Aspect Medical Systems

BIS™ MONITOR

Export Data Technical Specification

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070-1003 REV 2.00

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1 INTRODUCTION

The BIS VISTA ™ and BIS VIEW ™ Bispectral Index™ (BIS™) monitors have one Universal Serial Bus (USB) Host port located on the rear panel of the instrument. The Host port is labeled as USB-A. This document describes the formats of the data that may be exported (downloaded) to a USB FLASH Memory Drive attached to this port.

Types of data that may be downloaded include:

- Live Data: EEG, BIS as well as other processed variable information
- BIS History Data: BIS and other processed variables from the BISx
- Monitor Error Logs: Critical events and any monitor errors

Following downloads are available only on the VISTA Monitor starting with software Rev. 2.00:

- Monitor BISx Connection Logs: Time of BISx connection
- Sensor History Data: Sensor information from the BISx
- Snapshot Data: 10 minutes of EEG and Processed Variables
- PDF Files for Printing: Snapshot and Trend

1.1 References

Please refer to the following documents for Monitor description and how to initiate Data Export.

BIS VISTA Users Manual, Aspect Part Number 070-0069
BIS VIEW Users Manual, Aspect Part Number 070-0089

1.2 Notes

Error Log and BISx Connection files are saved in the top-level directory of the USB drive.

This specification applies to VISTA 2.00 and VIEW 1.01 revisions or greater.

VIEW revision 1.01 notes:

- Live Data Export does not create an error file (.e_a) as described in section 4.3 Error File.
- BIS History header does not include application revision.
- Live Export and BIS data are not stored in subdirectories. All VIEW exported files are saved in the top-level directory of the USB drive.

USB Drives should be formatted as FAT32.

2 Monitor Error Log

The monitor error log contains Monitor critical events (e.g., Sensor Overcurrent) as well as any Monitor errors.

Export file format is as follows:

```
29 Mar 2007 14:58:23,[0014],Sensor Disconnected
29 Mar 2007 14:58:18,[0096],Sensor Invalid
```

where [XXXX] is a unique error number.

The last 5000 event entries are downloaded to a single file. Events are downloaded in reverse time order (latest event first).

Name of the file is of the format:

nx_errorDDMMYYYYHHMMSS_SNNNNNNN.log

where **DDMMYYYYHHMMSS** is the timestamp (day, month, year, hour, minute, second) reflecting the first error in the file. **NNNNNN** is the monitor serial number.

Note	Error strings are translated to the current language of the Monitor except in languages that do not fully support ASCII (e.g., Greek) – such languages are translated to English.

3 BISx Connection Log [VISTA Only]

The BISx Connection Log contains the time of each BISx connection as well as the start of an internal demo case. The BISx serial number is recorded for each BISx connection.

Export file format is as follows:

```
29 Mar 2007 13:46:50,Demo Case
29 Mar 2007 13:35:06,BISx SN#BX03583,REV:  1.04.06.21
```

The last 6000 connection events are downloaded to a single file. Events are downloaded in reverse time order (latest event first).

Name of the file is of the format:

nx_bisxcDDMMYYYYHHMMSS_SNNNNNNN.log

where **DDMMYYYYHHMMSS** is the timestamp (day, month, year, hour, minute, second) reflecting the first event in the file. **NNNNNN** is the monitor serial number.

Note	Connection log is translated to the current language of the Monitor except in languages that do not fully support ASCII (e.g., Greek) – such languages are translated to English.

4 Live Data Export

Live data export provides raw EEG and processed EEG variables, as well as impedance and other events, at 1-second resolution.

The root *filename* for Live Data is **LMMDDHHMM** where MM is the month (01-12), DD is the day (01-31), HH is the hour (00-23), and MM is the minute (00-59).

Files are stored in *filename* directory (**LMMDDHHMM**).

Export data files are created as soon as export is initiated. Data logging, however, occurs only when a sensor is inserted. A new directory (if started on a different minute than the previous export) and set of files is created when a valid sensor is inserted.

Note Inserting an "invalid"[1] sensor will continue to log (invalidated) data to the existing set of files.

The last letter of the file name extension ('a' below) is changed to the next available letter if a file with the same base name exists (e.g., if user starts, stops and re-starts export in the same minute.)

FILE TYPE	FILE NAME	DESCRIPTION
Processed data	*filename*.spa	BISx processed EEG variables and other data. The time interval for updates is fixed at 1 second.
Marker file	*filename*.m_a	Contains sensor impedance values, system revision numbers and serial numbers. May also contain the comments typed by the user from an RS-232 terminal.
Error file	*filename*.e_a	Contains any errors detected during the live data export session.
Time file	*filename*.t_a	Contains the start time for recording case data.
Raw data	*filename*.r2a *filename*.r4a	Contains up to 4 channels of EEG data sampled at 128 Hz. The channels are interleaved on a sample-by-sample basis. Each sample is a 16-bit word in 2's complement form. .r2a is a 2-channel file, .r4a is a 4-channel file
Header file	*filename*.h_a	Binary file that defines the EEG data format and parameters.
Artifact file	*filename*.ara	Contains artifact words corresponding to the EEG data in the .r2a file. Each artifact word is 4 bytes long, and there is one for each channel for each second of EEG data. 16-byte "header" information is included at the beginning of the file.
Offset file	*filename* .o_a	Contains size of raw data file
Spectra file	*filename.f_a*	Contains one line for every spectra message received from the VISTA. This line has spectrum values in µV for frequencies from 0.5 Hz to 30 Hz, with 0.5 Hz increments, for two channels. This gives a total of 60 values per channel per line. The line format is: ch0_0.5, ch0_1.0, ...,ch0_30, ch1_0.5, ch1_1.0, ch1_30 where ('ch0_0.5' is the power at 0.5 Hz for channel 0, 'ch0_1.0' is the power at 1.0 Hz for channel 0 and so on.) The default operating status does not record spectra data, and leaves the file with 0 bytes. VIEW 1.01, VISTA 2.0, 3.0: not supported, empty file is generated

Table 1: Live Data Export Files

[1] An "invalid" sensor is a sensor that cannot be recognized by the BISx.

4.1 Processed Data File

The Processed Data file is named "*filename*.spa" where *filename* is the "base" file name as described above. The Processed Data file consists of two header records followed by *n* data records. This file contains the following information:

- Processed Data Variables from BISx.
- Data are formatted into fields that are 8 characters wide (not including delimiters), with the exception of the Time field, which is 19 characters wide.
- Fields are separated by the pipe character (|).
- Each line is terminated by a Carriage Return character (CR, 0x0d) followed by a Line Feed character (LF, 0x0a).
- Five additional fields containing the impedance values from a Sensor Check or Ground Check(Ch1posImp, Ch1negImp, GndImp, Ch2posImp and Ch2negImp).

Samples of the .spa file header and data format appear below. Note that each header is really one long line.

4.1.1 Dual Channel Processed Data Format

The first line of the header record always begins with "S_HDR3". It is formatted as follows (the numbers in gray illustrate the field widths):

```
12345678901234567890 12345678 12345678 12345678 12345678 12345678 12345678
S_HDR3               |   VISTA|    3.00|        |        |        |
12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678
12345678
Ch 1     |        |        |        |        |        |        |        |        |        |        |        |        |
         |
Ch 2     |        |        |        |        |        |        |        |        |        |        |        |        |
         |
Ch12     |        |        |        |        |        |        |        |        |        |        |        |        |
         |
         |        |        |        |<CR><LF>
Time                 |SpSmooth|BiSmooth|LoFilter|NotFiltr|HiFilter|PIC_ID  |
SR12     |SEF08   |MEDFRQ08|BISBIT00|B34U05  |DB11U04 |DB13U01 |TOTPOW08|EMGLOW01|SQI10   |IMPEDNCE|ARTF2   |BURST   |
RESVR    |
SR12     |SEF08   |MEDFRQ08|BISBIT00|B34U05  |DB11U04 |DB13U01 |TOTPOW08|EMGLOW01|SQI10   |IMPEDNCE|ARTF2   |BURST   |
RESVR    |
SR12     |SEF08   |MEDFRQ08|BISBIT00|B34U05  |DB11U04 |DB13U01 |TOTPOW08|EMGLOW01|SQI10   |IMPEDNCE|ARTF2   |BURST   |
RESVR    |
C1POSIMP|C1NEGIMP|GNDIMP   |C2POSIMP|C2NEGIMP|<CR><LF>
```

Note	The header labels listed above originate from the BISx and may change with later releases of the software.
Note	VISTA 3.00 refers to Monitor and Application Revision

A description of the Processed Data is shown in **Table 2: Live Data Export Processed Variables**

Variable Name	Description	Format/Range
Time	The initial value shall come from the time in the processed variable packet. The time shall be incremented by one second for each data record	Real time MM/DD/YYYY HH:MM:SS
SpSmooth	Extracted from the processed variables message spectral smoothing setting.	Formatted as a right justified decimal number: 0 = 0 seconds 1 = 5 seconds 2 = 10 seconds 3 = 30 seconds 4 = 60 seconds
BiSmooth	Extracted from the processed variables message bispectral smoothing setting.	Formatted as a right justified decimal number: 0 = 15 seconds 1 = 30 seconds 2 = 60 seconds 3 = 10 seconds
LoFilter	Extracted from the processed variables message Low Filter setting.	Formatted as a right justified decimal number: 0 = 0.25 Hz 1 = 1.00 Hz 2 = 2.00 Hz 3 = 2.50 Hz
NotFilter	Extracted from the processed variables message Notch Filter setting.	Formatted as a right justified decimal number: 0 = none 1 = 50 Hz 2 = 60 Hz 3 = 50 and 60 Hz
HiFilter	Extracted from the processed variables message High Filter setting.	Formatted as a right justified decimal number: 0 = none 1 = 30 Hz 2 = 50 Hz 3 = 70 Hz
PIC_ID	Patient Interface Cable ID. Smart sensors combine the value from the sensor cable along with a sensor type value. PIC ID = ([sensor type] * 10) + [smart cable]	Sensor types = 1-14 Smart cable = 7 (ex: PIC_ID 27 = Quatro Sensor)
Suppression Ratio (SR)	The percentage of epochs in the past 63 seconds in which the EEG signal is considered suppressed.	Formatted as a right-justified decimal number with a decimal point and one digit to the right of the decimal point. 0.0 - 100.0 %
Spectral Edge Frequency (SEF)	The frequency at which 95% of the total power lies below it and 5% lies above it.	Formatted as a right-justified decimal number with a decimal point and one digit to the right of the decimal point. 0.5 - 30.0 Hz

BISBIT	Codes that represent features of the BIS algorithm being activated by EEG data characteristics; helpful for troubleshooting by Aspect personnel.	Formatted as a right-justified 4-digit hexadecimal number.
Bispectral Index (BIS) (B34…, DB1…)	The output from a multivariate discriminate analysis that quantifies the overall bispectral properties (frequency, power, and phase) throughout the entire frequency range.	Formatted as a right-justified decimal number with a decimal point and one digit (0) to the right of the decimal point. 0.0 - 100.0
Alternate BIS Value	See BIS	0.0 - 100.0
Second Alternate BIS Value	See BIS	0.0 - 100.0
TOTPOW	A measure of the absolute total power in the frequency range from 0.5 to 30.0 Hz. Value is in dB with respect to 0.0001 μV^2.	Formatted as a right-justified decimal number with a decimal point and one digit to the right of the decimal point. 40.0 - 100.0 dB
EMG	The absolute power in the 70-110 Hz range. The power value is reported in dB with respect to 0.0001μV2. All the artifact detection is turned off for this variable.	Formatted as a right-justified decimal number with a decimal point and one digit to the right of the decimal point. 0.0 – 100.0 dB (Note Trend displays 30 - 80 dB while the EMG Bar Graph represents 30 - 55 dB.)
Signal Quality Index (SQI)	A measure of the signal quality for the EEG channel source(s) that is calculated based on impedance data, artifact, and other variables. Not affected by Suppression Ratio.	Formatted as a right-justified decimal number with a decimal point and one digit to the right of the decimal point. 0.0 - 100.0 %
IMPEDNCE	The impedance value for that channel as detected by the continuous impedance check.	Formatted as a right-justified decimal number with a decimal point and one digit to the right of the decimal point. Values in Kohms
ARTF2	Artifact flags, or diagnostic codes, for that channel. The codes represent various hardware and software status conditions and are helpful for troubleshooting by Aspect personnel. Derived from second_artifact.	Formatted as 8 hex digits
BURST	Burst Count – an alternative means for measuring EEG suppression. Valid only when an Extend or Bilateral sensor is in use.	Formatted as a right-justified decimal number with a decimal point and one digit (0) to the right of the decimal point. 0.0 - 30.0 bursts/minute
RESVAR	Reserved Variable	Formatted as a right-justified decimal number with a decimal point and one digit (0) to the right of the decimal point.
C1POSIMP (et al.)	Values representing the impedance during a Sensor Check or Ground Check for the Positive and Negative leads for each channel and also for the Ground lead.	All values in Ohms Value is blanked during non-Ground / Sensor checks and if electrode is state

		is clipping, noise or lead-off, or value cannot be displayed.

Table 2: Live Data Export Processed Variables

Note	Values set to -327.7, -3276.8, -32768.0 and 3276.7 are not valid outputs and thus should not be used. Values may be invalidated by low SQI, an unsupported feature or for other reasons.
Note	IMPDENCE equal 32768.0 represent out of range impedance values during periodic ground check and should not be used.

Each data record appears as follows (the 1st field is 19 characters, 2nd and all other fields are 8 characters long.):

```
1234567890123456789 12345678 12345678 12345678 12345678 12345678 12345678
04/24/2007 11:56:02|       2|       0|       3|       3|       2|      57|
12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678
12345678
     0.0|    22.8|  -327.7|    0601|    71.2| -3276.8| -3276.8|    52.2|    27.3|   100.0|       9|00000000| -3276.8|
  0.0|
     0.0|     1.6|  -327.7|    0601|    71.2| -3276.8| -3276.8|    52.2|    27.3|   100.0|       7|00000000| -3276.8|
  0.0|
     0.0|    22.8|  -327.7|    0601|    71.2| -3276.8| -3276.8|    52.2|    27.3|   100.0|  3276.7|00000000| -3276.8|
  0.0|
       0|       0|       0|       0|       0|<CR><LF>
```

4.1.2 Bilateral Processed Data Format (VISTA Revision 3.00 or greater)

The first line of the header record is formatted as follows (the 1st field is 19 characters, 2nd and all other fields are 8 characters long.):

```
1234567890123456789 12345678 12345678 12345678 12345678 12345678 12345678
S_HDR3             |   VISTA|    3.00|        |        |        |        |
12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678
Ch1     |        |        |        |        |        |        |        |        |        |        |        |
        |        |        |        |        |        |        |        |
Ch2     |        |        |        |        |        |        |        |        |        |        |        |
        |        |        |        |        |        |        |        |
Ch3     |        |        |        |        |        |        |        |        |        |        |        |
        |        |        |        |        |        |        |        |
Ch4     |        |        |        |        |        |        |        |        |        |        |        |
        |        |        |        |        |        |        |        |
        |        |        |        |        |        |        |        |        |        |<CR><LF>
```

The second line of the header record looks like this:

```
Time               |SpSmooth|BiSmooth|LoFilter|NotFiltr|HiFilter|PIC_ID  |
SR12    |SEF07   |MEDFRQ07|BISBIT00|DB13U01 |DB11U04 |B34U05  |TOTPOW07|EMGLOW01|SQI10   |IMPEDNCE|ARTF2   |
BURST   |RESVR   |ASYM    |SBIS    |SEMG    |RESVR3  |RESVR1  |RESVR2  |
SR12    |SEF07   |MEDFRQ07|BISBIT00|DB13U01 |DB11U04 |B34U05  |TOTPOW07|EMGLOW01|SQI10   |IMPEDNCE|ARTF2   |
BURST   |RESVR   |ASYM    |SBIS    |SEMG    |RESVR3  |RESVR1  |RESVR2  |
SR12    |SEF07   |MEDFRQ07|BISBIT00|DB13U01 |DB11U04 |B34U05  |TOTPOW07|EMGLOW01|SQI10   |IMPEDNCE|ARTF2   |
BURST   |RESVR   |ASYM    |SBIS    |SEMG    |RESVR3  |RESVR1  |RESVR2  |
SR12    |SEF07   |MEDFRQ07|BISBIT00|DB13U01 |DB11U04 |B34U05  |TOTPOW07|EMGLOW01|SQI10   |IMPEDNCE|ARTF2   |
BURST   |RESVR   |ASYM    |SBIS    |SEMG    |RESVR3  |RESVR1  |RESVR2  |
C1POSIMP|C1NEGIMP|GNDIMP  |C2POSIMP|C2NEGIMP|C3POSIMP|C3NEGIMP|C4POSIMP|C4NEGIMP|BILBITS |<CR><LF>
```

Additional Bilateral Variables are as shown in **Table 3: Additional Bilateral Processed Data**

Variable Name	Description	Format/Range/Notes
ASYM	Asymmetry or the percentage of EEG power present in left or right hemispheres. Calculated as (Total Power Left / Total Power Left + Right) *1000 VISTA Display ASYM > 50.0: xxL where xx = (ASYM - 50) * 2 ASYM < 50.0: xxR where xx = (50 - ASYM) * 2	Formatted as a right-justified decimal number with a decimal point and one digit (0) to the right of the decimal point. 0.0 – 100.0 % Invalid ASYM: -3276.8 ASYM is only valid for Ch. 1
SBIS	A BIS variability index calculated for each side of the head. The index represents the standard deviation of the BIS variable over the last minute.	Formatted as a right-justified decimal number with a decimal point and one digit (0) to the right of the decimal point. 0.0 to 10.0 Invalid SBIS: -3276.8
SEMG	An EMG variability index calculated for each side of the head. The index represents the standard deviation of the EMG values over the last minute.	Formatted as a right-justified decimal number with a decimal point and one digit (0) to the right of the decimal point. 0.0 to 10.0 Invalid SEMG: -3276.8
RESVR3	Reserved	0.0
BILBITS	Supplemental Bilateral Bits E.g.: 1 -> Left Hemisphere 3 -> Right Hemispere	Formatted as a 2-digit right justified hexadecimal number. Bit 0: 1 indicates Bilateral Sensor Bit 1: 0 indicates Left Hemisphere, 1 indicates Right Hemisphere

Table 3: Additional Bilateral Processed Data

4.2 Marker File

The Marker File (*.m_a) contains Monitor and BISx revision information, the start and end time of recording, and impedance data. Comment information may be included using keystrokes captured from an external serial terminal.

A sample marker file is shown below:

```
10/30/2006 15:16:28 > VISTA Revision Information
10/30/2006 15:16:28 > VISTA serial number: VT015434
10/30/2006 15:16:28 > Application revision: 3.00
10/30/2006 15:16:28 > Platform revision: 2.02
10/30/2006 15:16:28 > Serial protocol revision: 1.08
10/30/2006 15:16:28 > Hardware revision:  2.00
10/30/2006 15:16:28 > BISx Revision Information
```

```
10/30/2006 15:16:28 > BISx serial number: BX015487
10/30/2006 15:16:28 > BISx Software revision: 1.04
10/30/2006 15:16:28 > BISx Hardware revision: 3.00
10/30/2006 15:16:28 > BISx Serial protocol revision: 1.07
10/30/2006 15:16:28 > Algorithm Revision: BIS 3.4
10/30/2006 15:18:34 > IMPEDNCE|10/30/2006 15:17:28|-   1000|-   1000
10/30/2006 15:18:40 > IMPEDNCE|10/30/2006 15:17:34|+   1000|+   1000
10/30/2006 15:18:44 > IMPEDNCE|10/30/2006 15:17:38|-   1000|-   1000
10/30/2006 15:18:48 > IMPEDNCE|10/30/2006 15:17:42|g   1000
10/30/2006 15:20:54 > EVENT   |10/30/2006 15:19:48
10/30/2006 15:28:37 > Start
10/30/2006 15:29:00 > IMPEDNCE|10/30/2006 15:27:54|g   3000
10/30/2006 15:29:02 > IMPEDNCE|10/30/2006 15:27:55|g   1000
10/30/2006 15:29:10 > Incision
10/30/2006 15:29:37 > Patient Eyes Open
10/30/2006 15:30:37 > # Patient smiled
```

IMPEDNCE represents impedances during sensor or ground check for the 4 dual-channel sensor electrodes: (+) is electrode1 (recorded twice), (-) are electrode 3 (Channel 1) and 4 (Channel 2), and (g) is electrode 2 (Ground). The first timestamp represents the time the IMPEDNCE was written to the marker file while the second timestamp represents the time the event was first received.

Only sensor check and periodic ground check impedances are logged to the marker file.

4.2.1 Comment Entry

Comments during Live Data session may be entered using a terminal program running on a PC. The PC and Monitor communicate using RS-232 using the settings in **Table 4: ASCII Terminal Settings**. (VISTA must be set to ASCII Serial Port Mode.)

	ASCII Protocol
Baud Rate	9600
Data Bits	8
Stop Bits	1
Parity	No Parity
Flow Control	None

Table 4: ASCII Terminal Settings

Marker events using control-A through control-Z (with the exception of control-H, J, M, and I) are supported as shown in **Table 5: Live Export Event Marker Commands**.

Control Character	Comment	Control Character	Comment
CTRL A	Start Induction	CTRL P	Fuzz ESU Off
CTRL B	Loss of Responsiveness	CTRL Q	Clipping ESU On
CTRL C	NM Blocker Administered	CTRL R	Clipping ESU Off
CTRL D	Laryngoscopy / Intubation	CTRL S	Moving Patient
CTRL E	Nitrous Oxide (On/Off)	CTRL T	Patient Eyes Open
CTRL F	Start Skin Prep	CTRL U	Anesthetic Agent Up
CTRL G	Incision	CTRL V	Anesthetic Agent Down
CTRL K	Extubation	CTRL W	I.V. Bolus / Med
CTRL L	Patient Responding	CTRL X	Pt. Moves / Coughs
CTRL N	Generic Noise	CTRL Y	Generic Event Marker
CTRL O	Fuzz ESU On	CTRL Z	Discard Previous Marker

Table 5: Live Export Event Marker Commands

The time of the event is logged as soon as the single control character is entered. The full comment is appended to the marker file upon entering a carriage return or **Enter**.

A generic comment may be entered starting with a # character. The comment is terminated by pressing **Enter**. Note that the comment timestamp represents the time # was first entered.

The default strings can be replaced using a ***winlog.cfg*** file located on the USB drive. The Monitor will look at this file and remap any strings, if the file and appropriate section are found. A sample ***winlog.cfg*** is shown below:

```
# Event Markers
[Event_Markers]
Ctrl_A_Marker = Start Induction
Ctrl_B_Marker = Loss of Responsiveness
Ctrl_C_Marker = NM Blocker Administered
Ctrl_D_Marker = Laryngoscopy / Intubation
Ctrl_E_Marker = Nitrous Oxide (On/Off)
Ctrl_F_Marker = Start Skin Prep
Ctrl_G_Marker = Incision
Ctrl_K_Marker = Extubation
```

4.2.2 Bilateral Sensor Marker File (VISTA Revision 3.00 or greater)

The Bilateral marker file is similar to the dual-channel marker file; however, IMPEDNCE represents impedances during sensor or ground check for the 6 bilateral sensor electrodes: (+) is electrode C, (-) are electrodes LT, LE, RT, RE, and (g) is electrode G.

Mapping of bilateral electrodes to channels is as follows:

Electrode	Description	Channel
LT	Left Temple	1
LE	Left Eye	2
RT	Right Temple	3
RE	Right Eye	4
G	Ground	n/a
C	Center	n/a

Table 6: Bilateral Electrodes

```
10/30/2006 15:18:34 > IMPEDNCE|10/30/2006 15:17:28|-   1000|-   1000|-   1000|-   1000
10/30/2006 15:18:40 > IMPEDNCE|10/30/2006 15:17:34|+   1000
10/30/2006 15:18:44 > IMPEDNCE|10/30/2006 15:17:38|-   1000|-   1000|-   1000|-   1000
10/30/2006 15:18:48 > IMPEDNCE|10/30/2006 15:17:42|g   1000
```

4.3 Error File

The Error File contains Monitor error and status messages, including any drops in raw EEG data packets during live data recording. A sample is shown below:

```
10/30/2006 15:19:52 > ERROR   |10/30/2006 15:18:46| Excessive Artifact Detected in Signal (E27)
10/30/2006 15:20:02 > CLEAR   |10/30/2006 15:18:55| Excessive Artifact Detected in Signal (E27)
10/30/2006 15:22:38 > ERROR   |10/30/2006 15:21:32| Press electrodes 1 and 2 (E13)
```

Note Only the initial string of the error or status message as well as a unique error code (e.g., E27 above) is logged.

Note	Errors are translated to the current language of the Monitor except in languages that do not fully support ASCII (e.g., Greek) – such languages are translated to English.

4.4 Header File

The Header file is a binary file primarily for the use of Aspect clinical research personnel. The Header file contains information obtained from several sources and is compatible with header files from legacy Aspect programs. There are some alignment restrictions noted below that dictate that some fields defined as 'long' or 'time_t' are treated as character fields. Header file contents are described below in **Table 7: Live Data Header File**.

Field	Format	offset	Contents	Source	Notes
h_channel_marker	unsigned char	0	Channel marker	constant 0xFF (255)	
h_begin_hrs	unsigned char	1	Current time-hour	Set to Monitor time, changed if user changes time	
h_begin_mins	unsigned char	2	Current time-minute	Set to Monitor time, changed if	

Field	Format	offset	Contents	Source	Notes
				user changes time	
h_begin_secs	unsigned char	3	Current time-second	Set to Monitor time, changed if user changes time	
h_magic	unsigned short	4	Magic number	Unique for each version of Monitor	0x380 (896 decimal)
h_rev_major	unsigned short [5]	6	Revision number of software	Monitor Application revision number Format: [0].[1].[2].[3].[4] if ([3] == -1) end of rev number	
h_file_format	short	16	File format code	Ox4C (76 decimal)	
h_filename	char [13]	18	Base name of this file when it as originally generated	MMDDhhmm.h_a	Limited to 8+3 format.
h_dummy_pack_0	char	31	0	0	Alignment padding
h_file_length	long	32	Total file length of the r2x file in bytes	Running total kept as raw data received	
h_data_offset	long	36	0		
h_foot_offset	long	40	0		
h_rec_pt_offset	long	44	0		
h_crc_hdr	long [3]	48	0		
h_crc_data	long [3]	60	0		
h_crc_foot	long [3]	72	0		
h_creat_utime	time_t	84	File creation timestamp	Set when file created to cmos time	
h_creat_dtime	short	88	0		
h_creat_btime	short	90	0		
h_adstart_utime	time_t	92	0		
h_adstart_dtime	short	96	0		
h_adstart_btime	short	98	0		
h_close_utime	time_t	100	File close timestamp	Written immediately before header file is closed	
h_close_dtime	short	104	0		
h_close_btime	short	106	0		
h_close_adtime	long	108	0		
h_compress_code	short[16]	112	0		
h_error_code	short[16]	144	0		
h_shr	unsigned char	176	0		
h_front_end_type	unsigned char	177	DSC type	Snippet Header dsc_id	
h_num_eeg	short	178	Number of EEG channels (constant 2)		
h_num_other	short	180	0		
h_num_serial	short	182	0		
h_num_total	short	184	2		
h_rate OR h_rate_chars	long OR char[4]	186	Sampling rate of raw EEG data	From raw eeg record (rate)	Do not word align
h_machine	char[16][32]	190	ASCII	First 4 are	

Field	Format	offset	Contents	Source	Notes
			machine type	initialized to "BIS-Monitor", rest are hex zero	
h_slope_ad OR h_slope_add_chars	float[16] OR char[16][4]	702	m (slope) of calibration equation: y = mx+b	First 4 are initialized to float .050043788, others are hex 0	Do not word align
h_intercept_ad OR h_intercept_ad_chars	float[16] OR char[16][4]	766	b (intercept) of calibration equation: y = mx+b	First 4 are initialized to float -3231.1703 others are hex 0	Do not word align
h_skip	short[16]	830	Number of values to skip in input stream	First 4 are initialized to 64 others are hex 0	
h_units_ad	short [16]	862	units of calibration equation: y = mx+b	First 4 are initialized to 1 (UNITS_UV) others are hex 0	
h_param_ad_code	unsigned short [16]	894	parameter code for A/D channels	First 4 are initialized to 13 ,others are hex 0	
h_param_serial_code	unsigned short [2][4]	926	0		
h_baud	unsigned short [2]	942	0		
h_parity	unsigned char [2]	946	0		
h_bits	unsigned char [2]	948	0		
h_stop	unsigned char [2]	950	0		
h_units_serial	unsigned short [2]	952	0		
h_prompt	char [2][16]	956	0		
h_z_timeout	char	988	0		
h_time_zone	char[32]	989	Time zone	Set to GMT	
h_dummy_pack_1	char[3]	1021	0	0	Alignment padding
h_packet_length_half_secs	long	1024	1		
h_packet_length_bytes	long	1028	16384		
h_ipu_rev	signed char[5]	1032	-1		
h_biseng_sw_rev	signed char[8]	1037	-1		
h_biseng_fw_rev	signed char[8]	1045	-1		
h_biseng_hw_rev	signed char[8]	1053	-1		
h_dummy_pack_1	char[3]	1061	0	0	Alignment padding
h_biseng_serial_no	unsigned long	1064	0		
h_reserved	char[36]	1068	0		
h_mr_num	char[21]	1104	Patient medical	From file name (mmddhhmm)	

Field	Format	offset	Contents	Source	Notes
			record number		
h_pt_sex	char	1125	Patient sex	1=male, 2=female. From user data entry, blank if not specified (unknown)	
h_pt_dob_month	unsigned char	1126	0		
h_pt_dob_day	unsigned char	1127	0		
h_pt_dob_year	unsigned short	1128	0		
h_pt_age	char[4]	1130	Patient age	From user data entry, blank if unknown	
h_pt_wt	char[4]	1134	Patient weight	From user data entry, blank if unknown	
h_pt_ht	char[4]	1138	Patient height	From user data entry, blank if unknown	
h_asa_class	char[2]	1142	Patient ASA class	From user data entry, blank if unknown	
h_ surgical_proc	char[80]	1144	Surgical procedure	From user data entry, blank if unknown	
h_op_name	char[80]	1224	0		
h_center_name	char[80]	1304	Center name	From configuration file, blank if none	
h_ center_code OR h_center_code_char	long OR char[4]	1384	0		Do not word align
markers_used	char[18][29]	1388	0		
h_rev_reformat	short[5]	1910	-1		
h_rev_ compress	short[5]	1920	-1		
h_rev_ generate	short[5]	1930	-1		
h_rev_ ratedelta	short[5]	1940	-1		
h_ratedelta_cmd	char[32]	1950	0		
h_newheader_utime OR h_newheader_utime_char	time_t OR char[4]	1982	0		Do not word align
h_ratedelta_utime OR h_ratedelta_utime_char	time_t OR char[4]	1986	0		Do not word align
h_dummy_pack_1	char[2]	1990	0		Alignment padding
h_rev_rmchans	Short[5]	1992	-1		
h_rmchans_cmd	Char[32]	2002	0		
h_host_rev	Signed char[5]	2034	-1		
h_ipu_type	Unsigned char	2039	0		
h_padding	Char	2040	0		

Table 7: Live Data Header File

4.5 Raw (EEG) Data File

The Raw Data file is a binary file containing unfiltered EEG data. The data are as received from the BISx and are interleaved, starting with a Channel 1 value, followed by a Channel 2 value, then a Channel 1 value, etc, for a dual channel sensor. For a four-channel sensor, EEG data start with a Channel 1 value, followed by a Channel 2 value, then a Channel 3 value, a Channel 4 value, then again a Channel 1 value, etc.

Each EEG sample is 16-bit signed integer, in units of 0.05 μV. Data are sampled 128 times a second per channel.

Any dropped EEG packets from BISx will result in an error message in the error file. Any dropped EEG packets are replaced with zero (0) amplitude data.

4.6 Time File

The Time file contains the date and time at which Live Data download began. Example:

```
04/03/2002 17:47:21
```

4.7 Offset File

The Offset file contains the following information:

- Reference to the corresponding Raw Data file.
- Monitor application revision.
- Some invariant text for the benefit of legacy post-processing programs.
- Date and time at which Live Data download began.
- Offset (always 0) and size of the Raw Data file in bytes.

A sample Offset file:

```
# Time/Offset file for L04031747.r2a
# VISTA Version 1.02
SAD
Delimiter Tab
NaN NaN
SAD
Time                    Offset      Size
04/03/2006 17:47:21     0           307200
```

4.8 Artifact File

The Artifact file is a binary file primarily for the use of Aspect clinical research personnel. The Artifact file consists of a 384 byte header sent from the BISx, followed by all of the artifact flags (second_artifact) from the Processed Data messages. The header is copied from the message with no reformatting. Each entry after the header is four bytes for each channel with byte order reversed from that in the Processed Data message.

5 BIS History

Downloaded BIS History originates in the BISx. Note that it may take up to 1 hour to download a BISx, depending on the speed of the USB drive and how long a BISx has been used.

File root name shall be **HMMDDHHMM_SNXXXXX** where MM is the month (01-12), DD is the day (01-31), HH is the hour (00-23), and MM is the minute (00-59) of initial file creation, and XXXXX is the BISx serial number.

Files are stored in *filename* directory (**HMMDDHHMM_SNXXXXX**).

If a file with the same base name exists (e.g., if user starts, stops and re-starts export in the same minute), the file shall be overwritten.

The files created by BIS History Export are shown in **Table 8: BIS History Files**.

File Type	Extension	Description
Marker	.m_a	text file containing header, user and configuration data
Processed Data	.spa	text file containing processed data variables

Table 8: BIS History Files

5.1 Processed Data File

The Processed Data file contains the numeric data from the BISx History data records. With the exception of the first data record for each case, each data item represents the average (or minimum or maximum) for that variable over the previous minute. (The first data record contains data from the time the case was started up to the top of the next minute, i.e. xx:xx:00.) Data are formatted into fields that are 8 characters wide, with the exception of the Time field, which are 19 characters wide. Fields are separated by the pipe character (|). Each line is terminated by a Carriage Return character (CR, 0x0d) followed by a Line Feed character (LF, 0x0a).

5.1.1 Dual Channel Processed Data Format

The data are formatted into fields, in the order specified:

Variable Name	Description	Range	Format
Time	Time stamp at which a data record was recorded in the BISx.	MM/DD/YYYY HH:MM:SS	Month/Day/Year Hour/Minute/Second
SENSOR	Patient Interface Cable ID and Sensor Type. SENSOR = ([sensor type] * 10) + [PIC ID] (E0x: SENSOR = Quatro Sensor type 2 * 10 = 20 + PIC$^+$ = 27)	Sensor types = 1-11 PIC$^+$ cable = 7	Right justified decimal number.
AVGBIS	The average BIS value for the preceding 1 minute. The type of BIS index (e.g. BIS 3.4 or BIS 4.0) depends on the SENSOR value.	0.0 – 100.0	Right justified decimal number with a decimal point and one zero to the right of the decimal point. 255.0 indicates invalid value

MINBIS	The minimum BIS value for the preceding 1 minute.	0.0 – 100.0	See AVGBIS
MAXBIS	The maximum BIS value for the preceding 1 minute.	0.0 – 100.0	See AVGBIS
AVGBISAL	The average alternate BIS value for the preceding 1 minute.	0.0 – 100.0	See AVGBIS
AVGBISA2	The average second alternate BIS value for the preceding 1 minute.	0.0 – 100.0	See AVGBIS
AVGSQI	The average Signal Quality Index value for the preceding 1 minute.	0.0 – 100.0 %	See AVGBIS
AVGEMG	The average EMG value for the preceding 1 minute.	30.0 – 80.0 dB	See AVGBIS
AVGSR	The average Suppression Ratio value for the preceding 1 minute.	0.0 – 100.0 %	See AVGBIS
AVGIMPD1	The average continuous combined impedance value for Channel 1 for the preceding 1 minute.	0.0 – 25.4 Kohms	Right justified decimal number with a decimal point and one zero to the right of the decimal point. 25.5 indicates invalid impedance
AVGIMPD2	The average continuous combined impedance value for Channel 2 for the preceding 1 minute.	0.0 – 25.4 Kohms	See AVGIMPD1
BISBITS	4 hex characters that represent features of the BIS algorithm being activated by EEG data characteristics.	0000 – FFFF	Right justified 4 hex digits
AVGBURST	Burst Count is an alternative method to SR of quantifying suppression, providing a measurement of the number of EEG bursts per minute.	0.0 – 30.0	Right justified decimal number with a decimal point and one zero to the right of the decimal point. 254.0, 255.0 indicate invalid value
RESVAR	Reserved for future variable.	0	n/a

Table 9: BIS History Processed Data Items

> **Note** Values set to -327.7, -3276.8, -32768.0 and 3276.7 are not valid outputs and thus should not be used.Values equal to 255.0, 25.5 in case of AVGIMPD1 and AVGIMPD1, and 254.0 in case of AVGBURST, are not valid outputs and thus should not be used. Values may be invalidated by low SQI, an unsupported feature or for other reasons.

The Processed Data file begins with a 2-line header. First line contains the Monitor master revision, while the second line contains labels as described in **Table 9: BIS History Processed Data Items**.

A typical processed data file is shown below:

```
HISTORY            |VISTA   |    3.00|        |        |        |        |        |        |        |
   |        |        |        |
Time               |SENSOR  |AVGBIS  |MINBIS  |MAXBIS  |AVGBISAL|AVGBISA2|AVGSQI  |AVGEMG  |AVGSR   |AVGIMPD1|
AVGIMPD2|BISBITS |AVGBURST|RESVAR  |<CR><LF>
01/01/2007 00:00:00|      57|    58.0|    55.0|    59.0|    59.0|    59.0|    83.0|    29.0|     0.0|     8.6|
     7.3|    0600|       255|     0.0|
01/01/2007 00:01:00|      57|    58.0|    55.0|    59.0|    59.0|    59.0|    83.0|    29.0|     0.0|     8.6|
     7.3|    0600|       255|     0.0|
01/01/2007 00:02:00|      57|    60.0|    57.0|    62.0|    60.0|    60.0|    85.0|    26.0|     0.0|     9.5|
     7. 4|    0601|       255|     0.0|<CR><LF>
```

Where `VISTA 3.00` represents the monitor type and application revision, respectively.

5.1.2 Bilateral Processed Data Format (VISTA Revision 3.00 or greater)

When a Bilateral Sensor is used, the BIS History data is doubled, with average values for both the Left and Right Hemispheres, and the Average Asymmetry (AVGASYM) variable replaces RESVAR in the Right Hemisphere data. A typical Bilateral BIS History processed data file is shown below:

```
HISTORY            |VISTA   |    3.00|        |        |        |        |        |        |        |
        |        |        |        |RIGHT   |        |        |        |        |        |        |
        |        |        |        |        |<CR><LF>
Time               |SENSOR  |AVGBIS  |MINBIS  |MAXBIS  |AVGBISAL|AVGBISA2|AVGSQI  |AVGEMG  |AVGSR   |AVGIMPD1|
AVGIMPD2|BISBITS |AVGBURST|RESVAR  |AVGBIS  |MINBIS  |MAXBIS  |AVGBISAL|AVGBISA2|AVGSQI  |AVGEMG  |AVGSR   |
AVGIMPD3|AVGIMPD4|BISBITS |AVGBURST|AVGASYM |
02/20/2008 21:49:00|     147|    38.0|    33.0|    41.0|    36.0|    26.0|    98.0|    26.0|     0.0|     8.4|
     9.7|    0000| -3276.8|     0.0|    38.0|    33.0|    41.0|    35.0|    26.0|    98.0|    27.0|     0.0|
     9.6|     9.7|    0000| -3276.8|    50.0|
02/20/2008 21:50:00|     147|    37.0|    34.0|    40.0|    35.0|    25.0|   100.0|    26.0|     0.0|     8.4|
     9.7|    0000| -3276.8|     0.0|    37.0|    33.0|    39.0|    34.0|    25.0|   100.0|    26.0|     0.0|
     9.6|     9.7|    0000| -3276.8|    50.0|
02/20/2008 21:51:00|     147|    40.0|    38.0|    41.0|    38.0|    29.0|   100.0|    25.0|     0.0|     8.4|
     9.7|    0000| -3276.8|     0.0|    40.0|    38.0|    42.0|    37.0|    29.0|   100.0|    26.0|     0.0|
     9.6|     9.7|    0000| -3276.8|    50.0|<CR><LF>
```

AVGASYM is defined as follows:

Item	Description	Format	Example/Range
AVGASYM	ASYM average	Formatted as a right justified decimal number with a decimal point and one digit (0) to the right of the decimal point 254.0, 255.0 represent 2 types of not AVGASYM values – see Note below.	0.0 – 100.0, where 0.0 is 100% right, 100.0 is 100% left, 50.0 is equal power on left and right

Table 10 Bilateral BIS History Processed Data Items

> **Note** 254 AVGASYM occurs when Ch3 SQI is greater or equal to 15 for at least 1 second in the one minute period but there were no SQI qualified ASYM values in the one minute period. 255 AVGASYM occurs when Ch3 SQI is less than 15 for all processed variables in the one minute period.

5.2 Marker File

The Marker file shall contain all other data received from the BISx. Each line of the Marker file shall be terminated by a Carriage Return character followed by a Line Feed character. The Marker file shall contain the data shown in **Table 11: BIS History Marker File Items**.

Item	Description / Source
BISx serial number	Obtained from the BISx
BISx system software revision	Obtained from the BISx
BISx interface protocol revision	Communication Protocol Revision
BISx FPGA Firmware revision	BISx Hardware Information
BISx DSC Firmware revision	BISx Hardware Information
BISx Hardware revision	BISx Hardware Information
BISx current date and time	BISx Time
User-input Institution date/time	Monitor Time
Number of data records expected	Number of History records on BISx
BISx start case date and time	BISx case start date and time
Case ID (for each case in the BISx)	Obtained from the BISx and based on Case, Clock Adjust or Event records (whichever is encountered first).
Clock adjustments	Obtained from BISx
Time updates	Obtained from BISx, giving both the record time (New) and the derived time (Old).
Log date and time	Obtained from the Monitor
Events	Obtained from the BIS History EVENT records.
Number of CLOCK ADJUST records received.	Obtained from BISx
Number of data records received.	Obtained from Monitor
Date and time when data collection ended, followed by 's' for "stop".	Monitor Time

Table 11: BIS History Marker File Items

A typical marker file is shown below:

```
BISx Serial Number : BX03583
BISx Software Revision: 1.4.6.21
BISx Interface Protocol Revision: 1.4.-1.-1
BISx FPGA Firmware Revision: 1.4.6.9
BISx DSC Firmware Revision: 3.0.6.16
BISx Hardware Revision: 3.0.0.0
BISx System Current Date/Time: 10/16/2007 17:40:54
Number of data records expected: 78888
BISx Time Derived (Old) Date/Time: 12/18/2006 01:17:00
BISx Time Record  (New) Date/Time: 12/18/2006 10:17:01
BISx Start Case Date/Time: 12/18/2006 07:37:33
Case_id:  Wn4X
BISx Time Derived (Old) Date/Time: 12/18/2006 08:37:59
BISx Time Record  (New) Date/Time: 12/18/2006 08:37:59
BISx Time Derived (Old) Date/Time: 12/18/2006 09:37:59
BISx Time Record  (New) Date/Time: 12/18/2006 09:37:59
BISx Start Case Date/Time: 12/18/2006 09:42:24
Case_id:  Wn4X
BISx Time Derived (Old) Date/Time: 12/18/2006 10:42:59
BISx Time Derived (Old) Date/Time: 03/27/2007 09:36:01
BISx Time Record  (New) Date/Time: 03/27/2007 09:36:01
Log date/time: 03/27/2007 11:23:43
Number of data records received: 78888
03/27/2007 11:23:43 s
```

6 Sensor History [VISTA Only]

Sensor History Export downloads sensor data from the BISx.

Sensor History file root name is **SDMMDDHHMM_SNXXXXX** where **MMDDHHMM** is the timestamp (month, day, hour, minute of initial file creation, and XXXXX is the BISx serial number.

Files are stored in *filename* directory (**SDMMDDHHMM_SNXXXXX**).

If a file with the same base name exists (e.g., if user starts, stops and re-starts export in the same minute), the file shall be overwritten.

The files created by Sensor History Export are shown in **Table 12: Sensor History Export Files**.

File Type	Extension	Description
Marker	.m_a	text file containing header, user and configuration data
Disposable Data	.sda	text file containing data for disposable sensor
Semi-Reus. Data	.ssa	text file containing data for semi-reusable cables sensor

Table 12: Sensor History Export Files

6.1 Sensor Data File

The Sensor Data file contains data for disposable sensors and the following fields, in order shown, in **Table 13: Sensor SD File**:

Field	**Description / Format**
LOTCODE	Decoded Lot Code formatted as MMDDYY plus uppercase character
SERNUM	Sensor Serial Number (1 to 16383)
SHELFLIF	Shelf Life: 1=6 months, 2 = 9 months, 3 = 12 months, 4 = 18 months, 5 = 24 months
USAGECNT	Usage Count - the number of available uses for this sensor.
STYPE	Sensor Type 2 digit unsigned number from 1-99
C_TIME01..44	Connect Times (up to 44 of these, blank if unused) - mm/dd/yyyy hh:mm:ss
CHECKSUM	For use by Aspect personnel

Table 13: Sensor SD File

A sample Sensor Data File:

The first line of the header record:

```
12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678
SENSOR  DATA     |VISTA   |    3.00|<CR><LF>
```

The second line of the header record:

```
12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678
LOTCODE |SERNUM  |SHELFLIF|USAGECNT|STYPE   |
C_TIME01           |C_TIME02           |C_TIME03           |C_TIME04           |C_TIME05           |
C_TIME06           |C_TIME07           |C_TIME08           |C_TIME09           |C_TIME10           |
C_TIME11           |C_TIME12           |C_TIME13           |C_TIME14           |C_TIME15           |
C_TIME16           |C_TIME17           |C_TIME18           |C_TIME19           |C_TIME20           |
C_TIME21           |C_TIME22           |C_TIME23           |C_TIME24           |C_TIME25           |
C_TIME26           |C_TIME27           |C_TIME28           |C_TIME29           |C_TIME30           |
C_TIME31           |C_TIME32           |C_TIME33           |C_TIME34           |C_TIME35           |
C_TIME36           |C_TIME37           |C_TIME38           |C_TIME39           |C_TIME40           |
C_TIME41           |C_TIME42           |C_TIME43           |C_TIME44           |CHECKSUM|<CR><LF>
```

Data: (one line for each sensor)

```
12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678
0427071D|     218|       5|       9|      14|
05/24/2007 18:37:48|05/24/2007 19:40:12|05/24/2007 20:42:25|05/24/2007 21:45:00|05/24/2007 22:47:12|
05/24/2007 23:49:40|05/25/2007 00:51:41|05/25/2007 01:54:00|05/25/2007 02:56:19|05/25/2007 03:58:42|
05/25/2007 05:01:19|05/25/2007 06:03:24|05/25/2007 07:05:52|05/25/2007 08:08:14|05/25/2007 09:10:36|
05/25/2007 10:13:02|05/25/2007 10:43:51|05/25/2007 10:53:50|05/25/2007 13:31:44|05/25/2007 18:02:04|
05/25/2007 19:04:27|05/25/2007 20:07:00|05/25/2007 21:09:10|05/25/2007 22:11:36|05/25/2007 23:14:12|
05/26/2007 00:16:24|05/26/2007 01:18:52|05/26/2007 02:21:16|05/26/2007 03:23:27|05/26/2007 04:25:45|
05/29/2007 10:08:35|05/29/2007 11:09:37|05/29/2007 11:48:24|06/01/2007 15:55:58|06/06/2007 17:04:49|
                   |                   |                   |                   |                   |
                   |                   |                   |                   |00008891|
```

6.2 Semi-Reusable Sensor Data File

The Semi-Reusable Sensor Data File contains the data for semi-reusable sensor cables and has the following fields, in order shown, in **Table 14: Semi-Reusable Sensor Data**.

Field	Description / Format
LOTCODE	Lot Code mmddyysm, mm=month, dd=day, yy=low order year, s=sensor type(1-7), m = manufacturing facility (blank or A)
SERNUM	Cable Serial Number Number from 1 to 4095
RECNUM	Record Number 1-23, giving the record sequence number for this cable
ST_USES	Usage count at beginning, or number of uses remaining in the cable when sensor first inserted
STYPE	Sensor Type
USESREM	Cable Usages Remaining (0-1024)
C_TIME01..23	Cable Usage Times (up to 23 of these, blank if unused) - mm/dd/yyyy hh:mm:ss
CHECKSUM	For use by Aspect personnel

Table 14: Semi-Reusable Sensor Data

A sample Semi-Reusable Sensor Data File:

The first line of the header record:

```
12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678
CABLE  DATA      |VISTA   |    3.00|<CR><LF>
```

Note: “3.00” refers to the Monitor Application Revision. The second line of the header record:

```
12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678
LOTCODE  |SERNUM  |RECNUM|ST_USES|STYPE|USESREM|
C_TIME01           |C_TIME02           |C_TIME03           |C_TIME04           |C_TIME05           |
C_TIME06           |C_TIME07           |C_TIME08           |C_TIME09           |C_TIME10           |
C_TIME11           |C_TIME12           |C_TIME13           |C_TIME14           |C_TIME15           |
C_TIME16           |C_TIME17           |C_TIME18           |C_TIME19           |C_TIME20           |
C_TIME21           |C_TIME22           |C_TIME23           |CHECKSUM|
```

Data: (one line for each record)

```
12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678
S1062105 |      70|     1|    103|   12|   7734|
                   |                   |                   |                   |                   |
                   |                   |                   |                   |                   |
                   |                   |                   |                   |                   |
                   |                   |                   |                   |                   |
                   |                   |                   |0000ab97|<CR><LF>
```

6.3 Marker File

The marker file contains information on number of sensor records and time of export, and BISx as shown below:

```
BISx serial number: BX015487
BISx software revision:  1.10.01.10
Number of data records expected: 27
Log date/time: 10/10/2007 13:47:32
Number of data records received: 27
Number of disposable records received: 27
Number of semi-reusable records received: 0

10/10/2007 13:47:41
```

7 Snapshot Data [VISTA Only]

Snapshots represent up to 10 minutes of previously captured EEG and processed variable data.

Snapshot file root name is **SMMDDHHMM** where **MMDDHHMM** is the timestamp (month, day, hour, minute of initial file creation. A list of Snapshot files is shown in **Table 15: Snapshot Files**.

Files are stored in *filename* directory (**SMMDDHHMM**).

The last letter of the file name extension ('a' below) is changed to the next available letter if a file with the same base name exists (e.g., if user starts, stops and re-starts export in the same minute).

File Type	Extension	Description
Header	.h_a	binary file containing configuration and other parameters
Raw Data	.r2a / .r4a	binary file containing 2 or 4 channel EEG Data
Processed Data	.spa	text file containing processed data variables
Marker	.m_a	text file containing header, user and configuration data
Time	.t_a	text file containing date and time of the snapshot
Offset	.o_a	text file containing configuration and other data
Artifact	.ara	binary file containing header and all artifact flag

Table 15: Snapshot Files

7.1 Header File

See Live Export 4.4 Header File.

7.2 Raw Data File

See Live Export 4.5 Raw (EEG) Data File. Any dropped EEG packets are replaced with zero (0) amplitude data.

7.3 Processed Data File

The Processed Data file is a text file, containing processed data variables with one line entry per second. Data are formatted into fields that are 8 characters wide, with the exception of the Time field, which is 19 characters wide. Fields are separated by the pipe character (|). Each line is terminated by a Carriage Return character (CR, 0x0d) followed by a Line Feed character (LF, 0x0a).

The data are formatted into the following fields, in the order specified, as shown in **Table 16: Snapshot Global Processed Data**:

Variable	Description	Format
Time	The initial time is calculated by subtracting the number of seconds of data, from the time the snapshot was marked. The time shall be incremented by one second for each data record.	MM/DD/YYYY hh:mm:ss where MM is the month, DD is the day, YYYY is the year, hh is the hour, mm is the minutes, and ss is the seconds.
SpSmooth BiSmooth LoFilter NotFiltr HiFilter		These fields are intentionally blanked
PIC-ID	Patient Interface Cable ID. Smart sensors combine the value from the sensor cable along with a sensor type value. PIC ID = ([sensor type] * 10) + [smart cable]	Right justified unsigned integer.

Table 16: Snapshot Global Processed Data

Additional 11 fields represent BISx processed variables and are repeated for each channel, as shown in **Table 17: Channel Snapshot Data File**:

Variable	**Description**	**Format / Range**
Suppression Ratio (SR)	The percentage of epochs in the past 63 seconds in which the EEG signal is considered suppressed. Value calculated by dividing burst_suppress_ratio by ten.	Formatted as a right-justified decimal number with a decimal point and one digit (0) to the right of the decimal point. 0.0 – 100.0%
Spectral Edge Frequency (SEF)	The frequency at which 95% of the total power lies below it and 5% lies above it.	Formatted as a right-justified decimal number with a decimal point and one digit (0) to the right of the decimal point. This field shall be blank for dual channel sensors. 0.5 - 30.0 Hz
BIS Bits (BISBIT)	Codes that represent features of the BIS algorithm being activated by EEG data characteristics; helpful for troubleshooting by Aspect personnel.	Formatted as 4 hex digits, right justified
BIS Value (B34…, DB1…)	The output from a multivariate discriminate analysis that quantifies the overall bispectral properties (frequency, power, and phase) throughout the entire frequency range.	Formatted as a right-justified decimal number with a decimal point and one digit (0) to the right of the decimal point. 0.0 – 100.0
Alternate BIS Value	See BIS	See BIS

Second Alternate BIS Value	See BIS	See BIS
Total Power (TOTP..)	Reserved	This field shall be blank
EMG	The absolute power in the 70-110 Hz range. The power value is reported in dB with respect to 0.0001μV2. All the artifact detection is turned off for this variable.	Formatted as a right-justified decimal number with a decimal point and one digit to the right of the decimal point. 0.0 – 100.0 dB
Signal Quality Index (SQI)	A measure of the signal quality for the EEG channel source(s) that is calculated based on impedance data, artifact, and other variables. Not affected by Suppression Ratio.	Formatted as a right-justified decimal number with a decimal point and one digit to the right of the decimal point. 0.0 - 100.0 %
Impedance (MPEDNCE)	The impedance value for that channel as detected by the continuous impedance check.	Formatted as a right-justified decimal number with a decimal point and one digit to the right of the decimal point. Values in Kohms
Artifact (ARTF2)	Artifact flags, or diagnostic codes, for that channel. The codes represent various hardware and software status conditions and are helpful for troubleshooting by Aspect personnel. Derived from second_artifact.	Formatted as 8 hex digits
BURST	Burst Count – an alternative means for measuring EEG suppression. Valid only when an Extend or Bilateral sensor is in use.	Formatted as a right-justified decimal number with a decimal point and one digit (0) to the right of the decimal point. 0.0 - 30.0 bursts/minute
RESVAR	Reserved Variable	0.0

Table 17: Channel Snapshot Data File

> **Note** Values set to 3276.8 are not valid outputs and thus should not be used. Values may be invalidated by low SQI, an unsupported feature or for other reasons.

7.3.1 Dual Channel Sensor Data

The first line of the header record is shown below

```
12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678
12345678 12345678

S_HDR3            |VISTA   |    3.00|        |        |        |        |
Ch1     |        |        |        |        |        |        |        |        |        |
        |        |
Ch2     |        |        |        |        |        |        |        |        |        |
        |        |<CR><LF>
```

The second line of the header record is shown below:

```
Time              |SpSmooth|BiSmooth|LoFilter|NotFiltr|HiFilter|PIC_ID  |
SR12    |SEF08   |BISBIT00|B34U05  |DB11U04 |DB13U01 |TOTPOW08|EMGLOW01|SQI10   |IMPEDNCE|ARTF2   |
BURST   |RESVR   |
SR12    |SEF08   |BISBIT00|B34U05  |DB11U04 |DB13U01 |TOTPOW08|EMGLOW01|SQI10   |IMPEDNCE|ARTF2   |
BURST   |RESVR   |<CR><LF>
```

All of the labels in the second and third rows except for “IMPEDNCE” originate from the BISx and thus may change in future revisions.

Each data record is shown below:

```
01/16/2007 09:32:29|        |        |        |        |        |      47|
     0.0|        |    20d5|    97.7|    97.7|    97.7|        |    53.0|    35.7|  6.6|00000000|
     1.0|     0.0|
     0.0|        |    20d5|    97.7|    97.7|    97.7|        |    53.0|   100.0|  9.0|00000000|
     1.0|     0.0|<CR><LF>
```

7.3.2 Bilateral (4 channel) Sensor Data (VISTA 3.00 or greater only)

The first line of the header record is shown below

```
12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678
12345678 12345678

S_HDR3            |VISTA   |    3.00|        |        |        |        |
Ch1     |        |        |        |        |        |        |        |        |        |        |
        |        |
Ch2     |        |        |        |        |        |        |        |        |        |        |
        |        |
Ch3     |        |        |        |        |        |        |        |        |        |        |
        |        |
Ch4     |        |        |        |        |        |        |        |        |        |        |
        |        |<CR><LF>
```

The second line of the bilateral header record is shown below:

```
Time              |SpSmooth|BiSmooth|LoFilter|NotFiltr|HiFilter|PIC_ID  |
SR12    |SEF08   |BISBIT00|DB13U01 |DB11U04 |B34U05  |TOTPOW08|EMGLOW01|SQI10   |IMPEDNCE|ARTF2   |
BURST   |RESVR   |
SR12    |SEF08   |BISBIT00|DB13U01 |DB11U04 |B34U05  |TOTPOW08|EMGLOW01|SQI10   |IMPEDNCE|ARTF2   |
BURST   |RESVR   |
SR12    |SEF08   |BISBIT00|DB13U01 |DB11U04 |B34U05  |TOTPOW08|EMGLOW01|SQI10   |IMPEDNCE|ARTF2   |
BURST   |RESVR   |
SR12    |SEF08   |BISBIT00|DB13U01 |DB11U04 |B34U05  |TOTPOW08|EMGLOW01|SQI10   |IMPEDNCE|ARTF2   |
BURST   |RESVR   |<CR><LF>
```

All of the labels in the second and third rows except for “IMPEDNCE” originate from the BISx and thus may change in future revisions.

Each data record is shown below:

```
12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678 12345678
12345678 12345678

06/13/2008 13:28:14|        |        |        |        |        |     147|
     0.0|        |    0600|    59.5|  3276.8|  3276.8|        |    25.2|    17.1|     9.4|00000000|
  3276.8|     0.0|
     0.0|        |    0600|    59.5|  3276.8|  3276.8|        |    25.2|    17.1|    10.7|00000000|
  3276.8|   128.0|
     0.0|        |    0600|    59.5|  3276.8|  3276.8|        |    25.2|    17.1|    10.7|00000000|
  3276.8|     0.0|
     0.0|        |    0600|    59.5|  3276.8|  3276.8|        |    25.2|    17.1|    10.6|00000000|
  3276.8|   128.0|<CR><LF>
```

7.4 Marker File

The marker file is a text file containing revision, time and sensor information.

A sample marker file:

```
Reason for recording: none
VISTA serial number: VT09396
Event date/time: 04/03/2008 17:47:21
Case ID: AM9o
VISTA application revision:  3.00
DSC ID: 10
PIC ID: 27
No. of processed packets: 600
No. of raw packets: 4800
Log date/time: 04/04/2007 11:01:57
04/04/2007 11:02:05 s
```

7.5 Time File

The Time File contains the date and time at which the Snapshot was marked:

```
04/03/2007 17:47:21
```

7.6 Offset File

See Live Data 4.4 Header File.

7.7 Artifact File

See Live Data 4.8 Artifact File.