

# **FREQUENCY to ANALOGUE CONVERTER**

Type 107-10B

User Guide

Continuous development may necessitate  
changes in these details without notice  
Doc ref UD107-10B.vp Rev 2



PROCESS MEASUREMENT, CONTROL & DISPLAY INSTRUMENTATION

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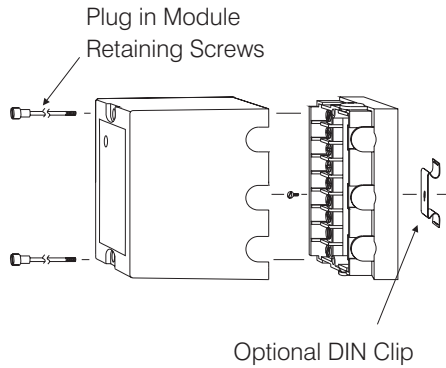
sales@sil.co.uk <http://www.sil.co.uk>

## Installation

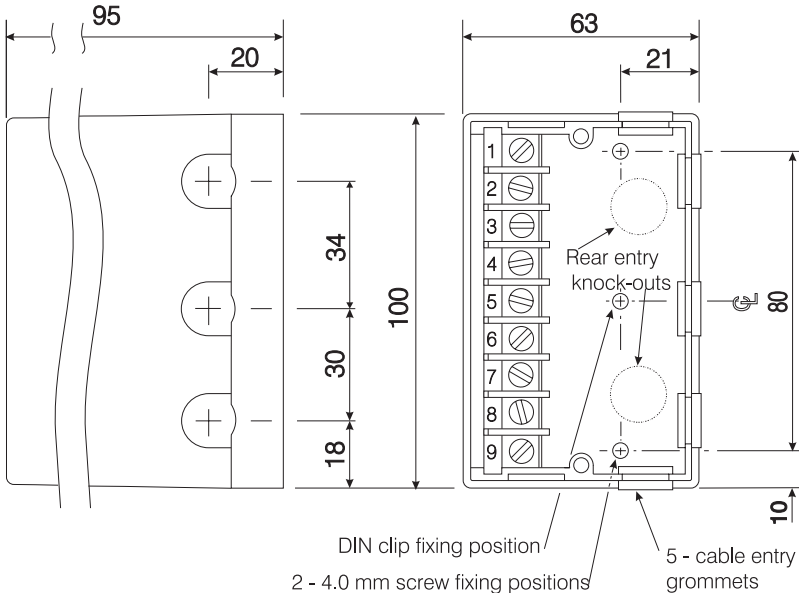
107 Series Modules are designed to be fitted to any flat dry surface using two 4mm screws. Alternatively, by fitting an optional DIN clip, they may be clipped to a rail conforming to BS5584:1978, EN50 022, DIN46277-3.

Grommets are provided on three sides of the base section and there are two rear entry knock outs in the bottom.

**WARNING! This unit can be mains powered. All inputs must be isolated from dangerous voltages before the plug in module is removed from the base section for maintenance or adjustment. Live terminals will be exposed.**



## Dimensions and fixing positions



## Wiring

Good instrumentation practice must be observed when wiring to the unit to ensure segregation of supply and signal wiring, and the use of suitably screened signal cabling.

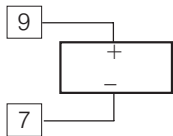
## Terminal connections

Supply	AC	Optional DC
1	Line	Positive (+)
2	Neutral	Negative (-)
3	Earth	Earth
Outputs		
4	Output Signal (-)	
5	Output Signal (+)	
6	reserved	
Inputs		
7	Input Signal (+)	
8	Input Signal (-)	
9	Transducer supply (+)	

## Typical input connections

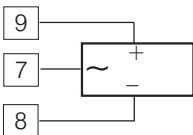
NB the 107-10 is configured internally for the appropriate application during manufacture. The unit cannot be used with another type of input transducer until reconfigured, preferably by returning to Stroud Instruments Ltd.

### 2 Wire Transmitter



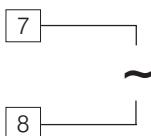
*Typical Applications*  
 KDG 7402 Flow meter with 918/T Pre-amplifier  
 GWF Opto Pulse Generator types 01, 02, 03, 04

### 3 Wire Transmitter

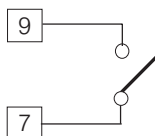


*Typical Applications*  
 IPG 11 Pulse Generator  
 RS 256-225 Flow Sensor

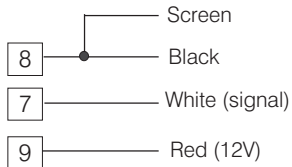
### Voltage Change



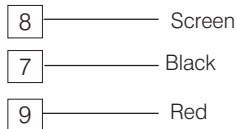
### Contact Closure



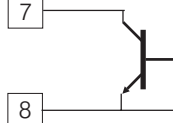
### Kent Pulse Unit Type HRP



### Kent Pulse Unit Type LRP



### Open Collector



## Operation

The 107-10B provides an output current or voltage which is proportional to the frequency of an alternating voltage or pulse input signals. Digital and analogue filtering are provided to optimise performance to site conditions.

Optional computer software and infra red link enable ranging to be adjusted, e.g. to suit a turbine meter replacement, and other parameters tuned to filter the effects of input signal noise.

### Input/Output configuration

The 107-10B is configured for a particular type of transducer and output signal during manufacture. For a change of either input type or output signal, the instrument should be returned to Stroud Instruments Ltd. Output signal span and zero are calibrated during manufacture and adjustment is not required.

### Input signal level

The 'Level' control accessed through the front panel, sets the sensitivity or trigger threshold for the instrument. Turning the level control anticlockwise will decrease the trigger point making the instrument more sensitive to lower amplitude signals. To reduce sensitivity to noise, the level control should be turned clockwise (decreases sensitivity) until the output signal falls and then back off the control until reliable triggering off the input signal is achieved.

## Setting up for programming

Programming the 107-10B requires the optional Software and Infra red link

adaptor kit. The software is Windows™ 95/98/NT/ME/2000 compatible and the minimum hardware specification is a PC with Pentium 133 Mhz, 32Mb RAM. Communication is via an infra red link. Depending on which version of IR link supplied, this will require either a free RS232 serial or USB port.

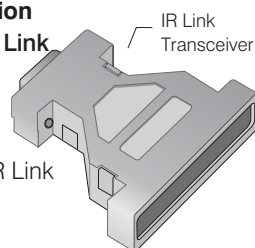
### Hardware installation

#### a) RS 232 Serial IR Link

Power down the PC. Connect IR Link cable between a serial port and the IR Link Transceiver.

#### b) USB IR Link

Before connecting to PC, install the 'USB Link IR driver from the SIL CD: run '\Data\software\USB-Link\setup.exe'. Further instructions for installing the USB Link IR will appear on screen at end of the driver installation.



### Programming Software installation

On the SIL CD, locate and run '\Data\software\107-10\setup.exe'-also on the SIL website [www.sil.co.uk/software.htm](http://www.sil.co.uk/software.htm)

### Positioning the IR Link Transceiver

Infrared communications are effective at distances up to one metre. The IR Link Transceiver must be pointed at the apertures in the side of the 107-10B Frequency to Analogue unit. The IR Link Transceiver has a beam angle of approximately 15° so alignment is not critical however the line of sight must be unobstructed.

**NB If there are other 107-10B units in the vicinity, ensure they are shielded from the infrared beam.**

## Setting up the IR link

Before communication with the 107-10B can be initiated, the software must be configured for the appropriate serial (COM) port. Open the 107-10B programmer application and select the appropriate COM port from the 'Communications Port' drop down list (*bottom left hand of the application window*).

Confirm communication with the 107-10B has been established by clicking the "Read current settings from unit" button. Refer to 'Troubleshooting' (page 5) if no reply is received from the 107-10B.

## Programming

Settings are stored in non-volatile memory. To obtain the settings currently programmed into the 107-10B, click the "Read current settings from unit" button.

### Digital filtering

Digital filtering enables effective attenuation of noise yet permits a rapid response to a change in the input signal.

Spurious input signals are attenuated by averaging a series of input measurements. The number of measurements used in the averaging process is specified by the '**Averaging Count**' parameter. When this is set to a count of '1', no digital filtering is performed. Increasing the Averaging Count will increase the amount of input signal filtering but will incur a proportionate increase in response time.

To enable a rapid response to a change in the input signal, the most recent input

measurement is continuously compared with the current average. If the change is greater than that specified by the '**Change Threshold**' parameter (this is specified as a percentage of FSD), the current averaging cycle is abandoned and a new one started.

The characteristics of the digital filter can therefore be modified by the Change Threshold and Averaging Count parameters. Changes in input due to noise or spurious signals that do not exceed the Change Threshold will be filtered therefore increasing the Change Threshold increases the maximum change in input that can be filtered. Increasing the Averaging Count will increase the attenuation of these spurious signals.

The response time for the output of the 107-10B to settle will depend on the number of readings specified by the Averaging Count; consequently a large value of Change Threshold will result in slow response times for all but large changes in input. The Change Threshold should therefore be set to the lowest setting that gives adequate noise rejection whilst providing satisfactory response times for the application.

With the Change Threshold set low, the value of the Averaging Count will not affect the response time for a step input change but if the input is changing very slowly, a large value of Averaging Count will cause the output signal to lag behind the input. The Averaging Count should therefore be set to the lowest value that gives sufficient filtering.

### Default values

These are the values programmed during manufacture if alternative values are not specified at the time of ordering.

### Averaging Count

The number of measurements used for calculating the running average.

Minimum: 1 (no digital filtering)

Maximum: 20

Default: 5

### Change Threshold (%)

The percentage of full scale which the measurement may change between each reading without abandoning the current running average.

Minimum: 0 (no averaging)

Maximum: 100

Default: 10

### Output scaling

The output signal may be scaled to any portion of the input signal frequency range with the following parameters.

#### 1- Zero Scale Frequency (Hz)

The input signal frequency giving zero output signal.

Minimum: 0

Maximum: 10000

Default: 10000

#### 2- Full Scale Frequency (Hz)

The input signal frequency giving full scale output signal.

Minimum: 0.1 *(NB to function correctly three places of decimal only may be entered)*

Maximum: 10000

Default: 10000

### Static State Timeout (seconds)

The time which the input measurement is permitted to remain in the same state

without causing the the current measurement to be abandoned and the output signal cut-off to zero. In the event of a transducer or signal line failure, this facility ensures the output is not erroneously held at the last reading. The maximum allows for valid measurements to be taken with a single pulse every 4000 seconds i.e.  $f=0.00025\text{Hz}$ .

Minimum: 2

Maximum: 4000

Default: 2

### Minimum Threshold (%)

The percentage of full scale below which the output signal is cut-off to zero (i.e. low level cut-off). This is applicable only to successful measurements within the available time frame defined by the Static State Timeout. This parameter is more suitable for measurements that are typically well above 1Hz. As the sampling period is a minimum of one second, it will take at least this time for the output to clip to zero if such a measurement suddenly stops.

Minimum: 0

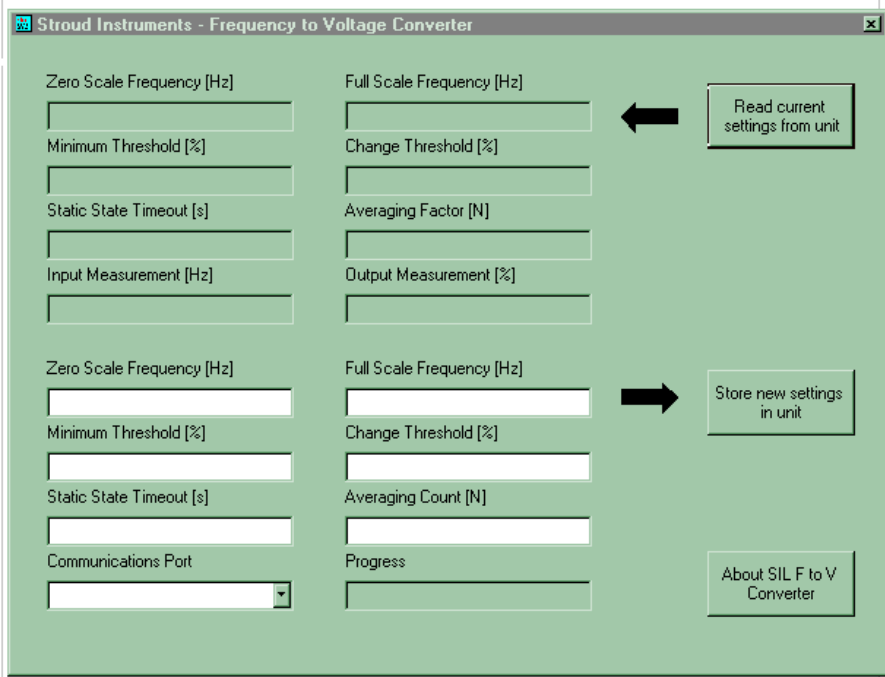
Maximum: 100

Default: 1

### Troubleshooting

If no response is received from the 107-10B, check the following:

- The correct COM port has been chosen.
- IR Link connections are secure.
- The 107-10B is powered up.
- The IR Link Transceiver is positioned correctly.



**Notes:**

- (i) Programmed settings are stored in non-volatile memory.
- (ii) Storing or reading parameters will cause the current measurement of the input signal to be abandoned. The software will generate a warning if a new measurement has not taken place since the last computer reading taken.
- (iii) Parameter settings are restricted by the software to valid limits. Notification is given by the software in the event of range errors.
- (iv) Fractional precision outside valid limits will be truncated on downloading to the instrument.
- (v) A warning will be given by the software if the minimum threshold setting corresponds to a time greater than the combined static state timeout for high and low states. NB Static State Timeout always takes precedence.
- (vi) Measurements outside of defined input range are clipped to limits with the exception of a 2.3% over-range which allows measurements and outputs of up to 102.3% of full scale. NB *This does not include any measurements over 10kHz.*

# Supply voltage and fuse replacement

## Opening the module

- (i) Isolate all supplies to the unit.
- (ii) Unscrew two module retaining screws and separate the plug-in module from the base section.
- (iii) With the fingers, ease apart the shorter sides of the cover releasing the interlocking tongue and groove fastenings to remove the plastic plate (i.e. the plate with the connections label).
- (iv) Slide out the printed circuit board.

## Fuse replacement

The fuse holder is located at the edge of the circuit board and above the mains transformer or DC power unit.

**Fuse size:** 20mm x 5mm dia.

**Fuse ratings:**

- AC Supply - 100mA Quick Blow
- 12V/24V DC - 250mA Anti-surge
- 48V DC - 100mA Anti-surge

## Changing supply voltage

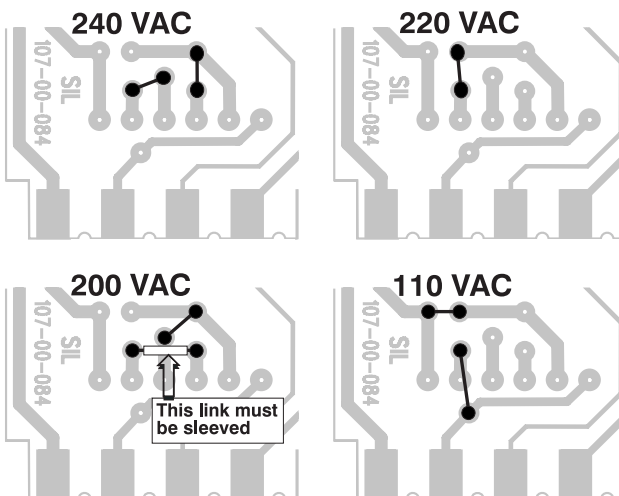
**Please Note:** There are no facilities for changing the operating voltage of DC powered versions.

Details of the linking arrangements for AC supplies are shown below. The links are located on the back of the circuit board. The required tapings are made by soldering tinned copper wire links.

**IMPORTANT - Links for 200V operation must be insulated with silicon rubber sleeving.**

## Re-assembly

- (i) Slide the main board into the slots in the cover.
- (iii) Replace the plastic plate, PCB edge first, and press into place engaging the locking tongues into their slots.
- (iv) Insert the plug-in module into the base section and secure with the retaining screws. NB do not over tighten.



## SPECIFICATION

### INPUT TYPE - factory set

Sine, square or triangular waveforms from volt-free switches, proximity switches, turbine meters, open collector, current pulse, etc.

**Input amplitude:** 10 mV p.t.p. to 250 V R.M.S.

**Current inputs:** ...use the change in current drawn on switching by proximity switches. Typical input currents include 1—3 mA.

### INPUT RANGE

See programmable options

### OUTPUTS - factory set

*NB other output signal ranges available to order.*

mA ranges	Max. Load (ohms)	Option*(ohms)
0 - 10mA	2000	4000
0 - 20mA	1000	2000
4 - 20mA	1000	2000

Current sink 4-20mA @ 50V max.

\* *High output drive options available to order*

### Voltage ranges Min. Load (ohms)

0 - 5 V	500
1 - 5 V	500
0 - 10V	1000
2 - 10V	1000

### TRANSDUCER POWER SUPPLY

Standard: 12 Volts @ 10mA max.

Other voltages from 5v to 15v available to order

### RESPONSE TIME

Typically 1 sec. with Averaging Count of 1 (i.e. no digital filtering).

### ISOLATION

Input and output are isolated from each other and from the power supply. Maximum voltage 250v RMS or 400v DC. Resistance  $\geq 50 \times 10^6$  ohms measured at 1000VDC.

### SPAN ERROR

$\leq \pm 0.2\%$  FSD

### LINEARITY ERROR

$\leq \pm 0.1\%$  FSD (from 1 to 100% FSD)

### SUPPRESSION/ ELEVATION ERROR

$\leq \pm 0.1\%$  FSD

### OUTPUT RIPPLE

$\leq 0.1\%$  (Peak to Peak) of FSD

### LOAD RESISTANCE EFFECT

$\leq 0.001\%$  of Span / 100 ohms change.

### SUPPLY VOLTAGE REJECTION

Output change  $< 0.01\%$  Span per % supply change.

### TEMPERATURE COEFFICIENTS

Zero:  $\pm 0.02\%$  Span / °C

Span:  $\pm 0.02\%$  Span / °C

### TEMPERATURE RANGE

Operating:  $-10^\circ\text{C}$  to  $+60^\circ\text{C}$

Storage:  $-20^\circ\text{C}$  to  $+70^\circ\text{C}$

### POWER SUPPLY

**AC versions:** 110, 220, 240V  $\pm 10\%$   
50/60Hz 5VA

Fuse (internal) 100mA quick-blow (20 x 5mm)

**DC versions:** 12, 24, 48V  $-10\%$   $+20\%$  3.5W

Fuse (internal) 250mA anti-surge (20 x 5mm)

### DIMENSIONS

100H x 63 W x 95D (mm)

### WEIGHT

Approximately 550 grams.

**Notes:**