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# Willtek 8300

## Griffin Fast Measurement Receiver



user's guide

Griffin Front Panel Software version 15.0



## WARRANTY

**HARDWARE:** Willtek Communications warrants its hardware products to be free from defects in workmanship and materials, under normal use and service, for one year from the date of purchase from Willtek or its authorised agent. Willtek certifies that all instruments are tested and inspected to comply with the published specifications originating from the company.

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All information in this manual is given in good faith. However, Willtek Communications shall not be liable for any loss or damage whatsoever arising from the use of this manual, the product described in it or any errors or omissions in either.

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## INTRODUCTION

Thank you for choosing Willtek Communications and allowing us to support your measurement needs.

The Griffin range of receivers from Willtek Communications are rugged, portable instruments designed for high-performance and ease of use. The receivers use a PC to provide the all of the usual receiver controls as well as a range of advanced display formats. These are provided by a software package, known as the Griffin Front Panel Software, which must be loaded onto a PC before you can use the Griffin.

Thanks again for choosing Willtek Communications products. We think that you will find your Griffin a pleasure to use and an exciting addition to your portfolio of instruments.

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### ABOUT THIS MANUAL

This manual covers using the 8301/8302 Griffin Fast Measurement Receiver, the 8381 Griffin UMTS Down Converter, the 8382 Griffin Up-Converter, and the Griffin Front Panel Software version 15.0. The manual is written in a 'how to' style familiar to users of Windows applications.

If you need more information about the interface protocol between the Griffin and the Front Panel Software, please contact Willtek Communications.

A companion document covering in detail the protocol operating between the Griffin hardware and the Front Panel Software is available on request as Willtek document number P4/2019.

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### INSTALLING THE GRIFFIN FRONT PANEL SOFTWARE

Before using the Griffin receiver you must install the Griffin Front Panel Software on a suitable PC. Refer to Appendix 1 for detailed instructions on installing the software.

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### CONTACTING WILLTEK

If you have any problems using the receiver you can contact Willtek either directly or via one of our representatives and we will do our best to help you. Our address and contact details are:

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Roebuck Place,  
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Chessington, KT9 1EU

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Email: support.uk@willtek.com  
www.willtek.com

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## **TROUBLESHOOTING**

Before you call Willtek, be sure to check the Troubleshooting Guide appendix to this manual and the Willtek web site for a solution to your problem.

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## **OPERATING ENVIRONMENT**

It is inadvisable to leave the receiver exposed to direct strong sunlight or low temperatures for long periods before making measurements. The receiver temperature may fall outside that given in the specification so causing the measurement accuracy to be impaired.

Only connect the mains supply inside buildings. The mains supply is not designed for outdoor usage.

## CONNECTING TO THE GRIFFIN

For use with the 8381 Griffin UMTS Down Converter or the 8382 Griffin Up-Converter, please check the section starting on page 12.

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### ANTENNA INPUT

The antenna should be chosen to suit the frequency band of the Griffin in use (800 to 1000 MHz or 1700 to 2000 MHz). It can be connected directly to the RF input connector or via a length of low-loss cable. The input is a conventional 50  $\Omega$  N-type.

A telescopic antenna is supplied with the Griffin. It is suitable for general surveying, but, for precision measurements, an antenna with a known antenna factor should be used.

---

### RS-232-C

Connect the Griffin to the COM port on the PC with the Null Modem cable supplied. The connectors are the same at both ends of the cable so it can be fitted either way around.

You can use a longer or shorter lead if necessary. It should have a 9-way D-type socket at each end and be wired:

- Pin 2 to Pin 3
- Pin 3 to Pin 2
- Pin 5 to Pin 5
- Shield to Pin 5 at each end.

---

### POWER CONNECTOR

#### DC Power Supply

You can connect the Griffin to the cigar socket of a motor car directly with the lead supplied. The DC input is designed for a nominal 12 V supply. Do not connect it to a vehicle using a 24 V supply.

You can use other sources of DC power such as a laboratory power supply. Refer to the Specifications section for the connections and voltage/current requirements.

#### Mains Supply

The Griffin is supplied with a universal mains power supply that needs no switch settings to be used on any common mains supply. It has exchangeable adaptors to allow it to plug into a variety of mains outlets.

Choose the right adaptor for your region and slide it onto the mains supply then plug the supply into a mains outlet.

To protect yourself from an electric shock, NEVER plug an adaptor into a mains outlet before it is securely fitted to the power supply.

Only connect the mains supply inside buildings. The mains supply is not designed for outdoor usage.

### **Internal Batteries**

There is no need to connect an external power supply to the Griffin as you can run it off its internal batteries for up to four hours.

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## **AUXILIARY CONNECTOR**

There is no need to connect anything to the Auxiliary connector in most applications. This connector has various signals to give the Griffin flexibility to meet special situations. Refer to the Specifications section for pin out and electrical details.

### **Remote On/Off**

This line can be used to turn the Griffin on or off remotely. When the line is grounded the Griffin will be on. You should leave the on/off switch on the Griffin in the Off position for the remote control to be able to turn the Griffin off.

This control will work whether the Griffin is powered from the external DC input or the internal batteries. If an external supply is connected to the battery charge pins then any internal batteries fitted will be charged.

### **Battery out**

This line provides power from the internal batteries to supply external accessories.

### **Detector Output**

This is an analogue output with a voltage proportional to the logarithm of the input signal level.

### **Sampling pulse**

This is an output pulse that is synchronized with the start of a measurement in the Griffin. It can be used to synchronize external instruments to the Griffin. It is driven from an open-collector transistor so to get an output voltage change, the output must be connected to a positive voltage via a resistor. The resistor value must be chosen to keep the maximum current less than 200 mA.

## **PULSE ENCODER CONNECTOR**

There is no need to connect anything to this connector in applications where the Griffin is not part of a Willtek survey system.

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## **IF OUTPUT CONNECTORS**

There are two IF Outputs on the Griffin, one for the in-phase and one for the quadrature components of the IF. You can use these to fit external demodulators to the Griffin. You should not connect anything to these connectors unless they are being used.

---

## **EXTERNAL REFERENCE CONNECTOR**

The External Reference connector can act as an input or an output. You can use it to synchronize the synthesizers in the Griffin with those in other test equipment. You should not connect anything to this connector unless it is being used.

---

## **LED INDICATORS**

### **Front Panel**

The Griffin has a single red LED on the front panel to show the state of the power supply. When operating from normal supplies it will be on continuously.

When operating from the internal batteries the LED will flash to indicate when the batteries are running low. It will start to flash slowly when there is less than about 15 minutes power remaining in the batteries. The rate of flashing increases when the batteries have reached their minimum allowed voltage.

### **Battery Panel**

The LEDs associated with the two batteries show the status of the batteries.

Off – No battery connected.

Green – The battery has some charge in it and could be used. (It needs not be fully charged).

Red – The battery is in use.

Orange – The battery is being charged.

When both batteries are very fully charged the LEDs might flash for a period before settling down. This is normal and does not indicate a fault.

## **BATTERIES**

The Griffin is fitted with two batteries each able to run the receiver for about two hours. The receiver continuously checks the voltages on the batteries and the DC input and automatically switches between them. The DC input is used if it is connected. If there is no DC input then the battery with less charge is used first. Once this battery is emptied the Griffin switches to the other battery.

The batteries as shipped by Willtek will normally be very low on charge so you will need to charge them before you can use them.

Since the receiver checks the voltages continuously, you can plug or unplug the DC input or remove or fit batteries with no interruption to the receiver operation. You must be careful, however, when both batteries are running very low as the receiver might not be able to switch to a battery which is nearly empty.

If you need to change the batteries when both are very low then:

- First change the battery which is not in use for one which has plenty of charge in it.
- Next change the battery which is in use.

### **Fitting and Removing Batteries**

To fit a battery simply push it into an empty socket until the retaining clip clicks into place.

To remove a battery push the retaining clip sideways to release it and then allow the spring to push the battery end out of its socket. You can then pull the battery completely out.

### **Charging the Batteries**

The Griffin is fitted with sophisticated charging circuitry able to recharge both batteries in about four hours. To charge the batteries inside the Griffin, simply supply the Griffin with DC power using either the DC power supply or the mains supply (see page 7).

Charging is indicated by a Green LED adjacent to each battery. Once the fast charging has finished the batteries are trickle-charged to maintain them in good condition.

For safety reasons, do not charge the batteries in an outdoor environment.

### **Care of the Batteries**

Each Griffin battery contains five NiMH cells. They are protected against over-current and short circuits but it is still advisable to treat them with care.

All rechargeable batteries have a limited lifetime. The life of your Griffin batteries can be enhanced by treating them with care.

**Do Not**

- expose the batteries to extremes of heat or cold.
- continue to use a battery once it is fully discharged. The Griffin will give you warnings through the software and by flashing the front panel LED when the batteries are running low. It is up to you to turn it off or change the supply.
- Use a battery for anything other than in a Griffin.
- short-circuit a battery.

**Do**

- run a battery right down and then recharge it. Batteries tend to lose their capacity if not used so occasional complete discharge and recharge cycles help to maintain them.
- power the receiver from the mains and leave the batteries in and the receiver turned on overnight. This will charge the batteries fully and then the long period of trickle charging helps to even any differences between the cells in each battery.
- replace the batteries when they reach the end of their lifetime and their capacity falls.
- store batteries carefully so that they cannot be accidentally short-circuited.
- dispose of old batteries carefully

## CONNECTING DOWN OR UP CONVERTERS TO THE GRIFFIN

The capabilities of the 8301 Griffin can be used in other bands as well. With the addition of the 8381 Griffin UMTS Down Converter, measurements in the frequency band from 2000 to 2200 MHz can be taken. And the 8382 Griffin Up-Converter allows for measurements in the range from 300 to 400 MHz.



### Connecting the 8381 Griffin UMTS Down Converter

The 8381 Griffin UMTS Down Converter turns the Willtek 8301 Griffin Fast Measurement Receiver into a measuring device for the UMTS band. The Griffin with the UMTS Down Converter is wider than without the converter and has four additional connectors (from top to bottom):

- an N-type antenna connector (UMTS RF In),
- an N-type RF connector to connect the UMTS Down Converter to the Griffin (RF Out),
- a Lemo-type Auxiliary connector and
- an SMA reference oscillator input (Ext.Ref.).

If you want to use the Griffin in the frequency range from 2000 to 2200 MHz:

1. Ensure that the RF connector of the Griffin is connected to the RF out connector of the converter module at the right-hand side. Use cable 382 826.
2. Use cable 384 896 to connect the Auxiliary connector on the Griffin front panel to the Auxiliary connector at the module to the right-hand side.
3. The Ext.Ref. output of the Griffin must be connected to the Ext.Ref. input of the converter module with cable 382 828.
4. Fix the antenna at the UMTS RF In connector of the converter module.



5. Follow the instructions on page 23 to set up the Griffin Front Panel Software.

### Connecting the 8382 Griffin Up-Converter

The 8382 Griffin Up-Converter turns the Willtek 8301 Griffin Fast Measurement Receiver into a measuring device for the frequency range from 300 to 500 MHz (TETRA, CDMA-450). The Griffin with the Up-Converter is wider than without the converter and has four additional connectors (from top to bottom):

- an N-type antenna connector (300 to 500 MHz RF In),
- an N-type RF connector to connect the Up-Converter to the Griffin (RF Out),
- a Lemo-type Auxiliary connector and
- an SMA reference oscillator input (Ext.Ref.).

If you want to use the Griffin in the frequency range from 300 to 500 MHz:

6. Ensure that the RF connector of the Griffin is connected to the RF out connector of the converter module at the right-hand side. Use cable 382 826.
7. Use cable 384 896 to connect the Auxiliary connector on the Griffin front panel to the Auxiliary connector at the module to the right-hand side.
8. The Ext.Ref. output of the Griffin must be connected to the Ext.Ref. input of the converter module with cable 382 828.
9. Fix the antenna at the 300 to 500 MHz RF In connector of the converter module.
10. Follow the instructions on page 23 to set up the Griffin Front Panel Software.

### Disconnecting a Converter

If you want to use the Griffin in the original frequency range from 800 to 1000 MHz:

1. Ensure that the Antenna connector of the Griffin is disconnected from the respective connector of the converter module at the right-hand side.
2. Disconnect the Battery out connector on the Griffin front panel from the Battery connector at the converter module.
3. Fix the antenna at the antenna connector of the Griffin (on the left-hand side).
4. Follow the instructions on page 24 to set up the Griffin Front Panel Software for normal band operation (800 to 1000 MHz).

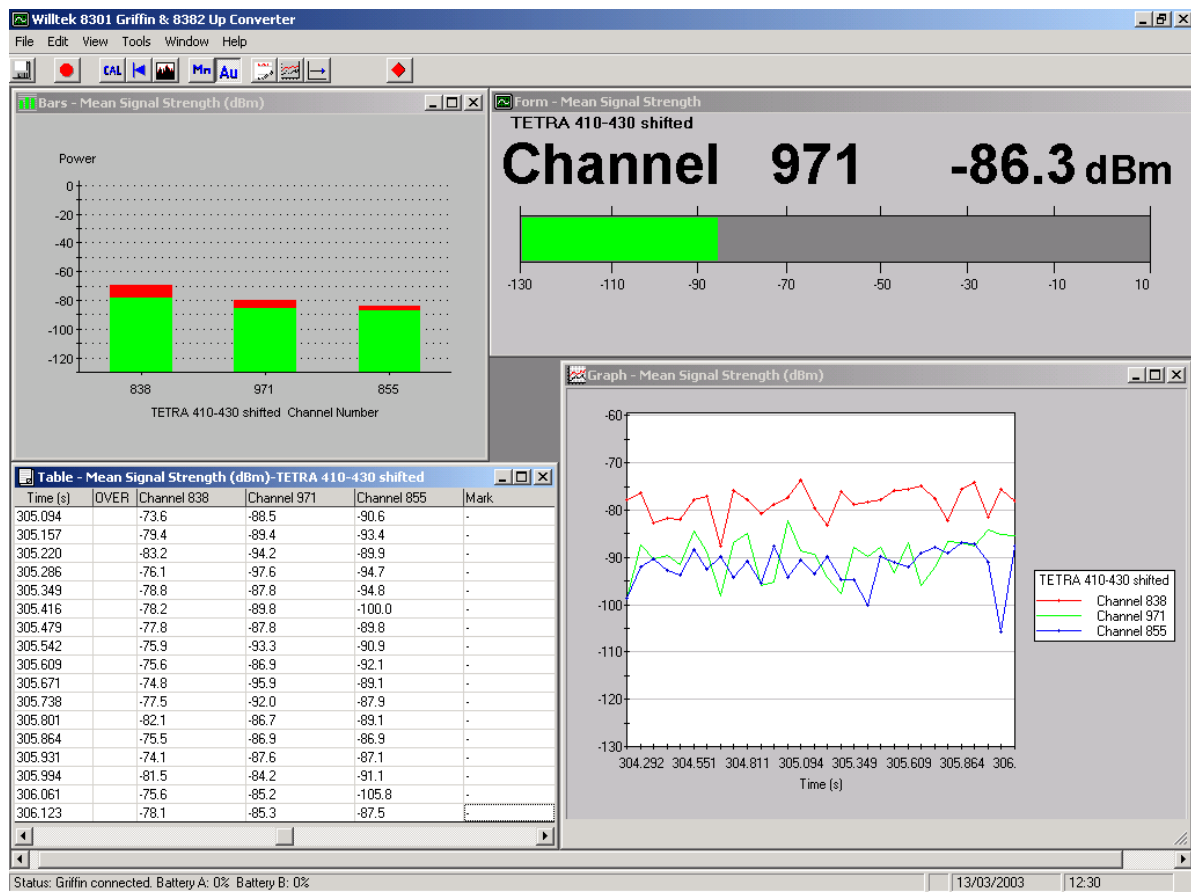


## USING THE GRIFFIN

This chapter explains how to operate the Griffin with the Griffin Front Panel Software. For instructions how to install the software on your PC, please refer to Appendix 1.

Connect a free serial port (COM port) of the PC to the Griffin using the RS-232-C cable supplied with the Griffin.

On your PC, start the Griffin Front Panel Software to operate the Griffin as explained below. See page 21 to ensure proper settings for the communication between the Griffin and the PC.



## STATUS BAR

The current status of the Griffin is normally shown on the status bar at the bottom of the window. You can turn the Status Bar off and on, turn off by ticking or unticking Status Bar on the Views menu.

## Searching or Connected

When the Front Panel Software is connected to the Griffin hardware it will display 'Looking for Griffin ...xxBaud' and, once a reply is received from the Griffin, 'Griffin Connected'. The software searches through all of the possible baud rates of the Griffin, starting with the last one used.

If the connection is lost, the status bar will briefly display 'Griffin connection failed'.

## Battery Capacity

The remaining capacity of both batteries is shown running from 0 to 100%. This is only an indication of capacity and should not be taken as precise. The actual capacity remaining will depend on the health of the battery, the temperature and the measurements being performed by the receiver.

Although the capacity is displayed as 0 to 100%, the receiver only reports 16 separate battery capacities. This means that the displayed capacity will change in jumps of about 6% rather than continuously.

## Warnings on the Status Bar

You will see certain warnings appear on the status bar from time to time. These warn of situations that do not stop the receiver from operating but will result in lost or incorrect data. You must correct the problem to make good measurements.

## Underrange and Overrange

Under- and overrange warnings refer to the signal that you are trying to measure. They should not be confused with an overload warning which might be caused by a signal at any frequency at the input to the receiver.

The Griffin has an instantaneous dynamic range of 80 dB. If the signal being measured falls below or above the range then it is reported as under or overrange.

When autoranging is enabled in the Griffin it will try to adjust the receiver to suit the dynamic range of the signals being measured. Very wide dynamic range signals will still cause occasional under/overrange warnings.

If you have a signal that varies over more than 80 dB you could choose to ignore occasional under/overrange warnings. No harm will be caused by signals out of range signals but obviously they cannot be measured.

When you have chosen to fix the range in the Griffin you must then decide whether to change the range to avoid too many under/overrange warnings.

You will not get any under/overrange warnings when making Histogram, AFD or LCR measurements. Histograms ignore any under/over range readings, simply reporting the readings that are in range. AFD and LCR measurements only look for crossings of the threshold level set and treat under/overrange readings as being low or high levels.

### **Overload**

An overload warning is very serious. It indicates that the total power within the RF band of the receiver is so great as to overload the receiver. This is often caused by one or two very high level signals. It will cause the input circuits of the receiver to become non-linear and might produce spurious signals or change the level of real signals.

Note that the receiver need not be tuned to a high-level signal. The overload detector is connected to the front of the receiver and is sensitive to signals over the whole 200 or 300 MHz RF bandwidth and even ones just outside the band.

If you have autoranging enabled then the receiver will add attenuation at its input to try to reduce the power at the input circuits. If the maximum attenuation of 30 dB is not sufficient to remove the overload then the environment is beyond the capability of the receiver to measure without some help.

If you have chosen to fix the receiver's range then you will have to increase the attenuation until the overload is removed.

If 30 dBs of attenuation is not enough to remove the overload then you will need to add an external circuit to reduce the total power at the input of the Griffin. If the high-power signal is the one you are trying to measure or if it is very close to it then you will have to add an external attenuator. If the high-power signal is a long way from the one you wish to measure you might be able to use an RF filter to reduce it whilst not affecting the signal you wish to measure. You might need to experiment to find the best solution in any particular situation.

The Griffin can be used to indicate the frequencies of high-level signals that are in-band but any level measurements will be inaccurate.

### **Synthesizer out of lock**

This message indicates that the synthesizers in the Griffin hardware are not working properly. This could be due to a poor external reference source or a fault in the hardware of the Griffin.

If you are using an external reference then try switching to the internal reference. If the fault goes away then the problem lies with the external reference. Check the connections to it and perhaps check that its output meets the Griffin's specifications.

If you are using the internal reference and the fault persists then you must return the Griffin to Willtek for repair.

### **Baud Rate too low**

This message means that the Baud Rate you have chosen is too low to allow all of the results to be passed to the PC. It means that some results are being lost. This might not be important if you are simply viewing the results on the PC screen but would mean that you are losing results if you are logging them to a file. To resolve the problem:

- Check that you are using Binary mode as this is able to carry more results.
- Try to increase the Baud Rate to the maximum that the PC is able to support.
- Reduce the number of results to be sent by increasing the Measurement Period or introducing a Pause Time after each Measurement.

This message will not appear when you first start the measurements as the Griffin hardware has a buffer of 64,000 characters and the message will only appear when this buffer is full.

### **Other problem messages**

There are some other problem messages that can appear and which usually mean a problem with the Griffin hardware. If you see any other Problem messages please refer to Willtek for help.

## **Problem Reports**

Some Problems are so serious that the measurements cannot be continued. In these cases the Griffin Front Panel Software brings up a dialog box to explain the problem and stops communicating with the Griffin hardware.

### **Lost Connection with the Griffin**

The software polls the Griffin every 10 seconds for its status information and if it does not get a reply to the poll then it displays this dialog box. Once you click OK, the software tries to reconnect to the receiver. Once the connection is restored the receiver will be re-programmed with your settings and the measurements will resume automatically.

To resolve the problem first click on OK then check that the Griffin still has power and then that the RS-232-C (serial link) connectors are still firmly in place. The Status bar will show 'Looking for Griffin' and 'Griffin connection failed' messages until the connection is restored.

This message can be seen on some PCs when switching between the Griffin Front Panel Software and other applications. The solution is to avoid running other applications while using the Griffin.


### Software Problems

The Griffin Front Panel Software is able to recover from many problem situations without any help. Under rare conditions it encounters a problem that it cannot overcome. It will display a dialog box to describe the problem and then the software will stop. Please refer to Willtek for help.

---

## FEATURES IN BOTH MANUAL AND AUTOMATIC MODES

### Opening and Saving Settings

You can save and recall all of the settings you have made in the Software. In the File menu choose Save Settings or Save Settings As to save the current settings. Alternatively press the  button on the toolbar. Choose Open Settings to restore saved settings. These files have an extension of .SMR.

When you shut-down the software it saves all of the settings and restores them when you next start it.

### Changing Mode

You can change between Manual and Automatic mode in any of three ways.

- Press either the Manual Mode or Auto Mode buttons on the toolbar.
- Click on the Manual Mode item in the Edit menu.
- Open a setting file in the required mode.

### Display modes

The Front Panel Software can be run in frequency or channel display modes. In frequency mode all frequency information is displayed and entered in either MHz or kHz. This is the default mode. In channel mode frequency information is entered as a channel number. This channel number is related to the frequency by the channel definitions. Willtek supplies some definitions and you can create your own. To change the display mode click on the Options item on the Tools menu. Then choose the required display mode from the Channel definitions box. For more information see Channel Definitions.

## Improving the Accuracy of Measurements

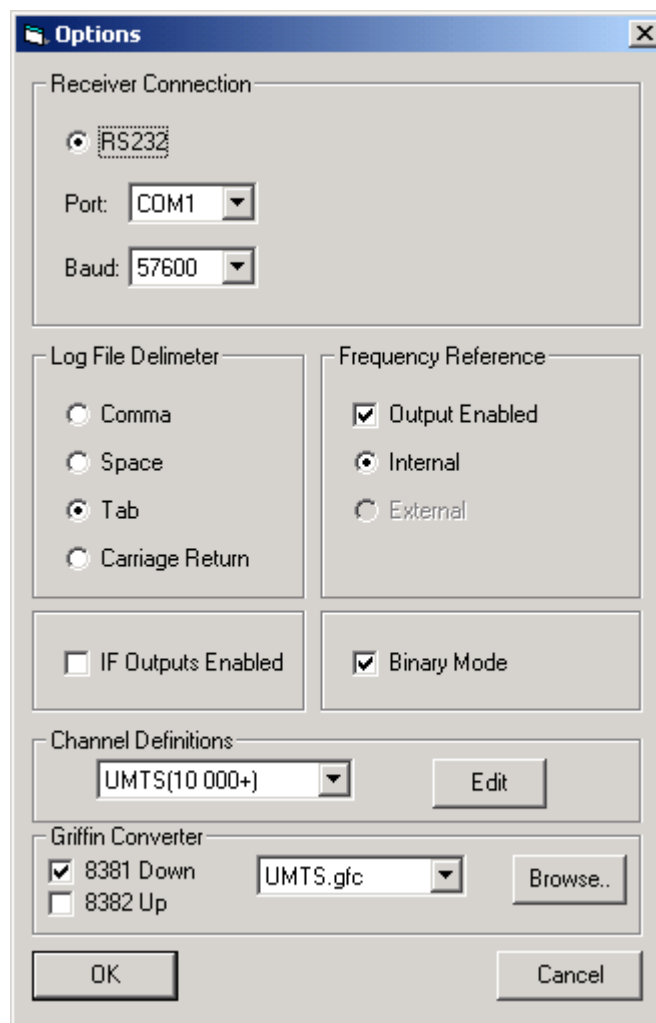
The Griffins feature sophisticated algorithms to correct for most imperfections in the receiver. To provide optimum accuracy over variations in temperature and over the extended period between calibrations the receiver contains a built-in reference source. To get the best precision from the receiver you should click on the 'Self-Correct' button or choose Self-Correct from the Tools menu before making measurements.

It is not necessary to do the self-correction to make measurements but the receiver is only guaranteed to be within specification after the self-correction measurements are made.

It is best to remove the antenna from the receiver while doing the self-correction measurements to avoid a strong signal from interfering with them.

The results of the self-correct measurements are kept until the receiver is switched off or reset. Simply changing the measurement mode or settings will not lose them.

## Setting Options





The Front Panel Software has various options that you can use to adjust how it operates. These options are recalled the next time you run the Software. To change the options choose Options from the Tools menu. This will give you a dialog box which has six sections as follows.

### **Receiver Connection**

This contains two boxes, one to let you choose the serial port (COM1, 2, 3 or 4) and the other to set the baud rate from 2400 to 57,600. These settings will be used as soon as you click on OK.

If a Griffin is connected then the baud rate of the Griffin will be changed as well. The Griffin will be reset so will lose the results of any self-correct measurements made. The Griffin will remember the new baud rate even when turned off.

Reducing the baud rate reduces the amount of data that can be sent from the Griffin to the PC. You can very easily end up with the receiver producing more data than can be sent if you reduce the baud rate from the default of 57600. You are strongly recommended to use the highest possible baud rate and only to reduce it to overcome problems within the PC or the serial connection.

### **Log File Delimiter**

When the data are logged to a file, each item is separated by a character. This option allows you to choose which character Comma, Space or Tab is used. Many programs, such as Excel, can use any of these characters as a separator so it does not matter which you choose. Some programs, however, need a specific separator. You should check which is the best option before logging a lot of data.

### **Frequency Reference**

The Griffin has an internal precision 10 MHz crystal reference, which is used to tune the receiver. You can use this reference as an output from the receiver to ensure that other equipment is tuned to precisely the same frequency. Alternatively you can connect your own 10 MHz reference to the receiver which will then use it instead of the internal one. The reference needs CMOS/TTL levels and is ac-coupled within the Griffin.

Note that when the receiver is corrected in the factory any error in this reference is measured and recorded in the receiver. This error is used to compensate for the error when the receiver is tuned. This means that measuring the accuracy of the 10 MHz reference does not measure the accuracy of the tuning of the Griffin.

When the reference input or output is turned on the error compensation is disabled to avoid any difference in tuning between the Griffin and external equipment.

To enable the reference output click on Output Enabled. This will disable the External reference input below since you cannot have the reference as both an output and an input at the same time.

To use an external reference, first ensure that the Output Enabled check box is cleared then select External. Connect a low-noise CMOS/TTL level reference to the reference input. If the Griffin is not able to use the external reference for any reason you will get 'Synthesizer out of Lock' messages.

### **IF Outputs Enabled**

To turn on the two IF outputs check this box. Leaving them off saves power when operating from batteries.

The outputs are the in-phase and quadrature components of an image reject mixer at 10.7 MHz. The effective bandwidth is far wider than the 15 or 200 kHz IF filters. To use these apply to Willtek for technical details of the circuitry necessary.

### **Binary Mode**

The data can be passed over the RS-232-C link in a form that you can read or in a form that only a PC can read. Binary mode can only be read by a PC. It has the advantage of reducing the amount of data that needs to be transferred over the RS-232-C link. You are recommended to use binary mode unless you are using a connection between the Griffin and the Front Panel Software that cannot handle binary data.

### **Channel Definitions**

This option allows you to choose how frequency information is input and displayed by the Griffin Front Panel Software. A wide range of standard channel definition files is delivered with Griffin Front Panel Software.



If you choose the Frequency option then all frequency information will be in MHz or kHz. If you choose the channel option then all frequencies will be represented by a channel number.

To inspect or edit the channel definitions press the Edit button. You can also edit the channel definitions by choosing the Edit menu followed by Channel Definitions.

### **Editing Channel Definitions**

This displays the channel definitions already entered and permits you to delete or add entries. Each channel definition has the following six parameters.

- Definition – This is the name of the channel definition. This must be unique.
- Low Channel Number – This is the channel number of the lowest frequency.
- High Channel Number – This is the channel number of the highest frequency. This must be greater than the Low Channel Number.
- Low Frequency – This is the frequency in MHz corresponding to the Low Channel Number. It must be within the frequency range of the Griffin being used.
- High Frequency – This is the frequency in MHz corresponding to the High Channel Number. It must be within the frequency range of the Griffin being used. This can be left blank as it will automatically be computed from the other data.
- Frequency Step – This is the frequency difference in kHz between adjacent channels.

To navigate between the different channel definitions use the  and  buttons. To add a new definition click the Add button and fill in the necessary parameters. Click OK and the new channel definition will now be available. To delete a channel definition, navigate to the required entry and press Delete. Note that the IF bandwidth will automatically be changed to 15 kHz if the channel frequency step is below 100 kHz.

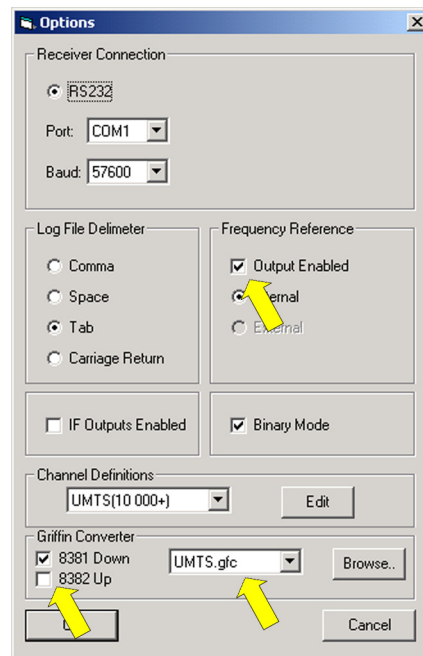
### Using the Griffin with a Converter

When either the 8381 Griffin UMTS Down Converter or the 83828 Griffin Up-Converter is being used with the 8301 Griffin Fast Measurement Receiver, the Front Panel Software will apply corrections to the raw readings from the Griffin to give the correct power readings. The corrections are held in a file which is supplied on a floppy disk with the converter. This file has an extension GFC and includes the serial number of the converter in its title. This file should be copied to a folder on your hard disk, e.g. to the folder where the software is installed; depending on the system configuration, this could be C:/Program files/Willtek/GFC by default.

To apply the corrections:

1. Open the Options menu.
2. In the Griffin Converter section, click the appropriate check box (note that the converter check boxes are only available if the Griffin being used is an 8301 model).

3. Select the appropriate correction file in the Griffin Converter section. If the required correction file is not shown, you can use the browse button to navigate to the correct location.
4. Select Output Enabled in the Frequency Reference section of the Options menu (this is automatically enabled when selecting a converter).



When the Griffin with the Griffin converter is operating properly, the green LED at the module is on.

### Griffin with Converter in Normal Band

The Griffin with a converter can also be used in the 800 to 1000 MHz band.

- For proper connections follow the description on page 13.
- In the Griffin Front Panel Software, uncheck both converters in the **Griffin Converter** section in the Options menu described above.
- Ensure that the Output Enabled check box in the Frequency Reference section of the Options menu is set if you are using this output connector.

### Using the Toolbar

The Griffin Front Panel Software toolbar has several buttons that act as short-cuts to common actions.

You can disable the toolbar to get more space on the screen for your data by unticking the Toolbar option from the View menu.

**Record, Pause and Stop**

These buttons allow you to control logging of data to a file in Automatic mode.

**Self Correct**

This starts the self-correction process in the Griffin. See Improving the Accuracy of Measurements for more details of the process.

**Zero Time**

Press this button to zero the times shown by the Griffin on Graphs or logged to files. These times are taken from the PC internal clock and are in seconds. They reset to zero whenever you change the receiver settings but not when you start logging to a file.

**Reset Peak**

This is a momentary-action button that resets the peak hold display line on graphs.

**Manual Mode**

This button switches to manual mode.

**Auto Mode**

This button switches to Auto mode.

**Save**

This button will save the current configuration. You will be prompted for a file name if necessary.

**Edit Parameters**

This will show the Auto mode parameters form.

**Edit graph Parameters**

This will show the Graph settings form.

**Zoom Limits**

The Zoom limits button will be visible in scanning mode (but not when doing Histogram measurements). Click on it to return the graph to its maximum X and Y limits. If the Griffin settings have been changed when you used Channel or Frequency zoom functions (see below) then the Griffin will be returned to its previous setting.

### Zoom In



This will zoom in on the X-axis.



### Zoom Out



This will zoom out on the X-axis.

### Delta Marker



Press this button to show two markers, Marker 1 (green) and Marker 2 (red). Initially they will appear on the same frequency or channel so only one will be visible. You can move the markers by activating the required marker using the  and  toolbar buttons which will now be visible, and then clicking on the new position. The **absolute** frequency (or channel) and power of Marker 1 will be displayed underneath the graph together with the **relative** position and power of Marker 2 with respect to Marker 1.

### Marker 1 control



If this is selected Marker 1 will be the active marker.

### Marker 2 control



If this is selected then Marker 2 will be the active marker.

### Peak Search



This will move the current marker to the highest peak on the visible graph. If the delta marker function is not selected the vertical dashed marker will be moved.

### Zoom Graph



When this button is selected, zooming does not change the settings of the Griffin. It is only a visual zoom.

### Zoom Channels



When this button is selected, the Griffin settings are changed to scan only the zoomed area, while maintaining the frequency spacing between adjacent frequencies.

### Zoom Frequency



When this button is selected, the Griffin settings are changed to scan only the zoomed area while maintaining the total number of frequencies the same. In effect this increases the frequency resolution of the zoomed area.

**Scan**

This can be used as a shortcut back to scanning mode from cycling mode.

**Cycle**

This can be used as a shortcut to cycling mode.

**Time Mark**

This is visible when cycling and doing min, mean, max or single measurements with the table visible or when recording. Press the button to put a mark in the Mark column of the table and also in the log file if recording. The marks are sequenced numbers.

---

**MANUAL MODE****Tuning the Griffin**

There are three ways to tune the frequency of the Griffin, either by typing directly into the frequency display, or with the up or down spin wheels or in the Parameters dialog box.

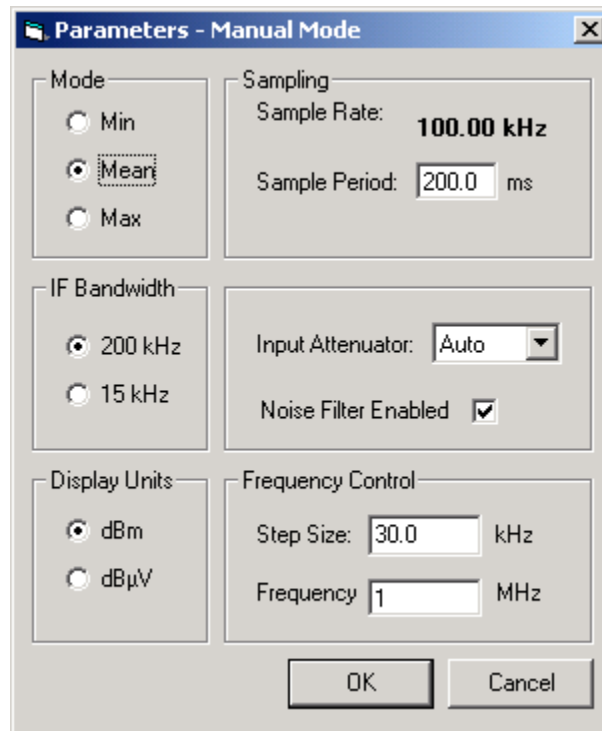
To tune the Griffin with the frequency display click next to the digit(s) that you wish to change in the display area. Delete the digit(s) and then type in the new ones. The display will change appearance to show that the frequency has not yet been sent to the Griffin. Now you must press the Return key to set the new frequency.

To tune the Griffin with the spin wheels, put the mouse over the up or down spin wheel arrow to the right of the frequency display then press and hold the left mouse button until the frequency you want is reached then release the button. The receiver is only tuned to the new frequency when you release the mouse button.

You can change the frequency step size in the Parameters dialog box.

**Setting the Receiver Parameters**

To set the receiver parameters click on the Parameters button or choose Parameters from the Edit menu. These parameters are saved when you save the settings. The Parameters dialog box has six sections as follows:



### Mode

You can choose one of three measurement modes.

- Min – The level displayed is the minimum observed over the measurement period.
- Mean – The level displayed is the mean of all levels observed over the measurement period.
- Max – The level displayed is the maximum observed over the measurement period.

### Sampling

This allows you to set the measurement period from 1 to 650 ms in Mean mode or from 1 to 1300 ms in Min or Max modes.

It also shows you the sampling rate in the chosen measurement mode. It will be 100 kHz in Mean mode, 50 kHz in Min or Max mode.

### IF Bandwidth

This allows you to set the IF bandwidth of the Griffin to either 200 kHz for GSM measurements or 15 kHz for CW measurements.



## Attenuator

This allows you to set a fixed attenuator rather than allow the Griffin to select the attenuator itself. You should choose the largest attenuator setting that is suitable for the expected range of signals. The setting of Hi Gain uses the 0dB attenuator with an additional IF amplifier. This is most useful when measuring very low level signals with the 15 kHz IF bandwidth.

The ranges of signals that can be measured are as follows:

- 30dB: 0 dBm to –80 dBm
- 20dB: –10 dBm to –90 dBm
- 10dB: –20 dBm to –100 dBm
- 0dB: –30 dBm to –110 dBm
- Hi Gain: –45 dBm to –125 dBm

This section of the dialog box also allows you to enable or disable the Noise filter.

## Display Units

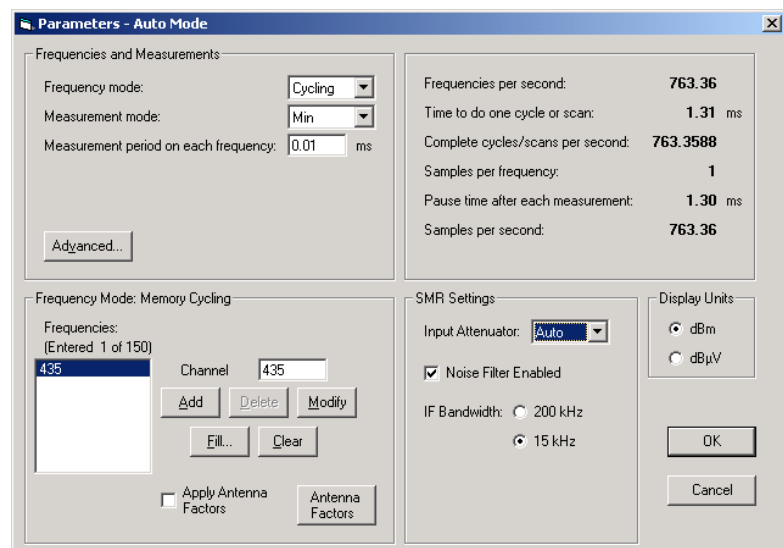
You can choose whether to display the data in dBm or in dB $\mu$ V units. If an Antenna factor is being used the data will be displayed in dBm/m or dB $\mu$ V/m.

## Manual Frequency Control


Sets the amount by which the frequency of the receiver is tuned for each press on the frequency setting spin wheel.

## AUTOMATIC MODE

Automatic mode offers you much more control over how the Griffin operates as well as the ability to log the measured data to a file for later analysis.



## Setting the Receiver Parameters

To set the receiver parameters click on the Parameters button  or choose Parameters from the Edit menu. These parameters are saved when you save the settings. The Parameters dialog box has four sections covering various topics as follows.

### Setting the Frequencies

You can choose between the three frequency modes of Fixed, Scanning and Cycling. The Parameters dialog box will change to suit the mode you have chosen.

#### Fixed

To set the frequency in fixed frequency mode type the frequency (or channel number) into the Frequency (or channel number) entry box. In frequency mode, it can be entered with a resolution of 1 kHz.

In Fixed frequency mode the Griffin remains tuned to one frequency (or channel) but pauses in its measurements to allow for autoranging.

#### Scanning

In Scanning mode the Griffin scans in equal steps across a band of frequencies making the same measurement on each frequency. This is most useful for spectrum-analyzer type displays showing how the spectrum is occupied across a band.

You must enter three frequencies into the entry boxes Low Frequency, High Frequency and Frequency Step if in frequency mode, or channel numbers if in channel mode.

The number of frequencies in the scan is shown below the Step box. It is only recalculated when you click outside of the entry box. Each scan is limited to a maximum of 12,000 frequencies.

#### Cycling

In Cycling mode the Griffin's 150 memories are programmed with different frequencies or channels. The Griffin goes through its memories making the same measurement on each frequency. Unlike Scanning mode, the frequencies can be at any spacing and in any order. This is most useful for measuring on specific frequencies or channels.

You must enter the list of frequencies in the order they are to be measured.

To add a new frequency or channel to the list click on the frequency or channel that is to follow it in the list. Type the new frequency or channel into the entry box then click on Add. The new frequency or channel will appear in the list before the one you had selected.

To change a frequency or channel in the list select it by clicking on it, change it in the entry box then click on Modify.

To delete a frequency or channel in the list select it by clicking on it, then click on Delete.

To clear all bar one entry from the list click on Clear.

To fill the list with equally-spaced frequencies click on Fill. This will bring up a dialog box allowing you to enter a Low frequency, a High frequency and a frequency Step (or channel numbers). When you click on OK the frequencies or channels will replace those in the frequency list.

### **Setting up Cycling Mode from Scanning Mode**

It is often useful to identify frequencies of interest in scanning mode and then cycle around them to study them in detail. The Front Panel Software makes this process easier by allowing you to copy frequencies from a scan to the cycle list.

In scanning mode (apart from histogram measurement mode) enable the cycle list information on the right hand side of the graph (choose the View menu and then Setup). To enter a frequency or channel into the list double click on the required position on the graph or single click to position the vertical dashed marker correctly and then press the space bar. The Frequency or channel selected will then appear in the Frequency Cycle list.

Once you have selected all the frequencies, you can sort them by pressing the Sort button. To delete selected frequencies or channels use either the Clear All button or double click on the entry in the list to be deleted.

To start cycling on the selected frequencies press the Cycle button.

### **Choosing the Measurement Mode**

In Automatic mode you can choose between seven measurement modes. When you choose the mode the Measurement Period entry box will change depending on the mode.

### **Measurement Period on each Frequency**

The minimum Measurement Period on each Frequency is generally  $1/(\text{Sampling Rate})$ . You can type a new Measurement Period into the entry box. The maximum period that you can enter is about 65,000 times  $1/(\text{Sampling Rate})$ . To change the Sampling Rate see Sampling Settings.

### **Single**

In Single mode a single measurement is made. This is the fastest mode and allows up to 1000 frequencies to be measured per second.

The Measurement Period will be shown as 0.00 and cannot be changed.

### **Min**

The level displayed is the minimum observed over the measurement period. This mode is particularly useful where you need to know that a minimum acceptable level is maintained. It can also be use to indicate the range of variation of a signal.

### **Mean**

The level displayed is the mean of all levels observed over the measurement period. This has the effect of filtering the signal to reduce sample to sample variations.

### **Max**

The level displayed is the maximum observed over the measurement period. This is most useful to indicate the range of variation of a signal over a period.

### **Level Crossing Rate (LCR)**

Level Crossing Rate counts how often a given threshold level is crossed during the measurement period.

When you select the LCR mode two entry boxes will appear, one for the level and the other for the hysteresis. The hysteresis setting is used to prevent noise on the signal from causing many level crossings while the signal is near the threshold. The actual levels used by the Griffin are the level plus the hysteresis and the level minus the hysteresis.

If you set a measurement period of one second then the result is directly the number of level crossings per second. If you set any other period then you must make due allowance to normalise the results to the one second rate. For example, if you set a measurement period of 200 ms, you should multiply the results by 1000/200 or five to get the number of times the level is crossed per second.

Autoranging is disabled during LCR measurements so you should select an attenuator suitable for the level you have set.

### **Histogram**

Autoranging is disabled during Histogram measurements.

The minimum Measurement Period is 50 ms.

### **Average Fade Duration**

Average Fade Duration counts how many samples are below a given threshold level during the measurement period.

When you select the AFD mode two entry boxes will appear, one for the level and the other for the hysteresis. The hysteresis setting is used to prevent noise on the signal from causing many decisions while the signal is near the threshold. The actual levels used by the Griffin are the level plus the hysteresis and the level minus the hysteresis.

You must make due allowance for the sampling rate and measurement period to normalise the results.

Autoranging is disabled during AFD measurements so you should select an attenuator suitable for the level you have set.

## **Griffin Settings**

### **IF Bandwidth**

This allows you to set the IF bandwidth of the Griffin to either 200 kHz for GSM measurements or 15 kHz for CW measurements.

### **Attenuator**

This allows you to set a fixed attenuator rather than allow the Griffin to select the attenuator itself. You should choose the largest attenuator setting that is suitable for the expected range of signals. The setting of Hi Gain uses the 0 dB attenuator with an additional IF amplifier. This is most useful when measuring very low level signals with the 15 kHz IF bandwidth. The ranges of signals that can be measured are as follows:

- 30dB: 0 dBm to –80 dBm
- 20dB: –10 dBm to –90 dBm
- 10dB: –20 dBm to –100 dBm
- 0dB: –30 dBm to –110 dBm
- Hi Gain: –45 dBm to –125 dBm

### **Noise Filter**

This section of the dialog box allows you to enable or disable the Noise filter.

### **Applying Antenna Factors**

When doing Min, Mean, Max or Single measurements an Antenna correction factor can be added to the power measurement. This is activated by checking the Apply Antenna factor checkbox, which is only visible in these modes. To edit the Antenna factors press the Antenna Factors button.

### **Editing Antenna Factors**

To add an antenna factor, fill in the Frequency entry box with the frequency and the Antenna factor entry box with the associated Antenna factor and press the Add button. The entry will now appear in the list. To modify an entry, click on the entry and alter the information as required, then press the Modify button. To delete an entry, click on the entry and then press the Delete button.

The Antenna factor used for a particular frequency will be interpolated if that frequency is between two entered antenna factor frequencies. If it is not between two entered antenna factor frequencies it will be set to the antenna factor associated with the nearest antenna factor frequency entered.

### **Sampling and Noise Filter Settings**

To change the sampling noise filter settings click on the Advanced button to bring up the Advanced dialog box. This allows you to change three parameters – Sampling Rate, Pause Time after each measurement and the Noise filter bandwidth.

#### **Sampling Rate**

The Sampling Rate sets the number of samples per second that the Griffin uses to make the measurement that you have selected.

In general it is better to leave this at its default setting which will be its fastest. The main reason to use slower sampling rates is when you need to sample over an extended period. The Griffin can take up to a maximum of 65,535 samples to make a single measurement. At a sampling rate of 100 kHz this takes 655 ms. If you need to sample for longer than 650 ms you must reduce the sampling rate.

The maximum sampling rate is 100 kHz for mean measurements and 50 kHz for all other measurement modes.

### **Pause Time after each Measurement**

Normally the Griffin will start a new measurement as soon as it can after finishing the previous measurement. The minimum time between measurements is just under 1 ms, which is the time the receiver takes to tune to the new frequency. You can make the receiver pause between measurements by entering the pause time into this entry box. This allows you to create measurement patterns such as taking the mean over 10 ms every 100 ms.

The minimum time allowed will depend on the IF bandwidth and the Noise filter bandwidth chosen. The maximum time depends on the Sampling Rate. If you need to enter a longer time than is allowed then you must reduce the sampling rate.

### **Noise filter**

The Noise filter in the Griffin is similar to the Video filter in a spectrum analyzer. It filters the signal after the detector to reduce noise before it is sampled.

You can choose a noise filter bandwidth between 200 Hz and 12.5 kHz.

The disadvantage of a narrow noise filter is that it reduces the number of RF channels that you can measure in a second as it takes longer for the filter to settle. If you have problems with noisy signals try different noise filter settings and consider using mean measurements over different periods of time.

### **Sampling**

This allows you to set the measurement period from 1 to 650 ms in Mean mode or from 1 to 1300 ms in Min or Max modes.

It also shows you the sampling rate in the chosen measurement mode. It will be 100 kHz in Mean mode, 50 kHz in Min or Max mode.

## Display Units

You can choose whether to display the results in dBm or in dB $\mu$ V units. This setting will select the units for all of the ways of viewing the results. If an Antenna factor is being used the data will be displayed in dBm/m or dB $\mu$ V/m.

## Measurement Statistics

### Frequencies per second

This shows the number of frequencies that the Griffin measures on per second. The maximum rate of 1000 frequencies per second is only feasible with the 200 kHz IF filter and taking a single sample on each frequency. Many settings will reduce the maximum available rate. For example, using the 15 kHz IF filter, using the Noise filter or doing a Mean measurement.

Sometimes the values here can be confusing, the thing to remember is that the Griffin needs some time to change frequency and then for its filters to settle. (It is the settling time that is affected by your choice of IF filter and Noise filter.) So, if you select a Measurement Period on each frequency of 10 ms, the actual time needed on each frequency is 11 ms and the number of Frequencies per second is shown correctly as 90.91. Setting a Measurement Period on each frequency of 9 ms, results in a time of 10 ms on each frequency and 100 frequencies per second.

### Time to do one cycle or scan

This is the time taken to complete each Cycle or Scan. For example, if you have set the Griffin to scan 1000 frequencies per second and there are 500 frequencies in the scan then the Time to do one cycle or scan will be 500 ms.

### Complete cycles/scans per second

This is the reciprocal of the Time to do one cycle or scan, so in the example above it will read 2.

### Samples per frequency

This is the number of samples taken on a frequency to make a single measurement. (It is not the total number of samples on that frequency per second.) Mathematically it is the Measurement Period on each frequency multiplied by the Sampling Rate. You can change this by changing the Measurement Period on each frequency or the Sampling Rate.



### **Pause time after each measurement**

This is the time that the Griffin takes to move from one frequency to another and for its filters to settle ready to start the next measurement. This will depend on the IF filter and Noise filter that you have chosen.

You can increase the time beyond its minimum with the Pause time entry brought up after pressing the Advanced button.

### **Samples per second**

This is the average sampling rate achieved. It will never reach the 100 kHz (Mean measurements) or 50 kHz (all other measurements) maximum sampling rates as some time is lost while the Griffin is re-tuning.

For example, if you select a Mean measurement over 1ms, 200 kHz IF filter and Noise filter disabled, the Griffin will spend 1 ms measuring on each frequency and 1 ms changing from frequency to frequency. Thus the receiver is only sampling for half the time and the Samples per second will read 50,000 even though the sampling rate is 100 kHz.

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## **VIEWING THE RESULTS**

Automatic mode offers you four ways of viewing the measurements by the receiver. Any combination of views can be used at the same time and various parameters can be changed to suit the measurements you are making.

You can Close, Minimise, Restore or Maximise a View with the familiar three buttons at the top right of the View's window. (The exceptions are the Form and Bar Graphs Views which can only be closed.)

### **Form View**

The Form View in Automatic mode shows the results of different measurements. When doing AFD or LCR measurements it will show counts rather than signal strengths. It is not suitable for use with Histograms.

When Cycling or Scanning it will attempt to show the result for each frequency in turn. When the receiver is covering more than about 10 frequencies per second it is not possible to see the individual results and the Form View is of limited value.

The scaling for the bar on the form is always sufficient to cover the full range of the receiver (-130 to +10 dBm, -30 to +110 dB $\mu$ V or 0 to 65,535 counts).

The size of the Form View is fixed and it cannot be changed.

## Graph View

The Graph View shows line graphs of your results and automatically adapts to suit different measurements. There are many Graph Settings that you can use to customize the Graph change.

To change the settings choose Graph Settings from the Edit menu to bring up a form with five sections as detailed below.

To change the size of the Graph View hold your mouse over the edge of the Window and drag it to the new size.

## Ranges

To Change the scaling of the Y-axis you can change the Maximum and Minimum values for the axis. The units for the axis will change to suit the units that you have chosen for the measurements.

## Memory Cycling Min/Mean/Max/LCR

This section of the Form will only be enabled if you have selected Memory Cycling otherwise it will be greyed out.

### Display frequencies

The Graph is able to display the results from up to ten frequencies at one time, each in a different colour. You can choose which frequencies to display by checking or unchecking the box next to the frequency. All of the frequencies programmed into the receiver are listed on the form.

The frequencies selected to be displayed on the Graph will also be shown as columns on the Table View and as Bars on the Bar Chart View.

To change the number of intervals shown on the X-axis type the new number into the entry box.

## Histograms

This section of the Form will only be enabled if you have selected Histograms otherwise it will be greyed out. You can choose whether to display all Histograms or only those from a single frequency.

Choose Show All Histograms to see the Histograms from each frequency one after the other. The title of the Graph View will change to show the frequency of the Histogram being displayed. You can use the Peak Hold to compare the Histograms as it will show the peak of all of the Histograms.

Choose Single Frequency and then select the frequency to see only the Histograms from one frequency. Note that the Griffin continues to measure the Histograms on all frequencies and, if you are logging the results, they will all be logged to file.

### **Scanning Min/Mean/Max/LCR**

This section of the Form will only be enabled if you have selected Scanning otherwise it will be greyed out. You can choose between three formats for displaying the results of the scanning.

#### **Frequency/Signal Strength – Line Graph**

Choose this format to see a line graph showing the measured Signal Strength on the Y-axis against Frequency on the X-axis. The measured value need not be a Signal strength, it could be a Minimum, Maximum, Average Fade Duration or Level Crossing Rate.

#### **Frequency/Signal Strength – Bar Chart**

Choose this format to see a bar chart showing the measured Signal Strength as the height of a bar, with one bar for each frequency. The measured value need not be a Signal strength, it could be a Minimum, Maximum, Average Fade Duration or Level Crossing Rate.

#### **Time/Signal Strength**

Choose this format to see a line graph showing the measured Signal Strength for a single frequency on the Y-axis against Time on the X-axis. The measured value need not be a Signal strength, it could be a Minimum, Maximum, Average Fade Duration or Level Crossing Rate.

To change the number of intervals shown on the X-axis type the new number into the entry box.

### **Peak Hold**

You can turn the Peak Hold function on or off by ticking or unticking this check box.

### **Zooming Functions**

You can zoom into the graph data when in scanning mode (apart from during Histogram measurements). Zooming functionality is determined by which Zooming mode button is selected. These buttons are located on the right of the toolbar. See Zoom Graph, Zoom Channels and Zoom Frequency for specifics on the different zooming modes. You can zoom by clicking and dragging a zoom rectangle on the graph. This action can be cancelled by using the escape button. You can also use the Zoom In and Zoom Out buttons.

## Markers

In scanning mode (apart from Histogram measurements) there are two marker modes available. The default mode is the normal marker mode. In this mode there is one marker indicated by a vertical and a horizontal dashed line. The marker power and frequency (or channel number) are displayed below the bottom left of the graph. The other marker mode is the Delta marker mode. See Delta Marker for more information on this mode.

## Table View

The Table View shows up to ten columns of your results as numbers. It is only available in Fixed and Cycling modes.

The left-most column shows the time on the PC clock when the measurement was made. The next column shows the time from the start of the measurements or since you pressed 'Zero time'. The next column shows if any of the measurements were overloaded. The remaining columns excluding the right-hand column show the measured results in the units you have selected. The final column is headed "Mark" and will show a number if the Time Mark button has been pressed during a measurement. See Time Mark for more details. To change the units refer to Display Units in Setting the Receiver Parameters.

To change the number of columns and which frequencies they list choose Graph Settings from the Edit menu and tick or untick the Display frequencies.

To change the size of the Table View, hold your mouse over the edge of the Window and drag it to the new size.

## Bar Graphs View

The Bar Graphs View shows the measured results as bars. It is only available in Fixed and Cycling modes. In Scanning Mode a similar result can be obtained by using the Bar Graph option on a Graph View.

To change which frequencies are displayed choose Graph Settings from the Edit menu and tick or untick the Display frequencies.

To change the units refer to Display Units in Setting the Receiver Parameters.

To change the Y-axis of the Bar Graph View, select the Edit menu and Bar settings. Enter the required maximum and minimum values and press OK.

## Making More Space Available on the Screen

You can turn off the Status Bar and the Toolbar to make more space available for the Views. On the Views menu turn off the tick against Status Bar and Toolbar.

## LOGGING THE DATA

When in Automatic Mode you can log the data to a file by clicking on the Record button or by choosing Start Recording from the Tools menu.

You will be asked if you wish to Perform Self-Correct on the Griffin before recording. You can answer yes to do the self-correction measurements, No to skip them and start recording or Cancel to not start recording at all.

If it is estimated that there is less than 10 hrs recording time left, you will be told approximately how long the recording can continue before filling the available space on your hard disk. It is a very rough estimate and should only be used as a check.

You can Pause and then restart the logging of data by clicking on the Pause button or choosing Pause Recording from the Tools menu. The Griffin will continue to make measurements while logging is paused.

When you have finished logging click on the Stop button or choose Stop Recording from the Tools menu. You will then be shown the usual file save dialog box to allow you to select the folder and file name.

---

## HELP SYSTEM

### Diagnostics

The Diagnostics item on the Help menu brings up a box with two entries – Power-Up Status and Report Status. You will probably find that the contents are not particularly easy to interpret yourself as they are there to help Willtek to help you if there is a problem with the receiver. If you contact Willtek to ask for support you might be asked to report the contents of the Diagnostics window.

### Power-Up Status

This should be a line of 12 zeros. It indicates any faults found with the Griffin during the power-up self-test process. If any of the zeros is a 1 then a fault was found. To find out what was faulty press the details button or refer to the item 'Power Up Self Test' in the appendix 'Griffin Commands'. If you have a fault try the following:

- Check the power supply to the receiver.
- Check the ambient temperature (–10 to +40 for normal operation).
- Turn off and on a few times to see if the fault is continuous or intermittent.

If the fault persists then you must return the receiver to Willtek for repair.

The receiver will try to make measurements even if a fault is found but you should be very careful as the results might be wrong.

### **Report Status**

The Report Status line contains eight groups of two hexadecimal digits. This is updated about every 10 seconds by the Front Panel Software polling the receiver for its status. To find out what the status means press the Details button or refer to the item 'Status Reports' in the appendix 'Griffin Commands'.

### **About Griffin**

Click on this menu item to see the version of the Front Panel Software that you are running.

### **Manual and Automatic Modes**

The Griffin can be used in two modes called Manual and Automatic.

In Manual mode the Griffin emulates a conventional receiver, reporting a single RF level on a bar-chart and providing basic controls.

In Automatic mode the Griffin uses its advanced features to provide scans and measurements beyond the capabilities of conventional receivers. The results can be viewed in different ways and stored in files for future processing.

## SPECIFICATIONS

### NORMAL CONDITIONS

Unless otherwise qualified, these specifications apply at 25°C, and using the 200 kHz IF filter and 0 dB attenuator setting.

### SPECIFICATIONS OF THE WILLTEK 8300 GRIFFIN SERIES

#### Frequency

Input Frequency Range	800 to 1000 MHz (Willtek 8301) 1700 to 2000 MHz (Willtek 8302)
Tuning Increment	1 kHz
Tuning Speed	1 ms

#### Input

Maximum Input measurable	0 dBm (30 dB attenuator) -10 dBm (20 dB attenuator) -20 dBm (10 dB attenuator) -30 dBm no attenuator
Input 3 <sup>rd</sup> Order Intercept Point	> 20 dBm (30 dB attenuator) ±2 MHz of tuned frequency > 30 dBm (30 dB attenuator) within RF bandwidth
Overload Detector	Broadband input level measurement detects high-level off-channel signals that might cause overload.
RF Input Impedance	50 Ω nominal
Connector	N-type
Input VSWR	< 1.6:1 typical
Maximum Safe RF Input	+20 dBm
Input Clipping Level	5.6 V peak-to-peak
DC Blocking	±50 V maximum
Input Protection	To meet ETS 300 339
Attenuation	0, 10, 20, 30 dB Switched

## Dynamic Range

Instantaneous Dynamic Range	80 dB (corrected)
Noise Floor	-112 dBm typical
In-band Blocking	Less than 1 dB error in measured level of a signal at -104 dBm for inputs at:
600 MHz to 1200 MHz or	600 kHz to 800 kHz, -38 dBm
1400 MHz to 2300 MHz	800 kHz to 1.8 MHz -33 dBm > 1.8 MHz -23 dBm
Out-of-band Blocking < 600 MHz or 1200 MHz to 1400 MHz or > 2300 MHz	Less than 2 dB error in measured level of a signal at -104 dBm for inputs at 0 dBm
De-sensitisation (10 dB attenuator)	> -20 dBm at $\pm 1$ MHz of tuned frequency  A signal at this level will cause < 0.3 dB error in measured signal level of a signal at -60 dBm

## Level Measurements

Gain Change over Full Temperature Range (analogue path, uncorrected)	< 3 dB
Gain Change over Power Supply Voltage Range (analogue path, uncorrected)	< 1 dB
Gain Drift per year (analogue path, uncorrected)	< 1 dB
Warm-up Time	< 5 minutes to quoted measurement accuracy
Amplitude Measurement Error after correction	$\pm 1$ dB
Response Time (Noise filter out)	< 1 ms to produce output within 0.5 dB of steady-state value following channel change command
Analogue RSSI Bandwidth	> 12 kHz
Post-Detector Filtering (Noise filter)	Switched bandwidths of: 200, 400, 800, 1600, 3125, 6250, 12500 and 'out'
Sampling Rate (maximum)	100 k samples per second
Sampling Interval (time-based sampling)	10 $\mu$ s to 13.1 ms in 200 ns steps
Distance Measurement Input	Up to 500 pulses per metre at 35 m/s



Sampling Interval (distance-based sampling)	Minimum one pulse, maximum 65,535 pulses (0.05 to 300 metres at 200 pulses/metre)
Sequence Modes	Fixed, Cycling, Scanning
Measurement Modes	Single, Histogram, Min/Mean/Max, Level Crossing Rate / Average Fade Duration
Histogram Measurement Rate	50 histograms per second maximum
Number of samples per measurement	Up to 65,535 samples per measurement
Number of measurements per frequency	Up to 255 measurements on each frequency
Number of frequency memories	150

### Distance Input

Interface	DC supply output to the distance encoder and logic-level pulses input
Output	Pulses output for use by navigation receiver, open collector, 20 V, 50 mA maxima

### Reference Characteristics

Reference Frequency	10.0 MHz
External Reference Input	AC-coupled CMOS/TTL logic levels ±50 V DC maximum
External Reference Output	AC-coupled CMOS/TTL logic levels
Reference Connector	SMA
Reference Warm-up Time	< 5 minutes to quoted frequency accuracy
Tuning Accuracy	Within 2 kHz
Ageing Rate	< 1 kHz/year
Reference Adjustment Range	Unlimited under firmware control; has no effect on the reference output

### IF Filtering

200 kHz Bandpass Response	-1dB > 100 kHz -3 dB < 220 kHz -60 dB < 400 kHz Passband ripple < ±1.5 dB
---------------------------	--

15 kHz Bandpass Response	-1 dB > 12 kHz
	-3 dB < 18.5 kHz
	-60 dB < 50 kHz
	Passband ripple < $\pm 1.5$ dB

### Unfiltered IF I&Q Output

IF Frequency	10.7 MHz
Format	I&Q signals
	Needs an image reject mixer with 20 dB rejection to achieve specified performance
Maximum Level	-18 dBm typical
Minimum Level	-98 dBm typical (assuming 80 dB of dynamic range)
Amplitude Imbalance	Within 6 dB
VSWR	< 1.6:1
Bandwidth	1.6 MHz
Gain Variation	< 5 dB All effects
Connector	SMA
Harmonics	< 40 dBc

### Spurious Responses

Adjacent Channel Rejection (200 kHz)	> 70 dB typical (unmodulated carrier, $\pm 400$ kHz)
Adjacent Channel Rejection (15 kHz)	> 60 dB typical (unmodulated carrier, $\pm 200$ kHz)
Image Rejection	> 70 dB
IF Rejection	> 70 dB
Harmonically Related Spurious Response Rejection	> 50 dB
Spurious Signal Level (non-harmonically-related)	< -90 dBm
In-band Intermodulation Products at Unfiltered IF Output	< 60 dBc (two tones at 20% of channel bandwidth)
Conducted Spurious Emissions	< 2 nW (< 1 GHz)
	< 250 nW (> 1 GHz)
Radiated Spurious Emissions	< 2 nW <sub>erp</sub> (< 1 GHz)
	< 250 nW <sub>erp</sub> (> 1 GHz)

**Control**

RS-232-C	Baud rates of 57600, 28800, 14400, 38400, 19200, 9600, 4800, 2400
RS-232-C Handshaking	Xon/Xoff protocol

**Processing**

Processors	Dual 32-bit Motorola 68332 processors
Clock Speed	25 MHz
ROM	640 kB
RAM	432 kB

**Battery Power**

Supply	Batteries or external DC input
Batteries	Two 6 V 4 Ah NiMh batteries each of five cells. One can be changed whilst the other is in use.
Battery Size	140 x 55 x 20.5 mm, weight 300 g
Battery Voltage	+6 V; +1.5 V, -0.5 V
Power Consumption	< 12 W at 7 V input
Battery Life Time	2 hours per battery Can change batteries to achieve unlimited operation
Battery Charging	Internal charger giving 4 hour charge time followed by continuous trickle charge Powered from an external DC source separate to receiver power
Battery Charge Power	12 V nominal at 2 A
Battery Charge Time	4 hours maximum inside the receiver
Battery Indicators	One for each battery Red means in use Green means available Amber means on-charge Off means not in use

**External Power Input**

External DC Input	9.5 to 18 V
External DC Connector	7-pin Lemo size 1B

Current	2.5 A maximum with batteries inserted and on charge from a 12 V supply 1.5 A maximum without batteries inserted
Environmental	The batteries contain no Pb, Cd or Hg materials

### Signals

Protection	All signal lines are protected against static discharges and EMC
Distance Pulses Input	Logic level pulses from a wheel encoder
Auxiliary Pulses Input	Logic level pulses Can be used to trigger the receiver or as alternative distance pulses
Remote On/Off	Ground to turn the receiver on
Sampling Pulse Out	Logic level pulse Indicates when the receiver samples the detector output
Distance Pulses Output	Logic level pulses Connected to the wheel encoder input. Intended for a navigation receiver
Detector Output	Approx. 0.65 to 2.5 V from an op-amp output at 25 mV/dB

### Mechanics

Receiver Size	240 x 170 x 92 mm
Appearance	Blue Texel textured paint
Receiver Weight	3.32 kg estimate, including batteries
Indicators	One LED to show when on One LED for each battery to show state

### Environmental

Operating Temperature Range	-10 to +45°C
Temperature Range for Full Accuracy	+5 to +35°C
EMC Approval (fully assembled into case, using the cables provided by Willtek for use with the Griffin)	ETS 300 339

## CONNECTOR DETAILS

### RF Input

Standard 50  $\Omega$  N-type.

### I&Q Outputs

Standard 50  $\Omega$  SMA (one for the I output and one for the Q output).

### RS-232-C

Standard 9-way D-type with pins.

Tx Data, Rx Data, as RS-232-C levels. (RTS, CTS connected but not used).

Function	Computer		Griffin
	25-way connector	9-way connector	9-way connector
Ground	7	5	5
Tx Data from PC	2	3	2
Rx Data to PC	3	2	3
CTS to PC	5	8	7
RTS from PC	4	7	8

### Auxiliary Connector Functions

Seven-way Lemo plug with a green strain relief. The connector is Willtek part number 591360, Lemo part number FGA1B307CLCD72Z (two keyways, 30°). The green strain relief boot is Willtek part number 591330, Lemo part number GMA1B065DV).

Pin	Function	Specification
1	Ground	
2	Remote on/off. Ground to turn receiver on.	Open circuit 3 V. Current to ground 0.5 mA.
3	Wheel encoder pulse input or output.	TTL level pulses. Must have a short rise-time. Directly connected to pin 3 of the Pulse Encoder connector.
4	Auxiliary pulses input.	TTL level pulses. Must have a short rise-time. Directly connected to pin 4 of the Pulse Encoder connector.
5	Raw battery voltage out. Switched to the battery or DC supply in use.	+5.5 V minimum. 300 mA maximum available.
6	Log amp output.	Approx. 0.65 V for minimum RF input. Scaling approx. 25 mV per dB over 80 dB range. Minimum load 1 k $\Omega$ .

Pin	Function	Specification
7	Sampling pulse output.	Open collector output, max sink current 200 mA. Maximum voltage +30 V.

### Power Input Connector

Seven-way Lemo plug with a red strain relief. The connector is Willtek part number 591358, Lemo part number FGG1B307CLCD42Z (one keyway). The red strain relief boot is Willtek part number 591328, Lemo part number GMA1B035DR).

Pin	Function	Specification
1	Ground	
2	Remote on/off. Ground to turn receiver on.	Open circuit 3 V. Current to ground 0.5 mA.
3	Not used	
4	Not used	
5	+12 V input. This will power the receiver and any items connected to it. Will not charge the batteries.	See above for specification.
6	Batteries charge supply	12 V nominal, 1.5 A to charge the batteries.
7	Not used	

### Pulse Encoder Connector

Seven-pin Lemo connector colour-coded blue.

Seven-way Lemo plug with a blue strain relief. The connector is Willtek part number 591359, Lemo part number FGB1B307CLCD72Z (two keyways, 45°). The green strain relief boot is Willtek part number 591330, Lemo part number GMA1B065DA).

Pin	Function	Specification
1	Ground	
2	Remote On/off	Open circuit 3 V. Current to ground 0.5 mA.
3	Wheel encoder pulse input or output.	TTL level pulses. Must have a short rise-time. Directly connected to pin 3 of the Auxiliary connector.
4	Auxiliary pulses input.	TTL level pulses. Must have a short rise-time. Directly connected to pin 4 of the Auxiliary connector
5	Battery +ve output (to power encoder)	+5.5 V minimum. 300 mA maximum available.
6	Not used	
7	Not used	

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**SPECIFICATIONS OF THE 8381 GRIFFIN UMTS DOWN CONVERTER**
**RF data**

Input frequency range	2000 to 2200 MHz
Output frequency range	800 to 1000 MHz
Noise figure	< 8 dB; typical 5.5 dB
Overall gain	0 to 3 dB; typical 2.0 dB
Gain variation	
over freq. at 25 °C	< 1 dB; typical 0.6 dB
over freq. from 0 to 40 °C	< 2 dB; typical 0.6 dB
over level range < -30 dBm	< 0.2 dB
Nominal input impedance	50 Ω
Nominal output impedance	50 Ω
RFin/RFout VSWR	< 2 : 1
RFin/RFout return loss	> 10 dB
Image rejection	> 70 dB; typical 90 dB
Spurious response rejection	> 40 dB
Phase noise at 200 kHz offset	< -100 dB/Hz
LO level at RF input	< -80 dBm
Blocking level	> 80 dB
Maximum RF input level	
linear range (1 dB comp.)	> -15 dBm
without damage	> +10 dBm
External LO reference input	10 MHz, e.g. Griffin Receiver
Frequency error	based on reference

**General data**

Supply voltage	5.5 to 9.0 V
Supply current	< 300 mA; typical 165 mA
Operating temperature range	0 to 50°C
Dimensions	
UMTS Down Converter only	235 x 170 x 35 mm
with Griffin Receiver	235 x 170 x 126 mm

---

**SPECIFICATIONS OF THE 8382 GRIFFIN UP-CONVERTER**
**RF data**

Input frequency range	300 to 500 MHz
Output frequency range	800 to 1000 MHz
Noise figure	< 6 dB; typical 4.5 dB
Overall gain	1 to 4 dB; typical 2.5 dB
Gain variation	
over freq. at 25°C	< 1 dB; typical 0.8 dB
over freq. from 0 to 40°C	< 2 dB; typical 1 dB
over level range < -30 dBm	< 0.2 dB
Nominal input impedance	50 Ω
Nominal output impedance	50 Ω
RFin/RFout VSWR	< 2:1
RFin/RFout return loss	> 10 dB; typ. 15 dB
Image rejection	> 60 dB
Spurious response rejection	> 40 dB
Phase noise at 200 kHz offset	< -100 dB/Hz
LO level at RF input	< -80 dBm
Blocking level	> 80 dB
Maximum RF input level	
linear range (1 dB comp.)	> -15 dBm
without damage	> +10 dBm
External LO reference input	10 MHz, e.g. Griffin Receiver
Frequency error	based on reference

**General data**

Supply voltage	5.5 to 9.0 V
Supply current	< 300 mA; typical 164mA
Operating temperature range	0 to 50°C
Dimensions	
UMTS Down Converter only	235 x 170 x 35 mm
with Griffin Receiver	235 x 170 x 126 mm



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## APPENDIX 1 – INSTALLING THE GRIFFIN SOFTWARE

---

### BEFORE YOU START

The Griffin Front Panel Software will run on most PCs using a 486 or Pentium processor running Windows 95 or later versions of Windows. The only real essentials are a serial port (COM1, 2, 3 or 4) and sufficient space on the hard disk (10 megabytes). For best performance use a PC with a clock speed of at least 400 MHz and fitted with at least 64 Mbytes of RAM.

Your software license allows you to install the Front Panel Software on as many PCs as you wish.

### Updating Existing Files

During the installation process some files will be copied to your Windows folder. These are files that can be shared by many applications and there might be versions of the files already in your Windows folder. If the version on the installation disk is newer than the existing version then the existing file is replaced by the newer one. This is perfectly normal and is the Microsoft recommended procedure.

---

### INSTALLING IN WINDOWS 95, 98

Insert the CD or floppy disk1.

- Close all applications to avoid any conflicts with files in use during the installation process.
- On the Start Menu choose Run then click on Browse. Browse on the CD or floppy disk drive until you find setup.exe. Click to select the file then click on Open to finish browsing.
- Click on OK to start the installation process.

The remainder of the installation process is automatic. If installing from floppy disks, insert subsequent disks as requested.

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### INSTALLING IN WINDOWS NT4 OR 2000

Follow the instructions for Windows 95, 98.



## APPENDIX 2 – LOG FILE FORMATS

---

### INTRODUCTION

The format of the data in the log file has been designed to be easy to import into standard Windows packages such as Excel, which means that it is not always the easiest format for you to read.

The measurement parameters are stored at the end of the file, after all of the data. This is done to avoid confusing the automatic import algorithms in applications such as Excel.

The log files are all in ASCII format even if the data link between the Griffin and the PC is set to Binary.

The results are stored in the same units you have chosen for display of the results or counts as appropriate.

Each 'column' of data is given a header in the first line of the results file.

There are four fundamental formats to consider depending on the combination of modes chosen. They all follow the same strategy and are described in detail in the following sections.

The numeric values in the file are separated by a character called a delimiter. You can change the delimiter to suit the program that you are going to use to process the data. Refer to Log File Delimiter in Setting Options.

---

### MEASUREMENT INFORMATION

A block of Measurement Information is recorded at the end of the log file. This is in the format of the title followed by an = sign, followed by the actual value which might contain units. For example, the following is typical Measurement Information

```
Recording start time = 07/08/2000 11:10:09
Recording end time = 07/08/2000 11:10:12
Frequency mode = Fixed
Measurement mode = AFD
Noise Filter Enabled, Bandwidth = 12500 Hz
Number of samples = 1000
Measurement period on each freq = 10 ms
Sampling rate = 100.00 kHz
Pause time on each freq = 1 ms
Input attenuator = Auto
IF bandwidth = 200 kHz
```

Refer to Measurement Statistics section of Automatic Mode for explanations of these values.

## **FIXED FREQUENCY**

### **Simple Measurements**

There will be one line per measurement. The first number is the time from the PC clock when the measurement was made. The second is the time from the start of the measurements by the receiver in seconds. The third number is the measured value in the units that you selected.

### **Histogram Measurements**

There will be one line per measurement. The first number is the time from the PC clock when the measurement was made. The second is the time from the start of the measurements by the receiver in seconds. The third number is the frequency in MHz or the channel number.

The following 130 numbers are the Histogram counts, starting with the count for the lowest dB value and working to the greatest dB value.

---

## **CYCLING OR SCANNING IN FREQUENCY**

### **Simple Measurements**

There will be one line per Cycle or Scan. The first number is the time from the PC clock when the measurement was made. The second number is the time from the start of the measurements by the receiver in seconds. The following numbers are the measured values for each frequency or channel in the units that you selected.

### **Histogram Measurements**

There will be one line per measurement. The first number is the time from the PC clock when the measurement was made. The second is the time from the start of the measurements by the receiver in seconds. The third number is the frequency in MHz or the channel number.

The following 130 numbers are the Histogram counts, starting with the count for the lowest dB value and working to the greatest dB value.

As the receiver Cycles or Scans round the frequencies you programmed so there will be one line in the file for each frequency.

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## APPENDIX 3 – TROUBLESHOOTING GUIDE

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### COMMUNICATIONS PROBLEMS

If the Status bar never changes to show Griffin Connected there must be a problem with the communications link between the Griffin hardware and the PC running the Griffin Front Panel Software.

The software automatically tries to connect with all of the baud rates that are supported by the Griffin. If it cannot connect then there might be a problem with the physical connection.

#### Basic Checks

First try checking:

- That the Griffin is connected to the correct COM port.
- The cable connecting the Griffin to the PC is secure at both ends.

Try replacing the cable in case it is faulty or testing it as described below.

#### Testing the Griffin and Cable

One way to check the output from the Griffin and the cable is to connect an oscilloscope to pin 2 (ground to pin 5) of the null modem cable. When you turn the Griffin on it should output a short message which will be seen on the oscilloscope. This will check the ground and one data line in the cable. To check the other data line reverse the cable and repeat the test.

#### Testing the PC Port

You can use HyperTerminal, which is a communications programme supplied with Windows to check the serial port in the PC. HyperTerminal does not support all of the Baud Rates that the Griffin can use so you might not be able to communicate with the Griffin, but it worth a try.

- Close the Griffin Front Panel Software.
- Open the HyperTerminal Folder (Start, Programs, Accessories, Communications, HyperTerminal) then click on hyperterm.exe to start HyperTerminal.
- Enter a name for the connection.
- Choose Direct to COMx, where x is the number of the COM port that is connected to the Griffin, in the Connect using section. HyperTerminal will complain if the port is not available. Check that you have closed the Griffin Front Panel Software. If it is closed then either there is no COMx on your PC, or some other programme is using it.

- Set the port settings to:
  - Bits per second – the Baud rate that the Griffin is set to.
  - Data bits – 8.
  - Parity – None.
  - Stop bits – 1.
  - Flow control – None.
- Then press OK.
- Try turning the Griffin on and off. If the connection is working you will see the power-up message appear. This should be the pu000000000000. If anything else appears it is likely that the Baud rate is wrong. Try changing the Baud rate until the message is correct. To change the Baud rate in HyperTerminal
  - Choose Properties from the File menu, then click on Configure.
  - Make the changes then click on OK.
  - Now save the settings (choose Save from the File menu) then close HyperTerminal. You can choose where to save the file but a convenient place is your desktop.
  - Double-click on the file (or its icon) to re-open HyperTerminal.
- Once you can see the power-up message you can try sending a message to the Griffin to test the other direction of data flow. Type PWU followed by pressing enter (also called carriage return). If everything is working properly the Griffin will respond with 'kAPWU'. Note that you might not see the characters that you type as there is a setting in HyperTerminal that can hide or show them.

If this does not resolve the problem then contact Willtek.

# Publication History

Revision	Comment
Issue 3, Oct. 2001	First available edition.
Issue 4, Dec. 2001	Update of techn. specifications.
Issue 4, Febr. 2002	General corrections, specs written correctly, RS232 changed to RS-232-C. Specs corrected: Harmonics, In-band Intermodulation, Radiated Spurious Emissions.
0210-120-A	Willtek issue. UMTS Down Converter Option added.
0212-120-A	Improved formatting.
0303-150-A	Griffin Front Panel Software now supports 8382 Griffin Up-Converter, and includes many new channel definitions for various wireless communication systems.

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