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M I S T
BUBBLE CHAMBER DATA REDUCTION PROGRAM

Jerry M. Friedman

February 1963

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BROOKHAVEN NATIONAL LABORATORY

APPLIED MATHEMATICS DIVISION

INTERNAL REPORT

M I S T

BUBBLE CHAMBER DATA REDUCTION PROGRAM

by

Jerry M. Friedman

February 1963

Work performed under the auspices of the U. S. Atomic Energy Commission

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I. PURPOSE

Mist reads the data prepared by the Brookhaven or CERN scan tables and outputs it on magnetic tape in a suitable format for input to the Haze-Fog-Cloudy-Fair Programs used with a Flying Spot Digitizer. Mist deletes erroneous data, edits, sequences, and supplies additional physical information not digitized. It also prepares detailed summaries and statistics for the events processed, and checks digitizer operation.

Mist is an IBM 7090 program prepared at Brookhaven National Laboratory to be used with Brookhaven data and, with slight modifications, with CERN data. It is part of the cooperative effort of the BNL, LRL, and CERN Laboratories for Bubble Chamber Data processing.

The program was designed by Philip Connolly, Jerry Friedman, Alan Thorndike, and Neil Webre, and written by Jerry Friedman.

II. Input

1. Scan Tape A (Tape made from Scan table data)

The cards digitized on the Scan tables are read onto magnetic tape, and serve as input to Mist. In the following discussion of card formats, the reference is to the card image, a record on magnetic tape. The following are the card formats (CF) produced by the scan tables.

CF0 Fiducial information
 CF1 Track information
 CF9 comment
 CF8 End (Beginning) of Roll information
 CF6 view error indicator
 CF7 event error indicator

See Appendix 1 page 13 for detailed descriptions of each card format.

The input to Mist should be in the following sequence.

To identify Beginning of Roll _____ CF8

For each event	First view _____	CF0
		CF1
	* 1 for	:
	each	:
	track	CF1
	Second view _____	CF0
		CF1
	1 for	:
	each	:
	track	CF1
	Third view _____	CF0
		CF1
	1 for	:
	each	:
	track	CF1

Same for succeeding
 events

·
·
·

·
·
·

·
·
·

to identify End of Roll _____ CF8

The above sequence is repeated for each roll digitized.

* In the case of kinked tracks there may be more than 1 CF1 digitized. For details of digitizer procedure see "Rough Digitizing Procedure (Provisional)" - A.M. Thorndike BNL Bubble Chamber Group Report G-19

In general three views will be measured for each event, although two views are acceptable. (CF9) may be entered anywhere within the view measurement, or immediately preceding or following the view measurement. However, only one CF9 per view, per event is acceptable for output. If more than one is entered, the last one only will be used. CF6 and CF7 are indicators to Mist to ignore the view or event immediately preceding. They must follow the view or event to be deleted, and they must have the correct view or event number. They are usually followed by a remeasure of the view or event.

In addition, events must be measured in order of increasing picture number, and within the picture, by increasing event number. The view within an event may be measured in any order.

2. Assignment List Tables

For each experiment a set of tables is compiled which provide Mist with enough information to provide the physical information about each track in each event. (Used when operating in the automatic mode.) The appropriate table is loaded at execution time along with the Mist program. (See page 6.6 for details of tables and their function.)

3. Variable data card

One card of variable data must be provided at execution time. This card contains the date of execution, can indicate a merge of output onto one output tape, and may provide new constants and error tolerances for the Fiducial separation test in Mist. (See Operation Section for format of this card. page 10)

III. Output

1. Scan Tape B (Edited Scan Tape A information)

Mist prepares four (4) output tapes, one for each camera. Only correctly measured events that have been accepted by Mist are output. CF8 is written on each of the tapes for which there are measurements, with the correct camera number inserted. (A detailed description of the output formats can be seen in Appendix II page 15 . Note that some CF identifications have been changed by Mist. CF8 becomes CF9, CF9 becomes CF0)

After processing each roll of film, Mist interrogates a control word (entered on the variable data card) , to determine if the four output tapes are to be merged onto one tape. If the option is exercised, any output for the given roll that is present on the tapes for camera 2, 3 or 4 is written onto the tape for camera 1. Thus the sequence is changed from one in which all measurements for an event appear together, to one in which all measurements for one view appear together.

Note: Although only 3 views are measured per event, these views may be different combinations of cameras 1, 2, 3 and 4. Therefore at the end of a Mist run there may be output for all four camera tapes.

2. Printed Output

Mist prepares a printed list of rejected events along with an error code to indicate the reason for rejection. For each roll processed, a summary of number of events rejected by error category is printed. At the completion of a Mist run, a run summary is printed of events accepted and rejected by scanner, scan table, remeasure number and Assignment List name. In addition a digit count per scan table is printed to help determine accurate performance of each table. (See page 8 for details of printed output).

IV. Detailed Program Functions

1. Sequencing

As indicated under Output-Scan Tape B (page 4), Mist changes the sequence of data from one in which all views of a given event come together (as in rough digitizer measurements) to one in which all events in a given view come together (as in flying spot digitizer measurements).

2. Error Check and Deletion

Mist will not output erroneous data either indicated by the scanner (CF6, CF7) or found by its own error checking.

a. Event Error-View error deletion

A view error (CF6) in the input will cause the immediately preceding data for that view to be ignored. CF6 must immediately follow the data to be deleted and have the correct view number. A count of CF6 is kept and indicated on the printed output.

An event error (CF7) in the input will cause the preceding data for that event to be ignored. CF7 must immediately follow the data to be deleted. A count of CF7 is kept and indicated on the printed output.

b. Test Mode Deletion

Each card image is examined for an "overpunch" in the first column. The presence of an overpunch indicates that this is not data, but "test cards." These card images are ignored, and a count of them is kept and indicated on the printed output.

c. Mist error checks and deletions

Mist checks for any errors it can detect and that seem to have some possibility of occurring. When an error is found, the event is rejected and recorded on the printed output, with identifying information and an error code to indicate which error caused the rejection.

Mist will not attempt to correct errors found or to proceed with data that includes detected errors. If, however, a CF6 or CF7 follows erroneous data, Mist will forget about any other errors for that view or event and delete on the basis of CF6 or CF7.

3. Joining tracks

Fog Cloudy Fair input requires that tracks joining two vertices must be measured twice, once for each vertex, as track A below. However, these tracks are only digitized once. Mist recognizes joining tracks and outputs them twice, the second time with the correct track number and vertex number for the second vertex.

4. Miscellaneous Changes

1. The card Format identifications are changed as follows

CF9 → CFC

CF8 → CF9

2. The first CF8 is tagged to indicate a Beginning of Roll.
3. Experiment Number on the first CF8 is output on all data.

Fog Cloudy Fair will accept only one experiment at a time. However, different experiment numbers can be used on the input to increase the limits of Assignment List (See page 7 for this use).

5. Digitizer Check

A check on digitizer operation is incorporated by tallying the number of occurrences of each digit (0, 1...9) in the units, tens, and hundreds position of x,y coordinates. Any abnormal frequency of occurrence is a sign of malfunction of encoders or circuitry. This tally is kept for each scan table and output on the final Run summary (See sample page output. Appendix V page 22).

6. Assignment List Information

When measurements on the scan tables are made in the automatic mode of operation, depression of a single key enters a number (from 1-18) on CF0, the fiducial information card. This number along with the experiment number on CF0 completely describes the event to Mist. Mist can then supply automatically all the physical information about the event in general, and each track in particular, required for processing by the Fog Cloudy Fair programs. This information is part of the Mist input in the form of tables. These tables need to be written and assembled once and the binary decks for the experiment being run entered at execution time along with the Mist deck.

(Appendix III page 16 describes in detail how to set up these tables.)

It is clear then that at most 18 different event types can be handled for a given experiment. However, if more than 18 types exist, this upper limit can be increased by multiples of 18, by entering more than one set of tables, each set with a different experiment number. Mist will accept different experiment numbers on CF0 to "look up" the proper table but will output on all events measured for a given roll of film the experiment number appearing on CF8 (Beginning of Roll card).

The information inserted for each CF1 is:

1. Assignment List name [event type name needed by Fog Cloudy Fair]
2. chain description [linkage code for vertices making up event]
3. Φ PS code [particle code for track]
4. Track number
5. *Topology number [code to tell which configurations of neutral tracks are to be tried by Fog Cloudy Fair.]

* For details on Topologies see BNL Applied Mathematics Internal Report
CALM-STORM BUBBLE CHAMBER DATA PROCESSING
PROGRAMS ADDENDUM 1 - July 1962- Joyce Tichler

7. Bookkeeping

Any event that is rejected by Mist is recorded and printed. The following information is given for each rejected event.

Frame number

Event number (within frame)

Measurement Date (last digit of year, month, day)

Scanner number

Scan Table number

x and y coordinate of incoming track in the first view measured. This will be 0(zero) if the rejection takes place before the first CF1 is processed.

Rejection code (See appendix IV page 21 for dictionary of rejection codes).

The list is sequential for all rejected events measured for one roll of film. When an "End of Roll card" is found, a scan table summary of rejections is printed for that roll.

It has the following information

1. Range of Picture Numbers (Picture Number on "Beginning of roll", and "End of roll" cards)
2. Number of cards found before the "Beginning of roll" card
3. Number of "Test mode overpunch" cards found before non-test data (if any)
4. Number of "Test mode overpunch" cards after non-test data (if any)
5. Number of CF6 found
6. Number of CF7 found
7. Number of rejections by following categories
 - Frame out of sequence
 - Event out of sequence
 - View sequence or View number wrong
 - Card sequencing wrong
 - Wrong vertex number

Wrong number of tracks
Wrong Fiducial separation
Wrong number of coordinates measured
Character in coordinate not numeric
Assignment list missing or garbled
Inconsistency of data with provided Assignment List tables

The list of rejections, and roll summary print is repeated for each roll of film measured.

At the completion of the run, a run summary is printed.
It has the following information

1. A list of camera's for which there were no measurements this run (if any)
2. Number of events accepted and rejected for each scan table
3. Number of events accepted and rejected for each scanner
4. Number of events accepted and rejected by remeasure number
5. Number of events accepted and rejected by Assignment List name
6. Digit count of hundreds, tens and units position of all coordinates for each scan table.

(See Appendix V page 22 for sample page output).

V. Program Details and Operation

Mist is written in FAP with FORTRAN and FAP subroutines.
It consists of the following

MIST	Fap main program
HEAD	Fortran sub program to print event rejections
ROLSUM	Fortran sub program to print Roll summary
RUNSUM	Fortran sub program to print RUN summary
FSHT	Fap sub program of RUNSUM
ONLINE	Fortran sub program to print on line instructions

Operation: Mist operates under the Fortran monitor

1. Standard Input

The input deck consists of the binary decks for the above programs, along with the binary decks for the assignment List tables for the experiment being run. This is followed by the variable data card. (This is behind a "data" card and will actually be "read in" by the program during execution.) Thus the input deck is as follows

```
* XEQ
* on-line comment to operator
  specifying tape assignments
* PAUSE
  BINARY DECKS
* DATA
  VARIABLE DATA CARD
  EOF
```

The format for the variable data card follows:

1) Columns 1 - 6 - DATE

```
col. 1-2 month
col. 3-4 day
col. 5-6 year
```

2) Columns 7 - 12 - output indicator

```
all blanks (b)(b)(b)(b)(b)(b) - 4 output tapes
MERGE (b) - 1 output tape
```

- 3) Columns 13-18 - Fiducial separation constant view 1 *
all blanks - use constant in program
number (left adjusted) - use number on card
- 4) Columns 19-24 - Fiducial separation error tolerance view 1 *
all blank - use constant in program
number (left adjusted) - use number on card
- 5) Columns 25-30 Same as 3 for view 2 *
- 6) Columns 31-36 same as 4 for view 2 *
- 7) Columns 37-42 same as 3 for view 3 *
- 8) Columns 43-48 same as 4 for view 3 *
- 9) Columns 49-54 same as 3 for view 4 *
- 10) Columns 55-60 same as 4 for view 4 *

* Mist performs a separation test on the fiducials measured in each view. The distance between the two fiducials for each view is calculated and tested to see if it differs from a constant by more than an error constant. The constants in the program (used if no new one is entered on the variable data card) are

<u>Separation Constant</u>		<u>Error tolerance constant</u>
View 1	230	100
View 2	378	200
View 3	417	200
View 4	250	100

The input deck as described is entered as a normal Fortran monitor job, on the standard input tape. (At BNL this is physical tape A2)

2. Scan Table Input

The scan table data is card to taped as output by the scan tables. There may be several such input tapes for one Mist run. Each reel should be terminated by an "end of File." The last reel should be terminated by an End of file, a card with the word END punched in the first three columns, followed by another End of file. (The physical tape assignment is B9).

3. Output tapes

Four output tapes should be provided if the program is run in the "non-merge" mode. Only the View 1 tape need be provided if the program is run in the "merge" mode. In this later case, the on-line comment should request scratch tapes for the units where the view 2, 3 and 4 tapes would ordinarily go.

The printed output is written on the Standard output tape (A3 at BNL). Therefore the tape assignments at BNL are as follows

<u>INPUT</u>	<u>OUTPUT</u>
Standard input (A2)	view 1 (C2) view 3 (A7)
Scan Tape input (B9)	view 2 (B6) view 4 (C1)
	Standard output (A3)

Appendix I

HPD Scan Table - MIST INPUT

Punched Card Formats

Column	Contents	Fid CF0	Track CF1	View Error CF6	Event Error CF7	End Roll CF8	Comm. CF9
1	Test mode overpunch (X≡11 punch)	✓	✓	✓	✓	✓	✓
1 - 2	Experiment No.	✓	-	✓	✓	✓	✓
3 -10	Frame No. (3, 4 punched as zero)	✓	✓	✓	✓	✓	✓
	X-overpunch in column 10 says "do not believe pict. no. as read from film".						
11	View (Camera) Number	✓	✓	✓	-	✓	✓
12	Vertex Number: X-overpunch for charged vertex	-	✓	-	-	-	-
13-14	Unassigned	-	-	-	-	-	-
15-16	Scan Table Number	✓	-	✓	✓	✓	✓
17	IONIZATION	-	✓	-	--	-	-
18-22	Scan Date	✓	-	✓	✓	✓	✓
23	Event No.	✓	✓	✓	✓	✓	✓
24-27	Unassigned	-	-	-	-	--	-
28-29	Scanner Number	✓	-	✓	✓	✓	✓
30	Card Format Number	0	1	6	7	8	9
31-34	Assignment List 0000 punched if no key depr.	✓	--	-	-	✓	αN Comment
35-40	Unassigned	-	*	-	-	-	
41	Fiducial Code	✓	-	-	-	✓	
42	Remeasure Number	✓	-	-	-	✓	
43-45	OPS Code	-	*	-	-	-	
45	Range Symbol (X-overpunch)	-	✓	-	-	-	
46	Poor (symbol-1) Non-existent (2)	-	✓	-	-	-	
47	Continue (symbol-1)	-	✓	-	-	-	
48	Unassigned	-	-	-	-	-	
49-56	X ₁ , Y ₁ (skip xxx) (skip yyy)	✓	✓	-	-	✓	

Punched Card Formats (cont'd)

Column	Contents	Fid CFO	Track CF1	View Error CF7	Event Error CF7	End Roll CF8	Comm. CF9
57-64	X_2, Y_2	✓	✓	-	-	✓	
65-72	X_3, Y_3	-	✓	-	-	-	
73-80	Unassigned		*				

* - in "manual" mode of operation { OPS codes are punched in cols. 43-54
Topology is punched in cols. 79-80
Chain Description is punched in cols. 35-40

Appendix II

MIST-OUTPUT FORMAT

(Identical with Scan Tape B)

Column	Contents	Fid CFO	Track CF1	End of Roll CF 9	Comment CF C
1-2	Experiment #	✓	✓	✓	✓
3-10	Frame # (3, 4 zero)	✓	✓		
10	(X-overpunch) Do not believe frame # or film	✓	-	-	-
11	View	✓	✓	✓	✓
12	Vertex	-	✓	-	-
13-14	Track	-	✓	-	-
15-16	Scan Table #	✓	✓	✓	✓
17	Unassigned	-	-	-	-
18-22	Scan Date	✓	✓	✓	✓
23	Event #	✓	✓	✓	✓
24	Beginning of roll flag = 1	-	-	✓	-
25-27	Unassigned	-	-	-	-
28-29	Scanner #	✓	✓	✓	✓
30	Card Format #	0	1	9	C
31-34	Assignment List	-	✓	-	aN Comment
35-40	Chain Description	-	✓	-	
41	Fiducial Code	✓	✓	-	
42	Remeasure #	✓	-	-	
43-45	OPS Code	-	✓	-	
45	Range Symbol (X-overpunch)	-	✓	-	
46	Quality Estimate (symbol-1)	-	✓	-	
47-48	Subexperiment #	-	✓	-	
49-56	X ₁ , Y ₁	✓	✓	-	
57-64	X ₂ , Y ₂	✓	✓	-	
65-72	X ₃ , Y ₃	-	✓	-	
73-77	Unassigned	-	-	-	
78	Ionization	-	✓	-	
79-80	Topology No.	-	✓	-	

Appendix III

Formats for Assignment List tables follow

INDEX TABLE - MTTBLE

	ENTRY	MTTBLE	
MTTBLE	BCI	1, 0100EE	Experiment number
			Key
	PZE	\$ABCD	
	BCI	1, 0200EE	Experiment number
			Key
	PZE	\$GHIJ	
	⋮		
	PZE	0	Indicates End of Table. For a given experiment number, the key may go from 01 to 18.

ABCD }
 GHIJ } name of table describing particular event type.

There is a table for each event type (each key, experiment number pair).

	ENTRY	ABCD
ABCD	PZE	a,b,c
	BCI	1, Assignment List Name ((b) (b) XYZA)
	OCT	Topology control word
	BCI	1, Track description
	BCI	1, Track description
	⋮	
	PZE	0

First word

- a = number of tracks
- b = number of origins (vertices)
- c = number of Assignment List Names *

Second word

Assignment List Name used by FOG

Requirement is that last letter be A for any type with
a possibility of more than six (6) topologies

Third word

a bit is set in topology control word for each topology wanted; so that if topology 0 and 1 are to be tried, the word should look like

OCT 600000000000

- * If more than six topologies are to be tried, MIST will output the event again with a new Assignment List Name (change the A in the Assignment List Name to B) and in this way indicate the next group of six topologies. There may be up to five Assignment List Names for one event type and therefore up to 30 topologies.

Track description

One word for each track in each vertex by order of vertex. Example:

BCI 1,XTNOPS

X = C for charged incoming particle
 X = U for uncharged incoming particle
 X = 0 other tracks
 TN = track number (BNL)
 OPS = ops code for the track

This would be clearer with an example.

Assume experiment 91 has 2 event types

Tables may look like

	ENTRY	MTTBLE
MTTBLE	BCI	1,010091
	PZE	\$J110
	BCI	1,020091
	PZE	\$J120
	PZE	0

	ENTRY	J110
J110	PZE	3, 2, 1
	BCI	1,bbB11A
	OCT	400000000000
	BCI	1,C01011
	BCI	1,U02011
	BCI	1,003802
	PZE	0

(Try topology 0)

	ENTRY	J120
J120	PZE	5, 2, 1
	BCI	1,bbB12A
	OCT	700000000000
	BCI	1,C01011
	BCI	1,U02011
	BCI	1,003802
	BCI	1,U04011
	BCI	1,005802
	PZE	0

(Try topology 0, 1, 2)

where OPS

011 π^-
 802 $\pi^+ p$

Following is a list of OPS codes.

PARTICLE CODE	<u>OPS</u>	<u>CODE</u>
	01	π^+
	02	ρ
	03	η
	04	π^0
	05	κ
	06	Λ
	07	Σ^+
	08	Ξ^-
	09	d
	10	e
	11	
	12	μ^+
	13	ν
	14	ω
	80	π^+, ρ
	81	ρ, Σ
	82	$\pi, \kappa, \rho, \Sigma$
	83	κ, ρ, Σ
	84	κ, Σ
	85	π, κ, Σ
	86	κ, ρ
	87	κ, Σ, Ξ
	88	π^+, κ, ρ
	89	Short heavy recoil
	90	e^+, μ^+, π^+
	91	μ^+, π^+
	92	π, κ
	93	μ^+, π^+, κ
	94	μ, π, κ, ρ
	95	e, π
	96	π, ν
	97	π, ω
	98	κ, Λ

The sign code in the OPS code is:

0	don't know sign
1	negative
2	positive
3	neutral [†]
4	anti-particle don't know sign
5	anti-particle negative
6	anti-particle positive
7	anti-particle neutral [†]

[†] 3 and 7 will never be used here since these tables describe only the measured tracks.

See "BNL Applied Mathematics Internal Report CALM-STORM Bubble Chamber Data Processing Programs Addendum 1" July - 1962 Joyce Tichler for more detailed information on Topologies and OPS codes.

Appendix IV

Following is a list of rejection codes used in the print output

CODE

A - Event rejected because event error card found.
B - Event rejected because picture number out of sequence.
C - Event rejected because event number out of sequence.
Dn View number not 1-4 but = n.
Enp View changed from n to p while processing track records.
Fnp Track view p not equal to preceding fiducial view n.
Gn View n has repeated measurement.
H Track record found with no preceding fiducial record.
Inp Two fiducials in sequence views n and p (n may = p)
Jn Vertex error in view n.
Kn Wrong number of tracks measured in view n.
Ln Fiducial separation test fails for view n.
Mn Wrong number of co-ordinates on track in view n.
Nn Wrong number of co-ordinates on fiducial in view n.
Pn Nonnumeric track co-ordinate in view n.
Qn Nonnumeric fiducial co-ordinate in view n.
S No match between experiment number and key number on record
and index table provided.
T Entry in Assignment List table not readable.
U Assignment List table apparently not complete.
W Assignment List key number not 1-18.
X Too few views (< 2) measured correctly.

***R This is a remeasure of event just rejected. EVENT ACCEPTED

***V Only two views measured correctly - EVENT ACCEPTED

The last two codes are not really rejection codes, but
provide information about special accepted events.

EVENTS REJECTED OR CONDITIONALLY ACCEPTED

CODE	FRAME	EVENT	DATE	SCANNER	TABLE	XC000	YC000
A	525957	2	30107	30	01	0935	0674
***R	525957	2	30107	30	01	0935	0674
A	525957	3	30107	30	01		
K 4	525962	2	30107	30	01	0942	0578
A	525976	1	30107	30	01	0833	0685
***R	525976	1	30107	30	01	0834	0687
A	526010	1	30107	35	01	0348	0719
***R	526010	1	30107	35	01	0348	0719
K 4	526010	1	30107	35	01	0348	0719
A	526024	1	30107	35	01		
G 4	526030	3	30107	35	01	0808	0601
I 44	526039	1	30107	35	01	0401	0681
I 44	526051	2	30107	35	01	0947	0606
I 33	526078	1	30107	35	01	0724	0677
A	526106	1	30107	30	01	0354	0728
A	526109	1	30107	30	01	0909	0567
A	526111	1	30107	30	01	0291	0771
***R	526111	1	30107	30	01	0291	0771
X	526113	1	30107	30	01	0398	0417
I 33	526120	4	30107	30	01	0937	0626
I 22	526131	1	30107	30	01	0000	0000
L 4	526137	2	30107	30	01	0000	0000
***V	526173	1	30107	30	01	0523	0779
***V	526184	1	30108	35	01	0408	0688
L 4	526194	1	30108	35	01	0873	0621
I 33	526194	2	30108	35	01	0871	0624
A	526196	1	30108	35	01	0597	0579
G 2	526209	1	30108	35	01	0346	0728
K 3	526244	1	30108	35	01	0651	0755
K 3	526267	1	30108	35	01	0596	0712
A	526273	1	30108	35	01	0000	0000
***R	526273	1	30108	35	01	0840	0443
K 2	526298	1	30109	30	01	0567	0561
K 3	526308	1	30109	30	01	0426	0659
A	526332	2	30109	30	01	0662	0689
***R	526332	2	30109	30	01	0691	0681
A	526344	1	30109	30	01	0511	0648
***R	526344	1	30109	30	01	0510	0648
H	526346	1	30109	30	01	0606	0681
K 2	526361	1	30109	30	01		
G	526394	1	30109	30	01	0000	0000
K 2	526483	1	30109	35	01	0654	0738
A	526506	2	30109	35	01	0862	0655
***K	526506	2	30109	35	01	0829	0510
K 2	526538	2	30109	35	01	0639	0674
K 2	526538	3	30109	35	01	0843	0584
L 4	526569	1	30110	30	01	0000	0000
K 2	526601	2	30110	30	01	0876	0561
A	526617	1	30110	30	01	0697	0584
***K	526617	1	30110	30	01	0696	0584
A	526617	1	30110	30	01	0696	0584

***K	526617	1	30110	30	01	0696	0584
A	526640	1	30110	30	01	0602	0654
***R	526640	1	30110	30	01	0000	0000
A	526640	1	30110	30	01	0000	0000
***R	526640	1	30110	30	01	0602	0655
A	526648	1	30110	30	01	0550	0771
L 3	526671	2	30110	30	01	0892	0595
I 3	526684	1	30110	30	01	0298	0845
K 2	526739	1	30110	30	01		
X	526740	2	30110	30	01	0000	0000
G 3	526812	2	30110	30	01	0772	0696
G 3	526853	1	30111	30	01	0503	0730
K 2	526869	1	30111	30	01		
A	526875	1	30111	30	01	0872	0656
***R	526875	1	30111	30	01	0872	0658
***V	526880	1	30111	30	01	0325	0892
A	526898	1	30111	30	01	0000	0000
***R	526898	1	30111	30	01	0392	0797
G 2	526898	1	30111	30	01	0392	0797
X	526910	3	30111	30	01	0000	0000
H	526919	3	30141	30	01	0698	0639
G 3	526955	3	30141	30	01	0755	0623
K 2	527002	1	30141	30	01		
K 4	527039	1	30141	35	01	0604	0715
K 4	527045	1	30141	35	01	0818	0821
Z	527045	1	30141	35	01	0000	0000
G 3	527065	1	30141	35	01	0428	0802
G 3	527150	1	30141	35	01	0892	0841
A	527217	2	30115	30	01	0595	0536
***K	527217	2	30115	30	01	0596	0537
A	527258	1	30115	35	01	0844	0565
***R	527258	1	30115	35	01	0000	0000
I 22	527258	1	30115	35	01	0000	0000
K 2	527358	1	30115	35	01		
K 4	527379	1	30115	35	01	0889	0685
A	527439	1	30116	30	01	0732	0531

SCAN TABLE SUMMARY

ROLL BEGINS AT 525954 AND ENDS AT 527501

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CARDS WITH TEST MODE OVERPUNCH AFTER NON TEST DATA 20

ERROR CARDS FOUND HAD THE FOLLOWING FREQUENCIES

VIEW ERROR CARDS	50
EVENT ERROR CARDS	23

CAUSES FOR REJECTED EVENTS HAD THE FOLLOWING FREQUENCIES

FRAME OUT OF ORDER	0
EVENT OUT OF ORDER	1
VIEW ORDER OR VIEW NUMBER WRONG	11
CARD SEQUENCING WRONG	10
WRONG VERTEX NUMBER	0
WRONG NUMBER OF TRACKS	18
WRONG FIDUCIAL SEPERATION	5
WRONG NUMBER OF COORDINATES	0
CHARACTER IN COORDINATE NOT NUMERIC	0
ASSIGNMENT LIST MISSING OR GARBLED	0
INCONSISTANCY WITH PROVIDED TABLES	0

MIST BUBBLE CHAMBER DATA REDUCTION PROGRAM
RUN SUMMARY

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030863

SCAN TABLE DIGIT COUNTS

SCAN TABLE 1

DIGIT X	0	1	2	3	4	5	6	7	8	9
HUNDREDS	1	0	149	785	2034	3518	2883	1560	445	53
TENS	1092	1158	1152	1179	1190	1057	1065	1248	1142	1145
UNITS	1041	1157	1092	1033	1285	1095	1063	1144	1120	1398
DIGIT Y	0	1	2	3	4	5	6	7	8	9
HUNDREDS	1021	350	675	1544	1775	1317	1274	1154	1278	1040
TENS	1049	1119	1106	1086	1198	1183	1108	1266	1138	1175
UNITS	1223	1134	1148	1161	890	1196	993	860	1837	986