# PERFORMANCE SPECIFICATION
# CHARGE AMPLIFIER
# 2680M14-XXX

| Document Number | Rev | Date | Entered by | Description of Change | Change Accountable Engineer | ECO |
|---|---|---|---|---|---|---|
| EDVPS2680M14 | L | 5/13/24 | NAD | Updated Limited Output Voltage | EPL | 54761 |

## 1.0 DESCRIPTION

The ENDEVCO® Model 2680M14-XXX Series Charge Amplifier is designed for use with piezoelectric transducers and is suitable for airborne applications. Hybrid microcircuits construction results in small size, ruggedness and low power consumption. The unit is a charge amplifier; that is, it has an output voltage proportional to the charge at the input. As a result, the amplifier sensitivity is not appreciably affected by the capacitance of the input cable.

This unit has two outputs, an unbiased, low gain output with a gain range of 1-10 mV/pC, and an unbiased high gain output with a gain range of 10-100 mV/pC. Both outputs are adjustable with a common gain control.

The -XXX describes the upper cutoff frequency (-5% point) per Table 1. For example, a -101 has a low pass filter which is flat up to 100 Hz, a -502 has a low pass filter which is flat up to 5000 Hz.

### 1.1 KEY FEATURES

- For use with piezoelectric transducers
- Small, rugged, light weight
- Dual unbiased outputs
- Adjustable gain
- Optional low pass filter

## 2.0 INPUTS

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|---|---|---|
| 2.1 | TYPE | Piezoelectric single-ended with one side connected to signal ground. |
| 2.2 | SOURCE RESISTANCE | 3 MΩ minimum. |
| 2.3 | SOURCE CAPACITANCE | 10 000 pF maximum. |
| 2.4 | OVERLOAD RECOVERY | A half sine pulse of 1 ms duration and an amplitude of 5000 pC or less will cause no spurious effects at the amplifier output other than clipping. |

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| **3.0** | **OUTPUT CHARACTERISTICS** (the following characteristics apply to both outputs) | |
| 3.1 | TYPE | Single-ended with one side connected to circuit ground. |
| 3.2 | OUTPUT IMPEDANCE | 50 Ω maximum, in series with at least 16 µF. |
| 3.3 | DC OUTPUT BIAS VOLTAGE | 0.00 V + .050 V/-0.00 V |
| 3.4 | LINEAR OUTPUT VOLTAGE | ≥ 5.00 V pk-pk (1.77 V rms) with 10 kΩ load resistance |
| 3.5 | LIMITED OUTPUT VOLTAGE | 15.6 V MAX |
| 3.6 | LINEAR OUTPUT CURRENT | 0.500 mA pk-pk minimum (0.177 mA rms) with 10 kΩ load at linear output voltage. |
| **4.0** | **TRANSFER CHARACTERISTICS** | |
| 4.1 | GAIN RANGE | |
| 4.1.1 | Low Gain Output | 1 to 10 mV/pC, adjustable |
| 4.1.2 | High Gain Output | 10 to 100 mV/pC, adjustable |
| 4.1.3 | Gain Ratio | 10:1 ± 3% between high and low gain outputs at any gain control setting |
| 4.2 | GAIN STABILITY | 0.05% maximum change per 1000 pF change in source capacitance at the input. |
| 4.2.1 | Gain Stability with Source Capacity | 0.25% maximum with changes in supply voltage over the specified limits. |
| 4.2.2 | Gain Stability with Temperature at Reference Frequency | The gain change referred to the 77°F (25°C) gain over the range -67°F to 212°F (-55°C to 100°C) is dependent upon gain setting as shown in Figure 3. |
| 4.2.3 | Gain Stability with Supply Voltage | 0.25% maximum with changes in supply voltage over the specified limits |
| 4.3 | FREQUENCY RESPONSE | The gain at the lower and upper cutoff frequency is 5% lower than the gain at 20 Hz. See Table 1. |
| 4.4 | AMPLITUDE LINEARITY | ± 0.5% of reading from best fit straight line approximation to the curve of output amplitude versus input amplitude for signals less than the output limits. |

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| 4.5 | TOTAL HARMONIC DISTORTION | Less than 0.5% for signals within the output limits. |
| 4.6 | RESIDUAL NOISE | 0.01 pC rms +0.01 pC rms per 1000 pF RTI or 1.5 mV rms RTO low gain and 15 mV rms RTO high gain, whichever is greater, when measured over a bandwidth of 3 Hz to 20 kHz. |
| 4.7 | SHOCK AND VIBRATION SENSITIVITY | 0.01 pC/g maximum RTI |

**5.0 ENVIRONMENTAL**

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|---|---|---|---|
| 5.1 | TEMPERATURE<br>Storage: | Operating: -67°F to 212°F(-55°C to 100°C)<br>-99°F to 257°F(-73°C to 125°C) | |
| 5.2 | HUMIDITY | 100% R.H. when sealing screw is soldered. Meets MIL-STD-810D, Method 507.2, Procedure III. | |
| 5.3 | ALTITUDE | No effect when sealing screw is soldered. | |
| 5.4 | VIBRATION | 120 mils D.A.<br>20g | 5 Hz to 55 Hz<br>55 Hz to 2000 Hz |
| 5.5 | SHOCK | 100g<br>sawtooth | 6.5 millisecond |
| 5.6 | E.M.C. CAPABILITY | The unit will meet the requirements of the following specifications:<br>MIL-STD-826, Class Am MIL-I-6181D<br>MSFC-SPEC-279, Class I; AF/BSD Exhibit 62-87 | |

**6.0 POWER REQUIREMENTS**

| | | |
|---|---|---|
| 6.1 | VOLTAGE | 20 to 32 VDC (28 VDC nominal) |
| 6.2 | CURRENT | 22mA maximum |
| 6.3 | WARMUP TIME | 30 seconds maximum to meet all specifications. |
| 6.4 | POLARITY PROTECTION | Not damaged by a polarity reversal of the 28 V supply. |
| 6.5 | CASE ISOLATION | Case and signal grounds isolated from each other by 50 MΩ or greater at 50 VDC. Case ground must be connected to signal ground at some point in the system to keep the residual noise within specifications. |

## 7.0 PHYSICAL

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| 7.1 | DIMENSIONS | 1.20" l x 1.00" w x 0.75" h (30.5 mm x 25.4 mm x 19.1 mm) exclusive of mounting flange and connectors see outline drawing on page 6. |
| 7.2 | MOUNTING | Unit mounts with two 6-32 screws. |
| 7.3 | CASE MATERIAL AND FINISH | Aluminum with electroless nickel plate finish. |
| 7.4 | WEIGHT | 1.5 oz (42.5 gm) maximum |
| 7.5 | CONNECTORS | |
| 7.5.1 | Input | 10-32 coaxial connector is used to connect the signal from the transducer to the amplifier. |
| 7.5.2 | Output | Viking VR5/4AG15.<br>Pin A is the 28 VDC,<br>Pin B unbiased low gain output,<br>Pin C unbiased high gain output,<br>Pin D power and signal ground,<br>Pin E case ground. |
| 7.5.3 | Gain Control | The gain control is a 12 turn trim pot, and varies the gain of both outputs as specified in paragraph 2.3.1. |

## 8.0 ORDERING INFORMATION

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| 2680M14-xxx | -xxx is the upper -5% cutoff frequency, if the optional low-pass filter is equipped. |

## 9.0 ACCESSORIES

9.1 INSTRUCTION MANUAL

9.2

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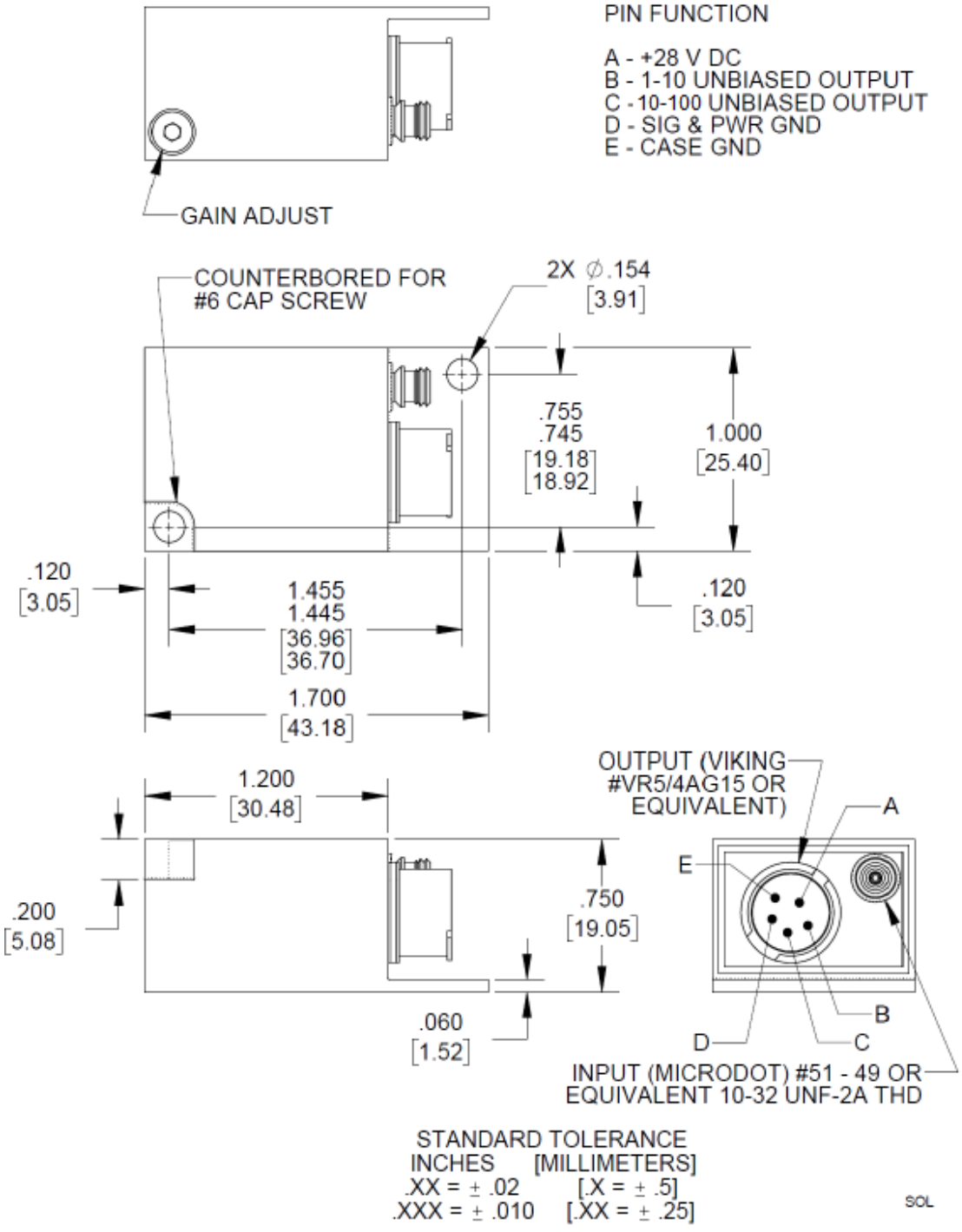
|---|---|---|
| 21997 | Accessory Kit includes: | |
| EP38 | Mating Plug | Viking #VP5/4CE6 |
| EP35 | Hood | Viking #VS4/16C5 |
| EP31 | Potting Sleeve | Viking #VS4/16C9 |
| | Mounting Hardware | |
| | 6-32 Cap Screws & Lockwashers | |

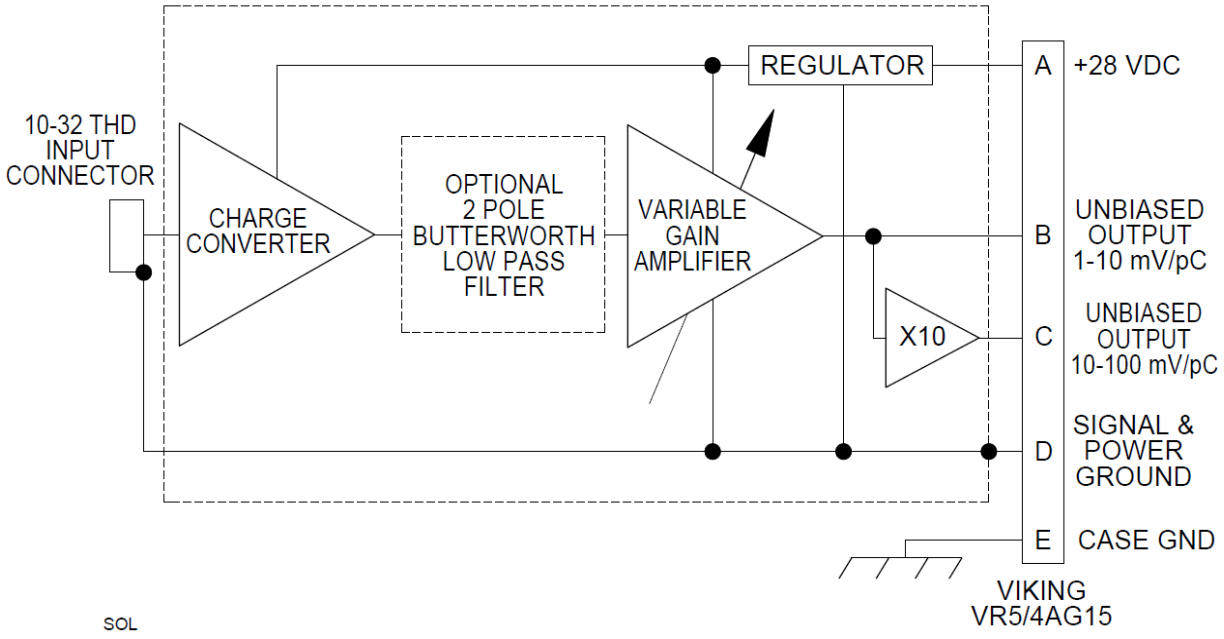
TABLE 1

| DASH NO. | GAIN RANGE | +5% -10% | ± 5% | +5% -10% | -3 dB | -12dB |
|---|---|---|---|---|---|---|
| None | 1-10 | 3 Hz to 5 Hz | 5 Hz to 20 kHz | - | - | - |
| | 10-100 | 3 Hz to 5 Hz | 5 Hz to 10 kHz | 20 kHz | - | - |
| -101 | Both | 3 Hz to 5 Hz | 5 Hz to 100 Hz | - | 200 Hz | 400 Hz |
| -201 | Both | 3 Hz to 5 Hz | 5 Hz to 200 Hz | - | 400 Hz | 800 Hz |
| -501 | Both | 3 Hz to 5 Hz | 5 Hz to 500 Hz | - | 1 kHz | 2 kHz |
| -102 | Both | 3 Hz to 5 Hz | 5 Hz to 1 kHz | - | 2 kHz | 4 kHz |
| -202 | Both | 3 Hz to 5 Hz | 5 Hz to 2 kHz | - | 4 kHz | 8 kHz |
| -502 | Both | 3 Hz to 5 Hz | 5 Hz to 5 kHz | - | 10 kHz | 20 kHz |
| -103 | Both | 3 Hz to 5 Hz | 5 Hz to 10 kHz | - | 20 kHz | 40 kHz |
| -203 | 1-10 | 3 Hz to 5 Hz | 5 Hz to 20 kHz | - | 40 kHz | 80 kHz |
| | 10-100 | 3 Hz to 5 Hz | 5 Hz to 10 kHz | 20 kHz | 40 kHz | 80 kHz |

OUTLINE DRAWING
FIGURE 1



BLOCK DIAGRAM
FIGURE 2



GAIN STABILITY
FIGURE 3