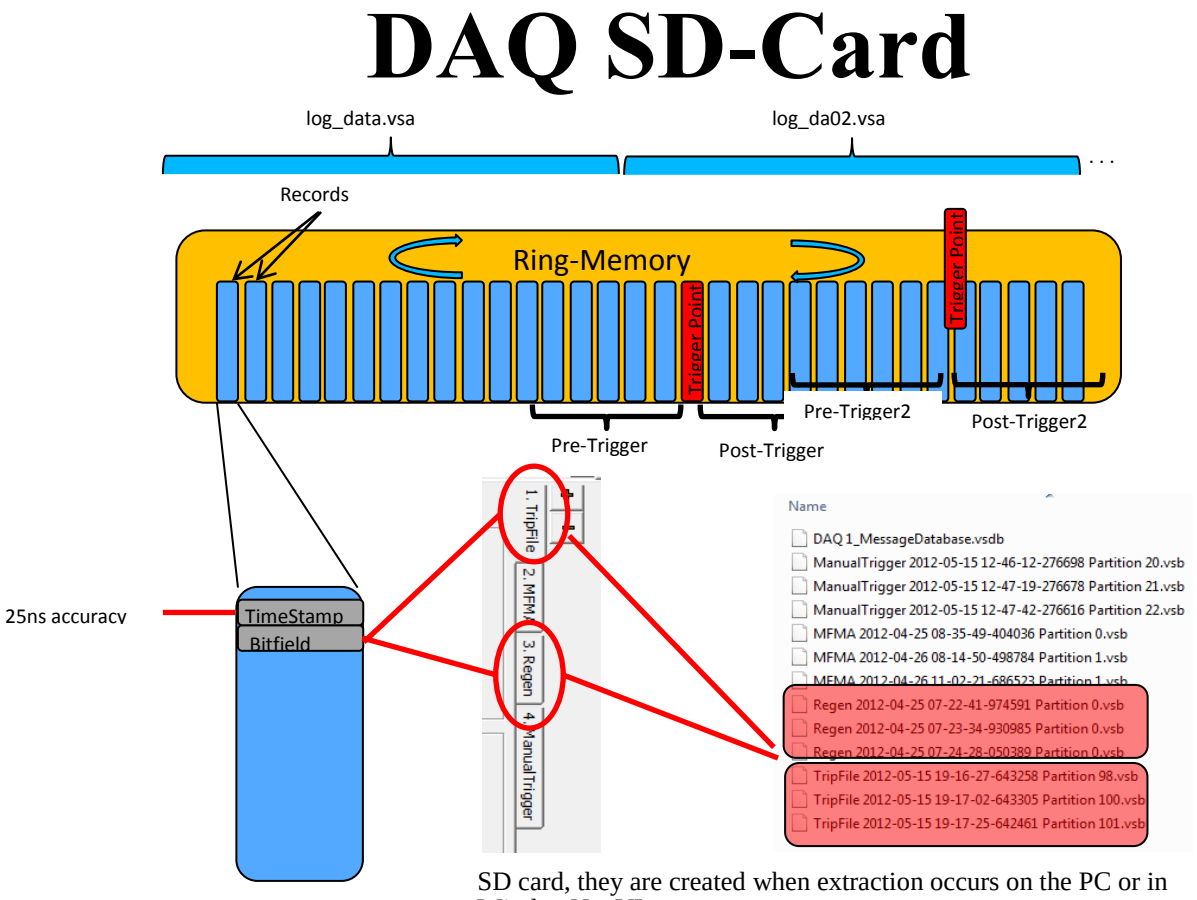


Figure 1: FAT32 File System of a 32GB SD card used in the Intrepid CoreMini based hardware.

3. **Data storage on the SD Card**

Data on the SD card is stored inside the "log_data.vsa" files in sequential file system where each network message or piece of data is stored in a record. The overall layout of this system is shown in Figure 2. On the SD card data is stored in individual records that contain a network message or piece of video or analog data. Each of these records is stored with a TimeStamp and a Bitfield. The Bitfiled is 16bits wide. Each bit can be associated with a Capture Function Block from the setup file. When extracting data if the bit associated with a CaptureBlock is set for a record, that record is placed in the CaptureBlocks data file. In this way each record can be placed in up to 16 data files without duplicating the data on the SD card.



SD card, they are created when extraction occurs on the PC or in WirelessNeoVI.com

Figure 2: This figure shows how data is stored on the SD card for a single partition. Each network message or piece of analog or video data is stored in a record with a Bitfield and Timestamp. In the Record for this example, bits associated with "1. Trip File" and "3. Regen" are set and therefore the Record's data is stored in the Regen and TripFiles.

As each network message is read into the neoVI hardware, it is immediately stored into the SD card and the next message after it and so on. When the end of the SD card is reached, the oldest records begin to be overwritten with new data. For a single partition, the SD card works like a large ring buffer of data.

4. **Pre-Post Trigger Data Storage**

There is no RAM buffer used as a pre-trigger buffer. The SD card itself is the pre-trigger buffer. If the logger is setup with a pre-post trigger collection, a Trigger Marker record is stored on the SD card when the trigger occurs. Then the extractor program will detect this marker and count back to the pre-trigger time and forward to the post-trigger time from this marker and store this data into the triggered file. For multiple triggers, this action is simply repeated around the new trigger point. See figure 2 for more information.

5. **Multiple Partitions**

When using a single partition, data is constantly stored on the SD card. When the SD card is completely filled, then the oldest data is overwritten regardless if the data is part of a pre-post trigger event or not. This means that, with a single partitioned SD card, long term data logging with pre-post triggers is not possible. For this reason, it is possible to divide the SD card into many Partitions where each partition is treated like an individual SD card. For pre-post trigger logging, each partition will contain a single pre-post trigger event. After the post-trigger time elapses, the logger advances the partition and begins to store pre-trigger data in the new partition.

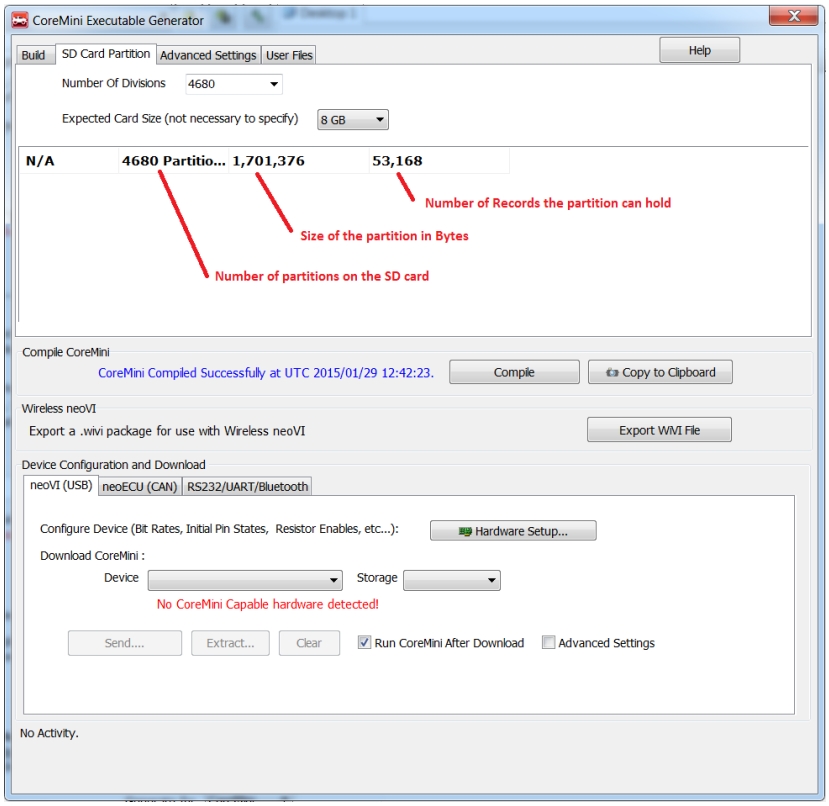


Figure 3: The CoreMini SD Card Partition dialog. This dialog is where it is possible to configure multiple partitions for data logging that requires long term pre-post trigger storage that does not get overwritten and does not use wireless functionality.

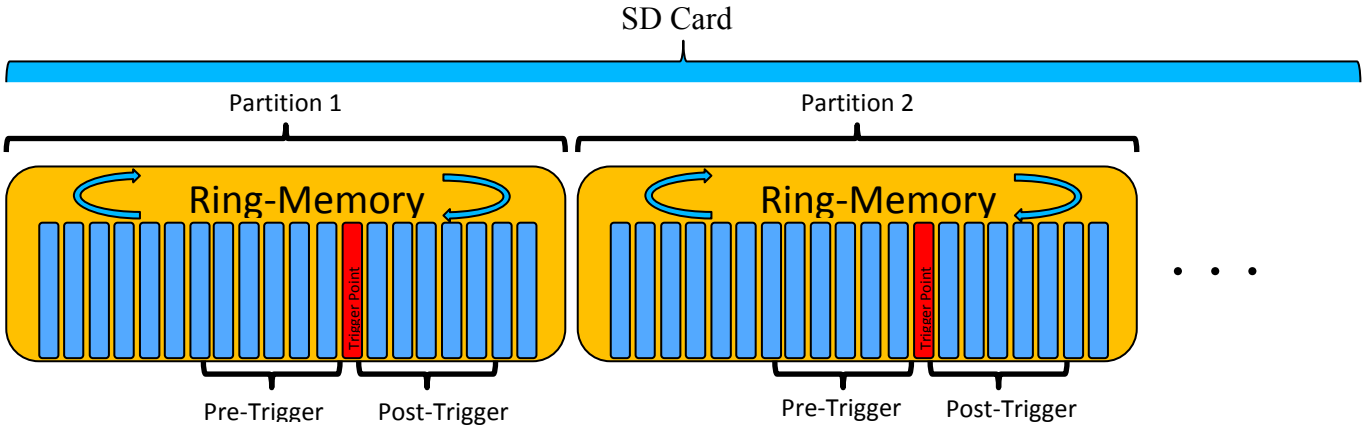


Figure 4: When using multiple partitions, each partition is treated as if it were an individual SD card. Data is constantly written to a single partition until a trigger occurs. After a trigger, when the post-trigger time elapses, the data logger advances to the next partition.

When using multiple partitions, it is important to keep the following points in mind:

1. Multiple partitions cannot be used with WirelessNeoVI.com for remote data upload.
2. Partitions should be sized so that complete pre-trigger plus post-trigger Records can be stored in a single partition. If the partition is too small to hold pre and post trigger data, then some pre-trigger data will be overwritten.
3. When the post-trigger time elapses, the partition is switched and new pre-trigger data begins to be stored in the new partition. If a trigger occurs before the pre-trigger time elapses, then a complete pre-trigger will not be extracted for that trigger event. Figure 5 depicts this situation.

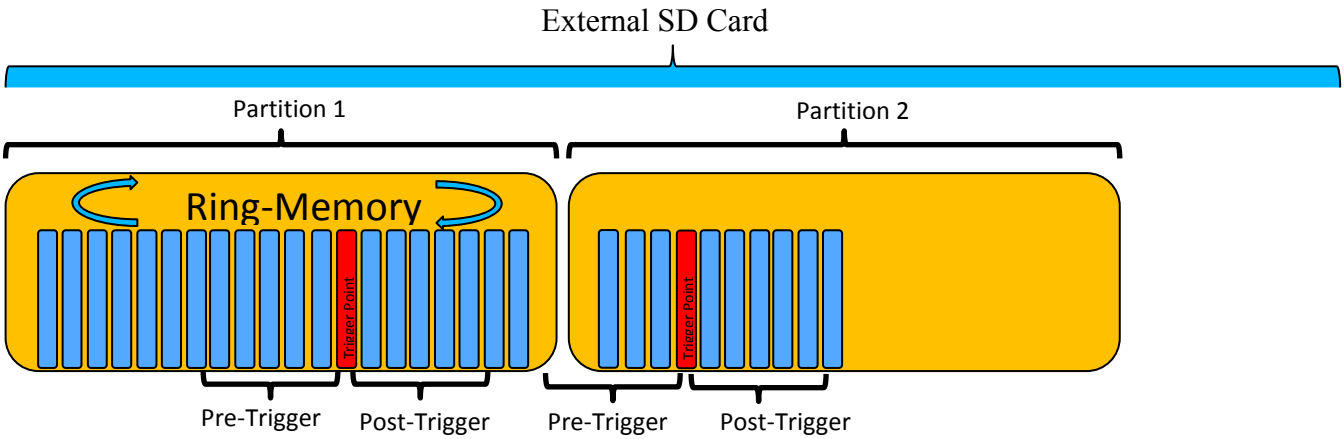


Figure 5: Looking at Partition 2, the trigger condition occurred before the logger had enough time to fill Partition 2 with pre-trigger data. As a result, this file will contain less than the entire pre-trigger.

6. Contact Us:

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