



# Scitec Instruments Ltd

---

Bartles Industrial Estate, North Street, Redruth, Cornwall TR15 1HR  
Tel. (01209) 314608 E-mail: [scitec@scitec.uk.com](mailto:scitec@scitec.uk.com)  
Fax. (01209) 314609 Web: <http://www.scitec.uk.com>

**MODEL 300CDCLOCK VARIABLE FREQUENCY OPTICAL  
CHOPPER WITH CRYSTAL STABILITY**



Boston Electronics Corporation, 91 Boylston Street, Brookline MA 02445  
(800)347-5445 or (617)566-3821 \* fax (617)731-0935 \* [boselec@boselec.com](mailto:boselec@boselec.com) \* [www.boselec.com](http://www.boselec.com)



# Scitec Instruments Ltd

---

Bartles Industrial Estate, North Street, Redruth, Cornwall TR15 1HR  
Tel. (01209) 314608 E-mail: [scitec@scitec.uk.com](mailto:scitec@scitec.uk.com)  
Fax. (01209) 314609 Web: <http://www.scitec.uk.com>

## 1 INTRODUCTION

The model 300 optical chopper consists of a remotely mounted chopping head connected by a cable to a control unit.

## 2 UNPACKING

When the Model 300 is shipped, the control unit, chopping head, chopping discs and interconnecting cable are individually packed. The chopping discs are packed between pieces of plywood or polystyrene and must be unpacked with extreme care.

## 3 ASSEMBLY

First, slot the bottom edge of the chopping disc into the slot formed by the reference pick-up. Second, mount the disc onto the brass mounting boss fitted to the motor spindle using the three M3 screws provided. **DO NOT SLACKEN THE GRUB SCREWS FITTED TO THE BOSS OR ATTEMPT TO CHANGE THE POSITION OF THE BOSS ON THE SPINDLE.**

Using the cable supplied, connect the chopping head to the socket on the rear panel of the control unit.

**BEFORE CONNECTING THE POWER, ENSURE THAT THE VOLTAGE INDICATED ON THE REAR OF THE UNIT IS CORRECT. DAMAGE TO THE UNIT COULD RESULT IF THE WRONG VOLTAGE IS APPLIED.** A voltage selection switch is mounted inside the unit. To remove the instrument cover remove four screws, two on either side of the instrument case and lift the cover. **MAKE SURE THAT THE POWER IS DISCONNECTED BEFORE OPENING COVER.**

## 4 OPERATION

### 4.1 On/Off

Power to the control unit is controlled by the ON/OFF switch located on the right side of the front panel. The frequency display of the model 300CD lights when the power is switched on.

### 4.2 Chopping Frequency

The model 300CD chopper control unit is fitted with an LED display which reads the chopping frequency correctly for all discs. The frequency is set either by the front panel mounted FREQUENCY control dial or by an internally generated crystal clock signal. To control the chopper speed by the control dial set the front panel switch to DIAL. To control the chopper frequency from the internal clock, set the front panel switch to CLOCK. In this mode the control unit either speeds up or slows down the chopper until the chopping head reference signal is at the same frequency as the internal clock.





# Scitec Instruments Ltd

---

Bartles Industrial Estate, North Street, Redruth, Cornwall TR15 1HR  
Tel. (01209) 314608 E-mail: [scitec@scitec.uk.com](mailto:scitec@scitec.uk.com)  
Fax. (01209) 314609 Web: <http://www.scitec.uk.com>

When the chopping head reference and the internal clock are frequency locked together, the LOCK OUTPUT connector drops from 5V to 0V. A steady 0V for 10 seconds or so on this output, indicates that the chopper is frequency locked and stable.

## 4.3

### Display

The front panel display can either display the current chopper chopping frequency or the frequency of the internal clock. A switch on the rear of the control unit selects between the two. Please note that as the display counter and the clock generation circuitry use different crystals, there may be a small difference between the displayed frequency and the set frequency (<0.1%).

The display can either display the frequency to 1Hz resolution (1 second update rate) or 0.1Hz resolution (10 second update rate).

## 4.4

### Setting Internal Clock Frequency

The frequency of the internal clock is set via jumpers internal to the unit. Hence it is necessary to remove the lid to change the clocks operating frequency. To remove the instrument cover remove four screws, two on either side of the instrument case and lift the cover. MAKE SURE THAT THE POWER IS DISCONNECTED BEFORE OPENING COVER.

DO NOT ATTEMPT TO MAKE CHANGES TO THE CLOCK FREQUENCY WITH MAIN POWER CONNECTED AS LIVE CONNECTIONS ARE ACCESSABLE INTERNALLY WITHIN THE UNIT.

A picture of the jumper connections is shown below. It is used to set up the “clock generating chip” and the “divide by N” chip.

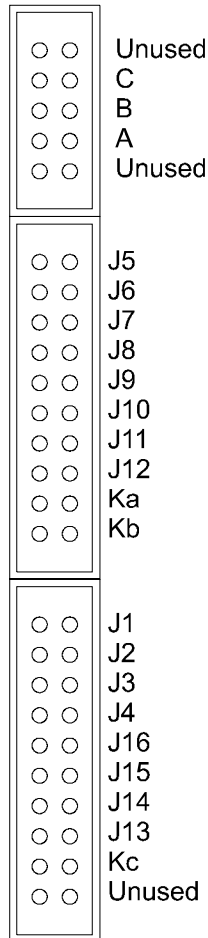
The absence of a jumper sets the pin to a logic “1”. Adding a jumper sets the pin to a logic “0”.





# Scitec Instruments Ltd

Bartles Industrial Estate, North Street, Redruth, Cornwall TR15 1HR  
 Tel. (01209) 314608 E-mail: scitec@scitec.uk.com  
 Fax. (01209) 314609 Web: http://www.scitec.uk.com



Jumpers A, B & C set the output frequency of the clock generating chip as follows:

Frequency	A	B	C
8MHz	0 - Closed	0 - Closed	0 - Closed
4MHz	1 - Open	0 - Closed	0 - Closed
2MHz	0 - Closed	1 - Open	0 - Closed
1MHz	1 - Open	1 - Open	0 - Closed
500kHz	0 - Closed	0 - Closed	1 - Open
250kHz	1 - Open	0 - Closed	1 - Open
125kHz	0 - Closed	1 - Open	1 - Open
62.5kHz	1 - Open	1 - Open	1 - Open





# Scitec Instruments Ltd

---

Bartles Industrial Estate, North Street, Redruth, Cornwall TR15 1HR  
Tel. (01209) 314608 E-mail: [scitec@scitec.uk.com](mailto:scitec@scitec.uk.com)  
Fax. (01209) 314609 Web: <http://www.scitec.uk.com>

It is recommended that the 1MHz setting is used.

The output of the “clock generating chip” is fed into the “divide by N” chip. The settings for this chip are numerous and rather complicated. Fortunately, there is a setting which simplifies things a bit.

To use this simplified mode, Ka, Kb and Kc have to be set to “Mode 10” as follows:

Mode	Ka	Kb	Kc
10	1 - Open	1 - Open	0 - Closed

To use the other modes please consult the 4059 data sheet included.

Using “Mode 10” the remaining jumpers, J1 to J16, are set to the clock generator output divided by the required frequency in Binary Coded Decimal (BCD). This is best illustrated with an example:

Required Frequency: 710Hz

Clock Generator Frequency: 1MHz (recommended setting)

$1,000,000 / 710 = 1408.45$  rounding down gives 1408.

Binary Coded Decimal (BCD) takes each digit in turn and converts into binary as per the following table:

Decimal Digit	Binary Equivalent
0	0000
1	0001
2	0010
3	0011
4	0100
5	0101
6	0110
7	0111
8	1000
9	1001

In our example 1408 decimal converts to 0001 0100 0000 1000 BCD. These BCD digits are now used to set J16 to J1 respectively.



Boston Electronics Corporation, 91 Boylston Street, Brookline MA 02445

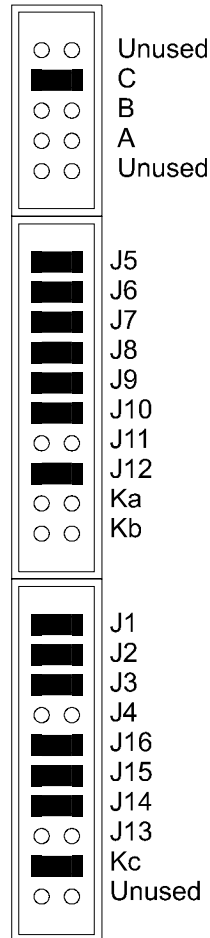
(800)347-5445 or (617)566-3821 \* fax (617)731-0935 \* [boselec@boselec.com](mailto:boselec@boselec.com) \* [www.boselec.com](http://www.boselec.com)



# Scitec Instruments Ltd

Bartles Industrial Estate, North Street, Redruth, Cornwall TR15 1HR  
Tel. (01209) 314608 E-mail: [scitec@scitec.uk.com](mailto:scitec@scitec.uk.com)  
Fax. (01209) 314609 Web: <http://www.scitec.uk.com>

The overall settings for this example are therefore as follows:



(Setting required to produce a 710.2Hz clock)

## 4.5 Chopping Reference

The reference signal is output from a BNC socket on the front panel of the control unit. This signal is a HCT TTL square wave at the chopping frequency and has a constant phase relative to the chopping action.

## 4.6 Clock Reference

The internally generated clock signal is available from the BNC socket on the rear of the control panel. This signal is a TTL pulse. It does not have 1:1 mark space ratio.





# Scitec Instruments Ltd

---

Bartles Industrial Estate, North Street, Redruth, Cornwall TR15 1HR  
Tel. (01209) 314608 E-mail: [scitec@scitec.uk.com](mailto:scitec@scitec.uk.com)  
Fax. (01209) 314609 Web: <http://www.scitec.uk.com>

## 4.7

### Frequency range

The following table gives the maximum usable frequency range for each blade.

2 slot blade	5 to 200 Hz
5 slot blade	12.5 to 500 Hz
10 slot blade	25 to 1000 Hz
30 slot blade	75 to 3000 Hz
200 slot blade	500 to 20000 Hz

## 4.8

### Fuse

The line fuse in this instrument is mounted on the printed circuit board. Before changing the fuse, ensure that the unit is isolated from the line supply. Replace only with a 1 Amp 20mm x 5mm semi-delay fuse.

