

M-LOG

USER GUIDE

For use with the following sensors:-

**ECHO 20
ECHO 10
ECHO 5**

And, optionally, with the ASL temperature sensor

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Section 1. Overview

The function of the M-LOG is to measure the volumetric moisture percentage in soil and other media. By adding an optional temperature sensor, it will also measure the soil/media temperature.

Although it is possible to use the M-LOG as a stand-alone moisture/temperature monitor, its full capability is only realized when used as an “on-line” data logging system by cabling it to a PC running Compugrow Software. This allows reading to be transferred to the PC where they are displayed and also saved on disk so that they may be reviewed graphically. It also allows alarms to be set so that if moisture or temperature levels stray outside user set limits the PC will sound an alarm and can even be set to phone or text a warning to a mobile phone.

The M-Log can be used with a range of sensors of different lengths from the 5cm long ECHO 5 to the 20cm long ECHO 20.

For each of the available sensors, the M-LOG can be loaded with factory recommended calibration constants for soil or potting mix. Alternatively, it can be calibrated for hydroponic media by drying the probe (to calibrate 0%) and then immersing it in water (to calibrate 100%).

Strictly speaking, every soil type requires different calibration and so the factory specified constants will not be completely accurate for all soils. If a higher degree of accuracy is required then instructions for specific soil calibrations may be obtained from the Decagon web site.

In all cases the read out is presented as a percentage from 0% to 100% volumetric moisture content.

Section 2. Installation

This section assumes that the M-LOG is connected to a PC and so, where possible the settings will be changed at the PC rather than from the key-pad and LCD interface on the controller. Following this section, there is a brief description of the key-pad interface.

Step 1 Connect the moisture sensor to the M-LOG (and the temperature sensor if available). See diagram below.

Step 2.

Next connect the M-LOG to the PC interface (or to the previous M-LOG or other Autogrow controller). Also, connect a power adapter to provide low voltage power to the M-LOG(s). M-LOGs will operate at any voltage between 10V and 24V AC or DC. Normally 24V is provided so that volt drops in long cables will not cause a problem

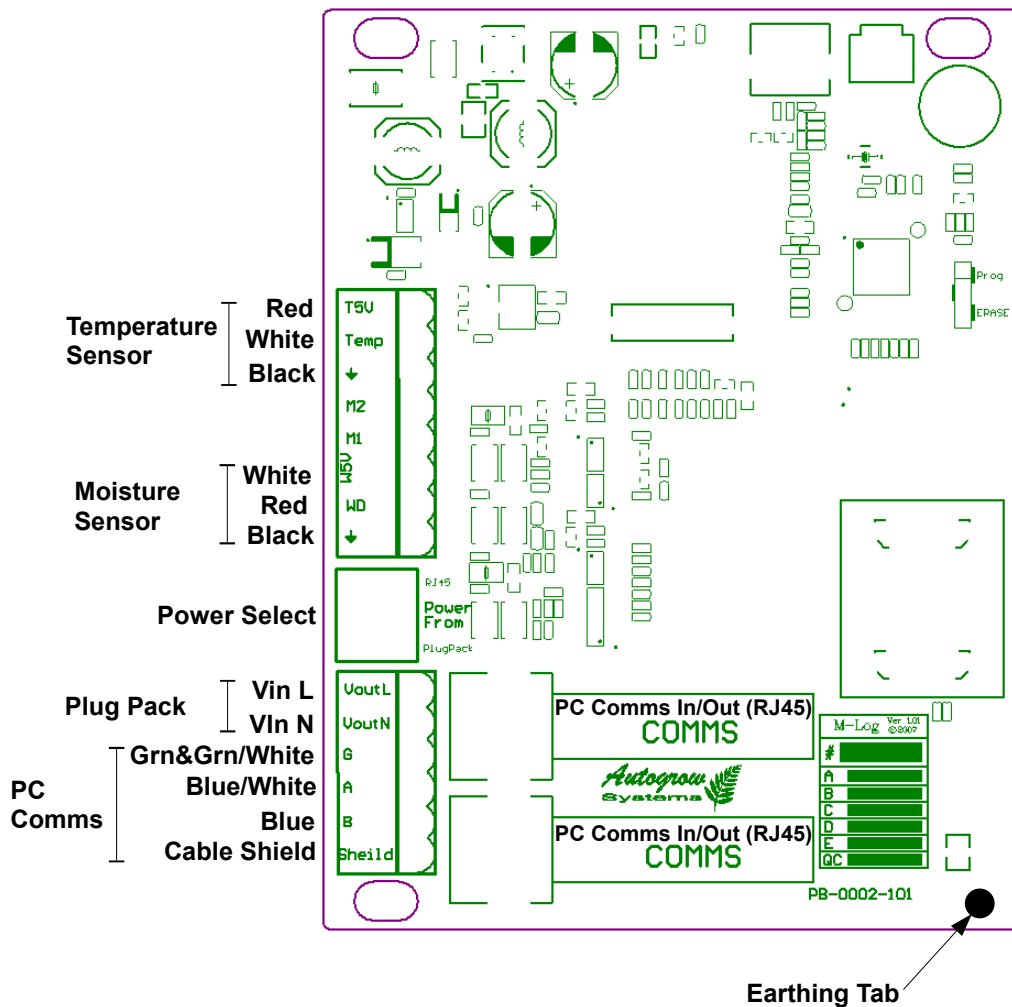
There are various ways of making these connections. The most convenient way is to use an Autogrow breakout box as means for introducing the power supply (24V DC or AC) into the CAT5 PC bus cable. If a break out box used then it is possible to use plug-in CAT5 patch cables to easily link to the first M-LOG and then on to additional unit(s). These patch cables will then carry both the data signal back to the PC as well as the power supply to all units in the chain. NOTE that when doing this each M-LOG will draw a current of about 100mA (0.1A) each. It is important that the total load imposed on the power supply adapter does not exceed its capability. For example, if the power adapter has a current rating of 24V and 0.5Amps (12VA or 12W) then the maximum number of M-LOGs that can be powered would be $500\text{mA} / 100\text{mA} = 5$ M-LOGs. If it is required to connect to more than 5 M-LOGs then a second “break out” box would be required. Between the

first string of 5 M-LOGs and the next.

Note that the use of multiple “Break out” boxes is advisable anyway as each breakout box also provides substantial lightning suppression to help stop an indirect lightning surge from propagating along the bus.

Where a break out box is not used, each M-LOG must be powered separately by connecting the powers supply and the PC comms bus to the green/terminal plug at the bottom left. Note that it is still possible to power subsequent M-LOGs by using spare wires in the CAT5 cable (doubled up) to connect between the power supply of the first M-LOG to the power terminals of the next and subsequent M-LOGs.

Note that if power is supplied via the plug in cables the power selector switch must be moved to the RJ45 position but if directly connected to the lower left terminal block then it should be moved to the “plug pack” position.



Connections to the M-LOG

Step 3. Set the sensor type

Press “menu” and then the down arrow to get to the “Configure” screen. Now press “enter” to go into the configure sub-menu and then press “down arrow” to get to “moisture sensor type”. Press “edit” and then use the up/down keys to select the sensor to be used. Press “save” to save your selection in permanent memory and exit from the edit screen.

Step 4. Set the PC comms “address” also in the “configure” sub-menu.

Every M-LOG or other controller connected on the PC bus must have a unique address. Normally we start at address 34 and work up from there. So the first device will have an address of 34 the next 35 and so on. Later you will set these same addresses on the PC so make a note of them as you go.

IMPORTANT

Step 5. Choose the calibration method.

Navigate to the “Calibration” menu, then move to select “Calibrate to presets”. In this screen select from Default wet/dry; Default soil, Default potting mix. Note that after selecting the sensor type that you are using it is important to use this screen to load the default calibration parameters even if you are intending to use the dry/wet method for calibrating. By loading the defaults it will get you in the vicinity of an accurate calibration and save a lot of time.

Note on the calibration methods:-

- 1) Wet/dry method. This method is suitable for most open hydroponic media in which the effect of the dry media is virtually zero. ie if you dried out the media thoroughly, the instrument would read close to zero. This method may be used for coir, rock wool etc and gives a reasonable comparative reading. Once the wet/dry defaults have been loaded, proceed to the “Calibrate % wet” sub-menu and then start by editing 0% wet. This is done by holding the perfectly dry sensor in air and using the arrow keys to adjust the display to 0%. Save this and then move to the 100% wet edit screen. Place the sensor in a bucket of water and adjust to read 100%. Save this and the calibration is complete.
- 2) Soil or potting mix method. If using soil or potting mix navigate to either the soil or pot mix edit screens. Press “set” and the Decagon factory suggested constants will be loaded and saved. Note that all soils and potting mixes are different and so this calibration will only be approximate. If you want to achieve absolute accuracy when using soil or potting mix then you will need to go through the procedure recommended by Decagon on their web site www.decagon.com in the application notes section. For specific calibrations the calibration parameters may be entered directly by navigating to Calibration/Direct calibration where you can set the “offset” and then the “slope” parameters. These are the numbers from the Decagon equations which are in the form $\Theta = A \times mV + B$ where B is the offset and A is the slope

Step 6. Enable temperature sensor (only if fitted)

If you have a temperature sensor then in “Configure” go to Temperature sensor and enable it.

Step 7. Also in “Configure” enable the buzzer if you wish to use alarms and have the monitor beep whenever readings go outside a range.

Step 8. Set the alarms (if desired). These are more easily set from the PC but may also be set from the keypad. The only setting here that needs some explanation is the “Hold off time” This allows you to set a delay period before the alarm sounds. For example, when an irrigation occurs, the moisture level may go to a very high saturation value for perhaps 5 minutes. If you want to avoid this from triggering an alarm then set the hold off time to say 10 minutes.

Step 9. Insert the moisture sensor in the media

In soil, particularly, but even in softer media a metal implement should be used to make a slot into which the sensor can be inserted. It is important not to exert excessive strain on the sensor. Once inserted the media should be packed in gently to make good contact with the sensor. Check the reading looks reasonable.

Step 10. At the PC, select “setup” and “system setup” then select “new” if it is a new system otherwise select “configure”. If a new system then give the system a name and check “monitors”. This will open a dialogue box into which you can give each M-LOG a short name eg mlog1, mlog2 etc or even gerbera, toms, lettuce, house1, shade, eastwing etc avoid spaces and strange characters. Next to each name insert the address as loaded into each of the M-LOGs and choose the type using the drop-down menu. Finally, check the enable box for all installed M-LOGs

Section 2. Menu System

Virtually, all settings available at the PC are also available from the keypad. Exceptions are the calibrations which are only available at the controller and not at the PC.

Operation of the keypad is similar to a cell phone. The two keys at the bottom of the display are “soft keys”. This means that their function at any particular time is shown on the screen above them. After switching on you will find that the right hand key has the label “menu” on the lcd above it and the left hand key is unused at this point. Below these soft keys are two arrow keys. These are for moving down or back up, through the menus and, when you are in a screen which allows you to edit a numeric value, they are used for increasing or decreasing the displayed values. They are also used to select between different options – eg to select from the possible alternative sensors that can be connected.

On first pressing the “menu” button, you will find yourself in the **main** menu. Use the down arrow to move down through this and you will find the following items

MENU

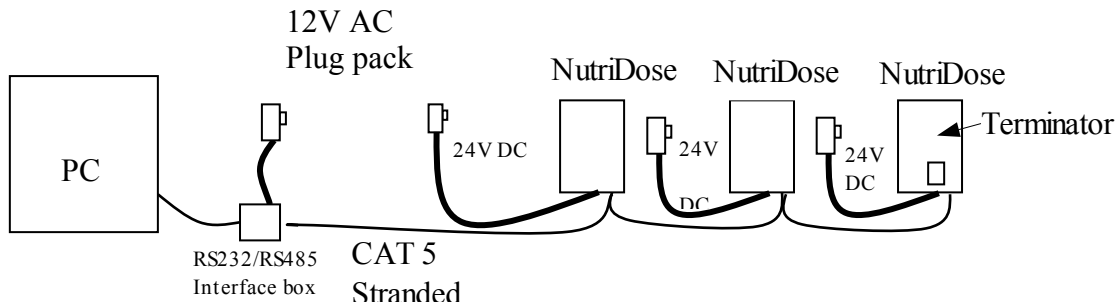
Readings	Calibration	Calibrate % Wet	0% Wet 100% Wet
		Calibrate to Presets	Default Wet/Dry Default soil Default Pot Mix
		Direct Calibration	OffSet Slope
	Alarms - Alarm Settings	Alarms Enable/Disable Hold off Time - Delay before activating Alarm (x Minutes) Moist Temp - Alarm when Moist under (xx.x) Moist Temp - Alarm When Moist over (xx.x) Min Temp - Alarm when Temp under (xx.x) Max Temp - Alarm When Temp over (xx.x)	
	Configure - Units &System Config	Temperature Unit (C,/F) Moisture Sensor type Temperature Sensor Enable/Disable Buzzer Allowed (Allowed/Muted) Address Screen Contrast (xx) Technician Report - Numerically Encoded	

If you wish to make a change to, say, calibration parameters, you would move down to Calibration and then press the “enter” soft key in order to enter the Calibration sub-menu. Now, by pressing the down and/or up arrows move through this sub-menu to find the item that you wish to change and then press enter to access this item. After making any changes the soft keys will allow you to either save the new setting or to cancel and exit out of that screen.

The setting order is the same as when using the PC and the settings that you will access are also the same and so we suggest that you use the previous pages on PC settings to guide you through the setting procedure.

Section 3. PC interface

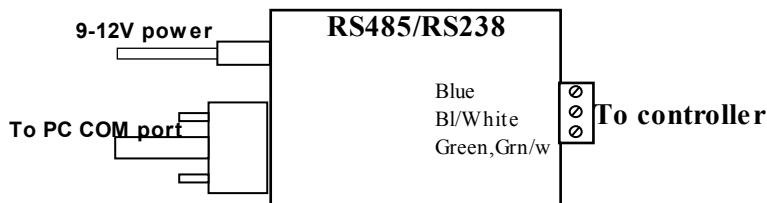
Use light coloured (so as not to attract heat) CAT5 stranded computer network cable between the PC interface and the AutoVent and/or monitors. This cable is “looped in” to each controller/monitor in a “daisy chain” fashion. The last monitor (and only the last monitor) in the chain must have a “terminator” fitted. Remember, when adding a further controller/monitor to remove the terminators from any monitor or controller between the PC interface and the last monitor in the chain. See connection diagram below.



PC connection showing a single terminator at the end of the cable

Installing the PC interface

The PC interface box must be positioned close to the PC and is connected to the PC by means of a short standard serial cable. The PC interface box is powered from a small plug pack that supplies it with 9V-12V AC or DC power. The connection between the PC interface box and the first controller must be by means of a stranded CAT5 cable. See the wiring diagram in section 5.



PC interface connections

Section 4. Installation of Compugrow Software on the PC

The CompuGrow software is suitable for PC compatible computer running Windows 2000, XP or VISTA. It may also run on Windows 98 SE but the resources under W98 are limited and operation is not so reliable as with 2000 or later. The computer must have a free serial COM port and should be a Pentium or better. If the PC has no serial COM ports but has USB instead then a proprietary USB to Serial converter may be used – normally we supply the BAFO brand converter.

To install the software on your PC, insert the disk in drive A and execute the CompuGrow install programme. This will self-install the software onto your hard drive. You will be prompted during installation to select a folder. The default folder is C:\Program Files\Compugrow\ . When the program is executed it will create some sub-folders under the main folder. Each system (greenhouse group) installed will have its own sub-folder where the files for each of its monitors is stored. Each file will save the data for the whole current month.

Communication addresses. When the PC requests data from a controller or monitor it first sends the address for that unit. All units connected to the PC must have a different address and moving to SYSTEM/address sets this. The base address for these controllers is 34. Press the up or down arrows to change the address and when the required address is displayed, press save to store it in permanent memory. Set up the monitors in sequence starting with the first one at 34 and working upward from there. ie set the first monitor to 34 the second to 35 the third to 36 etc. Make a note of the address of each controller/monitor and its type as you will need to enter this information on the PC.

Terminator. If this is not the furthest controller/monitor from the PC then the terminator must be removed and the Data comms cable will be connected as shown and will then loop back out of the box and on to the next controller/monitor. Only the furthest unit should have a terminator connected. See connection diagrams above.

Configuring the PC software.

Before running the software it is best to install all the controllers and monitors. They should all have their address set to a unique number. Remember to save the addresses after making any changes and to note these down as you will need them when installing the PC software.

Setting the comms addresses

At the controller, press the Menu button and then press the down arrow until you reach the “Configure” menu item. Then press “enter” to enter this sub menu. Continue pressing the down arrow until you reach “address”. This is the communications address which is normally set by the factory to 34. If you have more than one controller or monitor in your system then they must all have different addresses. Just press the edit key and then up and down arrows to get the addresses to be different. Although it doesn’t matter what they are it makes sense to work logically with the first one set to 34 the second to 35 etc. Make a note of the addresses associated with each monitor. Now, at the PC, run the compugrow application and then set up as follows.

When the Compugrow software is first executed the immediate task is to select the required access level. In order to set the system up, security must either be “disabled” or else you must select ‘advanced’ and enter the advanced password which is ‘consult’. The basic level password is ‘grower’. When in advanced mode you can disable security by selecting setup/security/disable. Next, select the serial COM port that the RS232/RS485 adaptor is connected to. (Note that the

adaptor must be one supplied by Autogrow as it performs some special functions as well as converting the signal levels.)

Under “setup” select “add” to add a new system then give the system a name (usually the name of the greenhouse eg lettuce 1) also check the controller box and monitor box if you also have any monitors in the system.

The idea of having different “systems” is that in a large installation where you might have a number of controllers and/or monitors in each greenhouse, it allows you to collect together all of the devices from the one greenhouse as one system so that when you view them they are not muddled in with devices from the other houses. However, if you are only intending say one or two controllers per greenhouse then it is probably more convenient to put all devices into one system.

Once a system has been added, select setup/system setup/configure/<system name>

And for each controller and monitor, add the address (as set at the actual controller), select the type of controller, enable it and finally click on “save”.

The PC will now try to communicate with the device and values should appear on the “Readings and Settings” tab. If not, try clicking on “refresh” on the main menu bar and observe the message at the bottom, right of the screen. If this says “offline” then the communication link has failed and you will need to recheck that everything is wired correctly and switched on etc. Also recheck all settings. If still not working refer to the fault finding section.

Section 5 – Maintenance

There is no regular maintenance required other than checking that the readings appear to be normal

Section 6 - Fault finding

- 1) Unit is completely dead – ie no display, no power light and no outputs
Check that the power pack is functioning (by measuring with a voltmeter if possible) and that it is plugged in, switched on and properly connected to the controller.
If power is via a Break Out box then check the fuses. The Break Out box contains two 2Amp glass fuses.
If either fuse is blown, replace with a genuine fuse of the correct size.
The most likely cause of the fuse blowing is that wires connecting to the M-LOGs have touched together and shorted out. To fix this it is important to clear the fault first. Inspect all wiring and ensure that all wires are well insulated right to the point where they enter the connector. Also check the connections at the solenoid valves. Then replace the fuse with a genuine 2A fuse. **DO NOT ATTACH WIRE OR ALUMINIUM FOIL ACROSS IT.**

- 2) Cannot calibrate moisture. Replace the moisture sensor.

Section 7. Warranty

The warranty on the controller, and temperature sensor is limited to 2 years – return to factory. Before returning the unit for service you must call Autogrow Systems Ltd for a return authorization

Moisture sensors carry a 12 month warranty from their respective manufacturer.

This warranty specifically excludes any parts that have been broken or damaged by water, chemical attack or excessive temperature. In particular, the controller and power adapter must be stored and used in a dry, shaded and well ventilated situation. At no time must the case temperature be allowed to exceed 60 deg C (140 deg F).

This warranty expressly excludes liability for consequential damages or for charges for labour or other expense in making repairs or adjustments, or loss of time or inconvenience. Freight to the factory must be prepaid.

Appendix - Break Out box connections

