13 Communications

13.1 Connect to the Instrument

Start the software by double clicking the SFM icon on the desk top of your PC.

13.1.1 The opening Splash Screen displays the following

1. Type of instrument being operated – Sap Flow Meter
2. The connection Status – Not Connected
3. Product Version – 2.0.1.7
4. Release Date – 20/11/2010
5. File Menu along the top of the Window
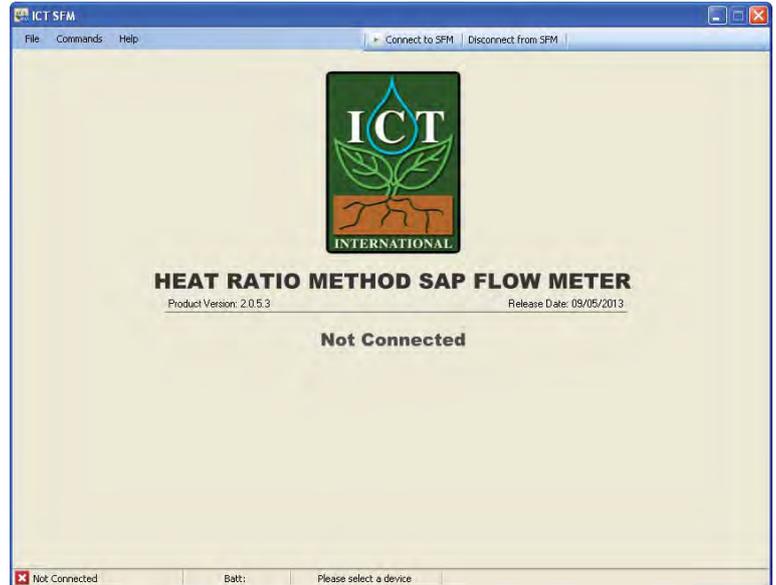6. Function buttons
   a. Connect to SFM
   b. Disconnect from SFM

Figure 15 SFM1 Software Splash Screen

NOTE 32: the "Disconnect from SFM" icon is greyed out as the instrument is not connected

13.1.2 A status bar along the bottom of the window

A status bar along the bottom of the window
   a. Not Connected to ICT SFM
   b. Battery Voltage
   c. Please Select Device

NOTE 33: The SFM1 is a Plug & Play USB device. Once connected to a USB port, Windows automatically detects it and allocates it a COM port. You do not need to select or configure the COM port. Once connected the allocated COM port will be displayed in the status bar.

To establish a connection click *"Connect to SFM".*
There are two ways of connecting to the SFM1: either via direct USB connection or via wireless RF Modem.

13.2 USB Connection

Drop down the *"Connection Type"* box (located in the bottom left hand corner of the screen) and select USB.
 If the message *"No compatible devices found"* is displayed; before proceeding to click the *"Find Devices"* icon please check the following:

(a) The Instrument is turned on – see <u>Turn the SFM1 ON</u>
(b) You are connected to a device – A USB cable must be connected between the PC and the USB port of the instrument.
(c) You are connected to the correct device that is compatible with the Utility software you are using e.g., SFM software will only connect to a SFM1 Sap Flow Meter not a PSY1 Stem Psychrometer. The software automatically recognizes the type of device and will not connect to instruments that operate on different principles.

Figure 16: Device Selection Window

13.2.1 USB - Find Devices
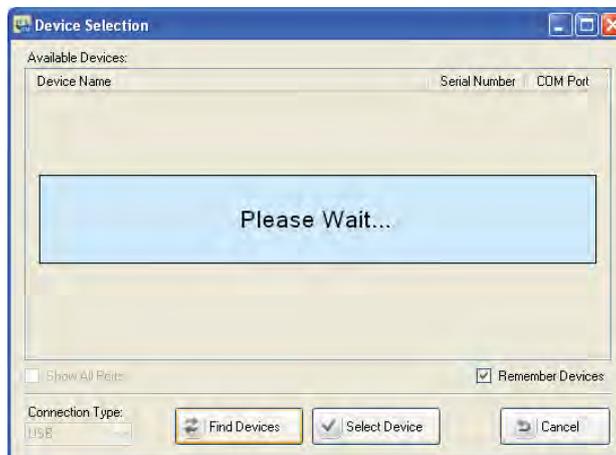Now, click the *"Find Devices"* icon.

Figure 17: Device Selection Window searching for the connected device

NOTE 34: To eliminate the need to conduct the *"Find Devices"* routine each time you run the software you can tick the *"Remember Devices"* check box. Next time you click on *"Connect to SFM"* the last instrument connected will already be displayed in the list and you can connect to it either by highlighting the device and clicking on *"Select Device"* or double clicking on the device name.

After polling all compatible devices the compatible device that is connected is displayed.

Figure 18: Device Selection Window reporting the device that was found.

13.2.2 USB Select Device
You can now select the device by clicking on it with the mouse to highlight the device and then clicking on *"Select Device"*. Alternatively, you can simply double click on the device name.

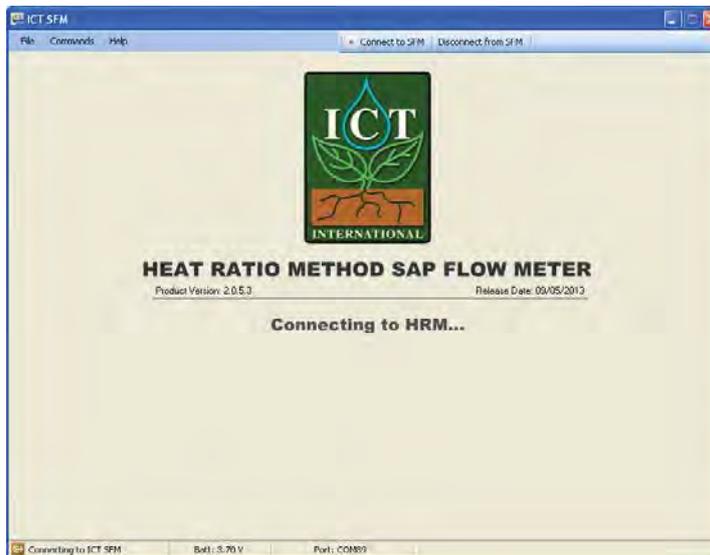After selecting the device the following splash screen will appear.

Figure 19: SFM1 Splash Screen displayed while connecting to the instrument.

It states the following:

    (1) That the software is *"Connecting to the SFM"*
    (2) Battery Voltage prior to the software actually connecting. In this example it is 3.70V
    (3) COM Port the device is located on, in this example COM 89.

NOTE 35: The software detects the Generic Coms or communication circuit board first. The integrated voltmeter measures the internal battery voltage as soon as a connection is initiated and displays it in the status bar tighter with the allocated COM Port. This provides a diagnostic check during the connection process and prevents frustration that might otherwise occur should the instrument not be able to connect due to a flat battery.

You are now connected to the SFM1 Sap Flow Meter. You will see the Instrument Information Section filled with the configuration data of the instrument you are connected to. This data is read directly from the instruments configuration held in non-volatile RAM.
The instrument is now ready to be used. The configuration can be modified, logging interval set, Data downloaded or readings performed manually.
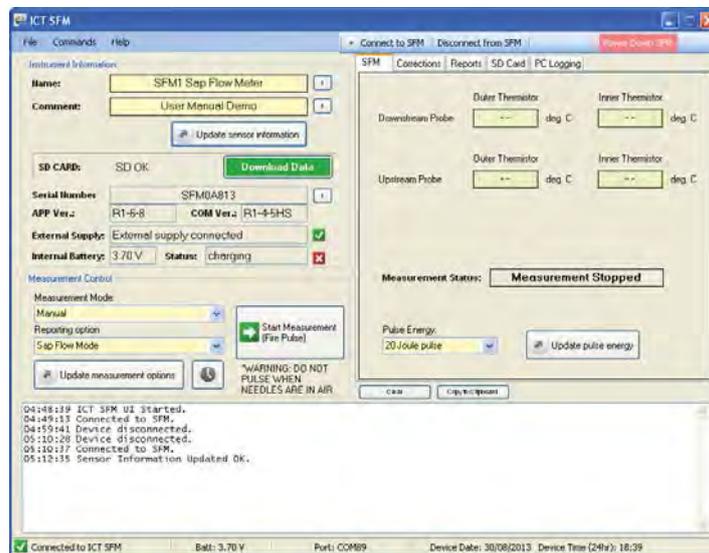

Figure 20: The SFM1 Graphical User Interface connected to an instrument

13.2.3 SFM Connection Options

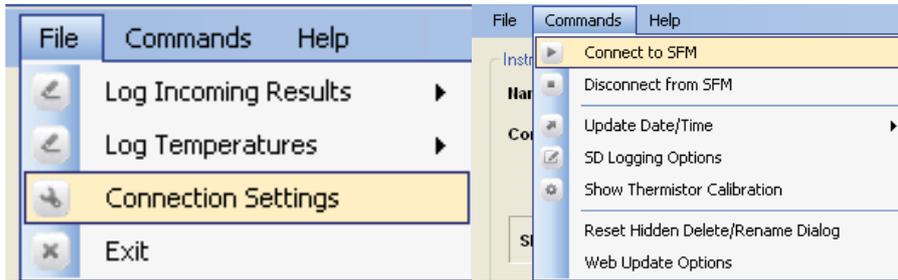The File and Commands dropdown menus provide alternative access to connect to other instruments.

Figure 21: File & Commands Drop-Down Menus

Choosing "Connect to SFM" has the same effect as choosing "Connection Settings" in the File Menu. The same warning appears and lets you know that you will next have to reconnect manually to any device you choose in the "Available Devices" list of the Device Selection dialog which appears once you select "Yes".

Figure 22: User Advice Message when attempting to connect to a SFM1 whilst connected to the SFM1

13.2.3.1 Disconnect from SFM

Before closing the SFM software you should disconnect from the instrument. This can be done from the "Disconnect from SFM" icon in the top menu bar or from the "Commands" drop-down menu. Both options disconnect from the SFM which will automatically close the software displaying the SFM connection Splash Screen.
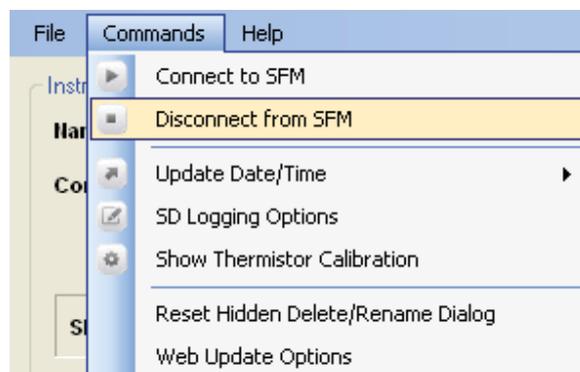

Figure 23: The SFM Software Menu Bar.

Figure 24: the SFM Software Commands dropdown menu for disconnection from the SFM1.

If you choose "Disconnect from SFM" while in Manual mode you will receive the following warning:
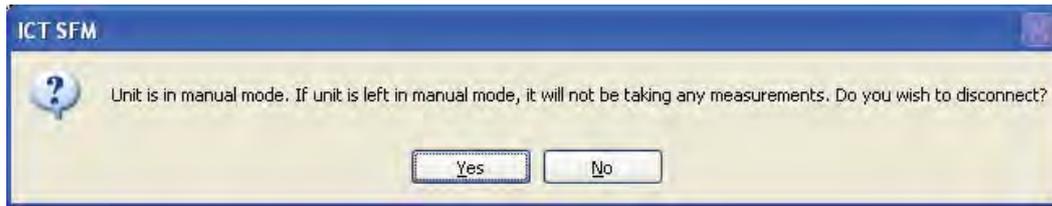
Figure 25: User Advice Message when disconnecting from the SFM1 when in Manual Mode.

This is to prevent you from disconnecting and thinking that your device is automatically collecting data. Manual mode has no effect without being connected to the SFM Software, as it requires human intervention to initiate a measurement by clicking the "Start Measurement (Fire Pulse)" icon. If you are consciously disconnecting the device with no intention of collecting data, select "Yes" and it will disconnect with no further warnings. Otherwise abort the disconnection, by clicking "No".
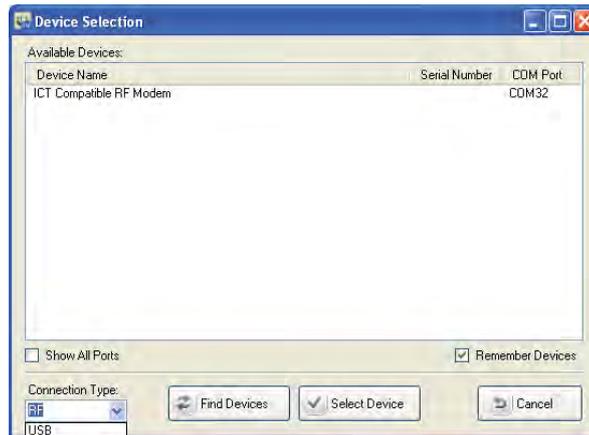
13.3 MCC1 - RF Modem

13.3.1 RF Connection Type

Figure 26: Device Selection Window – Connection Type RF.

Drop down the *"Connection Type"* box (located in the bottom left hand corner of the screen) and select RF (Radio Frequency).

If an MCC1 – Multi-Converter RF Modem is connected to the PC it will automatically be displayed in the list of "Available Devices" showing the COM port it has been automatically allocated by the Windows OS.

Figure 27: Device Selection Window.

13.3.2 RF Find Devices
If the message *"No compatible devices found" is displayed* before proceeding to click the *"Find Devices"* icon please check the following:
   (a) The MCC1 is connected via a USB cable to the PC
   (b) The LED of the MCC1 is lit up to confirm the MCC1 is functioning.
   (c) The *"Connection Type"* has been changed from USB to RF
   (d) Then click the *"Find Devices"* icon

13.3.3 RF Select Device

You can now select the device "ICT Compatible RF Modem" by clicking on it to highlight the device, then clicking on the *"Select Device"* icon. Alternatively, you can simply double click on the device name.

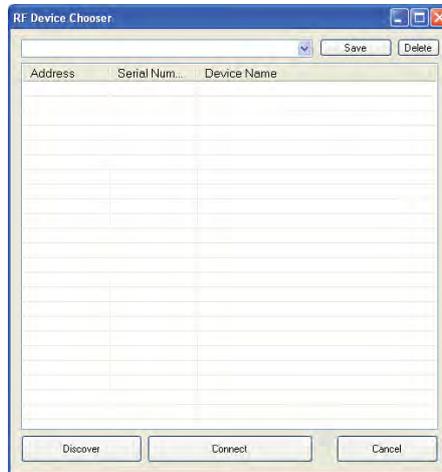Clicking on the *"Select Device"* icon will open the *"RF Device Chooser"* List

Figure 28: RF Device Chooser Window.

The list will initially be blank until a search has been performed for instruments within range (approx. 250m).

NOTE 36: Range is strictly line of sight and will vary depending up ambient conditions that affect signal strength such as atmospheric moisture and density of foliage.

13.3.4 RF Discover

Click on the *"Discover"* icon to begin the *"Device Wake Up Routine"*

Figure 29: RF Device Chooser Window – attempting to wake up devices within range.

NOTE 37: Each SFM1 instrument has an integrated radio transceiver and antenna. They are configured to wake up every 10 seconds for a millisecond to send a short signal.

13.3.5 RF Device Wake Up Routine

During the *"Device Wake Up Routine"*, the RF Modem scans the 2.4 GHz frequency for a period of 20 seconds, "listening" for a signal from any SFM1 Sap Flow Meters that may be within range. As each unit only emits a signal every 10 seconds, an initial wait time of 20 seconds is required to ensure all instruments within the area have had time to respond within the discovery window.
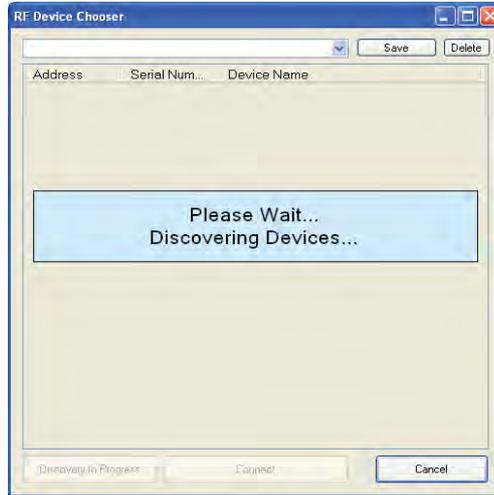

Figure 30: RF Device Chooser Window – Discovering devices within range.

13.3.6 RF Search for more Devices

If a known instrument has not been discovered during the initial 20 second polling routine, the GUI software allows you to continue to search for more devices, to do so click the "OK" icon when asked, **"Search for more Devices?"** If all devices have been discovered click the "Cancel" icon to gain access to the list of devices found.

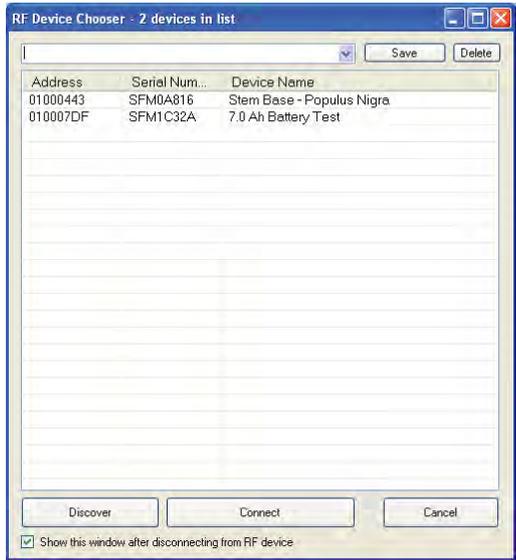Figure 31: RF Device Chooser Window – Search for more Devices?

Figure 32: RF Device Chooser Window – displaying the devices within range that have been discovered.

Once the discovery routine has finished polling all compatible devices, a list of all compatible devices found will be displayed. Each instrument displayed in the list can be individually selected and you can connect to it either by highlighting the device and clicking on *"Connect"* or double clicking on the device name itself.

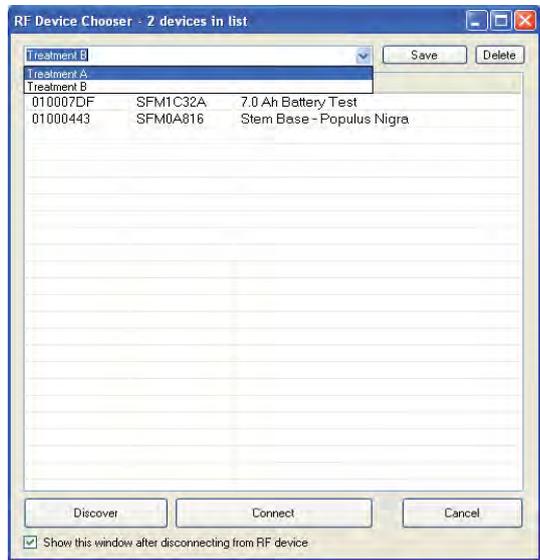### 13.3.7 Saving Discovered Devices as a Group

Figure 33: RF Device Chooser Window – Save Groups Option.

To eliminate the need to find devices each time you run the software you can create groups of instruments. Once a group of instruments are discovered, allocate them a name such as "*Treatment A*" and click on the "Save" Icon. Next time you click on "I*CT Compatible Modem*" you can choose to drop down the group of sensors you wish to download as the discovery routine has already been done and saved by the SFM GUI Software. Each instrument displayed in the list can be individually selected and you can connect to it either by highlighting the device and clicking on "Connect" or double clicking on the device name itself.

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13.3.8 Adding Devices to a Saved Group

Devices that have not been found initially or new instruments added to the experiment since the previous discovery can be added to the Device Chooser List. You are given the option of merging new instruments or clearing the list and repopulating it with a completely new search. The results of a new search can be saved as a New Group.
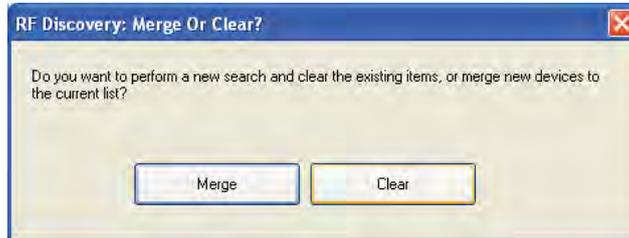

Figure 34: Device Discovery Merge or Clear Discovery Search Option Window.

13.3.9 Connecting to a Device via RF

After selecting an instrument or an individual instrument from within a saved group, the following screen will appear. The message establishing RF Link is displayed in the status bar of the splash Screen.

Figure 35: Establishing RF Link wirelessly via the MCC1 Radio Frequency modem.

Once the generic communication board is accessed and an RF link has been established, the message in the status bar changes from "establishing link" to "connecting to ICT SFM". The battery voltage and temperature are displayed along with the COM port allocated to the instrument by the Windows OS.

Figure 36: Connecting to an SFM1 Wirelessly via the MCC1 Radio Frequency modem.

The status bar of the splash screen states the following information:
(1) The software is Establishing the RF Link.
(2) "Connecting to the SFM"
(3) Battery Voltage was 4.18 V prior to the software actually connecting.
(4) Internal battery temperature is 42.2°C
(5) The device is located on COM 82.

NOTE 38: During charging of the instrument, the internal battery temperature can become elevated well above ambient temperature. This is due to the heat given off by the charging process inside the instrument at the point where the instrument temperature is measured.

You are now connected to the SFM1 Sap Flow Meter wirelessly through the MCC1 Multi-Converter RF Modem. You have all the same functionality and speed of a direct physical connection via a USB cable, plus the freedom to move around the area beyond the physical reach of the instrument.

You will see the Instrument Information Section filled with the configuration data of the instrument you are connected to. This data is read directly from the instruments configuration held in non-volatile RAM.

The instrument is now ready to be used. The configuration can be modified, logging interval set, Data downloaded or readings performed manually.