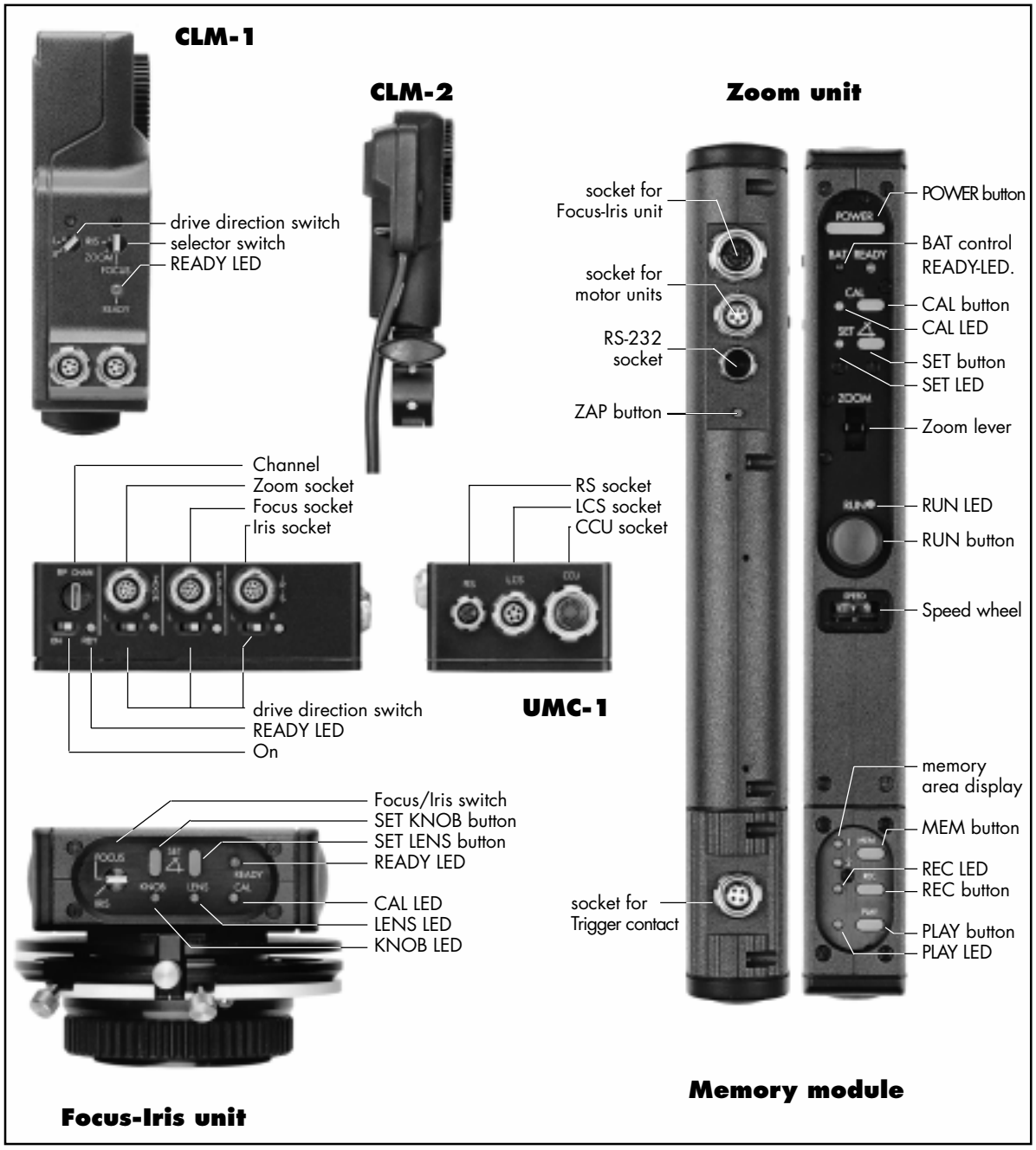
ARRI

LENS-CONTROL-SYSTEM

Instruction Manual
September 1998


CLM-1
drive direction switch
selector switch
READY LED
CLM-2
Zoom unit
socket for
Focus-Iris unit
socket for
motor units
RS-232
socket
ZAP button
POWER button
BAT control
READY-LED.
CAL button
CAL LED
SET button
SET LED
Zoom lever
RUN LED
RUN button
Speed wheel
Channel
Zoom socket
Focus socket
Iris socket
RS socket
LCS socket
CCU socket
drive direction switch
READY LED
On
UMC-1
Focus/Iris switch
SET KNOB button
SET LENS button
READY LED
CAL LED
LENS LED
KNOB LED
memory
area display
MEM button
REC LED
REC button
PLAY button
PLAY LED
socket for
Trigger contact
Focus-Iris unit
Memory module

Safety Specifications:

- The Lens Control System - LCS - has been thoroughly tested for quality of workmanship and operating functions before leaving the factory.

- In order to ensure optimal performance, it is essential that you acquaint yourself with this instruction manual.

- Warnings are indicated as follows:

Danger of injury
or equipment damage possible!

- Set-up and operation of the LCS unit should only be carried out by persons who are familiar with the equipment!

- In wet weather the usual precautions for use of electrical equipment must be taken!

- Do not use solvents to clean the LCS!

- Do not loosen any screws which are painted over!

- Use only original ARRI spare parts and accessories!

- Repairs must only be carried out by authorised professionals!

Meaning of the symbols in this user manual

⇨ **photo** indicates objects which are shown in the illustration.

Product Identification

When ordering parts or accessories, or if any questions should arise, please advise your type of product and serial number.

Contents

1. The System

1.1 Easy Electronic Lens Control

The ARRI Lens Control System – LCS – is an easy-to-use remote control system for camera lenses. A compact, modular system, it can be expanded from simple zoom control to a complete remote-control system for zoom, focus and iris, and can also be used as an interface for a computer. It covers all control possibilities for all prime lenses on ARRIFLEX cameras and can also be used on other cameras, e.g. Moviecam.

ARRIFLEX 535 with complete 3-axis LCS

The user can adapt the LCS with its varied functions to his own needs, for example adjustment range and speed as well as transmission ratio – at the touch of a button.

With the memory module programs and settings can be stored and repeated.

1.2 System Components

All operations of the lens control system can be performed with very few individual units.
The Lens Control System consists of:

Zoom with memory module, focus-iris-unit and motor

Motor Unit CLM-1

The powerful motor unit CLM-1 ➪ **photo** can be used for all applications with virtually all prime and zoom lenses. The vertical mounting configurations allow the motor unit to be attached even when the available space for the setup is restricted, e. g. when mounting a focus and iris drive on an ARRIFLEX 35 III equipped with a small Zeiss standard lens and a matte box. The motor units can be installed on and removed from the fully equipped camera. The matte box does not need to be removed.

Motor Unit CLM-2

The small, lightweight motor units CLM-2 ➪ **photo** are particularly suited to applications for which weight and size are decisive factors, for example Steadicam shots, when using 16mm or video

cameras, or with sensitive lenses. As with the CLM-1 motor units the vertical mounting enables working in particularly tight conditions. Through the consoles to the motors mounting is very flexible.

Universal Motor Controller UMC-1

The universal motor controller UMC-1 ⇨ **photo** is used to control the CLM-2 motors on the camera. Up to three CLM-2 motors (zoom, focus, iris) can be controlled. Mixed operation with CLM-1 and CLM-2 motors is also possible.

Zoom Unit ZMU-1

The zoom unit ⇨ **photo** is the main control for focal length control. In most situations, the zoom unit is used as the central operating unit.

Focus-Iris Unit FIU-1

The focus-iris unit can be used for remote, electronic follow focus as well as remote iris control. It is user-friendly and can be operated on the same principles as the mechanical follow-focus system.

Power Supply

The LCS is operated with a separate 24V or 12V battery. When only one CLM-1 motor unit or maximum two CLM-2 motor units are used, the LCS can be powered directly from the camera.

Cables

A modular cable-connecting system allows easy connection from one unit to the other, as well as to the system operating control. The LCS recognises connected units and detects also defective cables.

1.3 Operating Modes

Configuring Operating Modes

The user can set up any desired configuration by combining the individual units as needed.
The following combinations are possible:

Units / Configuration	Motor CLM-1 or CLM-2	Zoom ZMU-1	Focus-Iris FIU-1
Zoom	1	1	–
Focus	1	1	1
Iris	1	1	1
Focus and Zoom	2	1	1
Iris and Zoom	2	1	1
Focus and Iris	2	1	2
Focus, Iris and Zoom	3	1	2

If CLM-2 motor units are used, a universal motor controller UMC-1 is necessary.

Zoom operation is discussed in chapter 2. All other operating modes are discussed in chapter 3, Focus-Iris Operation.

Motor unit CLM-1 mounted on the ARRIFLEX 35 III

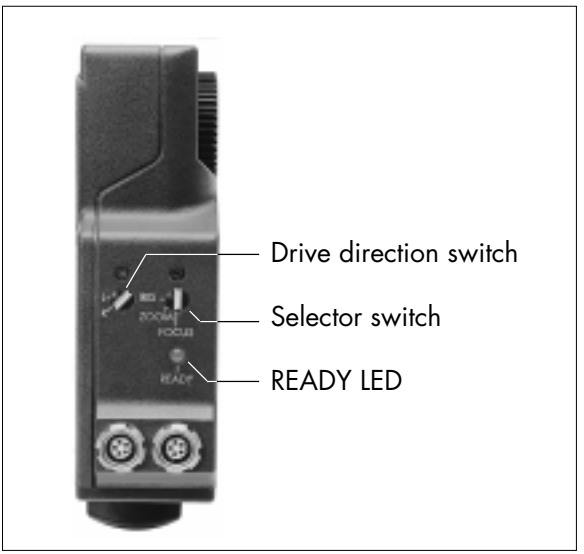
2. Zoom Operation

2.1 Set-up

Installing the Motor Unit CLM-1

- Clamp the motor unit CLM-1 ➪ photo on the lens support rods and fasten with the quick-clamp screw. Make sure the motor unit's drive gear engages the lens' zoom-control gear. Ensure as little play as possible!

- Turn the selector switch ➪ photo on the motor unit to the zoom position.



Motor unit CLM-1

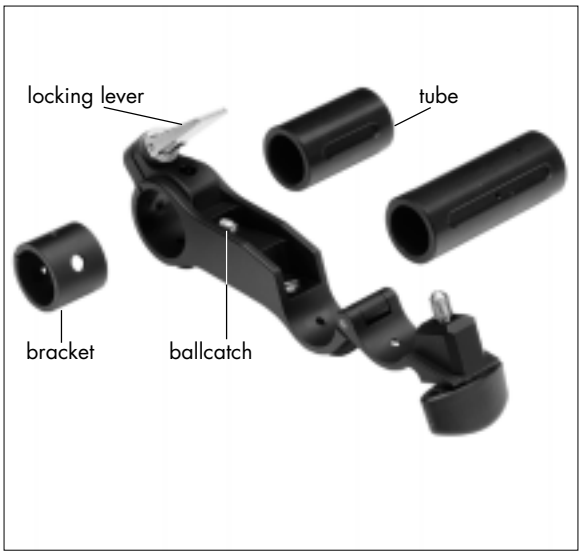
Mounting the Motor Unit CLM-2 with/without the console

Console order number: K2.52035.0

- Flip up the locking lever ➪ **photo** and screw back the ballcatch ➪ **photo** with a screwdriver as far as it will go until it disappears completely in the bracket.

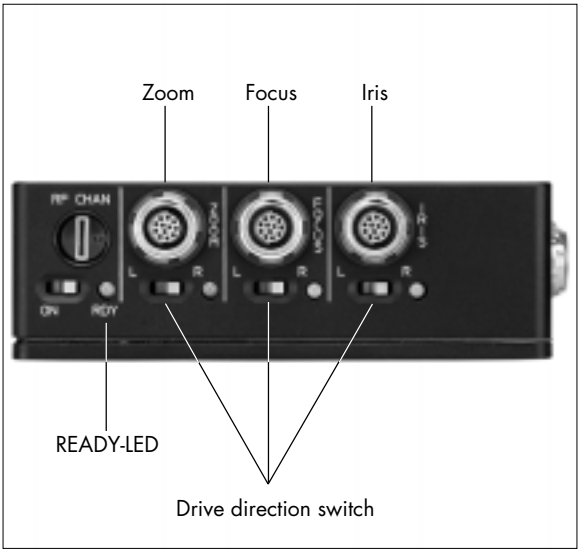
- Push the tube ➪ **photo** flush into the console receptacle, taking care that the slit in the tube points towards the ballcatch.

- Screw the ballcatch out of the bracket until the tube can no longer be pushed out of the bracket.



- Turn the locking lever until a slight resistance can be felt, then press the lever downwards.
- Fasten the motor unit CLM-2 to the console tube.
- Fasten the console to the support rods so that the motor unit's drive gear engages with the gear of the zoom ring. Ensure as little play as possible!

The motor unit CLM-2 can also be mounted directly onto the support rods without the console.



- Attach the universal motor controller UMC-1 ➪ **photo** to the camera. The UMC-1 can be mounted on the camera, e. g. with a lens support on the support rods.

- Attach the plug of the motor unit CLM-2 to the zoom socket ➪ **photo** of the universal motor controller UMC-1.

Electrical Connections

Turn off power on the zoom unit with the POWER button before connecting or disconnecting individual units! Use only 24V or 12V power sources!

The LCS detects the voltage automatically. When using a 12V power source, the maximum speed is reduced.

The LCS can be supplied with power from either the camera or a separate battery.

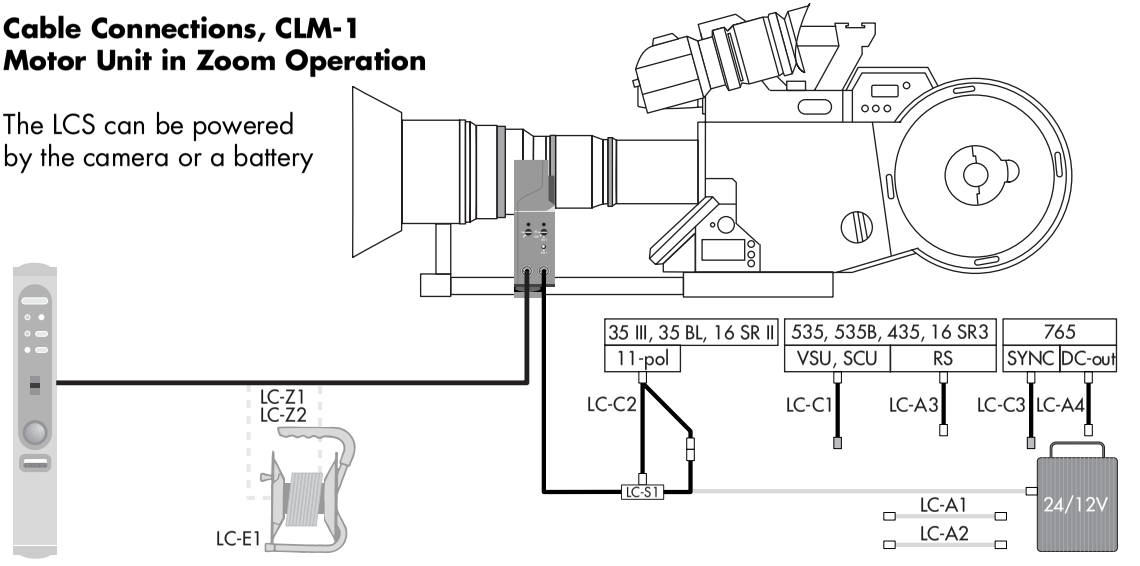
Only one motor unit CLM-1 or maximum two motor units CLM-2 can be supplied directly from the camera. When using more motor units, utilise a separate battery.

- Connect cables according to the following cable diagrams.

For REMOTE operation, the zoom cable LC-Z1 can be extended 75 m with the cable drum LC-E1.

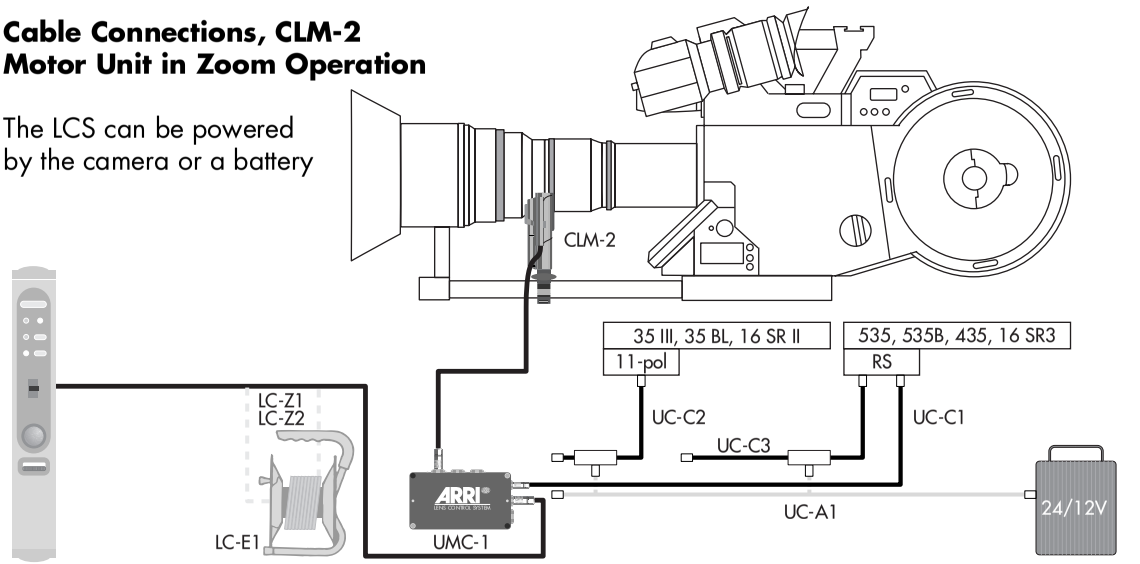
Cable Connections, CLM-1 Motor Unit in Zoom Operation

The LCS can be powered by the camera or a battery



Cable Connections, CLM-2 Motor Unit in Zoom Operation

The LCS can be powered by the camera or a battery



Cable Connections for the REMOTE-RUN Function when using the Power Cable LC-S1

The RUN Cables marked with a yellow sleeve can only be connected to the distributor box of the power cable LC-S1.

- When using the power cable LC-S1, connect the RUN Cable LC-C1, LC-C2 or LC-C3 to the camera according to the table below:

Camera	RUN-cabel	Connection to camera
535, 535B, 435, 16 SR3	LC-C1	Socket VSU, RU
435, 35 III 35 BL, 16 SRII	LC-C2	11-pin accessory socket XLR-connector for 1 axis
765	LC-C3	7-pin SYNC-socket

If the LCS is used on a non-ARRI camera, installation information must be obtained from the manufacturer of that camera.

For simple cable connection of the LCS, optional power cables LC-S2 and LC-S3 are available as an alternative to the LC-S1 power cable, RUN cable and DC cable:

– LC-S2 for the ARRIFLEX 35 III, 35 BL, 16 SR II and 435 without the functional expansion module and at reduced motor speed (12 V supply)

– LC-S3 for the ARRIFLEX 535, 535B, 16 SR3 and 435 with the functional expansion module.

Cable Connections for the REMOTE-RUN Function when using the Universal Motor Controller UMC-1

- When using the universal motor controller UMC-1, connect the RUN cable UC-C1, UC-C2 or UC-C3 to the UMC-1 and the camera according to the following table:

camera	RUN-cabel	connection to camera
535, 535B, 435, 16 SR3	UC-C1 only for power from the camera	RU-socket
535, 535B, 435, 16 SR3	UC-C2	RU-socket
35 III, 35 BL, 16 SR II	UC-C3	11-pin accessory socket

Only one motor unit CLM-1 or maximum two motor units CLM-2 can be supplied directly from the camera.
When using more motor units, utilise a separate battery.

When using a battery to power the LCS, the battery cable UC-A1 must be plugged into the socket in the thickened section of the cable UC-C2 or UC-C3.

If the LCS is used on a non-ARRI camera, installation information must be obtained from the manufacturer of that camera.

Switching On

- Before switching on, ensure that:
  - the support rods are securely fastened to the camera
  - the motor unit is securely fastened to the support rods
  - the motor drive gear engages the lens gear ring with as little play as possible.

- If using a universal motor controller UMC-1, switch its main switch to ON.
  Note: It is possible to leave the UMC-1 switched on all the time.

- Switch on power with the POWER button ⇨ **photo** on the zoom unit. Note: When the UMC-1 is switched off, the zoom unit must also be reset by switching off and on.

The READY LEDs on the zoom unit ⇨ **photo** and the motor unit CLM-1 or the universal motor controller UMC-1 briefly illuminate red, then display the operating status of the LCS as shown below:

◯ green	LCS is ready for operation
◔ flashing green	lens is at the end of the operating range
● red	operating error on one unit power cable LC-S1 defective (see also 6. trouble-shooting)
◓ flashing red	the selector switch on the motor unit is set incorrectely motor unit is not attached cable defective (see 6.trouble-shooting)

- Calibrate the LCS by depressing the CAL-button on the zoom unit (see section 2.2, Adjustments).

- Turn the drive direction switch on the CLM-1 motor unit or on the universal motor controller UMC-1 to the desired direction.

Operation after Break with Power Down

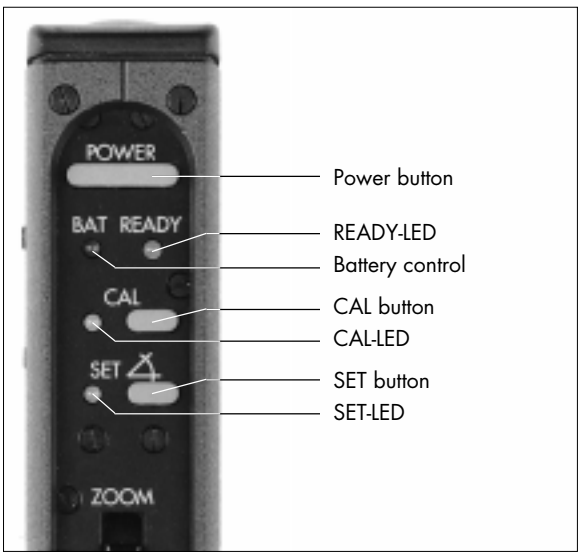
If a lens ring was moved manually while the LCS was turned off, the stored values for the end stops are no longer correct.

- Switch on the LCS and recalibrate (see chapter 2.2).

Operation after Lens Change

- Connect motor unit and fasten securely.

- Switch the LCS on and recalibrate (see chapter 2.2).

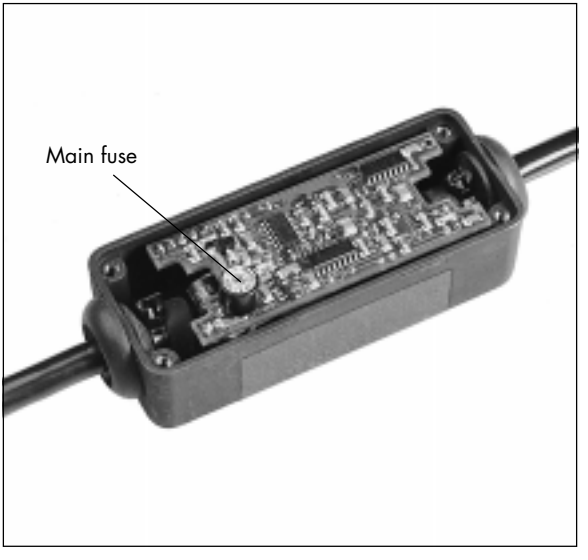


Operating elements on the zoom unit

Main Fuse

Type: Wickmann T 6,3 A

The main fuse ⇨ **photo** is located in the distributor module of the power cable LC-S1, and is accessible after unscrewing the module's cover.



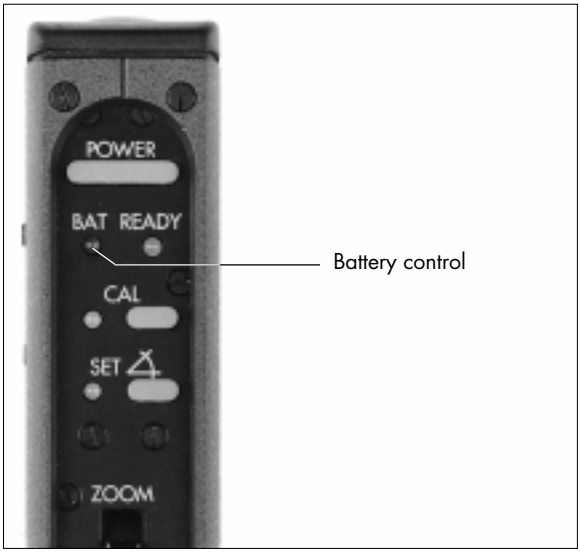
Opened distributor module

The universal motor controller UMC-1 is equipped with a self-resetting fuse.

Battery Control (BAT)

When the battery control LED (BAT) ⇨ **photo** on the zoom unit flashes, replace the battery.

Do not start any new scenes!



If the battery control flashes, replace the battery immediately (Danger of completely discharging the battery)

The battery control reacts to the following voltage limits:

Battery	BAT-LED	Voltage
24V	illuminated	<20V
	flashing	<18V
12V	illuminated	<10V
	flashing	<9V

2.2 Adjustments

Calibrating

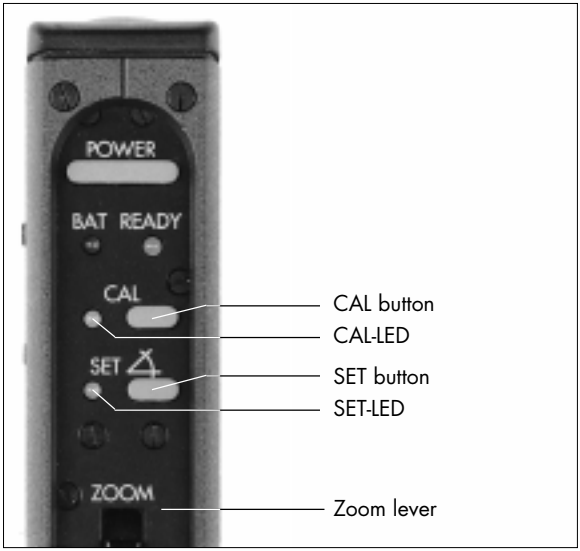
During automatic calibration, the LCS searches for the end stops of the zoom range of the lens. It then stores these values to prevent driving the lens ring up against the lens' end stops. Previously stored values are erased during a new calibration procedure.

It is essential that you recalibrate
– during initial set-up
– after a lens change
– after the lens control ring has been manually moved while the units were disconnected from the power, e.g. after an extended break
– after the motor drive gear has been removed from the lens control ring.

• To calibrate: Press the CAL-button on the zoom unit.

The yellow CAL LED will be illuminated during the automatic recalibration process, and the READY LED on the universal motor controller UMC-1 will flash red / green.

If the CAL LED flashes:
either the end stops have not been defined or a lens ring has been moved with the LCS switched off and has now been driven against the lens' end stop. Recalibration is necessary!



Motor Drive Direction

The operating direction of the motor unit can be changed at any time (except during the calibration process), including after the unit has been calibrated. To change the operating direction

- turn the drive direction selector switch (L/R) on the motor unit CLM-1 or the universal motor controller UMC-1 for the CLM-2 motor units.

Programming the Zoom Range

The LCS can be programmed to operate within any portion of the zoom range you wish.

- Drive the zoom control ring to one end of the range you have chosen.
- Press the SET button, and hold down. The SET LED will start flashing.
- Drive the zoom control ring to the other end of your selected range, and release the SET button.

The SET LED will now be illuminated.

The READY LEDs on the zoom and motor units indicate the current status of the LCS:

green	LCS is ready for operation
flashing green	lens is at the end of the operating range
red	operating error on one unit power cable LC-S1 defective (see also 6. trouble-shooting)
flashing red	the selector switch on the motor unit is set incorrectely motor unit is not attached cable defective (see 6.trouble-shooting)

Selection of a new zoom range is only possible if the new range is smaller than the previously selected one. Otherwise the original setting must be erased.

Erasing the Selected Zoom Range

- Press the SET button ➪ **photo** and hold down until the SET LED ➪ **photo** goes out.

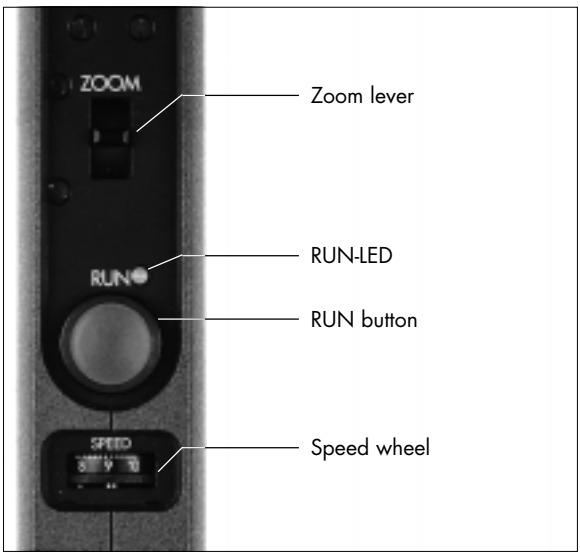
2.3 Operating Functions

Setting Zoom Speed

Sensitivity of the zoom lever is programmed with the speed wheel on the zoom unit. The fastest setting is 10, the slowest is 1. With full deflection of the zoom lever in either direction and the speed wheel set at 10, a half turn takes 1 second; with the speed wheel set to 1approx. 2 minutes (for lenses with 130mm diameter gear ring). Even slower speeds can be achieved with smaller deflections of the zoom lever.

Zoom Operation

- Push/pull the zoom lever ⇨ **photo** in the desired direction.
  The focal distance will be altered. The greater the deflection of the zoom lever, the faster the zoom speed will be.



Operating elements on the zoom unit

ZAP Function

The ZAP button ➪ **photo** switches to maximum zoom speed – independent of the position of the speed wheel.

Camera-RUN

- To start or stop the camera:
  Depress the RUN button ➪ **photo**.

When the camera is running, the RUN LED ➪ **photo** will illuminate green.

During REMOTE-RUN operation with the ARRIFLEX 35 BL, 35 III and 16SR II, the camera can only be stopped with the same button with which it was started.

Rear of the zoom unit

3. Focus-Iris-Operation

The system can be set up to control
– focus or iris
– focus or iris with zoom
– focus and iris
– focus, iris and zoom.

This chapter describes these variations.

3.1 Initial set-up

Mounting the Motor Unit

- Fasten the motor units securely to the support rods so that the drive gears of the motor units engage in the lens gear control rings. Ensure as little play as possible!

- Lenses with laterally moved gears: twist the lens ring with the motor unit attached in order to ensure that the drive gear is properly engaged.

- Set the selection switch on the CLM-1 motor units or on the universal motor controller for the CLM-2 motors to iris, focus or zoom as desired.

- Set the function to be used on the focus-iris unit switch focus/iris.

Electrical connections

Before connecting or disconnecting electrical connections, switch off the zoom unit with the POWER button!

Use only 24V or 12V batteries!

The LCS detects the voltage automatically. When using a 12V power source, the maximum speed is reduced.

Only one motor unit CLM-1 or maximum two motor units CLM-2 can be supplied directly from the camera. When using more motor units, utilise a separate battery.

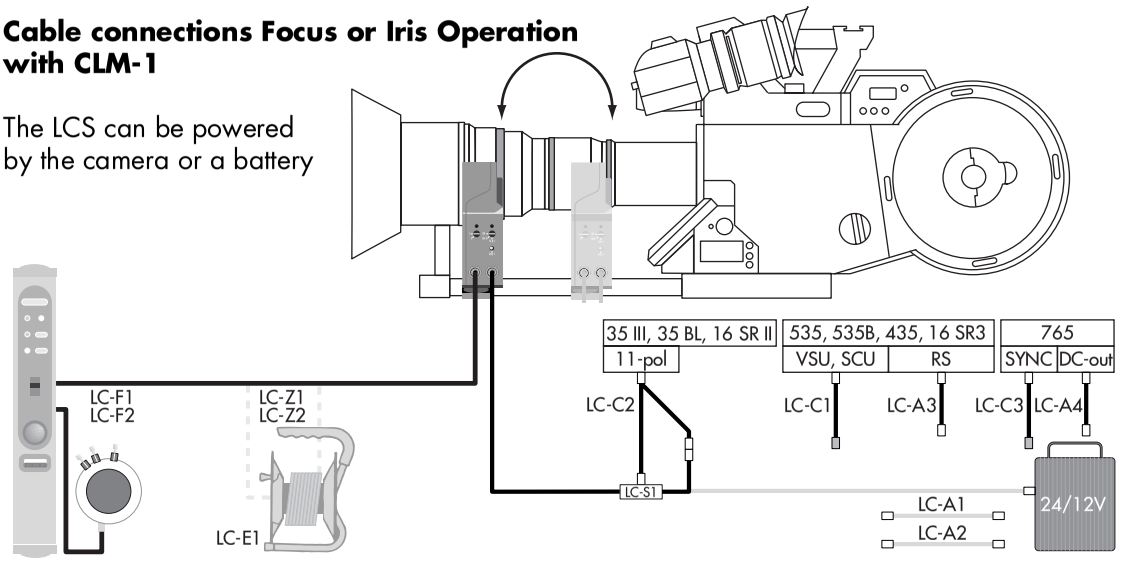
Cable connections

- Connect cables for each mode of operation according to the cable diagrams.
  The first four cable diagrams show the cable connections for CLM-1 motor units.
  The second four cable diagrams show the cable connections for CLM-2 motor units,
  The following three pages show examples for the combined use of CLM-1 and CLM-2 motor units.

REMOTE Operation:
The zoom cable can be extended 75 m for all operational modes with the cable drum LC-E1.

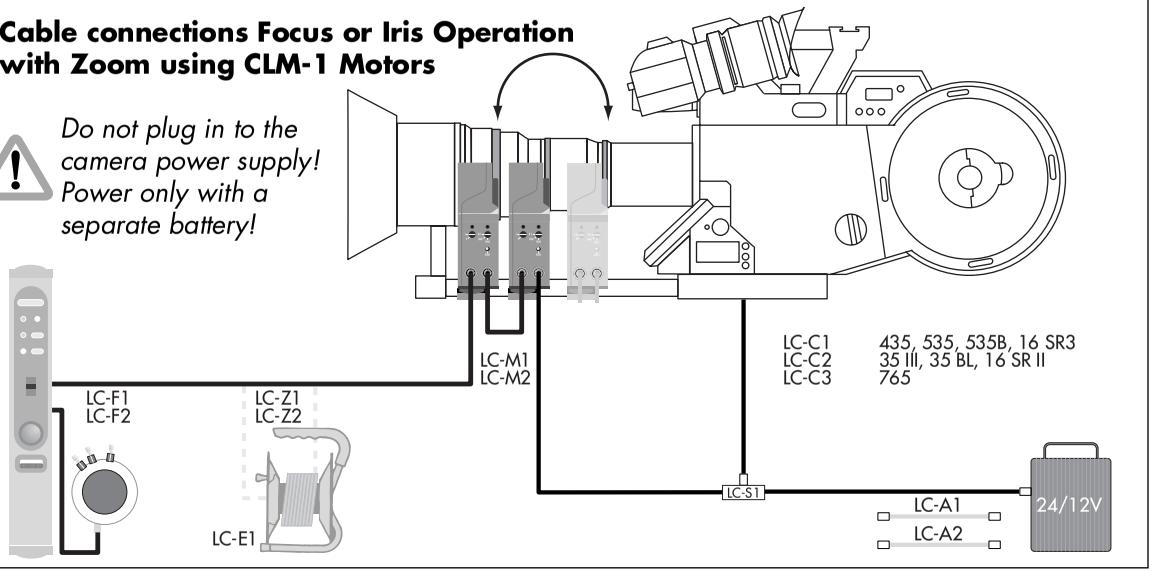
Cable connections Focus or Iris Operation with CLM-1

The LCS can be powered by the camera or a battery



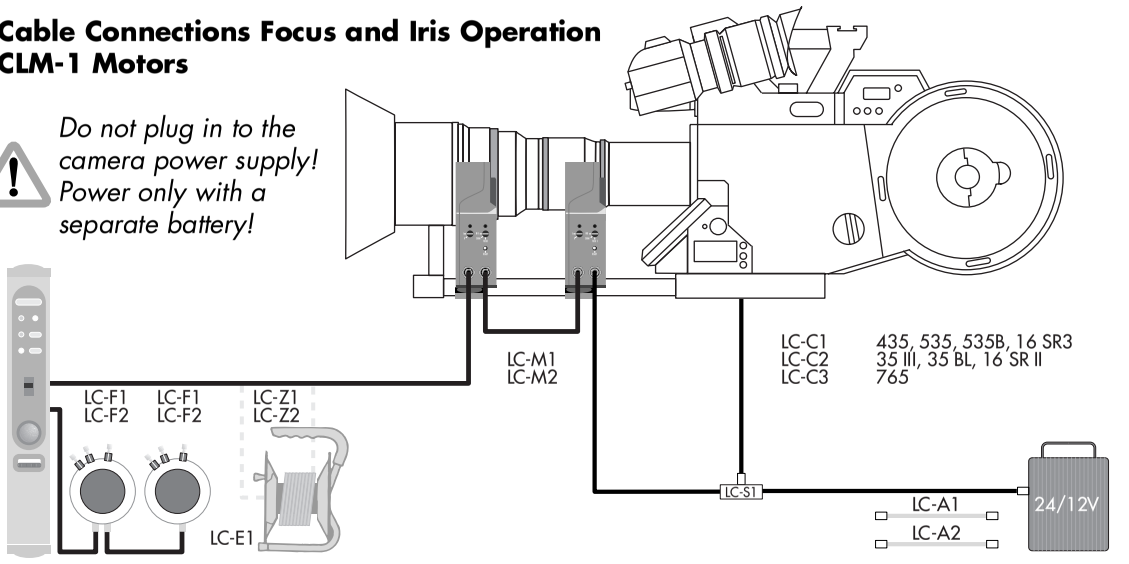
Cable connections Focus or Iris Operation with Zoom using CLM-1 Motors

Do not plug in to the camera power supply! Power only with a separate battery!



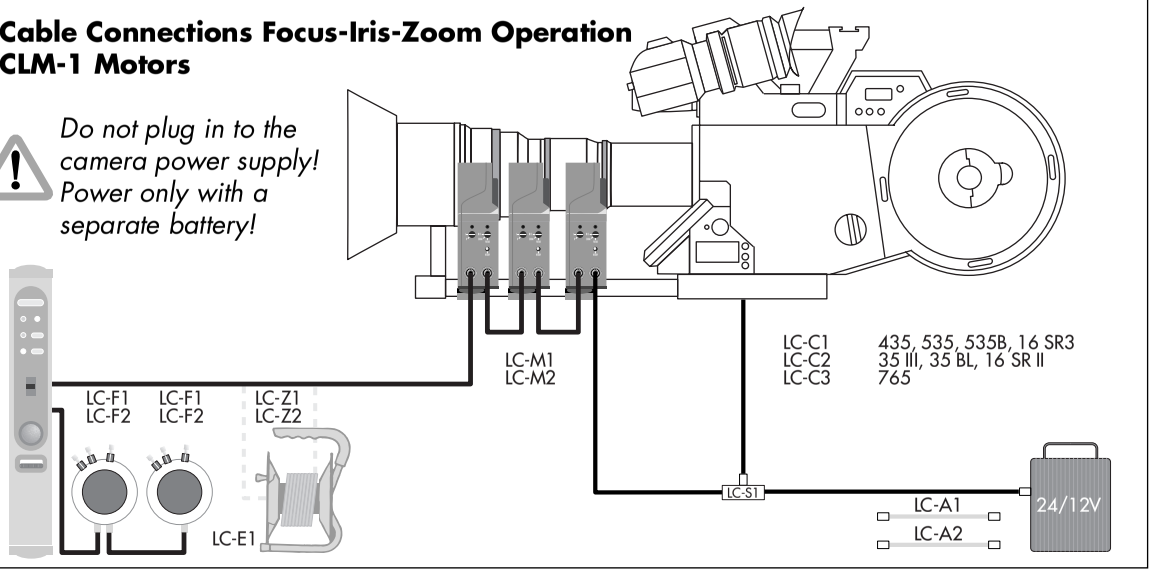
Cable Connections Focus and Iris Operation CLM-1 Motors

Do not plug in to the camera power supply! Power only with a separate battery!



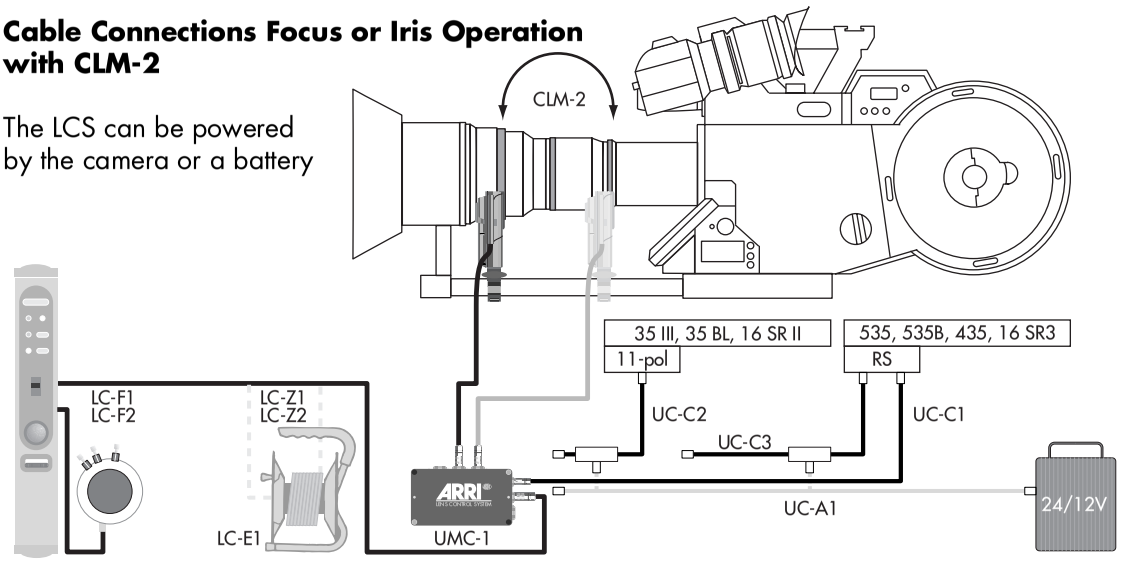
Cable Connections Focus-Iris-Zoom Operation
CLM-1 Motors

Do not plug in to the camera power supply! Power only with a separate battery!



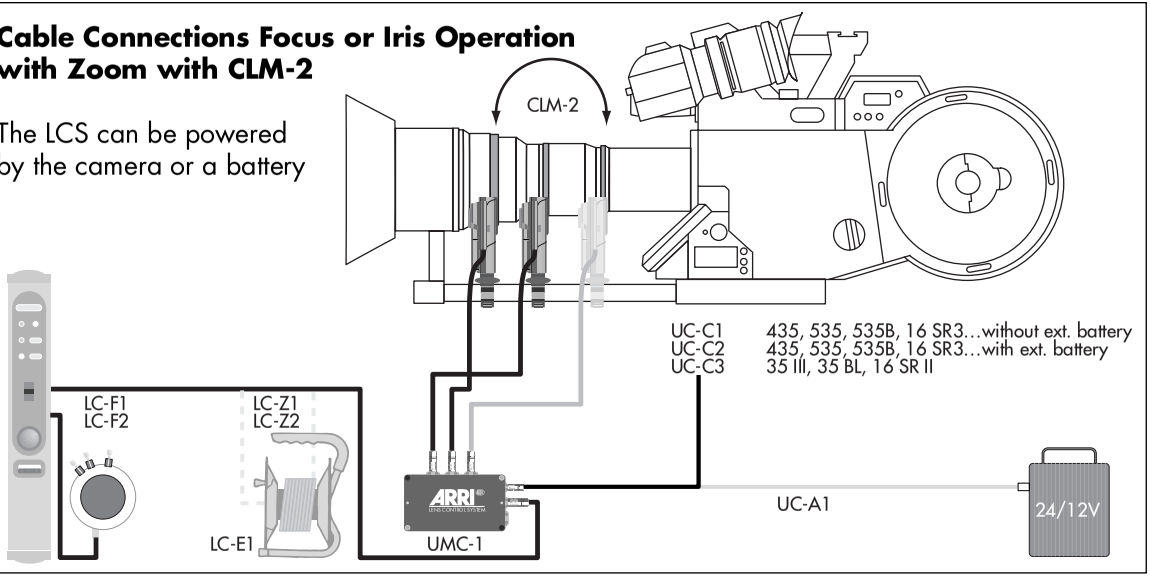
Cable Connections Focus or Iris Operation with CLM-2

The LCS can be powered by the camera or a battery



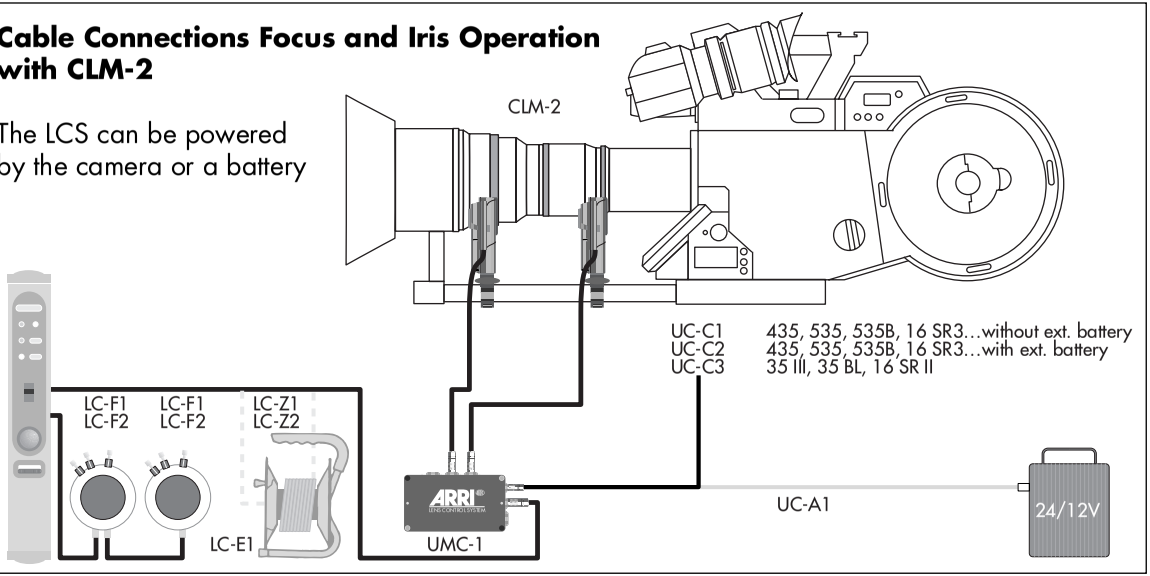
Cable Connections Focus or Iris Operation with Zoom with CLM-2

The LCS can be powered by the camera or a battery



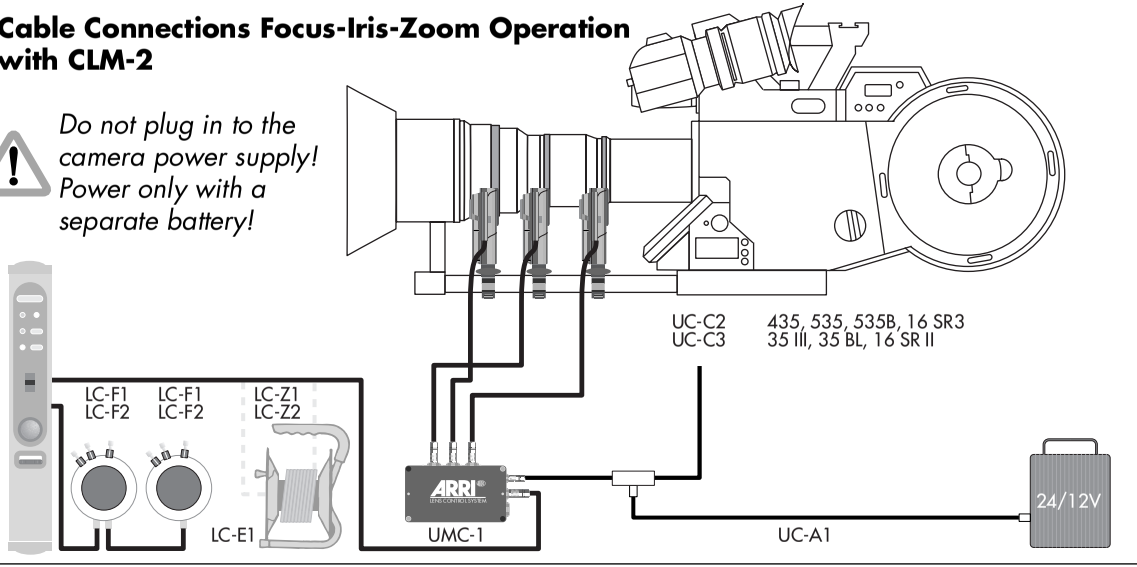
Cable Connections Focus and Iris Operation with CLM-2

The LCS can be powered by the camera or a battery



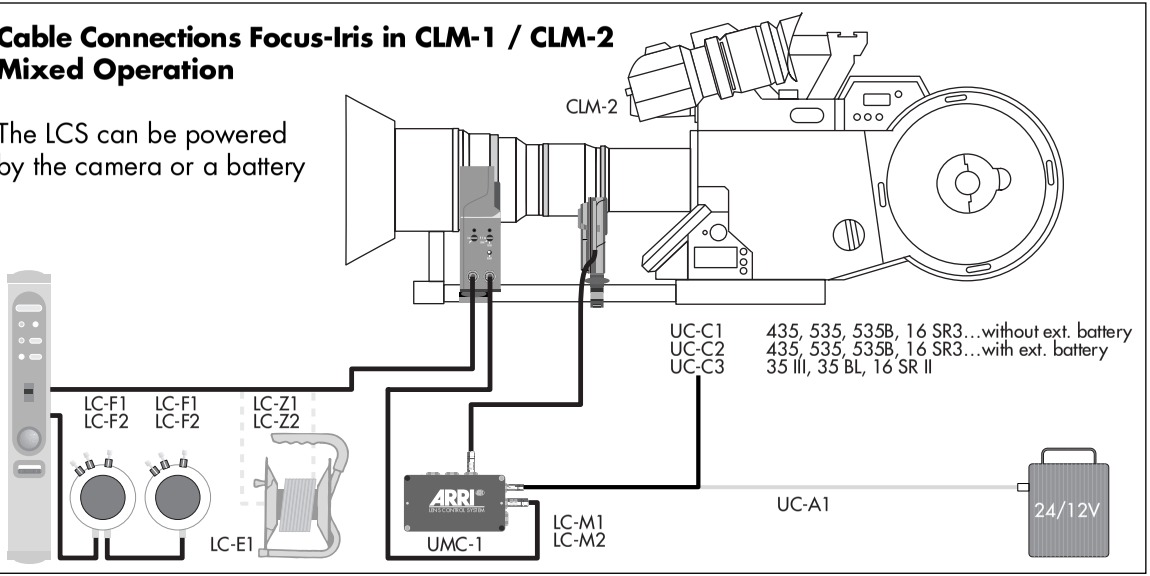
Cable Connections Focus-Iris-Zoom Operation with CLM-2

Do not plug in to the camera power supply! Power only with a separate battery!



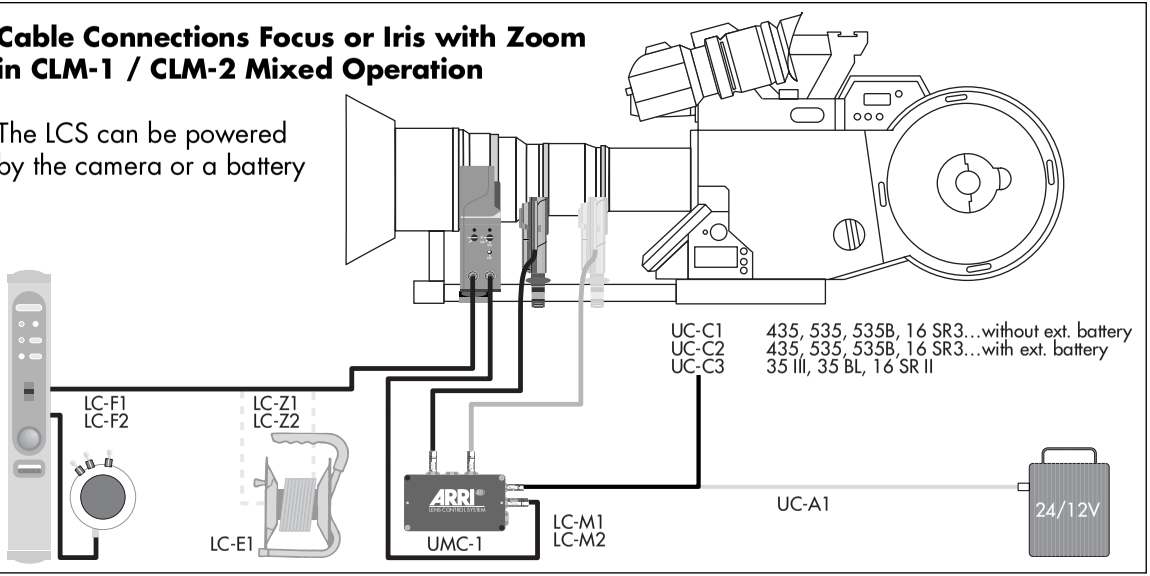
Cable Connections Focus-Iris in CLM-1 / CLM-2 Mixed Operation

The LCS can be powered by the camera or a battery



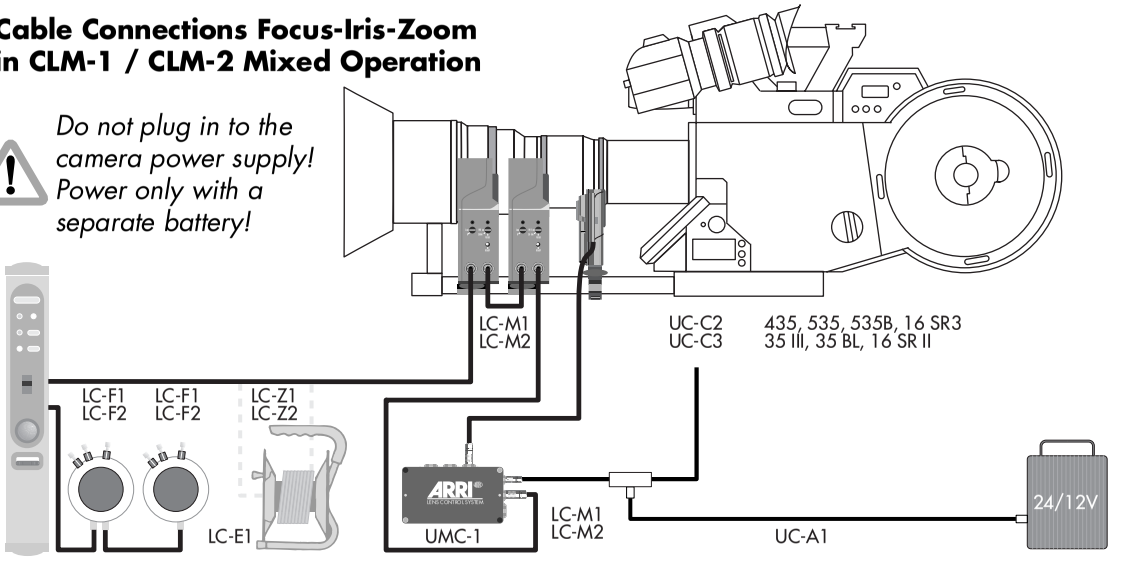
Cable Connections Focus or Iris with Zoom in CLM-1 / CLM-2 Mixed Operation

The LCS can be powered by the camera or a battery



Cable Connections Focus-Iris-Zoom in CLM-1 / CLM-2 Mixed Operation

Do not plug in to the camera power supply! Power only with a separate battery!



Cable Connections for the REMOTE-RUN-Function when using the Power Cable LC-S1

The RUN cables which are marked with a yellow sleeve may only be plugged into the distributor module of the power cable LC-S1.

- When using the power cable S1, connect the RUN cables LC-C1, LC-C2 or LC-C3 to the camera according to the table below:

camera	RUN-cable	connection to camera
535, 535B, 435, 16 SR3	LC-C1	Socket VSU, RU
435, 35 III 35 BL, 16 SRII	LC-C2	11pin accessory socket XLR-connector for 1 axis
765	LC-C3	7pin SYNC-socket

If the LCS is used on a non-ARRI camera, installation information must be obtained from the manufacturer of that camera.

For simple cable connection of the LCS, optional power cables LC-S2 and LC-S3 are available as an alternative to the LC-S1 power cable, RUN cable and DC cable:

– LC-S2 for the ARRIFLEX 35 III, 35 BL, 16 SR II;

– LC-S3 for the ARRIFLEX 535, 535B, and 16 SR3.

Cable Connections for the REMOTE-RUN Function when using the Universal Motor Controller UMC-1

- When using the universal motor controller UMC-1, connect the RUN cables UC-C1, UC-C2 or UC-C3 to the UMC-1 and the camera according to the table below:

camera	RUN-cable	Connection to camera
535, 535B, 435, 16 SR3	UC-C1 and for power from the camera	RU socket
535, 535B, 435, 16 SR3	UC-C2	RU socket
35 III, 35 BL, 16 SR II	UC-C3	11 pin accessory socket

Only one motor unit CLM-1 or maximum two motor units CLM-2 can be supplied directly from the camera. When using more motor units, utilise a separate battery.

When using a battery to supply the LCS, the battery cable UC-A1 must be plugged into the socket in the thickened section of the cable UC-C2 or UC-C3.

If the LCS is used on a non-ARRI camera, installation information must be obtained from the manufacturer of that camera.

Switching on

- Before switching on ensure that
  – the support rods on the camera are securely fastened
  – the motor unit is securely fastened to the support rods
  – the motor unit drive gear engages in the lens gear ring with very little play

- When using the universal motor controller UMC-1, switch its main switch to ON. Note: Always switch on the UMC-1 first. The UMC-1 can remain switched on at all times.

- Switch on the power supply with the POWER button on the zoom unit. Note: When the UMC-1 is switched off, the zoom unit must also be reset by switching off and on.

- On initial set-up or after changing the lens, **hold the CAL button depressed** while switching on until the CAL LED illuminates!

This prevents damaging the mechanical end stops and enables smooth operation at the lens' end stops.

The focus and/or iris motors will automatically drive into the position defined by the current setting of the hand control wheels.

The READY LEDs on the zoom unit and the motor units CLM-1 or the universal motor controller UMC-1 will briefly illuminate red and then display the status of the LCS as shown below:

green	LCS is ready for operation
flashing green	lens is at the end of the selected operating range
red	malfunction
flashing red	see 6. trouble shooting

- Turn the drive direction switch as desired (L/R) on the motor unit CLM-1 or the universal motor controller UMC-1 for the CLM-2 motor units.

Operation after Break with Power Down

If the LCS was turned off during an extended break, it is possible that the lens control ring may have been moved manually. If so, the stored values for the end stops are no longer correct.

- Before switching on, depress the CAL button (see Switching on/Initial Set-Up)

Operation after Lens Change

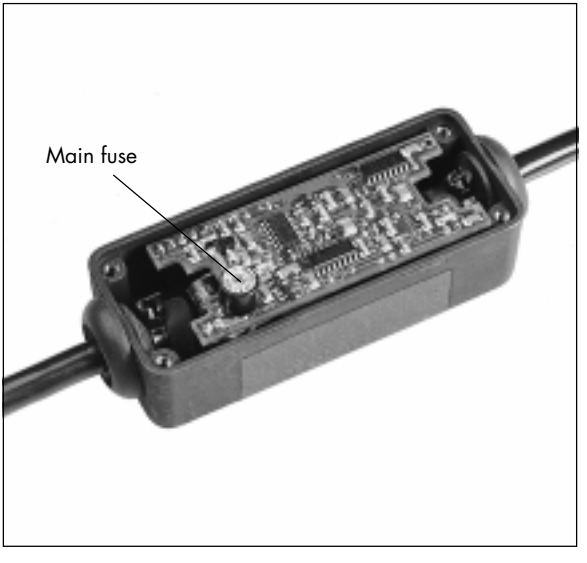
- Connect the motor units and fasten securely.
- Before switching on, depress the CAL button (see Switching on/Initial Set-Up)

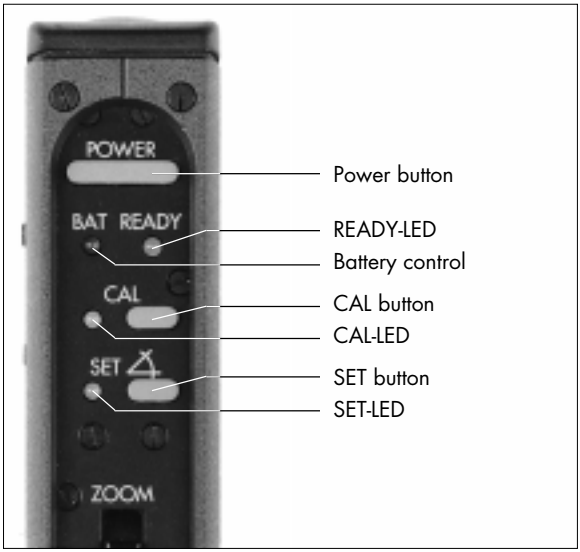
Main Fuse

Type: Wickmann T 6,3 A

The main fuse is located in the distributor module of the power cable LC-S1, and is accessible after unscrewing the module's cover ⇨ **photo**.

The universal motor controller UMC-1 is equipped with a self-resetting fuse.





Operating elements of the zoom unit.

Battery Control (BAT)

When the battery control LED (BAT) ➪ **photo** on the zoom unit flashes, replace the battery (Danger of completely discharging the battery

Do not start any new scenes!

The battery control reacts to the following voltage limits:

Battery	BAT-LED	Voltage
24V	illuminated	<20V
	flashes	<18V
12V	illuminated	<10V
	flashes	<9V

3.2 Adjustments

Calibration

The calibration function of the LCS allows the automatic recognition of all engaged lens gear rings and their end stops. Soft stops can then be created at the end of the control ranges of the lens to prevent damaging the lens' mechanical stops. The selector switches must be correctly set before calibration in order to properly calibrate with reduced motorspeed for the iris ring.

Previously programmed settings will be erased. The complete handwheel range of 330° corresponds to the entire focus or iris range of the lens being used.

New calibration is necessary
– during initial set-up
– after a lens change
– after the lens control ring has been manually moved while the units were disconnected from the power, e.g. after an extended break
– after the motor drive gear has been removed from the lens control ring.

- Set the selection switch on the motor unit CLM-1 to the desired function (the function of the CLM-2 motor units is fixed by attaching to the respective socket on the universal motor controller UMC-1).

- To calibrate, depress the CAL-button on the zoom unit.

- Calibration is then carried out automatically for all attached units. During this process, the CAL LEDs on all attached operating units illuminate yellow, the READY LED on the universal motor controller UMC-1 flashes red / green.

If the CAL LED on one or more operation units flashes: either the end stops have not been defined or a lens ring has been moved with the LCS switched off and has now been driven against the lens' end stop. Recalibration is necessary!

Motor Drive Direction

The operating direction of the motor unit can be changed at any time (except during the calibration process), including after the unit has been calibrated. To change the operating direction

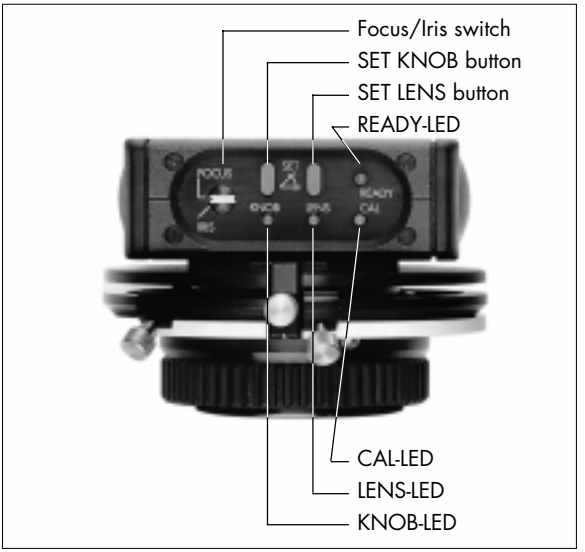
- turn the drive direction selector switch (L/R) on the motor unit CLM-1 or the universal motor controller UMC-1 for the CLM-2 motor units.

Setting the Operating Range of the lens

For every lens adjustment ring controlled by the LCS, the desired operating range can be selected. The smaller the range, the more precisely it can be adjusted.

The adjustment range is set separately for each parameter. The SET button on the zoom unit and the SET LENS button ⇨ **photo** on the focus-iris unit are used to select the range:

- Set one end of the range with the control unit.
- Press the SET (LENS) button, and hold down. The SET (LENS) LED ⇨ **photo** will start flashing.
- Set the other end of the range.
- Release the SET (LENS) button.
  – The SET (LENS) LED will now be illuminated.



The selected operating range must cover at least 2 % of the entire lens range. A setting of less than 2 % is not possible.

READY LEDs on the zoom unit, on the motor units CLM-1 or on the universal motor controller UMC-1 then display the status:

◯ green	LCS is ready for operation
◯ flashing green	lens is at the end of the selected operating range
● red	malfunction
◓ flashing red	see 6. trouble shooting

Erasing the Operating Range

- Depress the SET (LENS) button and hold down briefly – the SET (LENS) LED will go out.

Matching the Scale Range on the Focus-Iris Unit

On the focus scale disk on the focus-iris unit any desired range can be selected and premarked. Previously marked focus disks can also be used, e.g. from the mechanical follow-focus system.

For every focus-iris unit the range is aligned to the stored adjustment range of the lens ring as follows:

- Match and set the movable mechanical stops with the range-end markings on the marked disk.
- Turn the handwheel to the first stop.
- Depress the SET KNOB button and hold down – the KNOB LED will flash.
- Turn the handwheel to the second end-stop and release the SET KNOB button – the KNOB LED will illuminate.

The selected scale range on the handwheel must cover at least 30° or the adjustment is not possible.

Erasing the Scale Range

- Depress the SET KNOB button and hold down briefly – the KNOB LED will go out.

Using Scales from Mechanical Follow-Focus

When a focus disk from a mechanical follow-focus system is used on the focus-iris unit, the following steps must be taken before marking the disk on the follow-focus:

- Turn the focus knob on the follow-focus mechanism clockwise to the lens stop.
- Move the index indicator of the follow-focus system to the disk-positioner pin and fix it at this position.
- Mark the scale.

Scales marked in this way can be used for LCS focus-iris operation. Match the scale ranges as described above.

3.3 Operating Functions

Zoom Functions

see Chapter 2 Zoom Operation

Focus Adjustment and Iris Adjustment

- Turn the handwheel on the focus-iris unit.

The focus ring on the lens will follow the handwheel precisely without catching.

When turning the handwheel faster than the motor can follow, the motor will follow the handwheel at its highest speed, and will slow to the handwheel speed once it has caught up. The maximum speed of the motor is lower at 12V operation.

Camera-RUN

- To start or stop the camera:
  Depress the RUN button.

The RUN LED illuminates green while the film is running.

In REMOTE-RUN operation with the ARRIFLEX 35 BL, 35 III and 16 SR II the camera can only be stopped with the button with which it was started.

Note: While the camera is running, the universal motor control unit UMC-1 and the zoom unit can not be switched off.

4. Memory Module

With the optional memory module functions of the zoom, iris and focus controls can be recorded and played back at any time. Recording and playback can also be done remotely, in the trigger mode with an external trigger signal. Stored values will remain in the memory even when the main voltage is disconnected. Order number: K2.41382.0

4.1 Installation

- Remove the screws that hold the cover on the bottom part of the zoom unit.
- Remove the bottom cover.
- Plug the connecting cable into the zoom unit and the memory module ⇨ **photo**.
- Attach the memory module onto the zoom unit.
- Replace the cover on the memory module.
- Secure the unit with the appropriate screws.

4.2 Operating Functions

The memory module's storage function has two memory banks. These can be used individually or simultaneously. According to the memory bank selection recording time is limited (see Technical Data).

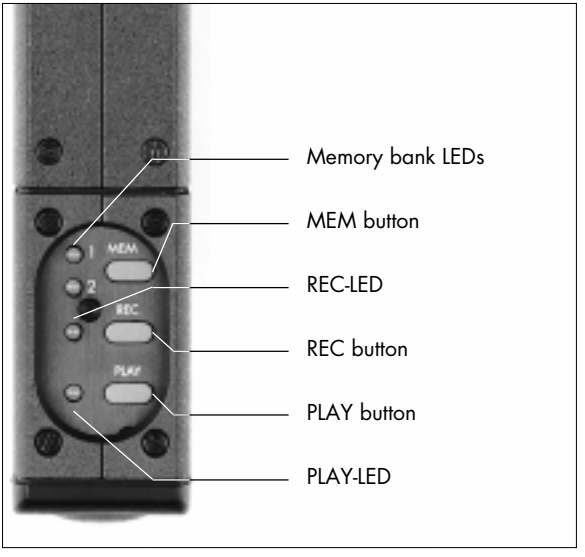
Memory bank indicators 1 and 2 display how these memory banks can be used :

◯ 1 ◯ 2	both memory banks are locked no recording or playback possible
◉ 1 ◯ 2	memory bank 1 active recording and playback in memory bank 1 possible data in memory bank 2 is stored
◯ 1 ◉ 2	memory bank 2 active recording and playback in memory bank 2 possible data in memory bank 1 is stored
◉ 1 ◉ 2	memory bank 1 and 2 active recording and playback in memory bank 1 and 2 data in memory bank 1 and 2 will be erased

When the zoom unit is turned on, the memory banks are locked to prevent accidental erasure of stored data.

Selecting Memory Bank

- Press the MEM button repeatedly until the desired memory bank is active.



Recording Operating Functions

- Select the desired memory bank.

- To initialise:
  Depress the REC button – the REC LED ➪ **photo** will flash. The LCS is ready for recording. This status can be cancelled by pressing the MEM button. If no memory bank has been pre-selected, memory bank LEDs 1 and 2 will flash. Select memory bank!

- To start recording:
  Press the REC button again. During recording, the REC LED will illuminate.

- To stop recording:
  Press the REC button again or wait until the entire sequence has been recorded.

Playback Operating Functions

- Select the desired memory bank.

- To set the starting position: press the PLAY button. During the search for the start positions, the PLAY LED will flash fast; once the positions have been reached, the LED will flash slowly.

The LCS is ready for playback. This status can be cancelled by pressing the MEM button.

If there is no recorded data in the memory bank, both memory bank LEDs will flash, and the READY LED on the zoom unit will be illuminated red. Select the correct memory bank!

- To start playback: press the PLAY button again. During playback the PLAY LED will be illuminated.

- To stop playback: press the PLAY button again or wait until the entire sequence has been played back.

4.3 Trigger Function

The trigger function allows precisely timed activation of recording or playback functions of selected ranges. Operations like focusing on a moving object can be more accurately reproduced when the adjustments of memory module are activated by the trigger functions via a remote activation signal.

Recording

- Select the desired memory bank.

- To initialise:
  press the REC button – the REC LED will flash. The LCS is ready for recording.

  This status can be cancelled by pressing the MEM button.

  If no memory bank has been pre-selected, memory bank LEDs 1 and 2 will flash. Select memory bank!

- To start recording: connect the trigger contacts. During recording, the REC LED will be illuminated.

- To stop recording: press the REC button again or wait until the entire sequence has been recorded.

Playback

- Select the desired memory bank.

- To set the starting positions:
  press the PLAY button. During the search for the start positions, the PLAY LED will flash fast; once the positions have been reached, the LED will flash slowly.

  The LCS is ready for playback. This status can be cancelled by pressing the MEM button.

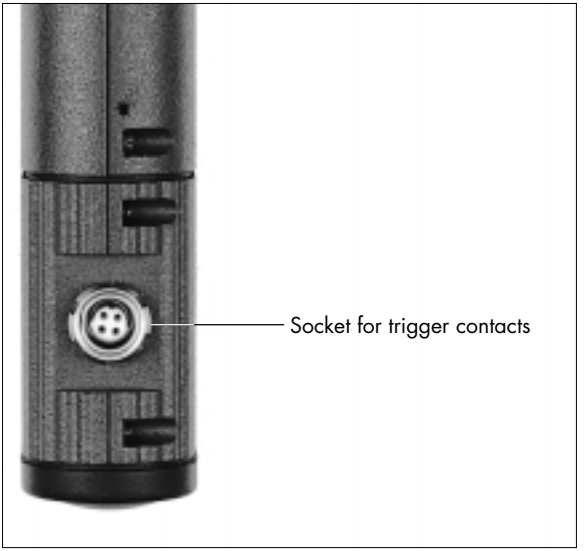
  If there is no recorded data in the memory banks, both memory bank LEDs will flash, and the READY LED on the zoom unit will be illuminated red. Select the correct memory bank!

- To start playback:
  connect the trigger contacts. During playback the PLAY LED will be illuminated.

- To stop playback:
  press the PLAY button again or wait until the entire sequence has been played back.

1	TRIG +	Activate trigger mode by
2	TRIG -	connecting both contacts
3	–	not connected
4	–	not connected

Pin assignment for the trigger contacts



The rear of the memory module

4.4 RS-232 Interface

The RS-232 interface ➪ **photo** is an optional accessory for the memory module which allows data exchange between the memory module and a PC. The following functions can be operated via the RS-232 interface:

– The selected range values and the system status of the LCS can be recorded by the PC and monitored by the operator.
– Recorded ranges can be transferred to the PC, and a variety of data can be permanently stored.
– Values stored in the PC can be transferred to the memory module.

Additional information is available upon request.

5. Mechanical Accessories

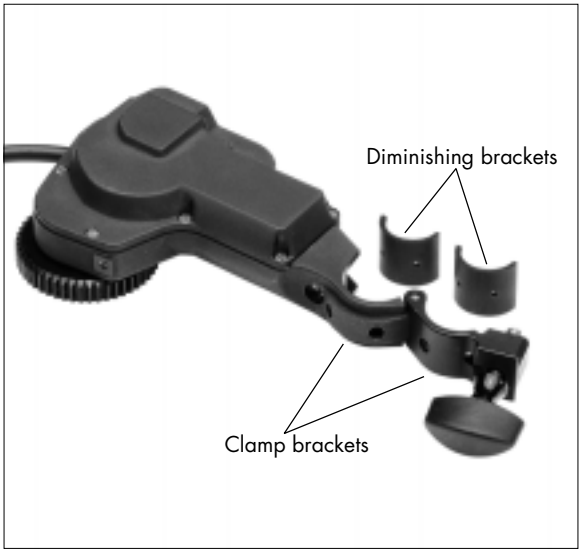
5.1 Conversion for ø 15mm Support Rods

The motor units can also be mounted on ø 15mm lens support rods.

To Replace the Offset Clamp Unit on the Motor Unit CLM-1

- Remove the two screws on the bottom of the motor unit and the screws on the side.
- Replace clamp unit.
- Replace screws.

Order number for the clamp unit: K2.41379.0



Mounting Diminishing Brackets on the Motor Unit CLM-2

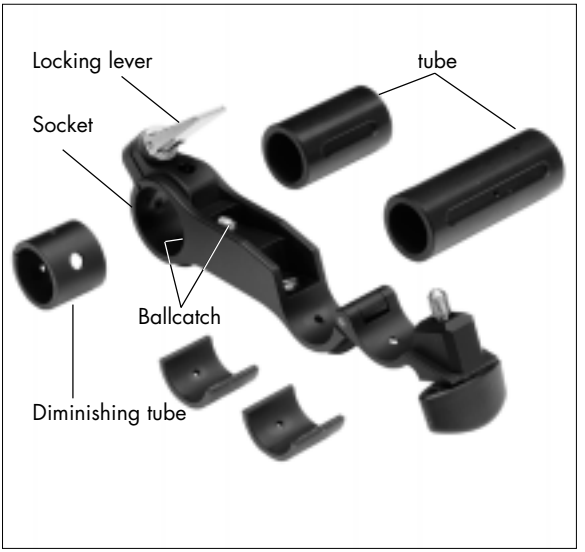
- Flip up the clamp brackets ➪ **photo** on the motor unit CLM-2.

- Place the diminishing brackets ➪ **photo** into the clamp bracket of the motor unit CLM-2.

- Fasten the diminishing brackets externally with two screws each.

Mounting the Diminishing Brackets on the Console

- Flip up the locking lever ➪ **photo** and unscrew the ballcatch ➪ **photo** with a screwdriver until it completely disappears in the bracket.



- Push the tube with the slit ➪ **photo** flush into the console socket ➪ **photo**, ensuring that the slit in the tube corresponds with the clamp slit.

- Fix the diminishing tube with two screws from the outside.

- Push the tube ø 15mm flush into the diminishing tube on the console. Ensure that the slit ➪ **photo** in the tube points in the direction of the ballcatch.

- Screw the ballcatch out of the bracket until the tube can no longer be pushed out of the bracket.

- Turn the locking lever until a slight resistance can be felt, then press the lever downwards.

- Flip up the clamp brackets.
- Place the diminishing brackets into the clamp brackets.
- Secure the diminishing brackets with two screws each on the exterior.

Order number for the console: K2.52035.0

5.2 Offset Mounting

If the motor unit CLM-1 is to be used on a very short lens, a different offset clamp unit should be mounted to reach the iris control ring of the lens. This is not necessary on the ARRIFLEX 765 or the ARRIFLEX 35 III (see motor holder for the ARRIFLEX 35 III)

Order numbers:
K2.41381.0 for ø 19mm rods
K2.41380.0 for ø 15mm rods

To Replace the Offset Clamp Unit

- Remove the two screws on the bottom of the motor unit and the screws on the side.
- Replace clamp unit.
- Replace screws.

5.3 Panhandle Holder

The zoom unit can be used with a panhandle holder on the following SACHTLER fluid heads:
– Video 17III_25II
– Horizon II
– Studio II
– Dutch Head
– Studio 80

The zoom unit can also be used with the panhandle holder on fluid heads of other manufacturers.

Order number: K2.44809.0

5.4 Motor Holder for ARRIFLEX 35 III

If the motor unit is to be used with the ARRIFLEX 35 III with a short lens, a special motor holder is necessary in order to reach the iris control ring.

Order number: K2.41390.0

Mounting the Motor Holder

- Mount the motor holder instead of the standard 35 III carrying handle.

- Mount the motor unit onto the motor holder.

5.5 Movable Iris Drive Gear

On lenses where the iris control ring moves laterally when the lens is being focused, the iris drive gear must move with it. To enable this, the motor unit is equipped with a movable iris drive gear which allows the iris ring to move 15 mm.

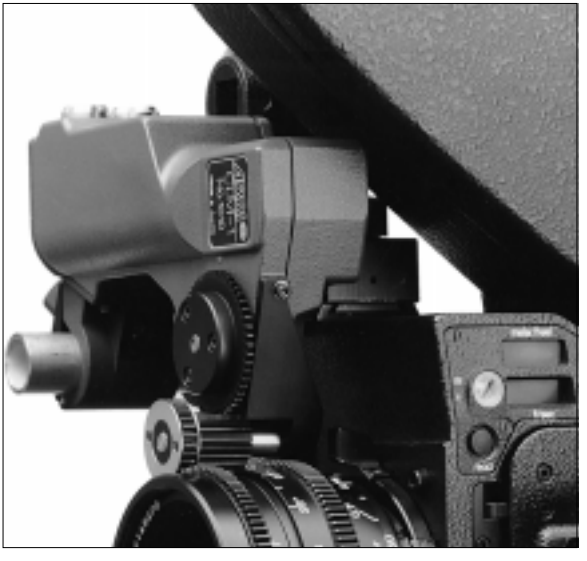
Order number: K2.41388.0

Mounting the Movable Iris Drive Gear

- Replace the original standard motor unit drive gear with the narrow gear. (included in the conversion kit).

- Mount the movable iris drive gear with two screws onto the standard motor unit ➪ **photo**.

Before calibration of the LCS unit, ensure that the lens ring is engaged properly in the movable iris drive gear. Otherwise damage to the lens or the LCS can occur.



Motor unit with the movable iris drive gear mounted on the ARRIFLEX 35 III

5.6 Iris Drive Gear

To enable greater adjustment speeds, gears with a larger diameter are available. Gears for use on video camera lenses are also available.

Order numbers:

K5.52457.0 Gear for motion picture camera lenses with large diameter (65 teeth)

K5.53091.0 Normal gear for video camera lenses

K5.53092.0 Gear for video camera lenses with large diameter (104 teeth)

5.7 Iris Gear Rings

Retrofit iris gears are available for the following older lenses that were not available with integrated iris gear rings.

Order numbers:

K2.43351.0 for Zeiss Vario-Sonnar T2.0, 10-100mm and for Zeiss Vario-Sonnar T2.2, 11-110mm

K2.44925.0 for Zeiss standard lenses

K2.44811.0 for 35mm High Speed Zeiss T1.3

K2.44833.0 for 16mm High Speed Zeiss T1.3 and for standard Zeiss 180mm

K2.44835.0 for Cooke Cine Varotal T4.0, 25-250mm

K2.44863.0 for Cooke T1.6, 10-30mm and for Cooke T3.1, 20-60mm

K2.44925.0 for Angenieux T2.9, 20-120mm

K2.44928.0 for Angenieux T3.9, 25-250mm

6. Trouble-Shooting

6.1 Power Supply

No Reaction when switched on	
Battery empty	Check battery level
Main fuse defective	Replace fuse in the LC-S1. The UMC-1 is equipped with self-resetting fuses (wait several seconds)
Power cable LC-S1 defective	Connect cable directly to zoom unit and depress POWER button. If there is no reaction, replace power cable
Power cable UC-A1 (UC-C1, UC-C2, UC-C3) defective	Replace power cable
Zoom cable LC-Z1 or LC-Z2 defective Motor cable LC-M1 or LC-M2 defective	When using several motor units, connect zoom cable directly to the motor unit which is also connected to the power cable LC-S1. If there is no reaction, replace zoom cable. Otherwise replace motor cable.

Battery Control (BAT) illuminated	
Battery nearly empty	Replace battery. Do not start a new scene!
Battery Control (BAT) flashing	
Battery empty	Replace battery immediately Danger of completely discharging the battery.

6.2 LEDs Universal Motor Controller UMC-1

READY LED illuminated red	
Zoom unit is switched off	Switch on zoom unit
UMC-1 was switched on after the zoom unit	switch zoom unit off and on again
Motor LED flashes red	
Several motor units are set to the same operational function or plugged into the UMC-1. The READY LEDs on the manual control units also flash red	Switch off, set selector switch on the motor unit CLM-1 to the corresponding function, or plug CLM-2 motor units into the corresponding position. Switch on.
CLM-2 motor unit defective	Replace CLM-2 motor unit

Motor LED illuminated red	
CLM-2 motor unit was plugged in after switching on the zoom unit	Switch off the zoom unit, switch on again and recalibrate the system

6.3 LEDs Motor Units CLM-1

READY LED flashes red	
Several motor units are set to the same operational function or plugged into the UMC-1. The READY LEDs on the manual control units also flash red	Switch off, set the selector switch on the motor units to the corresponding function, switch on.
Motor cable LC-M1 or LC-M2 defective	Check all motor cables and replace if necessary

READY LED illuminated red	
Operational error, e.g. selector switch on the motor unit was operated while the unit was switched on	Switch off, check settings on control units and motor units, switch on
Power cable LC-S1 defective	Replace power cable

6.4 LEDs Zoom Unit

READY LED flashes red	
Wrong configuration	Switch off, set selector switch on motor units CLM-1 or focus-iris switch on focus-iris unit to the corresponding function, switch on
Motor unit is not plugged in	Plug in motor unit
Motor cable LC-M1 or LC-M2 or focus cable LC-F1 or LC-F2 defective	Check all motor cables and focus cables and replace if necessary
UMC-1 is switched off (READY-LED of the FIU units is flashing red)	Switch on UMC-1, switch zoom unit off and on again.
UMC-1 was switched on after the zoom unit	Switch zoom unit off and on again.

READY LED illuminated red	
Operational error on one control unit	Switch off, check settings on control units, switch on
Use of a locked control element, e.g. SET button while calibrating	Perform all functions in proper sequence

CAL LED flashes	
Motor units were replaced or moved. After switching on the end stops are incorrect	Recalibrate
Stops not yet defined or the lens ring has been moved with the LCS switched off and was then driven against the lens' end stop.	Recalibrate
Lens control ring does not move easily	Check for damage of lens ring.

6.5 LEDs Focus-Iris Unit

READY LED flashes red	
Incorrect configuration	Switch off, set selector switch on motor units or on focus-iris unit to corresponding function, switch on
Motor unit not plugged in	Plug in motor unit
Motor cable LC-M1 or LC-M2 or focus cable LC-F1 or LC-F2 defective	Check all motor cables and focus cables and replace if necessary

READY LED illuminated red	
Operational error on one control unit	Switch off, check settings on control units, switch on
Focus or Iris wheel is moved during calibration process	Wait until calibration is finished
Use of a locked control element e.g. SET button during calibration	Perform all functions in the proper sequence

CAL LED flashes	
Motor units were moved or replaced. After switching on the end stops are incorrect	Recalibrate
Stops not yet defined or the lens ring has been moved with the LCS switched off and was then driven against the lens' end stop.	Recalibrate
Lens ring does not move freely	Check for damage of lens ring

7. Technical Data

Description of System Components

Motor Unit CLM-1
Small Motor Unit CLM-2
Universal Motor Controller for CLM-2 . UMC-1
Zoom Unit ZMU-1
Focus-Iris Unit FIU-1
Power Cable for CLM-1 ..... LC-S1

Power Supply

Voltage: ..... 24V DC or 12V DC
(reduced speed)
Power consumption
without motor running: 24V/12V
Motor Unit CLM-1: ..... 0.09/0.15 A
Motor Unit CLM-2 ..... 0,01/0,01 A
Universal Motor Controller UMC-1 .. 0,06/0,08 A
Zoom Unit: ..... 0.08/0.13 A
Focus-Iris Unit: ..... 0.10/0.10 A
Power Cable LC-S1: ..... 0.04/0.04 A
LCS with 1 Motor Unit CLM-1
operating at full torque: 1.60/1.90A
LCS with one UMC-1 and one CLM-2
at full torque ..... 0.90/0.90 A

Torque of Motor Unit

Maximum torque
on CLM-1 drive gear: ..... 1 Nm
on CLM-2 drive gear: ..... 0,65 Nm
Maximum speed of the CLM-1
drive gear at 24V DC: ..... 2 Rps at 0.25 Nm
Maximum speed of the CLM-2
drive gear at 24V DC: ..... 1 Rps at 0.25 Nm
2 Rps at 0.15 Nm
Adjustment range on drive gear: .... 8 revolutions
Accuracy of adjustments: ..... max. 1/2 thickness of
lens barrel witness marks

Weight

Motor Unit CLM-1 ..... 0.63 kg
Motor Unit CLM-2 ..... 0.28 kg
Console for CLM-2 ..... 0.07 kg
Universal Motor Controller UMC-1 .. 0.28 kg
Zoom Unit ..... 0.42 kg
Focus-Iris Unit ..... 0.49 kg
Power Cable LC-S1 ..... 0.09 kg

Operating Noise Level

Noise level according to DIN 45635/51 for drive gear of motor unit CLM-1
n < 0.5 Rps ..... < 20 dBA
n < 1 Rps ..... < 25 dBA
Motor unit CLM-2
n < 0.5 Rps ..... < 22.5 dBA

Temperature Range

Operating temperature: ..... - 20…50°C
Storage temperature: ..... - 40…50°C

Memory Module

Recording time in seconds for:

Number of units	1	2	3
Range 1, 2 separate	242	162	81
Range 1+2 together	485	242	162

Trigger voltage required
between TRIG+ and TRIG–
when open: ..... +4.5 V DC
Allowable voltage range
between TRIG+ and TRIG–: ..... –5 ... +30V DC
Minimal pulse duration for trigger: .. 0.2 s

8. ARRI SERVICE

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Fax: (089) 3809-1244

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Fax: (914) 425 12 50

ARRIFLEX Corporation
600 North Victory Blvd.
Burbank, California 91502
Phone: (818) 841 70 70
Fax: (818) 848 40 28

GB ..... ARRI (GB) Ltd.
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Heston TW5 9 NR
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Fax: (081) 561 13 12

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*) Pin Assignment

Type	Pin	Assignment
XLR 3 pin	1	ground
	2	+24V or +12V DC
XLR 4 pin	1	ground
	4	+24V or +12V DC
XLR 5 pin	1	ground
	3	+24V or +12V DC

Straight cables are marked with s, coiled cables are marked with c. Length is maximum usable value.

No.	Description	Connecting between ...		Length		Connector no.	Contacts
For conecting between units							
LC-M1	Motor Cable	Motor Units		1.00	c	Fischer 5	Fischer 5
LC-M2	Motor Cable	Motor Units		0.15	s	Fischer 5	Fischer 5
LC-Z1	Zoom Cable	Motor Unit	Zoom Unit	3.50	s	Fischer 5	Fischer 5
LC-Z2	Zoom Cable	Motor Unit	Zoom Unit	7.00	s	Fischer 5	Fischer 5
LC-F1	Focus Cable	Zoom Unit or Focus-Iris Unit	Focus-Iris Unit	2.00	c	Fischer 10	Fischer 10
LC-F2	Focus Cable	Zoom Unit or Focus-Iris Unit	Focus-Iris Unit	0.15	s	Fischer 10	Fischer 10
For power supply from battery							
LC-S1	Power Cable	Motor Unit	Battery	4.50	c	XLR 3*	Fischer 5
LC-A1	Battery Cable	Power Cable	Battery	0.15	s	XLR 3*	XLR 4*
LC-A2	Battery Cable	Power Cable	Battery	0.15	s	XLR 3*	XLR 5*
For power supply from camera							
	for ARRIFLEX 535, 535B and 16 SR3:						
LC-A3	DC-cable	Power Cable	camera	0.15	s	Fischer 3	XLR 3*
	for ARRIFLEX 35 BL, 35 III and 16 SR II:						
LC-C2	DC-RUN-cable	Power Cable	camera	1.00	c	Fischer 6	Fischer 11+
	for ARRIFLEX 765:						
LC-A4	DC-Kabel	Power Cable	camera	0.15	s	Fischer 2	XLR 3*
For REMOTE-RUN Operation							
	for ARRIFLEX 535, 535B and 16 SR3:						
LC-C1	RUN-cable	Power Cable	camera	1.00	c	Fischer 6	Fischer 9
	for ARRIFLEX 35 BL, 35 III and 16 SR II:						
LC-C2	DC-RUN-cable: same cable as for power supply from camera (see above)						
	for ARRIFLEX 765:						
LC-C3	RUN-cable	Power Cable	camera	1.00	c	Fischer 6	Fischer 7
Extension for LC-Z1 or LC-Z2							
LC-E1	Cable Drum	Zoom Cable	Motor Unit	75		Fischer 5	Fischer 5

No.	Description	Connecting between ...		Length		Connector / No. Contacts	
For power supply from camera							
	for ARRIFLEX 435, 535, 535B and 16 SR3:						
UC-C1	DC RUN Cable	UMC-1	Camera	1.00	s	Fischer 3	Fischer 3
For power supply from camera and/or battery							
	for ARRIFLEX 35 BL, 35III, 16 SR II:						
UC-C2	DC RUN Cable	UMC-1	Camera and Battery Cable UC-A1	1.00	s	Fischer 3	Fischer 11 Fischer 3
	for ARRIFLEX 435, 535, 535B and 16 SR3:						
UC-C3	DC RUN Cable	UMC-1	Camera and Battery Cable UC-A1	1.00	s	Fischer 3	Fischer 3 Fischer 3
For power supply from battery							
UC-A1	Battery Cable	UMC-1 UC-C2 UC-C3	Battery	2.00	s	Fischer 3	XLR3*

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available languages
Deutsch
English

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