ORTEC®

ORTEC Software
File Structure Manual
for DOS and Windows® Systems

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Advanced Measurement Technology, Inc.

a/k/a/ ORTEC®, a subsidiary of AMETEK®, Inc.

WARRANTY

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1. INTRODUCTION

This manual describes the file structure for the files used in the ORTEC MCA control software and the analysis software. These files are used to transfer information among the programs in these products and to store data for future use. Developers who wish to design programs to use these files or to create files that will be used by ORTEC software must adhere to the specifications given.

There are six types of files used:

- Message files (**.MSG**)
- Integer spectrum data files (**.CHN**)
- Analysis files (various extensions)
- Library files (**.LIB**)
- System files (various extensions)
- Table files (**.TBL**)

Other file types (**.BAT**, **.EXE**, **.COM**) are system files and defined in other manuals.

All real numbers used in these files conform to the IEEE real data type as implemented by Microsoft® and Intel®.

The files described here, especially the spectrum files and the analysis results files, have been expanded to include more information about the details of the spectrum collection and the analysis options. This was done to enable customers to better maintain their file archives and to support their QA requirements.

Programs written for the DOS operating system are no longer supported because they do not pass the Y2K tests. References to DOS in this manual are for the convenience of those using old programs and does not imply support.

2. MESSAGE FILES

2.1. DOS

The message files contain the operator prompts, keyword replies, and error messages for the programs. There is no internal file header. They are created as 64-byte fixed-length direct access records (i.e., there are no interrecord delimiters). Program MSGCOM is used to compile the random length sequential access records (i.e., there are interrecord delimiters), as from a text editor, into this format. The extension is **`.MSG`**.

2.2. Windows

The message (**`.TXT`**) and initialization files (**`.INI`**) contain the operator prompts, keyword replies, startup conditions, and error messages for the programs. There is no internal file header. They are created as random length, sequential access records (i.e., there are interrecord delimiters). They are read by the program as text files and require no processing.

3. EMULATOR FILES

3.1. Integer Data Files (.CHN)

.CHN files can be produced by the pulse-height analysis (PHA) programs (A63-BI, A64-BI, A65-BI, and A65-B32), Transfer Program (A48-BI), Applications Manager (A18-BI), analysis programs (A30-BI, A34-BI, A66-BI, and A66-B32) and others.

The **.CHN** integer data files contain the channel-by-channel contents of the MCB. The header is 32-bytes long and contains the following:

Byte Offset	Byte Length	Use
0	2	Must be –1
2	2	MCA number or Detector number
4	2	Segment number (set to 1 in UMCBI)
6	2	ASCII seconds of start time
8	4	Real Time (increments of 20 ms) (4-byte integer)
12	4	Live Time (increments of 20 ms) (4-byte integer)
16	8	Start date as ASCII DDMMMYY* or binary zeros, if not known. The * character should be ignored if it is not a "1". If it is a "1", it indicates the data is after the year 2000.
24	4	Start time as ASCII HHMM or binary zeros, if not known (see Byte 6 above)
28	2	Channel offset of data
30	2	Number of channels (length of data)

The next part of the file contains the spectrum stored as 4-byte integers. There are no record separators in the file. The number of spectrum records is determined by the number of channels in the spectrum.

3.1.1. Early Versions

The last part of the spectrum file contains additional descriptive information about the spectrum, as follows (the byte offsets are relative to the end of the spectrum) for all DOS versions, for GammaVision® V2 and below, MAESTRO® for Windows V3 and below:

Byte Offset	Byte Length	Use
0	2	Must be –101
2	2	Reserved
4	4	Energy calibration zero intercept, 0.0 for uncalibrated spectrum (4-byte real)

8	4	Energy calibration slope, 1.0 for uncalibrated spectrum (4-byte real)
12	4	Reserved
16	4	Peak shape calibration zero intercept, 1.0 for uncalibrated spectrum (4-byte real)
20	4	Peak shape calibration slope, 0.0 for uncalibrated spectrum (4-byte real)
24	232	Reserved
256	1	Length of detector description
257	63	Detector description
320	1	Length of sample description
321	63	Sample description
384	128	Reserved (The total length is 512 bytes)

This file is also created by STORE (A18-BI) and XFER (A48-BI).

3.1.2. New Versions

The last part of the spectrum file contains additional descriptive information about the spectrum, as follows (the byte offsets are relative to the end of the spectrum) for GammaVision V2.2 and later, MAESTRO V3.1 and later, MicroMCB and all versions of programs for Windows 95/98/NT:

Byte Offset	Byte Length	Use
0	2	Must be −102
2	2	Reserved
4	4	Energy calibration zero intercept, 0.0 for uncalibrated spectrum (4-byte real)
8	4	Energy calibration slope, 1.0 for uncalibrated spectrum (4-byte real)
12	4	Energy calibration quadratic term, 0.0 for uncalibrated spectrum (4-byte real)
16	4	Peak shape calibration zero intercept, 1.0 for uncalibrated spectrum (4-byte real)
20	4	Peak shape calibration slope, 0.0 for uncalibrated spectrum (4-byte real)
24	4	Peak shape calibration quadratic term, 0.0 for uncalibrated spectrum (4-byte real)
28	228	Reserved
256	1	Length of detector description
257	63	Detector description
320	1	Length of sample description
321	63	Sample description
384	128	Reserved (The total length is 512 bytes)

3.1.3. Old AlphaVision Version

The old (A36-BI) versions of AlphaVision used the following **.CHN** files. This file type is not used in the new (A36-B32) versions. See Section 4.14 for the new AlphaVision spectrum files.

Byte Offset	Byte Length	Use
0	2	Must be −102
2	2	Reserved
4	4	Energy calibration zero intercept, 0.0 for uncalibrated spectrum (4-byte real)
8	4	Energy calibration slope, 1.0 for uncalibrated spectrum (4-byte real)
12	4	Energy calibration quadratic term, 0.0 for uncalibrated spectrum (4-byte real)
16	4	Peak shape calibration zero intercept, 1.0 for uncalibrated spectrum (4-byte real)
20	4	Peak shape calibration slope, 0.0 for uncalibrated spectrum (4-byte real)
24	4	Peak shape calibration quadratic term, 0.0 for uncalibrated spectrum (4-byte real)
28	228	Reserved
256	1	Length of detector description
257	63	Detector description
320	1	Length of sample description
321	63	Sample description
384	4	AlphaVision ID must be 0x53495641
388	32	Sample type name
420	10	ASCII collection date
430	10	ASCII collection time
440	4	Total volume of sample
444	4	Aliquot volume of sample
448	4	Tracer amount (DPM)
450	2	Volume units
454	4	Detector efficiency
458	4	Old calibration intercept
462	4	Old calibration slope
466	4	Old calibration shape
470	4	Old calibration efficiency
474	4	Old background counts
478	4	Old background CPM
482	30	Group Name

3.2. ROI Files

This file is created by SAVE ROI and contains a list of the start and stop channels for the ROIs in the display. The file contents are as follows:

Byte Offset	Byte Length	Use
0	2	Must be −2
2	2	Start channel number of first ROI
4	2	Stop channel number of first ROI
.	.	.
.	.	.
.	.	.
		Continue for all ROIs in the display
n	2	Start channel = −1 is end of data

3.3. Start Files

This file is written by the DOS Emulator (A63-BI) to store the start time and date of the MCB/Segment data. It is used by Emulator when storing the data on disk. There is no header block. This file is not used in any Windows program. The contents are:

Byte Offset	Type	Use
0	I*2	File type = −4
2		Unused
16	C*8	Start date as MMM-DD-YY
24	C*8	Start time as HH:MM:SS
28		Unused

This file is put in the default directory.

3.4. Other Files

The file **`PRECAL.MCB`** is used for internal data transfer in the DOS Emulator. The contents are reserved.

4. ANALYSIS FILES

4.1. Inform Structure

The analysis files are written in a defined format called the inform structure. This is a format that allows great flexibility in the use and contents of the file. The header record contains the definition of the contents and their position(s) in the file. As all of the inform files are dynamically allocated, the first record must be carefully used, and must be modified if the file is modified. If the particular record type doesn't exist in the file, the pointer is zero or negative. The recommended (or default) extension is given in the following. The file extension does not, however, override the file-type bits set in the file. All inform files have a record length of 128 bytes with no interrecord delimiter.

Significant changes have been made for analysis software files for Windows 95/98/NT.

4.2. Analysis Parameters Files

An analysis parameters file is created by GERPAR (B30) or MINPAR (A34) and contains the analysis parameters used in the analysis. The file extension is **.PRM**. The first record in this file contains the pointers to the four analysis parameters records (Words 9 through 12).

Word Number	Use
1	Must be 1
2	Must be 32
3–8	Reserved
9	First analysis parameters record pointer
10	Second analysis parameters record pointer
11	Third analysis parameters record pointer
12	Hardware parameters record pointer
13–27	Reserved
28	Maximum record number ever used
29	Maximum record number in use
30–69	Reserved

4.2.1. Germanium Parameters

The first two records are used for germanium analysis (A34 and B30). The files are not produced by GammaVision but the analysis parameters records in the spectrum and other files are in this format. The first germanium record contains the following data:

Word Number	Local Name	Type	Use
1	GELI	I*2	Bit 0 must be 1 for germanium. Bit 14 = 1 for extended analysis records.
2	FCHAN	I*2	Start channel for analysis
3	LCHAN	I*2	Stop channel for analysis
4	SIGMA	I*2	Standard deviation for uncertainty (1, 2, or 3)
5	UNPEKS	I*2	Maximum number of unused peaks allowed
6	ENGCAL	I*2	True if spectrum is energy-calibrated
7	DECDUR	L*2	Decay during acquisition flag
8	FORM	I*2	1 = Count as %, 2 = Count as activity, 3 = Count and total as %, 4 = Count and total as activity
9	GAMMA3	L*2	(Old) True to enable peak interference correction (Gamma 3)
		I*2	(New) Analysis flag controls as follows (true if bit set to 1)

Bit	Description
Bit 0	Enable library peak stripping
Bit 1	Enable average energy calculation
Bit 2	Enable iodine equivalence
Bit 3	Write ASCII report
Bit 4	Report RPG
Bit 5	Run at high priority
Bit 6	Directed fit flag
Bit 7	Use GV Report Writer
Bit 8	Manual peak stripping
Bit 9	Use collection dates
Bit 10	Enable TCC analysis
Bit 11	Display analysis results
Bit 12–16	Reserved

10	MPCON	L*2	Maximum permissible concentration on/off
11	PBCOR	L*2	Peaked background correction on/off
12	RNDSUM	L*2	Random summing on/off
13	DECAY	L*2	Decay correction on/off
14	GEOM	L*2	Geometry correction on/off
15	FACCOR	R*4	Reserved
17	EFCALB	L*2	True if spectrum is efficiency-calibrated
18	MDATYP	I*2	MDA type, 1 to 20 (see B30 manual)
19	LIBNOT	L*2	True if analysis library found
20	LSTISO	L*2	True if isotopic abundance output requested

21	FIVE	I*2	1 = Automatic background, 2 = five-point background width only, 3 = 3-point background, 4 = minimum point
22	SENS	R*4	Sensitivity
24	RECFCT	R*4	Reserved
25	DETIDN	I*2	Detector identification number
26	MATISO	L*2	True if isotopic/peak output requested
27	MATCHN	I*2	Output print control, true if bit set to 1. Bit — Description Bit 0 — Print library peak list Bit 1 — Print unknown peak list Bit 2–16 — Reserved
28	RSFCT	R*4	Random summing factor
30	SORFCT	R*4	Absorption factor
32	DAYS	R*8	Decay correction date in DECDAY format. Days since 1Jan79. The example time date, 2Jan79 12:00:00, is 1.5
36	SAMWGH	R*4	Sample weight
38	UFCTN	R*4	Units factor numerator
40	UFCTD	R*4	Units factor denominator
42	IRRAD	R*4	Reserved
44	PKRPRO	R*4	Additional random error
46	GERPRO	R*4	Additional systematic error
48	UNITS	C*1	Units name in ASCII (14 characters)
55	CORDAT	C*1	Date in ASCII (DD-MMM-YY*) (10 characters)
60	CORTIM	C*1	Time in ASCII (HH:MM:SS) (8 characters)
64	SORP	L*2	Absorption correction flag

The DECDAY format is defined to be a double precision real number that represents the number of days since 1-JAN-79. For dates before this date the number is negative.

The extended analysis record follows the above and contains:

Word Number	Use
1–2	Fraction Limit test in percent
3–4	Unknown peak cutoff (REN-B32-G)
5	Divide activity by weight
6–7	Half-lives decay limit
8–9	Activity range factor

10–11	Minimum step background energy
12	Second MDA type
13–16	Analysis version
17–32	Reserved
33–48	Second library for manual peak strip
49–64	Third library for manual peak strip

The second germanium record contains the library names used in the analysis.

Word Number	Local Name	Type	Use
1	LIB1	C*32	First nuclide library filename
17	LIB2	C*32	Attenuation filename
33	LIB3	C*32	Geometry correction filename
49	PBCFIL	C*32	Peaked background correction filename

If long filenames are enabled, then the following 8 sequential records are defined as follows:

1+2	256 characters for LIB1
3+4	256 characters for Attenuation filename
5+6	256 characters for Geometry filename
7+8	256 characters for PBC filename

The third germanium record contains more filenames used in the analysis.

Word Number	Local Name	Type	Use
1	RPGPROG	C*32	MPCFIL
17	RPTOUT	C*32	Report filename
33	SUSLIB	C*32	Suspected nuclide file
49	ANLPROG	C*32	Analysis executable name

If long filenames are enabled, then the following 8 sequential records are defined as follows:

1+2	MPCFIL filename
3+4	Report filename
5+6	Suspected nuclide file
7+8	Analysis executable name

4.2.2. Sodium Iodide Parameters

Analysis parameters record structure:

Word Number	Local Name	Type
1	GELI	Low byte must be 2; if bit 14 is 1, the extended analysis record is included
2	FCHAN	Start channel for analysis
3	LCHAN	Last channel
4	SIGMA	Standard deviation for uncertainty (1, 2, or 3)
5	UNPEKS	Maximum number of unused peaks allowed
6	ENGCAL	Spectrum is energy calibrated?
7	DECDUR	Decay during acquisition?
8	FORM	(1 = Count as %, 2 = Count as activity, 3 = Count and total %, 4 = Count and total activity)
9	GAMMA3	Bit / Description if = 1 0 Enable library peak stripping 1 Enable average energy calc 2 Enable iodine equivalence 3 Save report as file 4 Report RPG 5 Run at high priority 6 Directed fit flag 7 Use the GammaVision Report Writer 8 Fix the linear background fit 9 Report to printer 10 Report MDA (RENAISSANCE) 11 Report individual detectors (RENAISSANCE-32)
10	MPCON	Maximum permissible concentration
11	PBCOR	Peaked background correction
12	RNDSUM	Random summing correction
13–14	DECAY	Calculation of ICRFAC
15–16	FACCOR	(Usually 0.5) acceptance width for identification of peak to library
17	EFFCALB	Spectrum is efficiency calibrated
18	MDATYP	MDA type
19	LIBNOT	Analysis library found?

20	LSTISO	Isotopic abundance listing requested
21	FIVE:	Background type
22–23	SENS	Peak error cut off
24–25		Peak cutoff
26	MATISO	Isotopic/peak output requested?
27	MATCHN	Energy/peak output requested
28–29		Linear background energy
28–29	RSFCT	Random summing factor
30–31	SORFCT	Absorption factor
32–35	DAYS	DECDAY format of decay correction date CORDAT,CORTIM
36	SAMWGH	Sample weight or volume
38	UFCTN	Units factor numerator
40	UFCTD	Units factor denominator
42–43		Sample collection time
44–45		Fraction limit
46–47		Decay limit
48–54	UNITS	Units name
55–59	CORDAT	Decay correction date (DD-MMM-YY*) (sample collection date)
60–63	CORTIM	Decay correction time (HH:MM:SS) (sample collection time)
64	SORP	Absorption correction

Analysis Parameters Extension 1 Record

This record follows next if bit 14, word 1 above is set to 1.

Word Number	Use
1	1 = use peak cutoff, 0 = critical level cutoff
2	Directed fit flag
3–4	Fraction limit test in percent
5	Divide activity by weight (REN-B32 only)
5–64	Reserved

Record 2

The second sodium iodide record contains the library names used in the analysis.

Word Number	Local Name	Type	Use
1	LIB1	C*32	First nuclide library filename
17	LIB2	C*32	Attenuation filename
33	LIB3	C*32	Geometry correction filename
49	PBCFIL	C*32	Peaked background correction filename

If long filenames are enabled, then the following 8 sequential records are defined as follows:

1+2	256 characters for LIB1
3+4	256 characters for attenuation filename
5+6	256 characters for geometry filename
7+8	256 characters for PBC filename

Record 3

The third sodium iodide record contains more filenames used in the analysis.

Word Number	Local Name	Type	Use
1	RPGPROG	C*32	MPCFIL
17	RPTOUT	C*32	Report filename
33	SUSLIB	C*32	Suspected nuclide file
49	ANLPROG	C*32	Analysis executable name

If long filenames are enabled, then the following 8 sequential records are defined as follows:

1+2	MPCFIL filename
3+4	Report filename
5+6	Suspected nuclide file
7+8	Analysis executable name

4.2.3. AlphaVision Parameters

AlphaVision analysis record 1.

Word Number	Use
0	must be 4
1	AlphaVision ID, must be Ox53495641
2	Sample type name
18	ASCII collection date
23	ASCII collection time
27	Total Volume of sample
29	Aliquot Volume of sample
31	Tracer amount (DPM)
33	Tracer units
34	Detector Efficiency
36	Old calibration intercep
38	Old calibration slope
40	Old calibration shape
42	Old calibration efficiency
44	Old background counts
46	Old background CPM
48	Group name
54–255	Reserved
256	Calibration intercept
258	Calibration slope (1.0 = none)
260	Calibration shape (5.93)
262	Peak shape intercept (1.0 = none)
264	Peak shape slope (0.0 = none)
266	Peak shape
268	Calibration units
270	Efficiency
272–329	Reserved
330	Detector description length
331–362	Detector description
363	Sample description length
364–385	Sample description
386–511	Reserved

Analysis records 2 and 3 are not used in AlphaVision.

4.3. Calibration Files

A calibration file is created by the calibration program and contains the calibration information used in the analysis programs. The filename extension should be **.CLB**. This file contains the calibration description (if any), the calibration parameter records, and the efficiency pairs records (if any). The calibration file contents are:

Word Number	Use
1	Must be 1
2	Must be 256
3	Contents flag Bit 0 = 1 for long filename Bit 1 = 1 for ZDT spectrum and ROI in file.
16	Reserved
17	Calibration description record pointer
18	First calibration data record pointer
19	Second calibration data record pointer
20	Efficiency pairs record pointer (first record)
21	Reserved
22	Energy pairs record pointer (first record)
23	Number of energy pairs records (first record)
24–27	Reserved
28	Maximum record number ever used
29	Maximum record number in use
30	Number of efficiency pairs records (See Word 20)
31–64	Reserved

4.3.1. Calibration Description Record

The calibration description record contains the user-supplied description of the calibration parameters. The record is divided into two 64-character lines of ASCII text. The first 64 characters are used for the energy calibration and the second 64 characters for the efficiency calibration.

4.3.2. Calibration Parameter Records

The first calibration data record contains the various coefficients produced by the calibration program, as described below. Note that the FWHM coefficients (FC(i)) produce the FWHM in channels, while the programs usually display the FWHM in energy units.

4.3.2.1. Germanium Calibration

Word Number	Local Name	Type	Use
1	AFIT	I*2	Above knee efficiency calibration fit type
2	BFIT	I*2	Below knee efficiency calibration fit type
3	EFFPRS	I*2	Number of efficiency pairs
4	NCH	I*2	Number of channels in spectrum
5	KNEE	R*4	Detector knee (keV)
7	ASIG	R*4	2-sigma uncertainty above knee
9	BSIG	R*4	2-sigma uncertainty below knee
11	EC(1)	R*4	Energy vs. channel coefficient A
13	EC(2)	R*4	Energy vs. channel coefficient B
15	EC(3)	R*4	Energy vs. channel coefficient C
17	FC(1)	R*4	FWHM vs. channel coefficient A
19	FC(2)	R*4	FWHM vs. channel coefficient B
21	FC(3)	R*4	FWHM vs. channel coefficient C
23	PE(1)	R*4	Above knee efficiency vs. energy coefficient A or polynomial coefficient (1)
25	PE(2)	R*4	Above knee efficiency vs. energy coefficient B or polynomial coefficient (2)
27	PE(3)	R*4	Above knee efficiency vs. energy coefficient C or polynomial coefficient (3)
29	SE(1)	R*4	Below knee efficiency vs. energy coefficient A or polynomial coefficient (4)
31	SE(2)	R*4	Below knee efficiency vs. energy coefficient B or polynomial coefficient (5)
33	SE(3)	R*4	Below knee efficiency vs. energy coefficient C or polynomial coefficient (6)
35	FWHTYP	I*2	FWHM type
36	PETYPE		True for p-type
37			MAESTRO peak-search sensitivity
38	ENGPRS	I*2	Number of energy pairs
39	DETNUM	I*2	Detector number
40	NBKNEE	I*2	Number of calibration points below knee
41	ENA2	R*4	Temp energy calibration
43	ENB2	R*4	Temp energy calibration
45	ENC2	R*4	Temp energy calibration
47	CALUNC	R*4	Calibration source uncertainty
49	CALDIF	R*4	Energy calibration difference
51	R(7)	R*4	Polynomial coefficient 7
53	R(8)	R*4	Polynomial coefficient 8

55	R(9)	R*4	Polynomial coefficient 9
57	R(10)	R*4	Polynomial coefficient 10
59–60			Low channel FWHM error
61–62			High channel FWHM error
63			Low channel limit for calibrating
64	STYPEFLAG	I*2	True = next record has TCC data

This record contains the TCC calibration information and the standard efficiency certificate data

Word Number	Use
1–2	Number of TCC calibration records including this one
3	First certificate record pointer
4	First total record pointer
5–6	Reserved
7–8	Number of certificate energies
9–10	Number peak-to-total pairs
11–12	Reserved
13–16	Peak-to-total fit intercept
17–20	Peak-to-total fit slope
21–24	LTS efficiency intercept
25–28	LTS efficiency slope
29–32	LTS efficiency quadratic
33–34	Live-time preset for energy calibration
35–36	Live-time preset for efficiency calibration
37–38	Live-time preset for background
39–40	Calibration SPC live time
41	Absorber flag: 0 = without absorber 1 = with absorber
42	TCC calibration method 0 = multiple point source 1 = single point source 2 = single extended source
43–47	TCC calibration date
48–51	TCC calibration time
52–64	Unused

First Certificate Record

Word Number	Use
1–4	Isotope name
5–8	Isotope half-life in days
9–12	Peak energy
13–16	Branching ratio (%)
17–20	Measured value
21–24	Fitted value
25–28	Error in fit
29–33	Certificate date
34–37	Certificate time
38	Activity units
39–40	Live time for peak-to-total analysis
41–64	Unused

First Total Record

The total record contains the peak-to-total ratio for the isotope and energy given. There are two entries per record. The record is repeated for as many times as needed for the complete list.

Word Number	Use
	Words 1–32 are for the first isotope in record
1– 4	Isotope name (ASCII)
5–8	Peak energy
9–12	Fitted value
13–16	Peak-to-total ratio
17–20	Difference between the fit and ratio
21–22	Live time
23–32	Unused
	Words 33–64 are for the second isotope in record
33–36	Isotope name (ASCII)
37–40	Peak energy
41–44	Fitted value
45–48	Peak-to-total ratio
49–52	Difference between the fit and ratio
53–54	Live time
55–64	Unused

Second Calibration Data Record

Word Number	Local Name	Type	Use
1	CALSPC	C*1	Filename in ASCII original calibration file (32 characters)
17	CREDAT	C*1	ASCII date calibration file was created (10 characters). The last character should be ignored if it is not a "1". If it is a "1", it indicates the data is after the year 2000.
22	CRETIM	C*1	ASCII time calibration file was created (8 characters)
26–32			Reserved
33	EFFDAT	C*1	ASCII date when spectrum for efficiency calibration was collected (10 characters)
38	EFFTIM	C*1	ASCII time efficiency calibration file was created (8 characters)
42–64			Unused

If long filenames are enabled, then the following 2 sequential records are defined as follows:

1+2	Filename in ASCII original calibration file

The energy channel pairs are stored as three records for peak centroid, three records for peak energy, and three records for peak FWHM. The three records each contain 32 four-byte real numbers for a total of 96 data points. The three sets of numbers are arranged in ascending energy order. The records are stored sequentially beginning with the record number in Word 22 of the first record. They are in the following order:

Word-22	Contents
+0	Centroid values from 1 to 32
+1	Energy values from 1 to 32
+2	FWHM values from 1 to 32
+3	Centroid values from 33 to 64
+4	Energy values from 33 to 64
+5	FWHM values from 33 to 64
+6	Centroid values from 65 to 96
+7	Energy values from 65 to 96
+8	FWHM values from 65 to 96

The following is a description of an efficiency pairs record(s). The first such record is pointed to by Word 20 of the first record; the remaining records (if any) are positioned sequentially for the number of records in Word 30 of the first record.

Word Number	Local Name	Type	Use
1	EFF(1,1)	R*4	Energy of first energy-efficiency pair in keV
3	EFF(2,1)	R*4	Efficiency of first energy-efficiency pair
5	EFF(1,2)	R*4	Energy of second energy-efficiency pair in keV
.	. .	.	
.	. .	.	
.	. .	.	
61	EFF(1,16)	R*4	Energy of 16th energy-efficiency pair in keV
63	EFF(2,16)	R*4	Efficiency of 16th energy-efficiency pair

4.3.2.2. Sodium Iodide Calibration

Record 1 (only valid if first analysis record, word 1 is 2 in the low byte)

Byte Number	Type	Use
1	AFIT	Above-knee efficiency calibration fit type (0 = None; 1 = Interp; 2 = Linear; 3 = Quad; 4 = Cubic)
2	DETNUM	Detector number
3	EFFPRS	# of efficiency pairs for interpolation
4	NCH	No. of channels in spectrum
5–6	ASIG	Error in fit above knee (2-sigma uncertainty)
7–8		Error in FWHM at bottom channel
9–10		Error in FWHM at top channel
11–16		Energy calibration (offset, linear, quadratic parameters)
17–22		FWHM calibration (offset, linear, quadratic parameters)
23–30	RE(1–4)	Cubic efficiency fit
31	ENGPRS	Number of energy triples
32–33	CALUNC	Calibration source uncertainty Record 2 (only valid if first analysis record, word 1 is 2 in the low byte)

Byte Number	Type	Use
1–128	CALSPC	Filename in ASCII for original calibration file
129–135	CREDAT	ASCII calibration creation date
136–140	CRETIM	ASCII calibration creation time

141–146	EFFDAT	ASCII date when spectrum for efficiency calibration was collected
147–151	EFFTIM	ASCII time when spectrum for efficiency calibration was collected
152–184		Description line 1
184–216		Description line 2
217–512		Reserved

4.4. Detector Description Files

A detector description file is created by the Detector program (A18) and contains the detector description input by the operator. The file extension should be **.DET**. These are not used in Windows programs. The contents of the file are:

Record 1

Word Number	Use
1	Must be 1
2	Must be 16
3–6	Reserved
7	Detector description record pointer
8–27	Unused
28	Maximum record number ever used
29	Maximum record number in use
30–50	Reserved
51	Detector identification number
52–64	Reserved

4.4.1. Detector Description Record

The detector description record contains the user-supplied description of the detector used to acquire the spectrum. The record is divided into two 64-character lines of text.

4.5. Old Geometry Correction Files

A geometry correction file is created by the program GEO (A30) and contains the correction information used in the analysis program (A30). The contents are:

Record 1

Word Number	Use
1	Must be 1
2	Must be 128
3–14	Reserved
15	Geometry correction description record pointer
16	Geometry correction data record pointer
17–27	Reserved
28	Maximum record number ever used
29	Maximum record number in use
30–64	Reserved

4.5.1. Geometry Correction Data Record

The geometry correction data record contains the data required to perform geometry correction. The record is as follows:

Word Number	Local Name	Type	Use
1	GEKEV(1)	R*4	Energy of the first datum in keV
3	GEKEV(2)	R*4	Energy of the second datum in keV
.	.	.	
.	.	.	
.	.	.	
31	GEKEV(16)	R*4	Energy of the 16th datum in keV
33	GEVAL(1)	R*4	Correction value for the first datum
35	GEVAL(2)	R*4	Correction value for the second datum
.	.	.	
.	.	.	
.	.	.	
63	GEVAL(16)	R*4	Correction value for the 16th datum

4.5.2. Geometry Correction Description Record

The geometry correction description record contains information about the data on the geometry correction data record. Note that this record differs from the geometry record in the **`.UFO`** file (Section 4.15.5). The record is as follows:

Word Number	Local Name	Type	Use
1	NPAIRS	I*2	Number of data pairs on data record
2	DTYPE	I*2	1 indicates geometry correction
3	GDETID	I*2	Detector identification number
4	DATE1	C*1	Date geometry file was created (DD-MMM-YY*) (10 characters). The * character should be ignored if it is not a "1". If it is a "1", it indicates the data is after the year 2000.
9	TIME1	C*1	Time geometry file was created (HH:MM:SS) (8 characters)
13	FILESP	C*1	Original geometry filename in ASCII (32 characters)
29	IDENT	C*1	Detector description in ASCII (32 characters)
49–64			Reserved

4.6. New Geometry Correction Files

The new geometry correction master file is written by GammaVision and contains the energy, Area1, Area2, ratio values, reference file, current file, and Detector ID. It has a file extension of **.GEO**. This file contains the following format, which is the same as the **.SOR** file format:

Line 1:	date and time
Line 1:	header
Lines 2–n:	Energy, Area1, Area2, Ratio values
blank line	
Length:	(absorption only)
blank line	(absorption only)
Reference File:	
Current File:	
blank line	
Detector ID:	(geometry only)

If long filenames are enabled, then the following 4 sequential records are defined as follows:

1+2	Reference UFO
3+4	Current UFO

4.7. Sample Description Files

A sample description file is written by the program SAMPLE (A18) and contains the sample description entered by the operator. It has a file extension of **.SMP**. This file is not used in GammaVision. This file contains the following:

Record 1

Word Number	Use
1	Must be 1
2	Must be 8
3–5	Reserved
6	Sample description record pointer
7–27	Reserved
28	Maximum record number ever used
29	Maximum record number in use
30–64	Reserved

4.7.1. Sample Description Record

This record is 128 ASCII characters split into two 64-character lines exactly as input by the operator. Unused characters are set ASCII spaces.

4.8. ROI File

The ROI (region-of-interest) file is created by the program ROIDEFIN (A18) and contains the definition of the regions of interest entered by the operator. The file contents are as follows:

4.8.1. Record 1

Word Number	Use
1	Must be 1
2	Must be 2048
3–20	Reserved
21	Record number of the first of the two ROI records
22–27	Reserved
28	Maximum record number ever used
29	Maximum record number in use
30–64	Reserved

4.8.2. ROI Data Record 1 and 2

There are two ROI data records, each record containing 64 short integer (2 byte) values. The first record contains the starting channel number for up to 64 ROIs. The second record, which always follows ROI Record 1, contains the number of channels for each of up to 64 ROIs. Undefined ROIs will have −1 as start channel number. Entries in Record 2 for undefined ROIs are undefined, but should be written as −1. The records are formatted as follows:

ROI Record 1

Word Number	Type	Use
1	I*2	Start channel number for ROI 1
2	I*2	Start channel number for ROI 2
3	I*2	Start channel number for ROI 3
.	.	.
.	.	.
.	.	.
64	I*2	Start channel number for ROI 64ROI Record 2

Word Number	Type	Use
1	I*2	Number of channels in ROI 1
2	I*2	Number of channels in ROI 2
3	I*2	Number of channels in ROI 3
.	.	.
.	.	.
.	.	.
64	I*2	Number of channels in ROI 64

4.9. Old Absorption Correction Files

The absorption correction file is written by the SOR program (A30) and contains the correction information used by the analysis programs. The contents of the file are as follows:

Word Number	Use
1	Must be 1
3	Must be 64
3–12	Reserved
13	Absorption correction description record pointer
14	Absorption correction data record pointer

15–27	Reserved
28	Maximum record number ever used
29	Maximum record number in use
30–64	Reserved

4.9.1. Absorption Correction Data Record

The absorption correction data record contains the data required to perform absorption correction. The record is formatted as follows:

Word Number	Local Name	Type	Use
1	SRKEV(1)	R*4	Energy of the first datum in keV
3	SRKEV(2)	R*4	Energy of the second datum in keV
.	.	.	
.	.	.	
.	.	.	
31	SRKEV(16)	R*4	Energy of the 16th datum in keV
33	SRVAL(1)	R*4	Correction value for the first datum
35	SRVAL(2)	R*4	Correction value for the second datum
.	.	.	
.	.	.	
.	.	.	
63	SRVAL(16)	R*4	Correction value for the 16th datum

4.9.2. Absorption Correction Description Record

The absorption correction description record, indexed by Word 13 of the first record, contains information about the data contained on the absorption correction data record. See also the UFO Absorption record (Section 4.15.4). The record is formatted as follows:

Word Number	Local Name	Type	Use
1	NPAIRS	I*2	Number of data pairs in data record
2	DTYPE	I*2	2 = internal, 4 = external
3		C*2	Reserved
4	DATE1	C*10	Date absorption file was created (DD-Mmm-YY); (stored as 10 ASCII characters). The * character should be ignored if it is not a "1". If it is a "1", it indicates the data is after the year 2000.

9	TIME1	C*1	Time absorption file was created (HH:MM:SS); (stored as 8 ASCII characters)
14		C*2	Reserved
16	FILESP	C*1	Original absorption (stored as 32 ASCII characters)
32		C*2	Reserved
33	IDENT	C*1	Unit of measure as 30 ASCII characters (e.g., grams)
49–64			Reserved

4.10. New Absorption Correction Files

The new absorption correction master file is written by GammaVision and contains the energy, area1, area2, ratio values, length, reference file, current file, and Detector ID. It has a file extension of **.SOR**. This file contains the following format, which is the same as the **.GEO** file format:

Line 1:	date and time
Line 1:	header
Lines 2–n:	Energy, Area1, Area2, Ratio values
blank line	
Length:	(absorption only)
blank line	(absorption only)
Reference File:	
Current File:	
blank line	
Detector ID:	(geometry only)

If long filenames are enabled, then the following 4 sequential records are defined as follows:

1+2	Reference UFO
3+4	Current UFO

4.11. Real Format Spectrum Files

A real format spectrum file is created by the program CONVERT (A18) and the file extension should be **.SPC**. This file contains a spectrum and the associated information required to analyze the spectrum. The associated information is obtained from other files related to the MCA and segment that acquired the spectrum and are merged by CONVERT.

The contents of the real format spectrum files are:

4.11.1. Record 1

Word Number	Local Name	Type	Use
1	INFTYP	I*2	Must be 1
2	FILTYP	I*2	Must be 5
3			Contents flag Bit 0 = 1 for long filename Bit 1 = 1 for ZDT spectrum and ROI in file
4			Reserved
5	ACQIRP	I*2	Acquisition information record pointer
6	SAMDRP	I*2	Sample description record pointer
7	DETDRP	I*2	Detector description record pointer
8	EBRDESC	I*2	EBR description record pointer
9	ANARP1	I*2	First analysis parameters record pointer
10	ANARP2	I*2	Second analysis parameters record pointer
11	ANARP3	I*2	Third analysis parameters record pointer
12	ANARP4	I*2	Fourth analysis parameters record pointer
13	SRPDES	I*2	Absorption correction description record pointer
14	IEQDESC	I*2	IEQ description record pointer
15	GEODES	I*2	Geometry correction description record pointer
16	MPCDESC	I*2	MPC description record pointer
17	CALDES	I*2	Calibration description record pointer
18	CALRP1	I*2	First calibration data record pointer
19	CALRP2	I*2	Second calibration data record pointer
20	EFFPRP	I*2	Efficiency pairs record pointer (first record)
21	ROIRP1	I*2	Record number of the first of the two ROI records
22			Energy pairs record pointer
23			Number of energy pair records
24			Reserved
25			Disable deconvolution of unknown peaks
26			True = microcuries, false = becquerels
27	PERPTR	I*2	Laboratory and operator name record pointer
28	MAXRCS	I*2	Maximum record number ever used
29	LSTREC	I*2	Maximum record number in use
30	EFFPNM	I*2	Number of efficiency pairs records (See Word 20)

31	SPCTRP	I*2	Spectrum record pointer (pointer to first record)
32	SPCRCN	I*2	Number of records in the spectrum
33	SPCCHN	I*2	Number of channels in spectrum
34	ABSTCH	I*2	Physical start channel for data
35	ACQTIM	R*4	Date and time of acquisition start in DECDAY format
37	ACQTI8	R*8	Date and time as double precision DECDAY
41	SEQNUM	I*2	Sequence number
42	MCANU	I*2	MCA number as two ASCII characters (old) or Detector number as integer for systems with Connections
43	SEGNUM	I*2	Segment number as two ASCII characters (old) or as integer value 1 for systems with Connections
44	MCADVT	I*2	MCA device type
45	CHNSRT	I*2	Start channel number
46	RLTMDT	R*4	Real Time in seconds
48	LVTMDT	R*4	Live Time in seconds
50		I*2	Pointer to MGA or U235 or CZTU records
51		I*2	Pointer to FRAM records
53		I*2	Pointer to TRIFID records
54		I*2	Pointer to NaI records
55–62			Reserved
63–64	RRSFCT	R*4	Total random summing factor

4.11.2. Acquisition Information Record

The acquisition information record contains character data that is written by CONVERT from information in the **.CHN** file.

Byte Number	Type	Use
1	C*1	Default spectrum file name (stored as 16 ASCII characters)
17	C*1	Date in the form DD-MMM-YY* (stored as 12 ASCII characters). The * character should be ignored if it is not a "1". If it is a "1", it indicates the data is after the year 2000.
29	C*1	Time in the form HH:MM:SS (stored as 10 ASCII characters)
39	C*1	Live Time rounded to nearest second (stored as 10 ASCII characters)
49	C*1	Real Time rounded to nearest second (stored as 10 ASCII characters)
59–90		Reserved

91	C*1	Start date of sample collection (10 ASCII characters)
103	C*1	Start time of sample collection (8 ASCII characters)
111	C*1	Stop date of sample collection (10 ASCII characters
121	C*1	Stop time of sample collection (8 ASCII characters)

4.11.3. Sample Description Record

This record is discussed in Section 4.7.

4.11.4. Detector Description Record

This record is described in Section 4.4.

4.11.5. First, Second, and Third Analysis Parameter

These records are described in Section 4.2.

4.11.6. Absorption Correction Description Record

Word Number	Local Name	Type	Use
1	SORPRS	I*2	Number of pairs (between 1 and 100)
2	SORINT	I*2	1 if geometry record, 2 if internal, 4 if external absorption
3	SORGEO	I*2	1 if cylindrical geometry (internal only), 2 if Marinelli geometry (internal only)
4–5	SORDEN	R*4	Absorber density
6–7	SORLNG	R*4	Absorber length
8–12	SORDAT	C*10	Date absorption file created
13–16	SORTIM	C*10	Time absorption file created
17–32	SORNAM	C*32	Absorber name
33–48	SREFNAM	C*32	Reference UFO name
49–64	SCURNAM	C*32	Current UFO name

If long filenames are enabled, then the following 4 sequential records are defined as follows:

1+2	Reference UFO name
3+4	Current UFO name

4.11.7. Absorption Correction Data Record

Word Number	Local Name	Type	Use
1–16	SORKEV (1–8)	R*4	Energy
17–32	SORAREA1 (1–8)	R*4	Reference area
33–48	SORAREA2 (1–8)	R*4	Current area
49–64	SORVAL (1–8)	R*4	Linear attenuation values

If fewer than 8 pairs are used, the array values are set to zero. There are as many data records as necessary, up to 64 energies.

4.11.8. Geometry Correction Description Record

Word Number	Local Name	Type	Use
1	GEOPRS	I*2	Number of pairs (between 1 and 100)
2	GEOINT	I*2	1 if geometry record, 2 if internal, 4 if external absorption
3	unused	I*2	
4–5	unused	R*4	
6–7	unused	R*4	
8–12	GEODAT	C*10	Date geometry file created
13–16	GEOTIM	C*10	Time geometry file created
17–32	unused	C*32	
33–48	GREFNAM	C*32	Reference UFO name
49–64	GCURNAM	C*32	Current UFO name

If long filenames are enabled, then the following 4 sequential records are defined as follows:

1+2	Reference UFO name
3+4	Current UFO name

4.11.9. Geometry Correction Data Record

Word Number	Local Name	Type	Use
1–16	GEOKEV (1–8)	R*4	Energy
17–32	GEOAREA1 (1–8)	R*4	Reference peak area
33–48	GEOAREA2 (1–8)	R*4	Current peak area
49–64	GEOVAL (1–8)	R*4	Geometry correction ratios

If fewer than 8 pairs are used, the array values are set to zero. Up to 64 energies can be stored. The unused values are set to zero.

4.11.10. Calibration Description Record, Calibration Data Records, and Efficiency Pairs Records

These records are described in Section 4.3.

4.11.11. Region-of-Interest Records

This format follows the format described in Section 3.2. The ROI records will be three consecutive records, with the first record pointed to by word 21 of record 1 (FORTRAN name = ROIRP1). The end of the list of regions is given by a negative start channel.

Record 1

Word Number	Use
0	Must be −2
1	Start channel of first ROI
2	Stop channel of first ROI
3	Start channel of second ROI
4	Stop channel of second ROI
.	.
.	.
.	.
61	Start channel of thirty-first ROI
62	Stop channel of thirty-first ROI
63	Reserved

A negative start channel terminates the list of regions.

Record 2

Word Number	Use
0	Start channel of thirty-second ROI
1	Stop channel of thirty-second ROI
.	.
.	.
.	.

62	Start channel of 63rd ROI
63	Stop channel of 63rd ROI

Record 3

This contains the energy calibration for the MCB or buffer at the time the ROIs were defined.

Word Number	Type	Use
0	R*4	Energy calibration zero intercept
3	R*4	Energy calibration slope
7	R*4	Energy calibration quadratic term
11–63		Reserved

4.11.12. Hardware Parameters Records

These records contain the hardware parameters for the MCB when the data were collected. The appropriate values are entered into the record when the spectrum file is saved. Any value that is correctly inserted must have the corresponding bit set in the validity flag words at the beginning of the first record. All unused bytes are set to binary 0. Any program reading this record must check the validity bit for the specific value before using the value in the record.

These two sequential records are pointed to by word 12 of record 1 in any inform file (FORTRAN name = ANARP4).

Record 1

Word Number	Type	Use
1–4		Validity flag, each bit corresponds to a single entry. 1 = valid contents, 0 = unused for this record. Bits are counted from the right, starting with 1. The bit number corresponds to the word number; i.e., if preset real time (word 5) is valid, then bit 5 and 6 are 1.
5	R*4	Preset real time in seconds
7	R*4	Preset live time in seconds
9	I*4	Preset counts
11	I*4	Preset integral
13	R*4	Preset uncertainty in percent
15		Overflow preset, 0 = off, 1 = on
16	I*2	Start channel for uncertainty preset region
17	I*2	Stop channel for uncertainty preset region
18	I*2	ADC conversion gain in channels

19	I*2	ADC offset in channels
20	I*2	Lower level discriminator in channels
21	I*2	Upper level discriminator in channels
22	I*2	Input gate: 0 = off, 1 = coincidence, 2 = anti
23	I*2	Amplifier coarse gain
24	R*4	Amplifier fine gain as the value of the multiplier seen on the MAESTRO display
26	R*4	Amplifier fine offset in fractional channels
28	I*2	Gain stabilizer adjustment amplifier gain setting as the value from the MCB
29	R*4	Start channel for gain stabilizer region
31	R*4	Stop channel for gain stabilizer region
33		Gain stabilizer mode; 0 = Gauss, 1 = peak
34		Gain stabilizer on/off; 1 = on, 0 = off
35	I*2	Zero stabilizer adjustment setting as the value from the MCB
36	R*4	Start channel for zero-stabilizer region
38	R*4	Stop channel For zero-stabilizer region
40		Zero stabilizer on/off; 1 = on, 0 = off
41	R*4	Shaping time constant in microseconds (as reported)
43	I*2	Preamplifier type; 0 = resister, 1 = TRP
44	I*2	PZ valid; 0 = no, 1 = yes
45	I*2	PZ value as reported by MCB
46	I*2	High voltage value in volts
47	R*4	Rise time (DSPEC®) as reported on MAESTRO display
49	R*4	Width (DSPEC) as reported on MAESTRO display
51	R*4	Cusp (DSPEC) as reported on MAESTRO display
53	R*4	Tilt (DSPEC) as reported on MAESTRO display
55	I*2	Baseline type; 1 = auto, 2 = fast, 3 = slow
56	R*4	Baseline value in microseconds
58	I*2	Amplifier mode, 1 = germanium, 2 = sodium iodide
59	I*2	Acquisition mode, 1 = PHA, 2 = MCS
60		MCB serial number, as ASCII text, 8 characters
64	I*2	Number of hardware records in file

Record 2

Word Number	Type	Use
1–2	I*4	Validity flags for words 1–32, each bit corresponds to a single entry. 1 = valid contents, 0 = unused for this record
3–4	I*4	Validity flags for words 33–64

5	I*2	Amplifier input polarity, +1 = positive, −1 = negative
6–7	R*4	Thermistor value, in ohms
8	I*2	Pileup rejector, 0 = off, 1 = on
9–10	I*4	Pileup rejector width in ns
11	I*2	OCTÊTE-PC current in nA
12	I*2	OCTÊTE-PC vacuum in mT
13–20	C*8	Firmware revision in ASCII, 16 characters
21	I*2	High Voltage enabled: 1 = Yes, 0 = No
22	I*2	Shaping time constant index
23	I*2	Battery Stat: 0 = Ext, 1 = Battery 1, 2 = Battery 2
24–25	R*4	Battery 1 voltage
26–27	R*4	Battery 2 voltage
28	I*2	Desired high voltage
29	I*2	HV shutdown mode: 0 = TTL, 1 = ORTEC, 2 = Off
30	I*2	ADC type: 0 = CI34, 1 = CI36, 2 = ORTEC, 3 = Silena
31	I*2	Maximum vacuum value
32	I*2	Automatic threshold flag (SBS-60): 0 = Off, 1 = On
33–38	float	MDA preset coefficients
39–40	float	MDA preset value
41–42	float	User's MDA preset value
43	I*2	Low MDA preset ROI limit
44	I*2	High MDA preset ROI limit
45	short	MDA preset units: 0 = Bq, 1 = µCi, −1 = None
46–49	char	MDA preset nuclide name in ASCII
50	I*2	ZDT-enabled flag: 1 = On, 0 = Off
51	I*2	ZDT refresh rate in micosecs
52	I*2	ZDT view spectrum (1 = Normal, 2 = Corrected)
53–54	R*8	Total count rate in CPS
55	I*2	MiniMCA-166: analog threshold value
56	I*2	MiniMCA-166: input routing 0 = through internal amplifier 1 = bypass internal amplifier with 0 to +3 V 2 = bypass internal amplifier with 0 to −3 V
57	I*2	Firmware revision code (MiniMCA-166)
58	I*2	Hardware revision code (MiniMCA-166)
59	I*2	Time value low for PZ (MiniMCA-166)
60	I*2	Time value high for PZ (MiniMCA-166)
61	I*2	Slow discriminator value (MiniMCA-166)
62	I*2	Fast discriminator value (MiniMCA-166)

63	I*2	Power switches (MiniMCA-166)
64	I*2	ZDT mode: 0 = Off, 1 = Normal-Corrected (LTC-ZDT), 2 = Error-Uncertainty (ERR-ZDT)

Record 3

Word Number	Local Name	Type	Use
1–2	dwFlg1	I*4	Validity flags for words 1–32
3–4	dwFlg2	I*4	Validity flags for words 33–64
5	wP12I	I*2	+12-V current in mA (MiniMCA-166)
6	wM12I	I*2	−12-V current in mA (MiniMCA-166)
7	wP24I	I*2	+24-V current in mA (MiniMCA-166)
8	wM24I	I*2	−24-V current in mA (MiniMCA-166)
9	wBatI	I*2	Battery current in mA (MiniMCA-166)
10	wHvI	I*2	HV current in mA (MiniMCA-166)
11	wChrI	I*2	Charger current in mA (MiniMCA-166)
12	wColl	I*2	Collection time (SBS-60)
13	wCollFast	I*2	Collection start on fast signal: 0 = No, 1 = Yes
14	wCollSlow	I*2	Collection start on slow signal: 0 = No, 1 = Yes
15	wHVRise	I*2	HV rise time in seconds
16	wFastThr	I*2	Fast threshold value (SBS-60)
17	wSyncT	I*2	Synchronize thresholds flag: : 0 = No, 1 = Yes
18	wDifTC	I*2	Differentiation time constant in µs
19	wIntTC	I*2	Integration time constant in µs
20	wInhbt	I*2	Inhibit signal polarity (SBS-60): 0 = Off, 1 = High, 2 = Low
21			Number of valid nuclides in MDA preset
22			High voltage polarity ±1
22–30			Text associated with shutdown modes
31–32			HV current in mA (good for all HVPS)
33–40			Text associated ADC type
41–48			Text associated with Gate
49–56			Text associated with PZ mode
57			Number of strings with szViewNames
58			HV shutdown status () = OK, 1 = Shutdown)
59–60			Gain stabilizer adjustment in percent (−100 to +100)
61–62			Zero stabilizer adjustment in percent (−100 to +100)
63			Number of status string pairs following View strings
64			Unused

Record 4

Word Number	Use
1–2	Validity flags for 1–32
3–4	Validity flats for 33–64
5	Start delay in seconds (DART)
6	Conserve delay in seconds (DART)
7	Off delay in seconds (DART)
8	Power mode (0 = On, 1 = Conserve)
9–32	Unused
33–64	Data view name strings

Multi-Nuclide MDA Preset Storage

Up to 20 nuclides according to Word 21 in record 3, which corresponds to records 5–9.

Word Number	Type	Use
1–2	R*4	MDA user preset (in Bq)
3–4	R*4	Eff * Yield
5–6	R*4	MDA hardware preset
7–8	R*4	MDA energy
9	I*2	Low ROI limit
10	I*2	High ROI limit
11		Reserved
12–16	C*5	MDA nuclide 1 name
17–18		MDA user preset (in Bq)
19–20		Eff * Yield
21–22		MDA hardware preset
23–24		MDA energy
25		Low ROI limit
26		High ROI limit
27		Reserved
28–32		MDA nuclide 2 name
33–34		MDA user preset (in Bq)
35–36		Eff * Yield
37–38		MDA hardware preset
39–40		MDA energy
41		Low ROI limit
42		High ROI limit
43		Reserved

44–48	MDA nuclide 3 name
49–50	MDA user preset (in Bq)
51–52	Eff * Yield
53–54	MDA hardware preset
55–56	MDA energy
57	Low ROI limit
58	High ROI limit
59	Reserved
60–64	MDA nuclide 4 name

This is repeated in blocks of 4 nuclides for the total needed. Records 10 and up contain status records for the hardware. The number of records is Word 63 of record 3.

4.11.13. Personality Record

This record contains the laboratory name and the operator name for this spectrum. These are set in the GammaVision dialogs.

Word Number	Local Name	Type	Use
1	LABNAM	C*64	Laboratory name
33	OPRNAM	C*64	Operator name

4.11.14. Table Description Record

This set of records is pointed to by the TABREC pointer of record 1. It contains the tables for the IEQ, EBAR, and MPC corrections.

Word Number	Local Name	Type	Use
1	ITBLTYP	I*2	Data type: 3 = EBR, 4 = IEQ, 5 = MPC
2	NTBLVAL	I*2	Number of data pairs
3–7	TBLDAT	C*10	Date geometry file created
8–11	TBLTIM	C*8	Time geometry file created
12–18	MPCUNIT	C*14	MPC data units
19–34	TABNAM	C*32	Table filename

If long filenames are enabled, then the following 2 sequential records are defined as follows:

1+2	Table filename

4.11.15. Table Data Record

This record follows the table description record. Any unused values are set to –1.

Word Number	Local Name	Type	Use
1–40	ISONAM (1–10)	C*8	Array of isotope names
41–61	TABVAL (1–10)	R*4	Array of average energy or IEQ or MPC values

Table Data Records 2–N follow if necessary. Up to 40 isotopes can be stored. The unused values are set to zero.

4.11.16. Spectrum Records

These records are the spectrum data stored as REAL*4 numbers beginning with the channel number given and going through the number of channels in the file. They are stored as 64-word records, which gives 32 data channels per record. They are stored sequentially, beginning with the record pointer given.

4.12. Integer Format Spectrum Files

An integer format spectrum file is created by the GammaVision and the file extension should be **.SPC**. This file contains a spectrum and the associated information required to analyze the spectrum. The contents of the integer format spectrum files are as follows.

Record 1

Word Number	Local Name	Type	Use
1	INFTYP	I*2	Must be 1
2	FILTYP	I*2	Must be 1
3			Contents flag Bit 0 = 1 for long filename Bit 1 = 1 for ZDT spectrum and ROI in file.
4			Reserved
5	ACQIRP	I*2	Acquisition information record pointer
6	SAMDRP	I*2	Sample description record pointer
7	DETDRP	I*2	Detector description record pointer
8	EBRDESC	I*2	EBAR description record
9	ANARP1	I*2	First analysis parameters record pointer
10	ANARP2	I*2	Second analysis parameters record pointer
11	ANARP3	I*2	Third analysis parameters record pointer

12	ANARP4	I*2	Fourth analysis parameters record pointer
13	SRPDES	I*2	Absorption correction description record pointer
14	IEQDESC	I*2	IEQ description record pointer
15	GEODES	I*2	Geometry correction description record pointer
16	MPCDESC	I*2	MPC description record pointer
17	CALDES	I*2	Calibration description record pointer
18	CALRP1	I*2	First calibration data record pointer
19	CALRP2	I*2	Second calibration data record pointer
20	EFFPRP	I*2	Efficiency pairs record pointer (first record)
21	ROIRP1	I*2	Record number of the first of the two ROI records
22			Energy pairs record pointer
23			Number of energy pair records
24			Reserved
25			Disable deconvolution of unknown peaks
26			True = microcuries, false = becquerels
27	PERPTR	I*2	Laboratory and operator name record pointer
28	MAXRCS	I*2	Maximum record number ever used
29	LSTREC	I*2	Maximum record number in use
30	EFFPNM	I*2	Number of efficiency pairs records (See Word 20)
31	SPCTRP	I*2	Spectrum record pointer (pointer to first record)
32	SPCRCN	I*2	Number of records in the spectrum
33	SPCCHN	I*2	Number of channels in spectrum
34	ABSTCH	I*2	Physical start channel for data
35	ACQTIM	R*4	Date and time of acquisition start in DECDAY format
37	ACQTI8	R*8	Date and time as double precision DECDAY
41	SEQNUM	I*2	Sequence number
42	MCANU	I*2	MCA number as two ASCII characters (old) or Detector number as integer for systems with Connections
43	SEGNUM	I*2	Segment number as two ASCII characters (old) or as integer value 1 for systems with Connections
44	MCADVT	I*2	MCA device type
45	CHNSRT	I*2	Start channel number
46	RLTMDT	R*4	Real time in seconds
48	LVTMDT	R*4	Live time in seconds

50	Reserved
51–64	Reserved

4.12.1. Other Records

The remaining records are described in the real format spectrum file section with the exception that the spectrum is stored as 4-byte integers.

4.12.2. Spectrum Records

These records are the spectrum data stored as INTEGER*4 numbers beginning with the channel number given and going through the number of channels in the file. They are stored as 64-word records, which gives 32 data channels per record. They are stored sequentially, beginning with the record pointer given.

4.13. Net Spectrum Files

A net spectrum file should have the extension of **.SPC**. This file contains the difference between two spectra with the analysis parameters and other associated data taken from the foreground spectrum. The contents of the net spectrum file are:

Record 1

Word Number	Local Name	Type	Use
1	INFTYP	I*2	Must be 1
2	FILTYP	I*2	Must be 7 (real) or 3 (integer)
3			Contents Flag Bit 0 = 1 for long filename Bit 1 = 1 for ZDT spectrum and ROI in file
4			Reserved
5	ACQIRP	I*2	Acquisition information record pointer
6	SAMDRP	I*2	Sample description record pointer
7	DETDRP	I*2	Detector description record pointer
8	EBRDESC	I*2	EBAR description record
9	ANARP1	I*2	First analysis parameters record pointer
10	ANARP2	I*2	Second analysis parameters record pointer
11	ANARP3	I*2	Third analysis parameters record pointer
12	ANARP4	I*2	Fourth analysis parameter record pointer
13	SRPDES	I*2	Absorption correction description record pointer

14	IEQDESC	I*2	IEQ description data record pointer
15	GEODES	I*2	Geometry correction description record pointer
16	MPCDESC	I*2	MPC description record pointer
17	CALDES	I*2	Calibration description record pointer
18	CALRP1	I*2	First calibration data record pointer
19	CALRP2	I*2	Second calibration data record pointer
20	EFFPRP	I*2	Efficiency pairs record pointer (first record)
21	ROIRPI	I*2	Record number of the first of the two ROI records
22	PERPTR	I*2	Personality record pointer
27	CALRP2	I*2	Second calibration data record pointer
28	MAXRCS	I*2	Maximum record number ever used
29	LSTREC	I*2	Maximum record number in use
30	EFFPNM	I*2	Number of efficiency pairs records (see Word 20)
31	SPCTRP	I*2	Spectrum record pointer (pointer to first record)
32	SPCRCN	I*2	Number of records in the spectrum
33	SPCCHN	I*2	Number of channels in spectrum
35	ACQTIM	R*4	Date and time of acquisition start in DECDAY format
37	ACQTI8	R*8	Date and time as double precision DECDAY
41	SEQNUM	I*2	Sequence number
42	SEQNAM	C*1	Sequence name of 4 ASCII characters
44	MCADVT	I*2	MCA device type
45	CHNSRT	I*2	Start channel number
46	RLTMDT	R*4	Real time in seconds
48	LVTMDT	R*4	Live time seconds
50–64			Reserved

The remaining records are described in the real format spectrum file section.

4.14. AlphaVision Spectrum Files

These files are written by AlphaVision (A36-B32). They can be read by other programs (e.g., MAESTRO and WINPLOTS), but only the analysis parameters are used by AlphaVision.

The first record is:

Word Number	Use
1	Must be 1
2	Must be 1
3	Contents flag; on is true
	Bit: Description
	Bit 1: Long file names
4	Reserved
5	Acquisition information record pointer
6	Sample description record pointer
7	Detector description record pointer
8	First table record pointer
9	First analysis parameters record pointer
10	Second analysis parameters record pointer
11	Third analysis parameters record pointer
12	Fourth analysis parameters record pointer
13	Absorption correction description record pointer
14	Absorption correction data record pointer
15	Geometry correction description record pointer
16	Geometry correction data record pointer
17	Calibration description record pointer
18	First calibration data record pointer
19	Second calibration data record pointer
20	Efficiency pairs record pointer (first record)
21	ROI record pointer (first of the three records)
22	Energy pairs record pointer (first record)
23	Number of energy-pairs records
24	Reserved
25	Reserved
26	True = microcuries, False = becquerels
27	Pointer to personality record (laboratory name)
28	Maximum record allocated (unused for UFO)
29	Maximum record in use (or allocated for UFO)
30	Reserved
31	Spectrum record pointer
32	Number of records in spectrum
33	Number of channels
34	Start channel
35–36	Acquisition start in DECDAY format

37–40	Acquisition start in DECDAY8 format
41	Sequence number
42	Detector ID
43	Segment number (always 1)
44	MCA device type
45	Start channel number
46	Real time in seconds
48	Live time in seconds
50–64	Reserved

The remaining records are the same as the germanium spectrum files (see Section 4.12).

4.15. Germanium Unformatted Output Files

An unformatted output (**.UFO**) file is created by the programs AN1, FMPC (B30), MAN1, WAN1, GAM32 (A66), MFMPC (A34), and all other Windows germanium-analysis programs. Older **.UFO** files are used by PBC and PEAKPLOT, but **.UFO** files created by GammaVision cannot be used with older programs. It should have a file extension of **.UFO**. A **.UFO** file contains the results, both intermediate and final, of the germanium spectral analysis. Because of their size, the user should delete **.UFO** files that are no longer needed.

The **.UFO** file has changed in GammaVision 5.2, that is, the "old" **.UFO** file was written before version 5.2 and the "new" **.UFO** file is used by version 5.2 and later. To determine if a **.UFO** file is "old" or "new," look at Words 50 and 51 of Record 2. These will be **2** for new **.UFO** files and **0** (zero) for old files. Other values (i.e., not 2 or zero) should be interpreted as zero (old).

4.15.1. Records 1 and 2

4.15.1.1. Old UFO Records 1 and 2

The contents of the old **.UFO** file are:

Record 1

Word Number	Local Name	Use
1		Must be 1
2		Must be 1024
3		Special application record pointer – 1
4		Special application record pointer – 2
5		Acquisition information record pointer
6		Sample description record pointer

7		Detector description record pointer
8		Special application record pointer
9		First analysis parameters record pointer
10		Second analysis parameters record pointer
11		Third analysis parameters record pointer
12		Fourth analysis parameters record pointer
13		Absorption correction description record pointer
14		Absorption correction data record pointer
15		Geometry correction description record pointer
16		Geometry correction data record pointer
17		Calibration description record pointer
18		First calibration data record pointer
19		Second calibration data record pointer
20		Efficiency pairs record pointer (first record)
21		Record number of the first of the ROI records
22		Energy pairs record pointer
23		Number of energy pair records
24		Reserved
25		Disable deconvolution of unknown peaks
26		True = microcuries, False = becquerels
27	PERPTR	Laboratory and operator name record pointer
28		Maximum record number ever used
29		Maximum record number in use
30		Number of efficiency pairs records (see Word 20)
31–64		Reserved

Record 2

The second record of the old **.UFO** file contains pointers to other records used in the **.UFO** file and data used by the various analysis programs used to analyze the data.

Word Number	Local Name	Use
1	I*2	GEN record pointer
2	I*2	CSI 1 record pointer
3	I*2	CSI 2 record pointer
4	I*2	Library 1 peak records start pointer
5	I*2	Number of Library 1 peaks used
6	I*2	Number of Library 1 peaks allocated
7	I*2	Library 2 peak records start pointer
8	I*2	Number of Library 2 peak records used

9	I*2	Number of Library 2 peak records allocated
10	I*2	Library 3 peak records start pointer
11	I*2	Number of Library 3 peak records used
12	I*2	Number of Library 3 peak records allocated
13	I*2	Unknown peak records start pointer
14	I*2	Number of unknown peak records used
15	I*2	Number of unknown peak records allocated
16	I*2	Library 1 nuclide records start pointer
17	I*2	Number of Library 1 nuclide records used
18	I*2	Number of Library 1 nuclide records allocated
19	I*2	Library 2 nuclide records start pointer
20	I*2	Number of Library 2 nuclide records used
21	I*2	Number of Library 2 nuclide records allocated
22	I*2	Library 3 nuclide records start pointer
23	I*2	Number of Library 3 nuclide records used
24	I*2	Number of Library 3 nuclide records allocated
25		Reserved
28	I*2	CSI 3 record pointer
29	I*2	CSI 4 record pointer
30	I*2	Lowest in-range peak pointer for Lib-1 and this analysis
31	I*2	Lowest in-range peak pointer for Lib-2 and this analysis
32	I*2	Lowest in-range peak pointer for Lib-3 and this analysis
33	R*4	NUPISA
35	R*4	EBRDEC
37	R*4	IEQVAL
39	R*4	IEQDEC
41	I*2	NAC shadow for library 1
43	I*2	NAC shadow for library 2
45	I*2	NAC shadow for library 3
49		Pointer to start record 3
50		Reserved
59	R*4	EBRVAL
61	R*4	Total activity
63	R*4	Etime

Other Records

The records not described below are described in the real format spectrum file discussion, Section 4.11.

4.15.1.2. New UFO Records 1 and 2

The contents of the new **.UFO** file are:

Record 1

Word Number	Local Name	Use
1		Must be 1
2		Must be 1024
3		Contents flag, 1 = true Bit 0 Long filename Bit 1 ZDT
4		Reserved
5		Acquisition information record pointer
6		Sample description record pointer
7		Detector description record pointer
8		First table record pointer
9		First analysis parameters record pointer
10		Second analysis parameters record pointer
11		Third analysis parameters record pointer
12		Fourth analysis parameters record pointer
13		Absorption correction description record pointer
14		Absorption correction data record pointer
15		Geometry correction description record pointer
16		Geometry correction data record pointer
17		Calibration description record pointer
18		First calibration data record pointer
19		Second calibration data record pointer
20		Efficiency pairs record pointer (first record)
21		Record number of the first of the three ROI records
22		Energy pairs record pointer
23		Number of energy pair records
24		DLAN1.DLL debug, True = write AN1TRAIL.TXT
25		Disable deconvolution of unknown peaks
26		True = microcuries, False = becquerels
27	PERPTR	Laboratory and operator name record pointer
28		Maximum record number ever used
29		Maximum record number in use
30		Number of efficiency pairs records (see Word 20)
31	SPCTRP	Spectrum record pointer

32	SPCRCN	Number of records in spectrum
33	SPCCHN	Number of channels
34	ABSTCH	Start channel
35–36	ACQTIM	Acquisition start in DECDAY format
37–40	ACQT88	Acquisition start in DECDAY8 format
41	SEQNUM	Sequence number
42	MCANUM	Detector ID
43	SEGNUM	Segment number (always 1)
44	MCADVT	MCA device type
45	CHNSRT	Start channel number
46	RLTMDT	Real time in seconds
48	LVTMDT	Live time in seconds
50		Pointer to MGA records
51		Pointer to FRAM records
52		Pointer to TRIFID records
53		Pointer to NaI records
54		Pointer to description record
55–62		Reserved
63–64		Random summing factor

Record 2

The second record of the new **.UFO** file contains pointers to other records used in the **.UFO** file and data used by the various analysis programs used to analyze the data.

Word Number	Local Name	Use
1	I*2	GEN record pointer
2	I*2	CSI 1 record pointer
3	I*2	CSI 2 record pointer
4	I*2	Library 1 peak records start pointer
5	I*2	Number of Library 1 peaks used
6	I*2	Number of Library 1 peaks allocated
7	I*2	Library 2 peak records start pointer
8	I*2	Number of Library 2 peak records used
9	I*2	Number of Library 2 peak records allocated
10	I*2	Library 3 peak records start pointer
11	I*2	Number of Library 3 peak records used
12	I*2	Number of Library 3 peak records allocated
13	I*2	Unknown peak records start pointer
14	I*2	Number of unknown peak records used

15	I*2	Number of unknown peak records allocated
16	I*2	Library 1 nuclide records start pointer
17	I*2	Number of Library 1 nuclide records used
18	I*2	Number of Library 1 nuclide records allocated
19	I*2	Library 2 nuclide records start pointer
20	I*2	Number of Library 2 nuclide records used
21	I*2	Number of Library 2 nuclide records allocated
22	I*2	Library 3 nuclide records start pointer
23	I*2	Number of Library 3 nuclide records used
24	I*2	Number of Library 3 nuclide records allocated
25		Reserved
28	I*2	CSI 3 record pointer
29	I*2	CSI 4 record pointer
30	I*2	Lowest in-range peak pointer for Lib-1 and this analysis
31	I*2	Lowest in-range peak pointer for Lib-2 and this analysis
32	I*2	Lowest in-range peak pointer for Lib-3 and this analysis
33	R*4	NUPISA
35	R*4	EBRDEC
37	R*4	IEQVAL
39	R*4	IEQDEC
41	I*2	NAC shadow for library 1
43	I*2	NAC shadow for library 2
45	I*2	NAC shadow for library 3
49		Pointer to start record 3
50	I*2	Ratio of new nuclide record size to old size. Must be 2
51	I*2	Ratio of new peak record size to old size. Must be 2
52–58		Unused.
59	R*4	EBRVAL
61	R*4	Total activity
63	R*4	Etime

Other Records

The records not described below are described in the real format spectrum file section.

4.15.2. UFO File CSI Records

Records 1 and 3

UFO File CSI 1 Record

Word Number	Use
1	NAA standard table filename
17	Uranium fission correction filename
33	Reserved
49	Reserved

If long filenames are enabled, then the following 4 sequential records are defined as follows:

1+2	NAA standard table filename
3+4	Uranium fission correction filename

UFO File CSI 3 Record

Word Number	Use
1	MPC Column Title; 64 ASCII characters
33	Unused

Records 2 and 4

CSI Records 2 and 4 contain the four filenames that are used in an analysis. Each file specification is stored left-justified in its field as ASCII characters padded with spaces to the end. The contents are:

UFO File CSI 2 Record

Word Number	Use
1	RPT filename
32	MPC Table filename

If long filenames are enabled, then the following 4 sequential records are defined as follows:

1+2	RPT filename
3+4	MPC Table filename

UFO File CSI 4 Record (indexed by Word 29 of the second record)

Word Number	Use
1	UFO filename
32	Spectrum filename

If long filenames are enabled, then the following 4 sequential records are defined as follows:

1+2	UFO filename
3+4	Spectrum filename

4.15.3. UFO File GEN Record

The UFO file GEN record, indexed by Word 1 of the second record, is a special record that contains details about the analysis.

Word Number	Local Name	Type	Use
1–7			Reserved
8	QA	L*2	Reserved
9	IEQ	L*2	Reserved
10	EBAR	L*2	Reserved
11	RPTLUN	I*2	Logical unit for report output
12	UFOLUN	I*2	Logical unit for UFO file I/O
13	SPCLUN	I*2	Logical unit for spectrum I/O
14–15			Reserved
16	TBLLUN	I*2	Logical unit for table I/O
17	LB1LUN	I*2	Logical unit for Library 1 I/O
18	LB2LUN	I*2	Logical unit for Library 2 I/O
19	LB3LUN	I*2	Logical unit for Library 3 I/O
20	LB4LUN	I*2	Logical unit for Library 4 I/O
21	PAGENM	I*2	Current output page number in RPT
22	LINENM	I*2	Current output line number in RPT

23	NOPISA	I*2	Number of unknown peaks above sens. cutoff
24	LIVETM	R*4	Live time (seconds) value for spectrum
26	REALTM	R*4	Real time (seconds) value for spectrum
28	STTIME	R*4	Analysis start time
30	GAMID	I*2	Type of analysis to perform
31	GAMVER	C*1	Analysis version as 8 ASCII characters
35	GAMNAM	C*1	ASCII name of analysis program as 8 ASCII characters
39	ACQTI8	R*8	Date and time as double precision DECDAY
43	DIRFTD	L*2	True = do directed fit flag
44	SUM	R*8	Sum of all channels in the spectrum
49–64			Reserved

4.15.4. UFO Absorption Description Record

This record is the same as the absorption record in the **.SPC** file (Section 4.11.6).

Word Number	Local Name	Type	Use
1	SORPRS	I*2	Number of pairs (between 1 and 100)
2	SORINT	I*2	1 if geometry record, 2 if internal, 4 if external absorption
3	SORGEO	I*2	1 if cylindrical geometry (internal only), 2 if Marinelli geometry (internal only)
4, 5	SORDEN	R*4	Absorber density
6, 7	SORLNG	R*4	Absorber length
8–12	SORDAT	C*10	Date absorption file created
13–16	SORTIM	C*10	Time absorption file created
17–32	SORNAM	C*32	Absorber name
33–48	SREFNAM	C*32	Reference UFO name
49–64	SCURNAM	C*32	Current UFO name

If long filenames are enabled, then the following 4 sequential records are defined as follows:

1+2	Reference UFO name
3+4	Current UFO name

4.15.5. UFO Geometry Description Record

Note that this record is the same as the geometry record in the **.SPC** file (Section 4.11.8).

Word Number	Local Name	Type	Use
1	GEOPRS	I*2	Number of pairs (between 1 and 100)
2	GEOINT	I*2	1 if geometry record, 2 if internal, 4 if external absorption
3	unused	I*2	
4–5	unused	R*4	
6–7	unused	R*4	
8–12	GEODAT	C*10	Date geometry file created
13–16	GEOTIM	C*10	Time geometry file created
17–32	unused	C*32	
33–48	GREFNAM	C*32	Reference UFO name
49–64	GCURNAM	C*32	Current UFO name

If long filenames are enabled, then the following 4 sequential records are defined as follows:

1+2	Reference UFO name
3+4	Current UFO name

4.15.6. UFO File Nuclide Records

4.15.6.1. Old UFO File Nuclide Records

The **.UFO** file nuclide records are 32 words long with two of these records packed in each **.UFO** file 64-word record. These records are allocated in groups of two so that an integer number of 64-word records is always used. The nuclide record contains information about the analysis of a specific nuclide as described below:

Word Number	Local Name	Type	Use
1	ISONAM	C*I	Isotope name as 8 ASCII characters
5	HAFLIF	R*4	Half-life in days
7	UNCERT	R*4	Uncertainty
9		I*2	Reserved
10		I*2	Reserved
11	PBCVAL	R*4	PBC correction factor
13	ISONAA	R*4	NAA concentration
15	MPCVAL	R*4	MPC value

17	THSREC	I*2	This record pointer
18	ISOFLG	I*2	Nuclide analysis flag, bits as follows:

Bit	Description
Bit 0	MDA value used for activity
Bit 1	Area is below critical level
Bit 2	Nuclide must have a report entry
Bit 3	No valid peaks were detected
Bit 4	Area is between sensitivity and critical level
Bit 5	Decay correction time >12 half-lives
Bit 6	Decay time during acquisition >12 half-lives
Bit 7	Nuclide not present
Bit 8	Unused
Bit 9	All peaks used in abundance calculation were good
Bit 10	Library energy conflict
Bit 11	Directed fit activity
Bit 12	NAA concentration factor valid
Bit 13	NAA calculated
Bit 14	Activity calculated using Gamma 3
Bit 15	Unused

19	FRPKPT	I*2	Pointer to first in-range peak for this nuclide
20		I*2	Unused
21		I*2	Unused
22		I*2	Reserved
23	ISOCUR	R*4	Calculated abundance in becquerels
25	ICRFAC	R*4	Decay time correction factor
27	ISOERR	R*4	Isotope counting error
29	TOTERR	R*4	Total error
31	ISOMDA	R*4	MDA for this isotope

4.15.6.2. New UFO File Nuclide Records

The first part of the **.UFO** file nuclide records is 32 words long with two of these records packed in each **.UFO** file 64-word record (see Section 4.15.1.2). These records are allocated in groups of two so that an integer number of 64-word records is always used. The second part is pointed to by Word 13 below. The nuclide record contains information about the analysis of a specific nuclide as described below:

Word Number	Local Name	Type	Use
1	ISONAM	C*I	Isotope name as 8 ASCII characters
5	HAFLIF	R*4	Half-life in days
7	UNCERT	R*4	Uncertainty
9		I*2	Reserved
10		I*2	Reserved
11	PBCVAL	R*4	PBC correction factor
13	H2REC	I*2	Pointer to nuclide record Part 2
14		I*2	Unused
15	MPCVAL	R*4	MPC value
17	THSREC	I*2	This record pointer
18	ISOFLG	I*2	Nuclide analysis flag, bits as follows:
			Bit 0 — MDA value used for activity
			Bit 1 — Area is below critical level
			Bit 2 — Nuclide must have a report entry
			Bit 3 — No valid peaks were detected
			Bit 4 — Area is between sensitivity and critical level
			Bit 5 — Decay correction time >12 half-lives
			Bit 6 — Decay time during acquisition >12 half-lives
			Bit 7 — Nuclide not present
			Bit 8 — Nuclide in table
			Bit 9 — All peaks used in abundance calculation were good
			Bit 10 — Library energy conflict
			Bit 11 — PBC subtracted
			Bit 12 — NAA concentration factor valid
			Bit 13 — Failed key line or fraction test
			Bit 14 — Unused
			Bit 15 — Unused
19	FRPKPT	I*2	Pointer to first in-range peak for this nuclide
20		I*2	Unused
21		I*2	Unused
22		I*2	Reserved
23	ISOCUR	R*4	Calculated abundance in becquerels
25	ICRFAC	R*4	Decay time correction factor
27	ISOERR	R*4	Isotope counting error

29	TOTERR	R*4	Total error
31	ISOMDA	R*4	MDA for this isotope

Second part:

Word Number	Local Name	Type	Use
1			Atomic number and atomic mass of the current isotope
3			Branching ratio to first daughter
5			Branching ratio to second daughter
7			Branching ratio to third daughter
9			Pointer to first parent record
10			Pointer to second parent record
11			Pointer to third parent record
12			Pointer to first daughter record
13			Pointer to second daughter record
14			Pointer to third daughter record
15			Decay during acquisition factor
17			Decay during collection factor
19			Second MDA value (see **`B30WINS.INI`**)
21–32			Unused

4.15.7. UFO File Peak Records

4.15.7.1. Old UFO File Peak Records

The UFO file peak records are 64 words long. These records contain information about the analysis of specific peaks as described below:

Word Number	Local Name	Type	Use
1	PEKENG	R*4	Library energy of the peak in keV
3	PGMPRD	R*4	Gammas per 100 disintegration
5	PEKCON	R*4	Peak concentration for NAA
7	AREA	R*4	Corrected net area of the peak
9	BKG	R*4	Corrected background of the peak
11	FPAREA	R*4	First pass net area of the peak
13	FPBKG	R*4	First pass background of the peak

15	CNTR	R*4	Peak centroid in fractional channels
17	FWO4M	R*4	Full-width-.04-maximum in fractional channels
19	FW10M	R*4	Full-width-.10-maximum in channels
21	FWHMOO	R*4	Full-width-half-maximum in channels
23	PKUNCT	R*4	Peak counting uncertainty, as fraction
25	ISNUM	I*2	Pointer to nuclide record
26	ENPRE	I*2	Pointer to next lower library energy
27	ENNXT	I*2	Pointer to next higher library energy
28	PKARE	I*2	Pointer to next lower nuclide energy
29	PKNXT	I*2	Pointer to next higher nuclide energy
30	PEK1	I*2	Pointer to first in-range peak for this nuclide
31	FLAG1	I*2	Peak flag 1 as described below:

Bit	Description
Bit 0	FW25M/2.2 >1.2*FWHM
Bit 1	FW10M/1.83 >1.2*FWHM
Bit 2	Only 1 entry in library <FWHM
Bit 3	2 or more entries in library <FWHM
Bit 4	FWHM(actual) <0.8 FWHM(calc) or >1.2 FWHM(calc)
Bit 5	Peak out of range
Bit 6	Net area <0
Bit 7	Reserved
Bit 8	Centroid is too far from library line
Bit 9	HI ≤ LO + .8 * FWHM
Bit 10	Centroid not found
Bit 11	Beta peak (obsolete files only)
Bit 12	FW25M/2.2 <.8 * FWHM
Bit 13	Result of deconvolution
Bit 14	Set if error > sensitivity for first in-range peak
Bit 15	Unused

32	FLAG 2	I*2	Peak Flag 2 as described below:

Bit	Description
Bit 0	Unused
Bit 1	Abundance for this peak higher than average
Bit 2	Abundance for this peak lower than average

			Bit 3 Subtraction has occurred Bit 4 Peak used for MDA calculation Bit 5 Reserved Bit 6 Peak used for abundance calculation Bit 7 Peak used for subtraction Bit 8 First in-range peak rejected for any reason Bit 9 Peak itself has error > sensitivity Bit 10 Duplicate energies in library Bit 11 Unknown/library multiplet Bit 12 Peak grossly out of shape Bit 13 Peak had PBC subtracted Bits 14–15 Unused
33	PKCNTS	R*4	Number of uncorrected counts in peak
35	LACTWD	I*2	Width of background region below peak
36	HACTWD	I*2	Width of background region above peak
37	CNTENG	R*4	Actual peak centroid in energy
39	PKLOLM	I*2	Peak low limit of integration
40	PKHILM	I*2	Peak high limit of integration
41	LOAVE	R*4	Average background below peak
43	HIAVE	R*4	Average background above peak
45	PKABUN	R*4	Isotopic abundance based on this peak only Or efficiency-corrected area for unknown peaks
47	PEKMDA	R*4	MDA based on this peak only
49	MPLOLM	I*2	Multiplet region low limit of integration
50	MPHILM	I*2	Multiplet region high limit of integration
51	UFSLOP	R*4	Average background slope across peak
53	PKCONC	R*4	
55	FLAG3	I*2	Peak Flag 3 as described below: Bit Description Bit 0 NAC available Bit 1 Used in concentration calculation Bit 2 Parabolic background used Bit 3 Directed fit on this peak Bit 4–15 Reserved
56		I*2	Gamma fraction

57	BKCOEF	R*4	Parabolic background coefficients (3)
63		I*2	0 = No other peaks close 1 = Other peaks are too close for reliable deconvolution 2 = The peak area is derived via Gamma3

4.15.7.2. New UFO File Peak Records

The UFO file peak records are 64 words long. These records contain information about the analysis of specific peaks as described below:

Word Number	Local Name	Type	Use
1	PEKENG	R*4	Library energy of the peak in keV
3	PGMPRD	R*4	Gammas per 100 disintegration
5	PEKCON	R*4	Peak concentration for NAA
7	AREA	R*4	Corrected net area of the peak
9	BKG	R*4	Corrected background of the peak
11	FPAREA	R*4	First pass net area of the peak
13	FPBKG	R*4	First pass background of the peak
15	CNTR	R*4	Peak centroid in fractional channels
17	FWO4M	R*4	Full-width-.04-maximum in fractional channels
19	FW10M	R*4	Full-width-.10-maximum in channels
21	FWHMOO	R*4	Full-width-half-maximum in channels
23	PKUNCT	R*4	Peak counting uncertainty, as fraction
25	ISNUM	I*2	Pointer to nuclide record
26	ENPRE	I*2	Pointer to next lower library energy
27	ENNXT	I*2	Pointer to next higher library energy
28	PKARE	I*2	Pointer to next lower nuclide energy
29	PKNXT	I*2	Pointer to next higher nuclide energy
30	PEK1	I*2	Pointer to first in-range peak for this nuclide
31	FLAG1	I*2	Peak flag 1 as described below:

Bit	Description
Bit 0	FW25M/2.2 >1.2*FWHM
Bit 1	FW10M/1.83 >1.2*FWHM
Bit 2	Only 1 entry in library <FWHM
Bit 3	2 or more entries in library <FWHM
Bit 4	FWHM(actual) <0.8 FWHM(calc) or >1.2 FWHM(calc)
Bit 5	Peak out of range

			Bit 6 Net area <0
			Bit 7 Reserved
			Bit 8 Centroid is too far from library line
			Bit 9 HI ≤ LO + .8 * FWHM
			Bit 10 Centroid not found
			Bit 11 Beta peak (obsolete files only)
			Bit 12 FW25M/2.2 <.8 * FWHM
			Bit 13 Result of deconvolution
			Bit 14 Set if error > sensitivity for first in-range peak
			Bit 15 Unused
32	FLAG 2	I*2	Peak Flag 2 as described below:
			Bit Description
			Bit 0 Unused
			Bit 1 Abundance for this peak higher than average
			Bit 2 Abundance for this peak lower than average
			Bit 3 Subtraction has occurred
			Bit 4 Peak used for MDA calculation
			Bit 5 Reserved
			Bit 6 Peak used for abundance calculation
			Bit 7 Peak used for subtraction
			Bit 8 First in-range peak rejected for any reason
			Bit 9 Peak itself has error > sensitivity
			Bit 10 Duplicate energies in library
			Bit 11 Unknown/library multiplet
			Bit 12 Peak grossly out of shape
			Bit 13 Peak had PBC subtracted
			Bits 14–15 Unused
33	PKCNTS	R*4	Number of uncorrected counts in peak
35	LACTWD	I*2	Width of background region below peak
36	HACTWD	I*2	Width of background region above peak
37	CNTENG	R*4	Actual peak centroid in energy
39	PKLOLM	I*2	Peak low limit of integration
40	PKHILM	I*2	Peak high limit of integration

41	LOAVE	R*4	Average background below peak
43	HIAVE	R*4	Average background above peak
45	PKABUN	R*4	Isotopic abundance based on this peak only or efficiency-corrected area for unknown peaks
47	PEKMDA	R*4	MDA based on this peak only
49	MPLOLM	I*2	Multiplet region low limit of integration
50	MPHILM	I*2	Multiplet region high limit of integration
51	UFSLOP	R*4	Average background slope across peak
53	PKCONC	R*4	
55	FLAG3	I*2	Peak Flag 3 as described below: Bit — Description Bit 0 — NAC available Bit 1 — Used in concentration calculation Bit 2 — Parabolic background used Bit 3 — Directed fit on this peak Bit 4–15 — Reserved
56		I*2	PKCNUN
57	BKCOEF	R*4	Parabolic background coefficients (3)
63		I*2	0 = No other peaks close 1 = Other peaks are too close for reliable deconvolution 2 = The peak area is derived via Gamma3
64			Peak flags from library (see lib.h)
65	MLTPRE		First peak in multiplet pointer
66	CURREC		Current record pointer
67	LENPRE		Previous library peak pointer
68	LENNXT		Next library peak pointer
69	G3PRE		Previous overlapping peak pointer
70	G3NXT		Next overlapping peak pointer
71	FLAGT		TCC flag Bit — Description Bit 1 — TCC library
72–73	MDA2		Second MDA value
74–75	BRUNCT		Branching ratio uncertainty
76–77	TCCBR		Original branching ratio of TCC library peak
78–81	SUSNAM		Suspect library nuclide
82–128			Unused

4.16. Sodium Iodide Unformatted Output (UFO) File Peak Records

4.16.1. UFO Records 1 and 2

The contents of the **.UFO** file are:

Record 1

Word Number	Local Name	Use
1		Must be 1
2		Must be 4096
3		Special application record pointer −1
4		Special application record pointer −2
5		Acquisition information record pointer
6		Sample description record pointer
7		Detector description record pointer
8		Special application record pointer
9		First analysis parameters record pointer
10		Second analysis parameters record pointer
11		Third analysis parameters record pointer
12		Fourth analysis parameters record pointer
13		Absorption correction description record pointer
14		Absorption correction data record pointer
15		Geometry correction description record pointer
16		Geometry correction data record pointer
17		Calibration description record pointer
18		First calibration data record pointer
19		Second calibration data record pointer
20		Efficiency pairs record pointer (first record)
21		Record number of the first of the two ROI records
22		Energy pairs record pointer
23		Number of energy pair records
24		Reserved
25		Disable deconvolution of unknown peaks
26		True = microcuries, False = becquerels
27	PERPTR	Laboratory and operator name record pointer
28		Maximum record number ever used
29		Maximum record number in use

30	Number of efficiency pairs records (see Word 20)
31–64	Reserved

Record 2

The second record of the **.UFO** file contains pointers to other records used in the **.UFO** file and data used by the various analysis programs used to analyze the data.

Word Number	Local Name	Use
1		GEN record pointer
2		CSI record 1 pointer
3		CSI record 2 pointer
4–6		Peak record 1 pointer
7–9		Peak record 2 pointer
10–12		Peak record 3 pointer
13–15		unknown peak record pointer
16–18		Nuclide record 1 pointer
19–21		Nuclide record 2 pointer
22–24		Nuclide record 3 pointer
25–27		Reserved
28		CSI record 3 pointer
29		CSI record 4 pointer
30	LNRGPK	First in-range peak
31	LNRGP2	
32	LNRGP3	
33–34	NUPISA	
35–36	EBRDEC	
37–38	IEQVAL	
39–40	IEQDEC	
41–42	NAC1	
43–44	NAC2	
45–46	NAC3	
47–58		Reserved
59–60	EBRVAL	
61–62	TOTAC	Total activity
63–64	Etime	Other records

The remaining record pointers shown in Record 1 above are described in the real format spectrum file section.

4.16.2. UFO File CSI Records

Records 1 and 3

UFO File CSI 1 Record

Word Number	Use
1	NAA standard table filename
17	Uranium fission correction filename
33	Reserved
49	Reserved

If long filenames are enabled, then the following 4 sequential records are defined as follows:

1+2	NAA standard table filename
3+4	Uranium fission correction filename

UFO File CSI 3 Record

Word Number	Use
1	MPC Column Title; 64 ASCII characters
33	Unused

Records 2 and 4

CSI Records 2 and 4 contain the four filenames that are used in an analysis. Each file specification is stored left-justified in its field as ASCII characters padded with spaces to the end.

The contents are:

UFO File CSI 2 Record

Word Number	Use
1	RPT filename
32	MPC Table filename

If long filenames are enabled, then the following 4 sequential records are defined as follows:

1+2	RPT filename
3+4	MPC Table filename

UFO File CSI 4 Record (indexed by Word 29 of the second record)

Word Number	Use
1	UFO filename
32	Spectrum filename

If long filenames are enabled, then the following 4 sequential records are defined as follows:

1+2	UFO filename
3+4	Spectrum filename

4.16.3. UFO File GEN Record

Word Number	Use
1	Reserved
2–5	Reserved
6	Reserved
7	Reserved
8	Reserved
9	Reserved
10	Reserved
11	Logical unit for report output
12	Logical unit for UFO file I/O
13	Logical unit for spectrum I/O
14	Reserved
15	Reserved
16	Logical unit for table I/O
17	Logical unit for library 1 I/O
18	Logical unit for library 2 I/O
19	Logical unit For library 3 I/O
20	Logical unit For library 4 I/O
21	Current output page number in RPT
22	Current output line number in RPT
23	Reserved

24	Live time
26	Real time
28	Start time
30	Type of analysis to perform
31	Analysis version
35	Analysis program
39–40	Acquisition date and time in DECDAY format
41–43	Reserved
44–45	Sum of all channels in spectrum
46–47	Reserved
48–51	Reserved
52	Reserved
53	Reserved
54	Reserved
55	Random summing factor
57–58	Reserved
59–64	Reserved

4.16.4. UFO File Nuclide Records

Word Number	Local Name	Type
1–4	LIBNAM	
5–6	HAFLIF	Half-life in days
7–8	UNCERT	Source uncertainty
9	NACERR	
10	THSISO	
11–12	PBCVAL	
13–14	ISONAA	
15–16	MPCVAL	
17	THSREC	This nuclide record pointer
18	ISOFLG	Nuclide analysis flag word

Bit	Description
0	MDA value used for activity
1	Area is below critical level
2	Nuclide must have a report entry
3	No peaks in analysis range
4	Area is between sensitivity and critical level
5	Decay correction time > 12 half-lives
6	Decay during acquisition > 12 half-lives
7	Nuclide present

		8 Nuclide in table
		9 All peaks used in abundance calculation were good
		10 Library energy conflict
		11 PBC subtracted
		12 NAACON fact available
19	ISOPEK	Pointer to first in-range peak for this nuclide
20	BCKISO	Pointer to previous isotope nuclide record
21	FREISO	Pointer to free isotope nuclide record
22	NCCNER	
23–24	ISOCUR	Calculated abundance in Bq
25–26	ICRFAC	Decay-time correction factor
27–28	ISOERR	Isotope counting error
29–30	TOTERR	Total error
31–32	ISOMDA	MDA for this isotope

4.16.5. UFO File Peak Records

Word Number	Local Name	Type
1–2	PEKENG	Library energy
3–4	PGMPRD	
5–6		Cubic background coefficient GSA change
7–8	AREA	
9–10	BKG	
11–12	AREA1	(FirstNet)
13–14	BKG1	(FirstBackground)
15–16	CNTR	Centroid in channels
17–18	FWHM04	
19–20	FWHM01	
21–22	FWHM00	
23–24	PKUNCT	
25	ISOPTR	Nuclide record (−1 means this is an unknown peak)
26	ENPR	Next lower library energy peak record (not necessarily same nuclide)
27	ENNXT	Next higher library energy peak record (not necessarily same nuclide)
28	PKPRE	Next lower energy for this nuclide
29	PKNXT	Next higher energy for this nuclide
30	PEK1	Pointer to first in–range peak for this nuclide

31	FLAG1	Peak Flag 1 Bit Description 0 FW25M/2.2 > 1.2 × FWHM 1 FW10M/1.83 > 1.2 × FWHM 2 Only one entry in library < FWHM 3 Two or more entries in library < FWHM 4 FWHM(actual) not in range, i.e., !(0.8FWHM(calc) < FWHM(actual) < 1.2FWHM(calc)) 5 Peak out of range 6 Net area < 0 7 Centroid is too far from library line 8 HI ≤ LO + 0.8 × FWHM 9 Unused 10 Centroid not found 11 Beta peak (obsolete) 12 FW25M/2.2 < 0.8 × FWHM 13 Result of deconvolution 14 Error > Sensitivity for first in-range peak
32	FLAG2	Peak Flag 2 Bit Description 0–5 unused 6 Used in abundance calculation 7 First in-range peak rejected for any reason 8 Error > Sensitivity for peak itself 9 Peak grossly out of shape 10 Unused 11 PBC peak
33–34	PKCNTS	Number of uncorrected counts in peak
35		Pointer to next higher present peak
36		Number peaks in multiplet region
37–38	CNTENG	Centroid in energy
39	PKLOLM	Peak low limit
40	PKHILM	Peak high limit
41–42	LOAVE	Average background below peak
43–44	HIAVE	Average background above peak
45–46	PKABUN	Isotopic abundance based on this peak only
47–48	PEKMDA	MDA based on this peak only
49	MPLOLM	Multiplet low limit
50	MPHILM	Multiplet high limit
51–52	UFSLOP	Average background slope above peak (SlopeAbove)
53–54	PKCONC	(PKCONC)

55	FLAG3	Peak Flag 3 Bit Description 0–3 Unused 4 Can use this line to calculate peak contribution 5 Subtract peak contribution from this line 6 unused 7 Use this line to calculate average activity 8 Background peak — no activity calculations 9 Peak used in fraction limit test, but not for Average Activity 10 Peak used in fraction limit test, and, if matched, for Activity 11 If nuclide absent, MDA is calculated for this peak energy 12 If nuclide absent, LTL is calculated for this peak energy 13 If nuclide absent, NET is calculated for this peak energy (and critical level test performed) 14 Reserved
56		Reserved
57–62	BKCOEF	Parabolic background coefficients (57,58),(59,60),(61,62)
63		Width
64		Library peak pointer

4.17. AlphaVision Output File

AlphaVision stores the analysis results directly in the database and does not create binary output files.

5. ASCII FORMAT FILES

5.1. SPE Spectrum Files

The SPE format files are ASCII text files with several fields before and after the spectrum data. The fields are delimited by fixed keywords beginning with $ in column 1. The spectrum data is one channel per line. A program can read and use or ignore any fields or keywords not wanted or recognized. Blank lines are ignored. This format is used by several different groups for data interchange.

Keyword	Content
$SPEC_ID:	One line of text describing the data
$SPEC_REM:	Any number of lines containing remarks about the data
$DATE_MEA:	Measurement date in the form mm/dd/yyyy hh:mm:ss
$MEAS_TIM:	Live time and realtime of the spectrum in integer seconds, separated by spaces
$DATA:	The first line contains the channel number of the first channel and the number of channels separated by spaces. The remaining lines contain one channel each of data.
$ROI:	This group contains the regions of interest marked in the spectrum. The first line the number of regions, the following lines contain the start and stop channels for each region.
$ENER_FIT:	This contains the energy calibration factors (a + b * chn) as two real numbers, separated by spaces.
$MCA_CAL:	This contains the number of energy calibration factors on the first line, then the factors on the second line as two numbers, separated by spaces.
$SHAPE_CAL:	This contains the number of FWHM calibration factors on the first line, then the factors on the second line as two numbers, separated by spaces.

5.2. IEEE Spectrum Format

The IEEE spectrum file consists of a variable number of ASCII lines. Each line is 70 characters long. Each line starts with a 4 character prefix of A004. The prefix is followed by 64 characters of data. All lines end with carriage return and line feed characters. All unused characters in a line are ASCII spaces. The contents of the lines are defined as follows:

Line	Contents
1	System identification, sub-system identification, analog-to-digital-converter number, segment number, digital offset
2	Live time, real time, number of channels
3	Acquisition start time, sample collection time
4	Energy calibration coefficients

5	Peak full-width-half-maximum (FWHM) calibration coefficients
6	Sample description — 1
7	Sample description — 2
8	Sample description — 3
9	SAMPLE DESCRIption — 4
10	Spare
11–22	Energy and channel pairs
23–34	Energy and resolution pairs
35–46	Energy and efficiency pairs
47–58	User defined
59	Spectral data continues to the end

6. LIBRARY FILES

6.1. Library Files (Germanium)

The germanium library files are created and maintained by the ULI program (A30), the GammaVision program (A66) or the NuclideNavigator programs (B53, C53) and contain the nuclide information needed by the analysis program to analyze germanium spectra. The library file has a header record, nuclide records, and peak records. All types have 64-word records. The extension should be **`.LIB`**.

6.1.1. Header Record

Record 1

Word Number	Local Name	Type	Use
1	LIBID	I*2	Must be 4
2	LIBID2	I*2	Each bit represented below: Bit — Description Bits 0–13 — Reserved Bit 14 — Sorted library flag Bit 15 — Library corrupt flag
3	RECLEN	I*2	Must be 64
4	RECTOT	I*2	Number of absolute records in the file
5		I*2	Must be 2
6	TYPREC	I*2	Pointer to library type name
7–8			Unused
9	ISOMAX	I*2	Number of nuclide records allocated
10	ISOLEN	I*2	Must be 21
11	ISOSTR	I*2	Start of used nuclide records
12	ISOEND	I*2	End of used nuclide records
13	ISOFRE	I*2	Start of free nuclide records
14		I*2	Must be 1
15		I*2	Must be 1
16	ISOBAS	I*2	First 64-word record with nuclide records
17	PKMAX	I*2	Number of peak records allocated
18	PKLEN	I*2	Must be 16
19	PKSTR	I*2	Start of used peak records
20	PKEND	I*2	End of used peak records
21	PKFRE	I*2	Start of free peak records

22		I*2	Must be 2
23		I*2	Must be 0
24	PKBAS	I*2	First 64-word record with peak records
25–32			Reserved
33		C*1	Creation date and time as 18 ASCII characters. The * character should be ignored if it is not a "1". If it is a "1", it indicates the data is after the year 2000.
43		C*1	Last edit date and time as 18 ASCII characters
52	NUCUSE	I*2	Number of used nuclide records
53	PKUSE	I*2	Number of used peak records
54–64			Reserved

6.1.2. Nuclide Records

The nuclide records are each 21 words long. Three of these records are stored on each 64-word record with one word at the end of each 64-word record left unused. Nuclide records are always referred to by a number which is the ordinal number of the record counting from the start of the nuclide records (not a number of a 64-word record).

Word Number	Local Name	Type	Use
1	NAME	C*1	Nuclide name as 8 ASCII characters
5	HAFLIF	R*4	Half-life
7	UNCERT	R*4	Gammas per disintegration uncertainty
9	UNI	I*2	Half-life units (S = 1, M = 2, H = 3, D = 4, or Y = 5)
10	ISONUM	I*2	Position in the nuclide chain
11		I*2	Isotope type
12			Nuclide flags

Bit	Description
Bit 0	Thermal neutron activiation
Bit 1	Fast neutron activation
Bit 2	Fission product
Bit 3	Naturally occurring isotope
Bit 4	Photon reaction
Bit 5	Charged particle reaction
Bit 6	No MDA calculation
Bit 7	Activity not in total

13–16		Reserved
17	I*2	Pointer to this record
18		Reserved
19	I*2	Pointer to first peak for this nuclide
20	I*2	Back pointer in nuclide chain
21	I*2	Fore pointer in nuclide chain

6.1.3. Peak Records

The peak records are each 16 words long. Four of these records are stored on each 64-word record. Peak records are always referred to by a number which is the ordinal number of the record counting from the start of the peak records (not a number of a 64-word record).

Word Number	Local Name	Type	Use
1	KEV	R*4	Energy in keV
3	GAMPRD	R*4	Gammas per disintegration
5		I*2	Peak flags
			Bit 0 — Gamma ray
			Bit 1 — X-ray
			Bit 2 — Positron decay
			Bit 3 — Single escape
			Bit 4 — Double escape
			Bit 5 — Key line
			Bit 6 — Not in average
6–8			Unused
9	PKNUM	I*2	Position in the sorted peak chain
10		I*2	Pointer to the nuclide record
11–12			Reserved
13		I*2	Back pointer in the sorted peak chain
14		I*2	Fore pointer in the sorted peak chain
15		I*2	Back pointer in the nuclide chain
16		I*2	Fore pointer in the nuclide chain

6.2. PBC Files (Germanium)

The peak background correction (**.PBC**) files are created and maintained by the GammaVision program (A66) and contain the nuclide information needed by the analysis program to correct for isotopes in the background spectrum. The **.PBC** file has a header record, nuclide records, and peak records. All types have 64-word records. The extension should be **.PBC**.

6.2.1. Header Record

Record 1

Word Number	Local Name	Type	Use
1	LIBID	I*2	Must be 16
2	LIBID2	I*2	Each bit represented below: Bit — Description Bits 0–13 — Reserved Bit 14 — Sorted file flag Bit 15 — File corrupt flag
3	RECLEN	I*2	Must be 64
4	RECTOT	I*2	Number of absolute records in the file
5		I*2	Must be 2
6	TYPREC	I*2	Pointer to file type name
7–8			Unused
9	ISOMAX	I*2	Number of nuclide records allocated
10	ISOLEN	I*2	Must be 21
11	ISOSTR	I*2	Start of used nuclide records
12	ISOEND	I*2	End of used nuclide records
13	ISOFRE	I*2	Start of free nuclide records
14		I*2	Must be 1
15		I*2	Must be 1
16	ISOBAS	I*2	First 64-word record with nuclide records
17	PKMAX	I*2	Number of peak records allocated
18	PKLEN	I*2	Must be 16
19	PKSTR	I*2	Start of used peak records
20	PKEND	I*2	End of used peak records
21	PKFRE	I*2	Start of free peak records
22		I*2	Must be 2
23		I*2	Must be 0
24	PKBAS	I*2	First 64-word record with peak records
25–32			Reserved
33		C*1	Creation date and time as 18 ASCII characters. The * character should be ignored if it is not a "1". If it is a "1", it indicates the data is after the year 2000.
43		C*1	Last edit date and time as 18 ASCII characters

52	NUCUSE	I*2	Number of used nuclide records
53	PKUSE	I*2	Number of used peak records
54–64			Reserved

6.2.2. Nuclide Records

The nuclide records are each 21 words long. Three of these records are stored on each 64-word record with one word at the end of each 64-word record left unused. Nuclide records are always referred to by a number which is the ordinal number of the record counting from the start of the nuclide records (not a number of a 64-word record).

Word Number	Local Name	Type	Use
1	NAME	C*1	Nuclide name as 8 ASCII characters
5–9			Reserved
10	ISONUM	I*2	Position in the nuclide chain
11–16			Reserved
17		I*2	Pointer to this record
18			Reserved
19		I*2	Pointer to first peak for this nuclide
20		I*2	Back pointer in nuclide chain
21		I*2	Fore pointer in nuclide chain

6.2.3. Peak Records

The peak records are each 16 words long. Four of these records are stored on each 64-word record. Peak records are always referred to by a number which is the ordinal number of the record counting from the start of the peak records (not a number of a 64-word record).

Word Number	Local Name	Type	Use
1	PBCKEV	R*4	Peak energy in keV
3	PBCVAL	R*4	Background peak in counts per second
5–7			Unused
9	PKNUM	I*2	Position in the sorted peak chain
10		I*2	Pointer to the nuclide record
11–12			Reserved
13		I*2	Back pointer in the sorted peak chain
14		I*2	Fore pointer in the sorted peak chain
15		I*2	Back pointer in the nuclide chain
16		I*2	Fore pointer in the nuclide chain

6.3. Library Files in NuclideNavigator

The NuclideNavigator database library files are created and maintained by the NuclideNavigator programs (B53, C53). These files are in Microsoft Access® format. Access can be used to view these files and their structure. NuclideNavigator can also produce GammaVision format libraries as described above.

6.4. Library Files in AlphaVision

AlphaVision (A36-B32) will read NuclideNavigator libraries and convert them to the following format used internally.

Word Number	Use
0	AlphaVision ID, must be Ox53495641
1	Length of each library nuclide field
2	Number of nuclides (records) in library
3	Starting record number
4	Starting peak number
5–14	Creation date/time
15–24	Last modification date/time

6.4.1. Nuclide Records

The nuclide records follow directly after the library header record. The number of records is word 2 of the header.

Word Number	Use
0	Alpha library entry ID, must be ox53495641
1–4	Nuclide name
5–6	Half-life
7	Half-life units
	1 seconds
	2 minutes
	3 hours
	4 days
	5 years
8–9	First peak — energy value
10–11	First peak — branching ratio
12	First peak — low-channel ROI value

13	First peak — high-channel ROI value
14	First peak — starting record number
15	First peak — starting peak number
16–17	Second peak — energy value
18–19	Second peak — branching ratio
20	Second peak — low-channel ROI value
21	Second peak — high-channel ROI value
22	Second peak — starting record number
23	Second peak — starting peak number
24–25	Third peak — energy value
26–27	Third peak — branching ratio
28	Third peak — low-channel ROI value
29	Third peak — high-channel ROI value
30	Third peak — starting record number
31	Third peak — starting peak number
32–33	Fourth peak — energy value
34–35	Fourth peak — branching ratio
36	Fourth peak — low-channel ROI value
37	Fourth peak — high-channel ROI value
38	Fourth peak — starting record number
39	Fourth peak — starting peak number
40	Low-channel tracer ROI value
41	High-channel tracer ROI value
42–45	Contaminant name
46–47	Contaminant percent
48–49	Unused
50–51	Expected DPM (used in efficiency calibration)
52	Expected CHN (used in energy calibration)
53–64	Reserved

7. DOS SYSTEM FILES

This section describes the files that are used by the system to pass information among programs or to define the hardware system. These are used in DOS, but are not used in the Windows programs.

7.1. Sequence Number File

This file is created by the program SEQNUM (A18) and is always put in directory MCA. It consists of one 64-word direct access record. The values are used to store the spectrum sequence number that is added to the **.SPC** file by CONVERT (A18) or used to generate the default filename in STORE (A18).

The contents are:

Word Number	Use
1	Sequence number for MCA #1 Segment 1
2	Sequence number for MCA #1 Segment 2
3	Sequence number for MCA #1 Segment 3
4	Sequence number for MCA #1 Segment 4
.	.
.	.
.	.
.	.
64	Sequence number for MCA #4 Segment 16

7.2. Configuration File

The configuration file is created by the program SETUP (A18) and contains the information about the number of MCAs on the system and the number of segments within those MCAs. The configuration of a system may contain up to 16 MCAs, each having up to 16 segments. The configuration file is always named **\MCA\CONFIG.DAT**. Each record is 256 bytes long.

Record 1

Word Number	Use
1	Must be 16
2	Number of MCAs defined
3–64	Unused

7.2.1. Configuration Records

There is one configuration record for each MCA in the system. The MCA number (as seen by the operator) is one less than the record number of the corresponding configuration record. The contents are:

Word Number	Type	Use
1	I*2	Total number of channels in MCA
2	I*2	Number of Segments in MCA
3	C*1	MCA device name as 4 ASCII characters
5	I*2	MCA unit number (0 or 1)
6	I*2	MCA type
7	I*2	Multiplexer address (0 for none)
8		Reserved
9		Reserved
10		Reserved
12	I*2	Start channel number for Segment 1
13	I*2	Number of channels in Segment 1
14		Reserved
15		Reserved
17	I*2	Start channel number for Segment 2
18	I*2	Number of channels in Segment 2
.	.	.
.	.	.
.	.	.
84		Reserved
85	I*2	Start channel number of Segment 16
87	I*2	Number of channels in Segment 16
88	I*2	
89		Reserved
90	C*1	MCA description as 64 ASCII characters

7.3. Report File

The report file is created by the program RPT to hold the analysis output report. The extension should be **.RPT**. This file is a formatted, sequential file of variable length records (i.e., it has interrecord deliminators). The DOS commands TYPE or PRINT may be used to read this file.

8. TABLE FILES

8.1. Header Record

These files are mainly used in the DOS programs. Newer formats have been adopted for the Windows programs.

A table file can be created by the programs PBCTABLE or MPCTABLE and contains a table of REAL*4 values associated with a list of nuclides. The table may contain up to four columns of values for each nuclide and it may have up to 300 rows of nuclides and values. A table file has 12-word records with the first five records containing the header information and the rest of the records containing one row each (nuclide name and four values). The following list describes a table file.

Record 1

Word Number	Use
1	Must be 64
2	Reserved
3	Number of columns in table
4	Number of rows in table
5–12	Reserved

8.2. Title Records

These are Records 2 through 5 and are the titles for Columns 1 through 4, respectively. Title records for unused columns are undefined. They are:

Word Number	Use
1	Column title as 12 ASCII characters
6	Column units as 12 ASCII characters

8.3. Nuclide Records

There is one nuclide record for each nuclide defined above. Column values for undefined columns are undefined.

Word Number	Type	Use
1	C*1	Nuclide name as 8 ASCII characters
5	R*4	Column #1 value
7	R*4	Column #2 value
9	R*4	Column #3 value
11	R*4	Column #4 value

8.3.1. PBC Type

Record 1

Word Number	Use
1	Must be 64
2	Reserved
3	Number of columns in table
4	Number of rows in table
5–12	Reserved

For **.PBC** files the nuclide records are:

Word Number	Type	Use
1	C*1	Nuclide name as 8 ASCII characters
5	R*4	PBC value
7	R*4	Unused
9	R*4	Unused
11	R*4	Unused