

Remote Environment Monitor/Data Logger

TRS 2000 Mk3

ENVIRO MINDER

Operator Manual

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1. Overview

The TRS2000 Mk3 remote monitor measures air temperature, relative humidity (RH), solar irradiance(PAR), and optionally CO². The unit also provides a “solar integrator” output which may be used to trigger irrigations from a standard irrigation controller or from a fertigation system. When the unit is set up to provide the irrigation output the solar integrator resets to zero every time it starts an irrigation, when the integration trigger is set to zero the solar integrator resets each midnight. It also has an alarm function and can sound a built in beeper, provide a 24V AC alarm signal and send alarm signals to the connected PC.

It can be connected via a RS485 bus to a remote PC or PLC up to 1.2 km away along with up to 127 similar units.

When **on-line** it can respond as requested to supply data either every minute or every 5 minutes. When off-line (ie disconnected from the PC or the PC switched off) it will log data to its internal memory at 5 minute intervals for up to 10 days. It will up-load the data to the PC as soon as it is reconnected.

The *Compugrow* software from Autogrow makes it easy to collect data and present it in easy to understand graphical form. It also allows monitors (and other Autogrow controllers) to be grouped into logical collections (eg greenhouses) so that similar data is easy to find.

Furthermore, it allows **alarms** to be set so that if values drift too far out, the PC will sound an alarm (provided that it has a sound card and speakers) and will even send alarm signals to pagers, telephones or cell phones via the telephone system.

The monitor is set up by pressing the mode button to get to the required function then pressing the up or down buttons to change that setting and finally pressing the save button to store the changed setting in permanent memory. The modes are as follows:

MODE	FUNCTION
a	Normal display showing temperature, RH and Solar irradiance
b	View solar integrator count (and trigger points if irrigation is enabled)
c	CO ² Reading
1	View (and change) Solar Integrator count
2	Set the solar integrator trigger point (if enabled)
3	Display Date and Time
4	Set Minutes
5	Set Hours
6	Set Days
7	Set Month
8	Set Year
9	Alarm Enable
10	Alarm temperature minimum
11	Alarm temperature maximum
12	Alarm RH minimum
13	Alarm RH maximum
14	Alarm CO2 minimum
15	Alarm CO2 maximum
16	Alarm Solar
17	Alarm Detent (Mins)
18	Address for PC communications

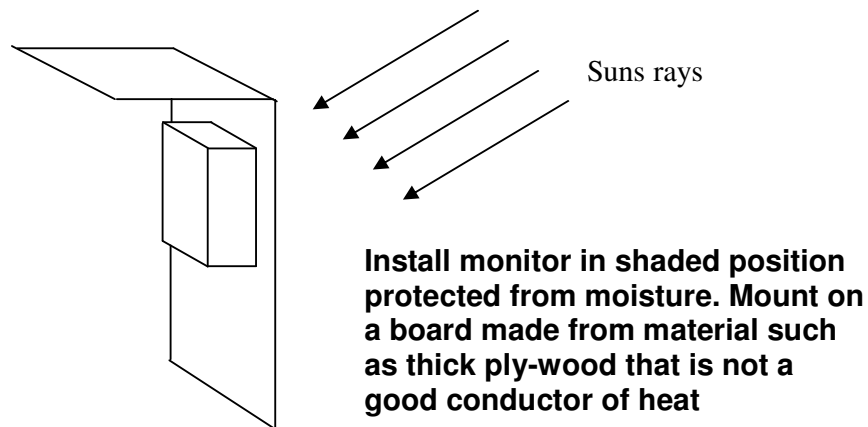
- 19 Calibrate RH
- 20 Calibrate Temperature
- 21 Calibrate Solar (Zero)
- 22 Calibrate Solar (Scale)
- 23 Calibrate CO2
- 24 View readings at factory settings

When calibrating, the display shows the calibrated value (that you can alter) as well as the “raw” value from the sensor. When comparing temperatures and RH it is important that all sensors are adequately shaded from all sources of radiation (sun, reflected sun, heating pipes) and are in free flowing air. To calibrate solar first cover the solar sensor so that it is totally dark and then go to MODE 21. Press the up button until a small reading appears and then press the down button – step-by-step to reduce the reading to zero. To calibrate the scale, Mode 22, an accurate light sensor is required in order to compare against.

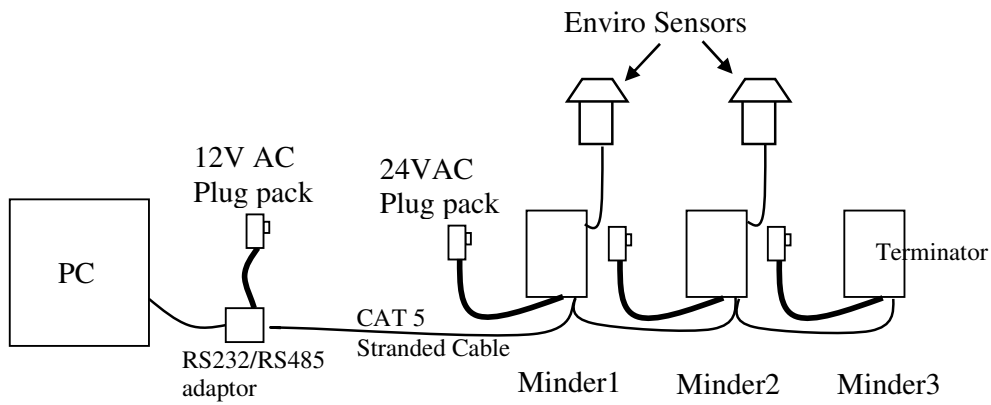
2. Installation and storage

IMPORTANT: The monitor must be installed (and stored) in the shade. It must never be left in full sunlight or in very hot conditions such as in an automobile glove box.

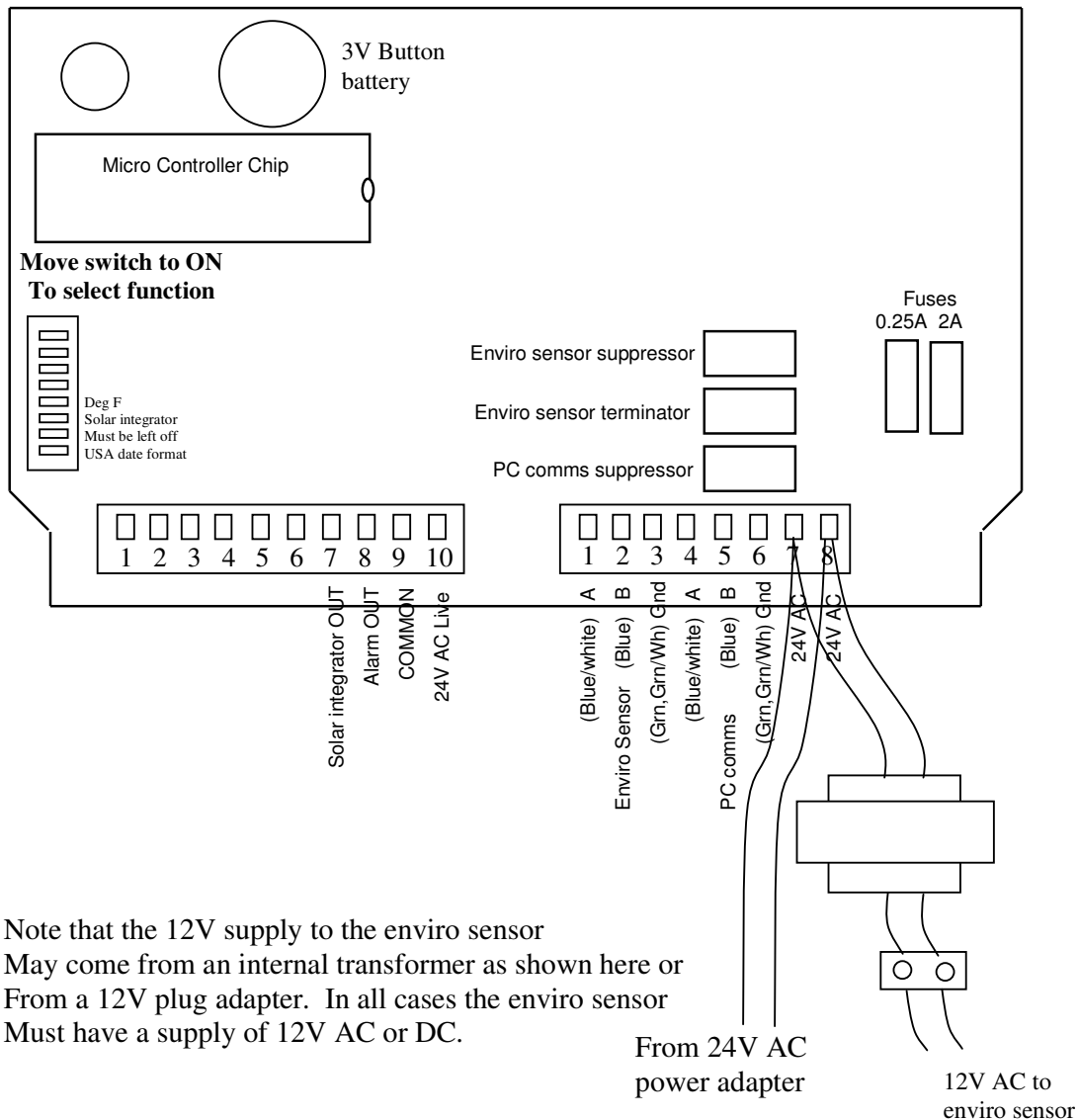
Normally this means that a shade cover must be provided in the greenhouse to protect the monitor from the sun's rays. This is important as the surface temperatures of items in a greenhouse in summer, in full sun, may easily exceed 60 deg C (140 deg F). If this is allowed to happen the warranty is voided. The shade cover will also prevent condensation drips falling onto the monitor.



Use light coloured (so as not to attract heat) CAT5 **stranded** computer network cable between the PC interface and the monitors. This cable is “looped in” to each 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 monitor to remove the terminators from any monitor between the PC interface and the last monitor in the chain. See connection diagram below. For the longest life from the product it should not be exposed to excessive temperatures or humidity for long periods of time.



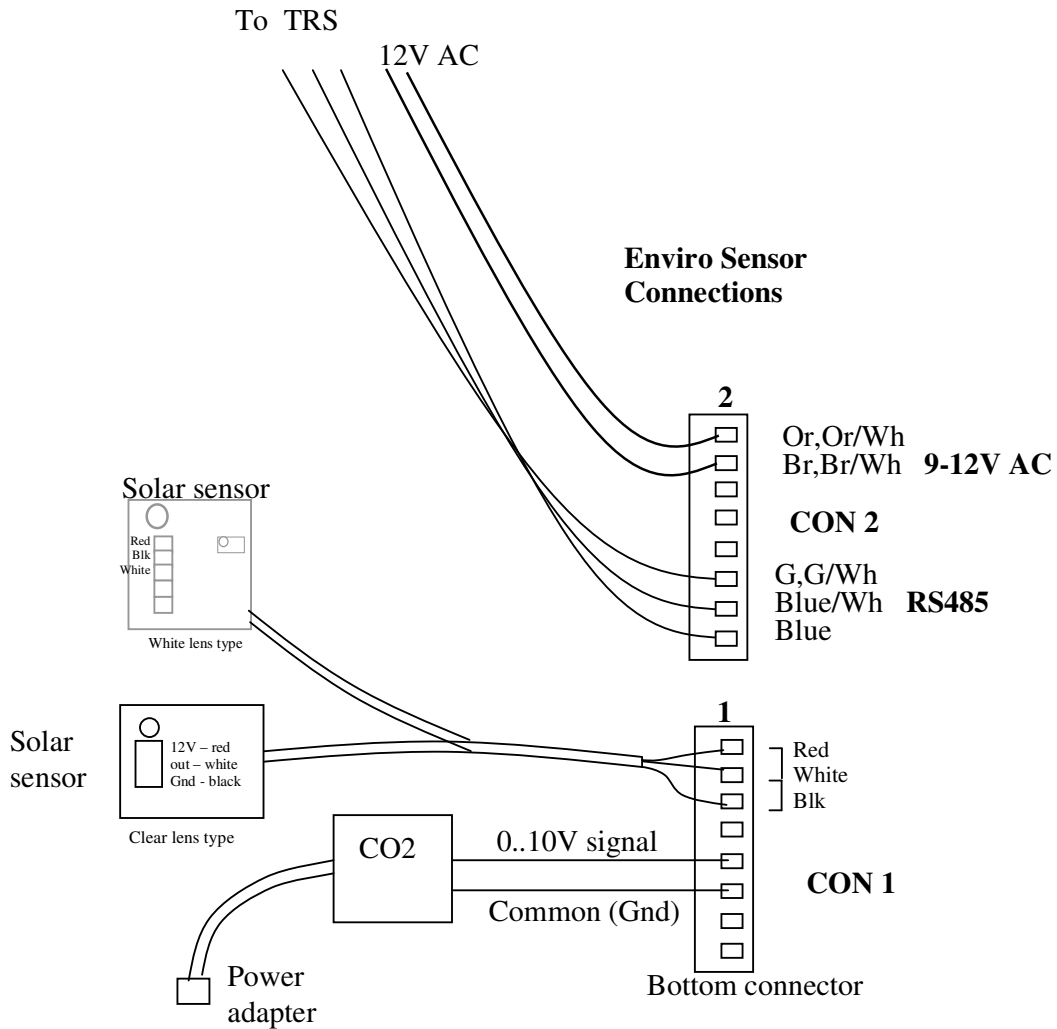
Note that when only one monitor is supplied the terminator is fitted inside the box. If a second monitor is added then the terminator must be removed from inside the boxes and the external terminator fitted. This is needed as if the end monitor is ever removed (for servicing etc) the terminator must be left in place so that the rest of the system will operate.



Note that the 12V supply to the enviro sensor
 May come from an internal transformer as shown here or
 From a 12V plug adapter. In all cases the enviro sensor
 Must have a supply of 12V AC or DC.

For the connection to the Enviro Sensor, Autogrow suggests using “stranded” CAT5 cable and to use the blue wire for B, blue/white wire for A and both the green and green/white wires in parallel for Gnd. The two remaining pairs of wires (brown+brown/white and orange + orange/white) may then be used to carry the 12V ac power to the enviro sensor. These two pairs of wires can be connected together with the incoming power on the two right most terminals inside the TRS2000.

The monitors require 24V AC power. This is usually provided from a small plug pack. Each monitor requires about 300mA at 24V AC.



Configuration.

A small DIP switch located on the circuit board can be use to select the following alternatives.

- 1) Display the temperature in DegF
- 2) Display date in USA format
- 3) Not used
- 4) Solar integrator output enable

Move switch to the ON position to select the required function

Therefore, if you are not using the solar integrator, but you do want the daily solar count to be sent to the PC, you need to move this switch to the ON position and then set the trigger set point to zero.

Monitor addresses. When the PC requests data from a monitor it first sends the address for that monitor. All monitors must have a different address and this is set pressing the “MODE” button to get to mode 12. The base address for these monitors 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 monitor and its type as you will need to enter this information on the PC.

Settings available at the PC

From the PC it is possible to clear the logged data memory, set the clock/calendar, set the alarm trigger values and also enable or disable the alarm. In addition, a pager or phone number may be entered so that the user is telephoned in the event of an alarm.

To set the clock to be the same as the PC clock, go into settings/set device clocks. This displays the current time of the PC clock and has a button that can be clicked to set ALL device clocks to that value.

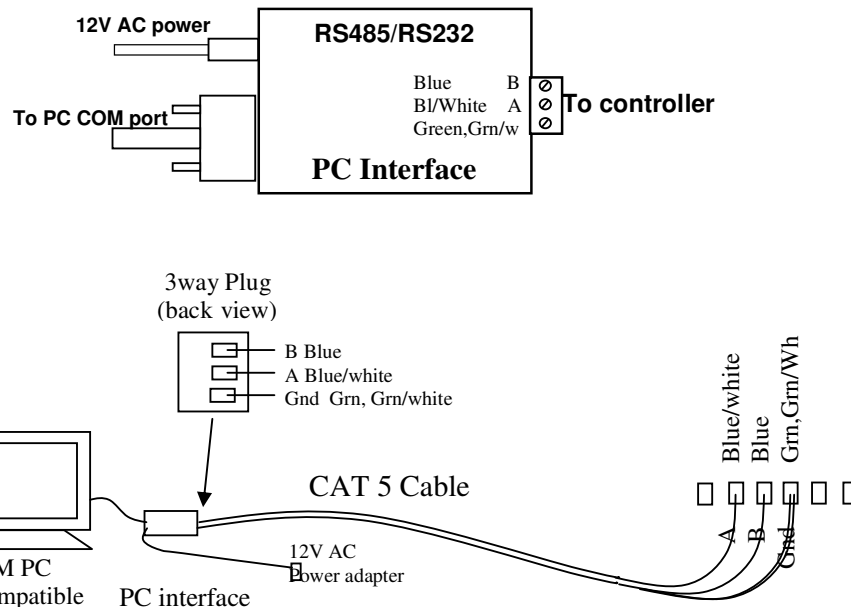
To clear the logs stored in the TRS memory (useful when setting up a new system), move the cursor over the name of the monitor and click the right button. A dialogue box asks if you want to clear the logs.

The alarm MIN's and MAX's can be set by entering values directly into the boxes on the main monitor screen. Similarly, the alarm can be enabled or disabled by clicking in the enabled box.

Connection to the PC (optional)

Terminator. If this is not the furthest 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 monitor. Only the furthest monitor should have a terminator connected. See connection diagrams above.

The PC Interface. The RS484/RS232 optically isolated interface box should be installed adjacent to the PC computer. It requires a 12V AC supply. A lead is supplied to connect this to a free DB9 COM port on the back of the PC. The CAT 5 cable should be connected as shown below.



Connection of PC interface to the TRS2000

Software installation

The CompuGrow software is suitable for PC compatible computer running Windows 98/Me/2000/XP. The computer must have a free serial COM port and should be a Pentium or better. If no serial port is available a USB port with a USB to serial converter may be used.

To install the software on your PC, insert the disk in drive A and execute the CompuGrow install program. 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\Compugro\ . When the programme 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.

Setting up the PC software. When the Compugrow software is first executed the first task is to 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.)

Next, go into Main/setup/add system and add the systems or group names for your monitors. For example if you have say two greenhouses (maybe one growing tomatoes and the other lettuce) and the lettuce greenhouse is divided into two growing systems, say lettuce-main and lettuce-nursery then you might add three systems:- Tomatoes, Lettuce1 and Lettuce2. Once you have allocated names to your systems the next job is to allocate the monitors to each system. To do this, go into Main/setup/configure and select the first system. Now add a short name for each monitor and alongside enter its address number and select the type of monitor that it is. EPT = EC/pH/Temperature, EPR = EC/pH/RunOff, TRS = Temp/RH/Solar

When you save this information the PC will try to communicate with these monitors on the selected port.

If it fails to communicate this could be due to a number of factors:-

- 1) Wrong COM port on PC selected or COM port not installed
- 2) No power to monitors
- 3) No power to the PC adaptor
- 4) More than one monitor with the same address
- 5) Address set on PC different to address set on monitor
- 6) Wires crossed between monitors and PC adaptor
- 7) No terminator fitted at furthest monitor in the chain
- 8) Terminators left inside the boxes of the intermediate monitors or two terminators fitted at the end monitor (one inside the box and the other outside)

Finally set the logging frequency to be either every minute or every 5 minutes. The software creates one file for each monitor for each month..

3. Calibration

The values displayed may be calibrated by the user from the keypad. This is done by moving to the appropriate MODE screen (by pressing the MODE button). Once on the appropriate screen, the UP or DOWN buttons are pressed to obtain the correct reading. Finally press the SAVE button to permanently save the calibration. Obviously, this should only be done when the correct value is known, ie if one has access to a very accurate thermometer, light sensor, RH meter etc.

The date and time are set in exactly the same way. The internal clock has its own battery which should be replaced every four years.

If you ever want to return to the factory settings just do the following:-

- switch off the power to the unit
- hold down the mode and save keys
- switch on the power
- keep the mode and save keys held down until the display comes on

You will now display the original values.

If you just want to view the original values (without changing the current settings) then just go to mode 22.

4. Maintenance

Monthly: Brush off any dust from the air grill on the aspirated chamber. Wipe the top of the light sensor with a soft damp cloth. Check readings and time settings. Calibrate if necessary.

The temperature sensor is guaranteed by the manufacturer (Dallas semiconductors) to be accurate to within 0.5 deg C and so any adjustment should be very small. Only calibrate this if you have a **very** accurate reference thermometer.

5. Faultfinding

No display : Check power supply 24VAC

RH reading incorrect: Ensure fan is ON, dust off the probe and recalibrate

If calibration impossible, replace the sensor. These simply plug in to a socket.

Solar reading incorrect, clean the top of the sensor. Ensure it is horizontal. Recalibrate

Temperature reading incorrect: Calibrate temperature

No PC communications – PC reports monitor to be offline

- address at monitor different to address at PC
- cable between monitor and PC broken – try moving the monitor close to the PC to exclude the long cable
- Wires in cable between monitor and PC crossed
- Terminator missing from furthest monitor or terminator present on intermediate monitor. (Only one terminator should be in the system at the furthest monitor from the PC)
- No power to the PC interface unit

- Cable between PC and interface unit disconnected or in wrong COM port of PC
- PC configuration incorrect (IRQ clash or port not installed)
- Wrong COM port selected within CompuGrow software

Uploaded data cannot be viewed in the history screen

- Date and/or time on monitor incorrect

Upload of logged data does not stop.

- Monitor must be reset. To do this remove the power to the monitor. Hold down both the MODE and the SAVE buttons and switch on the power. Keep the buttons held in until the display comes up. Note that this will reset the units address and all calibration constants. These must be reset manually. Also check that the date and time is correct.

Specification

These monitors can be used on-line to a PC or off-line for data logging

On-Line

Up to 128 devices may be connected in “daisy chain” fashion to the PC adapter.

These can include any mix of the Minder series monitors, AutoVent control systems or NutriDose II, dosing/fertigation controllers.

The monitors (and controllers) may be grouped into different systems. Usually a group will represent one greenhouse so that viewing is organised in a logical way.

Data may be uploaded to the PC either every 1 or 5 minutes. This is set on the PC.

Alarms may be set for each monitor and even for each measured variable.

Data is logged to the hard disk of the computer for later graphical display.

Off-line

Whenever a PC is not connected the monitors continue in off-line mode. In this mode they record data every 5 minutes to an internal memory. They may then be carried to a PC and as soon as they switched on and connected to the computer, the data will be uploaded for logging to disk and display. The maximum data storage is limited to 10 days.

Air temperature, RH, CO2 and Solar

Air temperature resolution: +/-0.1 deg C

Air temperature accuracy +/-0.5 deg C uncalibrated, 0.2 deg calibrated

Relative Humidity accuracy +/- 5%

CO2 accuracy – refer to sensor manufacturers specification

Solar irradiance accuracy with low cost PAR sensor +/- 12%

Solar integration to 999,000 mmol (999 mol)

Warranty

The warranty on the monitor, solar sensor 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.

RH sensors and fans carry only a 6 month warranty from their respective manufacturers. CO2 sensors carry a warranty according to 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 monitor and PC interface 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 specifically excludes liability for consequential damages or for charges for labour or other expense in making repairs or adjustments, or loss of time or inconvenience.