Digital Power Meter Display

Operation Manual

Instruction Manual Part Number 920-5000-NG Rev. C

Safety Precautions

The following are general safety precautions that are not necessarily related to any specific part or procedure, and do not necessarily appear elsewhere in this publication. These precautions must be thoroughly understood and apply to all phases of operation and maintenance.

WARNING

Keep Away From Live Circuits

Operating Personnel must at all times observe general safety precautions. Do not replace components or make adjustments to the inside of the test equipment with the high voltage supply turned on. To avoid casualties, always remove power.

WARNING

Shock Hazard

Do not attempt to remove the RF transmission line while RF power is present.

WARNING

Do Not Service Or Adjust Alone

Under no circumstances should any person reach into an enclosure for the purpose of service or adjustment of equipment except in the presence of someone who is capable of rendering aid.

WARNING

Safety Earth Ground

An uninterruptible earth safety ground must be supplied from the main power source to test instruments. Grounding one conductor of a two conductor power cable is not sufficient protection. Serious injury or death can occur if this grounding is not properly supplied.

WARNING

Resuscitation

Personnel working with or near high voltages should be familiar with modern methods of resuscitation.

WARNING

Remove Power

Observe general safety precautions. Do not open the instrument with the power on.

Safety Symbols

WARNING

Warning notes call attention to a procedure, which if not correctly performed, could result in personal injury.

CAUTION

Caution notes call attention to a procedure, which if not correctly performed, could result in damage to the instrument.

The caution symbol appears on the equipment indicating there is important information in the instruction manual regarding that particular area.

Note: *Calls attention to supplemental information.*

Warning Statements

The following safety warnings appear in the text where there is danger to operating and maintenance personnel, and are repeated here for emphasis.

WARNING

Never attempt to connect or disconnect RF equipment from the transmission line while RF power is being applied.
Leaking RF energy is a potential health hazard.

On page 7.

Caution Statements

The following safety warnings appear in the text where there is danger to operating and maintenance personnel, and are repeated here for emphasis.

CAUTION

Only use the supplied AC adapter to charge the unit.
Due to the amperage required to charge the 5000-NG, charging from another power source (i.e. laptop USB port) may damage that power source.

On pages 2 and 6.

Safety Statements

USAGE

ANY USE OF THIS INSTRUMENT IN A MANNER NOT SPECIFIED BY THE MANUFACTURER MAY IMPAIR THE INSTRUMENT'S SAFETY PROTECTION.

USO

EL USO DE ESTE INSTRUMENTO DE MANERA NO ESPECIFICADA POR EL FABRICANTE, PUEDE ANULAR LA PROTECCIÓN DE SEGURIDAD DEL INSTRUMENTO.

BENUTZUNG

WIRD DAS GERÄT AUF ANDERE WEISE VERWENDET ALS VOM HERSTELLER BESCHRIEBEN, KANN DIE GERÄTESICHERHEIT BEEINTRÄCHTIGT WERDEN.

UTILISATION

TOUTE UTILISATION DE CET INSTRUMENT QUI N'EST PAS EXPLICITEMENT PRÉVUE PAR LE FABRICANT PEUT ENDOMMAGER LE DISPOSITIF DE PROTECTION DE L'INSTRUMENT.

IMPIEGO

QUALORA QUESTO STRUMENTO VENISSE UTILIZZATO IN MODO DIVERSO DA COME SPECIFICATO DAL PRODUTTORE LA PROZIONE DI SICUREZZA POTREBBE VENIRNE COMPROMESSA.

About This Manual

This manual covers the operating and maintenance instructions for the following models:

5000-NG	Digital Power Meter Display

Changes to this Manual

We have made every effort to ensure this manual is accurate at the time of publication. If you should discover any errors or if you have suggestions for improving this manual, please send your comments to our factory. This manual may be periodically updated, when inquiring about updates to this manual refer to the part number and revision level on the title page.

Chapter Layout

Introduction — Provides an introduction to the 5000-NG, lists the items supplied with the Digital Power Meter Display, and the optional accessories. This chapter also provides a description of the controls and connectors for the 5000-NG as well as a list of compatible Bird power sensors.

Operation — This chapter includes details on charging the units battery, and procedures for RF connections to a Bird power sensor as well as making a data connection between the 5000-NG and a Bird power sensor.

User Interface — Provides a description of the menus and options available in the RF Power Meter Software, and the units operating systems file management.

Measurements — Details the measurements possible with Bird power sensors as well as providing basic procedures for making measurements with each Bird power sensor.

Specifications — Tables of 5000-NG specifications as well as equipment part numbers.

Table of Contents

Chapter 1 Introduction

The Digital Power Meter Display, 5000-NG is a hand held device designed for use with many of Bird's Power Sensors to measure RF power in a variety of systems.

Figure 1 Digital Power Meter Display, 5000-NG

Measuring RF Power

The 5000-NG utilizes the RF Power Meter Software. The Bird RF Power Meter Software allows the 5000-NG to be used with a variety of Bird RF Power Sensors.

To measure transmitter RF power, connect the power sensor to the 5000-NG. RF Power measurements verify and monitor the condition of a transmitter system. See "RF Power Meter Software User Interface" on page 11 for details on how to use the Bird RF Power Meter Software.

Items Supplied

The Digital Power Meter Display, 5000-NG includes the equipment in the following table.

Description	Part Number
Digital Power Meter	5000-NG
Charger, US, 5V, 2.5A	5B5002-2
International Charger, 5V, 2.5A	5B5002-1
USB Micro charging cable	5A2653-3R5NL4
Model 5000-NG Soft Carry Case	5B5000-1
Stylus	SK-TP-112
SeaLATCH USB Type A to USB Type B Device Cable, 72" Length	25-T-MN
User Operation Manual (Installed PDF)	920-5000-NG

Optional Accessories

Description	Part Number
Protective Rubber Boot	TV-RCV2
Scratch-resistant Screen Protector	TV-SP-BSPV1
Impact-resistant Screen Protector	TV-SP-GCV1

Power Source

CAUTION

Only use the supplied AC adapter to charge the unit.
Due to the amperage required to charge the 5000-NG, charging from another power source (i.e. laptop USB port) may damage that power source.

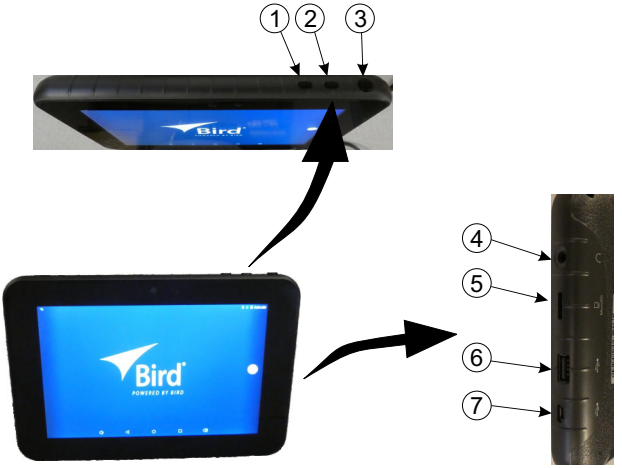
The 5000-NG has an internal battery capable of 8 hrs of operation from a full charge, the actual battery life will vary according to the power sensor used and the amount of time the display is active, see "Specifications" on page 68.

The internal battery will automatically recharge when the AC adapter is connected to the micro-USB port on the 5000-NG. The 5000-NG can be used for RF power measurement while charging.

The internal battery is not field replaceable.

Controls and Connectors

Figure 2 5000-NG Controls and Connectors



Item	Name	Description
1	Volume Down	Increases volume when pressed. When this button and power button are pressed simultaneously a screenshot is taken of the display.
2	Volume Up	Decreases volume when pressed.
3	Power Button	Used to power on and off the 5000-NG. Also used to “wake” the 5000-NG when in sleep mode.
4	Headphone Jack	3.5 mm jack for headphone connection.
5	MicroSD Card Slot	Memory card slot used to augment internal storage.
6	USB-A	USB device port for connection to a USB Drive, PC, or Bird Power Sensor.
7	USB-Micro Charger Input	Input connector for charging the 5000-NG using the supplied charger. See "Charging the Battery" on page 6. May also be used to connect to a PC for file management.

Compatible Power Sensors

Wideband Power Sensors (WPS)

5012D, 5016D, 5017D, 5018D, 5019D

The Bird Wideband Power Sensor (WPS) is a Thruline sensor that can be used to diagnose RF component integrity. The WPS can be used with the Bird 5000-NG by launching the Bird RF Power Meter Software.

These sensor's connect via USB, see "USB Connection" on page 8.

See "Wideband RF Power Sensor (WPS) Measurements" on page 48.

7020

The Bird 7020 series sensors are Thruline sensors that can measure forward and reflected average power and VSWR.

These sensor's connect via USB, see "USB Connection" on page 8.

See "7020 Sensor Measurements" on page 51.

Directional Power Sensors (DPS)

5014

The 5014 sensor utilizes elements to make power measurements. Each element has an arrow on it that represents the direction in which it measures power. The elements ignore power in the opposite direction with a directivity of at least 25 dB.

The DPS series can make power measurements using either 43 type or APM/DPM elements, and the readings available vary, based on which elements are being used.

The frequency the 5014 is capable of measuring is dependent on the elements used.

These sensor's connect via USB, see "USB Connection" on page 8.

See "Directional Power Sensor (DPS) Measurements" on page 52.

Statistical Power Sensors

The Bird Statistical Power Sensor (7022) is a Thruline sensor that can measure Average, Real Time, Peak and Statistical power. The frequency range of the 7022 is 350 MHz to 6 GHz.

These sensor's connect via USB, see "USB Connection" on page 8.

See "Statistical Power Sensor Measurements" on page 54.

Antenna and Cable Monitor (ACM)

ACMI Series

Bird's Antenna & Cable Monitor is the solution for monitoring transmission antenna systems. Designed to detect antenna and cable faults that transmitter-internal VSWR monitors may not detect, it also provides accurate in-line power measurement functionality.

Measures forward and reflected power as well as VSWR and Return Loss.

The 5000-NG connects to the ACM via WiFi, see "Automatic WiFi Network Connection" on page 9 or "Manual WiFi Network Connection" on page 9.

See "Antenna and Cable Monitor (ACMI) Measurements" on page 59.

Enhanced Broadcast Power Monitor (BPM-E)

The BPM-E is a compact, microprocessor controlled instrument intended for long-term system VSWR and power monitoring.

The 5000-NG connects to the BPM-E via WiFi, see "Automatic WiFi Network Connection" on page 9 or "Manual WiFi Network Connection" on page 9.

See "Broadcast Power Monitor (BPM) Measurements" on page 62.

Channel Power Monitor (CPM)

The Bird CPM is a multiple-channel power monitoring system that is capable of continuously monitoring power and VSWR performance simultaneously for up to 16 analog / 16 digital channels and is scalable to accommodate any-sized radio system operating between 118 and 940 MHz. The CPM works with a variety of power sensors.

The 5000-NG connects to the CPM via WiFi, see "Automatic WiFi Network Connection" on page 9 or "Manual WiFi Network Connection" on page 9.

See "Channel Power Monitor (CPM) Measurements" on page 65.

Chapter 2 Operation

Unpacking and Inspection

1. Carefully inspect shipping container for signs of damage.
   - If the shipping container is damaged, do not unpack the unit. Immediately notify the shipping carrier and Bird Technologies.
   - If the shipping container is not damaged, unpack the unit. Save shipping materials for repackaging.
2. Inspect unit for visual signs of damage.

   Note: *If there is damage, immediately notify the shipping carrier and Bird Technologies.*

Charging the Battery

CAUTION

Only use the supplied AC adapter to charge the unit.
Due to the amperage required to charge the 5000-NG, charging from another power source (i.e. laptop USB port) may damage that power source.

The 5000-NG has an internal battery capable of up to 24 hrs of operation from a full charge, the actual battery life will vary according to the power sensor used and the amount of time the display is active, see "Specifications" on page 68.

1. Connect AC adapter to the micro-USB port on the 5000-NG.

   Note: *The 5000-NG can be used for RF power measurement while charging.*

2. Allow the 5000-NG to charge until charge indicator indicates the unit is fully charged.

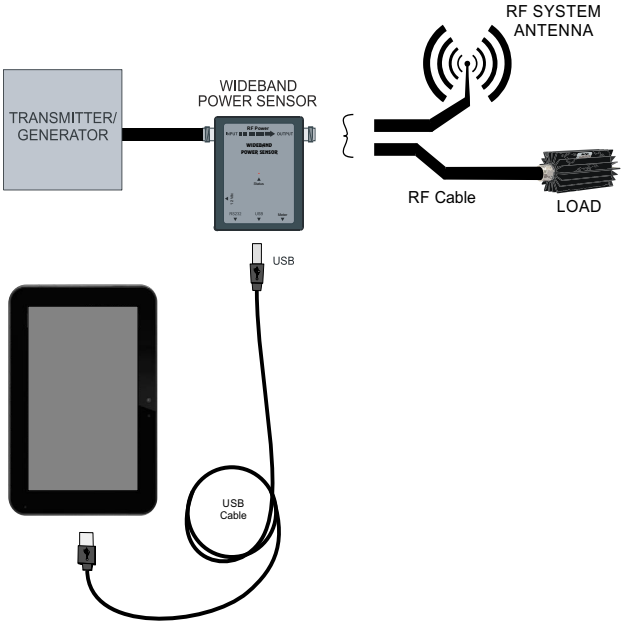
RF Line Connection

WARNING

Never attempt to connect or disconnect RF equipment from a transmission line while RF power is applied. Leaking RF energy is a potential health hazard.

1. Connect output of the transmitter to the input of the power sensor.
2. Connect output of the power sensor to the systems antenna or a load.

Figure 3 RF Power Measurement Setup



For a description of RF Power Meter Software displays and menus, see "Sensor Displays and Menus" on page 12.

Sensor Data Connection

RF Power measurement is accomplished using the RF Power Meter Software on the 5000-NG with a Power Sensor. The following section describes how to connect the 5000-NG to a Power Sensor, user interface description, and measurement procedure.

There are two ways the 5000-NG can connect to a compatible power sensor, USB connection and WiFi connection.

- "USB Connection" on page 8
- "Automatic WiFi Network Connection" on page 9
- "Manual WiFi Network Connection" on page 9

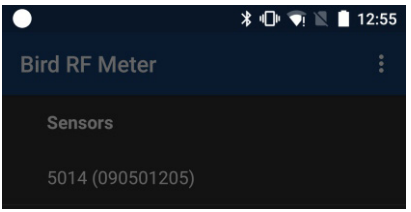
USB Connection

1. Connect USB cable to Bird Power Sensor. See Figure 3 on page 7.
2. Connect USB cable to 5000-NG.

   Note: *The Bird RF Power Meter Software will save all sensor settings (by serial number). Sensor settings will automatically load when the sensor is connected. Settings are saved in a Session File. Session Files are saved in the Session List.*

3. The Power Sensor model number and serial number will be displayed on the Bird RF Power Meter Software device selection screen.

Figure 4 Device Selection Screen



4. Tap the Power Sensor model number to connect to the Power Sensor.

Automatic WiFi Network Connection

> **Note:** *The Bird RF Power Meter Software is capable of connecting to Bird Ethernet enabled devices when those devices are connected to a WiFi enabled network.*

Instructions for enabling WiFi can be found in "5000-NG Communications Settings" on page 33.

1. Enable WiFi on the 5000-NG and connect to the network supporting the Bird Ethernet enabled device (s).
2. Tap the menu icon on the RF Meter device selection screen to display the Preferences menu.
3. Tap Network Scan option.
4. Any Bird devices connected to the selected network should be displayed on the device selection screen as Found Devices.

   > **Note:** *Device will be displayed by device name, followed by the IP Address.*

5. Tap the device to connect.
6. Disconnect from the WiFi device when measurements are complete. See "WiFi Device Disconnect" on page 10.

   > **Note:** *Consult device manual for additional operating instructions.*

Manual WiFi Network Connection

Instructions for enabling WiFi can be found in "5000-NG Communications Settings" on page 33.

1. Enable WiFi on the Android device and connect to the network supporting the Bird Ethernet enabled device (s).
2. Tap the menu icon on the RF Meter device selection screen to display the Preferences menu.
3. Tap Add Connection.
4. Tap on the type: BPME or CPM.
5. Enter the IP address of the device as the Hostname.
6. For CPM, enter a Name if desired.
7. Tap OK.

   > **Note:** *Consult device manual for additional operating instructions.*

8. Disconnect from the WiFi device when measurements are complete. See "WiFi Device Disconnect" on page 10.

WiFi Device Disconnect

Once finished using a WiFi device it is recommended that you disconnect from the device.

1. Tap the 5000-NG back button to display the Bird RF Meter device selection screen.
2. Press on the WiFi sensors's name/IP Address until Disconnect is displayed.
3. Tap Disconnect.

Forget a Remembered WiFi Device

Once the RF Power Meter Software remembers the details of a WiFi device, those details are remembered and the device is listed on the sensor selection screen.

1. Press on the WiFi sensors's name/IP Address until Forget Device is displayed.
2. Tap Forget Device

> **Note:** *The WiFi devices Forget Device menu option will remove the device from the list of devices, a Network Scan must be done to add the device to the list.*

Zeroing a Sensor

> **Note:** *Not all power sensors require a zero cal, only sensors with the zero cal option on the Sensor Operation Menu require zero cal.*

Over time, the sensor's “zero value” (reading with no applied RF power) can drift, making all readings inaccurate by this value. For example, if the zero value is 0.02W, measuring a 50 W signal will give a reading of 49.98 W, a 0.04% error. Measuring a 1 W signal will give a reading of 0.98 W, a 2% error. If the drift would be a significant error, zero the sensor.

> **Note:** *RF power must be turned off before zeroing a power sensor.*

1. Ensure the sensor has reached a stable operating temperature.
2. Tap the Sensor Operation Menu  .
3. Tap the Device Actions item.
4. Tap Zero Cal.
5. Verify no RF is applied to the sensor.
6. Tap OK if no RF is applied.

> **Note:** *Calibration may take up to 40 seconds. Do not interrupt the calibration. A “Performing Zero Calibration” message will be displayed during the calibration.*

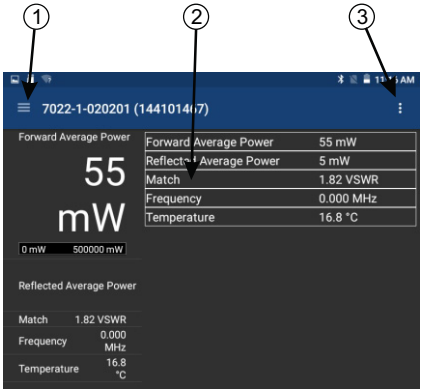
Chapter 3 User Interface

The user interface objects discussed in this chapter consists of the RF Power Meter Software User Interface and the 5000-NG Operating System User Interface.

RF Power Meter Software User Interface

Sensor Displays and Menus

Figure 5 Power Meter Display



Item		
1	Display Controls Menu	Used to configure the sensor and choose the format for displaying measurement data. See "Display Controls Menu" on page 14.
2	Display Area/ Readings Menu	Displays the numerical readings available/selected device readings. The information on the readings menu can also be displayed in table or graphical format. See "Display Area" on page 12.
3	Sensor Operations Menu	Used to load Presets, select modes, send device commends, start Logging and share measurement results. See "Sensor Operations Menu" on page 23 for detailed description of the available options.

Display Area

Readings Menu

Sensor measurements are displayed on the reading menu in a list format. The top reading is enlarged to aid visibility and an analog bar meter provides visual reference of the signal level.

Graphical Displays — Any readings may be displayed in graphical or tabular format by tapping the Display Controls Menu to display the graph options and selecting a graph from the list. See Graph Displays for additional information.

Changing Units and Scale — The analog bar meter is displayed with the top sensor reading, to provide a visual display of the measurement. The Analog Bar Meter's minimum and maximum scale value can be manually adjusted. See "Changing Readings Menu Settings" on page 13.

Reorder Menu — Any of the readings may be moved to the top of the list to ease reading. See "Arranging the Readings Menu Order" on page 13.

Changing Readings Menu Settings

Note: *The Bird RF Power Meter Software will save all settings for each sensor (by serial number). Sensor specific settings will automatically load when the sensor is connected. All settings are saved in Session Files.*

The following changes can be made to any reading:

- Unit of measure
- Analog Bar Meter Scale

Changing the Unit of Measure

1. Tap the sensor reading to display the popup dialog.
2. Tap Edit Unit.
3. Tap the measurement unit and select the new unit of measure from the drop down list.

Changing the Analog Bar Meter Scale

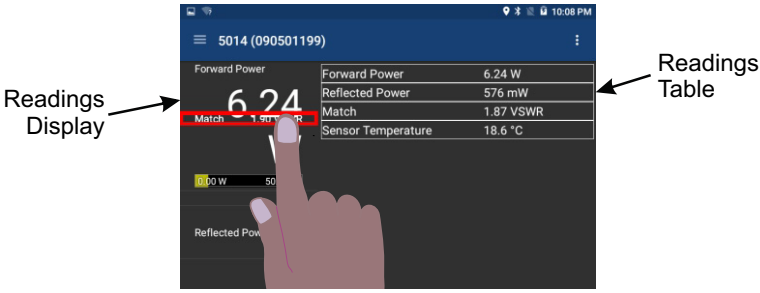
1. Tap the sensor reading to display the popup dialog.
2. Tap Edit Meter Scale.
3. Tap the drop-down list and select Custom.
4. Enter the maximum value for the bar meter in the first text field.
5. Enter the minimum value for the bar meter in the second text field.
6. Select the unit of measure from the drop-down list for the value entered.

Arranging the Readings Menu Order

The measurement type displayed at the top of the Readings Menu is selected by gesture.

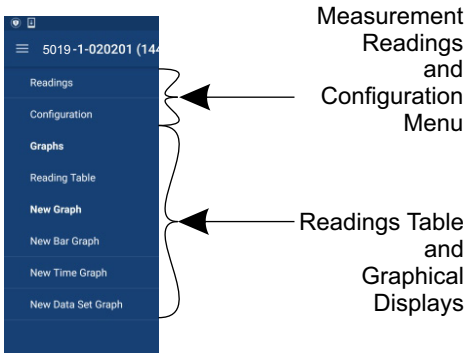
1. Press the value until red border appears.
2. Drag the value to the top position in the Readings Menu until it displaces the top value then release.

Figure 6 Changing Readings Order



Display Controls Menu

Figure 7 Display Controls Menu



Sensor Configuration Menu

Note: *Menu options and readings displayed will vary according to the capabilities of the connected sensor.*

Measurement Type — Choose the Measurement Type by tapping one of the available radio buttons in the menu.

Offset — Offset menu is used to enter the total value of all couplers and attenuators connected to the sensor (for example, the coupling factor of a directional coupler).
Tap Offset, enter the total attenuation of couplers and attenuators connected to the sensor then press OK.

Forward Scale — For model 5014 Sensors only:
Enter the watt rating of the forward element then press OK. See 5014 Sensor Element Types for

Filter Value — For Wideband Power Sensors:
Set filter value, this filter can be set to either 4.5 kHz, 400 kHz, or full bandwidth, see Video Filter.

CCDF Limit — For Wideband Power Sensors:
Enter the threshold to be used for CCDF measurement. See CCDF

> **Note:** *Statistical Power Sensors (7022) have numerous unique configuration settings, for a description of these settings see Statistical Power Sensor Measurements.*

Bandwidth — For Statistical Sensors:
Set bandwidth (filter value), this filter can be set to either 4.5 kHz, 500 kHz, 5 MHz, or None (no filter, full bandwidth). See Bandwidth (Video Filter).

Correction Frequency — For Statistical Sensors:
Enter the frequency under test, or allow sensor to automatically detect frequency under test (default).

Duty Cycle — For Statistical Sensors:
Enter the Duty Cycle of the system under test, or allow sensor to automatically detect the Duty Cycle of the system under test (default).

Sample Interval — For Statistical Sensors, Time Domain Measurement:
Select the desired time interval between samples (this will affect the length of time required to complete Time Domain Measurement).

Trigger settings — For Statistical Sensors, Time Domain Measurement:
Select trigger source, trigger mode, trigger edge, trigger level, trigger hold off, or trigger delay. See Time Domain Mode.

Run Mode — For Statistical Sensors, Statistical Measurement:
Select whether a single measurement is acquired, or measurements will automatically be repeated.

Confidence, Sample Time, and Sample Count — For Statistical Sensors, Statistical Measurement:
Select one of these settings to adjust, Confidence, Sample Time, or Sample Count. Setting one of these affects the other two settings, only one needs to be adjusted for each measurement, see Confidence Percentage.

Dynamic Range — For Statistical Sensors, Statistical Measurement:
Select the decibel measurement range for each measurement, this setting will determine the values on the x-axis of the graphed results.

Graph Displays

Any measurement can be displayed in graphical or tabular format. Several different graph types may be displayed.

Tap the Display Controls Menu  to display the graph options.

Graph List — Default options are Reading Table, New Bar Graph, New Time Graph, and New Data Set Graph (CCDF and Time Domain modes only). Any saved graph for the current sensor/mode will also be displayed on the list. See How to Display a Graph.

Reading Table — The reading table displays all of the connected unit's measurements in a tabular

format. The reading table will be displayed until a different option is selected.

Graph Types

Any power measurement on the readings menu may be displayed on a graph. See "How to Display a Graph" on page 16. Graph setup may also be saved so frequently used settings will automatically be selected.

> **Note:** *Graphs are saved for the mode only. If the mode is changed the saved graph will not be available, until the device/mode associated with the saved graph is reconnected. Graphs can be saved for other devices of the same type by saving a Default Preset.*

Time Graph — The time graph displays signal measurements over time. The x-axis displays the time of the reading, the y-axis displays the measurement value. The graph is limited to 2000 data collection points, once the graph reaches this limit the oldest data is discarded as new data is added, so the chart data will constantly be shifting to the left side of the screen. See "Time Graph Controls" on page 21 for detailed information on interacting with Time Graphs.

Bar Graph — The bar graph displays instantaneous power levels of one or more signal measurements. The x-axis displays the name of the reading, the y-axis displays the measurement value. The graph initial setting is a single bar, but additional bars may be added. See "Bar Graph Controls" on page 17 for detailed information on interacting with Bar Graphs.

Data Graph — Power CCDF and Time Domain measurements are displayed on a Data Graph. The results are displayed following a measurement and continue to be displayed until a new scan is triggered. See "Data Graph Controls" on page 18 for detailed information on viewing Data Graphs.

> **Note:** *Data Graphs are not available on all sensors.*

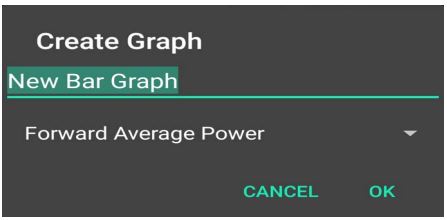
How to Display a Graph

1. Tap the Display Controls Menu to display the graph options.
2. Tap the name of graph type you wish to display (New Bar, New Time, New Data Set).

   > **Note:** *It is recommended a descriptive name be used as graph names, including graph type and other distinguishing information, since multiple graphs may be saved.*

3. Tap the name of the graph in the Create Graph Dialog a replace it with a descriptive name. See Figure 8 on page 16.

Figure 8 Rename New Graph



4. Select the measurement to graph from the drop-down menu.
5. Tap OK.
6. The new graph will be displayed in the Display Controls Menu below Reading Table.
7. Tap the graph's name in the menu to display the graph.

Note: *Graphs are saved for the current mode only. If mode is changed the saved graph will not be available until the mode associated with the saved graph is selected. Graphs can be saved by saving a Default Preset.*

Note: *Only the settings are saved, not the data. To save data see* "Logging" on page 24.

How to delete saved graphs

1. Tap the Display Controls Menu  to display the graph options.
2. Press the name of the graph in the list until the highlighted color changes, then tap the trash can symbol in the top right corner of the screen.

Bar Graph Controls

Note: *Graph controls are located in the Sensor Operation Menu*  .

Pause/Resume

When pause is tapped, graph data collection is stopped and the bar is paused. When resume is tapped, data collection begins and bar begins moving.

Graph Readings

The bar graph initially opens with only one measurement displayed, additional measurements may be displayed using this menu.

1. Tap the Sensor Operation Menu  .
2. Tap Graph Readings to display the dialog.
3. Select as many of the listed measurements as desired.
4. Click OK after a check mark is displayed for all measurements you wish to display together on the graph.

Graph Unit

The graph unit of measure may be changed manually by selecting a unit from the menu.

Note: *Changing the graph unit will automatically change the scale value.*

1. Tap the Sensor Operation Menu  .

2. Tap Graph Unit to display the dialog.
3. Tap the radio button for the desired unit of measure.

Graph Scale

The graph scale on the Y-axis may be changed by manually entering the minimum and maximum scale values.

1. Tap the Sensor Operation Menu  .
2. Tap Graph Scale to display the dialog.
3. Tap drop-down list. Select Custom.
4. Tap the first value entry field (maximum) and enter the maximum scale value.
5. Tap the second value entry field (minimum) and enter the minimum scale value.
6. Tap the units drop-down list and select the appropriate value.
7. Click OK.

Data Graph Controls

Note: *Graph controls are located in the Sensor Operation Menu*  .

- Pinch the graph to zoom in or zoom out.
- Swipe up, down, left, or right to move the trace within the graph area.
- Tap Reset Zoom on the Sensor Operation Menu to return the graph to normal operation.

Graph Unit

The graph unit of measure may be changed manually by selecting a unit from the menu.

Note: *Changing the graph unit will automatically change the scale value.*

1. Tap the Sensor Operation Menu  .
2. Tap Graph Unit to display the dialog.
3. Tap the radio button for the desired unit of measure.

Graph Scale

The graph scale on the Y-axis may be changed by manually entering the minimum and maximum scale values.

1. Tap the Sensor Operation Menu  .
2. Tap Graph Scale to display the dialog.

3. Tap drop-down list. Select Custom.
4. Tap the first value entry field (maximum) and enter the maximum scale value.
5. Tap the second value entry field (minimum) and enter the minimum scale value.
6. Tap the units drop-down list and select the appropriate value.
7. Click OK.

Add Marker

Note: *Markers are not available on Bar Graphs.*

1. Tap the Sensor Operation Menu ⋮.
2. Tap Add Marker.

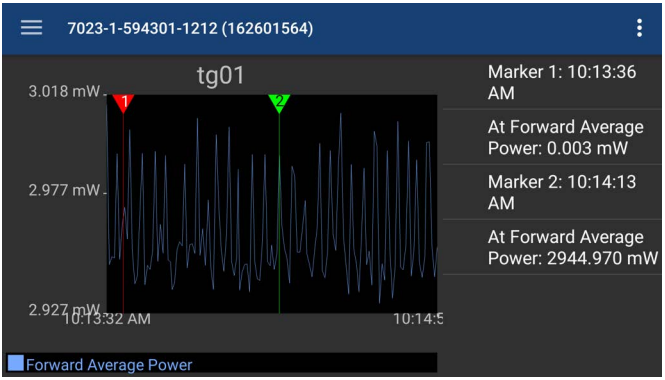
When Add Marker is tapped, a marker is added at the center point of the graph All markers are added at the center point of the graph, newly added markers will be positioned directly "over" previous markers if the previous marker has not moved from the center point. The value of the signal at the marker position may be displayed in a list.

Marker List

1. Tap the Sensor Operation Menu ⋮.
2. Tap Marker List.

When Marker List is tapped, marker list is displayed on the screen to the right or below the chart. The marker list is removed from the screen by tapping Marker List a second time.

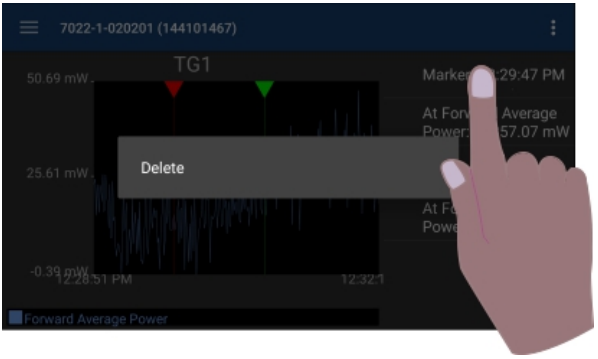
Figure 9 Marker List



Deleting Markers

Press the marker data in the marker list until Delete is displayed, then tap Delete.

Figure 10 Delete Marker



Reset Zoom

when tapped, graph will be return to default view and the trace will update as data is collected.

Time Graph Controls

Any measurement can be displayed in graphical or tabular format. See "How to Display a Graph" on page 16.

Note: *Graph controls are located in the Sensor Operation Menu* .

- Touching the graph area will stop the trace on the screen, however data will continue to be collected.
- Pinch the graph to zoom in or zoom out.
- Swipe up, down, left, or right to move the trace within the graph area.
- Tap Reset Zoom on the Sensor Operation Menu to return the graph to normal operation.

Pause/Resume

When pause is tapped, graph data collection is stopped and the trace is paused. When resume is tapped, data collection begins and trace begins moving.

Graph Readings

The graph initially opens with only one measurement displayed, additional measurements may be displayed using this menu.

1. Tap the Sensor Operation Menu .
2. Tap Graph Readings to display the dialog.
3. Select as many of the listed measurements as desired.
4. Click OK after a check mark is displayed for all measurements you wish to display together on the graph.

Graph Unit

The graph unit of measure may be changed manually by selecting a unit from the menu.

Note: *Changing the graph unit will automatically change the scale value.*

1. Tap the Sensor Operation Menu .
2. Tap Graph Unit to display the dialog.
3. Tap the radio button for the desired unit of measure.

Graph Scale

The graph scale on the Y-axis may be changed by manually entering the minimum and maximum scale values.

1. Tap the Sensor Operation Menu .
2. Tap Graph Scale to display the dialog.
3. Tap drop-down list. Select Custom.
4. Tap the first value entry field (maximum) and enter the maximum scale value.
5. Tap the second value entry field (minimum) and enter the minimum scale value.
6. Tap the units drop-down list and select the appropriate value.
7. Click OK.

Add Marker

1. Tap the Sensor Operation Menu .
2. Tap Add Marker.

When Add Marker is tapped, a marker is added at the center point of the graph All markers are added at the center point of the graph, newly added markers will be positioned directly "over" previous markers if the previous marker has not moved from the center point. The value of the signal at the marker position may be displayed in a list.

Marker List

1. Tap the Sensor Operation Menu .
2. Tap Marker List. See Figure 9 on page 19.

When Marker List is tapped, marker list is displayed on the screen to the right or below the chart. The marker list is removed from the screen by tapping Marker List a second time.

Deleting Markers

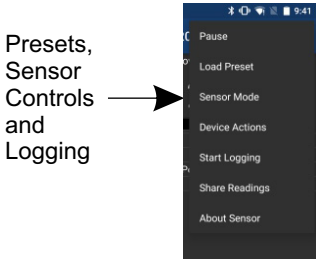
Press the marker data in the marker list until Delete is displayed, then tap Delete. See Figure 10 on page 20.

Reset Zoom

when tapped, graph will be return to default view and the trace will update as data is collected.

Sensor Operations Menu

Figure 11 Sensor Operation Menu



Pause/Resume — The Pause option will stop the updates of measurement readings and graphs.

Load Preset — This option allows you to load a preset configuration file, see Session Files for details.

Device Actions — The Device Actions menu contains actions available for the connected sensor such as Zero Calibration or Alarm Reset, see Device Actions Menu.

Start Logging — The Start Logging function will log measurements to a text file.

> **Note:** *Logging is Mode specific, if the sensor in use has multiple modes and the mode is changed, logging will automatically stop.*

1. Tap Start Logging to display the Logging Options Dialog Box, see Logging Interval and Logging Condition. The menu option will change to Stop Logging once logging is activated.
2. Once logging begins an Icon is displayed in the notification area on the android device.
3. Logging will continue until Stop Logging is tapped, on the Sensor Operations Menu .

> **Note:** *If Logging Interval and Logging Condition are both checked. Logging will occur when the condition is met AND the interval has elapsed.*

Logging Interval — Logging Interval is used to set a repetitive time used to log all sensor measurements.

Enter a repeat time and select from seconds, minutes, or hours.

Logging Condition — Logging Condition is used to set a criteria for logging. Select a measurement and the criteria the measurement must meet or exceed for logging to take place.

Viewing Logged Data — The Log files are saved on the internal memory of the Android device. See Logging for details about the log files.

Share Readings — The Share Readings function will send a text report of the current measurement readings to a selectable destination via bluetooth. See "Share Readings via Bluetooth" on page 26.

About Sensor — Displays the model number, serial number, and firmware version of the connected sensor.

Device Actions

Zero Cal — Some sensors include a zero calibration feature. For these sensors, pressing Zero Calibration will cause the sensor to be calibrated to compensate for noise in the transmission line when no RF power is actually present. RF must be removed before performing calibration. The length of time required for calibration will vary by sensor being used.

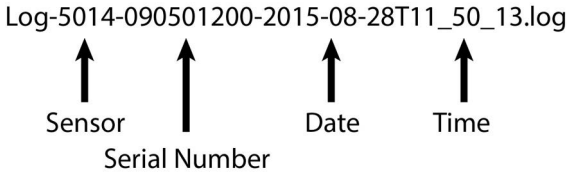
A "Performing Zero Calibration" message will be displayed during the calibration. A message will be displayed indicating a successful calibration or calibration failed. If the calibration fails, check the sensor connections and try again.

See "Zeroing a Sensor" on page 10.

Logging

Sensor data can be logged by the Bird RF Power Meter Software. Logging saves all the sensors active readings into a text file. Logging can be started on the Sensor Operations Menu . Logs are saved using the following file naming convention:

Figure 12 Log File Name Example



Viewing Logged Data

The Log files are saved on the internal memory of the Android device.

Typical Path: SDCARD>Bird RF Meter>Logs.

The data is saved in JSON format in the log file. The data is broken into two sections and is shown below.

The data may be viewed as text in any text editor, or imported into a spreadsheet program. See Importing Logs into Excel for steps to import into Microsoft Excel.

Log File Definition

Section 1: Data Definition, often referred to as an Object. The data logged will vary according to the sensor connected when the log file is created.

Section 1 includes:

- Model, serial number, date and time log was created
- Readings definition
- Mode definition, including settings

Section 2: Data Array. The values recording in the log file are defined by the readings definition in section 1. Each array of values is prefaced by the word "results". Each log file will contain multiple data arrays, even hundreds or thousand depending on the length of time logging was allowed to run.

Section 1 Example:

Note: *The format of the data has been altered in the example for simplification, the text runs together in log files.*


```
{"model":"BPMon002","serialNumber":"Unknown","created":"2015-09-09T15:55:40",

"readings":[    {"id":"Measurement.ForwardAveragePower","name":"Forward Power",
                 "readingType":"DoubleReading","unit":"Unit.Watts"},

                {"id":"Measurement.ReflectedAveragePower","name":"Reflected Power",
                 "readingType":"DoubleReading","unit":"Unit.Watts"},

                {"id":"Measurement.Match","name":"Match","readingType":"DoubleReading",
                 "unit":"Unit.ReturnLoss"},],

"mode":"Mode.AveragePower",

"settings":[    {"id":"Configuration.AlarmSense","name":"Alarm Sense",
                 "value":"Configuration.Disabled"},

                {"id":"Configuration.AlarmEnable","name":"Alarm Enable",
                 "value":"Configuration.Enabled"},

                {"id":"Configuration.VSWRTripPoint","name":"VSWR Trip Point",
                 "value":"Configuration.VSWRTripPoint_1_5"},
```


Section 2 Example:

Note: *The format of the data has been altered in the example for simplification, the text runs together in log files.*


```
{"results":[    {"reading":"Measurement.ForwardAveragePower","value":25.5,
                 "maxValue":125,"status":"Normal"},
                {"reading":"Measurement.ReflectedAveragePower","value":0,
                 "maxValue":12.5,"status":"Normal"},
                {"reading":"Measurement.Match","value":0,
                 "maxValue":null,"status":"Normal"},
                "timestamp":1441814140972}


{"results":[    {"reading":"Measurement.ForwardAveragePower","value":25.5,
                  "maxValue":125,"status":"Normal"},
```

Importing Logs into Excel

This procedure will display each group of results on one row with each measurement and values grouped by columns.

1. Transfer the log files to a PC.
2. Open an Excel spreadsheet.
3. Select Data Tab.
4. Click From Text on the menu. The Import Text File dialog box will open.
5. Select All Files, in the drop down menu at the bottom of the dialog box. Log files have the file extension .log.
6. Navigate to the folder containing the log file to import.
7. Select the file and click Import. This will open the Text Import Wizard.
8. On step 1, Select Delimited radio button, then click Next.
9. On step 2, select Comma and Other (add {) as the delimiters, then click Next.
10. On step 3, click finish.

Figure 13 Log File Open In Excel

results:[	reading:"Measurement.ForwardAveragePower"	value:25.5		reading:"Measurement.ReflectedAveragePower"	value:0
results:[	reading:"Measurement.ForwardAveragePower"	value:25.5		reading:"Measurement.ReflectedAveragePower"	value:0
results:[	reading:"Measurement.ForwardAveragePower"	value:25.5		reading:"Measurement.ReflectedAveragePower"	value:0

Note: *Columns have been removed in the example for simplicity.*

Share Readings via Bluetooth

Readings may be transfered from the 5000-NG using the following steps.

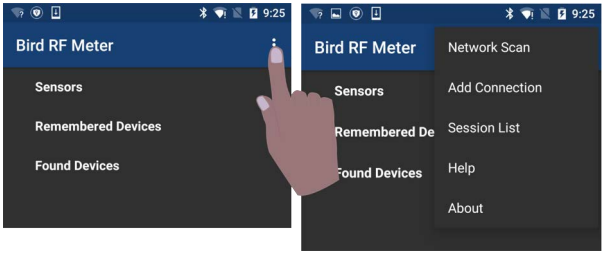
1. Prepare destination PC or Android device to receive Bluetooth
2. Verify Bluetooth is on. If off, see "Starting and Stopping Communication Services" on page 33.
3. Tap the Sensor Operation Menu  .
4. Select Share Readings.
5. Tap Bluetooth
6. Select the Bluetooth device from the list.

Figure 14 Share Readings

Preferences Menu

Tap the menu icon on the RF Meter device selection screen to display the Preferences menu.

Figure 15 Bird RF Meter Preferences Menu



Network Scan — This menu option scans the WiFi network the android device is connected to for any Bird devices connected to the same network.

Add Connection — The menu is used to manually connect to a Bird Device on the WiFi network the android device is connected to.

Session List — This is a list of all session files saved from connecting to Bird Power Sensors. Session files are automatically created and saved for each sensor (by serial number) connected to the Bird RF Power Meter Software. For more information see Session Files.

Help — Displays this help documentation.

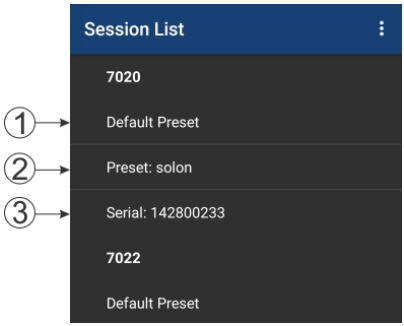
About — Displays copyright information and software source credits.

Session Files

Session List Definitions

Session files are used to initialize the Bird RF Power Meter Software when a Bird Power Sensor is connected. The following definitions describe the different session files.

Figure 16 Session List



When a power sensor is connected to the Bird RF Meter the first time the Generic Session File (Default Preset if created) is used to initialize the App then a Serial Number Specific Session File is automatically created.

1. Default Preset: A menu option is provided that allows you to save a preferred setup as a Default Preset setup for all sensors of the same sensor type.
2. Preset: A Preset is similar to a Default Preset, the difference is the Preset must be manually loaded to be used.
3. Serial Number Specific Session File: When a power sensor is connected to the Bird RF Meter the first time the Generic Session File (Default Preset if created) is used to initialize the App then a Serial Number Specific Session File is automatically created. Any changes made to the configuration for the power sensor will be saved in the Serial Number Specific Session File (the Default Preset is NOT updated unless the menu option is used).
4. Generic Session File: (Generic Session Files do not appear in the Session List) The first time a Bird Power Sensor is connected to the Bird RF Power Meter Software the generic session file for that sensor type is used to initialize the software. The software will use default settings for the power sensor type.

Open the Session List

1. Tap the menu icon on the RF Meter device selection screen to display the Preferences menu.
2. Tap Session List on the menu.

Save a Custom Configuration as a Default Preset

> **Note:** *Your custom setup can be saved as a Default Preset session file. This allows the same custom setup to be viewed the first time you connect to the same type of Bird Power Sensor.*

1. Connect to a Bird Power Sensor.

2. Setup the User Interface to your preferred setup. The following are examples of custom setup items:
    a. Save configurations for Graphs.
    b. Organize the readings menu.
    c. Configure the sensor.
    d. Setup logging criteria.
3. Tap the menu overflow icon.
4. Tap Session List.
5. Press the session file for the device setup up above until the save menu is displayed.
6. Tap Save As.
7. Select Default Preset then tap OK.

    Note: *You must delete any previous session files so your Default Preset will be used as the default Session File. This allows the same custom setup to be viewed every time you connect to the same type of Bird Power Sensor.*

Edit Session File

Once a session file has been created, you can easily edit the session file even when not connected to the sensor.

1. Tap the menu overflow icon.
2. Tap Session List.
3. Press the session file until the menu is displayed.
4. Tap Edit Session.
5. Edit any settings just as if the sensor was connected, any changes will be automatically saved in the selected session file.

Export Session File

When you connect to a Bird Power Sensor with the Bird RF Power Meter Software a Serial Number Specific Session File is created. You can also save your settings as the default settings for your power sensor type in a Default Preset or Preset. All of these file types can be exported from the Bird RF Power Meter Software for use on other devices.

1. Tap the menu overflow icon.
2. Tap Session List.
3. Press the session file for the device setup up above until the save menu is displayed.
4. Tap Export.
5. Rename the file if desired then click OK.

Exported Session Files are saved on the internal memory of the Android device and can them be transfer to a PC or another Android device.

Typical Path: SDCARD>Bird RF Meter>Sessions.

Import Session File

If you wish to import one or more Session Files onto an Android device you must first copy the files onto the Android device into the Bird RF Meter folder.

1. Transfer the desired Session Files into the following folder on the destination Android device: SDCARD>Bird RF Meter>Sessions
2. Tap the menu overflow icon.
3. Tap Session List.
4. Tap the menu overflow icon in the Session List.
5. Tap Import Session.
6. Select the files for import in the Dialog Box (if no files are visible, repeat step 1).
7. Tap OK

Load a Session File

1. Connect a sensor.
2. Tap the Sensor Operation Menu  .
3. Tap load preset.
4. Tap the session file to load from the list in the dialog box.

Delete Session File

1. Open the Session List.
2. Press the Session File you wish to delete until the delete menu is displayed.
3. Tap Delete.

5000-NG Operating System User Interface

The Operating System User Interface provides access to the device settings and file explorer. Both of these services are password protected.

The password is **5000ng**.

Camera

A Camera App is not preinstalled on the 5000-NG, to use the camera the Camera App APK must be manually installed, see "Package File (APK) Installation" on page 41.

The 5000NG_Camera.apk is available on the 5000-NG product page on Bird's website.

https://birdrf.com/Products/Sensors/RF-Power-Sensors/Digital-Power-Meter-Display/5000-NG-Digital-Power-Meter-Display.aspx

Camera Operation

1. Tap Home icon on the 5000-NG display.
2. Tap the Apps icon on the unit's home screen.
1. Tap the **Open Camera** Icon.
    a. Pictures are stored in: Internal Memory/DCIM/OpenCamera
    b. Detailed Operating Instructions can be found at https://opencamera.org.uk/

    Note: *If the Open Camera Icon is not displayed then the 5000NG_Camera.apk must be downloaded from the Bird website and manually installed, see* "Package File (APK) Installation" on page 41.

Memory Expansion

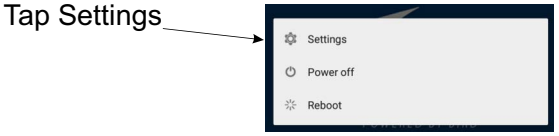
There are two options for extending the internal memory of the 5000-NG. There is a MicroSD slot and a USB port. While memory expansion is not required for proper operation of the 5000-NG, it provides a easy way to transfer information off of the power meter. Memory devices should be unmounted via software before being physically removed, see "Eject Memory Device" on page 32.

Eject Memory Device

This procedure should be performed to avoid corrupting the data stored on the external memory device.

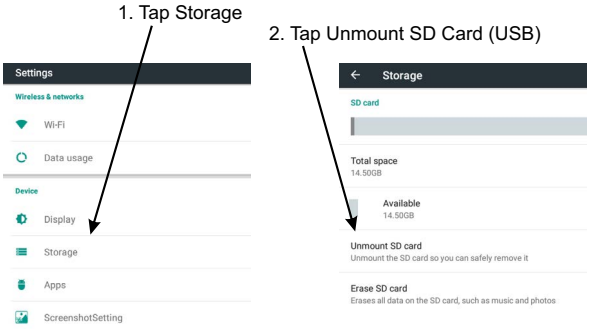
1. Long Press the Home Icon.
2. Tap **Settings** on the menu. See Figure 17.

Figure 17 Settings Menu



3. Type the password (5000ng) and tap confirm.
4. Tap **Storage**.

Figure 18 Unmount Storage Device



5. Scroll to **SD Card** or **USB Storage**
6. Tap the **Unmount** option.
7. Wait for unmount operation to complete.
8. Remove the storage device.

5000-NG Communications Settings

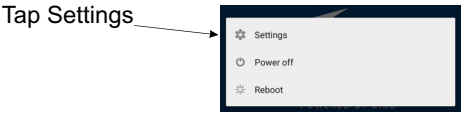
The 5000-NG utilizes Wi-Fi to perform functions described in the previous sections and Bluetooth can be used to transfer files from the 5000-NG to a PC.

These communications functions may be turned on and off using the 5000-NG's settings menus, See Figure 19.

Starting and Stopping Communication Services

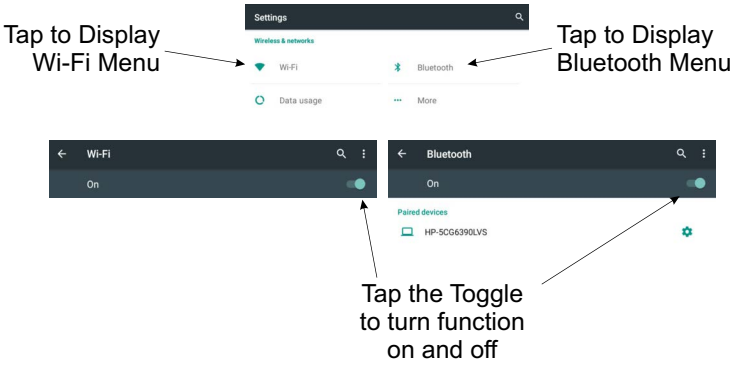
1. Long press the power button.
2. Tap settings in popup menu.

Figure 19 Settings Menu



3. Type password (5000ng) and tap **Confirm**.
4. Tap the service Icon to start (or stop) the service, see Figure 20 on page 33
   a. WiFi: tapping Wi-Fi icon opens the Wi-Fi dialog. Tap the toggle on the upper right side of the screen to turn Wi-Fi on and off.
   b. Bluetooth: tapping Bluetooth icon opens the Bluetooth dialog. Tap the toggle on the upper right side of the screen to turn Bluetooth on and off.

Figure 20 5000-NG Communications Settings menus

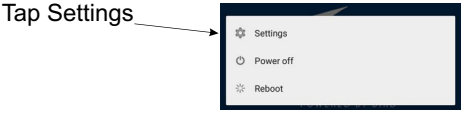


Pairing a Bluetooth Device with the 5000-NG

5000-NG

1. Long press the power button.
2. Tap settings in popup menu.

Figure 21 Settings Menu



3. Type password (5000ng) and tap **Confirm**.
4. Tap Bluetooth icon to open the Bluetooth dialog.
5. If Bluetooth is off, tap the toggle to turn on.

   Note: *A list of Bluetooth devices will be listed on the Bluetooth dialog. If the PC is not listed make sure Bluetooth on the PC is turned on.*

6. Tap the PC name in the list of available devices to pair it with the 5000-NG.

Windows PC

Note: *A notification will appear on the PC, indicating the 5000-NG is attempting to pair with the PC.*

7. Click the **Add a Device** notification to pair the PC with the 5000-NG.
8. Verify the PIN number displayed on the PC matches the PIN number display on the 5000-NG.
9. Click **Yes** on the PCs pairing dialog box.

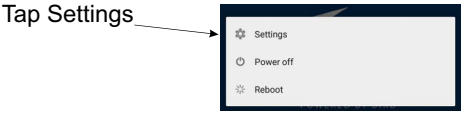
5000-NG

10. Tap Pair on the 5000-NGs pairing dialog box to complete the pairing process.

Connecting to a Wi-Fi Network

1. Long press the power button.
2. Tap settings in popup menu.

Figure 22 Settings Menu



3. Type password (5000ng) and tap **Confirm**.
4. Tap Wi-Fi icon to open the Wi-Fi dialog.
5. If Wi-Fi is off, tap the toggle to turn on.

   Note: *A list of* Wi-Fi networks *will be listed on the Wi-Fi dialog.*

6. Tap the name of the Wi-Fi network you want to connect 5000-NG with.
7. Type the network password into dialog box and tap **CONNECT**.

Chapter 4 File Transfers and Updates

File Transfers

File transfers from the 5000-NG may be accomplished using USB Drive, SD Card, USB Cable, or PC Bluetooth connection.
For instructions on how to make transfers see:

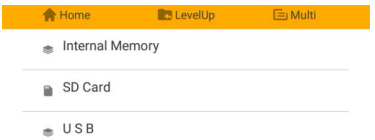
- "Transfer Files from Internal Storage to USB Drive or MicroSD" on page 36
- "Transfer Files from the 5000-NG to a PC via USB Cable" on page 38
- "Transfer Files from 5000-NG to a PC using Bluetooth" on page 38

Transfer Files from Internal Storage to USB Drive or MicroSD

Files can be transferred from or to the 5000-NG internal memory with either a MicroSD Card or a USB drive.

1. Connect one of the following to begin:
   - Insert a MicroSD card into the MicroSD slot
   - Connect the USB drive to the USB port on the 5000-NG.
2. Tap Home icon on the 5000-NG display.
3. Tap the Apps icon on the unit's home screen.
4. Tap the Explorer App.
5. Type the password (5000ng) and tap yes.
6. Navigate to the location of the file. See Figure 23.
   Example: Internal Memory **>** Bird RF Meter **>** Logs

Figure 23 Media Selection



Note: *Log files must be renamed because they contain colons (:). Files containing certain special characters must be renamed.*

7. Rename files as required, log files contain colons (:) and must be renamed.
   a. Long press the file to be renamed.

b. Tap rename in the pop-up menu.

c. Delete or replace special characters in the file name, or type a new file name.

d. Tap OK to finish.

8. If transferring multiple files:

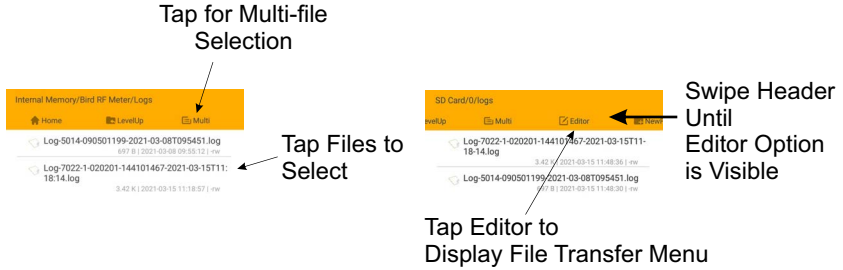
a. Tap Multi Multi in the header. See Figure 24.

b. Tap each file to copy.

c. Tap Editor Editor.

d. Tap Copy.

Figure 24 Multiple File Selection



9. If transferring just one file:

a. Long press the file name.

b. Tap Copy.

10. Tap the Home Icon Home.

11. Tap Storage location for transfer:

- SD Card
- USB

12. Navigate to the directory where the file will be saved.

Note: *To create a folder on an external drive, tap* NewFolder.

13. Tap Editor.

14. Tap the Paste.

15. Exit the File Manager.

Transfer Files from the 5000-NG to a PC via USB Cable

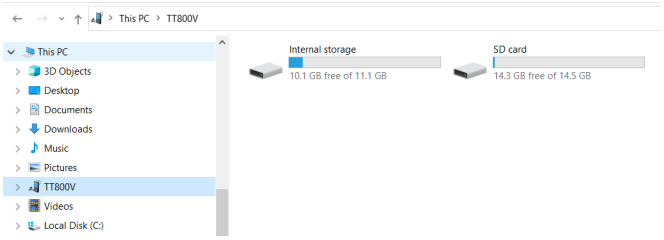
CAUTION

Ensure 5000-NG is fully charged using the supplied adapter before connection to a PC for file transfers.
Due to the amperage required to charge the 5000-NG, charging from a PC may damage that power source.

1. Connect USB cable between USB port on the 5000-NG and USB port on a PC.
2. On the PC, open the device (TT800V) in Windows Explorer.
3. Files may be copied directly to or from the 5000-NG's internal storage and connected a USB Drive or MicroSD card to the PC.

Note: *Log files and session logs generated by the Bird RF Power Meter Software are stored in the 5000-NG Internal storage in a folder titled Bird RF Meter.*

Figure 25 Windows Explorer Display



Transfer Files from 5000-NG to a PC using Bluetooth

Note: *The PC and the 5000-NG must be paired prior to performing Bluetooth file transfers.*

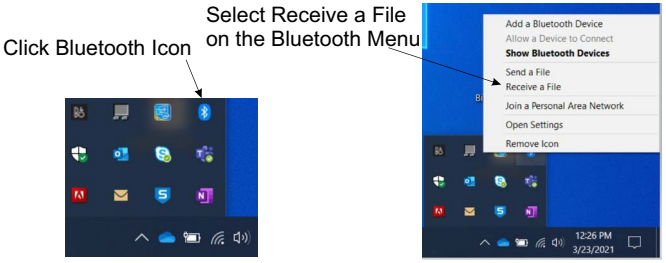
Note: *These instructions are for a Windows 10 PC with Bluetooth capability, this process may be different on other operating systems.*

Files may be transfered to a Windows 10 PC using the following steps:

Windows PC

1. Click on the Bluetooth icon on the PCs taskbar.
2. Select **Receive a File**.

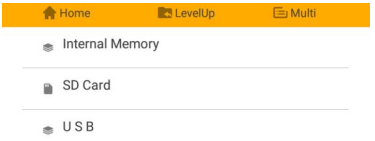
Figure 26 PC Bluetooth Setup



5000-NG

3. Tap Home icon on the 5000-NG display.
4. Tap the Apps icon on the unit's home screen.
5. Tap the Explorer App.
6. Type the password (5000ng) and tap yes.
7. Navigate to the location of the file. See Figure 23.
   Example: Internal Memory **>** Bird RF Meter **>** Logs

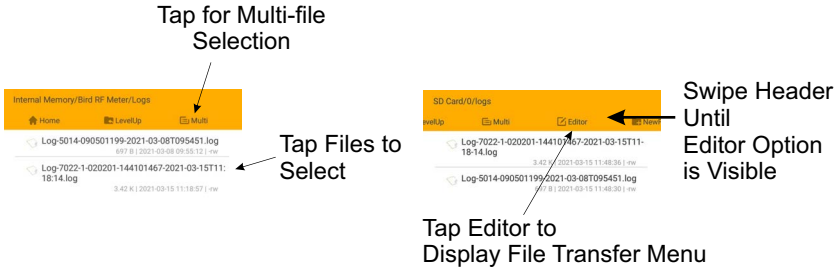
Figure 27 Media Selection



Note: *Log files must be renamed because they contain colons (:). Files containing certain special characters must be renamed.*

8. Rename files as required, log files contain colons (:) and must be renamed.
   a. Long press the file to be renamed.
   b. Tap rename in the pop-up menu.
   c. Delete or replace special characters in the file name, or type a new file name.
   d. Tap OK to finish.
9. If transferring multiple files:
   a. Tap Multi Multi in the header. See Figure 24.
   b. Tap each file to copy.
   c. Tap Editor Editor.
   d. Tap Send.

Figure 28 Multiple File Selection



10. If transferring just one file:
    a. Long press the file name.
    b. Tap Send.
11. Tap the Bluetooth option in the Send Menu.
12. Tap the PC name in the Bluetooth Device Selection screen. See Figure 29.

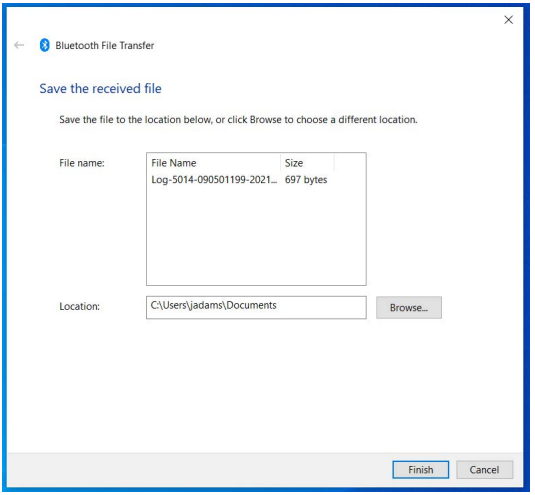
Figure 29 Bluetooth Device selection

Windows PC

Note: *The "Save the received file" dialog will appear on the PC once the files are received from the 5000-NG. See Figure 30.*

13. Click the **Browse..** button to select a location to save the files. Skip to use the default.

Figure 30 Received File Dialog Box



Click Finish to save the files on the PC in the selected location.

Package File (APK) Installation

Package files (APK) are the format used to install apps on the 5000-NG. The RF Power Meter Software (and other applications provided by Bird) may be updated and made available on the 5000-NG product page on Bird's Website (birdrf.com).

To install an APK follow these steps:

PC

1. Download the APK from the Bird website to a PC. https://birdrf.com/Products/Sensors/RF-Power-Sensors/Digital-Power-Meter-Display/5000-NG-Digital-Power-Meter-Display.aspx
2. Unzip the file to obtain **5000NG_xxxx.apk**
3. Copy the file **5000NG_xxxx.apk** to a USB drive.
4. Eject the drive from your PC.

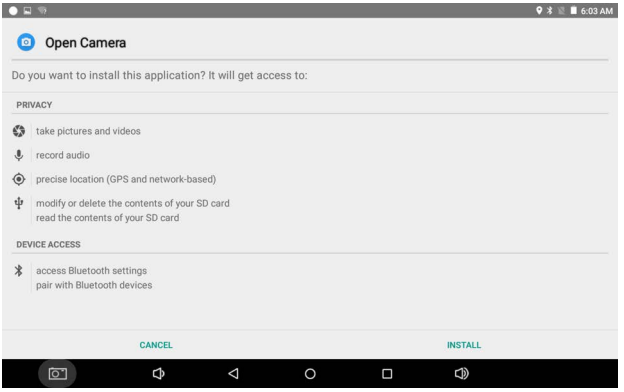
5000-NG

5. Power on the 5000-NG power meter display.
6. Insert the USB drive into the slot on the 5000-NG.
7. Press and hold the power button.
8. Tap **Settings** in the dialog box.
9. Type the password (5000ng) and tap **CONFIRM**.
10. Scroll down and tap **Security**.

Note: *The Bird apps are not on the Google Play Store®, Installing Apps from Unknown Sources must be enabled to allow the Bird APK to be installed.*

11. Scroll down to **Unknown sources** and tap the switch to enable. Tap OK when the message is displayed.
12. Tap Home icon on the 5000-NG display.
13. Tap the Apps icon on the unit's home screen.
14. Tap the Explorer App.
15. Type the password (5000ng) and tap yes.
16. Tap USB, then USB_DISK0, then udisk0
17. If necessary, navigate to the directory where the file was saved.
18. Tap the file name (**5000NG_xxxx.apk**).
19. Tap **INSTALL** on the installation window.

Figure 31 APK Installation Window



20. Once the installation is complete, tap **DONE**.
21. Press and hold the power button.
22. Tap **Settings** in the dialog box.
23. Type the password (5000ng) and tap **CONFIRM**.
24. Scroll down and tap **Security**.
25. Scroll down to **Unknown sources** and tap the switch to disable. Tap OK when the message is displayed.
26. Eject USB drive from 5000-NG, see "Eject Memory Device" on page 32.

Chapter 5 Measurements

This chapter describes the measurements available from compatible sensors.

The Measurement Descriptions section contains in-depth descriptions of some the measurements possible using Bird power sensors.

Procedures for each compatible sensor can be found in the following sections:

Measurement Descriptions

This section provides in-depth descriptions of some the measurements possible using Bird power sensors.

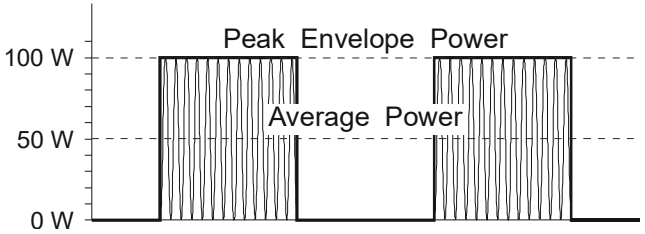
Average Power

All Sensors

Average power is a measure of the equivalent “heating” power of a signal, as measured with a calorimeter. It measures the total RF power in the system, and does not depend on number of carriers or modulation scheme. The WPS is a broadband sensor that measures power across its entire frequency range. Its diodes operate in their ‘square law’ region so that the detector output is directly proportional to the average power, without any additional error correction.

Average power is the most important measurement of any transmission system since the average power is normally specified on the operating license. It is also valuable as a maintenance tool, showing overall system health, and for calibration.

Figure 32 Average and Peak Envelope Power - Square Wave Signal



VSWR

All Sensors

VSWR measures the relation between forward and reflected average power. The Bird Wideband Power Sensor calculates the VSWR from the Forward and Reflected Average Power measurements. Rho and Return Loss are also the same measurement, but in different units:

Rho

$$Rho(\rho) = \sqrt{P_R / P_F}$$

VSWR

$$VSWR = \frac{1+\rho}{1-\rho}$$

Return Loss (dB)

$$ReturnLoss(dB) = 10\log(P_R / P_F)$$

The health of the feedline and antenna systems can be monitored using VSWR measurement under full power operating conditions. High VSWR is an indicator of feed line damage, overtightened cable or feed line clamps, or antenna changes/damage due to weather conditions, icing, or structural damage to the tower.

Peak Envelope Power

5012, 5016, 5017, 5018, 5019

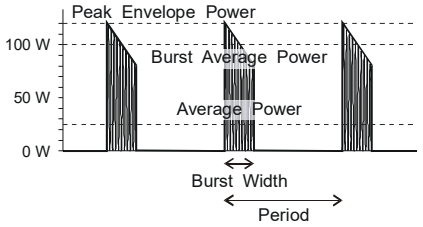
Peak power measurements detect amplitude changes as a signal modulates the carrier envelope. The WPS operates in an asynchronous cycle: 300 ms of waveform sampling followed by a 50 ms reset period. The peak power is then displayed and the cycle repeats. The display therefore updates about three times per second.

Transmitter overdrive can be detected with peak measurements. Common problems are overshoot at the beginning of burst packets, amplitude modulation, and excessive transients. These damage system components with excessive peak power and also cause data degradation, increasing the Bit Error Rate. For TDMA applications, Peak and Burst Power measurements are used to detect overshoot in single time slots. Other time slots must be turned off for this test.

Burst Average Power

5012, 5016, 5017, 5018, 5019

Figure 33 Burst Average Power



Burst width (BW) is the duration of a pulse. Period (P) is the time from the start of one pulse to the start of the next pulse. Duty cycle (D) is the percentage of time that the transmitter is on. To calculate the duty cycle simply divide the burst width by the period (D = BW / P). Low duty cycles mean that the burst width is much less than the period; a large amount of dead time surrounds each burst. For low duty cycles, the burst average power will be much larger than the average power.

After peak power is measured, a threshold of ½ the peak is set. The sampled power crosses that threshold at the beginning and end of each burst. The time between crossings is used to calculate the duty cycle. Burst Average Power is calculated by dividing the Average Power by the Duty Cycle.

Burst power measurements provide accurate, stable measurements in bursting applications such as TDMA and radar. Accurately measuring the output signal strength is essential for optimizing radar coverage patterns. Actual transmitted power in a single time slot can be deter-mined in TDMA. The other time slots must be off during this test.

Statistical Power Measurement

7022

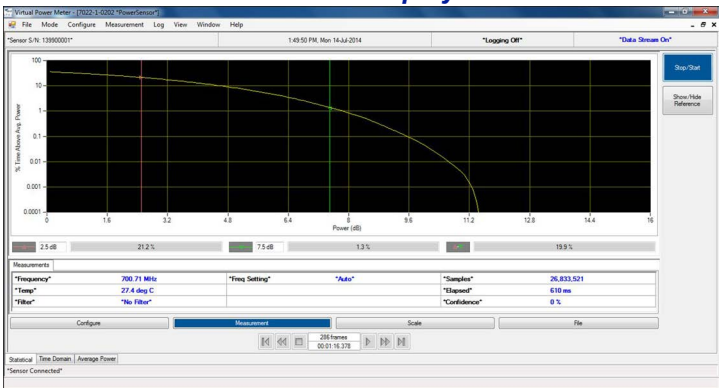
Provides statistical measurements to display the percentage of time that a particular waveform exists at a specific peak to average power ratio. The Figure 34 on page 46 illustrates this concept, as applied to an LTE-TDD waveform.

In Figure 34 the horizontal axis represents the peak to average power ratio of the waveform being measured. The vertical axis on the display represents time in percent. Reading a specific point on the graph provides information as to the percentage of time that the signal being measured exhibits a specific peak to average power ratio characteristic.

The performance curve illustrated in Figure 34 indicates that the maximum peak to average ratio of the waveform being measured is indicated at the point where the curve intersects the horizontal axis. This corresponds to a value of 11.5 dB.

Two movable cursors are available within the VPM3 display. These cursors may be located at any point on the curve, in order to determine specific values of the waveform peak to average ratio, and corresponding time.

Figure 34 VPM Statistical Power Display



This table represents a few of the statistical curve data points in numeric format.

Time (%)	Peak/Average Ratio (dB)
10%	**4.8**
1%	**7.5**
0.1%	**9.6**
0.01%	**10.6**

Interpreting Statistical Data

There are many factors that influence the performance of modern communications systems. Some examples:

- The presence of interfering signals within the operating bandwidth of the system.
- Transmission line discontinuities resulting in multiple reflections within the transmission system.
- Poor amplifier linearity caused by amplifier compression. This results in signal distortion and poor fidelity of transmitted waveforms.
- Antenna damage or degradation resulting in high transmission system reflections.
- Issues with transmitter modulator performance resulting in high error vector magnitude (EVM).

Many of the above transmission system issues may be identified through the use of the statistical techniques mentioned above. For example, if a particular LTE radio system was known to be dropping calls at a higher rate than expected, a service technician will need to know whether the problem is with the radio itself, or with some element of the transmission system, or with the air interface.

Measuring the statistics of the base station radio, while terminated with a high quality 50 ohm termination, and then again with the radio connected to the transmission and antenna system will provide clues as to where the issues may be.

Wideband RF Power Sensor (WPS) Measurements

See "Wideband RF Power Sensor (WPS) Measurements" on page 48.

The WPS are available with the frequency ranges shown below:

5012D: 350-4000 MHz

5016D: 350-4000 MHz

5017D: 25-1000 MHz

5018D: 150-4000 MHz

5019D: 25-1000 MHz

Figure 35 Wideband Power Sensor

The 501xD can be used to measure:

- Forward Power
- Reflected Power
- Peak Power
- Burst Power
- Match Measurements
- Crest Factor
- CCDF (displayed when CCDF is selected for Measurement Type)
- Duty Cycle (displayed when Avg is selected for Measurement Type)

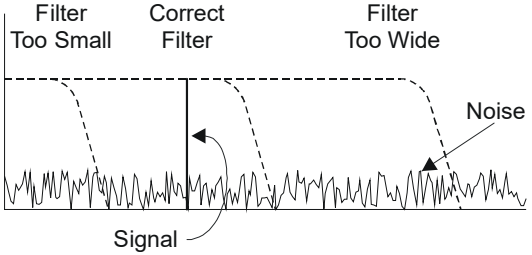
Measurement procedure

1. Connect the 501xD sensor to the cable or communications system. See "Sensor Data Connection" on page 8.
2. Zero the WPS. See "Zeroing a Sensor" on page 10.
3. Tap the Display Controls Menu
4. Tap Configuration.

5. Enter the Offset value (total attenuation of couplers and attenuators connected to the WPS, if used).
6. Enter Filter Value. See "Video Filter" on page 50 for an explanation of the filter.
7. Tap the Display Controls Menu 
8. Tap Readings.

Video Filter

Figure 36 Video Filter Settings, 300 kHz Signal



Except for average power and VSWR measurements, all WPS measurements rely on a variable video filter to improve accuracy. This filter can be set to either 4.5 kHz, 400 kHz, or full bandwidth (10000kHz). It should be as narrow as possible while still being larger than the demodulated signal bandwidth (video bandwidth). Narrowing the filter limits the noise contribution caused by interfering signals. Listed below are some common modulation schemes and the appropriate video filter.

Video Filter	*Modulation Type*
4.5 kHz	CW Burst (Burst width > 150 µs), Voice Band AM, FM, Phase Modulation, Tetra
400 kHz	CW Burst (b.w. > 3 µs), GSM, 50 kHz AM, DQPSK
Full Bandwidth 10000kHz	CW Burst (b.w. > 200 ns), CDMA, WCDMA, DQPSK, DAB/DVB-T

7020 Sensor Measurements

The 7020 is available in models covering the following frequency ranges:

350-4000 MHz

350-4200 MHz

25-1000 MHz

Figure 37 7020 Power Sensor

The 7020 sensors can be used to measure:

- Forward Power
- Reflected Power
- VSWR

Measurement procedure

1. Zero the sensor. See "Zeroing a Sensor" on page 10
2. Tap the Display Controls Menu .
3. Tap Configuration.
4. Enter the Offset value (total attenuation of couplers and attenuators connected to the WPS).
5. Tap the Display Controls Menu
6. Tap Readings.

Directional Power Sensor (DPS) Measurements

Figure 38 Directional Power Sensor

The 5014 can be used to measure:

- Forward Power
- Reflected Power
- Match Measurements
- Sensor Temperature

Measurement procedure

1. Tap the Sensor Operation Menu.
2. Tap Sensor Mode.
3. Select measurement type based on elements inserted in the sensor. See "5014 Sensor Element Types" on page 53.
4. Tap the Display Controls Menu .
5. Tap Configuration.
6. Enter the Offset value (total attenuation of couplers and attenuators connected to the DPS).
7. Enter Forward Scale (watt rating of the forward element).
8. Tap the Display Controls Menu .
9. Tap Readings.

5014 Sensor Element Types

The DPS series sensors utilize elements in order to make power measurements. Each element has an arrow on it that represents the direction in which it measures power. The elements ignore power in the opposite direction with a directivity of at least 25 dB. The DPS series can make power measurements using either 43 type or APM/DPM elements, and the readings available vary, based on which elements are being used.

Since the DPS uses two elements, it can measure the quality of the system by comparing the forward and the reflected power. This is usually presented in the form of VSWR or Return Loss.

43 Type Elements

The 43 type elements are normally used to measure peak power. These elements can measure the peak power of a system with an accuracy of +/-8% of full scale as long as the signal meets the following requirements:

"At least 15 pps (pulses per second)

"Minimum pulse width of 15 ?s (800 ns if frequency is greater than 100 MHz)

"Minimum Duty Cycle of 0.01%

In addition, 43 type elements can be used to measure average power in signals with a peak-to-average ratio close to 1, like a CW or FM signals. In these cases, the average power is measured with an accuracy of +/- 5% of full scale.

APM/DPM Elements

The APM/DPM elements are used to measure true average power. True average power means the sensor provides equivalent heating power of the signal, regardless of modulation or number of carriers. These elements can measure average power with an accuracy of +/-5% of reading from full scale down to 2.5% of full scale.

Note: The equivalent heating power is dependent on the duty cycle of a signal. If a system puts out 50 watts with a 50% duty cycle, the APM/DPM elements will measure 25 watts.

Statistical Power Sensor Measurements

Figure 39 Statistical Power Sensor

The 7022 has three measurement modes and can be used to measure:

- Average Power Mode
  - Forward Power
  - Reflected Power
  - Match Measurements
  - Frequency
  - Sensor Temperature
- Time Domain Power Mode
  - Peak envelope power
  - Burst Average Power
  - Power Time Series
  - Duty Cycle
  - Overshoot
  - Width
  - Rise Time
  - Fall Time
  - Off Time
  - Period
  - Rep Rate
- Statistical Power Mode
  - Confidence
  - Duration
  - Power CCDF

Measurement procedure

If additional information about any settings is desired prior to beginning a measurement, see Additional Information.

1. Select Sensor Mode on the Sensor Operation Menu  .
   - Average Power
   - Time Domain
   - Statistical Power

Average Power Measurement

1. Zero the STAT Sensor. See "Zeroing a Sensor" on page 10
2. Tap the Display Controls Menu.
3. Tap Configuration.
4. Enter Bandwidth value, if desired (see Bandwidth (Video Filter)).
5. Tap the Display Controls Menu.
6. Tap Readings.

Time Domain Measurement

1. Zero the STAT Sensor. See "Zeroing a Sensor" on page 10
2. Tap the Display Controls Menu.
3. Tap Configuration.
4. Select Bandwidth value, if desired (see Bandwidth (Video Filter)).
5. Enter Sample Interval.
6. Select Trigger source and associated values, if desired.
7. Tap the Display Controls Menu.
8. Tap Readings.
9. Tap the Sensor Operation Menu.
10. Tap Device Actions.
11. Tap Start to initiate measurement.

Statistical Power Measurement

1. Zero the STAT Sensor. See "Zeroing a Sensor" on page 10
2. Tap the Display Controls Menu
3. Tap Configuration.
4. Select Bandwidth value, if desired (see Bandwidth (Video Filter)).
5. Select normal Run Mode (single sweep) or Clear/Restart (continuous sweeps).
6. Select Confidence Percentage, Sample Count, OR Sample Time. Change only one of these parameters. See Confidence Percentage.
7. Enter the dynamic Range value. This sets the dB scale (x-axis) for the graph.

8. Tap the Display Controls Menu.
9. Tap Readings.
10. Tap the Sensor Operation Menu.
11. Tap Device Actions.
12. Tap Start to initiate measurement.

Additional Information

Time Domain Mode

In Time Domain, the amplitude of a single frequency is measured, rather than sweeping a range of frequencies. The RF Meter measures and displays the amplitude of the frequency for a specified period (sweep time) and refreshes the display during the next sweep. The Time Domain trace resembles the horizontal line display on an oscilloscope.

Bandwidth (Video Filter) — The variable video filter is used to improve accuracy. The filter should be as narrow as possible while still being larger than the demodulated signal bandwidth (video bandwidth). Narrowing the filter limits the noise contribution caused by interfering signals.

- None (no filter)
- 4.5 kHz
- 500 kHz
- 5 MHz

Correction Frequency — Allows the user to input frequency to be measured or allow the sensor to determine frequency.

- Setting is a user selectable value between 6 GHz and 3.5 GHz. The specified frequency will be used in correcting the power measurement.
- auto enabled (default, sensor determines frequency)

  Note: *Use correction frequency when the sensor is unable to measure the frequency of a signal.*

Duty Cycle — Sets the duty of a measurement for determining the Burst Average power. If sensor is capable, the duty cycle will be inferred by the sensor hardware and reported. A user-defined duty cycle can be entered to override the sensor provided value.

User settings for duty cycle: user selects duty cycle or allows the sensor to determine duty cycle.

- Setting is a user selectable value between 100.00 and 0.00
- auto enabled

Sample Interval — Desired time interval between samples. Changing this setting will change the time duration of the Time Domain Measurement Graph. Actual time interval is the largest multiple of 1/44 Msps (~22 nanoseconds) less than the desired time interval. This setting will affect length of time required to complete Time Domain Measurement and the value on the x-axis of the graph.

- Setting is a user selectable value between 0.001489 and 0.000001

Trigger Source —

- Internal
- External
- Manual

Trigger Mode —

- Single
- Auto
- Normal

Trigger Edge —

- Rising
- Falling

Trigger Level — Specifies the power level required initiate a trigger.

- user selectable value between 0 and 1500 watts.

Trigger Level Auto Enabled

Trigger Hold Off time — Specifies the minimum amount of time after one trigger before another trigger can occur.

- user selectable value between 0 and 1 second.

Trigger Delay — Time interval between the occurrence of the trigger and acquisition of data.

- user selectable value between negative 3600 and positive 3600.

Statistical Power Mode

In Statistical Power Mode,the Bird RF Meter is capable of making meaningful power measurements of signals incorporating complex modulation methods. In essence, provide meaningful measurements independent of the modulation method used in the system.

Correction Frequency — Setting is a user selectable value between 6 GHz and 3.5 GHz

- auto enabled

Duty Cycle — Setting is a user selectable value between 100 and 0.

- auto enabled

Bandwidth (Video Filter) — See Bandwidth (Video Filter) under Time Domain Measurement.

Run Mode —

- Normal, RF Meter takes one measurement and stops
- Clear/Restart, Once one measurement is completed and displayed another measurement is started automatically.

Confidence Percentage — Setting is a user selectable value of: 80, 90, 95, 99, 99.9, or 99.99%.

Confidence Percentage	Sample Time (seconds)	Sample Count
80%	0.0261	1148400
90%	0.0339	1491600
95%	0.0421	1852400
99%	0.0604	2657600
99.9%	0.6038	26571600
99.99%	6.03850	265694000

Sample Time — Setting is a user selectable value of 0.0261 (26.1 ms) to 6.5535 seconds.

Sample Count — Setting is a user selectable value of 1144900 to 288354000 samples.

Dynamic Range — Selects the x-axis chart scale, setting is a user selectable value 0 - 43 dB.

Zeroing Sensor — Over time, the sensor's "zero value" (reading with no applied RF power) can drift, making all readings inaccurate by this value. For example, if the zero value is 0.02W, measuring a 50 W signal will give a reading of 49.98 W, a 0.04% error. Measuring a 1 W signal will give a reading of 0.98 W, a 2% error. If the drift would be a significant error, zero the sensor.

Antenna and Cable Monitor (ACMI) Measurements

Figure 40 ACMI

The ACMI is available in a variety of frequency ranges:

L0-xxxxxx	108 – 144 MHz
L1-xxxxxx	136 – 225 MHz
L2-xxxxxx	225 – 520 MHz
M-xxxxxx	470 – 960 MHz
H-xxxxxx	960 – 2400 MHz

The ACMI is used to measure:

- Forward Power
- Reflected Power
- Match Measurements
- Sensor Temperature

Alarms can be set for the following conditions:

- Low Power
- High Power
- High
- VSWR

Measurement procedure

The only configuration options for the ACMI are for alarms, relay control, and analog outputs for forward and reflected power. See "ACMI Configuration Menu Options" on page 60.

Reset Alarm option is available under Device Actions on the Sensor Operation Menu 

Alarms can be reset on the Functions Menu.

ACMI Configuration Menu Options

Alarm Sense — Alarm Sense sets the relay state (*NO* or *NC*) when an alarm condition occurs. This setting should match the relay electrical output (*NO* or *NC*) selected for ACMI relay interfacing equipment.
Options are Enabled and Disabled.

Alarm Enable — When Enable is selected, alarms will be reported whenever signal conditions exceed alarm settings.
Options are Enabled and Disabled.

VSWR Trip Point — Selectable set point for *VSWR* alarm, Settings are 1.3 through 2.5.

An alarm is triggered when:

- If *VSWR* is equal to or slightly higher than the trip point, reflected power is monitored for trend.
  - ✓ If reflected power is increasing an alarm is triggered.
  - ✓ If reflected power is not increasing, and
  - ✓ *VSWR* exceeds trip point for 30 seconds an alarm is triggered.
- If *VSWR* is much greater than the trip point an alarm is triggered immediately.

Low Power Alarm Enable — When Low Power Alarm **AND** Alarm Enable<XREF> are enabled, alarms will be reported whenever signal conditions fall below alarm settings.

Options are Enabled and Disabled.

Low Power Alarm Level — Setting for the trip point for the low power alarm. Enter the low power level for the alarm then select the unit associated with the value.

High Power Alarm Enable — When High Power Alarm **AND** Alarm Enable<XREF> are enabled, alarms will be reported whenever signal conditions exceed alarm settings.

Options are Enabled and Disabled.

High Power Alarm Level — Setting for the trip point for the high power alarm. Enter the high power level for the alarm then select the unit associated with the value.

Forward DAC Gain — The ACMI has an linear analog output voltage of 0-5 VDC representing the full scale of the forward power. The Forward *DAC* Gain setting allows the adjustment of the value the voltage represents. This allows for increased resolution at lower power levels.

1 - 5 VDC = Full Power
2 - 5 VDC = 1/2 Full Power
4 - 5 VDC = 1/4 Full Power
8 - 5 VDC = 1/8 Full Power

> **Note:** *If the full scale of the ACMI is 2.5 W to 100 W.*
> *If 1 is selected for the DAC Gain the 5 VDC output would be the equivalent of 100 W.*
> *If 2 is selected for the DAC Gain the 5 VDC output would be equivalent of 50 W.*

Reflected DAC Gain — The ACMI has an linear analog output voltage of 0-5 VDC representing the full scale of the reflected power. The Reflected *DAC* Gain setting allows the adjustment of the value the voltage represents. This allows for increased resolution at lower power levels.

1 - 5 VDC = Full Power
2 - 5 VDC = 1/2 Full Power
4 - 5 VDC = 1/4 Full Power
8 - 5 VDC = 1/8 Full Power

> **Note:** *If the reflected full scale of the ACMI is 250 mW to 10 W.*
> *If 1 is selected for the DAC Gain the 5 VDC output would be the equivalent of 10 W.*
> *If 2 is selected for the DAC Gain the 5 VDC output would be equivalent of 5 W.*

Alarm Latch Enable — When enabled, alarms must be manually reset. When disabled alarms will automatically reset after approximately 40 seconds.

VSWR Alarm on Zero Enable — When enabled, *VSWR* will alarm at low power (less than 2.5% of full scale) due to noise floor the sensor. When disabled,VSWR is NOT monitored at very low power levels (less than 2.5% of full scale).

Power Up Alarm Enable — When enabled, the ACMI will be in alarm condition on power on until first power measurements are made. When disabled, ACMI will not set an alarm at power on.

Figure 41 BPME

The BPME is available in a variety of frequency ranges and transmission line size:

VHF low	45 – 88 MHz
VHF	88 - 230 MHz
UHF	470-890 MHz

The BPME is used to measure:

- Forward Power
- Reflected Power
- Match Measurements
- Sensor Temperature

Alarms can be set for the following conditions:

- Low Power
- High Power
- High VSWR

Measurement procedure

The only configuration options for the BPME are for alarms, relay control, and analog outputs for forward and reflected power. See BPME Configuration Menu Options.

Reset Alarm option is available under Device Actions on the Sensor Operation Menu

BPME Configuration Menu Options

Alarm Sense — Alarm Sense sets the relay state (NO or NC) when an alarm condition occurs. This setting should match the relay electrical output (NO or NC) selected for BPME relay interfacing equipment.

Options are Enabled and Disabled.

Alarm Enable — When Enable is selected, alarms will be reported whenever signal conditions exceed alarm settings.

Options are Enabled and Disabled.

VSWR Trip Point — Selectable set point for VSWR alarm, Settings are 1.3 through 2.5.

An alarm is triggered when:

- If VSWR is equal to or slightly higher than the trip point, reflected power is monitored for trend.
  - If reflected power is increasing an alarm is triggered.
  - If reflected power is not increasing, and VSWR exceeds trip point for 30 seconds an alarm is triggered.
- If VSWR is much greater that the trip point an alarm is triggered immediately.

Low Power Alarm Enable — When Low Power Alarm AND Alarm Enable are enabled, alarms will be reported whenever signal conditions fall below alarm settings.

Options are Enabled and Disabled.

Low Power Alarm Level — Setting for the trip point for the low power alarm. Enter the low power level for the alarm then select the unit associated with the value.

High Power Alarm Enable — When High Power Alarm AND Alarm Enable are enabled, alarms will be reported whenever signal conditions exceed alarm settings.

Options are Enabled and Disabled.

High Power Alarm Level — Setting for the trip point for the high power alarm. Enter the high power level for the alarm then select the unit associated with the value.

Forward DAC Gain — The BPME has an linear analog output voltage of 0-2 VDC representing the full scale of the forward power. The Forward DAC Gain setting allows the adjustment of the value the voltage represents. This allows for increased resolution at lower power levels.

1 - 2 VDC = Full Power
2 - 2 VDC = 1/2 Full Power
4 - 2 VDC = 1/4 Full Power
8 - 2 VDC = 1/8 Full Power

Note: *If the full scale of the BPME is 2.5 W to 250 W.*
If 1 is selected for the DAC Gain the 2 VDC output would be the equivalent of 250 W.
If 2 is selected for the DAC Gain the 2 VDC output would be equivalent of 125 W.

Reflected DAC Gain — The BPME has an linear analog output voltage of 0-2 VDC representing the full scale of the reflected power. The Reflected DAC Gain setting allows the adjustment of the value the voltage represents. This allows for increased resolution at lower power levels.

1 - 2 VDC = Full Power
2 - 2 VDC = 1/2 Full Power
4 - 2 VDC = 1/4 Full Power
8 - 2 VDC = 1/8 Full Power

> **Note:** *If the reflected full scale of the BPME is 250 mW to 25 W.*
> *If 1 is selected for the DAC Gain the 2 VDC output would be the equivalent of 25 W.*
> *If 2 is selected for the DAC Gain the 2 VDC output would be equivalent of 12.5 W.*

Alarm Latch Enable — When enabled, alarms must be manually reset. When disabled alarms will automatically reset after approximately 40 seconds.

VSWR Alarm on Zero Enable — When enabled, VSWR will alarm at low power (less than 2.5% of full scale) due to noise floor the sensor. When disabled, VSWR is NOT monitored at very low power levels (less than 2.5% of full scale).

Power Up Alarm Enable — When enabled, the BPME will be in alarm condition on power on until first power measurements are made. When disabled, BPME will not set an alarm at power on.

Channel Power Monitor (CPM) Measurements

Figure 42 Channel Power Monitor

The CPM evaluates and monitors LMR systems by checking the key elements of the transmission path in real time and alerting users of degraded performance or failures.

> **Note:** *The number of channels the CPM can monitor is dependent on the number and type of RF sensors connected to the system.*

The CPM can be used to measure:

- Forward Power on multiple channels
- Reflected Power on multiple channels
- Match Measurements on multiple channels
- User Inputs X 3 (NO or NC)

Alarms can be set for the following conditions:

- Forward Power, min and max
- VSWR, min and max

Measurement procedure

The only configuration options for the CPM are for alarms, push to talk, and user inputs. See CPM Configuration Menu Options.

CPM Configuration Menu Options

> **Note:** *Each channel menu item is repeated for all 16 channels. User input menu items are repeated for all three user inputs.*

Channel X Enabled — When enabled, the associated channel is measured and the results will be displayed in the Readings Menu. When disabled, the channel is not measured.

Channel X VSWR Alarm — Selectable set point for VSWR alarm, settings are: Disabled, 1.25, 1.50, 1.75, and 2.00.

Channel X Forward Power Alarm — Setting for the trip point for the power alarm. Enter the power level for the alarm. Enter a zero to disable the power alarm.

Channel X Max Power — Enter the maximum power capability or the sensor connected to the associated channel.

Channel X Label — Enter a unique name for the associated channel.

Channel X Push To Talk Enabled — If channel alarms are enabled:

When Push To Talk is enabled, alarms for the associated channel will only be enabled when the push to talk input to the CPM back panel is active (radio is keyed). When disabled, alarms for the associated channel will be enabled regardless of radio status.

User Input X Enabled — When enabled, the CPM will monitor the associated input to the CPM back panel. When disabled the CPM does not monitor the input.

User Input X Normally Open — Used to select the type of circuit connected to the associated user input, options are Normally Open or Normally Closed.

User Input X Label — Enter a unique name for the associated user input.

Site Name — Enter a unique name for the site location of the CPM.

General Specifications

Display	Full-Color 8" 1280 x 800 pixel display with backlight.
Compatible Sensors	5012D, 5014,5016D, 5017D, 5018D, 5019D, 7020, 7022, 5015,5016D, 5017D, 5018D, 5019D, 7020, 7022, 5015-EF, 3141 CPM (4042, 4043, 4044, 4045), ACM/ACMI Series, BPME
Primary Display Functions (Sensor dependent)	True Average Power (Forward and Reflected)
	VSWR, Return Loss, rho, Match Efficiency
	Peak Power, Peak to Average Ratio, Crest Factor, PEP
	Burst and Burst Average Power
	CDF, CCDF, Confidence %
	IEEE 194 Pulse Parameters
	Sensor temperature.
Additional Functions	Data Logging, Numerical & Graphing display
Sensor Detection	Automatic USB sensors WiFi 802.11 Network scan for ACMI, BPME & CPM
Storage	16 GB
Operating System	Android 5.1
Camera[1]	Front / Rear, 5MP, AF and Flash
Data Transfer	WiFi 802.11, USB Storage Device
Upgradability	Field firmware update-able via USB port.
Calibration Interval	No Calibration required (sensor calibration required)
Languages	English
Power	
Operating Power	Internal Battery, AC Adapter/Charger
Internal Battery	Rechargeable, 3.7V/6200 mAh lithium battery
Field Replaceable	No
AC Adapter/Charger	AC: 100-240V / 50-60Hz; DC: 5V/2.5A
Charge Indicator	Icon on display

Battery Life	Minimum 8 Hours continuous usage (except 7022)
	24 hour data logging (display in sleep mode) (except 7022)

1 Camera interface disabled from factory for security, user activation required.

Physical and Environmental Specifications

Operating Temperature	-20 to +60 °C (-4 to +140 °F)
Storage Temperature	–20 to +80 °C (–4 to +176 °F)
Mechanical Shock	60G half-sine shock pulse
Vibration	Swept 5 to 100 Hz, all axis, 0.35mm
Drop	EN 61010-1: 1 m in most severe position MIL-PRF-28800F, Class 2: 10 drops corners & faces
Bench Handling	MIL-PRF-28800F, Class 2: 4 drops each face
Humidity, Max	95% maximum (non-condensing)
Altitude, Max	15,000 ft. (4,600 m)
Dimensions, Nominal	
Bare Unit	8.78” x 5.95” x 0.77” (223 x 151 x 20 mm)
With optional protective boot	9.19” x 6.31” x 1.1” (233 x 160 x 28 mm)
Weight, Max	1.3 lbs. (590g)
Housing	PC/ABS with rubber protective edge cover
Connectors/Interfaces	Micro USB PC interface & charging, Standard USB power sensor interface

Compliance

CE	Conforms to Radio Equipment Directive 2014/53/EU, 3.1(a) Health & Safety, 3.1(b) Electromagnetic Compatibility & 3.2 Effective Use of Spectrum
RoHS	Compliant to RoHS Directive 2011/65/EU Annex II and amending Annex (EU)2015/863

Accessories

Included Accessories

Item	Part Number
Charger, US, 5V, 2.5A	5B5002-2
Charger, International, 5V, 2.5A	5B5002-1
Cable, USB, Standard	5A2653-3R5NL4
Soft Carry Case, 5000-NG	5B5000-1
Instruction Manual (PDF)	920-5000-NG
Stylus	SK-TP-112
Cable, USB SeaLATCH Cable, 72"	5A2653-6L

Optional Accessories

Item	Part Number
Boot, Protective Rubber	TV-RCV2
Screen Protector, Scratch-resistant	TV-SP-BSPV1
Screen Protector, Impact-resistant	TV-SP-GCV1

Limited Warranty

All products manufactured by Seller are warranted to be free from defects in material and workmanship for a period of one (1) year, unless otherwise specified, from date of shipment and to conform to applicable specifications, drawings, blueprints and/or samples. Seller's sole obligation under these warranties shall be to issue credit, repair or replace any item or part thereof which is proved to be other than as warranted; no allowance shall be made for any labor charges of Buyer for replacement of parts, adjustment or repairs, or any other work, unless such charges are authorized in advance by Seller.

If Seller's products are claimed to be defective in material or workmanship or not to conform to specifications, drawings, blueprints and/or samples, Seller shall, upon prompt notice thereof, either examine the products where they are located or issue shipping instructions for return to Seller (transportation-charges prepaid by Buyer). In the event any of our products are proved to be other than as warranted, transportation costs (cheapest way) to and from Seller's plant, will be borne by Seller and reimbursement or credit will be made for amounts so expended by Buyer. Every such claim for breach of these warranties shall be deemed to be waived by Buyer unless made in writing within ten (10) days from the date of discovery of the defect.

The above warranties shall not extend to any products or parts thereof which have been subjected to any misuse or neglect, damaged by accident, rendered defective by reason of improper installation or by the performance of repairs or alterations outside of our plant, and shall not apply to any goods or parts thereof furnished by Buyer or acquired from others at Buyer's request and/or to Buyer's specifications. Routine (regularly required) calibration is not covered under this limited warranty. In addition, Seller's warranties do not extend to the failure of tubes, transistors, fuses and batteries, or to other equipment and parts manufactured by others except to the extent of the original manufacturer's warranty to Seller.

The obligations under the foregoing warranties are limited to the precise terms thereof. These warranties provide exclusive remedies, expressly in lieu of all other remedies including claims for special or consequential damages. SELLER NEITHER MAKES NOR ASSUMES ANY OTHER WARRANTY WHATSOEVER, WHETHER EXPRESS, STATUTORY, OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS, AND NO PERSON IS AUTHORIZED TO ASSUME FOR SELLER ANY OBLIGATION OR LIABILITY NOT STRICTLY IN ACCORDANCE WITH THE FOREGOING.