

Using the SDM-A04/CV04 Continuous Analog Output Modules

MultiLogger Application Note #12

Overview

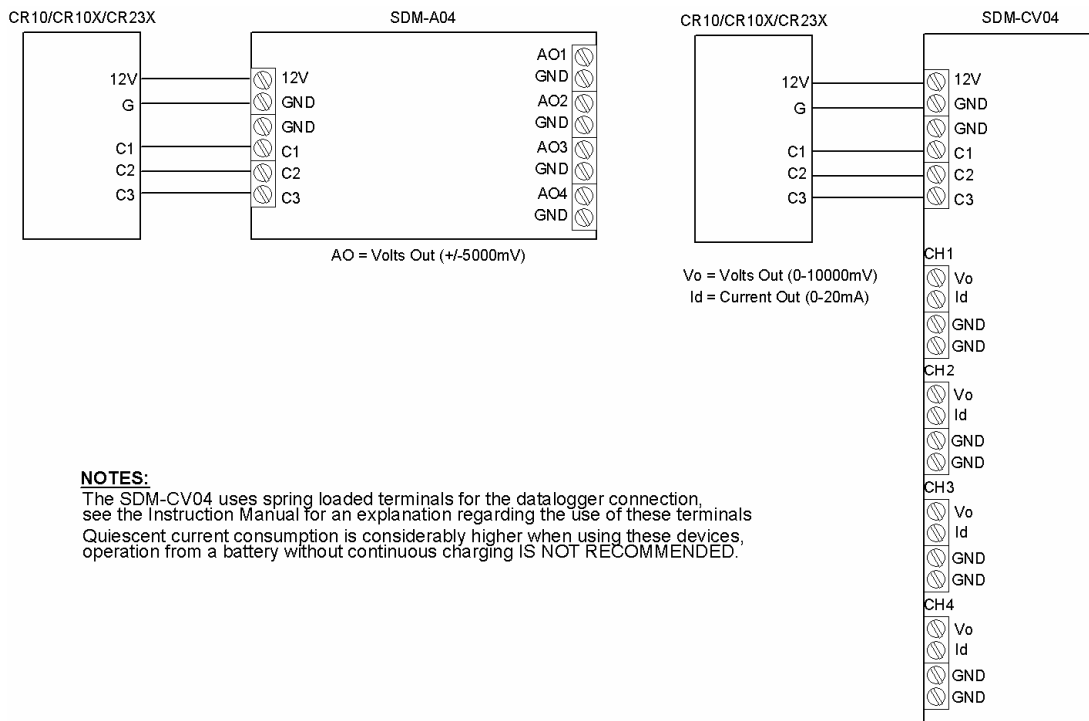
This MultiLogger Application Note will provide information on using the continuous analog output modules manufactured by Campbell Scientific, the SDM-A04 and SDM-CV04. These synchronous peripherals are very similar, both offer 4 channels of analog output capability, scaled accordingly to input storage values of the control module, however the CV04 offers 0-20mA output current capability, via an internal jumper, as well as the voltage output. Also, the voltage output capabilities of the two devices are implemented slightly differently, the A04 outputs +/-5000mV (in 2.5mV increments) for an input storage value of +/-5000, the CV04 will output 0-10000mV (in 2.5mV increments) for the same input storage value range.

Please see the SDM-A04 or SDM-CV04 Instruction Manuals for more information on these devices.

Note: Some of the functionality described in this Application Note was added to MultiLogger beginning with v2.1.4, please contact Canary Systems or your software vendor to obtain the updated software via the Internet, without charge to registered users.

Wiring

The SDM-A04 and SDM-CV04 are synchronously addressed datalogger peripherals which means they are controlled by connecting them to the first 3 control ports of the CR10/CR10X/CR23X. They are addressable, up to 16 devices may be connected to the 3 control ports by configuring a unique address for each unit. This Application Note will assume the use of a single device, with it's address set to 0. If your application requires more than a single device then contact Canary Systems or your hardware vendor for more information. Typical wiring is shown below.



NOTES:

The SDM-CV04 uses spring loaded terminals for the datalogger connection, see the Instruction Manual for an explanation regarding the use of these terminals. Quiescent current consumption is considerably higher when using these devices, operation from a battery without continuous charging IS NOT RECOMMENDED.

Software Configuration

There are essentially 3 steps for configuring MultiLogger to use the these SDM devices.

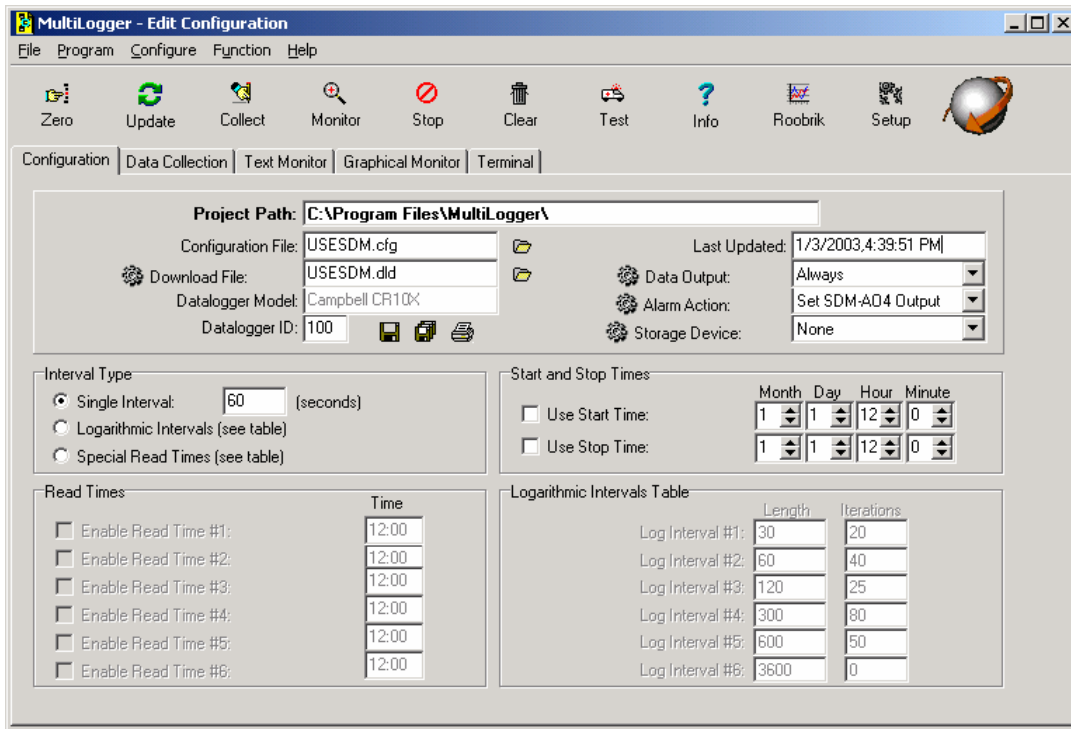
1. The channels to be used for controlling the continuous output must be configured. Direct Connect or Multiplexers may be used, however the first 4 Direct Connect channels, or the first 4 channels of the multiplexer (does not matter which multiplexer) **MUST BE USED**, the readings from these 4 instruments will be used to set the 4 continuous outputs of the SDM devices, respectively. If you are not using all 4 channels it doesn't matter, the corresponding SDM outputs will be activated but since they won't be connected to any devices this will be of no consequence. Configuring the channels requires selection of an appropriate **Type | Make | Model** and then entering scaling factors to convert to the engineering units that will be used to set the continuous output.
2. The second step is to configure the **Check Alarms** for each of the 4 channels to be used to activate the respective output of the SDM-A04 or the SDM-CV04. Select the option **SDM-A04/CV04 Output** as the **Type** for each of the 4 channels. You will also need to enter an appropriate scaling factor and offset to convert the instrument output to the range of values required by the SDM device, these are entered in the **Low Limit** and **High Limit** fields below the Alarm Type selection. To illustrate, you are measuring water level measurements in a well and wish to convert this water level for continuous output by the SDM device, to be used for process control or to pass the water level information to another system. Assuming use of the SDM-CV04 the full-scale output of the device is 10000mV, or 10 volts, the full-scale output of the instrument, after considering an appropriate **Zero Reading**, **Gage Factor** and **Units Conversion** is 100' of water, so 100 must be converted to 10000, so a scaling factor of 100 would be entered as the Low Limit. However, the SDM-CV04 requires the value to be in the range of -5000 to +5000, so an offset must be entered, in this case -5000, as shown below.

The screenshot shows the 'Channel Configuration Multiplexer #1' dialog box. Channel 1 is selected. The configuration includes:
- Label: WELL_1A
- Description: Near a pumping well
- Gage Type: Vibrating Wire
- Make: Generic
- Model: High Freq-12V
- Units Conversion: Pressure, Input Units: psi, Output Units: feet H2O
- Conversion Method: Linear
- Linear Coefficients: Zero Reading: 9867, Gage Factor: 0.01234, Offset: 0.0
- Polynomial Coefficients: Coefficient A: 0.00000, Coefficient B: 1.00000, Coefficient C: 0.00000
- Upper Channel (16CH Mode Only): Label: WELL_1ATEMP, Device: Thermistor-°C, Apply Temperature Correction: unchecked, Initial Temp: 0.00, Temp Factor: 0.000
- Check Alarms: Type: SDM-A04/CV04 Outp, Low Limit: 100, High Limit: -5000
Buttons: Print, Help, Accept, Cancel

The instrument output of 0 to 100' of water will now be converted to -5000 to +5000 for configuring the respective SDM channel output to a voltage range of 0 to 10VDC.

See the comments following for configuring when using the current output of the SDM-CV04.

- The last step is to activate the outputs of the SDM device, this is done by selecting the Set SDM-A04 Output option for the **Alarm Action** on the Configuration tab, as shown below:



Current Output Configuration Details

If the SDM-CV04 is being used in 0-20mA current mode, and the output actually must be 4-20mA, corresponding to the range of the instrument readings, then follow these instructions to scale the output accordingly.

- The scaling factor and offset, as entered in the Low Limit and High Limit fields, must be modified because the working range is reduced, in other words the numerical range must be converted to -3000 to +5000 to correspond to a the full-scale range of the instrument output. Using our previous example of a water level measurement of 0-100', which must correspond to 4-20mA, you would enter 80 as the scaling factor (since 4-20 is 80% of the range available) in the Low Limit edit and -3000 as the offset, entered in the High Limit edit.
- It is advisable to check for the minimum low level value and force an adjustment if necessary, this will prevent output of a current of less than 4mA should the sensor go below 0. With the proper **Alarm Type** selected, click on the gear button located to the left, this will load the instruction file into an editor, the listing is shown on the following page. Note the instructions near the bottom, particularly the value of -5000 shown in two places, in the instruction P89 and P30. You will need to edit these values, both must be changed to -3000, this represents the minimum value sent to the SDM-CV04 which corresponds to 4mA. When editing is completed Save the file using the button on the toolbar at the top, close the editor and finish your configuration. This step only needs to be done a single time, i.e. not for every channel.

SDM-A04/CV04 Instruction File Listing

;Enter Scaling Factor

P37 Z=X*F ;

1:[MuxReadingLoc++] X Loc ;

2:[mlLowLimit] F ;

3:[SDM1Loc++] Z Loc ;

;Enter Offset

P34 Z=X+F ;

1:[SDM1Loc++] X Loc ;

2:[mlHighLimit] F ;

3:[SDM1Loc++] Z Loc ;

;Check for minimum

P89 If (X<=>F) ;

1:[SDM1Loc++] X Loc ;

2:[4] Comparison Code Option (<) ;

3:[-5000] F ;

4:[30] Command Code Option (Then Do) ;

P30 Z=F ;

1:[-5000] F ;

2:[0] Exponent of 10 ;

3:[SDM1Loc++] Z Loc ;

P95 End ;