



User's Guide  
Software Version 2

**See page 11 for information on the new features**

03/2004

This page has been intentionally left blank

# Contents

<b>1. Introduction.....</b>	<b>11</b>
1.1. Simple Motion Control .....	12
1.2. System Components Overview.....	13
1.3. Who Does What?.....	15
1.4. Definitions .....	16
1.5. System Components List.....	18
<b>2. Setup.....</b>	<b>21</b>
2.1. Basic Sample Configuration .....	22
2.2. Prerequisites .....	25
2.3. Prep Check .....	25
2.4. Attach the Main Controller .....	26
2.5. Attach CHM-1s .....	27
2.6. Attach Cables & CLM-2s .....	29
2.7. Emergency Stop .....	31
2.8. Power Up .....	31
2.9. Defining Axes, Assigning Mimics .....	32
2.10. Home Axes .....	33
2.11. Power Down .....	35
<b>3. Operation.....</b>	<b>37</b>
3.1. Basic Jogbox Navigation .....	38
Recording a Basic Move .....	41
3.2. Saving, Loading, Erasing and Renaming Moves .....	43
3.3. Setting Gear Ratios .....	45
3.4. Setting Limits .....	46
3.5. More on Recording and Playing Back Moves .....	48
3.6. Stop- and Go- Motion Playback .....	52
3.7. Multitrack Recording .....	61
3.8. Reassigning Mimics .....	63
3.9. Rejecting Revolutions .....	64
3.10. Jogging / Browsing .....	65
3.11. GPI Outputs .....	67
3.12. The Bloop Light Setup .....	69
3.13. GPI Triggers .....	71
3.14. Timecode In/Out .....	73
3.15. VTR Control .....	74
3.16. Operating the Panther dolly .....	75
3.17. FAQ / Troubleshooting.....	77
<b>4. Software Reference .....</b>	<b>79</b>
4.1. The File Menu .....	80
4.2. The Axis Menu .....	86
4.3. The Mimic Menu .....	93
4.4. The Camera Menu .....	96
4.5. The Lens Menu .....	103
4.6. The Rec/Play Menu .....	106
4.7. The Trigger and Synchronization Menu.....	111
4.8. The Browse / Jog Menu .....	117
<b>5. Hardware Reference.....</b>	<b>119</b>

5.1.	ARRIHEADs .....	120
5.2.	The Head Adapter Mounting Bracket.....	122
5.3.	Configuring the Main Controller .....	123
5.4.	The Camera Control Box CCB-1 .....	127
5.5.	The Motor Control Box MCB-1.....	131
5.6.	Lens Control Box LCB-1 .....	132
5.7.	Auxiliary Motor Control Box ACB-1 .....	133
5.8.	Controlled Head Motor CHM-1 .....	136
5.9.	The Jog box JBO-1 .....	138
5.10.	The Jog box Hand Wheel Controller JHC-1.....	140
5.11.	The Jog box Cradle .....	141
5.12.	The JCA-2 for Encoded Fluid Heads .....	142
5.13.	The GPI Trigger Box GPI-1.....	143
5.14.	The Blooplight BLT-1 .....	146
5.15.	CLM-2 Cable Swap.....	147
5.16.	The Panther Evolution .....	149
5.17.	Compatibility .....	160

## Disclaimer

No part of this document may be copied or reproduced in any form or by any means without prior written consent of ARRI. ARRI assumes no responsibility for any errors that may appear in this document. The information is subject to change without notice. For actual design-in, refer to the latest publications of ARRI Motion data sheets or data books, etc., for the most up-to-date specifications of ARRI Motion products. Not all products and/or types are available in every country. Please check with an ARRI sales representative for availability and additional information.

While ARRI endeavours to enhance the quality, reliability and safety of the ARRI Motion products, customers agree and acknowledge that the possibility of defects thereof cannot be eliminated entirely. To minimize risks of damage to property or injury (including death) to persons arising from defects in the ARRI Motion products, customers must incorporate sufficient safety measures in their work with the system.

ARRI or its subsidiaries does not assume any liability for infringement of patents, copyrights or other intellectual property rights of third parties by or arising from the use of ARRI Motion products or any other liability arising from the use of such products. No license, express, implied or otherwise, is granted under any patents, copyrights or other intellectual property rights of ARRI or others.

ARRI or its subsidiaries expressly excludes any liability, warranty, demand or other obligation for any claim, representation, or cause, or action, or whatsoever, express or implied, whether in contract or tort, including negligence, or incorporated in terms and conditions, whether by statute, law or otherwise. In no event shall ARRI or its subsidiaries be liable for or you have a remedy for recovery of any special, direct, indirect, incidental, or consequential damages, including but not limited to lost profits, lost savings, lost revenues or economic loss of any kind or for any claim by third party, downtime, good-will, damage to or replacement of equipment or property, any costs or recovering of any material or goods associated with the assembly or use of our products, or any other damages or injury of persons and so on or under any other legal theory.

All trademarks are courtesy of their respective owners.

# Safety Instructions

**Please always follow these instructions  
to prevent injury to yourself and damage to the system!**

These safety instructions are given in addition to the product-specific operating instructions and must be strictly observed. However, they are no substitute for taking your own safety measures when operating the equipment.

## Warning Symbols



This symbol indicates that an improper operation of the equipment is possible, which could result in injury or equipment damage.



This symbol indicates the risk of electric shock or fire danger, which could result in injury or equipment damage.

## General Safety Instructions



**Read and Understand** all safety and operating instructions before you operate or install the ARRIMOTION System.



**Retain** all safety and operating instructions for future reference.



**Heed** all warnings on the ARRIMOTION system and in the safety and operating instructions before you operate or install the ARRIMOTION System.



**Follow** all installation and operating instructions.



**Do not use** accessories or attachments not recommended by ARRI, as they may cause hazards and void the warranty.



**Do not repair** any part of the system. Repairs must only be carried out by authorized ARRI repair shops.



**Do not remove** any safety measure of the System.



**Do not operate** the system in high humidity areas or expose it to water or moisture.





**Do not place** the system on an unstable cart, stand, tripod, bracket, table or other surface. The System may fall, causing serious personal injury and damage to the System.













**Operate** the ARRIMOTION system using only the type of power source indicated on the marking label. Unplug the power cord by gripping the power plug, not the cord.



**Never insert** objects of any kind into the any part of the system, as the objects may touch dangerous voltage points or short out parts. This could cause fire or electrical shock.

-  **Unplug** the system from the AC power outlet before opening any part of the system or before making any changes to the systems, especially when attaching or removing cables.
-  **Be sure** that all electric cables are intact and install properly before you running the system

### **Additional Safety Instructions for the Dolly System**

-  **Read and Understand** the Panther instruction manual before operating the dolly
-  **Read and Understand** all dolly related sections of the operating manual
-  **Check** the function of the safety bumpers and the emergency cutout switch before lacing the timing belt through the drive system
-  **Do Not** permit anybody to stand in the track or close to the track. If anybody is standing in the track hit the emergency stop immediately even if the dolly is at standstill
-  **Do Not** permit anybody to ride the panther while the drive or lift motors are switched off. Use the Handwheel or Fluid head remote controllers instead
-  **Check** the clearance of the drive System, the Bumpers and the limit switches of the drive system as described in the manual before lacing the belt
-  **Do not** leave the dolly system unobserved when it is under power
-  **Do not** bend over the lift column
-  **Prevent** all cabling to the panther from getting close to the track or under the wheels of the dolly
-  **Do not** mount a jib or crane arm to the dolly

### **Important Note**

When operating the equipment in humid conditions to prevent fire or electric shock, take appropriate precautions to protect the electrical equipment.

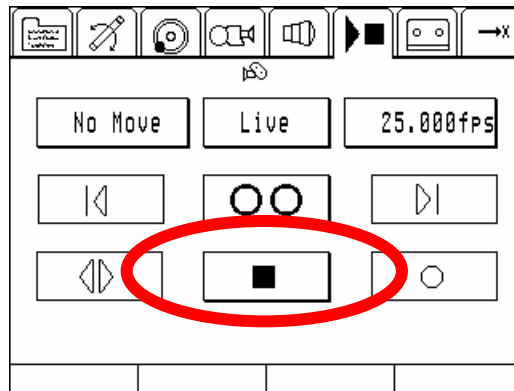
### **Important Note**

When shooting double exposure with the 435 Advanced in CAN mode always check the camera frame counter before exposing a pass to avoid misalignment.

## Safety Features

The ARRIMOTION System can be stopped by the following means:

- The STOP button in the Play/Record screen of the Jogbox stops the system's movement.



- The silver button above the screen on the Jogbox stops the system's movement. It may take a moment till the motors come to a standstill. This is **not** an emergency stop button.



- The EMERGENCY STOP button on the Camera Control Box (CCB) cuts the power supply to the motors and thus the motors stop instantly.



- Removing power from the system will stop the system.



## Software Version

This User's Guide is for the ARRIMOTION system as of software version 1.8. To check the software version, look at the Jog box display while the ARRIMOTION system powers up. In addition, the software packet version can be seen in the *System Settings* screen that is accessible via the *File* screen.

## Software Features

Software version 1.0 had the following features:

- Support of 435 ES, 535B, 16SR 3, 435 Advanced (435 ES Modus), ARRICAM (LT und ST with software packet 03 or higher)
- Supports WHA-2, WZU, WFU, ZMU 1&2, FIU
- Supports CLM-2 und CHM-1
- Supports the Encoded ARRIHEAD
- Supports the basic functions of the Bloop Light (BLT-1)
- Recording and playback of moves at variable speeds
- Multitrack recording, including the option to record individual tracks at differing speeds
- Creating, editing, managing and interpolating lens tables
- Remote control of the supported cameras
- Filing system
- Update system

Software version 1.8 added the following features:

- Part Move
- Stop Motion (Single Frame)
- Go Motion
- Support of 435 Advanced for stop and go-motion (use the K-CAM-CCB-2 for stop and go-motion and the K-CAM-CCB-1 for live action and part move) including capping shutter control.
- Support of up to four GPI trigger boxes
- Support of different bloop events on any frame
- Support of Sony® Control 1 compatible VTR/ATR for playback
- Support of external triggers (Time code, GPI)
- Browsing
- Jogging
- Running the camera at an integer multiple of the move frame rate
- Support of the ACB-1
- Support of the Panther Evolution dolly with lift and track
- Support of the Panther lift mimic and the force sensitive pushbar
- Refined status and warning icons
- Time code output

Software 2.0 adds the following features (435 Advanced SW package 02D or higher required)

- Shutter compensated speed ramping with the 435 Advanced
- Live Action mode over K-CAM-CCB2 (CAN mode) with 435 Advanced
- Frame accurate control of the 435 Advanced in CAN mode
-

This page has been intentionally left blank

# 1. Introduction

## 1.1. Simple Motion Control

The ARRIMOTION system gives productions a simple and user friendly alternative to complex and expensive motion control rigs. Just add a couple of small, lightweight components to an ARRIHEAD, and suddenly camera moves, lens operations, fps changes and shutter changes can be recorded and played back without any loss of production time.

The basic ARRIMOTION system is small and portable and can be operated by the camera assistant, especially since it seamlessly integrates with most modern ARRI cameras and uses other familiar components, like the ARRIHEAD and the ARRI Lens Control System. Moves can be created by operating the camera, ARRIHEAD and Lens Control System in the normal fashion, while the ARRIMOTION system records all actions. Playing moves back is as easy as pushing the PLAY button on a video recorder. Because standard ARRI components are used, the producer will be pleased since fewer specialty items have to be rented.



## 1.2. System Components Overview

### The Main Controller

The main controller is attached to the ARRIHEAD's right side. It is the brain of the ARRIMOTION system and all cables connect here. The main controller consists of at least one module, the Camera Control Box (CCB-1). Its functions can be expanded by adding other modules which control head motors, lens motors and other equipment. A typical main controller would include:

- The Camera Control Box (CCB-1) controls the camera and has the processor and data storage.
- The Motor Control Box (MCB-1) controls the ARRIHEAD motors.
- The Lens Control Box (LSB-1) controls the lens motors.



### The Controlled Head Motors

The Controlled Head Motors (CHM-1) are attached between the ARRIHEAD and the ARRIHEAD hand wheels. The ARRIHEAD can still be operated normally when the CHM-1 motors are attached. While the ARRIHEAD is operated, the sensors inside the CHM-1 motors record all pan and tilt movements. When the move is played back, these motors will precisely repeat the pan and tilt movements of the operator.



## The Jogbox

The Jogbox is used to setup the ARRIMOTION system and to record and playback moves.



## Other Components

Here is a list of other components that can be used to complete the picture:

- **ARRI Lens Control System**  
In order to control a lens from the main controller, CLM-2 lens motors are used. The hand control units of the wired or wireless ARRI Lens Control System allow the operator to change focus, iris and zoom. Note that the hand control units of the wireless Lens Control System must be used with the WHA-2 cabled to the main controller; wireless use is not supported at this time.
- **Bloop Light**  
the ARRIMOTION Bloop Light is used to expose a reference mark on the film.
- **GPI Trigger Box**  
The GPI Trigger Box is used to trigger external events from the ARRIMOTION system, or to have the ARRIMOTION system be triggered by external events.
- **Encoded ARRIHEAD-2**  
Even though ARRIMOTION can be used with the normal ARRIHEAD-1 and ARRIHEAD-2, higher precision and easier setup is achieved with the Encoded ARRIHEAD-2.
- **Jogbox Hand Wheel Controller**  
This is a station that the Jogbox, two ARRIHEAD hand wheels and a video monitor can be attached to.
- **Jogbox Cable Adapter JCA-2**  
This is an adapter that interfaces encoded fluid heads like the Movie Engineering CAMS encoded Fluid head to remotely control the Arrihead
- **The Auxiliary Control Box (ACB-1)**  
The ACB-1 controls up to 3 external servo motors (model movers, dolly drives, etc.)
- **The Panther Evolution with Arrimotion interface** that allows to control the drive and lift axis.

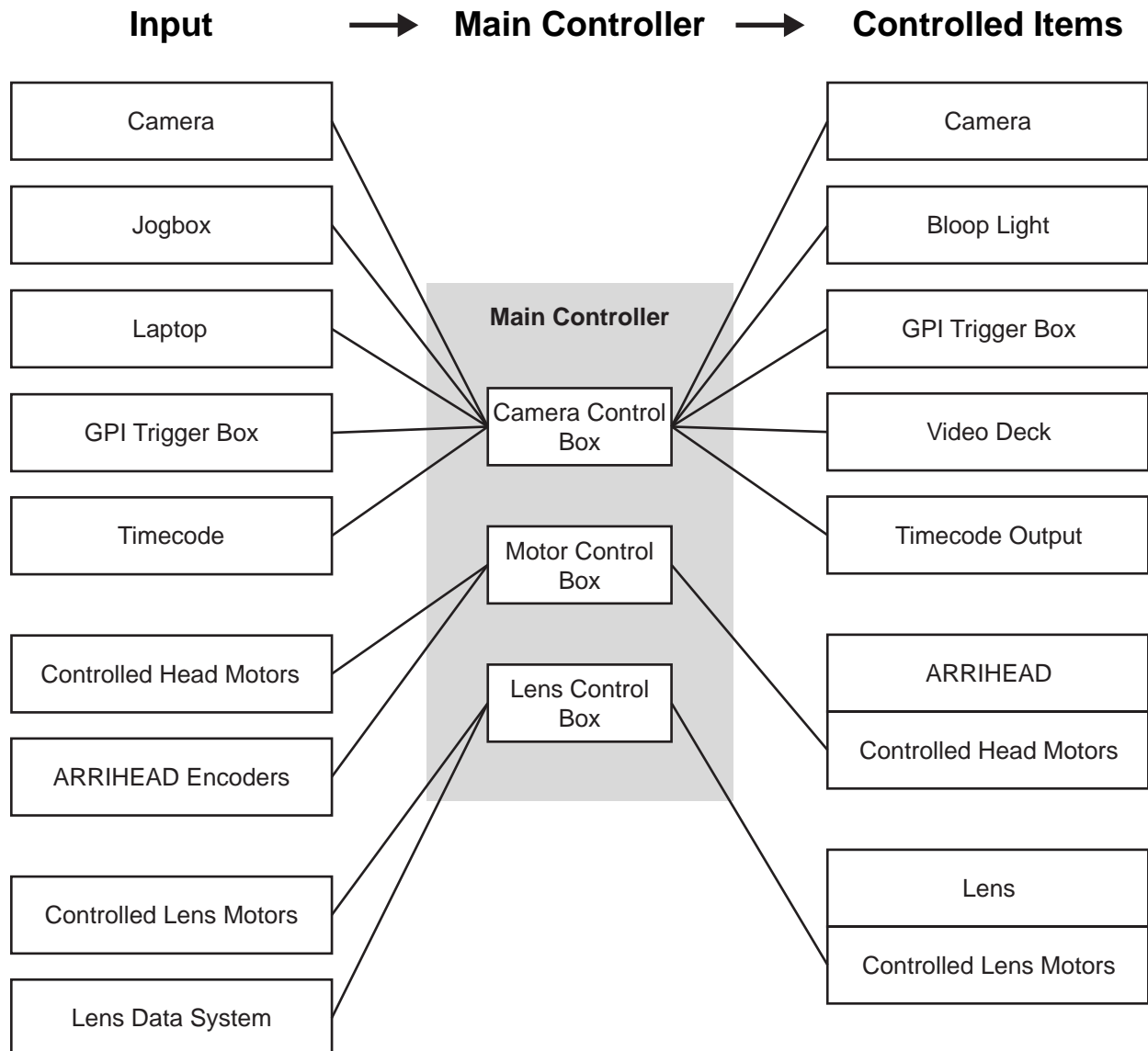
## Camera Compatibility

For most record/repeat moves the ARRIFLEX 16SR3, 435ES, 435 Advanced, 535B and ARRICAM cameras can be used. Frame accurate effects such as time lapse, multiple exposure, speed ramps, stop motion or go motion can be accomplished with the 435 Advanced.



### 1.3. Who Does What?

The graphic shows what inputs a basic ARRIMOTION configuration receives and what it controls.



#### Input

The **Camera Control Box** sees everything the camera does (start/stop, fps, shutter), receives input from Jogbox and Laptop and can be triggered by the GPI Trigger Box or by Timecode.

The **Motor Control Box** receives the position of the Controlled Head Motors. If an ARRIHEAD with encoders is connected, it uses the more precise ARRIHEAD encoders instead.

The **Lens Control Box** receives the position of the Controlled Lens Motors on the lens. In addition it can record the signals from the Lens Data System, which interprets the raw position data into human readable values (focus in meters or feet, iris in T-stops and focal length in mm).

#### Control

The **Camera Control Box** controls the camera (start/stop, fps, shutter) and makes the Blooplight flash. It can trigger external devices with the GPI Trigger Box, and can control a video deck.

The **Motor Control Box** controls the Controlled Head Motors on the ARRIHEAD.

The **Lens Control Box** controls the Controlled Lens Motors on the lens.

## 1.4. Definitions

There are seven terms which should be understood to operate the ARRIMOTION system, since these terms are used in this manual and in the Jogbox software.

### 1. What is an Encoder?

An encoder is an electrical component that translates motion into an electrical signal. Underneath the focus knob of the ARRI Lens Control System, for instance, is an encoder that converts the rotation of the knob into an electrical signal. This signal is then used to drive the lens motors.

### 2. What is a Mimic?

A Mimic is a device that is operated by a human and that translates the human's motions into electrical signals. It usually consists of some sort of wheel or knob or other device that a human can manipulate, and an encoder that translates the human action into electrical pulses.

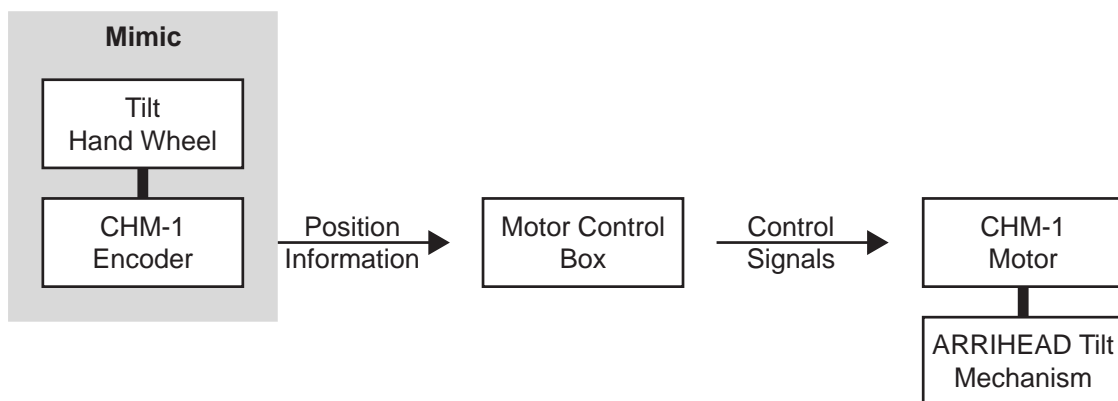
Examples of Mimics are:

A focus knob on a lens control

A hand wheel connected to a position sensor (encoder)

A panhandle on a fluid head fitted with position sensors (encoders)

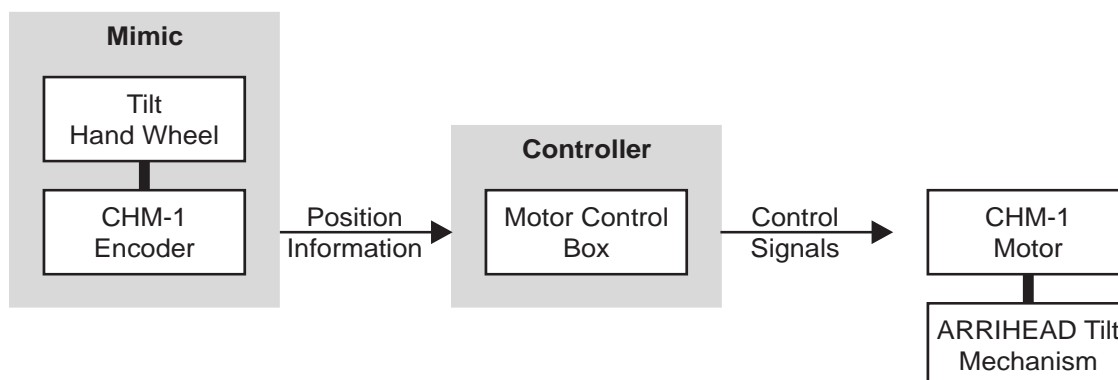
In the example below, the tilt hand wheel turns an encoder inside the Controlled Head Motor (CHM-1), which records the turning (=position information). The tilt hand wheel and the encoder together are called a "Mimic".



### 3. What is a Controller?

A controller is a box of electronics that reads the position either from a Mimic (while recording) or from memory (while playing back) and controls a motor.

In the example below, the position information from the tilt Mimic is passed on to the main controller, where it is used to drive the motor inside the CHM-1.





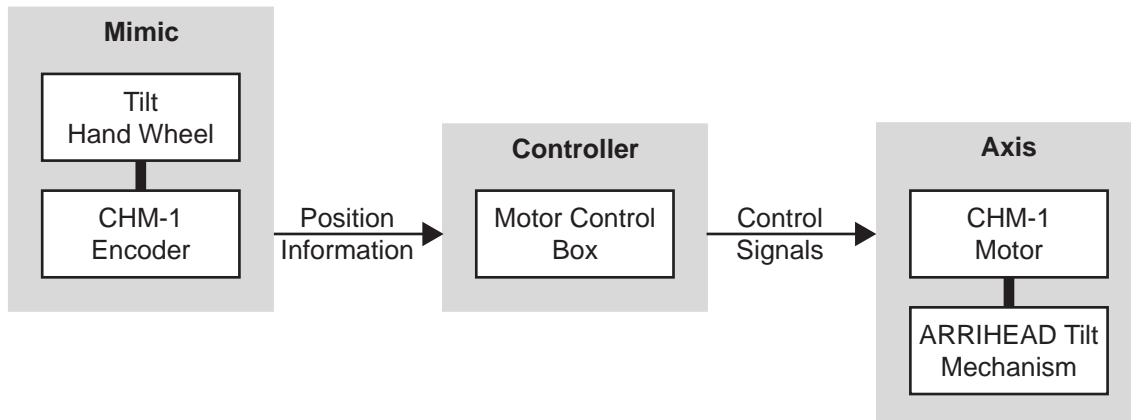
## What is an Axis

An axis is a thing that performs a movement along a certain path. There are two types of axes relevant to Motion Control work:

### Real Axis

A real axis is a motor that is connected to some mechanics that perform a motion.

In the example below, the position information from the tilt Mimic is passed on to the main controller, where it is used to move the real tilt axis.



### Capture Axis

A capture axis is a position measurement system that reports the current position of something moving on a path. This could be the rotational position of a lens motor, for instance.

## 5. What is a Setup?

A Setup is the configuration of a motion control system. It includes a list of which axis you want to use and how these axis are controlled (which Mimics are used). This information is stored as a Setup.

## 6. What is a Move?

A Move describes the changing of all axes that have been defined. If you push the *record* button on the ARRIMOTION system, than pan and tilt around wildly and then push *Stop*, you have recorded a Move. This Move can now be played back, at full or some partial speed.

Each recorded ARRIMOTION Move also contains the Setup data for the system.

## 7. Homing

Homing is a way to establish accurately the position of each motor, and of the motors to each other. This is necessary to find accurately the same positions when the system is switched of and on, or when the system was moved to another place. There are several different methods of homing:

- going to both end stops (the method used in the ARRI Lens Control System)
- special reference sensors (the method used in the Encoded ARRIHEAD-2)
- manual reference marks on the system.

## 1.5. System Components List

<i>Code</i>	<i>Ident#</i>	<i>Name</i>	<i>Description</i>
CCB-1	K2.52103.0 (HDD) K2.52231.0 (SSD)	Camera Control Box	The main module that contains move storage and camera control (requires a camera cable). HDD: Harddisk SSD:Solid State Disk
MCB-1	K2.52107.0	Motor Control Box	Controller for the CHM-1 motors.
LCB-1	K2.52104.0	Lens Control Box	Controller for 3 CLM-2 motors.
Accessory Bracket	K2.52227.0	Accessory Bracket	This bracket mounts to the ARRIHEAD-2. The Head Adapter slides into it and holds the CCB-1.
Head Adapter	K2.52206.0	Mounting Bracket	Mounts CCB-1 to ARRIHEAD-2 (Accessory Bracket required). Not compatible with ARRIHEAD-1.
Battery Holder 1	K2.34340.0	Mounting Bracket	Battery bracket holds CCB-1 on ARRIHEAD-1.
Adapter Plate 2	K2.47000.0	Mounting Bracket	A plate for the ARRIHEAD-2 for less play in camera mounting and better nodal mounting.
ACB-1	K2.52108.0	Auxiliary Control Box	Controller for external servo motors or dolly.
CHM-1	K2.52134.0	Controlled Head Motor	Motor to drive pan or tilt of an ARRIHEAD.
K-MCB-CHM	K2.52098.0	Cable, 0.6m/2 feet	Cable from CHM-1 motors to MCB-1.
Encoded ARRIHEAD-2	K2.52090.0	ARRIHEAD-2	ARRIHEAD-2 with integrated encoders and brake detection.
ARRIHEAD-2	K2.43670.0 K2.43670.0 K2.43670.0	ARRIHEAD-2	ARRIHEAD-2 prepared for encoders, but encoders not installed.
K-ARRIH-MCB	K2.52216.0	Cable, 0.8 m/2.6 feet	Cable from Encoded ARRIHEAD to CCB.
CC-M2	K2.52224.0	Cable, 0.8 m/2.6 feet	Longer replacement cable for CLM-2 cable (necessary for ARRIMOTION).
JBO-1	K2.52102.0	Jogbox	Handheld Controller with touchscreen.
JCA-1	K2.52135.0	Jogbox Cable Adapter	Adapter necessary when connecting Jogbox with a cable to CCB.
JHC-1	K2.52136.0	Jogbox Hand Wheel Controller	Remote control station with 2 arms for the hand wheels, monitor platform and Jogbox holder.

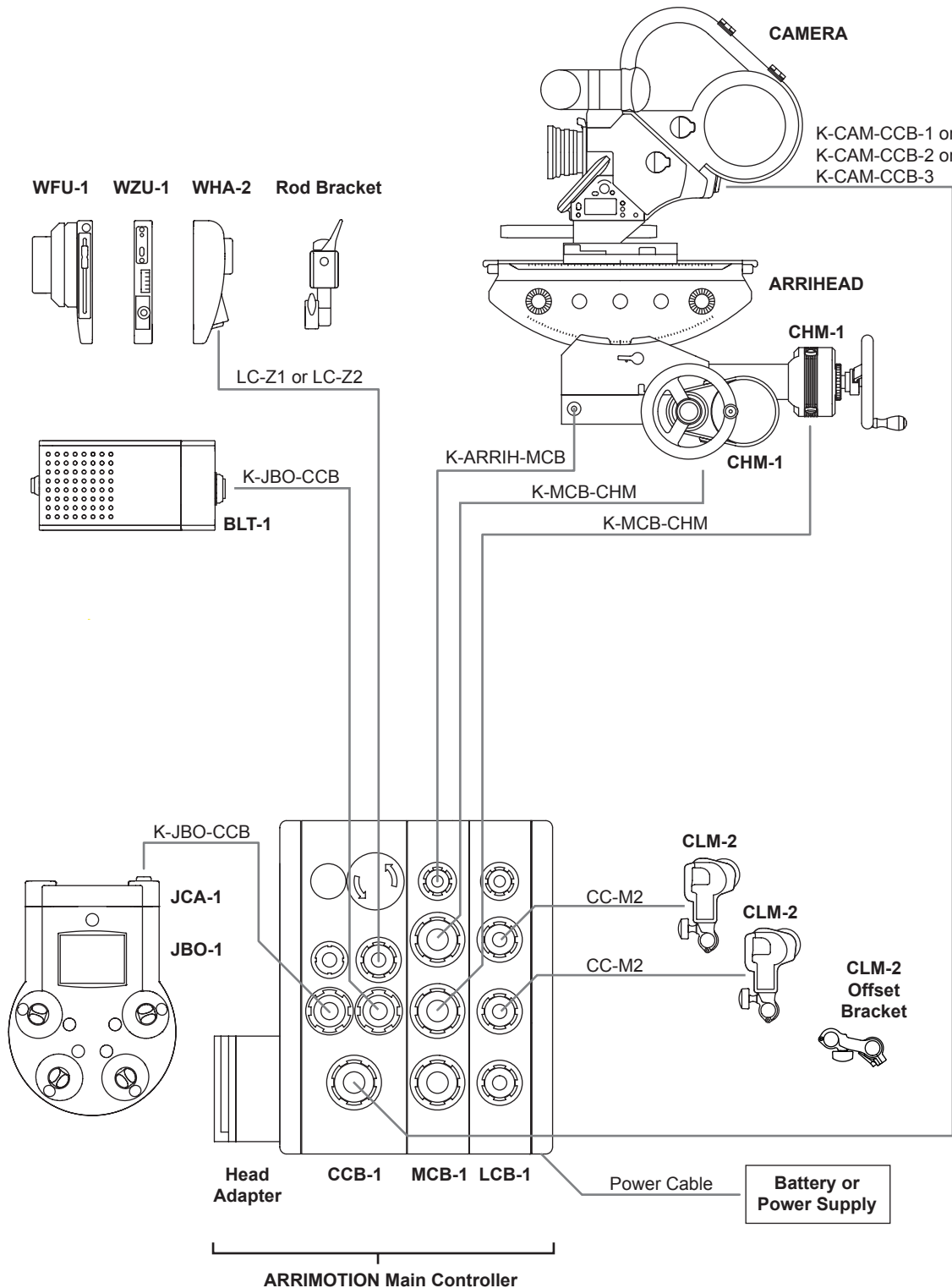
K-JCA-CCB	K2.52152.0	Cable, 10 m/33 feet	Cable to connect JCA-1, JHC-1, Blooplight and/or GPI-1 to the CCB (10m/33 feet long).
K-JCA-CCB 2m	K2.52252.0	Cable, 2m/6.5feet	
K-JCA-CCB 25m	K2.52253.0	25m Cable, 25m/82 feet	
K-CAM-CCB-1	K2.52219.0	Cable, 1 m/3.2 feet	Cable to connect 435 Advanced, 435ES, 535B, 16SR3, 16SR3 HS, 16SR 3 Advanced or 16SR3 HS Advanced to the CCB. Note: when used with the 435 Advanced, no special motion control features are accessible. For those features, use cable K-CAM-CCB-2 instead.
K-CAM-CCB-2	K2.52220.0	Cable, 1 m/3.2 feet	Cable to connect 435 Advanced/MCI-1 to the CCB.
K-CAM-CCB-3	K2.52221.0	Cable, 1 m/3.2 feet	Cable to connect ARRICAM Studio or Lite to the CCB.
K-LDD-LDS	K2.52215.0	Cable, 1 m/3.2 feet	Cable that connects LDD connector on ARRICAM or FEM-2 to LCB-1 LENS DATA connector.
GPI-1	K2.52223.0	General Purpose Interface	GPI Trigger Box to trigger external events by the ARRIMOTION or vice versa.
BLT-1	K2.52222.0	Blooplight	Blooplight to record sync marks.
LSW-1	K2.52137.0	Laptop Software	Software for Windows PC (Laptop).
NG12/26R	K2.47351.0	Power Supply	Mains Power Supply
Jogbox Cradle	K2.52259.0		Jogbox Cradle for mounting the Jogbox on various heads
JCA-2	K2.52260.0		for interfacing encoded fluid heads
K-Update-LP	K2.52230.0		Update Cable for direct Laptop / PC connection
SER-DISTR	K2.52261.0		Splits SER2 into BLT and VTR connector
K-SER-VTR	K2.52250.0		Connects CCB to Sony Control 1 interface of VTRs
PANTHER MOD	K2.52249.0		Modification for Panther Evolution for Arrimotion
K-ACB-LIFT	K4.52802.0	Cable, 2m/6.5 feet	Connects ACB-AUX-2 to the Panther Electronics
K-ACB-CAN	K4.52801.0	Cable, 2m/6.5 feet	Connects ACB-AUX-CAN to the Panther Electronics
K-ACB-DMA	K4.52800.0	Cable, 3.5m/11.5feet	Connects ACB-AUX-1 to the Panther drive motor

This page has been intentionally left blank

## **2. Setup**

## 2.1. Basic Sample Configuration

The basic sample configuration described here includes an ARRIHEAD and the ARRI Lens Control System for focus and zoom.



<b>Basic ARRIMOTION System (6 axes)</b>			
<i>Code</i>	<i>Ident#</i>	<i>Amount</i>	<i>Name/Description</i>
CCB-1	K2.52103.0 (HDD) K2.52231.0 (SSD)	1	Camera Control Box (requires camera cable) HDD=Harddisk, SSD=Flashdisk (more robust)
MCB-1	K2.52107.0	1	Controller for the CHM-1 motors
LCB-1	K2.52104.0	1	Controller for 3 CLM-2 motors
Accessory Bracket	K2.52270.0	1	This bracket mounts to the ARRIHEAD-2. The Head Adapter slides into it and holds the CCB-1.
Head Adapter	K2.52206.0	1	Mounts CCB-1 to ARRIHEAD-2 (Accessory Bracket required)
CHM-1	K2.52134.0	2	Controlled Head Motor
K-MCB-CHM	K2.52098.0	2	Cable from CHM-1 motors to MCB-1.
JBO-1	K2.52102.0	1	Jogbox
JCA-1	K2.52135.0	1	Jogbox Cable Adapter
BLT-1	K2.52222.0	1	Bloopligh
K-JCA-CCB	K2.52152.0	2	Cable from Jogbox or Bloopligh to CCB.
CLM-2	K2.52036.0	2	Controlled Lens Motors
CC-M2	K2.52224.0	2	Long cable for CLM-2 (required for ARRIMOTION)

<b>Camera Cables</b>		
K-CAM-CCB-1	K2.52219.0	Cable from 435 Advanced, 435ES, 535B, 16SR3, 16SR3 HS, 16SR 3Advanced or 16SR3 Advanced HS to CCB.
K-CAM-CCB-2	K2.52220.0	Cable from 435 Advanced/MCI-1 to CCB. This cable supports only stop and go motion in the Arrimotion software release 1.8
K-CAM-CCB-3	K2.52221.0	Cable from ARRICAM Studio or Lite to CCB.

<b>Also Needed/Optional</b>			
ARRIHEAD-2, or Encoded ARRIHEAD-2	K2.43670.0, or K2.52090.0	1	
K-ARRIH-MCB	K2.52216.0	1	Cable from Encoded ARRIHEAD to CCB-1
Battery Holder 1	K2.34340.0	1	Battery bracket, can hold CCB-1 on ARRIHEAD-1.
Adapter Plate 2	K2.47000.0	1	A plate for the ARRIHEAD-2 for less play in camera mounting and better nodal mounting.
NG12/26 R	K2.47351.0	1	Power Supply (or battery)
KC20, or KC29	K2.41966.0, or K2.44693.0	1	Power cable (straight), or Power cable (coiled)
CLM-2 Offset Bracket	K2.52035.0	1	"Dogbone" to mount CLM-2 in tricky situations.
Rod Bracket, or Rosette Bracket	K2.52150.0, or K2.52153.0	1	Attaches WHA-2 to support rods, or attaches WHA-2 to ARRIHEAD rosette.
Lens Control System			Either WHA-2 + WZU-1 + WFU-1 + cable, or ZMU (1 or 2) + FIU-1 + cables
Jogbox Cradle	K2.52259.0	1	Jogbox Cradle for mounting the Jogbox on various heads
JCA-2	K2.52260.0	1	for interfacing encoded fluid heads

K-Update-LP	K2.52230.0	1	Update Cable for direct Laptop / PC connection
SER-DISTR	K2.52261.0	1	Splits SER2 into BLT and VTR connector
K-SER-VTR	K2.52250.0	1	Connects CCB to Sony Control 1 interface of VTRs
PANTHER MOD	K2.52249.0	1	Modification for Panther Evolution for Arrimotion



## 2.2. Prerequisites



### **Danger**

No Persons or other items should ever be in the pan range of the ARRIHEAD, otherwise personal injury or equipment damage can result



### **Danger**

If the weight on the ARRIHEAD is not properly balanced, the motors can get very hot.



**Be sure** that all electric cables are intact and install properly before you running the system.

Use only ARRI batteries and power supplies.

This setup guide assumes that you have a camera on an ARRIHEAD with a lens and CLM-2 motors attached. It describes the setup for the basic configuration, where you can control camera start/stop, camera fps and shutter, lens zoom, iris and focus and ARRIHEAD pan and tilt.

For more detailed information check the Hardware Reference part.

## 2.3. Prep Check

Before setting up the ARRIMOTION system, check the following items:

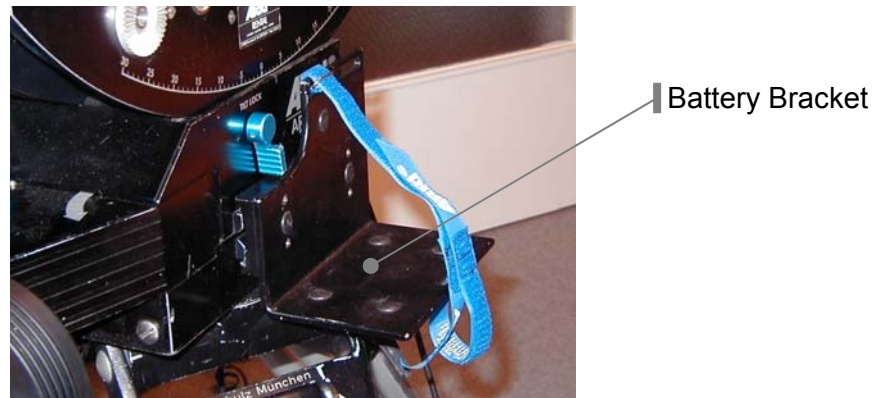
- A separate battery or power supply for camera and ARRIMOTION are available.
- The main controller has been assembled containing one CCB-1, one MCB-1, one LCB-1 (details are in the Hardware Reference part).
- If you have an ARRIHEAD-2, the main controller should have a Head Adapter, and the ARRIHEAD should have an Accessory Bracket attached. If you have an ARRIHEAD-1, it should have been equipped with a Battery Bracket.
- On all ARRIHEAD pan and tilt gear boxes one screw has been exchanged for a special pin with a hex driver head. If a pin with a slotted head is already there, it must also be replaced with the pin with the hex driver head. These special pins come with the CHM-1 motors. Details are in the ARRIHEAD chapter of Hardware Reference.
- The CLM-2 motors have their normal cables replaced with the longer CC-M2 cables (details are in the Hardware Reference part).
- You have a long 3 mm hex driver.
- Rotate the EMERGENCY button on the main controller clockwise to make sure it is disengaged.

## 2.4. Attach the Main Controller

- ARRIHEAD-2: Slide the main controller's Head Adapter into the ARRIHEAD Accessory Bracket.



- ARRIHEAD-1: Place the main controller on the Battery Bracket and secure it.



## 2.5. Attach CHM-1s



### **Danger**

Ensure, that no objects, especially hairs or clothes, come in contact with the Lens Control Motors or the cogwheels. Otherwise they could clamp and cause serious injury or equipment damage.

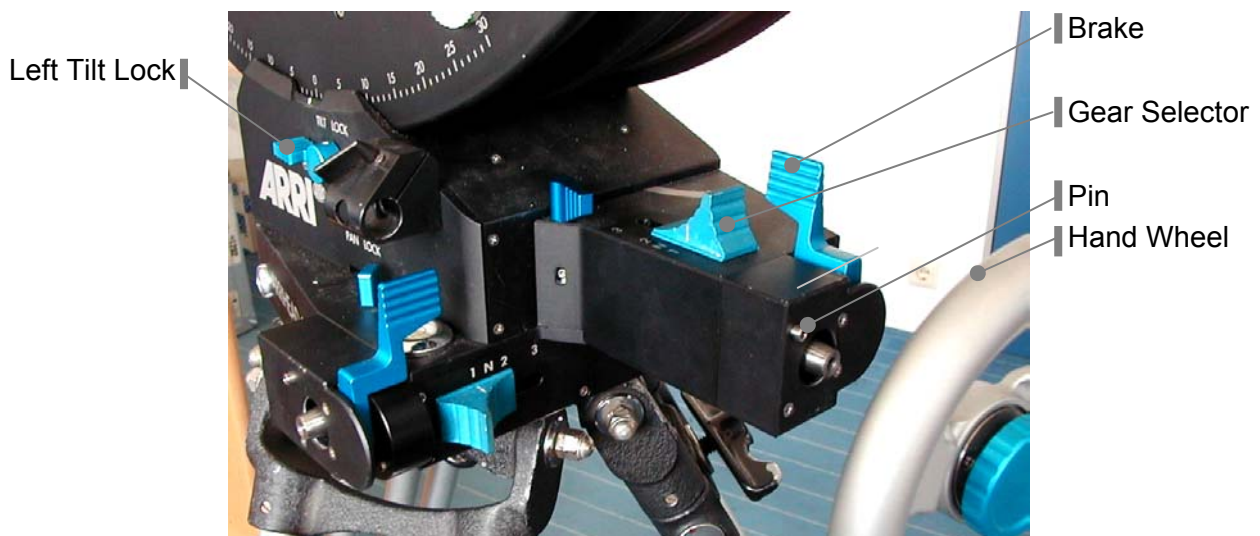


### **Danger**

Ensure that all components of the system are properly installed. Otherwise they can cause heat which can cause serious injury or equipment damage.

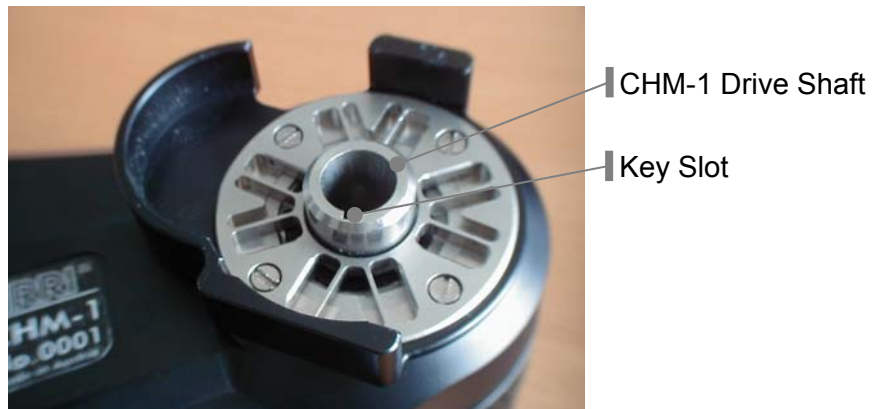
This describes how to attach a CHM-1 between the ARRIHEAD and the tilt hand wheel. The same procedure applies for pan.

Before attaching the CHM-1 motors, make sure the ARRIHEAD gears moves freely. The quality of the complete system is dependant on the quality of the ARRIHEAD. It is especially important that the gears are free of play. During very cold or warm temperatures the pan gears may have to be re-adjusted for minimum play.



- To ensure that the CHM-1 on the tilt axis performs optimally, first balance the camera. If the camera is very unbalanced, the tilt CHM-1 motor will need more power and may overload. After balancing the camera, push it slightly off balance (about 15 mm/0.5 inches) to pre-load the tilt mechanism.
- Lock the two tilt locks (one on each side) of the ARRIHEAD.
- Loosen the tilt brake by turning it all the way counter-clockwise.
- Remove the tilt hand wheel.
- Set the tilt gear selector to N (Neutral).

- Look at the back of the CHM-1 motor and note in which position the drive shaft's key slot is. Turn the drive shaft on the ARRIHEAD so it matches the key slot on the CHM-1.



- Switch the ARRIHEAD tilt gear selector to 1.

The ARRIHEAD gear selectors for pan and tilt should always be set to 1 when using CHM-1 motors. Using gear position 2 or 3 can lead to equipment damage. The gear ratio can still be adjusted with the Jogbox.

- Place the CHM-1 motor on the ARRIHEAD tilt drive shaft. First rotate the brake collar so it engages the ARRIHEAD hand wheel brake. Then push the motor towards the ARRIHEAD while slightly rotating it, so the CHM-1 key slot engages the ARRIHEAD drive shaft key.



- Once the CHM-1 key slot has engaged the ARRIHEAD drive shaft key, the CHM-1 can be rotated to be mounted in 8 positions, every 45°. It is preferable to mount the CHM-1 so the BRAKE button is easily accessible.
- Use a 3 mm hex driver to tighten the screw inside the CHM-1 drive shaft.
- Turn the fluid drag ring clockwise to tighten. This makes attaching the hand wheel easier.
- Place the hand wheel onto the CHM-1 drive shaft and tighten the locking screw.
- Adjust the fluid drag to your personal preference.
- Unlock the two tilt locks (one on each side) of the ARRIHEAD.

Note: if you need to pan or tilt while the system is off, you can always switch the gear selector to N (Neutral). Careful, though: if the system is unbalanced, the camera may tilt with surprising speed and equipment could be damaged! Make sure to move the gear selector back to 1 once you are done. Switching the gear selector to neutral while the system is on is not recommended, since you will lose your homing reference.

## 2.6. Attach Cables & CLM-2s



### **Danger**

Always make sure the cables are routed so they do not catch on anything, as the system could be seriously damaged!

We recommend the long CLM-2 Motor Cables (CC-M2) for the Lens Control Motors.



### **Danger**

Ensure, that no objects, especially hairs or clothes, come in contact with the Lens Control Motors or the cogwheels. Otherwise they could clamp and cause serious injury or equipment damage.



### **Danger**

Ensure that all components of the system are properly installed. Otherwise they can cause heat which can cause serious injury or equipment damage.



### **Danger**

Don't operate camera and ARRIMOTION from one battery or power supply!

Use a separate ARRI battery or a ARRI power supply for the ARRIMOTION System (e.g. the NG 12/26R)



**Be sure** that all electric cables are intact and install properly before you running the system.

Use only ARRI batteries and power supplies.

- Connect a battery or power supply to the 2 pin connector on the backside of the main controller. Connect another battery or power supply to the camera's BAT connector.
- Connect the camera to the CAM connector on the CCB-1 according to this chart:

<i>Camera</i>	<i>Connector on camera</i>	<i>Cable</i>
435 Advanced, 435ES, 535B, 16SR3, 16SR3 HS, 16SR 3 Advanced or 16SR3 HS Advanced	CCU & ACC connectors	K CAM-CCB-1 Note: when used with the 435 Advanced, no special motion control features are accessible. For those features, use cable K-CAM-CCB-2 instead.
435 Advanced (Motion Control Mode)	MC connector on MCI-1	K CAM-CCB-2
ARRICAM Studio, ARRICAM Lite	CAC connector	K CAM-CCB-3

Note that some of those cables have two connectors on the camera side: an 8 pin connector that goes in the CCU receptacle on the camera and a 9 pin connector that goes into the ACC (or MCL/ESU) connector on the camera. It is easy to distinguish between the two: the 8 pin connector has no center pin, the 9 pin one does.

- Connect the Jogbox or Jogbox Hand Wheel Controller to the SER1 connector on the CCB-1 using cable K-JCA-CCB.
- Attach the WHA-2 (with WFU-1 and/or WZU-1) or the ZMU (with or without the FIU) to the LCS connector on the CCB-1.



- Connect the connectors on the bottom of the CHM-1 motors to the respective connectors on the MCB-1 with cables K MCB-CHM. The side with the angled connector goes into the CHM-1. If you have more than one MCB-1, use the one closest to the CCB-1.
- Attach the CLM-2 motors to the rods and plug their cables into the respective connectors on the LCB-1. Cables for motors that are attached to the camera left rod should be fed between the lens and the rod, not underneath the rod.
- If you have an Encoded ARRIHEAD-2, use cable K-ARRIH-MCB to connect the connector on the Encoded ARRIHEAD-2 to the ARRIHEAD connector on the MCB-1 closest to the CCB-1.
- If you have a 435 Advanced with an FEM-2 or an ARRICAM, and you are using LDS lenses, you can connect their LDD connector with the LENS DATA connector on the LCB-1 using cable K-LDD-LDS.



The ARRIMOTION system all cabled up!

## 2.7. Emergency Stop

In an emergency the ARRIMOTION system can be stopped by pushing the big red *EMERGENCY* button on the Camera Control Box (CCB-1). All motors will be deactivated and all brakes will be applied. The *ON/OFF* LED will blink red.

### To Reset After an Emergency Stop:

- Remove the reason for the emergency.
- Rotate the *EMERGENCY* button in the direction of the arrows to release it. The *ON/OFF* LED blinks red and green.
- Push the *ON/OFF* button to turn the system back on.
- Go into the Axes screen and turn all axes back on.

Pushing the *EMERGENCY* button will immediately stop all motors, which can lead to extreme stress on all mechanical components. It is therefore recommended to use this feature only in case of a real emergency.

## 2.8. Power Up



### **Danger**

Always make sure the cables are routed so they do not catch on anything, as the system could be seriously damaged!

We recommend to use the long CLM-2 Motor Cables (CC-M2) for the Lens Control Motors.



### **Danger**

Ensure, that no objects, especially hairs or clothes, come in contact with the Lens Control Motors or the cogwheels. Otherwise they could clamp and cause serious injury or equipment damage.



### **Danger**

Ensure that all components of the system are properly installed. Otherwise they can cause heat which can cause serious injury or equipment damage.



### **Danger**

Don't operate camera and ARRIMOTION from one battery or power supply!

Use a separate ARRI battery or a ARRI power supply for the ARRIMOTION System (e.g. the NG 12/26R)



**Be sure** that all electric cables are intact and install properly before you running the system.

Use only ARRI batteries and power supplies.

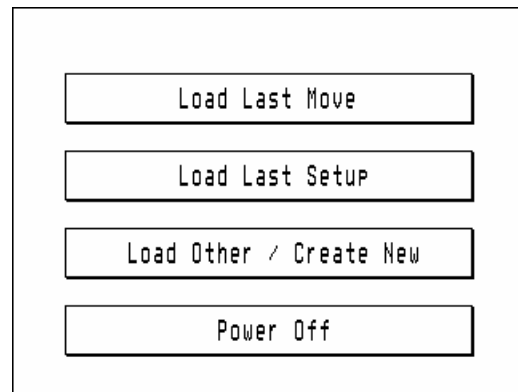
- Now is an excellent time to double check that the two tilt locks and the one pan lock on the ARRIHEAD are loose, and that pan and tilt are set to the first gear.
- Turn camera power on.
- Push the *ON/OFF* button on the CCB-1.

The LEDs on the main controller will light up while a system check is being performed. If the CCB finds any ARRIMOTION components attached with incompatible software versions, it automatically updates those components.

- If you use the ZMU, turn its *POWER* button on now (the CCB can only supply power to the ZMU once the CCB is powered up).

#### The Quick Start Screen

- If you were working on a move before the system was powered off, push *Load Last Move* and the last move plus its setup will be loaded.
- If your setup has not changed, but you do not want to continue to work with the last move, push *Load Last Setup*.
- In all other cases, push the *Load Other / Create New* button.



## 2.9. Defining Axes, Assigning Mimics

In the basic configuration, the ARRIMOTION system will automatically recognize the axes and Mimics connected. It will automatically define the axes and assign the Mimics to their default axes, i.e. the pan hand wheel to the pan axes, the focus knob to the focus lens motor, etc.

If components are used that are not part of the basic configuration, axes and Mimics have to be configured manually.



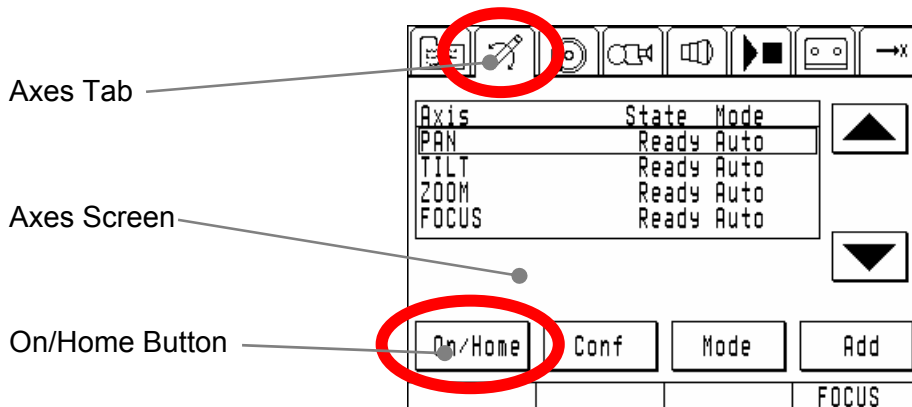
## 2.10.Home Axes



### Danger

The system moves on its own when homing. Make sure that nothing obstructs the system and all cables are neatly tucked away so they do not catch on anything!

Every time the ARRIMOTION system is powered up, all existing axes must be homed. Homing is a way to accurately establish the position of each motor.



- Push the *Axes* tab to open the *Axes* screen. Select the first axis in the list, which should be *PAN*.
- Push the *On/Home* button once to turn the axis on. The axis *State* will change to ?. Push *On/Home* again to start homing. While homing the respective LED on the main controller will blink red/green.
- Now select the next item in the list, and again push *On/Home* twice. Go through the whole list using the same method. Tip: when homing the lens axes, you do not need to wait for one to finish before you start homing the next. They can home simultaneously.

Note: if you have trouble with an axis, unplug its cable from the main controller and then plug it back in. Then turn the axes back on in the *Axes* screen.

### Homing PAN with a Non-encoded ARRIHEAD-1 or ARRIHEAD-2

The procedure described above is slightly different for the non-encoded ARRIHEADs.



- Place a piece of tape on the rotating part of the head and another one close-by on a non-rotating part. Draw a line through both pieces of tape. This is your home mark.
- Push the *Axes* tab to open the *Axes* screen. Select the first axis in the list, which should be *PAN*.
- Push the *On/Home* button once to turn the pan axis on. The axis *State* will change to ?. Push *On/Home* again. The current position will become the homing position.

- The next time you home the system, push the *On/Home* button twice to turn the pan axis on and to home it. Go to the *Play/Record* screen and turn *Connect* on. Now you can move the pan with the hand wheel so the marks on the two pieces of tape line up. Go back to the *Axes* screen and push *On/Home* a second time to home the pan axis.
- If a more precise referencing is needed on a non encoded Arrihead select "search index" as a homing method. The motor will then move the output shaft of the motor in increments of exactly 180°. This will result in about 130 different positions on the pan axis. Mark one of them and it will be exactly found again within the next homing.

This method will only work under the following circumstances

- leave the CHM-1 motor of the Pan axis mounted to the Arrihead
- never switch the gear to a other position than 1
- Do not change the motors position
- Do not exchange the CHM-1 motor
- Stay within +/- 180° on the PAN since the gear ratio of the gearbox is not an integer number

Explanation of this method for techies:

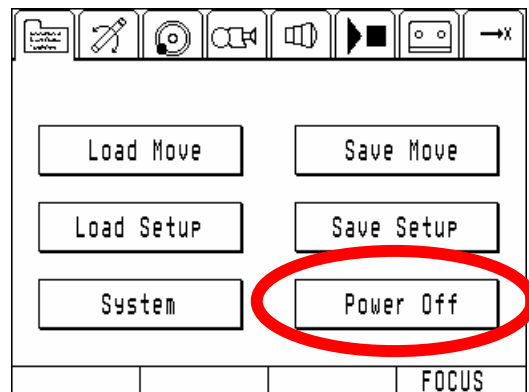
The servomotor inside the CHM has an incremental encoder with an index pulse. This pulse always appears on the same position. Since there is a 2:1 gear in the CHM-1 motor this would result in half a revolution of the CHM-1s output shaft per servomotor revolution.

## 2.11.Power Down

### Regular Power Down

The ARRIMOTION system is properly powered down with the Jogbox, not with the *ON/OFF* button on the Camera Control Box (CCB-1).

- Push the *File* tab to open the *File* screen. Then push the *Power Off* button.



### Hard Power Down

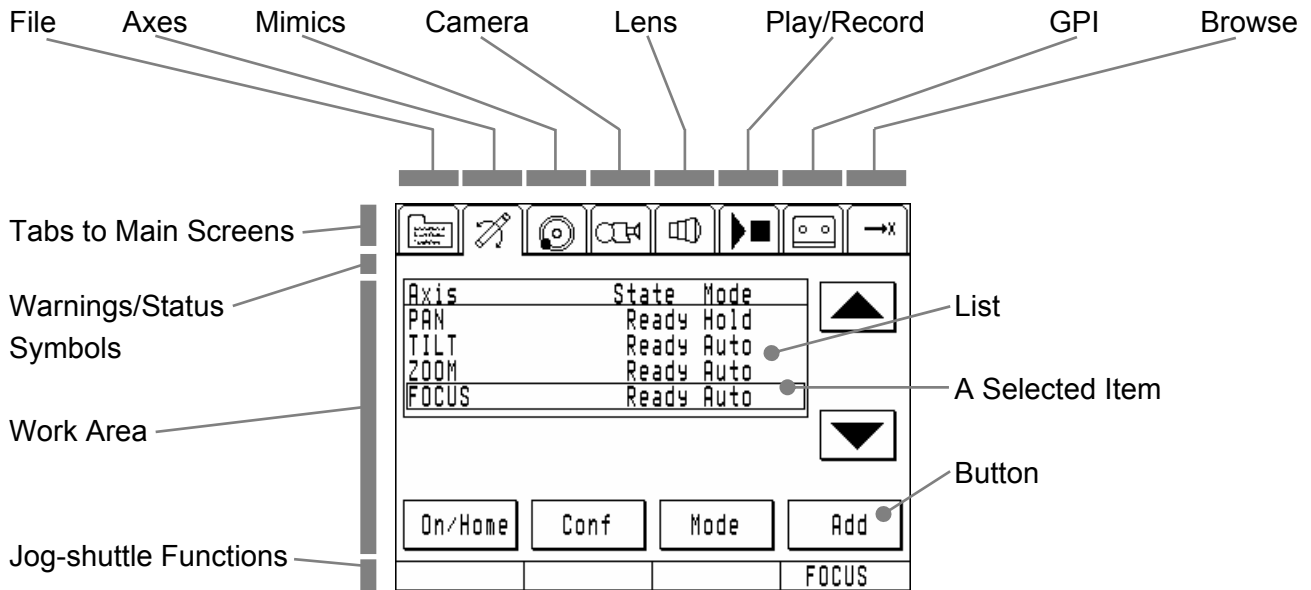
In case the regular power down does not work, you can perform a hard power down by pushing the *ON/OFF* button on the Camera Control Box for 3 seconds. The system will power down within the next 10 seconds. During this time the power LED will blink green. During a hard power down, all data that has not been saved can be lost.

Note: a hard power down is not possible while an emergency stop is still in place.

This page has been intentionally left blank

# **3. Operation**

### 3.1. Basic Jogbox Navigation



The Jogbox has a touch screen that can be operated with a finger, with the pen that is tucked into the back of the Jogbox, or with any blunt item that does not scratch the screen. The screen is divided into four horizontal areas:

1. At the very top is a row of tabs. Pushing one of those tabs will open one of the main screens.
2. Below is a small area for warnings and status symbols.
3. In the center is the work area, which contains lists and buttons. Items in lists can be selected by directly pushing on them, or by using the arrow buttons on the right to move the selection.
4. At the very bottom are four rectangular areas that will indicate functions assigned to the Jog-shuttles. In our example, the top right Jog-shuttle has the focus axis assigned.

#### Buttons

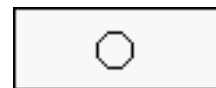
Buttons come in three flavors: enabled, active and disabled. The normal button state is enabled, which means the button will perform its duty when pushed. The active state indicates that the buttons function is actively being performed. If the function of a button is not available, the button will be disabled, and pushing it will have no effect.



Button Enabled



Button Active



Button Disabled

## Status and Warning Symbols



### Low Battery Warning

This symbol will blink when the incoming voltage is too low. What the exact level is depends on which Battery Type is set in the System Settings (*File* screen)



### Encoded ARRIHEAD-2 OK

This symbol indicates that an Encoded ARRIHEAD-2 has been connected and is communicating properly with the ARRIMOTION system.



### Encoded ARRIHEAD-2 Brakes

This symbol indicates that at least one of the two ARRIHEAD brakes is applied.



### Encoded ARRIHEAD-2 Error

This symbol indicates that an error in the communication to the encoded Arrihead occurred.



### Camera OK

This symbol indicates that the ARRIMOTION system has detected and identified a camera, and the camera is OK.



### Camera Not Ready

This symbol indicates that the ARRIMOTION system has detected and identified a camera, and there is a problem with the camera.



### Camera Roll Off

This symbol indicates that the Roll Camera is switched off in the camera menu. The camera will not be synchronized and/or rolling during record and playback.



### Camera Sync

This symbol indicates that the camera has not synchronized properly. The takes might not match. Do not use any pass with such a fault.



### Camera not present

This symbol indicates that a camera was selected and configured to run but is not detected on the camera interface.



### Camera Running

This symbol indicates that the camera connected to the ARRIMOTION system has is running and everything is OK.



### Emergency Stop

This symbol indicates that the *EMERGENCY* button has been pushed.



### GPI BOX active

This symbol indicates that a GPI box is connected and working.



### GPI BOX active but all Outputs disabled

This symbol indicates that a GPI box is connected and working but the outputs are globally disabled in the GPI Outputs menu.



GPI BOX events defined but box missing

This symbol indicates that GPI events have been defined but there is no GPI Box found or GPI events are defined on a box that is not present (2<sup>nd</sup>, 3<sup>rd</sup> or 4<sup>th</sup> GPI box).



Bloop Light active

This symbol indicates that a Bloop Light is connected and working.



Bloop Light active

This symbol indicates that a Bloop Light events are programmed but the bloop light was not found.



Laptop Connected

This symbol indicates that a Laptop connection is active.



Panther Dolly Connected

This symbol indicates that a Panther Evolution dolly was detected.



Panther Dolly and Pushbar Connected

This symbol indicates that a Panther Evolution dolly with an electronic pushbar was detected.



VTR found

This symbol indicates that a VTR or ATR was found on the serial interface and is ready for operation.



VTR disabled

This symbol indicates that a VTR or ATR sync is programmed in the move but the *Sync VTR* is set to off in the playback menu.



VTR not found

This symbol indicates that a VTR or ATR should be synchronized in the current move but was not found on the serial interface or is not ready for operation.



LDS OK

This symbol indicates that a LDS connection to the camera was established and working.



LDS not OK

This symbol indicates that there is a LDS problem on the camera. Please check the camera.



## Recording a Basic Move



### Danger

The system moves on its own when moving to begin, moving to end or playing back a move. Make sure that no humans or any other items obstruct the system and that all cables are neatly tucked away so they do not catch on anything!



### Danger

Playback of a move should be tested first at slow speeds.

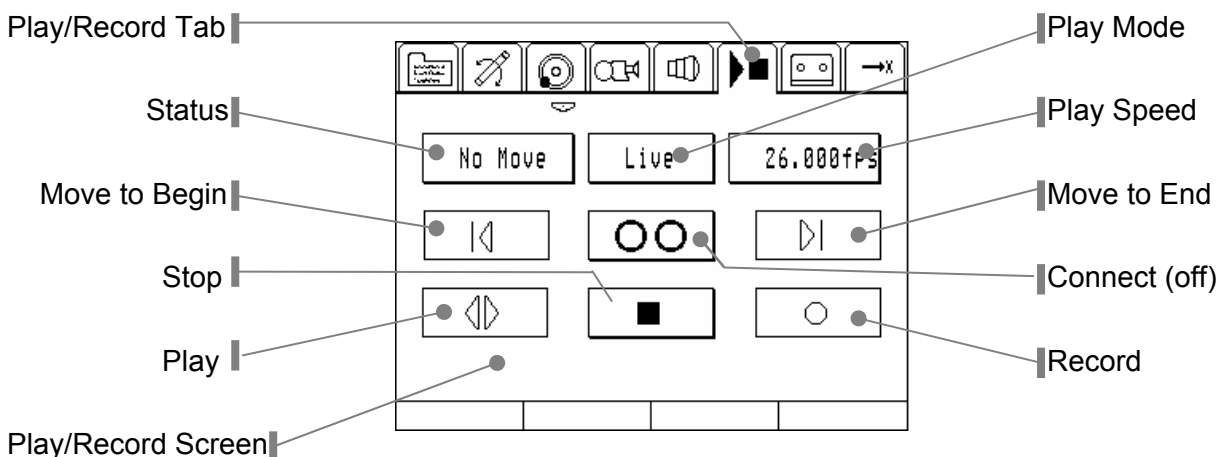


### Danger

During playback the system can move with high speeds.

### Moving the System

- Push the *Play/Record* tab in the top part of the display to open the *Play/Record* screen. This is the screen that is used most when recording and playing back moves.



- For safety reasons, the Mimics (the wheels and knobs you fiddle with) are disconnected by default from their assigned axes (the motors and mechanical parts that move the camera). In order to connect them, push the *Connect* button. You should be able to move the ARRIHEAD now with the pan and tilt hand wheels. If not, look at the troubleshooting chapter at the end of the Operation part.



Connect Off



Connect On

**Recording a Move**

- Make sure the *Connect* button is on.
- Push the *Record* button. In the top left corner of the *Play/Record* screen the move duration will be displayed. The ARRIMOTION system will now precisely record every change you make to camera, lens and head.
- Push the *Stop* button to stop recording.
- The system will now ask you if you want to save this move. In the *Save Move* screen, push the big empty button to name the move, and the *Version* button to differentiate between different versions (takes) of the same move.

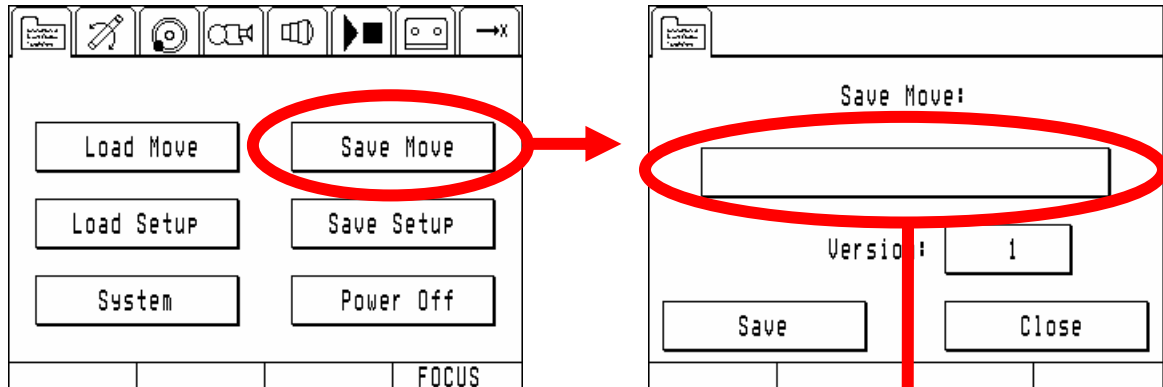
**Playing Back a Move**

- Push the *Connect* button to disconnect the Mimics from the axes. This is necessary because you will not be controlling the motors during playback, but the ARRIMOTION system will.
- Push the *Move to Begin* button to move all motors to the beginning position.
- Push the *Play* button to play back the move.

## 3.2. Saving, Loading, Erasing and Renaming Moves

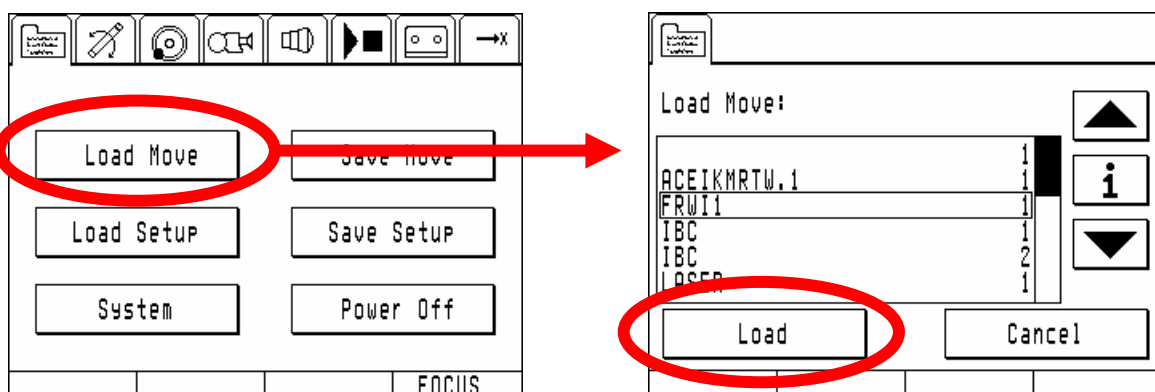
### Saving a Move

If you have not saved the move, you can save it after the fact to the digital storage media that is built into the CCB-1 (either a hard disk or a flash card).



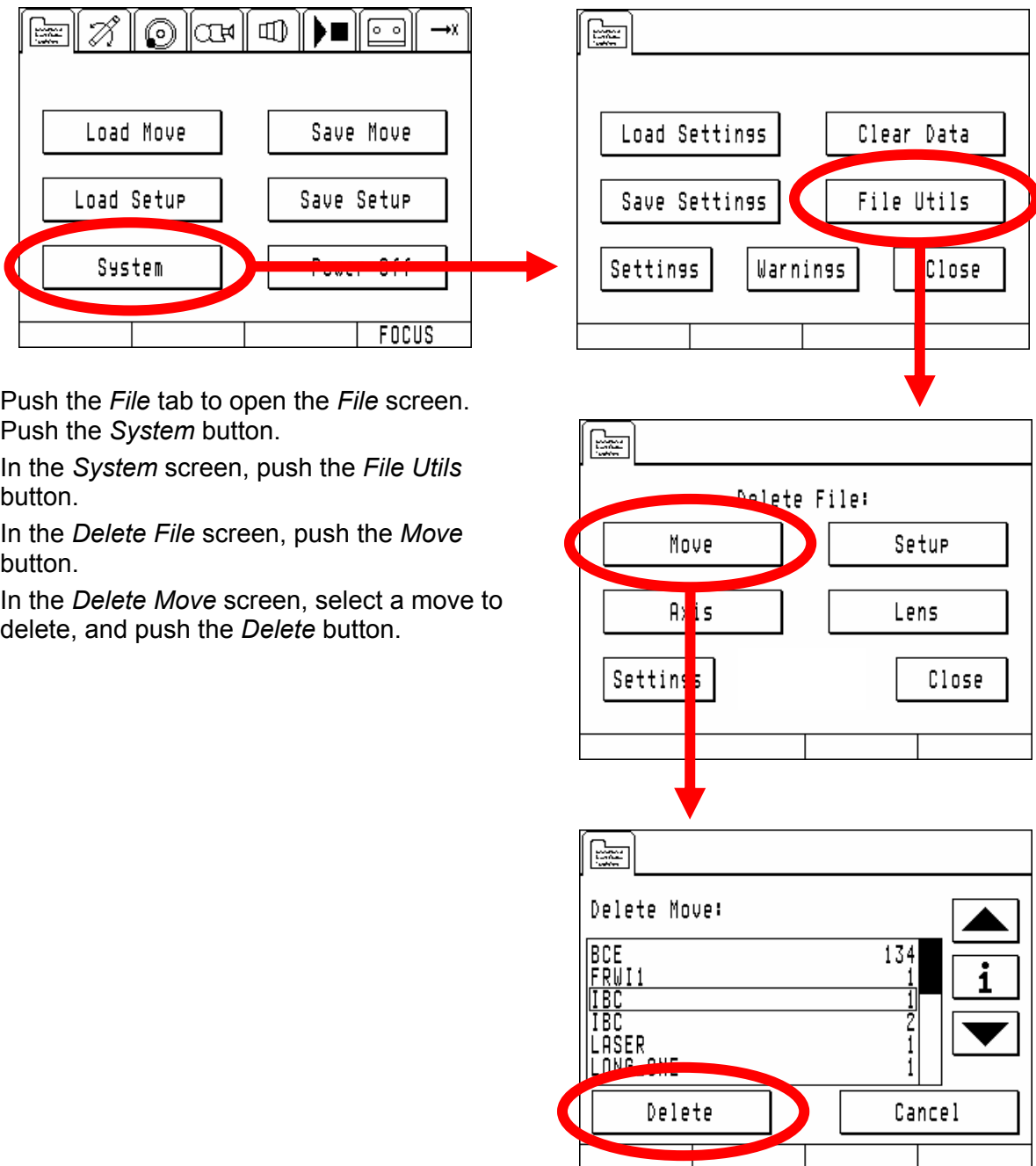
- Push the *File* tab to open the *File* screen. Push the *Save Move* button.
- In the *Save Move* screen, push the big empty button to name the move.
- In the *Move Name* screen, use the letter buttons to enter a move name. If you need numbers or special symbols, push the button under the *Clr* button.
- Push OK when you are done. Back in the *Save Move* screen, you can also enter a version number for this move by pushing the button to the right of the word *Version*.
- Push the *Save* button.

### Loading a Move



- Push the *File* tab to open the *File* screen. Push the *Load Move* button.
- In the *Load Move* screen the list shows the names and version numbers of all stored moves. Select the move to load, and push the *Load* button.

## Erasing a Move



- Push the *File* tab to open the *File* screen. Push the *System* button.
- In the *System* screen, push the *File Utils* button.
- In the *Delete File* screen, push the *Move* button.
- In the *Delete Move* screen, select a move to delete, and push the *Delete* button.

## Renaming a Move

To rename a move, you should save the move under a different name (see saving a move), and then erase the original move.

### 3.3. Setting Gear Ratios



#### **Danger**

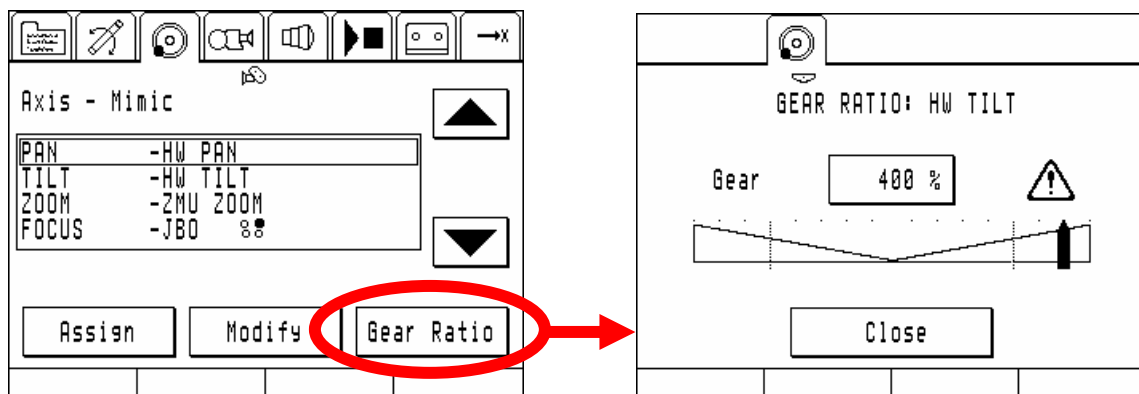
When very high gear ratios are set, the system can move very fast.



#### **Danger**

Very high gear ratios and an inappropriate acceleration or dampening setting can lead to vibrations (for instance: ARRIHEAD pan).

A higher gear ratio allows for faster response when shooting fast moving objects, and a lower gear ratio allows for more precision, useful for instance when shooting miniatures. 100% gear ratio for pan and tilt is the gear ratio an ARRIHEAD-2 would have with its mechanical gear set to 1. 100% gear ratio for the lens hand units approximates what they normally have.



- Push the *Mimics* tab to open the *Mimics* screen. Select an axis and push the *Gear Ratio* button.
- Change the gear ratio by touching the slider where you want the new ratio to be, or by pushing the button with the gear ratio percentage and entering a new percentage. You can also reverse the turning direction by moving the slider left past the 0% point.

Note: It is OK to change the gear ratio while *Connect* is turned on in the *Play/Record* screen. In fact, it is convenient to do so since you can see the effect of the new gear ratio immediately.

Note: When a gear ratio higher than 100% is set a warning symbol with an exclamation mark will show up.

### 3.4. Setting Limits



#### **Danger**

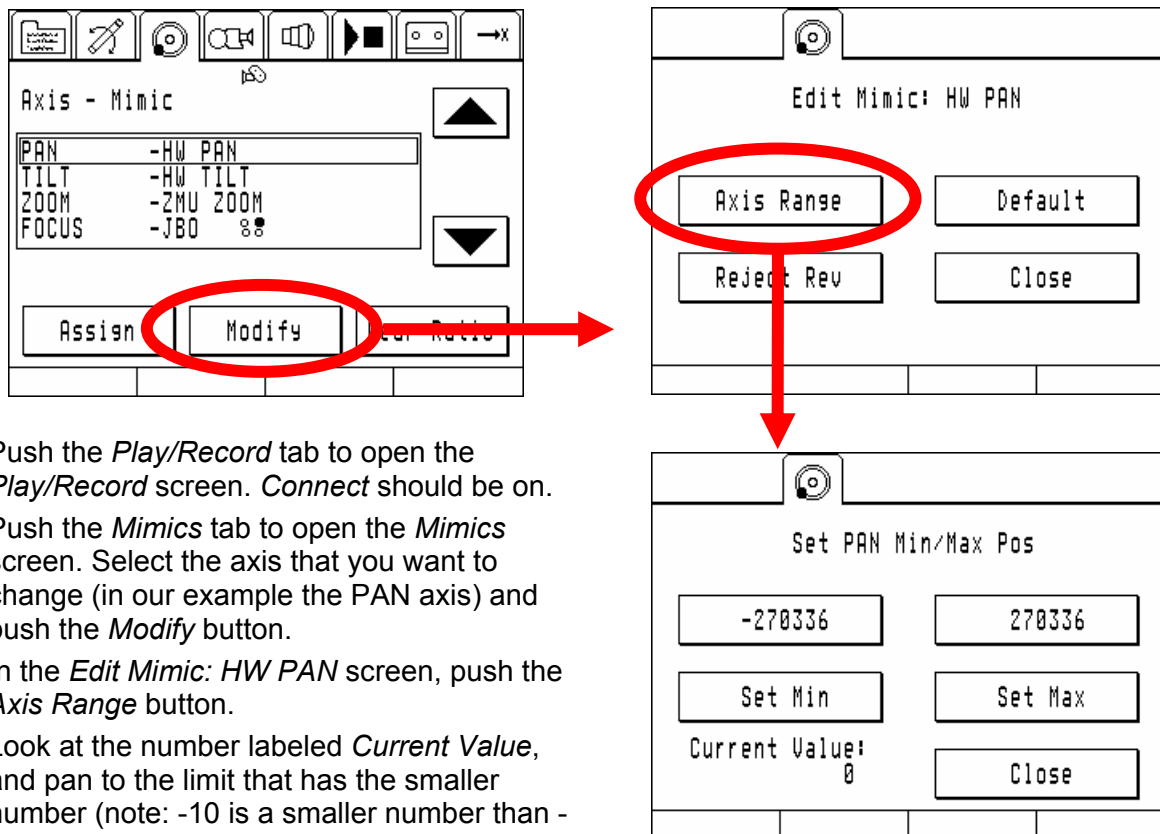
Under some circumstances it is possible that the ARRIMOTION system will override the set limits.



#### **Danger**

The limits should not be used to ensure that the ARRIMOTION system does not collide with humans or other items.

If an axis should only move up to a certain point and no further, it is possible to set limits.

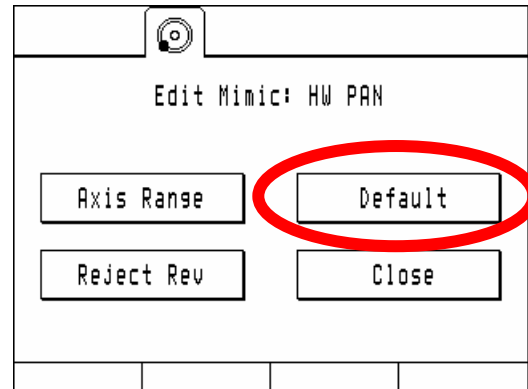


- Push the *Play/Record* tab to open the *Play/Record* screen. *Connect* should be on.
- Push the *Mimics* tab to open the *Mimics* screen. Select the axis that you want to change (in our example the PAN axis) and push the *Modify* button.
- In the *Edit Mimic: HW PAN* screen, push the *Axis Range* button.
- Look at the number labeled *Current Value*, and pan to the limit that has the smaller number (note: -10 is a smaller number than -5). Push the *Set Min* button.
- Look at the number labeled *Current Value*, and pan to the limit that has the higher number. Push the *Set Max* button.

The two buttons above the *Set/Release Min* and *Set/Release Max* buttons show the minimum and maximum encoder values you have set. Instead of moving the ARRIHEAD to the respective positions and setting the limits, it is also possible to enter the encoder values directly. To do so, push on the buttons above the *Set Min* or *Set Max* buttons and enter the numbers.

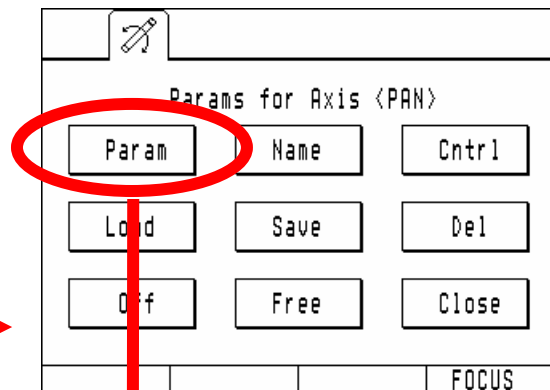
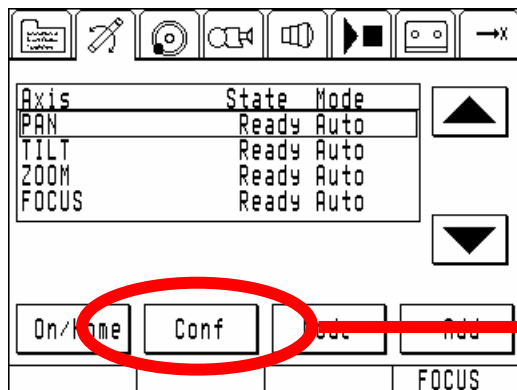
### Erasing Limits

- Push the *Mimics* tab to open the *Mimics* screen. Select the axis that you want to change (in our example the PAN axis) and push the *Modify* button.
- In the *Edit Mimic: HW PAN* screen, push the *Default* button.

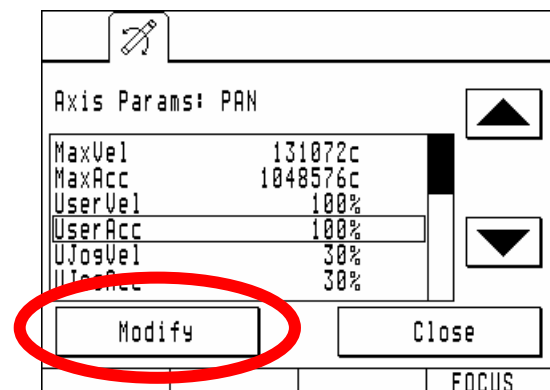


### Soft Stops

The ARRIMOTION System will stop at the limits as fast as it can. Smoother stopping can be set in the Axes screen.



- Push the *Axis* tab to open the *Axis* screen. Select the axis that you want to change (in our example the PAN axis) and push the *Conf* button.
- In the *Params for Axis (PAN)* screen, push the *Param* button.
- Scroll down the list until *UserAcc* is selected and push the *Modify* button.
- The default value for user acceleration is 100%. Stops will be smoother if you set it to a value less than 100%. Set the new value and push OK.
- In the *Axis Params: PAN* screen push the *Close* button. In the *Params for Axis (PAN)* screen, push the *Close* button.



### Smoothing

The same parameter that sets soft stops (*UserAcc*, see Soft Stops above) also will smooth out any irregularities, and make a pan or tilt smoother.

### 3.5. More on Recording and Playing Back Moves


**Danger**

The system moves on its own when moving to begin, moving to end or playing back a move. Make sure that no humans or any other items obstruct the system and that all cables are neatly tucked away so they do not catch on anything!


**Danger**

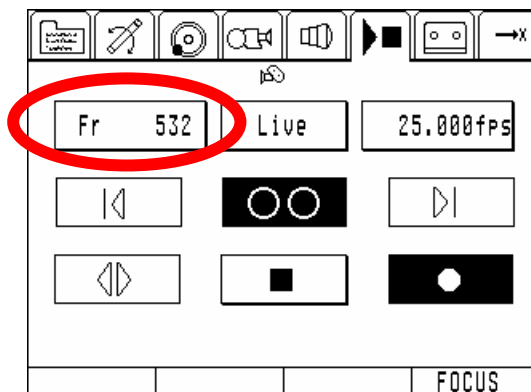
Playback of a move should be tested first at slow speeds.


**Danger**

During playback the system can move with high speeds.

#### The Counter/Status Field

During record and play back the Status Field in the top left corner of the *Play/Record* screen will display a running counter. This counter is also a button: pushing it will switch from a time counter to a frames counter. During standby the move status will be displayed in this space:

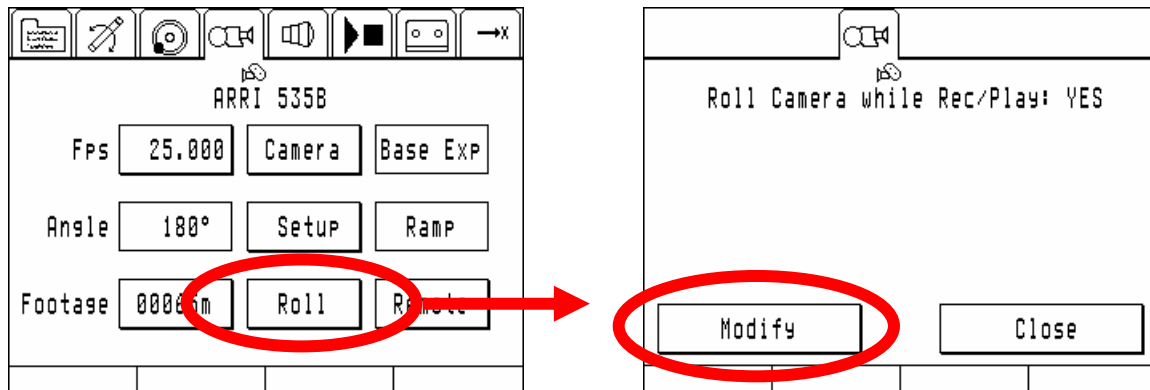


No Move	No move data is stored in memory.
Move Begin	The system is at the beginning of the move.
Move End	The system is at the end of the move.
Not on Move	After a move is loaded, or if a move is stopped in mid move, the system will not be on the exact path of the move.

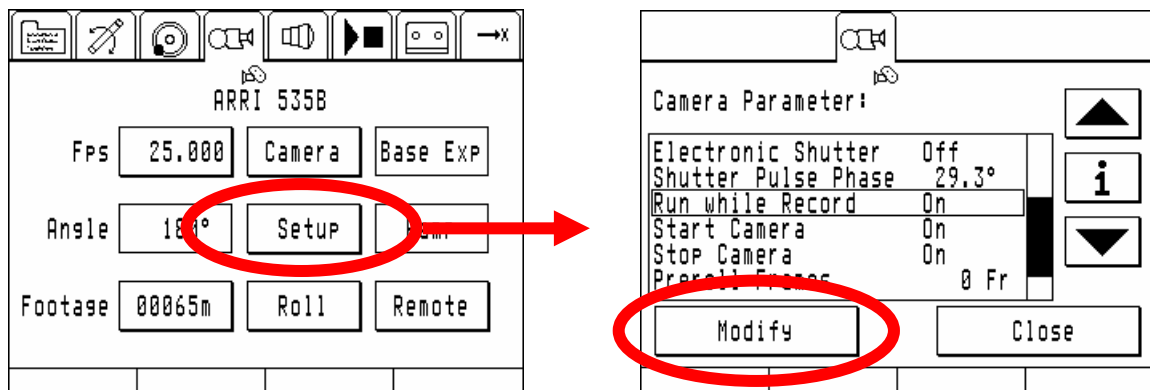


## Camera Roll

There are various ways to fine tune who starts the camera and how. The master switch that overrides all other settings is the *Roll* button in the *Camera* screen.



- Push the *Camera* tab to open the *Camera* screen. Push the *Roll* button.
- If the camera will not run at all, disregarding who turns it on or off, this setting should be *NO*. The ARRIMOTION system will then ignore the camera. Even if the camera is turned on manually while a move is recorded or plays back, the ARRIMOTION system will make no attempt to synchronize itself to the camera. The *NO* setting is recommended for rehearsals.
- If the camera will run during record or play back, started by the ARRIMOTION system or manually, this setting should be *YES*. In that case the ARRIMOTION system will synchronize itself to the camera. Detail options can be set via the *Setup* button in the *Camera* screen.



- To access the detail options, push the *Setup* button in the *Camera* screen.
- Scroll down the list until you see the following three items:

**Run While Record** When *On*, the camera will start running each time a move is recorded or played back.

When *Off*, the camera will not run when a move is recorded, but it will run each time a move is played back.

**Start Camera** When *On*, the camera will start running each time a move is recorded or played back.

When *Off*, the camera will not start running when a move is recorded or played back. Instead, the ARRIMOTION system will expect you to start the camera before the move. This is useful when the action begins before the move.

**Stop Camera** When *On*, the ARRIMOTION system will stop the camera each time a move recording or play back is stopped.

When *Off*, the ARRIMOTION system will not stop the camera on its own. This is useful when the action is longer than the move.

### **Rehearsing Without a Camera (Camera Setup)**

If the ARRIMOTION system is used for rehearsals without a camera, it should know which camera it will ultimately accommodate.

- Push the *Camera* tab to open the *Camera* screen.
- Push the *Camera* button. From the list choose the camera you will use.
- Push the *Select* button.

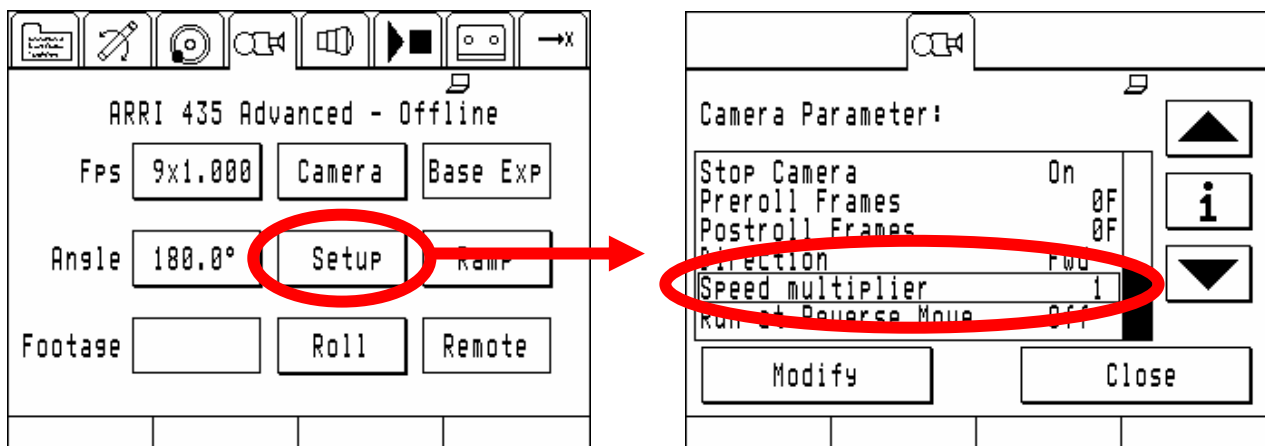
### Running the camera with a different frame rate than the move

It is quite often required that the camera runs a different frame rate than the Arrimotion system when doing CGI Effects in the Post.

Usually the frame rate is an integer factor of the Arrimotion frame rate.

The result will be that the camera records one, two, three,... and up to seven frames per frame of the Arrimotion move.

You have to be very careful when combining takes which were shot with different camera frame rates since the motion blur and the exposure time will be different.



To modify the so called speed multiplier hit Setup in the camera menu, scroll down to speed multiplier and push modify to change.

The camera speed will be:

$$\text{camerafps} = \text{movefps} \times \text{multiplier}$$

movefps: record and/or playback speed of the move

Please note that the resulting value must be within the camera's limit and that the maximum move fps will be limited to

$$\text{movespeed max} = \text{cameratopfps} / \text{multiplier}$$

cameratopfps: maximum possible frame rate of the camera

movespeedmax: maximum possible record/playback speed (will be limit during playback to the record fps if no replay speed multiplier has been selected in the live action mode menu).

If non integer multiples are required the camera can not be synchronized anymore and has to be run wild (without connection to Arrimotion). Be very careful when doing so since a lot of problems can occur in the postproduction then.

## 3.6. Stop- and Go- Motion Playback

**Danger**

The system moves on its own when moving to begin, moving to end or playing back a move. Make sure that no humans or any other items obstruct the system and that all cables are neatly tucked away so they do not catch on anything!

**Danger**

Playback of a move should be tested first at slow speeds.

**Danger**

During playback the system can move with high speeds.

### Basics

Stop- and Go-Motion modes work with the 435 Advanced in the CAN-Bus Mode using the K-CAM-CCB 2 Cable (connects the camera socket on the CCB with the 435 Advanced 11 pin Fischer Socket on the camera body).

A integrated capping shutter ICS should be used on the camera.

The single frame hand controller SFHC must not be used.

### The difference between Stop- and Go-Motion

Stop Motion works like a stills camera that takes a picture on the mid shutter open position of each frame on the move. All objects that are not moving will have no motion blur since the camera is also not moving.

The exposure time could be as short as 1/128 of a second in Stop Motion.

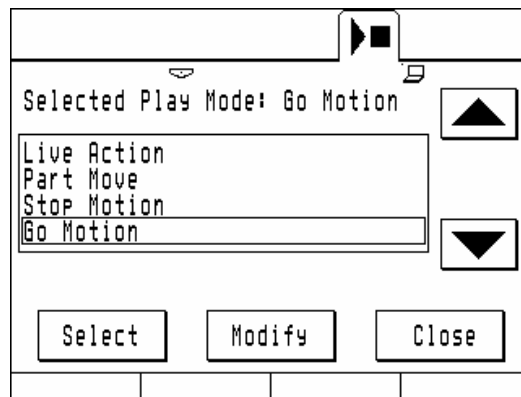
Go Motion moves the camera the same amount of motion like on a live action move during the exposure and create the same amount of motion blur like on a live action move. The moving speed is dependent on the exposure time and the virtual shutter angle (future option) set in the go motion options.

The minimum exposure time in Go-Motion is 1/8 of a second.

## Setting up and Selecting Stop- or Go-Motion Mode



In the play mode list select either Stop- or Go-Motion by moving the cursor with the two arrows over the desired play mode and push the select button



## Modifying the Parameters of Stop and Go-Motion

To modify the parameters of the play mode push the Modify button. A list box with all parameters of the Stop or Go-Motion mode will appear.

### Start Frame

The start frame is the frame that is defined as the first frame of the sequence. This is the frame where the system will go to when go to begin is pressed.

This is also the first frame that will be shot in a sequence.

To delete a start frame simply enter Zero.

### Stop Frame

The stop frame is the frame that is defined as the first frame of the sequence. This is the frame where the system will go to when go to end is pressed.

This is the last frame that will be shot in a sequence.

To delete a start frame simply enter Zero.

### Exposure Time

The exposure time can be entered in seconds.

<i>Fractionals</i>	<i>Time</i>
½ sec	0.500s
¼sec	0.250s
1/8sec	0.125s
1/16sec	0.063s
1/32sec	0.031s
1/64sec	0.016s
1/128sec	0.008s

Minimum exposure time is 1/8 sec in Go Motion and 1/128sec in Stop Motion.

The shortest Exposure time in Go-Motion is also limited by the recording speed of the move.

The exposure time of the live action move is another limit for the minimum exposure time in Go-Motion. E.g. if the live action move was recorded at 2fps the minimum exposure time will be 1/4<sup>th</sup> of a second which is the same as the exposure time at 2fps.

**Burst**

This is the number of frames that will be shot on one position.

**Interval**

The interval is the time between two consecutive exposures.

If the Interval time is set to zero the system will do consecutive exposures as fast as possible.

The Interval must be larger than the time the camera needs for the exposure of a frame times the burst number plus the time needed for the capping shutter to open and close.

**Cont / Single**

In continuous Mode the system will shoot the frames of the move in a continuous process with the interval that was defined.

The process starts with the frame defined as start frame and ends at frame defined as the stop frame.

This is very useful for time lapse operation.

In Single Mode the system will wait for a trigger for each frame. This trigger could either be a GPI event or the EXP button in the rec/play menu.

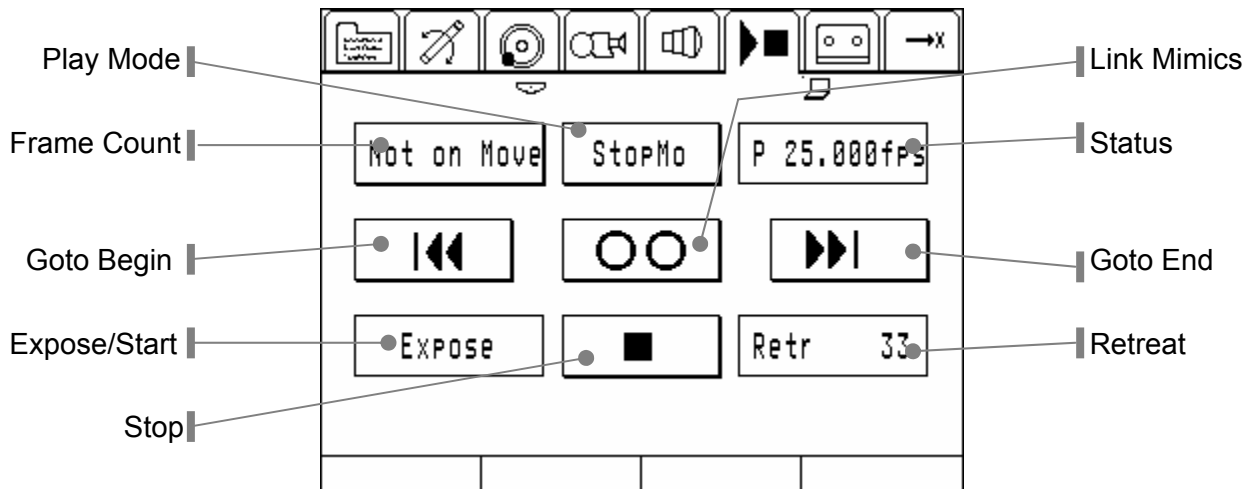
This mode is typically used in animation.

**Retreat Frame**

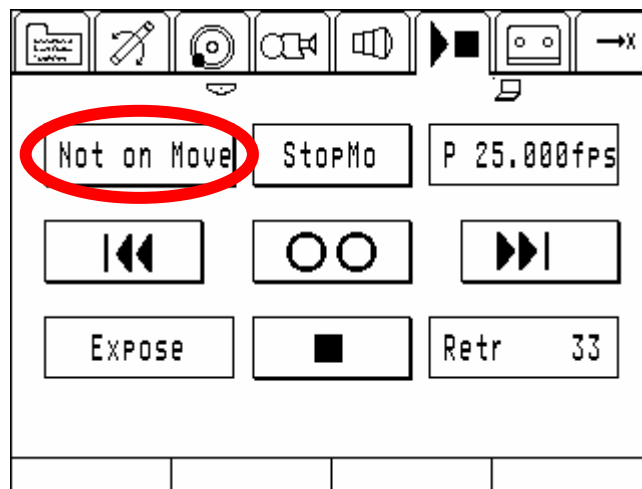
The retreat frame can be defined as one frame of the move. It is used to give a better access to the set e.g. for animating characters. The Arrimotion system will go to this frame on the predefined move and return also exactly on the move.

## The Play/Rec Screen in Stop- or Go-Motion Mode

The screen looks a little bit different from the standard play/record screen.



## The Frame Counter Button



The Frame counter Button can be used to bring the system to a certain frame of the move. When the button is pushed a framenumber can be entered and the system will go to that frame number.

If the system is not on the trajectory of the move the button will show "Not On Move". The system can be brought on the move by pressing the button and entering a frame number or by pressing go to begin or go to end.

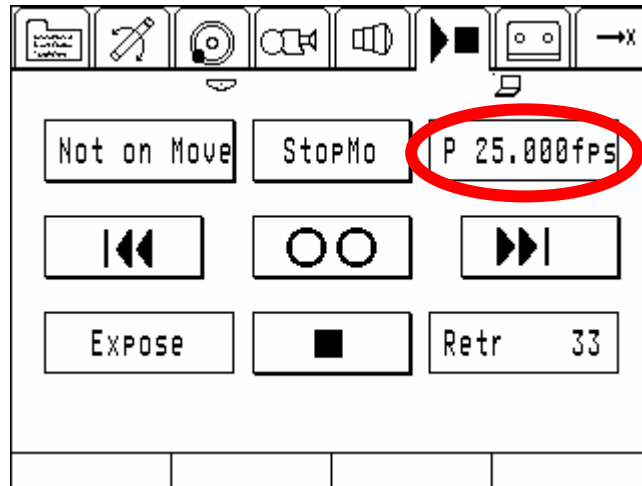
When the system is not ready to shoot single frame but the system is on the move the button will display FR(ame) followed by a frame number.

When the system is ready for shooting single frame the button will display BR(owsing) followed by the current frame number.





## The Status Button



While browsing the Button will display P(rietary) followed by the primary frame rate of move (the frame rate the move was recorded with at the first time)

When the single frame exposure is active the Status Button will display the current operating state:  
INT followed by a countdown for the interval

EXP followed by a countdown for the exposure time (might not be visible when the exposure time is less than a second)

MOVE during the move from one frame to another or during the pre- and postroll in go-motion mode.

## The Play / Expose Button

The expose button triggers either a exposure of a single frame or burst or starts a time lapse sequence when the system is set up with an interval for automatic operation

system is in the single mode when the button is labeled "Expose" and in the automatic mode when the button reads "Play fwd".

## The Retreat Button

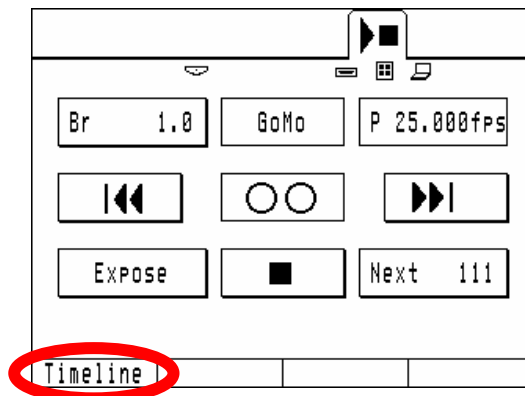
When the system is set up that each frames exposure is triggered manually (Single) the system can be brought into the retreat position defined in the setup by pressing this button.

The button shows "Retr" followed by the number of the frame that is defined as retreat frame.

When the system is in retreat position the button shows "Next" followed by the frame number of the next frame that should be exposed. it can be sent back to the current frame by pressing the button again.

### Browsing during Single Frame

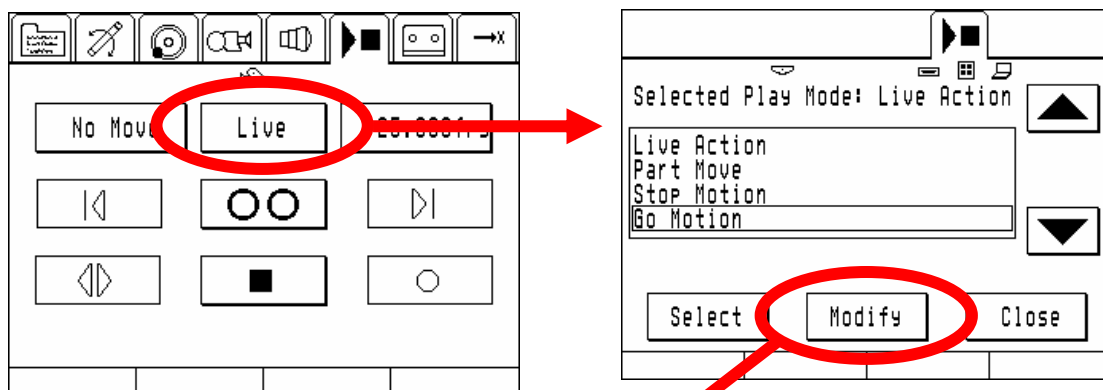
When the system is ready for single frame mode it is possible to browse through the move with the primary jog/shuttle. The bottom line indicates which jog shuttle is attached to the Timeline.



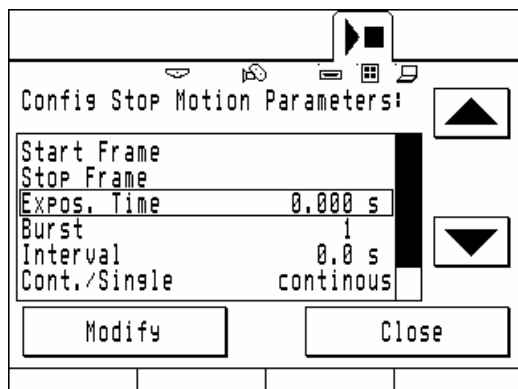
### Quick Setup for Go- and Stop Motion

It is assumed that a move is loaded in the systems and all needed axes and accessories are connected and ready and the system is in live action mode.

Push the play mode button and select either stop or go-motion by moving the cursor to the desired mode and pushing select:



Push modify and configure the parameters:



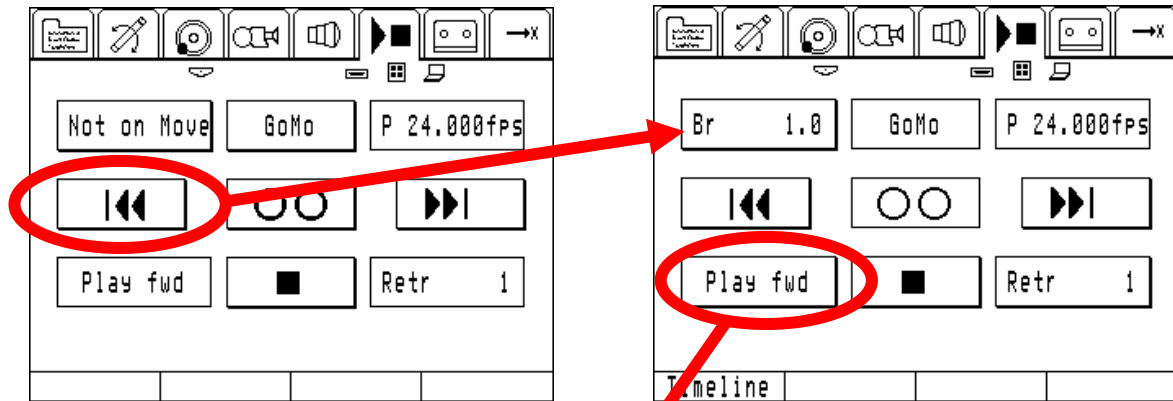
e.g.

Expos time	0.5s
Burst	1
Intervall	10sec
Cont/Single	continuous

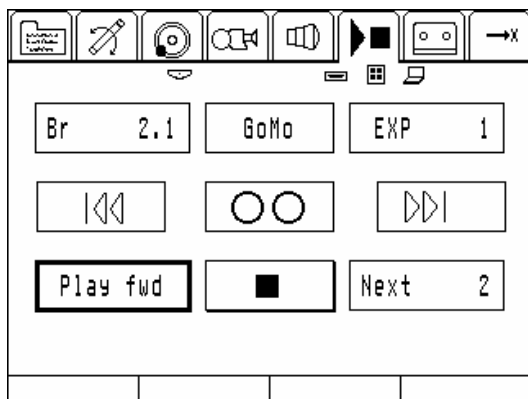
When all parameters are configured push close twice

The play / rec screen will look as follows:

Push the go to begin button and the system will enter browsing mode at frame 1



Start the go motion (or the stop motion) mode now by pushing play fwd



With the suggested parameters we have created a go motion move where the frames are taken every 10 seconds with an exposure time of half an second.

Since we haven't defined a start and a stop frame the system will do the full move.

### 3.7. Multitrack Recording



#### Danger

During Multitrack recording, one or more axis can move on their own. Before starting a Multitrack recording, make sure that no humans or any other items obstruct the system and that all cables are neatly tucked away so they do not catch on anything!

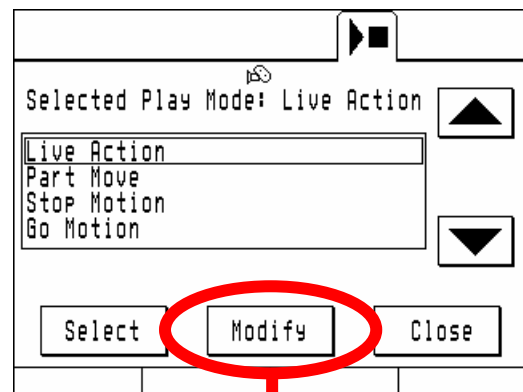
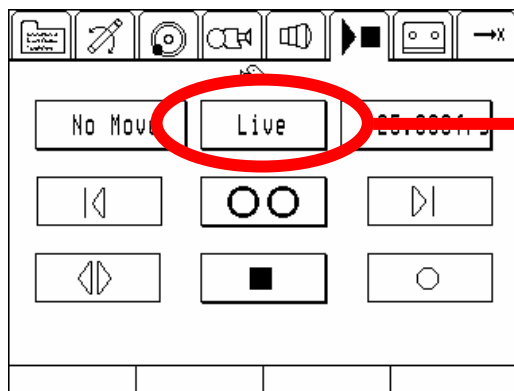


#### Danger

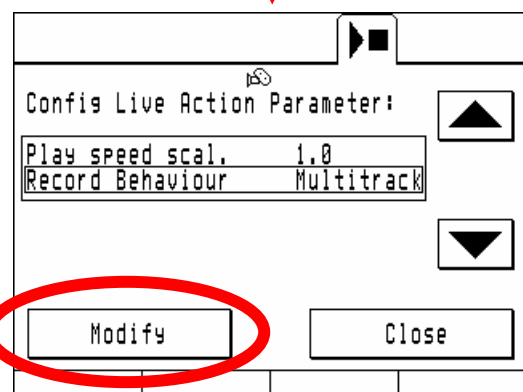
During Multitrack recording the system can move with high speeds.

When you record a new move, the ARRIMOTION system will by default erase the move data for all axes in memory and write the new move. This is called the *Normal* record behavior. In some situations, though, it is advantageous to build a move one axis at a time. This can be done with Multitrack recording, where you can record one axis, and then play this axis back while recording the next one, building the move axis by axis.

#### Enabling Multitrack Recording



- Push the *Play/Record* tab to open the *Play/Record* screen. *Connect* should be off.
- Push the *Play Mode* button (probably labeled *Live*) to open the *Play Mode* screen.
- Select *Live Action*, and push *Modify*.
- In the *Config Live Action Parameter* screen, select *Record Behaviour*. Push the *Modify* button to switch to *Multitrack*.
- Now close the screens until you are back in the *Play/Record* screen.



The Record button in the Play/Record screen will change its look when Multitrack is enabled.



Multitrack Off

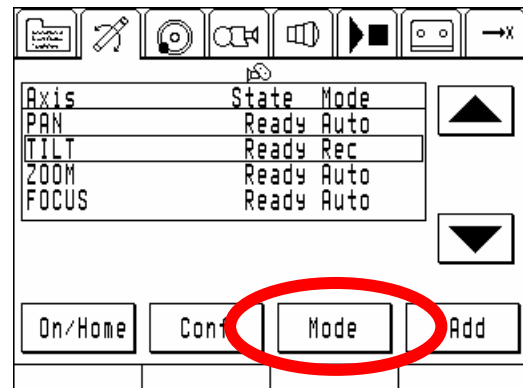


Multitrack On

## Recording Multitracks

- In the *Play/Record* screen, switch the *Connect* button on, and push the *Record* button. Move only the pan this time, and not tilt or focus. Push *Stop*.
- Push the *Axes* tab to open the *Axes* screen. Here you set the behavior of the individual axes.

Auto	If move data for this axis exists, the axis will play back during the next recording. If no data exists, the axis will record.
Rec	Any previously recorded data for this axis will be discarded. New data will be recorded.
Hold	Move data will be retained, and the axis will not move at all.



In our case, select the *TILT* axis and push the *Mode* button to switch its mode to *Rec*.

Note: The *Rec* option is only available when you have switched the playback behavior to *Multitrack*. During *Normal* playback, all you get is *Auto* and *Hold*.

- Go back to the *Play/Record* screen. Turn *Connect* off. Push *Move to Begin*. Turn *Connect* back on.
- Now push the *Record* button. The previously recorded pan movement will play back, but any tilting you do will be recorded. Push *Stop* when you are done.
- When you stop recording a move, the ARRIMOTION will automatically set the tilt axis from *Rec* to *Auto*, so you do not accidentally erase it.
- Open the *Axes* screen to set the next axis you want to record to *Rec*. If you did not like the tilt, set it to *Rec* and record it again. If you liked it, set the *FOCUS* to *Rec*.
- Go back to the *Play/Record* screen, turn *Connect* off, push *Move to Begin* and turn *Connect* back on. When you push *Record*, you will record the new axis while the old ones all play back.

## Move Length

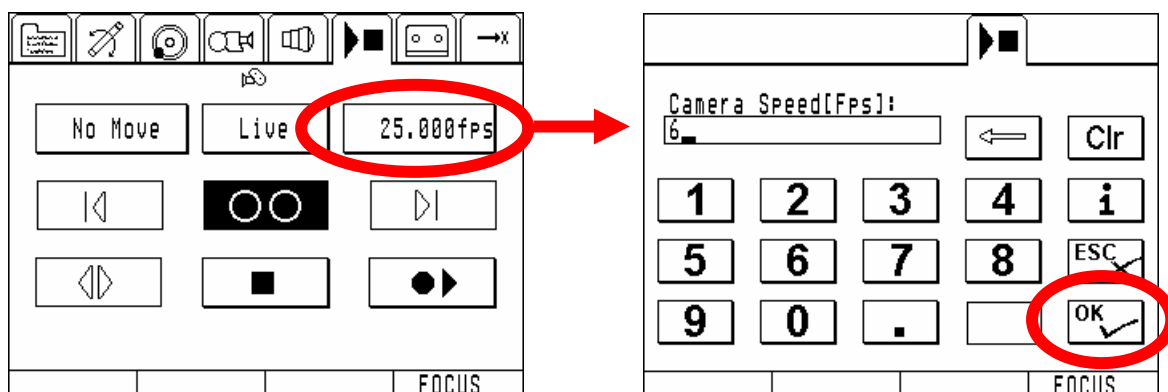
A multitrack move will be as long in duration as the axis with the longest duration. If a new axis you record is longer than the previously recorded axes, the whole move will be made longer to include the new axis. If a new axis is shorter, the move length will remain the same.

## Hold

If you want an axis to not move at all, set it in the *Axes* screen to *Hold*. The *Hold* mode will not be reset to *Auto* each time a record is made (like the *Rec* mode), but it will remain in *Hold* until you change it.

## Slow Play Back

For increased accuracy, it is possible to slow down the speed of the axes that are playing back.



- Push the *Play/Record* tab to open the *Play/Record* screen.
- Push the *Play Speed* button (it has some fps number on it). In the following screen enter a slower fps, in our example 6 fps. Push the *OK* button.
- Now when you record a new axis, all previously recorded axis will play back much slower.

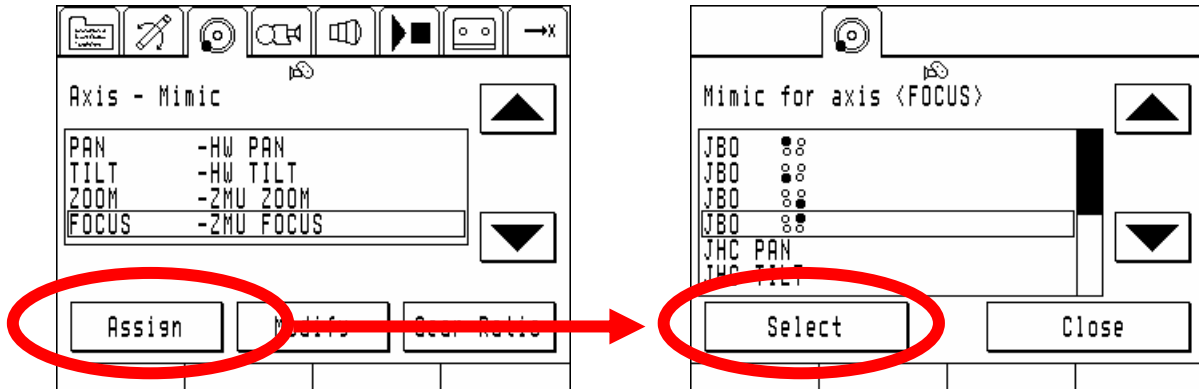
### 3.8. Reassigning Mimics

When the basic ARRIMOTION system is turned on, it will scan all available axes and Mimics, and assign by default the hand wheels as Mimics for the CHM-1 motors, and the Lens Control System hand units as Mimics for the CLM-2 motors:

Axis	Default Mimic	Mimic Name
PAN	Hand Wheel Pan	HW PAN
TILT	Hand Wheel Tilt	HW TILT
ZOOM	WHA-2 (with WZU) or ZMU	WHA2 ZOOM or ZMU ZOOM
FOCUS	WHA-2 (with WFU) or ZMU (with FIU)	WHA2 FOCUS or ZMU FOCUS
IRIS	WHA-2 (with WFU) or ZMU (with FIU)	WHA2 IRIS or ZMU IRIS

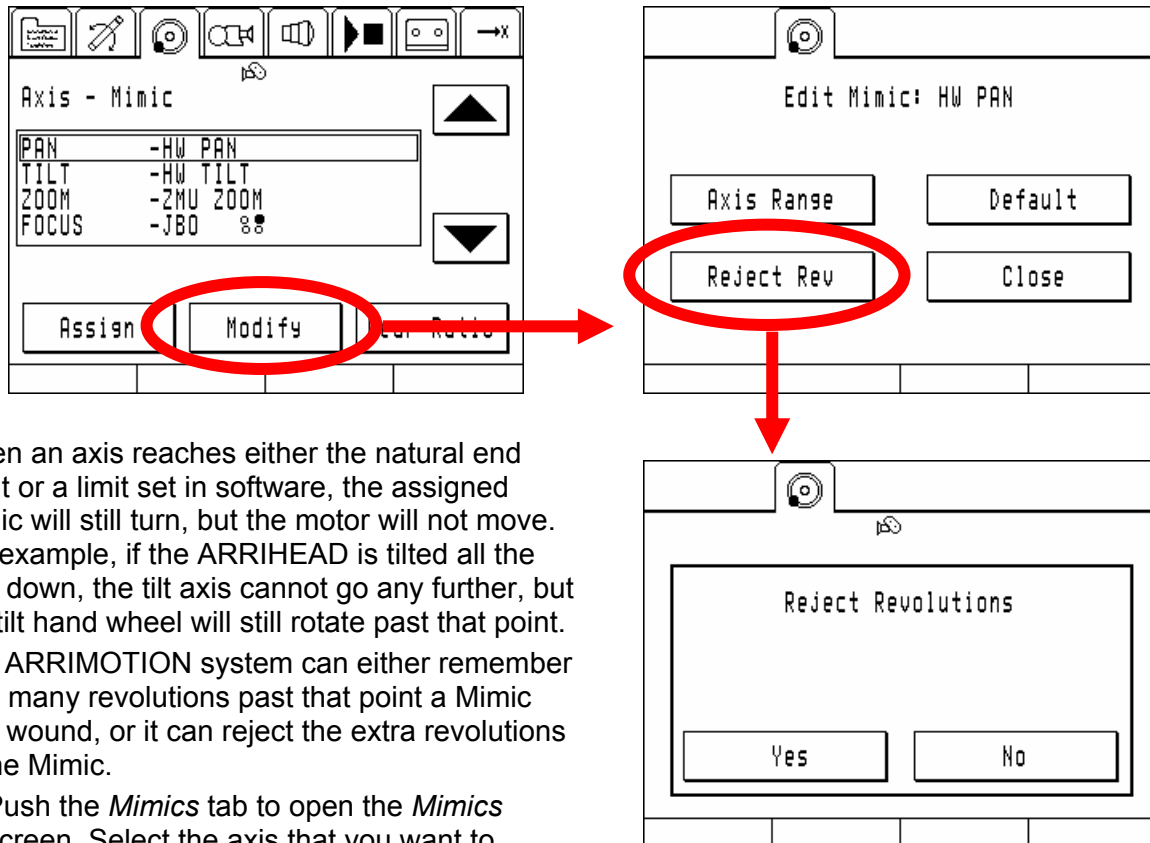
Note that if you have multiple MCBs or LCBs in a main controller, the ARRIMOTION system will automatically assign the CHM-1 or CLM-2 motors plugged into the MCB or LCB that is closest to the CCB. All other axes have to be configured manually.

It is, of course, also possible to assign the axes to other Mimics.



- Push the *Play/Record* tab to open the *Play/Record* screen and turn *Connect* on. This will allow you to test your new Mimic assignment quickly.
- Push the *Mimics* tab to open the *Mimics* screen. Select the axis to re-assign in the list. In our example we chose *FOCUS*.
- Push the *Assign* button.
- You will be presented with a list of all available Mimics. Select one (we chose the top right Jog-shuttle of the Jogbox) and push *Select*.
- Now operate the Jogbox top right Job-shuttle to see how it moves the focus.

### 3.9. Rejecting Revolutions



When an axis reaches either the natural end point or a limit set in software, the assigned Mimic will still turn, but the motor will not move. For example, if the ARRIHEAD is tilted all the way down, the tilt axis cannot go any further, but the tilt hand wheel will still rotate past that point. The ARRIMOTION system can either remember how many revolutions past that point a Mimic was wound, or it can reject the extra revolutions of the Mimic.

- Push the *Mimics* tab to open the *Mimics* screen. Select the axis that you want to change (in our example the PAN axis) and push the *Modify* button.
- In the *Edit Mimic: HW PAN* screen, push the *Reject Rev* button.
- If you want the extra revolutions rejected, push *Yes*.

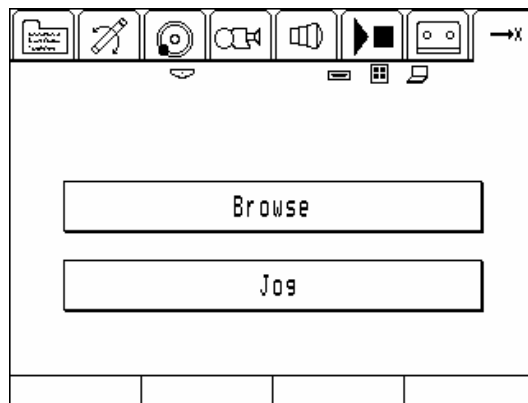


### 3.10.Jogging / Browsing

The rightmost Tab in the Jogboxscreen is assigned to the jog/browse menu.

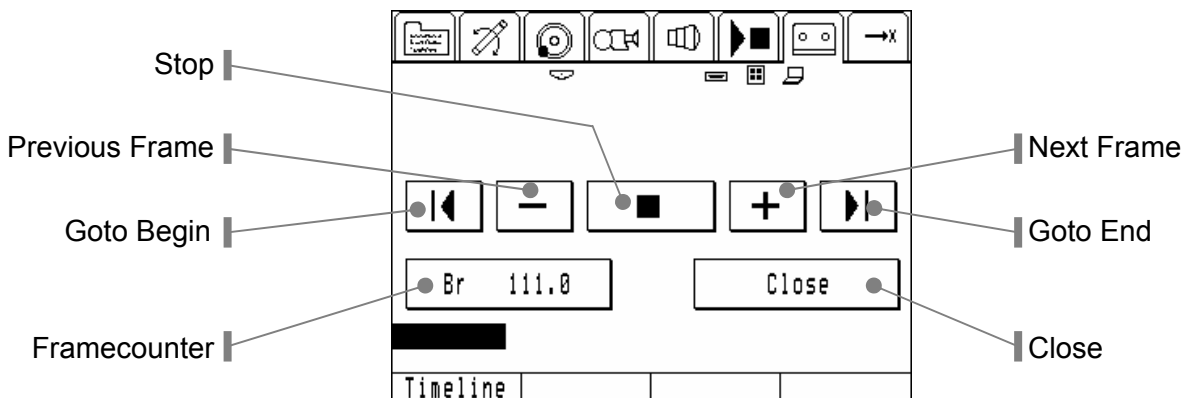
The browsing enables the system to move through the timeline of the move, the jog function enables the system to move the axes with the jog/shuttles of the jogbox.

Browsing is very usefull for the careful examination of the programmed move while jogging will be used for keyframing in combination with the laptop software.



Browse/Jog menu

#### The Browsing Menu



When the system is not on move the browsing, the jog shuttle for the timeline, the goto previous and the goto next frame buttons are disabled.

The system can be brought onto the move by either pressing goto begin, goto end or entering a frame number in the framecounter.

#### The Framecounter Button

The Framecounter Button shows either "Not on Move" when the system is not on the waypath of the move or the current frame number of the move. By pressing the button a frame number can be entered and the system will move to that frame after entering the number.

Frame numbers without fractionals are the accurate mid shutter open position of the camera.

**The goto previous / goto next Frame buttons**

By these buttons the system can be brought accurately to the next or previous frame.

### 3.11.GPI Outputs


**Danger**

The GPI outputs must not be connected with voltages / currents higher than rated.


**Danger**

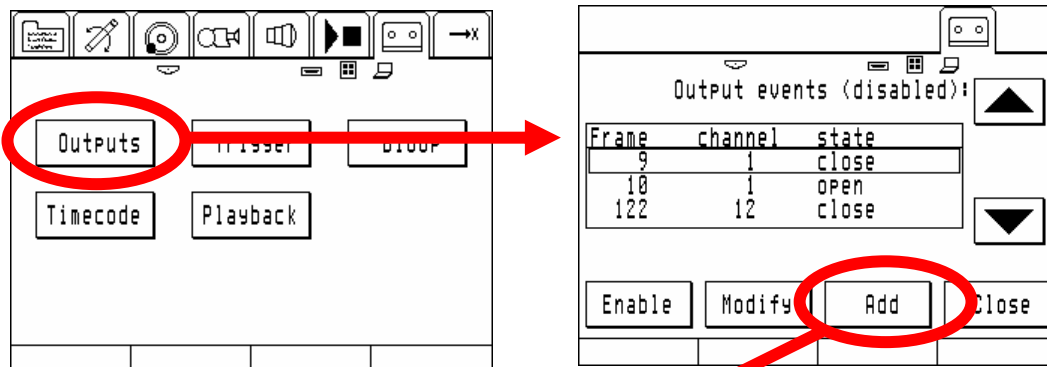
Every device connected to these GPI outputs must be secured by an external safety device according to the regulations that apply in your country.

GPI (General Purpose Interface) Outputs are simple relay contacts that can be triggered to close or open on certain frame numbers. These contacts can be used to control a plethora of things like lamps in miniatures, igniters, magnetic valves,

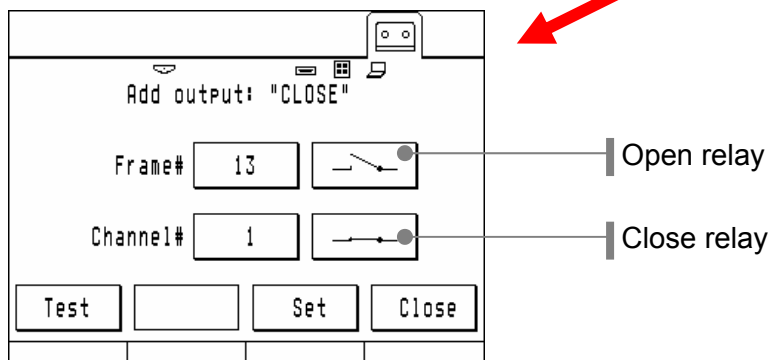
The GPI Channels will change its state always in the mid shutter closed position (the position which is exactly between two frames).

#### Defining an GPI Output Event

Select the GPI Menu and select Outputs



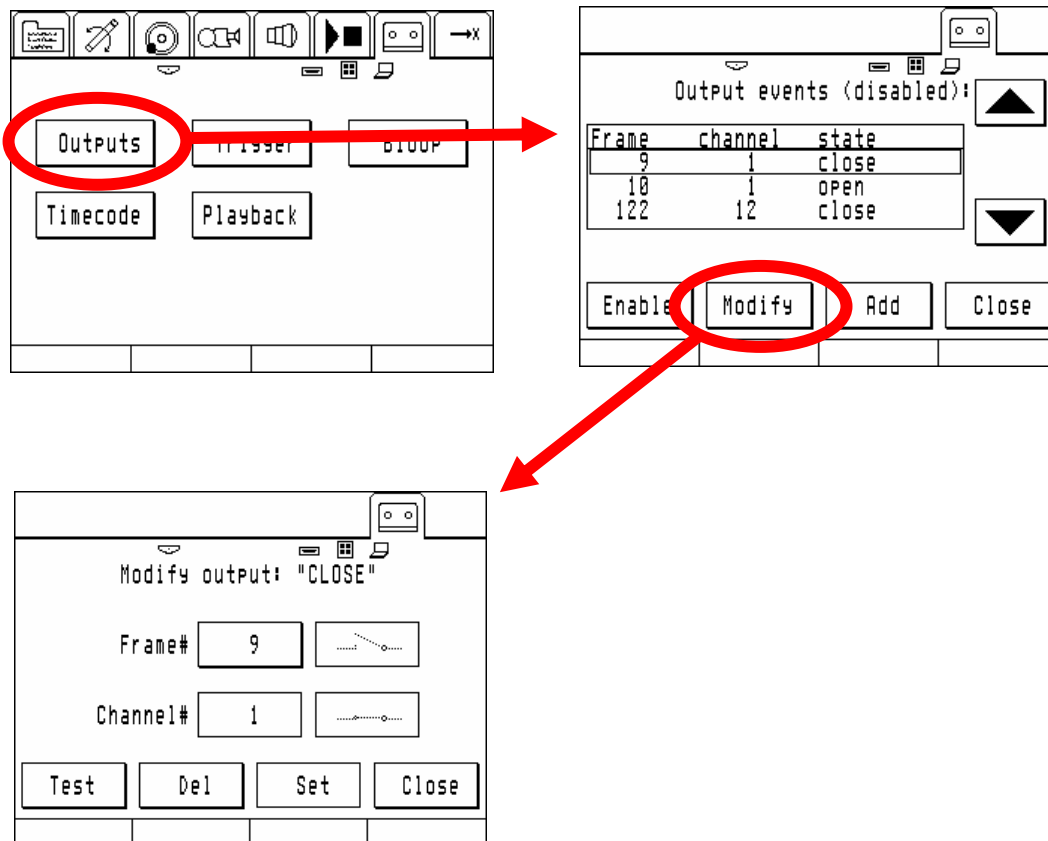
Now select add



Now enter a frame number and an output channel and select whether the relay contact should close or open at that frame. If this has been done confirm the data by pressing set. With the test function it is possible to check the relay output.

## Modifying or Deleting

Select the GPI Menu and select Outputs

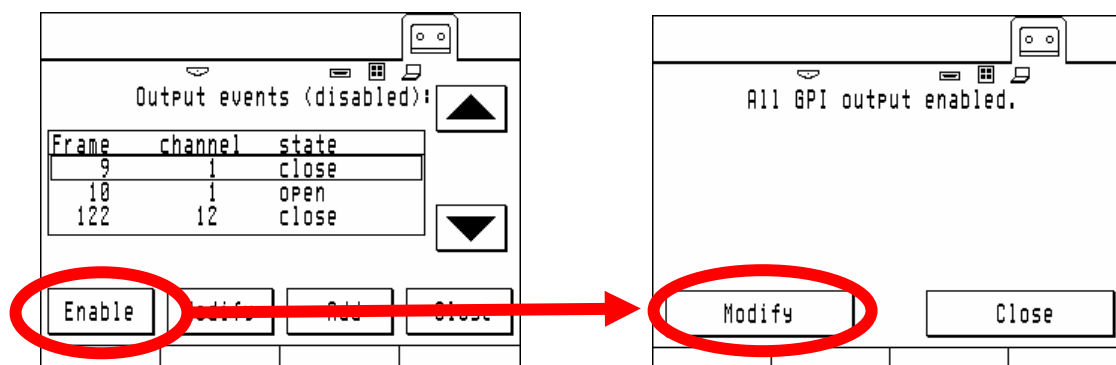


The event can be deleted by pressing Del.

It is possible to modify the frame number of the GPI output by changing the frame number and the confirming the frame number with set. The range in that the frame number can be changed is limited by the frame number of the previous and the next GPI output event on that channel.

## Enabling and Disabling GPI Outputs

All GPI outputs can be globally enabled or disabled. The default setting after power on or loading a move is disabled.



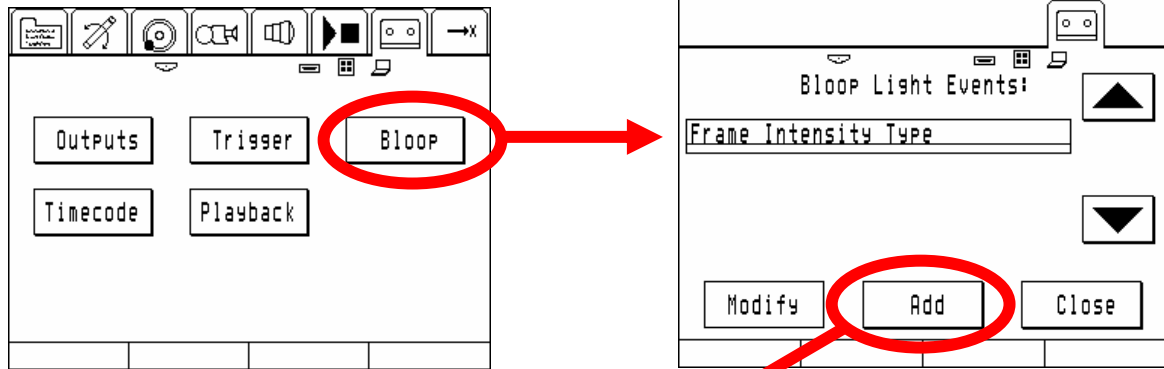
## Important Note on GPI Outputs

If GPI events are defined in a move the GPI Box has to be present to enable the system to play the move back. If a GPI Box is not present all outputs have to be disabled to enable the system to play back the move.

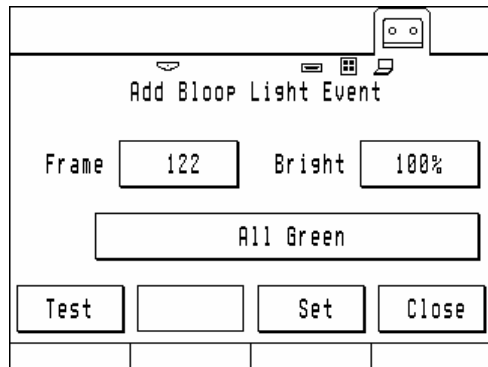
### 3.12.The Bloop Light Setup

One of the advantages of the Arrimotion system is that it supports a multi colored bloop light and a bloop light event list.

To setup the bloop light go to the GPI menu and push the Bloop button



Push add to add a bloop light event



Enter a frame number, a brightness and pattern.

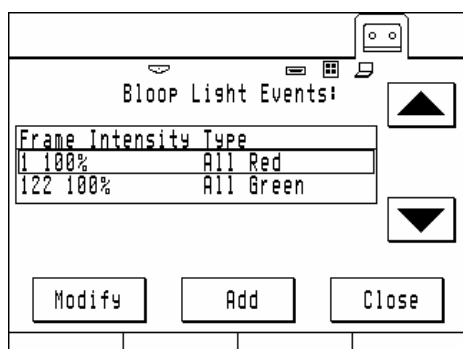
A typical setting is Frame 1, 100% brightness and all red/green.

Here we have defined a second event on frame 122.

This feature is particular useful when doing part moves (The second event is defined on the start frame of the part move).

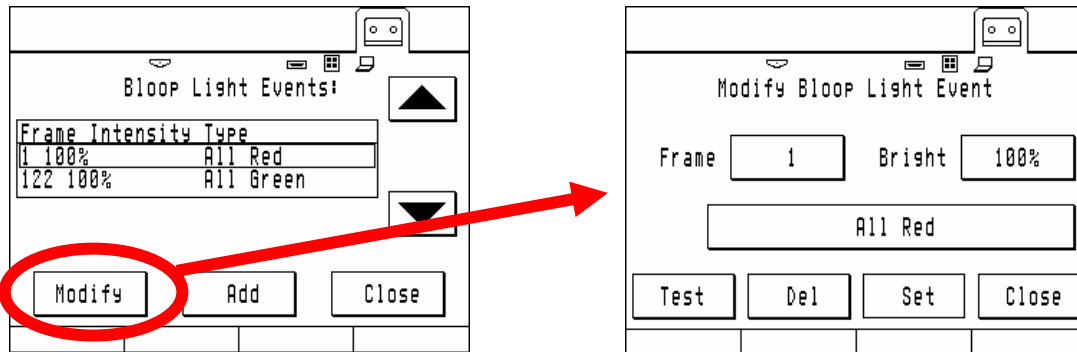
The test button can be used to check the selected pattern and brightness of the BLT-1.

After pushing close the events list will look as following:



## Modifying or Deleting a BLT-1 Event

Select the desired event and push modify



It is now possible to change the pattern intensity or the frame number of the event.

When pushing Del the event will be deleted.

## Important Notes on Bloop Events

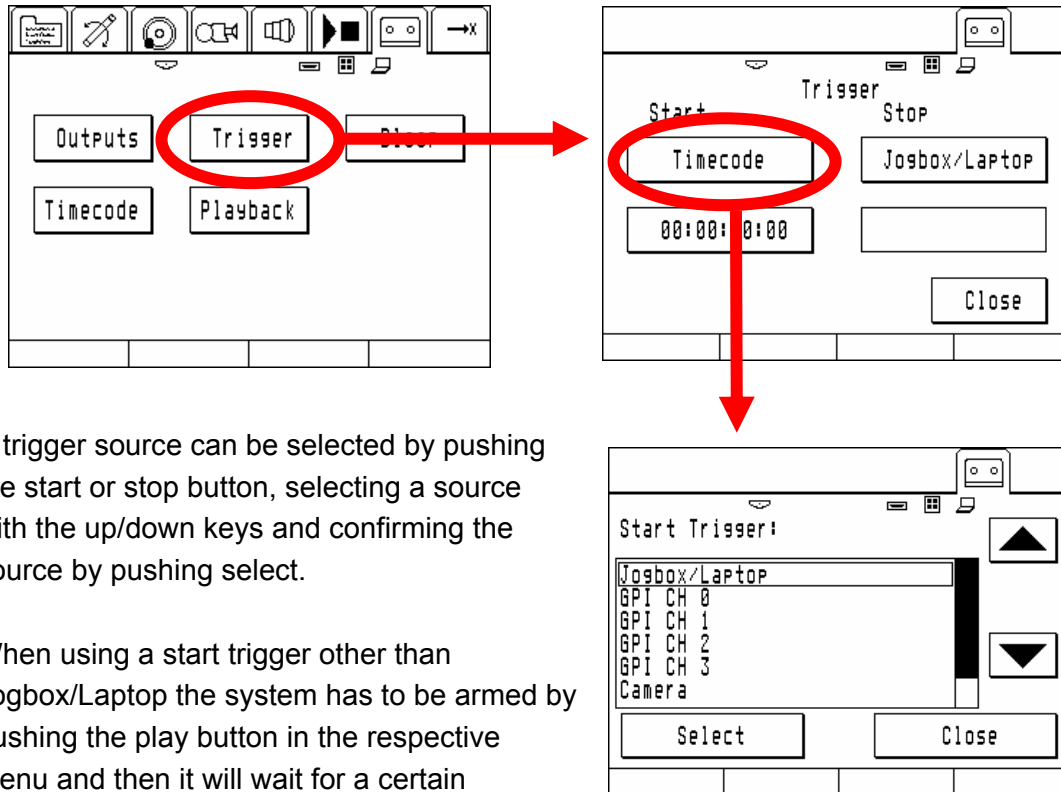
If Bloop events are defined in a move the bloop light has to be present to enable the system to play the move back. If a bloop light is not available all events that are defined in a move have to be deleted to enable the system to play back the move.

When the system is playing back a move on very low fps the system can not be stopped during the time the bloop light flashes.

### 3.13.GPI Triggers

The system can be started or stopped with external triggers.

To select external trigger modes push the Trigger button in the GPI menu.



A trigger source can be selected by pushing the start or stop button, selecting a source with the up/down keys and confirming the source by pushing select.

When using a start trigger other than Jogbox/Laptop the system has to be armed by pushing the play button in the respective menu and then it will wait for a certain period (30 sec) for the trigger. If the trigger doesn't occur within that time the system disarms for safety reasons and has to be rearmed by pushing play again.

The following sources are available:

#### Jogbox/Laptop

The move can be started / stoped by the corresponding buttons on the laptop or the jogbox (default).

#### GPI Channels

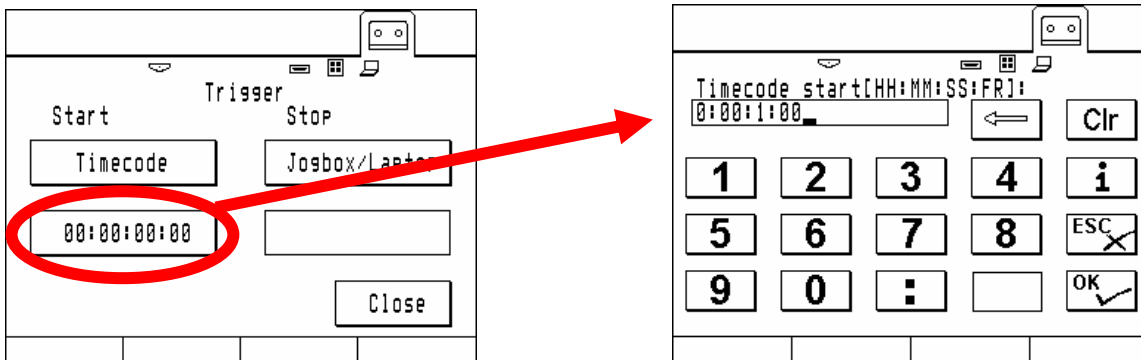
The move can be started or stopped by applying a signal to the respective GPI input.

#### Camera

Not yet implemented

## Timecode

The system will wait for a timecode value defined in the timecode window under the start trigger source button to appear on the timecode input.



Push the button near TC Type to select the timecode type (either based on 24, 25, or 30fps).

The TC Start Value is the timecode value is sent for frame 1.

Use the following format for entering the timecode: hh:mm:ss:ff Use a colon for separation.

Leading zeroes are not required.



### 3.14. Timecode In/Out

Arrimotion generates a timecode that is synchronized to the move.

The timecode is based either on 24, 25 or 30 frames (non drop).

The timecode will be sent out in real time when playing back or recording at 24, 25 or 30fps.

When the system is playing at a non timecode speed the timecode will be sent out based on the selected TC rate (24, 25 or 30 fps).

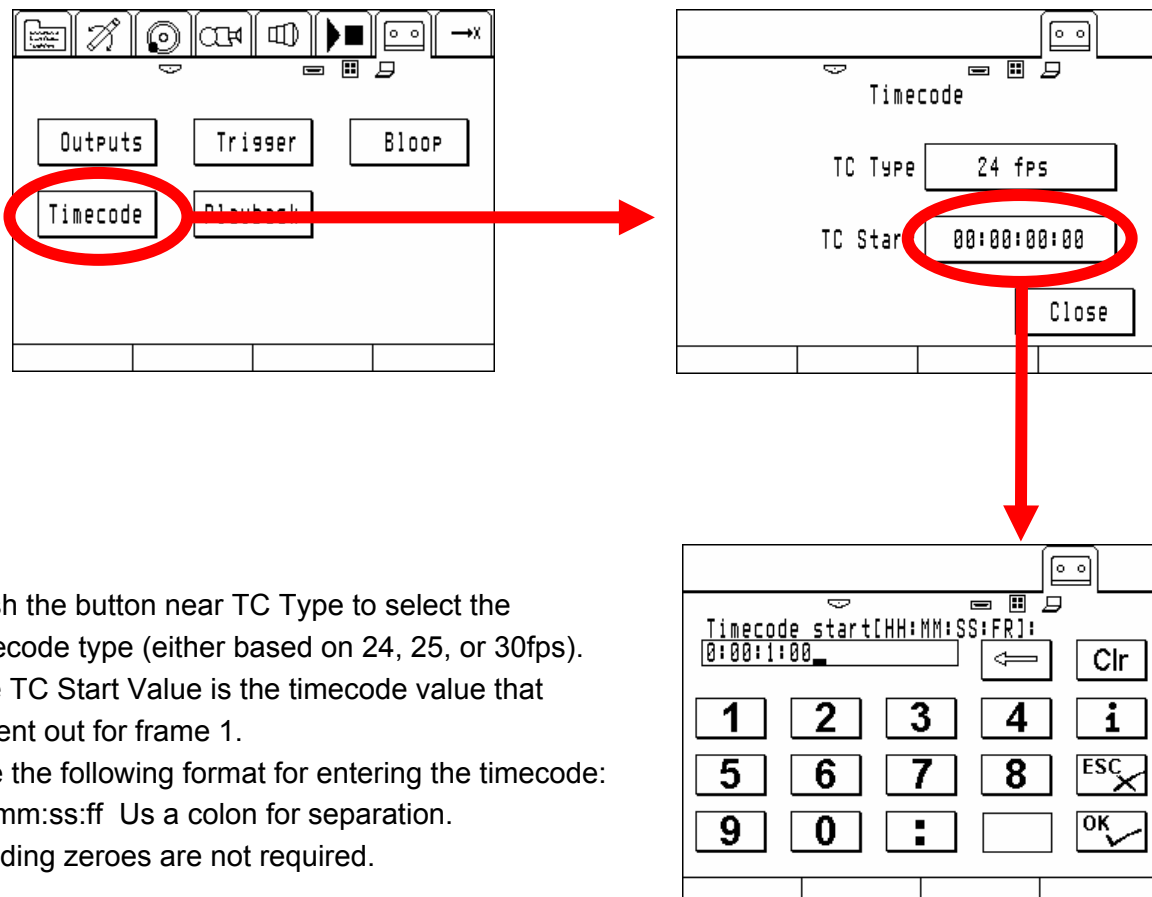
When the playback is done with low frame rates some timecode values will be sent out several times per frame.

When the playback is done with very high frame rates timecode will be sent out whenever a new timecode value can be sent but the system might drop certain values.

E.g. when shooting at 150fps with a timecode base speed of 30 fps only every 5<sup>th</sup> timecode value will be sent out.

#### Timecode setup

Select timecode in the GPI menu



Push the button near TC Type to select the timecode type (either based on 24, 25, or 30fps).

The TC Start Value is the timecode value that is sent out for frame 1.

Use the following format for entering the timecode:  
hh:mm:ss:ff Use a colon for separation.

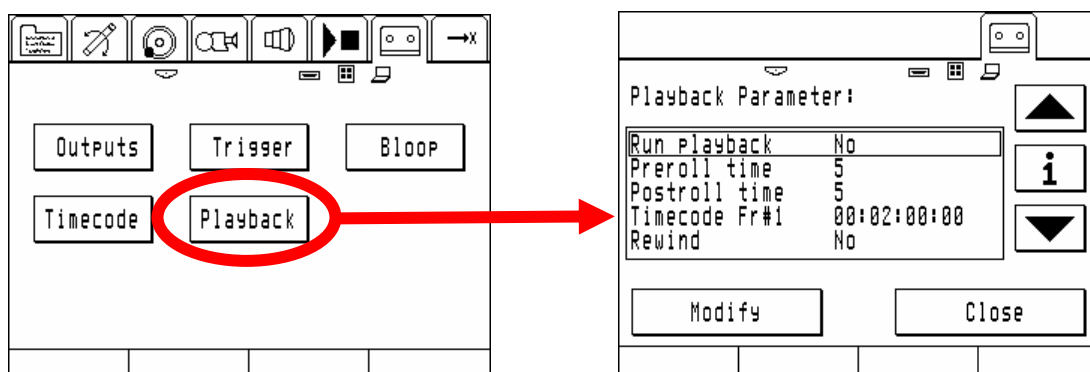
Leading zeroes are not required.

### 3.15.VTR Control

The Arrimotion system can control any VTR that is compatible to the Sony™ RS 422 Control 1™ protocol. This is particular useful when shooting music videos to synchronize the actors or for synchronizing actors on multiple passes.

The VTR has to be connected to the SER-2 output.

To select the VTR control push Playback in the GPI menu



The following parameters can be set in the playback menu:

#### Run Playback

The control of the VTR can be switched on and off. When off the VTR is not controlled by Arrimotion, when set to on Arrimotion controls the VTR.

#### Preroll time

This is the duration in seconds where the VTR is started before the timecode for frame 1.

Take care that there is sufficient preroll on the tape with uninterrupted timecode.

The minimum value is five seconds.

#### Postroll time

This is the duration in seconds how long the VTR continues to roll after the end of the move.

#### Timecode Fr#1

This is the timecode value that is synchronized to frame one of the move.

#### Rewind

When rewind is selected then the VTR is automatically winded to the cue-in after the end of the move. Cue in is the value of timecode fr#1 minus the preroll time.

When rewind is not selected the VTR will be cued up when the move is started (this can result in a delay).

## 3.16. Operating the Panther dolly

### Prerequisites

Prior to operating the dolly the setup and tests described in the hardware section of this manual have to be carried out.

### Special operation mode of the ACB-1

The ACB-1 will automatically assign the AUX-1 Axis to the drive and the AUX-2 axis to the lift axis. Since the panther axes are not automatically detected the ACB-AUX1 and ACB-AUX2 axes have to be added manually.

Before adding the axes make sure that the Panther dolly is connected and switched on.

Due to variations of motors used by Panther for the dolly there are several different sets of control parameters that can only be assigned when the Panther dolly is switched on before adding the lift axis.

When adding the axes the control loop parameters of AUX1 and AUX2 will automatically be set to the parameters required for the Panther drive and lift axes.

**ATTENTION:** Do not alter any of the control loop parameters in the axis configuration menu since this can lead to destruction / oscillation of the system.

### Referencing methods

The panther dolly uses special referencing methods for its axes:

The track (drive) will first move towards the amplifiers side until the proximity switch that is mounted close to the timing belt wheel of the gearbox detects the track end. Then a search sequence for the precision detection of the position of the limit switch is carried out. Afterwards the dolly will run to the drive motor sides direction until the other limit switch detects the opposite track end. Again a search sequence is carried out and after completion the dolly will return to the middle of the track.

The lift axis will move down (or when lower than 12cm upwards) to find the limit switch that is integrated in the panther. Then a precision search for the edge of the switch is carried out and the lift column will afterwards position herself to the lowest position.

### Switching between normal panther mode and motion control mode

The panther dolly is switched to Arrimotion mode as soon as the ACB-1 detects it.

When the dolly is in Arrimotion mode it will display some Error messages on its display that can be ignored except the following:

- Amplifier overload: switch the dolly off and on again to recover. The lift axis has to be homed again after doing so.
- Low Battery: switch off the dolly and replace the batteries.

To bring the dolly back to normal operation switch off the dolly, disconnect the Arrimotion cables and switch it on again.

**Pushbar tricks**

Since the pushbars power is supplied from the Panther dolly it is not operational when the Panther is switched off.

**Saving dolly battery life**

The lift column of the panther draws quite a high current from the batteries when switched on (even when not moving!). To save battery lifetime we recommend the following:

- Switch off the lift axis in the axis dialogue on the jogbox whenever possible. The system will give a warning message prior to any play and record cycle when axes are switched off. Switch on again then when required. The position will not be lost if the axis is switched to off in the axis dialogue so no new homing cycle will be required when switching on again.
- Charge the dolly permanently with the panther charger when in motion control mode by using the long charge cable that attaches directly to the panther.
- Have a set of spare batteries available.
- If the dolly is used for motion control only the internal gas springs can be exchanged to weaker ones or two of them can be removed (diagonal). If there are weaker springs in the dolly no one must ride it anymore.

## 3.17.FAQ / Troubleshooting

### I Cannot Move an Axis

- Are all cables connected properly? Is the system turned on?
- Look in the *Play/Record* screen. The *Connect* button should be on, that is it should have white circles on a black background.
- Look in the *Axes* screen. Unless the axis state is *Ready*, it will not move. If the axes states are *Off*, maybe you forgot to home the system or those axes.
- Look in the *Axes* screen, at the *Mode* column: if the *Axis* is set to *Hold*, it will not move.
- Look in the *Mimic* screen. Is the *Mimic* you are moving really assigned to the axis you thought it was?

### Camera doesn't start

- Are the settings for roll camera in the camera menu correct? Is start camera set to yes? Is roll camera in the main camera menu set to yes?

### Camera starts but Arrimotion doesn't start the move

A typical indication is that after pushing play the system displays a negative framecount (preroll) for some seconds and the stops automatically.

- Is the camera connected to the system?
- If there is a little R/S Distributor box on the right side of the 435 Advanced remove it. These units often cause trouble.
- Is there anything else connected to the R/S socket of the camera? Pull the cable.
- Check camera fps
- Change camera cable

### Camera doesn't accept fps / fps entry not possible

- Is the camera set to PS/CCU?
- Is the camera connected and does the camera displayed in the camera menu match with the camera that is connected?
- Does the Arricam show CCB? Check cabling, remove any other speed controlling accessory
- Change camera cable

### Couldn't set a speed higher than the recording speed

- The play speed scaling factor has not been set to a value  $>1$ . Store your move, clear the data out of memory (file/system menu) and record again after setting the playback speed scaling factor. The factor reduces the top speed and accelerations of all motors to ensure that a faster playback is definitely possible.
- Is the desired speed possible with the connected and/or selected camera?

### The system will not move in GoMotion or Stop Motion in the Play Menu

- Press the Frame Counter Button to bring the system on the move. This will enable the browsing, Goto start, Goto stop and Play button

**I can not replay a move that was created with an older software version**

- Go to the trigger menu and select a valid start trigger like Jogbox/Laptop. The old file format doesn't support triggers, so no valid setting for the start trigger will be in the system after loading an old move.

**I have a 435A camera connected with a K-CAM-CCB2 and it does not work in Live Action**

- The K-CAM-CCB2 currently supports only stop and go motion operation in software versions below V2.0

**I can not get Ethernet connection to my CCB**

- Please check all the required settings with your system administrator as described in the network setup document that is included in the update file package.

**I have selected a certain Frame for the begin (end) of a part move but when I select go to start (end) in the play menu it doesn't hit this frame**

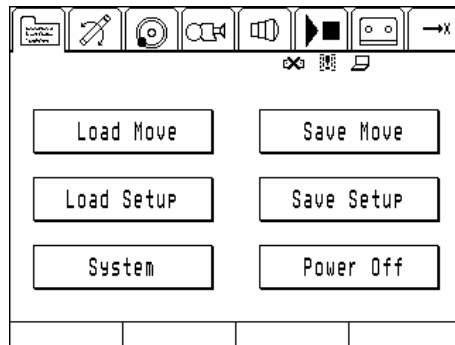
- The system will need a certain time to come up to speed so it goes to a position that is somewhere before this frame to pick up the speed. This is called a preroll (postroll) and is not a malfunction of the system. The length depends on the allowed accelerations of the axes and the speed of the start frame.

**We need to synchronize an actor (event) to the Arrimotion system**

- The best method is to record the action with the actor so the camera reacts to the actor and not vice versa. If this is not possible there are several other methods
- Use a GPI box to switch lights, buzzers,.... or any other device suitable for Your application. The events can be programmed frame accurate.
- Use more than one bloop light events. For example set a all red/green event on frame one as a reference for the post and then program different colours/patterns to trigger actors,...
- Connect a buzzer or a LED lamp to the connector on top fo the bloop light for marking frames / triggering events. This is very suitable if an actor can not look at anything since it might be in frame
- If an actor has to interact with himself in multiple passes ("multiplicity") You can record the first pass with the actor. While recording thhe first pass You can record the Audio of the actor and the video assist image of the camera on a VTR that has a RS422 control input. For the second pass synchronize the VTR to arrimotion. You will find out the correct timecode value for frame one by searching the bloop light on the video image. From now on provide him the Audio as a playback.
- Use the timecode output of the system and feed it into a timecode display or slate, this will give a nice countdown for the actors
- If You need to synchronize lighting use the timecode out of arrimotion and feed it into the lighting control desk
- When shooting a music video use either a VTR with the soundtrack that is controlled from arrimotion as a playback or trigger arrimotion from the playback timecode.

# **4. Software Reference**

## 4.1. The File Menu



The file menu offers the options of loading moves and setups, saving them, changing system settings and powering off the systems.

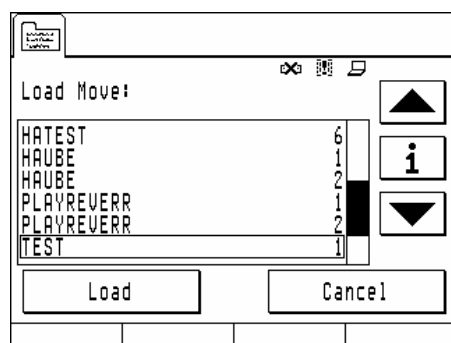
System Setups contain the following data

- axis configuration and their parameters
- mimics connections and settings
- camera settings
- play mode settings
- bloop light events
- trigger events
- output settings

Moves contain the same data as a setup but additional the motion data for each axis.

Move and Setup file do not contain system specific information like the IP-address of the CCB or their name.

### The Load Move Menu



In this menu a move can be selected by the up and down keys and loaded by pushing load.

With the information button information on the selected move like the date it was recorded can be displayed. The menu can be exited without loading a move by pushing cancel.



## The Save Move Menu

To save a move push the large move name button and enter a move name. The move name must consist of at least one character. A whole group of moves can be saved under the same name with different version (take) numbers.

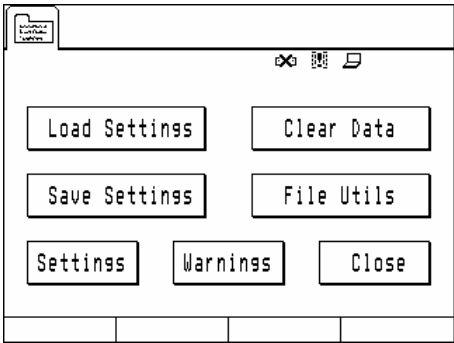
## The Load Setup Menu

A setup can be loaded by selecting it with the up/down keys and then pushing load. Information on the setup can be displayed by pushing the info button. Due to the unified data structure a setup can be extracted of each stored move.

## The Save Setup Menu

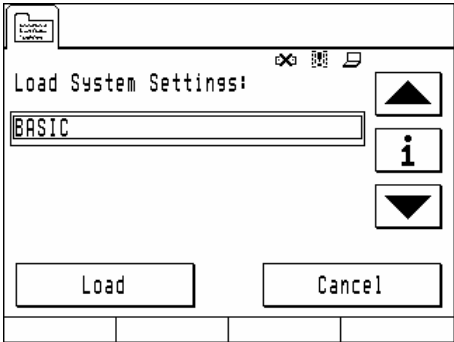
A system setup can be saved in this menu. The name of the setup has to contain at least one character. Due to the unified data structure of the system a setup with the same name as a move will overwrite the move (the system will give you a warning). This function is particular useful when the system has to be pre configured on a prep day to decrease setup time on the shooting day.

**The System menu**



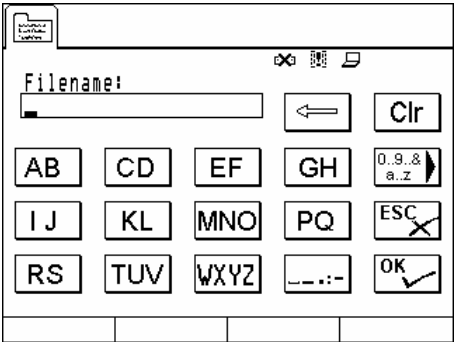
The system menu is for customizing the system for different needs and/or operators. System settings could be saved, loaded and changed.

The Load Settings Menu



This menu will display a list of stored settings.

The Save Settings Menu



A setup can be stored in this menu. The name of the setup has to contain at least one character.

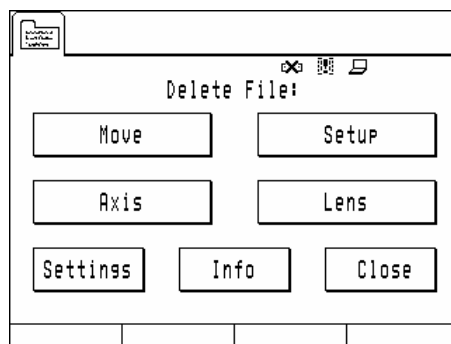
### The Clear Data Menu



This function will clear all move data in the RAM of the CCB and set the mode to live action / normal.

This function can be used to enable the play back speed scaling functionality when a new move should be created but there is old data in the RAM.

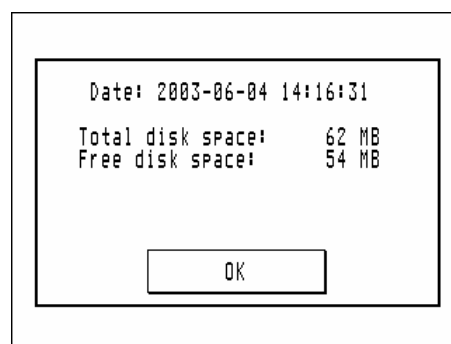
### The File Utils Menu



All user data like moves, setups, axis config, lens config and system settings can be deleted in this menu.

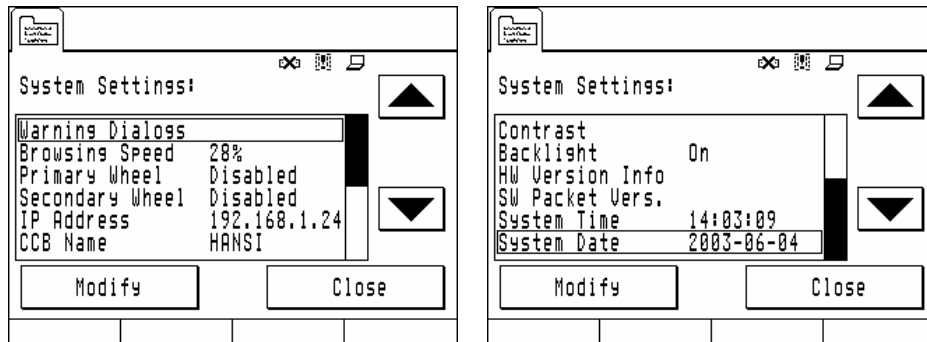
**WARNING:** There is no undo function after a file has been deleted.  
Backup your files on a PC before deleting them.

### The Info menu



The info menu will display the amount of installed and available hard disk space.

## The Settings menu



The following system parameters can be changed here:

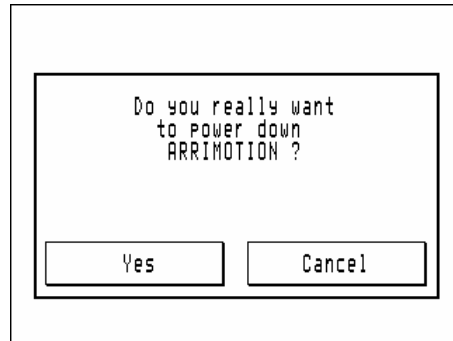
- Warning dialogs will present a list of all warnings that can be displayed by the system. Each dialog can be switched on or off.
- Browsing speed will set the maximum speed in percent of the move speed for browsing.
- Primary wheel sets which of the four jog/shuttles will be used as primary. The primary jog shuttle will have the following functions in the user interface
  - Browsing in the browse menu and the single frame player
  - Lens calibration in the Lens Menu
- Secondary Wheel sets which of the four jog/shuttles will be used as secondary. The secondary jog shuttle will have the following functions in the user interface
  - Not supported in V1.8
- IP-adress sets the IP address of the CCB. The new address will become valid after the next power up of the system. The IP address is related to the CCB and can not be stored in or recalled from a system setup file.
- CCB name will set the CCB Name for the Network. The CCB name is related to the CCB and can not be stored in or recalled from a system setup file.
- Supply allows to set different thresholds depending on the battery type the system is powered from for the low battery warning. The supply setting is related to the CCB and can not be stored in or recalled from a system setup file.
- Contrast adjusts the display contrast. The contrast setting is related to the CCB and can not be stored in or recalled from a system setup file.
- Backlight selects whether the Jogbox Backlight should be on or off
- HW Version info will display a list of all hardware versions of the connected components
- SW Packet Version will display the version of the SW in the CCB
- System Time sets the Time. The System Time is related to the CCB and can not be stored in or recalled from a system setup file.
- System Date sets the Date. The system date is related to the CCB and can not be stored in or recalled from a system setup file.

### The Warnings menu

The warnings menu will display a list with detailed information on current warnings.

The warnings menu is not implemented yet.

### **Power Off**

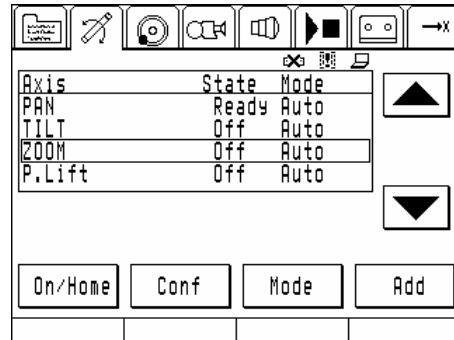


Power Off will switch of the system. Take care that all relevant data has been saved before powering off the system.

#### **Attention:**

Switch off al axes connected to an ACB-1 prior to switching of the Arrimotion system to avoid unintended movement.

## 4.2. The Axis Menu



All axis relevant data and states can be configured in the axis menu. It represents a list of axes that are re-configured.

The list starts with real (physical) axes and is followed by all capture axes.

Real axes are all basically the electrical motors and gears that drive a function in the system.

Examples for real axes are PAN, TILT, FOCUS,...

A physical axis can produce motion.

Capture axes are axes that can only report their positional information but do not have the possibility to reproduce motion by themselves.

Examples for capture axes are the LDS System, the Encoded Arrihead,...

### The On/Home Button

An axis physical axis has to be switched on to enable its motor. This can be done by selecting the desired axis with the up/down keys and then pushing on/home.

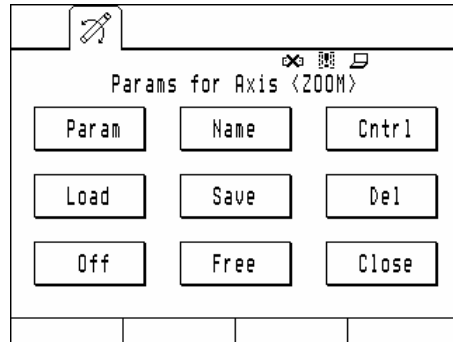
If an axis does not know its absolute position, the "off" indicator right to the axis name will change to "?". The question mark represents that the axis is operational but needs to be referenced. As long as an axis is not referenced it can not be moved by any mimic.

Push the On/Home button again to start referencing the axis.

The axis will then perform the homing sequence that has been set in the axis parameters.

While axes connected to a MCB or ACB are homed a warning dialogue with the option to abort homing will be displayed. When axes connected to an LCB are homed no such dialogue will be displayed to speed up homing of the LCB axes.

## The Conf menu



The Conf menu offers all the tools required to setup an axis and its controller.

There are some restrictions to the axis configuration:

The ZOOM, FOCUS and IRIS motors have to be connected to the leftmost LCB and the axes must be named ZOOM, FOCUS and IRIS to operate as the lens axes in the lens and camera menu.

When using an Encoded Arrihead the following restrictions apply:

The encoded Arrihead and the two CHM motors driving the Arrihead must be connected to the same MCB.

The Arrihead PAN motor must be connected to the PAN socket of the MCB.

The Arrihead TILT motor must be connected to the TILT socket of the MCB.

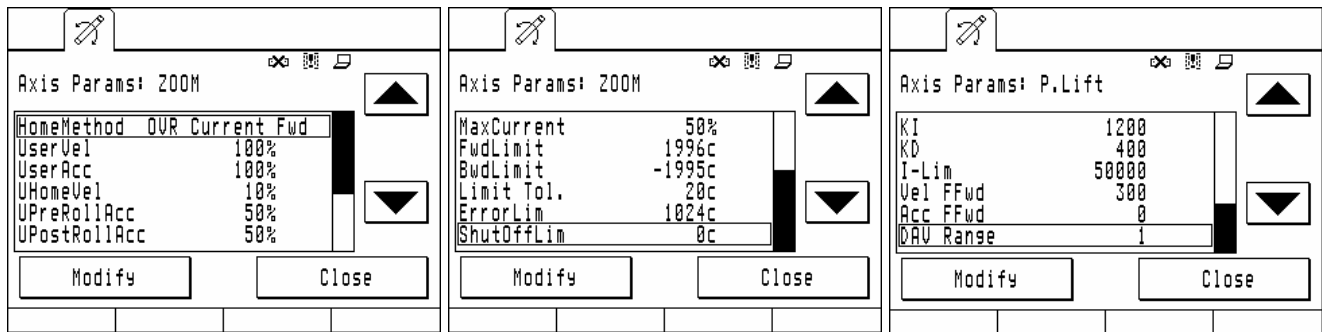
When using an Panther Evolution Dolly System the following restrictions apply:

The Panther CAN-Bus cable, the drive and the lift axis must be connected to the same ACB.

The drive amplifier box must be connected to the AUX-1 socket.

The lift collum cable must be connected to the AUX-2 socket.

## The Param(eter) Menu



Be careful when changing parameters in the conf menu since alteration of parameters can lead to unintended movement, oscillation, instability or damage of an axis.

The following parameters of the selected axis can be configured here

- Homing Method selects the method which is used to figure out the absolute position. Be careful to select a homing method that works with the selected axis.
- User Vel sets the velocity that can be governed by a mimic in percent of the maximum axis velocity.
- User Acc sets the acceleration that can be governed by a mimic in percent of the maximum axis acceleration.
- UPreRollAcc sets the maximum acceleration for the preroll. Do not set the preroll acceleration to a smaller value than the user acceleration.
- UPostRollAcc sets the maximum acceleration for the postroll. Do not set the postroll acceleration to a smaller value than the user acceleration.
- MaxCurrent sets the maximum current for the LCB motors. 50% is a comparable setting to the Lens Control System. This value will also be used as the trip level for the homing by end stop.
- FWD Limit is the maximum position of an axis measured in encoder counts. Some home methods set these limit during homing (all methods that are based on finding two endstops and the panther lift axis)
- REV Limit is the minimum position of an axis measured in encoder counts. Some home methods set these limit during homing (all methods that are based on finding two endstops and the panther lift axis)
- Limit Tolerance in encoder ticks that a motor can overshoot the set limit. This parameter is needed in the case that the detected travel of axis varies after a further homing attempt.
- Error Limit is the maximum allowed Magnitude of the difference between commanded and actual position in ticks that is tolerated by the system without warning.
- Shut off Limit is the Magnitude of the difference between commanded and actual position where a emergency shutoff is done by the axis controller
- KP Proportional term of the control loop (only on ACB-axes)
- KD Derivate term of the control loop (only on ACB-axes)
- KI Integral term of the control loop (only on ACB-axes)
- I Limit maximum magnitude of the integrator component in the summation term of the control loop
- Vel FFWD Velocity feed forward term of the control loop (only on ACB-axes)



- Acc FFWD Acceleration feed forward term of the control loop (only on ACB-axes)
- DAV Range Number of sampling intervals for the derivate term

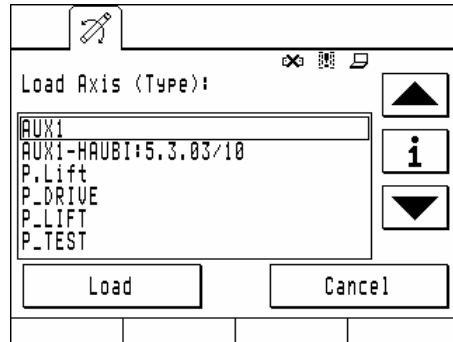
### The Name Menu

This Menu sets the name that is displayed in the axis menu.

### The Cntrl Menu

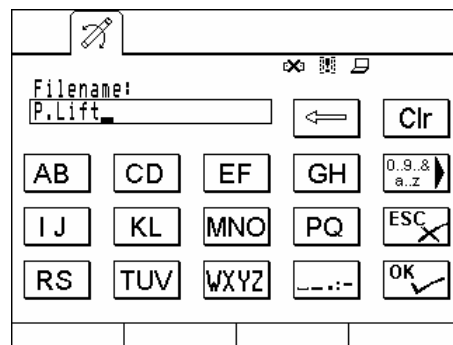
Select the controller that the axis is connected to when the axis is switched to a other controller.

## The Load Menu



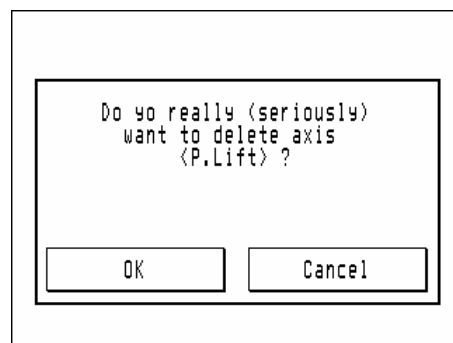
A pre configured axis can be loaded by selecting it from the list box and pushing load.

## The Save Menu



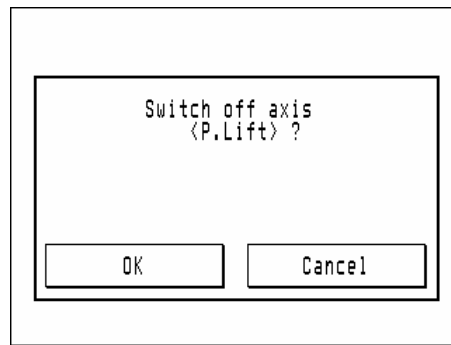
The configuration of a single axis can be saved. The name must contain at least one character.

## The Del(ete) Button



An axis can be deleted from the axis listing by pushing delete.

## The Off Button

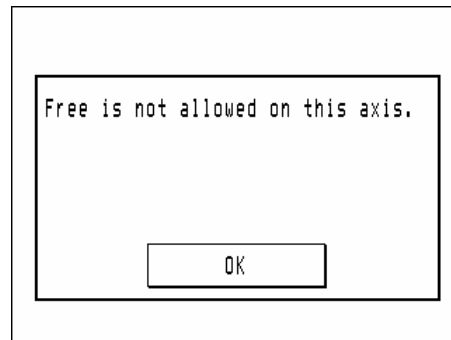


An axis can be switched off by pushing off.

If the axis is fitted with a safety brake the brake will be engaged.

As long as the system is under power and the axis is not disconnected the axis will memorize its position.

## The Free Button



Free releases the control loop on an axis. The axis can be moved manually after switching it to free.

Axes that are fitted with safety brakes can not be switched to free.

Axes with safety brakes are for example

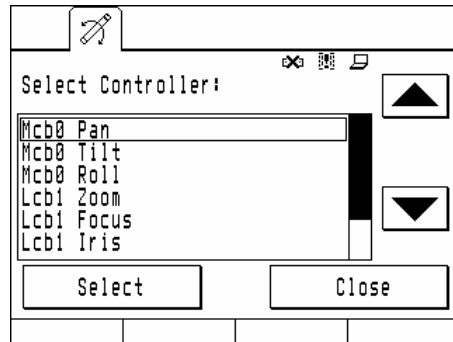
- CHM motors on pan and tilt
- Panther lift
- Panther drive

## The Mode Button

The mode button toggles the axis states

- AUTO: axis is in record if there is no data for that axis and in play as soon as data has been recorded
- REC: axis is set to record new data (in multitrack mode only).
- HOLD: axis holds its current position but will not move during record or playback.

## The Add Menu

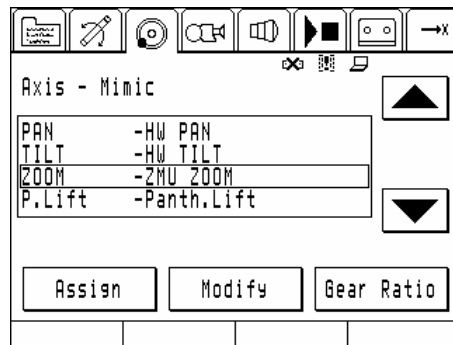


An axis can be added here. All axes connected to an ACB have to be added manually since there is no auto detection method implemented in the ACB.

Axes connected to a second MCB or LCB attached to a CCB will not be auto detected.

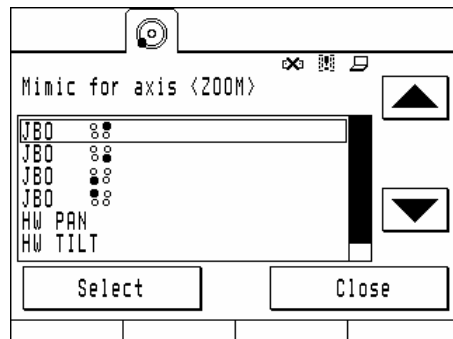
Note: The Panther Evolution has to be switched on before entering the add menu when the correct axis parameters for the drive and lift should be loaded to the ACB on which the Panther CAN bus is connected.

### 4.3. The Mimic Menu



The mimics menu presents a list of axes-mimic relationships. All mimic related parameters can be changed in this menu.

#### The Assign Menu



Each axis will require a mimic assigned to it when it should be moved during recording a move. There is a wizard that automatically assigns mimic to some axes upon power up of the system based on the following rules:

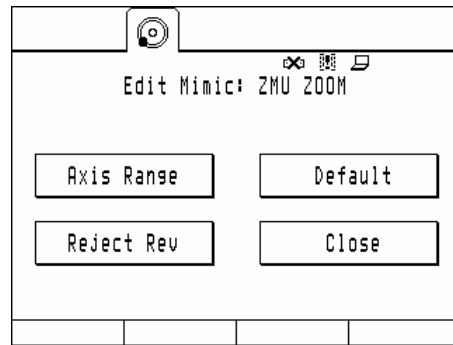
- Each CHM motor will get its own handwheel as a mimic
- The Focus motor will get the WHA-2 WFU Focus mimic or the ZMU-Focus mimic if no WHA-2 was detected.
- The Iris motor will get the WHA-2/WFU Iris mimic or the ZMU-Focus Iris if no WHA-2 was detected.
- The Zoom motor will get the WHA-2/WZU Zoom mimic or the ZMU-Zoom mimic if no WHA-2 was detected.
- The 1<sup>st</sup> axis on the ACB which detects a panther dolly will get the Panther drive axis and will be linked to the force sensitive pushbar if detected.
- The 2nd axis on the ACB which detects a panther dolly will get the Panther lift axis and will be linked to the panther lift controller.

If a move is loaded from the hard disk no auto assignment of mimics will take place to avoid unintentional behavior.

Note: The ZMU has to be switched on before entering the assign menu.

Note: The Panther Evolution has to be switched on before entering the assign menu. Otherwise the push bar and panther lift mimic wouldn't be visible.

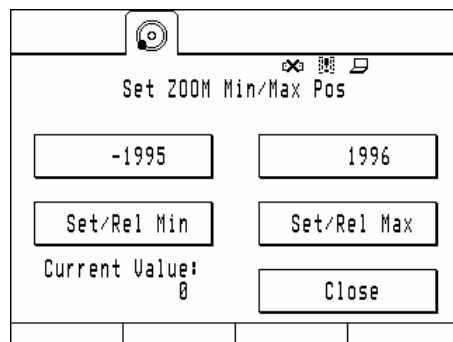
## The Modify Menu



The modify menu offers the following functions:

- Changing the range of an axis (soft stops)
- Resetting the range of an axis to its maximum travel set in the axis configuration menu
- Rejection revolutions

## The Axis Range



If the range of a axis should be limited (e.g. to hit a certain endpoint) this can be done by setting minimum and / or maximum limits for an axis.

Set limits as following:

Figure out if it's the maximum or the minimum limit by moving the axis towards the limit from the desired side and observing the Current Value display.

If the numbers decrease push the Set Min button on the desired position.

If the numbers increase push the Set Max button on the desired position.

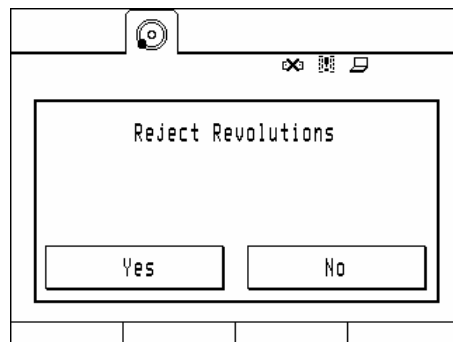
The dampening with which the limits will be hit can be altered by changing the user acceleration parameter in the axis configuration on the corresponding axis.

When a limit is active the corresponding button will toggle to Rel Limit (release limit).

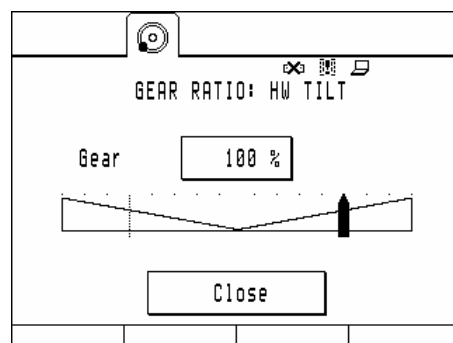
**Attention:** The limits set in the mimics menu will apply to the mimic only; it is called a relative limit. The absolute limits are a different set of limits that limit the total possible travel to the maximum possible of an axis. Do not use the relative mimics as safety limits as they will not apply to loaded moves. If you want to change the axis limits find out the values of these limits by jogging the axis to these positions and set these limits in the axis menu.

The Default Button

Default resets the limits that were set in the mimics menu to the maximum allowed travel of the axis.

The Reject Revolution Menu

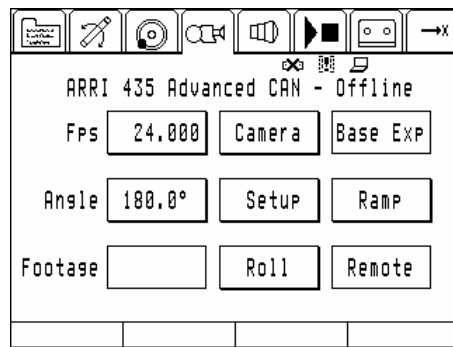
Rejection revolutions is a eat feature of the Arrimotion system: It will take care if You crank a axis into its limits that the mimic will pick up moving the axis accurately on the same position of the mimics wheel where it hit the axis limits. By using this function the system will memorize the pins position (e.g. on the Arrihead) without the need to wind back several turns on the mimic.

**The Gear Ratio Menu**

The gear ratio of a mimic can be changed by pushing the arrow on the screen or by pushing the gear ratio button and entering a gear ratio.

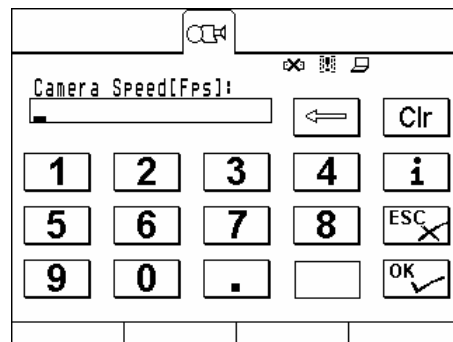
Negative numbers or moving the arrow to the left half of the gear ratio indicator will reverse the direction of the mimic.

## 4.4. The Camera Menu



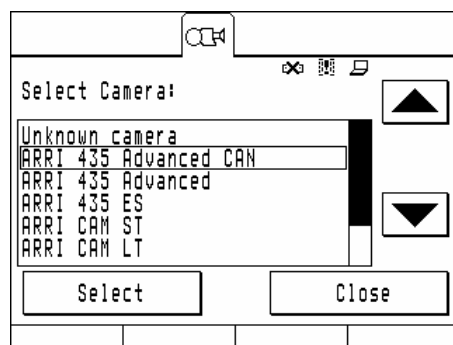
The camera menu allows setting all camera related functions of the Arrimotion system.

### The fps Button



The camera fps is the camera speed that is used to shoot the move. It must be within the limits of the selected camera.

### The Camera Menu



The camera menu displays a list of all cameras that can be used with Arrimotion. Select the camera that is connected to the Arrimotion system.

Arrimotion will synchronize to all cameras except the “435Advanced CAN” and the “Unknown Camera”



The "435 Advanced CAN" is the only camera that is slaved to Arrimotion and allows complete control of all camera functions. This camera is the only camera that can be used for stop motion, go motion and repeatable speed ramping (implemented from V2.0 on)

The "Unknown Camera" is a special camera that can be used when there is no connection to the camera available that sits on the system. It offers the following limits and constraints

- 0.001 to 150fps
- no pre or post roll
- the camera is not synced to the system
- the camera is not started or stopped by the system

This camera type can be used when there is the need of shooting with a camera that can not be connected to the Arrimotion system.

**WARNING:** It might cause problems in post production when the camera is not synchronized to the Arrimotion system.

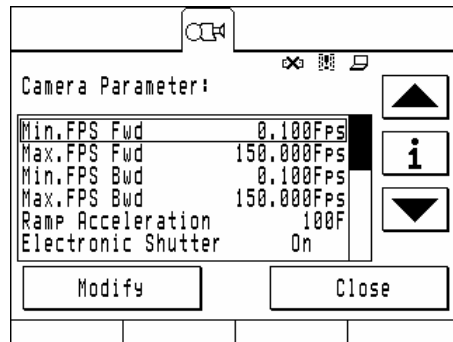
### **The Base Exp(posure) Button**

The Base Exposure function is not yet implemented.

### **The Shutter Angle Button**

This button allows setting the shutter angle on all cameras with an electronic shutter.

## The Setup Menu



The setup menu displays all important limits of the selected camera and allows controlling certain functions of the camera.

### Min FPS Fwd

This indicates the minimum camera speed that the selected camera can run forward.

### Max FPS Fwd

Indicates the maximum camera speed the camera can run forward. This speed can be limited to a lower value by a magazine, the supply voltage or some other parameters. See the corresponding camera manual for further information.

### Min FPS Bwd

This indicates the minimum camera speed that the selected camera can run in reverse.

### Max FPS Bwd

Indicates the maximum camera speed the camera can run in reverse. This speed can be limited to a lower value by a magazine, the supply voltage or some other parameters (some magazines can not run in reverse). See the corresponding camera manual for further information.

### Ramp acceleration (435 Advanced CAN only)

This indicates the maximum ramping acceleration of the camera movement.

### Electronic Shutter

Indicates that an electronic shutter is available and enabled in the camera.

### Min Shutter

Indicates the minimum shutter angle of the camera

### Max Shutter

This indicates the maximum shutter angle of the camera.

### Shutter Speed

This indicates the maximum angular speed of the shutter.

### Shutter pulse phase

Indicates the phase angle of the shutter pulse for synchronization

ICS Status (435 Advanced CAN only)

Indicates the capping shutter status

SFHC

This selects if the external camera has a single frame controller connected (and is not a 435 Advanced over CAN). If this is selected a relay of the GPI Trigger Box with the address 0 is triggered on each exposure.

This option will only work in stop and go motion (trigger position in go-motion might need external post-processing).

Capping while wind (435 Advanced CAN only)

Selects if the capping shutter should be closed while the camera is winding

Wind camera (435 Advanced CAN only)

Wind camera allows winding a camera a defined number of frames forward or backward. This function is only supported on the 435 Advanced connected with a K-CAM-CCB 2.

Wind speed (435 Advanced CAN only)

This indicates the winding speed. The winding speed is set to 5fps.

Run while Record

This selects if the camera should run during record or not. This control can be overridden by the roll camera button in the camera menu.

Start camera (not available with 435 Advanced CAN)

This selects if Arrimotion starts the camera or if this is done manually. If its set to no the camera has to be started manually before playing or recording a move.

Stop camera (not available with 435 Advanced CAN)

This selects if the camera is stopped by Arrimotion after recording / playing a move.

Preroll (not available with 435 Advanced CAN)

This selects the number of preroll frames. The number of preroll frames will be accurate on the 435 Advanced CAN, on all other cameras a slight deviation of the number of frames can occur.

In the 435 Advanced CAN Mode these frames will not be exposed automatically but there is a separate trigger button for them in the camera remote menu.

Postroll (not available with 435 Advanced CAN)

This selects the number of post roll frames. The number of post roll frames will be accurate on the 435 Advanced CAN, on all other cameras a slight deviation of the number of frames can occur.

In the 435 Advanced CAN mode these frames will not be exposed automatically but there is a separate trigger button for them in the camera remote menu.

Direction

Selects the camera shooting direction (forward or reverse)

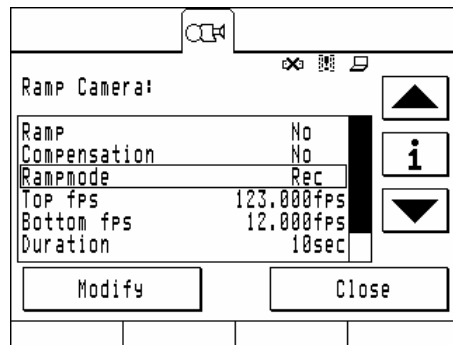
Speed multiplier

This control allows to select multiple camera speeds. The camera will run the move fps times the speed multiplier. This function will not work when the camera is speed ramping.

Run in Reverse Move

This selects if the camera should also run when the move is played in reverse. This function will not work when the camera is speed ramping.

## The Ramp Menu (435 Advanced CAN only)



The ramp menu offers all controls for shutter compensated speed ramps with the 435 Advanced CAN camera.

### Ramp

Selects ramping mode is switched on.

### Compensation

This selects if Shutter compensation is desired. If off no exposure compensation is performed or a ICU can be used to compensate exposure.

### Ramp mode

This selects if the camera ramp is being recorded or played back. Play can only be selected after ramp data has been recorded.

### Ramp mimic

If this control is set to manual the camera speed can be controlled by the mimic that is linked to the camera speed in the mimic menu. If automatic mode is selected the ramp can be started with the corresponding control button of the jog box mimic that is connected to the camera.

Please note that the camera speed can only be controlled with one of the four jog box mimics.

### Top fps

Sets the upper speed limit of the ramping mode

### Bottom fps

Sets the lower limit of the ramping mode

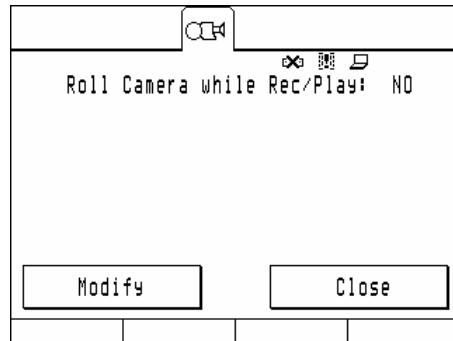
### Duration

This sets the minimum speed to get from bottom to top fps or vice versa.

### The Footage Counter

The footage counter represents the footage counter of the camera. When a 435 Advanced CAN camera is connected to the system the footage counter will switch to a frame counter.

### The Roll Button



The roll button selects if the camera shall be synchronized / run during record and playback or if the camera should stay in standby (e.g. for rehearsals)

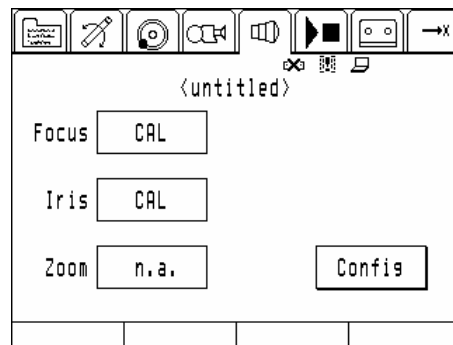
When roll camera is activated with a 435 Advanced CAN camera the camera will enter motion control mode.

### The Remote Menu

The remote menu allows the remote control of the camera like WRC in CAM mode. The screen represents the cameras display and control buttons.

When a 435 Advanced CAN is selected this menu will be limited to a RUN button to shoot slates.

## 4.5. The Lens Menu



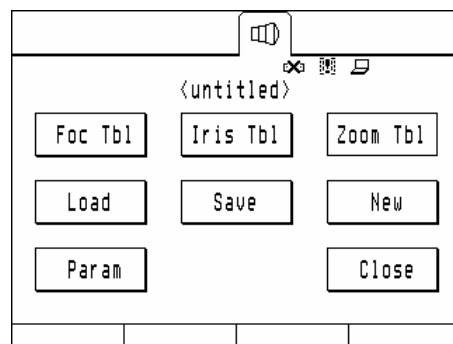
The purpose of the lens menu is the indication of focus, iris and zoom settings in their corresponding measurement units. The conversion from encoder counts is based on conversion tables. These tables can be created, modified, stored and retrieved manually or they will be automatically created based on the LDS system in later software versions.

### The Focus, Iris and Zoom Display

These will indicate the current position of the corresponding lens axis. If they indicate “CAL” the corresponding axis is not yet calibrated or no conversion table is available.

If they indicate “n.a.” the axis is not available or no motor is connected to this axis.

### The Config Menu



The Config menu gives access to the Lens calibration file system and the lens calibration tables.

### The Focus, Iris and Zoom Table Buttons

Focus Value	Position
0.000ft	-10579cnt
0.123ft	-5113cnt
0.153ft	-778cnt
0.183ft	+1723cnt
0.213ft	+3288cnt
2.00ft	+4384cnt
2.30ft	+5215cnt

Buttons: Delete, Add, Close

The correction tables consist of several records of data that contain a pair of encoder ticks to absolute value entries.

Adding values should be carried out by pushing the Add button.

Focus Table:

Value: 0.000ft

Position: +652cnt

Buttons: Set, Close

FOCUS

Move the lens now to the desired position using the primary wheel (as defined in the system menu) and enter the corresponding value by pushing the value button followed by pushing set.

Several entries can be created now. We suggest entering all marked positions of the corresponding lens barrel.

By pushing add new entries can be added, by selecting one of the data with the up/down arrows pairs and pressing delete this data pair could be removed.

### The Load Button

Load Lens:

Buttons: Load, Cancel

The load buttons allows loading calibration tables from the hard disk.

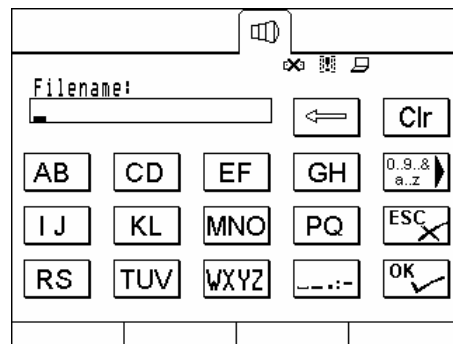
Please not that Arri lenses come in eight different metric and eight different imperial calibrations.

We suggest using exactly the same lens since calibration may vary from lens to lens of the same type. Other manufacturers have individually calibrated lenses so it might be necessary to create a



table for each single lens. The calibration can be done during checkout and the tables can be saved to the internal hard disk. The tables can then be retrieved from the hard disk during shooting to speed up the lens calibration process.

### The Save Button

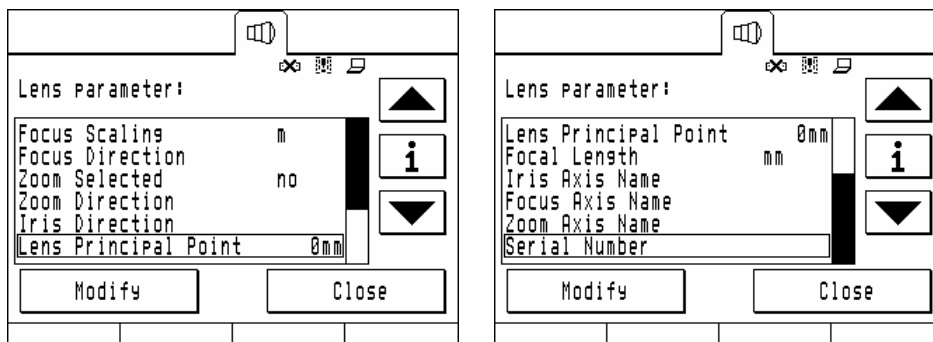


The save button allows to save lens calibration tables to the hard disk.

### The New Button

The new button will delete all calibration information stored in the system (not on the hard disk, so no files will be deleted).

### The Param Menu



#### Focus Scaling

Selects either metric or imperial scaling units

#### Zoom selected

Selects if a zoom lens is used or not

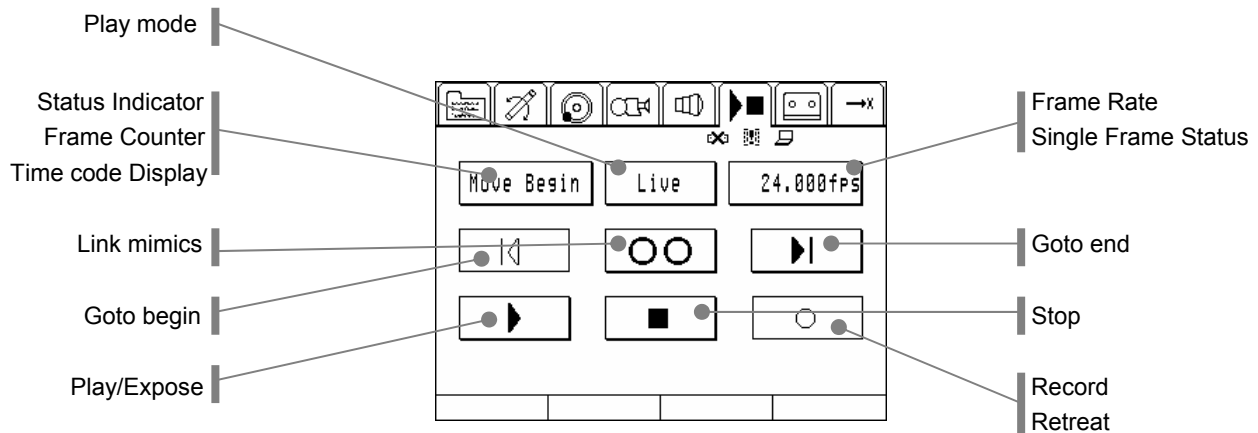
#### Focus direction, Zoom Direction, Iris Direction

Selects the direction of the focus motor (depending on which side of the lens the motor is mounted)

#### Lens principal point

This defines the distance of the principal (nodal) point of the lens to the film plane.

## 4.6. The Rec/Play Menu



This menu is the most important of the system since it enables the user to create, modify and replay moves.

### The Position / Frame counter / Time code Button

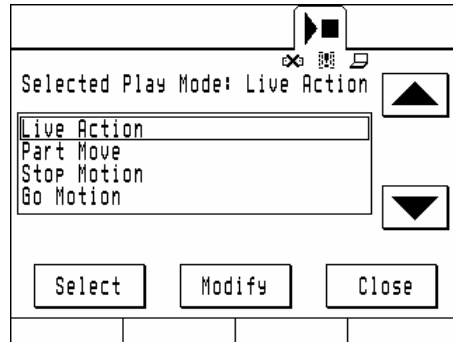
The position counter indicates the current position of the system on the move.

It can be switched from time code to frame count by pushing it.

It will display the following messages

Not on move	The system is not positioned on the move. One or more axes are not positioned on a point of the move. Use the go to start, go to end or the browsing menu to get the system on the move.
No move	No move data is stored in the system. Record a move or load a move from the file menu.

## The Play Mode Menu



The play mode menu allows the selection of the following play modes

Live Action	This is the only mode which allows recording of motion. The recording or the playback can be done at various camera speeds.
Part Move	This mode allows playing back a part of the move.
Stop Motion	This mode will play the move in a frame by frame manner. The camera will not move during exposure. Exposure time could be as small as 1/128s.
Go Motion	Go Motion mode is similar to stop motion but the camera is moving the same amount as she would do in live action. The advantage of go motion is that the recorded images have the similar motion blur as in live action mode. Exposure time could be as small as 1/8 of a second but we suggest to use exposure times well above one second to reduce shake.

### The Select Button

By pushing select one of the above play modes can be selected.

Disable multitrack mode in live action if it was activated before selecting any other play mode.

The Modify Button (Live Action)

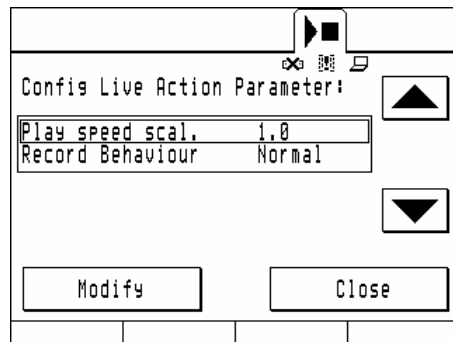
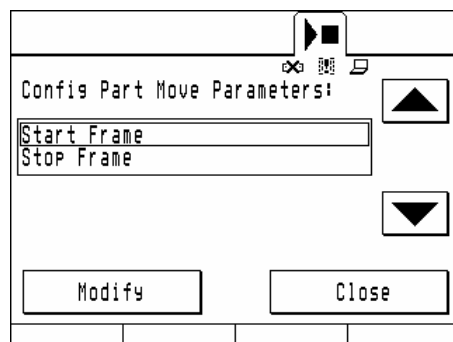
The modify button will give access to the parameters of the selected play mode.

In live action mode the following items can be varied:

**Play speed scaling** If playback at a higher frame rate than the move will be recorded at is required then this multiplier has to be set to the appropriate factor. The maximum possible playback speed is given by the following formula

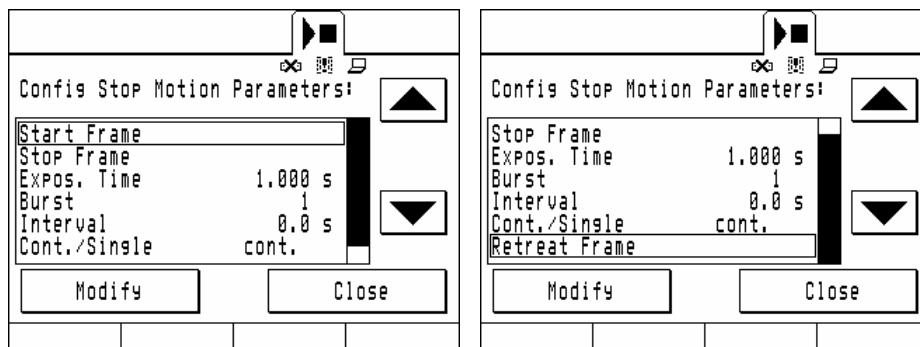
$$MaxPlayfps = Recfps \times Multiplier$$

**Record Behaviour** Normal will record all axes simultaneously.  
Multitrack will enable multitracking -> one or more axes can be re-recorded.  
Select the axes that should be re-recorded in the axis menu

The Modify Button (Part Move)

**Start Frame** Start Frame will define the frame where playback will start.  
If no number is entered the system will start playback at frame one.  
Please not that if some axes are already at speed during frame one a pre roll will be required that can move axes well before their respective positions in the selected start frame.

**Stop Frame** Stop Frame will define the frame number where playback stops. All axes that are still at speed in that frame will do a post roll. The axes can have a certain amount of "overtravel" past the end frame.

The Modify Button (Go- and Stop Motion)

The following parameters can be modified in stop and go motion mode:

Start Frame	First frame of playback (similar to part move)
Stop Frame	Last Frame of playback
Exposure time	Exposure time in seconds. The minimum time is limited to 1/8 of a second in go motion and to 1/128s in stop motion
Burst	Number of exposures in a certain position
Interval	Interval between consecutive exposures. If zero is entered the minimum possible delay will be used.
Cont/Single	Continouos will automatically expose a sequence of frames from the start to the stop frame, Single waits for a trigger on each exposure.
Retreat Frame	For animation work a retreat frame can be defined to give the crew better access (to move the camera and rig out of their way)

### **The fps Button**

This button sets the frame rate in live action and part move mode. During stop and go motion it will give information on the current status of the exposure.

### **The Lock Mimics Button**

Locking mimics will enable the mimics and the axes will exactly follow the positions commanded by the mimics. If the button is not selected the system can e.g. play back moves.

### **The Goto Start Button**

Pushing this button will move the system to the start position. The start position is the begin of the preroll (or frame one in stop motion mode).

### **The Goto End Button**

Pushing this button will move the system to the end position. The start position is the begin of the preroll (or the last frame one in stop motion mode).

### **The Play Button (available in Live Action, Part Move, and in Stop- and Go Motion Mode in continuous mode)**

Pushing play will start the replay of the move. If the system is not on the start or the stop position of the move this button is inactive.

### **The Expose Button (available in Stop- and Go Motion mode with manual exposure instead of the play button)**

Pushing expose will trigger the exposure of a single frame.

### **The Stop Button**

Pushing the stop button will decelerate the system smoothly to standstill.

The stop button is not an emergency cutout button since axes will not stop immediately.

### **The Record Button (available Live Action Mode)**

The record button will trigger the recording of a move. In multitrack mode the button will show a combined play/rec icon.

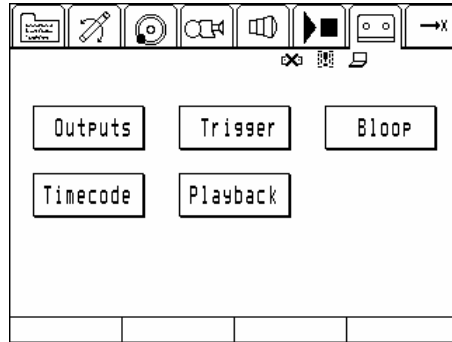
### **The Retreat Button (available in Stop- and Go Motion mode)**

Pushing retreat will move the system on the move to the selected frame.

### **The Timeline Wheel (available in Stop- and Go Motion mode)**

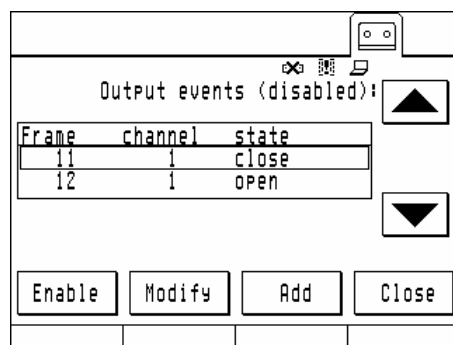
The system will browse through the move when rotating the primary mimic.

## 4.7. The Trigger and Synchronization Menu



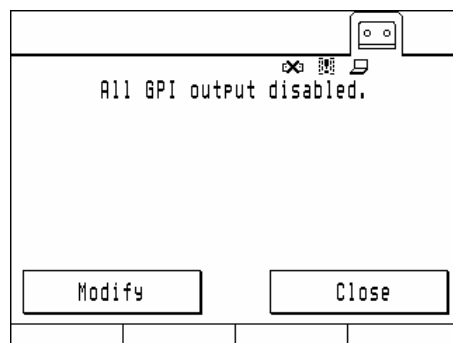
The trigger and sync menu will give access to all functions that are required to either synchronize the arrimotion system to any other device or to control or synchronize any other device from Arrimotion.

### The Outputs Menu



The outputs are Form C relay contacts housed in the GPI trigger box. Each GPI trigger box has eight output channels that can be opened or closed in any frame of the move.

### The Enable Button



The Enable button will globally enable or disable all output relays. This is particularly useful when no action of the relays is required during rehearsals.

### The Modify Button

The modify button will give access to the parameters of a GPI event. The frame number of the event can be edited by pushing the frame button.

### The Add Button

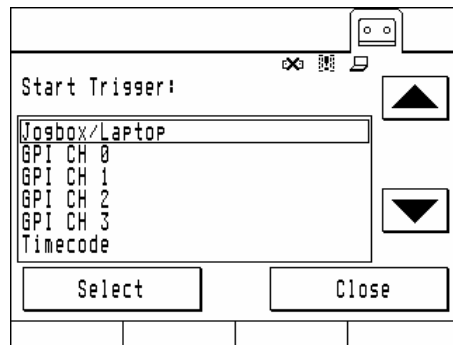
By pushing the add button a new GPI event can be added. Select the frame number, the channel of the GPI event and the event type (open or close relay). By pushing test the corresponding channel will be activated, by pushing Set the event will be added to the event list. Leave the menu by pushing close.

### **The Trigger Menu**

The trigger menu will define the events upon which Arrimotion will start or stop the playback or expose a single frame during the manually triggered stop and go motion mode.



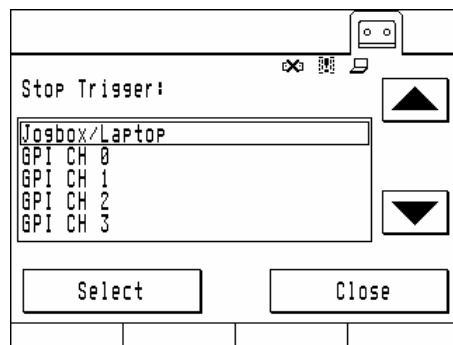
### The Start Trigger Field



The start trigger field defines the type of the event Arrimotion is starting the playback.

If any other event than Jogbox/Laptop has been selected the system has to be armed by pushing the play button in the play menu and then the system waits that the trigger occurs. For safety reasons there is a timeout. If the timeout period is over the system will not accept the trigger anymore and will go back to the play menu.

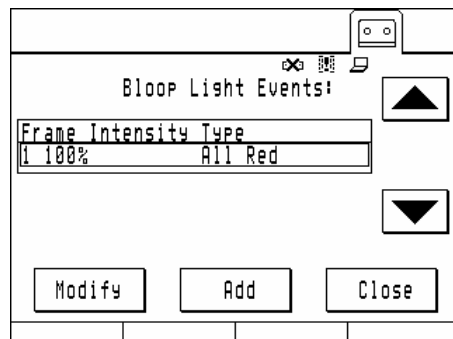
### The Stop Trigger Field



The stop trigger is the event upon arrimotion stops the playback of a move.

The external trigger input must not be used for safety cutout switches since it does not fulfill the safety regulations for cutout switches.

### **The Bloop Menu**



The bloop menu controls the function of the bloop light. It presents a list of bloop events that can be edited.

### The Modify Button

Modify Bloop Light Event			
Frame	1	Bright	100%
All Red			
Test	Del	Set	Close

By selecting a bloop event from the events list and pushing modify the position, intensity and pattern can be edited or the event can be deleted.

By pushing frame a frame number for the bloop event can be entered, by pushing intensity the intensity of the event can be modified and by pushing the event type the pattern can be modified.

To see a preview of the pattern push the test button.

### The Add Button

Add Bloop Light Event			
Frame	1	Bright	100%
All Red			
Test		Set	Close

The add function will create new events. Push set to add the event to the list after all settings for the event are made.

## The Timecode Menu

The Timecode menu interface is a window titled "Timecode". It contains three input fields: "TC Type" with the value "24 fps", "TC Start" with the value "00:00:00:00", and "TC In:" followed by a series of dashes. A "Close" button is located at the bottom right of the menu.

The timecode menu will control the mode of timecode that is being read and sent out by the system. The timecode will be sent out frame rate independent.

### Attention:

If the frame rate of the record/playback is lower than the timecode frame rate of the selected timecode system some values will be sent out more than once, if the frame rate of the record/playback is higher some timecode values will be skipped.

### The TC Type Button

The "Select timecode type" dialog box contains a list box with three options: "24 fps", "25 fps", and "30 fps". Above the list box is the text "Select timecode type:". To the right of the list box are up and down arrow buttons. At the bottom of the dialog are "Select" and "Close" buttons.

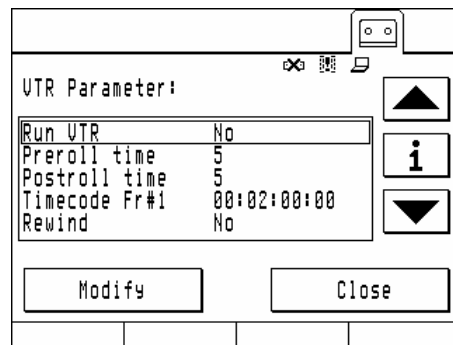
Select the type of time code that is being used. Drop Frame time code is not supported

### The TC Start Button

The "Timecode start" dialog box features a text input field labeled "Timecode start[HH:MM:SS:FR]:" containing the value "00:00:00:00". To the right of the input field is a "Clr" button. Below the input field is a numeric keypad with buttons for digits 1-9, 0, and a colon (:). There are also buttons for "i", "ESC" (with a cross), and "OK" (with a checkmark). A left arrow button is positioned to the left of the "Clr" button.

The time code start button will define the time code number that is sent out on frame one of the move. The time code will be incremented on each frame.

## The Playback Menu



The playback menu offers all controls needed to run a external VTR or ATR in sync with the Arrimotion system.

Since Arrimotion is continuously syncing on the camera the timebase of the VTR or ATR should be at least as precise as the cameras timebase to reduce drift.

Please allow a tolerance of up to three frames when a camera is synchronized to Arrimotion.

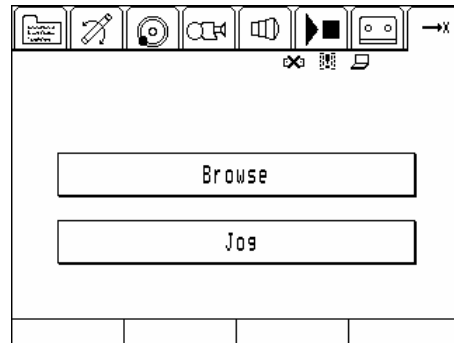
For maximum precision use a 435 Advanced over CAN bus since Arrimotion will have full control over this camera and no camera sync phase is needed.

The control is carried out over RS422 using the Sony® Control 1™ protocol.

The following controls are available in the playback menu

Run VTR	Enables or disables the VTR control
Preroll time	This is the time in seconds that the VTR is cued up to prior to the time code for Frame one. Do not use values less than five seconds.
Postroll time	this is the time in seconds that the VTR continues to play after the playback of the move is finished.
Timecode Fr#1	Defines the time code value that the VTR will be at on frame one of the move.
Rewind	If selected Arrimotion will automatically rewind the VTR to the cue in time code after playback is stopped.

## 4.8. The Browse / Jog Menu

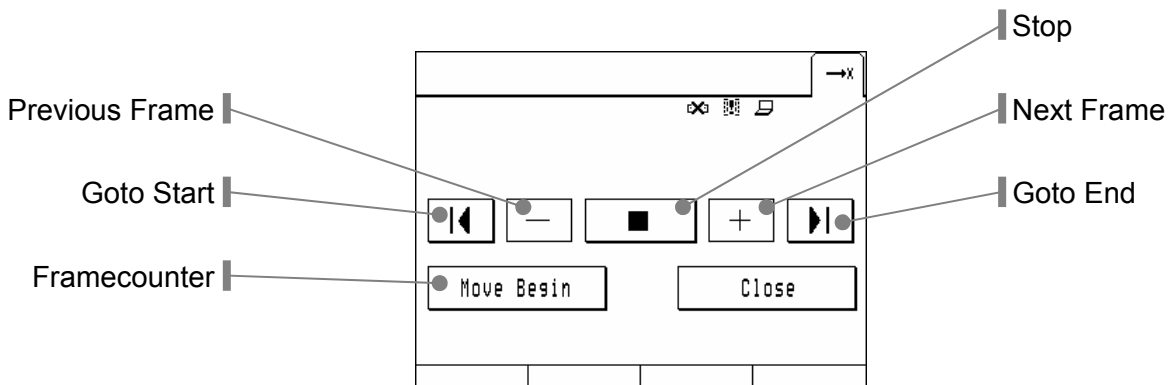


The Browse / Jog menu can be used to move axes independent of their mimics or to examine a move.

Browsing will always move all axes according to their stored motion path (a.k.a. move) and can be used for a precise analyses of the recorded move.

Jogging will move any axis within their limits and can be used e.g. for manual homing or for wrapping the equipment (e.g. retracting the Panther lift column).

### The Browse Menu

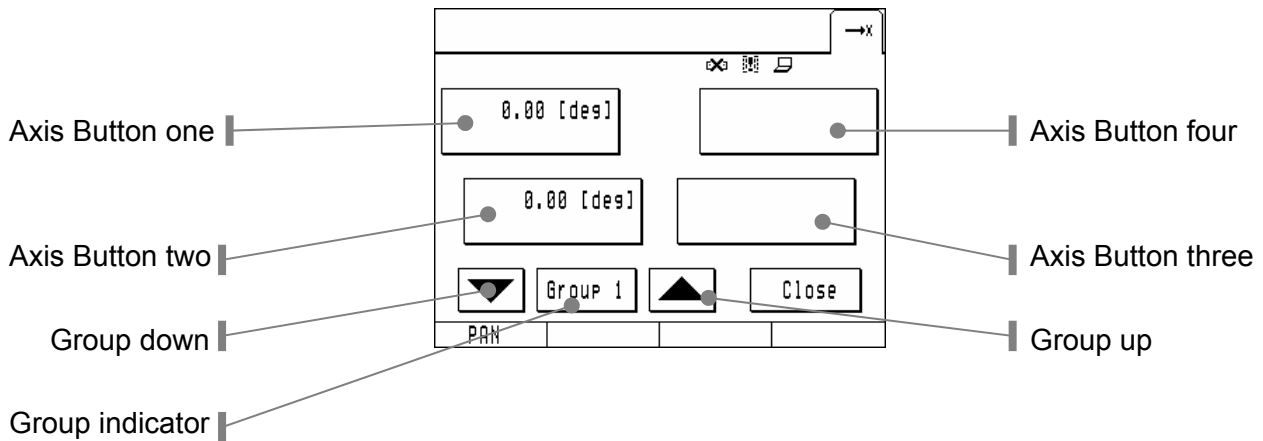


Before Browsing can be done the system has to be on any point of the move. This can be accomplished either by pushing go to start, go to stop or by pushing the frame counter button and entering a frame number to which the system should go.

When in browse modus the system can be moved by the four go to buttons (start, stop, previous, next) or the jog shuttle that is assigned to the primary wheel in the system menu.

Pushing stop will exit browse mode.

## The Jog Menu



The Jog menu is arranged in groups of up to four axes. The axis within a group can be selected by pushing the axis button and selecting an axis. Each axis can only be assigned to one button in a jog group but it can appear in several groups.

The axis buttons are linked to the jog shuttle wheels on the jog box.

Axis button one is linked to the top left, Axis button two is linked to the bottom left,

Axis button four is linked to the bottom right and Axis button four is linked to the top right one.

## The four Axis Buttons

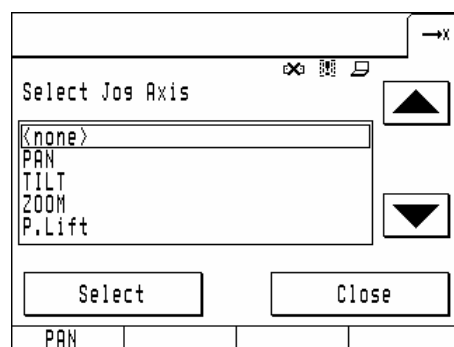
The four axis buttons will display the name and the current position of the axis.

They will also display the key frame status in conjunction with the laptop software.

A key frame can be set by pushing the button that is corresponding to the jog shuttle wheel.

When pushing the axis button the desired axis that should be displayed on the button can be selected from a list. Axes that are already assigned to a other axis button in the jog group will not be shown.

When you want to move a axis to a other axis button within the jog group first go to the current axis button and select <none> and then go to the new axis button and select the desired axis.



# **5. Hardware Reference**

## 5.1. ARRIHEADs



### **Danger**

Whichever ARRIHEAD is used, it should NEVER be operated upside down, as that would damage the head.



### **Danger**

Disconnect the System from the power supply or battery when assembling, disassembling or servicing the equipment.

The ARRIMOTION system can work with a regular ARRIHEAD-1, a regular ARRIHEAD-2 or with an Encoded ARRIHEAD-2.

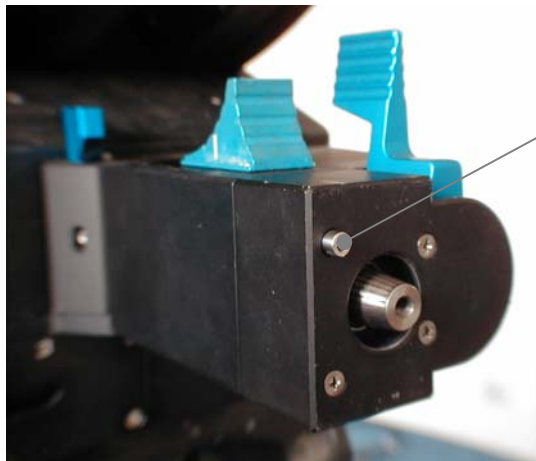
### **Exchanging the Position Pin**

On the pan and tilt gear boxes of all ARRIHEADs, one screw must be exchanged for a special pin with a hex driver head (use a 2.5 mm hex driver). These special pins come with the CHM-1 motors. Some ARRIHEADs already have pins with slotted heads; those must also be replaced with the pins with the hex driver heads.

Position Pin with  
Hex Driver Head



Position Pin with  
Slotted Head (replace)



Position Pin  
on Tilt Gear Box

### **Encoded ARRIHEAD-2**

The Encoded ARRIHEAD-2 is equipped with position sensors on the main pan gear and on the left rail of the tilt mechanism and there are three sensors for the three locks.

- Encoders in the pan and tilt mechanisms provide higher precision in position detection (=easier and more accurate homing).
- Automatic lock detection



- Automatic gear check during homing
- Automatic detection of CHM-1 motors
- Automatic identification of the ARRIHEAD-2

### Identifying an Encoded ARRIHEAD-2

An Encoded ARRIHEAD-2 has a connector on the base housing. An ARRIHEAD-2 prepared for encoders has a connector on the base housing that is covered by a plug. A plain old ARRIHEAD-2 has no connector on the base housing.



Connector for ARRIMOTION on ARRIHEAD-2 with Encoders

### Connecting an ARRIHEAD-2 with Encoders to the ARRIMOTION system

- Use cable K-ARRIH-MCB to connect the connector on the Encoded ARRIHEAD-2 to the ARRIHEAD connector on the MCB-1 closest to the CCB-1.
- The head will be automatically identified when the ARRIMOTION system is turned on, and during homing the other features will be activated (automatic lock detection, home marking and automatic gear check).

### Adapter Plate-2 for ARRIHEAD-2

The Adapter Plate-2 slides onto the ARRIHEAD-2 instead of the usual balancing sled. Since there are fewer components then between camera and ARRIHEAD, the whole structure is more stable. In addition, the camera sits lower, which makes nodal positioning of the camera possible.



The Adapter Plate-2 mounted on the ARRIHEAD-2

## 5.2. The Head Adapter Mounting Bracket

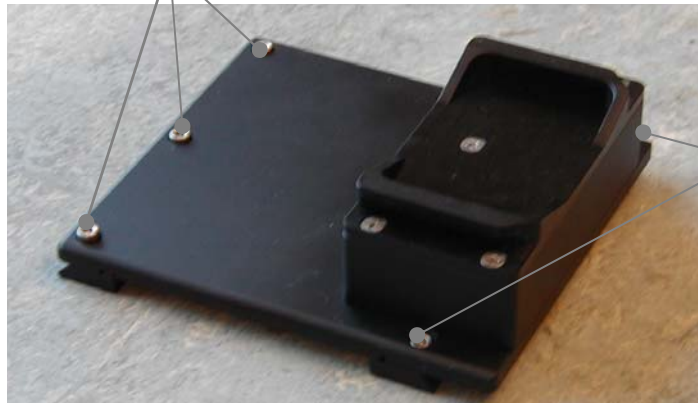
The Head Adapter is used to attach the main controller to an ARRIHEAD-2. It can be attached to the left or right side cover of the main controller. The ARRIHEAD-2 must be equipped with the Accessory Bracket, which was previously used to attach a battery holder.

When attached to the ARRIHEAD with the Head Adapter, the main controller can contain up to a CCB-1 and five other modules. Otherwise the weight is too much for the Head Adapter.

### Attaching the Head Adapter

- Use a 2.5 mm hex driver to remove the 3 screws that hold the upper bar in place.

3 Screws holding upper bar in place



2 bottom screws

- Loosen the two bottom screws, but don't remove.
- Place the upper bar into the top dovetail groove on the side cover as shown in the picture.



- Hook the lower portion of the Head Adapter into the bottom dovetail groove.
- Put the 3 screws back into the Head Adapter and upper bar.
- Move the Head Adapter into the desired position and then tighten the 3 upper and two lower screws. It is best on an ARRIHEAD-2 to position the Head Adapter in the middle. Move to another position only if the main controller interferes with your other camera equipment.

### Removing the Head Adapter

- Use a 2.5 mm hex driver to remove the 3 screws that hold the upper bar.
- Partially loosen the bottom two screws.
- Remove the Head Adapter and the upper bar from the main controller.
- Put the 3 screws back into the Head Adapter and upper bar so you don't lose them.

### 5.3. Configuring the Main Controller

The main controller is the brain of the ARRIMOTION system. It consists of at least the CCB-1. Its features can be expanded by attaching various other modules. Here are all the items that the main controller can consist of:

- Camera Control Box (CCB-1)
- Motor Control Box (MCB-1)
- Lens Control Box (LCB-1)
- Auxiliary Control Box (ACB-1)
- Side Covers (included in CCB-1)
- Head Adapter (to mount main controller to the ARRIHEAD)



A typical main controller configuration  
(from left to right: left side cover, CCB-1, MCB-1, LCB-1, right side cover)

#### Working on the Main Controller

- Make sure no power is applied to the CCB-1, and disconnect all cables from all modules before assembly or disassembly of the main controller.
- Assembling or disassembling a module while it is still powered up will lead to the destruction of the module and possibly all other connected modules.
- Assembly or disassembly of the main controller should only be carried out in an ESD safe workplace. Such a workplace should consist at least of:
  - a grounded work mat,
  - a grounded wrist band,
  - a grounded mat on the floor,
  - a conductive seat,
  - proper grounding of all components.
  - It is absolutely necessary to wear antistatic clothing and shoes.
- Do not touch the electronic boards and the contacts of the connectors.
- The main controller should only be operated when:
  - both side covers have been installed,
  - and all modules have been safely attached to each other.

## Tools

For basic assembly and disassembly of the ARRIMOTION main controller, the following tools are needed. These tools can be found, for instance, at [www.wiha.de](http://www.wiha.de).

- 3mm hex driver, for instance WIHA Type 353, order number 01227
- 2,5mm hex driver, for instance WIHA Type 353, order number 01226
- 7x1, 05mm straight slot screwdriver (7mm wide, 1,05mm thick blade), for instance WIHA Type 148, order number 00101

## Adding and Removing Modules

The order in which expansion modules are attached to the CCB-1 is irrelevant, although we suggest the following order: CCB - MCB (s) - LCB (s) - ACB (s). This is so the modules consuming higher current are closer to the CCB.

A maximum of 16 modules can be attached to the CCB-1, limited by the total current draw. Here some theoretical maximum configurations:

- 2 MCBs, 1 LCB, 14 ACBs, or
- 1 MCB, 3 LCBs, 12 ACBs, or
- no MCB, 5 LCBs, 11 ACBs.

When attached to the ARRIHEAD with the Head Adapter, the main controller can contain up to a CCB-1 and five other modules. Otherwise the weight is too much for the Head Adapter.

### 1. Remove the Head Adapter

It is more comfortable to work on the main controller without the Head Adapter attached. A detailed description of the removal process can be found in the chapter "The Head Adapter Mounting Bracket".

### 2. Remove the Right Side Cover

The left side cover should only be removed by a service technician!

Place the main controller on its left side.



Four screws

- Remove the four screws on the right side of the main controller with a 3 mm hex driver.

On each module and the side cover, always carefully check the condition of the gasket. These gaskets not only function as gaskets, but also ensure conductivity between the modules to reduce electromagnetic interference. In case a gasket is damaged, replace it only with original ARRI spare

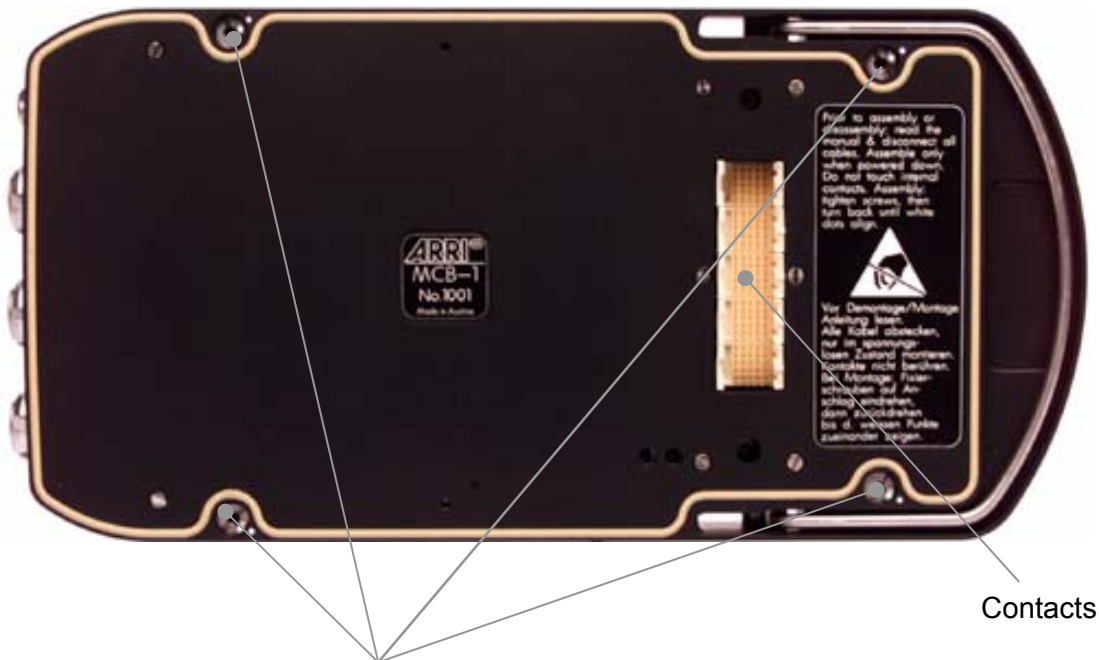


parts! These gaskets are made from a special, highly conductive material, and their replacement with a rubber or silicone substance would lead to problems in operating the ARRIMOTION system.

### 3a. Attaching Modules

- Slide the first expansion module onto the side of the CCB 1. Make sure that the module slides on straight.

Never touch the contacts of the connectors between the modules.



Four screws to attach expansion modules

- Tighten the four screws on the new module with a straight slow screwdriver 7x1,05mm until you feel the end stop, then rotate counter-clockwise until the white alignment dot on each screw lines up with the white dots on the module.



White alignment dots

- Slide the next module onto the first module and attach in the same manner.
- Repeat until all modules are attached.

### 3b. Removing Modules

- Loosen the four screws on the top module with a straight slot screwdriver 7x1, 05mm.
- With one hand grab the center of the detent on the top and bottom of the module (see picture). With the other hand pull the release lever up.



- Carefully pull the module off. Make sure to pull the module up straight and not at an angle, since it could bind. Never touch the contacts of the connectors between the modules.
- If a module is to be stored on its own, it should be placed into its original packaging (conductive plastic bag, conductive packaging).

### 4. Re-attach the Right Side Cover

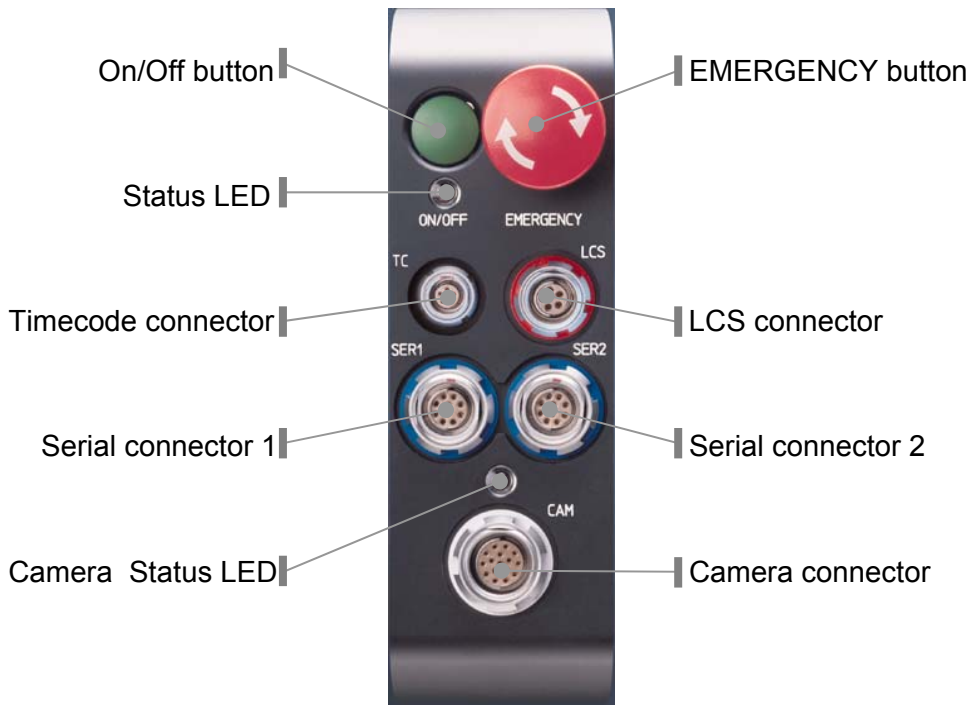
- When all modules are attached, place the right side cover back on and tighten with the four screws.

### 5. Re-attach the Head Adapter

A detailed description of the removal process can be found in the chapter "The Head Adapter Mounting Bracket".

## 5.4. The Camera Control Box CCB-1

The CCB is the basic module of the main controller. The CCB contains the central processor, the power supply, data storage and connectors for controllers.



### ON/OFF Button

#### Power On

Push the *ON/OFF* button to turn the ARRIMOTION system on.

#### Power Down

The ARRIMOTION system is properly powered down through the Jog box or Laptop software.

#### Hard Power Down

In case the regular power down does not work, you can perform a hard power down by pushing the *ON/OFF* button on the Camera Control Box for 3 seconds. The system will power down within the next 10 seconds. During this time the power LED will blink green. During a hard power down, all data that has not been saved can be lost.

Note: A hard power down is not possible while an emergency stop is still active.

#### Electromagnetic Brakes

When the ARRIMOTION system is powered down, or during an emergency stop, a special electromagnetic safety brake will be applied to the CHM-1 motors. These safety brakes open and close with an audible “clack” sound. This sound will only occur during system initialization, power off and emergency stop.

The electromagnetic safety brakes are not the same as the electronic brakes that are activated with the blue *BRAKE* button on the CHM-1.

## Status LED

The status LED provides information about system and emergency stop status.

<i>LED</i>	<i>Meaning</i>
Off	System is turned off.
Green	System is on and ready
Red	Incoming voltage too high or low or current too high.
Red blinking	Emergency stop has been activated, and the emergency stop button has not been released yet.
Red/green alternating	The emergency stop is not active anymore, and the system can be turned on again.

## EMERGENCY Button

In an emergency the ARRIMOTION system can be stopped by pushing the big red *EMERGENCY* button on the Camera Control Box (CCB-1). All motors will be deactivated and all brakes will be applied. The *ON/OFF* LED will blink red.

### To Reset After an Emergency Stop:

- Remove the reason for the emergency.
- Rotate the *EMERGENCY* button in the direction of the arrows to release it. The *ON/OFF* LED blinks red and green.
- Push the *ON/OFF* button to turn the system back on.
- Go into the Axes screen and turn all axes back on.

Pushing the EMERGENCY button will immediately stop all motors, which can lead to extreme stress on all mechanical components. It is therefore recommended to use this feature only in case of a real emergency.

## TC Connector

The TC (Time code) connector provides longitudinal Time code (LTC) in and outputs. The Time code output is synchronous with the move. The Time code format (24/25/30fps, drop/non drop) can be set by the Jog box or Laptop software.

The matching cable connector is: LEMO FGG0B-305

<i>Pin</i>	<i>Signal</i>	<i>Description</i>
1	GND	signal ground
2	TC-IN	LTC in
3		not used, reserved for future features
4		not used, reserved for future features
5	TC-OUT	LTC out

## LCS Connector

The following hand controllers of the ARRI Lens Control System can be attached to the LCS connector:

- Zoom Main Unit (ZMU-1 or ZMU-2)  
The Focus/Iris Unit (FIU-1) can then be attached to the ZMU-1 or ZMU-2.
- Wireless Handgrip Attachment (WHA-2)  
The Wireless Focus/Iris Unit (WFU-1) and/or the Wireless Zoom Unit (WZU-1) can be attached to the WHA-2. Please note that the WHA-2 attaches with a cable to the ARRIMOTION CCB-1. Wireless operation is not possible at this point in time.



All other Lens Control System Components (CLM-1 motors, FIU) should not be connected to the LCS connector since they can damage the system if connected here.

### SER1 and SER2 Connectors

The following ARRIMOTION controllers and accessories connect to the two serial connectors (SER1 and SER2):

- Jog box (JBO-1) with cable adapter (JCA-1)
- Jog box (JBO-1) with Jog box Hand Wheel Controller (JHC-1)
- Bloop light (BLT-1)
- GPI Trigger Box (GPI-1)
- Betacam Playback deck (RS422)

### Camera Status LED

The LED shows camera status:

<i>LED</i>	<i>Meaning</i>
Off	Camera is in standby
Green	Camera runs
Red	Camera not ready or no camera present.
Red blinking	Communications Error between camera and ARRIMOTION

### CAM Connector

Attach one of the following cables between the camera and the CAM connector on the CCB-1:

<i>Camera</i>	<i>Connector on camera</i>	<i>Cable</i>
435 Advanced, 435ES, 535B, 16SR3, 16SR3 HS, 16SR 3 Advanced or 16SR3 HS Advanced to the CCB. Note: when used with the 435 Advanced, no special motion control features are accessible. For those features, use cable K-CAM-CCB-2 instead.	CCU & ACC connectors	K-CAM-CCB-1
435 Advanced (Motion Control Mode)	MC connector on the MCI-1	K-CAM-CCB-2
ARRICAM Studio, ARRICAM Lite	CAC connector	K-CAM-CCB-3

### Power Connector

An ARRI 2 pin power connector is located on the backside of the CCB-1. The ARRIMOTION system needs its own power supply. Do not use a "Y" cable to power the ARRIMOTION system and something else simultaneously.

We recommend the use of the ARRI power supply NG12/26 for ARRIMOTION configurations with up to 10A current draw.

The amount of power needed depends on the ARRIMOTION system configuration. Always ensure that the power supply or battery you are using can provide enough power to the ARRIMOTION configuration in question.

Power Connector



CCB-1 Back with door closed

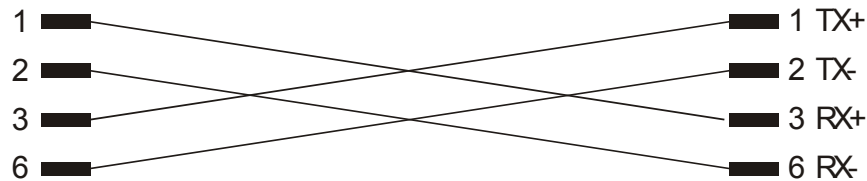
Ethernet Connector



CCB-1 Back with door open

### Ethernet 100/10Mbit with SYNC Connector

On the CCB backside is a RJ45 network connector labeled "Ethernet 100/10Mbit with SYNC". The Laptop connects here, and this connector can also be used to network multiple main controllers for further system expansion.



ARRIMOTION Ethernet Cable for Laptop

When connecting the CCB-1 to a Laptop, make sure to use only Ethernet cables that have just the 4 conductors necessary for 100 Mbit Ethernet.

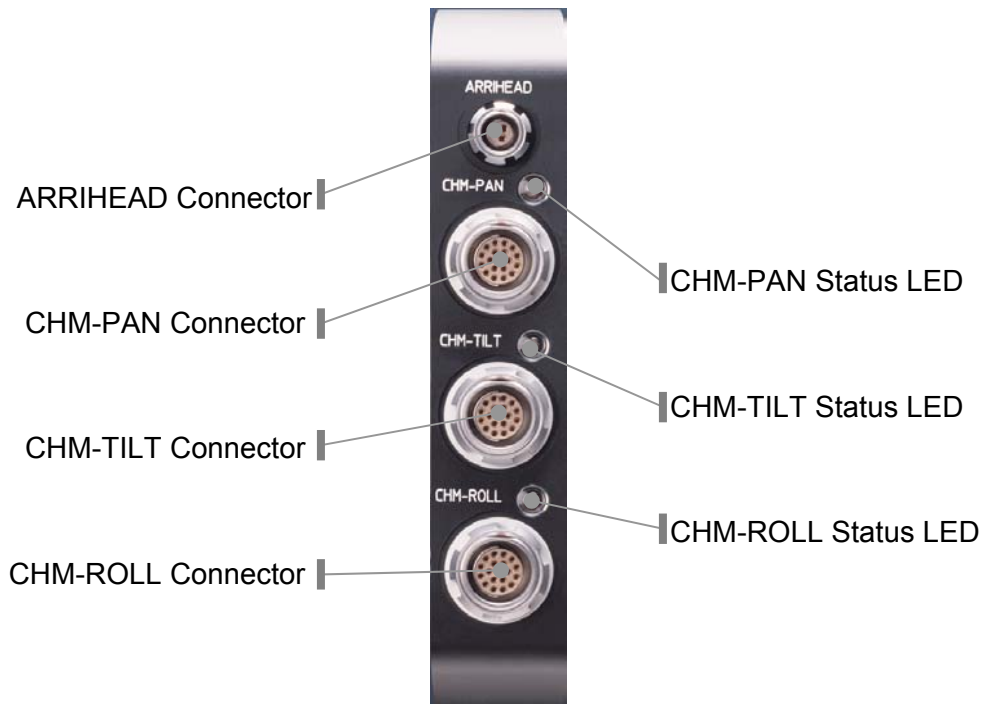
Do not use the number 4, 5, 7 and 8 pins.

These pins are used for special signals to synchronize more than one CCB.

Using other Ethernet cables than the cables supplied by Arri can damage the CCB.

## 5.5. The Motor Control Box MCB-1

The MCB controls up to 3 CHM-1 ARRIHEAD motors and it reads the encoder signals from the ARRIHEAD-2 with encoders.



### ARRIHEAD Connector

An ARRIHEAD-2 with encoders can be attached to this connector. Even though the ARRIMOTION system can work with a regular ARRIHEAD-1 or ARRIHEAD-2, using an ARRIHEAD-2 with encoders provides higher precision position detection plus other automated features.

### CHM Connectors (PAN, TILT, ROLL)

The Controlled Head Motors (CHM-1) can be connected to the CHM connectors:

- Use the cable K-MCB-CHM to connect the CHM-1 motors to the MCB-1. Connect the pan motor to the CHM-PAN connector, and the tilt motor to the CHM-TILT connector.

### Status LEDs

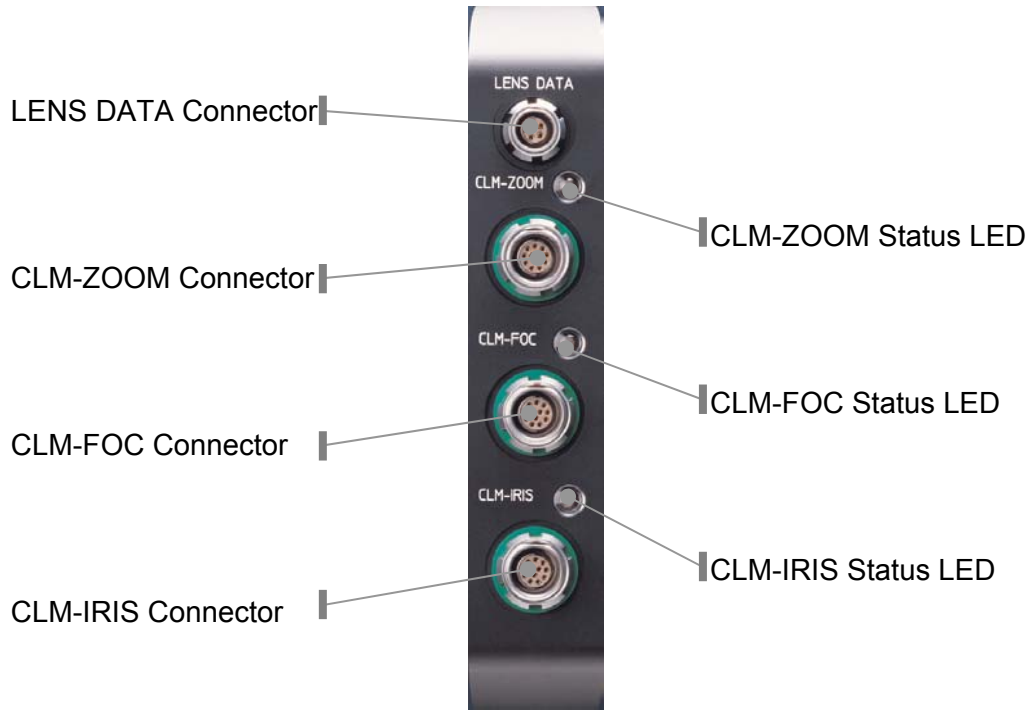
The status of each axis is displayed here.

<i>LED</i>	<i>Meaning</i>
Off	Axis turned off
Green	Motor is ready
Green blinking	Motor is ready, but at the end stop
Red blinking	Error. Detailed information is displayed on the Jogbox.
Red/green alternating	Homing in process

## 5.6. Lens Control Box LCB-1

The LCB is used to control up to 3 CLM-2 lens motors, and to process the information from the Lens Data System, if a Lens data System (LDS) capable camera and lens are used.

Note: CLM-1 motors are not compatible with the ARRIMOTION system.



### LENS DATA Connector

Use cable K-LDD-LDS to connect the LENS DATA connector on the LCB-1 to the LDD connector on the ARRICAM or FEM-2.

### CLM Connectors (ZOOM, FOC, IRIS)

Connect CLM-2 lens motors here.

Connect the zoom lens motor to the CLM-ZOOM connector, the focus lens motor to the CLM-FOC connector and the iris lens motor to the CLM-IRIS connector.

When CLM-2 motors are used with the ARRIMOTION system, it is best to replace the cable on the CLM-2 motors with the longer version cable

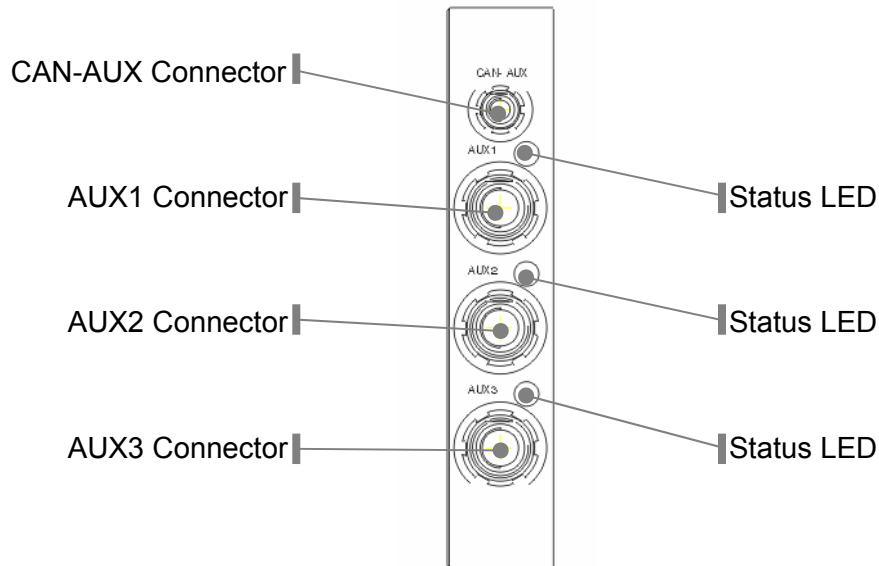
### Status LEDs

The status of each axis is displayed here.

<i>LED</i>	<i>Meaning</i>
Off	Axis turned off
Green	Motor is ready
Green blinking	Motor is ready, but at the end stop
Red blinking	Error. Detailed information is displayed on the Jogbox.
Red/green alternating	Homing in process

## 5.7. Auxiliary Motor Control Box ACB-1

The ACB is used to control up to 3 external servo motors with external servo amplifiers. It is also possible to control other equipment (like a dolly, for instance) equipped with a CAN bus interface. The ACB can control a total of three axes. If one axis is controlled over the CAN bus, only two of the AUX connectors can be used.



### CAN-AUX Connector

Any ARRIMOTION compatible equipment using the CAN bus can be connected to the CAN-AUX connector.

### Status LEDs

The status of each axis is displayed here.

<i>LED</i>	<i>Meaning</i>
Off	Axis turned off
Green	Motor is ready
Green blinking	Motor is ready, but at the end stop
Red blinking	Error. Detailed information is displayed on the Jogbox.
Red/green alternating	Homing in process

**AUX Connectors (1, 2, 3)**

An external servo amplifier with encoder feedback according to the RS-422 standard can be connected to each of the AUX connectors.

<i>Pin</i>	<i>Signal</i>	<i>Description</i>
1	MOT A+	Encoder RS422 Input Track A+
2	MOT A-	Encoder RS422 Input Track A-
3	MOT B+	Encoder RS422 Input Track B+
4	MOT B-	Encoder RS422 Input Track B-
5	MOT I+	Encoder RS422 Input Track Index+
6	MOT I-	Encoder RS422 Input Track Index-
7	GND1	GND for Encoder Signals
8	BRAKE	<p>Enable (open collector, active low) for a safety brake that is attached to the drive.</p> <p>The Enable input should have a pull up on the servo amplifier to prevent malfunction due to broken wiring and to activate the brake when ARRIMOTION is not switched on.</p> <p><i>not used, reserved for future features</i></p>
9	MCOMMAND	+/- 10V Motor Command to Amplifier
10	GND-CMND	GND for Motor Command
11		not used, reserved for future features
12	HOME	<p>Home (Reference) Switch Input (active high)</p> <p>The switch is normally open and should be closed when it is activated. This is a safety precaution that protects against broken wiring.</p>
13	nFWD_LIMIT	<p>Forward Limit Switch Input (active low)</p> <p>The switch is normally closed and should open when it is activated. This is a safety precaution that protects against broken wiring.</p>
14	nREV_LIMIT	<p>Reverse Limit Switch Input (active low)</p> <p>The switch is normally closed and should open when it is activated. This is a safety precaution that protects against broken wiring. Enable (open collector, active low) for an external servo amplifier.</p>
15	GND1	GND for Control Signals
16		not used, reserved for future features
17		not used, reserved for future features
18	EN/nDIS	The Enable input should have a pull up on the servo amplifier to prevent malfunction due to broken wiring and disable the drive when ARRIMOTION is switched off.
19		not used, reserved for future features

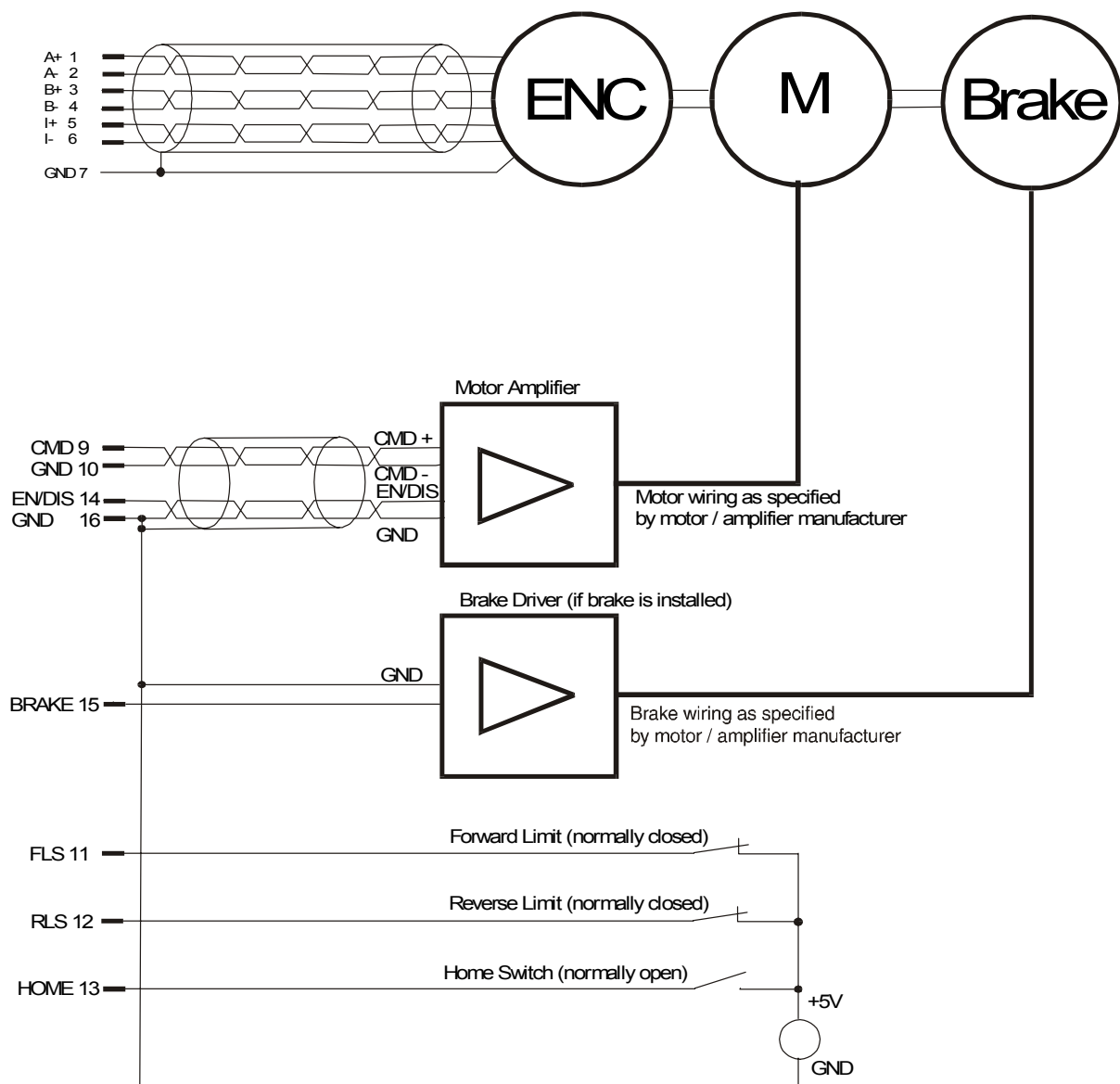
### AUX Connector Cable Diagram

The connector on the AC1 is a W.W.Fischer DGP104Z092-230.

The matching cable connector is:

- W.W.Fischer S104Z092-230 (with solder contacts)
- W.W.Fischer S104Z092-250 (with crimp contacts)

Note: Some other connector parts and tools have to be ordered based on the cable diameter used. The friendly folk at W.W. Fischer can help.



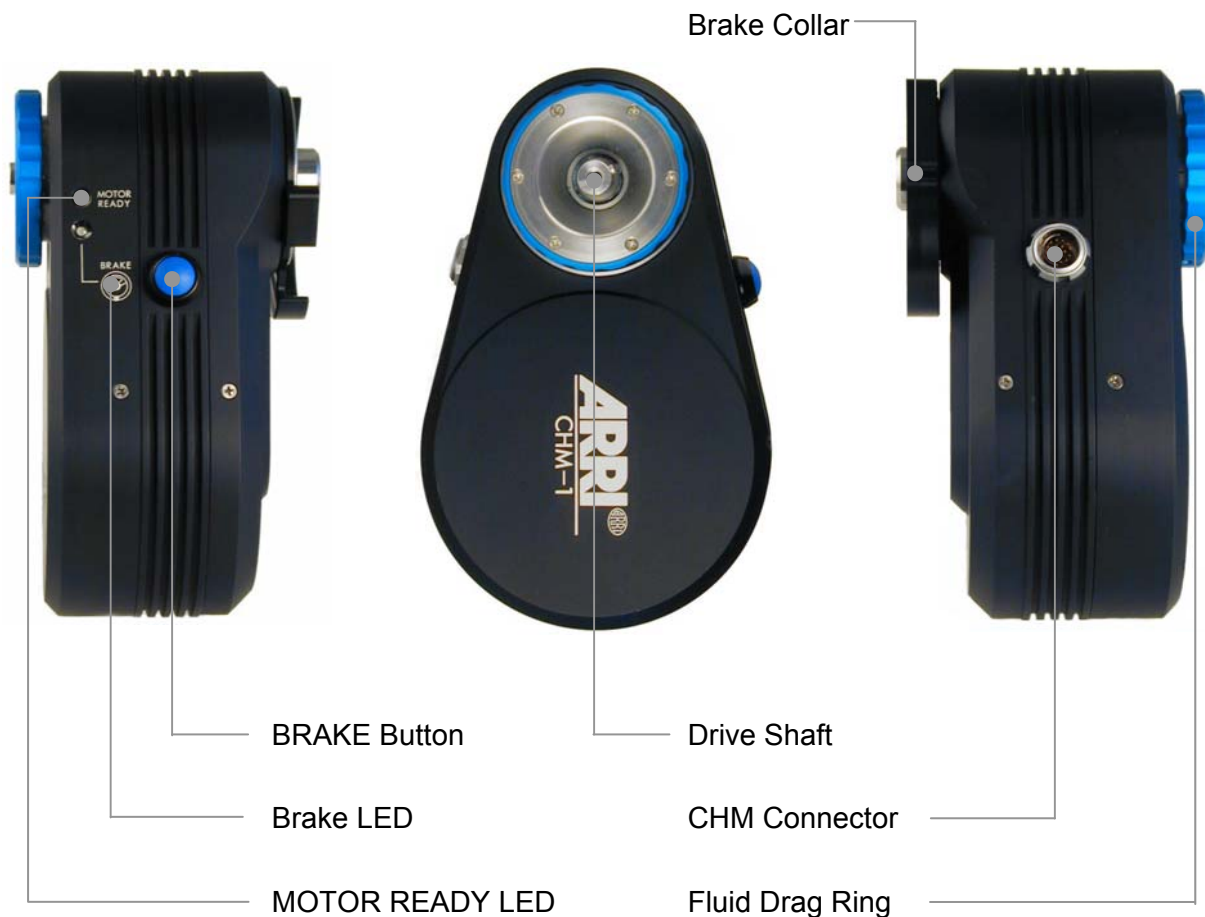
## 5.8. Controlled Head Motor CHM-1

The Controlled Head Motors CHM-1 are attached between the ARRIHEAD and the ARRIHEAD hand wheels. They can be used on an ARRIHEAD-1, ARRIHEAD-2 or Encoded ARRIHEAD-2.

A hand wheel that is attached to a CHM-1 motor will turn an encoder. This encoder provides control signals for a motor inside the CHM-1 that turns the ARRIHEAD drive shaft. There is no mechanical connection between the hand wheel on the CHM-1 and the ARRIHEAD gears.

Using the CHM-1 on an ARRIHEAD feels very much like operating the ARRIHEAD without the CHM-1, with one exception: it is not possible to stop a panning ARRIHEAD anymore by pushing on the head or the camera. This takes a little getting used to. The head must be stopped with the Mimic (usually the respective hand wheel) that is assigned to the CHM-1 motor.

The hand wheel on a CHM-1 motor does not necessarily have to control the CHM-1 motor. In fact, it can be assigned to any motor attached to the ARRIMOTION system. It is, for instance possible to assign the pan and tilt hand wheels of the CHM-1 to the pan and tilt functions of a snorkel lens.





**Brake Collar**

The ARRIHEAD pan and tilt brakes have to be loose when the CHM-1 is attached, otherwise the CHM-1 motors could overload. To ensure that they are loose, a collar fixes the brakes in the loose position when the CHM-1 is attached.

**BRAKE Button and LED**

The Brake button will disconnect the hand wheel from whichever motor it is assigned to. Thus the motor will not receive a signal anymore, and hold its current position. When the brake is applied, the BRAKE LED will glow red.

**MOTOR READY LEDs**

The status of each axis is displayed here.

<i>LED</i>	<i>Meaning</i>
Off	Axis turned off
Green	Motor is ready
Green blinking	Motor is ready, but at the end stop
Red	No Mimic has been assigned
Red blinking	Error. Detailed information is displayed on the Jogbox.
Red/green alternating	Homing in process

**Fluid Drag Ring**

With the fluid drag ring the friction on the hand wheel can be adjusted. This allows the operator to set the friction until the hand wheels feel just like they do without a CHM-1. Clockwise rotation increases friction, counter-clockwise rotation decreases friction.

**CHM Connector**

Use cable K-MCB-CHM to connect the CHM connector on the CHM-1 to the CHM-PAN, CHM-TILT or CHM-ROLL connector on the MCB-1.

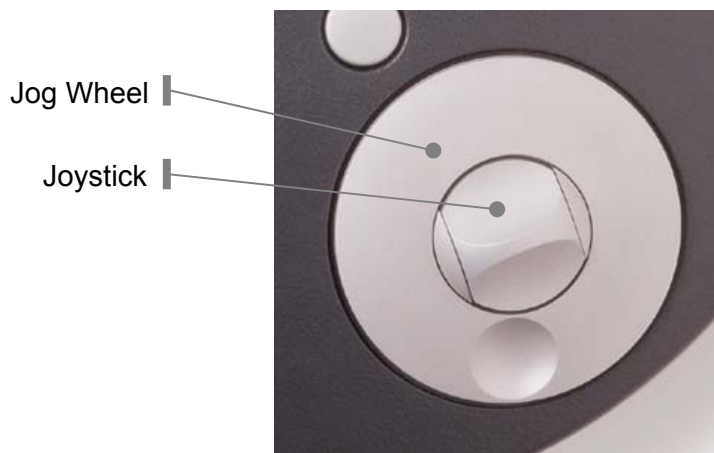
## 5.9. The Jog box JBO-1

The Jog box JBO-1 or the Laptop must be connected to the ARRIMOTION system to use the system. The Jog box can be either attached to the CCB-1 with a cable, or it can be attached to the Jog box Hand Wheel Controller.



### What is a Jog-shuttle?

The Jog box has four unique input devices, called Jog-shuttles. In the center of each Jog-shuttle is a joystick that can be pushed up or down, and around the joystick is a jog wheel that can be rotated. The joystick can change values quickly, whereas the jog wheel allows for precision positioning.



### Using the Jogbox with a Cable

If the Jogbox is used with a cable, the Jogbox Cable Adapter (JCA-1) must be attached.

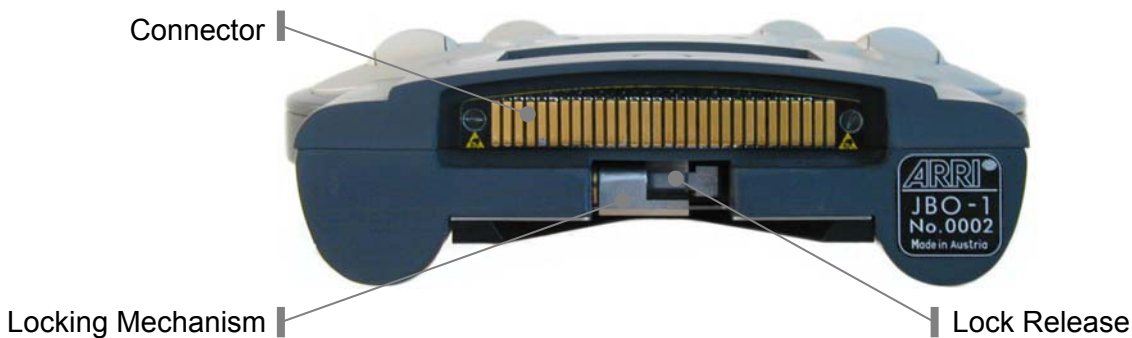


- Tension the locking lever by moving it clockwise into the 8 O'clock position.
- Push the Jog box Cable Adapter carefully onto the Jog box. Make sure that it goes on straight.
- When the Jog box Cable Adapter is pushed all the way onto the Jog box, the locking lever releases and locks automatically. Make sure that it is all the way counter-clockwise in the 6 O'clock position.
- Use cable K-JCA-CCB to connect the connector on the Jog box Cable Adapter to the SER1 or SER2 connector on the CCB-1.

### The Stop Button

This button has the same function as the *Stop* button in the *Play/Record* menu. It is NOT an emergency stop all button like the big red button on the CCB.

### If the Locking Lever is Locked Accidentally



If the locking lever has been released accidentally (6 o'clock position) without a JCA-1 or JHC-1 attached, it can be tensioned again by pushing the lock release down with a small tool.

Do not touch the contacts of the connector on the Jog box or JCA-1!

## 5.10. The Jog box Hand Wheel Controller JHC-1

The Jog box Hand Wheel Controller JHC-1 can be used as the central station for controlling the ARRIMOTION system. It can accept two hand wheels from the ARRIHEAD, a video monitor and the Jog box. It must be attached to a flat Mitchell tripod base (this suggests of course that it is easily mounted on a tripod), and can then be rotated freely.

On the right side of the JHC-1 is a connector that can accept a future controller for a roll axis.



### JHC-1 Set up

- Attach the JHC-1 to a tripod or other secure surface that has a flat Mitchell base.
- Use cable K-JCA-CCB to connect the connector on the right side of the Jog box Hand Wheel Controller base to the SER1 connector on the CCB-1.
- Attach two ARRIHEAD hand wheels to the drive shafts on the JHC-1 arms.

### Attaching the Jog box

- Release the Jog box locking lever by moving it clockwise into the 8 O'clock position. If the Jog box Cable Adapter (JCA-1) is attached, carefully pull it off the Jog box.
- Push the Jog box carefully onto the Jog box Hand Wheel Controller. Make sure that it goes on straight and not at an angle.
- When the Jog box is pushed all the way onto the Jog box Hand Wheel Controller, the locking lever locks automatically. Make sure that it is all the way counter-clockwise in the 6 O'clock position.

### Adjusting the Arms

- Lift the arm lock and then position the arm to the most comfortable position.
- Push the arm lock back down to lock the position.

### Monitor Platform

The Monitor Platform is designed for 9" CRT Monitors.

The platform is mounted by two 3/8" screws and can be adjusted in its angle by a lever on the right side. The monitor platform can be screwed on the monitor. The monitor can be used without the JHC-1 for other applications. The black monitor platform can stay on the monitor.

### 3<sup>rd</sup> Axis Connector

The 3<sup>rd</sup> Axis connector is for future expansion.

## 5.11.The Jog box Cradle



### Mounting the Jog box on the Arrihead

The Jog box can be mounted on any of the four Arrihead Rosettes. Take care that the cradle is at approximately 45° to prevent that the Jog box dropping out of the cradle at extreme tilt angles.

The Cradle support rod bracket should be mounted in a way that it does not interfere with anything else mounted on the Arrihead (CHM-1's, Main Controller,...). Check for proper clearance by manually moving the tilt sled of the Arrihead.

### Mounting the Jog box to Encoded Fluid Heads

Attach one of the two rosette adapters between the head and the panbar. The cradle support rod can be mounted on the small Sachtler rosette of the adapter.

Adapters for other heads can be provided upon request.

The Jogbox can be secured with a Velcro strap that is included in the jogbox cradle kit.

## 5.12.The JCA-2 for Encoded Fluid Heads

The JCA-2 is an Adapter for the Jog box that enables the use of encoded fluid heads as a master head for the remote control of the Arrimotion system. It should be used in combination with the jog box cradle.



The JCA-2 is mounted on the Jog box in the same way as the JCA-1.

It features three additional connectors for external encoders on an encoded fluid head.

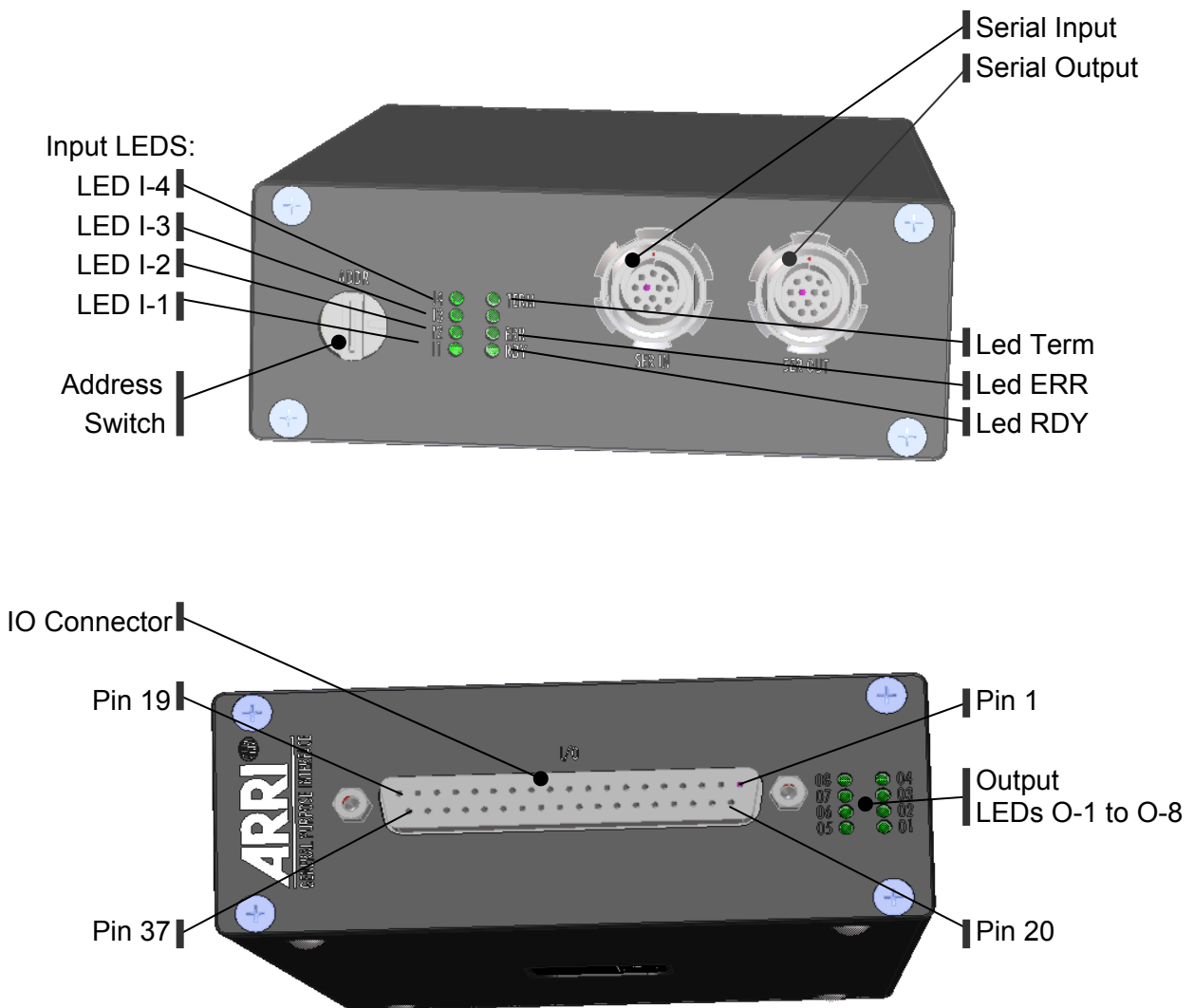
The JCA-2 can be used instead of the JCA-1 as a backup. It is not necessary to connect external encoders if no encoded fluid head is needed.



### 5.13. The GPI Trigger Box GPI-1

With the GPI-1 external events can be triggered by the ARRIMOTION system, or the ARRIMOTION system can be triggered by external events.

Each GPI-1 is equipped with eight relays with one form C contact (maximum 1A 42V DC) and four trigger inputs (5V DC). The trigger inputs are only active on the GPI-1 with the address 0. It is possible to connect up to four GPI-1s to the CCB-1.



#### GPI-1 Cabling

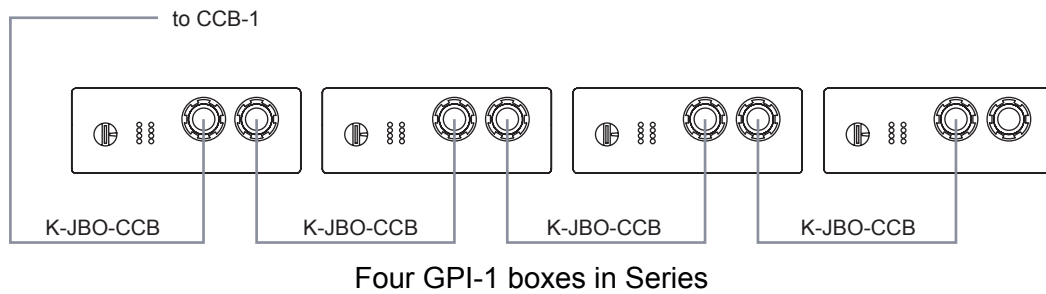
Use the K-JCA-CCB cable to connect the SER IN connector on the GPI-1 to the SER1 or SER2 connector on the CCB-1.

Note: The GPI-1 provides a loop trough for the serial signals, so it is possible to connect another device (like the Jog box) to the SER OUT connector on the GPI-1.

#### Using More than One GPI-1

It is possible to connect up to four GPI-1 boxes to a CCB-1. These boxes are connected in series with the SER IN and SER OUT connectors. Each box must be given a unique address between 0 and 7. The first box in line has to be set to address 0.





Note: Make sure that the last GPI-1 in the chain either has no cable attached to its SER OUT connector, or that a Jog box, Jog box Hand Wheel Controller or Blooplight is attached to the cable. If no further device is attached to the last GPI-1 in the chain, its TERM LED should be illuminated, showing that the chain is properly terminated here.

### ADDR Rotary Switch

Each GPI-1 must be given a unique address with a rotary switch. This address is set by turning the ADDR rotary switch to any position from 0 to 3. The first box in line has to be set to address 0. The other three boxes can have any address between 1 and 3. Addresses have to be set before the system is turned on. If a wrong address is set, the ERR LED will blink.

Note: It is possible to connect up to four GPI-1 Boxes to a CCB-1, but no more.  
Never set more than one GPI-1 to the same address.

The addresses 8 and 9 will put the GPI-1 into a test mode. When in the test mode, the GPI-1 cannot communicate with the CCB-1.

### SER IN Connector

The SER IN (Serial In) connector can be connected to the SER 1 or SER2 connector on the CCB-1, or to the SER OUT connector on another GPI-1.

### SER OUT Connector

The SER OUT connector can be connected to either a Bloop Light, a Jogbox, a Jogbox Hand Wheel Controller, or another GPI-1.

### Input LEDs (I-1 to I-4)

These LEDs show the status of the respective trigger inputs.

LED off     0 Volts

LED on     5 Volts

### TERM LED

When the TERM LED illuminates, the serial connection has been automatically terminated. This happens when no other device is connected to the GPI-1.

Do not connect a cable without another device at the other end to the SER OUT connector, since this can lead to errors in data communications.

If the TERM LED is illuminated even though another device has been connected with a cable to the SER OUT connector, either a cable or a GPI-1 box is faulty. Determine which one is faulty and exchange it.

### ERR LED

The ERR LED will blink if an invalid address has been set, if two boxes have the same address, if an internal error has occurred or if the address switch has been changed while powered.

### RDY LED

The RDY LED illuminates when the GPI-1 is ready.



### Output LEDs (O-1 to O-8)

These LEDs show the status of the eight relay outputs. If an LED is illuminated, the respective channel is active.

### I/O Connector

The contacts of the eight relays as well as the four trigger inputs are available on the 37pin d-sub connector. There is also an isolated +5V output that can be loaded with up to 50mA. A trigger input can either be activated by connecting an external switch between the +5V-ISO and the trigger input or to a voltage source that feeds in 5V to the trigger input (connect ground of the external voltage source to GND-ISO).

<i>Pin</i>	<i>Signal</i>	<i>Description</i>
1	O1-NC	GPI Output 1 normally closed
2	O1-NO	GPI Output 1 normally open
3	O2-AC	GPI Output 2 Alternating (center) contact
4	O3-AC	GPI Output 3 normally closed
5	O3-NO	GPI Output 3 normally open
6	O4-NC	GPI Output 4 Alternating (center) contact
7	O5-NC	GPI Output 5 normally closed
8	O5-NO	GPI Output 5 normally open
9	O6-AC	GPI Output 6 Alternating (center) contact
10	O7-NC	GPI Output 7 normally closed
11	O7-NO	GPI Output 7 normally open
12	O8-AC	GPI Output 8 Alternating (center) contact
13		not connected
14	+5V-ISO	Isolated +5V Supply for GPI Inputs
15	I1	Isolated GPI input 1
16	I2	Isolated GPI input 2
17	GND-ISO	Isolated GND for GPI inputs
18		not used / reserved for future expansions
19		not used / reserved for future expansions
20	O1-AC	GPI Output 1 Alternating (center) contact
21	O2-NC	GPI Output 2 normally closed
22	O2-NO	GPI Output 2 normally open
23	O3-AC	GPI Output 3 Alternating (center) contact
24	O4-NC	GPI Output 4 normally closed
25	O4-NO	GPI Output 4 normally open
26	O5-AC	GPI Output 5 Alternating (center) contact
27	O6-NC	GPI Output 6 normally closed
28	O6-NO	GPI Output 6 normally open
29	O7-AC	GPI Output 7 Alternating (center) contact
30	O8-NC	GPI Output 8 normally closed
31	O8-NO	GPI Output 8 normally open
32		not used / reserved for future expansions
33	+5V-ISO	Isolated +5V Supply for GPI Inputs
34	I3	Isolated GPI input 3
35	I4	Isolated GPI input 4
36	GND-ISO	Isolated GND for GPI inputs
37		not used / reserved for future expansions

## 5.14. The Blooplight BLT-1

The Blooplight is used to expose sync marks onto film. Various different patterns can be displayed by the 64 LEDs on the front. To allow for a smaller light source when filming a small area, an external LED can also be connected.



### SER IN Connector

Use cable K-JCA-CCB to connect the SER IN connector on the Blooplight to the SER1 or SER2 connectors on the CCB-1.

### LED Field

64 dual color (red/green) LEDs are arranged in a 4 x 4 matrix. With the Jogbox or Laptop software it is possible to define different patterns for sync marks, as well as to adjust the LED brightness.

### EXT LED Connector

To allow for a smaller sized light source when filming a small area, an external LED can be connected to the Blooplight. The connector is a W.W.Fischer Type DG102A051. The matching cable connector is a W.W. Fischer S102A051-120.

EXT LED connector pin out:

<i>Pin</i>	<i>Signal</i>	<i>Description</i>
1	GND-SW	GND
2	+9V-SW	9V (max 150mA)

It is not allowed to switch loads with an external power supply with the signals on the EXT LED connector. The power for the external LED must be supplied by the Blooplight.

### 3/8" Threaded Hole

The Blooplight can be attached with a 3/8" bolt. The bolt should not be screwed in any deeper than 6,35mm/0.14 inches.

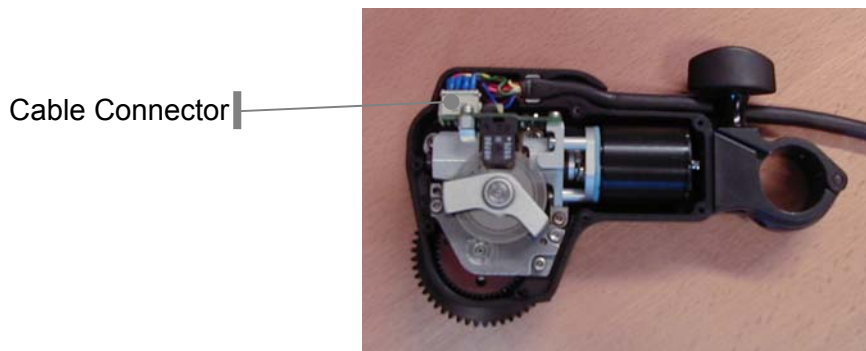
## 5.15.CLM-2 Cable Swap

The regular cables of the CLM-2s should be exchanged for the longer cables CC-M2.

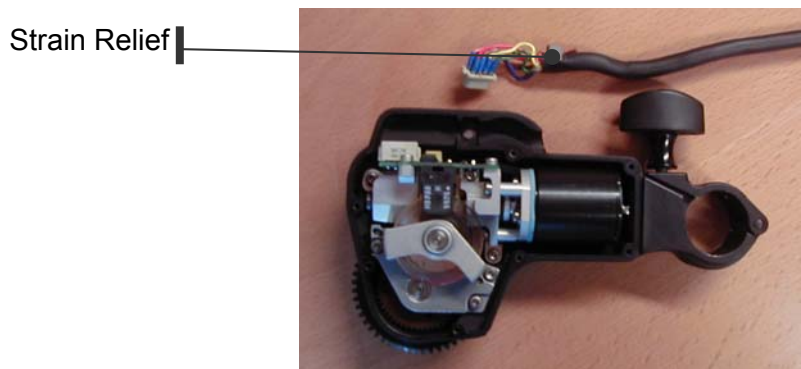
- Remove the seven straight slotted screws that hold the cover, then remove the cover.



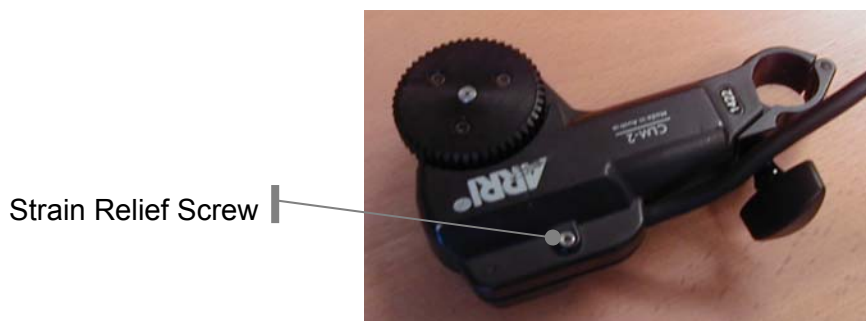
- Use a screwdriver with a thin blade to carefully remove the cable connector from the CLM-2.



- Lift the cable out of the CLM-2 motor. Remove the silver strain relief from the cable.



- Flip the motor over and loosen the strain relief screw with a 2 mm hex driver.



- Fold the shield of cable CC-M2 over and place the strain relief on the cable so the shield is between the cable and the strain relief. Place the cable in the cable channel, making sure the strain relief goes in its proper place.
- Attach the cable connector to the CLM-2.
- Make sure the individual cable strands coming from the cable connector are tucked under the edge of the CLM-2 motor housing, so they do not get pinched when the cover is replaced.
- Place the cover back on the CLM-2 and put the seven screws back in.
- Now tighten the strain relief screw on the other side of the CLM-2.

## 5.16.The Panther Evolution

### Overview



The Arrimotion can control the track and lift of a modified Panther Evolution Dolly.

The following items are needed for the dolly system

- one ACB-1
- a modified Panther Evolution
- The dolly driver kit

The dolly driver kit contains the following items

- Hardware for the modification of the Panther. This modification has to be made at Arri Austria. Field modification is not possible.
- Drive Motor Assembly for the track
- Servo Amplifier box
- Two safety bumpers
- Force Sensitive Pushbar
- Track Endpieces for Panther precision track MK2 and the timing belt for the drive
- Cabling

The lift axis is driven by the internal motor of the panther and can be controlled by the panther handcontroller that is fully implemented in the mimics system of arrimotion. For the necessary precision the lift axis drive of the panther is modified to a timing belt instead of a multi-V belt which will result in increased noise.

**Attention: Motion Control Mode must not be operated with the multi-V belt.**

The lift axis is powered from the panther batteries. In motion control mode a set of full charged batteries will last for about one hour. It is recommended that the panther charger is permanently connected to the grey connector on the bottom of the panther to recharge the batteries. See the manual of the panther for the installation and operation of the charger. Whenever possible switch the lift axis to off in the axis menu to save power.

The Panther is driven along the track by a brushless servo motor with a high precision planetary gearbox and a timing belt that is in the center of the track. There are safety bumpers installed on both sides of the dolly.

The drive axis is operated with a force sensitive pushbar that allows the Arrimotion to mimic the behavior of a normal dolly.

## Setting up the Panther drive system

### **Attention:**

**Read the panther operating manual before using the panther**

The first step is to mount the motor on the mounting bridge that is attached to the dolly.

Tighten the wheel brakes of the panther. The panther should be preset to 620mm track width (all wheel arms at 45°)

Loosen the four M8 screws with a 6mm Allen key on the bolts on the mounting plate. Do not use the ferrules on the bolts.

Attach the motor to the panther and take care that the gas spring is not torn and the cables for the limit switches are not clamped anywhere. First insert the two M8 screws with their ferrules on top and then the bottom ones. Do not tighten them.

Now attach the safety bumper without amplifier platform on the drive motor side and the other bumper with the platform on the opposite side.

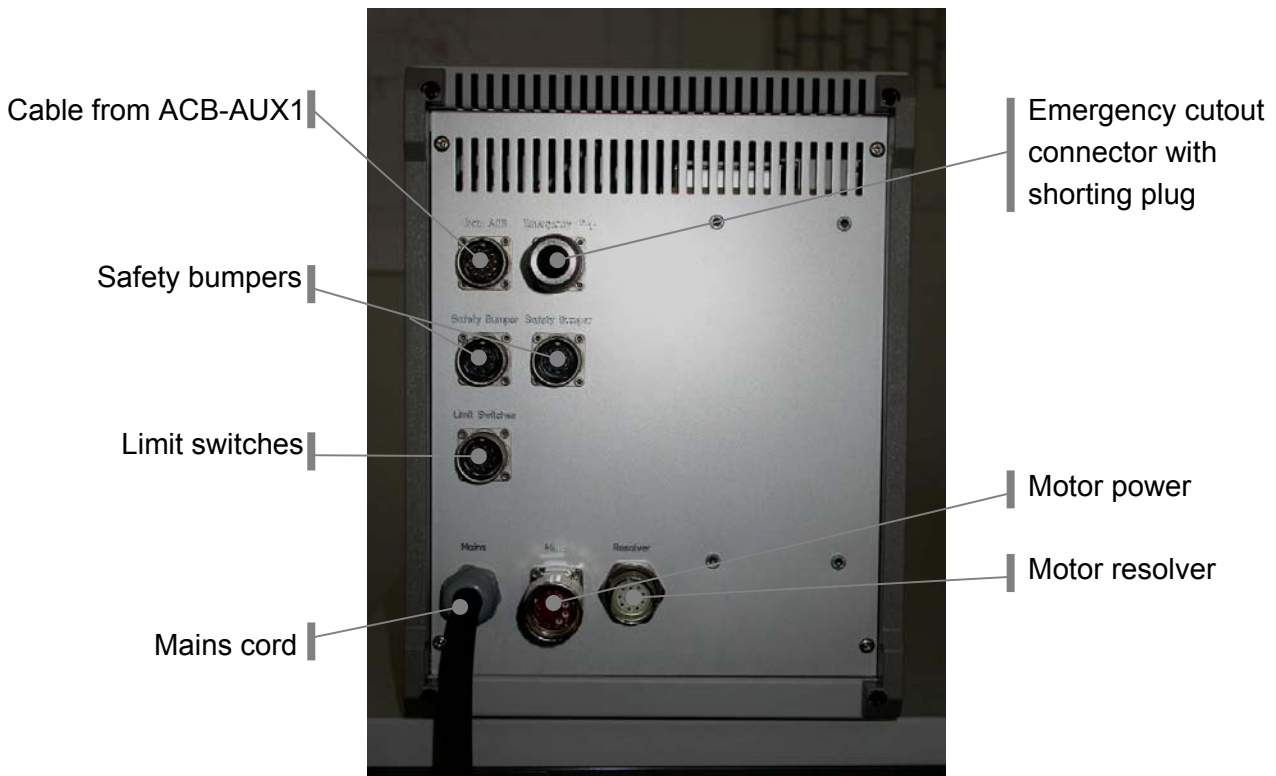
**ATTENTION: The top surface of the bumper mounts must be about 5mm above the pushbar mounts to clear the timing belt clamping elements!**

Now the drive motor amplifier can be placed on its platform and the force sensitive pushbar can be placed in one of the four wheel arms.

## Wiring the Drive Motor

**ATTENTION:** The servo amplifier must not be connected to mains unless wiring and setup is completed.

Connectors on the rear side of the amplifier box



The two bumper cables have to be attached to the safety bumper sockets on the rear of the drive amplifier.

The limit switches (the two proximity switches on the drive assembly) have to be connected to the socket marked limit switches

The emergency cutout socket should have a shorting plug on it. If an external emergency cutout button should be used it can be connected to this socket (it has to be looped into the emergency loop which is available on pins 1 and 2 with its NC contact).

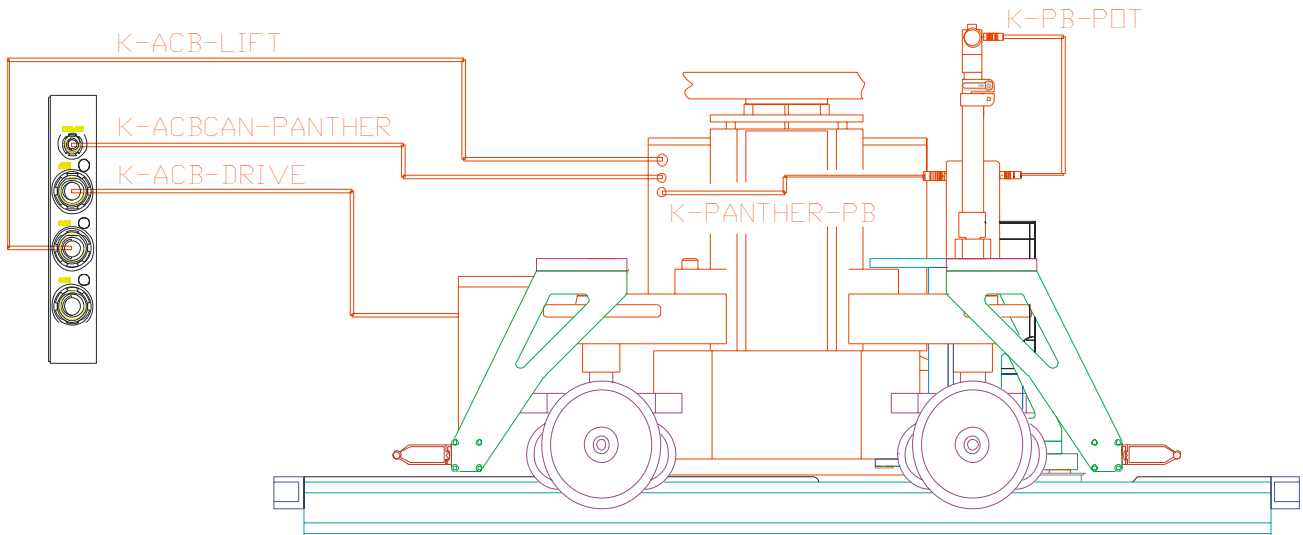
The orange motor power and resolver (A special version of a position sensor on the motor shaft) cables should be connected to the corresponding sockets.

**Attention:** The drive motor is running on 560V DC. Do not pull any of the cables while the system is connected to mains.



### Wiring the dolly to the ACB

The dolly should be connected to the leftmost ACB-1 on the main controller in the following way.



### Laying the track and installing the dolly on the track

The Track must be perfectly leveled and in good condition. The surface underneath the track must be rigid enough to accept the load of the dolly without any movement.

After placing the dolly on the track attach the two end pieces for the timing belt to the track ends. Do not mount the belt yet.

Place the dolly in such a position that the drive motor can be adjusted to about 2mm of clearance above the sleeper. The drive motor can be lowered by pushing it down and after adjustment the four screws should be tightened.

2mm clearance





Tighten the screws  
after adjusting clearance



After the clearance has been adjusted and the track end pieces including the timing belt clamping elements have been mounted move the dolly manually from one end to the other end of the track and check if the clearance is sufficient at all sleepers and that the bumpers have enough clearance over the track end pieces and the timing belt clamping elements.

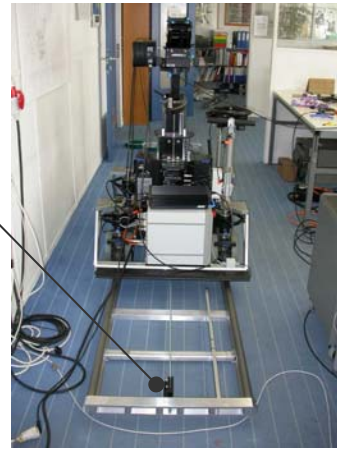
The bumpers should be at least 12 mm above the track end pieces to have enough clearance for the timing belt clamping elements.

Check that the both proximity switches are not closer than two and not further away than 6mm from the blades on the track end pieces.

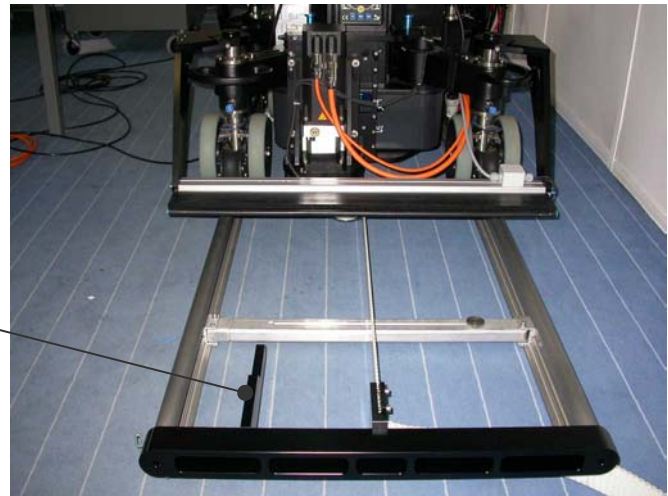
Limit switches



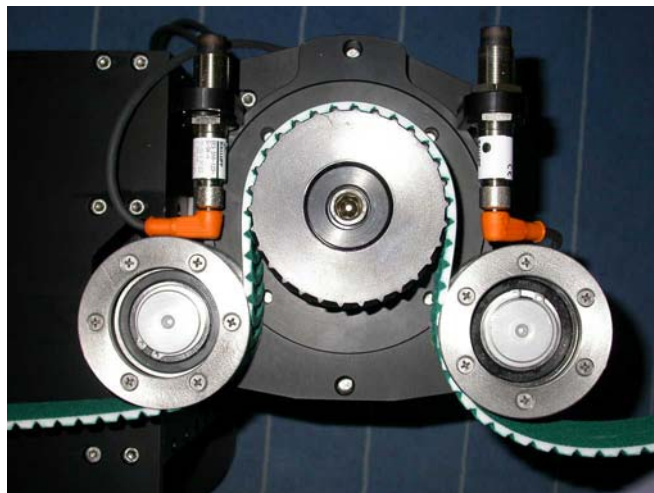
End piece with long limit switch blade on amplifier side  
(Will fit on a 2 meter track section of  
Panther precision track MK2)



End piece with short blade on motor side



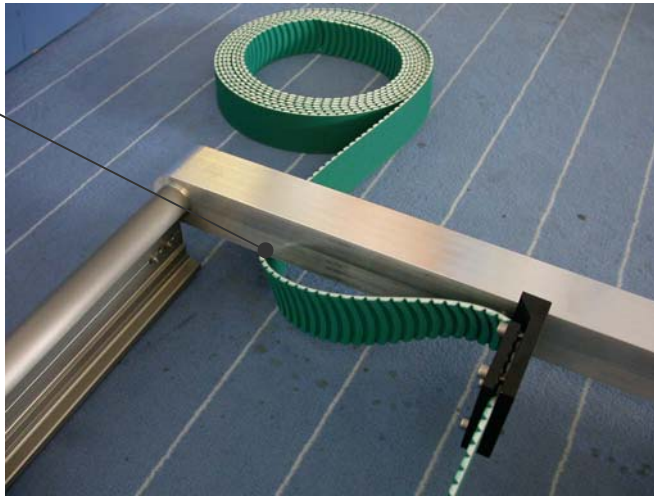
After all clearances /sleepers, end pieces) have been successfully checked loop the timing belt in an omega shape through the drive motor assembly. The dolly should be somewhere in the middle of the track or at least more than half a meter away from the track end.



The timing belt clamping element on the amplifier side end piece should now be loosened to the maximum and the timing belt should be clamped on the motor sides end piece as strong as manually possible.

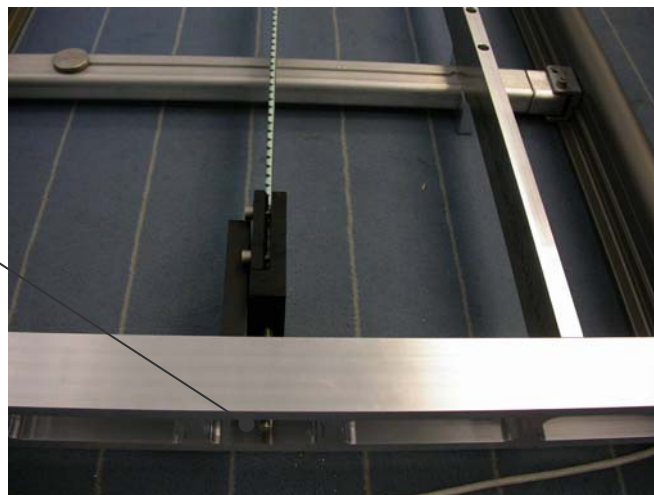
The unused end of the timing belt must be run underneath the end piece otherwise it might be damaged by the bumper.

run timing belt underneath  
the end piece to avoid damage

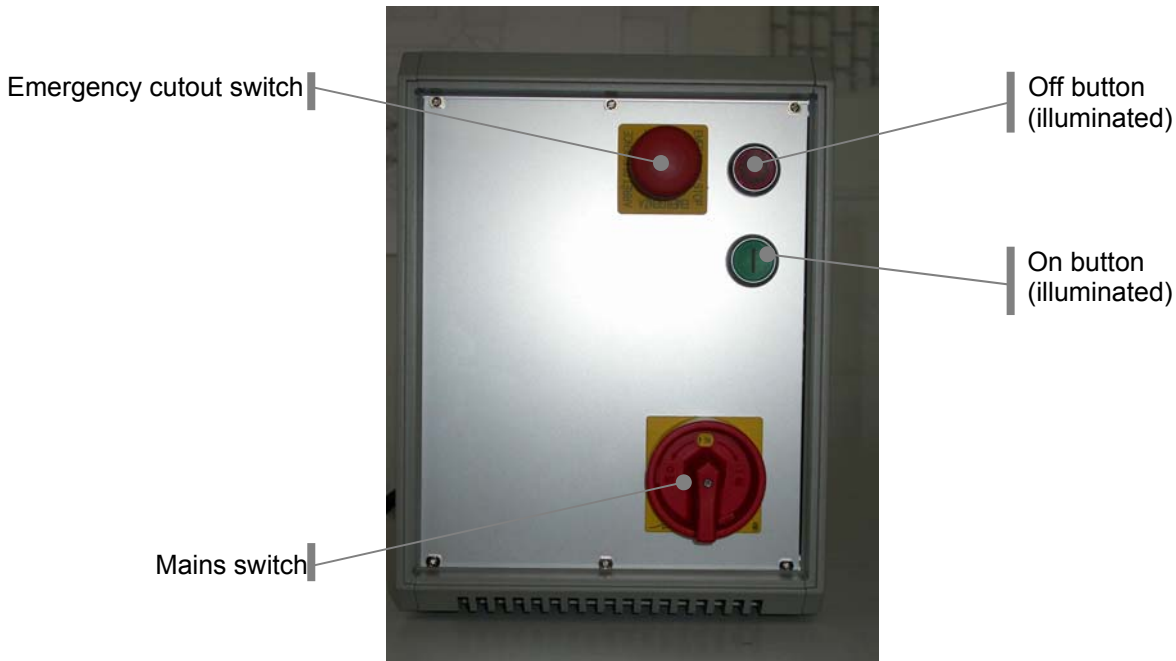


Now tighten the timing belt with a long 13mm nut on the amplifier end piece side quite strong (the timing belts tension is sufficient when it is in an upright position over the entire length of the track).

13mm hex nut for tightening the  
timing belt with a nut



## Checking the safety systems on the drive amplifier



Check if the emergency cutout switch is released (a yellow ring must be visible), if not pull on the red button until it locks in the released position.

Switch on the drive motor amplifiers main switch. The red light on the off button should come on.

Wait for approx. ten seconds until the amplifier is ready.

Now push the on button. The green light should come on.

If the green light doesn't come on check the following things:

- Emergency cutout switch activated?
- Shorting plug on the emergency cutout connector on the rear missing?
- one or both bumpers activated?

When the green light is on proceed as follows:

- Push the emergency cutout switch -> the green light should go off and the red light should come on
- Release the emergency cutout switch -> the red light must stay on
- Push the green button -> the green light should go on
- Activate one of the safety bumpers -> the green light should go off and the red light should come on
- Release the Bumper -> the red light must stay on
- Push the green button -> the green light should go on
- Activate the other safety bumper -> the green light should go off and the red light should come on
- Release the Bumper -> the red light must stay on
- Push the green button -> the green light should go on
- Remove the connector from the emergency loop on the rear side -> the green light should go off and the red light should come on
- Attach the connector again -> the red light must stay on
- Push the green button -> the green light should go on

**Attention:**

Check the operation of the two emergency bumpers prior to operating the system.

Check the function of the emergency cutout switch(es) prior to operating the system.

The timing belt must not be greased or treated with talkum powder.



### Interaction of the drive motor amplifier and the emergency cutout system on the CCB-1

When the drive motor amplifier is wired to the ACB-1 on a CCB-1 the CCB-1 will go into the emergency cutout state as long as the green light of the on button is not lit. You can only release the emergency cutout state of the CCB after switching on the drive motor amplifier.

If both limit switches of the drive axis are activated simultaneously (e.g. due to excessive overtravel on the track) the emergency system will also be activated and could only be reset after at least one of the limit switches is de-activated.

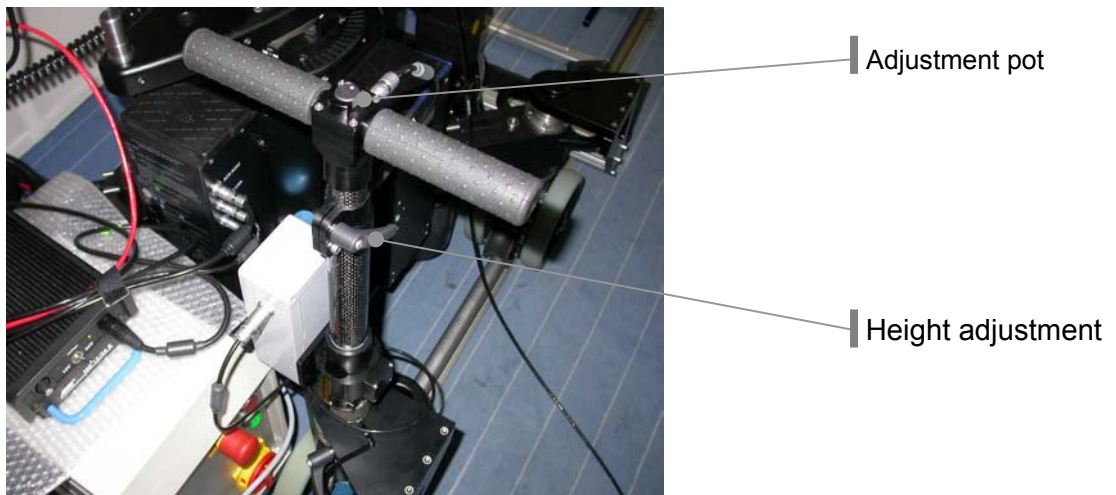
If the green light of the drive amplifier is on but it is not possible to recover from the emergency cutout on the CCB-1 then power cycle the drive amplifier by using its main switch. In rare cases the amplifier will have an internal error after an emergency stop that can only be recovered by power cycling it.

### The force sensitive pushbar

As a user interface for the dolly drive Arri designed a force sensitive pushbar that allows the dolly grip to push the dolly as he is used to do.

The pushbar can be mounted in any of the 4 wheel arms.

The sensitivity of the pushbar can be adjusted with a little knob on top of the pushbar in the range of 10% to 100%.



The orientation of the pushbar is critical, if reversed the dolly will move in the wrong direction.

Either reverse the gear ratio setting on the CCB or simply turn the pushbar base by 180° so that it matches the direction of the dolly.

If the pushbar is located on the side of the dolly where the connectors for the Arrimotion operation are (the left side of the track in positive counting direction of the drive) the grey electronics box of the pushbar should look to the center, if the pushbar is mounted on the other (right side) the electronics box should be on the outer side.

For best performance grip the pushbar firmly with both hands and set the gear ration in a way that the force that is needed matches the force on an unmotorised dolly.

**Attention:** Do not use the pushbar for steering the dolly when not on track

**Replacement Cables for the dolly drive system**

<i>Code</i>	<i>Ident#</i>	<i>Description</i>
K-ACB-CAN	K4.52801.0	Connects the CAN socket of the ACB to the Panther dolly
K-ACB-LIFT	K4.52802.0	Connects the AUX-2 Socket of the ACB to the Panther dolly
K-ACB-DRIVE	K4.52800.0	Connects the AUX-1 socket of the ACB to the drive amplifier
K-PB-POT	K4.52809.0	Connects the electronics box of the pushbar to the handgrip of the pushbar
K-PANTHER-PB	K4.52805.0	connects the pushbar electronics box to the panther
Resolver cable		Orange resolver cable for the drive motor
Motor cable		Orange motor cable for the drive motor

## 5.17. Compatibility

Camera Support

Cameras:

ARRIHEAD-1, ARRIHEAD-2, Encoded ARRIHEAD-2

ARRICAM Studio, Lite

ARRIFLEX 435ES, 435 Advanced

ARRIFLEX 535B

ARRIFLEX 16SR 3, 16SR3 HS, 16SR3 Advanced,  
16SR3 HS Advanced

Lens Motors:

CLM-2

Lens Controls:

WHA-2, WFU-1, WZU-1

ZMU-1, ZMU-2, FIU-1

### Temperature Range

All units except CCB and JBO:

-20°C to +50°C (-4°F to +122°F)

Jogbox (JBO):

-10°C to +50°C (+14°F to +122°F)

CCB with Hard disk:

+5°C to +50°C (+41°F to +122°F)

CCB with Flash disk:

-20°C to +50°C (-4°F to +122°F)

Transport:

-20°C to +60°C (-4°F to 140°F)

### Power

Input Voltage:

22 to 35 V DC

Power Draw:

6 axes system (1 MCB, 1 LCB, 2 CHM, 2 CLM2, WHA-2):  
in standby: 2,2A

maximum: 14A

complete system maximum: 25A

Dolly drive

3Phase 400V AC including neutral and earth

Fused to 16A

### Other

Humidity:

5-95% (none-condensing)

Elevation above sea level

0 to 3000m (0 to 9800 feet)

Environmental protection:

IP 42 (particle >1mm, drip water)

Vibration:

Operating: Random (RMS) 0.67G (5-500Hz)

Swept Sine 1G peak (5-500Hz)



## Corrections

20.3.2003	HA	Pinout of the ACB axis connectors corrected K-number of Accessory Bracket corrected
25.3.2003	HA	Definition of new status / warning symbols added Stop / go motion instructions added Browsing instructions added
27.3.2003	HA	Playback / VTR control instructions added
27.8.2003	HA	Ident numbers for CCB versions changed/added Ident number and items added in optional equipment list JCA-2, Jogbox Cradle added in HW Reference Troubleshooting questions added JHC-1 reference improved
8.9.2003	HA	Maximum number of GPI Boxes and address range changed
16.10.2003	HA	Added first parts of the dolly drive hardware reference
20-21.10.2003	HA	Added further details to the dolly hardware reference and safety instructions for the dolly drive
22-23.10.2003	HA	corrected Head Adapter ident-number, added emergency cutout procedures on the dolly drive
7-12.11.2003	HA	Reformatted, added Software Reference for Lens, Camera and Play/Rec menu, added warnings in Panther HW Reference
14.11.2003	HA	Added Browse Jog Software Reference / minor other corrections
29.3.2004	HA	Added some FAQ items
17.5.2004	HA	Added detailed description to sync symbol
14.9.2004	HA	Minor corrections
22.2.2005	HA	Added various cables to the partlist on pages 19-20