SPECTRUM INSTRUMENTS LTD.

SI-557 Accelerometer and Temperature Signal Conditioner Module

1. **Description.** The SI-557 Signal Conditioner is used with a 100mV/g constant current type accelerometer (other sensor options available upon request) and either a 10mV/°C or PT-100 temperature sensor to provide dual 4-20mA outputs suitable for direct input to a vibration monitoring PLC. The module 4-20mA output is proportional to true RMS velocity in mm/s. A buffered AC output is provided via the BNC connector and screw terminals to enable vibration analysis using an FFT signal analyser. The unit is housed in a compact DIN-Rail mounting plastic case and operates from 24VDC at 50mA. Terminal connections are shown on the drawing overleaf.

2. **Accelerometer Input**. The SI-557 provides a nominal 3.5mA constant current supply to an accelerometer, such as the Hansford Sensors SI-100 Series, which connects directly to the module input terminals.

3. **Temperature Input.** The SI-557 can accept two configurations of temperature signal, a 10mV/°C input, such as a SI-100T, or a PT-100 input, such as the SI-100PT. Both provide an output of 4-20mA with a temperature range of 0-100°C (other ranges available upon request).

4. **AC Output.** A buffered AC output, proportional to acceleration, is provided via the BNC and screw terminal connectors. The 100mV/g signal is DC coupled to the accelerometer output and thus swings about the accelerometer bias voltage (12VDC nominal). If a data-collector is used to monitor this signal for vibration analysis, it must have the sensor power function of the data-collector turned off.

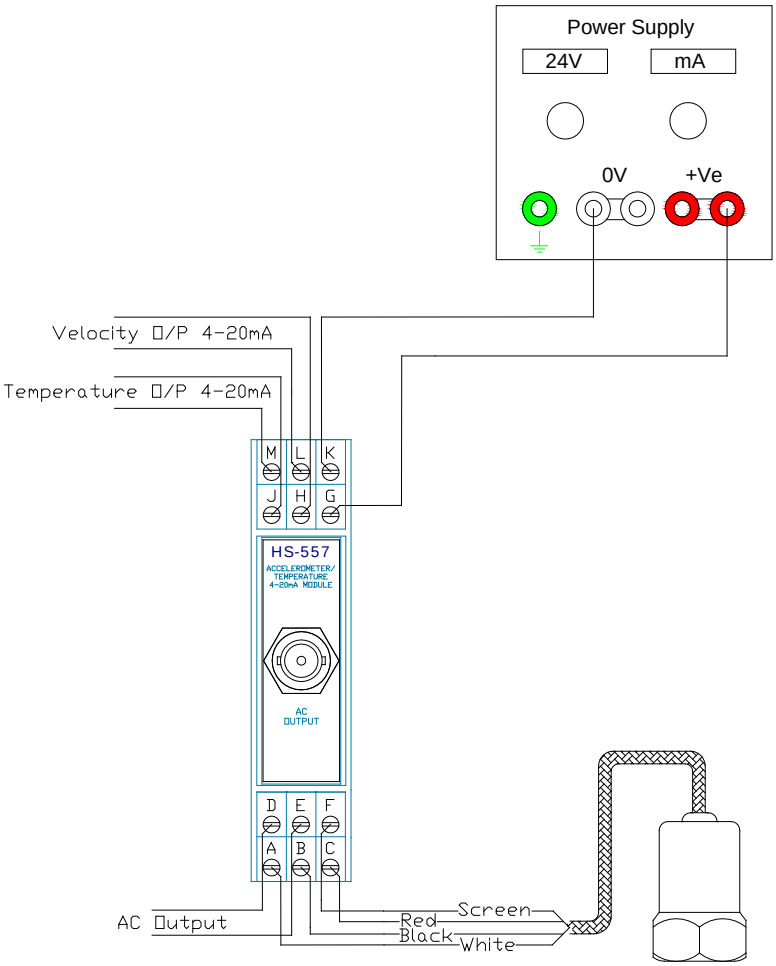
5. **4-20mA Output – Velocity.** The 4-20mA output is proportional to vibration velocity in mm/s RMS, and the circuit incorporates high and low pass filters to limit the measurement bandwidth at 10Hz to 5kHz, as requested by the customer. The output range is set at the factory for 4-20mA = 0-20mm/s peak and alternative ranges can be specified at time of order. On request, this output can be configured at the factory to detect RMS acceleration (g).

6. **4-20mA Output – Temperature.** The 4-20mA output is proportional to temperature in °C. The output is set at the factory for 4-20mA = 0-100°C and alternative ranges can be specified at time of order, up to 140°C.

7. **System Grounding.** To avoid spurious 50Hz pick-up from surrounding equipment it is advisable for the cases of the sensors and the SI-557 power supply 0V to be grounded. This is normally achieved by the sensors being fitted to a grounded machine casing, and the SI-557 power supply 0V being grounded locally. In this instance the screen wires of the sensors should not be grounded at the measurement end in order to avoid grounding loop currents. For this reason, whilst the SI-557 is operating with a 10mV/°C temperature input the accelerometer screen terminals are not internally connected to the power supply 0V.

In some applications the machine ground is sufficiently noisy to inject spurious signals into the measurement system. In this instance, the case of the accelerometer should be isolated from the machine casing using an isolating stud, and the screen wire connected, via wire links, from the SI-557 accelerometer screen terminals to the power supply 0V terminals and to ground.

8. Connection details for the SI-557 Signal Conditioner (10mV/°C input)



SI-557 and HS-557 Models are synonymous.

9. Terminal Connections

Connector	Function
A	Accel PWR/SIG In
B	Accel 0V In
C	Temp In
D	Accel PWR/SIG Out
E	Accel 0V Out
F	Screen / Temp
G	+24V Power In
H	Iout + (Vel/g)
J	Iout + Temp Out
K	0V Power In
L	Iout – (0V) (Vel/g)
M	Iout – (0V) Temp

10. SI-557 Specification

Power Input..... +24VDC ±10% (regulated) 50mA max

Accelerometer Power..... 3.5mA ±20% constant current, 23VDC driving voltage

Accel. Input Sensitivity..... 100mV/g

Temperature Input..... 10mV/°C or PT-100

Filters ..... 2 pole Butterworth 2Hz – 10kHz (-3dB)

Dual 4-20mA Output ..... Max. load resistance, 450Ω

Max. output current (input overload), 21mA

AC Output..... Sensitivity 100mV/g (as accelerometer)

Output resistance, < 200Ω

DC level + 12V nominal (as accelerometer)

Connector, BNC and Screw Terminals (50Ω)

Dimensions ..... 24mm(w) x 75mm(d) x 118mm(overall height)

Weight..... 0.1kg

11. SI-557 Calibration

The module velocity output is calibrated at the factory using a sine-wave signal generator to simulate a 100mV/g accelerometer. eg. 200mVrms @ 156Hz = 20mm/s RMS velocity. Should periodic calibration be required, the zero and span adjustment potentiometers are accessible on removal of the left side panel of the module. First, with a milli-ammeter connected in series with the output terminals

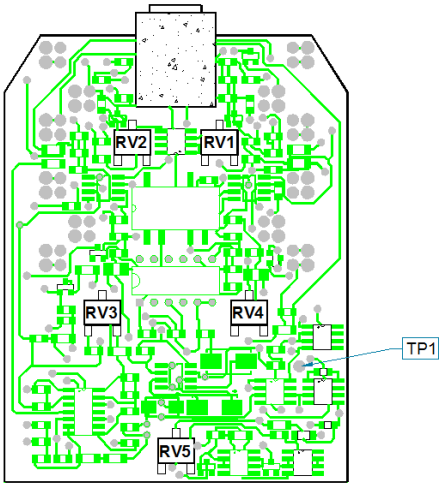
(H & L) and with no input signal applied, adjust potentiometer RV1 to set the measured output current to 4.0mA.

Then apply a sinusoidal input signal, corresponding to the required full-scale velocity level, to the input terminals A & B. This is most easily achieved using the SI-661 Accelerometer Simulator which has switched velocity levels of 5 mm/s RMS and 20mm/s RMS and can be directly connected to the SI-557 input terminals.

If a signal generator is to be used to provide the input signal then it will be necessary to connect a 3.3Kohm resistor across the input terminals A & B in order to simulate an accelerometer bias voltage. The signal generator should then be connected to terminal A via a 1µF 35V capacitor to block the bias voltage from the signal generator. If a polarized capacitor is used, the positive leg should be connected to terminal A.

A signal generator frequency of 156Hz is convenient to use since the required amplitude for a given velocity is easily obtained. ie. 25mm/s = 250mVrms, 50mm/s = 500mVrms etc.

When the correct input signal is applied, corresponding to the maximum velocity level required, then adjust potentiometer RV3 to set the output current to 20.0mA.



To calibrate the temperature output for a module configured for a 10mV/°C sensor, the milli-ammeter is connected to terminals M and J. With no input signal applied the output current can be set to 4.0mA using potentiometer RV2. A dc voltage corresponding to the maximum temperature (eg. 1.0V = 100°C) is then applied to terminals C and F. The output current can then be adjusted to the maximum 20.0mA using potentiometer RV4.

For modules configured for PT100 temperature sensors it is convenient to use a proprietary PT100 simulator connected to terminals C and F and the output current milli-ammeter connected to terminals M and J. Set the PT100 simulator to the minimum temperature to be measured: eg. 0°C (100Ω). It is then necessary to set the internal ambient temperature compensation circuit by adjusting the voltage measured between 0V (terminal F) and test point TP1to 1.0Vdc using potentiometer RV5. The output current can now be set to 4.0mA using potentiometer RV2. The PT100 simulator can then be set to the maximum temperature required and the output current set to 20.0mA using potentiometer RV4.