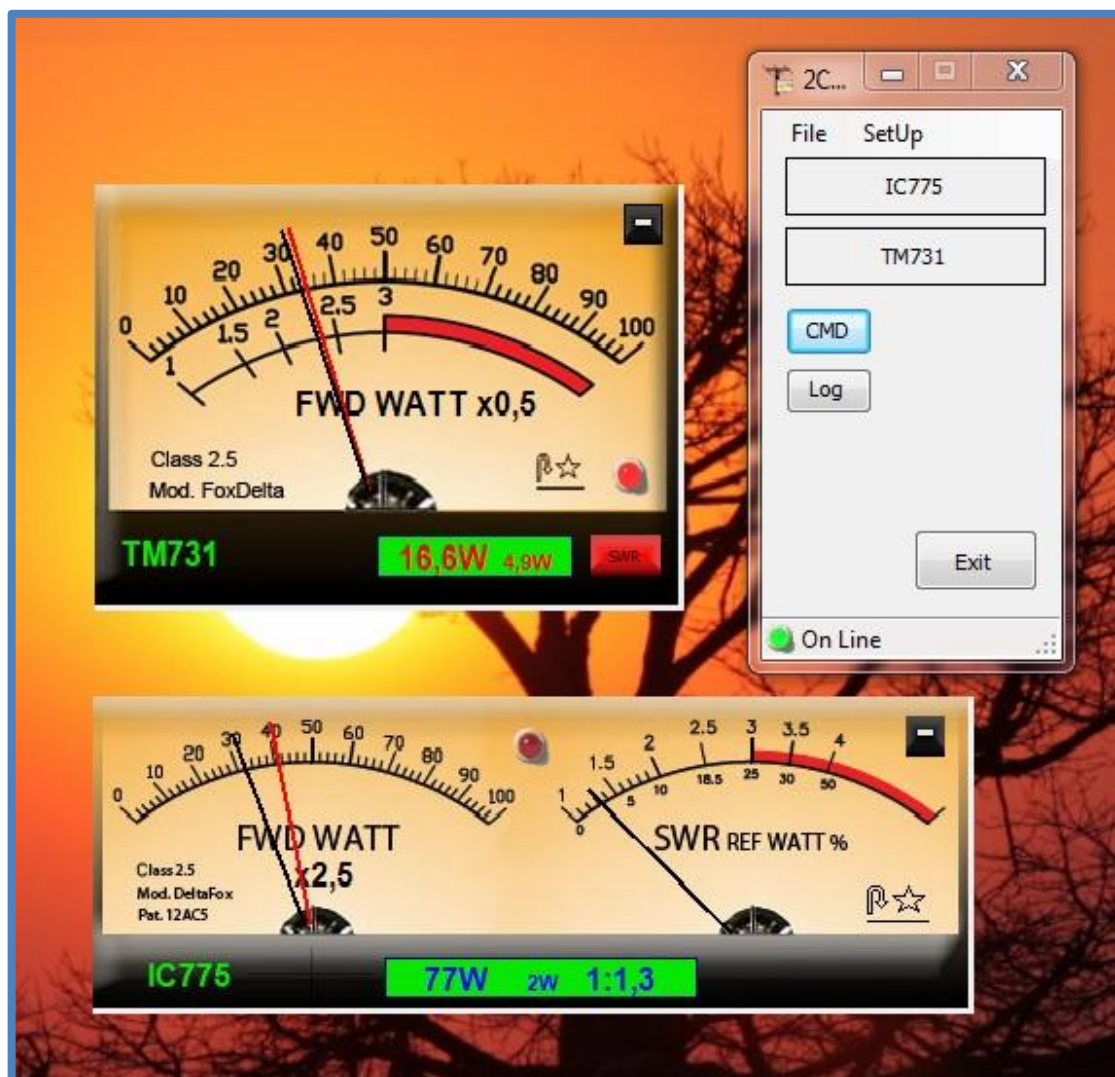


2 Channels Watt & SWR Meter



1. 2CH SWRMETER: THE ARCHITECTURE

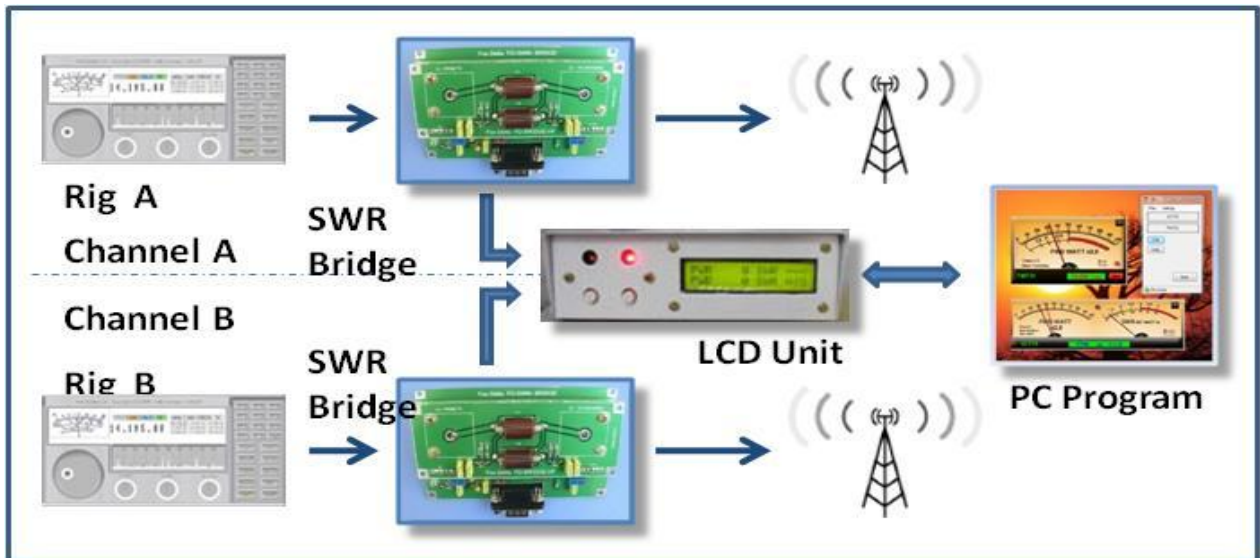
- 1.1 LCD UNIT
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2. WINDOW BASED PROGRAM

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 - 2.7.4 CONFIGURATION: COMMUNICATION PORT

1. 2CH SwrMeter: The Architecture

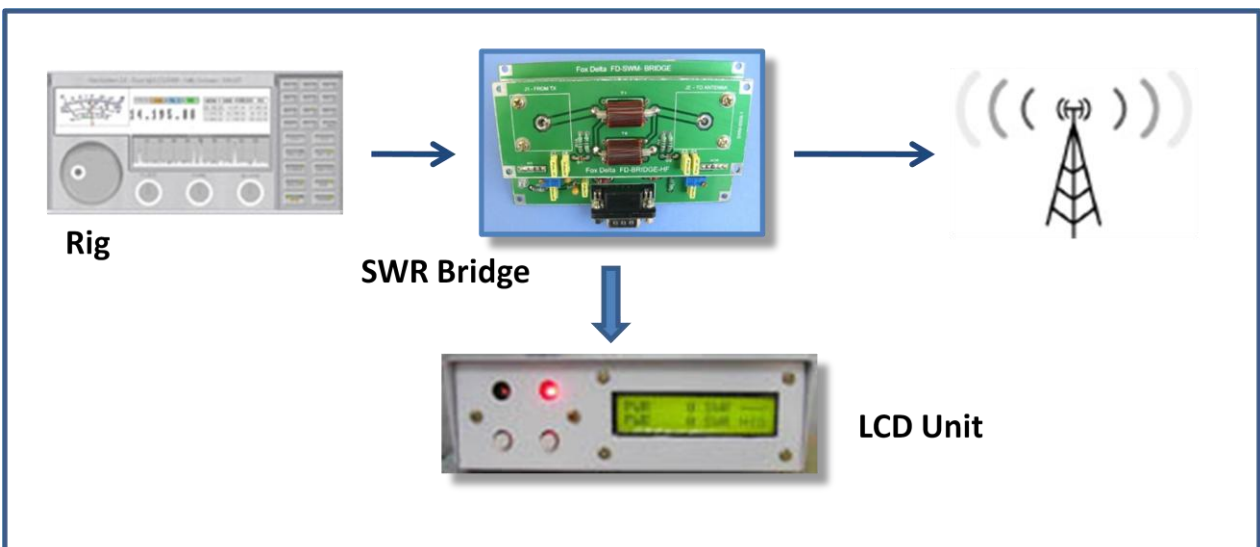
The Two Channels Watt & SWR Meter project has the following architecture:



The components are:

- LCD Unit
- 2 SWR bridges
- PC program (Windows based)

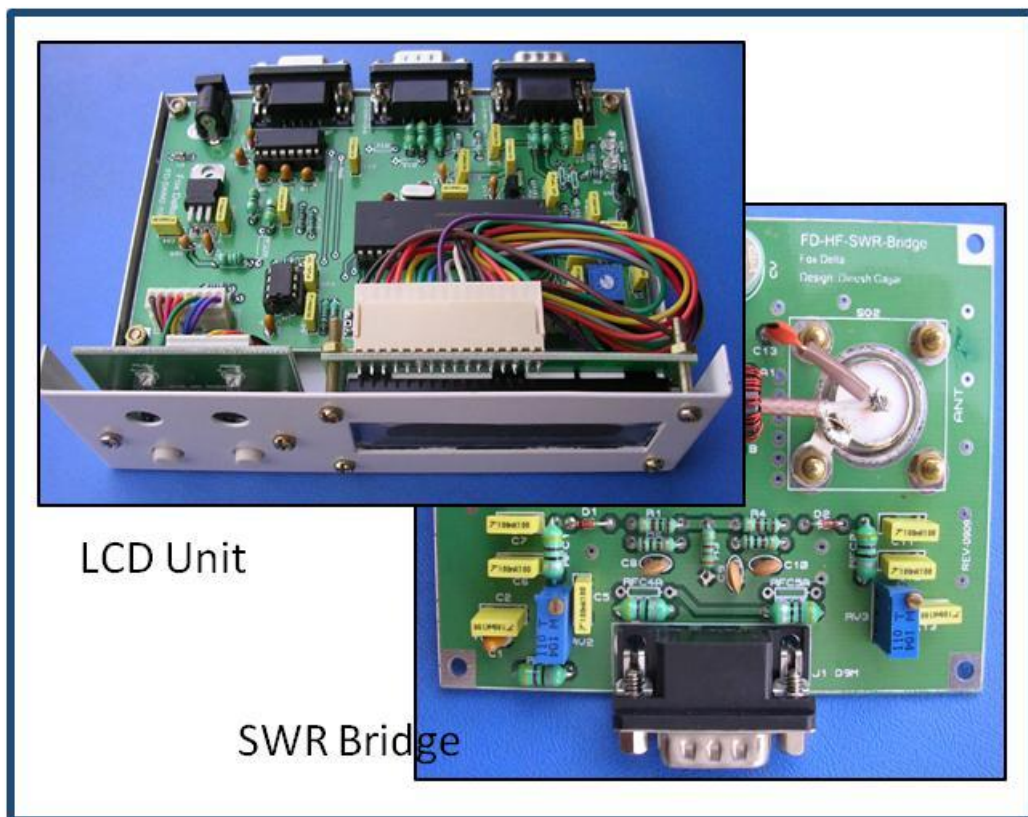
The 2ChWattMeter can be used also as stand-alone unit with one (or two) SWR bridge.



1.1 LCD UNIT

The main features of the LCD Unit are:

- Simple single Micro Controller with built-in A/D converter.
- 4 A/D 10 bits channels driven by 2 SWR Bridges.
- RS232 port to communicate with the PC at 115200Bauds.
- Back light controlled by steps.
- SWR, FWD and REF Power , Actual Power to antenna calculations/display for 2 Radios .
- Dual Range Bargraph mode for average and PEP Forward Power .
- Compact Design.
- May be powered from DC9V battery or 12V DC.
- Led to alert when high SWR level is detected.
- Led stating the auto channel selection operative mode.
- 2 power scales for each channel, selection based on the SWR Bridge calibration.
- Fully configurable from the PC Program .
- New f/w releases updated from the PC without need of any external PIC programmer.
- Almost real time data exchange via the serial port to replicate on the PC screen the LCD values.
- Data collection for further PC analysis



1.2 WINDOW BASED PROGRAM

2ChWattMeter.exe is a PC Windows Program written to connect the PC to the LCD Unit, exchange data and send commands. The program's main features are:

Graphic interface displaying data read from the LCD Unit

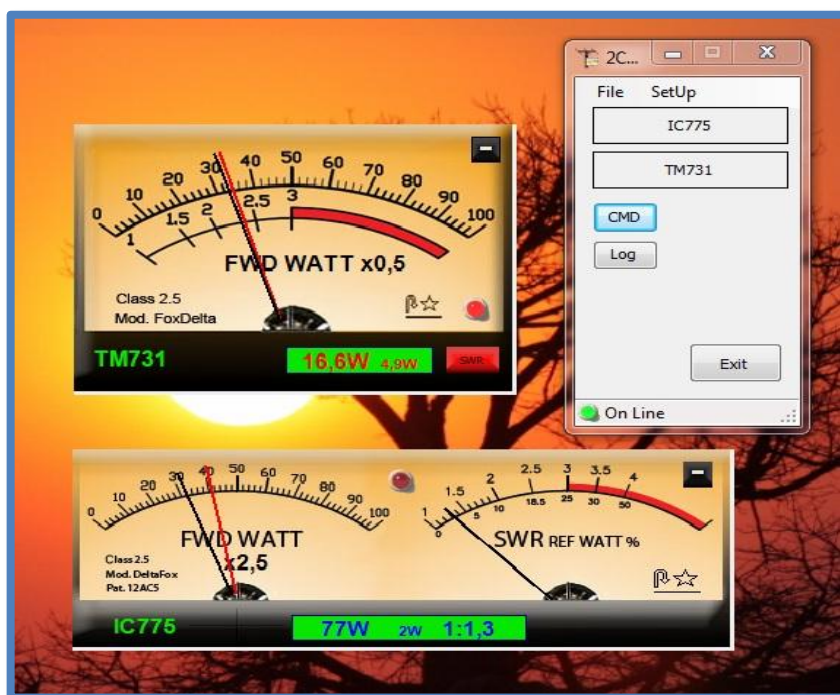
- Single analog meter reading power and SWR on the same gauge
- Double analog meter
- Digital panel with power graphic bar
- Two styles: classic and ambra
- Second RED needle indicating peak power

SWR Alarm System, 5 modes available:

- Alarm disabled
- One time Windows message
- Repetitive Windows message
- User program one time executed
- User program repetitive execution

Additional

- Emulate the LCD Unit buttons and send relevant commands to switch the unit to any operative mode.
- Configure the computational parameters of the LCD Unit.
- Collect data for later statistical analysis
- Automatic detection of the LCD Unit port



2. WINDOW BASED PROGRAM

2.1 Program installation

The 2ChWattMeter Win program requires a very simple installation process:

- Create a folder (ex. C:\FoxDelta).
- Unzip/copy the *.exe file in this folder.
- Optional: create a link to the desktop (right click the file 2ChWattMeter.exe, select “Send to” and “Desktop”).
- Launch the program by double clicking the file name or the desktop icon.

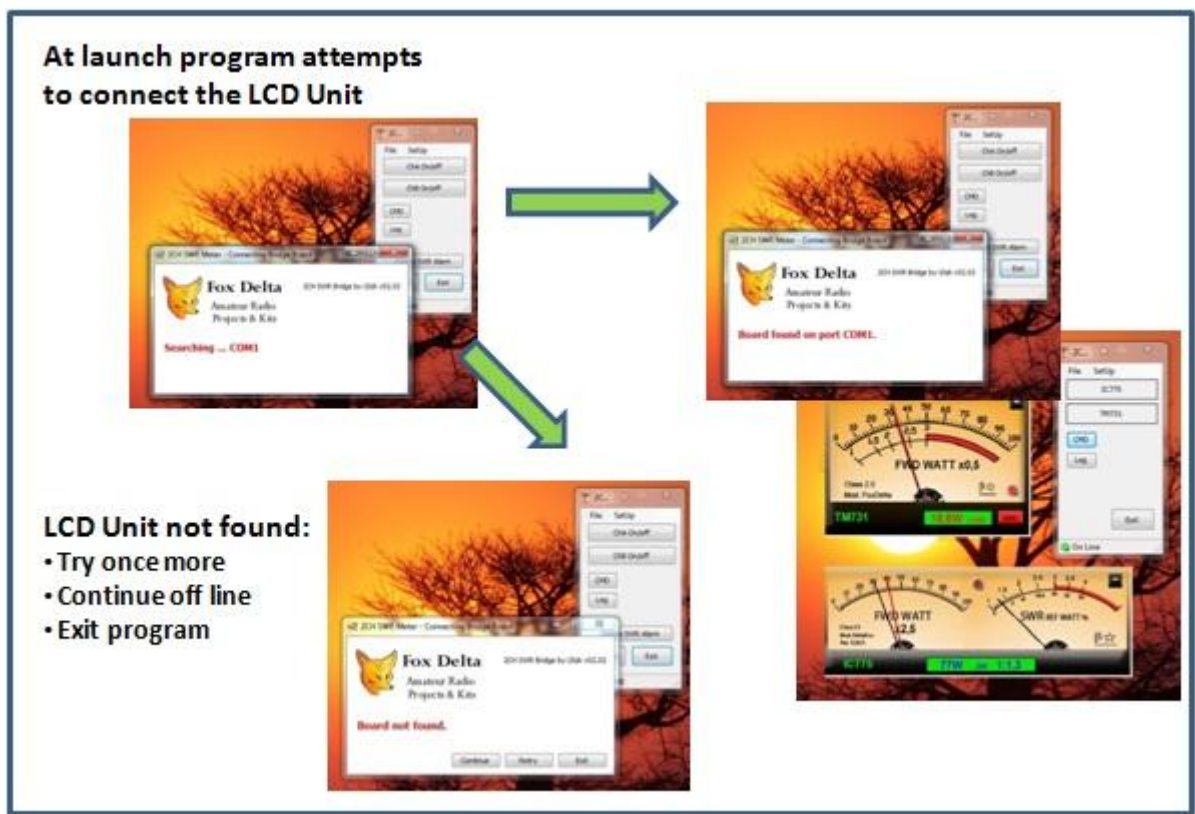
2.2 Running the program

Before launching the 2ChWattMeter program, please verify that:

- The serial cable is properly connected to the LCD Unit and to the PC.
- The LCD Unit is powered ON.

When program starts, by default, it attempts to connect at first the LCD Unit on the last used serial port. If no LCD Unit is detected here, program goes through the list of the installed and available serial ports, searching again.

If the **LCD Unit is detected**, the program reads from the LCD Unit the configuration parameters used by the computational Power/SWR algorithms, the GREEN led "on-line" of the main window starts to blink and the last used graphical interfaces are selected.



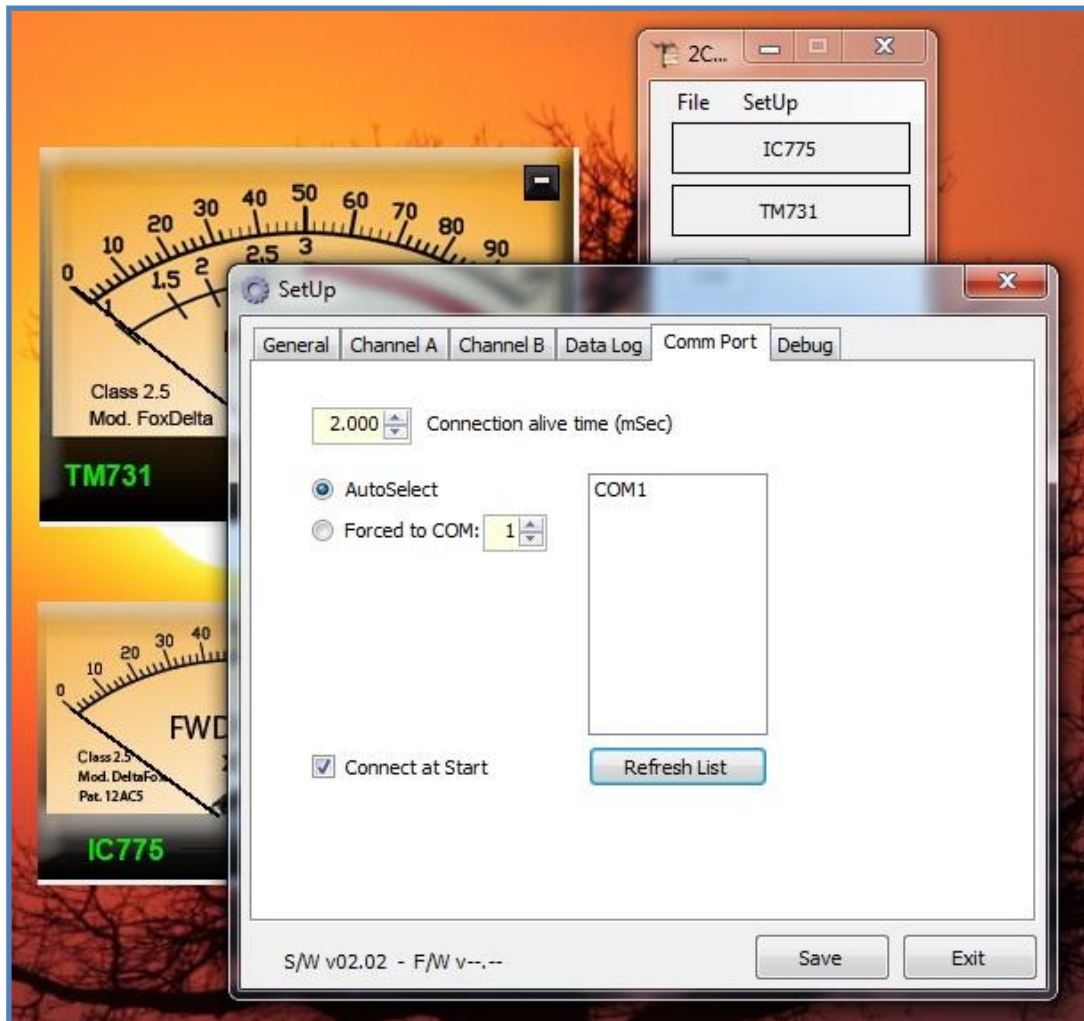
If the **LCD Unit detection fails**, three options are available :

- Exit: terminate the program.
- Retry: before retrying, double check that the cable LCD Unit <-> PC is properly working and the unit is powered on, reset the LCD Unit if needed.
- Continue: program will continue off-line.

If your LCD Unit is properly connected to the PC and powered ON but program doesn't detect it, you can manually force the port selection to the one where the LCD Unit is connected.

Please "Continue" off line, select the menu "SetUp" and the tab "Comm Port". Check "Force to COM:" and enter the COM number you want to be forced.

"Save" to apply the new parameters and restart the program, "Exit" to ignore any modification you did.



2.3 Graphic meters

The graphical interface offers several choices for any single channel:

- Single analog meter reading power and SWR on the same gauge
- Double analog meter
- Digital panel with power graphic bar

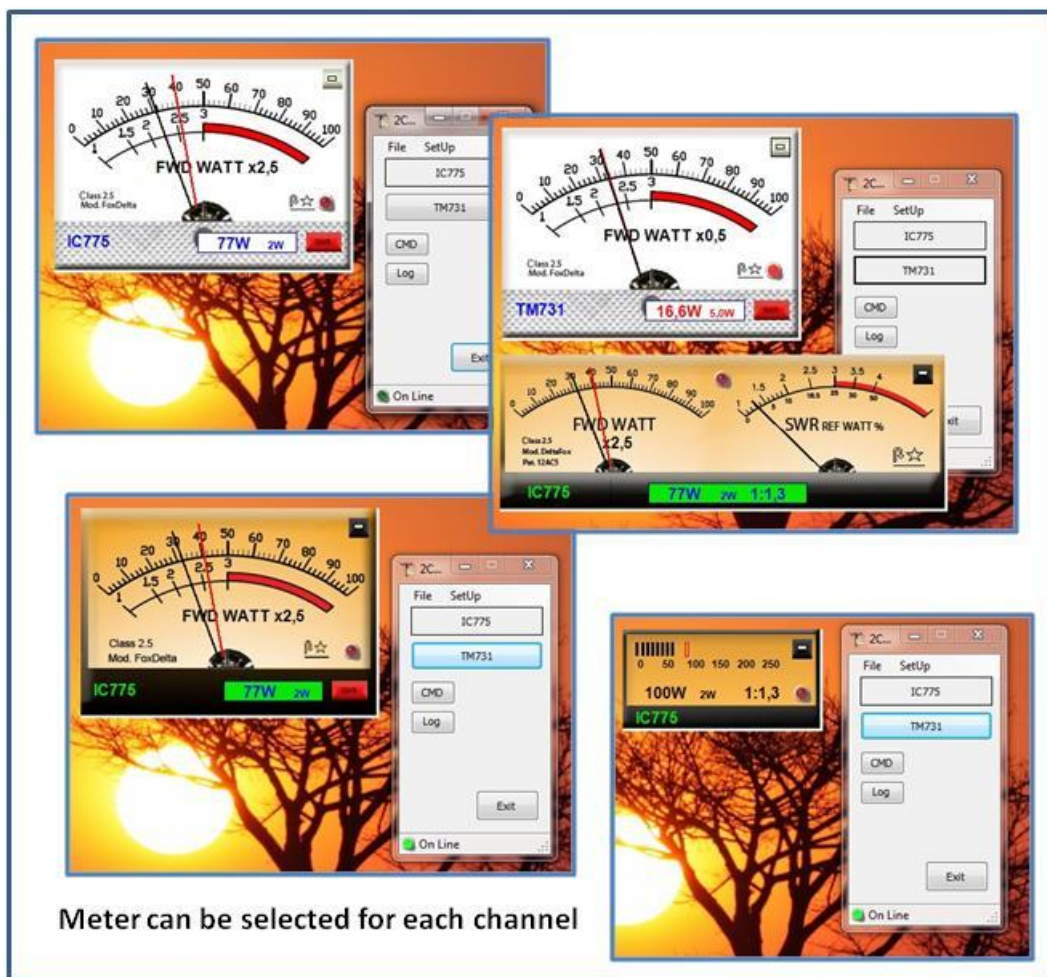
Two styles are available: classic white and ambra .

The “analog meter” reports also :

- Scale multiplier
- Peak and reflected power (double meter only)
- SWR referred to the peak power

A second **RED needle** measure, with memory, the peaks of power.

The analog meter mimic the movement of a “real” coil instrument having a configurable speed of “return to zero”.



2.4 Command window

The “Send Command” window emulates the Buttons B1 and B2 of the LCD Unit sending commands to switch operative modes and selections.

Buttons on the frames “Channel” allow to select the Scale 1 or Scale 2 or the AUTO feature.



2.5 SWR Alarm System

The “SWR Alarm System” is activated when the LCD Unit measures a Channel SWR level greater than the threshold “SWR Alert level” indicated by the correspondent configuration parameter.

The analog meter **red led** is lighted on, the power and swr figures are switched to a red color.

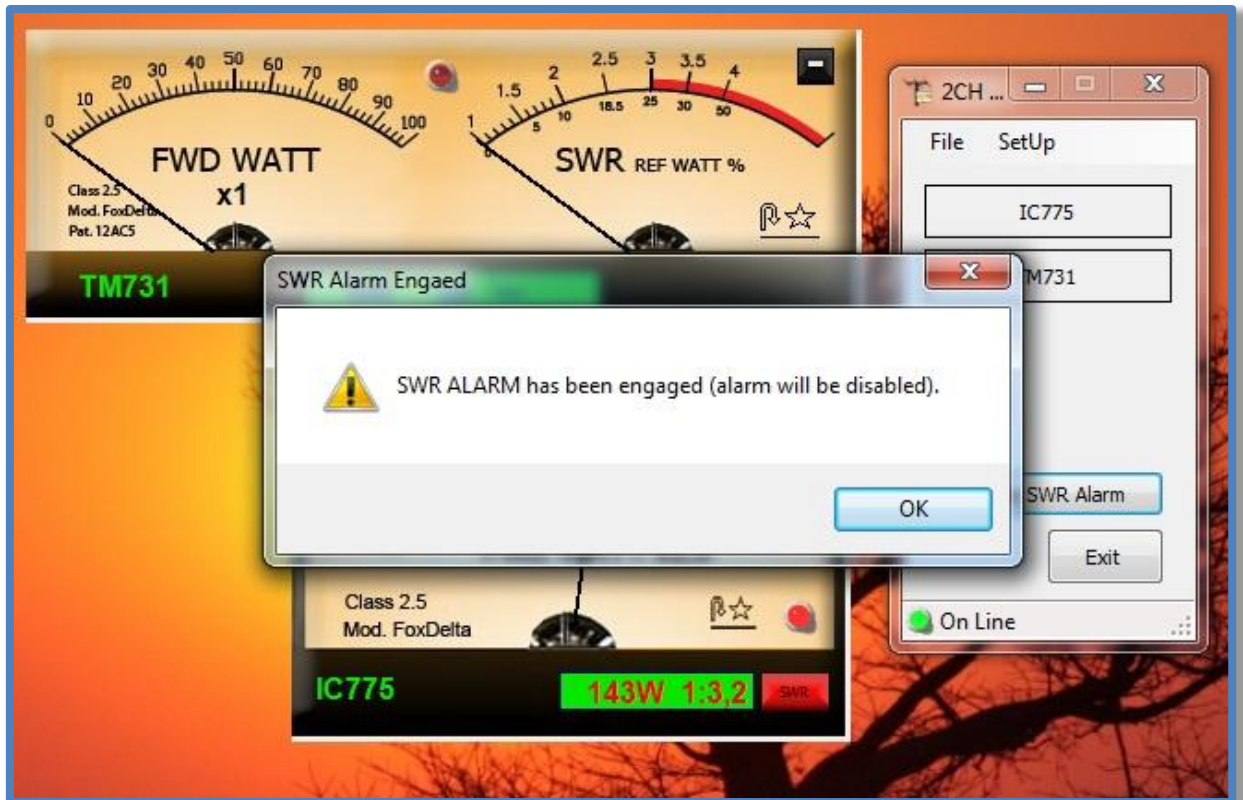


If the SWR Level returns under the threshold the **led is switched off**.

This “visual” **warning can be improved by an additional alert system** activated selecting one of the available modes on the “General” configuration panel.

A new button “Disable/Enable SWR Alarm” of the Main Window will indicate that this additional alert system is activated, allowing to temporary disable/enable this feature.

When enabled, if the program detects that an “High SWR Level” is continuously reported by the LCD Unit during the interval of time “SWR Alarm Delay” (see configuration panel), the alarm is engaged and the selected action is executed.



Depending on the selected mode, the Alarm System will be disabled or time resetted and new cycle started.

2.6 Data collection

This feature collects data from the LCD Unit and generates a file that can be imported in any spreadsheet (like Microsoft Excel or OpenOffice Calc) able to read the CSV file format.

The “Data collection” is activated clicking the button “LOG” of the main window, the blinking **GREEN led** that point out the LCD/PC link activity, switches to the **YELLOW** color during the data acquisition time.

A record will be appended to the log file each time data are collected from the LCD unit, the reading period can be adjusted (see the tab “Data Log” of the SetUp menu).

The name of generated file is “**SwrMeter.csv**”, the path can be initialized from the configuration menu.

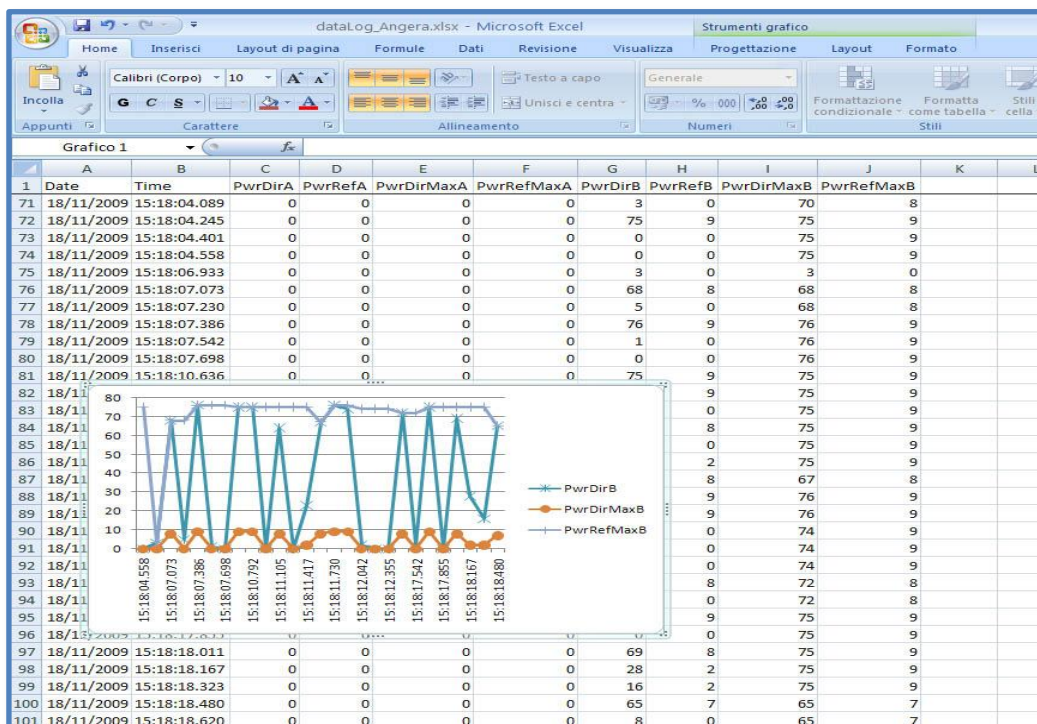
If the option “Clear data file” is enabled, the contents of the file will be cleared before starting a new session of data collection. On the contrary, if option “Clear data file” is disabled new data are appended at the end of the existing ones.

“No zero power” allows to collect data only if a power level greater than the minimum (Min Pwr Read) is detected.

The record layout is :

“DateTime”, “PwrDirA”, “PwrRefA”, “PwrDirMaxA”, “PwrRefMaxA”, “PwrDirB”, “PwrRefB”, “PwrDirMaxB”, “PwrRefMaxB”.

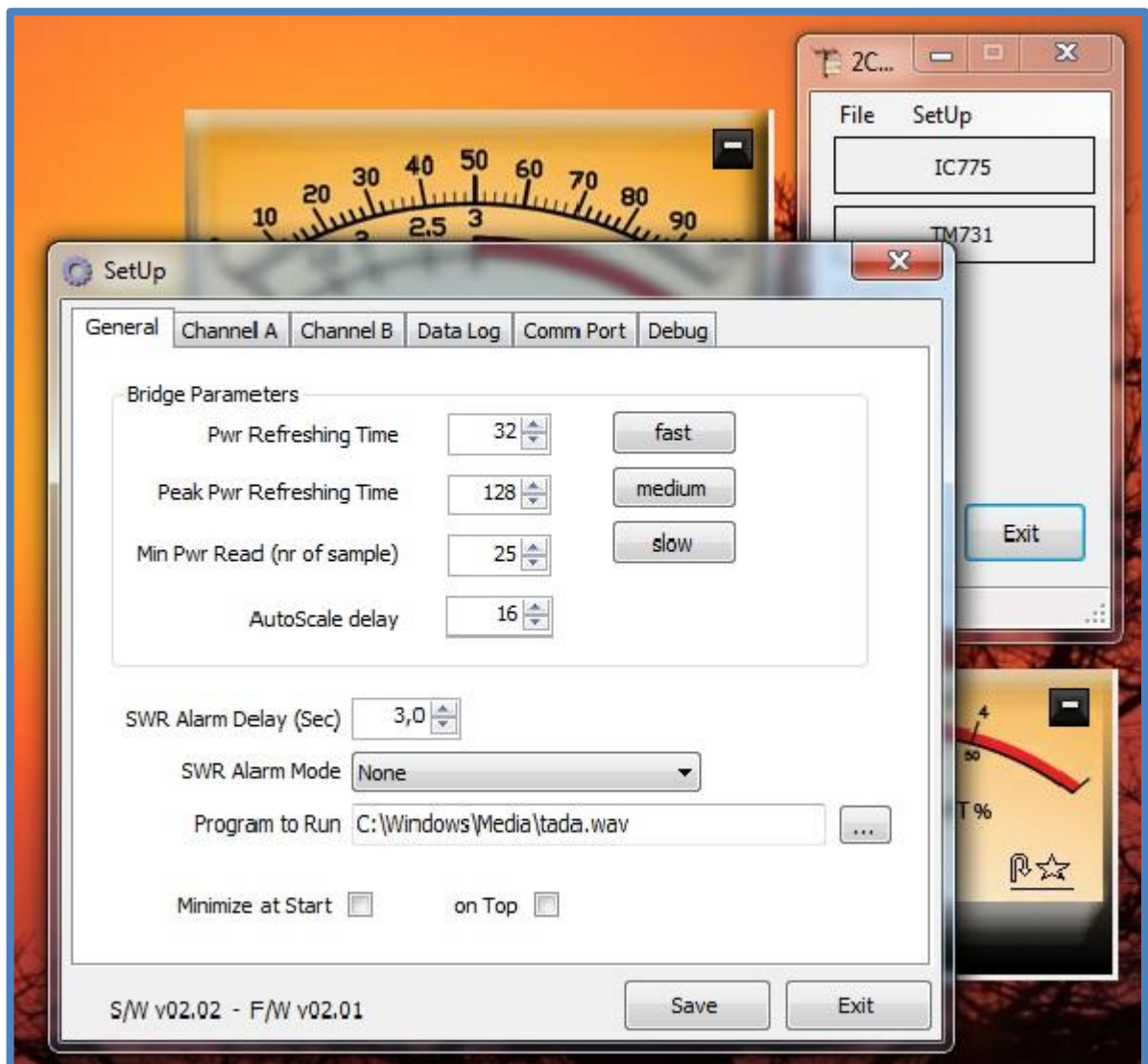
Following figure is an example of the analysis that can be done importing data into Microsoft Excel.



2.7 Configuration

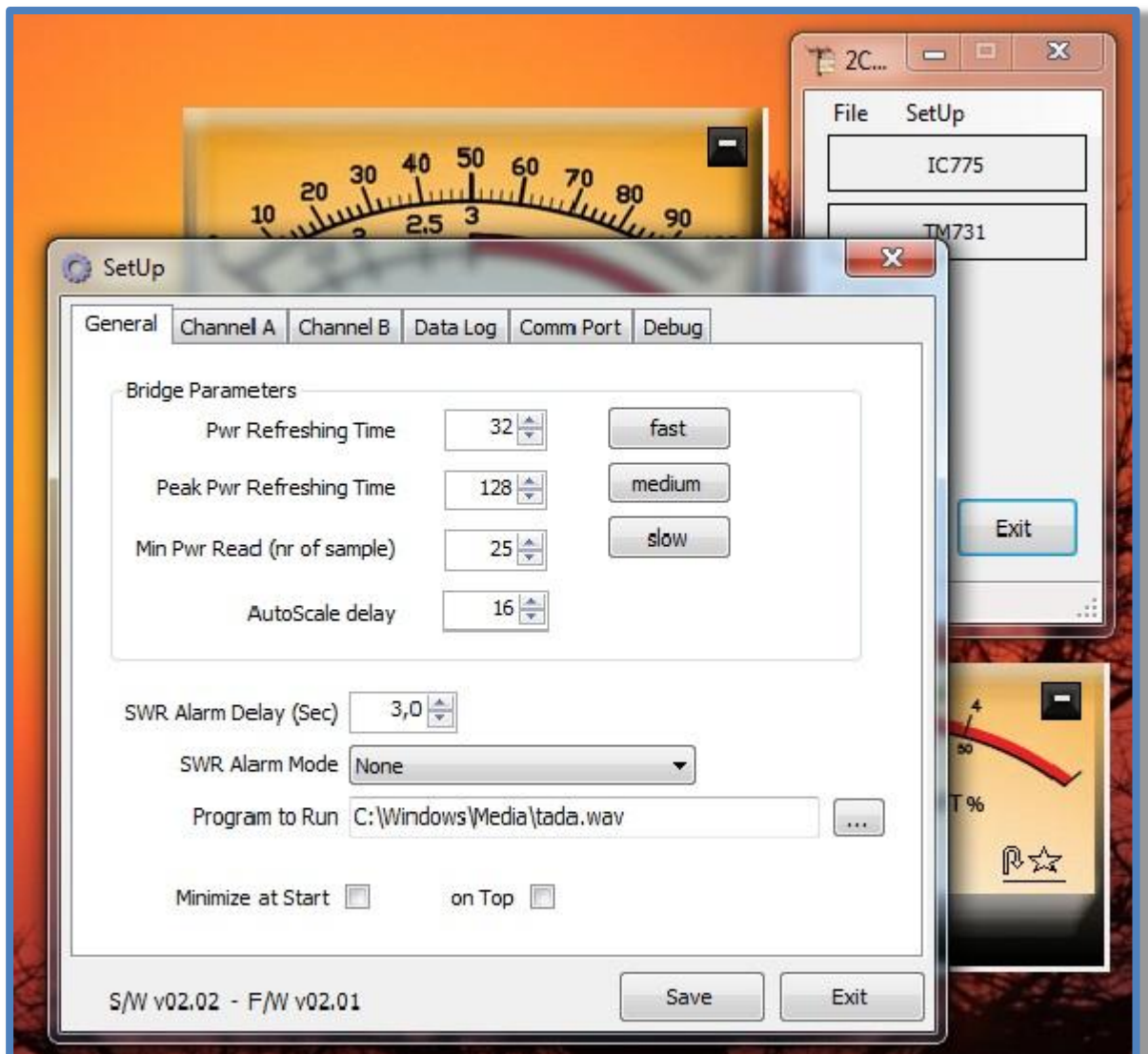
The configuration panels are activated by the “SetUp” menu.

Fields surrounded by the frame “**Bridge Parameters**” are referring to the LCD Unit, **these parameters can be modified only when the LCD Unit is connected and on line**. Button “Save” updates the “Bridge Parameters” only on this condition. When the LCD Unit is off line, these parameters are initialized to the default values.



2.7.1 Configuration : General

The parameters shown by the panel “**Bridge Parameters**” are read at the program startup from the LCD Unit, these parameters **can be modified only when the LCD Unit is connected and on line**. If the LCD Unit is off line, these parameters are initialized to the default values.



Bridge parameters

- **Pwr Refreshing Time:**
This value determines the amount of delay on the instantaneous reading of the LCD display. Three preset values can be selected by the “Fast”, “Medium” and “Slow” buttons to the right.
- **Peak Pwr Refreshing Time:**
This value determines the maximum “Hold” time for the display reading. Preset values are available by the “Fast” “Medium” and “Slow” preset buttons.

- **Min Pwr Read:**
This value determines the minimum number of samples necessary for the LCD Unit to compute the SWR. This value will affect the minimum amount of power required to make this calculation.
The three presets will provide default values, however, the lower values will provide better results.
- **AutoScale Delay:**
This value indicates the delay applied by the “AutoScale” routine before to switch from one scale to the second one. AUTO scale mode can be selected from the “Command” window.

SWR Alarm parameters

- **SWR Alarm delay:**
This value determines the amount of time the program waits before to engage the alarm when an “SWR Alarm” condition is detected from the LCD Unit. If the “SWR Alarm” condition terminates before this time expires, the program resets his waiting time.
- **SWR Alarm Mode:**
Use the drop-down arrow to select one of five modes:
 - Alarm disabled
 - One time Windows message
 - Repetitive Windows message (max 10 repeats)
 - User program one time executed
 - User program repetitive execution (max 10 repeats)
- **Program to run:**
Enter here the path and the file that will be executed if the option “User Program ... “ is selected.

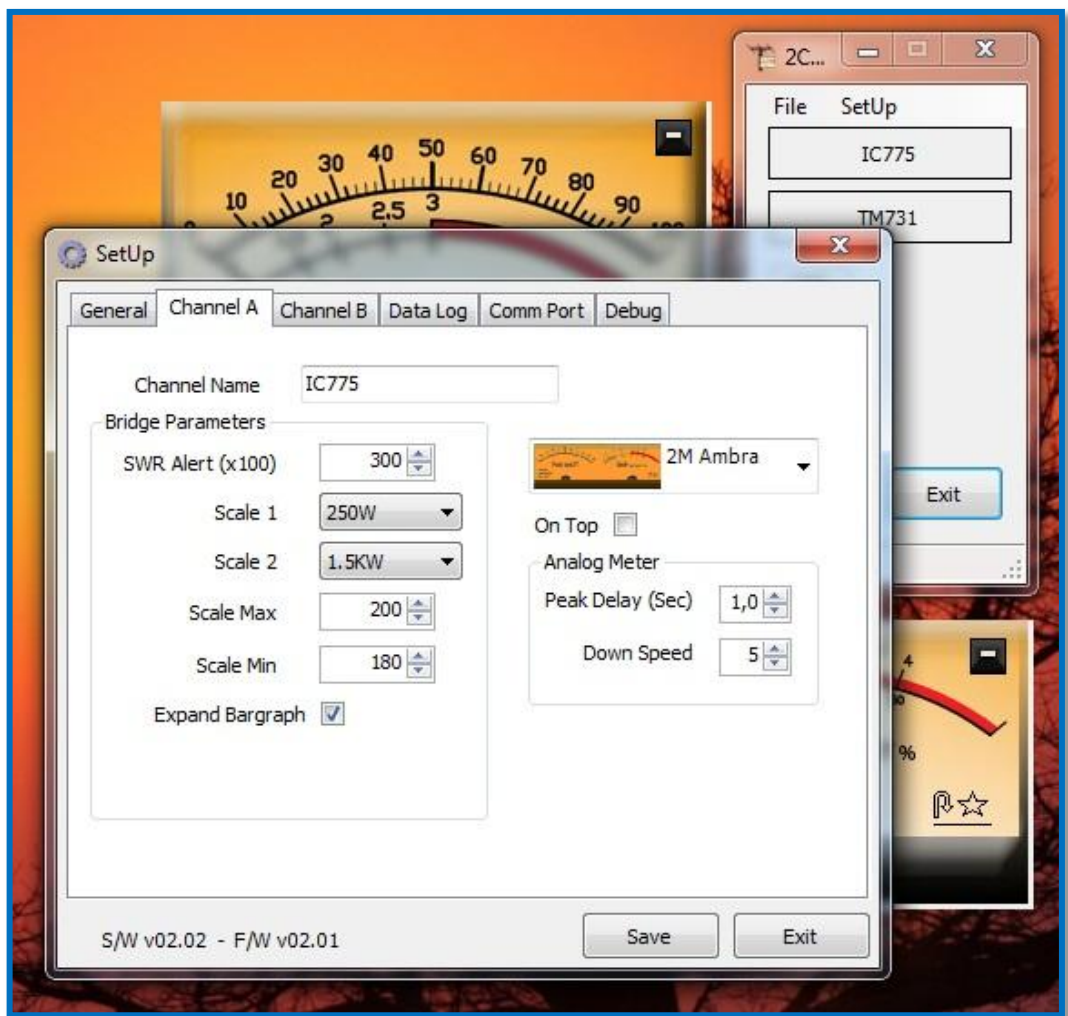
Main window

- Minimize at start
- On Top

2.7.2 Configuration: Channels A and B

The parameters shown by the panel “**Bridge Parameters**” are read at the program startup from the LCD Unit, these parameters **can be modified only when the LCD Unit is connected and on line**. If the LCD Unit is off line, these parameters are initialized to the default values.

Channel A and Channel B can be configured each one on a different style.



Channel Panel Parameters

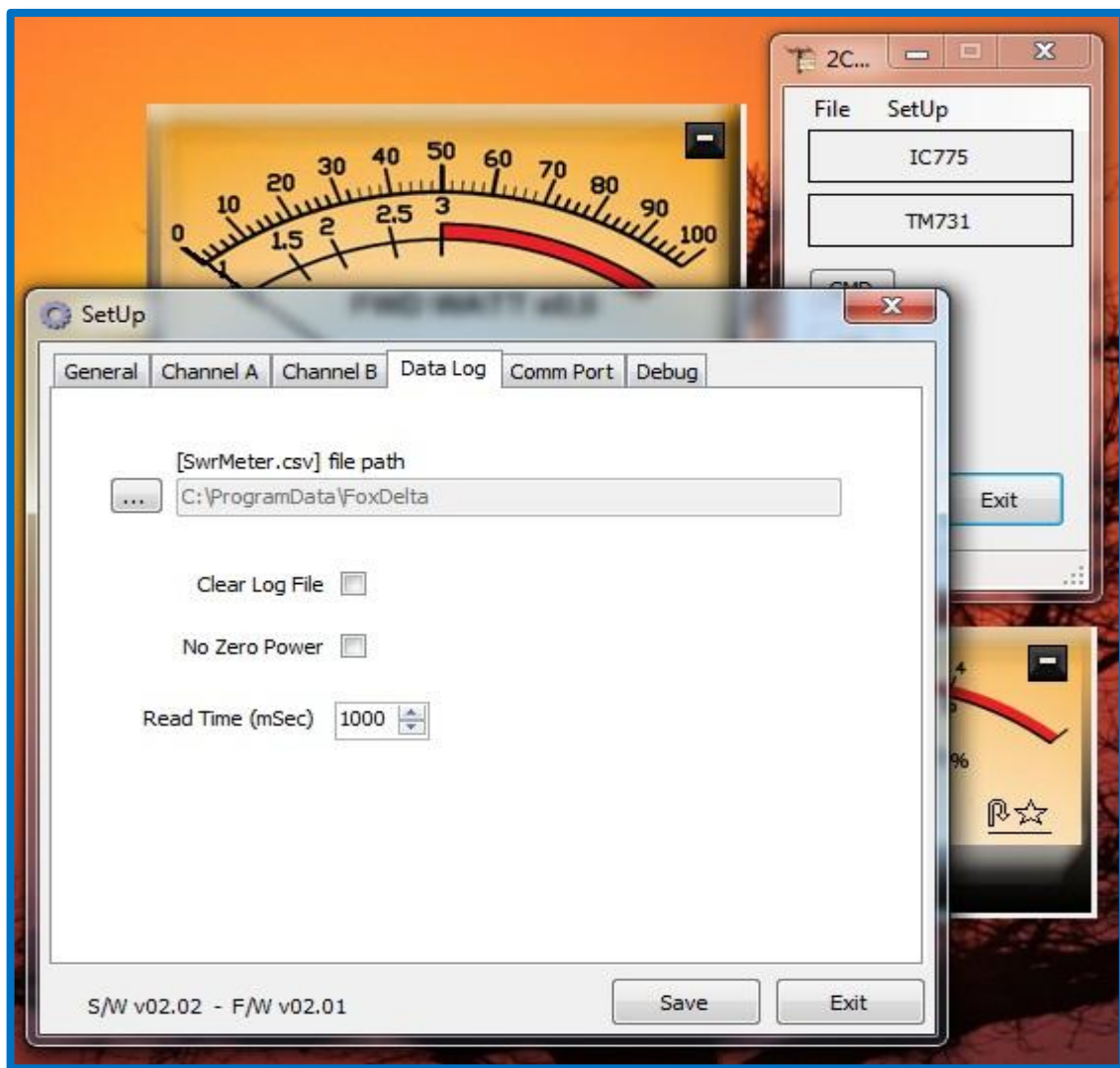
- Channel Name:
This is the description shown by the graphical interfaces to identify the channel.
- Meter Style:
Use the drop-down arrow to select one of the possible modes.
- Peak Delay:
This is the time how long the red needle stay on max power when a peak is detected.

- Down Speed:
This value adjust the speed of the black and red needles when moving down to zero. The value "0" remove any control over the needles motion.
- On Top:
Brings the Channel Panel on top of any window.

Bridge Parameters

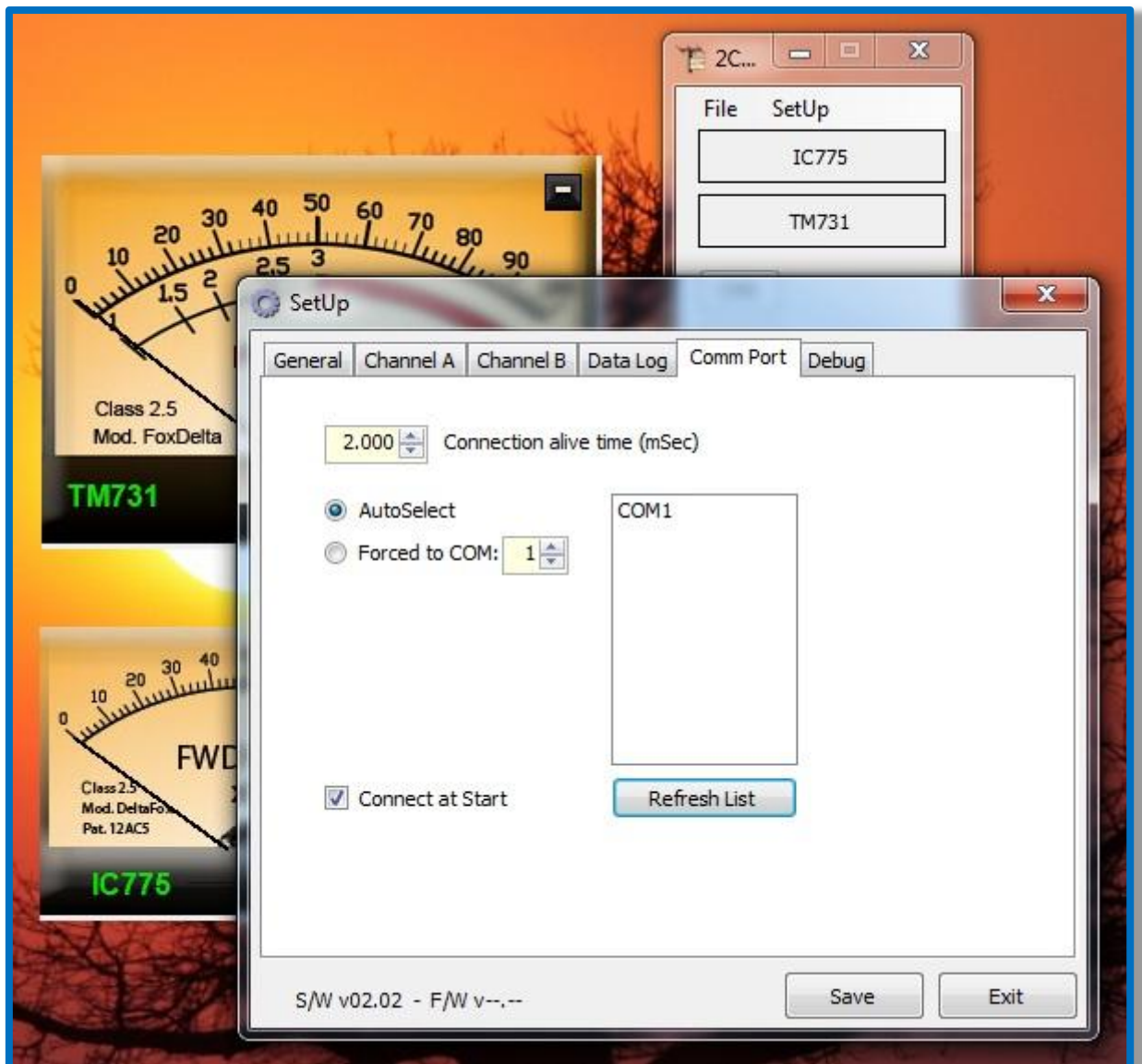
- SWR Alert level:
This adjustment allows to set the maximum SWR value that will be indicated before "SWR HIG" is displayed on the LCD Display and the Alarm on the Main Windows is engaged. (Ie. 300 = a SWR of 3:1 and 200 = 2:1).
- Wattmeter Scale1:
When using the dual range sensor board, this is the low power scale, and should probably be set to a lower scale than Wattmeter Scale2. Use the drop-down arrow to select the desired scale. Ie: 100W
- Wattmeter Scale2:
When using the dual range sensor board, this is the "High Power" scale that will be switched to when the power on Wattmeter Scale1 is exceeded. (Ie: 1000W).
- Scale Max:
When using the dual range sensor board and the AUTO scale function, if the input power is greater than this value the wattmeter scale switches from Scale1 to Scale2. (Ie Scale 1 = 100W, Scale2 = 1KW, till power is < 90W Scale1 is selected, if > 90W Scale2 is automatically selected). AUTO scale mode can be selected from the "Command" window
- Scale Min:
When using the dual range sensor board and the AUTO scale function, if the input power is less than this value the wattmeter scale switches from Scale 2 to Scale1. (Ie Scale 1 = 100W, Scale2 = 1KW, being the wattmeter measuring in Scale2, untill power is > 75W Scale2 remains selected, if < 75 Scale1 is automatically selected). AUTO scale mode can be selected from the "Command" window
- Expand bar graph scale:
If enabled, when the input power is less that the 25% of the full scale value, the bar graph, will expand to the full scale. This allows a better measure at low power level.

2.7.3 Configuration: Data Log



- “file path”:
This is the path of file “SwrMeter.csv” generated by the data collection feature. The filename “SwrMeter.csv” can not be edited.
- “Clear Log File”:
if selected, will clear the file before starting the data collection, unchecked will append data to the already existing records.
- “No zero power”:
allows to collect data only if a power level greater than the minimum (Min Pwr Read) is detected.
- “Read Time”:
This value indicates the interval a record is appended to the file.

2.7.4 Configuration: Communication Port



- “Connection alive time (mSec)”:
This parameter is not used.
- “AutoSelect” and “Forced to COM”:
If “AutoSelect” is checked the program at start, attempts to connect at first the LCD Unit on the last used serial port. If no LCD Unit is detected here, program goes through the list of the installed and available serial ports, searching again. If “Forced to COM” is selected, program skips the port list and tries to connect the LCD Unit on the port indicated by the next field.
- “Connect at Start”:
forces the program to search and connect the LCD Unit at start.