

## ZEBRA CHECKOUT SOFTWARE

### Usage Notes and Programmers' Reference

A report to the ZEBRA collaboration.

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This document has been prepared by:

L.Chiappetti, IFC Milano

The software described in this document has  
been contributed by the following persons :

L.Chiappetti	IFC Milano
A.Rampini	IFC Milano
C.Moriaggio	IFC Milano

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## Introduction

The present document describes the Zebra checkout software available at IFC Milano, with a twofold aim :

To allow easy usage of the software at its native site in Milano.

To enable implementation of the same software modules at RAL and/or Southampton for use during the Zebra integration.

Therefore the description of each module includes two sections : "usage notes" and "programmers' reference".

Prerequisites to this document are :

A basic knowledge of the format of the Zebra telemetry, e.g. like the one provided by my note "Summary of Zebra telemetry content" dated 1986 July 24 (appended).

Basic knowledge of Fortran programming, and in particular some acquaintance with IBM systems, specially under VM/SP (CMS).

## General - Usage notes

The data from the Zebra experiment are collected on magnetic tapes by the Frascati GSE (PDP-11). The format of the tapes is briefly described in the note mentioned above. Since such format is quite awkward to use, the tapes are reformatted as a preliminary step : only reformatted tapes are used by the rest of the software.

A number of programs is available in Milano on an IBM computer to inspect the content of the telemetry, verify the content of the timing data, of the image (PHA) data, of the calibration spectra and of some HK. Most of such programs produce both print files and some "reduced data" files. All IBM programs are immediately available for use.

Programs to plot or display the content of the "reduced data" files, or to perform further analysis (e.g. fitting calibration spectra), are available in Milano on the HP 1000 computer. Such programs are not immediately available for implementation on another machine. The source code of the HP analysis program is available for conversion (no support will however be provided in this sense, apart from the notes contained in the present document), while plotting and display facilities are too dependent on hardware and local site peculiarities to be usefully exchanged. Users at other sites must develop their own utilities or interfaces.

In order to plot the content of such files they must be transferred to the HP. A file containing an arbitrary time axis (e.g. in consecutive frame number) in PABLO format must be created. The time column from the latter file, and the column of the ratemeter file corresponding to the wished bar should be then merged in a new PABLO file using utility MERPA (see parameter file MER.PF), which can then be plotted with PABLO.

#### HK time profiles - Programmers' reference

The program makes use of the system routine CANCEL and of the bit-handling routine IPRE (see Programmers' reference for RATTOPPA).

The program currently handles only plane 1 (the number of bars is contained in a PARAMETER constant NBAR, however further modifications are necessary to access plane 2, e.g. contemplate separate output files for the two planes, as a PABLO file shall not have more than 9 columns).

The output files contain 9 columns (one for each bar), in PABLO format (in this case 9(1X,E10.4)) : each column contains the ratemeter values in one frame.

This program may be easily converted to handle any HK parameter if one replaces the PARAMETER constants WORD and FRAME (FRANGE, FRAMDT) with the relevant values.

The program and EXEC are set-up to produce an hexadecimal dump (like TAPE64) of each subframe on unit 9, but this is currently disabled (commented out).

#### HK statistics - Usage notes

This program is used to produce time profiles of ratemeters (PGE, GE and dead time) and perform some basic statistical analysis. One must have set the input unit for a reformatted tape (command INPUT) and the mode for output (command SETMODE), than issue the command :

##### EVENT

The program asks the number of the first and last scientific record (cube) to be processed. There are some output files called respectively ZEBPGE PABLO, ZEBGE PABLO and ZEBDT PABLO (identical to the ones produced by PMGOOD) and EVENT PRINT.

This program is an improved version of PMGOOD, which produces the same time history files, and in addition performs some simple statistical checks (writing the output in EVENT PRINT). Currently this program just computes the average of the ratemeters for the 9 bars.

## Summary of ZEBRA Telemetry content

Prepared by: L.Chiappetti - IFCTR

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A summary of the content of the ZEBRA telemetry is provided. The aim is to make order about the various conventions on bit, frame, channel etc. counters which can be found in the different documents, and also to clarify the situation about bit and byte ordering at the different stages of data acquisition and processing. Reference is made to the Laben document TL1832. Some information about the current status of data stripping and checkout software in Milano is also given.

The structure of the flight telemetry is as follows :

The fundamental unit is the Scientific Record.

1 Scientific Record (SR)	= 128 SF	numbered 0-127
1 Sub-frame (SF)	= 64 F	numbered 0-63
1 frame (F)	= 32 words	numbered 1-32 here
1 word	= 16 bits	by definition

The numbering of SF and F starts from 0, consistently with the counters contained in the telemetry itself. The numbering of words within one frame starts from 1, consistently with usual Fortran usage, and unlike the Laben documentation, which starts from 0. All numbering of words within a Fortran array starts from 1 in the present document.

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The structure of a tape produced by the GSE merges the above flight telemetry with an 8-word ground frame. The tape physical blocksize is 4096 bytes, which is exactly one SF. However there is no one-to-one correspondence between tape blocks and SF. This is because the ground frame is always inserted as the first 8 words of a block. Therefore the content of any SF will span from one block to the next. Moreover there is no guarantee that a block starts at the beginning of a frame, SF or SR.

where SF and FRAME range respectively 0-127 (actually 64-127 only) and 0-63, while all other counters (WORD, ENERGY, POSITN and HIBAR) range from 1. Fortran INTEGER notation is assumed. MOD0(a,b) is the same as MOD(a,b), but returns the full value b (i.e. 6) instead of 0. The formula for HIBAR returns the highest bar in the word, corresponding to bits 2-6, i.e.  $N=3$  according to the formula above.

No parity check is performed by current software.

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**Calibration words** (Laben pag. 37) are grouped in 128 channel spectra, and occur in SF 1-36 only, in words 7 and 8. There is a total of 36 spectra, one per SF. Each SF contains  $2*64=128$  words. Channels are numbered 1 to 128 here.

Only bits 2-16 (IPRE) of each words must be used. Bit 1 is parity. No parity check is performed by current software.

In each SF word 7 contains odd channels (1,3,etc.) (as Frame counter goes 0 to 63), and word 8 contains even channels (2,4,etc.).

Channel	$(FRAME+1)*2 - 1$	in word	7 of frame FRAME
	$(FRAME+1)*2$		8 of frame FRAME

Spectra are ordered two per bar, hence SF 1 is (bar 1, PM 1), SF 2 is (bar 1, PM 2), SF 3 is (bar 2, PM 1) etc.

## Zebra calibration spectra analysis software

A program to fit Zebra PM calibration spectra has been implemented on the HP computer. The program plots a calibration spectrum, and fits the main peak with a Gaussian. The plot and the results of the fit may be made available as a hardcopy.

The program is preliminarily called just ZEBRA and should be available to all users in the IHAP group (if not contact me and I'll load it). The program **must** be run on a HP 2648 graphic terminal with HP 2671 thermal printer attached. The program input is a binary file containing a sequence of  $n \times 36$  spectra ( $n$  is the number of Scientific Records), produced by the IBM program PMSPETTR.

The program can be run in a manual way, in a semi-automatic way or in a fully automatic way. The manual way is used for single checks: you just run ZEBRA and reply to all questions. Questions are explained below. Note that suitable defaults are provided for most questions.

The semi-automatic way implies you pass all (or most) of the replies in the run string. E.g.

```
ZEBRA,,file,sr,bar,pm,Y,p1,p2,p3,c1,c2,N,Y
```

Replies will be echoed to the terminal. A parameter or group of parameters may be omitted typing two consecutive commas. This parameter must then be entered interactively from the terminal. **Note that the two commas after the name of the program must be typed exactly like above** (this is just a placeholder for the command file name, see below). No automatic defaults are provided for parameters passed in the run string (unless you specify a command file containing all blanks).

The automatic way implies you write all the replies in a command file and pass this as first argument in the run string. E.g.

```
ZEBRA,@ZEB
```

where @ZEB is a command file like the one shown below. Each reply (with one or more parameters) must be typed on a single line, followed by comments if desired. To use default values enter a **blank line without comments**. If you enter a backslash (\) the parameter will be prompted at the terminal.

It is possible to combine command file and run string parameters (the latter take precedence).

You should note that the dialogue with the program does not follow an unique flow, but the questions you are asked may change according to your previous answer. This is briefly explained below.

Sample command file.

Comments which may be present in the file body are indicated in upper case after an exclamation mark. Comments in lower case on the right hand side are **not** intended as part of the file.

```

ZEBSP::X2          !FILENAME      input full filename
1                 !SR           SR number
4                 !BAR          Bar number
2                 !PM           PM number
Y                 !FIT?         enter Y, YE, y, N, NO, etc.
9000.,.65.,.7.5   !PARAMETERS   3 values with commas or blanks
55 75             !CHANNELS     2 values with commas or blanks
Y                 !PRE-DISPLAY
Y                 !OK?         present only if predisplay=yes
Y                 !HARDCOPY     last line for current spectrum
2                 !SR           next SR number
4                 Bar number
1                 PM number
Y                 Fit?
                  default values for parameters
                  default values for channels
N                 !PRE-DISPLAY  =NO no next question
Y                 !HARDCOPY     last line for current spectrum
                  default next SR
                  default next bar
                  default next PM
Y                 !FIT
                  default parameters
                  default channels
N                 !PRE-DISPLAY
Y                 !HARDCOPY
0                 !END         end-of-program (SR=0)

```

Blank lines (containing default values) are **not** allowed to contain any comment.

L.Chiappetti - IFCTR  
24 July 1986

this document is file pmcalib.zeb