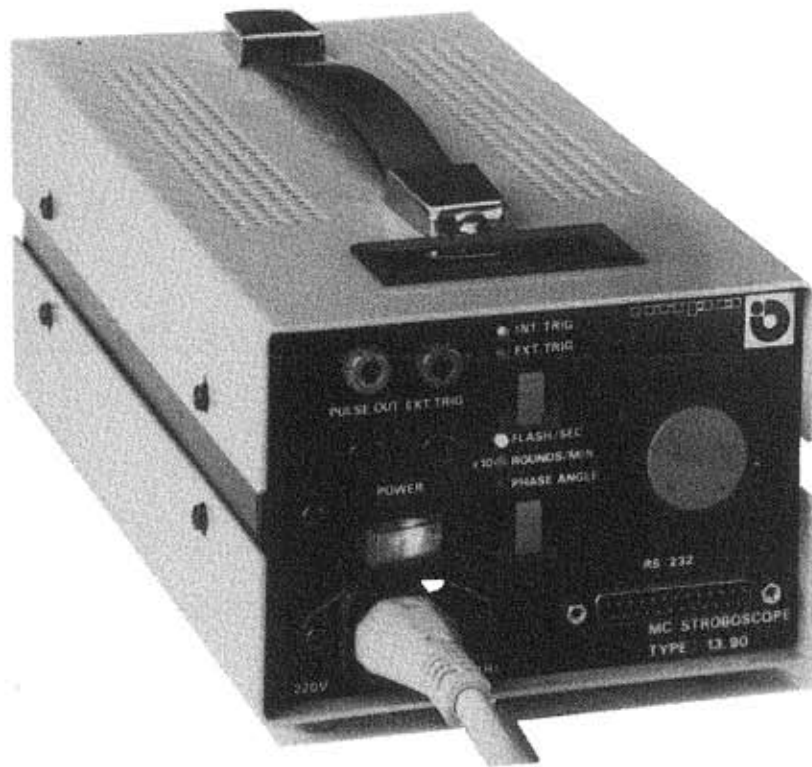


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## 1. GENERAL DESCRIPTION

The Stroboscope is especially designed to operate in the frequency range 1 - 300 Hz, with a microprocessor controlled homogenous continuous maximum light output in the frequency range.

Only one turnable knob is used to coarse and fine adjust both operating frequency and phase delay.

Frequency, in both flash per sec. and rounds per minute, and phase delay, can be read on a four digit autoranging display on the top of the stroboscope.

Continuous internal memory of all set-up parameters, and latest frequency and phase delay, even after power off of the stroboscope.

Computer interface standard RS232 with maximum control of all functions.

## 2. OPERATING THE STROBOSCOPE

### 2.1 General control

After power on, the mode of operation can be selected with two push buttons located on the front panel of the stroboscope. The top push button is used to select either Internal or External - trigger mode, the lower button is used to select between control and readout of flash per sec., rounds per minute and phase angle.

The big sized infinite turnable knob, is used to both coarse and fine adjust frequency and phase angle delay. If you make a fast turn, then a large step is taken, "coarse regulation". If you make a slow turn, the change is only in small steps, "fine regulation". In other words, the change in rate is proportional to the angle and speed of turn. If the turn is clock-wise, the rate of operation is increased, if the turn is counter clock-wise, then the rate of operation is decreased.

Two set of input/output connectors is located on the front panel. One set named PULSE OUT is supplying output pulses with the same frequency as the flash rate, and delayed according to the phase angle setting. The other set of connectors named EXT. TRIG is used if external trigger mode is selected, then the flash rate is locked to a frequency supplied to this connector pair, in this mode the flash and the puls out is delayed with respect to the ext. trigger puls according to the phase angle setting.

The RS232/V.24 serial computer interface can be used for complete programming of all functions of the stroboscope. Programming baud rate is at power up set to the default value 1200 baud.

### 2.2 Internal trigger

If Internal trigger mode is selected, all frequency regulation is controlled by either the big turn-knob or by the computer interface as described later.

The delay of pulse out between 0.0 and 360.0 Deg. is controlled with respect to the flash light.

### 2.3 External trigger

When External trigger mode is selected, the frequency of the flash light and the puls out are locked to the frequency on the ext. trig input terminals, and can be delayed between 0.0 and 360.0 Deg. from the input frequency.

The frequency on the ext. trig input terminals should be between 1.000 and 300.0 Hz., if a lower or higher frequency is supplied, the display on the top of the Stroboscope will start flashing, to indicate that the frequency is out of range. If the frequency on the input terminals is dropped far below 1.000 Hz., the display indicates this with a flashing "Lo" on the display. If the frequency on the input terminals is increased to a value well over 300.0 Hz., the display indicates this with a flashing "Hi" and the flash light will be turned off, the flash light will be turned on again as soon as the frequency is decreased to a value close to or lower than 300.0 Hz.

If the external frequency is changing rapidly, the situation can occur, that the stroboscope will not be able to flash according to the frequency and delay read on the display.

**NOTE:** If the external frequency is lower than 1.000 Hz. or higher than 300.0 Hz., no valid phase angle calculation can be done and therefore the phase delay will not be reliable.



### **3. COMPUTER INTERFACE**

#### **3.1 General**

The serial interface is controlled by a microprocessor, which also controls the measuring and regulation of the flash frequency. Thus enabling an intelligent and easy to use interface with data units formatted to a standard data format, direct readable by almost any computer.

By sending different commands to the Stroboscope, it responds either by returning an alphanumeric string or by changing its mode of operation.

Included in the interface is a help facility menu that returns a short form explanation of the Stroboscope commands, this menu is called with the character "?".

#### **3.2 Connection of the data cable**

The interface connector is located at the bottom right corner of the Stroboscope's front panel. The connector is a 25-pin Cannon female contact strip V.24/RS-232.

Standard data cables are available for the connection of the Stroboscope to a great number of different computers, including the Commodore 64/128, IBM PC/XT/AT and Olivetti M24.

The possible baud rates are 300, 1200, 2400, 4800 and 9600, the Stroboscope is at power up set to use 1200 baud.

The data format used is 7 bit ASCII, even parity, 1 start/stop bit.

#### **3.3 Interface commands**

The flash frequency and phase delay can be controlled either by the front panel knob and push buttons, or by the appropriate commands through the interface.

The following commands are accepted by the Stroboscope, in either upper- or lower-case letters:

(in the following a command e.g. "V" means "V" + CR)

- ? The short form help screen is returned as followed. Each line is followed by CR, and a Control-Z ends the text.

Stroboscope commands

```

-----
"?": this help screen
"V" or "v": version no. returned.
"B" or "b": set baud rate (fx."b1200")
"F" or "f": read frequency in mhz
"R" or "r": read frequency in mRPM
"S" or "s": set frequency #value mhz
"A" or "a": read phase angle in Deg/10
"P" or "p": set phase angle in Deg/10
"L" or "l": restore standard set-up
"E" or "e": external trigger
"I" or "i": internal trigger
"T" or "t": flash on
"O" or "o": flash off
"M" or "m": messages on
"N" or "n": no messages
    
```

- V The Version number is returned e.g. "Stroboscope English version 1.0" + CR.
- B Baud rate (bits/sec.) transmit and receive set command. The default value is 1200 bits/sec., this may be changed by use of this command, e.g. "B300" sets all following communication to the rate 300 bits/sec. The default baud rate 1200 bits/sec. will be restored after power on. If a "B" is sent without data, the current transmit and receive speed is returned.
- F Frequency reading returned in milli-Hertz. If External trigger mode is selected, last valid frequency reading will be returned. The data is sent in the format "00123400" + CR (= 123.4 Hz).
- R Frequency reading returned in milli-Rounds per minute. IF External trigger mode is selected, last valid frequency reading will be returned. The data is sent in the format "07404000" + CR (= 7404 R/M).
- S Set frequency command, for controlling the flash rate via the interface. The value following "S" must be in milli-Hertz. "S0123400" sets the flash rate to 123.4 Hz. NOTE: This command is only valid if Internal trigger mode is selected.
- A Phase angle reading returned in 1/10 of degrees. The data is sent in the format "00000657" + CR (= 65.7 Deg).
- P Set phase angle command, for controlling the delay of puls out with respect to flash, or flash and puls out with respect to the External trigger puls, depending on mode of operation, "Internal- or External trigger mode". "P0000657" sets the phase angle to 65.7 Deg.
- L Restore standard set-up command, The standard set up parameters is restored, that is 1200 Baud, 1.000 Hz. 0.0 Deg. of phase angle, flash on and no messages.
- E External trigger command, sets the mode of operation to external trigger and locks the frequency to correspond to the frequency present on the ext. trig input terminals.

- I** Internal trigger command, sets the mode of operation back to Internal trigger.
- T** Flash on command, turns the flash light on if it previously has been turned off.
- O** Flash off command, turns the flash light off, all modes of operation remains unchanged only the flash is turned off. This mode of operation is intended only as a helping feature during parameter change and so on.
- M** Messages on. Response and error messages are answered back.
- N** No messages. Turn response and error messages off.

#### 4. TECHNICAL DATA

Flash tube	: XENON long-life
Flash duration	: approx. 100 $\mu$ S
Light intensity	: approx. 500 Lux at 0.2 m
Frequency range	: 1 - 300 Hz. (flash per second) 60 - 18000 RPM (rounds per minute)
Phase delay range	: 0 - 360° (continuous regulation) delay of flash with respect to the external trigger pulse
Phase delay output	: 0 - 360° (continuous regulation) delayed pulse with respect to the flash selected in the internal trigger mode
Display	: 4 digit autorange readout in Hz, RPM or Deg (Phase angle)
Trigger	: Internal or external mode
Puls out	: $\pm$ 12 V
Ext. trig puls	: 0 - 12 V. Trigger level is approx. 2.5 V
Interface	: RS232/V.24 serial computer interface
Baud rate	: 300, 1200, 2400, 4800, 9600 bits/sec.
Data format	: 7 bit ASCII, even parity, 1 start/stop bit
Mains voltage	: 220 VAC $\pm$ 10 %, 50 Hz
Dimensions	: 105 x 133 x 273 mm, incl. handle, knob and rubber bumpers
Weight	: 3.2 kg

##### 4.1 Interface data

Pulse out	: $\pm$ 12 V
External trigger pulse	: 0-12 V trigger level appr. 2.5 V

##### 4.2 RS 232 Interface cable

Stroboscope connector	V.24 Designations
Pin 1 (ground)	Signal ground
- 2 (input)	Transmitted data (computer output)
- 3 (output)	Received data (computer input)
- 4 (to 5)	Request to send
- 5 (to 4)	Ready to send
- 7 (ground)	Signal ground