



410 and 420 10V Operation

Application Note Overview

A number of customers have required a +/- 10V output from the Scitec Instruments 410 and 420 lockin amplifiers. This application note gives details of how this can be achieved.

Standard Operation

During standard operation, the 410 and 420 units will produce output voltages and meter readings as specified in the following table:

Standard Operation (60dB Dynamic Reserve)				
Gain Setting	Input Signal	Maximum Input Noise Signal Before Overload Occurs	Output Voltage*	Meter Reading*
1V	1V AC RMS	14V Peak	1V DC	Full Scale (+1)
300mV	300mV AC RMS	14V Peak		
100mV	100mV AC RMS	14V Peak		
30mV	30mV AC RMS	14V Peak		
10mV	10mV AC RMS	14V Peak		
3mV	3mV AC RMS	4.2V Peak		
1mV	1mV AC RMS	1.4V Peak		
300µV	300µV AC RMS	420mV Peak		
100µV	100µV AC RMS	140mV Peak		
30µV	30µV AC RMS	42mV Peak		
10µV	10µV AC RMS	14mV Peak		
3µV	3µV AC RMS	4.2mV Peak		

* Assumes input signal is in phase with reference.

An input signal of the same size as the gain setting will give full scale or 1V output. Signals smaller than the gain setting will give proportionately smaller outputs.

When operated as above, the unit has a dynamic reserve of 60dB.

Overdriving the Input to Give +/-10V Output

A 10V output signal can be produced by reducing the gain setting by a factor of 10. No modifications to the 410 or 420 are required to do this.

Overdriving the input by a factor of 10 (40dB Dynamic Reserve)				
Gain Setting	Input Signal	Maximum Input Noise Signal Before Overload Occurs	Output Voltage*	Meter Reading*
1V	10V AC RMS	14V Peak	+10V DC	OVERLOAD
300mV	3V AC RMS	14V Peak		
100mV	1V AC RMS	14V Peak		
30mV	300mV AC RMS	14V Peak		



10mV	100mV AC RMS	14V Peak		
3mV	30mV AC RMS	4.2V Peak		
1mV	10mV AC RMS	1.4V Peak		
300µV	3mV AC RMS	420mV Peak		
100µV	1mV AC RMS	140mV Peak		
30µV	300µV AC RMS	42mV Peak		
10µV	100µV AC RMS	14mV Peak		
3µV	30µV AC RMS	4.2mV Peak		

* Assumes input signal is in phase with reference

This method of operation has a number of disadvantages which need to be noted:

- The dynamic reserve of the system is reduced to 40dB
- The meter reading is off scale. This will not harm the meter as the 410 and 420 instruments have meter protection circuitry built into them.

Factory Modification to Give +/-10V Output

The internal circuitry of the 410 or the 420 can be modified at the factory to give a +/-10V Output.

Standard Operation (60dB Dynamic Reserve)				
Gain Setting	Input Signal	Maximum Input Noise Signal Before Overload Occurs	Output Voltage*	Meter Reading*
1V	1V AC RMS	14V Peak	10V DC	Full Scale (+10)
300mV	300mV AC RMS	14V Peak		
100mV	100mV AC RMS	14V Peak		
30mV	30mV AC RMS	14V Peak		
10mV	10mV AC RMS	14V Peak		
3mV	3mV AC RMS	4.2V Peak		
1mV	1mV AC RMS	1.4V Peak		
300µV	300µV AC RMS	420mV Peak		
100µV	100µV AC RMS	140mV Peak		
30µV	30µV AC RMS	42mV Peak		
10µV	10µV AC RMS	14mV Peak		
3µV	3µV AC RMS	4.2mV Peak		

* Assumes input signal is in phase with reference.

There is no charge for making this modification if specified at any time before delivery.

Care must be taken with these units that the time constant used on the output is sufficiently large to keep the output signal below about 12V DC. If the output has an average level of 10V but has a noise level of say +/-5V then the signal above 12V DC will be removed, causing the average output level to be lowered. This will cause the meter to read low.

If you currently own a 410 or 420 instrument and wish to modify the unit yourself, then please contact Scitec for details.

