

# Operator's & Service manual

**bel**  
DIGITAL AUDIO

## Model 7110 Delay synchroniser

BEL (Digital Audio) Ltd.  
Invicta Works Elliott Road Bromley Kent BR2 9NT UK  
Tel: +44 (0)20 8460 7299 Fax: +44 (0)20 8460 0499  
Email: [sales@michael-stevens.com](mailto:sales@michael-stevens.com)  
Web: [www.bel-digital.com](http://www.bel-digital.com)

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# **BEL 7110**

## **Delay synchroniser**

### **DESCRIPTION**

The BEL 7110 offers manual synchronisation of audio and video signals. The unit was designed to resynchronise audio to video following processes such as standards conversion, video F/X, video synchronisation, satellite transmission etc.

The BEL 7110 provides 0-1.32 mSecs (0-33 frames) of stereo audio delay. Three modes of operation are possible, stereo, mono and dual mono. Frequently used delay parameters can be stored in one of eight memories. Inadvertent operation of the keys can be avoided by invoking the key 'lock' function. An LCD display is used to show delay, mode, increment value, programme number and bypass. The delay may be adjusted in steps of 1 sample, 1mSec, 20mSec, 40mSec, fields or frames. The field and frame step values change to reflect the PAL or NTSC selection. Bypass can be selected by means of the front panel control which will automatically engage in the event of a power failure.

The unit will power-on with the keys in a **locked** state, refer to the **lock** section before attempting adjustments.

### **OPERATION AND FRONT PANEL CONTROLS**

Eight controls are located on the front panel, from left to right these are:-

#### **INPUT SENSITIVITY**

This control permits the amplitude of the signal entering the unit to be adjusted. Initially, this should be set to the centre position and then adjusted as required (with audio present) to provide the desired level.

The peak program indicators to the left of this control give a visual indication of input level. For normal operation the yellow LEDs should be consistently illuminated with the green LEDs flashing on the peaks.

#### **BYPASS**

This switch connects the input directly to the output and thus bypasses the delay set. The unit powers up in the delay mode: press the switch once to enter the bypass mode and again to return to the delay mode. A letter **B** is displayed on the bottom right hand corner of the LCD display when the unit is in the bypass mode.

#### **MODE**

Depressing this switch will cause the unit to cycle through the operating modes in the sequence: stereo, mono, left, right. The delay setting in each mode is independent. Thus left or right delay can be adjusted without affecting the stereo or mono settings.

## PROGRAM

This control will allow up to eight frequently used settings to be stored in a non volatile memory. Program numbers P0 to P7 are initially factory set to:

P0	-	0mS
P1	-	20 mS
P2	-	40 mS
P3	-	80 mS
P4	-	100 mS
P5	-	140 mS
P6	-	180 mS
P7	-	200 mS
Increment	-	20 mS
TV mode	-	PAL

To change these settings proceed as follows: Press PROG switch until the required program number appears on the display. Any adjustment carried out will now be associated with that program number.

## LOCK

When the unit is 'locked' all the front panel switches, except LOCK are inoperative. To release the switches press and hold the LOCK key for a period in excess of three seconds. A momentary press of the LOCK key will lock the unit again. The LCD display indicates the locked mode thus:

Default display

PO	STEREO	0 ← mS
	'LOCKED'	

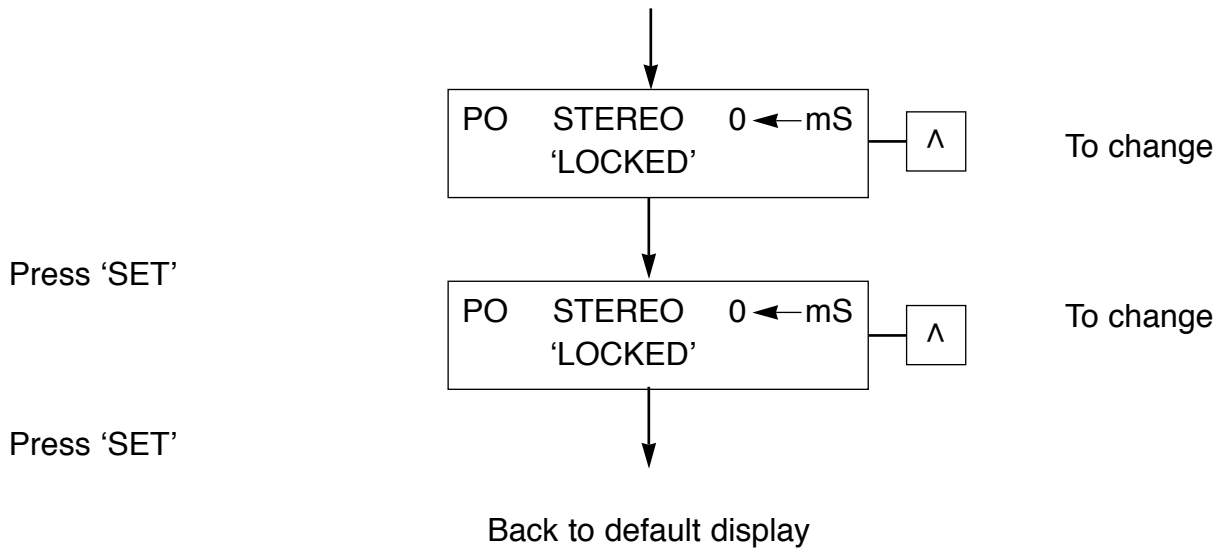
Default display with controls unlocked and in bypass

PO	STEREO	0 ← mS
	DELAY INC	20 B

**SET ^ AND v**

These switches are used to access the 'MENU' and to change values and parameters within the menu.

Press 'SET' from default display.



## LCD DISPLAY

On power-up the LCD will show model number, software version and model description for a few seconds before resetting to the default display.

## MENU DESCRIPTION (SET KEY)

### DELAY INCREMENT

This allows the delay increment value to be selected. The possible values are:

- 0 This is used to signify an increment value of one sample.
- 1 1 mSec increments.
- 20 20 mSec increments.
- 40 40 mSec increments.
- field 20 mSec in PAL mode 14.85 mSecs in NTSC mode.
- frame 40 mSec in PAL mode 29.7 mSecs in NTSC mode.

Each press of the  $\wedge$  or  $\vee$  key will increase or decrease the delay by the value selected above. If the  $\wedge$  or  $\vee$  key are held down, the delay will continuously increase or decrease until the key is released.

### TV SYSTEM

This allows the TV system used to be selected (PAL or NTSC). The system selected will affect the field and frame increments thus:

PAL field = 20 mSec, frame = 40 mSec.

NTSC field = 14.85 mSec, frame = 29.7 mSec.

## CONNECTIONS

The rear panel of the BEL 7110 has 4 XLR connectors, a mains voltage selector and a combined IEC inlet, fuseholder, switch.

From the left these are:-

Power switch

Fuse

Ratings are (semi delay) 250 mA @ 230V ac or 500mA @ 115V ac.

IEC inlet

Power-in socket.

Voltage selector

115V or 230V ac.

Left and right audio outputs

3 Pin XLR male balanced Pin 2 hot.

To unbalance connect pin 3 to pin 1 on the cable connector.

Left and right audio inputs

3 Pin XLR female balanced Pin 2 hot.

To unbalance connect pin 3 to pin 1 on the cable connector.

\* Note: The fuse can only be removed for replacement if the mains (IEC) cable connector is disconnected from the unit.

## MOUNTING

If mounted in an enclosure that does not include forced air cooling, allow 1U of space above and below the unit.

## AUDIO CONNECTORS

It is recommended that, where possible, all cables be good quality screened twisted pairs with the screening braid connected to pin 1 on the XLR connector. Optimum performance is obtained using double screened cable with separate ground returns. It is also recommended that 360 degree connection be made to the screening braid on the BNC connectors.

## EMC COMPLIANCE

The BEL 7110 was designed and tested to comply with the EMC directive numbers EN55103, EN55022, EN55082-1 and EN60950 when used as directed.

This unit must be used with an earthed mains lead to comply with the CE low voltage directive.



## SPECIFICATION

Delay	0 - 1.32 Sec (0-33 frames)
Delay increments	1 sample, 1 mSec, 20 mSec, 40 mSec 1 field, 1 frame
TV system	PAL or NTSC
Frequency response	20 Hz - 20 kHz $\pm$ 3dB
Input dynamic range	96 dB
Signal to noise ratio	-90dB. r.m.s. 20 -20 kHz
Distortion	less than 0.015% at 1 kHz
Conversion accuracy	A/D 16 bit Delta Sigma 64 x oversampled D/ A 16 bit 8 x oversampled
Sampling rate	48 kHz.
Inputs	Electronically balanced 25k $\Omega$
Outputs	Electronically balanced 600 $\Omega$ Max. drive capability +18dBu

## TROUBLESHOOTING

The Bel 7110 is designed and constructed to ensure a long and fault free life, but if a problem does occur the following guidelines are provided.

The unit is constructed using 1 main printed circuit board and 3 sub assemblies.

The 3 sub assembly printed circuit boards are:-

1. Analogue audio I/O EMC suppression
2. The keyboard interface
3. The LCD interface

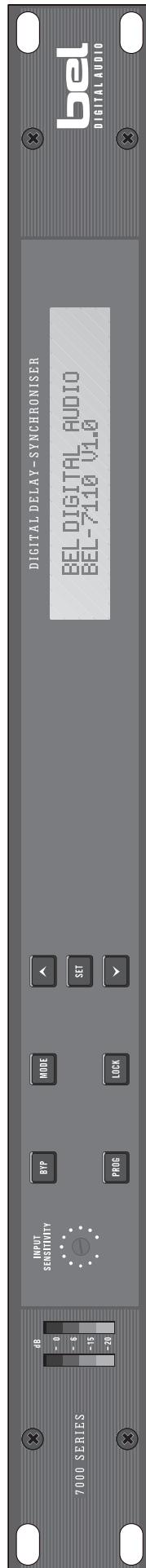
The main (mother) printed circuit board includes the analogue to digital and digital to analog connection, digital control, memory and power supply circuitry.

For replacement/removal of these printed circuit boards see the servicing section.

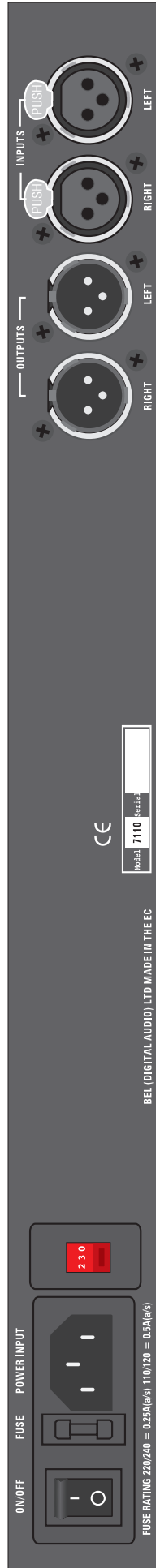
If the outline fault finding suggestions which follow are unsuccessful, contact your BEL distributor, or the main BEL distributor, who will advise you and arrange for the unit to be repaired or provide replacement PCB's.

<b>Fault</b>	<b>Causes</b>	<b>Action</b>
'Dead' unit	Power supply fault	Check fuses in the IEC and supply connector then check fuses & connectors on the main PCB
Only LCD backlight on	Power supply fault	Check fuses on the main PCB
Power on message, then unresponsive	CMOS RAM corruption	Reset memory to factory preset values by holding prog key down while powering on (LCD should say "power reset".)
No audio output	Various	Check an audio input is present (PPI indication) check input sensitivity control is set.
Distorted output	Headroom	Check audio input is not greater than +18dB. Check input sensitivity control is set correctly for the input level (PPI indication).

**FRONT VIEW OF UNIT**



# REAR PANEL



## Service information - Contents

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## **PRESET INPUT & OUTPUT LEVEL CONTROLS**

RV1 & RV2 are set to balance A/D input levels left and right. Nominally set for +8dB at U31 Pin 1 or 7 with input sensitivity set for 'max' and +8dB at the audio inputs. (RV1 is right level, RV2 is left level)

RV4 & RV5 are output level presets and are set as follows:-

Monitor U1 / Pin 1 (right) and U4 / Pin 1 (left). For the onset of clipping when adjusting input sensitivity this should be nominally + 8.5dB monitor audio outputs (single ended/across 600Ω) and adjust RV5 (left) RV4 (right) for +18dB.

## **TO REMOVE MAIN PRINTED CIRCUIT BOARD**

- 1) Remove cover plate.
- 2) Note positions of LCD & keyboard ribbon connectors, unplug LCD ribbon, keyboard ribbon and transformer plug from main PCB.
- 3) Remove 3 screws fixing heat sink (see PCB position drawing).
- 4) Remove screws fixing front panel & front chassis assembly.  
These are:- 2 at each end (M4 pan head)  
5 on the underside (M3 CSK head)
- 5) De-solder LCD backlight wires (note position) from LCD.
- 6) Remove front panel and front chassis assembly complete.
- 7) Remove main PCB fixing screws (M3 pan head) 8 off.
- 8) Main PCB can now be pulled forward. Disconnecting SK3 connection and lifted out from chassis.

## **TO RE-ASSEMBLE MAIN PRINTED CIRCUIT BOARD**

Re-assemble in reverse order making sure the LEDs (PPI indicators) locate in the front panel slots before final fixing of front panel assembly.