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Acronyms and abbreviations

AIT	Assembling Integration and Testing
APID	Application Identifier
COE	Check Out Equipment
DPE	Digital Processing Unit
DFEE	Digital Front End Electronics
EGSE	Electrical Ground Support Equipment
EM	Engineering Model
FEE	Front End Equipment
FM	Flight Model
GUI	Graphic User Interface
HK	Housekeeping
HSL	High Speed Link
JEM-X	Joint European X-Ray Monitor
LAN	Local Area Network
LSL	Low Speed Link
MMI	Man Machine Interface
PLM	Payload Module
S/C	Spacecraft
S/C GSE	Spacecraft Ground Support Equipment
SIS	Spacecraft Interface Simulator
TBC	To Be Confirmed
TBW	To Be Written
TC	Tele-Command
TCP/IP	Transmission Control Protocol / Internet Protocol
TM	Telemetry

1 Introduction

This document describes the use and maintenance of the JEM-X “**Instrument Station**” software. The manual provides information needed by user to understand the purpose of the program and its role in the testing of the JEM-X instrument during the followed phases of development. This includes a general overview and procedures for preparing, starting and using the system.

1.1 Purpose and scope

This Document is applicable to the “ **Instrument Station** ” program version 3.22. This manual is intended for readers with basic knowledge of EGSE systems, computers, and software. No elementary information on those topics is given, and it gives no assistance with analysis of information in status windows and real-time graphical displays. It has been assumed that the user is familiar with the Windows NT interface. Therefore no explanation are provided for standard commands and buttons.

1.2 Manual conventions

This manual uses the following special fonts:

Courier	type represents text that you type or text as it appears onscreen.
<i>Italics</i>	are used to emphasize and introduce words, and to indicate variable names (identifiers), function names, window names, and structure names.
Bold	type indicates reserved keywords, format specifiers, and command-line options.
<i>Keycap</i>	type represents a particular key you should press on your keyboard. For example, "Press <i>Del</i> to erase the character."
Key1+Key2	indicates a command that requires you to press Key1 with Key2. For example, <i>Shift</i> +a (although not a command) indicates the uppercase letter "A."
ALL CAPS	type represents disk directories, file names, and application names
<u>Menu/Choice</u>	represents menu commands. Rather than use the phrase "choose the Save command from the File menu," manual use the convention "choose <u>File/Save</u> "

1.3 Applicable and reference documents

- | | | | |
|-----|---|-------------|----------------------------|
| 1. | EID-B - X-Ray Monitor for
The INTEGRAL Mission | Issue 4.0 | |
| 2. | IASW for JEM-X /DPE-
Software Specification Document | ver 1.9 | |
| 3. | PEPbug User's Manual | Issue 1.0.1 | 1995 PEP Modular Computers |
| 4. | VM62/VM42-User's Manual | Issue 4 | 1995 PEP Modular Computers |
| 5. | CXC Schematics User's Manual | Preliminary | 1993 PEP Modular Computers |
| 6. | CXM-SCSI User's Manual | Issue 1 | 1992 PEP Modular Computers |
| 7. | CXM-IMOD User's Manual | Issue 6.0.1 | 1996 PEP Modular Computers |
| 8. | VMOD-2/VMOD-2D User's
Manual | Rev. 0200 | 1997 PEP Modular Computers |
| 9. | CXM-SIO3-0 User's Manual; | Issue 1 | 1996 PEP Modular Computers |
| 10. | PB-ADC3 -User's Manual | Issue 3 | 1994 PEP Modular Computers |
| 11. | JEM-X EGSE
Technical Description | Issue 2.2 | (JEMX-EGSE-01) |
| 12. | JEM-X "EGSE Control"
Users Manual | Issue 1.2 | (JEMX-EGSE-03) |

2 Installation and setup procedures

It is recommend a 300MHz or better Pentium computer with at least 64Mbytes of RAM running Windows NT4 or Windows 95/98 (the software has not been qualified or tested for Windows 2000). For best system performance we suggest you use a 17-inch monitor and 4Mbyte graphics card displaying 1024x768 pixels.

2.1 Installation

1. Open DOS window (for WIN95 or NT)
2. Insert DISK #1 to drive A:
3. Run INSTALL1.BAT
4. Insert DISK #2 to drive A:
5. Run INSTALL2.BAT
6. Return to Windows (type EXIT command)
7. Using NOTEPAD program (or other editor for text files) add contents of file C:\EGSE\IDAPI\IDAPI.INI to the end of WIN.INI file (should be located in WINDOWS or WINNT directory).! The section [IDAPI] should be added only ONES !

```
[IDAPI]
DLLPATH=C:\EGSE\IDAPI
CONFIGFILE01=C:\EGSE\EGSEBASE.CFG
```

- 8 You may put program shortcut ICON into desktop.

Directory structure: (NOW FIXED!!)

C:\EGSE\	;programs	
+ BASE	;setup database & log	(initially EMPTY)
+ DATA	;instrument data files	(examples only)
+ IDAPI	;database system DLL's	
+ SCRIPTS	;script files	(example1.scp)

2.2 Setup Procedures

When successfully installed, application does not require special set up activity.

3 Menu commands

The menu bar includes File, View, Tools, Setup, Window, and Help menus, which contain program basic commands. Additionally most of views have its own operational menu that will be merged into main menu. When the child window (view) is created, its pop-up menu, called "Data", is automatically placed between the "File" and "View" menu. Additionally, most of created windows maintain themselves *SpeedMenus*. The *SpeedMenus* contain commands that are context sensitive to the area of the program you are working in. Right-clicking (click the right mouse button) accesses the menu command associated with focused window or dialog.











3.1 The tool bar

The Toolbar is a row of buttons at the top of main window, which represent application commands. Clicking one of the buttons is a quick alternative to choosing a command from the menu. Buttons on the toolbar activate and deactivate according to the state of the application. The JEM-X EGSE software provides you with the ability to perform frequently used commands without accessing the application menus. Please note that there is no way to select these buttons using the keyboard - the equivalent commands can be found in the menus.



Figure 3-1 Program menu bar and tool bar.

Telemetry packets processing and display

Button	TM format	Menu Equivalent
	ALL BLOCKS	<u><i>View/TM Data Block</i></u>
	HOUSEKEEPING	<u><i>View/HK Data List</i></u>
	HOUSEKEEPING	<u><i>View/HK Data Monitor</i></u>
	HOUSEKEEPING	<u><i>View/HK Calibration Spectra</i></u>
	FULL IMAGING	<u><i>View/Full Imaging Blocks</i></u>
	RESTRICTED IMAGING	<u><i>View/Restricted Imaging Blocks</i></u>
	SPECTRAL/TIMING	<u><i>View/Spectral/Timing Blocks</i></u>
	COUNTRATE	<u><i>View/CountRate Blocks</i></u>
	SPECTRUM	<u><i>View/Spectrum Blocks</i></u>
	TIMING	<u><i>View/Timing Blocks</i></u>



TEST

[View/Test Blocks](#)



DIAGNOSTIC

[View/Diagnostic Blocks](#)



CALIBRATION





[View/Calibration Blocks](#)



CALIBRATION

[View/Calibration Monitor](#)

Other Commands

Button	Action	Menu Equivalent
	Display/Hide log window	<u>View/Program Log</u>
	Print the active window	<u>File/Print</u>
	Preview the printout	<u>File/Print Preview</u>
	Display help file contents	<u>Help/Contents</u>

3.2 The status bar

The Status Bar at the bottom of the program main windows contains "flyby" help hints, when the cursor is over a button or points to menu command. Additionally, the bitmap gadgets (lamps) located on the right side indicates status of socket connection and current archive file name and location.



Figure 3-2 Program status bar.

3.3 File menu commands

New

Opens a new IPF document file. Existing documents will be closed when opening a new document.

Open...

Opens a new window with the contents of an existing document/file.

The application can open an IPF type data file. Select the appropriate drive and directory, enter a file to open and choose the OK button. The default directory for the File Open command is set to C:\EGSE\DATA. Once a file is opened the full path and filename is displayed in the status bar of the main window.

Close

Closes the active document window. If the document has unsaved changes, you will be asked to save the file before closing the window.

Save

Saves the contents of the current window to disk. If the document is UNTITLED, program prompts you for a file name.

Save As...

Choose the Save As option to save the contents of the active window to a new or different filename.

Print Preview...

File/Print Preview command opens a special window that shows how the active window/view will appear when printed. The preview window shows one or two pages of the active document as they would be laid out on printer pages. Controls on the window allow you to page through the pages of the document. Displays the current view printout on screen. This command is disabled if focused window has no printing facility.

Print...

The **File/Print** command prints the contents of the active window/view. Use **File/Print Preview** to see how the document will be laid out on printer pages. Use **File/Print Setup** to select a printer, and to set printer options. You can select the page numbers to be printed, if active view has more than one page.

This command is disabled if focused window has no printing facility.

Printer Setup...

This command displays the system Printer Setup dialog box where you select which printer you want to use for printing views. Allows you to choose a printer and to access printer options. This command is disabled if no printer can be detected.

Exit

Close all open windows and exits the “Instrument Station” program. If there is active connection to telemetry source application prompts .you to disconnect link. All open files are closed before exiting. If you intend to close all of the open windows/view and not exit Instrument Station, then choose **Window/Close All** rather than **File/Exit**.

3.4 View menu commands

The View menu provides commands to create data processing and display windows.

TM Data Block	Displays last processed TM Block
HK Data Monitor	Displays selected HK data as list of plots
HK Data List	Displays Housekeeping data as numbers
HK Calibration Spectra	Displays calibration spectra from HK packets

Full Imaging Blocks	Processing and display of FULL IMAGING format data
Restricted Imaging Blocks	Processing and display of RESTRICTED IMAGING format data
Spectral/Timing Blocks	Processing and display of SPECTRAL/TIMING format data
Count Rate Blocks	Processing and display of COUNTRATE format data
Spectrum Blocks	Processing and display of SPECTRUM format data
Timing Blocks	Processing and display of TIMING format data
Test Blocks	Processing and display of TEST format data.
Diagnostic Blocks	Processing and display of DIAGNOSTIC format data
Calibration Blocks	Processing and display of CALIBRATION format data
Calibration Monitor	Displays CALIBRATION data as plots
Events Count Rate	Displays processed events Count Rate (1/sec)
On Event Message List	Displays list of "Telemetry On Event Messages"
Program Log	Displays application log window

3.4.1 View TM Data Block

This window processes and displays all valid data packets. The menu "**Data**", merged to main menu when view window gets focus, lets perform following commands:

Byte format	Changes display to BYTE mode (block data are displayed as separate bytes hex numbers)
Word format	Changes display to WORD mode (block data are displayed as 16-bits hex numbers)
Decimal format	Changes display to DECIMAL mode (block data are displayed as integers - two bytes decimal numbers)
Setup	Sets the data filter - NOT USED FOR THIS VIEW
Properties	Sets View properties
About	Displays general information about this view

The sample of such window is shown on Figure 3-3.

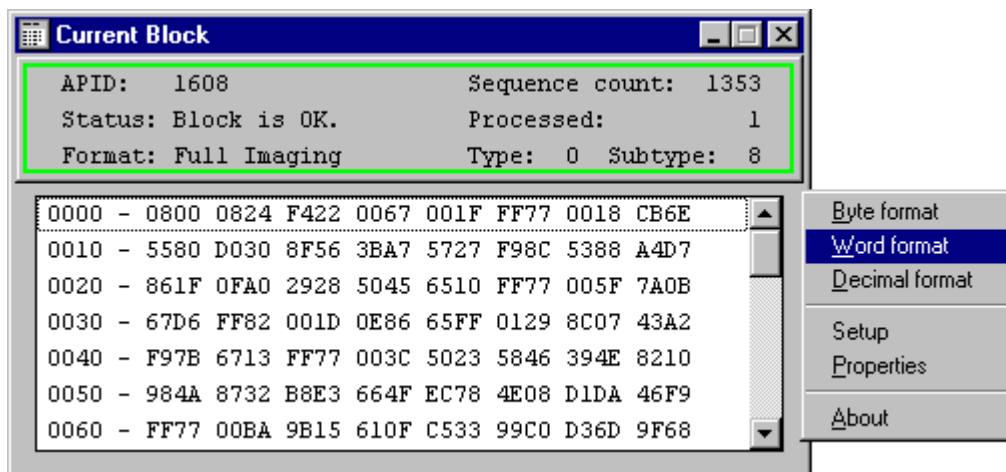


Figure 3-3 The All block view window.

The window has "freeze" facility it means double clicking the label of window (upper pane) will disable receiving of data. Double clicking the label again will enable receiving data. The state of view is indicated by the rectangle on the label window:

- Green rectangle means Enabled
- Red rectangle means Enabled (Frozen).

When enabled, window displays most recent data packet.

View facilities

Freeze	Printing	Count Rate	Pages	Number of windows
Yes	Yes	No	1 (3)	2

3.4.2 View HK Data Monitor

Selected housekeeping data could be recorded and display as a list of plots. Use **View/HK Data Monitor** command to create monitoring window. Program allows you to create up to four separate windows of such type (example is shown in Figure 3-4) each of them can collect different sub-set of HK parameters (up to eight signals), called '*Profile*'. This view has printing facility. Up to four plots on each page will be printed.

Maintained "**Data**" popup menu and/or '*SpeedMenu*' let you change or configure current '*Profile*'. Available commands are listed below:

Command	Action
Auto Scale selected	Makes Y-axis adjustment to current data for selected plot. Left-click mouse button when pointing to plot rectangle to make selection. Selected plot appears to be raised into the list box window
Clear selected	Clears data in associated with plots.
Setup Y axis	Create dialog box that lets change the data range to be displayed

Auto Scale All	Makes Y-axis adjustment to current data for all plot.
Clear All	Clears all data in associated with plots.
Set Profile #1(#2, #3, #4)	Changes list of parameters to be displayed as assigned for profile #1(#2, #3, #4). Command clear all data collected even new profile is the same as current one.
Setup	Creates dialog box that lets you change the sub-set of displayed parameters for current profile.
Properties	Not implemented
About	Displays basic information about this view

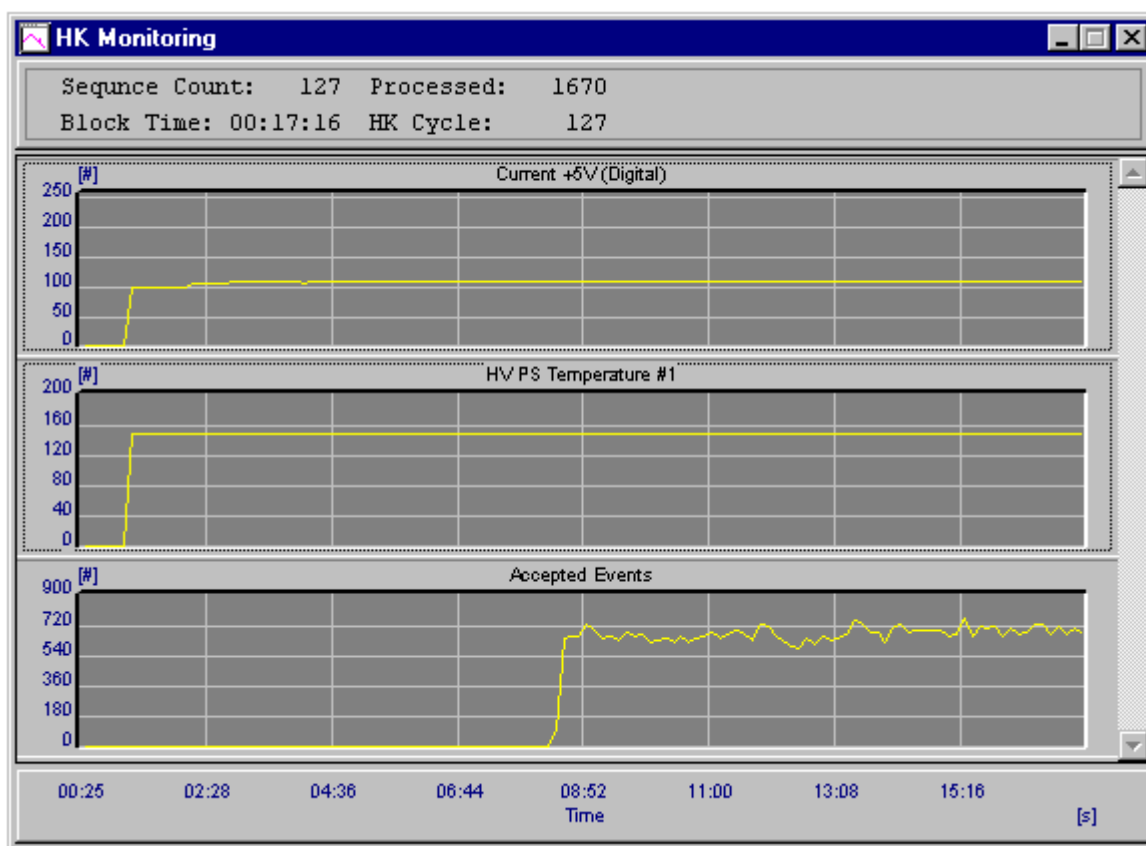


Figure 3-4 Housekeeping monitor window.

Use the 'Monitoring Setup' dialog box (Figure 3-5) to configure or change data to be collected and displayed:

1. Run Data/Properties command or use 'SpeedMenu' for creation of this window.

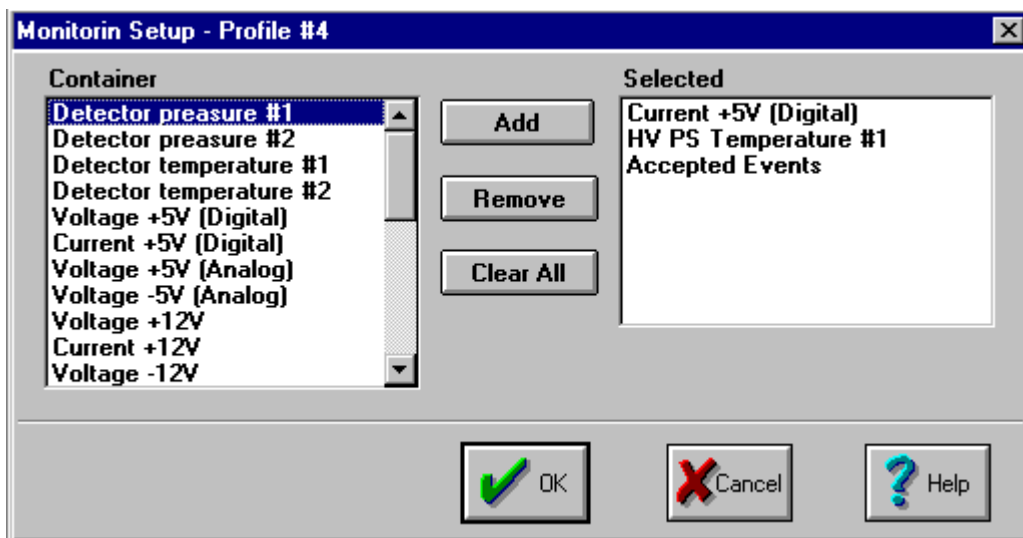


Figure 3-5 HK Monitoring set up dialog box.

2. Click **Clear All** button to remove all selected parameters (optionally) or click name of parameter in 'Selected' list and use **Remove** button to remove selected one,
3. Select parameter name in the 'Container' list,
4. Click **Add** button - marked item will appear in 'Selected' list,
5. Repeat steps 3 and 4 to make required configuration. Up to eight parameters can be selected.
6. Click **OK** button to validate changes made or **Cancel** button to return to the previous configuration.

Note: All previous data will be cleared when new configuration has been approved.

New settings are stored and will be recalled whenever the program re-opens 'HK Monitoring' window for this profile.

View facilities

Freeze	Printing	Count Rate	Pages	Number of windows
No	Yes	No	Scrolled up to 8 plots	4

3.4.3 View HK Calibration Spectra

The DFEE part of housekeeping packet (APID 1536 or 1664) contains calibration spectra data. Each HK-packet contains a "partition number" (between 0 and 31) and 8 channels from each of the four spectra. The partition number defines the channel positions in the restored spectra. The window collects and display reported spectra (example of such window is shown on Figure 3-6). However these spectra will only be collected when the instrument is in 'Data Taking' mode (regardless of the telemetry format chosen).

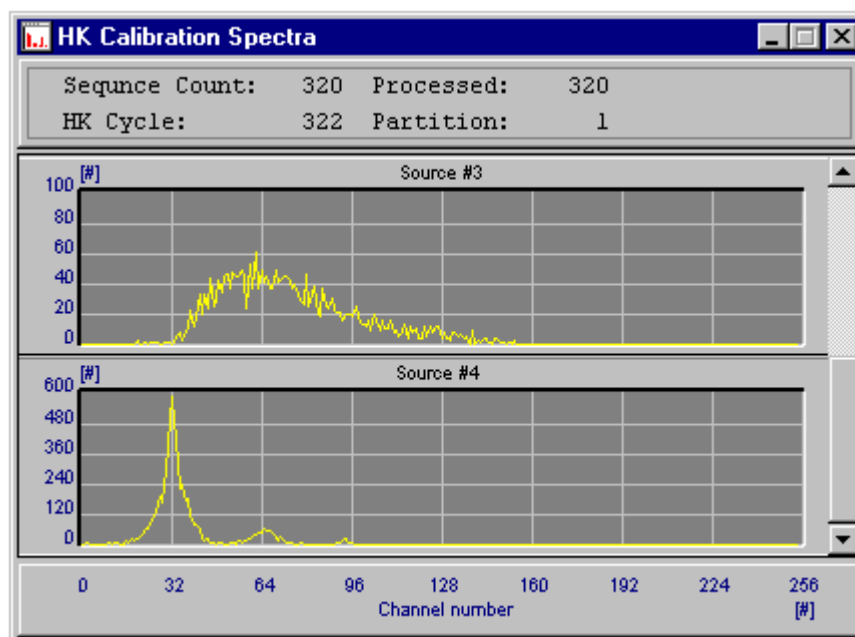


Figure 3-6 The "HK Calibration Spectra" window.

Command	Action
Auto Scale selected	Makes Y-axis adjustment to current data for selected plot. Left-click mouse button when pointing to plot rectangle to make selection. Selected plot appears to be raised into the list box window
Clear selected	Clears data in associated with plots.
Setup Y axis	Create dialog box that lets change the data range to be displayed
Auto Scale All	Makes Y-axis adjustment to current data for all plot.
Clear All	Clears all data in associated with plots.
Setup	Creates dialog box that lets you change the spectra processing method and displayed plot labels text.
Properties	Not implemented
About	Displays basic information about this view

Use the Data/Setup command to create 'Calibration Spectra Setup' dialog box (Figure 3-6) for change data processing method and/or labels text

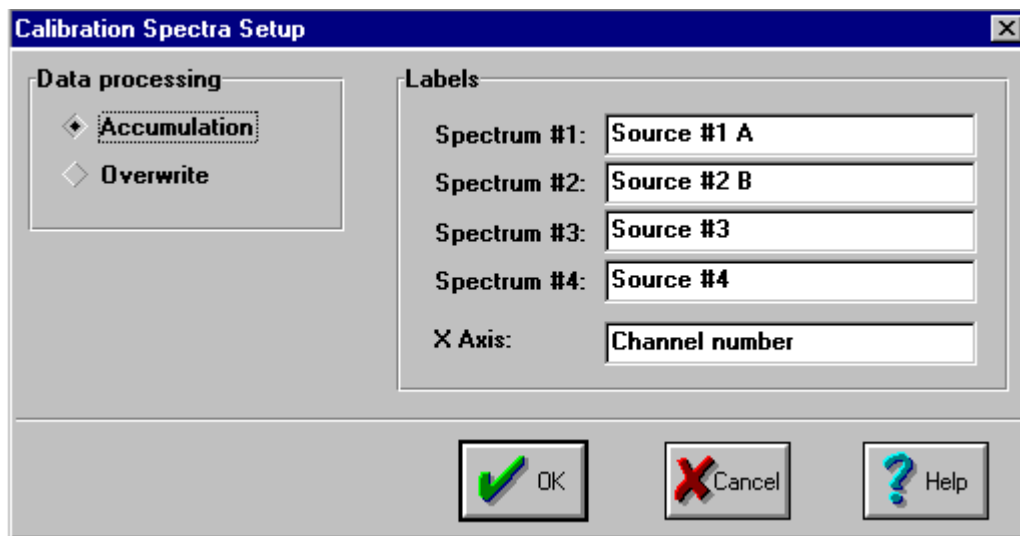


Figure 3-7 HK Monitoring set up dialog box.

Data processing

Check spectra processing method

Accumulation reported in HK packet spectrum values would be added (accumulated) to previous one

Overwrite reported spectrum values would overwrite (replace) previous one

Labels

Enter the text string for plot labels.

Buttons

OK. closes the dialog box and saves any changes made

Cancel closes the dialog box without saving any changes made

Help opens help window.

View facilities

Freeze	Printing	Count Rate	Pages	Number of windows
No	Yes	No	Scrolled 4 plots	1

3.4.4 View HK Data List

Housekeeping data view window display all HK parameters contained in telemetry packets of APID 1536 or 1664.

Label pane presents data processing statistic:

- Sequence count sequence count number of last received packet,
- Processed number of packets,

- Block Time as reported in last processed packet,
- HK Cycle housekeeping cycle number as reported by DFEE.

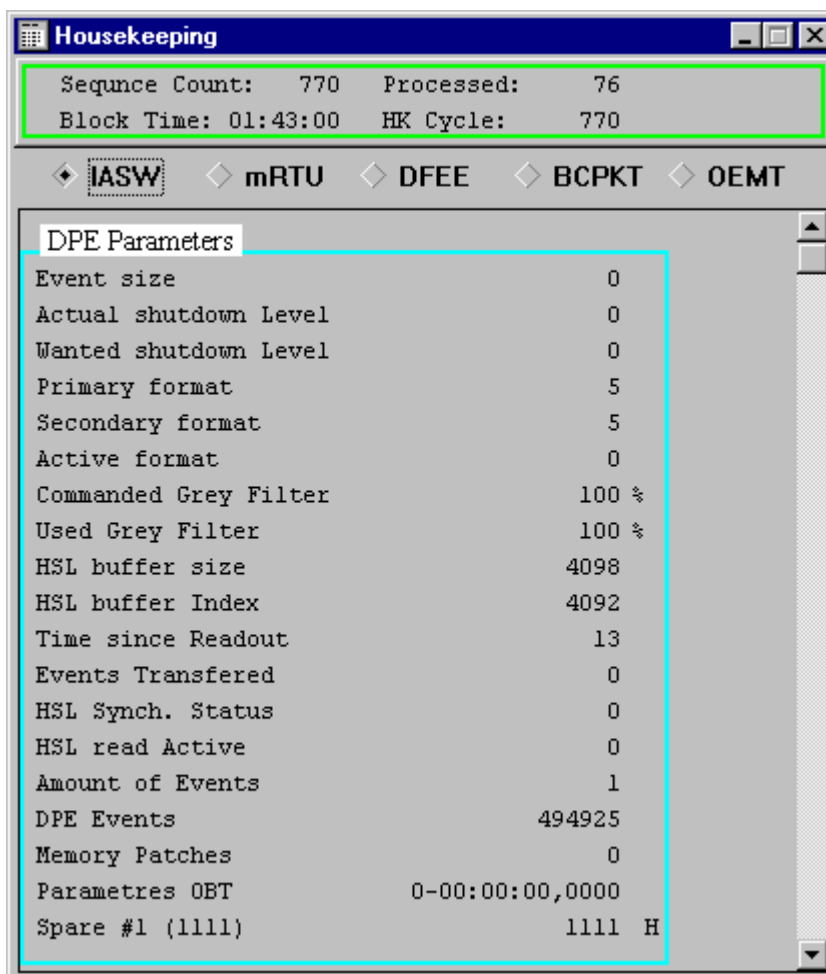


Figure 3-8 The Housekeeping data view as list window

The window maintains "**Data**" popup in main menu and its own '*SpeedMenu*' that lets you change the data display format or select page to be displayed.

Available commands are listed below:

Command	Action
State of <u>I</u>ASW	Selects IASW page to be displayed (clicking I ASW 'radio button' equivalent)
<u>m</u>RTU data	Selects DPE mRTU data to be displayed (clicking m RTU 'radio button' equivalent)
&DFEE Housekeeping	Selects DFEE part of HK to be displayed (clicking D FEE 'radio button' equivalent)
<u>B</u>roadcast Package	Selects Broadcast packets page to be displayed (clicking B CPKT 'radio button' equivalent)

<u>O</u>n Event Messages	Selects 'On Event Message Telemetry' page to be displayed (clicking OEMT 'radio button' equivalent)
<u>H</u>ex Format	Changes display to HEX mode (data are displayed as hex numbers)
<u>D</u>ecoded <u>F</u>ormat	Changes display to DECODED mode (data are displayed as decimal or converted engineering values)
<u>S</u>etup	Not implemented.
<u>P</u>roperties	Not implemented
<u>A</u>bout	Displays basic information about this view

View facilities

Freeze	Printing	Count Rate	Pages	Number of windows
YES	Yes	No	5	2

3.4.5 View Full Imaging Blocks

The command **View/Full Imaging Blocks** creates window for processing and display of FULL IMAGING format data packets. Window receives and processes only TM packets of APID 1608 or 1736. During packet processing the data are encoded and following plots are displayed:

- Events XY map
- X position histogram
- Y position histogram
- Energy spectrum
- Event time distribution

Label, topmost pane, presents data processing statistic:

- Sequence count sequence count number of last received packet,
- Processed number of packets,
- Number of Events current number of events accumulated for plot,
- Grey filter grey filter value as reported in last packet (this is information only; window do not processes grey filter values for plot display),
- OBT of 1.st Event as reported in last processed packet.

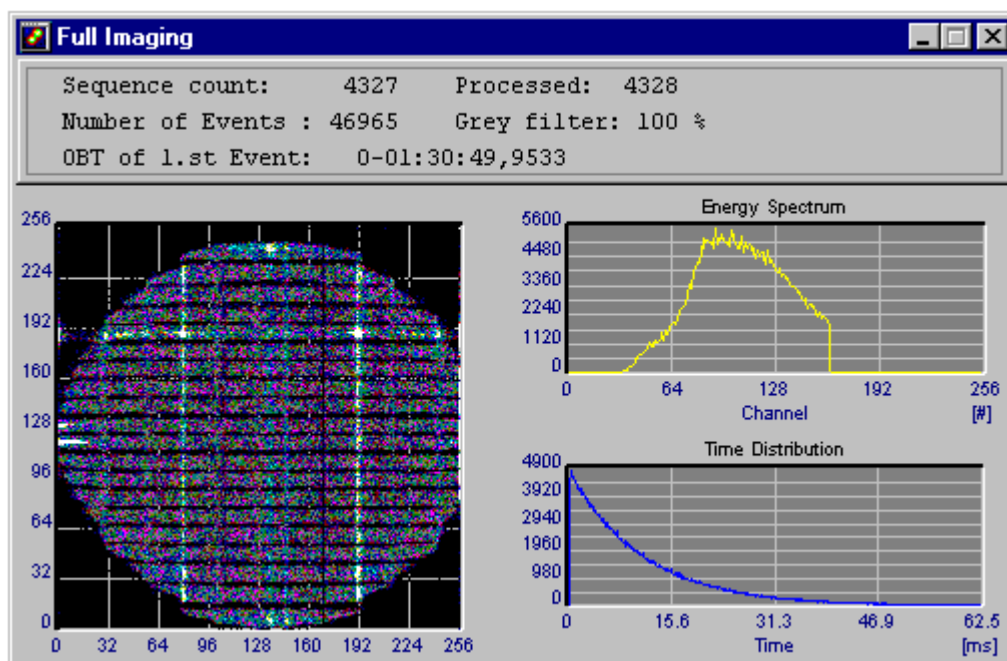


Figure 3-9 The "Full Imaging" data XY map view.

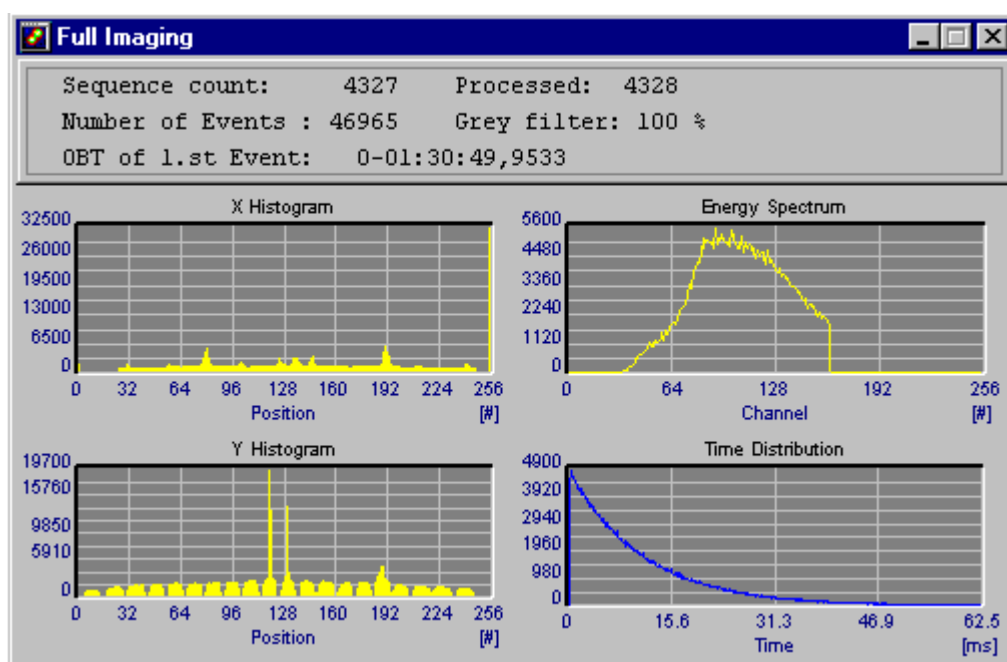


Figure 3-10 The "Full Imaging" data X and Y histogram view.

The menu "**Data**", merged to main menu when view window gets focus, lets perform following commands:

Command	Action
Export map data	Saves XY map data to file (ASCII format)
Auto scale XY map	Makes Z-axis adjustment to current data for XY Map.
Auto scale XY Histograms	Makes Y-axis adjustment to current data for XY

histograms.

Auto scale Spectrum	Makes Y-axis adjustment to current data for spectrum plot.
Auto scale Time distribution	Makes Y-axis adjustment to current data for Time distribution plot.
Auto Scale All	Makes Y-axis adjustment to current data for all plots.
<u>C</u>lear All	Clears all data in associated with plots and processing statistic.
Display <u>M</u>ap	Displays events as XY map (see Figure 3-9)
Display <u>H</u>istograms	Displays events as X and Y histograms (see Figure 3-10)
<u>S</u>etup	Not implemented for this view
<u>P</u>roperties	Not implemented
About	Displays basic information about this view

View facilities

Freeze	Printing	Count Rate	Pages	Number of windows
No	Yes	Yes	2	1

3.4.6 View Restricted Imaging Blocks

This command creates view for processing and displays RESTRICTED IMAGING format data. Created window receives and processes only TM packets of APID 1624 or 1752. During packet processing the data are encoded and following plots are displayed:

- Events XY map
- Energy spectrum

Label, topmost pane, presents data processing statistic:

- Sequence count sequence count number of last received packet,
- Processed number of packets,
- Number of Events current number of events accumulated for plot,
- Grey filter grey filter value as reported in last packet (this is information only; window do not processes grey filter values for plot display),

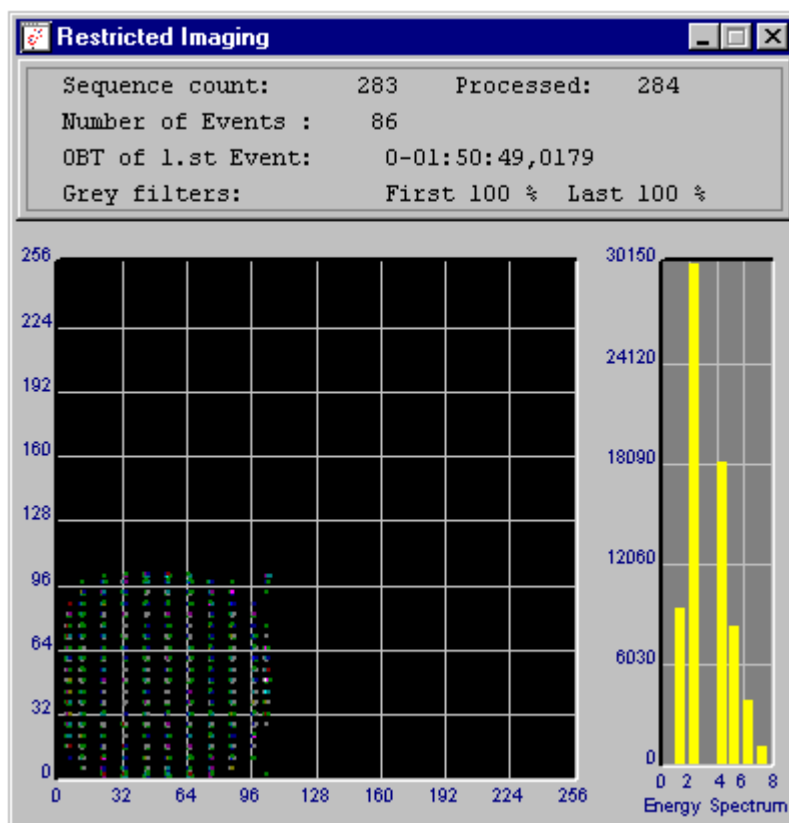


Figure 3-11 The "Restricted Imaging" data view window

The menu "**Data**", merged to main menu when view window gets focus, lets perform following commands:

Command	Action
<u>E</u>xport map data	Saves XY map data to file (ASCII format)
Auto scale XY map	Makes Z-axis adjustment to current data for XY Map.
Auto scale XY Histograms	Makes Y-axis adjustment to current data for XY histograms.
Auto scale Spectrum	Makes Y-axis adjustment to current data for spectrum plot.
Auto Scale All	Makes Y-axis adjustment to current data for all plots.
<u>C</u>lear All	Clears all data in associated with plots.
Display <u>M</u>ap	Displays events as XY map
Display <u>H</u>istograms	Displays events as X and Y histograms
<u>S</u>etup	Not implemented for this view
<u>P</u>roperties	Not implemented
About	Displays basic information about this view

View facilities

Freeze	Printing	Count Rate	Pages	Number of windows
--------	----------	------------	-------	-------------------

No	Yes	No	2	1
----	-----	----	---	---

3.4.7 View Spectral/Timing Blocks

The command **View/Spectral/Timing Blocks** creates window for processing and display of SPECTRAL/TIMING format data packets. Window receives and processes only TM packets of APID 1616 or 1744. During packet processing the data are encoded and accumulated. The following plots are displayed:

- Energy spectrum
- Event time distribution

Label, topmost pane, presents data processing statistic:

- Sequence count sequence count number of last received packet,
- Processed number of packets,
- Number of Events current number of events accumulated for plot,
- Grey filter grey filter value as reported in last packet (this is information only; window do not processes grey filter values for plot display),
- OBT of 1.st Event as reported in last processed packet.

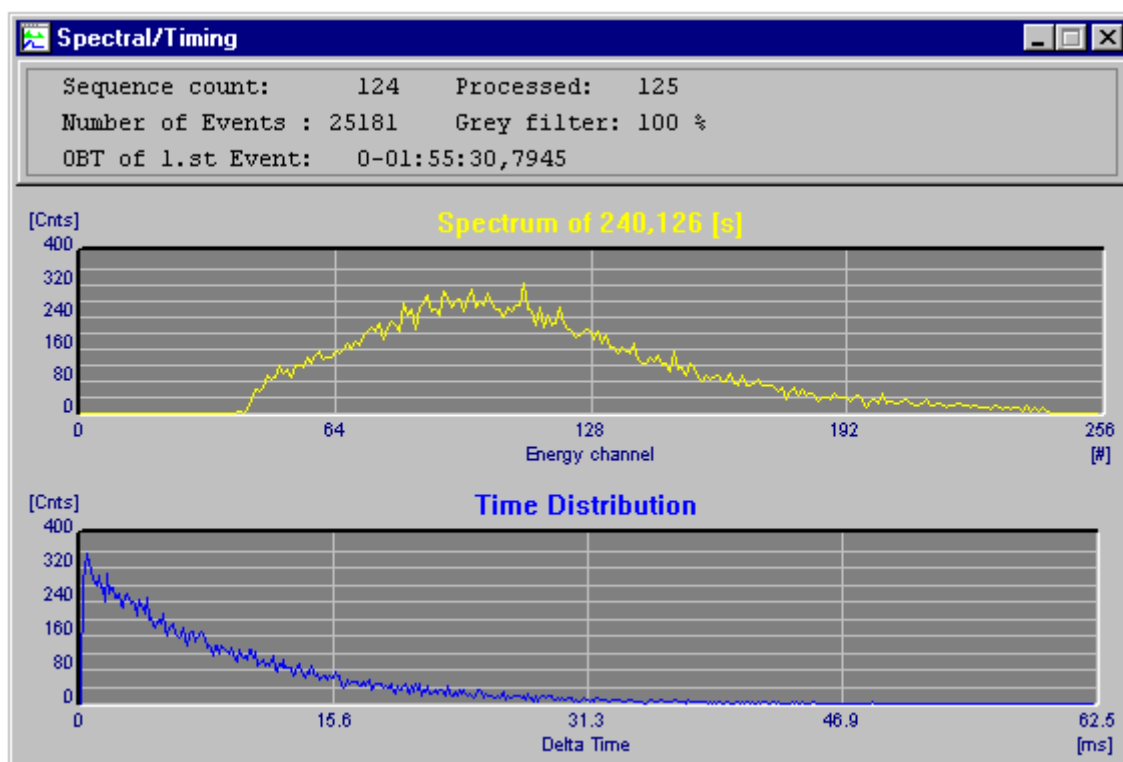


Figure 3-12 The "Spectral/Timing" view window.

The menu **"Data"**, merged to main menu when view window gets focus, lets perform following commands:

Command	Action
Auto Scale All	Makes Y-axis adjustment to current data for all plots.
<u>C</u>lear All	Clears all data in associated with plots and processing statistic.
<u>S</u>etup	Not implemented for this view
<u>P</u>roperties	Not implemented
<u>A</u>bout	Displays basic information about this view

View facilities

Freeze	Printing	Count Rate	Pages	Number of windows
No	Yes	Yes	1	1

3.4.8 View Count Rate Blocks

The command **View/Count Rate Blocks** creates window for processing and display of COUNTRATE format data packets. Window receives and processes only TM packets of APID 1656 or 1784. During packet processing the encoded data are displayed as plot (cunts vs. time)

Label, topmost pane, presents data processing statistic:

- Sequence count sequence count number of last received packet,
- Processed number of packets,
- Number of Events current number of events accumulated for plot,
- Grey filter grey filter value as reported in last packet (this is information only; window do not processes grey filter values for plot display),
- OBT of 1.st Event as reported in last processed packet.

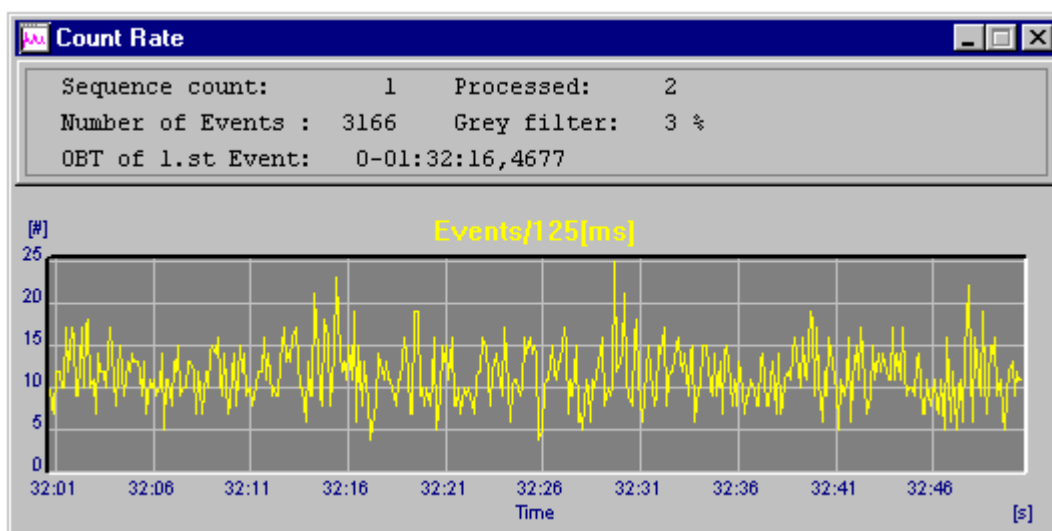


Figure 3-13 The "Count Rate" data view window.

The menu "**Data**", merged to main menu when view window gets focus, lets perform following commands:

Command	Action
Auto Scale All	Makes Y-axis adjustment to current data for all plots.
<u>C</u>lear All	Clears all data in associated with plots and processing statistic.
<u>S</u>etup	Not implemented for this view
<u>P</u>roperties	Not implemented
<u>A</u>bout	Displays basic information about this view

View facilities

Freeze	Printing	Count Rate	Pages	Number of windows
No	Yes	Yes	1	1

3.4.9 View Spectrum Blocks

The command **View/Spectrum Blocks** creates window for processing and display of SPECTRUM format data packets. Window receives and processes only TM packets of APID 1640 or 1768. During packet processing the encoded data are displayed as plot (accumulated spectrum)

Label, topmost pane, presents data processing statistic:

- Sequence count sequence count number of last received packet,
- Processed number of packets,
- Number of Events current number of events accumulated for plot,
- Grey filter grey filter value as reported in last packet (this is information only; window do not processes grey filter values for plot display),
- OB_T of 1.st Event as reported in last processed packet.

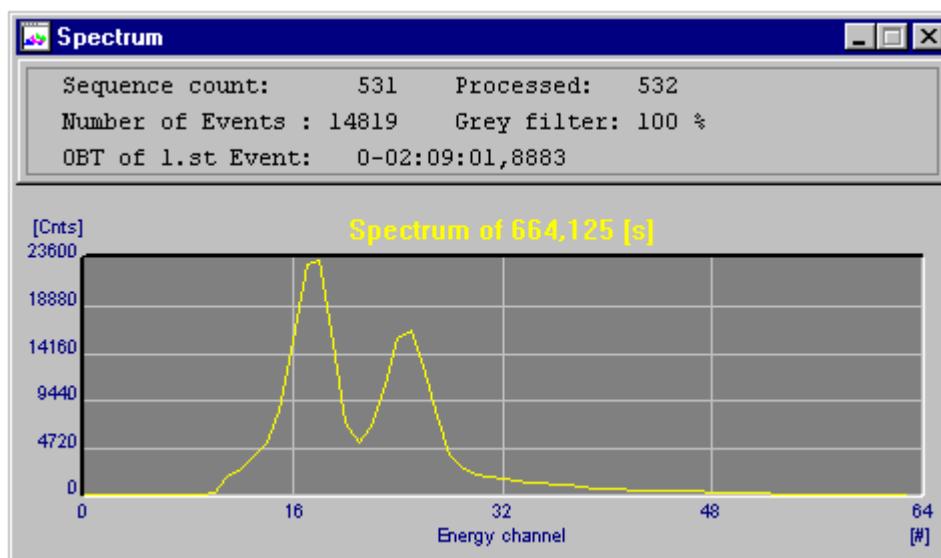


Figure 3-14 The "Spectrum" data view window.

The menu "**Data**", merged to main menu when view window gets focus, lets perform following commands:

Command	Action
Auto Scale All	Makes Y-axis adjustment to current data for all plots.
<u>C</u>lear All	Clears all data in associated with plots and processing statistic.
<u>S</u>etup	Not implemented for this view
<u>P</u>roperties	Not implemented
<u>A</u>bout	Displays basic information about this view

View facilities

Freeze	Printing	Count Rate	Pages	Number of windows
No	Yes	Yes	1	1

3.4.10 View Timing Blocks

The command **View/Timing Blocks** creates window for processing and display of TIMING format data packets. Window receives and processes only TM packets of APID 1632 or 1760. During packet processing the encoded data are displayed as plot (events time distribution)

Label, topmost pane, presents data processing statistic:

- Sequence count sequence count number of last received packet,
- Processed number of packets,
- Number of Events current number of events accumulated for plot,
- Grey filter grey filter value as reported in last packet (this is information only; window do not processes grey filter values for plot display),

- OBT of 1.st Event as reported in last processed packet.

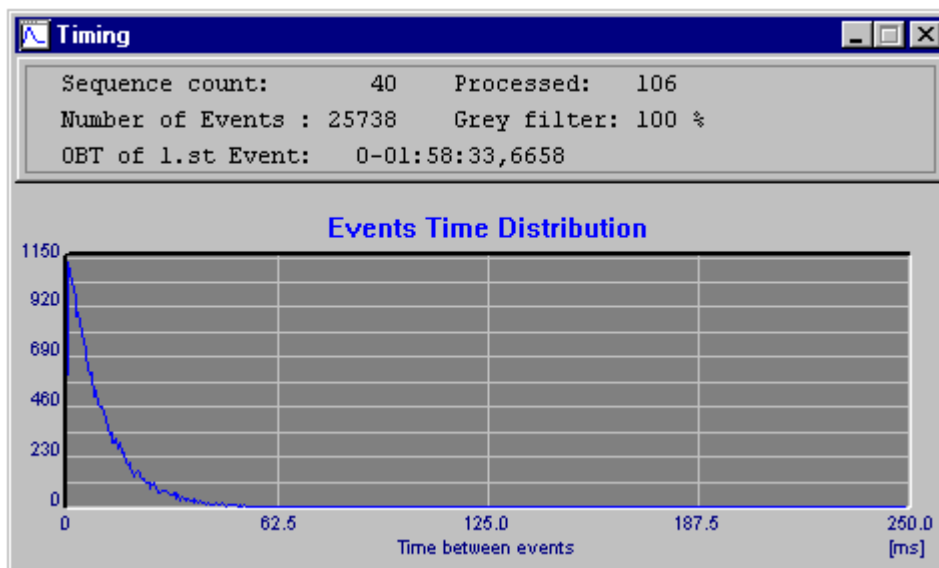


Figure 3-15 The "Timing" data view window.

The menu "Data", merged to main menu when view window gets focus, lets perform following commands:

Command	Action
Auto Scale All	Makes Y-axis adjustment to current data for all plots.
Clear All	Clears all data in associated with plots and processing statistic.
Setup	Not implemented for this view
Properties	Not implemented
About	Displays basic information about this view

View facilities

Freeze	Printing	Count Rate	Pages	Number of windows
No	Yes	Yes	2	1

3.4.11 View Test Blocks

The command **View/Test Blocks** creates window for processing and display of TEST format data packets. Window receives and processes only TM packets of APID 1607 or 1735. This view is mainly devoted to support instrument calibration and checkout activity when JEM-X is connected to EGSE rather than satellite subsystems or simulators. The 'real' TEST packet data format, as produced by DPE' has few data structures. Views data display is divided to several pages:

- Numerical
- Events XY map
- X and Y position histograms

- Energy spectrum
- Event time distribution
- Event count rate

Label pane presents data processing statistic:

- Sequence count sequence count number of last received packet,
- Processed number of packets,
- Grey filter grey filter value as reported in last packet (this is information only; window do not processes grey filter values for plot display),
- OBT of 1.st Event as reported in last processed packet.

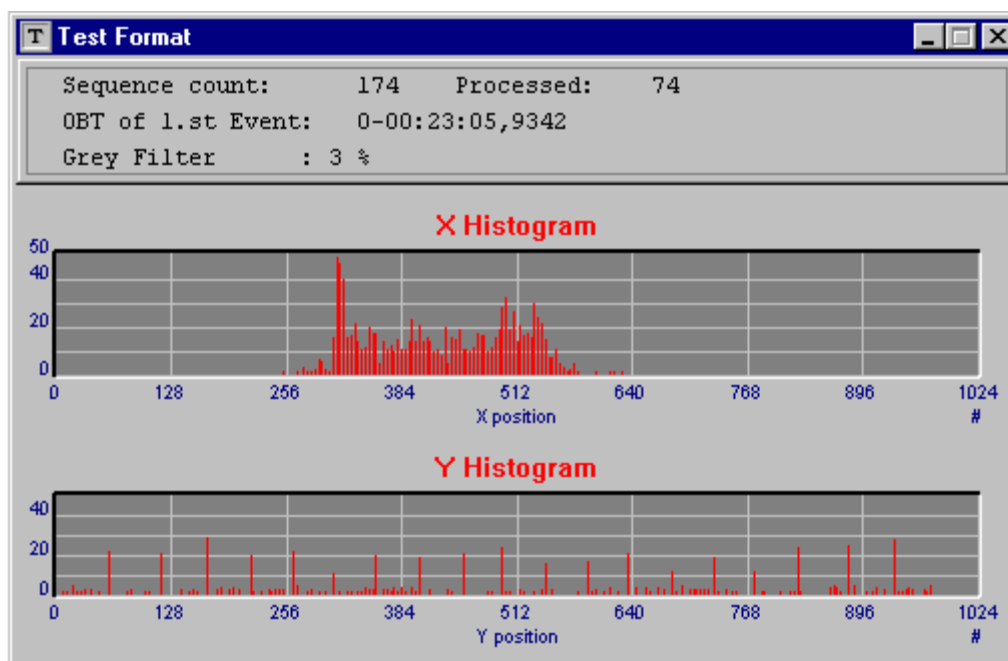


Figure 3-16 The "Test" data view example - "X and Y histogram" page.

The menu "**Data**", merged to main menu when view window gets focus, lets perform following commands:

Command	Action
<u>E</u>xport map data	Saves XY map data to file (ASCII format)
<u>N</u>umerical	Activates display of "Numerical" page (list of event in last received block)
<u>X</u>Y Map	Activates display of "XY map" page
<u>X</u>Y <u>H</u>istogram	Activates display of "X and Y histograms" page
<u>E</u>nergy Spectrum	Activates display of "Energy spectrum" page
<u>T</u>ime Distribution	Activates display of "Time Distribution" page
<u>C</u>ount &Rate	Activates display of "Count Rate" page
Auto Scale All	Makes Y-axis adjustment to current data for all plots.

<u>C</u>lear All	Clears all data associated with plots and processing statistic.
<u>S</u>etup	Creates "Test data setup" dialog.(see Figure 3-17)
<u>P</u>roperties	Not implemented
<u>A</u>bout	Displays basic information about this view

When **Data/Setup** command is executed, the following dialog allows you to change data processing parameters.

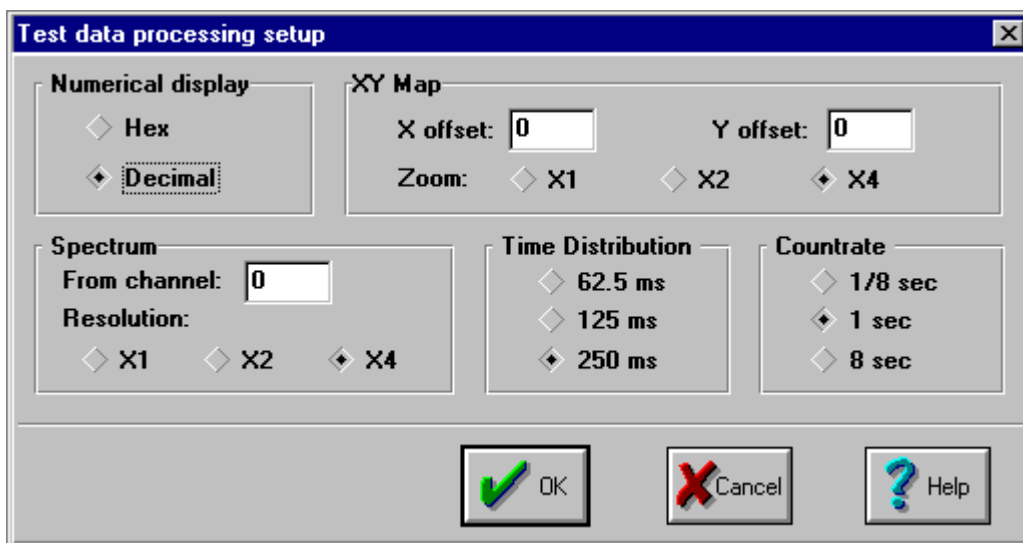


Figure 3-17 Test data processing setup dialog.

Numerical display

Select required numbers display format (Hex or Decimal).

XY Map

Select map resolution and displacement

X1 - High resolution: 256 x 256 points

X2 - Medium resolution: 512 x 512 points

X4 - Low resolution: 1024 x 1024 points (full detector)

Spectrum

Select spectrum processing resolution and channel offset

Time Distribution

Select time axis range

Count rate

Select count rate accumulation period.

Buttons

OK.	closes the dialog box and saves any changes made
Cancel	closes the dialog box without saving any changes made
Help	opens help window.

View facilities

Freeze	Printing	Count Rate	Pages	Number of windows
No	Yes	Yes	6	1

3.4.12 View Diagnostic Blocks

The command **View/Diagnostic Blocks** creates window for processing and display of DIAGNOSTIC format data packets. Window receives and processes only TM packets of APID 1602 or 1730. Views data display is divided to several pages:

- Numerical
- Events XY map
- X and Y position histograms
- Energy spectrum
- Event time distribution
- Event count rate

Label pane presents data processing statistic:

- Sequence count sequence count number of last received packet,
- Processed number of packets,
- OBT of 1.st Event as reported in last processed packet.
- Anode switch as reported in last processed packet.

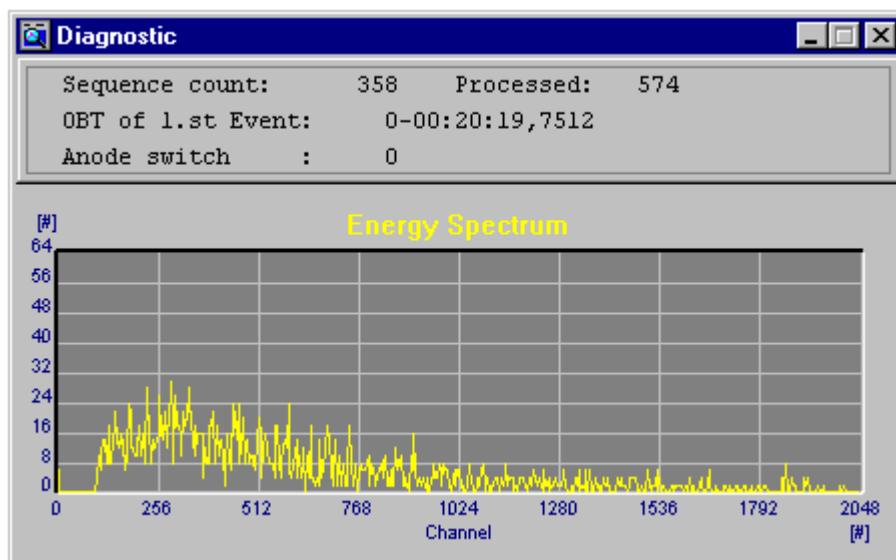


Figure 3-18 The "Diagnostic" data view example - "Energy spectrum" page

The menu **"Data"**, merged to main menu when view window gets focus, lets perform following commands:

Command	Action
<u>E</u>xport map data	Saves XY map data to file (ASCII format)
<u>N</u>umerical	Activates display of "Numerical" page (list of event in last

	received block)
<u>XY Map</u>	Activates display of "XY map" page
<u>XY Histogram</u>	Activates display of "X and Y histograms" page
<u>Energy Spectrum</u>	Activates display of "Energy spectrum" page
<u>Time Distribution</u>	Activates display of "Time Distribution" page
<u>Count &Rate</u>	Activates display of "Count Rate" page
<u>Auto Scale All</u>	Makes Y-axis adjustment to current data plot (current page).
<u>Clear All</u>	Clears all data associated with plots and processing statistic.
<u>Setup</u>	Creates "Diagnostic data setup" dialog.(see Figure 3-17)
<u>Properties</u>	Not implemented
<u>About</u>	Displays basic information about this view

View facilities

Freeze	Printing	Count Rate	Pages	Number of windows
No	Yes	Yes	6	1

3.4.13 View Calibration Blocks

The command **View/Calibration Blocks** creates window for processing and display of CALIBRATION format data packets. Window receives and processes only TM packets of APID 1601 or 1729. Views data display is divided to several pages:

- Numerical
- Energy spectrum
- Event time distribution
- Event count rate

Label pane presents data processing statistic:

- Sequence count sequence count number of last received packet,
- Processed number of packets,
- OBT of 1.st Event as reported in last processed packet.
- Calibration amplitude as reported in last processed packet.
- Frequency as reported in last processed packet.
- Anode switch as reported in last processed packet.

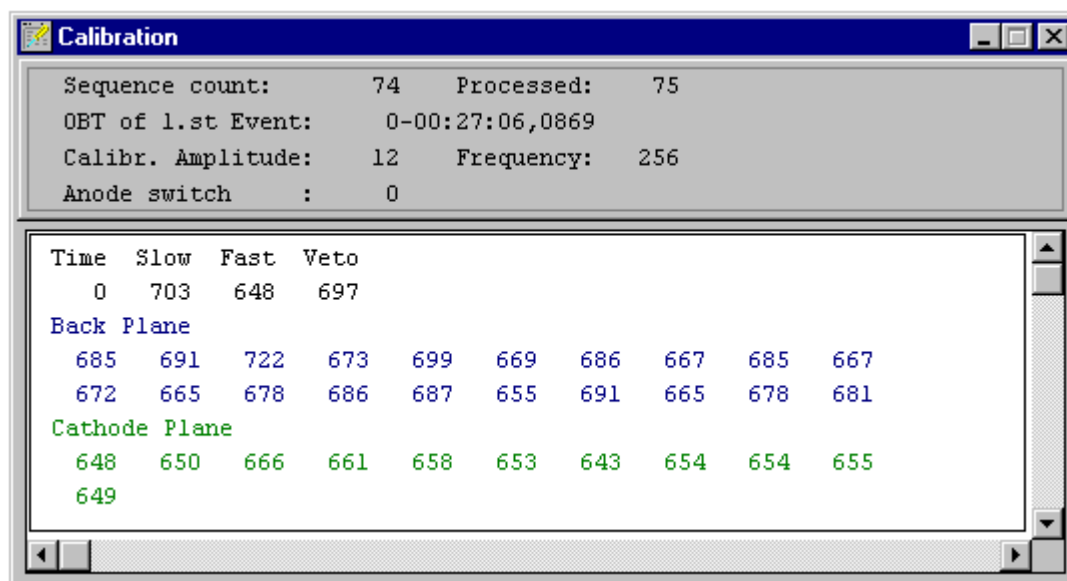


Figure 3-19 The "Calibration" data view example - "Numerical" page.

The menu "Data", merged to main menu when view window gets focus, lets perform following commands:

Command	Action
<u>N</u>umerical	Activates display of "Numerical" page (list of event in last received block)
<u>E</u>nergy Spectrum	Activates display of "Energy spectrum" page
<u>T</u>ime Distribution	Activates display of "Time Distribution" page
<u>C</u>ount &Rate	Activates display of "Count Rate" page
Auto Scale All	Makes Y-axis adjustment to current data for all plots.
<u>C</u>lear All	Clears all data associated with plots and processing statistic.
<u>S</u>etup	Creates "Calibration view setup" dialog.
<u>P</u>roperties	Not implemented
About	Displays basic information about this view

View facilities

Freeze	Printing	Count Rate	Pages	Number of windows
No	YES	No	4	1

3.4.14 View Calibration Monitor

The command **View/Calibration Monitor** creates window for processing and display of selected part of CALIBRATION format data packets. This view is mainly devoted to support instrument calibration and checkout activity.

Label pane presents data processing statistic:

- Sequence count sequence count number of last received packet,
- Processed number of packets,
- OBT of 1.st Event as reported in last processed packet.

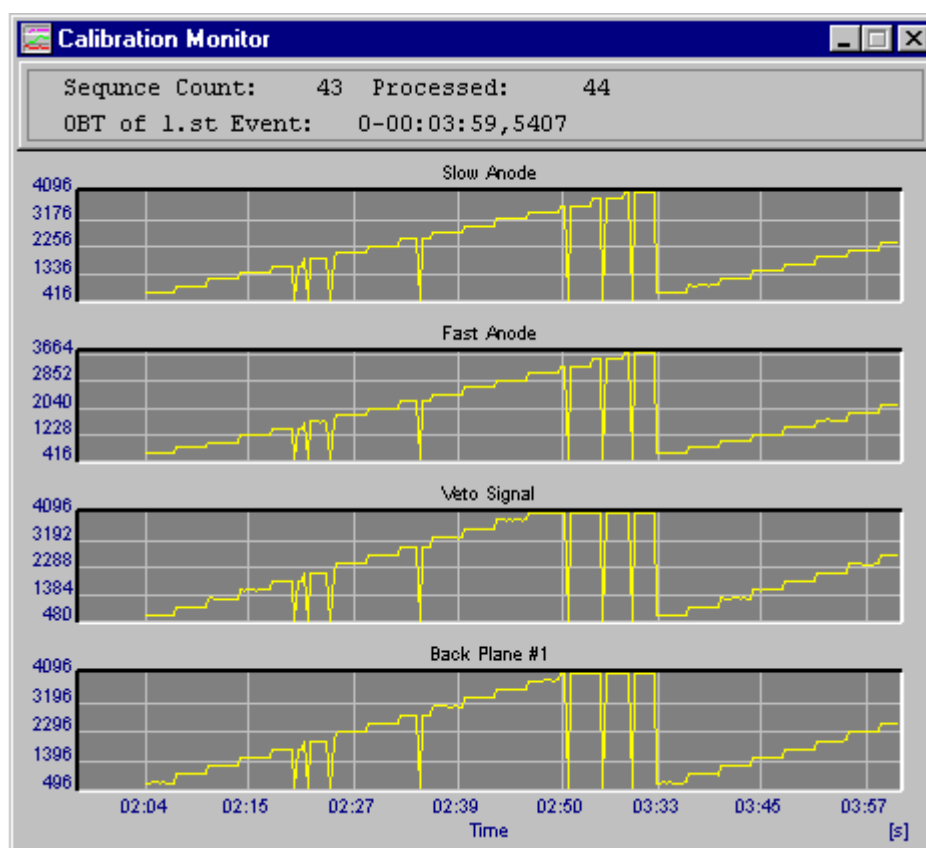


Figure 3-20 The "Calibration Monitor" view window.

The menu "**Data**", merged to main menu when view window gets focus, lets perform following commands:

Command	Action
<u>F</u>ollow data	Switches on or off (according the menu check mark) automatic Y-axis adjustment to last data inserted to plot. (scale adjustment follows data values).
<u>A</u>uto Scale All	Makes Y-axis adjustment to current data for all plots.
<u>C</u>lear All	Clears all data associated with plots and processing statistic.
<u>S</u>etup	Creates "Calibration Monitoring Setup" dialog. (see Figure 3-21)
<u>P</u>roperties	Not implemented
<u>A</u>bout	Displays basic information about this view

When **Data/Setup** command is executed, the following dialog allows you to change data processing parameters.

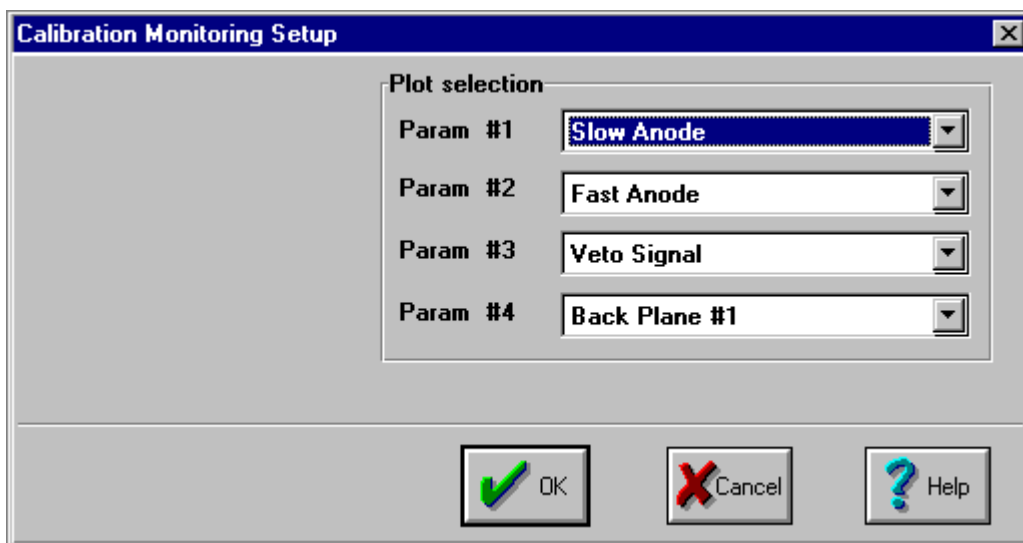


Figure 3-21 The "Calibration Monitoring Setup" dialog window.

Plot Selection

Select event data to be collected and displayed in plot..

Buttons

- OK.** closes the dialog box and saves any changes made
- Cancel** closes the dialog box without saving any changes made
- Help** opens help window.

View facilities

Freeze	Printing	Count Rate	Pages	Number of windows
No	Yes	No	1	4

3.4.15 View Events Count Rate

The command **View/Event Count Rate** creates window for processing and display of count rate messages produced by another data views. This window does not receive or process TM packets directly. Instead, it receives notification about number of event processed by other view. The following views produce such notification as a result of packed data processing:

- Full Imaging View
- Spectral/Timing View
- Count Rates View
- Spectrum View
- Timing View
- Test View
- Diagnostic View

- Calibration View

To obtain "Event count rate" plot at least one of view listed above should be active (created).

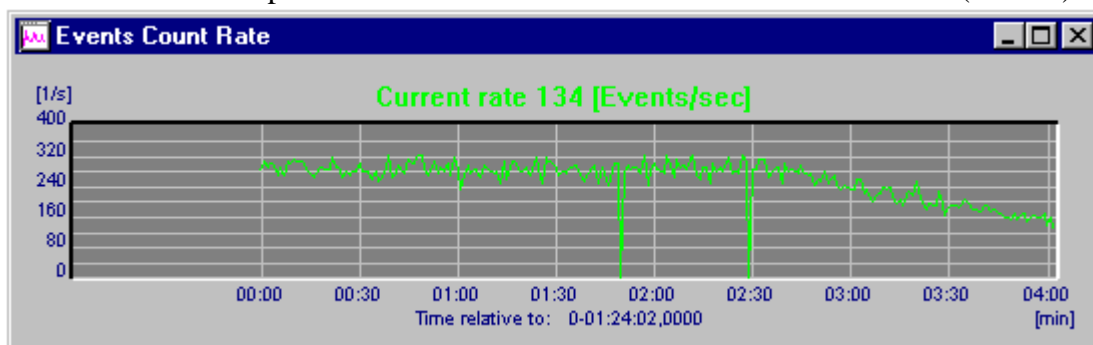


Figure 3-22 The "Events Count Rate" view window.

The menu "**Data**", merged to main menu when view window gets focus, lets perform following commands:

Command	Action
Auto Scale	Makes Y-axis adjustment to current data for all plots.
<u>C</u>lear All	Clears data associated with plot and processing statistic.
<u>P</u>roperties	Not implemented
About	Displays basic information about this view

View facilities

Freeze	Printing	Count Rate	Pages	Number of windows
No	Yes	---	1	1

3.4.16 View On Events Message List

This command shows (or hides) the window that display list of "On Event Message Telemetry" records that was reported in HK packets. Window is created as a child of main application window and is active during whole program activity.

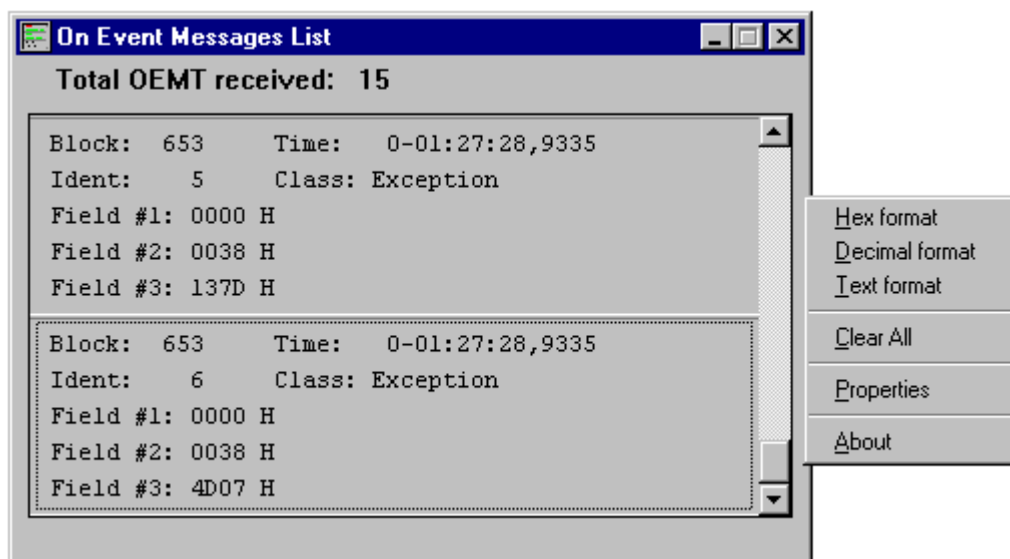


Figure 3-23 The "On Event Messages list" window.

The menu "**Data**", merged to main menu when view window gets focus, lets perform following commands:

Command	Action
<u>H</u> ex format	Displays OEMT records as hex numbers
<u>D</u> ecimal format	Displays OEMT records as decimal numbers
<u>T</u> ext format	Displays OEMT records as text
<u>C</u> lear All	Clears list of OEMT.
<u>P</u> roperties	Not implemented
<u>A</u> bout	Displays basic information about this view

View facilities

Freeze	Printing	Count Rate	Pages	Number of windows
No	Yes	No	Scroll list	1 - Persistent

3.4.17 View Log Command

The **View/Program Log** command displays list of 32 most recent log events.









Event Log			
Type	Time	Event	Comment
	15:45:26	TM Connected	148.81.24.55,1075
	15:45:29	Block received	Spectrum 18
	15:45:29	Block received	Spectrum 19
	15:45:30	Block received	Spectrum 20
	15:45:31	Block received	Spectrum 21
	15:45:31	Block received	Spectrum 22
	15:45:32	TM Disconnected	OK.
	15:45:41	Setup Changed	Network

Figure 3-24 Program events LOG window.

3.5 Tools menu commands

The Tools menu provides commands to establish TM source connection (one type on the time) and other miscellaneous commands:

Connect to TM Source	Listen for connection to the CORE EGSE TM socket
Connect to JEM-X EGSE	Connects to EGSE TM data source
Connect to SIS	Connects to SIS TM data source
Connect to MOC	Connects to MOC TM data source
Log Report	Prepares program Log report
Debug	Opens connection debugging window

3.5.1 TM Source Connections

The **Tools/Connect to xxx** commands creates window that services TM source connection via LAN.

See chapter 4.1 "Connecting to telemetry data source" for more details.

3.5.2 Log Report

The JEM-X EGSE software is producing "log" files and saving them in directory: C:\EGSE\BASE. The new database table (log) is opened for each day with the name LGYMMDD.DBF. For example log file name for 25-January-2000 is **LG000125.DBF**.

The files are formatted as 'dBase' tables and each record includes following fields:

- Field 1 TIME Event time (HH:MM:SS),
- Field 2 TYPE Event code ('@' + nr) ;(for example "Block Received"),
- Field 3 INFO Event info (char [20]) ; additional description,
- Field 4 FLAG Flags (category); (Normal, Communication, Setup, Alert, act).

This command generates a report listing of selected part of program events of the specified type during the specified time. To create report: choose **Tools/Log Report** to open the report selection dialog box (see Figure 3-25).

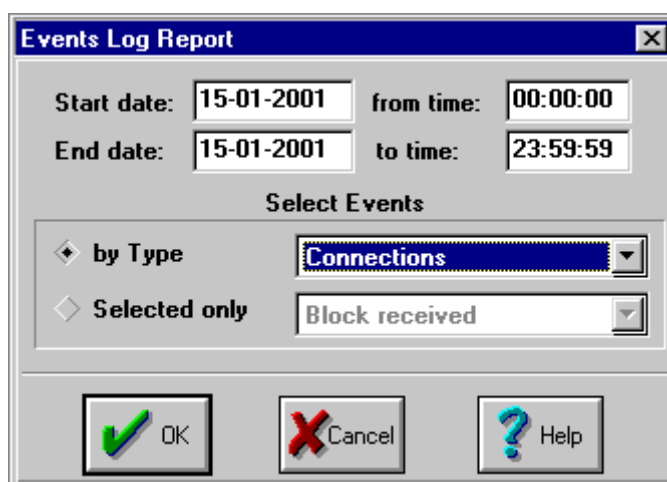


Figure 3-25 Event log report selection dialog box.

1. Enter data in the fields as follows:

Start date: from time:
End date: to time:

Enter the range of time during which the transactions you want to appear in the report occurred. (Defaults to today.) Enter the date using the calendar. Enter the time using the 24 hour clock - 00:00:00 for midnight, 23:59:59 for one second to midnight.

Select Events:

Determines the type of log records, which appear in the report.

Default setting: by type - All.

2. Click "OK." button to generate report.

The computer searches the database for the records that match the conditions and sorts them into a logical order. You can print the report immediately or preview it on the screen first.

3.6 Setup menu commands

The **Setup/xxx** commands are used to define various program settings, such as connection parameters or options that apply to all program windows. Configuration settings are saved into the "EGSE.INI" file located in system directory (usually: C:\WINDOWS\ or C:\WINNT). The program is delivered with empty EGSE.INI file, so when first running a default values are used. However, the user can

change default settings executing "Setup" menu commands. These settings are recalled whenever the program is re-started. Although this file is in text format, you should not attempt to manually change it except where specifically instructed. Where an application is to be made portable, this configuration file should be copied into the C:\WINDOWS directory of the target computer. The Setup menu provides commands to execute setup dialogs for:

Network	Configures Network connection
HK Data Base	Modifies Housekeeping Data Base (not implemented ver. 3.22)
Operator Data Base	Configures program operator Data Base (not implemented ver. 3.22)
Save setup	Saves current setup settings
Restore setup	Restores last saved setup

3.7 Window menu commands

The Window menu provides commands to control the position and layout of application's windows.

Cascade

Resize and position all windows in an overlapping pattern. The **Window/Cascade** command arranges all document windows from the top-left position of the application's main window so that the title bar of each is visible.

Tile

Resize and position all windows in an non overlapping pattern.

Arrange Icons

Align all iconized windows along a grid. The **Window/Arrange** Icons command arranges all iconized windows into rows along the bottom of the application's main window.

Close All

Closes all windows. If there is active connection to TM source **IS** prompts .you to disconnect link.

3.8 Help menu commands

Contents

The **Help/Contents** displays the help contents page

Using Help

This command displays information on how to use the JEM-X Help system in Windows. If you do not know how to use Help in Windows, choose Using Help from the Help menu or press F1 from an active Help window.

About

This command displays the About JEM-X "Instrument Station" window that shows copyright and version information.

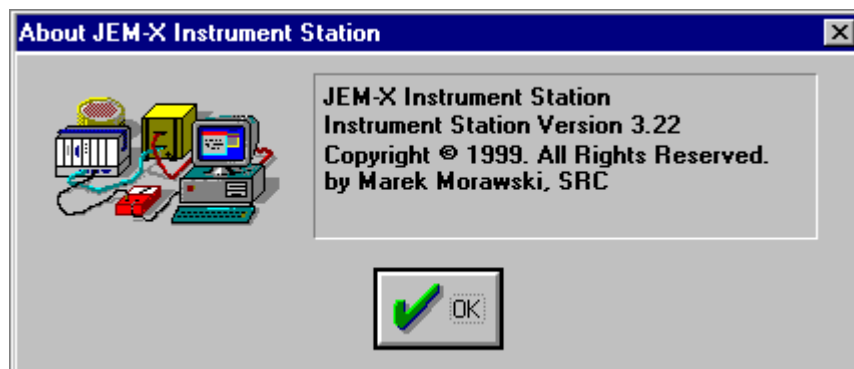


Figure 3-26 'Instrument Station' about window.

4 Operating procedures

4.1 Connecting to telemetry data source

The "Instrument Station" for JEM-X program can receive TM packets using a unidirectional non-blocking TCP/IP stream socket. The format of this link is a 16-bit word (Hi byte first) indicating the length of the subsequent TM Source Packet and TM Packet itself following the length word.

<LEN:16><Raw TM Pct. (binary byte-aligned MSB first)> ..

According to document:

- INT-MA-SAT-0002; (page B-12)
- INT-SR-AI-0003, Issue 5; (chapter 3.1.1.)

The exception is "MOC" connection when other protocol is used as described in:
INT-MOC-SYS-ICD-0001-OGI document.

There are few possible sources of TM packets:

Source	IP address (at DSRI)	Port Number	Connection Type
SIS-OBDAH Front End	130.226.216.165	3100	client socket
SIS Workstation	130.226.216.165	1108	client socket
Core EGSE	194.192.25.1 (Alenia!!)	3300	server socket
JEMXEGSE	130.226.216.92	5100	client socket
JEMXEGSE2	130.226.216.93	5100	client socket
JEMXEGSE3	130.226.216.94	5100	client socket
MOC	195.74.166.67	2039	client socket (*)

(*) MOC protocol.

TM Source stream connection procedure:

1. Run ISJEMX.EXE
2. Set IP and Port number (according table above) using command *Setup/ Network*
3. Activate View processing window (at least one) using commands from View Menu,
4. Connect to TM Source (OBDAH FE or SIS WS): MENU->*Tool//Connect to SIS*,
5. Select/Enter the archive data file: "File Open Dialog".

4.2 Network Configuration Dialog Box

This dialog lets you to configure or change the network connection parameters.

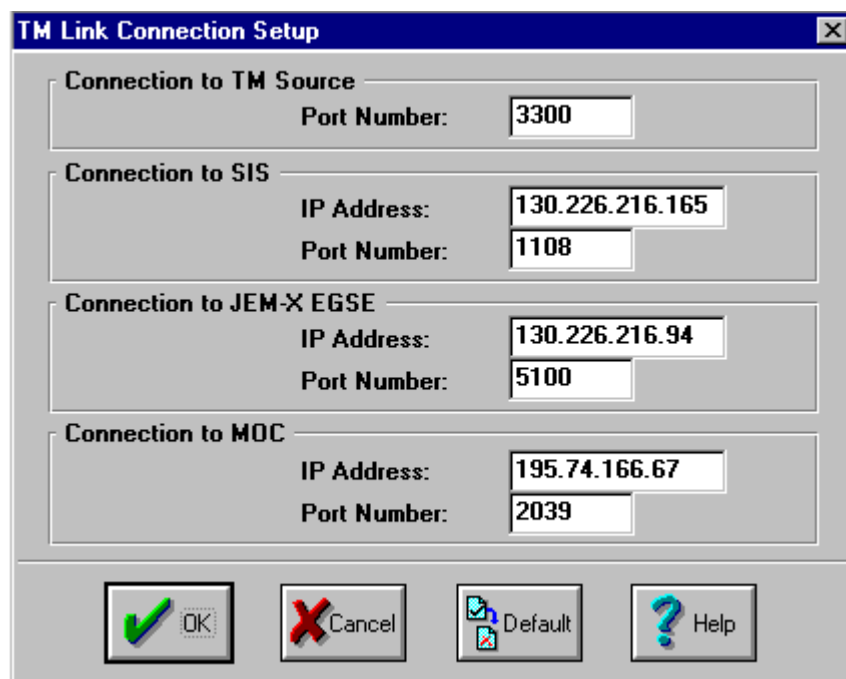


Figure 4-1 Network Configuration dialog.

IP Address

Enter the internet IP address of the remote TM source. A dotted-decimal version of the internet address should be entered.

The following IP addresses are used for JEMX-EGSE (DSRI LAN):

- "jemxegse" 130.226.216.92
- "jemxegse2" 130.226.216.93
- "jemxegse3" 130.226.216.94

Port Number

Enter the socket port number (see table above for the default values)

Buttons

- | | |
|----------------|---|
| OK. | Closes the Dialog Box and saves any changes made |
| Cancel | Closes the Dialog Box without saving any changes made |
| Default | Sets default values (at DSRI) |
| Help | Displays help window. |

Note: Before using this command to change your network configuration, be sure to close 'TM Link Status' window. Your changes take effect the next time you start connection procedure.

4.3 TM Link Status window

When the operator executes one of connection command the new window will be created. This window receives incoming TM data packets. The current TM source connection status and packet statistic is displayed.

This window is also responsible for data archiving. Received packets would be saved as IPF files. The "Status Bar"(see Figure 3-2) of main window shows current archive file and connection status.

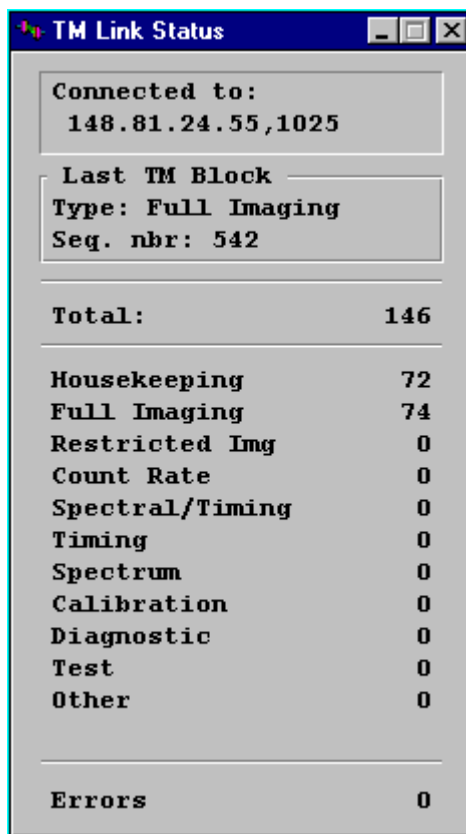


Figure 4-2 Connection status window.

Figure 4-2 shows the sample of the TM Link status window. If the connection is successful, the most upper pane displays IP address of source. Last received packet short information will appear in the pane below.

If the connection is not successful, an error message will appear in the message box.

You can disconnect by right clicking the window and selecting "Disconnect" command from popup menu or choosing the Connection/Disconnect command from main menu.

When you close the "TM Link Status" window or Exit the Application you will be prompted to allow disconnection. Clicking "YES" button will close window and connection is automatically terminated.

When Connection/Properties command is executed, the following dialog allows you to change data processing parameters.

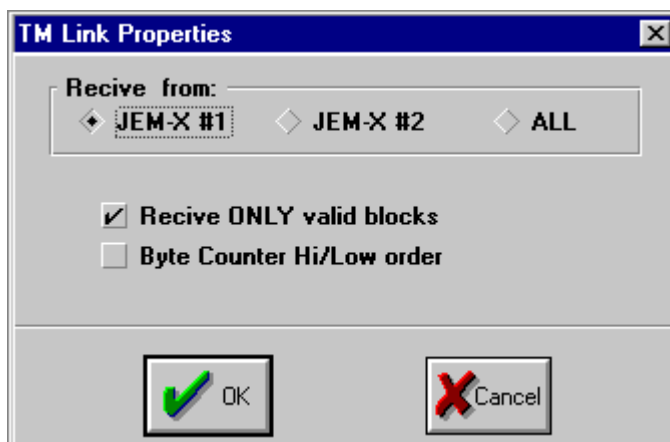
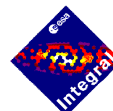


Figure 4-3 TM Link Properties window.

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5 Data formats

5.1 LOG file format

The JEM-X EGSE software is producing "log" files and saving them in directory: **C:\EGSE\BASE**. The new database table (log) is opened for each day with the name **LGYYMMDD.DBF**. For example log file name for 25-January-2000 is **LG000125.DBF**.

The record of such files includes:

Field 1	TIME	Event time (HH:MM:SS)
Field 2	TYPE	Event code ('@' + nr) ; code of log event (for example "Block Received")
Field 3	INFO	Event info (char [32]) ; additional description
Field 4	FLAG	Flags (category); for example (Normal, Communication, Setup, Alert, act)

There are two windows that displays log records:

- Event log - list of 32 most recent log events; **View/Program Log**
- Event Log Report - list of selected events; **Tools/Log Report**

It is possible to make report of selected type of events and print them.

5.2 The IPF file format

The Telemetry packets received by JEM-X "Instrument Station" are stored on the disk as IPF format files. The files has following structure:

MSB Bit Number LSB
<0|1|2|3|4|5|6|7|8|9|10|11|12|13|14|15>

File Header

```

<1|1|1|1|0|0|1|1|  File Version number > Word 1
<Instrument mode| Instrument submode > Word 2
<1|1|1|1|1|1|1|1|  Day nbr   | Month nbr > Word 3
<1|1|1|1|1|      Year number > Word 4
<      Comment Words (maximum = 255) > Word 5
<      Comment Field Word 1           > Word 6
<      Comment Field Word 2           > Word 7
<      ...                           >
<      Comment Field Word N           > Word N +6

<      Total number of Packets (N) MSW > Word N +7
<      Total number of Packets (N) LSW > Word N+ 8

```

Packet Data (440 bytes fixed length)

```

<      Packet Data Word 1           >
<      Packet Data Word 1           >
<      ...                           >
<      Packet Data Word 220         >

```

The coding convention will be positive integer binary. The first Word (the beginning of the Header) is Word1

File Header:

The first 5 16-bit words (Words 1 - 5 inclusive) are the File Header. The first 8 bits of the file header are a code unique from any possible data, so as to avoid confusion.

File Version Number (Word 1 I Bits 8 - 15)

Field holds the file version number for the instrument and mode of the data, encoded in binary.

Instrument Mode (Word 2 I Bits 0 - 7)

Field holds the binary encoding of the ASCII character for the instrument mode as defined in table 2. 1 (i.e. the first character of the last column).

Instrument Submode Word 2 I Bits 8 -15)

Field holds the binary encoding of the ASCII character for the instrument submode as defined in table 2.1 (i.e. the second character of the last column).

Day Number (Word 3 I Bits 7 - 11)

Field holds the day of the month on which the file was created. encoded in binary, This field contains an integer value which can take the value 1 to 31.

Month Number (Word 3 I Bits 12 - 15)

Field holds the month on which the file was created, encoded in binary. This field contains an integer value which can take the value 1 to 12.

Year Number (Word 4 I Bits 4 - 15)

Field contains the year on which the current file was created. the full integer value up to 2047 encoded in binary.

Comment Words (Word 5 I Bits 0 - 15)

This field holds the number of words in the comment string (up to a maximum of 255 words).

Comment Field (Word 6 up to 261 max.)

This field holds a comment which can be provided with the file. The comment can be from 0 to 510 ASCII characters long, which translates into a block of 1 to 510 bytes, holding the binary encoded characters (1 byte per ASCII character). e.g. 'a' is 61 (hex). The field must contain an even number of bytes so that the last word is a complete word (pad out with a space if necessary). This field is used to define the instrument configuration in which the IPF file was produced.

Number of Data Packets (follows Comment Field)

This is the field which shows how many science packets follow in the remainder of the file. That is, the value of N encoded in binary on 2 words.

5.3 The Telemetry Packet format

The Packet Data is a block of 220 words (440 bytes), the packet length being fixed for INTEGRAL. The first 3 words (6 bytes) of the packet data comprise the packet header as defined in the packet structure definition document :

```

MSB                               Bit Number                               LSB
<0|1|2|3|4|5|6|7|8|9|10|11|12|13|14|15>
Packet Header
<Version Number=100|Type=0|Data Field
Header
Flag=1|APID
Sequence
<    Flag=11|Source Sequence Count    >
<    Packet Length-1 (=433 bytes)    >

```

The next 2 words (4 bytes) of the science packet data comprise the data field header (also as defined in the packet structure definition document [AD-1])

```

MSB                               Bit Number                               LSB
<0|1|2|3|4|5|6|7|8|9|10|11|12|13|14|15>
Packet Data
< Type   |Subtype|          Spare          >
<      Packet Generation Time      >
<      Packet Generation Time      >
<          SC-TM Header          >
<          ...          >
<      Compressed Data      >
<          ...          >
<          CRC          >

```

The JEM-X instrument has several scientific and diagnostic data formats:

TM format	APID (JEM-X “K”)	APID (JEM-X “J”)	Type/Subtype
Housekeeping	1536	1664	1/8
Full Imaging	1608	1736	0/8
Restricted Imaging	1624	1752	1/8
Count Rates	1656	1784	3/8
Spectral/Timing	1616	1744	1/0
Timing	1632	1760	2/0
Spectrum	1640	1768	2/8
Calibration	1601	1729	0/1
Diagnostic Dump	1602	1730	0/2
Test	1607	1735	0/7
Idle (Not implemented)	1600	1728	0/0

5.3.1 FULL IMAGING TM Packets

APID: 1608/1736

Type/Subtype: 0/8

Packet format:

Start (word#)	Size (words)	Content
0	3	Data Header (OBT of 1.st event in packet)
<u>SC-TM Header</u>		
3	1	Number of events in packet
4	1	Grey filter number (coded) for first event in packet
<u>Data</u>		
5	211	Compressed events
<u>CRC</u>		
217	1	

Compressed event format:

Start (bit#)	Size (bits)	Content
0	8	X position (1..255)
8	8	Y position (1..255)
16	8	Energy
24	8	Delta time relative to previous event, or 255 (see note 2)
32	16	+ extra word (Delta time extension) present only when the Delta time field = 255

Compressed dummy-event "Grey filter change report" format: (see note 1)

Start (bit#)	Size (bits)	Content
0	16	= 0
16	16	Grey filter # (0..31)

Comments:

1. When interpreting data in Full Imaging Format one should first check the value of the first word of each compressed event - when equal to zero, it is Grey filter change report, otherwise it is normal compressed event.
2. Delta time is shown in units of 1/8192 sec. First event in each packet will have zero delta time. Next event show time relative to the previous one, which is a true event - not a Grey Filter change report.

5.3.2 RESTRICTED IMAGING TM Packets

APID: 1624/1752

Type/Subtype: 1/8

Packet format:

Start (word#)	Size (words)	Content
0	3	Data Header (OBT of 1.st event in packet)

SC-TM Header

3	1	Delta OBT of last event (unit = 1/2048 sec)
4	1	Number of events in packet
5	1	Grey filter number for first event in the image
6	1	Grey filter number for last event in the image
7	1	X Y position for first event in packet (X first)
8	1	X Y position for last event in packet
9	1	Packet number in sequence (see note 1)

Data

10	206	Compressed events
----	-----	-------------------

CRC

217	1	
-----	---	--

Compressed event format:

Start (bit#)	Size (bits)	Content
0	5	Delta position, or 31 (see note 2)
5	3	Energy
8	8	+ extra byte (Delta position extension#1 or 255) present only when the delta position field = 31
16	16	+ extra word (Delta position extension#2) present only when the delta position extension#1 = 255:

Comments:

1. Last packet of the image is marked by 16#8000# added to the field "Packet # in sequence".
2. Delta position is a result of subtraction two 16-bits words, each of them contains X position in MSB and Y position in LSB. Before compression events are sorted by words X|Y.

For each image about 8 TM Packets in Restricted Format are generated. In parallel, but asynchronously, *Count Rate* format packets are also produced. DPE will wait maximum about 32 seconds for completing 2580 events needed to construct an image. After this time the image will be constructed with the available events.

5.3.3 COUNTRATE TM Packets

APID: 1656/1784

Type/Subtype: 3/8

Packet format:

Start (word#)	Size (words)	Content
0	3	Data Header (OBT of 1.st event in packet)
<u>SC-TM Header</u>		
3	8	8 x Grey filter marker (see note 1)
11	1	Number of 125 ms wide Time Channels for Count Rates including the first one
12	1	Count Rate for the first time channel

<u>Data</u>		
13	200	400 8-bits delta count rates
<u>CRC</u>		
217	1	

Format of Grey filter marker (each of the eight):

Start (bit#)	Size (bits)	Content
0	5	Grey filter # (0..31)
5	11	Number of the time channel in which change of grey filter has taken place (0..400).

Comments:

1. First of the eight grey filter markers are always present, it has grey filter # on the first 5 bits and zero on remaining 11 bits. It reports the starting grey filter. Other 7 entries are used only when grey filter changes. Non-zero value means valid grey filter marker.

Count rates are coded on the following way:

- Count rate for the first time channel is put without any compression as the first 16-bits word #12,
- Count rates for all time channels, but the first, are coded by calculating the difference between count rates in the current and previous time channel,
- If the difference fits into the range -127+126, than it is placed into the consecutive 8-bit byte. For negative values U2 coding is used. Otherwise constant 127 is put first, and then full 16-bits value of the count rate (not the difference). The 16-bits value is placed into the buffer without any gap, even if it starts with odd byte address.

5.3.4 SPECTRAL/TIMING TM Packets

APID: 1616/1744

Type/Subtype: 1/0

Packet format:

Start (word#)	Size (words)	Content
0	3	Data Header (OBT of 1.st event in packet)
<u>SC-TM Header</u>		
3	1	No. of events in packet
4	1	Grey filter # for first event in packet
<u>Data</u>		
5	211	Compressed events
<u>CRC</u>		
217	1	

Compressed event format:

Start (bit#)	Size (bits)	Content
0	8	Energy
8	8	Delta time relative to previous event, or 255

16 16 + extra word (**Delta time extension**) present only when the Delta time field = 255

Comments:

Dummy events "Grey Filter Report" are coded as: Energy = 0, Delta time = Grey Filter. It is guaranteed that DFEE will never produce real events with zero energy.

5.3.5 TIMING TM Packets

APID: 1632/1760

Type/Subtype: 2/0

Packet format:

Start (word#)	Size (words)	Content
0	3	Data Header (OBT of 1.st event in packet)
<u>SC-TM Header</u>		
3	1	Number of events in packet
4	1	Grey filter # for first event in packet
<u>Data</u>		
5	?	6-bit delta times, or 63. Packed without gaps. Grows upward.
215	?	16-bit extensions, when 6-bit field = 63. Grows downward.
<u>CRC</u>		
217	1	

Comments:

Dummy events "Grey Filter Report" are coded as: FFE0 + Grey Filter. Because of this, the range of the real delta time is limited to FFDF.

5.3.6 SPECTUM TM Packets

APID: 1640/1768

Type/Subtype: 2/8

Packet format:

Start (word#)	Size (words)	Content
0	3	Data Header (OBT of 1.st event in packet)
<u>SC-TM Header</u>		
3	1	Number of spectra in packet
4	1	Grey filter # for first event in packet
<u>Data</u>		
5	210	Up to 10 compressed spectra, 21 words each
215	1	unused
<u>CRC</u>		
217	1	

Compressed spectrum format:

1 x 16-bit word - Grey filter for last event in spectrum,

64 x 4-bit fields - counters in 64 energy channels
 8 x 8-bit fields - extensions used in case of overflow in 4-bits fields (see note 1)
 Total length = 21 words

Comments:

Extension fields are used from left to right.

5.3.7 CALIBRATION TM Packets

APID: 1601/1729

Type/Subtype: 0/1 or 1/8

Packet format:

Start (word#)	Size (words)	Content
0	3	Data Header (OBT of 1.st event in packet)
<u>SC-TM Header</u>		
3	1	Calibration amplitude (see note 1)
4	1	Calibration frequency (see note 1)
5	1	Anode switch status
<u>Data</u>		
6	210	Calibration compressed events (up to 6 events)
<u>CRC</u>		
217	1	

When compressing calibration event the two first words (**HK Cycle Counter + Timer Counter**) are compressed to one word - delta time relative to the first event in the packet. Unit of this delta time is 1/8192 sec. All remaining 34 words are copied to the TM packet without compression. Dummy-events "Calibration amplitude report" are also reported.

Comments:

Field Calibration amplitude contains 5-th word from the last dummy- event "Calibration amplitude report" received BEFORE the current TM packet was started. Similarly the field Calibration frequency contains 6-th word from the same dummy-event. If "Calibration amplitude report" dummy-event is the first event in the packet, then header fields: Calibration amplitude and Calibration frequency repeat the data from this dummy-event. If there are calibration events, but no "Calibration amplitude report" was yet received, zero is reported in the two fields.

5.3.8 DIAGNOSTIC TM Packets

APID: 1602/1730

Type/Subtype: 8/0 or 8/1/ or 8/2 or 0/7

Packet format:

Start (word#)	Size (words)	Content
0	3	Data Header (OBT of 1.st event in packet)
<u>SC-TM Header</u>		

3	1	Spare (0)
4	1	Spare (0)
5	1	Anode switch status
<u>Data</u>		
6	210	Diagnostic dump events (up to 5 events)
<u>CRC</u>		
217	1	

Comments:

Full 42-words of event records is copied to TM packet.

5.3.9 TEST TM Packets

APID: 1607/1735

Type/Subtype: 1/8

Packet format:

Start (word#)	Size (words)	Content
0	3	Data Header (OBT of 1.st event in packet; EGSE Time)
<u>SC-TM Header</u>		
3	1	Spare (0)
4	1	Spare (0)
5	1	Spare(0)
<u>Data</u>		
6	210	Normal dump (HSL) events
<u>CRC</u>		
217	1	

Comments:

The TEST packet of this format are produced by EGSE DPE simulator