

## Using the CSI AM416 or AM16/32 Multiplexer with EC-5, -10, and -20 Soil Moisture Sensors

Colin S. Campbell, Ph.D

Multiplexers are a popular solution for measuring a large number of sensors with a single datalogger. Although conceptually straightforward, care must be taken in wiring the multiplexer to ensure that all sensors are properly grounded or measurements may be susceptible to considerable electronic interference.

We recommend that you use the SCWin (Short Cut Program Builder for Windows) solution to program and wire your multiplexer. If you are careful to follow the wiring directions, using the Short Cut program builder is very simple and straightforward. Information on how to download and add in the ECH<sub>2</sub>O Shortcut files is available on our website (<http://www.decagon.com/appnotes/EchoCSlappnote.pdf>).

In some cases, more complicated programs are required that allow for other sensors to be connected to the multiplexer. In this case, care must be taken to wire and program your system correctly. It is important to remember that a multiplexer is simply a switching mechanism. In the 4 x 16 mode, it connects four static terminals on your datalogger to 16 individual sets of four terminals on your multiplexer (switching sequentially from the first to the last). Thus, if you have an excitation terminal (i.e. Ex1) wired to your Odd H terminal on your multiplexer, everything plugged into odd numbered high terminals on the multiplexer (1H,

3H, 5H...nH) must be a wire going to a sensor excitation. Similarly, if Odd L is wired to a single ended measurement terminal on your datalogger, everything plugged into odd numbered low terminals will need to have the output of a sensor that can be read using a single-ended voltage measurement.

For example, if you wanted to read 16 EC-5 sensors and 16 thermocouples on an AM16/32, you would have to connect your Odd H to Ex1, Odd L to SE1, Even H to DiffChan 2H and Even L to DiffChan 2L. On the multiplexer, you would connect the EC-5 to 1 H (white wire), 1L (red wire), and Gnd (bare wire), and repeat for each odd channel. Similarly, you would connect the 2H to the positive side of the thermocouple and 2L to the negative side and repeat for each even channel. In your program, each time you pulse the "CLK" port, you will read one single ended voltage (EC-5) and one differential voltage (thermocouple). For more information, please refer to your AM16/32 Owner's Manual ("AM16/32 Relay Multiplexer")

We have included an example program and wiring diagram for a CR1000 and multiplexer wired with 48 EC-5 sensors. Although most applications will differ from this one, use the program as a template to help you create a program for your specific needs. Programs can be created for other datalogger using the SCWin program.

' Example of CR1000 Multiplexer Program created by Short Cut (2.5)

'See wiring diagram below

'Declare Variables and Units

```
Dim LCount_3
Public Batt_Volt
Public VW(48)
```

Units Batt\_Volt=Volts

'Define Data Tables

```
DataTable(Table2,True,-1)
    DataInterval(0,1440,Min,10)
    Minimum(1,Batt_Volt,FP2,False,False)
EndTable
```

'Main Program

```
BeginProg
    Scan(30,Sec,1,0)
        'Default Datalogger Battery Voltage measurement Batt_Volt:
        Battery(Batt_Volt)
        'Turn AM16/32 Multiplexer On
        PortSet(1,1)
        LCount_3=1
        SubScan(0,uSec,16)
            'Switch to next AM16/32 Multiplexer channel
            PulsePort(2,10000)
            'ECHO Probe EC-5 measurement VW on the AM16/32 Multiplexer:
            BrHalf(VW(LCount_3),3,mV2500,1,1,3,2500,False,10000,_60Hz,2.975,-0.4)
            LCount_3=LCount_3+3
        NextSubScan
        'Turn AM16/32 Multiplexer Off
        PortSet(1,0)
        'Call Data Tables and Store Data
        CallTable(Table2)
    NextScan
EndProg
```

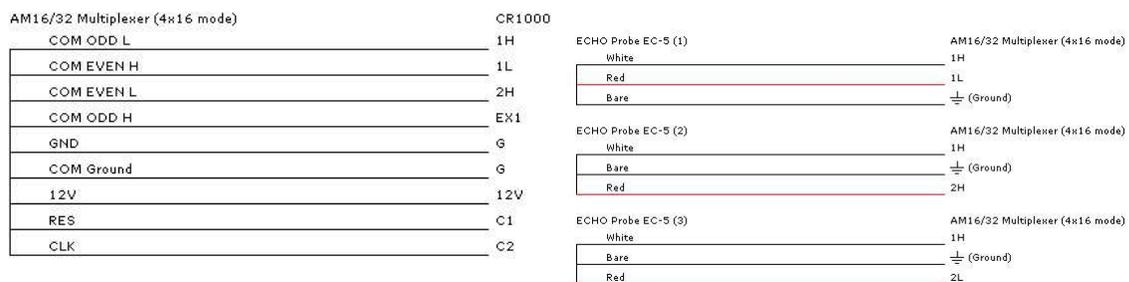


Figure 1. Wiring diagram for CR1000 and AM16/32 mutiplexer. Note that only the first three EC-5 sensors are show but wiring will be similar for each set of four terminals.