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OG7700A
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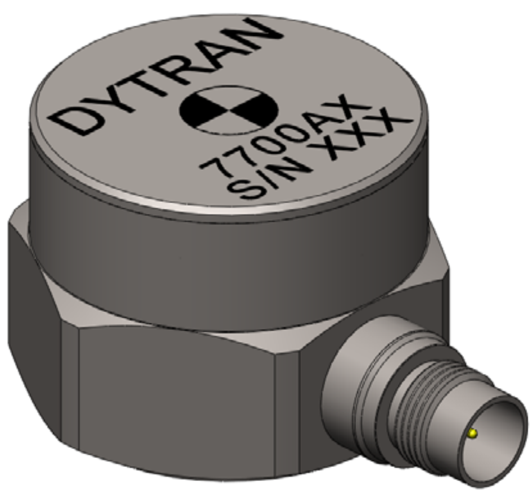
OPERATING GUIDE

SERIES 7700A

Variable Capacitance Accelerometer with Piezoresistive Electrical Interface



OPERATING GUIDE
SERIES 7700A ACCELEROMETER

INTRODUCTION

Dytran Series 7700A is a family of high performance, wide temperature range variable capacitance (VC) accelerometers intended to directly replace piezoresistive units for existing or new applications. This accelerometer utilizes a capacitive sensing element and an advanced ASIC to simulate the operation of a piezoresistive bridge. It combines an integrated VC accelerometer chip with high drive, low impedance buffering for measuring acceleration in commercial/industrial environments. It is tailored for zero to medium frequency instrumentation applications. This module contains a hermetically sealed micromachined capacitive sensing element, a custom integrated circuit amplifier, and differential output stages. The hermetically sealed titanium case has a M4.5 X 0.35 4-pin receptacle, and is easily mounted via two 4-40 screws. On-board regulation is provided to minimize the effects of supply voltage variation. It is relatively insensitive to temperature changes and thermal gradients. The cable shield is electrically connected to the titanium case; the power and signal wires are isolated from the case. An initial calibration sheet is included and periodic calibration checking is available.

OPERATION

Series 7700A accelerometer modules produce two analog voltage outputs which vary with acceleration as shown in Figure 1. The sensitive axis is perpendicular to the bottom of the package, with positive acceleration defined as a force pushing on the bottom of the package. The signal outputs are fully differential about a common mode voltage which is centered midway between the two supply voltages used. The output scale factor is independent from the supply voltage of ±3 to ±11 volts. Single supply operation is possible, in which case the negative supply pin should be grounded. The bias voltage is expected to be half of the supply voltage at the positive supply pin. At zero acceleration, the output differential voltage is nominally 0 volts DC. At ± full scale acceleration, the output differential voltage is ±0.5 volts DC.

CABLE LENGTH CONSIDERATIONS

Cable lengths of up to 15 meters (50 feet) can be used with the 7700A accelerometer. For lengths longer than 15 meters, we recommend you check each individual installation for oscillation by tapping the accelerometer and watching the differential output for oscillation in the 20kHz to 50kHz region. If no oscillation is present, then the cable length being used is acceptable. From the standpoint of output current drive and slew rate limitations, the 7700A series is capable of driving over 600 meters (2000 feet) of its cable type but at some length between 15 and 600 meters, each device will likely begin to exhibit oscillation.

ADDING A SINGLE ENDED OUTPUT

To achieve the highest resolution and lowest noise performance, the 7700A series accelerometer should be connected to a voltage measurement instrument in a differential configuration using both the AOP and AON output signals. If the measurement instrument lacks differential input capability, or if it is desired to use a differential input capable instrument in single-ended mode, then the circuit shown in Figure 2 can be used to preserve the low noise performance of the Series 7700A while using a single ended type connection.

This circuit converts the ±0.5V differential output of the 7700A series accelerometer, centered midway between the two supply voltages, to a single-ended output centered near ground (0.0Vdc). That provides the advantage of low common mode noise by preventing the accelerometer's ground current from causing an error in the voltage reading.

The Op Amp should be located as close as possible to the voltage monitoring equipment. The majority of the signal path can therefore be differential so any noise will affect the wire run as a common mode signal which will be rejected. The op-amp type is not critical; a A741 or a LM124 can be used. The power supplies need to be ±5V to ±15V to allow for both positive and negative output swing.

The gain of the op-amp is determined by the ratio R2/R1 (where R4=R2 and R3=R1). If R1 through R4 are all the same value, the gain equals 1 and the output swing will be ±4V, single-ended with respect to ground. To obtain a ±5V single ended output, set R2/R1=R4/R3=5/4=1.25. The single-ended output of the op-amp will be centered at ground if R2 and C1 are tied to ground; using some other fixed voltage for this reference can shift the output. The value of the optional capacitors C1 and C2 (C1=C2) can be selected to roll off the frequency response to the frequency range of interest.

MAINTENANCE AND REPAIR

Should you experience a problem with your system, contact the Dytran factory for technical assistance with analysis and troubleshooting. If the product must be returned for evaluation and/or repair, you will be given an RMA (returned materials authorization) number and instructions for returning the instrument to the factory. Do not return the instrument without first obtaining this authorization to return.

Figure 1

SIGNAL DESCRIPTIONS

V+ and V- Pin 1 and Pin 4 respectively. Power ±3 to ±11 Volts DC

AOP and AON (Output): Pin 2 and Pin 3 respectively. Analog output voltages proportional to acceleration; AOP voltage increases (AON decreases) with positive acceleration. At zero acceleration both outputs are nominally equal to the midway between two supply voltages. The device experiences positive (+1g) acceleration with its lid facing up in Earth's gravitational field. Either output can be used individually or the two outputs can be used differentially. (See output response plot below).

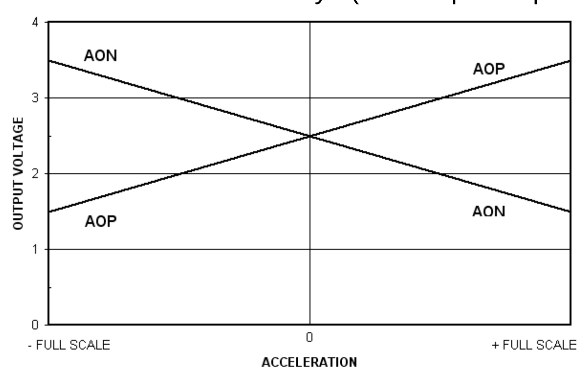


Figure 1: Output Diagram

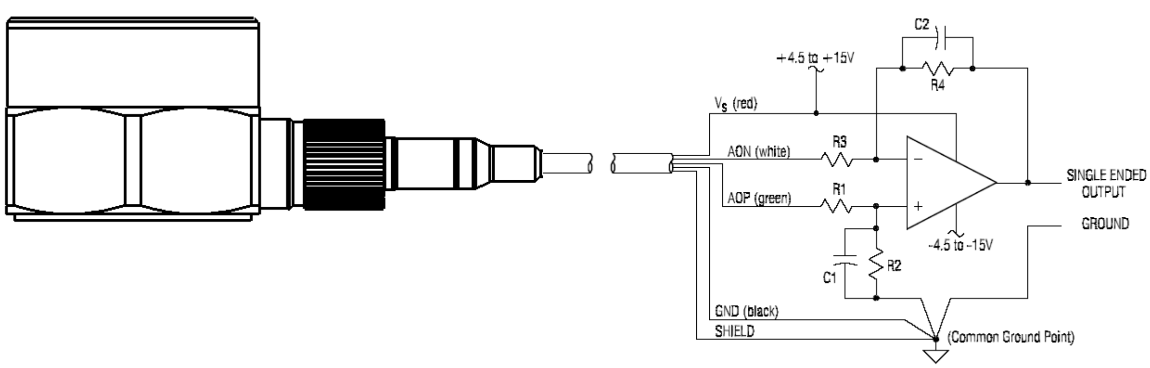


Figure 2: Conversion to single ended output

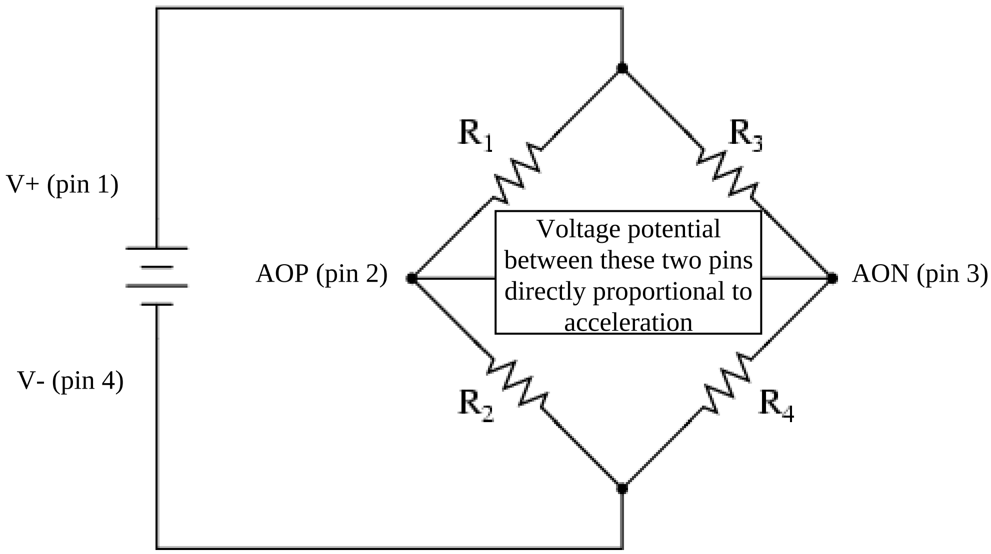


Figure 3: Powering Schematic