



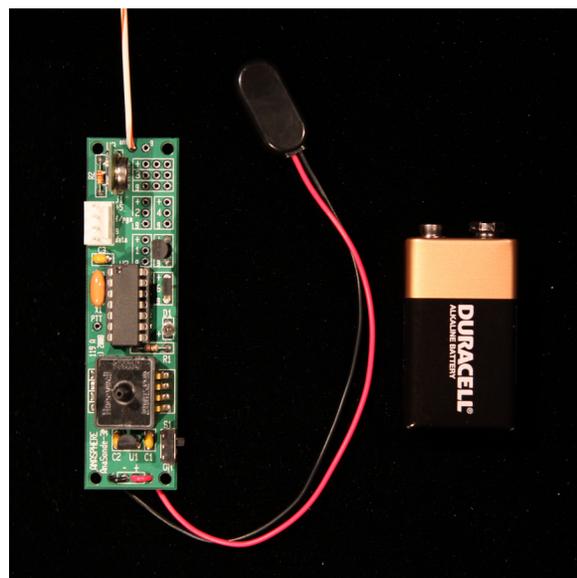
*Analytical and Atmospheric Instrumentation*

# AnaSonde-3M Configuration Procedures

The AnaSonde-3M will generally be configured using the associated SondeWorks-3M software. However, if a user wishes to manually configure a sonde using HyperTerminal or another terminal program, it is possible to do so using the following instructions. **This procedure is not recommended for inexperienced users.** If an error is made, it will not result in any irreversible damage to the AnaSonde; the AnaSonde may then be reprogrammed with a correct configuration. Input of an improper configuration string will result in errors in sonde behavior.

The standard AnaSonde-3M configuration procedure is carried out through its serial port. When the AnaSonde is first turned on, it looks for activity (i.e., any logic highs) on its frequency and programming pin. The LED is on during this time. If there is any activity, the AnaSonde will immediately start running. If there is no activity, or the line is being held low by the serial connection, the AnaSonde will turn off the LED and then monitor the frequency/programming line for 10 seconds. So, right after the LED turns off, you should initiate the configuration sequence.

Before turning the AnaSonde on, be sure it is connected to the serial port if you want to program it. Turn the AnaSonde on, wait for the light to go out, and then within ten seconds send the / character to the AnaSonde. Serial port settings are 1200 baud, 8 data bits, no parity, 1 stop bit (8N1). It is recommended that you set your terminal program to echo the characters you type locally, and be certain that your caps lock key is pressed. The AnaSonde expects the numbers 0-9 and the letters A-F (sending little a-f characters will cause problems). Also, the AnaSonde is set for direct connection to a serial port on your computer; do not put a level converter or inverter between the AnaSonde and your computer.



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The AnaSonde-3M configuration string consists of 88 bytes which are entered as nibbles (i.e., 4 bits at a time) – so that is 2 x 88 or 176 characters that are entered into the AnaSonde-3M. All characters must be entered each time the AnaSonde is reprogrammed.

The following characters must be sent in their entirety; sending an insufficient number of characters will cause errors. Aside from the first character, all characters are hexadecimal numbers ranging from \$00 to \$FF. As an example, if you are to enter \$A7, what this means is that you are entering a hexadecimal (indicated by \$) number as a byte (8 bits) consisting of the two nibbles A and 7. So, to enter \$A7, you would type A followed by 7.

### AnaSonde-3M Memory Configuration

The following table describes the location of variables in the AnaSonde-3M nonvolatile memory. This is not critical to understand to program the AnaSonde, but may be a useful reference. Each memory location holds one byte of information.

Memory Location	Notes
1	ASCII baud rate and inversion control this does not affect the configuration baud rates, only data output rates \$05: 1200 baud 8N1, direct connection to computer \$06: 9600 baud 8N1, direct connection to computer \$07: 300 baud 8N1, direct connection to computer \$01: 1200 baud 8N1, inverted for use with drivers \$02: 9600 baud 8N1, inverted for use with drivers \$03: 300 baud 8N1, inverted for use with drivers
2	Morse speed – dot length in milliseconds Default is 100 milliseconds Default value to enter is \$64
3	Upper byte of delay time between transmissions Default delay is 15000 milliseconds Default value to enter is \$3A
4	Lower byte of delay time between transmissions Default value to enter is \$98
5	Pointer to location where channel definitions start Always set to decimal 25 Default value to enter is \$19
6-24	Morse code identifier See notes below for how to encode the callsign
25+	Channel configurations Eight characters (16 nibbles) are entered per channel: these must be entered for every channel available, whether used or not, plus the frequency channel See the following notes for how to encode channel configurations

There is no end character; upon receiving an adequate number of configuration characters the sonde reads back its configuration and automatically starts running.



## Channel Configurations

The AnaSonde is capable of completing simple integer math equations to allow output values to be scaled according to equations of the following form:

$$y = (\pm ax \pm b) / c$$

To use these equations, the user enters values for the coefficients a, b, and c (each is a 16-bit word), plus an indication of whether the sign is + or -. The variable x is the output from the on-board 10-bit analog-to-digital converter (so the range of x is 0-1023). Negative outputs are not supported. Outputs (y) are integer values in the range 0-65,535. Users should go through their equation to ensure that intermediate values (namely a\*x, and a\*x + b) do not exceed 65535. For example, the maximum recommended value for a would be 64, because 64\*1023 < 65535. However, if b were 5000, the maximum recommended value for a would be 59, because 59\*1023 + 5000 < 65535.

If users wish to output raw decimal data – that is, the raw value from the analog-to-digital converter, a is set to 1, b is set to 0, and c is set to 1. This is handy to output first, so that calibration equations can be developed. This configuration, as well as stock configurations for temperature, pressure, and humidity sensors, is given on the following page.

Here is the baseline configuration for each channel. The sonde expects 8 hexadecimal characters to be entered per channel.

Byte Number	Notes
1	To enter: \$00 = channel unused \$01 = channel used (Morse) \$02 = channel used (ASCII), comma delimit (-3M only) \$03 = channel used (ASCII), tab delimit (-3M only) \$0B = channel used (Morse), last channel used \$0C = channel used (ASCII), comma delimit, last channel used \$0D = channel used (ASCII), tab delimit, last channel used
2	Indicates the signs of coefficients a and b: \$00 = +a, +b \$01 = +a, -b \$02 = -a, +b \$03 = -a, -b (technically disallowed and not supported)
3	High byte of coefficient a
4	Low byte of coefficient a
5	High byte of coefficient b
6	Low byte of coefficient b
7	High byte of coefficient c
8	Low byte of coefficient c

## Representative equations and configurations:

### 1. Unused channel

enter: \$00 \$00 \$00 \$01 \$00 \$00 \$00 \$01

(the 01 values are just protective 1's for multiplication and division, to avoid dividing by 0)

### 2. Output raw data

equation:  $y = (1 * a + 0) / 1$

enter (in this example, it is ASCII format, tab delimited, not the last character)

\$03 \$00 \$00 \$01 \$00 \$00 \$00 \$01

### 3. Temperature sensor, Kelvin output:

equation:  $y = [(-50 * x) + 50971] / 117$

enter (in this example, it is Morse format, not the last character):

\$01 \$02 \$00 \$32 \$C7 \$1B \$00 \$75

### 4. Pressure sensor, millibar output:

equation:  $y = [(67 * x) - 6839] / 54$

enter (in this example, it is Morse format, last character):

\$0B \$01 \$00 \$43 \$1A \$B7 \$00 \$36

### 5. Humidity sensor, percent RH output:

equation:  $y = [(60 * x) - 9768] / 359$

enter (in this example, it is ASCII format, comma delimited, last character):

\$0C \$01 \$00 \$3C \$26 \$28 \$01 \$67

## Examples

Example 1: The default AnaSonde-3M configuration as shipped includes transmission of the raw values of all 8 channels (7 analog voltage, 1 frequency), plus the transmission of "NOTVALID" as the callsign. To input this configuration from scratch, you would type in (omit the spaces):

```
05 64 3A 98 19 49 59 80 61 84 20 90 F0 00 00 00 00 00 00 00 00
00 00 00 01 00 00 01 00 00 00 01 01 00 00 01 00 00 00 01 01 00
00 01 00 00 00 01 01 00 00 01 00 00 00 01 01 00 00 01 00 00 00
01 01 00 00 01 00 00 00 01 01 00 00 01 00 00 00 01 0B 00 00 01
00 00 00 01
```

The sonde would immediately echo this back as:

```
$05 $64 $3A $98 $19 $49 $59 $80 $61 $84 $20 $90 $F0 $00 $00 $00
$00 $00 $00 $00 $00 $00 $00 $00 $01 $00 $00 $01 $00 $00 $00 $01
$01 $00 $00 $01 $00 $00 $00 $01 $01 $00 $00 $01 $00 $00 $00 $01
$01 $00 $00 $01 $00 $00 $00 $01 $01 $00 $00 $01 $00 $00 $00 $01
$01 $00 $00 $01 $00 $00 $00 $01 $01 $00 $00 $01 $00 $00 $00 $01
$0B $00 $00 $01 $00 $00 $00 $01
```

Example 2: If you had a temperature sensor in channel 5, a humidity sensor in channel 6, and a pressure sensor in channel 7, and wanted to output the identifier ANASONDE (with carriage return and line feed) followed by the temperature, humidity, and pressure data through the serial port at 9600 baud, 8N1, with a direct connection to your computer, you would type in (again omit the spaces):

```
06 64 3A 98 19 41 4E 41 53 4F 4E 44 45 0D 0A 00 00 00 00 00 00  
00 00 00 00 00 00 01 00 00 00 01 00 00 00 01 00 00 00 01 00 00  
00 01 00 00 00 01 00 00 00 01 00 00 00 01 02 02 00 32 C7 1B 00  
75 02 01 00 3C 26 28 01 67 0C 01 00 43 1A B7 00 36 00 00 00 01  
00 00 00 01
```

Again, this would be echoed back by the sonde.