CompuGamma

Gamma Counter

Models 1282-001 and -002

The LKB-Wallac 1282 CompuGamma is an automatic micro-computer controlled universal gamma counter which can count samples of gamma emitting isotopes with energies in the range 10 to 2000 KeV. The standard model functions in two modes, Mode 0 allows a spectrum plot of CPM values, Mode 1 allows measurement in two channels of CPM values for single and double labelled samples.

CompuGamma is operated by typing instructions with a teleprinter keyboard. Results are printed out using the teleprinter and instantaneous count information appears on the built-in display. Step by step operating instruc-tions are given in this manual, including printout exam-ples with explanations.

LKB
WALLAC

CONTROL LETTERS

Control Letter	Operation	See Page
P	Allows parameter values to be set	4,6,8a
A	Starts automatic counting	5,7b,8b
O	Interrupts any operation and sets the instrument to the READY state	5b,7b,8b
L	Lists the stored parameter groups	3b
C	Allows a parameter group to be cleared from the memory	3b
M	Moves parameters from one group to a new one	3b
I	Lists the control letters	3a
D	Instructs the numeric display to show a particular quantity	12a
R	Allows counting to be resumed	10a
Q	Allows counting of one rack	11a
E	Interrupts counting of a sample in the measuring chamber and allows editing of parameters	10a

Note: Page 6b means page 6 right hand half, page 15a means page 15 left hand half

FEATURE INDEX

Feature	Page
Coding and correction	6b,15a
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Display – spectrum	12a
Editing – interrupt	10b
Error numbers	16,17
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Overprint indicates important points, and in the figures information typed by the user

INTRODUCTION

USING THE MANUAL

This page shows the use of two of the control letters I and L. The different operating modes are described with examples in the pages following: Mode 0, Spectrum Plot, on pages 4 and 5; Mode 1, CPM counting, on pages 6 and 7 with single label samples, and on page 8 with double label samples, decay correction etc. Other features are described in the rest of the manual from page 9 onwards. If Mode 0 is required start reading from page 4, if Mode 1 start from page 6.

SWITCHING ON

If the instrument and output device are not in operation switch them on, and if a teleprinter is being used, set it for on-line operation.

CONTROL LETTER LISTING

The control letters can be listed by typing I and RETURN as shown in the example

```
READY ->? I      - Type I and press RETURN to
                    list control letters

P)ARAMETER EDIT   C)LEAR GROUP   L)IST GROUPS   D)ISPLAY
A)UTOMATIC OP     Q)UICK ASSAY   E)DIT OFF      R)ESUME
```

EDITING OF STORED PARAMETER GROUPS

The number of parameter groups that are stored and the amount of memory available can be printed out by typing L. A group can be deleted from the memory by typing C. Parameters in one group can be moved to a new group by using control letter M; they cannot be moved to an existing group without that group being cleared.

```
READY -? L               - Type L and press RETURN
                           Stored groups listed

GR MODE SIZE% ID
 1   1   2.6 BG-TEST
 2   1   2.6 CS-137 EFF
 3   0   1.6 SPECTRUM
20   1   3.3 DOUBLE
                         - Group number, mode, percentage
                           of the memory occupied by each
                           group, identifier

FREE MEMORY 89.9 %       - Percentage of the memory free


READY - ? C              - Type C to start clearing a group
PARAMETER GROUP (1-99) - ? 1 - Give group number first time
CLEAR:
PARAMETER GROUP (1-99) - ? 1 - Give number second time. If this
                               is a different number than the
FREE MEMORY 92.5 %             first ERROR 75 will be printed
                               The group is cancelled and the
                               free memory increases


READY - ? M              - Type M to begin move operation
MOVE FROM
PARAMETER GROUP (1-99) - ? 2 - Give the number of the group
TO                             to be moved
PARAMETER GROUP (1-99) - ? 4 - Give a new group number. If a
                               group already exists with this
                               number the parameters will not
                               be moved
                             - Memory available decreases as
                               new group is stored
FREE MEMORY 89.9%        Note: End every line by pressing
                               RETURN
```

MODE 0 SPECTRUM PLOT

STANDARD PARAMETERS FOR MODE 0

CompuGamma includes standard values which can be set for a parameter group, as shown in the example. In addition the allowed range of values for each parameter is also given. To begin parameter setting type P and press RETURN.

```
READY->? P
PARAMETER GROUP   (1-99) ->? 10    -  Type P and press RETURN
CREATE GROUP: 10                   -  Give a group number (1-99)
                                   -  Shows a new group has been created

ID(MAX 20 CHAR)        ->? SPECTRUM -  Give group name (Max.20 characters)
MODE(0-1)              ->? 0        -  Select MODE 0

LINE(1-13)                         -  Press RETURN list standard param.

 1 LISTING          N              -  Y-Yes,parameter listing required
                                   -  N-No listing required
 2 TIME             10             -  Count time(1-99 999) secs
 3 COUNTS           900000         -  Maximum no.of counts (0-9 999 000)
 4 BACKGROUND       0              -  Preset value subtracted from each
                                      counting window (0-999 999)CPM
 5 PEAKPRESET       0              -  Base value for peaks (0-99 999)CPM
 6 START CH         0              -  Starting level no. (1-255)
 7 WINDOW WIDTH     1              -  No.of levels per window (1-256)
 8 STEP             1              -  No.of levels from first level in one
                                      channel to first in next (1-255)
 9 STOP CH          256            -  Level no.at which counting ends
10 RAW DATA         N              -  Y-Yes,results printed before plot
                                   -  N-No,only plot required
11 REPEAT           1              -  No.of times sample counted (1-999)
12 TTY LINE         72             -  Max.width of printout(72-132)
13 FIRST POS        1              -  Sequence no. of first sample (0-999)

READY->?                ->? /      -  Jump to the READY state
```

SPECTRUM PLOT PARAMETER SETTING

Parameter values can be changed and the new parameters stored with their own group number. The number of groups that can be stored depends on their sizes: at least 20 Mode 0 groups can be stored; Mode 1 groups are larger so less of them can be stored.

```
READY->? P
PARAMETER GROUP   (1-99) ->? 10    -  Type P to set parameters
EDIT GROUP: 10                     -  Select the parameter group number

ID(MAX 20 CHAR)   SPECTRUM->?
MODE(0-1)              ->?

LINE(1-13)            ->? 5         -  Select first line to be changed

 5 PEAKPRESET       0  ->? 2000     -  Peak base level set at 2000CPM
 6 START CH         0  ->? 150      -  Spectrum begins from level no.150
 7 WINDOW WIDTH     1  ->?
 8 STEP             1  ->?
 9 STOP CH          256 ->? 190     -  Spectrum ends at level no.190
10 RAW DATA         N  ->? Y        -  A printout of results is required
11 REPEAT           1  ->?
12 TTY LINE         72 ->? 120      -  Max.width of plot 120 characters
13 FIRST POS        1  ->?

LINE(1-13)            ->? /         -  Jump to READY state

READY ->?                          Note: Press RETURN to end each
                                   line
```

LOADING SAMPLES ON THE CONVEYOR

Load samples — make sure that the racks are loaded so the two slots are towards the user, see the figure below. Each set of samples should have its own group selection plug, see page 14. Put a STOP plug after the last sample to stop the instrument. All sample holders should have a colour code ring, this fits into the top of the holder.

Colour
Code
Ring

Two slots

Conveyor Direction
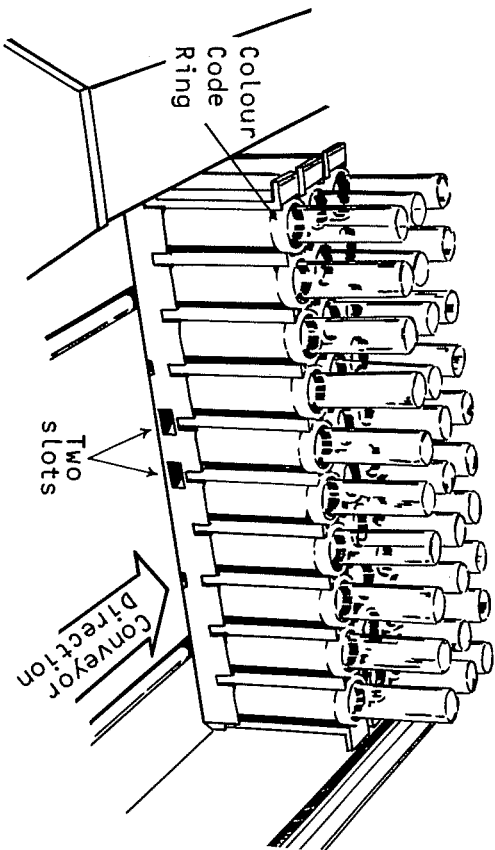
AUTOMATIC SPECTRUM PLOT

Type A and give the group number to start automatic counting. Results are first listed then the spectrum is plotted out as shown in the example in the next column.

STOPPING AUTOMATIC OPERATION

Type O and press RETURN to interrupt automatic counting and cause a jump to the READY state or use a STOP code plug in the last rack to be counted.

```
READY ->? A                          - Type A to begin automatic counting
PARAMETER GROUP (1-99)    ->? 10     - Select parameter group
ID:SPECTRUM                          - Identifier and mode are printed automatically
MODE 0
```

LEVEL NO	CH 1	CH 2	CH 3	CH 4	CH 5	TIME	ETIME CPM
150-155	770	629	931	552	610	10	0.00
155-160	777	610	571	616	571	10	0.01
160-165	668	713	847	1111	1342	10	0.01
165-170	1060	1195	1394	1439	1695	10	0.01
170-175	2439	3185	6104	9518	15840	10	0.01
175-180	20863	19753	15846	11458	6095	10	0.02
180-185	3178	1310	571	315	250	10	0.02
185-190	141	180	122	122	160	10	0.02

CPM results are obtained in five counting channels simultaneously as shown here

In the spectrum plot the CPM at each level number is given and the percentage that this is of the total CPM

```
SPECTRUM PLOT:POS 1

LEVEL NO  % OT  CPM 0            5200           10400          20800
                    +==============+==============+//=============+

150-151  0.52   770 I*
151-152  0.43   629 I*
152-153  0.65   951 I*
153-154  0.37   552 I*
154-155  0.41   610 I*
155-156  0.53   777 I*
156-157  0.41   610 I*
157-158  0.39   571 I*
158-159  0.42   616 I*
159-160  0.39   571 I*
160-161  0.45   668 I*
161-162  0.48   713 I*
162-163  0.57   847 I*
163-164  0.75  1111 I*
164-165  0.91  1342 I*
165-166  0.72  1060 I*
166-167  0.81  1195 I*
167-168  0.95  1394 I*
168-169  0.98  1439 I*
169-170  1.15  1695 I*
170-171  1.65  2439 I*
171-172  2.16  3183 I*
172-173  4.14  6104 I*
173-174  6.46  9518 I*
174-175 10.74 15840 I*
175-176 14.15 20863 I*
176-177 13.40 19753 I*
177-178 10.75 15846 I*
178-179  7.77 11458 I*
179-180  4.13  6095 I*
180-181  2.16  3178 I*
181-182  0.89  1310 I*
182-183  0.39   571 I*
183-184  0.21   315 I*
184-185  0.17   250 I*
185-186  0.10   141 I*
186-187  0.12   180 I*
187-188  0.08   122 I*
188-189  0.08   122 I*
189-190  0.11   160 I*

PEAK 1
150-190 100.00 147424
170-181  75.52 114277
```

Peak indicated by values with double lines (=)
Integrated area under peak includes all values marked in colour here

- Total CPM within this counting window 150 - 190
- First peak greater than PEAKPRESET value: width of the peak, percentage of the total CPM within the peak, and CPM within the peak are given

MODE 1 CPM SINGLE LABEL

STANDARD PARAMETERS FOR MODE 1

To set the standard parameters type P and press RETURN CompuGamma includes standard values which can be set for a parameter group, as shown in the example. In addition the allowed range of values for each parameter is also given. To begin parameter setting type P and press RETURN.

```
READY- ? P            – Type P to set count parameters
PARAMETER GROUP  (1-99) ->? 1   – Give a parameter group number (1-99)
CREATE GROUP: 1       – Shows a new group has been created.
ID(MAX 20 CHAR)  ->? EXAMPLE1   – Give group name (max.20 characters)
                      – Note: Do not use , ' / in the ID
MODE(0-1)         ->? 1   – Select MODE 1
LINE(1-20)        ->?     – Press RETURN to list standard param.

 1 LISTING       N    – Y-Yes,parameter listing required
                      – N-No listing
 2 TIME          60   – Count time (1-99 999)secs
 3 COUNTS 1      900000 – Max.no. counts in ch.1(0-9 999 000)
 4 COUNTS 2      900000 – Same for channel 2
 5 LCR COUNTS    0    – Low count reject count(0-999 999)
 6 LCR TIME      0    – LCR time(0-999)secs
 7 BACKGROUND 1  0    – Ch.1 preset background(0-999 999)CPM
 8 BACKGROUND 2  0    – Ch.2 preset background(0-999 999)CPM
 9 WINDOW 1      035-102 – Ch.1 window width(0-256)
10 WINDOW 2      000-000 – Ch.2 window width(0-256)
11 HALF LIFE 1   0    – Half life,ch.1(0.001-9 999.99)hours
12 HALF LIFE 2   0    – Half life,ch.2(0.001-9 999.99)hours
                      – 0-no correction See Instr.Man.Sec.4
13 FACTOR 1      1    – Half life corr. for channel 1
14 FACTOR 2      1    – Half life corr. for channel 2
15 SUMMATION     N    – For multiplying RATIO1(0.0-999 999.9)
16 REPLICATE     1    – For multiplying RATIO2(0.0-999 999.9)
                      – Y-Yes,add ch.1 and ch.2 results
17 REPEAT        1    – N-No,do not add results
18 LABELS(1/2)   1    – Number of replicates(1-99)
                      – No.of times sample counted(1-999)
19 CODING             – 1 – single label samples
20 PRINT              – 2 – double label samples
   POS CODE           – Sample position and code
   -1-2-3-4-5-6-7-8   – Printout selection

READY->?              – Type RETURN to jump to READY,
                      – Parameters are stored automatically

LINE(1-20)       ->? /   – Note: Type / 0 RETURN to go to LINE,
                      – and / xx RETURN to go to line xx
```

CPM MEASUREMENT PARAMETER SETTING EXAMPLE 1

Parameter values can be changed: first type P and select the parameter group then give the new parameter values, as shown in the example. Always press RETURN at the end of every line.

```
READY- ? P            – Parameter setting selected
PARAMETER GROUP  (1-99) ->? 1   – Parameter group selected
EDIT GROUP: 1         – Param.group created previously
                      – is to be edited
ID(MAX 20 CHAR) EXAMPLE1 ->?   – RETURN pressed as line unchanged

MODE(0-1)        1    – RETURN pressed
LINE(1-20)       ->? 6 6 2   – Line 2 selected,(6 was an error)
                      – Note: If a typing error occurs
                      – go back to the error by pressing
                      – DELETE and correct it

 2 TIME          60   ->? 40   – New count time set
 3 COUNTS 1      900000 ->? /16   – Jump to line 16
16 REPLICATE     1    ->? 2   – Duplicates selected
17 REPEAT        1    ->? 2   – Count to be repeated
18 LABELS(1/2)   1    ->?     – RETURN pressed

19 CODING                     – Position and code for control
   POS-CODE         POS-CODE  – samples and unknowns. No. of
   000-     ->? 1-BGND        – replicates for controls deter-
   000-     ->? 3-REFA        – mined by coding not line 16
   000-     ->? 5-UNKS        – RETURN pressed to end coding
   000-     ->?
   -1-2-3-4-5-6-7-8
   ->? 1-2-3-4-5-6-7-8-9      – New printouts selected
20 PRINT         ->?          – RETURN pressed as no more coding
```

LOADING SAMPLES ON THE CONVEYOR

Load samples – make sure that the racks are loaded so the two slots are towards the user. Each set of samples should have its own group selection plug, see page 14. Put a STOP plug after the last sample to stop the instrument.

```
LINE(1-20)          ->?        -  Press RETURN to list parameters
 1 LISTING      N                 if required
 2 TIME         40             -  Parameters listed
 3 COUNTS 1     900000
 4 COUNTS 2     900000
 5 LCR COUNTS   0
 6 LCR TIME     0
 7 BACKGROUND 1 0
 8 BACKGROUND 2 0
 9 WINDOW 1     035-102
10 WINDOW 2     000-000
11 HALF LIFE 1  0
12 HALF LIFE 2  0
13 FACTOR 1     1
14 FACTOR 2     1
15 SUMMATION    N
16 REPLICATE    2
17 REPEAT       2
18 LABELS(1/2)  1
19 CODING
          POS-CODE
          001-BGND
          003-REFA
          005-UNKS
          000-
          -1-2-3-4-5-6-7-8-9
20 PRINT

LINE(1-20)          ->? /       -  / RETURN given to jump to READY

READY->?                        Note: RETURN must be pressed to end
                                      every line
```

AUTOMATIC SAMPLE COUNTING

Type A and give the group number to start automatic counting.

```
READY ->? A                        -  Type A to begin automatic counting
PARAMETER GROUP (1-99)  ->? 1      -  Select parameter group 1
ID:EXAMPLE1                        -  Identifier and mode are printed
MODE 1                                out automatically followed by results
```

POS	CODE	ETIME	CTIME	DTIME%	COUNTS1	CPM1	ERR1%	RATIO1
001	BGND	0.04	40	0.6	165	249	7.8	
001		0.05	40	0.6	166	251	7.8	
	MEAN					250	5.5	
002		0.07	40	0.6	146	220	8.3	
002		0.08	40	0.6	143	216	8.4	
	MEAN					218	5.9	
	MEAN					234	4.0	
003	REFA	0.09	40	1.4	18366	27697	0.7	
003		0.11	40	1.4	18520	27933	0.7	
	MEAN					27815	0.5	
004		0.12	40	1.4	18326	27635	0.7	
004		0.13	40	1.4	18072	27246	0.8	
	MEAN					27441	0.5	
	MEAN					27628	0.4	0.0000
005	UNKS	0.15	40	1.8	16422	24720	0.8	0.8930
005		0.16	40	1.8	16312	24552	0.8	0.8793
	MEAN					24636	0.6	0.8861
006		0.17	40	1.8	16591	24672	0.8	0.8947
006		0.19	40	1.8	16144	24294	0.8	0.8887
	MEAN	0.20	40	1.8		24483	0.6	0.8917
	MEAN					24559	0.4	0.8889

STOPPING AUTOMATIC OPERATION

Type O and press RETURN to interrupt automatic counting and cause a jump to the READY state or use a STOP code plug in the last rack to be counted.

MODE 0 SPECTRUM PLOT

STANDARD PARAMETERS FOR MODE 0

CompuGamma includes standard values which can be set for a parameter group, as shown in the example. In addition the allowed range of values for each parameter is also given. To begin parameter setting type P and press RETURN.

```
READY->? P             - Type P and press RETURN
PARAMETER GROUP  (1-99) ->? 10    - Give a group number (1-99)
CREATE GROUP: 10       - Shows a new group has been created

ID(MAX 20 CHAR)   ->? SPECTRUM    - Give group name (Max.20 characters)
MODE(0-1)         ->? 0           - Select MODE 0

LINE(1-13)             - Press RETURN list standard param.

 1 LISTING        N    - Y-Yes,parameter listing required
                       - N-No listing required
 2 TIME           10   - Count time(1-99 999) secs
 3 COUNTS         900000 - Maximum no.of counts (0-9 999 000)
 4 BACKGROUND     0    - Preset value subtracted from each
                         counting window (0-999 999)CPM
 5 PEAKPRESET     0    - Base value for peaks (0-99 999)CPM
 6 START CH       0    - Starting level no. (1-255)
 7 WINDOW WIDTH   1    - No.of levels per window (1-256)
 8 STEP           1    - No.of levels from first level in one
                         channel to first in next (1-255)
 9 STOP CH        256  - Level no.at which counting ends
10 RAW DATA       N    - Y-Yes,results printed before plot
                       - N-No,only plot required
11 REPEAT         1    - No.of times sample counted (1-999)
12 TTY LINE       72   - Max.width of printout(72-132)
13 FIRST POS      1    - Sequence no. of first sample (0-999)

LINE(1-13)        ->? /  - Jump to the READY state
READY->?
```

SPECTRUM PLOT PARAMETER SETTING

Parameter values can be changed and the new parameters stored with their own group number. The number of groups that can be stored depends on their sizes: at least 20 Mode 0 groups can be stored; Mode 1 groups are larger so less of them can be stored.

```
READY->? P
PARAMETER GROUP  (1-99) ->? 10    - Type P to set parameters
EDIT GROUP: 10                    - Select the parameter group number

ID(MAX 20 CHAR) SPECTRUM->?
MODE(0-1)        ->?

LINE(1-13)        ->? 5    - Select first line to be changed

 5 PEAKPRESET  0  ->? 2000 - Peak base level set at 2000CPM
 6 START CH    0  ->? 150  - Spectrum begins from level no.150
 7 WINDOW WIDTH 1 ->?
 8 STEP        1  ->?
 9 STOP CH     256 ->? 190 - Spectrum ends at level no.190
10 RAW DATA    N  ->? Y    - A printout of results is required
11 REPEAT      1  ->?
12 TTY LINE    72 ->? 120  - Max.width of plot 120 characters
13 FIRST POS   1  ->?

LINE(1-13)        ->? /    - Jump to READY state
READY ->?                    Note: Press RETURN to end each
                             line
```

GENERAL

PRINTOUT SELECTION

Information to be printed out can be selected according to individual requirements, it can be printed out in any order, special characters may be introduced, information can be repeated and can extend to as many printout lines as required. Each item is selected according to its reference number as shown in the accompanying table, for convenience the standard program includes a preset printout format. The following points should be noted:

1 Tabulation is possible by using the symbol >xx where xx is the number of characters from the left margin at which printing is to start, e.g. -5->20-6-means that printout column 6 starts 20 character positions in from the left margin. This assumes that printout column 5, and those before it, have ended before postion 20 has been reached, if this is not so, the tabulation will be ignored in the printout. The tabulation instruction must be separated from the other printout options by hyphens (-) in the usual way.

2 Text can be included in the printout by putting it between apostrophes in print selection e.g. -5-'channel 1-6-

3 The 's' in the printout column width listing means that an extra character place is reserved in the printout, this is either a space if the number is positive or a minus sign (-) if the number is negative. The 'SP' in the listing means that one extra space is included after every column. The numbers given are the total width of the printout column for that printout option.

4 If the number measured or calculuated is too big for the column width assigned to it, the column will be filled with asterisks e.g. ******.

Ref No		Heading	Column width
0	Return and line feed		
1	Sequence number	POS	xxx SP 4
2	Code	CODE	xxx SP 5
3	Elapsed time in hours	ETIME	sxxxx.xx SP 9
4	Counting time in seconds	CTIME	sxxxxx SP 7
5	Dead time as a percentage of count time	DTIME%	sxxx.x SP 7
6	Counts in channel 1	COUNTS1	sxxxxxxx SP 9
7	CPM in channel 1	CPM1	sxxxxxxx SP 9
8	Error in ch1 CPM	ERR1%	sxxx.x SP 7
9	Unk CPM ch1 / Ref A mean CPM ch1 (or for ref.sample A) Mean CPM ch1	RATIO1	sxx.xxxx SP 9
10	Ratio 1 x factor 1 / Mean CPM ch2	FACTOR1	sxxxx.xx SP 9
11	Counts in ch2	COUNTS2	sxxxxxxx SP 9
12	CPM in ch2	CPM2	sxxxxxxx SP 9
13	Error in ch2 CPM	ERR2%	sxxx.x SP 7
14	Unk CPM ch2 / Ref B mean CPM ch2 (or for ref.sample B) Mean CPM ch2	RATIO2	sxx.xxxx SP 9
15	Ratio 2 x factor 2 / Mean CPM ch2	FACTOR2	sxxxx.xx SP 9
16	Counts 1 + counts 2	COUNTS#	sxxxxxxx SP 9
17	CPM1 + CPM2	CPM#	sxxxxxxx SP 9
18	Error in(ch1 + ch2) CPM	ERR#	sxxx.x SP 7
19	Unk CPM1 + Unk CPM 2 / Ref A mean CPM1 + CPM2	RATIO#	sxx.xxxx SP 9
20	Ratio # x factor 1	FACTOR#	sxxxx.xx SP 9

INTERRUPTING THE STANDARD CURVE

The control letter O can be typed at any time but if this happens during curve calculation the curve will be lost and no curve will be in the memory if an attempt is made to resume the assay, only CPM values will be calculated and printed.

Control letter E can be given at anytime but it will not interrupt calculation of the standard curve. The program only jumps to the EDIT state after the curve has been plotted.

INTERRUPT FOR EDITING

Counting of a sample in the measuring chamber can be interrupted by typing E followed by pressing RETURN. Any of the control letters C)lear L)ist P)arameter R)esume and O)ff can be typed. When the editing procedure has been completed type R followed by RETURN; counting will resume in the normal way and will include any changes made during editing; it will begin with the sample in the measuring chamber which will be recounted.

```
                                      - Counting is started
READY ->? A
PARAMETER GROUP (1-99) ->? 1
ID:TEST
MODE 1

POS CODE  CTIME COUNTS1  CPM1  ERR1%
001 BGND    60     21      21   21.8    - Observe the count time
002         60     28      28   18.9      and number of printout
    MEAN                    25   14.3      columns

003 REFA    60   27822   28182   0.6
004         60   28055   28421   0.6
    MEAN           28055   28301   0.4

005 UNKS    60   23780   24056   0.6

*COUNTING INTERRUPTED*                  - Counting interrupted by
PARAMETER GROUP  1                        typing letter E
ID:TEST
MODE 1
POS 6

EDIT ->? L                              - After EDIT is printed other
                                          operations can be performed,
                                          e.g. Listing
GR MODE SIZE% ID
2   1    2.1  DEMO
1   1    2.8  TEST

FREE MEMORY 95.0%

EDIT ->? P                              - Parameters can be changed,
PARAMETER GROUP (1-99) ->? 1              (including parameters of the
EDIT GROUP:1                              group being used when
                                          counting was interrupted as
ID(MAX 20 CHAR) TEST   ->?                shown here)
MODE(0-1)  1           ->?

LINE(1-20)
2 TIME      60        ->? 2             - A new count time is set
3 COUNTS 1  900000    ->? 30
20 PRINT              ->? /20           - Printout options are changed
            -1-2-4-6-7-8
            ->? 1-2-4-6-7-8-9-10
            ->? /

EDIT ->? R                              - R is typed to resume counting
*COUNTING RESUMED*                        with the same parameter group
PARAMETER GROUP  1                        as when counting was
ID:TEST                                   interrupted (in this case with
MODE 1                                    changed parameters)
POS 6

POS CODE  CTIME COUNTS1  CPM1  ERR1% RATIO1 FACTOR   - Observe
006        30   12014   24309   0.9  0.8589  0.86      count time
007        30    9107   18391   1.0  0.6498  0.65      and printout
008        30    9170   18518   1.0  0.6543  0.65      columns
009        30    6490   13080   1.2  0.4622  0.46
010        30    6565   13231   1.2  0.4675  0.47
```

```
*COUNTING INTERRUPTED*
PARAMETER GROUP    1
ID.TEST
MODE 1
POS 11
```

   — Q has been typed to
     interrupt counting and
     cause a jump to the
     READY state

```
READY ->? Q
```

   — Load the rack to be counted

```
PARAMETER GROUP  (1-99)   ->? 2
```

   — Type Q
   — Select the parameter group
     required for the assay
     (It can be a different mode
     from the interrupted mode)
     Counting of the samples
     starts in the normal way

   — followed by RETURN. Give the group number of the parameters to be used in counting the rack. After all the samples have been counted the rack will be driven out

```
SPECTRUM PLOT:POS 1
LEVEL NO  % OT    CPM 0       3500      7000     10500     14000
                     +=======+=======+=======+=======+===
035-040   1.19    532   I-*
040-045   1.64    733   I-*
045-050   2.84    1271  I---*
050-055   6.63    2963  I------*
055-060   19.35   8645  I===============*
060-065   32.19   14381 I========================*
065-070   22.88   10219 I=================*
070-075   9.32    4162  I========*
075-080   2.90    1296  I---*
080-085   0.70    312   I*
085-090   0.12    55    I*
090-095   0.05    24    I
095-100   0.14    61    I
100-105   0.04    18    I
                     +=======+=======+=======+=======+===
035-105 100.00  44673
```

```
*END OF ASSAY

SPECTRUM PLOT:POS 2
 .    .    .    .    .    .    .    .    .    .
 .    .    .    .    .    .    .    .    .    .
 .    .    .    .    .    .    .    .    .    .
```

   — When counting of the samples is finished the rack is driven out from the counting position Insert the rack which was being counted when the interrupt came

```
READY ->? R
```

   — Type R to resume counting
     of the original samples

```
*COUNTING RESUMED*
PARAMETER GROUP    1
ID.TEST
MODE 1
POS 11
```

   — The last sample in the measuring
     chamber will be recounted

```
011   30   3265   6556   1.8   0.2316   0.23
012   30   1236   2464   2.9   0.0870   0.09
```

INTERRUPT FOR QUICK COUNTING

Quick counting of one rack using the control letter Q can take place at any time provided the instrument is in the ready state. If a series of samples is being counted already, type letter Q followed by RETURN to interrupt counting, then, when READY has been printed, put the rack of samples to be counted on the conveyor so that it is the first rack to enter the counting position and type Q followed by RETURN. Give the group number of the parameters to be used in counting the rack. After all the samples have been counted the rack will be driven out from the measuring position and counting of the original sequence of samples can be resumed. Move the rack that was in the counting position when counting was interrupted to the head of the in-stream of racks on the conveyor and press R. The sample which was being counted when the interrupt occurred will be recounted and then counting will continue in the normal way.

LOW COUNT REJECT

The low count reject parameters lines 5 and 6 of Mode 1 allow the user to give the count level below which the sample will be rejected. On line 5 the user gives the number of counts that must be measured during the time given on line 6. E.g. if less than 100 counts are measured in ten seconds the sample is rejected and the next moved into the measuring chamber. If repeat measurements have been selected and one of the repeats satisfies the reject condition no further repeat measurements will be made on the sample and any measurements made already will be ignored. Counting of the next sample will begin.

The low count reject condition is only satisfied if the number of counts in both channels falls below the level set on lines 5 and 6.

DISPLAY

Numerical information on the display is selected by typing D followed by a number, or a letter and a number, then pressing RETURN. Display possibilities are listed below.

Table of display information

D1	Position
D2	Time
D3	Elapsed time
DWx	Window setting for ch x where x is 1 - 5
DGx	Counts in ch x
DCx	CPM in ch x
D9	Scans each value and displays it for 4 secs

SPECTRUM DISPLAY

Part of the display also provides an indication of the energy distribution of gamma emission from the sample. Thirty-two light emitting diodes are arranged to cover the 256 energy levels, (eight levels for each diode,) they indicate by their intensity the spectral distribution of radiation from the sample. Each diode covers a segment of the energy range, the maximum energy for each is indicated by the energy level number marked for the individual diodes. Together they provide a rapid means of checking that the count window is set correctly for the sample.

SETTING THE COUNTING WINDOW

The energy range of radiation detectable by the Computer Gamma is 10 - 2000 KeV; this range is divided logarithmically into 256 levels, each of which is given a number. The counting window is defined by giving the upper and lower level numbers. Once this window has been set only those particles with energies falling within in the range of the window will be counted by the microcomputer. There are various ways of deciding where to set the window limits:

Preset window

There is a standard window setting given in Mode 1, this is from level number 35 to 102 for WINDOW 1 which is a good starting window for counting isotopes ^{125}I and ^{129}I, however the user may change this window and also WINDOW 2 which is set at 000-000 in the standard parameters.

Spectrum Display

The 32 LEDs on the display show the peak position and allow approximate limits to be set.

Spectrum Plot Mode 0

The main method for deciding which levels to set is by running a spectrum plot on the sample using Mode 0. This allows the optimum window to be set for a particular sample.

LEVEL NUMBER/ENERGY PLOT

The figure below shows a plot of the log of energy against level number, from this the level number corresponding to a particular energy, or the energy range corresponding to a particular LED may be obtained.
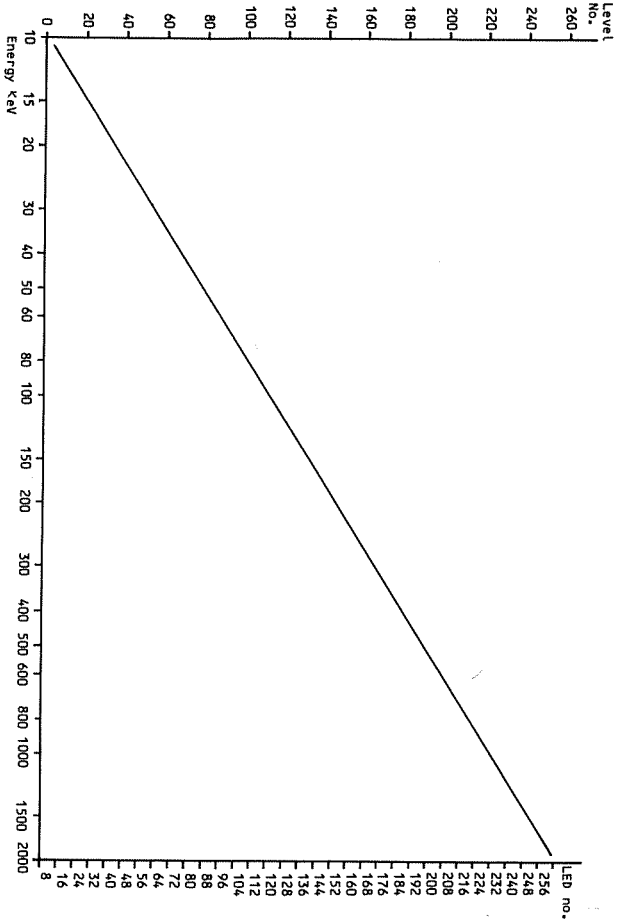
ISOTOPE/LEVEL NUMBER PLOT

The figure below shows the peak positions in terms of the level number of some selected isotopes.
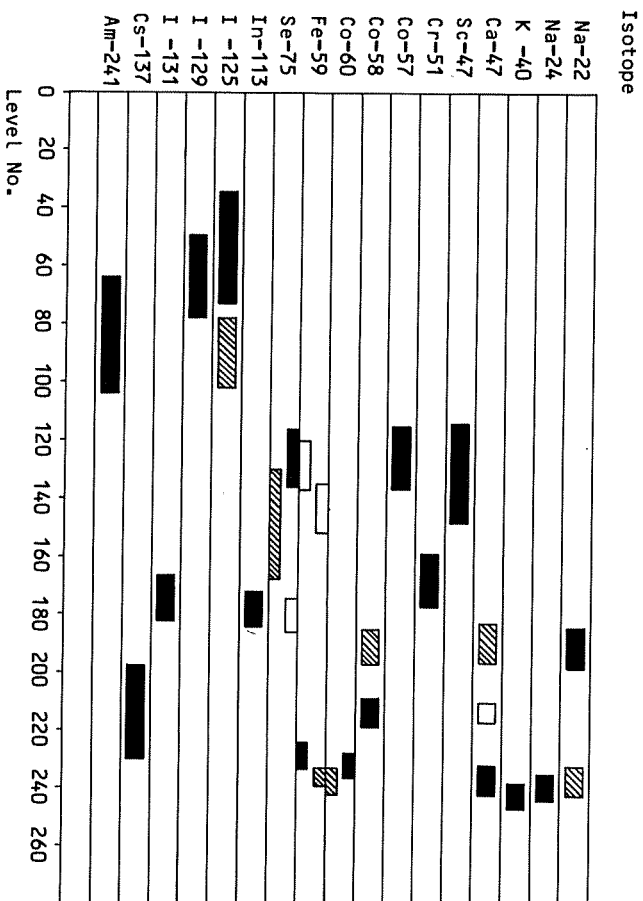
■ Strongest peaks

▨ Intermediate peaks

☐ Weakest peaks

CODE PLUGS

Automatic counting of racks can be controlled by the use of code plugs. A code plug occupies one position in a sample rack and when it reaches the counting position it gives information to the instrument. There are three main types of information:

Normal numeric code plug

This plug has a number in the range 0-9. When the instrument detects one or two of these plugs it starts counting the samples that follow the plug(s) using the parameters in the group given by the number of the code plugs. Using two plugs, groups in the range 1-99 can be selected automatically. If LISTING has been set to Y parameters will be listed before results are printed. If N only the group number, identifier and mode will be printed out before count results.

Note: Not more than two numeric code plugs may be put in successive rack positions.

Pass plug

When a pass plug is detected the samples following are not counted until another pass plug is detected at which point counting resumes normally. The message   * PASS will be printed out. Letter O should not be typed during the time between the detection of the first and last pass plugs. A pass plug must not be put after a numeric code plug with no samples in between.

Stop plug

Counting can be stopped by inserting this plug. The rack will be driven out of the counting position and the instrument will jump to the READY state. The message * END OF ASSAY will be printed out. A STOP plug will be ignored if it is in between two pass plugs.

Note: Any plugs in a rack the wrong way round will be ignored but the sample position number will be increased by ten after the rack has passed through the measuring position.

Samples counted
with parameters
from group 2

Counting with
parameters from
group 2 continued

Samples passed
over and not
counted

Counting
stopped
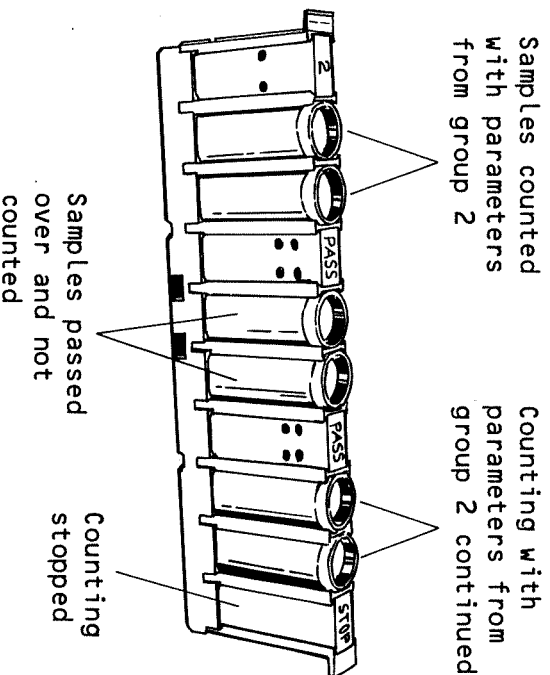
CODING

The instrument recognises four special codes: BGND REFA REFB UNKS. No code is recognised after the UNKS code has been given, it will be treated as a name for unknown samples. If an unrecognised code is given before UNKS it will be treated as an unknown sample as far as possible e.g. if it comes between REFA and REFB it cannot be treated as a double label sample because the second reference sample has not been measured. It will be given the name typed in coding. If the next code is a special one e.g. REFB it will be treated in the normal way. The first three special codes can be given in any order but the background sample will only be subtracted from those samples coded after it. A second background sample can be coded before UNKS and will be subtracted from the unknown samples. The position numbers given to the samples should be in increasing order. Replicate samples must not be coded.

Editing of coding can be done in the following way:

If a line of coding is to be left out type - .
If only position number is to be changed give the new number only.
If only code is to be changed give - followed by the new code
If both number and code are to be changed then type both with the - in between in the normal way.

Note: To correct an error 74 be sure that the new position number given is greater than the position number before it in the coding and less than the one after it otherwise another error 74 will be indicated.

POWER FAILURE

The CompuGamma is fitted with a standby power supply which protects it for up to 45 mins. against the loss of parameters if a power failure occurs. If power is off for a longer time all the parameters will be lost and the instrument will be in the MASTER CLEAR state when power returns. When power returns the instrument enters a power failure loop. This is indicated on the display by the numerical display showing a row of 8s and the other LEDs all being lit up except for the TIME indicator LED which goes on and off. This state will continue for about 15 minutes if uninterrupted, then the program will jump to the READY state unless it was in the automatic counting mode when power failure occurred in which case it will resume counting. This state can be interrupted in the following ways:

Typing C causes a jump to MASTER CLEAR and all the parameters will be lost.
Typing / causes a jump to the READY state but saves the parameters
Pressing RETURN causes the words POWER FAILURE to be printed then the program jumps to the READY state or continues counting if it was in the automatic counting mode when power was lost.

Note: The printer must always be reset by pressing the TERM READY button although results can still be printed out by the instrument if this has not been done.

ERROR NUMBERS

If an error occurs during operation, the CompuGamma will inform the user by means of an error number. The meaning of each error number is described in the table following. Where necessary, instructions are given about the action that needs to be taken.

No.Error

6 The conveyor does not start. This may be caused by one or more motors not being at the starting point of their operational cycle, or by a sensor failure. Type letter O and press RETURN to drive the motors to their initial positions.

11 Operation cannot be resumed because there is a Stop plug, a Code plug or no sample in the first rack position to be counted.

41 Stabilisation failed during measurement.

42 Error when calculating CPM or counting error in CPM. The count time is very small or zero causing a division-by-zero error or an overflow error.

43 Error in spillover correction in double label assay. Ratios q(A) and q(B) are such that calculation of corrected CPM or its error leads to an error.

44 Error when calculating q(A), q(B), their errors or 1-q(A)·q(B) in a double label assay. Check the window settings, coding and reference samples to see if they are correct.

45 Overflow has occurred when summing repeat CPMs or their errors. This error can also result after errors 42, 43, and 47.

46 Overflow has occurred when summing CPM or CPM error values for the replicate mean value calculation. This can also result after errors 42, 43, 47 and 45.

No.Error

47 Error in half life correction. The ratio elapsed time/half life has become so large that calculation of corrected CPM or its error leads to overflow.

48 No double label nor half life correction has been made because one or both of the reference samples is missing.

49 Total sum of CPMs is zero (or nearly zero) leading to error in percent calculations (MODE 0).

50 Parameter group number given after A or Q command differs from the group number specified by the code plugs. Code plugs override the number given.

51 No group is stored with the group number specified by the code plugs. All samples up to the next code or stop plug are ignored.

53 Rack error. The rack has been put the wrong way round on the conveyor. The samples in the rack will not be counted but the sample positioning number will increase by ten for the next sample. Any plugs in the rack will be ignored.

57 Checksum error. An error has been introduced into the BASIC program in the non-permanent memory, the program is reloaded automatically.

58 Error discovered which prevents the instrument going to the READY state, instead it goes to the service state; call a service engineer.

59 Operation has stopped because the BASIC interpreter has detected an error while the program was running. Type the same control letter as was used to start the operation. If the same error occurs again (and also after Master Clear) it is an indication of a memory fault. This error message will be followed by another of the form ?xx Error in yyyy, then READY ? will be printed out.

61 Command is not recognised. Type I to list those control letters allowed.

62 No parameter group is stored with this number. Check list of parameter groups by typing L followed by pressing RETURN.

63 An integer number was expected as input and instead some other characters have been given.

64 Illegal characters given in the numeric data.

65 Numerical value given as input is outside the range allowed. See the Reference Card.

66 Instruction to jump to a parameter line cannot be followed because either the line number is not correct, or the mode has not been given so the number of lines is not defined.

67 An illegal window has been set: windows must be given in the format xxx-yyy where $0 \leq xxx \leq yyy \leq 256$.

68 Incorrect printout selection, illegal number given.

69 Incorrect printout selection, tabulation exceeds line width.

70 A number must follow the tab (>) character.

71 Illegal character in printout selection: text must be given inside apostrophes (').

72 Printout selection too long, more than 80 items.

73 Y(ES) or N(O) must be given.

74 Difference in position number in coding must be within the range 1 - 99. If the earlier position number is greater than the second then 1000 is added to the second and the test is made again. E.g. the difference between samples coded with position 997 and 003 is 1003 - 997 = 6.

75 Parameter group cannot be cleared because the group number given the second time (in response to the group number confirmation question) differs from that given first. Start clear procedure again from the READY state by typing C.

80 Mode must be given when creating a new group.

81 Memory size exceeded. Jump to the READY state and cancel some other parameter group from the memory.

82 Cannot resume because no assay interrupted.

83 Cannot resume because the mode in the parameter group has been changed.

84 A checksum test has revealed an error in a parameter group in the memory. The numbers of the groups which have been lost are listed.

91 One or more motors have been on too long (more than 9 minutes) so all motors have been stopped. Possible causes are:

a) An obstacle on the conveyor. Remove the obstacle and type letter O then press RETURN to drive the motor to the initial position.

b) The instrument has been left running in the A mode with no racks, or invalid racks, for more than 9 minutes. Continue as in a)

c) A motor is not working properly.

Note: If the message RAM FAILURE xxxx occurs contact the service engineer and inform him of the problem and the number xxxx.

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