

# Michell Dewpoint Hygrometer

## System description

The Michell dew point hygrometer is a chilled mirror humidity sensor sampling air from the Picarro inlet line in the lab van. It sits on top of the right side of the APIMS rack, facing the rear. The primary use of this unit was to monitor the efficiency of the Nation air driers on the DMS and Picarro analyzers. Currently, it's just measuring the ambient humidity from the inlet and only makes a useful measurement when the Picarro is running.

The RTD temperature sensor on the tower was supposed to be connected to the Michell so we could get air temperature and relative humidity, but we don't yet have a suitable connector for the RTD input. See the Michell manual for greater detail beyond this short instruction sheet.

The outlet is connected to the Picarro vacuum pump. A needle valve on the outlet regulates flow to ~100 ml/min. The front display is configured to show specific humidity, dew/frost point and flow rate.



# System startup and setting system clock

After power up, instrument functions are controlled through a series of menus accessed by the buttons on the front panel. There is one **menu/enter** button in the center and **up/down**, **right/left** arrows to either side. Response is a bit slow when you push a button, so have patience. Push the **menu/enter** button to access the main top level menu. The most important commands at this level are **STANDBY/OPERATE**, **SETUP** and **EXIT**. Use the arrow keys to navigate up/down through menus and back up from submenus. Use the **enter** key to go down into a submenu.

If the analyzer is in normal operating mode, use the up/down arrow keys to highlight **STANDBY** and then press the **enter** key when you want to stop normal operation and let the sensor sit at room temperature. To resume normal measurements, select **OPERATE** to start the normal humidity measurement cycle. Select **EXIT** to go back to the normal instrument display.

Selecting **SETUP** in the main menu opens a long list of configuration options and submenus. The most important are **LOGGING**, **CLOCK** and **EXIT**. Highlight **LOGGING** and press enter to get to the data logging submenu. Then highlight **LOGGING** again in this menu and press **enter** to change the setting (use **up/down** arrows to select **YES** or **NO**, then press **enter**). When logging is enabled it displays the current file name. Use the arrow keys to back out of the logging submenu. The log file is written to the SD card inserted just below the menu/enter button. When logging is enabled, a small doc icon will appear in the upper left corner of each data panel on the main display, as shown in the photo above. The analyzer writes data into a single file from the time logging is started and doesn't close that file until logging is stopped.

Selecting **CLOCK** from the **SETUP** submenu lets you to set the system clock for file timestamps. Use the time displayed on the GPS unit immediately below the hygrometer in the rack. The Michell seems to gain a minute or so every several days, so reset the clock whenever you remove the SD card to copy the data file.

Select **EXIT** from any menu to go back to the main display.

## Data Backup

Use the APIMS laptop to read the SD card and copy the data file, since this laptop is the only computer with an SD reader built-in.

**Stop the LOGGING function on the Michell before removing the SD card, otherwise the file may be corrupted and unreadable.**

The file name is a strange format of `DDMMhhmm.txt` and it can be difficult to tell which file is newest. For our archive, I'm changing the file names on the SC card to something more useful before I copy them to the APIMS laptop and backup drive: `MDPYYYYMMDDhhmm.txt`. Copy all new files since the last download. A new file will be created every time logging is stopped and restarted.

## System shutdown

Put the analyzer in **STANDBY** mode, close the outlet valve to the vacuum pump, and turn off the power.

## Routine maintenance

There's a small kit to clean the chilled mirror in the computer supplies drawer. Turn off LOGGING and put the instrument in STANDBY, open the chilled mirror chamber, and use a swab with alcohol to gently wipe the gold mirror. See the Michell manual for further details. This cleaning might only be necessary every few months.

## Data archive and submission

The Michell data are saved in the `t_rh_ship_bow` directory on the backup SSD drive, iMac and in the MCS archive.

Since the raw data is just written into a continuous file, I have set up a python script to parse the raw Michell file(s) into daily files. Put the most recent Michell file(s) into the `t_rh_ship_bow/inbox` folder (along with the last file from the prior download, since there's usually partial day at the end of that file that goes with the beginning of the new file). There's a python script in the `inbox` folder. Run the python script on the new raw file(s) to generate the `mdp0YYMMDD_raw.txt` daily files. The procedure is the same as for parsing the raw Picarro and ship data files.

Copy new daily files into the `parsed` folder, discarding duplicates and the last (partial) file from the end of the new data, since this can be regenerated as a complete day on the next download.

Copy the parsed daily files to the MCS archive.