The World Leader in Vibrating Wire Technology

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Installation Instructions

Model 8020-42CPR

Single Coil Autoresonant Adapter
4-20Ma Output

(Rev F, 08/23/2018)

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1. INTRODUCTION

The Geokon 8020-42CPR is a device that allows single coil vibrating wire gages to be driven in the "Autoresonant" mode, instead of the standard "Pluck and Read" mode, resulting in a greater dynamic range (up to 20Hz). The benefits of Autoresonant vs. Pluck and Read topologies are many, including greater reading stability and wider dynamic bandwidth. In addition, since there is no asynchronous swept frequency or pulse pluck excitation to interfere with the vibrating wire signal, there is the ability to read the gage frequency with a general-purpose frequency counter or low cost datalogger, instead of a complex dedicated readout device or datalogger. In addition to the gage frequency output, the 8020-42CPR also provides two 4-20mA signals that are proportional to "digits" (frequency^2). These 4-20mA outputs are factory set for the range of 2250 digits (1500Hz – 20mA) to 12250 digits (3500Hz - 4mA), but may be adjusted for other ranges. One of the 4-20mA outputs is a non-isolated current source (I_out, / I_out). The other 4-20mA output (LOOP_+, LOOP_-) is a current sink designed to be used in applications that require an isolated controller. Typically, the 4-20mA output is adjusted to cover the full range span of a single transducer.

Historically, autoresonant vibrating wire gages have employed two coils. The first is the Transmit (excitation) coil that provides a phase synchronous pulse (pluck) to maintain oscillation, while the second is the Receive (reading) coil that recovers the vibrating wire signal. The two-coil approach, while dependable, adds to the cost and imposes a considerable mechanical limitation to the design and construction of the gage. Since the SCA is designed to operate as a "transceiver" using only one coil, these limitations are eliminated while providing the benefits of the autoresonant mode.

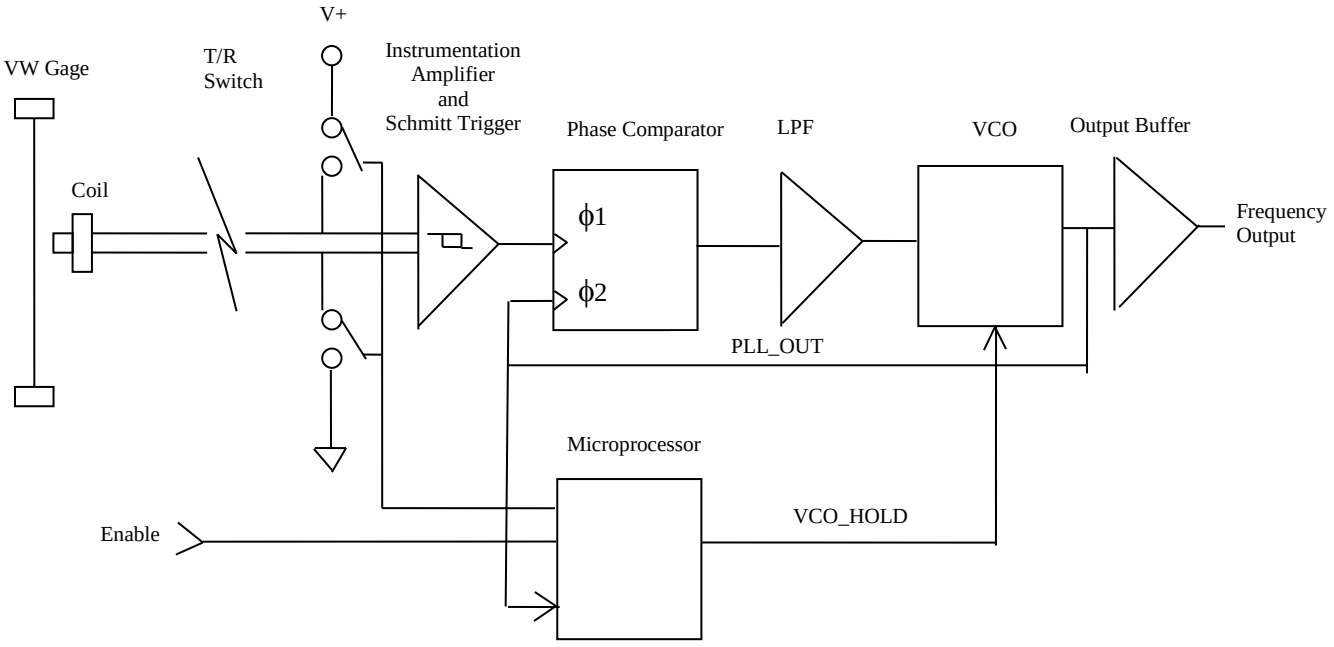

Figure 1 - Block Diagram

2. CONNECTIONS

Connector Position	Signal Name	Signal Description	Type	Level (typ.)
1	FOUT	Vibrating Wire Gage Frequency	Output	5Vpp
2	FOUT_ATT	Vibrating Wire Gage Frequency - Attenuated	Output	200mVpp
3	LOOP+	Isolated current loop + input (loop power)	Power	+10 to +30VDC
4	LOOP-	Isolated current loop output	Output	Load dependent
5	DAS GND	Power ground for 24V option	Ground	0V
6	+12V	+12V Power Supply input	Power	6-15VDC
7	GND	Ground	Power	0V
8	/I_OUT	Ground return for 4-20mA signal	Power	0V
9	I_OUT	4-20mA source	Output	4-20mA
10	C+	VW coil +	Input	1mVpp
11	C-	VW coil -	Input	1mVpp
12	CR10EX	Excitation (Micro-10 configuration)	Input	TTL/CMOS (EX)
13	CR10EN	Enable (Micro-10 configuration)	Input	TTL/CMOS (C1.C7)
14	CR10CLK	Clock (Micro-10 configuration) Enable (Generic Datalogger configuration)	Input	TTL/CMOS (C8)
15	GND	Ground	Ground	0V

Table 1 - Connector/Signal Description

NOTE: Because the 8020-42 requires each vibrating wire gage to have its own pair of twisted leads, the 8020-42 is not compatible with Geokon models 4900 (VW Load Cell) and 4350-3 (Biaxial Stressmeter).

3. CONFIGURATIONS

3.1 Micro-10 Datalogger

The 8020-42CPR can be incorporated as the vibrating wire interface in a Micro-10 Datalogger system, taking the place of the Campbell Scientific Inc. AVW-1. In order to configure the 8020-42CPR for the Micro-10 Datalogger, internal jumpers JP1, JP2 and JP3 must be set across pins one and two. Remove the cover of the 8020-42 and set the jumpers:

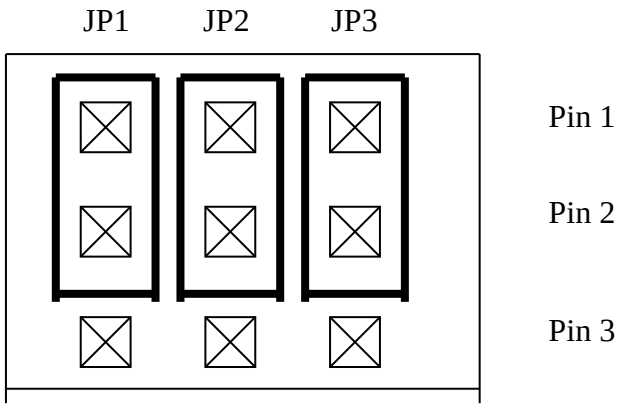

Figure 2 - Internal Jumper Settings for Micro-10 Configuration

Between readings, the 8020-42CPR will be "asleep", drawing approximately 20μA from the 12V system battery.

When it is time to take a reading, the datalogger will set C1..C7 (CR10EN) high in order to enable the respective multiplexer, and the individual channels are clocked by pulsing C8 (CR10CLK) high.

When "CR10EN" and "CR10CLK" are both high, the 8020-42CPR will wake up and wait for the swept frequency excitation signal to appear at EX. The 8020-42CPR will track and apply this swept frequency to the VW gage. Once the swept frequency is complete, the 8020-42CPR will lock onto the returned VW signal and maintain excitation by applying one excitation pulse for every 16 cycles of VW frequency. The VW frequency is provided as both a 200mv(pp) signal at FOUT_ATT (connector position two), and as a 5v(pp) 50Ω output at FOUT (connector position one).

It is helpful to add a small amount of delay (≈ 0.5 Sec.) from the time that the swept frequency excitation ends and the time that the reading is taken. MultiLogger software, ver. 1.4.0 and above provides this delay when selecting a gage type that has the letters sca included within it, i.e., 4500sca, 4700sca etc.

3.2 Generic Datalogger Configuration

The 8020-42CPR can be incorporated as the vibrating wire interface for any datalogger that is capable of reading a frequency input or a 4-20mA current input and has the ability to output a single 5V CMOS level control signal. In order to configure the 8020-42CPR for a generic Datalogger, internal jumpers JP1 and JP3 must be set across pins one and two, while JP2 is set across pins two and three. Remove the cover of the 8020-42CPR and set the jumpers:

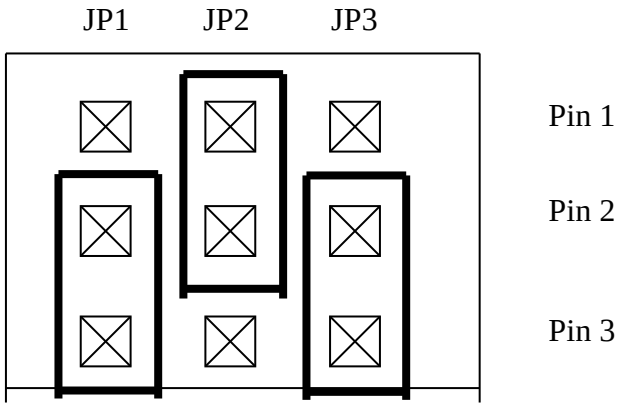

Figure 3 - Internal Jumper Settings for Generic Datalogger Configuration

Between readings, the 8020-42CPR will be “asleep”, drawing approximately 20μA from the 12V system battery.

When it is time to take a reading, the datalogger will set its control signal, which should be connected to CR10CLK, high. When CR10CLK goes high, the 8020-42CPR will generate a 400-4500 Hz swept frequency pluck in order to excite the VW gage. As with the Micro-10 configuration, once the swept frequency is complete, the 8020-42CPR will lock onto the returned VW signal and maintain excitation by applying one excitation pulse for every 16 cycles of VW frequency.

The 8020-42CPR will provide continuous VW frequency output until the CR10CLK control line is brought low. At this time, the 8020-42CPR will go back to sleep

3.3. Stand Alone Configuration

When configured in the Stand Alone mode, the 8020-42CPR will provide continuous excitation and frequency output from a single Vibrating Wire gage. All that is needed is a 12V (nominal) voltage source and a frequency counter to read the VW frequency. In order to configure the 8020-42CPR for Stand Alone mode, internal jumpers JP1, JP2 and JP3 must be set across pins two and three. Remove the cover of the 8020-42CPR and set the jumpers:

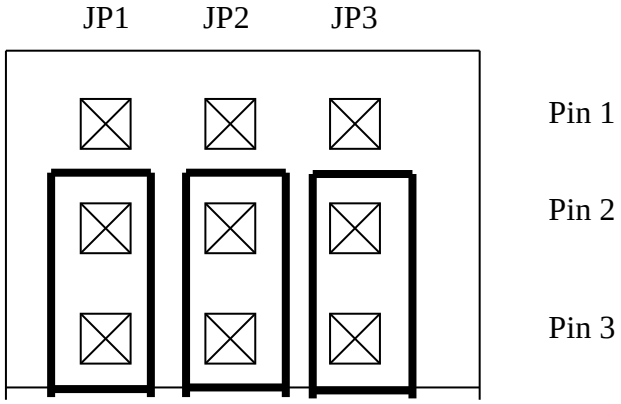

Figure 4 - Internal Jumper Settings for Stand Alone Configuration

6. OUTPUT TO DIGITS CONVERSION

Use the following formula to convert the 4-20mA output signal to “Digits”:

$$Digits = 12250 - [625 \times (mA-4)]$$

Equation 1 - Convert 4-20mA Output to Digits

Where;
mA = 8020-42CPR 4-20mA output signal

For example:

If the 8020-42CPR is outputting a 4-20mA current of 12mA then:

Digits = 12250 – [625 x (12 – 4)]
Digits = 12250 – [625 x 8]
Digits = 12250 – 5000
Digits = 7250

APPENDIX A. SPECIFICATIONS

POWER	
Power Requirements:	6-15 VDC (12V nominal)
Current Consumption:	**Sleep:** 30 μA (max.), 20μA (typ.) **Plucking:** 50 mA peak **PLL locked:** 30 mA (max.), 22 mA (typ.) 50 mA (max) with 4-20mA Iout
PLL Capture Range:	1200 – 4000 Hz
PLL Lock Range:	1150 – 4500 Hz
Internally Generated Fsweep:	**Frequency (start):** 400 Hz **Frequency (end):** 4500 Hz **Sweep Duration:** 750 mSec **Sweep Shape:** Linear
Frequency Outputs:	**FOUT_ATT:** 200mVpp 1kΩ AC coupled **FOUT:** 5Vpp 50Ω AC coupled
Control Inputs:	**CR10EN:** 5V CMOS **CR10CLK:** 5V CMOS **EX:** 5V CMOS: VW excitation
ENVIRONMENTAL	
Temperature range:	0 - 70 °C

Table 2 - Specifications