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VERY LARGE TELESCOPE

VLT CCD Cameras

User Manual

Software part

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1.2	31/07/96	2.1.2 2.3.1, 2.3.2, 2.3.3 2.7.7	Sun platform supported with JUL96 release New features added Change State panel included in control panel Help on failure added
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1.5	31/10/97	1.2 2.6 2.7.9	Scope explicitely restricted to ACE systems Operationa state INITIALISED removed Temp. monitoring automatic started when online

1 INTRODUCTION

The software described in this manual is intended to be used in the ESO VLT project by ESO and authorized external contractors only.

While every precaution has been taken in the development of the software and in the preparation of this documentation, ESO assumes no responsibility for errors or omissions, or for damage resulting from the use of the software or of the information contained herein.

1.1 Purpose

This document is the Software part of the CCD cameras User Manual. At the moment it is a stand-alone document. It is proposed to transform it at a later stage into a chapter of the CCD cameras User Manual, which should include system, hardware and software aspects

It is intended to provide people who want to operate a camera as stand-alone instrument, e.g. for laboratory or on-line tests, with all the necessary information.

The manual assumes that the reader has some experience with astronomical CCD cameras. It is not intended to be an introduction to CCD cameras, and therefore it uses common terminology in this field (e.g. pixel, binning, readout, frame-transfer chip, etc.) without further explanations.

In addition to the **Introduction**, this manual contains the following chapters:

User's Guide: it contains information about:

1. Overview of the environment needed to operate a CCD camera as stand-alone instrument
2. Getting started. Simple sessions to gain experience with the CCD software.
3. Definitions: exposures, operational modes and states
4. Running the system.

Reference: manual pages of panels and scripts used.

The CCD control software is going to be used by several categories of users. The information related to this software package has been spread over several documents, in order to give each user an easier access only to the information he needs (see also section *Purpose* in [14]).

The following table presents the complete list of documents available about the CCD software, together with a summary of the contents and the category of users who may be interested in reading them.

Document #	Title	Contents	Users
VLT-MAN-ESO-17240-0672	CCD Software - User Manual	• Software installation • Programmatic interface	• Responsible for VLT sw installation • Software developers
VLT-MAN-ESO-17240-0917	CCD Cameras - User Manual - Software part	CCD stand-alone	• Responsible for CCD cameras and chips tests. • Software developers

Document #	Title	Contents	Users
VLT-MAN-ESO-17240-0918	CCD Cameras - Maintenance Manual - Software part	• Camera configuration • Periodical maintenance • Trouble-shooting	• Responsible for camera installation. • Software developers
VLT-MAN-ESO-17240-0919	CCD Software - Device Control Libraries - User Manual	Integration of special hardware in the CCD sw (e.g. FORS shutter).	• Software developers (only if special hw used).

1.2 Scope

The present document is intended to be used for both scientific and technical CCD cameras based on the ACE controller.
For CCD cameras using the FIERA controller, refer to [19].

1.3 Applicable Documents

The following documents, of the exact issue shown, form a part of this document to the extent specified herein. In the event of conflict between the documents referenced herein and the contents of this document, the contents of this document shall be considered as a superseding requirement.

[1] VLT-PRO-ESO-10000-0228, 1.0 10/03/93 ---- VLT Software Programming Standards

[2] VLT-SPE-ESO-17212-0001, 2.0 12/04/95 ---- VLT Instrumentation Sw Specification

[3] VLT-SPE-ESO-17240-0227, 1.0 08/04/93 ---- CCD Detectors Control Software Specification

[4] VLT-SPE-ESO-17240-0385, 2.1 15/07/96 ---- INS Common Software Specification

[5] GEN-SPE-ESO-19400-0794, 1.08 15/11/96 ---- ESO Data Interface Control Document

[6] VLT-ICD-ESO-17240-19400, 2.6 23/05/97 --- ICD between VCS and VLT Archive System

1.4 Reference Documents

The following documents contain additional information and are referenced in the text.

[7] VLT-MAN-ESO-17200-0642, 1.8 31/05/97 ---- VLT Common Software Installation Manual

[8] VLT-MAN-ESO-17200-0888, 1.0 17/08/95 ---- VLT Common Software Overview

[9] VLT-MAN-SBI-17210-0001, 3.4 05/05/97 ---- LCU Common Software User Manual

[10] VLT-MAN-ESO-17210-0619, 1.7 30/04/97 ---- Central Control Software User Manual

[11] VLT-MAN-ESO-17240-0816, 1.0 28/09/95 ---- CCD DCS Sw Maintenance Manual WS part

[12] VLT-MAN-ESO-17240-0932, 1.0 28/09/95 ---- CCD Stand-alone Sw Maint. Manual WS part

[13] VLT-MAN-ESO-17240-0817, 1.0 28/09/95 ---- CCD Sw Maintenance Manual LCU part

[14] VLT-MAN-ESO-17240-0672, 1.5 19/11/97 ---- CCD Sw User Manual

[15] VLT-MAN-ESO-17240-0918, 1.4 19/11/97 ---- CCD Cameras Maintenance Manual, Sw part

[16] VLT-MAN-ESO-17240-0919, 1.0 28/09/95 ---- CCD Software DCL User Manual

[17] VLT-MAN-ESO-17240-0866, 2.4 01/10/96 ---- INS Common Sw - rtd User Manual

[18] VLT-SPE-ESO-13600-0381, 1.0 19/07/93 --- ACE Technical Specification

[19] VLT-MAN-ESO-13640-1388, 1.0 13/11/97 ---- FIERA sw User Manual

1.5 Abbreviations and Acronyms

The following abbreviations and acronyms are used in this document:

ACE	Array Control Electronics
CCD	Charge-Coupled Device
CCS	Central Control Software
CPU	Central Processing Unit
DCL	Device Control Library
DCS	Detector Control Software
ESO	European Southern Observatory
FDDI	Fiber Distributed Data Interface
FIERA	Fast Imager Electronic Readout Assembly
FITS	Flexible Image Transport Format
HW	Hardware
INS	Instrumentation Software Package
I/O	Input/Output
LAN	Local Area Network
LCC	LCU Common Software
LCU	Local Control Unit
MIDAS	Munich Image Data Analysis System
N/A	Not Applicable
SCCD	Scientific CCD
SW	Software
TBC	To Be Clarified
TBD	To Be Defined
TCCD	Technical CCD
TCS	Telescope Control Software
TIM	Time Interface Module
TRS	Time Reference System
UIF	(Portable) User Interface (Toolkit)
VLT	Very Large Telescope
VME	Versa Module Eurocard
WAN	Wide Area Network
WS	Workstation

1.6 Glossary

No special definition is introduced in this manual

1.7 Stylistic Conventions

The following styles are used:

bold in the text, for commands, file names, etc. as they have to be typed.

italic in the text, for parts that have to be substituted with the real content before typing.

`teletype` for examples.

<name> in the examples, for parts that have to be substituted with the real content before typing.

The **bold** and *italic* styles are also used to highlight words.

1.8 Naming conventions

This implementation follows the naming conventions as outlined in [2].

1.9 Problem Reporting/Change Request

The form described in [7] shall be used.

2 USER'S GUIDE

This part of the document provides a description of the way how a **CCD stand-alone** system must be operated. Operations are performed through GUI panels; no programming is involved nor required. On the other hand, the DCS part of the CCD software, described in [14], does not include any GUI panel and can be commanded, also from a remote station, through messages sent by higher level applications belonging to instrumentation software or telescope control software.

2.1 Overview

The CCD control software is distributed over three hardware platforms: WS, LCU and ACE transputer network (see Fig.1).

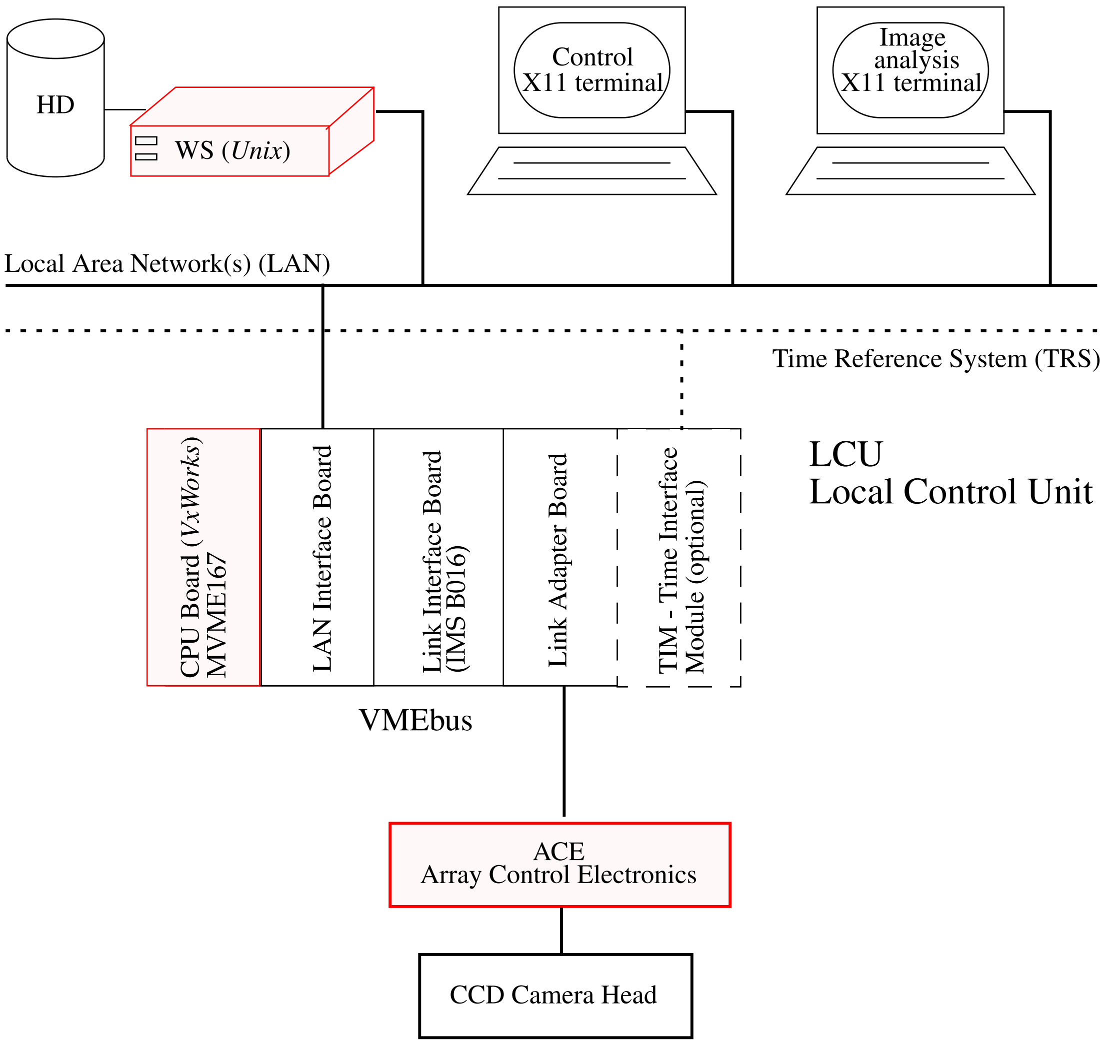


Fig.1 CCD stand-alone system hardware architecture

2.1.1 User Station

It consists of:

- one X11 terminal, used to define configuration and setup parameters, control exposures and display the status of the system. It is equipped with mouse and keyboard.

- one X11 terminal (for performance reasons would be preferable the Workstation console) used to analyse the images stored on disk by the CCD software with the real-time display (see [17]) or any other image analysis sw package, such as ESO-MIDAS. It is equipped with mouse and keyboard.

In a simplified version, currently used, the functionality of both terminals is put into one.

2.1.2 Workstation

See [14].

2.1.3 LCU

See [14]

2.1.4 ACE

See [18]

2.2 Control panel

One single panel, shown in Fig.2, provides all functionality needed to startup/shutdown the CCD software, define an exposure setup, start and control an exposure, display an image as result of an exposure.
The same panel is used, independently if and which parts of the CCD system used are simulated.
Detailed information about meaning and scope of each widget in the panel can be found in the manual page of *ccdCtrl*, section 3.1
Note: the panel is rather big and contains quite some information. Depending on the load of the Workstation CPU it can take a few seconds before being displayed. Please, wait and don't panic!

2.3 Getting started

In order to be able to operate the CCD software, the installation procedure, as described in [14], section *Installation Guide* must have been completed successfully.
As already mentioned in section 2.1, the CCD software runs on three platforms. In order to help beginners in the learning phase and to localize better possible cause of failure, it is suggested to get into the system gradually, executing in sequence:

1. A simple demo session (the whole CCD sw is simulated within the control panel).
2. A brief session with LCU simulated (the complete LCU sw is simulated, see also section 2.5)
3. A brief session with ACE simulated (the complete ACE sw is simulated).

Note: In the following, the usage of the mouse is limited to the left button, e.g. to push buttons and select entry fields in panels.

2.3.1 Simple Demo session

Type from the Workstation shell prompt:

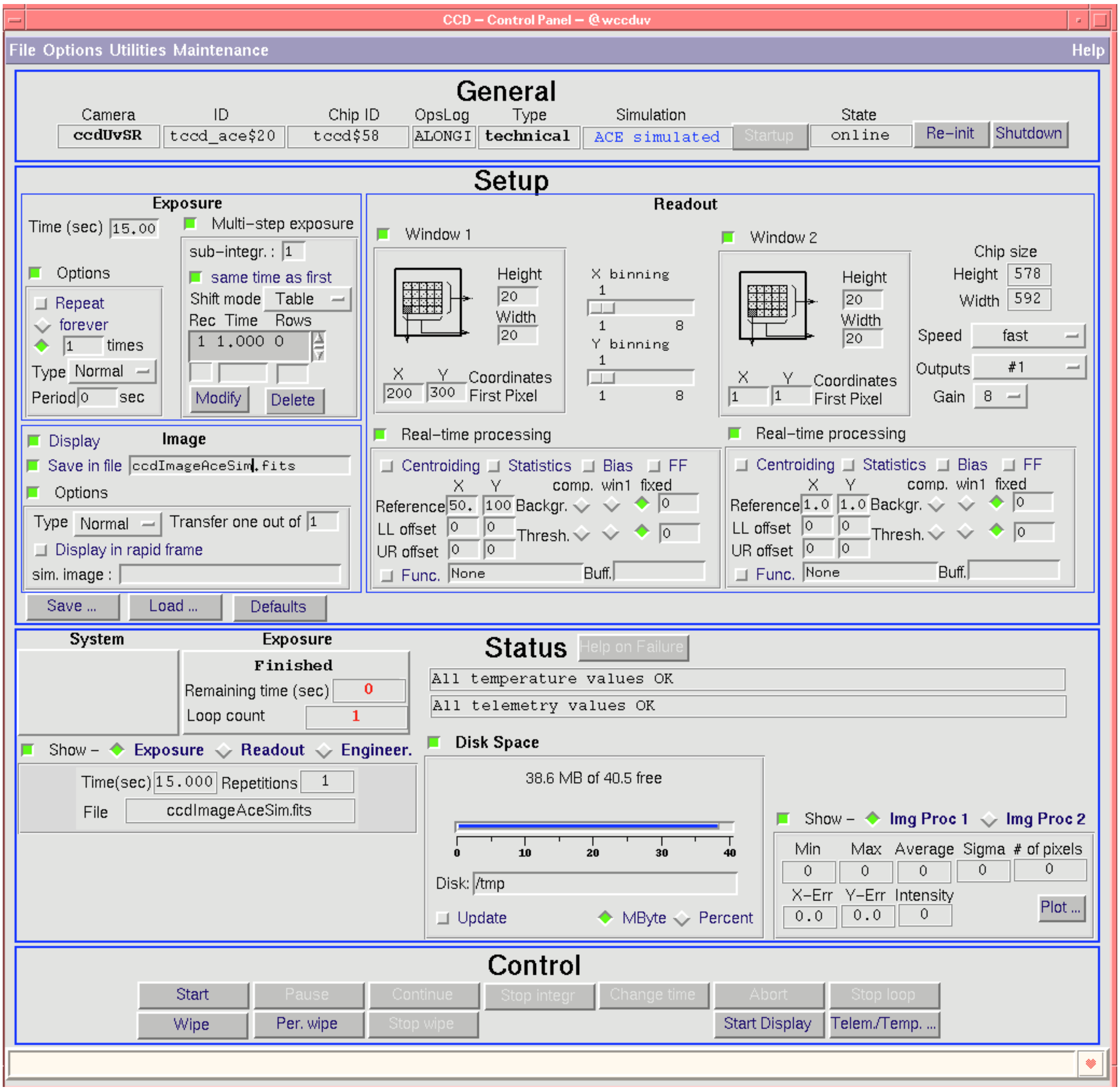


Fig.2 CCD Control panel

```
$ ccdDemo.sh
```

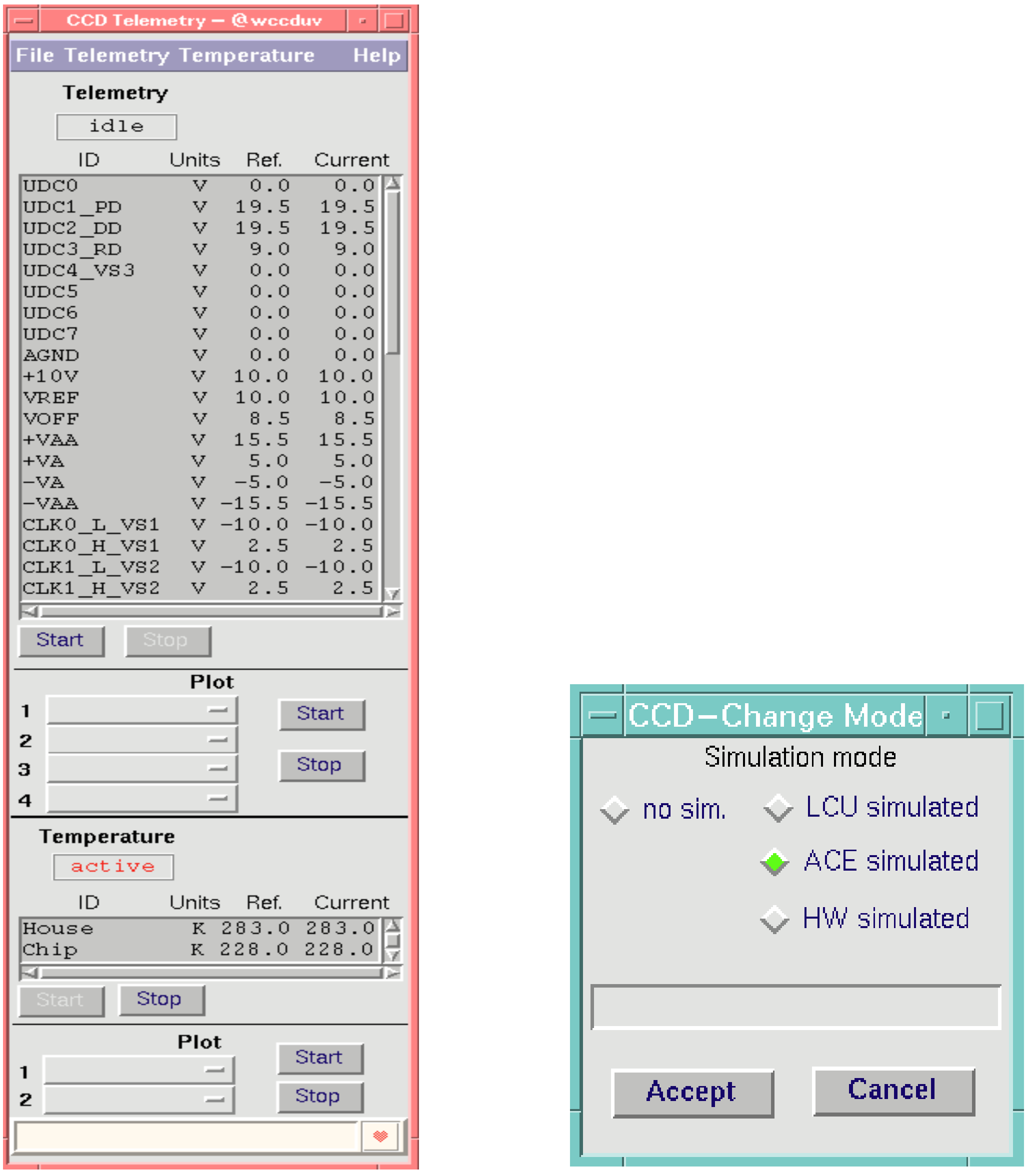
The control panel (Fig.2) is displayed.

Execute in sequence the following operations:

1. Start an observation session (area *General*).
   a. Push the button *Startup*. The CCD state will turn to *on-line*.
2. Retrieve an existing setup file into the panel (area *Setup*).
   a. Push button "*Load ...*". A file selection box appears.
   b. Enter in the Selection field file name *ccdSetupComplete.det*
   c. Push OK. The file selection box disappears and the entries in the *Setup* area are updated according to the contents of the setup file.
3. Change a few setup values.

   a. Area *Exposure*
      i. Enter Time 30
   b. Area *Image:*
      i. Enter file name *ccdImageWsSim.fits*
      ii. Unselect *Display*
4. Save the defined setup in a setup file.
   a. Push button "*Save ...". *A file selection box appears.
   b. Enter in the Selection field file name *myFirstSetup.det*
   c. Push OK. The file selection box disappears and your setup definition is saved
5. Simulate cleaning the chip (area *Control*).
   a. Push the *Per. Wipe* button. The string *Wiping* appears in the *System* box (area *Status*).
   b. Push the *Stop wipe* button. The string *Wiping* disappears.
6. Run one single exposure (area *Control*).
   a. Push the button *Start*.This will animate the area *Status*, simulating the execution of the exposure.
   b. Push the button *Pause.* The status of the running exposure goes to *paused* and the remaining time remains fixed
   c. Push the button *Continue*. The status of the running exposure goes to *integrating* and the remaining time decreases again.
   d. Push the button *Stop integr.* The remaining time goes to 0 and the exposure status changes to *Read&Transfer.* After a while it changes to *Finished*.
7. Run a loop of repeated exposures.
   a. Area *Setup Exposure*
      i. Select *Options*
      ii. Select *Repeat forever*
   b. Push the button *Start*.The string *Loop active* will appear the area *Exposure Status*.
   c. Push the *Stop loop* button. The current exposure is terminated regularly and then no further exposure is started.
   d. Push the button *Abort*. The execution of the current exposure is immediately stopped.
8. Monitor telemetry and temperature values
   a. Push the button *Telem/Temp...* (area *Control*). The panel dedicated to telemetry and temperature monitoring is displayed (see Fig.3).
   b. Push the button *Start* in the *Telemetry* area. The telemetry status will turn to *Active* and the values displayed are updated periodically.
   c. Select any telemetry parameter in the *Telemetry Plot* area, button labeled 1.
   d. Push the button *Start* in the *Telemetry Plot* area. A new window pops-up, showing the plotting of the selected parameter.
   e. Push the button *Stop* in the *Telemetry Plot* area. The plot disappears.
   f. Push the button *Stop* in the *Telemetry* area. The telemetry status will turn to *Idle*.
   g. Push the button *Start* in the *Temperature* area. The temperature status will turn to *Active* and the values displayed are updated periodically.
   h. Push the button *Stop* in the *Temperature* area. The temperature status will turn to *Idle*.

   i. Close the panel (select menu item *File* option *Quit*).
9. Terminate the session.
   a. Push the button *Shutdwon* (area *General*). The CCD state will turn to *OFF*.
   b. Close the panel (select menu item *File* option *Quit*).



Telemetry and temperature panel   Change Operational Mode panel

Fig.3

2.3.2 LCU simulated session

Type from the Workstation shell prompt:

```
$ ccdStart.sh
```

The control panel (Fig.2) is displayed.

Execute in sequence the following operations:

1. Check *State* in the area *General*. If it is OFF, go to 2., otherwise:
    a. Check the status of the button *Shutdwon*: if it is disabled, unselect option *context sensitive* in the menu *Options.* The button *Shutdwon* is enabled
    b. Push the button *Shutdown*. After a while the *State* will turn to *OFF.*
2. Set the operational mode
    a. Select the *CCD Engineering Interface* option in menu *Maintenance*. The panel *Engineering* pops up (see also [15]).
    b. Push the button *Change Mode (*area *CCD System)*. The panel *Change mode* (Fig.3) pops up
    c. Select option *LCU simulated*
    d. Push *Accept*. The panel disappears and the simulation field in the area *General* of the main panel turns to *LCU simulated*
    e. Close the panel *Engineering* (select menu item *File* option *Quit*).
3. Start an observation session simulating the whole LCU sw.
    a. Push the button *Startup* (area *General*). After a while the CCD state will turn to *on-line*.
4. Retrieve an existing setup file into the panel (area *Setup*).
    a. Push button "*Load ...".* A file selection box appears.
    b. Enter in the Selection field file name *ccdSetupComplete.det*
    c. Push OK. The file selection box disappears and the entries in the *Setup* area are updated according to the contents of the setup file.
5. Start Real-time display (area *Control*).
    a. Verify if *rtdServer* is running:
       csh> ps -aef | grep rtdServer | grep -v grep
    b. If it is not running, start it:
       csh> rtdServer &
    c. Push the *Start Display* button. It takes a while to pop up the *Real-Time Image Display* utility.
    d. In the latter panel, select the menu entry *Real-time,* item *Attach Camera.*
6. Modify the setup (area *Setup*).
    a. Area *Exposure*
        i. Enter Time 3
    b. Area *Image:*
        i. Enter file name *ccdImageLcuSim.fits*
        ii. Select *Display* (only if no problems encountered at point 5. above, otherwise unselect *Display*)
7. Simulate cleaning the chip (area *Control*).
    a. Push the *Per. Wipe* button. The string *Wiping* appears in the *System* box (area *Status*).
    b. Push the *Stop wipe* button. The string *Wiping* disappears.
8. Run an exposure (area *Control*).
    a. Push the button *Start*.This will animate the area *Status*, simulating the execution of the exposure. Please note that **only a few fields are updated** when LCU is simulated,

namely the exposure status and remaining time. As a result of the simulated exposure, an artificial image, consisting of a linear scale (1,2,3....) is saved in the specified file in FITS format and displayed with the Real-Time Image Display utility, the latter only if real-time display has been selected in the setup definition (point 6.b.ii.); to improve the quality of the displayed image press the button *Auto Set Cut Levels*

9. Terminate the session.
    a. Close the Real-Time Display panel (select menu item *File* option *Quit*)
    b. Push the button *Shutdwon* (area *General*). The *State* will turn to *OFF*.
    c. Close the main panel (select menu item *File* option *Quit*).

2.3.3 ACE simulated session

Type from the Workstation shell prompt:

```
$ ccdStart.sh
```

The control panel (Fig.2) is displayed.

Execute in sequence the following operations:

1. Check *State* in the area *General*. If it is OFF, go to 2., otherwise:
    a. Check the status of the button *Shutdwon*: if it is disabled, unselect option *context sensitive* in the menu *Options.* The button *Shutdwon* is enabled
    b. Push the button *Shutdown*. After a while the *State* will turn to *OFF*.
2. Set the operational mode
    a. Select the *CCD Engineering Interface* option in menu *Maintenance*. The panel *Engineering* pops up (see also [15]).
    b. Push the button *Change Mode (*area *CCD System)*. The panel *Change mode* (Fig.3) pops up
    c. Select option *ACE simulated*
    d. Push *Accept.* The panel disappears and the simulation field in the area *General* of the main panel turns to *ACE simulated*
    e. Close the panel *Engineering* as well (select menu item *File* option *Quit*).
3. Start an observation session simulating the whole LCU sw.
    a. Push the button *Startup* (area *General*). After a while the CCD state will turn to *on-line*.
4. Retrieve an existing setup file into the panel.
    a. Push button "*Load ...".* A file selection box appears.
    b. Enter in the Selection field file name *ccdSetupComplete.det*
    c. Push OK. The file selection box disappears and the entries in the *Setup* area are updated according to the contents of the setup file.
5. Start Real-time display (area *Control*).
    a. Verify if *rtdServer* is running:

       csh> ps -aef | grep rtdServer | grep -v grep
    b. If it is not running, start it:

       csh> rtdServer &

c. Push the *Start Display* button. It takes a while to pop up the *Real-Time Image Display* utility.

d. In the latter panel, select the menu entry *Real-time,* item *Attach Camera.*

6. Modify the setup (area *Setup*).
   a. Area *Exposure*
      i. Enter Time 15
   b. Area *Image:*
      i. Enter file name *ccdImageAceSim.fits*
      ii. Select *Display* (only if no problems encountered at point 5. above, otherwise unselect *Display*)
7. Simulate cleaning the chip (area *Control*).
   a. Push the *Per. Wipe* button. The string *Wiping* appears in the *System* box (area *Status*).
   b. Push the *Stop wipe* button. The string *Wiping* disappears.
8. Run an exposure (area *Control*).
   a. Push the button *Start*.This will animate the area *Status*, simulating the execution of the exposure. As a result of the simulated exposure, an artificial image, consisting of a linear scale (1,2,3....) is saved in the specified file in FITS format and displayed on both main and rapid frame of the Real-Time Image Display utility, the latter only if real-time display has been selected in the setup definition; to improve the quality of the displayed image press the button *Auto Set Cut Levels*.
9. Terminate the session.
   a. Close the Real-Time Display panel (select menu item *File* option *Quit*)
   b. Push the button *Shutdwon* (area *General*). The *State* will turn to *OFF*.
   c. Close the main panel (select menu item *File* option *Quit*).

2.4 Exposure definitions

2.4.1 Exposure types

The CCD stand-alone supports only exposure types as known to CCD DCS (see [14]).

2.5 Operational modes and simulation

The operational modes implemented are:

1. **Normal**. The CCD software tries to access the related hardware, assuming that the whole software and hardware exist and are properly installed.
2. **Simulation**, at various levels:
   a. **Workstation software simulated**. The whole CCD sw package is simulated in CCS at the level of Message System (see [10]). Useful only to test the command interface between CCD and external software and for demo purposes (see section 2.3.1).
   b. **LCU software simulated.** The whole LCU SW is simulated at WS level. The LCU processes are simulated by means of the simulation option in the CCS Message System (same as at point 2.). This kind of simulation is useful when no LCU is available; the user must be aware that at this level of simulation **the behaviour of the CCD camera is rather**

simplified. In particular, the exposure setup used is hard-coded (single exposure, no binning). Nevertheless the interface towards the external software can be almost completely tested as for *Normal* mode.

c. **ACE software simulated.** The LCU software behaves the same as in *Normal* mode, except at the level of the so called Device Control Libraries (see [16]), i.e. just one level above the device drivers. These libraries simulate driver function calls, assuming that no failure takes place and the most realistic results are returned. This mechanism is implemented in a way that the hardware do not need to exist at all and even the device drivers do not need to be installed.

d. **Hardware simulated**. The hardware behaviour is simulated within the ACE software with the most realistic response. If chip read-out is simulated, fixed images with the appropriate windows and binning replace real images.

Changing the operational mode is allowed ONLY when the system state is OFF (see 2.6). The wanted operational mode has to be configured in the local database (both in the WS and LCU!!) before start-up (see panel *CCD Change Mode* Fig.3 and section 2.7.3).

2.6 Operational states

The CCD software can be in one of the following operational states (see [4] for standard states definition).

1. **OFF.** The CCD software is in OFF state when it is not loaded or some task is not running. No operations are possible in this state.
2. **LOADED.** The CCD software goes to LOADED state as soon the database is loaded and all processes needed after cold start-up are activated.
3. **STAND-BY.** Normally all hardware components are powered-off, except those which are needed to preserve the camera from damages, such as the temperature control and the periodical chip wiping.

   In detail all actions needed to bring the whole CCD camera to stand-by mode are very dependent on the system hardware architecture and therefore cannot be defined in this document for all cameras. Typically the following actions are implemented:

   a. Shutter control hardware is switched off, whenever the hardware architecture allows it.
   b. Temperature control remains active (*not in the present release*)
   c. Periodical chip wiping remains active (*not in the present release*)
   d. Telemetry acquisition software inactive.
   e. LAN connection active (command reception enabled)
4. **ON-LINE**. This is the only state where the CCD software can perform exposures.

2.7 Running the system

In order to be able to operate the CCD software, **the installation procedure,** as described in [14], section "Installation Guide", has to be followed and completed successfully.

2.7.1 Start the control panel

Type from the Workstation shell prompt:

```
$ ccdStart.sh
```

The control panel (Fig.2) is displayed.

2.7.2 Check CCD camera configuration

Before starting to operate the camera it is essential to verify that the configuration parameters stored in the on-line database are properly set.
Push the button "*Configuration ..*" in the area *General.* The CCD configuration panel, described in [15], pops-up.
In order to verify the correctness of the parameters stored, knowledge of the CCD camera characteristics is needed, and therefore assistance of a specialist, at least for the very first verification is recommended.

2.7.3 Set the operational mode

1. Check *State* in the area *General*. If it is OFF, go to 2., otherwise:
   a. Check the status of the button *Shutdwon*: if it is disabled, unselect option *context sensitive* in the menu *Options.* The button *Shutdwon* is enabled
   b. Push the button *Shutdown*. After a while the *State* will turn to *OFF.*
2. Set the operational mode
   a. Select the *CCD Engineering Interface* option in menu *Maintenance*. The panel *Engineering* pops up (see also [15]).
   b. Push the button *Change Mode (*area *CCD System)*. The panel *Change mode* (Fig.3) pops up
   c. Select option *no sim.*
   d. Push *Accept*. The panel disappears and the simulation field in the area *General* of the main panel turns to *no simulation* (or the desired simulation mode if this is the case)
   e. Close the panel *Engineering* as well (select menu item *File* option *Quit*).
3. Define the contents of the header in the FITS files produced:
   a. All information (basic and HIERARCH FITS) in the image file.
      Select *complete FITS* option in the menu *Options*.
   b. basic FITS information in the image file and HIERARCH information in a separate ASCII file with extension *.det* (default, same output produced by the CCD DCS part).
      Unselect *complete FITS* option in the menu *Options*.
4. Define, through the option *archive* in the menu *Options*, if the VLT Archive System has to be informed or not about new files produced by the CCD stand-alone sw. The interface is defined in [6].

2.7.4 Start the control software

Push the button *Startup* (area *General*). After a while the CCD state will turn to *on-line*.

2.7.5 Define exposure setups

The whole Setup area of the control panel is dedicated to this purpose. See section 3.1 for more information about its contents.
The user can:

1. Define the setup for the next exposure to be started.
2. Save the displayed setup in a setup file for later usage (button *Save*).
3. Retrieve a previously defined setup from a setup file (button *Load*)

Note 1: The current version of the CCD software does not allow to change setup parameters, except exposure time, while an exposure is running. It is therefore recommended to check carefully the setup definition before starting an exposure.

2.7.6 Control exposures

It is done through the buttons in the *Control* area.
The status of a running exposure is displayed in the *Status* area.

It is suggested, before starting any exposure, but specially the very first one, to clean the chip from charges possibly accumulated during periods when the camera was not active. To do this, push the button *Start wipe.* One complete clean-up cycle of the whole chip may take, depending on the chip size, a few seconds; it is recommended to wait about 20 seconds and then push *Stop wipe.*

To start an exposure, push the button *Start.* The setup currently displayed will be first passed to the system (for the very first exposure it takes a few seconds longer, since the whole Data Dictionary has to be scanned) and then the exposure is started.This will animate the *Status* area.
The actions which can be performed while an exposure is running are:

1. Pause the exposure (not possible if Dark or the system has no shutter). Button *Pause.*
2. Continue a paused exposure. Button *Continue.*
3. Stop the current integration and start immediately the read-out. Button *Stop integr.*
4. Change the integration time of the running exposure. The new value is taken from the Setup area. Button *Change time.*
5. Abort an exposure. Button *Abort.* The current version of the CCD software allows to abort an exposure only while it is integrating. It is not possible to interrupt the read-out.
6. Stop a loop of repeated exposures. Button *Stop loop*. Note that the exposure currently running will be terminated regularly. Therefore, if one is not interested in it either, the *Abort* button must be pushed additionally.

2.7.7 Failure report

Failures can be divided in the following categories:

1. *Synchronous*. They occur while executing a command. They are normally reported to the user automatically through a pop-up window.
2. *Asynchronous*. They occur while some background activity is running. Typical example is a failure during the execution of an exposure. The exposure itself is started through the command *START*; the execution of the command is completed when the exposure is started; if a failure occurs after the exposure has been started, then there is no automatic mechanism to report to the user why such a failure occurred. Such information can be retrieved by pushing the button *Help on Failure* in the *Status* area of the main panel.

2.7.8 Analyse images

The image files produced by the CCD sw stand-alone are in FITS format. They can therefore be analyzed by any image analysis software supporting FITS, e.g. ESO-MIDAS.

Furthermore, for quick-look, one can start the VLT Real-Time Display (Rtd) utility (button *Start Display*). When the *Rtd* new panel appears (it takes a few seconds), in order to display the CCD images during acquisition, select the menu entry *Real-time*, item *Attach Camera.* Of course, the image display option must have been selected during the setup operations (see section 2.7.5).

2.7.9 Monitor telemetry and temperature values

In order to monitor telemetry and temperature values the following has to be done:

1. Push the button *Telem/Temp..* (area *Control*). The panel dedicated to telemetry and temperature monitoring is displayed (see Fig.3). All values defined in the *Configuration* panel are monitored
2. The telemetry system can be monitored only if the indicated status is *Idle*. If it is not *Idle*, it means that something failed during system initialisation and the connections to the hardware have to be checked.
    a. To start monitoring, push the button *Start* in the *Telemetry* area. The telemetry status will turn to *Active* and the values displayed are updated periodically.
    b. The trend of up to 4 telemetry parameters can be plotted: select the parameters to be plotted through the associated option buttons and then push the button *Start* in the *Telemetry Plot* area. A new window pops-up, showing the plotting of the selected parameters.
    c. To stop plotting, push the button *Stop* in the *Telemetry Plot* area. The plot disappears.
    d. To stop monitoring, push the button *Stop* in the *Telemetry* area. The telemetry status will turn to *Idle*.
3. The temperature system is normally monitored as soon the system goes to state ONLINE If the temperature status is neither *Active* nor *Idle*, it means that something failed during system initialisation and the connections to the hardware have to be checked. Please note that the current ACE system for scientific CCDs does not provide temperature monitoring facilities. From the *Temperature* area of the panel one can stop (button *Stop,* status goes to *Idle*) and restart (button *Start,* status goes to *Active)* monitoring. The trend of temperature values can also be plotted (same rules as for the telemetry).
4. When monitoring is not wanted any more, close the panel (select menu item *File* option *Quit*).

2.7.10 Shut-down the control software

Push the button *Shutdwon* (area *General*). The *State* will turn to *OFF*.

2.7.11 Shutdown the panels

1. Close the Real-Time Display panel, if active (select menu item *File* option *Quit*)
2. Close the main panel (select menu item *File* option *Quit*).

3 REFERENCE

This chapter provides a detailed description in terms of manual pages of the panels, scripts and the options available for the CCD stand-alone.

3.1 Panels

In this section the manual pages for the following panels are presented:

1. CCD control panel (*ccdCtrl*)
2. CCD telemetry and temperature monitoring panel (*ccdTelemetry*)
3. CCD Change Mode panel (*ccdOpMode*)

3.1.1 ccdCtrl(1)

NAME

```
ccdCtrl - Main panel for CCD stand-alone operations
```

MENU BAR

```
"File" menu
    "Quit"
        exit the application

"Options" menu
    "context sensitive"
        If selected, buttons are enabled/disabled according to the current
        context. If not selected, all buttons are enabled, independently
        from the current status of the system.
    "complete FITS"
        If enabled, the HIERARCH FITS information, normally saved in a
        separate ASCII file, is merged into the image FITS file
    "archive"
        If enabled, the CCD stand-alone sw informs VLT archive about new
        image data available whenever a new image is saved on disk.

"Utilities" menu
    "Problem Report"
        It calls the sprBrowse utility. Enabled only in those environment
        where this utility is available and in the search PATH for
        executable.
    "Show Configuration"
        The current values of the configuration parameters, as stored
        in the on-line database, is shown through the panel ccdConfig.

"Maintenance" menu
    "Edit Configuration"
        The current values of the configuration parameters, as stored
        in the on-line database, is shown through the panel ccdConfig
        and can be modified
    "Self Test"
        The panel ccdVerifyGui is called. It allows to perform an off-line
        check of all environments and connections concerning the CCD system
    "CCD Engineering Interface"
        Start the engineering panel ccdei for CCD operations.
    "CCS Engineering Interface"
        Start the engineering panel ccsei.

"Help" menu
    Extended Help. Not implemented yet
```

APPLICATION AREA

```
"General"
  "Camera"
    The line below shows the name of the camera according to
    environment variable CCDNAME
  "ID"
    The line below shows an unique identifier of the camera used.
  "Chip ID"
    The line below shows an unique identifier of the chip used.
  "OpsLog"
    The line below shows the source mask used by the WS and LCU CCD sw in
    configuration and operational logs
  "Type"
```

```
        The line below shows if the camera is of type scientific or technical.
        It is derived from the name of the clock patterns.
      "Simulation"
        The line below shows the level of simulation the software is supposed
        to run.
      "Startup"
        Perform a complete ("cold") startup of the whole CCD sw.
        If the software is already partially or fully running, first it is
        shut-down.
        It takes a few seconds.
        After successful completion of the startup, the operational state
        becomes on-line
      "State"
        The line below shows the current state of the CCD sw.
      "Shutdown"
        Shutdown the CCD sw. After successful completion, the operational
        state becomes OFF
    "Setup"
      "Exposure"
        "Time"
          Exposure time in seconds
        "Options"
          "Repeat"
            "forever" --> infinite loop of repeated exposures
            "n times" --> repeat the exposure n times
          "Type"
            Currently only options are Normal and Dark (the latter disabled
            if the system has no shutter, e.g. TCCDS)
          "Period"
            Periodicity, in sec, for repeated exposures. If set to 0,
            the next exposure is started as soon the previous one is finished.
            Meaningful only for repeated exposures.
        "Multi-step exposure"
          "sub-integr"
            Number of subintegrations to be performed
          "same time as first"
            If enabled, all subintegrations will have the same time as the
            first one
          "Shift mode"
            "Altern." ---> rows are shifted alternatively down-up-down-up etc
            "Down"    ---> rows are always shifted down
            "Table"   ---> rows are shifted according to the table below
          "Subintegrations table"
            "Rec"
              Index of sub-integration
            "Time"
              sub-integration time
            "Rows"
              rows to be shifted (minus sign means upwards)
            "Modify"
              enter in the table the values currently being edited
            "Delete"
              remove from the table the record currently being edited
      "Image"
        "Display"
          If set, the image is written in shared memory for Real-Time Display.
        "Save in file"
          If set, the image is saved in the specified file in
          FITS uncompressed format
        "Options"
          "Type"
            Type of image which is going to be produced.
            Options:
```

```
        "Normal". Normal case
        "Bias". The image has to be saved as bias frame for processing
        "FF". The image has to be saved as flat field frame for process
    "Transfer one out of"
      Transfer to WS only one image out of n acquired.
      Meaningful only for repeated exposures.
    "Display in rapid frame"
      The image is displayed in the Rtd rapid frame instead of the main
      frame
    "sim. image"
      name of the file containing the image to be loaded in the LCU
      if operational mode is ACE simulated
"Readout"
  "Window n"
    If set, the readout of that window is enabled.
    If no window is enabled, then the whole frame is read
    "Coordinates first pixel"
      Coordinates of the lower left pixel in the window (first pixel 1,1)
    "Height, Width"
      Window dimension
  "Real-time processing"
    "Centroiding"
      If set, the LCU computes the centroid for that window
    "Statistics"
      If set, the LCU computes some statistics (min/max, average,
      standard deviation) over the whole image
    "Bias"
      If set, the LCU does a bias subtraction to the whole image
    "FF"
      If set, the LCU does a flat field correction to the whole image
    "Reference"
      Coordinates of the reference pixel for centroiding error vector
    "LL offset"
      offset to the defined window lower left corner coordinates
      defining the sub-frame where image processing has to be performed
    "UR offset"
      offset to the defined window upper right corner coordinates
      defining the sub-frame where image processing has to be performed
    "Backgr."
      "comp." ---> background value is computed by centroid algorythm
      "win1"  ---> background value is taken from window 1
      "fixed" ---> background value is entered in the field on the right
    "Thresh."
      "comp." ---> threshold value is computed by centroid algorythm
      "win1"  ---> threshold value is taken from window 1
      "fixed" ---> threshold value is entered in the field on the right
    "Func."
      If set, the LCU calls the specified user function.
    "Buff."
      Name of the LCU global variable used as buffer to be passed to
      the user function when calling it.
  "Binning"
    Binning in both direction applied to the chip readout. For TCCDS
    it can be higher than 1 (no binning) only if the whole frame is
    read (no windowed readout)
  "Speed"
    Select the wanted readout speed among those supported
  "Outputs"
    Select the on-chip outputs to be used during readout among those
    supported for the selected speed
  "Gain"
    Gain applied to the output signal. After selection of speed and
    outputs, it is set to the default values associated to that
```

```
      combination.
      For SCCDS, the allowed range is 0-7
      For TCCDS, the allowed values are 1,2,4,8
"Status"
  "System"
    Major information about system status (shutter, readout) is given
    in this box
  "Exposure"
    See manual page of ccdExpStatus_uifClass
  "Help on Failure"
    Information about the last asynchronous error logged by the LCU sw
    can be retrieved. Enabled only if failure is still actual.
  "Show"
    "Exposure"
      See manual page of ccdExpSetup_uifClass
    "Readout"
      See manual page of ccdReadoutSetup_uifClass
    "Engineer."
      Show additional engineering information about on-going exposure
  "Disk space"
    See manual page of istDiskMon
  "Show"
    "Img Proc n"
      See manual page of ccdIpStatus_uifClass
"Control"
  "Start"
    Start a new exposure with the setup parameters shown in the Setup area
  "Pause"
    Pause a running integration
  "Continue"
    Continue integrating after a pause
  "Stop integr."
    Stop immediately the current integration and read-out the chip
  "Change time"
    Change the integration time for a running exposure
  "Abort"
    Abort the current exposure. Image data are lost !!!
  "Stop loop"
    It applies only to repeated (possibly forever) exposures. The current
    exposure is terminated regularly and no new exposure is started.
  "Wipe"
    Wipe the CCD chip once
  "Per. wipe"
    Stop periodical wipe of the CCD chip
  "Stop wipe"
    Start to wipe the CCD chip periodically
  "Start Display"
    Start the rtd demo application as Real_time Display facility
  "Telem/Temp..."
    Start the panel for telemetry and temperature monitoring
```

SEE ALSO

```
ccdOpMode, ccdConfig, sprBrowse, ccdei
ccdExpStatus_uifClass, ccdIpStatus_uifClass, istDiskMon
ccdExpSetup_uifClass, ccdReadoutSetup_uifClass
```

CAVEATS

```
Some values read from the on-line database have a fixed refresh rate.
The change of some values, although faster in the database, might be
shown on the panel with some delay (up to 2 seconds).
```

```
- - - - - -
Last change:  19/11/97-14:25
```

3.1.2 ccdTelemetry(1)

NAME

```
ccdTelemetry - panel for CCD telemetry and temperature monitoring
```

MENU BAR

```
"File" menu
    "Quit"
        exit the application

"Telemetry" menu
    "Polling Rate"
        select a polling rate for telemetry monitoring

"Temperature" menu
    "Polling Rate"
        select a polling rate for temperature monitoring

"Help" menu
    Extended Help. Not implemented yet
```

APPLICATION AREA

```
"Telemetry"
    On the same line the current status of the telemetry process is shown
    Below is a table showing information about the current status of
    single telemetry values:
    "ID"
        Unique identifier of telemetry value
    "Units"
        Units the value is represented
    "Ref."
        Reference value
    "Current"
        Current value

    The buttons corresponding to possible actions on telemetry values are:
    "Start"
         Start monitoring telemetry values
    "Stop"
         Stop monitoring telemetry values

"Telemetry Plot"
    "1-4"
         Select telemetry parameter to be plotted (up to 4)
    "Start"
         Start plotting telemetry values
    "Stop"
         Stop plotting telemetry values

"Temperature"
    On the same line the current status of the temperature process is shown
    Below is a table showing information about the current status of
    single temperature values:
    "ID"
        Unique identifier of temperature value
    "Units"
        Units the value is represented
    "Ref."
        Reference value
    "Current"
```

```
            Current value

        Buttons corresponding to possible actions on temperature values:
        "Start"
             Start monitoring temperature values
        "Stop"
             Stop monitoring temperature values

    "Temperature Plot"
        "1-4"
             Select temperature parameter to be plotted (up to 4)
        "Start"
             Start plotting temperature values
        "Stop"
             Stop plotting temperature values
```

SEE ALSO

```
    ccdCtrl, ccdSetTel
```

```
- - - - - -
Last change:  19/11/97-14:25
```

3.1.3 ccdOpMode(1)

NAME

```
ccdOpMode - Panel used to change the operational mode of the CCD sw
```

APPLICATION AREA

```
"Simulation mode"
    "not sim."
        no simulation, the whole hardware is used.
    "LCU simulated"
        The whole LCU software is simulated at workstation level
    "ACE simulated"
        The whole ACE embedded software is simulated at LCU level
    "HW simulated"
        The hardware is simulated at ACE level
```

ACTION BUTTONS

```
"Accept"
    The currently selected operational mode is set.
    Note: a change of the operational mode is allowed only when the
    CCD sw is in operational state OFF.

"Cancel"
    Close this panel without action.
```

SEE ALSO

```
ccsCtrl
```

```
- - - - - -
Last change:  05/05/97-17:38
```

3.2 Scripts

In this section the manual pages for the following scripts are presented:

1. CCD stand-alone demo session start-up (*ccdDemo.sh*)
2. CCD stand-alone session start-up (*ccdStart.sh*)

3.2.1 ccdDemo.sh(1)

NAME

```
ccdDemo.sh - start the CCD stand-alone sw
```

SYNOPSIS

```
ccdDemo.sh [<camera>] [<WS env.>] [<LCU env.>] [<INS root>]
```

DESCRIPTION

```
This shell script pops up the panels used to control a CCD camera in
stand-alone. Actions are simulated within the panels. No CCD program need
to run.

<camera>     camera name, also root point in DB (default env. var. CCDNAME)
<WS env.>    name of workstation environment (default env. var. RTAPENV)
<LCU env.>   name of LCU environment (default env. var. CCDLENV)
<INS root>   INS_ROOT environment variable
```

ENVIRONMENT

```
CCDNAME  default for camera name (e.g. ccdFors)
RTAPENV  default for WS local environment (e.g. wte13)
CCDLENV  default for LCU environment (e.g lte25)
INS_ROOT default root directory for instrument data
```

EXAMPLES

```
ccdDemo.sh ccdFors wte13 lte25 $INS_ROOT
Start CCD sw for camera "ccdFors" on environments wte13 (WS) and
lte25 (LCU). Panels run in simulation
```

SEE ALSO

```
ccdStart.sh
```

```
- - - - - -
Last change:  05/05/97-17:39
```

3.2.2 ccdStart.sh(1)

NAME

```
ccdStart.sh - start the CCD stand-alone sw
```

SYNOPSIS

```
ccdStart.sh [<camera>] [<WS env.>] [<LCU env.>] [<INS root>] [<simulation>]
```

DESCRIPTION

```
This shell script pops up the panels from which the operations with
the CCD stand-alone can be executed.
It also loads the on-line database values for the selected camera.

<camera>     camera name, also root point in DB (default env. var. CCDNAME)
<WS env.>    name of workstation environment (default env. var. RTAPENV)
<LCU env.>   name of LCU environment (default env. var. CCDLENV)
<INS root>   INS_ROOT environment variable
<simulation> 1 = panels are entered in simulation mode: no action done.
```

ENVIRONMENT

```
CCDNAME  default for camera name (e.g. ccdFors)
RTAPENV  default for WS local environment (e.g. wte13)
CCDLENV  default for LCU environment (e.g lte25)
INS_ROOT default root directory for instrument data
INS_USER default SYSTEM
```

EXAMPLES

```
ccdStart.sh ccdFors wte13 lte25 $INS_ROOT 1
Start CCD sw for camera "ccdFors" on environments wte13 (WS) and
lte25 (LCU). Panels run in simulation
```

SEE ALSO

```
ccdDcsStart.sh ccdDcsStop.sh
```

```
- - - - - -
Last change:  05/05/97-17:39
```