



CC-1 Camera Controller

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CAMERA CONTROLLER

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DRAWINGS

CAMERFP

Front panel drawing showing KEY and Display functions.

MOTORCON

Rear panel drawing showing input/output connectors and typical connection.

50Hz-2

Block diagram showing detailed interconnection.

50Hz-3

VIA, Feedback input, Microcontroller PLL, Digital to analog conversion, Control output.

50Hz-4

SPG, Video Output, Timers, Pulse Output.

PSU-1

Video reference decoder, reference selection, reference monostable.

PSU-2

Power fail detect, +12 volt, +6 volt, +5 volt, -12 volt regulator circuit, battery backup.

MICRO

CPU, Front panel driver, Asynchronous data communications.

MOTORFRAME

Frame drawing showing all internal connections.

1.0 DISPLAY

In normal operation the eight digit display will show either
Film position in TIME and FRAMES
Film position in FEET and FRAMES

Time Code reader time

1.01 Film position in TIME and FRAMES

To display Film position in time and frames depress **SELECT** until the **FILM T** LED is illuminated.

1.02 Film position in FEET and FRAMES

To display film position in FEET and FRAMES depress **SELECT** until the **FILM F** LED is illuminated.

1.03 Timecode reader time

To display film position in FEET and FRAMES depress **SELECT** until both **FILM F** and **FILM T** LED's are extinguished.

1.04 FRZ

This key may be used to Freeze the display at any time. When the display is frozen the **FRZ** LED is illuminated.

1.05 FRM.D

This key is used to enable or disable the display of frames. The **FRM.D.** LED is illuminated when the frame display is disabled.

This key also enable's and disable's the frame display in the inserted video if this option is fitted.

1.6 SPEED

These LED's will illuminate to indicate the selected film frame rate.

The film frame rates generated are 23.97, 24, and 25 fps.

The **VAR** LED indicates that varispeed is active.

Note. See the 4.00 CONFIGURATION section for the method of selecting the film frame rate varispeed.

1.07 REF

These LED's illuminate to indicate the selected frame rate reference for the timecode generator when set to FREE RUN. The following external references may be selected:-

XTAL	Internal crystal controlled SPG
VIDEO	External composite video input
READER/EXT	Timecode reader frame rate when fitted or External frame or 2*frame rate input
MAINS	Internally derived mains line

The selected reference LED will flash if the reference is not present. When the film speed is locked to the external reference the LED will cease flashing.

Note: See section 4.00 CONFIGURATION for method of selecting generator reference.

1.08 PULSE

These LED's indicate the selected pulse output frequency.

2.0 PAL / NTSC

2.1 PAL SETUP

2.2 NTSC SETUP

2.21 29.97 / 30 / DROP

With the advent of DAT and other digital tape recorders the complexities of drop frame code increased. it is now necessary to consider the frame rate and numeric update separately. there are normally four settings on a dat machine for SMPTE timecode as follows:-

30 NON-DROP 30 fps frame rate, sequential numeric update.

30 DROP 30 fps frame rate, drop frame numeric update.

29 NON-DROP 29.97 fps frame rate. sequential numeric update.

29 DROP 29.97 fps frame rate, drop frame numeric update.

2.22 DROP FRAME

The definition of drop frame is as follows:-

Frames 0 and 1 of each new minute except for modulo ten minutes are left out. this implies numeric update as follows:-

XX:01:59:29 -> XX:02:00:02

XX:02:59:29 -> XX:03:00:02

but for modulo ten minutes

XX:09:59:29 -> XX:10:00:00

This calculates as 108 frames lost for each hour (29.97fps) or 16 frames lost each 1000 feet (23.97fps)

3.0 HOW TO SETUP

3.1 24fps CAMERA LOCKED TO INTERNAL XTAL

Film follower reference Camera Controller Pulse output
DAT reference Camera Controller Video output

Setting	Comment
Film SPd 24	Automatic
SYS rEF XTAL	
runUP 03	
PLSE SPd	
V-SPd 00	

3.2 24fps CAMERA LOCKED TO MAINS

Film follower reference Mains
DAT reference Not available

Setting	Comment
Film SPd 24	Automatic
SYS rEF LINE	
runUP 03	
PLSE SPd	
V-SPd 00	

3.3 24fps CAMERA LOCKED TO EXTERNAL VIDEO

Film follower reference Camera Controller Pulse output or External video output.
DAT reference External Video output.

Setting	Comment
Film SPd 24	Automatic
SYS rEF VIDEO	
runUP 03	
PLSE SPd	
V-SPd 00	

3.4 24fps CAMERA LOCKED TO TIMECODE

DAT reference None
Timecode Standard 50Hz Motor:- 25 fps
60Hz Motor:- 29.97/30 fps

Setting	Comment
Film SPd 24	Automatic
SYS rEF READER	
runUP 03	
PLSE SPd	
V-SPd 00	

3.5 23.97, 24.024 or 25fps CAMERA

Film follower reference Camera Controller Pulse output
DAT reference Camera Controller Video output

Setting	Comment
Film SPd 239, 241 or 25	As required
SYS rEF XTAL	Only available on XTAL!
runUP 03	
PLSE SPd	
V-SPd 00	

3.6 VARISPEED CAMERA ONLY

Film follower reference	Camera Controller Pulse output
DAT reference	Camera Controller Video output
Setting	Comment
Film SPd 24	Base speed
SYS rEF XTAL	Vari-speed only available on XTAL!
runUP 03	
PULSE Fi	Pulse output fixed at 50Hz(PAL)/59.97(NTSC)
V-SPd ?? As required	Entry in frames per 1000 feet

3.61 VARISPEED CALCULATIONS

The Varispeed is calibrated in 35mm frames per 1000 feet, thus if the audio is 1500 feet long and 6 frames late at the end the correct adjustment is $6 \times 1000 / 1500 = \text{V-Spd } -4$. Negative varispeed will speed up the audio.

3.62 MAKING A MAGNETIC TEST FILM

To check a transfer or to check a varispeed setting it is possible to make a magnetic test film using the pulse output to reference a magnetic follower locked to pulse output of the camera controller.

Film follower reference	Camera Controller Pulse output
DAT reference	Camera Controller Video output
Setting	Comment
Film SPd 24	Base speed
SYS rEF XTAL	Vari-speed only available on XTAL!
runUP 03	
PLSE SPd	Pulse output follows varispeed setting, base rate 50Hz
V-SPd ?? As required	Entry in frames per 1000 feet

4.0 CONFIGURATION

CONFIGURATION SELECTION

The configuration of the unit is selected by first depressing the **SET** key so that the **SET** LED is illuminated then depress both <- and -> simultaneously to enable configuration selection. The first display indicates which configuration the Camera Controller is set to. There are four choices **CONFIG 1** .. **CONFIG 4** to change the selected configuration simply use the **INC**, **DEC**, <- or -> keys, once you have chosen the configuration use the **SET** key to exit.

CONFIGURATION MODIFICATION

To modify a parameter within a selected configuration simultaneously depress both <- and -> keys a second time to enter the configuration menu (note. a third simultaneous depression of these keys will enter the **SERIAL CONFIGURATION MENU**). Once in the **CONFIGURATION MENU** the display indicates either the parameter to be modified or the various selections of a particular parameter as follows:-

Filn 24 / Filn 25 / Filn 239 / Filn241
SYS rEF
PLSE SPd / PULSE F1
runUP ??
V-SPd ??

The < and > keys are used to select the parameter displayed. The **INC** and **DEC** keys are used to change the selection of the displayed parameter.

When the **SET** key is depressed both the configuration and setup modes are exited. The parameters are then set as selected whilst in setup or configuration.

4.01 FILM SPEED: Filn 24 / Filn 25 / Filn 239 / Filn241

XTAL REFERENCE The film frame rate may be set to 23.97, 24, 24.024 or 25 frames per second.
VIDEO/EXT/LINE/READER The film rate will be fixed at 24 frames per second.

4.02 SYSTEM REFERENCE: SYS REF

The system reference may be set to any of the following:-

XTAL	Internal crystal SPG reference 50Hz system=50Hz, 60Hz system=59.97Hz
VIDEO	External video reference.
EXT / READER	External frame or 2 x frame rate./ Timecode reader frame rate
LINE	Internal reference derived from the power input.

4.03 PULSE OUTPUT: PLSE SPd / PULSE FI

The pulse output may be fixed **PULSE FI** at any selected rate or follow the frequency drive to the motor **PLSE SPd** for example:-

50Hz System	PULSE SPEED	PULSE FIX
Motor Speed	Pulse frequency	frequency
23.97fps	49.95Hz	50Hz
24fps	50Hz	50Hz
24.024fps	50.05Hz	50Hz
25fps	52.08Hz	50Hz

60Hz System	Pulse frequency	
Motor Speed	Pulse frequency	
23.97fps	59.94Hz	60Hz
24fps	60Hz	60Hz
24.024fps	60.06Hz	60Hz
25fps	62.5Hz	60Hz

4.04 MOTOR ACCELERATION: RUNUP ??

Whilst the motor is run up to speed the microcomputer PLL is turned off to prevent errors in the calculations. This parameter should be set to the same value as the acceleration on the motor controller.

4.05 VARISPEED CONTROL: V-SPd ??

The varispeed control is calibrated in frames per 1000 feet, currently an adjustment of +/- 20 frames per 1000 feet is allowed. The frequency of the motor drive is increased dependant on the setting. If **PLSE SPd** is selected then this also adjusts the pulse output.

Before using varispeed the correct frame rate should be selected. Assuming a nominal frame rate of 24 fps then the following corrections will be made:-

23.97fps	16 frames per 1000 feet
25fps	667 frames per 1000 feet

4.** USER CONFIGURATION TABLE

When installing new software or after a **HARD RESET** it is important that the configuration of the unit remains the same. This sheet is provided for that purpose, please write down the current configuration so as to be able to reset the unit correctly. Remember that the next engineer to use the unit may not be a fully understand why it has been set up in this way!

CONFIGURATION

To enter the configuration mode first enable **SET** then when the **SET LED** is illuminated depress both **<** and **>** simultaneously. In CONFIGURATION the display indicates either the parameter to be modified or the various selections of a particular parameter as follows:-

CONFIG 1

Setting	Nominal	Options
_____	24	Film SPd 23.9, 24, 25
_____	XTAL	SYS rEF XTAL, Video, External, Line
_____	PLSE SPd	PLSE SPd / PULSE F1
_____	runUP 03	runUP 00 - 14
_____	V-SPd 00	V-SPd -20 - 20

CONFIG 2

Setting	Nominal	Options
_____	24	Film SPd 23.9, 24, 25
_____	XTAL	SYS rEF XTAL, Video, External, Line
_____	PLSE SPd	PLSE SPd / PULSE F1
_____	runUP 03	runUP 00 - 14
_____	V-SPd 00	V-SPd -20 - 20

CONFIG 3

Setting	Nominal	Options
_____	24	Film SPd 23.9, 24, 25
_____	XTAL	SYS rEF XTAL, Video, External, Line
_____	PLSE SPd	PLSE SPd / PULSE F1
_____	runUP 03	runUP 00 - 14
_____	V-SPd 00	V-SPd -20 - 20

CONFIG 4

Setting	Nominal	Options
_____	24	Film SPd 23.9, 24, 25
_____	XTAL	SYS rEF XTAL, Video, External, Line
_____	PLSE SPd	PLSE SPd / PULSE F1
_____	runUP 03	runUP 00 - 14
_____	V-SPd 00	V-SPd -20 - 20

6.00 RESET

6.01 POWER UP RESET

When switched on the unit will reset, On reset the memory is not completely cleared since the current film position, timecode offset, and configuration are battery backed. If a memory backup failure is detected the unit will reset the whole memory. During the power up sequence the LED Display will show the following:-

LEd Good	This indicates that the CPU, ROM, LED display, and driver are working correctly.
Ran Good	This indicates that the RAM has been checked and is good.
RAn BAd	This indicates that the RAM has been found to be bad.
bC12	This is the revision code of the software
HArd rSt	This indicated that an error was found in the configuration ram and that the memory backed ram has been reset.

6.02 CPU CARD RESET

When servicing the unit it may be required to reset the unit without switching off the power. To do this short the two pins on the front of the PROCESSOR BD labels SW1. This will reset the unit in the same way as a power up reset.

6.03 SOFT RESET

A power up reset may be initiated from the front panel by a simultaneous depression of the **SELECT** and **SET** keys.

6.04 HARD RESET

If it is required to reset the battery backed memory manually a hard reset may be initiated from the front panel by simultaneous depression of the **SELECT** and **FREEZE** keys. This may be necessary when new software is fitted. **CAUTION** this will wipe the Configuration memory! If the front panel software is not working correctly the unit will only reset if the **SELECT** and **FREEZE** keys are depressed during the power up sequence.

6.05 MANUAL HARD RESET

The front panel hard reset is only possible if the front panel software is running correctly. If all else fails switch off the power, open the unit, and unplug the PROCESSOR BD. This will disconnect the memory from the backup battery. Replace the PROCESSOR BD, and power up the unit.

8.00 REAR PANEL CONNECTIONS

8.01 POWER INPUT

The unit is supplied for either 220-250v A.C. or 110v-125v A.C. operation. The mains IEC input socket contains an integral power line filter and mains switch. The mains lead supplied should be connected as follows:-

Brown	Live
Blue	Neutral
Green/Yellow	Earth

Later units are supplied with a voltage selector switch.

8.02 INPUT XLR

This is the input to the timecode reader. The timecode may be viewed on the LED display and the frame rate of the timecode may be selected as the motor speed reference.

The 3 pin female XLR INPUT socket is a balanced input to the timecode reader. The input is connected as follows:-

Pin 1	Chassis
Pin 2	Positive Input
Pin 3	Negative input

When connected to an unbalanced source of timecode the connection should be made as follows:-

INPUT SOURCE

Pin 1	Chassis
Pin 2	Signal
Pin 3	Signal Ground

8.03 OUTPUT XLR

This is the pulse output, approx 1v user selectable frequency that either follows the motor frequency selected or remains fixed.

The 3 pin male XLR OUTPUT plug is a balanced output from the Pulse Generator. The output is connected as follows:-

Pin 1	Analog Ground
Pin 2	Positive output
Pin 3	Negative output

When connected to an unbalanced load the connections should be made as follows:-

OUTPUT LOAD

Pin 1	Ground
Pin 2	Signal
Pin 3	Leave open

8.04 EXT. REF. BNC

The EXT REF BNC is connected to the reference input of the time code generator. This input when selected should be fed with either frame rate or twice frame rate signal. The preferred input is a 5 volt square wave, but a 5v sine wave is also acceptable.

8.05 VIDEO REF. BNC's

The two VIDEO REF BNC's are connected in parallel and routed to the reference input of the time code generator. This input when selected should be fed with a nominal 1 volt composite or black and burst video signal. The input has an impedance of approximately 100K.

The video input will normally be fed from station sync's in parallel with the video recorder's. In an audio studio there is normally a Sony F1 or equivalent which may be used as a source of station

8.06 INSERT I/P BNC

The INSERT I/P BNC is connected to the video inserter input. The inserter input has an input impedance of 75 ohms, see section A.11 for further information on input termination.

This input will normally be connected to the output of the telecine.

8.07 INSERT O/P BNC's

The INSERT O/P BNC's are connected to the internal SPG output. Each output has a source impedance of 75 ohms, and is resistively isolated.

The output's will normally be connected the audio source reference input.

8.08 SERIAL-A

This connector is used to connect to the CAMERA

A female 9 pin 'D'

Pin	Direction	Function
1	I/P	Forward Start Switch
2	I/P	Stop Switch
3	O/P	0v, Switch Common
4	I/P	Film Break detect Must be linked to 3 for unit to operate
5	I/P	Reverse Start Switch
6		
7		
8		
9		

8.09 SERIAL-B

This connector is used to connect to the Motor control box.

A male 9 pin 'D'

Pin	Direction	Function
1	I/P	Output frequency feedback
2	I/P	Output frequency feedback
3	I/P	Frequency feedback ground
4	O/P	3 phase control volts
5	O/P	3 phase control volts ground
6	N.C.	
7	I/P	Motor controller switch volts
8	O/P	Start Forward
9	O/P	Start Reverse

APPENDIX: HARDWARE SETUP

A.00 MOTOR CONTROLLER SETUP

For normal operation the motor controller should be setup as follows:-

'[Pr 1]' represents display

'=[1]' represents set display to 1

OLD MOTOR CONTRLER Z024-S

(PU OP)

(SET) (2nd) 79 [Pr.79] (READ) =[1] (WRITE) ; enable internal operation
(SET) (2nd) 8 [Pr 8] (READ) =[9] (READ) [ALLC] (WRITE) ; RESET UNIT
(SET) 1 [Pr 1] (READ) =[65] (WRITE) ; set Max frequency @ 65Hz
(SET) 2 [Pr 2] (READ) =[45] (WRITE) ; set Min frequency @ 45Hz
(SET) 7 [Pr 7] (READ) =[3] (WRITE) ; set Acceleration @ 3 sec
(SET) 8 [Pr 8] (READ) =[3] (WRITE) ; set Deceleration @ 3 sec
(SET) (2nd) 73 [Pr.73] (READ) =[1] (WRITE) ; set @ 10v INPUT
(SET) (2nd) 20 [Pr.20] (READ) =[65] (WRITE) ; set @ 65Hz for 10v
(SET) (2nd) 79 [Pr.79] (READ) =[2] (WRITE) ; Set for external DC Control

In case of failure use :-

(SET) (2nd) 79 [Pr.79] (READ) =[1] (WRITE) ; enable internal operation

To revert to internal operation

To change back to external mode use:-

(SET) (2nd) 79 [Pr.79] (READ) =[2] (WRITE) ; Set for external DC Control

NEW MOTOR CONTROLLER A024S

NO[2nd]!!

(PU OP)

(SET) 79 [Pr.79] (READ) =[1] (WRITE) ; enable internal operation
(SET) 998 [Pr998] (READ) =[ALLC] (WRITE) ; Reset Unit
(SET) 72 [Pr.72] (READ) =[14] (WRITE) ; SET SWITCHING FREQUENCY
(SET) 1 [Pr 1] (READ) =[65] (WRITE) ; set Max frequency @ 65Hz
(SET) 2 [Pr 2] (READ) =[45] (WRITE) ; set Min frequency @ 45Hz
(SET) 7 [Pr 7] (READ) =[3] (WRITE) ; set Acceleration @ 1 sec
(SET) 8 [Pr 8] (READ) =[3] (WRITE) ; set Deceleration @ 1 sec
(SET) 73 [Pr.73] (READ) =[1] (WRITE) ; set @ 10v INPUT
(SET) 38 [Pr.38] (READ) =[65] (WRITE) ; set @ 65Hz for 10v
(SET) 79 [Pr.79] (READ) =[2] (WRITE) ; Set for external DC Control

B.00 SPG + AC MOTOR CONTROL Board

When connecting to a motor controller it is necessary to setup the nominal speed, this is performed in the following way:-

- 1) Depress **F3** until the LED is illuminated
- 2) Select **LOCAL**.
- 3) Depress **RUN**
- 4) With the motor running adjust **VR1** so that the motor runs at the correct nominal speed. This may be monitored with a dual beam oscilloscope on TP1 and the right hand pin of L1. Note TP1 is twice the frequency!

B.01 LINK FUNCTIONS

- L1 XTAL Motor reference when **XTAL** selected is from Internal Video Sync Pulse Generator.
- L2 XTAL Motor reference when **XTAL** selected is from Local Sync Separator (Not Fitted).
- L3 XTAL Motor reference when **XTAL** selected is from divider U12 (Normal)
- L4 5MHz (PAL) or 5.034964MHz (NTSC) Crystal fitted
- L5 2.5MHz (PAL) Crystal fitted.
- L6 2.501748MHz (NTSC) Crystal fitted.

For normal operation links L3 and L4 should be fitted.

B.02 INTERFERENCE

When there are interference problems divider U12 will not function properly! to verify correct operation:-

- 1) Insert Link L3.
- 2) Select a motor speed of 24fps.
- 3) Monitor both sides of L1 with a dual beam oscilloscope.
The two signals should be locked, both when the motor is stopped or running.

If this is not the case then check the filtering to the motor and motor controller. If the error cannot be rectified notify CB Electronics or your local agent. By removing L3 and inserting Link L1 the unit will work correctly but **only at 24fps!**

C.00 PSU Board

C.01 Colour Frame detection

VR1 is used to setup the colour frame detection circuit in PAL mode. VR2 is used to set up the colour frame detection circuit in NTSC mode.

To set the colour frame detection, connect a SPG with a colour frame reference output to the video reference input. set the unit for video reference, 8 field colour lock, and PAL or NTSC. Connect one channel of an oscilloscope to the colour field flag output on the SPG, connect pin of U23 on the TCR pcb to the second channel of the oscilloscope. Then adjust VR1(PAL) or VR2(NTSC) so that the two signals are in phase.

The colour frame detection is not currently used on this unit.